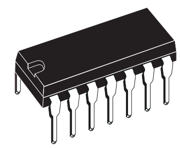
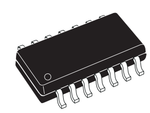
QUADRUPLE OPERATIONAL AMPLIFIERS

- LOW SUPPLY CURRENT: 0.53mA/AMPLIFIER
- CLASS AB OUTPUT STAGE: NO CROSS OVER DISTORTION
- PIN COMPATIBLE WITH LM124
- LOW INPUT OFFSET VOLTAGE: 1mV
- LOW INPUT OFFSET CURRENT: 2nA
- LOW INPUT BIAS CURRENT: 30nA
- GAIN BANDWIDTH PRODUCT: 1.3MHz
- HIGH DEGREE OF ISOLATION BETWEEN AMPLIFIERS: 120dB
- OVERLOAD PROTECTION FOR INPUTS AND OUTPUTS



N
DIP14
(Plastic Package)

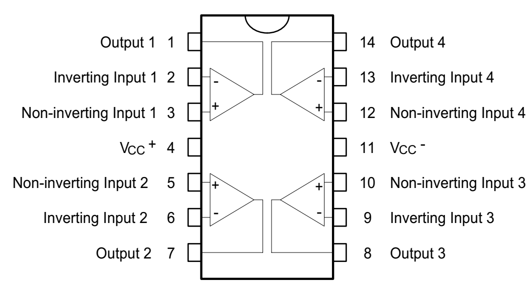


M
SOP14
(Plastic Micropackage)

DESCRIPTION

The LM148 consists of four independent, high gain internally compensated, low power operational amplifiers which have been designed to provide functional characteristics identical to those of the familiar UA741 operational amplifier. In addition the total supply current for all four amplifiers is compatible to the supply current of a single UA741 type op amp. Other features include input offset current and input bias current which are much less than those of a standard UA741. Also, excellent isolation between amplifiers has been achieved by independently biasing each amplifier and using layout techniques qhich minimize thermal coupling.

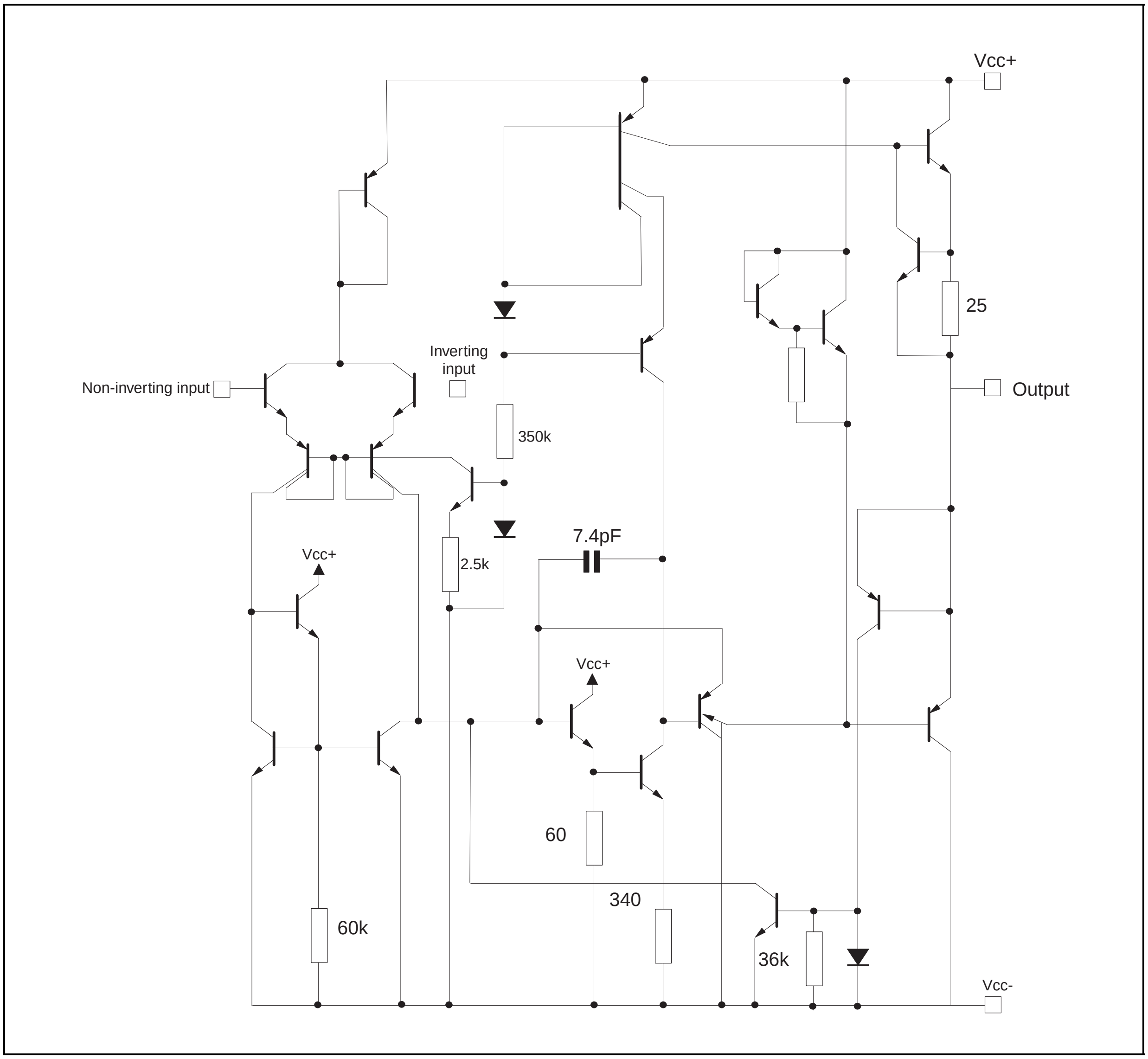
PIN CONNECTIONS (top view)



ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM148N	DIP14	LM148	TUBE	1000/box
LM248N		LM248	TUBE	1000/box
LM348N		LM348	TUBE	1000/box
LM148M/TR	SOP14	LM148	REEL	2500/reel
LM248M/TR		LM248	REEL	2500/reel
LM348M/TR		LM348	REEL	2500/reel

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	LM148	LM248	LM348	Unit
V_{CC}	Supply voltage	±22			V
V_i	Input Voltage 1)	±22			V
V_{id}	Differential Input Voltage	±44			V
	Output Short-circuit Duration 2)	Infinite			
P_{tot}	Power Dissipation	500			mW
T_{oper}	Operating Free-air Temperature Range	-55 to +125	-40 to +105	0 to +70	°C
T_{stg}	Storage Temperature Range	-65 to +150			°C

1. For supply voltage less than maximum value, the absolute maximum input voltage is equal to the supply voltage.
2. Any of the amplifier outputs can be shorted to ground indefinitly; however more than one should not be simultaneously shorted as the maximum junction will be exceeded.

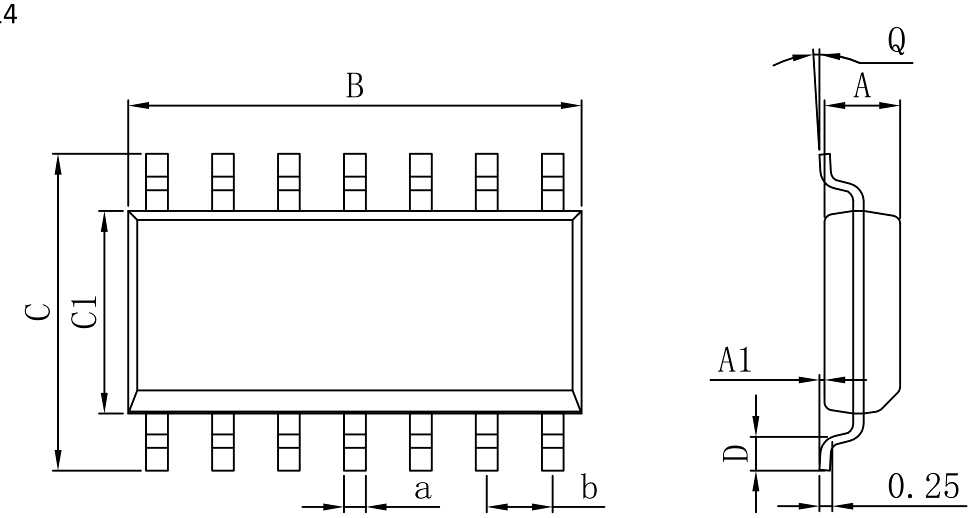
ELECTRICAL CHARACTERISTICS

V_{CC} = ±15V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage ($R_S \le 10k\Omega$) T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$		1	5 6	mV
I_{io}	Input Offset Current T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$		2	25 75	nA
I_{ib}	Input Bias Current T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$		30	100 300	nA
A_{vd}	Large Signal Voltage Gain (V_o = ±10V, R_L = 2kΩ) T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$	50 25	160		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S \le 10k\Omega$) T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$	77 77	100		dB
I_{cc}	Supply Current, all Amp, no load T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$		2.1	3.6 4.8	mA
V_{icm}	Input Common Mode Voltage Range T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$	±12 ±12			
CMR	Common Mode Rejection Ratio ($R_S \le 10k\Omega$) T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$	70 70	110		dB
I_{os}	Output Short-circuit Current T_{amb} = 25°C	10	25	35	mA
$\pm V_{opp}$	Output Voltage Swing T_{amb} = 25°C $R_L \le 10k\Omega$ $R_L \le 2k\Omega$ $T_{min} \le T_{amb} \le T_{max}$ $R_L \le 10k\Omega$ $R_L \le 2k\Omega$	12 10 12 10	13 12		V
SR	Slew Rate (V_I = ±10V, R_L = 10kΩ, C_L = 100pF, unity Gain)	0.25	0.5		V/µs
t_r	Rsie Time (V_I = ±10V, R_L = 10kΩ, C_L = 100pF, unity Gain)		0.3		µs
K_{OV}	Overshoot (V_I = ±10V, R_L = 10kΩ, C_L = 100pF, unity Gain)		5		%
R_I	Input Resistance	0.8	2.5		MΩ
GBP	Gain Bandwith Product (V_I = 10 mV, R_L = 10kΩ, C_L = 100pF f =100kHz)	0.7	1.3		MHz
THD	Total Harmonic Distortion (f = 1kHz, A_v = 20dB, R_L = 10kΩ C_L = 100pF, V_o = $2V_{pp}$)		0.08		%
e_n	Equivalent Input Noise Voltage (f = 1kHz, R_S = 100Ω		40		$\frac{nV}{\sqrt{Hz}}$
V_{o1}/V_{o2}	Channel Separation		120		dB

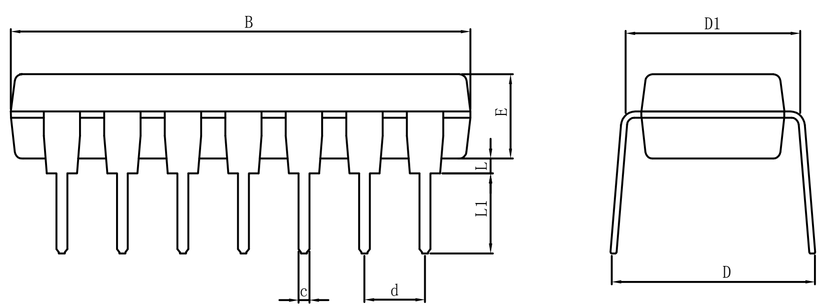
PACKAGE

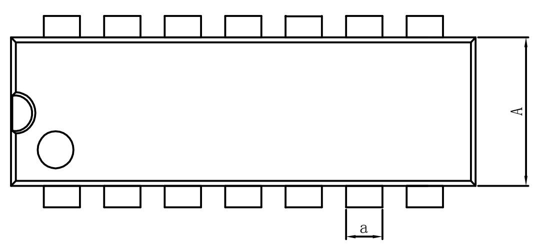
SOP14



Dimensions In Millimeters					
Symbol :	**Min :**	**Max :**	**Symbol :**	**Min :**	**Max :**
A	1.225	1.570	**D**	0.400	0.950
A1	0.100	0.250	**Q**	0°	8°
B	8.500	9.000	**a**	0.420 TYP	
C	5.800	6.250	**b**	1.270 TYP	
C1	3.800	4.000			

DIP14





Dimensions In Millimeters					
Symbol :	**Min :**	**Max :**	**Symbol :**	**Min :**	**Max :**
A	6.100	6.680	**L**	0.500	0.800
B	18.940	19.560	**L1**	3.000	3.600
D	8.200	9.200	**a**	1.524 TYP	
D1	7.42	7.820	**c**	0.457 TYP	
E	3.100	3.550	**d**	2.540 TYP	

Important statement:

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