

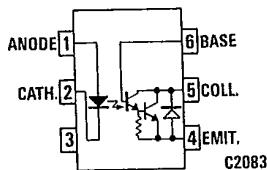
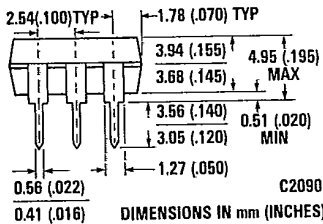
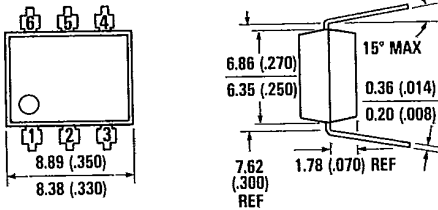
# GENERAL INSTRUMENT

## HIGH VOLTAGE PHOTODARLINGTON OPTOCOUPERS

Optocouplers

**MCA11G1 (H11G1)**  
**MCA11G2 (H11G2)**  
**MCA11G3 (H11G3)**

### PACKAGE DIMENSIONS



Equivalent Circuit

### DESCRIPTION

The MCA11G1 and MCA11G2 are photodarlington-type optically coupled optoisolators. Both devices have a gallium arsenide infrared emitting diode coupled with a silicon darlington connected phototransistor which has an integral base-emitter resistor to optimize elevated temperature characteristics.

### FEATURES

- High  $BV_{CEO}$   
 Minimum 100V for MCA11G1  
 Minimum 80V for MCA11G2
- Pin for pin replacement for H11G1, H11G2, H11G3
- High sensitivity to low input current—Minimum 500 percent CTR at  $I_F = 1$  mA
- High isolation voltage  
 2500 VAC RMS—Steady State Rating
- Low leakage current at elevated temperature (maximum 100  $\mu$ A at 80°C)
- Underwriters Laboratory (UL) recognized File #50151

### APPLICATIONS

- CMOS logic interface
- Telephone ring detector
- Low input TTL interface
- Power supply isolation
- Replace pulse transformer

### ABSOLUTE MAXIMUM RATINGS

#### TOTAL PACKAGE

Storage temperature	.....-55°C to 150°C
Operating temperature	.....-55°C to 100°C
Lead temperature (Soldering, 10 sec.)	..... 260°C
Total package power dissipation @ 25°C	
(LED plus detector)	..... 260 mW
Derate linearly from 25°C	..... 3.5 mW/°C
Isolation voltage	..... 2.5 kV RMS

#### INPUT DIODE

Forward DC current	..... 60 mA
Reverse voltage	..... 6 V
Peak forward current (1 $\mu$ s pulse, 300 pps)	.. 3.0 A
Power dissipation 25°C ambient	..... 100 mW
Derate linearly from 25°C	..... 1.8 mW/°C

#### OUTPUT TRANSISTOR

Power dissipation @ 25°C	..... 200 mW
Derate linearly from 25°C	..... 2.67 mW/°C
Collector to emitter voltage	
MCA11G1	..... 100 V
MCA11G2	..... 80 V
MCA11G3	..... 55 V

**MCA11G1 MCA11G2 MCA11G3 (H11G1 H11G2 H11G3)**

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**ELECTRO-OPTICAL CHARACTERISTICS (25°C Temperature Unless Otherwise Specified)**

TRANSFER CHARACTERISTICS							
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
DC	Current Transfer Ratio collector to emitter MCA11G1/2 MCA11G1/3 MCA11G3	CTR	1000			%	$I_F = 10 \text{ mA}; V_{CE} = 1 \text{ V}$
	500				%	$I_F = 1 \text{ mA}; V_{CE} = 5 \text{ V}$	
	Saturation voltage	$V_{CE(SAT)}$		0.85 0.75	1.0 1.0	V V	$I_F = 16 \text{ mA}; I_C = 50 \text{ mA}$ $I_F = 1 \text{ mA}; I_C = 1 \text{ mA}$
SWITCHING TIMES	Turn-on time	$t_{on}$		5		$\mu\text{s}$	$R_L = 100\Omega; I_F = 10 \text{ mA}$ $V_{CE} = 5 \text{ V}$ Pulse width $\leq 300 \mu\text{sec}$ , $f \leq 30 \text{ Hz}$
	Turn-off time	$t_{off}$		100		$\mu\text{s}$	
ISOLATION	Surge isolation	$V_{iso}$	4000			VDC	Relative humidity $\leq 50\%$ , $I_{I-O} \leq 10 \mu\text{A}$ 1 second
			3000			VAC-rms	
	Steady state isolation	$V_{iso}$	3500			VDC	Relative humidity $\leq 50\%$ , $I_{I-O} \leq 10 \mu\text{A}$ 1 minute
			2500			VAC-rms	
	Isolation resistance	$R_{iso}$	$10^{11}$			ohms	$V_{I-O} = 500 \text{ VDC}$
	Isolation capacitance	$C_{iso}$		0.5		pF	$f = 1 \text{ MHz}$

INDIVIDUAL COMPONENT CHARACTERISTICS								
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS	
INPUT DIODE	Forward voltage	$V_F$		1.3	1.50	V	$I_F = 10 \text{ mA}$	
	Forward voltage temp. coefficient			-1.8		$\text{mV}/^\circ\text{C}$		
	Reverse breakdown voltage	$BV_R$	3.0	25		V	$I_R = 10 \mu\text{A}$	
	Junction capacitance	$C_J$		50		pF	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$	
					65		pF	$V_F = 1 \text{ V}, f = 1 \text{ MHz}$
	Reverse leakage current	$I_R$		0.35	10	$\mu\text{A}$	$V_R = 3.0 \text{ V}$	
OUTPUT DARLINGTON	Breakdown voltage							
	Collector to emitter	$BV_{CEO}$				V	$I_C = 1.0 \text{ mA}, I_F = 0$	
	MCA11G1		100					
	MCA11G2		80					
	MCA11G3		55					
	Collector to base	$BV_{CBO}$					V	$I_C = 100 \mu\text{A}$
	MCA11G1		100					
	MCA11G2		80					
	MCA11G3		55					
	Emitter to base	$BV_{EBO}$		7	10		V	$I_E = 100 \mu\text{A}, I_F = 0$
Leakage current								
Collector to emitter	$I_{CEO}$					nA	$V_{CE} = 80 \text{ V}, I_F = 0$	
MCA11G1					100	nA	$V_{CE} = 60 \text{ V}, I_F = 0$	
MCA11G2					100	nA	$V_{CE} = 80 \text{ V}, I_F = 0,$ $T_A = 80^\circ\text{C}$	
MCA11G1					100	$\mu\text{A}$	$V_{CE} = 60 \text{ V}, I_F = 0,$ $T_A = 80^\circ\text{C}$	
MCA11G2					100	$\mu\text{A}$	$V_{CE} = 30 \text{ V}, I_F = 0,$	
MCA11G3					100	$\mu\text{A}$		

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Optocouplers

TYPICAL ELECTRICAL CHARACTERISTIC CURVES  
(25°C Free Air Temperature Unless Otherwise Specified)

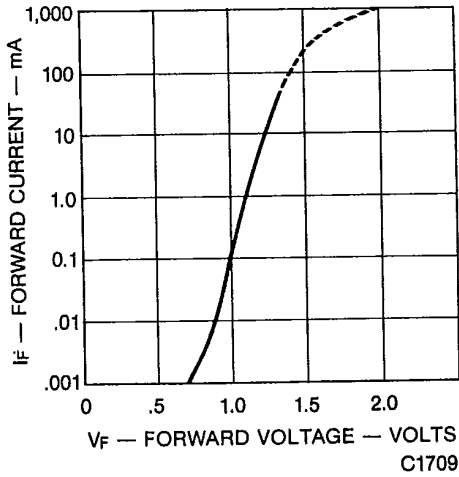


Fig. 1. Forward Voltage vs. Forward Current

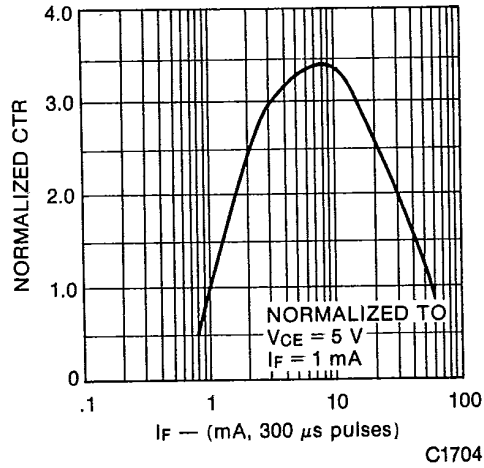


Fig. 2. Normalized CTR vs. Input Current

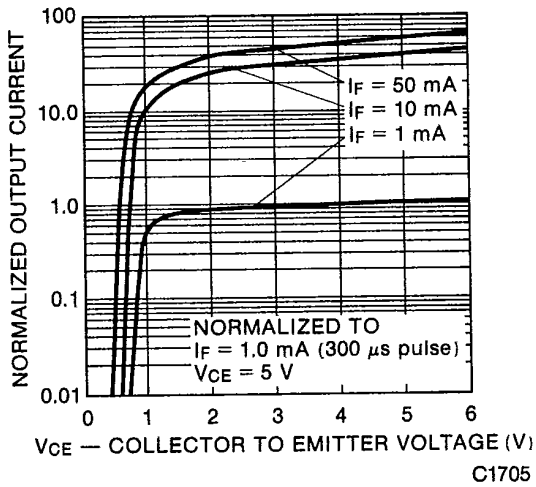


Fig. 3. Output Characteristics

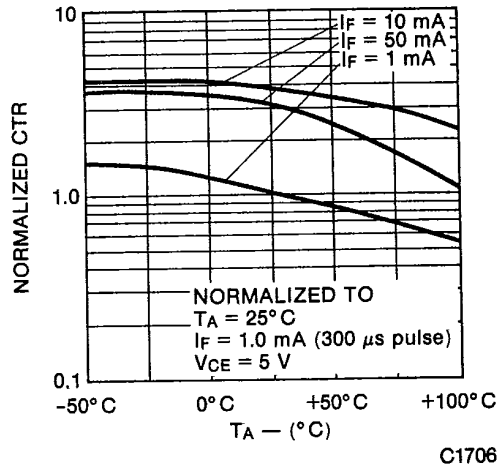
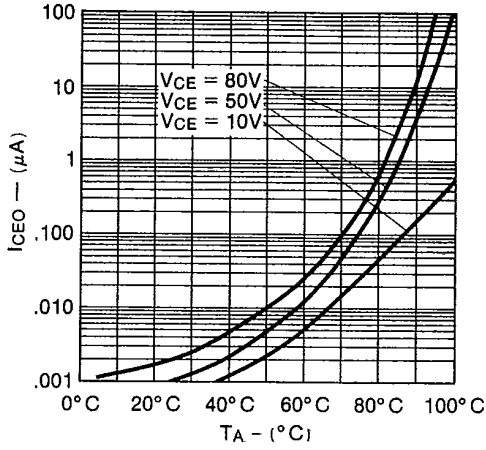


Fig. 4. Normalized CTR vs. Temperature

**MCA11G1 MCA11G2 MCA11G3 (H11G1 H11G2 H11G3)**

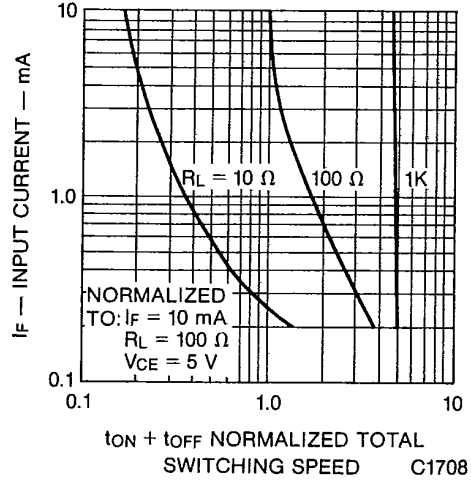
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**TYPICAL ELECTRICAL CHARACTERISTIC CURVES (Cont'd)**  
(25°C Free Air Temperature Unless Otherwise Specified)



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Fig. 5. Dark Current vs. Temperature



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Fig. 6. Switching Speed