Features

- Supply Voltage: 4.5 V to 30 V, ±2 V to ±15 V
- Gain Setting Option:
  - TPA9372, TPA9373: 0.8333
  - TPA9382, TPA9383: 0.8
  - TPA9376, TPA9377: 0.25
  - TPA9386, TPA9387: 0.2
- Offset Voltage: ±60 μV (Max)
- Gain Error: 0.05% (Max)
- Gain Error Temperature Drift:
  - TPA937x, TPA938x: 5ppm/℃ (Max)
  - TPA937xA, TPA938xA: 1ppm/℃ (Max)
- Operating Temperature Range: −40°C to 125°C

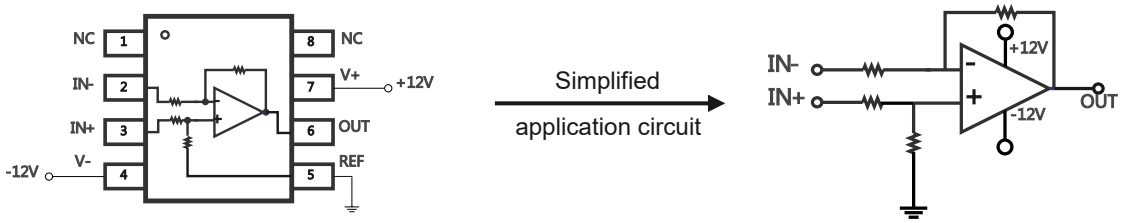
Description

The devices are general-purpose, fixed-gain difference amplifiers,which are intended for precision signal conditioning. The devices have extremely low-gain drift within the operating temperature range. The devices also provide an exceptional common-mode rejection ratio (85 dB typical). The common-mode range of the amplifiers exceeds the supply voltage rails, making the devices ideal for single-supply applications that require a wide common-mode voltage range.

Applications

- Instrumentation
- Industrial Control
- Audio
- Building Block for the Precision Amplifier Circuit

Typical Application Circuit - TPA93x2/TPA93x6



Typical Application Circuit - TPA93x3/TPA93x7

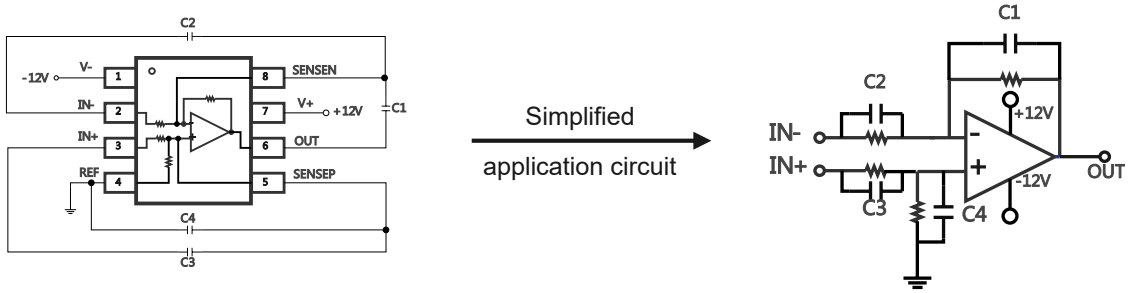


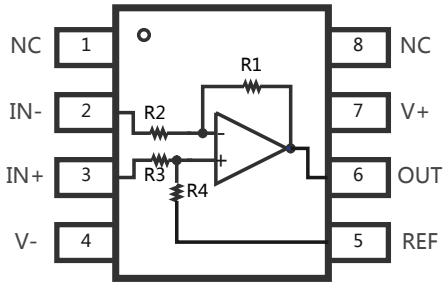
Table of Contents

Revision History

Date	Revision	Notes
2025-07-29	Rev.A.0	Initial version

Pin Configuration and Functions

TPA93x2, TPA93x6
SOP8 Package
Top View



TPA93x3, TPA93x7
SOP8 Package
Top View

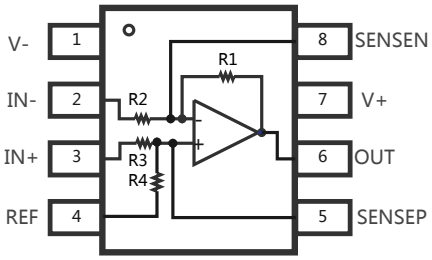


Table 1. Internal Resistor Value for TPA937x, TPA938x

Part Number	R1 = R4 (kΩ)	R2 = R3 (kΩ)	Gain	Note
TPA9372-SO1R	100	120	0.8333	
TPA9373-SO1R	100	120	0.8333	With Sense PIN
TPA9376-SO1R	30	120	0.25	
TPA9377-SO1R	30	120	0.25	With Sense PIN
TPA9382-SO1R	8	10	0.8	
TPA9383-SO1R	8	10	0.8	With Sense PIN
TPA9386-SO1R	2	10	0.2	
TPA9387-SO1R	2	10	0.2	With Sense PIN

Table 2. Pin Functions: TPA937x, TPA938x

Pin No. TPA93x2 TPA93x6	Pin No. TPA93x3 TPA93x7	Pin Name	I/O	Description
1	-	NC	-	Not Connect
2	2	IN-	I	Inverting input.
3	3	IN+	I	Noninverting input
4	1	V-	-	Negative power supply (1)
5	4	REF	I	Reference input.
6	6	OUT	O	Output
7	7	V+	-	Positive power supply (1)
8	-	NC	-	Not Connect
-	8	SENSEN	I	Negative Sense input.
-	5	SENSEP	I	Positive Sense input.

(1) In this document, $(+V_S) - (-V_S)$ is referred to V_S.

Specifications

Absolute Maximum Ratings (1)

Parameter		Min	Max	Unit
	Supply Voltage: ($+V_S$) − ($-V_S$)		32	V
	Input Voltage Range TPA9372, TPA9373, TPA9382, TPA9383(2)	−33	33	V
	Input Voltage Range, TPA9376, YPA9377(2)	−75	75	V
	Input Voltage Range, TPA9386, YPA9387(2)	−30	30	V
	Input Current: +IN, −IN (3)	−10	10	mA
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 input voltage range is also limited by the supply voltage. The maximum values listed in the table can be achieved when Vs=±15V
(3) The inputs are protected by ESD protection diodes to each power supply. If the input extends more than 300 mV beyond the power supply, the input current should be limited to less than 10 mA.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001 (1)	1	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002 (2)	1.5	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	Single Supply	4		30	V
		Dual Supply	±2		±15	V
T_A	Operating Temperature Range		−40		125	°C

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOP8	158	43	°C/W

Electrical Characteristics - TPA937x, TPA938x

All test conditions: ($+V_S$) = +15 V, ($-V_S$) = –15 V, R_L = 10 kΩ to ground, reference pin connected to ground, T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Conditions	Additional Conditions	Min	Typ	Max	Unit
Power Supply							
V_S	Supply Voltage Range	(V_+) − (V_-)		4		30	V
I_Q	Quiescent Current per Amplifier	No load			140	200	µA
			−40°C to 125°C			250	µA
Gain							
	Initial	V_{OUT} = ±10 V	TPA9372, TPA9373		0.8333		V/V
			TPA9382, TPA9383		0.8		V/V
			TPA9376, TPA9377		0.25		V/V
			TPA9386, TPA9387		0.2		V/V
GE	Gain Error	V_{OUT} = ±10 V			0.01	0.05	%FSR
	Gain Drift	TPA937x, TPA938x	−40°C to 125°C		1	5	PPM/°C
		TPA937xA, TPA938xA	−40°C to 125°C		0.2	1	PPM/°C
	Nonlinearity				0.001		%FSR
Offset Voltage							
V_{OS}	Input Offset Voltage	V_{CM} = 0 V			10	60	µV
			−40°C to 125°C			120	µV
V_{OS} TC	Offset Voltage Drift		−40°C to 125°C		0.1		µV/°C
PSRR	Power Supply Rejection Ratio	V_S = 4 V to 30 V, (IN+) = (IN-) = 0 V		125	145		dB
Input							
	Input Voltage Range	Differential V_S=±15V	TPA9372, TPA9373 TPA9382, TPA9383	-30		26	V
			TPA9376, TPA9377	-60		60	V
			TPA9386, TPA9387	-24		24	V
CMRR	Common-Mode Rejection	V_{CM} = −12 V to 12 V		74	85		dB
Output							
	Output Swing from Supply Rail	R_{LOAD} = 10 kΩ to V_S / 2			90	151	mV
I_{SC}	Output Short-Circuit Current			45	62		mA
AC Specifications							
GBW	Gain-Bandwidth Product		TPA9372, TPA9373		500		kHz
			TPA9376, TPA9377		1000		kHz

Symbol	Parameter	Conditions	Additional Conditions	Min	Typ	Max	Unit
			TPA9382, TPA9383		1000		kHz
			TPA9386, TPA9387		2000		kHz
SR	Slew Rate	10-V step			0.7		V/μs
Noise Performance							
E_N	Input Voltage Noise	f = 0.1 Hz to 10 Hz	TPA9372, TPA9373		1.3		μV_{pp}
		f = 0.1 Hz to 10 Hz	TPA9376, TPA9377		0.7		μV_{pp}
		f = 0.1 Hz to 10 Hz	TPA9382, TPA9383		0.8		μV_{pp}
		f = 0.1 Hz to 10 Hz	TPA9386, TPA9387		0.5		μV_{pp}
e_N	Input Voltage Noise Density	f = 1 kHz	TPA9372, TPA9373		90		$nV/\sqrt{Hz}$
		f = 1 kHz	TPA9376, TPA9377		45		$nV/\sqrt{Hz}$
		f = 1 kHz	TPA9382, TPA9383		50		$nV/\sqrt{Hz}$
		f = 1 kHz	TPA9386, TPA9387		30		$nV/\sqrt{Hz}$

Typical Performance Characteristics - TPA937x, TPA938x

All test conditions: V_S = ±15 V, V_{CM} = 0 V, R_L = 10 kΩ, unless otherwise specified.

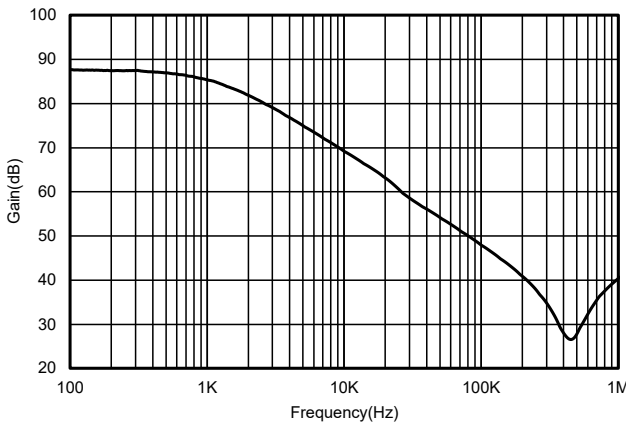


Figure 1. TPA9372 CMRR vs. Frequency

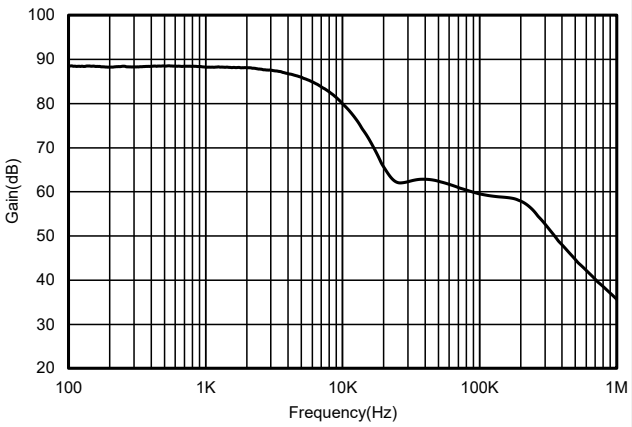


Figure 2. TPA9382 CMRR vs. Frequency

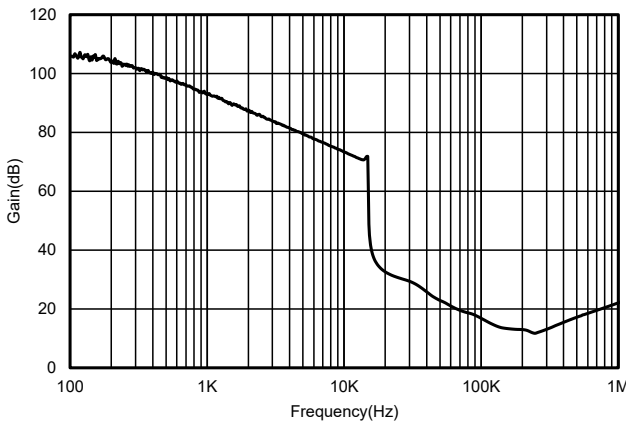


Figure 3. TPA9372 PSRR+ vs. Frequency

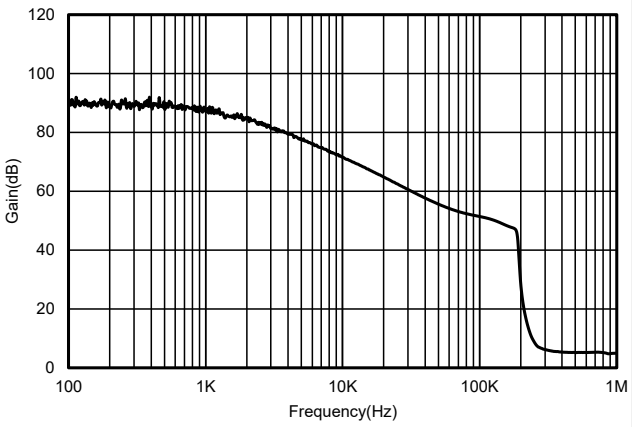


Figure 4. TPA9372 PSRR- vs. Frequency

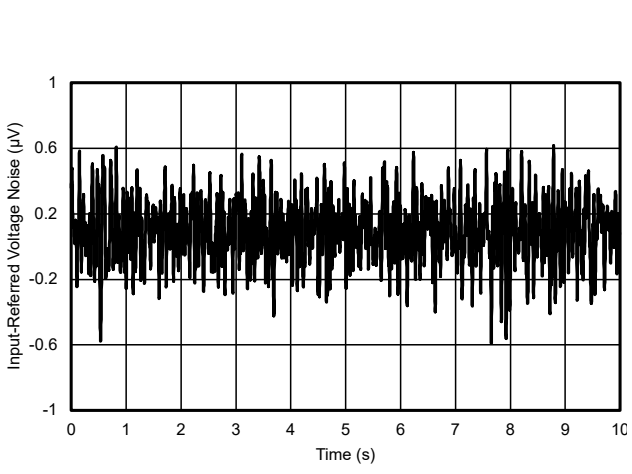


Figure 5. TPA9372 0.1-Hz to 10-Hz Voltage Noise

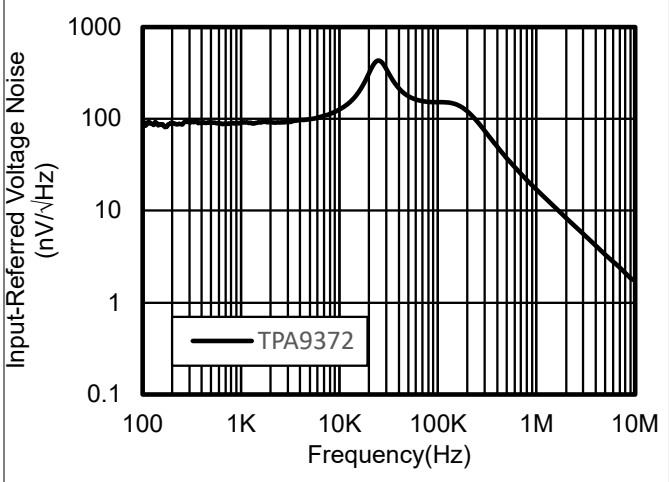


Figure 6. TPA9372 Input Referred Noise vs. Frequency

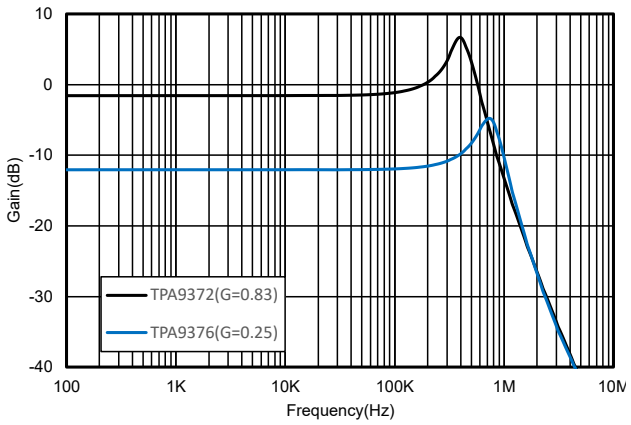


Figure 7. TPA937x GAIN vs. Frequency

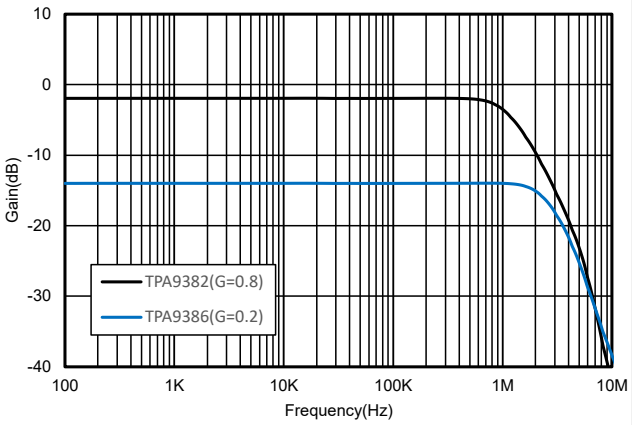
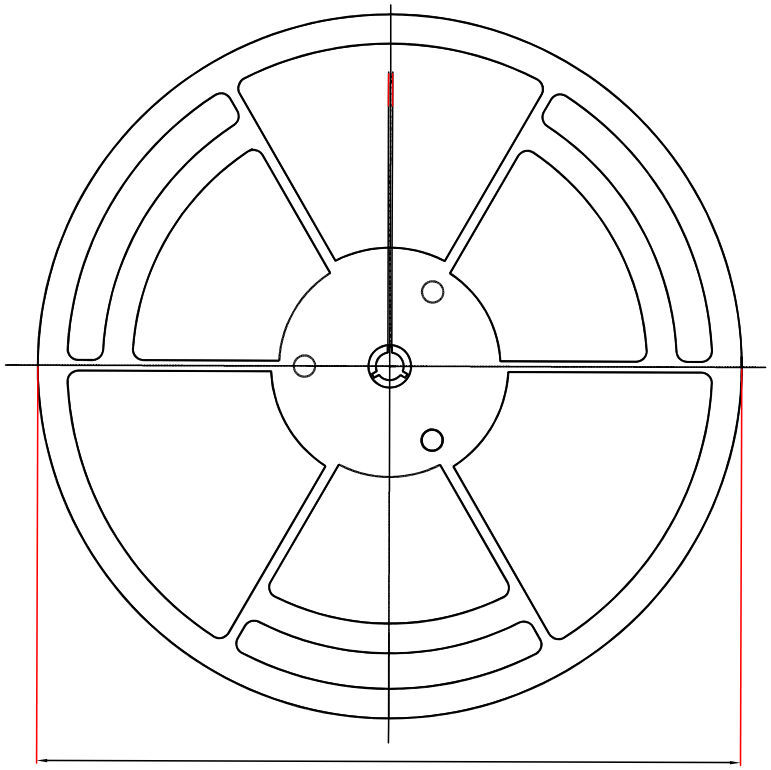
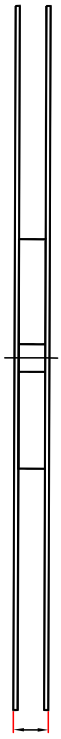
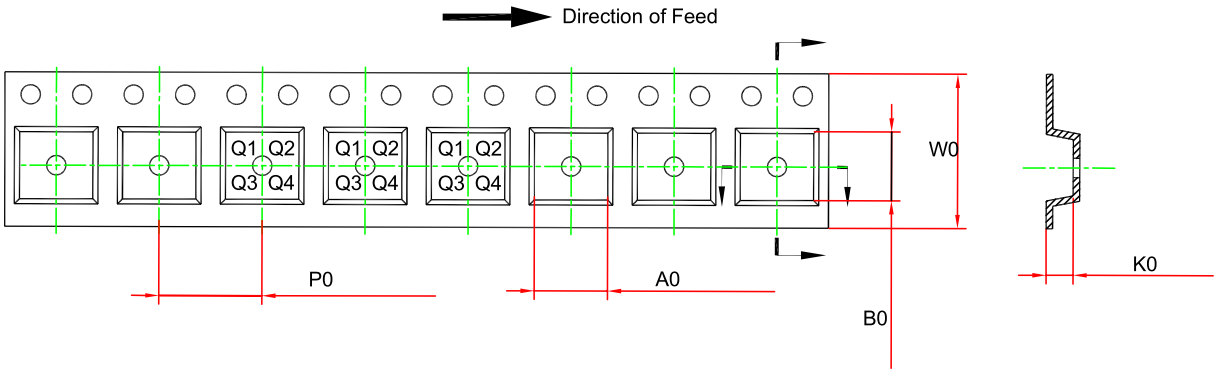


Figure 8. TPA938x GAIN vs. Frequency

Tape and Reel Information







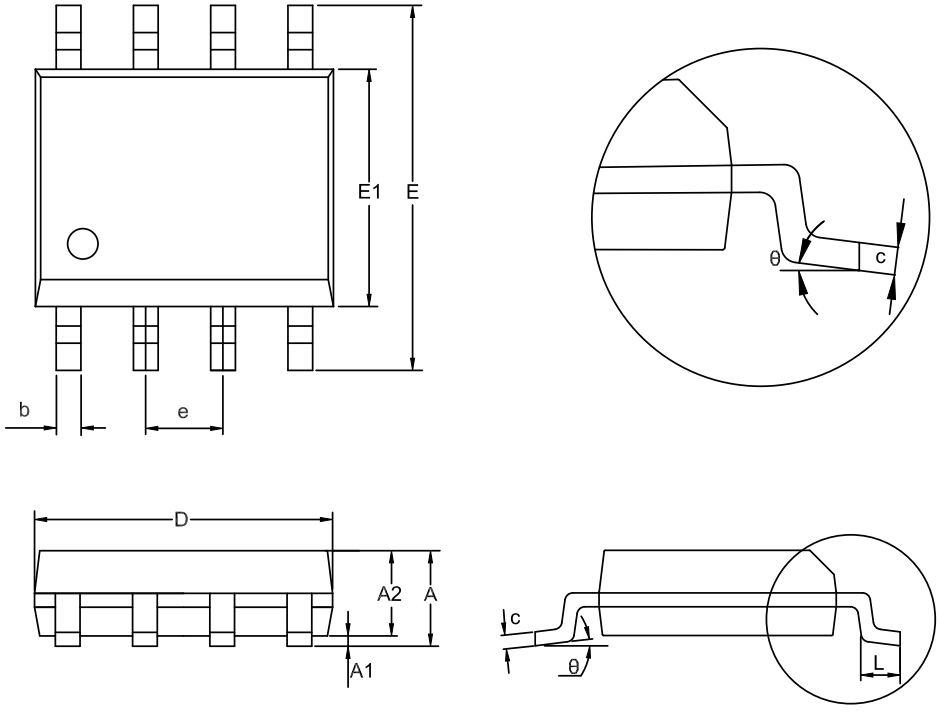
Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm) (1)	B0 (mm) (1)	K0 (mm) (1)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPA937x-SO1R	SOP8	330.0	17.6	6.5	5.4	2.0	8.0	12.0	Q1
TPA938x-SO1R	SOP8	330.0	17.6	6.5	5.4	2.0	8.0	12.0	Q1

(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.

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPA9372-SO1R	−40 to 125°C	SOP8	A9372	3	Tape and Reel, 4000	Green
TPA9372A-SO1R	−40 to 125°C	SOP8	A9372	3	Tape and Reel, 4000	Green
TPA9373-SO1R	−40 to 125°C	SOP8	A9373	3	Tape and Reel, 4000	Green
TPA9373A-SO1R	−40 to 125°C	SOP8	A9373	3	Tape and Reel, 4000	Green
TPA9376-SO1R	−40 to 125°C	SOP8	A9376	3	Tape and Reel, 4000	Green
TPA9376A-SO1R	−40 to 125°C	SOP8	A9376	3	Tape and Reel, 4000	Green
TPA9377-SO1R	−40 to 125°C	SOP8	A9377	3	Tape and Reel, 4000	Green
TPA9377A-SO1R	−40 to 125°C	SOP8	A9377	3	Tape and Reel, 4000	Green
TPA9382-SO1R	−40 to 125°C	SOP8	A9382	3	Tape and Reel, 4000	Green
TPA9382A-SO1R	−40 to 125°C	SOP8	A9382	3	Tape and Reel, 4000	Green
TPA9383-SO1R	−40 to 125°C	SOP8	A9383	3	Tape and Reel, 4000	Green
TPA9383A-SO1R	−40 to 125°C	SOP8	A9383	3	Tape and Reel, 4000	Green
TPA9386-SO1R	−40 to 125°C	SOP8	A9386	3	Tape and Reel, 4000	Green
TPA9386A-SO1R	−40 to 125°C	SOP8	A9386	3	Tape and Reel, 4000	Green
TPA9387-SO1R	−40 to 125°C	SOP8	A9387	3	Tape and Reel, 4000	Green
TPA9387A-SO1R	−40 to 125°C	SOP8	A9387	3	Tape and Reel, 4000	Green

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

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