



THE DATASHEET OF MCT2202



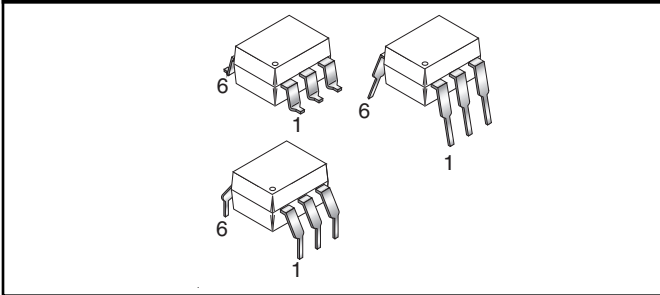
**MCT2
MCT2200**

**MCT2E
MCT2201**

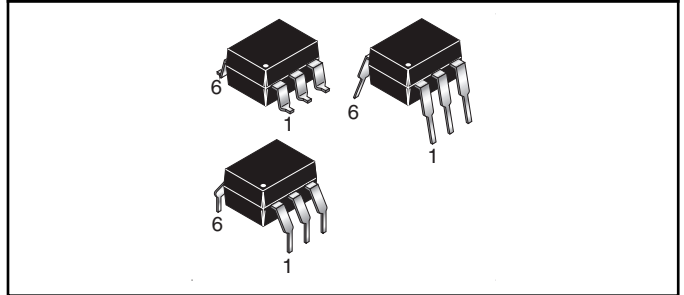
**MCT210
MCT2202**

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.

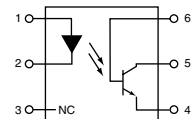
FEATURES

- 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
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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	

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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
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 $T_A = 25^\circ\text{C}$

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

DC Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
Output Collector Current	($T_A = 0-70^\circ\text{C}$)	CTR	MCT210	150			%
	(I _F = 10 mA, V _{CE} = 5 V)		MCT2200	20			
			MCT2201	100			
			MCT2202	63		125	
	(I _F = 10 mA, V _{CE} = 10 V)		MCT2 MCT2-M MCT2E MCT2E-M	20			
	(I _F = 3.2 mA to 32 mA, V _{CE} = 0.4 V) ($T_A = 0-70^\circ\text{C}$)		MCT210	50			
Collector-Emitter Saturation Voltage	(I _C = 2 mA, I _F = 16 mA)	V _{CE (SAT)}	MCT2 MCT2-M MCT2E MCT2E-M MCT271			0.4	V
	(I _C = 16 mA, I _F = 32 mA, $T_A = 0-70^\circ\text{C}$)		MCT210				
	(I _C = 2.5 mA, I _F = 10 mA)		MCT2200 MCT2201 MCT2202				
AC Characteristic Saturated Turn-on Time from 5 V to 0.8 V	(I _F = 15 mA, V _{CC} = 5 V, R _L = 2 kΩ) (R _B = Open) (Fig. 20)	t _{on}	MCT2		1.1		μs
	(I _F = 20 mA, V _{CC} = 5 V, R _L = 2 kΩ) (R _B = 100 kΩ) (Fig. 20)		MCT2E		1.1		
Saturated Turn-off Time from SAT to 2.0 V	(I _F = 15 mA, V _{CC} = 5 V, R _L = 2 kΩ) (R _B = Open) (Fig. 20)	t _{off}	MCT2		50		
	(I _F = 20 mA, V _{CC} = 5 V, R _L = 2 kΩ) (R _B = 100 kΩ) (Fig. 20)		MCT2E		50		
Turn-on Time	(I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω)	t _{on}	MCT2-M MCT2E-M		2		
Turn-off Time	(I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω)	t _{off}	MCT2-M MCT2E-M		2		
Rise Time	(I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω)	t _r	MCT2-M MCT2E-M		2		
Fall Time	(I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω)	t _f	MCT2-M MCT2E-M		1.5		

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

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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

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

Note

* Typical values at T_A = 25°C

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TYPICAL PERFORMANCE CURVES

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

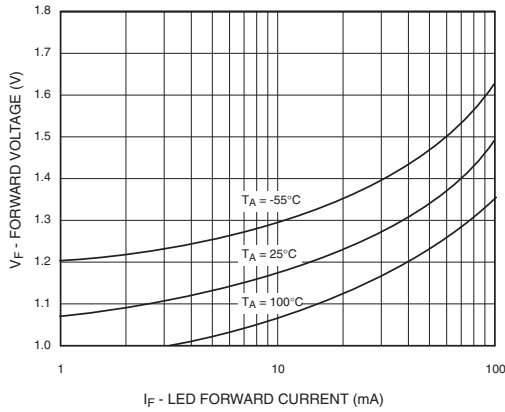


Fig. 2 LED Forward Voltage vs. Forward Current (White Package)

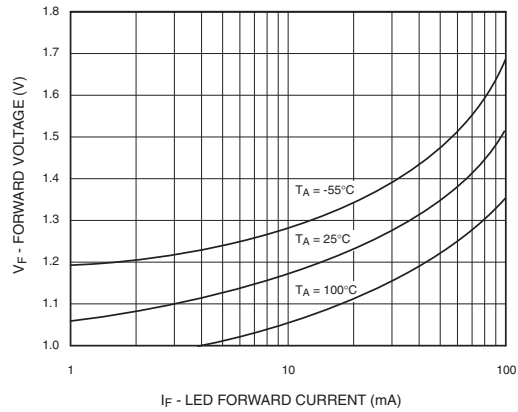


Fig.3 Normalized CTR vs. Forward Current (Black Package)

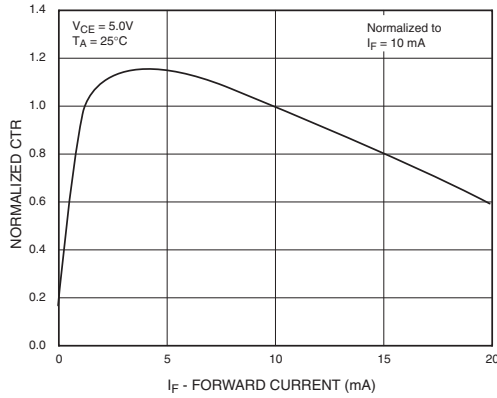


Fig.4 Normalized CTR vs. Forward Current (White Package)

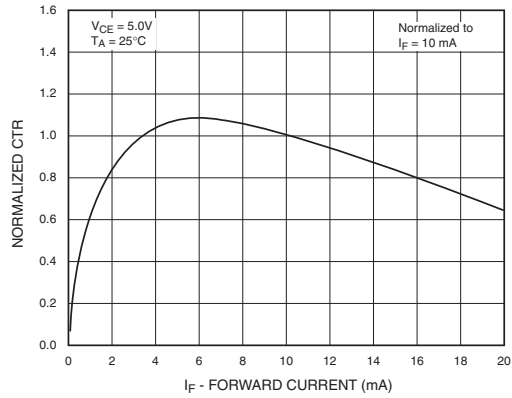


Fig. 5 Normalized CTR vs. Ambient Temperature (Black Package)

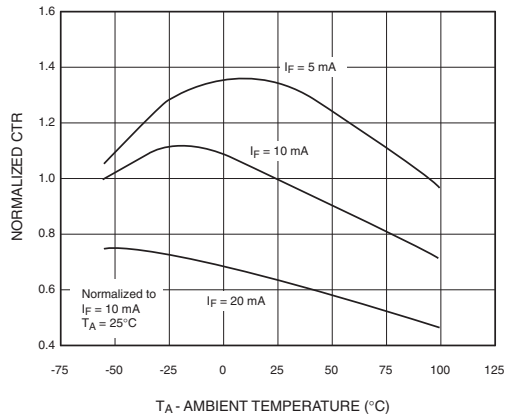
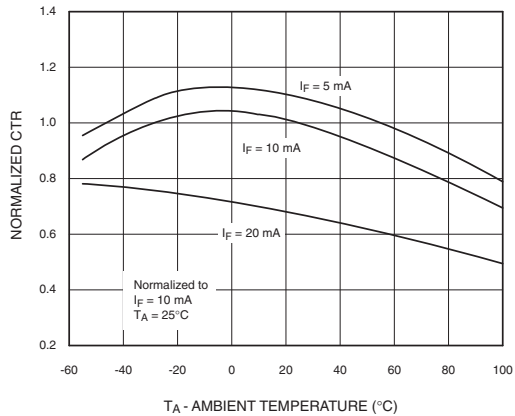


Fig. 6 Normalized CTR vs. Ambient Temperature (White Package)



MCT2
MCT2200

MCT2E
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MCT271

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

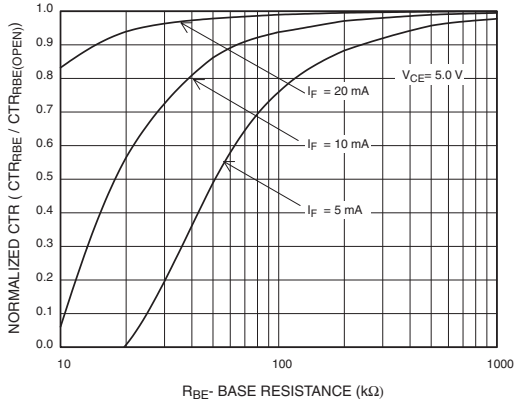


Fig. 8 CTR vs. RBE (Unsaturated)
(White Package)

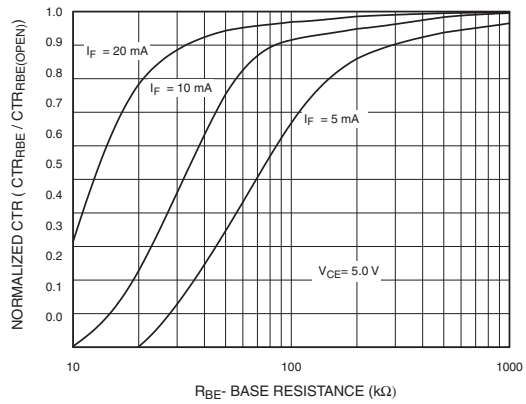


Fig. 9 CTR vs. RBE (Saturated)
(Black Package)

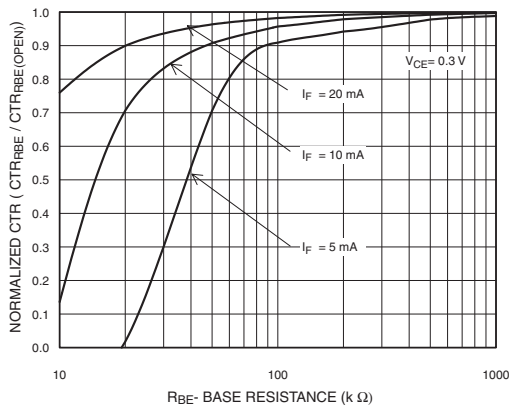


Fig. 10 CTR vs. RBE (Saturated)
(White Package)

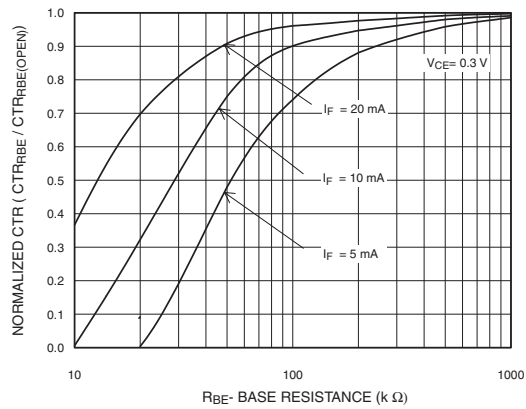


Fig. 11 Collector-Emitter Saturation Voltage vs. Collector Current
(Black Package)

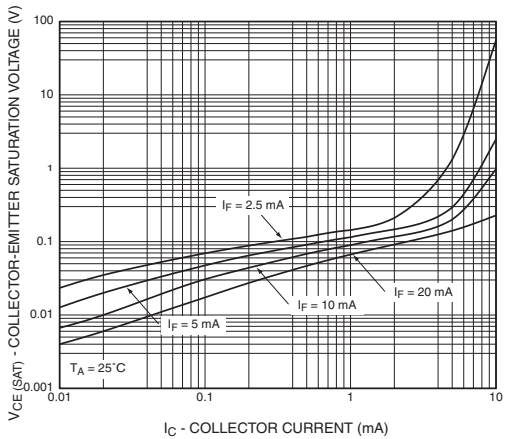
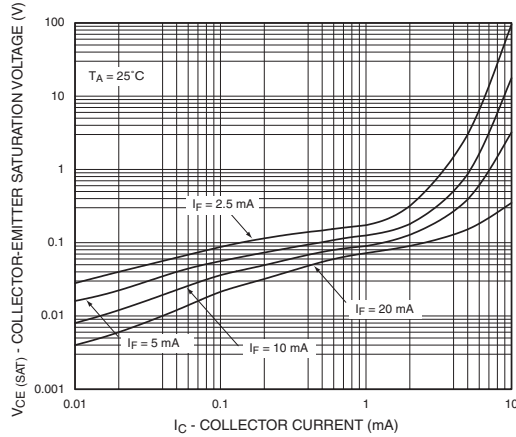


Fig. 12 Collector-Emitter Saturation Voltage vs. Collector Current
(White Package)



MCT2
MCT2200

MCT2E
MCT2201

MCT210
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Fig. 13 Switching Speed vs. Load Resistor (Black Package)

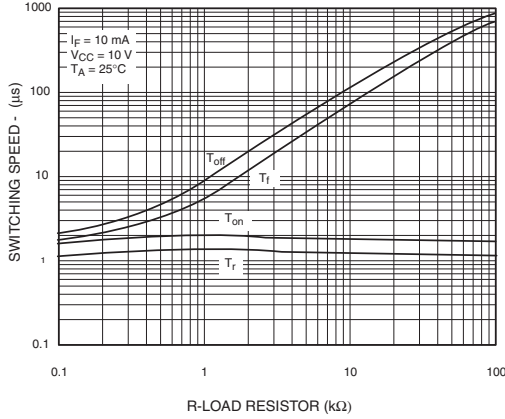


Fig. 14 Switching Speed vs. Load Resistor (White Package)

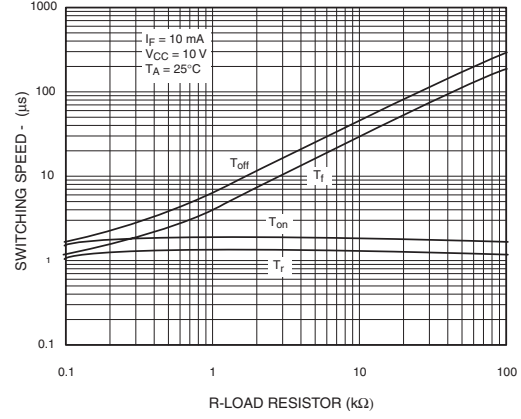


Fig. 15 Normalized t_{on} vs. R_{BE} (Black Package)

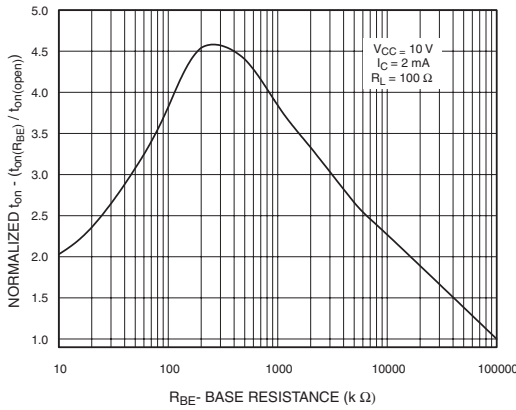


Fig. 16 Normalized t_{on} vs. R_{BE} (White Package)

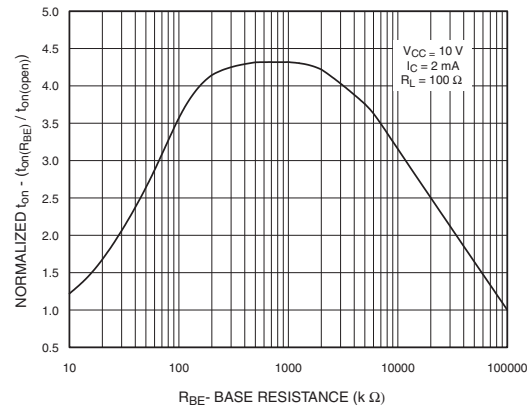


Fig. 17 Normalized t_{off} vs. R_{BE} (Black Package)

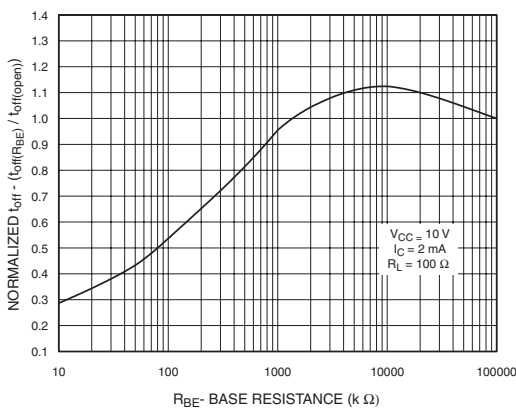
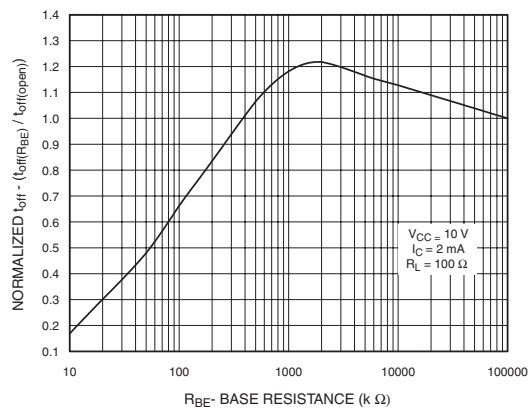


Fig. 18 Normalized t_{off} vs. R_{BE} (White Package)



**MCT2
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Fig. 19 Dark Current vs. Ambient Temperature

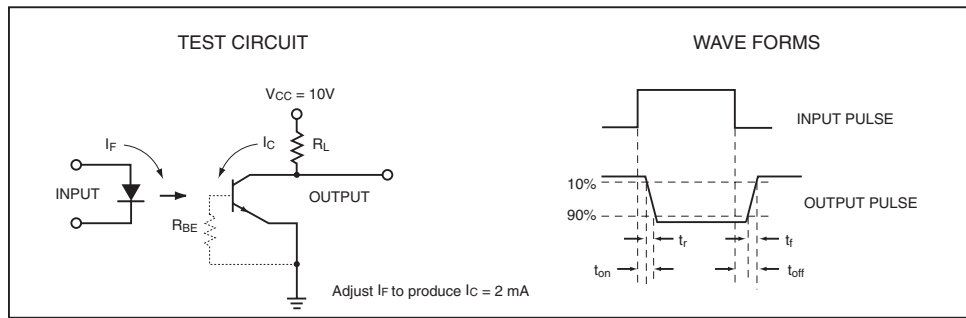
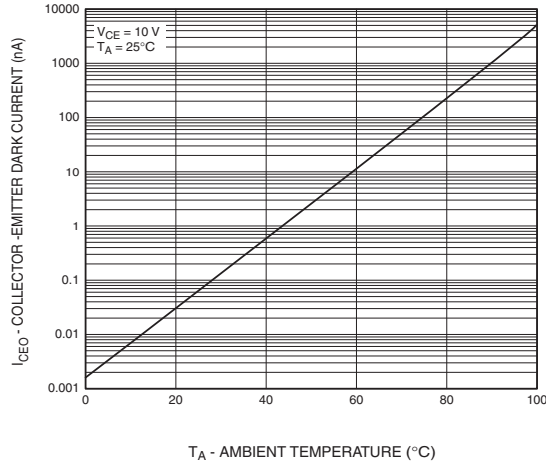


Figure 20. Switching Time Test Circuit and Waveforms

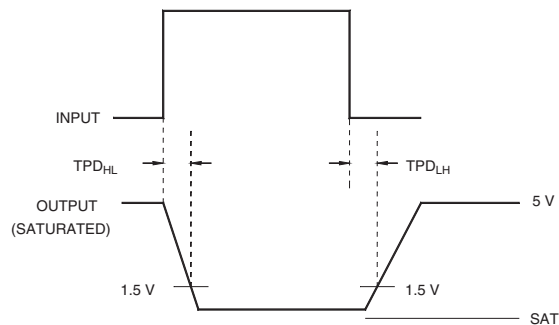


Figure 21. Switching Time Waveforms (MCT210)

**MCT2
MCT2200**

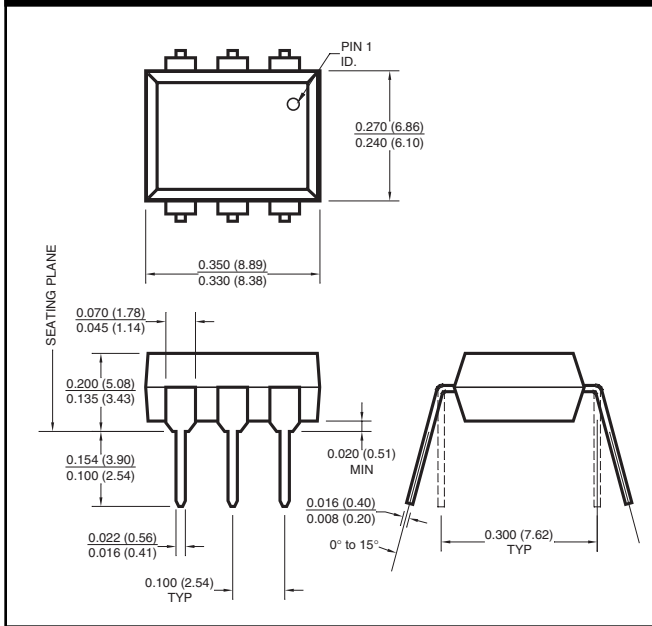
**MCT2E
MCT2201**

**MCT210
MCT2202**

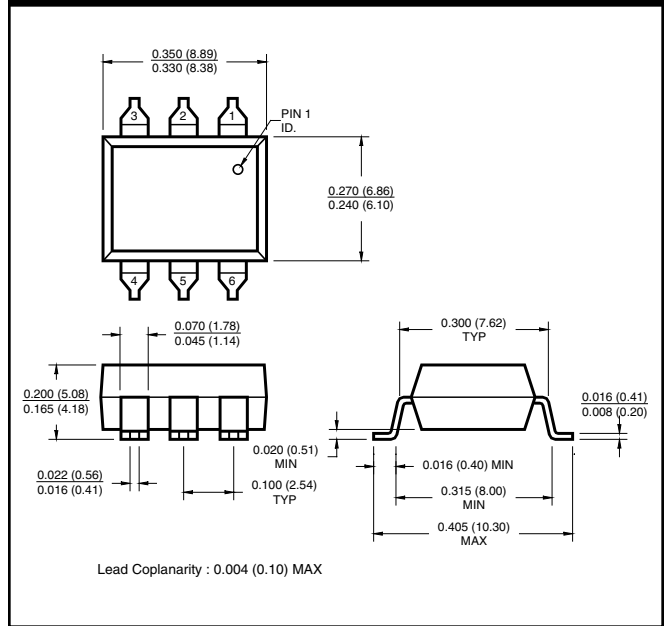
MCT271

Black Package (No -M Suffix)

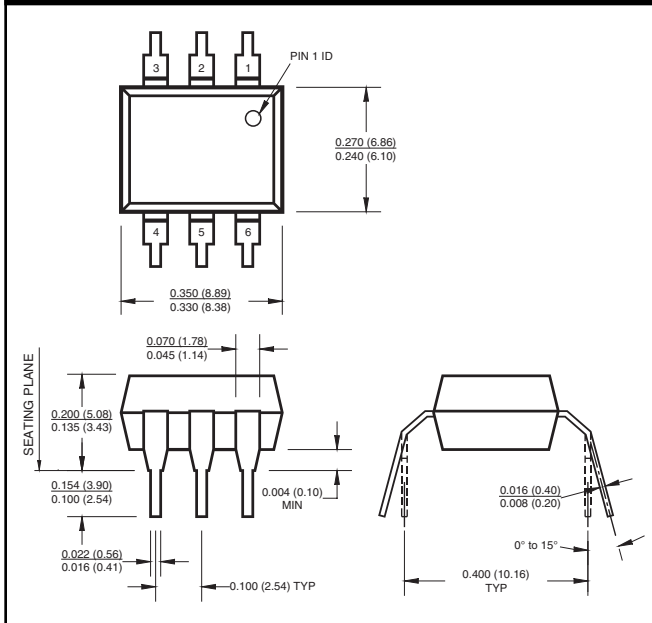
Package Dimensions (Through Hole)



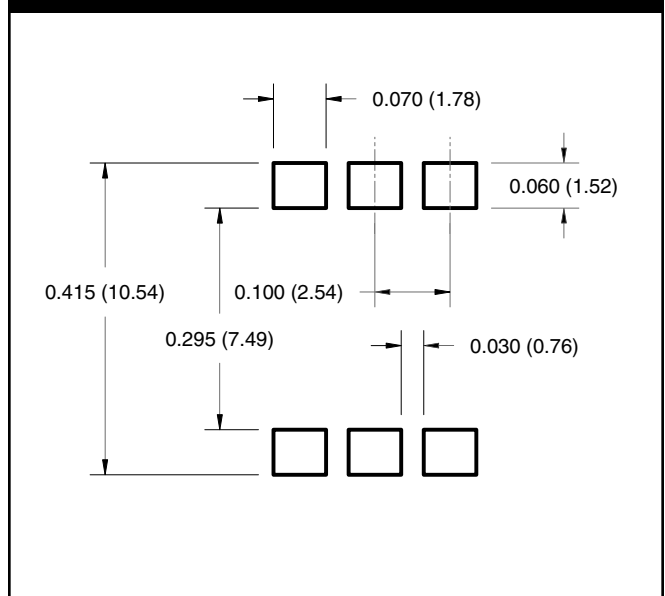
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

All dimensions are in inches (millimeters)

**MCT2
MCT2200**

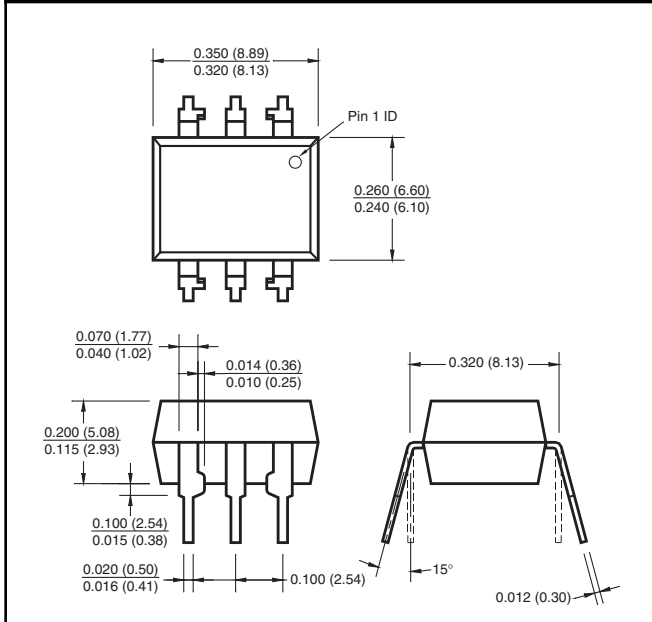
**MCT2E
MCT2201**

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MCT2202**

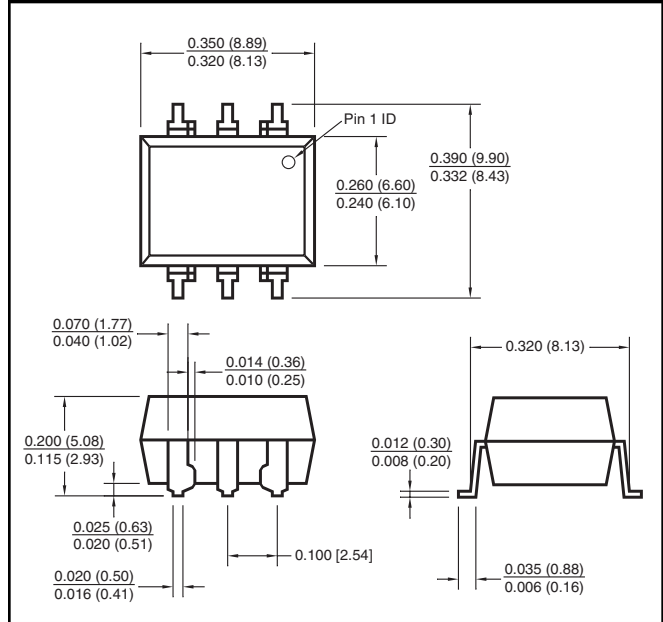
MCT271

White Package (-M Suffix)

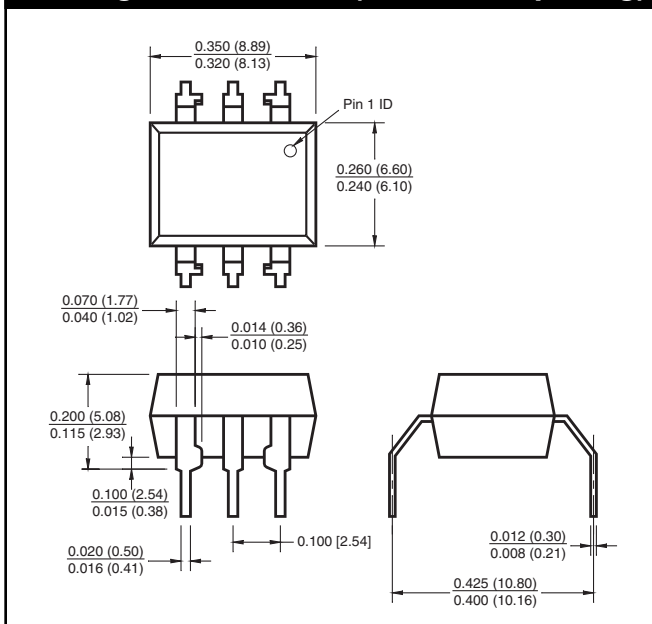
Package Dimensions (Through Hole)



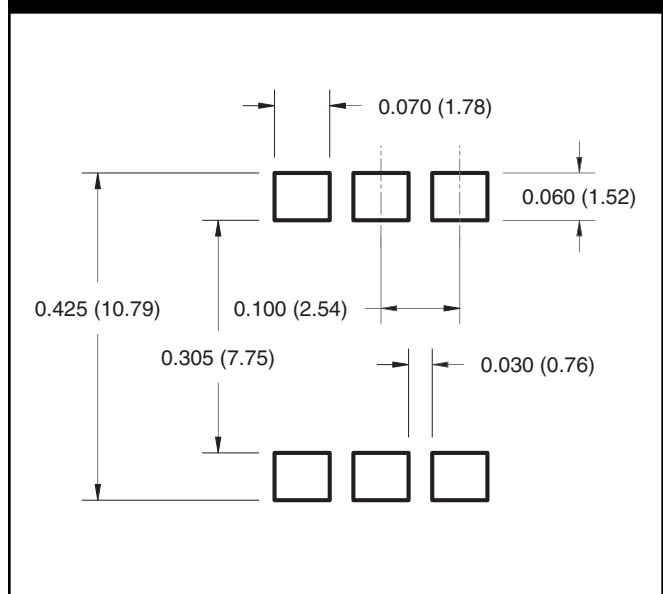
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

All dimensions are in inches (millimeters)

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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

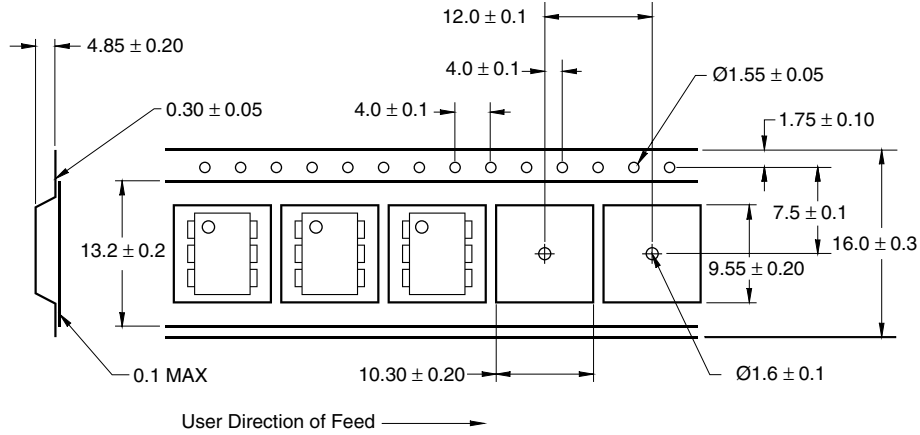
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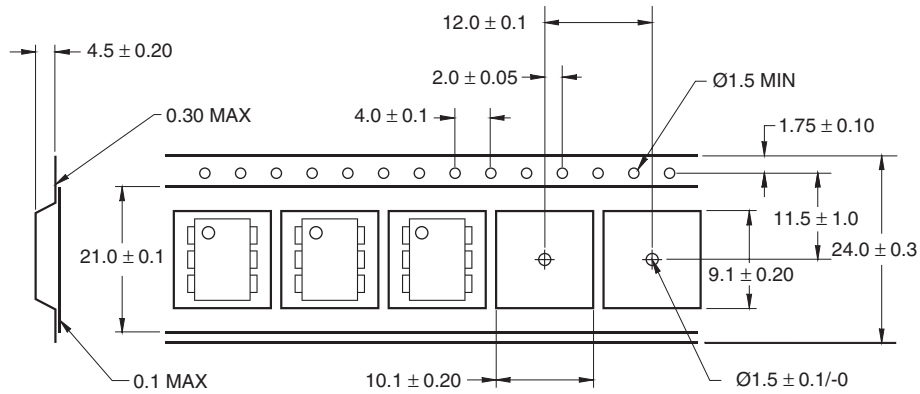
MCT210
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QT Carrier Tape Specifications ("D" Taping Orientation) (Black Package, No Suffix)



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



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