

Features

- Supply Voltage: 2.7 V to 5.5 V
- Offset Voltage: ± 2 mV (Max)
- Bandwidth: 10 MHz; Slew Rate: 8 V/ μ s
- Low Power: 1.2 mA per Channel
- Rail-to-Rail Input and Output
- Low 1/f Noise: 10 nV/ $\sqrt{\text{Hz}}$ at 1 kHz
- No Significant Output Glitch during Power-on and Power-off
- Operating Temperature Range: -40°C to 125°C

Applications

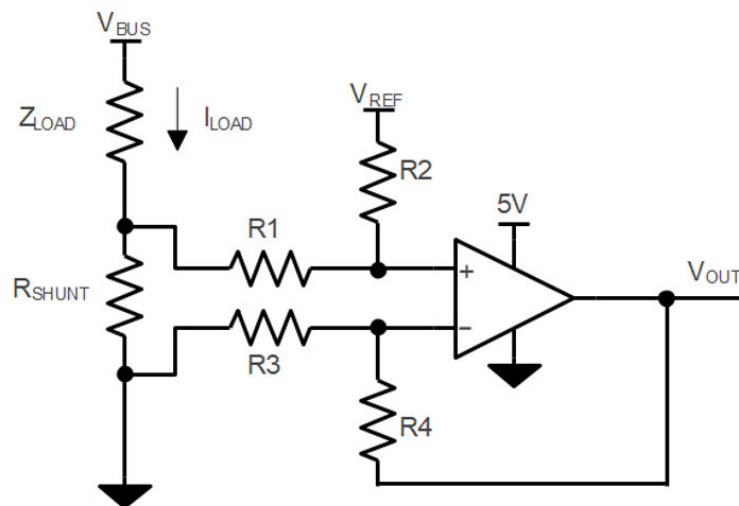
- Instrumentation
- Audio
- Motor Control
- Industrial Control

Description

The TPA658x is a series of CMOS single, dual, and quad RRIO operational amplifiers with low offset, low power, and stable high-frequency response. It incorporates 3PEAK's proprietary and patented design techniques to achieve high-performance AC with a 10-MHz bandwidth, an 8-V/ μ s slew rate, and low distortion while drawing a quiescent current of only 1.2 mA per amplifier. The TPA658x series is suitable for audio and motor control applications.

The TPA658x series has isolation during power-off even when the signal exits on the input pins as there is no ESD diode from the input pins to the positive power supply pin.

Typical Application Circuit



$$V_{\text{OUT}} = (I_{\text{LOAD}} \times R_{\text{SHUNT}}) \times (R_2 / R_1) + V_{\text{REF}}$$

$$\text{When } R_3 = R_1, R_2 = R_4, R_{\text{SHUNT}} \ll R_1$$

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Revision History

Date	Revision	Notes
2021-11-20	Rev.A.0	Initial version.
2022-04-30	Rev.A.1	Updated the format of Package Outline Dimensions, and there is no change on the products.
2023-03-05	Rev.A.2	Updated the status of the part number.
2023-06-23	Rev.A.3	Updated the POD of DFN2×2-8. Adjusted some of the POD specifications.
2023-06-23	Rev.A.4	Updated the POD and the pin configuration of DFN0.8×0.8-4.
2023-12-20	Rev.A.5	Updated the typical characteristics.
2024-12-18	Rev.A.6	The following updates are all about the new datasheet formats or typos, and the actual product remains unchanged. <ul style="list-style-type: none">• Updated to a new datasheet format.• Updated the Tape and Reel Information of TPA6582-DF4R.

Pin Configuration and Functions

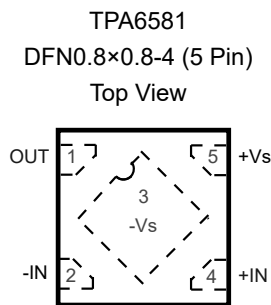
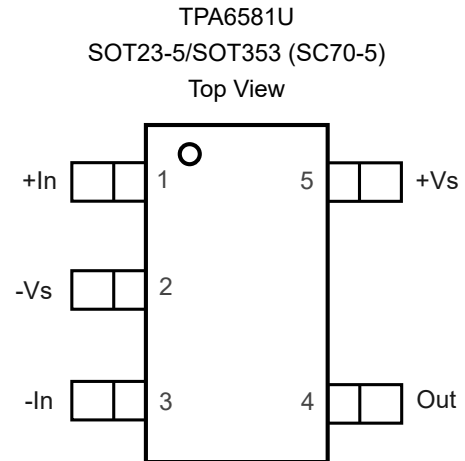
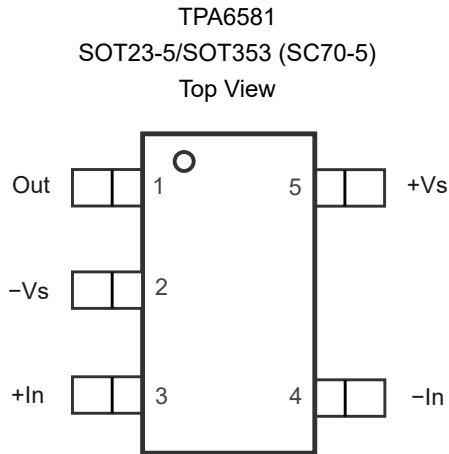
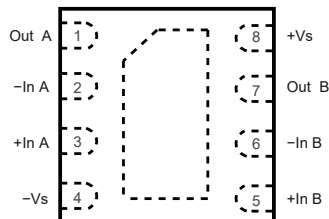
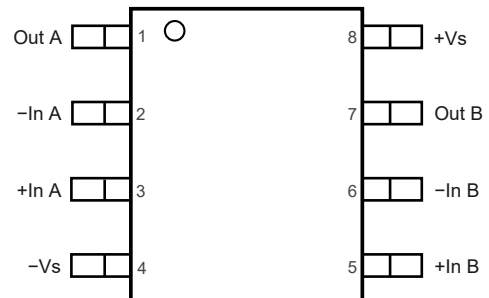


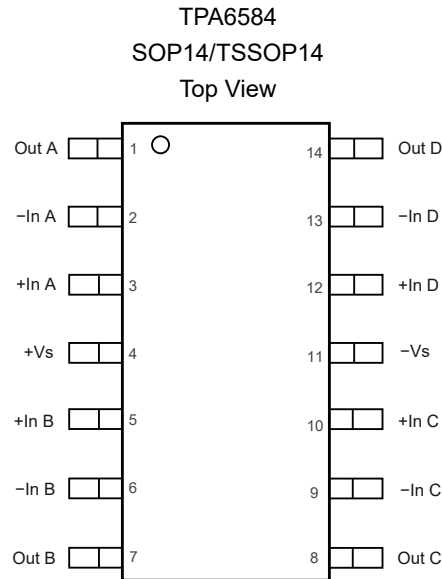
Table 1. Pin Functions: TPA6581, TPA6581U

Pin No.			Name	I/O	Description
TPA6581		TPA6581U			
SOT23-5 /SOT353	DFN0.8×0.8-4 (5 Pin)	SOT23-5 /SOT353			
1	1	4	Out	O	Output
2	3	2	-Vs		Negative power supply
3	4	1	+In	I	Non-inverting input
4	2	3	-In	I	Inverting input
5	5	5	+Vs		Positive power supply

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 TPA6582
 DFN2x2-8
 Top View

 TPA6582
 SOP8/TSSOP8/MSOP8
 Top View

Table 2. Pin Functions: TPA6582

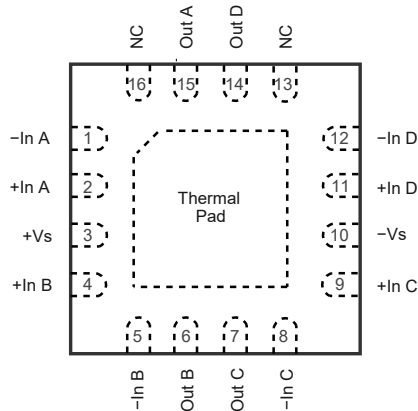
Pin No.	Name	I/O	Description
1	Out A	O	Output
2	-In A	I	Inverting input
3	+In A	I	Non-inverting input
4	-Vs		Negative power supply
5	+In B	I	Non-inverting input
6	-In B	I	Inverting input
7	Out B	O	Output
8	+Vs		Positive power supply


Table 3. Pin Functions: TPA6584

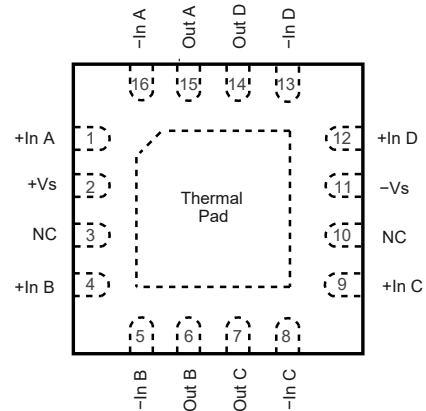
Pin No.	Name	I/O	Description
1	Out A	O	Output
2	-In A	I	Inverting input
3	+In A	I	Non-inverting input
4	+V _S		Positive power supply
5	+In B	I	Non-inverting input
6	-In B	I	Inverting input
7	Out B	O	Output power supply
8	Out C	O	Output power supply
9	-In C	I	Inverting input
10	+In C	I	Non-inverting input
11	-V _S		Negative power supply
12	+In D	I	Non-inverting input
13	-In D	I	Inverting input
14	Out D	O	Output power supply

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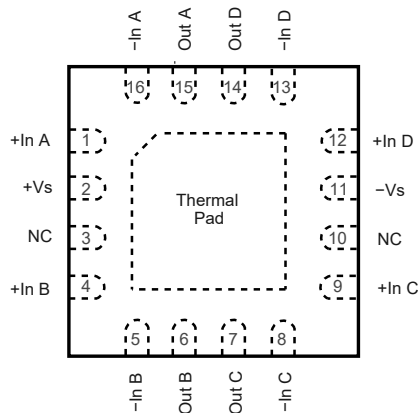
TPA6584
QFN3x3-16
Top View



TPA6584U
QFN3x3-16
Top View



TPA6584V
QFN3x3-16
Top View



The thermal pad of the DFN8 and QFN16 packages is recommended to be left float or connected to $-V_s$.

Table 4. Pin Functions: TPA6584, TPA6584U, TPA6584V

Pin No.			Name	I/O	Description
TPA6584	TPA6584U	TPA6584V			
1	16	16	-In A	I	Inverting input
2	1	1	+In A	I	Non-inverting input
3	2	2	+Vs		Positive power supply
4	4	4	+In B	I	Non-inverting input
5	5	5	-In B	I	Inverting input
6	6	6	Out B	O	Output power supply
7	7	7	Out C	O	Output power supply

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Pin No.			Name	I/O	Description
TPA6584	TPA6584U	TPA6584V			
8	8	8	-In C	I	Inverting input
9	9	9	+In C	I	Non-inverting input
10	11	11	-Vs		Negative power supply
11	12	12	+In D	I	Non-inverting input
12	13	13	-In D	I	Inverting input
13, 16	3, 10	3, 10	NC		No connection
14	14	14	Out D	O	Output power supply
15	15	15	Out A	O	Output power supply

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier

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)		6.5	V
	Input Voltage	(–V _S) – 0.3	6.5	V
	Differential Input Voltage	(–V _S) – (+V _S)	(+V _S) – (–V _S)	V
	Input Current: +I _N , –I _N ⁽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 the negative 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⁾	3	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)	2.7		5.5	V
T _A	Operating Temperature Range	–40		125	°C

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT353 (SC70-5)	400	150	°C/W
DFN0.8×0.8-4 (5 Pin)	500	200	°C/W
SOT23-5	250	81	°C/W
SOP8	158	43	°C/W
MSOP8	210	45	°C/W
TSSOP8	191	44	°C/W
DFN1.5×1.5-8	200	100	°C/W
DFN2×2-8	100	60	°C/W
DFN3×3-8	75	54	°C/W
SOP14	120	36	°C/W
TSSOP14	180	35	°C/W

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier
Electrical Characteristics

 All test conditions: $T_A = 25^\circ\text{C}$, $R_L = 10\text{ k}\Omega$, $C_L = 100\text{ pF}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Power Supply						
V_S	Supply Voltage Range		2.7		5.5	V
I_Q	Quiescent Current per Amplifier	$V_S = 2.7\text{ V to }5.5\text{ V}$		1.2	1.5	mA
		$V_S = 2.7\text{ V to }5.5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$			1.8	mA
PSRR	Power Supply Rejection Ratio	$V_S = 2.7\text{ V to }5.5\text{ V}$	90	120		dB
		$V_S = 2.7\text{ V to }5.5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$	85			dB
Input Characteristics						
V_{OS}	Input Offset Voltage	$V_{CM} = 0\text{ V to }2.5\text{ V}$	-2	0.1	2	mV
		$V_{CM} = 0\text{ V to }2.5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$	-2.5		2.5	mV
		$V_{CM} = 3.5\text{ V to }5\text{ V}$	-3	0.1	3	mV
		$V_{CM} = 3.5\text{ V to }5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$	-4		4	mV
$V_{OS\ TC}$	Input Offset Voltage Drift	$V_{CM} = 0\text{ V to }2.5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$		0.1	2	$\mu\text{V}/^\circ\text{C}$
		$V_{CM} = 3.5\text{ V to }5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$		0.3	5	$\mu\text{V}/^\circ\text{C}$
I_B	Input Bias Current	$V_{CM} = 2.5\text{ V}$		10		pA
		$V_{CM} = 2.5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$		100		pA
I_{OS}	Input Offset Current	$V_{CM} = 2.5\text{ V}$		10		pA
		$V_{CM} = 2.5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$		100		pA
C_{IN}	Input Capacitance	Differential Mode		2		pF
		Common Mode		4		pF
A_V	Open-Loop Voltage Gain	$V_O = 0.1\text{ V to }4.9\text{ V}$	100	120		dB
		$V_O = 0.1\text{ V to }4.9\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$	90			dB
V_{CMR}	Common-Mode Input Voltage Range	$T_A = -40^\circ\text{C to }125^\circ\text{C}$	$(-V_S)$ - 0.1		$(+V_S)$ + 0.1	V
CMRR	Common-Mode Rejection Ratio	$V_{CM} = 0\text{ V to }3.5\text{ V}$	70	90		dB
		$V_{CM} = 0\text{ V to }3.5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$	60			dB
		$V_{CM} = 0\text{ V to }5\text{ V}$	60	80		dB

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_{CM} = 0\text{ V to }5\text{ V}$, $T_A = -40^\circ\text{C to }125^\circ\text{C}$	55			dB
Output Characteristics						
	Output Voltage Swing from Positive Rail or Negative Rail	$V_S = 5.5\text{ V}$, $R_L = 10\text{ k}\Omega$ to $V_S / 2$		3	10	mV
		$V_S = 5.5\text{ V}$, $R_L = 10\text{ k}\Omega$ to $V_S / 2$ $T_A = -40^\circ\text{C to }125^\circ\text{C}$			15	mV
		$V_S = 5.5\text{ V}$, $R_L = 2\text{ k}\Omega$ to $V_S / 2$		15	30	mV
		$V_S = 5.5\text{ V}$, $R_L = 10\text{ k}\Omega$ to $V_S / 2$ $T_A = -40^\circ\text{C to }125^\circ\text{C}$			40	mV

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier
Electrical Characteristics (Continued)

 All test conditions: $V_S = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $R_L = 10\text{ k}\Omega$, $C_L = 100\text{ pF}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{sc}	Output Short-Circuit Current	$V_S = 5.5\text{ V}$, Source	110	135		mA
		$V_S = 5.5\text{ V}$, Source, $T_A = -40^\circ\text{C}$ to 125°C	80			mA
		$V_S = 5.5\text{ V}$, Sink	100	120		mA
		$V_S = 5.5\text{ V}$, Sink, $T_A = -40^\circ\text{C}$ to 125°C	70			mA
AC Specifications						
GBW	Gain-Bandwidth Product			10		MHz
SR	Slew Rate	$G = 1$, 2-V Step	6	8		V/ μs
t _{OR}	Overload Recovery			400		ns
t _s	Settling Time, 0.1%	$G = 1$, 2-V Step		200		ns
	Settling Time, 0.01%			250		ns
PM	Phase Margin	$R_L = 10\text{ k}\Omega$, $C_L = 100\text{ pF}$		40		°
GM	Gain Margin	$R_L = 10\text{ k}\Omega$, $C_L = 100\text{ pF}$		8		dB
	Channel Separation	$f = 100\text{ kHz}$		120		dB
Noise Performance						
E _N	Input Voltage Noise	$f = 0.1\text{ Hz}$ to 10 Hz , $V_{CM} = 1\text{ V}$		0.3		μV_{RMS}
		$f = 0.1\text{ Hz}$ to 10 Hz , $V_{CM} = 4\text{ V}$		1		μV_{RMS}
e _N	Input Voltage Noise Density	$f = 1\text{ kHz}$, $V_{CM} = 1\text{ V}$		10		nV/ $\sqrt{\text{Hz}}$
		$f = 1\text{ kHz}$, $V_{CM} = 4\text{ V}$		33		nV/ $\sqrt{\text{Hz}}$
i _N	Input Current Noise	$f = 1\text{ kHz}$		20		fA/ $\sqrt{\text{Hz}}$
THD+N	Total Harmonic Distortion and Noise	$f = 1\text{ kHz}$, $G = 1$, $R_L = 10\text{ k}\Omega$, $V_{OUT} = 1\text{ V}_{RMS}$		0.001		%

Typical Performance Characteristics

All test conditions: $V_S = 5\text{ V}$, $T_A = +25^\circ\text{C}$, the tested device is the TPA6581-DF0R, unless otherwise noted.

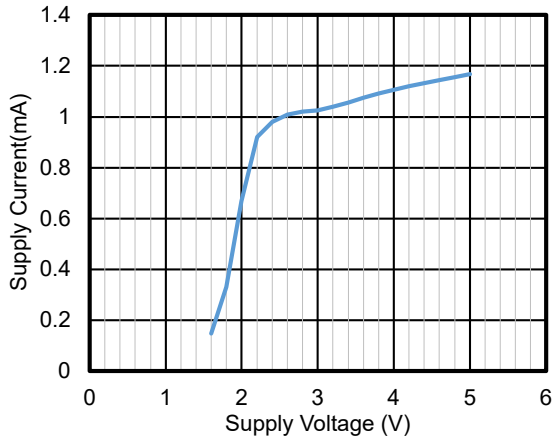


Figure 1. Supply Current vs. Supply Voltage

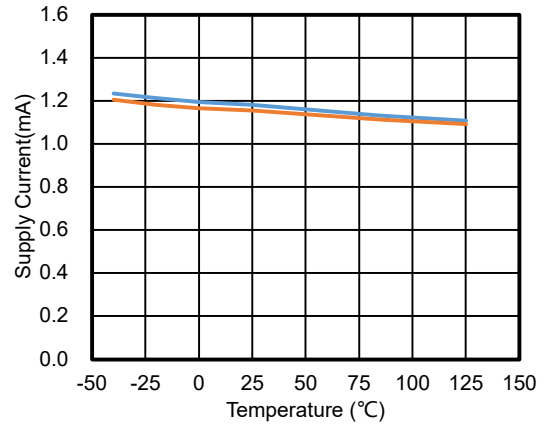


Figure 2. Supply Current vs. Temperature

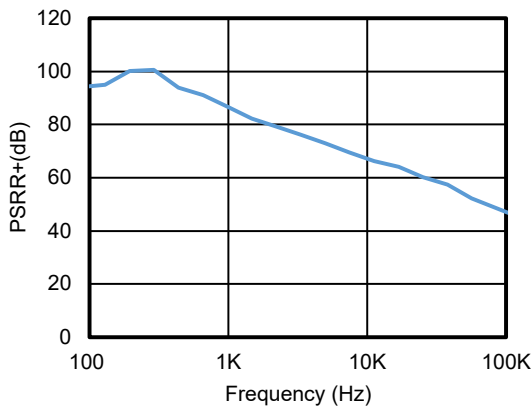


Figure 3. PSRR+ vs. Frequency

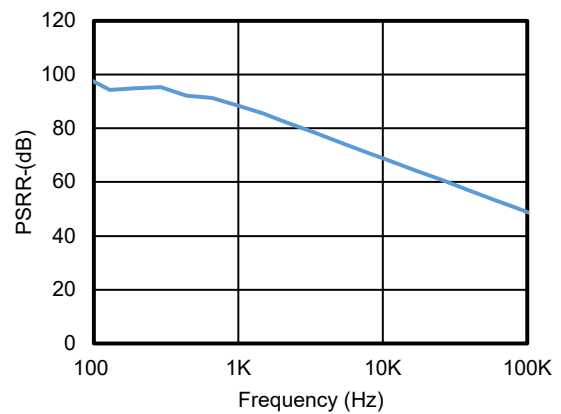


Figure 4. PSRR- vs. Frequency

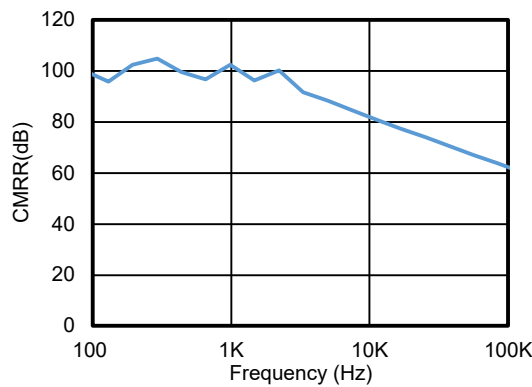


Figure 5. CMRR vs. Frequency

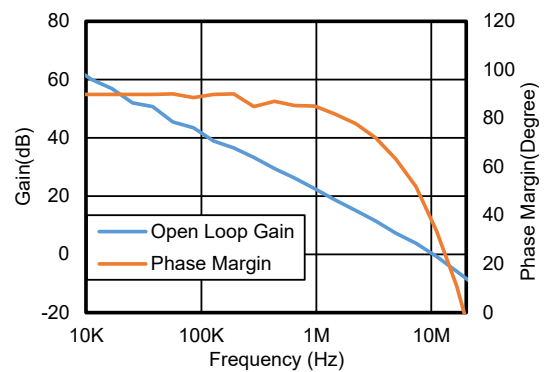


Figure 6. Open-Loop Gain and Phase Margin vs. Frequency, $R_L = 10\text{ k}\Omega$, $C_L = 100\text{ pF}$

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier

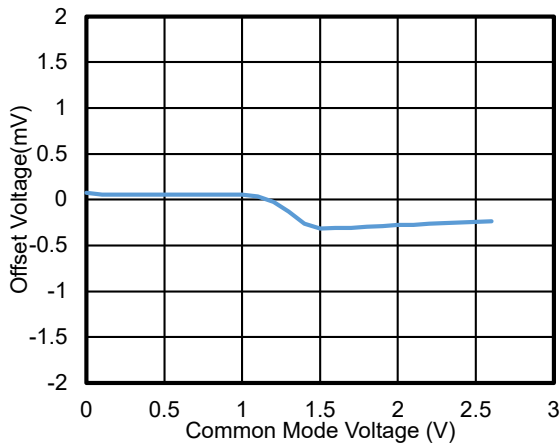


Figure 7. V_{OS} vs. V_{CM} , $V_S = 2.7\text{ V}$

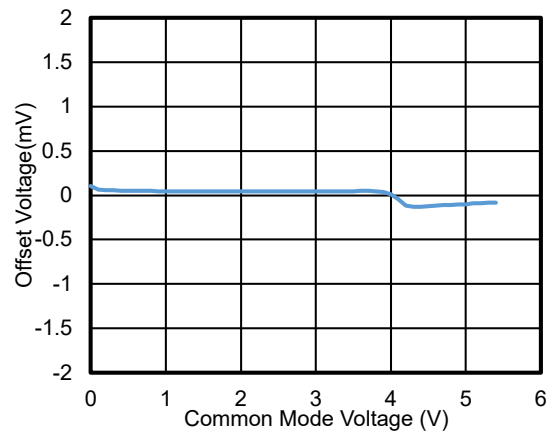


Figure 8. V_{OS} vs. V_{CM} , $V_S = 5.5\text{ V}$

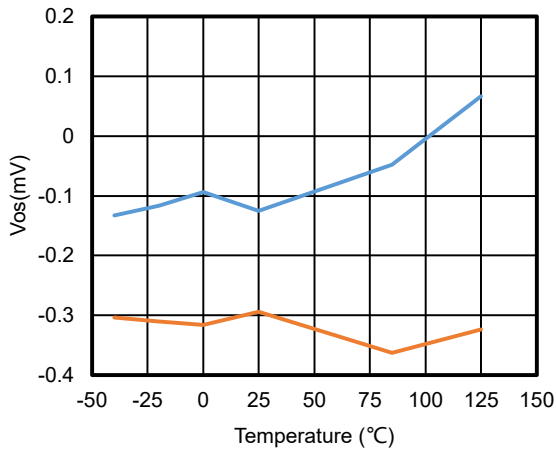


Figure 9. V_{OS} vs. Temperature

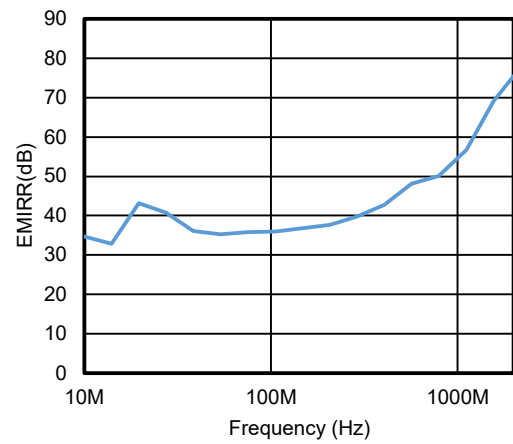


Figure 10. EMIRR vs. Frequency

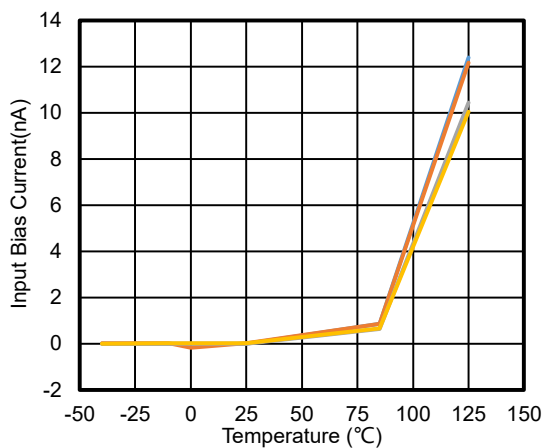


Figure 11. I_B vs. Temperature

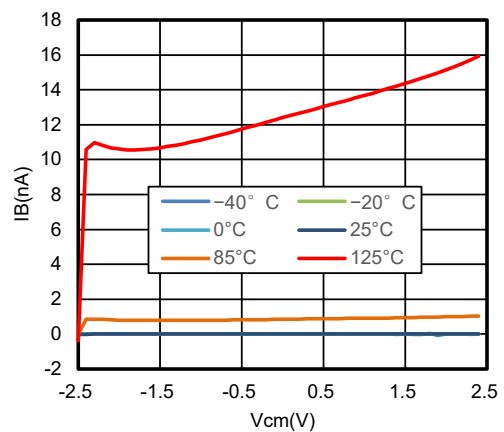


Figure 12. I_B vs. Common Voltage, $(-V_S) = -2.5\text{ V}$, $(+V_S) = 2.5\text{ V}$

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier

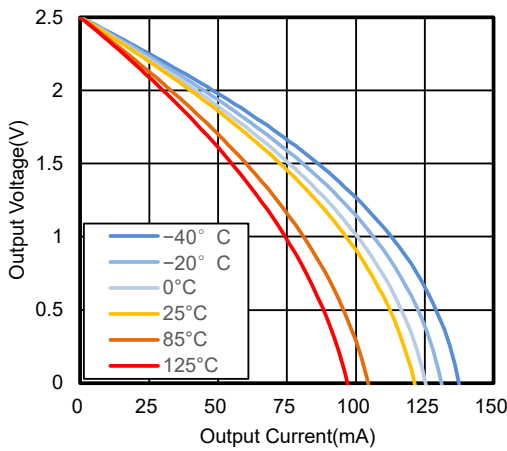


Figure 13. Output Voltage vs. Output Current, $(-V_S) = -2.5\text{ V}$, $(+V_S) = 2.5\text{ V}$

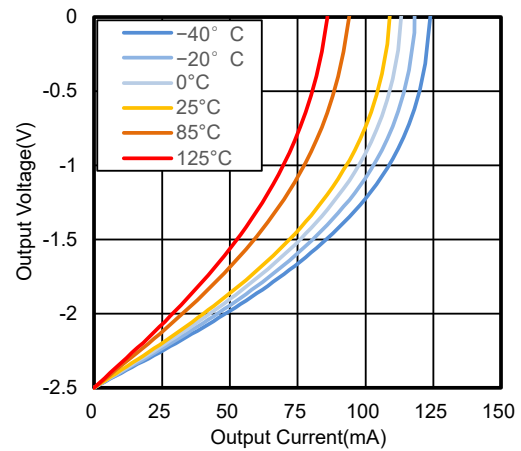


Figure 14. Output Voltage vs. Output Current, $(-V_S) = -2.5\text{ V}$, $(+V_S) = 2.5\text{ V}$



Figure 15. Overload Recovery at Negative Rail



Figure 16. Overload Recovery at Positive Rail



Figure 17. Small-Signal Step Response



Figure 18. Large-Signal Step Response

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier

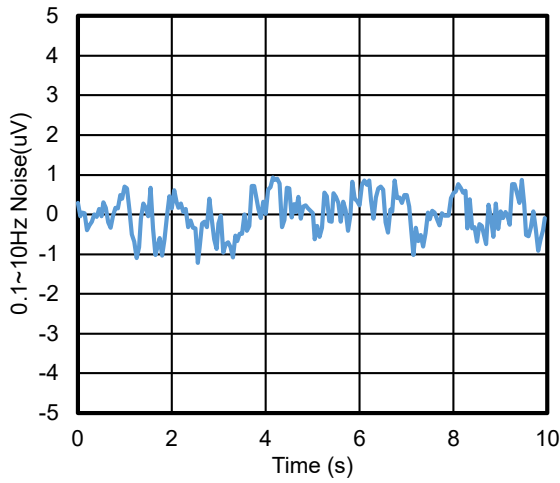


Figure 19. 0.1-Hz to 10-Hz Voltage Noise, $V_{CM} = 1\text{ V}$

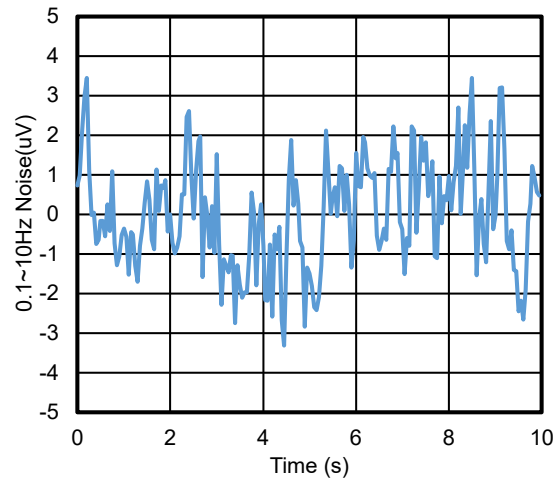


Figure 20. 0.1-Hz to 10-Hz Voltage Noise, $V_{CM} = 4\text{ V}$

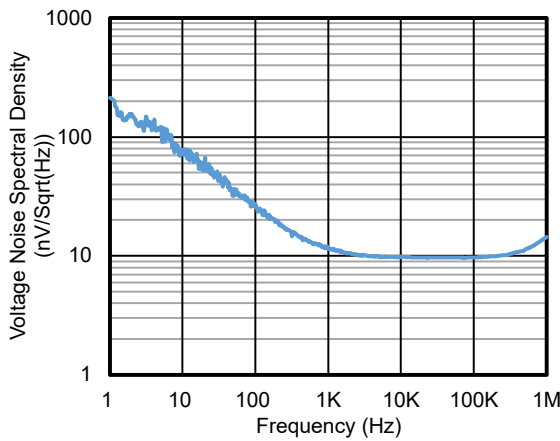


Figure 21. Voltage Noise Spectral Density vs. Frequency, $V_{CM} = 1\text{ V}$

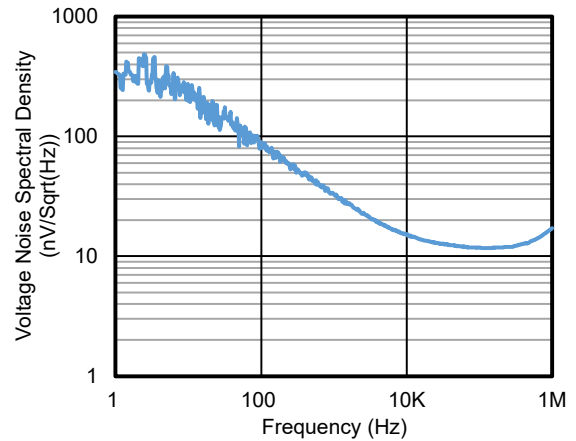


Figure 22. Voltage Noise Spectral Density vs. Frequency, $V_{CM} = 4\text{ V}$

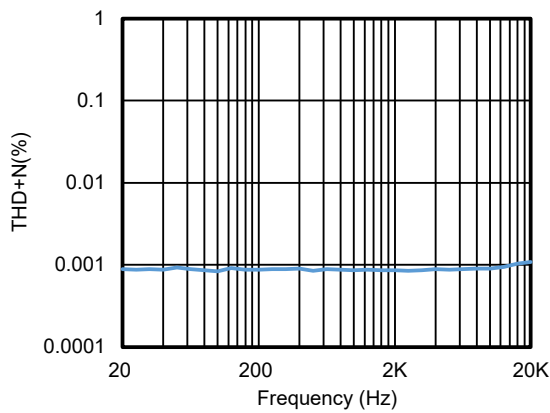


Figure 23. THD vs. Frequency, $G = 1$, $V_{IN} = 1\text{ V}_{RMS}$

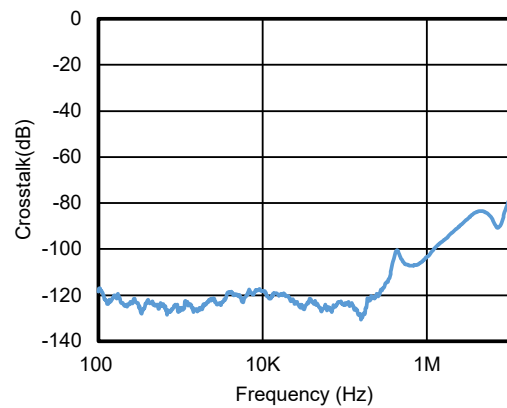


Figure 24. Crosstalk vs. Frequency, TPA6582

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier



Figure 25. Power On and Off Behavior

$G = 1$, $V_{IN} = 4\text{ V}$ during power-on and power-off;
Yellow: $+V_S$; Green: Output

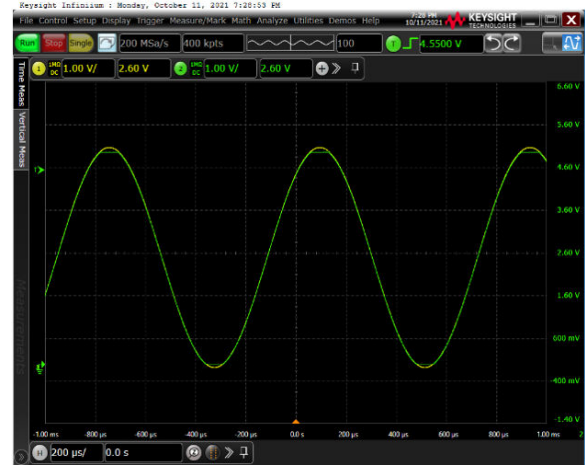


Figure 26. No Phase Reversal

Yellow: Input; Green: Output

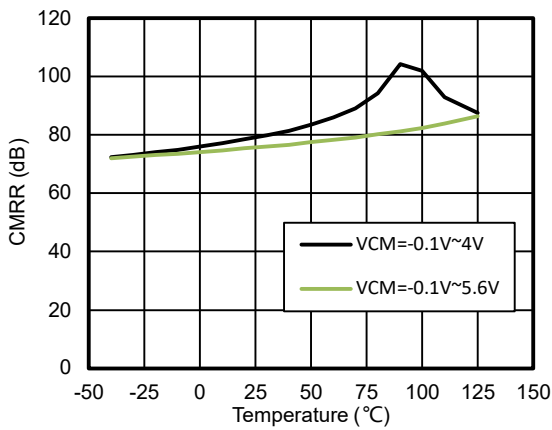


Figure 27. CMRR vs. Temperature, $R_L = 600\ \Omega$

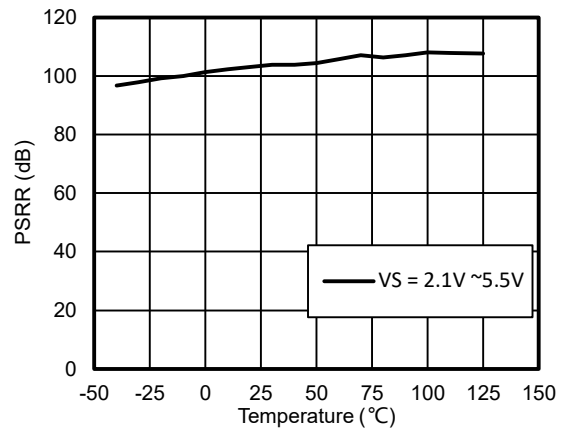


Figure 28. PSRR vs. Temperature, $R_L = 600\ \Omega$

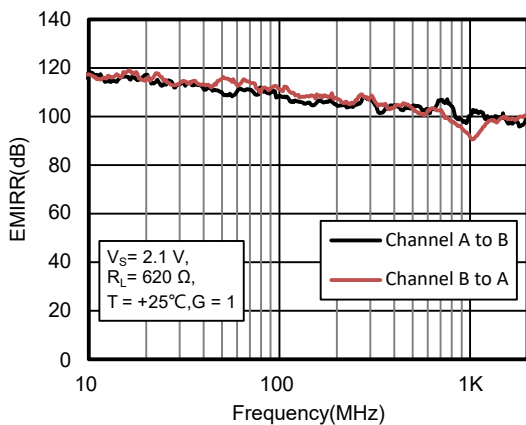


Figure 29. Channel Separation vs. Frequency

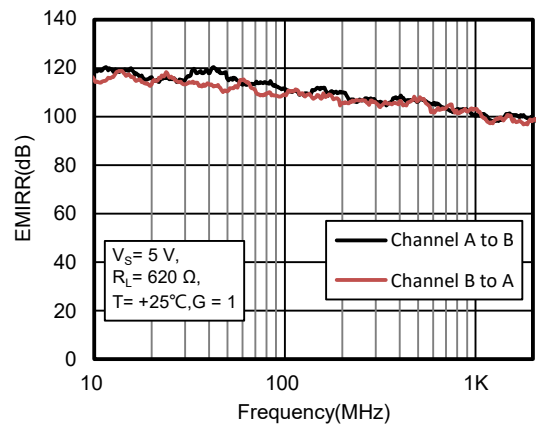
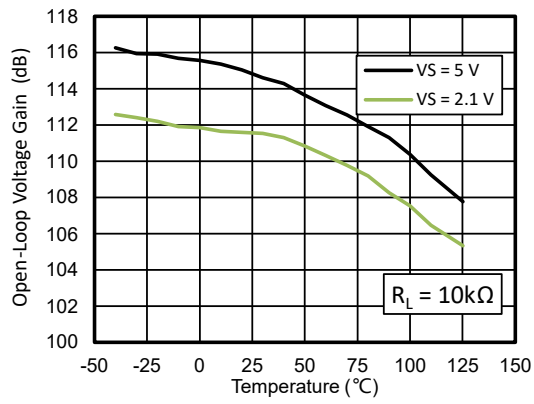


Figure 30. Channel Separation vs. Frequency

5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier**Figure 31. Open-Loop Voltage Gain vs. Temperature**

Detailed Description

Overview

The TPA658x is a series of low-power, rail-to-rail input and output operational amplifiers. The series operates from 2.7 V to 5.5 V, and is unity-gain stable and designed for a wide range of general-purpose applications.

Functional Block Diagram

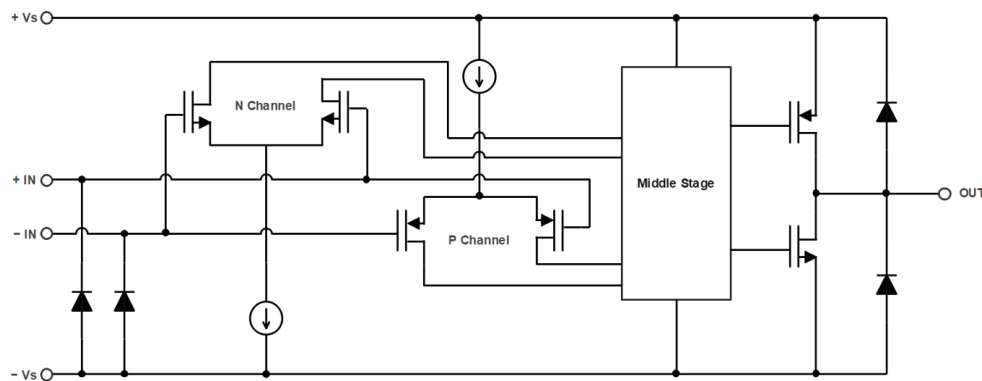


Figure 32. Functional Block Diagram

Feature Description

Operating Voltage

The TPA658x series is designed for the single-supply operation from 2.7 V to 5.5 V, or dual-supply operation from ± 1.35 V to ± 2.75 V.

Rail-to-Rail Input

The input common-mode voltage range of the TPA658x series extends 100 mV beyond the supply rails. This performance is achieved with a complementary input stage: a P-channel input differential pair in parallel with an N-channel differential pair. The P-channel pair is active for inputs from 100 mV below the negative supply to approximately $(+V_S) - 1.5$ V, whereas the N-channel pair is active for input voltages close to the positive rail, typically $(+V_S) - 1.5$ V to 100 mV above the positive supply. There is an around 200-mV transition region at $(+V_S) - 1.5$ V where both pairs are on. Within this transition region, PSRR, CMRR, offset voltage, offset drift, and THD can degrade comparing to that operating outside this region.

Rail-to-Rail Output

The TPA658x series delivers rail-to-rail output swing capability with a class-AB output stage. Different load conditions change the ability of the amplifier to swing close to the rails.

No ESD Diode Between Input Pins and +Vs Pin

There is no ESD diode between input pins and the $(+V_S)$ pin, so the voltage at the input pins can be applied from 0 V to 5.5 V regardless of the voltage at the $(+V_S)$ pin. The feature provides isolation when the device is powered off and the signal still exists at the input pin.

Application and Implementation

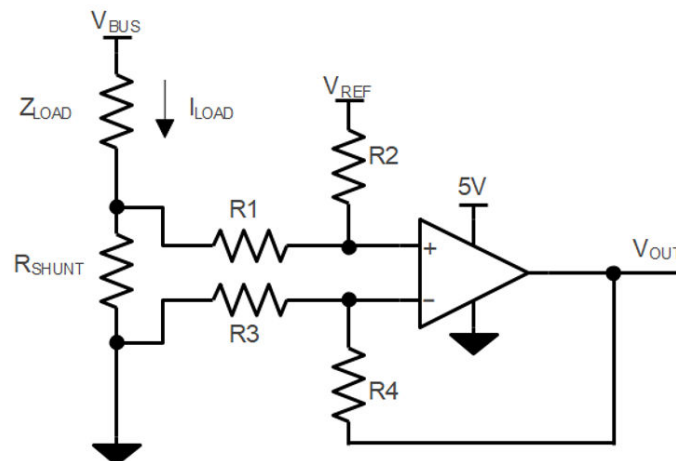
Note

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

Low-Side Current-Sensing Application

Figure 33 shows the TPA658x series is configured in a low-side current sensing application. The low-side current sensing methods consist of placing a sense resistor between the load and the circuit ground. The voltage dropping across the resistor is amplified by different amplifier circuits with the TPA658x series. V_{REF} can be used to add bias voltage to the output voltage. Particular attention must be paid to the matching and precision of R1, R2, R3, and R4, to maximize the accuracy of the measurement.



$$V_{OUT} = (I_{LOAD} \times R_{SHUNT}) \times (R2 / R1) + V_{REF}$$

$$\text{When } R3 = R1, R2 = R4, R_{SHUNT} \ll R1$$

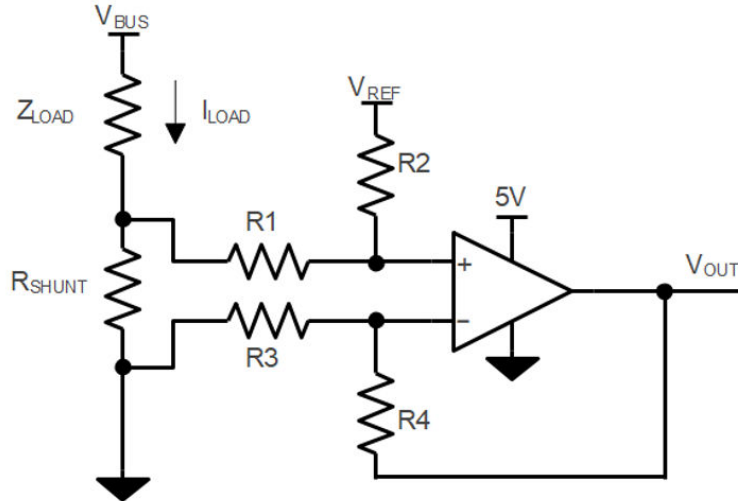
Figure 33. Dual-Supply Operation Connections

Power Supply Recommendations

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

Typical Application

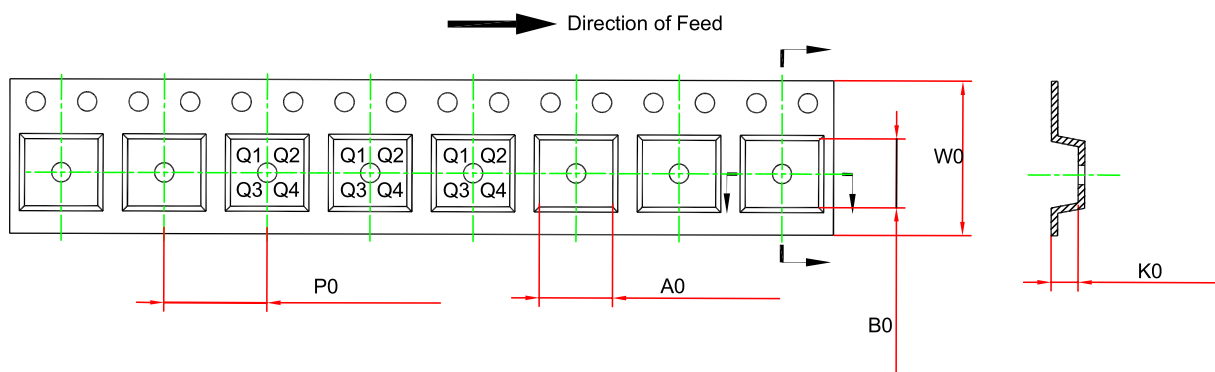
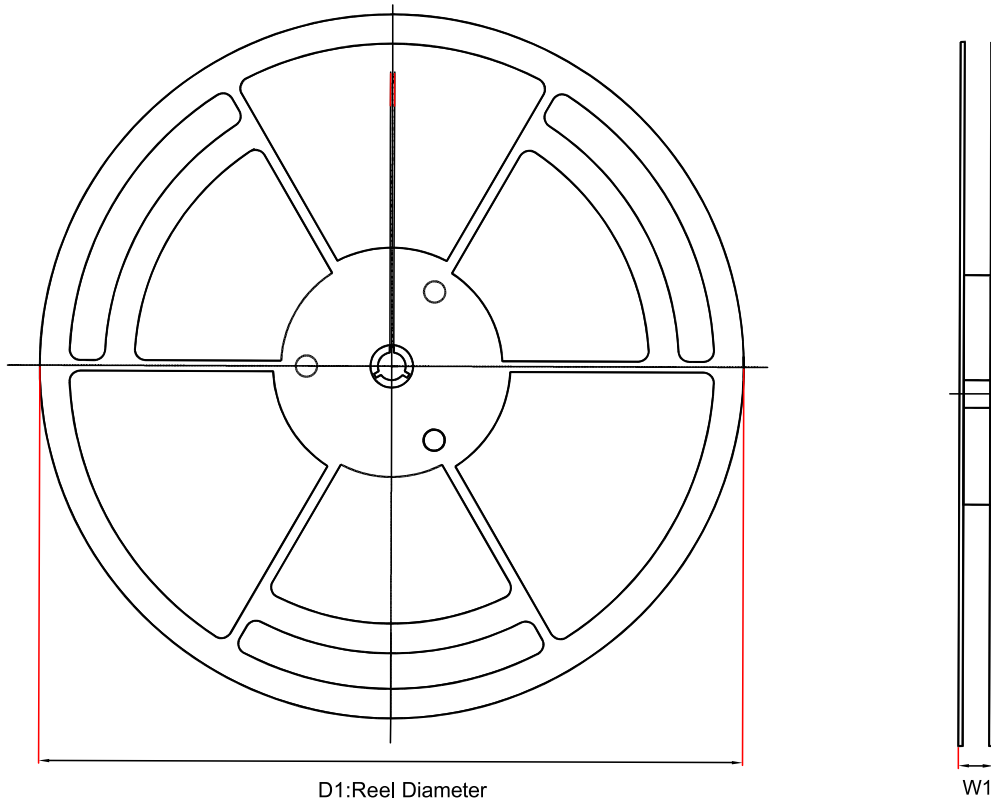
Figure 34 shows the typical application schematic.



$$V_{OUT} = (I_{LOAD} \times R_{SHUNT}) \times (R2 / R1) + V_{REF}$$

When $R3 = R1$, $R2 = R4$, $R_{SHUNT} \ll R1$

Figure 34. Typical Application Circuit

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
TPA6581-DF0R	DFN0.8X0.8-4	180	12.5	0.91	0.91	0.5	2	8	Q2
TPA6581-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPA6581-SC5R	SOT353	178	12.1	2.4	2.5	1.2	4	8	Q3
TPA6581U-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPA6581U-SC5R	SOT353	178	12.1	2.4	2.5	1.2	4	8	Q3
TPA6582-SO1R	SOP8	330	17.6	6.5	5.4	2	8	12	Q1

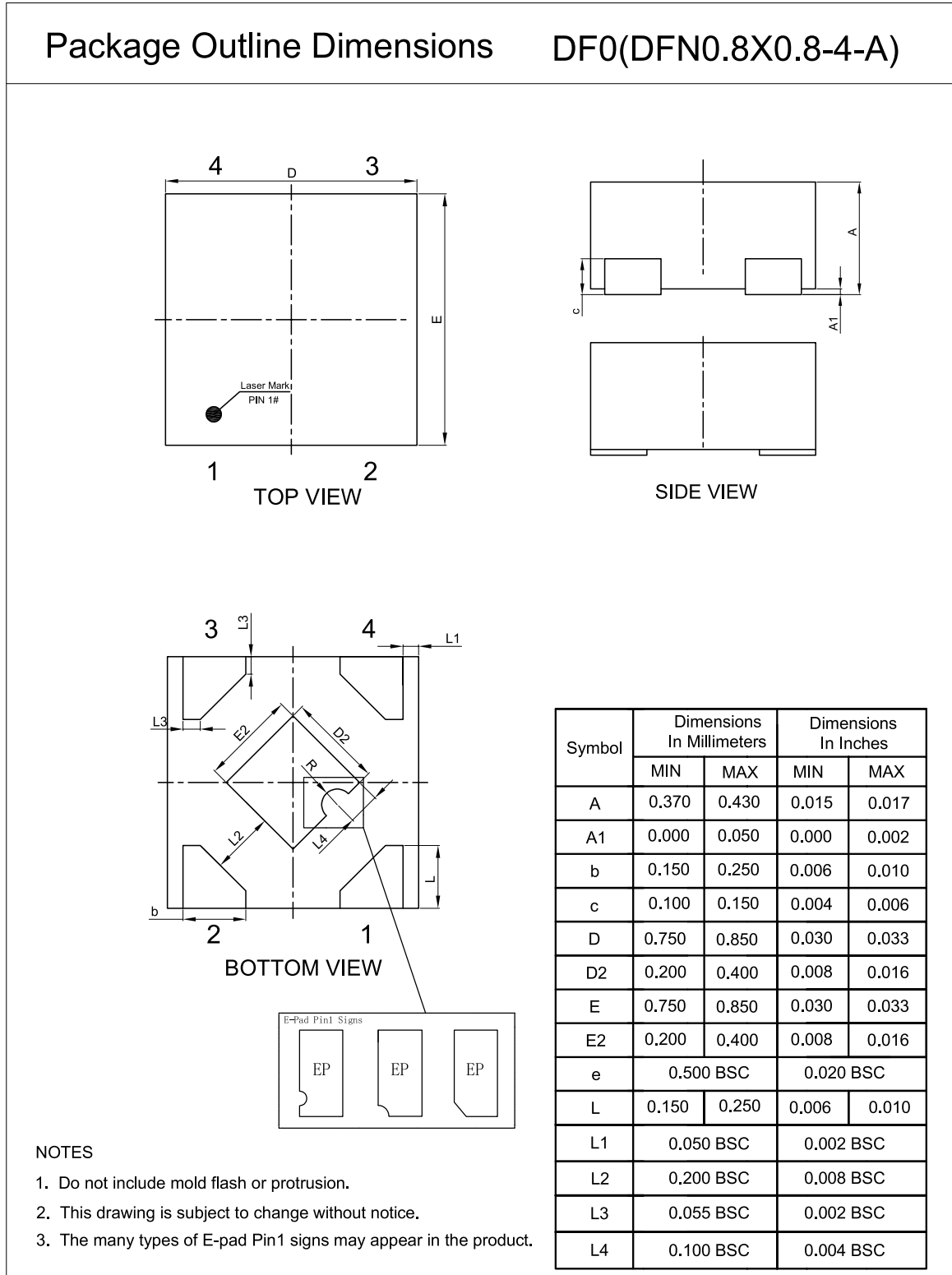
5-V, Rail-to-Rail Input/Output, 10-MHz Operational Amplifier

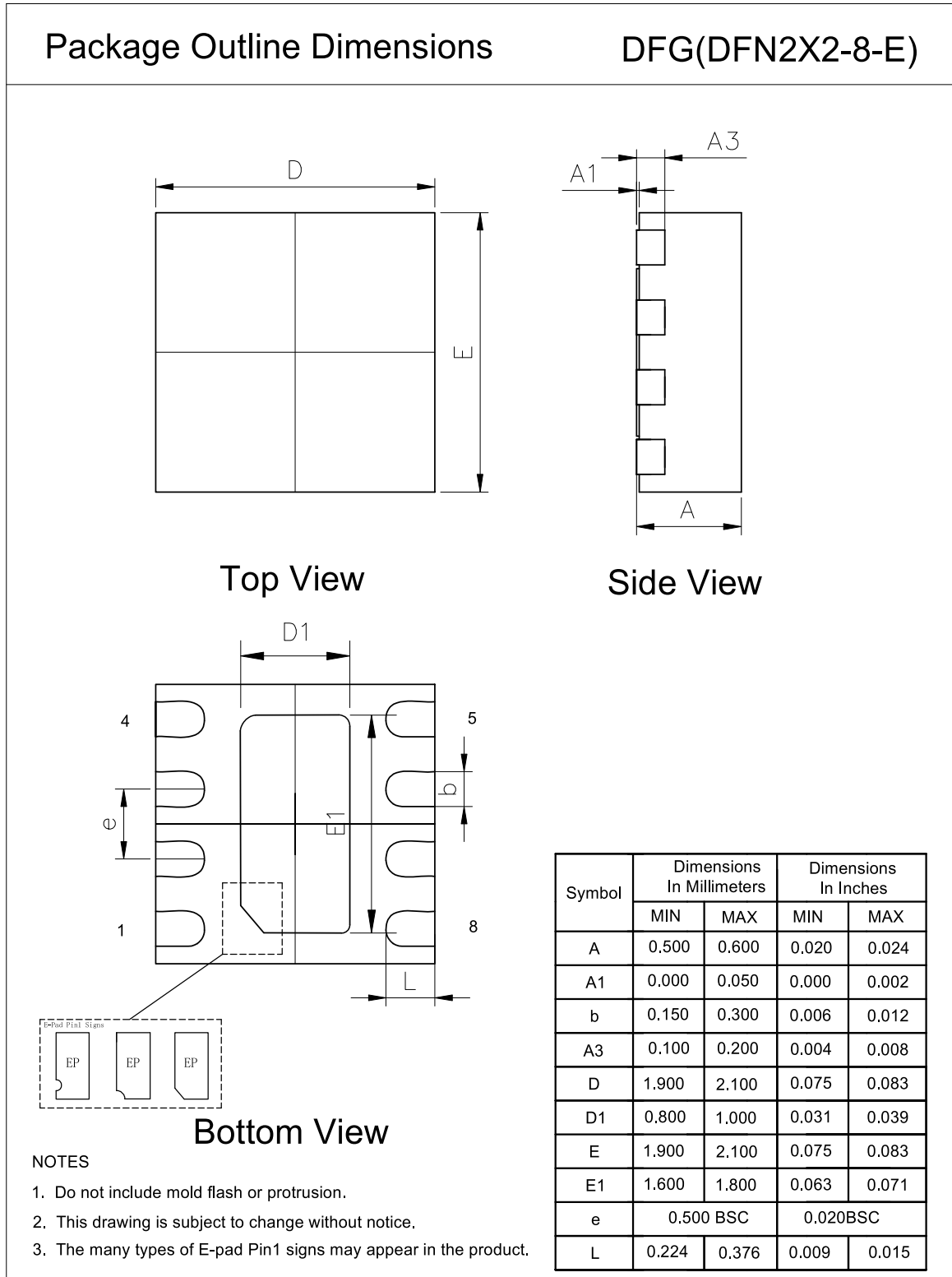
Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm) ⁽¹⁾	B0 (mm) ⁽¹⁾	K0 (mm) ⁽¹⁾	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPA6582-DF4R	DFN2×2-8	180	12.5	2.2	2.2	0.7	4	8	Q2
TPA6582-TS1R	TSSOP8	330	17.6	6.8	3.4	1.8	8	12	Q1
TPA6582-VS1R	MSOP8	330	17.6	5.3	3.4	1.3	8	12	Q1
TPA6584-SO2R	SOP14	330	21.6	6.5	9.3	2.1	8	16	Q1
TPA6584-TS2R	TSSOP14	330	17.6	6.8	5.5	1.5	8	12	Q1
TPA6584-QF4R	QFN3×3-16	330.0	17.6	3.4	3.4	1.1	8.0	12.0	Pending
TPA6584U-QF4R	QFN3×3-16	330.0	17.6	3.4	3.4	1.1	8.0	12.0	Pending
TPA6584V-QF4R	QFN3×3-16	330.0	17.6	3.4	3.4	1.1	8.0	12.0	Pending

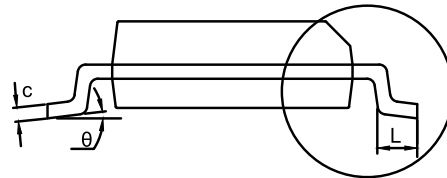
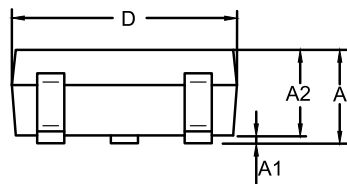
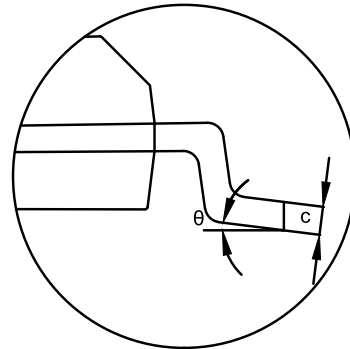
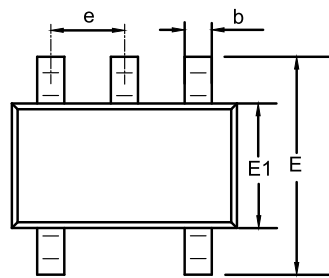
(1) The value is for reference only. Contact the 3PEAK factory for more information.

Package Outline Dimensions

DFN0.8x0.8-4



DFN2×2-8


SOT353 (SC70-5)
Package Outline Dimensions
SC5(SOT353-5-A)


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.850	1.100	0.033	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.230	0.004	0.009
D	2.000	2.200	0.079	0.087
E	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650 BSC		0.026 BSC	
L	0.260	0.460	0.010	0.018
θ	0	8°	0	8°

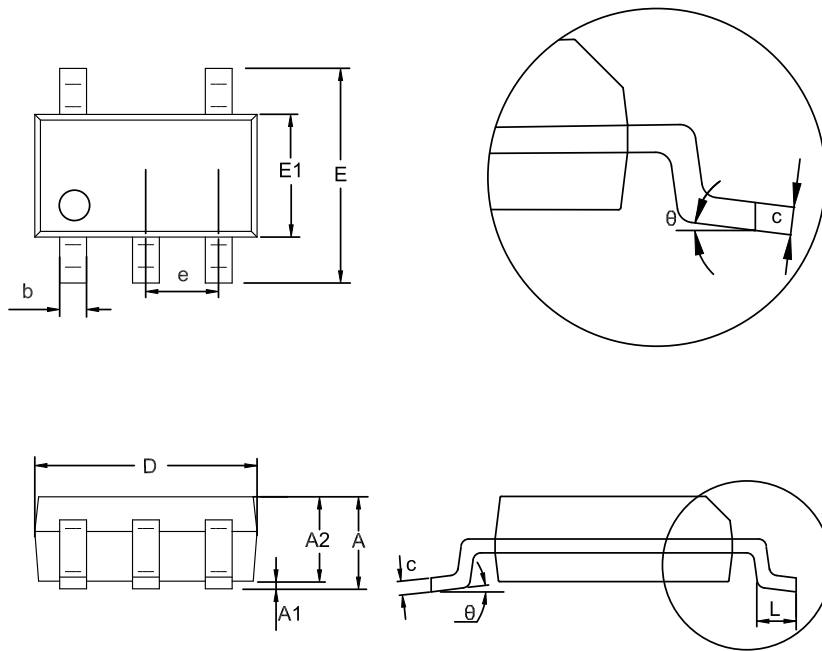
NOTES

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

SOT23-5

Package Outline Dimensions

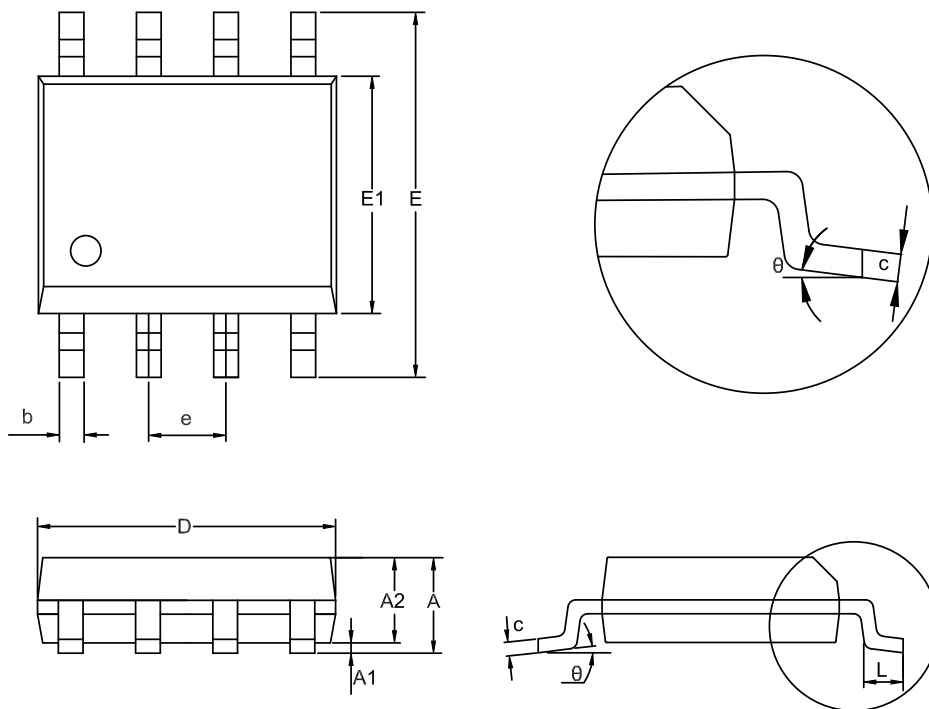
S5T(SOT23-5-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.280	0.500	0.011	0.020
c	0.100	0.230	0.004	0.009
D	2.820	3.020	0.111	0.119
E	2.600	3.000	0.102	0.118
E1	1.500	1.720	0.059	0.068
e	0.950 BSC		0.037 BSC	
L	0.300	0.600	0.012	0.024
θ	0	8°	0	8°

NOTES

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

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
theta	0	8°	0	8°

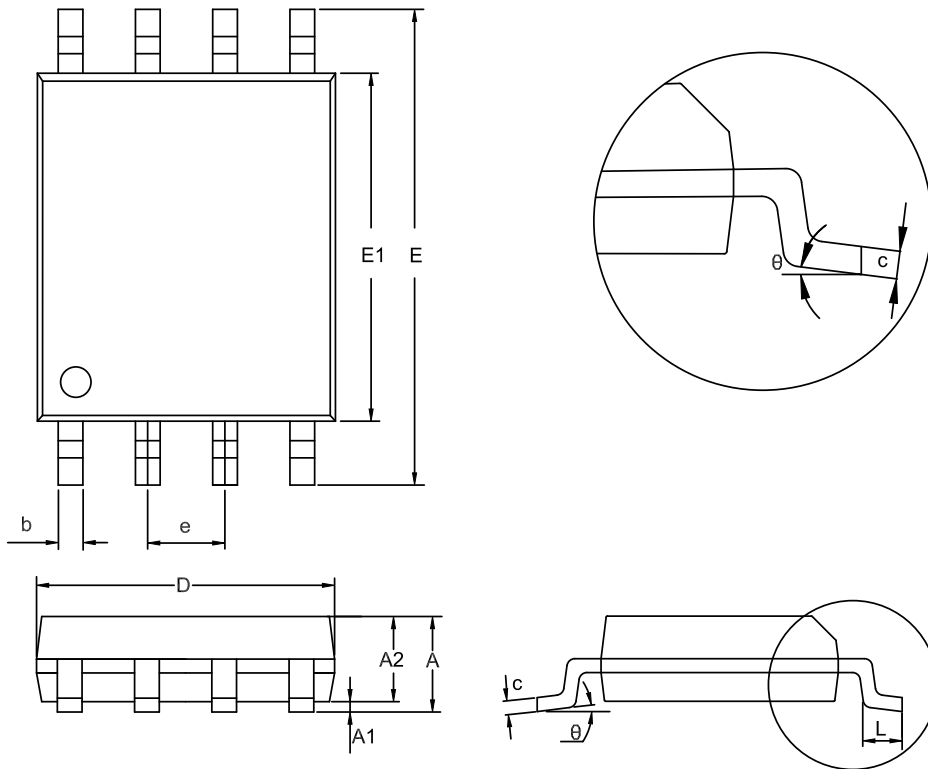
NOTES

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

TSSOP8

Package Outline Dimensions

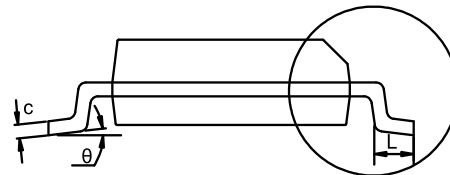
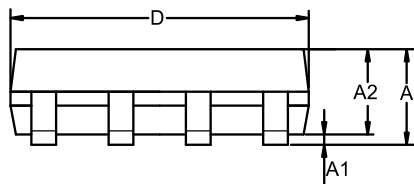
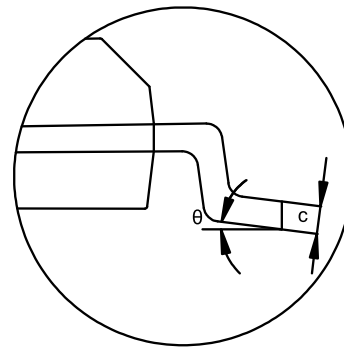
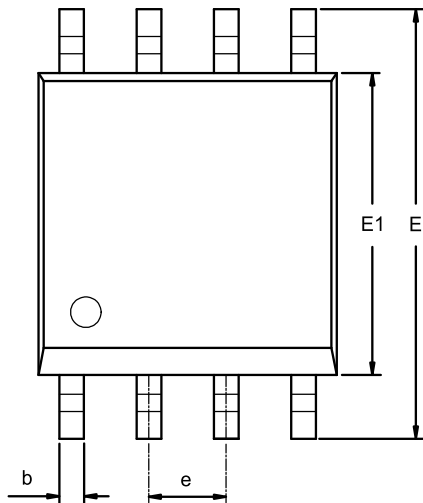
TS1(TSSOP-8-A)



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

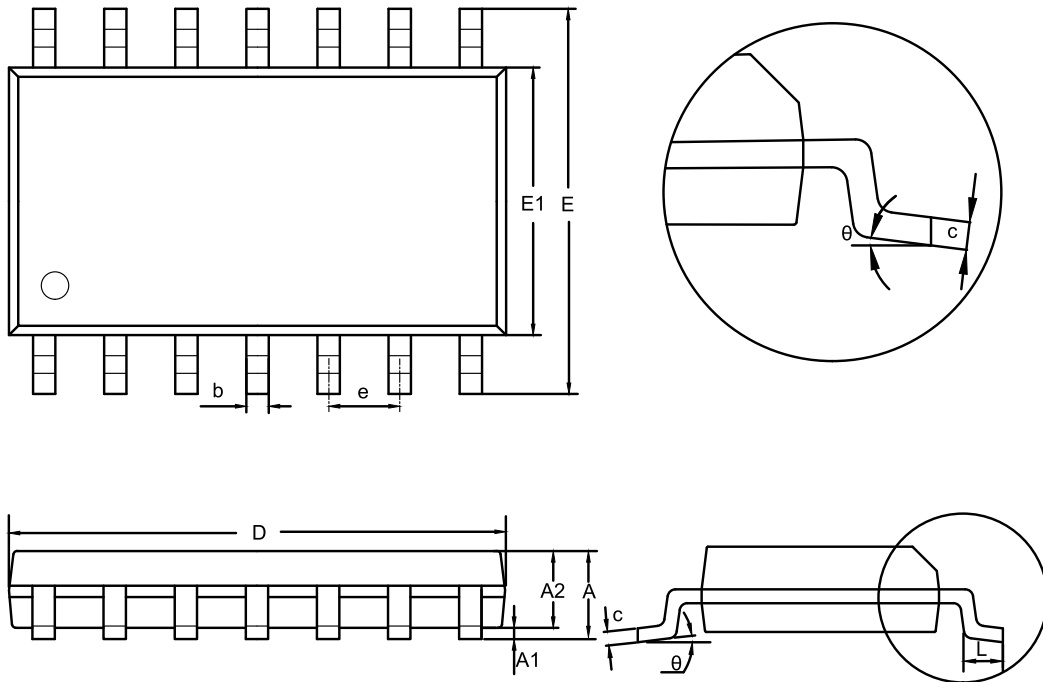
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

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

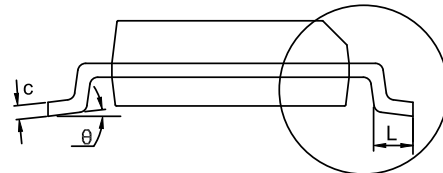
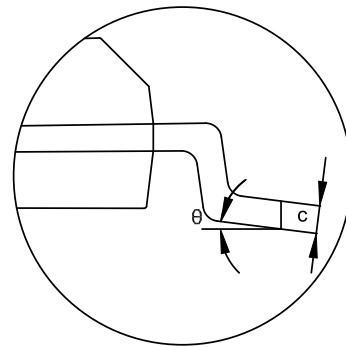
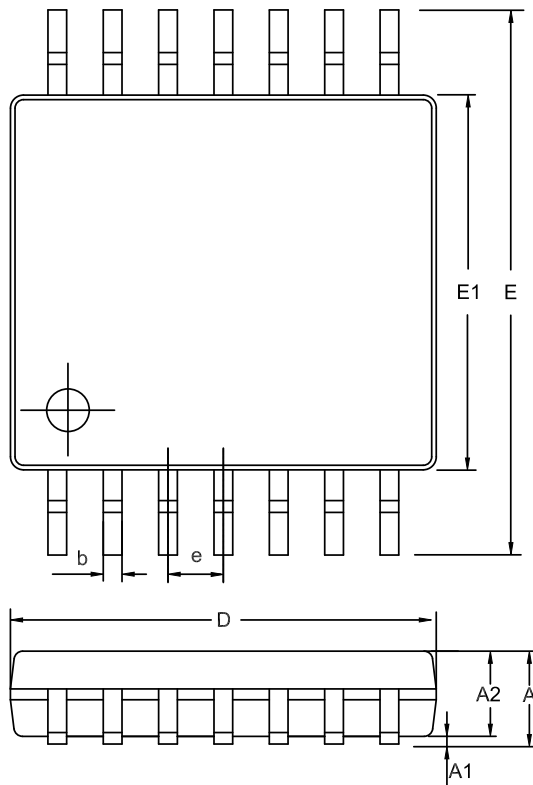
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

SOP14
Package Outline Dimensions
SO2(SOP-14-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	1.650	0.049	0.065
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
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	1.270	0.016	0.050
θ	0	8°	0	8°

NOTES

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

TSSOP14
Package Outline Dimensions
TS2(TSSOP-14-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	4.900	5.100	0.193	0.201
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
theta	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
TPA6581-DF0R	-40 to 125°C	DFN0.8×0.8-4 (5 Pin)	8	3	Tape and Reel, 12000	Green
TPA6581-SC5R	-40 to 125°C	SOT353 (SC70-5)	658	3	Tape and Reel, 3000	Green
TPA6581U-SC5R	-40 to 125°C	SOT353 (SC70-5)	68U	3	Tape and Reel, 3000	Green
TPA6581-S5TR	-40 to 125°C	SOT23-5	658	3	Tape and Reel, 3000	Green
TPA6581U-S5TR	-40 to 125°C	SOT23-5	68U	3	Tape and Reel, 3000	Green
TPA6582-SO1R	-40 to 125°C	SOP8	A6582	3	Tape and Reel, 4000	Green
TPA6582-DF4R	-40 to 125°C	DFN2×2-8	658	3	Tape and Reel, 3000	Green
TPA6582-TS1R	-40 to 125°C	TSSOP8	A6582	3	Tape and Reel, 3000	Green
TPA6582-VS1R	-40 to 125°C	MSOP8	A6582	3	Tape and Reel, 3000	Green
TPA6584-SO2R	-40 to 125°C	SOP14	A6584	3	Tape and Reel, 2500	Green
TPA6584-TS2R	-40 to 125°C	TSSOP14	A6584	3	Tape and Reel, 3000	Green
TPA6584-QF4R ⁽¹⁾	-40 to 125°C	QFN3×3-16	6584	3	Tape and Reel, 4000	Green
TPA6584U-QF4R ⁽¹⁾	-40 to 125°C	QFN3×3-16	658U	3	Tape and Reel, 4000	Green
TPA6584V-QF4R ⁽¹⁾	-40 to 125°C	QFN3×3-16	658V	3	Tape and Reel, 4000	Green

(1) For future products, contact the 3PEAK factory for more information and samples.

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

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