ON Semiconductor®

# P2180 / 81 / 82 / 83 / 84

# Peak Reducing EMI Solution

## Features

- FCC approved method of EMI attenuation.
- Provides up to 15dB EMI reduction.
- Generates a 1X low EMI spread spectrum clock from the input frequency.
- Optimized for frequency range:
  - P2180 / 84: 20MHz to 40MHz
  - P2181: 60MHz to 160MHz
  - P2182 / 83: 10MHz to 20MHz
- 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%.
- 3.3V operating voltage.
- CMOS/TTL compatible inputs and outputs.
- Low-power CMOS design.
- Supports notebook VGA and other LCD timing controller applications.
- Drop-in replacement to Cypress W180/1.
- Products are available for industrial temperature range.
- Available in 8-pin SOIC and TSSOP packages.

## Product Description

The P2180/81X is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies from 20MHz to 40MHz and 60MHz to 160MHz *(*Refer to *Input Frequency and Modulation Rate Table.)* The P2180/81X can generate an EMI reduced clock form an OSC or a system generated clock. The P2180/81A to P2180/81D offer various combinations of spread options and percentage deviations. *(*Refer to *Spread Deviation Selections Table.)* These combinations include Down and Center Spread and percentage deviation range from ± 0.625% to –3.50%.

The P2180/81X reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of down stream clock and data dependent signals. The P2180/81X allows significant system cost savings by reducing the number of circuit board layers and shielding that are traditionally required to pass EMI regulations.

The P2180/81X 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 P2180/81X uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all-digital method.

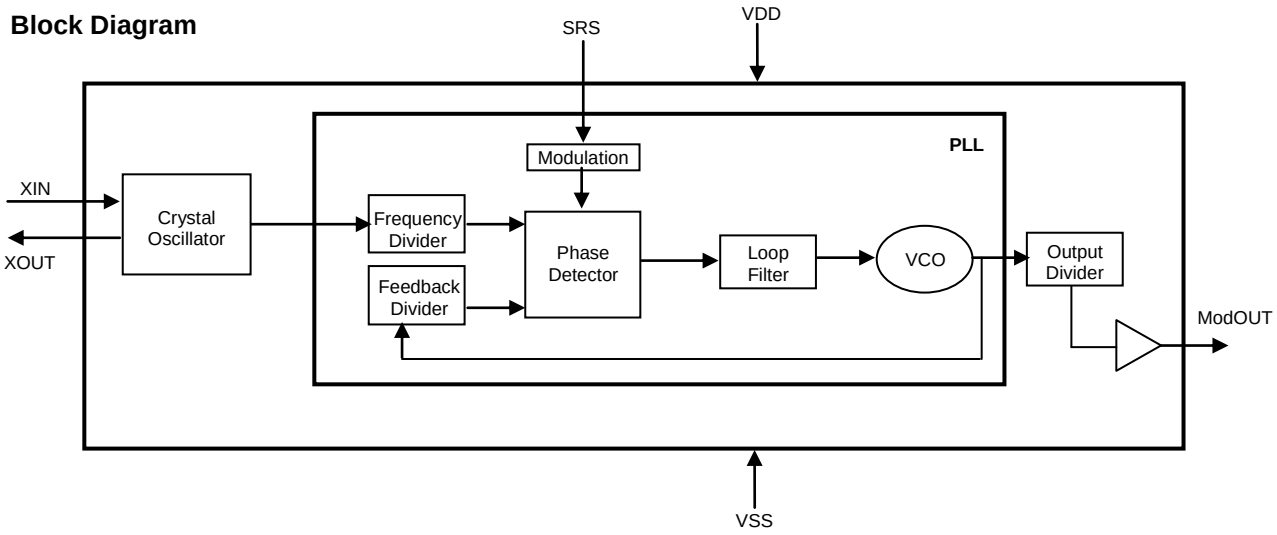
## Applications

The P2180/81X is targeted towards EMI management for memory and LVDS interfaces in mobile graphic chipsets and high-speed digital applications such as PC peripheral devices, consumer electronics, and embedded controller systems.

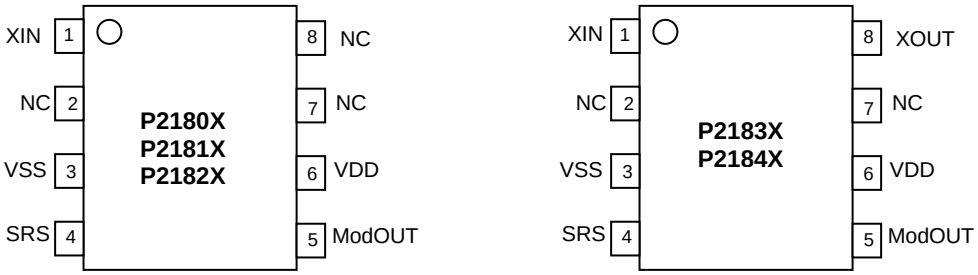

JANUARY 2010 – Rev. 2

Publication Order Number:
P2180/D

## Block Diagram




## Pin Diagram




## Pin Description

| Pin# | Pin Name | Type | Description |
|---|---|---|---|
| 1 | XIN | I | Connect to externally generated clock signal or crystal. |
| 2 | NC | | No connect. |
| 3 | VSS | P | Ground to entire chip. |
| 4 | SRS | I | Spread Range Select. Digital logic input used to select frequency deviation (Refer to *Spread Deviation Selections Table*). This pin has an internal pull-up resistor. |
| 5 | ModOUT | O | Spread spectrum low EMI output. |
| 6 | VDD | P | Connect to +3.3V. |
| 7 | NC | | No connect. |
| 8 | NC | | No connect. |
| 8[1] | XOUT | O | Crystal connection. |

Note: 1. Available for P2183 and P2184 only.

**Input Frequency and Modulation Rate**

| Part Number | Input Frequency Range (MHz) | Output Frequency Range (MHz) | Modulation Rate |
|---|---|---|---|
| P2180/P2184 | 20 to 40 | 20 to 40 | Input frequency / 768 |
| P2181 | 60 to 160 | 60 to 160 | Input frequency / 2048 |
| P2182/P2183 | 10 to 20 | 10 to 20 | TBD |

**Spread Deviation Selections**

| Part Number | SRS | Spread Deviation |
|---|---|---|
| P2180/1/2/3/4 **A** | 0 | -1.25% (Down) |
| | 1 | -1.75% (Down) |
| P2180/1/2/3/4 **B** | 0 | ±1.25% (Center) |
| | 1 | ±1.75% (Center) |
| P2180/1/2/3/4 **C** | 0 | -2.50% (Down) |
| | 1 | -3.50 (Down) |
| P2180/1/2/3/4 **D** | 0 | ±0.625%(Center) |
| | 1 | ±0.875% (Center) |

**Absolute Maximum Ratings**

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| VDD, $V_{IN}$ | Voltage on any pin with respect to Ground | -0.5 to +4.6 | 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

Unless otherwise noted, $V_{DD}$ = 3.3V and $T_A$ =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 (input SRS) | -60.0 | - | -20.0 | µA |
| $I_{IH}$ | Input high current | - | - | 1.00 | µA |
| $I_{XOL}$ | $X_{OUT}$ output low current (@ 0.4V, $V_{DD}$ = 3.3V) | 2.00 | - | 12.00 | mA |
| $I_{XOH}$ | $X_{OUT}$ output high current (@ 2.5V, $V_{DD}$ = 3.3V) | - | - | 12.00 | mA |
| $V_{OL}$ | Output low voltage ($V_{DD}$ = 3.3V, $I_{OL}$ = 20mA) | - | - | 0.4 | V |
| $V_{OH}$ | Output high voltage ($V_{DD}$ = 3.3V, $I_{OH}$ = 20mA) | 2.8 | - | - | V |
| $I_{CC}$ | Dynamic supply current normal mode (3.3V and 10pF loading) | 8.6 $f_{IN}$ - min | - | 27.0 $f_{IN}$ - max | mA |
| $I_{DD}$ | Static supply current standby mode | - | 4.5 | - | mA |
| $V_{DD}$ | Operating voltage | - | 3.3 | - | V |
| $t_{ON}$ | Power up time (first locked clock cycle after power up) | - | - | - | mS |
| $Z_{OUT}$ | Clock output impedance | - | - | - | Ω |

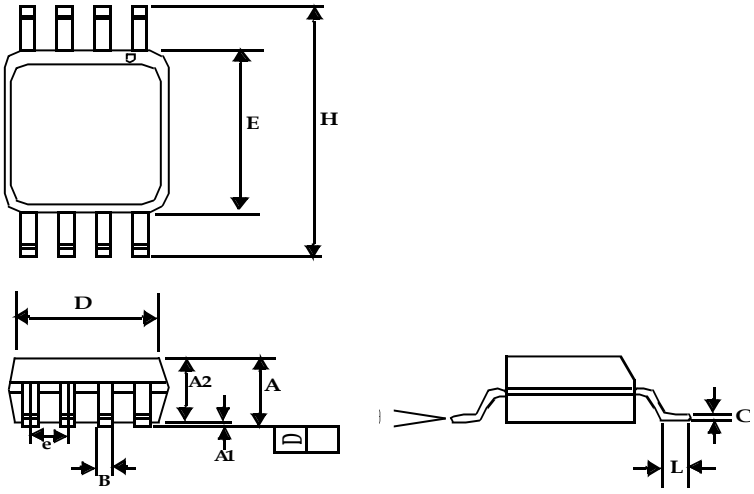
## AC Electrical Characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $f_{IN}$ | Input frequency | 10 | - | 160 | MHz |
| $f_{OUT}$ | Output frequency | 10 | - | 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 | % |

Note: 1. $t_{LH}$ and $t_{HL}$ are measured into a capacitive load of 15pF.

## Package Information

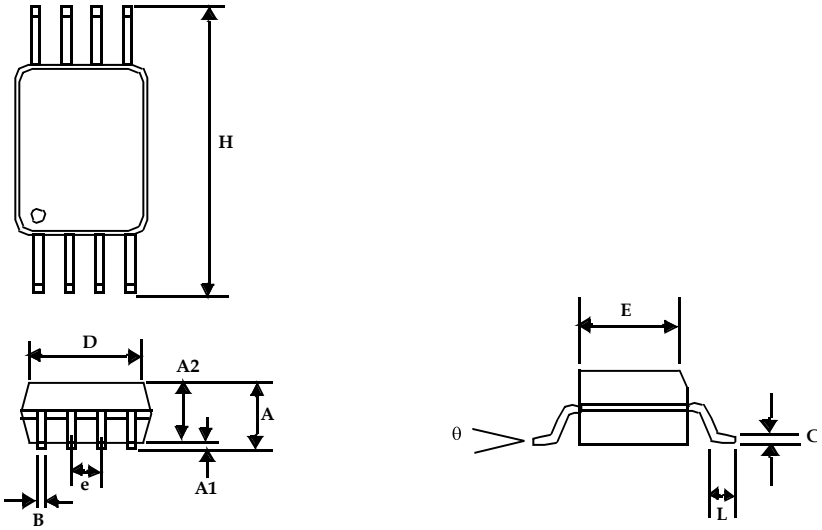
### 8-Pin SOIC Package




| 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° |

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

**8-Pin TSSOP**



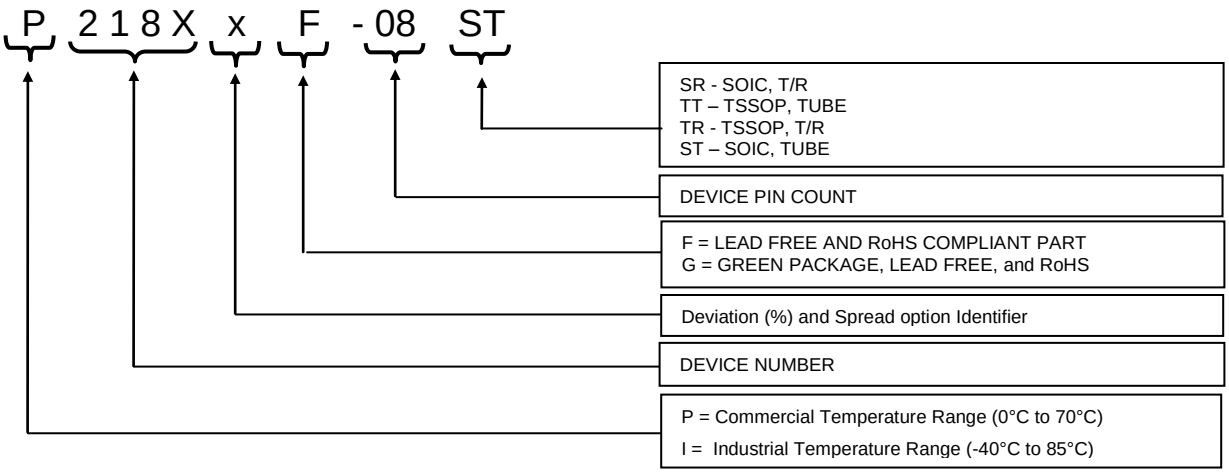

| Symbol | Dimensions | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | | 0.043 | | 1.10 |
| A1 | 0.002 | 0.006 | 0.05 | 0.15 |
| A2 | 0.033 | 0.037 | 0.85 | 0.95 |
| B | 0.008 | 0.012 | 0.19 | 0.30 |
| c | 0.004 | 0.008 | 0.09 | 0.20 |
| D | 0.114 | 0.122 | 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 |
|---|---|---|---|
| P218XxF-08-ST | P2181XxF | 8-Pin SOIC, Tube, Pb Free | Commercial |
| P218XxF-08-SR | P2181XxF | 8-Pin SOIC, Tape and Reel, Pb Free | Commercial |
| P218XxF-08-TT | P2181XxF | 8-Pin TSSOP, Tube, Pb Free | Commercial |
| P218XxF-08-TR | P2181XxF | 8-Pin TSSOP, Tape and Reel, Pb Free | Commercial |
| P218XxG-08-ST | P2181XxG | 8-Pin SOIC, Tube, Green | Commercial |
| P218XxG-08-SR | P2181XxG | 8-Pin SOIC, Tape and Reel, Green | Commercial |
| P218XxG-08-TT | P2181XxG | 8-Pin TSSOP, Tube, Green | Commercial |
| P218XxG-08-TR | P2181XxG | 8-Pin TSSOP, Tape and Reel, Green | Commercial |

Note: X= 0 / 1 / 2 / 3 / 4
x= A / B / C / D

## Device Ordering Information



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



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