

### 400MHz Slew Enhanced VFAs

The EL5x02 and EL5x03 families represent high-speed VFAs based on a CFA amplifier architecture. This gives the typical high slew rate benefits of a CFA family along with the stability and ease of use associated with the VFA type architecture. With slew rates of 3500V/ $\mu$ s this family of devices enables the use of voltage feedback amplifiers in a space where the only alternative has been current feedback amplifiers. This family will also be available in single, dual, and triple versions, with 200MHz, 400MHz, and 750MHz versions. These are all available in single, dual, and triple versions.

Both families operate on single 5V or  $\pm$ 5V supplies from minimum supply current. EL5x02 also features an output enable function, which can be used to put the output in to a high-impedance mode. This enables the outputs of multiple amplifiers to be tied together for use in multiplexing applications.

Typical applications for these families will include cable driving, filtering, A-to-D and D-to-A buffering, multiplexing and summing within video, communications, and instrumentation designs.

### Features

- Operates off 3V, 5V, or  $\pm$ 5V applications
- Power-down to 0 $\mu$ A (EL5x02)
- -3dB bandwidth = 400MHz
- $\pm$ 0.1dB bandwidth = 50MHz
- Low supply current = 5mA
- Slew rate = 3500V/ $\mu$ s
- Low offset voltage = 5mV max
- Output current = 140mA
- $A_{VOL}$  = 2000
- Diff gain/phase = 0.01%/0.01 $^\circ$

### Applications

- Video amplifiers
- PCMCIA applications
- A/D drivers
- Line drivers
- Portable computers
- High speed communications
- RGB applications
- Broadcast equipment
- Active filtering

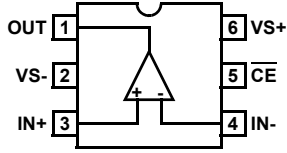
### Ordering Information

PART NUMBER	PACKAGE	TAPE & REEL	PKG. DWG. #
EL5102IS	8-Pin SO	-	MDP0027
EL5102IS-T7	8-Pin SO	7"	MDP0027
EL5102IS-T13	8-Pin SO	13"	MDP0027
EL5102IW-T7	6-Pin SOT-23	7" (3K pcs)	MDP0038
EL5102IW-T7A	6-Pin SOT-23	7" (250 pcs)	MDP0038
EL5103IC-T7	5-Pin SC-70	7" (3K pcs)	P5.049
EL5103IC-T7A	5-Pin SC-70	7" (250 pcs)	P5.049
EL5103IW-T7	5-Pin SOT-23	7" (3K pcs)	MDP0038
EL5103IW-T7A	5-Pin SOT-23	7" (250 pcs)	MDP0038
EL5202IY	10-Pin MSOP	-	MDP0043
EL5202IY-T7	10-Pin MSOP	7"	MDP0043

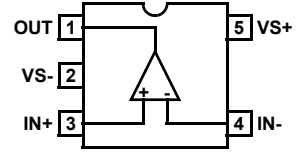
PART NUMBER	PACKAGE	TAPE & REEL	PKG. DWG. #
EL5202IY-T13	10-Pin MSOP	13"	MDP0043
EL5203IS	8-Pin SO	-	MDP0027
EL5203IS-T7	8-Pin SO	7"	MDP0027
EL5203IS-T13	8-Pin SO	13"	MDP0027
EL5203IY	8-Pin MSOP	-	MDP0043
EL5203IY-T7	8-Pin MSOP	7"	MDP0043
EL5203IY-T13	8-Pin MSOP	13"	MDP0043
EL5302IU	16-Pin QSOP	-	MDP0040
EL5302IU-T7	16-Pin QSOP	7"	MDP0040
EL5302IU-T13	16-Pin QSOP	13"	MDP0040

Pinouts

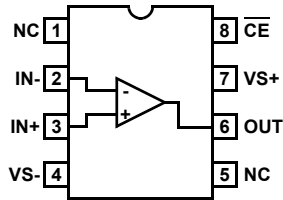
EL5102  
(6-PIN SOT-23)  
TOP VIEW



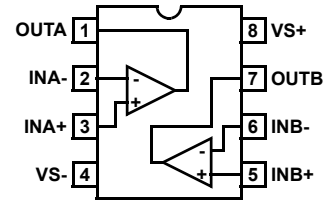
EL5103  
(5-PIN SOT-23)  
TOP VIEW



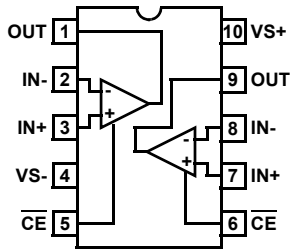
EL5102  
(8-PIN SO)  
TOP VIEW



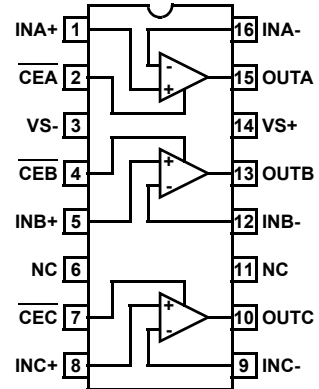
EL5203  
(8-PIN SO, MSOP)  
TOP VIEW



EL5202  
(10-PIN MSOP)  
TOP VIEW



EL5302  
(16-PIN QSOP)  
TOP VIEW



## EL5102, EL5103, EL5202, EL5203, EL5302

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

Supply Voltage between $V_{S+}$ and GND. . . . . 13.2V	Maximum Current into $I_{N+}$ , $I_{N-}$ , $\overline{CE}$ . . . . . $\pm 5\text{mA}$
Input Voltage . . . . . $\pm V_S$	Power Dissipation . . . . . See Curves
Differential Input Voltage . . . . . $\pm 4\text{V}$	Storage Temperature Range . . . . . $-65^\circ\text{C}$ to $+150^\circ\text{C}$
Maximum Continuous Output Current . . . . . 80mA	Ambient Operating Temperature Range . . . . . $-40^\circ\text{C}$ to $+85^\circ\text{C}$
	Operating Junction Temperature . . . . . $150^\circ\text{C}$

*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:  $T_J = T_C = T_A$*

### DC Electrical Specifications $V_{S+} = +5\text{V}$ , $V_{S-} = -5\text{V}$ , $T_A = 25^\circ\text{C}$ , $R_L = 150\Omega$ , $V_{ENABLE} = +5\text{V}$ , unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
$V_{OS}$	Offset Voltage	EL5102, EL5103, EL5202, EL5203		1	5	mV
		EL5302		2	8	mV
$TCV_{OS}$	Offset Voltage Temperature Coefficient	Measured from $T_{MIN}$ to $T_{MAX}$		10		$\mu\text{V}/^\circ\text{C}$
$I_B$	Input Bias Current	$V_{IN} = 0\text{V}$	-12	2	12	$\mu\text{A}$
$I_{OS}$	Input Offset Current	$V_{IN} = 0\text{V}$	-8	1	8	$\mu\text{A}$
$TCI_{OS}$	Input Bias Current Temperature Coefficient	Measured from $T_{MIN}$ to $T_{MAX}$		50		$\text{nA}/^\circ\text{C}$
PSRR	Power Supply Rejection Ratio	$V_S = \pm 4.75\text{V}$ to $\pm 5.25\text{V}$	-70	-80		dB
CMRR	Common Mode Rejection Ratio	$V_{CM} = -3\text{V}$ to $3.0\text{V}$	-60	-80		dB
CMIR	Common Mode Input Range	Guaranteed by CMRR test	-3	$\pm 3.3$	3	V
$R_{IN}$	Input Resistance	Common mode	200	400		$\text{k}\Omega$
$C_{IN}$	Input Capacitance	SO package		1		pF
$I_{S,ON}$	Supply Current - Enabled per amplifier		4.6	5.2	5.8	mA
$I_{S,OFF}$	Supply Current - Shut-down per amplifier	$V_{S+}$	+1	0	+25	$\mu\text{A}$
		$V_{S-}$	-25	7	-1	$\mu\text{A}$
AVOL	Open Loop Gain	$V_{OUT} = \pm 2.5\text{V}$ , $R_L = 1\text{k}\Omega$ to GND	58	66		dB
		$V_{OUT} = \pm 2.5\text{V}$ , $R_L = 150\Omega$ to GND		60		dB
$V_{OUT}$	Output Voltage Swing	$R_L = 1\text{k}\Omega$ to GND	$\pm 3.5$	$\pm 3.9$		V
		$R_L = 150\Omega$ to GND	$\pm 3.4$	$\pm 3.7$		V
$I_{OUT}$	Output Current	$A_V = 1$ , $R_L = 10\Omega$ to $0\text{V}$	$\pm 80$	$\pm 150$		mA
$V_{\overline{CE-ON}}$	$\overline{CE}$ Pin Voltage for Power-up		$(V_{S+})-5$		$(V_{S+})-3$	V
$V_{\overline{CE-OFF}}$	$\overline{CE}$ Pin Voltage for Shut-down		$(V_{S+})-1$		$V_{S+}$	V
$I_{EN-ON}$	Pin Current - Enabled	$\overline{CE} = 0\text{V}$	-1	0	+1	$\mu\text{A}$
$I_{EN-OFF}$	Pin Current - Disabled	$\overline{CE} = +5\text{V}$	1	14	25	$\mu\text{A}$

**Closed Loop AC Electrical Specifications**  $V_{S+} = +5V, V_{S-} = -5V, T_A = 25^\circ C, V_{ENABLE} = +5V, A_V = +1, R_F = 0\Omega, R_L = 150\Omega$  to GND pin, unless otherwise specified. (Note 1)

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
BW	-3dB Bandwidth ( $V_{OUT} = 400mV_{P.P}$ )	$A_V = 1, R_F = 0\Omega$		400		MHz
SR	Slew Rate	$A_V = +2, R_L = 100\Omega, V_{OUT} = -3V$ to +3V	1100	2200	5000	V/ $\mu$ s
		$R_L = 500\Omega, V_{OUT} = -3V$ to +3V		4000		V/ $\mu$ s
$t_R, t_F$	Rise Time, Fall Time	$\pm 0.1V$ step		2.8		ns
OS	Overshoot	$\pm 0.1V$ step		10		%
$t_S$	0.1% Settling Time	$V_S = \pm 5V, R_L = 500\Omega, A_V = 1, V_{OUT} = \pm 3V$		20		ns
dG	Differential Gain (Note 2)	$A_V = 2, R_F = 1k\Omega$		0.01		%
dP	Differential Phase (Note 2)	$A_V = 2, R_F = 1k\Omega$		0.01		°
$e_N$	Input Noise Voltage	$f = 10kHz$		6		nV/ $\sqrt{Hz}$
$i_N$	Input Noise Current	$f = 10kHz$		1.25		pA/ $\sqrt{Hz}$
$t_{DIS}$	Disable Time (Note 3)			50		ns
$t_{EN}$	Enable Time (Note 3)			25		ns

NOTES:

- All AC tests are performed on a "warmed up" part, except slew rate, which is pulse tested.
- Standard NTSC signal = 286mV<sub>P.P</sub>,  $f = 3.58MHz$ , as  $V_{IN}$  is swept from 0.6V to 1.314V.  $R_L$  is DC coupled.
- Disable/Enable time is defined as the time from when the logic signal is applied to the ENABLE pin to when the supply current has reached half its final value.

**Typical Performance Curves**

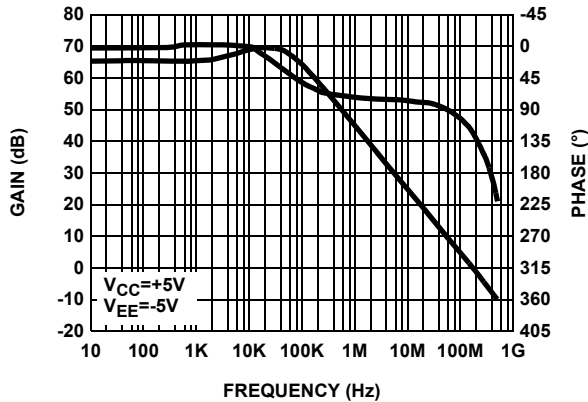


FIGURE 1. OPEN LOOP GAIN AND PHASE vs FREQUENCY

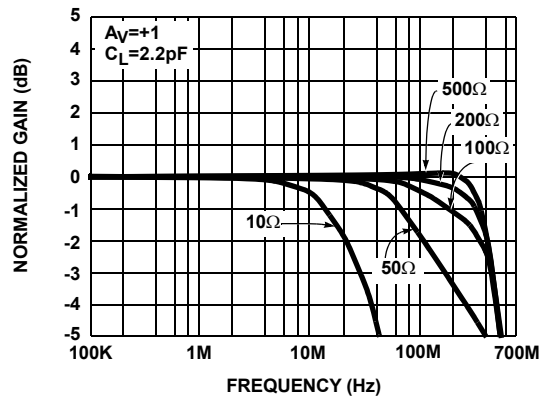


FIGURE 2. GAIN vs FREQUENCY FOR VARIOUS  $R_L$

Typical Performance Curves (Continued)

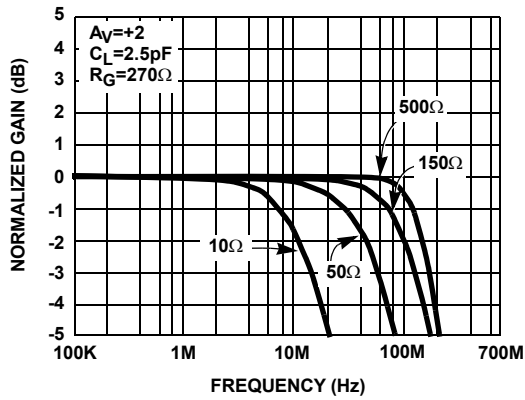


FIGURE 3. GAIN vs FREQUENCY FOR VARIOUS  $R_L$

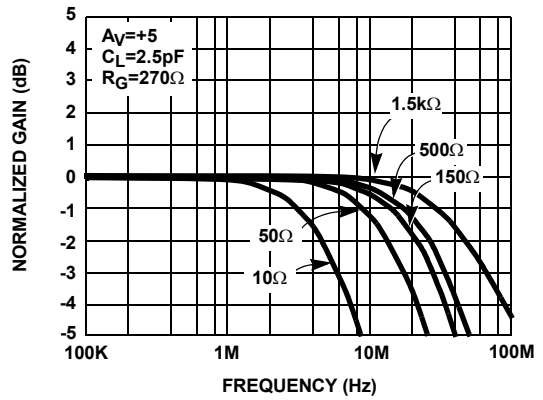


FIGURE 4. GAIN vs FREQUENCY FOR VARIOUS  $R_L$

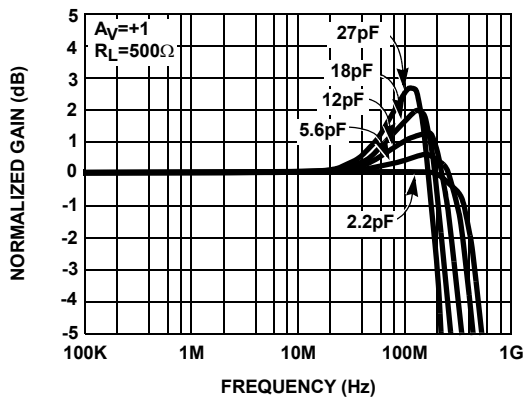


FIGURE 5. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

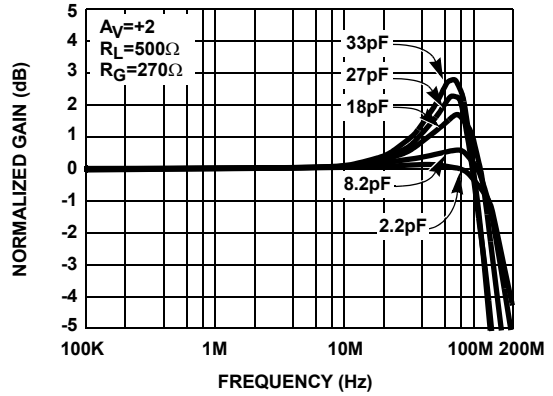


FIGURE 6. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

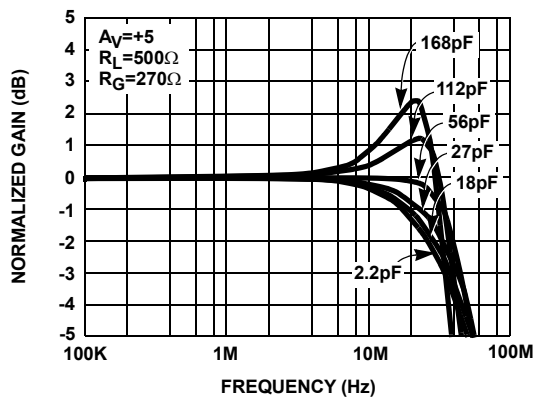


FIGURE 7. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

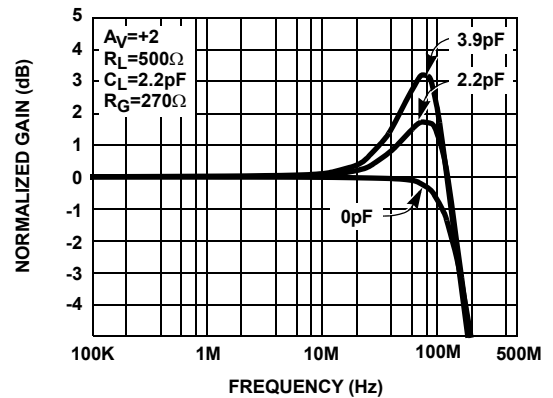


FIGURE 8. GAIN vs FREQUENCY FOR VARIOUS  $C_{IN}$

Typical Performance Curves (Continued)

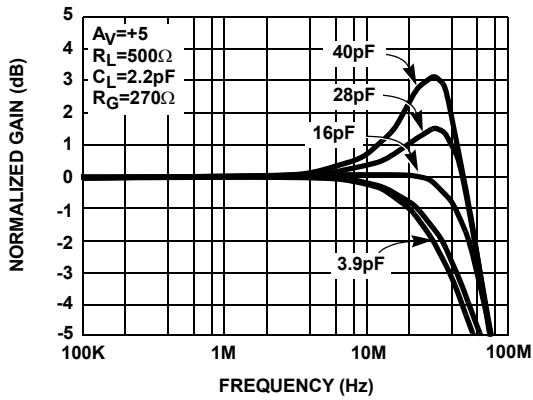


FIGURE 9. GAIN vs FREQUENCY FOR VARIOUS  $C_{IN}$

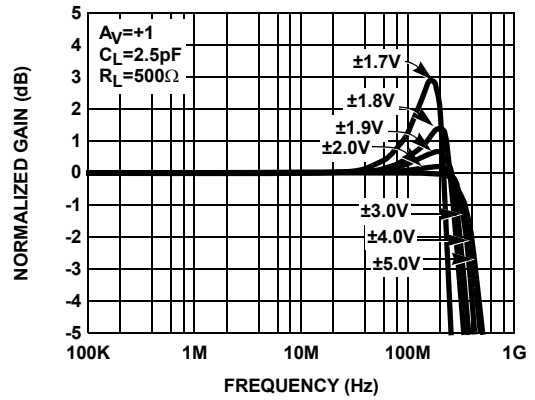


FIGURE 10. GAIN vs FREQUENCY FOR VARIOUS SUPPLY VOLTAGES

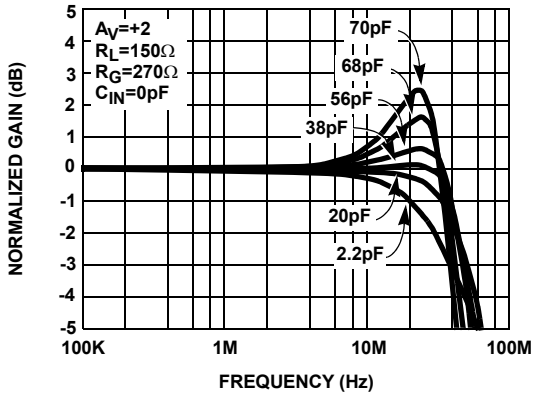


FIGURE 11. FREQUENCY vs GAIN FOR VARIOUS  $C_L$

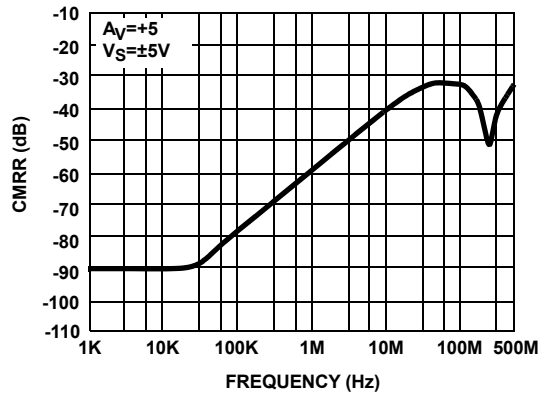


FIGURE 12. CMRR vs FREQUENCY

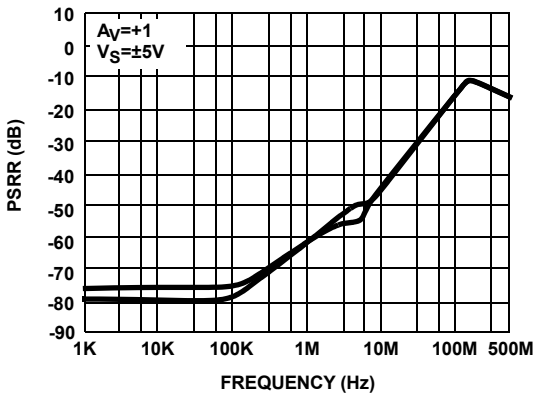


FIGURE 13. PSRR vs FREQUENCY

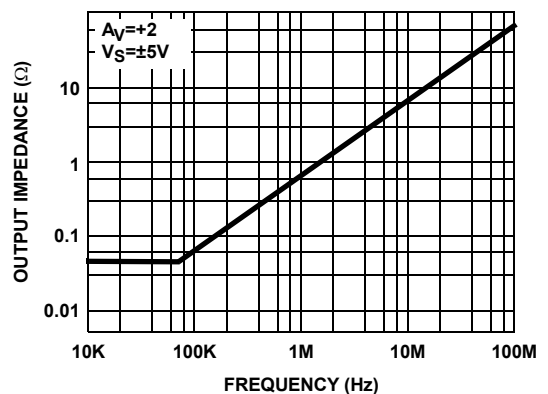


FIGURE 14. OUTPUT IMPEDANCE/PHASE vs FREQUENCY

Typical Performance Curves (Continued)

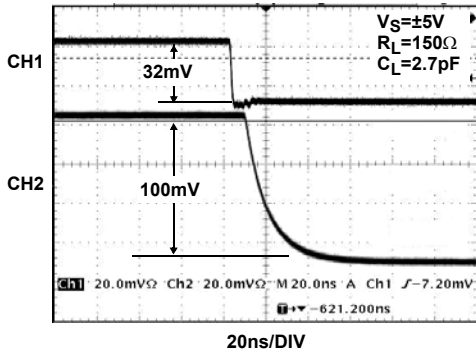


FIGURE 15. FALL TIME SMALL SIGNAL

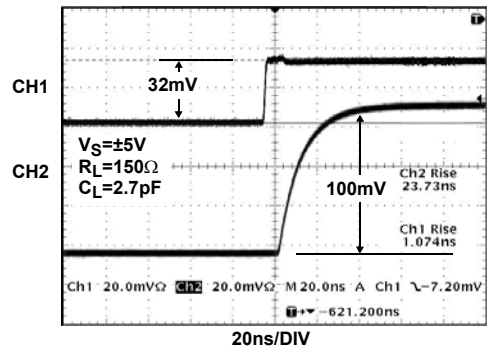


FIGURE 16. RISE TIME SMALL SIGNAL

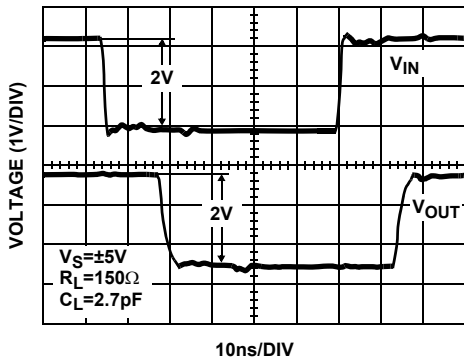


FIGURE 17. RISE AND FALL TIME LARGE SIGNAL

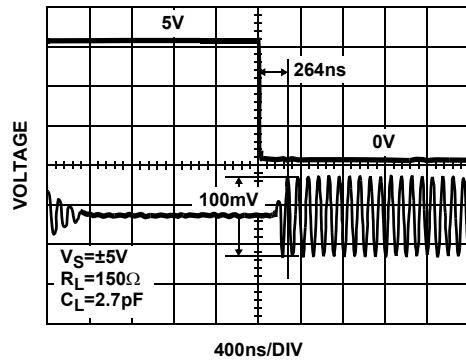


FIGURE 18. TURN-ON TIME

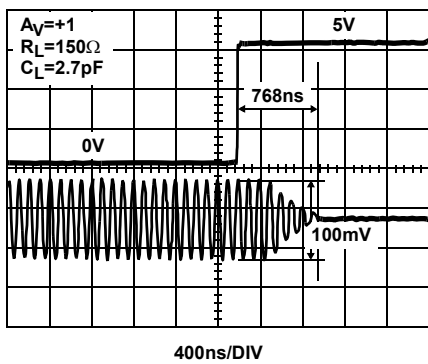


FIGURE 19. TURN-OFF TIME

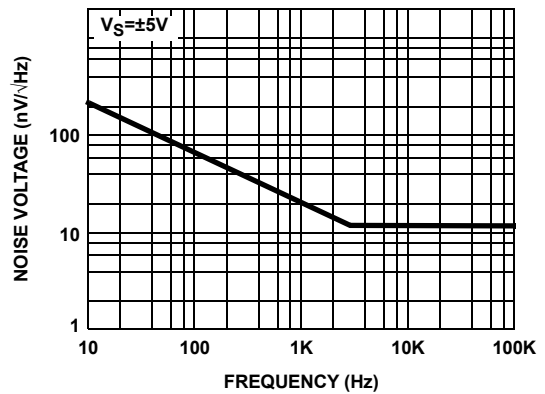


FIGURE 20. EQUIVALENT NOISE VOLTAGE vs FREQUENCY

Typical Performance Curves (Continued)

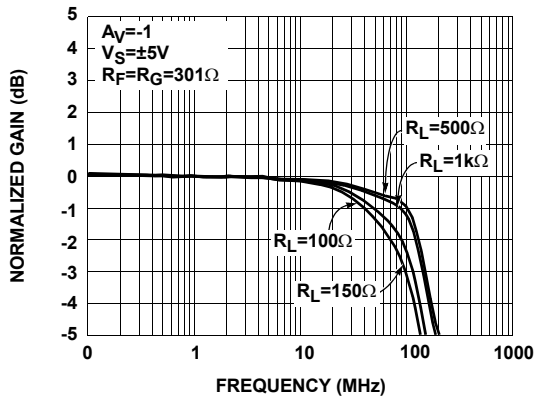


FIGURE 21. GAIN vs FREQUENCY FOR VARIOUS  $R_L$

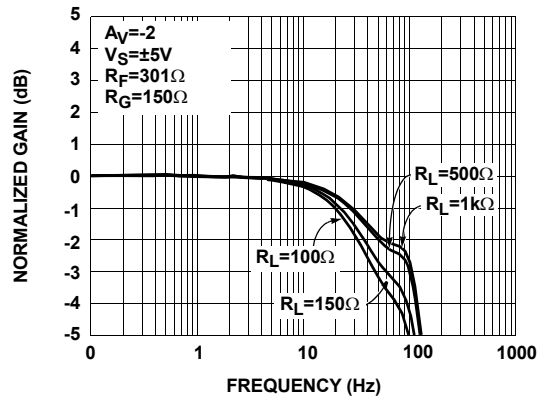


FIGURE 22. GAIN vs FREQUENCY FOR VARIOUS  $R_L$

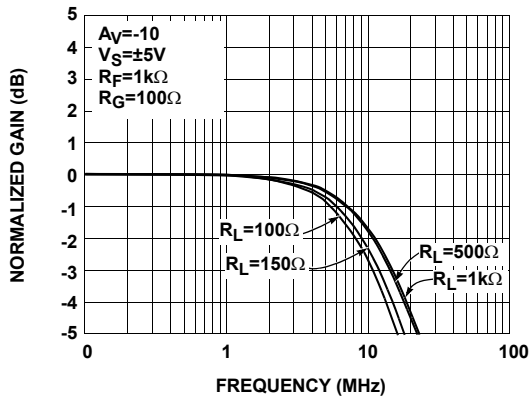


FIGURE 23. GAIN vs FREQUENCY FOR VARIOUS  $R_L$

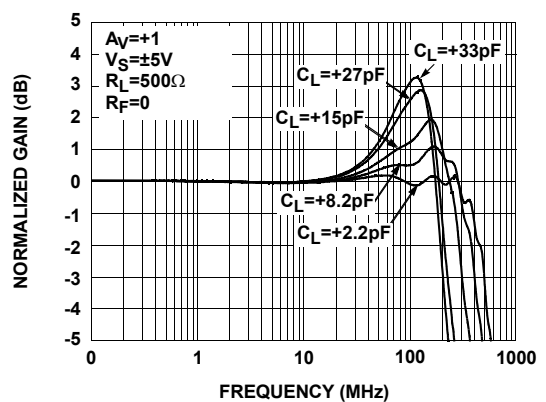


FIGURE 24. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

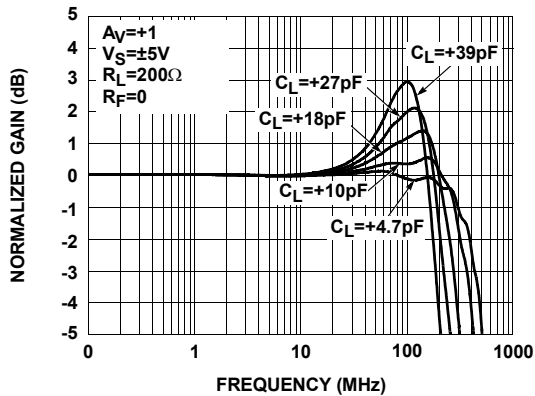


FIGURE 25. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

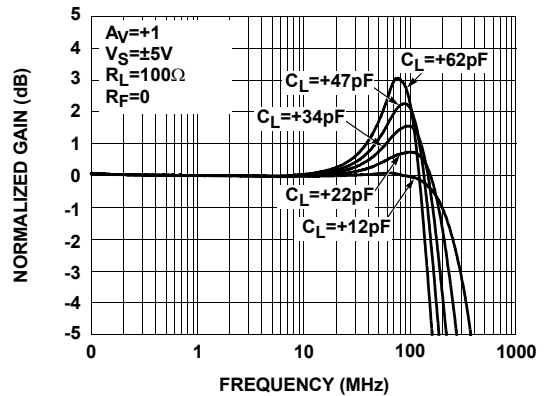


FIGURE 26. GAIN vs FREQUENCY FOR VARIOUS  $C_L$



Typical Performance Curves (Continued)

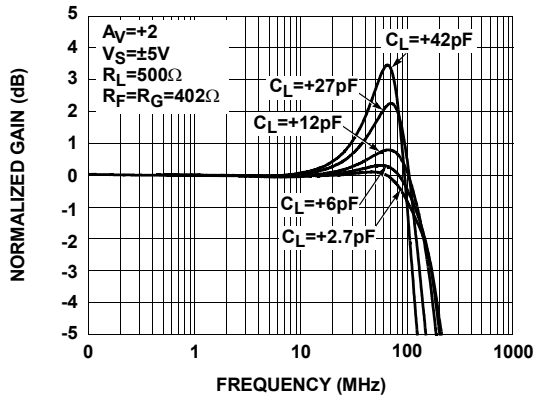


FIGURE 27. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

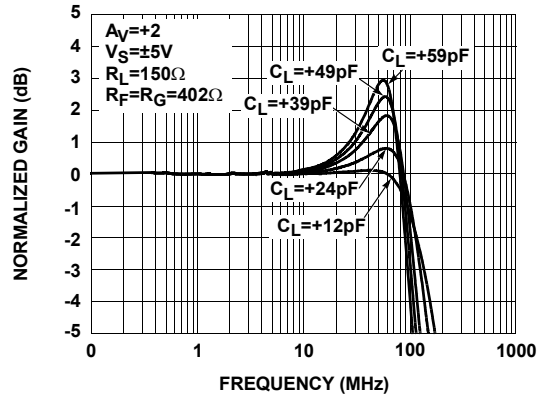


FIGURE 28. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

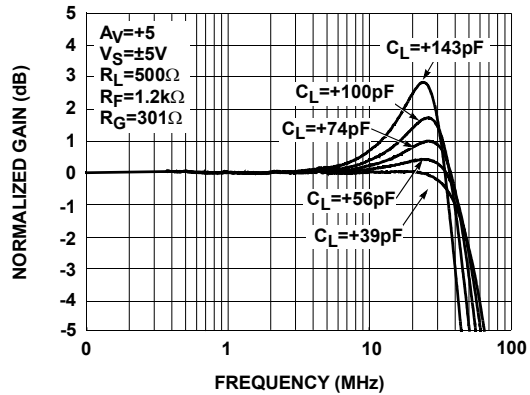


FIGURE 29. GAIN vs FREQUENCY FOR VARIOUS  $C_L$

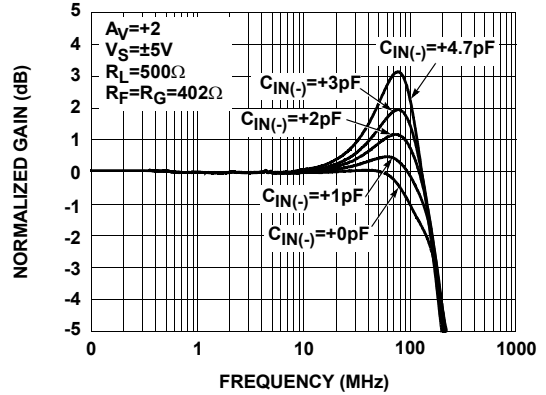


FIGURE 30. GAIN vs FREQUENCY FOR VARIOUS  $C_{IN(-)}$

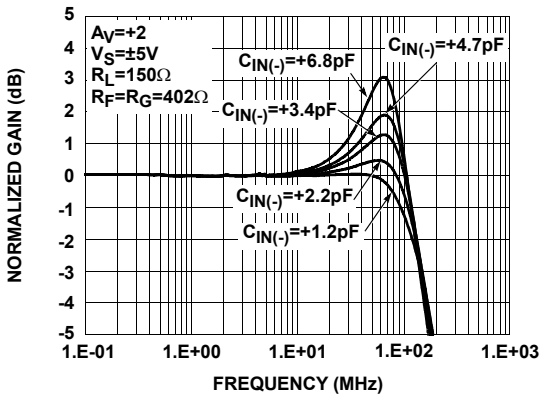


FIGURE 31. GAIN vs FREQUENCY FOR VARIOUS  $C_{IN(-)}$

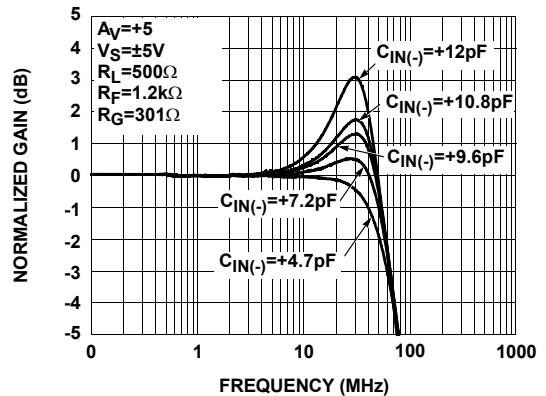


FIGURE 32. GAIN vs FREQUENCY FOR VARIOUS  $C_{IN(-)}$

Typical Performance Curves (Continued)

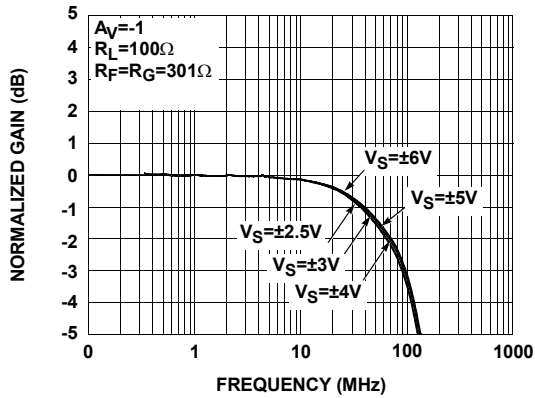


FIGURE 33. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

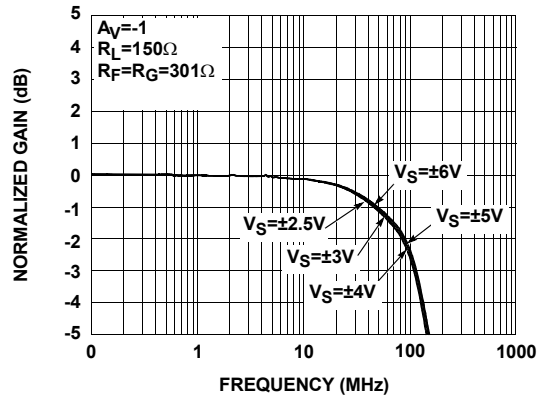


FIGURE 34. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

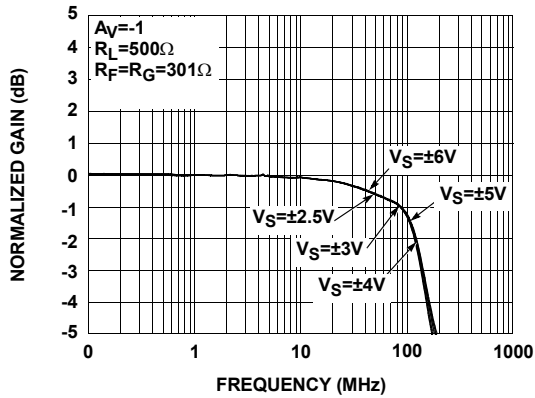


FIGURE 35. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

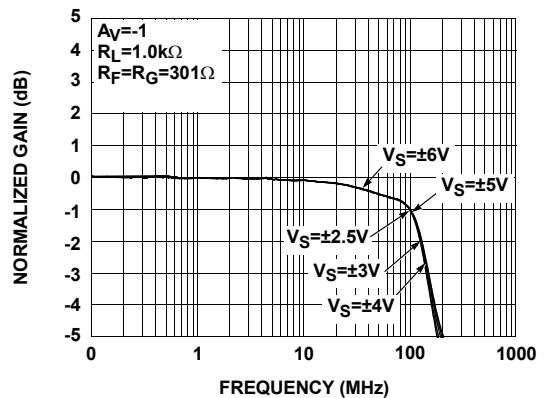


FIGURE 36. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

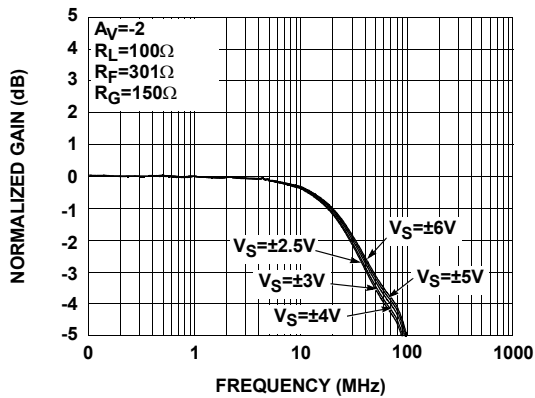


FIGURE 37. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

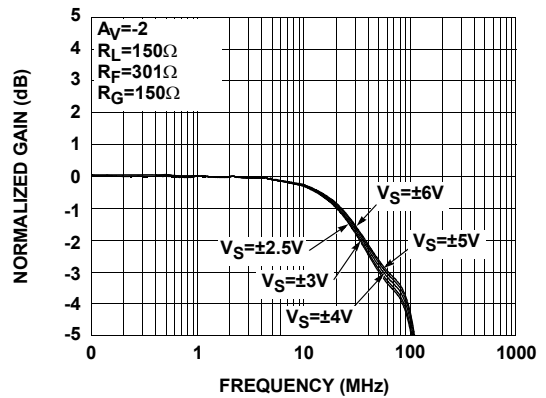


FIGURE 38. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

Typical Performance Curves (Continued)

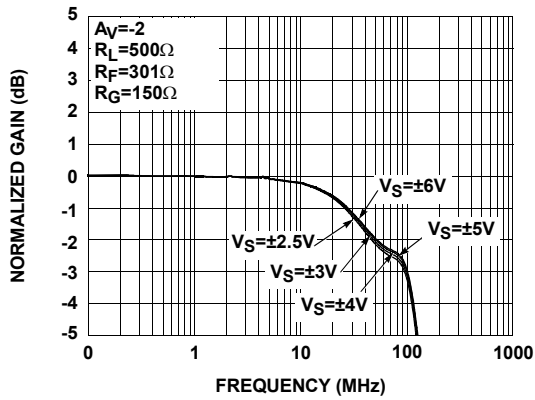


FIGURE 39. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

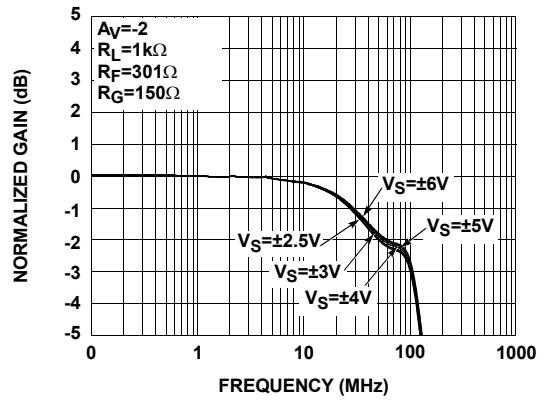


FIGURE 40. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

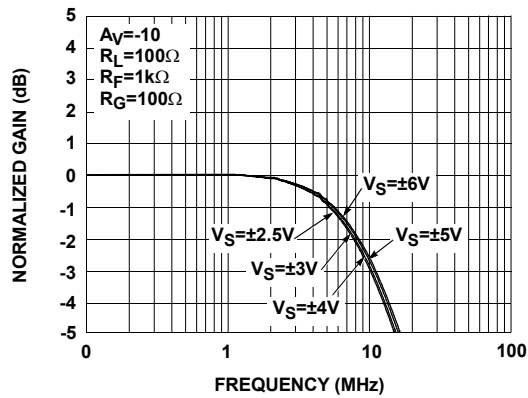


FIGURE 41. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

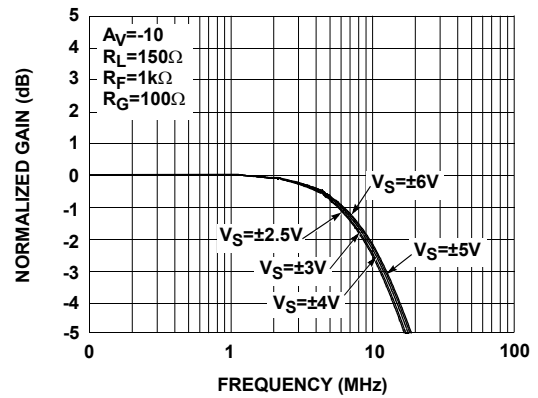


FIGURE 42. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

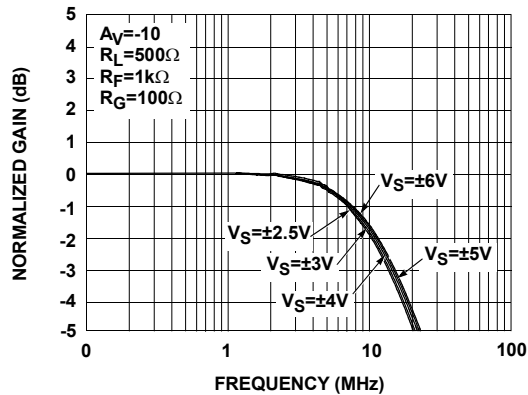


FIGURE 43. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

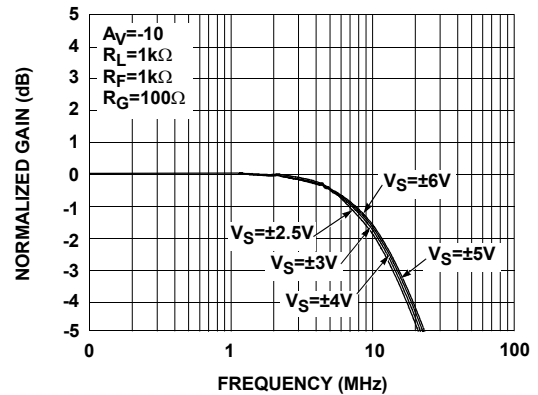


FIGURE 44. GAIN vs FREQUENCY FOR VARIOUS  $V_S$

Typical Performance Curves (Continued)

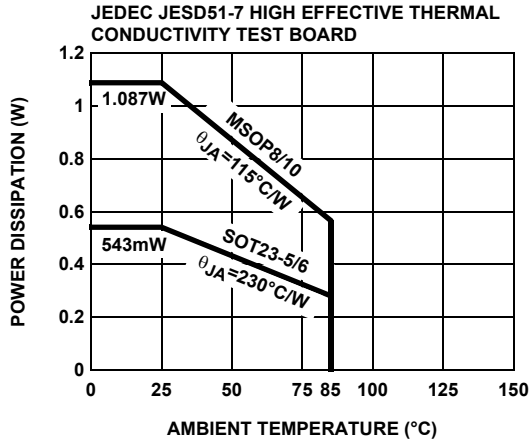


FIGURE 45. PACKAGE POWER DISSIPATION vs AMBIENT TEMPERATURE

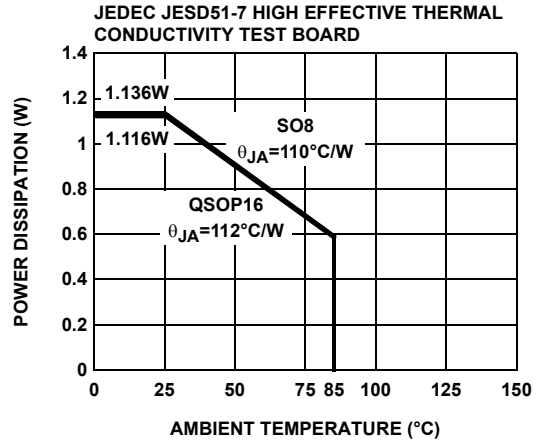


FIGURE 46. PACKAGE POWER DISSIPATION vs AMBIENT TEMPERATURE

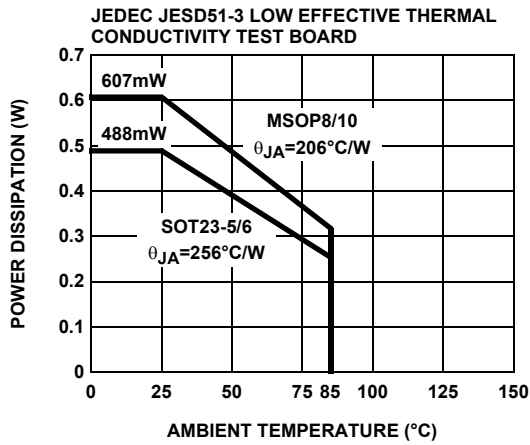


FIGURE 47. PACKAGE POWER DISSIPATION vs AMBIENT TEMPERATURE

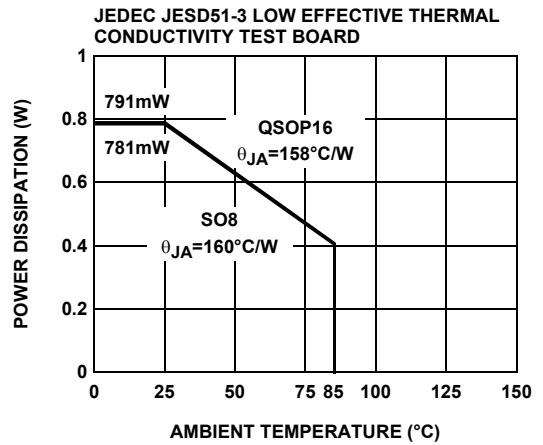


FIGURE 48. PACKAGE POWER DISSIPATION vs AMBIENT TEMPERATURE

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