Dual 36-V, Low Noise Audio Operational Amplifiers

Features

- High Sound Quality
- Low Noise: 5 nV/√Hz at 1 kHz
- Low Distortion: 0.0005% at 1kHz
- Wide Bandwidth: 30 MHz
- High Slew Rate: 20 V/μs
- Offset Voltage: ±3 mV (Max)
- Wide Supply Voltage: ±2 V to ±18 V
- Low Quiescent Current: 3 mA per Channel
- No Input Diode to +Vs and No Differential Diode from IN+ to IN-
- Bipolar Input Stage
- Unity Gain Stable
- Operating Temperature Range: −40°C to 125°C
- Drop-in Replacement for BA4580 RC4580 NJM4580

Applications

- Audio Equipment
- Microphone Preamplifiers
- Headphone Amplifiers
- Active Filters

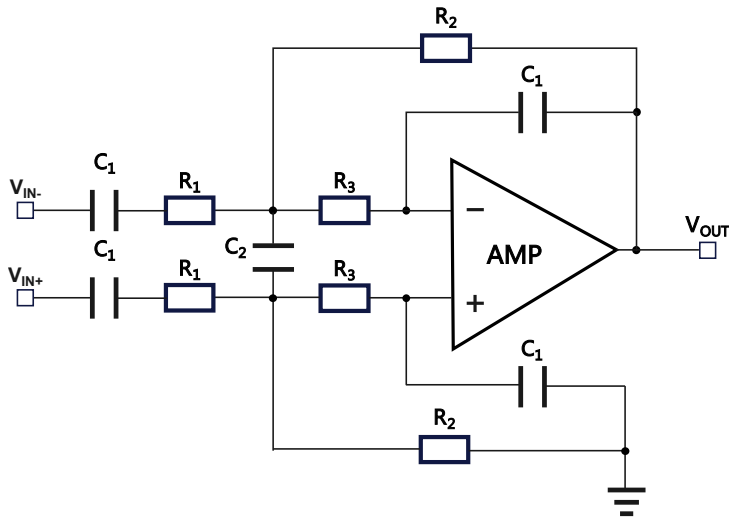
Description

The TPA2882 is a dual operational amplifier specifically optimized for audio applications, including tone control enhancement. With a bipolar input stage, the TPA2882 series achieves very low noise 5 nV/√Hz and low distortion of 0.0005% at 1 kHz, making it an excellent choice for various audio electronic systems such as preamplifiers, active filters, and industrial measurement equipment. With its ability to deliver high output current ±50 mA, the device can also serve directly as a headphone amplifier. Furthermore, its wide operating supply voltage range of ±2 V to ±18 V allows flexible use in low-voltage applications.

Device Table

Device	Package	Body Size
TPA2882-SO1R	SOP8	4.9 mm × 3.9 mm
TPA2882-VS1R	MSOP8	3.0 mm × 3.0 mm
TPA2882-TS1R	TSSOP8	3.0 mm × 4.4 mm

Typical Application Circuit



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Revision History

Date	Revision	Notes
2026-04-29	Rev.A.0	Initial Version.

Pin Configuration and Functions

TPA2882
SOP8/TSSOP8/MSOP8
Top View

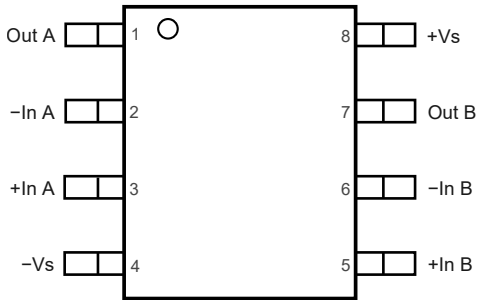


Table 1. Pin Functions: TPA2882

Pin No.	Name	I/O	Description
1	Out A	O	Output
2	−In A	I	Inverting input
3	+In A	I	Non-inverting input
4	$-V_S$		Negative power supply
5	+In B	I	Non-inverting input
6	−In B	I	Inverting input
7	Out B	O	Output
8	$+V_S$		Positive power supply

Specifications

Absolute Maximum Ratings (1)

All test conditions: over the operating ambient temperature, unless otherwise noted.

Parameter		Min	Max	Unit
	Supply Voltage, $(+V_S) - (-V_S)$		40	V
	Input Voltage	$(-V_S) - 0.3$	40	V
	Differential Input Voltage	$(-V_S) - (+V_S)$	$(+V_S) - (-V_S)$	V
	Input Current: +IN, −IN (2)	−10	10	mA
	Output Voltage	$(-V_S) - 0.3$	$(+V_S) + 0.3$	V
	Output Short-Circuit Duration (3)		Infinite	
T_J	Maximum Junction Temperature		150	°C
T_A	Operating Temperature Range	−40	125	°C
T_{STG}	Storage Temperature Range	−65	150	°C
T_L	Lead Temperature (Soldering, 10 sec)		260	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.
(2) The inputs are protected by ESD-protection diodes to each power supply. If the input extends more than 300 mV beyond the negative power supply, the input current should be limited to less than 10 mA.
(3) A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. The thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001 (1)	2	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002 (2)	1	kV

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

Parameter		Min	Typ	Max	Unit
V_S	Supply Voltage, $(+V_S) - (-V_S)$	4		36	V
T_A	Operating Temperature Range	−40		125	°C

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOP8	158	43	°C/W
TSSOP8	191	44	°C/W
MSOP8	210	45	°C/W

Electrical Characteristics

All test conditions: V_S = 30 V, T_A = 25°C, R_L = 10 kΩ, C_L = 100 pF, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Power Supply						
V_S	Supply Voltage Range		4		36	V
I_Q	Quiescent Current per Amplifier			3	4	mA
		T_A = −40°C to 125°C			4.5	mA
PSRR	Power Supply Rejection Ratio	V_S = 4 V to 30 V	85	110		dB
		V_S = 4 V to 30 V, T_A = −40°C to 125°C	80			dB
Input Characteristics						
V_{OS}	Input Offset Voltage	V_{CM} = 15 V	−3	±0.3	3	mV
		V_{CM} = 15 V, T_A = −40°C to 125°C	−4		4	mV
V_{OS} TC	Input Offset Voltage Drift	V_{CM} = 15 V, T_A = −40°C to 125°C		2		μV/°C
I_B	Input Bias Current	V_{CM} = 15 V		500	650	nA
I_{OS}	Input Offset Current	V_{CM} = 15 V		5	50	nA
R_{IN}	Input Resistance	Differential Mode		1		MΩ
		Common Mode		100		MΩ
C_{IN}	Input Capacitance	Differential Mode		2		pF
		Common Mode		4		pF
A_V	Open-Loop Voltage Gain	V_O = 8 V to 22 V	85	110		dB
		V_O = 8 V to 22 V, T_A = −40°C to 125°C	80			dB
V_{CMR}	Common-Mode Input Voltage Range		($-V_S$) + 1.5		($+V_S$) - 1.5	V
		T_A = −40°C to 125°C	($-V_S$) + 3		($+V_S$) - 3	V
CMRR	Common-Mode Rejection Ratio	V_{CM} = 3 V to 27 V	85	100		dB
		V_{CM} = 3 V to 27 V, T_A = −40°C to 125°C	80			dB
Output Characteristics						
V_{OM}	Maximum Output Voltage	V_S = 30 V, R_L = 2 kΩ to V_S / 2		± 13.5	± 13	V
		V_S = 30 V, R_L = 2 kΩ to V_S / 2 T_A = −40°C to 125°C			± 12	V

All test conditions: V_S = 30 V, T_A = 25°C, R_L = 10 kΩ, C_L = 100 pF, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{SC}	Output Short-Circuit Current	V_S = 30 V		50		mA
AC Specifications						
GBW	Gain-Bandwidth Product			30		MHz
SR	Slew Rate	G = 1, 2-V Step		20		V/μs
t_{OR}	Overload Recovery			200		ns
t_S	Settling Time, 0.1%	G = 1, 2-V Step		300		ns
PM	Phase Margin	R_L = 10 kΩ, C_L = 100 pF		41		°
GM	Gain Margin	R_L = 10 kΩ, C_L = 100 pF		8		dB
	Channel Separation	f = 100 kHz		120		dB
Noise Performance						
E_N	Input Voltage Noise	RIAA, R_S= 2.2 kΩ, 30 kHz LPF		0.8		μV_{RMS}
e_N	Input Voltage Noise Density	f = 1 kHz		5		$nV/\sqrt{Hz}$
i_N	Input Current Noise	f = 1 kHz		80		$fA/\sqrt{Hz}$
THD+N	Total Harmonic Distortion and Noise	f = 1 kHz, G = 1, R_L = 2 kΩ, V_{OUT} = 5 V_{RMS}		0.0005		%

Typical Performance Characteristics

All test conditions: V_S = 30 V (±15 V), V_{CM} = V_S /2, R_L = 10 kΩ, unless otherwise noted.

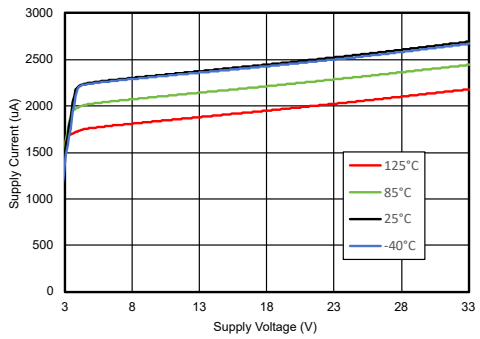


Figure 1. Quiescent Current vs. Supply Voltage

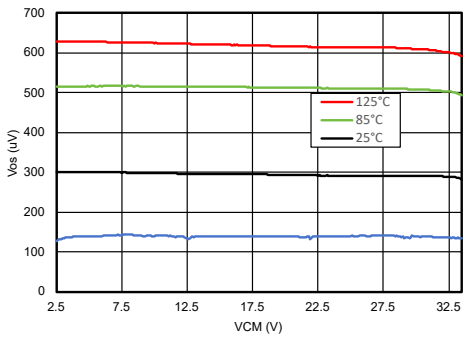


Figure 2. Offset Voltage vs. Common-Mode Voltage

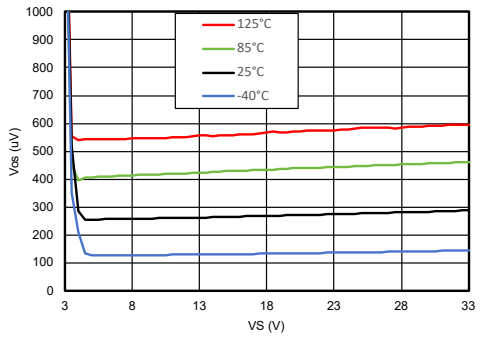


Figure 3. Offset Voltage vs. Supply Voltage

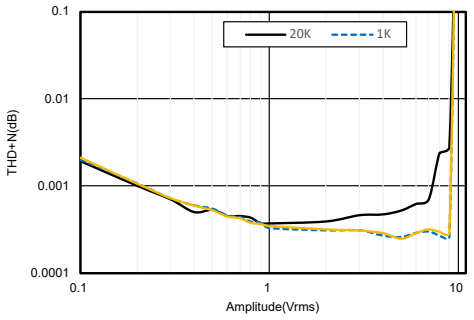


Figure 4. Total Harmonic Distortion - Output Voltage (AV = 20 dB, RL = 2 kΩ)

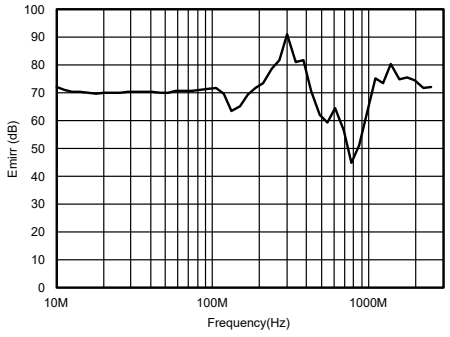


Figure 5. EMIRR+ vs. Frequency

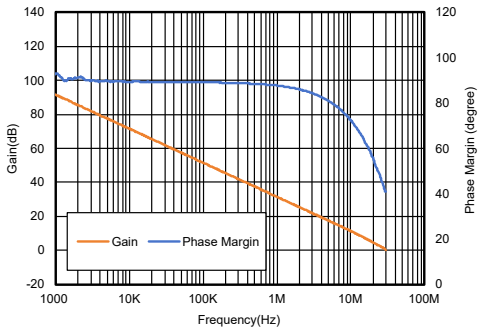


Figure 6. Open-Loop Gain and Phase vs. Frequency

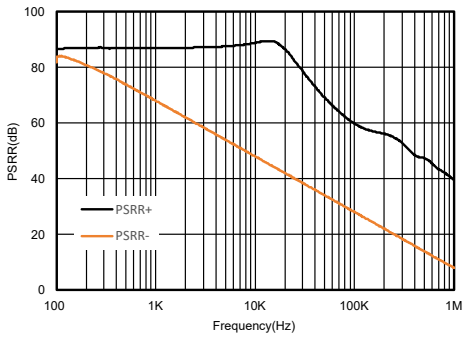


Figure 7. PSRR vs. Frequency

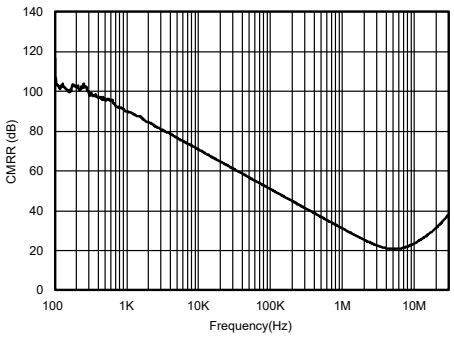


Figure 8. CMRR vs. Frequency

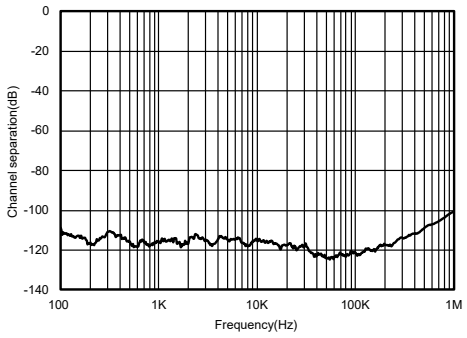


Figure 9. Channel Separation

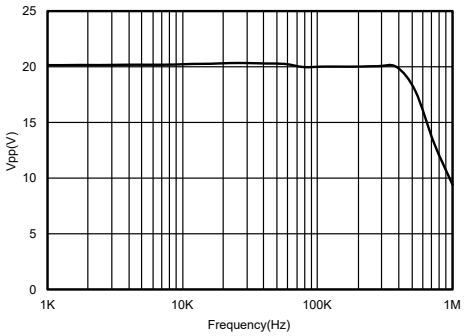


Figure 10. Maximum Output Voltage Swing vs. Frequency

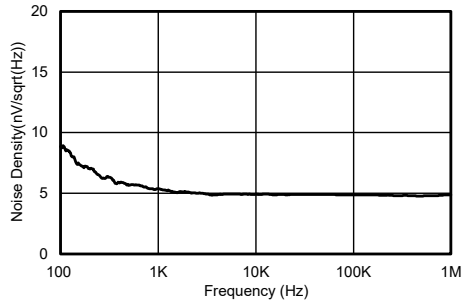


Figure 11. Voltage Noise Spectral Density vs. Frequency

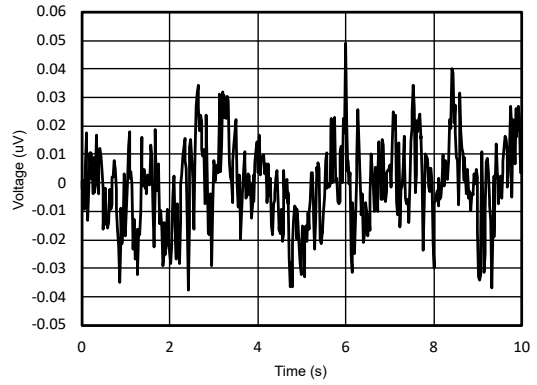


Figure 12. 0.1 Hz to 10 Hz Input Voltage Noise

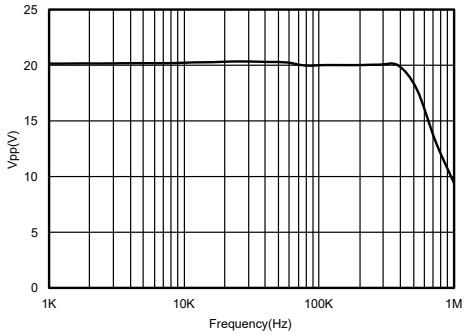


Figure 13. Output Swing vs. Frequency

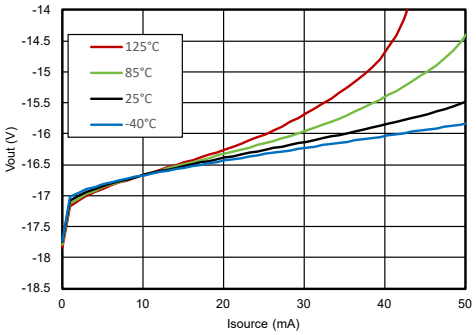


Figure 14. Sinking Current vs. Vout

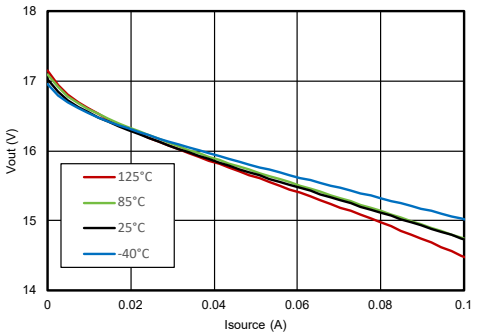


Figure 15. Source Current vs. Vout

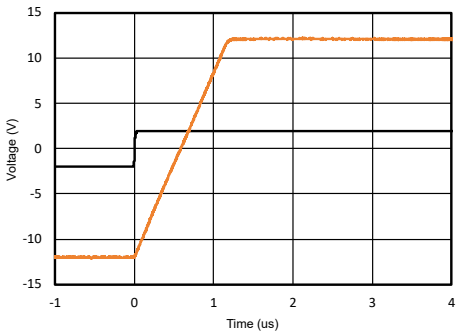


Figure 16. Negative Overload Recovery

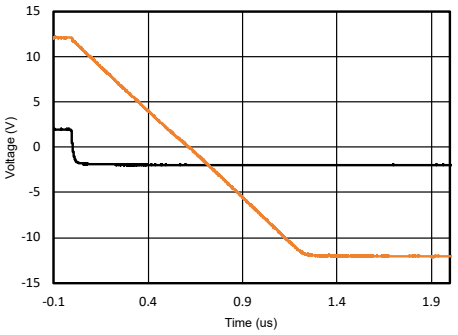


Figure 17. Positive Overload Recovery

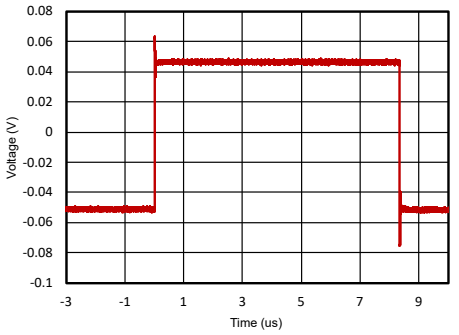


Figure 18. 100-mV Signal Step Response

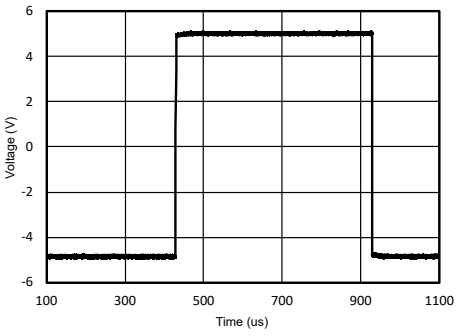


Figure 19. 10-V Signal Step Response

Detailed Description

Overview

The TPA2882 device is a dual operational amplifier that has been designed optimally for audio applications. The device offers low noise, low harmonic distortion, and high output current. The TPA2882 can operate on a single-supply voltage (4 V to 36 V), or split-supply voltage (±4 V to ±18 V). The strengths of the TPA2882 also include 4.5-nV/$\sqrt{Hz}$ noise density, 30-MHz bandwidth, and 50-mA output current. With a bipolar input stage, the TPA2882 has no input to the +Vs diode and no differential input diode.

Functional Block Diagram

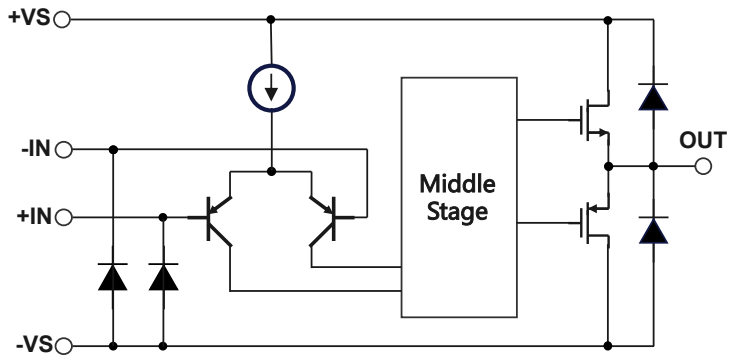


Figure 20. Functional Block Diagram

Feature Description

Operating Voltage Range

The TPA2882 is designed for single-supply operation from 4 V to 36 V or dual-supply operation from ±2 V to ±18 V. The recommended operating voltage conditions are as follows:

Power supply voltage ($+V_S$) − ($-V_S$): 4 V to 36 V. The power supply voltage can support the following three scenarios:

- Single supply;
- Dual supplies with equal voltage values;
- Various voltage configurations, as long as the voltage range of ($+V_S$) − ($-V_S$) is within 4 V to 36 V.

Low Noise and Low Distortion for Audio Applications

The TPA2882 provides 4.5-nV$\sqrt{Hz}$ noise density, which is very important for audio applications. This unique topology allows the TPA2882 to maintain a low distortion 0.0005% at 1kHz.

Bipolar Input Stage

With a bipolar input stage, there is no input to $+V_S$diode, which is crucial for battery application to cut off input to the power route. Besides, there is no differential diodes across IN+ and IN- pins, which enables the differential input voltage range up to supply rails.

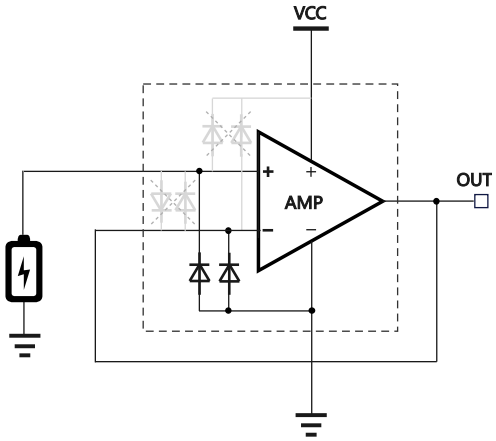


Figure 21. No Input Route to +V_S

High Output Current

The TPA2882 delivers high output current up to 50 mA (typ), which can be used as a headphone amplifier. To enhance the output current ability, the TPA2882 can drive extra power FETs at the system level.

Application and Implementation

> Note
>
> Information in the following application sections is not part of the 3PEAK's component specification and 3PEAK does not warrant its accuracy or completeness. 3PEAK's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

Application Information

Bandpass Filter for Audio Application

Figure 22 Typical Performance Characteristics shows the device configured as a bandpass filter in a typical audio application. V_{REF} can be used to add bias voltage to the output voltage. The R1, C1, RF, and CF will set the cut-off frequency of the filter.

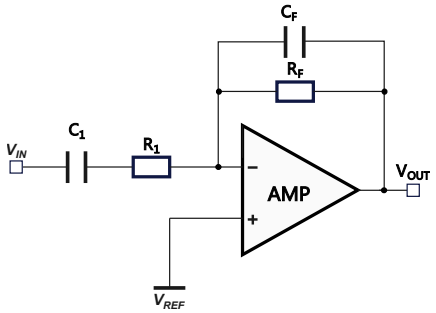


Figure 22. Typical Bandpass Filter for Audio Application

Driving Capacitive Load

To drive a large load capacitor in unity-gain configurations, an additional isolated resistor R_{ISO} (10R to 100R) should be added. R_{ISO} modifies the open-loop gain of the system to increase phase margin for better stability.

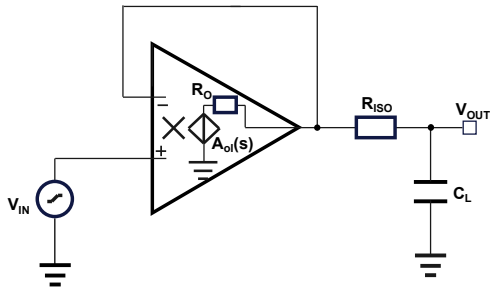
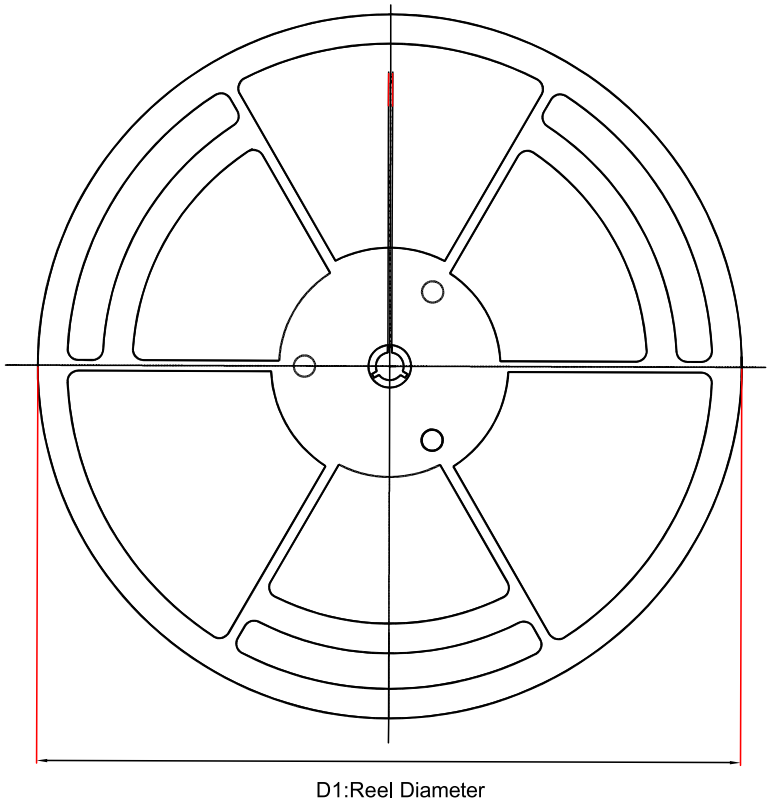


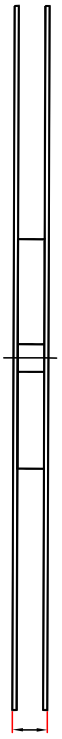
Figure 23. Isolated Resistor for Driving Capacitive Load

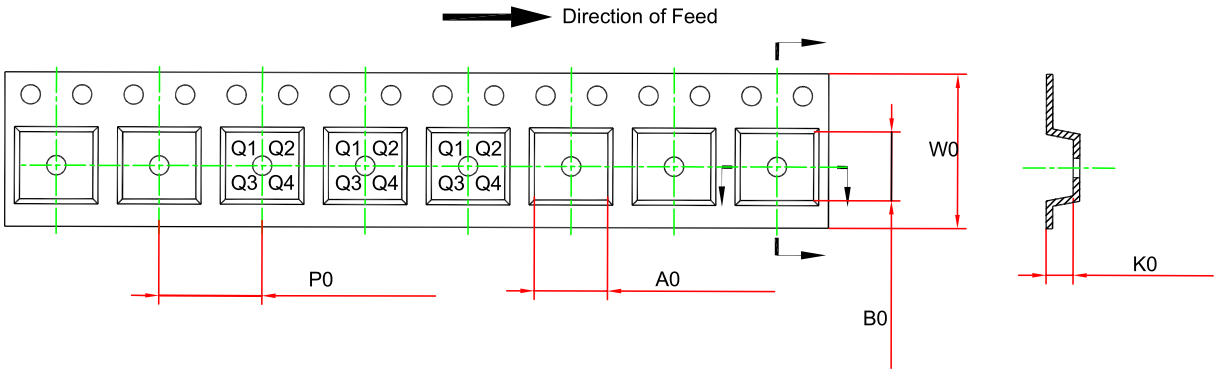
Power Supply Recommendations

Place 0.1-μF bypass capacitors close to the power supply pins to reduce coupling errors from the noisy or high-impedance power supplies.

Tape and Reel Information







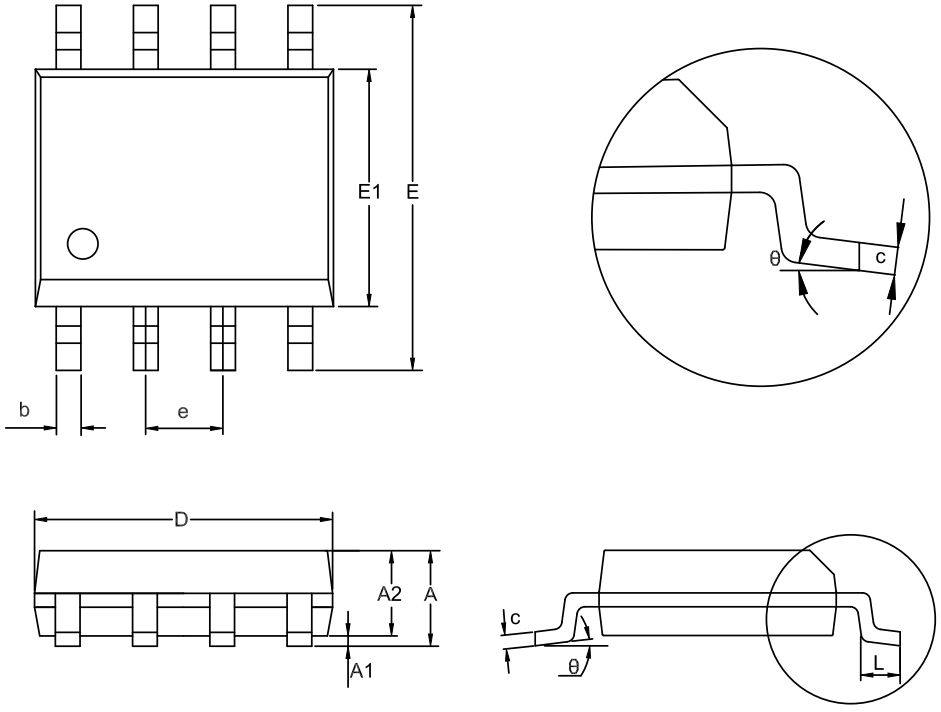
Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm) (1)	B0 (mm) (1)	K0 (mm) (1)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPA2882-SO1R	SOP8	330	17.6	6.5	5.4	2	8	12	Q1
TPA2882-TS1R	TSSOP8	330	17.6	6.8	3.4	1.2	8	12	Q1
TPA2882-VS1R	MSOP8	330	17.6	5.3	3.4	1.3	8	12	Q1

(1) The value is for reference only. Contact the 3PEAK factory for more information.

Package Outline Dimensions

SOP8

Package Outline Dimensions SO1(SOP-8-A)



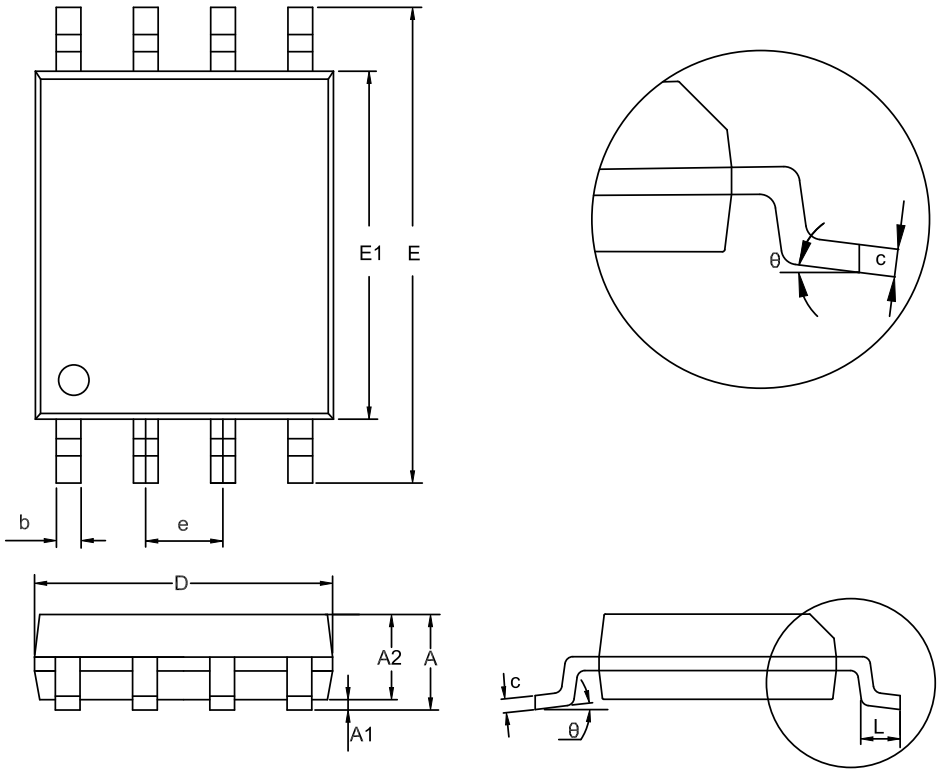
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.050	0.250	0.002	0.010
A2	1.250	1.550	0.049	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050 BSC	
L	0.400	1.000	0.016	0.039
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

TSSOP8

Package Outline Dimensions TS1(TSSOP-8-A)



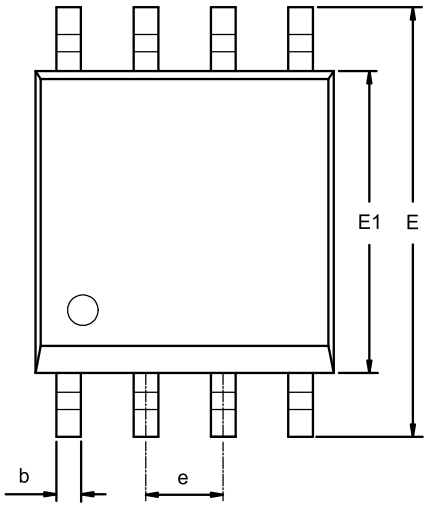
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.200	0.035	0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	2.900	3.100	0.114	0.122
E	6.200	6.600	0.244	0.260
E1	4.300	4.500	0.169	0.177
e	0.650 BSC		0.026 BSC	
L	0.450	0.750	0.018	0.030
θ	0	8°	0	8°

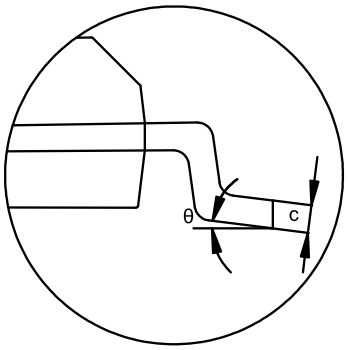
NOTES

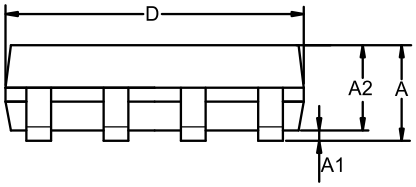
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

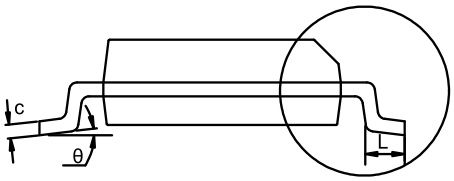
MSOP8

Package Outline Dimensions VS1(MSOP-8-A)









Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.800	1.100	0.031	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	4.700	5.100	0.185	0.201
E1	2.900	3.100	0.114	0.122
e	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPA2882-SO1R	−40 to 125°C	SOP8	2882	3	Tape and Reel, 4000	Green
TPA2882-TS1R	−40 to 125°C	TSSOP8	2882	3	Tape and Reel, 3000	Green
TPA2882-VS1R	−40 to 125°C	MSOP8	2882	3	Tape and Reel, 3000	Green

Green: 3PEAK defines "Green" to mean RoHS compatible and free of halogen substances.

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Performance Information. Performance tests or performance range contained in this document/material are either results of design simulation or actual tests conducted under designated testing environment. Any variation in testing environment or simulation environment, including but not limited to testing method, testing process or testing temperature, may affect actual performance of the product.

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