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# Low-Power EMI Reduction IC

## Features

- FCC approved method of EMI attenuation
- Provides up to 15 dB EMI reduction
- Generates 1X, 2X, and 4X low EMI spread spectrum clock of the input frequency
- 1X: P2811, 2X: P2812, 4X: P2814
- Optimized for input frequency range from 10 to 40 MHz P2811: 10 to 40 MHz P2812: 10 to 40 MHz P2814: 10 to 40 MHz
- Internal loop filter minimizes external components and board space
- Selectable spread options: Down Spread and Center Spread
- Low inherent cycle-to-cycle jitter
- Eight spread % selections: ±0.625% to –3.5%
- 3.3 V operating voltage
- CMOS/TTL compatible inputs and outputs
- Pinout compatible with Cypress CY25811, CY25812, and CY25814
- Products available for industrial temperature range
- Available in 8-pin SOIC and TSSOP

## Product Description

The P28xx is a versatile spread spectrum frequency modulator designed specifically for input clock frequencies from 10 to 40 MHz (see Input/Output Frequency Range Selections). The P28xx can generate an EMI reduced clock from crystal, ceramic resonator, or system clock. The P28xx-A and P28xx-B offer various combinations of spread options and percentage deviations (see Output Frequency Deviation and Spread Option Selections section). These combinations include Down Spread, Center Spread and percentage deviation range from ±0.625% to -3.50%.

The P28xx reduces electromagnetic interference (EMI) at the clock source, allowing a system wide EMI reduction for all the down stream clocks and data dependent signals. The P28xx allows significant system cost savings by reducing the number of circuit board layers, ferrite beads, shielding, and other passive components that are traditionally required to pass EMI regulations.

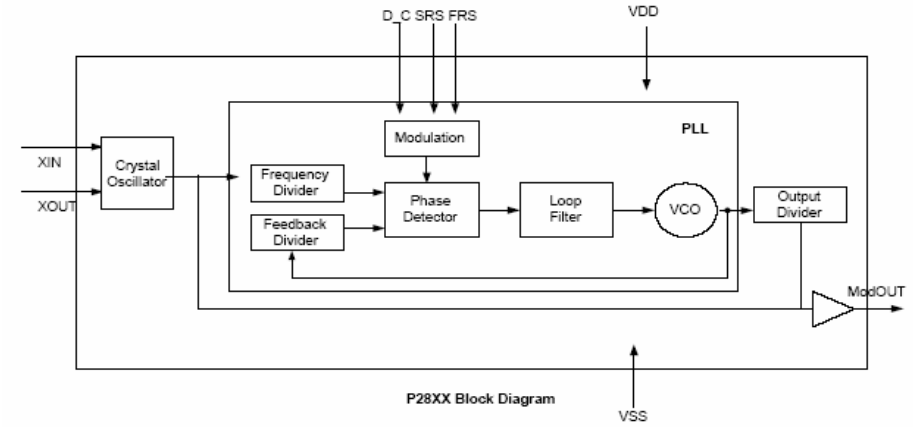
The P28xx modulates the output of a single PLL in order to "spread" the bandwidth of a synthesized clock, thereby decreasing the peak amplitudes of its harmonics. This results in significantly lower system EMI compared to the typical narrow band signal produced by oscillators and most clock generators. Lowering EMI by increasing a signal's bandwidth is called "spread spectrum clock generation".

The P28xx uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all-digital method.

## Applications

The P28xx is targeted towards EMI management for memory interfaces in mobile graphic chipsets and high-speed digital applications such as PC peripheral devices, consumer electronics, and embedded controller systems.

## Block Diagram




P28XX Block Diagram

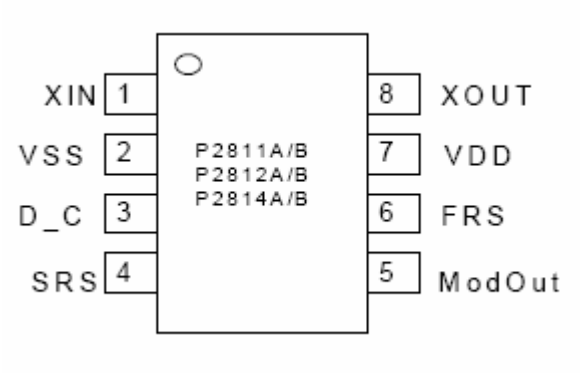
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### Pin Configuration




### Pin Description

| Pin# | Pin Name | Type | Description |
|---|---|---|---|
| 1 | XIN | I | Connect to externally generated clock signal or crystal. |
| 2 | VSS | P | Ground Connection. Connect to system ground. |
| 3 | D_C | I | Digital logic input used to select Down (LOW) or Center (HIGH) Spread Options (see Output Frequency Deviation and Spread Option Selections). This pin has an internal pull-up resistor. |
| 4 | SRS | I | Spread Range Selection. Digital logic input used to select frequency deviation (see Output Frequency Deviation and Spread Option Selections). This pin has an internal pull-up resistor. |
| 5 | ModOut | O | Spread Spectrum clock output (see Input/Output Frequency Range Selections and Output Frequency Deviation and Spread Option Selections). |
| 6 | FRS | I | Frequency Range Selection. Digital logic input used to select input frequency range (see Input/Output Frequency Range Selections). This pin has an internal pull-up resistor. |
| 7 | VDD | P | Connect to +3.3 V |
| 8 | XOUT | I | Connect to crystal. No connect if externally generated clock signal is used. |

### Input/Output Frequency Range Selections

| Pin 6 | Part number | | | | | | Modulation rate |
|---|---|---|---|---|---|---|---|
| | P2811 (1X) | | P2812 (2X) | | P2814 (4X) | | |
| FRS | Input (MHz) | Output (MHz) | Input (MHz) | Output (MHz) | Input (MHz) | Output (MHz) | |
| 0 | 10-20 | 10-20 | 10-20 | 20-40 | 10-20 | 40-80 | Input frequency / 448 |
| 1 | 20-40 | 20-40 | 20-40 | 40-80 | 20-40 | 80-160 | Input frequency / 896 |

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### Output Frequency Deviation and Spread Option Selections

| Part number | Pin 3 D_C | Pin 4 SRS | Output frequency deviation and spread option |
|---|---|---|---|
| P2811/12/14A | 0 | 0 | -2.50% (Down) |
| | 0 | 1 | -3.50% (Down) |
| | 1 | 0 | +/-1.25% (Center) |
| | 1 | 1 | +/-1.75% (Center) |
| P2811/12/14B | 0 | 0 | -1.25% (Down) |
| | 0 | 1 | -1.75% (Down) |
| | 1 | 0 | +/-0.625% (Center) |
| | 1 | 1 | +/-0.875% (Center) |

### 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

3.3 V, 25° C

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $V_{IL}$ | Input Low Voltage | GND – 0.3 | – | 0.8 | V |
| $V_{IH}$ | Input High Voltage | – | – | $V_{DD}$ + 0.3 | V |
| $I_{IL}$ | Input low Current (inputs D_C, SRS, and FRS) | -60.00 | – | -20.00 | µA |
| $I_{IH}$ | Input High Current | – | – | 1.00 | µA |
| $I_{XOL}$ | XOUT Output Low Current (@ 0.4V, VDD = 3.3V) | 2.00 | – | 12.00 | mA |
| $I_{XOH}$ | XOUT Output High Current (@ 2.5V, VDD = 3.3V) | – | – | 12.00 | mA |
| $V_{OL}$ | Output Low Voltage (VDD=3.3V, IOL = 20 mA) | – | – | 0.4 | V |
| $V_{OH}$ | Output High Voltage (VDD=3.3V, IOH = 20 mA) | – | – | 2.8 | V |
| $I_{DD}$ | Static Supply Current Standby Mode | – | 4.5 | – | mA |
| $I_{CC}$ | Dynamic Supply Current Normal Mode (3.3V and 25 pF probe loading) | 7.1 fIN-min | – | 13.9 $f_{IN-max}$ | mA |
| $V_{DD}$ | Operating Voltage | – | 3.3 | – | V |
| $t_{ON}$ | Power Up Time (First locked clock cycle after power up) | – | 0.18 | – | mS |
| $Z_{OUT}$ | Clock Output Impedance | – | 50 | – | Ω |

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**AC Electrical Characteristics**
3.3 V, 25° C

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $f_{IN}$ | Input frequency P2811/12/14 | 10 | – | 40 | MHz |
| $f_{OUT}$ | Output frequency P2811 | 10 | – | 40 | MHz |
| | Output frequency P2812 | 20 | – | 80 | MHz |
| | Output frequency P2814 | 40 | – | 160 | MHz |
| $t_{LH}$ [1] | Output rise time (measured at 0.8V to 2.0V) | | 0.69 | | ns |
| $t_{HL}$ [1] | Output fall time (measured at 2.0V to 0.8V) | | 0.66 | | ns |
| $t_{JC}$ | Jitter (cycle to cycle) | -200 | – | 200 | ps |
| $t_D$ | Output duty cycle | 45 | 50 | 55 | % |
| 1. tLH and tHL are measured into a capacitive load of 15 pF | | | | | |

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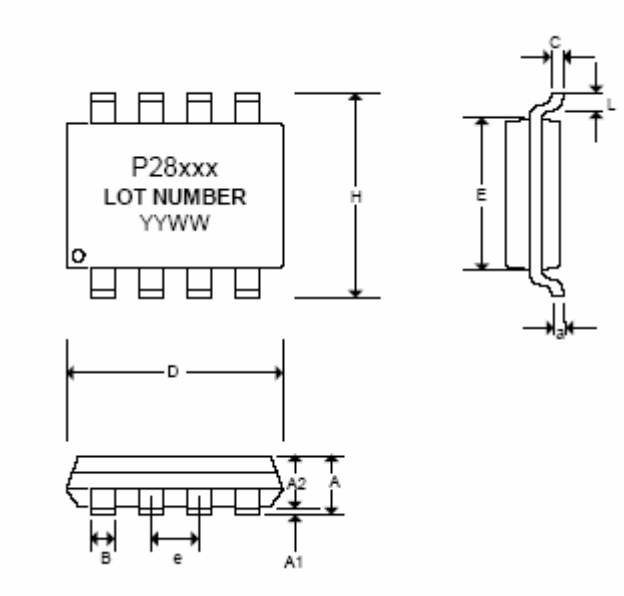


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**Package Information**

## 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° |

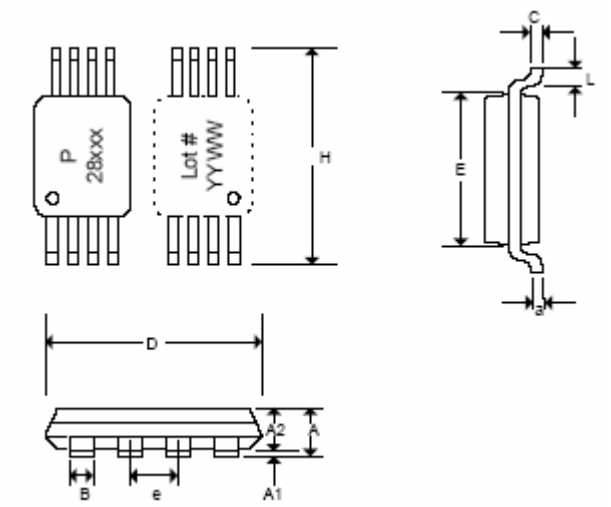
Note: Controlling dimensions are millimeters
SOIC – 0.074 grams unit weight

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## Mechanical Package Outline 8-Pin TSSOP




| | Dimensions in inches | | | Dimensions in millimeters | | |
|---|---|---|---|---|---|---|
| **Symbol** | **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
TSSOP – 0.034 grams unit weight

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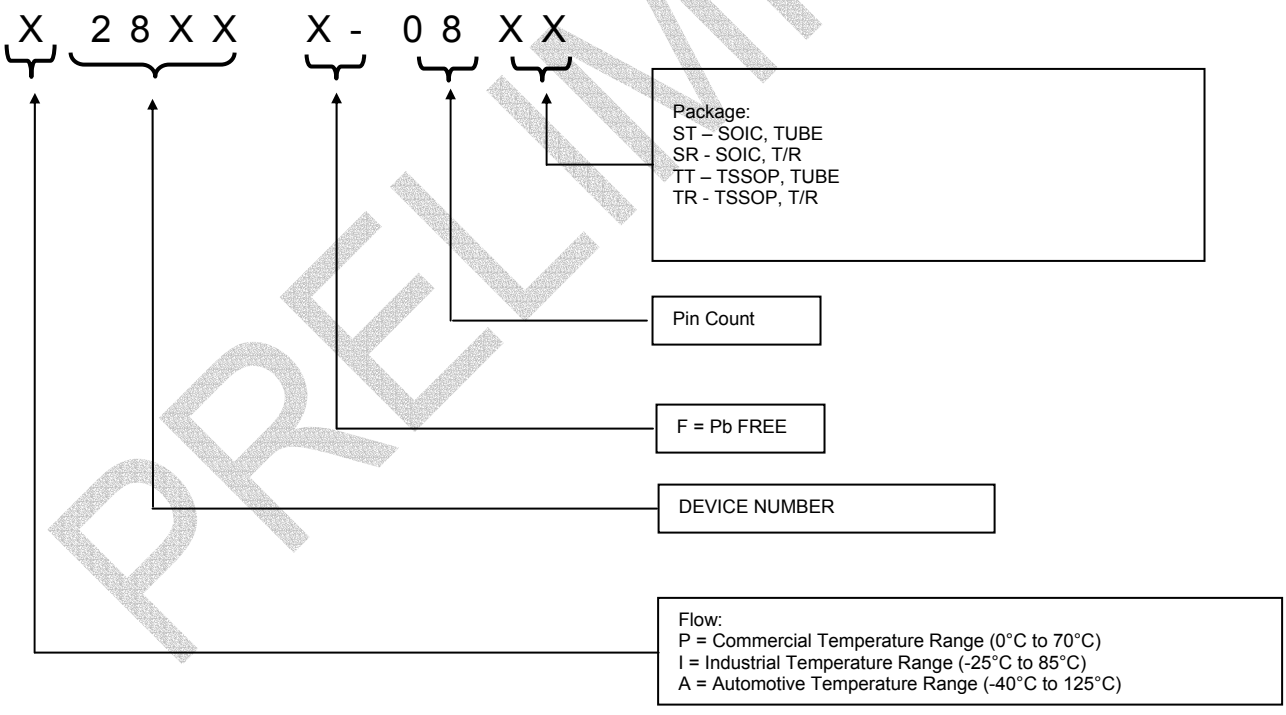
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### Ordering Codes

| Part Number | Marking | Package Type | Qty per reel | Temperature |
|---|---|---|---|---|
| P2811A-08ST | P2811A | 8-pin SOIC, tube | | 0 to 70 |
| P2812A-08ST | P2812A | 8-pin SOIC, tube | | 0 to 70 |
| P2814A-08ST | P2814A | 8-pin SOIC, tube | | 0 to 70 |
| P2811A-08SR | P2811A | 8-pin SOIC, tape reel | 2,500 | 0 to 70 |
| P2812A-08SR | P2812A | 8-pin SOIC, tape reel | 2,500 | 0 to 70 |
| P2814A-08SR | P2814A | 8-pin SOIC, tape reel | 2,500 | 0 to 70 |
| P2811A-08TT | P2811A | 8-pin TSSOP, tube | | 0 to 70 |
| P2812A-08TT | P2812A | 8-pin TSSOP, tube | | 0 to 70 |
| P2814A-08TT | P2814A | 8-pin TSSOP, tube | | 0 to 70 |
| P2811A-08TR | P2811A | 8-pin TSSOP, tape reel | 2,500 | 0 to 70 |
| P2812A-08TR | P2812A | 8-pin TSSOP, tape reel | 2,500 | 0 to 70 |
| P2814A-08TR | P2814A | 8-pin TSSOP, tape reel | 2,500 | 0 to 70 |

### Device Ordering Information




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



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