

H11G1M, H11G2M, H11G3M High Voltage Photodarlington Optocouplers

Features

- High BV_{CEO}
 - Minimum 100V for H11G1M
 - Minimum 80V for H11G2M
 - Minimum 55V for H11G3M
- High sensitivity to low input current
(Min. 500% CTR at $I_F = 1\text{mA}$)
- Low leakage current at elevated temperature
(Max. 100 μA at 80°C)
- Underwriters Laboratory (UL) recognized
File # E90700, Volume 2
- IEC 60747-5-2 approved (ordering option V)

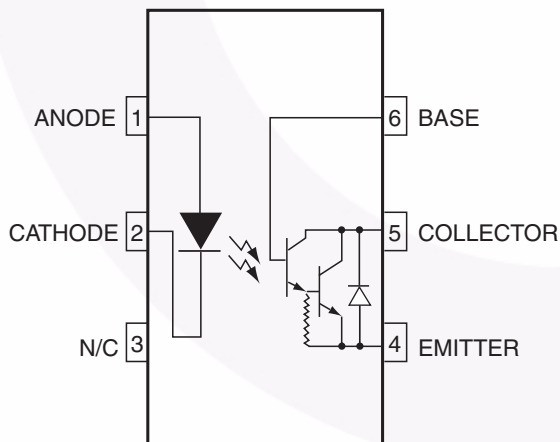
Applications

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

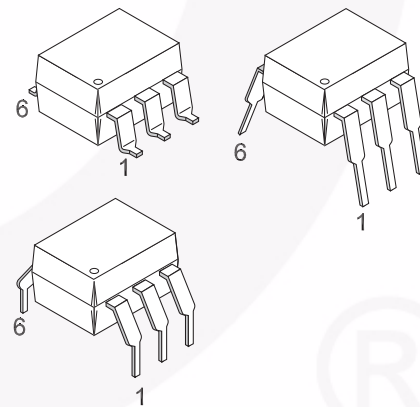
General Description

The H11GXM series 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



Package Outlines



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	Units
TOTAL DEVICE			
T _{STG}	Storage Temperature	-40 to +150	°C
T _{OPR}	Operating Temperature	-40 to +100	°C
T _{SOL}	Lead Solder Temperature (Wave Solder)	260 for 10 sec	°C
P _D	Total Device Power Dissipation @ T _A = 25°C Derate Above 25°C	260	mW
		3.5	mW/°C
EMITTER			
I _F	Forward Input Current	60	mA
V _R	Reverse Input Voltage	6.0	V
I _{F(pk)}	Forward Current – Peak (1µs pulse, 300pps)	3.0	A
P _D	LED Power Dissipation @ T _A = 25°C Derate Above 25°C	100	mW
		1.8	mW/°C
DETECTOR			
V _{CEO}	Collector-Emitter Voltage H11G1M H11G2M H11G3M	100	V
		80	
		55	
P _D	Photodetector Power Dissipation @ T _A = 25°C Derate Above 25°C	200	mW
		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
EMITTER							
V_F	Forward Voltage	$I_F = 10\text{mA}$	All		1.3	1.50	V
$\frac{\Delta V_F}{\Delta T_A}$	Forward Voltage Temp. 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		
I_R	Reverse Leakage Current	$V_R = 3.0\text{V}$	All		0.001	10	μA
DETECTOR							
BV_{CEO}	Breakdown Voltage Collector to Emitter	$I_C = 1.0\text{mA}, I_F = 0$	H11G1M	100			V
			H11G2M	80			
			H11G3M	55			
BV_{CBO}	Collector to Base	$I_C = 100\mu\text{A}$	H11G1M	100			V
			H11G2M	80			
			H11G3M	55			
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				
		$V_{CE} = 30\text{V}, I_F = 0$	H11G3M				
		$V_{CE} = 80\text{V}, I_F = 0, T_A = 80^\circ\text{C}$	H11G1M			100	μA
		$V_{CE} = 60\text{V}, I_F = 0, T_A = 80^\circ\text{C}$	H11G2M				

Transfer Characteristics

Symbol	Characteristics	Test Conditions	Device	Min.	Typ.*	Max.	Units
EMITTER							
CTR	Current Transfer Ratio, Collector to Emitter	$I_F = 10\text{mA}, V_{CE} = 1\text{V}$	H11G1M/2M	100 (1000)			mA (%)
		$I_F = 1\text{mA}, V_{CE} = 5\text{V}$	H11G1M/2M	5 (500)			
			H11G3M	2 (200)			
$V_{CE(SAT)}$	Saturation Voltage	$I_F = 16\text{mA}, I_C = 50\text{mA}$	H11G1M/2M		0.85	1.0	V
		$I_F = 1\text{mA}, I_C = 1\text{mA}$	H11G1M/2M		0.75	1.0	
		$I_F = 20\text{mA}, I_C = 50\text{mA}$	H11G3M		0.85	1.2	
SWITCHING TIMES							
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		μs
t_{OFF}	Turn-off Time		All		100		μs

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Device	Min.	Typ.*	Max.	Units
V_{ISO}	Isolation Voltage	$f = 60\text{Hz}, t = 1 \text{ sec.}$	All	7500			$V_{AC\text{PEAK}}$
R_{ISO}	Isolation Resistance	$V_{I-O} = 500 \text{ VDC}$	All	10^{11}			Ω
C_{ISO}	Isolation Capacitance	$f = 1\text{MHz}$	All		0.2		pF

*All Typical values at $T_A = 25^\circ\text{C}$

Safety and Insulation Ratings

As per IEC 60747-5-2, 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.

Symbol	Parameter	Min.	Typ.	Max.	Unit
	Installation Classifications per DIN VDE 0110/1.89 Table 1				
	For Rated Main Voltage < 150Vrms		I-IV		
	For Rated Main voltage < 300Vrms		I-IV		
	Climatic Classification		55/100/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
V_{PR}	Input to Output Test Voltage, Method b, $V_{IORM} \times 1.875 = V_{PR}$, 100% Production Test with $t_m = 1$ sec, Partial Discharge < 5pC	1594			V_{peak}
	Input to Output Test Voltage, Method a, $V_{IORM} \times 1.5 = V_{PR}$, Type and Sample Test with $t_m = 60$ sec, Partial Discharge < 5pC	1275			V_{peak}
V_{IORM}	Max. Working Insulation Voltage	850			V_{peak}
V_{IOTM}	Highest Allowable Over Voltage	6000			V_{peak}
	External Creepage	7			mm
	External Clearance	7			mm
	Insulation Thickness	0.5			mm
RIO	Insulation Resistance at T_s , $V_{IO} = 500V$	10^9			Ω

Typical Performance Curves

Fig. 1 Output Current vs. Input Current

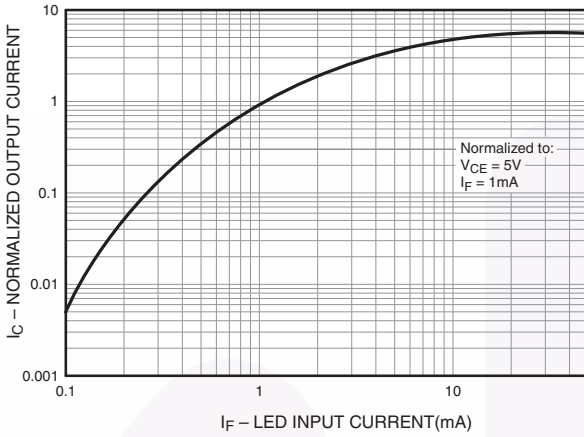


Fig. 2 Normalized Output Current vs. Temperature

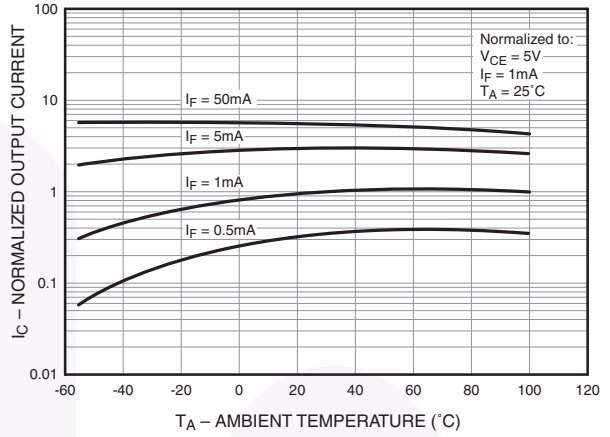


Fig. 3 Output Current vs. Collector - Emitter Voltage

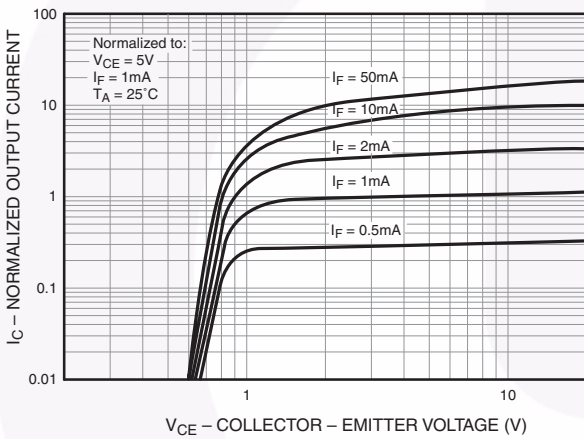


Fig. 4 Collector-Emitter Dark Current vs. Ambient Temperature

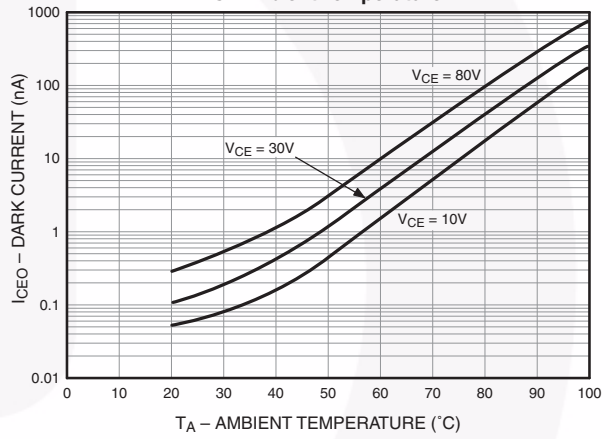
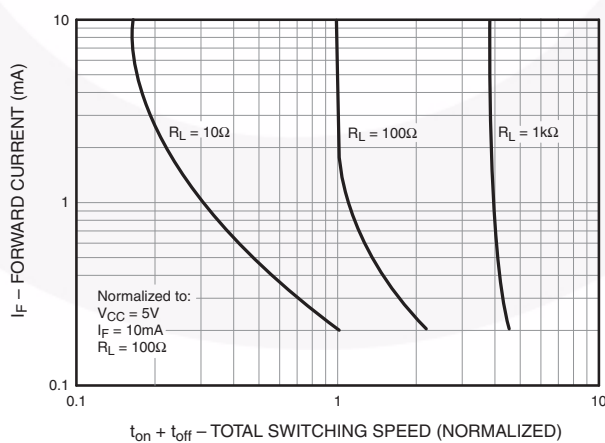
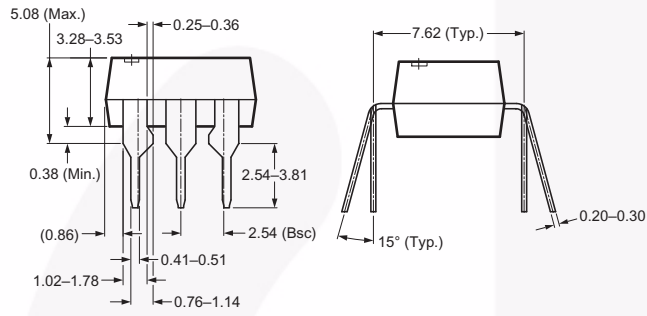
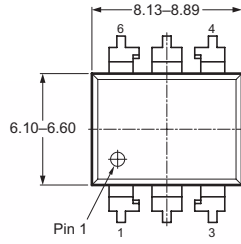


Fig. 5 Input Current vs. Total Switching Speed (Typical Values)

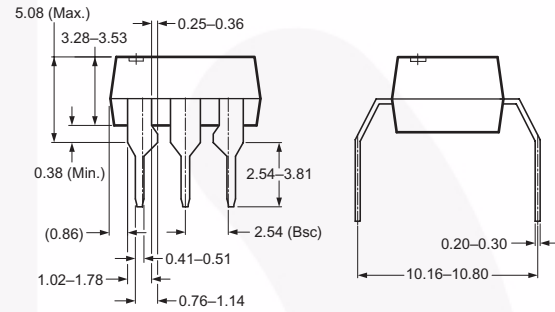
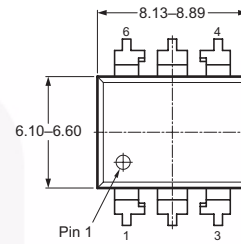


Package Dimensions

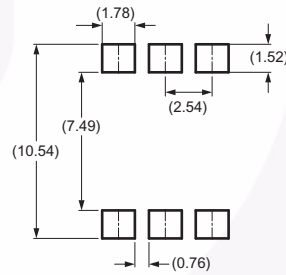
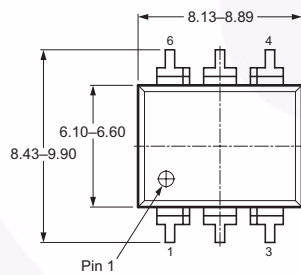
Through Hole



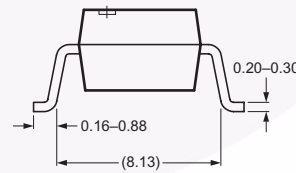
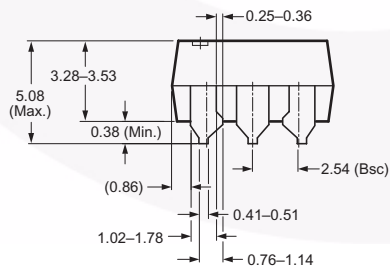
0.4" Lead Spacing



Surface Mount



Recommended Pad Layout

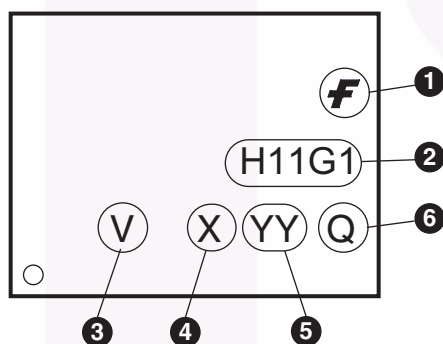


Note:
All dimensions in mm.

Ordering Information

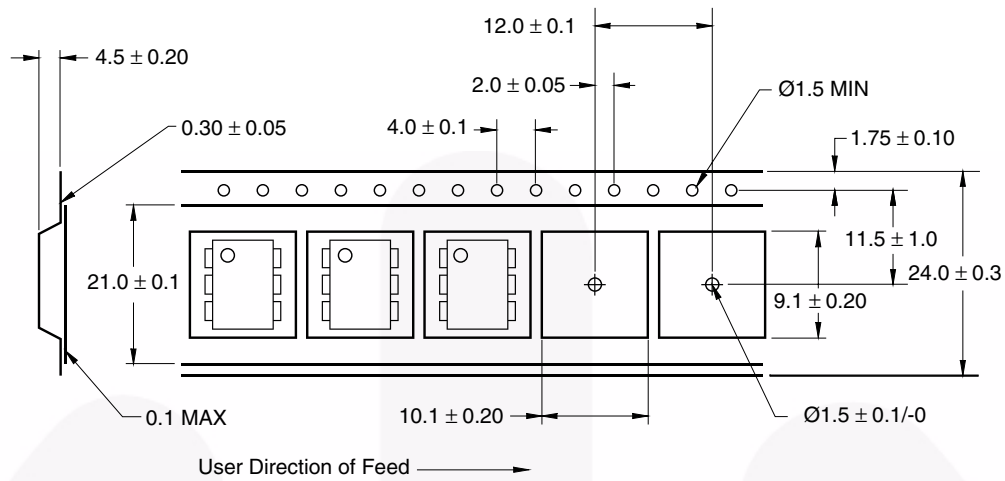
Option	Order Entry Identifier (Example)	Description
No option	H11G1M	Standard Through Hole Device
S	H11G1SM	Surface Mount Lead Bend
SR2	H11G1SR2M	Surface Mount; Tape and Reel
T	H11G1TM	0.4" Lead Spacing
V	H11G1VM	VDE 0884
TV	H11G1TVM	VDE 0884, 0.4" Lead Spacing
SV	H11G1SVM	VDE 0884, Surface Mount
SR2V	H11G1SR2VM	VDE 0884, Surface Mount, Tape and Reel

Marking Information

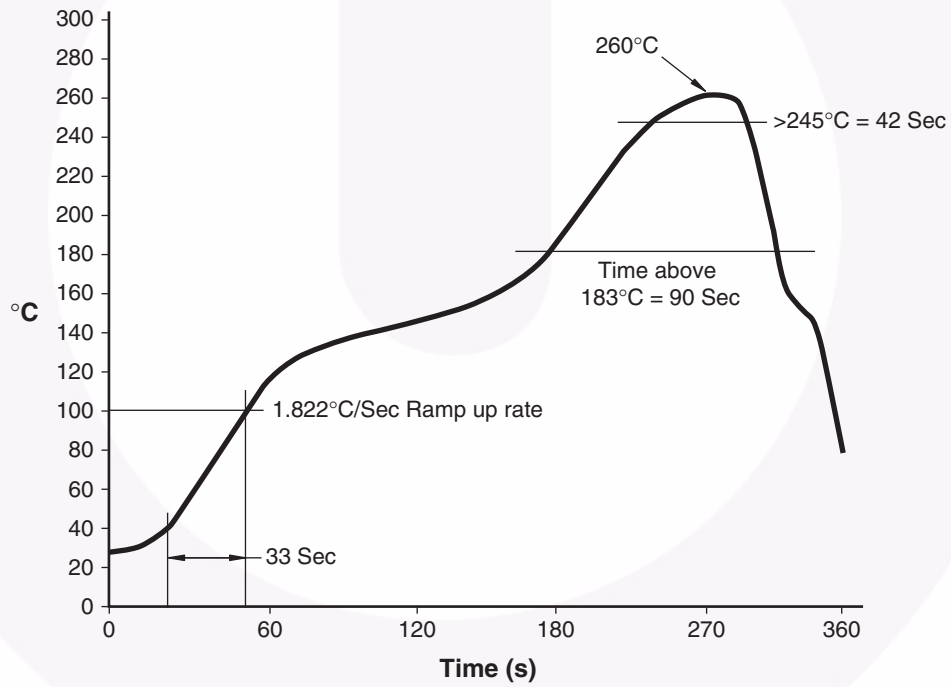


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '7'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Carrier Tape Specification








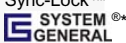
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