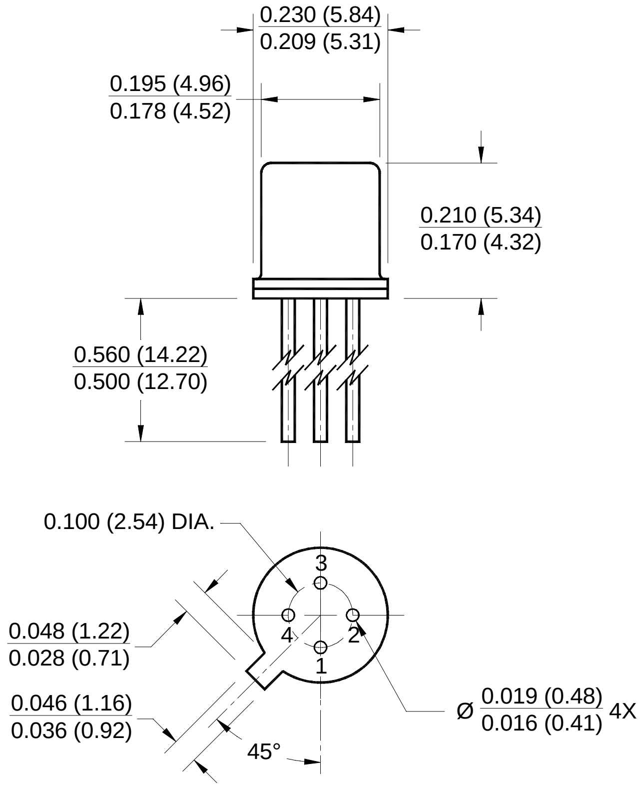
PHOTOTRANSISTOR OPTOCOUPLER

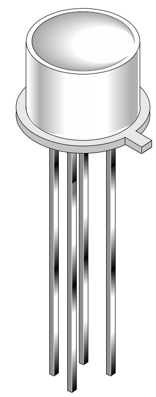
MCT4

PACKAGE DIMENSIONS

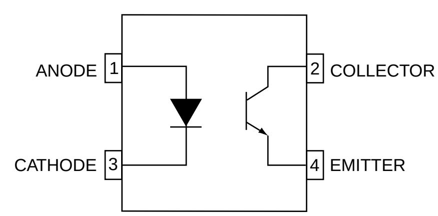


NOTES:

1. Dimensions for all drawings are in inches (mm).
2. Tolerance of ± .010 (.25) on all non-nominal dimensions unless otherwise specified.



SCHEMATIC



DESCRIPTION

The MCT4 is a standard four-lead, TO-18 package containing a GaAs infrared emitting diode optically coupled to an NPN silicon planar phototransistor.

FEATURES

- Hermetically package
- High current transfer ratio; typically 35%
- High isolation resistance; 10^{11} ohms at 500 volts
- High voltage isolation emitter to detector

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Rating	Unit
Operating Temperature	T_{OPR}	-55 to +125	°C
Storage Temperature	T_{STG}	-65 to +150	°C
Soldering Temperature (Flow)	T_{SOL-F}	260 for 10 sec	°C
EMITTER			
Power Dissipation at 25°C Ambient (1)	P_D	90	mW
Continuous Forward Current	I_F	40	mA
Reverse Voltage	V_R	3	V
Forward Current - Peak (1 µs pulse, 300 pps)	I_F(pk)	3.0	A
DETECTOR			
Power Dissipation 25°C Ambient (2)	P_D	200	mW
Collector to Emitter Voltage	V_{CEO}	30	V
Emitter to Collector Voltage	V_{ECO}	7	V
COUPLER			
Total Power Dissipation (3)	P_D	250	mW
Isolation Voltage		1000	VDC

ELECTRICAL / OPTICAL CHARACTERISTICS (T_A =25°C)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameters	Test Conditions	Symbol	Min	Typ	Max	Units
EMITTER						
Forward Voltage	I_F = 40 mA	V_F		1.30	1.50	V
Reverse Current	V_R = 3.0 V	I_R		0.15	10	µA
Capacitance	V = 0 V	C		150		pF
DETECTOR						
Breakdown Voltage Collector to Emitter	I_C = 1.0 mA, I_F = 0	BV_{CEO}	30			V
Emitter to Collector	I_E = 100 µA, I_F = 0	BV_{ECO}	7	12		V
Leakage Current Collector to Emitter	V_{CE} = 10 V, I_F = 0	I_{CEO}		5	50	nA
Capacitance Collector to Emitter	V_{CE} = 0	C_{CE}		2		pF

NOTE:
1. Derate power linearly 1.2 mW/°C above 25°C
2. Derate power linearly 2.67 mW/°C above 25°C
3. Derate power linearly 3.3 mW/°C above 25°C

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Min	Typ	Max	Units
COUPLED DC current Transfer Ratio (note 1)	V_{CE} = 10 V, I_F = 10 mA	CTR	15	35		%
Saturation Voltage	I_C = 500 µA, I_F = 10 mA	$V_{CE(SAT)}$		0.1		V
	I_C = 2 mA, I_F = 50 mA			0.2	0.5	
AC Characteristics	**Test Conditions**	**Symbol**	**Min**	**Typ**	**Max**	**Units**
Capacitance LED to Detector				1.8		pF
Bandwidth (Fig. 5)	Note 2			300		kHz
Rise Time and Fall Time (see operating schematic)	I_C = 2 mA, V_{CE} = 10 V, Note 3			2		µs

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Isolation Resistance	V = 500 VDC	R_{ISO}	10^{11}	10^{12}		Ω
Breakdown Voltage	Time = 1 sec		1000	1500		VDC

NOTE:

1. The current transfer ratio (I_C/I_F) is the ratio of the detector collector current to the LED input current with V_{CE} at 10 volts.
2. The frequency at which i_c is 3 dB down from the 1 kHz value.
3. Rise time (t_r) is the time required for the collector current to increase from 10% of its final value, to 90%. Fall time (t_f) is the time required for the collector current to decrease from 90% of its initial value to 10%.

Figure 1. Detector Output Characteristics

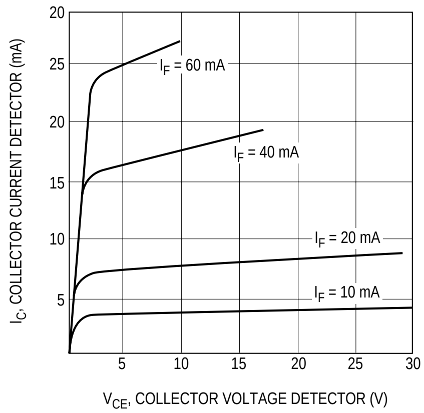


Figure 2. Input Current vs. Output Current

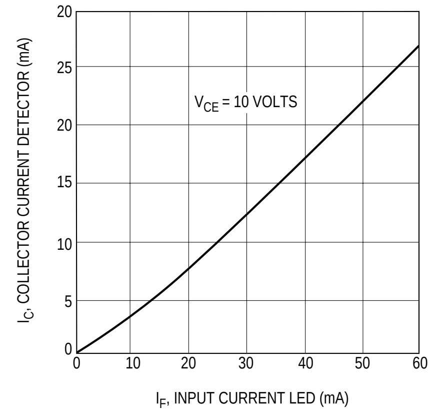


Figure 3. Dark Current vs. Temperature

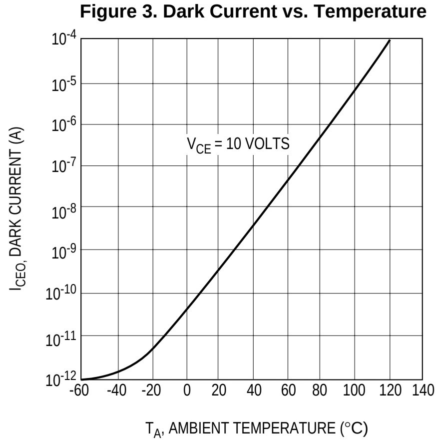


Figure 4. Current Output vs. Temperature

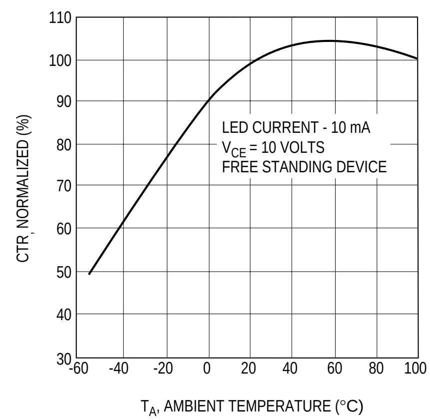


Figure 5. Output vs. Frequency

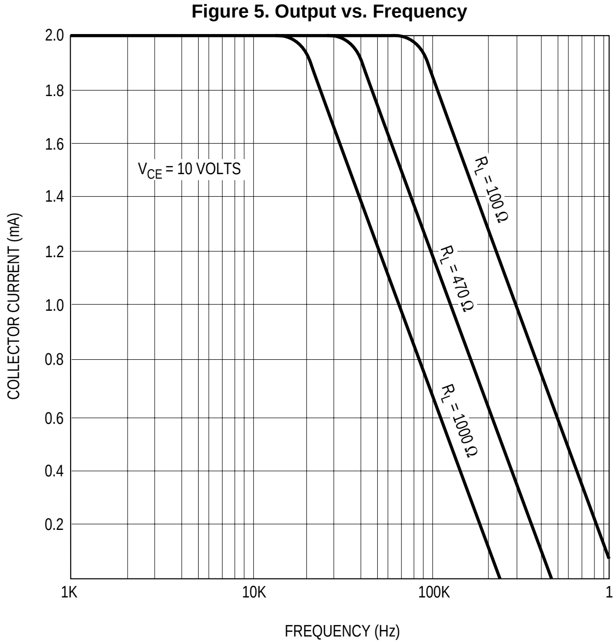
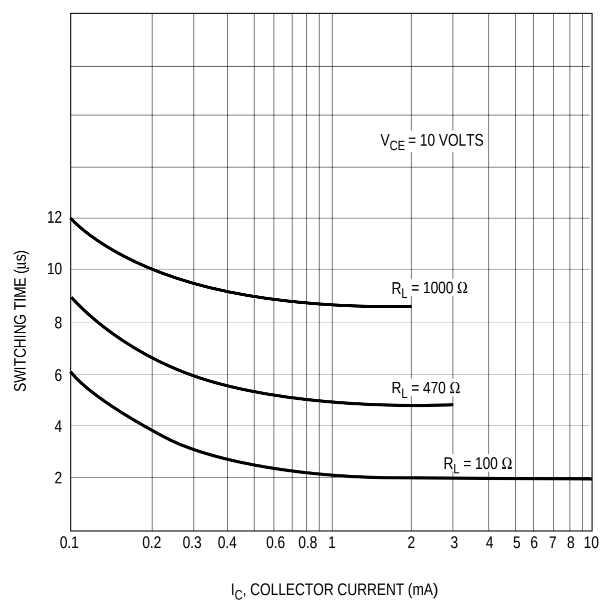


Figure 6. Switching Time vs. Collector Current



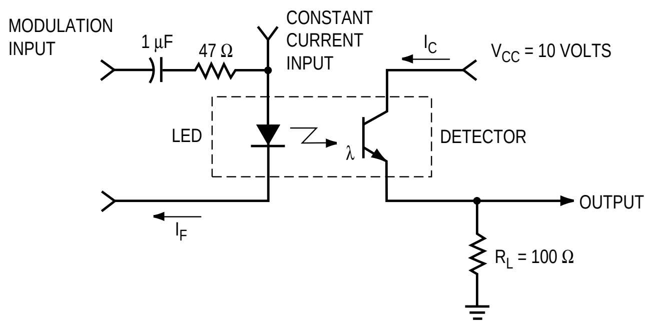


Figure 7. Modulation Circuit Used to Obtain Output vs. Frequency Plot

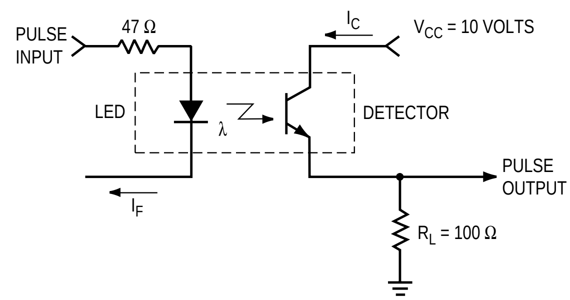


Figure 8. Circuit Used to Obtain Switching Time vs. Collector Current Plot

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