

Features

- Supply Voltage: 4.5 V to 36 V
- Offset Voltage: ±35μV Maximum
- Differential Input Voltage Range to Supply Rail, can Work as Comparator
- Rail-to-Rail Input and Output
- Bandwidth: 10 MHz
- Slew Rate: 20 V/μs
- Low Noise: 10 nV/√Hz at 1 kHz
- High Capacitive Load Drive Capability: 10 nF
- Operation Temperature Range: -40°C to 125°C

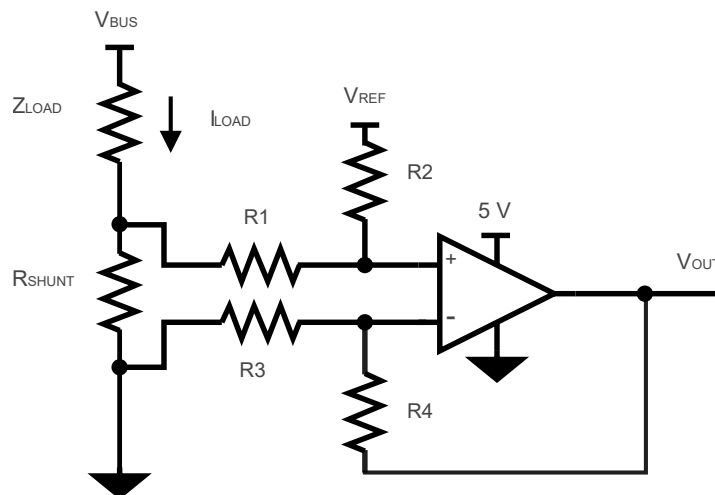
Applications

- Instrumentation
- Active Filters, ASIC Input, or Output Amplifier
- Sensor Interface
- Motor Control
- Industrial Control

Description

The TPA178x family is the newest high supply voltage amplifiers with low offset, low power, and stable high-frequency response. These devices incorporate the proprietary and patented design techniques of the 3PEAK to achieve very good AC performance with 10-MHz bandwidth, 20-V/μs slew rate, and low distortion while drawing only 2000 μA of quiescent current per amplifier. The input common-mode voltage range extends to V- and V+, and the outputs swing rail-to-rail. The TPA178x family can be used as plug-in replacements for many commercially available op-amps to reduce power and improve the range and performance of the input and output.

Typical Application Circuit



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

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

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Revision History

Date	Revision	Notes
2025-06-10	Rev.A.0	Released version.

Pin Configuration and Functions

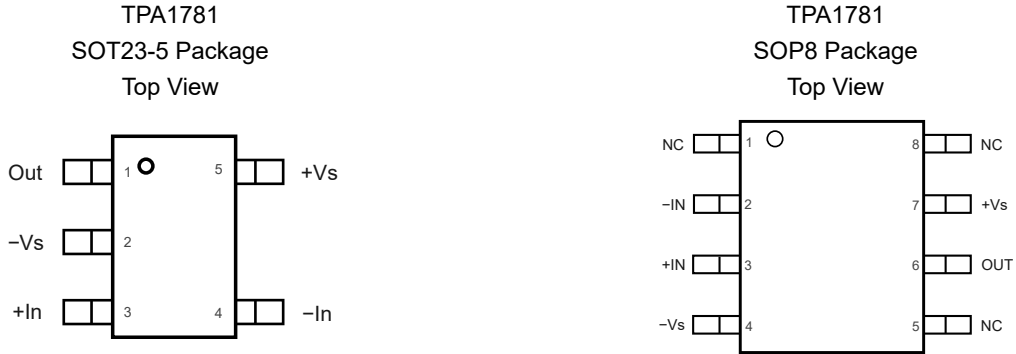


Table 1. Pin Functions TPA1781:

Pin		Name	I/O	Description
SOT23-5	SOP8			
1	6	Out	Output	Output
2	4	-Vs		Negative power supply
3	3	+In	Input	Non-inverting input
4	2	-In	Input	Inverting input
5	7	+Vs		Positive power supply
-	1, 5, 8	NC		Not connected

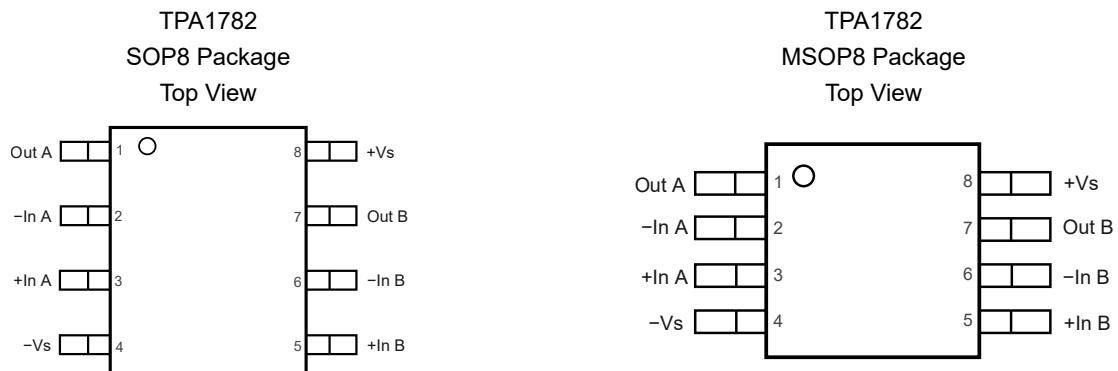
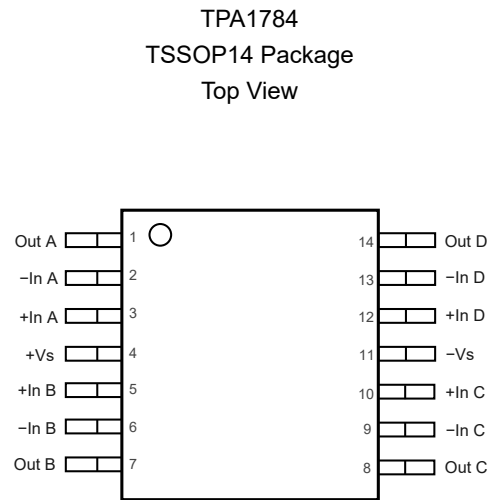
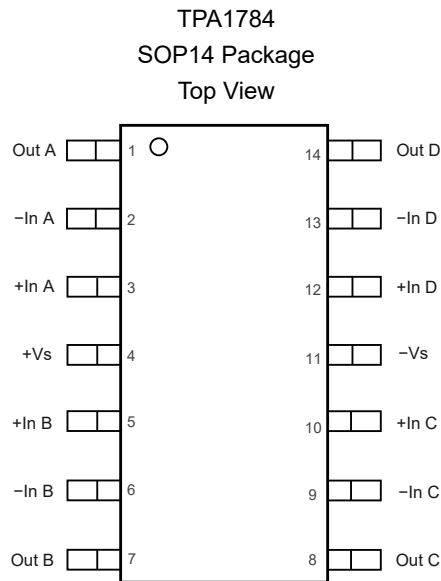


Table 2. Pin Functions: TPA1782

Pin		Name	I/O	Description
SOP8	MSOP8			
1	1	Out A	Output	Output
2	2	-In A	Input	Inverting input
3	3	+In A	Input	Non-inverting input
4	4	-Vs		Negative power supply
5	5	+In B	Input	Non-inverting input
6	6	-In B	Input	Inverting input
7	7	Out B	Output	Output
8	8	+Vs		Positive power supply


Table 3. Pin Functions: TPA1784

Pin		Name	I/O	Description
SOP14	TSSOP14			
1	1	Out A	Output	Output
2	2	-In A	Input	Inverting input
3	3	+In A	Input	Non-inverting input
4	4	+Vs		Positive power supply
5	5	+In B	Input	Non-inverting input
6	6	-In B	Input	Inverting input
7	7	Out B	Output	Output
8	8	Out C	Output	Output
9	9	-In C	Input	Inverting input
10	10	+In C	Input	Non-inverting input
11	11	-Vs		Negative power supply
12	12	+In D	Input	Non-inverting input
13	13	-In D	Input	Inverting input
14	14	Out D	Output	Output

Specifications

Absolute Maximum Ratings ⁽¹⁾

Parameter		Min	Max	Unit
	Supply Voltage, (+V _S) – (–V _S)		40	V
	Input Voltage	(–V _S) – 0.3	(+V _S) + 0.3	V
	Differential Input Voltage	(–V _S) – (+V _S)	(+V _S) – (–V _S)	V
	Input Current: +IN, –IN ⁽²⁾	–10	10	mA
	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 and outputs are protected by ESD protection diodes to the power supply. If the input or output extends more than 500 mV beyond the positive or negative power supply, the 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 comparators 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	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)	4.5		36	V
T _A	Operating Temperature Range	–40		125	°C

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT23-5	250	81	$^{\circ}\text{C}/\text{W}$
SOP8	158	43	$^{\circ}\text{C}/\text{W}$
MSOP8	210	45	$^{\circ}\text{C}/\text{W}$
SOP14	120	36	$^{\circ}\text{C}/\text{W}$
TSSOP14	180	35	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics

All test conditions: $V_S = 36\text{ V}$, $T_A = 25^\circ\text{C}$, $R_L = 10\text{ k}\Omega$, unless otherwise noted.

Symbol	Parameter	Conditions	T_A	Min	Typ	Max	Unit
Power Supply							
V_S	Supply Voltage Range			4.5		36	V
I_Q	Quiescent Current per Amplifier	$V_S = 36\text{ V}$			1.8	2.1	mA
			-40°C to 125°C			2.26	mA
PSRR	Power Supply Rejection Ratio	$V_S = 8\text{ V}$ to 36 V $V_{CM} = 0.5 V_S$		127	155		dB
			-40°C to 125°C	125	155		dB
Input Characteristics							
V_{OS}	Input Offset Voltage Drift	$V_S = 36\text{ V}$, $V_{CM} = 18\text{ V}$		-35	5.5	35	μV
			-40°C to 125°C	-75	5.5	75	μV
		$V_S = 36\text{ V}$, $V_{CM} = 34.5\text{ V}$		-100	10	100	μV
			-40°C to 125°C	-350		350	μV
$V_{OS\ TC}$	Input Offset Voltage			0.15		$\mu\text{V}/^\circ\text{C}$	
I_B	Input Bias Current			-200	25	200	pA
			-40°C to 125°C	-20000		20000	pA
I_{OS}	Input Offset Current			-200	25	200	pA
			-40°C to 125°C	-3000		3000	pA
CID	Input Capacitor	Differential mode			7.8		pF
CIC	Input Capacitor	Common mode			6.9		pF
A_V	Open-Loop Voltage Gain	$(V_-) + 0.6\text{ V} < V_O < (V_+) - 0.6\text{ V}$, $R_{LOAD} = 2\text{ k}\Omega$		120	150		dB
			-40°C to 125°C	114	150		dB
		$(V_-) + 0.3\text{ V} < V_O < (V_+) - 0.3\text{ V}$, $R_{LOAD} = 10\text{ k}\Omega$		130	155		dB
			-40°C to 125°C	125	155		dB
V_{CMR}	Common-Mode Input Voltage Range			-0.1		36.1	V
CMRR	Common-Mode Rejection Ratio	$(V_-) - 0.1\text{ V} < V_{CM} < (V_+) - 3\text{ V}$		122	130		dB
			-40°C to 125°C	120	130		dB
		$(V_+) - 1.5\text{ V} < V_{CM} < (V_+) - 0.1\text{ V}$		107	125		dB
			-40°C to 125°C	105	125		dB
Output Characteristics							
V_{OH}	Output Swing from Positive Rail	$R_{LOAD} = 10\text{ k}\Omega$ to $V_S / 2$			45	100	mV
			-40°C to 125°C			150	mV
		$R_{LOAD} = 2\text{ k}\Omega$ to $V_S / 2$			210	300	mV
			-40°C to 125°C			400	mV
	No Load			2	10	mV	

Symbol	Parameter	Conditions	TA	Min	Typ	Max	Unit
			-40°C to 125°C			15	mV
V _{OL}	Output Swing from Negative Rail	R _{LOAD} = 10 k Ω to V _S / 2			45	100	mV
			-40°C to 125°C				150
		R _{LOAD} = 2 k Ω to V _S / 2			210	300	mV
			-40°C to 125°C				400
		No Load			2	10	mV
			-40°C to 125°C			15	mV
I _{SC}	Output Short-Circuit Current	Source Current			55		mA
		Sink Current			70		mA
AC Specifications							
GBW	Gain-Bandwidth Product				10		MHz
SR	Slew Rate	G = 1, 10 V step			20		V/ μ s
t _{OR}	Overload Recovery				250		ns
t _s	Settling Time, 0.01%	G = 1, 10 V step			0.7		μ s
	Settling Time, 0.001%				1.8		μ s
Z _O	Open-loop Output Impedance	f = 1 MHz, I _O = 0 A			350		Ω
Noise Performance							
E _N	Input Voltage Noise	(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 0.1 Hz to 10 Hz			2.5		μ V _{PP}
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 0.1 Hz to 10 Hz			6		μ V _{PP}
e _N	Input Voltage Noise Density	(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 100 Hz			20		nV/ $\sqrt{\text{Hz}}$
		(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 1 kHz			10		nV/ $\sqrt{\text{Hz}}$
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 100 Hz			63		nV/ $\sqrt{\text{Hz}}$
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 1 kHz			24		nV/ $\sqrt{\text{Hz}}$
i _N	Input Current Noise	f = 1 kHz			1.5		fA/ $\sqrt{\text{Hz}}$
THD+N	Total Harmonic Distortion and Noise	f = 1 kHz, G = 1, R _L = 10 k Ω , V _{OUT} = 3.5 V _{RMS}			0.00004		%

36-V, 10-MHz, 20-V/ μ s, Precision Operational Amplifier

All test conditions: $V_S = 8\text{ V}$, $T_A = 25^\circ\text{C}$, $R_L = 10\text{ k}\Omega$, unless otherwise noted.

Symbol	Parameter	Conditions	T_A	Min	Typ	Max	Unit
Power Supply							
I_Q	Quiescent Current per Amplifier	$V_S = 8\text{ V}$			1.8	2.1	mA
			-40°C to 125°C			2.2	mA
Input Characteristics							
V_{OS}	Input Offset Voltage Drift	$V_S = 8\text{ V}$, $V_{CM} = 4\text{ V}$		-35	5.5	35	μV
			-40°C to 125°C	-75	5.5	75	μV
		$V_S = 8\text{ V}$, $V_{CM} = 6.5\text{ V}$		-100	10	100	μV
			-40°C to 125°C	-350		350	μV
$V_{OS\ TC}$	Input Offset Voltage			0.15		$\mu\text{V}/^\circ\text{C}$	
I_B	Input Bias Current			-200	25	200	pA
			-40°C to 125°C	-20000		20000	pA
I_{OS}	Input Offset Current			-200	25	200	pA
			-40°C to 125°C	-3000		3000	pA
C_{ID}	Input Capacitor	Differential mode			7.8		pF
C_{IC}	Input Capacitor	Common mode			6.9		pF
A_v	Open-Loop Voltage Gain	$(V^-) + 0.6\text{ V} < V_O < (V^+) - 0.6\text{ V}$, $R_{LOAD} = 2\text{ k}\Omega$		122	145		dB
			-40°C to 125°C	120	145		dB
		$(V^-) + 0.3\text{ V} < V_O < (V^+) - 0.3\text{ V}$, $R_{LOAD} = 10\text{ k}\Omega$		127	150		dB
			-40°C to 125°C	122	150		dB
V_{CMR}	Common-Mode Input Voltage Range			-0.1		8.1	V
$CMRR$	Common-Mode Rejection Ratio	$(V^-) - 0.1\text{ V} < V_{CM} < (V^+) - 3\text{ V}$		107	127		dB
			-40°C to 125°C	105	127		dB
		$(V^+) - 1.5\text{ V} < V_{CM} < (V^+) - 0.1\text{ V}$		107	125		dB
			-40°C to 125°C	105	125		dB
Output Characteristics							
V_{OH}	Output Swing from Positive Rail	$R_{LOAD} = 10\text{ k}\Omega$ to $V_S / 2$			8	20	mV
			-40°C to 125°C			25	mV
		$R_{LOAD} = 2\text{ k}\Omega$ to $V_S / 2$			30	100	mV
			-40°C to 125°C			110	mV
	No Load			3	8	mV	
		-40°C to 125°C			10	mV	
V_{OL}	Output Swing from Negative Rail	$R_{LOAD} = 10\text{ k}\Omega$ to $V_S / 2$			8	20	mV
			-40°C to 125°C			25	mV
		$R_{LOAD} = 2\text{ k}\Omega$ to $V_S / 2$			30	100	mV
			-40°C to 125°C			110	mV

Symbol	Parameter	Conditions	TA	Min	Typ	Max	Unit
		No Load			3	8	mV
			-40°C to 125°C				10
I _{SC}	Output Short-Circuit Current	Source Current			60		mA
		Sink Current			62		mA
AC Specifications							
GBW	Gain-Bandwidth Product				10		MHz
SR	Slew Rate	G = 1, 10 V step			20		V/ μ s
t _{OR}	Overload Recovery				250		ns
Z _O	Open-loop Output Impedance	f = 1 MHz, I _O = 0 A			350		Ω
Noise Performance							
E _N	Input Voltage Noise	(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 0.1 Hz to 10 Hz			2.5		μ V _{PP}
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 0.1 Hz to 10 Hz			7		μ V _{PP}
e _N	Input Voltage Noise Density	(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 100 Hz			20		nV/ $\sqrt{\text{Hz}}$
		(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 1 kHz			10		nV/ $\sqrt{\text{Hz}}$
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 100 Hz			63		nV/ $\sqrt{\text{Hz}}$
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 1 kHz			24		nV/ $\sqrt{\text{Hz}}$
i _N	Input Current Noise	f = 1 kHz			1.5		fA/ $\sqrt{\text{Hz}}$

36-V, 10-MHz, 20-V/ μ s, Precision Operational Amplifier

All test conditions: $V_S = 4.5\text{ V}$, $T_A = 25^\circ\text{C}$, $R_L = 10\text{ k}\Omega$, unless otherwise noted.

Symbol	Parameter	Conditions	TA	Min	Typ	Max	Unit
Power Supply							
I_Q	Quiescent Current per Amplifier	$V_S = 4.5\text{ V}$			1.68	1.92	mA
			-40°C to 125°C		2	2.09	mA
Input Characteristics							
V_{OS}	Input Offset Voltage Drift	$V_S = 4.5\text{ V}$, $V_{CM} = 1.5\text{ V}$		-35	5.5	35	μV
			-40°C to 125°C	-75	5.5	75	μV
		$V_S = 4.5\text{ V}$, $V_{CM} = 3\text{ V}$		-100	10	100	μV
			-40°C to 125°C	-350		350	μV
$V_{OS\ TC}$	Input Offset Voltage			0.15		$\mu\text{V}/^\circ\text{C}$	
I_B	Input Bias Current			-200	25	200	pA
			-40°C to 125°C	-20000		20000	pA
I_{OS}	Input Offset Current			-200	25	200	pA
			-40°C to 125°C	-3000		3000	pA
CID	Input Capacitor	Differential mode			7.8		pF
CIC	Input Capacitor	Common mode			6.9		pF
A_v	Open-Loop Voltage Gain	$(V^-) + 0.6\text{ V} < V_O < (V^+) - 0.6\text{ V}$, $R_{LOAD} = 2\text{ k}\Omega$		112	130		dB
			-40°C to 125°C	110	130		dB
		$(V^-) + 0.3\text{ V} < V_O < (V^+) - 0.3\text{ V}$, $R_{LOAD} = 10\text{ k}\Omega$		115	135		dB
			-40°C to 125°C	114	135		dB
V_{CMR}	Common-Mode Input Voltage Range			-0.1		4.6	V
CMRR	Common-Mode Rejection Ratio	$(V^-) - 0.1\text{ V} < V_{CM} < (V^+) - 3\text{ V}$		100	115		dB
			-40°C to 125°C	95	115		dB
		$(V^+) - 1.5\text{ V} < V_{CM} < (V^+) - 0.1\text{ V}$		102	125		dB
			-40°C to 125°C	100	125		dB
Output Characteristics							
V_{OH}	Output Swing from Positive Rail	$R_{LOAD} = 10\text{ k}\Omega$ to $V_S / 2$			8	20	mV
			-40°C to 125°C			25	mV
		$R_{LOAD} = 2\text{ k}\Omega$ to $V_S / 2$			30	100	mV
			-40°C to 125°C			110	mV
	No Load			3	8	mV	
		-40°C to 125°C			10	mV	
V_{OL}	Output Swing from Negative Rail	$R_{LOAD} = 10\text{ k}\Omega$ to $V_S / 2$			8	20	mV
			-40°C to 125°C			25	mV
		$R_{LOAD} = 2\text{ k}\Omega$ to $V_S / 2$			30	100	mV
			-40°C to 125°C			110	mV

Symbol	Parameter	Conditions	TA	Min	Typ	Max	Unit
		No Load			3	8	mV
			-40°C to 125°C				10
I _{SC}	Output Short-Circuit Current	Source Current			50		mA
		Sink Current			60		mA
AC Specifications							
GBW	Gain-Bandwidth Product				9		MHz
SR	Slew Rate	G = 1, 10 V step			13		V/ μ s
t _{OR}	Overload Recovery				250		ns
Z _O	Open-loop Output Impedance	f = 1 MHz, I _O = 0 A			350		Ω
Noise Performance							
E _N	Input Voltage Noise	(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 0.1 Hz to 10 Hz			2.5		μ V _{PP}
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 0.1 Hz to 10 Hz			7		μ V _{PP}
e _N	Input Voltage Noise Density	(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 100 Hz			20		nV/ $\sqrt{\text{Hz}}$
		(V-) - 0.1 V < V _{CM} < (V+) - 3V, f = 1 kHz			10		nV/ $\sqrt{\text{Hz}}$
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 100 Hz			63		nV/ $\sqrt{\text{Hz}}$
		(V+) - 1.5 V < V _{CM} < (V+) - 0.1V, f = 1 kHz			24		nV/ $\sqrt{\text{Hz}}$
i _N	Input Current Noise	f = 1 kHz			1.5		fA/ $\sqrt{\text{Hz}}$

Typical Performance Characteristics

All test conditions: $V_S = \pm 15$ V, $V_{CM} = 0$ V, $R_L = 10$ k Ω , unless otherwise noted.

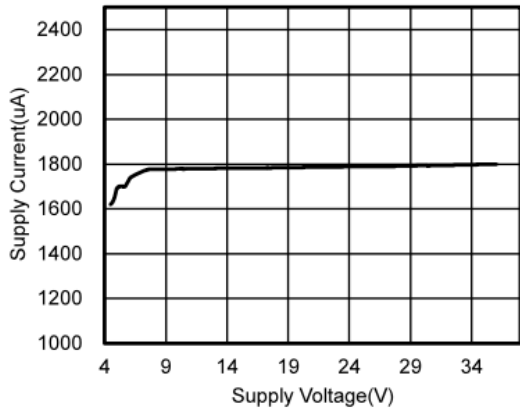


Figure 1. Quiescent Current vs. Supply Voltage

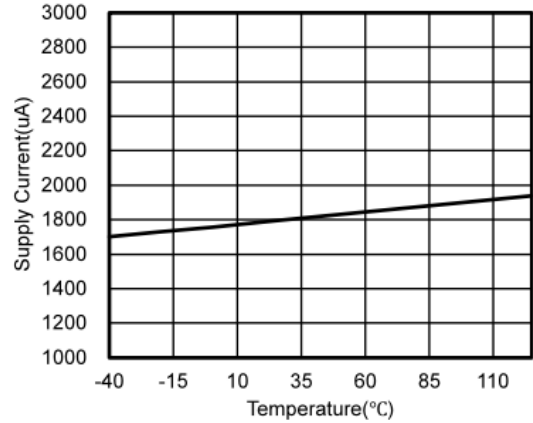


Figure 2. Quiescent Current vs. Temperature

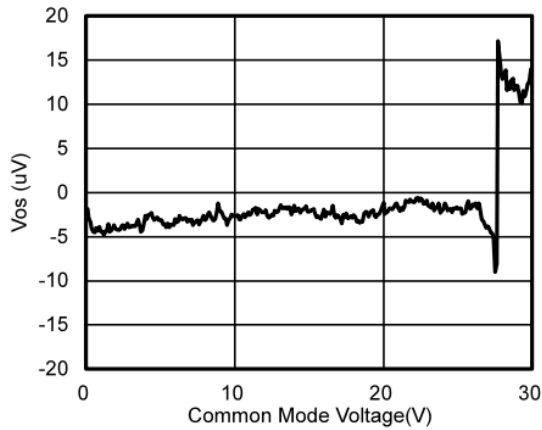


Figure 3. Offset Voltage vs. Common-Mode Voltage

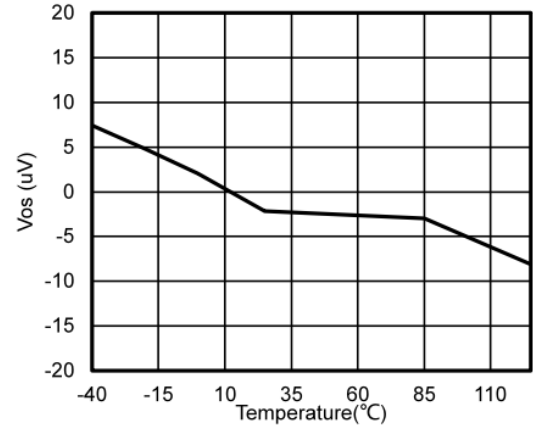


Figure 4. V_{OS} vs. Temperature

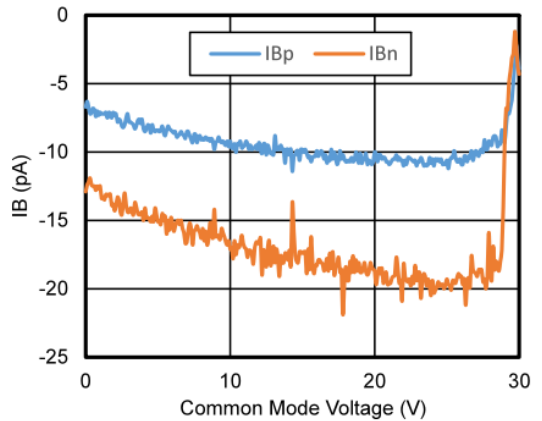


Figure 5. I_B vs. Common-Mode Voltage

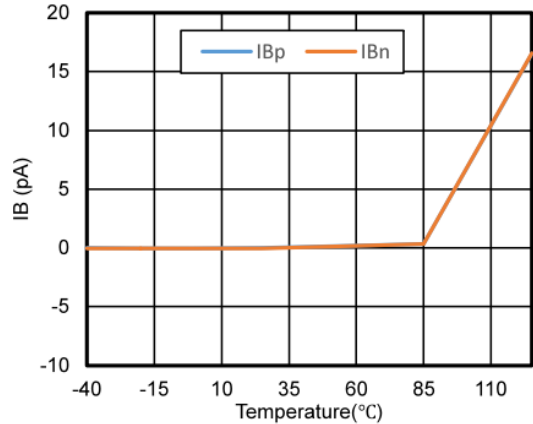


Figure 6. I_B vs. Temperature, -40 to 125°C

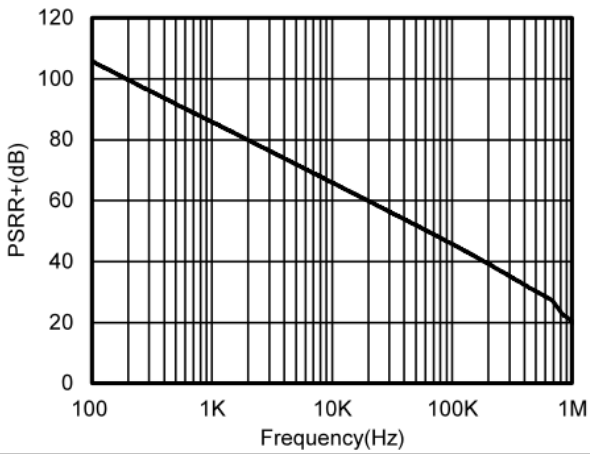


Figure 7. PSRR+ vs. Frequency

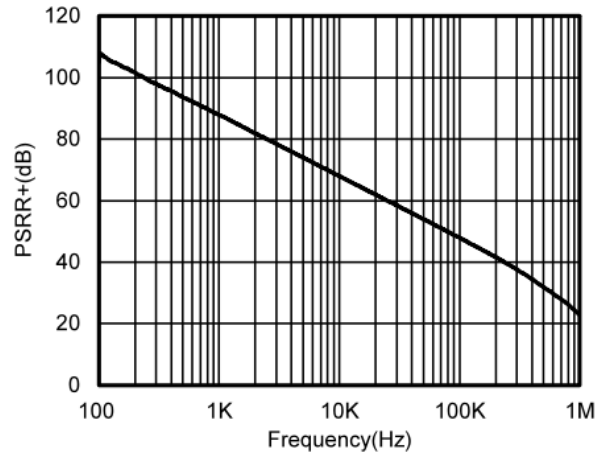


Figure 8. PSRR- vs. Frequency

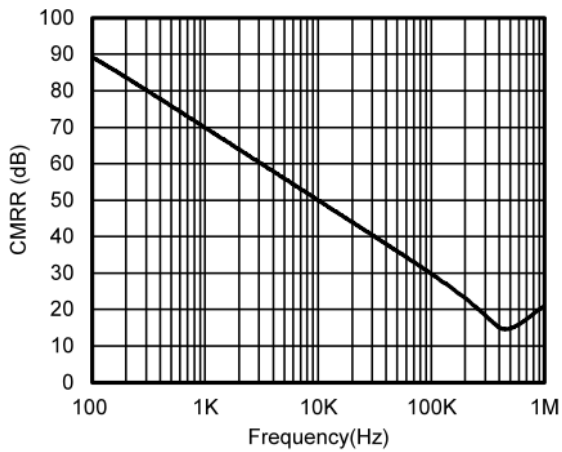


Figure 9. CMRR vs. Frequency

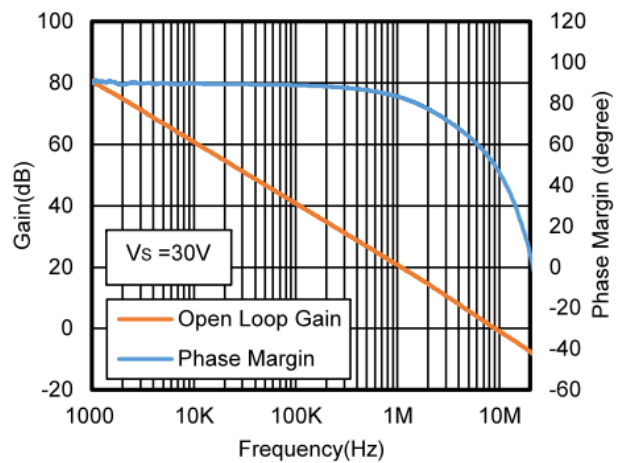


Figure 10. Open Loop Gain and Phase vs. Frequency
 $R_{LOAD} = 10\text{ K}$, $C_{LOAD} = 100\text{ pF}$

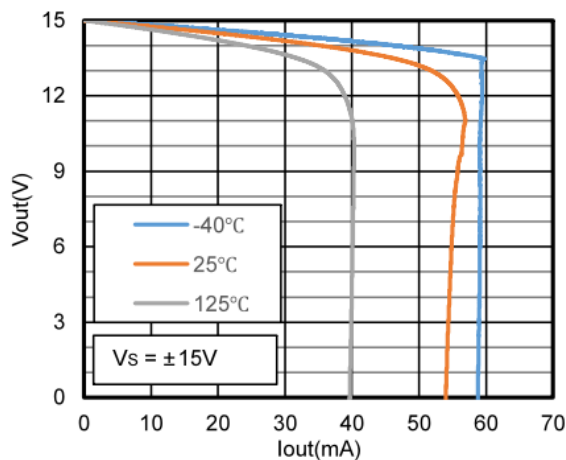


Figure 11. Output Voltage vs. Output Current, Source

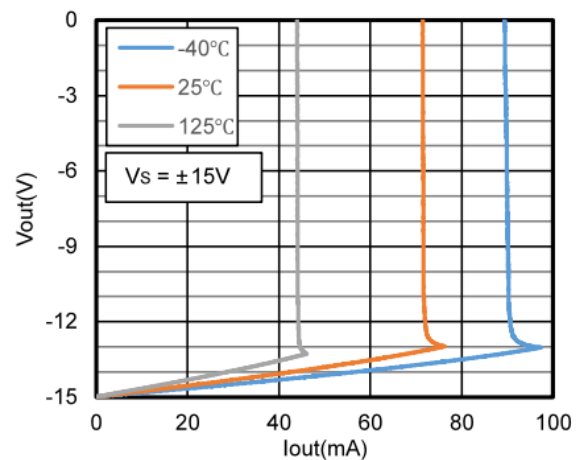


Figure 12. Output Voltage vs. Output Current, Sink

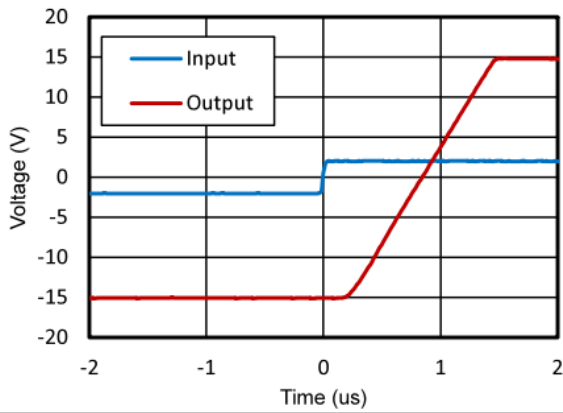


Figure 13. Positive Overload Recovery

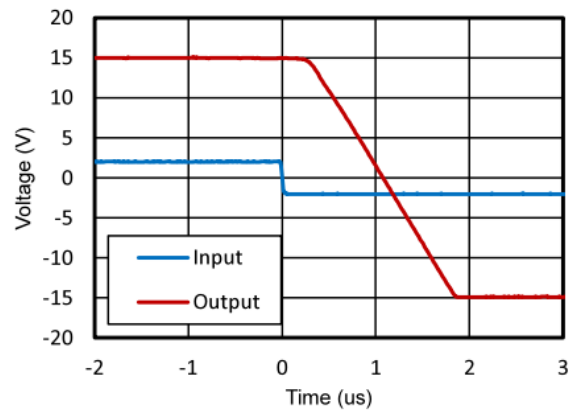


Figure 14. Negative Overload Recovery

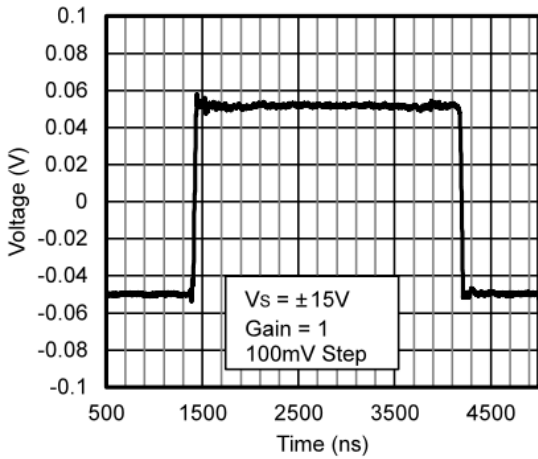


Figure 15. 100-mV Signal Step Response

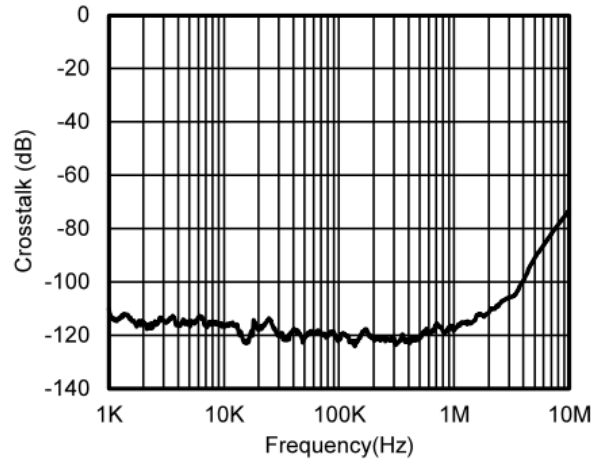


Figure 16. Crosstalk

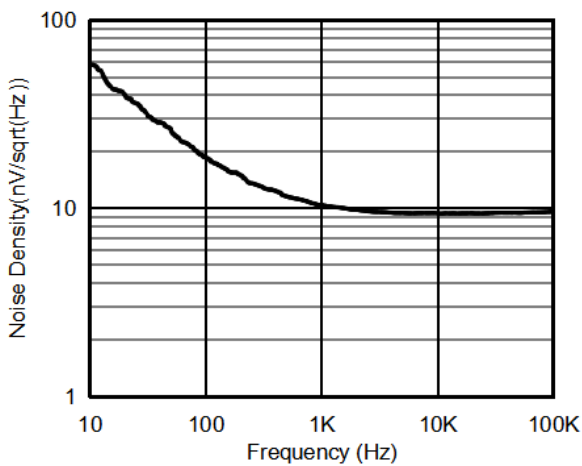


Figure 17. Voltage Noise Spectral Density vs. Frequency

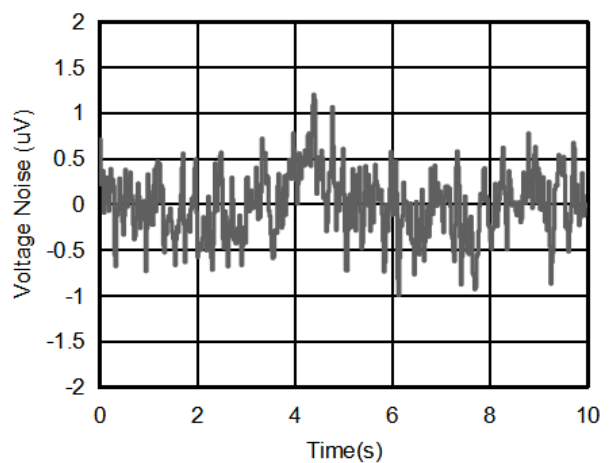


Figure 18. 0.1-Hz to 10-Hz Voltage Noise

Detailed Description

Overview

The TPA178x series is a new family of low-power, rail-to-rail input and output op amplifiers. These devices operate from 4.5 V to 36 V, and are unity-gain stable and designed for a wide range of general-purpose applications.

Functional Block Diagram

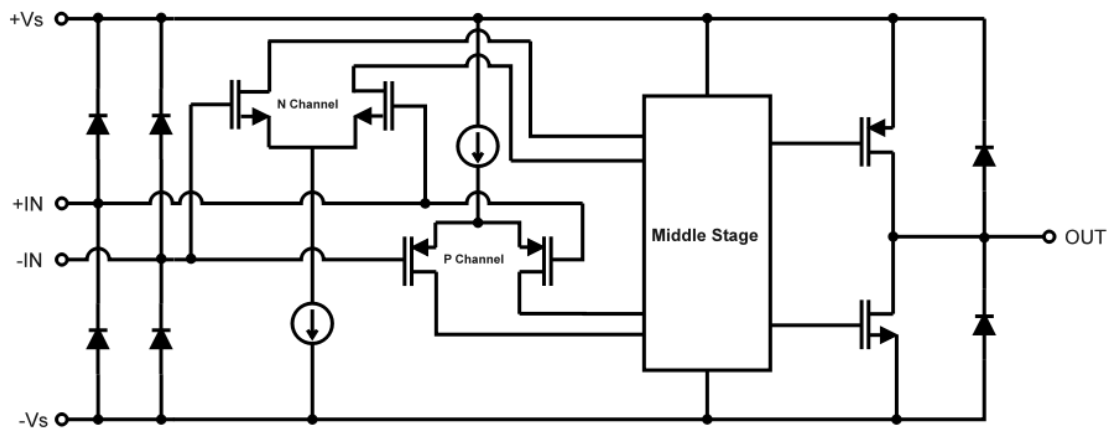
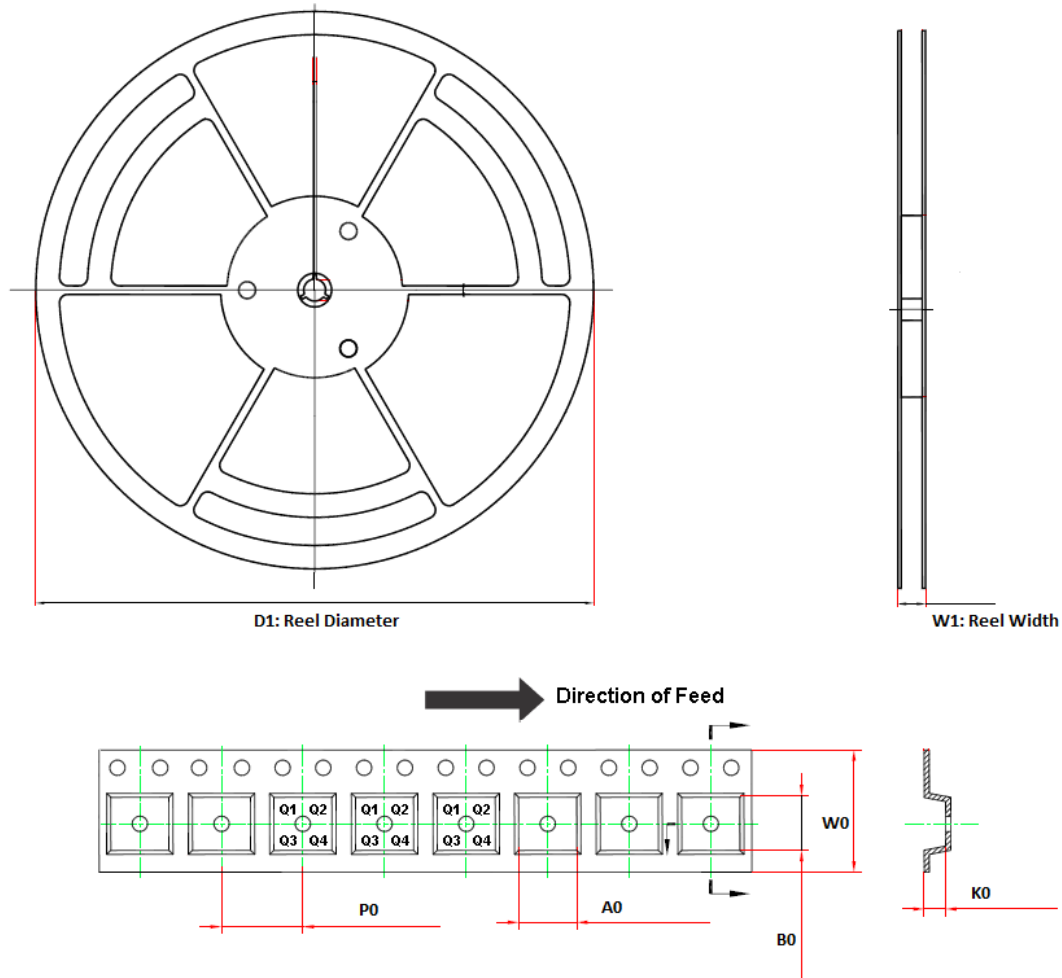


Figure 19. Functional Block Diagram

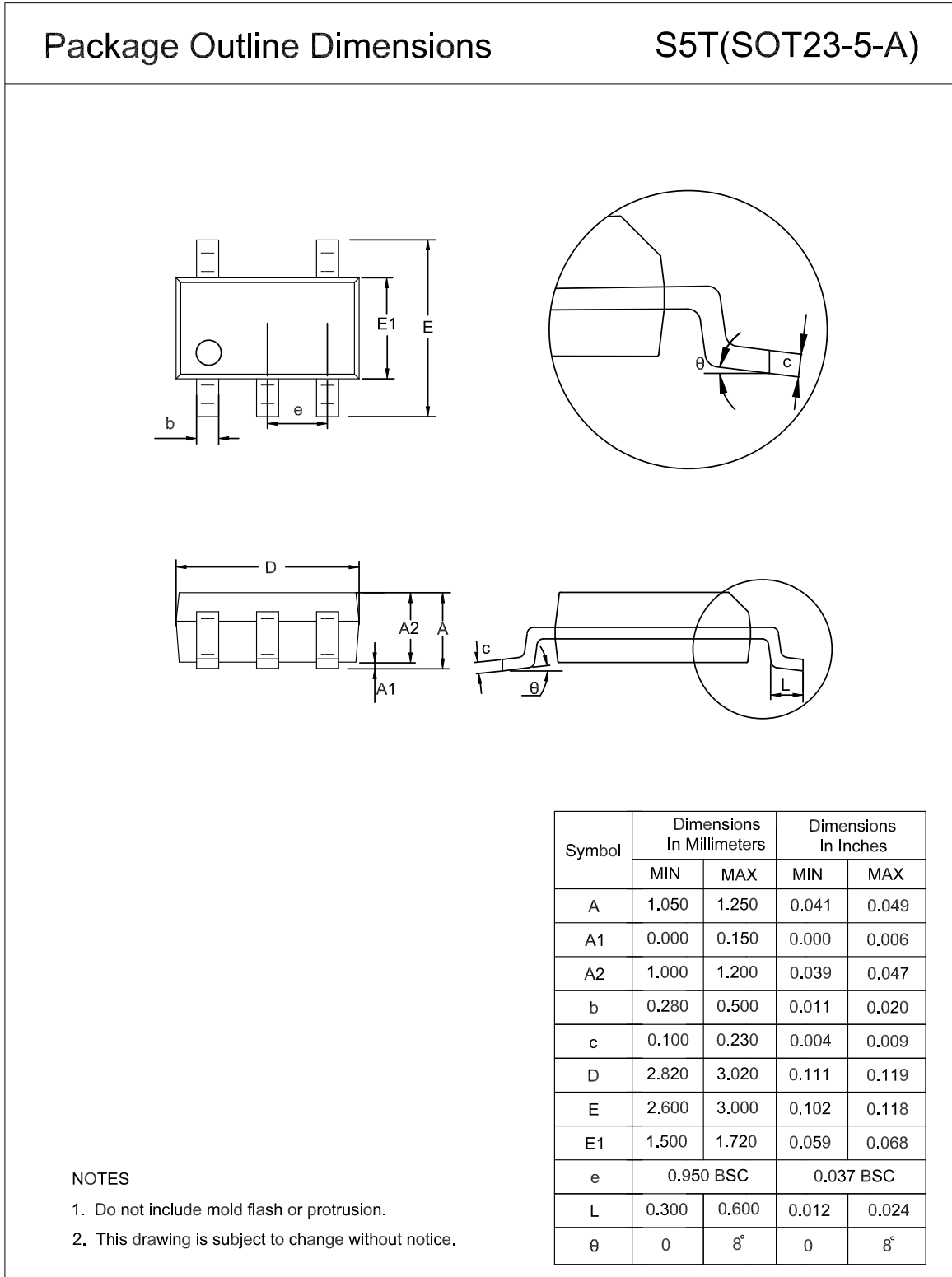
Tape and Reel Information


Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm) (1)	B0 (mm) (1)	K0 (mm) (1)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPA1781-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPA1781-SO1R	SOP8	330	17.6	6.5	5.4	2	8	12	Q1
TPA1782-VS1R	MSOP8	330	17.6	5.3	3.4	1.3	8	12	Q1
TPA1782-SO1R	SOP8	330	17.6	6.5	5.4	2	8	12	Q1
TPA1784-TS2R	TSSOP14	330	17.6	6.8	5.5	1.5	8	12	Q1
TPA1784-SO2R	SOP14	330	21.6	6.5	9.0	2.1	8	16	Q1

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

Package Outline Dimensions

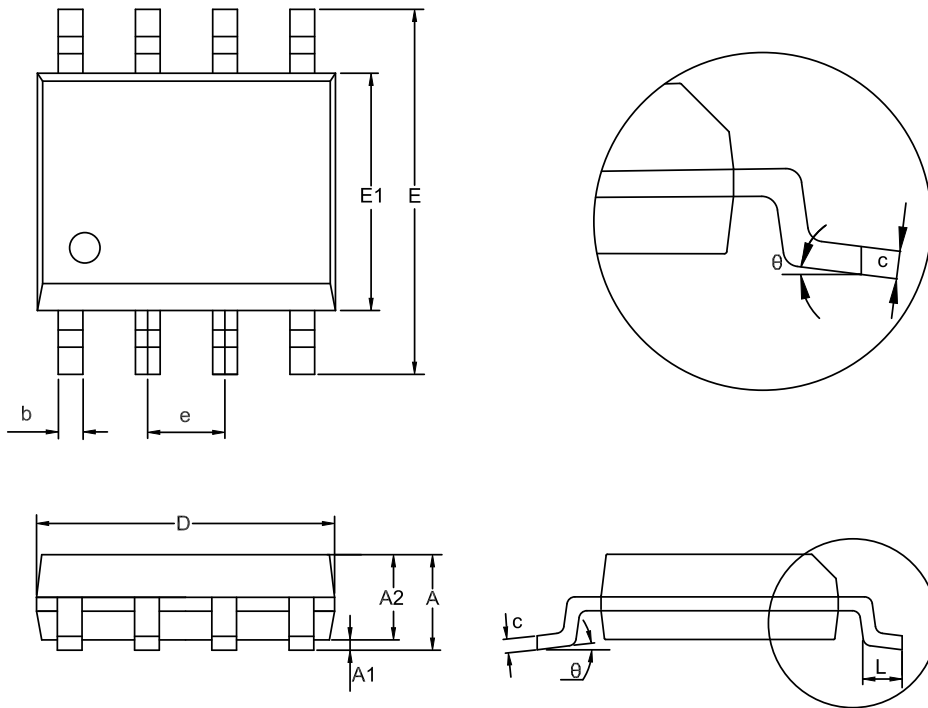
SOT23-5



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°

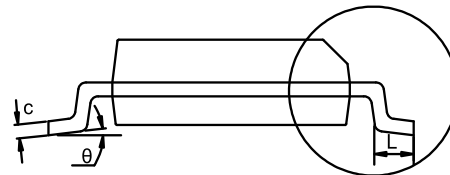
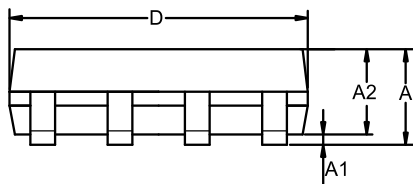
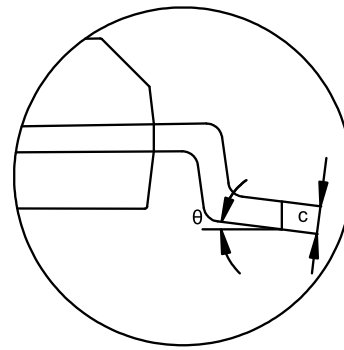
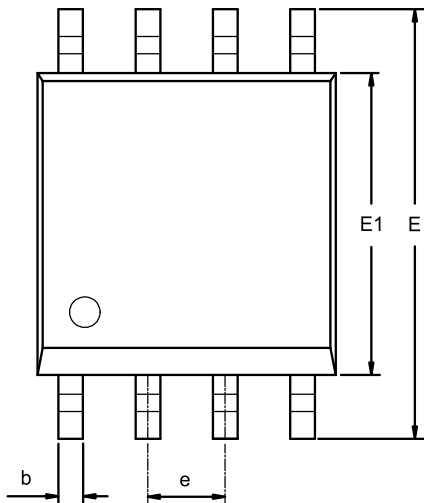
NOTES

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

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°

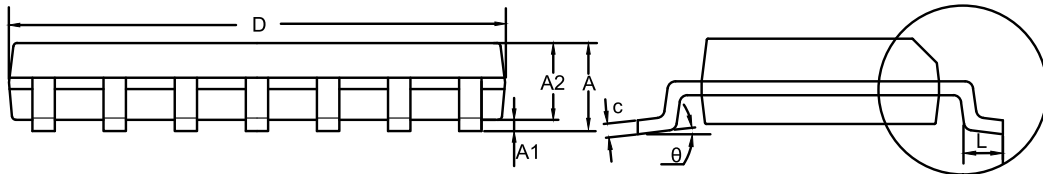
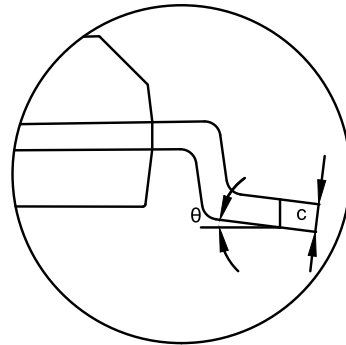
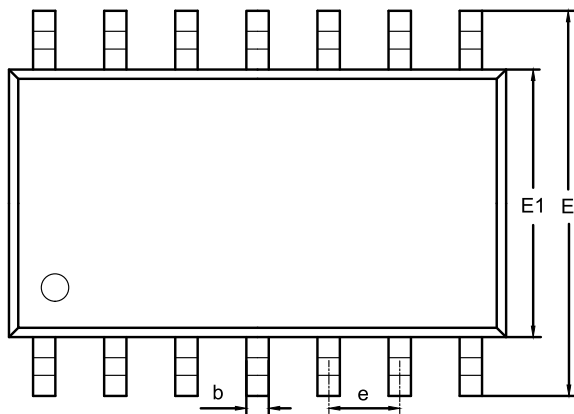
NOTES

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°

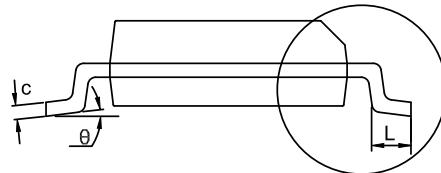
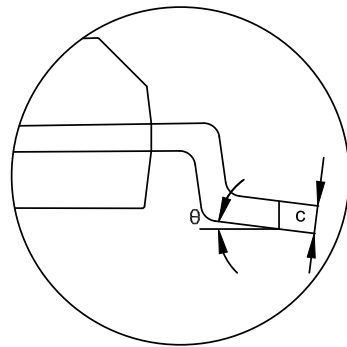
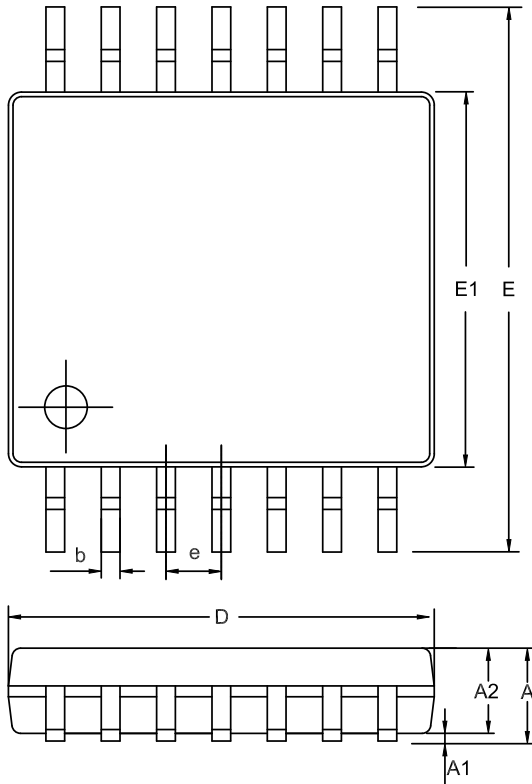
NOTES

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
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
TPA1781-SO1R	-40 to 125°C	SOP8	1781	1	Tape and Reel, 4000	Green
TPA1781-S5TR	-40 to 125°C	SOT23-5	178	3	Tape and Reel, 3000	Green
TPA1782-SO1R	-40 to 125°C	SOP8	1782	1	Tape and Reel, 4000	Green
TPA1782-VS1R	-40 to 125°C	MSOP8	1782	3	Tape and Reel, 3000	Green
TPA1784-SO2R ⁽¹⁾	-40 to 125°C	SOP14	1784	1	Tape and Reel, 2500	Green
TPA1784-VS2R ⁽¹⁾	-40 to 125°C	TSSOP14	1784	1	Tape and Reel, 3000	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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