Data Sheet October 26, 2004 FN2945.9

850MHz, Low Distortion Current Feedback Operational Amplifiers

The HFA1100 is a high-speed, wideband, fast settling current feedback amplifier built with Intersil's proprietary complementary bipolar UHF-1 process. It operates with single supply voltages as low as 4.5V (see Application Information section).

The HFA1100 is a basic op amp with uncommitted pins 1, 5, and 8.

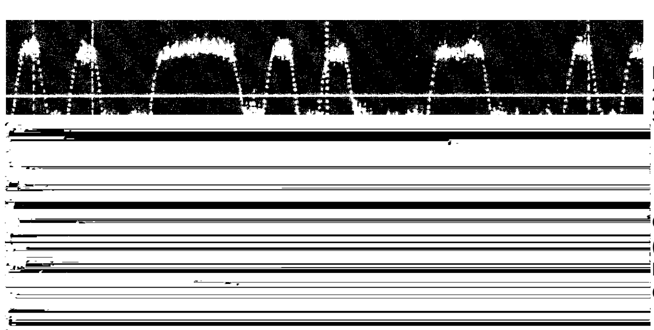
This device offers a significant performance improvement over the AD811, AD9617/18, the CLC400-409, and the EL2070, EL2073, EL2030.

Ordering Information

PART NUMBER (BRAND)	TEMP. RANGE (°C)	PACKAGE	PKG. DWG. #
HFA1100IP	-40 to 85	8 Ld PDIP	E8.3
HFA1100IB (H1100I)	-40 to 85	8 Ld SOIC	M8.15
HFA1100IB96 (H1100I)	-40 to 85	8 Ld SOIC Tape and Reel	M8.15
HFA1100IBZ (Note) (H1100I)	-40 to 85	8 Ld SOIC (Pb-free)	M8.15
HFA1100IBZ96 (Note) (H1100I)	-40 to 85	8 Ld SOIC Tape and Reel (Pb-free)	M8.15
HFA11XXEVAL	DIP Evaluation Board for High-Speed Op Amps		

NOTE: Intersil Pb-free 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-020C.

The Op Amps with Fastest Edges



Features

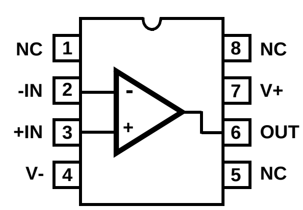
- Low Distortion (30MHz, HD2) . . . . -56dBc
- -3dB Bandwidth 850MHz
- Very Fast Slew Rate 2300V/µs
- Fast Settling Time (0.1%). 11ns
- Excellent Gain Flatness
  - (100MHz) . . . . ±0.14dB
  - (50MHz) . . . . ±0.04dB
- High Output Current. 60mA
- Overdrive Recovery . . . . <10ns
- Operates with 5V Single Supply (See AN9745)
- Pb-Free Available (RoHS Compliant)

Applications

- Video Switching and Routing
- Pulse and Video Amplifiers
- RF/IF Signal Processing
- Flash A/D Driver
- Medical Imaging Systems
- Related Literature
  - AN9420, Current Feedback Theory
  - AN9202, HFA11XX Evaluation Fixture
  - AN9745, Single 5V Supply Operation

Pinout

HFA1100 (PDIP, SOIC)
TOP VIEW



Absolute Maximum Ratings $T_A = 25°C$

Voltage Between V+ and V- 12V
Input Voltage . . . . V_{SUPPLY}
Differential Input Voltage 5V
Output Current (50% Duty Cycle) 60mA

Operating Conditions

Temperature Range. . . . . -40°C to 85°C

Thermal Information

Thermal Resistance (Typical, Note 1)	θ_{JA} (°C/W)	θ_{JC} (°C/W)
PDIP Package	130	N/A
SOIC Package	170	N/A

Maximum Junction Temperature (Plastic Package) . . . . 150°C
Maximum Storage Temperature Range . . . . -65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . 300°C
(SOIC - Lead Tips Only)

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.

NOTE:

1. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications $V_{SUPPLY} = \pm5V$, $A_V = +1$, $R_F = 510\Omega$, $R_L = 100\Omega$, Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	(NOTE 2) TEST LEVEL	TEMP. (°C)	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS							
Input Offset Voltage (Note 3)		A	25	-	2	6	mV
		A	Full	-	-	10	mV
Input Offset Voltage Drift		C	Full	-	10	-	µV/°C
V_{IO} CMRR	$\Delta V_{CM} = \pm2V$	A	25	40	46	-	dB
		A	Full	38	-	-	dB
V_{IO} PSRR	$\Delta V_S = \pm1.25V$	A	25	45	50	-	dB
		A	Full	42	-	-	dB
Non-Inverting Input Bias Current (Note 3)	+IN = 0V	A	25	-	25	40	µA
		A	Full	-	-	65	µA
$+I_{BIAS}$ Drift		C	Full	-	40	-	nA/°C
$+I_{BIAS}$ CMS	$\Delta V_{CM} = \pm2V$	A	25	-	20	40	µA/V
		A	Full	-	-	50	µA/V
Inverting Input Bias Current (Note 3)	-IN = 0V	A	25	-	12	50	µA
		A	Full	-	-	60	µA
$-I_{BIAS}$ Drift		C	Full	-	40	-	nA/°C
$-I_{BIAS}$ CMS	$\Delta V_{CM} = \pm2V$	A	25	-	1	7	µA/V
		A	Full	-	-	10	µA/V
$-I_{BIAS}$ PSS	$\Delta V_S = \pm1.25V$	A	25	-	6	15	µA/V
		A	Full	-	-	27	µA/V
Non-Inverting Input Resistance		A	25	25	50	-	kΩ
Inverting Input Resistance		C	25	-	20	30	Ω
Input Capacitance (Either Input)		B	25	-	2	-	pF
Input Common Mode Range		C	Full	±2.5	±3.0	-	V
Input Noise Voltage (Note 3)	100kHz	B	25	-	4	-	$nV/\sqrt{Hz}$
+Input Noise Current (Note 3)	100kHz	B	25	-	18	-	$pA/\sqrt{Hz}$
-Input Noise Current (Note 3)	100kHz	B	25	-	21	-	$pA/\sqrt{Hz}$
TRANSFER CHARACTERISTICS $A_V = +2$, Unless Otherwise Specified							
Open Loop Transimpedance (Note 3)		B	25	-	300	-	kΩ

Electrical Specifications V_{SUPPLY} = ±5V, A_V = +1, R_F = 510Ω, R_L = 100Ω, Unless Otherwise Specified **(Continued)**

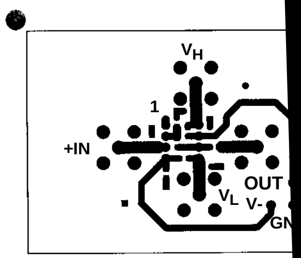
PARAMETER	TEST CONDITIONS	(NOTE 2) TEST LEVEL	TEMP. (°C)	MIN	TYP	MAX	UNITS
-3dB Bandwidth (Note 3)	V_{OUT} = 0.2V_{P-P}, A_V = +1	B	25	530	850	-	MHz
-3dB Bandwidth	V_{OUT} = 0.2V_{P-P}, A_V = +2, R_F = 360Ω	B	25	-	670	-	MHz
Full Power Bandwidth	V_{OUT} = 4V_{P-P}, A_V = -1	B	25	-	300	-	MHz
Gain Flatness (Note 3)	To 100MHz	B	25	-	±0.14	-	dB
Gain Flatness	To 50MHz	B	25	-	±0.04	-	dB
Gain Flatness	To 30MHz	B	25	-	±0.01	-	dB
Linear Phase Deviation (Note 3)	DC to 100MHz	B	25	-	0.6	-	Degrees
Differential Gain	NTSC, R_L = 75Ω	B	25	-	0.03	-	%
Differential Phase	NTSC, R_L = 75Ω	B	25	-	0.05	-	Degrees
Minimum Stable Gain		A	Full	1	-	-	V/V
OUTPUT CHARACTERISTICS A_V = +2, Unless Otherwise Specified							
Output Voltage (Note 3)	A_V = -1	A	25	±3.0	±3.3	-	V
		A	Full	±2.5	±3.0	-	V
Output Current	R_L = 50Ω, A_V = -1	A	25, 85	50	60	-	mA
		A	-40	35	50	-	mA
DC Closed Loop Output Impedance (Note 3)		B	25	-	0.07	-	Ω
2nd Harmonic Distortion (Note 3)	30MHz, V_{OUT} = 2V_{P-P}	B	25	-	-56	-	dBc
3rd Harmonic Distortion (Note 3)	30MHz, V_{OUT} = 2V_{P-P}	B	25	-	-80	-	dBc
3rd Order Intercept (Note 3)	100MHz	B	25	20	30	-	dBm
1dB Compression	100MHz	B	25	15	20	-	dBm
TRANSIENT RESPONSE A_V = +2, Unless Otherwise Specified							
Rise Time	V_{OUT} = 2.0V Step	B	25	-	900	-	ps
Overshoot (Note 3)	V_{OUT} = 2.0V Step	B	25	-	10	-	%
Slew Rate	A_V = +1, V_{OUT} = 5V_{P-P}	B	25	-	1400	-	V/μs
Slew Rate	A_V = +2, V_{OUT} = 5V_{P-P}	B	25	1850	2300	-	V/μs
0.1% Settling (Note 3)	V_{OUT} = 2V to 0V	B	25	-	11	-	ns
0.2% Settling (Note 3)	V_{OUT} = 2V to 0V	B	25	-	7	-	ns
Overdrive Recovery Time	2X Overdrive	B	25	-	7.5	10	ns
POWER SUPPLY CHARACTERISTICS							
Supply Voltage Range		B	Full	±4.5	-	±5.5	V
Supply Current (Note 3)		A	25	-	21	26	mA
		A	Full	-	-	33	mA

NOTES:

2. Test Level: A. Production Tested; B. Typical or Guaranteed Limit Based on Characterization; C. Design Typical for Information Only.
3. See Typical Performance Curves for more information.

The layout and schematic of the board [redacted]

TOP LAYOUT



Typical Performance Curves [redacted]

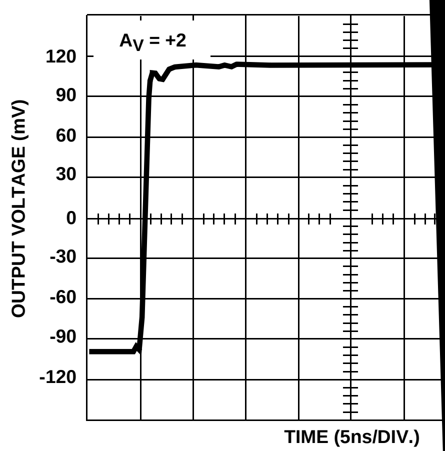


FIGURE 1. SMALL SIGNAL PU[redacted]

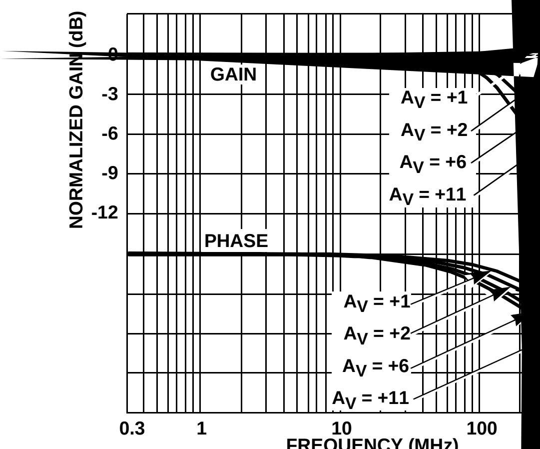


FIGURE 3. NON-INVERTING FREQUENC[redacted]

Typical Performance Curves $V_{SUPPLY} = \pm5V$, $R_F = 510\Omega$, $T_A = 25°C$, $R_L = 100\Omega$, Unless Otherwise Specified **(Continued)**

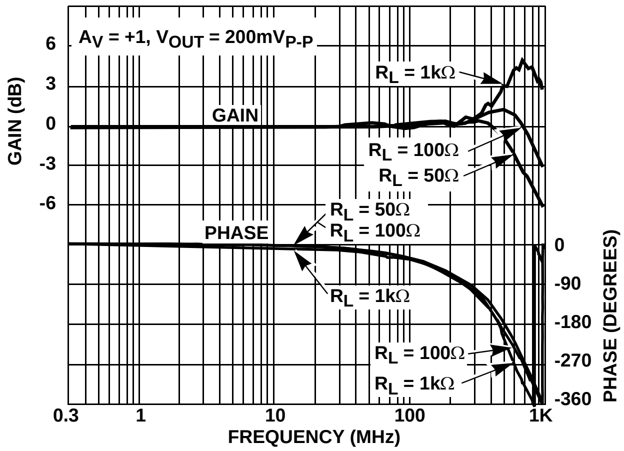


FIGURE 5. FREQUENCY RESPONSE FOR VARIOUS LOAD RESISTORS

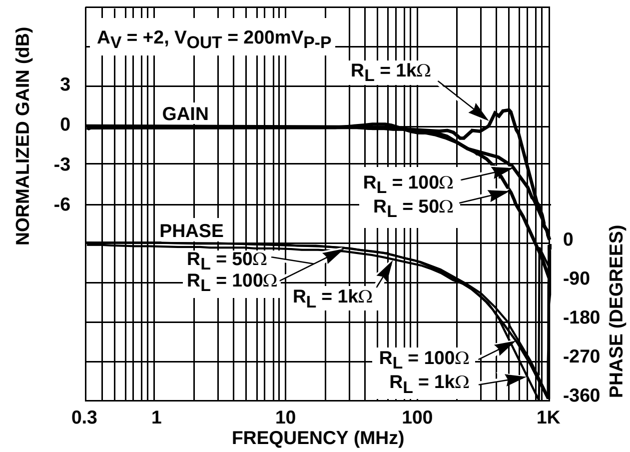


FIGURE 6. FREQUENCY RESPONSE FOR VARIOUS LOAD RESISTORS

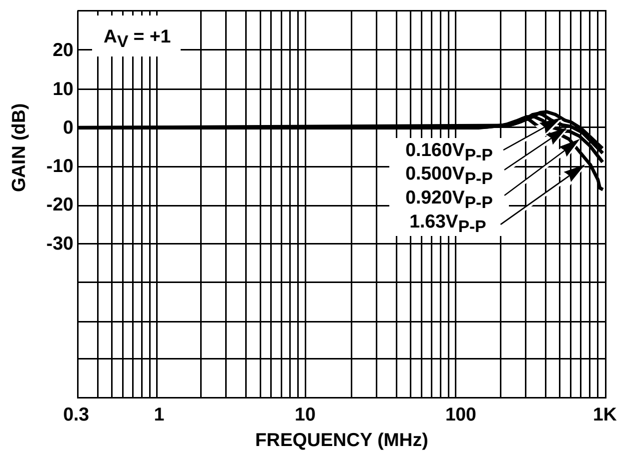


FIGURE 7. FREQUENCY RESPONSE FOR VARIOUS OUTPUT VOLTAGES

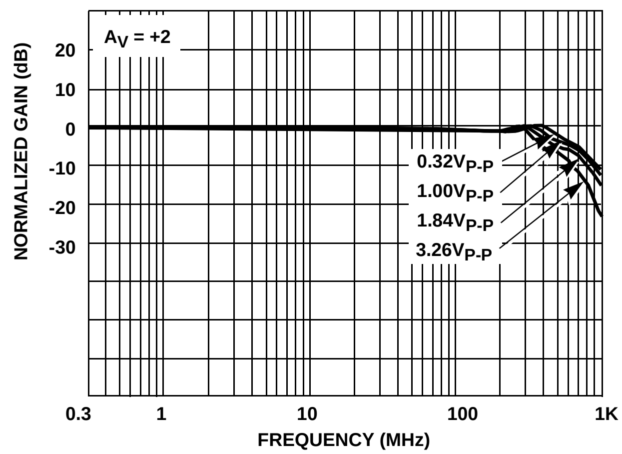


FIGURE 8. FREQUENCY RESPONSE FOR VARIOUS OUTPUT VOLTAGES

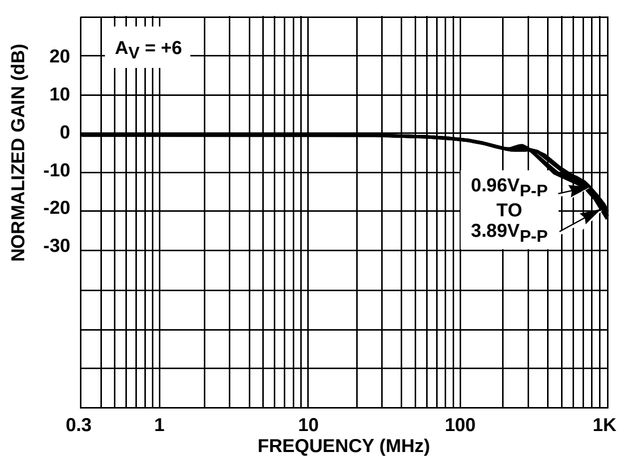


FIGURE 9. FREQUENCY RESPONSE FOR VARIOUS OUTPUT VOLTAGES

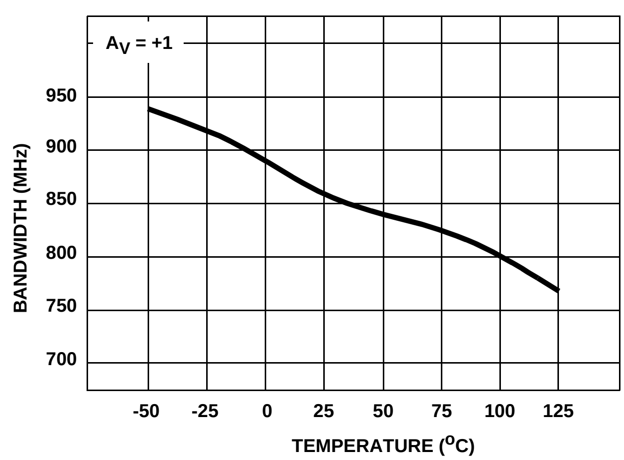


FIGURE 10. -3dB BANDWIDTH vs TEMPERATURE

Typical Performance Curves V_{SUPPLY} = ±5V, R_F = 510Ω, T_A = 25°C, R_L = 100Ω, Unless Otherwise Specified **(Continued)**

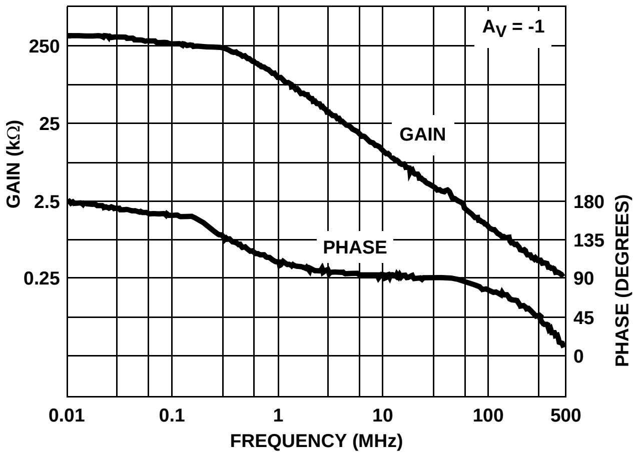


FIGURE 11. OPEN LOOP TRANSIMPEDANCE

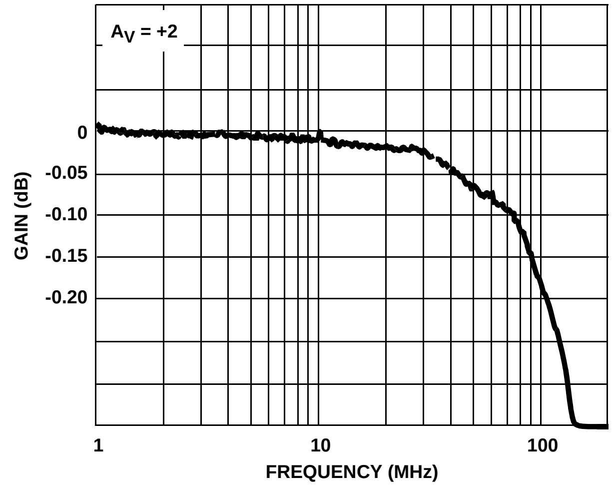


FIGURE 12. GAIN FLATNESS

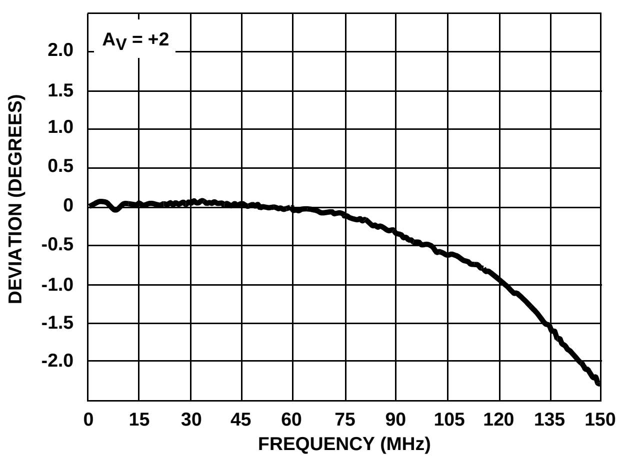


FIGURE 13. DEVIATION FROM LINEAR PHASE

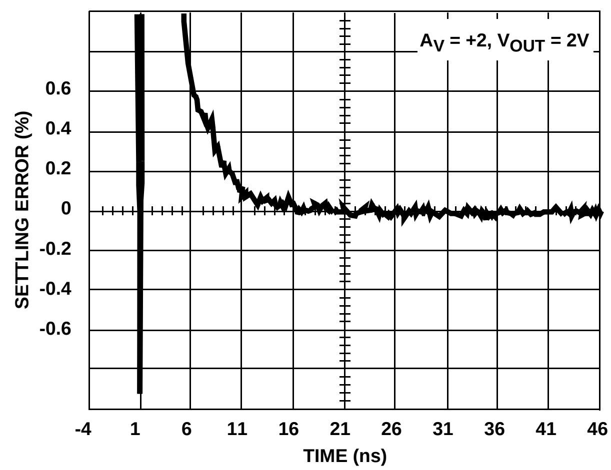


FIGURE 14. SETTLING RESPONSE

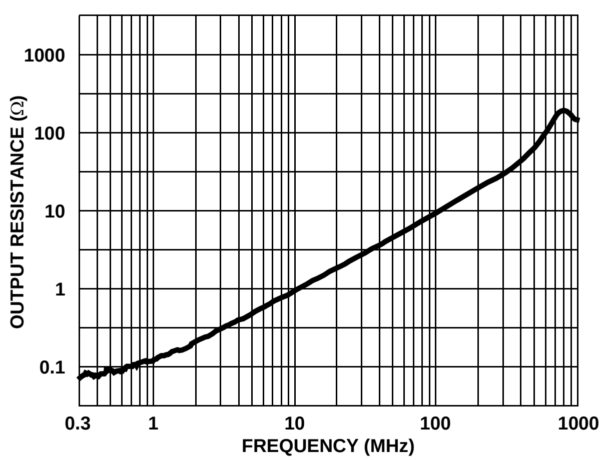


FIGURE 15. CLOSED LOOP OUTPUT RESISTANCE

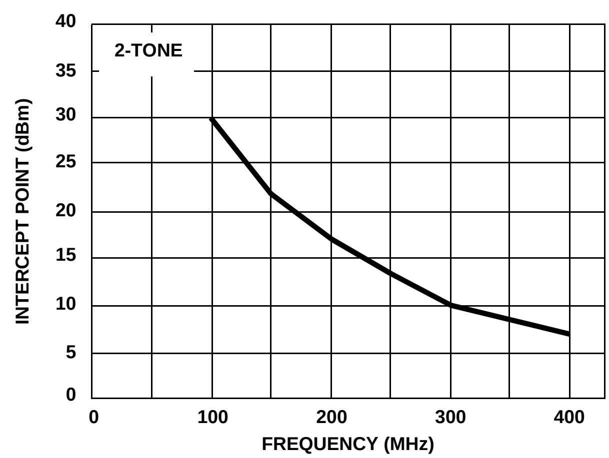


FIGURE 16. 3rd ORDER INTERMODULATION INTERCEPT

Typical Performance Curves $V_{SUPPLY} = \pm5V$, $R_F = 510\Omega$, $T_A = 25°C$, $R_L = 100\Omega$, Unless Otherwise Specified **(Continued)**

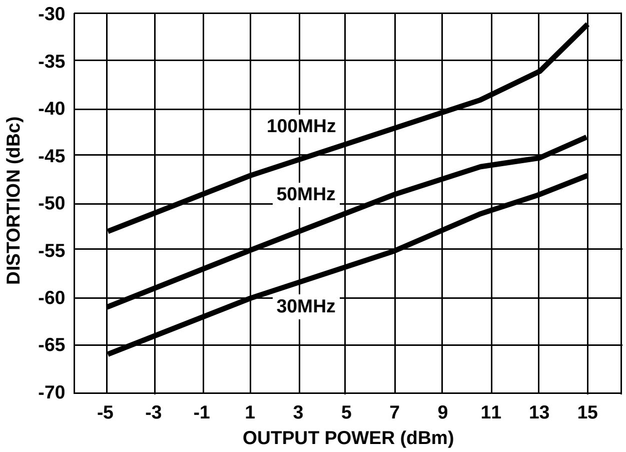


FIGURE 17. 2nd HARMONIC DISTORTION vs P_{OUT}

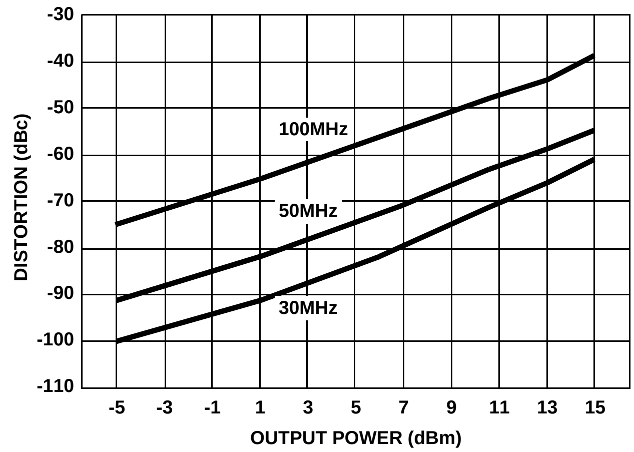


FIGURE 18. 3rd HARMONIC DISTORTION vs P_{OUT}

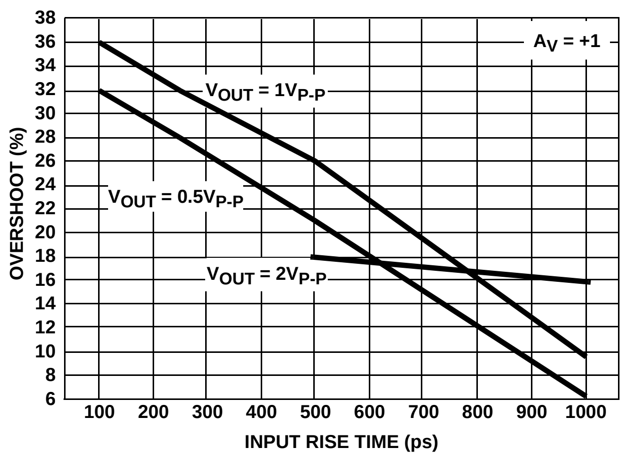


FIGURE 19. OVERSHOOT vs INPUT RISE TIME

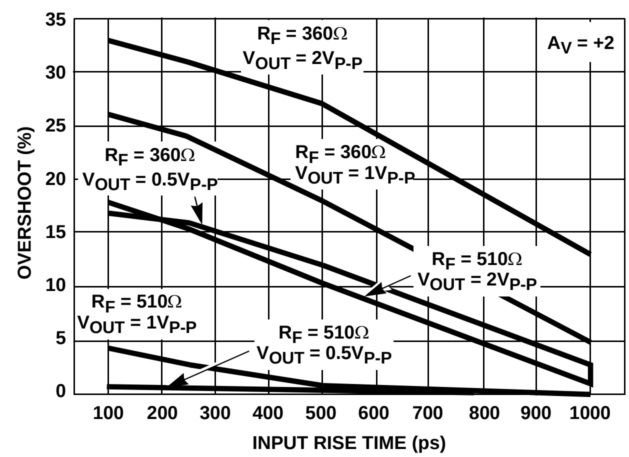


FIGURE 20. OVERSHOOT vs INPUT RISE TIME

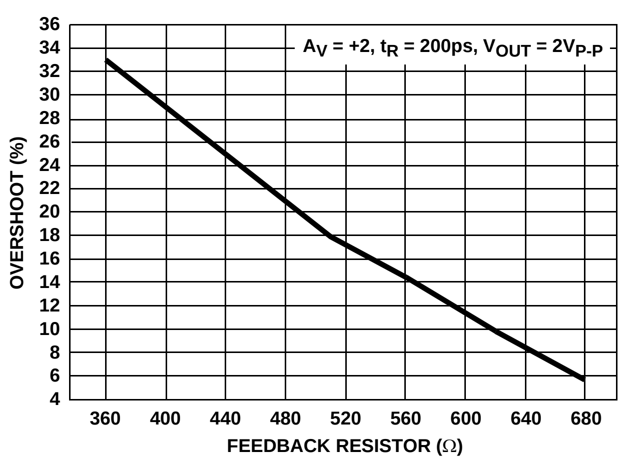


FIGURE 21. OVERSHOOT vs FEEDBACK RESISTOR

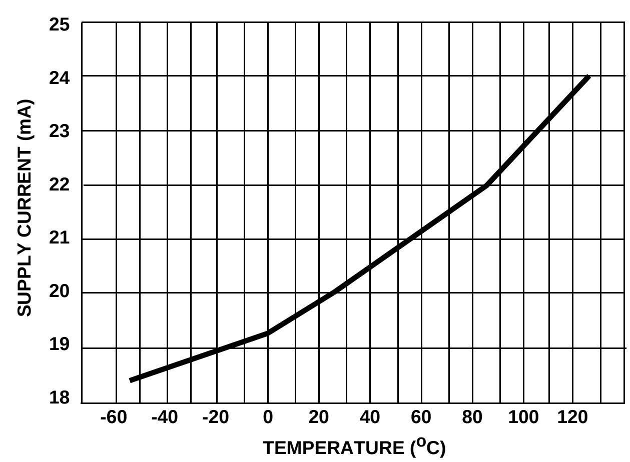


FIGURE 22. SUPPLY CURRENT vs TEMPERATURE

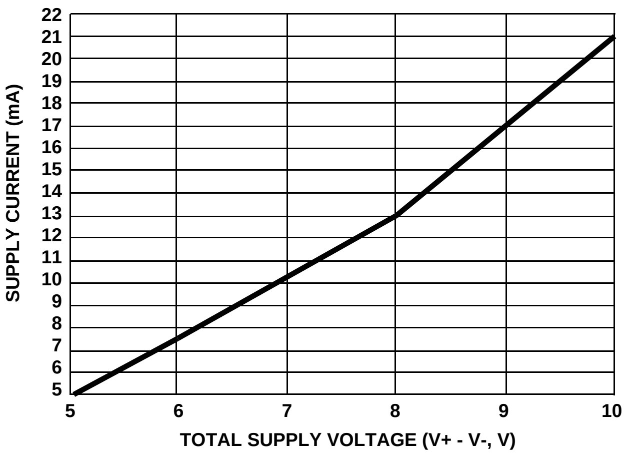


FIGURE 23. SUPPLY CURRENT vs SUPPLY VOLTAGE

45
42
39
36
33
30
27
24
BIAS CURRENTS (μA)

-60 -40 -20 200 20 0 0
27
12
TEMPERATURE (°C)

FIGURE 24. V_{IO} AND BIAS CURRENTS vs TEMPERATURE

FIGURE 25. OUTPUT VOLTAGE vs TEMPERATURE

FIGURE 26. INPUT NOISE vs FREQUENCY

Die Characteristics

DIE DIMENSIONS:

63 mils x 44 mils x 19 mils
1600μm x 1130μm

METALLIZATION:

Type: Metal 1: AlCu (2%)/TiW
Thickness: Metal 1: 8kÅ ±0.4kÅ
Type: Metal 2: AlCu (2%)
Thickness: Metal 2: 16kÅ ±0.8kÅ

PASSIVATION:

Type: Nitride
Thickness: 4kÅ ±0.5kÅ

TRANSISTOR COUNT:

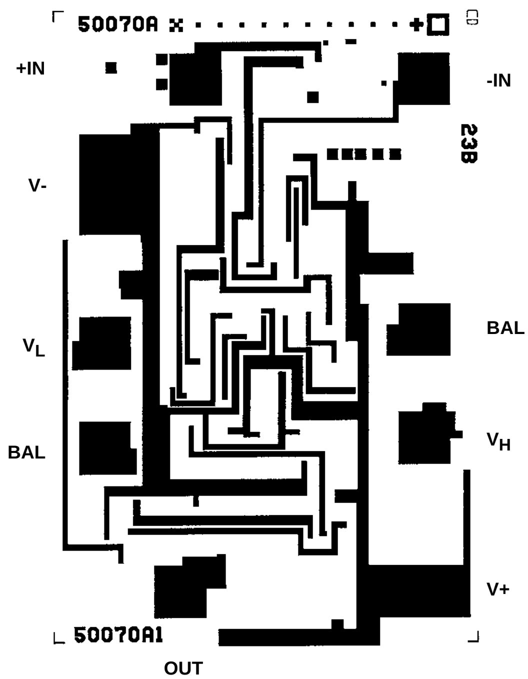
52

SUBSTRATE POTENTIAL (POWERED UP):

Floating (Recommend Connection to V-)

Metallization Mask Layout

HFA1100



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