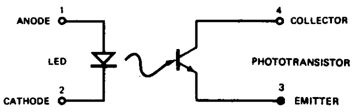
GENERAL INSTRUMENT
Optoelectronics

MCT8
MCT81
SLOTTED OPTICAL LIMIT SWITCH

PRODUCT DESCRIPTION

The MCT8 optical limit switch transmits light from a GaAs infrared emitting diode to a silicon phototransistor. Both semiconductor chips face each other across an .1-inch air gap. The MCT8 senses an object in the air gap by the effect on light transmission.

PACKAGE DIMENSIONS



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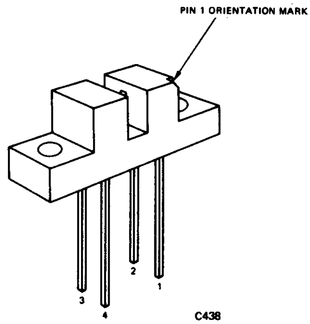

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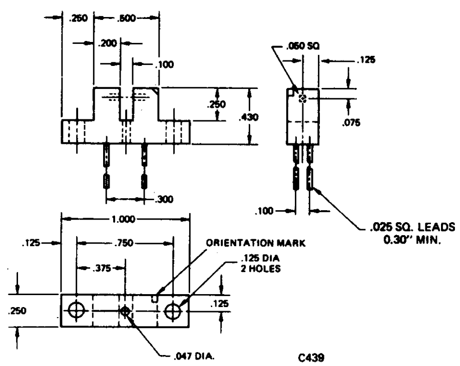

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Dimensions ± .010 inches
All dimensions are in inches.

FEATURES

- Transistor detector allows faster switching speeds thàn darlington detector.
- Modular package design permits low cost package modification to suit any application.
- Recessed detector and use of black plastic provide a high signal to noise ratio in ambient light.
- Plugs into standard DIP socket.
- Solid copper lead-frames provide excellent heat sinking.

APPLICATIONS

- Optical shaft position and velocity monitor using a digitally encoded disc mounted on a shaft.
- Optical sensing of holes in paper, paper tape, IBM card, or magnetic tape.
- Optical sensing of marks on paper, paper tape, or IBM card.
- End of tape sensor using a transparent section of tape, a reflective strip on the tape, or a hole in the tape.
- End of film sensor for films not áffected by infra-red light.
- Limit switch for mechanical travel such as cam switches, pressure switches, machine tool limit switches, foot pedal switches, safety interlock switches.
- Edge sensor for sheet materials such as paper, plastic film, fabric, foil, newsprint, belt sanders, reproduction paper.
- Fiber continuity monitor for fibers such as yarn, wire, thread.
- Fluid volume monitor by sensing turbine vanes passing through the slot.
- Liquid level detector of an opaque liquid.

ELECTRO-OPTICAL CHARACTERISTICS (25°C Free Air Temperature Unless Otherwise Specified)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE						
Forward Voltage	V_F		1.30	1.50	V	I_F = 20 mA
Reverse Breakdown Voltage	BV_R	3.0	20		V	I_R = 10 μA
Reverse Leakage Current	I_R		.01	10	μA	V_R = 3 V
OUTPUT TRANSISTOR—MCT8						
DC Current Transfer Ratio	CTR	.200	1.0		mA	I_F = 20 mA, V_{CE} = 10 V
Saturation Voltage	V_{CE}(SAT)		0.2	0.4	V	I_C = 50 μA, I_F = 20 mA (Note 1)
Collector Breakdown Voltage	BV_{CEO}	30	55		V	I_C = 1 mA, I_F = 0 (Note 1)
Emitter Breakdown Voltage	BV_{ECO}	5	7		V	I_C = 100 μA, I_F = 0
Dark Current	I_{CEO}		5	100	nA	V_{CE} = 10.0 V, I_F = 0 (Note 1)
Rise Time	tr		5		μsec	V_{CC} = 10 V, I_C = 1 mA R_L = 100 Ω CIRCUIT 1
Fall Time	tf		4		μsec	V_{CC} = 10 V, I_C = 1 mA R_L = 100 Ω CIRCUIT 1
Turn-on Time (from 5 V to 0.8 V)	t_{ON}		6		μsec	I_F = 40 mA CIRCUIT 2 R_B = 1.2kΩ, R_L = 2.4kΩ
Turn-off Time (from SAT. to 2 V)	t_{OFF}		4		μsec	I_F = 40 mA CIRCUIT 2 R_B = 1.2kΩ, R_L = 2.4kΩ
OUTPUT TRANSISTOR—MCT81						
DC Current Transfer Ratio	CTR	50	100		μA	I_F = 20 mA, V_{CE} = 10 V
Saturation Voltage	V_{CE}(SAT)		0.2	0.4	V	I_C = 25 μA, I_F = 20 mA (Note 1)
Collector Breakdown Voltage	BV_{CEO}	30	55		V	I_C = 1 mA, I_F = 0 (Note 1)
Emitter Breakdown Voltage	BV_{ECO}	5	7		V	I_C = 100 μA, I_F = 0
Dark Current	I_{CEO}		5	100	nA	V_{CE} = 10.0 V, I_F = 0 (Note 1)
Ambient Light Leakage Current			0.30		μA	V_{CE} = 10.0 V, I_F = 0
Rise Time	tr		3		μsec	V_{CC} = 10 V, I_C = 1 mA R_L = 100 Ω CIRCUIT 1
Fall Time	tf		4		μsec	V_{CC} = 10 V, I_C = 1 mA R_L = 100 Ω CIRCUIT 1
Turn-on Time (from 5 V to 0.8 V)	t_{ON}		6		μsec	I_F = 40 mA CIRCUIT 2 R_B = 1.2kΩ, R_L = 2.4kΩ
Turn-off Time (from SAT to 2 V)	t_{OFF}		3		μsec	I_F = 40 mA CIRCUIT 2 R_B = 1.2kΩ, R_L = 2.4kΩ

ABSOLUTE MAXIMUM RATINGS

Storage Temperature Range . . . . −65°C to +100°C
Operating Temperature Range . . . −55°C to +100°C
Lead Temp. (Soldering, 10 sec) . . . . 260°C
Total Power Diss. @ 25°C Free
Air Temperature . . . . 275 mW
Derate Linearly to 100°C (θ_{JA}). . . . . 3.7 mW/°C

Input Diode
Power Dissipation @ 25°C Ambient . . . . 90 mW
Derate Linearly Above 25°C . . . . 1.2 mW/°C
Forward Current . . . . 60 mA
Reverse Voltage . . . . 3 V
Peak Forward Current
(1 μs pulse, 300 pps) . . . . 3.0 A

Output Transistor
Collector-Emitter Voltage . . . . 30 V
Emitter-Collector Voltage . . . . 5 V

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES
(25°C Free Air Temperature Unless Otherwise Specified)

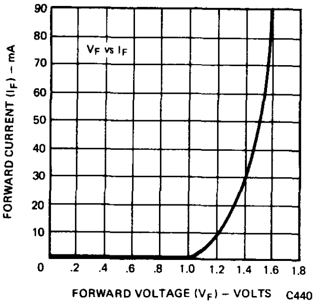


Fig. 1. Forward Voltage vs. Forward Current

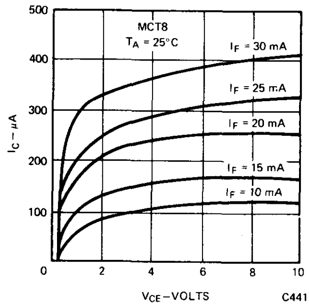


Fig. 2. Collector Current vs. Collector Voltage

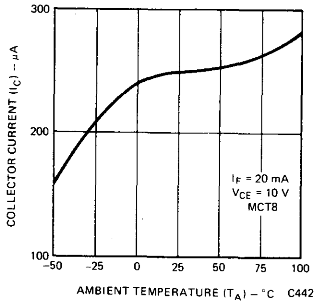


Fig. 3. Collector Current vs. Ambient Temperature

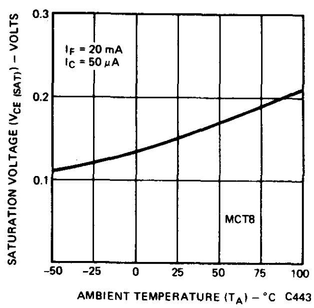


Fig. 4. Saturation Voltage vs. Temperature

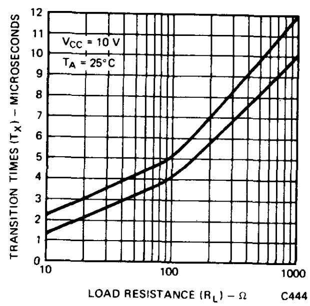


Fig. 5. Non-saturated Rise and Fall Times vs. Load Resistance

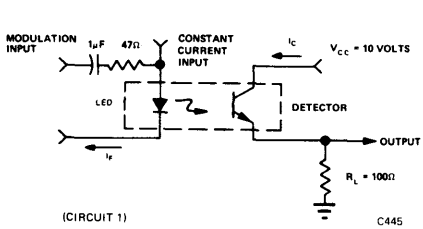


Figure 6.

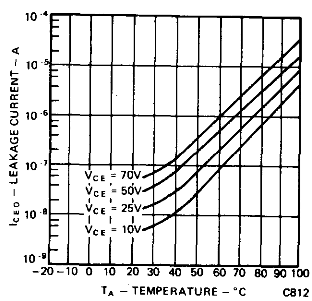
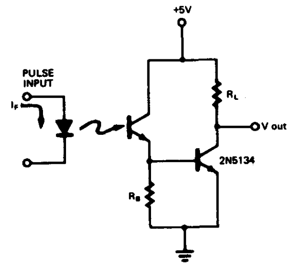


Fig. 7. Dark Current vs. Temperature

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES (CONT.)

PW = 10-100 μsec
DC = 10%
t_r t_f = ≤10 nsec



(CIRCUIT 2) C446

Figure 7.

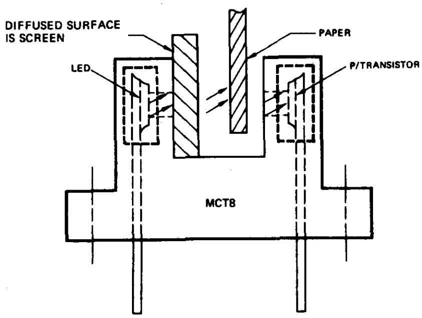


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Fig. 8. Detecting Paper by Using a Lens Screen

NOTES:

1. *Measured with radiation flux intensity of less than 0.1 μW/cm² (dark condition) over the spectrum from 0.1 micron to 1.5 microns.*