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December 2014

H11G1M, H11G2M — 6-Pin DIP High Voltage Photodarlington Optocouplers

# H11G1M, H11G2M 6-Pin DIP High Voltage Photodarlington Optocouplers

## Features

- High  $BV_{CEO}$ :
  - 100 V Minimum for H11G1M
  - 80 V Minimum for H11G2M
- High Sensitivity to Low Input Current (Minimum 500% CTR at  $I_F = 1 \text{ mA}$ )
- Low Leakage Current at Elevated Temperature (Maximum 100  $\mu\text{A}$  at 80°C)
- Safety and Regulatory Approvals:
  - UL1577, 4,170  $VAC_{RMS}$  for 1 Minute
  - DIN-EN/IEC60747-5-5, 850 V Peak Working Insulation Voltage

## Applications

- CMOS Logic Interface
- Telephone Ring Detector
- Low Input TTL Interface
- Power Supply Isolation
- Replace Pulse Transformer

## General Description

The H11G1M and H11G2M are photodarlington-type optically coupled optocouplers. These 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.

## Schematic

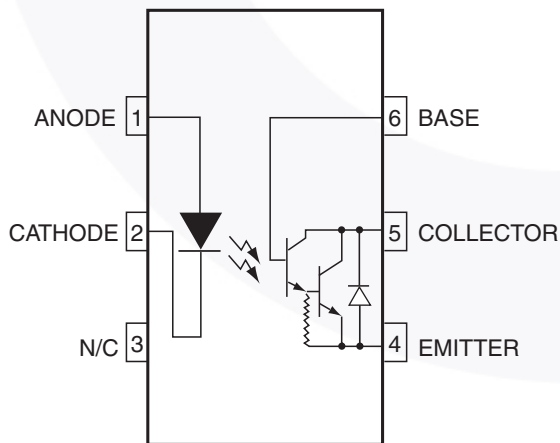


Figure 1. Schematic

## Package Outlines

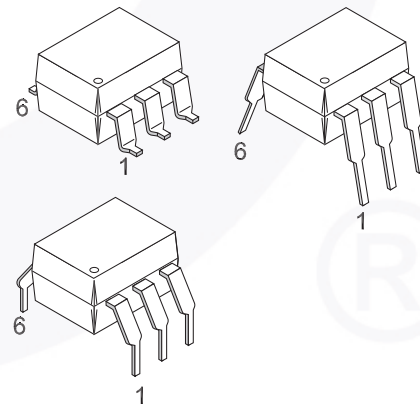


Figure 2. Package Outlines

## Safety and Insulation Ratings

As per DIN EN/IEC 60747-5-5, this optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

Parameter		Characteristics
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage	< 150 V <sub>RMS</sub>	I–IV
	< 300 V <sub>RMS</sub>	I–IV
Climatic Classification		55/100/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V <sub>PR</sub>	Input-to-Output Test Voltage, Method A, V <sub>IORM</sub> × 1.6 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 10 s, Partial Discharge < 5 pC	1360	V <sub>peak</sub>
	Input-to-Output Test Voltage, Method B, V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% Production Test with t <sub>m</sub> = 1 s, Partial Discharge < 5 pC	1594	V <sub>peak</sub>
V <sub>IORM</sub>	Maximum Working Insulation Voltage	850	V <sub>peak</sub>
V <sub>IOTM</sub>	Highest Allowable Over-Voltage	6000	V <sub>peak</sub>
	External Creepage	≥ 7	mm
	External Clearance	≥ 7	mm
	External Clearance (for Option TV, 0.4" Lead Spacing)	≥ 10	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.5	mm
T <sub>S</sub>	Case Temperature <sup>(1)</sup>	175	°C
I <sub>S,INPUT</sub>	Input Current <sup>(1)</sup>	350	mA
P <sub>S,OUTPUT</sub>	Output Power <sup>(1)</sup>	800	mW
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V <sup>(1)</sup>	> 10 <sup>9</sup>	Ω

### Note:

1. Safety limit values – maximum values allowed in the event of a failure.

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value	Unit
<b>TOTAL DEVICE</b>			
T <sub>STG</sub>	Storage Temperature	-40 to +125	°C
T <sub>OPR</sub>	Operating Temperature	-40 to +100	°C
T <sub>J</sub>	Junction Temperature	-40 to +125	°C
T <sub>SOL</sub>	Lead Solder Temperature	260 for 10 seconds	°C
P <sub>D</sub>	Total Device Power Dissipation @ T <sub>A</sub> = 25°C	290	mW
	Derate Above 25°C	3.5	mW/°C
<b>EMITTER</b>			
I <sub>F</sub>	Forward Input Current	60	mA
V <sub>R</sub>	Reverse Input Voltage	6.0	V
I <sub>F(pk)</sub>	Forward Current – Peak (1 μs pulse, 300 pps)	3.0	A
P <sub>D</sub>	LED Power Dissipation @ T <sub>A</sub> = 25°C	90	mW
	Derate Above 25°C	1.8	mW/°C
<b>DETECTOR</b>			
V <sub>CEO</sub>	Collector-Emitter Voltage		
	H11G1M	100	V
	H11G2M	80	V
P <sub>D</sub>	Photodetector Power Dissipation @ T <sub>A</sub> = 25°C	200	mW
	Derate Above 25°C	2.67	mW/°C

## Electrical Characteristics

$T_A = 25^\circ\text{C}$  unless otherwise specified.

### Individual Component Characteristics

Symbol	Characteristic	Test Conditions	Device	Min.	Typ.	Max.	Unit
<b>EMITTER</b>							
$V_F$	Forward Voltage	$I_F = 10\text{ mA}$	All		1.3	1.5	V
$\frac{\Delta V_F}{\Delta T_A}$	Forward Voltage Temperature Coefficient		All		-1.8		mV/°C
$BV_R$	Reverse Breakdown Voltage	$I_R = 10\ \mu\text{A}$	All	3.0	25		V
$C_J$	Junction Capacitance	$V_F = 0\text{ V}, f = 1\text{ MHz}$	All		50		pF
		$V_F = 1\text{ V}, f = 1\text{ MHz}$			65		pF
$I_R$	Reverse Leakage Current	$V_R = 3.0\text{ V}$	All		0.001	10	$\mu\text{A}$
<b>DETECTOR</b>							
$BV_{CEO}$	Breakdown Voltage Collector to Emitter	$I_C = 1.0\text{ mA}, I_F = 0$	H11G1M	100			V
			H11G2M	80			V
$BV_{CBO}$	Collector to Base	$I_C = 100\ \mu\text{A}$	H11G1M	100			V
			H11G2M	80			V
$BV_{EBO}$	Emitter to Base		All	7	10		V
$I_{CEO}$	Leakage Current Collector to Emitter	$V_{CE} = 80\text{ V}, I_F = 0$	H11G1M			100	nA
		$V_{CE} = 60\text{ V}, I_F = 0$	H11G2M			100	nA
		$V_{CE} = 80\text{ V}, I_F = 0, T_A = 80^\circ\text{C}$	H11G1M			100	$\mu\text{A}$
		$V_{CE} = 60\text{ V}, I_F = 0, T_A = 80^\circ\text{C}$	H11G2M			100	$\mu\text{A}$

### Transfer Characteristics

Symbol	Characteristics	Test Conditions	Device	Min.	Typ.	Max.	Unit
<b>EMITTER</b>							
CTR	Current Transfer Ratio, Collector to Emitter	$I_F = 10\text{ mA}, V_{CE} = 1\text{ V}$	All	100 (1000)			mA (%)
		$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$	All	5 (500)			mA (%)
$V_{CE(SAT)}$	Saturation Voltage	$I_F = 16\text{ mA}, I_C = 50\text{ mA}$	All		0.85	1.0	V
		$I_F = 1\text{ mA}, I_C = 1\text{ mA}$	All		0.75	1.0	V
<b>SWITCHING TIMES</b>							
$t_{ON}$	Turn-on Time	$R_L = 100\ \Omega, I_F = 10\text{ mA}, V_{CE} = 5\text{ V}, f \leq 30\text{ Hz}, \text{Pulse Width} \leq 300\ \mu\text{s}$	All		5		$\mu\text{s}$
$t_{OFF}$	Turn-off Time		All		100		$\mu\text{s}$

### Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
$V_{ISO}$	Input-Output Isolation Voltage	$t = 1\text{ Minute}$	4170			$V_{AC_{RMS}}$
$C_{ISO}$	Isolation Capacitance	$V_{I-O} = 0\text{ V}, f = 1\text{ MHz}$		0.2		pF
$R_{ISO}$	Isolation Resistance	$V_{I-O} = \pm 500\text{ VDC}, T_A = 25^\circ\text{C}$	$10^{11}$			$\Omega$

### Typical Performance Curves

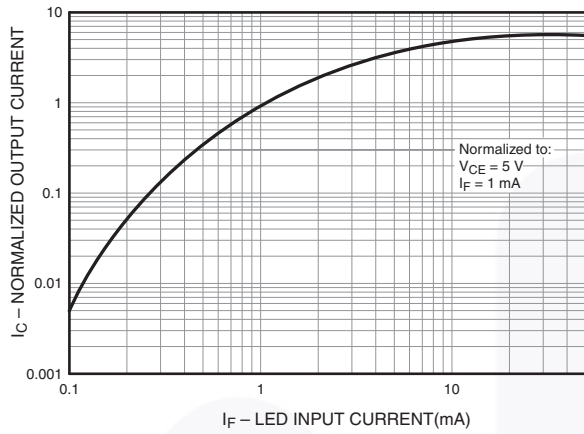


Figure 3. Output Current vs. Input Current

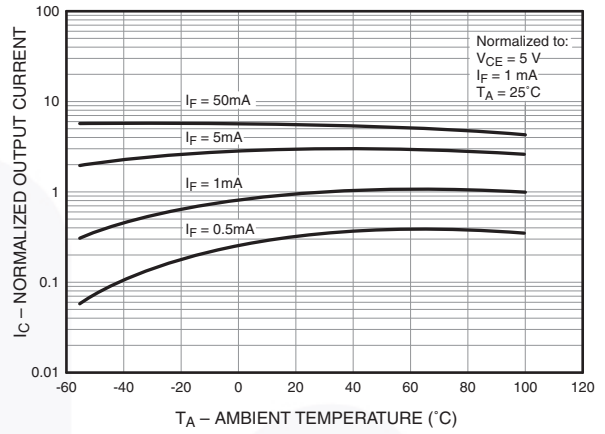


Figure 4. Normalized Output Current vs. Temperature

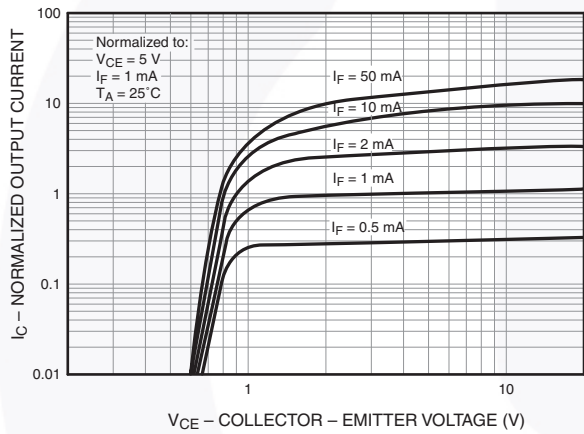


Figure 5. Output Current vs. Collector-Emitter Voltage

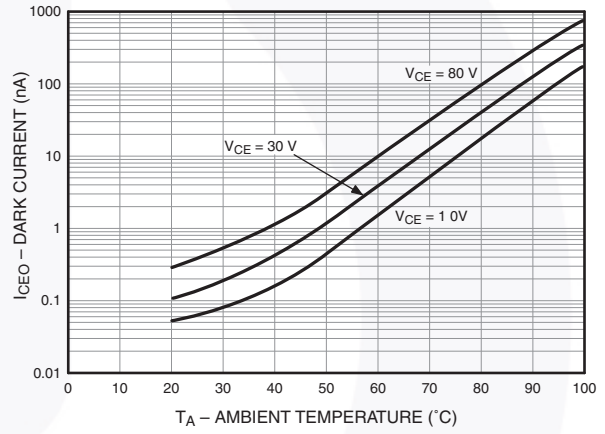


Figure 6. Collector-Emitter Dark Current vs. Ambient Temperature

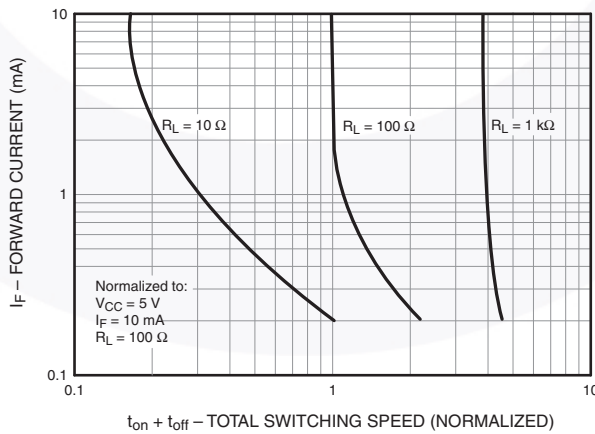


Figure 7. Input Current vs. Total Switching Speed (Typical Values)

### Reflow Profile

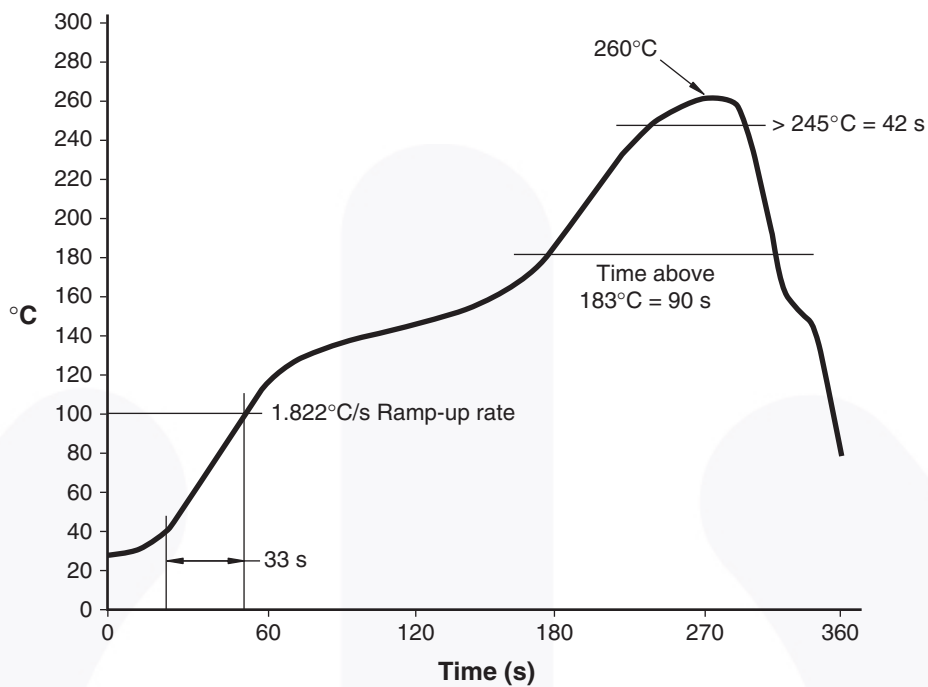


Figure 8. Reflow Profile



## Ordering Information

Part Number	Package	Packing Method
H11G1M	DIP 6-Pin	Tube (50 Units)
H11G1SM	SMT 6-Pin (Lead Bend)	Tube (50 Units)
H11G1SR2M	SMT 6-Pin (Lead Bend)	Tape and Reel (1000 Units)
H11G1VM	DIP 6-Pin, DIN EN/IEC60747-5-5 Option	Tube (50 Units)
H11G1SVM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tube (50 Units)
H11G1SR2VM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tape and Reel (1000 Units)
H11G1TVM	DIP 6-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 Option	Tube (50 Units)

**Note:**

2. The product orderable part number system listed in this table also applies to the H11G2M device.

## Marking Information

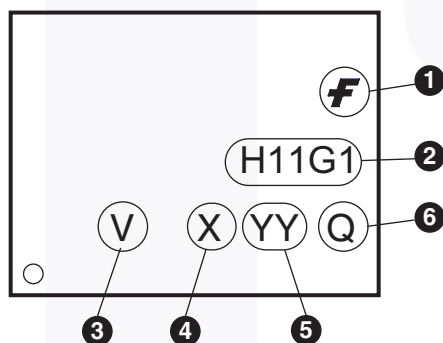


Figure 9. Top Mark

Table 1. Top Mark Definitions

1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)
4	One-Digit Year Code, e.g., "4"
5	Digit Work Week, Ranging from "01" to "53"
6	Assembly Package Code





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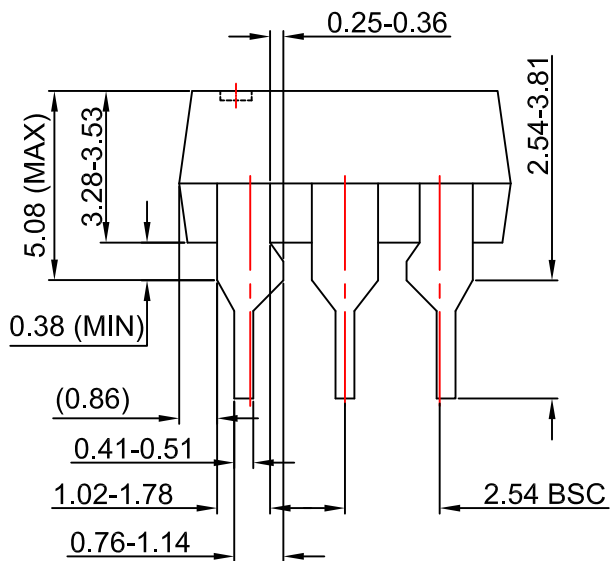
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