# CPC1943
# Optically Coupled AC Power Switch

| Parameter | Rating | Units |
|---|---|---|
| Blocking Voltage | 400 | $V_P$ |
| Load Current | 500 | $mA_{rms}$ |
| On State Voltage Drop | 1.4 | $V_{rms}$ (at $I_L$ = 500$mA_{rms}$) |

## Features
- Load Current up to 0.5$A_{rms}$
- 400$V_P$ Blocking Voltage
- 5mA Sensitivity
- Zero-Crossing Detection
- DC Control, AC Output
- Optically Isolated
- TTL and CMOS Compatible
- Low EMI and RFI Generation
- High Noise Immunity
- Machine Insertable, Wave Solderable
- Flammability classification rating of V-0

## Applications
- Programmable Control
- Process Control
- Power Control Panels
- Remote Switching
- Gas Pump Electronics
- Contactors
- Large Relays
- Solenoids
- Motors
- Heaters

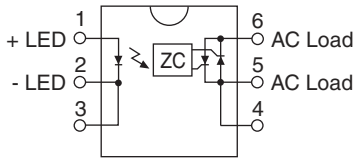
## Description
The CPC1943 is an AC Solid State Switch using optical coupling with dual power SCR outputs to produce an alternative to optocoupler and Triac circuits. The CPC1943 switches are robust enough to provide a blocking voltage of up to 400$V_P$ . In addition, tightly controlled zero cross circuitry ensures switching of AC loads without the generation of transients. The input and output circuits are optically coupled to provide 3750$V_{rms}$ of isolation and noise immunity between control and load circuits. As a result the CPC1943 is well suited for industrial environments where electromagnetic interference could disrupt the operation of electromechanical relays.

## Approvals
- UL 508 Certified Component: File E69938
- CSA Certified Component: Certificate 1172007

## Ordering Information

| Part # | Description |
|---|---|
| CPC1943G | 6-Pin Dip (50/Tube) |
| CPC1943GS | 6-Pin Surface Mount (50/Tube) |
| CPC1943GSTR | 6-Pin Surface Mount (1000/Reel) |

## Pin Configuration



## Absolute Maximum Ratings @ 25ºC

| Parameter | Ratings | Units |
|---|---|---|
| Blocking Voltage | 400 | $V_P$ |
| Reverse Input Voltage | 5 | V |
| Input Control Current | 100 | mA |
| Peak (10ms) | 1 | A |
| Input Power Dissipation[1] | 150 | mW |
| $P_{MAX}$ , Total Package Dissipation [2] | 800 | mW |
| Isolation Voltage, Input to Output | 3750 | $V_{rms}$ |
| Operational Temperature | -40 to +85 | °C |
| Storage Temperature | -40 to +125 | °C |

1 Derate linearly 1.33 mW / ºC
2 Derate linearly 6.67 mW / ºC

*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.*

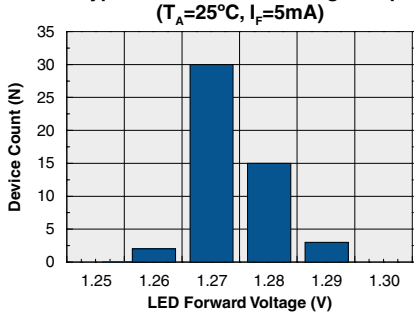
## Electrical Characteristics @ 25ºC

| Parameters | Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Output Characteristics** | | | | | | |
| Operating Voltage Range | $V_L$ | - | 20 | - | 120 | $V_{rms}$ |
| Load Current, Continuous | $V_L$=120-240$V_{rms}$ | $I_L$ | 0.005 | - | 0.5 | $A_{rms}$ |
| Off State Leakage Current | $V_L$=400$V_P$ | $I_{LEAK}$ | - | - | 1 | mA |
| On-State Voltage Drop | $I_L$=500m$A_{rms}$ | $V_{ON}$ | - | - | 1.4 | $V_{rms}$ |
| Critical Rate of Rise [3] | - | dV/dt | 1000 | - | - | V/µs |
| Switching Speeds | | | | | | |
| Turn-on | $I_F$=5 mA | $t_{on}$ | - | - | 0.5 | cycles |
| Turn-off | | $t_{off}$ | - | - | 0.5 | |
| Zero-Cross Turn-On Voltage | 1st half cycle | - | - | 2 | 10 | V |
| | Subsequent half cycle | - | - | 1 | - | V |
| Operating Frequency [1] | - | | 20 | - | 500 | Hz |
| Load Power Factor for Guaranteed Turn-On [2] | - | PF | 0.25 | - | - | - |
| **Input Characteristics** | | | | | | |
| Input Control Current [4] | - | $I_F$ | - | 0.8 | 5 | mA |
| Input Voltage Drop | $I_F$=5mA | $V_F$ | 0.9 | 1.2 | 1.4 | V |
| Input Drop-out Voltage | - | | 0.8 | - | - | V |
| Reverse Input Current | $V_R$=5V | $I_R$ | - | - | 10 | µA |
| **Common Characteristics** | | | | | | |
| Input to Output Capacitance | - | $C_{I/O}$ | - | 3 | - | pF |

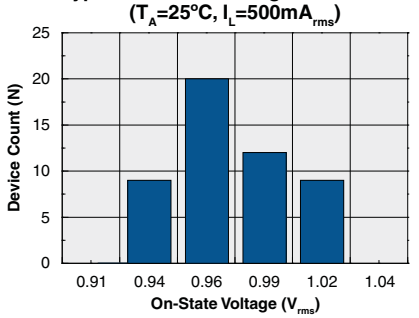
[1] Zero Cross 1st half cycle @ <100Hz
[2] Snubber circuits may be required at low power factors.
[3] Tested in accordance with EIA/NARM standard RS-443.
[4] For high noise environments, use $I_F$=10mA.

## PERFORMANCE DATA*

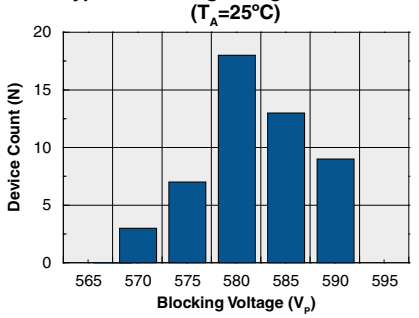
Typical LED Forward Voltage Drop ($T_A$=25°C, $I_F$=5mA)



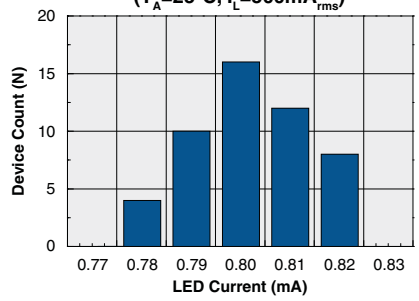

Typical On-State Voltage Distribution ($T_A$=25°C, $I_L$=500mA$_{rms}$)



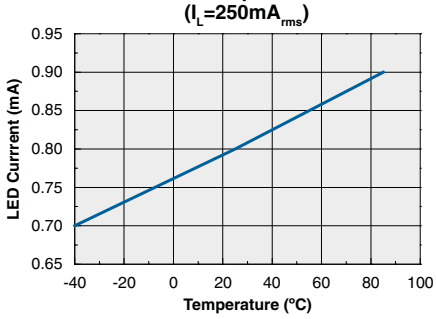

Typical Blocking Voltage Distribution ($T_A$=25°C)



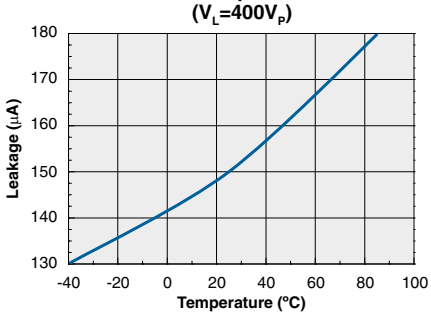

Typical $I_F$ for Switch Operation ($T_A$=25°C, $I_L$=500mA$_{rms}$)



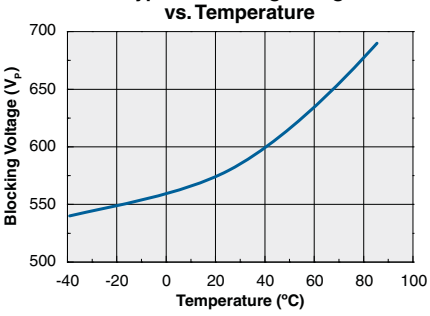

Typical $I_F$ for Switch Operation vs. Temperature ($I_L$=250mA$_{rms}$)



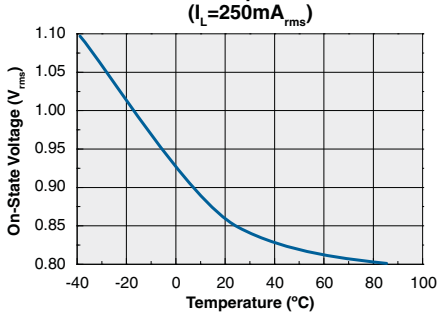

Typical Leakage Current vs. Temperature ($V_L$=400V$_p$)



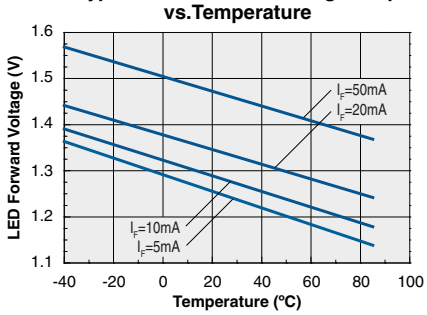

Typical Blocking Voltage vs. Temperature



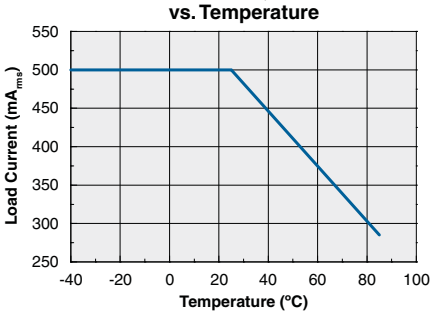

Typical On-State Voltage vs. Temperature ($I_L$=250mA$_{rms}$)



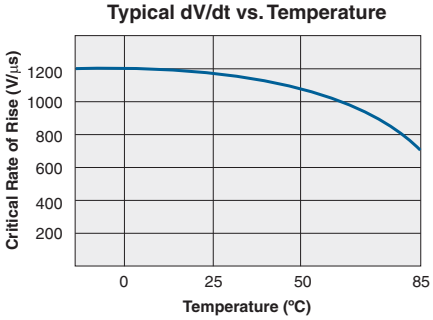

Typical LED Forward Voltage Drop vs. Temperature



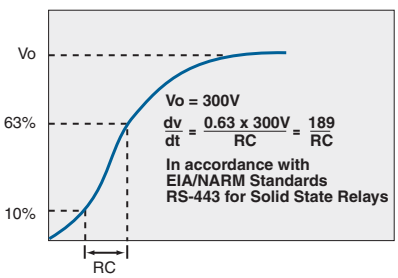

Load Current, Free Air vs. Temperature




Typical dV/dt vs. Temperature




dV/dt Method




*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

## Manufacturing Information

### Moisture Sensitivity

All plastic encapsulated semiconductor packages are susceptible to moisture ingression. Clare classified all of 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) rating** 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) Rating |
|---|---|
| CPC1943G / CPC1943GS | MSL 1 |

### ESD Sensitivity

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

### Reflow Profile

This product has a maximum body temperature and time rating as shown below. All other guidelines of **J-STD-020** must be observed.

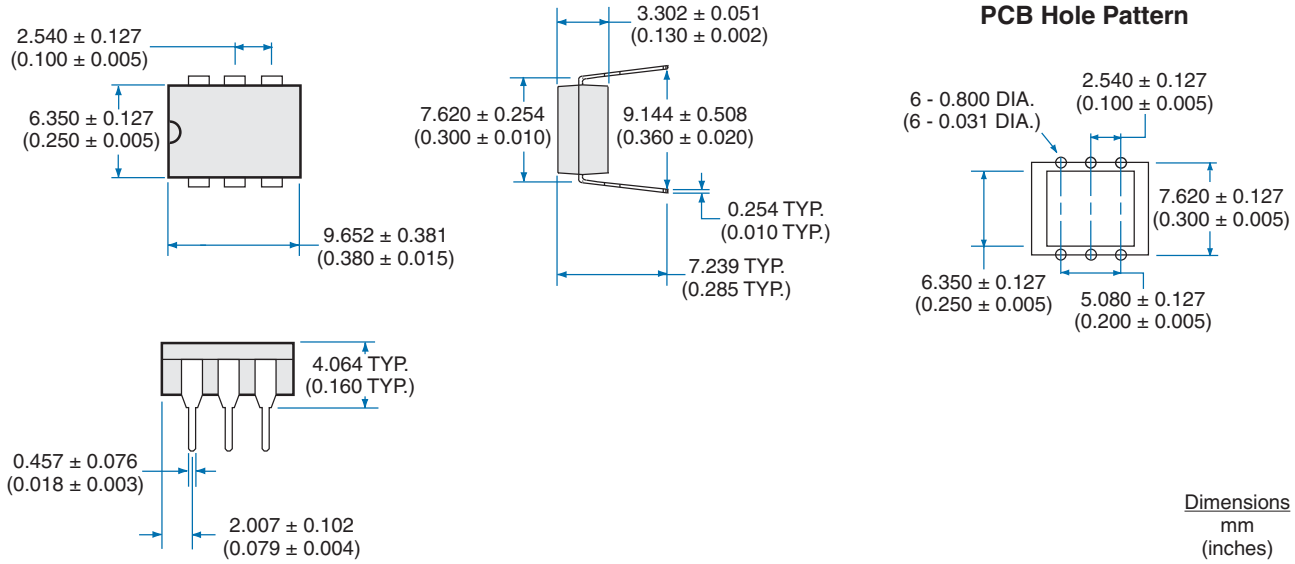
| Device | Maximum Temperature x Time |
|---|---|
| CPC1943G / CPC1943GS | 250°C for 30 seconds |

### Board Wash

Clare recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable. Since Clare employs the use of silicone coating as an optical waveguide in many of its optically isolated products, the use of a short drying bake could be necessary if a wash is used after solder reflow processes. Chlorine- or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.

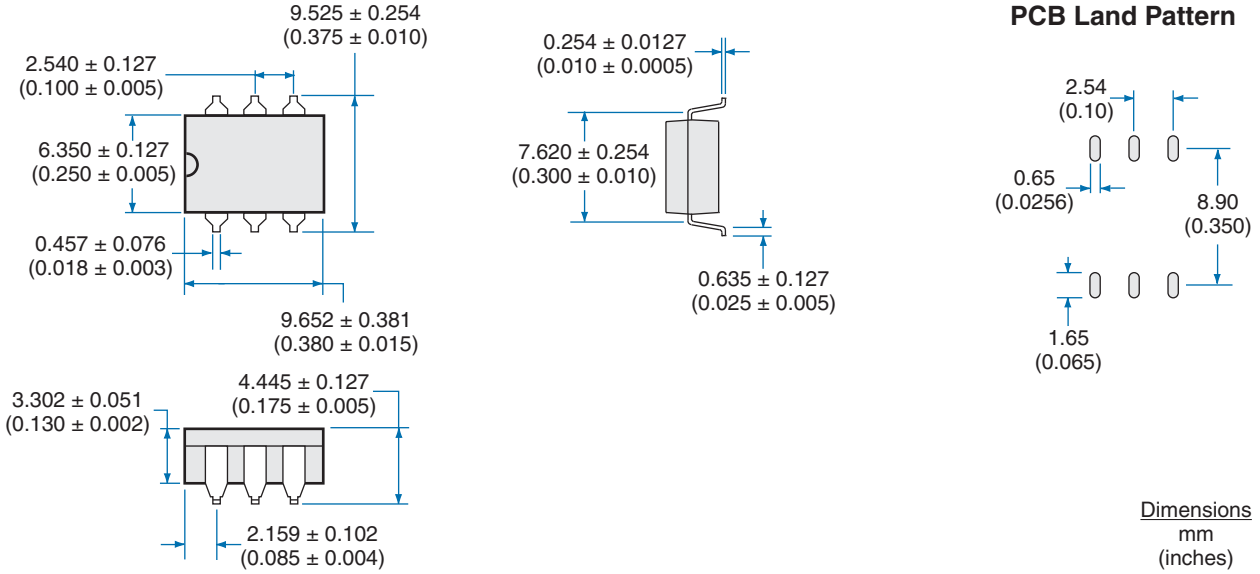
## MECHANICAL DIMENSIONS

### CPC1943G



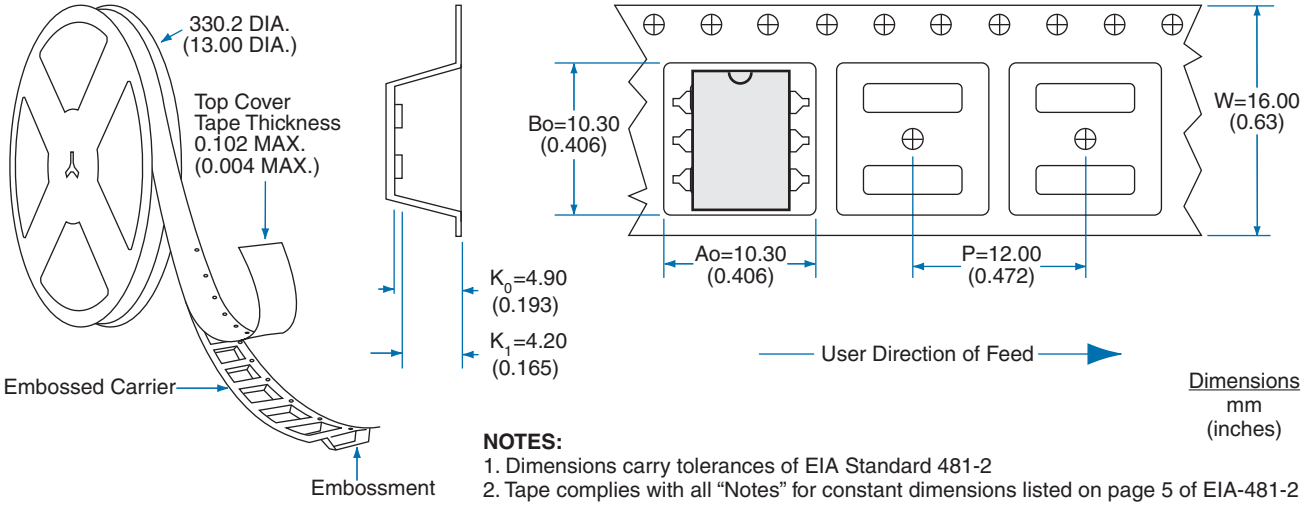

Dimensions
mm
(inches)

### CPC1943GS




Dimensions
mm
(inches)

## CPC1943GS Tape & Reel




**NOTES:**
1. Dimensions carry tolerances of EIA Standard 481-2
2. Tape complies with all "Notes" for constant dimensions listed on page 5 of EIA-481-2

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