



| Parameter                 | Ratings | Units                                |
|---------------------------|---------|--------------------------------------|
| Load Voltage              | 100     | V <sub>P</sub>                       |
| Load Current              | 150     | mA <sub>rms</sub> / mA <sub>DC</sub> |
| On-Resistance (max)       | 8       | Ω                                    |
| Output Leakage, Off-State | 20      | nA                                   |

## Features

- Extremely Low Output Leakage: 20nA
- 1500V<sub>rms</sub> Input/Output Isolation
- Small 4-Pin SOP Package
- Low Drive Power Requirements
- High Reliability
- No EMI/RFI Generation
- Tape & Reel Version Available

## Applications

- Instrumentation
- Multiplexers
- Data Acquisition
- Electronic Switching
- I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Medical Equipment—Patient/Equipment Isolation
- Security Systems
- Industrial Controls

## Description

CPC1009N is a miniature low voltage, low on-resistance, low off-state leakage, normally-open (1-Form-A) solid state relay in a 4-pin SOP package.

The MOSFET switches and photovoltaic die use IXYS Integrated Circuits' patented OptoMOS® architecture to provide 1500 V<sub>rms</sub> of input to output isolation. The optically coupled output is controlled by a highly efficient infrared LED.

The CPC1009N uses IXYS Integrated Circuits' state of the art double-molded vertical construction to produce one of the world's smallest 4-pin relays, which offers board space savings of 20% over the competitor's larger 4-pin SOP relay.

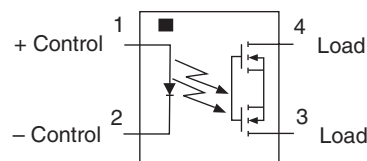
## Approvals

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

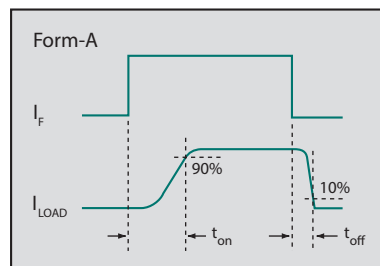
## Ordering Information

| Part #     | Description           |
|------------|-----------------------|
| CPC1009N   | 4-Pin SOP (100/tube)  |
| CPC1009NTR | 4-Pin SOP (2000/reel) |

## Pin Configuration



## Switching Characteristics of Normally-Open Devices



### Absolute Maximum Ratings @ 25°C

| Parameter                            | Ratings     | Units            |
|--------------------------------------|-------------|------------------|
| Blocking Voltage                     | 100         | V <sub>P</sub>   |
| Reverse Input Voltage                | 5           | V                |
| Input Control Current                | 50          | mA               |
| Peak (10ms)                          | 1           | A                |
| Input Power Dissipation <sup>1</sup> | 70          | mW               |
| Total Power Dissipation <sup>2</sup> | 400         | mW               |
| Isolation voltage, Input to Output   | 1500        | V <sub>rms</sub> |
| Operational Temperature, Ambient     | -40 to +85  | °C               |
| Storage Temperature                  | -40 to +125 | °C               |

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

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

### Electrical Characteristics @ 25°C (Unless Otherwise Noted)

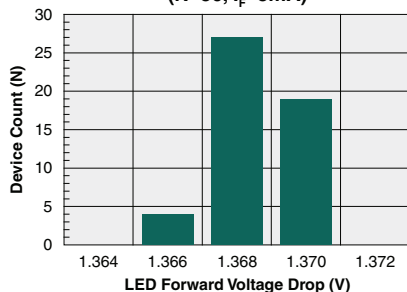
| Parameter                           | Conditions                                       | Symbol            | Min | Typ  | Max  | Units                                |
|-------------------------------------|--------------------------------------------------|-------------------|-----|------|------|--------------------------------------|
| <b>Output Characteristics</b>       |                                                  |                   |     |      |      |                                      |
| Blocking Voltage                    | I <sub>L</sub> =1μA                              | V <sub>DRM</sub>  | 100 | -    | -    | V                                    |
| Load Current                        |                                                  |                   |     |      |      |                                      |
| Continuous <sup>1</sup>             | -                                                | I <sub>L</sub>    | -   | -    | 150  | mA <sub>rms</sub> / mA <sub>DC</sub> |
| Peak                                | t=10ms                                           | I <sub>LPK</sub>  | -   | -    | ±350 | mA <sub>P</sub>                      |
| On-Resistance <sup>2</sup>          | I <sub>L</sub> =150mA                            | R <sub>ON</sub>   | -   | 5    | 8    | Ω                                    |
| Off-State Leakage Current           | V <sub>L</sub> =100V <sub>P</sub> , T=115°C      | I <sub>LEAK</sub> | -   | -    | 20   | nA                                   |
| Switching Speeds                    |                                                  |                   |     |      |      |                                      |
| Turn-On                             | I <sub>F</sub> =5mA, V <sub>L</sub> =10V         | t <sub>on</sub>   | -   | -    | 2    | ms                                   |
| Turn-Off                            |                                                  | t <sub>off</sub>  | -   | -    | 0.5  |                                      |
| Output Capacitance                  | I <sub>F</sub> =0mA, V <sub>L</sub> =50V, f=1MHz | C <sub>OUT</sub>  | -   | 6    | -    | pF                                   |
| <b>Input Characteristics</b>        |                                                  |                   |     |      |      |                                      |
| Input Control Current to Activate   | I <sub>L</sub> =150mA                            | I <sub>F</sub>    | -   | 0.87 | 2    | mA                                   |
| Input Control Current to Deactivate | -                                                | I <sub>F</sub>    | 0.3 | 0.86 | -    | 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                                   |
| <b>Input/Output Characteristics</b> |                                                  |                   |     |      |      |                                      |
| Capacitance, Input to Output        | V <sub>IO</sub> =0V, f=1MHz                      | C <sub>IO</sub>   | -   | 1    | -    | pF                                   |

<sup>1</sup> Load current derates linearly from 150mA @ 25°C to 120mA @ 85°C.

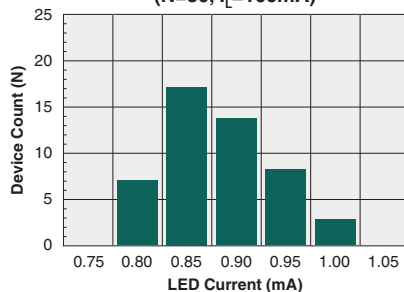
<sup>2</sup> Measurement taken within 1 second of on-time.

# PERFORMANCE DATA\*

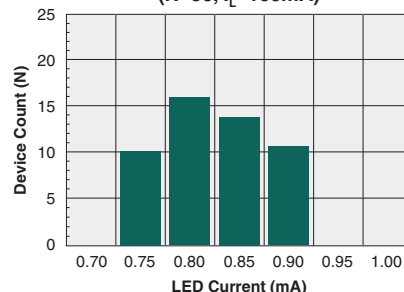
Typical LED Forward Voltage Drop  
(N=50,  $I_F=5\text{mA}$ )



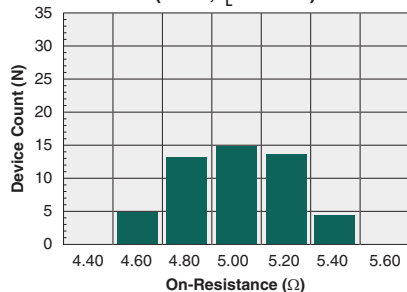
Typical  $I_F$  for Switch Operation  
(N=50,  $I_L=100\text{mA}$ )



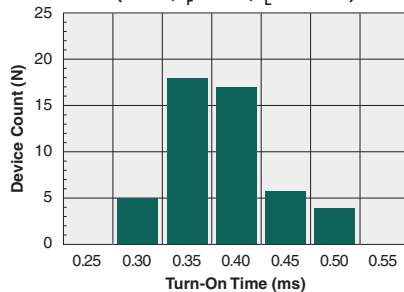
Typical  $I_F$  for Switch Dropout  
(N=50,  $I_L=100\text{mA}$ )



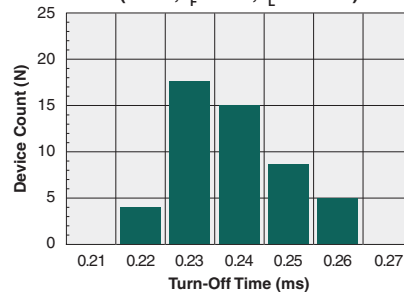
Typical On-Resistance Distribution  
(N=50,  $I_L=150\text{mA}$ )



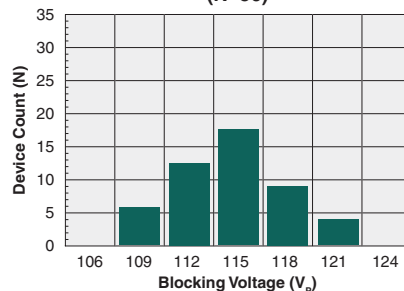
Typical Turn-On Time  
(N=50,  $I_F=5\text{mA}$ ,  $I_L=150\text{mA}$ )



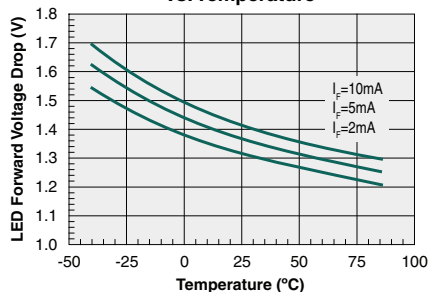
Typical Turn-Off Time  
(N=50,  $I_F=5\text{mA}$ ,  $I_L=150\text{mA}$ )



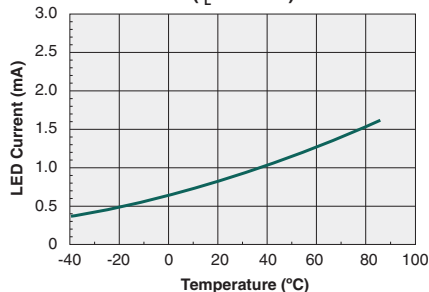
Typical Blocking Voltage Distribution  
(N=50)



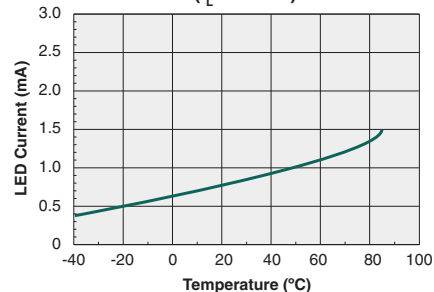
Typical LED Forward Voltage Drop  
vs. Temperature



Typical  $I_F$  for Switch Operation  
vs. Temperature  
( $I_L=100\text{mA}$ )



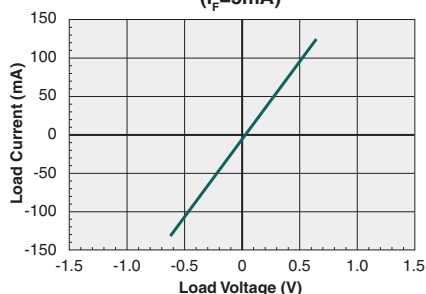
Typical  $I_F$  for Switch Dropout  
vs. Temperature  
( $I_L=100\text{mA}$ )



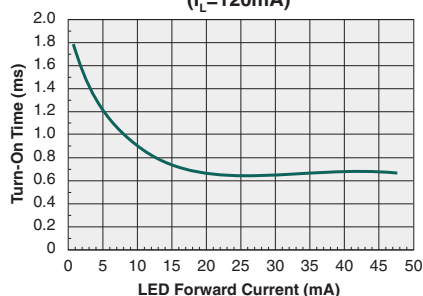
\*Unless otherwise noted, data presented in these graphs is typical of device operation at 25°C.

# PERFORMANCE DATA\*

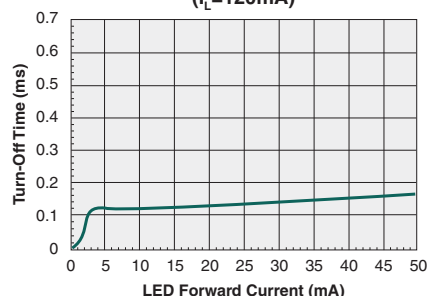
Typical Load Current vs. Load Voltage  
( $I_F=5\text{mA}$ )



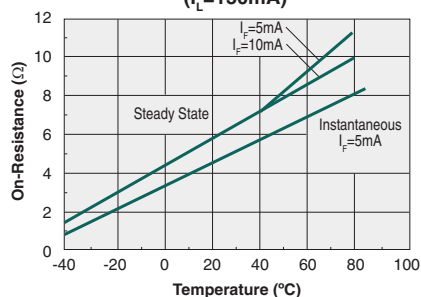
Typical Turn-On Time vs. LED Forward Current  
( $I_L=120\text{mA}$ )



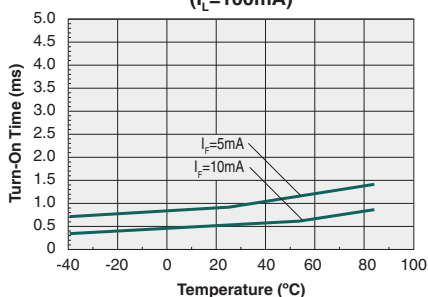
Typical Turn-Off Time vs. LED Forward Current  
( $I_L=120\text{mA}$ )



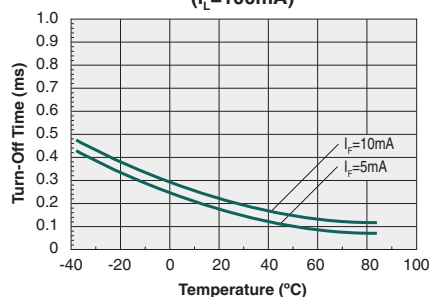
Typical On-Resistance vs. Temperature  
( $I_L=150\text{mA}$ )



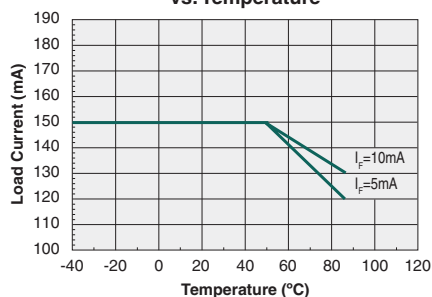
Typical Turn-On Time vs. Temperature  
( $I_L=100\text{mA}$ )



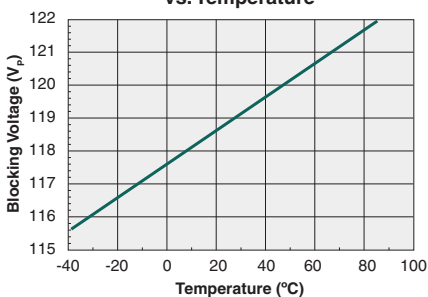
Typical Turn-Off Time vs. Temperature  
( $I_L=100\text{mA}$ )



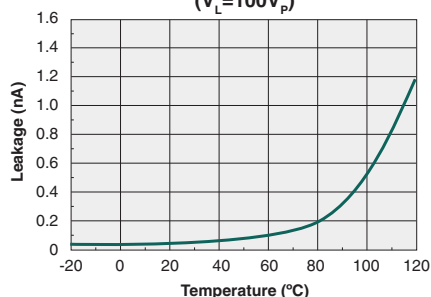
Typical Maximum Load Current vs. Temperature



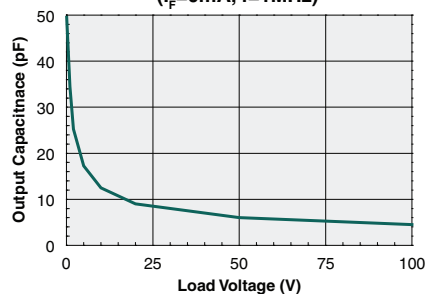
Typical Blocking Voltage vs. Temperature



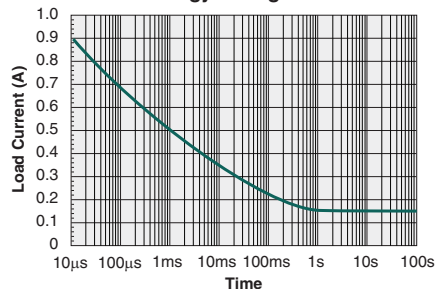
Typical Leakage vs. Temperature  
Measured Across Pins 3&4  
( $V_L=100\text{V}_p$ )



Output Capacitance vs. Load Voltage  
( $I_F=0\text{mA}$ ,  $f=1\text{MHz}$ )



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 |
|----------|-------------------------------------------------|
| CPC1009N | 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 |
|----------|--------------------------------------|----------------------|-------------------|
| CPC1009N | 260°C                                | 30 seconds           | 3                 |

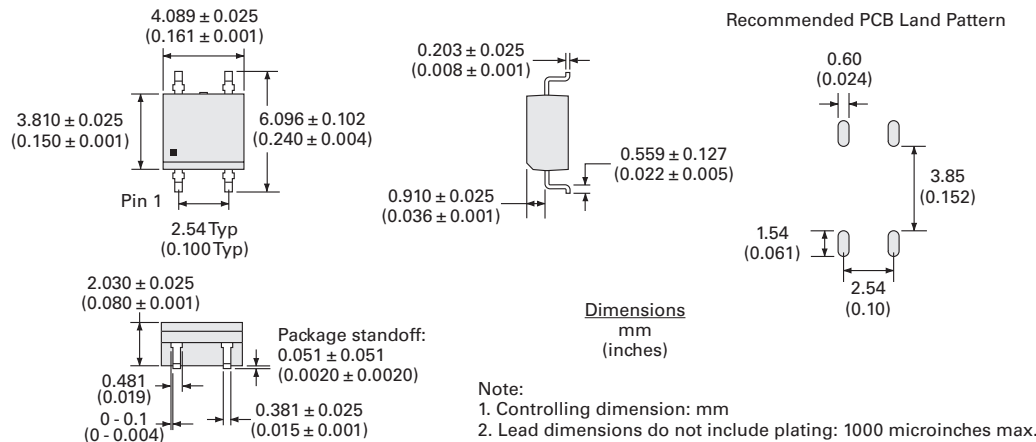
### Board Wash

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.

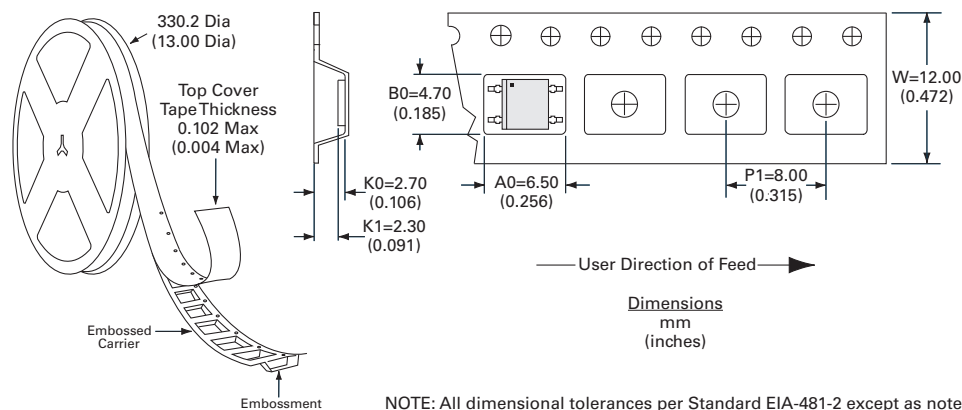


## MECHANICAL DIMENSIONS

### CPC1009N



### CPC1009NTR Tape & Reel



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