



6-Pin DIP Optoisolators Transistor Output

The 4N35, 4N36 and 4N37 devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Current Transfer Ratio — 100% Minimum @ Specified Conditions
- Guaranteed Switching Speeds
- 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
- Regulation Feedback Circuits
- Monitor & Detection Circuits
- Solid State Relays

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|--------|--------|-------|------|
|--------|--------|-------|------|

INPUT LED

| | | | |
|---|-------|-------------|----------------------------|
| Reverse Voltage | V_R | 6 | Volts |
| Forward Current — Continuous | I_F | 60 | mA |
| LED Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Output Detector Derate above 25°C | P_D | 120 1.41 | mW mW/ $^\circ\text{C}$ |

OUTPUT TRANSISTOR

| | | | |
|--|-----------|-------------|----------------------------|
| Collector–Emitter Voltage | V_{CEO} | 30 | Volts |
| Emitter–Base Voltage | V_{EBO} | 7 | Volts |
| Collector–Base Voltage | V_{CBO} | 70 | Volts |
| Collector Current — Continuous | I_C | 150 | mA |
| Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above 25°C | P_D | 150 1.76 | mW mW/ $^\circ\text{C}$ |

TOTAL DEVICE

| | | | |
|--|-----------|-------------|----------------------------|
| Isolation Source Voltage ⁽¹⁾ (Peak ac Voltage, 60 Hz, 1 sec Duration) | V_{ISO} | 7500 | Vac(pk) |
| Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 250 2.94 | mW mW/ $^\circ\text{C}$ |
| Ambient Operating Temperature Range ⁽²⁾ | T_A | –55 to +100 | $^\circ\text{C}$ |
| Storage Temperature Range ⁽²⁾ | T_{stg} | –55 to +150 | $^\circ\text{C}$ |
| Soldering Temperature (10 sec, 1/16" from case) | T_L | 260 | $^\circ\text{C}$ |

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.

4N35*

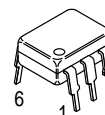
4N36

4N37

[CTR = 100% Min]

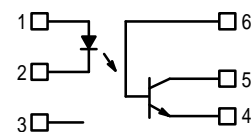
*Motorola Preferred Device

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

4N35 4N36 4N37

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)⁽¹⁾

| Characteristic | Symbol | Min | Typ ⁽¹⁾ | Max | Unit |
|---|----------------------------|------------------------------|---------------------|-------------------|---------------------|
| INPUT LED | | | | | |
| Forward Voltage ($I_F = 10\text{ mA}$) $T_A = 25^\circ\text{C}$ $T_A = -55^\circ\text{C}$ $T_A = 100^\circ\text{C}$ | V_F | 0.8 0.9 0.7 | 1.15 1.3 1.05 | 1.5 1.7 1.4 | V |
| Reverse Leakage Current ($V_R = 6\text{ V}$) | I_R | — | — | 10 | μA |
| Capacitance ($V = 0\text{ V}$, $f = 1\text{ MHz}$) | C_J | — | 18 | — | pF |
| OUTPUT TRANSISTOR | | | | | |
| Collector–Emitter Dark Current ($V_{CE} = 10\text{ V}$, $T_A = 25^\circ\text{C}$) ($V_{CE} = 30\text{ V}$, $T_A = 100^\circ\text{C}$) | I_{CEO} | — — | 1 — | 50 500 | nA μA |
| Collector–Base Dark Current ($V_{CB} = 10\text{ V}$) $T_A = 25^\circ\text{C}$ $T_A = 100^\circ\text{C}$ | I_{CBO} | — | 0.2 100 | 20 — | nA |
| Collector–Emitter Breakdown Voltage ($I_C = 1\text{ mA}$) | $V_{(BR)CEO}$ | 30 | 45 | — | V |
| Collector–Base Breakdown Voltage ($I_C = 100\text{ }\mu\text{A}$) | $V_{(BR)CBO}$ | 70 | 100 | — | V |
| Emitter–Base Breakdown Voltage ($I_E = 100\text{ }\mu\text{A}$) | $V_{(BR)EBO}$ | 7 | 7.8 | — | V |
| DC Current Gain ($I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$) | h_{FE} | — | 400 | — | — |
| Collector–Emitter Capacitance ($f = 1\text{ MHz}$, $V_{CE} = 0$) | C_{CE} | — | 7 | — | pF |
| Collector–Base Capacitance ($f = 1\text{ MHz}$, $V_{CB} = 0$) | C_{CB} | — | 19 | — | pF |
| Emitter–Base Capacitance ($f = 1\text{ MHz}$, $V_{EB} = 0$) | C_{EB} | — | 9 | — | pF |
| COUPLED | | | | | |
| Output Collector Current ($I_F = 10\text{ mA}$, $V_{CE} = 10\text{ V}$) $T_A = 25^\circ\text{C}$ $T_A = -55^\circ\text{C}$ $T_A = 100^\circ\text{C}$ | I_C (CTR) ⁽²⁾ | 10 (100) 4 (40) 4 (40) | 30 (300) — — | — — — | mA (%) |
| Collector–Emitter Saturation Voltage ($I_C = 0.5\text{ mA}$, $I_F = 10\text{ mA}$) | $V_{CE(sat)}$ | — | 0.14 | 0.3 | V |
| Turn-On Time | t_{on} | — | 7.5 | 10 | μs |
| Turn-Off Time | t_{off} | — | 5.7 | 10 | |
| Rise Time | t_r | — | 3.2 | — | |
| Fall Time | t_f | — | 4.7 | — | |
| Isolation Voltage ($f = 60\text{ Hz}$, $t = 1\text{ sec}$) | V_{ISO} | 7500 | — | — | Vac(pk) |
| Isolation Current ⁽⁴⁾ ($V_{I-O} = 3550\text{ Vpk}$) ($V_{I-O} = 2500\text{ Vpk}$) ($V_{I-O} = 1500\text{ Vpk}$) | I_{ISO} | — — — | — — 8 | 100 100 100 | μA |
| Isolation Resistance ($V = 500\text{ V}$) ⁽⁴⁾ | R_{ISO} | 10^{11} | — | — | Ω |
| Isolation Capacitance ($V = 0\text{ V}$, $f = 1\text{ MHz}$) ⁽⁴⁾ | C_{ISO} | — | 0.2 | 2 | pF |

1. Always design to the specified minimum/maximum electrical limits (where applicable).

2. Current Transfer Ratio (CTR) = $I_C/I_F \times 100\%$.

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

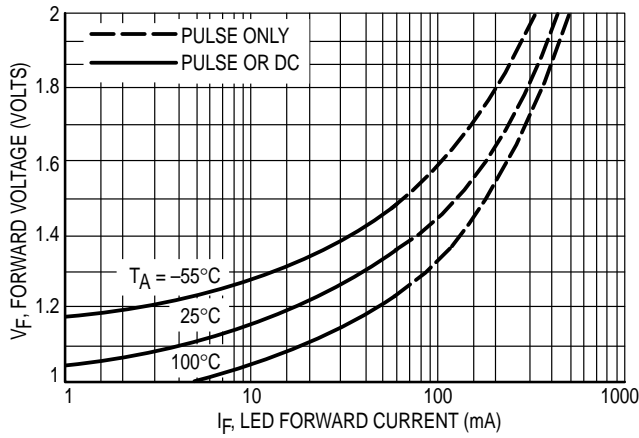


Figure 1. LED Forward Voltage versus Forward Current

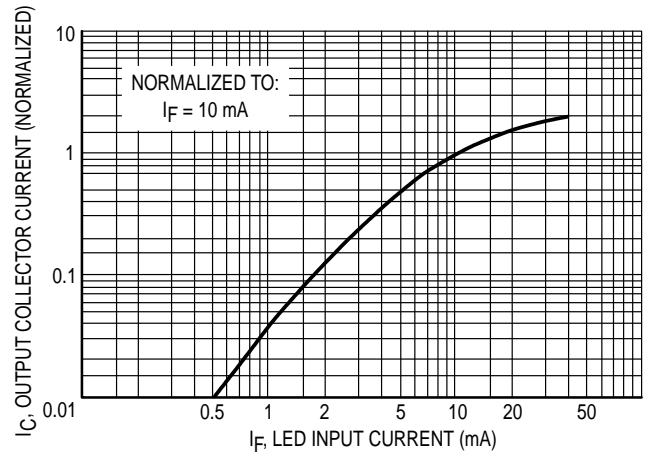


Figure 2. Output Current versus Input Current

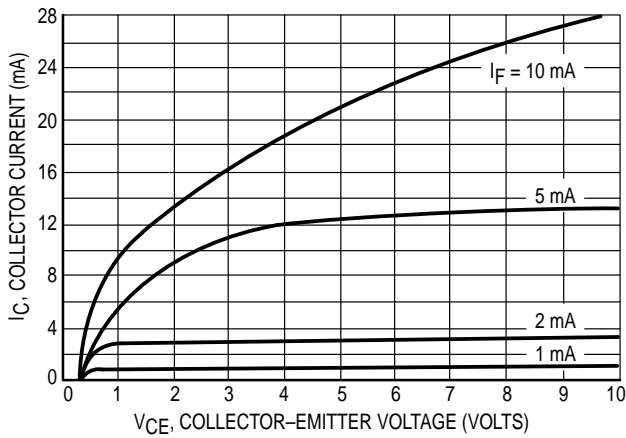


Figure 3. Collector Current versus Collector-Emitter Voltage

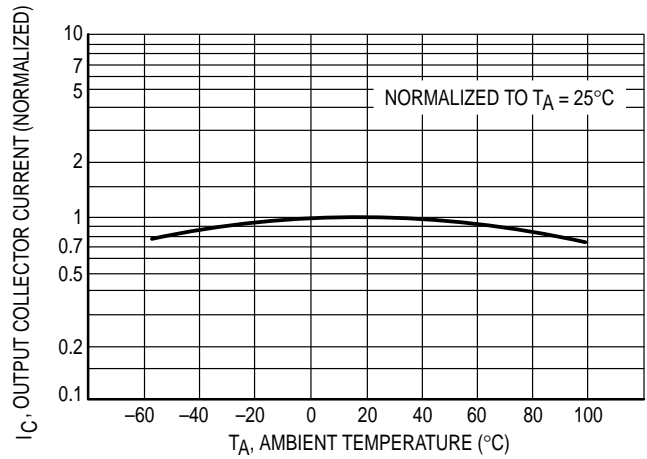


Figure 4. Output Current versus Ambient Temperature

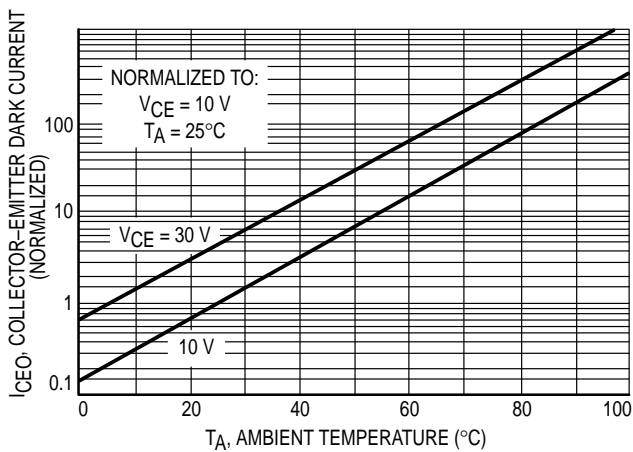


Figure 5. Dark Current versus Ambient Temperature

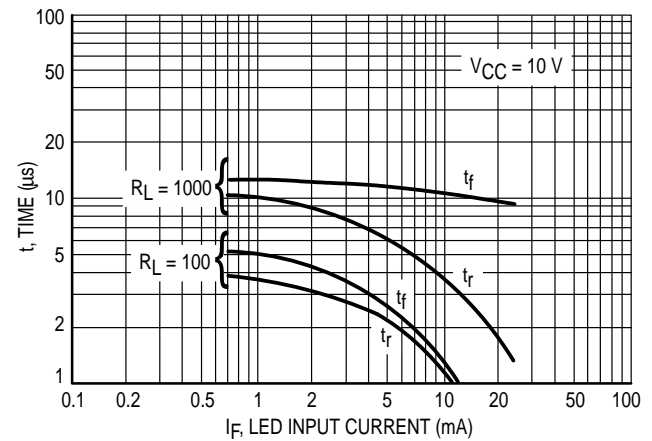


Figure 6. Rise and Fall Times (Typical Values)

4N35 4N36 4N37

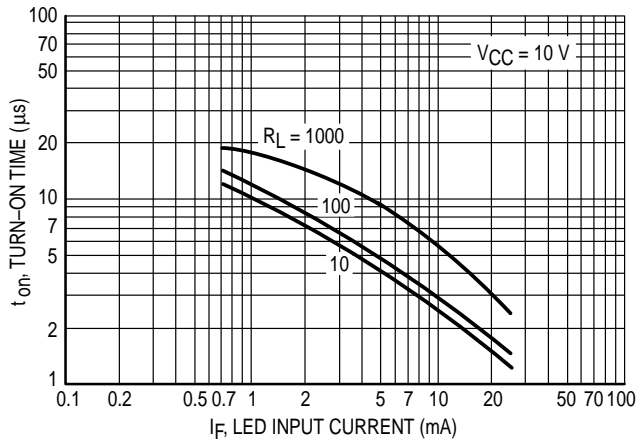


Figure 7. Turn-On Switching Times

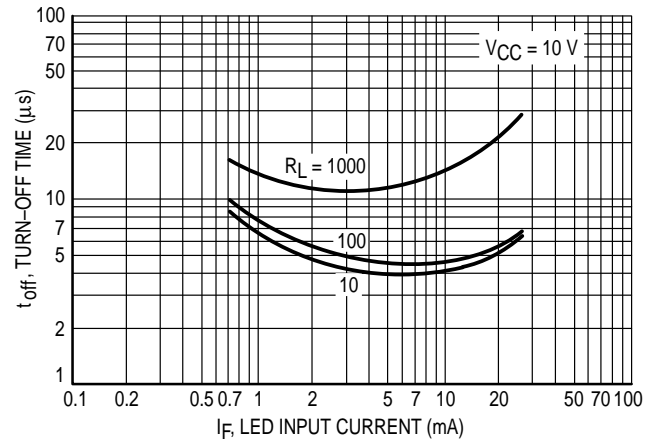


Figure 8. Turn-Off Switching Times

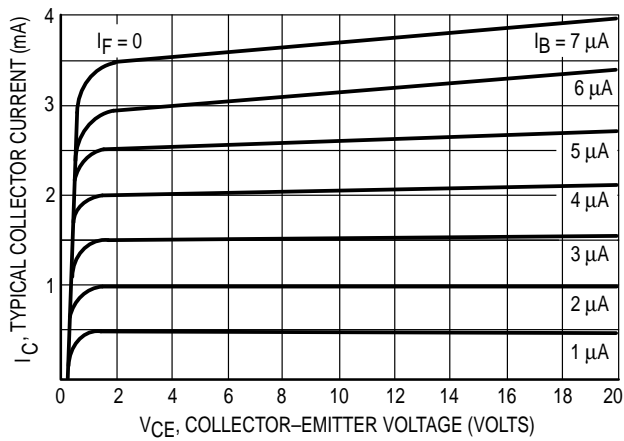


Figure 9. DC Current Gain (Detector Only)

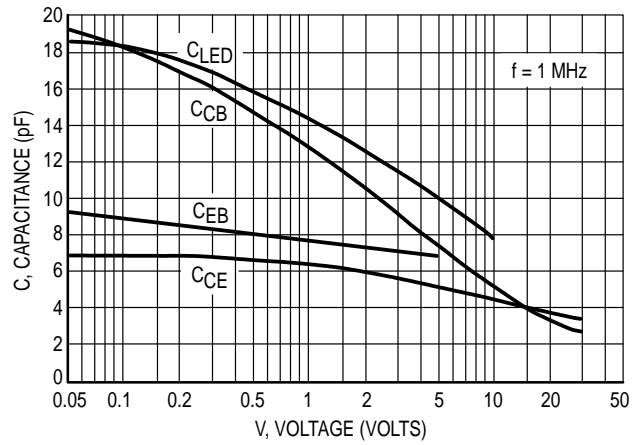


Figure 10. Capacitances versus Voltage

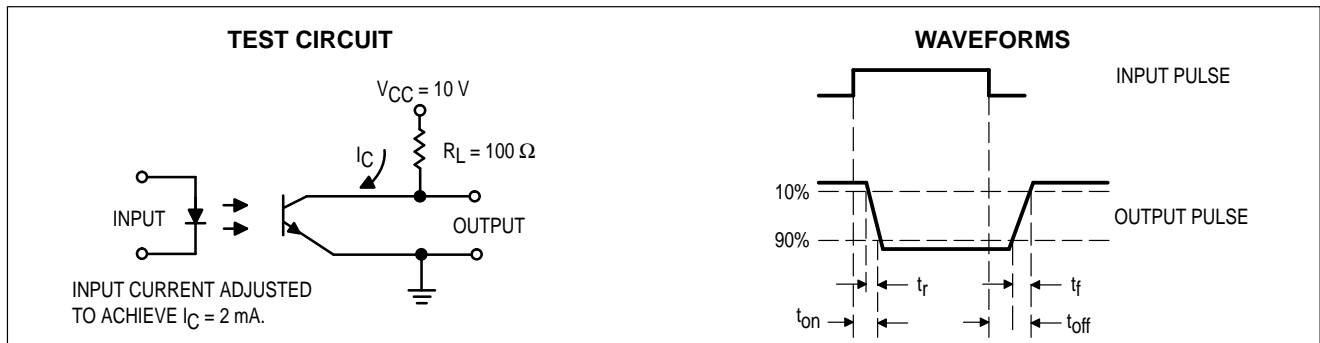
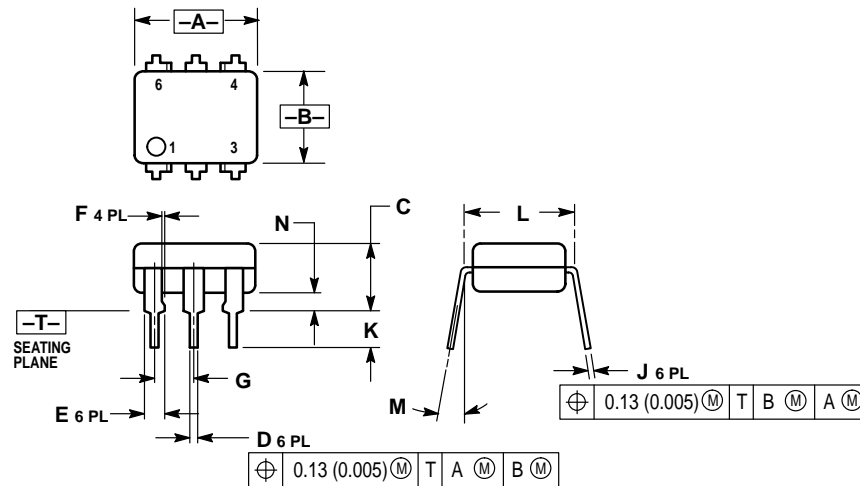


Figure 11. Switching Time Test Circuit and Waveforms

PACKAGE DIMENSIONS

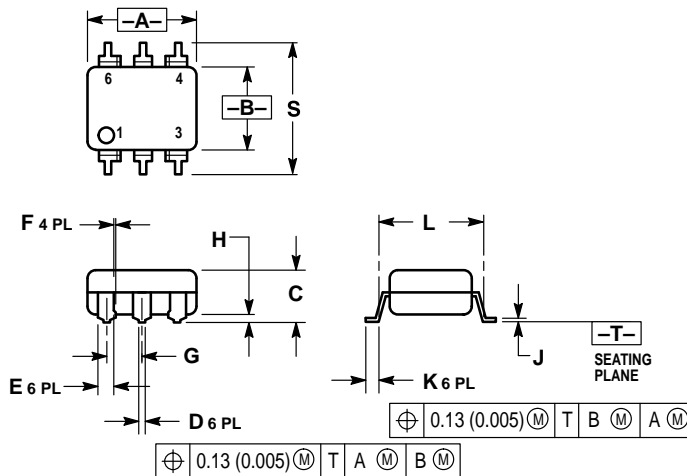


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | 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
 - CATHODE
 - NC
 - EMITTER
 - COLLECTOR
 - BASE

CASE 730A-04
ISSUE G



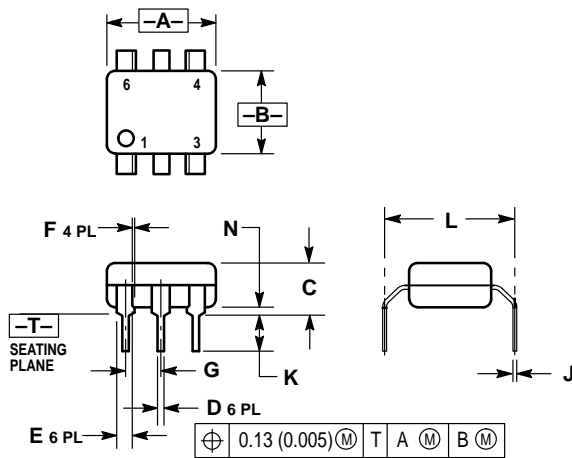
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| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 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

4N35 4N36 4N37




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

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | 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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4N35/D