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## Low Frequency EMI Reduction IC

### Features

- FCC approved method of EMI attenuation
- Provides up to 20 dB of EMI suppression
- Generates a low EMI spread spectrum clock of the input frequency
- Optimized for 10 MHz to 35MHz input frequency range
- Internal loop filter minimizes external components and board space
- 4 selectable spread ranges
- SSON control pin for spread spectrum enable and disable options
- Characterizes to work with **EMI-Lator**®, EMC simulation program.
- Low cycle-to-cycle jitter
- Wide operating range (3V to 5V)
- 16 mA output drives
- TTL or CMOS compatible outputs
- Low power CMOS design
- Available in 8 pin SOIC and TSSOP

reduction of EMI of all clock dependent signals. The P2010 allows significant system cost savings by reducing the number of circuit board layers and shielding that are traditionally required to pass EMI regulations.

The P2010 uses the most efficient and optimized modulation profile approved by the FCC and is implemented in a proprietary all-digital method.

The P2010 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”.

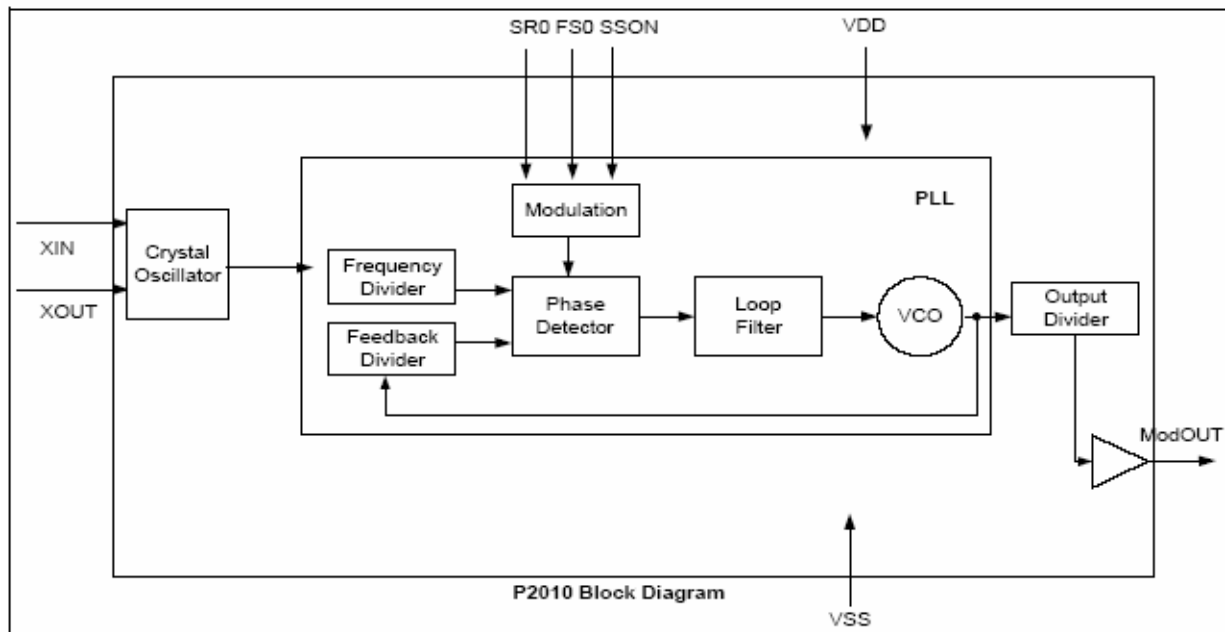
### Product Description

The P2010 is a selectable spread spectrum frequency modulator designed specifically for PC peripheral and embedded controller markets. The P2010 reduces electromagnetic interference (EMI) at the clock source which provides system wide

### Applications

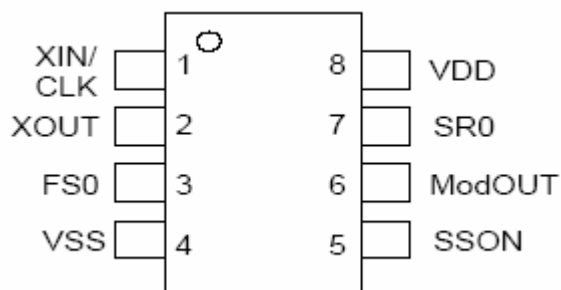
The P2010 is targeted towards the embedded controller market and PC peripheral markets including scanners, facsimile, MFP’s, printers, PDA, IA, and GPS devices.

### Block Diagram





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**Pin Configuration****Pin Description**

| Pin# | Pin Name | Type | Description                                                                                                                                                     |
|------|----------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | XIN/CLK  | I    | Connect to crystal or externally generated clock signal.                                                                                                        |
| 2    | XOUT     | I    | Connect to crystal. No connect if externally generated clock signal is used.                                                                                    |
| 3    | FS0      | I    | Digital logic input used to select Input Frequency Range (see Table 1). This pin has an internal pull-up resistor.                                              |
| 4    | VSS      | P    | Ground Connection. Connect to system ground.                                                                                                                    |
| 5    | SSON     | I    | Digital logic input used to enable Spread Spectrum function (Active Low). Spread Spectrum function enable when low. This pin has an internal pull-low resistor. |
| 6    | ModOUT   | O    | Spread Spectrum Clock Output.                                                                                                                                   |
| 7    | SR0      | I    | Digital logic input used to select Spreading Range (see Table 1). This pin has an internal pull-up resistor.                                                    |
| 8    | VDD      | P    | Connect to +3.3V or +5.0V                                                                                                                                       |

**Table 1 - Spread Range Selection**

| FS0 | SR0 | Spreading Range | Input Frequency  | Modulation rate                        |
|-----|-----|-----------------|------------------|----------------------------------------|
| 1   | 0   | +/- 1.50%       | 10 MHz to 20 MHz | $(F_{in}/10) \times 20.83 \text{ KHz}$ |
| 1   | 1   | +/- 2.50%       | 10 MHz to 20 MHz | $(F_{in}/10) \times 20.83 \text{ KHz}$ |
| 0   | 0   | +/- 1.25%       | 20 MHz to 35 MHz | $(F_{in}/10) \times 20.83 \text{ KHz}$ |
| 0   | 1   | +/- 2.00%       | 20 MHz to 35 MHz | $(F_{in}/10) \times 20.83 \text{ KHz}$ |



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### Spread Spectrum Selection

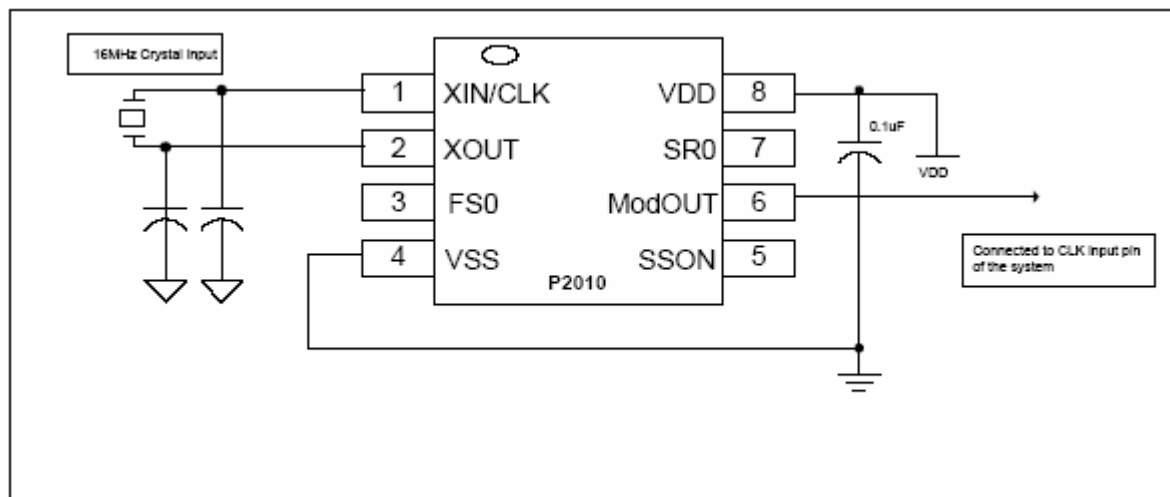
Table 1 illustrates the possible spread spectrum options. The optimal setting should minimize system EMI to the fullest without affecting system performance. The spreading is described as a percentage deviation of the center frequency (Note: the center frequency is the frequency of the external reference input on CLKIN, Pin 1).

### Example of a typical printer or scanner application that operates on a clock frequency of 16 MHz:

A spreading selection of FS0=1 and SR0=1 provides a percentage deviation of  $\pm 2.50\%$ \* (see Table 1) of  $F_{cen}$ . This results in the frequency on ModOUT being swept from 16.40 MHz to 15.60 MHz at a modulation rate of 33.33 KHz (see Table 1). This particular example (see Figure below) given here is a common EMI reduction method for scanner, printer, or embedded applications and has already been adopted by most of the leading manufacturers.

**NOTE:** Spreading range selection varies from different system manufacturers and their designs.

### P2010 Application Schematic for Flat-Bed Scanner



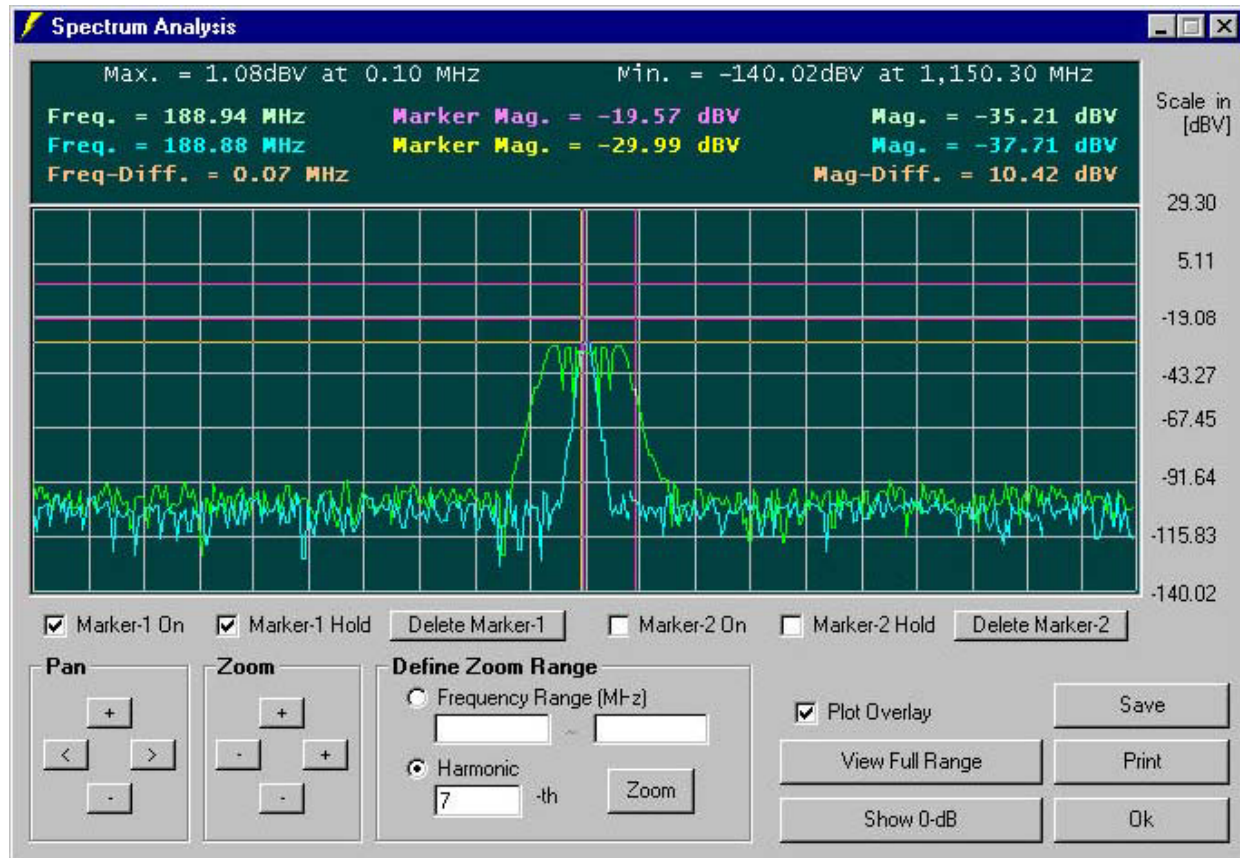


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### EMC Software Simulation

By using Alliance Semiconductor's proprietary EMC simulation software – EMI-lator®, radiated system level EMI analysis can be made easier to allow a quantitative assessment on Alliance's EMI reduction products. The simulation engine of this EMC software has already been characterized to correlate with the electrical characteristics of Alliance EMI reduction IC's. The figure below is an example of the simulation result. Please visit our web site at [www.alsc.com](http://www.alsc.com) for information on how to obtain a free copy and demonstration of EMI-lator®.

### Simulation Result from EMI-lator®





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**Absolute Maximum Ratings**

| Symbol           | Parameter                              | Rating        | Unit |
|------------------|----------------------------------------|---------------|------|
| $V_{DD}, V_{IN}$ | Voltage on any pin with respect to GND | -0.5 to + 7.0 | V    |
| $T_{STG}$        | Storage temperature                    | -65 to +125   | °C   |
| $T_A$            | Operating temperature                  | 0 to +70      | °C   |

**DC Electrical Characteristics**

| Symbol    | Parameter                                               | Min   | Typ  | Max            | Unit |
|-----------|---------------------------------------------------------|-------|------|----------------|------|
| $V_{IL}$  | Input Low Voltage                                       | GND – | -    | 0.8            | V    |
| $V_{IH}$  | Input High Voltage                                      | 2.0   | -    | $V_{DD} + 0.3$ | V    |
| $I_{IL}$  | Input Low Current (pull-up resistor on inputs SR0, 1)   | -     | -    | -35            | μA   |
| $I_{IH}$  | Input High Current (pull-down resistor on input SSON)   | -     | -    | 35             | μA   |
| $V_{OL}$  | Output Low Voltage ( $V_{DD}=3.3V$ , $I_{OL} = 20$ mA)  | -     | -    | 0.4            | V    |
| $V_{OH}$  | Output High Voltage ( $V_{DD}=3.3V$ , $I_{OH} = 20$ mA) | 2.5   | -    | -              | V    |
| $I_{DD}$  | Static Supply Current                                   | -     | 0.6  | -              | mA   |
| $I_{CC}$  | Dynamic Supply Current (3.3V and 15pF loading)          | 4     | 6    | 8              | mA   |
| $V_{DD}$  | Operating Voltage                                       | 2.7   | 3.3  | 5.5            | V    |
| $t_{ON}$  | Power Up Time (First locked clock cycle after power up) |       | 0.18 |                | ms   |
| $Z_{OUT}$ | Clock Output Impedance                                  |       | 50   |                | Ω    |

**AC Electrical Characteristics**

| Symbol     | Parameter                                      | Min | Typ | Max | Unit |
|------------|------------------------------------------------|-----|-----|-----|------|
| $f_{IN}$   | Input Frequency when                           | 10  | 20  | 30  | MHz  |
| $t_{LH}^*$ | Output rise time<br>(Measured at 0.8V to 2.0V) | 0.7 | 0.9 | 1.1 | ns   |
| $t_{HL}^*$ | Output fall time<br>(Measured at 0.8V to 2.0V) | 0.6 | 0.8 | 1.0 | ns   |
| $t_{JC}$   | Jitter (cycle to cycle)                        | -   | -   | 360 | ps   |
| $t_D$      | Output duty cycle                              | 45  | 50  | 55  | %    |

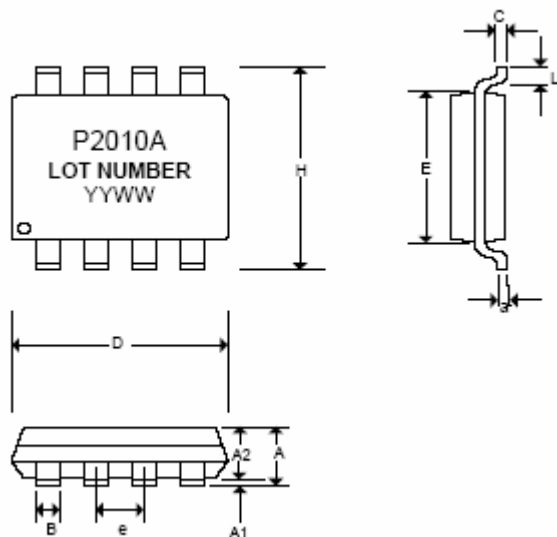
\* $t_{LH}$  and  $t_{HL}$  are measured into a capacitive load of 15pF



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## Package Information

## Mechanical Package Outline 8-Pin SOIC



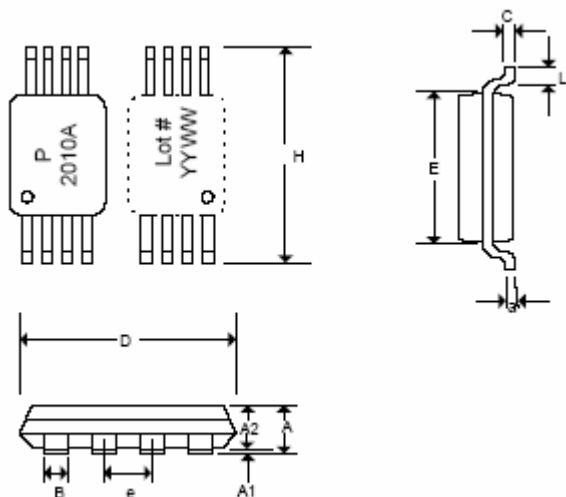
| Symbol | Dimensions in inches |       |       | Dimensions in millimeters |      |      |
|--------|----------------------|-------|-------|---------------------------|------|------|
|        | Min                  | Nor   | Max   | Min                       | Nor  | Max  |
| A      | 0.057                | 0.064 | 0.071 | 1.45                      | 1.63 | 1.80 |
| A1     | 0.004                | 0.007 | 0.010 | 0.10                      | 0.18 | 0.25 |
| A2     | 0.053                | 0.061 | 0.069 | 1.35                      | 1.55 | 1.75 |
| B      | 0.012                | 0.016 | 0.020 | 0.31                      | 0.41 | 0.51 |
| C      | 0.004                | 0.006 | 0.01  | 0.10                      | 0.15 | 0.25 |
| D      | 0.186                | 0.194 | 0.202 | 4.72                      | 4.92 | 5.12 |
| E      | 0.148                | 0.156 | 0.164 | 3.75                      | 3.95 | 4.15 |
| e      | 0.050 BSC            |       |       | 1.27 BSC                  |      |      |
| H      | 0.224                | 0.236 | 0.248 | 5.70                      | 6.00 | 6.30 |
| L      | 0.012                | 0.020 | 0.028 | 0.30                      | 0.50 | 0.70 |
| a      | 0°                   | 5°    | 8°    | 0°                        | 5°   | 8°   |

Note: Controlling dimensions are millimeters



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## Mechanical Package Outline 8-Pin TSSOP



| Symbol | Dimensions in inches |       |       | Dimensions in millimeters |      |      |
|--------|----------------------|-------|-------|---------------------------|------|------|
|        | Min                  | Nor   | Max   | Min                       | Nor  | Max  |
| A      |                      |       | 0.047 |                           |      | 1.10 |
| A1     | 0.002                |       | 0.006 | 0.05                      |      | 0.15 |
| A2     | 0.031                | 0.039 | 0.041 | 0.80                      | 1.00 | 1.05 |
| B      | 0.007                |       | 0.012 | 0.19                      |      | 0.30 |
| C      | 0.004                |       | 0.008 | 0.09                      |      | 0.20 |
| D      | 0.114                | 0.118 | 0.122 | 2.90                      | 3.00 | 3.10 |
| E      | 0.169                | 0.173 | 0.177 | 4.30                      | 4.40 | 4.50 |
| e      | 0.026 BSC            |       |       | 0.65 BSC                  |      |      |
| H      | 0.244                | 0.252 | 0.260 | 6.20                      | 6.40 | 6.60 |
| L      | 0.018                | 0.024 | 0.030 | 0.45                      | 0.60 | 0.75 |
| a      | 0°                   | 5°    | 8°    | 0°                        | 5°   | 8°   |

Note: Controlling dimensions are millimeters

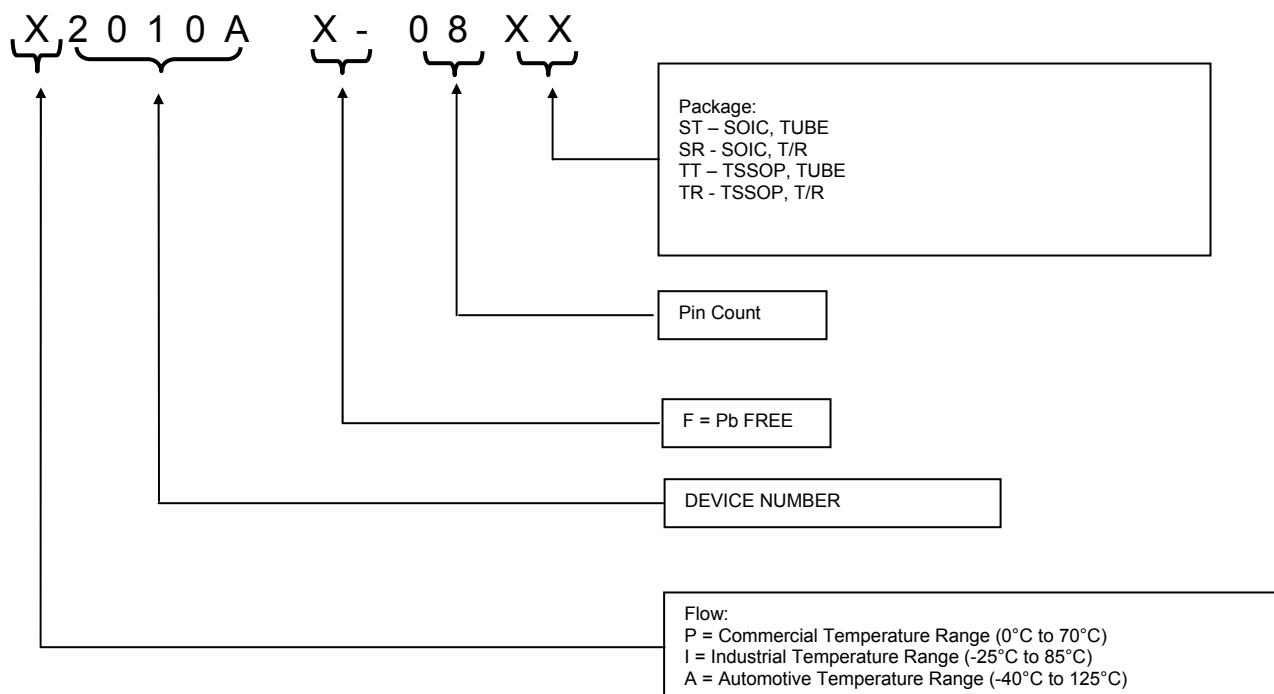


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## Ordering Codes

| Part Number | Marking | Package Type             | Qty per reel | Temperature (°C) |
|-------------|---------|--------------------------|--------------|------------------|
| P2010A-08ST | P2010A  | 8 PIN SOIC, TUBE         |              | 0 TO 70          |
| P2010A-08SR | P2010A  | 8 PIN SOIC, TAPE & REEL  | 2,500        | 0 TO 70          |
| P2010A-08TT | P2010A  | 8 PIN TSSOP, TUBE        |              | 0 TO 70          |
| P2010A-08TR | P2010A  | 8 PIN TSSOP, TAPE & REEL | 2,500        | 0 TO 70          |

## Device Ordering Information



Licensed under US patent Nos 5,488,627 and 5,631,920.  
 Preliminary datasheet. Specification subject to change without notice.



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