



## Low Power Peak EMI Reducing Solution

### Features

- Generates an EMI optimized clock signal at the output.
- Integrated loop filter components.
- Operates with a 3.3V / 2.5V supply.
- Operating current less than 4mA.
- Low power CMOS design.
- Input frequency: 12MHz
- Generates a 1X low EMI spread spectrum clock of the input frequency.
- Frequency deviation:  $\pm 0.4\%$ (Typ) @ 12MHz Input Frequency
- Available in 6-pin TSOT-23, 8-pin SOIC and 8-pin TSSOP packages.

### Product Description

The ASM3P2863A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2863A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2863A allows significant system cost savings by reducing the number of circuit board layers, ferrite beads and shielding that are traditionally required to pass EMI regulations.

The ASM3P2863A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2863A 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.’

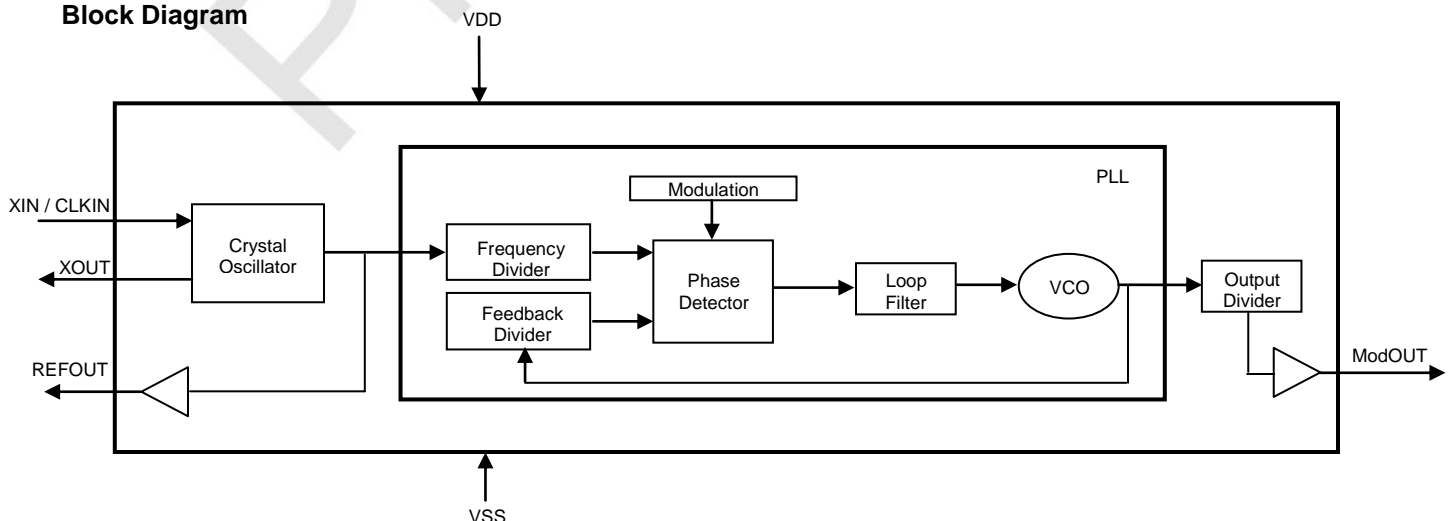
### Applications

The ASM3P2863A is targeted towards all portable devices with very low power requirements like MP3 players, Notebooks and Digital still cameras.

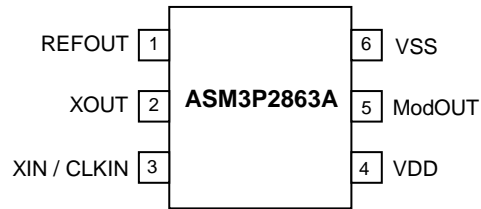
### Key Specifications

Description	Specification
Supply voltages	$V_{DD} = 2.5V / 3.3V$
Cycle-to-Cycle Jitter	200pS ( typ)
Output Duty Cycle	45/55% (worst case)
Modulation Rate Equation	$F_{IN}/256$
Frequency Deviation	$\pm 0.4\%$ (Typ) @ 12MHz

### Block Diagram



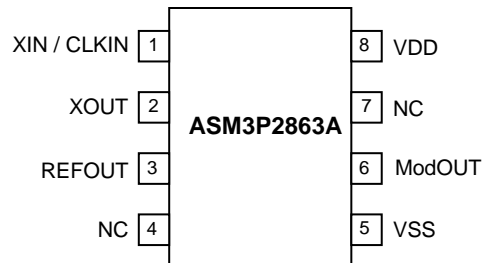
## Pin Configuration (6-pin TSOT-23 Package)



## Pin Description

Pin#	Pin Name	Type	Description
1	REFOUT	O	Buffered output of the input frequency.
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	VDD	P	Power supply for the entire chip.
5	ModOUT	O	Spread spectrum clock output.
6	VSS	P	Ground connection.

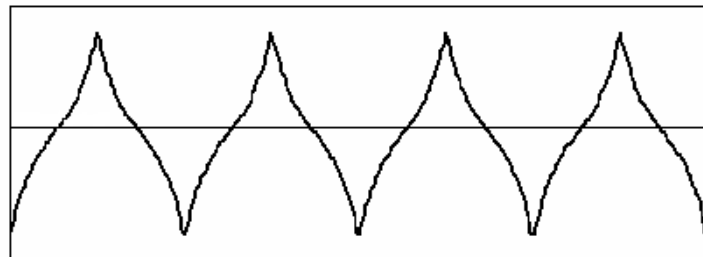
## Pin Configuration (8-pin SOIC and TSSOP Packages)



## 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	REFOUT	O	Buffered output of the input frequency.
4	NC	-	No connect.
5	VSS	P	Ground connection.
6	ModOUT	O	Spread spectrum clock output.
7	NC	-	No connect.
8	VDD	P	Power supply for the entire chip.

## Modulation Profile



## Specifications

Description	Specification
Input Frequency	12MHz
Modulation Equation	$F_{IN}/256$
Frequency Deviation	$\pm 0.4\%$ (Typ) @ 12MHz

## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
VDD, VIN	Voltage on any input pin with respect to Ground	-0.5 to +4.6	V
T <sub>STG</sub>	Storage temperature	-65 to +125	°C
T <sub>s</sub>	Max. Soldering Temperature (10 sec)	260	°C
T <sub>J</sub>	Junction Temperature	150	°C
T <sub>DV</sub>	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 <sub>IL</sub>	Input low voltage	VSS-0.3		0.8	V
V <sub>IH</sub>	Input high voltage	2.0		VDD+0.3	V
I <sub>IL</sub>	Input low current			-35	μA
I <sub>IH</sub>	Input high current			35	μA
I <sub>XOL</sub>	XOUT output low current (@ 0.5V, VDD = 2.5V)		3		mA
I <sub>XOH</sub>	XOUT output high current (@ 1.8V, VDD = 2.5V)		3		mA
V <sub>OL</sub>	Output low voltage (VDD = 2.5V, I <sub>OL</sub> = 8mA)			0.6	V
V <sub>OH</sub>	Output high voltage (VDD = 2.5V, I <sub>OH</sub> = 8mA)	1.8			V
I <sub>DD</sub>	Static supply current <sup>1</sup>		0.8		mA
I <sub>CC</sub>	Dynamic supply current (2.5V, 12MHz and no load)		3		mA
VDD	Operating voltage	2.375	2.5	2.625	V
t <sub>ON</sub>	Power-up time (first locked cycle after power-up)			5	mS
Z <sub>OUT</sub>	Output impedance		50		Ω

Note: 1. XIN / CLKIN pin is pulled low.

## AC Electrical Characteristics for 2.5V Supply

Symbol	Parameter	Min	Typ	Max	Unit
CLKIN	Input frequency		12		MHz
ModOUT	Output frequency		12		MHz
f <sub>d</sub>	Frequency Deviation		±0.4		%
t <sub>LH</sub> <sup>1</sup>	Output rise time (measured from 0.7V to 1.7V)	0.5	1.5	1.7	nS
t <sub>HL</sub> <sup>1</sup>	Output fall time (measured from 1.7V to 0.7V)	0.5	1.0	1.2	nS
t <sub>JC</sub>	Jitter (Cycle-to-Cycle)		200	300	pS
t <sub>D</sub>	Output duty cycle	45	50	55	%

Note: 1. t<sub>LH</sub> and t<sub>HL</sub> 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 <sub>IL</sub>	Input low voltage	VSS-0.3		0.8	V
V <sub>IH</sub>	Input high voltage	2.0		VDD+0.3	V
I <sub>IL</sub>	Input low current			-35	μA
I <sub>IH</sub>	Input high current			35	μA
I <sub>XOL</sub>	XOUT output low current (@ 0.4V, V <sub>DD</sub> = 3.3V)		3		mA
I <sub>XOH</sub>	XOUT output high current (@ 2.5V, V <sub>DD</sub> = 3.3V)		3		mA
V <sub>OL</sub>	Output low voltage (VDD = 3.3V, I <sub>OL</sub> = 8mA)			0.4	V
V <sub>OH</sub>	Output high voltage (VDD = 3.3V, I <sub>OH</sub> = 8mA)	2.5			V
I <sub>DD</sub>	Static supply current <sup>1</sup>		1		mA
I <sub>CC</sub>	Dynamic supply current (3.3V, 12MHz and no load)		3.5		mA
VDD	Operating Voltage	3.0	3.3	3.6	V
t <sub>ON</sub>	Power-up time (first locked cycle after power-up)			5	mS
Z <sub>OUT</sub>	Output impedance		45		Ω

Note: 1. XIN / CLKIN pin is pulled low.

## AC Electrical Characteristics for 3.3V Supply

Symbol	Parameter	Min	Typ	Max	Unit
CLKIN	Input frequency		12		MHz
ModOUT	Output frequency		12		MHz
f <sub>d</sub>	Frequency Deviation		±0.4		%
t <sub>LH</sub> <sup>1</sup>	Output rise time (measured from 0.8 to 2.0V)	0.5	1.4	1.6	nS
t <sub>HL</sub> <sup>1</sup>	Output fall time (measured at 2.0V to 0.8V)	0.4	1.0	1.2	nS
t <sub>JC</sub>	Jitter (Cycle-to-Cycle)		200	300	pS
t <sub>D</sub>	Output duty cycle	45	50	55	%

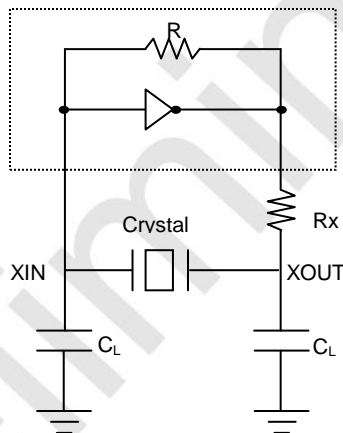
Note: 1. t<sub>LH</sub> and t<sub>HL</sub> are measured into a capacitive load of 15pF.

## Crystal Specifications

Fundamental AT cut parallel resonant crystal	
Nominal frequency	12MHz
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 (C <sub>P</sub> )	18pF
Shunt capacitance	7pF maximum
ESR	25Ω

Note: C<sub>L</sub> is Load Capacitance and Rx is used to prevent oscillations at overtone frequency of the Fundamental frequency.

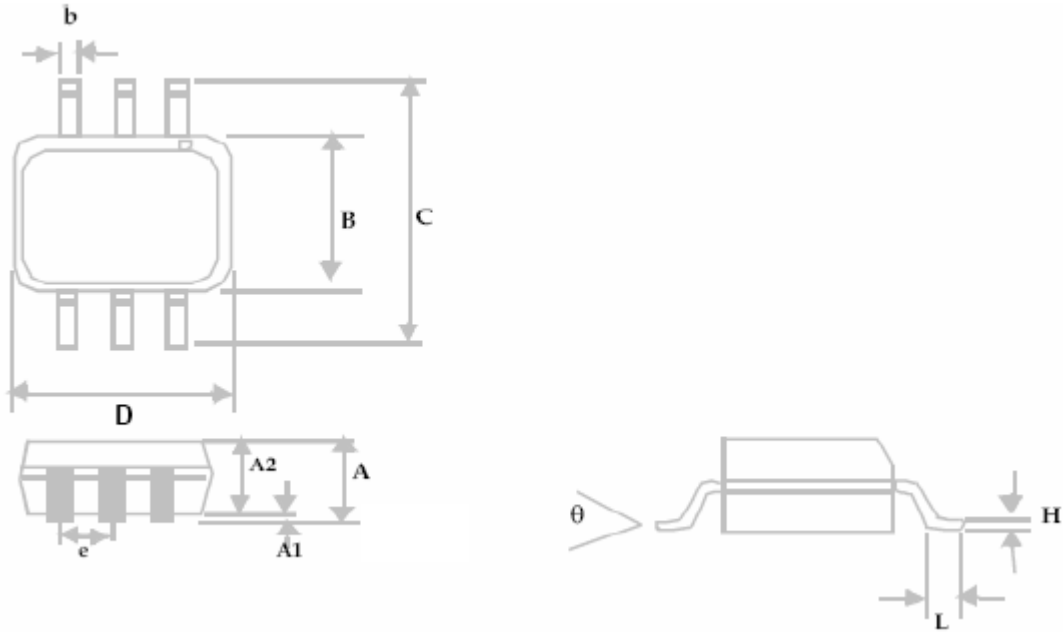
## Typical Crystal Interface Circuit



$C_L = 2 * (C_P - C_S)$ ,  
 Where C<sub>P</sub> = Load capacitance of crystal from crystal vendor datasheet.  
 C<sub>S</sub> = Stray capacitance due to C<sub>IN</sub>, PCB, Trace, etc.

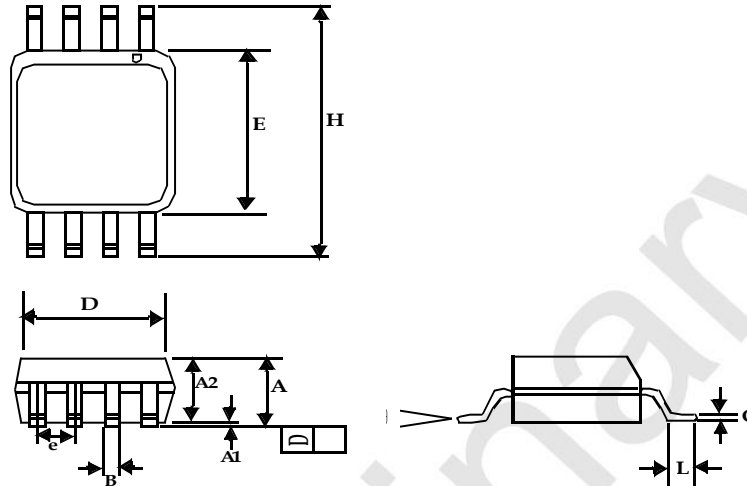
Package Information

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
theta	0°	4°	0°	4°

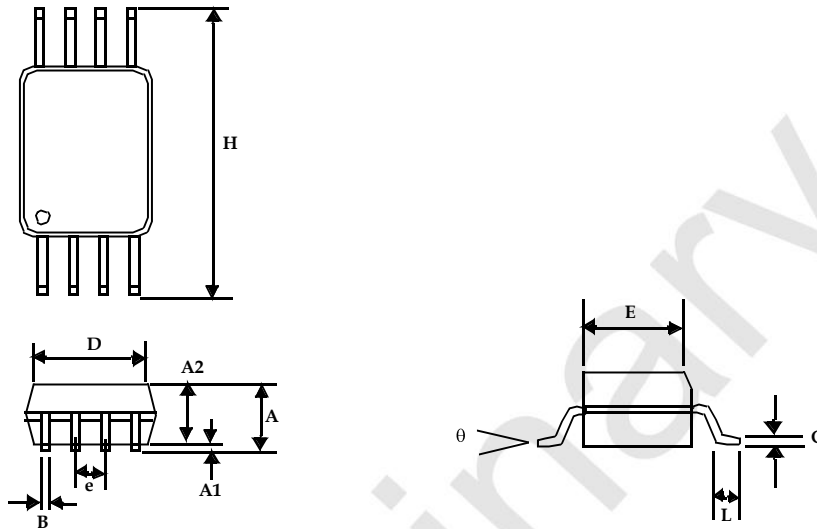
8-Pin SOIC Package



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°

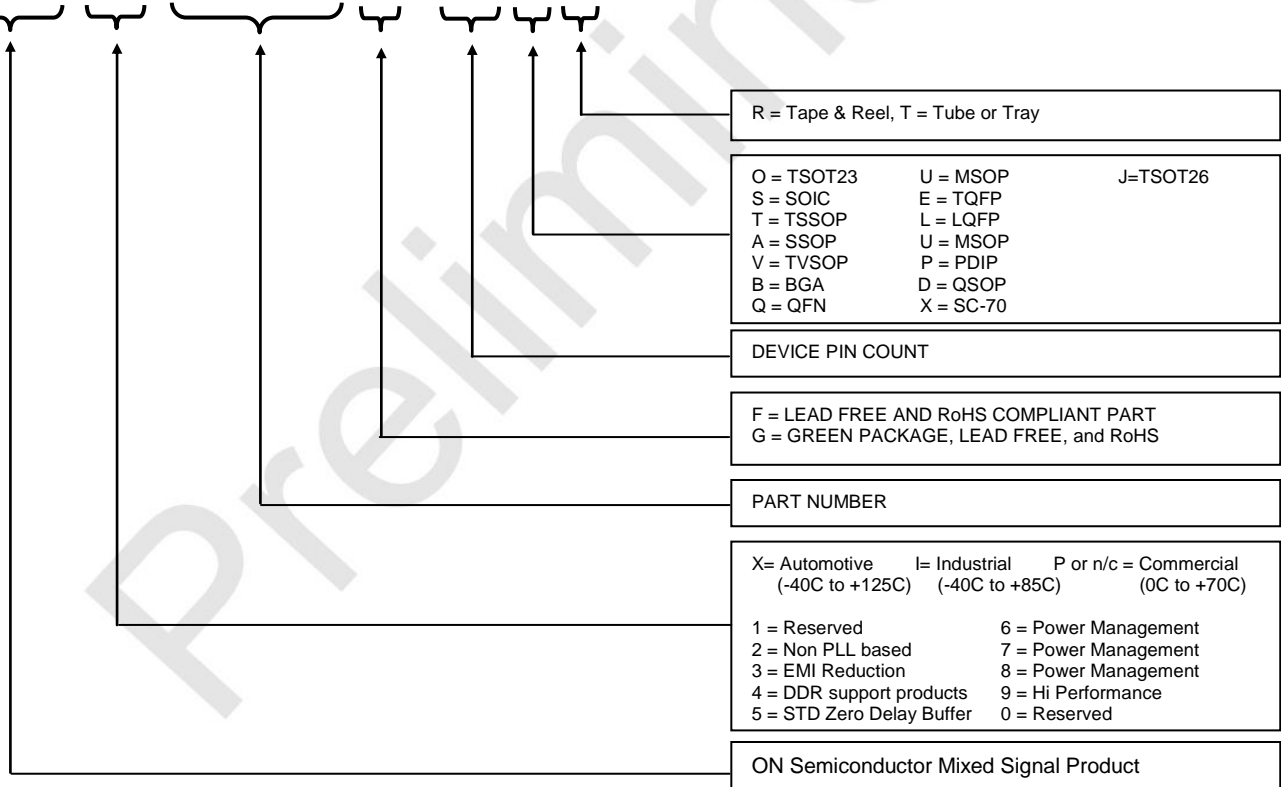
# ASM3P2863A

## Ordering Information

Part Number	Marking	Package Type	Temperature
ASM3P2863AF-06OR	V4LL	6-Pin TSOT-23, TAPE & REEL, Pb Free	Commercial
ASM3P2863AF-08TT	3P2863AF	8-Pin TSSOP, TUBE, Pb Free	Commercial
ASM3P2863AF-08TR	3P2863AF	8-Pin TSSOP, TAPE & REEL, Pb Free	Commercial
ASM3P2863AF-08ST	3P2863AF	8-Pin SOIC, TUBE, Pb Free	Commercial
ASM3P2863AF-08SR	3P2863AF	8-Pin SOIC, TAPE & REEL, Pb Free	Commercial
ASM3P2863AG-06OR	V3LL	6-Pin TSOT-23, TAPE & REEL, Green	Commercial
ASM3P2863AG-08TT	3P2863AG	8-Pin TSSOP, TUBE, Green	Commercial
ASM3P2863AG-08TR	3P2863AG	8-Pin TSSOP, TAPE & REEL, Green	Commercial
ASM3P2863AG-08ST	3P2863AG	8-Pin SOIC, TUBE, Green	Commercial
ASM3P2863AG-08SR	3P2863AG	8-Pin SOIC, TAPE & REEL, Green	Commercial


## Device Ordering Information

A S M 3 P 2 8 6 3 A F - 0 8 T R



Licensed under US Patent #5,488,627 and #5,631,921.

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

**ON Semiconductor** and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. U.S. Patent Pending; Timing-Safe and Active Bead are trademarks of PulseCore Semiconductor, a wholly owned subsidiary of ON Semiconductor. This literature is subject to all applicable copyright laws and is not for resale in any manner.

**PUBLICATION ORDERING INFORMATION****LITERATURE FULFILLMENT:**

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free  
USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free  
USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855  
Toll Free USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5773-3850

**ON Semiconductor Website:**  
[www.onsemi.com](http://www.onsemi.com)

**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative