

January 1999

**OBSOLETE PRODUCT  
POSSIBLE SUBSTITUTE PRODUCT  
HA-2525**

## 38MHz, Operational Amplifier

### Features

- High Open Loop Gain at Video  
Frequencies ..... 42dB (Typ) at 1MHz
- Unity Gain  
Crossover Frequency ( $f_T$ ) ..... 38MHz (Typ)
- Full Power Bandwidth  
 $V_O = 18V_{P-P}$  ..... 1.2MHz (Typ)
- Slew Rate
  - 20dB Amplifier ..... 70V/ $\mu$ s (Typ)
  - Unity Gain Amplifier ..... 25V/ $\mu$ s (Typ)
- Settling Time ..... 0.6 $\mu$ s (Typ)
- Output Current .....  $\pm 15mA$  (Min)
- Single Capacitor Compensation
- Offset Null Terminals

### Applications

- Video Amplifiers
- Fast Peak Detectors
- Meter Driver Amplifiers
- High Frequency Feedback Amplifiers
- Video Pre-Drivers
- Oscillators
- Multivibrators
- Voltage Controlled Oscillator
- Fast Comparators

### Description

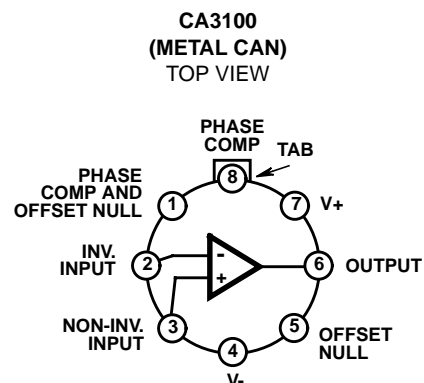
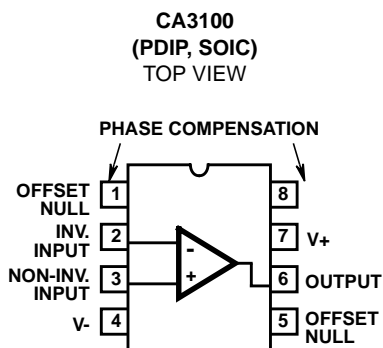
The CA3100 is a large signal wideband, high speed operational amplifier which has a unity gain cross over frequency ( $f_T$ ) of approximately 38MHz and an open loop, 3dB corner frequency of approximately 110kHz. It can operate at a total supply voltage of from 14V to 36V ( $\pm 7V$  to  $\pm 18V$  when using split supplies) and can provide at least 18V<sub>P-P</sub> and 30mA<sub>P-P</sub> at the output when operating from  $\pm 15V$  supplies. The CA3100 can be compensated with a single external capacitor and has DC offset adjust terminals for those applications requiring offset null. (See Figure 1).

The CA3100 circuit contains both bipolar and PMOS transistors on a single monolithic chip.

### Part Number Information

PART NUMBER (BRAND)	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
CA3100E	-40 to 85	8 Ld PDIP	E8.3
CA3100M (3100)	-40 to 85	8 Ld SOIC	M8.15
CA3100T	-55 to 125	8 Pin Metal Can	T8.C

### Pinouts



# CA3100

## Absolute Maximum Ratings

Supply Voltage (Between V+ and V- Terminals) . . . . .	36V
Differential Input Voltage . . . . .	12V
Input Voltage to Ground . . . . .	V+ to V-
Offset Terminal to V- Terminal Voltage . . . . .	±0.5V
Output Current (Note 2) . . . . .	50mA

## Operating Conditions

Temperature Range	
CA3100E, CA3100M . . . . .	-40°C to 85°C
CA3100T . . . . .	-55°C to 125°C

## Thermal Information

Thermal Resistance (Typical, Note 1)	$\theta_{JA}$ (°C/W)	$\theta_{JC}$ (°C/W)
PDIP Package . . . . .	100	N/A
SOIC Package . . . . .	165	N/A
Metal Can Package . . . . .	170	85
Maximum Junction Temperature (Metal Can) . . . . .	175°C	
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.

### NOTES:

- $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.
- CA3100 does not contain circuitry to protect against short circuits in the output.

## Electrical Specifications $T_A = 25^\circ\text{C}$ , $V_{\text{SUPPLY}} = \pm 15\text{V}$ , Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
<b>DC</b>						
Input Offset Voltage	$V_{IO}$	$V_O = 0 \pm 0.1\text{V}$	-	±1	±5	mV
Input Bias Current	$I_{IB}$	$V_O = 0 \pm 1\text{V}$	-	0.7	2	μA
Input Offset Current	$I_{IO}$	$V_O = 0 \pm 1\text{V}$	-	±0.05	±0.4	μA
Common Mode Input Voltage Range	$V_{ICR}$	CMRR ≥ 76dB	±12	+14 -13	-	V
Common Mode Rejection Ratio	CMRR	$V_{CM} = \pm 12\text{V}$	76	90	-	dB
Maximum Output Voltage	$V_{OM+}$	Differential Input Voltage = $0 \pm 0.1\text{V}$ , $R_L = 2\text{k}\Omega$	+9	+11	-	V
	$V_{OM-}$		-9	-11	-	V
Maximum Output Current	$I_{OM+}$	Differential Input Voltage = $0 + 0.1\text{V}$ , $R_L = 250\Omega$	+15	+30	-	mA
	$I_{OM-}$		-15	-30	-	mA
Supply Current	$I_+$	$V_O = 0 \pm 0.1\text{V}$ , $R_L \geq 10\text{k}\Omega$	-	8.5	10.5	mA
Power Supply Rejection Ratio	PSRR	$\Delta V_+ = \pm 1\text{V}$ , $\Delta V_- = \pm 1\text{V}$	60	70	-	dB
<b>DYNAMIC</b>						
Unity-Gain Crossover Frequency	$f_T$	$C_C = 0$ , $V_O = 0.3V_{P-P}$	-	38	-	MHz
Open Loop Voltage Gain	$A_{OL}$	$f = 1\text{kHz}$ , $V_O = \pm 1\text{V}$ , (Note 3)	56	61	-	dB
		$f = 1\text{MHz}$ , $C_C = 0$ , $V_O = 10V_{P-P}$	36	42	-	dB
Slew Rate	SR	$A_V = 10$ , $C_C = 0$ , $V_I = 1\text{V}$ (Pulse)	50	70	-	V/μs
		$A_V = 1$ , $C_C = 10\text{pF}$ , $V_I = 10\text{V}$ (Pulse)	-	25	-	V/μs
Full Power Bandwidth (Note 4)	FPBW	$A_V = 10$ , $C_C = 0$ , $V_O = 18V_{P-P}$	0.8	1.2	-	MHz
		$A_V = 1$ , $C_C = 10\text{pF}$ , $V_O = 18V_{P-P}$	-	0.4	-	MHz
Open Loop Differential Input Impedance	$Z_I$	$f = 1\text{MHz}$	-	30	-	kΩ
Open Loop Output Impedance	$Z_O$	$f = 1\text{MHz}$	-	110	-	Ω

# CA3100

## Electrical Specifications $T_A = 25^\circ\text{C}$ , $V_{\text{SUPPLY}} = \pm 15\text{V}$ , Unless Otherwise Specified (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Wideband Noise Voltage (RTI)	$e_N$ (Total)	$BW = 1\text{MHz}$ , $R_S = 1\text{k}\Omega$	-	8	-	$\mu\text{V}_{\text{RMS}}$
Settling Time (To Within $\pm 50\text{mV}$ of 9V Output Swing)	$t_S$	$R_L = 2\text{k}\Omega$ , $C_L = 20\text{pF}$	-	0.6	-	$\mu\text{s}$

### NOTES:

- Low frequency dynamic characteristic.
- Full Power Bandwidth =  $\frac{\text{Slew Rate}}{\pi V_{\text{OP-P}}}$ .

## Test Circuits

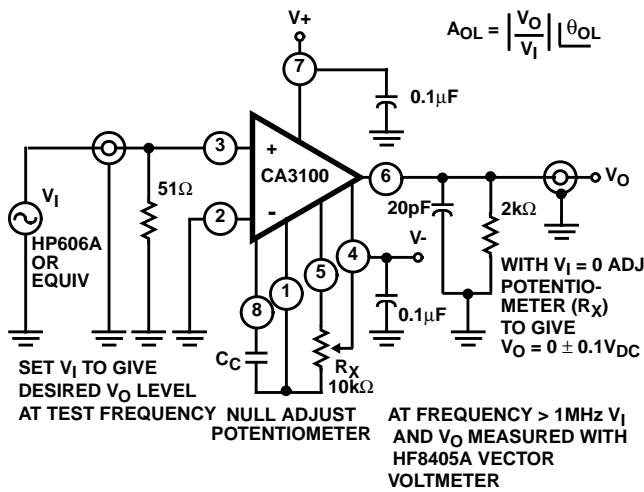


FIGURE 1. OPEN-LOOP VOLTAGE GAIN TEST CIRCUIT AND OFFSET ADJUST CIRCUIT

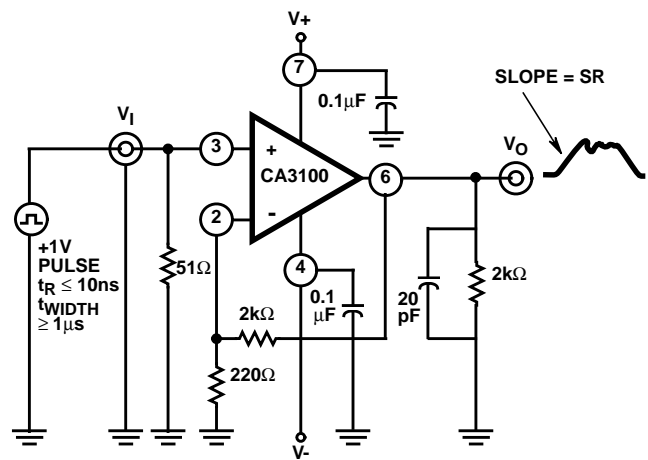


FIGURE 2. SLEW RATE IN 10X AMPLIFIER TEST CIRCUIT

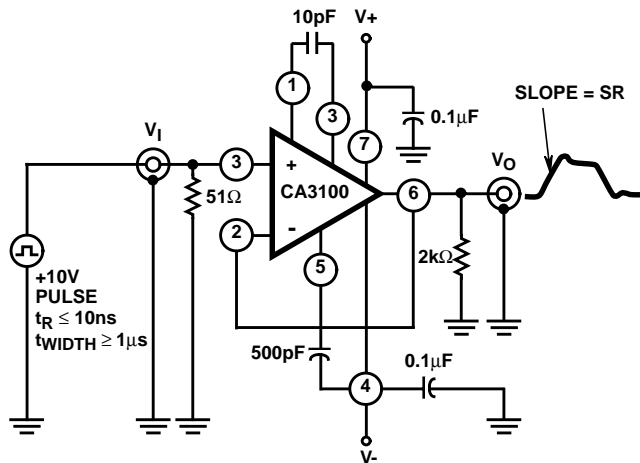


FIGURE 3. FOLLOWER SLEW RATE TEST CIRCUIT

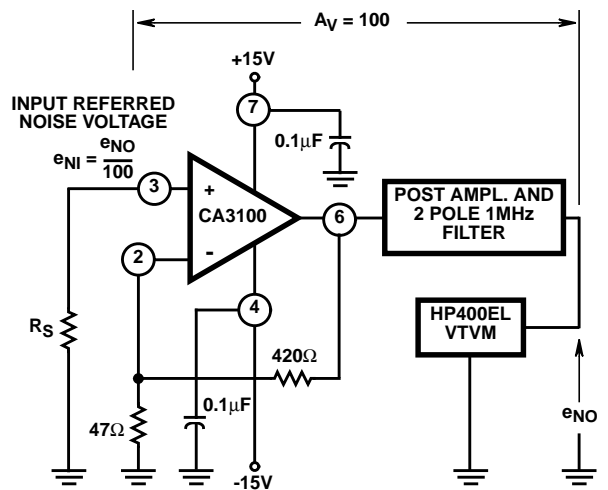


FIGURE 4. WIDEBAND INPUT NOISE VOLTAGE TEST CIRCUIT

# CA3100

## Test Circuits (Continued)

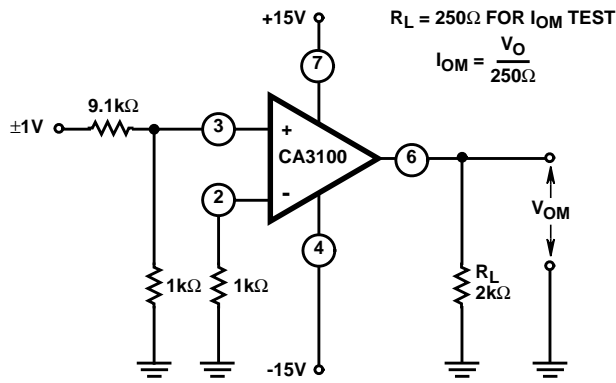


FIGURE 5. OUTPUT VOLTAGE SWING ( $V_{OM}$ ), OUTPUT CURRENT SWING ( $I_{OM}$ ) TEST CIRCUIT

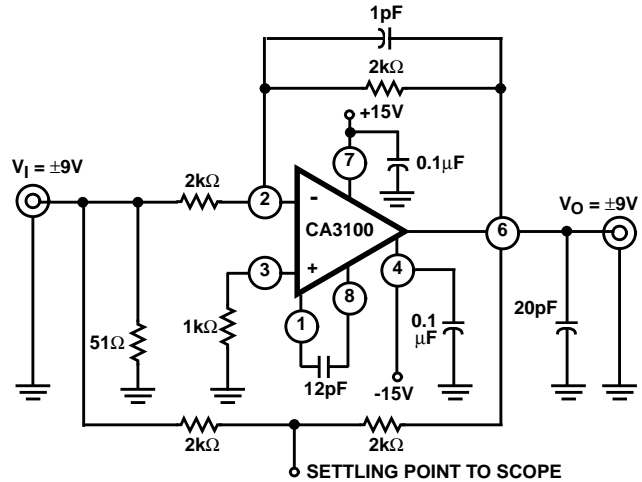
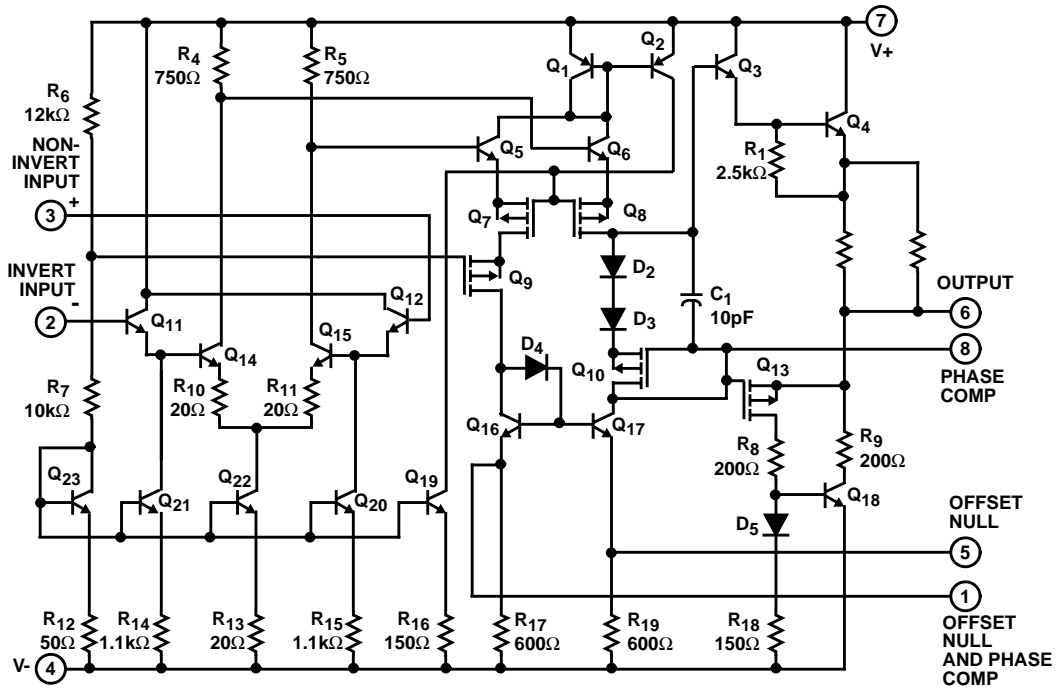


FIGURE 6. SETTLING TIME TEST CIRCUIT

## Schematic Diagram



Typical Applications

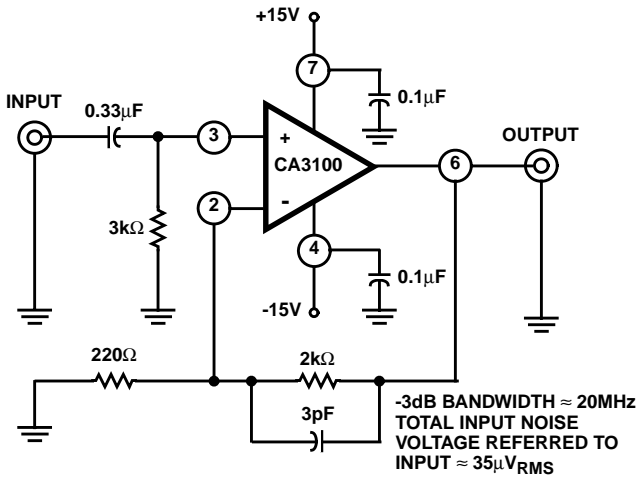


FIGURE 7. 20dB VIDEO AMPLIFIER

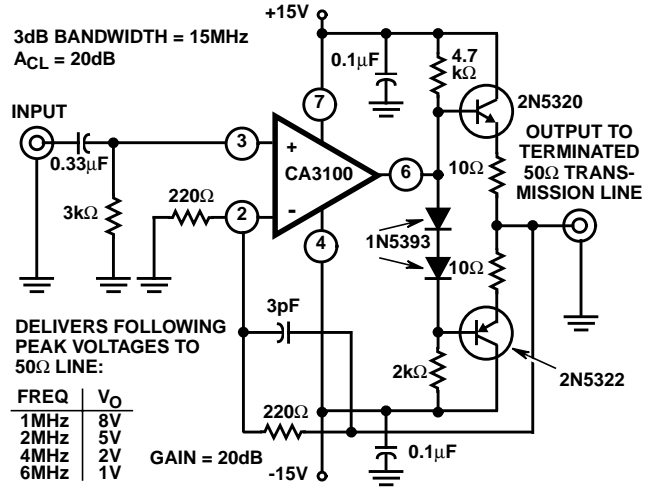


FIGURE 8. 20dB VIDEO LINE DRIVER

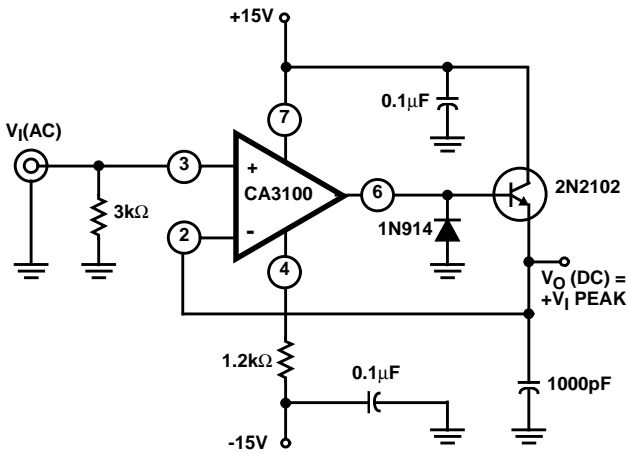


FIGURE 9. FAST POSITIVE PEAK DETECTOR

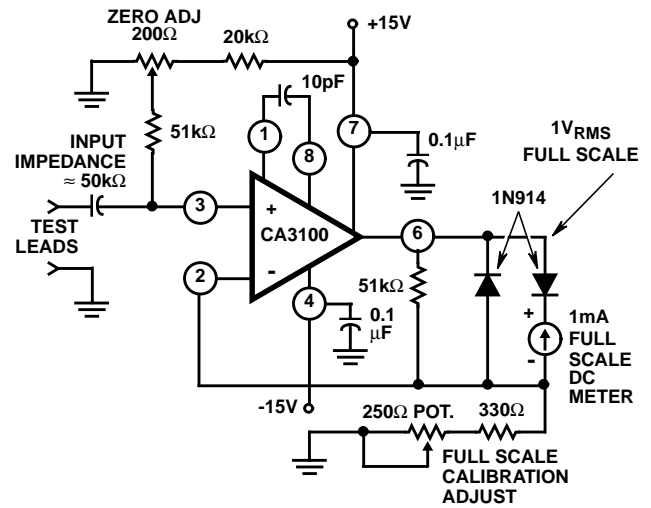


FIGURE 10. 1MHz METER-DRIVER AMPLIFIER

Typical Performance Curves

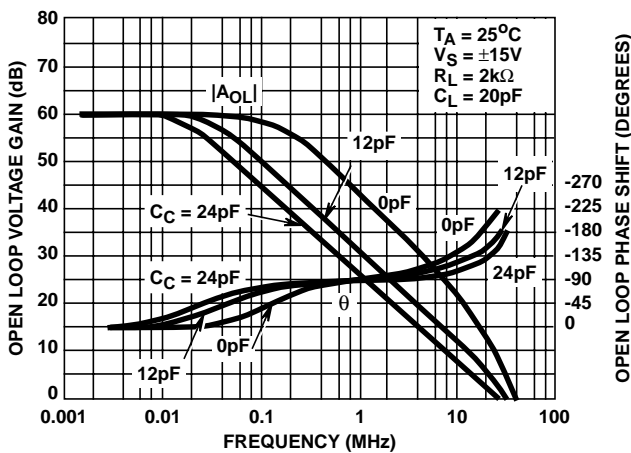


FIGURE 11. OPEN LOOP GAIN, OPEN LOOP PHASE SHIFT vs FREQUENCY

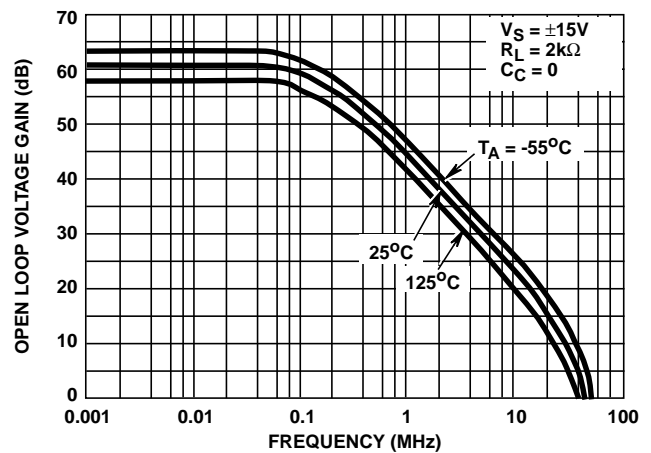


FIGURE 12. OPEN LOOP GAIN vs FREQUENCY

Typical Performance Curves (Continued)

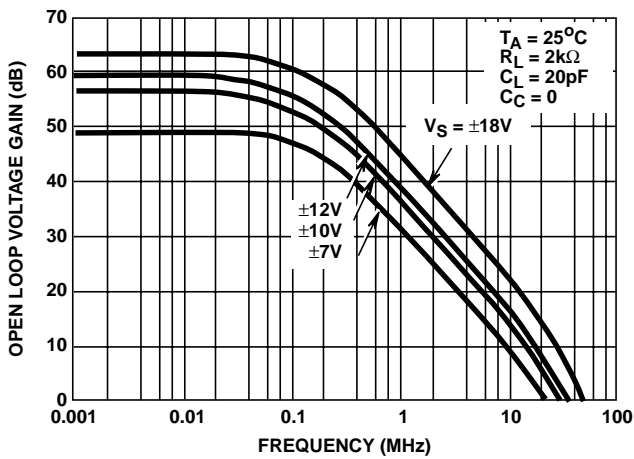


FIGURE 13. OPEN LOOP GAIN vs FREQUENCY

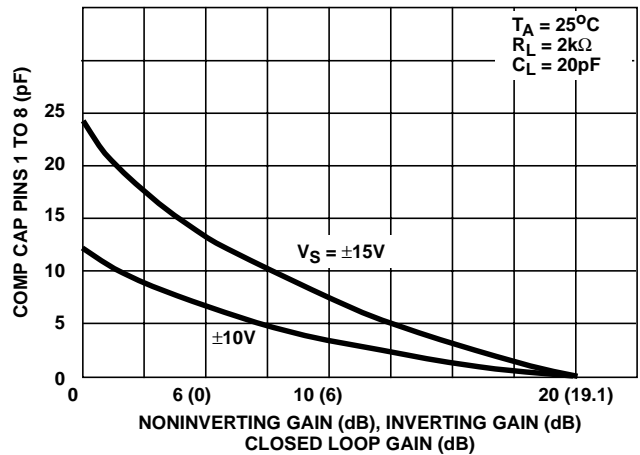


FIGURE 14. REQUIRED COMPENSATION CAPACITANCE vs CLOSED LOOP GAIN

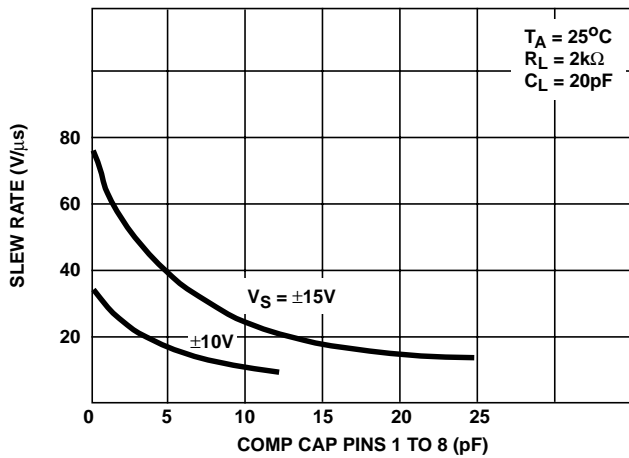


FIGURE 15. SLEW RATE vs COMPENSATION CAPACITANCE

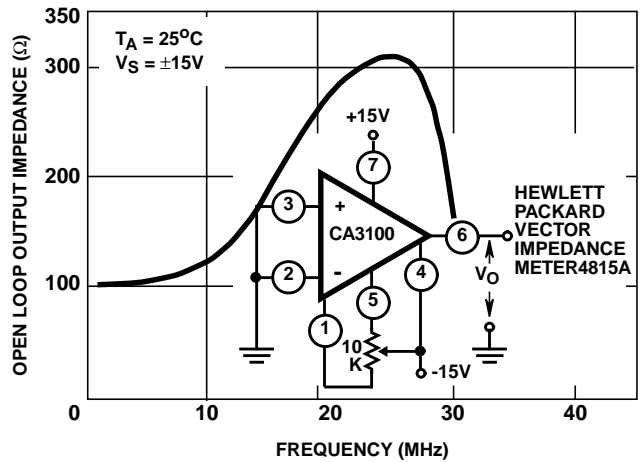


FIGURE 16. TYPICAL OPEN LOOP OUTPUT IMPEDANCE vs FREQUENCY

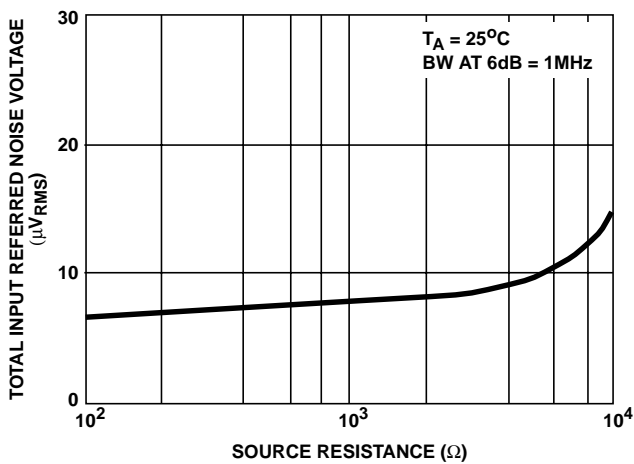


FIGURE 17. WIDEBAND INPUT NOISE VOLTAGE vs SOURCE RESISTANCE

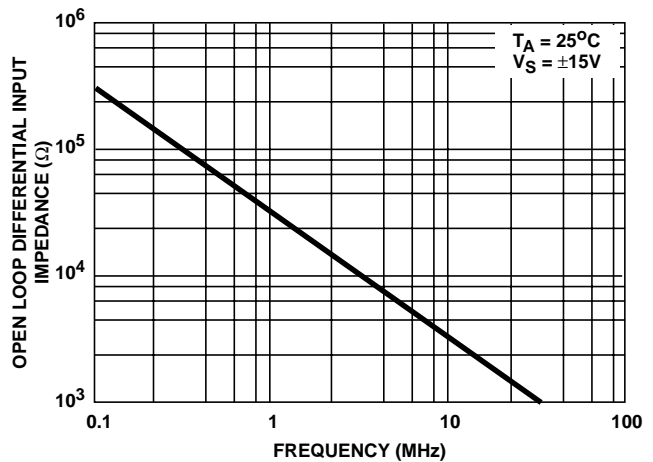


FIGURE 18. TYPICAL OPEN LOOP DIFFERENTIAL INPUT IMPEDANCE vs FREQUENCY

Typical Performance Curves (Continued)

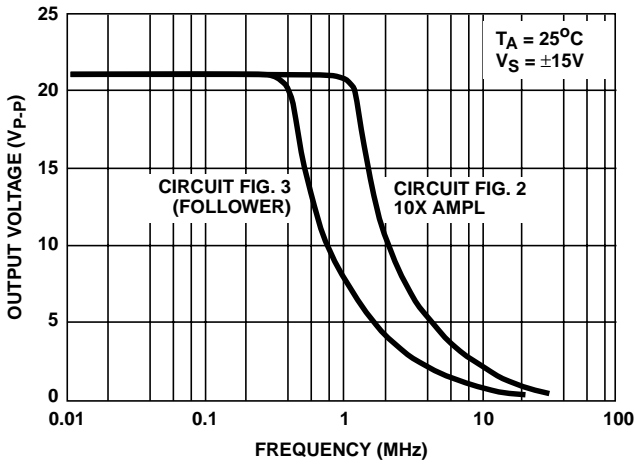


FIGURE 19. MAXIMUM OUTPUT VOLTAGE SWING vs FREQUENCY

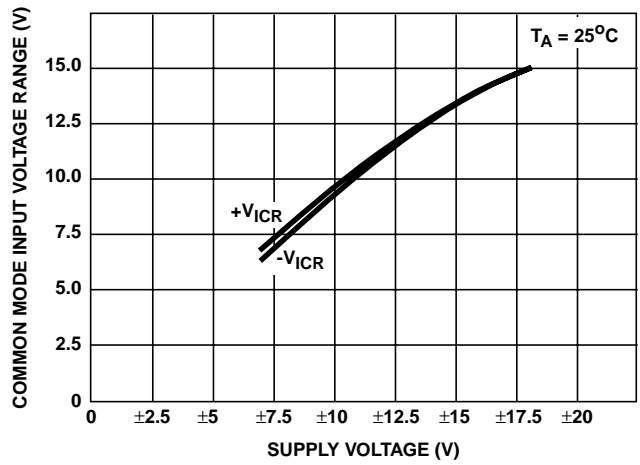


FIGURE 20. COMMON MODE INPUT VOLTAGE RANGE vs SUPPLY VOLTAGE

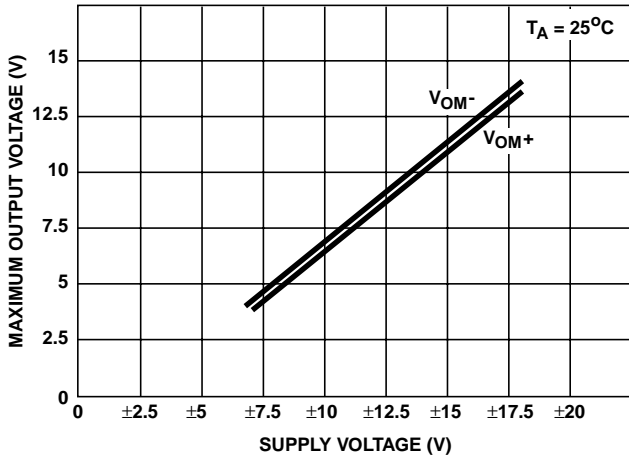


FIGURE 21. MAXIMUM OUTPUT VOLTAGE vs SUPPLY VOLTAGE

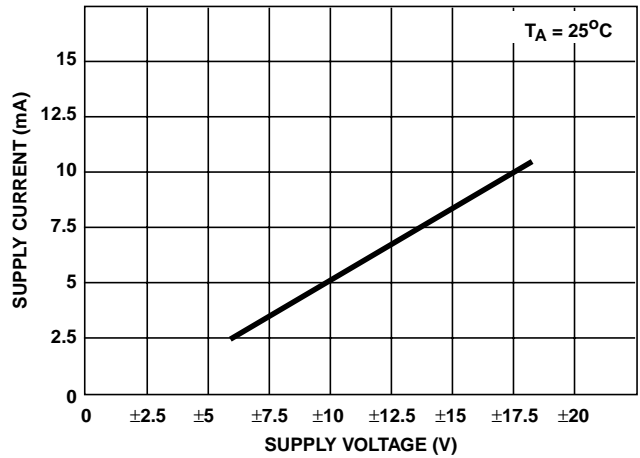


FIGURE 22. SUPPLY CURRENT vs SUPPLY VOLTAGE

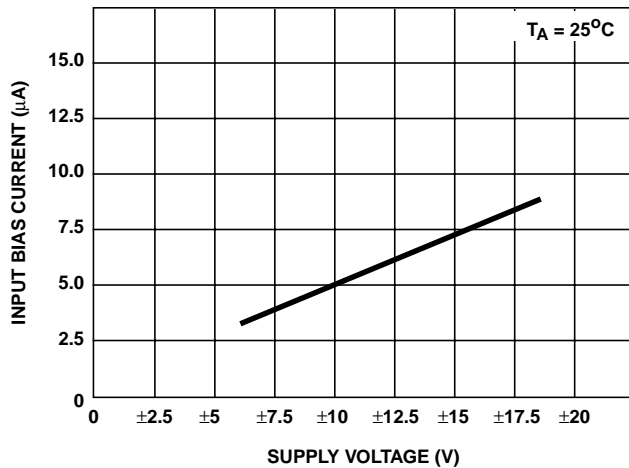


FIGURE 23. INPUT BIAS CURRENT vs SUPPLY VOLTAGE