International
IOR Rectifier

Data Sheet No. 1.036B

# PVO402P

HEXFET® POWER MOSFET PHOTOVOLTAIC RELAY

Microelectronic
Power IC Relay
Dual Pole, Normally Open + Ring Detector
0-400V, 120mA AC/DC

## General Description

The PVO402P Photovoltaic Relay is a dual-pole, normally open solid-state relay plus ring detector. By integrating these two functions in one package it can replace two discrete components, i.e., a relay and an AC-input opto-coupler. The relay portion of PVO402P utilizes International Rectifier's HEXFET power MOSFET as the output switch, driven by an integrated circuit photovoltaic generator of novel construction. The output switch is controlled by radiation from a GaAlAs light emitting diode (LED) which is optically isolated from the photovoltaic generator. The ring detector portion of PVO402P has two LEDs in inverse parallel connection as the input sensing element and a silicon NPN photo-transistor as the output switch.

PVO402P is ideally suited for PCMCIA fax/modem cards. Its extremely low profile allows it to be used in Type II cards whose outer shells are only 5mm thick.

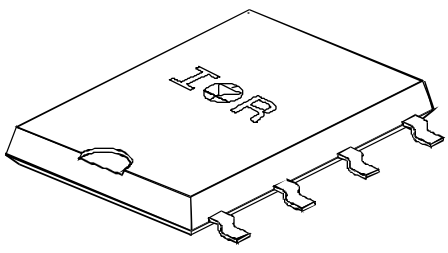
PVO402P Relays are packaged in an 8-pin, molded 'Thin-Pak' DIP package with 'gull-wing' surface mount terminals. It is available in plastic shipping tubes or on tape-and-reel. Please refer to Part Identification (opposite) for details.

## Applications

- On/Off Hook switch ■
- Dial pulsing ■
- Ringer injection ■
- Ring detection ■
- Loop current detection ■

## PVO402P Features

- HEXFET Power MOSFET output ■
- Bounce-free operation ■
- 3,750 $V_{RMS}$ I/O isolation ■
- Linear AC/DC operation ■
- Solid-State reliability ■
- UL recognized ■



**PVO402P**
**'Thin-Pak'**

## Part Identification

| | |
|---|---|
| PVO402P | SMT, plastic shipping tube |
| PVO402P-T | SMT, T&R |

*(HEXFET is the registered trademark for International Rectifier Power MOSFETs)*

**Electrical Specifications** (-40°C ≤ $T_A$ ≤ +85°C unless otherwise specified)

## RELAY

| INPUT CHARACTERISTICS | Limits | Units |
|---|---|---|
| Min. Control Current (See Fig.1) | 3.0 | mA |
| Max. Control Current for Off-State Resistance @$T_A$=+25°C | 0.4 | mA |
| Control Current Range (Caution: current limit input LED, see Fig.6) | 3.0 to 25 | mA |
| Max. Reverse Voltage | 7.0 | V |

| OUTPUT CHARACTERISTICS | Limits | Units |
|---|---|---|
| Operating Voltage Range | 0 to ±400 | $V_{(DC\ or\ AC\ peak)}$ |
| Max. Load Current @ $T_A$=+40°C<br>5mA Control (See Fig.1) | 120 | mA |
| Max. On-State Resistance @$T_A$=+25°C<br>For 50mA Pulsed Load, 5mA Control (See Fig.4) | 35 | Ω |
| Max. Off-State Leakage @$T_A$=+25°C, ±400V (See Fig.5) | 1.0 | µA |
| Max. Turn-On Time @$T_A$=+25°C (See Fig. 7)<br>For 50mA, 100 $V_{DC}$ Load, 5mA Control | 2.0 | ms |
| Max. Turn-Off Time @$T_A$=+25°C (See Fig. 7)<br>For 50mA, 100 $V_{DC}$ Load, 5mA Control | 0.5 | ms |
| Max. Output Capacitance @ 50$V_{DC}$ | 12 | pF |

## DETECTOR

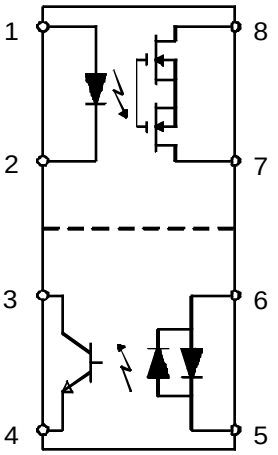
| INPUT CHARACTERISTICS | Limits | Units |
|---|---|---|
| Min. Control Current @ $I_C$ = 2mA, $V_{CE}$ = 0.5V | 6.0 | mA |
| Max. Control Current for Off-State Leakage $I_C$=1µA, $V_{CE}$=5V @$T_A$=+25°C | 5 | µA |
| Control Current Range (Caution: current limit input LED, see Fig.6) | 6.0 to 25 | mA |

| OUTPUT CHARACTERISTICS | Limits | Units |
|---|---|---|
| Min. Collector-Emitter Breakdown Voltage @ $I_C$ = 10µA | 20 | $V_{DC}$ |
| Min.Current Transfer Ratio @ $I_{LED}$ = 6mA, $V_{CE}$ = 5V (see Fig. 9) | 33 | % |
| Max. Saturation Voltage @ $I_{LED}$ = 16mA, $I_C$ = 2mA | 0.5 | V |
| Max. Leakage Current @ $I_{LED}$=0mA, $V_{CE}$ = 5V | 500 | nA |
| Max. Power Dissipation @$T_A$=+25°C (derate linearly 2.0mW/°C) | 150 | mW |

## COMBINED

| GENERAL CHARACTERISTICS | Limits | Units |
|---|---|---|
| Min. Dielectric Strength, Input-Output | 3750 | $V_{RMS}$ |
| Min. Dielectric Strength, Relay-Detector | 1000 | $V_{DC}$ |
| Min. Insulation Resistance, Input-Output<br>@$T_A$=+25°C, 50%RH, 100$V_{DC}$ | $10^{12}$ | Ω |
| Max. Capacitance, Input-Output | 3.0 | pF |
| Max. Pin Soldering Temperature (10 seconds max.) | +260 | °C |
| Ambient Temperature Range: Operating<br>Storage | -40 to +85<br>-40 to +100 | °C |

## Connection Diagram



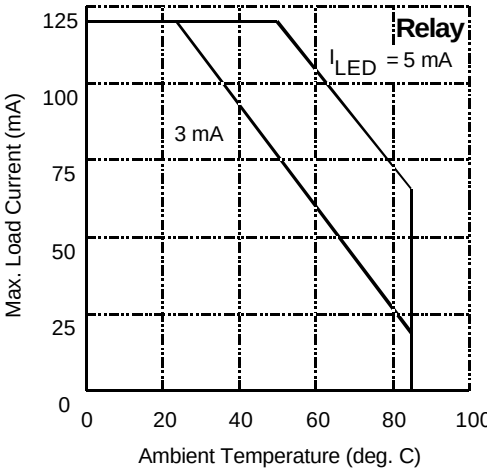




**Figure 1. Current Derating Curve**

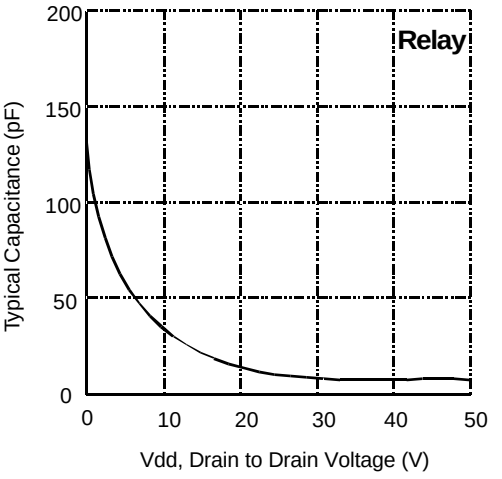



**Figure 2. Typical Output Capacitance**

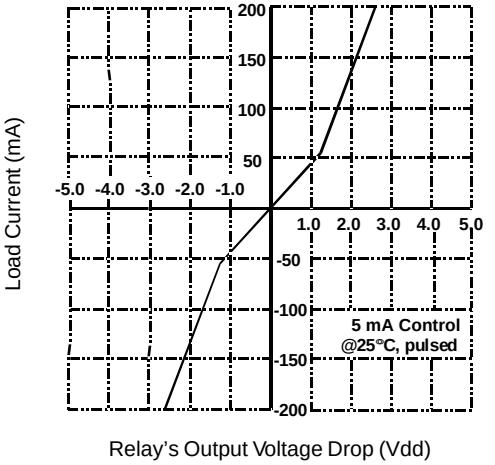



**Figure 3. Linearity Characteristics**

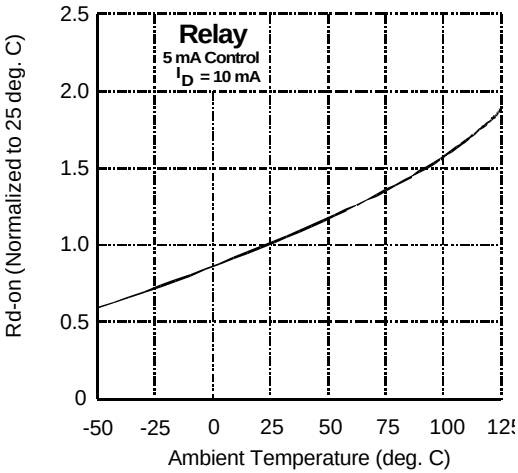



**Figure 4. Typical Normalized On-Resistance**

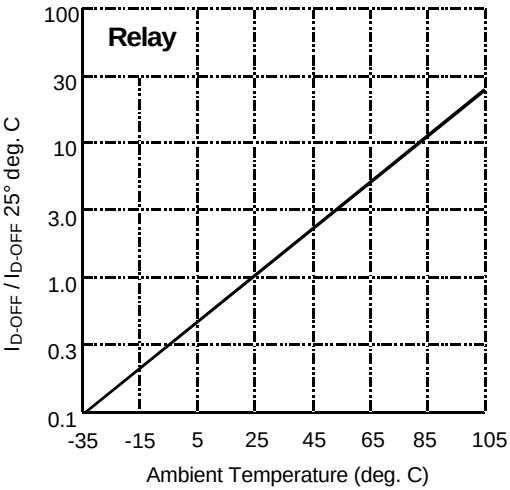



**Figure 5. Typical Normalized Off-State Leakage**

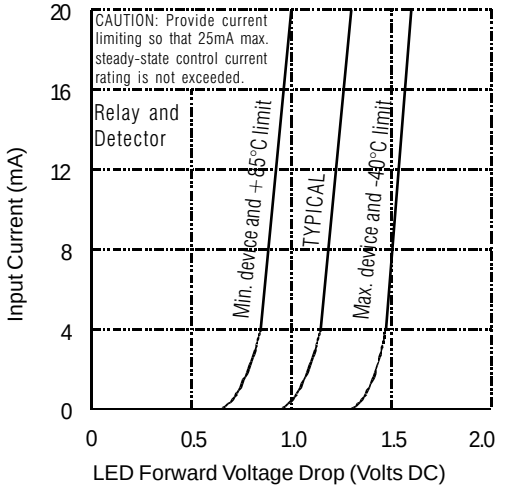



**Figure 6. Input Characteristics (Current Controlled)**

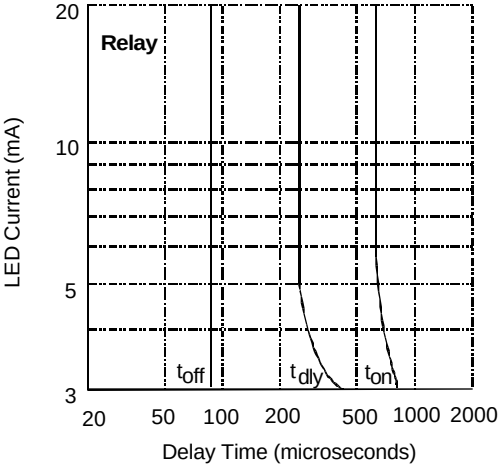



**Figure 7. Typical Delay Times**

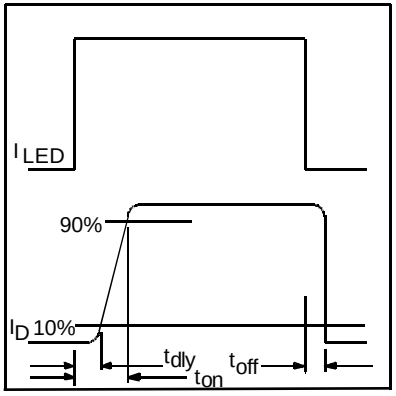



**Figure 8. Delay Time Definitions**

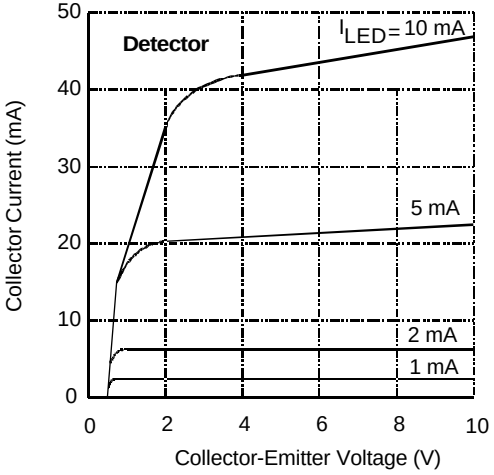
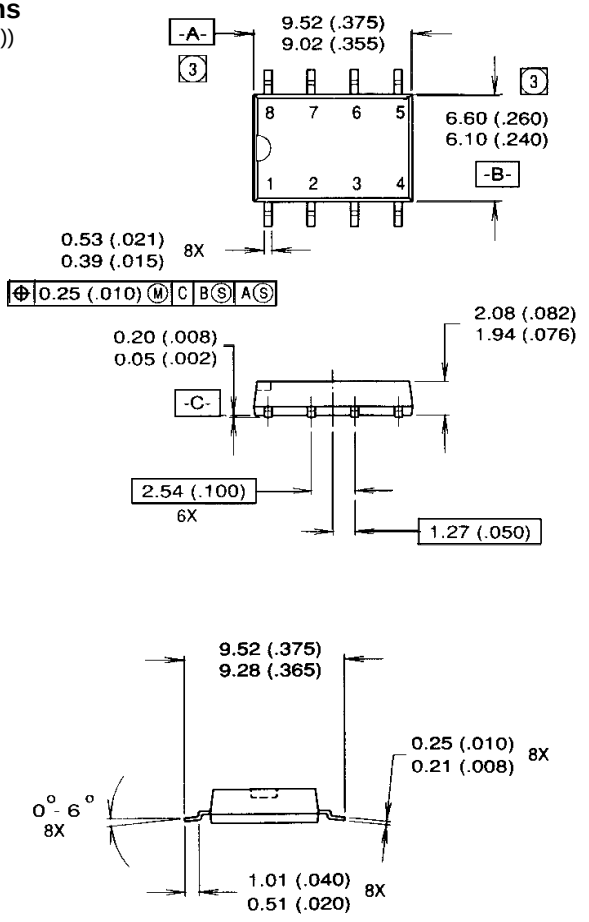



**Figure 9.Typical Transfer Characteristics**

## Mechanical Specifications

(Dimensions in millimeters (inches))




1. CONTROLLING DIMENSION: INCH
3 DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS SHALL NOT EXCEED 0.25 (.010).

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*Data and specifications subject to change without notice.* 5/96