

Features

- Power Supply Voltage: 2.5 V to 36 V
- Low Supply Current: 150 μ A per channel
- High-to-Low Propagation Delay: 300 ns
- Offset Voltage: ± 4.5 mV
- Input Common-Mode Range Includes Ground
- Open-Drain Output for Maximum Flexibility
- -40°C to 125°C Operation Range

Applications

- Peak and Zero-crossing Detectors
- Threshold Detectors/Discriminators
- Sensing at the Ground or Supply Line
- Logic Level Shifting or Translation
- Window Comparators
- IR Receivers

Description

The devices in this series consist of two comparators on a single monolithic substrate. The common-mode input voltage range includes ground and power even when operated from a single supply, and the low power supply current drain makes these comparators suitable for battery operation. The devices are designed to directly interface with TTL and CMOS, the outputs can be connected to other open-collector or open-drain outputs to achieve wired-AND relationships.

The devices are specified for the temperature range from -40°C to $+125^{\circ}\text{C}$.

Typical Application Circuit

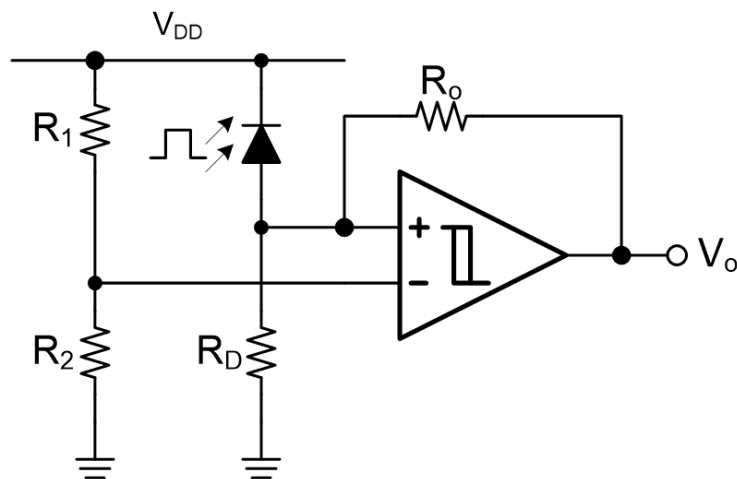


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Revision History

Date	Revision	Notes
2024-04-07	Rev.A.0	Initial version.
2024-06-09	Rev.A.1	The following updates are all about the new datasheet formats or typo, the actual product remains unchanged. Updated the Figure 5 and Figure 6 , the actual product remains unchanged.
2024-12-19	Rev.A.2	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 the Tape and Reel Information.
2025-02-21	Rev.A.3	Updated the description in Application Information . The actual product remains unchanged.

Pin Configuration and Functions

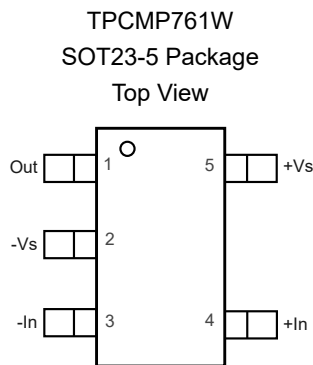
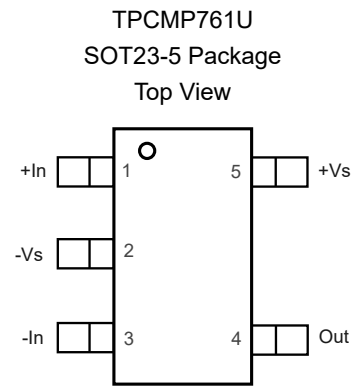
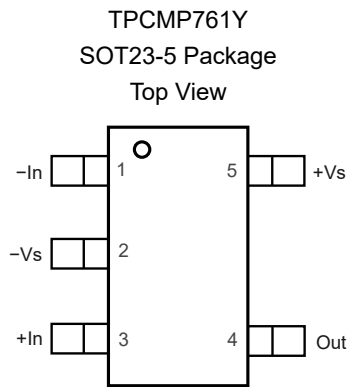


Table 1. Pin Functions: TPCMP761Y, TPCMP761U, TPCMP761W

Pin No.			Name	I/O	Description
TPCMP761W	TPCMP761U	TPCMP761Y			
1	4	4	Out	O	Output
2	2	2	-Vs	-	Negative power supply
3	3	1	-In	I	Inverting input
4	1	3	+In	I	Noninverting input
5	5	5	+Vs	-	Positive power supply

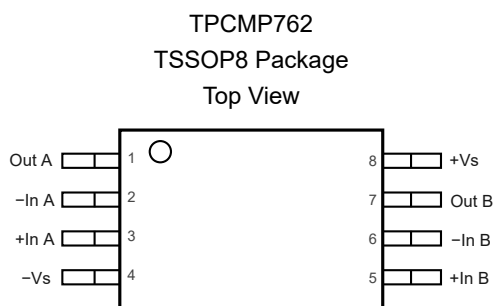
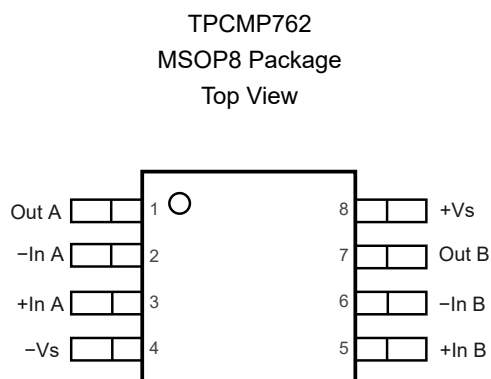
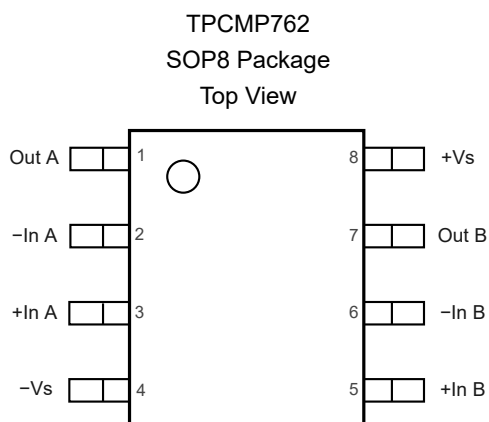


Table 2. Pin Functions: TPCMP762

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

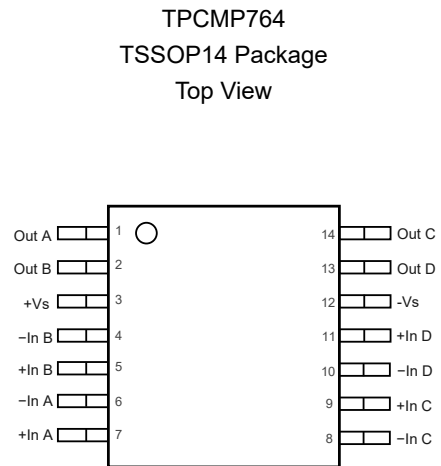
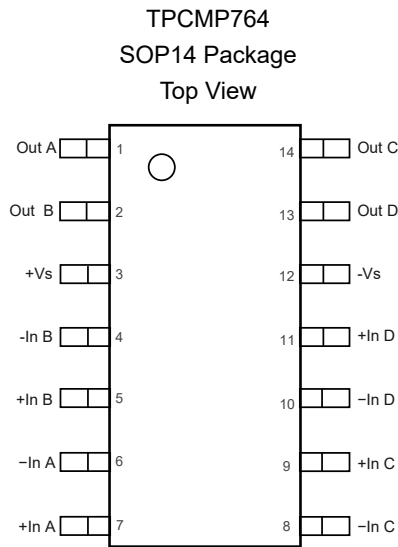


Table 3. Pin Functions: TPCMP764

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

Specifications

Absolute Maximum Ratings ⁽¹⁾

Parameter		Min	Max	Unit
	Supply Voltage, (+V _S) – (–V _S)		40	V
	Input Voltage: +IN, –IN	(–V _S) – 0.3	(+V _S) + 0.3	V
	Input Current: +IN, –IN ⁽²⁾	–20	+20	mA
	Output Voltage: OUT	(–V _S) – 0.3	36	V
	Output Current: OUT	–20	+20	mA
	Output Short-Circuit Duration ⁽³⁾		Infinite	
	Current at Supply Pins	–60	60	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 inputs are protected by ESD protection diodes to each power supply. If the input extends more than 500 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 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

Parameter		Condition	Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	0.5	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	Single Supply	2.5		36	V
		Dual Supply	±1.25		±18	V
T _A	Operating Temperature Range		–40		125	°C

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT23-5	250	81	°C/W
SOP8	158	43	°C/W
TSSOP8	191	50	°C/W
MSOP8	210	45	°C/W
SOP14	120	36	°C/W
TSSOP14	180	35	°C/W

Electrical Characteristics

All test conditions: $V_S = 5\text{ V}$, $R_{\text{PULL-UP}} = 5.1\text{ k}\Omega$, $C_L = 15\text{ pF}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameter		Conditions		Min	Typ	Max	Unit
Power Supply							
I _Q	Quiescent Current per Comparator	For TPCMP761, V _{CC} = 5 V			200	250	μA
		For TPCMP761, V _{CC} = 36 V			300	350	μA
		For TPCMP762/764, V _{CC} = 5 V			100	125	μA
		For TPCMP762/764, V _{CC} = 36 V			150	175	μA
Input Characteristics							
V _{OS}	Input Offset Voltage ⁽¹⁾	V _{CC} = 5 V to 36 V, V _{CM} = 0 V, T _A = -40°C to 125°C		-4.5	±0.5	4.5	mV
I _B	Input Bias Current ⁽²⁾	V _{DM} = 0 V, V _{CM} = 0 V		-50	±0.2	50	nA
		V _{DM} = 0 V, V _{CM} = 0 V, T _A = -40°C to 125°C		-150	1	150	nA
I _{OS}	Input Offset Current ⁽²⁾	V _{DM} = 0 V, V _{CM} = 0 V		-50	±0.2	50	nA
		V _{DM} = 0 V, V _{CM} = 0 V, T _A = -40°C to 125°C		-150	1	150	nA
C _{IN}	Input Capacitance	T _A = 25°C	Differential		1.5		pF
			Common Mode		2		
V _{CM}	Common-mode Input Voltage Range			(-V _S)		(+V _S) - 1.5	V
		T _A = -40°C to 125°C		(-V _S)		(+V _S) - 2	V
A _{VD}	Large-signal Differential voltage Amplification ⁽⁴⁾	V _{CC} = 15 V, V _O = 1.4 V to 11.4 V, R _L ≥ 15 kΩ to V _{CC}		50	400		V/mV
Output Characteristics							
I _{OH}	High-level Output Current	V _{OH} = 5 V, V _{ID} = 1 V			20	50	nA
		V _{CC} = 36 V, V _{OH} = 36 V, V _{ID} = 1 V, T _A = -40°C to 125°C				150	nA
V _{OL}	Low-Level Output Voltage	I _{OL} = 4 mA, V _{ID} = -1 V			200	250	mV
		I _{OL} = 4 mA, V _{ID} = -1 V, T _A = -40°C to 125°C				350	mV
I _{OL}	Low-level Output Current	V _{OL} = 1.5 V, V _{ID} = -1 V		15			mA
Switching Characteristics, T _A = -40°C to 125°C ⁽³⁾							
T _{PLH}	Propagation delay time, low-to-high	ΔV _{IN} = 0.1 V, V _{CM} = 0 V, 100-mV overdrive, C _L = 15pF ⁽²⁾			300	440	ns
		ΔV _{IN} = 0.1 V, V _{CM} = 0 V, 20-mV overdrive, C _L = 15pF ⁽²⁾			490	700	ns
		ΔV _{IN} = 0.1 V, V _{CM} = 0 V, 5-mV overdrive, C _L = 15pF ⁽²⁾			790	1130	ns
T _{PHL}	Propagation delay time, high-to-low	ΔV _{IN} = 0.1 V, V _{CM} = 0 V, 100-mV overdrive, C _L = 15 pF ⁽²⁾			300	470	ns

Parameter		Conditions	Min	Typ	Max	Unit
		$\Delta V_{IN} = 0.1\text{ V}$, $V_{CM} = 0\text{ V}$, 20-mV overdrive, $C_L = 15\text{ pF}$ ⁽²⁾		490	750	ns
		$\Delta V_{IN} = 0.1\text{ V}$, $V_{CM} = 0\text{ V}$, 5-mV overdrive, $C_L = 15\text{ pF}$ ⁽²⁾		870	1230	ns

(1) The input offset voltage is the average of the input-referred trip points.

(2) Provided by bench test and design simulation.

(3) Delay time is measured from input to mid-point of output.

(4) Provided by design simulation.

Typical Performance Characteristics

All test conditions: $V_S = 5\text{ V}$, $V_{CM} = 0\text{ V}$, $R_{pull-up} = 5.1\text{ K}$, $C_L = 15\text{ pF}$, unless otherwise noted.

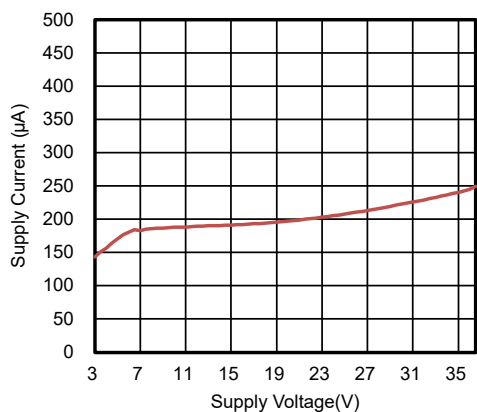


Figure 1. Supply Current vs. Supply Voltage (Dual channel)

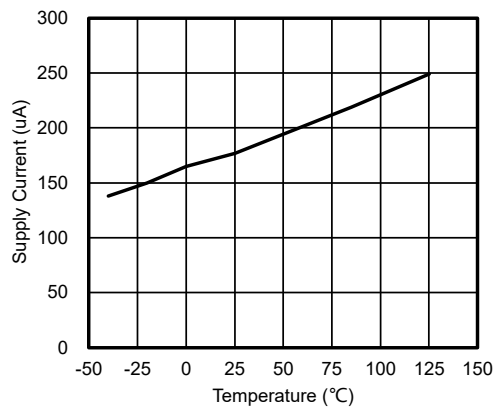


Figure 2. Supply Current vs. Temperature (Dual channel)

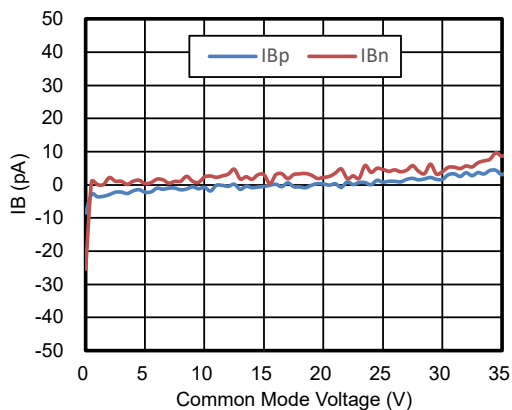


Figure 3. I_B vs. V_{CM} , $V_S = 36\text{ V}$

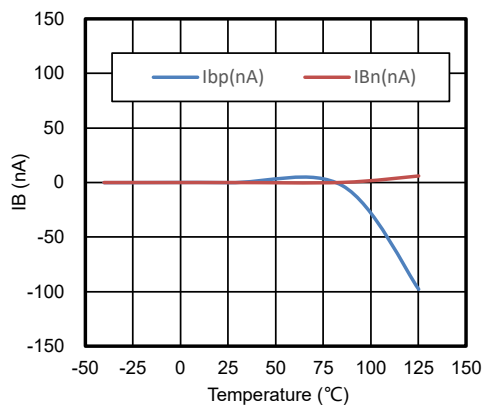


Figure 4. I_B vs. Temperature

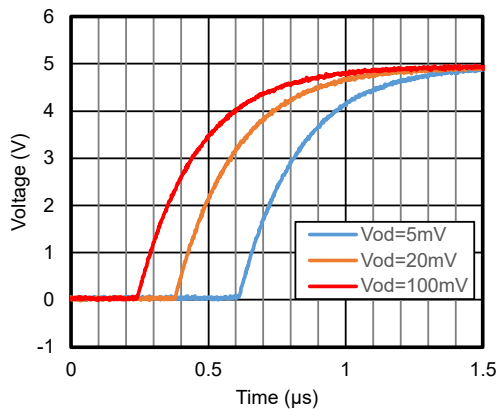


Figure 5. Propagation Delay, Low to High

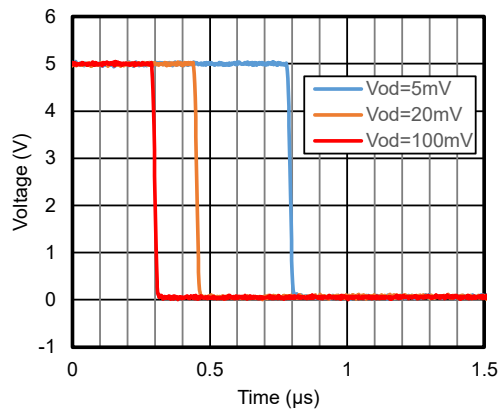


Figure 6. Propagation Delay, High to Low

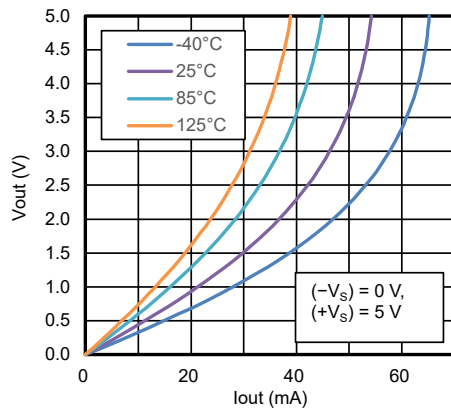


Figure 7. V_{OUT} vs. I_{OUT}, Sink

Detailed Description

Overview

The TPCMP76x series of comparators can operate from 2.5 V to 36 V and also have a very low I_q and fast response. The open-drain output allows the logic high voltage of the output to be configured or used in the AND functionality.

Functional Block Diagram

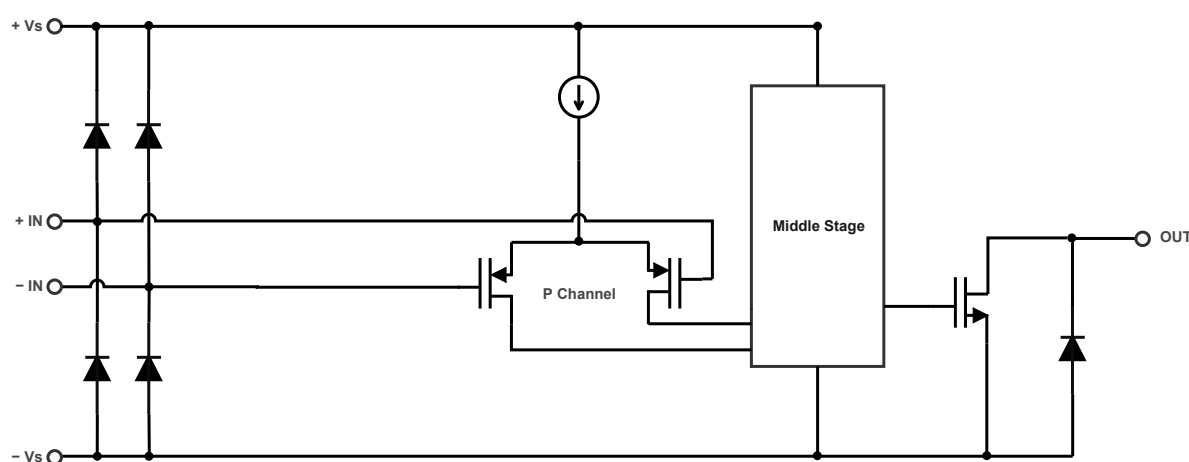


Figure 8. Functional Block Diagram

Feature Description

Operating Voltage

The devices are designed for single supply operation from 2.5 V to 36 V or dual supply operation from ± 1.25 V to ± 18 V.

The recommended operating voltage conditions are as follows:

Power supply voltage ($+V_S$) - ($-V_S$): 2.5 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 2.5 V to 36 V

For example, if operating with a single supply, ($-V_S$) = 0 V, then ($+V_S$) can support 2.5 V to 36 V. If using dual supplies with equal absolute values, the minimum voltage would be ± 1.25 V and the maximum voltage would be ± 18 V. It can even support other voltage configurations, such as ($-V_S$) = 100 V, ($+V_S$) = 136 V, or ($-V_S$) = -6 V, ($+V_S$) = 30 V, and so on.

No ESD Diode between the Output Pin and the $+V_S$ Pin

There is no ESD diode between the output pins and the ($+V_S$) pin, so the voltage at the output pins can be applied from 0 V to 36 V regardless of the voltage at the ($+V_S$) pin. The feature supports setting output logic as a high level to a voltage higher than the voltage at the ($+V_S$) 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

Power Supply Layout and Bypass

The power supply pin of the TPCMP76x family is supposed to have a local bypass capacitor (i.e., 0.01 μF to 0.1 μF) within 2 mm for good high-frequency performance. It can also use a bulk capacitor (i.e., 1 μF or larger) within 100 mm to provide large and slow currents. This bulk capacitor can be shared with other analog parts.

A good ground layout improves performance by decreasing the amount of stray capacitance and noise at the inputs and outputs of the comparator. To decrease stray capacitance, minimize PCB lengths and resistor leads, and place external components as close to the comparator pins as possible.

Operation Outside of the Common Input Voltage Range

The following is a list of input voltage situations and their outcomes:

1. When both $-IN$ and $+IN$ are within the common-mode range:
 - a. If the voltage at the $-IN$ pin is higher than the voltage at the $+IN$ pin and the offset voltage, the output is low, and the output MOSFET is a sinking current.
 - b. If the voltage at the $-IN$ pin is lower than the voltage at the $+IN$ pin and the offset voltage, the output is high and output MOSFET is sourcing current.
2. When the voltage at the $-IN$ pin is higher than the common-mode voltage range and the voltage at the $+IN$ pin is within the common-mode voltage range, the output is low, and the output MOSFET is a sinking current.
3. When the voltage at the $+IN$ pin is higher than the common-mode voltage range and the voltage at the $-IN$ pin is within the common-mode voltage range, the output is high impedance.
4. When the voltage at the $-IN$ pin is higher than the common-mode voltage range and the voltage at the $+IN$ pin is within the common-mode voltage range, the output is low, and the output MOSFET is a sinking current. After that the $+IN$ pin is above the common-mode voltage range (both $+IN$ and $-IN$ are above the common-mode voltage range), the output remains low.

When the voltage at the $+IN$ pin is higher than the common-mode voltage range and the voltage at the $-IN$ pin is within the common-mode voltage range, the output is high impedance. After that the $-IN$ pin is above the common-mode voltage range (both $+IN$ and $-IN$ are above the common-mode voltage range), and the output remains a high impedance state.

Typical Application

IR Receiver

The device is an ideal candidate to be used as an infrared receiver shown in [Figure 9](#). The infrared photo diode creates a current relative to the amount of infrared light present. The current creates a voltage across R_D . When this voltage level crosses the voltage applied by the voltage divider to the inverting input, the output transitions. Optional R_o provides additional hysteresis for noise immunity.

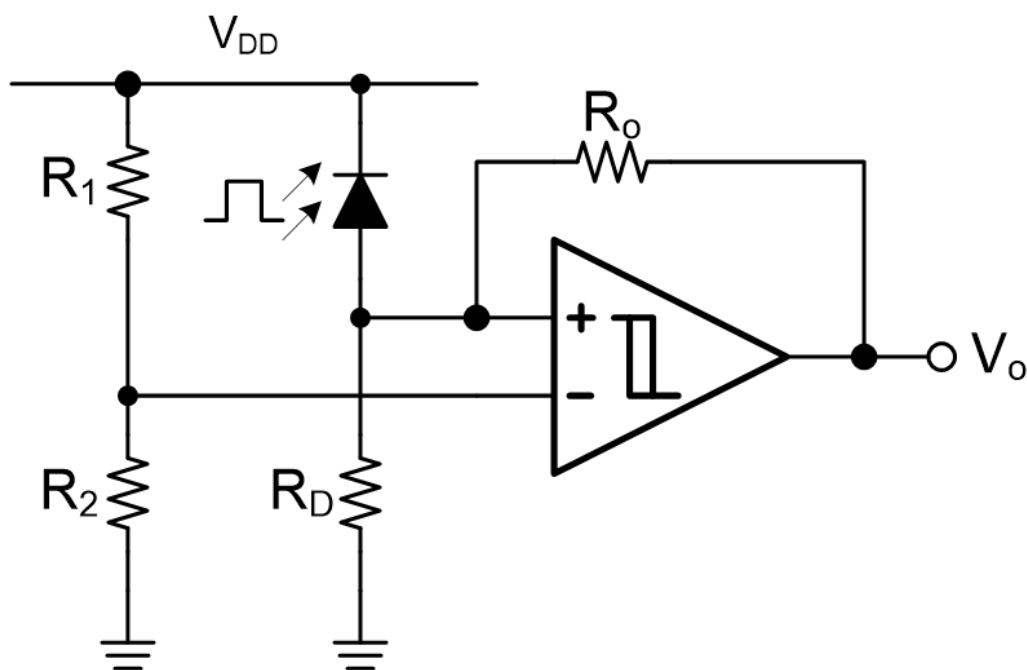
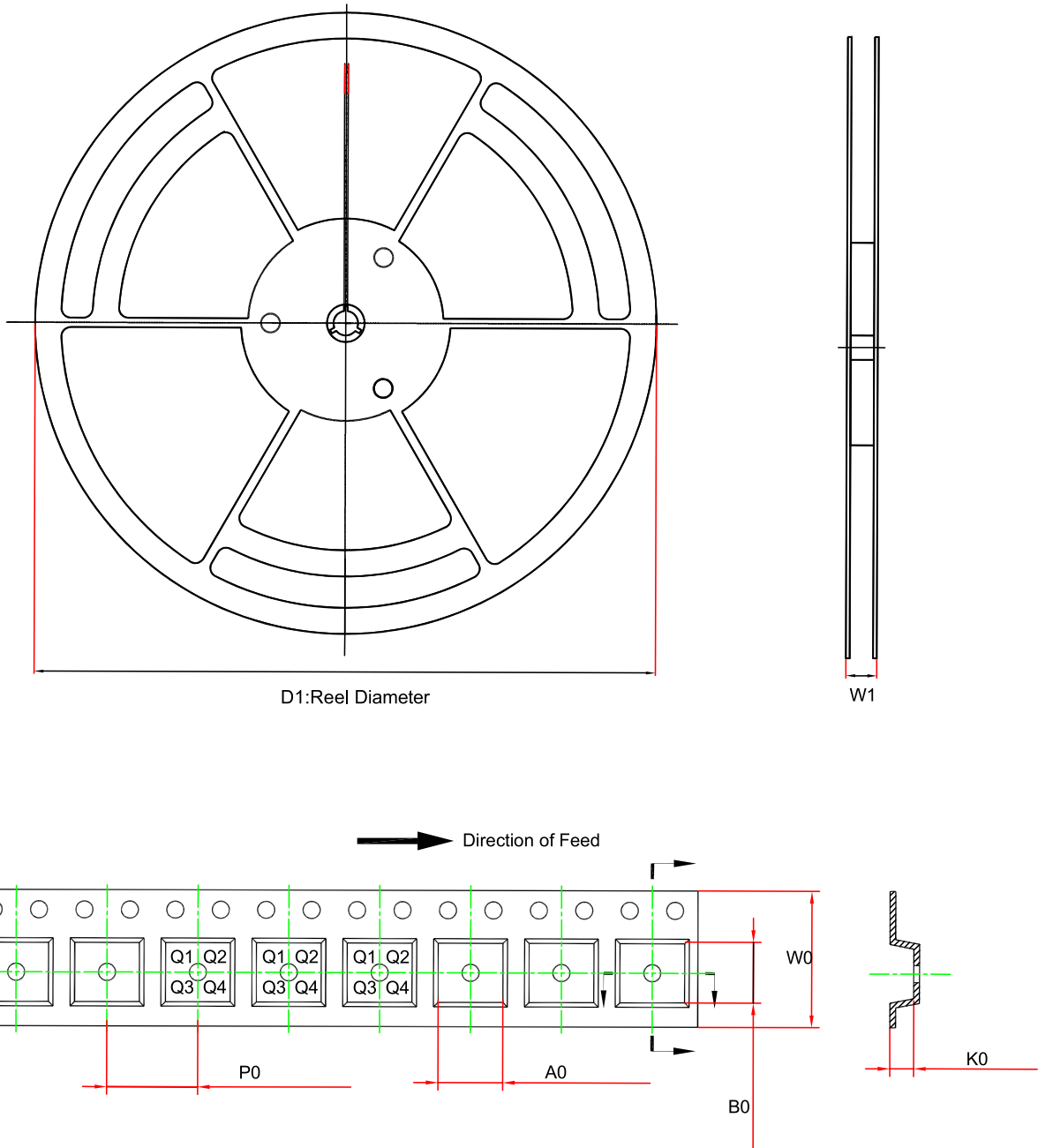


Figure 9. Typical Application Circuit

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
TPCMP762-SO1R	SOP-8	330	17.6	6.5	5.4	2	8	12	Q1
TPCMP762-TS1R	TSSOP-8	330	17.6	6.8	3.4	1.8	8	12	Q1
TPCMP762-VS1R	MSOP-8	330	17.6	5.3	3.4	1.3	8	12	Q1
TPCMP764-SO2R	SOP-14	330	21.6	6.5	9.3	2.1	8	16	Q1
TPCMP764-TS2R	TSSOP-14	330	17.6	6.8	5.5	1.5	8	12	Q1

36-V, Low Power Comparators with Open Drain Output

Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm) ⁽¹⁾	B0 (mm) ⁽¹⁾	K0 (mm) ⁽¹⁾	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPCMP761U-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPCMP761W-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPCMP761Y-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3

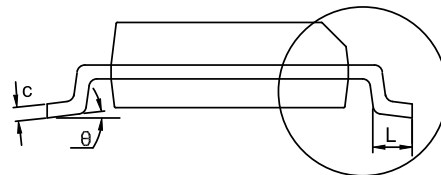
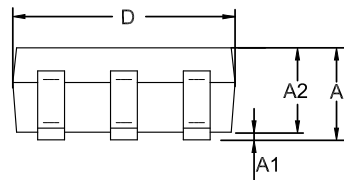
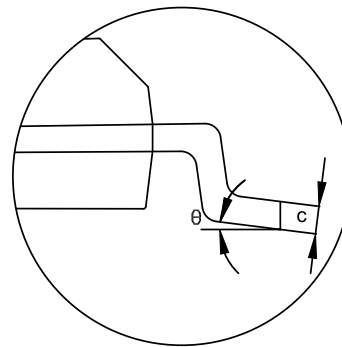
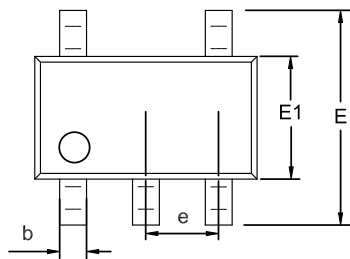
(1) The value is for reference only. Contact the 3PEAK factory for more information.

Package Outline Dimensions

SOT23-5

Package Outline Dimensions

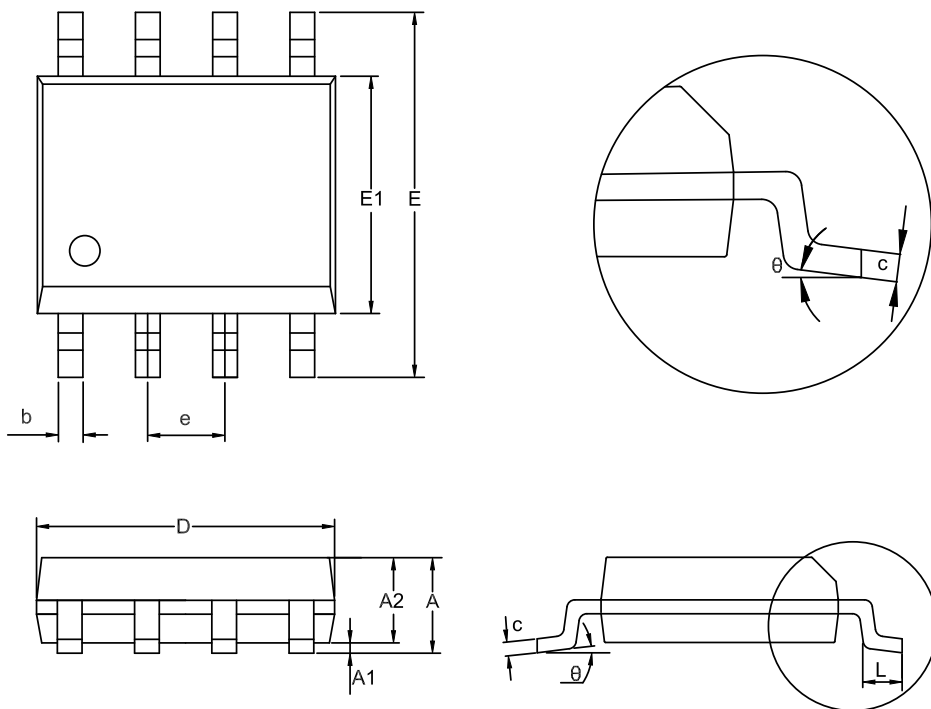
S5T(SOT23-5-A)



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

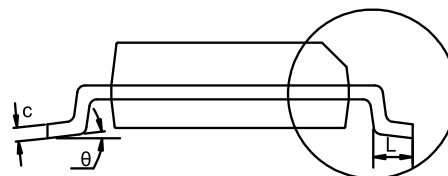
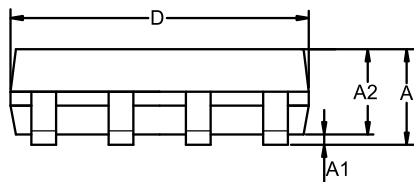
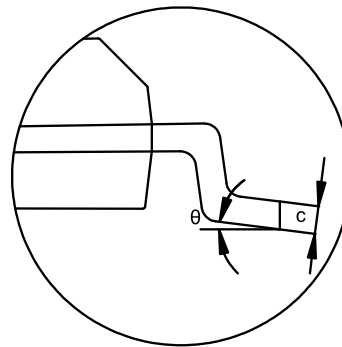
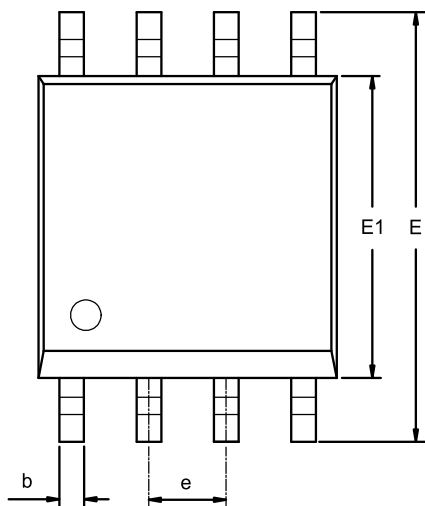
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

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
θ	0	8°	0	8°

NOTES

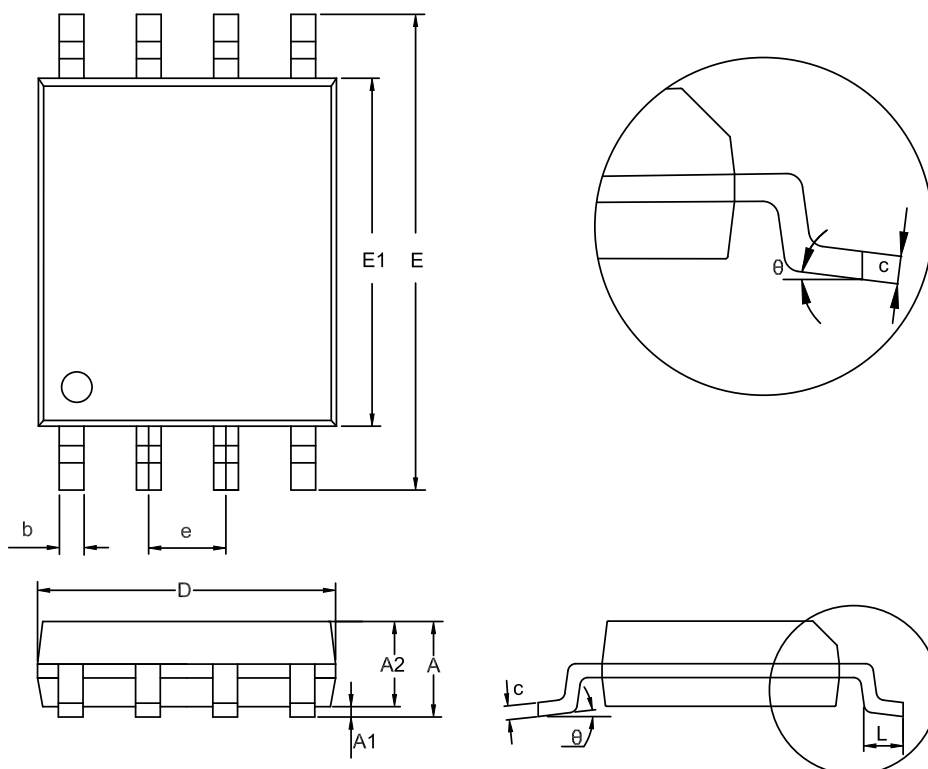
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

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

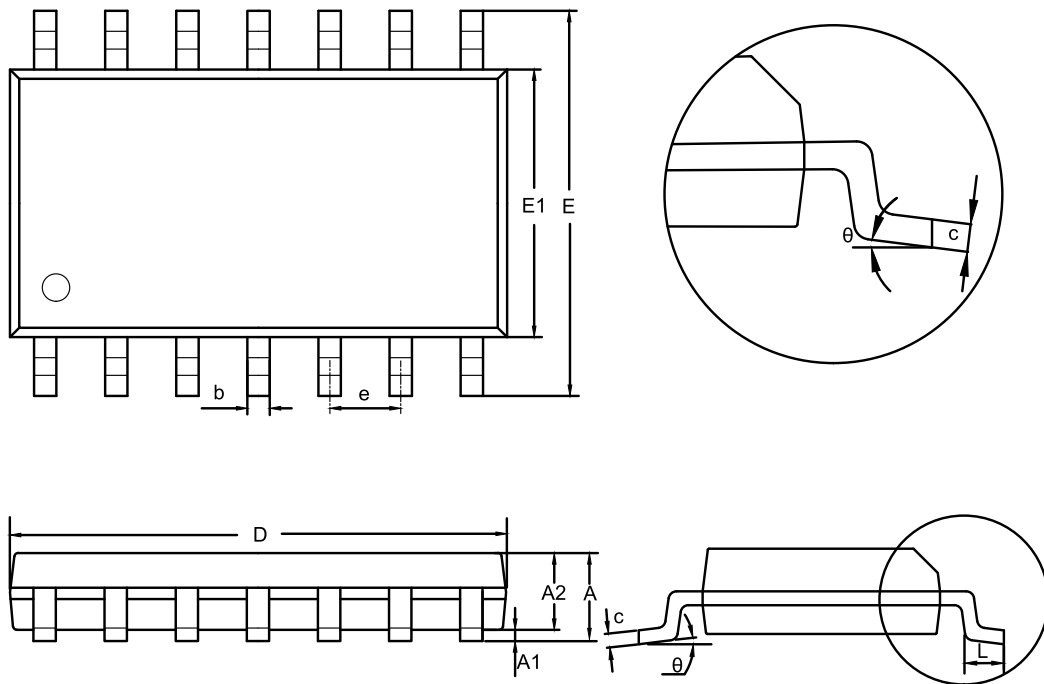
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

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

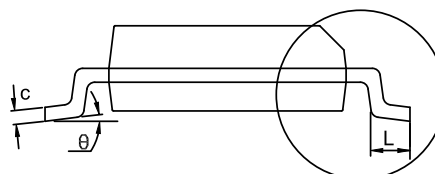
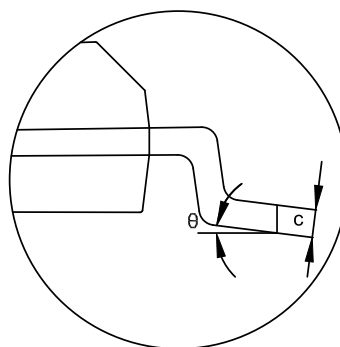
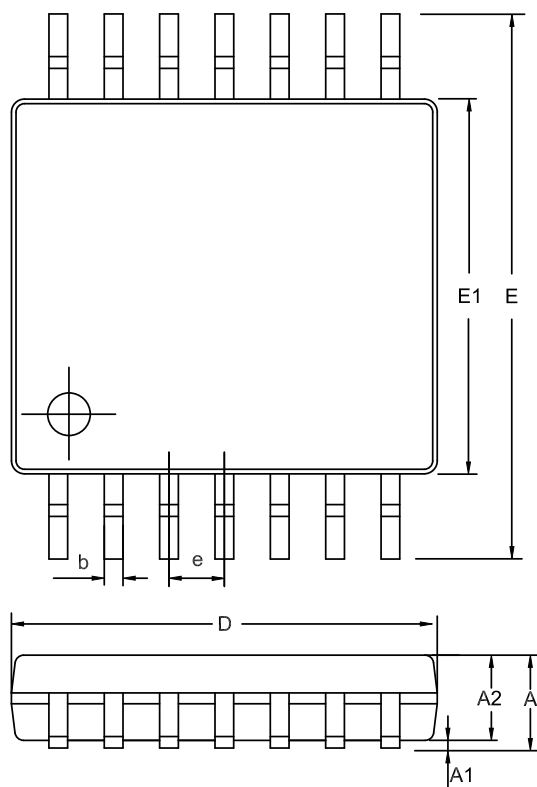
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

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
TPCMP761U-S5TR ⁽¹⁾	-40 to 125°C	SOT23-5	76U	MSL3	Tape and Reel,3000	Green
TPCMP761W-S5TR	-40 to 125°C	SOT23-5	76W	MSL3	Tape and Reel,3000	Green
TPCMP761Y-S5TR ⁽¹⁾	-40 to 125°C	SOT23-5	76Y	MSL3	Tape and Reel,3000	Green
TPCMP762-SO1R	-40 to 125°C	SOP-8	CM762	MSL3	Tape and Reel,4000	Green
TPCMP762-TS1R ⁽¹⁾	-40 to 125°C	TSSOP-8	CM762	MSL3	Tape and Reel,3000	Green
TPCMP762-VS1R ⁽¹⁾	-40 to 125°C	MSOP-8	CM762	MSL3	Tape and Reel,3000	Green
TPCMP764-SO2R	-40 to 125°C	SOP-14	CM764	MSL3	Tape and Reel,2500	Green
TPCMP764-TS2R	-40 to 125°C	TSSOP-14	CM764	MSL3	Tape and Reel,3000	Green

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

Green: Defines "Green" to mean RoHS compatible and free of halogen substances.

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