

12-Bit Plus Sign Temperature Sensors with SMBus/I2C-Compatible Serial Interface

General Description

The MAX6633/MAX6634/MAX6635 combine a temperature sensor, a programmable overtemperature alarm, and an SMBus[™]/I²C[™]-compatible serial interface into a single package. They convert their die temperatures into digital values using internal analog-to-digital converters (ADCs). The result of the conversion is then held in a temperature register as a 12-bit + sign value, allowing 0.0625°C resolution, readable at any time through the serial interface. The devices are capable of reading temperatures up to +150°C.

The MAX6633/MAX6634/MAX6635 feature a shutdown mode that saves power by turning off everything except the power-on reset (POR) and the serial interface. The devices can be configured to separate addresses, allowing multiple devices to be used on the same bus.

The MAX6633 has four address pins, allowing up to 16 devices to be connected to a single bus. The MAX6634 has three address pins, allowing up to eight devices to be connected to a single bus. The MAX6635 has two address pins, allowing up to four devices to be connected to a single bus.

The MAX6633/MAX6634/MAX6635 make temperature data available for transfer over the serial interface. The MAX6634 incorporates a dual-mode ALERT output (open drain) and can serve as an upgraded alternative to the LM75. The MAX6635 includes an ALERT output and an OVERT output (both open drain) and can function as an upgraded replacement for the LM76 in most applications. The MAX6634/MAX6635 feature user-programmable temperature thresholds. All three devices come in an 8-pin SO package.

Applications

Battery Temperature Alarms PC Temperature Control Automotive Equipment

Pin Configurations appear at end of data sheet.

SMBus is a trademark of Intel Corp. I²C is a trademark of Philips Corp.

Features

- ♦ +3V to +5.5V Supply Range
- **♦** Accuracy

±1°C max (0°C to +50°C)

±1.5°C max (-20°C to +85°C)

±2.5°C max (-40°C to +125°C)

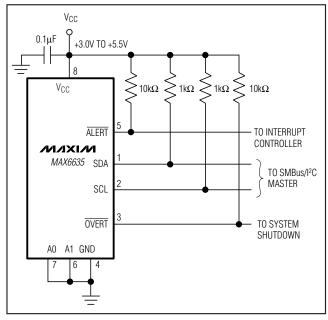
±2.5°C typ (+150°C)

- **♦** User-Programmable Temperature Thresholds (MAX6634/MAX6635)
- ◆ User-Configurable Alarm Output(s) (MAX6634/MAX6635)
- ♦ Ability to Respond to SMBus/I²C-Compatible Alert Response Address (MAX6634/MAX6635)
- ♦ OVERT Output for System Shutdown (MAX6635)
- ♦ Multiple Devices per Bus
 - **16 devices (MAX6633)**
 - 8 devices (MAX6634)
 - 4 devices (MAX6635)

Ordering Information

| PART | TEMP. RANGE | PIN-PACKAGE |
|------------|-----------------|-------------|
| MAX6633MSA | -55°C to +150°C | 8 SO |
| MAX6634MSA | -55°C to +150°C | 8 SO |
| MAX6635MSA | -55°C to +150°C | 8 SO |

Typical Operating Circuit



ABSOLUTE MAXIMUM RATINGS

| V _{CC} , SDA, SCL0.3V to +6.0V | Junction Temperature+150°C |
|---|---|
| All Other Pins0.3V to V _{CC} +0.3V | Operating Temperature Range55°C to +150°C |
| SDA, ALERT, OVERT Current1mA to +50mA | Storage Temperature Range65°C to +150°C |
| ESD Protection (Human Body Model)2000V | Lead Temperature (soldering, 10s)+300°C |
| Continuous Power Dissipation (T _A = +70°C) | |
| 8-Pin SO (derate 5.88mW/°C above +70°C)471mW | |

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

 $(V_{CC} = +3.0 \text{V to } +5.5 \text{V}, T_A = -55 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}, \text{ unless otherwise noted.}$ Typical values are $V_{CC} = +3.3 \text{V}, T_A = +25 ^{\circ}\text{C}, \text{ unless otherwise noted.})$

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------------------|---------------------|---|------|------|------|-------|
| TEMPERATURE-TO-DIGITAL CO | NVERTER | CHARACTERISTICS | | | | |
| Supply Range | Vcc | | 3.0 | | 5.5 | V |
| | | $0^{\circ}\text{C} \le \text{T}_{A} = \le +50^{\circ}\text{C}, \text{ V}_{CC} = +3.3\text{V}$ | -1.0 | ±0.4 | +1.0 | |
| | | $-20^{\circ}\text{C} \le \text{T}_{\text{A}} = \le +85^{\circ}\text{C}, \text{ V}_{\text{CC}} = +3.3\text{V}$ | -1.5 | ±0.6 | +1.5 | |
| Accuracy (Note 1) | | $-40^{\circ}\text{C} \le \text{T}_{A} = \le 125^{\circ}\text{C}, \text{ V}_{CC} = +3.3\text{V}$ | -2.5 | ±1.0 | +2.5 | °C |
| | | T _A = -55°C, V _{CC} = +3.3V | | ±1.5 | +2.8 | |
| | | $T_A = +150$ °C, $V_{CC} = +3.3V$ | | ±2.5 | | |
| Power-Supply Rejection Ratio | PSRR | | | 0.2 | 0.5 | °C/V |
| POR Threshold Hysteresis | | | | 90 | | mV |
| Supply Current in Shutdown | | V _{CC} = +3.0V, SMBus inactive | | 12 | 20 | |
| Supply Current in Shutdown | | V _{CC} = +5.5V, SMBus inactive | | 20 | 30 | μΑ |
| Average Operating Current | | V _{CC} = +3.0V, SMBus inactive | | 150 | | μΑ |
| 7.vorage operating current | | V _{CC} = +5.5V, SMBus inactive | | 200 | | μπ |
| Peak Operating Current (Note 2) | | V _{CC} = +3.0V, SMBus inactive | | 270 | 350 | μA |
| Teak Operating Current (Note 2) | | V _{CC} = +5.5V, SMBus inactive | | 350 | 700 | μΛ |
| Conversion Rate | | | 1.4 | 2 | 2.4 | Hz |
| DIGITAL INTERFACE | | | | | | |
| Logic Input Low Voltage | VIL | $V_{CC} = +3.0V \text{ to } +5.5V$ | | | 0.65 | V |
| Logic Input High | \/ | $V_{CC} = +3V$ | 2.2 | | | V |
| Voltage | V _{IH} | $V_{CC} = +5.5V$ | 2.4 | | | |
| Input Leakage Current | I _L LEAK | V _{IN} = GND or V _{CC} | | | ±1 | μΑ |
| Output Low Sink Current | loL | V _{OL} = 0.6V (SMBDATA, ALERT, OVERT) | 6 | | | mA |
| Output Leakage Current | IO_LEAK | ALERT, OVERT at V _{CC} | | | ±1 | μΑ |
| Input Capacitance | C _{IN} | | | 5 | | рF |

_ /N/1X1/W

ELECTRICAL CHARACTERISTICS (continued)

 $(V_{CC} = +3.0V \text{ to } +5.5V, T_A = -55^{\circ}\text{C to } +125^{\circ}\text{C}, \text{ unless otherwise noted.}$ Typical values are $V_{CC} = +3.3V, T_A = +25^{\circ}\text{C}, \text{ unless otherwise noted.})$

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|----------------|---------------------------------|-----|-----|-----|-------|
| SMBus TIMING (Note 3, Figures | 1, 2, and 3) | | | | | |
| Serial Clock Frequency | fscl | | 10 | | 100 | kHz |
| Bus Free Time Between STOP and START Condition | tBUF | | 4.7 | | | μs |
| START Condition Setup Time | | | 4.7 | | | μs |
| Repeat START Condition Setup Time | tsu:sta | 90% to 90% | 4.7 | | | μs |
| START Condition Hold Time | thd:STA | 10% of SMBDATA to 90% of SMBCLK | 4 | | | μs |
| STOP Condition Setup Time | tsu:sto | 90% of SMBCLK to 10% of SMBDATA | 4 | | | μs |
| Data Setup Time | tsu: DAT | 90% of SMBDATA to 10% of SMBCLK | 250 | | | ns |
| Data Hold Time (Note 4) | thd: dat | | 300 | | | ns |
| Receive SCL/SDA Rise Time | t _R | | | | 1 | μs |
| SCL/SDA Fall Time (Note 4) | tF | | | | 300 | ns |
| Clock Low Period | tLOW | 10% to 10% | 4.7 | | | μs |
| Clock High Period | thigh | 90% to 90% | 4 | | | μs |
| SMBus Timeout | | | 25 | | 48 | ms |

Note 1: Guaranteed by design and characterization.

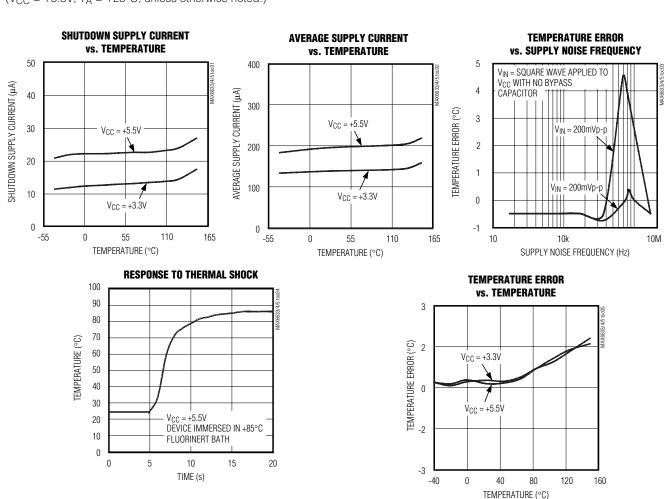
Note 2: Peak operating current measured during conversion. See Figure 4.

Note 3: Guaranteed by design, not production tested.

Note 4: A master device must provide a hold time of at least 300ns for the SDA signal in order to bridge the undefined region of SCL's falling edge.

Typical Operating Characteristics

 $(V_{CC} = +3.3V, T_A = +25^{\circ}C, \text{ unless otherwise noted.})$



Pin Description

| | PIN | | NAME | FUNCTION |
|---------|---------|---------|-------|---|
| MAX6633 | MAX6634 | MAX6635 | NAME | FUNCTION |
| 1 | 1 | 1 | SDA | Serial Data Input/Output. Open drain. |
| 2 | 2 | 2 | SCL | Serial Clock Input |
| 3 | _ | _ | A3 | Address Pin |
| 4 | 4 | 4 | GND | Ground |
| 5 | 5 | | A2 | Address Pin |
| 6 | 6 | 6 | A1 | Address Pin |
| 7 | 7 | 7 | A0 | Address Pin |
| 8 | 8 | 8 | Vcc | Supply Voltage Input. +3.0V to +5.5V. Bypass V _{CC} to GND with a 0.1µF capacitor. |
| _ | 3 | 5 | ALERT | ALERT Output. Open drain. |
| _ | | 3 | OVERT | OVERT Output. Open drain. |

Detailed Description

The MAX6633/MAX6634/MAX6635 continuously convert their die temperatures into digital values using their integrated ADCs. The resulting data is readable at any time through the SMBus/I²C-compatible serial interface. The device functions as a slave on the SMBus interface, supporting Write Byte, Write Word, Read Byte, and Read Word commands. Separate addresses can be configured using the individual address pins. Figures 5, 6, and 7 show the functional diagrams of the MAX6633/MAX6634/MAX6635, respectively.

SMBus/I²C-Compatible Operation

The MAX6633/MAX6634/MAX6635 are readable and programmable through their SMBus/I²C-compatible serial interface. Figures 1, 2, and 3 show the timing details of the clock (SCL) and data (SDA) signals. The devices function as slaves on the SMBus and support Write Byte, Write Word, Read Byte, and Read Word commands. Figure 8 is the MAX6633/MAX6634/MAX6635 programmer's model.

Addressing

Separate addresses can be configured using the individual address pins. The address of each device is selected by connecting the address (A_) pins to one of two potentials: GND or V_{CC}. The MAX6635 makes two address pins available (A0, A1), allowing up to four devices to be connected to a single bus line. The MAX6634 makes three address pins available (A0, A1, A2), allowing up to eight devices to be connected to a single bus line. The MAX6633 makes four address pins available (A0, A1, A2, A3), allowing as many as 16

devices to be connected to a single bus line. Table 1 shows the full SMBus/I²C address for each device type.

Control Registers (MAX6633)

Three registers control the operation of the MAX6633 (Figure 5 and Tables 2 through 6). The Pointer register is the first addressed and determines which of the other two registers is acted upon. The other two are the Temperature and Configuration registers. The temperature value is stored as 12 bits plus a sign bit, read only, and contains the latest temperature data. The true register length is 16 bits, with the lower 3 unused in this part. The digital temperature data contained in the temperature register is in °C, using a two's-complement format with 1LSB corresponding to 0.0625°C.

The Configuration register is 8 bits, read/write, and contains the SMBus timeout disable bit, fault queue enable bit, and the shutdown bit.

Control Registers (MAX6634)

Six registers control the operation of the MAX6634 (Figure 6 and Tables 2 through 7). The pointer register is the first addressed and determines which of the other five registers is acted upon. The other five are the Temperature, Configuration, High-Temperature (THIGH), Low-Temperature (TLOW), and Hysteresis (THYST) registers. The temperature value is stored as 12 bits plus a sign bit, read only, and contains the latest temperature data. The true register length is 16 bits, with the lowest 2 used as status bits, and the third bit (D2) is unused. The digital temperature data contained in the temperature register is in °C, using a two's-complement format with 1LSB corresponding to 0.0625°C.

| Write B | yte Format | | | | | | | |
|---------|---|--|-----|-------------------------------------|-----|------------------------------|-----|-----------------------|
| S | ADDRESS WR A | | ACK | COMMAND | ACK | DATA | ACK | Р |
| | 7 bits | | | 8 bits | | 8 bits | | |
| | Slave Address equivalent to chip-select wire interface | | | Command Byte: register you are v | | Data Byte: data command byte | O . | e register set by the |

Write Word Format

| S | ADDRESS | WR | ACK | COMMAND | ACK | DATA | ACK | DATA | ACK | Р |
|---|---|-------------|-----|--|-----|----------------------------------|-----|-----------------------|-----|---|
| | 7 bits | | | 8 bits | | | | 8 bits (LSB) | | |
| | Slave Address equivalent to d line of a 3-wire interfact | chip-select | | Command Byt selects registe are writing to | | Data Byte register se byte | _ | es into the ommand | | |

Read Byte Format

| S | ADDRESS | WR | ACK | COMMAND | ACK | s | ADDRESS | RD | ACK | DATA | /// | Р |
|---|---|----|-------|--|--------|---|------------------------------|----|-----|---|-----|---|
| | 7 bits | | | 8 bits | | | 7 bits | | | 8 bits | | |
| | 7 bits Slave Address: equivalent to chip-select line | | alent | Command Byte selects register are reading from | er you | | Slave Addres change in da | • | | Data Byte: re register set b byte | | |

Read Word Format

| S | ADDRESS | WR | ACK | COMMAND | ACK | S | ADDRESS | RD | ACK | DATA | ACK | DATA | /// | Р |
|---|------------------------------------|----|--------|-----------------|--------------|---------|--------------|----------|-----------|----------|-----------|------------|-----|---|
| | 7 bits | | | 8 bits | | | 7 bits | | | 8 bits | | 8 bits | | |
| | | | | | | | | | | (MSB) | | (LSB) | | |
| | Slave Address: | | | Command Byt | te: | | Slave Addres | s: repe | ated | Data By | tes: read | s from the | | |
| | equivalent to chip- selects regist | | er you | | due to chang | e in da | ta-flow | register | set by th | e commar | nd | | | |
| | select line | | | are reading fro | om | | direction | | | byte | | | | |

S = Start condition Shaded = Slave transmission
P = Stop condition /// = Not acknowledged

Figure 1. SMBus Protocols

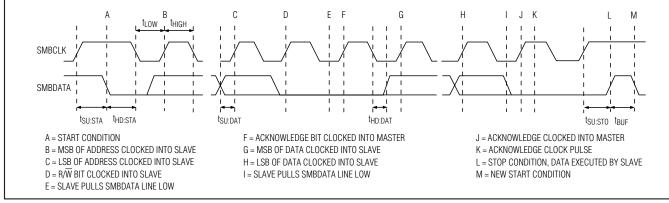


Figure 2. SMBus Write Timing Diagram

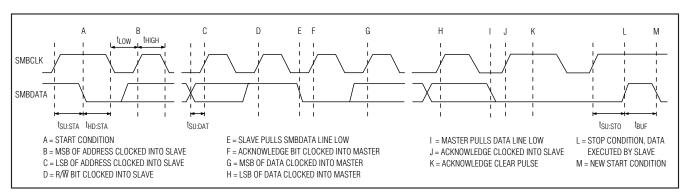


Figure 3. SMBus Read Timing Diagram

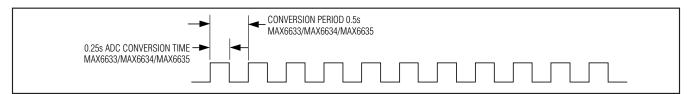


Figure 4. ADC Conversion Timing Diagram

The Configuration register is 8 bits, read/write, and contains the SMBus timeout disable bit, fault queue enable bit, the temperature alarm output polarity select bits, the interrupt mode select bit, and the shutdown bit. Registers THIGH and TLOW are 16 bits, read/write, and contain the values that trigger ALERT. Register THYST is 16 bits, read/write, and contains the values by which the temperature must rise or fall beyond THIGH or TLOW, before ALERT deasserts.

Control Registers (MAX6635)

Seven registers control the operation of the MAX6635 (Figure 7 and Tables 2 through 7). The Pointer register is the first addressed and determines which of the other six registers is acted upon. The other six are the Temperature, Configuration, High-Temperature (T_{HIGH}), Low-Temperature (T_{LOW}), Maximum Temperature (T_{MAX}), and Hysteresis (T_{HYST}) registers. The temperature value is stored as 12 bits plus a sign bit, read only, and contains the latest temperature data. The true register length is 16 bits, with the lower three used as status bits. The digital temperature data contained in the temperature register is in °C, using a two's-complement format with 1LSB corresponding to 0.0625°C.

The Configuration register is 8 bits, read/write, and contains the SMBus timeout disable bit, fault queue enable bit, the temperature alarm output polarity select bits, the interrupt mode select bit, and the shutdown

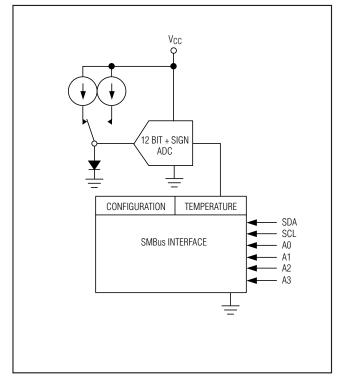


Figure 5. MAX6633 Functional Diagram

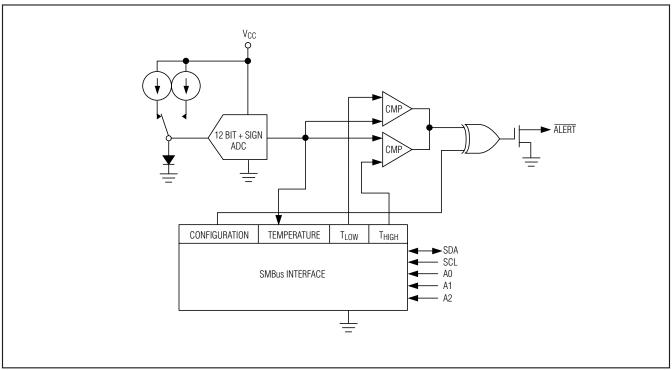


Figure 6. MAX6634 Functional Diagram

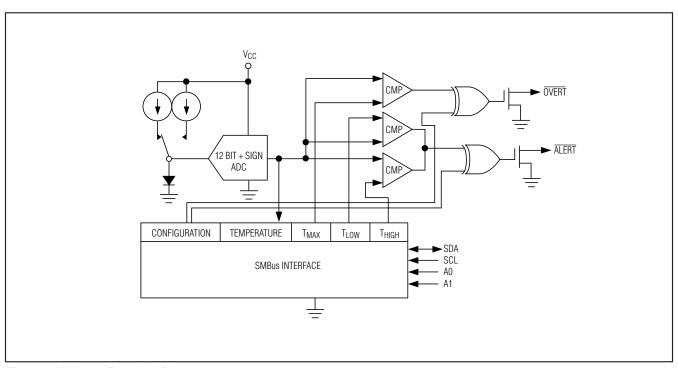


Figure 7. MAX6635 Functional Diagram

3 ______*NIXIM*

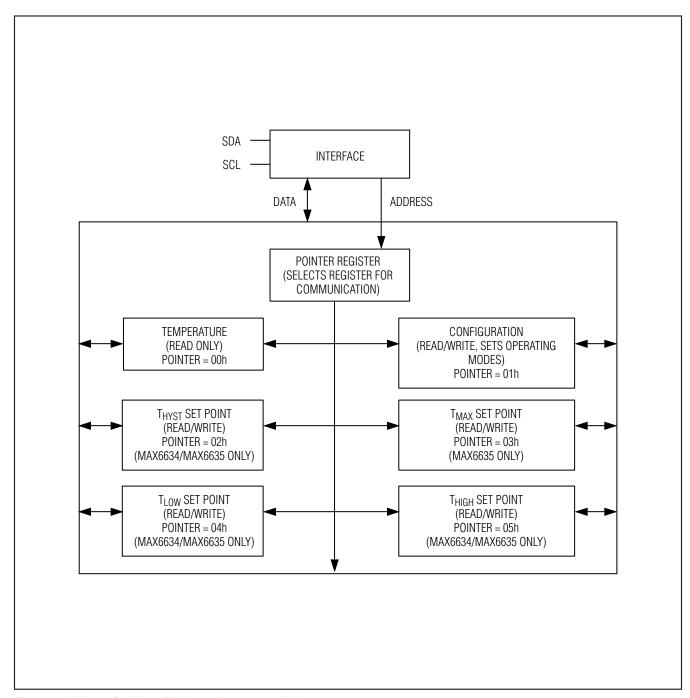


Figure 8. MAX6633/MAX6634/MAX6635 Programmer's Model

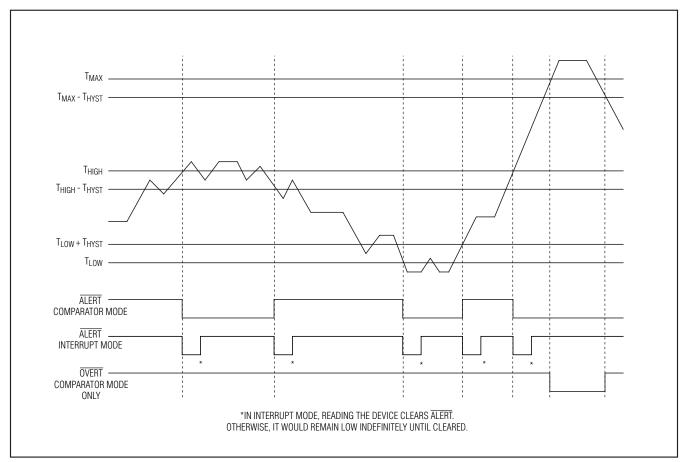


Figure 9. Alarm Output and Reset Diagram

bit. Registers T_{HIGH} and T_{LOW} are 16 bits, read/write, and contain values that trigger ALERT and OVERT. Register T_{HYST} is 16 bits, read/write, and contains the values by which the temperature must rise or fall beyond T_{HIGH}, T_{LOW}, or T_{MAX}, before ALERT or OVERT deassert.

Temperature Conversion

An on-chip bandgap reference produces a signal proportional to absolute temperature (PTAT), as well as the temperature-stable reference voltage necessary for the analog-to-digital conversion. The PTAT signal is digitized by the on-board ADC to a resolution of 0.0625°C. The resulting digital value is placed in the Temperature register. The temperature conversion runs continuously and asynchronously from the serial interface at a rate of 500ms per conversion. When the Temperature register is read, the conversion in progress is aborted. The bus transaction is completed by a stop condition.

Fault Queue (MAX6634/MAX6635)

A programmable fault queue on the MAX6634/ MAX6635 eliminates spurious alarm activity in noisy environments. The queue sets the number of consecutive out-of-tolerance temperature readings that must occur before the ALERT or OVERT alarm outputs are toggled. An out-of-tolerance reading is above THIGH or TMAX or below TLOW. The fault queue depth defaults to 1 at power-up and may be programmed—through the Configuration register—to four consecutive conversions. Any time the conversion result is in tolerance, and the particular alarm output is not asserted, the queue is cleared, even if it contains some out-of-tolerance counts. Additionally, the fault queue automatically clears at power-up and in shutdown. Whenever the fault queue is cleared, the alarm outputs are deasserted. Figure 9 is the alarm output and reset diagram.

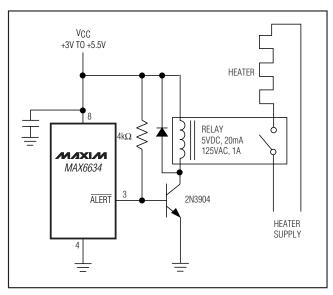


Figure 10. Simple Thermostat

Temperature Alert (MAX6634/MAX6635)

ALERT has programmable polarity and two modes: comparator and interrupt. Polarity and mode are selected through the Configuration register (Table 4). The ALERT output is open drain.

Interrupt Mode

With ALERT in interrupt mode, the MAX6634/MAX6635 look for a Thigh or a TLOW fault. The ALERT pin asserts an alarm for an undertemperature fault, as well as for an overtemperature fault. Once either fault has occurred, it remains active until deasserted by a read of any register. The device then begins to look for a temperature change crossing the hysteresis level. The activation of ALERT is subject to the depth of the fault queue.

For example: If THIGH is set to 100°C, THYST is set to 20°C, and the fault queue depth is set to 4, ALERT does not assert until four consecutive conversions exceed 100°C. If the temperature is then read through the I²C-compatible interface, ALERT deasserts. ALERT asserts again when four consecutive conversions are less than 80°C.

Comparator Mode

In comparator mode, $\overline{\text{ALERT}}$ is asserted when the number of consecutive conversions exceeding the value in the T_{HIGH} register, or lower than the value in the T_{LOW} register, is equal to the depth of the fault queue. $\overline{\text{ALERT}}$ deasserts when the number of consecutive conversions

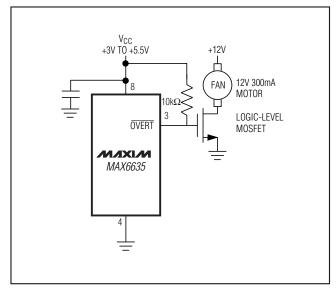


Figure 11. Fan Controller

less than T_{HIGH} - T_{HYST} or greater than T_{LOW} + T_{HYST} is equal to the depth of the fault queue.

For example: If Thigh is set to 100°C, TLOW is set to 80°C, and the fault queue depth is set to four, ALERT does not assert until four consecutive conversions exceed 100°C, or are below 80°C. ALERT only deasserts if four consecutive conversions are less than Thigh - Thyst or greater than TLOW + Thyst.

Comparator mode allows autonomous clearing of an ALERT fault without the intervention of a master and is ideal to use for driving a thermostat (Figure 10).

Overtemperature Alarm (MAX6635)

The MAX6635 also includes an overtemperature output that is always in comparator mode. Whenever the temperature exceeds a value in the programmable TMAX register, OVERT is asserted. OVERT only deasserts after the temperature drops below TMAX - THYST. When the fault queue is activated, OVERT is subject to that queue, which sets the number of faults that must occur before OVERT asserts or deasserts. This helps prevent spurious alarms in noisy environments.

Comparator mode also allows autonomous clearing of an OVERT fault without the intervention of a master and thus is ideal to use for driving a cooling fan (Figure 11). In this application, the polarity of OVERT is active high.

Shutdown

The MAX6633/MAX6634/MAX6635 feature a shutdown mode, accessible through the serial interface that saves power by turning off everything except the POR

and the serial interface. Enter shutdown by programming the shutdown bit of the Configuration register high. While in shutdown, the Temperature register retains the last conversion result and can be read at any time. The ADC is turned off, reducing the device current draw to 30µA (max). The outputs of ALERT and OVERT are latched upon entering shutdown, and the fault queue is held in reset. After coming out of shutdown, the Temperature register continues to read the last converted temperature, until the next conversion result is available.

Thermal Considerations

The MAX6633/MAX6634/MAX6635 supply current is typically 200µA when the serial interface is inactive. When used to drive high-impedance loads, the devices dissipate negligible power; therefore, the die temperature is essentially the same as the package temperature. The key to accurate temperature monitoring is good thermal contact between the MAX6633/MAX6634/MAX6635 package and the monitored device or circuit. Heat flows in and out of plastic packages primarily through the leads. Short, wide copper traces leading to the temperature monitor ensure that heat transfers quickly and reliably. The rise in die temperature due to self-heating is given by the following formula:

$\Delta T_J = PDISSIPATION \times \theta_{JA}$

where PDISSIPATION is the power dissipated by the MAX6633/MAX6634/MAX6635, and θ_{JA} is the package's thermal resistance.

The typical thermal resistance is 170°C/W for the 8-pin SO package. To limit the effects of self-heating, minimize the output currents. For example, if the MAX6634/MAX6635 sink 4mA with the maximum $\overline{\text{ALERT}}$ VL specification of 0.8V, an additional 3.2mW of power is dissipated within the IC. This corresponds to a 0.54°C rise in the die temperature.

Applications Information

Figure 10 shows the MAX6634 used as a simple thermostat to control a heating element. Figure 11 shows the MAX6635 used as a temperature-triggered fan controller.

_Chip Information

TRANSISTOR COUNT: 12,085

PROCESS: BICMOS

Table 1. Address Selection

| | | MAX663 | 3 | |
|-----|-----|------------|-----|----------|
| A3 | A2 | A1 | A0 | ADDRESS |
| GND | GND | GND | GND | 1000 000 |
| GND | GND | GND | Vcc | 1000 001 |
| GND | GND | Vcc | GND | 1000 010 |
| GND | GND | Vcc | Vcc | 1000 011 |
| GND | Vcc | GND | GND | 1000 100 |
| GND | Vcc | GND | Vcc | 1000 101 |
| GND | Vcc | Vcc | GND | 1000 110 |
| GND | Vcc | Vcc | Vcc | 1000 111 |
| Vcc | GND | GND | GND | 1001 000 |
| Vcc | GND | GND | Vcc | 1001 001 |
| Vcc | GND | Vcc | GND | 1001 010 |
| Vcc | GND | Vcc | Vcc | 1001 011 |
| Vcc | Vcc | GND | GND | 1001 100 |
| Vcc | Vcc | GND | Vcc | 1001 101 |
| Vcc | Vcc | Vcc | GND | 1001 110 |
| Vcc | Vcc | Vcc | Vcc | 1001 111 |
| | | MAX663 | 4 | |
| | A2 | A1 | A0 | ADDRESS |
| | GND | GND | GND | 1001 000 |
| | GND | GND | Vcc | 1001 001 |
| | GND | Vcc | GND | 1001 010 |
| | GND | Vcc | Vcc | 1001 011 |
| | Vcc | GND | GND | 1001 100 |
| | Vcc | GND | Vcc | 1001 101 |
| | Vcc | Vcc | GND | 1001 110 |
| | Vcc | Vcc | Vcc | 1001 111 |
| | ı | MAX663 | 5 | 1 |
| | | A 1 | A0 | ADDRESS |
| | | GND | GND | 1001 000 |
| | | GND | Vcc | 1001 001 |
| | | Vcc | GND | 1001 010 |
| | | Vcc | Vcc | 1001 011 |

Table 2. Pointer Register Bit Assignments

| ADDRESS | DESCRIPTION | POR STATE |
|---------|----------------------------------|-----------|
| 00h | Temperature register (READ only) | 0000h |
| 01h | Configuration-Byte register | 00h |
| 02h | T _{HYST} register | 0100h |
| 03h | T _{MAX} register | 2800h |
| 04h | T _{LOW} register | 0500h |
| 05h | T _{HIGH} register | 2000h |

Table 3. Temperature Register

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|-------|------------------|
| MSB (Sign) | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | T _{MAX} | THIGH | T _{LOW} |

D15: MSB is the first sign bit.

D2, D1, D0: Flag bits for T_{MAX}, T_{HIGH}, T_{LOW}.

1LSB = 0.0625°C.

Temperature is stored in two's complement format.

Table 4. Configuration Register

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|----|----|------------------------|-----------------------|-------------------|-------------------|-------------------------|----------|
| 0 | 0 | SMB Timeout Disable | Fault Queue Enable | ALERT Polarity | OVERT Polarity | Comparator or Interrupt | Shutdown |

Power-on default = 0h.

D0: 0 = normal operation; 1 = shutdown.

D1: 0 = comparator mode; 1 = interrupt mode.

D2 to D3: 0 = active low; 1 = active high.

D5: 0 = normal SMBus operation; $1 = \text{full } I^2C \text{ compatibility}$.

D7 to D6: Reserved locations, always write zeros.

Table 5. Fault Queue Depth

| D4 | NO. OF FAULTS | | | | | |
|----|---------------|--|--|--|--|--|
| 0 | 1 (DEFAULT) | | | | | |
| 1 | 4 | | | | | |

Table 6. Output Code vs. Temperature

| TEMP (°C) | DIGITAL OUTPUT CODE | | | | | | |
|------------|---------------------|-----------|------|--|--|--|--|
| TEMP. (°C) | BIN | HEX | | | | | |
| | MSB | LSB | | | | | |
| +150.0000 | 0100 1011 | 0000 0XXX | 4B00 | | | | |
| +125.0000 | 0011 1110 | 1000 0XXX | 3E80 | | | | |
| +25.0000 | 0000 1100 | 1000 0XXX | 0C80 | | | | |
| +0.0625 | 0000 0000 | 0000 1XXX | 8000 | | | | |
| 0.0000 | 0000 0000 | 0000 0XXX | 0000 | | | | |
| -0.0625 | 1111 1111 | 1111 1XXX | FFF8 | | | | |
| -25.0000 | 1111 0011 | 0111 0XXX | F370 | | | | |
| -55.0000 | 1110 0100 | 0111 0XXX | E470 | | | | |

Table 7. THIGH, TLOW, TMAX, and THYST Registers

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------|-------|-------|-------|-------|-------|-------|-------|-----|----|----|----|----|----|----|----|
| MSB (Sign) | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | LSB | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

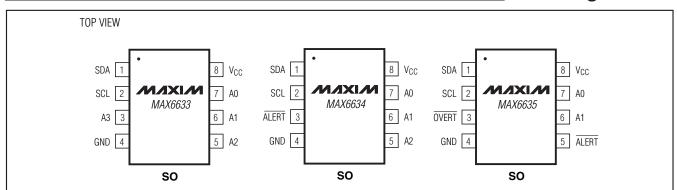
D6 to D0: Reads all zeros, cannot be written.

 $1LSB = 1^{\circ}C.$

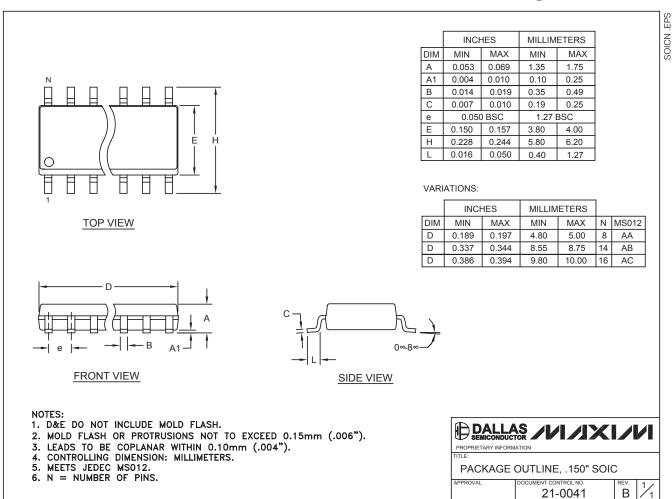
Power-On Default: $T_{HIGH} = +64^{\circ}C$ (2000h), $T_{LOW} = +10^{\circ}C$ (0500h), $T_{MAX} = +80^{\circ}C$ (2008h), $T_{HYST} = 2^{\circ}C$ (0100h).

___ /VI/IXI/VI

Pin Configurations



Package Information



Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.



OOO «ЛайфЭлектроникс" "LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 P/C 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 3010181090000000703 БИК 044030703

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С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

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- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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