SGM451LQ

Automotive, ±1℃ Local and Remote Temperature Sensor with η-Factor, Offset Correction, Series-Resistance Cancellation, and Programmable Digital Filter

GENERAL DESCRIPTION

The SGM451LQ is a high-accuracy, low-power temperature sensor which integrates local and remote temperature channels. The remote sensor which is connected to the SGM451LQ is made by discrete transistors or diodes, which would be the integrated inside the MCU and FPGA. The SGM451LQ is a 12-bit device with a resolution of only 0.0625℃. This device can measure the temperature of the local and remote diode sensors with an accuracy of ±0.25℃ (TYP).

Communication with the SGM451LQ is accomplished via the two-wire serial interface which is compatible with the SMBus communication protocol. Through this interface the SGM451LQ internal registers may be accessed.

There are many advantages of SGM451LQ, such as cancelling the series resistance, calibrating the offset, changing the cutoff frequency of the digital filter, changing the limitation of temperature and non-ideality factor with programming. The above factors are significant to improve the accuracy of the SGM451LQ.

The device is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and it is suitable for automotive applications.

The SGM451LQ is suitable for high precision temperature measurements in multiple locations in application system. The wide supply voltage range from 1.6V to 5.5V makes the SGM451LQ possible to use in a wide range of applications, including low power devices. The device operates over a wide temperature range of -40℃ to +125℃.

FEATURES

- **AEC-Q100 Qualified for Automotive Applications**
  Device Temperature Grade 1
  T_A = -40℃ to +125℃
- **Temperature Accuracy**
  - **Local Diode Sensor: ±0.25℃ (TYP)**
  - **Remote Diode Sensor: ±0.25℃ (TYP)**
- **Local and Remote Channels Resolution: 0.0625℃**
- **Supply and Logic Voltage Range: 1.6V to 5.5V**
- **Support 1.8V I^2C Bus Voltage at 3.3V Power Supply**
- **Operating Current: 4μA (TYP)**
- **Shutdown Current: 0.3μA (TYP)**
- **Cancelling the Series Resistor**
- **η-Factor**
- **Calibrating the Offset**
- **Programmable Digital Filter**
- **Diode Fault Detection**
- **Two-Wire and SMBus Serial Interface**
- **Available in a Green TDFN-2×2-8BL Package**

APPLICATIONS

Automotive Applications
CPU, GPU, DSP and FPGA Computing System
Smart Phones and Computers
Servers and Desktops
Storage Area Networks (SANs)
Telecom Equipment

TYPICAL APPLICATION

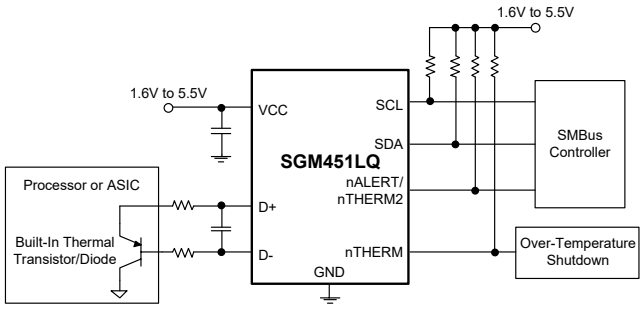


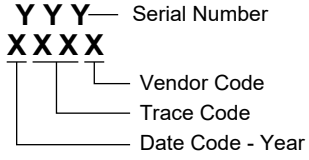
Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM451LQ	TDFN-2×2-8BL	-40℃ to +125℃	SGM451LQTEA8G/TR	15N XXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXX = Date Code, Trace Code and Vendor Code.



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Power Supply, V_{CC} ..... -0.3V to 6.5V
Input Voltage
nTHERM, SDA and SCL ..... -0.3V to 6.5V
nALERT/nTHERM2 ..... -0.3V to V_{CC}
D+ Only ..... -0.3V to V_{CC} + 0.3V
D- Only ..... -0.3V to 0.3V
Input Current 10mA
Package Thermal Resistance
TDFN-2×2-8BL, θ_{JA} ..... 129.9℃/W
TDFN-2×2-8BL, θ_{JB} ..... 54.2℃/W
TDFN-2×2-8BL, θ_{JC} ..... 73.7℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility (1) (2)
HBM ..... ±4000V
CDM ..... ±1000V

NOTES:

1. For human body model (HBM), all pins comply with AEC-Q100-002 specification.

2. For charged device model (CDM), all pins comply with AEC-Q100-011 specification.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 1.6V to 5.5V
Operating Temperature Range ..... -40℃ to +125℃

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

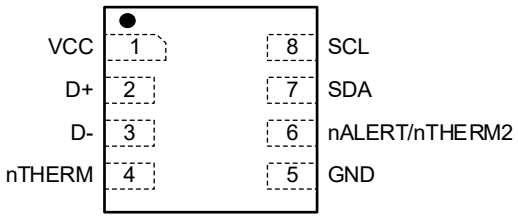
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION

(TOP VIEW)



TDFN-2×2-8BL

PIN DESCRIPTION

PIN	NAME	TYPE	DESCRIPTION
1	VCC	P	1.6V to 5.5V Power Supply Pin.
2	D+	AI	Positive Side Connected to Remote Temperature Sensor.
3	D-	AI	Negative Side Connected to Remote Temperature Sensor.
4	nTHERM	DO	Thermal Shutdown or Fan-Control Open-Drain Output Pin. An external pull-up resistor to voltage between 1.6V and 5.5V is required.
5	GND	G	Ground.
6	nALERT/nTHERM2	DO	Interrupt or SMBus Alert Output Pin. It can be used as another nTHERM open-drain output. An external pull-up resistor to voltage between 1.6V and 5.5V is required.
7	SDA	I/O	Data Input/Output Pin. Open-drain. An external pull-up resistor to voltage between 1.6V and 5.5V is required.
8	SCL	DI	Clock Input Pin for SMBus. If it is driven by open-drain output, an external pull-up resistor to voltage between 1.6V and 5.5V is required.

NOTE: AI = analog input, DI = digital input, DO = digital output, I/O = input/output, G = ground, P = power.

FUNCTIONAL BLOCK DIAGRAM

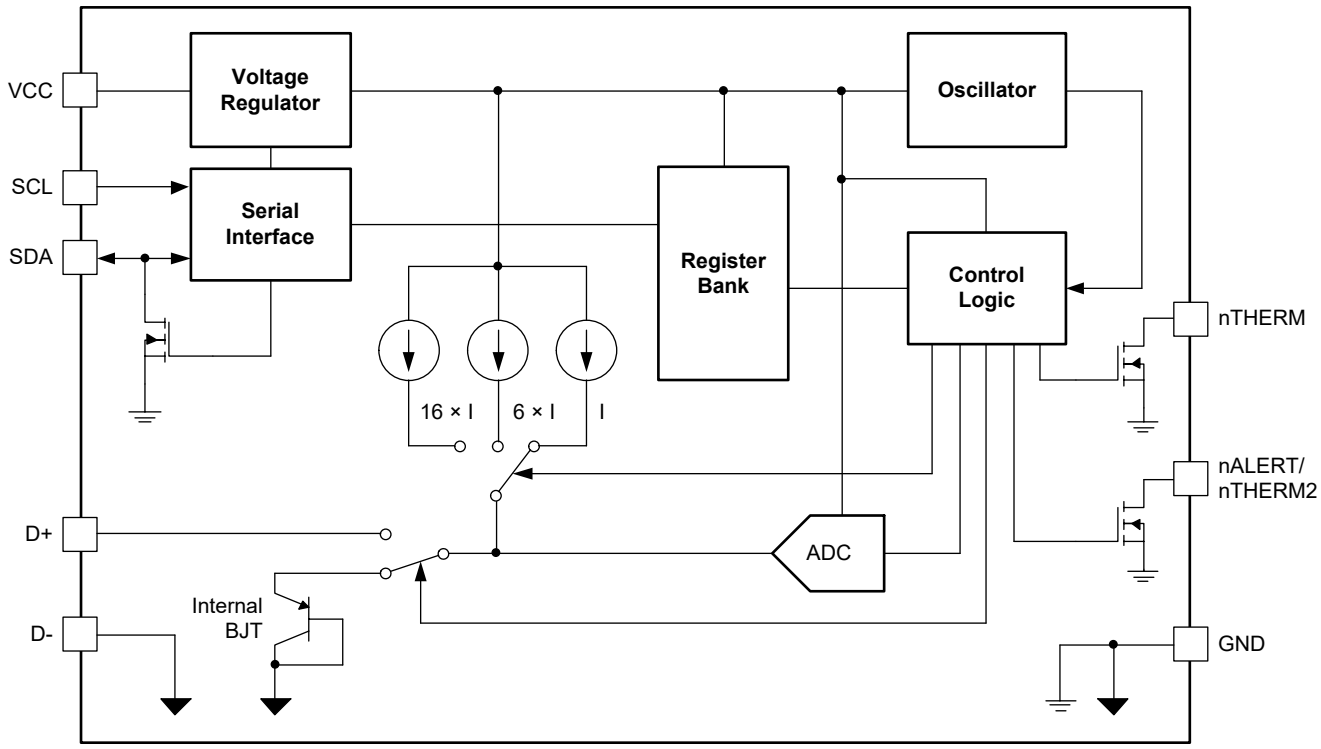
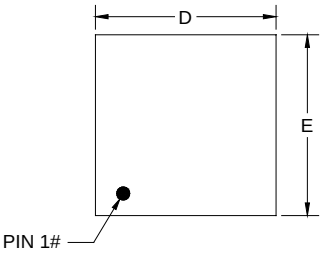


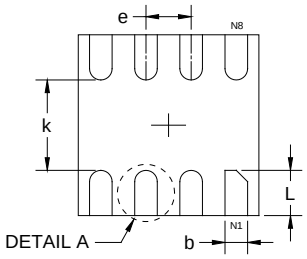
Figure 2. Block Diagram

PACKAGE OUTLINE DIMENSIONS

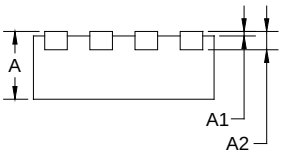
TDFN-2×2-8BL



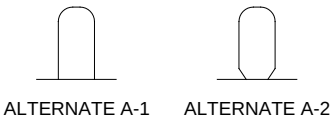
TOP VIEW



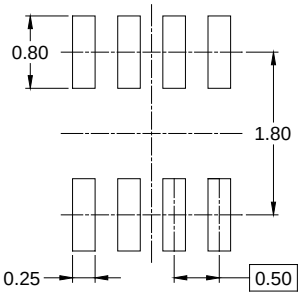
BOTTOM VIEW



SIDE VIEW



DETAIL A
ALTERNATE TERMINAL CONSTRUCTION



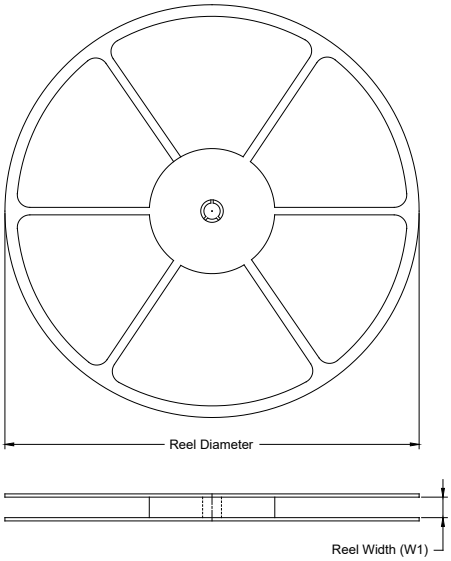
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.700	0.750	0.800
A1	0.000	0.020	0.050
A2	0.203 REF		
D	2.000 BSC		
E	2.000 BSC		
b	0.200	0.250	0.300
e	0.500 BSC		
L	0.450	0.500	0.550
k	1.000 REF		

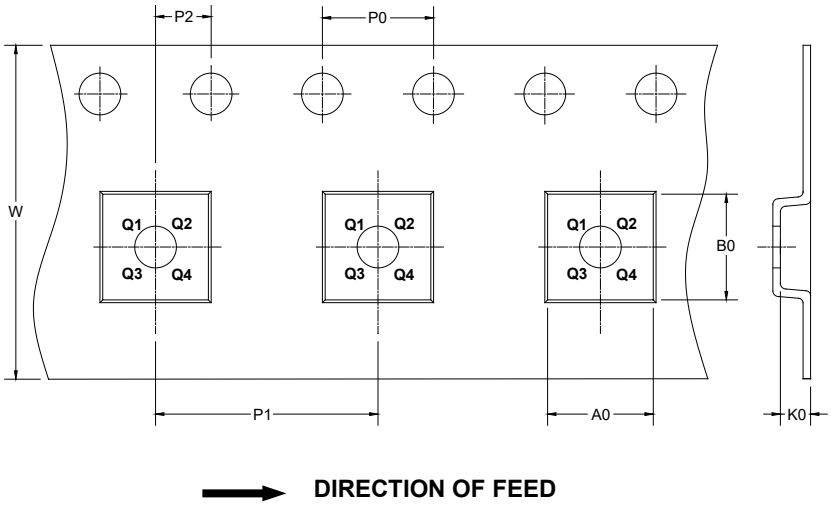
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



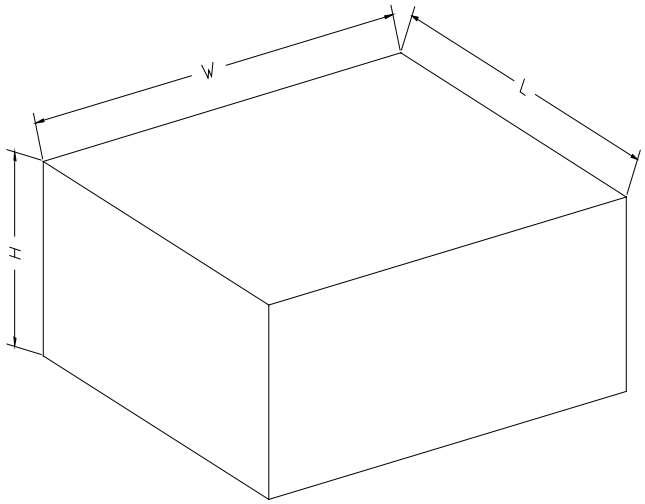
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TDFN-2×2-8BL	7″	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1

DD0001

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002