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Low Power Peak EMI Reducing Solution

Features

- Generates an EMI optimized clock signal at the output.
- Integrated loop filter components.
- Operates with a 3.3 / 2.5V Supply.
- Operating current less than 5mA.
- Low power CMOS design.
- Input frequency range: 30MHz to 50MHz for 2.5V.
  : 30MHz to 50MHz for 3.3V.
- Generates a 1X low EMI spread spectrum clock of the input frequency.
- Frequency deviation: ±0.75% (Typ) @46MHz Input Frequency.
- Available in 6 pin TSOT-23, 8 pin SOIC and 8 pin TSSOP Packages.

Product Description

The ASM3P2780A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2780A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2780A allows significant system cost savings by reducing the number of circuit board layers ferrite beads, shielding that are traditionally required to pass EMI regulations.

The ASM3P2780A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2780A modulates the output of a single PLL in order to “spread” the bandwidth of a synthesized clock, and more importantly, decreases the peak amplitudes of its harmonics. This results in significantly lower system EMI compared to the typical narrow band signal produced by oscillators and most frequency generators. Lowering EMI by increasing a signal’s bandwidth is called ‘spread spectrum clock generation’.

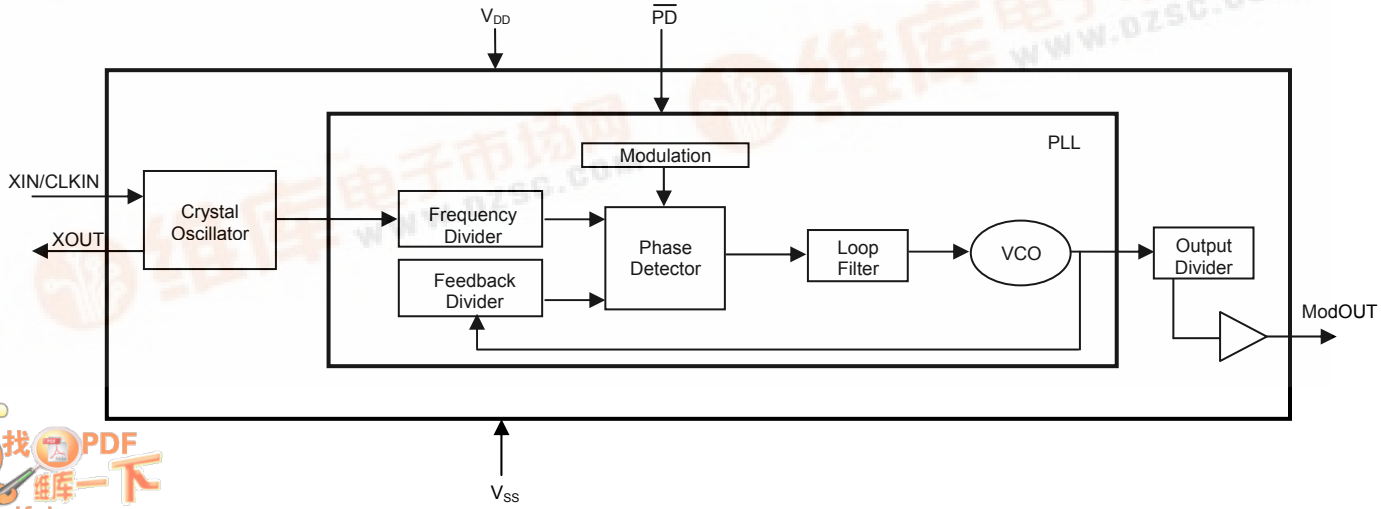
Applications

The ASM3P2780A is targeted towards all portable devices with very low power requirements like MP3 players and digital still cameras.

Key Specifications

Description	Specification
Supply voltages	V_{DD} = 3.3V / 2.5V
Cycle-to-Cycle Jitter	200pS (Max)
Output Duty Cycle	45/55%
Modulation Rate Equation	F_{IN}/1280
Frequency Deviation	±0.75 (Typ) @ 46MHz

Block Diagram



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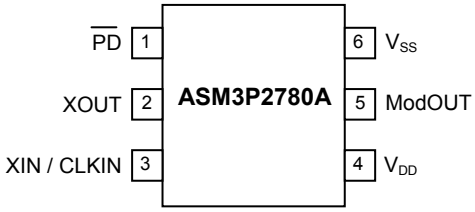
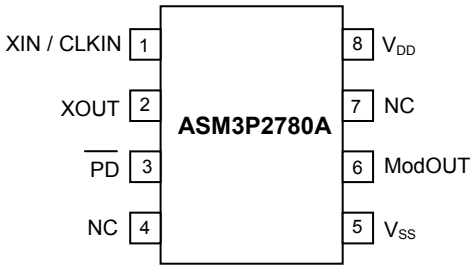
Pin Configuration (6-pin TSOT- 23 Package)



Pin Description

Pin#	Pin Name	Type	Description
1	$\overline{PD}$	I	Power-down control pin. Pull low to enable power-down mode. Connect to V_{DD} if not used.
2	XOUT	O	Crystal connection. If using an external reference, this pin must be left unconnected.
3	XIN / CLKIN	I	Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock.
4	V_{DD}	P	Power supply for the entire chip.
5	ModOUT	O	Spread spectrum clock output.
6	V_{SS}	P	Ground connection.

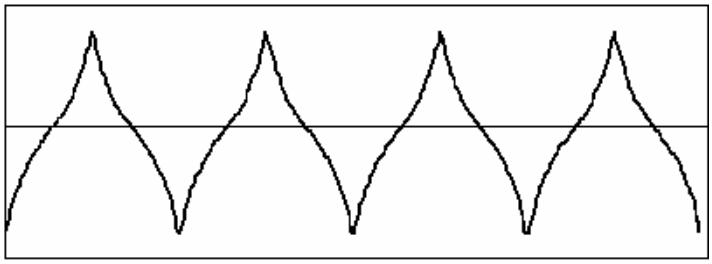
Pin Configuration (8-pin SOIC and TSSOP Packages)



Pin Description

Pin#	Pin Name	Type	Description
1	XIN/CLKIN	I	Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock.
2	XOUT	O	Crystal connection. If using an external reference, this pin must be left unconnected.
3	$\overline{PD}$	I	Power-down control pin. Pull low to enable power-down mode. Connect to VDD if not used.
4	NC	-	No connect.
5	V_{SS}	P	Ground connection.
6	ModOUT	O	Spread spectrum clock output.
7	NC	-	No connect.
8	V_{DD}	P	Power supply for the entire chip.

Modulation Profile



Specifications

Description		Specification
Frequency Range	For 2.5V Supply	30MHz < CLKIN < 50MHz
	For 3.3V Supply	
Modulation Equation		F_{IN}/1280
Frequency Deviation		±0.75% (Typ) @ 46MHz

rev 1.5

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{DD}, V_{IN}	Voltage on any pin with respect to Ground	-0.5 to +7.0	V
T_{STG}	Storage temperature	-65 to +125	°C
T_A	Operating temperature	0 to 70	°C
T_s	Max. Soldering Temperature (10 sec)	260	°C
T_J	Junction Temperature	150	°C
T_{DV}	Static Discharge Voltage (As per JEDEC STD22- A114-B)	2	KV

Note: These are stress ratings only and are not implied for functional use. Exposure to absolute maximum ratings for prolonged periods of time may affect device reliability

DC Electrical Characteristics for 2.5V Supply

(Test condition: All parameters are measured at room temperature (+25°C) unless otherwise stated)

Symbol	Parameter	Min	Typ	Max	Unit
V_{IL}	Input low voltage	V_{SS} - 0.3	-	0.8	V
V_{IH}	Input high voltage	2.0	-	V_{DD} + 0.3	V
I_{IL}	Input low current	-	-	-35	µA
I_{IH}	Input high current	-	-	35	µA
I_{XOL}	XOUT output low current (@0.6V, V_{DD}=2.5V)	-	3	-	mA
I_{XOH}	XOUT output high current (@1.8V, V_{DD}=2.5V)	-	3	-	mA
V_{OL}	Output low voltage (V_{DD} = 2.5 V, I_{OL} = 8mA)	-	-	0.6	V
V_{OH}	Output high voltage (V_{DD} = 2.5 V, I_{OH} = 8mA)	1.8	-	-	V
I_{DD}	Static supply current*	-	-	10	uA
I_{CC}	Dynamic supply current (2.5V, 46MHz and no load)	-	4.0	-	mA
V_{DD}	Operating Voltage	2.375	2.5	2.625	V
t_{ON}	Power-up time (first locked cycle after power-up)**	-	-	5	mS
Z_{OUT}	Output impedance	-	50	-	Ω

* XIN /CLKIN pin and $\overline{PD}$ pin are pulled low
** V_{DD} and XIN/CLKIN input are stable, PD pin is made high from low.

AC Electrical Characteristics for 2.5V Supply

Symbol	Parameter		Min	Typ	Max	Unit
CLKIN	Input frequency		30	-	50	MHz
ModOUT	Output frequency		30	-	50	MHz
f_d	Frequency Deviation	Input Frequency = 30MHz	-	± 1.10	-	%
		Input Frequency = 50MHz	-	± 0.65	-	
t_{LH}*	Output rise time (measured from 0.7V to 1.7V)		0.7	1.3	1.6	nS
t_{HL}*	Output fall time (measured from 1.7V to 0.7V)		0.4	0.8	1.0	nS
t_{JC}	Jitter (cycle to cycle)		-	-	200	pS
t_D	Output duty cycle		45	50	55	%

* t_{LH} and t_{HL} are measured into a capacitive load of 15pF

DC Electrical Characteristics for 3.3V Supply

(Test condition: All parameters are measured at room temperature (+ 25°C) unless otherwise stated)

Symbol	Parameter	Min	Typ	Max	Unit
V_{IL}	Input low voltage	V_{SS} - 0.3	-	0.8	V
V_{IH}	Input high voltage	2.0	-	V_{DD} + 0.3	V
I_{IL}	Input low current	-	-	-35	µA
I_{IH}	Input high current	-	-	35	µA
I_{XOL}	XOUT output low current (@0.4V, V_{DD}=3.3V)	-	3	-	mA
I_{XOH}	XOUT output high current (@2.5V, V_{DD}=3.3V)	-	3	-	mA
V_{OL}	Output low voltage (V_{DD} = 3.3 V, I_{OL} = 8mA)	-	-	0.4	V
V_{OH}	Output high voltage (V_{DD} = 3.3 V, I_{OH} = 8mA)	2.5	-	-	V
I_{DD}	Static supply current*	-	-	10	uA
I_{CC}	Dynamic supply current (3.3V, 46MHz and no load)	-	5.0	-	mA
V_{DD}	Operating Voltage	2.7	3.3	3.6	V
t_{ON}	Power-up time (first locked cycle after power-up)**	-	-	5	mS
Z_{OUT}	Output impedance	-	45	-	Ω

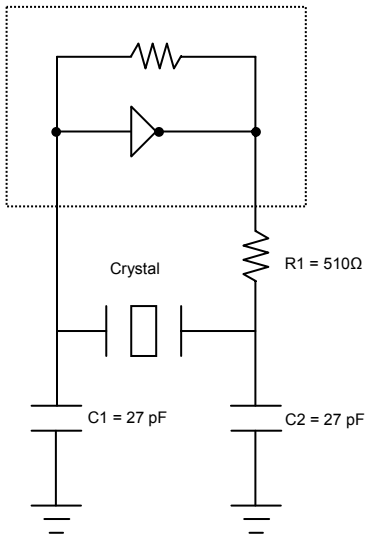
* XIN /CLKIN pin and $\overline{PD}$ pin are pulled low
** V_{DD} and XIN/CLKIN input are stable, PD pin is made high from low.

AC Electrical Characteristics for 3.3V Supply

Symbol	Parameter		Min	Typ	Max	Unit
CLKIN	Input frequency		30	-	50	MHz
ModOUT	Output frequency		30	-	50	MHz
f_d	Frequency Deviation	Input Frequency = 30MHz	-	±1.10	-	%
		Input Frequency = 50MHz	-	± 0.65	-	
t_{LH}*	Output rise time (measured from 0.8 to 2.0V)		0.5	1.1	1.4	nS
t_{HL} *	Output fall time (measured at 2.0V to 0.8V)		0.3	0.8	1.1	nS
t_{JC}	Jitter (cycle to cycle)		-	-	200	pS
t_D	Output duty cycle		45	50	55	%

*t_{LH} and t_{HL} are measured into a capacitive load of 15pF

Typical Crystal Oscillator Circuit

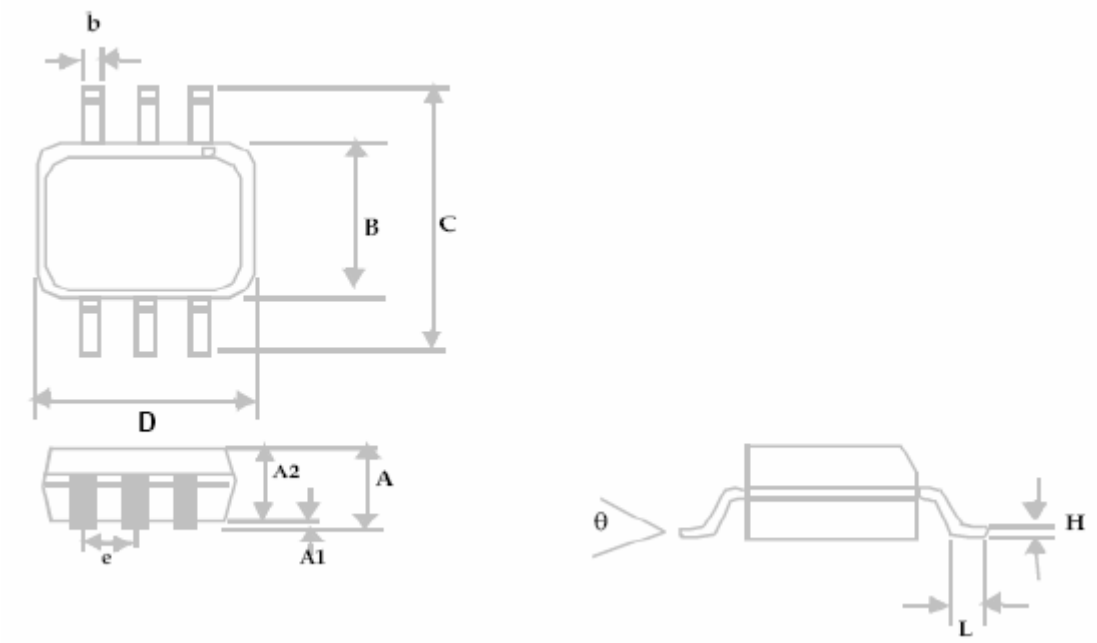


Typical Crystal Specifications

Fundamental AT cut parallel resonant crystal	
Nominal frequency	33MHz
Frequency tolerance	± 50ppm or better at 25°C
Operating temperature range	-25°C to +85°C
Storage temperature	-40°C to +85°C
Load capacitance	18pF
Shunt capacitance	7pF maximum
ESR	25Ω

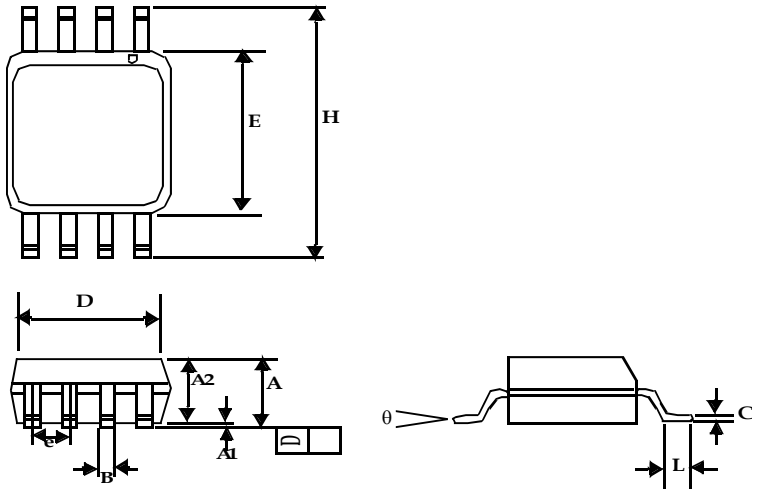
Package Information

6-pin TSOT-23 Package



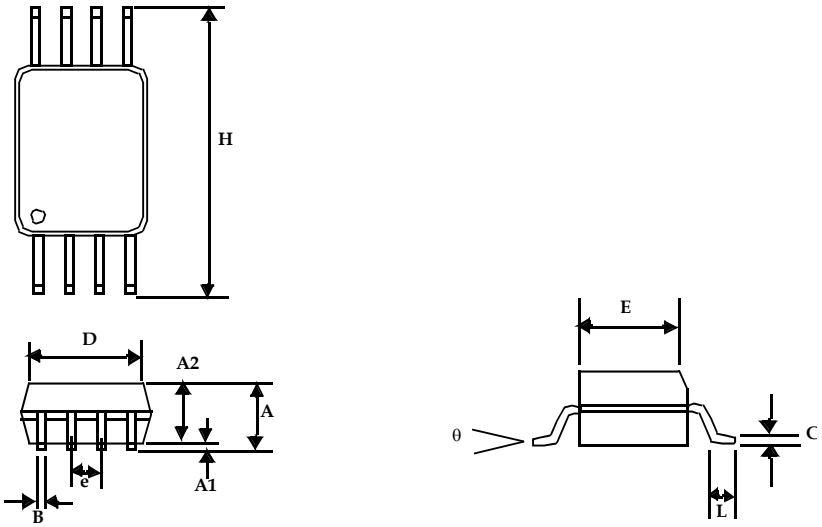
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.04		1.00
A1	0.00	0.004	0.00	0.10
A2	0.033	0.036	0.84	0.90
b	0.012	0.02	0.30	0.50
H	0.005 BSC		0.127 BSC	
D	0.114 BSC		2.90 BSC	
B	0.06 BSC		1.60 BSC	
e	0.0374 BSC		0.950 BSC	
C	0.11 BSC		2.80 BSC	
L	0.0118	0.02	0.30	0.50
θ	0°	4°	0°	4°

8-Pin SOIC Package



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A1	0.004	0.010	0.10	0.25
A	0.053	0.069	1.35	1.75
A2	0.049	0.059	1.25	1.50
B	0.012	0.020	0.31	0.51
C	0.007	0.010	0.18	0.25
D	0.193 BSC		4.90 BSC	
E	0.154 BSC		3.91 BSC	
e	0.050 BSC		1.27 BSC	
H	0.236 BSC		6.00 BSC	
L	0.016	0.050	0.41	1.27
θ	0°	8°	0°	8°

8-Pin TSSOP Package

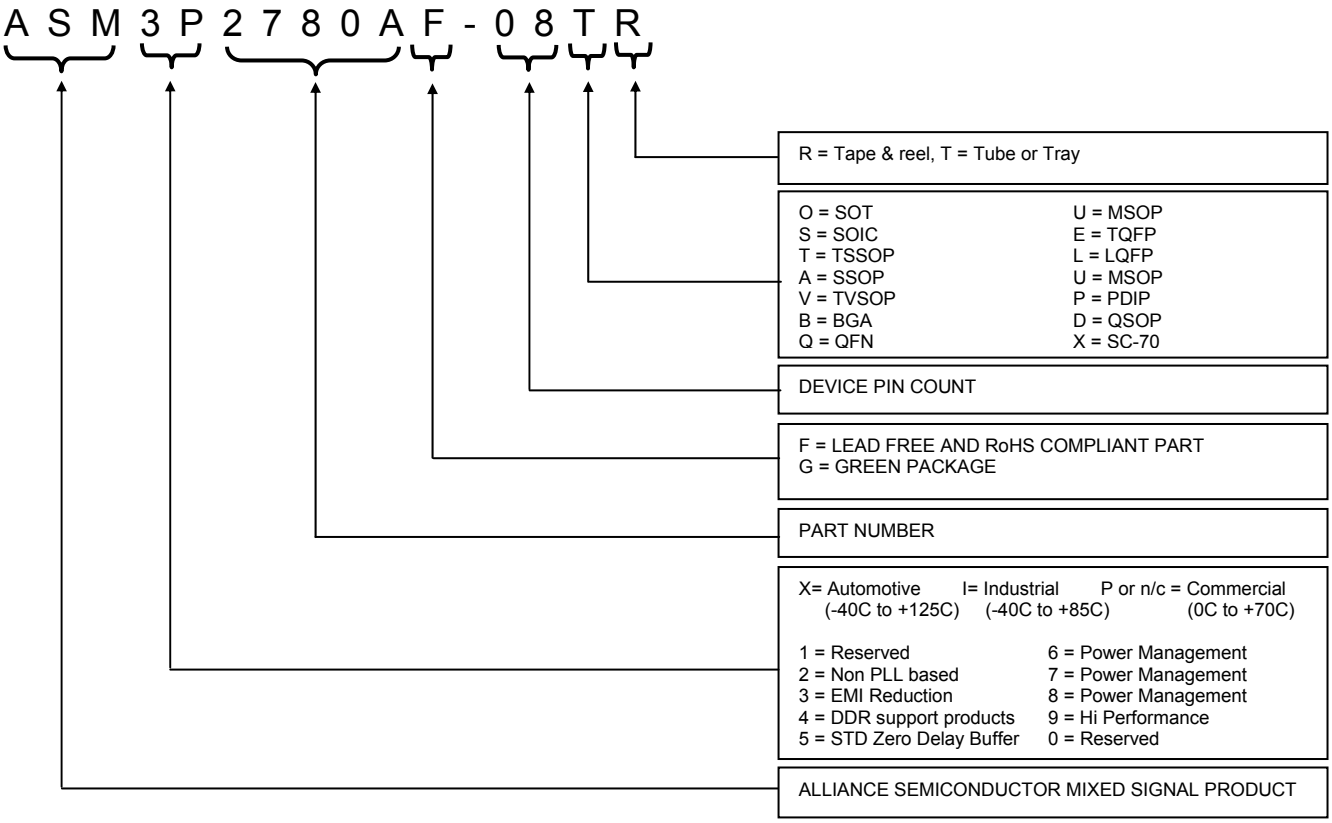


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.043		1.10
A1	0.002	0.006	0.05	0.15
A2	0.033	0.037	0.85	0.95
B	0.008	0.012	0.19	0.30
c	0.004	0.008	0.09	0.20
D	0.114	0.122	2.90	3.10
E	0.169	0.177	4.30	4.50
e	0.026 BSC		0.65 BSC	
H	0.252 BSC		6.40 BSC	
L	0.020	0.028	0.50	0.70
θ	0°	8°	0°	8°

Ordering Information

Part Number	Marking	Package Type	Temperature
ASM3P2780AF-06OR	G4LL	6-Pin TSOT-23, TAPE & REEL, Pb Free	Commercial
ASM3P2780AF-08TT	3P2780AF	8-Pin TSSOP, TUBE, Pb Free	Commercial
ASM3P2780AF-08TR	3P2780AF	8-Pin TSSOP, TAPE & REEL, Pb Free	Commercial
ASM3P2780AF-08ST	3P2780AF	8-Pin SOIC, TUBE, Pb Free	Commercial
ASM3P2780AF-08SR	3P2780AF	8-Pin SOIC, TAPE & REEL, Pb Free	Commercial
ASM3P2780AG-06OR	G3LL	6-Pin TSOT-23, TAPE & REEL, Green	Commercial
ASM3P2780AG-08TT	3P2780AG	8-Pin TSSOP, TUBE, Green	Commercial
ASM3P2780AG-08TR	3P2780AG	8-Pin TSSOP, TAPE & REEL, Green	Commercial
ASM3P2780AG-08ST	3P2780AG	8-Pin SOIC, TUBE, Green	Commercial
ASM3P2780AG-08SR	3P2780AG	8-Pin SOIC, TAPE & REEL, Green	Commercial
ASM3P2780A-06OR	G1LL	6-Pin TSOT-23, TAPE & REEL	Commercial
ASM3P2780A-08TT	3P2780A	8-Pin TSSOP, TUBE	Commercial
ASM3P2780A-08TR	3P2780A	8-Pin TSSOP, TAPE & REEL	Commercial
ASM3P2780A-08ST	3P2780A	8-Pin SOIC, TUBE	Commercial
ASM3P2780A-08SR	3P2780A	8-Pin SOIC, TAPE & REEL	Commercial
ASM3I2780AF-06OR	G5LL	6-Pin TSOT-23, TAPE & REEL, Pb Free	Industrial
ASM3I2780AF-08TT	3I2780AF	8-Pin TSSOP, TUBE, Pb Free	Industrial
ASM3I2780AF-08TR	3I2780AF	8-Pin TSSOP, TAPE & REEL, Pb Free	Industrial
ASM3I2780AF-08ST	3I2780AF	8-Pin SOIC, TUBE, Pb Free	Industrial
ASM3I2780AF-08SR	3I2780AF	8-Pin SOIC, TAPE & REEL, Pb Free	Industrial
ASM3I2780AG-06OR	G6LL	6-Pin TSOT-23, TAPE & REEL, Green	Industrial
ASM3I2780AG-08TT	3I2780AG	8-Pin TSSOP, TUBE, Green	Industrial
ASM3I2780AG-08TR	3I2780AG	8-Pin TSSOP, TAPE & REEL, Green	Industrial
ASM3I2780AG-08ST	3I2780AG	8-Pin SOIC, TUBE, Green	Industrial
ASM3I2780AG-08SR	3I2780AG	8-Pin SOIC, TAPE & REEL, Green	Industrial
ASM3I2780A-06OR	G2LL	6-Pin TSOT-23, TAPE & REEL	Industrial
ASM3I2780A-08TT	3I2780A	8-Pin TSSOP, TUBE	Industrial
ASM3I2780A-08TR	3I2780A	8-Pin TSSOP, TAPE & REEL	Industrial
ASM3I2780A-08ST	3I2780A	8-Pin SOIC, TUBE	Industrial
ASM3I2780A-08SR	3I2780A	8-Pin SOIC, TAPE & REEL	Industrial

Device Ordering Information



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Alliance Semiconductor Corporation
2575 Augustine Drive,
Santa Clara, CA 95054
Tel# 408-855-4900
Fax: 408-855-4999
www.alsc.com

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Note: This product utilizes US Patent # 6,646,463 Impedance Emulator Patent issued to Alliance Semiconductor, dated 11-11-2003

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