| 53274 | Solid State Relay<br>SPST, 90VDC – 10A | Mii<br>MICROPAC<br>MICROCIRCUITS PRODUCTS DIVISION |
|---|---|---|

| Features: | Applications: |
|---|---|
| • Hermetically Sealed in Surface Mount Package<br>• Low On-resistance<br>• 10A Continuous Output Current<br>• Performance over -55°C to +125°C<br>• Optically Coupled<br>• Input/Output Isolation Tested to 1000 VDC<br>• Shock and Vibration Resistant | • Military/High Reliability Systems<br>• Power Distribution/Switching<br>• Solenoid Driver<br>• Stepper Motor Driver<br>• Heater Switching |

## DESCRIPTION

The 53274 is a Power MOSFET Optocoupler designed for military applications. This light-weight device is resistant to damage from severe shock and vibration, and is immune to contact related problems inherent in electro-mechanical relays. The device is enclosed in a hermetic metal package to ensure reliability in harsh environments. Effective isolation of 1000 VDC between control and load circuits is achieved through the use of optical coupling.

Functionally, the device operates as a single-pole single-throw, normally open (1 Form A) DC solid-state relay. The SSR is actuated by an input current of 5 to 15 mA, which can be supplied from standard logic types such as open-collector TTL. Output is provided by a power MOSFET exhibiting very low $R_{DS(ON)}$ and capable of carrying a continuous current of 10 amperes. The basic data sheet part is environmentally screened to H level in accordance with Table C-IX of MIL-PRF-38534.

## ABSOLUTE MAXIMUM RATINGS

| | |
|---|---|
| Output Voltage | 90 VDC |
| Continuous Output current | 10 A |
| Peak Output Current (1) | 22 A |
| Storage Temperature Range | -65ºC to +150ºC |
| Operating Junction Temperature | -55ºC to +150ºC |
| Lead Solder Temperature for 10 seconds | 300ºC |
| Continuous Input Current | 20 mA |
| Peak Input Current (2) | 100 mA |
| Reverse Input Voltage | 6 VDC |
| Power Dissipation (3) | 25 W |
| Linear Derating Factor | 0.2 W/°C |

**WEIGHT:** ..... 4.2 grams (typical)

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**RECOMMENDED OPERATING CONDITIONS:**

| Parameter | Symbol | Min. | Max. | Units |
|---|---|---|---|---|
| Output Voltage | $V_{O\ (OFF)}$ | | 90 | VDC |
| Continuous Output Current | $I_{O\ (ON)}$ | | 10 | A |
| Input Current (on) | $I_{F\ (ON)}$ | 5 | 20 | mA |
| Input Voltage (off) | $V_{F\ (OFF)}$ | 0 | 1 | VDC |
| Operating Case Temperature | $T_C$ | -55 | 125 | °C |

**ELECTRICAL SPECIFICATIONS (Pre-Irradiation)**
$T_C$= -55°C to +125°C unless otherwise specified

| Parameter | Sym. | Min. | Typ.* | Max. | Units | Test Conditions | Notes |
|---|---|---|---|---|---|---|---|
| Output On-Resistance | $R_{(ON)}$ | — | 0.055 | 0.100 | Ω | $I_F$ = 15 mA<br>$I_O$ = 10 A<br>Pulse width = 15 ms<br>Duty cycle ≤ 1% | |
| Output Leakage Current | $I_{O\ (OFF)}$ | — | <1 | 250 | µA | $V_F$ = 1 VDC<br>$V_O$ = 90 VDC | |
| Input Forward Voltage | $V_F$ | 2.45 | 3.75 | 4.50 | VDC | $I_F$ = 10 mA | |
| Input Reverse Breakdown Voltage | $V_R$ | 6 | 40 | — | VDC | $I_R$ = 10 µA | |
| Input-Output Leakage | $I_{I-O}$ | — | — | 1 | µA | RH ≤ 45%, t = 5 s<br>$V_{I-O}$ = 1000 VDC<br>$T_C$ = 25°C | 4, 5 |
| Turn-On Time | $t_{ON}$ | — | 3.3 | 8.0 | ms | $I_F$ = 15 mA<br>$I_O$ = 10 A<br>Pulse width = 15 ms<br>Duty cycle ≤ 1% | Figures 3, 4 |
| Turn-Off time | $t_{OFF}$ | — | 0.35 | 2 | ms | | Figures 3, 5 |
| Rise Time | $t_R$ | — | 2.5 | 6.0 | ms | | 6, Figure 3 |
| Fall Time | $t_F$ | — | 0.19 | 1.0 | ms | | |
| Thermal Resistance (junction-case) | $\theta_{JC}$ | — | 4 | — | °C/W | | |
| Output Off-Capacitance | $C_{O\ (OFF)}$ | — | 1.7 | — | nF | $V_O$ = 28 VDC<br>f = 1 MHz | |
| Input Capacitance | $C_{IN}$ | — | 27 | — | pF | $V_F$ = 0 V<br>f = 1 MHz | |
| Input-Output Capacitance | $C_{I-O}$ | — | 2.6 | — | pF | $V_{I-O}$ = 0 V<br>f = 1 MHz | 4 |

* All typical values are at $T_C$ = 25°C

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**Notes:**

1. Non-repetitive, pulse width ≤ 10ms, $T_C$ = 25°C (see Figure 6).
2. Non-repetitive, pulse width ≤ 100µs, $T_C$ = 25°C.
3. Case Temperature $T_C$ = 25°C (see Figure 7).
4. Input pins shorted together and output pins shorted together.
5. Input-output potential applied momentarily, not an operating condition.
6. Rise time is measured from 10% to 90% of load current (90% to 10% of $V_O$). Fall time is measured from 90% to 10% of load current (10% to 90% of $V_O$).

**CAUTION:**

Care should be taken so as not to exceed the maximum power dissipation and maximum junction temperature when repetitively switching loads.

| INPUT | OUTPUT |
|---|---|
| ON | ON |
| OFF | OFF |

Figure 1. Truth Table

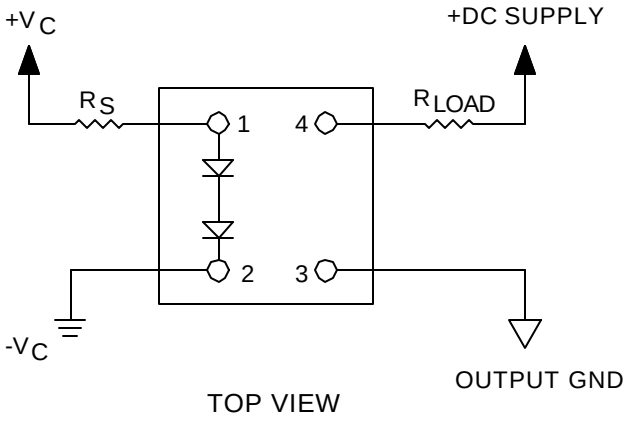



Figure 2. Terminal Connections

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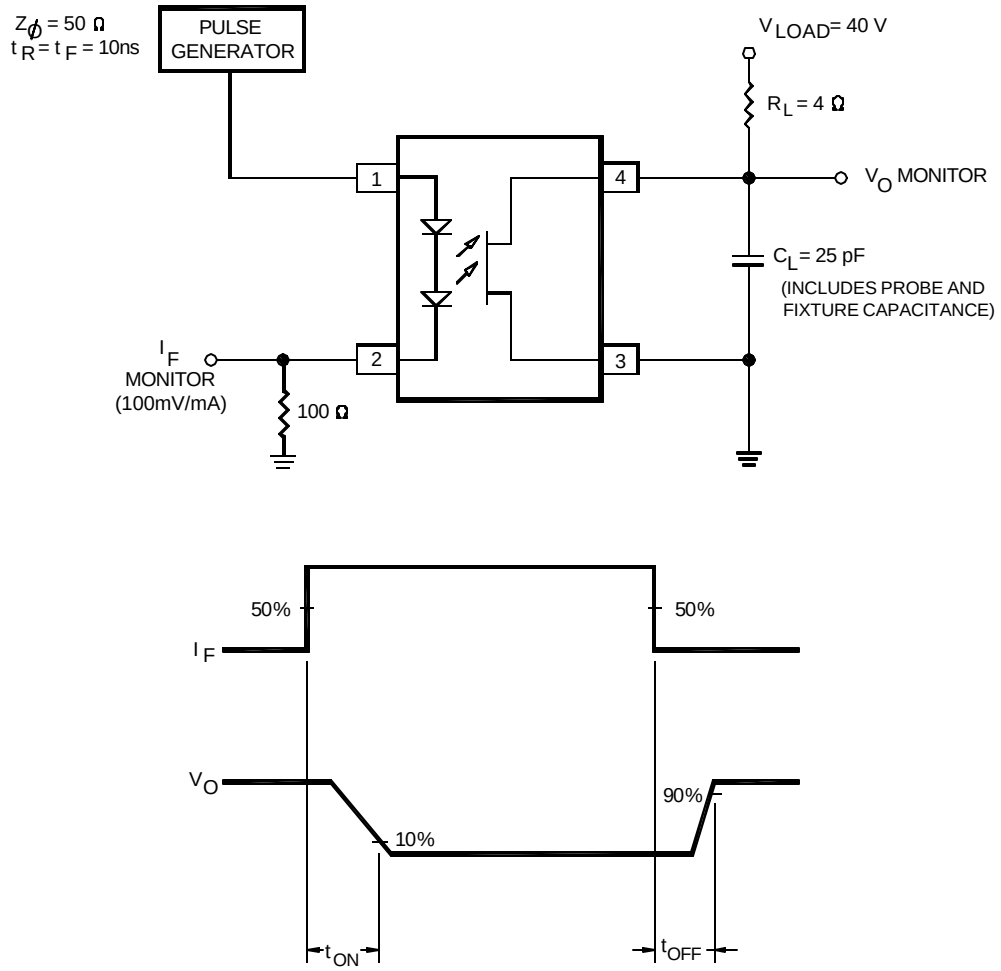



Figure 3. Switching Waveforms and Test Circuits

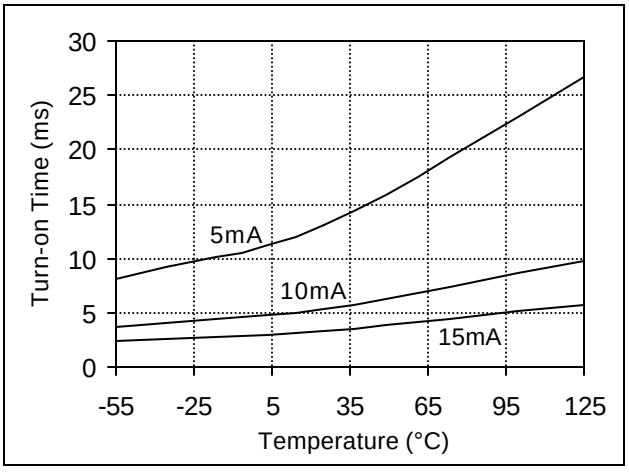



Figure 4. Turn-on Time vs. Case Temperature for Different Values of $I_F$ (typical data).

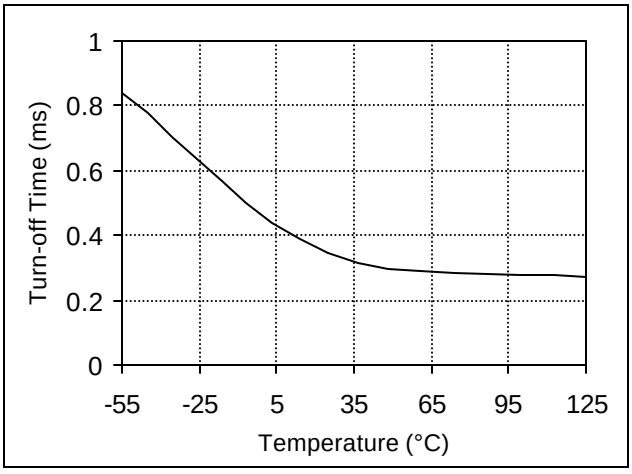



Figure 5. Turn-off Time vs. Case Temperature with $I_F$ = 5 to 15 mA (typical data).

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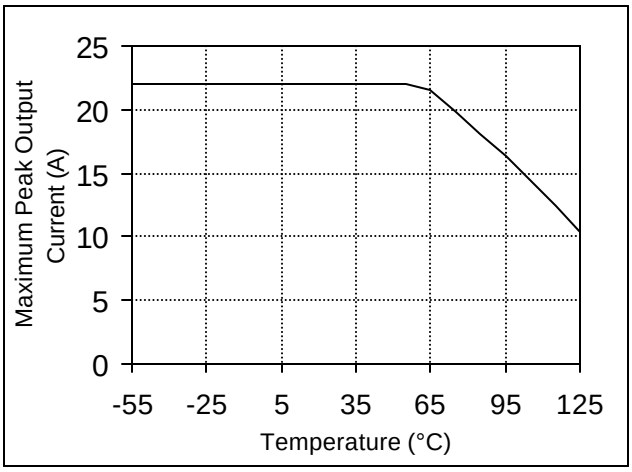



Figure 6. Maximum Non-repetitive Output Current vs. Case Temperature (pulse width ≤ 10 ms).

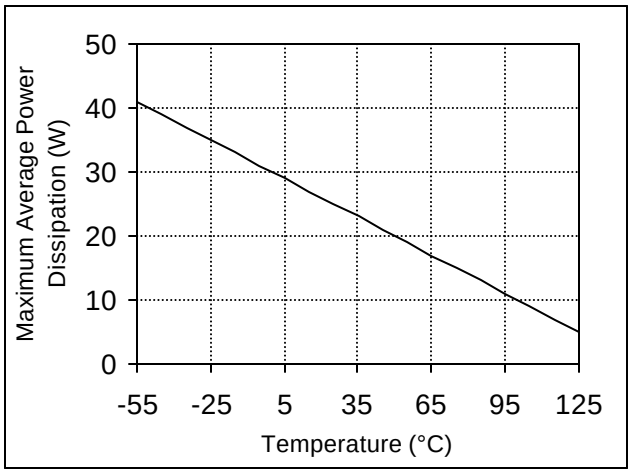
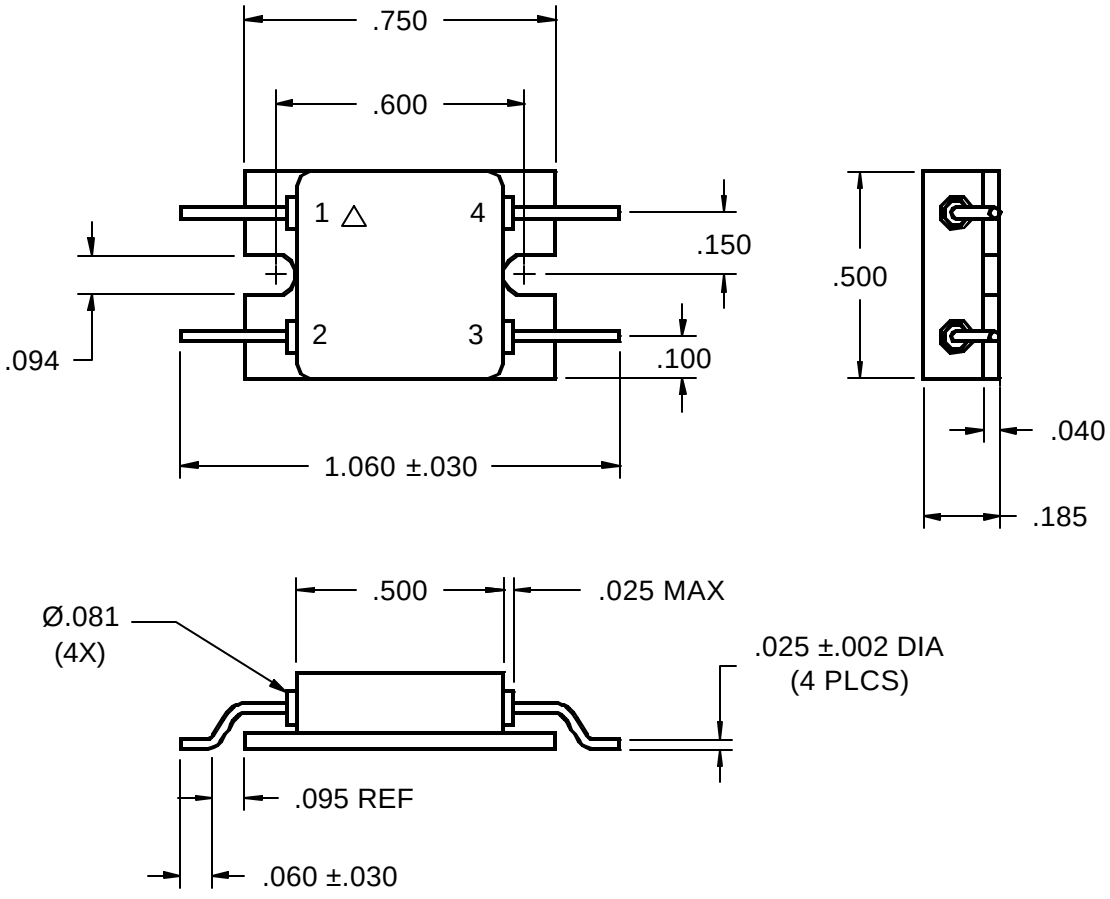



Figure 7. Maximum Average Output Power Dissipation vs. Case Temperature.

## CASE OUTLINE




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