

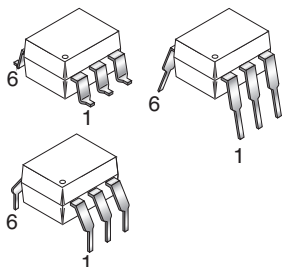
**MCT2  
MCT2200**

**MCT2E  
MCT2201**

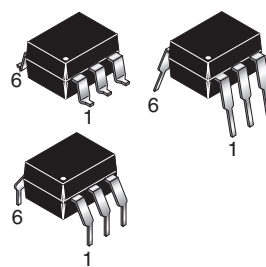
**MCT210  
MCT2202**

**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.

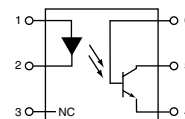
## FEATURES

- 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  
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**MCT271**

## ABSOLUTE MAXIMUM RATINGS

| Parameter                                                 | Symbol    | Device | Value          | Units |
|-----------------------------------------------------------|-----------|--------|----------------|-------|
| <b>TOTAL DEVICE</b><br>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 $25^\circ\text{C}$                           |           | -M     | 2.94           | mW/°C |
|                                                           |           | Non-M  | 3.3            |       |
| <b>EMITTER</b><br>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 $25^\circ\text{C}$                           |           | -M     | 1.41           | mW/°C |
|                                                           |           | Non-M  | 2.0            |       |
| <b>DETECTOR</b><br>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 $25^\circ\text{C}$                           |           | -M     | 1.76           | mW/°C |
|                                                           |           | Non-M  | 2.0            |       |

**MCT2**  
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**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 <sub>F</sub> = 20 mA)                          | V <sub>F</sub>    | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 |     | 1.25  | 1.50 | V    |
|                                     | (T <sub>A</sub> = 0-70°C, I <sub>F</sub> = 40 mA) |                   | MCT210                                                         |     | 1.33  |      |      |
| Reverse Leakage Current             | (V <sub>R</sub> = 3.0 V)                          | I <sub>R</sub>    | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 |     | 0.001 | 10   | μA   |
|                                     | (T <sub>A</sub> = 0-70°C, V <sub>R</sub> = 6.0 V) |                   | MCT210                                                         |     |       |      |      |
| <b>DETECTOR</b>                     |                                                   |                   |                                                                |     |       |      |      |
| Collector-Emitter Breakdown Voltage | (I <sub>C</sub> = 1.0 mA, I <sub>F</sub> = 0)     | BV <sub>CEO</sub> | ALL                                                            | 30  | 100   |      | V    |
|                                     | (T <sub>A</sub> = 0-70°C)                         |                   | MCT210                                                         |     |       |      |      |
| Collector-Base Breakdown Voltage    | (I <sub>C</sub> = 10 μA, I <sub>F</sub> = 0)      | BV <sub>CBO</sub> | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 | 70  | 120   |      | V    |
|                                     | (T <sub>A</sub> = 0-70°C)                         |                   | MCT210                                                         | 30  |       |      |      |
| Emitter-Collector Breakdown Voltage | (I <sub>E</sub> = 100 μA, I <sub>F</sub> = 0)     | BV <sub>ECO</sub> | MCT2/-M<br>MCT2E/-M<br>MCT271<br>MCT2200<br>MCT2201<br>MCT2202 | 7   | 10    |      | V    |
|                                     | (T <sub>A</sub> = 0-70°C)                         |                   | MCT210                                                         | 6   | 10    |      |      |
| Collector-Emitter Dark Current      | (V <sub>CE</sub> = 10 V, I <sub>F</sub> = 0)      | I <sub>CEO</sub>  | ALL                                                            |     | 1     | 50   | nA   |
|                                     | (V <sub>CE</sub> = 5 V, T <sub>A</sub> = 0-70°C)  |                   |                                                                |     |       | 30   | μA   |
| Collector-Base Dark Current         | (V <sub>CB</sub> = 10 V, I <sub>F</sub> = 0)      | I <sub>CBO</sub>  | ALL                                                            |     |       | 20   | nA   |
| Capacitance                         | (V <sub>CE</sub> = 0 V, f = 1 MHz)                | C <sub>CE</sub>   | ALL                                                            |     | 8     |      | pF   |

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

**MCT2**  
**MCT2200**

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**MCT271**

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

| DC Characteristic                                                                        | Test Conditions                                                                                               | Symbol                | Device                                       | Min | Typ** | Max | Unit |
|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------|-----|-------|-----|------|
| Output Collector Current                                                                 | (T <sub>A</sub> = 0-70°C)                                                                                     | CTR                   | MCT210                                       | 150 |       |     | %    |
|                                                                                          | (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5 V)                                                               |                       | MCT2200                                      | 20  |       |     |      |
|                                                                                          |                                                                                                               |                       | MCT2201                                      | 100 |       |     |      |
|                                                                                          |                                                                                                               |                       | MCT2202                                      | 63  |       | 125 |      |
|                                                                                          | (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V)                                                              |                       | MCT2<br>MCT2-M<br>MCT2E<br>MCT2E-M           | 20  |       |     |      |
|                                                                                          |                                                                                                               |                       | MCT271                                       | 45  |       | 90  |      |
| (I <sub>F</sub> = 3.2 mA to 32 mA, V <sub>CE</sub> = 0.4 V)<br>(T <sub>A</sub> = 0-70°C) | MCT210                                                                                                        | 50                    |                                              |     |       |     |      |
| Collector-Emitter Saturation Voltage                                                     | (I <sub>C</sub> = 2 mA, I <sub>F</sub> = 16 mA)                                                               | V <sub>CE (SAT)</sub> | MCT2<br>MCT2-M<br>MCT2E<br>MCT2E-M<br>MCT271 |     |       | 0.4 | V    |
|                                                                                          | MCT210                                                                                                        |                       |                                              |     |       |     |      |
|                                                                                          | MCT2200<br>MCT2201<br>MCT2202                                                                                 |                       |                                              |     |       |     |      |
| AC Characteristic Saturated Turn-on Time from 5 V to 0.8 V                               | (I <sub>F</sub> = 15 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 2 kΩ)<br>(R <sub>B</sub> = Open) (Fig. 20)   | t <sub>on</sub>       | MCT2                                         |     | 1.1   |     | μs   |
|                                                                                          | (I <sub>F</sub> = 20 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 2 kΩ)<br>(R <sub>B</sub> = 100 kΩ) (Fig. 20) |                       | MCT2E                                        |     | 1.1   |     |      |
|                                                                                          |                                                                                                               |                       | MCT2                                         |     | 1.3   |     |      |
|                                                                                          | MCT2E                                                                                                         |                       |                                              | 1.3 |       |     |      |
| Saturated Turn-off Time from SAT to 2.0 V                                                | (I <sub>F</sub> = 15 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 2 kΩ)<br>(R <sub>B</sub> = Open) (Fig. 20)   | t <sub>off</sub>      | MCT2                                         |     | 50    |     |      |
|                                                                                          |                                                                                                               |                       | MCT2E                                        |     | 50    |     |      |
|                                                                                          | (I <sub>F</sub> = 20 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 2 kΩ)<br>(R <sub>B</sub> = 100 kΩ) (Fig. 20) |                       | MCT2                                         |     | 20    |     |      |
|                                                                                          |                                                                                                               |                       | MCT2E                                        |     | 20    |     |      |
| Turn-on Time                                                                             | (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω)                                      | t <sub>on</sub>       | MCT2-M<br>MCT2E-M                            |     | 2     |     |      |
| Turn-off Time                                                                            | (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω)                                      | t <sub>off</sub>      | MCT2-M<br>MCT2E-M                            |     | 2     |     |      |
| Rise Time                                                                                | (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω)                                      | t <sub>r</sub>        | MCT2-M<br>MCT2E-M                            |     | 2     |     |      |
| Fall Time                                                                                | (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω)                                      | t <sub>f</sub>        | MCT2-M<br>MCT2E-M                            |     | 1.5   |     |      |

\*\* 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                                                      | $(I_F = 16 \text{ mA}, R_L = 1.9\text{k}\Omega, V_{CC} = 5 \text{ V})$<br>(Fig. 20) | $t_{on}$              | MCT271                        |     | 1.0   |     | $\mu\text{s}$ |
| Saturated turn-off time<br>(Approximates a typical TTL interface)           |                                                                                     | $t_{off}$             |                               |     | 48    |     |               |
| Saturated turn-on time                                                      | $(I_F = 16 \text{ mA}, R_L = 4.7\text{k}\Omega, V_{CC} = 5 \text{ V})$<br>(Fig. 20) | $t_{on}$              |                               |     | 1.0   |     |               |
| Saturated turn-off time<br>(Approximates a typical low power TTL interface) |                                                                                     | $t_{off}$             |                               |     | 98    |     |               |
| Saturated rise time                                                         | $(I_F = 16 \text{ mA}, R_L = 560\Omega, V_{CC} = 5 \text{ V})$<br>(Fig. 20, 21)     | $t_r$                 | MCT210                        |     | 1.0   |     |               |
| Saturated fall time                                                         |                                                                                     | $t_f$                 |                               |     | 11    |     |               |
| Saturated propagation delay - high to low                                   | $(I_F = 16 \text{ mA}, R_L = 2.7\text{k}\Omega)$ (Fig. 20, 21)                      | $T_{PD} \text{ (HL)}$ |                               |     | 1.0   |     |               |
| Saturated propagation delay - low to high                                   |                                                                                     | $T_{PD} \text{ (LH)}$ |                               |     | 50    |     |               |
| Non-saturated turn on time                                                  | $(I_C = 2 \text{ mA}, V_{CC} = 10 \text{ V}, R_L = 100\Omega)$<br>(Fig. 20)         | $T_{ON}$              | MCT2200<br>MCT2201<br>MCT2202 |     | 2     | 10  |               |
| Non-saturated turn off time                                                 |                                                                                     | $T_{OFF}$             |                               |     | 2     | 10  |               |
| Non-saturated rise time                                                     | $(I_C = 2 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 100\Omega)$<br>(Fig. 20)          | $t_r$                 | MCT210                        |     | 2     |     |               |
| Non-saturated fall time                                                     |                                                                                     | $t_f$                 |                               |     | 2     |     |               |
| Non-saturated turn-on time                                                  | $(I_C = 2 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 100\Omega)$<br>(Fig. 20)          | $t_{on}$              | MCT271                        |     | 2     | 7   |               |
| Non-saturated turn-off time                                                 |                                                                                     | $t_{off}$             |                               |     | 2     | 7   |               |

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

**ISOLATION CHARACTERISTICS**

| Characteristic                 | Test Conditions                                                      | Symbol    | Min       | Typ* | Max | Units    |
|--------------------------------|----------------------------------------------------------------------|-----------|-----------|------|-----|----------|
| Input-Output Isolation Voltage | (Non '-M', Black Package) ( $f = 60 \text{ Hz}, t = 1 \text{ min}$ ) | $V_{ISO}$ | 5300      |      |     | Vac(rms) |
|                                | ('M', White Package) ( $f = 60 \text{ Hz}, t = 1 \text{ sec}$ )      |           | 7500      |      |     | Vac(pk)  |
| Isolation Resistance           | $(V_{I-O} = 500 \text{ VDC})$                                        | $R_{ISO}$ | $10^{11}$ |      |     | $\Omega$ |
| Isolation Capacitance          | $(V_{I-O} = \&, f = 1 \text{ MHz})$                                  | $C_{ISO}$ |           | 0.5  |     | pF       |
|                                | ('M' White Package)                                                  |           |           | 0.2  | 2   | pF       |

Note

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

**MCT2  
MCT2200**

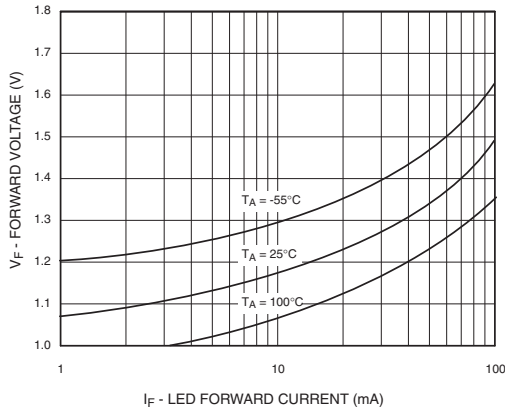
**MCT2E  
MCT2201**

**MCT210  
MCT2202**

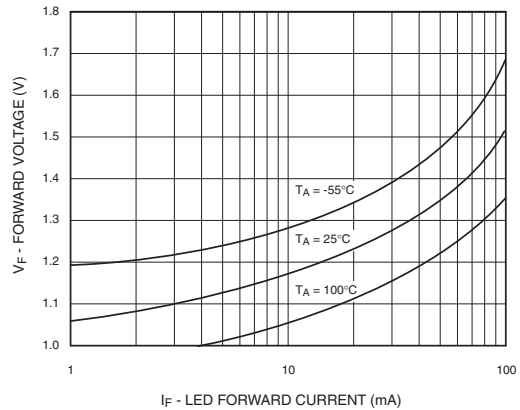
**MCT271**

**TYPICAL PERFORMANCE CURVES**

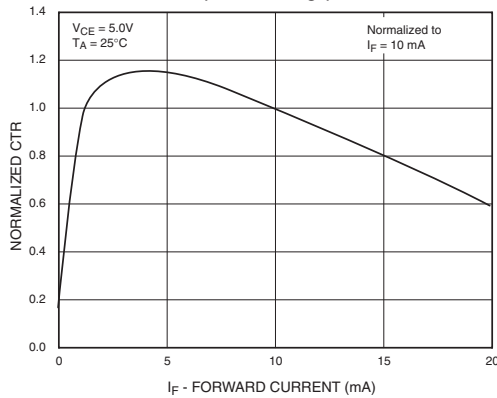
**Fig. 1 LED Forward Voltage vs. Forward Current  
(Black Package)**



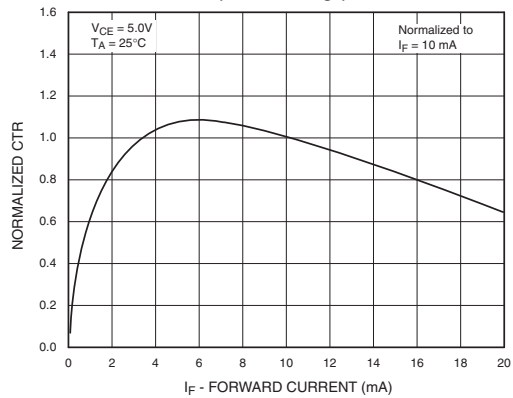
**Fig. 2 LED Forward Voltage vs. Forward Current  
(White Package)**



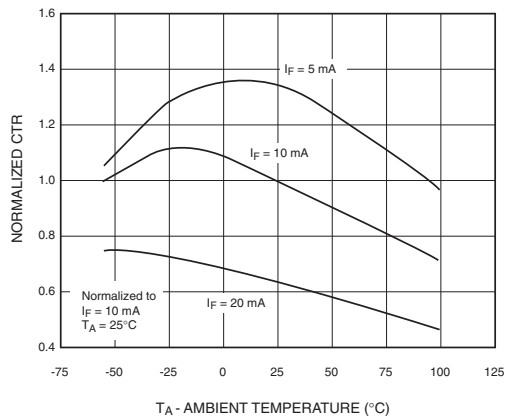
**Fig.3 Normalized CTR vs. Forward Current  
(Black Package)**



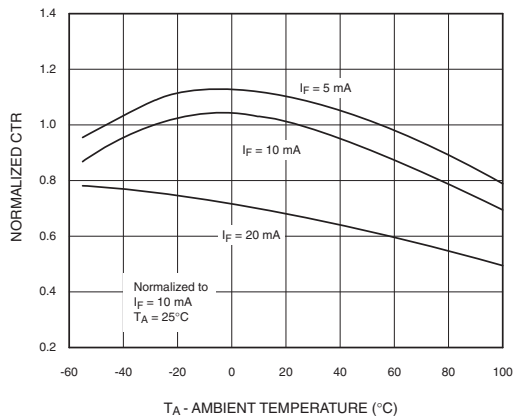
**Fig.4 Normalized CTR vs. Forward Current  
(White Package)**



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



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



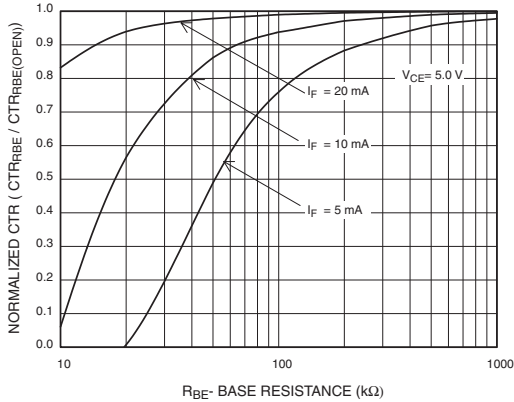
**MCT2  
MCT2200**

**MCT2E  
MCT2201**

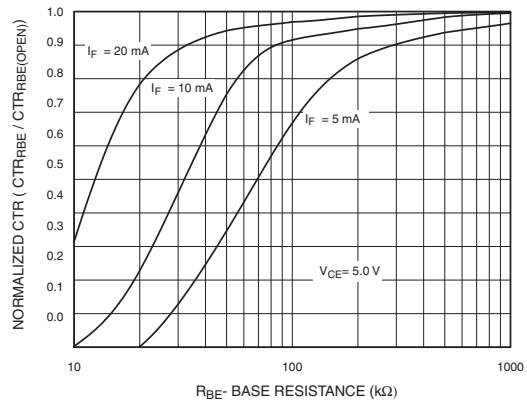
**MCT210  
MCT2202**

**MCT271**

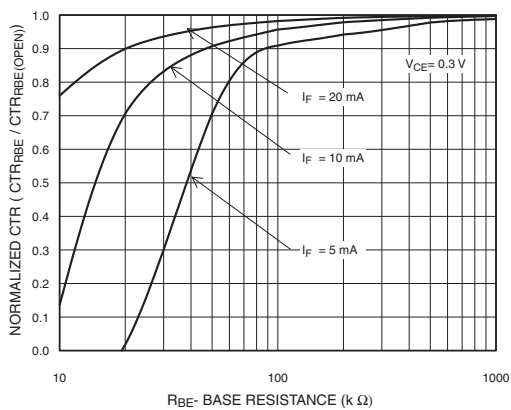
**Fig. 7 CTR vs. RBE (Unsaturated)  
(Black Package)**



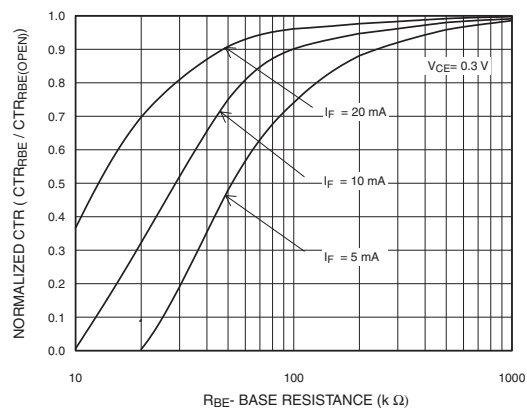
**Fig. 8 CTR vs. RBE (Unsaturated)  
(White Package)**



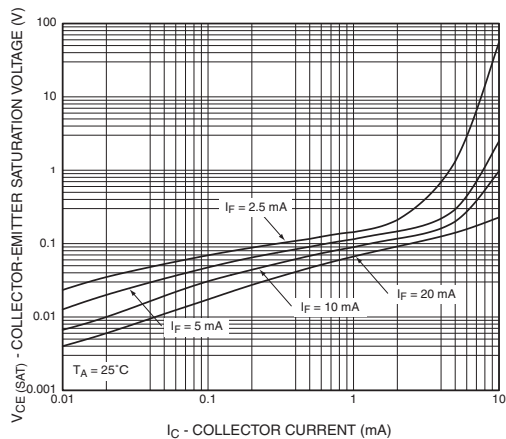
**Fig. 9 CTR vs. RBE (Saturated)  
(Black Package)**



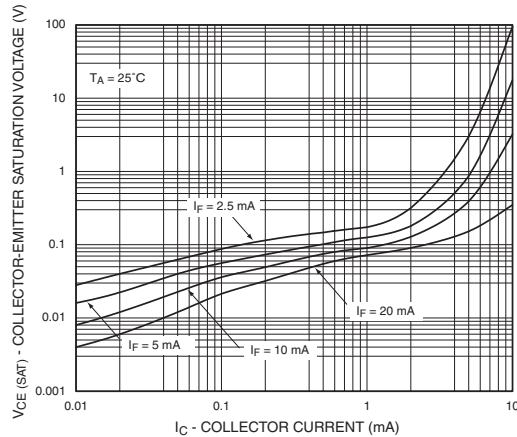
**Fig. 10 CTR vs. RBE (Saturated)  
(White Package)**



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



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



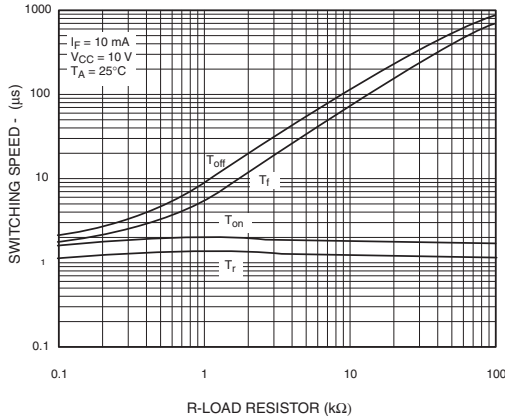
**MCT2  
MCT2200**

**MCT2E  
MCT2201**

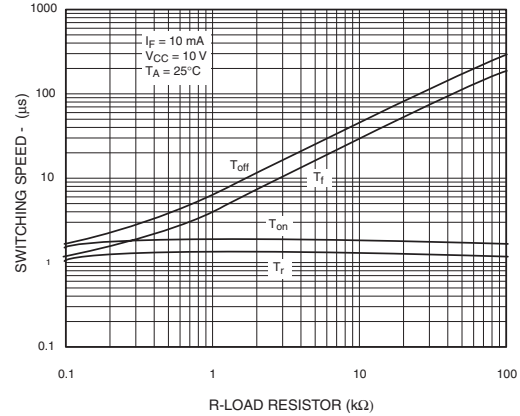
**MCT210  
MCT2202**

**MCT271**

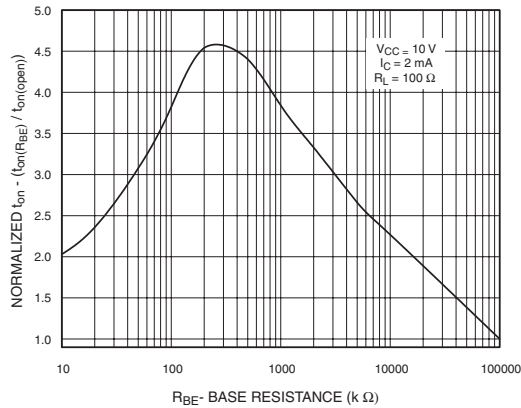
**Fig. 13 Switching Speed vs. Load Resistor  
(Black Package)**



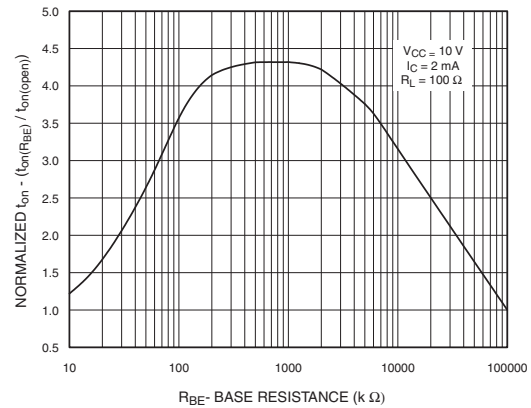
**Fig. 14 Switching Speed vs. Load Resistor  
(White Package)**



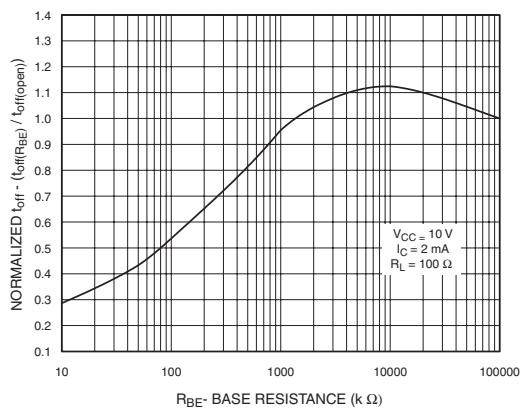
**Fig. 15 Normalized  $t_{on}$  vs.  $R_{BE}$   
(Black Package)**



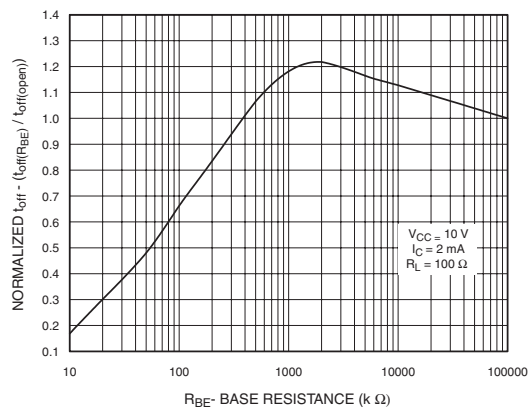
**Fig. 16 Normalized  $t_{on}$  vs.  $R_{BE}$   
(White Package)**



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



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



**MCT2  
MCT2200**

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MCT2201**

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**MCT271**

Fig. 19 Dark Current vs. Ambient Temperature

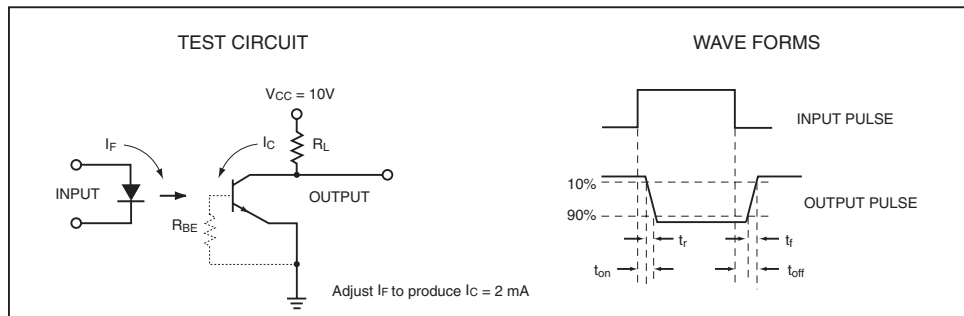
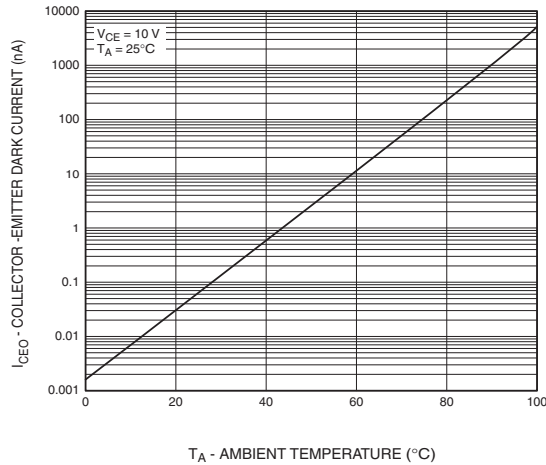


Figure 20. Switching Time Test Circuit and Waveforms

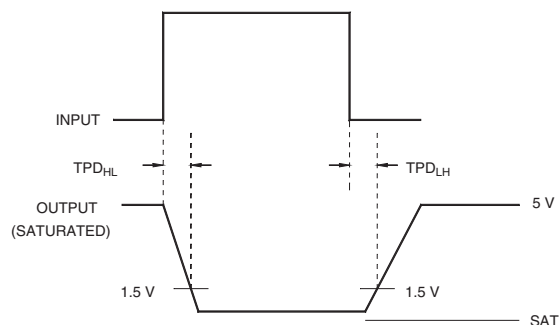


Figure 21. Switching Time Waveforms (MCT210)

**MCT2  
MCT2200**

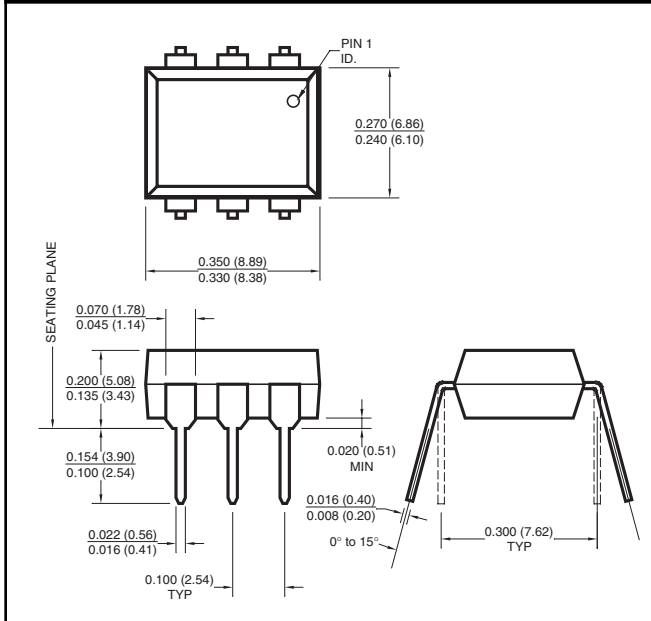
**MCT2E  
MCT2201**

**MCT210  
MCT2202**

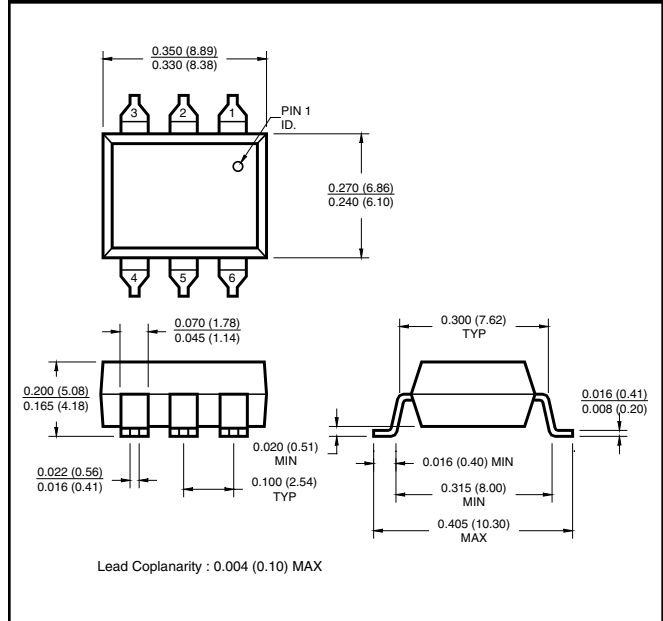
**MCT271**

## Black Package (No -M Suffix)

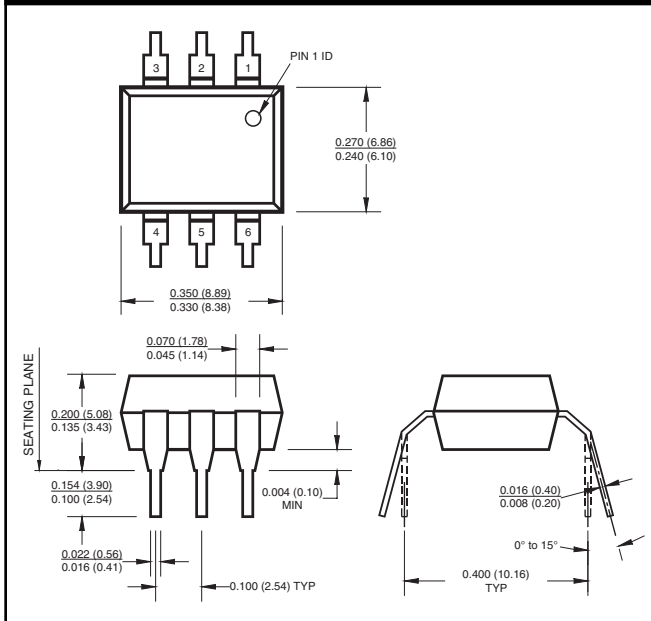
### Package Dimensions (Through Hole)



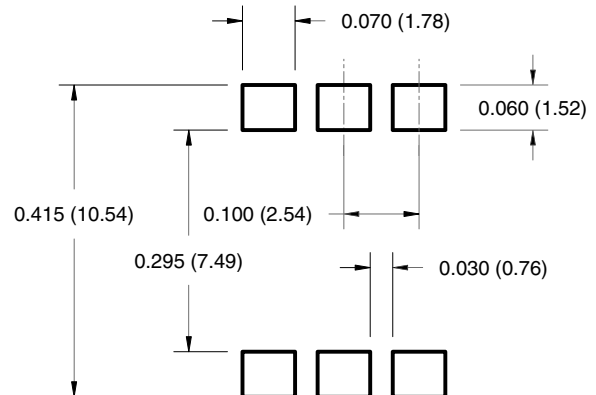
### Package Dimensions (Surface Mount)



### Package Dimensions (0.4" Lead Spacing)



### Recommended Pad Layout for Surface Mount Leadform



#### NOTE

All dimensions are in inches (millimeters)

**MCT2  
MCT2200**

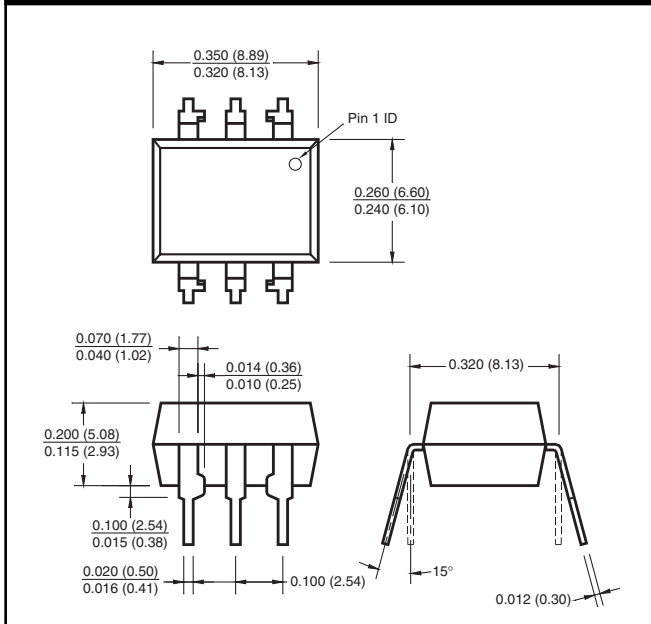
**MCT2E  
MCT2201**

**MCT210  
MCT2202**

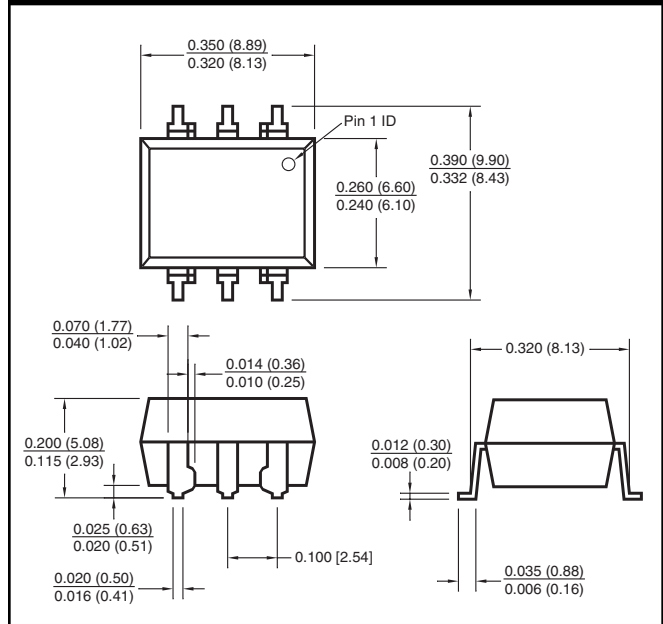
**MCT271**

**White Package (-M Suffix)**

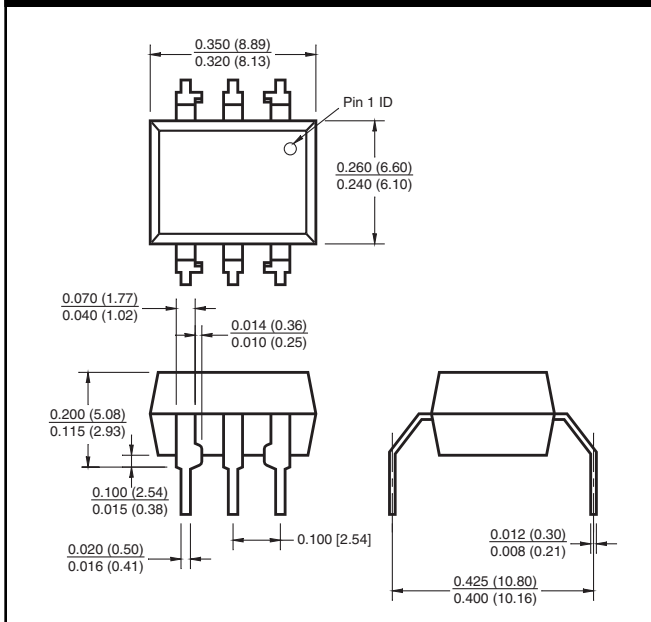
**Package Dimensions (Through Hole)**



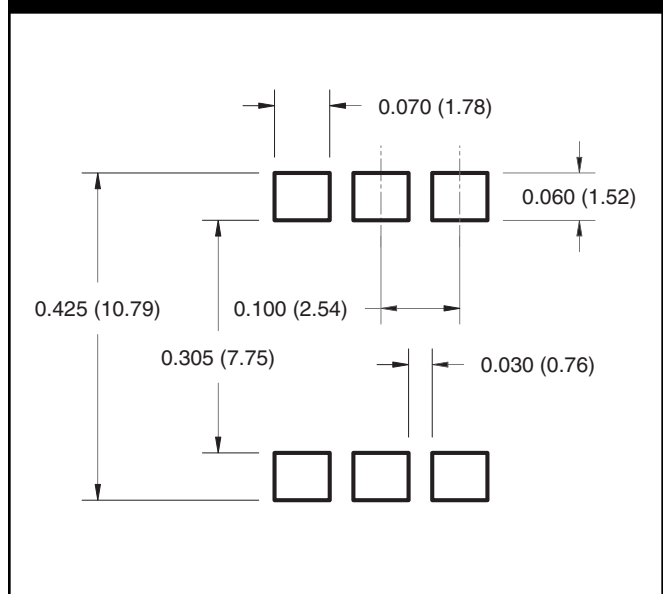
**Package Dimensions (Surface Mount)**



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



**Recommended Pad Layout for Surface Mount Leadform**



**NOTE**

All dimensions are in inches (millimeters)

**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

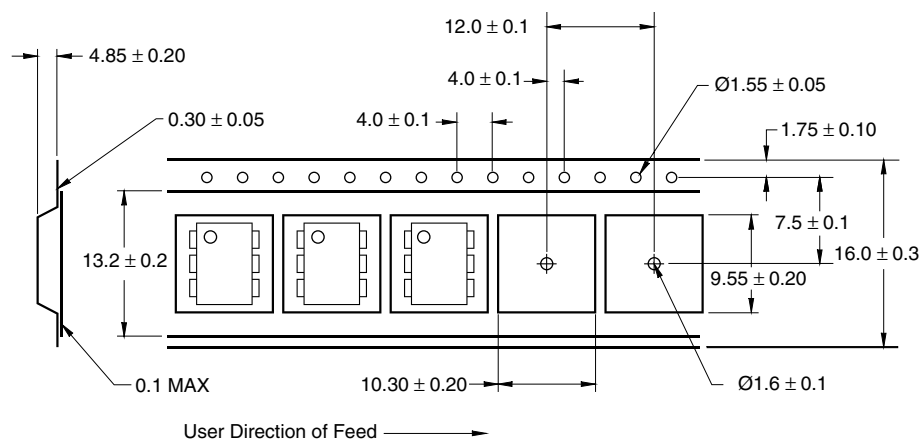
**MCT210**  
**MCT2202**

**MCT271**

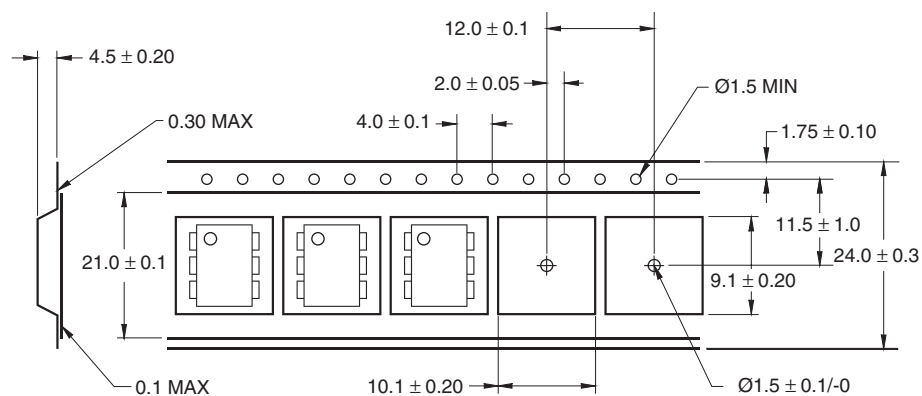
## ORDERING INFORMATION

| Order Entry Identifier    |                           |                                      |
|---------------------------|---------------------------|--------------------------------------|
| Black Package (No Suffix) | White Package (-M Suffix) | Description                          |
| .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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