NXP SMBus/I²C-bus digital temp sensor SA56004x

High-precision digital temp sensor with programmable over/under-temp alarms

Highly accurate temperature readings over a wider range and with lower power dissipation than most industry-standard devices.

Key features

- Highly accurate temperature readings of:
    - Thermal diodes in remote microprocessor/graphic controller (< ±1 °C)
    - Diode-connected transistors (< ±1 °C)
    - Local, on-chip conditions (< ±2 °C)
- Pin-for-pin compatible with LM86, LM99, MAX6646/7/9, MAX6657/8, and ADM1032
- Offset registers for system calibration
- Supports SMBus ALERT and TIMEOUT
- Supports I²C-bus up to 400 kHz (standard/fast)
- Programmable conversion rate
- Programmable under/over-temperature alarms
- Eight factory-programmed device address options for multiple slaves in server applications
- True, 11-bit resolution for all conversion rates
- Small, 8-pin package in two options: SO8, TSSOP8 (MSOP8)

Applications

- System thermal management in laptops, desktops, servers, workstations
- Computers and electronic office equipment, communication equipment
- Electronic test equipment and instrumentation
- HVAC
- Industrial controllers and embedded systems

The NXP SA56004x is an 11-bit, remote/local digital temperature sensor with programmable over- and under-temperature alarms. Fully compatible with the SMBus and the I²C-bus (standard and fast modes), it provides temperature readings with an accuracy of within ±1 °C.

The sensor uses a remote channel to monitor diode junctions such as a substrate PNP in a remote microprocessor or graphic processor. The sensor can also be used with diode-connected transistors like the 2N3904 (NPN) or the 2N3906 (PNP), or for local, on-chip temperature readings.

Pin-for-pin compatible with industry-standard temperature sensors, including the LM86, LM99, MAX6646/7/9, MAX6657/8, and the ADM1032, the SA56004x typically supports a wider temperature range and, under most conditions, offers lower power dissipation and higher performance than competing solutions.


founded by Philips

The under- and over-temperature alert thresholds can be programmed to indicate out-of-range readings in the on-chip or remote temperature. The alert output, triggered by temperature readings above the programmed threshold register value, can be used as a system interrupt or an SMBus alert, activating a cooling fan, sending a warning, or prompting a system shutdown.

To further enhance system reliability, the SA56004x supports the SMBus 2.0 timeout protocol.

A programmable conversion rate (62.5 mHz to 32 Hz), combined with resolution of 0.125 °C, means the sensor delivers true, 11-bit resolution for all conversion rates.

User-selectable conversion times optimize system performance, while offset registers correct for series resistance, different diode types, or for system calibration. Fault queues can be used to increase noise immunity and under-voltage lockout prevents erroneous temperature readings.

The SA56004x is available in SO8 and TSSOP (MSOP8) packages.
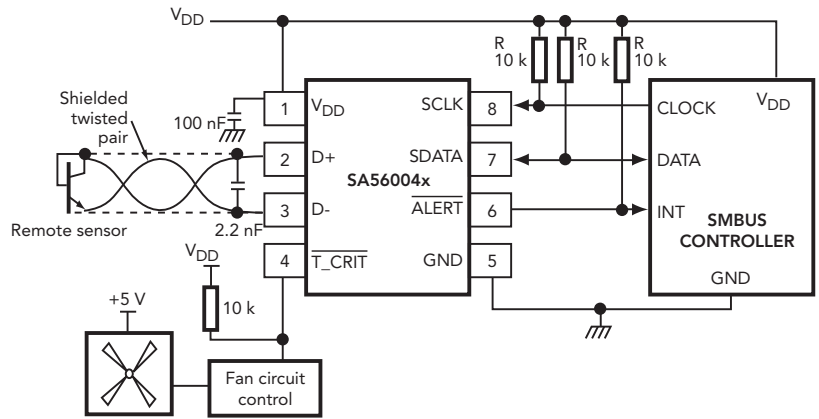
SA56004x system application diagram

Ordering information

Part Number	Temp. Range	Package	Description
SA56004xD*	0 to +125 °C	SO8	Plastic Small Outline Package, eight leads, 3.9-mm body width
SA56004xDP*	0 to +125 °C	TSSOP8 (MSOP8)	Plastic Thin Shrink Small Outline Package, eight leads, 3.9-mm body width

* Note: "x" in type number denotes the I²C-bus address variations "A" through "H" since the address is fixed on each version. "E" is the most commonly used address.

Pin designation and description

Pin Location	Pin No.	Pin Name	Function
	1	V_{DD}	Positive supply voltage. DC from 3.0 to 5.5 V.
	2	D+	Diode source current (anode)
	3	D–	Diode sink current (cathode)
	4	$\overline{\text{T\_CRIT}}$	Alarm for system interrupt or power shutdown. Open-drain, active-low output requires an external pull-up resistor.
	5	GND	Power-supply ground
	6	$\overline{\text{ALERT}}$	Under/over-temperature alarm. Open-drain, active-low output requires external pull-up resistor. Provides an interrupt, indicating that the on-chip or remote-diode temperature is above or below programmed thresholds.
	7	SDATA	SMBus/I²C-bus bidirectional data line. Open-drain output requires external pull-up resistor.
	8	SCLK	SMBus/I²C-bus clock input. Requires external pull-up resistor.

For more information visit www.nxp.com/i2clogic.