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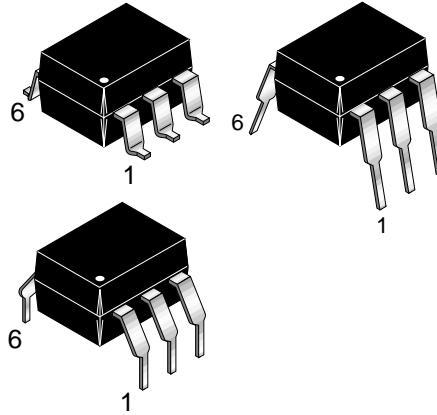
DESCRIPTION

The 4N39 and 4N40 have a gallium-arsenide infrared emitting diode optically coupled with a light activated silicon controlled rectifier in a dual in-line package.

4N39 4N40

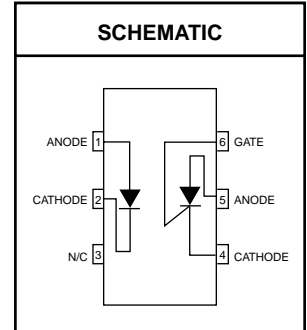
FEATURES

- 10 A, T²L compatible, solid state relay
- 25 W logic indicator lamp driver
- 400 V symmetrical transistor coupler
- Underwriters Laboratory (UL) recognized — File #E90700



APPLICATIONS

- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances.



| Parameter | Symbol | Device | Value | Units |
|---|--------------------|--------|----------------|-------|
| TOTAL DEVICE | | | | |
| *Storage Temperature | T _{STG} | All | -55 to +150 | °C |
| *Operating Temperature | T _{OPR} | All | -55 to +100 | °C |
| *Lead Solder Temperature | T _{SOL} | All | 260 for 10 sec | °C |
| *Total Device Power Dissipation (-55°C to 50 °C) Derate above 50°C | P _D | All | 450 | mW |
| | | | 9.0 | mW/°C |
| EMITTER | | | | |
| *Continuous Forward Current | I _F | All | 60 | mA |
| *Reverse Voltage | V _R | All | 6 | V |
| *Forward Current - Peak (300 μs, 2% Duty Cycle) | I _{F(pk)} | All | 1.0 | A |
| *LED Power Dissipation (-55°C to 50 °C) Derate above 50°C | P _D | All | 100 | mW |
| | | | 2.0 | mW/°C |
| DETECTOR | | | | |
| *Off-State And Reverse Voltage | | 4N39 | 200 | V |
| | | 4N40 | 400 | V |
| *Peak Reverse Gate Voltage | | | 6 | V |
| *Direct On-State Current | | | 300 | mA |
| *Surge On-State Current (100 μs) | | | 10 | A |
| *Peak Gate Current | | | 10 | mA |
| *Detector Power Dissipation (-55°C to 50°C) Derate above 50°C | P _D | All | 400 | mW |
| | | | 8.0 | mW/°C |

Note

* Indicates JEDEC Registered Data

** Typical values at T_A = 25°C

| | |
|-------------|-------------|
| 4N39 | 4N40 |
|-------------|-------------|

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter | Test Conditions | Symbol | Device | Min | Typ** | Max | Unit |
|-------------------------|--|----------|--------|-----|-------|-----|---------------|
| EMITTER | | | | | | | |
| Input Forward Voltage | $I_F = 10\text{ mA}$ | V_F | All | | 1.1 | 1.5 | V |
| Reverse Leakage Current | $V_R = 3\text{ V}$ | I_R | All | | | 10 | μA |
| Capacitance | $V_F = 0\text{ V}, f = 1.0\text{ MHz}$ | C_J | All | | 50 | | pF |
| DETECTOR | | | | | | | |
| Peak Off-State Voltage | $R_{GK} = 10\text{ k}\Omega, T_A = 100^\circ\text{C}$ | V_{DM} | 4N39 | 200 | | | V |
| | | | 4N40 | 400 | | | |
| Peak Reverse Voltage | $T_A = 100^\circ\text{C}$ | V_{RM} | 4N39 | 200 | | | V |
| | | | 4N40 | 400 | | | |
| On-State Voltage | $I_T = 300\text{ mA}$ | V_T | All | | | 1.3 | V |
| Off-State Current | $V_{DM} = 200\text{ V}, T_A = 100^\circ\text{C},$ $I_F = 0\text{ mA}, R_{GK} = 10\text{ k}\Omega$ | I_{DM} | 4N39 | | | 50 | μA |
| | | | 4N40 | | | 150 | |
| Reverse Current | $V_R = 200\text{ V}, T_A = 100^\circ\text{C}, I_F = 0\text{ mA}$ | I_R | 4N39 | | | 50 | μA |
| | | | 4N40 | | | 150 | |
| Holding Current | $V_{FX} = 50\text{ V}, R_{GK} = 27\text{ k}\Omega$ | I_H | All | | | 1.0 | mA |

TRANSFER CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

| Characteristics | Test Conditions | Symbol | Device | Min | Typ** | Max | Units |
|---|---|-----------|--------|-----|-------|-----|------------------|
| *Input Current to Trigger | $V_{AK} = 50\text{ V}, R_{GK} = 10\text{ k}\Omega$ | I_{FT} | 4N39 | | | 30 | mA |
| | $V_{AK} = 100\text{ V}, R_{GK} = 27\text{ k}\Omega$ | | 4N40 | | | 14 | |
| *Turn-On Time | $V_{AK} = 50\text{ V}, I_F = 30\text{ mA}$ $R_{GK} = 10\text{ k}\Omega, R_L = 200\ \Omega$ | t_{on} | ALL | | | 50 | μA |
| Package Capacitance (input to output) | $f = 1\text{ MHz}$ Input to Output Voltage = 0 | C_{I-O} | ALL | | | 2 | pF |
| Coupled dv/dt, input to output (figure 13) | | dV/dt | ALL | 500 | | | V/ μS |

ISOLATION CHARACTERISTICS

| Characteristic | Test Conditions | Symbol | Min | Typ** | Max | Units |
|---------------------------------|---|-----------|-----------|-------|-----|----------|
| *Input-Output Isolation Voltage | ($I_{I-O} \leq 1\ \mu\text{A}, V_{rms}, t = 1\text{ min.}$) | V_{ISO} | 5300 | | | Vac(rms) |
| *Isolation Resistance | ($V_{I-O} = 500\text{ VDC}$) | R_{ISO} | 10^{11} | | | Ω |
| Isolation Capacitance | ($V_{I-O} = \emptyset, f = 1\text{ MHz}$) | C_{ISO} | | 0.8 | | pf |

Note

* Indicates JEDEC Registered Data

 ** Typical values at $T_A = 25^\circ\text{C}$

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Figure 1. Input Current To Trigger vs. Anode-Cathode Voltage

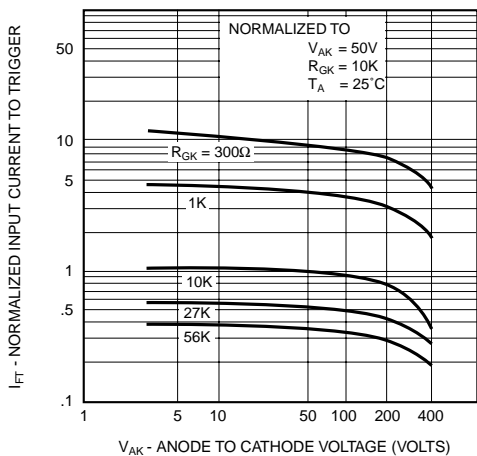


Figure 2. Input Current To Trigger vs. Temperature

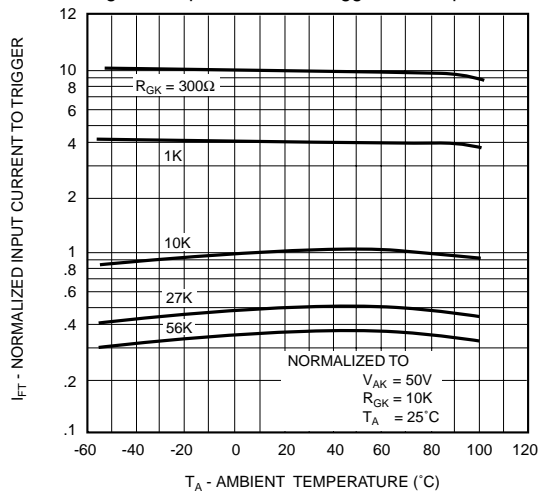


Figure 3. Input Current To Trigger Distribution vs. Temperature

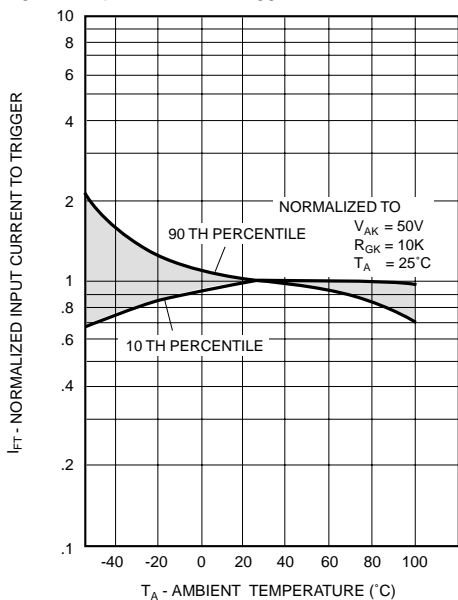


Figure 4. Input Current To Trigger vs. Pluse Width

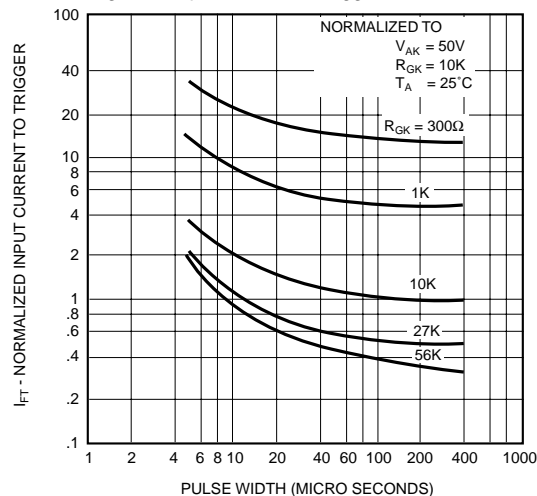


Figure 5. Turn-On Time vs. Input Current

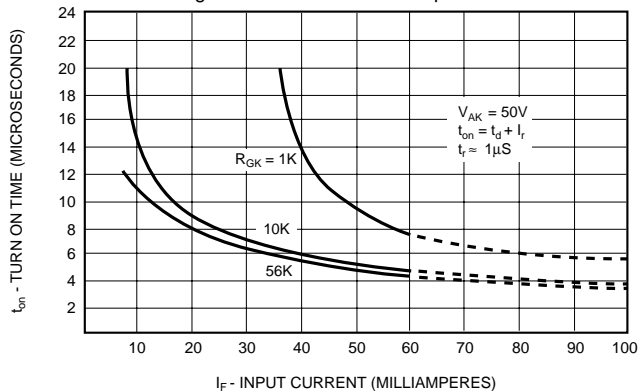
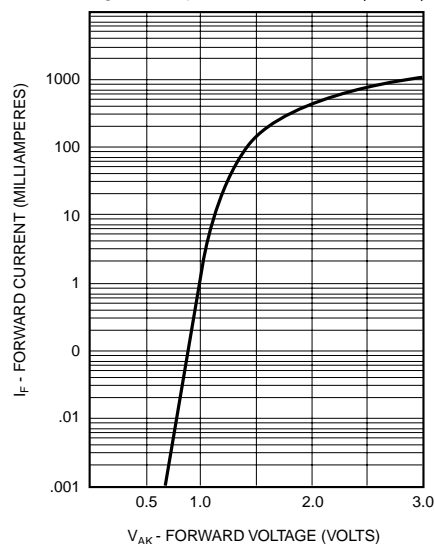


Figure 6. Input Characteristics I_F vs. V_F



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Figure 7. Holding Current vs. Temperature

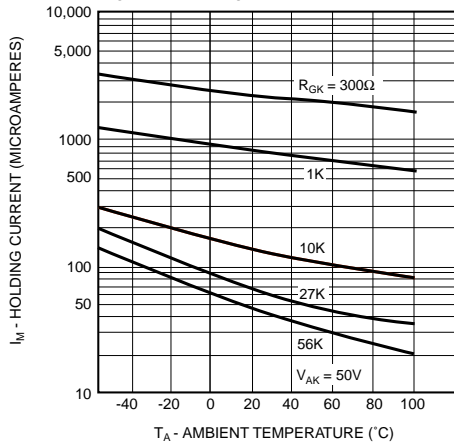


Figure 8. Maximum Transient Thermal Impedance

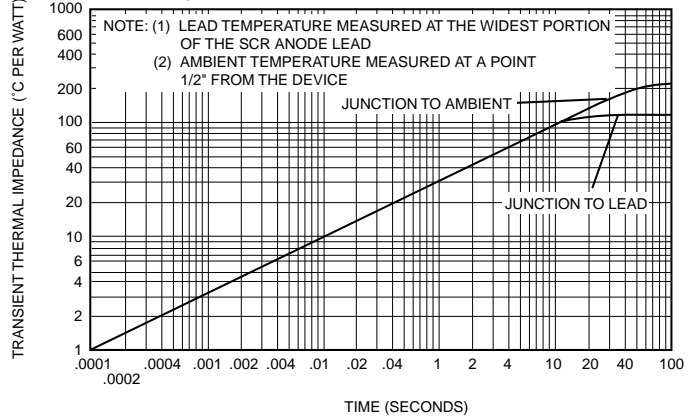


Figure 9. Off-State Forward Current vs. Temperature

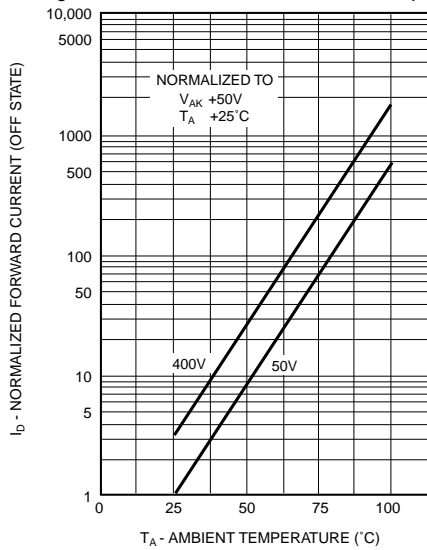


Figure 10. On-State Current vs. Maximum Allowable Temperature

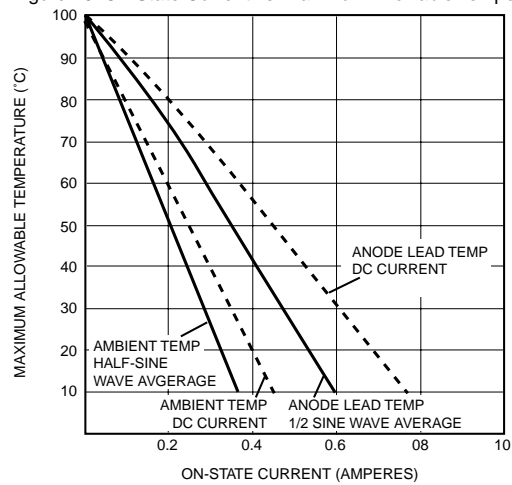


Figure 11. dv/dt vs. Temperature

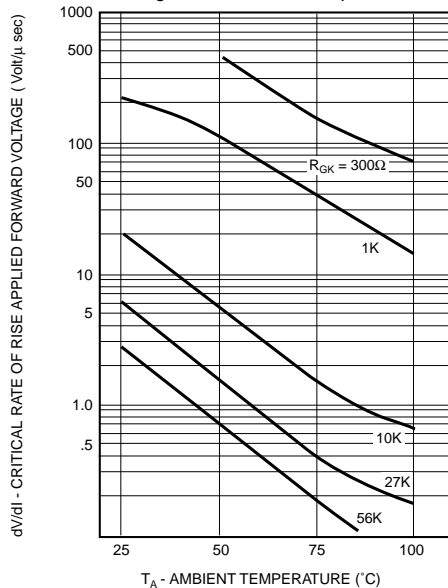
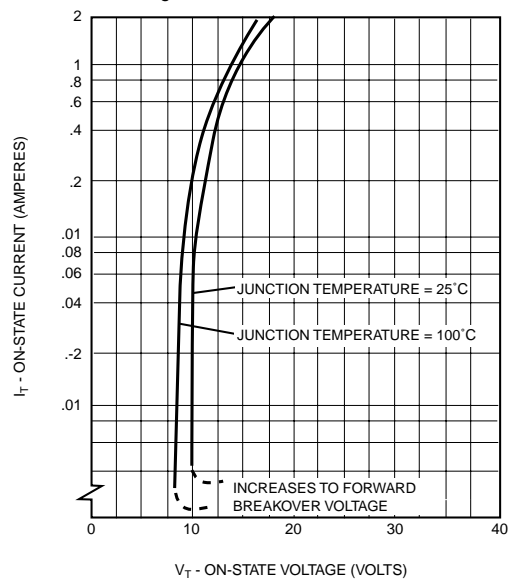


Figure 12. On-State Characteristics



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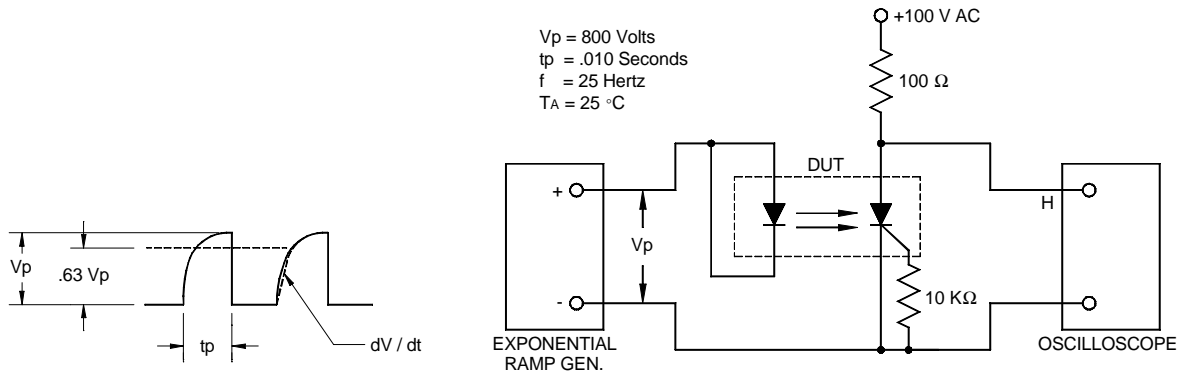
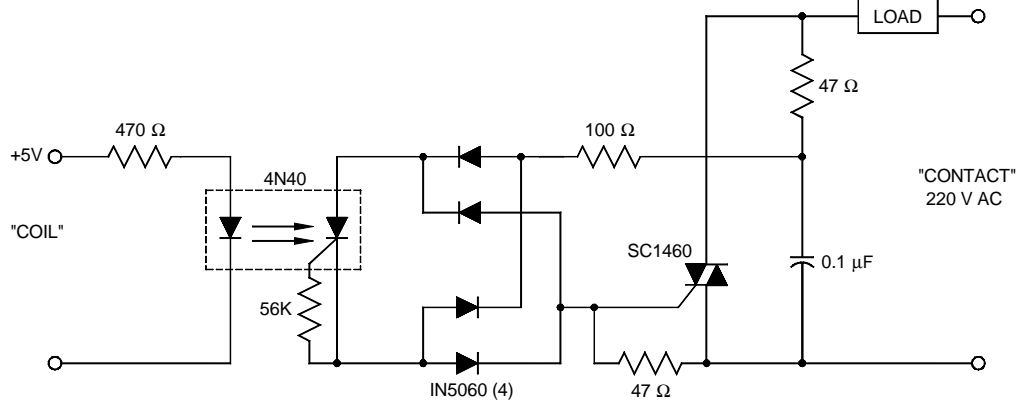


Fig. 13 Coupled dv/dt - Test Circuit

TYPICAL APPLICATIONS

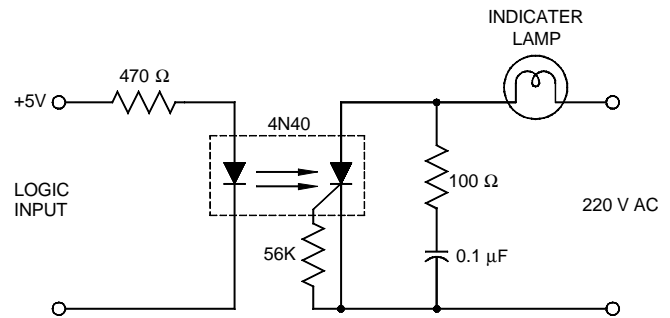
10A, T²L COMPATIBLE, SOLID STATE RELAY

Use of the 4N40 for high sensitivity, 5300 V isolation capability, provides this highly reliable solid state relay design. This design is compatible with 74, 74S and 74H series T²L logic systems inputs and 220V AC loads up to 10A.



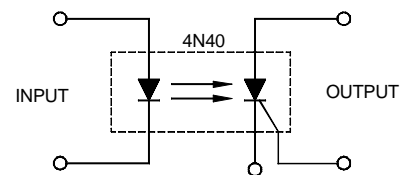
25W, LOGIC INDICATOR LAMP DRIVER

The high surge capability and non-reactive input characteristics of the 4N40 allow it to directly couple, without buffers, T²L and DTL logic to indicator alarm devices, without danger of introducing noise and logic glitches.



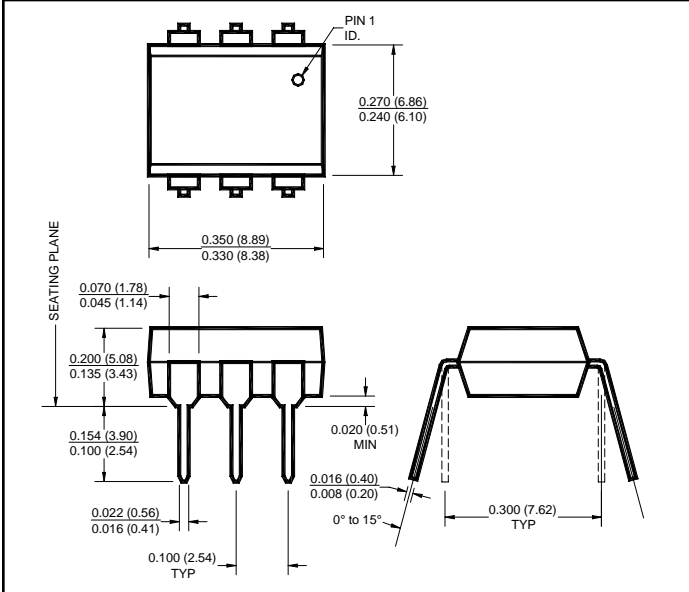
400V SYMMETRICAL TRANSISTOR COUPLER

Use of the high voltage PNP portion of the 4N40 provides a 400V transistor capable of conducting positive and negative signals with current transfer ratios of over 1%. This function is useful in remote instrumentation, high voltage power supplies and test equipment. Care should be taken not to exceed the 40mW power dissipation rating when used at high voltages.

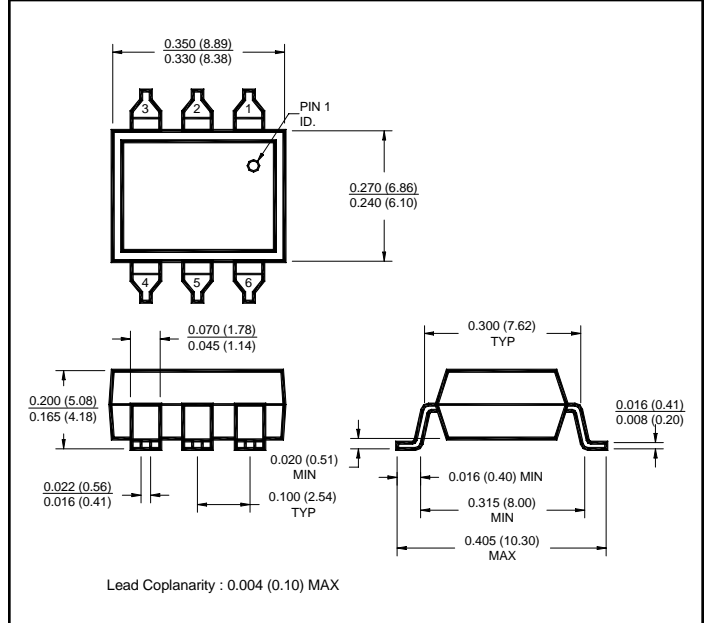


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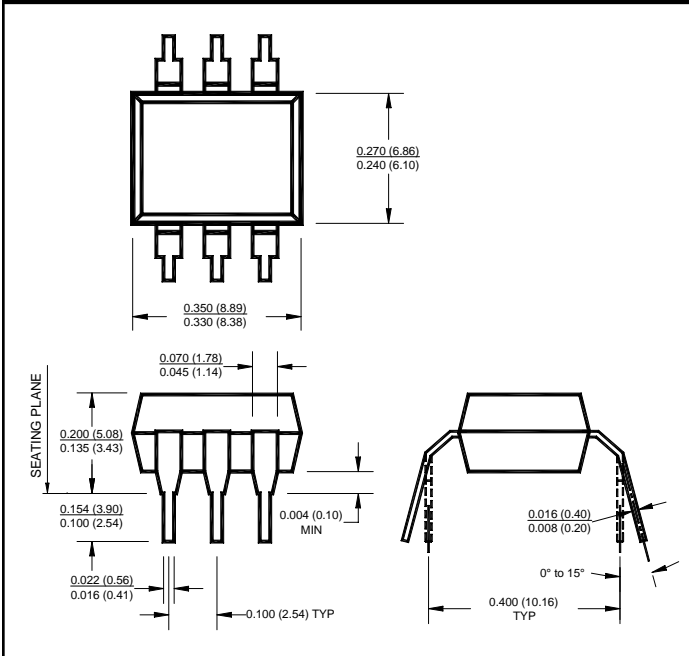
Package Dimensions (Through Hole)



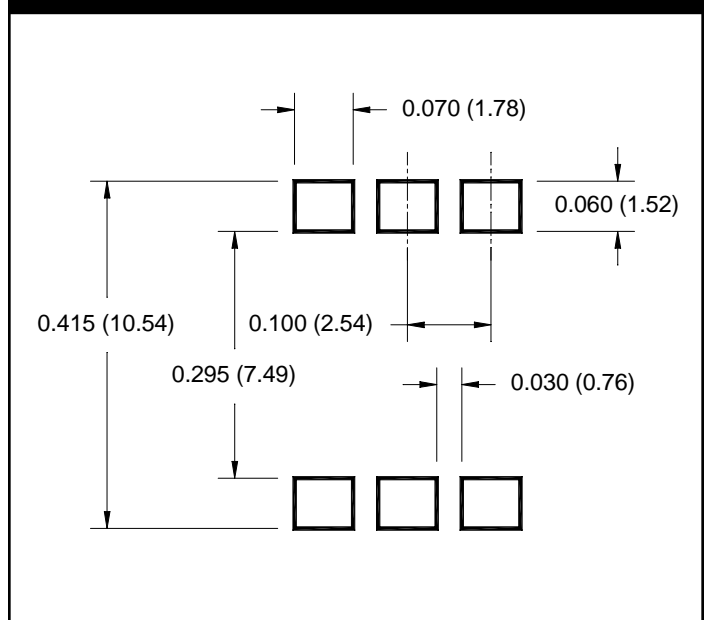
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

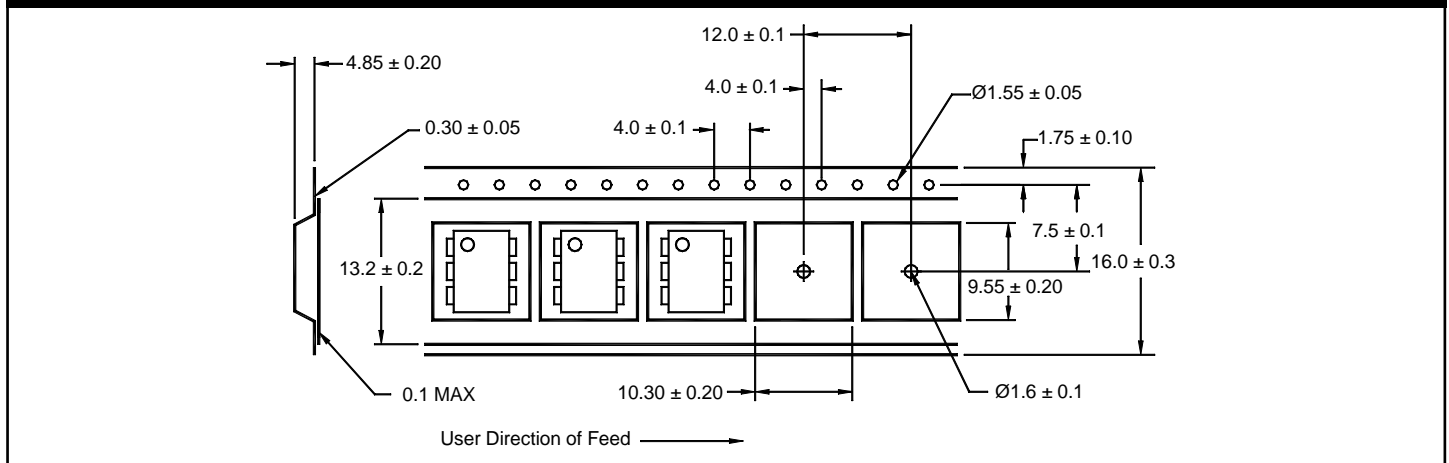
All dimensions are in inches (millimeters)

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ORDERING INFORMATION

| Option | Order Entry Identifier | Description |
|--------|------------------------|--------------------------------------|
| S | .S | Surface Mount Lead Bend |
| SD | .SD | Surface Mount; Tape and reel |
| W | .W | 0.4" Lead Spacing |
| 300 | .300 | VDE 0884 |
| 300W | .300W | VDE 0884, 0.4" Lead Spacing |
| 3S | .3S | VDE 0884, Surface Mount |
| 3SD | .3SD | VDE 0884, Surface Mount, Tape & Reel |

Carrier Tape Specifications ("D" Taping Orientation)



NOTE

All dimensions are millimeters

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