CIRCUIT TYPES SN52748, SN72748
HIGH-PERFORMANCE OPERATIONAL AMPLIFIERS

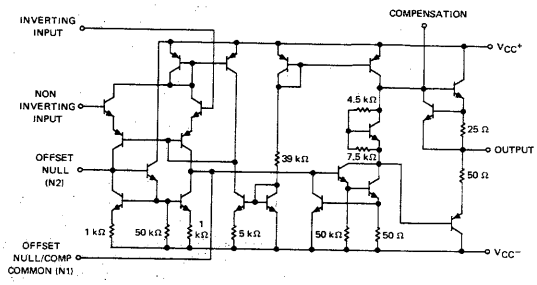
- Frequency and Transient Response Characteristics Adjustable
- Short-Circuit Protection
- Offset-Voltage Null Capability
- Large Common-Mode and Differential Voltage Ranges
- Low Power Consumption
- No Latch-up
- Same Pin Assignments as SN52709/SN72709

description

The SN52748 and SN72748 are high-performance operational amplifiers. They offer the same advantages and desirable features as the SN52741 and SN72741 with the exception of internal compensation. The external compensation of the SN52748 and SN72748 allows the changing of the frequency response (when the closed-loop gain is greater than unity) for applications requiring wider bandwidth or higher slew rate. These circuits feature high gain, large differential and common-mode input voltage range, output short-circuit protection, and may be compensated under unity-gain conditions with a single 30-pF capacitor. A potentiometer may be connected between the offset null inputs, as shown in Figure 12, to null out the offset voltage.

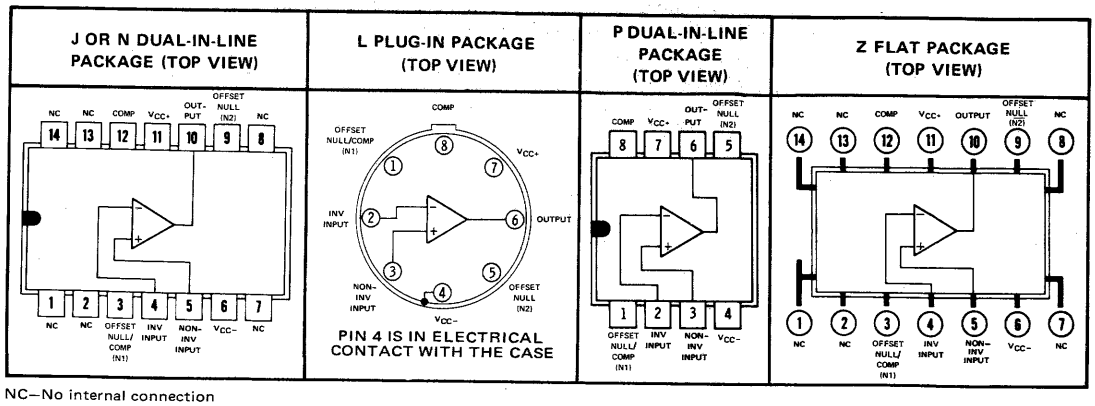
The SN52748 is characterized for operation over the full military temperature range of −55°C to 125°C; the SN72748 is characterized for operation from 0°C to 70°C.

schematic



COMPONENT VALUES SHOWN ARE NOMINAL

terminal assignments



NC—No internal connection

CIRCUIT TYPES SN52748, SN72748
HIGH-PERFORMANCE OPERATIONAL AMPLIFIERS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

		SN52748	SN72748	UNIT
Supply voltage V_{CC+} (see Note 1)		22	18	V
Supply voltage V_{CC-} (see Note 1)		−22	−18	V
Differential input voltage (see Note 2)		±30	±30	V
Input voltage (either input, see Notes 1 and 3)		±15	±15	V
Voltage between either offset null terminal (N1/N2) and V_{CC-}		−0.5 to 2	−0.5 to 2	V
Duration of output short-circuit (see Note 4)		unlimited	unlimited	
Continuous total power dissipation at (or below) 55°C free-air temperature (see Note 5)		500	500	mW
Operating free-air temperature range		−55 to 125	0 to 70	°C
Storage temperature range		−65 to 150	−65 to 150	°C
Lead temperature 1/16 inch from case for 60 seconds	J, L, or Z Package	300	300	°C
Lead temperature 1/16 inch from case for 10 seconds	N or P Package	260	260	°C

NOTES: 1. All voltage values, unless otherwise noted, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC+} and V_{CC-}.
2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
4. The output may be shorted to ground or either power supply. For the SN52748 only, the unlimited duration of the short-circuit applies at (or below) 125°C case temperature or 75°C free-air temperature.
5. For operation above 55°C free-air temperature, refer to Dissipation Derating Curve, Figure 13.

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electrical characteristics at specified free-air temperature, V_{CC+} = 15 V, V_{CC-} = −15 V

PARAMETER		TEST CONDITIONS†		SN52748			SN72748			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$R_S \leq 10$ kΩ	25°C		1	5		1	6	mV
			Full range			6			7.5	
I_{IO}	Input offset current		25°C		20	200		20	200	nA
			Full range			500			300	
I_{IB}	Input bias current		25°C		80	500		80	500	nA
			Full range			1500			800	
V_I	Input voltage range		25°C	±12	±13		±12	±13		V
			Full range	±12			±12			
V_{OPP}	Maximum peak-to-peak output voltage swing	R_L = 10 kΩ	25°C	24	28		24	28		V
		$R_L \geq$ 10 kΩ	Full range	24			24			
		R_L = 2 kΩ	25°C	20	26		20	26		
		$R_L \geq$ 2 kΩ	Full range	20			20			
A_{VD}	Large-signal differential voltage amplification	$R_L \geq$ 2 kΩ, V_O = ±10 V	25°C	50,000	200,000		50,000	200,000		
			Full range	25,000			25,000			
r_i	Input resistance		25°C	0.3	2		0.3	2		MΩ
r_o	Output resistance	V_O = 0 V, See Note 5	25°C		75			75		Ω
C_i	Input capacitance		25°C		1.4			1.4		pF
CMRR	Common-mode rejection ratio	$R_S \leq 10$ kΩ	25°C	70	90		70	90		dB
			Full range	70			70			
$\Delta V_{IO}/\Delta V_{CC}$	Power supply sensitivity	$R_S \leq 10$ kΩ	25°C		30	150		30	150	μV/V
			Full range			150			150	
I_{OS}	Short-circuit output current		25°C		±25	±40		±25	±40	mA
I_{CC}	Supply current	No load, No signal	25°C		1.7	2.8		1.7	2.8	mA
			Full range			3.3			3.3	
P_D	Total power dissipation	No load, No signal	25°C		50	85		50	85	mW
			Full range			100			100	

† All characteristics are specified under open-loop operation. Full range for SN52748 is −55°C to 125°C and for SN72748 is 0°C to 70°C.
NOTE 5: This typical value applies only at frequencies above a few hundred hertz because of the effects of drift and thermal feedback.

For definitions of terms, mechanical data, and ordering instructions, see SN52741/SN72741 data sheet dated November, 1970.

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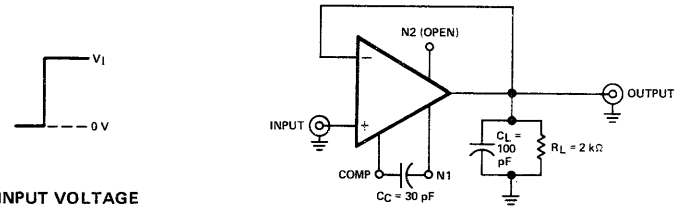
operating characteristics, $V_{CC+} = 15$ V, $V_{CC-} = -15$ V, $T_A = 25°C$

PARAMETER		TEST CONDITIONS	SN52748			SN72748			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
t_r	Rise time	$V_I = 20$ mV, $R_L = 2$ kΩ, $C_L = 100$ pF, $C_C = 30$ pF, See Figure 1		0.3			0.3		μs
	Overshoot			5%			5%		
SR	Slew rate at unity gain	$V_I = 10$ V, $R_L = 2$ kΩ, $C_L = 100$ pF, $C_C = 30$ pF, See Figure 1		0.5			0.5		V/μs

PARAMETER MEASUREMENT INFORMATION



INPUT VOLTAGE WAVEFORM

TEST CIRCUIT

FIGURE 1–RISE TIME, OVERSHOOT, AND SLEW RATE

TYPICAL CHARACTERISTICS

INPUT OFFSET CURRENT vs FREE-AIR TEMPERATURE

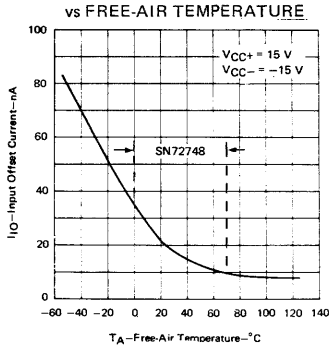


FIGURE 2

INPUT BIAS CURRENT vs FREE-AIR TEMPERATURE

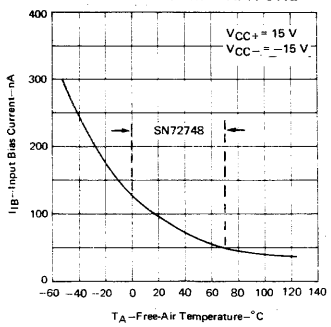


FIGURE 3

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs LOAD RESISTANCE

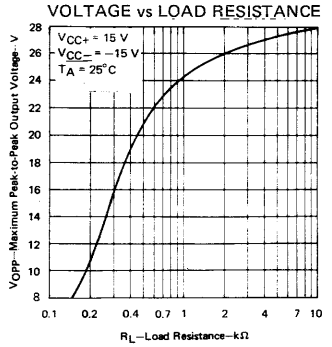


FIGURE 4

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY

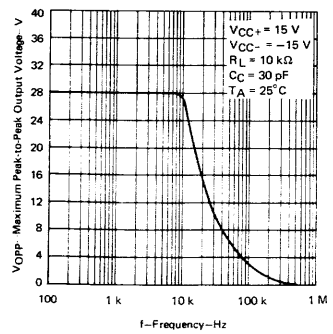


FIGURE 5

OPEN-LOOP LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs SUPPLY VOLTAGE

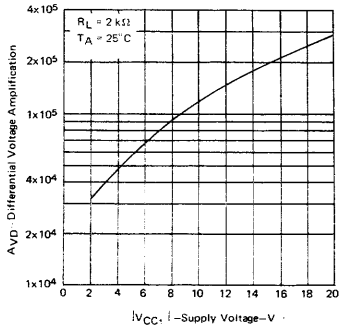


FIGURE 6

OPEN-LOOP LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREQUENCY

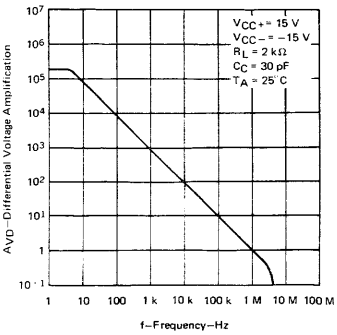


FIGURE 7

TYPICAL CHARACTERISTICS

COMMON-MODE REJECTION RATIO vs FREQUENCY

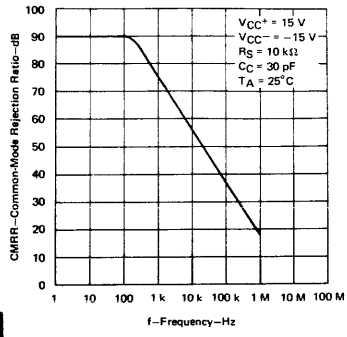


FIGURE 8

OUTPUT VOLTAGE vs ELAPSED TIME

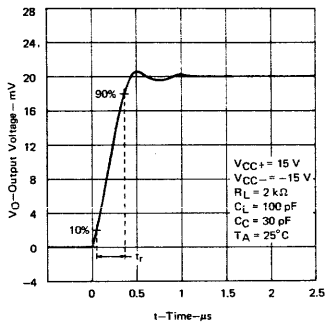


FIGURE 9

VOLTAGE-FOLLOWER LARGE-SIGNAL PULSE RESPONSE

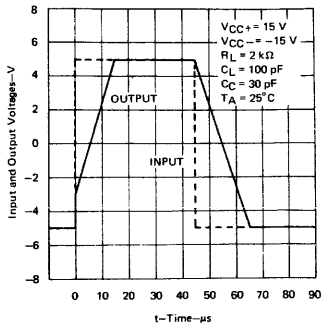


FIGURE 10

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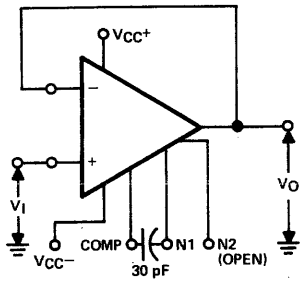
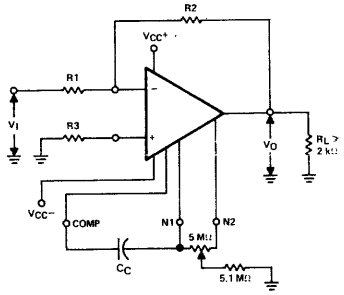
TYPICAL APPLICATION DATA



r_i = 400 MΩ, r_o < 1 Ω,
C_i = 1 pF, BW = 1 MHz

FIGURE 11–UNITY-GAIN VOLTAGE FOLLOWER



$$\frac{V_O}{V_I} = -\frac{R2}{R1}$$

$$C_C \geq \frac{R1 \cdot 30\ pF}{R1+R2}$$

$$R3 = \frac{R1 \cdot R2}{R1+R2}$$

FIGURE 12–INVERTING CIRCUIT WITH ADJUSTABLE GAIN, COMPENSATION, AND OFFSET ADJUSTMENT

THERMAL INFORMATION

DISSIPATION DERATING CURVE

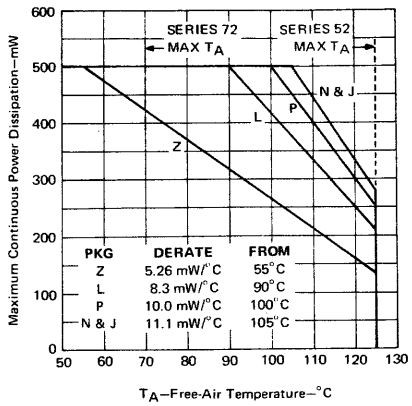


FIGURE 13

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