

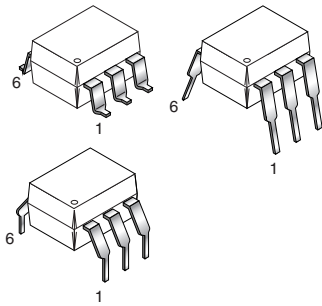
**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

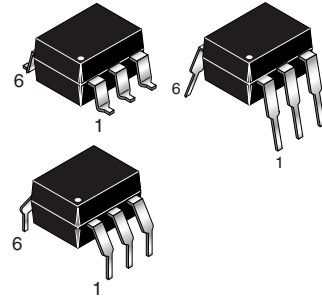
**MCT210**  
**MCT2202**

**MCT271**

**WHITE PACKAGE (-M SUFFIX)**



**BLACK PACKAGE (NO -M SUFFIX)**



**DESCRIPTION**

The MCT2XXX series optoisolators consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

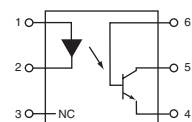
**FEATURES**

- UL recognized (File # E90700)
- VDE recognized (File # 94766)
  - Add option V for white package (e.g., MCT2V-M)
  - Add option 300 for black package (e.g., MCT2.300)
- MCT2 and MCT2E are also available in white package by specifying -M suffix, eg. MCT2-M

**APPLICATIONS**

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

**SCHEMATIC**



PIN 1. ANODE  
2. CATHODE  
3. NO CONNECTION  
4. EMITTER  
5. COLLECTOR  
6. BASE

**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

**MCT271**

| <b>ABSOLUTE MAXIMUM RATINGS</b>                           |               |               |                |              |
|---|---------------|---------------|----------------|--------------|
| <b>Parameter</b>  | <b>Symbol</b> | <b>Device</b> | <b>Value</b>   | <b>Units</b> |
| <b>TOTAL DEVICE</b>                                       |               |               |                |              |
| Storage Temperature                                       | $T_{STG}$     | ALL           | -55 to +150    | °C           |
| Operating Temperature                                     | $T_{OPR}$     | ALL           | -55 to +100    | °C           |
| Lead Solder Temperature                                   | $T_{SOL}$     | ALL           | 260 for 10 sec | °C           |
| Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ | $P_D$         | -M            | 250            | mW           |
|   |               | Non-M         | 260            |              |
| Derate above 25°C   |               | -M            | 2.94           | mW/°C        |
|   |               | Non-M         | 3.3            |              |
| <b>EMITTER</b>  |               |               |                |              |
| DC/Average Forward Input Current                          | $I_F$         | -M            | 60             | mA           |
|   |               | Non-M         | 100            |              |
| Reverse Input Voltage                                     | $V_R$         | ALL           | 3              | V            |
| Forward Current - Peak (300µs, 2% Duty Cycle)             | $I_F(pk)$     | ALL           | 3              | A            |
| LED Power Dissipation @ $T_A = 25^\circ\text{C}$          | $P_D$         | -M            | 120            | mW           |
|   |               | Non-M         | 150            |              |
| Derate above 25°C   |               | -M            | 1.41           | mW/°C        |
|   |               | Non-M         | 2.0            |              |
| <b>DETECTOR</b>   |               |               |                |              |
| Collector Current   | $I_C$         | ALL           | 50             | mA           |
| Collector-Emitter Voltage                                 | $V_{CEO}$     | ALL           | 30             | V            |
| Detector Power Dissipation @ $T_A = 25^\circ\text{C}$     | $P_D$         | ALL           | 150            | mW           |
| Derate above 25°C   |               | -M            | 1.76           | mW/°C        |
|   |               | Non-M         | 2.0            |              |

**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

**MCT271**

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

| Parameter                           | Test Conditions                                    | Symbol     | Device   | Min | Typ** | Max  | Unit          |
|-------------------------------------|--|------------|--|-----|-------|------|---------------|
| <b>EMITTER</b>                      |  |            |  |     |       |      |               |
| Input Forward Voltage               | $(I_F = 20 \text{ mA})$                            | $V_F$      | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 |     | 1.25  | 1.50 | V             |
|                                     | $(T_A = 0-70^\circ\text{C}, I_F = 40 \text{ mA})$  |            | MCT210   |     | 1.33  |      |               |
| Reverse Leakage Current             | $(V_R = 3.0 \text{ V})$                            | $I_R$      | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 |     | 0.001 | 10   | $\mu\text{A}$ |
|                                     | $(T_A = 0-70^\circ\text{C}, V_R = 6.0 \text{ V})$  |            | MCT210   |     |       |      |               |
| <b>DETECTOR</b>                     |  |            |  |     |       |      |               |
| Collector-Emitter Breakdown Voltage | $(I_C = 1.0 \text{ mA}, I_F = 0)$                  | $BV_{CEO}$ | ALL  | 30  | 100   |      | V             |
|                                     | $(T_A = 0-70^\circ\text{C})$                       |            | MCT210   |     |       |      |               |
| Collector-Base Breakdown Voltage    | $(I_C = 10 \mu\text{A}, I_F = 0)$                  | $BV_{CBO}$ | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 | 70  | 120   |      | V             |
|                                     | $(T_A = 0-70^\circ\text{C})$                       |            | MCT210   | 30  |       |      |               |
| Emitter-Collector Breakdown Voltage | $(I_E = 100 \mu\text{A}, I_F = 0)$                 | $BV_{ECO}$ | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 | 7   | 10    |      | V             |
|                                     | $(T_A = 0-70^\circ\text{C})$                       |            | MCT210   | 6   | 10    |      |               |
| Collector-Emitter Dark Current      | $(V_{CE} = 10 \text{ V}, I_F = 0)$                 | $I_{CEO}$  | ALL  |     | 1     | 50   | nA            |
|                                     | $(V_{CE} = 5 \text{ V}, T_A = 0-70^\circ\text{C})$ |            |  |     |       | 30   | $\mu\text{A}$ |
| Collector-Base Dark Current         | $(V_{CB} = 10 \text{ V}, I_F = 0)$                 | $I_{CBO}$  | ALL  |     |       | 20   | nA            |
| Capacitance                         | $(V_{CE} = 0 \text{ V}, f = 1 \text{ MHz})$        | $C_{CE}$   | ALL  |     | 8     |      | pF            |

\*\* Typical values at  $T_A = 25^\circ\text{C}$

**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

**MCT271**

| <b>TRANSFER CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ Unless otherwise specified.)         |   |               |         |     |       |     |               |  |
|---|---|---------------|---------|-----|-------|-----|---------------|--|
| DC Characteristic   | Test Conditions   | Symbol        | Device  | Min | Typ** | Max | Unit          |  |
| Output Collector Current  | $(T_A = 0-70^\circ\text{C})$<br>$(I_F = 10\text{ mA}, V_{CE} = 5\text{ V})$                                   | CTR           | MCT210  | 150 |       |     | %             |  |
|   |   |               | MCT2200 | 20  |       |     |               |  |
|   | MCT2201   |               | 100     |     |       |     |               |  |
|   | MCT2202   |               | 63      |     | 125   |     |               |  |
|   | $(I_F = 10\text{ mA}, V_{CE} = 10\text{ V})$  |               | MCT2    | 20  |       |     |               |  |
|   |   |               | MCT2-M  |     |       |     |               |  |
|   |   |               | MCT2E   |     |       |     |               |  |
| $(I_F = 3.2\text{ mA to } 32\text{ mA}, V_{CE} = 0.4\text{ V})$<br>$(T_A = 0-70^\circ\text{C})$ | MCT2E-M   |               |         |     |       |     |               |  |
|   | MCT271  | 45            |         | 90  |       |     |               |  |
|   |   | MCT210        | 50      |     |       |     |               |  |
| Collector-Emitter Saturation Voltage  | $(I_C = 2\text{ mA}, I_F = 16\text{ mA})$   | $V_{CE(SAT)}$ | MCT2    |     |       | 0.4 | V             |  |
|   |   |               | MCT2-M  |     |       |     |               |  |
|   | MCT2E   |               |         |     |       |     |               |  |
|   | MCT2E-M   |               |         |     |       |     |               |  |
|   | MCT271  |               |         |     |       |     |               |  |
|   | MCT210  |               |         |     |       |     |               |  |
| $(I_C = 16\text{ mA}, I_F = 32\text{ mA}, T_A = 0-70^\circ\text{C})$                            | MCT2200   |               |         |     |       |     |               |  |
| $(I_C = 2.5\text{ mA}, I_F = 10\text{ mA})$   | MCT2201   |               |         |     |       |     |               |  |
|   |   | MCT2202       |         |     |       |     |               |  |
| <b>AC Characteristic</b><br>Saturated Turn-on Time<br>from 5 V to 0.8 V                         | $(I_F = 15\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$<br>$(R_B = \text{Open})$ (Fig. 20)        | $t_{on}$      | MCT2    |     | 1.1   |     |               |  |
|   |   |               | MCT2E   |     | 1.1   |     |               |  |
|   | $(I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$<br>$(R_B = 100\text{ k}\Omega)$ (Fig. 20) |               | MCT2    |     | 1.3   |     |               |  |
|   |   |               | MCT2E   |     | 1.3   |     |               |  |
| Saturated Turn-off Time<br>from SAT to 2.0 V  | $(I_F = 15\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$<br>$(R_B = \text{Open})$ (Fig. 20)        | $t_{off}$     | MCT2    |     | 50    |     | $\mu\text{s}$ |  |
|   |   |               | MCT2E   |     | 50    |     |               |  |
|   | $(I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$<br>$(R_B = 100\text{ k}\Omega)$ (Fig. 20) |               | MCT2    |     | 20    |     |               |  |
|   |   |               | MCT2E   |     | 20    |     |               |  |
| Turn-on Time  | $(I_F = 10\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\ \Omega)$   | $t_{on}$      | MCT2-M  |     | 2     |     |               |  |
|   |   |               | MCT2E-M |     |       |     |               |  |
| Turn-off Time   | $(I_F = 10\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\ \Omega)$   | $t_{off}$     | MCT2-M  |     | 2     |     |               |  |
|   |   |               | MCT2E-M |     |       |     |               |  |
| Rise Time   | $(I_F = 10\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\ \Omega)$   | $t_r$         | MCT2-M  |     | 2     |     |               |  |
|   |   |               | MCT2E-M |     |       |     |               |  |
| Fall Time   | $(I_F = 10\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\ \Omega)$   | $t_f$         | MCT2-M  |     | 1.5   |     |               |  |
|   |   |               | MCT2E-M |     |       |     |               |  |

\*\* Typical values at  $T_A = 25^\circ\text{C}$

**MCT2  
MCT2200**

**MCT2E  
MCT2201**

**MCT210  
MCT2202**

**MCT271**

| TRANSFER CHARACTERISTICS (Cont.)  |   |                      |                    |     |       |     |      |
|---|---|----------------------|--------------------|-----|-------|-----|------|
| AC Characteristic   | Test Conditions   | Symbol               | Device             | Min | Typ** | Max | Unit |
| Saturated turn-on time  | (I <sub>F</sub> = 16 mA, R <sub>L</sub> = 1.9kΩ, V <sub>CC</sub> = 5 V)<br>(Fig. 20)    | t <sub>on</sub>      | MCT271             |     | 1.0   |     | μs   |
| Saturated turn-off time<br>(Approximates a typical TTL interface)           |   | t <sub>off</sub>     |                    |     | 48    |     |      |
| Saturated turn-on time  | (I <sub>F</sub> = 16 mA, R <sub>L</sub> = 4.7kΩ, V <sub>CC</sub> = 5 V)<br>(Fig. 20)    | t <sub>on</sub>      |                    |     | 1.0   |     |      |
| Saturated turn-off time<br>(Approximates a typical low power TTL interface) |   | t <sub>off</sub>     |                    |     | 98    |     |      |
| Saturated rise time   | (I <sub>F</sub> = 16 mA, R <sub>L</sub> = 560Ω, V <sub>CC</sub> = 5 V)<br>(Fig. 20, 21) | t <sub>r</sub>       | MCT210             |     | 1.0   |     |      |
| Saturated fall time   |   | t <sub>f</sub>       |                    |     | 11    |     |      |
| Saturated propagation delay - high to low                                   | (I <sub>F</sub> = 16 mA, R <sub>L</sub> = 2.7kΩ) (Fig. 20, 21)                          | T <sub>PD (HL)</sub> |                    |     | 1.0   |     |      |
| Saturated propagation delay - low to high                                   |   | T <sub>PD (LH)</sub> |                    |     | 50    |     |      |
| Non-saturated turn on time  | (I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100Ω)<br>(Fig. 20)     | T <sub>ON</sub>      | MCT2200            |     | 2     | 10  |      |
| Non-saturated turn off time   |   | T <sub>OFF</sub>     | MCT2201<br>MCT2202 |     | 2     | 10  |      |
| Non-saturated rise time   | (I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 100Ω)<br>(Fig. 20)      | t <sub>r</sub>       | MCT210             |     | 2     |     |      |
| Non-saturated fall time   |   | t <sub>f</sub>       |                    |     | 2     |     |      |
| Non-saturated turn-on time  | (I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 100Ω)<br>(Fig. 20)      | t <sub>on</sub>      | MCT271             |     | 2     | 7   |      |
| Non-saturated turn-off time   |   | t <sub>off</sub>     |                    |     | 2     | 7   |      |

\*\* Typical values at T<sub>A</sub> = 25°C

**MCT2**  
**MCT2200**

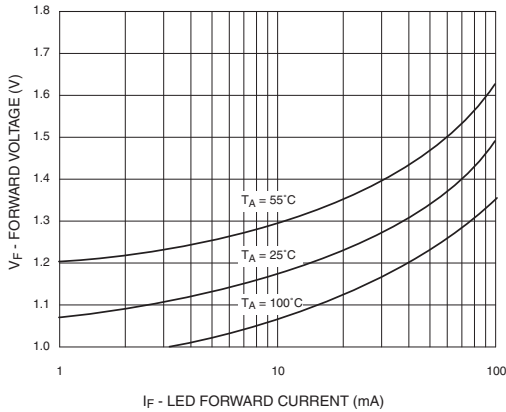
**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

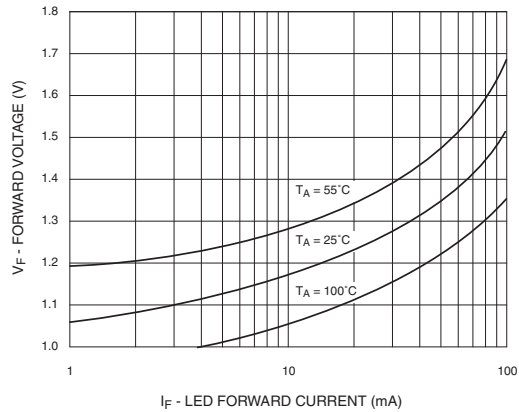
**MCT271**

**TYPICAL PERFORMANCE CURVES**

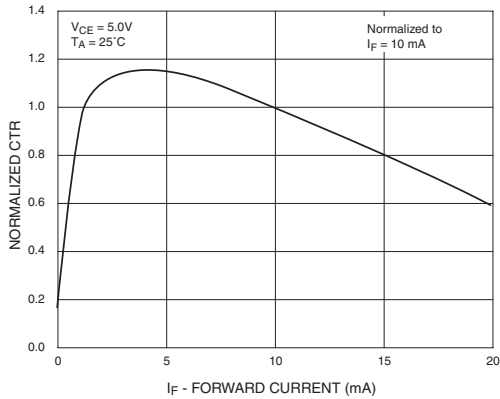
**Fig. 1 LED Forward Voltage vs. Forward Current (Black Package)**



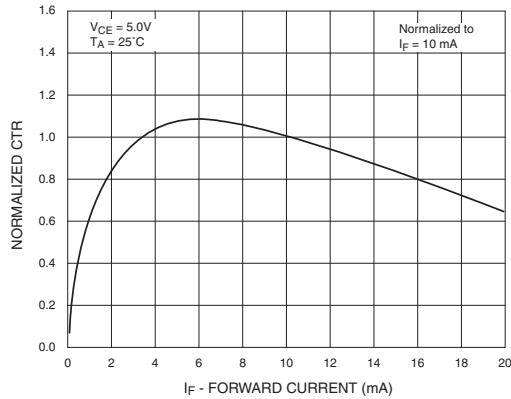
**Fig. 2 LED Forward Voltage vs. Forward Current (White Package)**



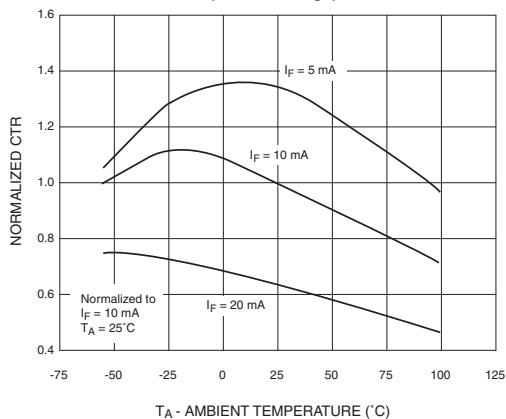
**Fig.3 Normalized CTR vs. Forward Current (Black Package)**



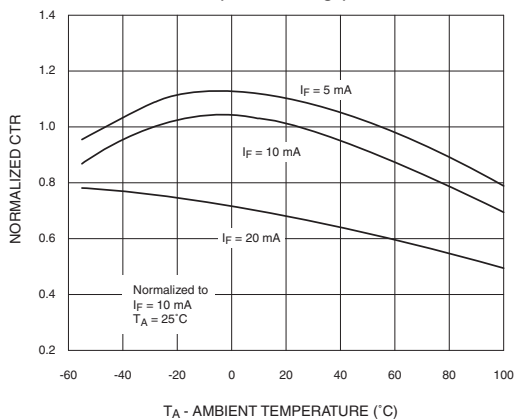
**Fig.4 Normalized CTR vs. Forward Current (White Package)**



**Fig. 5 Normalized CTR vs. Ambient Temperature (Black Package)**



**Fig. 6 Normalized CTR vs. Ambient Temperature (White Package)**



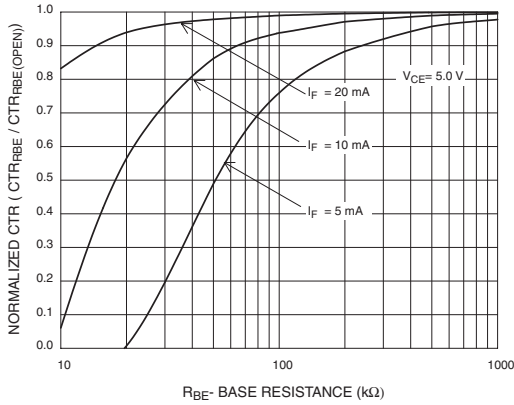
**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

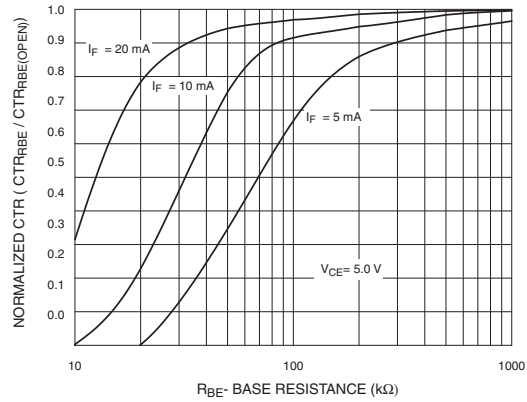
**MCT210**  
**MCT2202**

**MCT271**

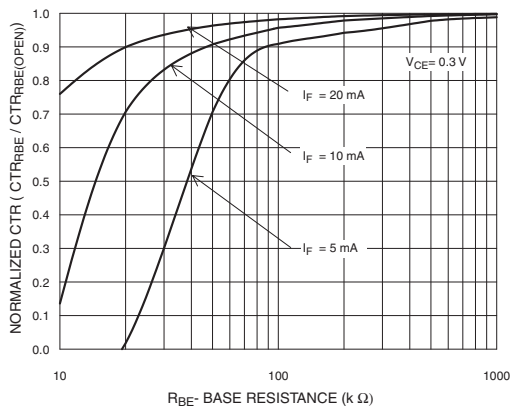
**Fig. 7 CTR vs. RBE (Unsaturated)**  
**(Black Package)**



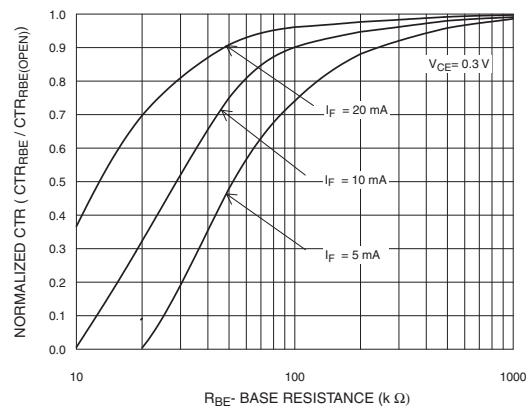
**Fig. 8 CTR vs. RBE (Unsaturated)**  
**(White Package)**



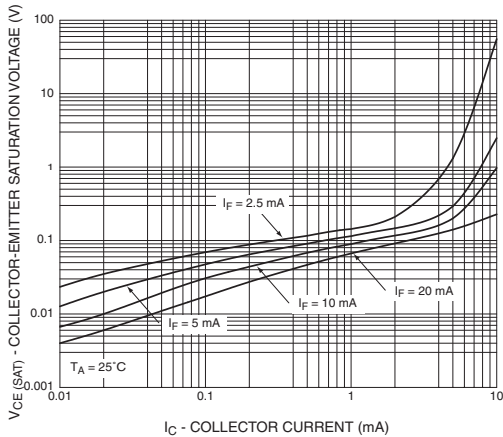
**Fig. 9 CTR vs. RBE (Saturated)**  
**(Black Package)**



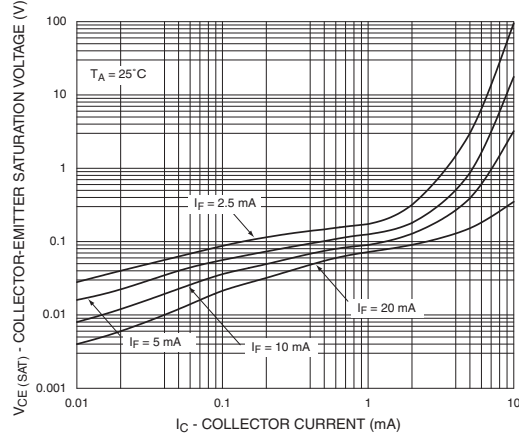
**Fig. 10 CTR vs. RBE (Saturated)**  
**(White Package)**



**Fig. 11 Collector-Emitter Saturation Voltage vs. Collector Current**  
**(Black Package)**



**Fig. 12 Collector-Emitter Saturation Voltage vs. Collector Current**  
**(White Package)**



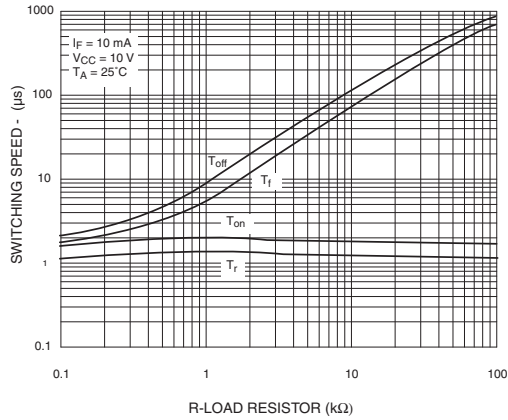
**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

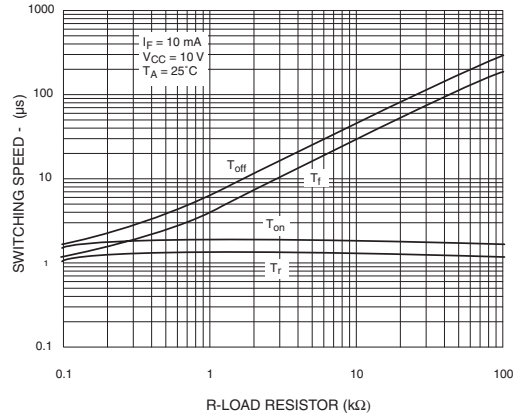
**MCT210**  
**MCT2202**

**MCT271**

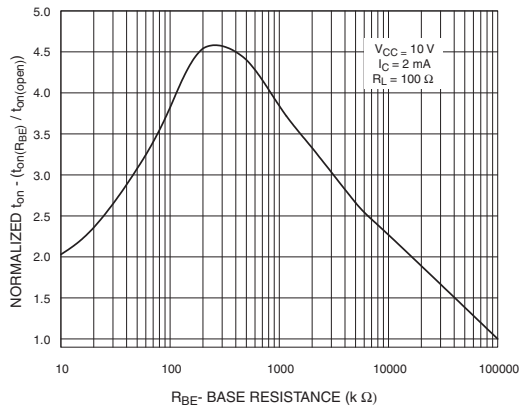
**Fig. 13 Switching Speed vs. Load Resistor (Black Package)**



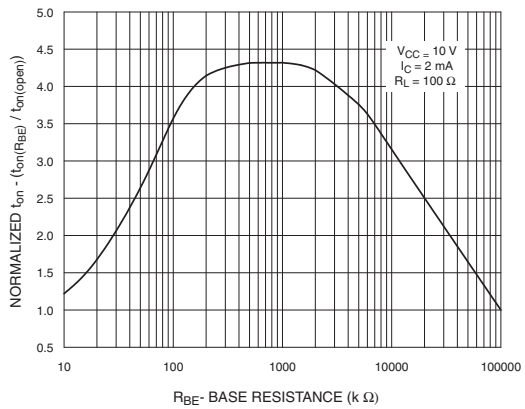
**Fig. 14 Switching Speed vs. Load Resistor (White Package)**



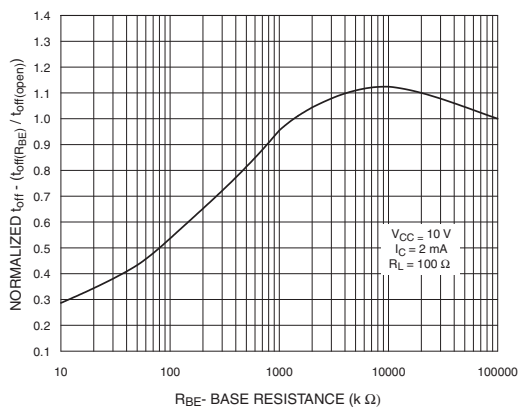
**Fig. 15 Normalized  $t_{on}$  vs.  $R_{BE}$  (Black Package)**



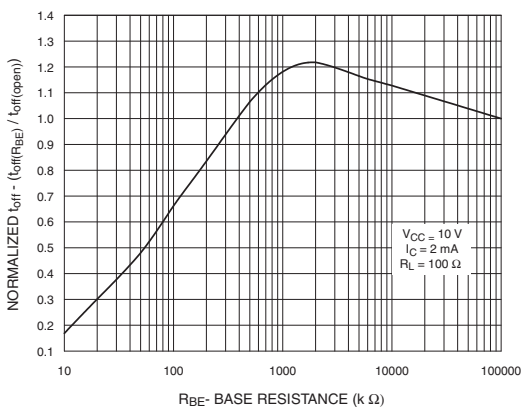
**Fig. 16 Normalized  $t_{on}$  vs.  $R_{BE}$  (White Package)**



**Fig. 17 Normalized  $t_{off}$  vs.  $R_{BE}$  (Black Package)**



**Fig. 18 Normalized  $t_{off}$  vs.  $R_{BE}$  (White Package)**





**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

**MCT271**

Fig. 19 Dark Current vs. Ambient Temperature

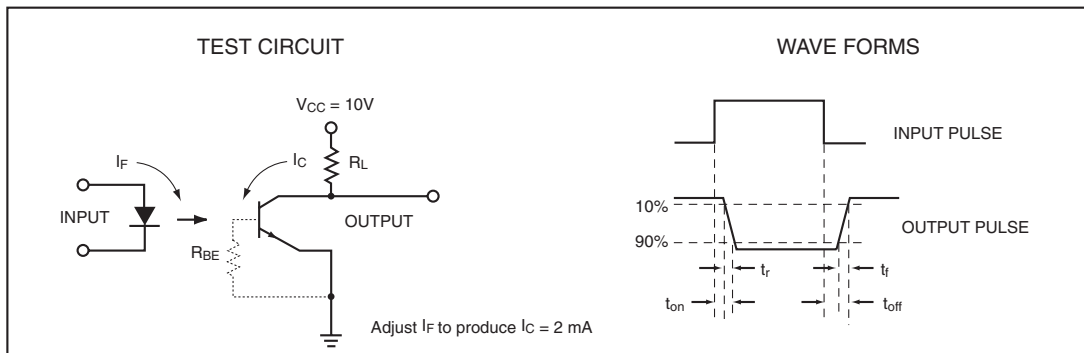
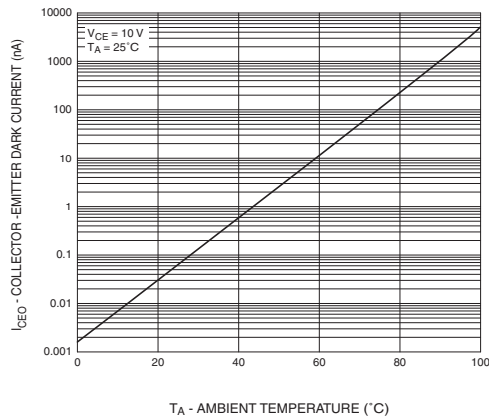


Figure 20. Switching Time Test Circuit and Waveforms

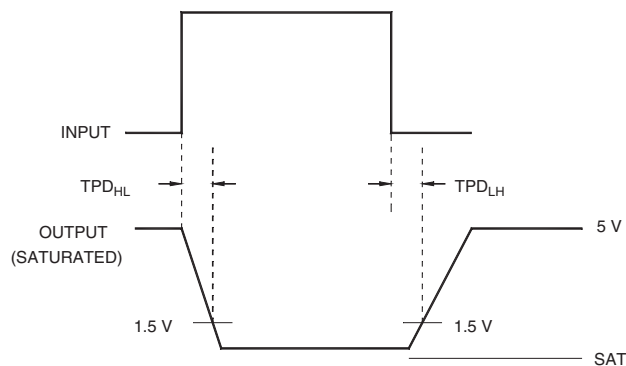


Figure 21. Switching Time Waveforms (MCT210)

**MCT2**  
**MCT2200**

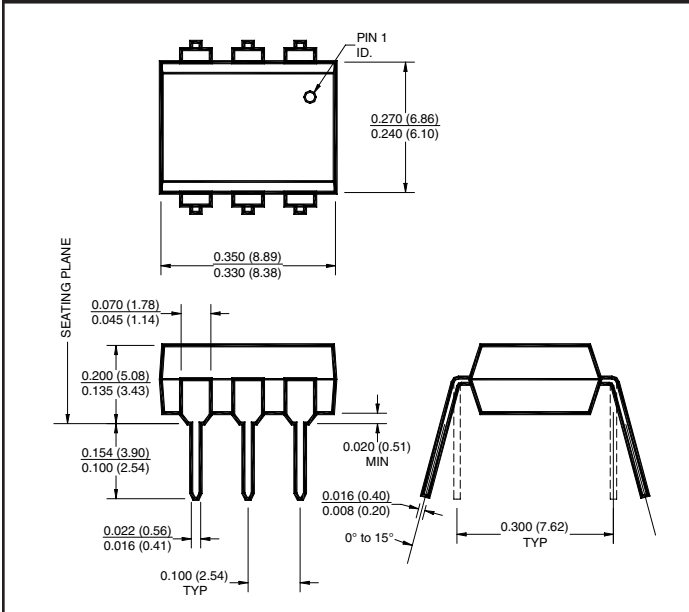
**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

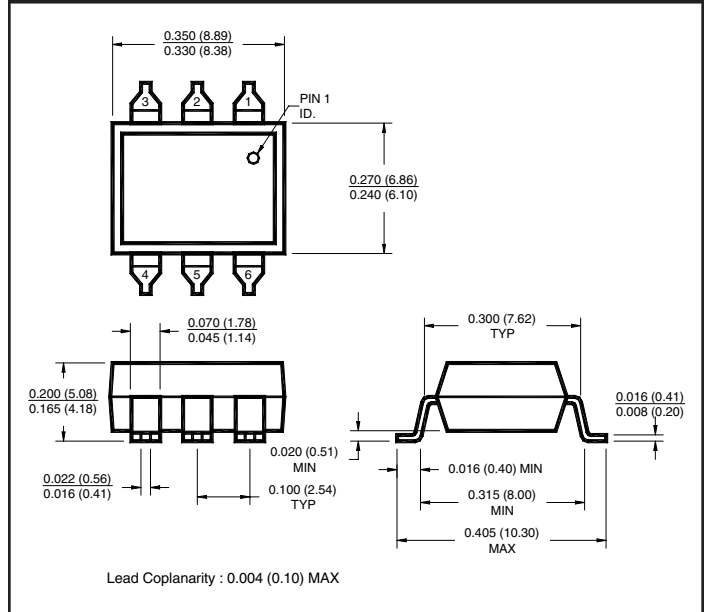
**MCT271**

**Black Package (No -M Suffix)**

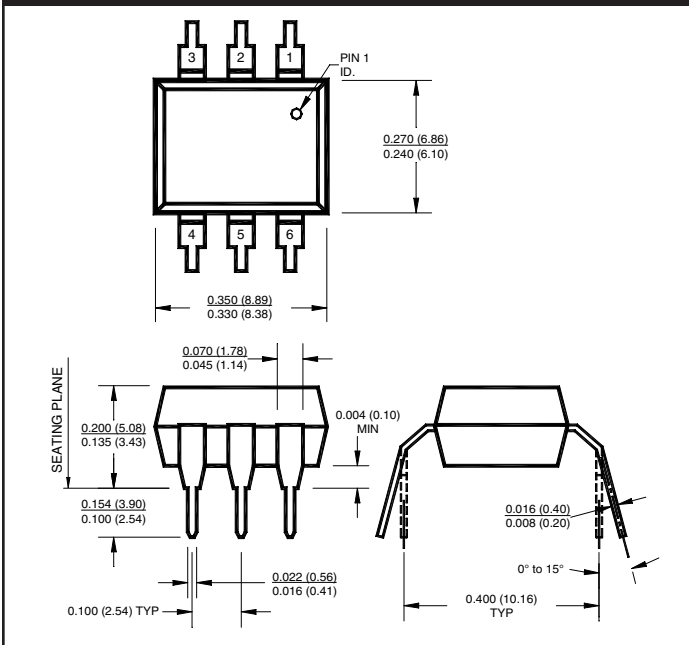
**Package Dimensions (Through Hole)**



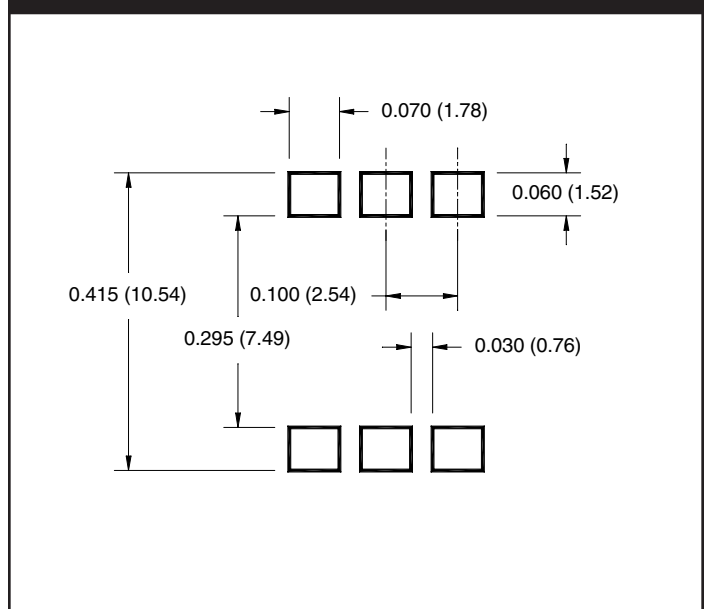
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for Surface Mount Leadform**



**NOTE**

All dimensions are in inches (millimeters)

**MCT2**  
**MCT2200**

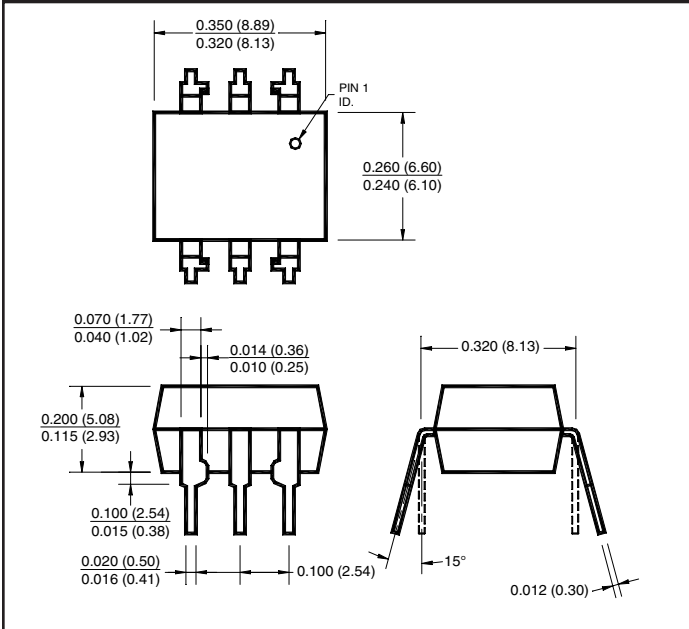
**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

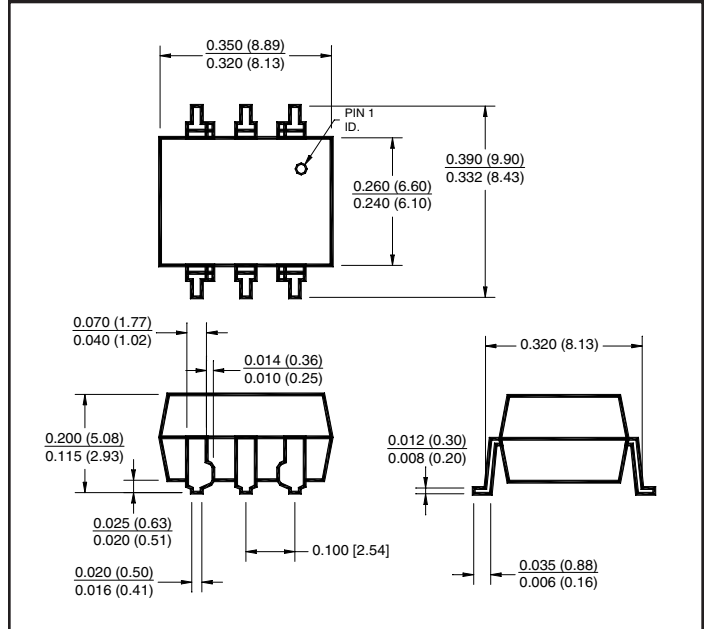
**MCT271**

**White Package (-M Suffix)**

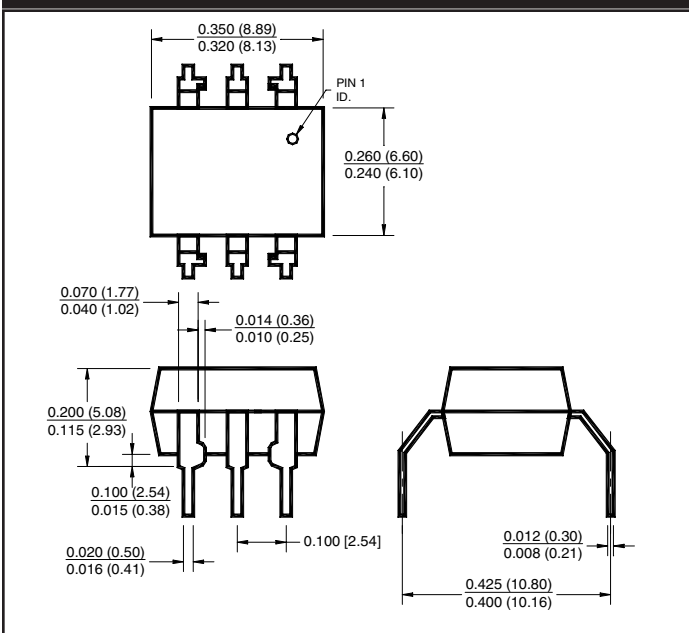
**Package Dimensions (Through Hole)**



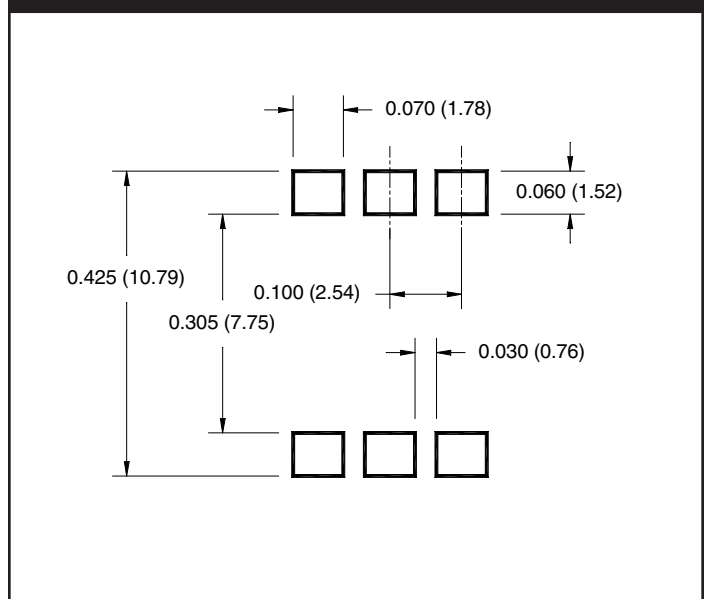
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for Surface Mount Leadform**



**NOTE**

All dimensions are in inches (millimeters)

**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

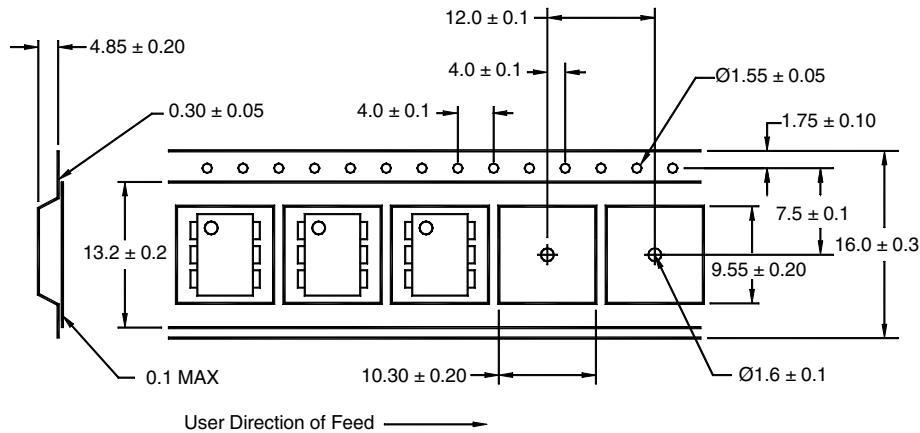
**MCT210**  
**MCT2202**

**MCT271**

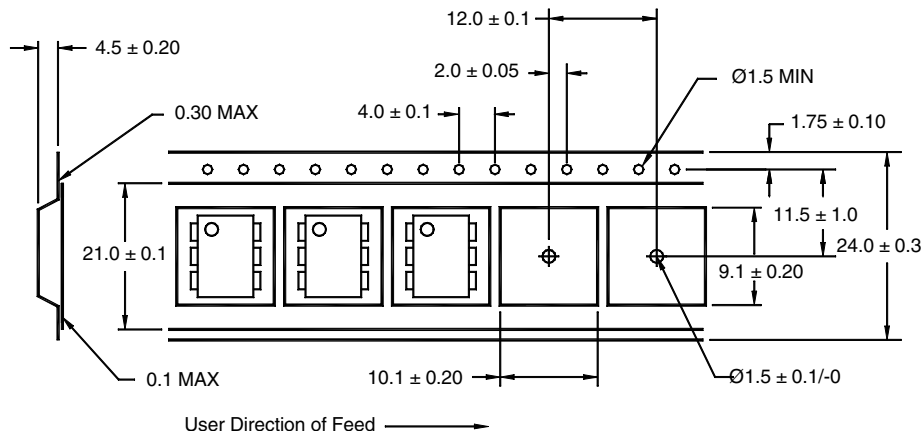
**ORDERING INFORMATION**

| Black Package<br>(No Suffix)  | White Package<br>(-m Suffix) | Description                          |
|-------------------------------|------------------------------|--------------------------------------|
| <b>Order Entry Identifier</b> |                              |                                      |
| .S                            | S                            | Surface Mount Lead Bend              |
| .SD                           | SR2                          | Surface Mount; Tape and reel         |
| .W                            | T                            | 0.4" Lead Spacing                    |
| .300                          | V                            | VDE 0884                             |
| .300W                         | TV                           | VDE 0884, 0.4" Lead Spacing          |
| .3S                           | SV                           | VDE 0884, Surface Mount              |
| .3SD                          | SR2V                         | VDE 0884, Surface Mount, Tape & Reel |

**QT Carrier Tape Specifications ("D" Taping Orientation) (Black Package, No Suffix)**



**QT Carrier Tape Specifications ("D" Taping Orientation) (White Package, -m Suffix)**



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**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

**MCT210**  
**MCT2202**

**MCT271**

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.