可提供评估板

MAXIM

精密的温度监视器，
用于DDR存储器模块

MAX6604

概述

高精度温度监视器MAX6604设计用于监视DDR存储器模块的温度，该器件通过2线SMBus™/I²C兼容接口读取和编程。三个地址输入端用于设置温度传感器的总线地址，从而允许在一条总线上挂接最多8个器件。

内部温度传感器连续监视温度，并以每秒8次的速度更新温度数据。主机在任何时刻都可读取温度数据。由于温度传感器位于存储器模块，所记录的温度数据即为模块温度的精确再现。与主板上嵌入温度传感器的方法相比，MAX6604可提供更高精度的模块温度读数。此外，与主板温度传感器相比，器件能更快地响应模块的温度变化。

MAX6604带有温度门限监测的中断输出指示，门限电平可通过数字接口编程设置。

MAX6604工作在-20°C至+125°C温度范围，提供JEDEC标准的8引脚TSSOP和8引脚TDFN (2mm x 3mm)封装。

应用

存储器模块

台式计算机

笔记本电脑

工作站

网络设备

特性

♦ 符合JEDEC标准

♦ ±1°C温度监测精度

♦ 高温中断，提供可编程门限

♦ +2.7V至+3.6V工作电压范围

♦ SMBus/I²C兼容接口

♦ 300µA典型工作电流

♦ 3µA典型关断电流

♦ -20°C至+125°C工作温度范围

♦ 8引脚TSSOP和8引脚TDFN (2mm x 3mm)封装

定购信息

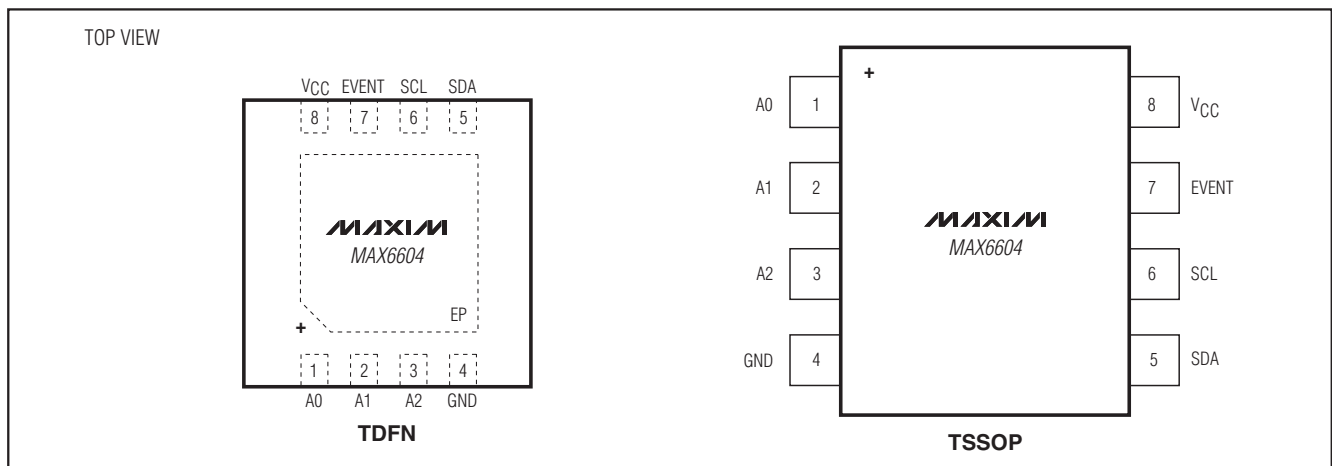| PART	SERIAL-CLOCK FREQUENCY (kHz)	PIN-PACKAGE	SPECIAL TOP MARK
MAX6604ATA+	100	8 TDFN-EP*	AAA
MAX6604AATA+	400	8 TDFN-EP* (MO229-WCED-2)	AAR
MAX6604AAHA+	400	8 TSSOP	—

+表示无铅(Pb)/符合RoHS标准的封装。
*EP = 裸焊盘。
注：所有器件均工作在-20°C至+125°C温度范围。

典型应用电路在数据资料的最后给出。

引脚配置

SMBus是Intel Corporation的商标。

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ABSOLUTE MAXIMUM RATINGS

All Input and Output Voltages ....-0.3V to +6V
Continuous Power Dissipation (T$_A$ = +70°C)
   8-Pin TDFN (derate 16.7mW/°C above +70°C) 1333.3mW
   8-Pin TSSOP (derate 8.1mW/°C above +70°C) 646.7mW
ESD Protection (all pins, Human Body Model) ....±2kV

Junction Temperature ....+150°C
Operating Temperature Range ....-20°C to +125°C
Storage Temperature Range ....-65°C to +150°C
Lead Temperature (soldering, 10s) ....+300°C
Soldering Temperature (reflow) ....+260°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V$_{CC}$ = +2.7V to +3.6V, T$_A$ = -20°C to +125°C, unless otherwise noted. Typical values are at V$_{CC}$ = +3.3V, T$_A$ = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Supply Voltage Range	V$_{CC}$		+2.7		+3.6	V
Temperature Resolution				0.125		°C
				11		bits
Temperature Accuracy		+3V ≤ V$_{CC}$ ≤ +3.6V, +75°C ≤ T$_A$ ≤ +95°C	-1		+1	°C
		+3V ≤ V$_{CC}$ ≤ +3.6V, +40°C ≤ T$_A$ ≤ +125°C	-2		+2	
		+3V ≤ V$_{CC}$ ≤ +3.6V, -20°C ≤ T$_A$ ≤ +125°C	-3		+3	
Power-On Reset (POR) Threshold		V$_{CC}$ falling edge		2.0		V
POR Threshold Hysteresis				90		mV
Undervoltage-Lockout Threshold				2.4		V
Operating Current		During conversion		0.3	0.5	mA
Standby Current				3	6	µA
Conversion Time	t$_{CONV}$				125	ms
Conversion Rate	f$_{CONV}$		8			Hz
DIGITAL INTERFACE (Note 2)						
Logic-Input High Voltage (SCL, SDA)	V$_{IH}$		2.1			V
Logic-Input Low Voltage (SCL, SDA)	V$_{IL}$				0.8	V
Logic-Input Hysteresis (SCL, SDA)				500		mV
Leakage Current (EVENT, SCL, SDA, A2, A1, A0)	I$_{LEAK}$	V$_{IN}$ = V$_{GND}$ or V$_{CC}$	-1		+1	µA
Logic-Output Low Voltage (SDA, EVENT)	V$_{OL}$	I$_{PULL\_UP}$ = 350µA			50	mV
Logic-Output Low Sink Current (SDA, EVENT)	I$_{OL}$	V$_{OL}$ = 0.6V	6			mA
Input Capacitance (SCL, SDA)	C$_{IN}$			5		pF

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TIMING CHARACTERISTICS—MAX6604ATA+

(V_{CC} = +2.7V to +3.6V, T_A = -20°C to +125°C, unless otherwise noted. Typical values are at V_{CC} = +3.3V, T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Serial-Clock Frequency	f_{SCL}		10		100	kHz
Bus Free Time Between STOP and START Condition	t_{BUF}		4.7			µs
Repeat START Condition Setup Time	$t_{SU:STA}$	90% of SMBCLK to 90% of SMBDATA	4.7			µs
START Condition Hold Time	$t_{HD:STA}$	10% of SMBDATA to 90% of SMBCLK	4			µs
STOP Condition Setup Time	$t_{SU:STO}$	90% of SMBCLK to 10% of SMBDATA	4			µs
Clock Low Period	t_{LOW}	10% of SMBCLK to 10% of SMBCLK	4.7			µs
Clock High Period	t_{HIGH}	90% of SMBCLK to 90% of SMBCLK	4			µs
Data Hold Time	$t_{HD:DAT}$		300			ns
Data Setup Time	$t_{SU:DAT}$	90% of SMBDATA to 10% of SMBCLK	250			ns
Receive SCL/SDA Rise Time	t_R				1000	ns
Receive SCL/SDA Fall Time	t_F				300	ns
Pulse Width of Spike Suppressed	t_{SP}		0		50	ns

TIMING CHARACTERISTICS—MAX6604AATA+, MAX6604AAHA+

(V_{CC} = +2.7V to +3.6V, T_A = -20°C to +125°C, unless otherwise noted. Typical values are at V_{CC} = +3.3V, T_A = +25°C.) (Note 1)
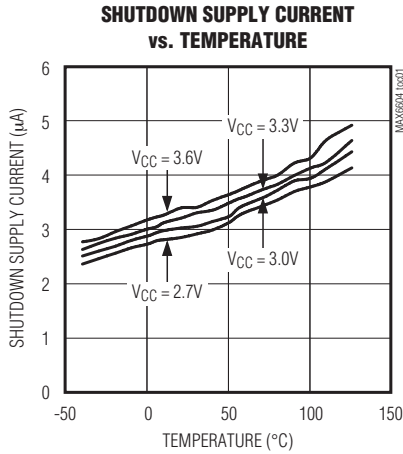
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
TIMING CHARACTERISTICS FOR FAST MODE						
Serial-Clock Frequency	f_{SCL}				400	kHz
Bus Free Time Between a STOP and a START Condition	t_{BUF}		1.3			µs
Hold Time for START Condition	$t_{HD:STA}$		0.6			µs
Low Period of the SCL Clock	t_{LOW}		1.3			µs
High Period of the SCL Clock	t_{HIGH}		0.6			µs
Setup Time for a Repeated START Condition	$t_{SU:STA}$		0.6			µs
Data Hold Time	$t_{HD:DAT}$		0		900	ns
Data Setup Time	$t_{SU:DAT}$		100			ns
Rise Time of Both SDA and SCL Signals, Receiving	t_R	Measured from $0.3V_{DD}$ - $0.7V_{DD}$	$20 + 0.1C_B$		300	ns
Fall Time of SDA Transmitting	t_F	Measured from $0.3V_{DD}$ - $0.7V_{DD}$	$20 + 0.1C_B$		300	ns
Setup Time for STOP Condition	$t_{SU:STO}$		0.6			µs
Capacitive Load for Each Bus Line	C_B				400	pF
Pulse Width of Spike Suppressed	t_{SP}				50	ns

Note 1: All parameters are tested at T_A = +25°C. Specifications over temperature are guaranteed by design.
Note 2: Guaranteed by design.

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(Typical values are at V_{CC} = +3.3V, T_A = +25℃.)

SHUTDOWN SUPPLY CURRENT
vs. TEMPERATURE

SUPPLY CURRENT
vs. TEMPERATURE

TEMPERATURE ERROR
vs. TEMPERATURE

TEMPERATURE ERROR
vs. POWER SUPPLY NOISE FREQUENCY
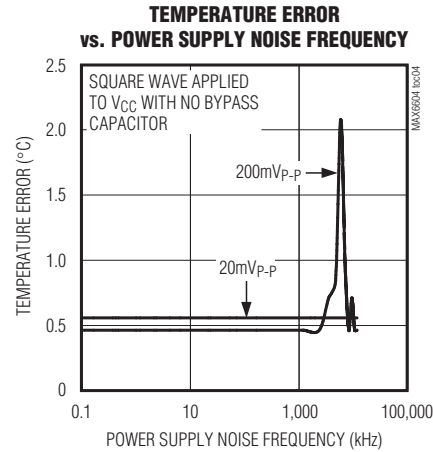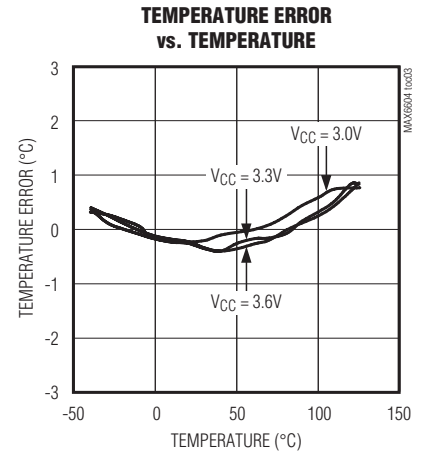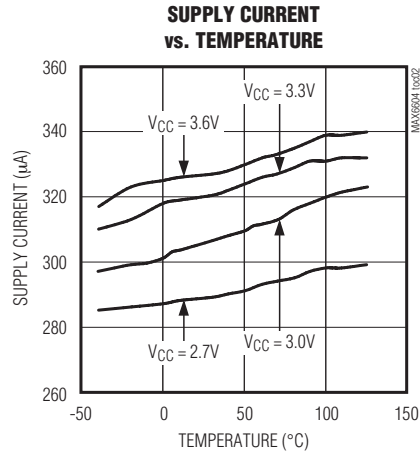
引脚	名称	功能
1	A0	地址输入，必须连接至GND或V_{CC}，用于设置地址。
2	A1	地址输入，必须连接至GND或V_{CC}，用于设置地址。
3	A2	地址输入，必须连接至GND或V_{CC}，用于设置地址。
4	GND	地。
5	SDA	串行数据输入/输出，开漏，需接上拉电阻。
6	SCL	串行时钟输入，需接上拉电阻。
7	EVENT	故障指示输出，开漏，需接上拉电阻。
8	V_{CC}	电源电压，通过0.1μF电容旁路至GND，并尽可能靠近器件安装。
—	EP	裸焊盘(TDFN封装)。内部连接至GND，将EP连接至大面积PCB地层。

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详细说明

MAX6604高精度温度传感器可连续监测温度，以每秒8次的速度更新温度数据。该器件作为从设备连接在SMBus/I2C兼容总线上。主机可以通过数字接口随时读取温度数据，同时MAX6604还带有漏极开路故障指示输出，用于监视温度门限。

串行接口

SMBus/I2C

MAX6604通过SMBus/I2C兼容接口读取或编程。该器件作为从设备连接在总线上。图1给出了SMBus/I2C兼容接口的时钟(SCL)和数据信号(SDA)时序图。

总线空闲时，SDA和SCL总线为逻辑高电平。没有使用推挽电路驱动总线时，应该在总线和电源之间接上拉电阻，仅当SCL总线为低电平时才能改变SDA总线的数据。SCL总线为高电平时，如果SDA状态发生改变则产生启动或停止条件(图1)。在SCL变为高电平之前的建立时间内($t_{SU:DAT}$)，SDA总线数据必须稳定。当SCL转换为高电平后，如果SDA数据在保持时间($t_{HD:DAT}$)内稳定，则数据被采样。注意数据以8位字节为一段进行传输。向MAX6604发送一个字节总共需要九个时钟周期。由于MAX6604使用16位寄存器，数据按照两个8位字节(16位)发送或接收。每成功传输一个字节，器件都会在字节传输的第九个时钟周期将SDA总线拉低(产生ACK)，产生应答信号。

从软件角度看，MAX6604可看成一组16位寄存器，包括温度数据、报警门限和控制位。可通过标准SMBus/I2C 2线串行接口读取温度数据、写入控制位和门限值。每个器件都响应各自的SMBus/I2C从地址，地址由A0、A1和A2设置。详细信息请参考*器件寻址*部分。

MAX6604采用标准I2C/SMBus协议和16位寄存器：以字为单位进行读写操作。写入一个数据字(16位)时，先发送MAX6604的I2C地址(0011-A2-A1-A0-0)，然后发送8位命令字节，接着是第一个8位数据字节。请注意每写入一个字节，从设备都会产生一个应答信号。写入第一个8位数据之后，MAX6604返回应答信号。然而，主机并未在写入第一个字节之后产生停止条件，而是在从设备产生应答后继续写入第二个数据字节。在写入第二个字节后，主机产生停止条件，见图2。要读取一个数据字时，主机需要发送一个新的启动条件并发送MAX6604 I2C地址和低电平R/W位(0011-A2-A1-A0-0)，然后发送8位命令字节。同样，MAX6604每收到一个字节都会产生应答信号ACK。然后，主机在从设备产生应答后再次发送器件地址和高电平R/W位(0011-A2-A1-A0-1)。接下来主机读取被选中寄存器的内容，从最高位开始并在成功接收高字节后产生应答。最后，主机读取低字节，并发送NACK以及停止条件，中止读周期。
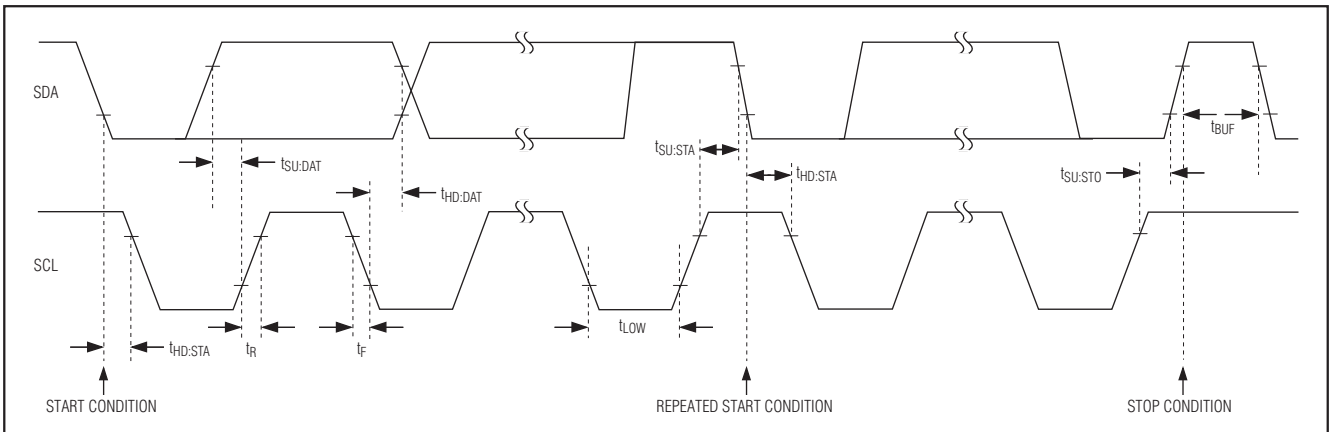

图1. SDA和SCL时序图

MAX6604

Write Word Format

S	ADDRESS	R/W	ACK	COMMAND	ACK	DATA	ACK	DATA	ACK	P
	7 bits			8 bits		8 bits (MSB)		8 bits (LSB)		

Slave Address: equivalent to chip-select line of a 3-wire interface

Command Byte: selects to which register you are writing

Data Byte: data goes into the register set by the command byte

Read Word Format

S	ADDRESS	R/W	ACK	COMMAND	ACK	S	ADDRESS	R	ACK	DATA	ACK	DATA	NA	P
	7 bits			8 bits			7 bits			8 bits (MSB)		8 bits (LSB)		

Slave Address: equivalent to chip-select line of a 3-wire interface

Command Byte: selects to which register you are writing

Slave Address: repeated due to change in data-flow direction

Data Bytes: reads from the register set by the command byte

S = Start condition   R/W = Read/Write   ACK = Acknowledge
P = Stop condition   Shaded = Slave transmission   NA = Not acknowledged
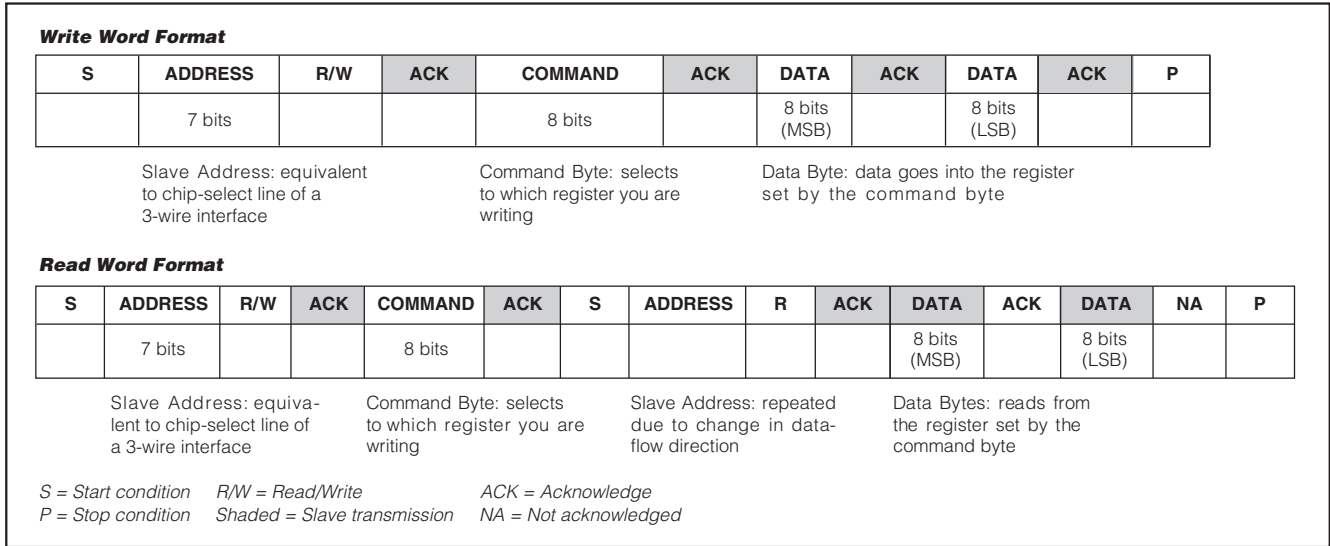
图2. SMBus/I²C协议

器件寻址

通过SMBus/I²C总线利用8位地址访问温度传感器。温度传感器地址为0011和随后的A2、A1、A0输入状态，地址输入端必须用硬件连接至GND或V_{CC}。三个地址输入设置温度传感器的总线地址，允许一条总线挂接最多8个器件。第8位(R/W)指示读或写操作，写操作时应将R/W位设置为低，读操作时应将R/W设置为高，器件地址请参考表1。

温度传感器

温度传感器连续监测温度并至少以每秒8次的速度更新温度数据，温度数据锁存在MAX6604内部，可随时由主机读取。

设置从机ID 0011-A2-A1-A0访问温度传感器。I²C地址选择输入(A2、A1、A0)允许同一条总线上最多挂接8个器件，从而支持8个内存模块，并给各模块提供一个从机地址插槽。

上电后，MAX6604的配置寄存器被置为缺省值。表2列出了温度寄存器及其缺省状态，注意，所有寄存器都是16位长度。

表1. MAX6604传感器地址

FUNCTION	ADDRESS							
Temperature sensor	0	0	1	1	A2	A1	A0	R/W

表2. MAX6604寄存器

ADDRESS	POR STATE	DESCRIPTION
00h	0017h	Capability register
01h	0000h	Configuration register
02h	0000h	Alarm-temperature upper-boundary trip register
03h	0000h	Alarm-temperature lower-boundary trip register
04h	0000h	Critical-temperature trip register
05h	0000h	Temperature register
06h	004Dh	Manufacturer's ID register
07h	5400h	Device ID/revision register
08h–0Eh	0000h	Vendor-defined registers (not used)

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EVENT输出功能

EVENT输出用于指示温度超出预定门限等状况，工作在以下三种模式的一种：中断模式、比较器模式和临界温度监测模式。图3给出了温度测量随时间变化的示例以及在各种模式下EVENT输出的相应动作，有关这两种模式的细节请参考EVENT工作模式部分。可通过配置寄存器选择EVENT模式。

事件输出的极性由配置寄存器(第1位)设置为高或低电平有效。也可以禁止EVENT输出(第3位)，使EVENT输出端总是高阻态。器件上电后，EVENT输出的缺省值为高阻态。将配置寄存器的第3位置1可使能EVENT输出。

EVENT门限

报警窗口

MAX6604提供具有温度上限和温度下限的窗检测比较器，分别通过报警温度上限寄存器和报警温度下限寄存器进行编程。使能后，一旦温度进入或超出报警窗口(上限或下限)，都将触发EVENT输出(图3)。

临界温度

临界温度值由临界温度寄存器设置，当温度达到寄存器的临界温度后(且EVENT输出使能)，EVENT产生报警输出，并一直保持到温度下降至临界温度以下。

EVENT工作模式

比较器模式

在比较器模式下，EVENT输出类似于窗比较器输出，当温度超出窗口范围时输出报警。在比较器模式下对MAX6604寄存器进行读/写操作不会影响EVENT输出。EVENT信号将继续保持报警状态，直到温度进入规定的门限以内，或对窗口门限值重新设置后使当前温度在报警窗口内。

中断模式

中断模式下，只要温度超出报警门限，EVENT就会产生报警输出。发生此类事件后，向配置寄存器的清除位写1可清除EVENT输出，直到发生下一次中断。临界温度寄
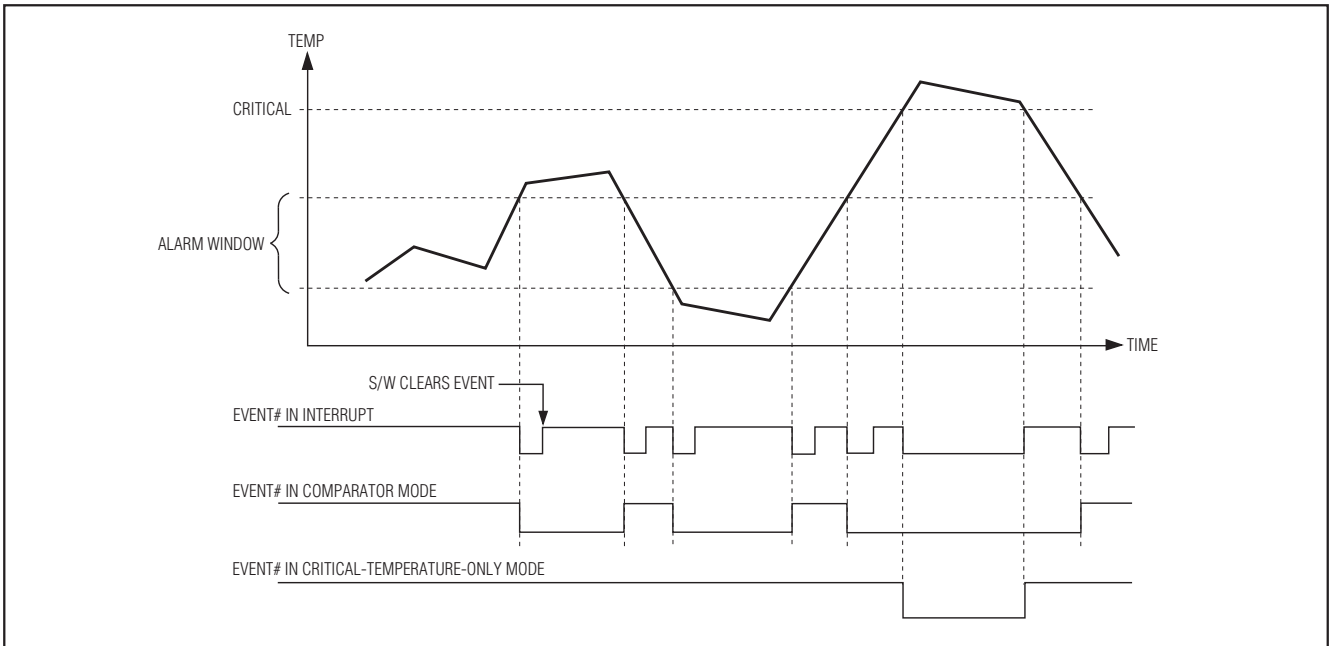

图3. 中断、比较器和临界温度模式下的EVENT输出

精密的温度监视器，
用于DDR存储器模块

存器的门限可能高于报警温度上限寄存器的值。这样，当温度高于临界温度时，势必也高于报警上限值。中断模式下，当温度超过报警上限时，EVENT将产生报警输出。

如果EVENT输出被清零，而温度持续上升并超过临界温度，则EVENT将再次产生报警输出。因为温度超过临界温度，事件清除命令无法清除EVENT输出。一旦温度降低到临界温度以下，EVENT将立即解除报警。

如果温度超过临界温度之前EVENT输出未被清零，EVENT将保持报警输出。此时事件清除命令无效，当温度降至临界温度以下时，在先前的事件清除命令作用下，将立即清除EVENT报警输出。如果没有事件清除命令，温度降到临界温度以下后EVENT仍然有效。此时，事件清除命令可清除EVENT报警状态。

寄存器详细说明

性能寄存器(只读)
[地址 = 00h, POR = 0017h]

该寄存器反映温度传感器的性能，包括精度、温度范围和分辨率，寄存器详细信息请参考表3。

配置寄存器(读/写)
[地址 = 01h, POR = 0000h]

该寄存器控制EVENT功能的各个特性以及温度传感器的关断模式位，寄存器详细信息请参考表4。

滞回

滞回功能使能时，用于设置温度触发门限的一个变量。例如：滞回设为3°C时，我们来考虑一下窗口报警位(温度寄存器的第14位)的动作：温度升高时，一旦温度寄存器值大于温度报警上限寄存器的值，第14位置1(温度超过报警窗口)；如果温度下降，则第14位将一直保持置位状态，直到被测温度低于或等于报警温度上限寄存器值减去3°C后才清零。

表3. 性能寄存器(只读)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	RFU	RFU	RFU	RFU	RFU	RFU	RFU	RFU	RFU	RFU	TRES1	TRES0	Wider range	Higher precision	Has alarm and critical trips

BIT	DEFINITION (DESCRIPTIONS IN BOLD TYPE APPLY TO THE MAX6604)
0	**Basic capability** **1: Has alarm and critical trips capability**
1	**Accuracy** 0 = Default accuracy ±2°C over the active and ±3°C monitor ranges **1 = High accuracy ±1°C over the active and ±2°C monitor ranges**
2	**Wider range** 0 = Values lower than 0°C are clamped and represented as binary value 0 **1 = Can read temperature below 0°C and set sign bit accordingly**
4:3	**Temperature resolution** 00 = 0.5°C LSB 01 = 0.25°C LSB **10 = 0.125°C LSB** 11 = 0.0625°C LSB
15:5	0: Reserved for future use (RFU). Must be zero.

/N/IXI/N

表4. 配置寄存器(读/写)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	RFU	RFU	RFU	RFU	Hysteresis		Shutdown mode	Critical trip lock bit	Alarm window lock bit	Clear EVENT	EVENT output status	EVENT output control	Critical EVENT only	EVENT polarity	EVENT mode

BIT	DEFINITION (DESCRIPTIONS IN BOLD TYPE ARE THE DEFAULT VALUES)
0	**EVENT mode** **0 = Comparator output mode (default)** 1 = Interrupt mode When either of the lock bits is set, this bit cannot be altered until unlocked.
1	**EVENT polarity** **0 = Active low (default)** 1 = Active high When either of the lock bits is set, this bit cannot be altered until unlocked.
2	**Critical EVENT only** **0 = EVENT output on alarm or critical temperature mode (default)** 1 = EVENT only if temperature is above the value in the critical temp register When the alarm window lock bit is set, this bit cannot be altered until unlocked.
3	**EVENT output control** **0 = EVENT output disabled (default) [Disabled means EVENT remains in an inactive voltage level]** 1 = EVENT output enabled When either of the lock bits is set, this bit cannot be altered until unlocked.
4	**EVENT output status (read only)** **0 = EVENT output condition is not being asserted by this device** 1 = EVENT output is being asserted by this device due to alarm window or critical trip condition The actual conditions causing an EVENT output can be determined from the temperature register. Interrupt mode can be cleared by writing to the clear EVENT bit. Writing to this bit has no effect; this bit is not affected by the polarity setting.
5	**Clear EVENT (write only)** **0 = No effect** 1 = Clears active event in interrupt mode. Writing to this register has no effect in comparator mode When read, this bit always returns to zero.
6	**Alarm window lock bit** **0 = Alarm trips are not locked and can be altered (default)** 1 = Alarm trip register settings cannot be altered This bit is initially cleared. When set, this bit returns a 1 and remains locked until cleared by the internal power-on reset. Lock bits and other configuration register bits are updated during the same write; double writes are not necessary.
7	**Critical trip lock bit** **0 = Critical trip is not locked and can be altered (default)** 1 = Critical trip register settings cannot be altered This bit is initially cleared. When set, this bit returns a 1 and remains locked until cleared by the internal power-on reset. Lock bits and other configuration register bits are updated during the same write; double writes are not necessary.

MAX6604

表4. 配置寄存器(读/写) (续)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	RFU	RFU	RFU	RFU	Hysteresis		Shutdown mode	Critical trip lock bit	Alarm window lock bit	Clear EVENT	EVENT output status	EVENT output control	Critical EVENT only	EVENT polarity	EVENT mode

BIT	DEFINITION (DESCRIPTIONS IN BOLD TYPE ARE THE DEFAULT VALUES)
8	**Shutdown mode** **0 = Enable temperature monitoring (default)** 1 = Shutdown temperature monitoring When shutdown occurs, the thermal-sensing device and analog-to-digital converter are disabled to save power; no EVENT output signals are generated. When either of the lock bits is set, this bit cannot be set until unlocked. However, it can be cleared at any time.
10:9	**Hysteresis enable** **00 = Disable hysteresis** 01 = Enable hysteresis at 1.5°C 10 = Enable hysteresis at 3°C 11 = Enable hysteresis at 6°C
15:11	0: Reserved for future use (RFU). Must be zero.

同样，当温度寄存器值大于等于报警温度下限寄存器值时，窗口报警下限位(温度寄存器第13位)被设置为0 (温度等于或高于窗口报警下限温度)。随着温度降低，当温度寄存器值等于或小于报警温度下限寄存器值减去3°C时，第13位置1。

请注意滞回效应同样作用于EVENT输出，任一锁定位置位后，将不能改变滞回位的值。滞回同时也作用于报警窗口比较和临界温度比较。

报警温度上限寄存器(读/写)
[地址 = 02h, POR = 0000h]

温度上限值的数据格式为2的补码，1 LSB = 0.25°C。报警温度上限寄存器的范围为-256.00°C至+255.75°C，所有没有使用的位都应置零。

表5. 报警温度上限寄存器(读/写)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	Sign MSB	128°C	64°C	32°C	16°C	8°C	4°C	2°C	1°C	0.5°C	0.25°C	0	0

МАХ1М

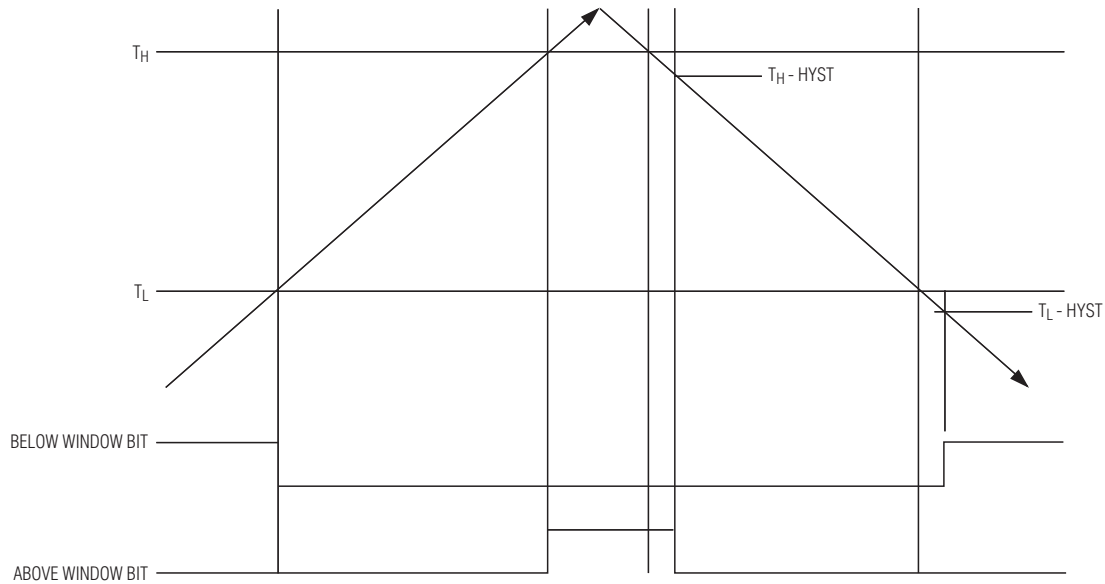| FUNCTION	BELOW ALARM WINDOW BIT		ABOVE ALARM WINDOW BIT	
	Temperature slope	Threshold temperature	Temperature slope	Threshold temperature
Sets	Falling	T_L - Hyst	Rising	T_H
Clears	Rising	T_L	Falling	T_H - Hyst

图4. 温度比较滞回

报警温度下限寄存器(读/写)
[地址 = 03h, POR = 0000h]

温度下限值的数据格式为2的补码，1 LSB = 0.25℃。报警温度下限寄存器的范围为-256.00℃至+255.75℃，所有没有使用的位都应置零。

表6. 报警温度下限寄存器(读/写)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	Sign MSB	128℃	64℃	32℃	16℃	8℃	4℃	2℃	1℃	0.5℃	0.25℃	0	0

精密的温度监视器，
用于DDR存储器模块

临界温度寄存器(读/写)
[地址 = 04h, POR = 0000h]

临界温度值的数据格式为2的补码，1 LSB = 0.25°C。临界

温度寄存器的范围为-256.00°C至+255.75°C，所有没有使用的位都应置零。

表7. 临界温度寄存器(读/写)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	Sign MSB	128°C	64°C	32°C	16°C	8°C	4°C	2°C	1°C	0.5°C	0.25°C	0	0

温度寄存器(只读)
[地址 = 05h, POR = 0000h]

温度值的格式为2的补码，1 LSB = 0.125°C，所有没有使用的位都应置零。最高有效位对应分辨率为128°C。转换状

态位反映内部温度转换的状态，不受EVENT或配置位的影响(比如事件输出控制、清零事件等)。如果上限报警窗口位(第14位)和下限报警窗口位(第13位)都未触发(即都为0)，则当前温度在报警窗口内。

表8. 温度寄存器(只读)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Above critical trip	Above alarm window	Below alarm window	Sign MSB	128°C	64°C	32°C	16°C	8°C	4°C	2°C	1°C	0.5°C	0.25°C	0.125°C	0

| BIT	DEFINITION
13	**Below alarm window** 0 = Temperature is equal to or above the alarm window lower boundary temperature 1 = Temperature is below the alarm window (temperature < alarm temperature lower boundary minus the hysteresis)
14	**Above alarm window** 0 = Temperature is equal to or below the alarm window upper boundary temperature minus the hysteresis 1 = Temperature is above the alarm window (temperature > alarm temperature upper boundary)
15	**Above critical trip** 0 = Temperature is below the critical temperature setting minus the hysteresis 1 = Temperature is equal to or above the critical temperature setting (temperature ≥ critical temperature)

表9. 制造商ID寄存器(只读) [地址 = 06h, POR = 004Dh]

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1

表10. 器件ID和版本寄存器(只读) [地址 = 07h, POR = 5400h]

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Device ID (0101-0100)								Device revision (0000-0000)							

典型应用电路
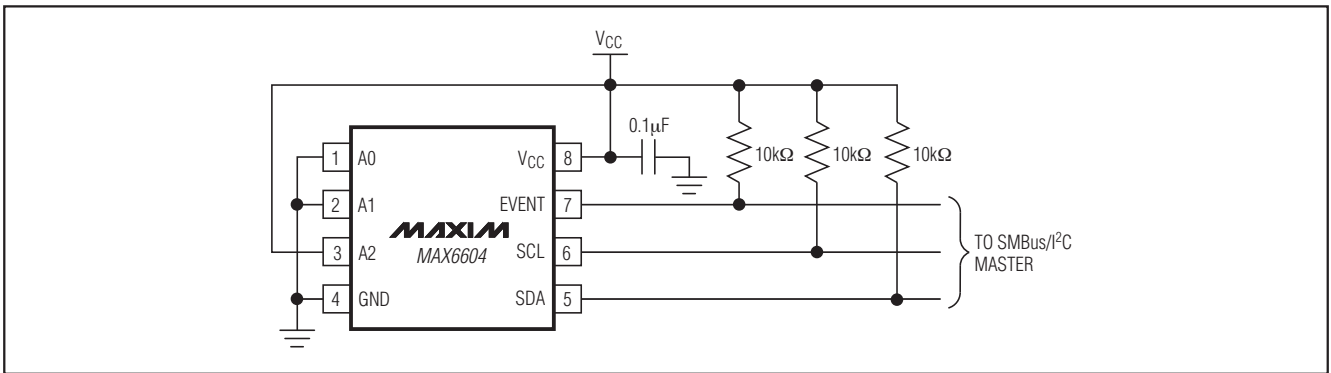
精密的温度监视器，
用于DDR存储器模块

芯片信息

PROCESS: BiCMOS

封装信息

如需最近的封装外形信息和焊盘布局，请查询 **china.maxim-ic.com/packages**。请注意，封装编码中的"+"、"#"或"-"仅表示RoHS状态。封装图中可能包含不同的尾缀字符，但封装图只与封装有关，与RoHS状态无关。

封装类型	封装编码	外形编号	焊盘布局编号
8 TDFN-EP	T823+1	**21-0174**	**90-0091**
8 TSSOP	H8+1	**21-0175**	**90-0248**

MAXIM

_____ **修订历史**

修订号	修订日期	说明	修改页
0	10/05	最初版本。	—
1	8/09	增加了串口时钟频率为400kHz的器件。	1-4 14, 15
2	10/10	在 *Absolute Maximum Ratings* 部分中增加了焊接温度信息；将表2和表10中寄存器07h的POR状态由3E00h更正为5400h，并将表10中的器件ID由0011-1110更正为0101-0100；在封装信息表中增加了焊盘布局编号。	2, 6, 13, 14

Maxim北京办事处