

## EL5130, EL5131

### 300MHz Low Noise Amplifiers

FN7381  
Rev 5.00  
May 28, 2010

The EL5130 and EL5131 are ultra-low voltage noise, high speed voltage feedback amplifiers that are ideal for applications requiring low voltage noise, including communications and imaging. These devices offer extremely low power consumption for exceptional noise performance. Stable at gains as low as 5, these devices offer 100mA of drive performance. Not only do these devices find perfect application in high gain applications, they maintain their performance down to lower gain settings.

These amplifiers are available in small package options (SOT-23) as well as the industry-standard SOIC packages. All parts are specified for operation over the -40°C to +85°C temperature range.

### Ordering Information

PART NUMBER	PART MARKING	TAPE & REEL	PACKAGE	PKG. DWG. #
EL5130IS	5130IS	-	8 Ld SOIC (150 mil)	MDP0027
EL5130ISZ (Note)	5130ISZ	-	8 Ld SOIC (150 mil) (Pb-free)	MDP0027
EL5130IS-T7	5130IS	7"	8 Ld SOIC (150 mil)	MDP0027
EL5130ISZ-T7 (Note)	5130ISZ	7"	8 Ld SOIC (150 mil) (Pb-free)	MDP0027
EL5130IS-T13	5130IS	13"	8 Ld SOIC (150 mil)	MDP0027
EL5130ISZ-T13 (Note)	5130ISZ	13"	8 Ld SOIC (150 mil) (Pb-free)	MDP0027
EL5131IW-T7	BBAA	7" (3k pcs)	5 Ld SOT-23	P5.064A
EL5131IWZ-T7 (Note)	BRAA	7" (3k pcs)	5 Ld SOT-23 (Pb-free)	P5.064A
EL5131IW-T7A	BBAA	7" (250 pcs)	5 Ld SOT-23	P5.064A
EL5131IWZ-T7A (Note)	BRAA	7" (250 pcs)	5 Ld SOT-23 (Pb-free)	P5.064A

NOTE: Intersil Pb-free plus anneal products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which are RoHS compliant and compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.

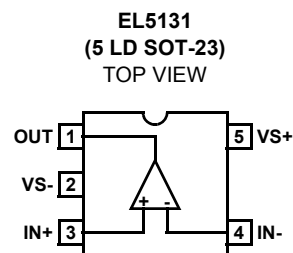
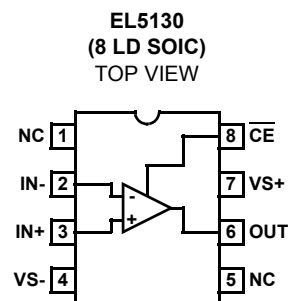
### Features

- 300MHz -3dB bandwidth
- Ultra low noise =  $1.8nV/\sqrt{Hz}$
- 350V/ $\mu$ s slew rate
- Low supply current = 4mA
- Single supplies from 5V to 12V
- Dual supplies from  $\pm 2.5V$  to  $\pm 6V$
- Fast disable on the EL5130
- Low cost
- Pb-free plus anneal available (RoHS compliant)

### Applications

- Imaging
- Instrumentation
- Communications devices

### Pinouts



**Absolute Maximum Ratings** ( $T_A = +25^\circ\text{C}$ )

Slewrates between $V_{S+}$ and $V_{S-}$ .....	1V/ $\mu\text{s}$
Supply Voltage from $V_{S+}$ to $V_{S-}$ .....	13.2V
$I_{IN-}$ , $I_{IN+}$ , CE.....	$\pm 5\text{mA}$
Continuous Output Current.....	100mA

**Thermal Information**

Storage Temperature.....	$-65^\circ\text{C}$ to $+125^\circ\text{C}$
Ambient Operating Temperature.....	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Operating Junction Temperature.....	$+125^\circ\text{C}$
Power Dissipation.....	See Curves
Pb-free reflow profile.....	see link below
	<a href="http://www.intersil.com/pbfree/Pb-FreeReflow.asp">http://www.intersil.com/pbfree/Pb-FreeReflow.asp</a>

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

**IMPORTANT NOTE:** All parameters having Min/Max specifications are guaranteed. Typical values are for information purposes only. Unless otherwise noted, all tests are at the specified temperature and are pulsed tests, therefore:  $T_J = T_C = T_A$

**Electrical Specifications**  $V_{S+} = +5\text{V}$ ,  $V_{S-} = -5\text{V}$ ,  $R_L = 500\Omega$ ,  $R_G = 50\Omega$ ,  $C_L = 5\text{pF}$ ,  $T_A = +25^\circ\text{C}$ , Unless Otherwise Specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
$V_{OS}$	Offset Voltage		-0.9	0.2	0.9	mV
$T_C V_{OS}$	Offset Voltage Temperature Coefficient	Measured from $T_{MIN}$ to $T_{MAX}$		0.8		$\mu\text{V}/^\circ\text{C}$
$I_B$	Input Bias Current	$V_{IN} = 0\text{V}$	1.5	2.27	3.3	$\mu\text{A}$
$I_{OS}$	Input Offset Current	$V_{IN} = 0\text{V}$	-500	100	500	nA
$T_C I_{OS}$	Input Bias Current Temperature Coefficient	Measured from $T_{MIN}$ to $T_{MAX}$		-3		$\text{nA}/^\circ\text{C}$
PSRR	Power Supply Rejection Ratio	$V_S = \pm 4.75\text{V}$ to $\pm 5.25\text{V}$	75	90		dB
CMRR	Common Mode Rejection Ratio	$V_{IN} = \pm 3.0\text{V}$	95	110		dB
CMIR	Common Mode Input Range	Guaranteed by CMRR test	$\pm 3$	$\pm 3.3$		V
$R_{IN}$	Input Resistance	Common mode	5	20		$\text{M}\Omega$
$C_{IN}$	Input Capacitance			1		pF
$I_S$	Supply Current		3.0	3.54	4.1	mA
AVOL	Open Loop Gain	$V_{OUT} = \pm 2.5\text{V}$ , $R_L = 1\text{k}\Omega$ to GND	10	16		kV/V
$V_O$	Output Voltage Swing	$R_L = 1\text{k}\Omega$ , $R_F = 900\Omega$ , $R_G = 100\Omega$	$\pm 3.5$	$\pm 3.8$		V
		$R_L = 150\Omega$	$\pm 3.5$	$\pm 3.3$		V
$I_{SC}$	Short Circuit Current	$R_L = 10\Omega$	50	100		mA
BW	-3dB Bandwidth	$A_V = +5$ , $R_L = 500\Omega$		300		MHz
BW	$\pm 0.1\text{dB}$ Bandwidth	$A_V = +5$ , $R_L = 500\Omega$		60		MHz
GBWP	Gain Bandwidth Product			1500		MHz
PM	Phase Margin	$R_L = 1\text{k}\Omega$ , $C_L = 6\text{pF}$		55		$^\circ$
SR	Slew Rate	$V_S = \pm 5\text{V}$ , $R_L = 150\Omega$ , $V_{OUT} = \pm 2.5\text{V}$	225	350		V/ $\mu\text{s}$
$t_R$ , $t_F$	Rise Time, Fall Time	$\pm 0.1V_{STEP}$		TBD		ns
$t_{PD}$	Propagation Delay	$\pm 0.1V_{STEP}$		TBD		ns
$t_S$	0.01% Settling Time			14		ns
dG	Differential Gain	$A_V = +2$ , $R_F = 1\text{k}\Omega$		0.01		%
dP	Differential Phase	$A_V = +2$ , $R_F = 1\text{k}\Omega$		0.01		$^\circ$
$e_N$	Input Noise Voltage	$f = 10\text{kHz}$		1.8		$\text{nV}/\sqrt{\text{Hz}}$
$i_N$	Input Noise Current	$f = 10\text{kHz}$		1.1		$\text{pA}/\sqrt{\text{Hz}}$

### Typical Performance Curves

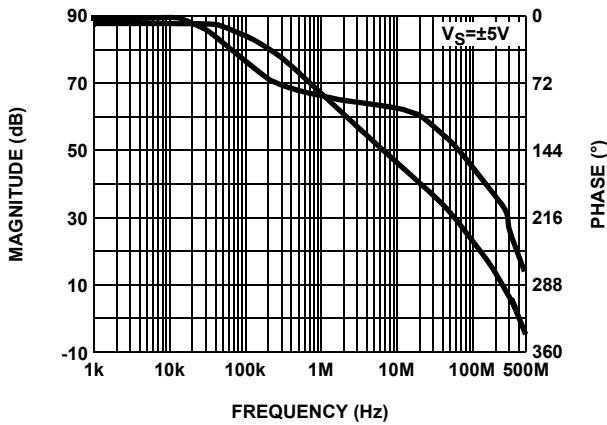


FIGURE 1. OPEN LOOP GAIN AND PHASE vs FREQUENCY

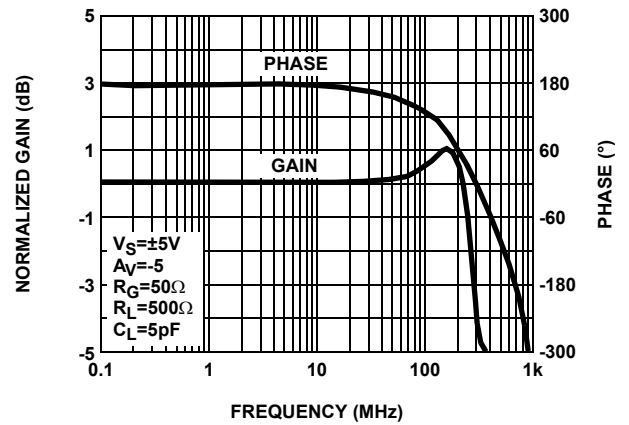


FIGURE 2. GAIN AND PHASE vs FREQUENCY (INVERTING)

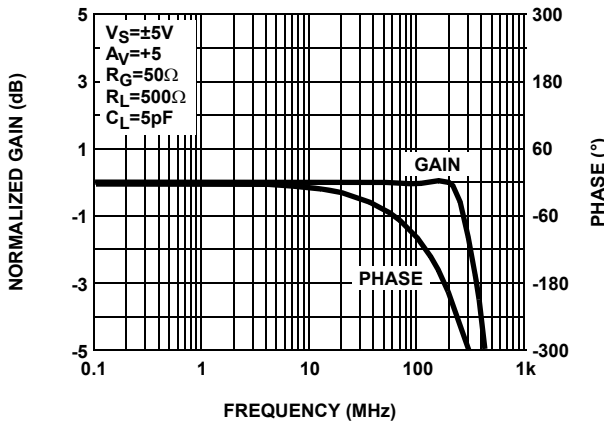


FIGURE 3. GAIN AND PHASE vs FREQUENCY (NON-INVERTING)

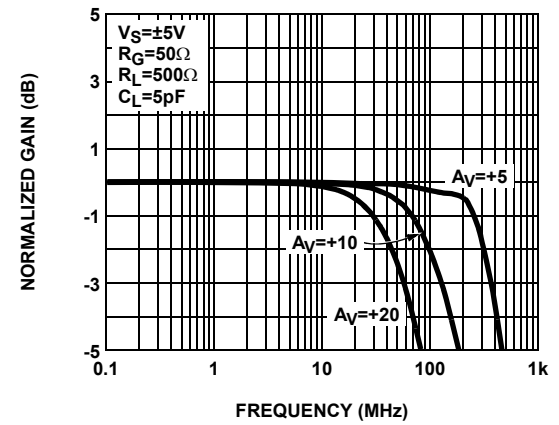


FIGURE 4. GAIN vs FREQUENCY FOR VARIOUS  $A_{V+}$

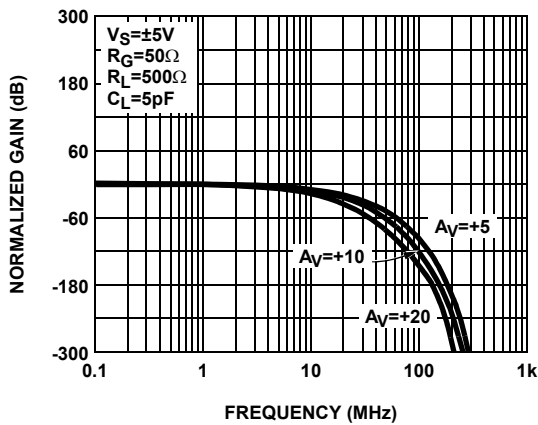


FIGURE 5. PHASE vs FREQUENCY FOR VARIOUS  $A_{V+}$

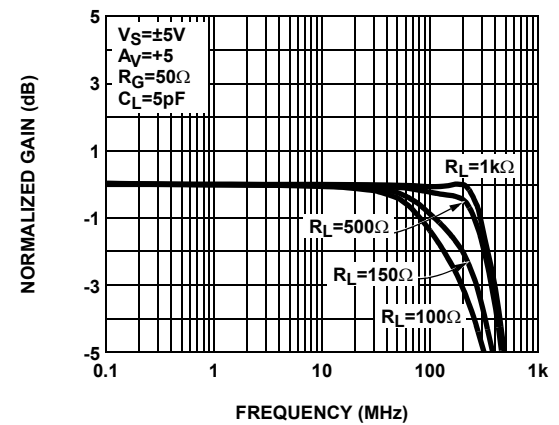


FIGURE 6. GAIN vs FREQUENCY FOR VARIOUS  $R_L$  ( $A_{V+} = +5$ )

Typical Performance Curves

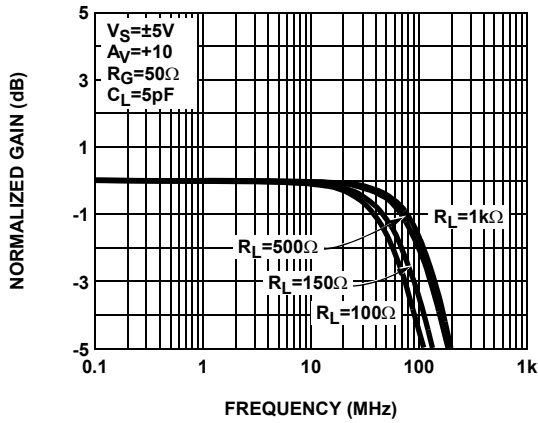


FIGURE 7. GAIN vs FREQUENCY FOR VARIOUS  $R_L$  ( $A_V = +10$ )

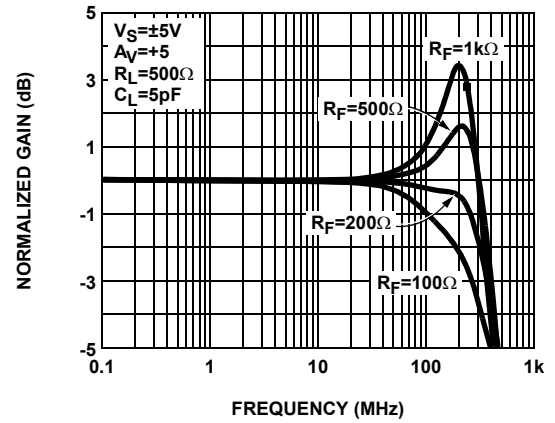


FIGURE 8. GAIN vs FREQUENCY FOR VARIOUS  $R_F$  ( $A_V = +5$ )

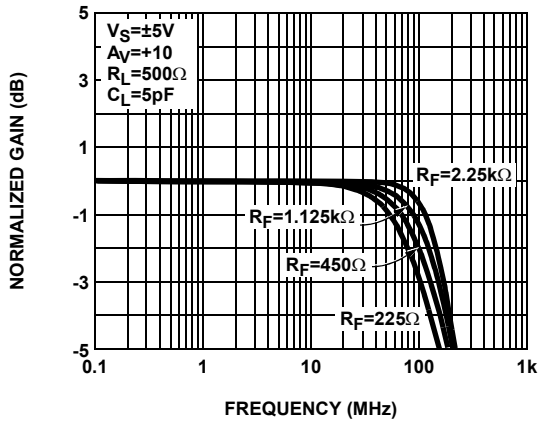


FIGURE 9. GAIN vs FREQUENCY FOR VARIOUS  $R_F$  ( $A_V = +10$ )

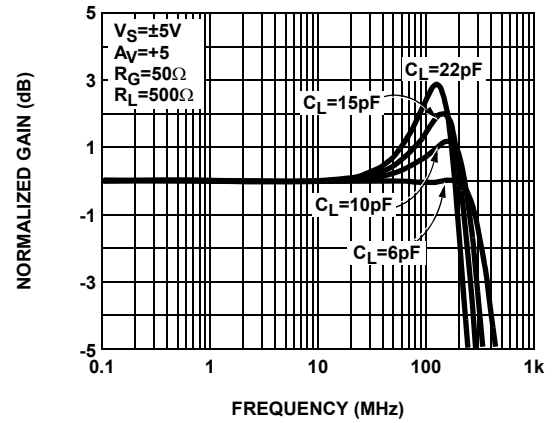


FIGURE 10. GAIN vs FREQUENCY FOR VARIOUS  $C_L$  ( $A_V = +5$ )

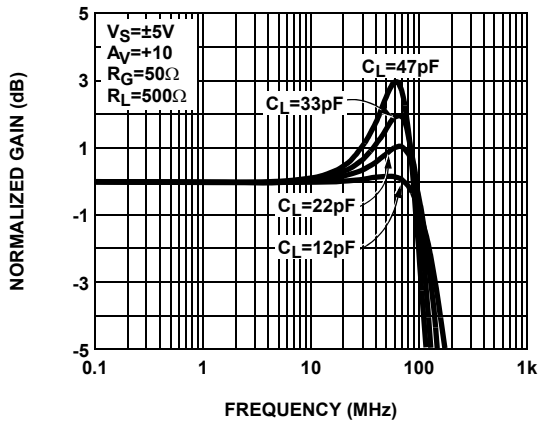


FIGURE 11. GAIN vs FREQUENCY FOR VARIOUS  $C_L$  ( $A_V = +10$ )

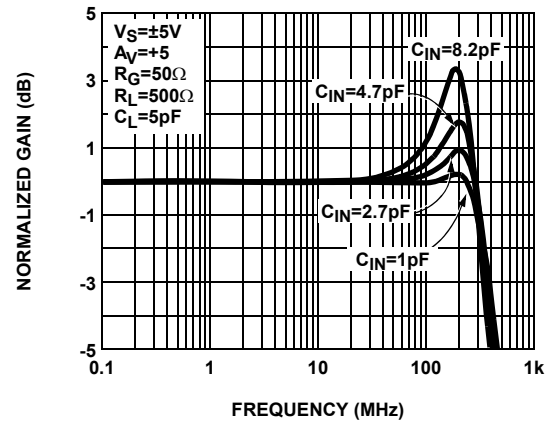


FIGURE 12. GAIN vs FREQUENCY FOR VARIOUS  $C_{IN-}$  ( $A_V = +5$ )

Typical Performance Curves

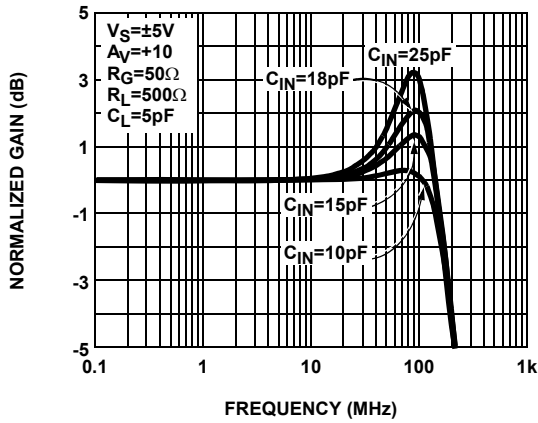


FIGURE 13. GAIN vs FREQUENCY FOR VARIOUS  $C_{IN}$  ( $A_V=+10$ )

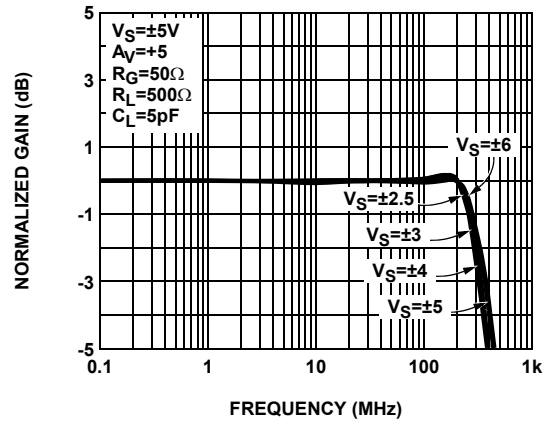


FIGURE 14. GAIN vs FREQUENCY FOR VARIOUS  $\pm V_S$  ( $A_V=+5$ )

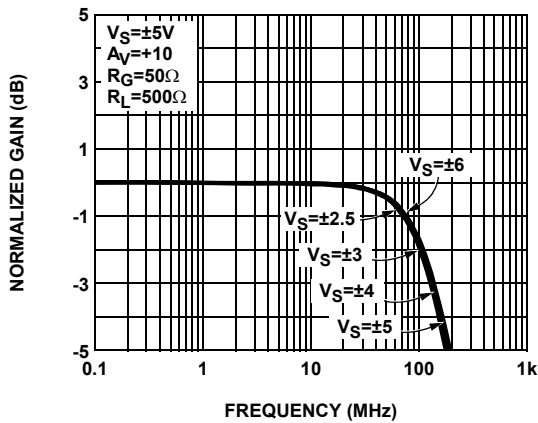


FIGURE 15. GAIN vs FREQUENCY FOR VARIOUS  $V_S\pm$  ( $A_V=+10$ )

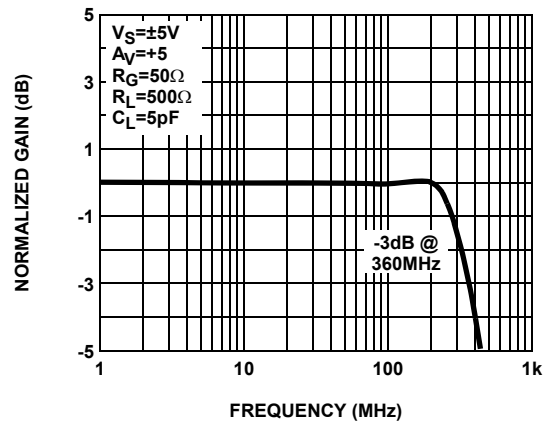


FIGURE 16. FREQUENCY RESPONSE (-3dB ROLL-OFF)

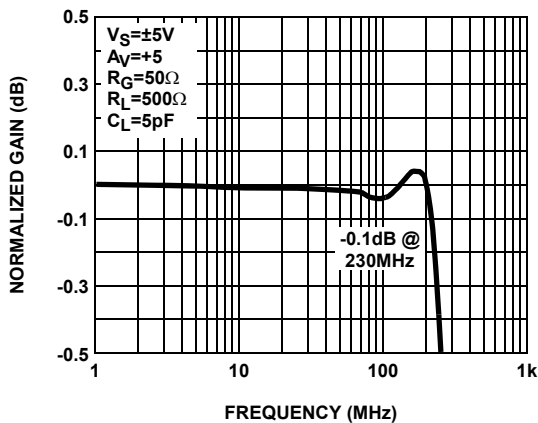


FIGURE 17. FREQUENCY RESPONSE (0.1dB GAIN FLATNESS)

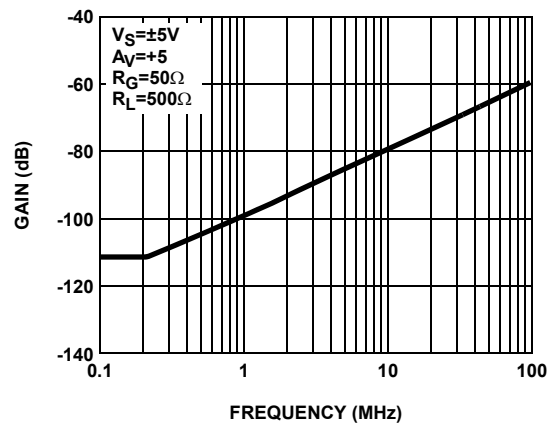


FIGURE 18. INPUT AND OUTPUT ISOLATION FOR DISABLE AMPLIFIER

## Typical Performance Curves

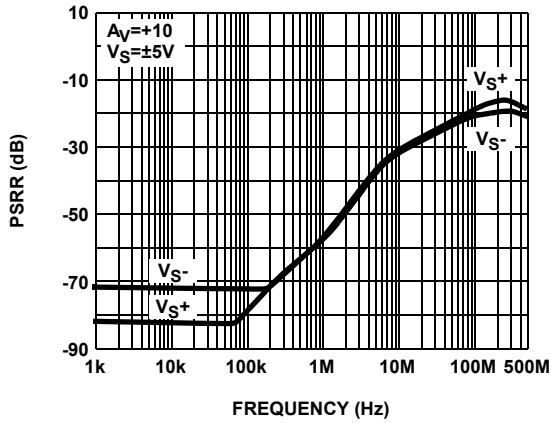


FIGURE 19. PSRR vs FREQUENCY

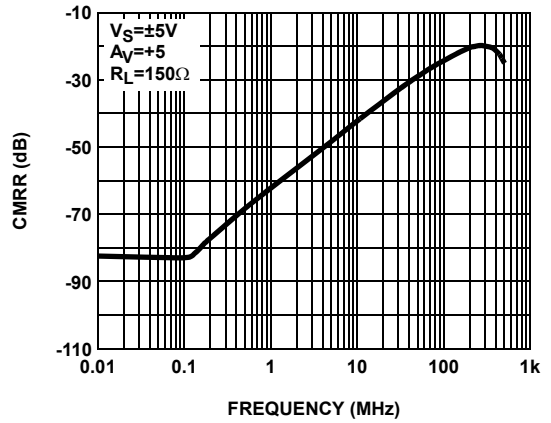


FIGURE 20. CMRR vs FREQUENCY

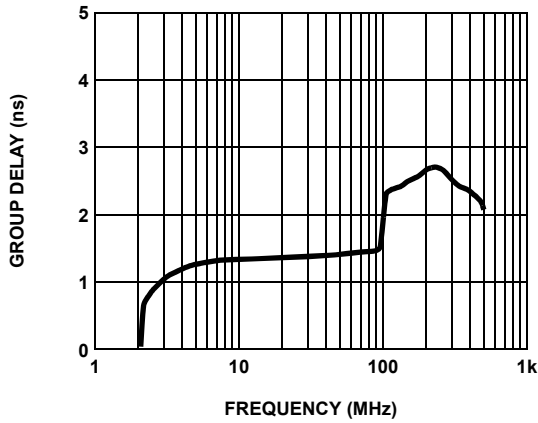


FIGURE 21. GROUP DELAY vs FREQUENCY

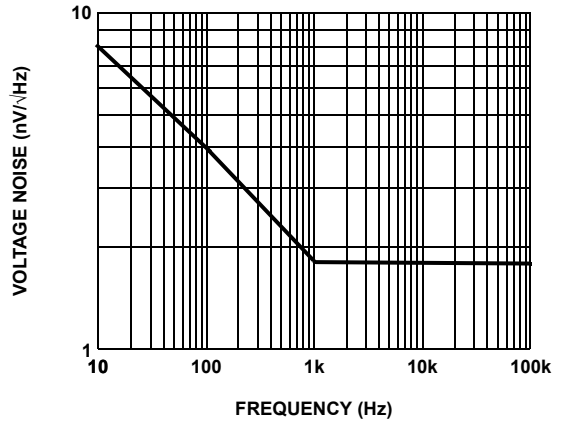


FIGURE 22. INPUT VOLTAGE NOISE

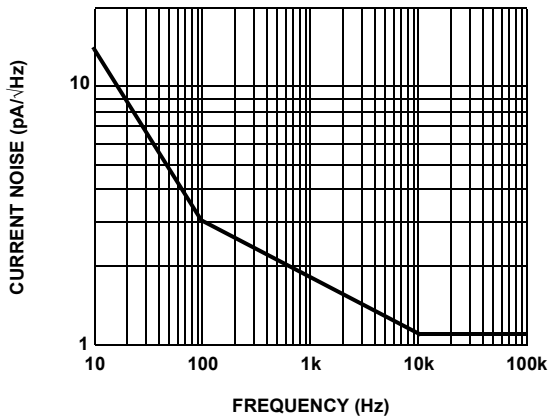


FIGURE 23. INPUT CURRENT NOISE

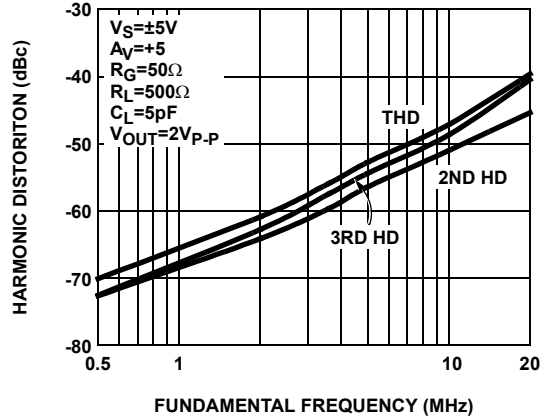


FIGURE 24. HARMONIC DISTORTION vs FREQUENCY ( $A_V=+5$ )

Typical Performance Curves

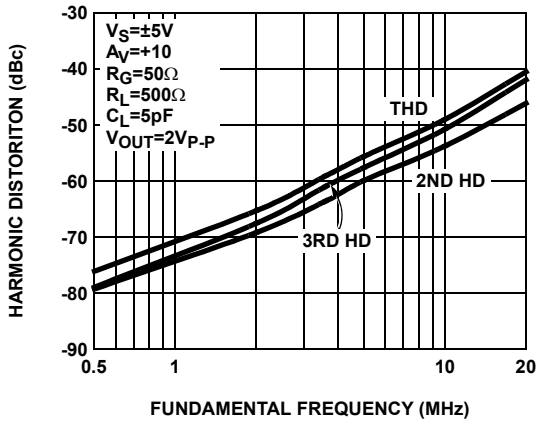


FIGURE 25. HARMONIC DISTORTION vs FREQUENCY ( $A_V=+10$ )

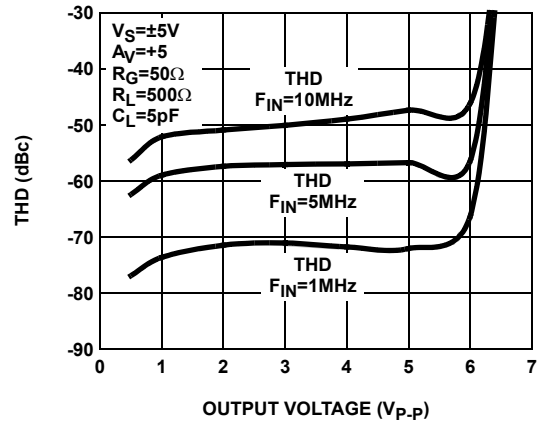


FIGURE 26. THD vs OUTPUT VOLTAGE (WORST HARMONIC)

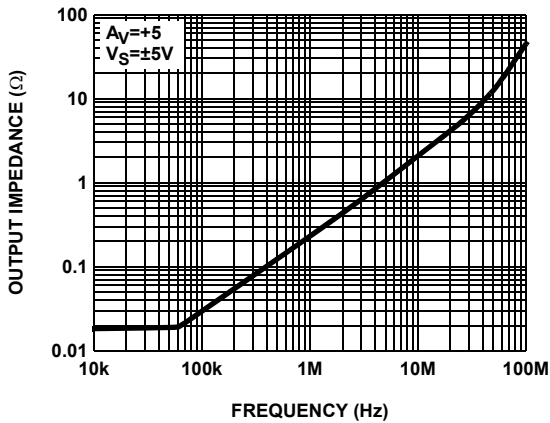


FIGURE 27. OUTPUT IMPEDANCE vs FREQUENCY

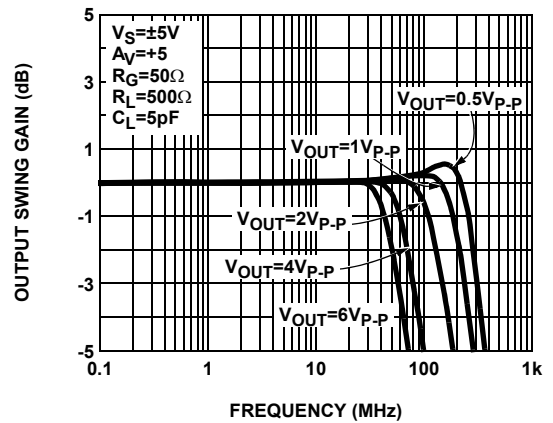


FIGURE 28. OUTPUT SWING vs FREQUENCY

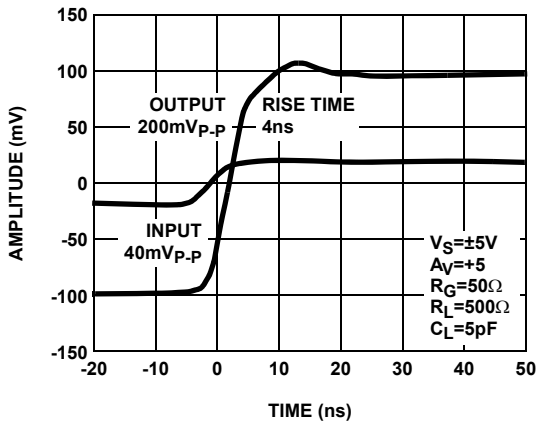


FIGURE 29. SMALL SIGNAL PULSE RESPONSE/RISE TIME

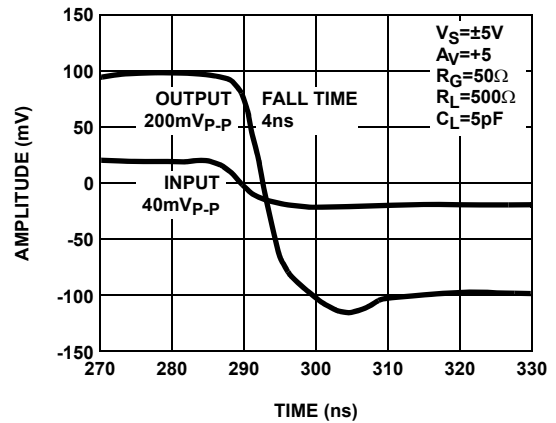


FIGURE 30. SMALL SIGNAL PULSE REPOSE/FALL TIME

### Typical Performance Curves

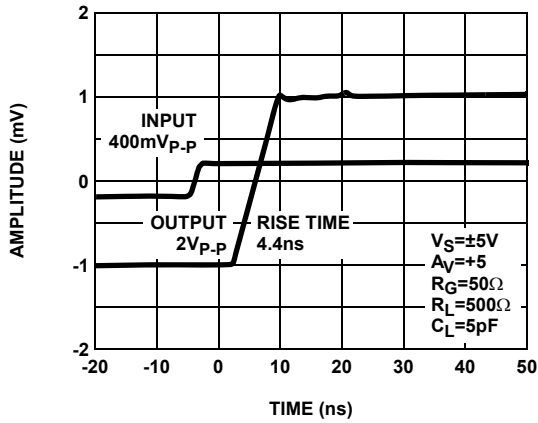


FIGURE 31. LARGE SIGNAL PULSE RESPONSE/RISE TIME

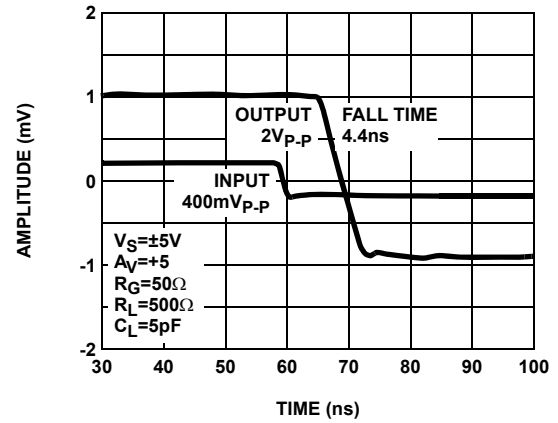


FIGURE 32. LARGE SIGNAL PULSE RESPONSE/RISE TIME

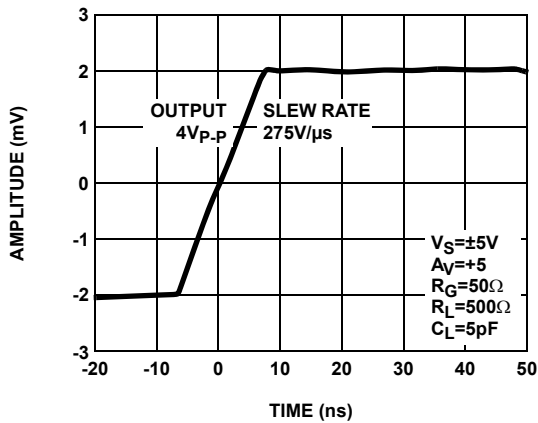


FIGURE 33. SLEW RATE (POSITIVE)

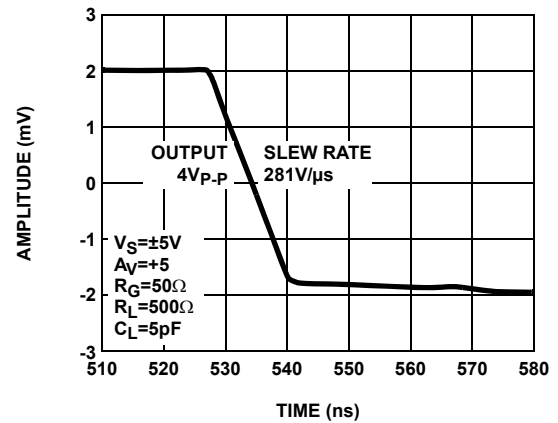


FIGURE 34. SLEW RATE (NEGATIVE)

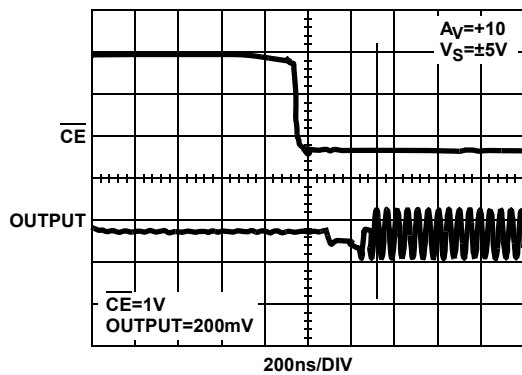


FIGURE 35. ENABLE RESPONSE/TURN-ON TIME

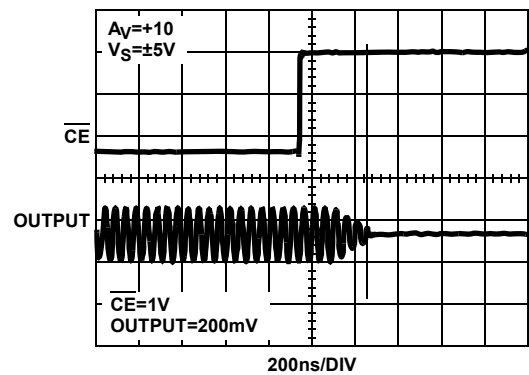


FIGURE 36. DISABLE RESPONSE/TURN-OFF TIME



Typical Performance Curves

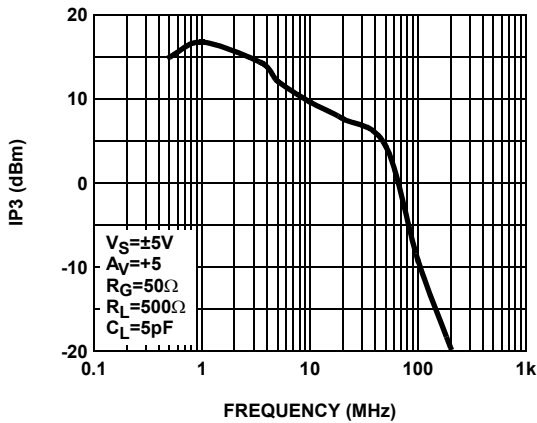


FIGURE 37. THIRD-ORDER INTERCEPT POINT

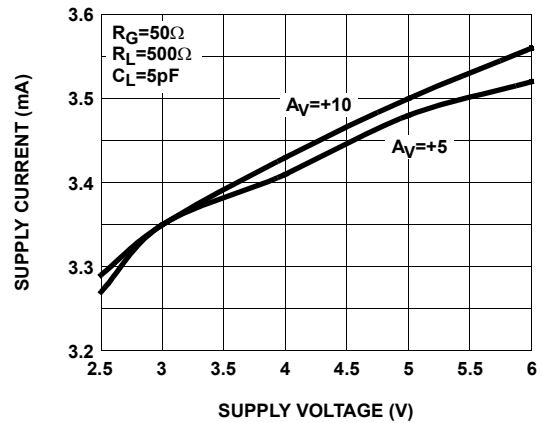


FIGURE 38. SUPPLY CURRENT vs SUPPLY VOLTAGE

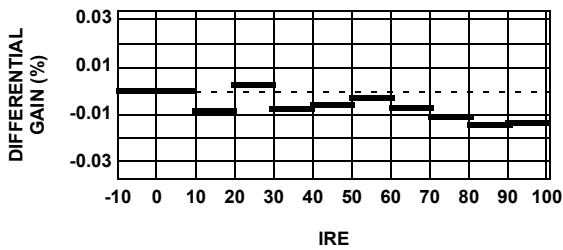


FIGURE 39. DIFFERENTIAL GAIN ERRORS

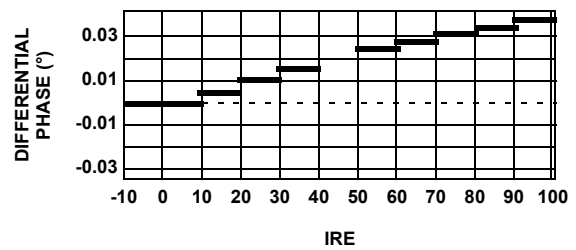


FIGURE 40. DIFFERENTIAL PHASE ERRORS

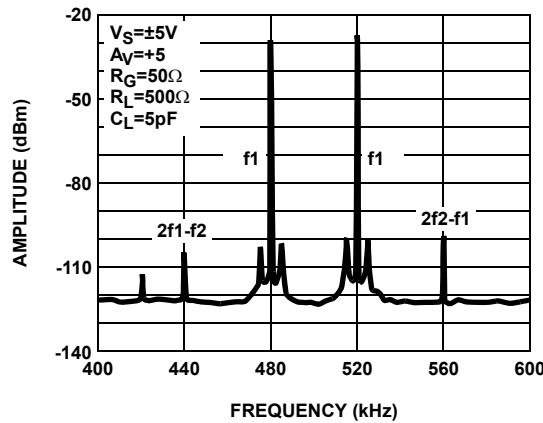


FIGURE 41. IP3

**Typical Performance Curves**

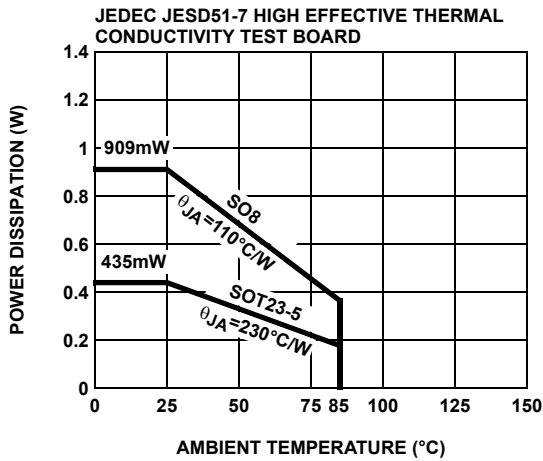


FIGURE 42. PACKAGE POWER DISSIPATION vs AMBIENT TEMPERATURE

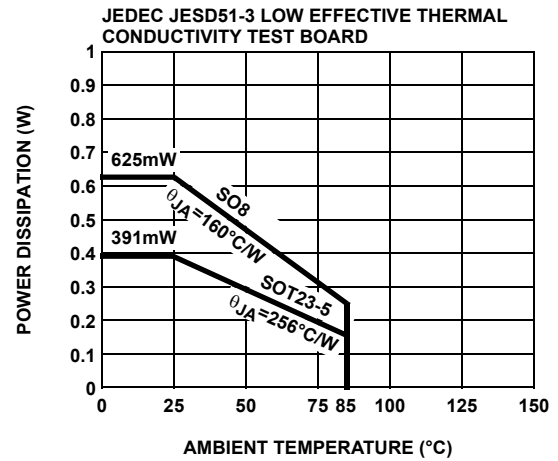


FIGURE 43. PACKAGE POWER DISSIPATION vs AMBIENT TEMPERATURE

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**Small Outline Package Family (SO)**



**MDP0027**

**SMALL OUTLINE PACKAGE FAMILY (SO)**

SYMBOL	INCHES							TOLERANCE	NOTES
	SO-8	SO-14	SO16 (0.150")	SO16 (0.300") (SOL-16)	SO20 (SOL-20)	SO24 (SOL-24)	SO28 (SOL-28)		
A	0.068	0.068	0.068	0.104	0.104	0.104	0.104	MAX	-
A1	0.006	0.006	0.006	0.007	0.007	0.007	0.007	±0.003	-
A2	0.057	0.057	0.057	0.092	0.092	0.092	0.092	±0.002	-
b	0.017	0.017	0.017	0.017	0.017	0.017	0.017	±0.003	-
c	0.009	0.009	0.009	0.011	0.011	0.011	0.011	±0.001	-
D	0.193	0.341	0.390	0.406	0.504	0.606	0.704	±0.004	1, 3
E	0.236	0.236	0.236	0.406	0.406	0.406	0.406	±0.008	-
E1	0.154	0.154	0.154	0.295	0.295	0.295	0.295	±0.004	2, 3
e	0.050	0.050	0.050	0.050	0.050	0.050	0.050	Basic	-
L	0.025	0.025	0.025	0.030	0.030	0.030	0.030	±0.009	-
L1	0.041	0.041	0.041	0.056	0.056	0.056	0.056	Basic	-
h	0.013	0.013	0.013	0.020	0.020	0.020	0.020	Reference	-
N	8	14	16	16	20	24	28	Reference	-

Rev. M 2/07

**NOTES:**

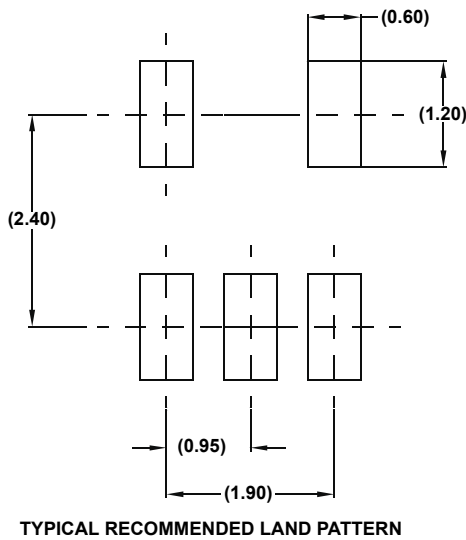
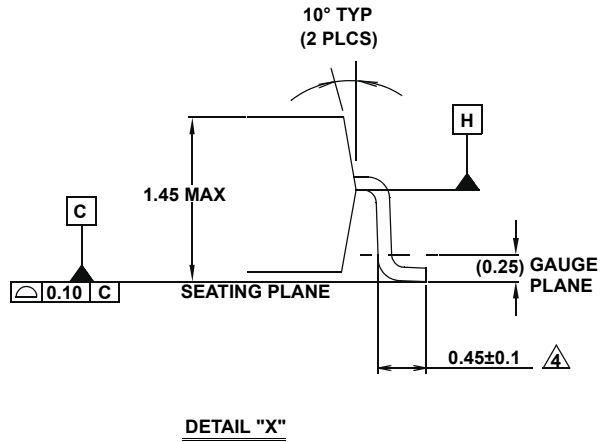
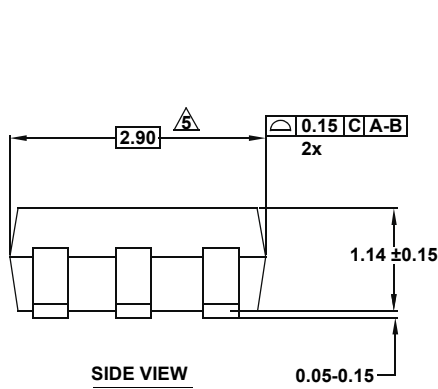
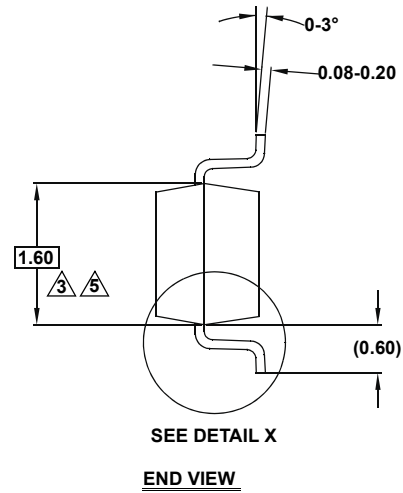
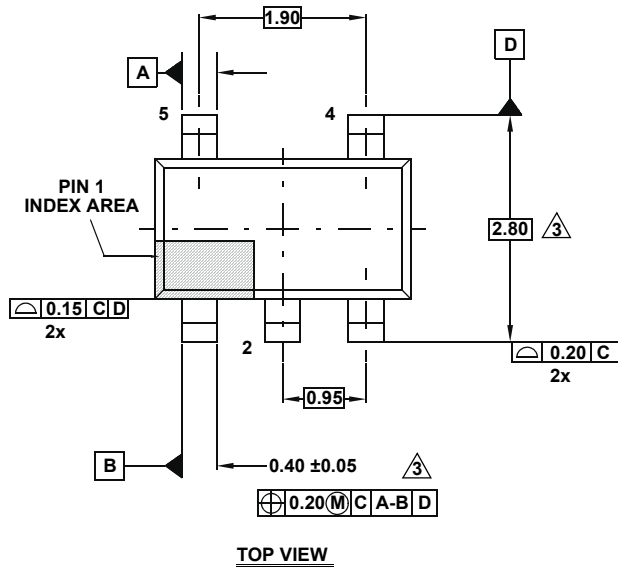
1. Plastic or metal protrusions of 0.006" maximum per side are not included.
2. Plastic interlead protrusions of 0.010" maximum per side are not included.
3. Dimensions "D" and "E1" are measured at Datum Plane "H".
4. Dimensioning and tolerancing per ASME Y14.5M-1994

# Package Outline Drawing

## P5.064A

### 5 LEAD SMALL OUTLINE TRANSISTOR PLASTIC PACKAGE

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**NOTES:**

1. Dimensions are in millimeters.  
Dimensions in ( ) for Reference Only.
2. Dimensioning and tolerancing conform to ASME Y14.5M-1994.
3. Dimension is exclusive of mold flash, protrusions or gate burrs.
4. Foot length is measured at reference to gauge plane.
5. This dimension is measured at Datum "H".
6. Package conforms to JEDEC MO-178AA.