

| Parameter           | Rating | Units                                |
|---------------------|--------|--------------------------------------|
| Blocking Voltage    | 350    | V <sub>p</sub>                       |
| Load Current        | 120    | mA <sub>rms</sub> / mA <sub>DC</sub> |
| On-Resistance (max) | 30     | Ω                                    |

### Features

- 0.4mm Distance Through Insulation (Supplementary Isolation Requirement of EN60950)
- 1500V<sub>rms</sub> Input/Output Isolation
- Low Drive Power Requirements
- High Reliability
- No EMI/RFI Generation
- Small 4-Pin SOP Package
- Tape & Reel Version Available
- Flammability Rating UL 94 V-0

### Applications

- Telecommunications
  - Telecom Switching
  - Tip/Ring Circuits
  - Modem Switching (Laptop, Notebook, Pocket Size)
  - Hook Switch
  - Dial Pulsing
  - Ground Start
  - Ringing Injection
- Instrumentation
- Multiplexers
- Data Acquisition
- Electronic Switching
- I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Medical Equipment Patient/Equipment Isolation
- Security
- Industrial Controls

### Description

The CPC1231N is a miniature normally-closed (1-Form-B) single-pole solid state relay in a 4-pin SOP package that employs optically coupled MOSFET technology to provide 1500V<sub>rms</sub> of input to output isolation. The optically coupled outputs, which use patented OptoMOS architecture, are controlled by a highly efficient infrared LED.

The device is compliant with supplementary isolation in accordance with EN/IEC 60950-1.

IXYS Integrated Circuits' state of the art double molded vertical construction packaging enables the CPC1231N to be one of the world's smallest 4-pin relays, which offers board space savings approaching 20% over the competitor's larger 4-pin SOP relay.

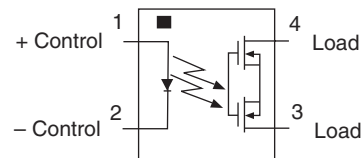
### Approvals

- UL Recognized Component: File E76270
- CSA Certified Component: Certificate 1172007
- TUV EN 62368-1: Certificate # B 082667 0008

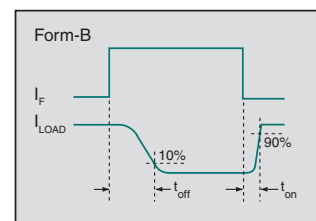
### Ordering Information

| Part #     | Description           |
|------------|-----------------------|
| CPC1231N   | 4-Pin SOP (100/tube)  |
| CPC1231NTR | 4-Pin SOP (2000/reel) |

### Pin Configuration



### Switching Characteristics of Normally-Closed Devices



**Absolute Maximum Ratings @ 25°C**

| Parameter                            | Ratings     | Units            |
|--------------------------------------|-------------|------------------|
| Blocking Voltage                     | 350         | V <sub>P</sub>   |
| Reverse Input Voltage                | 5           | V                |
| Input Control Current<br>Peak (10ms) | 50          | mA               |
|                                      | 1           | A                |
| Input Power Dissipation <sup>1</sup> | 150         | mW               |
| Total Power Dissipation <sup>2</sup> | 400         | mW               |
| Capacitance, Input to Output         | 1           | pF               |
| Isolation Voltage, Input to Output   | 1500        | V <sub>rms</sub> |
| Operational Temperature, Ambient     | -40 to +85  | °C               |
| Storage Temperature                  | -40 to +125 | °C               |

Absolute Maximum Ratings are stress ratings. Stresses in excess of these ratings can cause permanent damage to the device. Functional operation of the device at conditions beyond those indicated in the operational sections of this data sheet is not implied.

Typical values are characteristic of the device at +25°C, and are the result of engineering evaluations. They are provided for information purposes only, and are not part of the manufacturing testing requirements.

<sup>1</sup> Derate linearly 1.33 mW / °C

<sup>2</sup> Derate output power linearly 3.33 mW / °C

**Electrical Characteristics @ 25°C**

| Parameter                                      | Conditions   | Symbol            | Min | Typ  | Max | Units                                |
|--|--|-------------------|-----|------|-----|--------------------------------------|
| <b>Output Characteristics</b>                  |  |                   |     |      |     |                                      |
| Blocking Voltage                               | I <sub>L</sub> =1μA                                    | V <sub>DRM</sub>  | 350 | -    | -   | V                                    |
| Load Current                                   | -  | I <sub>L</sub>    | -   | -    | 120 | mA <sub>rms</sub> / mA <sub>DC</sub> |
|  |  |                   |     |      |     |                                      |
| On-Resistance <sup>2</sup>                     | I <sub>L</sub> =120mA                                  | R <sub>ON</sub>   | -   | 25   | 30  | Ω                                    |
| Off-State Leakage Current                      | I <sub>F</sub> =2mA, V <sub>L</sub> =350V <sub>P</sub> | I <sub>LEAK</sub> | -   | -    | 5   | μA                                   |
| <b>Switching Speeds</b>                        |  |                   |     |      |     |                                      |
| Turn-On<br>Turn-Off                            | I <sub>F</sub> =5mA, V <sub>L</sub> =10V               | t <sub>on</sub>   | -   | -    | 2   | ms                                   |
|  |  | t <sub>off</sub>  | -   | -    | 2   |                                      |
| Output Capacitance                             | I <sub>F</sub> =2mA, V <sub>L</sub> =50V, f=1MHz       | C <sub>OUT</sub>  | -   | 25   | -   | pF                                   |
| <b>Input Characteristics</b>                   |  |                   |     |      |     |                                      |
| Input Control Current to Activate <sup>3</sup> | I <sub>L</sub> =120mA                                  | I <sub>F</sub>    | -   | 0.6  | 2   | mA                                   |
| Input Voltage Drop                             | I <sub>F</sub> =5mA                                    | V <sub>F</sub>    | 0.9 | 1.36 | 1.5 | V                                    |
| Reverse Input Current                          | V <sub>R</sub> =5V                                     | I <sub>R</sub>    | -   | -    | 10  | μA                                   |

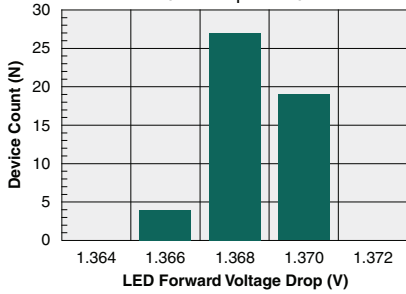
<sup>1</sup> Load current derates linearly from 120mA @ 25°C to 80mA @ 85°C.

<sup>2</sup> Measurement taken within 1 second of on-time.

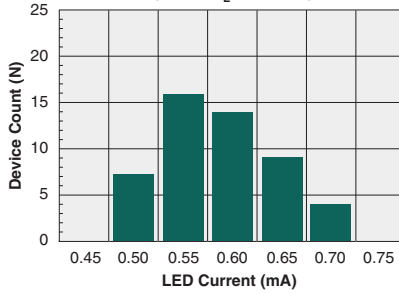
<sup>3</sup> For applications requiring high temperature operation (greater than 60°C) a minimum LED drive current of 5mA is recommended.

**PERFORMANCE DATA\***

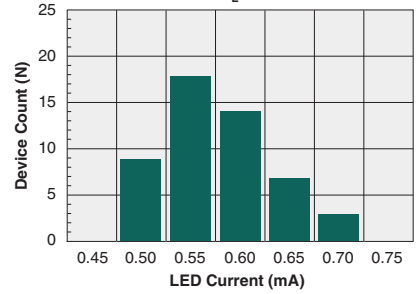
**Typical LED Forward Voltage Drop**  
(N=50,  $I_F=5mA$ )



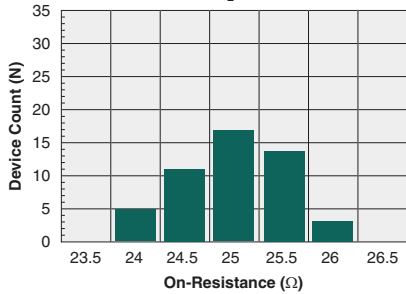
**Typical  $I_F$  for Switch Operation**  
(N=50,  $I_L=120mA$ )



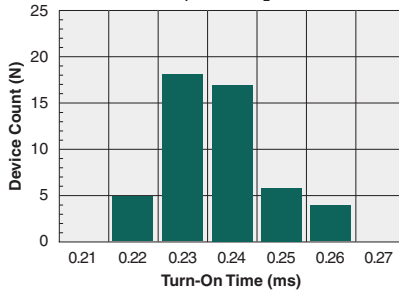
**Typical  $I_F$  for Switch Dropout**  
(N=50,  $I_L=120mA$ )



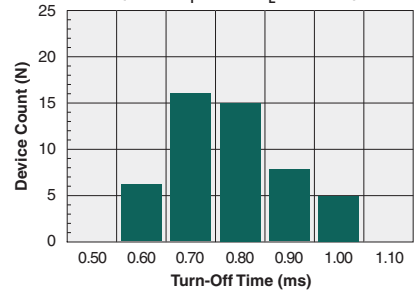
**Typical On-Resistance Distribution**  
(N=50,  $I_L=120mA$ )



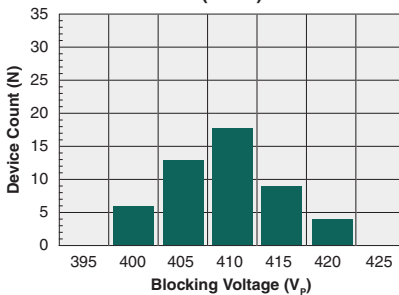
**Typical Turn-On Time**  
(N=50,  $I_F=5mA$ ,  $I_L=120mA$ )



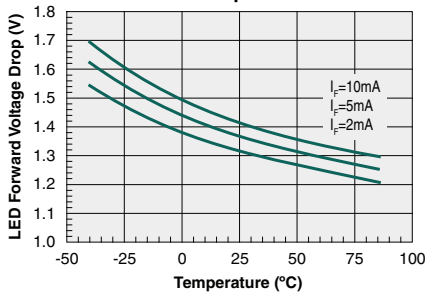
**Typical Turn-Off Time**  
(N=50,  $I_F=5mA$ ,  $I_L=120mA$ )



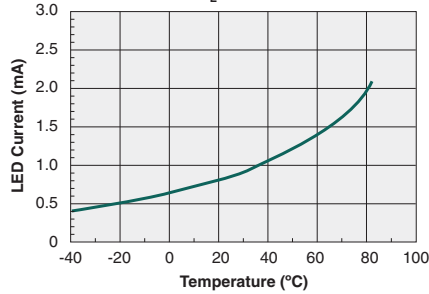
**Typical Blocking Voltage Distribution**  
(N=50)



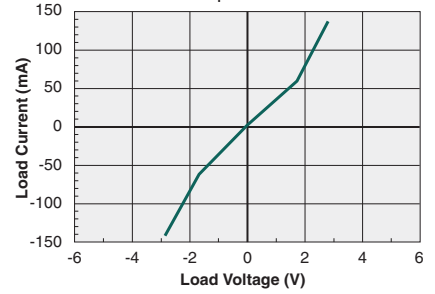
**Typical LED Forward Voltage Drop vs. Temperature**



**Typical  $I_F$  for Switch Operation vs. Temperature**  
( $I_L=50mA$ )



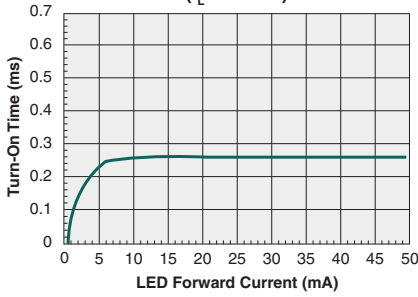
**Typical Load Current vs. Load Voltage**  
( $I_F=0mA$ )



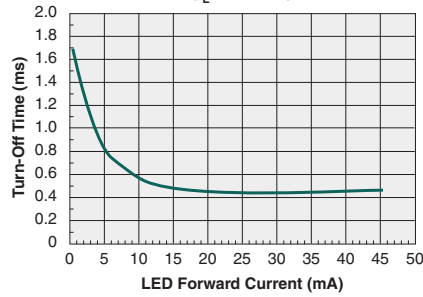
\*Unless otherwise noted, data presented in these graphs is typical of device operation at 25°C.

**PERFORMANCE DATA\***

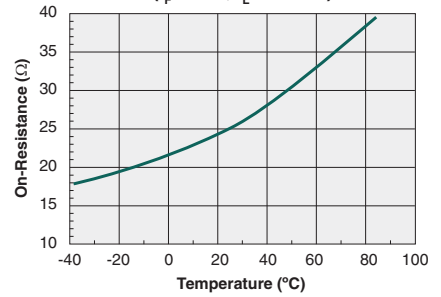
**Typical Turn-On Time vs. LED Forward Current**  
( $I_L=120\text{mA}$ )



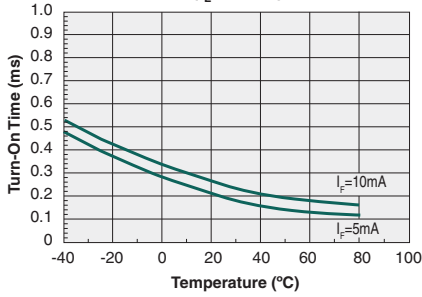
**Typical Turn-Off Time vs. LED Forward Current**  
( $I_L=120\text{mA}$ )



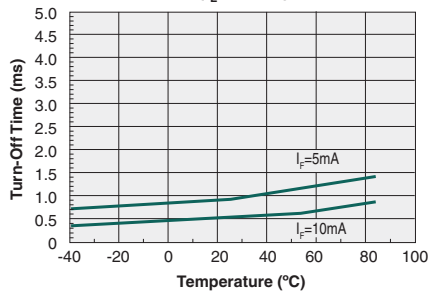
**Typical On-Resistance vs. Temperature**  
( $I_F=0\text{mA}$ ,  $I_L=120\text{mA}$ )



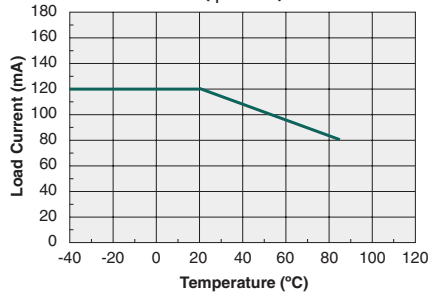
**Typical Turn-On Time vs. Temperature**  
( $I_L=50\text{mA}$ )



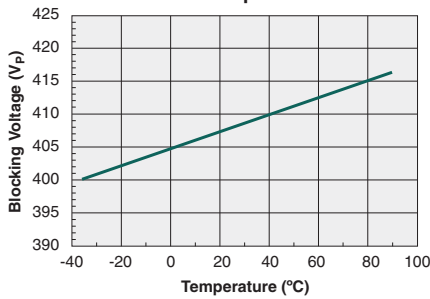
**Typical Turn-Off Time vs. Temperature**  
( $I_L=50\text{mA}$ )



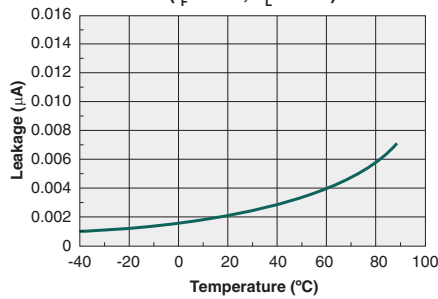
**Maximum Load Current vs. Temperature**  
( $I_F=0\text{mA}$ )



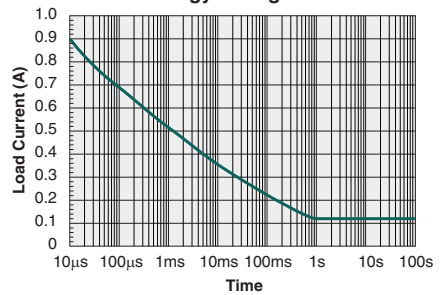
**Typical Blocking Voltage vs. Temperature**



**Typical Leakage vs. Temperature Measured Across Pins 3&4**  
( $I_F=2\text{mA}$ ,  $V_L=350\text{V}$ )



**Energy Rating Curve**



\*Unless otherwise noted, data presented in these graphs is typical of device operation at 25°C.

## Manufacturing Information

### Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. IXYS Integrated Circuits classifies its plastic encapsulated devices for moisture sensitivity according to the latest version of the joint industry standard, **IPC/JEDEC J-STD-020**, in force at the time of product evaluation. We test all of our products to the maximum conditions set forth in the standard, and guarantee proper operation of our devices when handled according to the limitations and information in that standard as well as to any limitations set forth in the information or standards referenced below.

Failure to adhere to the warnings or limitations as established by the listed specifications could result in reduced product performance, reduction of operable life, and/or reduction of overall reliability.

This product carries a **Moisture Sensitivity Level (MSL)** classification as shown below, and should be handled according to the requirements of the latest version of the joint industry standard **IPC/JEDEC J-STD-033**.

| Device   | Moisture Sensitivity Level (MSL) Classification |
|----------|---|
| CPC1231N | MSL 3   |

### ESD Sensitivity



This product is ESD Sensitive, and should be handled according to the industry standard **JESD-625**.

### Soldering Profile

Provided in the table below is the **IPC/JEDEC J-STD-020** Classification Temperature ( $T_C$ ) and the maximum dwell time the body temperature of these surface mount devices may be ( $T_C - 5$ )°C or greater. The Classification Temperature sets the Maximum Body Temperature allowed for these devices during reflow soldering processes.

| Device   | Classification Temperature ( $T_C$ ) | Dwell Time ( $t_p$ ) | Max Reflow Cycles |
|----------|--------------------------------------|----------------------|-------------------|
| CPC1231N | 260°C                                | 30 seconds           | 3                 |

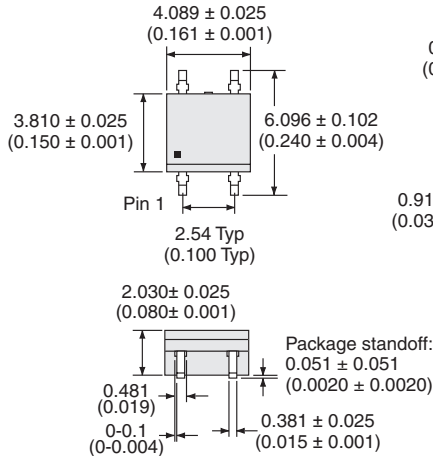
### Board Wash

IXYS Integrated Circuits recommends the use of no-clean flux formulations. Board washing to reduce or remove flux residue following the solder reflow process is acceptable provided proper precautions are taken to prevent damage to the device. These precautions include but are not limited to: using a low pressure wash and providing a follow up bake cycle sufficient to remove any moisture trapped within the device due to the washing process. Due to the variability of the wash parameters used to clean the board, determination of the bake temperature and duration necessary to remove the moisture trapped within the package is the responsibility of the user (assembler). Cleaning or drying methods that employ ultrasonic energy may damage the device and should not be used. Additionally, the device must not be exposed to halide flux or solvents.

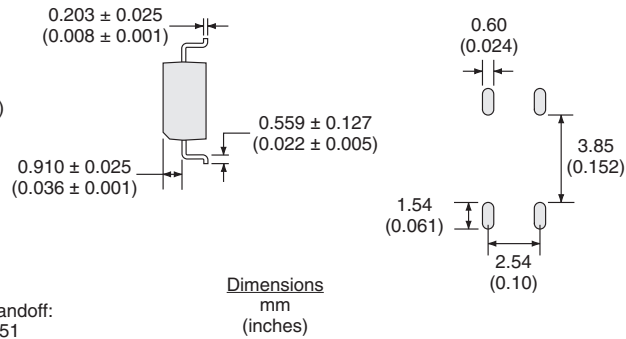


MECHANICAL DIMENSIONS

CPC1231N

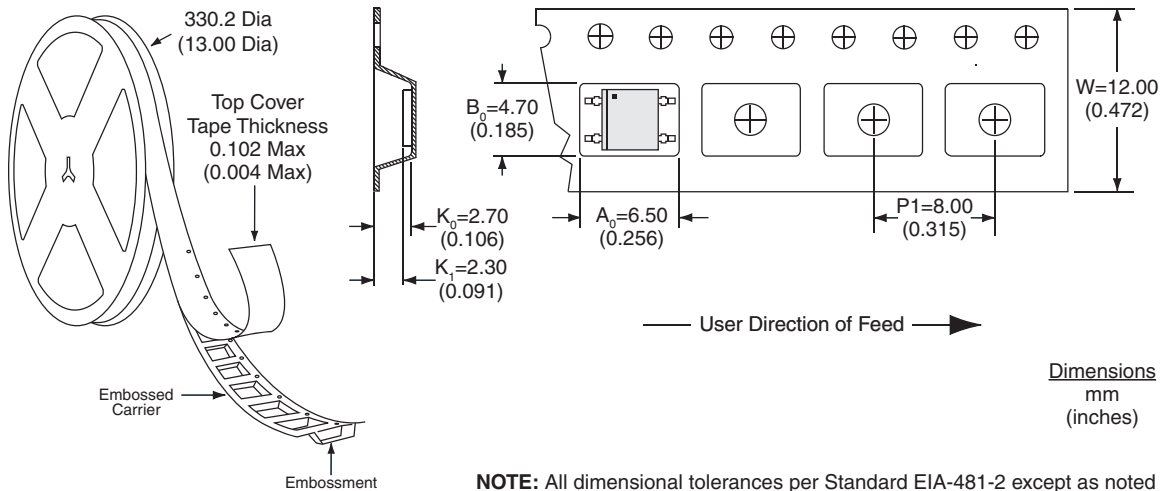


Recommended PCB Land Pattern



Note:  
1. Lead dimensions do not include plating: 1000 microinches max.  
2. Controlling dimension: mm

CPC1231NTR Tape & Reel



NOTE: All dimensional tolerances per Standard EIA-481-2 except as noted

For additional information please visit our website at: <https://www.ixysic.com>