FAIRCHILD SEMICONDUCTOR®

September 2009

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 = 1mA)
- Low leakage current at elevated temperature (Max. 100μA at 80°C)
- Underwriters Laboratory (UL) recognized File # E90700, Volume 2
- IEC 60747-5-2 approved (ordering option V)

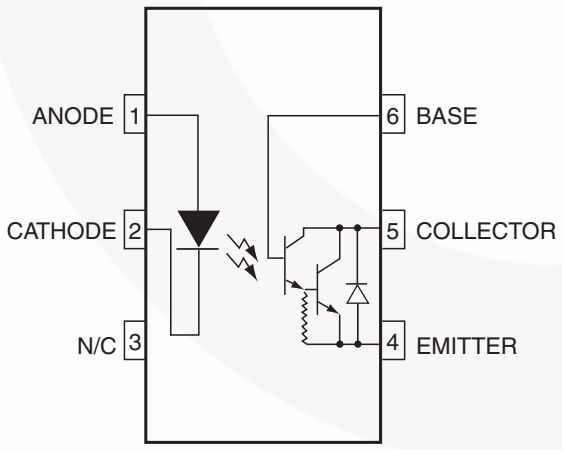
Applications

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

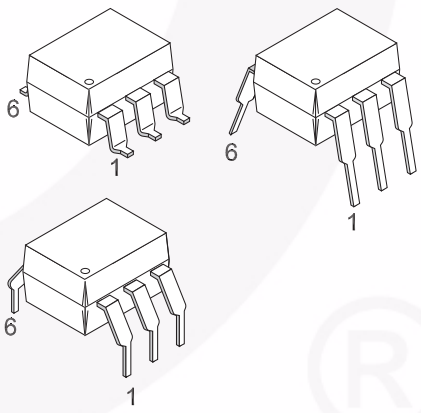
General Description

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	260	mW
	Derate Above 25°C	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	100	mW
	Derate Above 25°C	1.8	mW/°C
DETECTOR			
V_{CEO}	Collector-Emitter Voltage		V
	H11G1M	100	
	H11G2M	80	
	H11G3M	55	
P_D	Photodetector Power Dissipation @ T_A = 25°C	200	mW
	Derate Above 25°C	2.67	mW/°C

Electrical Characteristics (T_A = 25°C unless otherwise specified.)

Individual Component Characteristics

Symbol	Characteristic	Test Conditions	Device	Min.	Typ.*	Max.	Unit
EMITTER							
V_F	Forward Voltage	I_F = 10mA	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 = 10µA	All	3.0	25		V
C_J	Junction Capacitance	V_F = 0V, f = 1MHz	All		50		pF
		V_F = 1V, f = 1MHz			65		
I_R	Reverse Leakage Current	V_R = 3.0V	All		0.001	10	µA
DETECTOR							
BV_{CEO}	Breakdown Voltage Collector to Emitter	I_C = 1.0mA, I_F = 0	H11G1M	100			V
			H11G2M	80			
			H11G3M	55			
BV_{CBO}	Collector to Base	I_C = 100µA	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} = 80V, I_F = 0	H11G1M			100	nA
		V_{CE} = 60V, I_F = 0	H11G2M				
		V_{CE} = 30V, I_F = 0	H11G3M				
		V_{CE} = 80V, I_F = 0, T_A = 80°C	H11G1M			100	µA
		V_{CE} = 60V, I_F = 0, T_A = 80°C	H11G2M				

Transfer Characteristics

Symbol	Characteristics	Test Conditions	Device	Min.	Typ.*	Max.	Units
EMITTER							
CTR	Current Transfer Ratio, Collector to Emitter	I_F = 10mA, V_{CE} = 1V	H11G1M/2M	100 (1000)			mA (%)
		I_F = 1mA, V_{CE} = 5V	H11G1M/2M	5 (500)			
			H11G3M	2 (200)			
$V_{CE(SAT)}$	Saturation Voltage	I_F = 16mA, I_C = 50mA	H11G1M/2M		0.85	1.0	V
		I_F = 1mA, I_C = 1mA	H11G1M/2M		0.75	1.0	
		I_F = 20mA, I_C = 50mA	H11G3M		0.85	1.2	
SWITCHING TIMES							
t_{ON}	Turn-on Time	R_L = 100Ω, I_F = 10mA, V_{CE} = 5V, f ≤ 30Hz, Pulse Width ≤ 300µs	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 = 60Hz, t = 1 sec.	All	7500			V_{AC}PEAK
R_{ISO}	Isolation Resistance	V_{I-O} = 500 VDC	All	10^{11}			Ω
C_{ISO}	Isolation Capacitance	f = 1MHz	All		0.2		pF

*All Typical values at T_A = 25°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} x 1.875 = V_{PR}, 100% Production Test with tm = 1 sec, Partial Discharge < 5pC	1594			V_{peak}
	Input to Output Test Voltage, Method a, V_{IORM} x 1.5 = V_{PR}, Type and Sample Test with tm = 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 Ts, V_{IO} = 500V	10^9			Ω

Typical Performance Curves

Fig. 1 Output Current vs. Input Current

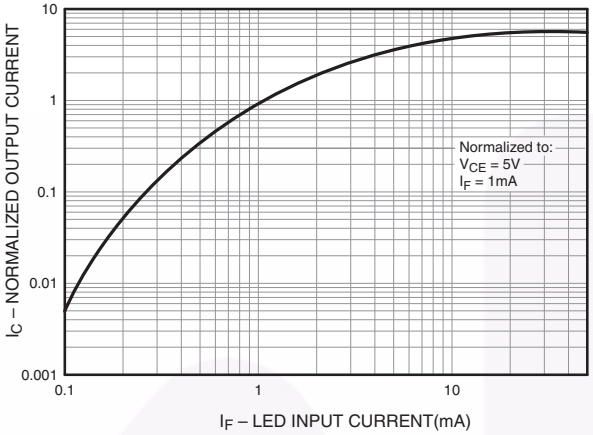


Fig. 2 Normalized Output Current vs. Temperature

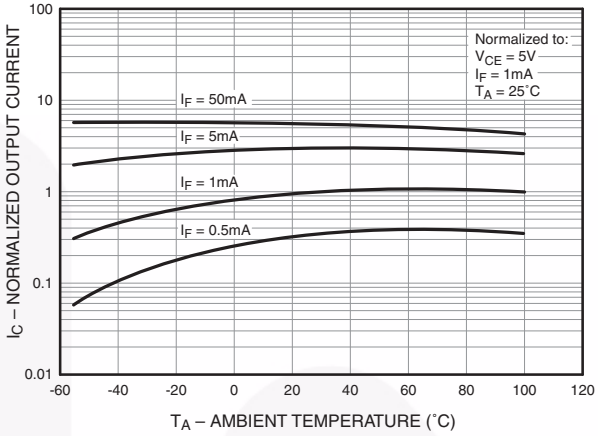


Fig. 3 Output Current vs. Collector - Emitter Voltage

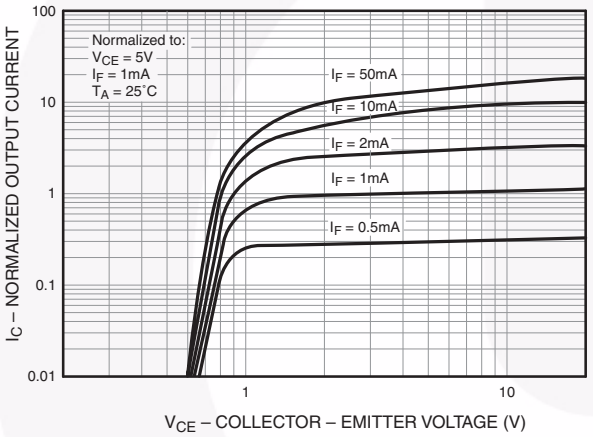


Fig. 4 Collector-Emitter Dark Current vs. Ambient Temperature

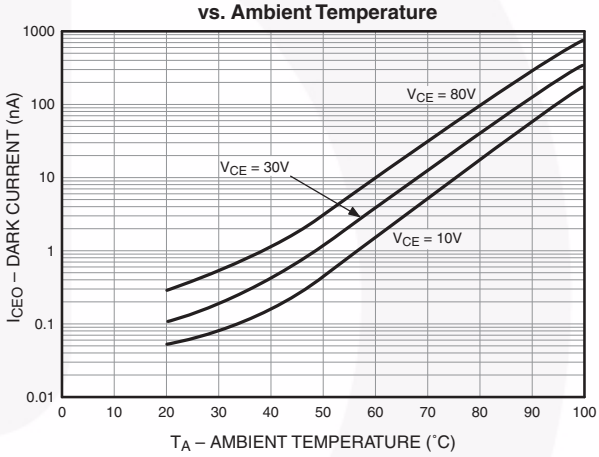
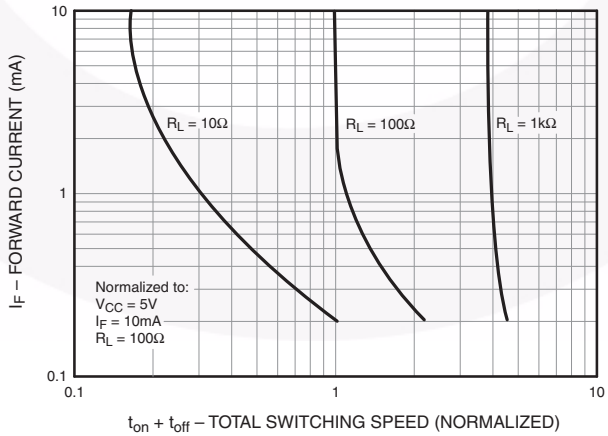
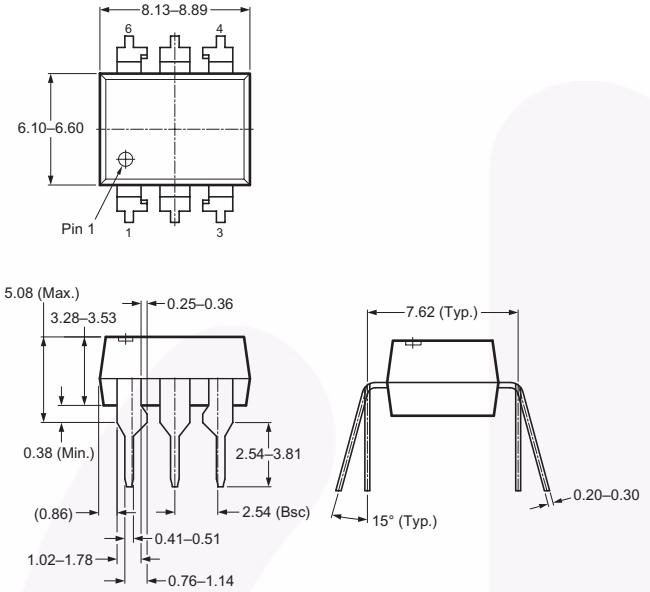


Fig. 5 Input Current vs. Total Switching Speed (Typical Values)

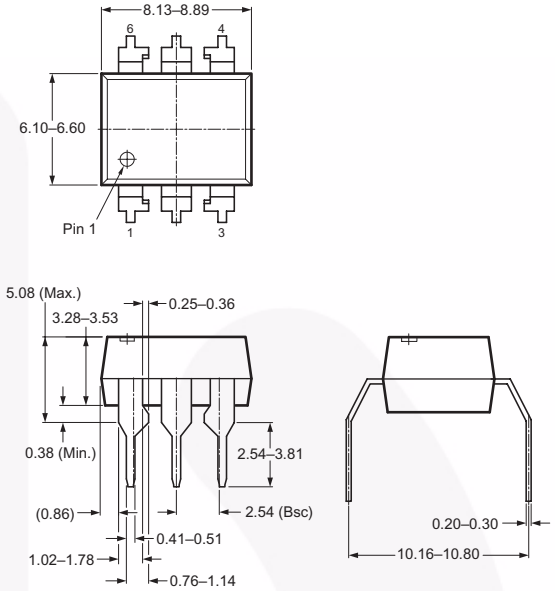


Package Dimensions

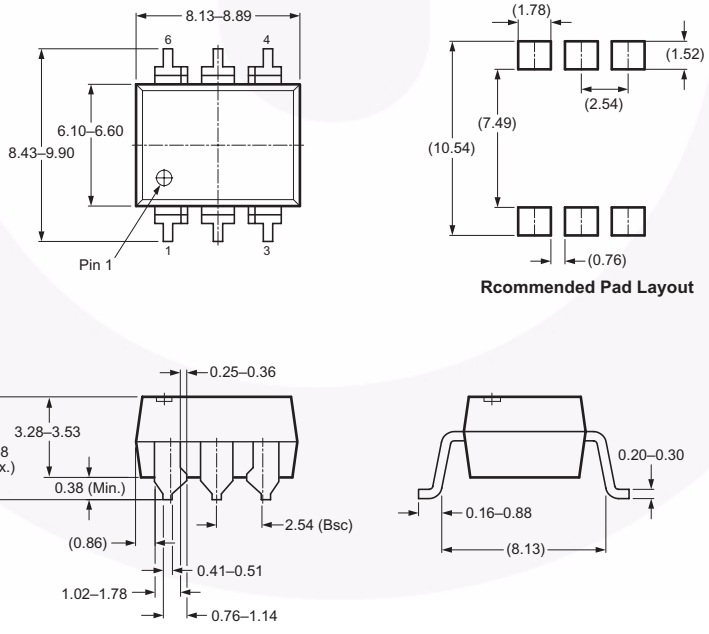
Through Hole



0.4" Lead Spacing



Surface Mount

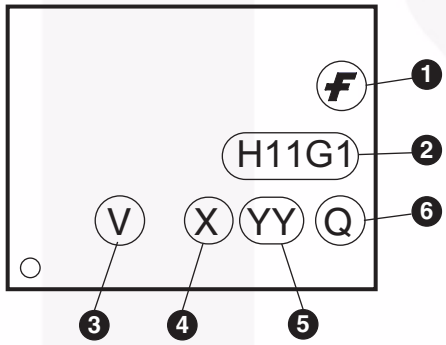


Note:
All dimensions in mm.

Ordering Information

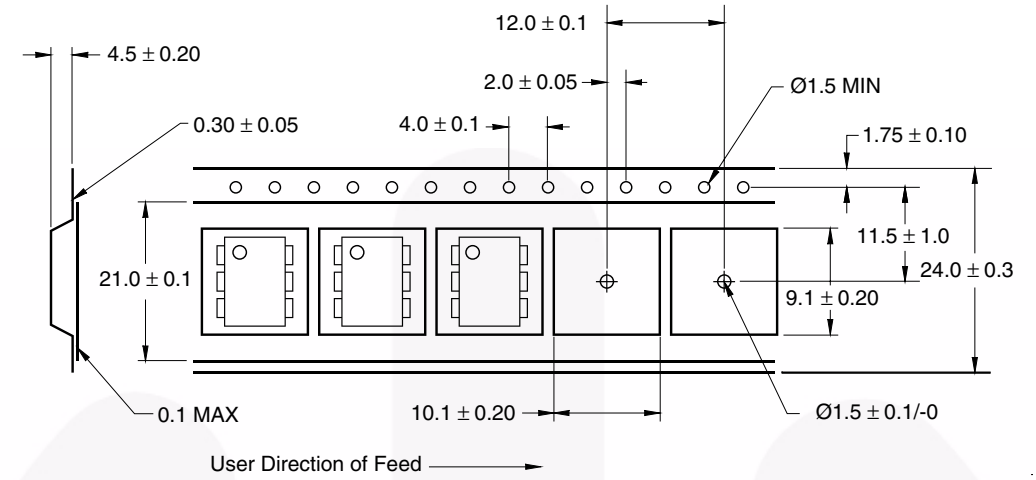
Option	Order Entry Identifier (Example)	Description
No option	H11G1M	Standard Through Hole Device
S	H11G1SM	Surface Mount Lead Bend
SR2	H11G1SR2M	Surface Mount; Tape and Reel
T	H11G1TM	0.4" Lead Spacing
V	H11G1VM	VDE 0884
TV	H11G1TVM	VDE 0884, 0.4" Lead Spacing
SV	H11G1SVM	VDE 0884, Surface Mount
SR2V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

Marking Information

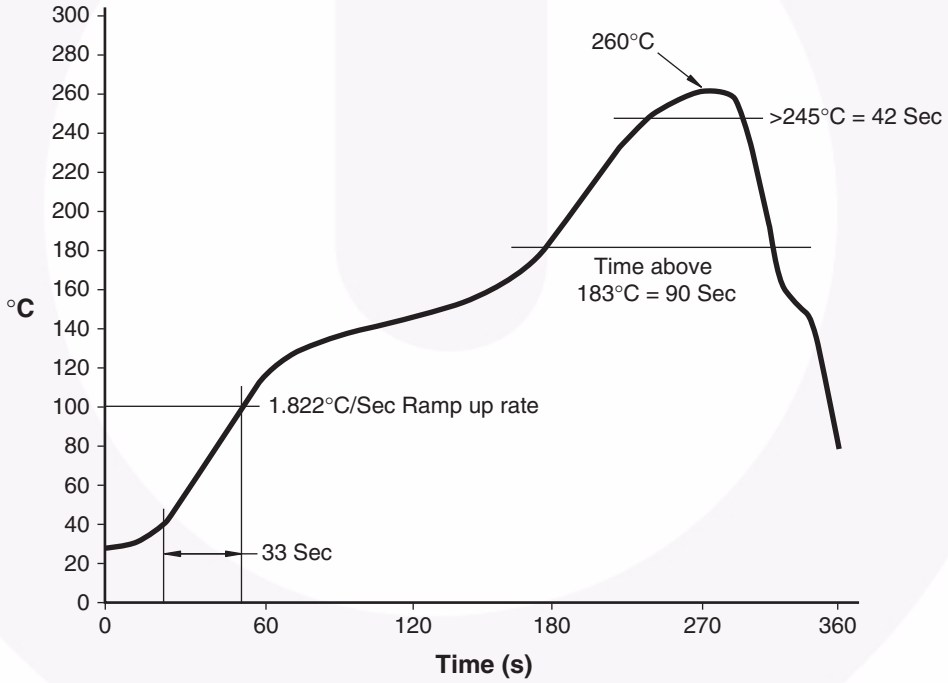


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., ‘7’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

Carrier Tape Specification



Reflow Profile



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