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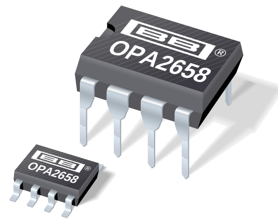


OPA2658

Dual Wideband, Low Power, Current Feedback OPERATIONAL AMPLIFIER

FEATURES

- UNITY GAIN STABLE BANDWIDTH: 750MHz
- LOW POWER: 50mW PER AMP
- LOW DIFFERENTIAL GAIN/PHASE ERRORS: 0.01%/0.03°
- HIGH SLEW RATE: 1700V/μs
- PACKAGE: 8-Pin DIP and 8-Pin SOIC

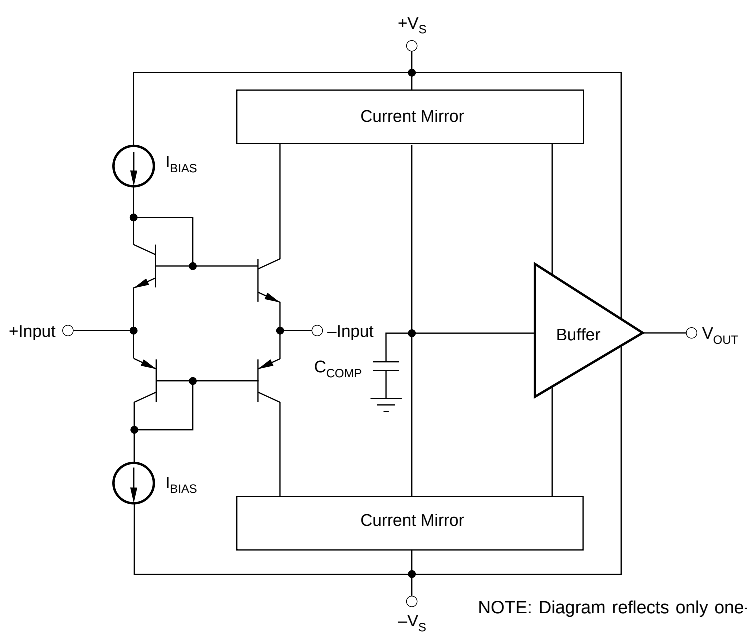
APPLICATIONS

- MEDICAL IMAGING
- HIGH-RESOLUTION VIDEO
- HIGH-SPEED SIGNAL PROCESSING
- COMMUNICATIONS
- PULSE AMPLIFIERS
- ADC/DAC GAIN AMPLIFIER
- MONITOR PREAMPLIFIER
- CCD IMAGING AMPLIFIER

DESCRIPTION

The OPA2658 is a dual, ultra-wideband, low power current feedback video operational amplifier featuring high slew rate and low differential gain/phase error. The current feedback design allows for superior large signal bandwidth, even at high gains. The low differential gain/phase errors, wide bandwidth and low quiescent current make the OPA2658 a perfect choice for numerous video, imaging and communications applications.

The OPA2658 is internally compensated for unity-gain stability, and is also available in single, OPA658 and quad, OPA4658 configurations.



NOTE: Diagram reflects only one-half of the OPA2658

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SPECIFICATIONS

T_A = +25°C, V_S = ±5V, R_L = 100Ω, C_L = 2pF, R_{FB} = 402Ω, unless otherwise noted.

PARAMETER	CONDITION	OPA2658P, U			OPA2658PB, UB			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
FREQUENCY RESPONSE								
Closed-Loop Bandwidth(2)	G = +1		800			*(1)		MHz
	G = +2		500			*		MHz
	G = +5		210			*		MHz
	G = +10		130			*		MHz
Slew Rate(3)	G = +2, 2V Step		1700		1000	*		V/μs
At Minimum Specified Temperature			1500		900	*		V/μs
Settling Time: 0.01%	G = +2, 2V Step		15			*		ns
0.1%	G = +2, 2V Step		12.6			*		ns
1%	G = +2, 2V Step		4.8			*		ns
Spurious Free Dynamic Range	f = 5MHz, G = +2, V_O = 2Vp-p		75			*		dBc
	f = 20MHz, G = +2, V_O = 2Vp-p		59			*		dBc
Third-Order Intercept Point	f = 10MHz		39			*		dBm
Differential Gain	G = +2, NTSC, V_O = 1.4Vp-p, R_L = 150Ω		0.01			*		%
Differential Phase	G = +2, NTSC, V_O = 1.4Vp-p, R_L = 150Ω		0.03			*		degrees
Crosstalk	Input Referred, 5MHz, channel-to-channel		78			*		dB
OFFSET VOLTAGE								
Input Offset Voltage			±3	±5.5		±2	±4.5	mV
Over Temperature			±5	±8		±4	±7	mV
Power Supply Rejection	V_S = ±4.5 to ±5.5V	55	64		58	68		dB
INPUT BIAS CURRENT								
Non-Inverting	V_{CM} = 0V		±4.0	±30		*	±18	μA
Over Temperature			±10	±80		*	±35	μA
Inverting	V_{CM} = 0V		±2.9	±35		*	*	μA
Over Temperature			±30	±75		*	*	μA
NOISE								
Input Voltage Noise Density								
f = 100Hz			6.7			*		nV/√Hz
f = 10kHz			3.2			*		nV/√Hz
f = 50kHz			3.1			*		nV/√Hz
f_B = 100Hz to 200MHz			44			*		μVrms
Input Bias Current Noise Density								
Inverting: f =10MHz			12.6			*		pA/√Hz
Non-Inverting: f =10MHz			12.6			*		pA/√Hz
Noise Figure (NF)	R_S = 50Ω		11			*		dBm
	R_S = 100Ω		9			*		dBm
INPUT VOLTAGE RANGE								
Common-mode Input Range			±2.9			*		V
Over Temperature		±2.5			*			V
Common-mode Rejection	V_{CM} = ±1V	45	51		*	*		dB
INPUT IMPEDANCE								
Non-Inverting			500 || 1			*		kΩ || pF
Inverting			25			*		Ω
OPEN-LOOP TRANSIMPEDANCE								
Open-loop Transimpedance	V_O = ±2V, R_L = 100Ω	150	180		200	250		kΩ
Over Temperature	V_O = ±2V, R_L = 100Ω	100			150			kΩ
OUTPUT								
Voltage Output	No Load	±2.7	±3.0		*	*		V
Over Temperature		±2.5	±2.8		*	*		V
Voltage Output	R_L = 250Ω	±2.7	±2.9		*	*		V
Over Temperature		±2.5	±2.8		*	*		V
Voltage Output	R_L = 100Ω	±2.2	±2.6		*	*		V
Over Temperature		±2.0	±2.4		*	*		V
Current Output	+25°C to max Temperature	±40	±60		±45	*		mA
Over Temperature		±30	±57		±35	*		mA
Short Circuit Current			60			*		mA
Output Resistance	1MHz, G = +2		0.06			*		Ω
POWER SUPPLY								
Specified Operating Voltage			±5			*		V
Operating Voltage Range		±4.5		±5.5	*		*	V
Quiescent Current	Both Channels, V_S = ±5V		±10	±15.5	±6.5	±9	±11.5	mA
Over Temperature			±11	±17		±9.4	±13	mA
TEMPERATURE RANGE								
Specification: P, U, PB, UB		–40		+85	*		*	°C
Thermal Resistance, θ_{JA}								
P			120			*		°C/W
U			170			*		°C/W

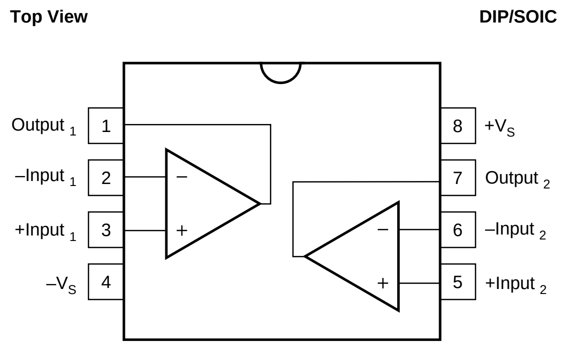
NOTES: (1) An asterisk (*) specifies the same value as the grade to the left. (2) Bandwidth can be affected by a non-optimal PC board layout. Refer to the demonstration board layout for details. (3) Slew rate is rate of change from 10% to 90% of output voltage step.

ABSOLUTE MAXIMUM RATINGS

Supply	±5.5VDC
Internal Power Dissipation(1)	See Applications Information
Differential Input Voltage	Total V_S
Input Voltage Range	See Applications Information
Storage Temperature Range: P, PB, U, UB	–40°C to +125°C
Lead Temperature (soldering, 10s)	+300°C
(soldering, SOIC 3s)	+260°C
Junction Temperature (T_J)	+175°C

NOTE: (1) Packages must be derated based on specified θ_{JA}. Maximum T_J must be observed.

PIN CONFIGURATION



PACKAGE INFORMATION(1)

MODEL	PACKAGE	PACKAGE DRAWING NUMBER
OPA2658P, PB	8-Pin Plastic DIP	006
OPA2658U, UB	8-Pin Plastic SOIC	182

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix D of Burr-Brown IC Data Book.

ORDERING INFORMATION(1)

MODEL	PACKAGE	TEMPERATURE RANGE
OPA2658P, PB	8-Pin Plastic DIP	–40°C to +85°C
OPA2658U, UB	8-Pin Plastic SOIC	–40°C to +85°C

NOTE: (1) The "B" grade of the SOIC package will be marked with a "B" by pin 8. Refer to mechanical section for the location.

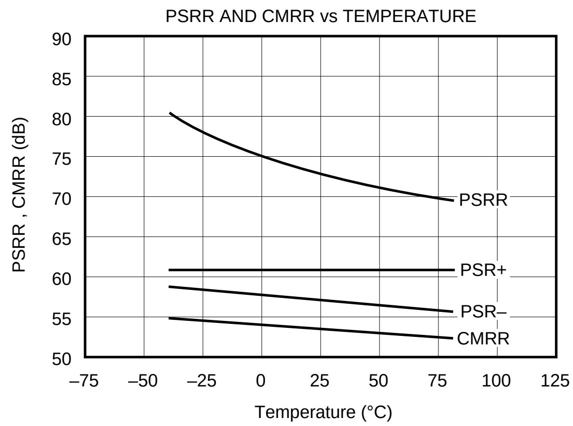
ELECTROSTATIC DISCHARGE SENSITIVITY

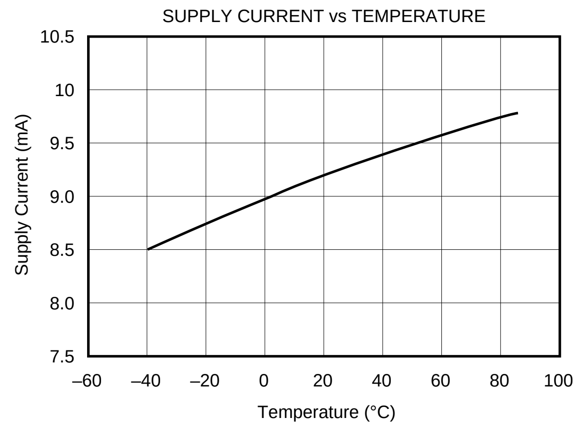
Electrostatic discharge can cause damage ranging from performance degradation to complete device failure. Burr-Brown Corporation recommends that all integrated circuits be handled and stored using appropriate ESD protection methods.

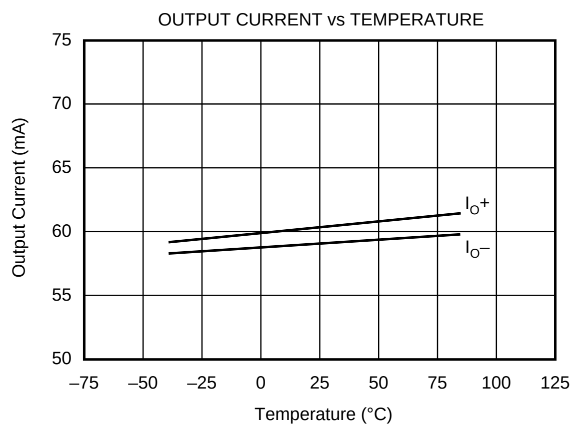
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet published specifications.

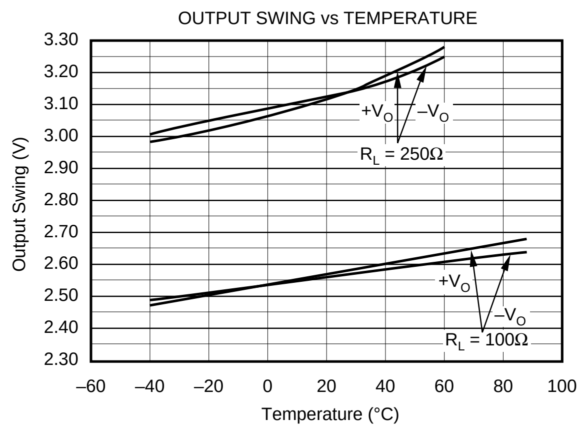
TYPICAL PERFORMANCE CURVES

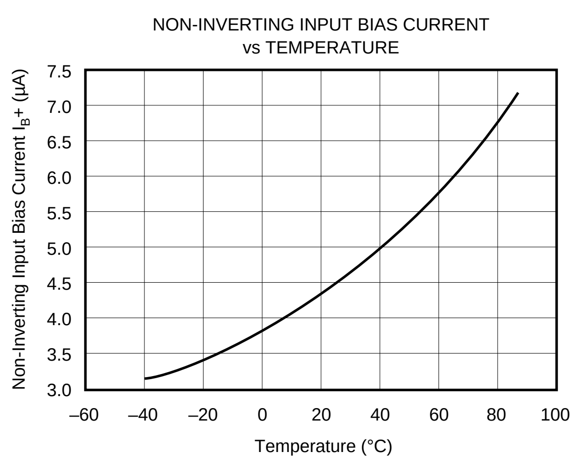
T_A = +25°C, V_S = ±5V, R_L = 100Ω, C_L = 2pF, R_{FB} = 402Ω, unless otherwise noted.

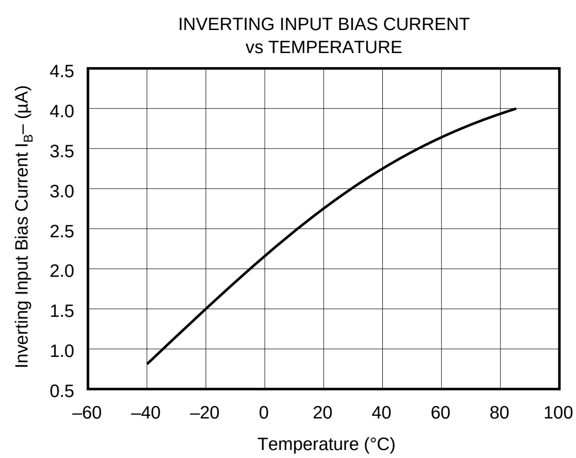






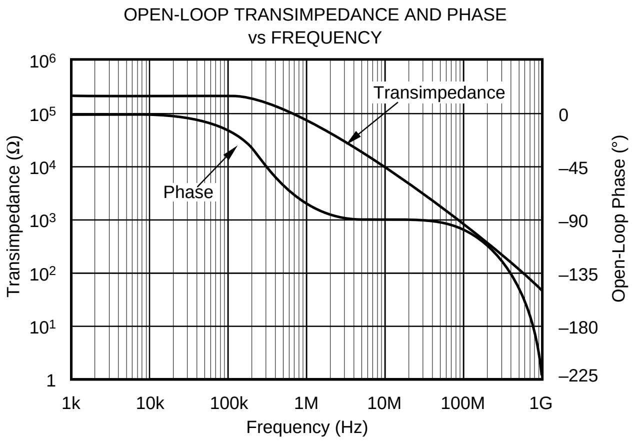


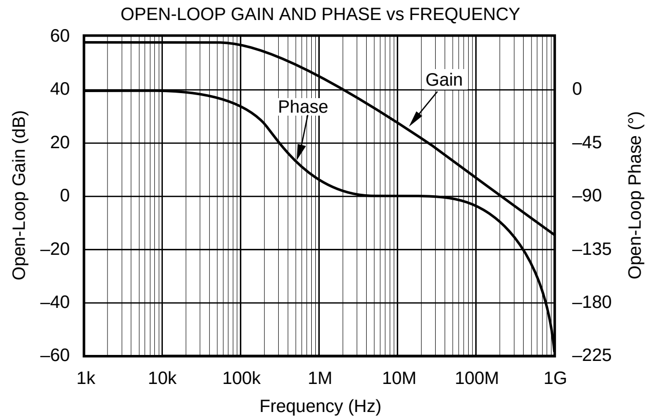


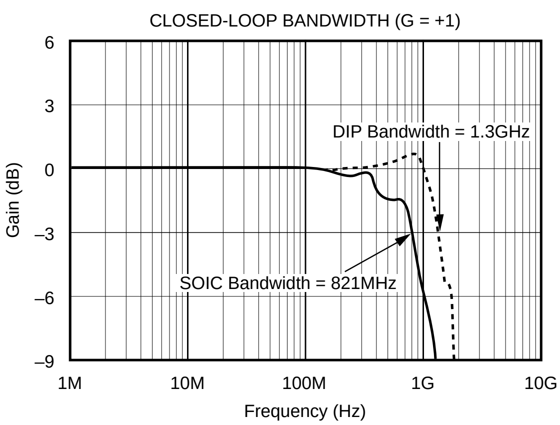


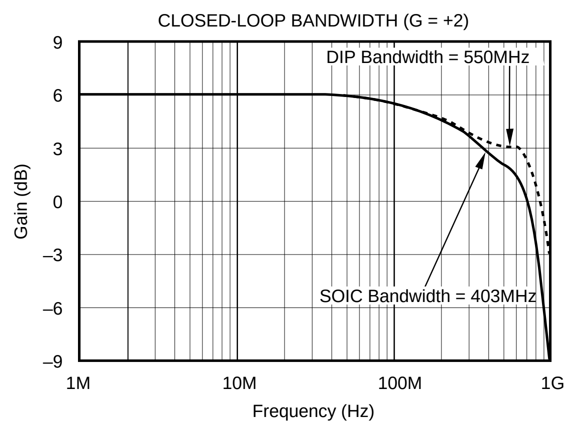
TYPICAL PERFORMANCE CURVES (CONT)

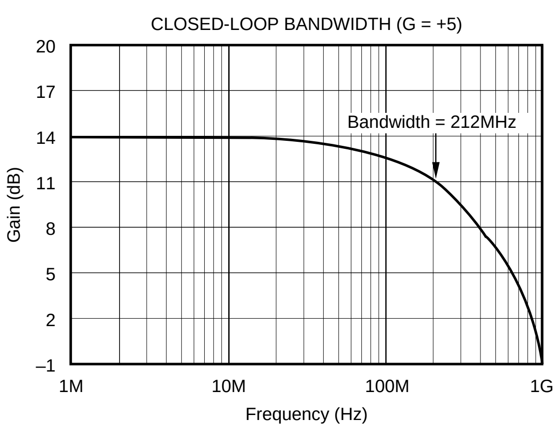
T_A = +25°C, V_S = ±5V, R_L = 100Ω, C_L = 2pF, R_{FB} = 402Ω, unless otherwise noted.

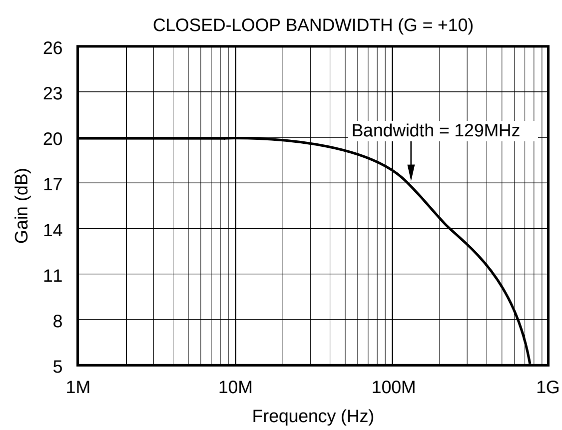








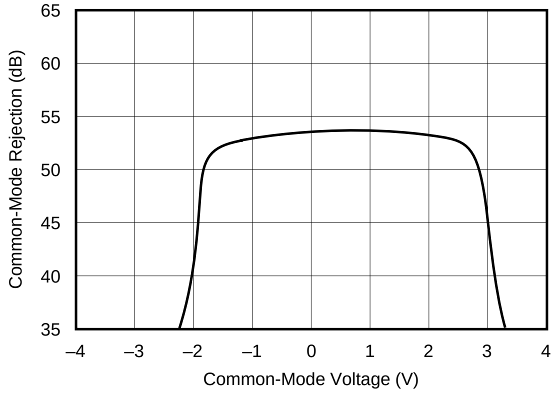




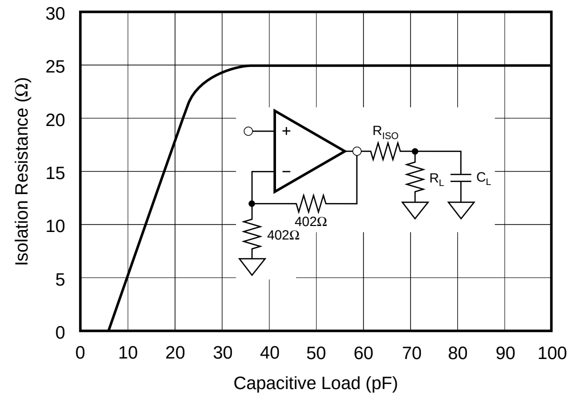
TYPICAL PERFORMANCE CURVES (CONT)

$T_A = +25°C$, $V_S = ±5V$, $R_L = 100Ω$, $C_L = 2pF$, $R_{FB} = 402Ω$, unless otherwise noted.

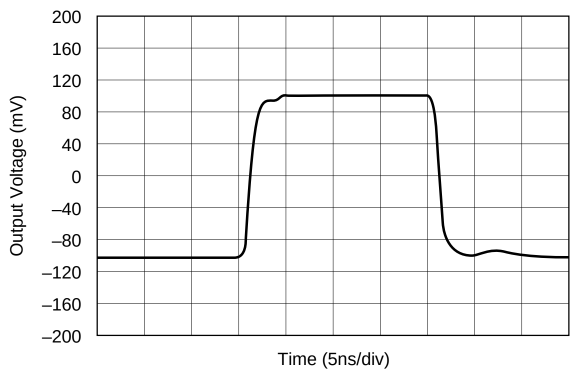
COMMON-MODE REJECTION
vs INPUT COMMON-MODE VOLTAGE



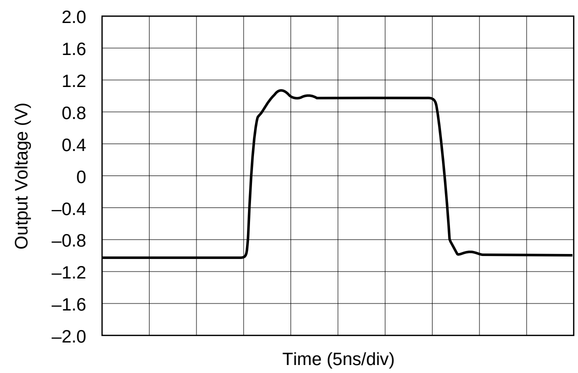
RECOMMENDED ISOLATION RESISTANCE
vs CAPACITIVE LOAD FOR G = +2



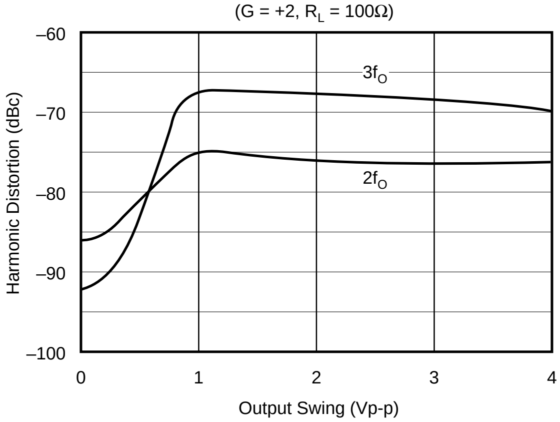
SMALL SIGNAL TRANSIENT RESPONSE
(G = +2, R_L = 100Ω)



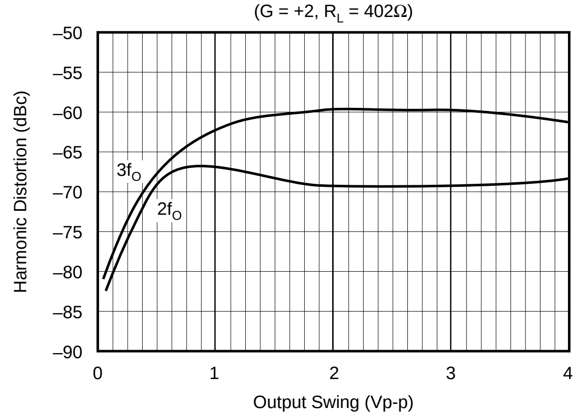
LARGE SIGNAL TRANSIENT RESPONSE
(G = +2, R_L = 100Ω)



5MHz HARMONIC DISTORTION vs OUTPUT SWING
(G = +2, R_L = 100Ω)

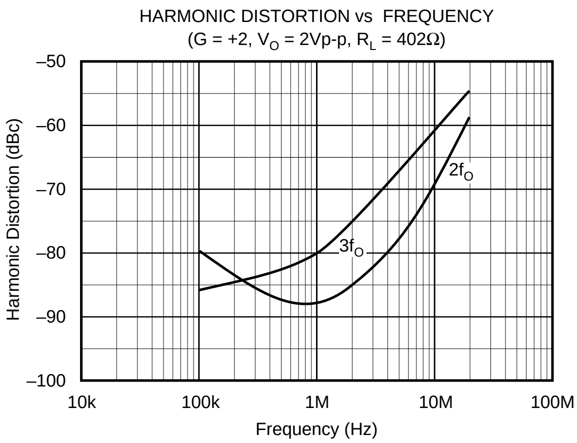


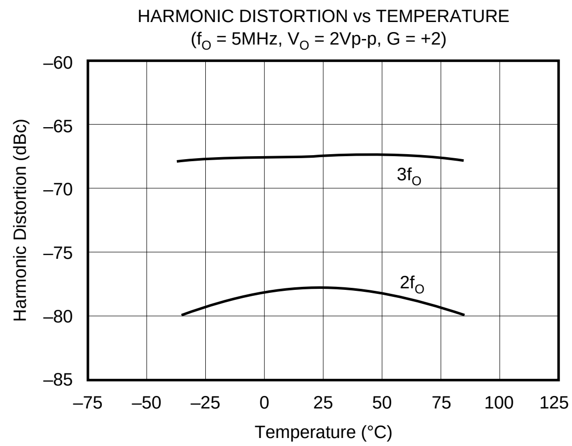
10MHz HARMONIC DISTORTION vs OUTPUT SWING
(G = +2, R_L = 402Ω)

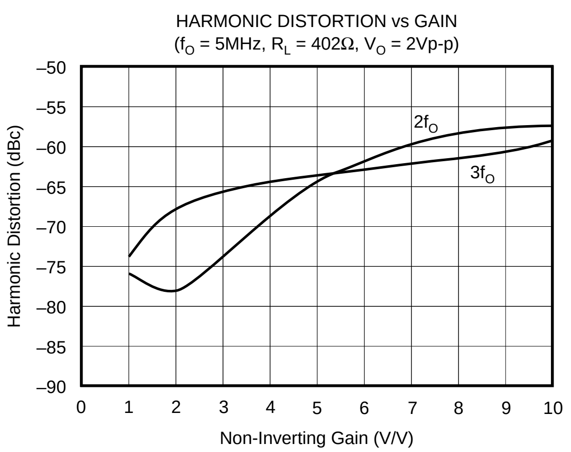


TYPICAL PERFORMANCE CURVES (CONT)

T_A = +25°C, V_S = ±5V, R_L = 100Ω, C_L = 2pF, R_{FB} = 402Ω, unless otherwise noted.







DISCUSSION OF PERFORMANCE

THEORY OF OPERATION

Conventional op amps depend on feedback to drive their inputs to the same potential. In current feedback op amps, inverting and non-inverting inputs are connected by a unity gain buffer, thus enabling the inverting input to automatically assume the same potential as the non-inverting input. This results in very low impedance and significant current sourcing/sinking ability at the inverting input.

The OPA2658 is a dual low-power, unity gain stable, current feedback operational amplifier which operates on ±5V power supplies. The current feedback architecture offers the following important advantages over voltage feedback architectures: (1) the high slew rate allows the large signal performance to approach the small signal performance, and (2) there is very little bandwidth degradation at higher gain settings.

The current feedback architecture of the OPA2658 provides the traditional strength of excellent large signal response plus wide bandwidth, making it a good choice for use in high resolution video, medical imaging and DAC I/V Conversion. The low power requirements make it an excellent choice for numerous portable applications.

DC GAIN TRANSFER CHARACTERISTICS

The circuit in Figure 1 shows the equivalent circuit for calculating the DC gain. When operating the device in the inverting mode, the input signal error current (I_E) is amplified by the open loop transimpedance gain (T_O). The output voltage is equal to T_O X I_E. Negative feedback is applied through R_{FB} such that the device operates at a gain equal to $–R_{FB}/R_{FF}$.

For non-inverting operation, the input signal is applied to the non-inverting (high impedance buffer) input. The output error current (I_E) is generated by the buffer at the low impedance inverting input. The signal generated at the op-amp output is fed back to the inverting input such that the overall gain is $(1 + R_{FB}/R_{FF})$.

The closed-loop gain for the OPA2658 can be calculated using the following equations:

$$\text{Inverting Gain} = \frac{-\left(\dfrac{R_{FB}}{R_{FF}}\right)}{1+\dfrac{1}{\text{Loop Gain}}} \qquad (1)$$

$$\text{Non–Inverting Gain} = \frac{\left[1+\dfrac{R_{FB}}{R_{FF}}\right]}{1+\dfrac{1}{\text{Loop Gain}}}$$

$$\text{where Loop Gain} = \left[\frac{T_O}{R_{FB}+R_S\left(1+\dfrac{R_{FB}}{R_{FF}}\right)}\right]$$

At higher gains the small inverting input impedance R_S causes an apparent loss in bandwidth. This can been seen from the equation:

$$BW_{ACTUAL} = \frac{BW_{IDEAL}}{\left[1+\left(\dfrac{R_S}{R_{FB}}\right)\times\left(1+\dfrac{R_{FB}}{R_{FF}}\right)\right]} \qquad (3)$$

This loss in bandwidth at high gains can be improved without affecting stability by lowering the value of the feedback resistor from the specified value of 402Ω.

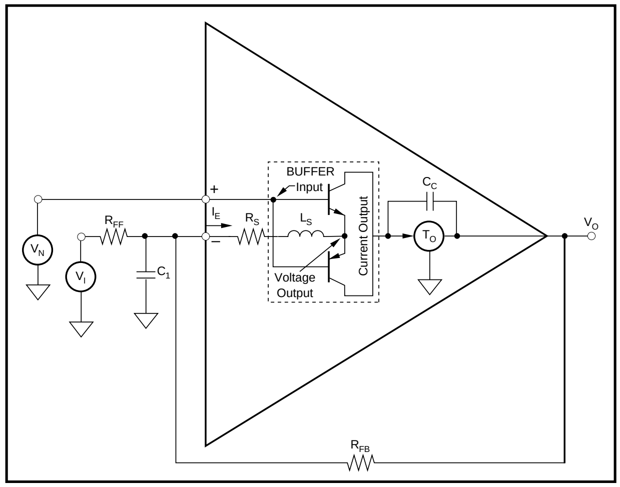


FIGURE 1. Equivalent Circuit.

OFFSET VOLTAGE AND NOISE

The output offset is the algebraic sum of the gained-up input offset voltage and effects from current sources that influence DC operation. The output offset is calculated by the following equation (refer to Figure 2):

$$\text{Output Offset Voltage} = \pm Ib_N \times R_N\left(1+\frac{R_{FB}}{R_{FF}}\right)\pm \qquad (4)$$

$$V_{IO}\left(1+\frac{R_{FB}}{R_{FF}}\right)\pm Ib_I \times R_{FB}$$

If all terms are divided by the gain $(1 + R_{FB}/R_{FF})$ it can be observed that the input referred offset improves as gain increases. The effective noise at the output can be determined by taking the root sum of the squares of equation (4) and substituting the spectral noise values for the DC current and voltage terms (found in the specification table). This applies

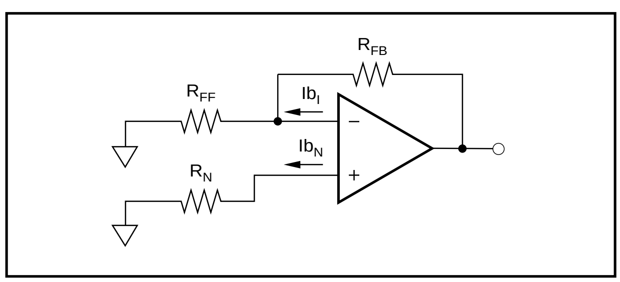


FIGURE 2. Output Offset Voltage Equivalent Circuit.

to noise from the op amp only. Note that both the noise figure (NF) and the equivalent input offset voltages improve as the closed loop gain increases (by keeping R_{FB} fixed and reducing R_{FF} with $R_N = 0\Omega$).

INCREASING BANDWIDTH AT HIGH GAINS

The closed-loop bandwidth can be extended at high gains by reducing the value of the feedback resistor R_{FB}. This bandwidth reduction is caused by the feedback current being split between R_S and R_{FF} (refer to Figure 1). As the gain increases (for a fixed R_{FB}), more feedback current is shunted through R_{FF}, which reduces closed-loop bandwidth.

WIRING PRECAUTIONS/CIRCUIT LAYOUT

Maximizing the OPA2658's capability requires some wiring precautions and use of high-frequency layout techniques. Oscillation, ringing, poor bandwidth, settling, gain peaking and instability are typical problems plaguing all high-speed amplifiers when they are improperly used. In general, all printed circuit board conductors should be wide to provide low impedance signal paths, and should be as short as possible. The entire physical circuit should be as small as practical. Stray capacitances should be minimized, especially at high impedance nodes such as the amplifier's input terminals. Stray signal coupling from the output or power supplies to the inputs should be minimized. All circuit elements should be no longer than 1/4 inch (6mm) to minimize lead inductance, and low values of resistance should be used. This will minimize time constants formed with the circuit capacitances and will eliminate stray parasitic circuits.

As with all high-frequency circuits, grounding is the most important application consideration for the OPA2658. Oscillations at high frequencies can easily occur if good grounding techniques are not used. A heavy ground plane (2 ounce copper recommended) should connect all unused areas on the component side. Good ground planes can reduce stray signal pickup, provide a low impedance common return path for signal and power, and conduct heat from active circuit package pins into ambient air by convection. However, do not place the ground plane under or near the inputs.

Supply bypassing is extremely critical and must **always** be used, especially when driving high current loads. Both power supply leads should be bypassed to ground as close as possible to the amplifier pins. Tantalum capacitors (1µF) with very short leads are recommended. A parallel 0.1µF ceramic must also be added. Surface mount bypass capacitors will produce excellent results due to their low lead inductance. Additionally, suppression filters can be used to isolate noisy supply lines. Properly bypassed and modulation-free power supply lines allow full amplifier output and optimum settling time performance.

Points to Remember

1) Power supply bypassing with 0.1µF and 1µF surface mount capacitors is recommended. It is essential to keep the 0.1µF capacitor very close to the power supply pins. Refer to the demonstration board layout in Figures 11a through d.

2) Whenever possible, use surface mount components. Do not use point-to-point wiring as the increase in wiring inductance will be detrimental to AC performance. However, if wires must be used, very short, direct signal paths are required. The input signal ground return, the load ground return, and the power supply common should all be connected to the same physical point to eliminate ground loops, which can cause unwanted feedback.

3) Surface mount on the back side of the PC board. Good component selection is essential. Capacitors used in critical locations should be low inductance type with a high quality dielectric material. Likewise, diodes used in critical locations should be Schottky barrier types, such as HP5082-2835 for fast recovery and minimum charge storage. Ordinary p-n diodes will not be suitable in RF circuits.

4) Whenever possible, solder the OPA2658 directly into the PC board without using a socket. Sockets add parasitic capacitance and inductance, which can seriously degrade the AC performance or produce small oscillations.

5) Use a feedback resistor (usually 402Ω) in unity-gain voltage follower applications for the best performance. For higher gain configurations, resistors used in feedback networks should have values of a few hundred ohms for best performance. Shunt capacitance problems limit the acceptable resistance range to about 1kΩ on the high end and to a value that is within the amplifier's output drive limits on the low end. Metal film and carbon resistors will be satisfactory, but wirewound resistors (even "non-inductive" types) are absolutely **unacceptable** in high-frequency circuits. Feedback resistors should be placed directly between the output and the inverting input on the backside of the PC board. This placement allows for the shortest feedback path and the highest bandwidth. A longer feedback path than this will decrease the realized bandwidth substantially. Refer to the demonstration board layout at the end of the datasheet.

6) As mentioned above, surface mount components (chip resistors, capacitors, etc.) have low lead inductance and are therefore strongly recommended. Circuits using all surface mount components with the OPA2658U (SOIC package) will offer the best AC performance. The parasitic package impedance for the SOIC is lower than the 8-pin PDIP.

7) Avoid overloading the output. Remember that output current must be provided by the amplifier to drive its own feedback network as well as to drive its load. Lowest distortion is achieved with high impedance loads.

8) These amplifiers are designed for ±5V supplies. Although they will operate well with +5V and –5.2V, use of ±15V supplies will destroy them.

9) Standard commercial test equipment has not been designed to test devices in the OPA2658's speed range. Bench top op amp testers and ATE systems will require a special test head to successfully test these amplifiers.

10) Terminate transmission line loads. Unterminated lines, such as coaxial cable, can appear to the amplifier to be a capacitive or inductive load. By terminating a transmission line with its characteristic impedance, the amplifier's load then appears purely resistive.

11) Plug-in prototype boards and wire-wrap boards will not be satisfactory. A clean layout using RF techniques is essential; *there are no shortcuts.*

ESD PROTECTION

ESD damage has been well recognized for MOSFET devices, but any semiconductor device is vulnerable to this potentially damaging source. This is particularly true for very high speed, fine geometry processes.

ESD damage can cause subtle changes in amplifier input characteristics without necessarily destroying the device. In precision operational amplifiers, this may cause a noticeable degradation of offset voltage and drift. Therefore, ESD handling precautions are strongly recommended when handling the OPA2658.

OUTPUT DRIVE CAPABILITY

The OPA2658 has been optimized to drive 75Ω and 100Ω resistive loads. The device can drive 2Vp-p into a 75Ω load. This high-output drive capability makes the OPA2658 an ideal choice for a wide range of RF, IF, and video applications. In many cases, additional buffer amplifiers are unneeded.

Many demanding high-speed applications such as ADC/DAC buffers require op amps with low wideband output impedance. For example, low output impedance is essential when driving the signal-dependent capacitances at the inputs of flash A/D converters. As shown in Figure 3, the OPA2658 maintains very low closed-loop output impedance over frequency. Closed-loop output impedance increases with frequency since loop gain is decreasing with frequency.

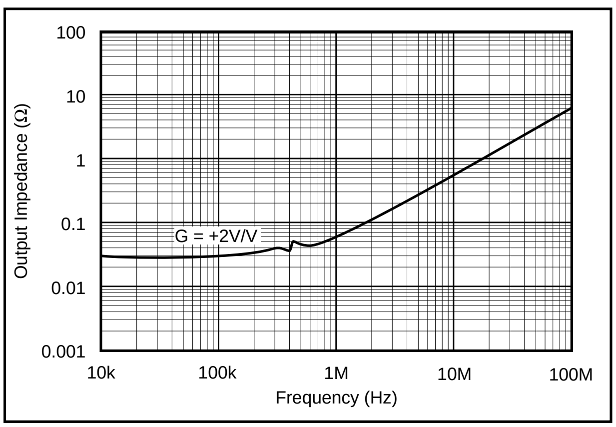


FIGURE 3. Closed-Loop Output Impedance vs Frequency.

THERMAL CONSIDERATIONS

The OPA2658 does not require a heat sink for operation in most environments. At extreme temperatures and under full load conditions a heat sink may be necessary.

The internal power dissipation is given by the equation $P_D = P_{DQ} + P_{DL}$, where P_{DQ} is the quiescent power dissipation and P_{DL} is the power dissipation in the output stage due to the load. (For $\pm V_S = \pm 5V$, P_{DQ} = 10V x 17mA = 170mW, max). For the case where the amplifier is driving a grounded load (R_L) with a DC voltage ($\pm V_{OUT}$) the maximum value of P_{DL} occurs at $\pm V_{OUT} = \pm V_S/2$, and is equal to P_{DL}, max = $(\pm V_S)^2/4R_L$. Note that it is the voltage across the output transistor, and not the load, that determines the power dissipated in the output stage.

The short-circuit condition represents the maximum amount of internal power dissipation that can be generated. The variation of output current with temperature is shown in the Typical Performance Curves.

CAPACITIVE LOADS

The OPA2658's output stage has been optimized to drive low resistive loads. Capacitive loads, however, will decrease the amplifier's phase margin which may cause high frequency peaking or oscillations. Capacitive loads greater than 5pF should be buffered by connecting a small resistance, usually 5Ω to 20Ω, in series with the output as shown in Figure 4. This is particularly important when driving high capacitance loads such as flash A/D converters.

In general, capacitive loads should be minimized for optimum high frequency performance. Coax lines can be driven if the cable is properly terminated. The capacitance of coax cable (29pF/foot for RG-58) will not load the amplifier when the coaxial cable or transmission line is terminated with its characteristic impedance.

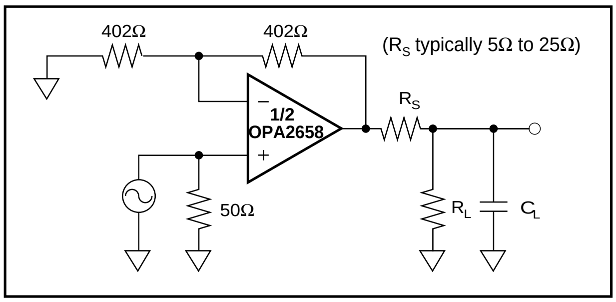


FIGURE 4. Driving Capacitive Loads.

COMPENSATION

The OPA2658 is internally compensated and is stable in unity gain with a phase margin of approximately 62°, and approximately 66° in a gain of +2V/V. (Note that, from a stability standpoint, an inverting gain of –1V/V is equivalent to a noise gain of 2.) Gain and phase response for other gains are shown in the Typical Performance Curves.

The high-frequency response of the OPA2658 in a good layout is very flat with frequency.

DISTORTION

The OPA2658's Harmonic Distortion characteristics into a 100Ω load are shown vs frequency and power output in the Typical Performance Curves. Distortion can be further improved by increasing the load resistance as illustrated in Figure 5. Remember to include the contribution of the feedback resistance when calculating the effective load resistance seen by the amplifier.

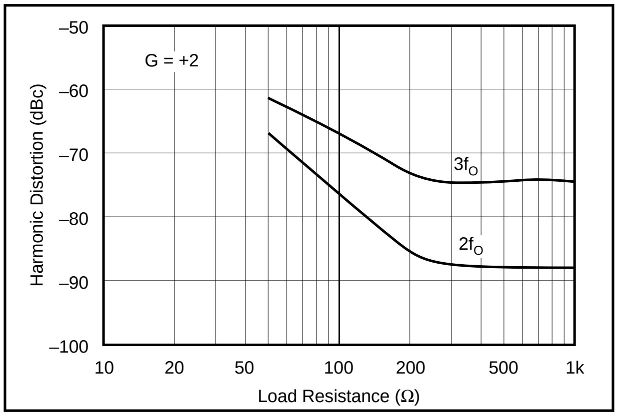


FIGURE 5. 5MHz Harmonic Distortion vs Load Resistance.

The third-order intercept is an important parameter for many RF amplifier applications. Figure 6 shows the OPA2658's single tone, third-order intercept vs frequency. This curve is particularly useful for determining the magnitude of the third harmonic as a function of frequency, load resistance, and gain. For example, assume that the application requires the OPA2658 to operate in a gain of +2V/V and drive 2Vp-p into 50Ω at a frequency of 10MHz. Referring to Figure 6 we find that the intercept point is +39.5dBm. The magnitude of the third harmonic can now be easily calculated from the expression:

$$\text{Third Harmonic (dBc)} = 2(\text{OPI}^3\text{P} - P_O)$$

where OPI^3P = third-order output intercept, dBm
P_O = output level, dBm

For this case OPI^3P = 39.5dBm, P_O = 7dBm, and the third harmonic = 2(39.5 – 7) = 65dB below the fundamental. The OPA2658's low distortion makes the device an excellent choice for a variety of RF signal processing applications.

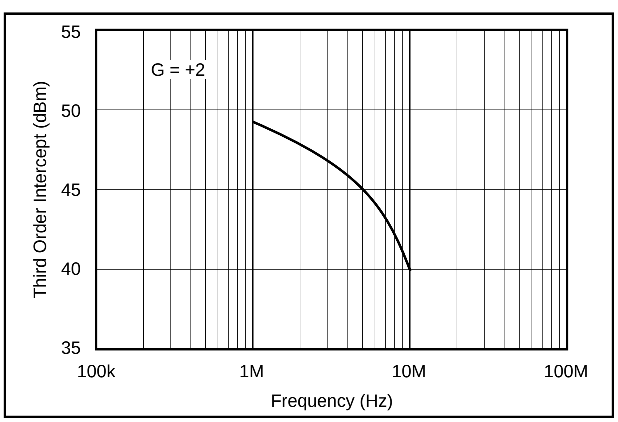


FIGURE 6. Third Order Intercept Point vs Frequency.

CROSS TALK

Crosstalk is the undesired result of the signal of one channel mixing with and reproducing itself in the output of the other channel. Crosstalk is inclined to occur in most multichannel integrated circuits. In dual devices, the effect of crosstalk is measured by driving one channel and observing the output of the undriven channel over various frequencies. The magnitude of this effect is referenced in terms of channel- to-channel isolation and expressed in decibels. "Input referred" points to the fact that there is a direct correlation between gain and crosstalk, therefore at increased gain, crosstalk also increases by a factor equal to that of the gain. Figure 7 illustrates the measured effect of crosstalk in the OPA2658U.

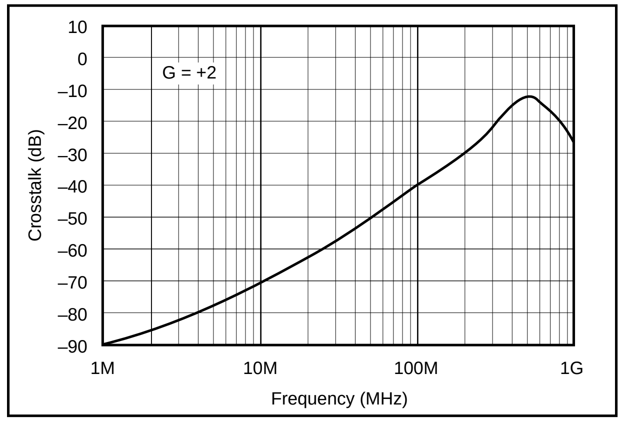


FIGURE 7. Channel-to-Channel Isolation.

DIFFERENTIAL GAIN AND PHASE

Differential Gain (DG) and Differential Phase (DP) are critical specifications for video applications. DG is defined as the percent change in closed-loop gain over a specified change in output amplitude. DP is defined as the change in degrees of the closed-loop phase over the same amplitude change. Both DG and DP are specified at the NTSC sub-carrier frequency of 3.58MHz and the PAL subcarrier of 4.43MHz. All NTSC measurements were performed using a Tektronix model VM700A Video Measurement Set.

DG and DP of the OPA2658 were measured with the amplifier in a gain of +2V/V with 75Ω input impedance and the output back-terminated in 75Ω. The input signal selected from the generator was a 0V to 1.4V modulated ramp with sync pulse. With these conditions the test circuit shown in Figure 8 delivered a 100IRE modulated ramp to the 75Ω input of the video analyzer. The signal averaging feature of the analyzer

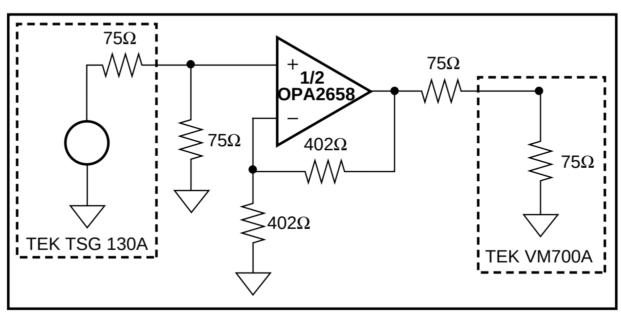


FIGURE 8. Configuration for Testing Differential Gain/Phase.

was used to establish a reference against which the performance of the amplifier was measured. Signal averaging was also used to measure the DG and DP of the test signal in order to eliminate the generator's contribution to measured amplifier performance. Typical performance of the OPA2658 is .01% differential gain and 0.03° differential phase to both NTSC and PAL standards.

NOISE FIGURE

The OPA2658's voltage and current noise spectral densities are specified in the Typical Performance Curves. For RF applications, however, Noise Figure (NF) is often the preferred noise specification since it allows system noise performance to be more easily calculated. The OPA2658's Noise Figure vs Source Resistance is shown in Figure 9.

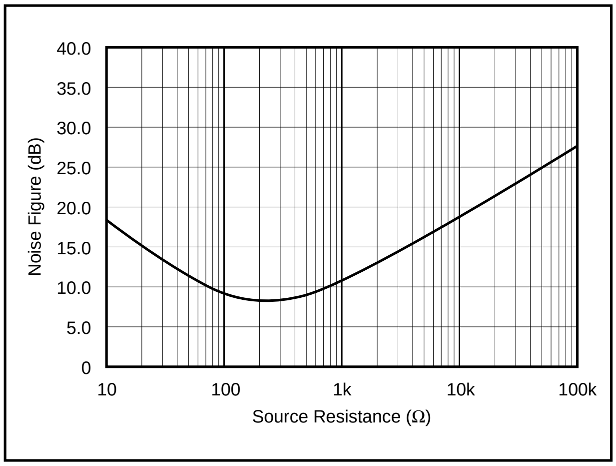


FIGURE 9. Noise Figure vs Source Resistance.

SPICE MODELS

Computer simulation using SPICE is often useful when analyzing the performance of analog circuits and systems. This is particularly true for Video and RF amplifier circuits where parasitic capacitance and inductance can have a major effect on circuit performance. SPICE models using MicroSim Corporation's PSpice are available for the OPA2658. Contract Burr-Brown applications departments to receive a SPICE Diskette.

TYPICAL APPLICATION

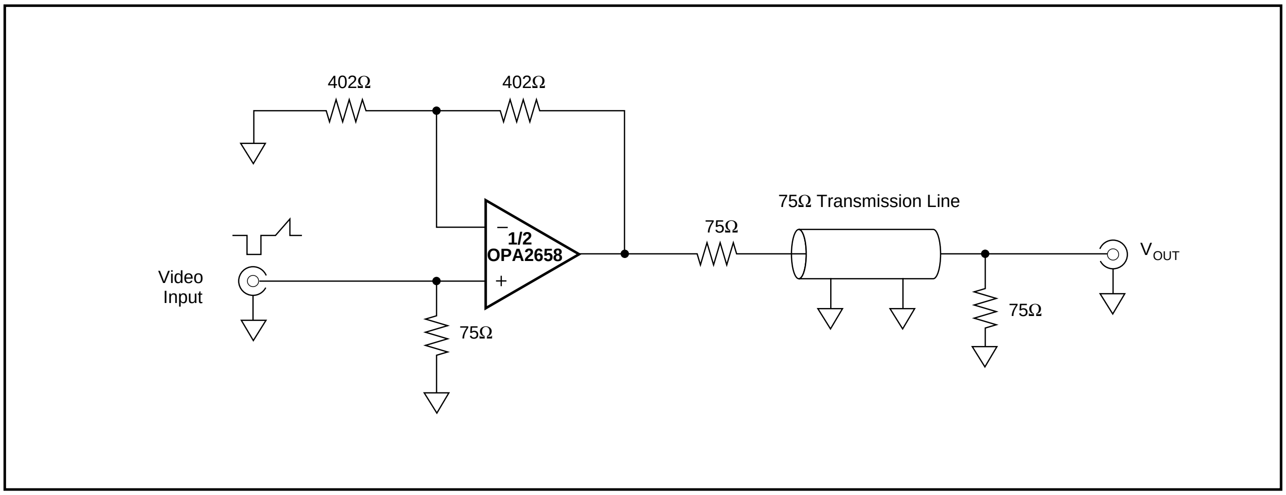


FIGURE 10. Low Distortion Video Amplifier.

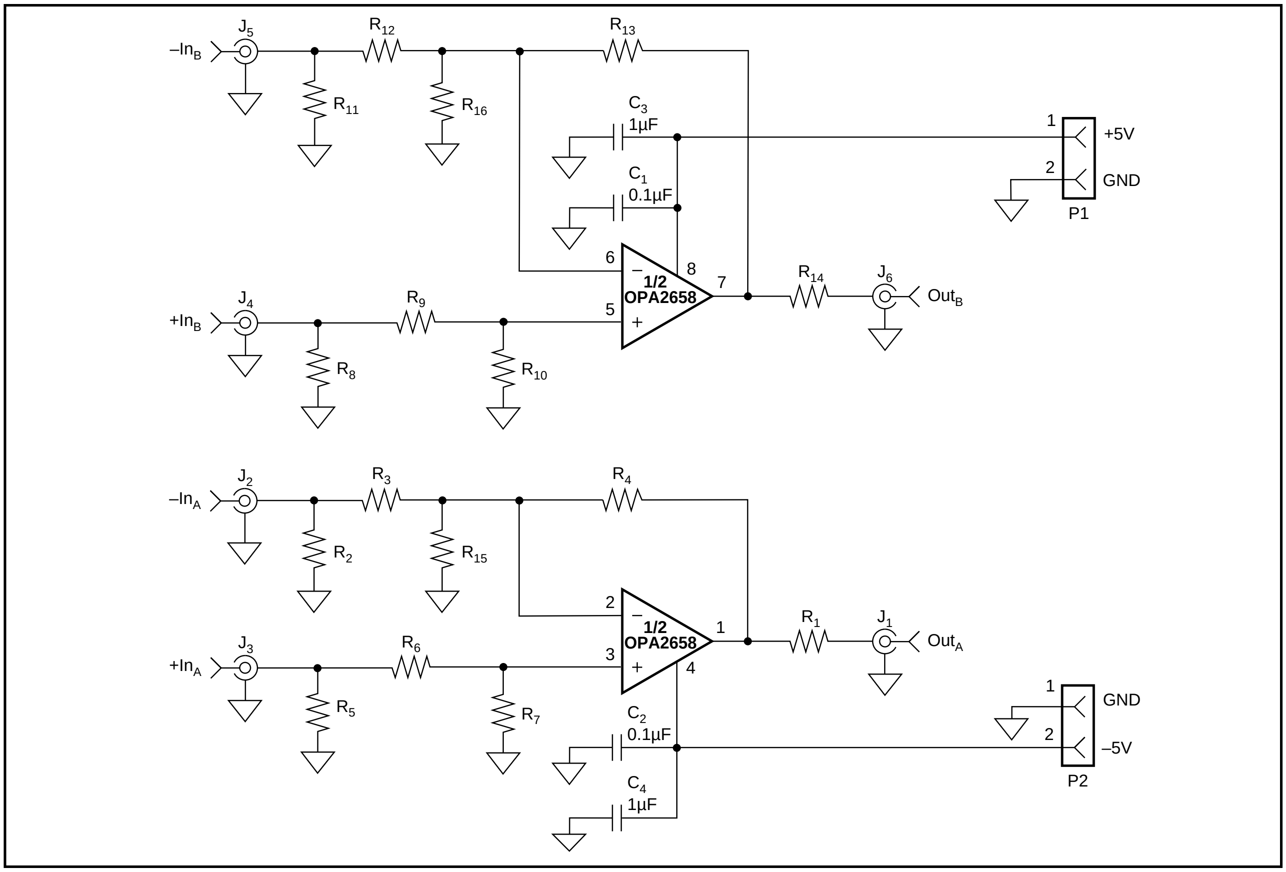


FIGURE 11. Circuit Detail For the PC Board Below.

Recommended PC Board Layout

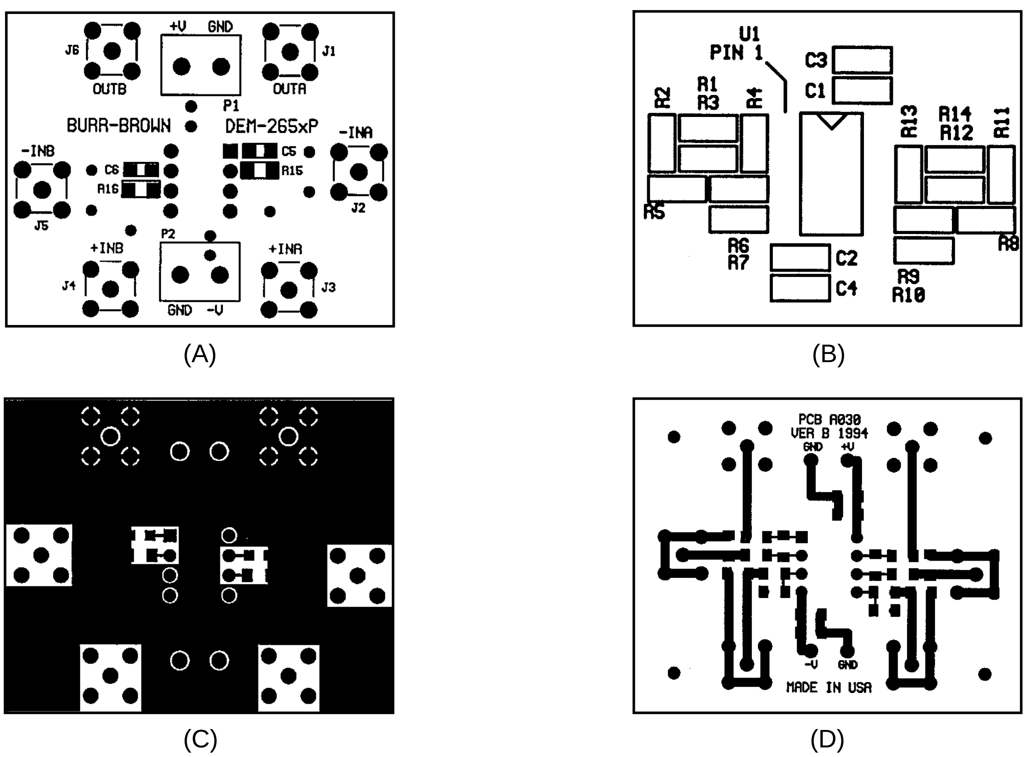


FIGURE 12a. Board Silkscreen (Bottom). 13b. Board Silkscreen (Top). 13c. Board Layout (Solder Side). 13d. Board Layout (Layout Side).