FAIRCHILD SEMICONDUCTOR®

December 2008

MCT9001
Dual Phototransistor Optocouplers

Features

- Two isolated channels per package
- Two packages fit into a 16 lead DIP socket
- Underwriters Laboratory (U.L.) recognized File E90700

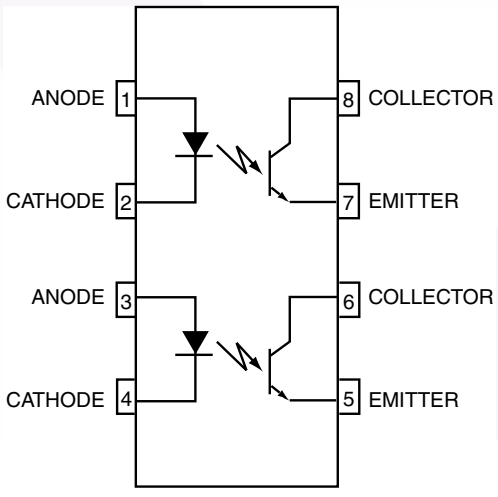
Applications

- AC line/digital logic – isolate high voltage transients
- Digital logic/digital logic – eliminate spurious grounds
- Digital logic/AC triac control – isolate high voltage transients
- Twisted pair line receiver – eliminate ground loop feedthrough
- Telephone/telegraph line receiver – isolate high voltage transients
- High frequency power supply feedback control – maintain floating grounds and transients
- Relay contact monitor – isolate floating grounds and transients
- Power supply monitor – isolate transients

Description

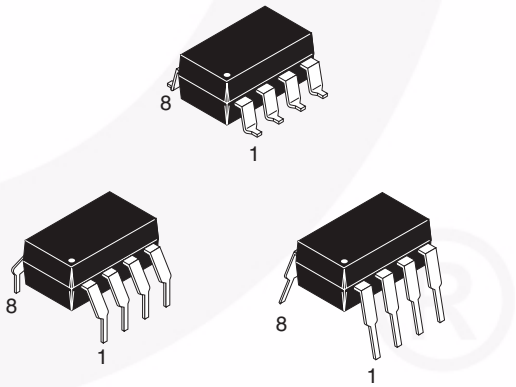
The MCT9001 Optocoupler has two channels for density applications. For four channel applications, two-packages fit into a standard 16-pin DIP socket. Each channel is an NPN silicon planar phototransistor optically coupled to a gallium arsenide infrared emitting diode.

Schematic



Equivalent Circuit

Package Outlines



Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Rating	Value	Unit
TOTAL DEVICE			
T_{STG}	Storage Temperature	-55 to +150	°C
T_{OPR}	Operating Temperature	-55 to +100	°C
T_{SOL}	Lead Solder Temperature (wave solder)	250 for 10 sec	°C
P_D	Total Device Power Dissipation @ T_A = 25°C	400	mW
	Derate above 25°C	4.83	mW/°C
EMITTER (Each channel)			
I_F	Forward Current – Continuous	60	mA
I_F(pk)	Forward Current – Peak (PW = 1µs, 300pps)	3	A
V_R	Reverse Voltage	5.0	V
P_D	LED Power Dissipation @ T_A = 25°C	100	mW
	Derate above 25°C (Total Input)	1.1	mW/°C
DETECTOR (Each channel)			
I_C	Collector Current – Continuous	30	mA
P_D	Detector Power Dissipation @ T_A = 25°C	150	mW
	Derate above 25°C	1.67	mW/°C

Electrical Characteristics (T_A = 25°C unless otherwise specified)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER						
V_F	Input Forward Voltage	I_F = 10mA		1.0	1.3	V
I_R	Reverse Current	V_R = 5V			10	µA
C_J	Junction Capacitance	V_F = 0 V, f = 1MHz		50		pF
DETECTOR						
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C = 0.5mA, I_F = 0	55			V
BV_{ECO}	Emitter-Collector Breakdown Voltage	I_E = 100µA, I_F = 0	7			V
I_{CEO}	Collector-Emitter Dark Current	V_{CE} = 24V, I_F = 0		5	100	nA
		V_{CE} = 24V, T_A = 85°C			50	µA
C_{CE}	Capacitance	V_{CE} = 0V, f = 1MHz		8		pF

Transfer Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Units
SWITCHING TIMES (AC)						
Non-Saturated						
t_{on}	Turn-on Time	R_L = 100Ω, I_C = 2mA, V_{CC} = 10V		3		µs
t_{off}	Turn-off Time			3		µs
t_r	Rise Time			2.4		µs
t_f	Fall Time			2.4		µs
Saturated						
t_{on}	Turn-on Time	I_F = 16mA, R_L = 1.9kΩ, V_{CE} = 5V		2.4		µs
t_{off}	Turn-off Time			25.0		µs
DC CHARACTERISTICS						
CTR	Current Transfer Ratio, Collector-Emitter	I_F = 5mA, V_{CE} = 5V	50		600	%
$CTR_{(sat)}$		I_F = 8mA, V_{CE} = 0.4V	30			%
$V_{CE(sat)}$	Saturation Voltage	I_F = 8mA, I_C = 2.4mA			0.40	V

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	$I_{I-O} \leq$ 1µA, t = 1min.	5300			Vac(rms)
R_{ISO}	Isolation Resistance	V_{I-O} = 500VDC	10^{11}			Ω
C_{ISO}	Isolation Capacitance	f = 1MHz		0.5		pF

*All typicals at T_A = 25°C

Typical Performance Curves

Fig. 1 Normalized CTR vs. Forward Current

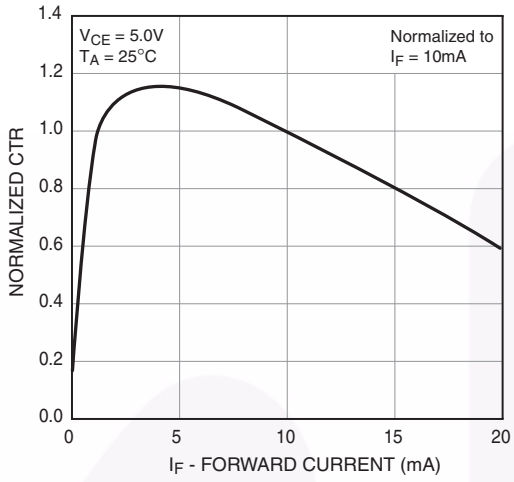


Fig. 2 Normalized CTR vs. Ambient Temperature

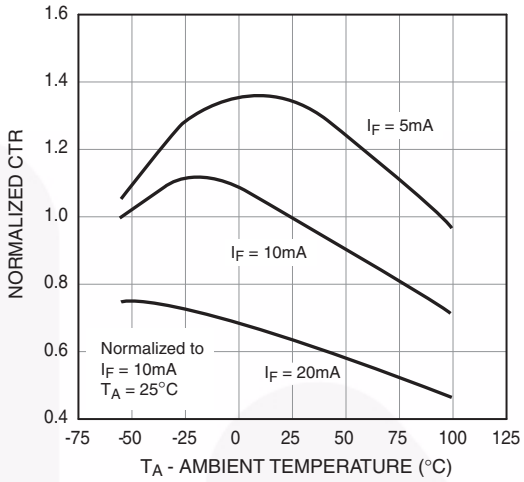


Fig. 3 Dark Current vs. Ambient Temperature

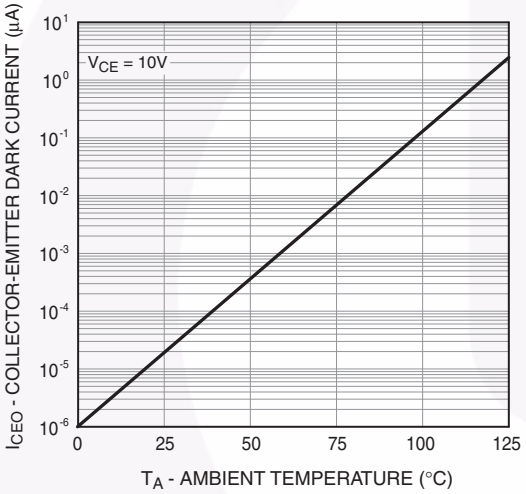


Fig. 4 Switching Speed vs. Load Resistor

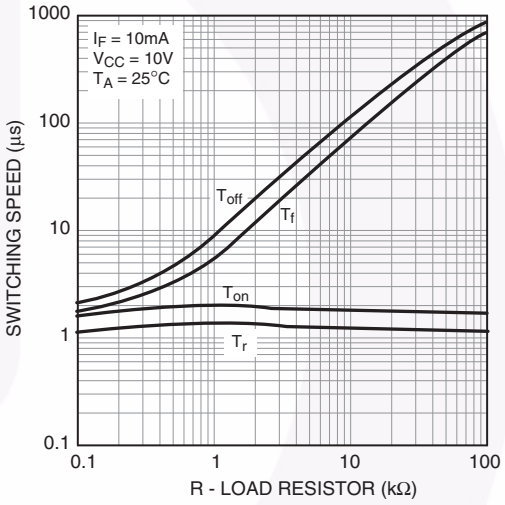


Fig. 5 LED Forward Voltage vs. Forward Current

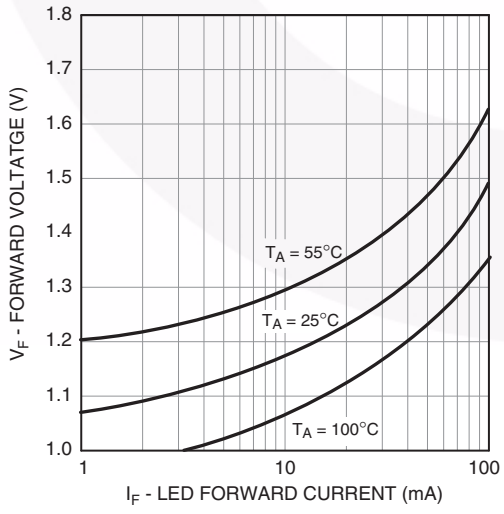
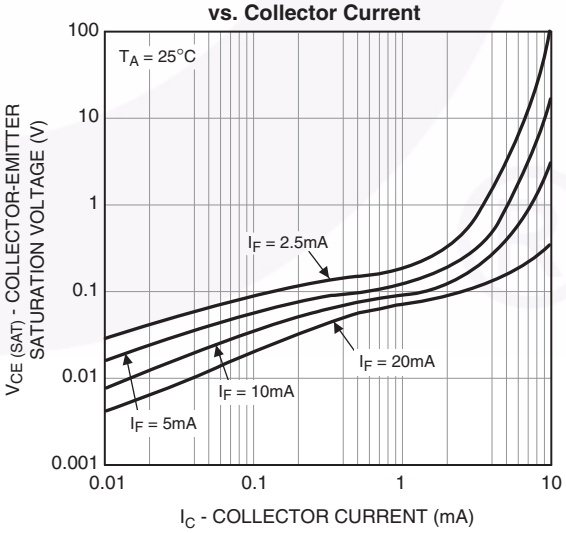
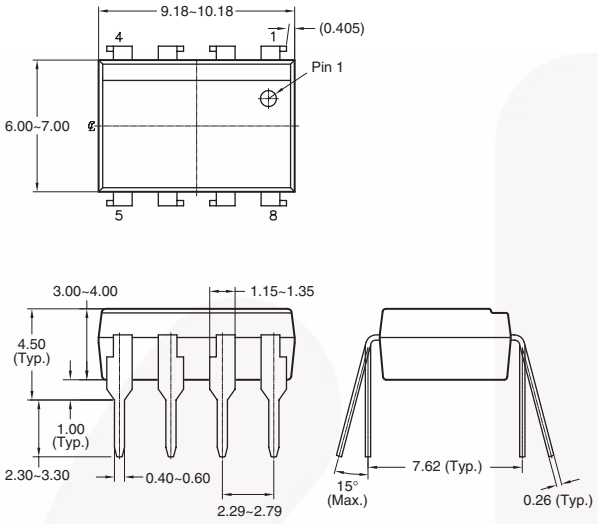


Fig. 6 Collector-Emitter Saturation Voltage vs. Collector Current

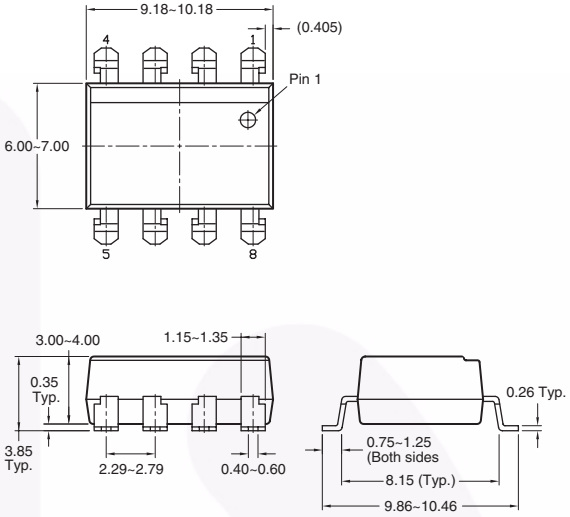


Package Dimensions

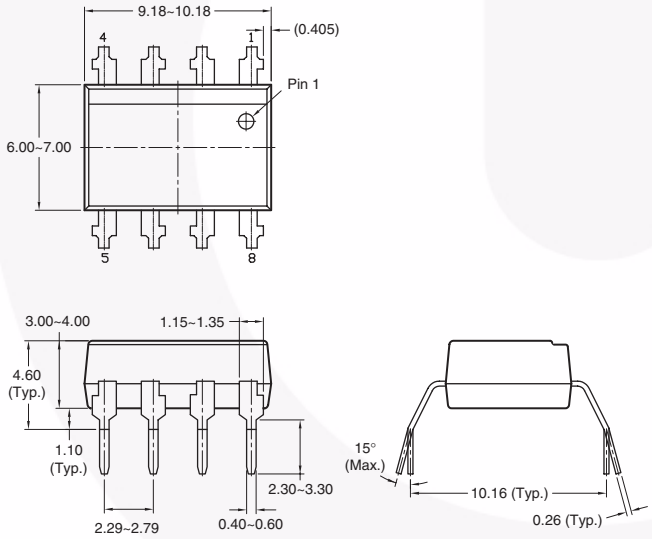
Through Hole



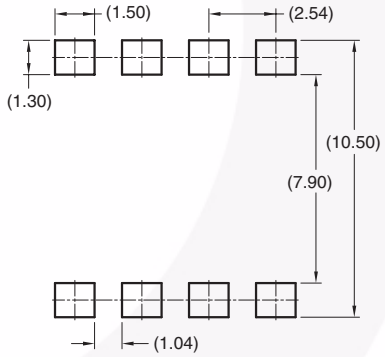
Surface Mount



0.4" Lead Spacing



Recommend Pad Layout for Surface Mount Leadform



Note:
All dimensions are in millimeters.

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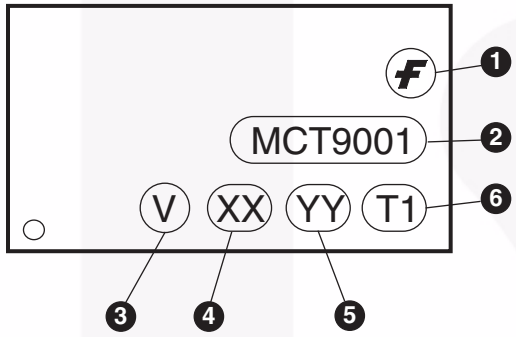
http://www.fairchildsemi.com/packaging/

Ordering Information

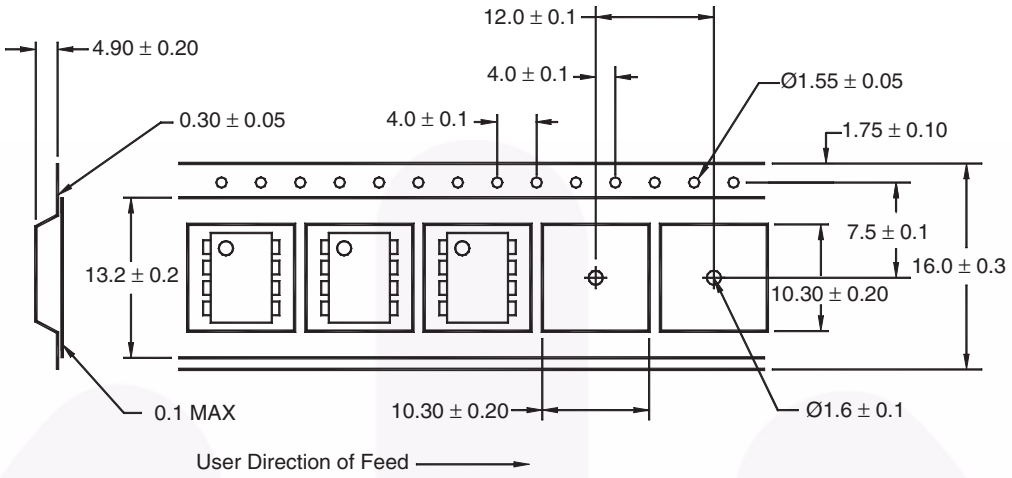
Option	Example Part Number	Description
No Option	MTC9001	Standard Through Hole
S	MTC9001S	Surface Mount Lead Bend
SD	MTC9001SD	Surface Mount; Tape and Reel
W	MTC9001W	0.4" Lead Spacing

Marking Information



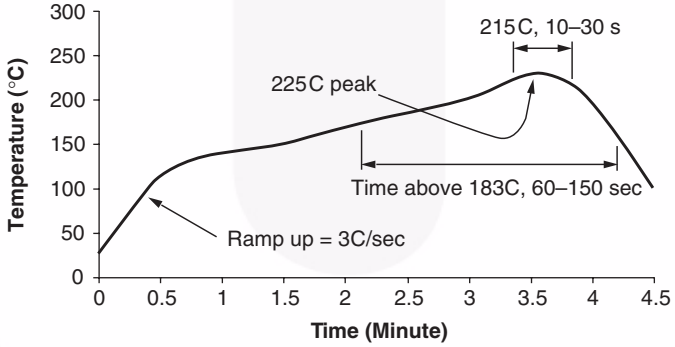
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Two digit year code, e.g., ‘03’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

Carrier Tape Specifications



Note:
All dimensions are in inches (millimeters)

Reflow Profile



- Peak reflow temperature: 225C (package surface temperature)
- Time of temperature higher than 183C for 60–150 seconds
- One time soldering reflow is recommended

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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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