Optoisolators QUICK REFERENCE CHART

OUTPUT FORMAT	PRODUCT	PACKAGE KEY	PACKAGE TYPE	MIN. CURRENT TRANSFER RATIO	MIN. DC ISOLATION VOLTAGE	MIN. OUTPUT VOLTAGE RATING (BV_{CEO})	TYPICAL BANDWIDTH $R_L = 100\Omega$
TRANSISTOR	MCT2	A	6 LEAD PLASTIC DIP	20%	1500 V	30 V	150 kHz
TRANSISTOR	MCT2E	A	6 LEAD PLASTIC DIP	20%	2500 V	30 V	150 kHz
TRANSISTOR	MCT210	A	6 LEAD PLASTIC DIP	150%	4000 V	30 V	150 kHz
TRANSISTOR	MCT26	A	6 LEAD PLASTIC DIP	6%	1500 V	30 V	150 kHz
TRANSISTOR	MCT4	C	TO-46 METAL CAN	15%	1000 V	30 V	150 kHz
TRANSISTOR	MCT4R*	C	TO-46 METAL CAN	15%	1000 V	30 V	150 kHz
TRANSISTOR	MCT6	B	8 LEAD PLASTIC DIP DUAL CHANNEL	20%	1500 V	30 V	150 kHz
TRANSISTOR	MCT66	B	8 LEAD PLASTIC DIP DUAL CHANNEL	6%	1500 V	30 V	150 kHz
TRANSISTOR	4N25	F	6 LEAD PLASTIC DIP	20%	2500 V	30 V	300 kHz
TRANSISTOR	4N26	F	6 LEAD PLASTIC DIP	20%	1500 V	30 V	300 kHz
TRANSISTOR	4N27	F	6 LEAD PLASTIC DIP	10%	1500 V	30 V	300 kHz
TRANSISTOR	4N28	F	6 LEAD PLASTIC DIP	10%	500 V	30 V	300 kHz
TRANSISTOR	4N35	F	6 LEAD PLASTIC DIP	100%	3550 V	30 V	150 kHz
TRANSISTOR	4N36	F	6 LEAD PLASTIC DIP	100%	2500 V	30 V	150 kHz
TRANSISTOR	4N37	F	6 LEAD PLASTIC DIP	100%	1500 V	30 V	150 kHz
DARLINGTON TRANS.	MCA230	A	6 LEAD PLASTIC DIP	100%	1500 V	30 V	10 kHz
DARLINGTON TRANS.	MCA231	A	6 LEAD PLASTIC DIP	200%	1500 V	30 V	10 kHz
DARLINGTON TRANS.	MCA255	A	6 LEAD PLASTIC DIP	100%	1500 V	55 V	10 kHz
DARLINGTON TRANS.	4N29	F	6 LEAD PLASTIC DIP	100%	2500 V	30 V	30 kHz
DARLINGTON TRANS.	4N30	F	6 LEAD PLASTIC DIP	100%	1500 V	30 V	30 kHz
DARLINGTON TRANS.	4N31	F	6 LEAD PLASTIC DIP	50%	1500 V	30 V	30 kHz
DARLINGTON TRANS.	4N32	F	6 LEAD PLASTIC DIP	500%	2500 V	30 V	30 kHz
DARLINGTON TRANS.	4N33	F	6 LEAD PLASTIC DIP	500%	1500 V	30 V	30 kHz

*Reliability conditioned to MIL-STD-883, Method 5005/B, 100% pre-conditioning.

OUTPUT FORMAT	PRODUCT	PACKAGE KEY	PACKAGE TYPE	DC ISOLATION VOLTAGE	FORWARD BLOCKING VOLTAGE (V_{DRRM})	MAX. TURN-ON CURRENT (I_F)
SCR	MCS2	A	6 LEAD PLASTIC DIP	1500 V	200 V	14.0 mA
SCR	MCS2400	A	6 LEAD PLASTIC DIP	1500 V	400 V	14.0 mA
2 SCR's (CONNECTED ANODE TO CATHODE)	MCS6200	B	8 LEAD PLASTIC DIP	1500 V	200 V	14.0 mA
2 SCR's (CONNECTED ANODE TO CATHODE)	MCS6201	B	8 LEAD PLASTIC DIP	2500 V	200 V	14.0 mA

OUTPUT FORMAT	PRODUCT	PACKAGE KEY	PACKAGE TYPE	MIN. DC ISOLATION VOLTAGE	MIN. BINARY DATA RATE (BDR)	MAX. TRIGGER (I_F)	TYP. HYSTERESIS (ΔI_F)
LOGIC GATE OPEN COLLECTOR	MCL601	B	8 LEAD PLASTIC DIP	2000 V	0.10 MHz	5.0 mA	1.0 mA
LOGIC GATE OPEN COLLECTOR	MCL611	B	8 LEAD PLASTIC DIP	2000 V	1.0 MHz	15.0 mA	5.0 mA

(TOTEM POLE OUTPUT – MCL600 & MCL610 available February, 1977.)

OUTPUT FORMAT	PRODUCT	PACKAGE KEY	PACKAGE TYPE	COLLECTOR CURRENT (I_C)	TYPICAL BANDWIDTH	MAX. DARK CURRENT (I_{CEO})
TRANSISTOR	MCT8	E	SLOTTED LIMIT SWITCH	200 μA @ I_F = 20 mA, V_{CE} = 10 V	150 kHz	100 nA
TRANSISTOR	MCT81	E	SLOTTED LIMIT SWITCH	50 μA @ I_F = 20 mA, V_{CE} = 10 V	200 kHz	100 nA
DARLINGTON	MCA7	D	REFLECTIVE SENSOR SWITCH	50 μA @ I_F = 50 mA, V_{CE} = 5 V	0.8 kHz	100 nA
DARLINGTON	MCA8	E	SLOTTED LIMIT SWITCH	2 mA @ I_F = 16 mA, V_{CE} = 1 V	0.8 kHz	100 nA
DARLINGTON	MCA81	E	SLOTTED LIMIT SWITCH	1.6 mA @ I_F = 50 mA, V_{CE} = 1 V	1.5 kHz	100 nA

Monsanto

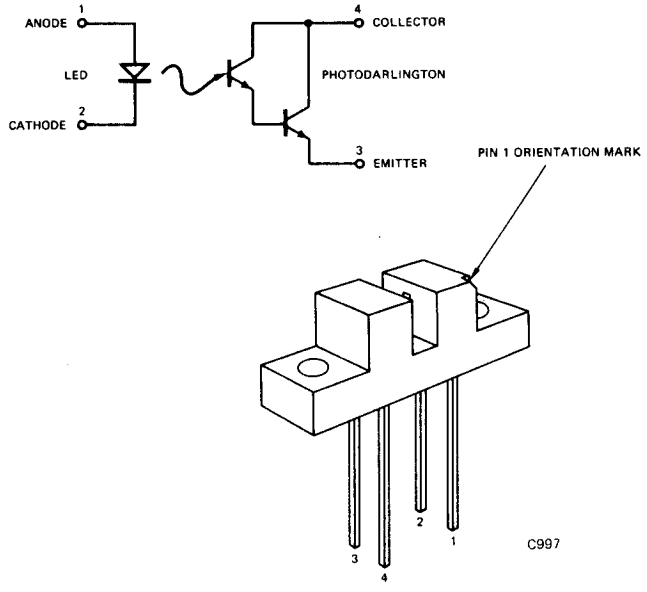
SLOTTED OPTICAL LIMIT SWITCH

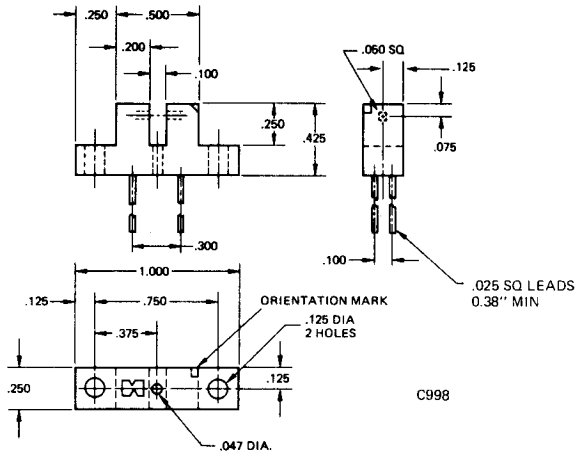
MCA8
MCA81

PRODUCT DESCRIPTION

The MCA8 optical limit switch transmits light from a GaAs infrared emitting diode onto a silicon photodarlington detector. Both semiconductor chips face each other across an .01 inch air gap. The MCA8 senses a moving object that passes through the air gap. Output current will directly operate a TTL Schmidt trigger.

PACKAGE DIMENSIONS





All dimensions are in inches.
Active area of LED is .014 x .014
Active area of PhotoDarlington is .010 x .020
Dimensions ± .010 inches

FEATURES

- High Sensitivity permits direct interface with TTL logic.
- Modular construction permits low cost package modification to suit any application.
- Recessed detector provides a high signal to noise ratio in ambient light.
- Plugs into standard DIP socket.
- Multiple flat reference surfaces allow precise mechanical alignment of the optical beam.
- Absence of lensing provides position sensitivity down to 0.020" between full on and full off.
- Solid copper lead-frame provides excellent heat sinking and highest reliability for the LED.
- One piece construction of the emitter and detector components provides excellent moisture resistance, immunity from thermal shocks, high and low temperature stability, and protection from shock and vibration.

APPLICATIONS

- Optical shaft position and velocity monitor using a digitally encoded disk 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 affected 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		1.25	1.5	V	I_F = 20 mA
Reverse Breakdown Voltage	BV_R	3.0	25		V	I_R = 10 μA
Reverse Leakage Current	I_R		.01	10	μA	V_R = 3 V
Junction Capacitance			50		pF	V_F = 0
OUTPUT DARLINGTON—MCA8						
Saturation Voltage	V_{CE}(SAT)		0.8	1.0	V	I_C = 2 mA, I_F = 16 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 (Note 2)
Dark Current—MCA8	I_{CEO}		5	100	nA	V_{CE} = 5.0 V, I_F = 0 (Note 1)
Ambient Leakage Current			20		μA	V_{CE} = 5.0 V, I_F = 0 (Note 2)
Rise Time	tr		2.3		ms	V_{CE} = 5 V, R_L = 1 KΩ
Fall Time	tf		1.7		ms	V_{CE} = 5 V, R_L = 1 KΩ
Turn-on Time	t_{ON}		.3		ms	I_F = 12 mA, FIG 12
Turn-off Time	t_{OFF}		1.0		ms	I_F = 12 mA, FIG 12
DC Current Transfer Ratio	CTR	15	30		%	I_F = 16 mA, V_{CE} = 5 V
OUTPUT DARLINGTON—MCA81						
Saturation Voltage	V_{CE}(SAT)		0.8	1.0	V	I_C = 1.6 mA, I_F = 50 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 (Note 2)
Dark Current	I_{CEO}		5	100	nA	V_{CE} = 5.0 V, I_F = 0 (Note 1)
Ambient Light Leakage Current			2		μA	V_{CE} = 5.0 V, I_F = 0 (Note 2)
Rise Time	tr		.36		ms	V_{CE} = 5 V, R_L = 1 KΩ
Fall Time	tf		.3		ms	V_{CE} = 5 V, R_L = 1 KΩ
Turn-on Time	t_{ON}		.15		ms	I_F = 40 mA, FIG 12
Turn-off Time	t_{OFF}		.2		ms	I_F = 40 mA, FIG 12
DC Current Transfer Ratio	CTR	4	8		%	I_F = 16 mA, V_{CE} = 5 V

ABSOLUTE MAXIMUM RATINGS

Storage Temperature Range. . . . . -65°C to +100°C
Operating Temperature Range. . . . -55°C to +100°C
Lead Temp. (Soldering, 10sec). . . . . 260°C
Total Power Diss. @ 25°C Free
Air Temperature . . . . . 275 mW
Derate Linearly to 100°C (θ_{JA}). . . . . 3.7 mW/°C
Input to Output Isolation Voltage . . . . . 1500 VAC

Input Diode
Forward DC Current . . . . . 60 mA
Reverse DC Current . . . . . 4 mA
Peak Forward Current
(1 μs pulse, 300 pps) . . . . . 3.0 A
Output Darlington
Collector-Emitter Voltage (BV_{CEO}) . . . . . 30 V
Collector Current . . . . . 100 mA

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified)

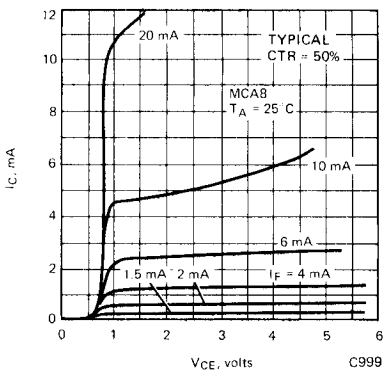


Figure 1 Collector Current vs. Collector Voltage

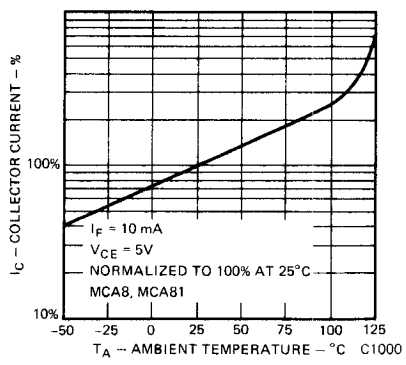


Figure 2 Collector Current vs. Ambient Temperature

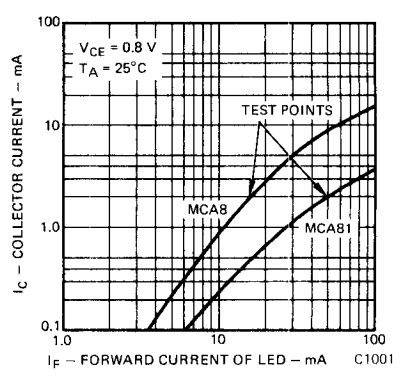


Figure 3 Collector Current vs. LED Current

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES (CONT.)

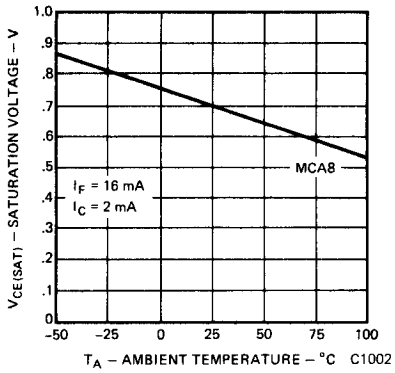


Figure 4 Saturation Voltage vs. Temperature

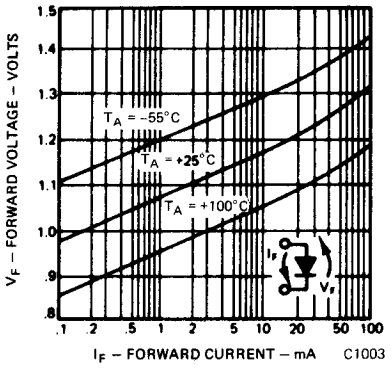


Figure 5 Forward Voltage vs. Forward Current

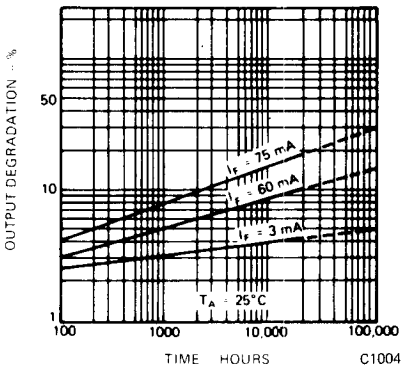


Figure 6 Lifetime vs. Forward Current

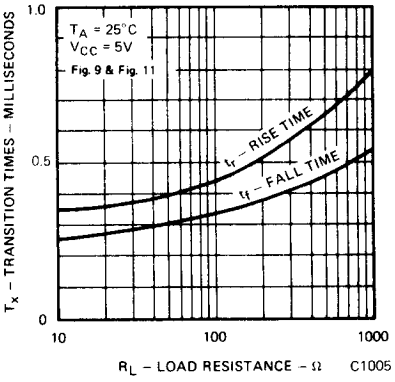


Figure 7 Non-Saturated Rise and Fall Times vs. Load Resistance

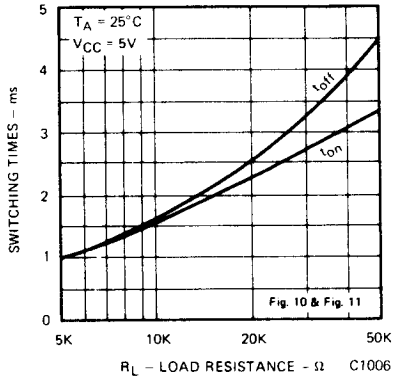


Figure 8 Saturated Switching Times vs. Load Resistance

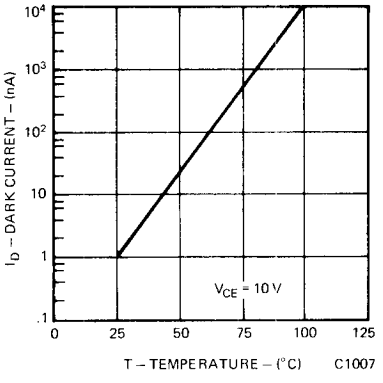


Figure 9. Dark Current vs. Temperature

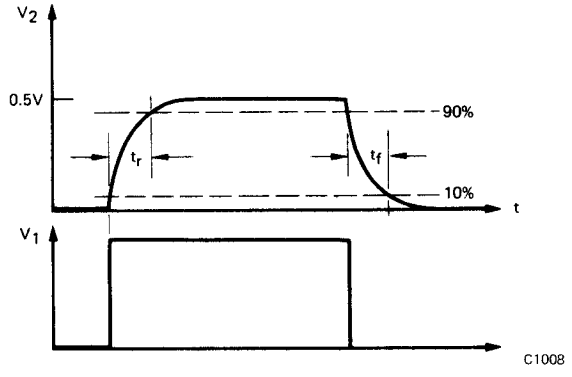


Figure 10 Non-Saturated Switching Waveforms

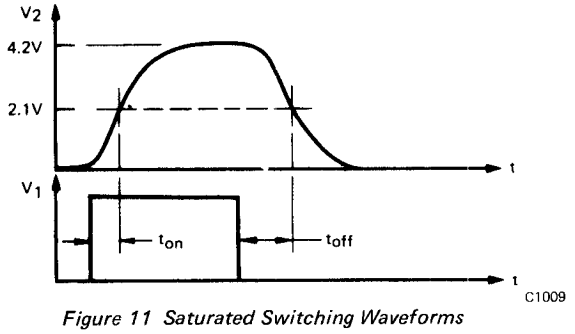


Figure 11 Saturated Switching Waveforms

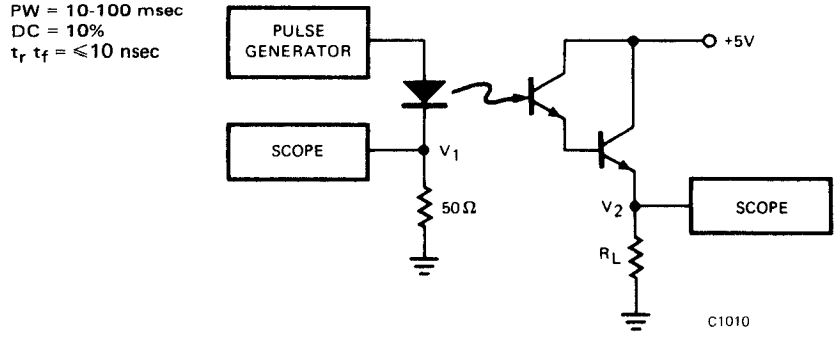


Figure 12 Circuit for Testing Switching Parameters

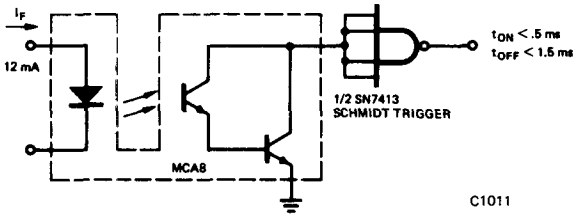


Figure 12 Driving a TTL Schmidt Trigger

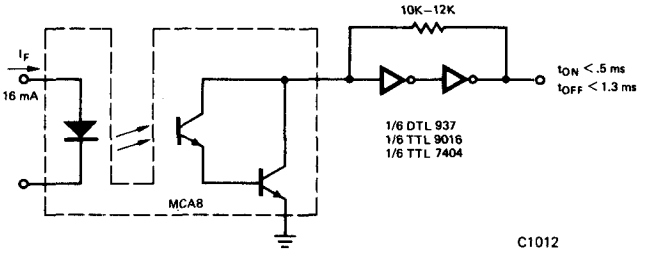


Figure 13 Driving Two Hex Inverters

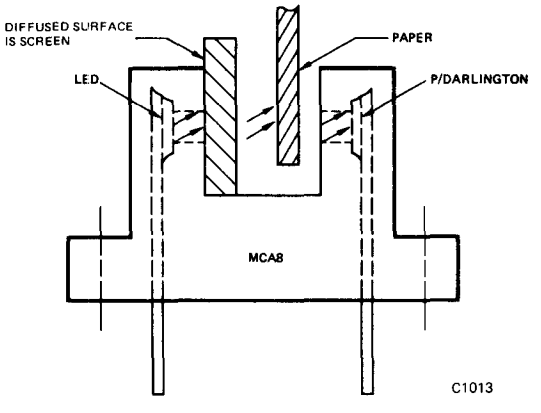


Figure 14 Detecting Paper by using a Lens Screen

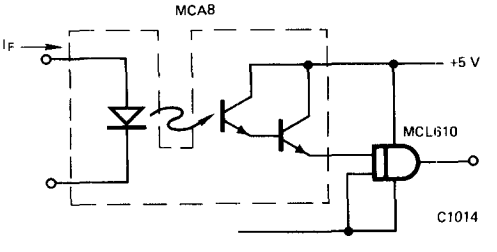


Figure 15 TTL Logic Interface

DETECTING PAPER BY USING A LENS SCREEN

Infrared light tends to go right through paper, making detection very difficult. For instance, one sheet of white 20# bond paper has an ON/OFF ratio of 1.5 to 1. This ratio can be greatly increased by diffusing the light from the LED prior to striking the paper. A piece of paper used as a diffusant increases the ON/OFF ratio to 5:1. For best results, use a plexiglas lens screen, No. LS85PL 1/16, made by Polacoat, 9750 Conklin Road, Cincinnati, Ohio 45242. This screen transmits 90% of the original light, yet increases the ON/OFF ratio to 16:1 for 20# bond paper, and 60:1 for a manila card.

NOTES:

1. *Measured with radiation flux intensity of less than 0.1 $\mu W/cm^2$ (dark condition) over the spectrum from 0.1 micron to 1.5 microns.*
2. *Measured at typical factory ambient of 150 foot-candles (150 lamberts per square foot).*