



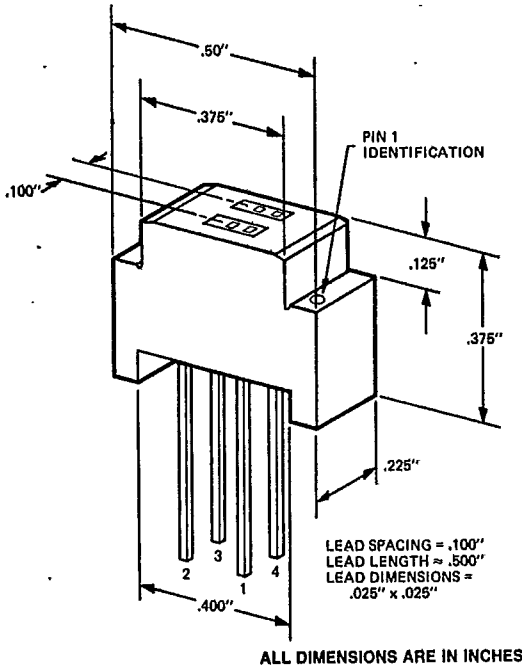
REFLECTIVE OBJECT SENSOR

MSA7

(OLD PART NO.—MCA7)



PACKAGE DIMENSIONS



DESCRIPTION

The MSA7 optoisolator consists of an infrared emitting diode and a silicon planar photodarlington. The on-axis radiation of the emitter and the on-axis response of the detector are both perpendicular to the face of the MSA7. The photodarlington responds to radiation emitted from the diode only when a reflective object or surface is in the field of view of the detector.

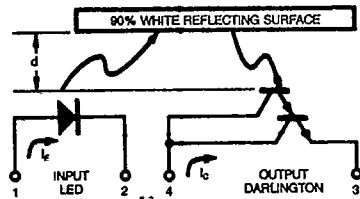
FEATURES

- High sensitivity
- Low cost
- High reliability

APPLICATIONS

- Object sensing
- End-of-tape sensing

PIN	
1	LED ANODE
2	LED CATHODE
4	PHOTODARLINGTON COLLECTOR
3	PHOTODARLINGTON EMITTER



C1016

Fig. 1. Parameter Symbols

ABSOLUTE MAXIMUM RATINGS

Storage Temperature	—55°C to 100°C
Operating Temperature	—55°C to 100°C
Lead Temperature (Soldering, 5 sec)	260°C
Total Power Dissipation (25° Free Air Temp.)	250 mW
Derate linearly from 25°C	3.3 mW/°C

INPUT DIODE

Power dissipation at 25°C ambient	90 mW
Derate linearly from 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 DARLINGTON

Power dissipation at 25°C Ambient	150 mW
Derate linearly from 25°C	2.0 mW/°C
Collector Current	25 mA
Collector to emitter voltage	30 V



T-41-73
REFLECTIVE OBJECT SENSOR

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	1.50	V	$I_F=20\text{ mA}$
Reverse breakdown voltage	BV_R	3.0	5.5		V	$I_R=10\ \mu\text{A}$
Junction capacitance	C_j		50		pF	$V_F=0\text{V}$
Reverse leakage current	I_R		.01	10	μA	$V_R=3.0\text{V}$
OUTPUT DARLINGTON						
Breakdown voltage	BV_{CEO}	30	55		V	$I_C=1.0\text{ mA}$ $I_F=0$ (NOTE 2)
Reverse breakdown voltage	BV_{ECO}	5	7		V	$I_C=100\ \mu\text{A}$ $I_F=0$ (NOTE 2)
Leakage current	I_{CEO} (dark)		0.6	100	nA	$V_{CE}=5\text{V}$ (NOTE2), $I_F=0$

TRANSFER CHARACTERISTICS

DC CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
COUPLED						
DC Collector Current	I_C	.050	1		mA	$I_F=50\text{ mA}$ $V_{CE}=5.0\text{V}$ (NOTE 1 & 2) $d=1.0\text{ cm}$

TRANSFER CHARACTERISTICS

AC CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Rise time, fall time	t_r, t_f		0.6		mS	$V_{CE}=5\text{V}$ $R_L=1\text{K}\Omega$

TYPICAL ELECTRO-OPTICAL CHARACTERISTICS
($T_A=25^\circ\text{C}$ Unless Otherwise Specified)

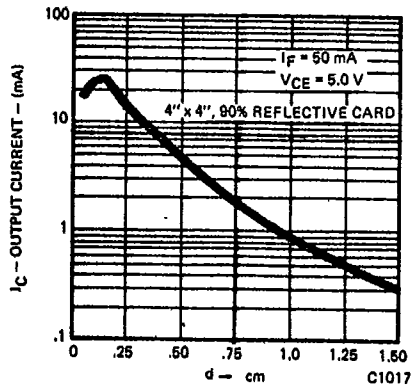


Fig. 2. Output Current vs. Distance

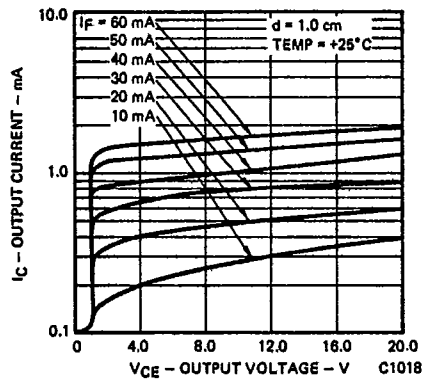


Fig. 3. I_C vs. V_{CE}



REFLECTIVE OBJECT SENSOR

T-41-73



TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

($T_A = 25^\circ\text{C}$ Unless Otherwise Specified) (Cont'd)

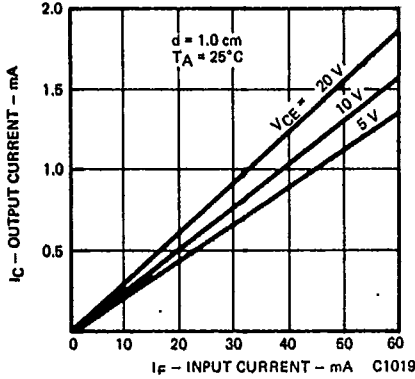


Fig. 4. I_C vs. I_F

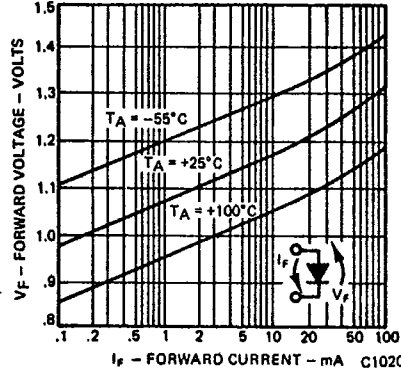


Fig. 5. Forward Voltage vs. Forward Current

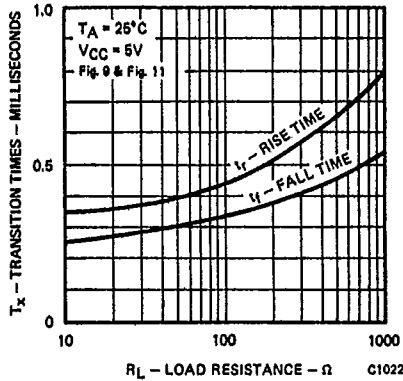


Fig. 6. Non-Saturated Rise and Fall Times vs. Load Resistance

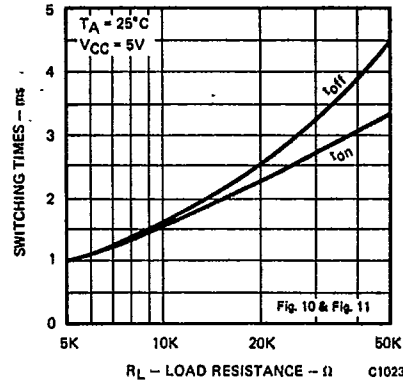


Fig. 7. Saturated Switching Times vs. Load Resistance

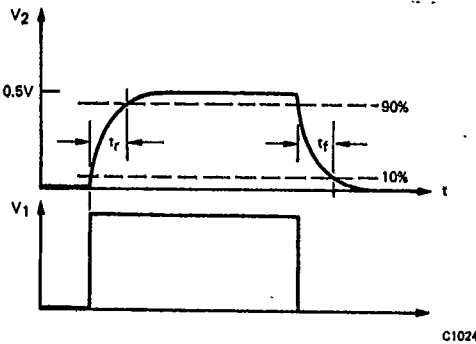


Fig. 8. Non-Saturated Switching Waveforms

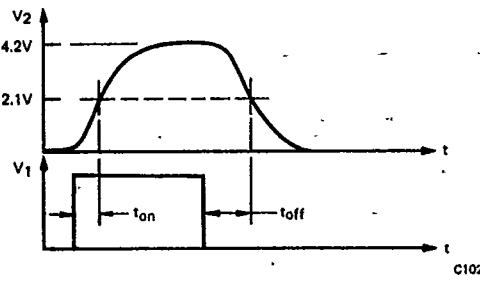


Fig. 9. Saturated Switching Waveforms



REFLECTIVE OBJECT SENSOR

T-41-73

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

($T_A = 25^\circ\text{C}$ Unless Otherwise Specified) (Cont'd)

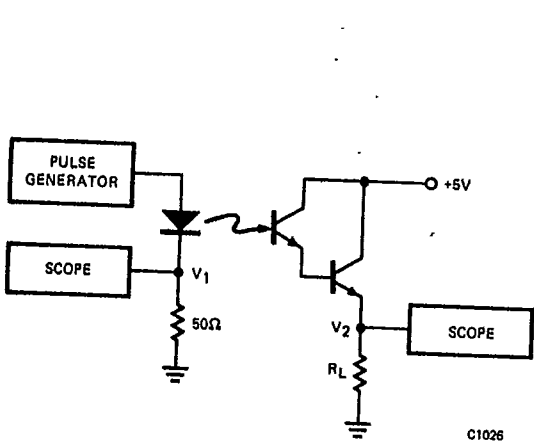


Fig. 10. Circuit for Testing Switching Parameters

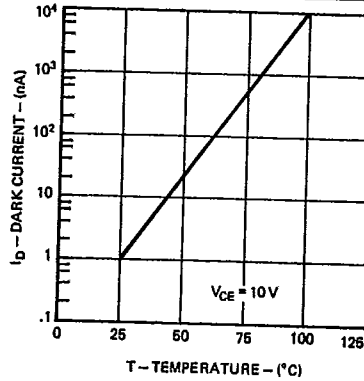
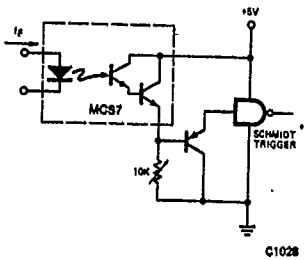
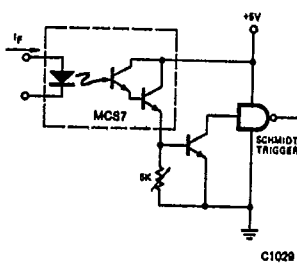


Fig. 11. Dark Current vs. Temperature

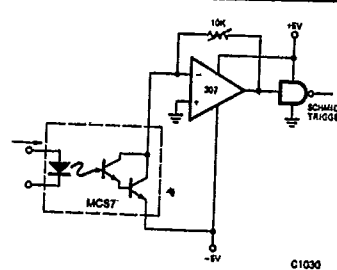
CIRCUITS TO INTERFACE THE MCS7 WITH 5V LOGIC



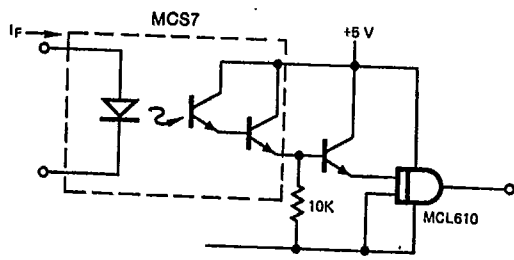
Circuit 1
Normally High Output



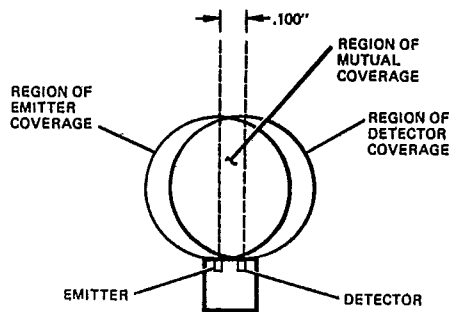
Circuit 2
Normally Low Output



Circuit 3
Comparator Driver



Circuit 4
Booster Drive to Logic Isolator



Spatial Distribution of Maximum Sensitivity

MSA7



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T-41-73

2

NOTES

1. Photo current is obtained from a $4.0'' \times 4.0''$, 90% white surface placed at a distance of 1.0 cm from the surface of the MCA7.
2. Measured with radiation flux intensity of less than $0.1 \mu\text{W}/\text{cm}^2$ (dark condition) over the spectrum from 0.1 micron to 1.5 microns.
3. Measured at typical factory ambient of 150 foot-candles (150 lamberts per square foot).