FAIRCHILD SEMICONDUCTOR®

October 2007

H11AG1M
Phototransistor Optocoupler

Features

- High efficiency low degradation liquid epitaxial IRED
- Logic level compatible, input and output currents, with CMOS and LS/TTL
- High DC current transfer ratio at low input currents (as low as 200μA)
- Underwriters Laboratory (UL) recognized File #E90700, Volume 2
- IEC 60747-5-2 approved (ordering option V)

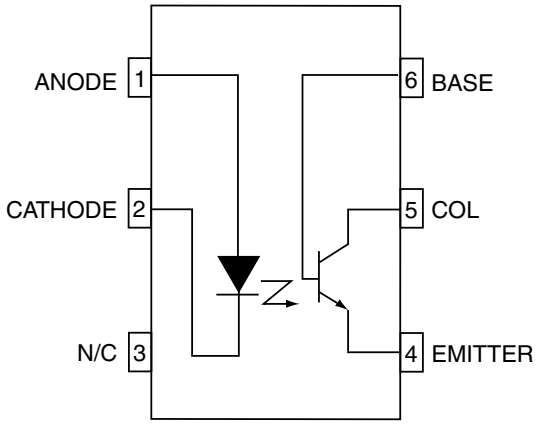
Applications

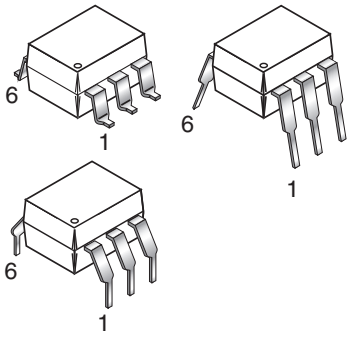
- CMOS driven solid state reliability
- Telephone ring detector
- Digital logic isolation

Description

The H11AG1M device consists of a Gallium-Aluminum-Arsenide IRED emitting diode coupled with a silicon phototransistor in a dual in-line package. This device provides the unique feature of the high current transfer ratio at both low output voltage and low input current. This makes it ideal for use in low power logic circuits, telecommunications equipment and portable electronics isolation applications.

Schematic





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	Parameters	Value	Units
TOTAL DEVICE			
T_{STG}	Storage Temperature	-55 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 @ 25°C (LED plus detector)	260	mW
	Derate Linearly From 25°C	3.5	mW/°C
EMITTER			
I_F	Continuous Forward Current	50	mA
V_R	Reverse Voltage	6	V
I_F(pk)	Forward Current – Peak (1µs pulse, 300pps)	3.0	A
P_D	LED Power Dissipation 25°C Ambient	75	mW
	Derate Linearly From 25°C	1.0	mW/°C
DETECTOR			
P_D	Detector Power Dissipation @ 25°C	150	mW
	Derate Linearly from 25°C	2.0	mW/°C
I_C	Continuous Collector Current	50	mA

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

Individual Component Characteristics

Symbol	Parameters	Test Conditions	Min.	Typ.*	Max.	Units
EMITTER						
V_F	Input Forward Voltage	I_F = 1mA		1.25	1.5	V
I_R	Reverse Leakage Current	V_R = 5V, T_A = 25°C			10	µA
C_J	Capacitance	V = 0, f = 1.0MHz			100	pF
DETECTOR						
BV_{CEO}	Breakdown Voltage, Collector to Emitter	I_C = 1.0mA, I_F = 0	30			V
BV_{CBO}	Collector to Base	I_C = 100µA, I_F = 0	70			V
BV_{ECO}	Emitter to Collector	I_C = 100µA, I_F = 0	7			V
I_{CEO}	Leakage Current, Collector to Emitter	V_{CE} = 10V, I_F = 0		5	10	µA
C_{CE}	Capacitance	V_{CE} = 10V, f = 1MHz		10		pF

*Typical values at T_A = 25°C.

Isolation Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	f = 60Hz, t = 1 sec.	7500			V_{AC}PEAK
R_{ISO}	Isolation Resistance	V_{I-O} = 500VDC, T_A = 25°C	10^{11}			Ω

Transfer Characteristics (T_A = 25°C Unless otherwise specified.)

Symbol	Characteristics	Test Conditions	Min.	Typ.*	Max.	Units
DC CHARACTERISTICS						
CTR	Current Transfer Ratio	I_F = 1mA, V_{CE} = 5V	300			%
		I_F = 1mA, V_{CE} = 0.6V	100			
		I_F = 0.2mA, V_{CE} = 1.5V	100			
$V_{CE(SAT)}$	Saturation Voltage	I_F = 2.0mA, I_C = 0.5mA			.40	V
AC CHARACTERISTICS						
Non-Saturated Switching Times						
t_{on}	Turn-On Time	R_L = 100Ω, I_F = 1mA, V_{CC} = 5V		5		µs
t_{off}	Turn-Off Time	R_L = 100Ω, I_F = 1mA, V_{CC} = 5V		5		µs

*Typical values at T_A = 25°C

Typical Performance Curves

Figure 1. LED Forward Voltage vs. Forward Current

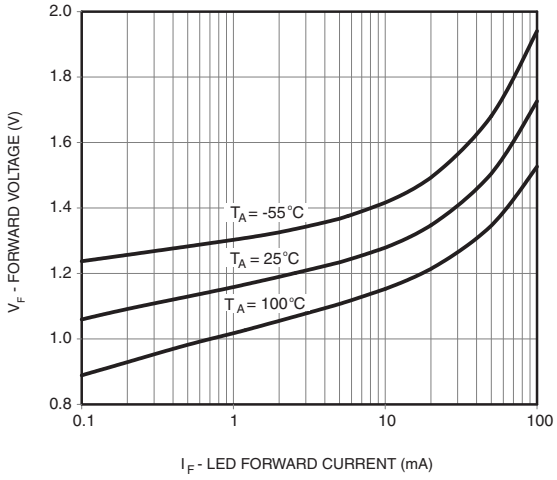


Figure 2. Normalized Current Transfer Ratio vs. Forward Current

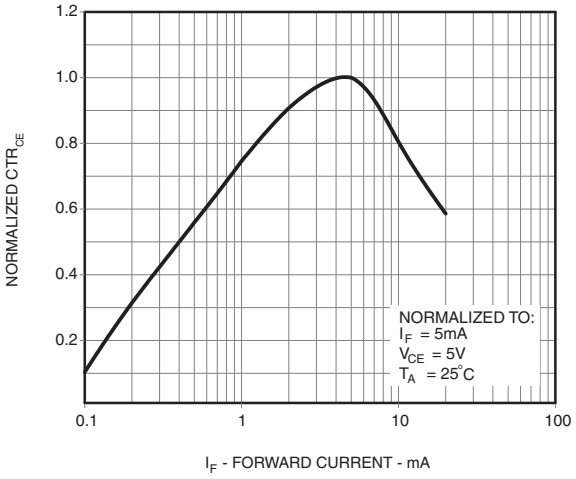


Figure 3. Normalized CTR vs. Temperature

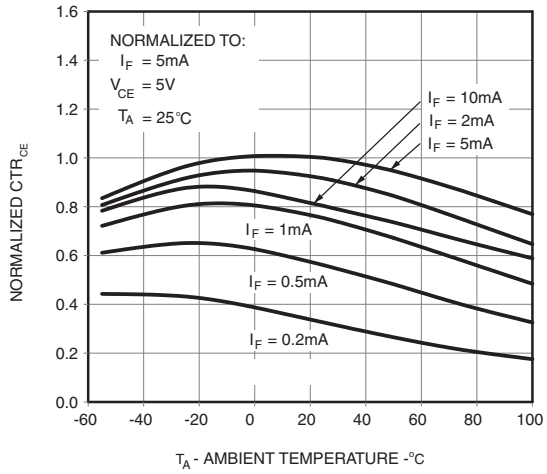


Figure 4. Normalized Collector vs. Collector - Emitter Voltage

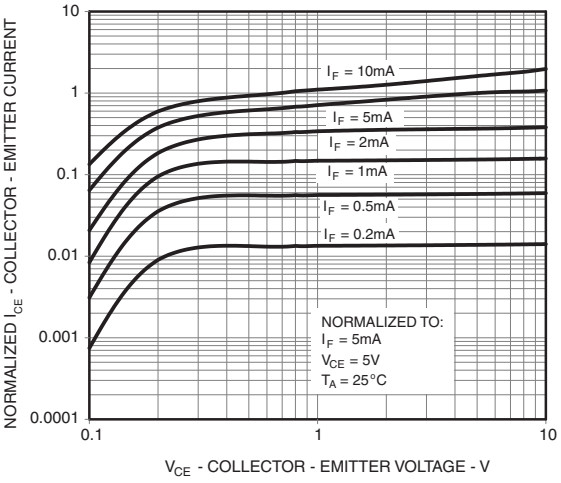


Figure 5. Normalized Collector Base Photocurrent Ratio vs. Forward Current

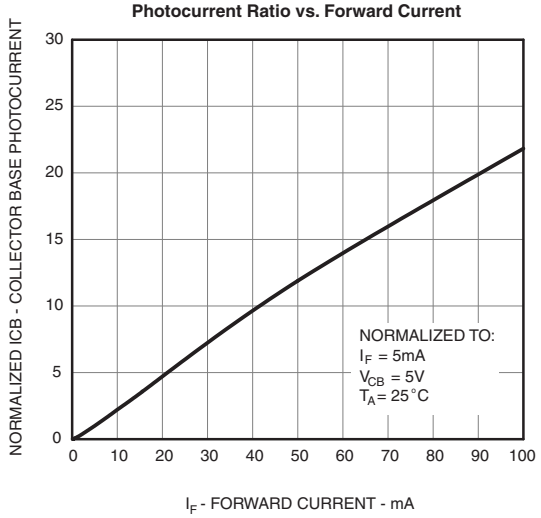
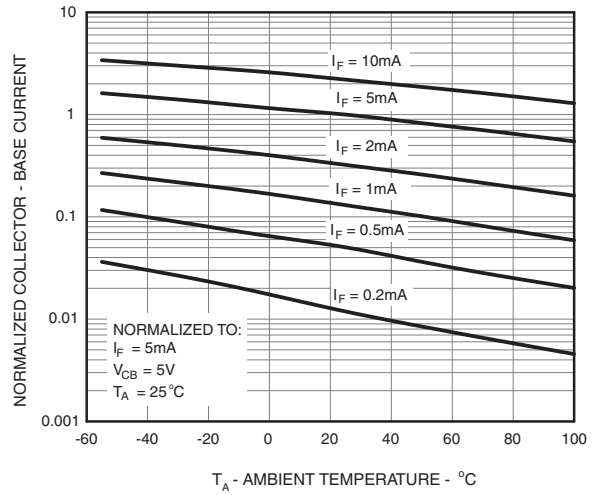
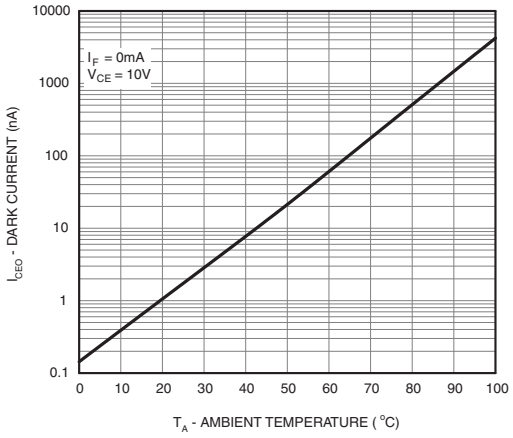


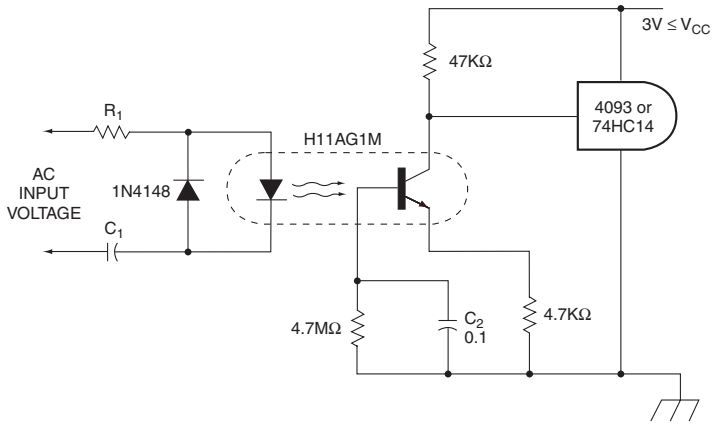
Figure 6. Normalized Collector - Base Current vs. Temperature



Typical Performance Curves (Continued)

Figure 7. Collector-Emitter Dark Current vs. Ambient Temperature





Input	R1	C1	Z
40-90 VRMS 20Hz	75K 1/10W	0.1µF 100V	109K
95-135 VRMS 60Hz	180K 1/10W	12 ηF 200 V	285K
200-280 VRMS 50/60Hz	390K 1/4W	6.80 ηF 400 V	550K

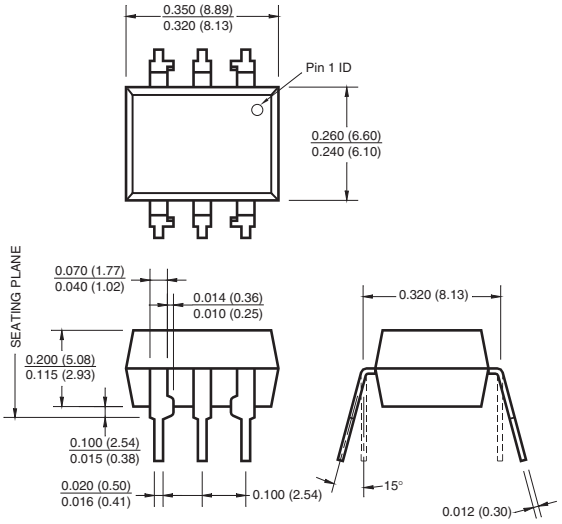
DC component of input voltage is ignored due to C1

Figure 8. Telephone Ring Detector/A.C. Line CMOS Input Isolator

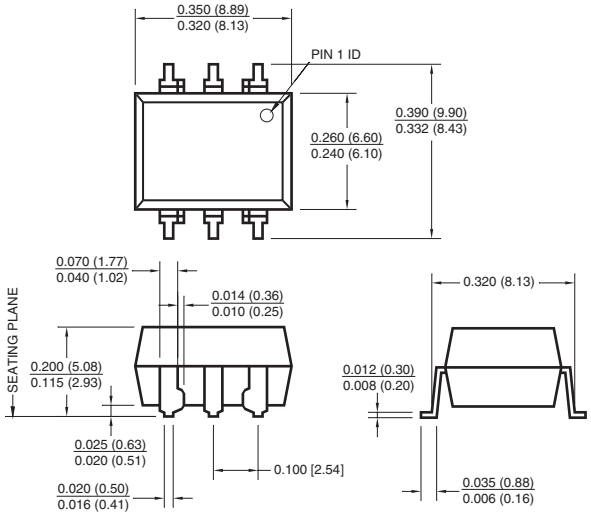
The H11AG1M uses less input power than the neon bulb traditionally used to monitor telephone and line voltages. Additionally. response time can be tailored to ignore telephone dial tap, switching transients and other undesired signals by modifying the value of C2. The high impedance to line voltage also can simply board layout spacing requirements.

Package Dimensions

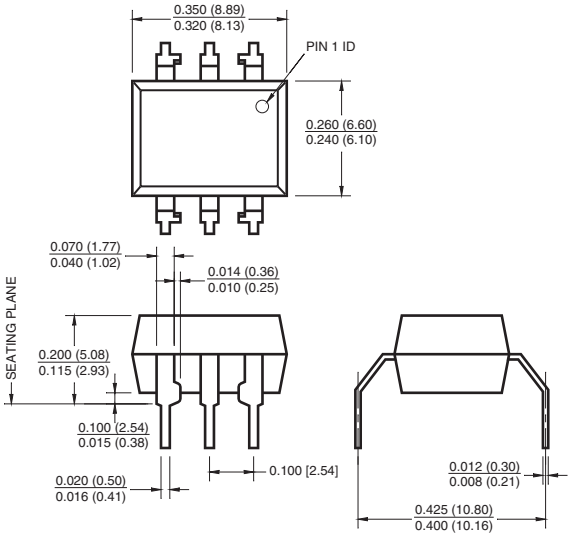
Through Hole



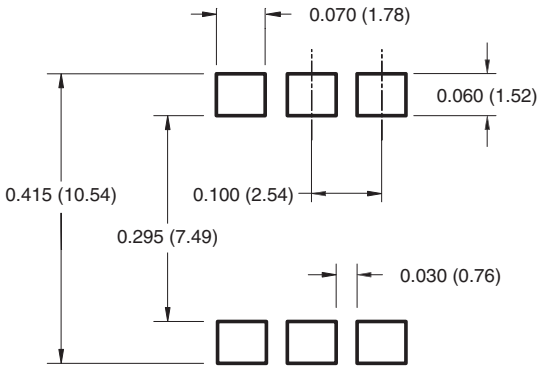
Surface Mount



0.4" Lead Spacing



Recommended Pay Layout for Surface Mount Leadform

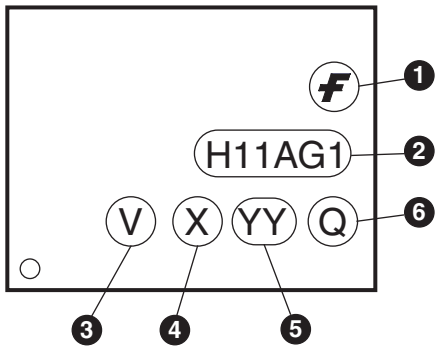


Note:
All dimensions are in inches (millimeters)

Ordering Information

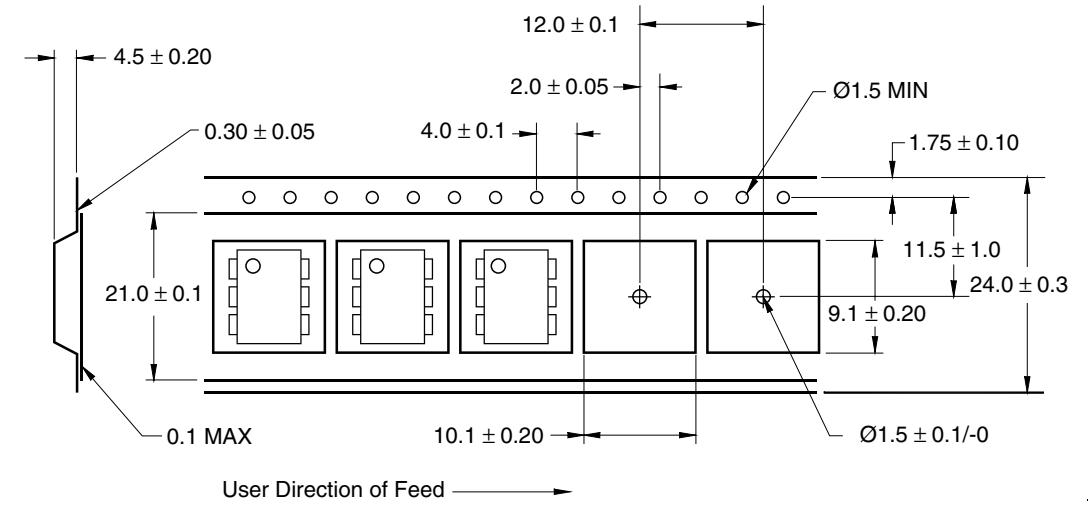
Suffix	Example	Option
No Suffix	H11AG1M	Standard Through Hole Device (50 units per tube)
S	H11AG1SM	Surface Mount Lead Bend
SR2	H11AG1SR2M	Surface Mount; Tape and Reel (1,000 units per reel)
T	H11AG1TM	0.4" Lead Spacing
V	H11AG1VM	VDE 0884
TV	H11AG1TVM	VDE 0884, 0.4" Lead Spacing
SV	H11AG1SVM	VDE 0884, Surface Mount
SR2V	H11AG1SR2VM	VDE 0884, Surface Mount, Tape & Reel (1,000 units per reel)

Marking Information



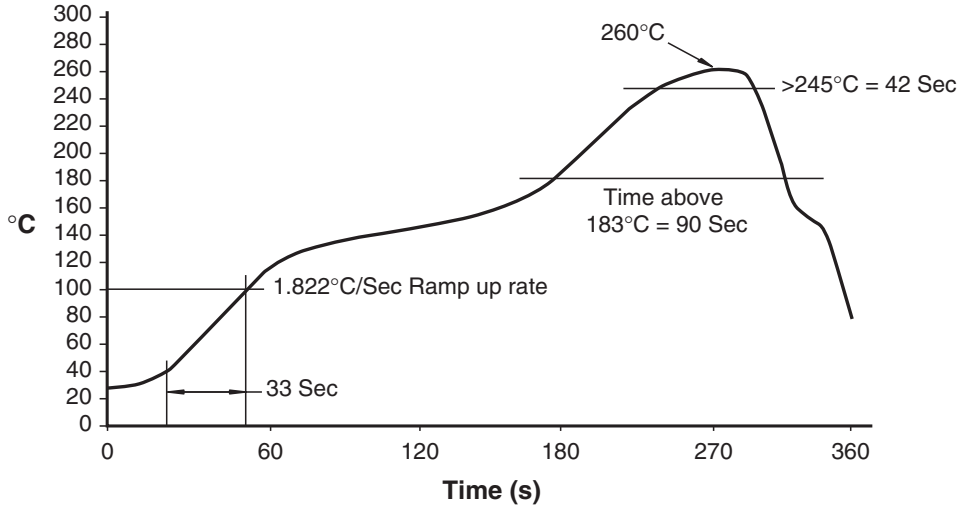
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., ‘7’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

Tape Dimensions



Note:
All dimensions are in inches (millimeters)

Reflow Soldering Profile



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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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