

# Low Voltage Analog Temperature Sensors

## 1 Features

- Scale factor: 10 mV/°C
- Operation range: -40°C to +125°C, up to +150°C
- Temperature accuracy: ±2°C (typical)
- Temperature linearity: ±0.5°C (typical)
- Package:
  - 5-Pin SOT23 (1.60mm × 2.92mm)
  - 2-Pin SOT23 (1.30mm × 2.90mm)
  - 8-Pin SOIC (4.90 mm × 3.90 mm)
  - 3-Pin SOT23 (4.60mm × 4.60mm)
- Supply voltage range: 2.7V to 5.5V
- Low quiescent current:
  - Normal operation: ≤50μA
  - Shutdown mode: ≤0.5μA
- Stable with large capacitive loads
- Digital output: analog

## 2 Applications

- Power system monitors
- Temperature control

## 3 Description

The GD30TS036N is a low voltage, precision centigrade temperature sensors, which provides an analog voltage output that is linearly proportional to the Celsius (Centigrade) temperature. Every GD30TS036N chip is factory calibrated, so no external calibration is required, and the typical accuracy is ±1°C at +25°C and ±2°C over the -40°C to +125°C temperature range.

The low output impedance of the GD30TS036N 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 2.7V to 5.5V. The supply current is less than 50μA, providing very low self-heating effect, less than 0.1°C in still air. In addition, a shutdown function is provided to reduce supply current to less than 0.5μA.

The GD30TS036N is specified from -40°C to +125°C, provides a 750mV output at 25°C, and operates up to 125°C from a single 2.7V supply. The output scale factor of the GD30TS036N is 10 mV/°C.

The GD30TS036N is available in low-cost 3/5-lead SOT-23 surface-mount, 3-lead TO-92 and 8-lead SOIC packages.

### Device Information<sup>1</sup>

PART NUMBER	PACKAGE	BODY SIZE (NOM)
GD30TS036N	SOT23-5	1.60mm × 2.92mm
	SOT23-3	1.30mm × 2.90mm
	SOIC-8	4.90mm × 3.90mm
	TO-92	4.60mm × 4.60mm

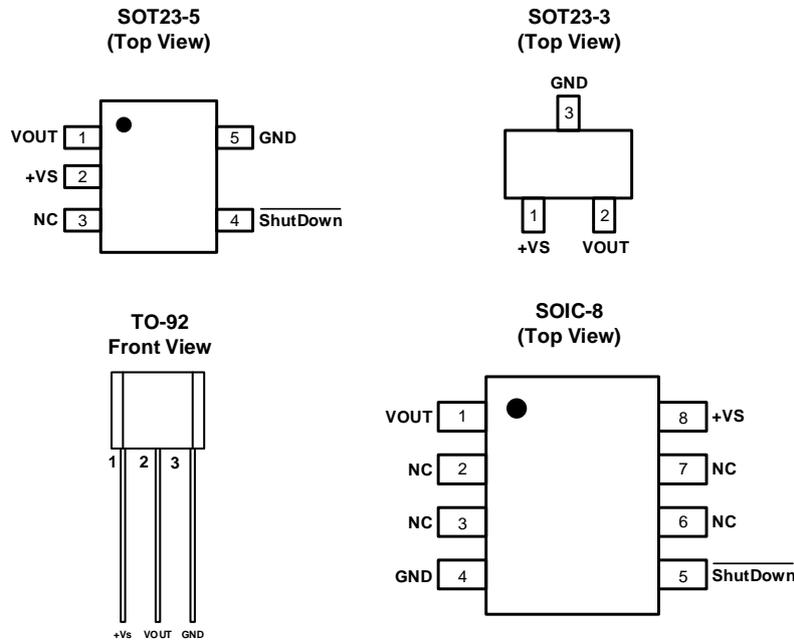
1. For packaging details, see [Package Information](#) section.

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## 4 Device Overview

### 4.1 Pinout and Pin Assignment



### 4.2 Pin Description

NAME	PINS				PIN TYPE <sup>1</sup>	FUNCTION
	SOT23-5	SOT23-3	TO92	SOIC8		
VOUT	1	2	2	1	O	Analog voltage output.
+VS	2	1	1	8	P	Device supply pin.
ShutDown	4			5	I	Device enable pin.
GND	5	3	3	4	G	Ground.
NC	3			2,3,6,7		

1. P = power, G = Ground, I = input, O = Output.

## 5 Parameter Information

### 5.1 Absolute Maximum Ratings

Exceeding the operating temperature range (unless otherwise noted)<sup>1</sup>

SYMBOL	PARAMETER	MIN	MAX	UNIT
V <sub>s</sub>	Power supply		6	V
V <sub>/SD</sub>	Shutdown pin	GND	+V <sub>s</sub>	V
V <sub>ALERT</sub>	Voltage at ALERT	-0.5	((V <sub>s</sub> )+0.3) and ≤ 5.5	V
T <sub>A</sub>	Operating temperature	-40	150	°C
T <sub>J</sub>	Junction temperature		160	°C
T <sub>stg</sub>	Storage temperature	-60	160	°C

1. Over operating free-air temperature range (unless otherwise noted). Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device.

### 5.2 Recommended Operation Conditions

SYMBOL <sup>1</sup>	PARAMETER	MIN	TYP	MAX	UNIT
V <sub>+</sub>	Supply voltage	2.7	3.3	5.5	V
T <sub>A</sub>	Operating Temperature	-40		125	°C

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

### 5.3 Electrical Sensitivity

SYMBOL <sup>1</sup>	CONDITIONS	VALUE	UNIT
V <sub>ESD(HBM)</sub>	Human Body Mode (HBM), per ANSI/ESDA/JEDEC JS-001	±2000	V
V <sub>ESD(MM)</sub>	Machine Mode (MM), per JEDEC-STD Classification	200	V

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

## 5.4 Electrical Characteristics

Electrical characteristics of devices at  $T_A = +25^\circ\text{C}$  and  $V_+ = 2.7\text{V}$  to  $5.5\text{V}$ , unless otherwise noted. (Typically,  $T_A = 25^\circ\text{C}$ ,  $V_+ = 3.3\text{V}$ )

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
$V_+$	Supply voltage range		2.7	3.3	5.5	V
$I_{IN}$	Supply current	Normal operation			40	$\mu\text{A}$
		Shutdown mode			0.5	$\mu\text{A}$
$T_A$	Temperature range		-40		125	$^\circ\text{C}$
$T_{ACC}$	Accuracy (Temperature error)	$+25^\circ\text{C}$ , $+V_s = 3.3\text{V}$		$\pm 1$	$\pm 2$	$^\circ\text{C}$
		$0^\circ\text{C}$ to $+70^\circ\text{C}$ , $+V_s = 3.3\text{V}$		$\pm 1$	$\pm 3$	$^\circ\text{C}$
		$-40^\circ\text{C}$ to $+125^\circ\text{C}$		$\pm 2$	$\pm 3$	$^\circ\text{C}$
	Supply voltage sensitivity	$T_A = 25^\circ\text{C}$ , $3.0\text{V} < +V_s < 5.5\text{V}$		20	100	$\text{m}^\circ\text{C}/\text{V}$
	Scale factor	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		10		$\text{mV}/^\circ\text{C}$
	Load Regulation	$-40^\circ\text{C} \leq T_A \leq +105^\circ\text{C}$		14	100	$\text{m}^\circ\text{C}/\mu\text{A}$
		$105^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		140	250	$\text{m}^\circ\text{C}/\mu\text{A}$
	Linearity			0.5		$^\circ\text{C}$
	Long-term stability			0.4		$^\circ\text{C}$
$V_{OUT}$	GD30TS036N output voltage	$T_A = +25^\circ\text{C}$		750		mV
$I_{OUT}$	Output load current		0		50	$\mu\text{A}$
$I_{SCP}$	Short-circuit current				550	$\mu\text{A}$
$C_L$	Capacitive load driving		1000	10000		pF
$t_{ON}$	Device turn-on time	Output within $\pm 1^\circ\text{C}$ , $100\text{ k}\Omega \parallel 100\text{ pF}$ load		0.5	1	ms

## 5.5 Typical Characteristics

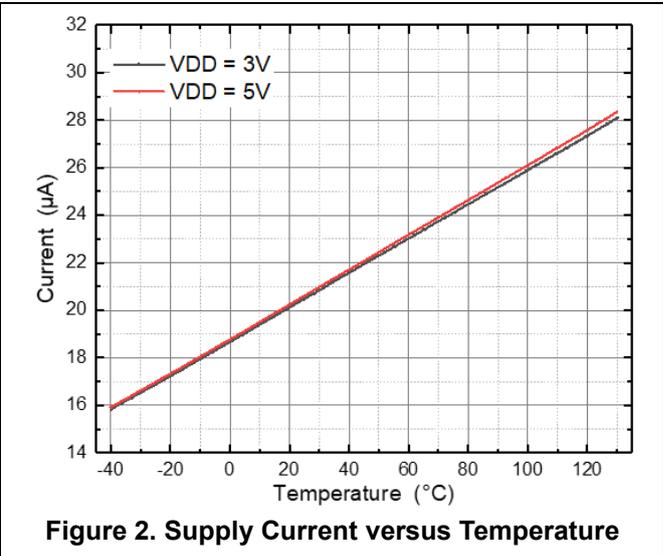
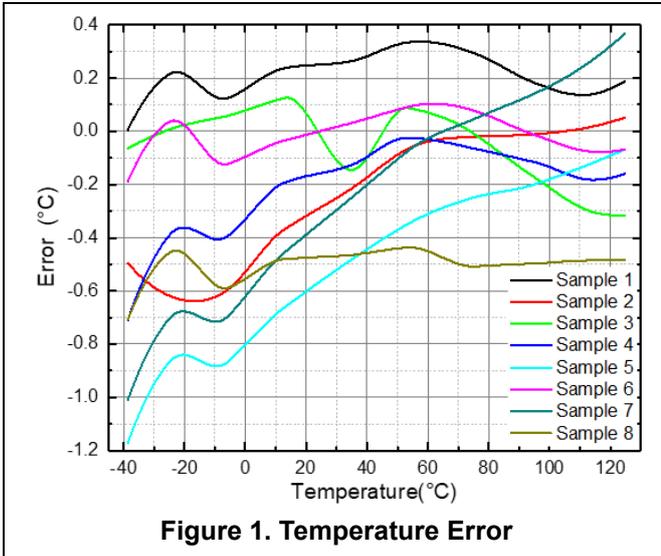


Table 1. Output Voltage versus Temperature

TEMPERATURE (°C)	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

## 6 Application Information

Figure 3 shows the basic temperature sensor connections for the GD30TS036N temperature sensor. Section 4.2 shows the corresponding pin descriptions for the three package types of temperature sensors. For the SOT23-5, Pin 3 is labeled as “NC” as are Pins 2, 3, 6, and 7 on the SOIC-8 package. It is recommended that no electrical connections be made to these pins. If the shutdown feature is not needed on the SOT23-5 or the SOIC-8 package, the  $\overline{\text{ShutDown}}$  pin should be connected to +V<sub>S</sub>. 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 0.1μF ceramic capacitor in parallel with a large value tantalum capacitor (2.2μF) can provide better noise reduction capability.

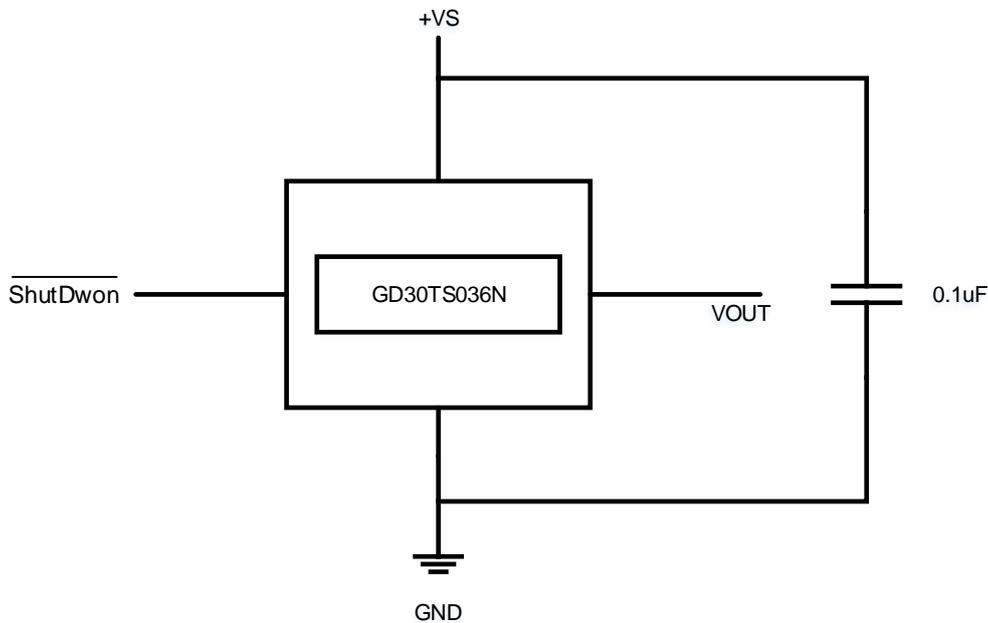
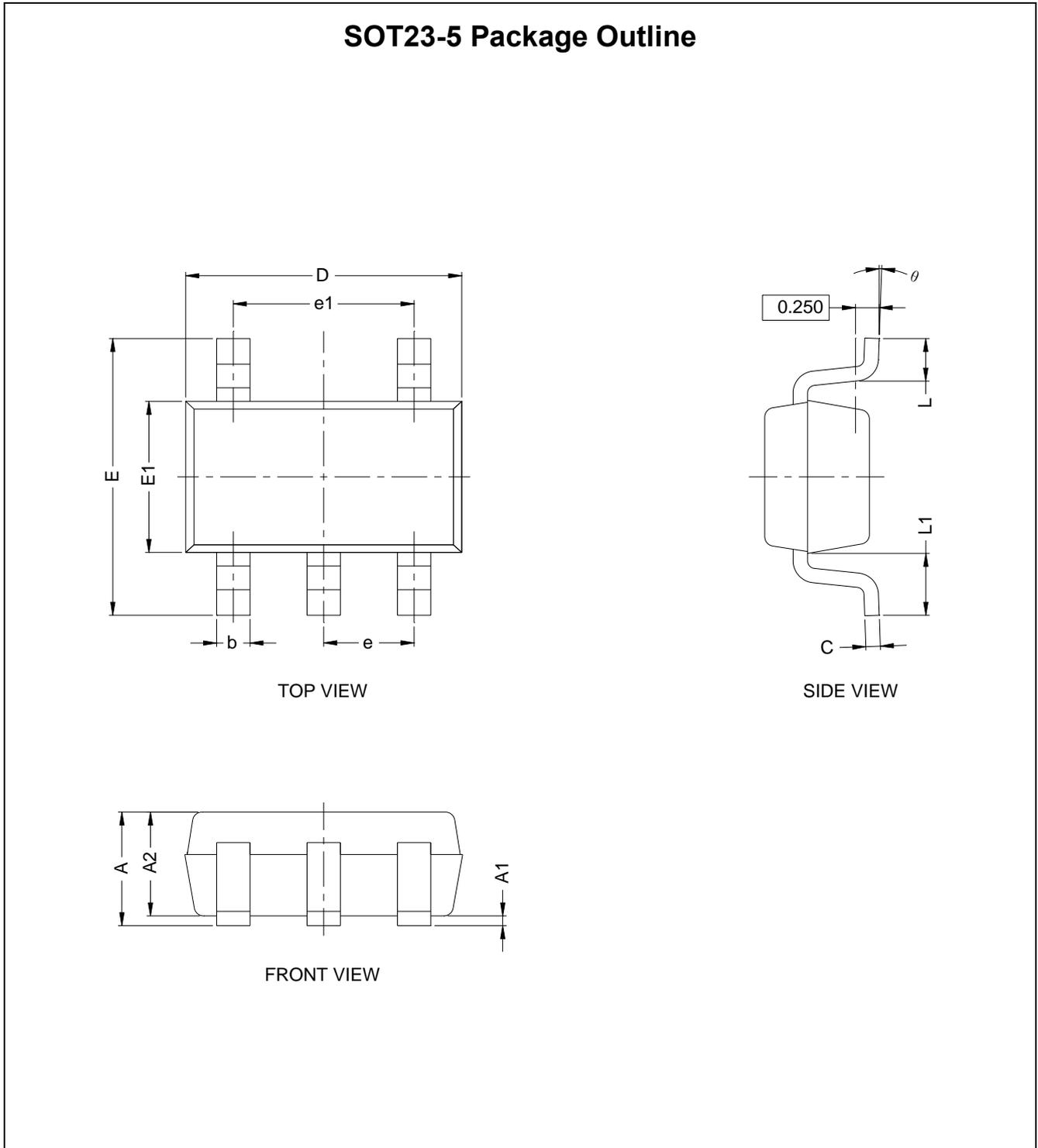


Figure 3. Basic Temperature Sensor Connections

## 7 Package Information

### 7.1 Outline Dimensions



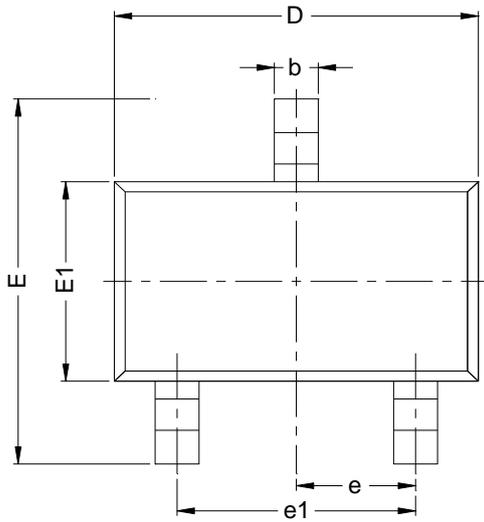
**NOTES:**

1. All dimensions are in millimeters.
2. Package dimensions does not include mold flash, protrusions, or gate burrs.
3. Refer to the [Table 2. SOT23-5 dimensions\(mm\)](#).

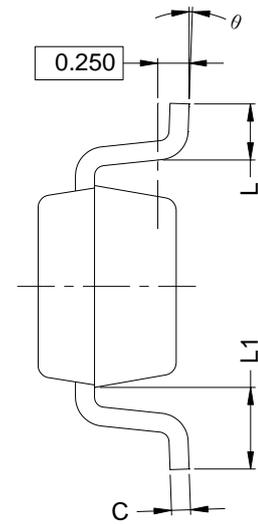
**Table 2. SOT23-5 dimensions(mm)**

SYMBOL	MIN	NOM	MAX
A	1.05	1.15	1.25
A1	0.00	0.05	0.10
A2	1.05	1.10	1.15
b	0.30	0.40	0.50
c	0.10	0.15	0.20
D	2.82	2.92	3.02
E1	1.50	1.60	1.70
E	2.65	2.80	2.95
e	0.950(BSC)		
e1	1.80	1.90	2.00
L	0.30	0.45	0.60
L1	0.60REF		
$\theta$	0°		8°

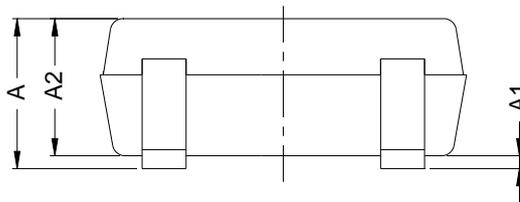
### SOT23-3 Package Outline



TOP VIEW



SIDE VIEW



FRONT VIEW

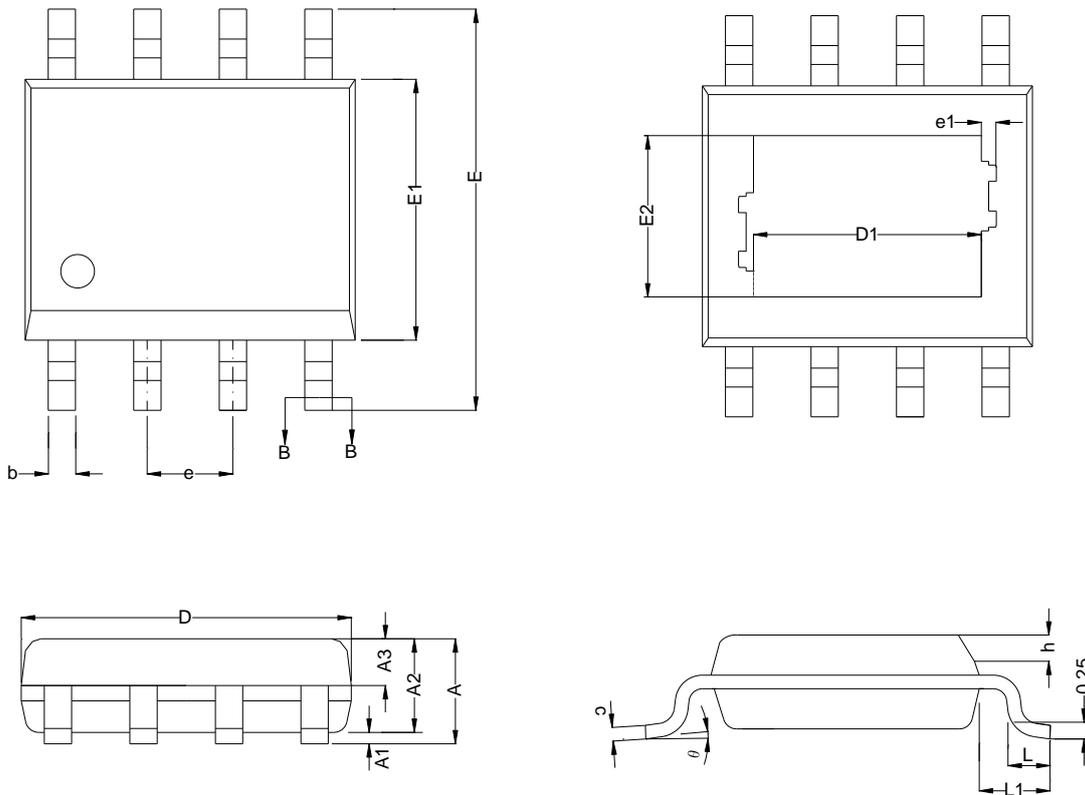
NOTES:

1. All dimensions are in millimeters.
2. Package dimensions does not include mold flash, protrusions, or gate burrs.
3. Refer to the [Table 3. SOT23-3 dimensions\(mm\)](#)Table 3. SOT23-3 dimensions(mm).

**Table 3. SOT23-3 dimensions(mm)**

SYMBOL	MIN	NOM	MAX
A	0.91		1.12
A1	0.01		0.10
A2	0.90		1.02
b	0.30		0.50
c	0.09		0.15
D	2.80		3.00
E	2.25		2.55
E1	1.20		1.40
e	0.950(TYP)		
e1	1.80		2.00
L1	0.30		0.50
L	0.55REF		
$\theta$	0°		8°

### SOIC-8 Package Outline



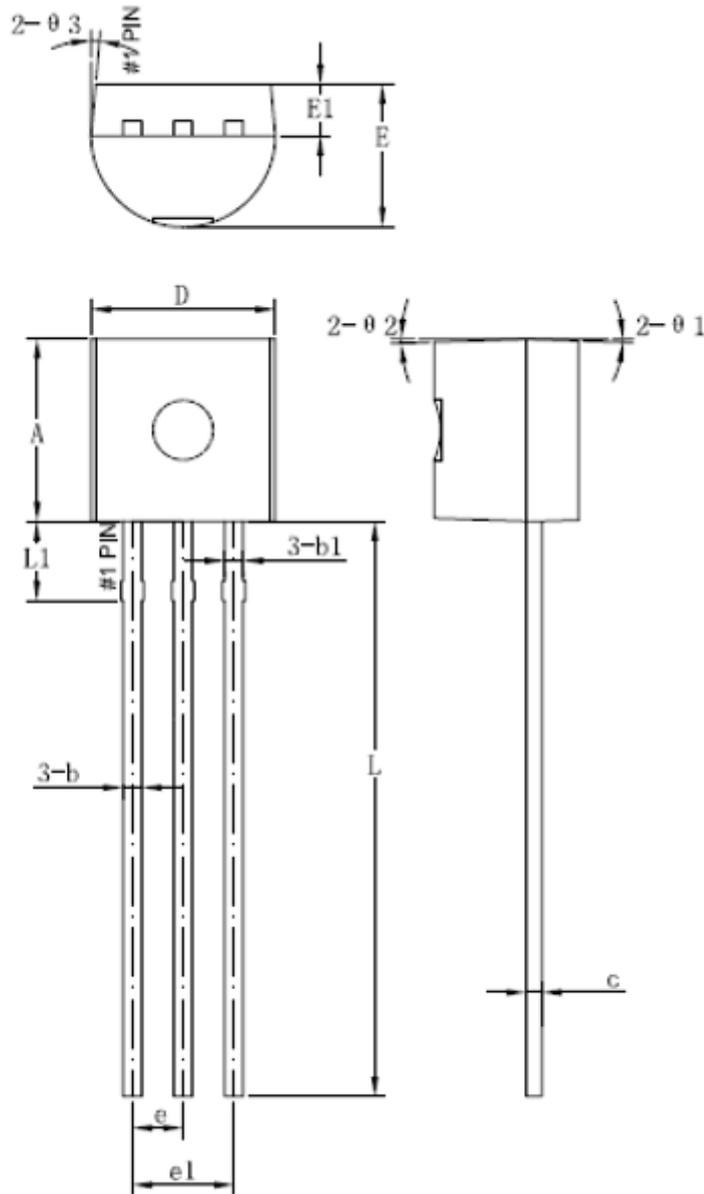
**NOTES:**

4. All dimensions are in millimeters.
5. Package dimensions does not include mold flash, protrusions, or gate burrs.
6. Refer to the [Table 4. SOIC-8 dimensions\(mm\)](#).

**Table 4. SOIC-8 dimensions(mm)**

SYMBOL	MIN	NOM	MAX
A			1.75
A1	0.10		0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.75
b	0.39		0.48
c	0.21		0.26
D	4.79	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC		
h	0.25		0.50
L	0.50		0.80
L1	1.05BSC		
$\theta$	0°		8°

### TO-92 Package Outline



**NOTES:**

7. All dimensions are in millimeters.
8. Package dimensions does not include mold flash, protrusions, or gate burrs.
9. Refer to the [Table 5. TO-92 dimensions\(mm\)](#)

**Table 5. TO-92 dimensions(mm)**

SYMBOL	MIN	NOM	MAX
A	4.5	4.6	4.7
b	0.38	0.46	0.56
b1		0.46	
c	0.36	0.38	0.51
D	4.5	4.6	4.7
E	3.45	3.6	3.75
E1	1.2	1.3	1.4
e		1.27	
e1		2.54	
L	13.5	14.5	15.3
L1		1.96	
$\theta 1$		2°	
$\theta 2$		2°	
$\theta 3$		5°	



## 8 Ordering Information

Ordering Code	Package Type	ECO Plan	Packing Type	MOQ	OP Temp(°C)
GD30TS036NNSTR-I	SOT23-5	Green	Tape & Reel	3000	-40°C to +125°C
GD30TS036NBSTR-I	SOT23-3	Green	Tape & Reel	3000	-40°C to +125°C
GD30TS036NWGTR-I	SOIC-8	Green	Tape & Reel	4000	-40°C to +125°C
GD30TS036NB9BU-I	TO-92	Green	Bulk	2000	-40°C to +125°C



## 9 Revision History

REVISION NUMBER	DESCRIPTION	DATE
1.0	Initial release and device details	2024

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