Analog Temperature Sensor – SiS60A

Single-supply voltage-output temperature sensor in bare die form

Rev 1.0
04/04/20

Description

The SiS60A measures temperature over a wide -60°C to 125°C range. The device operates from a single supply and provides a linear voltage output with temperature coefficient of 6.25mV/°C. By design DC offset of +424 mV permits measurement of negative temperature without need for negative supply. Nominal output range is within 49mV (-60°C) and 1205mV (125°C). Output precision is calibrated on-die to ±2% max at 25°C and ±4% max over the full range. 2.7V operation & 125µA max consumption enable logic gate outputs to power this device, which combines intrinsic shutdown capability with simplified integration.

Features:

- Wide temperature range: -60 to +125°C
- Single-supply range: 2.7-10V
- ±1% typical accuracy at 25°C
- ±2% typical accuracy over -60 to +125°C range
- Low supply current: 125µA maximum
- Minimal self-heating: <= 0.1°C in still air
- ESD rated to 2kV HBM

Ordering Information

The following part suffixes apply:

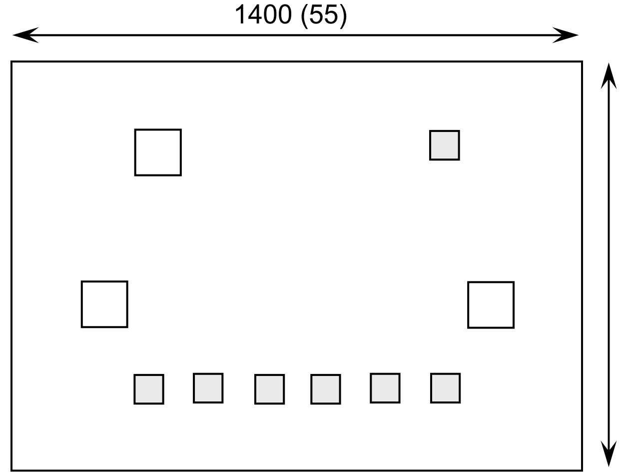
- No suffix - MIL-STD-883 /2010B Visual Inspection
- "**H**" - MIL-STD-883 /2010B Visual Inspection
  + MIL-PRF-38534 Class H LAT
- "**K**" - MIL-STD-883 /2010A Visual Inspection (Space)
  + MIL-PRF-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

www.siliconsupplies.com\quality\bare-die-lot-qualification

Die Dimensions in µm (mils)



Supply Formats:

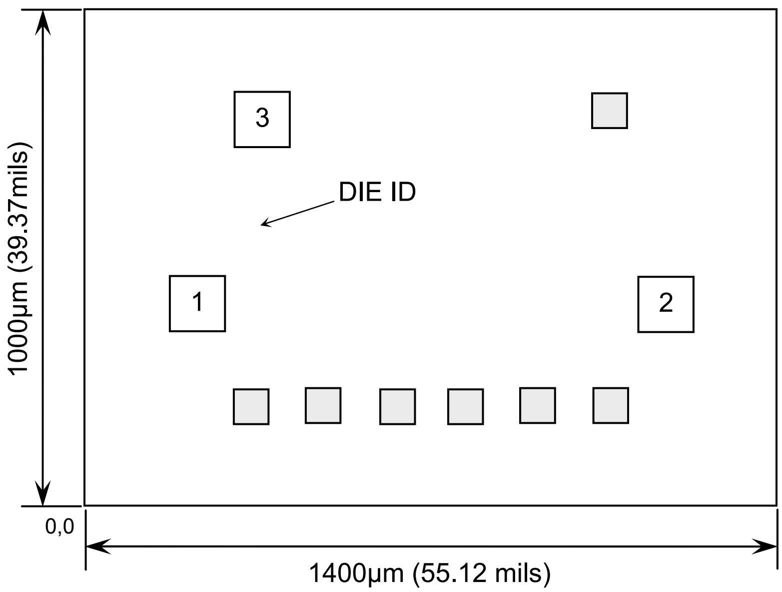
- Default – Die in Waffle Pack (400 per tray capacity)
- Sawn Wafer on Tape – On request
- Unsawn Wafer – On request
- Die Thickness <> 350µm(14 Mils) – On request
- Assembled into Ceramic Package – On request

Mechanical Specification

Die Size (Unsawn)	1400 x 1000 55 x 39	µm mils
Minimum Bond Pad Size	112 x 112 4.4 x 4.4	µm mils
Die Thickness	350 (±20) 13.78 (±0.79)	µm mils
Top Metal Composition	Al 1%Si 1.1µm	
Back Metal Composition	N/A – Bare Si	

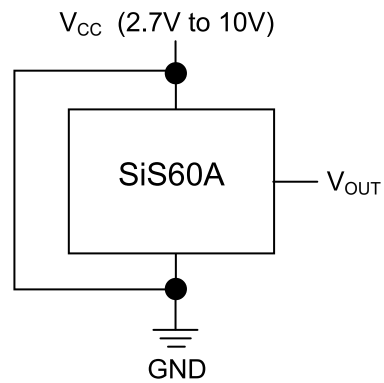
Rev 1.0
04/04/20

Pad Layout and Functions

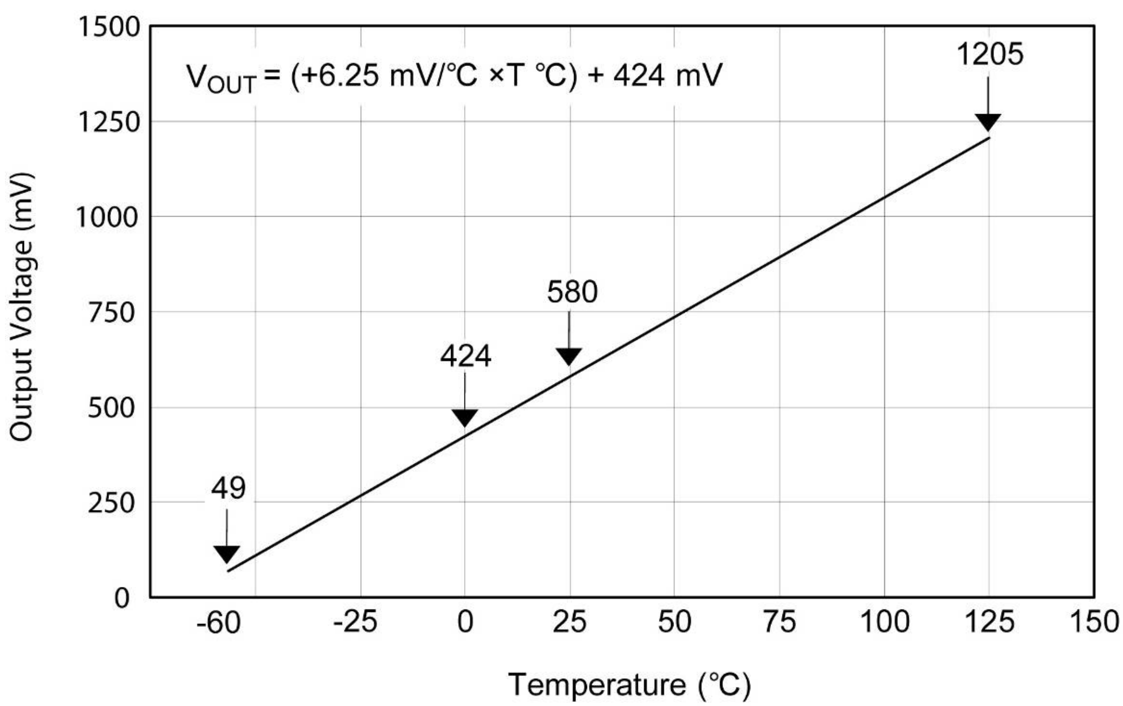


PAD	FUNCTION	COORDINATES (µm)	
		X	Y
1	V_{CC}	174.5	350
2	V_{OUT}	1124	350
3	GND	300	724
CONNECT CHIP BACK TO GND			

Simplified Schematic



Output Voltage versus Temperature



 www.siliconsupplies.com

Rev 1.0
04/04/20

Absolute Maximum Ratings[1]

PARAMETER	SYMBOL	VALUE	UNIT
DC Supply Voltage Range	V_{CC}	-0.2 to +12	V
Output Voltage	V_{OUT}	-0.6 to V_{CC} +0.6	V
Load Current	I_{LOAD}	10	mA
Input Current (Any pin)	I_{IN}	5	mA
Storage Temperature	T_{STG}	-65 to +150	°C
Operating Junction Temperature	T_J	-60 to +125	°C
Thermal Resistance[2]	$R_{\theta JA}$	162	°C/W
Electrostatic Discharge (HBM)	V_{ESD}	2	kV

1. Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability. **2.** Die assembled in TO-92 package in still air.

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNITS
DC Supply Voltage	V_{CC}	2.7	10	V
Load Current	I_{LOAD}	-	1	µA
Operating Temperature	T_A	-60	+125	°C

DC Electrical Characteristics (V_{CC} =3V, I_{LOAD} = 1µA , T_J = T_A = 25°C unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	LIMITS			UNITS
			MIN	TYP	MAX	
Accuracy	ΔT_1	$T_A = T_J$ = 25°C	-2	±1	+2	°C
		$T_A = T_J$ = Full Range	-4	±2	+4	
Output Voltage	V_{OUT}	0°C	-	424	-	mV
Non-linearity	-	-	-0.8	-	+0.8	°C
Sensor Gain	-	$T_A = T_J$ = Full Range	6.00	6.25	6.50	mV/°C
Output Impedance	R_{OUT}	$T_A = T_J$ = Full Range	-	-	800	Ω
Line Regulation	ΔV_{OUT}	3V ≤ +V_{CC} ≤ 10V, $T_A = T_J$ = Full Range	-0.3	-	0.3	mV/V
		2.7V ≤ +V_{CC} ≤ 3.3V, $T_A = T_J$ = Full Range	-3	-	3	mV
Quiescent Current	I_{CC}	2.7V ≤ +V_{CC} ≤ 10 V, $T_A = T_J$ = 25°C	-	82	110	µA
		2.7V ≤ +V_{CC} ≤ 10 V, $T_A = T_J$ = Full Range	-	-	125	
Quiescent Current Change	ΔI_{CC}	2.7V ≤ +V_{CC} ≤ 10 V	-	5	-	µA
Temperature coefficient of Quiescent current	-	-	-	0.2	-	µA/°C
Long-term stability	-	$T_J = T_{MAX}$ = 125°C for 1000 hours	-	±0.2	-	°C

Typical Characteristics (V_{CC} =3V, I_{LOAD} = 1µA , T_J = T_A = 25°C unless otherwise specified)

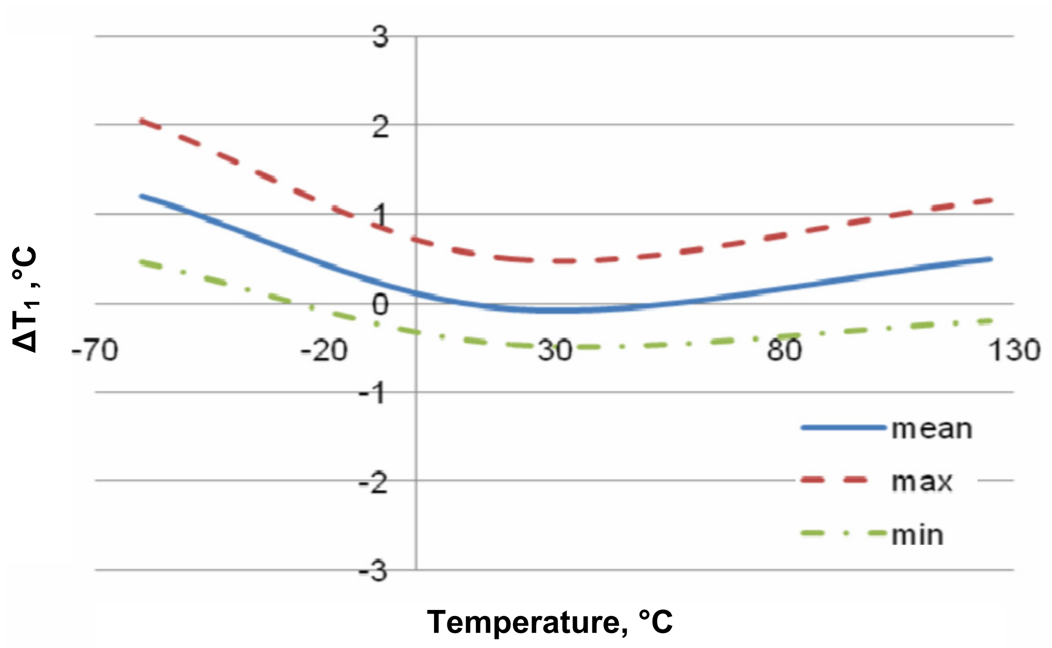
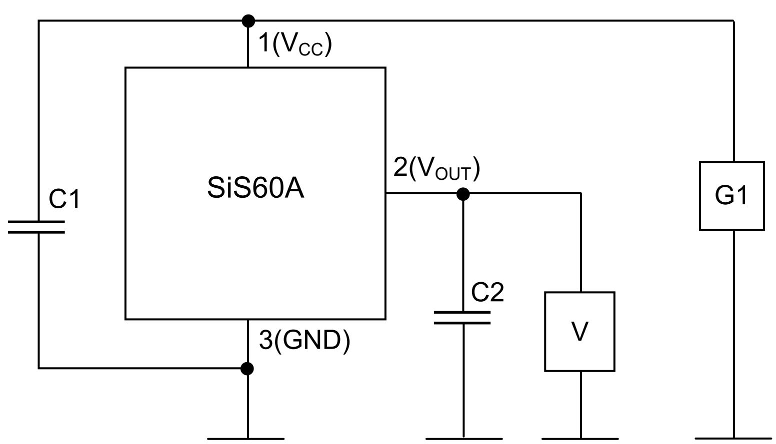


FIGURE 1. Temperature measurement accuracy

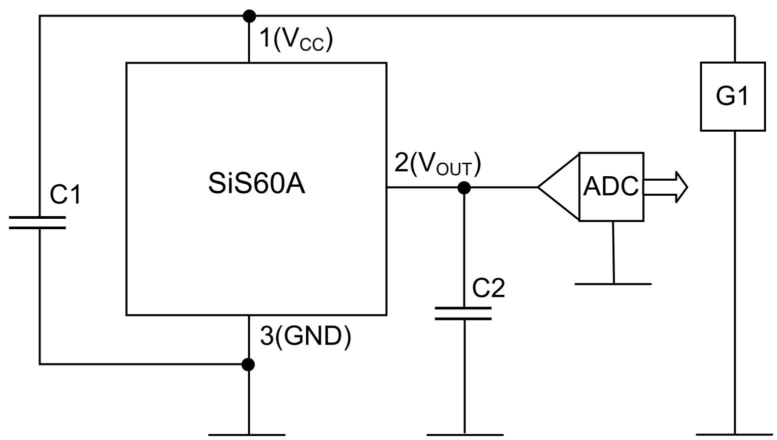
Typical Applications



C1 – 0.1µF ± 20% capacitor – Optional by-pass filter for noisy environments
C2 – 1µF ± 20% capacitor – Optional 199-Hz low-pass filter for noisy environments
G1 – DC supply 2.7V - 10V
V - Voltmeter

FIGURE 2. Output with noise reduction circuit

Typical Applications continued



C1 – 0.1µF ± 20% capacitor – Optional by-pass filter for noisy environments
C2 – 1µF ± 20% capacitor – Optional 199-Hz low-pass filter for noisy environments
G1 – DC supply 2.7V - 10V
ADC – Analog to Digital Converter

FIGURE 3. Output to ADC with noise reduction circuit

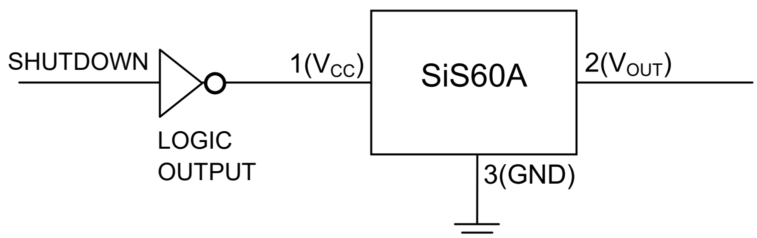


FIGURE 6. Logic device drive with intrinsic shutdown

Formulae

Linear Transfer Function

$V_{OUT} = (6.25mV/°C \times T°C) + 424mV$

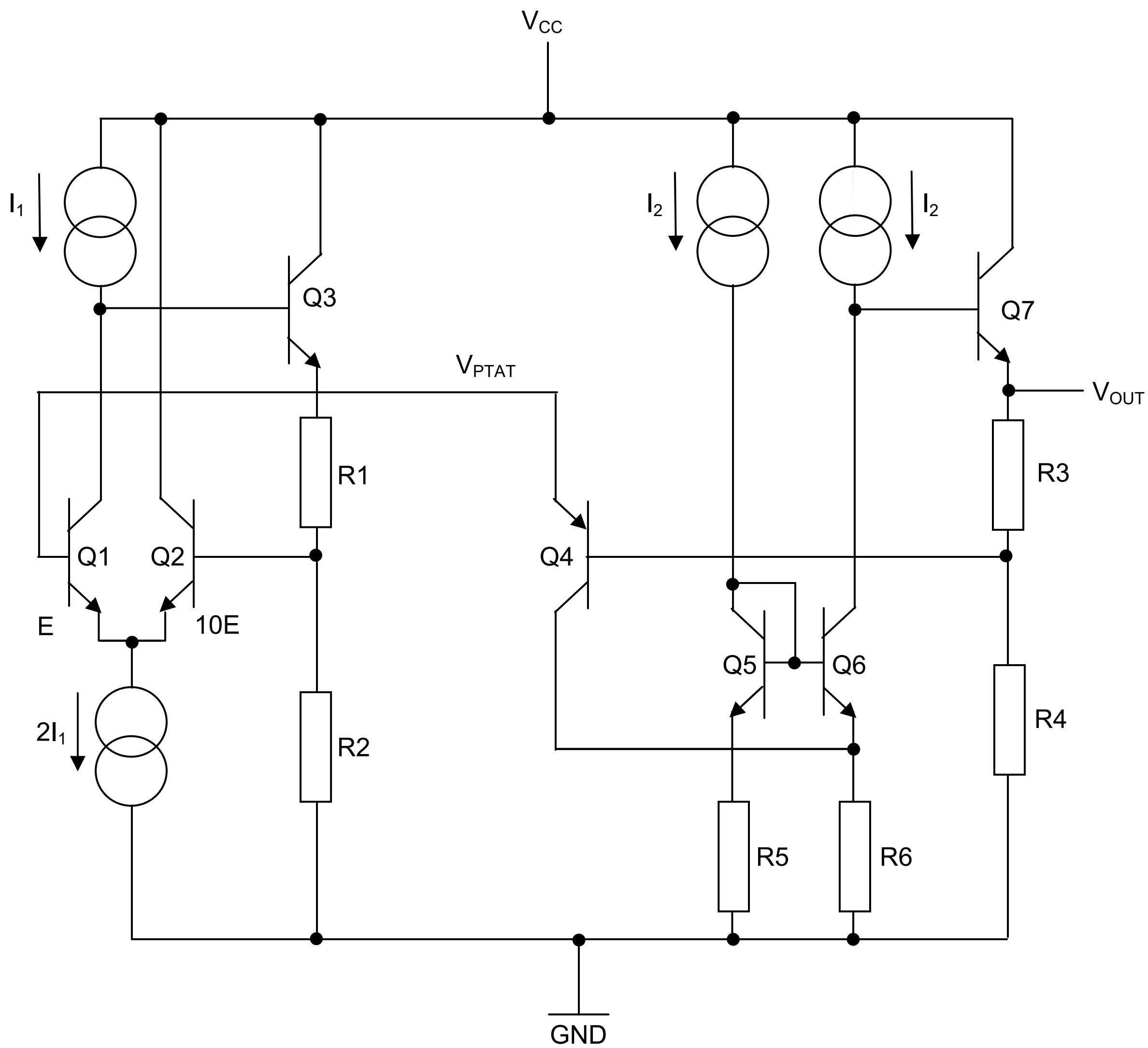
Where:
- T = Temperature
- V_{OUT} = SiS60A output voltage.

Die Self-Heating Calculation

$T_J = T_A + R_{\theta JA} [(V_{CC}\, I_{CC}) + (V_{CC} - V_{OUT})\, I_{LOAD}]$

Where:
- I_{CC} = SiS60A quiescent current
- I_{LOAD} = The load current on the SiS60A output

Block Diagram



DISCLAIMER: The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Silicon Supplies Ltd hereby disclaims any and all warranties and liabilities of any kind.

LIFE SUPPORT POLICY: Silicon Supplies Ltd components may be used in life support devices or systems only with the express written approval of Silicon Supplies Ltd, if a failure of such components can reasonably be expected to cause the failure of that life support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.