Features

- Hermetic 4-pin TO-72 package
- 1000Vdc isolation voltage
- High CTR
- High reliability and rugged construction
- High reliability screening available
- DC input with transistor output
- Operating temperature range -55℃ to +125℃
- MIL-883 screened version for MCT4R

Applications

- Switch mode power supplies
- Computer peripheral interface
- Motor control
- Ground signal isolation

Description

The MCT4/4R consists of a phototransistor optically coupled to an AlGaAs infrared-emitting diode in a hermetic TO-72 package.

Schematic Diagram

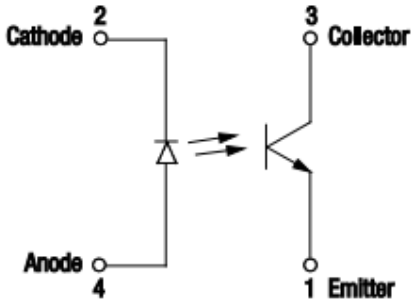

Figure 1. MCT4/4R Schematic Diagram

Package Dimensions in inches (mm)

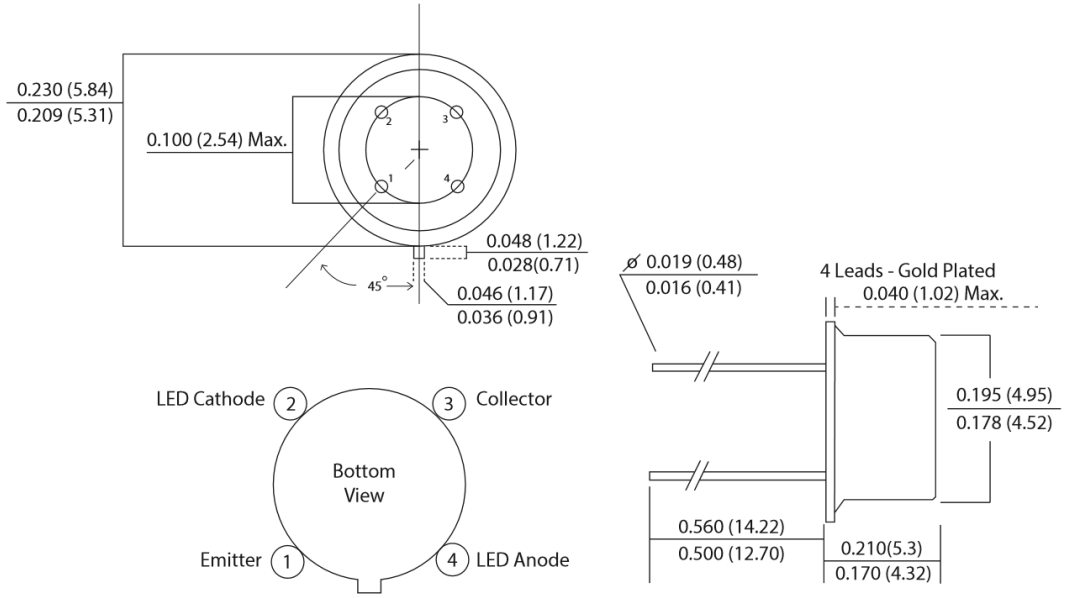

Figure 2. MCT4/4R Package Dimensions

Absolute Maximum Rating at 25°C (Note 1)

Symbol	*Parameters*	*Ratings*	*Units*	*Notes*
V_{DC}	Isolation voltage	-1000 to +1000	V	2
T_{OPR}	Operating temperature	-55 to +125	°C	
T_{STG}	Storage temperature	-65 to +150	°C	
T_{SOL}	Soldering temperature (10 seconds maximum)	240	°C	
P_D	Total Power Dissipation	250	mW	3
Emitter				
P_D	Emitter power dissipation	90	mW	4
I_F	Forward current	40	mA	
$I_{F(TRANS)}$	Peak transient current (≤1ms)	3	A	
V_R	Reverse voltage	3	V	
Detector				
P_D	Detector power dissipation	200	mW	5
V_{CE}	Collector-Emitter Voltage	30	V	
V_{EC}	Emitter-Collector Voltage	7	V	
I_{CC}	Continuous Collector Current	50	mA	

Notes

1. When using this product, please observe the absolute maximum ratings. Only one parameter may be set at the limit to ensure no damage to the device. Exceeding any of the limits listed here may damage the device.
2. Measured between input pins 2 and 3 shorted together, and output pins 1 and 4 shorted together. T_A = 25°C and duration = 1sec.
3. Linear derating factor: 3.30 mW/°C above 25°C
4. Linear derating factor: 1.20 mW/°C above 25°C
5. Linear derating factor: 2.67 mW/°C above 25°C

ESD Precaution

Please be advised that normal static precautions should be taken in the handling and assembly of this device to prevent damage or degradation which may be induced by electrostatic discharge (ESD).

Electrical Characteristics T_A = -25℃ *(unless otherwise specified)* (Note 1)

Emitter Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
V_F	Forward Voltage	I_F=10mA	-	1.3	1.5	V	
I_R	Reverse Current	V_R = 3V	-	-	10	µA	

Detector Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_{CE}= 1mA	30	-	-	V	
BV_{ECO}	Emitter-Collector Breakdown Voltage	I_{EC}= 100µA	7	-	-	V	
CTR	Current Transfer Ratio	V_{CE}= 10V, I_F=10mA	15	100	-	%	2
I_{CE_OFF}	Collector-Emitter Dark Current, Off-state	V_{CE}= 10V	-	-	50	nA	
C_{CE}	Collector-Emitter Capacitance	V_{CE}= 0V	-	2	-	pF	3

Transfer Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	I_F= 10mA, I_C= 500µA	-	0.1	-	V	
		I_F= 50mA, I_C= 2mA	-	0.2	0.5	V	
I_{IO}	Input to Output Leakage Current	R_H≤50%, V_{IO}= 1000V_{DC}	-	-	1	µA	3

Switching Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
t_r	Rise Time	I_C= 2mA, V_{CC}= 10V,	-	2	-	µs	4
t_f	Fall Time	R_L= 100Ω	-	2	-		

Notes

1. Performance guaranteed only under conditions listed in above tables.
2. CTR is the ratio of the output collector current I_{C_ON} to the forward LED current I_F multiplied by 100%
3. Measured between input pins 2 and 3 shorted together, and output pins 1 and 4 shorted together. T_A = 25°C and duration = 1sec.
4. Value applies for PW ≤100 µs, 300 pps.

Typical Characteristic Curves

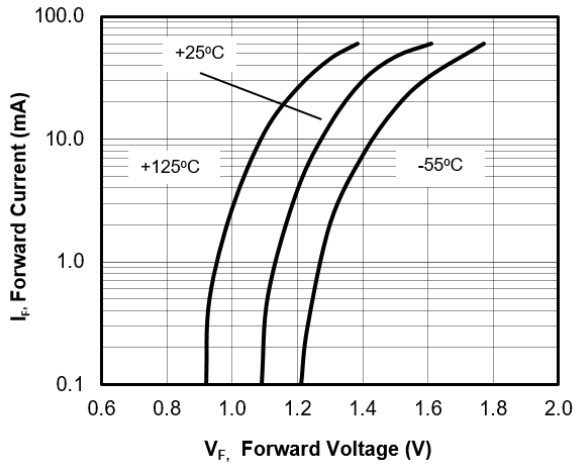

Figure 3. Forward Current vs Forward Voltage

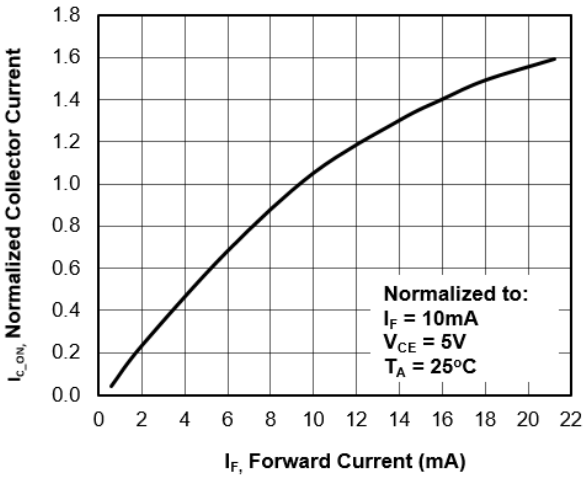

Figure 4. Collector Current vs Forward Current

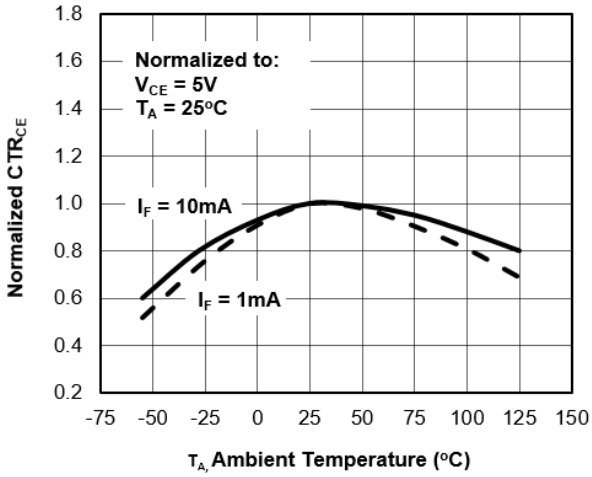

Figure 5. Normalized CTR_{CE} vs Temperature

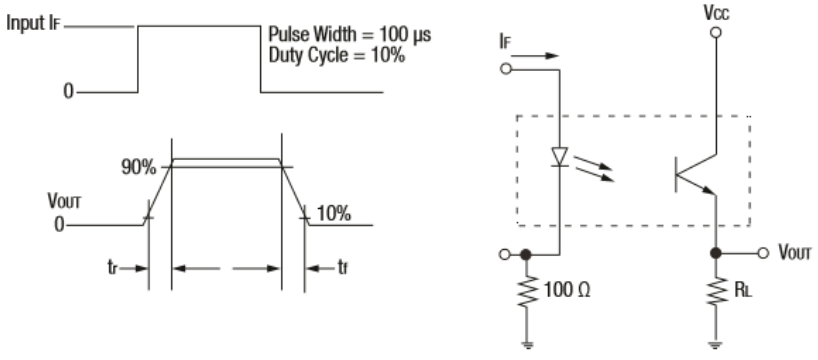

Figure 6. MCT4/4R Switching Test Circuit

Ordering Information

Manufacturing Part Number	*Part Description*
MCT4	Phototransistor Hermetic 4-pin TO-72 Package
MCT4R	Phototransistor Hermetic 4-pin TO-72 Package, Screened MIL-883

MIL-883 Screening

SCREEN – 100%	
Characteristic	***Method***
Internal Visual	2010 – Characteristics applicable to device
Stabilization Bake	1008 - 150°C. for 48 hours
Temperature Cycle	1010 – 10 cycles; -55°C., 25°C., 150°C., 25°C.
Centrifuge	2001 – Test Condition E
Hermeticity	1014 – Fine and Gross
Critical Electrical	-- Datasheet
Burn In	1015 – 160 hours @ 125°C
Final Electrical	-- Datasheet
Group A Sample Inspection	5005 – Table I Subgroups
External Visual	2009

LIFE TESTING 7% LTPD		
Characteristic	***Method***	***LTPD***
Subgroup VII		
High Temperature Storage	1008 - 150°C. for 1000 hours	
Critical Electrical	-- Datasheet	7%
Subgroup VII		
Operating Life	1005 – Condition B	7%
Critical Electrical	-- Datasheet	
Subgroup IX		
Steady State Reverse Bias	1015 – Condition At 72 hours at 150°C.	7%
Subgroup X		
Bond Strength	2001 – Condition C; 10 devices only	

LOT QUALIFICATION TESTS		
Characteristic	***Method***	***LTPD***
Subgroup I Visual Mechanical Marking Permanency Physical Dimensions	 2008	 15%
Subgroup II Solderability	 2003	 15%
Subgroup III Thermal Shock Temperature Cycle Moisture Resistance Critical Electrical	 1011 – 15 cycles; 150°C. to -65°C. 1010 – 10 cycles; -55°C., 25°C., 150°C., 25°C. 1004 -- Datasheet	 15%
Subgroup IV Mechanical Shock Vibration Fatigue Vibration Variable Frequency Constant Acceleration Critical Electrical	 2002 – Condition B 2005 – Condition A 2007 – Condition A 2001 – Condition E -- Datasheet	 15%
Subgroup V Lead Fatigue Hermeticity	 2004 – Condition B_2 1014 – Fine Condition A Gross Condition C	 15%
Subgroup VI Salt Atmosphere	 1009 – Condition A	 15%

Reference: MIL-STD-883C Test Methods and Procedures for Microelectronics.

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