



7929225 S G S SEMICONDUCTOR CORP

- SHORT CIRCUIT PROTECTION
- OFFSET VOLTAGE NULL CAPABILITY
- LARGE COMMON MODE AND DIFFERENTIAL VOLTAGE RANGE
- NO LATCH-UP
- SLEW-RATE =  $5.5\text{V}/\mu\text{s}$  ( $G_v = 10$ ,  $C_C = 3.5\text{ pF}$ )

The LM748 series consists of general purpose operational amplifiers, intended for a wide range of analog applications where tailoring of frequency characteristics is desirable. High common mode voltage range and absence of "Latch-up" tendencies make the LM748 series ideal for use as a voltage follower. The high gain and wide range of operating voltage provide superior performance in integrators, summing amplifiers and general feedback applications. Unity gain frequency compensation is achieved by means of a single 30 pF capacitor.

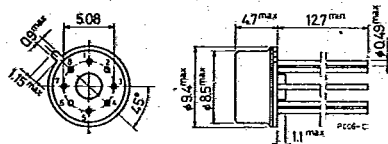
### ABSOLUTE MAXIMUM RATINGS

ABSOLUTE MAXIMUM RATINGS		LM748	LM748C
V <sub>s</sub>	Supply voltage	± 22V	± 22V
V <sub>I</sub> (1)	Input voltage	± 15V	± 15V
ΔV <sub>I</sub>	Differential input voltage	± 30V	± 30V
T <sub>op</sub>	Operating temperature	-55 to 125 °C	0 to 70 °C
	Output short circuit duration (2)	indefinite	indefinite
P <sub>tot</sub>	Power dissipation at T <sub>amb</sub> = 70°C: <b>TO-99</b>	520 mW	520 mW
	<b>Minidip</b>	—	665 mW
T <sub>stg</sub>	Storage temperature	65 to 150 °C	-55 to 150 °C

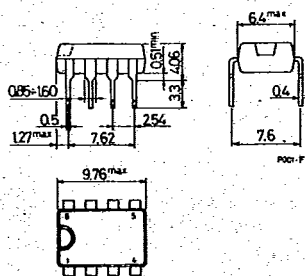
- 1) For supply voltage less than  $\pm 15V$ , input voltage is equal to the supply voltage
- 2) The short circuit duration is limited by thermal dissipation.

## MECHANICAL DATA

Dimensions in mm



TO-99



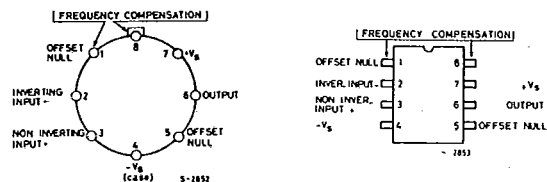
### Minidip

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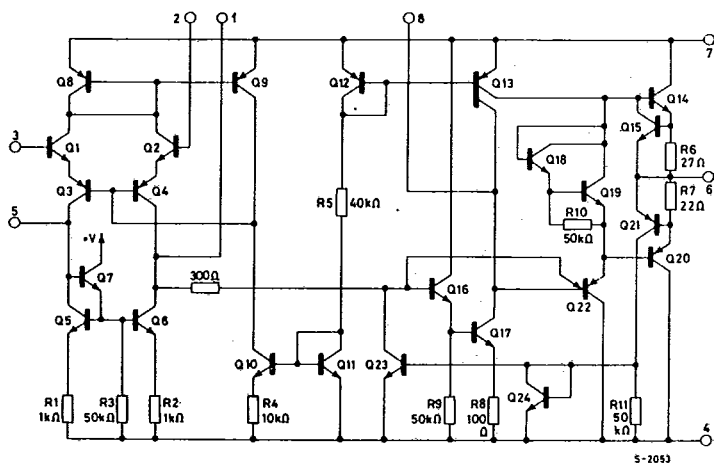
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# CONNECTION DIAGRAMS AND ORDERING NUMBERS (top views)



Type	TO-99	Minidip
LM 748	LM 748H	—
LM 748C	LM 748 CH	LM 748 CN

## SCHEMATIC DIAGRAM



## THERMAL DATA

			TO-99	Minidip
$R_{th J-amb}$	Thermal resistance junction-ambient	max	155 °C/W	120 °C/W

0234

C-05

196


**LM748**  
**LM748C**

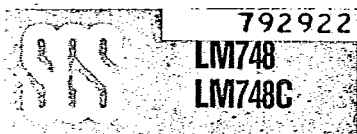
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## ELECTRICAL CHARACTERISTICS (see note)

Parameter	Test conditions	LM748			LM748C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$V_{os}$ Input offset voltage	$T_{amb} = 25^{\circ}\text{C}$ $R_g \leq 10\text{ k}\Omega$ $R_g \leq 50\Omega$		1	5		2	6	mV
	$T_{amb} = T_{min} \text{ to } T_{max}$ $R_g \leq 10\text{ k}\Omega$ $R_g \leq 50\Omega$		1	6			7.5	mV
$\Delta V_{os}$ Input offset voltage adjust. range	$T_{amb} = 25^{\circ}\text{C}$		$\pm 15$			$\pm 15$		mV
$I_{os}$ Input offset current	$T_{amb} = 25^{\circ}\text{C}$		20	200		20	200	nA
	$T_{amb} = T_{min} \text{ to } T_{max}$		50	500		300		nA
$I_b$ Input bias current	$T_{amb} = 25^{\circ}\text{C}$		80	500		80	500	nA
	$T_{amb} = T_{min} \text{ to } T_{max}$			1.5			0.8	$\mu\text{A}$
$R_i$ Input resistance	$T_{amb} = 25^{\circ}\text{C}$	0.3	2		0.3	2		M $\Omega$
$V_i$ Input voltage range		$\pm 12$	$\pm 13$		$\pm 12$	$\pm 13$		V
$G_v$ Large signal voltage gain	$T_{amb} = 25^{\circ}\text{C}$ $R_L \geq 2\text{ k}\Omega$ $V_s = \pm 15\text{V}$ $V_o = \pm 10\text{V}$	94	104		86	104		dB
	$T_{amb} = T_{min} \text{ to } T_{max}$ $R_L \geq 2\text{ k}\Omega$ $V_s = \pm 15\text{V}$ $V_o = \pm 10\text{V}$	88			84			dB
$V_o$ Output voltage swing	$V_s = \pm 15\text{V}$	$\pm 12$	$\pm 14$		$\pm 12$	$\pm 14$		V
	$R_L \geq 10\text{ k}\Omega$ $R_L \geq 2\text{ k}\Omega$	$\pm 10$	$\pm 13$		$\pm 10$	$\pm 13$		V
$I_{sc}$ Output short circuit current			25			25		mA
CMR Common mode rejection	$R_g \leq 10\text{ k}\Omega$ $V_{CM} = \pm 12\text{V}$	70	90		70	90		dB
SVR Supply voltage rejection	$V_s = \pm 5 \text{ to } \pm 20\text{V}$ $R_g \leq 10\text{ k}\Omega$	76	90		76	90		dB
SR Slew rate	$T_{amb} = 25^{\circ}\text{C}$ $R_L \geq 2\text{ k}\Omega$		0.5			0.5		V/ $\mu\text{s}$
	$G_v = 10^*$		5.5			5.5		V/ $\mu\text{s}$

\*  $C_C = 3.5\text{ pF}$

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## ELECTRICAL CHARACTERISTICS (continued)

Parameter	Test conditions	LM748			LM748C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Transient respon. (unity gain)	$T_{amb} = 25^{\circ}\text{C}$ $V_i = 20\text{ mV}$ $C_c = 30\text{ pF}$ $R_L = 2\text{ k}\Omega$ $C_L \leq 100\text{ pF}$							
Rise time			0.2			0.2		$\mu\text{s}$
Overshoot			5			5		%
$I_s$ Supply current	$T_{amb} = 25^{\circ}\text{C}$		1.9	2.8		1.9	2.8	mA
$P_S$ Power consumption	$T_{amb} = 25^{\circ}\text{C}$ $V_s = \pm 15\text{V}$		60	85		60	85	mW
	$V_s = \pm 15\text{V}$ $T_{amb} = T_{min}$		60	100		60	100	mW
	$T_{amb} = T_{max}$		45	75				mW

Note: These specifications, unless otherwise specified, apply for  $V_s = \pm 15\text{V}$  and  $T_{amb} = -55$  to  $125^{\circ}\text{C}$  for LM748. For LM748C these specifications apply for  $T_{amb} = 0$  to  $70^{\circ}\text{C}$  ( $C_c = 30\text{ pF}$ ).

Fig. 1 - Voltage offset null circuits

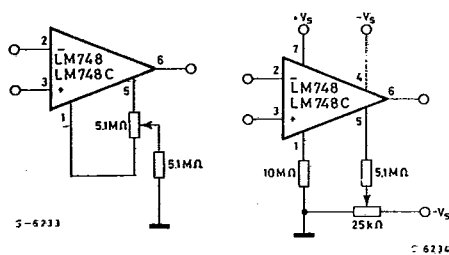
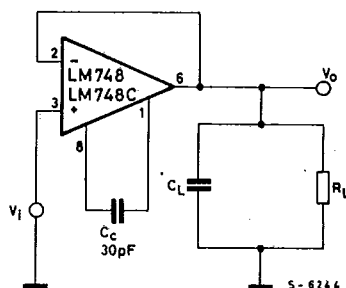


Fig. 2 - Transient response test circuit





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Fig. 3 - Input noise voltage vs. frequency

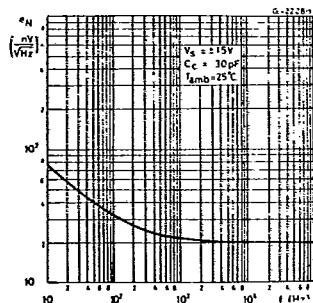


Fig. 4 - Input noise current vs. frequency

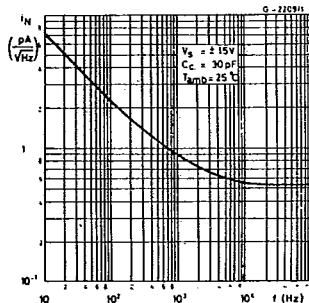


Fig. 5 - Broadband noise for various bandwidths

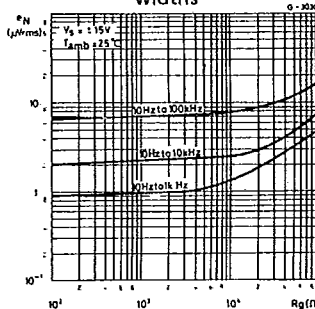


Fig. 6 - Open loop frequency and phase response vs. frequency

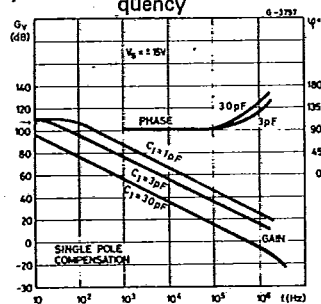


Fig. 7 - Output voltage swing vs. frequency

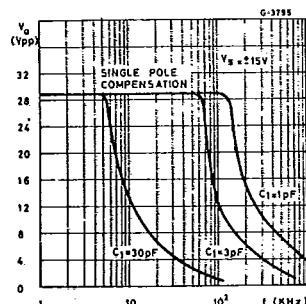


Fig. 8 - Slew-rate

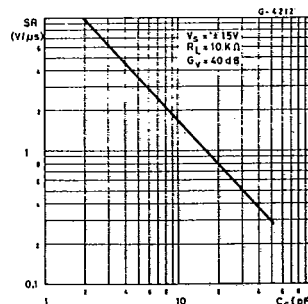


Fig. 9 - Compensation capacitance vs. closed loop voltage gain

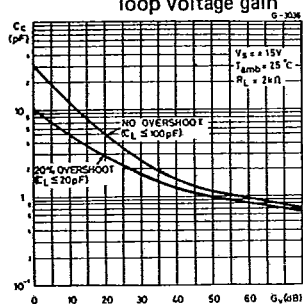


Fig. 10 - Input resistance and input capacitance vs. frequency

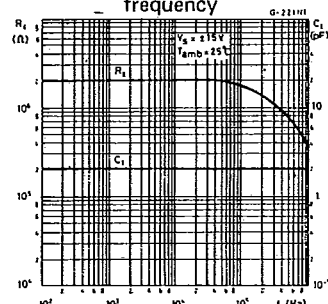


Fig. 11 - Output resistance vs. frequency

