

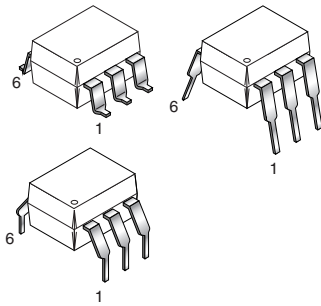
MCT2
MCT2200

MCT2E
MCT2201

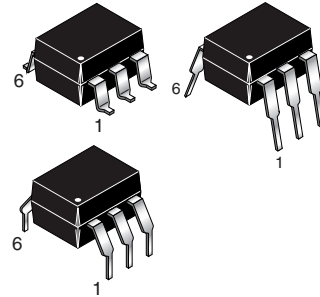
MCT210
MCT2202

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.

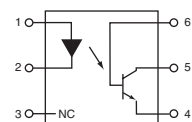
FEATURES

- 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

| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---------------|---------------|----------------|--------------|
| Parameter | Symbol | Device | Value | Units |
| TOTAL DEVICE | | | | |
| 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 | |
| EMITTER | | | | |
| 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 | |
| DETECTOR | | | | |
| 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 |
|-------------------------------------|--|------------|--|-----|-------|------|---------------|
| EMITTER | | | | | | | |
| Input Forward Voltage | $(I_F = 20 \text{ mA})$ | V_F | MCT2/-M MCT2E/-M MCT271 MCT2200 MCT2201 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 MCT2E/-M MCT271 MCT2200 MCT2201 MCT2202 | | 0.001 | 10 | μA |
| | $(T_A = 0-70^\circ\text{C}, V_R = 6.0 \text{ V})$ | | MCT210 | | | | |
| DETECTOR | | | | | | | |
| 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 MCT2E/-M MCT271 MCT2200 MCT2201 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 MCT2E/-M MCT271 MCT2200 MCT2201 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 | μA |
| 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

| TRANSFER CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.) | | | | | | | | |
|---|---|---------------|---------|-----|-------|-----|---------------|--|
| DC Characteristic | Test Conditions | Symbol | Device | Min | Typ** | Max | Unit | |
| Output Collector Current | $(T_A = 0-70^\circ\text{C})$ $(I_F = 10\text{ mA}, V_{CE} = 5\text{ V})$ | 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 | | | | | |
| $(I_F = 3.2\text{ mA to } 32\text{ mA}, V_{CE} = 0.4\text{ V})$ $(T_A = 0-70^\circ\text{C})$ | 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 | | | | | | |
| AC Characteristic Saturated Turn-on Time from 5 V to 0.8 V | $(I_F = 15\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$ $(R_B = \text{Open})$ (Fig. 20) | t_{on} | MCT2 | | 1.1 | | | |
| | | | MCT2E | | 1.1 | | | |
| | $(I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$ $(R_B = 100\text{ k}\Omega)$ (Fig. 20) | | MCT2 | | 1.3 | | | |
| | | | MCT2E | | 1.3 | | | |
| Saturated Turn-off Time from SAT to 2.0 V | $(I_F = 15\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$ $(R_B = \text{Open})$ (Fig. 20) | t_{off} | MCT2 | | 50 | | μs | |
| | | | MCT2E | | 50 | | | |
| | $(I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2\text{ k}\Omega)$ $(R_B = 100\text{ k}\Omega)$ (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 _F = 16 mA, R _L = 1.9kΩ, V _{CC} = 5 V) (Fig. 20) | t _{on} | MCT271 | | 1.0 | | μs |
| Saturated turn-off time (Approximates a typical TTL interface) | | t _{off} | | | 48 | | |
| Saturated turn-on time | (I _F = 16 mA, R _L = 4.7kΩ, V _{CC} = 5 V) (Fig. 20) | t _{on} | | | 1.0 | | |
| Saturated turn-off time (Approximates a typical low power TTL interface) | | t _{off} | | | 98 | | |
| Saturated rise time | (I _F = 16 mA, R _L = 560Ω, V _{CC} = 5 V) (Fig. 20, 21) | t _r | MCT210 | | 1.0 | | |
| Saturated fall time | | t _f | | | 11 | | |
| Saturated propagation delay - high to low | (I _F = 16 mA, R _L = 2.7kΩ) (Fig. 20, 21) | T _{PD (HL)} | | | 1.0 | | |
| Saturated propagation delay - low to high | | T _{PD (LH)} | | | 50 | | |
| Non-saturated turn on time | (I _C = 2 mA, V _{CC} = 10 V, R _L = 100Ω) (Fig. 20) | T _{ON} | MCT2200 | | 2 | 10 | |
| Non-saturated turn off time | | T _{OFF} | MCT2201 MCT2202 | | 2 | 10 | |
| Non-saturated rise time | (I _C = 2 mA, V _{CC} = 5 V, R _L = 100Ω) (Fig. 20) | t _r | MCT210 | | 2 | | |
| Non-saturated fall time | | t _f | | | 2 | | |
| Non-saturated turn-on time | (I _C = 2 mA, V _{CC} = 5 V, R _L = 100Ω) (Fig. 20) | t _{on} | MCT271 | | 2 | 7 | |
| Non-saturated turn-off time | | t _{off} | | | 2 | 7 | |

** Typical values at T_A = 25°C

MCT2
MCT2200

MCT2E
MCT2201

MCT210
MCT2202

MCT271

TYPICAL PERFORMANCE CURVES

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

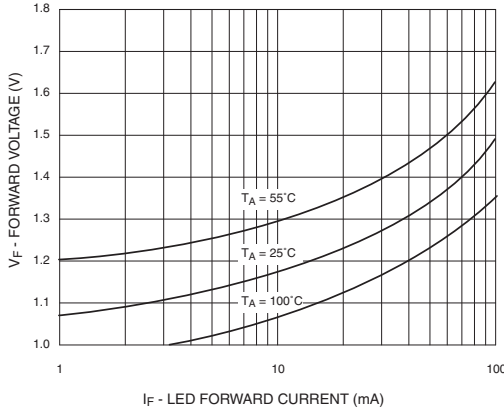


Fig. 2 LED Forward Voltage vs. Forward Current (White Package)

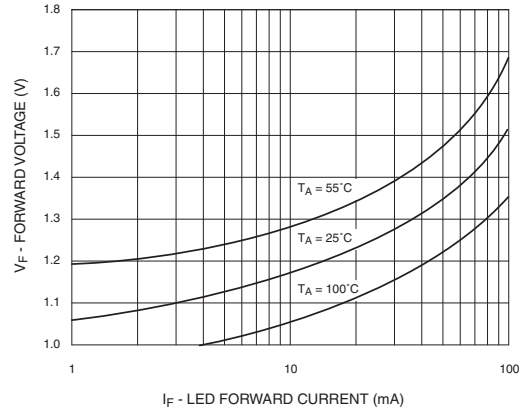


Fig.3 Normalized CTR vs. Forward Current (Black Package)

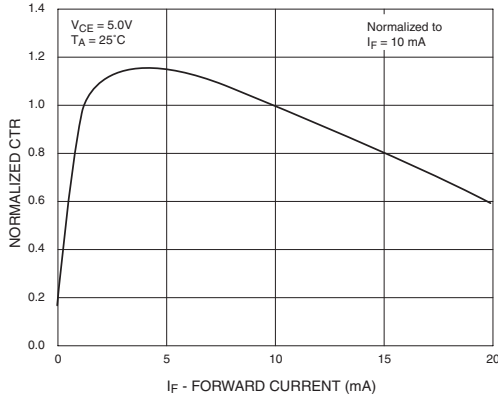


Fig.4 Normalized CTR vs. Forward Current (White Package)

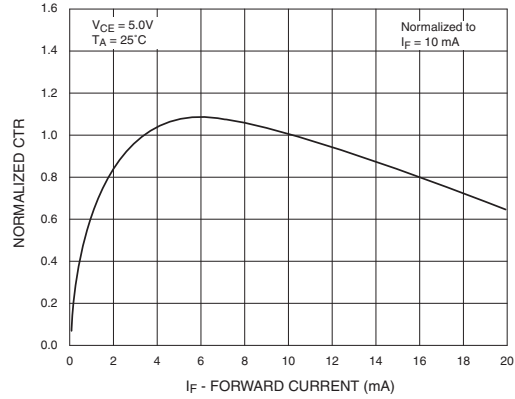


Fig. 5 Normalized CTR vs. Ambient Temperature (Black Package)

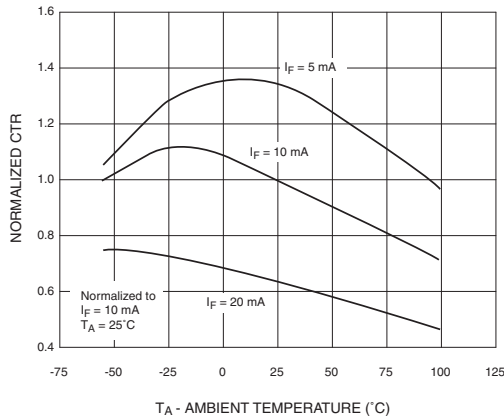
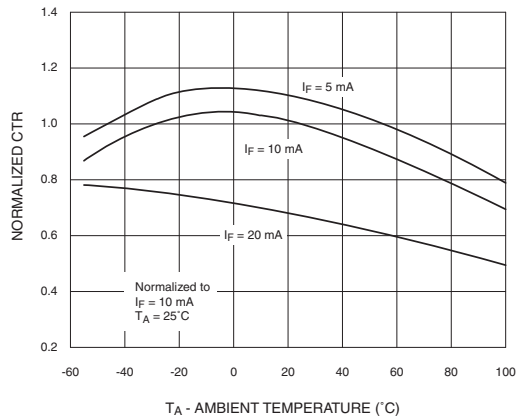


Fig. 6 Normalized CTR vs. Ambient Temperature (White Package)



MCT2
MCT2200

MCT2E
MCT2201

MCT210
MCT2202

MCT271

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

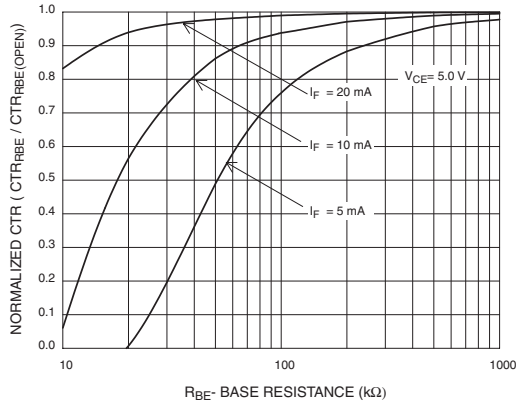


Fig. 8 CTR vs. RBE (Unsaturated)
(White Package)

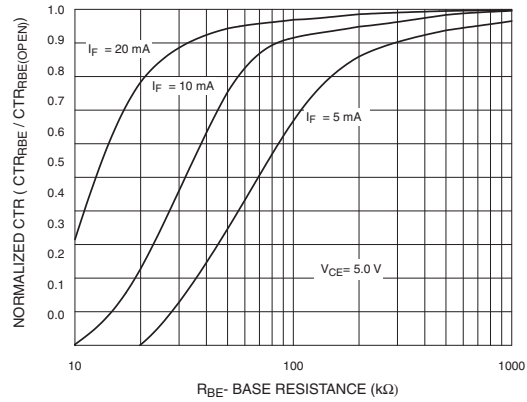


Fig. 9 CTR vs. RBE (Saturated)
(Black Package)

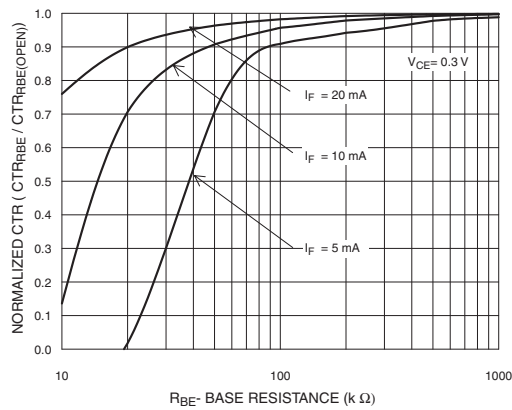


Fig. 10 CTR vs. RBE (Saturated)
(White Package)

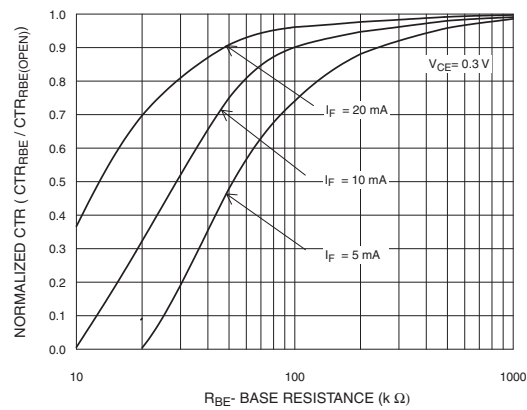


Fig. 11 Collector-Emitter Saturation Voltage vs. Collector Current
(Black Package)

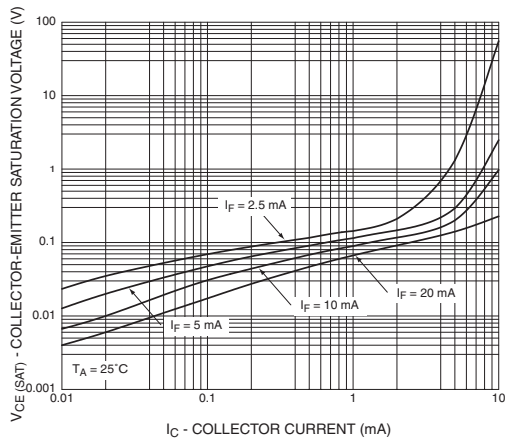
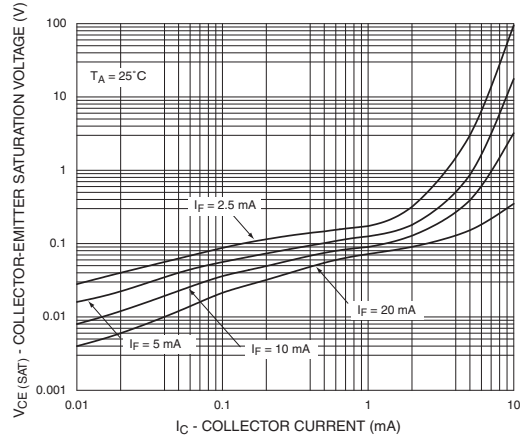


Fig. 12 Collector-Emitter Saturation Voltage vs. Collector Current
(White Package)



MCT2
MCT2200

MCT2E
MCT2201

MCT210
MCT2202

MCT271

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

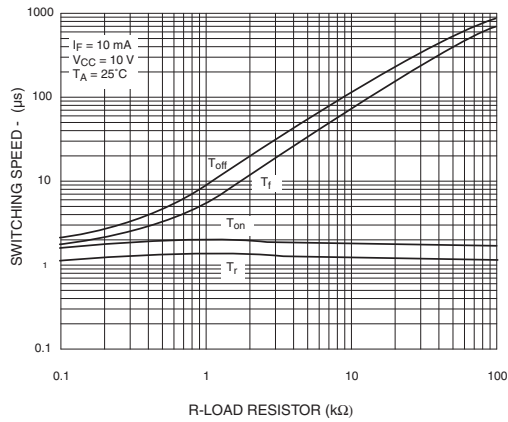


Fig. 14 Switching Speed vs. Load Resistor (White Package)

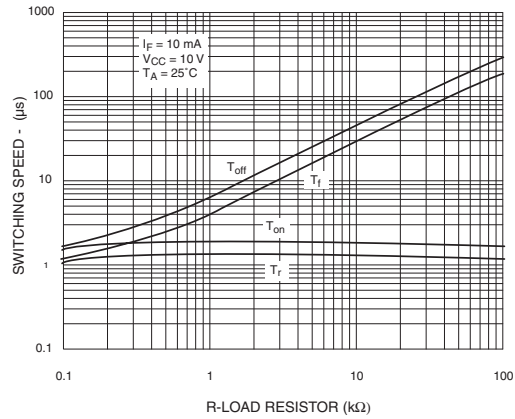


Fig. 15 Normalized t_{on} vs. R_{BE} (Black Package)

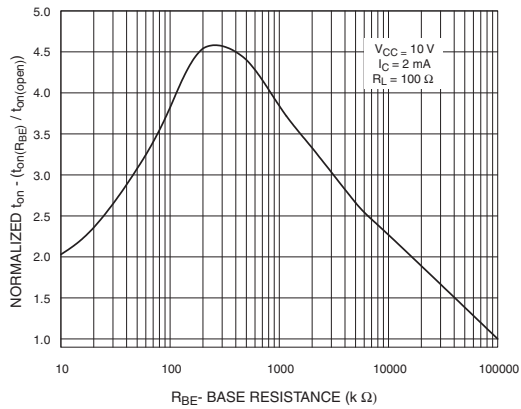


Fig. 16 Normalized t_{on} vs. R_{BE} (White Package)

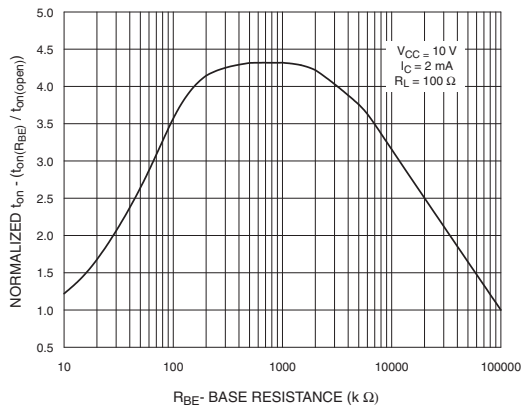


Fig. 17 Normalized t_{off} vs. R_{BE} (Black Package)

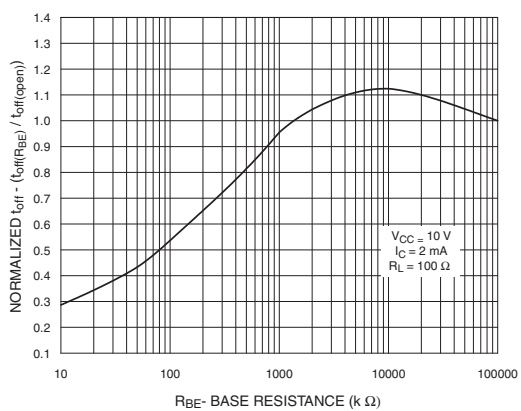
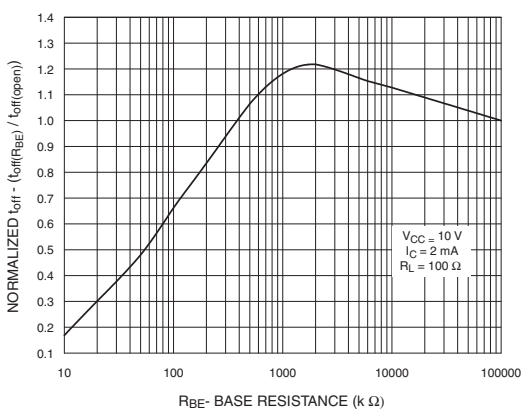


Fig. 18 Normalized t_{off} vs. R_{BE} (White Package)



MCT2
MCT2200

MCT2E
MCT2201

MCT210
MCT2202

MCT271

Fig. 19 Dark Current vs. Ambient Temperature

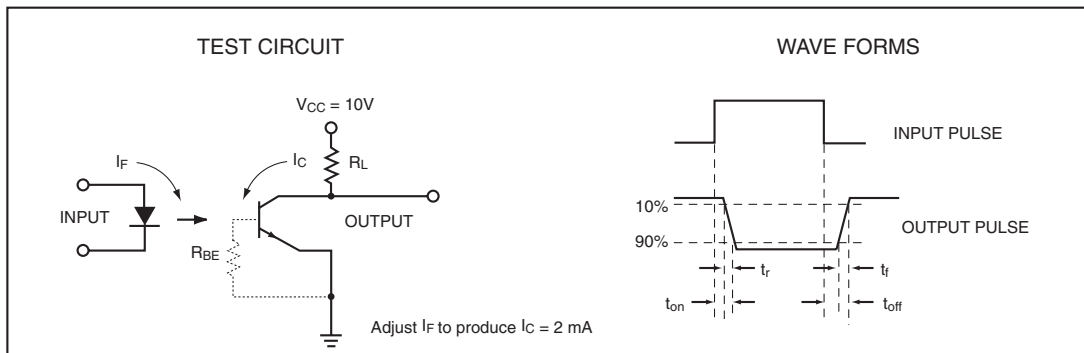
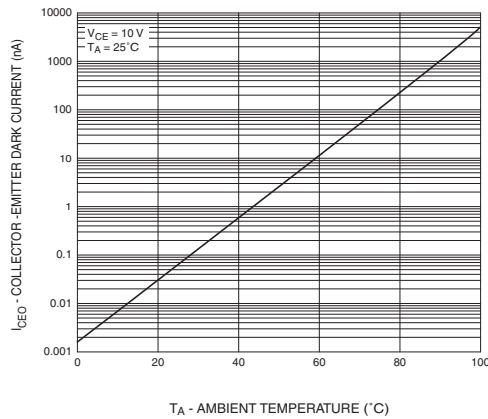


Figure 20. Switching Time Test Circuit and Waveforms

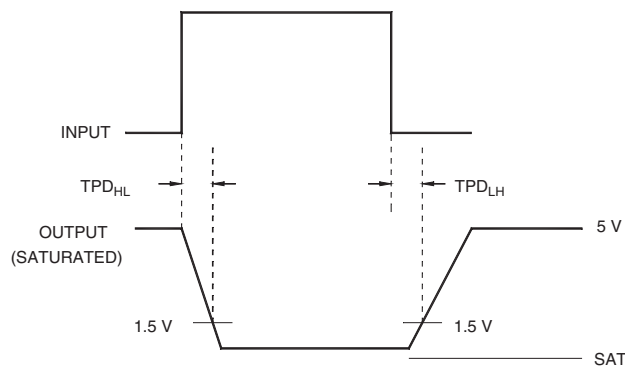


Figure 21. Switching Time Waveforms (MCT210)

MCT2
MCT2200

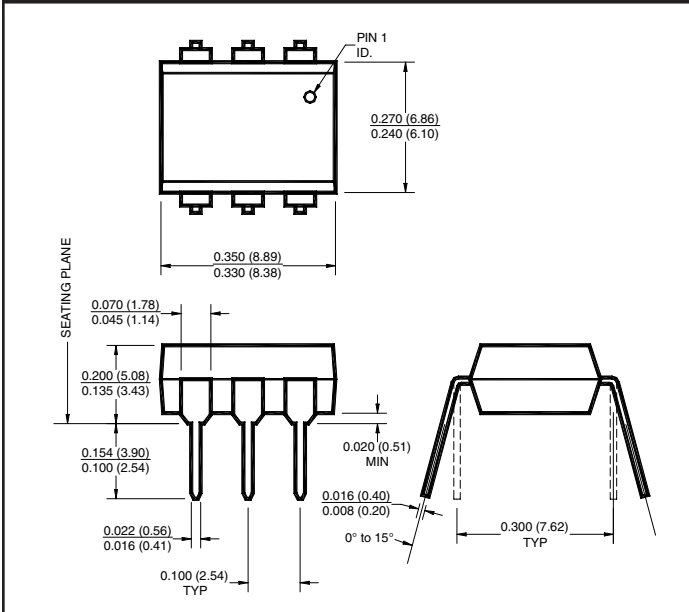
MCT2E
MCT2201

MCT210
MCT2202

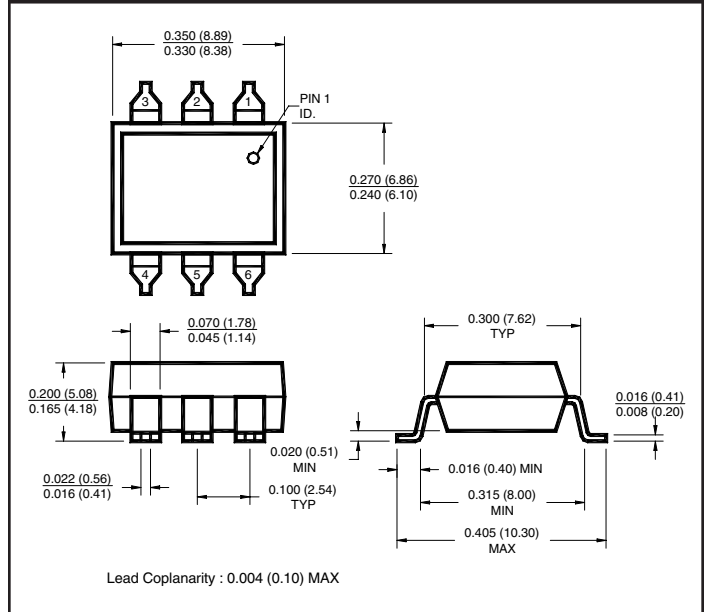
MCT271

Black Package (No -M Suffix)

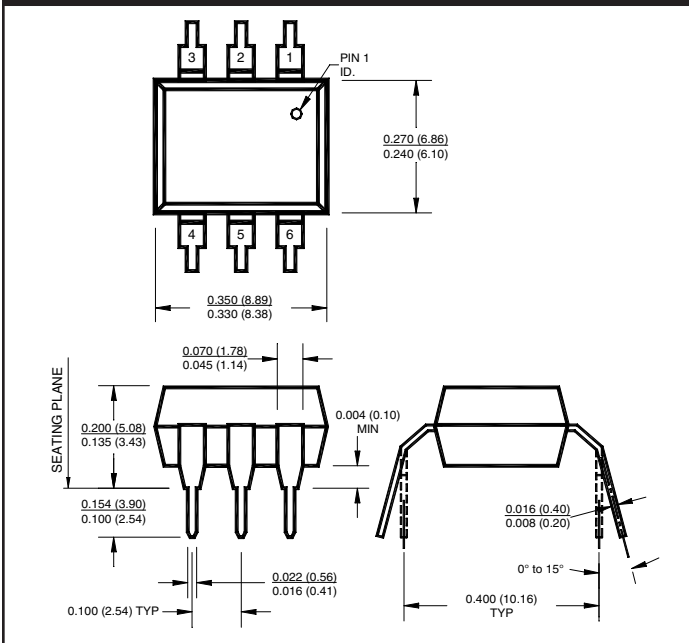
Package Dimensions (Through Hole)



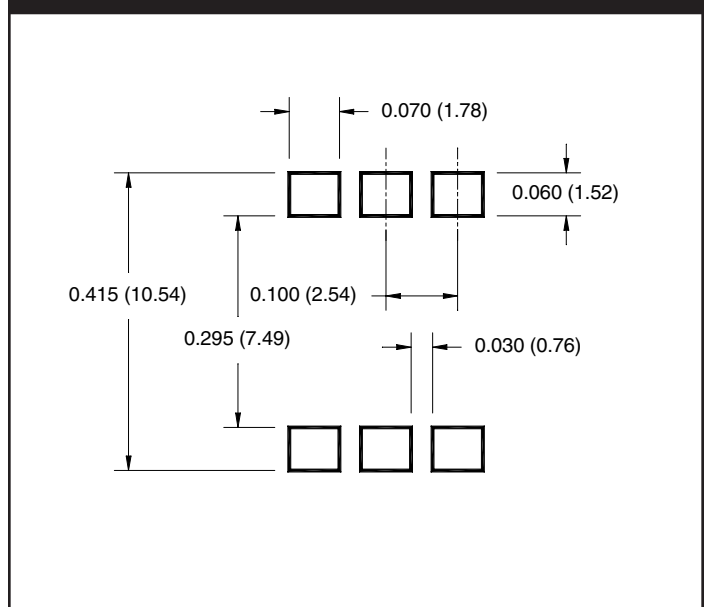
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

All dimensions are in inches (millimeters)

MCT2
MCT2200

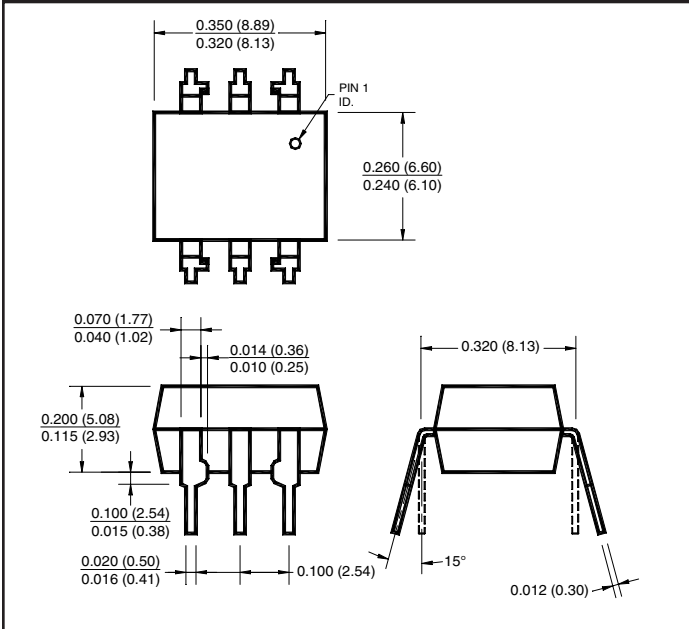
MCT2E
MCT2201

MCT210
MCT2202

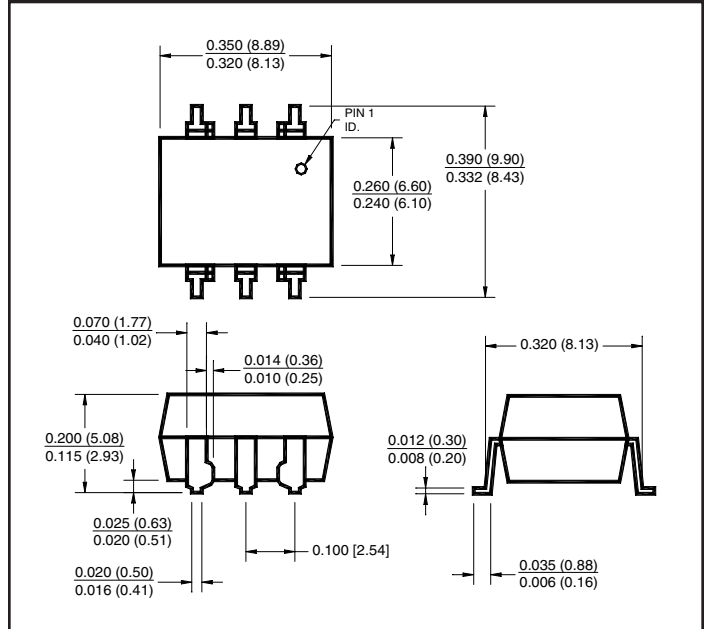
MCT271

White Package (-M Suffix)

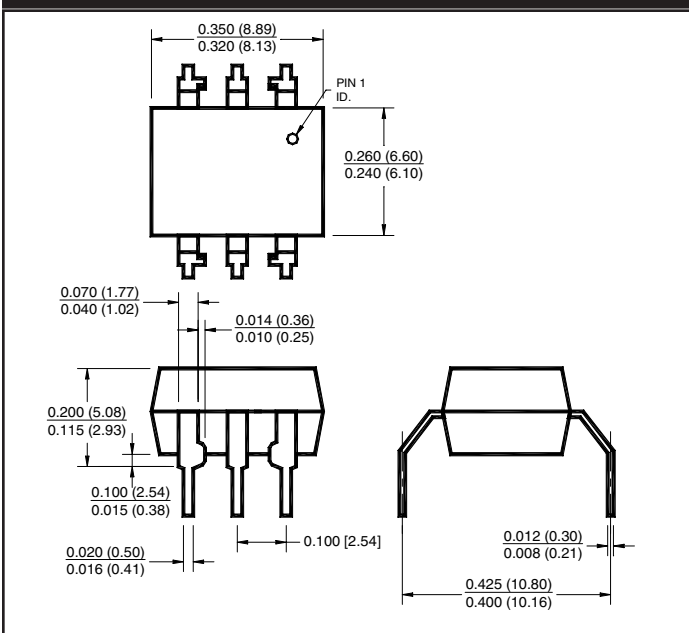
Package Dimensions (Through Hole)



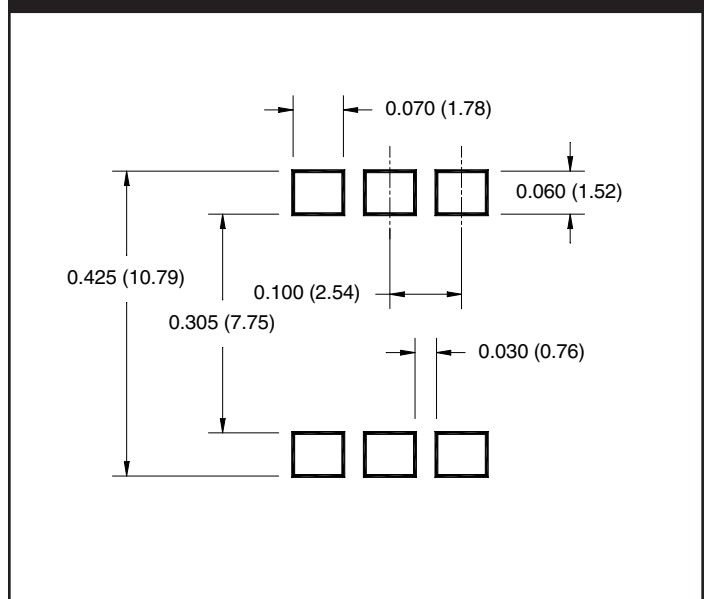
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

All dimensions are in inches (millimeters)

MCT2
MCT2200

MCT2E
MCT2201

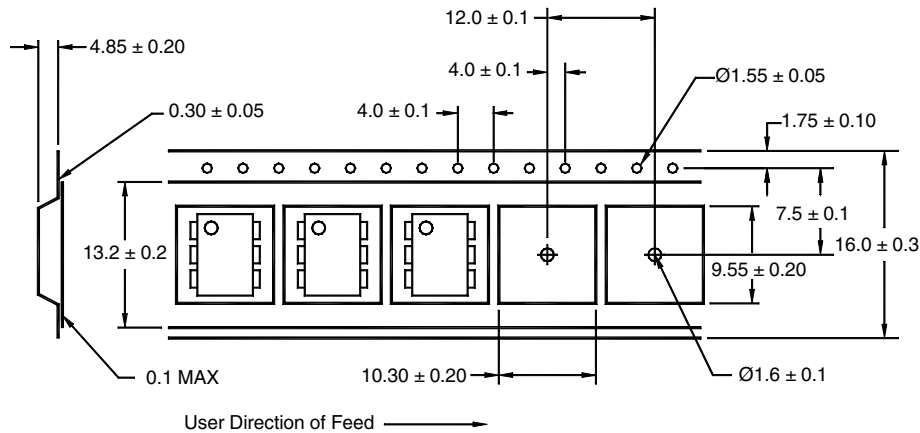
MCT210
MCT2202

MCT271

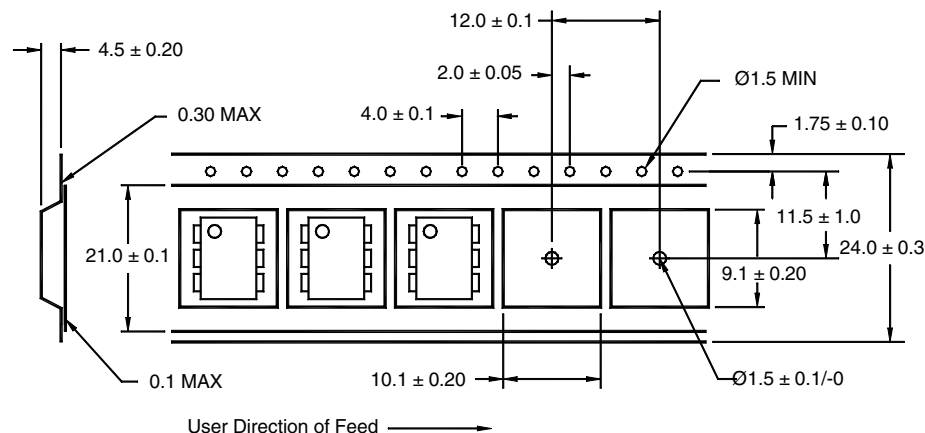
ORDERING INFORMATION

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



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.