MRD360 (SILICON)

MRD370

NPN SILICON HIGH SENSITIVITY PHOTO DARLINGTON TRANSISTORS

. . . designed for application in industrial inspection, processing and control, counters, sorters, switching and logic circuit or any design requiring very high radiation sensitivity at low light levels.

- Popular TO-18 Type Hermetic Package for Easy Handling and Mounting
- Sensitive Throughout Visible and Near Infra-Red Spectral Range for Wider Application
- Minimum Light Current 12 mA at H = 0.5 mW/cm^2 (MRD360)
- External Base for Added Control
- Switching Times –
  t_r @ I_L = 1.0 mA peak = 15 μs (Typ) – MRD370
  t_f @ I_L = 1.0 mA peak = 25 μs (Typ) – MRD370

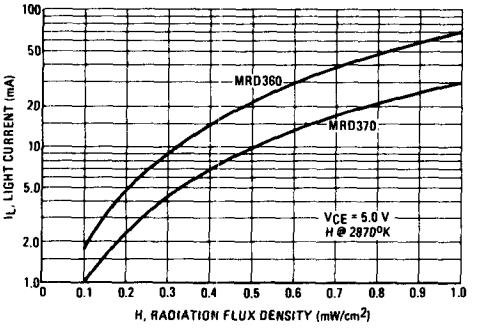
40 VOLT PHOTO DARLINGTON TRANSISTORS NPN SILICON

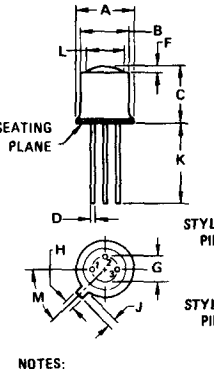
250 MILLIWATTS

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted).

Rating (Note 1)	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	40	Volts
Emitter-Base Voltage	V_{EBO}	10	Volts
Collector-Base Voltage	V_{CBO}	50	Volts
Light Current	I_L	250	mA
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	250 1.43	mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +200	°C

FIGURE 1 – LIGHT CURRENT versus IRRADIANCE





STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 2:
PIN 1. CATHODE
2. GATE
3. ANODE

NOTES:
1. LEADS WITHIN .13 mm (.005) RADIUS OF TRUE POSITION AT SEATING PLANE, AT MAXIMUM MATERIAL CONDITION.
2. PIN 3 INTERNALLY CONNECTED TO CASE.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	5.08	6.35	0.200	0.250
D	0.41	0.48	0.016	0.019
F	0.51	1.02	0.020	0.040
G	2.54 BSC		0.100 BSC	
H	0.99	1.17	0.039	0.046
J	0.84	1.22	0.033	0.048
K	12.70	–	0.500	–
L	3.35	4.01	0.132	0.158
M	45° BSC		45° BSC	

CASE 82
TO-18

STATIC ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Collector Dark Current (V_{CE} = 10 V, H ≈ 0) T_A = 25°C	I_{CEO}	–	10	100	nA
Collector-Base Breakdown Voltage (I_C = 100 μA)	BV_{CBO}	50	–	–	Volts
Collector-Emitter Breakdown Voltage (I_C = 100 μA)	BV_{CEO}	40	–	–	Volts
Emitter-Base Breakdown Voltage (I_E = 100 μA)	BV_{EBO}	10	–	–	Volts

OPTICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Device Type	Symbol	Min	Typ	Max	Unit
Light Current V_{CC} = 5.0 V, R_L = 10 Ohms (Note 1)	MRD360	I_L	12	20	–	mA
	MRD370		3.0	10	–	
Collector-Emitter Saturation Voltage (I_L = 10 mA, H = 2 mW/cm^2 at 2870°K)		$V_{CE(sat)}$	–	–	1.0	Volts
Photo Current Rise Time (Note 2) (R_L = 100 ohms, I_L = 1.0 mA peak)	MRD360	t_r	–	40	100	μs
	MRD370		–	15	100	
Photo Current Fall Time (Note 2) (R_L = 100 ohms, I_L = 1.0 mA peak)	MRD360	t_f	–	60	150	μs
	MRD370		–	25	150	

NOTES:

1. Radiation flux density (H) equal to 0.5 mW/cm^2 emitted from a tungsten source at a color temperature of 2870 K.
2. For unsaturated response time measurements, radiation is provided by pulsed GaAs (gallium-arsenide) light-emitting diode ($\lambda \approx 0.9$ μm) with a pulse width equal to or greater than 500 microseconds (see Figure 6) I_L = 1.0 mA peak.

TYPICAL ELECTRICAL CHARACTERISTICS

FIGURE 2 – COLLECTOR-EMITTER SATURATION CHARACTERISTIC

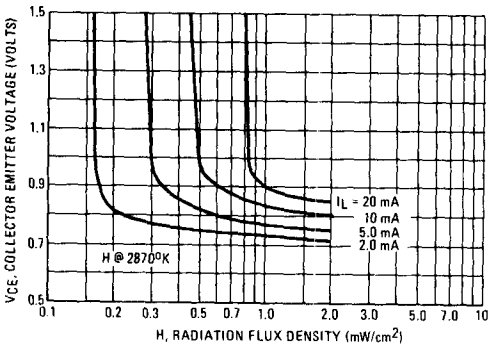


FIGURE 3 – COLLECTOR CHARACTERISTICS

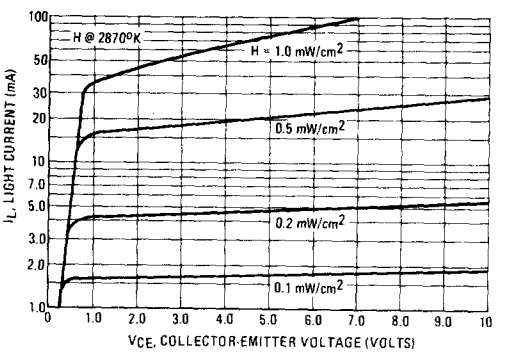


FIGURE 4 – NORMALIZED LIGHT CURRENT versus TEMPERATURE

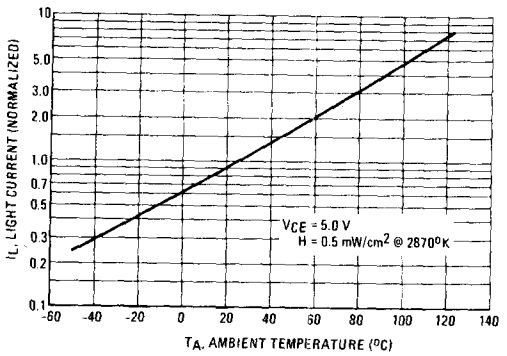


FIGURE 5 – DARK CURRENT versus TEMPERATURE

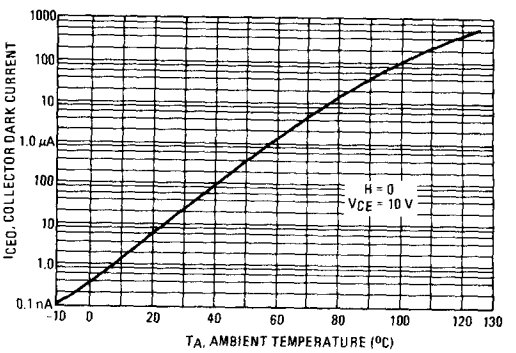
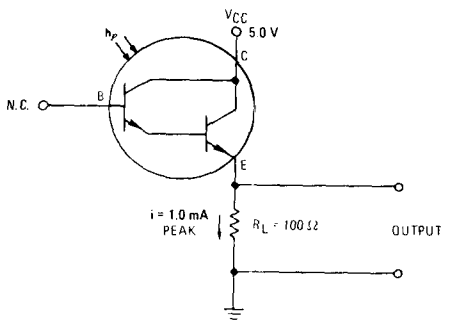


FIGURE 6 – PULSE RESPONSE TEST CIRCUIT AND WAVEFORM



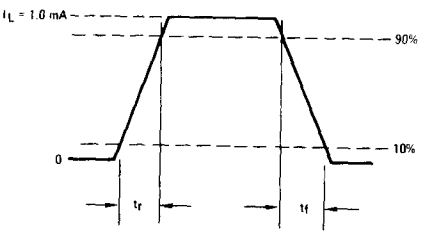


FIGURE 7 – CONSTANT ENERGY SPECTRAL RESPONSE

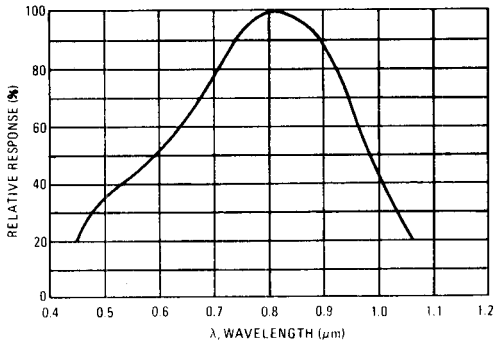
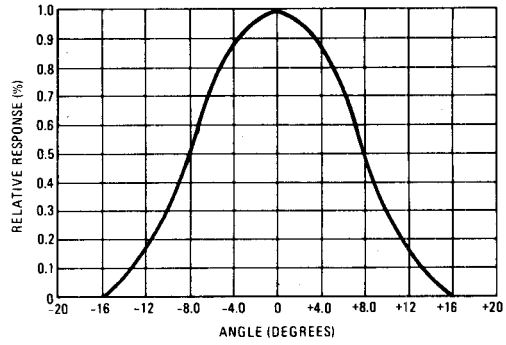


FIGURE 8 – ANGULAR RESPONSE



SELECTED OPTOELECTRONICS APPLICATION NOTES:

AN-440 Theory and Characteristics of Photo Transistors

AN-508 Applications of Phototransistors in Electro-Optic Systems.

AN-561 How to Use Photosensors and Light Sources

To obtain copies of these notes list the AN number(s) on your company letterhead and send your request to:

Technical Information Center
Motorola Semiconductor Products Inc.
P.O. Box 20924
Phoenix, Arizona 85036