Overview

The DSP56374 is a high density CMOS device with 3.3 V inputs and outputs.

NOTE

This document contains information on a new product. Specifications and information herein are subject to change without notice.

The DSP56374 supports digital audio applications requiring sound field processing, acoustic equalization, and other digital audio algorithms. The DSP56374 uses the high performance, single-clock-per-cycle DSP56300 core family of programmable CMOS digital signal processors (DSPs) combined with the audio signal processing capability of the Freescale Semiconductor, Inc. (formerly Motorola) Symphony™ DSP family, as shown in . Significant architectural enhancements include a barrel shifter, 24-bit addressing, and direct memory access (DMA). The DSP56374 offers 150 million instructions per second (MIPS) using an internal 150 MHz clock.

Data Sheet Conventions

This data sheet uses the following conventions:

$\overline{\text{OVERBAR}}$	Used to indicate a signal that is active when pulled low (For example, the $\overline{\text{RESET}}$ pin is active when low.)
"asserted"	Means that a high true (active high) signal is high or that a low true (active low) signal is low
"deasserted"	Means that a high true (active high) signal is low or that a low true (active low) signal is high

Examples:

Signal/ Symbol	Logic State	Signal State	Voltage*
$\overline{\text{PIN}}$	True	Asserted	V_{IL} / V_{OL}
$\overline{\text{PIN}}$	False	Deasserted	V_{IH} / V_{OH}
PIN	True	Asserted	V_{IH} / V_{OH}
PIN	False	Deasserted	V_{IL} / V_{OL}

Note: *Values for V_{IL}, V_{OL}, V_{IH}, and V_{OH} are defined by individual product specifications.

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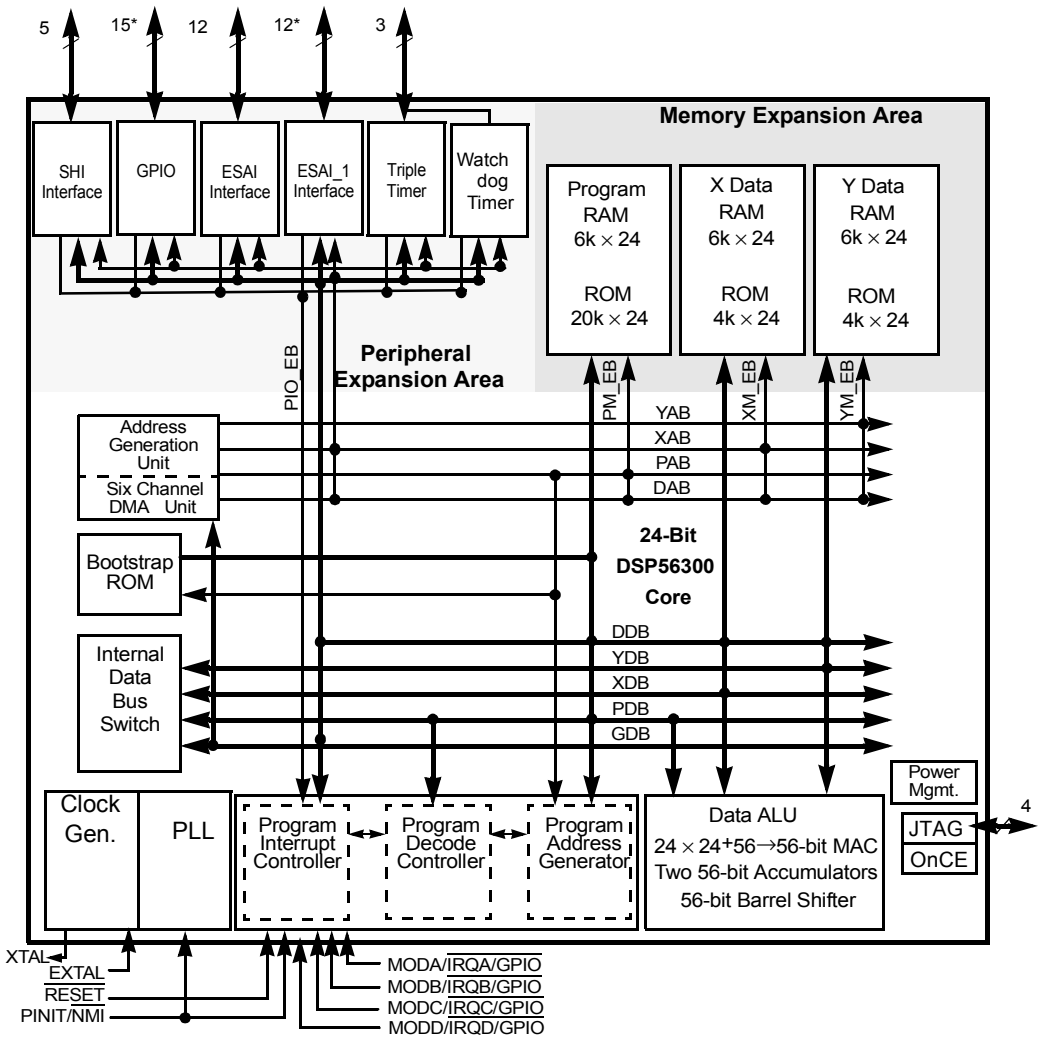


* ESAI_1 and dedicated GPIO pins are not available in the 52-pin package.

Figure 1. **DSP56374 Block Diagram**

1 Features

1.1 DSP56300 Modular Chassis

- 150 Million Instructions Per Second (MIPS) with a 150 MHz clock at an internal logic supply (QVDDL) of 1.25 V.
- Object Code Compatible with the 56K core.
- Data ALU with a 24 x 24 bit multiplier-accumulator and a 56-bit barrel shifter;16 bit arithmatic support.
- Program Control with position independent code support.
- Six-channel DMA controller.
- Provides a wide range of frequency multiplications (1 to 255), predivider factors (1 to 31), PLL feedback multiplier (2 or 4), Output divide factor (1, 2 or 4) and a power-saving clock divider (2^i: i = 0 to 7) to reduce clock noise
- Internal address tracing support and OnCE for Hardware/Software debugging.
- JTAG port, supporting boundary scan, compliant to IEEE 1149.1.
- Very low-power CMOS design, fully static design with operating frequencies down to DC.
- STOP and WAIT low-power standby modes.

1.2 On-chip Memory Configuration

- 6Kx24 Bit Y-Data RAM and 4Kx24 Bit Y-Data ROM.
- 6Kx24 Bit X-Data RAM and 4Kx24 Bit X-Data ROM.
- 20Kx24 Bit Program and Bootstrap ROM including a PROM patching mechanism.
- 6Kx24 Bit Program RAM.
- Various memory switches are available. See memory table below.

Table 1. DSP56374 Memory Switch Configurations

Bit Settings			Memory Sizes (24-bit words)					
MSW1	MSW0	MS	Prog RAM	X Data RAM	Y Data RAM	Prog ROM	X Data ROM	Y Data ROM
X	X	0	6K	6K	6K	20K	4K	4K
0	0	1	2K	10K	6K	20K	4K	4K
0	1	1	4K	8K	6K	20K	4K	4K
1	0	1	8K	4K	6K	20K	4K	4K
1	1	1	10K	4K	4K	20K	4K	4K

1.3 Peripheral modules

- Enhanced Serial Audio Interface (ESAI): up to 4 receiver pins and up to 6 transmitter pins, master or slave. I^2S, Sony, AC97, network and other programmable protocols.
- Enhanced Serial Audio Interface I (ESAI_1): up to 4 receiver pins and up to 6 transmitter pins, master or slave. I^2S, Sony, AC97, network and other programmable protocols. *Note: Available in the 80 pin package only*
- Serial Host Interface (SHI): SPI and I^2C protocols, 10-word receive FIFO, support for 8, 16 and 24-bit words. Three noise reduction filter modes.
- Triple Timer module (TEC).
- Most pins of unused peripherals may be programmed as GPIO pins. Up to 47 pins can be configured as GPIO on the 80 pin package and 20 pins on the 52 pin package.
- Hardware Watchdog Timer

1.4 Packages

- 80-pin and 52-pin plastic LQFP packages.

2 Documentation

Table 2 lists the documents that provide a complete description of the DSP56374 and are required to design properly with the part. Documentation is available from a local Freescale Semiconductor, Inc. (formerly Motorola) distributor, semiconductor sales office, Literature Distribution Center, or through the Freescale DSP home page on the Internet (the source for the latest information).

Table 2. DSP56374 Documentation

Document Name	Description	Order Number
DSP56300 Family Manual	Detailed description of the 56300-family architecture and the 24-bit core processor and instruction set	DSP56300FM/AD
DSP56374 User's Manual	Detailed description of memory, peripherals, and interfaces	DSP56374UM/D
DSP56374 Technical Data Sheet	Electrical and timing specifications; pin and package descriptions	DSP56374
DSP56374 Product Brief	Brief description of the chip	DSP56374PB/D

3 Signal Groupings

The input and output signals of the DSP56374 are organized into functional groups, which are listed in Table 3..

The DSP56374 is operated from a 1.25 V and 3.3 V supply; however, some of the inputs can tolerate 5.0 V. A special notice for this feature is added to the signal descriptions of those inputs.

Table 3. DSP56374 Functional Signal Groupings

Functional Group		Number of Signals[1]	Detailed Description
Power (V_{DD})		11	Table 15.
Ground (GND)		9	Table 5.
Scan Pins		1	Table 6.
Clock and PLL		3	Table 7.
Interrupt and mode control	Port H[2]	5	Table 8.
SHI	Port H[2]	5	Table 9.
ESAI	Port C[4]	12	Table 10.
ESAI_1	Port E[5]	12	Table 11.
Dedicated GPIO	Port G[3]	15	Table 12.
Timer		3	Table 13.
JTAG/OnCE Port		4	Table 14.

Note:
1. Pins are not 5 V. tolerant unless noted.
2. Port H signals are the GPIO port signals which are multiplexed with the MOD and $\overline{\text{HREQ}}$ signals.
3. Port G signals are the dedicated GPIO port signals.
4. Port C signals are the GPIO port signals which are multiplexed with the ESAI signals.
5. Port E signals are the GPIO port signals which are multiplexed with the ESAI_1 signals.

3.1 Power

Table 4. Power Inputs

Power Name	Description
PLLA_VDD (1)	PLL Power— The voltage (3.3 V) should be well-regulated and the input should be provided with an extremely low impedance path to the 3.3 V_{DD} power rail. The user must provide adequate external decoupling capacitors between PLLA_VDD and PLLA_GND. PLLA_VDD requires a filter as shown in Figure 21 and Figure 22 below. See the DSP56374 technical data sheet for additional details.
PLLP_VDD(1)	PLL Power— The voltage (3.3 V) should be well-regulated and the input should be provided with an extremely low impedance path to the 3.3 V_{DD} power rail. The user must provide adequate external decoupling capacitors between PLLP_VDD and PLLP_GND.
PLLD_VDD (1)	PLL Power— The voltage (1.25 V) should be well-regulated and the input should be provided with an extremely low impedance path to the 1.25 V_{DD} power rail. The user must provide adequate external decoupling capacitors between PLLD_VDD and PLLD_GND.
CORE_VDD (4)	Core Power—The voltage (1.25 V) should be well-regulated and the input should be provided with an extremely low impedance path to the 1.25 V_{DD} power rail. The user must provide adequate external decoupling capacitors.
IO_VDD (80-pin 4) (52-pin 3)	SHI, ESAI, ESAI_1, WDT and Timer I/O Power —The voltage (3.3 V) should be well-regulated, and the input should be provided with an extremely low impedance path to the 3.3 V_{DD} power rail. This is an isolated power for the SHI, ESAI, ESAI_1, WDT and Timer I/O. The user must provide adequate external decoupling capacitors.

3.2 Ground

Table 5. Grounds

Ground Name	Description
PLLA_GND(1)	PLL Ground—The PLL ground should be provided with an extremely low-impedance path to ground. This connection must be tied externally to all other chip ground connections. The user must provide adequate external decoupling capacitors between PLLA_VDD and PLLA_GND.
PLLP_GND(1)	PLL Ground—The PLL ground should be provided with an extremely low-impedance path to ground. This connection must be tied externally to all other chip ground connections. The user must provide adequate external decoupling capacitors between PLLP_VDD and PLLP_GND.
PLLD_GND(1)	PLL Ground—The PLL ground should be provided with an extremely low-impedance path to ground. This connection must be tied externally to all other chip ground connections. The user must provide adequate external decoupling capacitors between PLLD_VDD and PLLD_GND.
CORE_GND(4)	Core Ground—The Core ground should be provided with an extremely low-impedance path to ground. This connection must be tied externally to all other chip ground connections. The user must provide adequate external decoupling capacitors.
IO_GND(2)	SHI, ESAI, ESAI_1, WDT and Timer I/O Ground—IO_GND is the ground for the SHI, ESAI, ESAI_1, WDT and Timer I/O. This connection must be tied externally to all other chip ground connections. The user must provide adequate external decoupling capacitors.

3.3 SCAN

Table 6. SCAN signals

Signal Name	Type	State during Reset	Signal Description
SCAN	Input	Input	SCAN—Manufacturing test pin. This pin must be connected to ground.

3.4 Clock and PLL

Table 7. Clock and PLL Signals

Signal Name	Type	State during Reset	Signal Description
EXTAL	Input	Input	External Clock / Crystal Input—An external clock source must be connected to EXTAL in order to supply the clock to the internal clock generator and PLL.
XTAL	Output	Chip Driven	Crystal Output—Connects the internal Crystal Oscillator output to an external crystal. If an external clock is used, leave XTAL unconnected.
PINIT/$\overline{\text{NMI}}$	Input	Input	PLL Initial/Nonmaskable Interrupt—During assertion of $\overline{\text{RESET}}$, the value of PINIT/$\overline{\text{NMI}}$ is written into the PLL Enable (PEN) bit of the PLL control register, determining whether the PLL is enabled or disabled. After $\overline{\text{RESET}}$ de-assertion and during normal instruction processing, the PINIT/$\overline{\text{NMI}}$ Schmitt-trigger input is a negative-edge-triggered nonmaskable interrupt (NMI) request internally synchronized to the internal system clock. This pin has an internal pull up resistor. This input is 5 V tolerant.

3.5 Interrupt and Mode Control

The interrupt and mode control signals select the chip's operating mode as it comes out of hardware reset. After $\overline{\text{RESET}}$ is de-asserted, these inputs are hardware interrupt request lines.

Table 8. Interrupt and Mode Control

Signal Name	Type	State during Reset	Signal Description
MODA/$\overline{\text{IRQA}}$	Input	MODA Input	Mode Select A/External Interrupt Request A—MODA/$\overline{\text{IRQA}}$ is an active-low Schmitt-trigger input, internally synchronized to the DSP clock. MODA/$\overline{\text{IRQA}}$ selects the initial chip operating mode during hardware reset and becomes a level-sensitive or negative-edge-triggered, maskable interrupt request input during normal instruction processing. This pin can also be programmed as GPIO. MODA, MODB, MODC, and MODD select one of 16 initial chip operating modes, latched into the OMR when the $\overline{\text{RESET}}$ signal is de-asserted. If the processor is in the stop standby state and the MODA/$\overline{\text{IRQA}}$ pin is pulled to GND, the processor will exit the stop state. This pin has an internal pull up resistor. This input is 5 V tolerant.

Table 8. Interrupt and Mode Control (Continued)

Signal Name	Type	State during Reset	Signal Description
PH0	Input, output, or disconnected		Port H0—When the MODA/IRQA is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected.
MODB/$\overline{\text{IRQB}}$	Input	MODB Input	Mode Select B/External Interrupt Request B—MODB/$\overline{\text{IRQB}}$ is an active-low Schmitt-trigger input, internally synchronized to the DSP clock. MODB/$\overline{\text{IRQB}}$ selects the initial chip operating mode during hardware reset and becomes a level-sensitive or negative-edge-triggered, maskable interrupt request input during normal instruction processing. This pin can also be programmed as GPIO. MODA, MODB, MODC, and MODD select one of 16 initial chip operating modes, latched into OMR when the $\overline{\text{RESET}}$ signal is de-asserted. This pin has an internal pull up resistor. This input is 5 V tolerant.
PH1	Input, output, or disconnected		Port H1—When the MODB/IRQB is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected.
MODC/$\overline{\text{IRQC}}$	Input	MODC Input	Mode Select C/External Interrupt Request C—MODC/$\overline{\text{IRQC}}$ is an active-low Schmitt-trigger input, internally synchronized to the DSP clock. MODC/$\overline{\text{IRQC}}$ selects the initial chip operating mode during hardware reset and becomes a level-sensitive or negative-edge-triggered, maskable interrupt request input during normal instruction processing. This pin can also be programmed as GPIO. MODA, MODB, MODC, and MODD select one of 16 initial chip operating modes, latched into OMR when the $\overline{\text{RESET}}$ signal is de-asserted. This pin has an internal pull up resistor. This input is 5 V tolerant.
PH2	Input, output, or disconnected		Port H2—When the MODC/IRQC is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected.
MODD/$\overline{\text{IRQD}}$	Input	MODD Input	Mode Select D/External Interrupt Request D—MODD/$\overline{\text{IRQD}}$ is an active-low Schmitt-trigger input, internally synchronized to the DSP clock. MODD/$\overline{\text{IRQD}}$ selects the initial chip operating mode during hardware reset and becomes a level-sensitive or negative-edge-triggered, maskable interrupt request input during normal instruction processing. This pin can also be programmed as GPIO. MODA, MODB, MODC, and MODD select one of 16 initial chip operating modes, latched into OMR when the $\overline{\text{RESET}}$ signal is de-asserted. This pin has an internal pull up resistor. This input is 5 V tolerant.
PH3	Input, output, or disconnected		Port H3—When the MODD/IRQD is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected.

Table 8. Interrupt and Mode Control (Continued)

Signal Name	Type	State during Reset	Signal Description
RESET	Input	Input	Reset—$\overline{\text{RESET}}$ is an active-low, Schmitt-trigger input. When asserted, the chip is placed in the Reset state and the internal phase generator is reset. The Schmitt-trigger input allows a slowly rising input (such as a capacitor charging) to reset the chip reliably. When the $\overline{\text{RESET}}$ signal is de-asserted, the initial chip operating mode is latched from the MODA, MODB, MODC, and MODD inputs. The $\overline{\text{RESET}}$ signal must be asserted during power up. A stable EXTAL signal must be supplied while $\overline{\text{RESET}}$ is being asserted. This pin has an internal pull up resistor. This input is 5 V tolerant.

3.6 Serial Host Interface

The SHI has five I/O signals that can be configured to allow the SHI to operate in either SPI or I^2C mode.

Table 9. Serial Host Interface Signals

Signal Name	Signal Type	State during Reset	Signal Description
SCK	Input or output	Tri-stated	SPI Serial Clock—The SCK signal is an output when the SPI is configured as a master and a Schmitt-trigger input when the SPI is configured as a slave. When the SPI is configured as a master, the SCK signal is derived from the internal SHI clock generator. When the SPI is configured as a slave, the SCK signal is an input, and the clock signal from the external master synchronizes the data transfer. The SCK signal is ignored by the SPI if it is defined as a slave and the slave select ($\overline{\text{SS}}$) signal is not asserted. In both the master and slave SPI devices, data is shifted on one edge of the SCK signal and is sampled on the opposite edge where data is stable. Edge polarity is determined by the SPI transfer protocol.
SCL	Input or output		I^2C Serial Clock—SCL carries the clock for I^2C bus transactions in the I^2C mode. SCL is a Schmitt-trigger input when configured as a slave and an open-drain output when configured as a master. SCL should be connected to V_{DD} through an external pull-up resistor according to the I^2C specifications. This signal is tri-stated during hardware, software, and individual reset. This pin has an internal pull up resistor. This input is 5 V tolerant.

Table 9. Serial Host Interface Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
MISO	Input or output	Tri-stated	SPI Master-In-Slave-Out—When the SPI is configured as a master, MISO is the master data input line. The MISO signal is used in conjunction with the MOSI signal for transmitting and receiving serial data. This signal is a Schmitt-trigger input when configured for the SPI Master mode, an output when configured for the SPI Slave mode, and tri-stated if configured for the SPI Slave mode when $\overline{SS}$ is de-asserted. An external pull-up resistor is not required for SPI operation.
SDA	Input or open-drain output		I^2C Data and Acknowledge—In I^2C mode, SDA is a Schmitt-trigger input when receiving and an open-drain output when transmitting. SDA should be connected to V_{DD} through a pull-up resistor. SDA carries the data for I^2C transactions. The data in SDA must be stable during the high period of SCL. The data in SDA is only allowed to change when SCL is low. When the bus is free, SDA is high. The SDA line is only allowed to change during the time SCL is high in the case of start and stop events. A high-to-low transition of the SDA line while SCL is high is a unique situation, and is defined as the start event. A low-to-high transition of SDA while SCL is high is a unique situation defined as the stop event. This signal is tri-stated during hardware, software, and individual reset. Thus, there is no need for an external pull-up in this state. This pin has an internal pull up resistor. This input is 5 V tolerant.
MOSI	Input or output	Tri-stated	SPI Master-Out-Slave-In—When the SPI is configured as a master, MOSI is the master data output line. The MOSI signal is used in conjunction with the MISO signal for transmitting and receiving serial data. MOSI is the slave data input line when the SPI is configured as a slave. This signal is a Schmitt-trigger input when configured for the SPI Slave mode.
HA0	Input		I^2C Slave Address 0—This signal uses a Schmitt-trigger input when configured for the I^2C mode. When configured for I^2C slave mode, the HA0 signal is used to form the slave device address. HA0 is ignored when configured for the I^2C master mode. This signal is tri-stated during hardware, software, and individual reset. Thus, there is no need for an external pull-up in this state. This pin has an internal pull up resistor. This input is 5 V tolerant.
SS	Input	Ignored Input	SPI Slave Select—This signal is an active low Schmitt-trigger input when configured for the SPI mode. When configured for the SPI Slave mode, this signal is used to enable the SPI slave for transfer. When configured for the SPI master mode, this signal should be kept de-asserted (pulled high). If it is asserted while configured as SPI master, a bus error condition is flagged. If $\overline{SS}$ is de-asserted, the SHI ignores SCK clocks and keeps the MISO output signal in the high-impedance state.
HA2	Input		I^2C Slave Address 2—This signal uses a Schmitt-trigger input when configured for the I^2C mode. When configured for the I^2C Slave mode, the HA2 signal is used to form the slave device address. HA2 is ignored in the I^2C master mode. This pin has an internal pull up resistor. This input is 5 V tolerant.

Table 9. Serial Host Interface Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
HREQ	Input or Output	Tri-stated	Host Request—This signal is an active low Schmitt-trigger input when configured for the master mode but an active low output when configured for the slave mode. When configured for the slave mode, $\overline{\text{HREQ}}$ is asserted to indicate that the SHI is ready for the next data word transfer and de-asserted at the first clock pulse of the new data word transfer. When configured for the master mode, $\overline{\text{HREQ}}$ is an input. When asserted by the external slave device, it will trigger the start of the data word transfer by the master. After finishing the data word transfer, the master will await the next assertion of $\overline{\text{HREQ}}$ to proceed to the next transfer. This pin can also be programmed as GPIO. Port H4—When $\overline{\text{HREQ}}$ is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. This pin has an internal pull up resistor. This input is 5 V tolerant.
PH4	Input, output, or disconnected		

3.7 Enhanced Serial Audio Interface

Table 10. Enhanced Serial Audio Interface Signals

Signal Name	Signal Type	State during Reset	Signal Description
HCKR	Input or output	GPIO disconnected	High Frequency Clock for Receiver—When programmed as an input, this signal provides a high frequency clock source for the ESAI receiver as an alternate to the DSP core clock. When programmed as an output, this signal can serve as a high-frequency sample clock (e.g., for external digital to analog converters [DACs]) or as an additional system clock.
PC2	Input, output, or disconnected		Port C2—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. This pin has an internal pull up resistor. This input is 5 V tolerant.

Table 10. Enhanced Serial Audio Interface Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
HCKT	Input or output	GPIO disconnected	High Frequency Clock for Transmitter—When programmed as an input, this signal provides a high frequency clock source for the ESAI transmitter as an alternate to the DSP core clock. When programmed as an output, this signal can serve as a high frequency sample clock (e.g., for external DACs) or as an additional system clock.
PC5	Input, output, or disconnected		Port C5—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. This pin has an internal pull up resistor. This input is 5 V tolerant.
FSR	Input or output	GPIO disconnected	Frame Sync for Receiver—This is the receiver frame sync input/output signal. In the asynchronous mode (SYN=0), the FSR pin operates as the frame sync input or output used by all the enabled receivers. In the synchronous mode (SYN=1), it operates as either the serial flag 1 pin (TEBE=0), or as the transmitter external buffer enable control (TEBE=1, RFSD=1). When this pin is configured as serial flag pin, its direction is determined by the RFSD bit in the RCCR register. When configured as the output flag OF1, this pin will reflect the value of the OF1 bit in the SAICR register, and the data in the OF1 bit will show up at the pin synchronized to the frame sync in normal mode or the slot in network mode. When configured as the input flag IF1, the data value at the pin will be stored in the IF1 bit in the SAISR register, synchronized by the frame sync in normal mode or the slot in network mode.
PC1	Input, output, or disconnected		Port C1—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

Table 10. Enhanced Serial Audio Interface Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
FST	Input or output	GPIO disconnected	Frame Sync for Transmitter—This is the transmitter frame sync input/output signal. For synchronous mode, this signal is the frame sync for both transmitters and receivers. For asynchronous mode, FST is the frame sync for the transmitters only. The direction is determined by the transmitter frame sync direction (TFSD) bit in the ESAI transmit clock control register (TCCR).
PC4	Input, output, or disconnected		Port C4—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SCKR	Input or output	GPIO disconnected	Receiver Serial Clock—SCKR provides the receiver serial bit clock for the ESAI. The SCKR operates as a clock input or output used by all the enabled receivers in the asynchronous mode (SYN=0), or as serial flag 0 pin in the synchronous mode (SYN=1). When this pin is configured as serial flag pin, its direction is determined by the RCKD bit in the RCCR register. When configured as the output flag OF0, this pin will reflect the value of the OF0 bit in the SAICR register, and the data in the OF0 bit will show up at the pin synchronized to the frame sync in normal mode or the slot in network mode. When configured as the input flag IF0, the data value at the pin will be stored in the IF0 bit in the SAISR register, synchronized by the frame sync in normal mode or the slot in network mode.
PC0	Input, output, or disconnected		Port C0—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SCKT	Input or output	GPIO disconnected	Transmitter Serial Clock—This signal provides the serial bit rate clock for the ESAI. SCKT is a clock input or output used by all enabled transmitters and receivers in synchronous mode, or by all enabled transmitters in asynchronous mode.
PC3	Input, output, or disconnected		Port C3—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

Table 10. Enhanced Serial Audio Interface Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
SDO5	Output	GPIO disconnected	Serial Data Output 5—When programmed as a transmitter, SDO5 is used to transmit data from the TX5 serial transmit shift register.
SDI0	Input		Serial Data Input 0—When programmed as a receiver, SDI0 is used to receive serial data into the RX0 serial receive shift register.
PC6	Input, output, or disconnected		Port C6—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SDO4	Output	GPIO disconnected	Serial Data Output 4—When programmed as a transmitter, SDO4 is used to transmit data from the TX4 serial transmit shift register.
SDI1	Input		Serial Data Input 1—When programmed as a receiver, SDI1 is used to receive serial data into the RX1 serial receive shift register.
PC7	Input, output, or disconnected		Port C7—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SDO3	Output	GPIO disconnected	**Serial Data Output 3**—When programmed as a transmitter, SDO3 is used to transmit data from the TX3 serial transmit shift register.
SDI2	Input		**Serial Data Input 2**—When programmed as a receiver, SDI2 is used to receive serial data into the RX2 serial receive shift register.
PC8	Input, output, or disconnected		Port C8—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

Table 10. Enhanced Serial Audio Interface Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
SDO2	Output	GPIO disconnected	Serial Data Output 2—When programmed as a transmitter, SDO2 is used to transmit data from the TX2 serial transmit shift register
SDI3	Input		Serial Data Input 3—When programmed as a receiver, SDI3 is used to receive serial data into the RX3 serial receive shift register.
PC9	Input, output, or disconnected		Port C9—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SDO1	Output	GPIO disconnected	Serial Data Output 1—SDO1 is used to transmit data from the TX1 serial transmit shift register.
PC10	Input, output, or disconnected		Port C10—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SDO0	Output	GPIO disconnected	Serial Data Output 0—SDO0 is used to transmit data from the TX0 serial transmit shift register.
PC11	Input, output, or disconnected		Port C11—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

3.8 Enhanced Serial Audio Interface_1

Table 11. Enhanced Serial Audio Interface_1 Signals

Signal Name	Signal Type	State during Reset	Signal Description
HCKR_1	Input or output	GPIO disconnected	High Frequency Clock for Receiver—When programmed as an input, this signal provides a high frequency clock source for the ESAI_1 receiver as an alternate to the DSP core clock. When programmed as an output, this signal can serve as a high-frequency sample clock (e.g., for external digital to analog converters [DACs]) or as an additional system clock.
PE2	Input, output, or disconnected		Port E2—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
HCKT_1	Input or output	GPIO disconnected	High Frequency Clock for Transmitter—When programmed as an input, this signal provides a high frequency clock source for the ESAI_1 transmitter as an alternate to the DSP core clock. When programmed as an output, this signal can serve as a high frequency sample clock (e.g., for external DACs) or as an additional system clock.
PE5	Input, output, or disconnected		Port E5—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

Table 11. Enhanced Serial Audio Interface_1 Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
FSR_1	Input or output	GPIO disconnected	Frame Sync for Receiver_1—This is the receiver frame sync input/output signal. In the asynchronous mode (SYN=0), the FSR_1 pin operates as the frame sync input or output used by all the enabled receivers. In the synchronous mode (SYN=1), it operates as either the serial flag 1 pin (TEBE=0), or as the transmitter external buffer enable control (TEBE=1, RFSD=1). When this pin is configured as serial flag pin, its direction is determined by the RFSD bit in the RCCR_1 register. When configured as the output flag OF1, this pin will reflect the value of the OF1 bit in the SAICR_1 register, and the data in the OF1 bit will show up at the pin synchronized to the frame sync in normal mode or the slot in network mode. When configured as the input flag IF1, the data value at the pin will be stored in the IF1 bit in the SAISR_1 register, synchronized by the frame sync in normal mode or the slot in network mode.
PE1	Input, output, or disconnected		Port E1—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant
FST_1	Input or output	GPIO disconnected	Frame Sync for Transmitter_1—This is the transmitter frame sync input/output signal. For synchronous mode, this signal is the frame sync for both transmitters and receivers. For asynchronous mode, FST_1 is the frame sync for the transmitters only. The direction is determined by the transmitter frame sync direction (TFSD) bit in the ESAI_1 transmit clock control register (TCCR_1).
PE4	Input, output, or disconnected		Port E4—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

Table 11. Enhanced Serial Audio Interface_1 Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
SCKR_1	Input or output	GPIO disconnected	Receiver Serial Clock_1—SCKR_1 provides the receiver serial bit clock for the ESAI_1. The SCKR_1 operates as a clock input or output used by all the enabled receivers in the asynchronous mode (SYN=0), or as serial flag 0 pin in the synchronous mode (SYN=1). When this pin is configured as serial flag pin, its direction is determined by the RCKD bit in the RCCR_1 register. When configured as the output flag OF0, this pin will reflect the value of the OF0 bit in the SAICR_1 register, and the data in the OF0 bit will show up at the pin synchronized to the frame sync in normal mode or the slot in network mode. When configured as the input flag IF0, the data value at the pin will be stored in the IF0 bit in the SAISR_1 register, synchronized by the frame sync in normal mode or the slot in network mode.
PE0	Input, output, or disconnected		Port E0—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant
SCKT_1	Input or output	GPIO disconnected	Transmitter Serial Clock_1—This signal provides the serial bit rate clock for the ESAI_1. SCKT_1 is a clock input or output used by all enabled transmitters and receivers in synchronous mode, or by all enabled transmitters in asynchronous mode.
PE3	Input, output, or disconnected		Port E3—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant

Table 11. Enhanced Serial Audio Interface_1 Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
SDO5_1	Output	GPIO disconnected	Serial Data Output 5_1—When programmed as a transmitter, SDO5_1 is used to transmit data from the TX5 serial transmit shift register.
SDI0_1	Input		Serial Data Input 0_1—When programmed as a receiver, SDI0_1 is used to receive serial data into the RX0 serial receive shift register.
PE6	Input, output, or disconnected		Port E6—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant
SDO4_1	Output	GPIO disconnected	Serial Data Output 4_1—When programmed as a transmitter, SDO4_1 is used to transmit data from the TX4 serial transmit shift register.
SDI1_1	Input		Serial Data Input 1_1—When programmed as a receiver, SDI1_1 is used to receive serial data into the RX1 serial receive shift register.
PE7	Input, output, or disconnected		Port E7—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SDO3_1	Output	GPIO disconnected	**Serial Data Output 3**—When programmed as a transmitter, SDO3_1 is used to transmit data from the TX3 serial transmit shift register.
SDI2_1	Input		**Serial Data Input 2**—When programmed as a receiver, SDI2_1 is used to receive serial data into the RX2 serial receive shift register.
PE8	Input, output, or disconnected		Port E8—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

Table 11. Enhanced Serial Audio Interface_1 Signals (Continued)

Signal Name	Signal Type	State during Reset	Signal Description
SDO2_1	Output	GPIO disconnected	Serial Data Output 2—When programmed as a transmitter, SDO2_1 is used to transmit data from the TX2 serial transmit shift register.
SDI3_1	Input		Serial Data Input 3—When programmed as a receiver, SDI3_1 is used to receive serial data into the RX3 serial receive shift register.
PE9	Input, output, or disconnected		Port E9—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SDO1_1	Output	GPIO disconnected	Serial Data Output 1—SDO1_1 is used to transmit data from the TX1 serial transmit shift register.
PE10	Input, output, or disconnected		Port E10—When the ESAI is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.
SDO0_1	Output	GPIO disconnected	Serial Data Output 0—SDO0_1 is used to transmit data from the TX0 serial transmit shift register.
PE11	Input, output, or disconnected		Port E11—When the ESAI_1 is configured as GPIO, this signal is individually programmable as input, output, or internally disconnected. The default state after reset is GPIO disconnected. Internal Pull down resistor. This input is 5 V tolerant.

3.9 Dedicated GPIO - Port G

Table 12. Dedicated GPIO - Port G Signals

Signal Name	Type	State During Reset	Signal Description
PG0	Input, output, or disconnected	GPIO disconnected	Port G0—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant

Table 12. Dedicated GPIO - Port G Signals (Continued)

Signal Name	Type	State During Reset	Signal Description
PG1	Input, output, or disconnected	GPIO disconnected	Port G1—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG2	Input, output, or disconnected	GPIO disconnected	Port G2—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG3	Input, output, or disconnected	GPIO disconnected	Port G3—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG4	Input, output, or disconnected	GPIO disconnected	Port G4—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG5	Input, output, or disconnected	GPIO disconnected	Port G5—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG6	Input, output, or disconnected	GPIO disconnected	Port G6—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG7	Input, output, or disconnected	GPIO disconnected	Port G7—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG8	Input, output, or disconnected	GPIO disconnected	Port G8—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant

Table 12. Dedicated GPIO - Port G Signals (Continued)

Signal Name	Type	State During Reset	Signal Description
PG9	Input, output, or disconnected	GPIO disconnected	Port G9—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG10	Input, output, or disconnected	GPIO disconnected	Port G10—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG11	Input, output, or disconnected	GPIO disconnected	Port G11—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG12	Input, output, or disconnected	GPIO disconnected	Port G12—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG13	Input, output, or disconnected	GPIO disconnected	Port G13—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant
PG14	Input, output, or disconnected	GPIO disconnected	Port G14—This signal is individually programmable as input, output, or internally disconnected. Internal Pull down resistor. This input is 5 V tolerant

3.10 Timer

Table 13. Timer Signal

Signal Name	Type	State during Reset	Signal Description
TIO0	Input or Output	GPIO Input	Timer 0 Schmitt-Trigger Input/Output—When timer 0 functions as an external event counter or in measurement mode, TIO0 is used as input. When timer 0 functions in watchdog, timer, or pulse modulation mode, TIO0 is used as output. The default mode after reset is GPIO input. This can be changed to output or configured as a timer input/output through the timer 0 control/status register (TCSR0). If TIO0 is not being used, it is recommended to either define it as GPIO output immediately at the beginning of operation or leave it defined as GPIO input. Internal Pull down resistor. This input is 5 V tolerant
TIO1	Input or Output	Watchdog Timer Output	Timer 1 Schmitt-Trigger Input/Output—When timer 1 functions as an external event counter or in measurement mode, TIO1 is used as input. When timer 1 functions in watchdog, timer, or pulse modulation mode, TIO1 is used as output. The default mode after reset is GPIO input. This can be changed to output or configured as a timer input/output through the timer 1control/status register (TCSR1). If TIO1 is not being used, it is recommended to either define it as GPIO output immediately at the beginning of operation or leave it defined as GPIO input.
WDT	Output		WDT—When this pin is configured as a hardware watchdog timer pin, this signal is asserted low when the hardware watchdog timer counts down to zero. Internal Pull down resistor. This input is 5 V tolerant
TIO2	Input or Output	PLOCK Output	Timer 2 Schmitt-Trigger Input/Output—When timer 2 functions as an external event counter or in measurement mode, TIO2 is used as input. When timer 2 functions in watchdog, timer, or pulse modulation mode, TIO2 is used as output. The default mode after reset is GPIO input. This can be changed to output or configured as a timer input/output through the timer control/status register (TCSR2). If TIO2 is not being used, it is recommended to either define it as GPIO output immediately at the beginning of operation or leave it defined as GPIO input .

Table 13. Timer Signal (Continued)

Signal Name	Type	State during Reset	Signal Description
PLOCK	Output		PLOCK—When this pin is configured as a PLL lock pin, this signal is asserted high when the on-chip PLL enabled and locked and de-asserted when the PLL enabled and unlocked. This pin is also asserted high when the PLL is disabled. Internal Pull down resistor. This input is 5 V tolerant

3.11 JTAG/OnCE Interface

Table 14. JTAG/OnCE Interface

Signal Name	Signal Type	State during Reset	Signal Description
TCK	Input	Input	Test Clock—TCK is a test clock input signal used to synchronize the JTAG test logic. Internal Pull up resistor. This input is 5 V tolerant.
TDI	Input	Input	Test Data Input—TDI is a test data serial input signal used for test instructions and data. TDI is sampled on the rising edge of TCK. Internal Pull up resistor. This input is 5 V tolerant.
TDO	Output	Tri-stated	Test Data Output—TDO is a test data serial output signal used for test instructions and data. TDO is tri-statable and is actively driven in the shift-IR and shift-DR controller states. TDO changes on the falling edge of TCK.
TMS	Input	Input	Test Mode Select—TMS is an input signal used to sequence the test controller's state machine. TMS is sampled on the rising edge of TCK. Internal Pull up resistor. This input is 5 V tolerant.

4 Maximum Ratings

Caution

This device contains circuitry protecting against damage due to high static voltage or electrical fields. However, normal precautions should be taken to avoid exceeding maximum voltage ratings. Reliability of operation is enhanced if unused inputs are pulled to an appropriate logic voltage level (e.g., either GND or V_{DD}). The suggested value for a pullup or pulldown resistor is 4.7 kΩ.

NOTE

In the calculation of timing requirements, adding a maximum value of one specification to a minimum value of another specification does not yield a reasonable sum. A maximum specification is calculated using a worst case variation of process parameter values in one direction. The minimum specification is calculated using the worst case for the same parameters in the opposite direction. Therefore, a “maximum” value for a specification will never occur in the same device that has a “minimum” value for another specification; adding a maximum to a minimum represents a condition that can never exist.

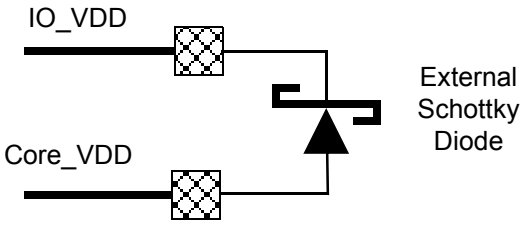
Table 15. Maximum Ratings

Rating[1]	Symbol	Value[1, 2]	Unit
Supply Voltage	V_{CORE_VDD}, V_{PLLD_VDD}	−0.3 to + 1.6	V
	V_{PLLP_VDD}, V_{IO_VDD}, V_{PLLA_VDD},	−0.3 to + 4.0	V
Maximum CORE_VDD power supply ramp time[4]	Tr	10	ms
All “5.0V tolerant” input voltages	V_{IN}	GND − 0.3 to 6V	V
Current drain per pin excluding V_{DD} and GND(Except for pads listed below)	I	12	mA
SCK_SCL	I_{SCK}	16	mA
TDO	I_{JTAG}	24	ma
Operating temperature range[3]	T_J	80 LQFP = 105 52 LQFP = 110	°C
Storage temperature	T_{STG}	−55 to +125	°C
ESD protected voltage (Human Body Model)		2000	V
ESD protected voltage (Machine Model)		200	V

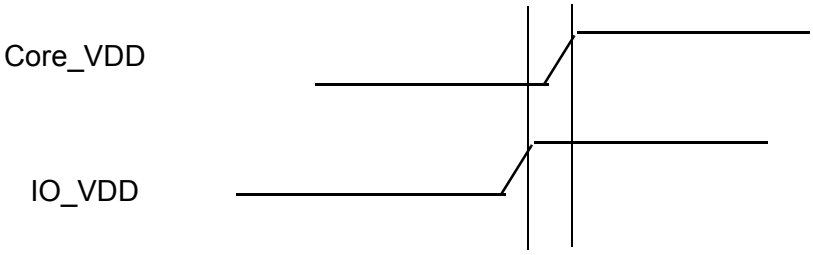
Note:
1. GND = 0 V, T_J = -40°C to 110°C (52 LQFP) / -40°C to 105°C (80 LQFP), CL = 50pF
2. Absolute maximum ratings are stress ratings only, and functional operation at the maximum is not guaranteed. Stress beyond the maximum rating may affect device reliability or cause permanent damage to the device.
3. Operating temperature qualified for automotive applications. $T_J = T_A + \theta_{JA}$ x Power. Variables used were Core Current = 100 mA, I/O Current = 60 mA, Core Voltage = 1.3 V, I/O Voltage = 3.46 V, T_A = 85°C
4. If the power supply ramp to full supply time is longer than 10 ms, the POR circuitry will not operate correctly, causing erroneous operation.

5 Power Requirements

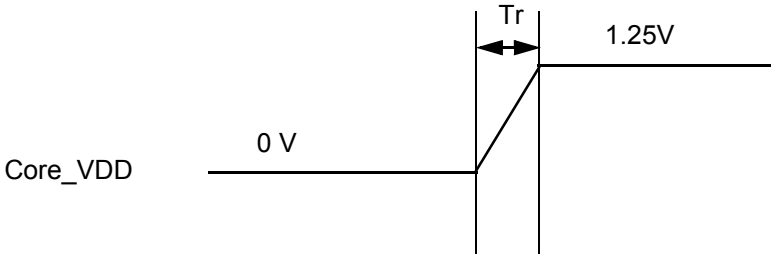
To prevent high current conditions due to possible improper sequencing of the power supplies, the connection shown below is recommended to be made between the DSP56374 IO_VDD and Core_VDD power pins.



To prevent a high current condition upon power up, the IO_VDD must be applied ahead of the Core_VDD as shown below if the external Schottky is not used.



For correct operation of the internal power on reset logic, the Core_VDD ramp rate (Tr) to full supply must be less than 10 ms. This is shown below.



6 Thermal Characteristics

Table 16. Thermal Characteristics

Characteristic	Symbol	LQFP Values	Unit
Natural Convection, Junction-to-ambient thermal resistance[1,2]	$R_{\theta JA}$ or θ_{JA}	68 (52 LQFP) 50 (80 LQFP)	°C/W
Junction-to-case thermal resistance[3]	$R_{\theta JC}$ or θ_{JC}	17 (52 LQFP) 11 (80 LQFP)	°C/W

Note:
1. Junction temperature is a function of die size, on-chip power dissipation, package thermal resistance, mounting site (board) temperature, ambient temperature, air flow, power dissipation of other components on the board, and board thermal resistance.
2. Per SEMI G38-87 and JEDEC JESD51-2 with the single layer board horizontal.
3. Thermal resistance between the die and the case top surface as measured by the cold plate method (MIL SPEC-883 Method 1012.1).

7 DC Electrical Characteristics

Table 17. DC Electrical Characteristics

Characteristics	Symbol	Min	Typ	Max	Unit
Supply voltages • Core (Core_VDD) • PLL (PLLD_VDD)	V_{DD}	1.2	1.25	1.3	V
Supply voltages • I/O (IO_VDD) • PLL (PLLP_VDD) • PLL (PLLA_VDD)	V_{DDIO}	3.14	3.3	3.46	V
Input high voltage • All pins	V_{IH}	2.0	—	V_{IO_VDD}+2V	V
Note: All 3.3 volt supplies must rise prior to the rise of the 1.25 volt supplies to avoid a high current condition and possible system damage.					
Input low voltage • All pins	V_{IL}	–0.3	—	0.8	V
Input leakage current	I_{IN}	—	—	± 84	µA
Clock pin Input Capacitance (EXTAL)	C_{IN}		4.7		pF
High impedance (off-state) input current (@ 3.46V)	I_{TSI}	–10	—	84	µA
Output high voltage I_{OH} = -5 mA XTAL Pin I_{OH} = -10mA	V_{OH}	2.4	—	—	V
Output low voltage I_{OL} = 5 mA XTAL Pin I_{OL} = 10 mA	V_{OL}	—	—	0.4	V

Table 17. DC Electrical Characteristics (Continued)

Characteristics	Symbol	Min	Typ	Max	Unit
Internal supply current[1] (core only) at internal clock of 150 MHz					
• In Normal mode	I_{CCI}	—	65	100	mA
• In Wait mode	I_{CCW}	—	16	—	mA
• In Stop mode[2]	I_{CCS}	—	1.2	—	mA
Input capacitance	C_{IN}	—	—	10	pF

Note:
1. The Current Consumption section provides a formula to compute the estimated current requirements in Normal mode. In order to obtain these results, all inputs must be terminated (i.e., not allowed to float). Measurements are based on synthetic intensive DSP benchmarks. The power consumption numbers in this specification are 90% of the measured results of this benchmark. This reflects typical DSP applications. Typical internal supply current is measured with V_{CORE_VDD} = 1.25V, V_{DD_IO} = 3.3V at T_J = 25°C. Maximum internal supply current is measured with V_{CORE_VDD} = 1.30V, $V_{IO\_VDD)}$ = 3.46V at T_J = 115°C.
2. In order to obtain these results, all inputs, which are not disconnected at Stop mode, must be terminated (i.e., not allowed to float).

8 AC Electrical Characteristics

The timing waveforms shown in the AC electrical characteristics section are tested with a V_{IL} maximum of 0.8V and a V_{IH} minimum of 2.0V for all pins. AC timing specifications, which are referenced to a device input signal, are measured in production with respect to the 50% point of the respective input signal's transition. DSP56374 output levels are measured with the production test machine V_{OL} and V_{OH} reference levels set at 1.0V and 1.8V, respectively.

9 Internal Clocks

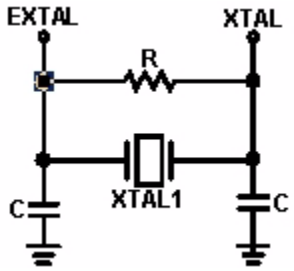
Table 18. INTERNAL CLOCKS[2]

No.	Characteristics	Symbol	Min	Typ	Max	Unit	Condition
1	Comparison Frequency	Fref	5	—	20	MHz	Fref = FIN/NR
2	Input Clock Frequency	FIN	Fref*NR				NR is input divider value
3	Output clock Frequency (with PLL enabled[1]	FOUT	75	(Ef × MF x FM)/ (PDF × DF x OD)	150	MHz	FOUT=FVCO/NO where NO is output divider value
4	Output clock Frequency (with PLL disabled[1]	FOUT	—	Ef	150	MHz	—
5	Duty Cycle	—	40	50	60	%	FVCO=300MHz~600MHz

Note:
1. DF = Division Factor
Ef = External frequency
MF = Multiplication Factor
PDF = Predivision Factor
FM= Frequency Multiplier
OD = Output Divider

10 External Clock Operation

The DSP56374 system clock is derived from the on-chip oscillator or is externally supplied. To use the on-chip oscillator, connect a crystal and associated resistor/capacitor components to EXTAL and XTAL; an example is shown below.

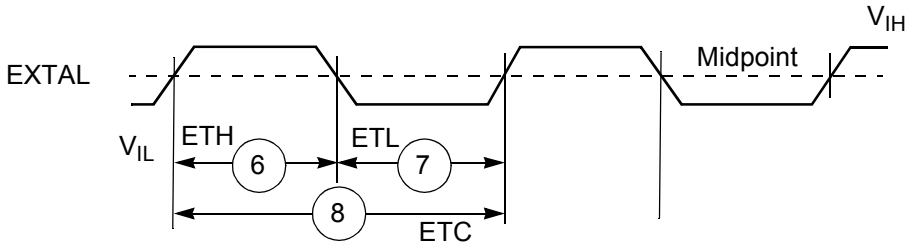


Suggested component values:

f_{osc} = 24.576 MHz
R = 1 M ±10%
C (EXTAL)= 18 pF
C (XTAL) = 47 pF

Calculations are for a 12 - 49 MHz crystal with the following parameters:
- shunt capacitance (C_0) of 10 pF - 12 pF
- series resistance 40 Ohm
- drive level of 10 μW

If the DSP56374 system clock is an externally supplied square wave voltage source, it is connected to EXTAL (). When the external square wave source connects to EXTAL, the XTAL pin is not used.



Note: The midpoint is 0.5 (V_{IH} + V_{IL}).

Figure 2. **External Clock Timing**

Table 19. Clock Operation

No.	Characteristics	Symbol	Min	Max	Units
6	EXTAL input high [1] (40% to 60% duty cycle)	Eth	3.33	50	ns
7	EXTAL input low[1] (40% to 60% duty cycle)	Etl	3.33	50	ns
8	EXTAL cycle time • With PLL disabled • With PLL enabled	Etc	 6.67 50	 inf 200	ns

Table 19. Clock Operation (Continued)

No.	Characteristics	Symbol	Min	Max	Units
9	Instruction cycle time= $I_{CYC} = T_C$[4] • With PLL disabled • With PLL enabled	Icyc	6.67 6.67	inf 13.33	ns

Note:
1. Measured at 50% of the input transition.
2. The indicated duty cycle is for the specified maximum frequency for which a part is rated. The minimum clock high or low time required for correct operation, however, remains the same at lower operating frequencies; therefore, when a lower clock frequency is used, the signal symmetry may vary from the specified duty cycle as long as the minimum high time and low time requirements are met.
3. A valid clock signal must be applied to the EXTAL pin within 3 ms of the DSP56374 being powered up.

11 Reset, Stop, Mode Select, and Interrupt Timing

Table 20. Reset, Stop, Mode Select, and Interrupt Timing

No.	Characteristics	Expression	Min	Max	Unit
10	Delay from $\overline{\text{RESET}}$ assertion to all pins at reset value[3]	—	—	11	ns
11	Required $\overline{\text{RESET}}$ duration[4] • Power on, external clock generator, PLL disabled • Power on, external clock generator, PLL enabled	 2 xT_C 2 x T_C	 13.4 13.4	 — —	 ns ns
13	Syn reset deassert delay time • Minimum • Maximum (PLL enabled)	 2× T_C $(2xT_C)+T_{LOCK}$	 13.4 5.0	 — —	 ns ms
14	Mode select setup time		10.0	—	ns
15	Mode select hold time		10.0	—	ns
16	Minimum edge-triggered interrupt request assertion width	2 xT_C	13.4	—	ns
17	Minimum edge-triggered interrupt request deassertion width	2 xT_C	13.4	—	ns
18	Delay from interrupt trigger to interrupt code execution	$10 \times T_C + 5$	72	—	ns

Table 20. Reset, Stop, Mode Select, and Interrupt Timing (Continued)

No.	Characteristics	Expression	Min	Max	Unit
19	Duration of level sensitive $\overline{\text{IRQA}}$ assertion to ensure interrupt service (when exiting Stop)[1, 2, 3]				
	• PLL is active during Stop and Stop delay is enabled (OMR Bit 6 = 0)	$9+(128\times T_C)$	854	—	µs
	• PLL is active during Stop and Stop delay is not enabled (OMR Bit 6 = 1)	$25\times T_C$	165	—	ns
	• PLL is not active during Stop and Stop delay is enabled (OMR Bit 6 = 0)	$9+(128xT_C) + T_{LOCK}$	5.7		ms
	• PLL is not active during Stop and Stop delay is not enabled (OMR Bit 6 = 1)	$(25 \times T_C) + T_{LOCK}$	5		ms
20	• Delay from $\overline{\text{IRQA}}$, $\overline{\text{IRQB}}$, $\overline{\text{IRQC}}$, $\overline{\text{IRQD}}$, $\overline{\text{NMI}}$ assertion to general-purpose transfer output valid caused by first interrupt instruction execution[1]	$10 \times T_C + 3.0$		69.0	ns
21	Interrupt Requests Rate[1]				
	• ESAI, ESAI_1, SHI, Timer	$12 \times T_C$	—	80.0	ns
	• DMA	$8 \times T_C$	—	53.0	ns
	• $\overline{\text{IRQ}}$, $\overline{\text{NMI}}$ (edge trigger)	$8 \times T_C$	—	53.0	ns
	• $\overline{\text{IRQ}}$ (level trigger)	$12 \times T_C$	—	80.0	ns
22	DMA Requests Rate				
	• Data read from ESAI, ESAI_1, SHI	$6 \times T_C$	—	40.0	ns
	• Data write to ESAI, ESAI_1, SHI	$7 \times T_C$	—	46.7	ns
	• Timer	$2 \times T_C$	—	13.4	ns
	• $\overline{\text{IRQ}}$, $\overline{\text{NMI}}$ (edge trigger)	$3 \times T_C$	—	20.0	ns

Note:

1. When using fast interrupts and $\overline{\text{IRQA}}$, $\overline{\text{IRQB}}$, $\overline{\text{IRQC}}$, and $\overline{\text{IRQD}}$ are defined as level-sensitive, timings 19 through 21 apply to prevent multiple interrupt service. To avoid these timing restrictions, the Edge-triggered mode is recommended when using fast interrupts. Long interrupts are recommended when using Level-sensitive mode.
2. For PLL disable, using external clock (PCTL Bit 16 = 1), no stabilization delay is required and recovery time will be defined by the OMR Bit 6 settings.

   For PLL enable, (if bet 12 of the PCTL register is 0), the PLL is shutdown during Stop. Recovering from Stop requires the PLL to get locked. The PLL lock procedure duration, PLL Lock Cycles (PLC), may be in the range of 0.5 ms.
3. Periodically sampled and not 100% tested.
4. $\overline{\text{RESET}}$ duration is measured during the time in which $\overline{\text{RESET}}$ is asserted, V_{DD} is valid, and the EXTAL input is active and valid. When the V_{DD} is valid, but the other "required $\overline{\text{RESET}}$ duration" conditions (as specified above) have not been yet met, the device circuitry will be in an uninitialized state that can result in significant power consumption and heat-up. Designs should minimize this state to the shortest possible duration.

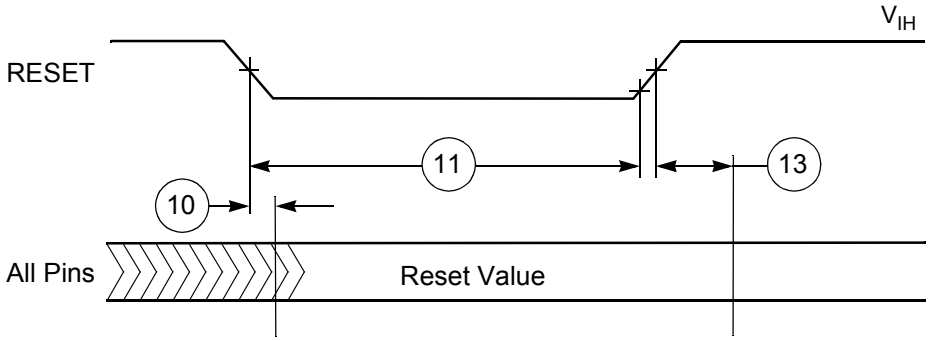
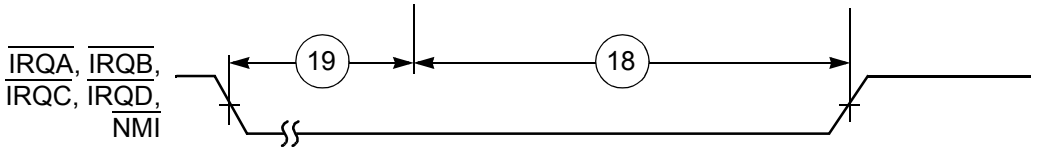
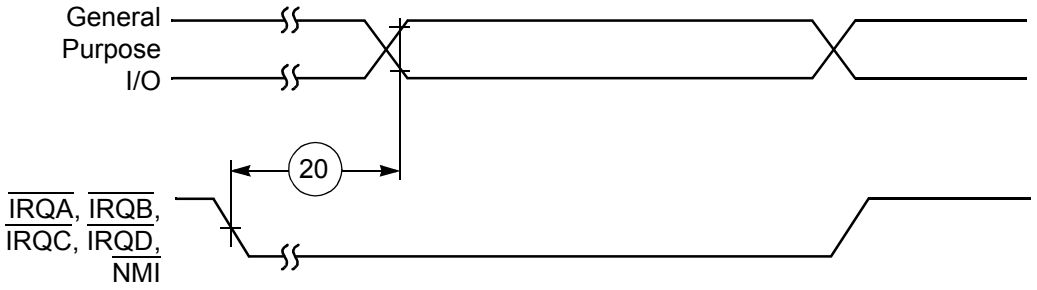


Figure 3. **Reset Timing**



a) First Interrupt Instruction Execution



b) General Purpose I/O

Figure 4. **External Fast Interrupt Timing**

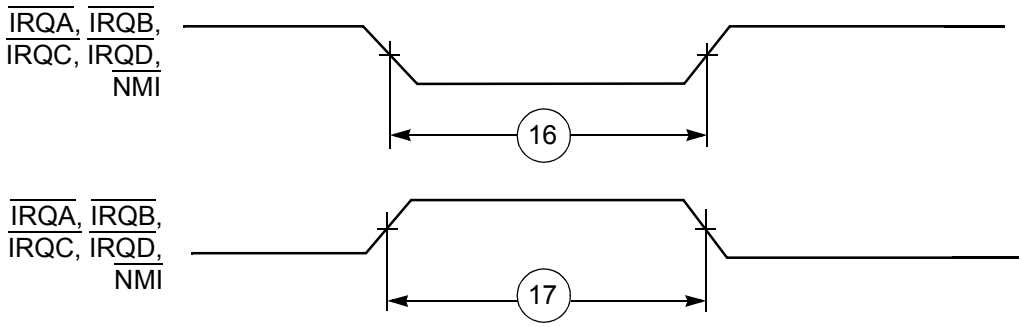


Figure 5. **External Interrupt Timing (Negative Edge-Triggered)**

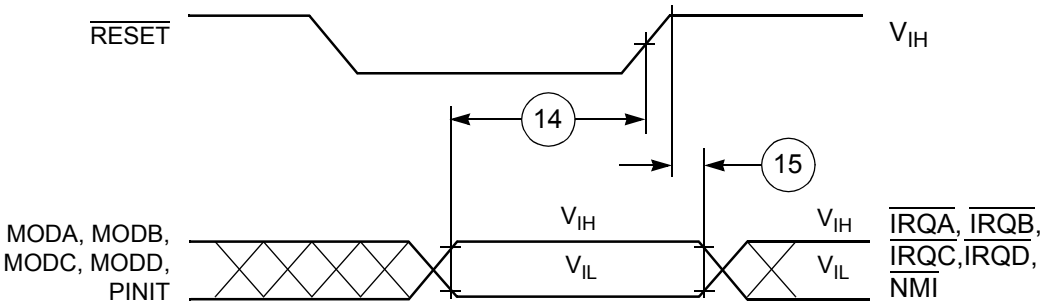


Figure 6. **Recovery from Stop State Using IRQA Interrupt Service**

12 Serial Host Interface SPI Protocol Timing

Table 21. Serial Host Interface SPI Protocol Timing

No.	Characteristics[1,3,4]	Mode	Filter Mode	Expression	Min	Max	Unit
23	Minimum serial clock cycle = t_{SPICC}(min)	Master/Slave	Bypassed	10.0 x T_C + 9	76.0	—	ns
			Very Narrow	10.0 x T_C + 9	76.0	—	ns
			Narrow	10.0 x T_C + 133	200.0	—	ns
			Wide	10.0 x T_C + 333	400.0	—	ns
XX	Tolerable Spike width on data or clock in.	—	Bypassed	—	—	0	ns
			Very Narrow	—	—	10	ns
			Narrow	—	—	50	ns
			Wide	—	—	100	ns
24	Serial clock high period	Master	Bypassed	—	38.0	—	ns
			Very Narrow	—	38.0	—	ns
			Narrow	—	100.0	—	ns
			Wide	—	200.0	—	ns
		Slave	Bypassed	2.0 x T_C + 19.6	33.0	—	ns
			Very Narrow	2.0 x T_C + 19.6	33.0	—	ns
			Narrow	2.0 x T_C + 86.6	100.0	—	ns
			Wide	2.0 x T_C + 186.6	200.0	—	ns
25	Serial clock low period	Master	Bypassed	—	38.0	—	ns
			Very Narrow	—	38.0	—	ns
			Narrow	—	100.0	—	ns
			Wide	—	200.0	—	ns
		Slave	Bypassed	2.0 x T_C + 19.6	33.0	—	ns
			Very Narrow	2.0 x T_C + 19.6	33.0	—	ns
			Narrow	2.0 x T_C + 86.6	100.0	—	ns
			Wide	2.0 x T_C + 186.6	200.0	—	ns
26	Serial clock rise/fall time	Master	—	—	—	—	ns
		Slave	—	—	—	5	ns
				—			

Table 21. Serial Host Interface SPI Protocol Timing (Continued)

No.	Characteristics[1,3,4]	Mode	Filter Mode	Expression	Min	Max	Unit
27	$\overline{SS}$ assertion to first SCK edge CPHA = 0	Slave	Bypassed	2.0 x T_C + 12.6	26	—	ns
			Very Narrow	2.0 x T_C + 2.6	16	—	ns
			Narrow	2.0 x T_C – 37.4[5]	0	—	ns
			Wide	2.0 x T_C – 87.4[5]	0	—	ns
	CPHA = 1	Slave	Bypassed	—	10	—	ns
			Very Narrow	—	0	—	ns
			Narrow	—	0	—	ns
			Wide	—	0	—	ns
28	Last SCK edge to $\overline{SS}$ not asserted	Slave	Bypassed	—	12	—	ns
			Very Narrow	—	22	—	ns
			Narrow	—	100	—	ns
			Wide	—	200	—	ns
29	Data input valid to SCK edge (data input set-up time)	Master /Slave	Bypassed	—	0	—	ns
			Very Narrow	—	0	—	ns
			Narrow	—	0	—	ns
			Wide	—	0	—	ns
30	SCK last sampling edge to data input not valid	Master /Slave	Bypassed	3.0 x T_C	20	—	ns
			Very Narrow	3.0 x T_C + 23.2	43.2	—	ns
			Narrow	3.0 x T_C + 53.2	73.2	—	ns
			Wide	3.0 x T_C + 80	100.0	—	ns
31	$\overline{SS}$ assertion to data out active	Slave	—	—	5	—	ns
32	$\overline{SS}$ deassertion to data high impedance[2]	Slave	—	—	—	9	ns
33	SCK edge to data out valid (data out delay time)	Master /Slave	Bypassed	3.0 x T_C + 26.1	—	46.2	ns
			Very Narrow	3.0 x T_C + 90.4	—	110.4	ns
			Narrow	3.0 x T_C + 116.4	—	136.4	ns
			Wide	3.0 x T_C + 203.4	—	223.4	ns
34	SCK edge to data out not valid (data out hold time)	Master /Slave	Bypassed	2.0 x T_C	13.4	—	ns
			Very Narrow	2.0 x T_C + 1.6	15	—	ns
			Narrow	2.0 x T_C + 41.6	55	—	ns
			Wide	2.0 x T_C + 91.6	105	—	ns
35	$\overline{SS}$ assertion to data out valid (CPHA = 0)	Slave	—	—	—	12.0	ns

Table 21. Serial Host Interface SPI Protocol Timing (Continued)

No.	Characteristics[1,3,4]	Mode	Filter Mode	Expression	Min	Max	Unit
36	SCK edge following the first SCK sampling edge to $\overline{\text{HREQ}}$ output deassertion	Slave	Bypassed	3.0 x T_C + 30	50	—	ns
			Very Narrow	3.0 x T_C + 40	60	—	ns
			Narrow	3.0 x T_C + 80	100	—	ns
			Wide	3.0 x T_C + 120	150	—	ns
37	Last SCK sampling edge to $\overline{\text{HREQ}}$ output not deasserted (CPHA = 1)	Slave	Bypassed	4.0 x T_C	57.0	—	ns
			Very Narrow	4.0 x T_C	67.0	—	ns
			Narrow	4.0 x T_C	107.0	—	ns
			Wide	4.0 x T_C	157.0	—	ns
38	$\overline{\text{SS}}$ deassertion to $\overline{\text{HREQ}}$ output not deasserted (CPHA = 0)	Slave	—	3.0 x T_C + 30	50.0	—	ns
39	$\overline{\text{SS}}$ deassertion pulse width (CPHA = 0)	Slave	—	2.0 x T_C	13.4	—	ns
40	$\overline{\text{HREQ}}$ in assertion to first SCK edge	Master	Bypassed	0.5 x T_{SPICC} + 3.0 x T_C + 5	63	—	ns
			Very Narrow	0.5 x T_{SPICC} + 3.0 x T_C + 5	63	—	ns
			Narrow	0.5 x T_{SPICC} + 3.0 x T_C + 5	125	—	ns
			Wide	0.5 x T_{SPICC} + 3.0 x T_C + 5	225	—	ns
41	$\overline{\text{HREQ}}$ in deassertion to last SCK sampling edge ($\overline{\text{HREQ}}$ in set-up time) (CPHA = 1)	Master	—	—	0	—	ns
42	First SCK edge to $\overline{\text{HREQ}}$ in not asserted ($\overline{\text{HREQ}}$ in hold time)	Master	—	—	0	—	ns
43	$\overline{\text{HREQ}}$ assertion width	Master	—	3.0 x T_C	20	—	ns

Note:
1. V_{CORE_VDD} = 1.2 5 ± 0.05 V; T_J = -40°C to 110°C (52 LQFP) / -40°C to 105°C (80 LQFP), C_L = 50 pF
2. Periodically sampled, not 100% tested
3. All times assume noise free inputs.
4. All times assume internal clock frequency of 150 MHz.
5. Equation applies when the result is positive T_C.

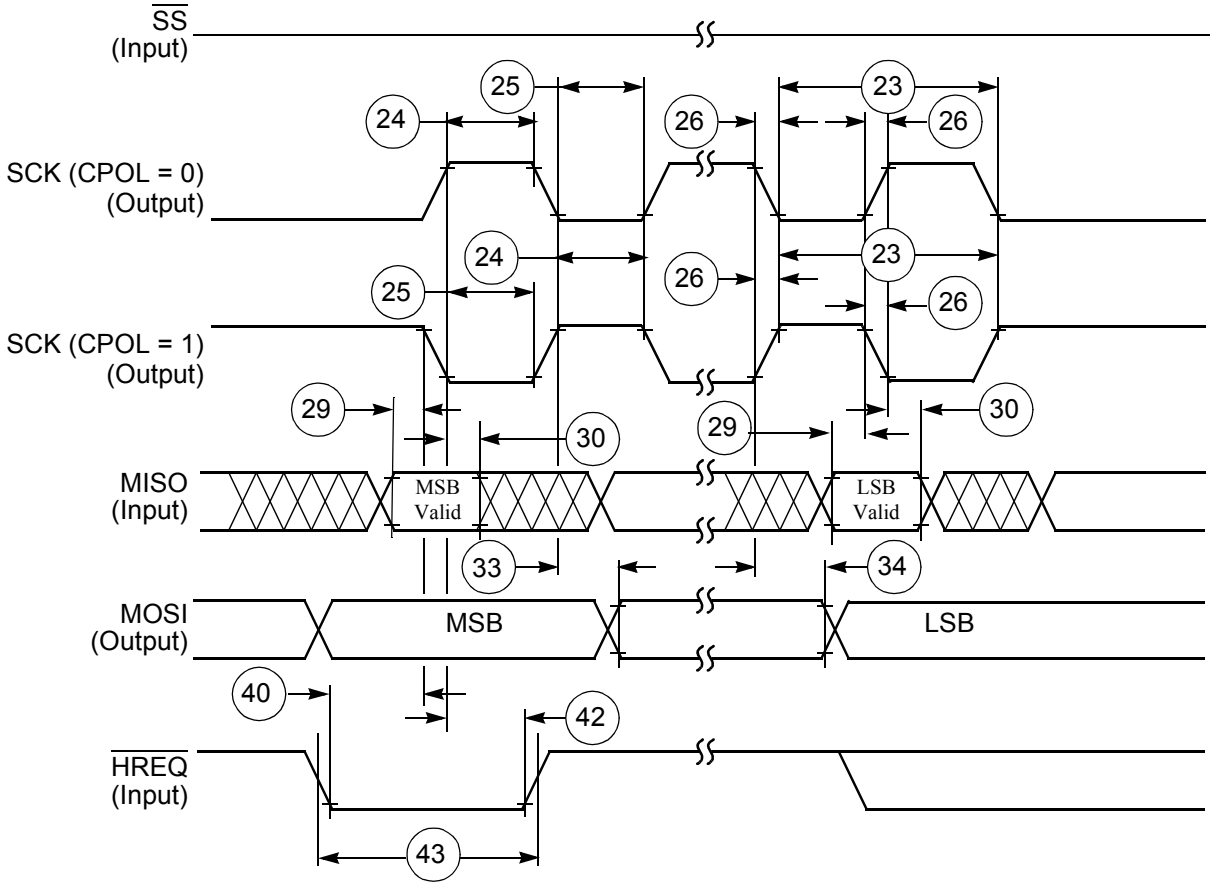


Figure 7. **SPI Master Timing (CPHA = 0)**

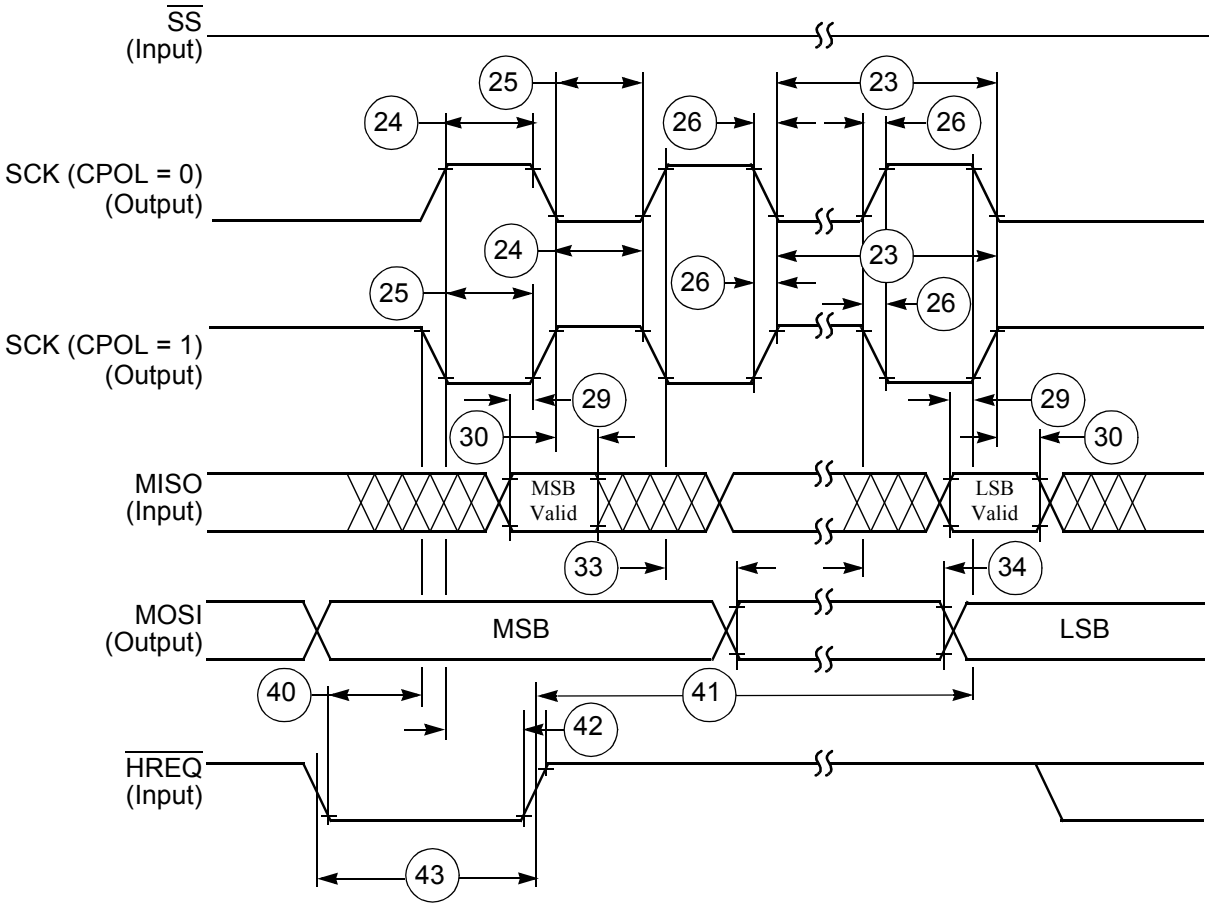


Figure 8. **SPI Master Timing (CPHA = 1)**

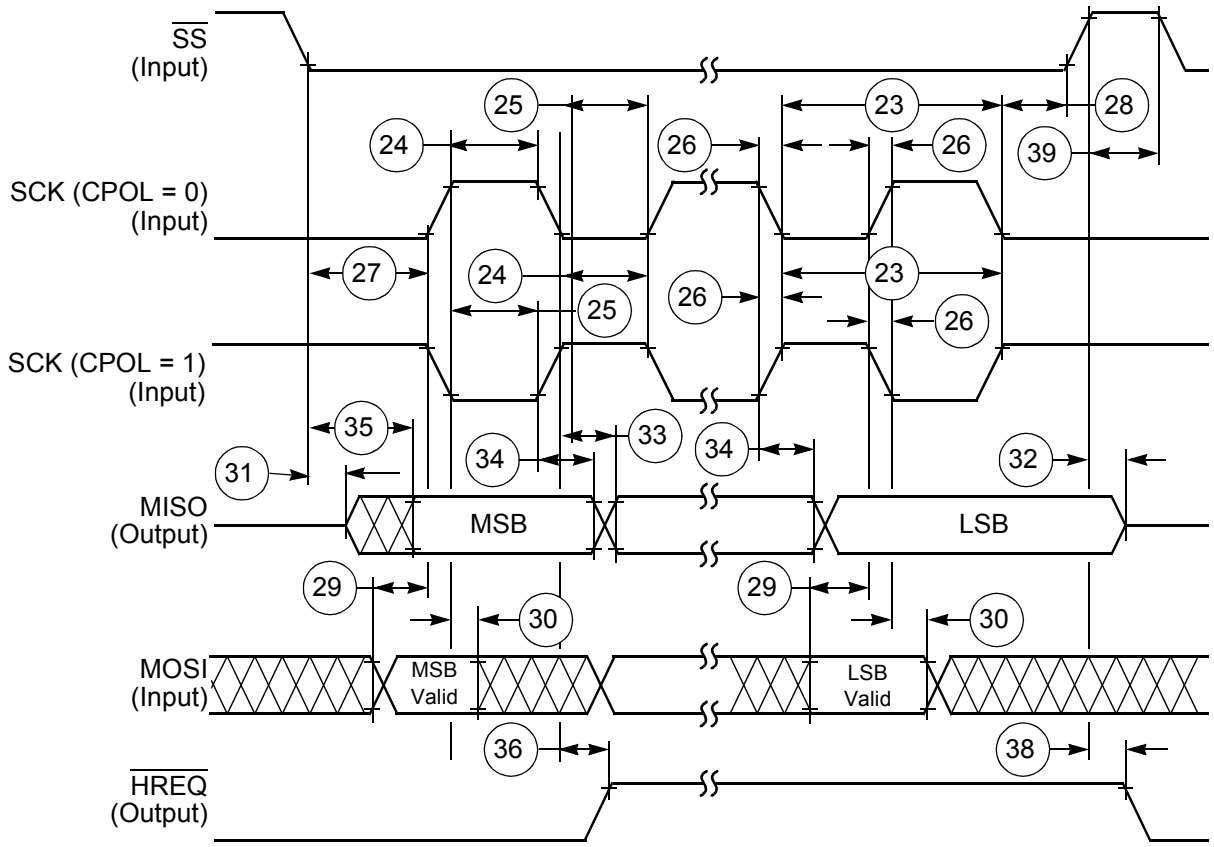


Figure 9. **SPI Slave Timing (CPHA = 0)**

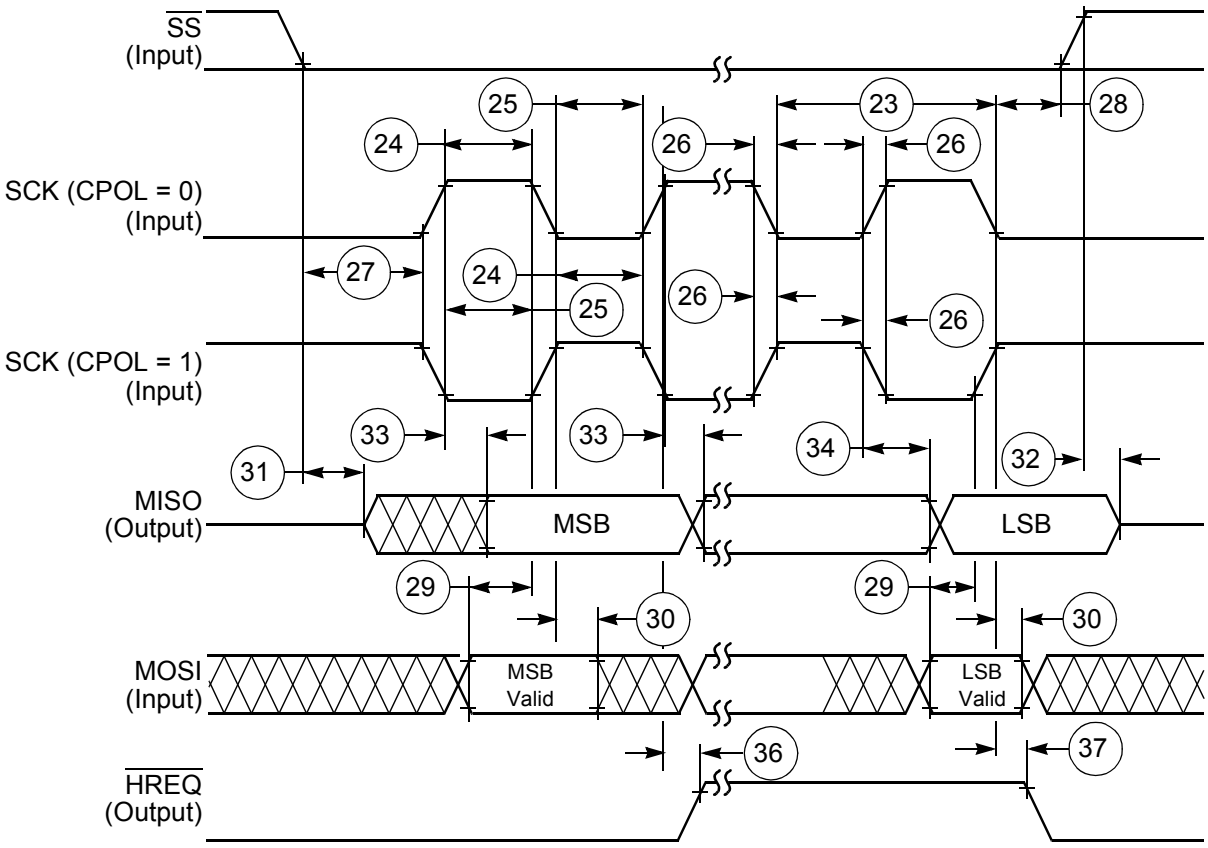


Figure 10. **SPI Slave Timing (CPHA = 1)**

13 Serial Host Interface (SHI) I²C Protocol Timing

Table 22. SHI I²C Protocol Timing

Standard I²C							
No.	Characteristics[1,2,3,4,5]	Symbol/ Expression	Standard		Fast-Mode		Unit
			Min	Max	Min	Max	
XX	Tolerable Spike Width on SCL or SDA	—					
	Filters Bypassed		—	0	—	0	ns
	Very Narrow Filters enabled		—	10	—	10	ns
	Narrow Filters enabled		—	50	—	50	ns
	Wide Fileters enabled.		—	100	—	100	ns
44	SCL clock frequency	F_{SCL}	—	100	—	400	kHz
44	SCL clock cycle	T_{SCL}	10	—	2.5	—	µs
45	Bus free time	T_{BUF}	4.7	—	1.3	—	µs
46	Start condition set-up time	T_{SUSTA}	4.7	—	0.6	—	µs
47	Start condition hold time	$T_{HD;STA}$	4.0	—	0.6	—	µs
48	SCL low period	T_{LOW}	4.7	—	1.3	—	µs
49	SCL high period	T_{HIGH}	4.0	—	1.3	—	µs
50	SCL and SDA rise time	T_R	—	5.0	—	5.0	ns
51	SCL and SDA fall time	T_F	—	5.0	—	5.0	ns
52	Data set-up time	$T_{SU;DAT}$	250	—	100	—	ns
53	Data hold time	$T_{HD;DAT}$	0.0	—	0.0	0.9	µs
54	DSP clock frequency	F_{OSC}					
	• Filters bypassed		10.6	—	28.5	—	MHz
	• Very Narrrow filters enabled		10.6	—	28.5	—	MHz
	• Narrow filters enabled		11.8	—	39.7	—	MHz
	• Wide filters enabled		13.1	—	61.0	—	MHz
55	SCL low to data out valid	$T_{VD;DAT}$	—	3.4	—	0.9	µs
56	Stop condition setup time	$T_{SU;STO}$	4.0	—	0.6	—	µs
57	$\overline{\text{HREQ}}$ in deassertion to last SCL edge ($\overline{\text{HREQ}}$ in set-up time)	$t_{SU;RQI}$	0.0	—	0.0	—	ns
58	First SCL sampling edge to $\overline{\text{HREQ}}$ output deassertion[2]	$T_{NG;RQO}$					
	• Filters bypassed	$4 \times T_C + 30$	—	57.0	—	57.0	ns
	• Very Narrow filters enabled	$4 \times T_C + 50$	—	77.0	—	67.0	ns
	• Narrow filters enabled	$4 \times T_C + 130$	—	157.0	—	157.0	ns
	• Wide filters enabled	$4 \times T_C + 230$	—	257.0	—	257.0	ns

Table 22. SHI I²C Protocol Timing (Continued)

Standard I²C							
No.	Characteristics[1,2,3,4,5]	Symbol/ Expression	Standard		Fast-Mode		Unit
			Min	Max	Min	Max	
59	Last SCL edge to $\overline{\text{HREQ}}$ output not deasserted[2]	$T_{AS;RQO}$					
	• Filters bypassed	$2 \times T_C + 30$	44	—	44	—	ns
	• Very Narrow filters enabled	$2 \times T_C + 40$	54	—	54	—	ns
	• Narrow filters enabled	$2 \times T_C + 80$	94	—	94	—	ns
	• Wide filters enabled	$2 \times T_C + 130$	144	—	144	—	ns
60	$\overline{\text{HREQ}}$ in assertion to first SCL edge	$T_{AS;RQI}$					
	• Filters bypassed		4327	—	927	—	ns
	• Very Narrow filters enabled		4317	—	917	—	ns
	• Narrow filters enabled		4282	—	877	—	ns
	• Wide filters enabled		4227	—	827	—	ns
61	First SCL edge to $\overline{\text{HREQ}}$ is not asserted ($\overline{\text{HREQ}}$ in hold time.)	$t_{HO;RQI}$	0.0	—	0.0	—	ns

Note:
1. V_{CORE_VDD} = 1.2 5 ± 0.05 V; T_J = -40°C to 110°C (52 LQFP) / -40°C to 105°C (80 LQFP), C_L = 50 pF
2. Pull-up resistor: R_P (min) = 1.5 kOhm
3. Capacitive load: C_b (max) = 50 pF
4. All times assume noise free inputs
5. All times assume internal clock frequency of 150MHz

14 Programming the Serial Clock

The programmed serial clock cycle, T_{I^2CCP}, is specified by the value of the HDM[7:0] and HRS bits of the HCKR (SHI clock control register).

The expression for T_{I^2CCP} is

$$T_{I^2CCP} = [T_C \times 2 \times (HDM[7:0] + 1) \times (7 \times (1 - HRS) + 1)]$$

where

— HRS is the prescaler rate select bit. When HRS is cleared, the fixed divide-by-eight prescaler is operational. When HRS is set, the prescaler is bypassed.

— HDM[7:0] are the divider modulus select bits. A divide ratio from 1 to 256 (HDM[7:0] = $00 to $FF) may be selected.

In I²C mode, the user may select a value for the programmed serial clock cycle from

$6 \times T_C$ (if HDM[7:0] = $02 and HRS = 1)

to

$4096 \times T_C$ (if HDM[7:0] = $FF and HRS = 0)

The programmed serial clock cycle (T_{I^2CCP}) should be chosen in order to achieve the desired SCL serial clock cycle (T_{SCL}), as shown in Table 23.

Table 23. SCL Serial Clock Cycle (T_{SCL}) Generated as Master

Nominal	$T_{I^2CCP} + 3 \times T_C + 45ns + T_R$

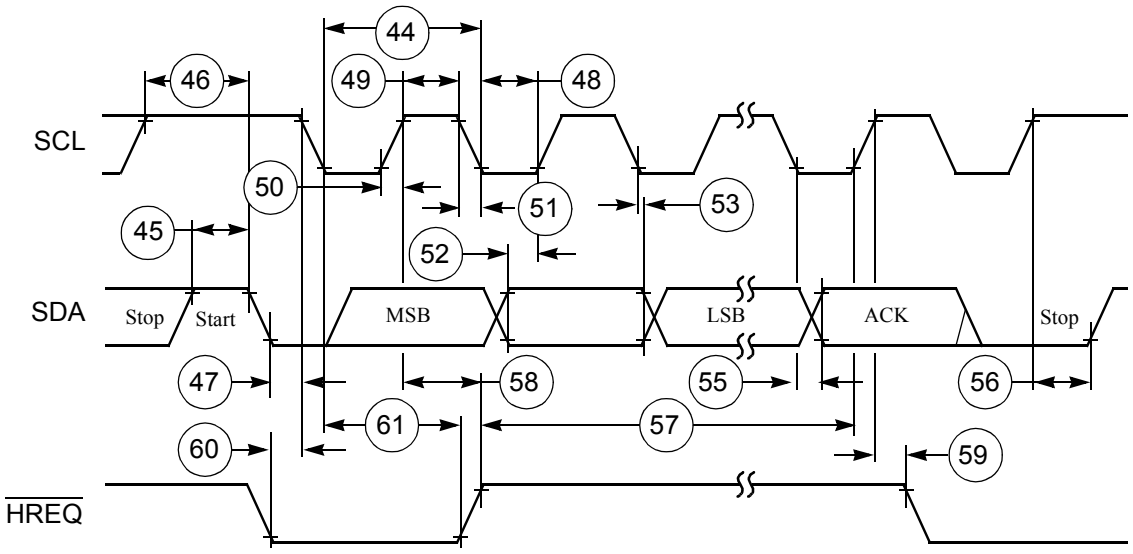


Figure 11. **I²C Timing**

15 Enhanced Serial Audio Interface Timing

Table 24. Enhanced Serial Audio Interface Timing

No.	Characteristics[1, 2, 3]	Symbol	Expression[3]	Min	Max	Condition[4]	Unit
62	Clock cycle[5]	t_{SSICC}	$4 \times T_C$ $4 \times T_C$	26.4 26.4	— —	x ck i ck	ns
63	Clock high period • For internal clock • For external clock	—	 $2 \times T_C - 0.5$ $2 \times T_C$	 12.8 13.4	 — —		ns
64	Clock low period • For internal clock • For external clock	—	 $2 \times T_C$ $2 \times T_C$	 13.4 13.4	 — —		ns
65	SCKR rising edge to FSR out (bl) high	—	—	— —	17.0 7.0	x ck i ck a	ns
66	SCKR rising edge to FSR out (bl) low	—	—	— —	17.0 7.0	x ck i ck a	ns
67	SCKR rising edge to FSR out (wr) high[6]	—	—	— —	19.0 9.0	x ck i ck a	ns
68	SCKR rising edge to FSR out (wr) low[6]	—	—	— —	19.0 9.0	x ck i ck a	ns
69	SCKR rising edge to FSR out (wl) high	—	—	— —	16.0 6.0	x ck i ck a	ns
70	SCKR rising edge to FSR out (wl) low	—	—	— —	17.0 7.0	x ck i ck a	ns
71	Data in setup time before SCKR (SCK in synchronous mode) falling edge	—	—	12.0 19.0	— —	x ck i ck	ns
72	Data in hold time after SCKR falling edge	—	—	3.5 9.0	— —	x ck i ck	ns
73	FSR input (bl, wr) high before SCKR falling edge [6]	—	—	2.0 12.0	— —	x ck i ck a	ns
74	FSR input (wl) high before SCKR falling edge	—	—	2.0 12.0	— —	x ck i ck a	ns
75	FSR input hold time after SCKR falling edge	—	—	2.5 8.5	— —	x ck i ck a	ns
76	Flags input setup before SCKR falling edge	—	—	0.0 19.0	— —	x ck i ck s	ns
77	Flags input hold time after SCKR falling edge	—	—	6.0 0.0	— —	x ck i ck s	ns
78	SCKT rising edge to FST out (bl) high	—	—	— —	18.0 8.0	x ck i ck	ns

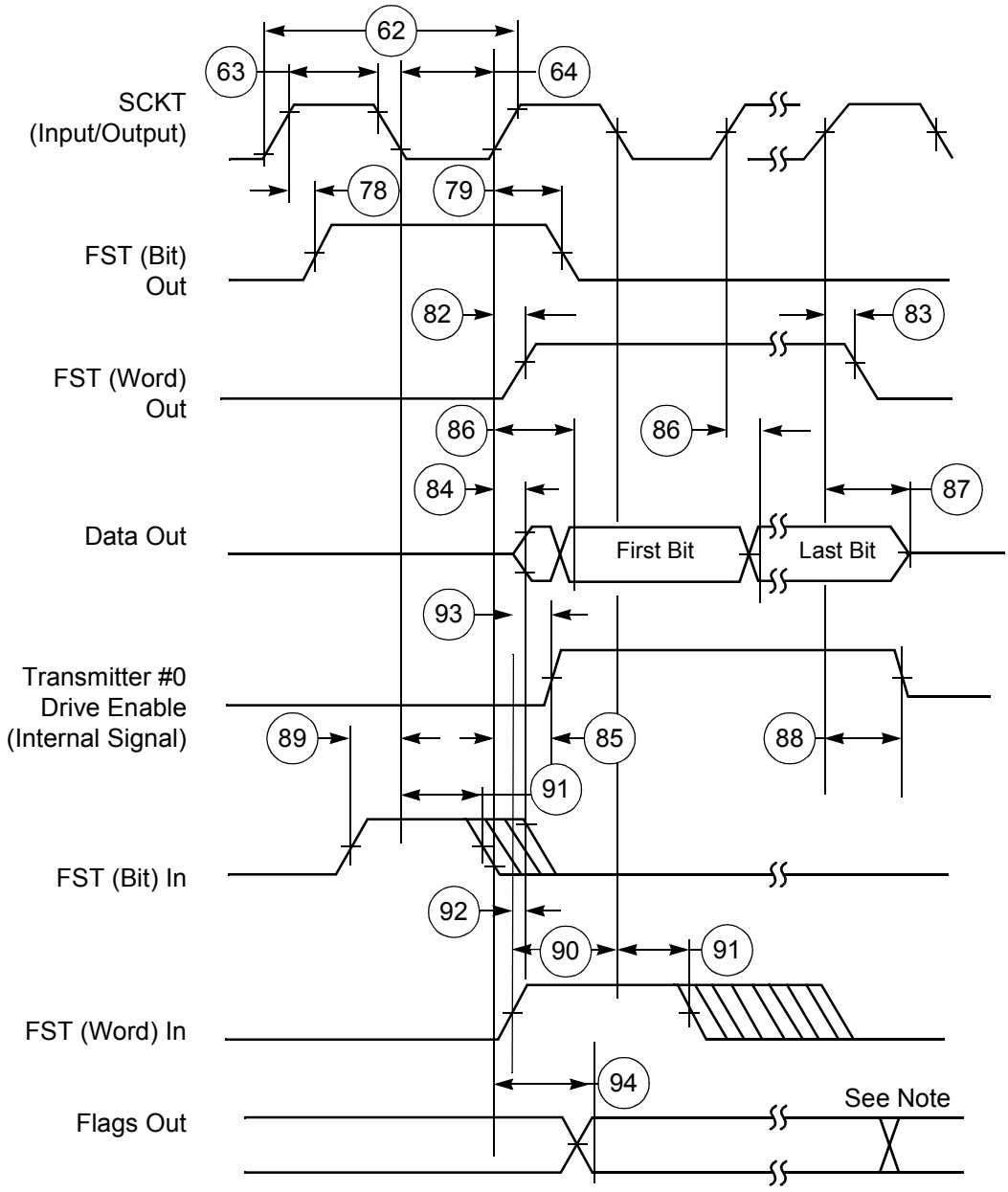
Table 24. Enhanced Serial Audio Interface Timing (Continued)

No.	Characteristics[1, 2, 3]	Symbol	Expression[3]	Min	Max	Condition[4]	Unit
79	SCKT rising edge to FST out (bl) low	—	—	— —	20.0 10.0	x ck i ck	ns
80	SCKT rising edge to FST out (wr) high[6]	—	—	— —	20.0 10.0	x ck i ck	ns
81	SCKT rising edge to FST out (wr) low[6]	—	—	— —	22.0 12.0	x ck i ck	ns
82	SCKT rising edge to FST out (wl) high	—	—	— —	19.0 9.0	x ck i ck	ns
83	SCKT rising edge to FST out (wl) low	—	—	— —	20.0 10.0	x ck i ck	ns
84	SCKT rising edge to data out enable from high impedance	—	—	— —	22.0 17.0	x ck i ck	ns
85	SCKT rising edge to transmitter #0 drive enable assertion	—	—	— —	17.0 11.0	x ck i ck	ns
86	SCKT rising edge to data out valid	—	—	— —	18.0 13.0	x ck i ck	ns
87	SCKT rising edge to data out high impedance[7]	—	—	— —	21.0 16.0	x ck i ck	ns
88	SCKT rising edge to transmitter #0 drive enable deassertion[7]	—	—	— —	14.0 9.0	x ck i ck	ns
89	FST input (bl, wr) setup time before SCKT falling edge[6]	—	—	2.0 18.0	— —	x ck i ck	ns
90	FST input (wl) setup time before SCKT falling edge	—	—	2.0 18.0	— —	x ck i ck	ns
91	FST input hold time after SCKT falling edge	—	—	4.0 5.0	— —	x ck i ck	ns
92	FST input (wl) to data out enable from high impedance	—	—	—	21.0	—	ns
93	FST input (wl) to transmitter #0 drive enable assertion	—	—	—	14.0	—	ns
94	Flag output valid after SCKT rising edge	—	—	— —	14.0 9.0	x ck i ck	ns
95	HCKR/HCKT clock cycle	—	$2 \times T_C$	13.4	—		ns
96	HCKT input rising edge to SCKT output	—	—	—	18.0		ns
97	HCKR input rising edge to SCKR output	—	—	—	18.0		ns

Table 24. Enhanced Serial Audio Interface Timing (Continued)

No.	Characteristics[1, 2, 3]	Symbol	Expression[3]	Min	Max	Condition[4]	Unit

Note:
1. V_{CORE_VDD} = 1.25 ± 0.05 V; T_J = -40°C to 110°C (52 LQFP) / -40°C to 105°C (80 LQFP), C_L = 50 pF
2. i ck = internal clock
   x ck = external clock
   i ck a = internal clock, asynchronous mode
   (asynchronous implies that SCKT and SCKR are two different clocks)
   i ck s = internal clock, synchronous mode
   (synchronous implies that SCKT and SCKR are the same clock)
3. bl = bit length
   wl = word length
   wr = word length relative
4. SCKT(SCKT pin) = transmit clock
   SCKR(SCKR pin) = receive clock
   FST(FST pin) = transmit frame sync
   FSR(FSR pin) = receive frame sync
   HCKT(HCKT pin) = transmit high frequency clock
   HCKR(HCKR pin) = receive high frequency clock
5. For the internal clock, the external clock cycle is defined by Icyc and the ESAI control register.
6. The word-relative frame sync signal waveform relative to the clock operates in the same manner as the bit-length frame sync signal waveform, but spreads from one serial clock before first bit clock (same as bit length frame sync signal), until the one before last bit clock of the first word in frame.
7. Periodically sampled and not 100% tested.
8. ESAI_1 specs match those of ESAI.



Note: In network mode, output flag transitions can occur at the start of each time slot within the frame. In normal mode, the output flag state is asserted for the entire frame period.

Figure 12. **ESAI Transmitter Timing**

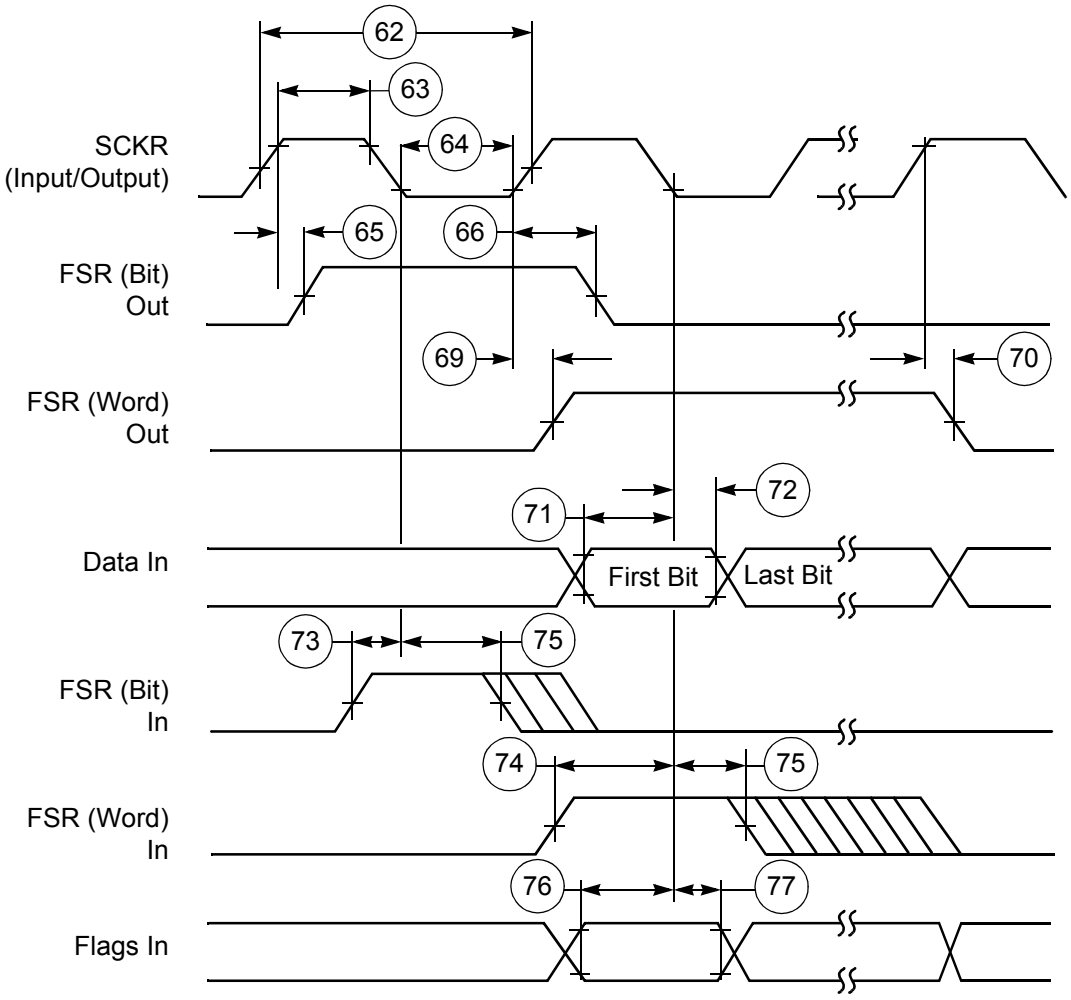


Figure 13. **ESAI Receiver Timing**

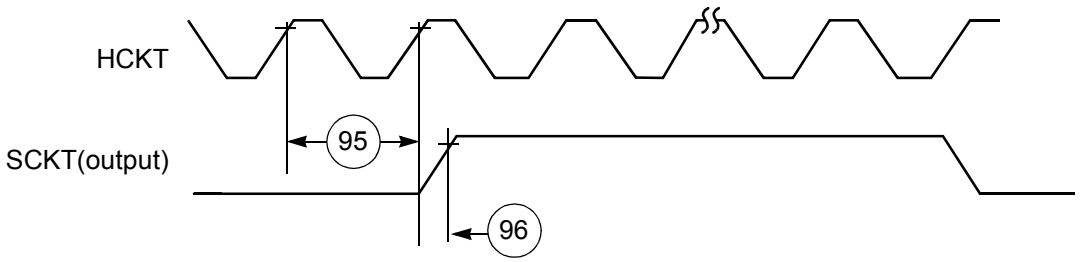


Figure 14. **ESAI HCKT Timing**

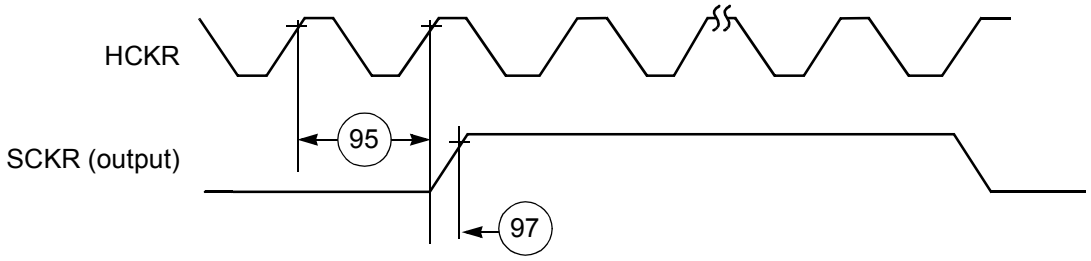


Figure 15. **ESAI HCKR Timing**

16 Timer Timing

Table 25. Timer Timing

No.	Characteristics	Expression	150 MHz		Unit
			Min	Max	
98	TIO Low	$2 \times T_C + 2.0$	15.4	—	ns
99	TIO High	$2 \times T_C + 2.0$	15.4	—	ns
Note: V_{CORE_VDD} = 1.25 V ± 0.05 V; T_J = -40°C to 110°C (52 LQFP) / -40°C to 105°C (80 LQFP), C_L = 50 pF					

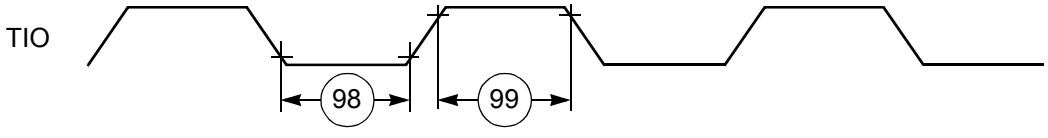


Figure 16. **TIO Timer Event Input Restrictions**

17 GPIO Timing

Table 26. GPIO Timing

No.	Characteristics[1]	Expression	Min	Max	Unit
100	EXTAL edge to GPIO out valid (GPIO out delay time)[2]		—	7	ns
101	EXTAL edge to GPIO out not valid (GPIO out hold time)[2]		—	7	ns
102	GPIO In valid to EXTAL edge (GPIO in set-up time)[2]		2	—	ns
103	EXTAL edge to GPIO in not valid (GPIO in hold time)[2]		0	—	ns
104	Minimum GPIO pulse high width	$T_C + 13$	19.7	—	ns
105	Minimum GPIO pulse low width	$T_C + 13$	19.7	—	ns
106	GPIO out rise time	—	—	13.0	ns
107	GPIO out fall time	—	—	13.0	ns

Note:
1. V_{CORE_VDD} = 1.25 V ± 0.05 V; T_J = -40°C to 110°C (52 LQFP) / -40°C to 105°C (80 LQFP), C_L = 50 pF
2. PLL Disabled, EXTAL driven by a square wave.

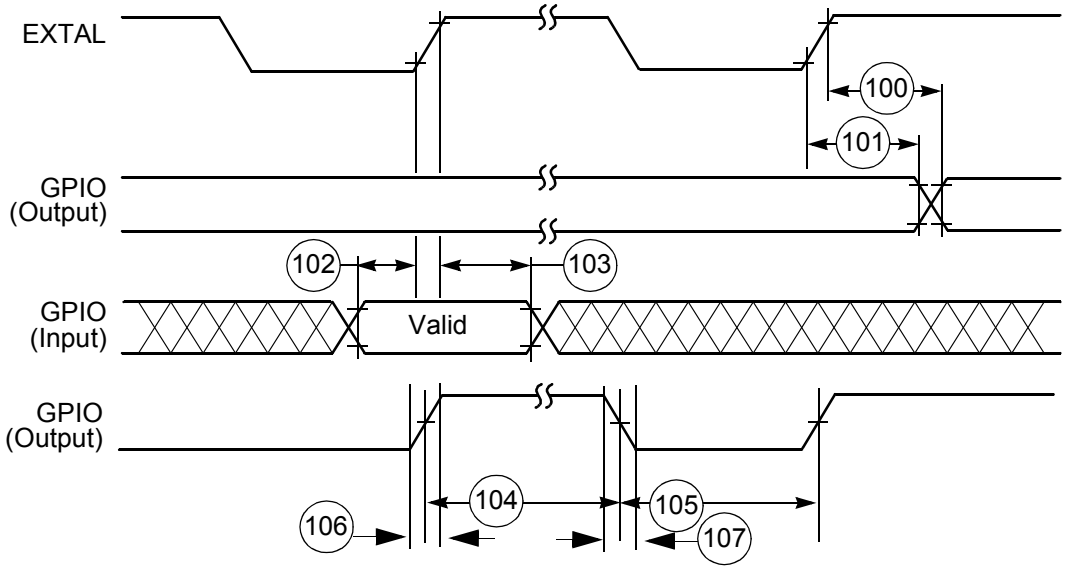


Figure 17. **GPIO Timing**

18 JTAG Timing

Table 27. JTAG Timing

No.	Characteristics	All frequencies		Unit
		Min	Max	
108	TCK frequency of operation (1/($T_C \times 3$); maximum 10 MHz)	—	10.0	MHz
109	TCK cycle time in Crystal mode	100.0	—	ns
110	TCK clock pulse width measured at 1.65 V	50.0	—	ns
111	TCK rise and fall times	—	3.0	ns
112	Boundary scan input data setup time	15.0	—	ns
113	Boundary scan input data hold time	24.0	—	ns
114	TCK low to output data valid	—	40.0	ns
115	TCK low to output high impedance	—	40.0	ns
116	TMS, TDI data setup time	5.0	—	ns
117	TMS, TDI data hold time	25.0	—	ns
118	TCK low to TDO data valid	—	44.0	ns
119	TCK low to TDO high impedance	—	44.0	ns

Note:
1. V_{CORE_VDD} = 1.25 V ± 0.05 V; T_J = -40°C to 110°C (52 LQFP) / -40°C to 105°C (80 LQFP), C_L = 50 pF
2. All timings apply to OnCE module data transfers because it uses the JTAG port as an interface.

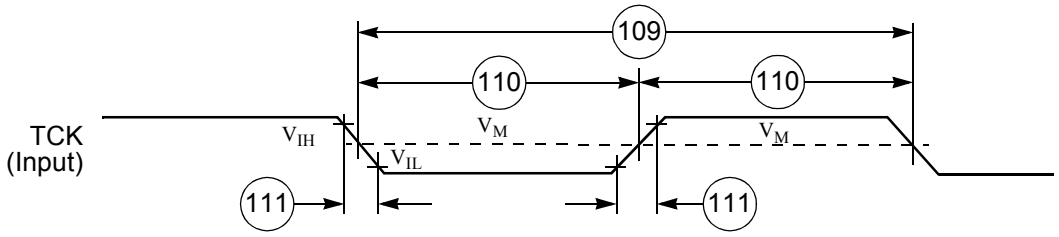


Figure 18. **Test Clock Input Timing Diagram**

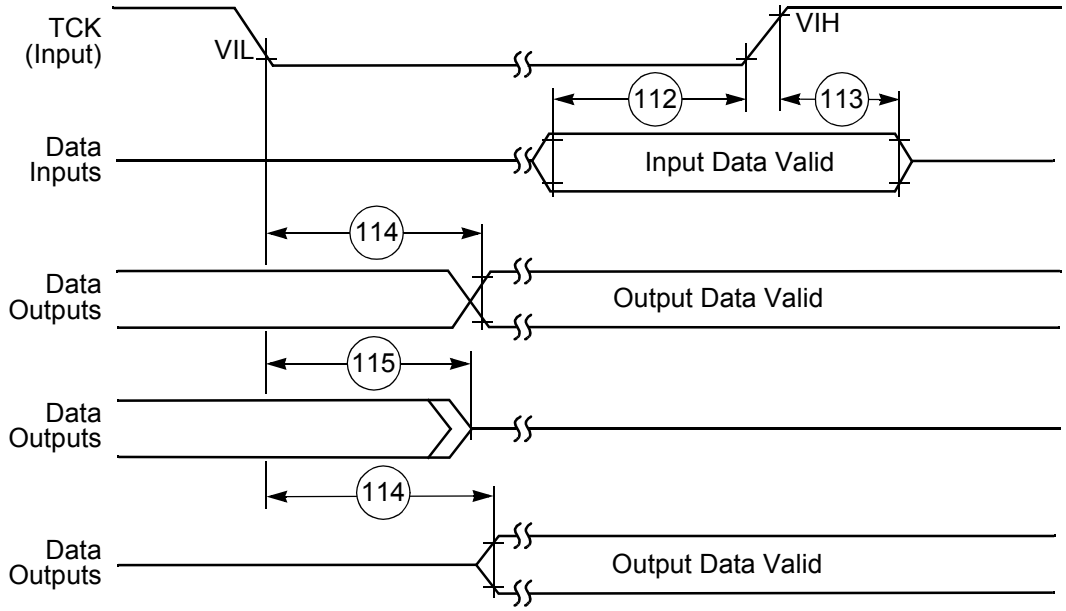


Figure 19. **Debugger Port Timing Diagram**

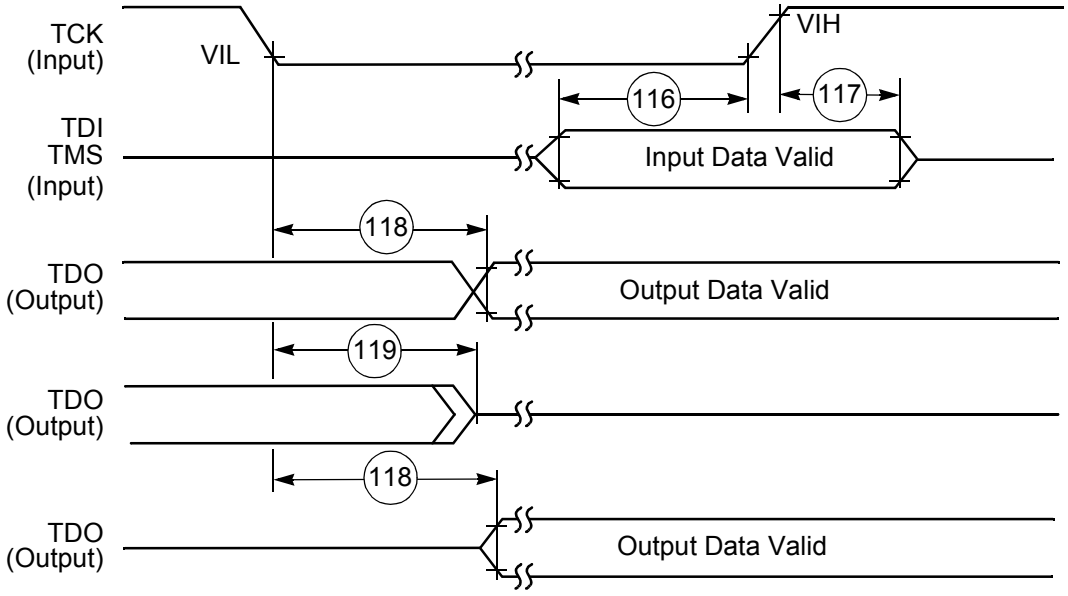


Figure 20. **Test Access Port Timing Diagram**

19 Watchdog Timer Timing

Table 28. Watchdog Timer Timing

No.	Characteristics	Expression	Min	Max	Unit
120	Delay from time-out to fall of TIO1	$2 \times T_C$	13.4	—	ns
121	Delay from timer clear to rise of TIO1	2 x Tc	13.4	—	ns

Appendix A Package Information

DSP56374 Pinout

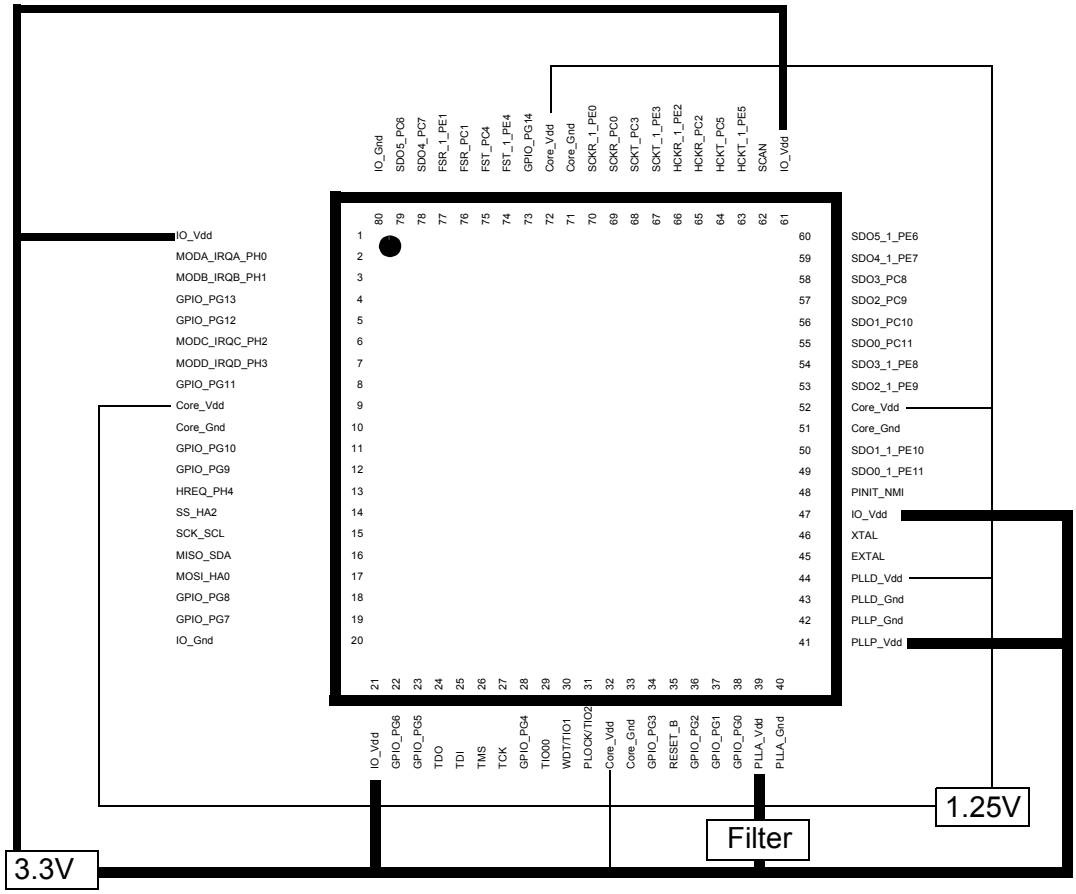


Figure 21. **80-pin Vdd Connections**

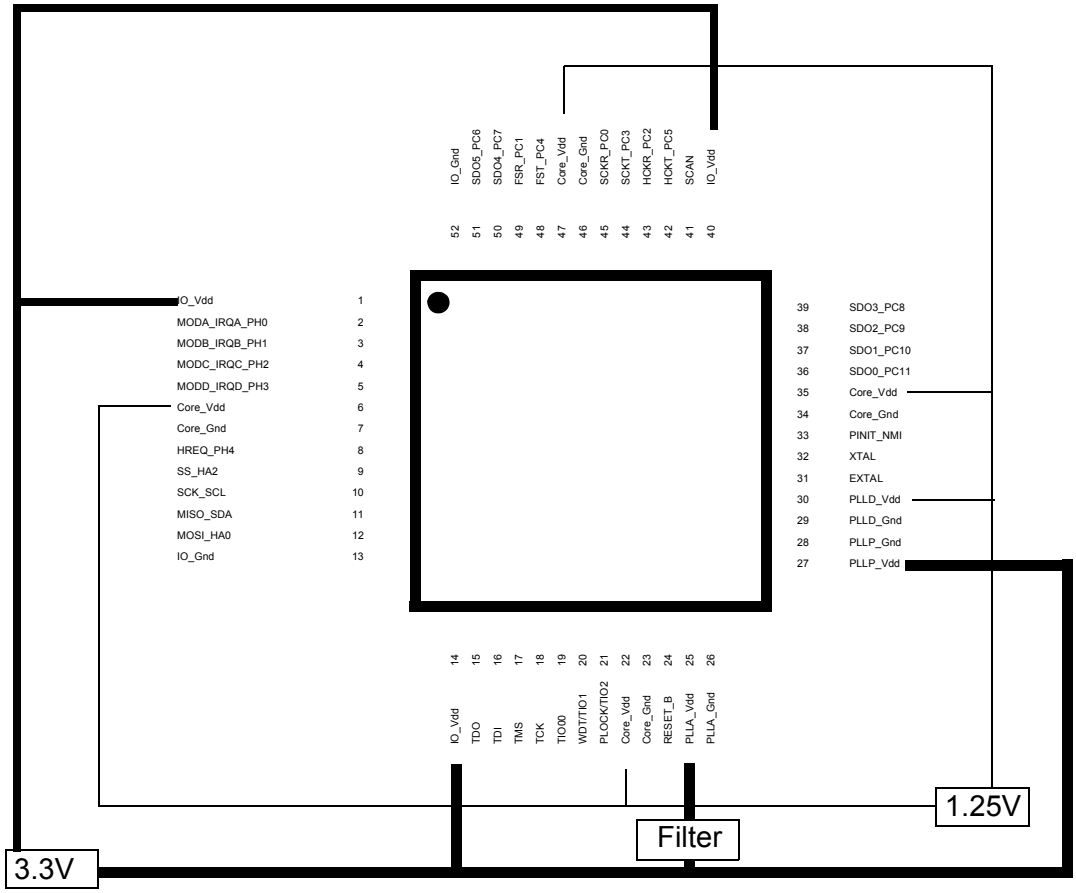
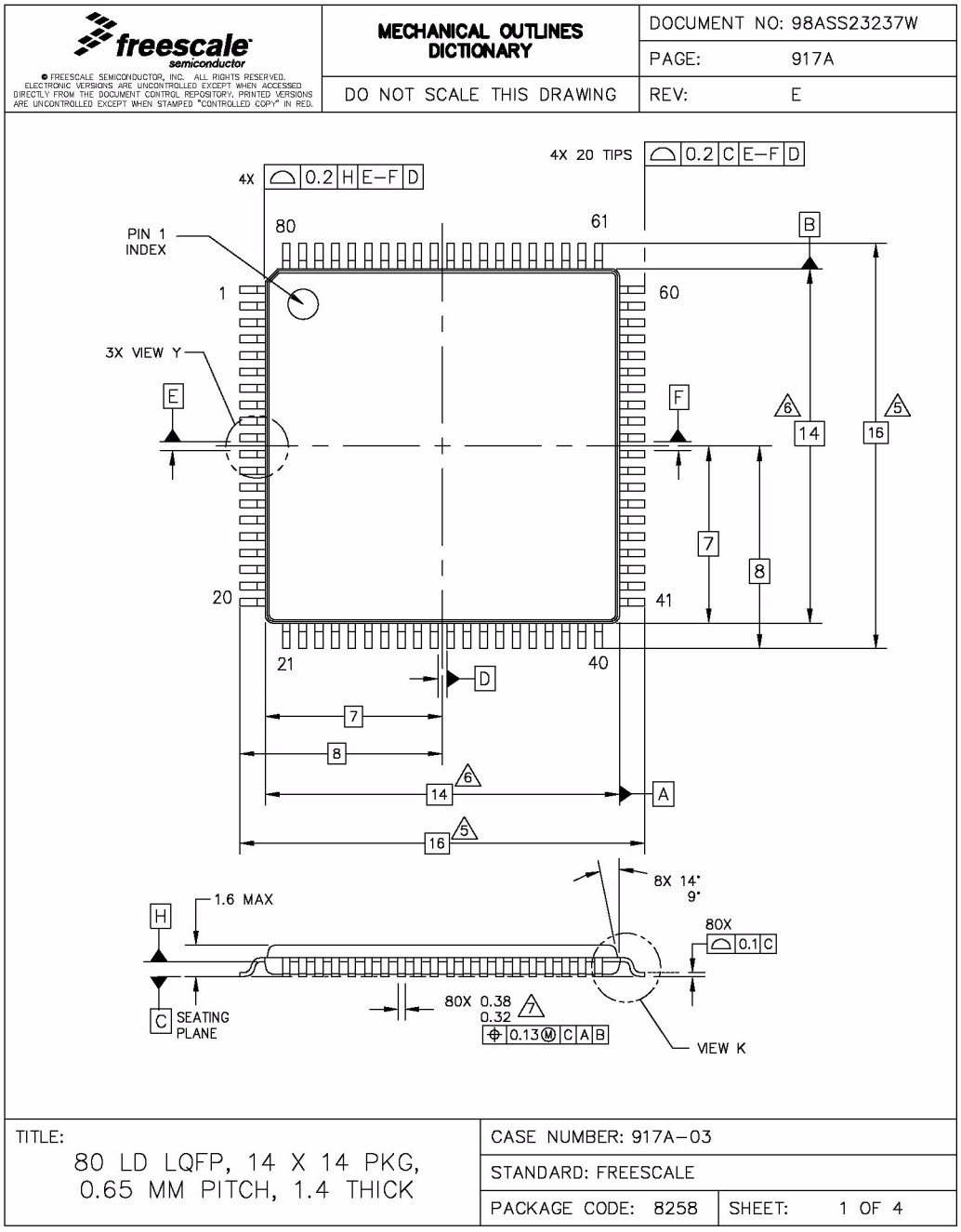


Figure 22. **52-pin Vdd Connections**

A.1 Package Information

80 pin package



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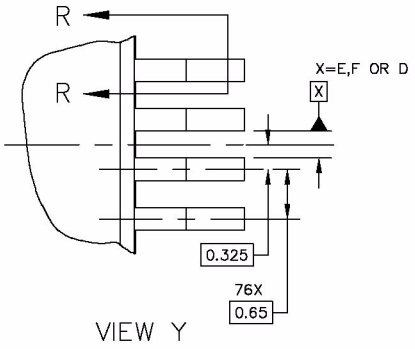
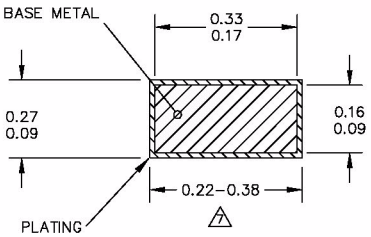
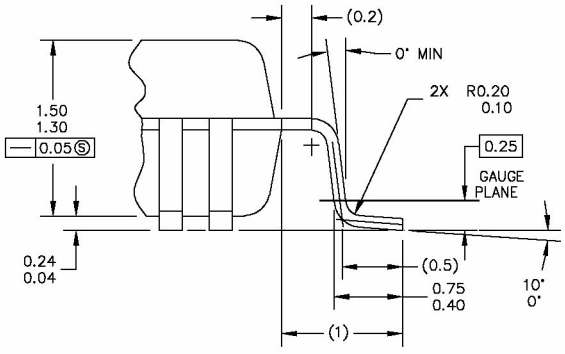


VIEW Y



SECTION R–R
ROTATED 90° CW



VIEW K

TITLE: 80 LD LQFP, 14 X 14 PKG, 0.65 MM PITCH, 1.4 THICK	CASE NUMBER: 917A–03	
	STANDARD: FREESCALE	
	PACKAGE CODE: 8258	SHEET: 2 OF 4

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		PAGE: 917A
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NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION : MILIMETER.
3. DATUM PLANE H IS LOCATED AT THE BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DATUM E, F AND D TO BE DETERMINED AT DATUM PLANE H.
5. DIMENSIONS TO BE DETERMINED AT SEATING PLANE C.
6. DIMENSIONS DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 PER SIDE. DIMENSIONS DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H.
7. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED 0.46. MINIMUM SPACE BETWEEN PROTRUSION AND ADJACENT LEAD OR PROTRUSION 0.07.

TITLE:	CASE NUMBER: 917A–03	
80 LD LQFP, 14 X 14 PKG, 0.65 MM PITCH, 1.4 THICK	STANDARD: FREESCALE	
	PACKAGE CODE: 8258	SHEET: 3 OF 4

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DOCUMENT NO: 98ASS23237W
PAGE: 917A
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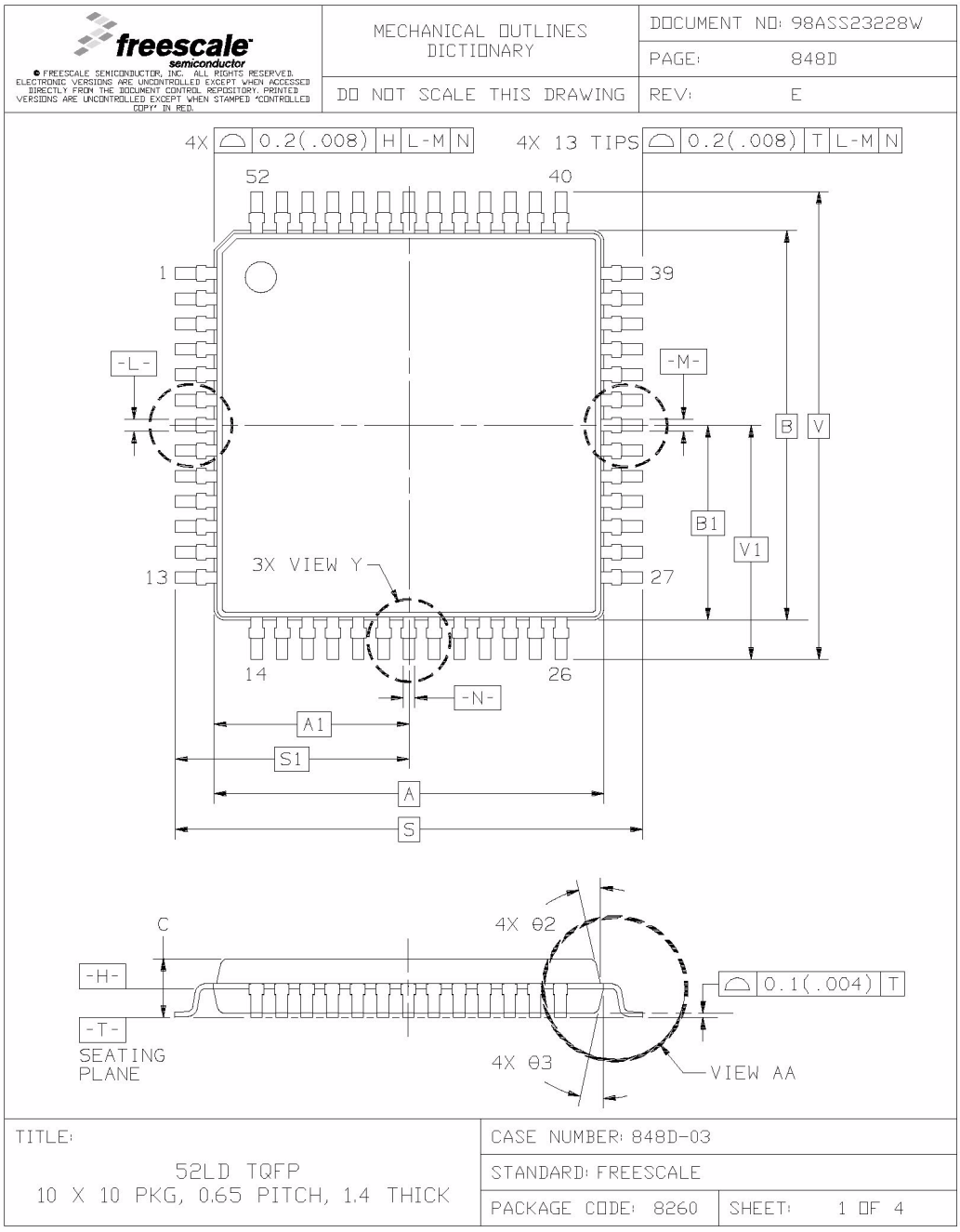
LTR	ORIGINATOR	REVISIONS	DRAFTER	DATE
0	-----	RELEASED FOR PRODUCTION	-----	-----
A	-----	-----	-----	-----
B	-----	-----	-----	-----
C	-----	-----	-----	-----
D	GARY JOHNSON	REFORMAT DOCUMENT. DELETED DUAL DIMENSIONS (INCH). CHANGED DOCUMENT TITLE FROM TQFP TO LQFP.	AZHAR A.	11 MAR 2004
E	PATRICE L.	UPDATED DRAWINGS PER FREESCALE FORMAT.	KL CHIN	7 OCT 2004

TITLE:
80 LQFP, 14 X 14 PKG,
0.65 MM PITCH, 1.4 THICK

CASE NUMBER: 917A-03
STANDARD: FREESCALE
PACKAGE CODE: 8258
SHEET: 4 OF 4

52 pin package



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		PAGE: 848D
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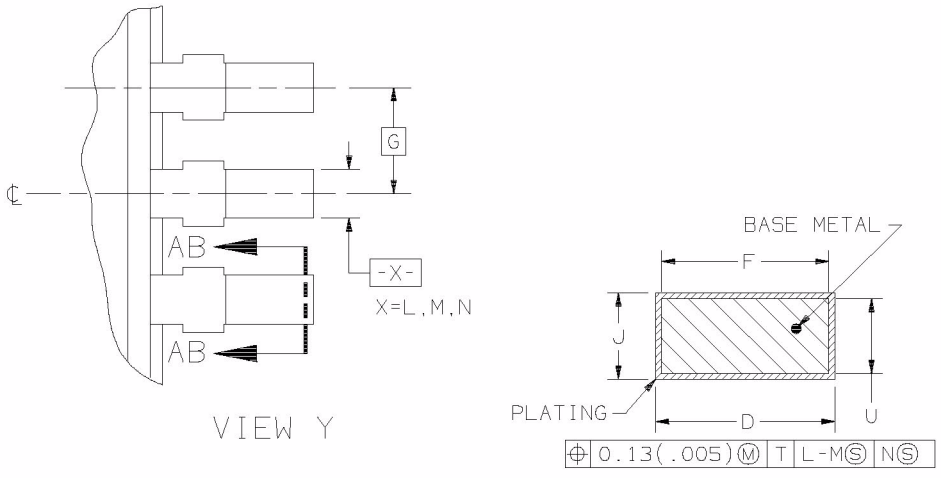
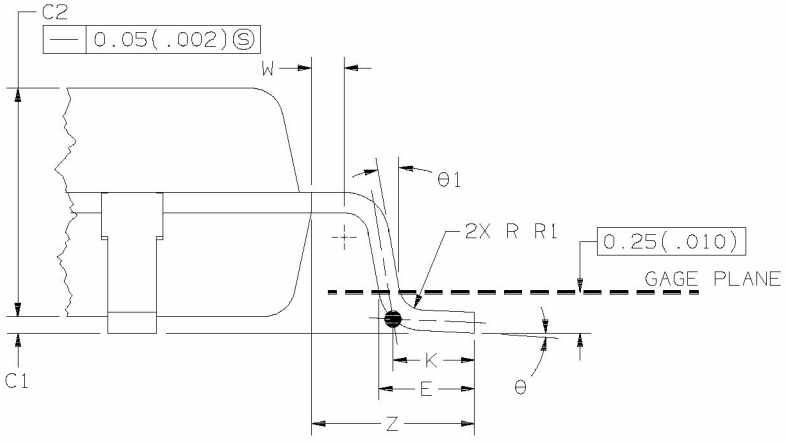


VIEW Y

SECTION AB-AB
ROTATED 90° CLOCKWISE



VIEW AA

TITLE: 52LD TQFP 10 X 10 PKG, 0.65 PITCH, 1.4 THICK	CASE NUMBER: 848D-03	
	STANDARD: FREESCALE	
	PACKAGE CODE: 8260	SHEET: 2 OF 4

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NOTES

1. DIMENSIONS AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DATUMS -L-, -M- AND -N- TO BE DETERMINED AT DATUM PLANE -H-.
5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -T-.
6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25(.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED 0.46(.018). MINIMUM SPACE BETWEEN PROTRUSION AND ADJACENT LEAD OR PROTRUSION 0.07(.003).

	MILLIMETERS		INCHES			MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX	DIM	MIN	MAX	MIN	MAX
A	10.00 BSC		0.394 BSC						
A1	5.00 BSC		0.197 BSC						
B	10.00 BSC		0.394 BSC						
B1	5.00 BSC		0.197 BSC						
C	---	1.70	---	0.067					
C1	0.05	0.20	0.002	0.008					
C2	1.30	1.50	0.051	0.059					
D	0.20	0.40	0.008	0.016					
E	0.45	0.75	0.018	0.030					
F	0.22	0.35	0.009	0.014					
G	0.65 BSC		0.026 BSC						
J	0.07	0.20	0.003	0.008					
K	0.50 REF		0.020 REF						
R1	0.08	0.20	0.003	0.008					
S	12.00 BSC		0.472 BSC						
S1	6.00 BSC		0.236 BSC						
U	0.09	0.16	0.004	0.006					
V	12.00 BSC		0.472 BSC						
V1	6.00 BSC		0.236 BSC						
W	0.20 REF		0.008 REF						
Z	1.00 REF		0.039 REF						
θ	0°	7°	0°	7°					
θ1	0°	---	0°	---					
θ2	12° REF		12° REF						
θ3	12° REF		12° REF						

TITLE:	CASE NUMBER: 848D-03	
52LD TQFP 10 X 10 PKG, 0.65 PITCH, 1.4 THICK	STANDARD: FREESCALE	
	PACKAGE CODE: 8260	SHEET: 3 OF 4

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REVISION HISTORY

DOCUMENT NO: 98ASS23228W
PAGE: 848D
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LTR	ORIGINATOR	REVISIONS	DRAFTER	DATE
0	-----	RELEASED FOR PRODUCTION	-----	-----
A	-----	-----	-----	-----
B	-----	-----	-----	-----
C	-----	-----	-----	-----
D	-----	-----	-----	-----
E	PATRICE L.	UPDATED DRAWINGS PER FREESCALE FORMAT. ADDED REVISION HISTORY PAGE.	KL CHIN	7 OCT 2004

TITLE:
52LD TQFP
10 X 10 PKG, 0.65 PITCH, 1.4 THICK

CASE NUMBER: 848D-03
STANDARD: FREESCALE
PACKAGE CODE: 8260
SHEET: 4 OF 4

Appendix B IBIS Model

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[File name]      tpz013g3.ibs
[File Rev]       1.0
[Date]           07/30/2002
[Source]         Made By 0.13uu HSPICE model.
[Disclaimer]     This information is for modeling purposes only and is not
                 guaranteed.
[Copyright]      Copyright 2002, Design Service, tsmc, All Rights Reserved.
|
|*****************************************************************
|                          Component tpz013g3
|*****************************************************************

(Pin)   signal_name          model_name
  1       IO_VDD          PVDD2DGZ/PVDD2POC
  2     MODA_IRQA_PH0          PDU12SDGZ
  3     MODB_IRQB_PH1         PDU12SDGZ
  4       GPIO_PG13           PRD12DGZ
  5       GPIO_PG12           PRD12DGZ
  6     MODC_IRQC_PH2         PDU12SDGZ
  7     MODD_IRQD_PH3         PDU12SDGZ
  8       GPIO_PG11           PRD12DGZ
  9       CORE_VDD            PVDD1DGZ
 10       CORE_GND            PVSS3DGZ
 11       GPIO_PG10           PRD12DGZ
 12       GPIO_PG9            PRD12DGZ
 13       HREQ_PH4            PDU12SDGZ
 14        SS_HA2             PDUSDGZ
 15        SCK_SCL            PDU12SDGZ
 16       MISO_SDA            PDU16SDGZ
 17       MOSI_HA0            PDU12SDGZ
 18       GPIO_PG8            PRD12DGZ
 19       GPIO_PG7            PRD12DGZ
 20        IO_GND             PVSS3DGZ
 21        IO_VDD             PVDD2DGZ
 22       GPIO_PG6            PRD12DGZ
 23       GPIO_PG5            PRD12DGZ
 24          TDO              PRT24DGZ
 25          TDI              PDUDGZ
 26          TCK              PDUDGZ
 27          TMS              PDUDGZ
 28       GPIO_PG4            PRD12DGZ
```

29	TIO0_PB0		PRD12DGZ
30	WDT_TIO1_PB1		PRD12DGZ
31	PLOCK_TIO2_PB2		PRD12DGZ
32	CORE_VDD		PVDD1DGZ
33	CORE_GND		PVSS3DGZ
34	GPIO_PG3		PRD12DGZ
35	RESET_B		PDUSDGZ
36	GPIO_PG2		PRD12DGZ
37	GPIO_PG1		PRD12DGZ
38	GPIO_PG0		PRD12DGZ
39	PLLA_VDD		PVDD1P
40	PLLA_GND		PVSS1P
41	PLLP_VDD		PVDD2DGZ
42	PLLP_GND		PVSS2P
43	PLLD_GND		PVSS1P
44	PLLD_VDD		PVDD1PC
45	EXTAL	1/2	PDX03DGZ
46	XTAL	1/2	PDX03DGZ
47	IO_VDD		PVDD2DGZ
48	PINIT_NMI		PDUSDGZ
49	SDO0_1_PE11		PRD12DGZ
50	SDO1_1_PE10		PRD12DGZ
51	CORE_GND		PVSS3DGZ
52	CORE_VDD		PVDD1DGZ
53	SDO2_1_PE9		PRD12DGZ
54	SDO3_1_PE8		PRD12DGZ
55	SDO0_PC11		PRD12DGZ
56	SDO1_PC10		PRD12DGZ
57	SDO2_SDI3_PC9		PRD12DGZ
58	SDO3_SDI2_PC8		PRD12DGZ
59	SDO4_1_PE7		PRD12DGZ
60	SDO5_1_PC6		PRD12DGZ
61	IO_VDD		PVDD2DGZ
62	SCAN		PDDDGZ
63	HCKT_1_PE5		PRD12DGZ
64	HCKT_PC5		PRD12DGZ
65	HCKR_PC2		PRD12DGZ
66	HCKR_1_PE2		PRD12DGZ
67	SCKT_1_PE3		PRD12DGZ
68	SCKT_PC3		PRD12DGZ
69	SCKR_PC0		PRD12DGZ
70	SCKR_1_PE0		PRD12DGZ
71	CORE_GND		PVSS3DGZ
72	CORE_VDD		PVDD1DGZ

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 73      GPIO_PG14            PRD12DGZ
 74       FST_1_PE4           PRD12DGZ
 75       FST_PC4             PRD12DGZ
 76       FSR_PC1             PRD12DGZ
 77       FSR_1_PE1           PRD12DGZ
 78      SDO4_SDI1_PC7        PRD12DGZ
|*****************************************************************************
|                             Model prd12dgz
|*****************************************************************************
|
[Model]          prd12dgz
Model_type       I/O
Polarity         Non-Inverting
Enable           Active-Low
Vinl =   0.80V
Vinh =   2.00V
Vmeas =   1.50V
Cref =  50.00pF
Rref =   1.00M
Vref =  0.000V
C_comp           4.17pF              3.75pF              4.58pF
|
|
[Temperature Range]       25.00               0.12k               0.000
[Pullup Reference]        3.30V               3.00V               3.60V
[Pulldown Reference]      0.000V              0.000V              0.000V
[POWER Clamp Reference]   5.00V               4.50V               5.50V
[GND Clamp Reference]     0.000V              0.000V              0.000V
[Pulldown]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30       0.000A              0.000A              0.000A
  -3.10       0.000A              0.000A             -10.00mA
  -2.90       0.000A              0.000A              0.000A
  -2.70       0.000A              0.000A              0.000A
  -2.50       0.000A             -10.00mA             0.000A
  -2.30      -10.00mA             0.000A             -10.00mA
  -2.10       0.000A             -10.00mA             0.000A
  -1.90       0.000A              0.000A             -10.00mA
  -1.70       0.000A              0.000A             -10.00mA
  -1.50      -10.00mA             0.000A             -10.00mA
  -1.00      -11.00mA             -5.00mA            -13.00mA
  -0.90      -12.00mA             -5.00mA            -15.00mA
  -0.80      -24.00mA             -7.00mA            -32.51mA
```

-0.70	-29.14mA	-8.00mA	-32.35mA
-0.60	-26.47mA	-13.80mA	-29.35mA
-0.50	-22.61mA	-14.54mA	-25.54mA
-0.40	-18.32mA	-12.17mA	-20.93mA
-0.30	-13.87mA	-9.16mA	-15.91mA
-0.20	-9.33mA	-6.10mA	-10.74mA
-0.10	-4.70mA	-3.05mA	-5.43mA
-0.00	2.86nA	7.25nA	11.72nA
0.10	4.61mA	2.94mA	5.36mA
0.20	8.96mA	5.69mA	10.49mA
0.30	13.07mA	8.26mA	15.36mA
0.40	16.92mA	10.65mA	20.00mA
0.50	20.53mA	12.86mA	24.40mA
0.60	23.91mA	14.90mA	28.55mA
0.70	27.04mA	16.76mA	32.48mA
0.80	29.95mA	18.46mA	36.18mA
0.90	32.61mA	19.99mA	39.64mA
1.00	35.06mA	21.37mA	42.87mA
1.10	37.27mA	22.58mA	45.87mA
1.20	39.27mA	23.64mA	48.64mA
1.30	41.04mA	24.55mA	51.19mA
1.40	42.60mA	25.32mA	53.50mA
1.50	43.95mA	25.95mA	55.60mA
1.60	45.08mA	26.44mA	57.46mA
1.70	46.00mA	26.80mA	59.11mA
1.80	46.70mA	27.07mA	60.53mA
1.90	47.20mA	27.26mA	61.71mA
2.00	47.55mA	27.41mA	62.63mA
2.10	47.81mA	27.53mA	63.31mA
2.20	48.01mA	27.63mA	63.79mA
2.30	48.17mA	27.71mA	64.15mA
2.40	48.31mA	27.78mA	64.43mA
2.50	48.42mA	27.85mA	64.65mA
2.60	48.53mA	27.90mA	64.84mA
2.70	48.62mA	27.96mA	65.00mA
2.80	48.70mA	28.01mA	65.14mA
2.90	48.78mA	28.05mA	65.27mA
3.00	48.85mA	28.09mA	65.38mA
3.10	48.92mA	28.14mA	65.49mA
3.20	48.99mA	28.18mA	65.59mA
3.30	49.05mA	28.23mA	65.68mA
3.40	49.12mA	28.42mA	65.77mA
3.50	49.20mA	28.97mA	65.86mA
3.60	49.24mA	29.74mA	65.95mA

```
   3.70       49.31mA             30.57mA             66.04mA
   3.80       49.40mA             31.13mA             66.12mA
   3.90       49.61mA             28.60mA             66.22mA
   4.00       50.41mA             28.66mA             66.33mA
   4.10       51.65mA             28.72mA             66.49mA
   4.20       52.87mA             28.80mA             66.72mA
   4.30       50.78mA             28.89mA             67.28mA
   4.50       50.67mA             29.12mA             70.40mA
   4.70       51.17mA             29.42mA             73.03mA
   4.90       51.85mA             29.83mA             69.12mA
   5.10       52.75mA             30.37mA             70.18mA
   5.30       53.86mA             31.02mA             71.45mA
   5.50       55.21mA             31.82mA             73.05mA
   5.70       56.82mA             32.77mA             74.98mA
   5.90       58.68mA             33.86mA             77.25mA
   6.10       60.78mA             35.10mA             79.83mA
   6.60       66.91mA             38.73mA             87.50mA
|
[Pullup]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30        0.11A              82.01mA              0.13A
  -3.10        0.11A              79.25mA              0.13A
  -2.90        0.10A              76.07mA              0.12A
  -2.70       97.60mA             72.55mA              0.11A
  -2.50       92.41mA             68.70mA              0.11A
  -2.30       87.04mA             64.55mA              0.10A
  -2.10       81.44mA             60.13mA             94.69mA
  -1.90       75.56mA             55.45mA             87.72mA
  -1.70       69.36mA             50.52mA             80.48mA
  -1.50       62.83mA             45.36mA             73.03mA
  -1.00       48.46mA             31.37mA             56.75mA
  -0.90       43.82mA             28.63mA             50.74mA
  -0.80       38.59mA             28.69mA             44.61mA
  -0.70       33.28mA             24.97mA             38.60mA
  -0.60       28.26mA             21.04mA             33.20mA
  -0.50       23.64mA             17.11mA             27.91mA
  -0.40       19.01mA             13.34mA             22.52mA
  -0.30       14.32mA              9.87mA             17.03mA
  -0.20        9.58mA              6.53mA             11.45mA
  -0.10        4.80mA              3.23mA              5.78mA
   0.00       34.08uA             11.20uA             71.92uA
   0.10       -4.58mA             -3.08mA             -5.50mA
   0.20       -8.94mA             -5.98mA            -10.80mA
```

0.30	-13.04mA	-8.72mA	-15.82mA
0.40	-16.89mA	-11.27mA	-20.56mA
0.50	-20.50mA	-13.66mA	-25.04mA
0.60	-23.86mA	-15.87mA	-29.25mA
0.70	-26.98mA	-17.92mA	-33.21mA
0.80	-29.87mA	-19.80mA	-36.91mA
0.90	-32.53mA	-21.51mA	-40.36mA
1.00	-34.96mA	-23.06mA	-43.56mA
1.10	-37.16mA	-24.45mA	-46.52mA
1.20	-39.15mA	-25.68mA	-49.24mA
1.30	-40.92mA	-26.75mA	-51.73mA
1.40	-42.48mA	-27.66mA	-53.98mA
1.50	-43.83mA	-28.43mA	-56.01mA
1.60	-44.98mA	-29.05mA	-57.81mA
1.70	-45.94mA	-29.53mA	-59.40mA
1.80	-46.72mA	-29.90mA	-60.77mA
1.90	-47.35mA	-30.20mA	-61.93mA
2.00	-47.86mA	-30.45mA	-62.90mA
2.10	-48.29mA	-30.66mA	-63.70mA
2.20	-48.65mA	-30.85mA	-64.37mA
2.30	-48.97mA	-31.02mA	-64.93mA
2.40	-49.25mA	-31.17mA	-65.40mA
2.50	-49.50mA	-31.31mA	-65.82mA
2.60	-49.72mA	-31.44mA	-66.18mA
2.70	-49.92mA	-31.56mA	-66.50mA
2.80	-50.11mA	-31.67mA	-66.79mA
2.90	-50.28mA	-31.78mA	-67.05mA
3.00	-50.44mA	-31.88mA	-67.29mA
3.10	-50.59mA	-31.98mA	-67.51mA
3.20	-50.74mA	-32.08mA	-67.72mA
3.30	-50.88mA	-32.20mA	-67.92mA
3.40	-51.01mA	-32.75mA	-68.11mA
3.50	-51.14mA	-40.35mA	-68.29mA
3.60	-51.27mA	-0.14A	-68.47mA
3.70	-51.42mA	-0.94A	-68.64mA
3.80	-51.84mA	-2.69A	-68.80mA
3.90	-53.78mA	-4.48A	-68.97mA
4.00	-64.80mA	-6.27A	-69.30mA
4.10	-0.29A	-8.06A	-70.82mA
4.20	-1.85A	-9.85A	-75.29mA
4.30	-3.90A	-11.63A	-83.12mA
4.50	-8.00A	-15.21A	-1.14A
4.70	-12.10A	-18.79A	-5.39A
4.90	-16.20A	-22.36A	-9.64A

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   5.10      -20.30A            -25.94A            -13.89A
   5.30      -24.40A            -29.51A            -18.15A
   5.50      -28.50A            -33.09A            -22.41A
   5.70      -32.60A            -36.67A            -26.66A
   5.90      -36.70A            -40.24A            -30.92A
   6.10      -40.80A            -43.82A            -35.17A
   6.60      -51.05A            -52.76A            -45.81A
|
[GND_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00      -85.83A            -77.78A            -88.32A
  -4.80      -81.73A            -74.20A            -84.06A
  -4.60      -77.63A            -70.62A            -79.80A
  -4.40      -73.53A            -67.04A            -75.54A
  -4.20      -69.43A            -63.46A            -71.28A
  -4.00      -65.33A            -59.88A            -67.02A
  -3.80      -61.23A            -56.30A            -62.76A
  -3.60      -57.13A            -52.72A            -58.50A
  -3.40      -53.03A            -49.14A            -54.24A
  -3.20      -48.93A            -45.56A            -49.98A
  -3.00      -44.84A            -41.99A            -45.73A
  -2.80      -40.74A            -38.42A            -41.48A
  -2.60      -36.64A            -34.84A            -37.22A
  -2.40      -32.54A            -31.27A            -32.97A
  -2.20      -28.45A            -27.69A            -28.72A
  -2.00      -24.35A            -24.12A            -24.46A
  -1.80      -20.25A            -20.54A            -20.21A
  -1.60      -16.15A            -16.97A            -15.95A
  -1.40      -12.05A            -13.39A            -11.70A
  -1.20       -7.95A             -9.82A             -7.44A
  -1.00       -3.85A             -6.24A             -3.19A
  -0.80       -0.23A             -2.66A            -70.99mA
  -0.60       -2.25mA            -0.10A             -5.98mA
  -0.40      -89.81uA            -0.52mA            -0.26mA
  -0.20      -27.92uA           -14.70uA           -42.92uA
  -0.00      -87.63nA           -89.05nA            -0.10uA
   0.20       18.71uA             7.31uA            32.27uA
   0.40       29.19uA            10.25uA            54.12uA
   0.60       32.49uA            10.67uA            65.78uA
   0.80       33.07uA            10.78uA            69.33uA
   1.00       33.30uA            10.86uA            70.17uA
   1.20       33.45uA            10.92uA            70.55uA
   1.40       33.57uA            10.97uA            70.80uA
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   1.60       33.68uA            11.02uA            70.99uA
   1.80       33.77uA            11.07uA            71.16uA
   2.00       33.87uA            11.11uA            71.32uA
   2.20       33.96uA            11.14uA            71.46uA
   2.40       34.01uA            11.15uA            71.61uA
   2.60       34.03uA            11.16uA            71.76uA
   2.80       34.05uA            11.17uA            71.84uA
   3.00       34.06uA            11.19uA            71.86uA
   3.20       34.07uA            11.51uA            71.88uA
   3.40       34.07uA            10.95uA            71.90uA
   3.60       34.07uA            10.39uA            71.92uA
   3.80       34.07uA             9.83uA            71.94uA
   4.00       34.07uA             9.27uA            71.96uA
   4.20       34.07uA             8.71uA            71.98uA
   4.40       34.07uA             8.15uA            72.00uA
   4.60       34.07uA             7.59uA            72.02uA
   4.80       34.07uA             7.03uA            72.04uA
   5.00       34.07uA             6.47uA            72.06uA
|
[POWER_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00       48.57uA            16.33uA            95.57uA
  -4.90       48.24uA            16.21uA            95.07uA
  -4.80       47.91uA            16.09uA            94.57uA
  -4.70       47.58uA            15.97uA            94.07uA
  -4.60       47.25uA            15.85uA            93.57uA
  -4.50       46.92uA            15.73uA            93.07uA
  -4.40       46.59uA            15.61uA            92.57uA
  -4.30       46.26uA            15.49uA            92.07uA
  -4.20       45.93uA            15.37uA            91.57uA
  -4.10       45.60uA            15.25uA            91.07uA
  -4.00       45.27uA            15.13uA            90.57uA
  -3.90       44.94uA            15.01uA            90.07uA
  -3.80       44.61uA            14.89uA            89.57uA
  -3.70       44.28uA            14.77uA            89.07uA
  -3.60       43.95uA            14.65uA            88.57uA
  -3.50       43.62uA            14.53uA            88.07uA
  -3.40       43.29uA            14.41uA            87.57uA
  -3.30       42.96uA            14.29uA            87.07uA
  -3.20       42.63uA            14.17uA            86.57uA
  -3.10       42.30uA            14.05uA            86.07uA
  -3.00       41.97uA            13.93uA            85.57uA
  -2.90       41.64uA            13.81uA            85.07uA
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  -2.80       41.31uA             13.69uA             84.57uA
  -2.70       40.98uA             13.57uA             84.07uA
  -2.60       40.65uA             13.45uA             83.57uA
  -2.50       40.32uA             13.33uA             83.07uA
  -2.40       39.99uA             13.21uA             82.57uA
  -2.30       39.66uA             13.09uA             82.07uA
  -2.20       39.33uA             12.97uA             81.57uA
  -2.10       39.00uA             12.85uA             81.07uA
  -2.00       38.67uA             12.73uA             80.57uA
  -1.90       38.34uA             12.61uA             80.07uA
  -1.80       38.01uA             12.49uA             79.57uA
  -1.70       37.68uA             12.37uA             79.07uA
  -1.60       37.35uA             12.25uA             78.57uA
  -1.50       37.02uA             12.15uA             78.07uA
  -1.40       36.71uA             12.05uA             77.57uA
  -1.30       36.42uA             11.95uA             77.07uA
  -1.20       36.15uA             11.87uA             76.57uA
  -1.10       35.89uA             11.79uA             76.07uA
  -1.00       35.66uA             11.72uA             75.57uA
  -0.90       35.45uA             11.66uA             75.10uA
  -0.80       35.26uA             11.60uA             74.67uA
  -0.70       35.09uA             11.55uA             74.28uA
  -0.60       34.93uA             11.51uA             73.93uA
  -0.50       34.80uA             11.47uA             73.61uA
  -0.40       34.68uA             11.43uA             73.34uA
  -0.30       34.59uA             11.41uA             73.10uA
  -0.20       34.50uA             11.38uA             72.89uA
  -0.10       34.43uA             11.36uA             72.72uA
   0.00       34.37uA             11.34uA             72.57uA
|
[Ramp]
| variable       typ                 min                 max
dV/dt_r          1.21/2.06n          0.85/2.62n          1.45/1.82n
dV/dt_f          1.22/2.51n          0.78/3.11n          1.45/2.14n
R_load = 50.00
|
[Rising Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)              V(min)              V(max)
```

|

0.000S	1.26uV	1.62uV	1.22uV
0.20nS	1.04uV	1.45uV	0.74uV
0.40nS	-5.64uV	-1.36uV	11.59uV
0.60nS	-0.29mV	-5.13uV	-3.27mV
0.80nS	-3.54mV	25.94uV	-9.17mV
1.00nS	-3.50mV	-4.79uV	56.24mV
1.20nS	33.86mV	-0.86mV	0.13V
1.40nS	79.34mV	-3.75mV	0.19V
1.60nS	0.14V	-8.09mV	0.27V
1.80nS	0.20V	3.52mV	0.36V
2.00nS	0.28V	38.97mV	0.47V
2.20nS	0.36V	82.84mV	0.59V
2.40nS	0.47V	0.13V	0.74V
2.60nS	0.60V	0.18V	0.90V
2.80nS	0.77V	0.27V	1.12V
3.00nS	0.92V	0.34V	1.32V
3.20nS	1.03V	0.40V	1.46V
3.40nS	1.16V	0.50V	1.63V
3.60nS	1.29V	0.59V	1.78V
3.80nS	1.39V	0.67V	1.91V
4.00nS	1.49V	0.75V	2.01V
4.20nS	1.58V	0.84V	2.11V
4.40nS	1.65V	0.91V	2.18V
4.60nS	1.69V	0.95V	2.21V
4.80nS	1.72V	0.99V	2.23V
5.00nS	1.76V	1.03V	2.27V
5.20nS	1.80V	1.07V	2.29V
5.40nS	1.83V	1.12V	2.31V
5.60nS	1.86V	1.16V	2.33V
5.80nS	1.88V	1.18V	2.34V
6.00nS	1.89V	1.20V	2.34V
6.20nS	1.91V	1.23V	2.35V
6.40nS	1.92V	1.25V	2.36V
6.60nS	1.93V	1.27V	2.37V
6.80nS	1.94V	1.28V	2.38V
7.00nS	1.95V	1.30V	2.38V
7.20nS	1.96V	1.31V	2.39V
7.40nS	1.97V	1.33V	2.39V
7.60nS	1.98V	1.34V	2.39V
7.80nS	1.98V	1.35V	2.40V
8.00nS	1.98V	1.36V	2.40V
8.20nS	1.99V	1.37V	2.40V
8.40nS	1.99V	1.37V	2.40V

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   8.60nS         1.99V              1.38V              2.41V
   8.80nS         2.00V              1.39V              2.41V
   9.00nS         2.00V              1.39V              2.41V
   9.20nS         2.00V              1.40V              2.41V
   9.40nS         2.01V              1.40V              2.41V
   9.60nS         2.01V              1.41V              2.42V
   9.80nS         2.01V              1.41V              2.42V
  10.00nS         2.01V              1.41V              2.42V
|
[Rising Waveform]
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)             V(min)             V(max)
|
  0.000S          1.27V              1.66V              1.18V
   0.20nS         1.27V              1.66V              1.18V
   0.40nS         1.27V              1.66V              1.18V
   0.60nS         1.27V              1.66V              1.19V
   0.80nS         1.28V              1.66V              1.24V
   1.00nS         1.40V              1.66V              1.47V
   1.20nS         1.60V              1.67V              1.71V
   1.40nS         1.77V              1.69V              1.88V
   1.60nS         1.99V              1.80V              2.12V
   1.80nS         2.24V              1.95V              2.41V
   2.00nS         2.50V              2.13V              2.70V
   2.20nS         2.74V              2.32V              2.99V
   2.40nS         2.94V              2.49V              3.21V
   2.60nS         3.09V              2.63V              3.34V
   2.80nS         3.18V              2.79V              3.44V
   3.00nS         3.24V              2.87V              3.49V
   3.20nS         3.26V              2.91V              3.52V
   3.40nS         3.27V              2.96V              3.55V
   3.60nS         3.29V              2.98V              3.57V
   3.80nS         3.29V              2.99V              3.59V
   4.00nS         3.30V              2.99V              3.59V
   4.20nS         3.30V              3.00V              3.60V
   4.40nS         3.30V              3.00V              3.60V
   4.60nS         3.30V              3.00V              3.60V
   4.80nS         3.30V              3.00V              3.60V
   5.00nS         3.30V              3.00V              3.60V
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   5.20nS         3.30V              3.00V              3.60V
   5.40nS         3.30V              3.00V              3.60V
   5.60nS         3.30V              3.00V              3.60V
   5.80nS         3.30V              3.00V              3.60V
   6.00nS         3.30V              3.00V              3.60V
   6.20nS         3.30V              3.00V              3.60V
   6.40nS         3.30V              3.00V              3.60V
   6.60nS         3.30V              3.00V              3.60V
   6.80nS         3.30V              3.00V              3.60V
   7.00nS         3.30V              3.00V              3.60V
   7.20nS         3.30V              3.00V              3.60V
   7.40nS         3.30V              3.00V              3.60V
   7.60nS         3.30V              3.00V              3.60V
   7.80nS         3.30V              3.00V              3.60V
   8.00nS         3.30V              3.00V              3.60V
   8.20nS         3.30V              3.00V              3.60V
   8.40nS         3.30V              3.00V              3.60V
   8.60nS         3.30V              3.00V              3.60V
   8.80nS         3.30V              3.00V              3.60V
   9.00nS         3.30V              3.00V              3.60V
   9.20nS         3.30V              3.00V              3.60V
   9.40nS         3.30V              3.00V              3.60V
   9.60nS         3.30V              3.00V              3.60V
   9.80nS         3.30V              3.00V              3.60V
  10.00nS         3.30V              3.00V              3.60V
|
[Falling Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)             V(min)             V(max)
|
  0.000S          2.02V              1.44V              2.43V
   0.20nS         2.02V              1.44V              2.43V
   0.40nS         2.02V              1.44V              2.43V
   0.60nS         2.02V              1.44V              2.38V
   0.80nS         1.97V              1.44V              2.13V
   1.00nS         1.73V              1.44V              1.82V
   1.20nS         1.45V              1.42V              1.49V
   1.40nS         1.24V              1.38V              1.24V
   1.60nS         0.96V              1.29V              0.92V
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   1.80nS         0.70V              1.12V              0.67V
   2.00nS         0.50V              0.92V              0.50V
   2.20nS         0.36V              0.73V              0.38V
   2.40nS         0.27V              0.55V              0.30V
   2.60nS         0.20V              0.40V              0.24V
   2.80nS         0.14V              0.27V              0.17V
   3.00nS        99.16mV             0.20V              0.13V
   3.20nS        79.41mV             0.16V              0.11V
   3.40nS        53.08mV             0.11V             78.74mV
   3.60nS        36.21mV            75.26mV            59.16mV
   3.80nS        23.36mV            51.00mV            39.59mV
   4.00nS        12.42mV            31.87mV            27.31mV
   4.20nS         6.73mV            18.57mV            15.01mV
   4.40nS         2.10mV             8.15mV             7.54mV
   4.60nS         1.57mV             5.93mV             4.99mV
   4.80nS         1.14mV             3.71mV             2.45mV
   5.00nS         0.68mV             1.71mV             1.29mV
   5.20nS         0.62mV             1.31mV             0.88mV
   5.40nS         0.54mV             0.89mV             0.54mV
   5.60nS         0.46mV             0.73mV             0.46mV
   5.80nS         0.41mV             0.65mV             0.42mV
   6.00nS         0.37mV             0.59mV             0.38mV
   6.20nS         0.34mV             0.53mV             0.34mV
   6.40nS         0.32mV             0.48mV             0.29mV
   6.60nS         0.27mV             0.43mV             0.26mV
   6.80nS         0.22mV             0.38mV             0.22mV
   7.00nS         0.18mV             0.34mV             0.20mV
   7.20nS         0.18mV             0.30mV             0.18mV
   7.40nS         0.18mV             0.26mV             0.15mV
   7.60nS         0.15mV             0.23mV             0.13mV
   7.80nS         0.12mV             0.22mV             0.12mV
   8.00nS         0.11mV             0.20mV             0.11mV
   8.20nS         0.11mV             0.18mV             0.10mV
   8.40nS         0.12mV             0.17mV            92.36uV
   8.60nS        97.87uV             0.16mV            78.53uV
   8.80nS        59.73uV             0.15mV            64.71uV
   9.00nS        36.18uV             0.14mV            61.02uV
   9.20nS        61.23uV             0.12mV            60.74uV
   9.40nS        87.87uV             0.10mV            58.12uV
   9.60nS        67.13uV             0.10mV            46.02uV
   9.80nS        29.42uV             0.10mV            39.81uV
  10.00nS        71.42uV            84.83uV            50.29uV
|
[Falling Waveform]
```

```
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)             V(min)             V(max)
|
  0.000S          3.30V              3.00V              3.60V
   0.20nS         3.30V              3.00V              3.60V
   0.40nS         3.30V              3.00V              3.60V
   0.60nS         3.30V              3.00V              3.59V
   0.80nS         3.30V              3.00V              3.48V
   1.00nS         3.22V              3.00V              3.36V
   1.20nS         3.12V              3.00V              3.25V
   1.40nS         3.06V              3.00V              3.16V
   1.60nS         2.96V              3.00V              3.04V
   1.80nS         2.86V              2.95V              2.90V
   2.00nS         2.75V              2.89V              2.76V
   2.20nS         2.64V              2.83V              2.61V
   2.40nS         2.52V              2.77V              2.48V
   2.60nS         2.40V              2.70V              2.34V
   2.80nS         2.26V              2.61V              2.18V
   3.00nS         2.16V              2.54V              2.04V
   3.20nS         2.10V              2.48V              1.93V
   3.40nS         2.01V              2.41V              1.79V
   3.60nS         1.93V              2.35V              1.68V
   3.80nS         1.86V              2.30V              1.57V
   4.00nS         1.78V              2.25V              1.49V
   4.20nS         1.68V              2.19V              1.41V
   4.40nS         1.58V              2.13V              1.34V
   4.60nS         1.53V              2.10V              1.31V
   4.80nS         1.49V              2.08V              1.29V
   5.00nS         1.43V              2.04V              1.26V
   5.20nS         1.39V              2.01V              1.24V
   5.40nS         1.35V              1.98V              1.22V
   5.60nS         1.32V              1.95V              1.21V
   5.80nS         1.31V              1.94V              1.20V
   6.00nS         1.30V              1.93V              1.20V
   6.20nS         1.29V              1.91V              1.19V
   6.40nS         1.29V              1.90V              1.19V
   6.60nS         1.29V              1.88V              1.19V
   6.80nS         1.28V              1.87V              1.19V
   7.00nS         1.28V              1.85V              1.19V
```

```
   7.20nS         1.28V               1.84V               1.19V
   7.40nS         1.28V               1.83V               1.19V
   7.60nS         1.28V               1.82V               1.19V
   7.80nS         1.28V               1.81V               1.19V
   8.00nS         1.28V               1.81V               1.19V
   8.20nS         1.28V               1.80V               1.19V
   8.40nS         1.27V               1.79V               1.19V
   8.60nS         1.27V               1.79V               1.19V
   8.80nS         1.27V               1.78V               1.19V
   9.00nS         1.27V               1.77V               1.19V
   9.20nS         1.27V               1.76V               1.19V
   9.40nS         1.27V               1.75V               1.19V
   9.60nS         1.27V               1.73V               1.18V
   9.80nS         1.27V               1.72V               1.18V
  10.00nS         1.27V               1.71V               1.18V
|
| End [Model] prd12dgz
|
|*****************************************************************************
|                              Model prd16dgz
|*****************************************************************************
|
[Model]          prd16dgz
Model_type       I/O
Polarity         Non-Inverting
Enable           Active-Low
Vinl =   0.80V
Vinh =   2.00V
Vmeas =   1.50V
Cref =  50.00pF
Rref =   1.00M
Vref =  0.000V
C_comp           3.86pF              3.48pF              4.25pF
|
|
[Temperature Range]       25.00               0.12k               0.000
[Pullup Reference]        3.30V               3.00V               3.60V
[Pulldown Reference]      0.000V              0.000V              0.000V
[POWER Clamp Reference]   5.00V               4.50V               5.50V
[GND Clamp Reference]     0.000V              0.000V              0.000V
[Pulldown]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30      -10.00mA             0.000A              0.000A
```

-3.10	0.000A	0.000A	0.000A
-2.90	0.000A	0.000A	0.000A
-2.70	0.000A	0.000A	0.000A
-2.50	0.000A	0.000A	0.000A
-2.30	0.000A	0.000A	0.000A
-2.10	-10.00mA	0.000A	0.000A
-1.90	0.000A	0.000A	-10.00mA
-1.70	-10.00mA	0.000A	-10.00mA
-1.50	-10.00mA	0.000A	-20.00mA
-1.00	-16.00mA	-6.00mA	-18.00mA
-0.90	-16.00mA	-8.00mA	-21.00mA
-0.80	-32.00mA	-8.00mA	-43.34mA
-0.70	-38.86mA	-10.60mA	-43.13mA
-0.60	-35.29mA	-18.40mA	-39.13mA
-0.50	-30.14mA	-19.39mA	-34.05mA
-0.40	-24.42mA	-16.22mA	-27.89mA
-0.30	-18.49mA	-12.22mA	-21.21mA
-0.20	-12.44mA	-8.14mA	-14.32mA
-0.10	-6.27mA	-4.06mA	-7.24mA
-0.00	4.09nA	6.98nA	10.67nA
0.10	6.14mA	3.92mA	7.15mA
0.20	11.95mA	7.59mA	13.98mA
0.30	17.42mA	11.01mA	20.48mA
0.40	22.56mA	14.20mA	26.67mA
0.50	27.38mA	17.14mA	32.53mA
0.60	31.88mA	19.86mA	38.07mA
0.70	36.06mA	22.35mA	43.31mA
0.80	39.93mA	24.61mA	48.24mA
0.90	43.49mA	26.66mA	52.85mA
1.00	46.74mA	28.49mA	57.16mA
1.10	49.69mA	30.11mA	61.16mA
1.20	52.35mA	31.52mA	64.86mA
1.30	54.72mA	32.74mA	68.25mA
1.40	56.80mA	33.76mA	71.34mA
1.50	58.59mA	34.59mA	74.13mA
1.60	60.11mA	35.25mA	76.62mA
1.70	61.33mA	35.74mA	78.81mA
1.80	62.26mA	36.09mA	80.70mA
1.90	62.93mA	36.35mA	82.27mA
2.00	63.40mA	36.55mA	83.51mA
2.10	63.75mA	36.71mA	84.41mA
2.20	64.01mA	36.84mA	85.06mA
2.30	64.23mA	36.95mA	85.54mA
2.40	64.41mA	37.04mA	85.91mA

```
   2.50       64.56mA             37.13mA             86.20mA
   2.60       64.70mA             37.21mA             86.45mA
   2.70       64.82mA             37.28mA             86.66mA
   2.80       64.94mA             37.34mA             86.85mA
   2.90       65.04mA             37.40mA             87.02mA
   3.00       65.14mA             37.46mA             87.17mA
   3.10       65.23mA             37.51mA             87.32mA
   3.20       65.32mA             37.57mA             87.45mA
   3.30       65.40mA             37.63mA             87.58mA
   3.40       65.49mA             37.81mA             87.70mA
   3.50       65.59mA             38.34mA             87.82mA
   3.60       65.66mA             39.10mA             87.93mA
   3.70       65.75mA             39.94mA             88.05mA
   3.80       65.86mA             40.42mA             88.16mA
   3.90       66.08mA             38.09mA             88.29mA
   4.00       66.86mA             38.16mA             88.44mA
   4.10       68.11mA             38.25mA             88.63mA
   4.20       69.36mA             38.35mA             88.90mA
   4.30       67.34mA             38.47mA             89.46mA
   4.50       67.43mA             38.78mA             92.67mA
   4.70       68.10mA             39.19mA             95.47mA
   4.90       69.00mA             39.73mA             91.91mA
   5.10       70.20mA             40.44mA             93.29mA
   5.30       71.67mA             41.32mA             95.00mA
   5.50       73.47mA             42.38mA             97.12mA
   5.70       75.61mA             43.64mA             99.69mA
   5.90       78.09mA             45.10mA              0.10A
   6.10       80.89mA             46.75mA              0.11A
   6.60       89.06mA             51.59mA              0.12A
|
[Pullup]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30        0.16A               0.12A               0.19A
  -3.10        0.16A               0.12A               0.18A
  -2.90        0.15A               0.11A               0.17A
  -2.70        0.14A               0.11A               0.16A
  -2.50        0.14A               0.10A               0.16A
  -2.30        0.13A              96.26mA              0.15A
  -2.10        0.12A              89.72mA              0.14A
  -1.90        0.11A              82.79mA              0.13A
  -1.70        0.10A              75.47mA              0.12A
  -1.50       93.76mA             67.80mA              0.11A
  -1.00       70.54mA             46.98mA             82.43mA
```

-0.90	63.97mA	42.83mA	74.23mA
-0.80	56.74mA	41.47mA	65.83mA
-0.70	49.39mA	36.27mA	57.50mA
-0.60	42.27mA	30.78mA	49.67mA
-0.50	35.43mA	25.27mA	41.79mA
-0.40	28.50mA	19.90mA	33.74mA
-0.30	21.47mA	14.79mA	25.52mA
-0.20	14.35mA	9.79mA	17.14mA
-0.10	7.19mA	4.85mA	8.64mA
0.00	34.08uA	11.19uA	71.92uA
0.10	-6.89mA	-4.62mA	-8.29mA
0.20	-13.43mA	-8.98mA	-16.24mA
0.30	-19.58mA	-13.08mA	-23.77mA
0.40	-25.36mA	-16.92mA	-30.88mA
0.50	-30.77mA	-20.50mA	-37.60mA
0.60	-35.81mA	-23.82mA	-43.93mA
0.70	-40.49mA	-26.89mA	-49.86mA
0.80	-44.83mA	-29.70mA	-55.41mA
0.90	-48.81mA	-32.27mA	-60.59mA
1.00	-52.46mA	-34.60mA	-65.39mA
1.10	-55.77mA	-36.68mA	-69.83mA
1.20	-58.75mA	-38.52mA	-73.91mA
1.30	-61.41mA	-40.13mA	-77.64mA
1.40	-63.75mA	-41.50mA	-81.02mA
1.50	-65.77mA	-42.65mA	-84.06mA
1.60	-67.50mA	-43.58mA	-86.77mA
1.70	-68.93mA	-44.31mA	-89.14mA
1.80	-70.10mA	-44.87mA	-91.20mA
1.90	-71.04mA	-45.31mA	-92.94mA
2.00	-71.82mA	-45.68mA	-94.40mA
2.10	-72.46mA	-46.00mA	-95.60mA
2.20	-73.01mA	-46.28mA	-96.60mA
2.30	-73.48mA	-46.53mA	-97.44mA
2.40	-73.90mA	-46.76mA	-98.15mA
2.50	-74.27mA	-46.97mA	-98.77mA
2.60	-74.60mA	-47.17mA	-99.31mA
2.70	-74.91mA	-47.35mA	-99.80mA
2.80	-75.18mA	-47.52mA	-0.10A
2.90	-75.44mA	-47.68mA	-0.10A
3.00	-75.68mA	-47.83mA	-0.10A
3.10	-75.90mA	-47.97mA	-0.10A
3.20	-76.12mA	-48.11mA	-0.10A
3.30	-76.32mA	-48.27mA	-0.10A
3.40	-76.52mA	-48.87mA	-0.10A

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   3.50      -76.71mA           -56.48mA            -0.10A
   3.60      -76.89mA            -0.15A             -0.10A
   3.70      -77.09mA            -0.95A             -0.10A
   3.80      -77.56mA            -2.71A             -0.10A
   3.90      -79.54mA            -4.50A             -0.10A
   4.00      -90.56mA            -6.29A             -0.10A
   4.10       -0.31A             -8.09A             -0.11A
   4.20       -1.88A             -9.88A             -0.11A
   4.30       -3.93A            -11.66A             -0.12A
   4.50       -8.04A            -15.24A             -1.17A
   4.70      -12.14A            -18.83A             -5.43A
   4.90      -16.25A            -22.41A             -9.69A
   5.10      -20.36A            -25.99A            -13.95A
   5.30      -24.46A            -29.57A            -18.21A
   5.50      -28.57A            -33.15A            -22.48A
   5.70      -32.68A            -36.73A            -26.74A
   5.90      -36.78A            -40.31A            -31.00A
   6.10      -40.89A            -43.89A            -35.27A
   6.60      -51.16A            -52.84A            -45.93A
|
[GND_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00      -85.90A            -77.84A            -88.40A
  -4.80      -81.80A            -74.26A            -84.14A
  -4.60      -77.70A            -70.68A            -79.88A
  -4.40      -73.60A            -67.10A            -75.62A
  -4.20      -69.50A            -63.52A            -71.36A
  -4.00      -65.40A            -59.94A            -67.10A
  -3.80      -61.30A            -56.36A            -62.84A
  -3.60      -57.20A            -52.78A            -58.58A
  -3.40      -53.10A            -49.20A            -54.32A
  -3.20      -49.00A            -45.62A            -50.06A
  -3.00      -44.90A            -42.04A            -45.80A
  -2.80      -40.80A            -38.46A            -41.54A
  -2.60      -36.69A            -34.89A            -37.28A
  -2.40      -32.59A            -31.31A            -33.02A
  -2.20      -28.49A            -27.73A            -28.76A
  -2.00      -24.38A            -24.15A            -24.50A
  -1.80      -20.28A            -20.57A            -20.24A
  -1.60      -16.17A            -16.99A            -15.97A
  -1.40      -12.06A            -13.40A            -11.71A
  -1.20       -7.96A             -9.83A             -7.45A
  -1.00       -3.86A             -6.25A             -3.19A
```

```
  -0.80       -0.23A             -2.66A            -70.76mA
  -0.60       -2.22mA            -0.10A             -5.90mA
  -0.40      -89.20uA            -0.52mA            -0.26mA
  -0.20      -27.89uA           -14.67uA           -42.88uA
  -0.00      -62.88nA           -63.80nA           -74.38nA
   0.20       18.73uA             7.33uA            32.30uA
   0.40       29.21uA            10.27uA            54.14uA
   0.60       32.51uA            10.69uA            65.81uA
   0.80       33.09uA            10.80uA            69.35uA
   1.00       33.31uA            10.87uA            70.19uA
   1.20       33.46uA            10.93uA            70.56uA
   1.40       33.58uA            10.98uA            70.81uA
   1.60       33.69uA            11.03uA            71.00uA
   1.80       33.78uA            11.08uA            71.17uA
   2.00       33.87uA            11.12uA            71.33uA
   2.20       33.96uA            11.14uA            71.47uA
   2.40       34.01uA            11.15uA            71.62uA
   2.60       34.03uA            11.16uA            71.76uA
   2.80       34.04uA            11.17uA            71.84uA
   3.00       34.05uA            11.18uA            71.86uA
   3.20       34.06uA            11.57uA            71.88uA
   3.40       34.08uA            10.87uA            71.90uA
   3.60       34.10uA            10.17uA            71.92uA
   3.80       34.12uA             9.47uA            71.94uA
   4.00       34.14uA             8.77uA            71.96uA
   4.20       34.16uA             8.07uA            71.98uA
   4.40       34.18uA             7.37uA            72.00uA
   4.60       34.20uA             6.67uA            72.02uA
   4.80       34.22uA             5.97uA            72.04uA
   5.00       34.24uA             5.27uA            72.06uA
|
[POWER_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00       48.54uA            16.29uA            95.93uA
  -4.90       48.21uA            16.17uA            95.42uA
  -4.80       47.88uA            16.05uA            94.91uA
  -4.70       47.55uA            15.93uA            94.40uA
  -4.60       47.22uA            15.81uA            93.89uA
  -4.50       46.89uA            15.69uA            93.38uA
  -4.40       46.56uA            15.57uA            92.87uA
  -4.30       46.23uA            15.45uA            92.36uA
  -4.20       45.90uA            15.33uA            91.85uA
  -4.10       45.57uA            15.21uA            91.34uA
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  -4.00       45.24uA             15.09uA             90.83uA
  -3.90       44.91uA             14.97uA             90.32uA
  -3.80       44.58uA             14.85uA             89.81uA
  -3.70       44.25uA             14.73uA             89.30uA
  -3.60       43.92uA             14.61uA             88.79uA
  -3.50       43.59uA             14.49uA             88.28uA
  -3.40       43.26uA             14.37uA             87.77uA
  -3.30       42.93uA             14.25uA             87.26uA
  -3.20       42.60uA             14.13uA             86.75uA
  -3.10       42.27uA             14.01uA             86.24uA
  -3.00       41.94uA             13.89uA             85.73uA
  -2.90       41.61uA             13.77uA             85.22uA
  -2.80       41.28uA             13.65uA             84.71uA
  -2.70       40.95uA             13.53uA             84.20uA
  -2.60       40.62uA             13.41uA             83.69uA
  -2.50       40.29uA             13.29uA             83.18uA
  -2.40       39.96uA             13.17uA             82.67uA
  -2.30       39.63uA             13.05uA             82.16uA
  -2.20       39.30uA             12.93uA             81.65uA
  -2.10       38.97uA             12.81uA             81.14uA
  -2.00       38.64uA             12.69uA             80.63uA
  -1.90       38.31uA             12.57uA             80.12uA
  -1.80       37.98uA             12.45uA             79.61uA
  -1.70       37.65uA             12.33uA             79.10uA
  -1.60       37.32uA             12.22uA             78.59uA
  -1.50       36.99uA             12.11uA             78.08uA
  -1.40       36.68uA             12.02uA             77.57uA
  -1.30       36.39uA             11.92uA             77.06uA
  -1.20       36.12uA             11.84uA             76.55uA
  -1.10       35.87uA             11.76uA             76.04uA
  -1.00       35.63uA             11.69uA             75.53uA
  -0.90       35.42uA             11.63uA             75.06uA
  -0.80       35.23uA             11.58uA             74.64uA
  -0.70       35.06uA             11.53uA             74.25uA
  -0.60       34.91uA             11.48uA             73.90uA
  -0.50       34.78uA             11.44uA             73.58uA
  -0.40       34.66uA             11.41uA             73.31uA
  -0.30       34.56uA             11.38uA             73.07uA
  -0.20       34.48uA             11.36uA             72.87uA
  -0.10       34.41uA             11.34uA             72.69uA
   0.00       34.35uA             11.32uA             72.55uA
|
[Ramp]
| variable       typ                 min                 max
```

```
dV/dt_r          1.43/2.06n          1.08/2.82n          1.66/1.86n
dV/dt_f          1.39/2.80n          0.98/4.41n          1.61/2.52n
R_load = 50.00
|
[Rising Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)              V(min)              V(max)
|
  0.000S          0.71uV              0.94uV              0.68uV
   0.20nS         0.48uV              0.81uV             0.000V
   0.40nS        -6.07uV             -1.89uV             12.38uV
   0.60nS        -0.29mV             -5.66uV             -3.13mV
   0.80nS        -3.39mV             26.90uV             -6.39mV
   1.00nS        -4.34mV             -5.17uV             43.34mV
   1.20nS        25.79mV             -0.87mV              0.11V
   1.40nS        62.40mV             -3.65mV              0.15V
   1.60nS         0.11V              -7.89mV              0.21V
   1.80nS         0.16V               0.71mV              0.28V
   2.00nS         0.22V              29.71mV              0.37V
   2.20nS         0.28V              65.63mV              0.46V
   2.40nS         0.37V               0.10V               0.59V
   2.60nS         0.48V               0.15V               0.71V
   2.80nS         0.63V               0.22V               0.92V
   3.00nS         0.79V               0.28V               1.12V
   3.20nS         0.90V               0.34V               1.28V
   3.40nS         1.07V               0.43V               1.49V
   3.60nS         1.24V               0.53V               1.70V
   3.80nS         1.39V               0.63V               1.89V
   4.00nS         1.55V               0.74V               2.07V
   4.20nS         1.71V               0.86V               2.24V
   4.40nS         1.84V               0.97V               2.37V
   4.60nS         1.90V               1.03V               2.44V
   4.80nS         1.96V               1.09V               2.50V
   5.00nS         2.03V               1.16V               2.54V
   5.20nS         2.08V               1.22V               2.59V
   5.40nS         2.13V               1.29V               2.62V
   5.60nS         2.18V               1.36V               2.65V
   5.80nS         2.20V               1.39V               2.66V
   6.00nS         2.22V               1.43V               2.67V
```

```
   6.20nS         2.24V              1.47V              2.68V
   6.40nS         2.26V              1.51V              2.69V
   6.60nS         2.27V              1.54V              2.70V
   6.80nS         2.29V              1.57V              2.71V
   7.00nS         2.30V              1.60V              2.72V
   7.20nS         2.31V              1.63V              2.72V
   7.40nS         2.32V              1.66V              2.73V
   7.60nS         2.33V              1.68V              2.74V
   7.80nS         2.34V              1.69V              2.74V
   8.00nS         2.34V              1.70V              2.74V
   8.20nS         2.35V              1.72V              2.75V
   8.40nS         2.35V              1.73V              2.75V
   8.60nS         2.36V              1.74V              2.75V
   8.80nS         2.36V              1.75V              2.76V
   9.00nS         2.36V              1.76V              2.76V
   9.20nS         2.37V              1.77V              2.76V
   9.40nS         2.37V              1.78V              2.76V
   9.60nS         2.38V              1.79V              2.77V
   9.80nS         2.38V              1.80V              2.77V
  10.00nS         2.38V              1.80V              2.77V
|
[Rising Waveform]
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)             V(min)             V(max)
|
  0.000S          0.98V              1.34V              0.92V
   0.20nS         0.98V              1.34V              0.92V
   0.40nS         0.98V              1.34V              0.92V
   0.60nS         0.98V              1.34V              0.92V
   0.80nS         0.99V              1.34V              0.94V
   1.00nS         1.05V              1.34V              1.07V
   1.20nS         1.18V              1.34V              1.24V
   1.40nS         1.31V              1.36V              1.37V
   1.60nS         1.49V              1.44V              1.55V
   1.80nS         1.69V              1.57V              1.76V
   2.00nS         1.92V              1.73V              2.02V
   2.20nS         2.18V              1.92V              2.33V
   2.40nS         2.46V              2.11V              2.62V
   2.60nS         2.73V              2.32V              2.91V
```

```
   2.80nS         2.97V              2.55V              3.20V
   3.00nS         3.09V              2.69V              3.33V
   3.20nS         3.15V              2.76V              3.39V
   3.40nS         3.20V              2.86V              3.44V
   3.60nS         3.24V              2.92V              3.50V
   3.80nS         3.26V              2.95V              3.53V
   4.00nS         3.28V              2.98V              3.55V
   4.20nS         3.29V              2.99V              3.57V
   4.40nS         3.29V              2.99V              3.59V
   4.60nS         3.30V              3.00V              3.59V
   4.80nS         3.30V              3.00V              3.59V
   5.00nS         3.30V              3.00V              3.60V
   5.20nS         3.30V              3.00V              3.60V
   5.40nS         3.30V              3.00V              3.60V
   5.60nS         3.30V              3.00V              3.60V
   5.80nS         3.30V              3.00V              3.60V
   6.00nS         3.30V              3.00V              3.60V
   6.20nS         3.30V              3.00V              3.60V
   6.40nS         3.30V              3.00V              3.60V
   6.60nS         3.30V              3.00V              3.60V
   6.80nS         3.30V              3.00V              3.60V
   7.00nS         3.30V              3.00V              3.60V
   7.20nS         3.30V              3.00V              3.60V
   7.40nS         3.30V              3.00V              3.60V
   7.60nS         3.30V              3.00V              3.60V
   7.80nS         3.30V              3.00V              3.60V
   8.00nS         3.30V              3.00V              3.60V
   8.20nS         3.30V              3.00V              3.60V
   8.40nS         3.30V              3.00V              3.60V
   8.60nS         3.30V              3.00V              3.60V
   8.80nS         3.30V              3.00V              3.60V
   9.00nS         3.30V              3.00V              3.60V
   9.20nS         3.30V              3.00V              3.60V
   9.40nS         3.30V              3.00V              3.60V
   9.60nS         3.30V              3.00V              3.60V
   9.80nS         3.30V              3.00V              3.60V
  10.00nS         3.30V              3.00V              3.60V
|
[Falling Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
```

C_fixture = 0.000F

time	V(typ)	V(min)	V(max)
0.000S	2.41V	1.87V	2.79V
0.20nS	2.41V	1.87V	2.79V
0.40nS	2.41V	1.87V	2.79V
0.60nS	2.41V	1.87V	2.76V
0.80nS	2.37V	1.87V	2.62V
1.00nS	2.24V	1.86V	2.44V
1.20nS	2.07V	1.85V	2.25V
1.40nS	1.94V	1.82V	2.10V
1.60nS	1.76V	1.75V	1.85V
1.80nS	1.54V	1.65V	1.55V
2.00nS	1.28V	1.51V	1.23V
2.20nS	1.01V	1.36V	0.96V
2.40nS	0.78V	1.18V	0.77V
2.60nS	0.61V	0.99V	0.63V
2.80nS	0.46V	0.76V	0.51V
3.00nS	0.37V	0.59V	0.43V
3.20nS	0.33V	0.49V	0.37V
3.40nS	0.26V	0.39V	0.32V
3.60nS	0.21V	0.31V	0.27V
3.80nS	0.17V	0.25V	0.22V
4.00nS	0.14V	0.19V	0.19V
4.20nS	0.10V	0.15V	0.14V
4.40nS	73.29mV	0.10V	0.11V
4.60nS	60.19mV	87.46mV	93.57mV
4.80nS	48.89mV	70.67mV	78.29mV
5.00nS	34.23mV	50.83mV	61.98mV
5.20nS	24.65mV	38.23mV	46.06mV
5.40nS	14.47mV	23.57mV	32.51mV
5.60nS	8.10mV	14.65mV	20.47mV
5.80nS	5.49mV	9.93mV	15.65mV
6.00nS	3.06mV	6.30mV	11.70mV
6.20nS	1.82mV	4.27mV	6.64mV
6.40nS	1.09mV	2.24mV	4.15mV
6.60nS	0.61mV	1.46mV	2.31mV
6.80nS	0.54mV	1.08mV	1.05mV
7.00nS	0.47mV	0.78mV	0.76mV
7.20nS	0.42mV	0.69mV	0.48mV
7.40nS	0.35mV	0.59mV	0.37mV
7.60nS	0.31mV	0.52mV	0.31mV
7.80nS	0.29mV	0.48mV	0.29mV
8.00nS	0.27mV	0.45mV	0.26mV

```
   8.20nS          0.24mV              0.40mV              0.24mV
   8.40nS          0.20mV              0.35mV              0.21mV
   8.60nS          0.18mV              0.32mV              0.18mV
   8.80nS          0.18mV              0.31mV              0.16mV
   9.00nS          0.17mV              0.28mV              0.16mV
   9.20nS          0.15mV              0.24mV              0.15mV
   9.40nS          0.12mV              0.20mV              0.12mV
   9.60nS          0.10mV              0.19mV             93.74uV
   9.80nS          0.11mV              0.20mV             90.71uV
  10.00nS          0.11mV              0.17mV             97.83uV
|
[Falling Waveform]
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)              V(min)              V(max)
|
  0.000S           3.30V               3.00V               3.60V
   0.20nS          3.30V               3.00V               3.60V
   0.40nS          3.30V               3.00V               3.60V
   0.60nS          3.30V               3.00V               3.59V
   0.80nS          3.30V               3.00V               3.52V
   1.00nS          3.25V               3.00V               3.43V
   1.20nS          3.17V               3.00V               3.34V
   1.40nS          3.12V               3.00V               3.27V
   1.60nS          3.05V               3.00V               3.17V
   1.80nS          2.97V               2.97V               3.06V
   2.00nS          2.87V               2.92V               2.95V
   2.20nS          2.78V               2.87V               2.83V
   2.40nS          2.68V               2.82V               2.70V
   2.60nS          2.58V               2.76V               2.58V
   2.80nS          2.45V               2.69V               2.43V
   3.00nS          2.34V               2.62V               2.30V
   3.20nS          2.26V               2.57V               2.21V
   3.40nS          2.17V               2.50V               2.07V
   3.60nS          2.07V               2.44V               1.91V
   3.80nS          1.98V               2.38V               1.76V
   4.00nS          1.89V               2.32V               1.62V
   4.20nS          1.76V               2.25V               1.49V
   4.40nS          1.63V               2.18V               1.37V
   4.60nS          1.55V               2.15V               1.32V
```

```
   4.80nS         1.48V               2.11V               1.27V
   5.00nS         1.40V               2.06V               1.21V
   5.20nS         1.32V               2.01V               1.16V
   5.40nS         1.25V               1.96V               1.10V
   5.60nS         1.19V               1.92V               1.06V
   5.80nS         1.15V               1.89V               1.04V
   6.00nS         1.13V               1.87V               1.02V
   6.20nS         1.10V               1.84V               1.00V
   6.40nS         1.07V               1.81V               0.98V
   6.60nS         1.05V               1.78V               0.96V
   6.80nS         1.03V               1.75V               0.95V
   7.00nS         1.02V               1.72V               0.94V
   7.20nS         1.01V               1.70V               0.93V
   7.40nS         1.00V               1.67V               0.93V
   7.60nS         1.00V               1.64V               0.92V
   7.80nS         1.00V               1.62V               0.92V
   8.00nS         1.00V               1.60V               0.92V
   8.20nS         0.99V               1.57V               0.92V
   8.40nS         0.99V               1.53V               0.92V
   8.60nS         0.99V               1.50V               0.92V
   8.80nS         0.99V               1.47V               0.92V
   9.00nS         0.99V               1.44V               0.92V
   9.20nS         0.99V               1.42V               0.92V
   9.40nS         0.99V               1.40V               0.92V
   9.60nS         0.99V               1.38V               0.92V
   9.80nS         0.99V               1.37V               0.92V
  10.00nS         0.99V               1.36V               0.92V
|
| End [Model] prd16dgz
|
|*****************************************************************
|                            Model prd24dgz
|*****************************************************************
|
[Model]          prd24dgz
Model_type       I/O
Polarity         Non-Inverting
Enable           Active-Low
Vinl =   0.80V
Vinh =   2.00V
Vmeas =   1.50V
Cref =  50.00pF
Rref =   1.00M
Vref =  0.000V
```

```
C_comp          4.15pF              3.73pF              4.56pF
|
|
[Temperature Range]       25.00               0.12k               0.000
[Pullup Reference]        3.30V               3.00V               3.60V
[Pulldown Reference]      0.000V              0.000V              0.000V
[POWER Clamp Reference]   5.00V               4.50V               5.50V
[GND Clamp Reference]     0.000V              0.000V              0.000V
[Pulldown]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30      -10.00mA             0.000A              0.000A
  -3.10       0.000A              0.000A             -10.00mA
  -2.90       0.000A              0.000A              0.000A
  -2.70       0.000A              0.000A              0.000A
  -2.50       0.000A              0.000A              0.000A
  -2.30       0.000A              0.000A             -10.00mA
  -2.10      -10.00mA             0.000A             -10.00mA
  -1.90      -10.00mA             0.000A             -10.00mA
  -1.70      -10.00mA            -10.00mA            -10.00mA
  -1.50      -10.00mA            -10.00mA            -20.00mA
  -1.00      -19.00mA            -10.00mA            -23.00mA
  -0.90      -21.00mA            -10.00mA            -26.00mA
  -0.80      -41.70mA            -11.00mA            -55.33mA
  -0.70      -50.61mA            -14.60mA            -55.12mA
  -0.60      -46.07mA            -25.10mA            -50.21mA
  -0.50      -39.45mA            -26.37mA            -43.90mA
  -0.40      -32.03mA            -22.06mA            -36.08mA
  -0.30      -24.29mA            -16.63mA            -27.48mA
  -0.20      -16.36mA            -11.11mA            -18.57mA
  -0.10       -8.26mA             -5.55mA             -9.40mA
  -0.00        3.80nA              7.33nA             12.06nA
   0.10        8.11mA              5.36mA              9.30mA
   0.20       15.76mA             10.37mA             18.18mA
   0.30       22.98mA             15.05mA             26.64mA
   0.40       29.76mA             19.40mA             34.69mA
   0.50       36.11mA             23.42mA             42.32mA
   0.60       42.04mA             27.12mA             49.54mA
   0.70       47.55mA             30.50mA             56.36mA
   0.80       52.66mA             33.58mA             62.78mA
   0.90       57.35mA             36.36mA             68.80mA
   1.00       61.65mA             38.84mA             74.42mA
   1.10       65.55mA             41.04mA             79.65mA
   1.20       69.06mA             42.96mA             84.48mA
```

```
   1.30       72.19mA             44.61mA             88.92mA
   1.40       74.94mA             45.99mA             92.97mA
   1.50       77.32mA             47.12mA             96.63mA
   1.60       79.33mA             48.01mA             99.91mA
   1.70       80.95mA             48.68mA              0.10A
   1.80       82.19mA             49.17mA              0.11A
   1.90       83.09mA             49.54mA              0.11A
   2.00       83.74mA             49.83mA              0.11A
   2.10       84.23mA             50.06mA              0.11A
   2.20       84.62mA             50.25mA              0.11A
   2.30       84.93mA             50.42mA              0.11A
   2.40       85.20mA             50.57mA              0.11A
   2.50       85.44mA             50.70mA              0.11A
   2.60       85.65mA             50.82mA              0.11A
   2.70       85.84mA             50.93mA              0.11A
   2.80       86.01mA             51.03mA              0.11A
   2.90       86.18mA             51.13mA              0.11A
   3.00       86.33mA             51.22mA              0.11A
   3.10       86.48mA             51.31mA              0.11A
   3.20       86.62mA             51.40mA              0.11A
   3.30       86.75mA             51.50mA              0.11A
   3.40       86.89mA             51.73mA              0.12A
   3.50       87.06mA             52.32mA              0.12A
   3.60       87.16mA             53.14mA              0.12A
   3.70       87.30mA             54.02mA              0.12A
   3.80       87.47mA             54.48mA              0.12A
   3.90       87.77mA             52.16mA              0.12A
   4.00       88.66mA             52.28mA              0.12A
   4.10       90.00mA             52.42mA              0.12A
   4.20       91.34mA             52.58mA              0.12A
   4.30       89.39mA             52.77mA              0.12A
   4.50       89.66mA             53.24mA              0.12A
   4.70       90.64mA             53.86mA              0.12A
   4.90       91.94mA             54.68mA              0.12A
   5.10       93.66mA             55.73mA              0.12A
   5.30       95.77mA             57.03mA              0.13A
   5.50       98.33mA             58.59mA              0.13A
   5.70        0.10A              60.44mA              0.13A
   5.90        0.10A              62.55mA              0.14A
   6.10        0.11A              64.93mA              0.14A
   6.60        0.12A              71.83mA              0.15A
|
[Pullup]
| voltage     I(typ)              I(min)              I(max)
```

|
-3.30	0.22A	0.16A	0.25A
-3.10	0.21A	0.16A	0.24A
-2.90	0.20A	0.15A	0.23A
-2.70	0.19A	0.14A	0.22A
-2.50	0.18A	0.14A	0.21A
-2.30	0.17A	0.13A	0.20A
-2.10	0.16A	0.12A	0.19A
-1.90	0.15A	0.11A	0.17A
-1.70	0.14A	0.10A	0.16A
-1.50	0.12A	90.15mA	0.14A
-1.00	92.80mA	62.50mA	0.11A
-0.90	84.30mA	57.02mA	97.94mA
-0.80	75.06mA	54.41mA	87.24mA
-0.70	65.63mA	47.70mA	76.50mA
-0.60	56.31mA	40.65mA	66.14mA
-0.50	47.22mA	33.53mA	55.68mA
-0.40	38.00mA	26.51mA	44.96mA
-0.30	28.62mA	19.71mA	34.00mA
-0.20	19.12mA	13.04mA	22.83mA
-0.10	9.57mA	6.46mA	11.50mA
0.00	34.08uA	11.19uA	71.92uA
0.10	-9.20mA	-6.16mA	-11.08mA
0.20	-17.92mA	-11.98mA	-21.68mA
0.30	-26.12mA	-17.45mA	-31.71mA
0.40	-33.83mA	-22.56mA	-41.21mA
0.50	-41.04mA	-27.33mA	-50.17mA
0.60	-47.76mA	-31.76mA	-58.60mA
0.70	-54.01mA	-35.85mA	-66.51mA
0.80	-59.78mA	-39.61mA	-73.91mA
0.90	-65.10mA	-43.04mA	-80.81mA
1.00	-69.96mA	-46.14mA	-87.22mA
1.10	-74.37mA	-48.91mA	-93.14mA
1.20	-78.35mA	-51.37mA	-98.58mA
1.30	-81.89mA	-53.51mA	-0.10A
1.40	-85.01mA	-55.34mA	-0.11A
1.50	-87.72mA	-56.87mA	-0.11A
1.60	-90.01mA	-58.11mA	-0.12A
1.70	-91.93mA	-59.08mA	-0.12A
1.80	-93.48mA	-59.83mA	-0.12A
1.90	-94.74mA	-60.42mA	-0.12A
2.00	-95.77mA	-60.91mA	-0.13A
2.10	-96.63mA	-61.34mA	-0.13A
2.20	-97.36mA	-61.71mA	-0.13A

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   2.30      -97.99mA           -62.05mA            -0.13A
   2.40      -98.55mA           -62.36mA            -0.13A
   2.50      -99.04mA           -62.64mA            -0.13A
   2.60      -99.49mA           -62.90mA            -0.13A
   2.70      -99.89mA           -63.14mA            -0.13A
   2.80       -0.10A            -63.36mA            -0.13A
   2.90       -0.10A            -63.57mA            -0.13A
   3.00       -0.10A            -63.78mA            -0.13A
   3.10       -0.10A            -63.97mA            -0.14A
   3.20       -0.10A            -64.15mA            -0.14A
   3.30       -0.10A            -64.35mA            -0.14A
   3.40       -0.10A            -64.99mA            -0.14A
   3.50       -0.10A            -72.69mA            -0.14A
   3.60       -0.10A             -0.17A             -0.14A
   3.70       -0.10A             -0.97A             -0.14A
   3.80       -0.10A             -2.72A             -0.14A
   3.90       -0.11A             -4.50A             -0.14A
   4.00       -0.12A             -6.28A             -0.14A
   4.10       -0.34A             -8.06A             -0.14A
   4.20       -1.90A             -9.85A             -0.14A
   4.30       -3.94A            -11.62A             -0.15A
   4.50       -8.02A            -15.19A             -1.21A
   4.70      -12.10A            -18.75A             -5.43A
   4.90      -16.18A            -22.31A             -9.67A
   5.10      -20.27A            -25.88A            -13.90A
   5.30      -24.35A            -29.44A            -18.14A
   5.50      -28.43A            -33.00A            -22.38A
   5.70      -32.51A            -36.56A            -26.62A
   5.90      -36.60A            -40.13A            -30.86A
   6.10      -40.68A            -43.69A            -35.09A
   6.60      -50.89A            -52.59A            -45.69A
|
[GND_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00      -85.26A            -77.43A            -87.91A
  -4.80      -81.20A            -73.87A            -83.67A
  -4.60      -77.14A            -70.31A            -79.43A
  -4.40      -73.08A            -66.75A            -75.19A
  -4.20      -69.02A            -63.19A            -70.95A
  -4.00      -64.96A            -59.63A            -66.71A
  -3.80      -60.90A            -56.07A            -62.47A
  -3.60      -56.84A            -52.51A            -58.23A
  -3.40      -52.78A            -48.95A            -53.99A
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  -3.20      -48.72A            -45.39A            -49.75A
  -3.00      -44.64A            -41.83A            -45.52A
  -2.80      -40.56A            -38.27A            -41.29A
  -2.60      -36.48A            -34.71A            -37.05A
  -2.40      -32.40A            -31.15A            -32.82A
  -2.20      -28.32A            -27.59A            -28.58A
  -2.00      -24.24A            -24.03A            -24.35A
  -1.80      -20.16A            -20.47A            -20.11A
  -1.60      -16.08A            -16.90A            -15.88A
  -1.40      -12.00A            -13.34A            -11.64A
  -1.20       -7.92A             -9.78A             -7.41A
  -1.00       -3.84A             -6.22A             -3.18A
  -0.80       -0.23A             -2.66A            -71.67mA
  -0.60       -2.33mA            -0.10A             -6.23mA
  -0.40      -91.55uA            -0.52mA            -0.28mA
  -0.20      -27.91uA           -14.70uA           -42.94uA
  -0.00      -75.80nA           -77.03nA           -90.19nA
   0.20       18.72uA             7.32uA            32.29uA
   0.40       29.20uA            10.26uA            54.13uA
   0.60       32.50uA            10.68uA            65.79uA
   0.80       33.08uA            10.79uA            69.34uA
   1.00       33.30uA            10.86uA            70.18uA
   1.20       33.45uA            10.92uA            70.55uA
   1.40       33.57uA            10.98uA            70.80uA
   1.60       33.68uA            11.03uA            71.00uA
   1.80       33.78uA            11.07uA            71.16uA
   2.00       33.87uA            11.11uA            71.32uA
   2.20       33.96uA            11.14uA            71.47uA
   2.40       34.01uA            11.15uA            71.61uA
   2.60       34.03uA            11.16uA            71.76uA
   2.80       34.04uA            11.17uA            71.84uA
   3.00       34.05uA            11.18uA            71.86uA
   3.20       34.06uA            11.75uA            71.88uA
   3.40       34.08uA            10.69uA            71.90uA
   3.60       34.10uA             9.63uA            71.92uA
   3.80       34.12uA             8.57uA            71.94uA
   4.00       34.14uA             7.51uA            71.96uA
   4.20       34.16uA             6.45uA            71.98uA
   4.40       34.18uA             5.39uA            72.00uA
   4.60       34.20uA             4.33uA            72.02uA
   4.80       34.22uA             3.27uA            72.04uA
   5.00       34.24uA             2.21uA            72.06uA
|
[POWER_clamp]
```

voltage	I(typ)	I(min)	I(max)
-5.00	48.55uA	16.31uA	95.55uA
-4.90	48.22uA	16.19uA	95.05uA
-4.80	47.89uA	16.07uA	94.55uA
-4.70	47.56uA	15.95uA	94.05uA
-4.60	47.23uA	15.83uA	93.55uA
-4.50	46.90uA	15.71uA	93.05uA
-4.40	46.57uA	15.59uA	92.55uA
-4.30	46.24uA	15.47uA	92.05uA
-4.20	45.91uA	15.35uA	91.55uA
-4.10	45.58uA	15.23uA	91.05uA
-4.00	45.25uA	15.11uA	90.55uA
-3.90	44.92uA	14.99uA	90.05uA
-3.80	44.59uA	14.87uA	89.55uA
-3.70	44.26uA	14.75uA	89.05uA
-3.60	43.93uA	14.63uA	88.55uA
-3.50	43.60uA	14.51uA	88.05uA
-3.40	43.27uA	14.39uA	87.55uA
-3.30	42.94uA	14.27uA	87.05uA
-3.20	42.61uA	14.15uA	86.55uA
-3.10	42.28uA	14.03uA	86.05uA
-3.00	41.95uA	13.91uA	85.55uA
-2.90	41.62uA	13.79uA	85.05uA
-2.80	41.29uA	13.67uA	84.55uA
-2.70	40.96uA	13.55uA	84.05uA
-2.60	40.63uA	13.43uA	83.55uA
-2.50	40.30uA	13.31uA	83.05uA
-2.40	39.97uA	13.19uA	82.55uA
-2.30	39.64uA	13.07uA	82.05uA
-2.20	39.31uA	12.95uA	81.55uA
-2.10	38.98uA	12.83uA	81.05uA
-2.00	38.65uA	12.71uA	80.55uA
-1.90	38.32uA	12.59uA	80.05uA
-1.80	37.99uA	12.47uA	79.55uA
-1.70	37.66uA	12.35uA	79.05uA
-1.60	37.33uA	12.23uA	78.55uA
-1.50	37.00uA	12.13uA	78.05uA
-1.40	36.69uA	12.03uA	77.55uA
-1.30	36.40uA	11.94uA	77.05uA
-1.20	36.13uA	11.85uA	76.55uA
-1.10	35.88uA	11.78uA	76.05uA
-1.00	35.64uA	11.71uA	75.55uA
-0.90	35.43uA	11.64uA	75.08uA

```
  -0.80       35.24uA             11.59uA             74.65uA
  -0.70       35.07uA             11.54uA             74.26uA
  -0.60       34.92uA             11.49uA             73.91uA
  -0.50       34.79uA             11.45uA             73.60uA
  -0.40       34.67uA             11.42uA             73.32uA
  -0.30       34.57uA             11.39uA             73.08uA
  -0.20       34.49uA             11.37uA             72.88uA
  -0.10       34.42uA             11.35uA             72.70uA
   0.00       34.36uA             11.33uA             72.56uA
|
[Ramp]
| variable       typ                 min                 max
dV/dt_r          1.54/2.22n          1.20/2.88n          1.77/2.15n
dV/dt_f          1.52/3.16n          1.15/4.46n          1.73/3.00n
R_load = 50.00
|
[Rising Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)              V(min)              V(max)
|
  0.000S          0.70uV              0.92uV              0.68uV
   0.20nS         0.45uV              0.77uV             0.000V
   0.40nS        -5.49uV             -1.76uV             16.07uV
   0.60nS        -0.25mV             -4.97uV             -2.66mV
   0.80nS        -2.88mV             24.27uV             -5.55mV
   1.00nS        -3.85mV             -5.54uV             32.40mV
   1.20nS        18.80mV             -0.76mV             80.52mV
   1.40nS        45.63mV             -3.09mV              0.11V
   1.60nS        80.05mV             -6.58mV              0.16V
   1.80nS         0.11V              -0.18mV              0.21V
   2.00nS         0.16V              21.52mV              0.27V
   2.20nS         0.20V              48.21mV              0.33V
   2.40nS         0.26V              76.15mV              0.41V
   2.60nS         0.32V               0.11V               0.48V
   2.80nS         0.41V               0.16V               0.61V
   3.00nS         0.51V               0.19V               0.73V
   3.20nS         0.58V               0.24V               0.82V
   3.40nS         0.71V               0.30V               0.97V
   3.60nS         0.85V               0.36V               1.16V
```

```
   3.80nS          1.00V                0.45V                1.35V
   4.00nS          1.17V                0.54V                1.55V
   4.20nS          1.38V                0.67V                1.80V
   4.40nS          1.57V                0.80V                2.03V
   4.60nS          1.68V                0.88V                2.15V
   4.80nS          1.78V                0.96V                2.26V
   5.00nS          1.91V                1.06V                2.39V
   5.20nS          2.01V                1.15V                2.51V
   5.40nS          2.13V                1.25V                2.61V
   5.60nS          2.22V                1.34V                2.70V
   5.80nS          2.27V                1.40V                2.74V
   6.00nS          2.31V                1.44V                2.77V
   6.20nS          2.35V                1.50V                2.80V
   6.40nS          2.38V                1.56V                2.82V
   6.60nS          2.41V                1.61V                2.84V
   6.80nS          2.43V                1.66V                2.86V
   7.00nS          2.45V                1.70V                2.87V
   7.20nS          2.46V                1.74V                2.88V
   7.40nS          2.48V                1.78V                2.89V
   7.60nS          2.49V                1.82V                2.90V
   7.80nS          2.50V                1.84V                2.91V
   8.00nS          2.51V                1.86V                2.91V
   8.20nS          2.52V                1.88V                2.92V
   8.40nS          2.52V                1.90V                2.92V
   8.60nS          2.53V                1.92V                2.92V
   8.80nS          2.54V                1.93V                2.93V
   9.00nS          2.54V                1.95V                2.93V
   9.20nS          2.55V                1.96V                2.94V
   9.40nS          2.55V                1.97V                2.94V
   9.60nS          2.56V                1.98V                2.94V
   9.80nS          2.56V                2.00V                2.95V
  10.00nS          2.57V                2.00V                2.95V
|
[Rising Waveform]
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)              V(min)              V(max)
|
  0.000S          0.76V                1.03V                0.72V
   0.20nS         0.76V                1.03V                0.72V
```

0.40nS	0.76V	1.03V	0.72V
0.60nS	0.76V	1.03V	0.72V
0.80nS	0.77V	1.03V	0.73V
1.00nS	0.81V	1.03V	0.82V
1.20nS	0.90V	1.03V	0.93V
1.40nS	0.98V	1.04V	1.01V
1.60nS	1.09V	1.11V	1.13V
1.80nS	1.22V	1.20V	1.26V
2.00nS	1.35V	1.32V	1.42V
2.20nS	1.51V	1.45V	1.58V
2.40nS	1.69V	1.59V	1.78V
2.60nS	1.91V	1.74V	2.02V
2.80nS	2.22V	1.96V	2.36V
3.00nS	2.47V	2.16V	2.63V
3.20nS	2.65V	2.31V	2.82V
3.40nS	2.85V	2.49V	3.03V
3.60nS	2.97V	2.62V	3.17V
3.80nS	3.08V	2.73V	3.30V
4.00nS	3.14V	2.83V	3.36V
4.20nS	3.19V	2.89V	3.42V
4.40nS	3.23V	2.94V	3.47V
4.60nS	3.25V	2.95V	3.50V
4.80nS	3.27V	2.97V	3.52V
5.00nS	3.28V	2.98V	3.54V
5.20nS	3.29V	2.99V	3.56V
5.40nS	3.29V	2.99V	3.57V
5.60nS	3.30V	3.00V	3.58V
5.80nS	3.30V	3.00V	3.59V
6.00nS	3.30V	3.00V	3.59V
6.20nS	3.30V	3.00V	3.59V
6.40nS	3.30V	3.00V	3.60V
6.60nS	3.30V	3.00V	3.60V
6.80nS	3.30V	3.00V	3.60V
7.00nS	3.30V	3.00V	3.60V
7.20nS	3.30V	3.00V	3.60V
7.40nS	3.30V	3.00V	3.60V
7.60nS	3.30V	3.00V	3.60V
7.80nS	3.30V	3.00V	3.60V
8.00nS	3.30V	3.00V	3.60V
8.20nS	3.30V	3.00V	3.60V
8.40nS	3.30V	3.00V	3.60V
8.60nS	3.30V	3.00V	3.60V
8.80nS	3.30V	3.00V	3.60V
9.00nS	3.30V	3.00V	3.60V

```
   9.20nS         3.30V              3.00V              3.60V
   9.40nS         3.30V              3.00V              3.60V
   9.60nS         3.30V              3.00V              3.60V
   9.80nS         3.30V              3.00V              3.60V
  10.00nS         3.30V              3.00V              3.60V
|
[Falling Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)             V(min)             V(max)
|
  0.000S          2.62V              2.12V              2.99V
   0.20nS         2.62V              2.12V              2.99V
   0.40nS         2.62V              2.12V              2.99V
   0.60nS         2.62V              2.12V              2.96V
   0.80nS         2.60V              2.12V              2.85V
   1.00nS         2.50V              2.12V              2.72V
   1.20nS         2.38V              2.11V              2.59V
   1.40nS         2.29V              2.09V              2.50V
   1.60nS         2.17V              2.04V              2.36V
   1.80nS         2.04V              1.96V              2.20V
   2.00nS         1.89V              1.85V              2.00V
   2.20nS         1.71V              1.74V              1.76V
   2.40nS         1.51V              1.63V              1.49V
   2.60nS         1.27V              1.50V              1.23V
   2.80nS         0.99V              1.33V              0.98V
   3.00nS         0.81V              1.17V              0.83V
   3.20nS         0.71V              1.04V              0.75V
   3.40nS         0.59V              0.87V              0.66V
   3.60nS         0.51V              0.72V              0.57V
   3.80nS         0.44V              0.59V              0.50V
   4.00nS         0.37V              0.49V              0.45V
   4.20nS         0.31V              0.40V              0.38V
   4.40nS         0.26V              0.33V              0.32V
   4.60nS         0.23V              0.28V              0.29V
   4.80nS         0.20V              0.25V              0.26V
   5.00nS         0.17V              0.21V              0.23V
   5.20nS         0.15V              0.18V              0.20V
   5.40nS          0.12V             0.14V              0.17V
   5.60nS        92.71mV             0.11V              0.14V
```

```
   5.80nS        79.46mV             96.17mV              0.12V
   6.00nS        67.17mV             83.01mV              0.11V
   6.20nS        54.74mV             65.86mV             89.82mV
   6.40nS        42.77mV             53.06mV             75.55mV
   6.60nS        33.26mV             41.31mV             61.63mV
   6.80nS        25.46mV             31.29mV             50.25mV
   7.00nS        18.21mV             23.99mV             40.51mV
   7.20nS        13.43mV             16.92mV             31.37mV
   7.40nS         8.06mV             11.32mV             23.11mV
   7.60nS         4.81mV              6.46mV             15.54mV
   7.80nS         3.27mV              4.82mV             12.49mV
   8.00nS         1.98mV              3.62mV              9.63mV
   8.20nS         1.32mV              2.10mV              6.17mV
   8.40nS         0.78mV              1.45mV              4.24mV
   8.60nS         0.50mV              1.01mV              2.46mV
   8.80nS         0.42mV              0.70mV              1.45mV
   9.00nS         0.34mV              0.61mV              0.94mV
   9.20nS         0.30mV              0.51mV              0.50mV
   9.40nS         0.27mV              0.45mV              0.38mV
   9.60nS         0.24mV              0.40mV              0.28mV
   9.80nS         0.21mV              0.35mV              0.23mV
  10.00nS         0.22mV              0.32mV              0.21mV
|
[Falling Waveform]
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)              V(min)              V(max)
|
  0.000S          3.30V               3.00V               3.60V
   0.20nS         3.30V               3.00V               3.60V
   0.40nS         3.30V               3.00V               3.60V
   0.60nS         3.30V               3.00V               3.59V
   0.80nS         3.30V               3.00V               3.52V
   1.00nS         3.25V               3.00V               3.44V
   1.20nS         3.18V               3.00V               3.37V
   1.40nS         3.14V               3.00V               3.32V
   1.60nS         3.09V               3.00V               3.24V
   1.80nS         3.03V               2.97V               3.16V
   2.00nS         2.96V               2.92V               3.07V
   2.20nS         2.88V               2.88V               2.98V
```

```
   2.40nS         2.80V               2.84V               2.88V
   2.60nS         2.72V               2.80V               2.78V
   2.80nS         2.61V               2.74V               2.65V
   3.00nS         2.51V               2.68V               2.55V
   3.20nS         2.44V               2.64V               2.47V
   3.40nS         2.34V               2.58V               2.35V
   3.60nS         2.25V               2.52V               2.23V
   3.80nS         2.15V               2.46V               2.09V
   4.00nS         2.06V               2.39V               1.93V
   4.20nS         1.93V               2.32V               1.75V
   4.40nS         1.81V               2.24V               1.58V
   4.60nS         1.73V               2.20V               1.50V
   4.80nS         1.65V               2.15V               1.43V
   5.00nS         1.54V               2.09V               1.34V
   5.20nS         1.44V               2.04V               1.26V
   5.40nS         1.32V               1.97V               1.18V
   5.60nS         1.23V               1.91V               1.11V
   5.80nS         1.18V               1.87V               1.07V
   6.00nS         1.13V               1.84V               1.04V
   6.20nS         1.08V               1.79V               1.00V
   6.40nS         1.04V               1.75V               0.96V
   6.60nS         1.00V               1.71V               0.92V
   6.80nS         0.96V               1.67V               0.89V
   7.00nS         0.93V               1.63V               0.87V
   7.20nS         0.90V               1.59V               0.84V
   7.40nS         0.87V               1.54V               0.82V
   7.60nS         0.85V               1.48V               0.80V
   7.80nS         0.83V               1.44V               0.78V
   8.00nS         0.82V               1.40V               0.78V
   8.20nS         0.81V               1.35V               0.76V
   8.40nS         0.80V               1.31V               0.75V
   8.60nS         0.79V               1.27V               0.75V
   8.80nS         0.78V               1.23V               0.74V
   9.00nS         0.78V               1.20V               0.73V
   9.20nS         0.78V               1.17V               0.73V
   9.40nS         0.77V               1.15V               0.73V
   9.60nS         0.77V               1.12V               0.72V
   9.80nS         0.77V               1.10V               0.72V
  10.00nS         0.77V               1.09V               0.72V
|
| End [Model] prd24dgz
|
|*****************************************************************************
|                              Model prt24dgz
```

```
|*****************************************************************************
|
[Model]          prt24dgz
Model_type       3-state
Polarity         Non-Inverting
Enable           Active-Low
Vmeas =   1.50V
Cref =  50.00pF
Rref =   1.00M
Vref =  0.000V
C_comp           4.09pF              3.68pF              4.50pF
|
|
[Temperature Range]       25.00               0.12k               0.000
[Pullup Reference]        3.30V               3.00V               3.60V
[Pulldown Reference]      0.000V              0.000V              0.000V
[POWER Clamp Reference]   5.00V               4.50V               5.50V
[GND Clamp Reference]     0.000V              0.000V              0.000V
[Pulldown]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30      -10.00mA             0.000A              0.000A
  -3.10       0.000A              0.000A             -10.00mA
  -2.90       0.000A              0.000A              0.000A
  -2.70       0.000A              0.000A              0.000A
  -2.50       0.000A              0.000A              0.000A
  -2.30       0.000A              0.000A             -10.00mA
  -2.10      -10.00mA             0.000A             -10.00mA
  -1.90      -10.00mA             0.000A             -10.00mA
  -1.70      -10.00mA            -10.00mA            -10.00mA
  -1.50      -10.00mA            -10.00mA            -20.00mA
  -1.00      -20.00mA            -10.00mA            -23.00mA
  -0.90      -21.00mA            -10.00mA            -26.00mA
  -0.80      -41.70mA            -12.00mA            -55.37mA
  -0.70      -50.60mA            -14.60mA            -55.11mA
  -0.60      -46.07mA            -25.10mA            -50.21mA
  -0.50      -39.45mA            -26.38mA            -43.90mA
  -0.40      -32.03mA            -22.06mA            -36.09mA
  -0.30      -24.30mA            -16.63mA            -27.49mA
  -0.20      -16.36mA            -11.10mA            -18.57mA
  -0.10       -8.26mA             -5.55mA             -9.40mA
  -0.00        3.97nA              7.41nA             12.45nA
   0.10        8.11mA              5.36mA              9.30mA
   0.20       15.76mA             10.38mA             18.18mA
```

0.30	22.98mA	15.05mA	26.64mA
0.40	29.76mA	19.40mA	34.68mA
0.50	36.11mA	23.42mA	42.32mA
0.60	42.04mA	27.11mA	49.54mA
0.70	47.55mA	30.50mA	56.36mA
0.80	52.65mA	33.58mA	62.78mA
0.90	57.35mA	36.36mA	68.80mA
1.00	61.64mA	38.84mA	74.42mA
1.10	65.54mA	41.04mA	79.65mA
1.20	69.06mA	42.96mA	84.48mA
1.30	72.18mA	44.61mA	88.92mA
1.40	74.93mA	45.99mA	92.97mA
1.50	77.31mA	47.12mA	96.63mA
1.60	79.32mA	48.01mA	99.91mA
1.70	80.95mA	48.68mA	0.10A
1.80	82.19mA	49.17mA	0.11A
1.90	83.08mA	49.54mA	0.11A
2.00	83.74mA	49.82mA	0.11A
2.10	84.23mA	50.06mA	0.11A
2.20	84.61mA	50.25mA	0.11A
2.30	84.93mA	50.42mA	0.11A
2.40	85.20mA	50.57mA	0.11A
2.50	85.43mA	50.70mA	0.11A
2.60	85.64mA	50.82mA	0.11A
2.70	85.83mA	50.93mA	0.11A
2.80	86.01mA	51.03mA	0.11A
2.90	86.17mA	51.13mA	0.11A
3.00	86.32mA	51.22mA	0.11A
3.10	86.47mA	51.31mA	0.11A
3.20	86.61mA	51.40mA	0.11A
3.30	86.75mA	51.50mA	0.11A
3.40	86.88mA	51.73mA	0.12A
3.50	87.01mA	52.32mA	0.12A
3.60	87.15mA	53.14mA	0.12A
3.70	87.30mA	54.01mA	0.12A
3.80	87.47mA	54.42mA	0.12A
3.90	87.77mA	52.16mA	0.12A
4.00	88.66mA	52.28mA	0.12A
4.10	90.00mA	52.42mA	0.12A
4.20	91.29mA	52.58mA	0.12A
4.30	89.03mA	52.77mA	0.12A
4.50	89.65mA	53.24mA	0.12A
4.70	90.63mA	53.86mA	0.12A
4.90	91.94mA	54.68mA	0.12A

```
   5.10       93.62mA             55.72mA              0.12A
   5.30       95.73mA             57.02mA              0.13A
   5.50       98.29mA             58.58mA              0.13A
   5.70        0.10A              60.42mA              0.13A
   5.90        0.10A              62.54mA              0.14A
   6.10        0.11A              64.92mA              0.14A
   6.60        0.12A              71.81mA              0.15A
|
[Pullup]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30        0.22A               0.16A               0.25A
  -3.10        0.21A               0.16A               0.24A
  -2.90        0.20A               0.15A               0.23A
  -2.70        0.19A               0.14A               0.22A
  -2.50        0.18A               0.14A               0.21A
  -2.30        0.17A               0.13A               0.20A
  -2.10        0.16A               0.12A               0.18A
  -1.90        0.15A               0.11A               0.17A
  -1.70        0.14A               0.10A               0.16A
  -1.50        0.12A              90.13mA              0.14A
  -1.00       92.59mA             62.48mA              0.11A
  -0.90       84.26mA             56.95mA             97.88mA
  -0.80       75.03mA             54.36mA             87.19mA
  -0.70       65.60mA             47.69mA             76.45mA
  -0.60       56.28mA             40.63mA             66.08mA
  -0.50       47.19mA             33.52mA             55.62mA
  -0.40       37.96mA             26.49mA             44.89mA
  -0.30       28.58mA             19.70mA             33.93mA
  -0.20       19.09mA             13.03mA             22.76mA
  -0.10        9.54mA              6.45mA             11.43mA
   0.00        0.17uA              0.16uA              0.19uA
   0.10       -9.23mA             -6.17mA            -11.15mA
   0.20      -17.95mA            -11.99mA            -21.75mA
   0.30      -26.16mA            -17.46mA            -31.79mA
   0.40      -33.86mA            -22.57mA            -41.28mA
   0.50      -41.07mA            -27.35mA            -50.24mA
   0.60      -47.79mA            -31.77mA            -58.67mA
   0.70      -54.04mA            -35.86mA            -66.58mA
   0.80      -59.82mA            -39.62mA            -73.98mA
   0.90      -65.13mA            -43.05mA            -80.88mA
   1.00      -69.99mA            -46.15mA            -87.29mA
   1.10      -74.41mA            -48.92mA            -93.21mA
   1.20      -78.38mA            -51.38mA            -98.65mA
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   1.30      -81.93mA           -53.52mA           -0.10A
   1.40      -85.05mA           -55.36mA           -0.11A
   1.50      -87.75mA           -56.88mA           -0.11A
   1.60      -90.05mA           -58.12mA           -0.12A
   1.70      -91.96mA           -59.09mA           -0.12A
   1.80      -93.52mA           -59.84mA           -0.12A
   1.90      -94.78mA           -60.43mA           -0.12A
   2.00      -95.80mA           -60.92mA           -0.13A
   2.10      -96.66mA           -61.35mA           -0.13A
   2.20      -97.39mA           -61.72mA           -0.13A
   2.30      -98.03mA           -62.06mA           -0.13A
   2.40      -98.58mA           -62.37mA           -0.13A
   2.50      -99.08mA           -62.65mA           -0.13A
   2.60      -99.52mA           -62.91mA           -0.13A
   2.70      -99.92mA           -63.15mA           -0.13A
   2.80       -0.10A            -63.37mA           -0.13A
   2.90       -0.10A            -63.58mA           -0.13A
   3.00       -0.10A            -63.78mA           -0.13A
   3.10       -0.10A            -63.96mA           -0.14A
   3.20       -0.10A            -64.14mA           -0.14A
   3.30       -0.10A            -64.33mA           -0.14A
   3.40       -0.10A            -64.95mA           -0.14A
   3.50       -0.10A            -72.61mA           -0.14A
   3.60       -0.10A             -0.17A            -0.14A
   3.70       -0.10A             -0.97A            -0.14A
   3.80       -0.10A             -2.72A            -0.14A
   3.90       -0.11A             -4.50A            -0.14A
   4.00       -0.12A             -6.28A            -0.14A
   4.10       -0.34A             -8.06A            -0.14A
   4.20       -1.90A             -9.85A            -0.14A
   4.30       -3.94A            -11.62A            -0.15A
   4.50       -8.02A            -15.19A            -1.20A
   4.70      -12.10A            -18.75A            -5.43A
   4.90      -16.18A            -22.31A            -9.67A
   5.10      -20.27A            -25.88A           -13.90A
   5.30      -24.35A            -29.44A           -18.14A
   5.50      -28.43A            -33.00A           -22.38A
   5.70      -32.51A            -36.56A           -26.62A
   5.90      -36.60A            -40.13A           -30.86A
   6.10      -40.68A            -43.69A           -35.09A
   6.60      -50.89A            -52.59A           -45.69A
|
[GND_clamp]
| voltage     I(typ)             I(min)             I(max)
```

|

-3.30	-50.75A	-47.17A	-51.87A
-3.20	-48.72A	-45.39A	-49.75A
-3.10	-46.68A	-43.61A	-47.63A
-3.00	-44.64A	-41.83A	-45.52A
-2.90	-42.60A	-40.05A	-43.40A
-2.80	-40.56A	-38.27A	-41.29A
-2.70	-38.52A	-36.49A	-39.17A
-2.60	-36.48A	-34.71A	-37.05A
-2.50	-34.44A	-32.93A	-34.94A
-2.40	-32.40A	-31.15A	-32.82A
-2.30	-30.36A	-29.37A	-30.70A
-2.20	-28.32A	-27.59A	-28.58A
-2.10	-26.28A	-25.81A	-26.47A
-2.00	-24.24A	-24.03A	-24.35A
-1.90	-22.20A	-22.25A	-22.23A
-1.80	-20.16A	-20.47A	-20.11A
-1.70	-18.12A	-18.68A	-18.00A
-1.60	-16.08A	-16.90A	-15.88A
-1.50	-14.04A	-15.12A	-13.76A
-1.40	-12.00A	-13.34A	-11.64A
-1.30	-9.96A	-11.56A	-9.53A
-1.20	-7.92A	-9.78A	-7.41A
-1.10	-5.88A	-8.00A	-5.29A
-1.00	-3.84A	-6.22A	-3.18A
-0.90	-1.80A	-4.44A	-1.07A
-0.80	-0.23A	-2.65A	-71.53mA
-0.70	-13.26mA	-0.90A	-13.93mA
-0.60	-2.23mA	-0.10A	-6.08mA
-0.50	-0.34mA	-7.99mA	-1.62mA
-0.40	-28.68uA	-0.48mA	-0.18mA
-0.30	-1.65uA	-27.22uA	-10.18uA
-0.20	-0.15uA	-1.61uA	-0.42uA
-0.10	-86.50nA	-0.17uA	-0.11uA
-0.00	-76.61nA	-77.36nA	-91.73nA
0.10	-68.52nA	-64.82nA	-83.30nA
0.20	-60.47nA	-56.49nA	-75.01nA
0.30	-52.43nA	-48.39nA	-66.73nA
0.40	-44.39nA	-40.30nA	-58.46nA
0.50	-36.35nA	-32.21nA	-50.19nA
0.60	-28.31nA	-24.12nA	-41.93nA
0.70	-20.27nA	-16.03nA	-33.68nA
0.80	-12.24nA	-7.94nA	-25.42nA
0.90	-4.20nA	0.15nA	-17.17nA

```
   1.00        3.83nA              8.23nA             -8.92nA
   1.10       11.86nA             16.32nA             -0.67nA
   1.20       19.89nA             24.41nA              7.58nA
   1.30       27.92nA             32.50nA             15.84nA
   1.40       35.95nA             40.59nA             24.10nA
   1.50       43.98nA             48.68nA             32.36nA
   1.60       52.00nA             56.77nA             40.64nA
   1.70       60.02nA             64.85nA             48.92nA
   1.80       68.04nA             72.94nA             57.21nA
   1.90       76.05nA             81.03nA             65.52nA
   2.00       84.05nA             89.12nA             73.85nA
   2.10       92.04nA             97.20nA             82.20nA
   2.20      100.00nA              0.11uA             90.59nA
   2.30        0.11uA              0.11uA             99.01nA
   2.40        0.12uA              0.12uA              0.11uA
   2.50        0.12uA              0.12uA              0.12uA
   2.60        0.13uA              0.13uA              0.12uA
   2.70        0.13uA              0.13uA              0.13uA
   2.80        0.14uA              0.13uA              0.14uA
   2.90        0.14uA              0.14uA              0.15uA
   3.00        0.15uA              0.15uA              0.15uA
   3.10        0.15uA              0.17uA              0.16uA
   3.20        0.15uA              0.56uA              0.16uA
   3.30        0.16uA              0.19uA              0.17uA
|
[POWER_clamp]
| voltage     I(typ)              I(min)              I(max)
|
  -3.30        0.37uA              0.37uA              0.40uA
  -3.20        0.37uA              0.36uA              0.39uA
  -3.10        0.36uA              0.36uA              0.39uA
  -3.00        0.35uA              0.35uA              0.38uA
  -2.90        0.35uA              0.34uA              0.37uA
  -2.80        0.34uA              0.34uA              0.37uA
  -2.70        0.33uA              0.33uA              0.36uA
  -2.60        0.33uA              0.33uA              0.36uA
  -2.50        0.32uA              0.32uA              0.35uA
  -2.40        0.32uA              0.31uA              0.34uA
  -2.30        0.31uA              0.31uA              0.34uA
  -2.20        0.30uA              0.30uA              0.33uA
  -2.10        0.30uA              0.29uA              0.32uA
  -2.00        0.29uA              0.29uA              0.32uA
  -1.90        0.28uA              0.28uA              0.31uA
  -1.80        0.28uA              0.28uA              0.30uA
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  -1.70        0.27uA              0.27uA              0.30uA
  -1.60        0.27uA              0.26uA              0.29uA
  -1.50        0.26uA              0.26uA              0.29uA
  -1.40        0.25uA              0.25uA              0.28uA
  -1.30        0.25uA              0.25uA              0.27uA
  -1.20        0.24uA              0.24uA              0.27uA
  -1.10        0.24uA              0.23uA              0.26uA
  -1.00        0.23uA              0.23uA              0.25uA
  -0.90        0.22uA              0.22uA              0.25uA
  -0.80        0.22uA              0.22uA              0.24uA
  -0.70        0.21uA              0.21uA              0.24uA
  -0.60        0.21uA              0.20uA              0.23uA
  -0.50        0.20uA              0.20uA              0.22uA
  -0.40        0.20uA              0.19uA              0.22uA
  -0.30        0.19uA              0.19uA              0.21uA
  -0.20        0.48mA              0.56uA              0.72uA
  -0.10        0.16uA              0.17uA              0.18uA
   0.00        0.16uA              0.15uA              0.18uA

|
[Ramp]
| variable       typ                 min                 max
dV/dt_r          1.54/2.19n          1.20/2.87n          1.77/2.14n
dV/dt_f          1.52/3.15n          1.15/4.45n          1.73/3.01n
R_load = 50.00
|
[Rising Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)              V(min)              V(max)
|
  0.000S          0.70uV              0.93uV              0.69uV
   0.20nS         0.46uV              0.77uV             0.000V
   0.40nS        -5.77uV             -1.75uV             11.67uV
   0.60nS        -0.27mV             -5.10uV             -2.79mV
   0.80nS        -2.96mV             26.03uV             -6.12mV
   1.00nS        -3.62mV             -5.61uV             32.64mV
   1.20nS        19.35mV             -0.80mV             81.12mV
   1.40nS        46.31mV             -3.19mV              0.11V
   1.60nS        79.98mV             -6.88mV              0.16V
```

```
   1.80nS          0.12V              -0.22mV              0.21V
   2.00nS          0.16V              21.89mV              0.27V
   2.20nS          0.20V              48.68mV              0.33V
   2.40nS          0.26V              76.62mV              0.41V
   2.60nS          0.32V               0.11V               0.49V
   2.80nS          0.42V               0.16V               0.61V
   3.00nS          0.51V               0.20V               0.73V
   3.20nS          0.58V               0.24V               0.82V
   3.40nS          0.71V               0.30V               0.99V
   3.60nS          0.85V               0.36V               1.17V
   3.80nS          1.01V               0.45V               1.36V
   4.00nS          1.18V               0.54V               1.56V
   4.20nS          1.38V               0.67V               1.81V
   4.40nS          1.57V               0.81V               2.03V
   4.60nS          1.69V               0.89V               2.16V
   4.80nS          1.79V               0.96V               2.27V
   5.00nS          1.91V               1.06V               2.40V
   5.20nS          2.03V               1.15V               2.52V
   5.40nS          2.14V               1.26V               2.61V
   5.60nS          2.24V               1.35V               2.70V
   5.80nS          2.28V               1.40V               2.74V
   6.00nS          2.31V               1.45V               2.77V
   6.20nS          2.36V               1.51V               2.80V
   6.40nS          2.39V               1.56V               2.83V
   6.60nS          2.41V               1.61V               2.85V
   6.80nS          2.43V               1.66V               2.86V
   7.00nS          2.45V               1.70V               2.87V
   7.20nS          2.46V               1.74V               2.88V
   7.40nS          2.48V               1.78V               2.89V
   7.60nS          2.49V               1.82V               2.90V
   7.80nS          2.50V               1.84V               2.91V
   8.00nS          2.51V               1.86V               2.91V
   8.20nS          2.52V               1.88V               2.92V
   8.40nS          2.52V               1.90V               2.92V
   8.60nS          2.53V               1.92V               2.93V
   8.80nS          2.54V               1.93V               2.93V
   9.00nS          2.54V               1.95V               2.93V
   9.20nS          2.55V               1.96V               2.94V
   9.40nS          2.55V               1.97V               2.94V
   9.60nS          2.56V               1.99V               2.94V
   9.80nS          2.56V               2.00V               2.95V
  10.00nS          2.57V               2.00V               2.95V
|
[Rising Waveform]
```

```
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)             V(min)             V(max)
|
  0.000S          0.76V              1.03V              0.72V
   0.20nS         0.76V              1.03V              0.72V
   0.40nS         0.76V              1.03V              0.72V
   0.60nS         0.76V              1.03V              0.72V
   0.80nS         0.77V              1.03V              0.73V
   1.00nS         0.81V              1.03V              0.82V
   1.20nS         0.90V              1.03V              0.93V
   1.40nS         0.98V              1.04V              1.02V
   1.60nS         1.10V              1.11V              1.13V
   1.80nS         1.22V              1.21V              1.26V
   2.00nS         1.36V              1.33V              1.42V
   2.20nS         1.53V              1.46V              1.58V
   2.40nS         1.72V              1.60V              1.80V
   2.60nS         1.93V              1.75V              2.04V
   2.80nS         2.23V              1.97V              2.36V
   3.00nS         2.48V              2.16V              2.62V
   3.20nS         2.66V              2.30V              2.82V
   3.40nS         2.85V              2.49V              3.04V
   3.60nS         2.97V              2.63V              3.19V
   3.80nS         3.09V              2.73V              3.29V
   4.00nS         3.14V              2.83V              3.36V
   4.20nS         3.19V              2.89V              3.42V
   4.40nS         3.23V              2.94V              3.47V
   4.60nS         3.25V              2.96V              3.50V
   4.80nS         3.27V              2.97V              3.52V
   5.00nS         3.28V              2.98V              3.54V
   5.20nS         3.29V              2.99V              3.56V
   5.40nS         3.29V              2.99V              3.57V
   5.60nS         3.30V              3.00V              3.58V
   5.80nS         3.30V              3.00V              3.59V
   6.00nS         3.30V              3.00V              3.59V
   6.20nS         3.30V              3.00V              3.60V
   6.40nS         3.30V              3.00V              3.60V
   6.60nS         3.30V              3.00V              3.60V
   6.80nS         3.30V              3.00V              3.60V
   7.00nS         3.30V              3.00V              3.60V
```

```
   7.20nS          3.30V                3.00V                3.60V
   7.40nS          3.30V                3.00V                3.60V
   7.60nS          3.30V                3.00V                3.60V
   7.80nS          3.30V                3.00V                3.60V
   8.00nS          3.30V                3.00V                3.60V
   8.20nS          3.30V                3.00V                3.60V
   8.40nS          3.30V                3.00V                3.60V
   8.60nS          3.30V                3.00V                3.60V
   8.80nS          3.30V                3.00V                3.60V
   9.00nS          3.30V                3.00V                3.60V
   9.20nS          3.30V                3.00V                3.60V
   9.40nS          3.30V                3.00V                3.60V
   9.60nS          3.30V                3.00V                3.60V
   9.80nS          3.30V                3.00V                3.60V
  10.00nS          3.30V                3.00V                3.60V
|
[Falling Waveform]
R_fixture = 50.00
V_fixture = 0.000
V_fixture_min = 0.000
V_fixture_max = 0.000
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)               V(min)               V(max)
|
  0.000S          2.62V                2.12V                2.99V
   0.20nS         2.62V                2.12V                2.99V
   0.40nS         2.62V                2.12V                2.99V
   0.60nS         2.62V                2.12V                2.96V
   0.80nS         2.60V                2.12V                2.85V
   1.00nS         2.50V                2.12V                2.72V
   1.20nS         2.37V                2.11V                2.59V
   1.40nS         2.29V                2.09V                2.50V
   1.60nS         2.17V                2.04V                2.36V
   1.80nS         2.04V                1.96V                2.20V
   2.00nS         1.89V                1.85V                2.00V
   2.20nS         1.71V                1.74V                1.75V
   2.40nS         1.50V                1.63V                1.48V
   2.60nS         1.28V                1.50V                1.24V
   2.80nS         1.01V                1.33V                1.01V
   3.00nS         0.82V                1.17V                0.82V
   3.20nS         0.72V                1.04V                0.75V
   3.40nS         0.61V                0.87V                0.65V
   3.60nS         0.51V                0.72V                0.57V
```

```
   3.80nS         0.44V              0.60V              0.50V
   4.00nS         0.38V              0.49V              0.44V
   4.20nS         0.32V              0.40V              0.38V
   4.40nS         0.26V              0.32V              0.32V
   4.60nS         0.23V              0.28V              0.29V
   4.80nS         0.21V              0.25V              0.26V
   5.00nS         0.17V              0.21V              0.23V
   5.20nS         0.15V              0.18V              0.20V
   5.40nS         0.12V              0.14V              0.17V
   5.60nS        93.14mV             0.11V              0.14V
   5.80nS        80.86mV            94.78mV             0.12V
   6.00nS        68.57mV            80.67mV             0.11V
   6.20nS        55.24mV            65.96mV            90.13mV
   6.40nS        43.92mV            51.39mV            74.96mV
   6.60nS        33.33mV            40.71mV            61.03mV
   6.80nS        25.91mV            31.19mV            50.31mV
   7.00nS        18.81mV            22.83mV            39.65mV
   7.20nS        13.52mV            17.13mV            31.61mV
   7.40nS         8.40mV            10.61mV            22.62mV
   7.60nS         4.73mV             6.73mV            15.75mV
   7.80nS         3.46mV             4.67mV            12.43mV
   8.00nS         2.19mV             3.16mV             9.14mV
   8.20nS         1.26mV             2.23mV             6.37mV
   8.40nS         0.84mV             1.32mV             4.12mV
   8.60nS         0.49mV             0.95mV             2.29mV
   8.80nS         0.41mV             0.74mV             1.55mV
   9.00nS         0.35mV             0.58mV             0.81mV
   9.20nS         0.31mV             0.51mV             0.53mV
   9.40nS         0.28mV             0.45mV             0.39mV
   9.60nS         0.24mV             0.40mV             0.27mV
   9.80nS         0.22mV             0.36mV             0.24mV
  10.00nS         0.20mV             0.32mV             0.21mV
|
[Falling Waveform]
R_fixture = 50.00
V_fixture = 3.30
V_fixture_min = 3.00
V_fixture_max = 3.60
L_fixture = 0.000H
C_fixture = 0.000F
| time           V(typ)             V(min)             V(max)
|
  0.000S          3.30V              3.00V              3.60V
   0.20nS         3.30V              3.00V              3.60V
```

0.40nS	3.30V	3.00V	3.60V
0.60nS	3.30V	3.00V	3.59V
0.80nS	3.30V	3.00V	3.52V
1.00nS	3.25V	3.00V	3.44V
1.20nS	3.18V	3.00V	3.37V
1.40nS	3.14V	3.00V	3.32V
1.60nS	3.09V	3.00V	3.24V
1.80nS	3.03V	2.97V	3.16V
2.00nS	2.96V	2.92V	3.07V
2.20nS	2.88V	2.88V	2.98V
2.40nS	2.80V	2.84V	2.88V
2.60nS	2.72V	2.80V	2.77V
2.80nS	2.60V	2.74V	2.64V
3.00nS	2.51V	2.68V	2.54V
3.20nS	2.44V	2.64V	2.46V
3.40nS	2.34V	2.58V	2.34V
3.60nS	2.25V	2.52V	2.22V
3.80nS	2.15V	2.46V	2.08V
4.00nS	2.05V	2.39V	1.92V
4.20nS	1.93V	2.32V	1.74V
4.40nS	1.81V	2.24V	1.58V
4.60nS	1.73V	2.19V	1.50V
4.80nS	1.65V	2.15V	1.42V
5.00nS	1.53V	2.09V	1.34V
5.20nS	1.43V	2.04V	1.26V
5.40nS	1.32V	1.97V	1.18V
5.60nS	1.22V	1.91V	1.11V
5.80nS	1.18V	1.87V	1.07V
6.00nS	1.13V	1.84V	1.03V
6.20nS	1.08V	1.79V	0.99V
6.40nS	1.03V	1.75V	0.95V
6.60nS	0.99V	1.70V	0.92V
6.80nS	0.96V	1.66V	0.89V
7.00nS	0.93V	1.63V	0.87V
7.20nS	0.90V	1.59V	0.84V
7.40nS	0.87V	1.53V	0.82V
7.60nS	0.84V	1.47V	0.80V
7.80nS	0.83V	1.44V	0.78V
8.00nS	0.82V	1.40V	0.78V
8.20nS	0.81V	1.35V	0.76V
8.40nS	0.80V	1.30V	0.75V
8.60nS	0.79V	1.26V	0.75V
8.80nS	0.78V	1.23V	0.74V
9.00nS	0.78V	1.19V	0.73V

```
   9.20nS         0.78V              1.17V              0.73V
   9.40nS         0.77V              1.14V              0.73V
   9.60nS         0.77V              1.12V              0.72V
   9.80nS         0.77V              1.10V              0.72V
  10.00nS         0.77V              1.08V              0.72V
|
| End [Model] prt24dgz
|
|******************************************************************************
|                             Model pdusdgz
|******************************************************************************
|
[Model]          pdusdgz
Model_type       Input
Polarity         Non-Inverting
Vinl =  0.000V
Vinh =   3.30V
C_comp           5.00pF             5.00pF             5.00pF
|
|
[Temperature Range]       25.00              0.12k              0.000
[Pullup Reference]        3.30V              3.00V              3.60V
[Pulldown Reference]      0.000V             0.000V             0.000V
[POWER Clamp Reference]   5.00V              4.50V              5.50V
[GND Clamp Reference]     0.000V             0.000V             0.000V
[GND_clamp]
| voltage     I(typ)              I(min)              I(max)
|
  -5.00      -64.63A             -59.13A             -66.41A
  -4.80      -61.55A             -56.41A             -63.21A
  -4.60      -58.47A             -53.69A             -60.01A
  -4.40      -55.39A             -50.97A             -56.81A
  -4.20      -52.31A             -48.25A             -53.61A
  -4.00      -49.23A             -45.53A             -50.41A
  -3.80      -46.15A             -42.81A             -47.21A
  -3.60      -43.07A             -40.09A             -44.01A
  -3.40      -39.99A             -37.37A             -40.81A
  -3.20      -36.91A             -34.65A             -37.61A
  -3.00      -33.82A             -31.94A             -34.41A
  -2.80      -30.73A             -29.22A             -31.22A
  -2.60      -27.64A             -26.51A             -28.02A
  -2.40      -24.56A             -23.79A             -24.82A
  -2.20      -21.47A             -21.08A             -21.62A
  -2.00      -18.38A             -18.36A             -18.42A
```

```
  -1.80      -15.29A            -15.64A            -15.22A
  -1.60      -12.20A            -12.93A            -12.03A
  -1.40       -9.12A            -10.21A             -8.83A
  -1.20       -6.03A             -7.50A             -5.63A
  -1.00       -2.94A             -4.78A             -2.43A
  -0.80       -0.20A             -2.07A            -64.17mA
  -0.60       -1.85mA            -96.40mA           -4.85mA
  -0.40      -83.24uA            -0.50mA            -0.23mA
  -0.20      -60.52uA           -36.82uA           -86.29uA
  -0.00      -60.40uA           -35.33uA           -85.95uA
   0.20      -60.32uA           -35.27uA           -85.85uA
   0.40      -60.23uA           -35.20uA           -85.73uA
   0.60      -60.11uA           -35.13uA           -85.57uA
   0.80      -59.96uA           -35.03uA           -85.37uA
   1.00      -59.74uA           -34.91uA           -85.08uA
   1.20      -59.32uA           -34.50uA           -84.56uA
   1.40      -58.35uA           -33.59uA           -83.44uA
   1.60      -56.47uA           -31.92uA           -81.36uA
   1.80      -53.57uA           -29.25uA           -78.20uA
   2.00      -49.55uA            -7.60uA           -73.89uA
   2.20      -43.70uA           -16.78nA           -68.43uA
   2.40       -3.73uA             0.10uA           -61.70uA
   2.60        0.10uA             0.11uA           -51.99uA
   2.80        0.12uA             0.12uA            -2.43uA
   3.00        0.13uA             0.13uA             0.13uA
   3.20        0.14uA             0.20uA             0.14uA
   3.40        0.15uA             0.15uA             0.15uA
   3.60        0.16uA            96.30nA             0.16uA
   3.80        0.17uA            43.50nA             0.17uA
   4.00        0.18uA            -9.30nA             0.18uA
   4.20        0.18uA           -62.10nA             0.19uA
   4.40        0.19uA            -0.11uA             0.20uA
   4.60        0.20uA            -0.17uA             0.21uA
   4.80        0.21uA            -0.22uA             0.22uA
   5.00        0.22uA            -0.27uA             0.23uA
|
[POWER_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00        0.61uA             0.59uA             0.65uA
  -4.90        0.60uA             0.58uA             0.65uA
  -4.80        0.59uA             0.58uA             0.64uA
  -4.70        0.59uA             0.57uA             0.63uA
  -4.60        0.58uA             0.56uA             0.63uA
```

-4.50	0.57uA	0.56uA	0.62uA
-4.40	0.56uA	0.55uA	0.61uA
-4.30	0.56uA	0.54uA	0.60uA
-4.20	0.55uA	0.54uA	0.60uA
-4.10	0.54uA	0.53uA	0.59uA
-4.00	0.54uA	0.52uA	0.58uA
-3.90	0.53uA	0.52uA	0.58uA
-3.80	0.52uA	0.51uA	0.57uA
-3.70	0.52uA	0.50uA	0.56uA
-3.60	0.51uA	0.50uA	0.56uA
-3.50	0.50uA	0.49uA	0.55uA
-3.40	0.50uA	0.48uA	0.54uA
-3.30	0.49uA	0.48uA	0.53uA
-3.20	0.48uA	0.47uA	0.53uA
-3.10	0.48uA	0.46uA	0.52uA
-3.00	0.47uA	0.46uA	0.51uA
-2.90	0.46uA	0.45uA	0.51uA
-2.80	0.46uA	0.44uA	0.50uA
-2.70	0.45uA	0.44uA	0.49uA
-2.60	0.44uA	0.43uA	0.49uA
-2.50	0.44uA	0.42uA	0.48uA
-2.40	0.43uA	0.41uA	0.47uA
-2.30	0.42uA	0.41uA	0.46uA
-2.20	0.42uA	0.40uA	0.46uA
-2.10	0.41uA	0.39uA	0.45uA
-2.00	0.40uA	0.39uA	0.44uA
-1.90	0.39uA	0.38uA	0.44uA
-1.80	0.39uA	0.37uA	0.43uA
-1.70	0.38uA	0.37uA	0.42uA
-1.60	0.37uA	0.36uA	0.42uA
-1.50	0.37uA	0.35uA	0.41uA
-1.40	0.36uA	0.35uA	0.40uA
-1.30	0.35uA	0.34uA	0.39uA
-1.20	0.35uA	0.33uA	0.39uA
-1.10	0.34uA	0.33uA	0.38uA
-1.00	0.33uA	0.32uA	0.37uA
-0.90	0.33uA	0.31uA	0.37uA
-0.80	0.32uA	0.31uA	0.36uA
-0.70	0.31uA	0.30uA	0.35uA
-0.60	0.31uA	0.29uA	0.35uA
-0.50	0.30uA	0.29uA	0.34uA
-0.40	0.29uA	0.28uA	0.33uA
-0.30	0.29uA	0.27uA	0.32uA
-0.20	0.28uA	0.27uA	0.32uA

```
  -0.10        0.27uA              0.26uA              0.31uA
   0.00        0.27uA              0.25uA              0.30uA
|
| End [Model] pdusdgz
|
|*****************************************************************
|                            Model pdddgz
|*****************************************************************
|
[Model]          pdddgz
Model_type       Input
Polarity         Non-Inverting
Vinl =  0.000V
Vinh =   3.30V
C_comp           5.00pF              5.00pF              5.00pF
|
|
[Temperature Range]       25.00               0.12k               0.000
[Pullup Reference]        3.30V               3.00V               3.60V
[Pulldown Reference]      0.000V              0.000V              0.000V
[POWER Clamp Reference]   5.00V               4.50V               5.50V
[GND Clamp Reference]     0.000V              0.000V              0.000V
[GND_clamp]
| voltage     I(typ)              I(min)              I(max)
|
  -5.00      -64.63A             -59.13A             -66.41A
  -4.80      -61.55A             -56.41A             -63.21A
  -4.60      -58.47A             -53.69A             -60.01A
  -4.40      -55.39A             -50.97A             -56.81A
  -4.20      -52.31A             -48.25A             -53.61A
  -4.00      -49.23A             -45.53A             -50.41A
  -3.80      -46.15A             -42.81A             -47.21A
  -3.60      -43.07A             -40.09A             -44.01A
  -3.40      -39.99A             -37.37A             -40.81A
  -3.20      -36.91A             -34.65A             -37.61A
  -3.00      -33.82A             -31.94A             -34.41A
  -2.80      -30.73A             -29.22A             -31.22A
  -2.60      -27.64A             -26.51A             -28.02A
  -2.40      -24.56A             -23.79A             -24.82A
  -2.20      -21.47A             -21.08A             -21.62A
  -2.00      -18.38A             -18.36A             -18.42A
  -1.80      -15.29A             -15.64A             -15.22A
  -1.60      -12.20A             -12.93A             -12.03A
  -1.40       -9.12A             -10.21A              -8.83A
```

```
  -1.20       -6.03A             -7.50A             -5.63A
  -1.00       -2.94A             -4.78A             -2.43A
  -0.80       -0.20A             -2.07A            -64.21mA
  -0.60       -1.89mA           -96.41mA            -4.91mA
  -0.40      -85.69uA            -0.50mA            -0.24mA
  -0.20      -27.91uA           -14.61uA           -42.88uA
  -0.00      -87.50nA           -88.83nA            -0.10uA
   0.20       18.71uA             7.31uA            32.27uA
   0.40       29.18uA            10.24uA            54.12uA
   0.60       32.49uA            10.66uA            65.78uA
   0.80       33.06uA            10.78uA            69.33uA
   1.00       33.29uA            10.85uA            70.16uA
   1.20       33.44uA            10.91uA            70.54uA
   1.40       33.56uA            10.96uA            70.78uA
   1.60       33.66uA            11.01uA            70.98uA
   1.80       33.76uA            11.06uA            71.15uA
   2.00       33.85uA            11.10uA            71.30uA
   2.20       33.94uA            11.12uA            71.44uA
   2.40       33.99uA            11.13uA            71.59uA
   2.60       34.01uA            11.14uA            71.74uA
   2.80       34.02uA            11.15uA            71.82uA
   3.00       34.03uA            11.16uA            71.84uA
   3.20       34.04uA            11.25uA            71.85uA
   3.40       34.06uA            11.17uA            71.87uA
   3.60       34.08uA            11.09uA            71.89uA
   3.80       34.10uA            11.01uA            71.91uA
   4.00       34.12uA            10.93uA            71.93uA
   4.20       34.14uA            10.85uA            71.95uA
   4.40       34.16uA            10.77uA            71.97uA
   4.60       34.18uA            10.69uA            71.99uA
   4.80       34.20uA            10.61uA            72.01uA
   5.00       34.22uA            10.53uA            72.03uA
|
[POWER_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00       48.19uA            16.29uA            95.53uA
  -4.90       47.87uA            16.17uA            95.03uA
  -4.80       47.55uA            16.05uA            94.53uA
  -4.70       47.23uA            15.93uA            94.03uA
  -4.60       46.91uA            15.81uA            93.53uA
  -4.50       46.59uA            15.69uA            93.03uA
  -4.40       46.27uA            15.57uA            92.53uA
  -4.30       45.95uA            15.45uA            92.03uA
```

```
  -4.20       45.63uA             15.33uA             91.53uA
  -4.10       45.31uA             15.21uA             91.03uA
  -4.00       44.99uA             15.09uA             90.53uA
  -3.90       44.67uA             14.97uA             90.03uA
  -3.80       44.35uA             14.85uA             89.53uA
  -3.70       44.03uA             14.73uA             89.03uA
  -3.60       43.71uA             14.61uA             88.53uA
  -3.50       43.39uA             14.49uA             88.03uA
  -3.40       43.07uA             14.37uA             87.53uA
  -3.30       42.75uA             14.25uA             87.03uA
  -3.20       42.43uA             14.13uA             86.53uA
  -3.10       42.11uA             14.01uA             86.03uA
  -3.00       41.79uA             13.89uA             85.53uA
  -2.90       41.47uA             13.77uA             85.03uA
  -2.80       41.15uA             13.65uA             84.53uA
  -2.70       40.83uA             13.53uA             84.03uA
  -2.60       40.51uA             13.41uA             83.53uA
  -2.50       40.19uA             13.29uA             83.03uA
  -2.40       39.87uA             13.17uA             82.53uA
  -2.30       39.55uA             13.05uA             82.03uA
  -2.20       39.23uA             12.93uA             81.53uA
  -2.10       38.91uA             12.81uA             81.03uA
  -2.00       38.59uA             12.69uA             80.53uA
  -1.90       38.27uA             12.57uA             80.03uA
  -1.80       37.95uA             12.45uA             79.53uA
  -1.70       37.63uA             12.33uA             79.03uA
  -1.60       37.31uA             12.22uA             78.53uA
  -1.50       36.99uA             12.11uA             78.03uA
  -1.40       36.68uA             12.01uA             77.53uA
  -1.30       36.38uA             11.92uA             77.03uA
  -1.20       36.11uA             11.84uA             76.53uA
  -1.10       35.86uA             11.76uA             76.03uA
  -1.00       35.63uA             11.69uA             75.53uA
  -0.90       35.41uA             11.63uA             75.06uA
  -0.80       35.22uA             11.57uA             74.63uA
  -0.70       35.05uA             11.52uA             74.24uA
  -0.60       34.90uA             11.48uA             73.89uA
  -0.50       34.77uA             11.44uA             73.58uA
  -0.40       34.65uA             11.41uA             73.30uA
  -0.30       34.55uA             11.38uA             73.06uA
  -0.20       34.47uA             11.35uA             72.86uA
  -0.10       34.40uA             11.33uA             72.68uA
   0.00       34.34uA             11.31uA             72.54uA
|
```

```
| End [Model] pdddgz
|
|*****************************************************************
|                            Model pdudgz
|*****************************************************************
|
[Model]          pdudgz
Model_type       Input
Polarity         Non-Inverting
Vinl =  0.000V
Vinh =   3.30V
C_comp           5.00pF              5.00pF              5.00pF
|
|
[Temperature Range]       25.00               0.12k               0.000
[Pullup Reference]        3.30V               3.00V               3.60V
[Pulldown Reference]      0.000V              0.000V              0.000V
[POWER Clamp Reference]   5.00V               4.50V               5.50V
[GND Clamp Reference]     0.000V              0.000V              0.000V
[GND_clamp]
| voltage     I(typ)              I(min)              I(max)
|
  -5.00      -64.63A             -59.13A             -66.41A
  -4.80      -61.55A             -56.41A             -63.21A
  -4.60      -58.47A             -53.69A             -60.01A
  -4.40      -55.39A             -50.97A             -56.81A
  -4.20      -52.31A             -48.25A             -53.61A
  -4.00      -49.23A             -45.53A             -50.41A
  -3.80      -46.15A             -42.81A             -47.21A
  -3.60      -43.07A             -40.09A             -44.01A
  -3.40      -39.99A             -37.37A             -40.81A
  -3.20      -36.91A             -34.65A             -37.61A
  -3.00      -33.82A             -31.94A             -34.41A
  -2.80      -30.73A             -29.22A             -31.22A
  -2.60      -27.64A             -26.51A             -28.02A
  -2.40      -24.56A             -23.79A             -24.82A
  -2.20      -21.47A             -21.08A             -21.62A
  -2.00      -18.38A             -18.36A             -18.42A
  -1.80      -15.29A             -15.64A             -15.22A
  -1.60      -12.20A             -12.93A             -12.03A
  -1.40       -9.12A             -10.21A              -8.83A
  -1.20       -6.03A              -7.50A              -5.63A
  -1.00       -2.94A              -4.78A              -2.43A
  -0.80       -0.20A              -2.07A             -64.17mA
```

```
  -0.60       -1.85mA           -96.40mA            -4.85mA
  -0.40      -83.24uA            -0.50mA            -0.23mA
  -0.20      -60.52uA           -36.82uA           -86.29uA
  -0.00      -60.40uA           -35.33uA           -85.95uA
   0.20      -60.32uA           -35.27uA           -85.85uA
   0.40      -60.23uA           -35.20uA           -85.73uA
   0.60      -60.11uA           -35.13uA           -85.57uA
   0.80      -59.96uA           -35.03uA           -85.37uA
   1.00      -59.74uA           -34.87uA           -85.08uA
   1.20      -59.32uA           -34.50uA           -84.56uA
   1.40      -58.35uA           -33.59uA           -83.44uA
   1.60      -56.47uA           -31.92uA           -81.36uA
   1.80      -53.57uA           -29.25uA           -78.20uA
   2.00      -49.55uA            -7.60uA           -73.89uA
   2.20      -43.70uA           -16.78nA           -68.43uA
   2.40       -3.73uA             0.10uA           -61.70uA
   2.60        0.10uA             0.11uA           -51.99uA
   2.80        0.12uA             0.12uA            -2.43uA
   3.00        0.13uA             0.13uA             0.13uA
   3.20        0.14uA             0.20uA             0.14uA
   3.40        0.15uA             0.15uA             0.15uA
   3.60        0.16uA            96.30nA             0.16uA
   3.80        0.17uA            43.50nA             0.17uA
   4.00        0.18uA            -9.30nA             0.18uA
   4.20        0.18uA           -62.10nA             0.19uA
   4.40        0.19uA            -0.11uA             0.20uA
   4.60        0.20uA            -0.17uA             0.21uA
   4.80        0.21uA            -0.22uA             0.22uA
   5.00        0.22uA            -0.27uA             0.23uA
|
[POWER_clamp]
| voltage     I(typ)             I(min)             I(max)
|
  -5.00        0.61uA             0.59uA             0.65uA
  -4.90        0.60uA             0.58uA             0.65uA
  -4.80        0.59uA             0.58uA             0.64uA
  -4.70        0.59uA             0.57uA             0.63uA
  -4.60        0.58uA             0.56uA             0.63uA
  -4.50        0.57uA             0.56uA             0.62uA
  -4.40        0.56uA             0.55uA             0.61uA
  -4.30        0.56uA             0.54uA             0.60uA
  -4.20        0.55uA             0.54uA             0.60uA
  -4.10        0.54uA             0.53uA             0.59uA
  -4.00        0.54uA             0.52uA             0.58uA
```

```
  -3.90        0.53uA              0.52uA              0.58uA
  -3.80        0.52uA              0.51uA              0.57uA
  -3.70        0.52uA              0.50uA              0.56uA
  -3.60        0.51uA              0.50uA              0.56uA
  -3.50        0.50uA              0.49uA              0.55uA
  -3.40        0.50uA              0.48uA              0.54uA
  -3.30        0.49uA              0.48uA              0.53uA
  -3.20        0.48uA              0.47uA              0.53uA
  -3.10        0.48uA              0.46uA              0.52uA
  -3.00        0.47uA              0.46uA              0.51uA
  -2.90        0.46uA              0.45uA              0.51uA
  -2.80        0.46uA              0.44uA              0.50uA
  -2.70        0.45uA              0.44uA              0.49uA
  -2.60        0.44uA              0.43uA              0.49uA
  -2.50        0.44uA              0.42uA              0.48uA
  -2.40        0.43uA              0.41uA              0.47uA
  -2.30        0.42uA              0.41uA              0.46uA
  -2.20        0.42uA              0.40uA              0.46uA
  -2.10        0.41uA              0.39uA              0.45uA
  -2.00        0.40uA              0.39uA              0.44uA
  -1.90        0.39uA              0.38uA              0.44uA
  -1.80        0.39uA              0.37uA              0.43uA
  -1.70        0.38uA              0.37uA              0.42uA
  -1.60        0.37uA              0.36uA              0.42uA
  -1.50        0.37uA              0.35uA              0.41uA
  -1.40        0.36uA              0.35uA              0.40uA
  -1.30        0.35uA              0.34uA              0.39uA
  -1.20        0.35uA              0.33uA              0.39uA
  -1.10        0.34uA              0.33uA              0.38uA
  -1.00        0.33uA              0.32uA              0.37uA
  -0.90        0.33uA              0.31uA              0.37uA
  -0.80        0.32uA              0.31uA              0.36uA
  -0.70        0.31uA              0.30uA              0.35uA
  -0.60        0.31uA              0.29uA              0.35uA
  -0.50        0.30uA              0.29uA              0.34uA
  -0.40        0.29uA              0.28uA              0.33uA
  -0.30        0.29uA              0.27uA              0.32uA
  -0.20        0.28uA              0.27uA              0.32uA
  -0.10        0.27uA              0.26uA              0.31uA
   0.00        0.27uA              0.25uA              0.30uA
|
| End [Model] pdudgz
|
|*********************************************************************
```

```
|                              Model pdidgz
|*****************************************************************************
|
[Model]          pdidgz
Model_type       Input
Polarity         Non-Inverting
Vinl =  0.000V
Vinh =   3.30V
C_comp           5.00pF              5.00pF              5.00pF
|
|
[Temperature Range]       25.00               0.12k               0.000
[Pullup Reference]        3.30V               3.00V               3.60V
[Pulldown Reference]      0.000V              0.000V              0.000V
[POWER Clamp Reference]   5.00V               4.50V               5.50V
[GND Clamp Reference]     0.000V              0.000V              0.000V
[GND_clamp]
| voltage     I(typ)              I(min)              I(max)
|
-5.00      -64.63A             -59.13A             -66.41A
-4.80      -61.55A             -56.41A             -63.21A
-4.60      -58.47A             -53.69A             -60.01A
-4.40      -55.39A             -50.97A             -56.81A
-4.20      -52.31A             -48.25A             -53.61A
  -4.00      -49.23A             -45.53A             -50.41A
  -3.80      -46.15A             -42.81A             -47.21A
  -3.60      -43.07A             -40.09A             -44.01A
  -3.40      -39.99A             -37.37A             -40.81A
  -3.20      -36.91A             -34.65A             -37.61A
  -3.00      -33.82A             -31.94A             -34.41A
  -2.80      -30.73A             -29.22A             -31.22A
  -2.60      -27.64A             -26.51A             -28.02A
  -2.40      -24.56A             -23.79A             -24.82A
  -2.20      -21.47A             -21.08A             -21.62A
  -2.00      -18.38A             -18.36A             -18.42A
  -1.80      -15.29A             -15.64A             -15.22A
  -1.60      -12.20A             -12.93A             -12.03A
  -1.40       -9.12A             -10.21A              -8.83A
  -1.20       -6.03A              -7.50A              -5.63A
  -1.00       -2.94A              -4.78A              -2.43A
  -0.80       -0.20A              -2.07A             -64.14mA
  -0.60       -1.79mA            -96.39mA             -4.77mA
  -0.40      -22.83uA             -0.47mA             -0.14mA
  -0.20       -0.15uA             -1.56uA             -0.37uA
```

```
  -0.00      -88.71nA            -89.34nA             -0.11uA
   0.20      -72.38nA            -68.50nA            -88.30nA
   0.40      -56.11nA            -52.12nA            -71.55nA
   0.60      -39.84nA            -35.76nA            -54.82nA
   0.80      -23.57nA            -19.40nA            -38.12nA
   1.00       -7.31nA             -3.04nA            -21.42nA
   1.20        8.94nA             13.32nA             -4.73nA
   1.40       25.19nA             29.68nA             11.97nA
   1.60       41.42nA             46.03nA             28.68nA
   1.80       57.64nA             62.39nA             45.42nA
   2.00       73.83nA             78.74nA             62.20nA
   2.20       89.95nA             94.86nA             79.06nA
   2.40        0.11uA              0.11uA             96.02nA
   2.60        0.12uA              0.12uA              0.11uA
   2.80        0.13uA              0.13uA              0.13uA
   3.00        0.14uA              0.14uA              0.14uA
   3.20        0.15uA              0.21uA              0.15uA
   3.40        0.15uA              0.15uA              0.16uA
   3.60        0.16uA              0.10uA              0.17uA
   3.80        0.17uA             47.20nA              0.18uA
   4.00        0.18uA             -5.80nA              0.18uA
   4.20        0.19uA            -58.80nA              0.19uA
   4.40        0.20uA             -0.11uA              0.20uA
   4.60        0.20uA             -0.16uA              0.21uA
   4.80        0.21uA             -0.22uA              0.22uA
   5.00        0.22uA             -0.27uA              0.23uA
|
[POWER_clamp]
| voltage     I(typ)              I(min)              I(max)
|
  -5.00        0.60uA              0.59uA              0.65uA
  -4.90        0.60uA              0.58uA              0.64uA
  -4.80        0.59uA              0.58uA              0.64uA
  -4.70        0.58uA              0.57uA              0.63uA
  -4.60        0.58uA              0.56uA              0.62uA
  -4.50        0.57uA              0.56uA              0.62uA
  -4.40        0.56uA              0.55uA              0.61uA
  -4.30        0.56uA              0.54uA              0.60uA
  -4.20        0.55uA              0.54uA              0.59uA
  -4.10        0.54uA              0.53uA              0.59uA
  -4.00        0.54uA              0.52uA              0.58uA
  -3.90        0.53uA              0.52uA              0.57uA
  -3.80        0.52uA              0.51uA              0.57uA
  -3.70        0.52uA              0.50uA              0.56uA
```

```
  -3.60        0.51uA              0.50uA              0.55uA
  -3.50        0.50uA              0.49uA              0.55uA
  -3.40        0.49uA              0.48uA              0.54uA
  -3.30        0.49uA              0.48uA              0.53uA
  -3.20        0.48uA              0.47uA              0.53uA
  -3.10        0.47uA              0.46uA              0.52uA
  -3.00        0.47uA              0.46uA              0.51uA
  -2.90        0.46uA              0.45uA              0.51uA
  -2.80        0.45uA              0.44uA              0.50uA
  -2.70        0.45uA              0.43uA              0.49uA
  -2.60        0.44uA              0.43uA              0.48uA
  -2.50        0.43uA              0.42uA              0.48uA
  -2.40        0.43uA              0.41uA              0.47uA
  -2.30        0.42uA              0.41uA              0.46uA
  -2.20        0.41uA              0.40uA              0.46uA
  -2.10        0.41uA              0.39uA              0.45uA
  -2.00        0.40uA              0.39uA              0.44uA
  -1.90        0.39uA              0.38uA              0.44uA
  -1.80        0.39uA              0.37uA              0.43uA
  -1.70        0.38uA              0.37uA              0.42uA
  -1.60        0.37uA              0.36uA              0.42uA
  -1.50        0.37uA              0.35uA              0.41uA
  -1.40        0.36uA              0.35uA              0.40uA
  -1.30        0.35uA              0.34uA              0.39uA
-1.20        0.35uA              0.33uA              0.39uA
-1.10        0.34uA              0.33uA              0.38uA
  -1.00        0.33uA              0.32uA              0.37uA
  -0.90        0.33uA              0.31uA              0.37uA
  -0.80        0.32uA              0.31uA              0.36uA
  -0.70        0.31uA              0.30uA              0.35uA
  -0.60        0.31uA              0.29uA              0.35uA
  -0.50        0.30uA              0.29uA              0.34uA
  -0.40        0.29uA              0.28uA              0.33uA
  -0.30        0.29uA              0.27uA              0.33uA
  -0.20        0.28uA              0.27uA              0.32uA
  -0.10        0.28uA              0.26uA              0.31uA
   0.00        0.27uA              0.26uA              0.31uA
|

| End [Model] pdidgz
```

Revision History

Revision	Date	Description
0.0	27 April 2004	Initial release

NOTES

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DSP56374
Rev. 3
07/2005

DSP56374 : 24-bit Audio Digital Signal Processor

The DSP56374 is designed to support a multitude of digital signal processing applications requiring a lot of horsepower in a small package. While the DSP56374 is designed with flexibility and thus is versatile in the types of applications it can support, it does include a powerful set of audio features, including various built-in audio peripherals and embedded software designed to meet the needs of both consumer and automotive audio applications.

The DSP56374 provides a wealth of audio processing functions including an operating system, various equalization algorithms, compression, signal generator, tone control, fade/balance, level meter/spectrum analyzer, and many more. The DSP56374 also supports various matrix decoders and sound field processing algorithms.

The DSP56374 uses the high performance, single-clock-per-cycle DSP56300 core family of programmable CMOS digital signal processors (DSPs) combined with the audio signal processing capability of the Freescale Symphony™ DSP family. This design provides a two-fold performance increase over Freescale's popular DSP56000 core family of DSPs while retaining code compatibility.

Significant architectural enhancements include a barrel shifter, 24-bit addressing, patch module, and direct memory access (DMA). The DSP56374 is available in either a 52-pin or 80-pin TQFP at 150 million instructions per second (MIPS) using an internal 150 MHz clock at 1.25 V.

Product Picture
Block Diagram

DSP56374 Features

Multimode, multichannel decoder software functionality

Dolby and/or DTS license required

- Dolby Digital
- ProLogic II
- Dolby Headphone (DH)
- Dolby Virtual Speaker (DVS)

Digital Signal Processing Core

- 1.25 V core with a 3.3 V peripheral I/O.
- 150 Million Instructions Per Second (MIPS) with a 150 MHz clock at an internal logic supply (QVDDL) of 1.25V (0 deg C to 70 deg C for consumer-grade devices; -40 deg C to 85 deg C for automotive devices)
- Object Code Compatible with the DSP56000 core with highly parallel instruction set
- Data ALU with a 24 x 24 bit multiplier-accumulator and a 56-bit barrel shifter. 16-bit arithmetic support
- Program Control with position independent code support and instruction cache support
- Six-channel DMA controller
- Low jitter, PLL based clocking with a wide range of frequency multiplications (1

to 1024), predivider factors (1 to 32) and power saving clock divider (2i: i=0 to 7). Reduces clock noise
- Internal address tracing support and OnCE for Hardware/Software debugging
- JTAG port
- Very low-power CMOS design, fully static design with operating frequencies down to DC
- STOP and WAIT low-power standby modes

On-chip Memory Configuration

- 4K - 6Kx24 Bit Y-Data RAM and 4Kx24 Bit Y-Data ROM.
- 4K - 10Kx24 Bit X-Data RAM and 4Kx24 Bit X-Data ROM.
- 20Kx24 Bit Program and Bootstrap ROM including a PROM patching mechanism.
- 2K - 10Kx24 Bit Program RAM.
- Various memory switches available

Peripheral modules

- Enhanced Serial Audio Interface (ESAI): up to 4 receivers and up to 6 transmitters, master or slave. I2S, Sony, AC97, network and other programmable protocols.
- Enhanced Serial Audio Interface I (ESAI_1): up to 4 receivers and up to 6 transmitters, master or slave. I2S, Sony, AC97, network and other programmable protocols. Note 80 pin package only.
- Serial Host Interface (SHI): SPI and I2C protocols, multi master capability in I2C mode, 10-word receive FIFO, support for 8, 16 and 24-bit words.
- Triple Timer module (TEC).
- Hardware Watchdog Timer.
- Most pins of unused peripherals may be programmed as GPIO lines. Up to 47 pins can be configured as GPIO on the 80-pin package and 20 pins on the 52-pin package.

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DSP56374 Parametrics

Sample Availability	Internal Data ROM W		Internal Program ROM (kwords)	Internal Data RAM W		Internal Program RAM (kwords)	Total DMA Channels
	X Data (kwords)	Y Data (kwords)		X Data (kwords)	Y Data (kwords)		
Y	4	4	20	6	6	6	6

Serial Interface		Timers					
Type	Number of	Number of Timers	Timer Size (bit)	Timer Channels	Timer Input Captures	Timer Output Compares	Core Performance DSP (MMACS)
ESAI, SHI	1, 2	3	24	3	3	3	150

Core Performance RISC (MIPS)	Device Speed (Max) (MHz)	Bus Frequency (Max) (MHz)	Bus Width	Core Voltage (Spec) (V)	I/O Voltage (Typ) (V)	I/O Ports	DSP Cores
			External Data Bus Width (bit)				

150	150	150	24	1.25	3.3	4, 5	1

Other Peripherals	Standby Functions
Nested Interrupt, On-Chip Emulation, On-Chip PLL, Peripheral Interrupt, Real-Time Interrupt, Watchdog Timer	STOP, WAIT

View expanded set of parameters | Parametric Search

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DSP56374 Documentation

Documentation

Application Notes

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
AN2013 UPDATED DSP56300 Family: Characterizing CMOS DSP Core Current for Low-Power Applications	FREESCALE	pdf	306	1	10/05/2005	Order Literature
AN2074 DSP56300 JTAG Examples	FREESCALE	pdf	670	1	8/02/2005	Order Literature
AN1772 Efficient Compilation of Bit-Exact Applications for DSP563xx	FREESCALE	pdf	214	1	8/01/2005	Order Literature
APR20 Application Optimization for the DSP56300/DSP56600 Digital Signal Processors	FREESCALE	pdf	636	0	10/05/2001	Order Literature
APR23 Using the DSP56300 Direct Memory Access Controller	FREESCALE	pdf	426	0	10/05/2001	Order Literature
APR30 DSP56300 Assembly Code Development Using the Freescale Toolsets	FREESCALE	pdf	380	0	10/05/2001	Order Literature
APR36 DSP56300 Interfacing the DSP560xx/DSP563xx Families to the Crystal CS4226 Multichannel Codec	FREESCALE	pdf	458	0	10/05/2001	Order Literature
APR37 DSP56300 Implementing AC-link With ESAI	FREESCALE	pdf	826	0	10/05/2001	Order Literature
APR40 DSP56300 Implementing Viterbi Decoders Using the VSL Instruction on DSP Families DSP56300 and DSP56600	FREESCALE	pdf	967	0	10/05/2001	Order Literature
APR35 DSP56300 Designing the DSP56xxx Software for Nonrealtime Tests File I/O Uisng SIM56xxx and ADS56xxx	FREESCALE	pdf	337	1	9/28/2001	Order Literature
AN1855 AN1855 Download and Checksum Programs for Use with the DSP5636x Family	FREESCALE	pdf	223	0	5/17/2000	Order Literature

AN1848 AN1848	FREESCALE	pdf	665	1.0	5/01/2000	Order Literature

Brochures

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
BRDSP56300 DSP56300 Family Brochure	FREESCALE	pdf	104	-	-	Order Literature

Data Sheets

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56374 DSP56374 Data Sheet	FREESCALE	pdf	2490	3	8/02/2005	Order Literature

Errata - **Click here for important errata information**

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56374E DSP56374E Digital Signal Processor	FREESCALE	pdf	76	1	2/07/2005	-

Fact Sheets

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56374FS DSP56374FS 24-Bit Audio Digital Signal Processor	FREESCALE	pdf	82	2	12/06/2004	Order Literature
SUITE56FACT Suite56 DSP Software Development Tools	FREESCALE	pdf	609	0	-	Order Literature

Product Briefs

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56374PB DSP56374 24-Bit Audio Digital Signal Processor Product Brief	FREESCALE	pdf	152	1	12/06/2004	Order Literature

Product Numbering Scheme

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSPDECODERMSC Audio DSP Part Decoder	FREESCALE	pdf	10	4	6/29/2005	-

Reference Manuals

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56300FM DSP56300 24-Bit Digital Signal Processor Family Manual	FREESCALE	pdf	12025	5	4/15/2005	Order Literature
DSP56300FMAD DSP56300 Family Manual Addendum	FREESCALE	pdf	115	3	10/29/2004	Order Literature

Selector Guides

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability

SG1004 SG1004 Digital Signal Processors and Controllers	FREESCALE	pdf	647	0	9/29/2005	Order Literature
SG2000CR SG2000CR Application Selector Guide Index and Cross-Reference	FREESCALE	pdf	130	7	7/05/2005	Order Literature
SG2047 Digital Audio	FREESCALE	pdf	125	2	12/27/2004	Order Literature

Users Guides

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56374UG DSP56374UG 24-Bit Digital Signal User Guide	FREESCALE	pdf	1787	1	11/22/2004	Order Literature

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DSP56374 Design Tools

Hardware Tools

Evaluation/Development Boards and Systems

ID and Description	Vendor ID	Format	Size K	Rev #	Order Availability
DSPAUDIOEVM DSPAUDIOEVM	FREESCALE	-	-	-	Buy from Distributor

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Orderable Parts Information

Order	Part Number	Package Description	Tape and Reel	Application/ Qualification Tier	Status	Budgetary Price QTY 1000+ ($US)	Package Peak Temperature (°C)	Compliance RoHS	Compliance Environmental Products	Details
Order Sample Buy from Distributor	DSPB56374AE	**LQFP 52 10*10*1.4P0.65**	No	COMMERCIAL, INDUSTRIAL, AUTOMOTIVE	Available	$6.82	260	RoHS	DSPB56374AE	**view**
-	DSPB56374AEC	**LQFP 52 10*10*1.4P0.65**	No	COMMERCIAL, INDUSTRIAL, AUTOMOTIVE	Available	-	220	RoHS	DSPB56374AEC	**view**
Order Sample Buy from Distributor	DSPB56374AF	**LQFP 80 14*14*1.4P0.65**	No	COMMERCIAL, INDUSTRIAL, AUTOMOTIVE	Available	$7.07	260	RoHS	DSPB56374AF	**view**
-	DSPB56374AFC	**LQFP 80 14*14*1.4P0.65**	No	COMMERCIAL, INDUSTRIAL, AUTOMOTIVE	Available	-	220	RoHS	DSPB56374AFC	**view**

NOTE:

- Not all orderable parts are offered through our online sampling program. For further assistance in selecting a similar part from within the program, please submit a Request for a sample order advice.
- Refer to Samples FAQ for more information.

- Looking for an obsolete part? Check our new part number search

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Related Links

- Industrial Control
- Suite56 Documentation for DSP563xx
- Suite56 for the DSP56300 Family

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