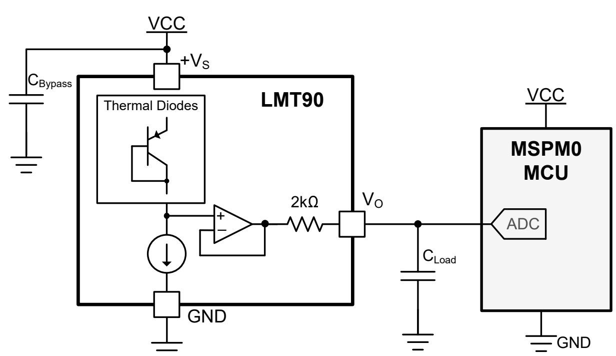
LMT90 Industry-Standard, ±3°C Accurate, Analog Centigrade (10mV/°C) Temperature Sensor in SOT-23 Package

1 Features

- Industry-Standard Sensor Gain/Offset:
  - 10mV/°C, 500mV at 0°C
  - Drop-in functional equivalent to LM50C
- LMT90 Temperature Accuracy:
  - ±3°C (Max) at 25°C
  - ±4°C (Max) over −40°C to +125°C
- Operating supply range: 4.5V to 10V
- Quiescent Current (Typ): 95µA
- Available in Standard SOT23-3 package
- Nonlinearity: ±0.8°C (Max)
- DC Output Impedance: 2kΩ/4kΩ (typ/Max)
  - Enables driving large capacitive loads
- Cost-Effective Alternative to Thermistors

2 Applications

- Mobile phones, PC & notebooks
- Data storage
- Battery Management
- Home and Multifunction printers
- Medical and healthcare Instruments
- HVAC System
- Power Supply Modules



Simplified Schematic

3 Description

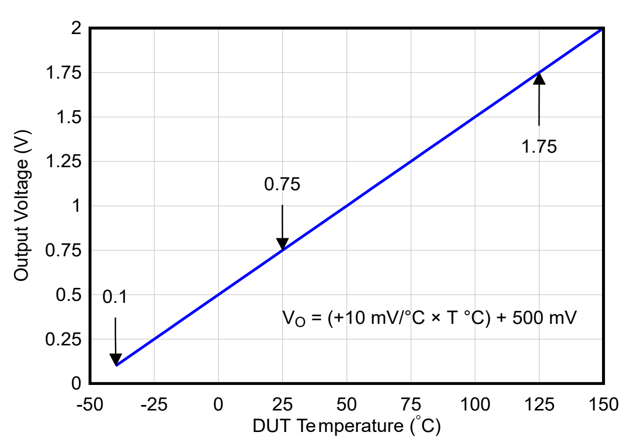
The LMT90 device is a cost-optimized precision analog temperature sensor developed as a linear alternative to discrete thermistors. This device can measure temperatures from -40°C to 125°C using a single positive supply. The output voltage of the device is linearly proportional to temperature (10mV/°C) and has a DC offset of 500mV at 0°C. The offset allows reading negative temperatures without the need for a negative supply. The output voltage of the LMT90 ranges from 100mV (at –40°C) to 1.75V (at 125°C), simplifying analog-to-digital converter (ADC) interfacing.

The LMT90 is a drop-in equivalent to LM50C and does not require any external calibration, trimming or software linearization leading to simplifying the circuitry requirements in a single supply environment. Due to low quiescent current of LMT90 (typically around 95µA), self-heating is limited to a very low 0.2°C (in still air). This device is suitable for HVAC, appliance, and consumer electronics applications. Trimming and calibration of the LMT90 at the wafer level supports long-term availability, low cost and consistent accuracy (±3°C at 25°C, ±4°C over temperature range).

Package Information

PART NUMBER	PACKAGE(1)	PACKAGE SIZE(2)
LMT90	DBZ (SOT-23, 3)	2.37mm × 2.92mm

(1) For more information, see Section 11.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.



Full-Range Centigrade Temperature Sensor (–40°C to 125°C)

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4 Device Comparison

Table 4-1. Device Comparison

Feature	LMT90 [(1)] LM50C [(1)]	LM50B [(1)]	TMP235	LM60 [(1)]	LM61B [(1)]	LM20B	LM35 [(1)]
Sensor gain (mV/°C)	10	10	10	6.25	10	-11.77	10
Sensor gain type	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Offset (at 0°C) (mV)	500	500	500	424	600	1864	0
Temp Range (°C)	-40 to 125	-40 to 125	-40 to 150	-40 to 125	-25 to 85	-55 to 130	-55 to 150
Power Supply Specifications							
V_{DD} (V)	4.5 to 10	4.5 to 10	2.3 to 5.5	2.7 to 10	2.7 to 10	2.4 to 5.5	4 to 30
I_Q (typ) (µA)	95	95	9	82	82	4.5	67
Temperature Accuracy							
25°C (typ)	-	-	±0.5	-	-	-	±0.2
-55°C (max)	-	-	-	-	-	±2.5	±1
-40°C (max)	±4	-3.5/3	±2	±3	-	±2.3	±0.9
-30°C (max)	±3.85	-3.3/2.85	±2	±2.85	-	±2.2	±0.85
-25°C (max)	±3.8	-3.2/2.8	±2	±2.8	±3	±2.1	±0.8
0°C (max)	±3.4	-2.6/2.4	±1	±2.4	±2.5	±1.9	±0.65
25°C (max)	±3	±2	±1	±2	±2	±1.5	±0.5
30°C (max)	±3.05	±2.05	±1	±2.05	±2.1	±1.5	±0.5
70°C (max)	±3.45	±2.45	±1	±2.45	±2.75	±1.9	±0.7
80°C (max)	±3.55	±2.55	±2	±2.55	±2.9	±2	±0.7
85°C (max)	±3.6	±2.6	±2	±2.6	±3	±2.1	±0.75
100°C (max)	±3.75	±2.75	±2	±2.75	-	±2.2	±0.8
125°C (max)	±4	±3	±2	±3	-	±2.5	±0.9
130°C (max)	-	-	±2	-	-	±2.5	±0.9
150°C (max)	-	-	±2	-	-	-	±1
Packaging Dimension							
Dimensions [mm × mm × mm]	**SOT23** (3-pin) 2.9 × 2.4 × 1.1	**SOT23** (3-pin) 2.9 × 2.4 × 1.1	**SOT23** (3-pin) 2.9 × 2.4 × 1.1 **SC70** (5-pin) 2.0 × 2.1 × 1.1	**SOT23** (3-pin) 2.9 × 2.4 × 1.1 **TO92** (3-pin) 7.4 × 4.8 × 3.7	**SOT23** (3-pin) 2.9 × 2.4 × 1.1 **TO92** (3-pin) 7.4 × 4.8 × 3.7	**SC70** (5-pin) 2.0 × 2.1 × 1.1 **DSBGA** (4-pin) 0.96 × 0.96 × 0.6	**SOIC** (8-pin) 4.9 × 6.0 × 1.75 **TO92** (3-pin) 7.4 × 4.8 × 3.7 **TOCAN** (3-pin) 4.7 × 4.7 × 2.67 **TO220** (3-pin) 15 × 10 × 4.6

1. LMT90, LM50C, LM50B, LM60, LM61B and LM35 temperature accuracy limits come from the "Accuracy vs Temperature" plot.

Table 4-2. LMT90 Device Orderable Options

ORDER NUMBER	PACKAGE	ACCURACY OVER TEMPERATURE	SPECIFIED TEMPERATURE RANGE
LMT90DBZR	SOT-23 (DBZ) 3-pin	±4°C	$-40°C \le T_A \le +125°C$

Table 4-3. LMT90 Device Nomenclature Detail

PRODUCT	DESCRIPTION
LMT90**yyy**R	This device can ship with the legacy chip (CSO: GF6 or SHE) or the new chip (CSO: RFB) with different *chip source origin (CSO)*. The reel packaging label provides date code information to distinguish which chip is being used. Device performance for new and legacy chips is denoted throughout the document. **yyy** indicates the package type of this device which is **DBZ** in SOT-23 3-pin package.

5 Pin Configuration and Functions

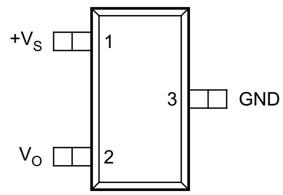


Figure 5-1. DBZ Package 3-Pin SOT-23 Top View

Table 5-1. Pin Functions

PIN		TYPE	DESCRIPTION
NO.	NAME		
1	$+V_S$	Power	Positive power supply pin.
2	V_O	Output	Temperature sensor analog output.
3	GND	Ground	Device ground pin, connected to power supply negative terminal.

6 Specifications

6.1 Absolute Maximum Ratings

Over operating free-air temperature range unless otherwise noted[(1)]

		MIN	MAX	UNIT
Supply voltage, $+V_S$	LMT90	-0.2	12	V
Output voltage, V_O		-1	$+V_S$ + 0.6	V
Output current, I_{OUT}			10	mA
Maximum junction temperature, T_{JMAX}			150	°C
Storage temperature, T_{stg}		-65	150	°C

(1) Operation outside the *Absolute Maximum Ratings* may cause permanent device damage. *Absolute Maximum Ratings* do not imply functional operation of the device at these or any other conditions beyond those listed under *Recommended Operating Conditions*. If used outside the *Recommended Operating Conditions* but within the *Absolute Maximum Ratings*, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$, Electrostatic discharge	LMT90	Human-body model (HBM), per JESD22-A114[(1)]	±2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101	±750	

(1) The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

6.3 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
$+V_S$	Supply voltage	4.5	10	V
T_{MIN},T_{MAX}	Specified temperature	-40	125	°C

6.4 Thermal Information

THERMAL METRIC[(1)]		LMT90 DBZ (SOT-23) 3 PINS		UNIT
		LEGACY CHIP	NEW CHIP	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	450	240.6	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	-	144.5	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	-	72.3	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	-	28.7	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	-	71.7	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	-	-	°C/W

(1) For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application note.

6.5 Electrical Characteristics

These specifications apply for $+V_S$ = 5V (DC) and I_{LOAD} = 0.5μA, $T_A = T_J$ = 25°C (unless otherwise noted)(1)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
SENSOR ACCURACY							
T_{ACY}	Temperature accuracy(2)	T_A = 25°C	LMT90	-3		3	°C
		$T_A = T_{MAX}$ = 125°C		-4		4	
		$T_A = T_{MIN}$ = -40°C		-4		4	
SENSOR OUTPUT							
$V_{0°C}$	Output voltage offset at 0°C				500		mV
T_C	Temperature coefficient (sensor gain)	$T_A = T_J = T_{MIN}$ to T_{MAX}		9.7	10	10.3	mV/°C
V_{ONL}	Output Nonlinearity(3)	$T_A = T_J = T_{MIN}$ to T_{MAX}		-0.8		0.8	°C
Z_{OUT}	Output impedance	$T_A = T_J = T_{MIN}$ to T_{MAX}			2000	4000	Ω
T_{ON}	Turn-On Time		Legacy chip		5		μs
			New chip		30		
T_{LTD}	Long-term stability and drift(4)	T_J = 125°C for 1000 hours			±0.08		°C
POWER SUPPLY							
I_{DD}	Operating current	4.5V ≤ $+V_S$ ≤ 10V	Legacy chip			130	μA
			New chip			75	
		$T_A = T_{MIN}$ to T_{MAX} 4.5V ≤ $+V_S$ ≤ 10V	Legacy chip		95	180	μA
			New chip		52	90	
PSR	Line regulation(5)	$T_A = T_{MIN}$ to T_{MAX} 4.5V ≤ $+V_S$ ≤ 10V		-1.2		1.2	mV/V
ΔI_{DD}	Change of quiescent current	$T_A = T_{MIN}$ to T_{MAX} 4.5V ≤ $+V_S$ ≤ 10V	Legacy chip			2	μA
			New chip			8	
I_{DD_TEMP}	Temperature coefficient of quiescent current	$T_A = T_{MIN}$ to T_{MAX} 4.5V ≤ $+V_S$ ≤ 10V			2		μA/°C

(1) Limits are specified to TI's AOQL (Average Outgoing Quality Level).
(2) Accuracy is defined as the error between the output voltage and 10mv/°C multiplied by case temperature of the device plus 500mV, at specified conditions of voltage, current, and temperature (expressed in °C).
(3) Nonlinearity is defined as the deviation of the output-voltage-versus-temperature curve from the best-fit straight line, over the rated temperature range of the device.
(4) For best long-term stability, any precision circuit provides best results if the unit is aged at a warm temperature, and/or temperature cycled for at least 46 hours before long-term life test begins. This is especially true when a small (Surface-Mount) part is wave-soldered; allow time for stress relaxation to occur. The majority of the drift occurs in the first 1000 hours at elevated temperatures. The drift after 1000 hours does not continue at the first 1000 hour rate.
(5) Regulation is measured at constant junction temperature, using pulse testing with a low duty cycle. Changes in output due to heating effects can be computed by multiplying the internal dissipation by the thermal resistance.

6.6 Typical Characteristics

To generate these curves the device is mounted to a printed circuit board as shown in Figure 8-9 or Figure 8-10.

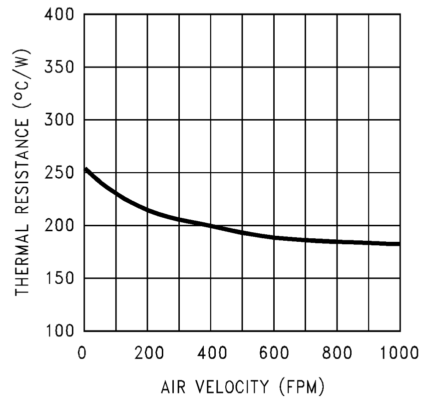


Figure 6-1. Thermal Resistance Junction-to-Ambient (Legacy chip)

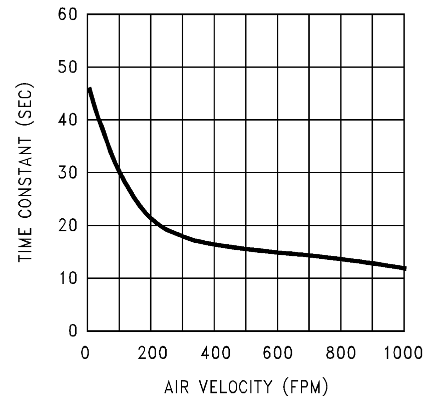


Figure 6-2. Thermal Time Constant (Legacy chip)

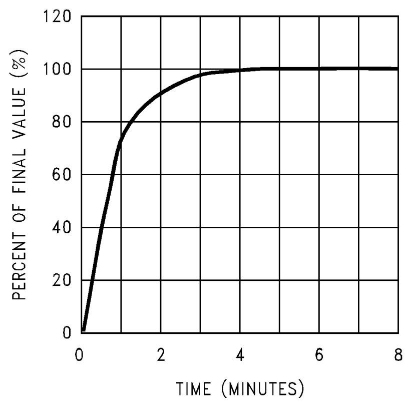


Figure 6-3. Thermal Response in Still Air With Heat Sink (Legacy chip)

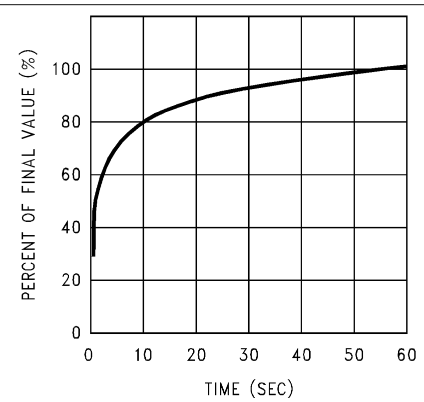


Figure 6-4. Thermal Response in Stirred Oil Bath With Heat Sink (Legacy chip)

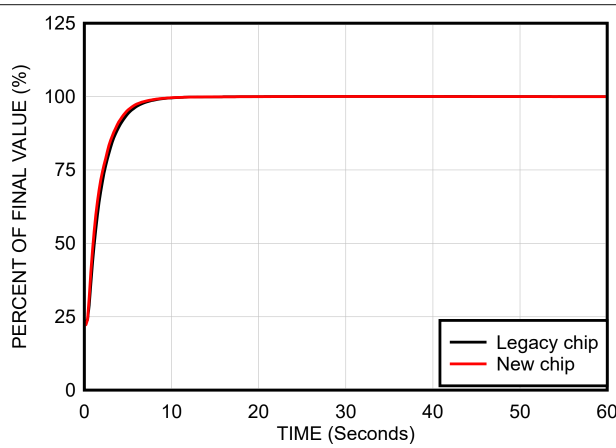


Figure 6-5. Thermal Response in Stirred Oil Bath With Heat Sink (0.5 inches × 0.5 inches PCB board)

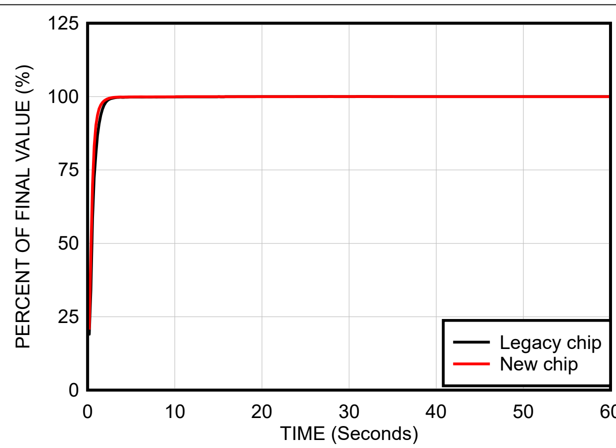


Figure 6-6. Thermal Response in Stirred Oil Bath Without Heat Sink

6.6 Typical Characteristics (continued)

To generate these curves the device is mounted to a printed circuit board as shown in Figure 8-9 or Figure 8-10.

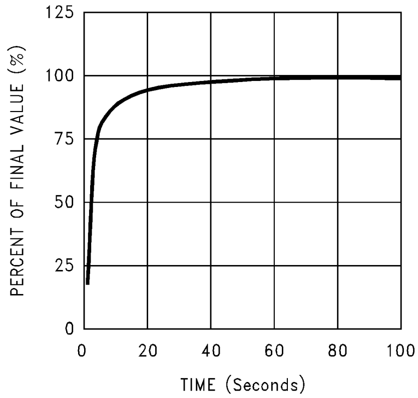


Figure 6-7. Thermal Response in Still Air Without a Heat Sink (Legacy chip)

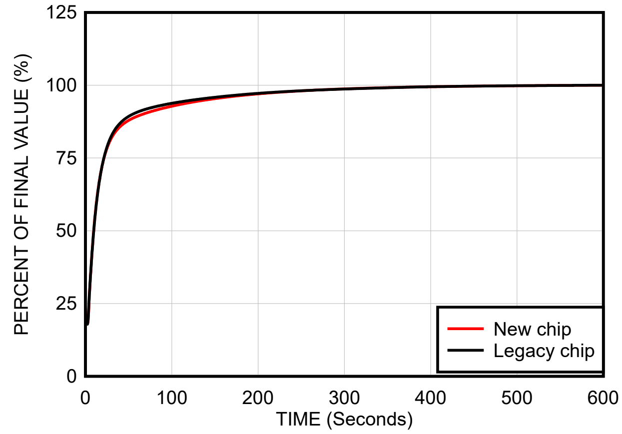


Figure 6-8. Thermal Response in Still Air Without a Heat Sink (Both Legacy and New Chip in the New Test Setup)

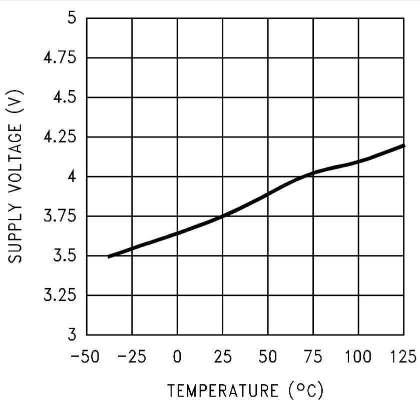


Figure 6-9. Start-Up Voltage vs Temperature (Legacy chip)

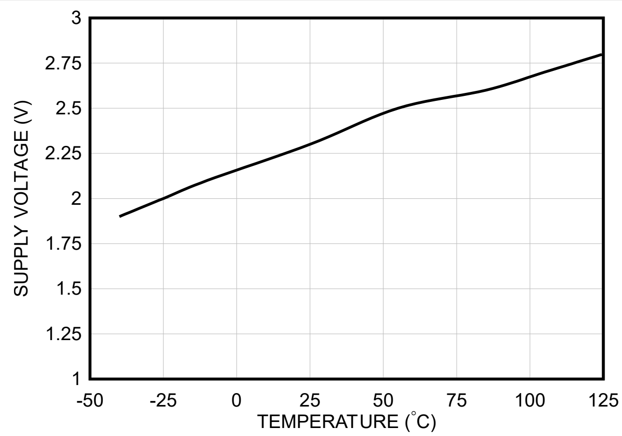


Figure 6-10. Start-Up Voltage vs Temperature (New chip)

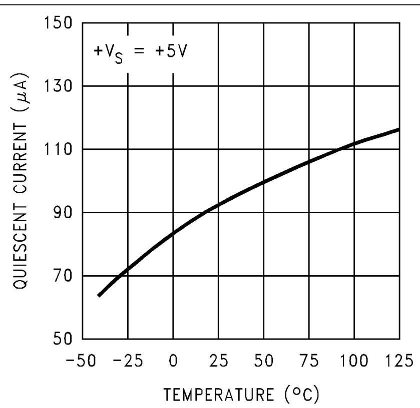


Figure 6-11. Quiescent Current vs Temperature (Legacy chip)

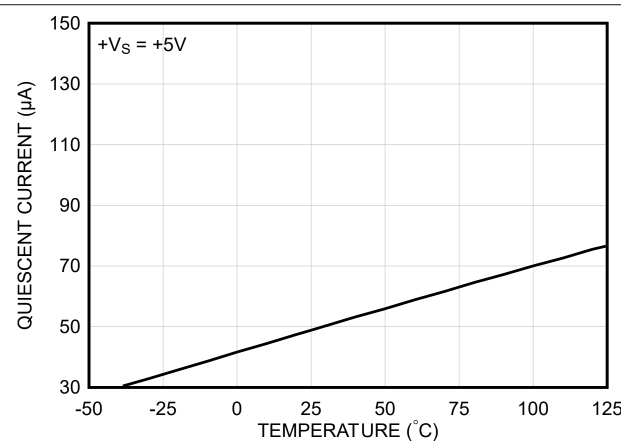


Figure 6-12. Quiescent Current vs Temperature (New chip)

6.6 Typical Characteristics (continued)

To generate these curves the device is mounted to a printed circuit board as shown in Figure 8-9 or Figure 8-10.

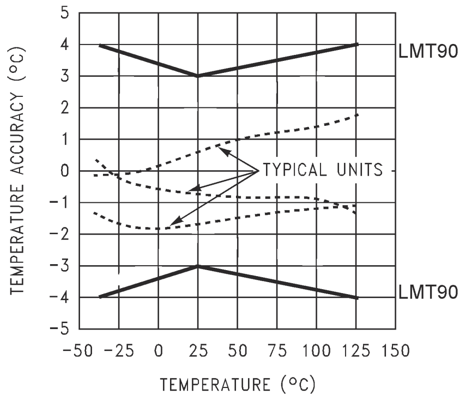


Figure 6-13. Accuracy vs Temperature (Legacy chip)

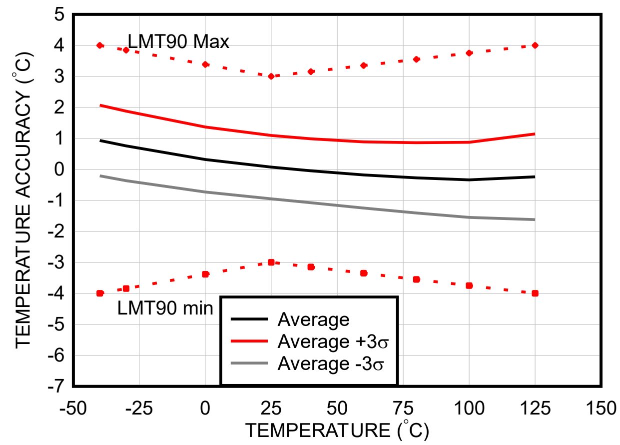


Figure 6-14. Accuracy vs Temperature (New chip)

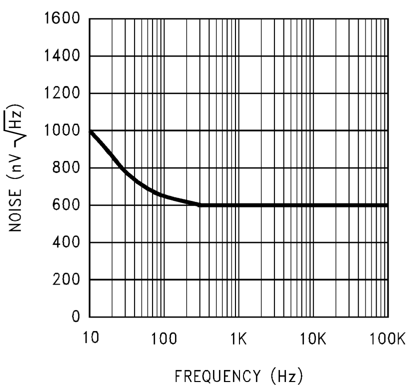


Figure 6-15. Noise Voltage (Legacy chip)

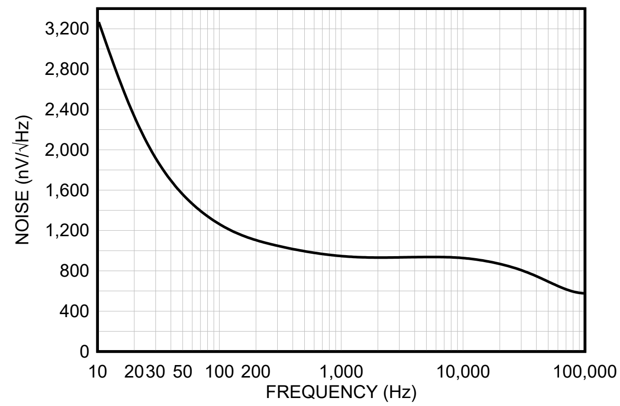


Figure 6-16. Noise Voltage (New chip)

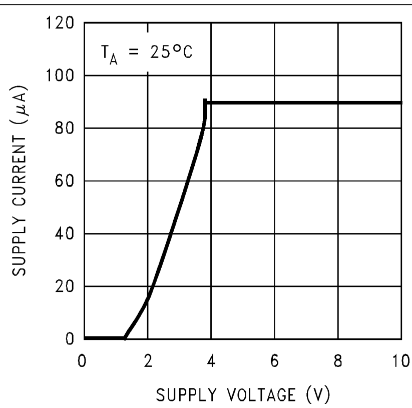


Figure 6-17. Supply Current vs Supply Voltage (Legacy chip)

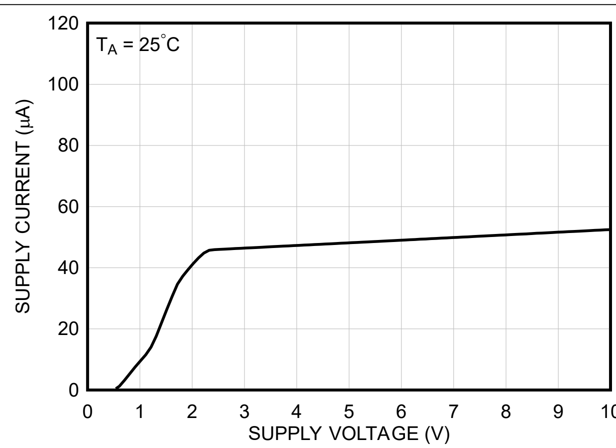


Figure 6-18. Supply Current vs Supply Voltage (New chip)

6.6 Typical Characteristics (continued)

To generate these curves the device is mounted to a printed circuit board as shown in Figure 8-9 or Figure 8-10.

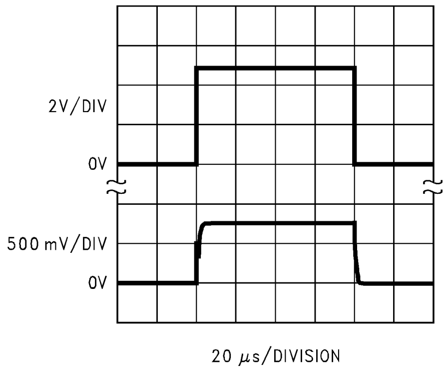


Figure 6-19. Start-Up Response (Legacy chip)

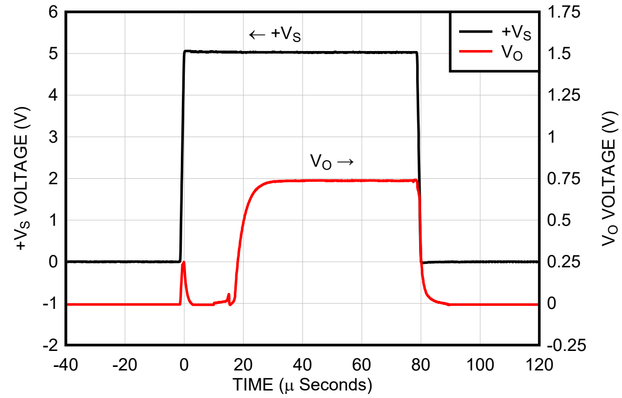


Figure 6-20. Start-Up Response (New chip)

7 Detailed Description

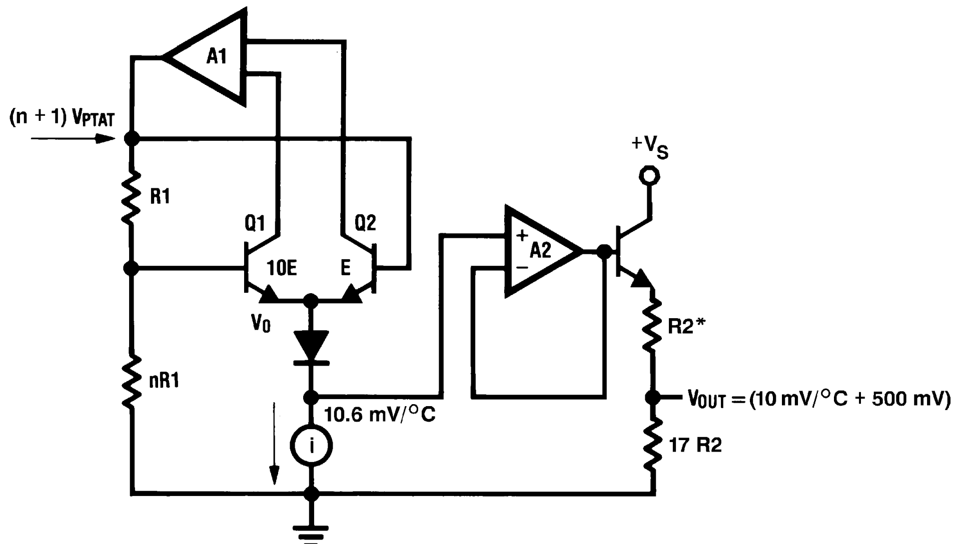
7.1 Overview

The LMT90 device is a precision integrated-circuit temperature sensor that can sense a –40°C to 125°C temperature range using a single positive supply. The output voltage of the LMT90 has a positive temperature slope of 10mV/°C. A 500mV offset is included enabling negative temperature sensing when biased by a single supply.

The temperature-sensing element is comprised of a delta-V_{BE} architecture. The temperature-sensing element is then buffered by an amplifier and provided to the V_O pin. The amplifier has a simple class A output stage with typical 2kΩ output impedance as shown in the *Functional Block Diagram*. The output impedance has a temperature coefficient of approximately 1300ppm/°C. Over temperature the output impedance will max out at 4kΩ.

7.2 Functional Block Diagram

*R2 ≅ 2k with a typical 1300ppm/°C drift.



7.3 Feature Description

7.3.1 LMT90 Transfer Function

The LMT90 follow a simple linear transfer function to achieve the accuracy as listed in the *Section 6.5* table.

Use Equation 1 to calculate the value of V_O.

$$V_O = 10mV/°C \times T\ °C + 500mV \quad (1)$$

where

- T is the temperature in °C
- V_O is the LMT90 output voltage

7.4 Device Functional Modes

The only functional mode of the device has an analog output directly proportional to temperature.

8 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

8.1 Application Information

The LMT90 has a wide supply range and a 10mV/°C output slope with a 500mV DC offset. Therefore, the device can be easily placed in many temperature-sensing applications where a single supply is required for positive and negative temperatures.

8.2 Typical Application

8.2.1 Full-Range Centigrade Temperature Sensor

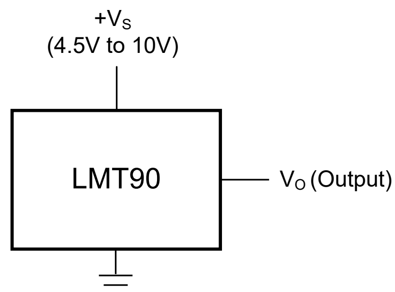


Figure 8-1. Full-Range Centigrade Temperature Sensor Diagram (–40°C to 125°C)

8.2.1.1 Design Requirements

For this design example, use the parameters listed in Table 8-1 as the input parameters.

Table 8-1. Design Parameters

PARAMETER	VALUE
Power supply voltage	4.5V to 10V
Output impedance	4kΩ (maximum)
Accuracy at 25°C	±3°C (maximum)
Accuracy over –40°C to 125°C	±4°C (maximum)
Temperature slope	10mV/°C

8.2.1.2 Detailed Design Procedure

The LMT90 is a simple temperature sensor that provides an analog output. Therefore design requirements related to layout are more important than other requirements. See *Layout* for more information.

8.2.1.2.1 Capacitive Loads

The LMT90 handles capacitive loading very well. Without any special precautions, the LMT90 can drive any capacitive load. The device has a nominal 2kΩ output impedance (shown in *Functional Block Diagram*). The temperature coefficient of the output resistors is approximately 1300ppm/°C. Taking into account this temperature coefficient and the initial tolerance of the resistors the output impedance of the device does not exceed 4kΩ. In an extremely noisy environment adding filtering can be necessary to minimize noise pickup. TI recommends adding a 0.1µF capacitor between $+V_S$ and GND to bypass the power supply voltage, as shown in Figure 8-3. Adding a capacitor from V_O to ground can be necessary. A 1µF output capacitor with the 4kΩ output impedance forms a 40Hz low-pass filter. Since the thermal time constant of the LMT90 is much slower than the

25ms time constant formed by the RC, the overall response time of the device is not significantly affected. For much larger capacitors this additional time lag increases the overall response time of the LMT90 .

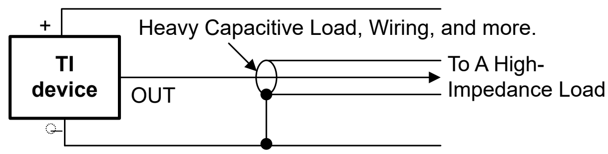


Figure 8-2. LMT90 No Decoupling Required for Capacitive Load

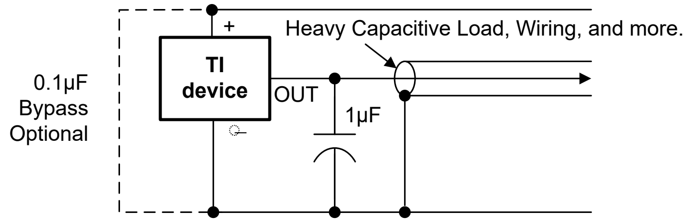


Figure 8-3. LMT90 With Filter for Noisy Environment

8.2.1.3 Application Curve

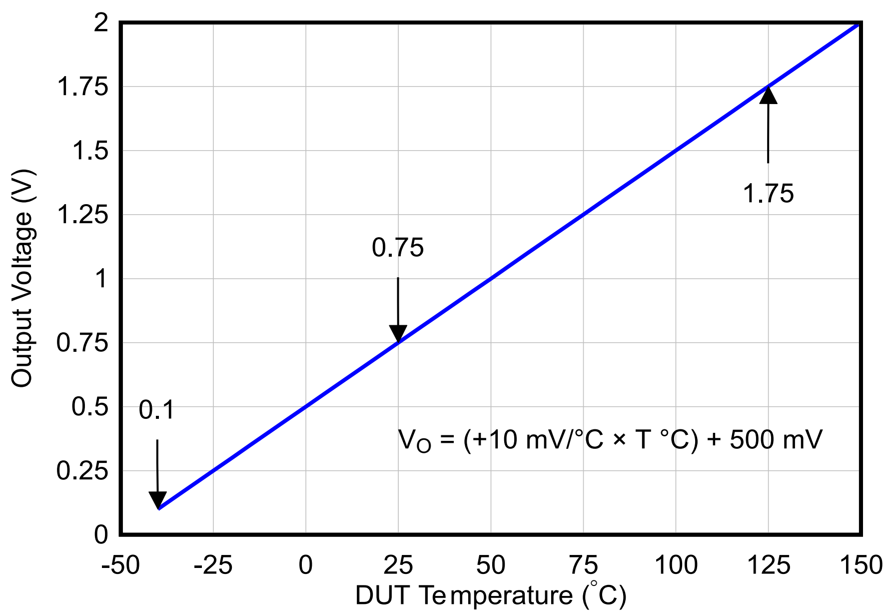


Figure 8-4. Output Transfer Function

8.3 System Examples

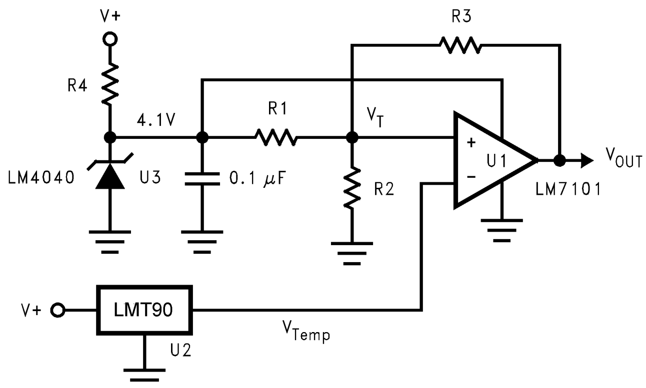


Figure 8-5. Centigrade Thermostat / Fan Controller

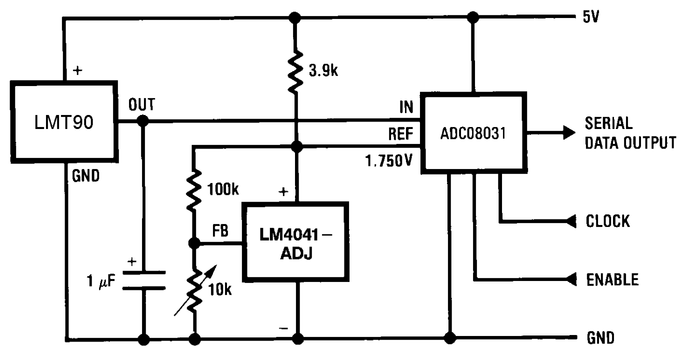


Figure 8-6. Temperature to Digital Converter (Serial Output) (125°C Full Scale)

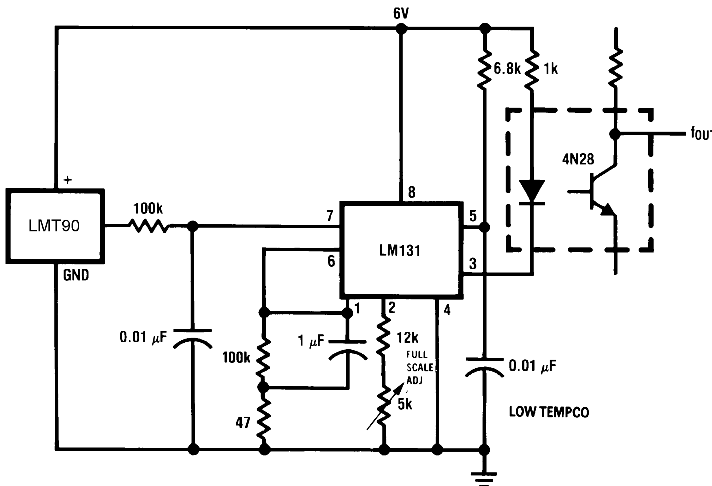


Figure 8-7. LMT90 With Voltage-To-Frequency Converter and Isolated Output (−40°C to 125°C; 100 Hz to 1750 Hz)

8.4 Power Supply Recommendations

In an extremely noisy environment, adding some filtering to minimize noise pickup can be necessary. TI recommends that a 0.1µF capacitor be added from $+V_S$ to GND to bypass the power supply voltage, as shown in Figure 8-3.

8.5 Layout

8.5.1 Layout Guidelines

The LMT90 can be applied easily in the same way as other integrated-circuit temperature sensors. The device can be glued or cemented to a surface and the temperature is within about 0.2°C of the surface temperature.

This presumes that the ambient air temperature is approximately the same as the surface temperature; if the air temperature are much higher or lower than the surface temperature, the actual temperature of the LMT90 die is at an intermediate temperature between the surface temperature and the air temperature.

To provide good thermal conductivity, the backside of the LMT90 die is directly attached to the GND pin. The lands and traces to the device is part of the printed-circuit board, which is the object whose temperature is being measured. These printed-circuit board lands and traces do not cause the LMT90 temperature to deviate from the desired temperature.

Alternatively, the LMT90 can be mounted inside a sealed-end metal tube, and can then be dipped into a bath or screwed into a threaded hole in a tank. As with any device, the LMT90 and accompanying wiring and circuits must be kept insulated and dry, to avoid leakage and corrosion. This is especially true if the circuit can operate at cold temperatures where condensation can occur. Printed-circuit coatings and varnishes such as HUMISEAL® and epoxy paints or dips are often used to verify that moisture cannot corrode the device or the connections.

8.5.2 Layout Example

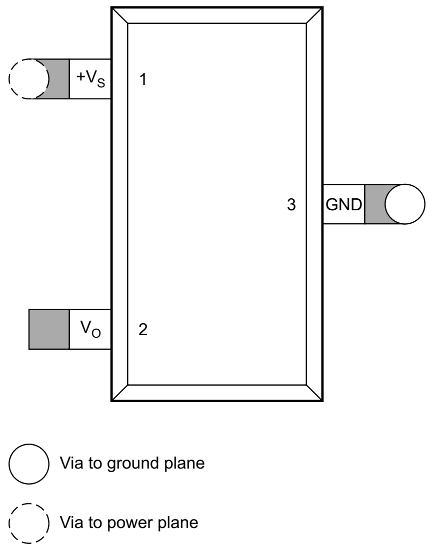
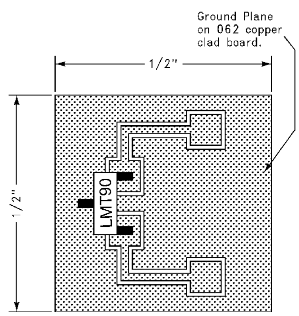


Figure 8-8. PCB Layout



1/2in, square printed-circuit board with 2oz foil or similar

Figure 8-9. Printed-Circuit Board Used for Heat Sink to Generate Thermal Response Curves (Legacy chip)

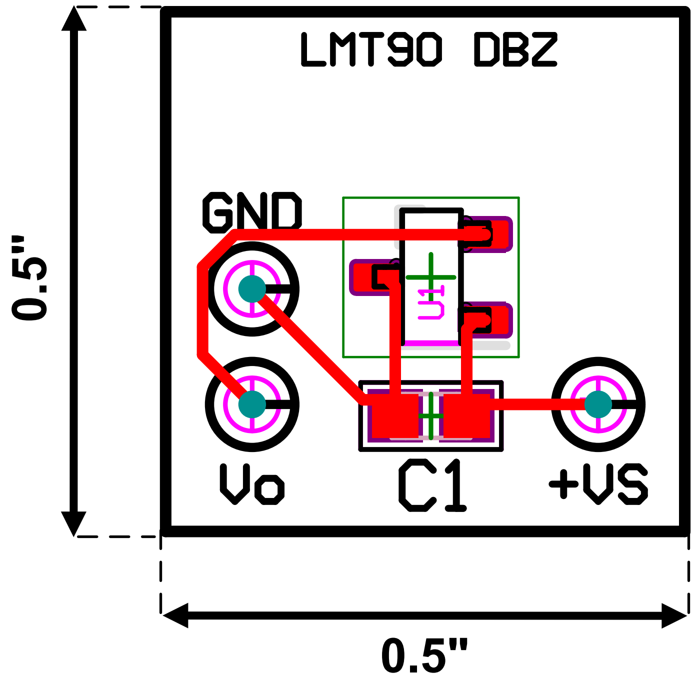


Figure 8-10. Printed-Circuit Board Used to Generate Thermal Response Curves (New Test Setup for Both New Chip and Legacy Chip)

8.5.3 Thermal Considerations

Table 8-2 summarizes the thermal resistance of the LMT90 for different conditions.

Table 8-2. Temperature Rise of LMT90 Due to Self-Heating

			$R_{\theta JA}$ (°C/W)
SOT-23	No heat sink(1)	Still air (Legacy chip)	450
		Moving air (Legacy chip)	-
	Small heat fin(2)	Still air (Legacy chip)	260
		Moving air (Legacy chip)	180

(1) Part soldered to 30 gauge wire.
(2) Heat sink used is 0.5inch, square printed-circuit board with 2oz foil; part attached as shown in Figure 8-9.

9 Device and Documentation Support

Related Documentation

For related documentation see the following:

- Texas Instruments, *LM50 SOT-23 Single-Supply Centigrade Temperature Sensor*, data sheet
- Texas Instruments, *TMP23x Low-Power, High-Accuracy Analog Output Temperature Sensors*, data sheet
- Texas Instruments, *ISOTMP35 ±1.2°C, 3-kVRMS Isolated Temperature Sensor With Analog Output With < 2 Seconds Response Time and 500VRMS Working Voltage*, data sheet
- Texas Instruments, *LM60 2.7V, SOT-23 or TO-92 Temperature Sensor*, data sheet
- Texas Instruments, *Tiny Temperature Sensors for Remote Systems*, application note
- Texas Instruments, *Semiconductor Temperature Sensors Challenge Precision RTDs and Thermistors in Building Automation*, application note
- Texas Instruments, *LMT90 Temperature Sensor Evaluation Module*, EVM

9.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

9.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

9.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
HUMISEAL® is a registered trademark of Columbia Chase Corporation.
All trademarks are the property of their respective owners.

9.4 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

9.5 Glossary

TI Glossary This glossary lists and explains terms, acronyms, and definitions.

10 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision B (September 2015) to Revision C (May 2025) — Page

- Updated the numbering forms for tables, figures, and cross-references throughout the document.................. 1
- Updated the document to reflect the latest family format and standards.. 1
- Added specifications and graphs for the New device and compared the device with the Legacy Device throughout the document.. 1
- Added *Device Comparison*, *Device Orderable Options*, and *Nomenclature Details* tables.............................. 3
- Deleted Machine Model (MM) Electrostatic discharge.. 5
- Added DBZ package “Thermal Information” for the New chip... 5
- Added “Turn-on Time” for both Legacy chip and New chip... 6

- Added “Operating current” and “Change of quiescent current” for the New chip... 6

Changes from Revision A (March 2013) to Revision B (September 2015)	Page
• Added Pin Configuration and Functions section, ESD Ratings table, Feature Description section, Device Functional Modes, Application and Implementation section, Power Supply Recommendations section, Layout section, Device and Documentation Support section, and Mechanical, Packaging, and Orderable Information section	1

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LMT90DBZR	Active	Production	SOT-23 (DBZ) | 3	3000 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	T8C
LMT90DBZR.A	Active	Production	SOT-23 (DBZ) | 3	3000 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	T8C
LMT90DBZR.B	Active	Production	SOT-23 (DBZ) | 3	3000 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	T8C
LMT90DBZT	Obsolete	Production	SOT-23 (DBZ) | 3	-	-	Call TI	Call TI	-40 to 125	T8C

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

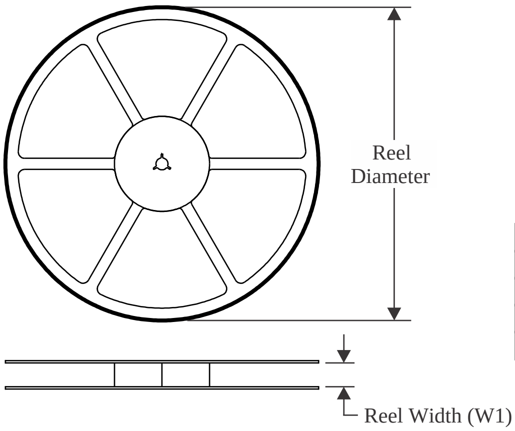
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

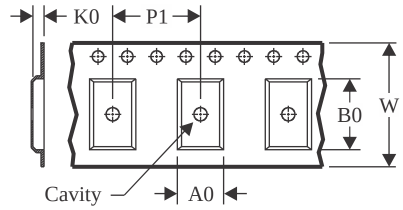
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

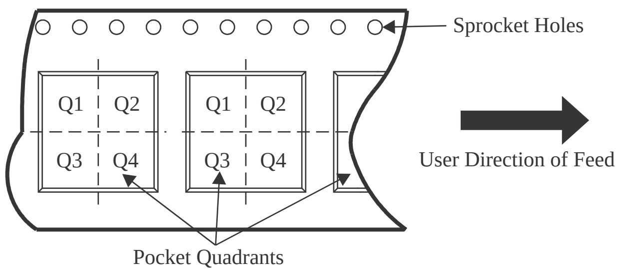


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

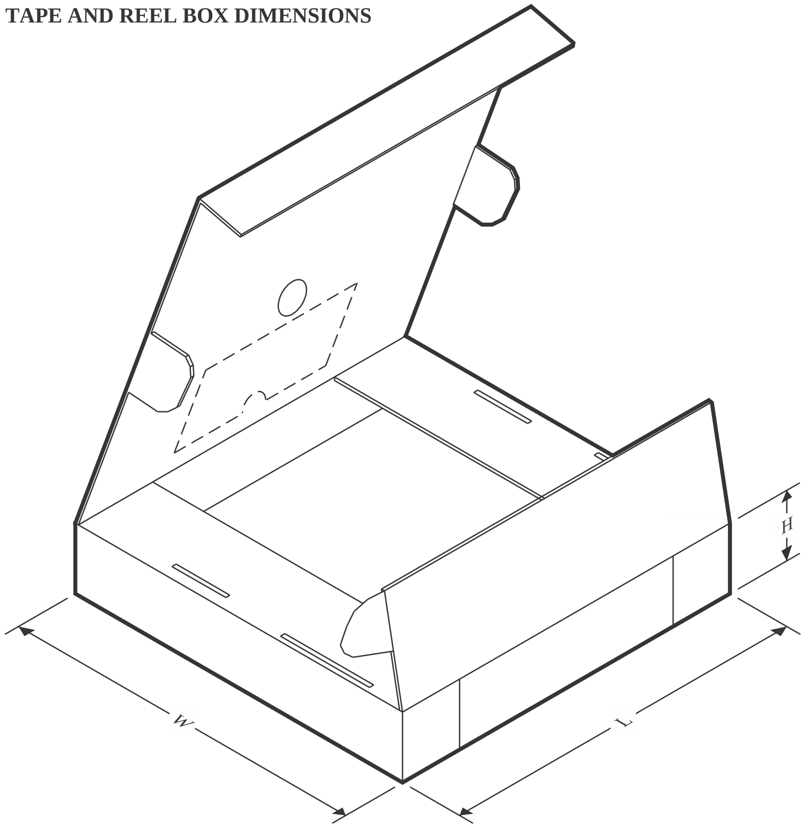
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

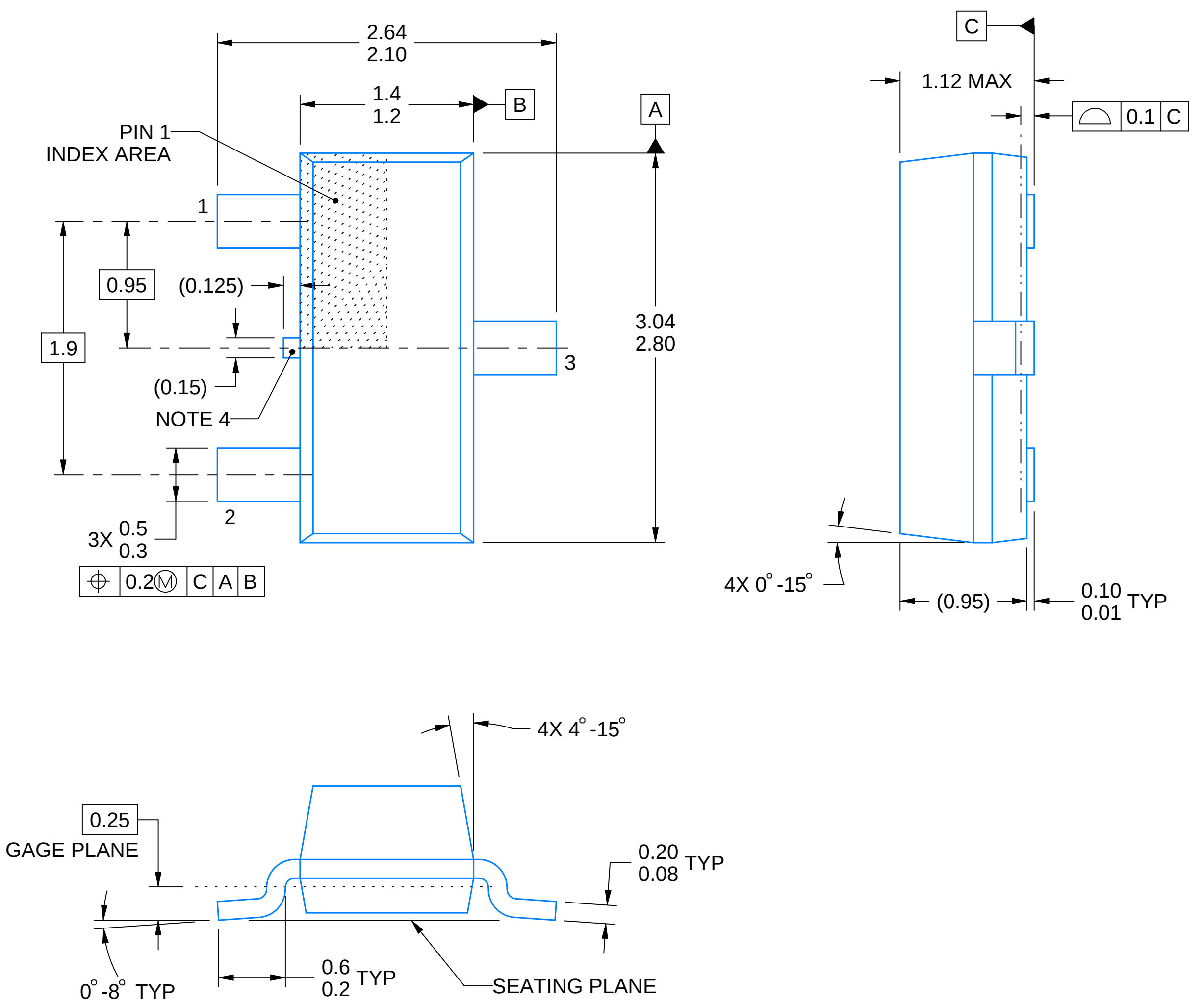
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LMT90DBZR	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LMT90DBZR	SOT-23	DBZ	3	3000	208.0	191.0	35.0



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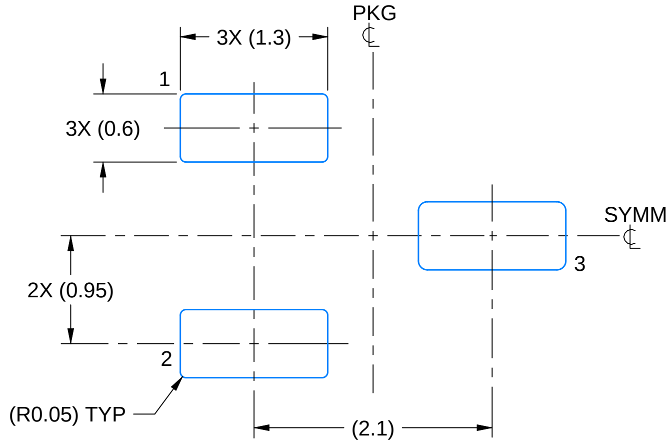
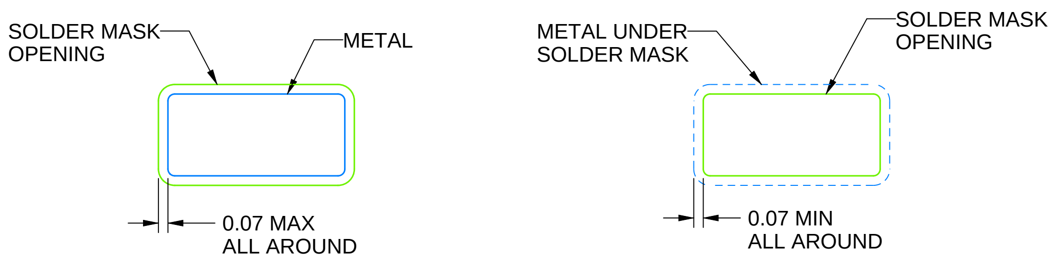
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.
4. Support pin may differ or may not be present.
5. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side



LAND PATTERN EXAMPLE
SCALE:15X



NON SOLDER MASK DEFINED (PREFERRED)

SOLDER MASK DEFINED

SOLDER MASK DETAILS

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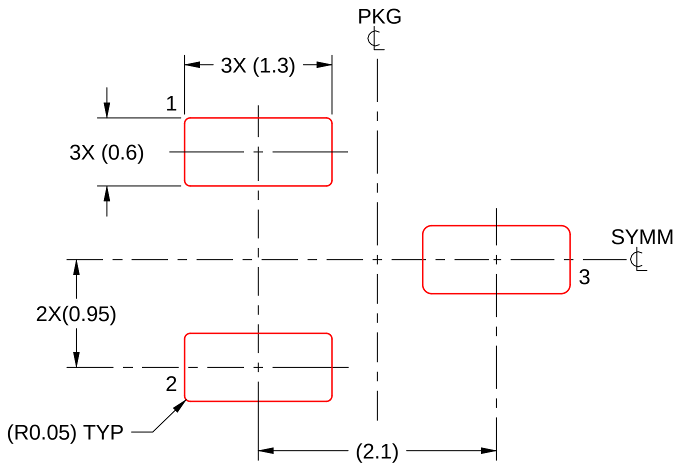
NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 THICK STENCIL
SCALE:15X

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NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.