# P2779A

*Product Preview*

# Low-Cost Notebook EMI Reduction IC

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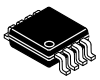
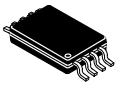
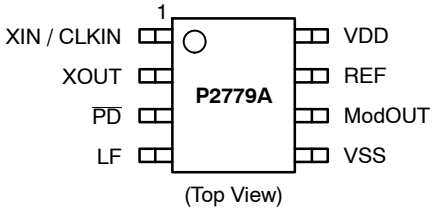


**SOIC−8**
**S SUFFIX**
**CASE 751BD**



**TSSOP−8**
**T SUFFIX**
**CASE 948AL**

**PIN CONFIGURATION**




(Top View)

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

### Product Description

The P2779A is a versatile spread spectrum frequency modulator designed specifically for mobile and digital camera and other digital video and imaging applications. The P2779A reduces electromagnetic interference (EMI) at the clock source, which provides system−wide reduction of EMI of all clock dependent signals. The P2779A allows significant system cost savings by reducing the number of circuit board layers and shielding that are traditionally required to pass EMI regulations.

The P2779A uses the most efficient and optimized modulation profile approved by the FCC.

The P2779A 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 P2779A is targeted toward mobile 3D graphics chip set applications.

### Features

- Provides up to 15 dB of EMI Suppression
- FCC Approved Method of EMI Attenuation
- Generates a 1X Low EMI Spread Spectrum Clock of the Input Frequency
- Operates between 20 MHz and 38 MHz Input Frequency Range
- External Loop Filter for Spread Percentage Adjustment
- Spreading Ranges from ±0.25% to ±2.5%
- Ultra Low Cycle−to−Cycle Jitter
- Zero−Cycle Slip at Small Deviations
- 3.3 V Operating Voltage
- Low Power CMOS Design
- Available in 8−pin SOIC and TSSOP Packages
- Available in Industrial Temperature Operating Range (−40°C to +85°C)
- These are Pb−Free Devices

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

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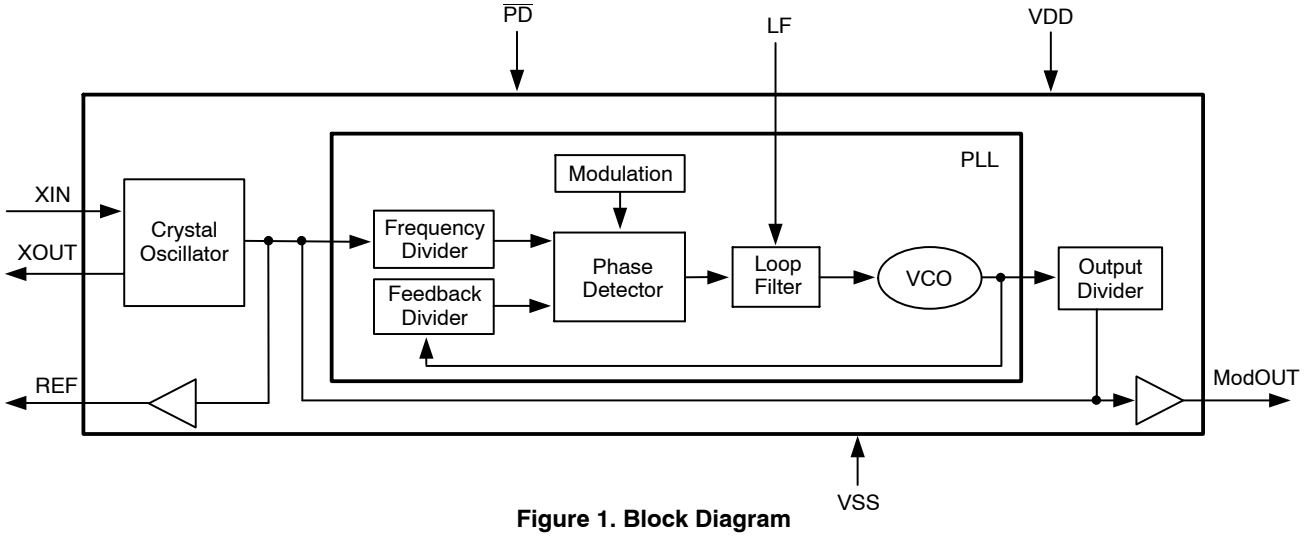



**Figure 1. Block Diagram**

**Table 1. ABSOLUTE MAXIMUM RATINGS**

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| $V_{DD}$, $V_{IN}$ | 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 | −40 to +85 | °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 |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Table 2. PIN DESCRIPTION**

| Pin# | Pin Name | Type | Description |
|---|---|---|---|
| 1 | XIN / CLKIN | I | Connect to crystal or clock input. |
| 2 | XOUT | O | Crystal output. |
| 3 | $\overline{PD}$ | I | Power−down control pin. Pull low to enable power−down mode.<br>This pin has an internal pull−up resistor. (Note 1) |
| 4 | LF | I | External loop filter for the PLL. By changing the value of the CRC circuit, the percentage spread can be adjusted accordingly.<br>(See *Loop Filter Selection Table* for detail values.) |
| 5 | VSS | P | Ground connection. Connect to system ground. |
| 6 | ModOUT | O | Spread spectrum clock output. |
| 7 | REF | O | Provides a reference clock output of the input frequency. |
| 8 | VDD | P | Connect to +3.3 V. |

1. Connect to VDD if not used.

**Loop Filter Selection Table VDD 3.3 V**

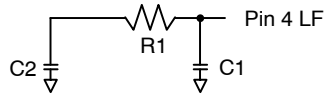



**Table 3. LOOP FILTER SELECTION TABLE VDD 3.3 V** (Note 2)

| Input (MHz) | FS1 | FS0 | BW = ±0.50% | | | BW = ±0.75% | | | BW = ±1.00% | | | BW = ±1.25% | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C1 (pF) | C2 (pF) | R1 (Ω) | C1 (pF) | C2 (pF) | R1 (Ω) | C1 (pF) | C2 (pF) | R1 (Ω) | C1 (pF) | C2 (pF) | R1 (Ω) |
| 20 | 1 | 0 | 270 | 100,000 | 330 | 270 | 100,000 | 560 | 270 | 100,000 | 750 | 560 | 100,000 | 910 |
| 21–22 | 1 | 0 | 270 | 100,000 | 390 | 270 | 100,000 | 620 | 270 | 100,000 | 866(1%) | 560 | 100,000 | 1,100 |
| 23–24 | 1 | 0 | 270 | 100,000 | 510 | 270 | 100,000 | 750 | 270 | 10,000 | 1,000 | 680 | 6,800 | 1,200 |
| 25–26 | 1 | 0 | 270 | 100,000 | 560 | 270 | 100,000 | 820 | 270 | 12,000 | 1,200 | 470 | 4,700 | 1,200 |
| 27–28 | 1 | 0 | 270 | 100,000 | 620 | 270 | 100,000 | 1,000 | 270 | 6,800 | 1,200 | 330 | 3,300 | 1,200 |
| 29–30 | 1 | 0 | 270 | 100,000 | 750 | 270 | 100,000 | 1,100 | 270 | 3,900 | 1,200 | 330 | 3,300 | 1,500 |
| 31–32 | 1 | 0 | 270 | 100,000 | 820 | 270 | 100,000 | 1,200 | 270 | 12,000 | 2,200 | 680 | 6,800 | 2,200 |
| 33–34 | 1 | 0 | 270 | 100,000 | 910 | 270 | 100,000 | 1,300 | 270 | 10,000 | 2,200 | 390 | 3,900 | 2,200 |
| 35–36 | 1 | 0 | 270 | 100,000 | 1,000 | 270 | 100,000 | 1,500 | 270 | 5,600 | 2,200 | 270 | 2,700 | 2,200 |
| 37–38 | 1 | 0 | 270 | 100,000 | 1,200 | 270 | 100,000 | 1,600 | 270 | 3,300 | 2,200 | 270 | 2,700 | 2,700 |

2. Please contact factory for loop filter values if desired spread settings are not listed.

**Spread Spectrum Selection**

The P2779A performs zero cycle slip when set at low percentage spreading. This prevents any occurrence of system timing error. 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 that the center frequency is the frequency of the external reference input on XIN / CLKIN, pin 1.)

The P2779A is designed for PC peripheral, networking, notebook PC, and LCD monitor applications. It is optimized for operation from 20 MHz to 38 MHz. The P2779A's spread percentage selection is determined by the external LF value specified in the *Loop Filter Selection Table*. The external LF allows the user to fine tune the spread percentage to optimize the EMI reduction benefits of the spread spectrum.

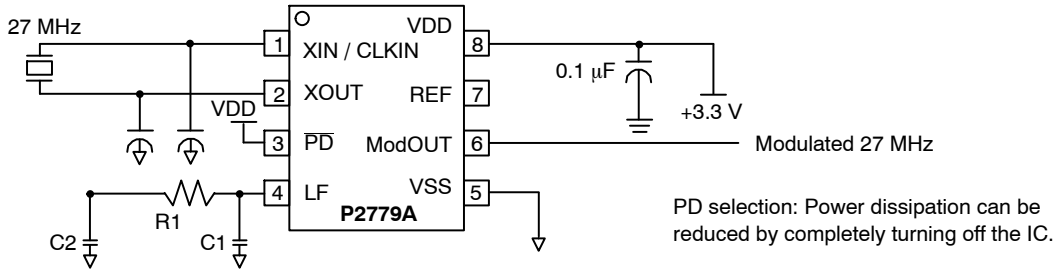



**Figure 2. Application Schematic**

**Table 4. DC ELECTRICAL CHARACTERISTICS**

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $V_{IL}$ | Input low voltage | VSS − 0.3 | – | 0.8 | V |
| $V_{IH}$ | Input high voltage | 2.0 | – | VDD + 0.3 | V |
| $I_{IL}$ | Input low current | – | 60 | – | μA |
| $I_{IH}$ | Input high current | – | 0 | – | μA |
| $I_{XOL}$ | XOUT output low current (at 0.4 V, $V_{DD}$ = 3.3 V) | – | 10 | – | mA |
| $I_{XOH}$ | XOUT output high current (at 2.5 V, $V_{DD}$ = 3.3 V) | – | 10 | – | mA |
| $V_{OL}$ | Output low voltage ($V_{DD}$ = 3.3 V, $I_{OL}$ = 20 mA) | – | – | 0.4 | V |
| $V_{OH}$ | Output high voltage ($V_{DD}$ = 3.3 V, $I_{OH}$ = 20 mA) | 2.5 | – | – | V |
| $I_{DD}$ | Static supply current | – | 3 | – | mA |
| $I_{CC}$ | Dynamic supply current (3.3 V, 25 pF loading, 32 MHz) | – | 12 | – | mA |
| $V_{DD}$ | Operating voltage | 3.0 | 3.3 | 3.6 | V |
| $t_{ON}$ | Power−up time (first locked cycle after power up) | – | 7 | – | mS |
| $Z_{OUT}$ | Clock output impedance | – | 28 | – | Ω |

**Table 5. AC ELECTRICAL CHARACTERISTICS**

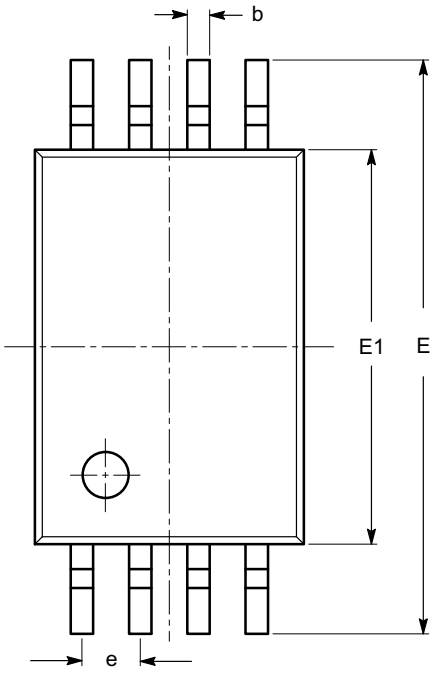
| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $f_{IN}$ | Input frequency | 20 | – | 38 | MHz |
| $f_{OUT}$ | Output frequency | 20 | – | 38 | MHz |
| $t_{LH}$ (Note 3) | Output rise time (measured at 0.8 V to 2.0 V) | – | 1 | – | nS |
| $t_{HL}$ (Note 3) | Output fall time (measured at 2.0 V to 0.8 V) | – | 1 | – | nS |
| $t_{JC}$ | Jitter (Cycle−to−cycle) | – | ±175 | – | pS |
| $t_D$ | Output duty cycle | 45 | 50 | 55 | % |

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

**Static Discharge Voltage (As per JEDEC STD22− A114−B)**

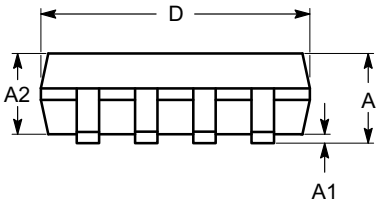
## PACKAGE DIMENSIONS

**TSSOP8, 4.4x3**
CASE 948AL−01
ISSUE O

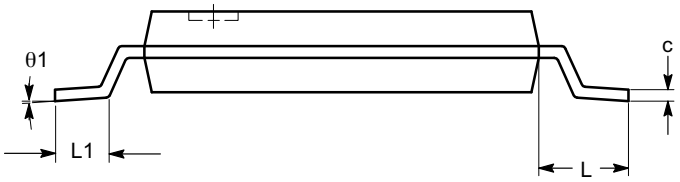



**TOP VIEW**

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | | | 1.20 |
| A1 | 0.05 | | 0.15 |
| A2 | 0.80 | 0.90 | 1.05 |
| b | 0.19 | | 0.30 |
| c | 0.09 | | 0.20 |
| D | 2.90 | 3.00 | 3.10 |
| E | 6.30 | 6.40 | 6.50 |
| E1 | 4.30 | 4.40 | 4.50 |
| e | 0.65 BSC | | |
| L | 1.00 REF | | |
| L1 | 0.50 | 0.60 | 0.75 |
| θ | 0º | | 8º |




**SIDE VIEW**



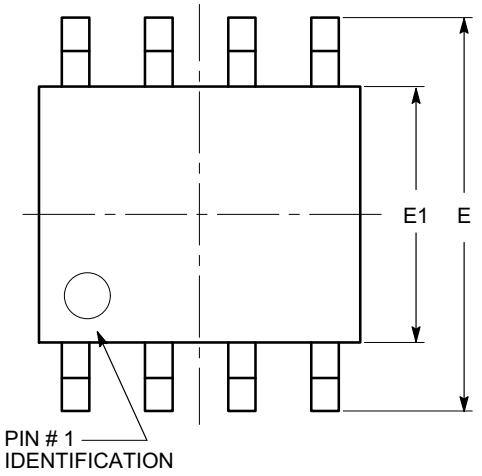

**END VIEW**

**Notes:**

(1) All dimensions are in millimeters. Angles in degrees.
(2) Complies with JEDEC MO-153.

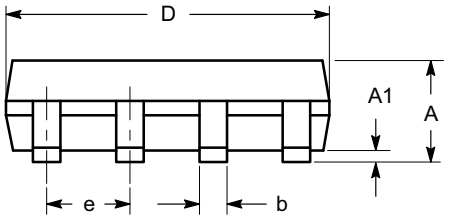
## PACKAGE DIMENSIONS

**SOIC 8, 150 mils**
CASE 751BD−01
ISSUE O

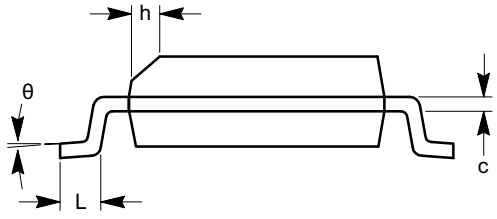



**TOP VIEW**

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 1.35 | | 1.75 |
| A1 | 0.10 | | 0.25 |
| b | 0.33 | | 0.51 |
| c | 0.19 | | 0.25 |
| D | 4.80 | | 5.00 |
| E | 5.80 | | 6.20 |
| E1 | 3.80 | | 4.00 |
| e | 1.27 BSC | | |
| h | 0.25 | | 0.50 |
| L | 0.40 | | 1.27 |
| θ | 0º | | 8º |




**SIDE VIEW**




**END VIEW**

**Notes:**
(1) All dimensions are in millimeters. Angles in degrees.
(2) Complies with JEDEC MS-012.

**Table 6. ORDERING INFORMATION**

| Part Number | Marking | Package Type | Temperature |
|---|---|---|---|
| P2779AF−08−ST | P2779AF | 8−Pin SOIC, Tube, Pb Free | Commercial |
| P2779AF−08−SR | P2779AF | 8−Pin SOIC, Tape and Reel, Pb Free | Commercial |
| P2779AG−08−ST | P2779AG | 8−Pin SOIC, Tube, Green | Commercial |
| P2779AG−08−SR | P2779AG | 8−Pin SOIC, Tape and Reel, Green | Commercial |
| I2779AF−08−ST | I2779AF | 8−Pin SOIC, Tube, Pb Free | Industrial |
| I2779AF−08−SR | I2779AF | 8−Pin SOIC, Tape and Reel, Pb Free | Industrial |
| I2779AG−08−ST | I2779AG | 8−Pin SOIC, Tube, Green | Industrial |
| I2779AG−08−SR | I2779AG | 8−Pin SOIC, Tape and Reel, Green | Industrial |
| P2779AF−08−TT | P2779AF | 8−Pin TSSOP, Tube, Pb Free | Commercial |
| P2779AF−08−TR | P2779AF | 8−Pin TSSOP, Tape and Reel, Pb Free | Commercial |
| P2779AG−08−TT | P2779AG | 8−Pin TSSOP, Tube, Green | Commercial |
| P2779AG−08−TR | P2779AG | 8−Pin TSSOP, Tape and Reel, Green | Commercial |
| I2779AF−08−TT | I2779AF | 8−Pin TSSOP, Tube, Pb Free | Industrial |
| I2779AF−08−TR | I2779AF | 8−Pin TSSOP, Tape and Reel, Pb Free | Industrial |
| I2779AG−08−TT | I2779AG | 8−Pin TSSOP, Tube, Green | Industrial |
| I2779AG−08−TR | I2779AG | 8−Pin TSSOP, Tape and Reel, Green | Industrial |

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