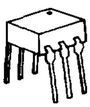
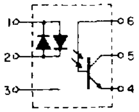
## H11AA1-H11AA4

# Optoisolator
# AC Input GaAs Infrared Emitting Diodes and NPN Silicon Phototransistor

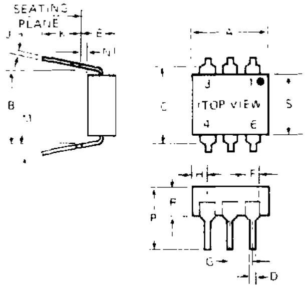


The H11AA1 through H11AA4 consist of two gallium arsenide infrared emitting diodes connected in inverse parallel and coupled with a silicon phototransistor in a dual in-line package. These devices are also available in surface-mount packaging.



**FEATURES:**

- AC or polarity insensitive inputs
- Fast switching speeds
- Built-in reverse polarity input protection
- High isolation voltage
- High isolation resistance
- I/O compatible with integrated circuits



## absolute maximum ratings: (25°C) (unless otherwise specified)

**INFRARED EMITTING DIODE**

| | | | |
|---|---|---|---|
| Power Dissipation | $T_A$ = 25°C | *100 | milliwatts |
| Power Dissipation | $T_C$ = 25°C | *100 | milliwatts |
| ($T_C$ indicates collector lead temperature 1/32" from case) | | | |
| Input Current (RMS) | | 60 | milliamps |
| Input Current (Peak) | | ± 1 | ampere |
| (Pulse width 1μsec, 300 pps) | | | |

*Derate 1.33mW/°C above 25°C

**PHOTO-TRANSISTOR**

| | | | |
|---|---|---|---|
| Power Dissipation | $T_A$ = 25°C | **300 | milliwatts |
| Power Dissipation | $T_C$ = 25°C | ***500 | milliwatts |
| ($T_C$ indicates collector lead temperature 1/32" from case) | | | |
| $V_{CEO}$ | | 30 | volts |
| $V_{CBO}$ | | 70 | volts |
| $V_{EBO}$ | | 5 | volts |
| Collector Current (Continuous) | | 100 | milliamps |

**Derate 4.0mW/°C above 25°C
***Derate 6.7mW/°C above 25°C

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | |
| A | 8.38 | 8.89 | 330 | 350 | |
| B | 7.62 REF | | 300 REF | | 1 |
| C | | 8.64 | | 340 | 2 |
| D | 406 | 508 | 016 | 020 | |
| E | - | 5.08 | | 200 | 3 |
| F | 1.02 | 1.78 | 040 | 070 | |
| G | 2.28 | 2.80 | 090 | 110 | |
| H | - | 2.16 | | 085 | 4 |
| J | 203 | 305 | 008 | 012 | |
| K | 2.54 | | 100 | | |
| M | - | 15 | | 15 | |
| N | 381 | | 015 | | |
| P | | 9.53 | | 375 | |
| R | 2.92 | 3.43 | 115 | 135 | |
| S | 6.10 | 6.86 | 240 | 270 | |

NOTES
1 INSTALLED POSITION LEAD CENTERS
2 OVERALL INSTALLED DIMENSION
3 THESE MEASUREMENTS ARE MADE FROM THE SEATING PLANE
4 FOUR PLACES

**TOTAL DEVICE**

Storage Temperature -55 to 150°C
Operating Temperature -55 to 100°C
Lead Soldering Time (at 260°C) 10 seconds
Surge Isolation Voltage (Input to Output)
2500$V_{(peak)}$ 1770$V_{(RMS)}$
Steady-State Isolation Voltage (Input to Output)
1500$V_{(peak)}$ 1060$V_{(RMS)}$

UL Covered under U.L component recognition program, reference file E51868

## H11AA1-H11AA4

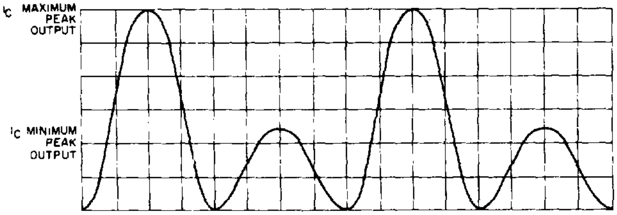
## individual electrical characteristics (25°C) *(unless otherwise specified)*

| INFRARED EMITTING DIODE | SYMBOL | MAX. | UNITS | PHOTO-TRANSISTOR | SYMBOL | MIN. | MAX. | UNITS |
|---|---|---|---|---|---|---|---|---|
| Input Voltage ($I_F = \pm 10$ mA) | $V_F$ | | | Breakdown Voltage ($I_C$ = 10mA, $I_F$ = 0) | $V_{(BR)CEO}$ | 30 | | volts |
| H11AA1, 3, 4 | | 1.5 | volts | | | | | |
| H11AA2 | | 1.8 | volts | Breakdown Voltage ($I_C$ = 100μA, $I_F$ = 0) | $V_{(BR)CBO}$ | 70 | | volts |
| Capacitance (V = 0, F = 1 MHz) | $C_J$ | 100 | picofarads | Breakdown Voltage ($I_E$ = 100μA, $I_F$ = 0) | $V_{(BR)EBO}$ | 5 | | volts |
| | | | | Collector Dark Current ($V_{CE}$ = 10V, $I_F$ = 0) | $I_{CEO}$ | | | |
| | | | | H11AA1, 3, 4 | | | 100 | nanoamps |
| | | | | H11AA2 | | | 200 | nanoamps |

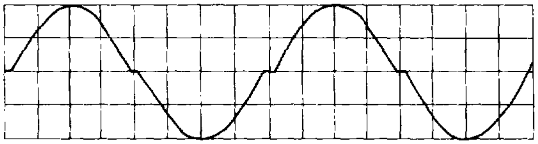
## coupled electrical characteristics (25°C) *(unless otherwise specified)*

| | MIN. | MAX. | UNITS |
|---|---|---|---|
| Current Transfer Ratio ($V_{CE}$ = 10V, $I_F = \pm$ 10mA) H11AA4 | 100 | | percent |
| H11AA3 | 50 | | percent |
| H11AA1 | 20 | | percent |
| H11AA2 | 10 | | percent |
| Saturation Voltage - Collector to Emitter ($I_{CEO}$=0.5mA, $I_F = \pm$10mA) | | 0.4 | volts |
| Current Transfer Ratio Symmetry: $\frac{I_{CEO}(V_{CE}=10V, I_F=10mA)}{I_{CEO}(V_{CE}=10V, I_F=-10mA)}$ Note 2 | | | |
| H11AA1, 3, 4 | 0.33 | 3.0 | |
| Isolation Resistance (Input to Output Voltage = 500$V_{DC}$. See Note 1) | 100 | | gigaohms |

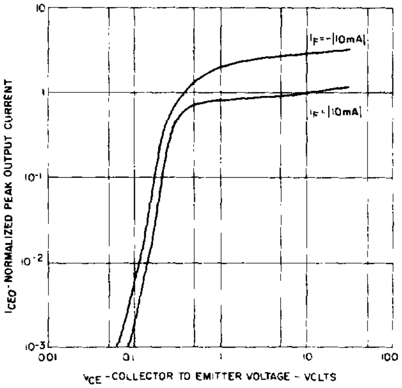
**Note 1:** Tests of input to output isolation current resistance, and capacitance are performed with the input terminals (diode) shorted together and the output terminals (transistor) shorted together



$I_{(CEO)}$OUTPUT WAVE FORM (SEE NOTE 2) AT $V_{CE}$=5V



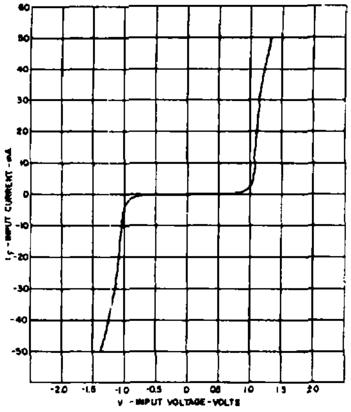
$I_F$ INPUT WAVE FORM



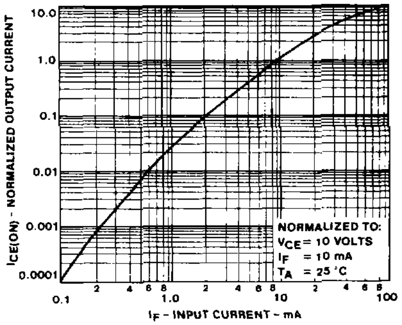
**Note 2:** The H11AA1 specification guarantees the maximum peak output current will be no more than three times the minimum peak output current at $I_F$ = 10 mA

# H11AA1-H11AA4

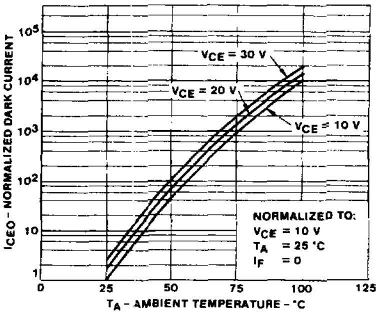
## TYPICAL CHARACTERISTICS



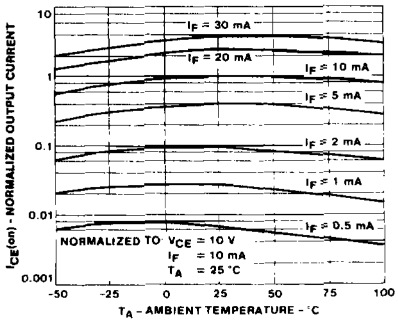
1. INPUT CHARACTERISTICS



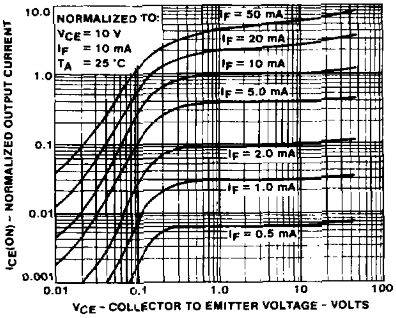
2. OUTPUT CURRENT VS INPUT CURRENT



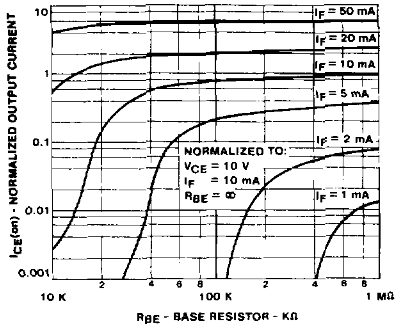
3. DARK $I_{CEO}$ CURRENT VS TEMPERATURE



4. OUTPUT CURRENT VS TEMPERATURE



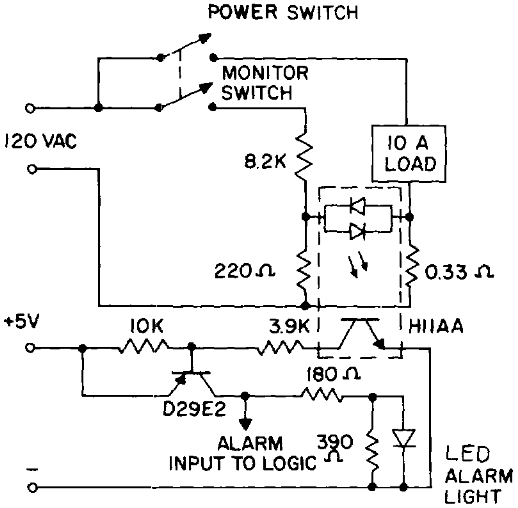
5. OUTPUT CHARACTERISTICS



6. OUTPUT CURRENT VS BASE EMITTER RESISTANCE

## H11AA APPLICATIONS

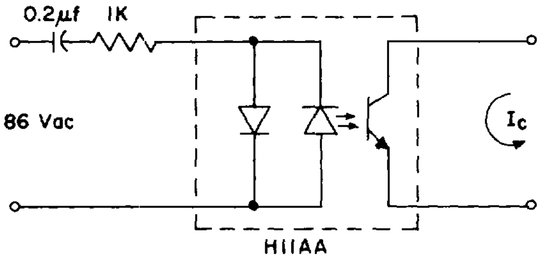
### LOAD MONITOR AND ALARM



In many computer controlled systems where AC power is controlled, load dropout due to filament burnout, fusing, etc. or the opposite situation - load power when uncalled for due to switch failure can cause serious systems or safety problems. This circuit provides a simple AC power monitor which lights an alarm lamp and provides a "1" input to the computer control in either of these situations while maintaining complete electrical isolation between the logic and the power system.

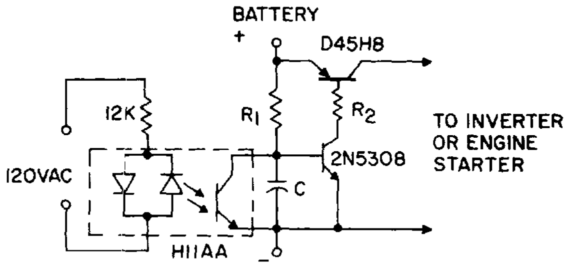
Note that for other than resistive loads, phase angle correction of the monitoring voltage divider is required.

### RING DETECTOR



In many telecommunications applications it is desirable to detect the presence of a ring signal in a system without any direct electrical contact with the system. When the 86 Vac ring signal is applied, the output transistor of the H11AA is turned on indicating the presence of a ring signal in the isolated telecommunications system.

### UPS SOLID STATE TURN-ON SWITCH



Interruption of the 120 VAC power line turns off the H11AA, allowing C to charge and turn on the 2N5308-D45H8 combination which activates the auxiliary power supply. This system features low standby drain, isolation to prevent ground loop problems and the capability of ignoring a fixed number of "dropped cycles" by choice of the value of C.