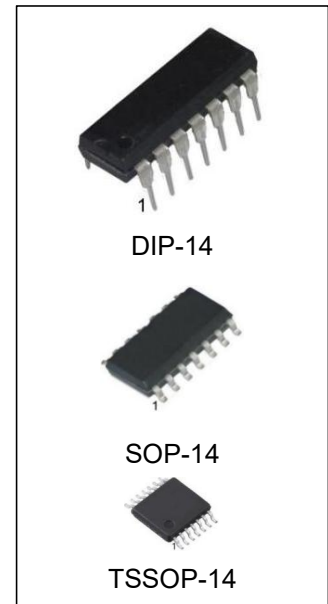


AUADRUPLE OPERATIONAL AMPLIFIERS

FEATURES

- Low Supply Current: 0.53mA/Ampli- Fier
- 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



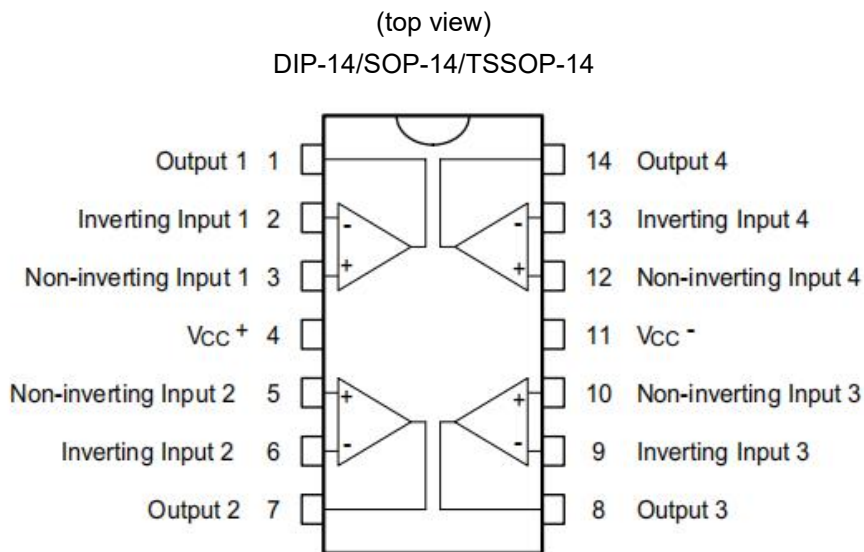
ORDERING INFORMATION

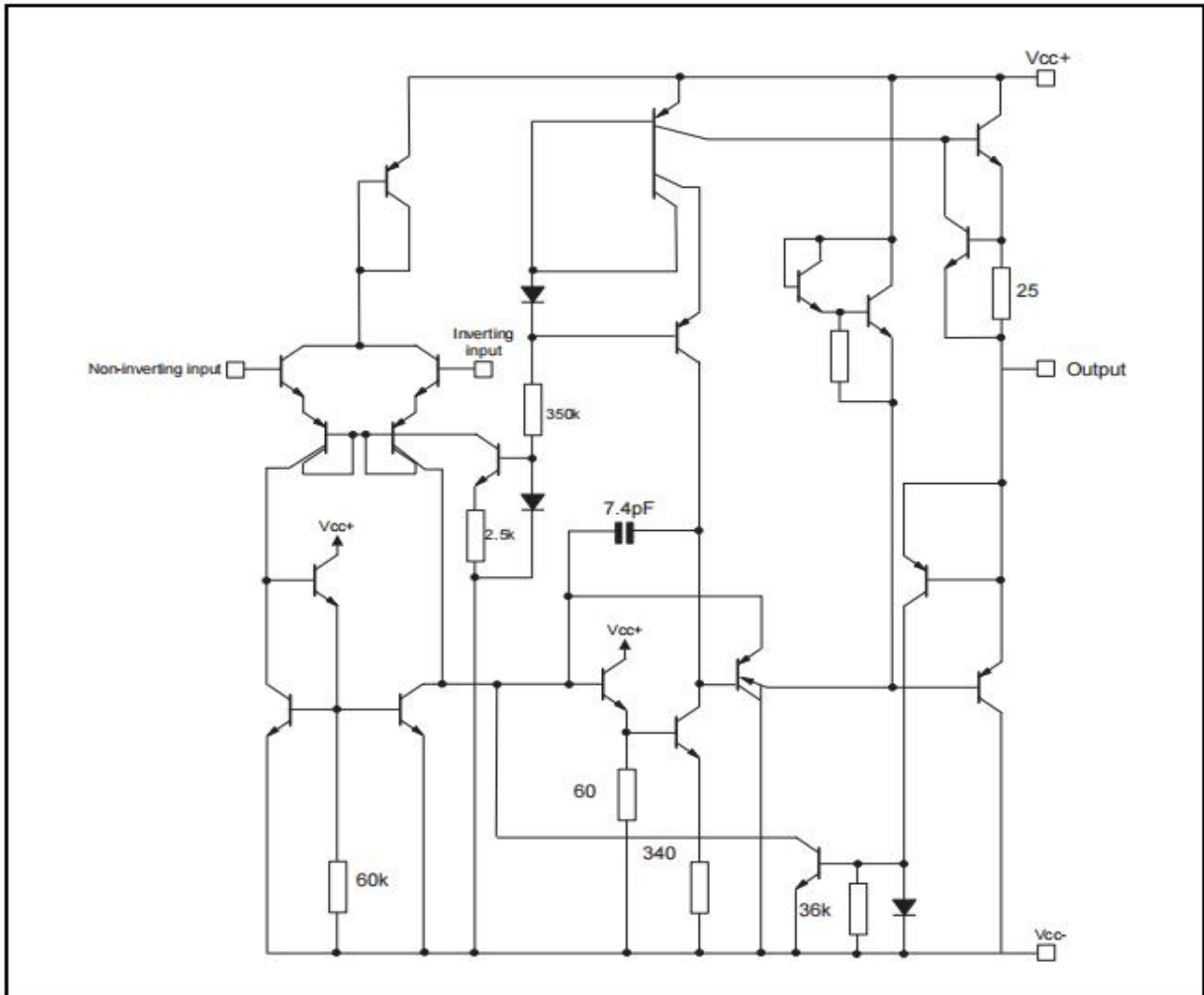
DEVICE	Package Type	MARKING	Packing	Packing Qty
LM148N	DIP-14	LM148	TUBE	1000/box
LM248N		LM248	TUBE	1000/box
LM348N		LM348	TUBE	1000/box
LM148M/TR	SOP-14	LM148	REEL	2500/reel
LM248M/TR		LM248	REEL	2500/reel
LM348M/TR		LM348	REEL	2500/reel
LM148MT/TR	TSSOP-14	LM148	REEL	2500/reel
LM248MT/TR		LM248	REEL	2500/reel
LM348MT/TR		LM348	REEL	2500/reel

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 which minimize thermal coupling

PIN CONNECTIONS



SCHEMATIC DIAGRAM

ABSOLUTE MAXIMUM RATINGS

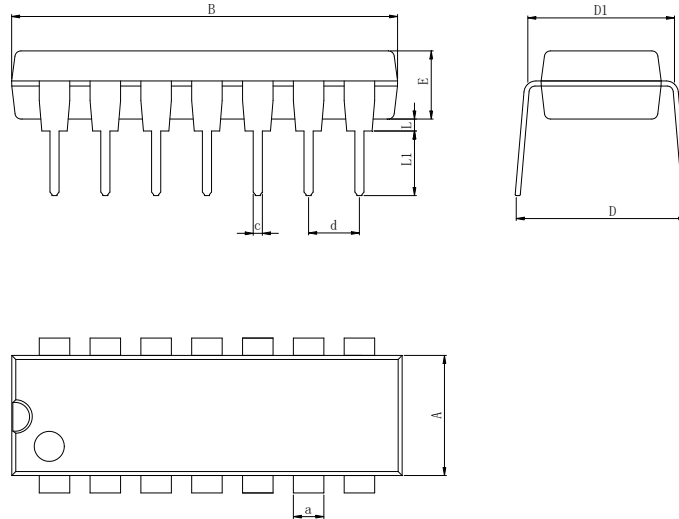
Symbol	Parameter	LM148	LM248	LM348	Unit
VCC	Supply voltage	±22			V
Vi	Input Voltage 1)	±22			V
Vid	Differential Input Voltage	±44			V
	Output Short-circuit Duration 2)	Infinite			
Ptot	Power Dissipation	500			mW
TL	Lead Temperature (Soldering, 10 seconds)	260			°C
Toper	Operating Free-air Temperature Range	-55 to +125	-40 to +85	0 to +70	°C
Tstg	Storage Temperature Range	-65 to +150			°C

- Note:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.
- Any of the amplifier outputs can be shorted to ground indefinitely; however more than one should not be simultaneously shorted as the maximum junction will be exceeded

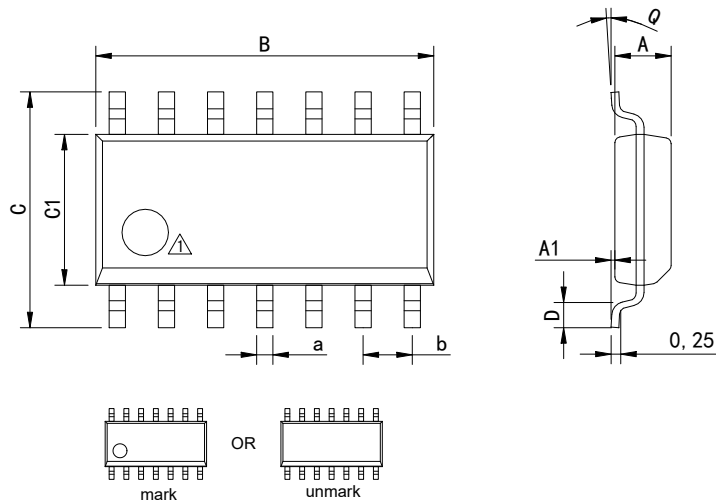
ELECTRICAL CHARACTERISTICS

$V_{CC} = \pm 15V$, $T_{amb} = 25^{\circ}C$ (unless otherwise specified)

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

PHYSICAL DIMENSIONS
DIP-14


Dimensions In Millimeters(DIP-14)										
Symbol:	A	B	D	D1	E	L	L1	a	c	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.50	

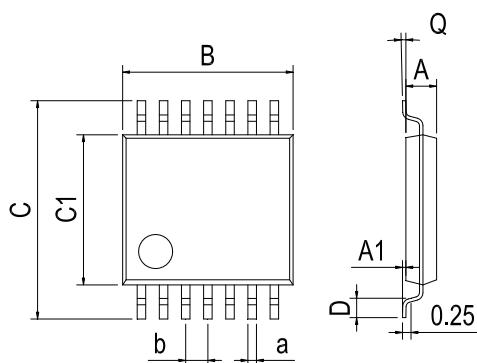
SOP-14


△ Package top mark may be in lower left corner or unmark

Dimensions In Millimeters(SOP-14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	

PHYSICAL DIMENSIONS

TSSOP-14



Dimensions In Millimeters(TSSOP-14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

REVISION HISTORY

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2014-6	New	1-8
V1.1	2016-9	Update encapsulation type、 Updated DIP-14 dimension	1、 5
V1.2	2024-11	Update Lead Temperature	3
V1.3	2025-12	Update important statements、 Update SOP-14 Dimension drawing	5、 8

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