



# Dual Trip SOT Temperature Switches

MAX6505-MAX6508

## General Description

The MAX6505–MAX6508 temperature switches have dual logic outputs that assert when the die temperature crosses their trip thresholds. Trip thresholds are factory programmed to convenient temperatures in 5°C increments.

The MAX6505/MAX6506 have an ALARM output that asserts when the temperature is above the factory-programmed thresholds (available from -40°C to +125°C). They also have a WARN output that asserts when the temperature is several degrees below the ALARM threshold. The difference between the ALARM and WARN thresholds ( $\Delta T_{AW}$ ) is pin selectable to +5°C, +10°C, +20°C, or +30°C. The MAX6505's logic outputs are open drain, while the MAX6506's logic outputs are push-pull.

The MAX6507 has open-drain outputs ( $\overline{\text{OVER}}$ ,  $\overline{\text{OK}}$ ), and the MAX6508 has push-pull outputs (OVER,  $\overline{\text{OK}}$ ), each with two factory-programmed threshold temperatures (TOVER and TUNDER) in the wide range of -40°C to +125°C. The overtemperature output asserts when the temperature is above TOVER. When the temperature is in the desired window (less than TOVER and greater than TUNDER),  $\overline{\text{OK}}$  ( $\overline{\text{OK}}$ ) asserts.

The MAX6505–MAX6508 are accurate to  $\pm 0.5^\circ\text{C}$  (typ),  $\pm 5.5^\circ\text{C}$  (max). Operating from a +2.5V to +5.5V supply, these low-cost devices typically consume 30 $\mu\text{A}$  supply current and require no external components for setting trip points. The MAX6505–MAX6508 are available in a 6-pin SOT23 package.

## Applications

- $\mu\text{P}$  Temperature Monitoring in High-Speed Computers
- Temperature Control
- Temperature Alarms
- Fan Control

## Features

- ◆  $\pm 0.5^\circ\text{C}$  (typ) Threshold Accuracy Over Full Temperature Range
- ◆ No External Components Required
- ◆ Low Cost
- ◆ 30 $\mu\text{A}$  (typ) Supply Current
- ◆ Factory-Programmed Thresholds from -40°C to +125°C in 5°C Increments
- ◆ Open-Drain Outputs (MAX6505/MAX6507), Push-Pull Outputs (MAX6506/MAX6508)
- ◆ Pin Selectable +2°C, +10°C Hysteresis (MAX6507/MAX6508)
- ◆ Pin Selectable +5°C, +10°C, +20°C, +30°C  $T_{\text{ALARM}} - T_{\text{WARN}}$  (MAX6505/MAX6506)
- ◆ SOT23-6 Package

## Ordering Information

| PART              | TEMP. RANGE     | PIN-PACKAGE |
|-------------------|-----------------|-------------|
| MAX6505UT____-T*  | -40°C to +125°C | 6 SOT23-6   |
| MAX6506UT____-T*  | -40°C to +125°C | 6 SOT23-6   |
| MAX6507UT____-T** | -40°C to +125°C | 6 SOT23-6   |
| MAX6508UT____-T** | -40°C to +125°C | 6 SOT23-6   |

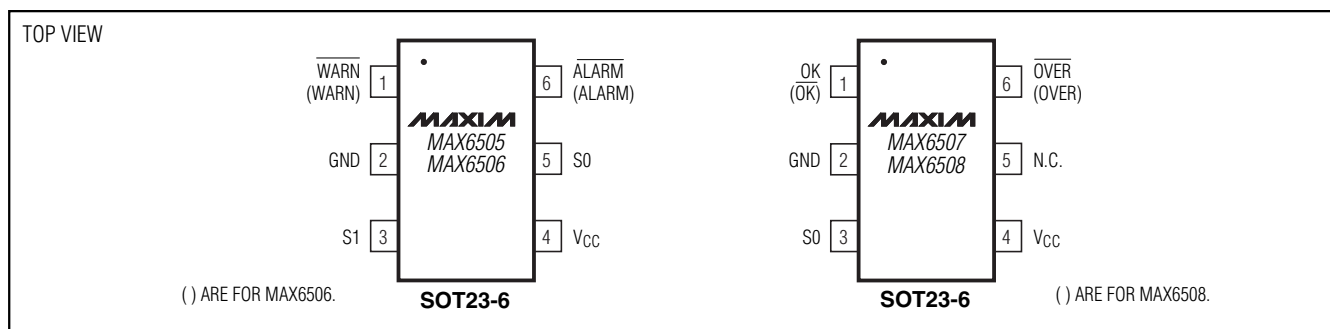
\*To complete the suffix information for the MAX6505/MAX6506, add P or N for positive or negative trip temperature, and select an available trip point in degrees centigrade. For example, the MAX6505UTP055-T describes a MAX6505 in a SOT23-6 package with a +55°C threshold (Table 3). Contact the factory for pricing and availability of temperature versions (minimum order 10,000 pieces).

\*\*To complete the suffix information for MAX6507/MAX6508, see Table 4.

Selector Guide appears at end of data sheet.

Typical Operating Circuits appear at end of data sheet.

## Pin Configurations



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## ABSOLUTE MAXIMUM RATINGS

|  |                                   |  |                 |
|--|-----------------------------------|--|-----------------|
| Supply Voltage (V <sub>CC</sub> to GND) .....  | -0.3V to +6V                      | Operating Temperature Range<br>(T <sub>MIN</sub> to T <sub>MAX</sub> ) ..... | -40°C to +125°C |
| S1, S0 to GND .....  | -0.3V to (V <sub>CC</sub> + 0.3V) | Thermal Resistance (Θ <sub>JA</sub> ) .....                                  | 115°C/W         |
| All Other Pins to GND .....  | -0.3V to (V <sub>CC</sub> + 0.3V) | Storage Temperature Range .....  | -65°C to +150°C |
| Input/Output Current, All Pins .....   | ±20mA                             | Maximum Die Temperature .....  | +150°C          |
| Continuous Power Dissipation (T <sub>A</sub> = +70°C)<br>6-Pin SOT23 (derate 7.1mW/°C above +70°C) ..... | 571mW                             | Lead Temperature (soldering, 10s) .....                                      | +300°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<sub>CC</sub> = +2.5V to +5.5V, R<sub>PULLUP</sub> = 100kΩ (MAX6505/MAX6507 only), T<sub>A</sub> = -40°C to +125°C, unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C and V<sub>CC</sub> = +5V, unless otherwise noted.) (Note 1)

| PARAMETER   | SYMBOL            | CONDITIONS  | MIN                             | TYP  | MAX | UNITS |  |
|---|-------------------|---|---------------------------------|------|-----|-------|--|
| Supply Voltage Range  | V <sub>CC</sub>   |   | 2.5                             |      | 5.5 | V     |  |
| Supply Current  | I <sub>CC</sub>   | S0 = S1 = GND<br>MAX6505/<br>MAX6506                |                                 | 40   | 80  | μA    |  |
|   |                   | S0 = GND<br>MAX6507/<br>MAX6508                     |                                 | 30   | 60  |       |  |
| Temperature Threshold Accuracy (Note 2)   | ΔT <sub>TH</sub>  | -40°C to 0°C  | -5.5                            | ±0.5 | 5.5 | °C    |  |
|   |                   | 0°C to +95°C  | -3.5                            | ±0.5 | 3.5 |       |  |
|   |                   | +95°C to +125°C                                     | -4                              | ±0.5 | 4   |       |  |
| Delta Temperature (T <sub>ALARM</sub> - T <sub>WARNING</sub> )<br>MAX6505/MAX6506 | ΔT <sub>AW</sub>  | S1 = GND, S0 = GND                                  |                                 | 5    |     | °C    |  |
|   |                   | S1 = GND, S0 = V <sub>CC</sub>                      |                                 | 10   |     |       |  |
|   |                   | S1 = V <sub>CC</sub> , S0 = GND                     |                                 | 20   |     |       |  |
|   |                   | S1 = V <sub>CC</sub> , S0 = V <sub>CC</sub>         |                                 | 30   |     |       |  |
| Temperature Threshold Hysteresis (Note 3)   | T <sub>HYST</sub> | ALARM (MAX6505/MAX6506)                             |                                 | 2    |     | °C    |  |
|   |                   | WARN (MAX6505/MAX6506)                              | ΔT <sub>AW</sub> = 5°C or 10°C  |      | 5   |       |  |
|   |                   |   | ΔT <sub>AW</sub> = 20°C or 30°C |      | 10  |       |  |
|   |                   | OK, OVER (MAX6507/MAX6508)                          | S0 = GND                        |      | 2   |       |  |
| S0 = V <sub>CC</sub>  |                   |   | 10                              |      |     |       |  |
| Logic Input Levels (S1, S0)   | V <sub>IH</sub>   |   | 0.8 x V <sub>CC</sub>           |      |     | V     |  |
|   | V <sub>IL</sub>   |   | 0.8                             |      |     |       |  |
| Output Voltage High (MAX6506/MAX6508)   | V <sub>OH</sub>   | I <sub>SOURCE</sub> = 500μA, V <sub>CC</sub> > 2.5V | 0.8 x V <sub>CC</sub>           |      |     | V     |  |
|   |                   | I <sub>SOURCE</sub> = 800μA, V <sub>CC</sub> > 4.5V | V <sub>CC</sub> - 1.5           |      |     |       |  |
| Output Voltage Low  | V <sub>OL</sub>   | I <sub>SINK</sub> = 3.2mA, V <sub>CC</sub> > 2.5V   |                                 |      | 0.5 | V     |  |
|   |                   | I <sub>SINK</sub> = 5mA, V <sub>CC</sub> > 4.5V     |                                 |      | 0.5 |       |  |

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## ELECTRICAL CHARACTERISTICS (continued)

( $V_{CC} = +2.5V$  to  $+5.5V$ ,  $R_{PULLUP} = 100k\Omega$  (MAX6505/MAX6507 only),  $T_A = -40^\circ C$  to  $+125^\circ C$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$  and  $V_{CC} = +5V$ , unless otherwise noted.) (Note 1)

| PARAMETER                         | SYMBOL | CONDITIONS  | MIN | TYP | MAX | UNITS   |
|-----------------------------------|--------|---|-----|-----|-----|---------|
| Open-Drain Output Leakage Current |        | $V_{CC} = 5.5V$ , $V_{ALARM} = 5.5V$ ,<br>$V_{WARN} = 5.5V$ (MAX6505) |     |     | 1   | $\mu A$ |
|                                   |        | $V_{CC} = 5.5V$ , $V_{OK} = 5.5V$ ,<br>$V_{OVER} = 5.5V$ (MAX6507)    |     |     | 1   |         |

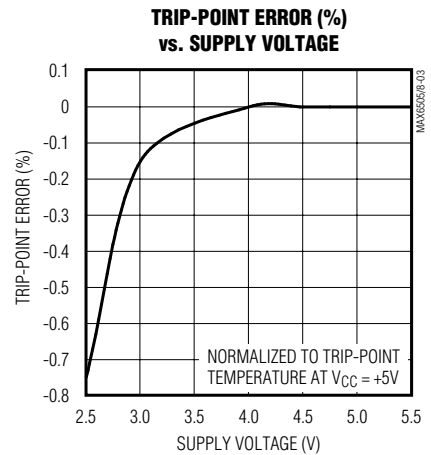
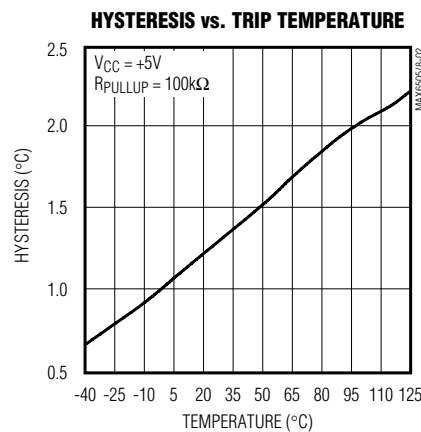
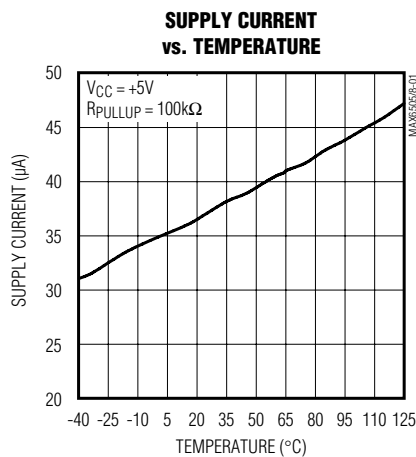
**Note 1:** 100% production tested at  $T_A = +25^\circ C$ . Specifications over temperature limits are guaranteed by design.

**Note 2:**  $T_{ALARM}$ ,  $T_{UNDER}$ , and  $T_{OVER}$  are factory-programmed temperature trip thresholds from  $-40^\circ C$  to  $+125^\circ C$  in  $5^\circ C$  increments.

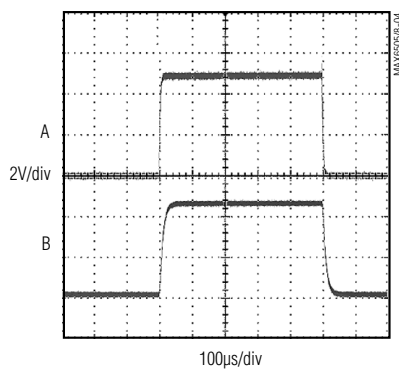
**Note 3:** Temperature threshold hysteresis is defined as the difference from positive-going temperature thresholds minus the negative-going temperature thresholds.

## Typical Operating Characteristics

( $V_{CC} = +5V$ , unless otherwise noted.)

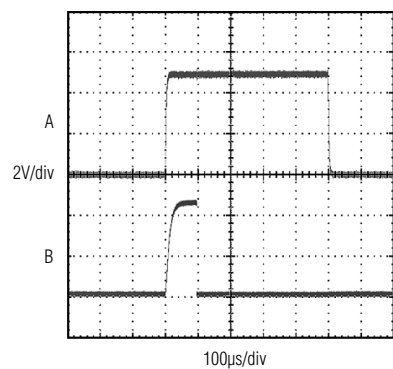


**MAX6505  
STARTUP AND POWER-DOWN  
( $T < T_{TH}$ )**



A:  $V_{CC}$  PULSE  
B: ALARM VOLTAGE,  $R_{PULLUP} = 100k\Omega$

**MAX6505  
STARTUP DELAY  
( $T > T_{TH}$ )**



A:  $V_{CC}$  PULSE  
B: ALARM VOLTAGE,  $R_{PULLUP} = 100k\Omega$

# Dual Trip SOT Temperature Switches

## Pin Description

| PIN     |         |         |         | NAME                      | FUNCTION   |
|---------|---------|---------|---------|---------------------------|--|
| MAX6505 | MAX6506 | MAX6507 | MAX6508 |                           |  |
| 1       |         | —       | —       | $\overline{\text{WARN}}$  | Open-Drain Active-Low Warning Output. $\overline{\text{WARN}}$ goes low when the die temperature exceeds $T_{\text{WARN}} = T_{\text{ALARM}} - \Delta T_{\text{AW}}$ .   |
| —       | 1       | —       | —       | WARN                      | Push-Pull Active-High Warning Output. WARN goes high when the die temperature exceeds $T_{\text{WARN}} = T_{\text{ALARM}} - \Delta T_{\text{AW}}$ .  |
| 2       | 2       | 2       | 2       | GND                       | Ground   |
| 3, 5    | 3, 5    | —       | —       | S1, S0                    | Delta Temperature Select Input. Connect to $V_{\text{CC}}$ or GND to select the difference between $T_{\text{ALARM}}$ and $T_{\text{WARN}}$ (Table 1 or see <i>Electrical Characteristics</i> ).   |
| —       | —       | 3       | 3       | S0                        | Hysteresis Select Input. Connect to $V_{\text{CC}}$ for 10°C hysteresis. Connect to GND for 2°C hysteresis.  |
| 4       | 4       | 4       | 4       | $V_{\text{CC}}$           | Supply Voltage Input. Bypass $V_{\text{CC}}$ to GND with a 0.1 $\mu\text{F}$ ceramic capacitor.  |
| —       | —       | 5       | 5       | N.C.                      | No Connection. Not internally connected.   |
| —       | —       | 6       | —       | $\overline{\text{OVER}}$  | Open-Drain Active-Low Overtemperature Output. $\overline{\text{OVER}}$ goes low when the die temperature exceeds the factory-set value of $T_{\text{OVER}}$ .  |
| —       | —       | —       | 6       | OVER                      | Push-Pull Active-High Overtemperature Output. OVER goes high when the die temperature exceeds the factory-set value of $T_{\text{OVER}}$ .   |
| —       | —       | 1       | —       | OK                        | Open-Drain Active-High Temperature Sensor Output. OK goes high impedance when the die temperature is between the factory-set values of $T_{\text{OVER}}$ and $T_{\text{UNDER}}$ . When the die temperature is above $T_{\text{OVER}}$ or below $T_{\text{UNDER}}$ , OK goes low.                             |
| —       | —       | —       | 1       | $\overline{\text{OK}}$    | Push-Pull Active-Low Temperature Sensor Output. $\overline{\text{OK}}$ goes low when the die temperature is between the factory-set values of $T_{\text{OVER}}$ and $T_{\text{UNDER}}$ . When the die temperature is above $T_{\text{OVER}}$ or below $T_{\text{UNDER}}$ , $\overline{\text{OK}}$ goes high. |
| 6       | —       | —       | —       | $\overline{\text{ALARM}}$ | Open-Drain Active-Low Alarm Output. $\overline{\text{ALARM}}$ goes low when the die temperature exceeds the factory-set value of $T_{\text{ALARM}}$ .  |
| —       | 6       | —       | —       | ALARM                     | Push-Pull Active-High Alarm Output. ALARM goes high when the die temperature exceeds the factory-set value of $T_{\text{ALARM}}$ .   |

# Dual Trip SOT Temperature Switches

MAX6505-MAX6508

## Detailed Description

The MAX6505–MAX6508 fully integrated temperature switches incorporate two temperature-dependent references and a comparator. One reference exhibits a positive temperature coefficient and the other a negative temperature coefficient. The temperature at which the two reference voltages are equal determines the temperature trip point. There are two versions, each of which has two logic outputs.

The MAX6505/MAX6506 have a main trip point ( $T_{ALARM}$ ) and a lower, “warning” trip point ( $T_{WARN}$ ). When the die temperature rises above these trip points, the ALARM and WARN outputs are asserted (Figure 1). The difference between the two trip points ( $\Delta T_{AW}$ ) is pin selectable to +5°C, +10°C, +20°C, or +30°C by connecting the two control pins (S0 and S1) high or low (Table 1). MAX6505 has open-drain active-low outputs; MAX6506 has push-pull active-high outputs.

The MAX6507/MAX6508 have two factory-programmed threshold temperatures ( $T_{OVER}$  and  $T_{UNDER}$ ) and two outputs (OK and OVER). One output (OK) asserts when the temperature is between  $T_{OVER}$  and  $T_{UNDER}$ . The other output (OVER) asserts when the temperature is above  $T_{OVER}$ . Table 4 shows the hex codes to determine the part numbers associated with specific values of  $T_{OVER}$  and  $T_{UNDER}$ . The first hex code indicates the lower trip point ( $T_{UNDER}$ ) and the second indicates the higher trip point ( $T_{OVER}$ ). For example, a part with  $T_{UNDER} = -10^{\circ}\text{C}$  and  $T_{OVER} = +75^{\circ}\text{C}$  will have the part number MAX6508UTA04B (Table 4 and Figure 2). MAX6507 has open-drain outputs; MAX6508 has push-pull outputs.

## Hysteresis Selection

The temperature threshold hysteresis for the ALARM output of the MAX6505/MAX6506 is 2°C. The hysteresis for the WARN output depends on the value of  $\Delta T_{AW}$ . If  $\Delta T_{AW}$  is 5°C or 10°C (set by S0 and S1), WARN hysteresis is 5°C. If  $\Delta T_{AW}$  is 20°C or 30°C, WARN hysteresis is 10°C. MAX6507 and MAX6508 have pin-selectable hysteresis of 2°C or 10°C for both OVER and OK outputs (Table 2).

## Applications Information

### Thermal Considerations

The MAX6505–MAX6508 supply current is typically 30µA. 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 MAX6505–MAX6508 package and the device being monitored. In

**Table 1. MAX6505/MAX6506  $\Delta T_{AW}$  Selection Table**

| CONTROL PINS |     | DESCRIPTION                                    |
|--------------|-----|--|
| S0           | S1  | $\Delta T_{AW} = T_{ALARM} - T_{WARN}$<br>(°C) |
| GND          | GND | 5  |
| GND          | VCC | 10   |
| VCC          | GND | 20   |
| VCC          | VCC | 30   |

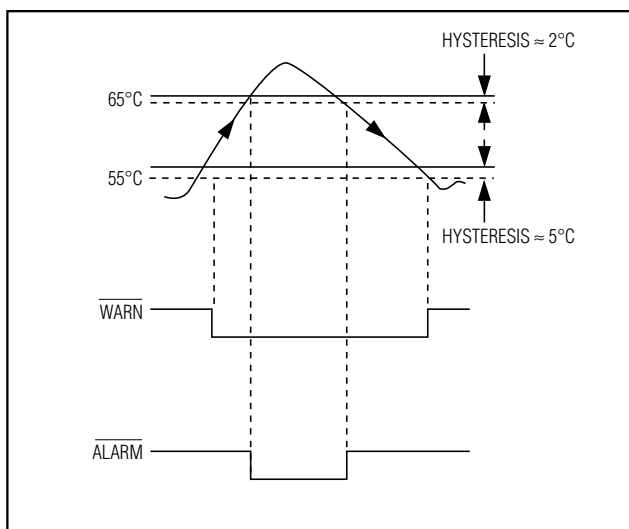


Figure 1. Temperature Response—MAX6505UTP065 Outputs,  $\Delta T_{AW} = 10^{\circ}\text{C}$ , and WARN Hysteresis  $\approx 5^{\circ}\text{C}$

some applications, the SOT23-6 packages may be small enough to fit underneath a socketed microprocessor ( $\mu\text{P}$ ), allowing the device to monitor the  $\mu\text{P}$ 's temperature directly. Use the monitor's output to reset the  $\mu\text{P}$ , assert an interrupt, or trigger an external alarm. Accurate temperature monitoring depends on the thermal resistance between the device being monitored and the MAX6505–MAX6508 die.

The rise in die temperature due to self-heating is given by the following formula:

$$\Delta T_J = P_{DISSIPATION} \times \theta_{JA}$$

where  $P_{DISSIPATION}$  is the power dissipated by the MAX6505–MAX6508, and  $\theta_{JA}$  is the package's thermal resistance. The typical thermal resistance is +115°C/W for the SOT23-6 package. To limit the effects of self-heating, minimize the output currents. For example, if the MAX6505 sinks 5mA, the output voltage is guaranteed to be less than 0.5V. Therefore, an additional 2.5mW of

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**Table 2. Hysteresis Selection**

| PART    | TYPICAL THRESHOLD HYSTERESIS |            |      |  |          |          |
|---------|------------------------------|------------|------|--|----------|----------|
|         | ALARM                        | CONDITIONS | WARN | CONDITIONS   | OK, OVER |          |
| MAX6505 | 2°C                          | —          | 5°C  | $\Delta T_{WA} = 5^\circ\text{C}$ or $10^\circ\text{C}$  | —        |          |
| MAX6506 | —                            | —          | 10°C | $\Delta T_{WA} = 20^\circ\text{C}$ or $30^\circ\text{C}$ |          |          |
| MAX6507 | —                            | —          | —    | —  | 2°C      | S0 = GND |
| MAX6508 | —                            | —          | —    | —  | 10°C     | S0 = VCC |

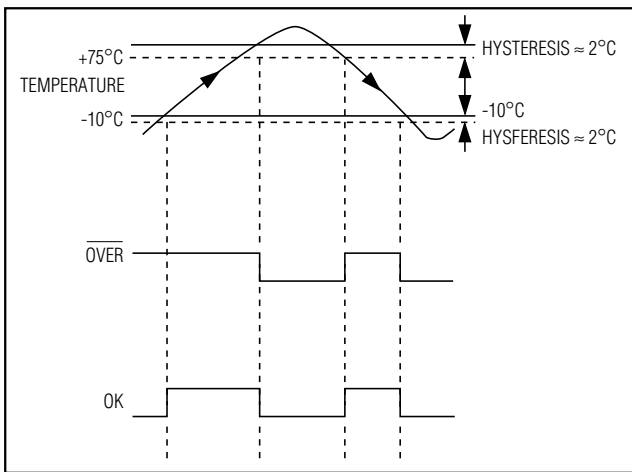


Figure 2. Temperature Response—MAX6507A04B Outputs with 2°C Hysteresis

power is dissipated within the IC. This corresponds to a +0.288°C shift in the die temperature in the SOT23-6.

### Power Supply and Bypassing

The MAX6505 and MAX6508 operate from a single-supply voltage in the +2.5V to +5.5V range. Connect a 0.1µF capacitor on the supply voltage line close to the VCC pin for bypassing.

### Low-Cost, Fail-Safe Temperature Monitor

The MAX6505/MAX6506 provide two outputs that can be used for fail-safe temperature applications (Figure 3). For example, the first output can activate a fan when the die temperature exceeds a certain preset temperature. The second output asserts at a higher temperature that could be caused by a wide variety of destructive fault conditions, including latchup, short circuit, and cooling system failure. This output can be used to initiate such actions as shutdown of the entire system (see *Typical Operating Circuits*).

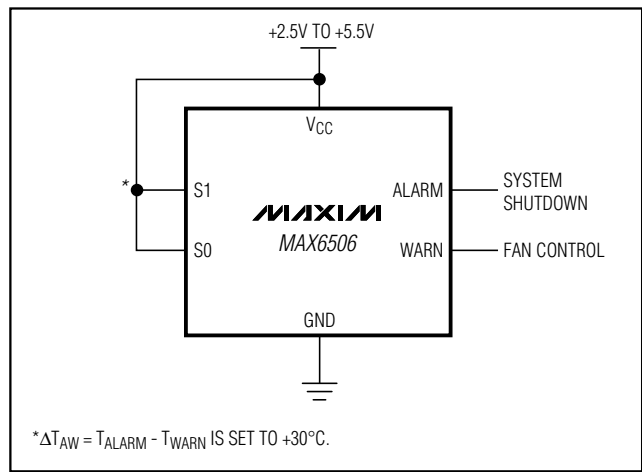


Figure 3. Low-Power, High-Reliability, Fail-Safe Temperature Monitor

The high-level integration, low cost, and small size of the MAX6505–MAX6508 facilitate the use of multiple temperature monitors to increase system reliability.

# Dual Trip SOT Temperature Switches

**Table 3. MAX6505/MAX6506 Suffix and Top Mark Codes**

| PART           | SUFFIX | TRIP POINT (°C) | TOP MARK |
|----------------|--------|-----------------|----------|
| <b>MAX6505</b> | UTN035 | -35             | AAKK     |
| MAX6505        | UTN030 | -30             | AAKL     |
| MAX6505        | UTN025 | -25             | AAKM     |
| MAX6505        | UTN020 | -20             | AAKN     |
| MAX6505        | UTN015 | -15             | AAKO     |
| MAX6505        | UTN010 | -10             | AAKP     |
| MAX6505        | UTN005 | -5              | AAKQ     |
| MAX6505        | UTP000 | 0               | AAKR     |
| MAX6505        | UTP005 | 5               | AAKS     |
| MAX6505        | UTP010 | 10              | AAKT     |
| MAX6505        | UTP015 | 15              | AAKU     |
| MAX6505        | UTP020 | 20              | AAKV     |
| MAX6505        | UTP025 | 25              | AAKW     |
| MAX6505        | UTP030 | 30              | AAKX     |
| MAX6505        | UTP035 | 35              | AAKY     |
| MAX6505        | UTP040 | 40              | AAKZ     |
| MAX6505        | UTP045 | 45              | AALA     |
| MAX6505        | UTP050 | 50              | AALB     |
| MAX6505        | UTP055 | 55              | AALC     |
| MAX6505        | UTP060 | 60              | AALD     |
| MAX6505        | UTP065 | 65              | AALE     |
| MAX6505        | UTP070 | 70              | AALF     |
| MAX6505        | UTP075 | 75              | AALG     |
| MAX6505        | UTP080 | 80              | AALH     |
| MAX6505        | UTP085 | 85              | AALI     |
| MAX6505        | UTP090 | 90              | AALJ     |
| MAX6505        | UTP095 | 95              | AALK     |
| MAX6505        | UTP100 | 100             | AALL     |
| MAX6505        | UTP105 | 105             | AALM     |
| MAX6505        | UTP110 | 110             | AALN     |
| MAX6505        | UTP115 | 115             | AALO     |
| MAX6505        | UTP120 | 120             | AALP     |
| MAX6505        | UTP125 | 125             | AALQ     |

| PART           | SUFFIX | TRIP POINT (°C) | TOP MARK |
|----------------|--------|-----------------|----------|
| <b>MAX6506</b> | UTN035 | -35             | AALR     |
| MAX6506        | UTN030 | -30             | AALS     |
| MAX6506        | UTN025 | -25             | AALT     |
| MAX6506        | UTN020 | -20             | AALU     |
| MAX6506        | UTN015 | -15             | AALV     |
| MAX6506        | UTN010 | -10             | AALW     |
| MAX6506        | UTN005 | -5              | AALX     |
| MAX6506        | UTP000 | 0               | AALY     |
| MAX6506        | UTP005 | 5               | AALZ     |
| MAX6506        | UTP010 | 10              | AAMA     |
| MAX6506        | UTP015 | 15              | AAMB     |
| MAX6506        | UTP020 | 20              | AAMC     |
| MAX6506        | UTP025 | 25              | AAMD     |
| MAX6506        | UTP030 | 30              | AAME     |
| MAX6506        | UTP035 | 35              | AAMF     |
| MAX6506        | UTP040 | 40              | AAMG     |
| MAX6506        | UTP045 | 45              | AAMH     |
| MAX6506        | UTP050 | 50              | AAMI     |
| MAX6506        | UTP055 | 55              | AAMJ     |
| MAX6506        | UTP060 | 60              | AAMK     |
| MAX6506        | UTP065 | 65              | AAML     |
| MAX6506        | UTP070 | 70              | AAMM     |
| MAX6506        | UTP075 | 75              | AAMN     |
| MAX6506        | UTP080 | 80              | AAMO     |
| MAX6506        | UTP085 | 85              | AAMP     |
| MAX6506        | UTP090 | 90              | AAMQ     |
| MAX6506        | UTP095 | 95              | AAMR     |
| MAX6506        | UTP100 | 100             | AAMS     |
| MAX6506        | UTP105 | 105             | AAMT     |
| MAX6506        | UTP110 | 110             | AAMU     |
| MAX6506        | UTP115 | 115             | AAMV     |
| MAX6506        | UTP120 | 120             | AAMW     |
| MAX6506        | UTP125 | 125             | AAMX     |

**MAX6505-MAX6508**

# Dual Trip SOT Temperature Switches

**Table 4. MAX6507/MAX6508 Trip Temperature Code**

| TRIP TEMPERATURE (°C) | HEX CODE* |
|-----------------------|-----------|
| -40                   | 82        |
| -35                   | 87        |
| -30                   | 8C        |
| -25                   | 91        |
| -20                   | 96        |
| -15                   | 9B        |
| -10                   | A0        |
| -5                    | A5        |
| 0                     | 00        |
| 5                     | 05        |
| 10                    | 0A        |
| 15                    | 0F        |
| 20                    | 14        |
| 25                    | 19        |
| 30                    | 1E        |
| 35                    | 23        |
| 40                    | 28        |
| 45                    | 2D        |
| 50                    | 32        |
| 55                    | 37        |
| 60                    | 3C        |
| 65                    | 41        |
| 70                    | 46        |
| 75                    | 4B        |
| 80                    | 50        |
| 85                    | 55        |
| 90                    | 5A        |
| 95                    | 5F        |
| 100                   | 64        |
| 105                   | 69        |
| 110                   | 6E        |
| 115                   | 73        |
| 120                   | 78        |
| 125                   | 7D        |

\*Two hex codes are used in the suffix. The first indicates the low trip temperature and the second indicates the high trip temperature. For example, the MAX6507UT8255-T has a lower trip point of -40°C and an upper trip point of +85°C.

## Temperature-Window Alarm

The MAX6507 and MAX6508 have an output (OK,  $\overline{\text{OK}}$ ) that indicates the die temperature is within the selected temperature window. This output is asserted when within the window, and deasserted when outside the window. Additionally, a second digital output indicates when the die temperature is above the upper set point. This is useful in systems where operation is optimized over a predetermined temperature range. The thermal overrange signal can be used to assert a thermal shutdown, power-up, recalibration, or other temperature-dependent function (Figure 4 and *Typical Operating Circuits*).

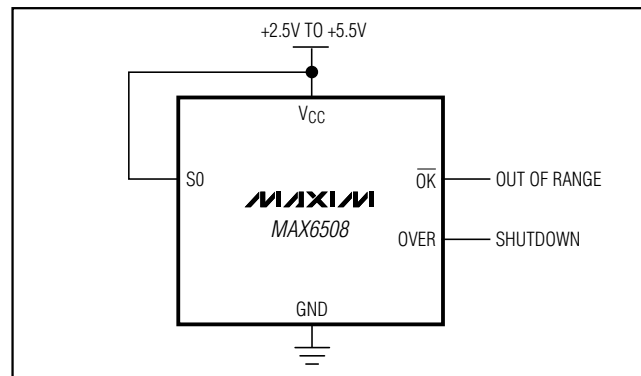


Figure 4. Temperature-Window Alarms

## Chip Information

TRANSISTOR COUNT: 796

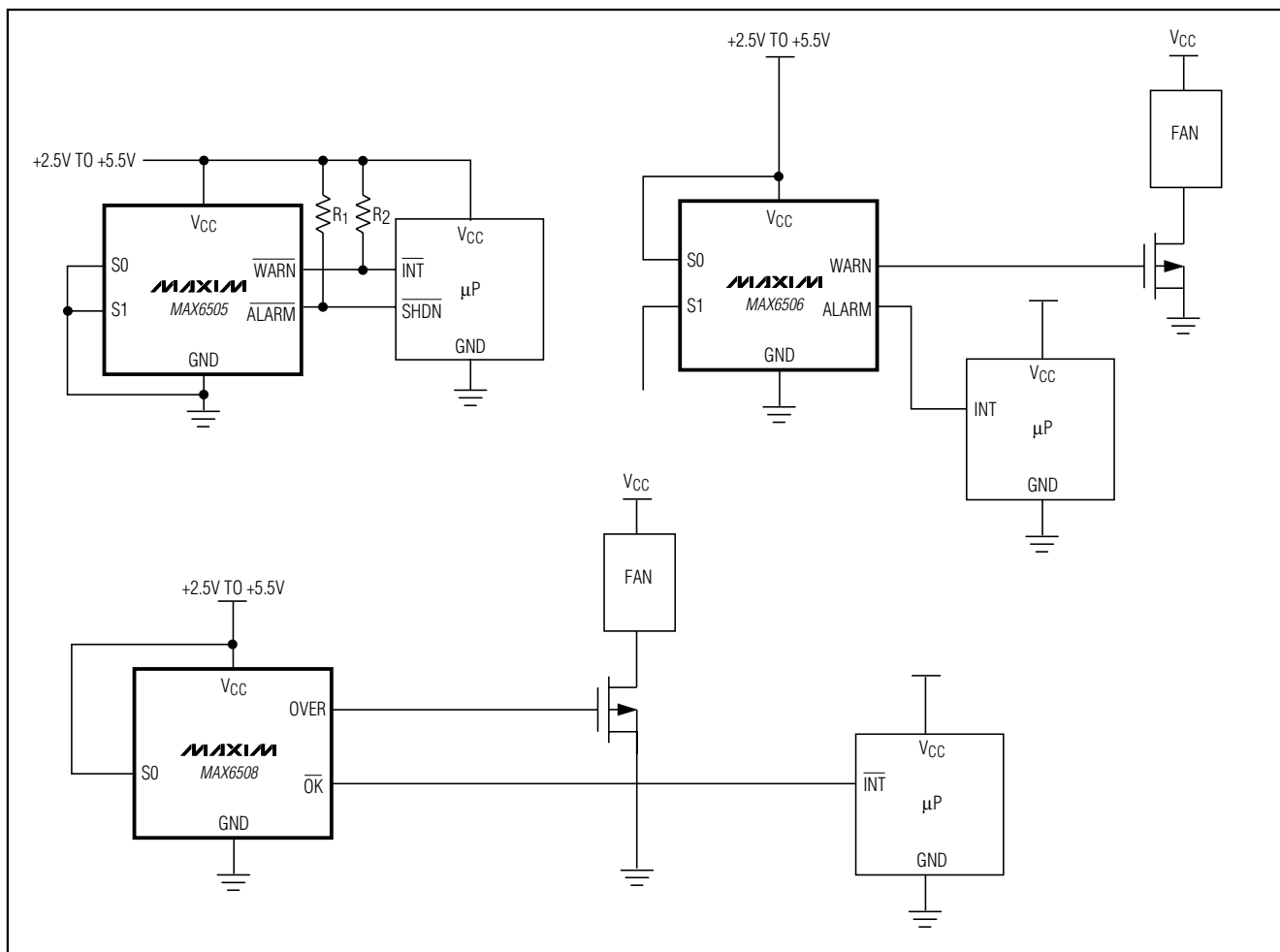
PROCESS: BiCMOS



# Dual Trip SOT Temperature Switches

## Typical Operating Circuits

MAX6505-MAX6508

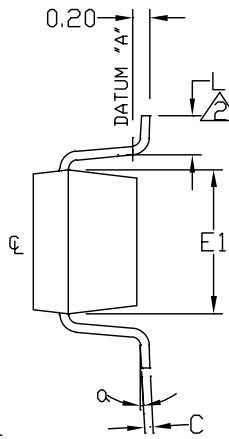
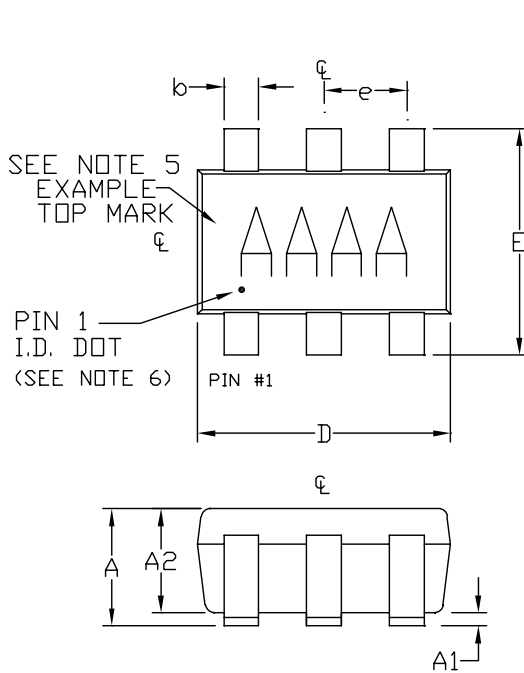


## Selector Guide

| PART    | OUTPUT LOGIC   | OUTPUT STAGE | TEMPERATURE THRESHOLD RANGE |
|---------|--|--------------|-----------------------------|
| MAX6505 | $\overline{\text{ALARM}}$ , $\overline{\text{WARN}}$ | Open Drain   | -40°C to +125°C             |
| MAX6506 | ALARM, WARN  | Push-Pull    | -40°C to +125°C             |
| MAX6507 | $\overline{\text{OVER}}$ , OK                        | Open Drain   | -40°C to +125°C             |
| MAX6508 | OVER, $\overline{\text{OK}}$                         | Push-Pull    | -40°C to +125°C             |

# Dual Trip SOT Temperature Switches

## Package Information



| SYMBOL | MIN  | MAX      |
|--------|------|----------|
| A      | 0.90 | 1.45     |
| A1     | 0.00 | 0.15     |
| A2     | 0.90 | 1.30     |
| b      | 0.35 | 0.50     |
| C      | 0.08 | 0.20     |
| D      | 2.80 | 3.00     |
| E      | 2.60 | 3.00     |
| E1     | 1.50 | 1.75     |
| L      | 0.35 | 0.55     |
| e      |      | 0.95 REF |
| α      | 0°   | 10°      |

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. FOOT LENGTH MEASURED AT INTERCEPT POINT BETWEEN DATUM A & LEAD SURFACE.
3. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & METAL BURR.
4. PACKAGE OUTLINE INCLUSIVE OF SOLDER PLATING.
5. PIN 1 IS LOWER LEFT PIN WHEN READING TOP MARK FROM LEFT TO RIGHT. (SEE EXAMPLE TOP MARK)
6. PIN 1 I.D. DOT IS 0.3 MM Ø MIN. LOCATED ABOVE PIN 1.

**MAXIM**  
 PROPRIETARY INFORMATION  
 TITLE:  
 PACKAGE OUTLINE, SOT23, 6L  
 APPROVAL: \_\_\_\_\_ DOCUMENT CONTROL NO. 21-0058 REV D 1/1

6LSOT.EPS

# **Dual Trip SOT Temperature Switches**

NOTES

**MAX6505-MAX6508**

# **Dual Trip SOT Temperature Switches**

## **NOTES**

*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.*

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# MAX6505, MAX6506, MAX6507, MAX6508

Dual Trip SOT Temperature Switches

**Dual Temperature Comparators in a SOT23! Small, Simple, and Low-Power**

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## Ordering Information

Notes:

1. Other options and links for purchasing parts are listed at: <http://www.maxim-ic.com/sales>.
2. **Didn't Find What You Need?** Ask our applications engineers. Expert assistance in finding parts, usually within one business day.
3. Part number suffixes: T or T&R = tape and reel; + = RoHS/lead-free; # = RoHS/lead-exempt. More: See [Full Data Sheet](#) or [Part Naming Conventions](#).
4. \* Some packages have variations, listed on the drawing. "PkgCode/Variation" tells which variation the product uses.

**Devices: 1-217 of 217**

| MAX6505         | Free Sample | Buy | Package: TYPE PINS FOOTPRINT<br>DRAWING CODE/VAR *  | Temp         | RoHS/Lead-Free?<br>Materials Analysis                                |
|-----------------|-------------|-----|---|--------------|--|
| MAX6505UTP070   |             |     |   | -40C to +85C | RoHS/Lead-Free: See data sheet                                       |
| MAX6505UTP070-T |             |     |   | -40C to +85C | RoHS/Lead-Free: See data sheet                                       |
| MAX6505UTP030+  |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTP005   |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6505UTP010+  |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTP010   |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6505UTP015+  |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTP015   |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6505UTP020+  |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTP020   |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6505UTP025+  |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTP025   |             |     | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |













|                 |                    |            |   |              |  |
|-----------------|--------------------|------------|---|--------------|--|
| MAX6505UTP010+T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTN030+T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTN035+T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTP000+T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6505UTP005+T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| <b>MAX6506</b>  | <b>Free Sample</b> | <b>Buy</b> | <b>Package: TYPE PINS FOOTPRINT<br/>DRAWING CODE/VAR *</b>                                | <b>Temp</b>  | <b>RoHS/Lead-Free?<br/>Materials Analysis</b>                        |
| MAX6506UTP130   |                    |            |   | -40C to +85C | RoHS/Lead-Free: See data sheet                                       |
| MAX6506UTP080+T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6506UTP080+  |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S+3* | -40C to +85C | RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>         |
| MAX6506UTP100   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <a href="#">No Materials Analysis</a>                |
| MAX6506UTP105   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP110   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP115   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <a href="#">No Materials Analysis</a>                |
| MAX6506UTP120   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP125   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP015   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP000   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP095   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP085   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <a href="#">No Materials Analysis</a>                |
| MAX6506UTN030   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTN035   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP050   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <a href="#">No Materials Analysis</a>                |
| MAX6506UTP005   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |





|                 |                    |            |   |              |  |
|-----------------|--------------------|------------|---|--------------|--|
| MAX6506UTP010-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP040-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP035-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP030-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP025-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP020-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| MAX6506UTP015-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: See data sheet<br><a href="#">Materials Analysis</a> |
| <b>MAX6507</b>  | <b>Free Sample</b> | <b>Buy</b> | <b>Package: TYPE PINS FOOTPRINT<br/>DRAWING CODE/VAR *</b>                                | <b>Temp</b>  | <b>RoHS/Lead-Free?<br/>Materials Analysis</b>                        |
| MAX6507UT002D   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6507UT0A32   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6507UT8255   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6507UT052D   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6507UT0A32-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6507UT002D-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6507UT052D-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6507UT8255-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| <b>MAX6508</b>  | <b>Free Sample</b> | <b>Buy</b> | <b>Package: TYPE PINS FOOTPRINT<br/>DRAWING CODE/VAR *</b>                                | <b>Temp</b>  | <b>RoHS/Lead-Free?<br/>Materials Analysis</b>                        |
| MAX6508UT824B-T |                    |            |   | -40C to +85C | RoHS/Lead-Free: See data sheet                                       |
| MAX6508UT002D   |                    |            |   | -40C to +85C | RoHS/Lead-Free: See data sheet                                       |
| MAX6508UT0A32   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6508UT8255   |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6508UT8255-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |
| MAX6508UT0A32-T |                    |            | SOT-23;6 pin;9 mm<br>Dwg: <a href="#">21-0058I</a> (PDF)<br>Use pkgcode/variation: U6S-3* | -40C to +85C | RoHS/Lead-Free: <b>No</b><br><a href="#">Materials Analysis</a>      |

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