GlobalOptoisolator™

VDE | UL | CSA | SETI | SEMKO | DEMKO | NEMKO | BABT

# 6-Pin DIP Optoisolators AC Input/Transistor Output

**H11AA1*** [CTR = 20% Min]
**H11AA2** [CTR = 10% Min]
**H11AA3** [CTR = 50% Min]
**H11AA4*** [CTR = 100% Min]

***Motorola Preferred Devices**

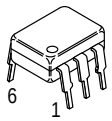
The H11AA1, H11AA2, H11AA3, H11AA4 devices consist of two gallium–arsenide infrared emitting diodes connected in inverse parallel, optically coupled to a monolithic silicon phototransistor detector.

- Built–In Protection for Reverse Polarity
- Guaranteed CTR Minimum Values as High as 100%
- Guaranteed Minimum/Maximum Symmetry Limits
- ***To order devices that are tested and marked per VDE 0884 requirements, the suffix "V" must be included at end of part number. VDE 0884 is a test option.***

**Applications**

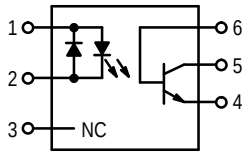
- Detecting or Monitoring ac Signals
- AC Line/Digital Logic Isolation
- Programmable Controllers
- Interfacing and coupling systems of different potentials and impedances
- AC/DC — Input Modules

**STYLE 8 PLASTIC**




**STANDARD THRU HOLE**
**CASE 730A–04**

**SCHEMATIC**




PIN 1. INPUT LED
2. INPUT LED
3. NO CONNECTION
4. EMITTER
5. COLLECTOR
6. BASE

**MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| **INPUT LED** | | | |
| Forward Current — Continuous (RMS) | $I_F$ | 60 | mA |
| LED Power Dissipation @ $T_A$ = 25°C<br>with Negligible Power in Output Detector<br>Derate above 25°C | $P_D$ | 120<br><br>1.41 | mW<br><br>mW/°C |
| **OUTPUT TRANSISTOR** | | | |
| Collector–Emitter Voltage | $V_{CEO}$ | 30 | Volts |
| Emitter–Base Voltage | $V_{EBO}$ | 5 | Volts |
| Collector–Base Voltage | $V_{CBO}$ | 70 | Volts |
| Collector Current — Continuous | $I_C$ | 150 | mA |
| Detector Power Dissipation @ $T_A$ = 25°C<br>with Negligible Power in Input LEDs<br>Derate above 25°C | $P_D$ | 150<br><br>1.76 | mW<br><br>mW/°C |
| **TOTAL DEVICE** | | | |
| Isolation Surge Voltage(1)<br>(Peak ac Voltage, 60 Hz, 1 sec Duration) | $V_{ISO}$ | 7500 | Vac(pk) |
| Total Device Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 250<br>2.94 | mW<br>mW/°C |
| Ambient Operating Temperature Range(2) | $T_A$ | –55 to +100 | °C |
| Storage Temperature Range(2) | $T_{stg}$ | –55 to +150 | °C |
| Soldering Temperature (10 sec, 1/16″ from case) | $T_L$ | 260 | °C |

1. Isolation surge voltage is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

**Preferred** devices are Motorola recommended choices for future use and best overall value.

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**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted)(1)

| Characteristic | | Symbol | Min | Typ(1) | Max | Unit |
|---|---|---|---|---|---|---|
| **INPUT LED** | | | | | | |
| Forward Voltage ($I_F$ = 10 mA, either direction) | H11AA1,3,4 | $V_F$ | — | 1.15 | 1.5 | Volts |
| | H11AA2 | | — | 1.15 | 1.8 | |
| $T_A$ = –55°C | All devices | | — | 1.3 | — | |
| $T_A$ = 100°C | All devices | | — | 1.05 | — | |
| Capacitance (V = 0 V, f = 1 MHz) | | $C_J$ | — | 20 | — | pF |
| **OUTPUT TRANSISTOR** | | | | | | |
| Collector–Emitter Dark Current ($V_{CE}$ = 10 V) | H11AA1,3,4 | $I_{CEO}$ | — | 1 | 100 | nA |
| | H11AA2 | | — | 1 | 200 | nA |
| $T_A$ = 100°C | All devices | | — | 1 | — | μA |
| Collector–Base Dark Current ($V_{CB}$ = 10 V) | | $I_{CBO}$ | — | 0.2 | — | nA |
| Collector–Emitter Breakdown Voltage ($I_C$ = 10 mA) | | $V_{(BR)CEO}$ | 30 | 45 | — | Volts |
| Collector–Base Breakdown Voltage ($I_C$ = 100 μA) | | $V_{(BR)CBO}$ | 70 | 100 | — | Volts |
| Emitter–Collector Breakdown Voltage ($I_E$ = 100 μA) | | $V_{(BR)ECO}$ | 5 | 7.8 | — | Volts |
| DC Current Gain ($I_C$ = 2 mA, $V_{CE}$ = 5 V) (Typical Value) | | $h_{FE}$ | — | 500 | — | — |
| Collector–Emitter Capacitance (f = 1 MHz, $V_{CE}$ = 0 V) | | $C_{CE}$ | — | 1.7 | — | pF |
| Collector–Base Capacitance (f = 1 MHz, $V_{CB}$ = 0 V) | | $C_{CB}$ | — | 20 | — | pF |
| Emitter–Base Capacitance (f = 1 MHz, $V_{EB}$ = 0 V) | | $C_{EB}$ | — | 10 | — | pF |
| **COUPLED** | | | | | | |
| Output Collector Current ($I_F$ = ±10 mA, $V_{CE}$ = 10 V) | H11AA1 | $I_C$ (CTR)(2) | 2 (20) | 5 (50) | — | mA (%) |
| | H11AA2 | | 1 (10) | 2 (20) | — | |
| | H11AA3 | | 5 (50) | 10 (100) | — | |
| | H11AA4 | | 10 (100) | 15 (150) | — | |
| Output Collector Current Symmetry(3) $\left(\frac{I_C \text{ at } I_F = +10 \text{ mA}, V_{CE} = 10 \text{ V}}{I_C \text{ at } I_F = -10 \text{ mA}, V_{CE} = 10 \text{ V}}\right)$ | H11AA1,3,4 | — | 0.33 | — | 3 | — |
| Collector–Emitter Saturation Voltage ($I_C$ = 0.5 mA, $I_F$ = ±10 mA) | | $V_{CE(sat)}$ | — | 0.1 | 0.4 | Volts |
| Isolation Voltage (f = 60 Hz, t = 1 sec)(4) | | $V_{ISO}$ | 7500 | — | — | Vac(pk) |
| Isolation Resistance (V = 500 V)(4) | | $R_{ISO}$ | $10^{11}$ | — | — | Ω |
| Isolation Capacitance (V = 0 V, f = 1 MHz)(4) | | $C_{ISO}$ | — | 0.2 | — | pF |

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = $I_C/I_F$ x 100%.
3. This specification guarantees that the higher of the two $I_C$ readings will be no more than 3 times the lower at $I_F$ = 10 mA.
4. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

## TYPICAL CHARACTERISTICS

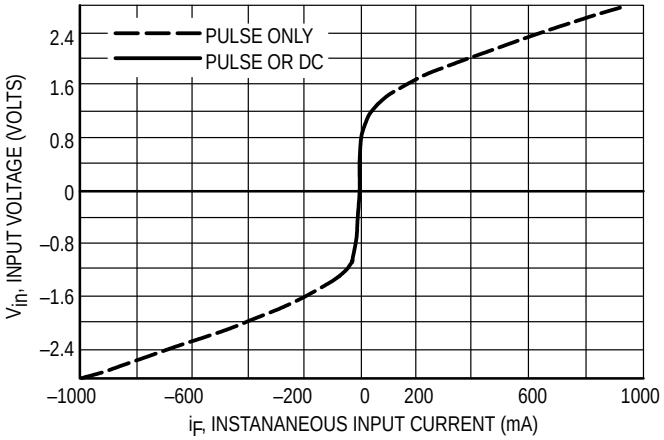



**Figure 1. Input Voltage versus Input Current**

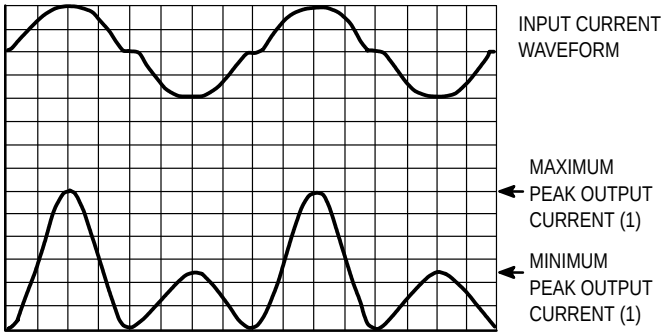



**Figure 2. Output Characteristics**

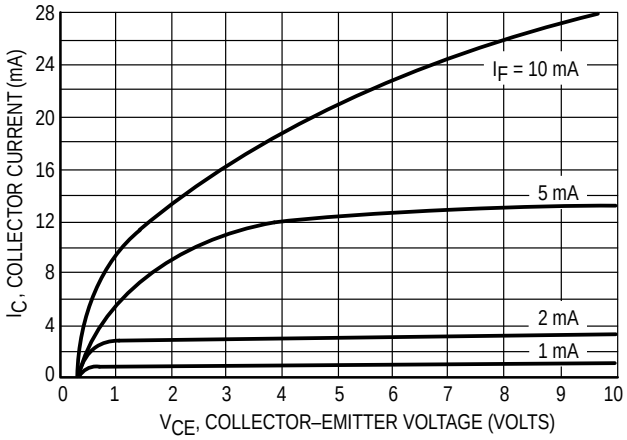



**Figure 3. Collector Current versus Collector–Emitter Voltage**

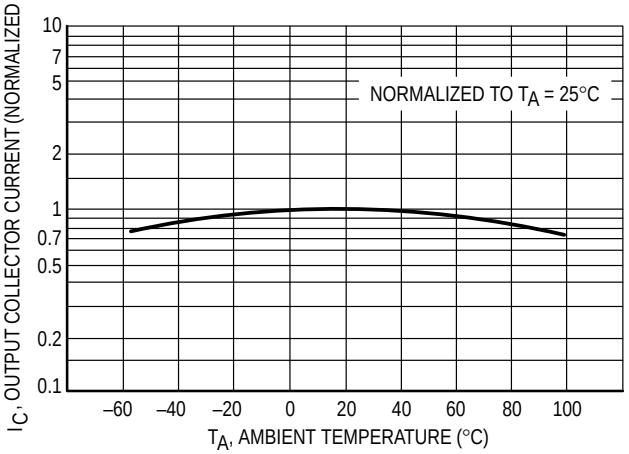



**Figure 4. Output Current versus Ambient Temperature**

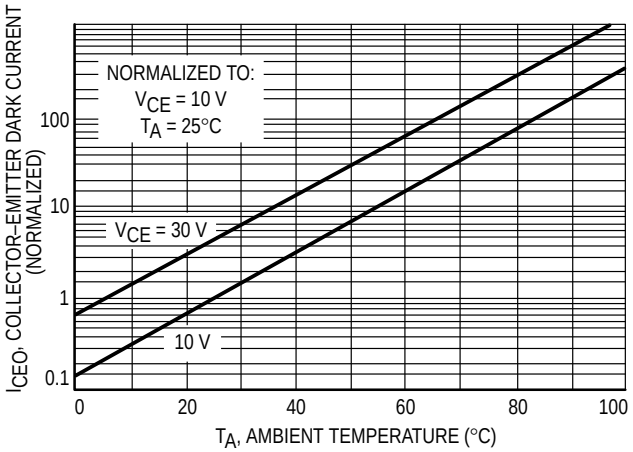



**Figure 5. Dark Current versus Ambient Temperature**

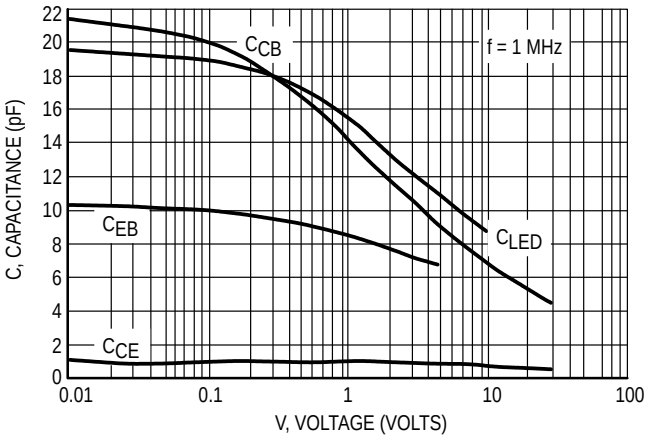
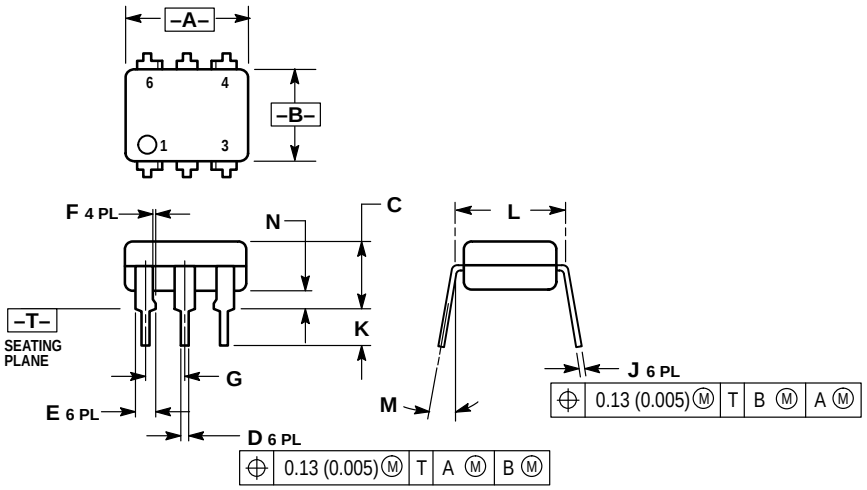



**Figure 6. Capacitances versus Voltage**

## PACKAGE DIMENSIONS

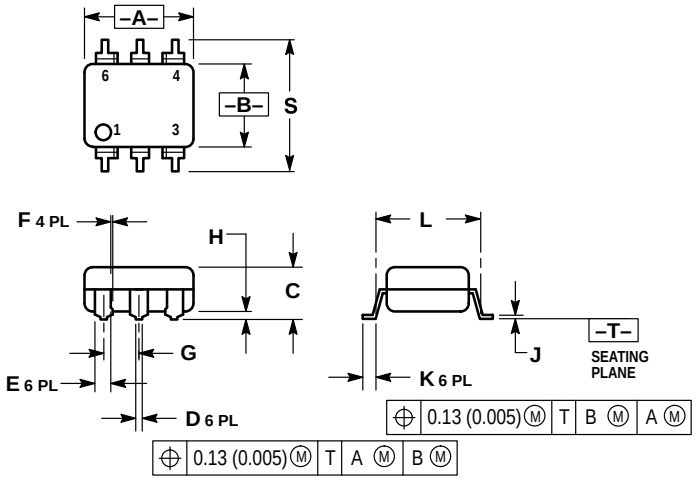



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 0.50 |
| E | 0.040 | 0.070 | 1.02 | 1.77 |
| F | 0.010 | 0.014 | 0.25 | 0.36 |
| G | 0.100 BSC | | 2.54 BSC | |
| J | 0.008 | 0.012 | 0.21 | 0.30 |
| K | 0.100 | 0.150 | 2.54 | 3.81 |
| L | 0.300 BSC | | 7.62 BSC | |
| M | 0 ° | 15 ° | 0 ° | 15 ° |
| N | 0.015 | 0.100 | 0.38 | 2.54 |

STYLE 8:
PIN 1. LED 1 ANODE/LED 2 CATHODE
2. LED 1 CATHODE/LED 2 ANODE
3. NC
4. EMITTER
5. COLLECTOR
6. BASE

**CASE 730A–04**
**ISSUE G**




NOTES:
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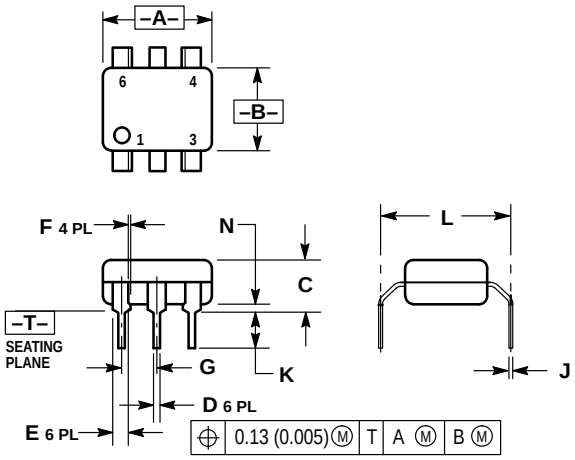
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 0.50 |
| E | 0.040 | 0.070 | 1.02 | 1.77 |
| F | 0.010 | 0.014 | 0.25 | 0.36 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.020 | 0.025 | 0.51 | 0.63 |
| J | 0.008 | 0.012 | 0.20 | 0.30 |
| K | 0.006 | 0.035 | 0.16 | 0.88 |
| L | 0.320 BSC | | 8.13 BSC | |
| S | 0.332 | 0.390 | 8.43 | 9.90 |

***Consult factory for leadform option availability**

**CASE 730C–04**
**ISSUE D**

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3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 0.50 |
| E | 0.040 | 0.070 | 1.02 | 1.77 |
| F | 0.010 | 0.014 | 0.25 | 0.36 |
| G | 0.100 BSC | | 2.54 BSC | |
| J | 0.008 | 0.012 | 0.21 | 0.30 |
| K | 0.100 | 0.150 | 2.54 | 3.81 |
| L | 0.400 | 0.425 | 10.16 | 10.80 |
| N | 0.015 | 0.040 | 0.38 | 1.02 |

***Consult factory for leadform option availability**

**CASE 730D–05**
**ISSUE D**

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