

## 1.Description

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The TMP36 is a low voltage, precision centigrade temperature sensors, which provides an analog voltage output that is linearly proportional to the Celsius (Centigrade) temperature. Every GX36 chip is factory calibrated, so no external calibration is required, and the typical accuracy is  $\pm 1^{\circ}\text{C}$  at  $+25^{\circ}\text{C}$  and  $\pm 2^{\circ}\text{C}$  over the  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  temperature range.

The low output impedance of the TMP36 and its linear output and precise calibration simplify interfacing to temperature control circuitry and ADC. The sensing devices can be powered from a single-supply of 2.7 V to 5.5 V. The supply current is less than  $50\mu\text{A}$ , providing very low self-heating effect, less than  $0.1^{\circ}\text{C}$  in still air. In addition, a shutdown function is provided to reduce supply current to less than  $0.5\mu\text{A}$ .

## 3.Applications

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- Power system monitors
- Temperature control

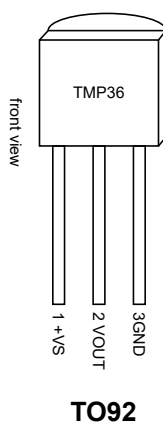
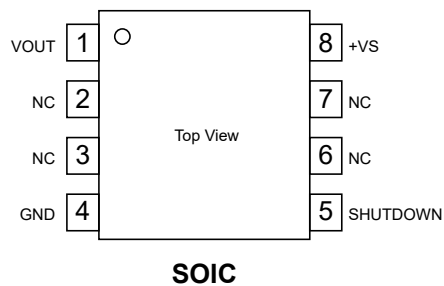
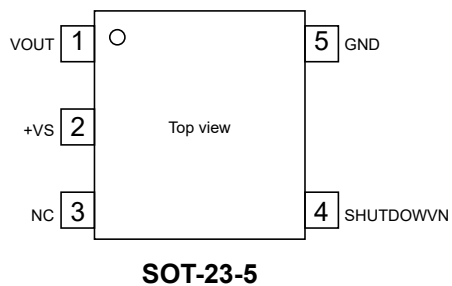
## 2.Features

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- Scale factor:  $10\text{ mV}/^{\circ}\text{C}$
- Operation range:  $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$   
up to  $+150^{\circ}\text{C}$
- Temperature accuracy:  $\pm 2^{\circ}\text{C}$  (typical)
- Temperature linearity:  $\pm 0.5^{\circ}\text{C}$  (typical)
- Package: 5-Pin SOT-23 (1.60mm $\times$ 3.00mm)  
8-Pin VSSOP (3.90 mm  $\times$  4.90 mm)
- Supply range: 2.7V  $\sim$  5.5V
- Low quiescent current:
  - Normal operation: less than  $50\mu\text{A}$
  - Shutdown mode: less than  $0.5\mu\text{A}$
- Stable with large capacitive loads
- Digital output: analog



#### 4. Pinning information





5.Pin Configuration and Functions

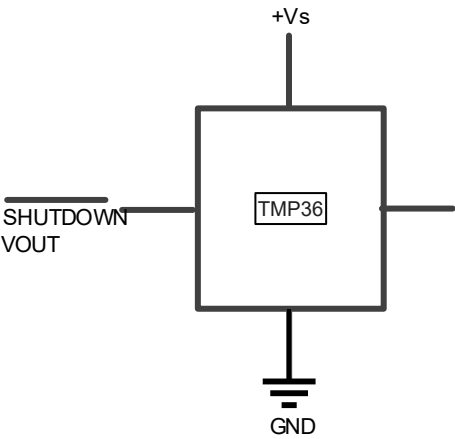


Figure 4. Pin Functions

Table 1. Device Pin Configuration and Functions

Name	PIN			Description
	SOT-23	TO92	SOIC	
Vout	1	2	1	Analog voltage output
+Vs	2	1	8	Device supply pin
/SHUTDOWN	4	/	5	Device enable pin
GND	5	3	4	Ground



## 6. Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power supply, +Vs		6	V
/SHUTDOWN pin	GND	+Vs	V
ALERT pin voltage	-0.5	(+Vs +0.3) and $\leq 5.5$	V
Operating range	-40	150	°C
Junction temperature		160	°C
Storage temperature	-60	160	°C

Unless otherwise stated, over operating free-air temperature range. Stress above these ratings may cause permanent damage to the device.

## 7. ESD Ratings

Parameter	Symbol	Value	Unit
Human Body Mode (HBM), per ANSI/ESDA/JEDEC JS-001	Electrostatic	$\pm 2000$	V
Machine Mode (MM), per JEDEC-STD Classification	discharge, $V_{ESD}$	200	V

## 8. Recommended Operating Conditions

Parameter	Symbol	Min	Nom	Max	Unit
Supply voltage	V+	2.7	3.3	5.5	V
Operating temperature range	$T_A$	-40		125	°C

Unless otherwise stated, over operating free-air temperature range.



## 9. Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply voltage range	$V_S$		2.7		5.5	V
Supply current	$I_{SY(ON)}$	Normal operation			40	$\mu A$
	$I_{SY(OFF)}$	Shutdown mode			0.5	$\mu A$
Temperature range			-40		125	$^{\circ}C$
Accuracy (Temperature error)		+25 $^{\circ}C$ , $+V_S=3.3V$		$\pm 1$	$\pm 2$	$^{\circ}C$
		0 $^{\circ}C$ to +70 $^{\circ}C$ , $+V_S=1.8V$		$\pm 1$	$\pm 3$	$^{\circ}C$
		-40 $^{\circ}C$ to +125 $^{\circ}$		$\pm 2$	$\pm 3$	$^{\circ}C$
Supply voltage sensitivity		$T_A=25^{\circ}C$ , $3.0V < +V_S < 5.5V$		20	100	$m^{\circ}C/V$
Scale factor		-40 $^{\circ}C \leq T_A \leq +125^{\circ}C$		10		$mV/^{\circ}C$
Load Regulation	PSSR	-40 $^{\circ}C \leq T_A \leq +105^{\circ}C$		8	30	$m^{\circ}C/\mu A$
		105 $^{\circ}C \leq T_A \leq +125^{\circ}C$		30	70	$m^{\circ}C/\mu A$
Linearity				0.5		$^{\circ}C$
Long-term stability				0.4		$^{\circ}C$
GX36 output voltage		$T_A=25^{\circ}C$		750		mV
Output load current	$I_L$		0		50	$\mu A$
Short-circuit current	$I_{SC}$				550	$\mu A$
Capacitive load driving	$C_L$		1000	10000		pF
Device turn-on time		Output within $\pm 1^{\circ}C$ 100 k $\Omega$    100 pF load <sup>2</sup>		0.5	1	ms



10. Typical characteristic

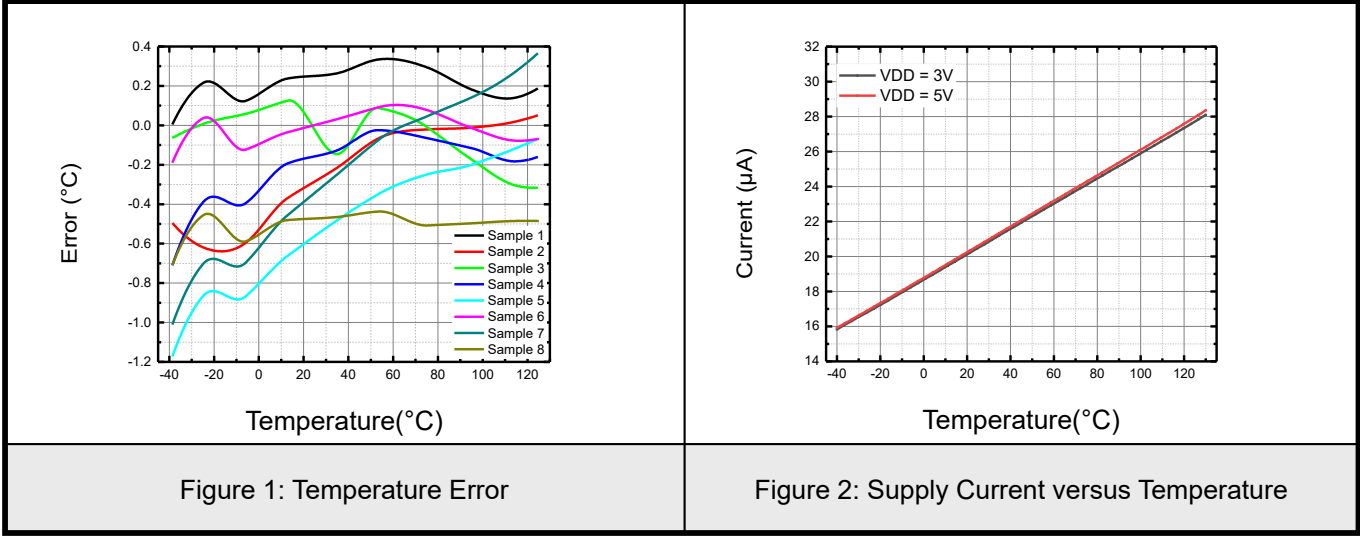


Table 2. Output Voltage versus Temperature

Conditions	V <sub>OUT</sub> (mV)	Temperature (°C)	V <sub>OUT</sub> (mV)
-40	100	50	1000
-30	200	60	1100
-20	300	70	1200
-10	400	80	1300
0	500	90	1400
10	600	100	1500
20	700	110	1600
30	800	120	1700
40	900	125	1750



## 11. Typical Applications

Figure 6 shows the basic temperature sensor connections for the TMP36 temperature sensor. Table 1 shows the corresponding pin descriptions for the three package types of temperature sensors. For the SOT-23, Pin 3 is labeled as “NC” as are Pins 2, 3, 6, and 7 on the SOIC package. It is recommended that no electrical connections be made to these pins. If the shutdown feature is not needed on the SOT-23 or the SOIC package, the /SHUTDOWN pin should be connected to +VS. Note the 0.1μF bypass capacitor on the input side of the power supply. This capacitor should be a ceramic type, and be located as close a physical proximity to the temperature sensor supply pin as practical to reach better filter effect. Minimizing the radio frequency interference (RFI) is especially important for these devices because the temperature sensor operates at very low current and can be exposed to extremely hostile electrical environments. When the sensor operates in an environment with high frequency radiation or high conducted noise, connecting a 0.1 μF ceramic capacitor in parallel with a large value tantalum capacitor (2.2 μF) can provide better noise reduction capability

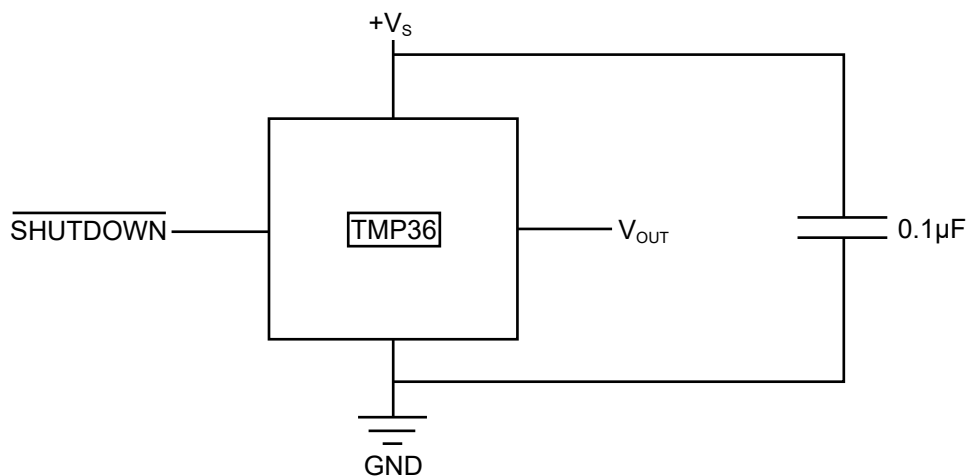
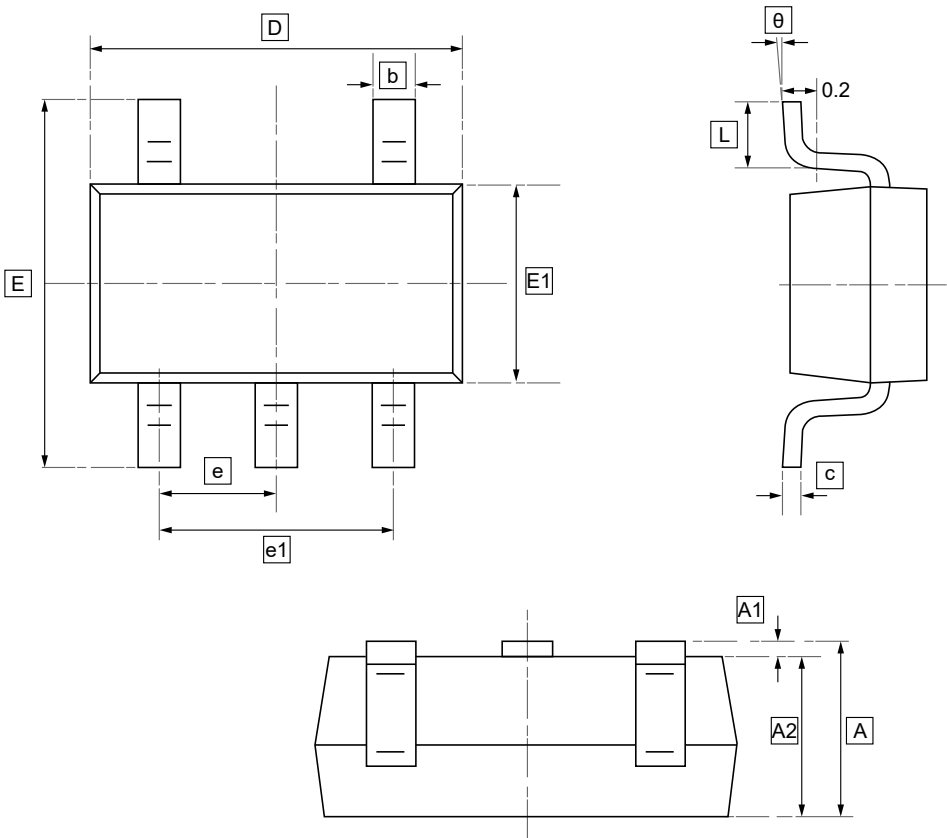


Figure 6. Basic Temperature Sensor Connections



12.1SOT23-5 Package Outline Dimensions

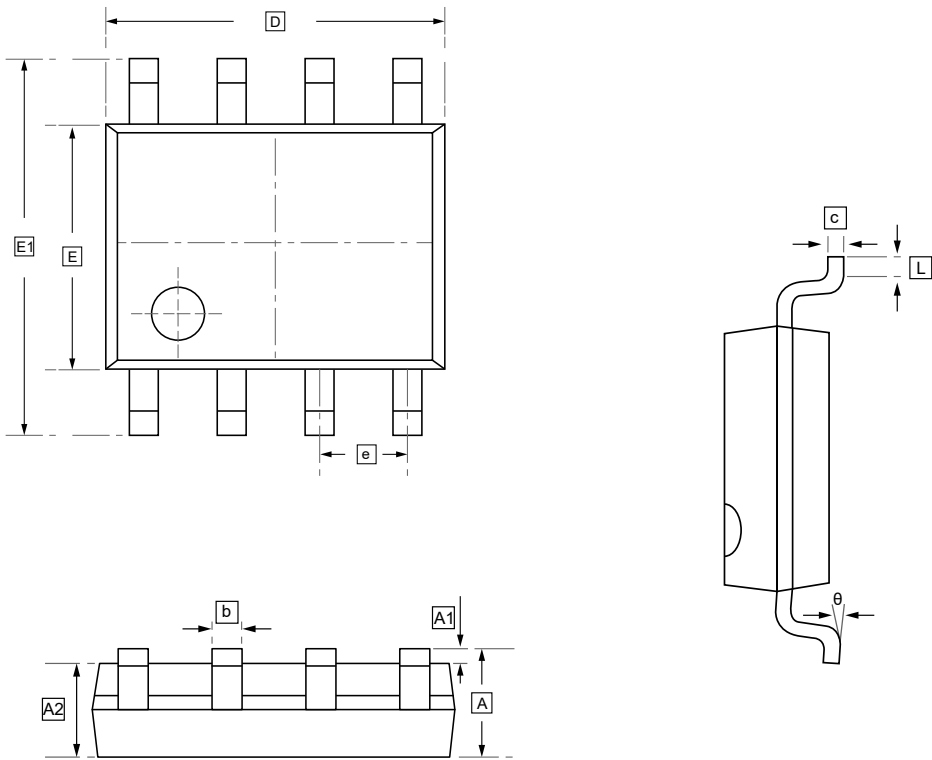


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E1	E	e	e1	L	θ
Min	1.050	0.000	1.050	0.300	0.100	2.820	1.500	2.650	0.950	1.800	0.300	0°
Max	1.250	0.100	1.150	0.500	0.200	3.020	1.700	2.950	BSC	2.000	0.600	8°



12.2SOP-8 Package Outline Dimensions

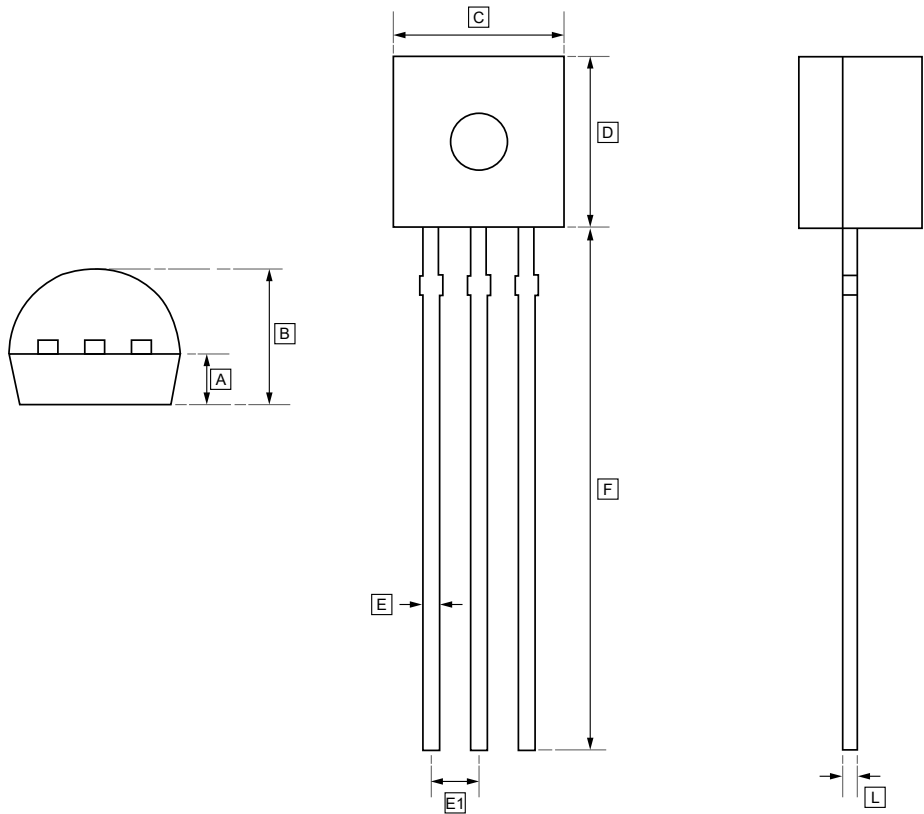


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E	E1	e	L	θ
Min	1.350	0.000	1.350	0.330	0.170	4.700	3.800	5.800	1.270	0.400	0°
Max	1.750	0.100	1.550	0.510	0.250	5.100	4.000	6.200	BSC	1.270	8°



12.3TO-92 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	D	E	E1	F	L
Min	1.10	3.50	4.50	4.40	0.35	1.27	13.50	0.35
Max	1.30	3.90	4.90	4.90	0.45	TYP	14.50	0.40



13.Ordering information

TO-92

UMW  
TMP36  
yyww

yy: Year Code  
ww: Week Code

SOT23-5

T6G  
UMW yyww

yy: Year Code  
ww: Week Code

SOP8

TMP36F  
#yww  
UMW

y: Year Code  
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW TMP36GT9Z	TMP36	TO-92	1000	Bulk Bag
UMW TMP36GRTZ	T6G	SOT23-5	3000	Tape and reel
UMW TMP36FSZ	TMP36F#	SOP-8	3000	Tape and reel



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