

**MOTOROLA**

SEMICONDUCTORS

P.O. BOX 20912 • PHOENIX, ARIZONA 85036

RESISTOR-DARLINGTON OPTOCOUPLER SERIES

... consists of a gallium arsenide IRED optically coupled to a silicon photodarlington detector which has an integral base-emitter resistor. The on-chip resistor improves higher temperature leakage characteristics. Designed with high isolation, high CTR, high voltage and low leakage, they provide excellent performance in interfacing and coupling systems, phase and feedback controls, solid state relays and general purpose switching circuits.

- High CTR, H11G1 — 1000%, H11G2 — 500%
- High Isolation, $V_{ISO} = 7500$ Vac pk Min.
- High $V_{(BR)CEO}$, H11G1 — 100 V, H11G2 — 80 V
- Standard, Economical, 6-Pin DIP Package
- UL Recognized — File No. E54915

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

Rating	Symbol	Value	Unit
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INFRARED-EMITTING DIODE

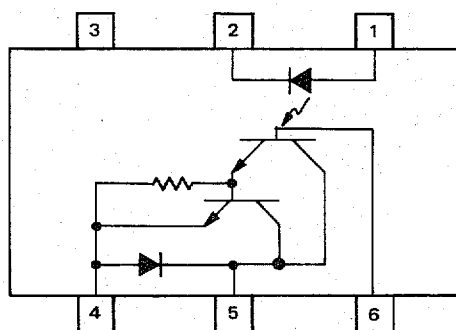
Reverse Voltage	V_R	6.0	Volts
Forward Current — Continuous	I_F	60	mA
Forward Current — Peak Pulse Width = 300 μs , 2.0% Duty Cycle	I_F	3.0	Amp
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	100	mW
Negligible Power in Transistor Derate above 25°C		1.33	mW/ $^\circ\text{C}$

PHOTO DARLINGTON TRANSISTOR

Collector-Emitter Voltage	V_{CEO}	100	Volts
H11G1		80	
H11G2		55	
H11G3			
Emitter-Base Voltage	V_{EBO}	7.0	Volts
Collector Current — Continuous	I_C	150	mA
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	150	mW
Negligible Power in Diode Derate above 25°C		2.0	mW/ $^\circ\text{C}$

TOTAL DEVICE

Total Device Dissipation @ $T_A = 25^\circ\text{C}$	P_D	250	mW
Equal Power Dissipation in Each Element Derate above 25°C		3.3	mW/ $^\circ\text{C}$
Operating Junction Temperature Range	T_J	-55 to +100	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$
Soldering Temperature (10 s)	—	260	$^\circ\text{C}$
Isolation Surge Voltage (Vac pk)	V_{ISO}	7500	Volts

FIGURE 1 — DEVICE SCHEMATIC

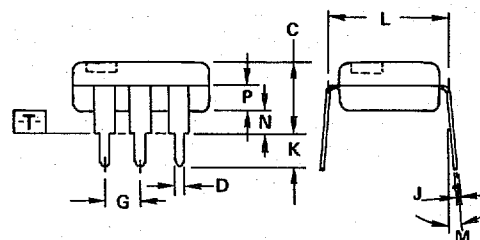
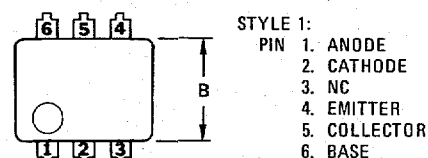
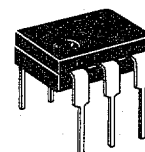
H11G1

H11G2

H11G3

OPTO COUPLER/ISOLATOR

DARLINGTON OUTPUT

**NOTES:**

1. DIMENSIONS A AND B ARE DATUMS.
2. [T] IS SEATING PLANE.
3. POSITIONAL TOLERANCES FOR LEADS:
 $\phi \pm 0.13$ (0.005) (M) T A (M) B (M)
4. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	8.13	8.89	0.320	0.350
B	6.10	6.60	0.240	0.260
C	2.92	5.08	0.115	0.200
D	0.41	0.51	0.016	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
J	0.20	0.30	0.008	0.012
K	2.54	3.81	0.100	0.150
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.38	2.54	0.015	0.100
P	1.27	2.03	0.050	0.080

CASE 730A-01

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

Characteristic	Symbol	Min	Typ	Max	Unit
Reverse Leakage Current ($V_R = 3.0\text{ V}$)	I_R	—	0.05	10	μA
Forward Voltage ($I_F = 10\text{ mA}$)	V_F	—	1.1	1.5	Volts
Capacitance ($V_R = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C	—	50	—	pF

PHOTODARLINGTON CHARACTERISTICS ($T_A = 25^\circ\text{C}$ and $I_F = 0$ unless otherwise noted.)

Collector-Emmitter Breakdown Voltage ($I_C = 1.0\text{ mA}$, $I_F = 0$)	H11G1 H11G2 H11G3	$V_{(BR)CEO}$	100 80 55	— — —	— — —	Volts
Collector-Base Breakdown Voltage ($I_C = 100\text{ }\mu\text{A}$, $I_F = 0$)	H11G1 H11G2 H11G3	$V_{(BR)CBO}$	100 80 55	— — —	— — —	Volts
Emitter-Base Breakdown Voltage ($I_E = 100\text{ }\mu\text{A}$, $I_F = 0$)		$V_{(BR)EBO}$	7.0	—	—	Volts
Collector-Emmitter Dark Current ($V_{CE} = 80\text{ V}$)	H11G1	I_{CEO}	—	—	100	nA
($V_{CE} = 80\text{ V}$, $T_A = 80^\circ\text{C}$)	H11G1		—	—	100	μA
($V_{CE} = 60\text{ V}$)	H11G2		—	—	100	nA
($V_{CE} = 60\text{ V}$, $T_A = 80^\circ\text{C}$)	H11G2		—	—	100	μA
($V_{CE} = 30\text{ V}$)	H11G3		—	—	100	nA
Capacitance ($V_{CB} = 10\text{ V}$, $f = 1.0\text{ MHz}$)		C_{CB}	—	6.0	—	pF

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

Collector Output Current ($V_{CE} = 1.0\text{ V}$, $I_F = 10\text{ mA}$)	H11G1, 2	I_C	100	—	—	mA
($V_{CE} = 5.0\text{ V}$, $I_F = 1.0\text{ mA}$)	H11G1, 2		5.0	—	—	
($V_{CE} = 5.0\text{ V}$, $I_F = 1.0\text{ mA}$)	H11G3		2.0	—	—	
Collector-Emmitter Saturation Voltage ($I_F = 1.0\text{ mA}$, $I_C = 1.0\text{ mA}$)	H11G1, 2	$V_{CE(sat)}$	—	0.75	1.0	Volts
($I_F = 16\text{ mA}$, $I_C = 50\text{ mA}$)	H11G1, 2		—	0.85	1.0	
($I_F = 20\text{ mA}$, $I_C = 50\text{ mA}$)	H11G3		—	0.85	1.2	
Isolation Surge Voltage (1, 2) (60 Hz ac Peak, 5 Seconds)		V_{ISO}	7500	—	—	Volts
Isolation Resistance (1) ($V = 500\text{ Vdc}$)			—	10^{11}	—	Ohms
Isolation Capacitance (1) ($V = 0\text{ V}$, $f = 1.0\text{ MHz}$)			—	—	2.0	pF

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

Turn-On Time	($I_F = 10\text{ mA}$, $V_{CE} = 5.0\text{ V}$, $R_L = 100\text{ }\Omega$,	t_{on}	—	5.0	—	μs
Turn-Off Time	Pulse Width $\leq 300\text{ }\mu\text{s}$, $f \leq 30\text{ Hz}$)	t_{off}	—	100	—	

(1) For this test LED Pins 1 and 2 are common and Phototransistor Pins 4 and 5 are common.

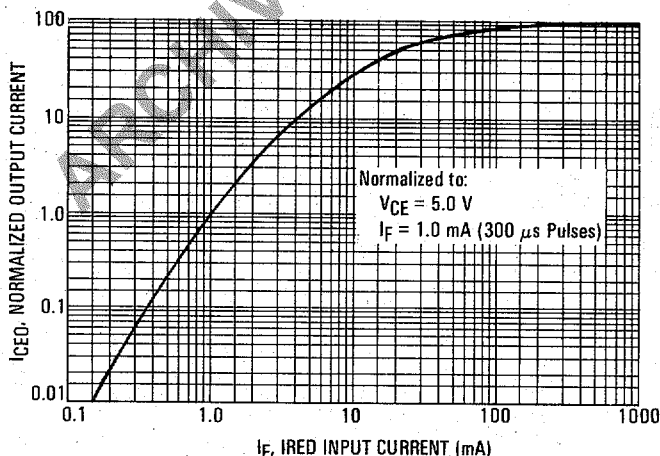
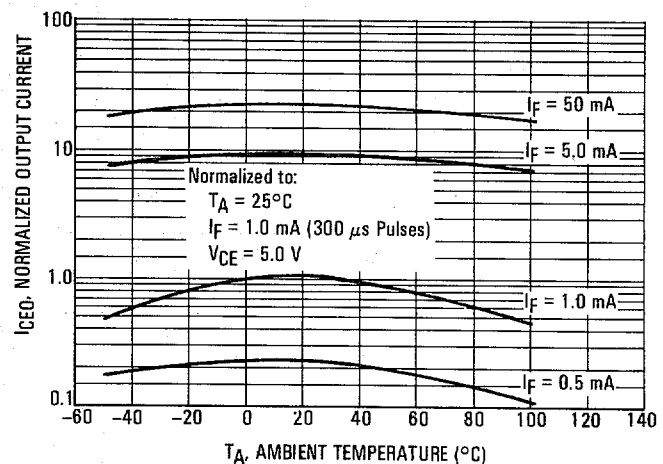
(2) Isolation Surge Voltage, V_{ISO} , is an internal device dielectric breakdown rating.**FIGURE 2 — OUTPUT CURRENT versus INPUT CURRENT****FIGURE 3 — OUTPUT CURRENT versus TEMPERATURE**

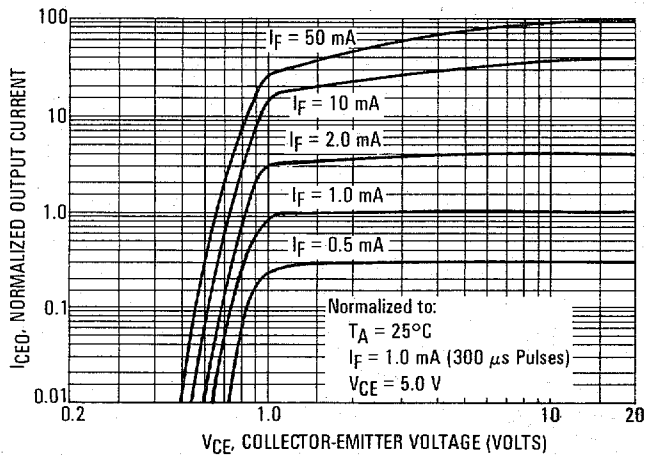
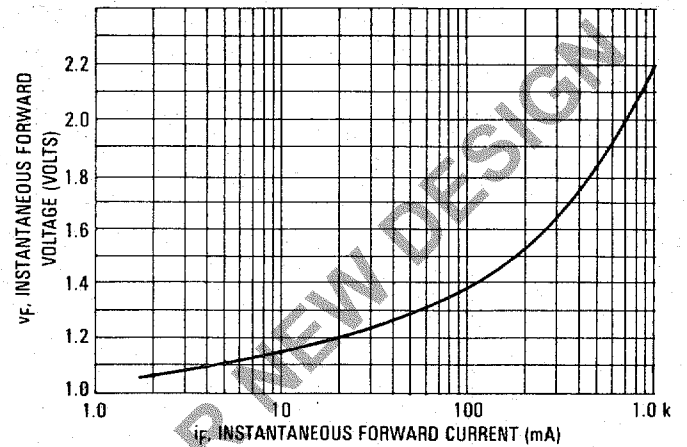
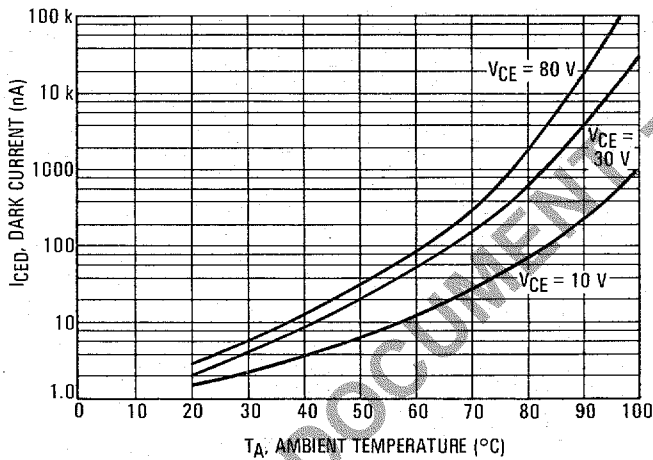
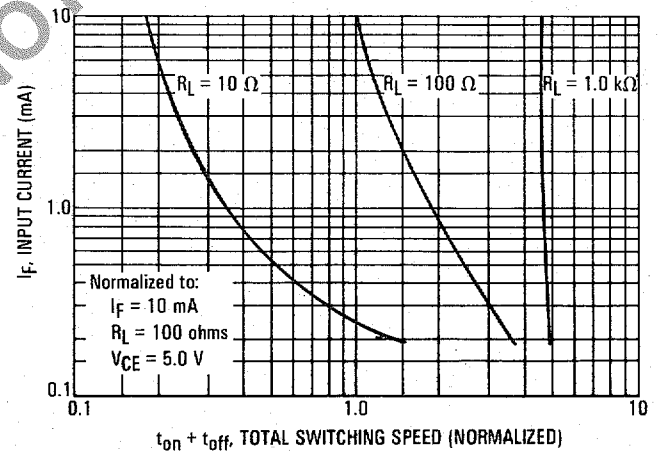
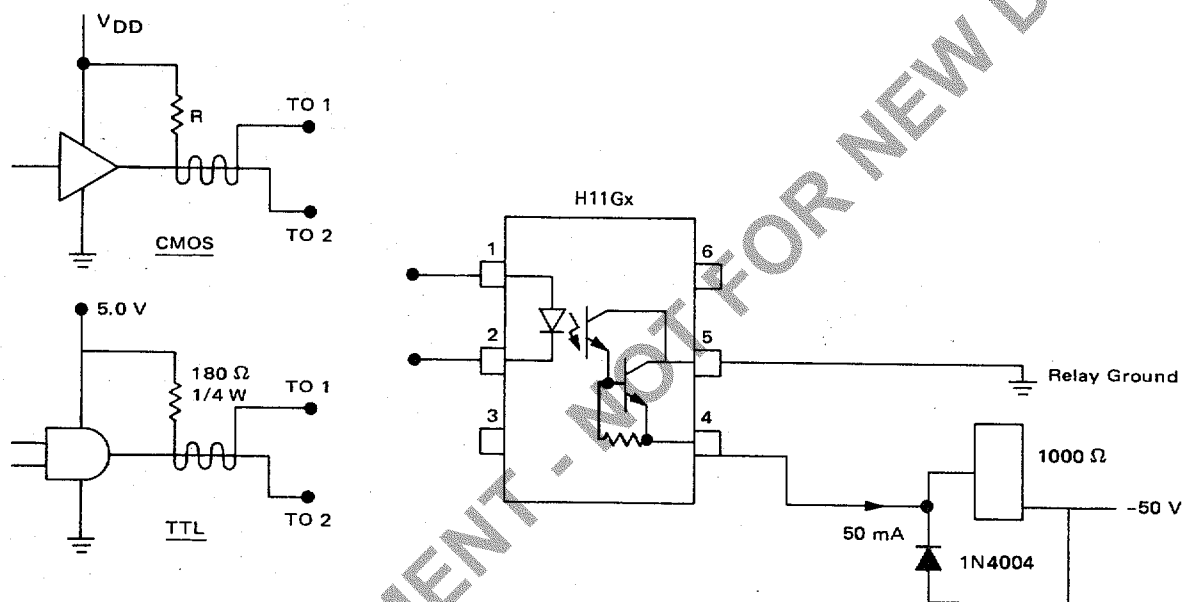
FIGURE 4 — OUTPUT CURRENT versus
COLLECTOR-EMITTER VOLTAGE

FIGURE 5 — LED FORWARD CHARACTERISTICS

FIGURE 6 — COLLECTOR-EMITTER DARK CURRENT
versus TEMPERATUREFIGURE 7 — INPUT CURRENT versus
TOTAL SWITCHING SPEED

INTERFACING TTL OR CMOS LOGIC TO 50-VOLT, 1000-OHMS RELAY FOR TELEPHONY APPLICATIONS

In order to interface positive logic to negative-powered electromechanical relays, a change in voltage level and polarity plus electrical isolation are required. The H11Gx can provide this interface and eliminate the external amplifiers and voltage divider networks previously required. The circuit below shows a typical approach for the interface.



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