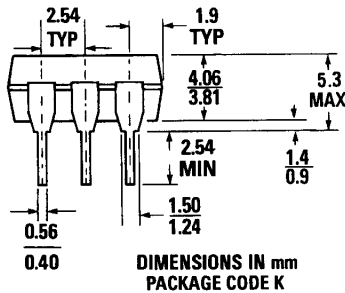
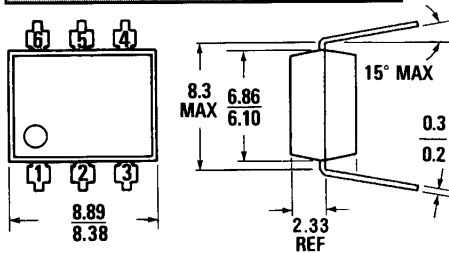
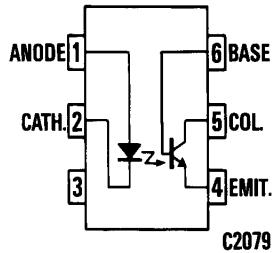


**H11AG1 H11AG2 H11AG3**

**PACKAGE DIMENSIONS**



ST1603A



Equivalent Circuit

**DESCRIPTION**

The H11AG series consists of a gallium-aluminum-arsenide infrared emitting diode coupled with a silicon phototransistor in a dual in-line package. This device provides the unique feature of 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.

**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
- Underwriters Laboratory (UL) recognized — File #E90700

**APPLICATIONS**

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

**ABSOLUTE MAXIMUM RATINGS**

**TOTAL PACKAGE**

Storage temperature ..... -50°C to 150°C  
 Operating temperature ..... -50°C to 100°C  
 Lead solder temperature ..... 260°C for 10 sec

**INPUT DIODE**

Power dissipation (25°C ambient) ..... 75 mW  
 Derate linearly (above 25°C) ..... 1.0 mW/°C  
 Continuous forward current ..... 50 mA  
 Reverse voltage ..... 6 V

**DETECTOR**

Power dissipation (at 25°C ambient) ..... 150 mW  
 Derate linearly (above 25°C ambient) ..... 2.0 mW/°C  
 $V_{CEO}$  ..... 30 V  
 $V_{CBO}$  ..... 70 V  
 $V_{ECO}$  ..... 7 V  
 Continuous collector current ..... 50 mA



## PHOTOTRANSISTOR OPTOCOUPERS

### ELECTRICAL CHARACTERISTICS ( $T_A=0-70^\circ$ Unless Otherwise Specified)

#### INDIVIDUAL COMPONENT CHARACTERISTICS

| PARAMETER                                 | SYMBOL     | MIN. | TYP. | MAX. | UNITS   | TEST CONDITIONS             |
|---|------------|------|------|------|---------|-----------------------------|
| <b>INPUT DIODE</b>                        |            |      |      |      |         |                             |
| Forward voltage                           | $V_F$      |      |      | 1.5  | V       | $I_F=1$ mA                  |
| Reverse current                           | $I_R$      |      |      | 10   | $\mu$ A | $V_R=5$ V, $T_A=25^\circ$ C |
|   |            |      |      | 100  | $\mu$ A | $V_R=5$ V, $T_A=70^\circ$ C |
| Capacitance                               | $C_J$      |      |      | 100  | pF      | $V=0$ , $f=1$ MHz           |
| <b>OUTPUT DETECTOR</b>                    |            |      |      |      |         |                             |
| Breakdown voltage<br>Collector to emitter | $BV_{CEO}$ | 30   |      |      | V       | $I_C=1$ mA, $I_F=0$         |
| Breakdown voltage<br>Collector to base    | $BV_{CBO}$ | 70   |      |      | V       | $I_C=100$ $\mu$ A, $I_F=0$  |
| Breakdown voltage<br>Emitter to Collector | $BV_{ECO}$ | 7    |      |      | V       | $I_C=100$ $\mu$ A, $I_F=0$  |
| Leakage current<br>Collector to emitter   | $I_{CEO}$  |      | 5    | 10   | $\mu$ A | $V_{CE}=10$ V, $I_F=0$      |
| Capacitance                               | $C_{CE}$   |      | 2    |      | pF      | $V_{CE}=10$ V, $f=1$ MHz    |

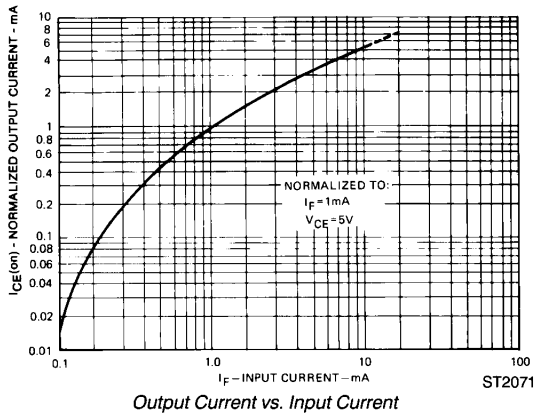
#### TRANSFER CHARACTERISTICS

| CHARACTERISTIC            | SYMBOL        | MIN. | TYP. | MAX. | UNITS   | TEST CONDITIONS                              |
|---------------------------|---------------|------|------|------|---------|--|
| DC current transfer ratio | (H11AG1)      | CTR  | 300  |      | %       | $I_F=1$ mA, $V_{CE}=5$ V                     |
|                           | (H11AG2)      | CTR  | 200  |      | %       | $I_F=1$ mA, $V_{CE}=5$ V                     |
|                           | (H11AG3)      | CTR  | 100  |      | %       | $I_F=1$ mA, $V_{CE}=5$ V                     |
|                           | (H11AG1)      | CTR  | 100  |      | %       | $I_F=1$ mA, $V_{CE}=0.6$ V                   |
|                           | (H11AG2)      | CTR  | 50   |      | %       | $I_F=1$ mA, $V_{CE}=0.6$ V                   |
|                           | (H11AG3)      | CTR  | 20   |      | %       | $I_F=1$ mA, $V_{CE}=0.6$ V                   |
|                           | (H11AG1)      | CTR  | 100  |      | %       | $I_F=0.2$ mA, $V_{CE}=1.5$ V                 |
|                           | (H11AG2)      | CTR  | 50   |      | %       | $I_F=0.2$ mA, $V_{CE}=1.5$ V                 |
| Saturation voltage        | $V_{CE(SAT)}$ |      |      | 0.4  | V       | $I_F=2.0$ mA, $I_C=0.5$ mA                   |
| Turn-on time              | $t_{on}$      |      | 5    |      | $\mu$ S | $V_{CC}=5$ V, $I_F=1$ mA, $R_L=100$ $\Omega$ |
| Turn-off time             | $t_{off}$     |      | 5    |      | $\mu$ S | $V_{CC}=5$ V, $I_F=1$ mA, $R_L=100$ $\Omega$ |

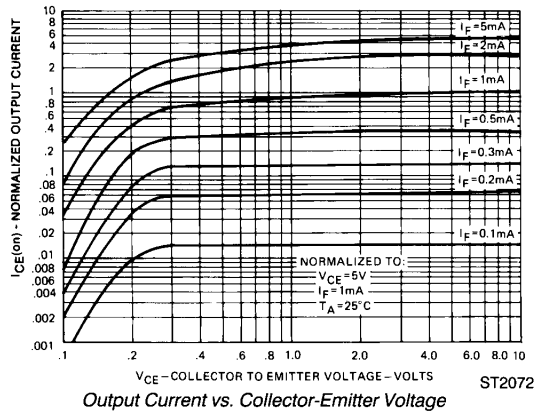
#### ISOLATION CHARACTERISTICS

|                         |           |      |  |  |            |          |
|-------------------------|-----------|------|--|--|------------|----------|
| Surge isolation voltage | $V_{ISO}$ | 7500 |  |  | $V_{PEAK}$ | 1 Minute |
| Surge isolation voltage | $V_{ISO}$ | 5300 |  |  | $V_{RMS}$  | 1 Minute |

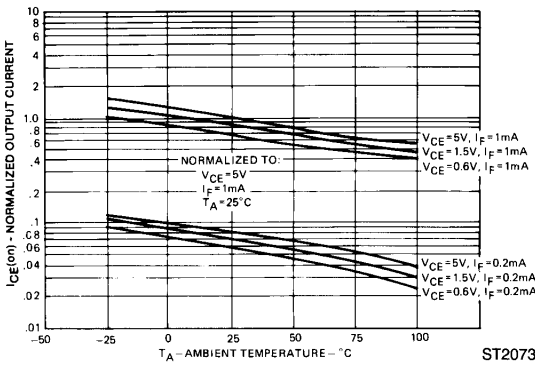
**TYPICAL CHARACTERISTICS**



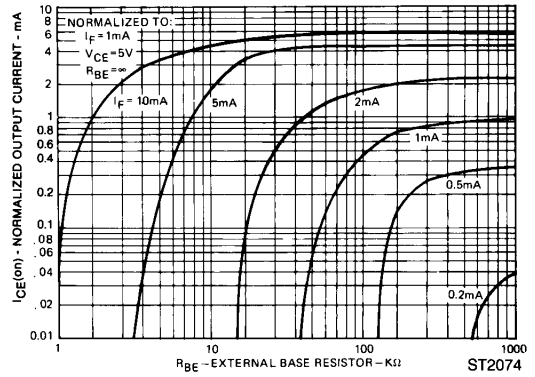
Output Current vs. Input Current



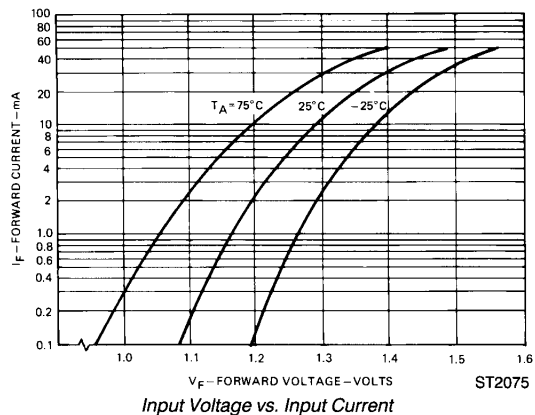
Output Current vs. Collector-Emitter Voltage



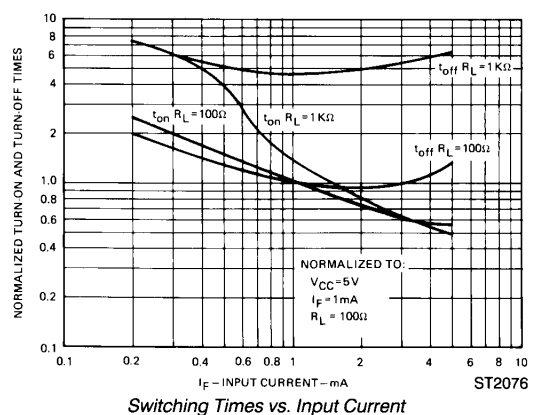
Output Current vs. Temperature



Output Current vs. Base Emitter Resistance

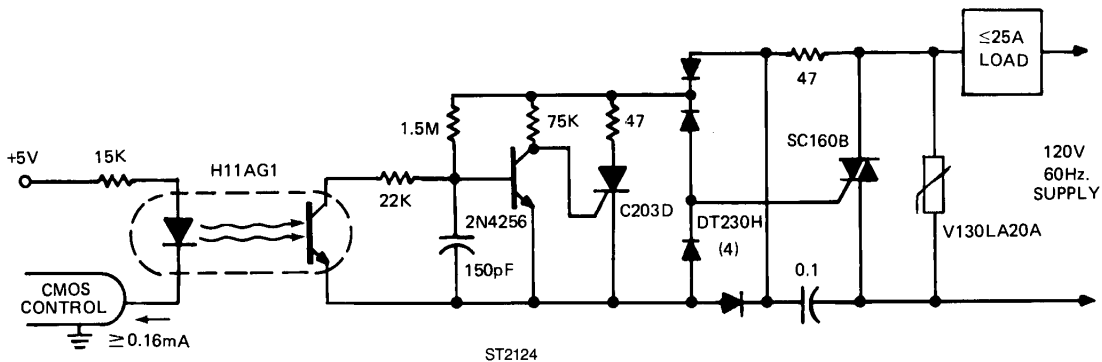
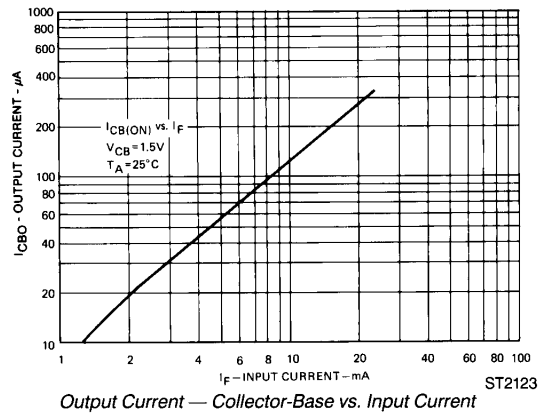
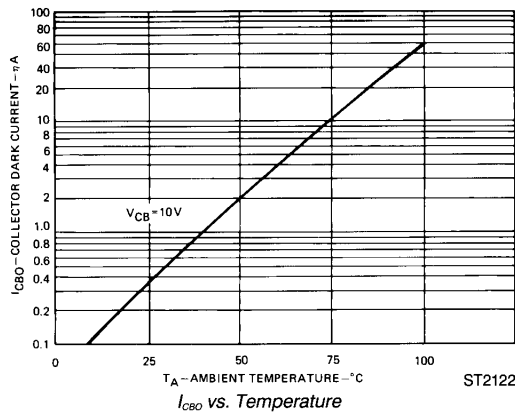


Input Voltage vs. Input Current



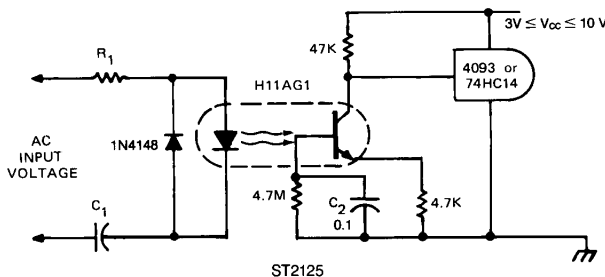
Switching Times vs. Input Current

## TYPICAL CHARACTERISTICS



### CMOS Input, 3KW, Zero Voltage Switching Solid State Relay

The H11AG1 superior performance at low input currents allows standard CMOS logic circuits to directly operate a 25A solid state relay. Circuit operation is as follows: power switching is provided by the SC160B, 25A triac. Its gate is controlled by the C203B via the DT230H rectifier bridge. The C203B turn-on is inhibited by the 2N4256 when line voltage is above 12V and/or the H11AG1 is off. False trigger and dv/dt protection are provided by the combination of a GE-MOV® varistor and RC snubber network.



| INPUT                     | R <sub>i</sub> | C <sub>i</sub>   | Z    |
|---------------------------|----------------|------------------|------|
| 40-90 VRMS<br>20 Hz.      | 75K<br>1/10 W  | 0.1 μF<br>100 V  | 109K |
| 95-135 VRMS<br>60 Hz.     | 180K<br>1/10 W | 12 ηF<br>200 V   | 285K |
| 200-280 VRMS<br>50/60 Hz. | 390K<br>1/4 W  | 6.80 ηF<br>400 V | 550K |

DC component of input voltage is ignored due to C1

### TELEPHONE RING DETECTOR/A.C. LINE CMOS INPUT ISOLATOR

The H11AG1 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 simplify board layout spacing requirements.