Video Distribution Amplifier

The 5962-0721201QXC is a fully DSCC SMD compliant parts and the SMD data sheets is available on the DSCC website (http://www.dscc.dla.mil/programs/specfind/default.asp). The 5962-0721201QXC is electrically equivalent to the EL8108. Reference equivalent “EL8108” data sheet for additional information. The 5962-0721201QXC is a dual current feedback operational amplifier designed for video distribution solutions. This device features a high drive capability of 450mA while consuming 13mA of supply current per amplifier and operating from a single 5V to 12V supply.

The 5962-0721201QXC is available in the industry standard 10 Ld Flatpack. The 5962-0721201QXC is ideal for driving multiple video loads while maintaining linearity.

Ordering Information

PART NUMBER	PART MARKING	PACKAGE	PKG. DWG. #
5962-0721201QXC	07212 01QHC	10 Ld Flat Pack	K10.A

TABLE 1.

150Ω	150Ω	DIFF GAIN	DIFF PHASE
1	0	0.03	0.01
1	1	0.03	0.01
2	1	0.05	0.02
2	2	0.06	0.03
3	2	0.08	0.03
3	3	0.11	0.03
2	0	0.04	0.01
3	0	0.05	0.02
4	0	0.07	0.02
5	0	0.08	0.03
6	0	0.10	0.03

Features

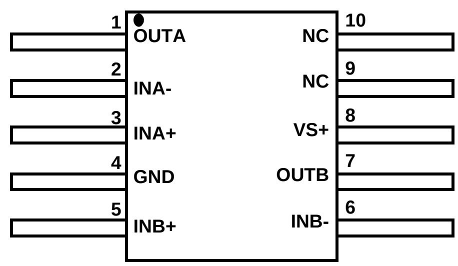
- Drives up to 450mA from a +12V supply
- $20V_{P-P}$ differential output drive into 100Ω
- -85dBc typical driver output distortion at full output at 150kHz
- -70dBc typical driver output distortion at 3.75MHz
- Low quiescent current of 13mA per amplifier
- 300MHz bandwidth

Applications

- Video distribution amplifiers

Pinout

5962-0721201QXC
(10 LD FLATPACK)
TOP VIEW



Absolute Maximum Ratings (T_A = +25°C)

V_S+ Voltage to Ground . . . . -0.3V to +13.2V
V_{IN}+ Voltage . . . . GND to V_S+
Current into any Input 8mA
Continuous Output Current 60mA

Thermal Information

Thermal Resistance (Typical) θ_{JA} (°C/W)
10 Lead Flatpack 177
Ambient Operating Temperature Range . . . .-55°C to +125°C
Storage Temperature Range . . . .-60°C to +150°C
Operating Junction Temperature . . . . +150°C

CAUTION: Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions may adversely impact product reliability and result in failures not covered by warranty.

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 = 12V, R_F = 750Ω, R_L = 100Ω connected to mid supply, T_A = +25°C, unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
AC PERFORMANCE						
BW	-3dB Bandwidth	R_F = 500Ω, A_V = +2		200		MHz
		R_F = 500Ω, A_V = +4		150		MHz
HD	Total Harmonic Distortion, Differential	f = 200kHz, V_O = 16V_{P-P}, R_L = 50Ω		-83		dBc
		f = 4MHz, V_O = 2V_{P-P}, R_L = 100Ω		-70		dBc
		f = 8MHz, V_O = 2V_{P-P}, R_L = 100Ω		-60		dBc
		f = 16MHz, V_O = 2V_{P-P}, R_L = 100Ω		-50		dBc
SR	Slew Rate, Single-ended	V_{OUT} from -3V to +3V		800		V/µs
INPUT CHARACTERISTICS						
e_N	Input Noise Voltage			6		nV/√Hz
i_N	-Input Noise Current			13		pA/√Hz
OUTPUT CHARACTERISTICS						
I_{OUT}	Output Current	R_L = 0Ω		450		mA

Typical Performance Curves

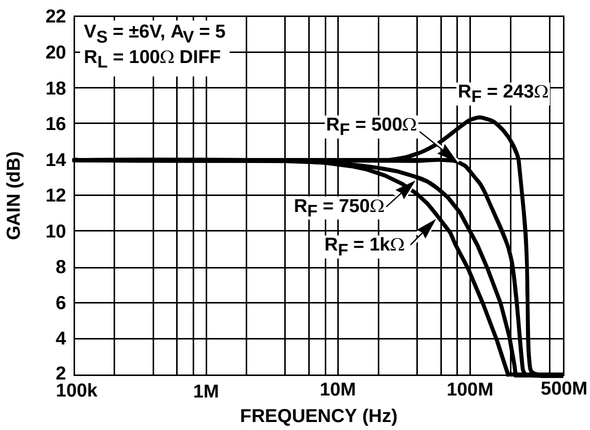


FIGURE 1. DIFFERENTIAL FREQUENCY RESPONSE WITH VARIOUS R_F (FULL POWER MODE)

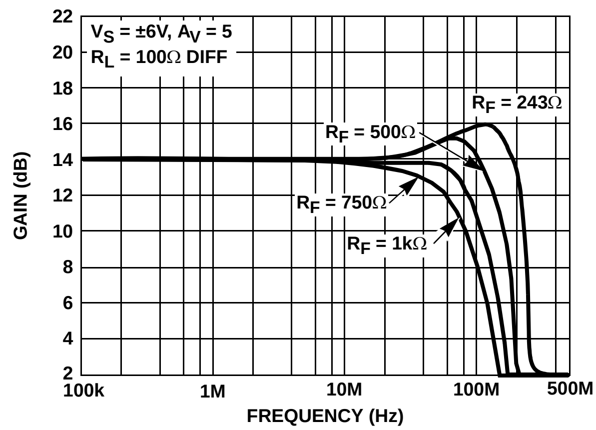


FIGURE 2. DIFFERENTIAL FREQUENCY RESPONSE WITH VARIOUS R_F (3/4 POWER MODE)

Typical Performance Curves (Continued)

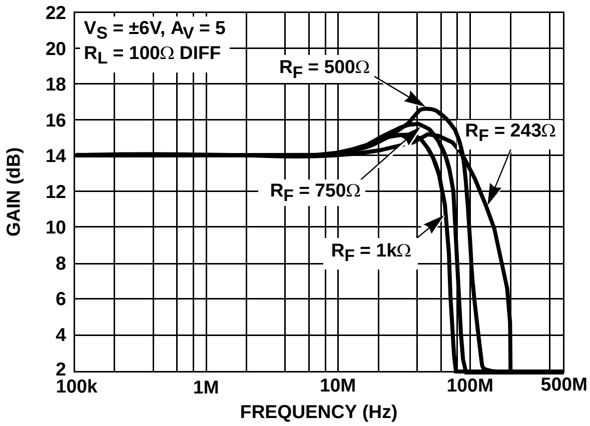


FIGURE 3. DIFFERENTIAL FREQUENCY RESPONSE WITH VARIOUS R_F (1/2 POWER MODE)

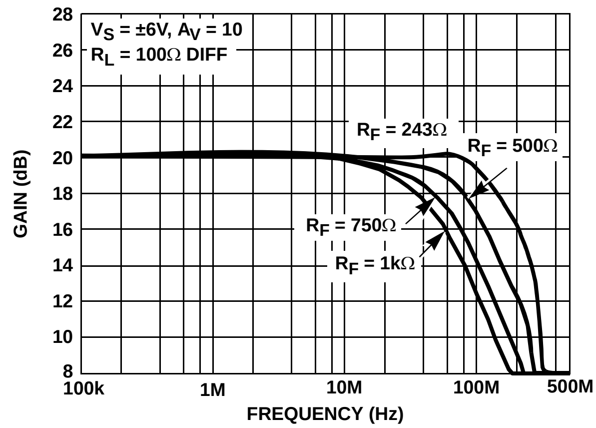


FIGURE 4. DIFFERENTIAL FREQUENCY RESPONSE WITH VARIOUS R_F (FULL POWER MODE)

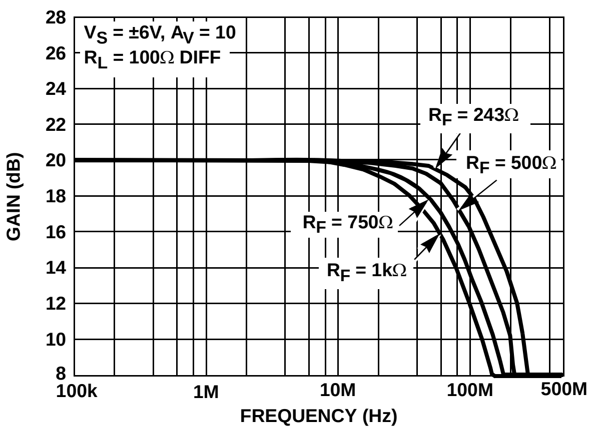


FIGURE 5. DIFFERENTIAL FREQUENCY RESPONSE WITH VARIOUS R_F (3/4 POWER MODE)

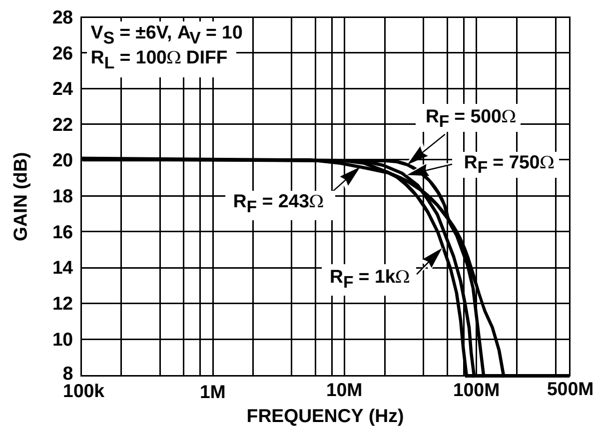


FIGURE 6. DIFFERENTIAL FREQUENCY RESPONSE WITH VARIOUS R_F (1/2 POWER MODE)

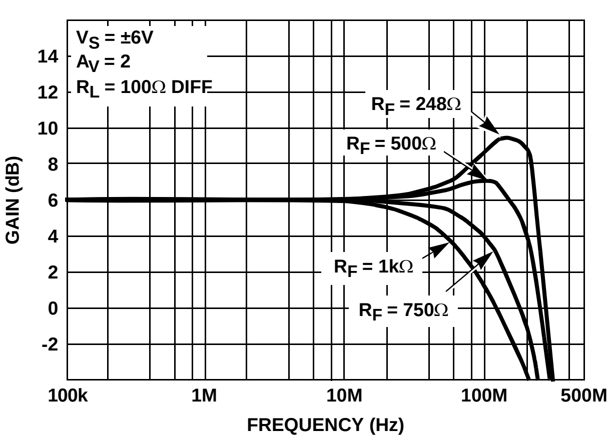


FIGURE 7. DIFFERENTIAL FREQUENCY RESPONSE WITH VARIOUS R_F

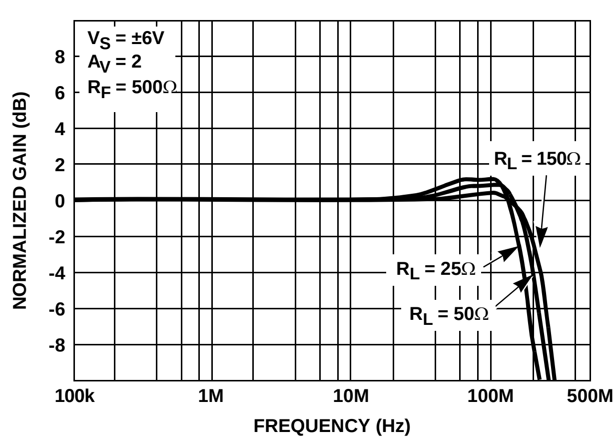


FIGURE 8. FREQUENCY RESPONSE FOR VARIOUS R_{LOAD}

Typical Performance Curves (Continued)

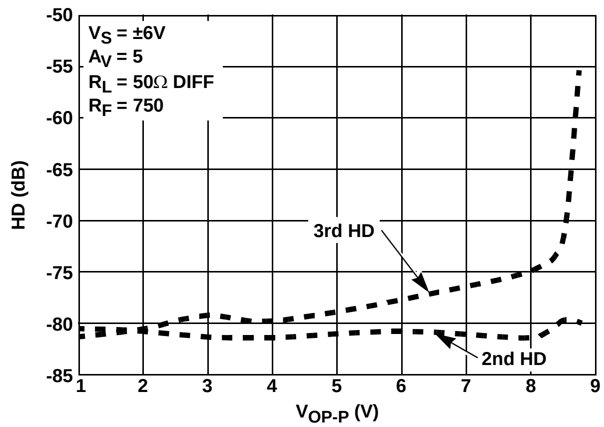


FIGURE 9. DISTORTION AT 2MHz

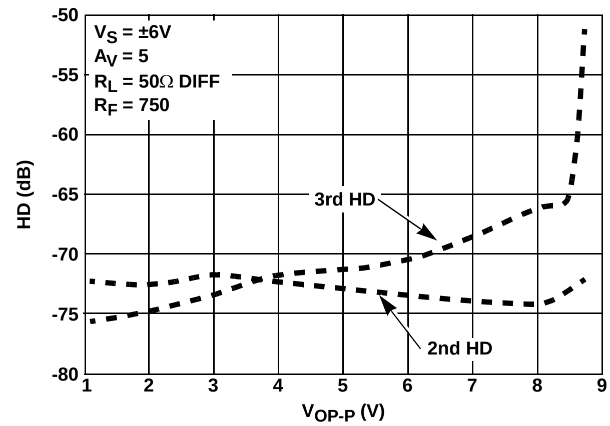


FIGURE 10. DISTORTION AT 3MHz

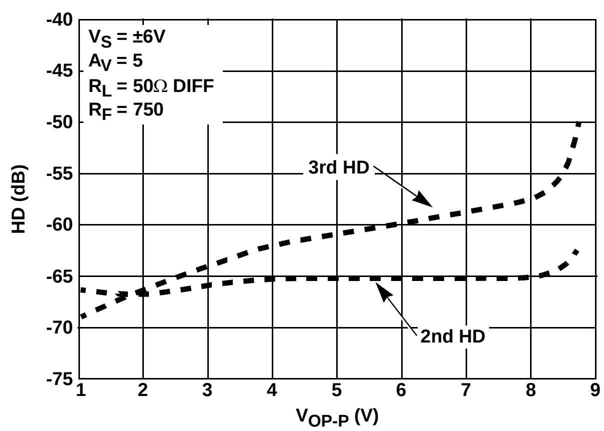


FIGURE 11. DISTORTION AT 5MHz

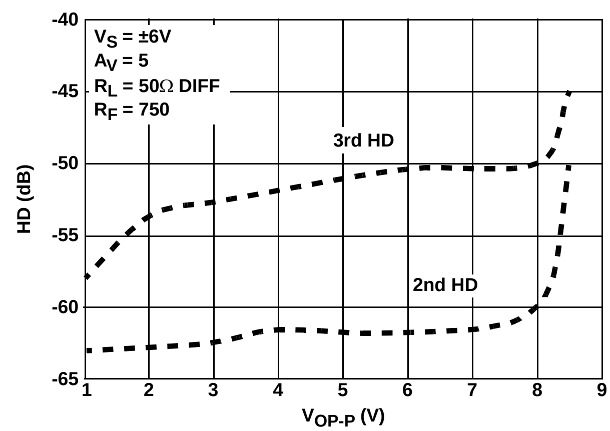


FIGURE 12. DISTORTION AT 10MHz

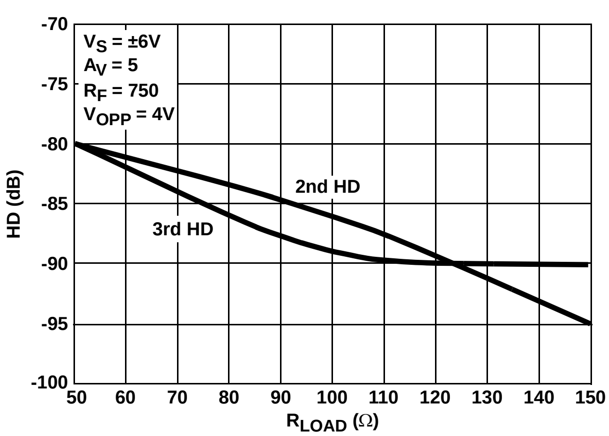


FIGURE 13. 2nd AND 3rd HARMONIC DISTORTION vs R_{LOAD} @ 2MHz

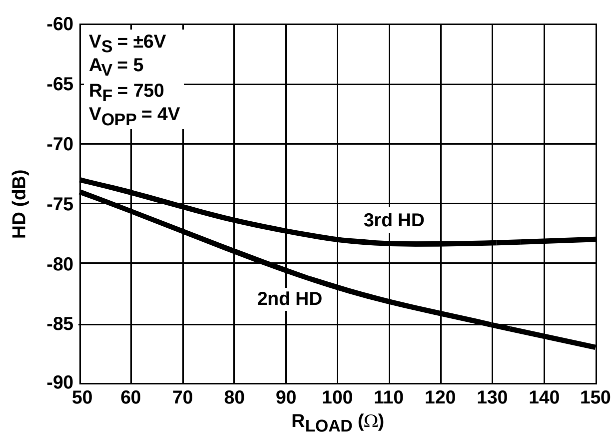


FIGURE 14. 2nd AND 3rd HARMONIC DISTORTION vs R_{LOAD} @ 3MHz

Typical Performance Curves (Continued)

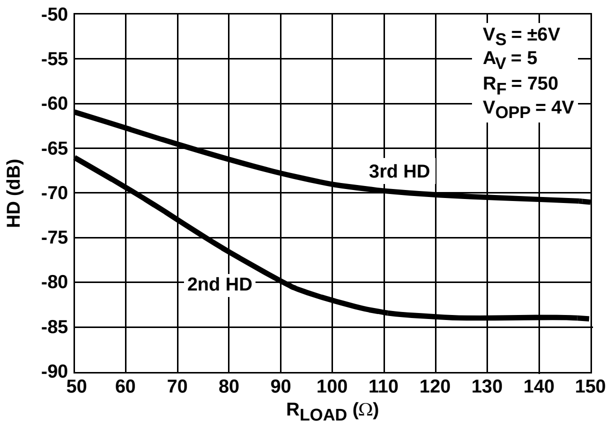


FIGURE 15. 2nd AND 3rd HARMONIC DISTORTION vs R_{LOAD} @ 5MHz

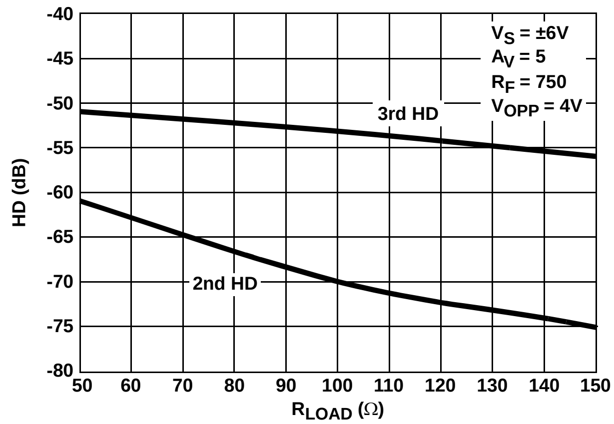


FIGURE 16. 2nd AND 3rd HARMONIC DISTORTION vs R_{LOAD} @ 10MHz

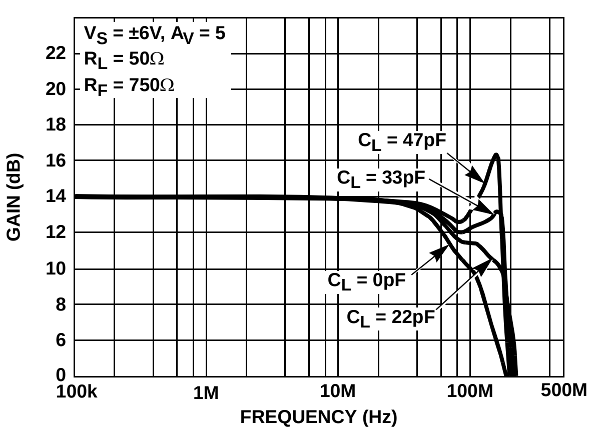


FIGURE 17. FREQUENCY RESPONSE WITH VARIOUS C_L

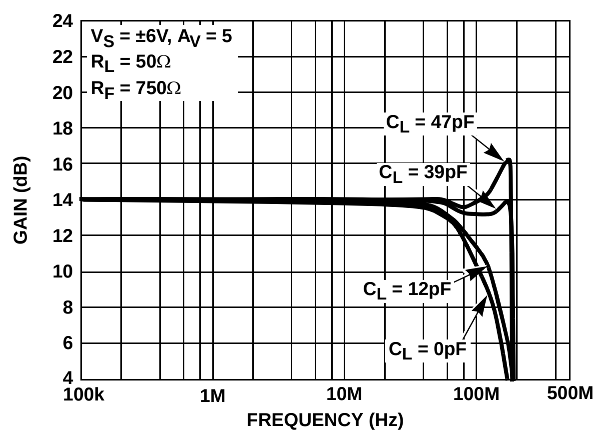


FIGURE 18. FREQUENCY RESPONSE vs VARIOUS C_L (3/4 POWER MODE)

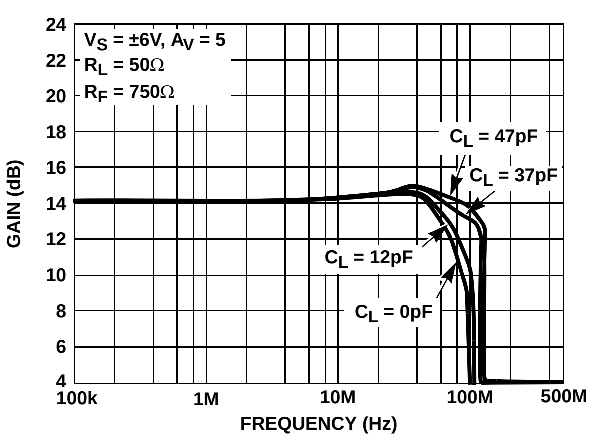


FIGURE 19. FREQUENCY RESPONSE WITH VARIOUS C_L (1/2 POWER MODE)

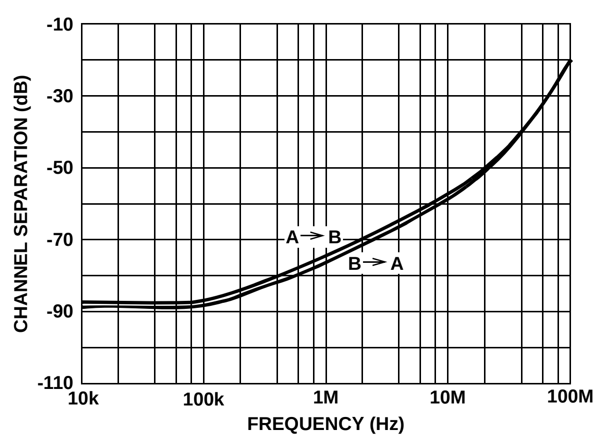


FIGURE 20. CHANNEL SEPARATION vs FREQUENCY

Typical Performance Curves (Continued)

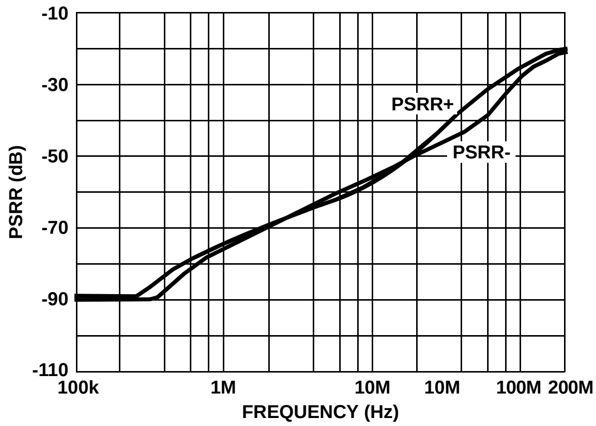


FIGURE 21. PSRR vs FREQUENCY

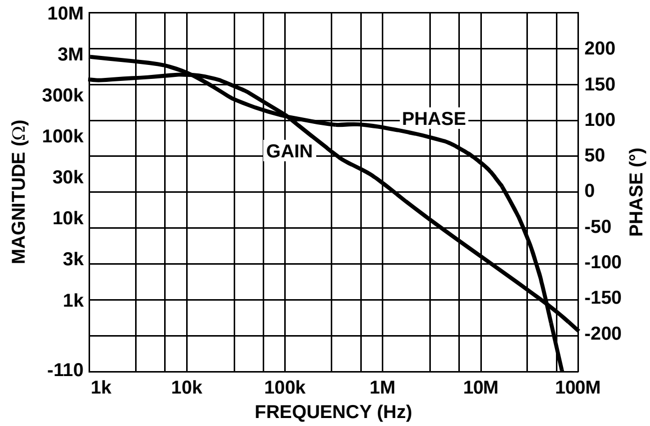


FIGURE 22. TRANSIMPEDANCE (R_{OL}) vs FREQUENCY

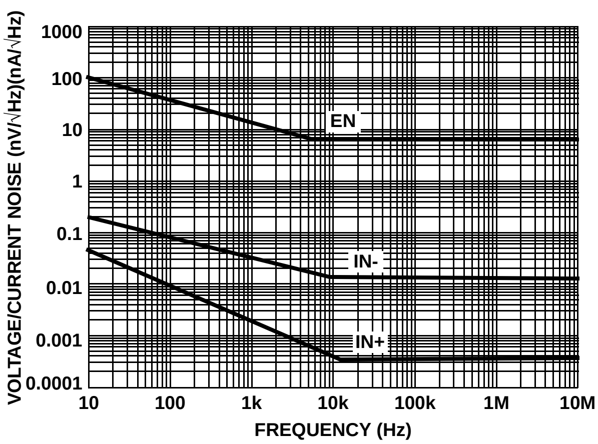


FIGURE 23. VOLTAGE AND CURRENT NOISE vs FREQUENCY

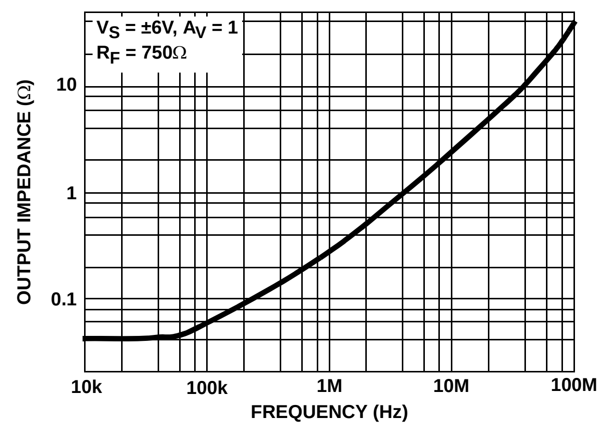


FIGURE 24. OUTPUT IMPEDANCE vs FREQUENCY

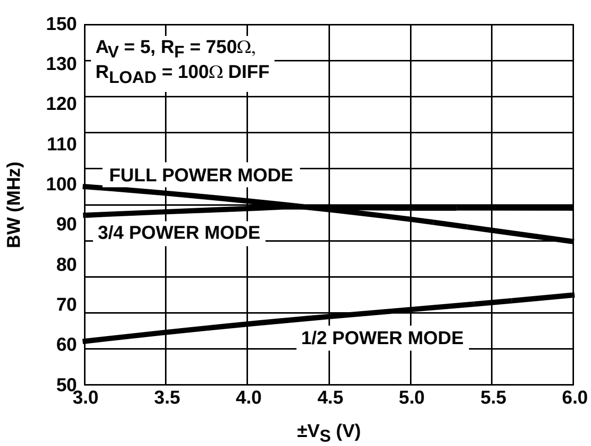


FIGURE 25. DIFFERENTIAL BANDWIDTH vs SUPPLY VOLTAGE

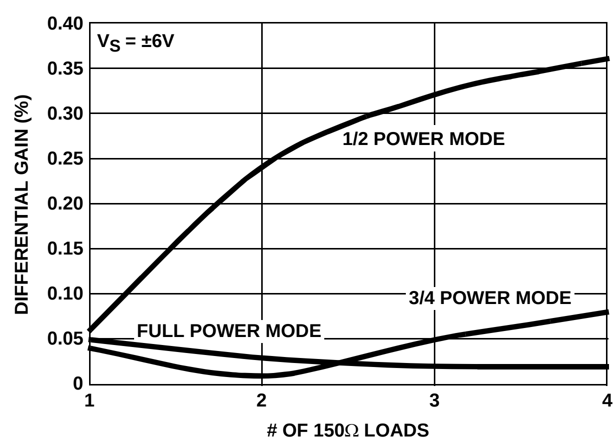


FIGURE 26. DIFFERENTIAL GAIN

Typical Performance Curves (Continued)

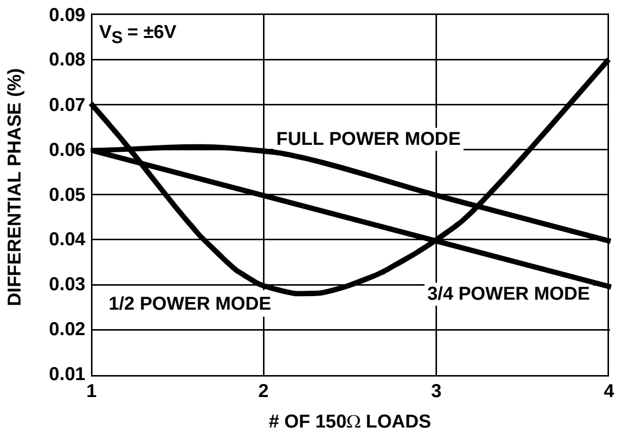


FIGURE 27. DIFFERENTIAL PHASE

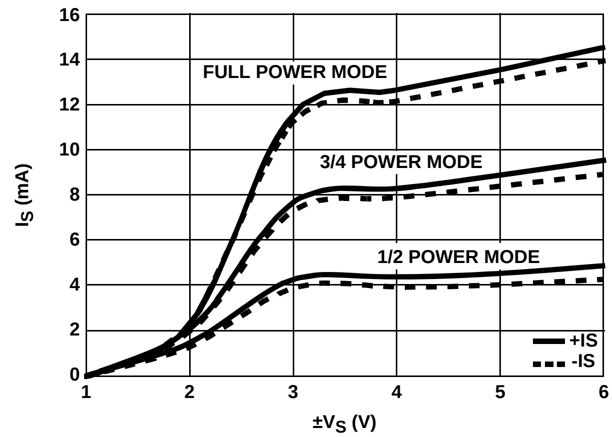


FIGURE 28. SUPPLY CURRENT vs SUPPLY VOLTAGE

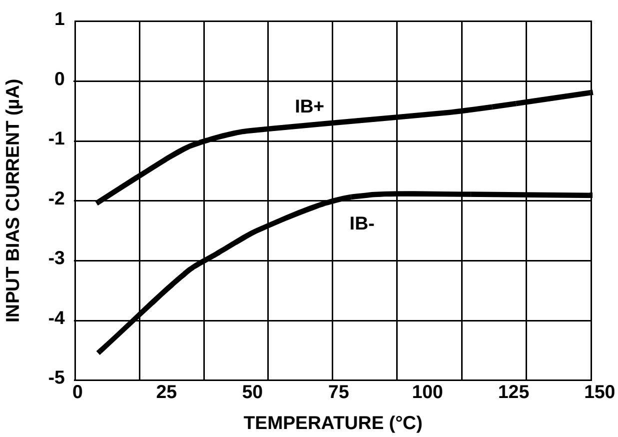


FIGURE 29. INPUT BIAS CURRENT vs TEMPERATURE

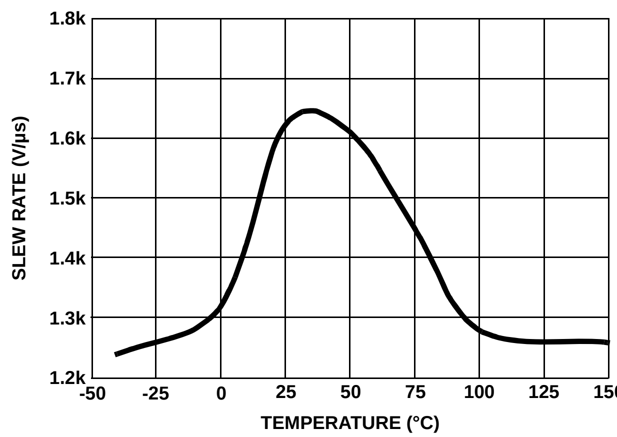


FIGURE 30. SLEW RATE vs TEMPERATURE

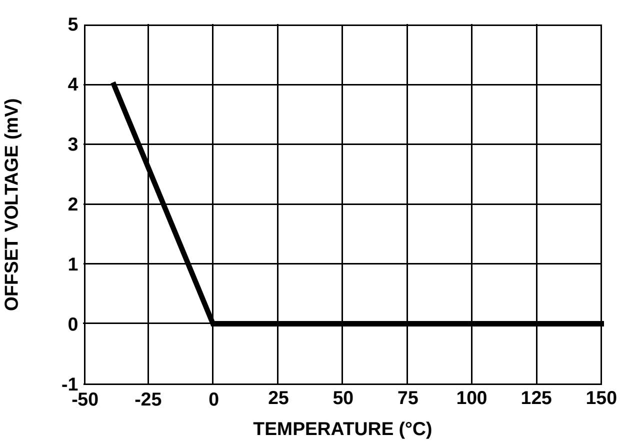


FIGURE 31. OFFSET VOLTAGE vs TEMPERATURE

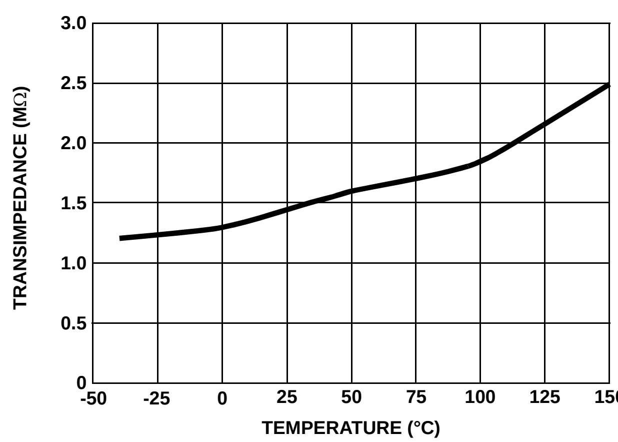


FIGURE 32. TRANSIMPEDANCE vs TEMPERATURE

Typical Performance Curves (Continued)

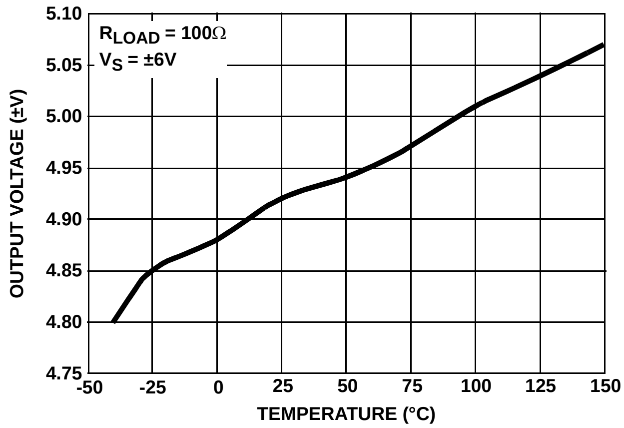


FIGURE 33. OUTPUT VOLTAGE vs TEMPERATURE

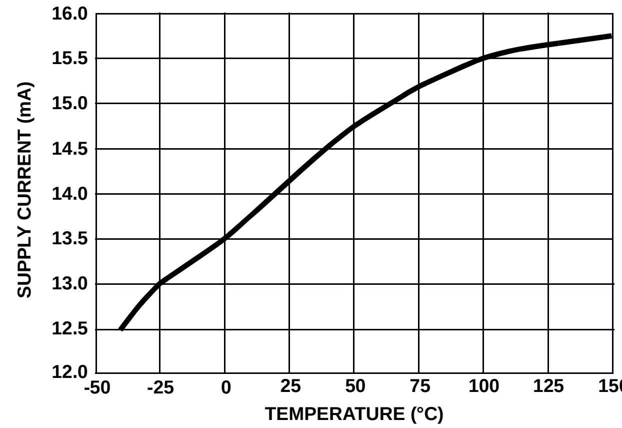


FIGURE 34. SUPPLY CURRENT vs TEMPERATURE

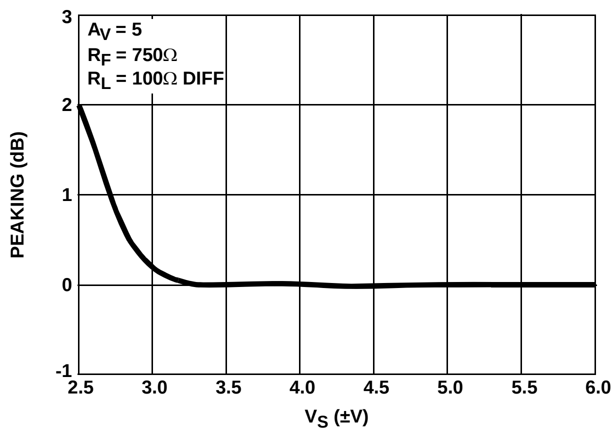


FIGURE 35. DIFFERENTIAL PEAKING vs SUPPLY VOLTAGE

Applications Information

Product Description

The 5962-0721201QXC is a dual current feedback operational amplifier designed for video distribution solutions. It is a dual current mode feedback amplifier with low distortion while drawing moderately low supply current. It is built using Intersil's proprietary complimentary bipolar process. Due to the current feedback architecture, the 5962-0721201QXC closed-loop 3dB bandwidth is dependent on the value of the feedback resistor. First the desired bandwidth is selected by choosing the feedback resistor, R_F, and then the gain is set by picking the gain resistor, R_G. The curves at the beginning of the Typical Performance Curves section show the effect of varying both R_F and R_G. The 3dB bandwidth is somewhat dependent on the power supply voltage.

Power Supply Bypassing and Printed Circuit Board Layout

As with any high frequency device, good printed circuit board layout is necessary for optimum performance. Ground plane construction is highly recommended. Lead lengths should be as short as possible, below ¼". The power supply pins must be well bypassed to reduce the risk of oscillation. A 4.7µF tantalum capacitor in parallel with a 0.1µF ceramic capacitor is adequate for each supply pin.

For good AC performance, parasitic capacitances should be kept to a minimum, especially at the inverting input. This implies keeping the ground plane away from this pin. Carbon resistors are acceptable, while use of wire-wound resistors should not be used because of their parasitic inductance. Similarly, capacitors should be low inductance for best performance.

Capacitance at the Inverting Input

Due to the topology of the current feedback amplifier, stray capacitance at the inverting input will affect the AC and transient performance of the 5962-0721201QXC when operating in the non-inverting configuration.

In the inverting gain mode, added capacitance at the inverting input has little effect since this point is at a virtual ground and stray capacitance is therefore not "seen" by the amplifier.

Feedback Resistor Values

The 5962-0721201QXC has been designed and specified with R_F = 500Ω for A_V = +2. This value of feedback resistor yields extremely flat frequency response with little to no peaking out to 200MHz. As is the case with all current feedback amplifiers, wider bandwidth, at the expense of slight peaking, can be obtained by reducing the value of the feedback resistor. Inversely, larger values of feedback resistor will cause rolloff to occur at a lower frequency. See the curves in the Typical Performance Curves section which show 3dB bandwidth and peaking vs. frequency for various feedback resistors and various supply voltages.

Bandwidth vs Temperature

Whereas many amplifier's supply current and consequently 3dB bandwidth drop off at high temperature, the 5962-0721201QXC was designed to have little supply current variations with temperature. An immediate benefit from this is that the 3dB bandwidth does not drop off drastically with temperature.

Supply Voltage Range

The 5962-0721201QXC has been designed to operate with supply voltages from ±2.5V to ±6V. Optimum bandwidth, slew rate, and video characteristics are obtained at higher supply voltages. However, at ±2.5V supplies, the 3dB bandwidth at A_V = +5 is a respectable 200MHz.

Single Supply Operation

If a single supply is desired, values from +5V to +12V can be used as long as the input common mode range is not exceeded. When using a single supply, be sure to either 1) DC bias the inputs at an appropriate common mode voltage and AC couple the signal, or 2) ensure the driving signal is within the common mode range of the 5962-0721201QXC.

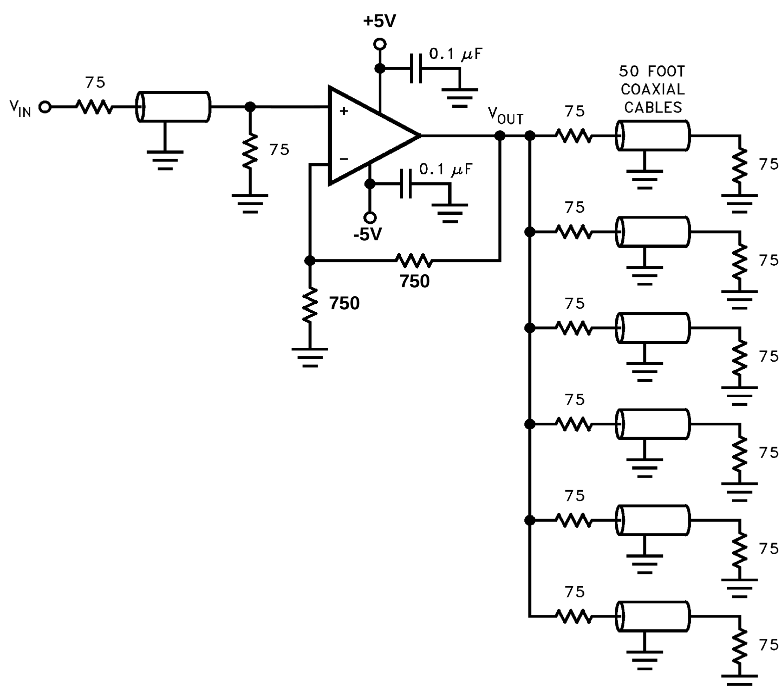
Driving Cables and Capacitive Loads

The 5962-0721201QXC was designed with driving multiple coaxial cables in mind. With 450mA of output drive and low output impedance, driving six, 75Ω double terminated coaxial cables to ±11V with one 5962-0721201QXC is practical.

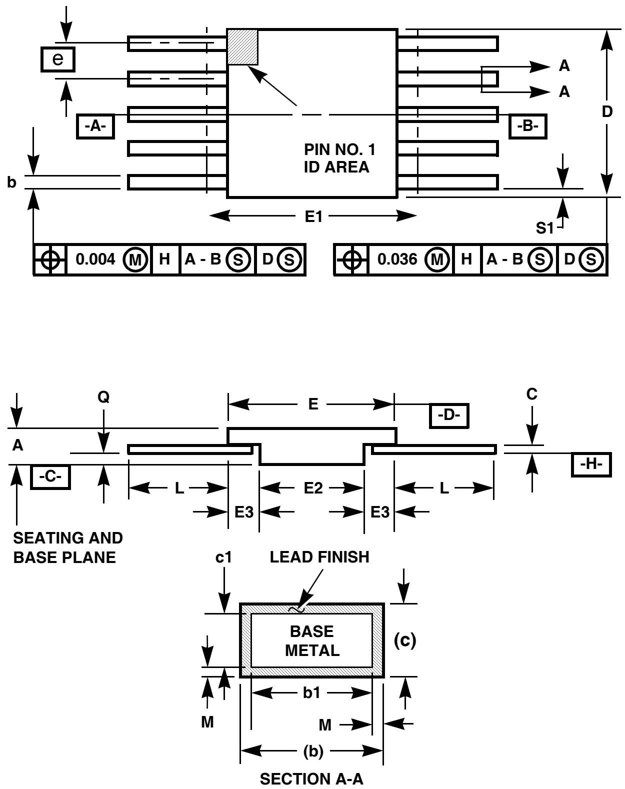
When used as a cable driver, double termination is always recommended for reflection-free performance. For those applications, the back termination series resistor will decouple the 5962-0721201QXC from the capacitive cable and allow extensive capacitive drive.

Other applications may have high capacitive loads without termination resistors. In these applications, an additional small value (5Ω to 50Ω) resistor in series with the output will eliminate most peaking.

The schematic below shows the EL8108 driving 6 double terminated cables, each of average length of 50 feet.



Ceramic Metal Seal Flatpack Packages (Flatpack)



K10.A **MIL-STD-1835 CDFP3-F10 (F-4A, CONFIGURATION B)**
10 LEAD CERAMIC METAL SEAL FLATPACK PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.045	0.115	1.14	2.92	-
b	0.015	0.022	0.38	0.56	-
b1	0.015	0.019	0.38	0.48	-
c	0.004	0.009	0.10	0.23	-
c1	0.004	0.006	0.10	0.15	-
D	-	0.290	-	7.37	3
E	0.240	0.260	6.10	6.60	-
E1	-	0.280	-	7.11	3
E2	0.125	-	3.18	-	-
E3	0.030	-	0.76	-	7
e	0.050 BSC		1.27 BSC		-
k	0.008	0.015	0.20	0.38	2
L	0.250	0.370	6.35	9.40	-
Q	0.026	0.045	0.66	1.14	8
S1	0.005	-	0.13	-	6
M	-	0.0015	-	0.04	-
N	10		10		-

Rev. 0 3/07

NOTES:

1. Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark. Alternately, a tab (dimension k) may be used to identify pin one.
2. If a pin one identification mark is used in addition to a tab, the limits of dimension k do not apply.
3. This dimension allows for off-center lid, meniscus, and glass overrun.
4. Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness. The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
5. N is the maximum number of terminal positions.
6. Measure dimension S1 at all four corners.
7. For bottom-brazed lead packages, no organic or polymeric materials shall be molded to the bottom of the package to cover the leads.
8. Dimension Q shall be measured at the point of exit (beyond the meniscus) of the lead from the body. Dimension Q minimum shall be reduced by 0.0015 inch (0.038mm) maximum when solder dip lead finish is applied.
9. Dimensioning and tolerancing per ANSI Y14.5M - 1982.
10. Controlling dimension: INCH.