

# P2779A

## Product Preview

# Low-Cost Notebook EMI Reduction IC

### 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  $\pm 0.25\%$  to  $\pm 2.5\%$
- 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 ( $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ )
- These are Pb-Free Devices

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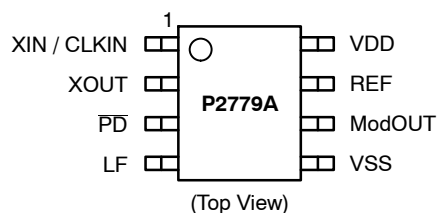


SOIC-8  
S SUFFIX  
CASE 751BD



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.

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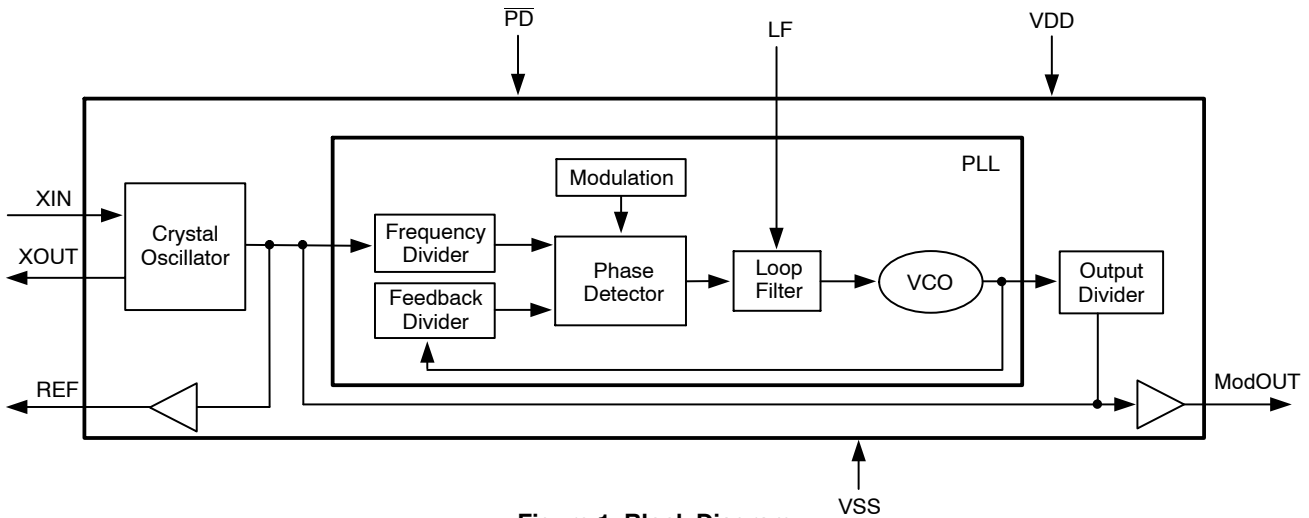


Figure 1. Block Diagram

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.

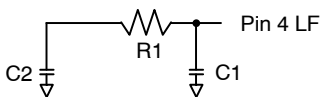
Table 2. PIN DESCRIPTION

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. 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. (See <i>Loop Filter Selection Table</i> 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.

# P2779A

## Loop Filter Selection Table VDD 3.3 V



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

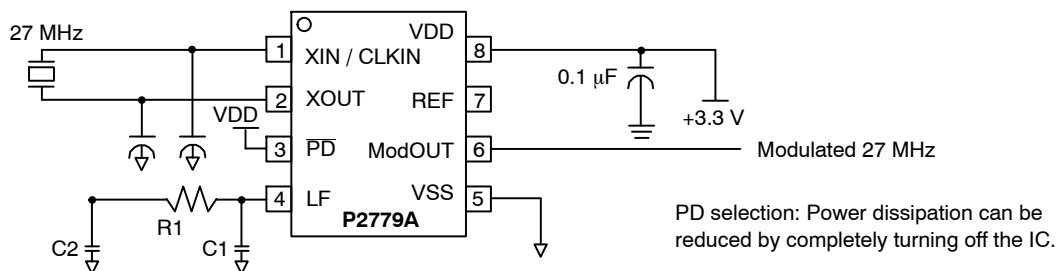
Input (MHz)	FS1	FS0	BW = ±0.50%			BW = ±0.75%			BW = ±1.00%			BW = ±1.25%		
			C1 (pF)	C2 (pF)	R1 (Ω)	C1 (pF)	C2 (pF)	R1 (Ω)	C1 (pF)	C2 (pF)	R1 (Ω)	C1 (pF)	C2 (pF)	R1 (Ω)
20	1	0	270	100,000	330	270	100,000	560	270	100,000	750	560	100,000	910
21–22	1	0	270	100,000	390	270	100,000	620	270	100,000	866(1%)	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 <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	–	60	–	μA
I <sub>IH</sub>	Input high current	–	0	–	μA
I <sub>XOL</sub>	XOUT output low current (at 0.4 V, V <sub>DD</sub> = 3.3 V)	–	10	–	mA
I <sub>XOH</sub>	XOUT output high current (at 2.5 V, V <sub>DD</sub> = 3.3 V)	–	10	–	mA
V <sub>OL</sub>	Output low voltage (V <sub>DD</sub> = 3.3 V, I <sub>OL</sub> = 20 mA)	–	–	0.4	V
V <sub>OH</sub>	Output high voltage (V <sub>DD</sub> = 3.3 V, I <sub>OH</sub> = 20 mA)	2.5	–	–	V
I <sub>DD</sub>	Static supply current	–	3	–	mA
I <sub>CC</sub>	Dynamic supply current (3.3 V, 25 pF loading, 32 MHz)	–	12	–	mA
V <sub>DD</sub>	Operating voltage	3.0	3.3	3.6	V
t <sub>ON</sub>	Power-up time (first locked cycle after power up)	–	7	–	mS
Z <sub>OUT</sub>	Clock output impedance	–	28	–	Ω

**Table 5. AC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	Min	Typ	Max	Unit
f <sub>IN</sub>	Input frequency	20	–	38	MHz
f <sub>OUT</sub>	Output frequency	20	–	38	MHz
t <sub>LH</sub> (Note 3)	Output rise time (measured at 0.8 V to 2.0 V)	–	1	–	nS
t <sub>HL</sub> (Note 3)	Output fall time (measured at 2.0 V to 0.8 V)	–	1	–	nS
t <sub>JC</sub>	Jitter (Cycle-to-cycle)	–	±175	–	pS
t <sub>D</sub>	Output duty cycle	45	50	55	%

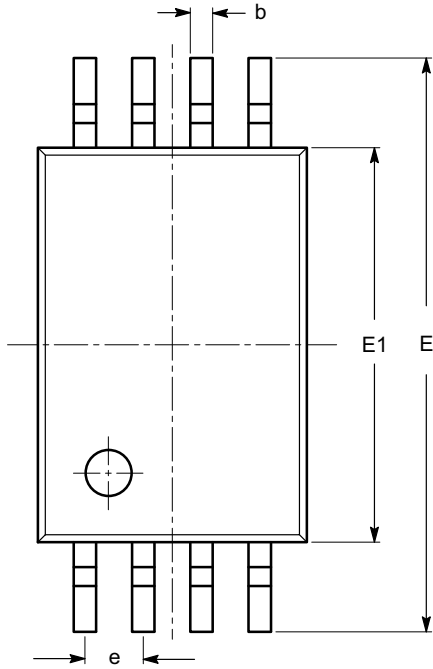
3. t<sub>LH</sub> and t<sub>HL</sub> are measured into a capacitive load of 15 pF.

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

# P2779A

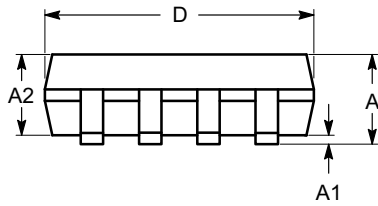
## PACKAGE DIMENSIONS

TSSOP8, 4.4x3  
CASE 948AL-01  
ISSUE O

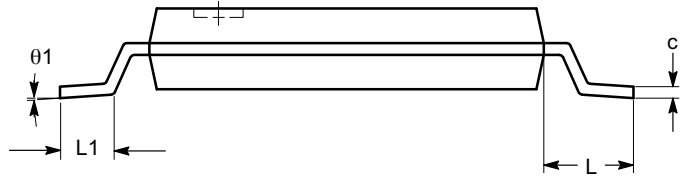


SYMBOL	MIN	NOM	MAX
A			1.20
A1	0.05		0.15
A2	0.80	0.90	1.05
b	0.19		0.30
c	0.09		0.20
D	2.90	3.00	3.10
E	6.30	6.40	6.50
E1	4.30	4.40	4.50
e	0.65 BSC		
L	1.00 REF		
L1	0.50	0.60	0.75
$\theta$	0°		8°

TOP VIEW



SIDE VIEW



END VIEW

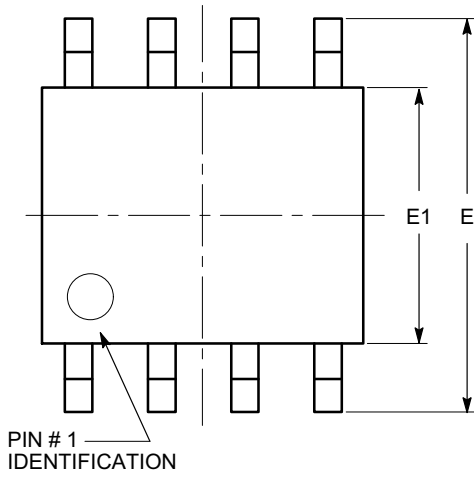
**Notes:**

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

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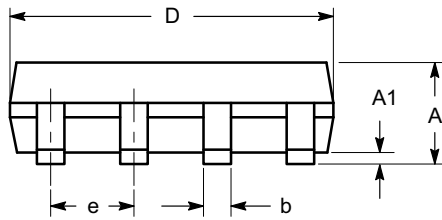
## PACKAGE DIMENSIONS

SOIC 8, 150 mils  
CASE 751BD-01  
ISSUE O

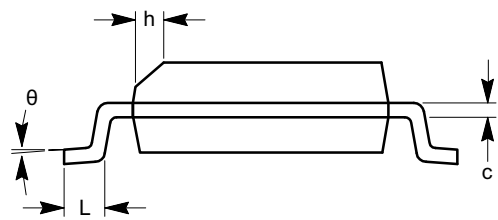


TOP VIEW

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
$\theta$	0°		8°



SIDE VIEW



END VIEW


**Notes:**

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

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**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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