

# 6-Pin DIP High Voltage Photodarlington Optocouplers

# H11G1M, H11G2M

### **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.

#### **Features**

- High BV<sub>CEO</sub>:
  - 100 V Minimum for H11G1M
  - 80 V Minimum for H11G2M
- High Sensitivity to Low Input Current (Minimum 500% CTR at I<sub>F</sub> = 1 mA)
- Low Leakage Current at Elevated Temperature (Maximum 100 μA at 80°C)
- Safety and Regulatory Approvals:
  - ◆ UL1577, 4,170 VAC<sub>RMS</sub> for 1 Minute
  - ◆ DIN-EN/IEC60747-5-5, 850 V Peak Working Insulation Voltage

### **Application**

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



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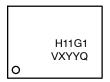


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#### **MARKING DIAGRAM**



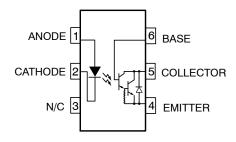
H11G1 = Specific Device Code

J = DIN EN/IEC60747-5-5 Option (only appears on component ordered with

this option)

X = One-Digit Year Code
YY = Digit Work Week
Q = Assembly Package Code

### SCHEMATIC



#### **ORDERING INFORMATION**

See detailed ordering and shipping information on page 6 of this data sheet.

### **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,	<150 V <sub>RMS</sub>	I–IV
For Rated Mains Voltage	<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, $V_{IORM} \times 1.6 = V_{PR}$ , Type and Sample Test with $t_m = 10$ s, Partial Discharge < 5 pC	1360	V <sub>peak</sub>
	Input–to–Output Test Voltage, Method B, $V_{IORM} \times 1.875 = V_{PR}$ , 100% Production Test with $t_m = 1$ s, Partial Discharge < 5 pC	1594	V <sub>peak</sub>
V <sub>IORM</sub>	Maximum Working Insulation Voltage	850	$V_{peak}$
V <sub>IOTM</sub>	Highest Allowable Over-Voltage	6000	$V_{peak}$
	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 (Note 1)	175	°C
I <sub>S,INPUT</sub>	Input Current (Note 1)	350	mA
P <sub>S,OUTPUT</sub>	Output Power (Note 1)	800	mW
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V (Note 1)	>10 <sup>9</sup>	Ω

<sup>1.</sup> Safety limit values - maximum values allowed in the event of a failure.

### **ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Max	Unit	
TOTAL DEV	CE			
T <sub>STG</sub>	Storage Temperature	-40 to +125	°C	
T <sub>OPR</sub>	Operating Temperature		-40 to +100	°C
TJ	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	
EMITTER				
I <sub>F</sub>	DC / Average Forward Input Current		60	mA
V <sub>R</sub>	Reverse Input Voltage	6.0	V	
I <sub>F</sub> (pk)	Forward Current – Peak (1 μs pulse, 300 pps)		3.0	Α
$P_{D}$	LED Power Dissipation @ T <sub>A</sub> = 25°C		90	mW
	Derate Above 25°C		1.8	mW/°C
DETECTOR				
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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### **ELECTRICAL CHARACTERISTICS - INDIVIDUAL COMPONENT CHARACTERISTICS**

(T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter		Test Conditions	Min	Тур	Max	Unit
MITTER							
V <sub>F</sub>	Forward Voltage		I <sub>F</sub> = 10 mA	-	1.3	1.5	V
$\Delta V_F/\Delta T_A$	Forward Voltage Temperature C	oefficient		_	-1.8	_	mV/°C
BV <sub>R</sub>	Reverse Breakdown Voltage		I <sub>R</sub> = 10 μA	3.0	25	_	V
CJ	Junction Capacitance		V <sub>F</sub> = 0 V, f = 1 MHz	_	50	_	pF
			V <sub>F</sub> = 1 V, f = 1 MHz	_	65	-	pF
I <sub>R</sub>	Reverse Leakage Current		V <sub>R</sub> = 3.0 V	-	0.001	10	μΑ
ETECTOR							
BV <sub>CEO</sub>		H11G1M	I <sub>C</sub> = 1.0 mA, I <sub>F</sub> = 0	100	-	_	V
	to Emitter	H11G2M	]	80	-	_	V
BV <sub>CBO</sub>	Collector to Base	H11G1M	I <sub>C</sub> = 100 μA	100	-	_	V
		H11G2M	]	80	-	_	V
$BV_{EBO}$	Emitter Base	•		7	10	_	V
I <sub>CEO</sub>	Leakage Current Collector	H11G1M	V <sub>CE</sub> = 80 V, I <sub>F</sub> = 0	_	-	100	nA
	to Emitter	H11G2M	V <sub>CE</sub> = 60 V, I <sub>F</sub> = 0	-	-	100	nA
		H11G1M	V <sub>CE</sub> = 80 V, I <sub>F</sub> = 0, T <sub>A</sub> = 80°C	_	-	100	μΑ
		H11G2M	V <sub>CE</sub> = 60 V, I <sub>F</sub> = 0, T <sub>A</sub> = 80°C	_	_	100	μΑ

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### $\textbf{ELECTRICAL CHARACTERISTICS - TRANSFER CHARACTERISTICS} \ (T_{A} = 25^{\circ}C \ unless \ otherwise \ noted)$

Parameter	Test Conditions	Min	Тур	Max	Unit
Current Transfer Ratio, Collector to Emitter	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 1 V	100 (1000)	-	-	mA (%)
	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V	5 (500)	-	-	mA (%)
Saturation Voltage	$I_F = 16 \text{ mA}, I_C = 50 \text{ mA},$	-	0.85	1.0	V
	$I_F = 1 \text{ mA}, I_C = 1 \text{ mA},$	-	0.75	1.0	V
TIMES					
Turn on Time	$R_L = 100 \Omega$ , $I_F = 10 \text{ mA}$ , $V_{CE} = 5 \text{ V}$ , $f < 30 \text{ Hz}$ . Pulse Width $< 300 \text{ us}$	-	5	-	μs
Turn off Time	55, : 5.55 γνατι _ 555 μο	-	100	_	μs
	Current Transfer Ratio, Collector to Emitter  Saturation Voltage  TIMES  Turn on Time	$ \begin{array}{c} \text{Current Transfer Ratio,} & I_F = 10 \text{ mA, V}_{CE} = 1 \text{ V} \\ \\ \text{Collector to Emitter} & I_F = 1 \text{ mA, V}_{CE} = 5 \text{ V} \\ \\ \text{Saturation Voltage} & I_F = 16 \text{ mA, I}_{C} = 50 \text{ mA,} \\ \\ I_F = 1 \text{ mA, I}_{C} = 1 \text{ mA,} \\ \\ \text{TIMES} & \\ \\ \text{Turn on Time} & R_L = 100 \ \Omega, I_F = 10 \text{ mA, V}_{CE} = 5 \text{ V,} \\ \\ \text{f} \leq 30 \text{ Hz, Pulse Width} \leq 300 \ \mu \text{s} \\ \\ \end{array} $		$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## ELECTRICAL CHARACTERISTICS - ISOLATION CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
V <sub>ISO</sub>	Input-Output Isolation Voltage	t = 1 Minute	4170	_	-	VAC <sub>RMS</sub>
C <sub>ISO</sub>	Isolation Capacitance	V <sub>I-O</sub> = 0 V, f = 1 MHz	-	0.2	-	pF
R <sub>ISO</sub>	Isolation Resistance	$V_{I-O} = \pm 500 \text{ VDC}, T_A = 25^{\circ}\text{C}$	10 <sup>11</sup>	_	1	Ω

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### **TYPICAL PERFORMANCE CURVES**

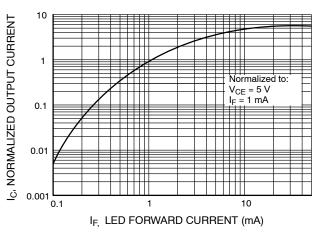


Figure 1. Output Current vs. Input Current

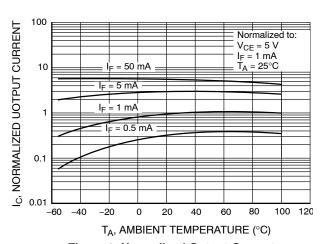


Figure 2. Normalized Output Current vs. Temperature

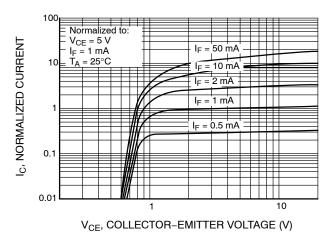


Figure 3. Output Current vs. Collector-Emitter Voltage

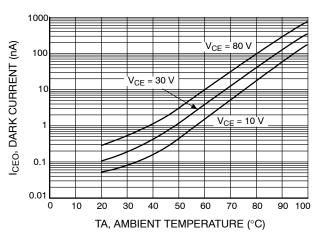
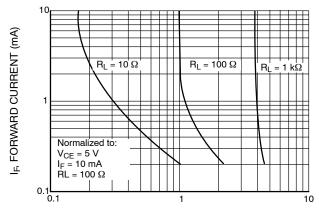


Figure 4. Collector–Emitter Dark Current vs.

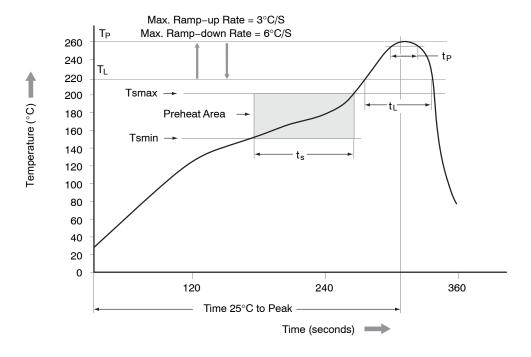
Ambient Temperature



 $t_{\text{on}}$  +  $t_{\text{off}}$ , TOTAL SWITCHING SPEED (NORMALIZED)

Figure 5. Input Current vs. Total Switching Speed (Typical Values)

### **REFLOW PROFILE**



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t <sub>S</sub> ) from (Tsmin to Tsmax)	60-120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60-150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (t <sub>P</sub> ) within 5°C of 260°C	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

Figure 6. Reflow Profile

### **ORDERING INFORMATION**

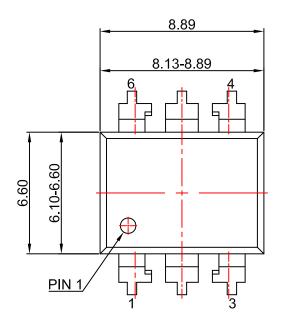
Part Number	Package	Shipping <sup>†</sup>
H11G1M	DIP 6-Pin	50 Units / Tube
H11G1SM	SMT 6-Pin (Lead Bend)	50 Units / Tube
H11G1SR2M	SMT 6-Pin (Lead Bend)	1000 / Tape & Reel
H11G1VM	DIP 6-Pin, DIN EN/IEC60747-5-5 Option	50 Units / Tube
H11G1SVM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	50 Units / Tube
H11G1SR2VM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	1000 / Tape & Reel
H11G1TVM	DIP 6-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 Option	50 Units / Tube

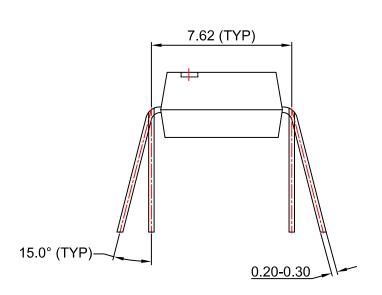
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

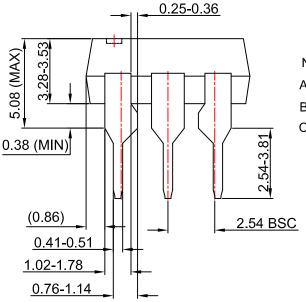


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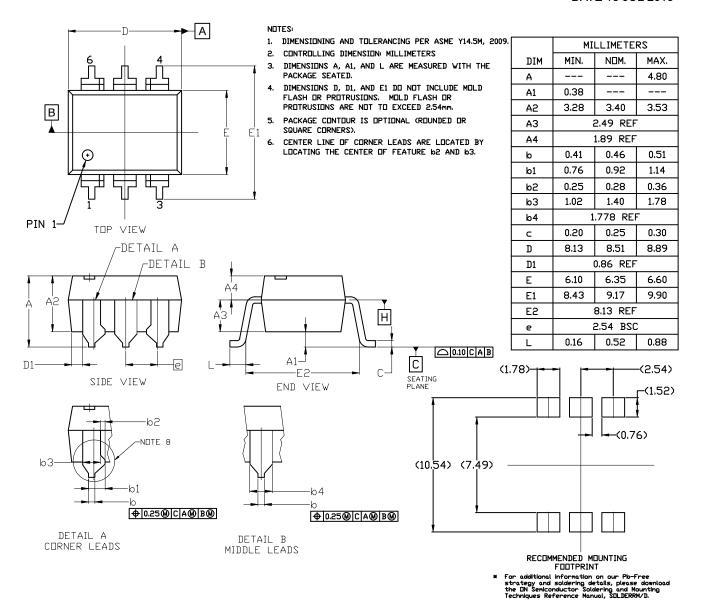
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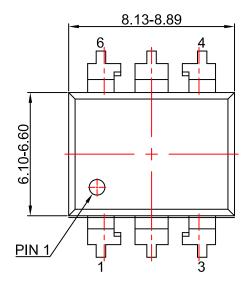
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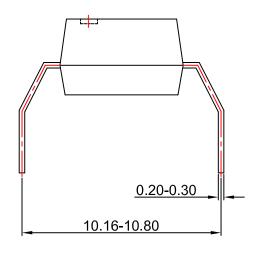
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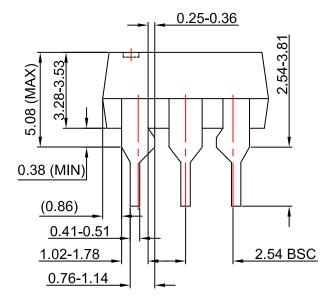


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