Low distortion, Low-noise, High Voltage Quad Operational Amplifiers

Features

* Low Distortion: 0.0005%
* Large Signal Voltage Gain: 110dB Typical
* Operating Voltage: up to 36V (dual ±18V)
* Low Noise Voltage: 0.7uVrms
* High Slew Rate: 5V/us Typical
* Wide Gain Bandwidth: 12MHz at 10KHz
* Operating Temperature range: -40'C to +85'C

Applications

* Audio AC-3 Decoder System
* Audio Amplifier
* Low Noise Amplifier Front End
* DAC Output Amplifier
* Precision Instrumentation

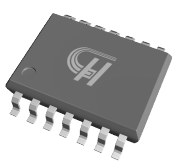
General Description

The HCR24580 is a high performance, low noise Quad operational amplifier. It is specifically designed for audio systems to improve tone control; it can be used in pre-amplifier, industrial measurement tools and applications where gain and phase matched channels are mandatory.

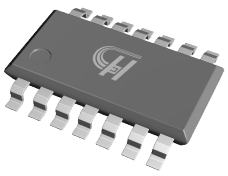
The HCR24580 feature internal frequency compensation, low noise, low distortion, high gain and high bandwidth.

The HCR24580 can operate under Quad power supply voltage up to ±18V or single power supply up to 36V.

The HCR24580 is available in Green SOIC-14(SOP-14), and TSSOP-14 package. It is specified over the extended -40'C to +85'C temperature range.



TSSOP-14



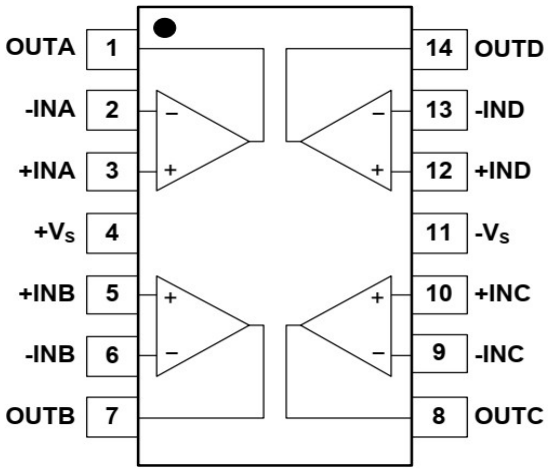
SOIC-14(SOP-14)

Figure 1. Package Type of HCR24580

Low distortion, Low-noise, High Voltage Quad Operational Amplifiers

Pin Configuration

HCR24580 (Top View)



SOIC-14(SOP-14)/TSSOP-14

Figure 2. Pin Configuration of HCR24580 (Top View)

Pin Function Table

Pin	Name	Function
3, 5, 10, 12	+INA, +INB, +INC, +IND	Non-inverting Inputs
2, 6, 9, 13	-INA, -INB, -INC, -IND	Inverting Inputs
11	-Vs	Negative Power Supply
4	+Vs	Positive Power Supply
1, 7, 8, 14	OUTA, OUTB, OUTC, OUTD	Outputs

Ordering Information

Circuit Type / □ □

Type:
HCR24580

TR : Tape and Reel

Package:
M14: SOIC-14(SOP-14)
TS14: TSSOP-14

Ordering Code

Part Number	Marking ID note1	Temperature Range	Package	Package Type
HCR24580/M14TR	HCR24580MXX	-40'C to +85'C	SOIC-14 (SOP-14)	4000pcs/TR
HCR24580/TS14TR	HCR24580TXX	-40'C to +85'C	TSSOP-14	5000pcs/TR

Note 1. the "XX" is date code as refer to message

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Functional Block Diagram

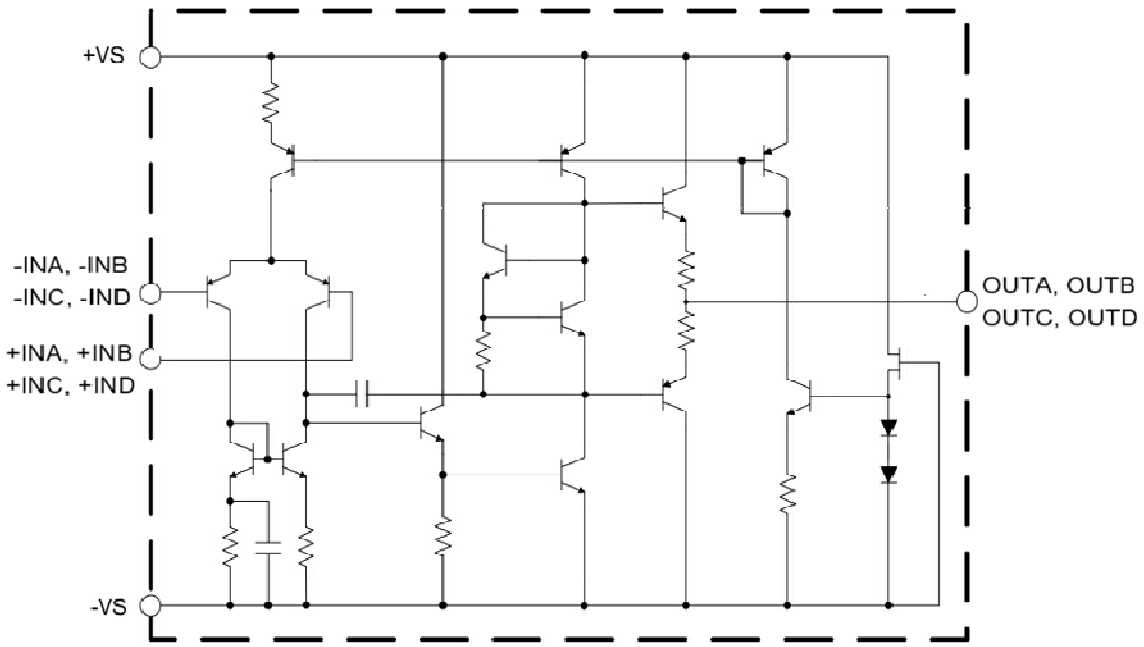


Figure 3. Pin Configuration of HCR24580 (Top View)

Typical Applications

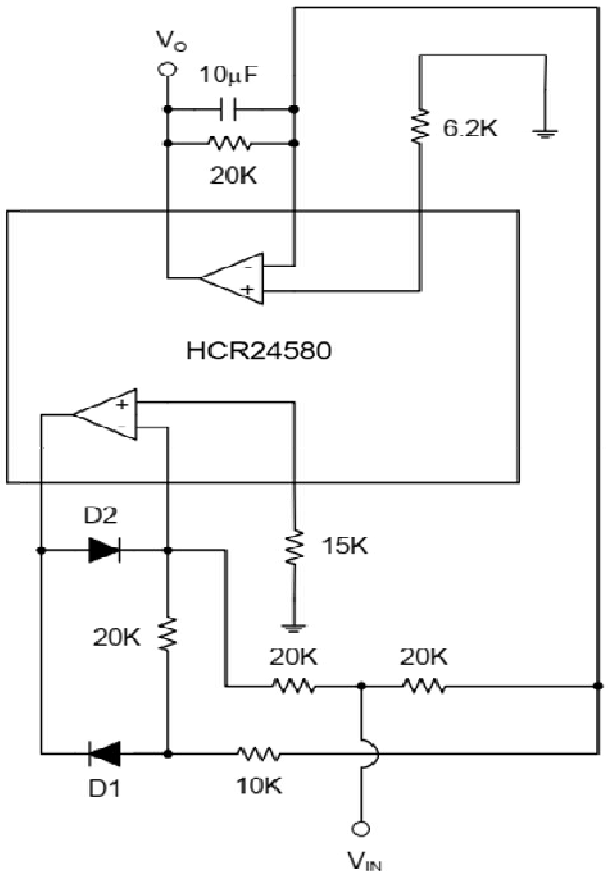


Figure 4. Application of HCR24580 in an AC/DC Converter

Absolute Maximum Ratings Note 2

Parameter		Symbol	Value	Unit
Supply Voltage, +Vs to -Vs		V+	+20	V
		V-	-20	
Input Voltage, VIN		VIN	±15	V
Differential Input Voltage		VDF	±30	V
Power Dissipation @TA=+25'C	TSSOP-14	PD	1.1	W
	SOIC-14 /SOP-14		1.5	W
Package Thermal Resistance	TSSOP-14	θJA	175	'C/W
	SOIC-14 /SOP-14		131	'C/W
Package Thermal Resistance (Junction to Case)	TSSOP-14	θJC	35	'C/W
	SOIC-14 /SOP-14		32	'C/W
Storage Temperature Range		TSTG	-65 to +150	'C
Junction Temperature		TJ	+150	'C
Lead Temperature (Soldering, 10s)		TLEAD	260	'C

Note 2: Stresses above those listed under"Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage V+ to V-	V+, V-	±2.0	±18.0	V
Operating Temperature Range	TA	-40	+85	'C

Electrical Characteristics

(Operating Conditions: +Vs=+15V, -Vs=-15V, Ta=25 `C, Unless Otherwise Specified.)

Parameter	Symbol	Conditions	Min	Type	Max	Unit
Supply Current	I_O	no load	-	6.0	9.0	mA
Input Offset Voltage	V_{IO}	R_S<=10KΩ	-	0.5	3.0	mV
Input Offset Current	I_{IO}	V_{CM}=0V	-	5.0	200	nA
Input Bias Current	I_B	V_{CM}=0V	-	150	500	nA
Maximum Output Voltage Swing	V_{OM}	R_L>=2KΩ	±12	±13.5	-	V
Input Common Mode Voltage Range	V_{ICM}		±12	±13.5	-	V
Common Mode Rejection Ratio	CMRR	V_{CM}=0V to V_{CC}-1.5V, R_S<=10KΩ	80	110	-	dB
Large Signal Voltage Gain	A_V	R_L=2KΩ, V_O=±10V	90	110	-	dB
Power Supply Rejection Ratio	PSRR	R_S=10KΩ	80	110	-	dB
Output Sink Current	I_{O1}	V-=1V, V+=0V, V_O=2V	-	80	-	mA
Output Source Current	I_{O2}	V+=1V, V-=0V, V_O=2V	-	45	-	mA
Slew Rate	SR	R_L>=2KΩ	-	5	-	V/uS
Gain Bandwidth Product	GB	R_L=2KΩ, f=±10KHz	-	12	-	MHz
Unity Gain Bandwidth	f_T	A_V=1	-	5.5	-	MHz
Total Harmonic Distortion	THD	A_V=20dB, V_O=5V, R_L=2KΩ, f=1KHz	-	0.0005	-	%
Equivalent Input Noise Voltage	en	f=1KHz Rs=2KΩ, 30KHz LPF	-	0.7	-	uVrms

Typical Performance Characteristics

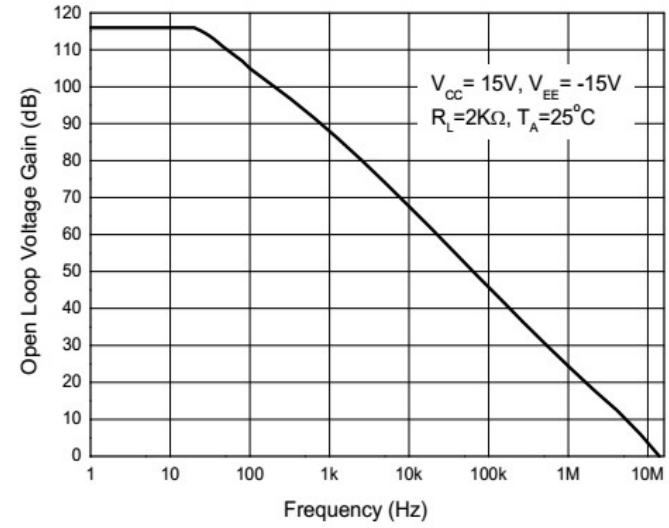


Figure 5. Open Loop Voltage Gain vs. Frequency

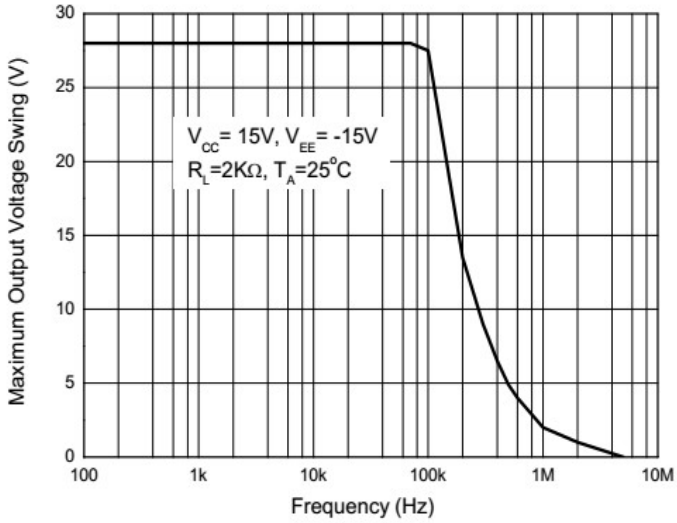


Figure 6. Maximum Output Voltage Swing vs. Frequency

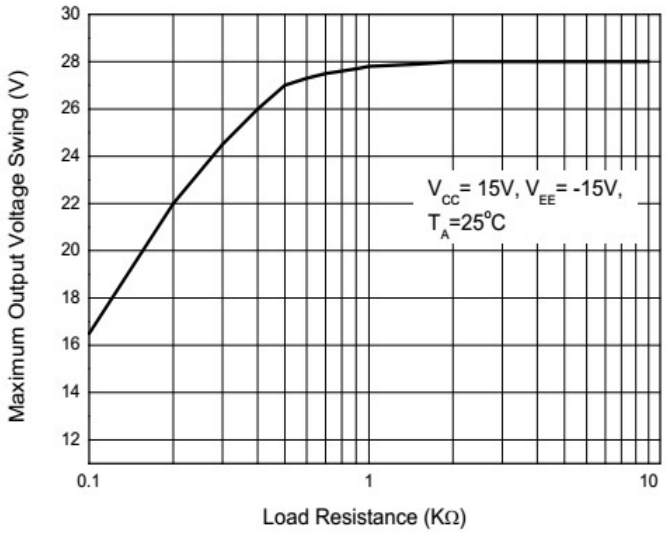


Figure 7. Maximum Output Voltage Swing vs. Load Resistance

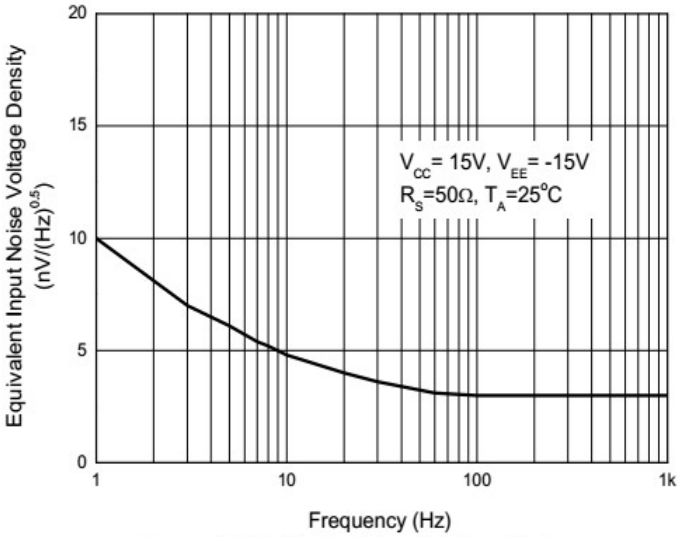


Figure 8. Equivalent Input Noise Voltage Density vs. Frequency

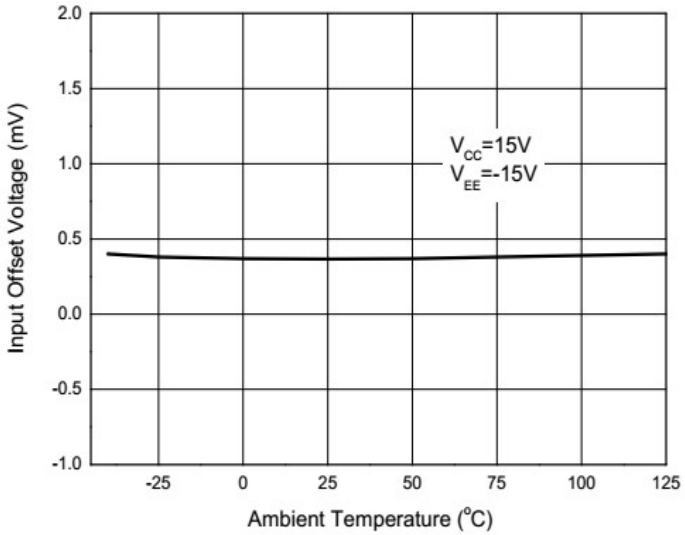


Figure 9. Input Offset Voltage vs. Temperature

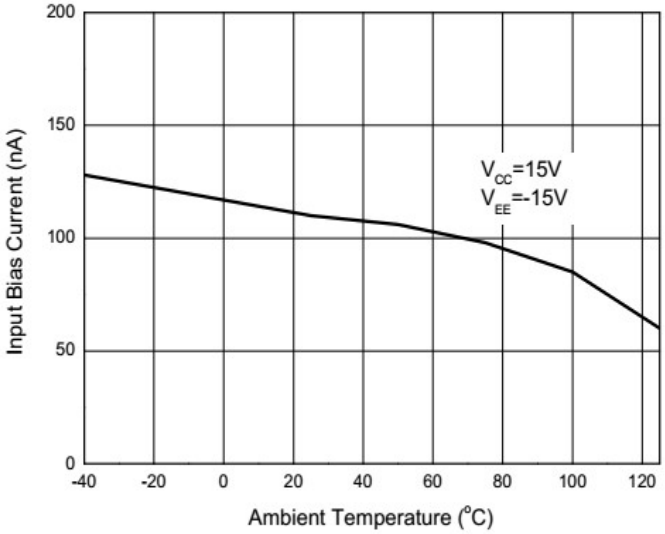


Figure 10. Input Bias Current vs. Temperature

Typical Applications Circuit

• RIAA Preamp Circuit

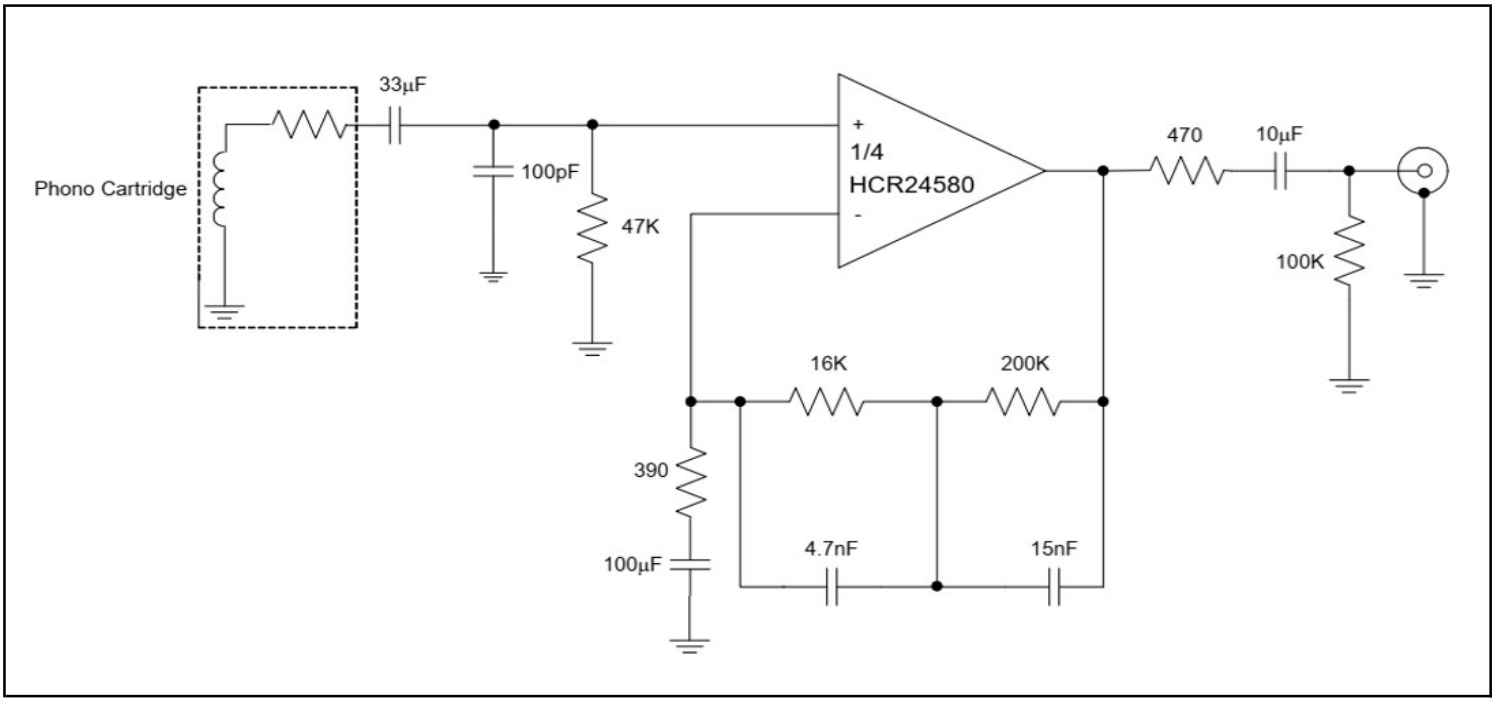


Figure 11. Application of HCR24580 in a RIAA Preamp

• Tone Control Circuit

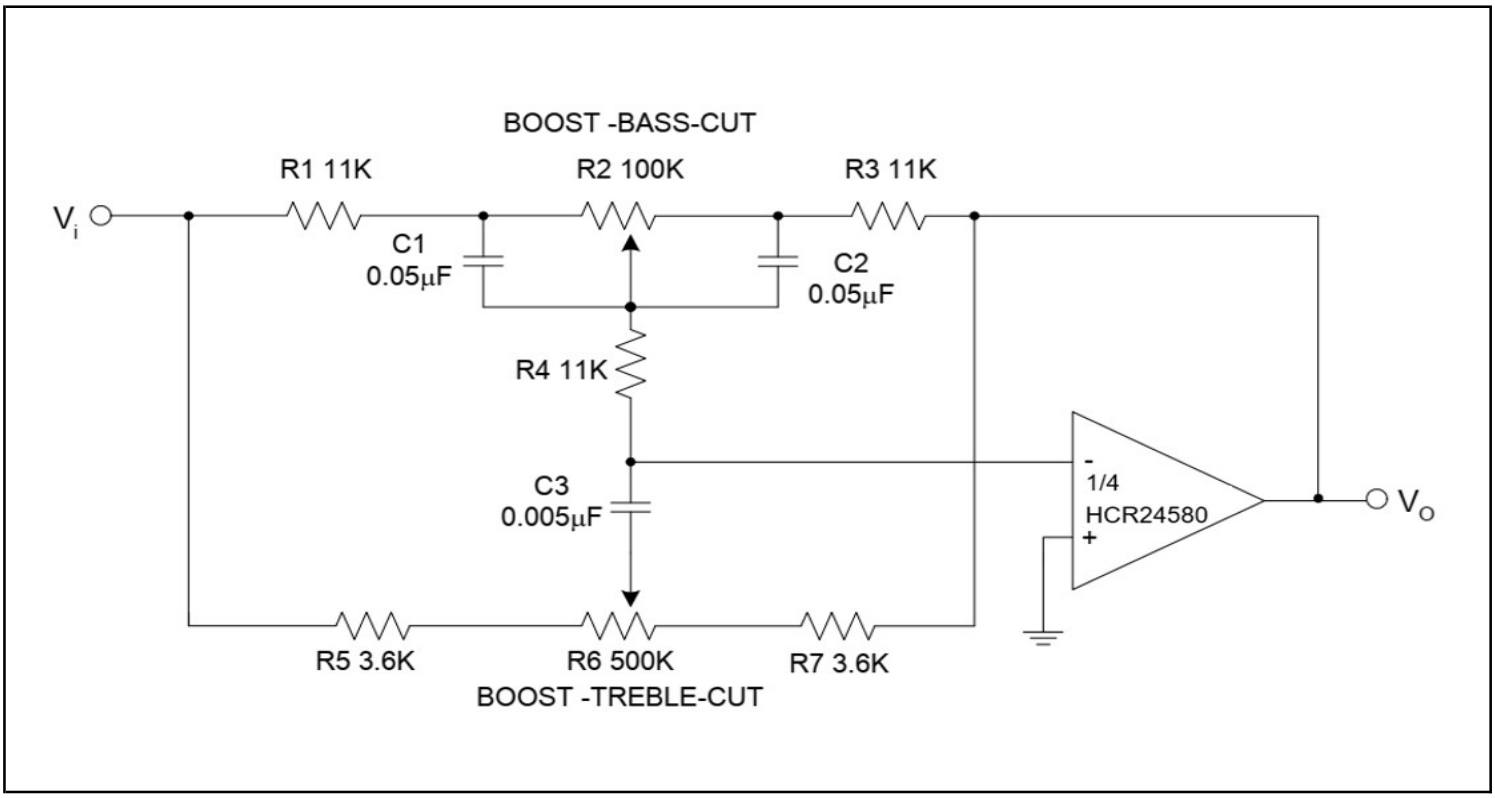
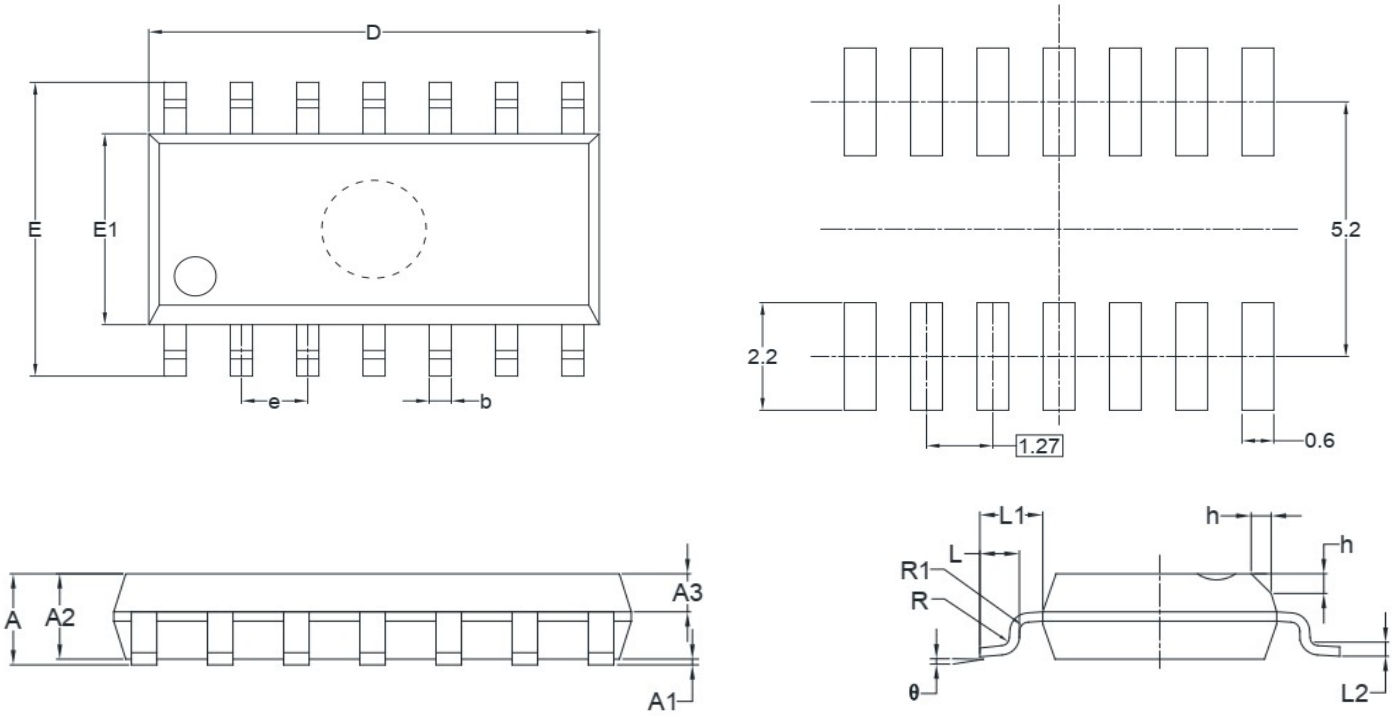


Figure 12. Application of HCR24580 in Tone Control

Mechanical Dimensions

PKG: SOIC-14/SOP-14 (M14)

Unit: mm (inch)



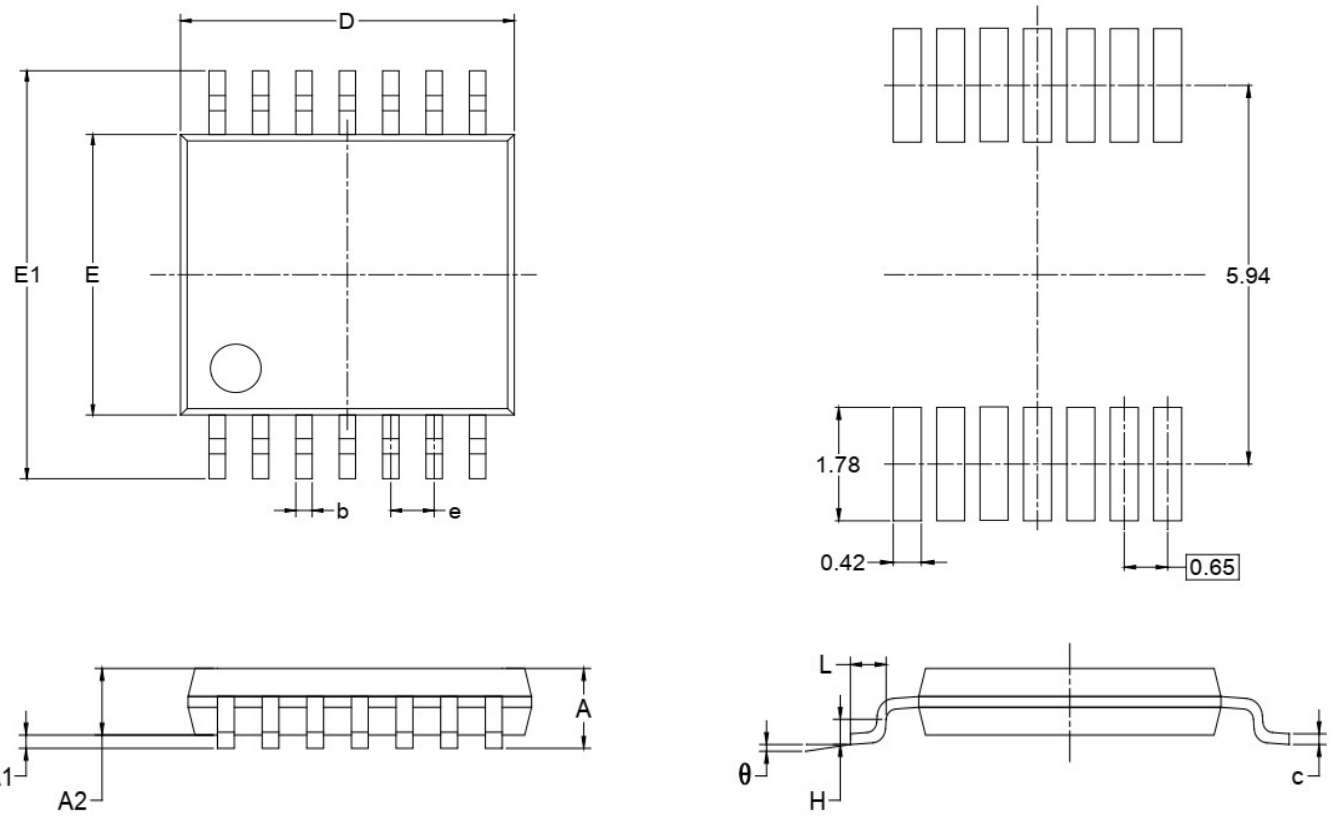
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80	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°

NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

Mechanical Dimensions(con.)

PKG: TSSOP-14 (TSP14)

Unit: mm (inch)

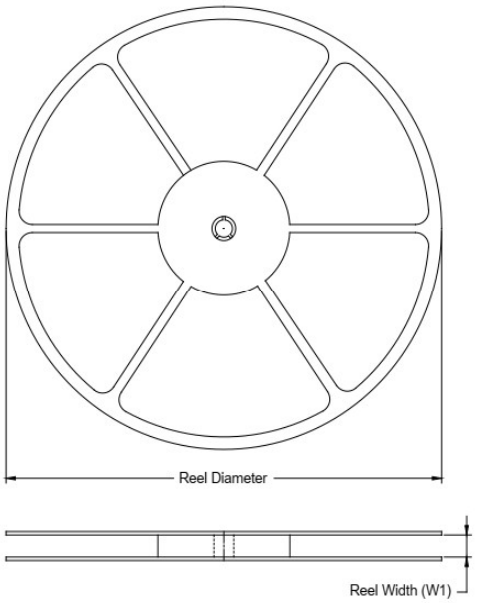


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

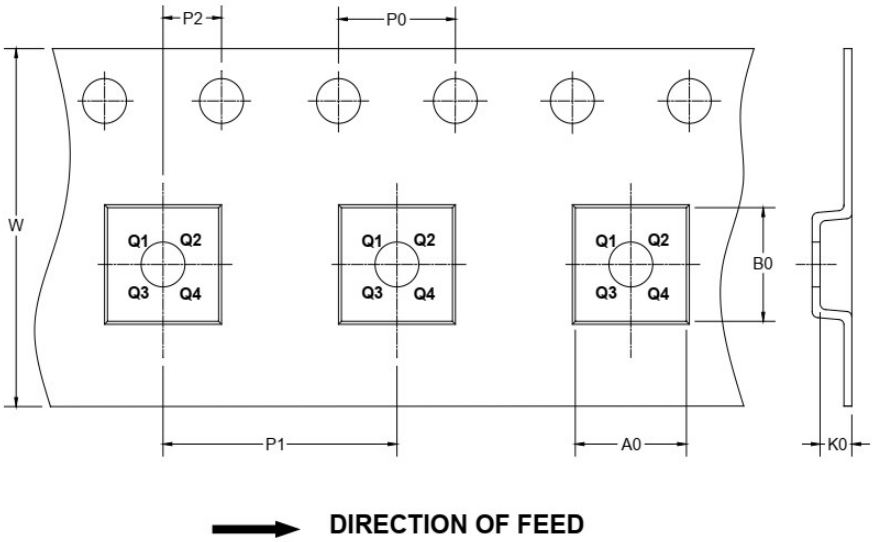
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



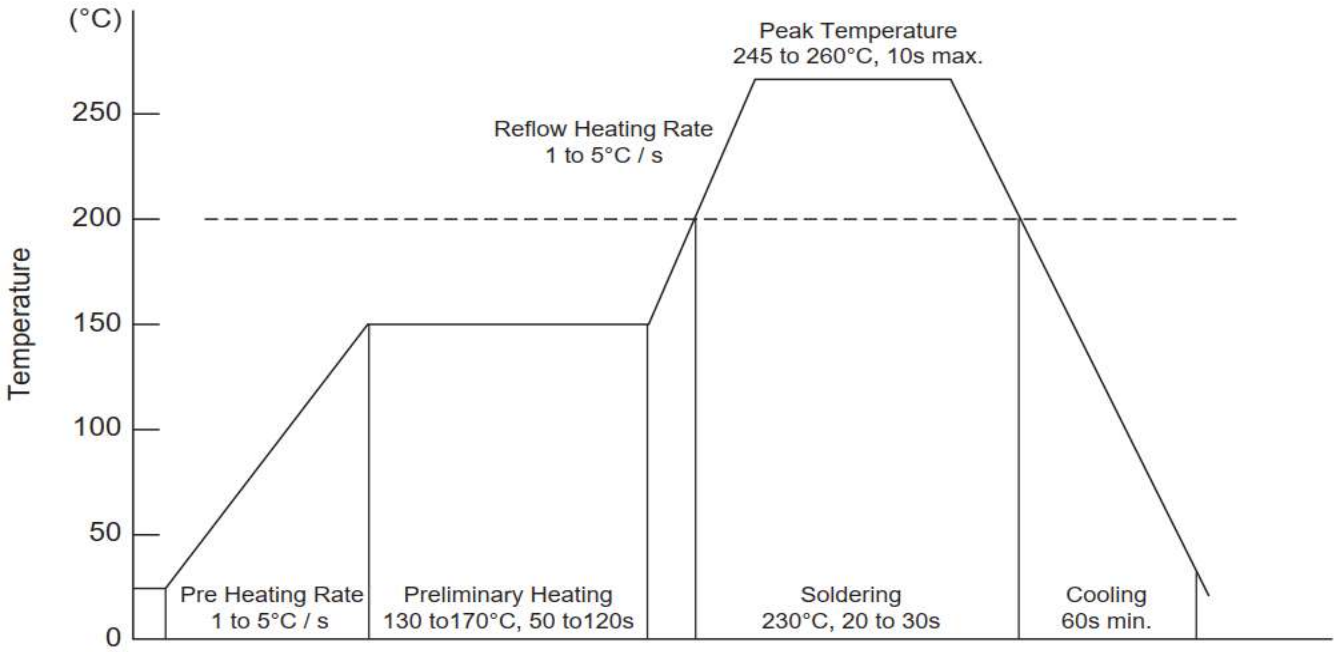
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1	A0	B0	K0	P0	P1	P2	W	Pin1
		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	Quadrant
SOIC-14	13"	16.4	6.60	9.30	2.10	4.0	8.0	2.0	16.0	Q1
TSSOP-14	13"	12.4	6.95	5.60	1.20	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

  Three year after manufacturing