

## DESCRIPTION

The MP8101 is a rail-to-rail output, operational amplifier in a TSOT-23 package. This amplifier provides 400kHz bandwidth while consuming an incredibly low 11 $\mu$ A of supply current. The MP8101 can operate with a single supply voltage as low as 1.8V.

## FEATURES

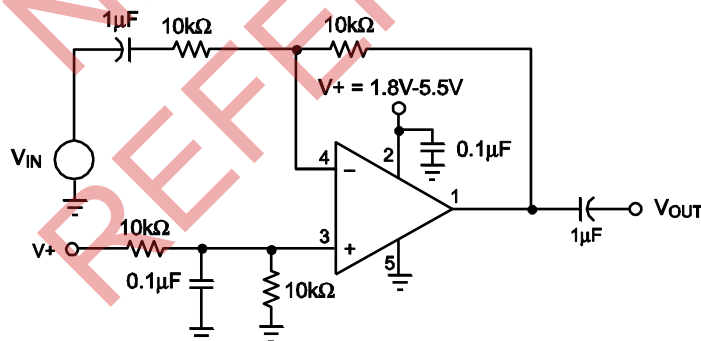
- Single Supply Operation: 1.8V to 5.5V
- TSOT23-5 Package
- 400kHz Gain Bandwidth
- 11 $\mu$ A Supply Current
- Rail-to-Rail Output
- Unity-Gain Stable
- Input Common Mode to Ground
- Drives Up to 1000pF of Capacitive Loads

## APPLICATIONS

- Portable Equipment
- PDAs
- Pagers
- Cordless Phones
- Handheld GPS
- Consumer Electronics

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## TYPICAL APPLICATION



### ORDERING INFORMATION

Part Number*	Package	Top Marking
MP8101DJ	TSOT23-5	See Below

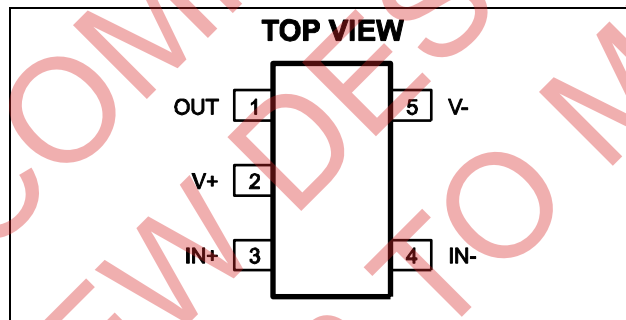
\* For Tape & Reel, add suffix -Z (e.g. MP8101DJ-Z);  
 For RoHS, compliant packaging, add suffix -LF (e.g. MP8101DJ-LF-Z).

### TOP MARKING

**|H5YW**

H5: product code of MP8101DJ;  
 Y: year code;  
 W: week code:

### PACKAGE REFERENCE



#### ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

Supply Voltage (V+ to V-) .....+6.0V  
 Differential Input Voltage ( $V_{IN+} - V_{IN-}$ ).....+6.0V  
 Input Voltage ( $V_{IN+} - V_{IN-}$ )..  $V_{IN+} + 0.3V$ ,  $V_{IN-} - 0.3V$   
 Junction Temperature ..... 150°C

#### Recommended Operating Conditions <sup>(2)</sup>

Supply Voltage ..... +1.8V to +5.5V  
 Operating Temperature..... -40°C to +85°C

Thermal Resistance <sup>(3)</sup>	$\theta_{JA}$	$\theta_{JC}$
TSOT23-5 .....	220 ....	110 .. °C/W

#### Notes:

- 1) Exceeding these ratings may damage the device.
- 2) The device is not guaranteed to function outside of its operating conditions.
- 3) Measured on approximately 1" square of 1 oz copper.

## ELECTRICAL CHARACTERISTICS

$V_+ = +5V$ ,  $V_- = 0V$ ,  $V_{CM} = V_+/2$ ,  $R_L = 10k\Omega$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Units
Input Offset Voltage	$V_{OS}$		-5	1	+5	mV
Input Offset Voltage Temp Coefficient				15		$\mu V/^\circ C$
Input Bias Current <sup>(4)</sup>	$I_B$			2		pA
Input Offset Current <sup>(4)</sup>	$I_{OS}$			0.2		pA
Input Voltage Range	$V_{CM}$	CMRR > 60dB	0		3.8	V
Common-Mode Rejection Ratio	CMRR	$0 < V_{CM} < 3.5V$		82		dB
Power Supply Rejection Ratio	PSRR	Supply Voltage change of 1.0V		80		dB
Large Signal Voltage Gain	$A_{VOL}$	$R_L = 100k\Omega$ , $V_{OUT} = 5.0$ Peak to Peak	60	88		dB
Maximum Output Voltage Swing	$V_{OUT}$	$R_L = 10k\Omega$		$(V_+) - 23mV$		V
Minimum Output Voltage Swing	$V_{OUT}$	$R_L = 10k\Omega$		$(V_-) + 19mV$		V
Gain-Bandwidth Product <sup>(4)</sup>	GBW	$R_L = 200k\Omega, C_L = 2pF$ , $V_{OUT} = 0$		400		KHz
-3dB Bandwidth <sup>(4)</sup>	BW	$A_V = 1, C_L = 2pF$ , $R_L = 1M\Omega$		1		MHz
Slew Rate <sup>(4)</sup>	SR	$A_V = 1, C_L = 2pF$ , $R_L = 1M\Omega$		0.2		V/ $\mu s$
Short Circuit Current	$I_{SC}$	Source		20		mA
		Sink		20		mA
Supply Current		No Load		11	20	$\mu A$

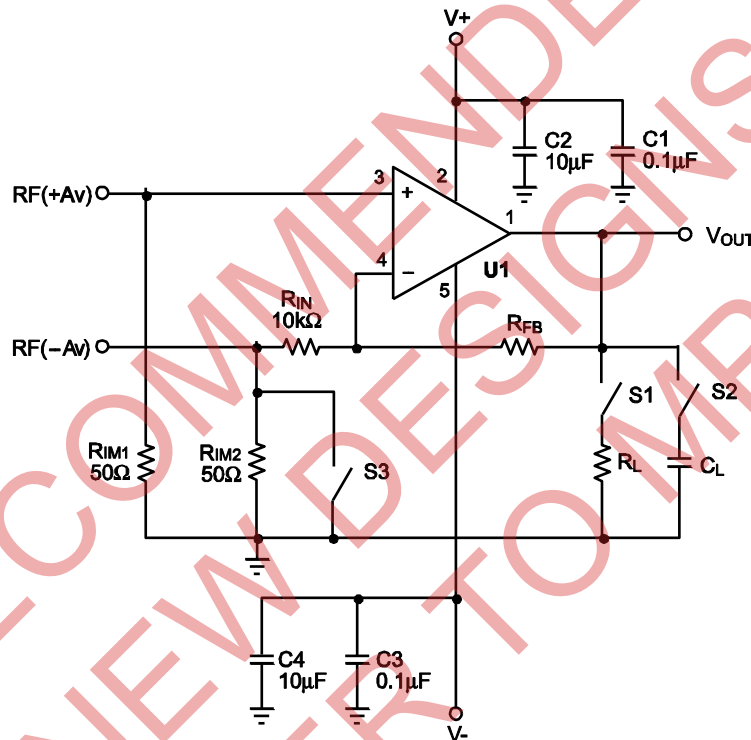
**Note:**

4) Guaranteed by design.

## PIN FUNCTIONS

Pin #	Name	Description
1	OUT	Output.
2	V+	Supply Voltage.
3	IN+	Non-Inverting Input.
4	IN-	Inverting Input.
5	V-	Ground or Supply Return Pin.

## TEST CIRCUITS



Notes: Close S3 for positive gain. Input signal to RF(+Av) connector.  
 The gain  $A_v = 1 + R_{FB}/R_{IN}$ .  
 For unity gain, remove  $R_{IN}$  and short  $R_{FB}$ .  
 Open S3 for negative gain. Input signal to RF(-Av) connector.  
 The gain  $A_v = -R_{FB}/R_{IN}$ .  
 S1 and S2 are switches for possible resistor and capacitor load connections.

Figure 1—AC Test Circuit

TEST CIRCUITS (continued)

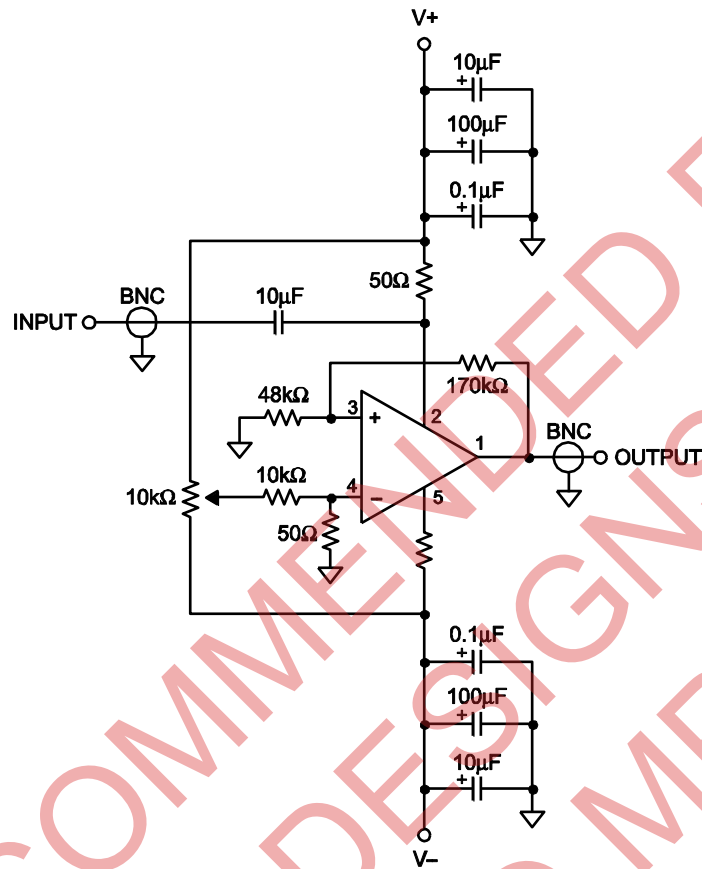
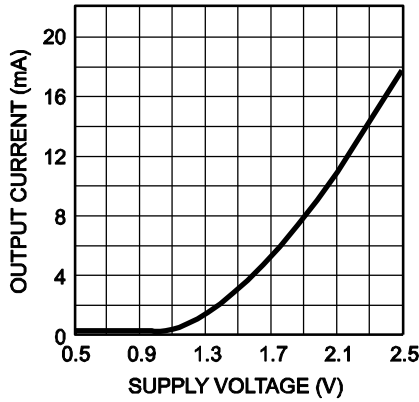


Figure 2—Positive Power Supply Rejection Ratio Measurement

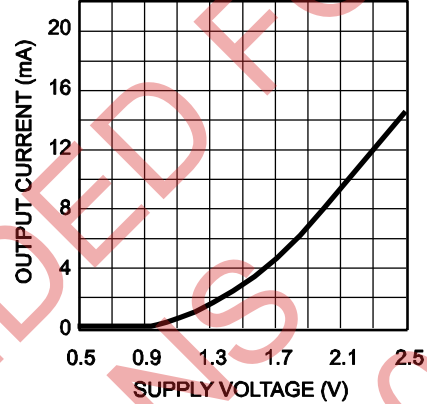
**TYPICAL PERFORMANCE CHARACTERISTICS**

T<sub>A</sub> = +25°C, unless otherwise noted.

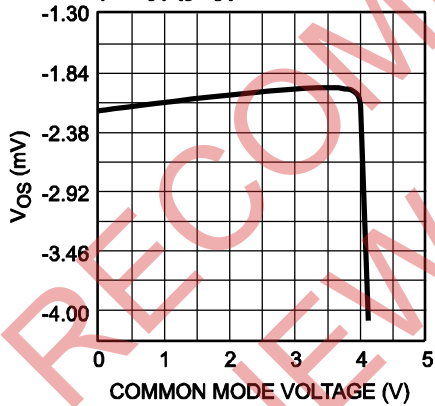
**Short Circuit Current vs Supply Voltage**  
Sourcing



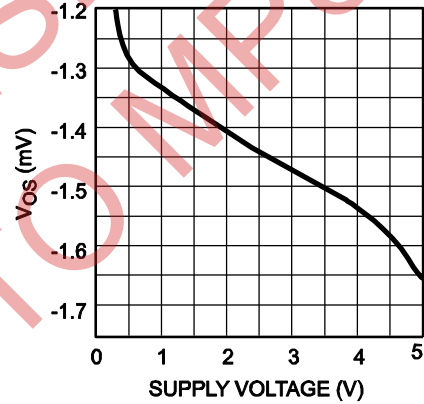
**Short Circuit Current vs Supply Voltage**  
Sinking



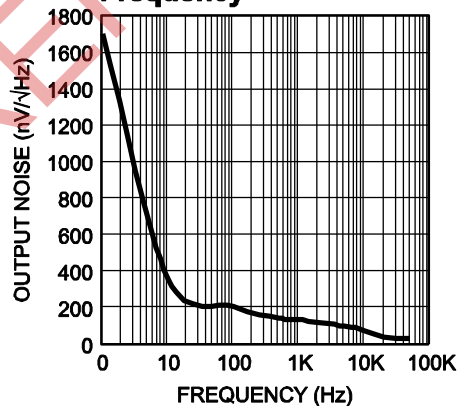
**Offset Voltage vs. Common Mode Voltage**  
R<sub>FB</sub> = 50kΩ, V<sub>-</sub> = -5V to 0V,  
V<sub>+</sub> = 0V to +5V



**Offset Voltage vs. Supply Voltage**  
R<sub>FB</sub> = 50kΩ, V<sub>-</sub> = -2.5V to 0V,  
V<sub>+</sub> = +2.5V to 0V

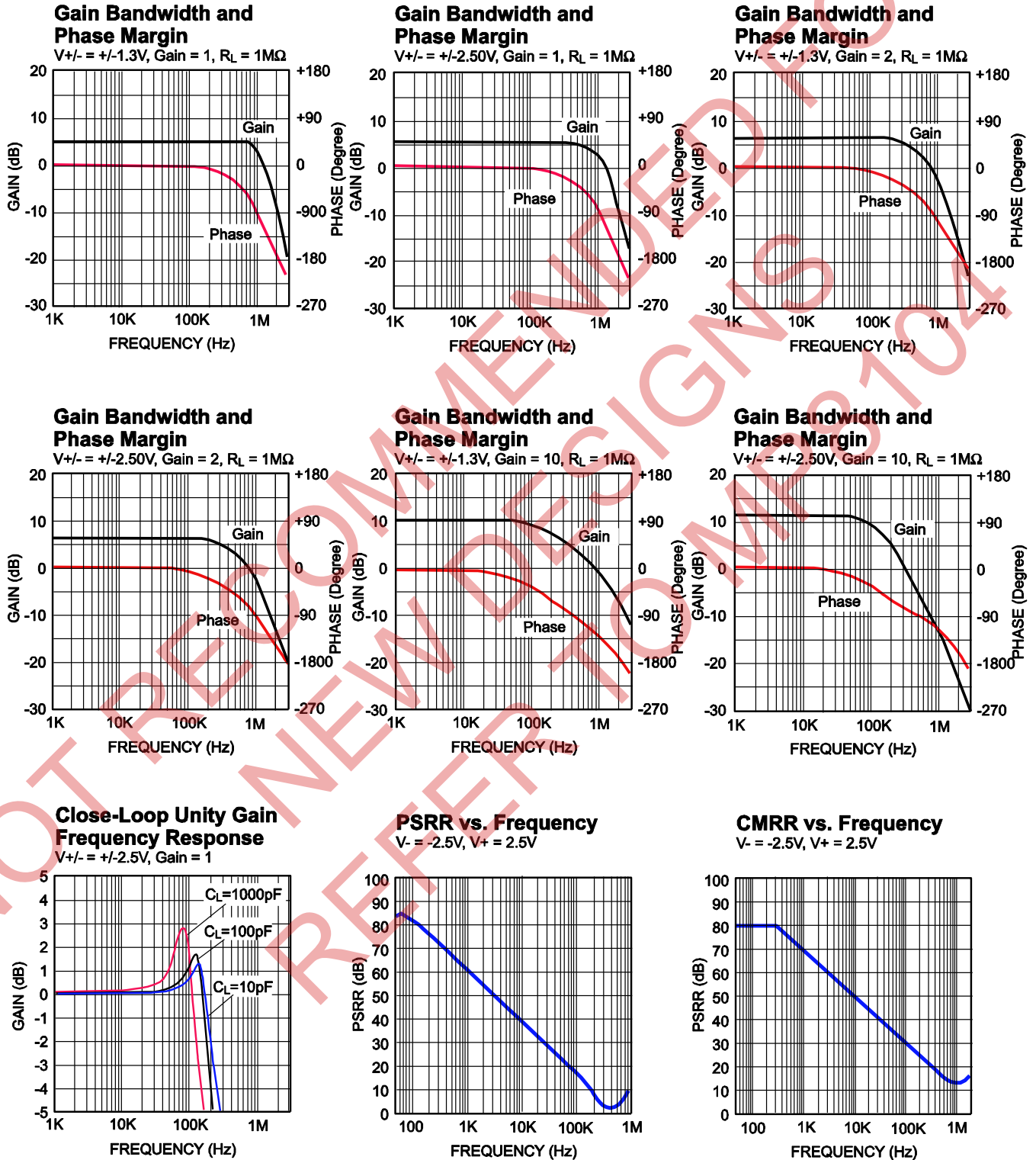


**Output Noise vs. Frequency**



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T<sub>A</sub> = +25°C, unless otherwise noted.

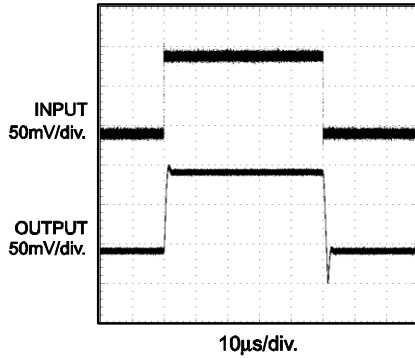


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T<sub>A</sub> = +25°C, unless otherwise noted.

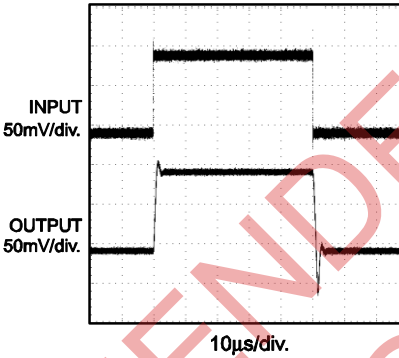
**Small Signal Pulse Response**

A<sub>v</sub> = 1, V<sub>+</sub> = 2.5V, V<sub>-</sub> = -2.5V  
R<sub>L</sub> = 1MΩ, C<sub>L</sub> = 8pF



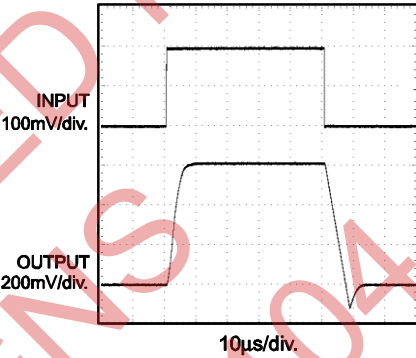
**Small Signal Pulse Response**

A<sub>v</sub> = 1, V<sub>+</sub> = 1.3V, V<sub>-</sub> = -1.3V  
R<sub>L</sub> = 1MΩ, C<sub>L</sub> = 8pF



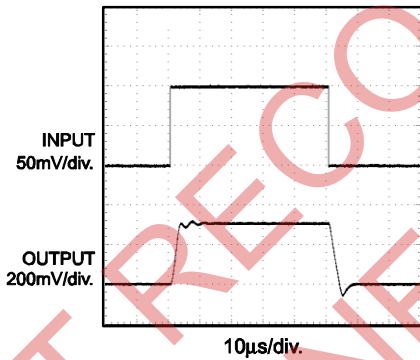
**Small Signal Pulse Response**

A<sub>v</sub> = 1, V<sub>+</sub> = 2.5V, V<sub>-</sub> = -2.5V  
R<sub>L</sub> = 1MΩ, C<sub>L</sub> = 47pF



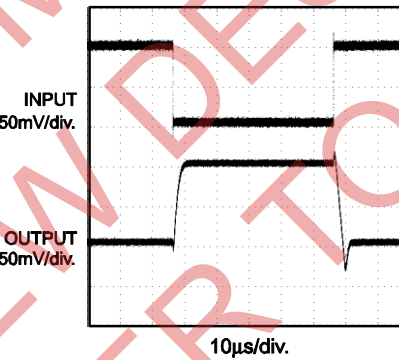
**Small Signal Pulse Response**

A<sub>v</sub> = 1, V<sub>+</sub> = 1.3V, V<sub>-</sub> = -1.3V  
R<sub>L</sub> = 1MΩ, C<sub>L</sub> = 47pF



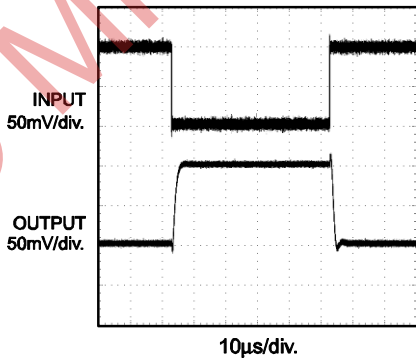
**Small Signal Pulse Response**

A<sub>v</sub> = -1, V<sub>+</sub> = 2.5V, V<sub>-</sub> = -2.5V  
R<sub>L</sub> = 1MΩ, C<sub>L</sub> = 8pF



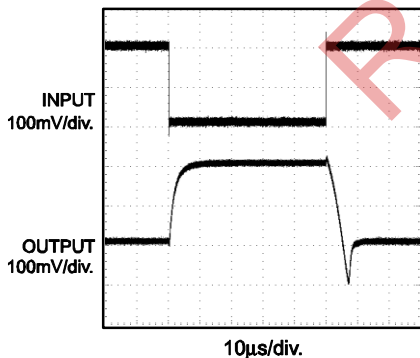
**Small Signal Pulse Response**

A<sub>v</sub> = -1, V<sub>+</sub> = 1.3V, V<sub>-</sub> = -1.3V  
R<sub>L</sub> = 1MΩ, C<sub>L</sub> = 8pF



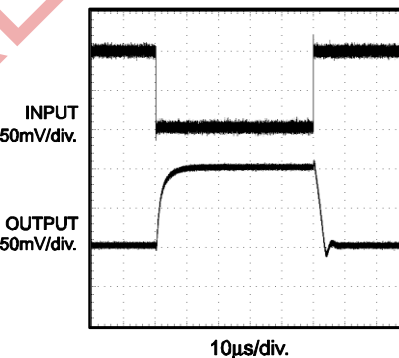
**Small Signal Pulse Response**

A<sub>v</sub> = -1, V<sub>+</sub> = 2.5V, V<sub>-</sub> = -2.5V  
R<sub>L</sub> = 4.7kΩ, C<sub>L</sub> = 8pF



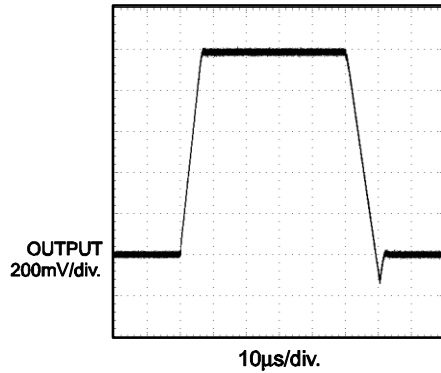
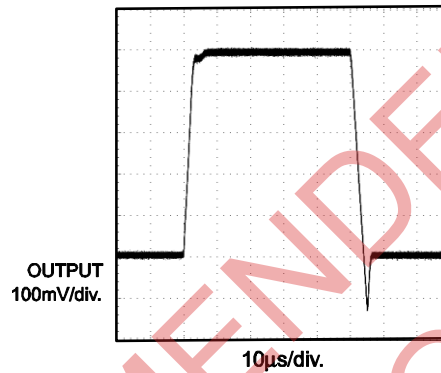
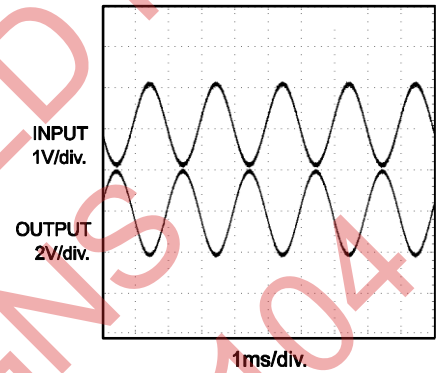
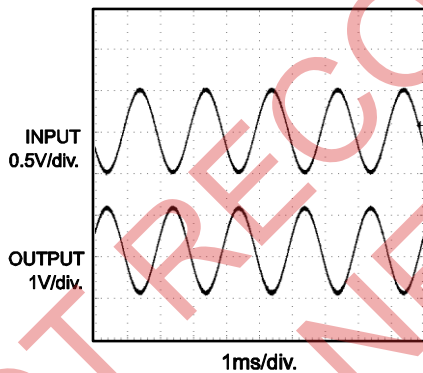
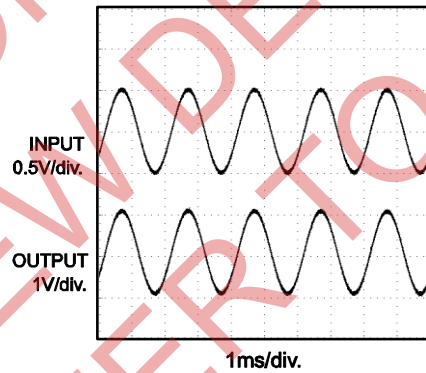
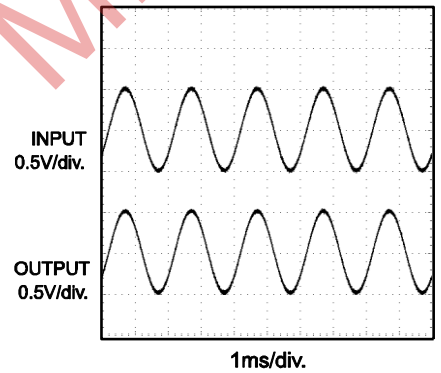
**Small Signal Pulse Response**

A<sub>v</sub> = -1, V<sub>+</sub> = 1.3V, V<sub>-</sub> = -1.3V  
R<sub>L</sub> = 4.7kΩ, C<sub>L</sub> = 8pF

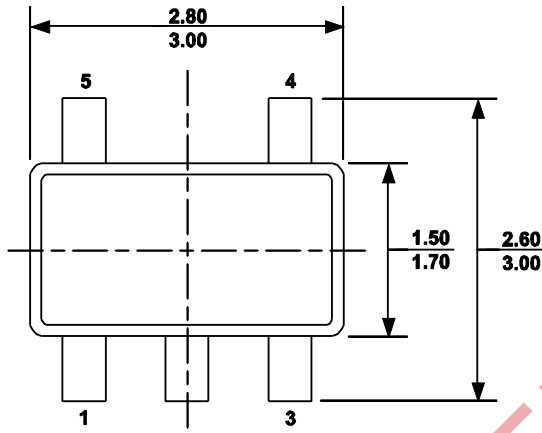
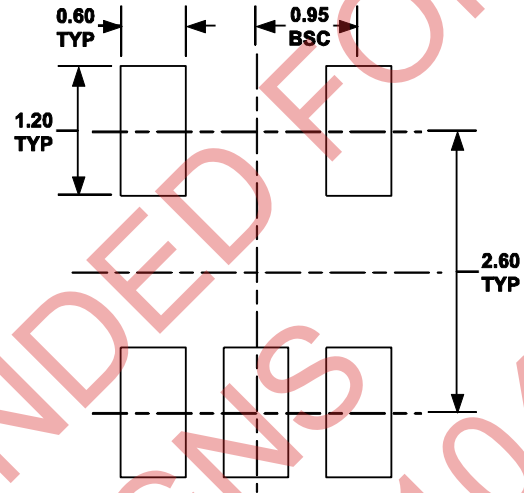
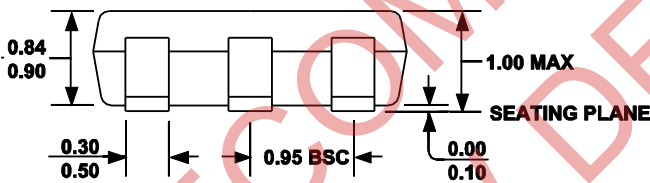
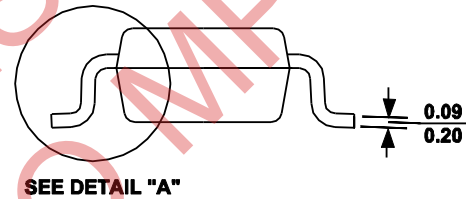
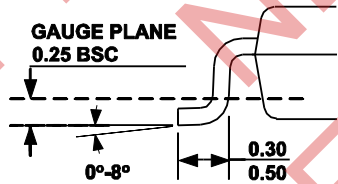




**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**
 $T_A = +25^\circ\text{C}$ , unless otherwise noted.

**Large Signal Pulse Response**
 $A_V = 1$ ,  $V_+ = 2.5\text{V}$ ,  $V_- = -2.5\text{V}$   
 $R_L = 1\text{M}\Omega$ ,  $C_L = 8\text{pF}$ 

**Large Signal Pulse Response**
 $A_V = 1$ ,  $V_+ = 1.3\text{V}$ ,  $V_- = -1.3\text{V}$   
 $R_L = 1\text{M}\Omega$ ,  $C_L = 8\text{pF}$ 

**Rail to Rail Output Operation**
 $A_V = -2$ ,  $V_+ = 2.5\text{V}$ ,  $V_- = -2.5\text{V}$   
 $R_L = 1\text{M}\Omega$ ,  $C_L = 50\text{pF}$ 

**Rail to Rail Output Operation**
 $A_V = -2$ ,  $V_+ = 1.3\text{V}$ ,  $V_- = -1.3\text{V}$   
 $R_L = 1\text{M}\Omega$ ,  $C_L = 50\text{pF}$ 

**Rail to Rail Output Operation**
 $A_V = 2$ ,  $V_+ = 2.5\text{V}$ ,  $V_- = -2.5\text{V}$   
 $R_L = 1\text{M}\Omega$ ,  $C_L = 8\text{pF}$ 

**Rail to Rail Output Operation**
 $A_V = 2$ ,  $V_+ = 1.3\text{V}$ ,  $V_- = -1.3\text{V}$   
 $R_L = 1\text{M}\Omega$ ,  $C_L = 8\text{pF}$ 




**PACKAGE INFORMATION**
**TSOT23-5**

**TOP VIEW**

**RECOMMENDED LAND PATTERN**

**FRONT VIEW**

**SIDE VIEW**

**DETAIL "A"**
**NOTE:**

- 1) ALL DIMENSIONS ARE IN MILLIMETERS.
- 2) PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR.
- 3) PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION.
- 4) LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.10 MILLIMETERS MAX.
- 5) DRAWING CONFORMS TO JEDEC MO-193, VARIATION AA.
- 6) DRAWING IS NOT TO SCALE.

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