芯伯乐®
XINBOLE

Product Specification

XBLW LM124

Quad Operational Amplifier

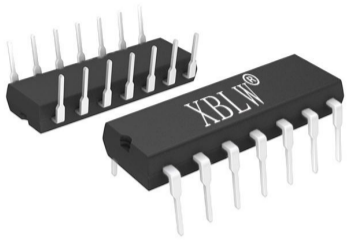
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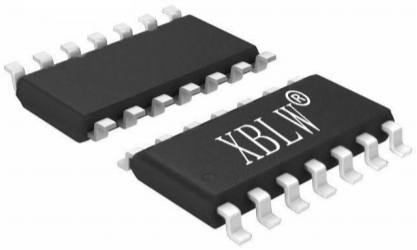
Descriptions

The LM124 consists of four independent, high gain operational amplifiers with frequency compensation implemented internally.It suits for radio recorders and audio systems as tone equalization network and also used in other situations.

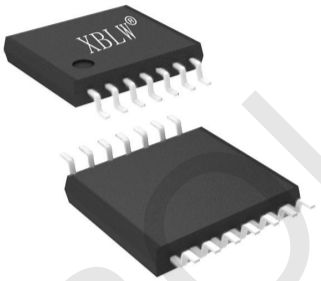
The chip is available in DIP 14 (Power Dissipation : 720mW) and SOP 14 plastic package(Power Dissipation : 400mW).



DIP-14



SOP-14



TSSOP-14

Feature

- No External Phase Compensation Circuit Required
- Supply Voltage Range:
  Single Power Supply: Vcc=3~32V
  Dual Power Supply: Vcc = ±1.5V~ 16V
- Low Power Consumption: Icc = 0.6mA (typical) (RL = ∞)
- Input Voltage Range Close To Ground Level

Ordering Information

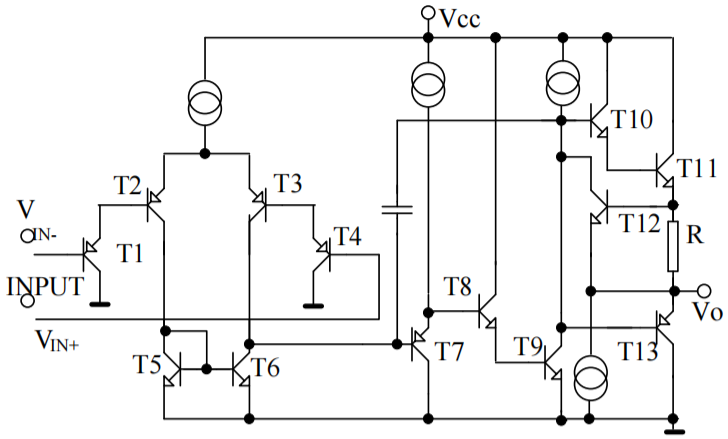
Product Model	Package Type	Marking	Packing	Packing Qty
XBLW LM124N	DIP-14	LM124N	Tube	1000pcs/Box
XBLW LM124DTR	SOP-14	LM124	Tape	2500pcs/Reel
XBLW LM124TDTR	TSSOP-14	LM124	Tape	3000pcs/Reel

Principle Introduction

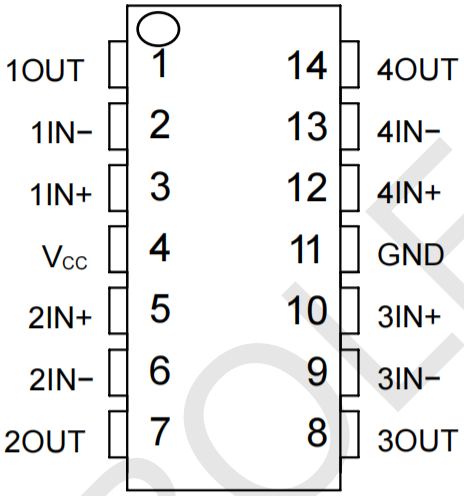
LM124 is composed of four identical operational amplifiers. The unit circuit is shown in the figure. Its working principle is briefly described as follows: The input signal is added to the base of T1 and T4, and after differential amplification; T8 and T9 form the intermediate stage in compound amplification; the output stage is composed of T10 ~ T13. Among them, T12 is a protection tube. When the output current is too large, the voltage drop on R increases, causing T12 to saturate conducting, and the collector potential of T12 decreases to nearly 1/2 Vcc, so that the push-pull tubes T10, T11 and T13 are cut off, thereby playing a protective role. Capacitor C is a phase compensation capacitor.

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Circuit Diagram



Pin Connections



Pins Configuration

No.	Function	Symbol	No.	Function	Symbol
1	Output 1	1OUT	8	Output 3	3OUT
2	Reverse Input 1	1 IN-	9	Reverse Input 3	3 IN -
3	Forward Input 1	1 IN+	10	Forward Input 3	3 IN+
4	Power Supply	VCC	11	Ground	GND
5	Forward Input 2	2 IN+	12	Forward Input 4	4 IN+
6	Reverse Input 2	2 IN-	13	Reverse Input 4	4 IN -
7	Output 2	2OUT	14	Output 4	4OUT

Absolute Maximum Ratings

TA=25℃,unless otherwise noted

Parameter Name	Symbol	Test Conditions	Rating	Unit
Power Supply	Vcc		32	V
Differential Input Voltage	V_{ID}		32	V
Maximum Input Voltage	V_{IN}		-0.3~32	V
Allowable Power Dissipation	P_D	DIP SOP	720 400	mW
Operating Temperature	Topr		-40~+125	℃
Storage Temperature	Tstg		-55~+125	℃

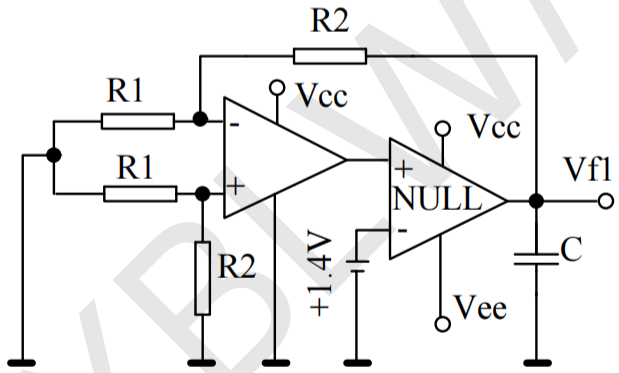
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Electrical Characteristics unless otherwise noted, Tamb =25℃

Parameters	Symbol	Test conditions	Standard Value			Unit
			Min.	Typ.	Max.	
Input Offset Voltage	V_{IO}			±2	±5	mV
Input Offset Current	I_{IO}	Iin(+)/Iin(-)		±5	±50	nA
Input Bias Current	I_{BA}			45	250	nA
Input Common Mode Voltage Range	V_{ICM}		0		Vcc-1.5	V
Common Mode Rejection Ratio	K_{CMR}		65	80		dB
Strong Signal Voltage Gain	G_V	Vcc=15V,R_L ≥2 kΩ	25	100		V/mV
Output Voltage Range	V_O		0		Vcc-1.5	V
Gain bandwidth product	GBP	VCC = 30 V, f = 100 kHz, Vin = 10 mV, RL = 2 kΩ, CL = 100 pF		1.2		MHz
Power Supply Ripple Rejection Ratio	P_{SRR}		65	100		dB
Channel Separation	C_S	f=1kHz~20kHz		120		dB
Current Consumption (1)	I_{CC}	Vcc=5V		0.6	2	mA
Current Consumption (2)	I_{CC}	Vcc=30V		1.5	3	mA
Output Current (1)	I_O	Vin+=1V,Vin⁻=0V	20	35		mA
Output Current (2)	I_O	Vin+=0V,Vin⁻=1V	10	13		mA

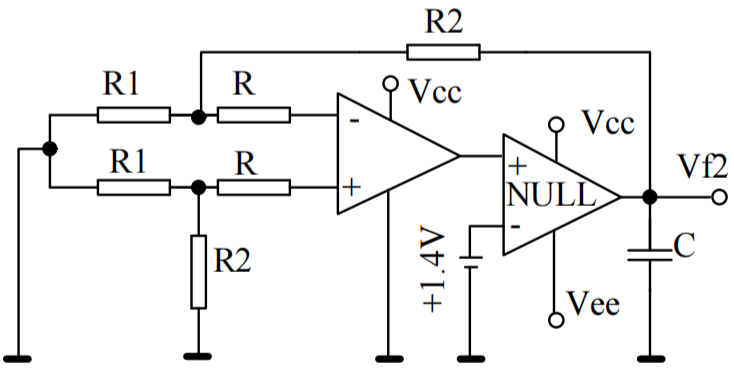
Test Parameter Diagram

Null refers to the Amplifier.



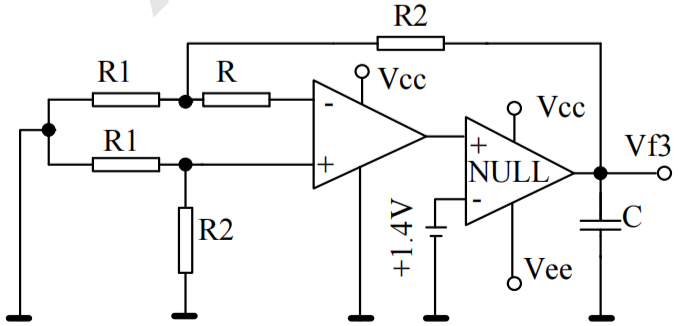
Vio=Vf1/ (1+R2/R1)

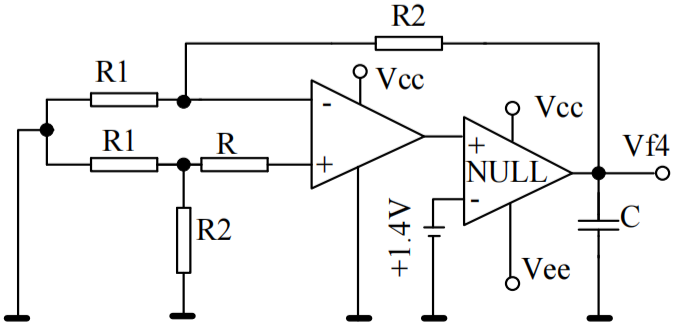
Input offset voltage Vio test diagram



Iio= (Vf2-Vf1) /R (1+R2/R1)

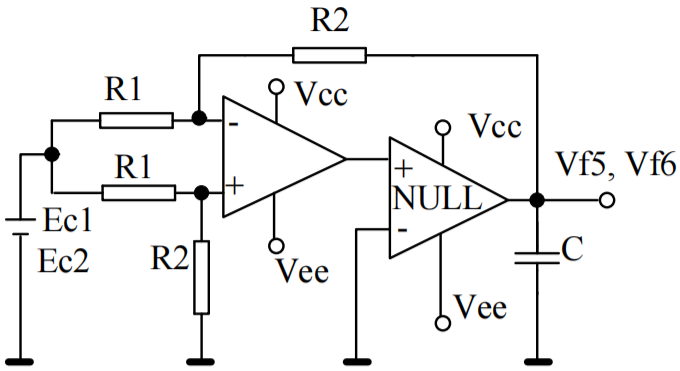
Input offset current Iio test diagram





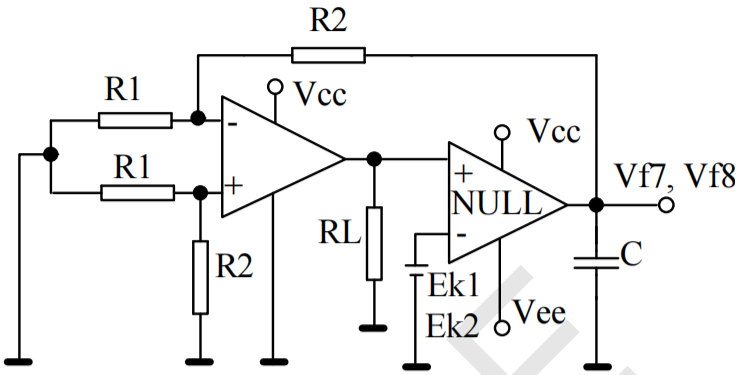
Input bias current IBA test diagram

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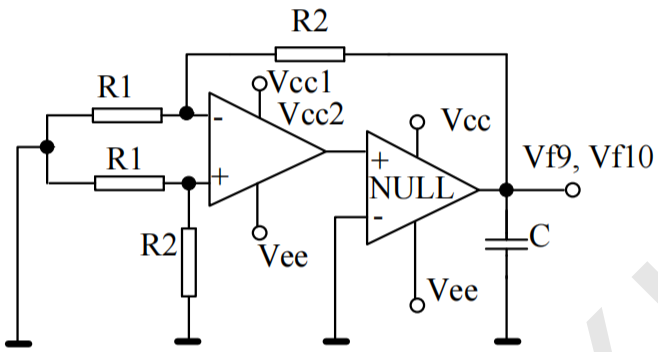
CMR=20log|（Ec1-Ec2）(1+R2/R1) / (Vf5-Vf6|

Common-mode rejection CMR and common-mode input voltage range VICM test chart

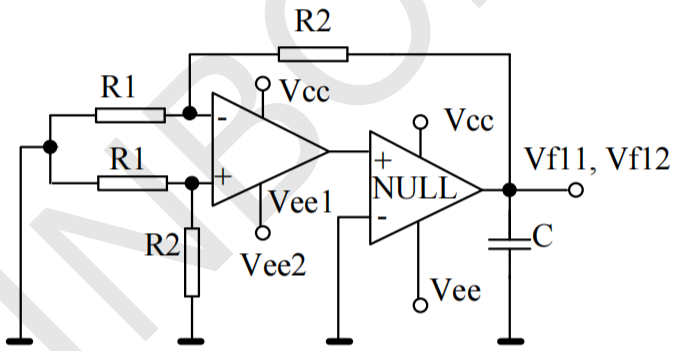


Gv=（Ek1-Ek2）(1+R2/R1) / (Vf8-Vf7)

Voltage gain Gv test diagram

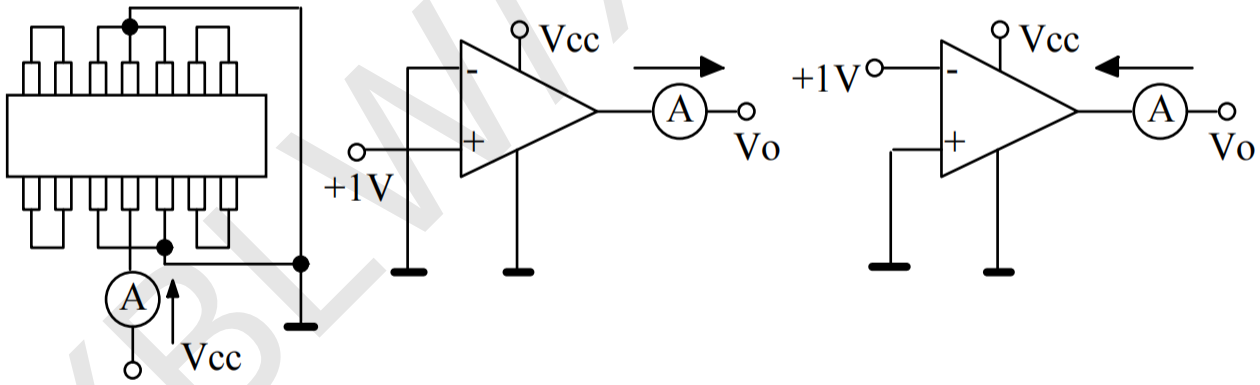


PSRR（+）=20log|（Vcc1-Vcc2）(1+R2/R1) / (Vf9-Vf10)|

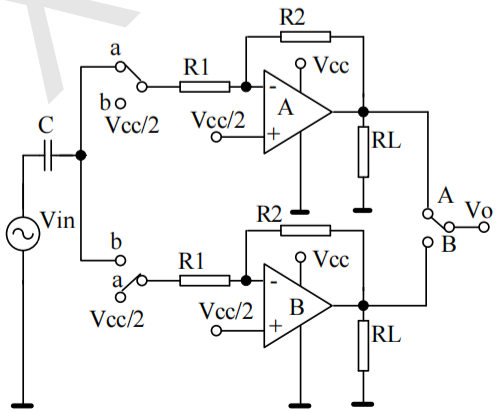


PSRR（-）=20log|（Vee1-Vee2）(1+R2/R1) / (Vf11-Vf12|

Power ripple rejection ratio PSRR test diagram



Consumption current Icc and output current Io test diagram



SW：A

$Cs(A \rightarrow B)=20\log(R2 * V_{OA})/(R1 * V_{OB})$

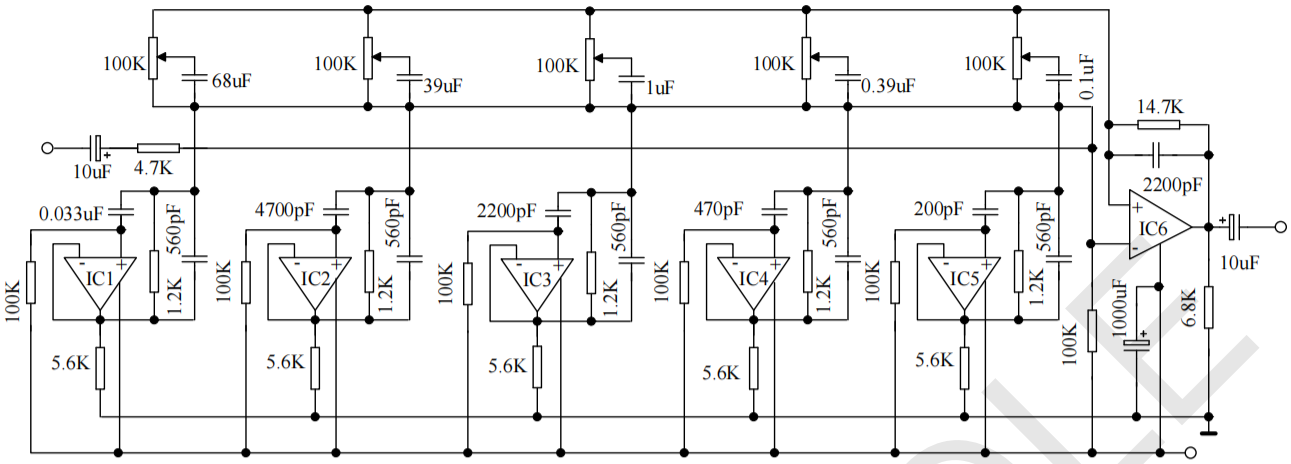
SW： B

$Cs(B \rightarrow A)=20\log(R2 * V_{OB})/(R1 * V_{OA})$

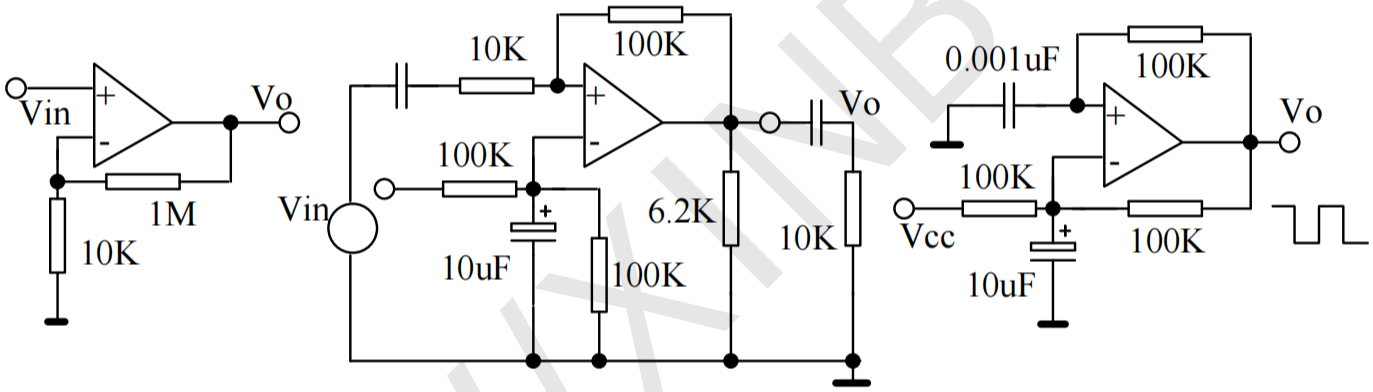
Channel separation Cs test diagram

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Applications

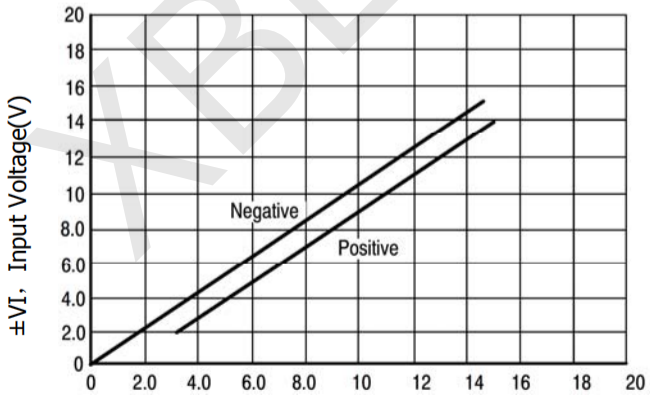


The LM124 is used in five-frequency tone control circuits

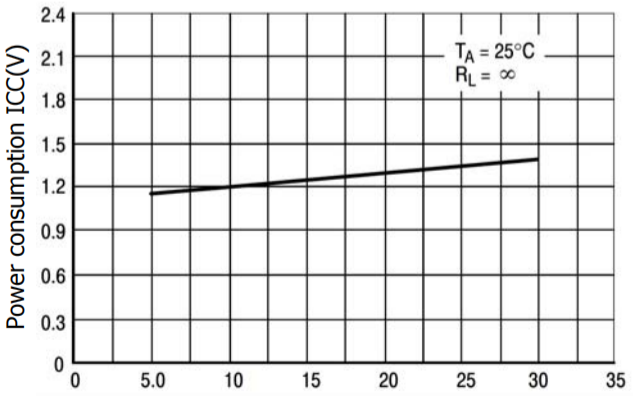


Other applications of LM124

Characteristic Curves



Supply voltage (V)
Input voltage range



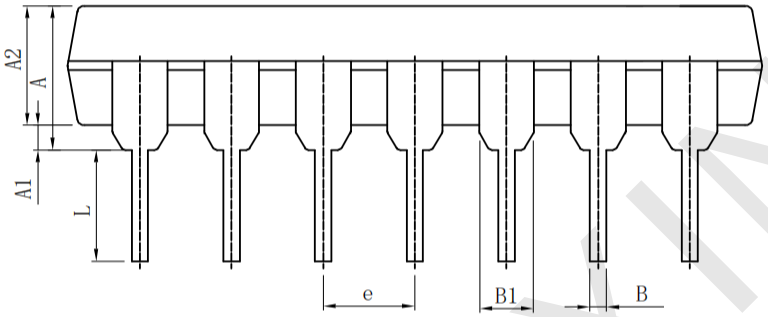
Power supply voltage (V)
Power consumption

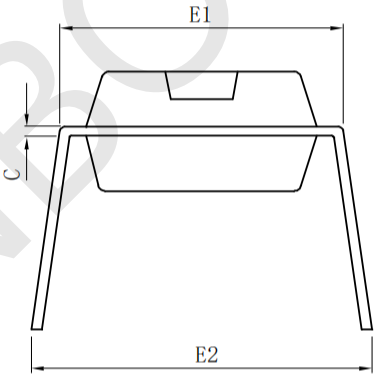
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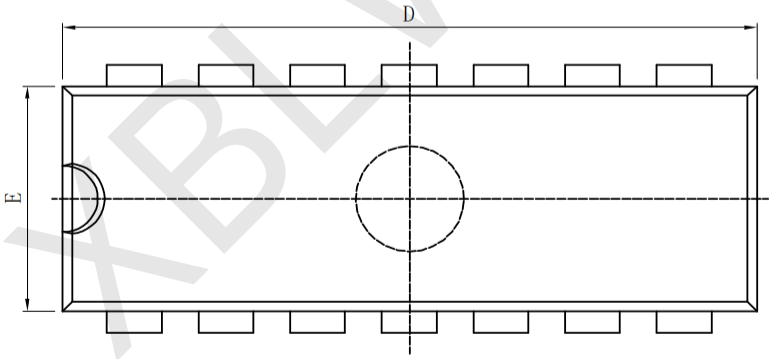
Package Information

· DIP-14

Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	3.710	4.310	A	0.146	0.170
A1	0.510		A1	0.020	
A2	3.200	3.600	A2	0.126	0.142
B	0.380	0.570	B	0.015	0.022
B1	1.524(BSC)		B1	0.060(BSC)	
C	0.204	0.360	C	0.008	0.014
D	18.800	19.200	D	0.740	0.756
E	6.200	6.600	E	0.244	0.260
E1	7.320	7.920	E1	0.288	0.312
e	2.540(BSC)		e	0.100(BSC)	
L	3.000	3.600	L	0.118	0.142
E2	8.400	9.000	E2	0.331	0.354



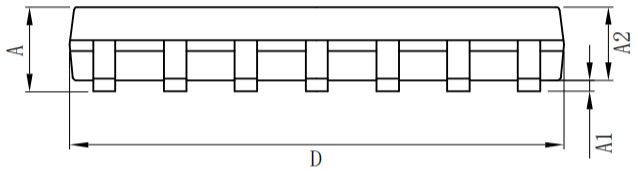


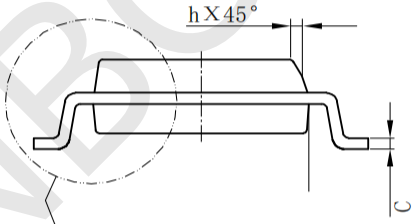


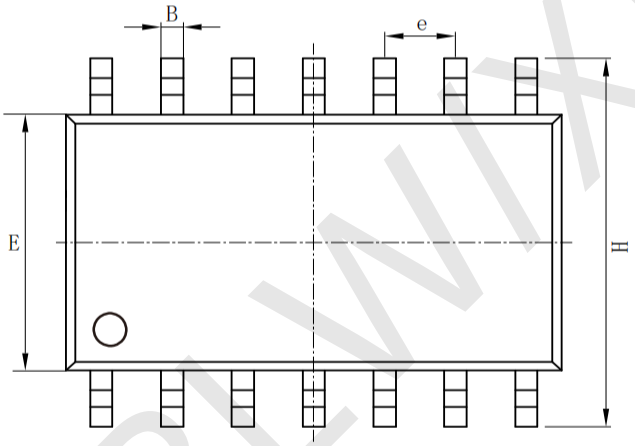
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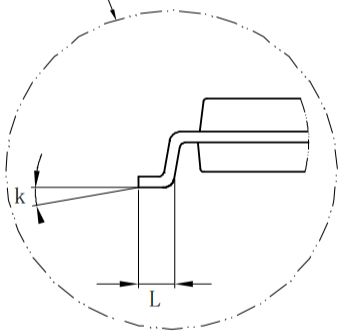
· SOP-14

Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	1.350	1.750	A	0.050	0.068
A1	0.100	0.250	A1	0.004	0.009
A2	1.100	1.650	A2	0.040	0.060
B	0.330	0.510	B	0.010	0.020
C	0.190	0.250	C	0.007	0.009
D	8.550	8.750	D	0.330	0.340
E	3.800	4.000	E	0.150	0.150
e	1.27		e	0.05	
H	5.800	6.200	H	0.220	0.240
h	0.250	0.500	h	0.009	0.020
L	0.400	1.270	L	0.015	0.050
k	8° (max)		k	8° (max)	





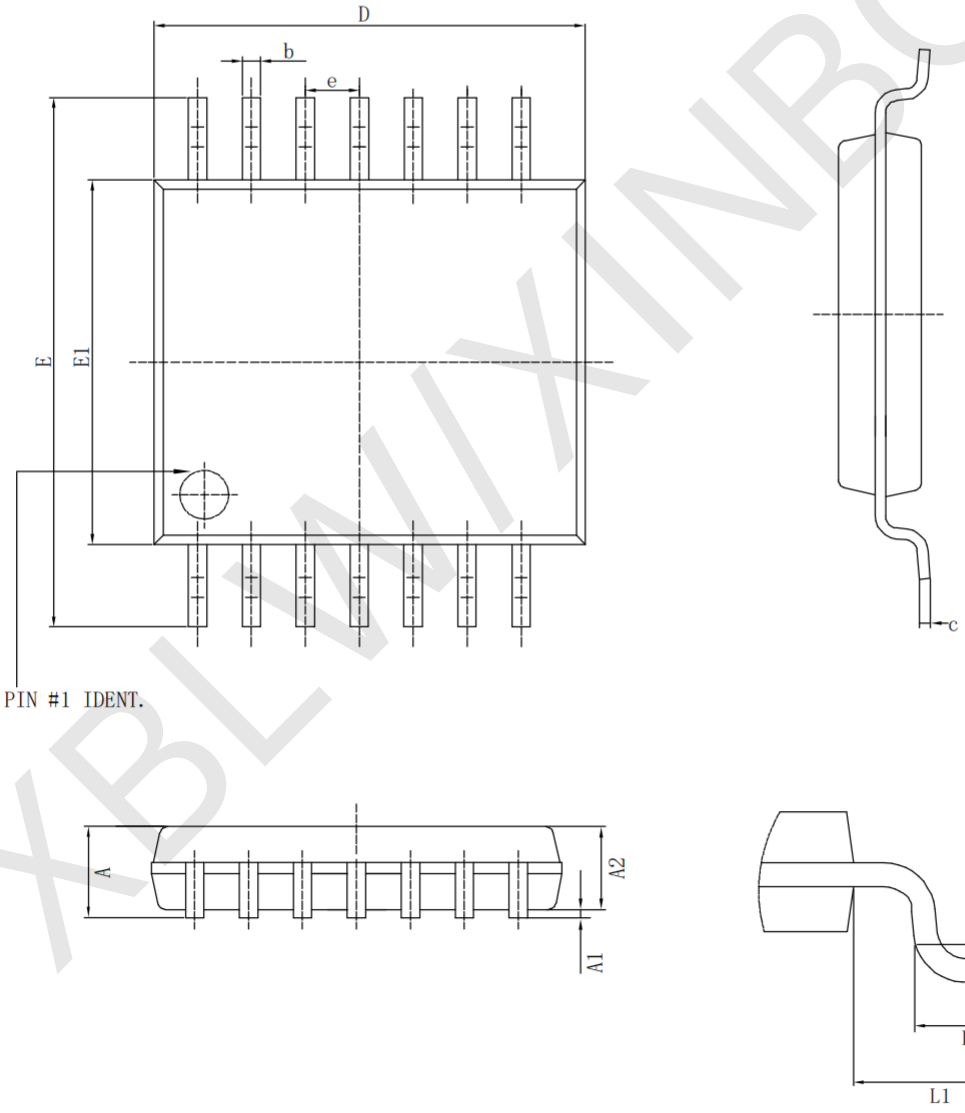




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· TSSOP-14

Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A		1.200	A		0.047
A1	0.050	0.150	A1	0.002	0.006
A2	0.800	1.050	A2	0.031	0.041
b	0.190	0.300	b	0.007	0.012
c	0.090	0.200	c	0.004	0.0089
D	4.900	5.100	D	0.193	0.201
E	6.200	6.600	E	0.244	0.260
E1	4.300	4.500	E1	0.169	0.176
e	0.65		e	0.0256	
L	0.450	0.750	L	0.018	0.030
L1	1.00		L1	0.039	
k	0°	8°	k	0°	8°



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