Analog Temperature Sensor with Class AB Output

Description

The LMT8x are a series of analog temperature sensors with negative temperature coefficients that provide an analog voltage output which is linearly proportional to the Celsius temperature. The LMT8X performs factory calibration, so no external calibration is required, with a typical accuracy of ±4°C at +25°C and a maximum accuracy of ±2.7°C in the temperature range from 40°C to + 125°C.

The LMT8x (the LMT8x series only include these four models) feature low-output impedance, linear output, and factory calibration, enabling significant simplification of temperature control circuits and ADC requirements. This series of sensor components can operate with a single power supply ranging from 1.5V to 5.5V. The power supply current is below 10μA, and the self-heating effect is minimal, with a temperature change of less than 0.1°C in static air.

The LMT8x are available in low-cost 5-pin SOT-23 surface mount, 3-pin TO-92 and 8-pin SOIC and three packages.

Features

- The LMT8x are a series of analog temperature sensors with negative temperature coefficients and average sensor gains of -5.5 mV/°C, -8.2 mV/°C, -10.9 mV/°C , -13.6 mV /°C.
- Temperature range: - 55°C ~ + 1 25 °C, up to +140°C
- Temperature accuracy: ± 0.4°C (typ.)
- The output is short-circuit protected
- Power supply voltage: 2.5V ~ 5.5 V
- Low quiescent current: less than 10μA
- Analog temperature sensors compatible with LM20/19 and LM35 package

Applications

- Thermal management system
- Temperature control
- Home appliances

图1 5-pin-SOT
（SC70）

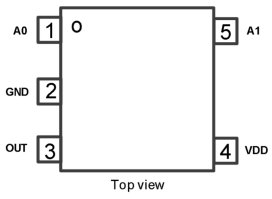
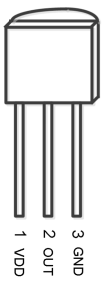
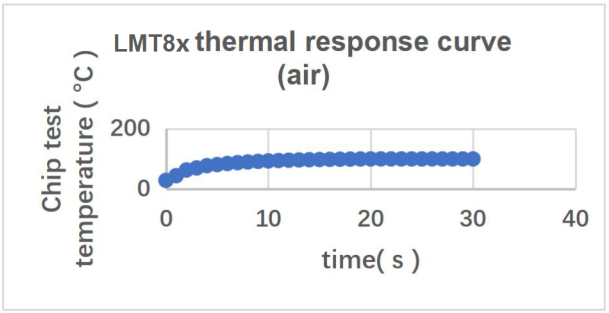


图2 TO-92



* Where X can represent 4, 5, 6, 7.



Pin Configuration and Functions

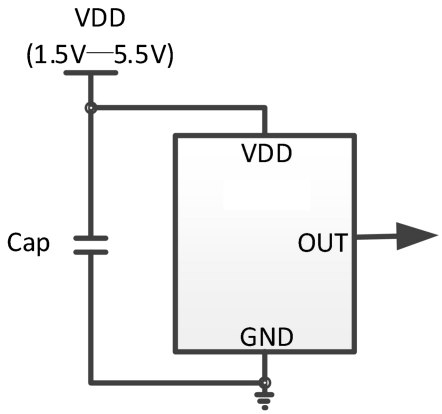


Figure 4 Typical Application

Table 1 Chip pin description

Pin name	Pin name		Illustration
	SOT (SC70)	TO-92	
A0	1	/	Chip enable pin 0
GND	2	3	Ground
OUT	3	2	Analog voltage output
VDD	4	1	Chip power supply port
A1	5	/	Chip enable pin 1

Table 2 Description of theLMT8x SOT (SC70) package and connections of pin A0 and A1

Pin name	Chip model and corresponding connection method			
	LMT84	LMT85	LMT86	LMT87
A0	GND	VDD	GND	VDD
A1	GND	GND	VDD	VDD

Absolute Maximum Ratings

	MIN	MAX	UNIT
Power Supply Voltage +Vs		6	V
OUT Pin	GND	VDD+0.4	V
Junction Temperature		1 50	°C
Storage Temperature	- 60	1 50	°C

Unless otherwise noted, the specifications in the above table apply within the atmospheric temperature range. Stresses beyond the range may cause permanent damage to the device.

Electrostatic Protection

		Value	UNIT
Electrostatic Discharge Voltage	Human Body Mode (HBM), per ANSI/ESDA/JEDEC JS-001	±4000	V
	Machine Mode (MM), per JEDEC-STD Classification	±200	V

Recommended Operating Conditions

	MIN	NOM	MAX	UNIT
Supply Voltage (VDD) LMT 84	1.5	3.3	5.5	V
Supply Voltage (VDD) LMT 85	1.8	3.3	5.5	V
Supply Voltage (VDD) LMT 86	2.2	3.3	5.5	V
Supply Voltage (VDD) LMT 87	2.7	3.3	5.5	V
LMT8X Operating Temperature Range ($TA_)$	- 50		140	°C

Unless otherwise noted, the specifications in the above table apply within the atmospheric temperature range.

Electrical Characteristics

Unless otherwise specified, the following data refer to the characteristics of the chips at +25°C and the power supply voltage is within the corresponding maximum and minimum operating voltage range of each chip. (Typical working conditions are at +25°C and 3.3V.)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply voltage range	LMT84	1.5		5.5	V
	LMT85	1.8		5.5	V
	LMT86	2.2		5.5	V
	LMT87	2.7		5.5	V
Supply current	Normal operation		5.6	9.3	uA
Temperature range	LMT 8x	- 50		140	°C
LMT8X accuracy (temperature error)	+25°C, +Vs = 3.3V		±0.4		°C
	-50°C to +140°C, +VS = 3.3 V		±1	±2.7	°C
Supply voltage sensitivity	T_A=25° C, 3.0V <+Vs<5.5V		20	100	m°C/V
Scale factor	LMT84		-5.5		mV/°C
	LMT85		- 8.2		mV/°C
	LMT86		- 10.9		mV/°C
	LMT87		- 13.6		mV/°C
Voltage linear regulation rate	LMT8X		2 00		μV/V
Output load current		-50		5 0	uA
capacitive load drive			1		pF
Device turn-on time	C_L=0pF -1 n F		0.7	2	ms

Typical Characteristics

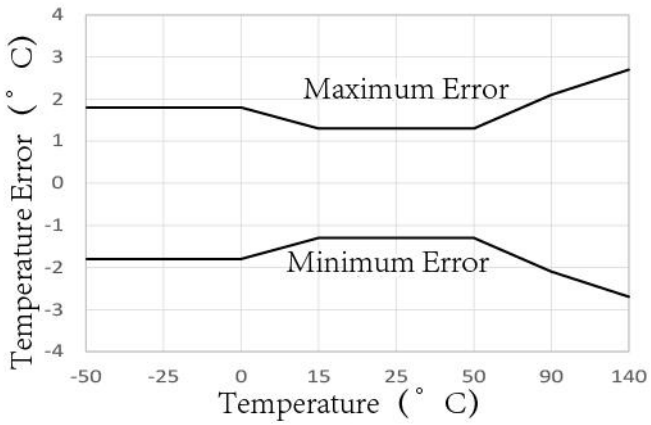


Figure 5 Temperature Error vs Temperature

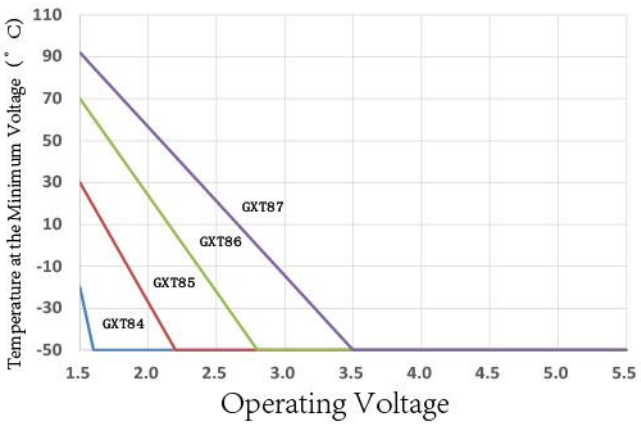


Figure 6 Operating Temperature vs Minimum Operating Voltage

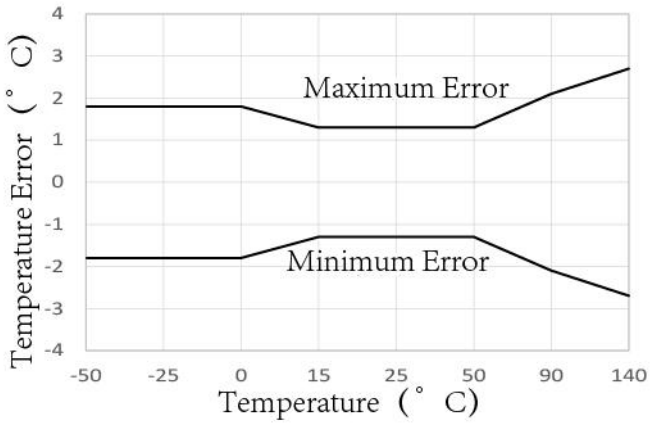


Figure 7 Operating Current vs Operating Temperature

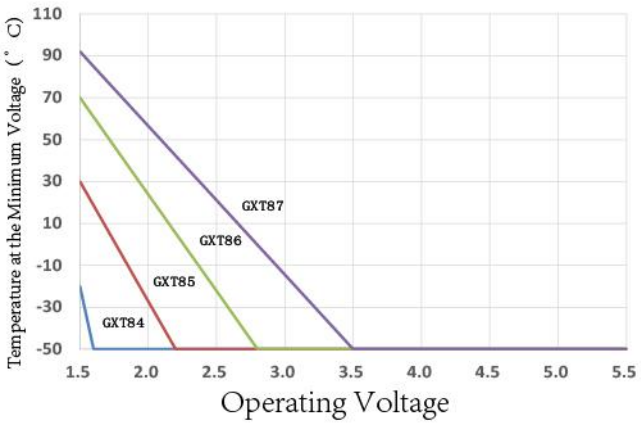


Figure 8 Operating Current vs Operating Voltage

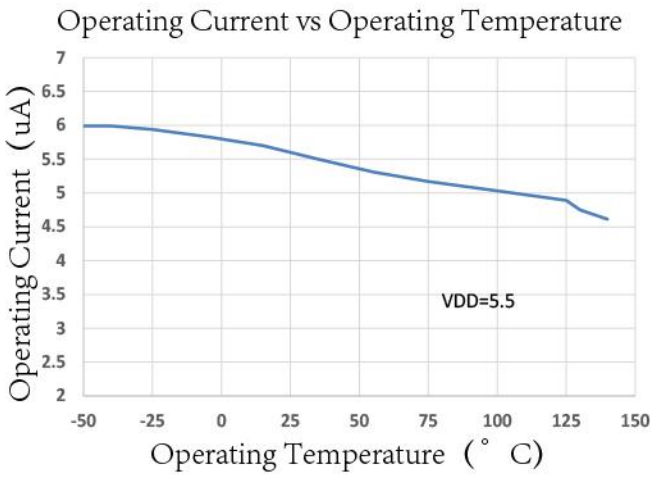


Figure 9 Current Load Adjustment

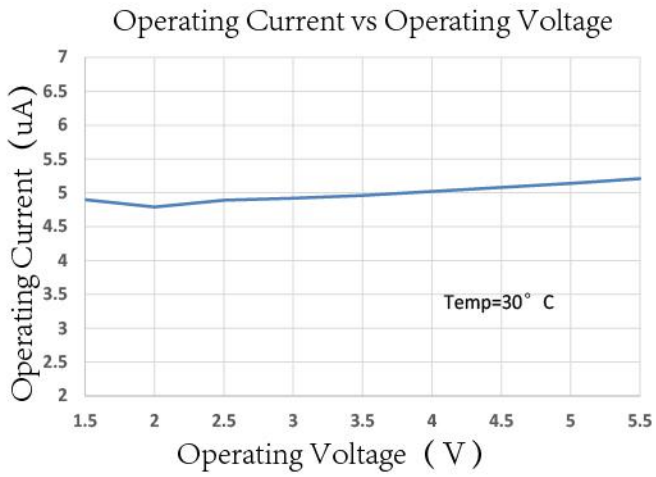
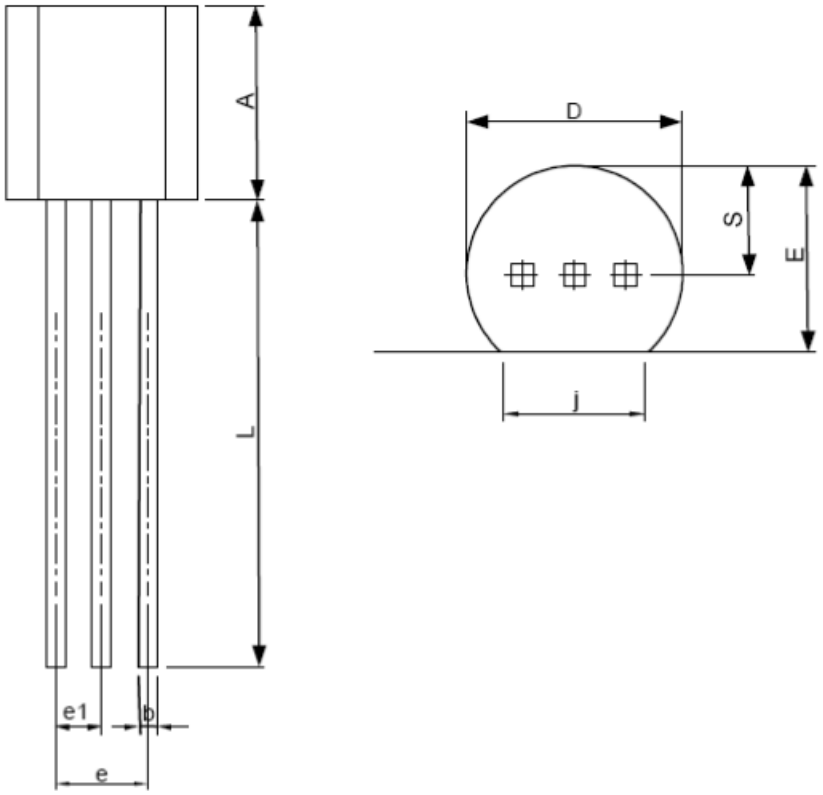


Figure 10 Sample test

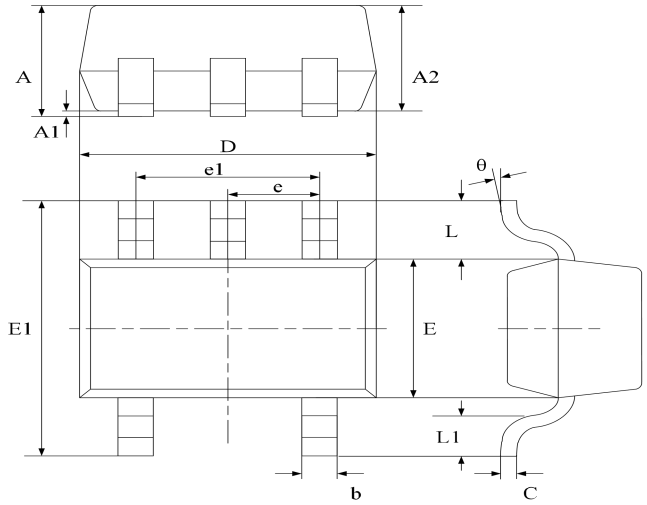
Package Dimension

TO-92



SYMBOL	TO-92			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.32	5.33	0.170	0.210
b	0.41	0.53	0.016	0.021
D	4.45	5.20	0.175	0.205
E	3.18	4.19	0.125	0.165
e	2.42	2.66	0.095	0.105
e1	1.15	1.39	0.045	0.055
j	3.43	4.00	0.135	0.157
L	12.70	15.00	0.500	0.591
S	2.03	2.66	0.080	0.105

SC70-5（SOT353）



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	0.900	0.035	0.039
b	0.150	0.350	0.006	0.014
C	0.080	0.150	0.003	0.006
D	1.8500	2.150	0.079	0.087
E	1.100	1.400	0.045	0.053
E1	1.950	2.200	0.085	0.096
e	0.850 typ.		0.026 typ.	
e1	1.200	1.400	0.047	0.055
L	0.42 ref.		0.021 ref.	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

Ordering information

Order code	Package	Baseqty	Deliverymode	Marking
UMW LMT84LP	TO-92	1800	Tube and box	LMT84
UMW LMT85LP	TO-92	1000	Tape and reel	LMT85
UMW LMT86LP	TO-92	1800	Tape and reel	LMT86
UMW LMT87LP	TO-92	1800	Tape and reel	LMT87
UMW LMT84DCKR	SC70-5	3000	Tape and reel	BNA U
UMW LMT85DCKR	SC70-5	3000	Tape and reel	BPA U
UMW LMT86DCKR	SC70-5	3000	Tape and reel	BSA U
UMW LMT87DCKR	SC70-5	3000	Tape and reel	BUA U