GlobalOptoisolator™

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

# 6-Pin DIP Optoisolators Transistor Output

**4N25***
**4N25A***
**4N26***
**[CTR = 20% Min]**
**4N27**
**4N28**
**[CTR = 10% Min]**

***Motorola Preferred Devices**

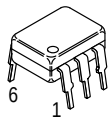
The 4N25/A, 4N26, 4N27 and 4N28 devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Most Economical Optoisolator Choice for Medium Speed, Switching Applications
- Meets or Exceeds All JEDEC Registered Specifications
- ***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

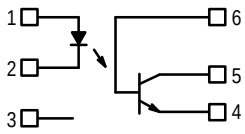
- General Purpose Switching Circuits
- Interfacing and coupling systems of different potentials and impedances
- I/O Interfacing
- Solid State Relays

**STYLE 1 PLASTIC**




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

**SCHEMATIC**




PIN 1. LED ANODE
2. LED CATHODE
3. N.C.
4. EMITTER
5. COLLECTOR
6. BASE

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

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| **INPUT LED** | | | |
| Reverse Voltage | $V_R$ | 3 | Volts |
| Forward Current — Continuous | $I_F$ | 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–Collector Voltage | $V_{ECO}$ | 7 | 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 LED<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.
GlobalOptoisolator is a trademark of Motorola, Inc.

**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) | $T_A$ = 25°C<br>$T_A$ = –55°C<br>$T_A$ = 100°C | $V_F$ | —<br>—<br>— | 1.15<br>1.3<br>1.05 | 1.5<br>—<br>— | Volts |
| Reverse Leakage Current ($V_R$ = 3 V) | | $I_R$ | — | — | 100 | μA |
| Capacitance (V = 0 V, f = 1 MHz) | | $C_J$ | — | 18 | — | pF |
| **OUTPUT TRANSISTOR** | | | | | | |
| Collector–Emitter Dark Current ($V_{CE}$ = 10 V, $T_A$ = 25°C | 4N25,25A,26,27<br>4N28 | $I_{CEO}$ | —<br>— | 1<br>1 | 50<br>100 | nA |
| ($V_{CE}$ = 10 V, $T_A$ = 100°C) | All Devices | $I_{CEO}$ | — | 1 | — | μA |
| Collector–Base Dark Current ($V_{CB}$ = 10 V) | | $I_{CBO}$ | — | 0.2 | — | nA |
| Collector–Emitter Breakdown Voltage ($I_C$ = 1 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) | | $V_{(BR)ECO}$ | 7 | 7.8 | — | Volts |
| DC Current Gain ($I_C$ = 2 mA, $V_{CE}$ = 5 V) | | $h_{FE}$ | — | 500 | — | — |
| Collector–Emitter Capacitance (f = 1 MHz, $V_{CE}$ = 0) | | $C_{CE}$ | — | 7 | — | pF |
| Collector–Base Capacitance (f = 1 MHz, $V_{CB}$ = 0) | | $C_{CB}$ | — | 19 | — | pF |
| Emitter–Base Capacitance (f = 1 MHz, $V_{EB}$ = 0) | | $C_{EB}$ | — | 9 | — | pF |
| **COUPLED** | | | | | | |
| Output Collector Current ($I_F$ = 10 mA, $V_{CE}$ = 10 V) | 4N25,25A,26<br>4N27,28 | $I_C$ (CTR)(2) | 2 (20)<br>1 (10) | 7 (70)<br>5 (50) | —<br>— | mA (%) |
| Collector–Emitter Saturation Voltage ($I_C$ = 2 mA, $I_F$ = 50 mA) | | $V_{CE(sat)}$ | — | 0.15 | 0.5 | Volts |
| Turn–On Time ($I_F$ = 10 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω)(3) | | $t_{on}$ | — | 2.8 | — | μs |
| Turn–Off Time ($I_F$ = 10 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω)(3) | | $t_{off}$ | — | 4.5 | — | μs |
| Rise Time ($I_F$ = 10 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω)(3) | | $t_r$ | — | 1.2 | — | μs |
| Fall Time ($I_F$ = 10 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω)(3) | | $t_f$ | — | 1.3 | — | μs |
| 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. For test circuit setup and waveforms, refer to Figure 11.
4. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

## TYPICAL CHARACTERISTICS

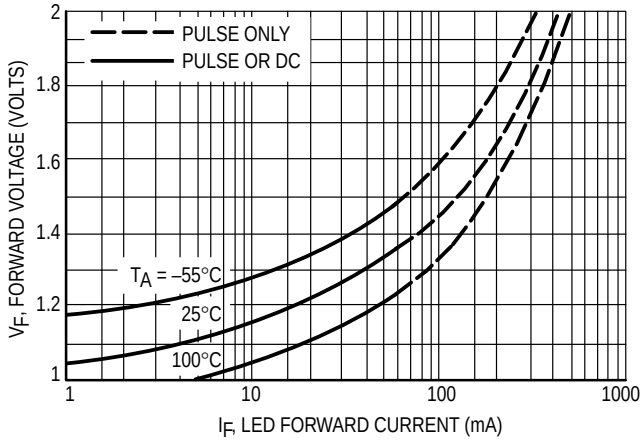



**Figure 1. LED Forward Voltage versus Forward Current**

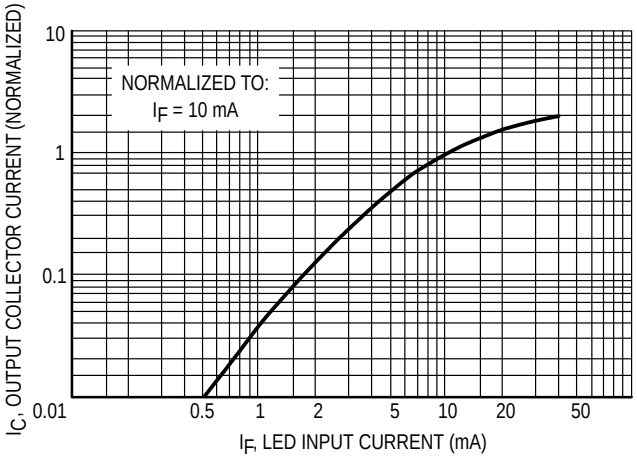



**Figure 2. Output Current versus Input Current**

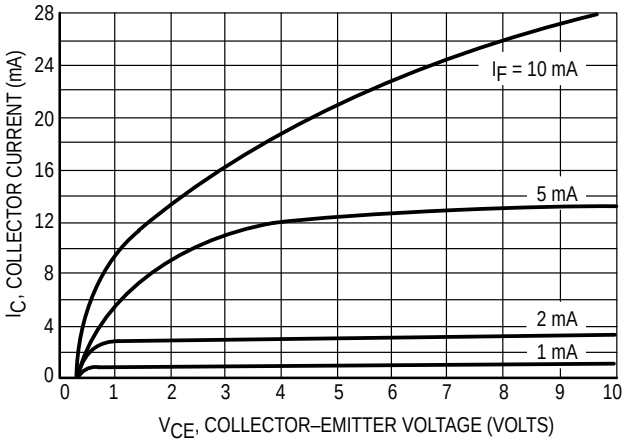



**Figure 3. Collector Current versus Collector–Emitter Voltage**

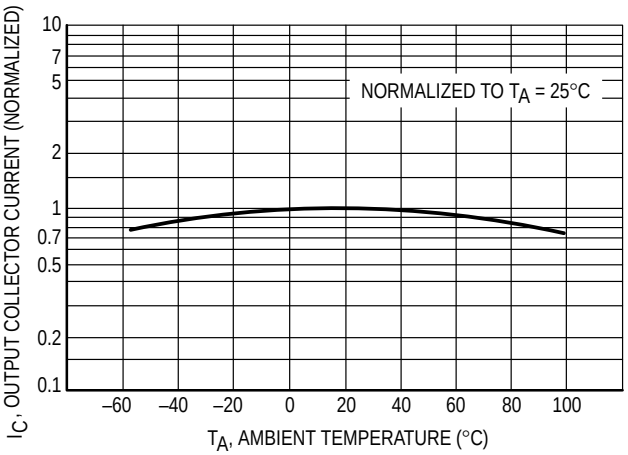



**Figure 4. Output Current versus Ambient Temperature**

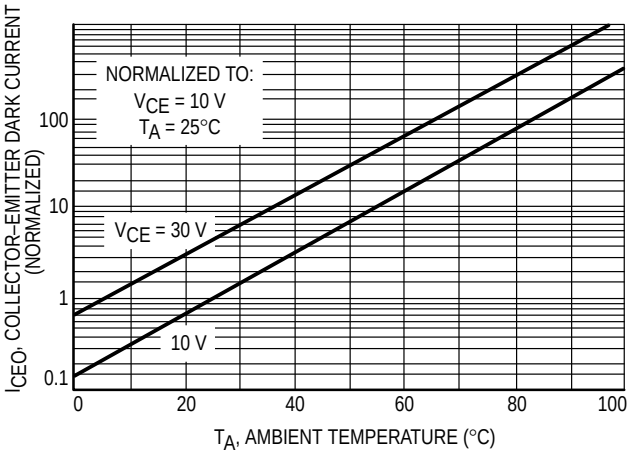



**Figure 5. Dark Current versus Ambient Temperature**

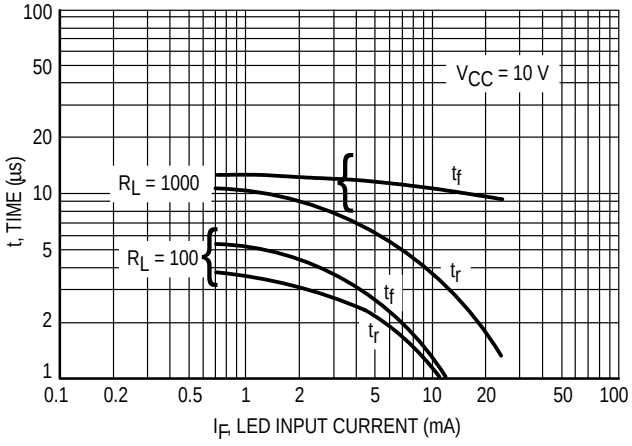



**Figure 6. Rise and Fall Times (Typical Values)**

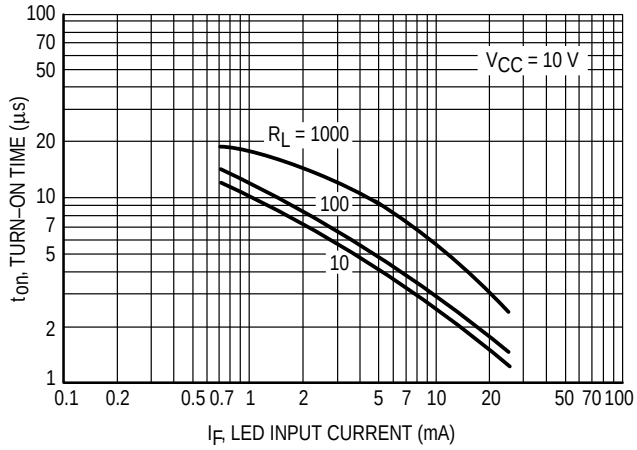



**Figure 7. Turn–On Switching Times (Typical Values)**

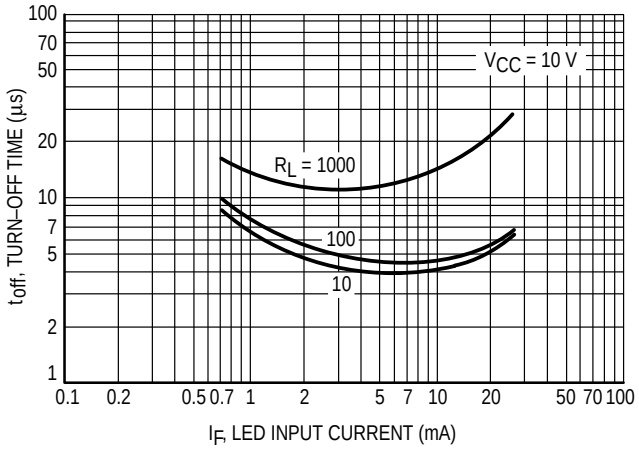



**Figure 8. Turn–Off Switching Times (Typical Values)**

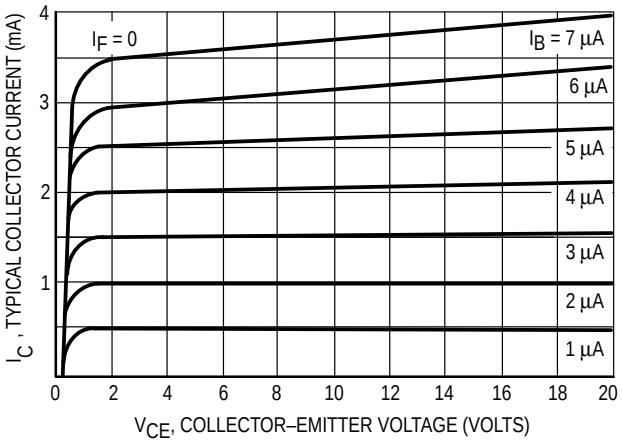



**Figure 9. DC Current Gain (Detector Only)**

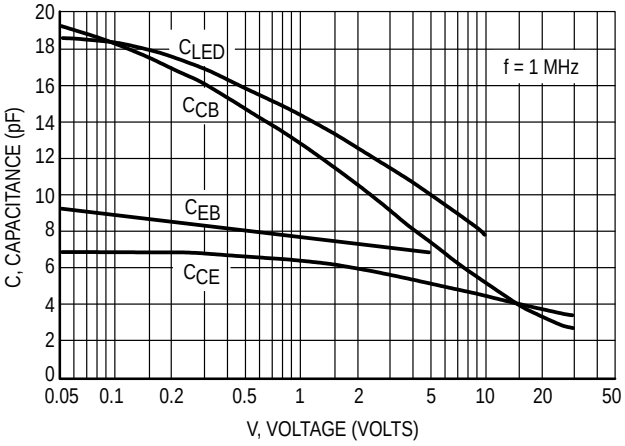



**Figure 10. Capacitances versus Voltage**

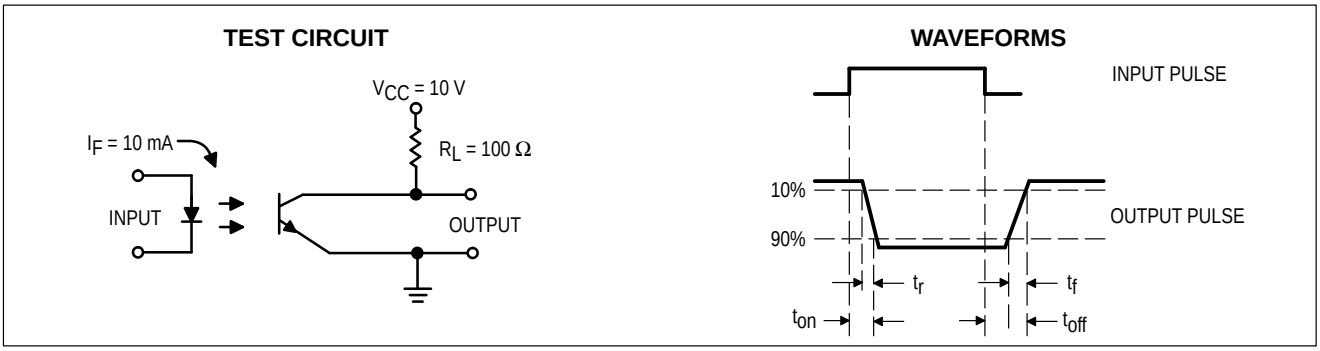
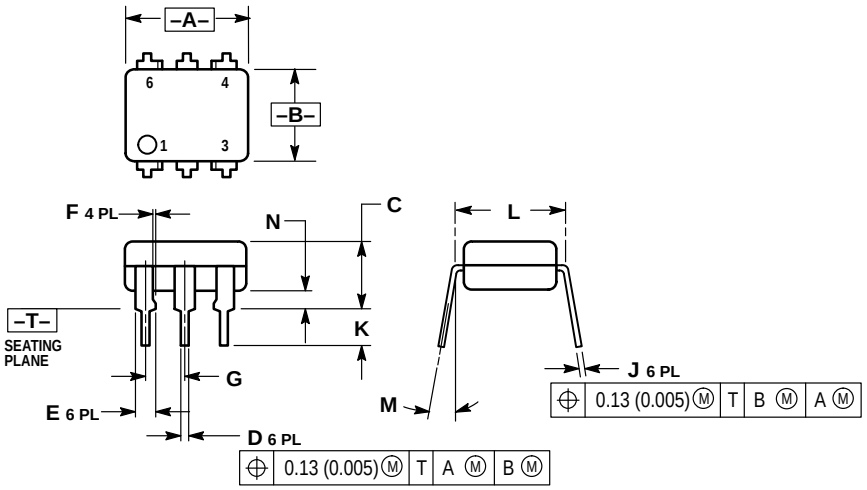



**Figure 11. Switching Time Test Circuit and Waveforms**

## PACKAGE DIMENSIONS

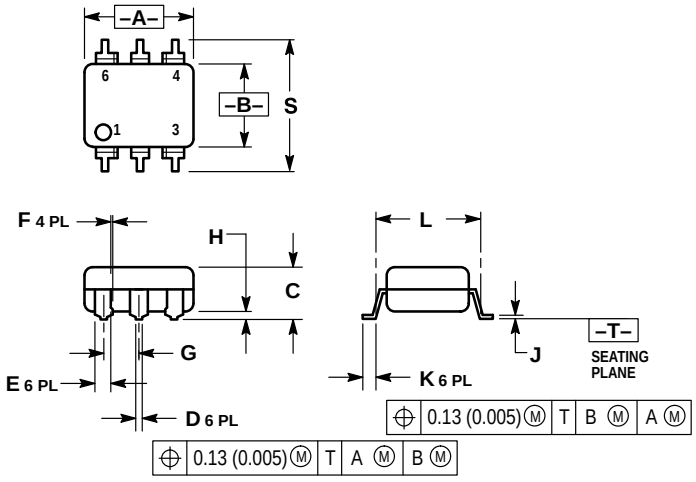



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

| | 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 1:
PIN 1. ANODE
2. CATHODE
3. NC
4. EMITTER
5. COLLECTOR
6. BASE

**CASE 730A–04**
**ISSUE G**

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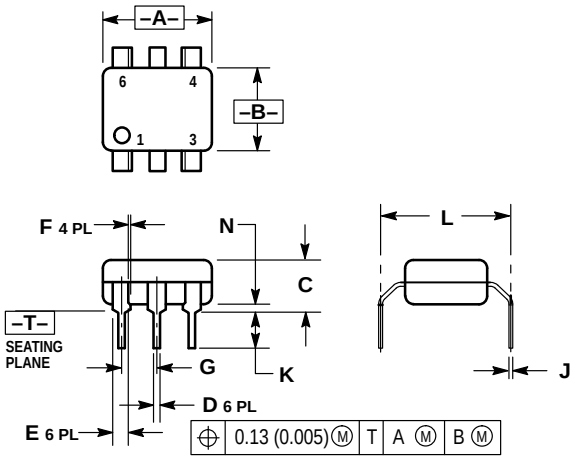
| DIM | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 0.50 |
| E | 0.040 | 0.070 | 1.02 | 1.77 |
| F | 0.010 | 0.014 | 0.25 | 0.36 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.020 | 0.025 | 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**




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

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|---|---|---|---|---|
| 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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