Dual, Ultra-low Distortion, 36V RRO Op-amps

Features

- **Wide Supply Range: 3.5 V to 36 V, or Dual-Supply ±1.75V to ±18 V**
- **Low Noise Voltage: 1.2 μVrms in audio band (TYP)**
- **High Slew Rate: 6 V/μs(TYP)**
- **Wide Bandwidth: 12 MHz(TYP)**
- **Ultra-low Distortion: 0.001% at 1 kHz (TYP)**
- **Rail-to-Rail Output**
- **Low Supply Current: 2mA per Amplifier**
- **–40°C to 125°C Operation Range**
- **Drop-In Replacement for NJM4580,RC4580**
- **Pin and Function Compatible With LM833,NE5532, NJM4558/9, and NJM4560/2/5**

Applications

- Professional Audio Equipments
- Pre-amplification and Filtering
- Transducer Amplifier

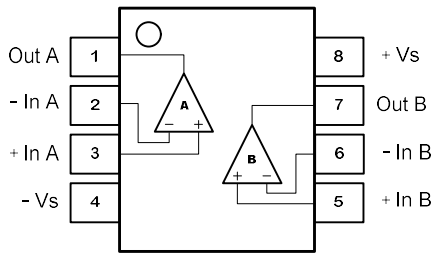
Description

The TP4580 is a dual operational amplifier that has been designed optimally for audio applications.

Featuring low noise, high gain bandwidth, low harmonic distortion, and high output current, all of which make the device ideally suited for acoustic audio electronics, such as audio preamplifiers and active filters, as well as industrial measurement equipment. Due to its wide operating supply voltage, the TP4580 also can be used in low-voltage applications.

Pin Configuration (Top View)

TP4580
8-Pin SOIC/MSOP
(-S and -V Suffixes)



Order Information

Model Name	Order Number	Package	Transport Media, Quantity	Marking Information
TP4580	TP4580-SR	8-Pin SOIC	Tape and Reel, 4,000	4580S
	TP4580-VR	8-Pin MSOP	Tape and Reel, 3,000	4580V

Note (1): 'YW' is date coding scheme. 'Y' stands for calendar year, and 'W' stands for single workweek coding scheme.

Absolute Maximum Ratings Note 1

Supply Voltage: $V^+ - V^-$.....40V
Input Voltage Note 2..... V– – 0.3V to V+ + 0.3V
Input Current: +IN, –IN ..... ±20mA
Output Short-Circuit Duration Note 3..... Indefinite
Current at Supply Pins……..... ±60mA

Operating Temperature Range.....–40°C to 125°C
Maximum Junction Temperature..... 150°C
Storage Temperature Range..... –65°C to 150°C
Lead Temperature (Soldering, 10 sec) ..... 260°C

Note 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.

Note 2: The inputs are protected by ESD protection diodes to each power supply. If the input extends more than 500mV beyond the power supply, the input current should be limited to less than 10mA.

Note 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. 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	MIL-STD-883H Method 3015.8	3	kV
CDM	Charged Device Model ESD	JEDEC-EIA/JESD22-C101E	2	kV

Thermal Resistance

Package Type	θ_{JA}	θ_{JC}	Unit
8-Pin SOIC	158	43	℃/W
8-Pin MSOP	210	45	℃/W

Electrical Characteristics

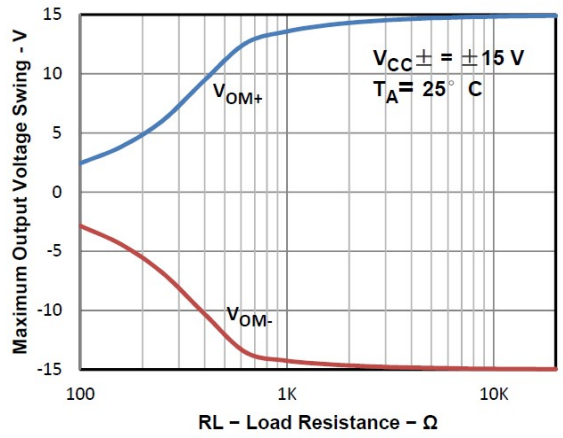
The specifications are at T_A = 27°C. V_S = ±15V, V_{CM} = V_{OUT} =0V, R_L = 100kΩ, C_L =100pF.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OS}	Input Offset Voltage	V_{CM} = V_{DD}/2	-6.0	±0.5	+6.0	mV
Ib	Input Bias Current			1		pA
I_{OS}	Input Offset Current			1		pA
V_N	Input Noise Voltage	f = 20Hz to 20KHz		1.2		μV_{RMS}
e_N	Input Noise Voltage Density	f = 1KHz		12		nV/ √ Hz
PSRR	Power Supply Rejection Ratio		80	110		dB
CMRR	Common Mode Rejection Ratio	Vcm = -14.5V to 13V	80	110		dB
V_{CM}	Common-mode Input Voltage Range		±12	±13.5		V
V_{OM}	Output Swing from Supply Rail	R_{LOAD} = 100kΩ	±14.5	±14.9		V
I_{SC}	Output Short-Circuit Current	Sink or Source current		25		mA
V_S	Supply Voltage		3.5		36	V
I_Q	Quiescent Current per Amplifier			2		mA
GBWP	Gain-Bandwidth Product	f = 1kHz		12		MHz
SR	Slew Rate	A_V = 1, V_{OUT} = 0V to 10V, C_{LOAD} = 100pF, R_{LOAD} = 100kΩ		6		V/μs
t_S	Settling Time, 0.1% Settling Time, 0.01%	A_V = –1, 10V Step		1.5 1.6		μs
THD+N	Total Harmonic Distortion and Noise	f = 1kHz, A_V =10, R_L = 1kΩ, V_{OUT} = 3.5V_{RMS}		0.001		%
X_{talk}	Channel Separation	f = 1kHz, R_L = 1kΩ		100		dB

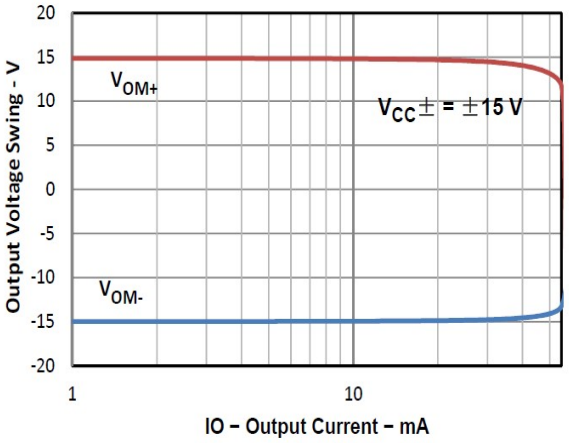
Typical Performance Characteristics

(The specifications are at T_A = 27°C. V_S = ±15V, V_{CM} = V_{OUT} =0V, R_L = 100kΩ, C_L =100pF)

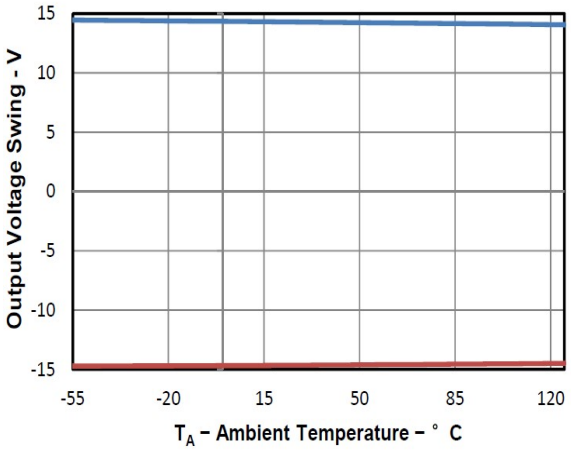
Maximum Output Voltage Swing vs. Load Resistance



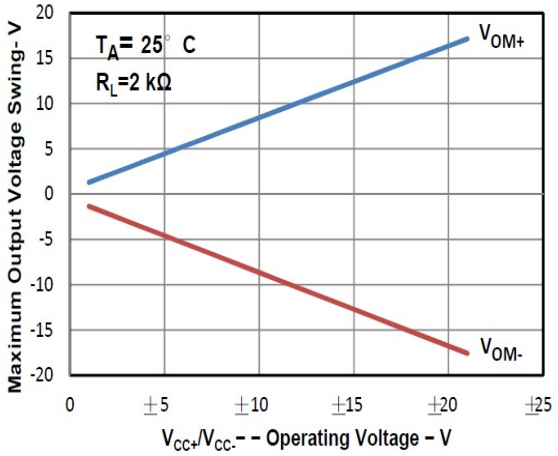
Output Voltage Swing vs. Output Current



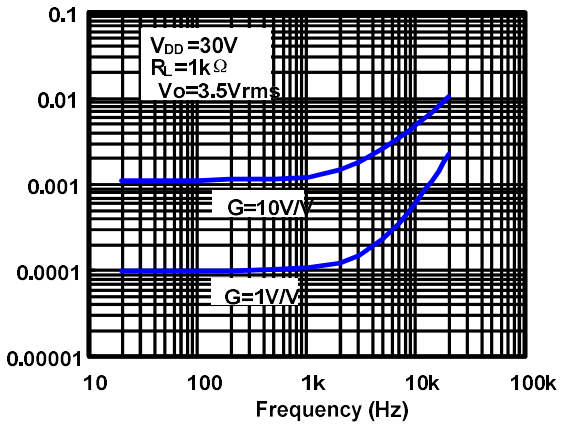
Output Voltage Swing vs. Temperature



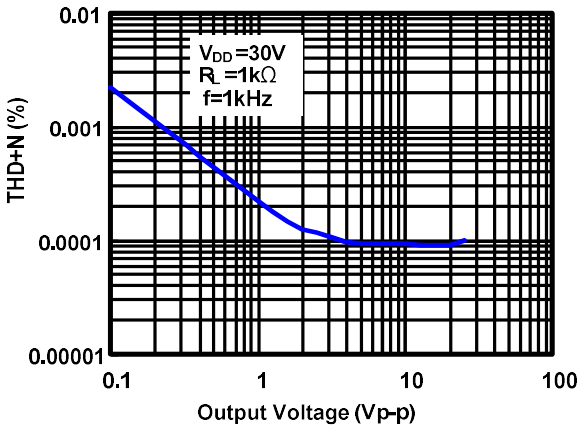
Maximum Output Voltage Swing vs. Operating Voltage



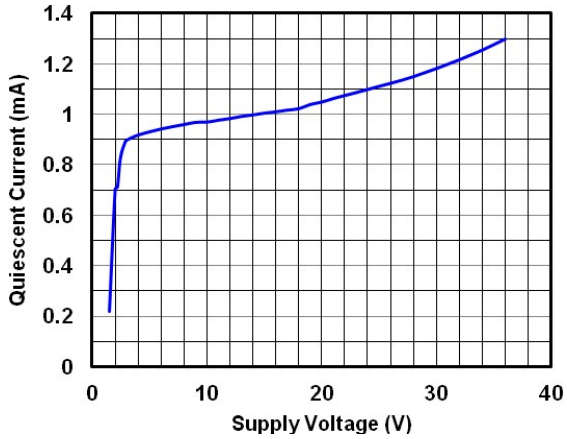
Total Harmonic Distortion + Noise vs. Frequency



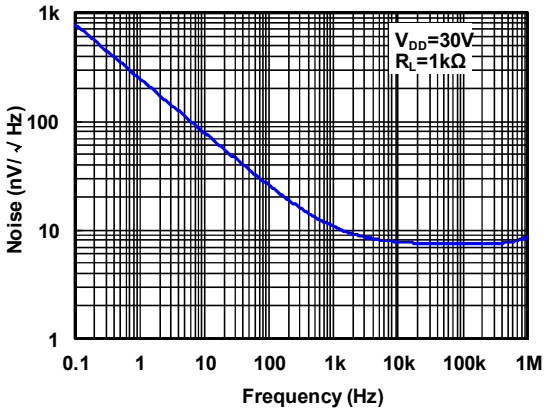
Total Harmonic Distortion + Noise vs. Output Voltage



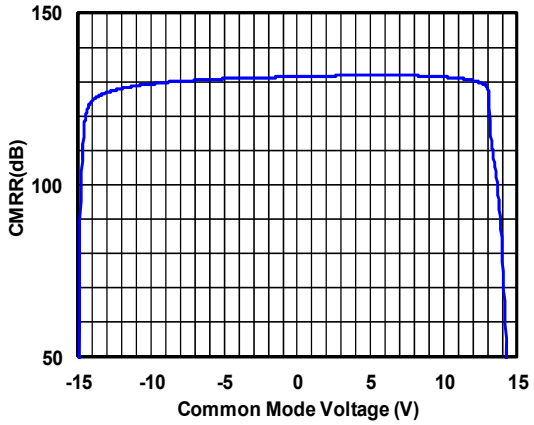
Quiescent Current vs. Supply Voltage



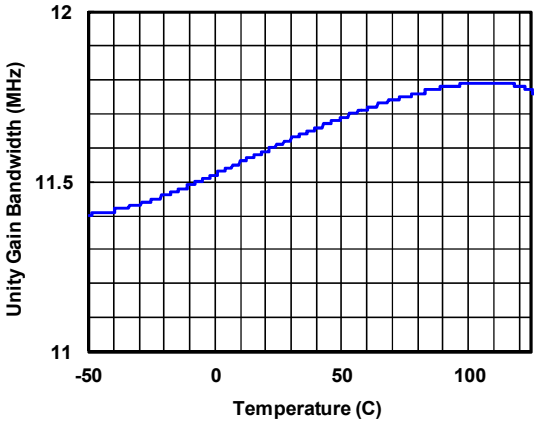
Input Voltage Noise Spectral Density



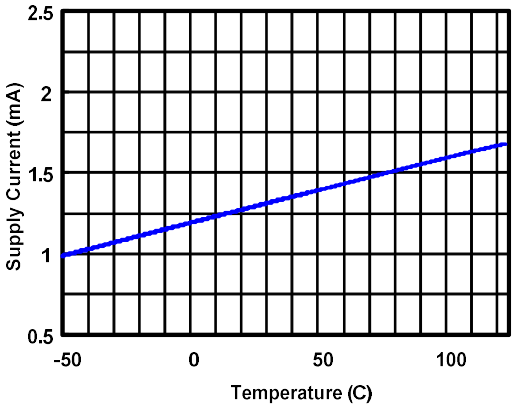
Common Mode Rejection Ratio



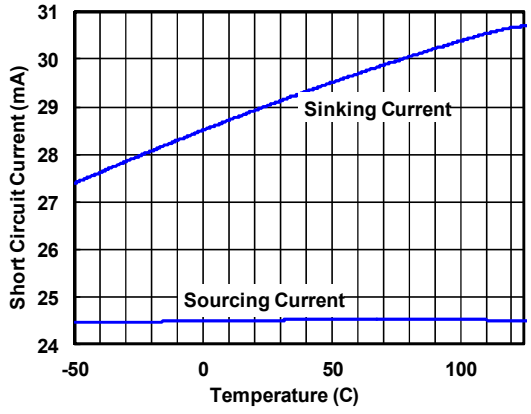
Unity Gain Bandwidth vs. Temperature



Quiescent Current vs. Temperature



Short Circuit Current vs. Temperature



Pin Functions

-IN: Inverting Input of the Amplifier. Voltage range of this pin can go from V^- to (V^+ - 2.0V).

+IN: Non-Inverting Input of Amplifier. This pin has the same voltage range as –IN.

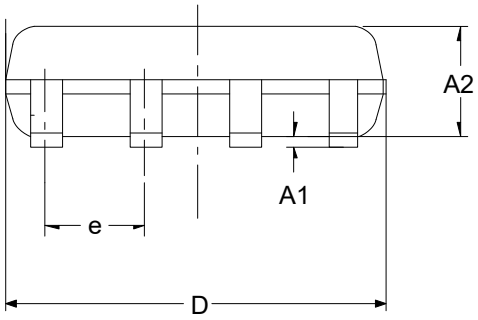
OUT: Amplifier Output. The voltage range extends to within milli-volts of each supply rail.

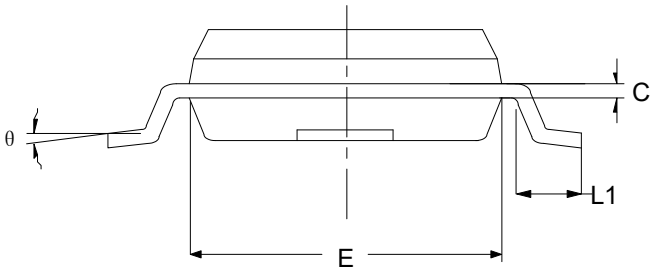
V+ or $+V_S$: Positive Power Supply. Typically the voltage is from 3.5V to 36V. Split supplies are possible as long as the voltage between V+ and V– is between 3.5V and 36V. A bypass capacitor of 0.1µF as close to the part as possible should be used between power supply pins or between supply pins and ground.

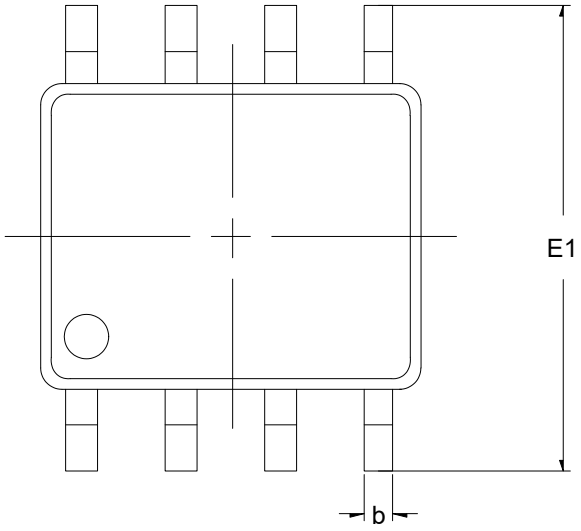
V^- or ^-V_S: Negative Power Supply. It is normally tied to ground. It can also be tied to a voltage other than ground as long as the voltage between V^+ and V^- is from 3.5V to 36V. If it is not connected to ground, bypass it with a capacitor of 0.1µF as close to the part as possible.

Package Outline Dimensions

SO-8 (SOIC-8)



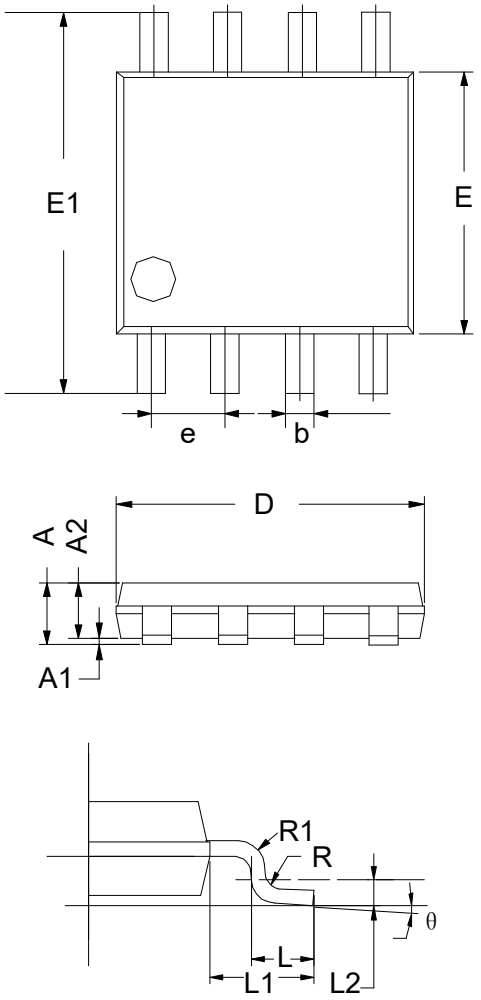




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270 TYP		0.050 TYP	
L1	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Package Outline Dimensions

MSOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L1	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°