

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

Photo Detector
Darlington Output

MRD360

Motorola Preferred Device

PHOTO DETECTOR
DARLINGTON OUTPUT
NPN SILICON

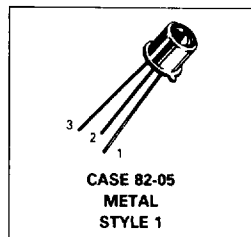
The MRD360 is designed for applications requiring very high radiation sensitivity at low light levels.

Features:

- Popular TO-18 Type Hermetic Package for Easy Handling and Mounting
- Sensitive Throughout Visible and Near Infrared Spectral Range for Wider Application
- Minimum Light Current 12 mA at $H = 0.5 \text{ mW/cm}^2$
- External Base for Added Control
- Switching Times –
 - $t_r @ I_L = 1 \text{ mA peak} = 40 \mu\text{s}$ (Typ)
 - $t_f @ I_L = 1 \text{ mA peak} = 60 \mu\text{s}$ (Typ)

Applications:

- Industrial Processing and Control
- Shaft or Position Readers
- Optical Switching
- Remote Control
- Light Modulators
- Punched Card Readers
- Logic Circuits
- Counters



MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CE0}	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 @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	250 2 27	mW mW/°C
Operating Temperature Range	T_A	-55 to +125	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

STATIC ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Collector Dark Current ($V_{CE} = 10 \text{ V}$, $H \approx 0$) $T_A = 25^\circ\text{C}$	I_{CEO}	—	10	100	nA
Collector-Base Breakdown Voltage ($I_C = 100 \mu\text{A}$)	$V_{(BR)CBO}$	50	—	—	Volts
Collector-Emitter Breakdown Voltage ($I_C = 100 \mu\text{A}$)	$V_{(BR)CEO}$	40	—	—	Volts
Emitter-Base Breakdown Voltage ($I_E = 100 \mu\text{A}$)	$V_{(BR)EBO}$	10	—	—	Volts

OPTICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Light Current ($V_{CC} = 5 \text{ V}$, $R_L = 10 \text{ Ohms}$) Note 1	I_L	12	20	—	mA
Collector-Emitter Saturation Voltage ($I_L = 10 \text{ mA}$, $H = 2 \text{ mW/cm}^2$ at 2870K)	$V_{CE(sat)}$	—	—	1	Volt
Photo Current Rise Time (Note 2) ($R_L = 100 \text{ ohms}$, $I_L = 1 \text{ mA peak}$)	t_r	—	40	100	μs
Photo Current Fall Time (Note 2) ($R_L = 100 \text{ ohms}$, $I_L = 1 \text{ mA peak}$)	t_f	—	60	150	μs
Wavelength of Maximum Sensitivity	λ_s	—	0.8	—	μm

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 ($\lambda = 940 \text{ nm}$) with a pulse width equal to or greater than 500 microseconds (see Figure 6) $I_L = 1 \text{ mA peak}$

TYPICAL CHARACTERISTICS

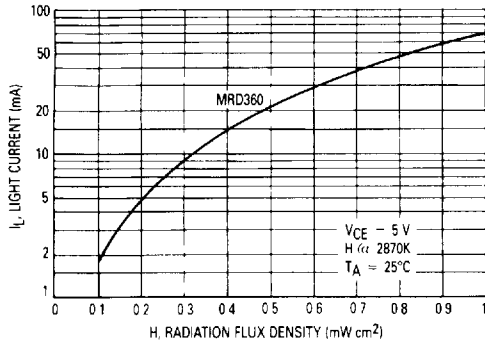


Figure 1. Light Current versus Irradiance

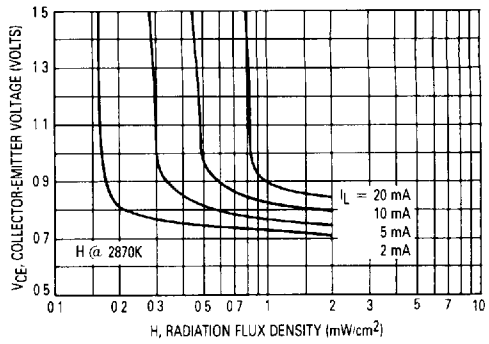


Figure 2. Collector-Emitter Saturation Characteristic

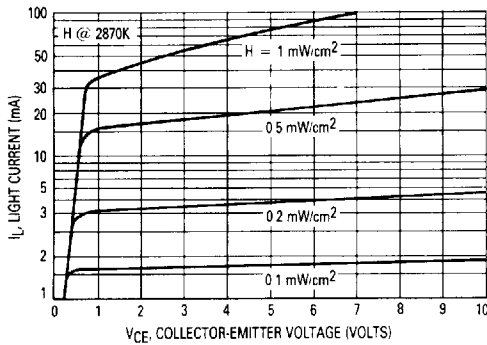


Figure 3. Collector Characteristics

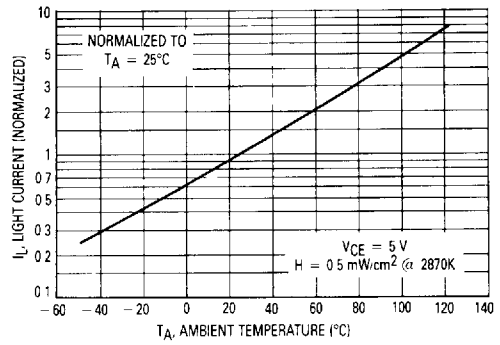


Figure 4. Normalized Light Current versus Temperature

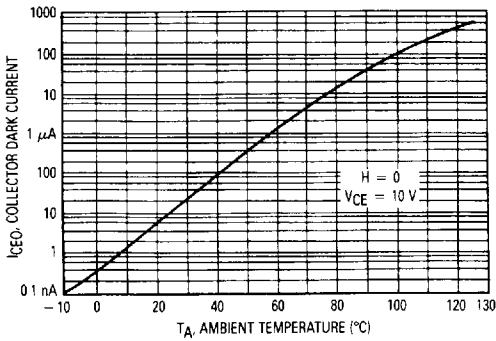


Figure 5. Dark Current versus Temperature

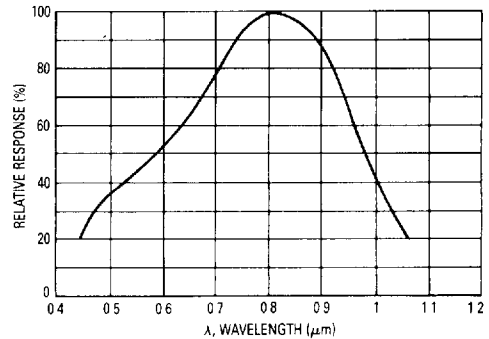


Figure 6. Constant Energy Spectral Response

MRD360

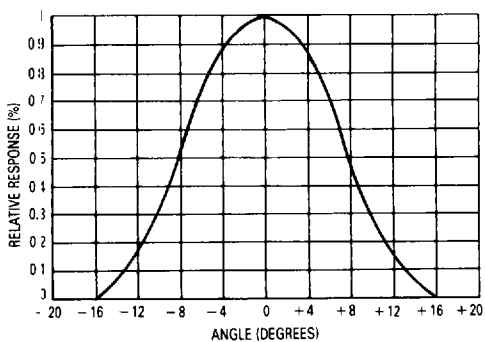


Figure 7. Angular Response

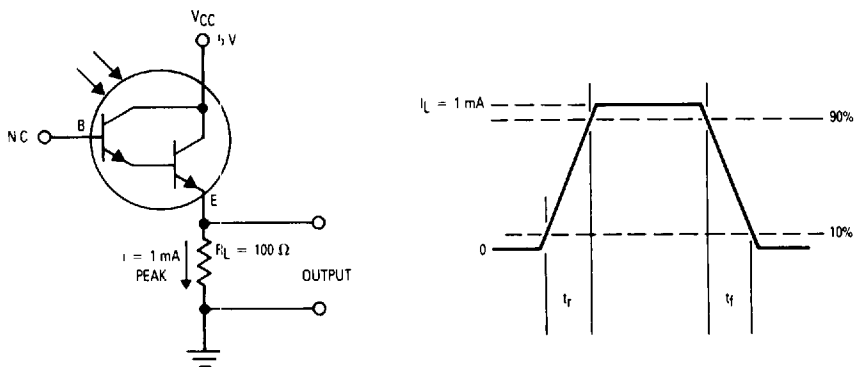


Figure 8. Pulse Response Test Circuit and Waveform