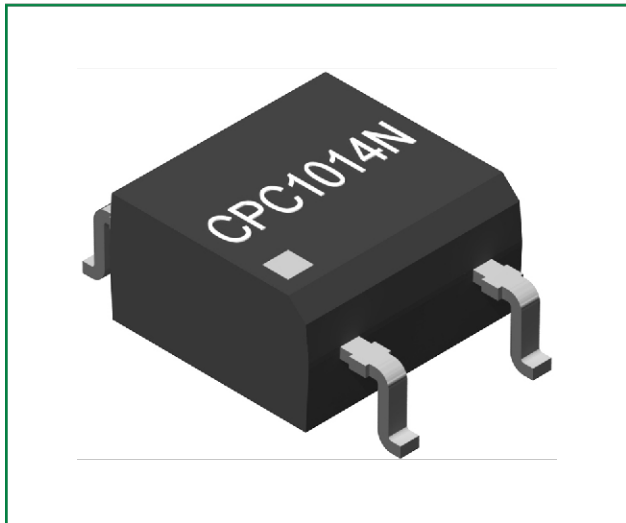


# CPC1014N

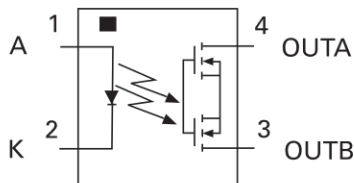
60V, 400 mA<sub>RMS</sub> / mA<sub>DC</sub> 1-Form-A SSR

## Key Attributes

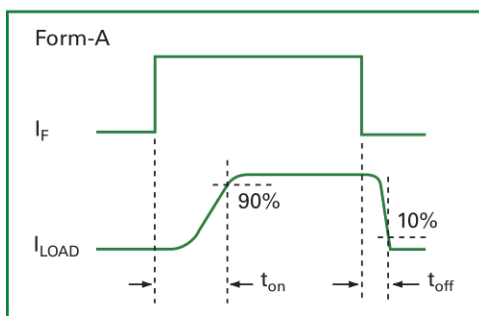
Characteristic	Rating	Unit
Blocking Voltage	60	V <sub>P</sub>
Load Current	400	mA <sub>RMS</sub> / mA <sub>DC</sub>
On-resistance (max)	2	Ω
LED Current to Operate	2	mA



## Pin Configuration



## Switching Characteristics of Normally Open Devices



## Description



The CPC1014N is a miniature single-pole, normally-open (1-Form-A) 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 super efficient MOSFET switches and photovoltaic die use Littelfuse's patented OptoMOS architecture. The optically coupled output is controlled by a highly efficient infrared LED.

Littelfuse's state of the art, double-molded vertical construction packaging makes the CPC1014N one of the world's smallest relays. It offers board space savings over the competitor's larger 4-pin SOP relay.

## Features

- Designed for use in security systems complying with EN 50130-4
- 1500V<sub>RMS</sub> Input/Output Isolation
- Small 4-Pin SOP Package
- No EMI/RFI Generation
- Immune to radiated EM fields
- Tape & Reel Version

## Applications

- Security
  - Passive Infrared Detectors (PIR)
  - Data Signalling
  - Sensor Circuitry
- Instrumentation
  - Multiplexers
  - Data Acquisition
  - Electronic Switching
  - I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Medical Equipment—Patient/Equipment Isolation
- Industrial Controls

## Approvals

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

## Ordering Information

Part Number	Description
CPC1014N	4-Pin SOP (100/tube)
CPC1014NTR	4-Pin SOP (2000/Reel)

## Specifications

### Absolute Maximum Ratings

Parameter	Ratings	Units
Blocking Voltage	60	V <sub>P</sub>
Reverse Input Voltage	5	V
Input Control Current	50	mA
Peak (10 ms)	1	A
Input Power Dissipation	70	mW
Total Power Dissipation <sup>1</sup>	400	
Isolation Voltage, Input to Output (60 s)	1500	V <sub>RMS</sub>
Operating Temperature, Ambient	-40 to +85	°C
Storage Temperature	-40 to +125	

<sup>1</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

Parameter	Conditions	Symbol	Value			Units
			Minimum	Typical	Maximum	
<b>Output Characteristics</b>						
Blocking voltage	I <sub>L</sub> = 1 μA	V <sub>DRM</sub>	60	-	-	V
Load current:						
Continuous <sup>1</sup>	I <sub>F</sub> = 2 mA	I <sub>L</sub>	-	-	400	mA <sub>RMS</sub> /mA <sub>DC</sub>
Peak	t ≤ 10 ms	I <sub>LPK</sub>	-	-	±1	A <sub>P</sub>
On-resistance <sup>2</sup>	I <sub>F</sub> = 2 mA, I <sub>L</sub> = 400 mA	R <sub>ON</sub>	-	-	2	Ω
Off-state leakage current	V <sub>L</sub> = 60V	I <sub>LEAK</sub>	-	-	1	μA
Switching speeds:						
Turn-on	I <sub>F</sub> = 5 mA, V <sub>L</sub> = 10V	t <sub>on</sub>	-	0.47	2	ms
Turn-off		t <sub>off</sub>	-	0.22	1	
Output capacitance	I <sub>F</sub> = 0 mA, V <sub>L</sub> = 50V, f = 1 MHz	C <sub>OUT</sub>	-	25	-	pF
<b>Input Characteristics</b>						
Input control current to activate <sup>3</sup>	I <sub>L</sub> = 400 mA	I <sub>F</sub>	-	0.25	2	mA
Input control current to deactivate	-	I <sub>F</sub>	0.1	0.2	-	
Input voltage drop	I <sub>F</sub> = 5 mA	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 = 1 MHz	C <sub>IO</sub>	-	1	-	pF

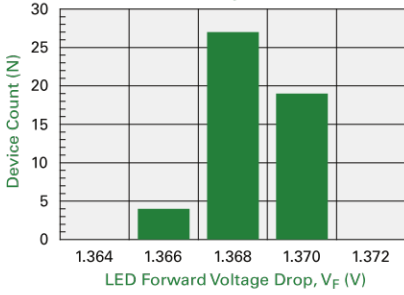
<sup>1</sup> Load current derates linearly from 400 mA @ 25 °C to 200 mA @ 85 °C.

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

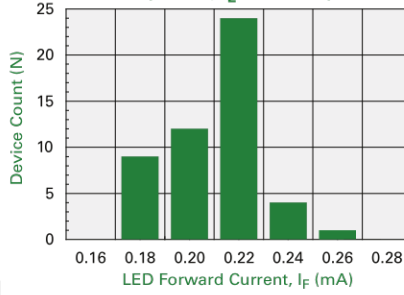
<sup>3</sup> For applications requiring operation greater than 60 °C, a minimum LED drive current of 4 mA is recommended.

### Characteristic Curves

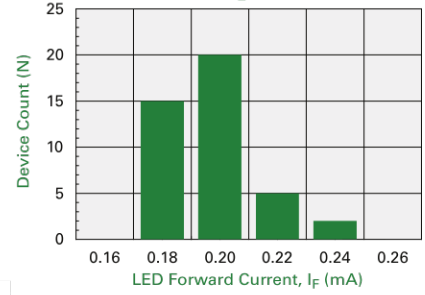
**Typical LED Forward Voltage Drop**  
(N = 50, I<sub>F</sub> = 5 mA)



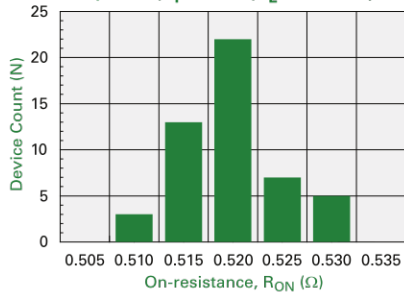
**Typical I<sub>F</sub> for Switch Operation**  
(N = 50, I<sub>L</sub> = 400 mA)



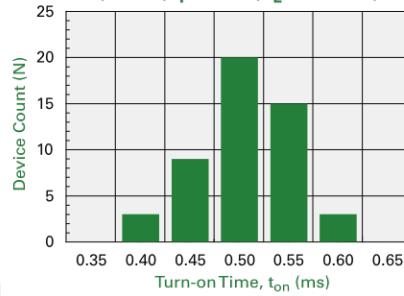
**Typical I<sub>F</sub> for Switch Dropout**  
(N = 50, I<sub>L</sub> = 400 mA)



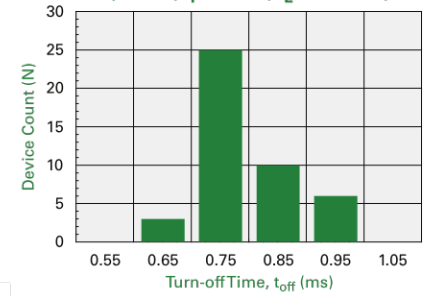
**Typical On-resistance Distribution**  
(N = 50, I<sub>F</sub> = 2 mA, I<sub>L</sub> = 400 mA)



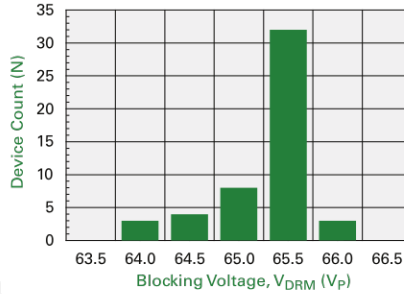
**Typical Turn-on Time**  
(N = 50, I<sub>F</sub> = 5 mA, I<sub>L</sub> = 100 mA)



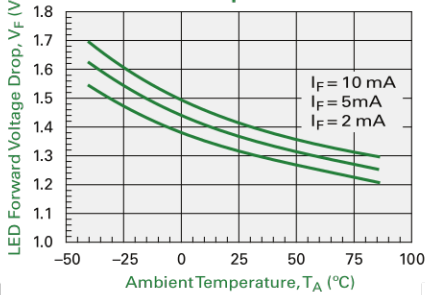
**Typical Turn-off Time**  
(N = 50, I<sub>F</sub> = 5 mA, I<sub>L</sub> = 100 mA)



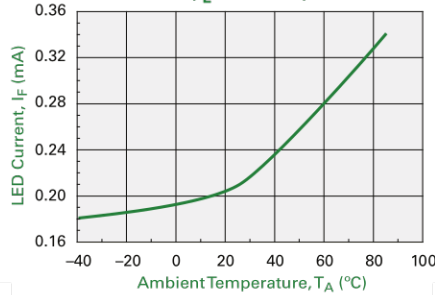
**Typical Blocking Voltage Distribution**  
(N = 50)



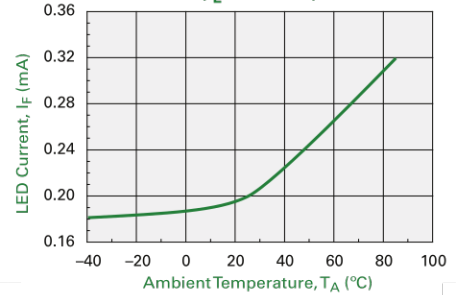
**Typical LED Forward Voltage Drop vs. Temperature**



**Typical I<sub>F</sub> for Switch Operation vs. Temperature**  
(I<sub>L</sub> = 200 mA)



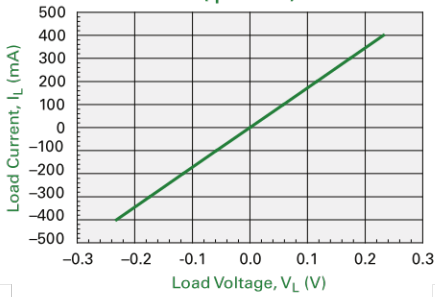
**Typical I<sub>F</sub> for Switch Dropout vs. Temperature**  
(I<sub>L</sub> = 200 mA)



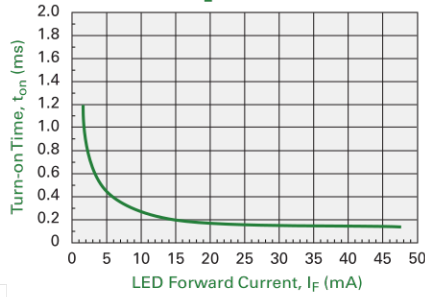
\*Unless otherwise noted, data presented in these graphs is typical of device operation at T<sub>A</sub> = 25°C.

### Characteristic Curves

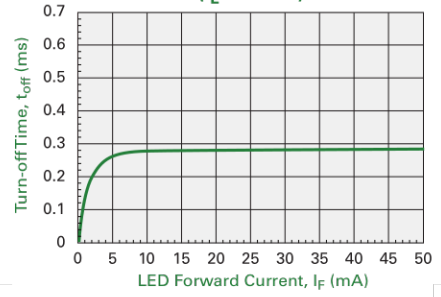
**Typical Load Current vs. Load Voltage**  
( $I_F = 2 \text{ mA}$ )



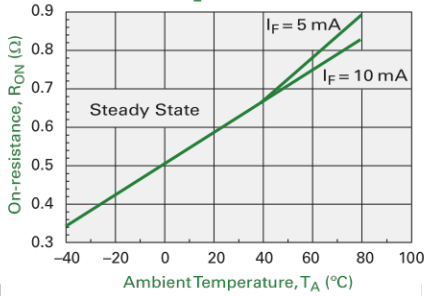
**Turn-on Time vs. LED Forward Current**  
( $I_L = 80 \text{ mA}$ )



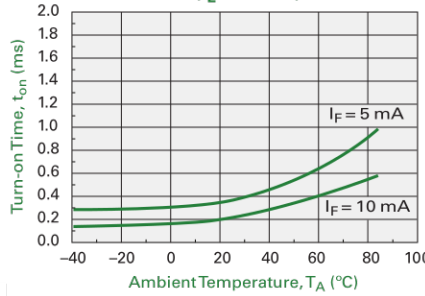
**Turn-off Time vs. LED Forward Current**  
( $I_L = 80 \text{ mA}$ )



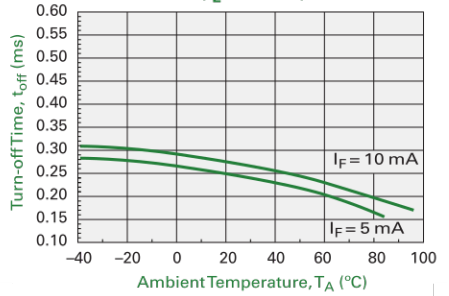
**Typical On-resistance vs. Temperature**  
( $I_L = 200 \text{ mA}$ )



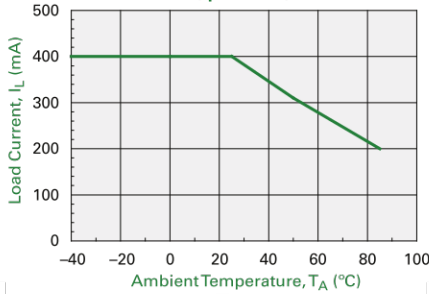
**Turn-on Time vs. Temperature**  
( $I_L = 80 \text{ mA}$ )



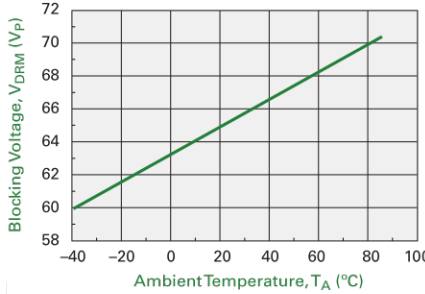
**Turn-off Time vs. Temperature**  
( $I_L = 80 \text{ mA}$ )



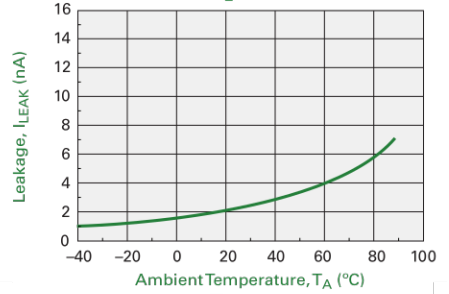
**Maximum Load Current vs. Temperature**  
( $I_F = 2 \text{ mA}$ )



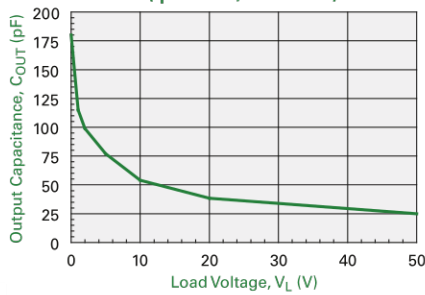
**Typical Blocking Voltage vs. Temperature**



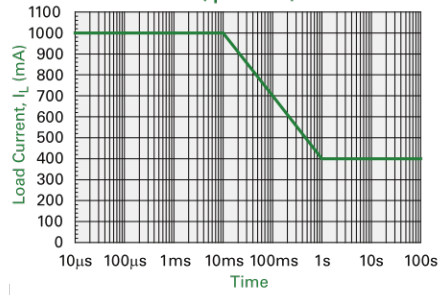
**Typical Leakage vs. Temperature**  
Measured Across Pins 3 & 4  
( $V_L = 60 \text{ V}$ )



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



**Energy Rating Curve**  
( $I_F = 2 \text{ mA}$ )



\*Unless otherwise noted, data presented in these graphs is typical of device operation at  $T_A = 25^{\circ}\text{C}$ .

## Manufacturing Information

### Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. Littelfuse classifies its plastic encapsulated devices for moisture sensitivity according to the latest revision 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 revision of the joint industry standard **IPC/JEDEC J-STD-033**.

Device	Moisture Sensitivity Level (MSL) Classification
CPC1014N	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
CPC1014N	260°C	30 seconds	3

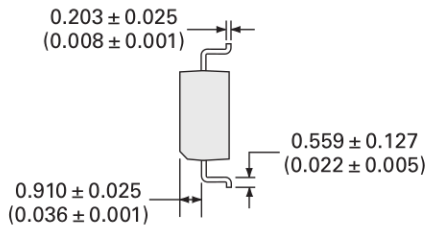
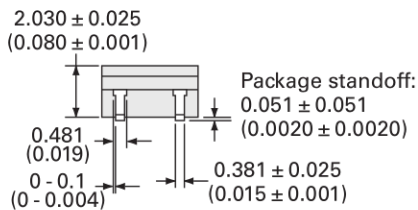
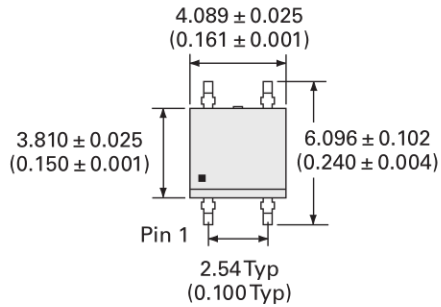
### Board Wash

Littelfuse 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.

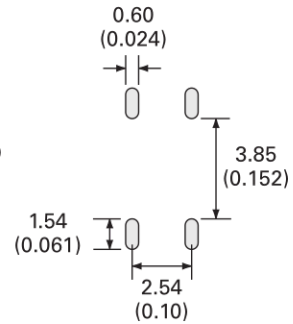


### Mechanical Dimensions

CPC1010N



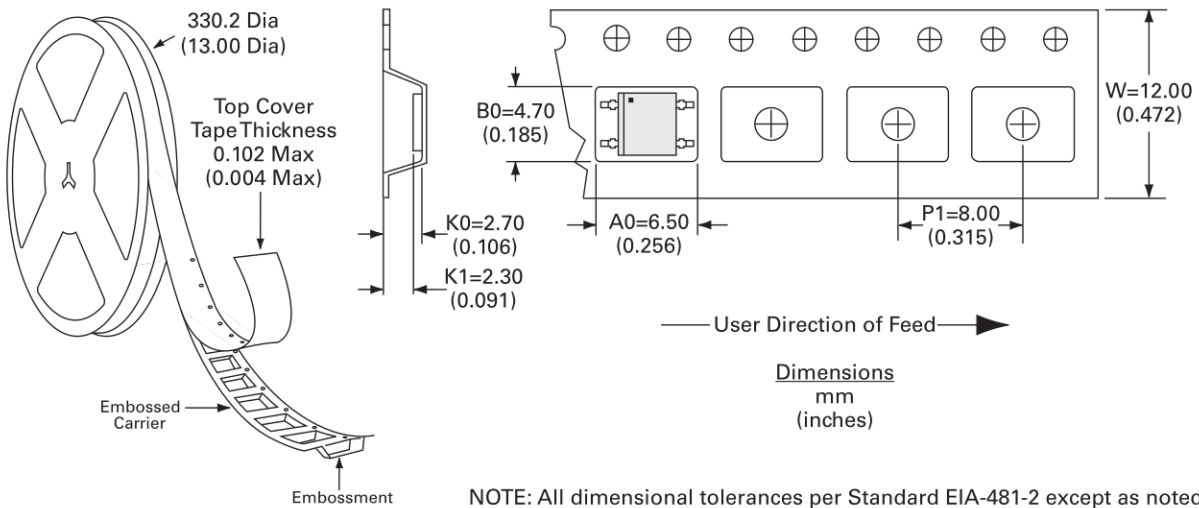
#### Recommended PCB Land Pattern



Dimensions  
mm  
(inches)

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

#### CPC1010NTR Tape & Reel Packaging



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

**Disclaimer Notice** - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <https://www.littelfuse.com/disclaimer-electronics>