Low-noise JFET Quad Operational Amplifier

Features

- Wide common-mode (up to VCC+) and differential voltage range
- Low input bias and offset current
- Low noise Vn=15nV/ √Hz (typ) at 1KHz
- Output short-circuit protection
- High input impedance JFET input stage
- Low harmonic distortion: 0.01% (typical)
- Internal frequency compensation
- Latch up free operation
- High slew rate: 16 V/μs (typical)
- Available in Green SOIC-14, DIP14 Packages
- Operating Temperature: -40'C to +85‘C

General Description

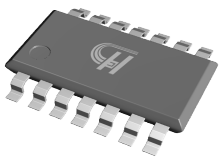
The HCR074C is high-speed, JFET input, quad operational amplifiers incorporating well matched, high voltage JFET and bipolar transistors n a monolithic integrated circuit.

The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

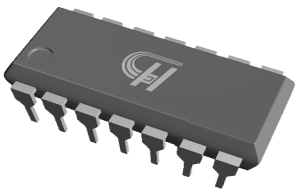
The HCR074C is available in green SOIC-14 (SOP-14) and DIP-14 packages, It is specified over the extended temperature range from -40'C to +85'C.

Applications

- Motor Drives:AC and servo drive control and power stage modules
- Single phase online UPS
- Three phase UPS
- Pro audio mixers
- Battery test equipment



SOIC-14(SOP-14)



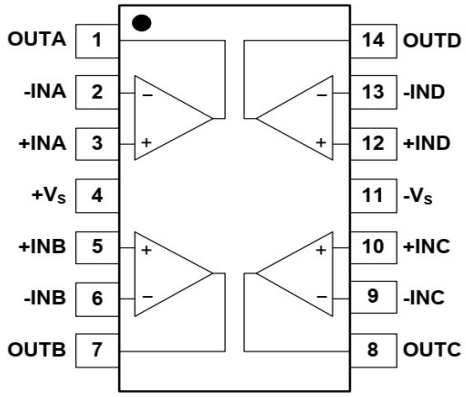
DIP-14

Figure 1. Package Type of HCR074C

Low-noise JFET Quad Operational Amplifier

Pin Configuration

HCR074C (TOP VIEW)



SOIC-14 / DIP-14

Figure 2. Pin Configuration of HCR074C (Top View)

Pin Function Table

Name	Function
+INA, +INB, +INC, +IND	Non-inverting Inputs
-INA, -INB, -INC, -IND	Inverting Inputs
+Vs	Positive Power Supply
-Vs	Negative Power Supply
OUTA, OUTB, OUTC, OUTD	Outputs

Typical Applications

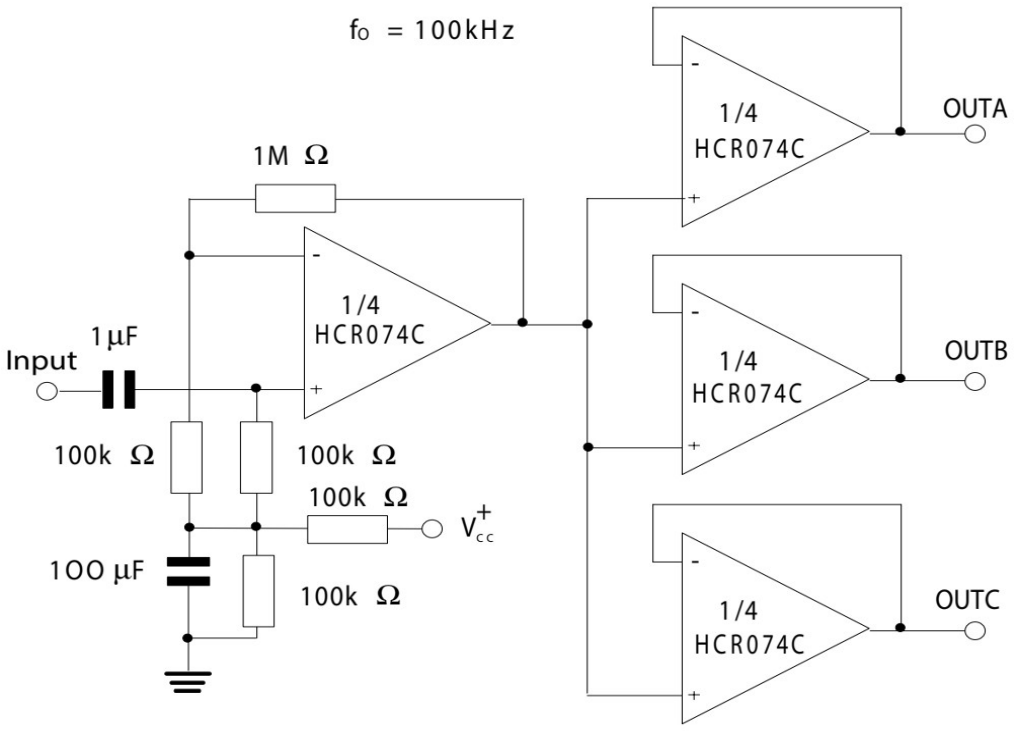
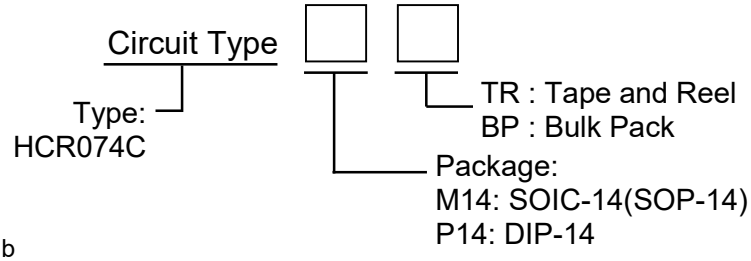


Figure 3. Audio Distribution Amplifier

Low-noise JFET Quad Operational Amplifier

Ordering Information



Ordering Code note b

Part Number	Marking ID	Temperature Range	Package	Package Type
HCR074CM14TR	HCR074CMXX	-40'C to +85'C	SOIC-14 (SOP-14)	2500pcs/TR
HCR074CP14BP	HCR074CPXX	-40'C to +85'C	DIP-14	2000pcs/Box

note b: The“XX” is date code.

Functional Bloack Diagram

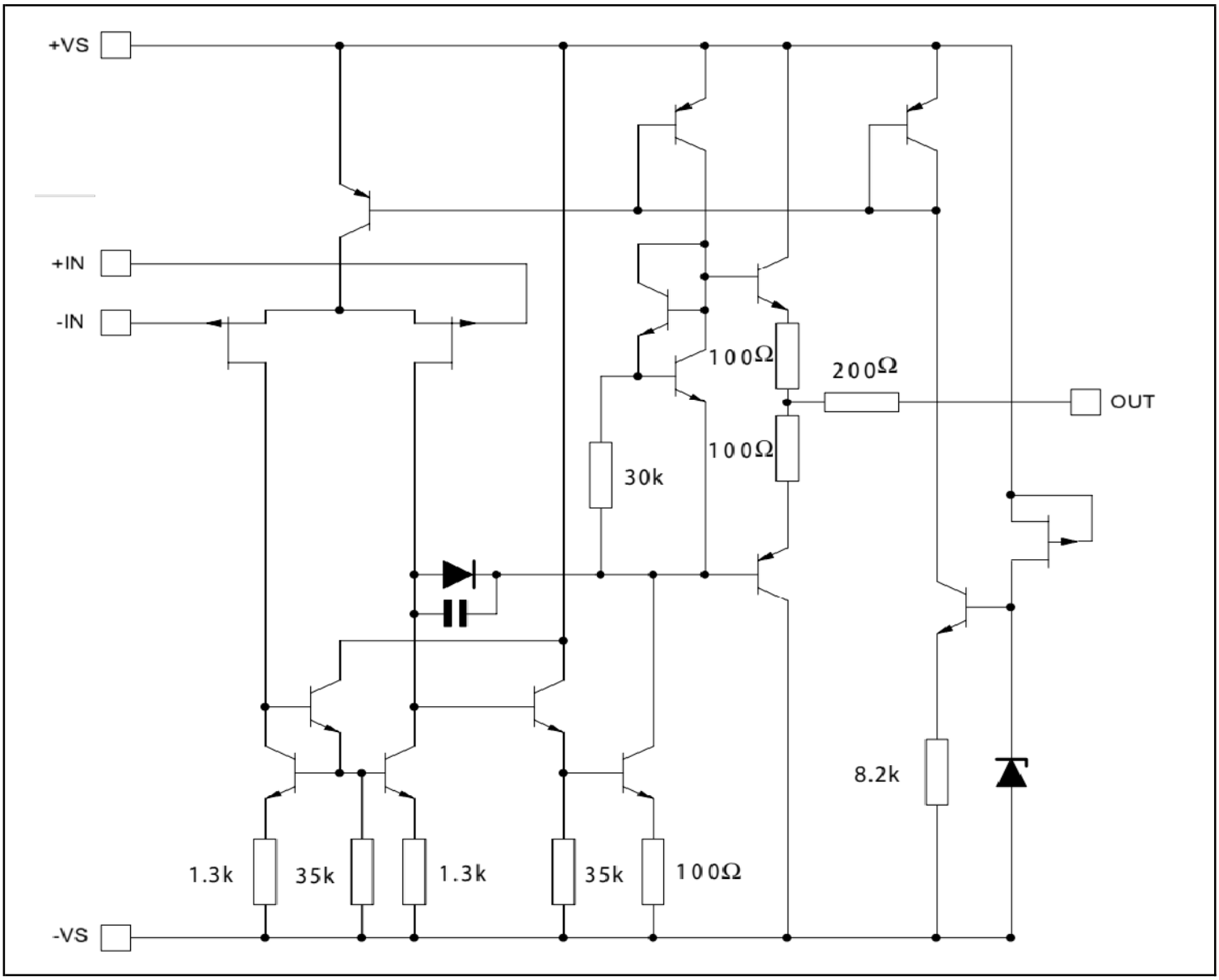


Figure 4. Functional Bloack Diagram

Low-noise JFET Quad Operational Amplifier

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Supply Voltage note1		VCC	±18	V
Input Voltage note2		Vi	±15	V
Differential Input Voltage note3		Vid	±30	V
Total Power Dissipation	SOIC-14	Ptot	680	mW
	DIP-14		710	mW
Storage Temperature Range		TSTG	-65 to 150	'C
Operating Temperature Range		Toper	0 to +70	'C
Junction Temperature		TJ	150	'C
Lead Temperature (Soldering, 10s)		TLEAD	260	'C
Thermal Resistance (Junction to Ambient) note4,5	SOIC-14	θJA	105	'C/W
	DIP-14		86	'C/W
Thermal Resistance (Junction to Case) note4,5	SOIC-14	θJC	31	'C/W
	DIP-14		26	'C/W
Output- Short-circuit duration note6		-	infinite	-
HBM:human body mode		ESD	1.0	KV
MM: machine mode			200	V
CDM charged device mode			1.5	KV

Note 1. All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between VCC+ and VCC-.

2. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.

3. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.

4. Short-circuits can cause excessive heating. Destructive dissipation can result from simultaneous short-circuits on all amplifiers.

5. θJA and θJC are typical values.

6. The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	6.0	36	V
Operating free-air temperature range	Toper	0	+70	'C

Low-noise JFET Quad Operational Amplifier

Electrical Characteristics

(T_{amb}=+25 `C, At V_{CC}=±15V, Unless Otherwise Specified.)

Parameter	Symbol	Conditions	Min	Type	Max	Unit
Input Offset Voltage	V_{OS}	V_O=1.4V, R_S=0Ω, V_{CC}=5V to 30V	-	3	10	mV
			-	-	13	
Input Offset Voltage Drift	ΔVOS/ΔT	-	-	10	-	uV/'C
Input Offset Current	I_{IO}	T_{amb}=+25'C	-	10	100	pA
		T_{min}<=T_{amb}<=T_{max}	-	-	4	nA
Input Bias Current[7]	I_{ib}	T_{amb}=+25'C	-	40	200	pA
		T_{min}<=T_{amb}<=T_{max}	-	-	20	nA
Large Signal Voltage Gain	Avd	R_L=2KΩ, V_O=±10V	25	200	-	V/mV
Supply Voltage Rejection Ratio	PSSR	R_S=50Ω	70	86	-	dB
Supply Current , no load	I_Q	T_{amb}=+25'C	-	1.4	2.5	mA
		T_{min}<=T_{amb}<=T_{max}	-	-	2.5	
Input Common Mode Voltage Range	V_{CM}	-	±11	+15	-	V
				-12	-	
Common Mode Rejection Ratio (R_S=50Ω)	CMR	T_{amb}=+25'C	70	86	-	dB
		T_{min}<=T_{amb}<=T_{max}	70	-	-	
Output Short Circuit Current to Ground	I_{OSC}	T_{amb}=+25'C	10	40	60	mA
Output Voltage Swing	±Vopp	T_{amb}=+25'C, R_L=2KΩ	10	12	-	V
		T_{amb}=+25'C, R_L=10KΩ	12	13.5	-	
		T_{min}<=T_{amb}<=T_{max}, R_L=2KΩ	10	28	-	
		T_{min}<=T_{amb}<=T_{max}, R_L=10KΩ	12	-	-	
Slew Rate	SR	V_{in}=10V, R_L=2KΩ, C_L=100pF, unity gain	8	13	-	V/us
Rise time	tr	V_{in}=20mV, R_L=2KΩ, C_L=100pF, unity gain	-	0.1	-	us
Gain Bandwidth Product	GBP	V_{in}=10mV, R_L=2KΩ, C_L=100pF, f=100KHz	2	3	-	MHz
Total harmonic distortion	THD	R_L=2KΩ, C_L=100pF, f=1KHz, Av=20dB, V_O=2V_{P-P}	-	0.01	-	%
Equivalent Input noise voltage	en	R_S=100Ω, f=KHz	-	15	-	nV/ √Hz
Phase margin	Φm	-	-	45	-	degrees
Channel Separation	V_{o1}/V_{o2}	Av=100	-	120	-	dB

Note [7].The input bias currents are junction leakage currents which approximately double for every 10°C increase in the junction temperature.

Low-noise JFET Quad Operational Amplifier

Typical Performance Characteristics.

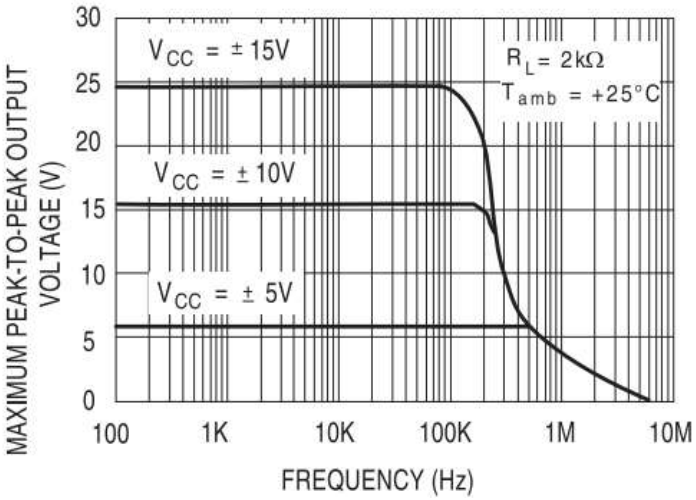


Figure 5. Maximum peak to peak output voltage vs frequency(RL=2KΩ)

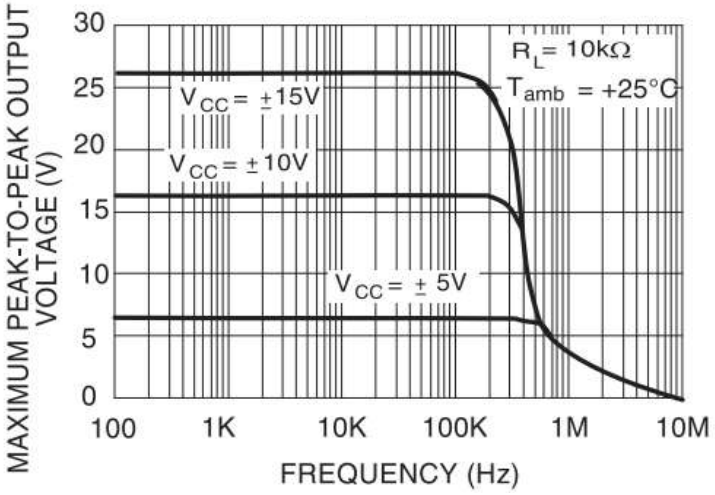


Figure 6. Maximum peak to peak output voltage vs frequency(RL=10KΩ)

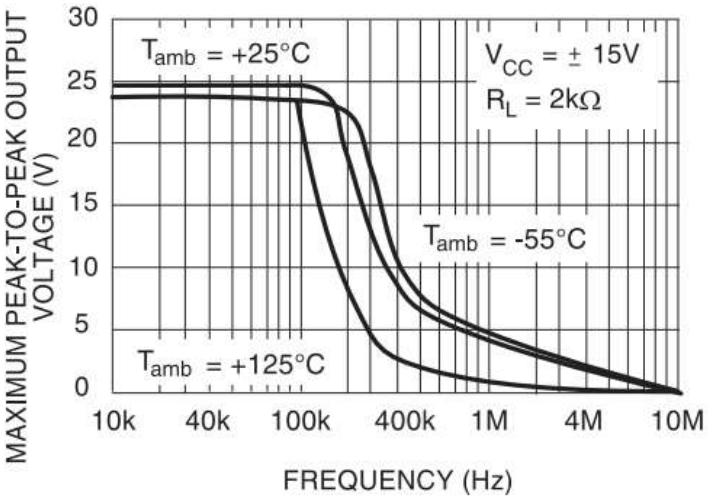


Figure 7. Maximum peak to peak output voltage vs frequency and temperature

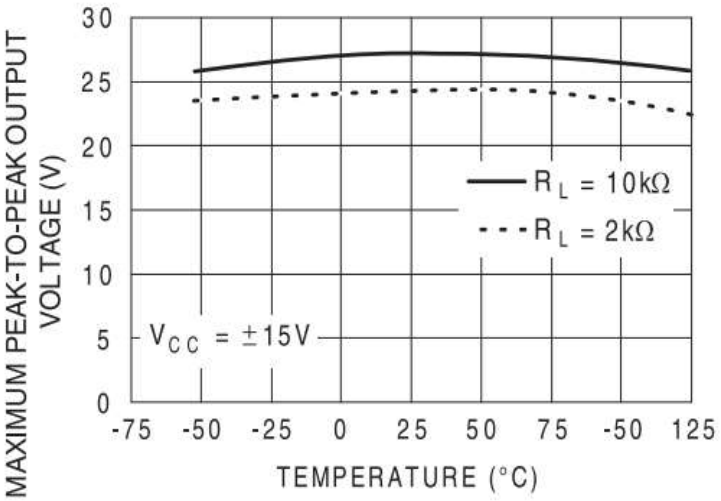


Figure 8. Maximum peak to peak output voltage vs free air temperature

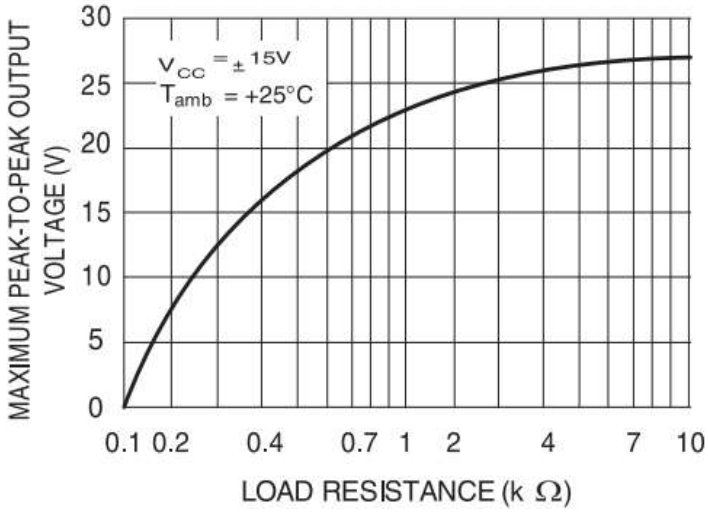


Figure 9. Maximum peak to peak output voltage vs load resistance

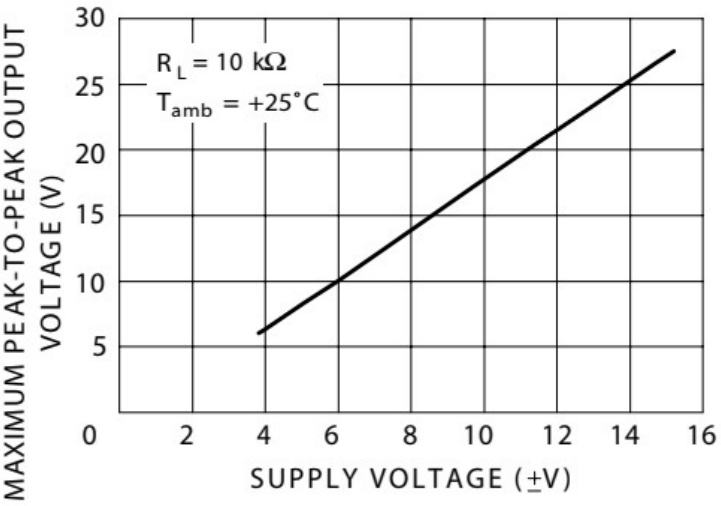


Figure 10. Maximum peak to peak output voltage vs supply voltage

Typical Performance Characteristics(Con.)

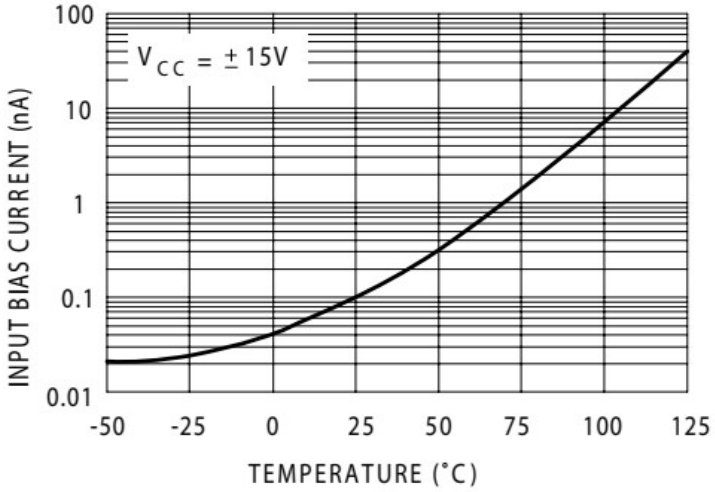


Figure 11. Input bias current vs free air temperature

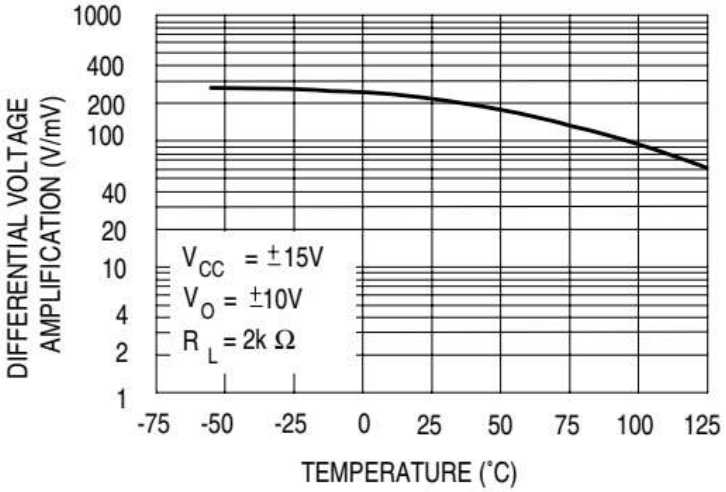


Figure 12. Large signal differential voltage amplification vs free air temperature

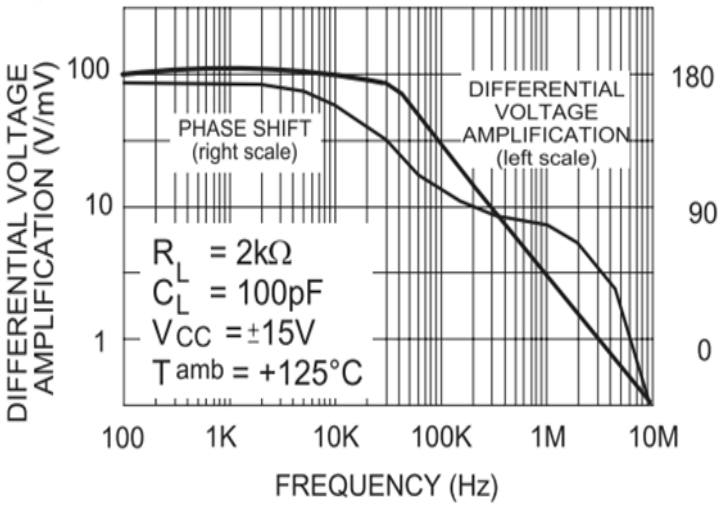


Figure 13. Large signal differential voltage amplification and phase shift vs frequency

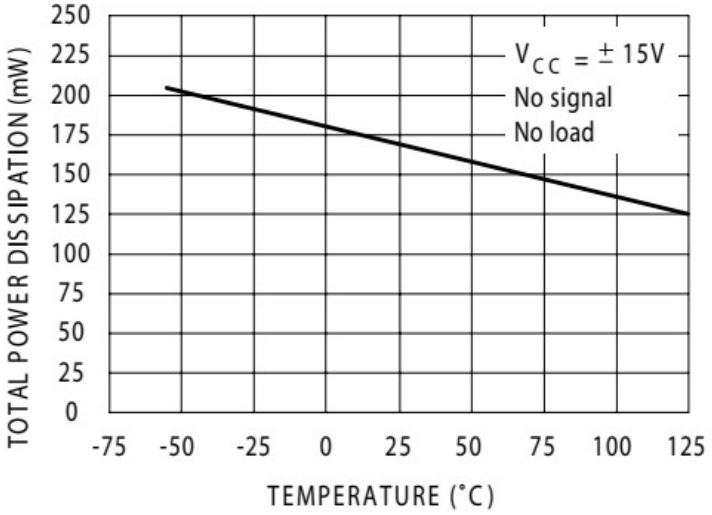


Figure 14. Total power dissipation vs free air temperature

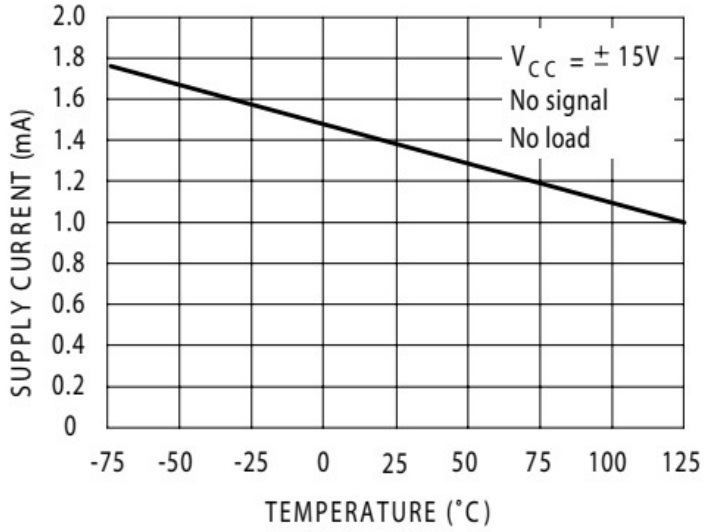


Figure 15. Supply current per amplifier vs free air temperature

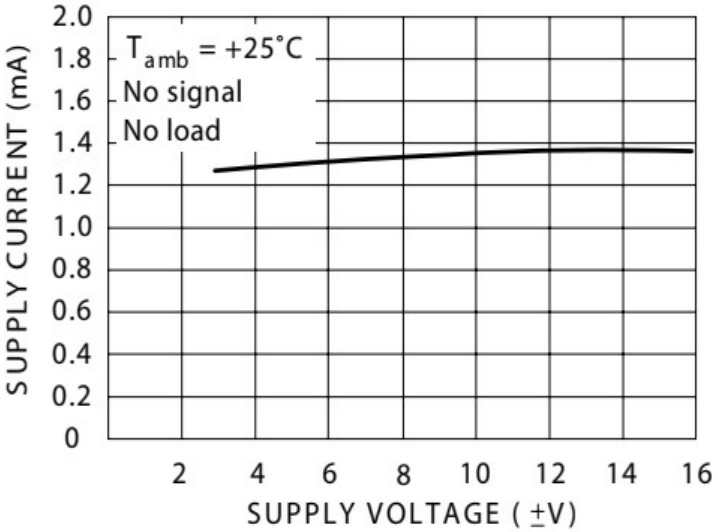


Figure 16. Common mode rejection ratio vs air temperature

Low-noise JFET Quad Operational Amplifier

Typical Performance Characteristics(Con.)

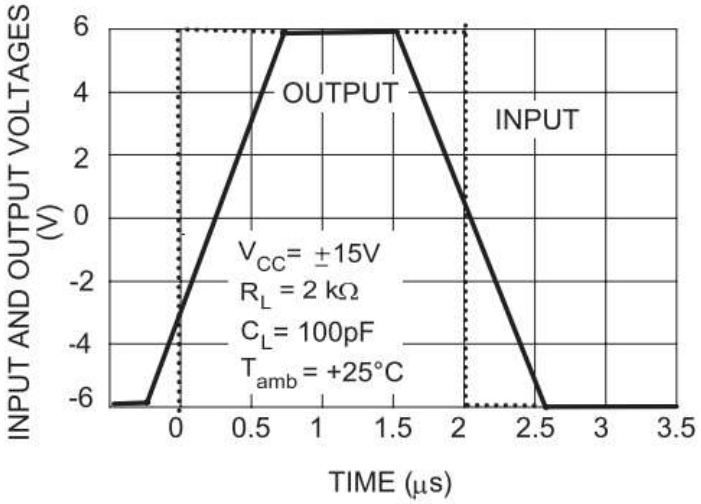


Figure 17. Voltage follower large signal pulse response

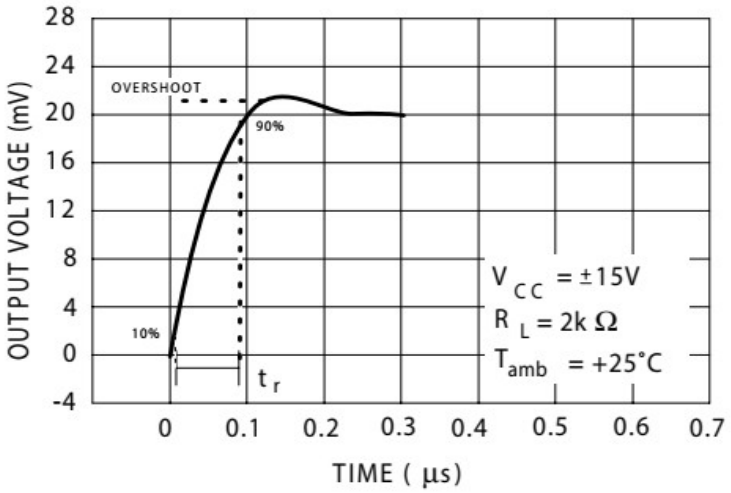


Figure 18. Output voltage vs elapsed time

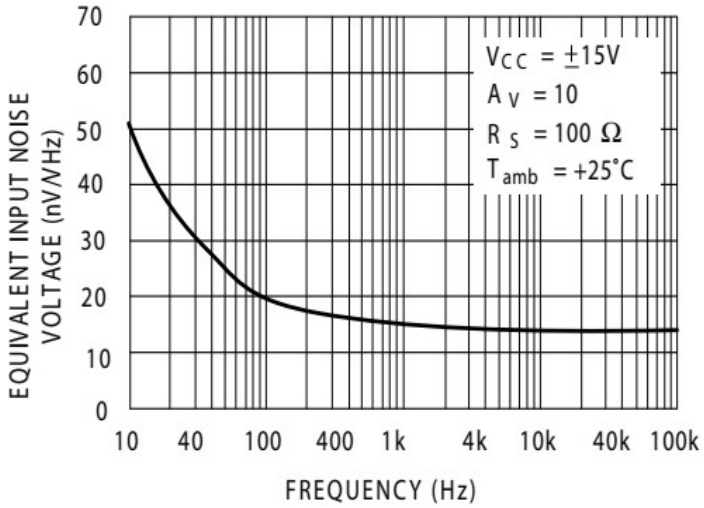


Figure 19. Equivalent input noise voltage vs frequency

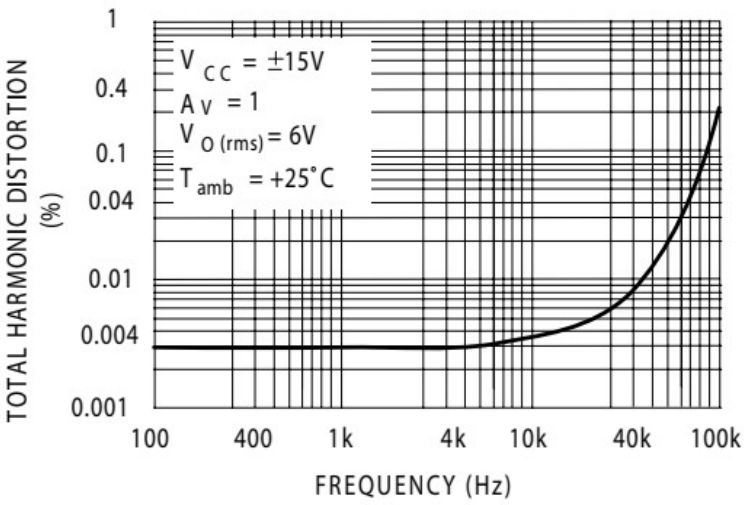


Figure 20. Total harmonic distortion vs frequency

Parameter measurement information

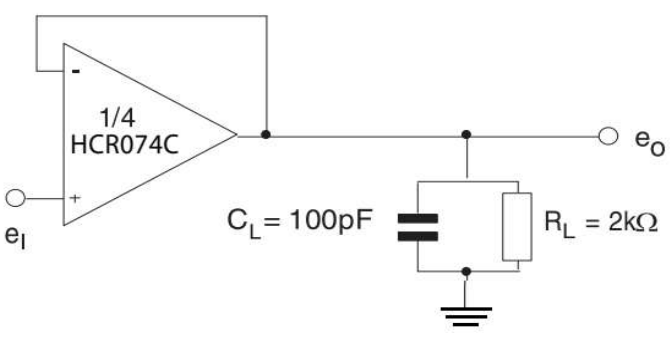


Figure 21. Voltage Follower

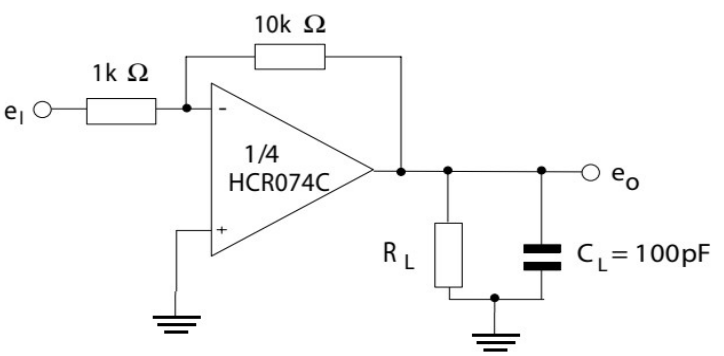


Figure 22. Gain-of-10 inverting amplifier

Low-noise JFET Quad Operational Amplifier

Typical Applications Circuit

Audio Distribution Amplifier

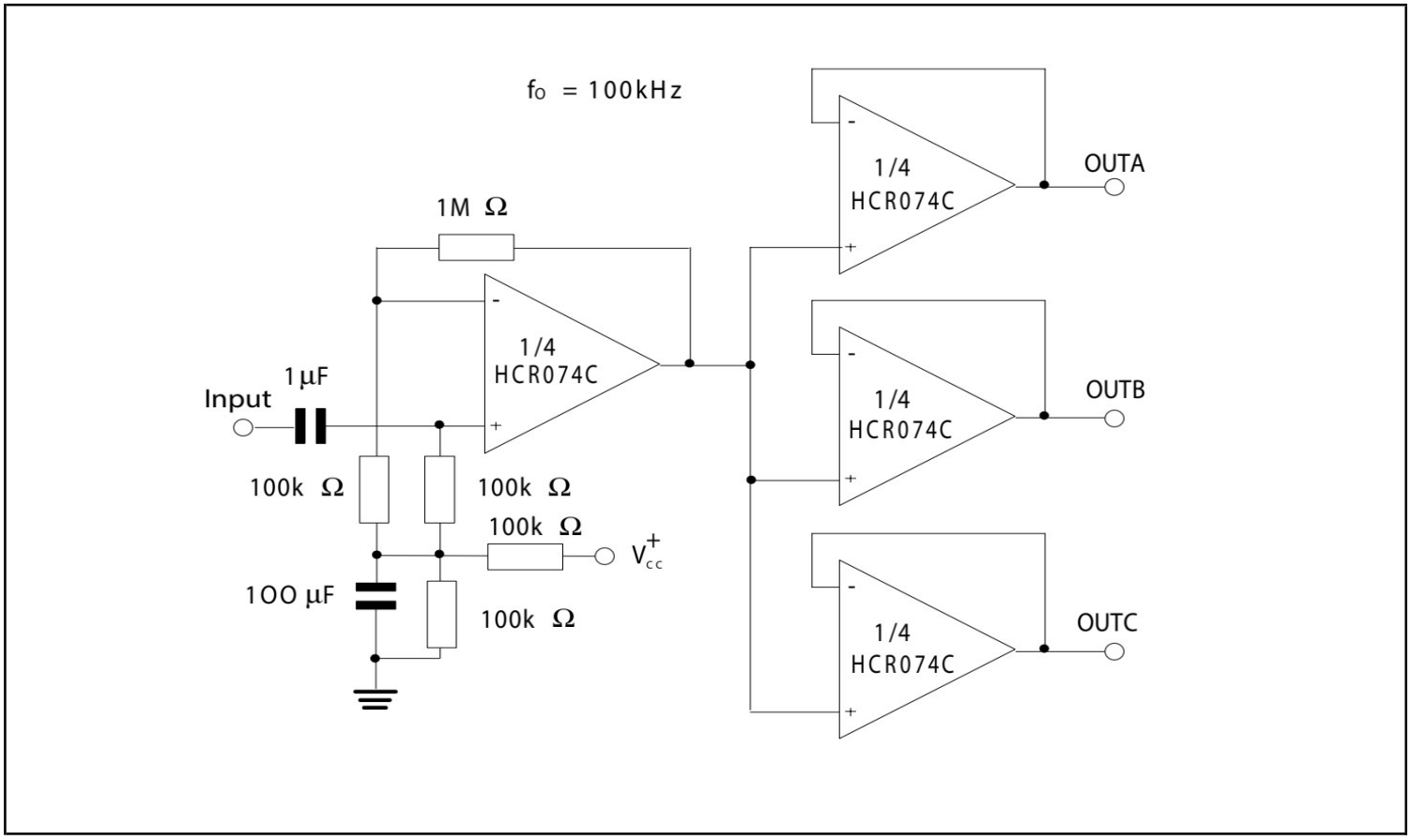


Figure 23. Audio Distribution Amplifier

Positive Feeback Bandpass Filter

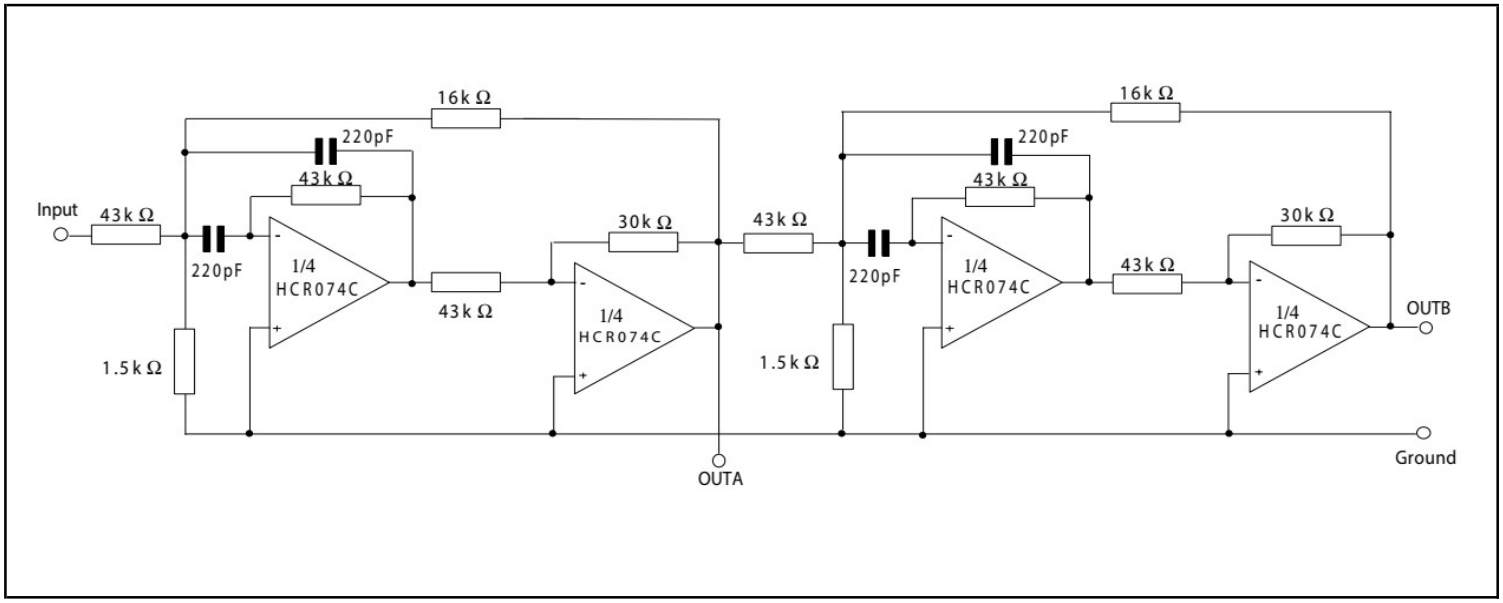
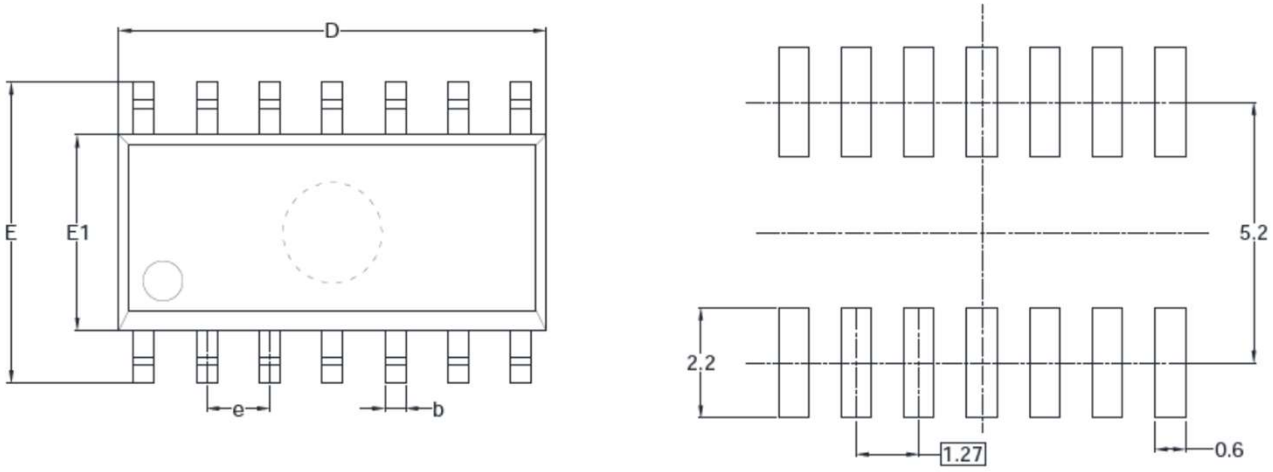


Figure 24. Positive Feeback Bandpass Filter

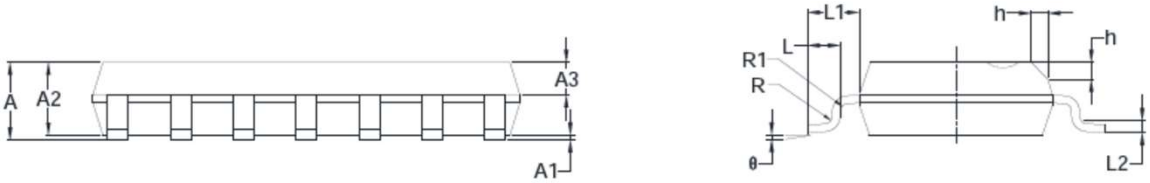
Low-noise JFET Quad Operational Amplifier

Mechanical Dimensions

M14: SOIC-14 Package



RECOMMENDED LAND PATTERN (Unit: mm)

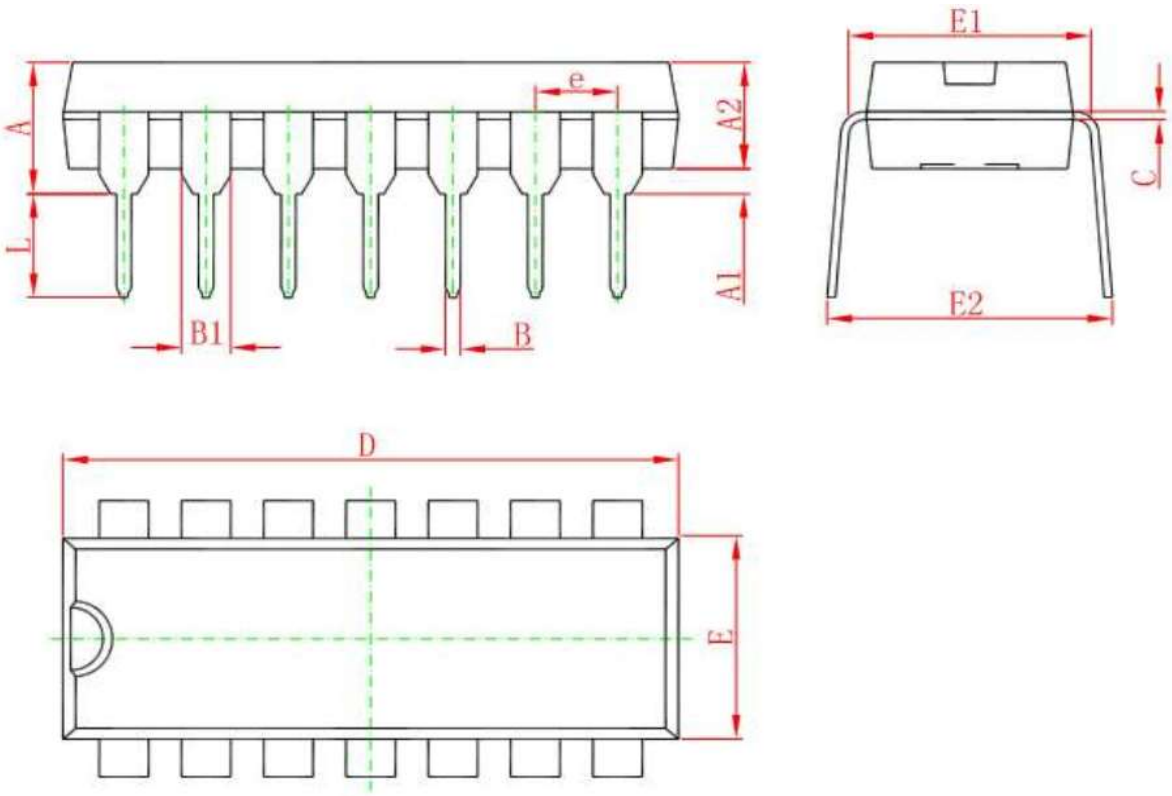


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80	0.018	0.032
L1	1.04 REF		0.040 REF	
L2	0.25 BSC		0.01 BSC	
R	0.07		0.003	
R1	0.07		0.003	
h	0.30	0.50	0.012	0.020
θ	0°	8°	0°	8°

Mechanical Dimensions(Con.)

DP14: DIP-14 Package

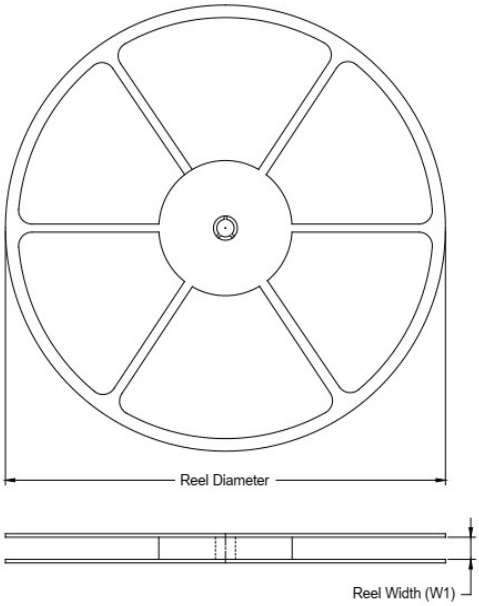
Unit:mm



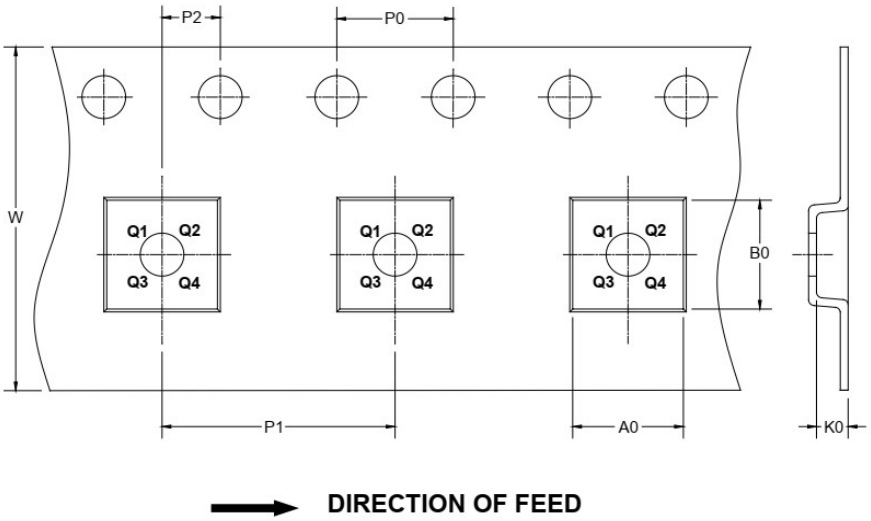
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312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

Tape and Reel Information

REEL DIMENSIONS



TAPE DIMENSIONS



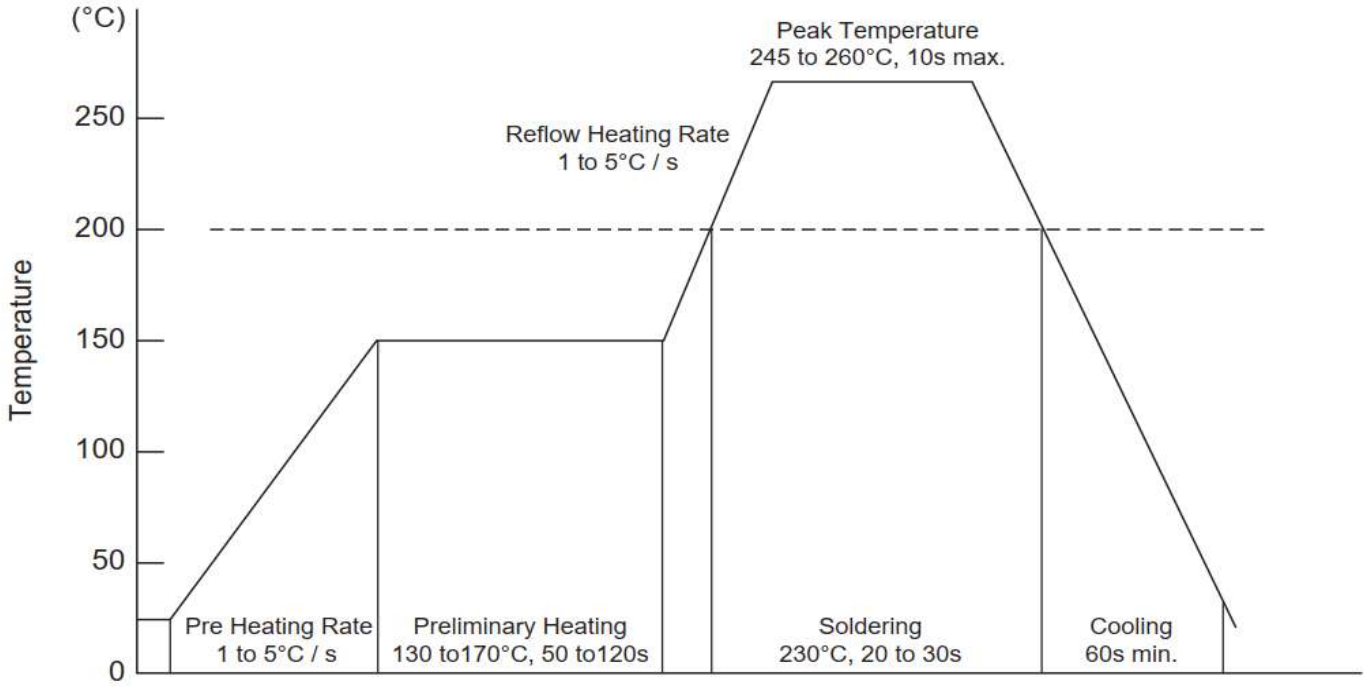
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOIC-14	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1

Conditins of Soldering and Storage

* Recommended condition of reflow soldering



Recommended peak temperature is over 245'C, if peak temperature is below 245'C, you may adjust the following parameters:

* Time length of peak temperature (longer)
* Time length of soldering (longer)
* Thickness of solder paste (thicker)

* Conditions of hand soldering
  * Temperature : 300'C
  * Time : 3s max
  * Times : one time

* Storage conditions
  * Temperature

    5 to 40'C
  * Humidity

    30 to 80% RH
  * Recommended period

    One year after manufacturing