



# THE DATASHEET OF MCT2200SD



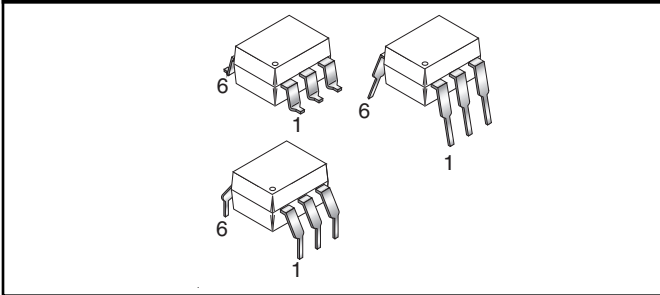
**MCT2  
MCT2200**

**MCT2E  
MCT2201**

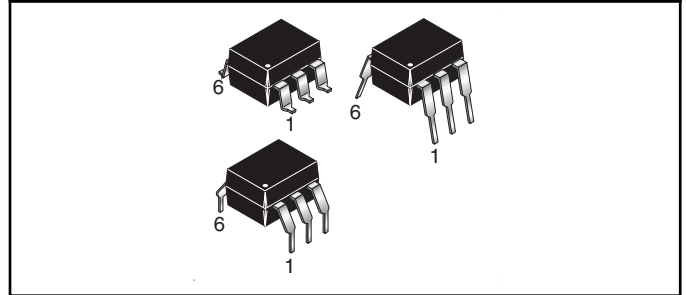
**MCT210  
MCT2202**

**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.

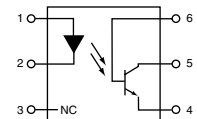
**FEATURES**

- 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	

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**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 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	$\mu\text{A}$
	$(T_A = 0-70^\circ\text{C}, V_R = 6.0 \text{ V})$		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 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	$\mu\text{A}$
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  
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<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	( $T_A = 0\text{-}70^\circ\text{C}$ )	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 MCT2-M MCT2E MCT2E-M	20			
	(I <sub>F</sub> = 3.2 mA to 32 mA, V <sub>CE</sub> = 0.4 V) ( $T_A = 0\text{-}70^\circ\text{C}$ )		MCT210	50			
Collector-Emitter Saturation Voltage	(I <sub>C</sub> = 2 mA, I <sub>F</sub> = 16 mA)	V <sub>CE (SAT)</sub>	MCT2 MCT2-M MCT2E MCT2E-M MCT271			0.4	V
	(I <sub>C</sub> = 16 mA, I <sub>F</sub> = 32 mA, $T_A = 0\text{-}70^\circ\text{C}$ )		MCT210				
	(I <sub>C</sub> = 2.5 mA, I <sub>F</sub> = 10 mA)		MCT2200 MCT2201 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) (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) (R <sub>B</sub> = 100 kΩ) (Fig. 20)		MCT2E		1.1		
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) (R <sub>B</sub> = Open) (Fig. 20)	t <sub>off</sub>	MCT2		50		
	(I <sub>F</sub> = 20 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 2 kΩ) (R <sub>B</sub> = 100 kΩ) (Fig. 20)		MCT2E		50		
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 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 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 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 MCT2E-M		1.5		

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

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<b>TRANSFER CHARACTERISTICS (Cont.)</b>							
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) (Fig. 20)	t <sub>on</sub>	MCT271		1.0		μs
Saturated turn-off time (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) (Fig. 20)	t <sub>on</sub>			1.0		
Saturated turn-off time (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) (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) (Fig. 20)	T <sub>ON</sub>	MCT2200		2	10	
Non-saturated turn off time		T <sub>OFF</sub>	MCT2201 MCT2202		2	10	
Non-saturated rise time	(I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 100Ω) (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) (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

<b>ISOLATION CHARACTERISTICS</b>							
Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units	
Input-Output Isolation Voltage	(Non '-M', Black Package) (f = 60 Hz, t = 1 min)	V <sub>ISO</sub>	5300			Vac(rms)	
	('-M', White Package) (f = 60 Hz, t = 1 sec)		7500			Vac(pk)	
Isolation Resistance	(V <sub>I-O</sub> = 500 VDC)	R <sub>ISO</sub>	10 <sup>11</sup>			Ω	
Isolation Capacitance	(V <sub>I-O</sub> = &, f = 1 MHz)	C <sub>ISO</sub>		0.5		pF	
	('-M' White Package)			0.2	2	pF	

Note

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

**MCT2  
MCT2200**

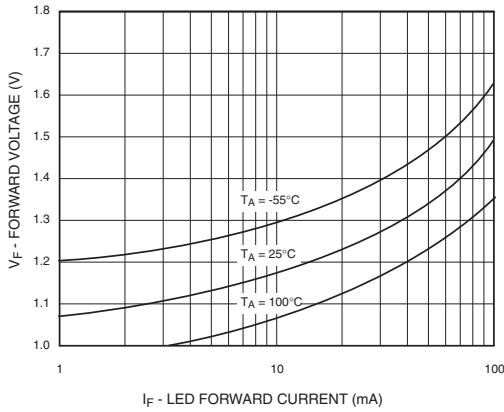
**MCT2E  
MCT2201**

**MCT210  
MCT2202**

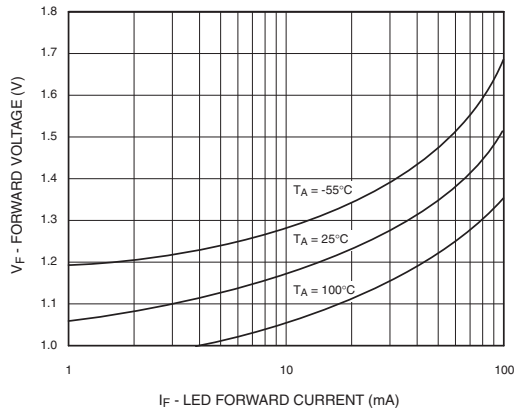
**MCT271**

**TYPICAL PERFORMANCE CURVES**

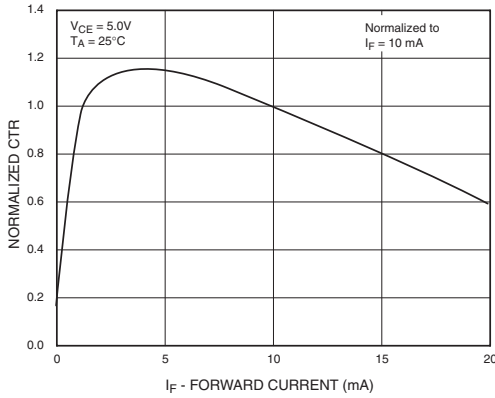
**Fig. 1 LED Forward Voltage vs. Forward Current (Black Package)**



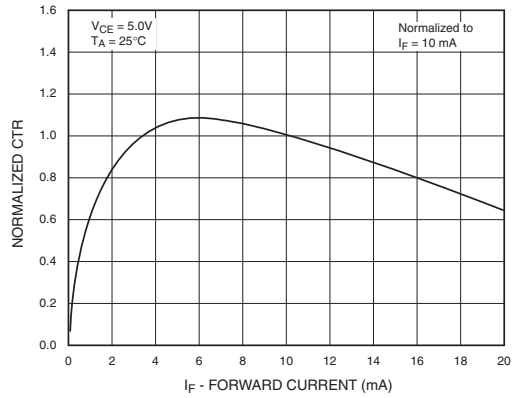
**Fig. 2 LED Forward Voltage vs. Forward Current (White Package)**



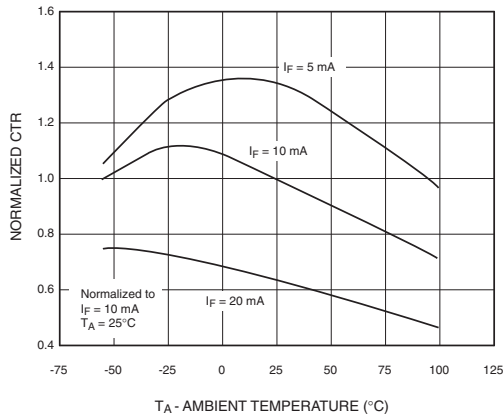
**Fig.3 Normalized CTR vs. Forward Current (Black Package)**



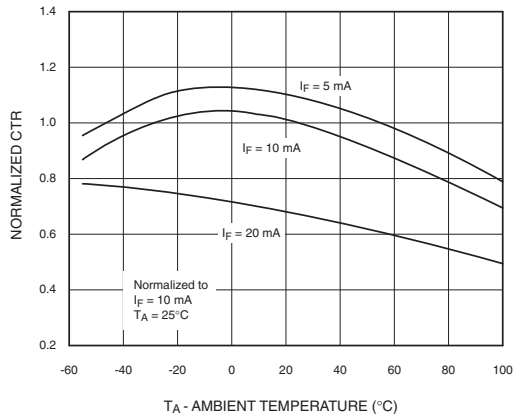
**Fig.4 Normalized CTR vs. Forward Current (White Package)**



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



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



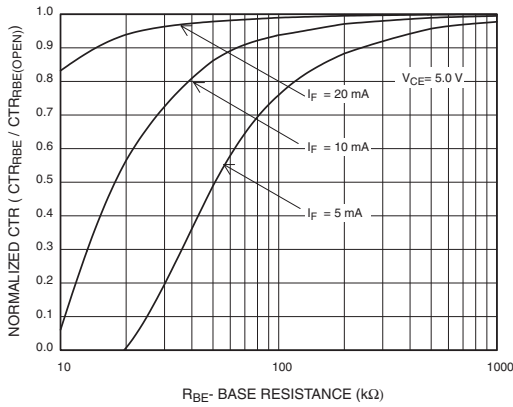
**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

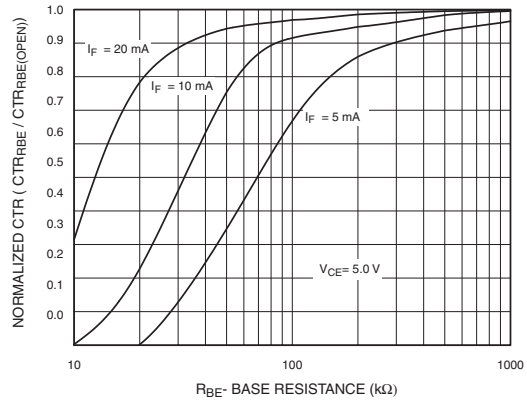
**MCT210**  
**MCT2202**

**MCT271**

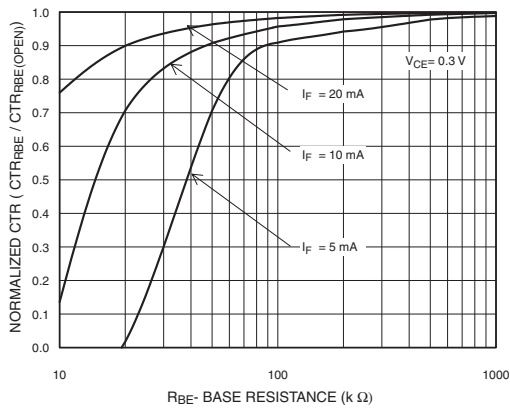
**Fig. 7 CTR vs. RBE (Unsaturated)**  
**(Black Package)**



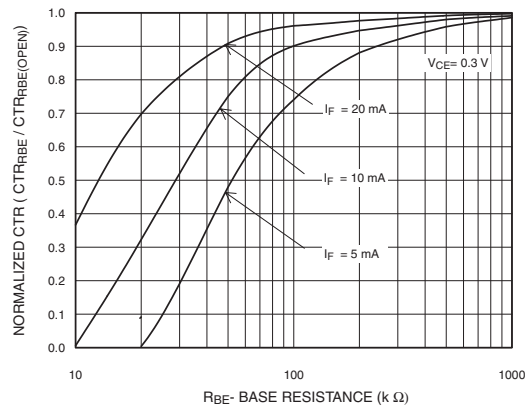
**Fig. 8 CTR vs. RBE (Unsaturated)**  
**(White Package)**



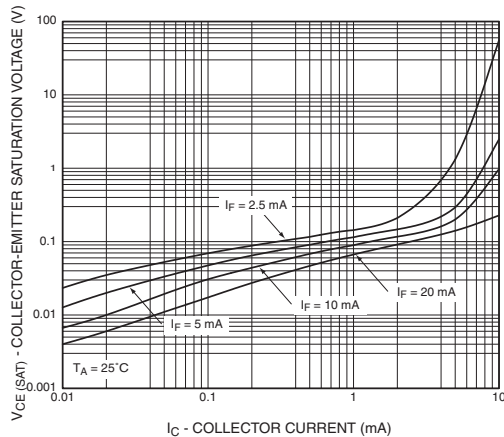
**Fig. 9 CTR vs. RBE (Saturated)**  
**(Black Package)**



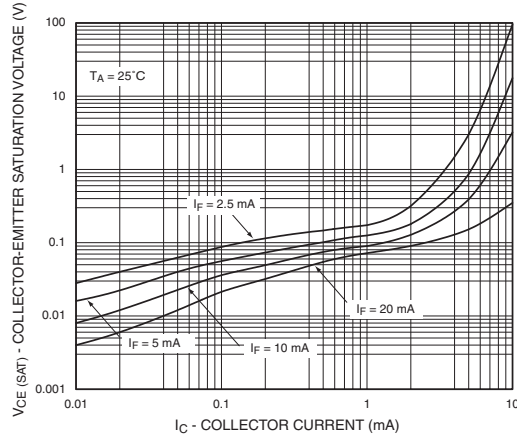
**Fig. 10 CTR vs. RBE (Saturated)**  
**(White Package)**



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



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



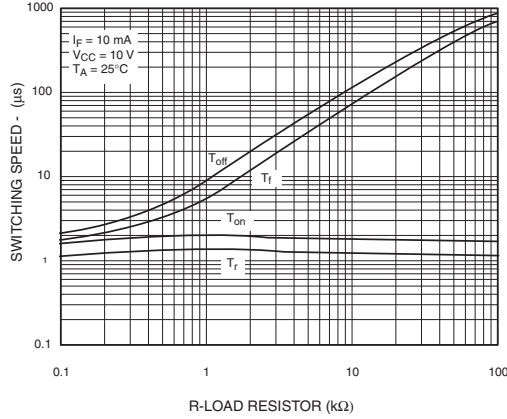
**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

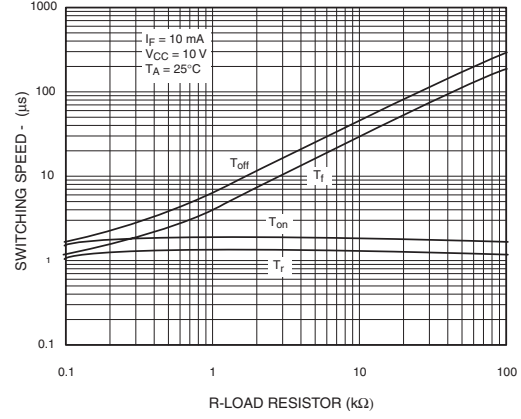
**MCT210**  
**MCT2202**

**MCT271**

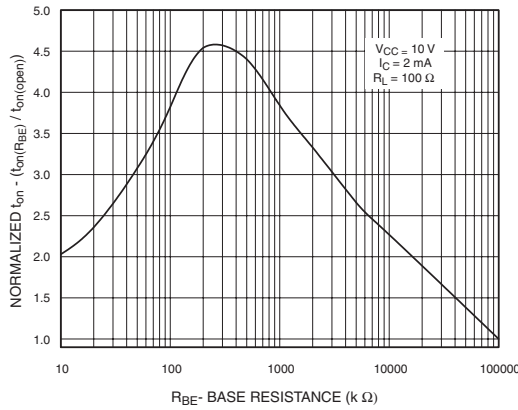
**Fig. 13 Switching Speed vs. Load Resistor (Black Package)**



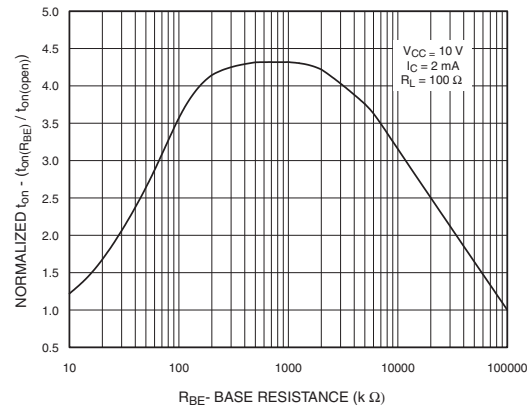
**Fig. 14 Switching Speed vs. Load Resistor (White Package)**



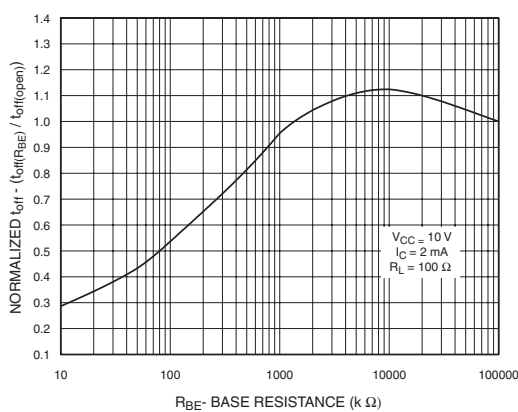
**Fig. 15 Normalized  $t_{on}$  vs.  $R_{BE}$  (Black Package)**



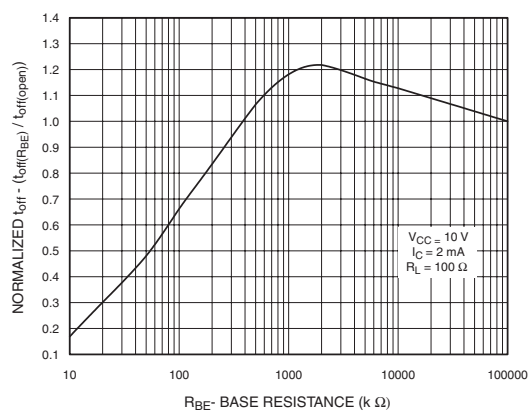
**Fig. 16 Normalized  $t_{on}$  vs.  $R_{BE}$  (White Package)**



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



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



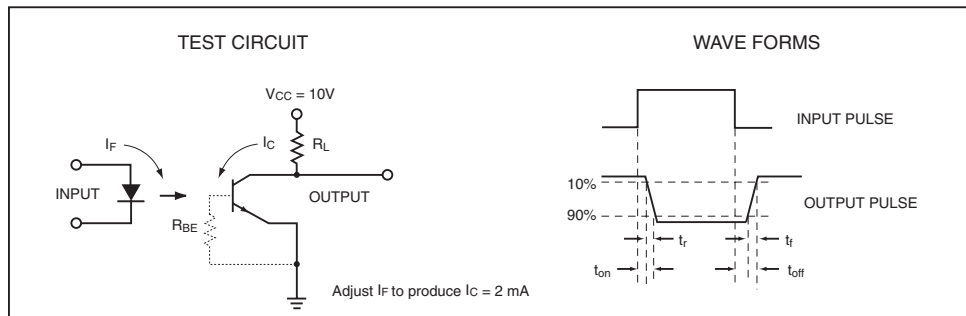
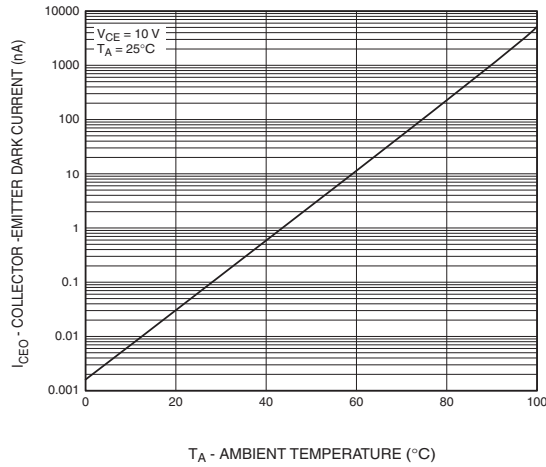
**MCT2  
MCT2200**

**MCT2E  
MCT2201**

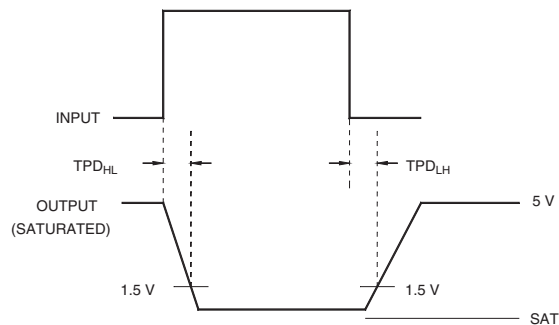
**MCT210  
MCT2202**

**MCT271**

**Fig. 19 Dark Current vs. Ambient Temperature**



**Figure 20. Switching Time Test Circuit and Waveforms**



**Figure 21. Switching Time Waveforms (MCT210)**



**MCT2  
MCT2200**

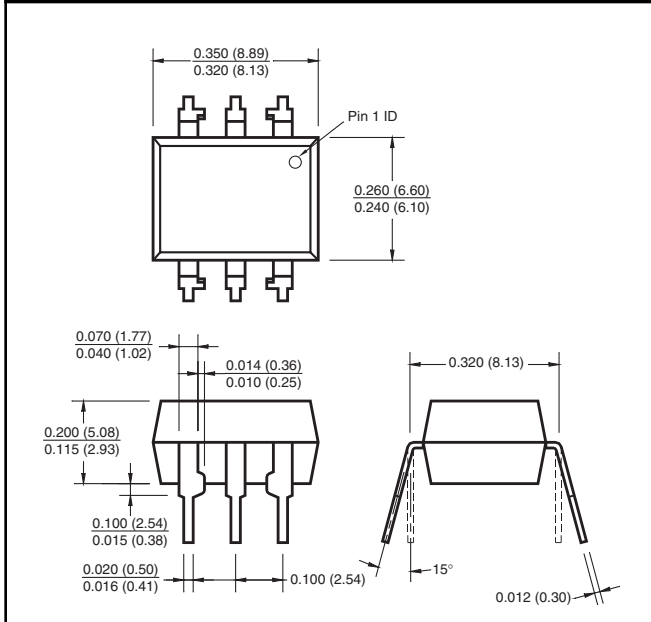
**MCT2E  
MCT2201**

**MCT210  
MCT2202**

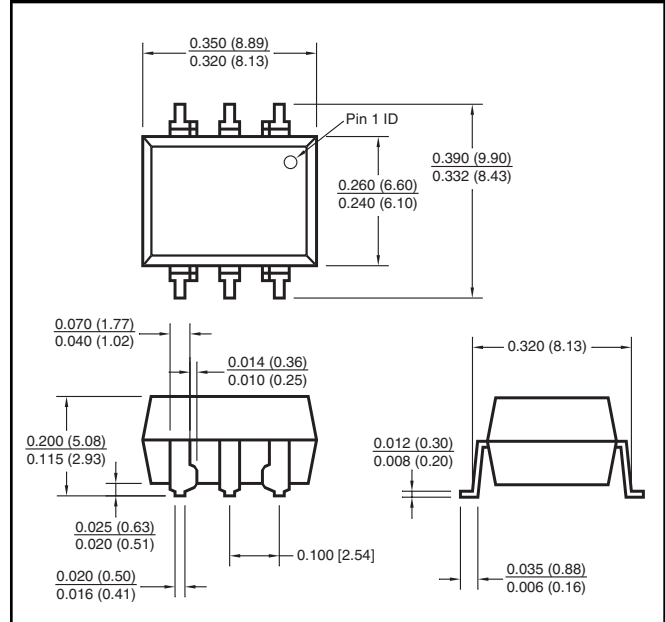
**MCT271**

**White Package (-M Suffix)**

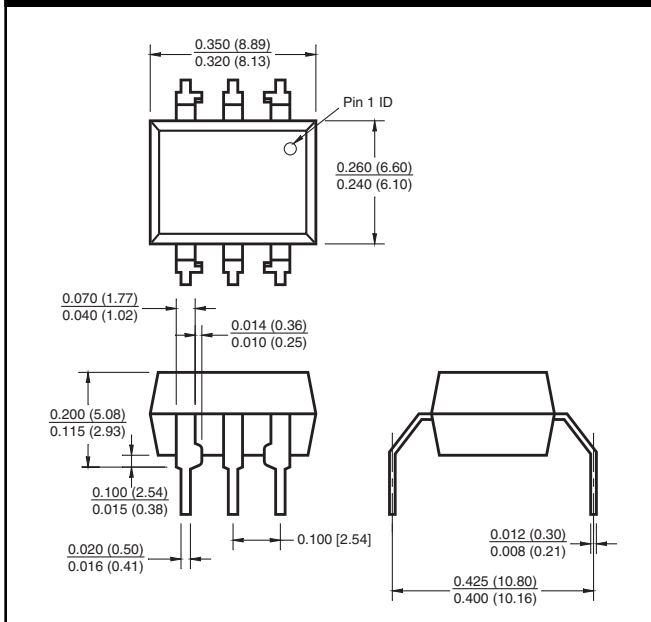
**Package Dimensions (Through Hole)**



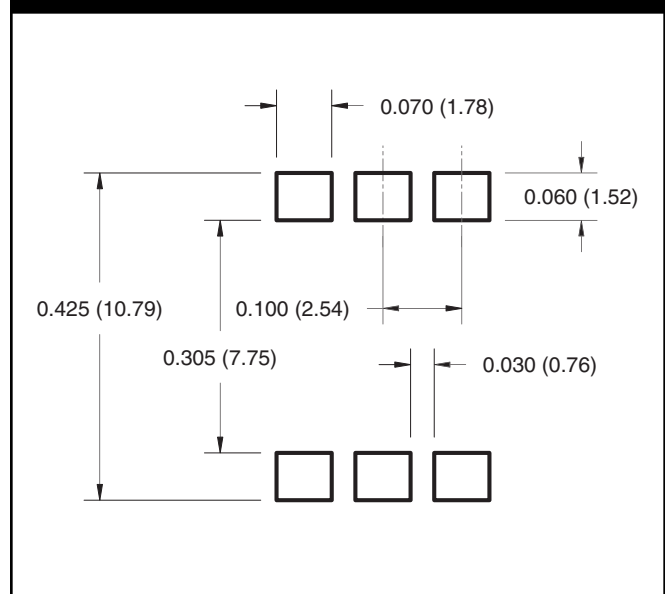
**Package Dimensions (Surface Mount)**



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



**Recommended Pad Layout for Surface Mount Leadform**



**NOTE**

All dimensions are in inches (millimeters)

**MCT2**  
**MCT2200**

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**ORDERING INFORMATION**

<b>Order Entry Identifier</b>		
<b>Black Package (No Suffix)</b>	<b>White Package (-M Suffix)</b>	<b>Description</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

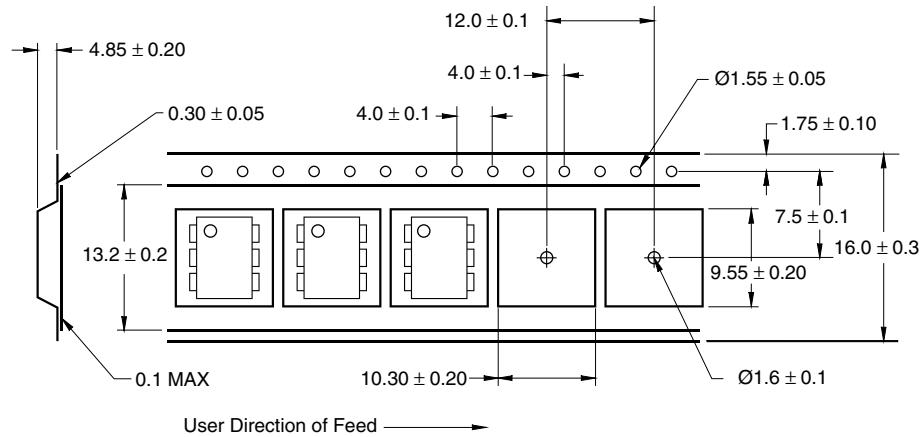
**MCT2**  
**MCT2200**

**MCT2E**  
**MCT2201**

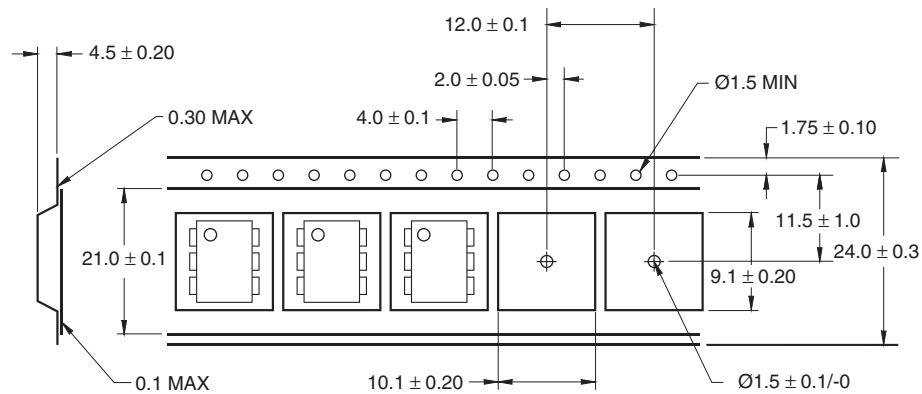
**MCT210**  
**MCT2202**

**MCT271**

**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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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.

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