

POWER MOSFET PHOTOVOLTAIC RELAYS FOR 28V DC AIRCRAFT APPLICATIONS

| | | | |
|--------------------|-------------------------|-------------------------|--------------------|
| SPST/NO DIH-133 | DUAL SPST/NO DIH-134 | DUAL SPST/NC DIH-135 | SPST/NO DIH-139 |
|--------------------|-------------------------|-------------------------|--------------------|

DIONICS

FEATURES

- Low Logic Level Input Compatibility
- Low On Resistance
- Optically Isolated to 400V DC
- Current Limiting
- Thermal Protection With Hysteresis
- Fast Switching Speed
- Meet 28V DC System Surge and Spike Requirements of MIL-STD-704
- Designed to Meet Requirements of MIL-R-28750
- Space Efficient Hermetic Packages

APPLICATIONS

- 28 V DC Aircraft Power Control & Distribution
- High Side DC Power Switching
- Load Control From Microprocessor I/O Ports
- Programmable Controllers

DESCRIPTION

The DIH-133, 134, 135 and 139 are State of the Art solid state relays designed for 28V dc aircraft power applications where speed, efficiency, current overload protection and immunity to transient voltages are critical.

DIH-133, 134 and 139 are normally opened relays capable of continuous currents of 1.0, 0.35 (dual) and 19.0 amps, respectively. DIH-135 is a dual normally closed relay, each channel capable of 0.3A.

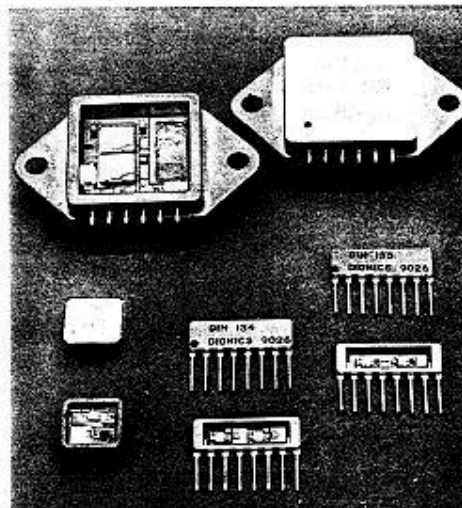
All four relays feature MOSFET outputs that are optically isolated from the input using DIONICS-manufactured photovoltaic integrated circuits. They have light emitting diode inputs that control the state of the output power MOSFETS.

DIH-133 and 134 contain current limiting networks and thermally sensitive integrated circuits that disable the outputs, if the output MOSFETS approach an unsafe operating temperature.

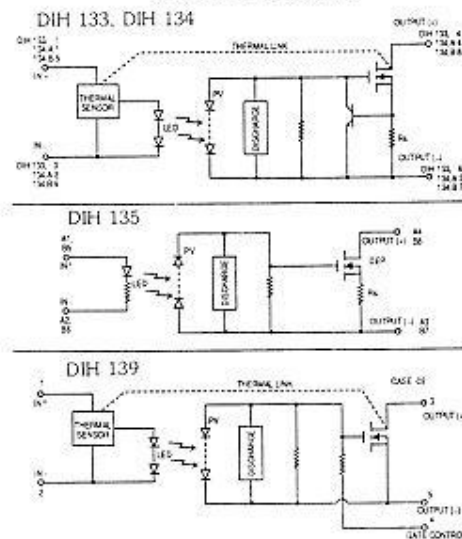
Because the thermally sensitive integrated circuits have built-in hysteresis, the output MOSFETS are automatically restarted when a safe temperature is reached. This auto restart feature eliminates the need for system restart signals. If the overload condition continues to exist, the cycle is repeated; if the overload condition is removed, the relay returns to normal operation.

DIH-139 also contains the thermally sensitive integrated circuit, but allows for current limiting by providing access to the gate terminal of the output power MOSFET.

The four solid state relays are manufactured in hermetically sealed packages, as shown. They may be screened to military specifications, as required.



EQUIVALENT CIRCUIT

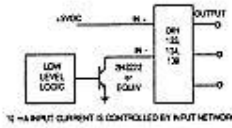


ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ Unless Otherwise Specified)

INPUT (CONTROL) CHARACTERISTICS DIH133, DIH134, DIH139 (NO)

| | MIN | TYP | MAX | UNITS |
|---|-----|---------|-----|----------|
| Input Current (Normal Operation) @ 5V (Thermal Shutdown Condition) | | 12 4 | | mA mA |
| Control Voltage Range | 4.5 | 5.0 | 5.5 | VDC |
| Turn OFF Voltage (Max. for Guaranteed OFF) | | | 1.5 | VDC |
| Turn ON Voltage (Min. for Guaranteed ON) | 3.5 | | | VDC |

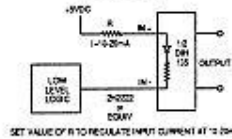
TYPICAL INPUT CIRCUIT (DIH-133, 134, 139)



INPUT (CONTROL) CHARACTERISTICS DIH135 (NC)

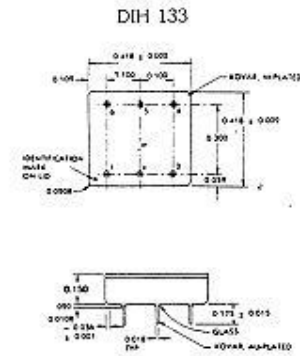
| | MIN | TYP | MAX | UNITS |
|---|-----|-------------|------------|--------|
| Input Current @ 5V | 5 | 25 | 40 | mA |
| Turn ON Voltage (Max. for Guaranteed ON) | 1.2 | | | V |
| Turn OFF Voltage (Min. for Guaranteed OFF @ 10mA) (Min. for Guaranteed OFF @ 25mA) | | 2.5 3.00 | 3.0 4.0 | V V |
| Reverse Voltage | 10 | | | V |

TYPICAL INPUT CIRCUIT (DIH-135)

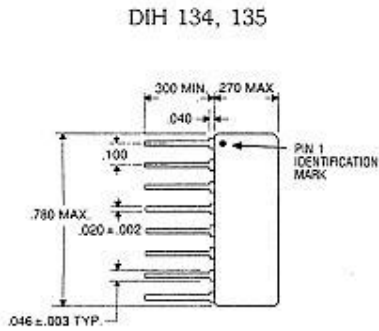


| OUTPUT CHARACTERISTICS | DIH-133 | DIH-134 | DIH-135 | DIH-139 | UNITS |
|---|-------------|---------|---------|---------|--------------------|
| | per channel | | | | |
| Max Load Current (Continuous $T_A = 25^\circ\text{C}$) | 1 | 0.350 | 0.300 | 19 | A |
| (Continuous $T_A = 75^\circ\text{C}$) | 0.60 | 0.250 | 0.250 | 12 | A |
| (20ms pulse, 1% duty cycle, $T_A = 25^\circ\text{C}$) | 2.5 | 0.5 | 0.5 | 40 | |
| Max Blocking Voltage (Non Shorted Output) | 80 | 60 | 80 | 200 | V |
| Max Operating Voltage (Shorted Output) | 30.3 | 30.3 | — | — | V |
| Max Operating Voltage (Shorted Output Limited to 5A) | | | | 120 | V |
| Max ON State Resistance ($T_A = 25^\circ\text{C}$, 100mA Load Current) | 0.80 | 3 | 5 | | Ω |
| ($T_A = 75^\circ\text{C}$, 100mA Load Current) | 1.0 | 4 | 7 | | Ω |
| ($T_C = 25^\circ\text{C}$, 5A Load Current) | | | | 0.10 | Ω |
| ($T_C = 75^\circ\text{C}$, 5A Load Current) | | | | 0.12 | Ω |
| Max OFF State Leakage @ 80% Max Blocking | 100 | 100 | 100 | 100 | μA |
| Max Output Capacitance @ 28VDC | 160 | 120 | 120 | 2400 | Pf |
| Max Turn ON Time @ $T_A = 25^\circ\text{C}$ | 0.70 | 0.50 | 0.50 | 5.0 | msec |
| Max Turn ON Time @ $T_A = 75^\circ\text{C}$ | 1.0 | 0.75 | 0.75 | 7.0 | msec |
| Max Turn OFF Time @ $T_A = 25^\circ\text{C}$ | 50 | 50 | 50 | 150 | μsec |
| Max Turn OFF Time @ $T_A = 75^\circ\text{C}$ | 40 | 40 | 40 | 120 | μsec |
| Min Transient Protection | 100 | 100 | 100 | 100 | V/ μsec |
| Min Input/Output Isolation | 500 | 500 | 500 | 500 | VDC |
| Min Input/Output Resistance | 10^6 | 10^6 | 10^6 | 10^6 | Ω |
| Typical Input/Output Capacitance | 10 | 10 | 10 | 10 | Pf |
| Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$ | 1 | 0.40 | 0.40 | 50 | W |

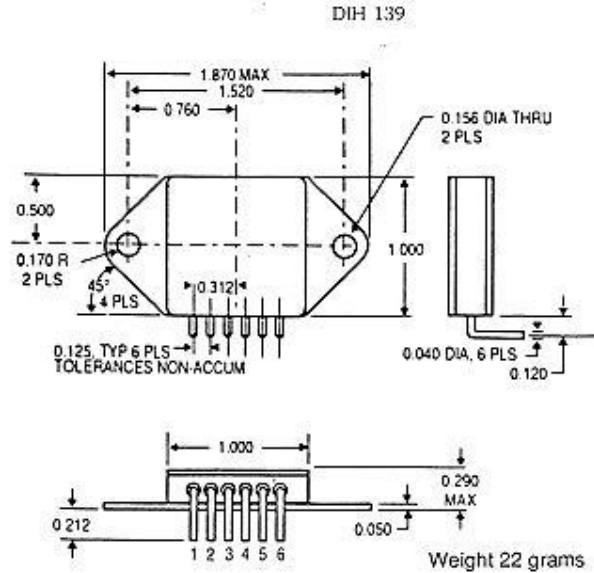
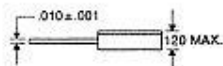
PACKAGE DRAWINGS



Weight 1.5 grams



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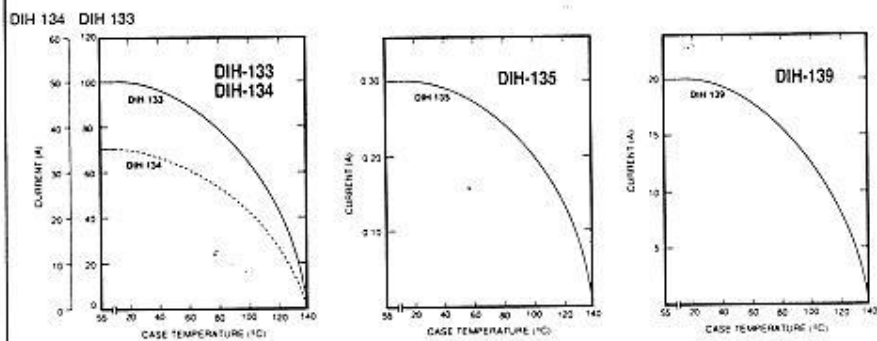


THERMAL CHARACTERISTICS DIH133, DIH134, DIH139

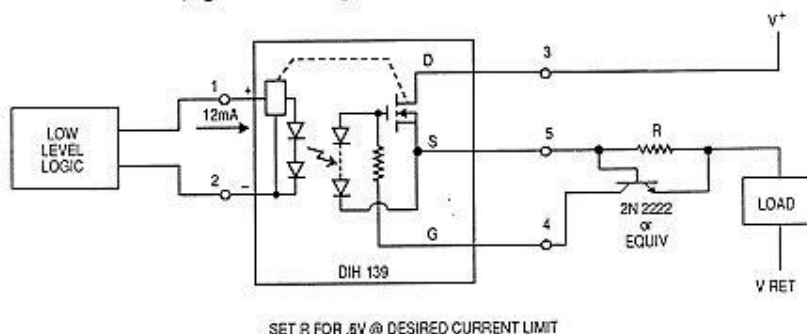
| | MIN | TYP | MAX | UNITS |
|---------------------------------------|-----|-----|-----|-------|
| Operating Temp (Ambient) | -55 | | +75 | °C |
| (Case) | -55 | | +90 | °C |
| Junction Temp (Operate) | -55 | | +95 | °C |
| Thermal-Tipping Temperature, Junction | | 130 | | °C |
| -Recovery Temperature, Junction | | 100 | | °C |
| Thermal Hysteresis | | 30 | | °C |
| Thermal Resistance | | | | |
| Θ _{JA} DIH-133 | | 100 | | °C/W |
| Θ _{JA} DIH-134 | | 200 | | °C/W |
| Θ _{JA} DIH-135 | | 200 | | °C/W |
| Θ _{JA} DIH-139 | | 2 | | °C/W |

ENVIRONMENTAL RATINGS

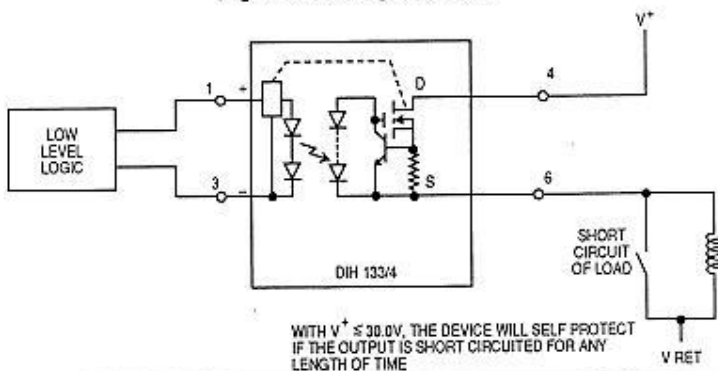
| | |
|---------------------|--|
| Storage Temperature | -55 to +125 °C (mil) |
| Shock | 50G, MIL 202 (mil) |
| Hermeticity | Fine Leak 5 × 10 ⁻⁸ atm cc/sec (mil) Gross Leak 10 ⁻⁵ atm cc/sec (comm) |
| Vibration | 20G, 10 to 2000 Hz (mil) |




TYPICAL APPLICATION OF DIH 139 (High Side Switching of DC Load With Current Limiting)



TYPICAL APPLICATION OF DIH 133 or DIH 134 (High Side Switching of DC Load)



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