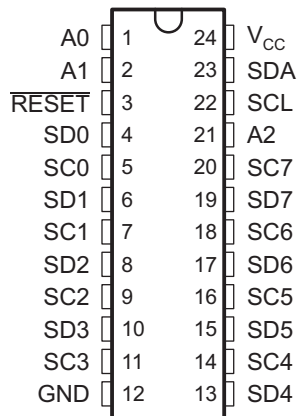


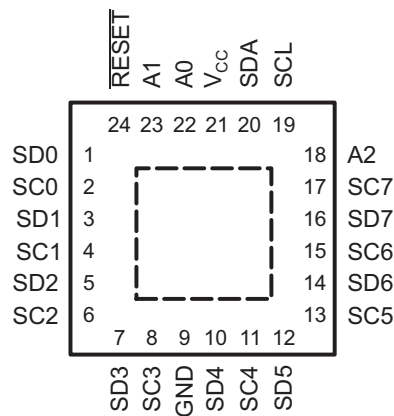
## FEATURES

- 1-of-8 Bidirectional Translating Switches
- I<sup>2</sup>C Bus and SMBus Compatible
- Active-Low Reset Input
- Address by Three Hardware Address Pins for Use of up to Eight Devices
- Channel Selection Via I<sup>2</sup>C Bus
- Power-Up With All Switch Channels Deselected
- Low  $r_{ON}$  Switches
- Allows Voltage-Level Translation Between 2.5-V, 3.3-V, and 5-V Buses
- No Glitch on Power Up
- Supports Hot Insertion
- Low Standby Current
- Operating Power-Supply Voltage Range of 2.3 V to 5.5 V
- 5-V-Tolerant Inputs
- 400-kHz Fast I<sup>2</sup>C Bus
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

DB, DGV, DW, OR PW PACKAGE  
(TOP VIEW)



RGE PACKAGE  
(TOP VIEW)



## DESCRIPTION/ORDERING INFORMATION

### ORDERING INFORMATION

T <sub>A</sub>	PACKAGE <sup>(1)(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RGE	Reel of 3000	PCA9548ARGER	PD548A
	SSOP – DB	Reel of 2000	PCA9548ADBR	PD548A
		Reel of 250	PCA9548ADBT	
	TVSOP – DGV	Reel of 2000	PCA9548ADGVR	PD548A
	SOIC – DW	Reel of 2000	PCA9548ADWR	PCA9548A
		Tube of 25	PCA9548ADW	
	TSSOP – PW	Reel of 2000	PCA9548APWR	PD548A
		Tube of 60	PCA9548APW	

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).
- (2) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

# PCA9548A 8-CHANNEL I<sup>2</sup>C SWITCH WITH RESET

SCPS143C–OCTOBER 2006–REVISED JUNE 2007

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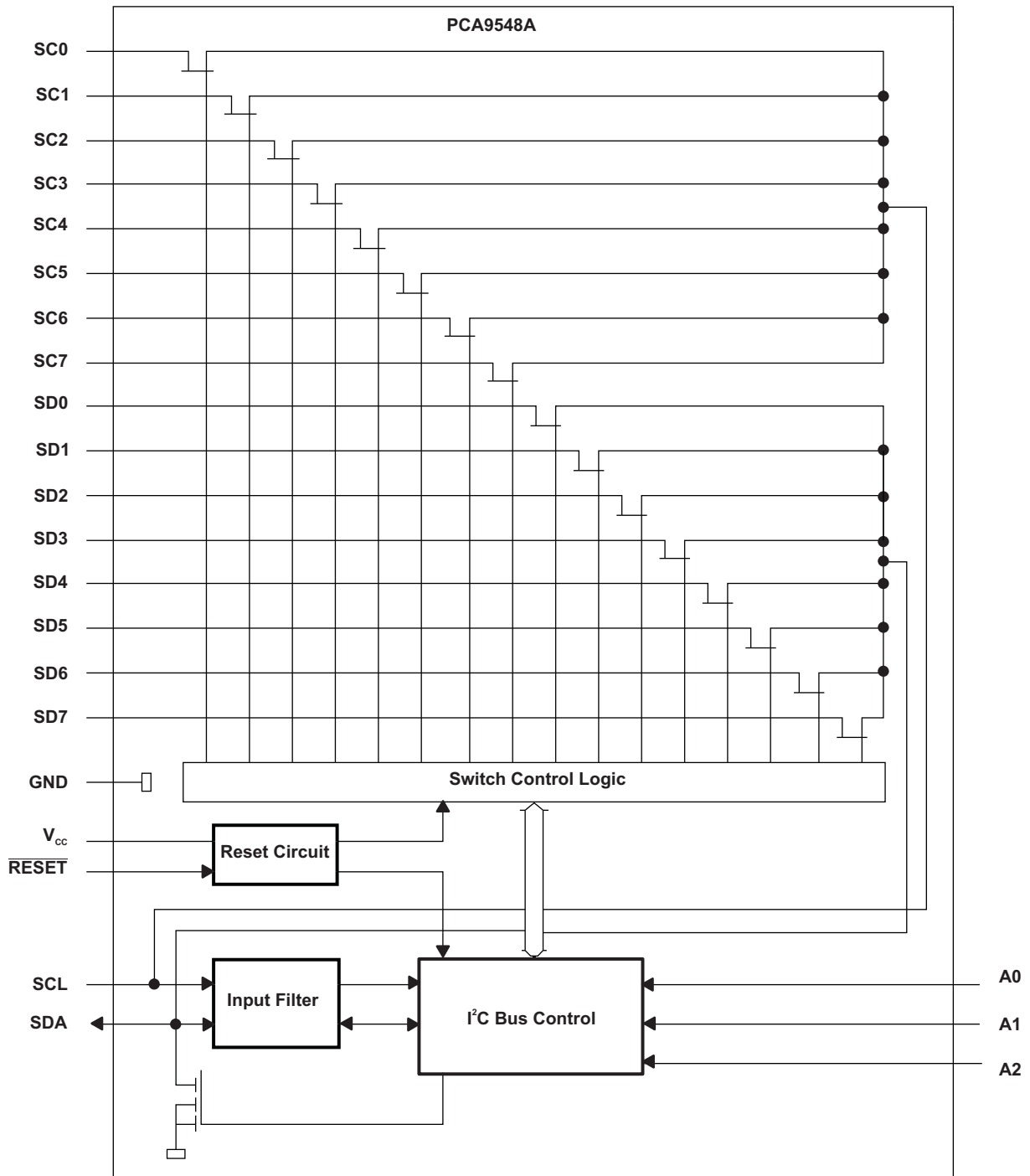
## DESCRIPTION/ORDERING INFORMATION (CONTINUED)

The PCA9548A has eight bidirectional translating switches that can be controlled via the I<sup>2</sup>C bus. The SCL/SDA upstream pair fans out to eight downstream pairs, or channels. Any individual SCx/SDx channel or combination of channels can be selected, determined by the contents of the programmable control register.

The system master can reset the PCA9548A in the event of a timeout or other improper operation by asserting a low in the  $\overline{\text{RESET}}$  input. Similarly, the power-on reset deselects all channels and initializes the I<sup>2</sup>C/SMBus state machine. Asserting RESET causes the same reset/initialization to occur without depowering the part.

The pass gates of the switches are constructed so that the V<sub>CC</sub> pin can be used to limit the maximum high voltage, which is passed by the PCA9548A. This allows the use of different bus voltages on each pair, so that 2.5-V or 3.3-V parts can communicate with 5-V parts, without any additional protection. External pullup resistors pull the bus up to the desired voltage level for each channel. All I/O pins are 5-V tolerant.

**FUNCTIONAL BLOCK DIAGRAM**



## TERMINAL FUNCTIONS

NO.		NAME	DESCRIPTION
SOIC (DW), SSOP (DB), TSSOP (PW), AND TVSOP (DGV)	QFN (RGE)		
1	22	A0	Address input 0. Connect directly to V <sub>CC</sub> or ground.
2	23	A1	Address input 1. Connect directly to V <sub>CC</sub> or ground.
3	24	RESET	Active-low reset input. Connect to V <sub>CC</sub> through a pullup resistor, if not used.
4	1	SD0	Serial data 0. Connect to V <sub>CC</sub> through a pullup resistor.
5	2	SC0	Serial clock 0. Connect to V <sub>CC</sub> through a pullup resistor.
6	3	SD1	Serial data 1. Connect to V <sub>CC</sub> through a pullup resistor.
7	4	SC1	Serial clock 1. Connect to V <sub>CC</sub> through a pullup resistor.
8	5	SC2	Serial data 2. Connect to V <sub>CC</sub> through a pullup resistor.
9	6	SC2	Serial clock 2. Connect to V <sub>CC</sub> through a pullup resistor.
10	7	SD3	Serial data 3. Connect to V <sub>CC</sub> through a pullup resistor.
11	8	SC3	Serial clock 3. Connect to V <sub>CC</sub> through a pullup resistor.
12	9	GND	Ground
13	10	SD4	Serial data 4. Connect to V <sub>CC</sub> through a pullup resistor.
14	11	SC4	Serial clock 4. Connect to V <sub>CC</sub> through a pullup resistor.
15	12	SD5	Serial data 5. Connect to V <sub>CC</sub> through a pullup resistor.
16	13	SC5	Serial clock 5. Connect to V <sub>CC</sub> through a pullup resistor.
17	14	SD6	Serial data 6. Connect to V <sub>CC</sub> through a pullup resistor.
18	15	SC6	Serial clock 6. Connect to V <sub>CC</sub> through a pullup resistor.
19	16	SD7	Serial data 7. Connect to V <sub>CC</sub> through a pullup resistor.
20	17	SC7	Serial clock 7. Connect to V <sub>CC</sub> through a pullup resistor.
21	18	A2	Address input 2. Connect directly to V <sub>CC</sub> or ground.
22	19	SCL	Serial clock bus. Connect to V <sub>CC</sub> through a pullup resistor.
23	20	SDA	Serial data bus. Connect to V <sub>CC</sub> through a pullup resistor.
24	21	V <sub>CC</sub>	Supply voltage

## I<sup>2</sup>C Interface

The bidirectional I<sup>2</sup>C bus consists of the serial clock (SCL) and serial data (SDA) lines. Both lines must be connected to a positive supply through a pullup resistor when connected to the output stages of a device. Data transfer may be initiated only when the bus is not busy.

I<sup>2</sup>C communication with this device is initiated by a master sending a start condition, a high-to-low transition on the SDA input/output while the SCL input is high (see [Figure 1](#)). After the start condition, the device address byte is sent, most significant bit (MSB) first, including the data direction bit (R/W).

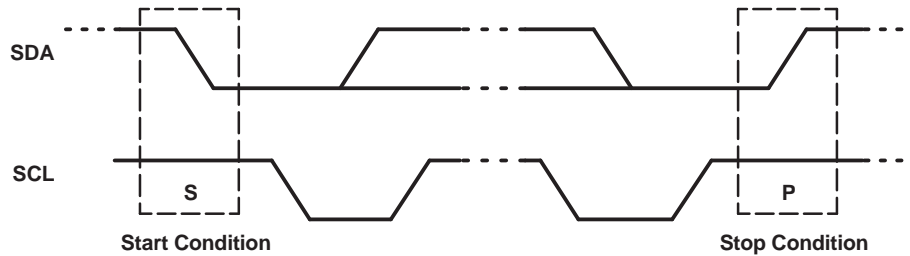
After receiving the valid address byte, this device responds with an acknowledge (ACK), a low on the SDA input/output during the high of the ACK-related clock pulse. The address inputs (A0–A2) of the slave device must not be changed between the start and the stop conditions.

On the I<sup>2</sup>C bus, only one data bit is transferred during each clock pulse. The data on the SDA line must remain stable during the high pulse of the clock period, as changes in the data line at this time are interpreted as control commands (start or stop) (see [Figure 2](#)).

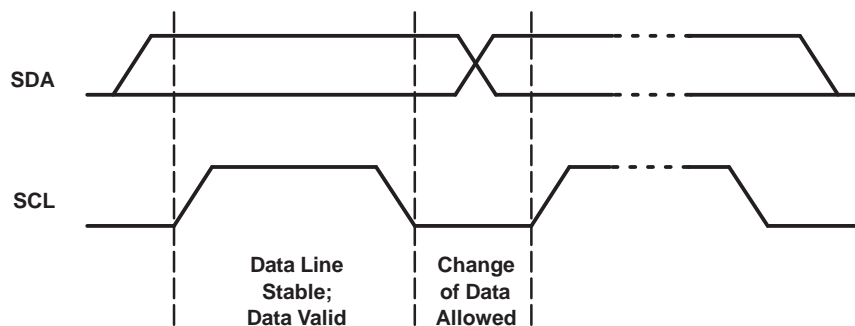
A stop condition, a low-to-high transition on the SDA input/output while the SCL input is high, is sent by the master (see [Figure 1](#)).

Any number of data bytes can be transferred from the transmitter to receiver between the start and the stop conditions. Each byte of eight bits is followed by one ACK bit. The transmitter must release the SDA line before the receiver can send an ACK bit. The device that acknowledges must pull down the SDA line during the ACK clock pulse so that the SDA line is stable low during the high pulse of the ACK-related clock period (see Figure 3). When a slave receiver is addressed, it must generate an ACK after each byte is received. Similarly, the master must generate an ACK after each byte that it receives from the slave transmitter. Setup and hold times must be met to ensure proper operation.

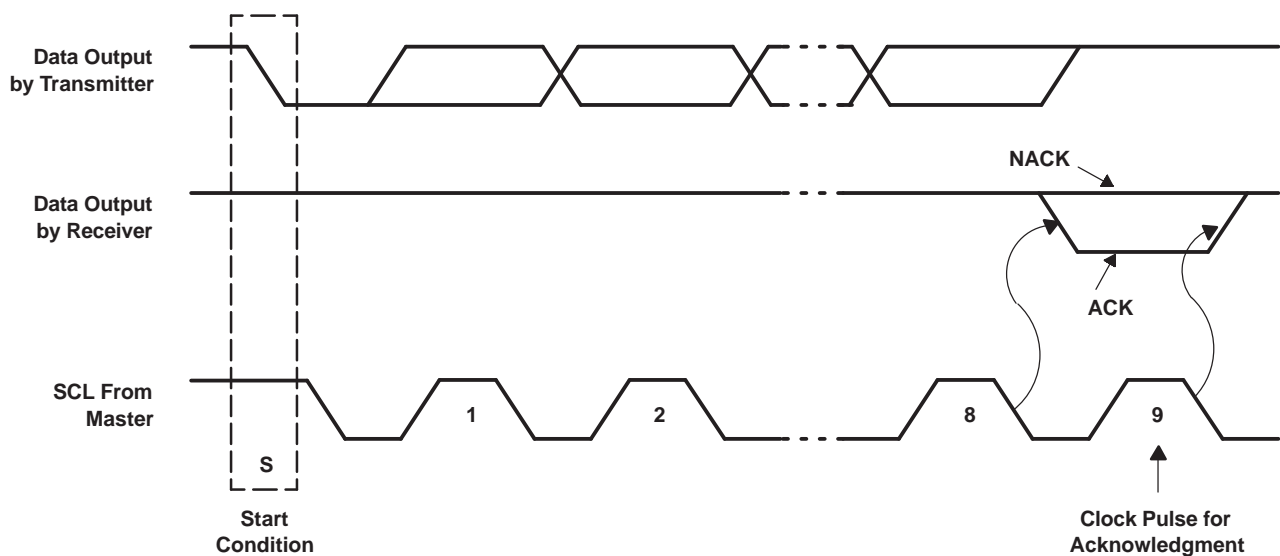
A master receiver signals an end of data to the slave transmitter by not generating an acknowledge (NACK) after the last byte has been clocked out of the slave. This is done by the master receiver by holding the SDA line high. In this event, the transmitter must release the data line to enable the master to generate a stop condition.



**Figure 1. Definition of Start and Stop Conditions**



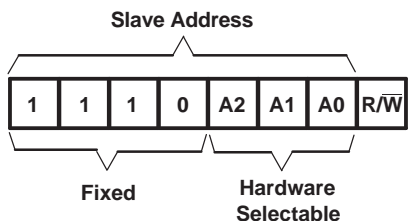
**Figure 2. Bit Transfer**



**Figure 3. Acknowledgment on I<sup>2</sup>C Bus**

**Device Address**

Figure 4 shows the address byte of the PCA9548A.



**Figure 4. PCA9548A Address**

**Address Reference**

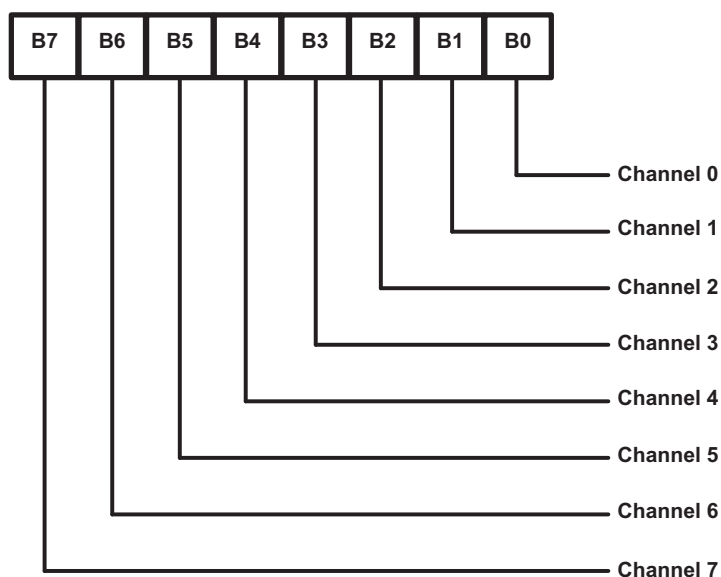
INPUTS			I <sup>2</sup> C BUS SLAVE ADDRESS
A2	A1	A0	
L	L	L	112 (decimal), 70 (hexadecimal)
L	L	H	113 (decimal), 71 (hexadecimal)
L	H	L	114 (decimal), 72 (hexadecimal)
L	H	H	115 (decimal), 73 (hexadecimal)
H	L	L	116 (decimal), 74 (hexadecimal)
H	L	H	117 (decimal), 75 (hexadecimal)
H	H	L	118 (decimal), 76 (hexadecimal)
H	H	H	119 (decimal), 77 (hexadecimal)

The last bit of the slave address defines the operation (read or write) to be performed. When it is high (1), a read is selected, while a low (0) selects a write operation.

**Control Register**

Following the successful acknowledgment of the address byte, the bus master sends a command byte that is stored in the control register in the PCA9548A (see Figure 5). This register can be written and read via the I<sup>2</sup>C bus. Each bit in the command byte corresponds to a SCn/SDn channel and a high (or 1) selects this channel. Multiple SCn/SDn channels may be selected at the same time. When a channel is selected, the channel becomes active after a stop condition has been placed on the I<sup>2</sup>C bus. This ensures that all SCn/SDn lines are in a high state when the channel is made active, so that no false conditions are generated at the time of connection. A stop condition always must occur immediately after the acknowledge cycle. If multiple bytes are received by the PCA9548A, it saves the last byte received.

**Channel Selection Bits (Read/Write)**



**Figure 5. Control Register**

**Command Byte Definition**

CONTROL REGISTER BITS								COMMAND
B7	B6	B5	B4	B3	B2	B1	B0	
X	X	X	X	X	X	X	0	Channel 0 disabled
X	X	X	X	X	X	X	1	Channel 0 enabled
X	X	X	X	X	X	0	X	Channel 1 disabled
X	X	X	X	X	X	1		Channel 1 enabled
X	X	X	X	X	0	X	X	Channel 2 disabled
X	X	X	X	X	1			Channel 2 enabled
X	X	X	X	0	X	X	X	Channel 3 disabled
X	X	X	X	1				Channel 3 enabled
X	X	X	0	X	X	X	X	Channel 4 disabled
X	X	X	1					Channel 4 enabled
X	X	0	X	X	X	X	X	Channel 5 disabled
X	X	1						Channel 5 enabled
X	0	X	X	X	X	X	X	Channel 6 disabled
X	1							Channel 6 enabled
0	X	X	X	X	X	X	X	Channel 7 disabled
1								Channel 7 enabled
0	0	0	0	0	0	0	0	No channel selected, power-up/reset default state

**RESET Input**

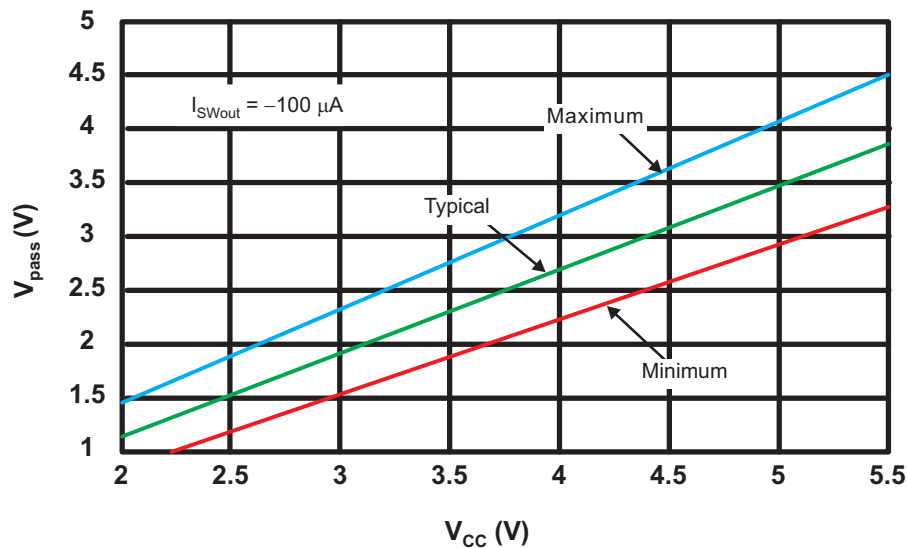
The  $\overline{\text{RESET}}$  input is an active-low signal that may be used to recover from a bus-fault condition. When this signal is asserted low for a minimum of  $t_{\text{WL}}$ , the PCA9548A resets its registers and I<sup>2</sup>C state machine and deselected all channels. The  $\overline{\text{RESET}}$  input must be connected to  $V_{\text{CC}}$  through a pullup resistor.

### Power-On Reset

When power (from 0 V) is applied to  $V_{CC}$ , an internal power-on reset holds the PCA9548A in a reset condition until  $V_{CC}$  has reached  $V_{POR}$ . At that point, the reset condition is released and the PCA9548A registers and I<sup>2</sup>C state machine initialize to their default states. After that,  $V_{CC}$  must be lowered to below 0.2 V and then back up to the operating voltage for a power-reset cycle.

### Voltage Translation

The pass-gate transistors of the PCA9548A are constructed such that the  $V_{CC}$  voltage can be used to limit the maximum voltage that is passed from one I<sup>2</sup>C bus to another. Figure 6 shows the voltage characteristics of the pass-gate transistors (note that the graph was generated using the data specified in the *Electrical Characteristics* section of this data sheet).



**Figure 6. Pass-Gate Voltage vs Supply Voltage at Three Process Points**

For the PCA9548A to act as a voltage translator, the  $V_{o(sw)}$  voltage must be equal to, or lower than, the lowest bus voltage. For example, if the main bus is running at 5 V and the downstream buses are 3.3 V and 2.7 V,  $V_{o(sw)}$  should be equal to or below 2.7 V to effectively clamp the downstream bus voltages. As shown in Figure 6,  $V_{o(sw)}(max)$  is 2.7 V when the PCA9548A supply voltage is 3.5 V or lower, so the PCA9548A supply voltage can be set to 3.3 V. Pullup resistors then can be used to bring the bus voltages to their appropriate levels (see Figure 11).

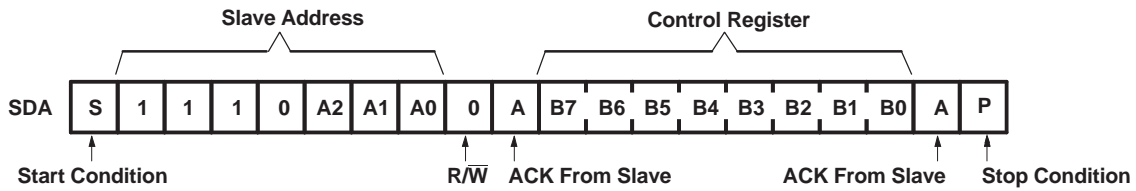
### Bus Transactions

Data is exchanged between the master and PCA9548A through write and read commands.

#### Writes

Data is transmitted to the PCA9548A by sending the device address and setting the least-significant bit (LSB) to a logic 0 (see Figure 4 for device address). The command byte is sent after the address and determines which SCn/SDn channel receives the data that follows the command byte (see Figure 7). There is no limitation on the number of data bytes sent in one write transmission.

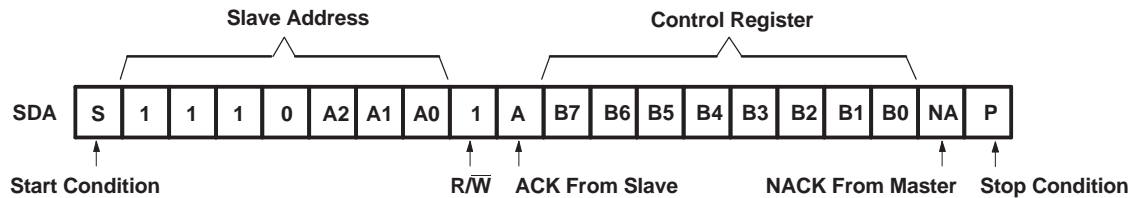




**Figure 7. Write to Control Register**

**Reads**

The bus master first must send the PCA9548A address with the LSB set to a logic 1 (see Figure 4 for device address). The command byte is sent after the address and determines which SCn/SDn channel is accessed. After a restart, the device address is sent again, but this time, the LSB is set to a logic 1. Data from the SCn/SDn channel defined by the command byte then is sent by the PCA9548A (see Figure 8). After a restart, the value of the SCn/SDn channel defined by the command byte matches the SCn/SDn channel being accessed when the restart occurred. Data is clocked into the SCn/SDn channel on the rising edge of the ACK clock pulse. There is no limitation on the number of data bytes received in one read transmission, but when the final byte is received, the bus master must not acknowledge the data.



**Figure 8. Read From Control Register**

# PCA9548A 8-CHANNEL I<sup>2</sup>C SWITCH WITH RESET

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## Absolute Maximum Ratings<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage range	–0.5	7	V	
V <sub>I</sub>	Input voltage range <sup>(2)</sup>	–0.5	7	V	
I <sub>I</sub>	Input current		±20	mA	
I <sub>O</sub>	Output current		±25	mA	
I <sub>CC</sub>	Supply current		±100	mA	
θ <sub>JA</sub>	Package thermal impedance, junction to free air <sup>(3)</sup>	DB package		63	°C/W
		DGV package		86	
		DW package		46	
		PW package		88	
		RGE package		45	
θ <sub>JP</sub>	Package thermal impedance, junction to pad			1.5	°C/W
T <sub>stg</sub>	Storage temperature range	–65	150	°C	
T <sub>A</sub>	Operating free-air temperature range	–40	85	°C	

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

(3) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions<sup>(1)</sup>

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage	2.3	5.5	V	
V <sub>IH</sub>	High-level input voltage	SCL, SDA	0.7 × V <sub>CC</sub>	6	V
		A2–A0, RESET	0.7 × V <sub>CC</sub>	V <sub>CC</sub> + 0.5	
V <sub>IL</sub>	Low-level input voltage	SCL, SDA	–0.5	0.3 × V <sub>CC</sub>	V
		A2–A0, RESET	–0.5	0.3 × V <sub>CC</sub>	
T <sub>A</sub>	Operating free-air temperature	–40	85	°C	

(1) All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

## Electrical Characteristics

$V_{CC} = 2.3\text{ V to }3.6\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	$V_{CC}$	MIN	TYP <sup>(1)</sup>	MAX	UNIT
$V_{POR}$	Power-on reset voltage <sup>(2)</sup>	No load, $V_I = V_{CC}$ or GND	$V_{POR}$	1.6	2.1		V
$V_{O(sw)}$	Switch output voltage	$V_{I(sw)} = V_{CC}$ , $I_{SWout} = -100\ \mu\text{A}$	5 V	3.6			V
			4.5 V to 5.5 V	2.6	4.5		
			3.3 V	1.9			
			3 V to 3.6 V	1.6	2.8		
			2.5 V	1.5			
			2.3 V to 2.7 V	1.1	2		
$I_{OL}$	SDA	$V_{OL} = 0.4\text{ V}$	2.3 V to 5.5 V	3	6		mA
		$V_{OL} = 0.6\text{ V}$		6	9		
$I_I$	SCL, SDA	$V_I = V_{CC}$ or GND	2.3 V to 5.5 V			$\pm 1$	$\mu\text{A}$
	SC7–SC0, SD7–SD0					$\pm 1$	
	A2–A0					$\pm 1$	
	RESET					$\pm 1$	
$I_{CC}$	Operating mode	$f_{SCL} = 400\text{ kHz}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V	50	80	$\mu\text{A}$
				3.6 V	20	35	
				2.7 V	11	20	
		$f_{SCL} = 100\text{ kHz}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V	9	30	
				3.6 V	6	15	
				2.7 V	4	8	
	Standby mode	Low inputs	$V_I = \text{GND}$ , $I_O = 0$	5.5 V	0.2	1	
				3.6 V	0.1	1	
				2.7 V	0.1	1	
		High inputs	$V_I = V_{CC}$ , $I_O = 0$	5.5 V	0.2	1	
				3.6 V	0.1	1	
				2.7 V	0.1	1	
$\Delta I_{CC}$	Supply-current change	SCL, SDA	2.3 V to 5.5 V	SCL or SDA input at 0.6 V, Other inputs at $V_{CC}$ or GND		3	20
				SCL or SDA input at $V_{CC} - 0.6\text{ V}$ , Other inputs at $V_{CC}$ or GND		3	20
$C_i$	A2–A0	$V_I = V_{CC}$ or GND	2.3 V to 5.5 V	4	5		pF
	RESET			4	5		
	SCL			20	28		
$C_{i(off)}$ <sup>(3)</sup>	SDA	$V_I = V_{CC}$ or GND, Switch OFF	2.3 V to 5.5 V	20	28		pF
	SC7–SC0, SD7–SD0			5.5	7.5		
$r_{on}$	Switch-on resistance	$V_O = 0.4\text{ V}$ , $I_O = 15\text{ mA}$	4.5 V to 5.5 V	4	10	20	$\Omega$
			3 V to 3.6 V	5	12	30	
			2.3 V to 2.7 V	7	15	45	

(1) All typical values are at nominal supply voltage (2.5-V, 3.3-V, or 5-V  $V_{CC}$ ),  $T_A = 25^\circ\text{C}$ .

(2) The power-on reset circuit resets the I<sup>2</sup>C bus logic with  $V_{CC} < V_{POR}$ .  $V_{CC}$  must be lowered to 0.2 V to reset the device.

(3)  $C_{i(ON)}$  depends on internal capacitance and external capacitance added to the SCn lines when channels(s) are ON.

## I<sup>2</sup>C Interface Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 9](#))

		STANDARD MODE I <sup>2</sup> C BUS		FAST MODE I <sup>2</sup> C BUS		UNIT
		MIN	MAX	MIN	MAX	
$f_{scl}$	I <sup>2</sup> C clock frequency	0	100	0	400	kHz
$t_{sch}$	I <sup>2</sup> C clock high time	4		0.6		μs
$t_{scl}$	I <sup>2</sup> C clock low time	4.7		1.3		μs
$t_{sp}$	I <sup>2</sup> C spike time		50		50	ns
$t_{sds}$	I <sup>2</sup> C serial-data setup time	250		100		ns
$t_{sdh}$	I <sup>2</sup> C serial-data hold time	0 <sup>(1)</sup>		0 <sup>(1)</sup>		μs
$t_{icr}$	I <sup>2</sup> C input rise time		1000	$20 + 0.1C_b$ <sup>(2)</sup>	300	ns
$t_{icf}$	I <sup>2</sup> C input fall time		300	$20 + 0.1C_b$ <sup>(2)</sup>	300	ns
$t_{ocf}$	I <sup>2</sup> C output (SDn) fall time (10-pF to 400-pF bus)		300	$20 + 0.1C_b$ <sup>(2)</sup>	300	ns
$t_{buf}$	I <sup>2</sup> C bus free time between stop and start	4.7		1.3		μs
$t_{sts}$	I <sup>2</sup> C start or repeated start condition setup	4.7		0.6		μs
$t_{sth}$	I <sup>2</sup> C start or repeated start condition hold	4		0.6		μs
$t_{sps}$	I <sup>2</sup> C stop condition setup	4		0.6		μs
$t_{vdL(Data)}$	Valid-data time (high to low) <sup>(3)</sup>	SCL low to SDA output low valid			1	μs
$t_{vdH(Data)}$	Valid-data time (low to high) <sup>(3)</sup>	SCL low to SDA output high valid		0.6	0.6	μs
$t_{vd(ack)}$	Valid-data time of ACK condition	ACK signal from SCL low to SDA output low			1	μs
$C_b$	I <sup>2</sup> C bus capacitive load		400		400	pF

- (1) A device internally must provide a hold time of at least 300 ns for the SDA signal (referred to the  $V_{IH}$  min of the SCL signal), to bridge the undefined region of the falling edge of SCL.  
(2)  $C_b$  = total bus capacitance of one bus line in pF  
(3) Data taken using a 1-kΩ pullup resistor and 50-pF load (see [Figure 10](#))

## Switching Characteristics

over recommended operating free-air temperature range,  $C_L \leq 100$  pF (unless otherwise noted) (see [Figure 9](#))

PARAMETER		FROM (INPUT)	TO (OUTPUT)	MIN	MAX	UNIT
$t_{pd}$ <sup>(1)</sup>	Propagation delay time	SDA or SCL	SDn or SCn	0.3		ns
				1		
$t_{rst}$ <sup>(2)</sup>	RESET time (SDA clear)	RESET	SDA	500		ns

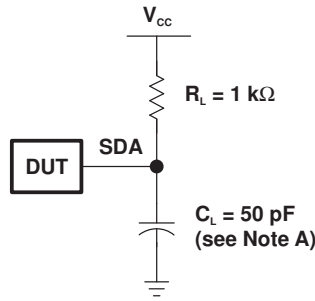
- (1) The propagation delay is the calculated RC time constant of the typical ON-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).  
(2)  $t_{rst}$  is the propagation delay measured from the time the RESET pin is first asserted low to the time the SDA pin is asserted high, signaling a stop condition. It must be a minimum of  $t_{WL}$ .

## Reset Timing Requirements

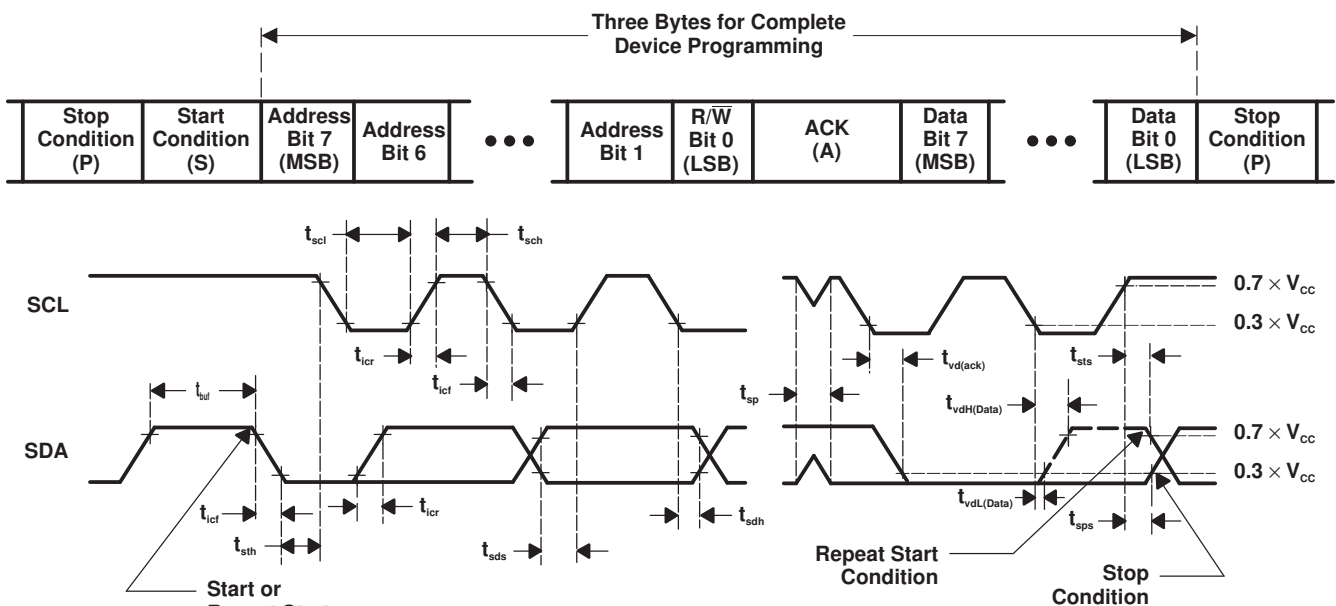
over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	MAX	UNIT
$t_{W(L)}$	Pulse duration, RESET low	6		ns
$t_{REC(STA)}$	Recovery time from RESET to start	0		ns

PARAMETER MEASUREMENT INFORMATION



SDA LOAD CONFIGURATION



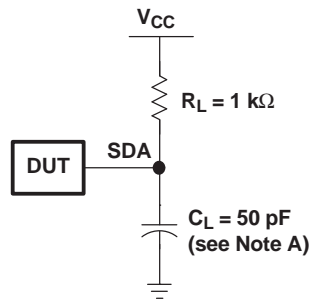
VOLTAGE WAVEFORMS

BYTE	DESCRIPTION
1	I <sup>2</sup> C address
2, 3	P-port data

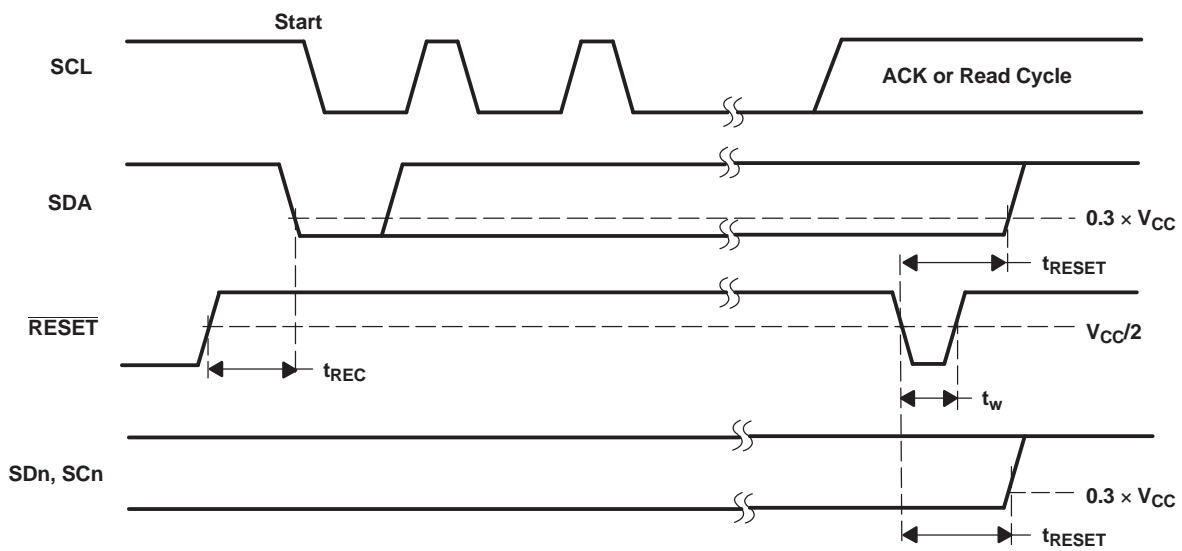
- A.  $C_L$  includes probe and jig capacitance.
- B. All inputs are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r/t_f \leq 30\text{ ns}$ .
- C. Not all parameters and waveforms are applicable to all devices.

Figure 9. I<sup>2</sup>C Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION (continued)



SDA LOAD CONFIGURATION

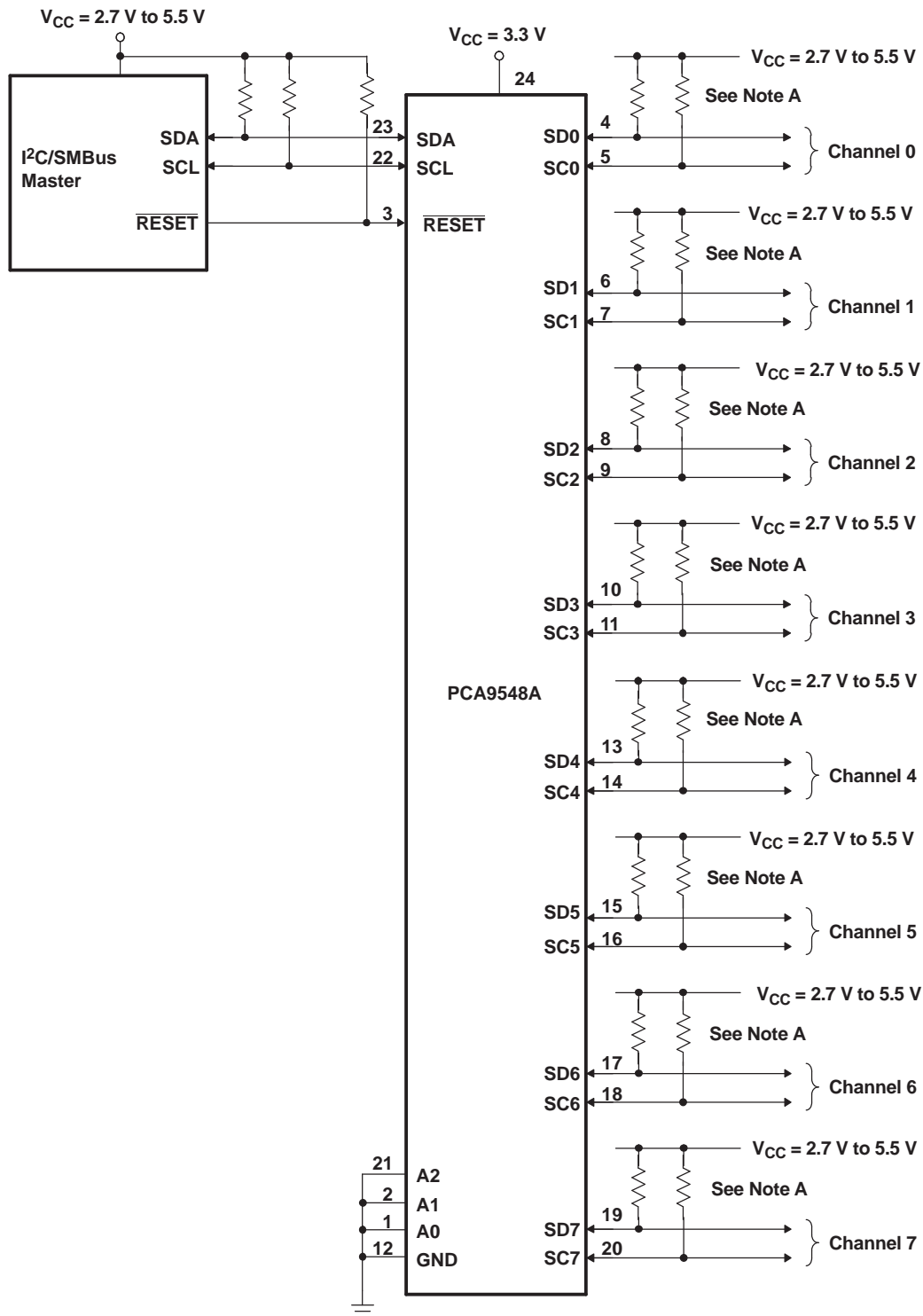


- A.  $C_L$  includes probe and jig capacitance.
- B. All inputs are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r/t_f \leq 30\text{ ns}$ .
- C. I/Os are configured as inputs.
- D. Not all parameters and waveforms are applicable to all devices.

Figure 10. Reset Load Circuit and Voltage Waveforms

APPLICATION INFORMATION

Figure 11 shows an application in which the PCA9548A can be used.



A. Pin numbers shown are for the DB, DW, PW, and DGV packages.

Figure 11. Typical Application

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
PCA9548ADB	ACTIVE	SSOP	DB	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADBG4	ACTIVE	SSOP	DB	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADBR	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADBRG4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADGVR	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADGVRG4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APW	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APWG4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APWRG4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ARGER	ACTIVE	QFN	RGE	24	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
PCA9548ARGERG4	ACTIVE	QFN	RGE	24	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)



<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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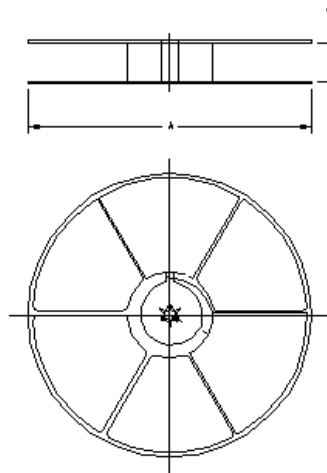
Carrier tape design is defined largely by the component length, width, and thickness.

$A_o$ = Dimension designed to accommodate the component width.
$B_o$ = Dimension designed to accommodate the component length.
$K_o$ = Dimension designed to accommodate the component thickness.
$W$ = Overall width of the carrier tape.
$P$ = Pitch between successive cavity centers.



**TAPE AND REEL INFORMATION**

Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
PCA9548ADBR	DB	24	MLA	330	16	8.2	8.8	2.5	12	16	Q1
PCA9548ADGVR	DGV	24	MLA	330	12	7.0	5.6	1.6	8	12	Q1
PCA9548ADWR	DW	24	TAI	330	24	10.75	15.7	2.7	12	24	Q1
PCA9548APWR	PW	24	MLA	330	16	6.95	8.3	1.6	8	16	Q1
PCA9548ARGER	RGE	24	MLA	330	12	4.3	4.3	1.5	8	12	Q2



**TAPE AND REEL BOX INFORMATION**

Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
PCA9548ADBR	DB	24	MLA	342.9	336.6	28.58
PCA9548ADGVR	DGV	24	MLA	338.1	340.5	20.64
PCA9548ADWR	DW	24	TAI	346.0	346.0	41.0
PCA9548APWR	PW	24	MLA	342.9	336.6	28.58
PCA9548ARGER	RGE	24	MLA	346.0	346.0	29.0



DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

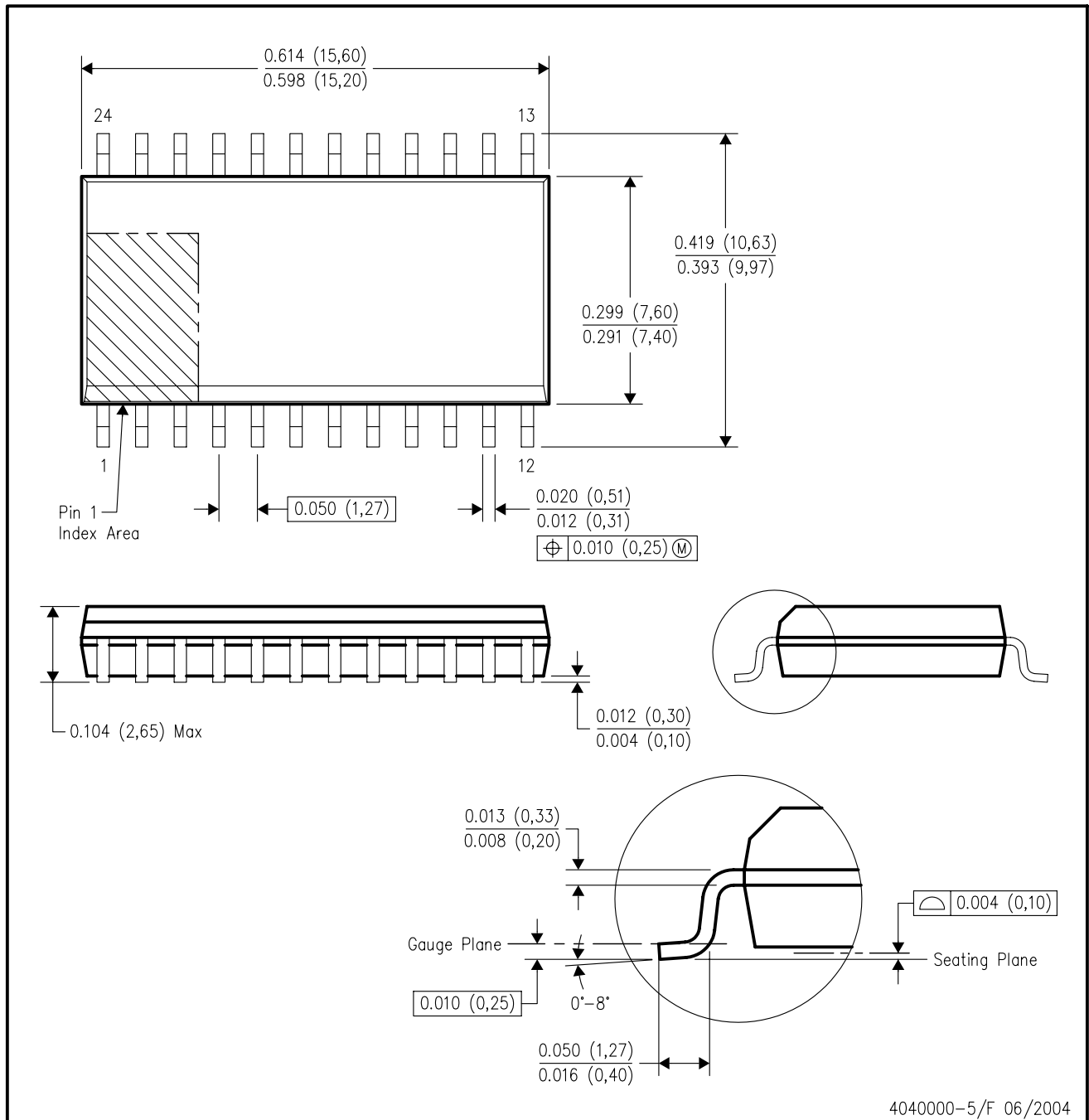
24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

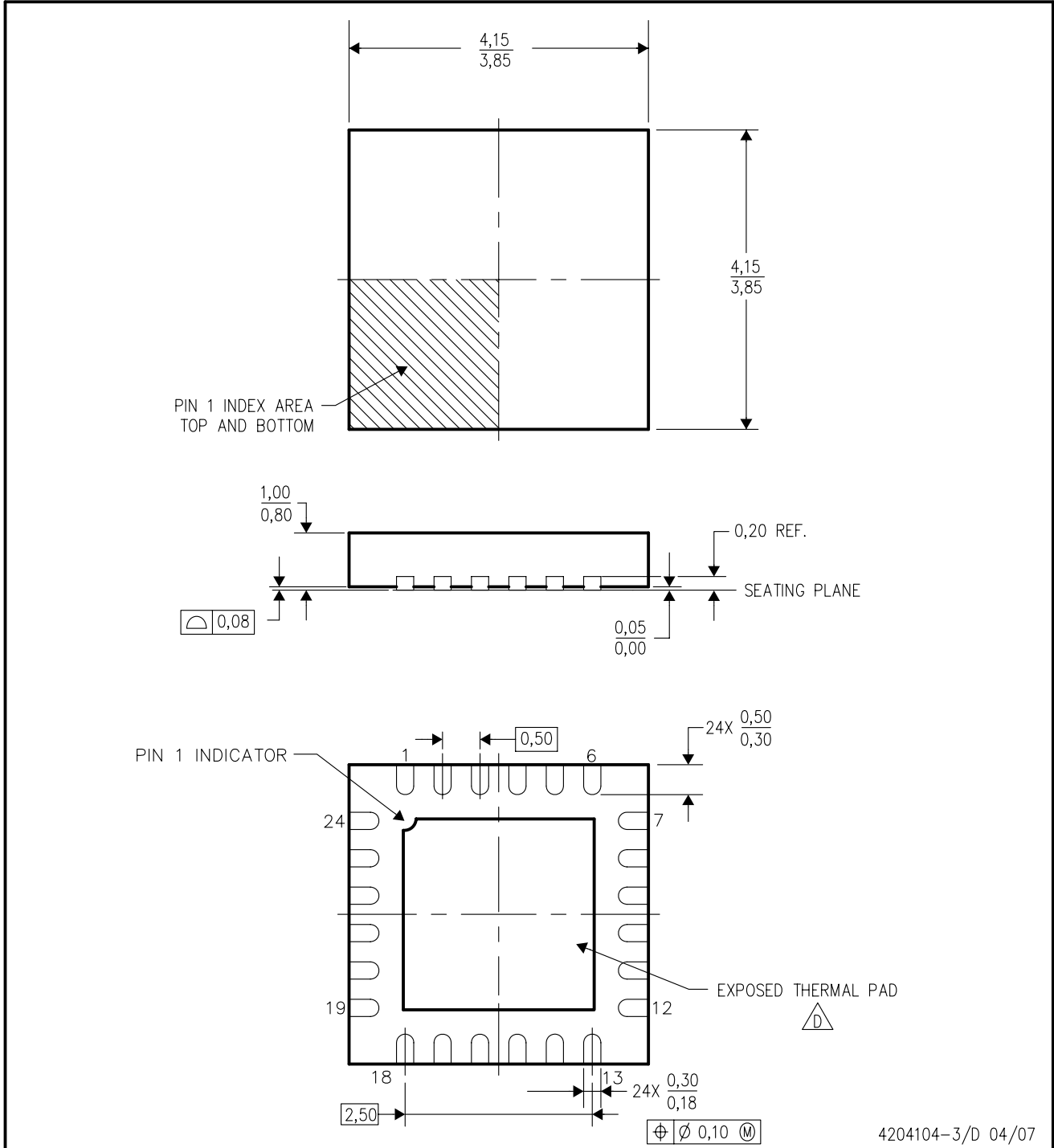
DW (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AD.

RGE (S-PQFP-N24) PIN 1 OPTION PLASTIC QUAD FLATPACK



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Quad Flatpack, No-Leads (QFN) package configuration.
  - D. The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.
  - E. Falls within JEDEC MO-220.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150



PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
PCA9548ADB	ACTIVE	SSOP	DB	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADBG4	ACTIVE	SSOP	DB	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADBR	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADBRG4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADGVR	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADGVRG4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ADWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APW	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APWG4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548APWRG4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCA9548ARGER	ACTIVE	VQFN	RGE	24	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
PCA9548ARGERG4	ACTIVE	VQFN	RGE	24	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR

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**TBD:** The Pb-Free/Green conversion plan has not been defined.

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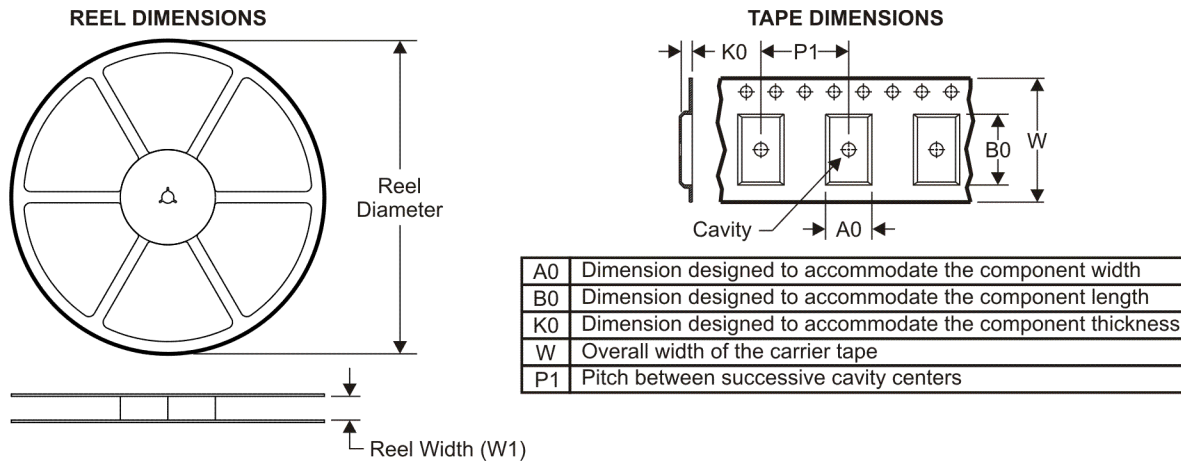
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<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**TAPE AND REEL INFORMATION**



**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
PCA9548ADBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
PCA9548ADGVR	TVSOP	DGV	24	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
PCA9548ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
PCA9548APWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1
PCA9548ARGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
PCA9548ADBR	SSOP	DB	24	2000	346.0	346.0	33.0
PCA9548ADGVR	TVSOP	DGV	24	2000	346.0	346.0	29.0
PCA9548ADWR	SOIC	DW	24	2000	346.0	346.0	41.0
PCA9548APWR	TSSOP	PW	24	2000	346.0	346.0	33.0
PCA9548ARGER	VQFN	RGE	24	3000	346.0	346.0	29.0

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