



| Parameter | Rating | Units |
|--------------------------------------|--------|--------------------|
| Blocking Voltage | 1000 | V_p |
| Load Current, $T_A=25^\circ\text{C}$ | 1.6 | A_{rms} |
| With 5°C/W Heat Sink | | |
| No Heat Sink | 0.65 | A_{rms} |
| On-resistance | 3 | Ω |
| $R_{\theta JC}$ | 0.35 | $^\circ\text{C/W}$ |

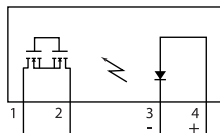
Features

- Compact i4-PAC Power Package
- Low Thermal Resistance (0.35°C/W)
- $1.6A_{rms}$ Load Current with 5°C/W Heat Sink
- Electrically Non-conductive Thermal Pad for Heat Sink Applications
- Low Drive Power Requirements
- Arc-Free With No Snubbing Circuits
- $2500V_{rms}$ Input/Output Isolation
- No EMI/RFI Generation
- Machine Insertable, Wave Solderable

Applications

- Industrial Controls
- Motor Control
- Robotics
- Medical Equipment—Patient/Equipment Isolation
- Instrumentation
 - Multiplexers
 - Data Acquisition
 - Electronic Switching
 - I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Transportation Equipment
- Aerospace/Defense

Pin Configuration



Description

Clare and IXYS have combined to bring OptoMOS® technology, reliability and compact size to a new family of high power Solid State Relays.

As part of this family, the CPC1986J single pole normally open (1-Form-A) Solid State Power Relay is rated for up to $1.6A_{rms}$ continuous load current with a 5°C/W heat sink.

The CPC1986J employs optically coupled MOSFET technology to provide $2500V_{rms}$ of input to output isolation. The output is constructed with efficient MOSFET switches and photovoltaic die that use Clare's patented OptoMOS architecture while the input, a highly efficient GaAlAs infrared LED provides the optically coupled control. The combination of low on-resistance and high load current handling capability makes this relay suitable for a variety of high performance switching applications.

The unique i4-PAC package pioneered by IXYS allows Solid State Relays to achieve the highest load current and power ratings. This package features a unique IXYS process where the silicon chips are soft soldered onto the Direct Copper Bond (DCB) substrate instead of the traditional copper leadframe. The DCB ceramic, the same substrate used in high power modules, not only provides $2500V_{rms}$ isolation but also very low thermal resistance (0.35°C/W).

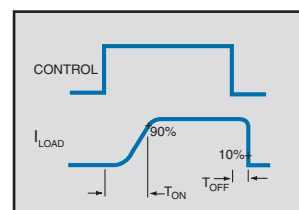
Approvals

- UL 508 Recognized Component: File # E69938

Ordering Information

| Part Number | Description |
|-------------|--------------------|
| CPC1986J | i4-PAC 25 per tube |

Switching Characteristics of Normally Open (Form A) Devices



Absolute Maximum Ratings

| Parameter | Ratings | Units |
|-----------------------------------|-------------|-----------|
| Blocking Voltage | 1000 | V_P |
| Reverse Input Voltage | 5 | V |
| Input Control Current | 100 | mA |
| Peak (10ms) | 1 | A |
| Input Power Dissipation | 150 | mW |
| Isolation Voltage Input to Output | 2500 | V_{rms} |
| Operational Temperature | -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.

Electrical absolute maximum ratings are at 25°C

Electrical Characteristics

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|--|------------------------------------|------------|-----|-----|------|---------------|
| Output Characteristics $T_A=25^\circ\text{C}$ | | | | | | |
| Load Current ¹ | | | | | | |
| Peak | $t \leq 10\text{ms}$ | I_L | - | - | 10 | A_P |
| Continuous | No Heat Sink | | | | 0.65 | A_{rms} |
| Continuous | $T_C=25^\circ\text{C}$ | | | | 6.5 | |
| Continuous | $T_C=99^\circ\text{C}$ | | | | 0.75 | |
| On-Resistance ² | $I_L = 1\text{A}, I_F=10\text{mA}$ | R_{ON} | - | 2.4 | 3 | Ω |
| Off-State Leakage Current | $V_L=1000\text{V}$ | I_{LEAK} | - | - | 1 | μA |
| Switching Speeds | | | | | | |
| Turn-On | $I_F=20\text{mA}, V_L=10\text{V}$ | T_{ON} | - | - | 20 | ms |
| Turn-Off | | T_{OFF} | - | - | 5 | |
| Output Capacitance | $V=25\text{V}, f=1\text{MHz}$ | C_{OUT} | - | 330 | - | pF |
| Input Characteristics $T_A=25^\circ\text{C}$ | | | | | | |
| Input Control Current ³ | $I_L=120\text{mA}$ | I_F | - | - | 10 | mA |
| Input Dropout Current | - | I_F | 0.6 | - | - | mA |
| Input Voltage Drop | $I_F=5\text{mA}$ | V_F | 0.9 | 1.2 | 1.4 | V |
| Reverse Input Current | $V_R=5\text{V}$ | I_R | - | - | 10 | μA |
| Common Characteristics $T_A=25^\circ\text{C}$ | | | | | | |
| Capacitance Input to Output | - | C_{IO} | - | 1 | - | pF |

¹ Higher load currents possible with proper heat sinking.

² Measurement taken within 1 second of on time.

³ For applications requiring high temperature operation (greater than 60°C) an LED drive current of 20mA is recommended.

Thermal Characteristics

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|--|------------|-----------------|-----|-----|------|-------|
| Thermal Resistance (junction to case) | - | $R_{\theta JC}$ | - | - | 0.35 | °C/W |
| Thermal Resistance (junction to ambient) | Free air | $R_{\theta JA}$ | - | 33 | - | °C/W |
| Junction Temperature (operation) | - | T_J | -40 | - | 100 | °C |

Thermal Management

Device high current characterization was performed using Kunze heat sink P/N KU-159. The heat sink was secured using Kunze transistor clip KU-499. Between the device and heat sink, Kunze's phase change thermal conductive interface material, part number KU-ALF5 was used.

Heat Sink Calculation

Higher load currents are possible by using lower thermal resistance heat sink combinations.

Heat Sink Rating

$$R_{\theta CA} = \frac{(T_J - T_A) I_{L(99)}^2}{I_L^2 \cdot P_{D(99)}} - R_{\theta JC}$$

T_J = Junction Temperature (°C), $T_J \leq 100^\circ\text{C}$ *

T_A = Ambient Temperature (°C)

$I_{L(99)}$ = Load Current with Case Temperature @ 99°C (A_{DC})

I_L = Desired Operating Load Current (A_{DC}), $I_L \leq I_{L(MAX)}$

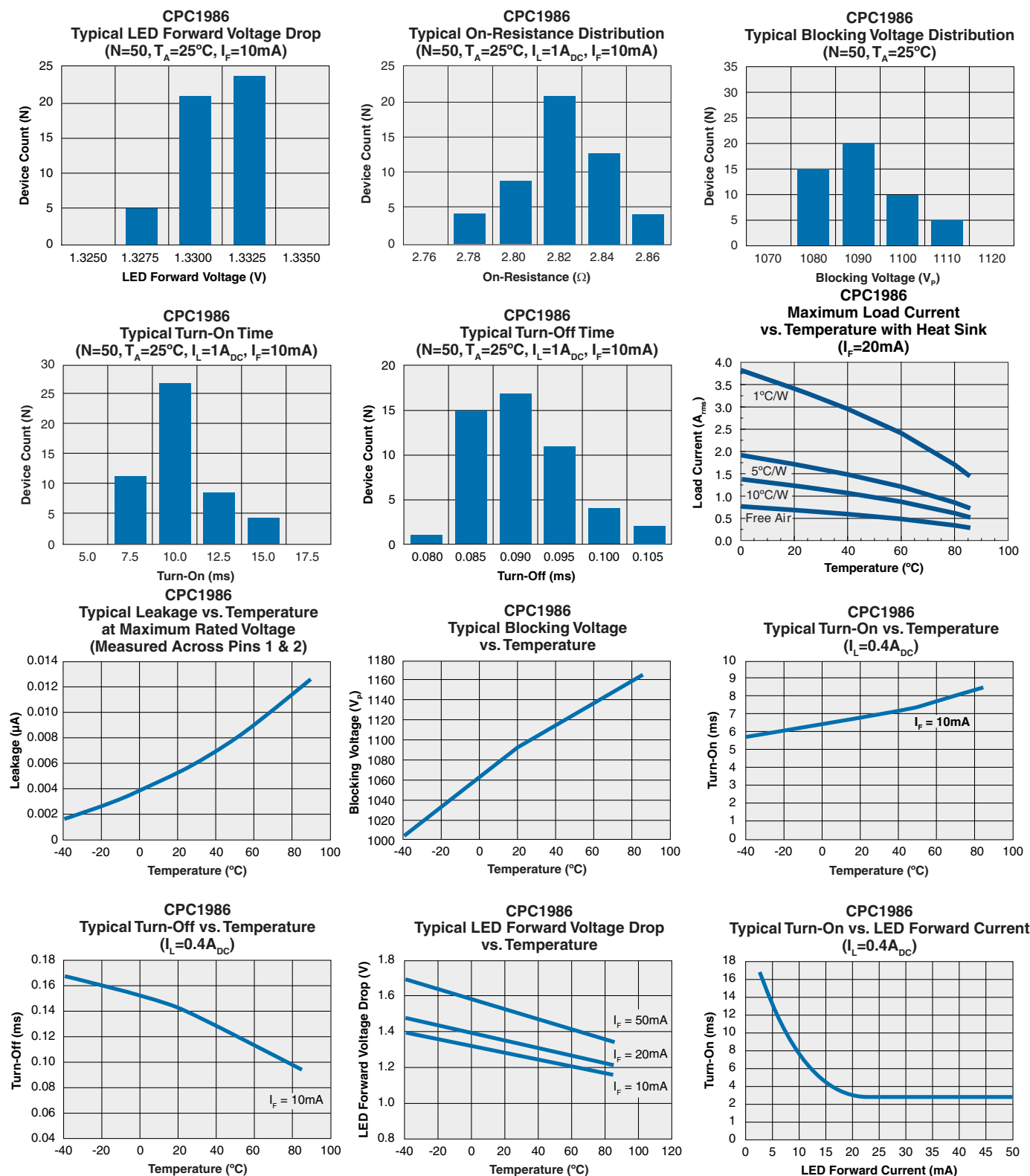
$R_{\theta JC}$ = Thermal Resistance, Junction to Case (°C/W) = 0.35°C/W

$R_{\theta CA}$ = Thermal Resistance of Heat Sink & Thermal Interface Material, Case to Ambient (°C/W)

$P_{D(99)}$ = Maximum power dissipation with case temperature held at 99°C = 2.86W

* Elevated junction temperature reduces semiconductor lifetime.

PERFORMANCE DATA*

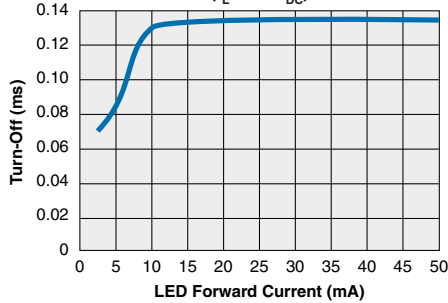


Unless otherwise specified, all performance data was acquired without the use of a heat sink.

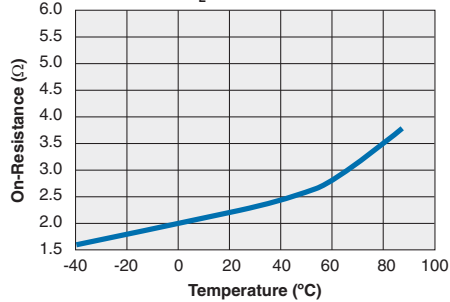
*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

PERFORMANCE DATA*

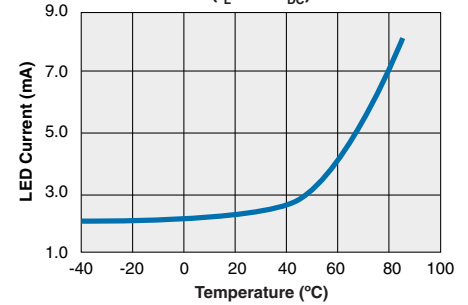
CPC1986
Typical Turn-Off vs. LED Forward Current
($I_L = 0.4A_{DC}$)



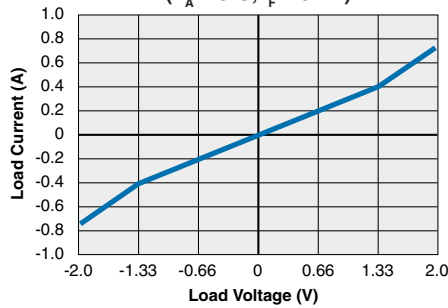
CPC1986
Typical On-Resistance vs. Temperature
($I_L = \text{max rated}$)



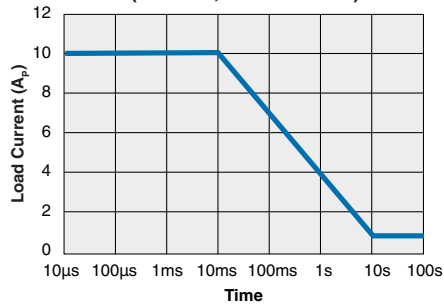
CPC1986
Typical I_F for Switch Operation
vs. Temperature
($I_L = 0.4A_{DC}$)



CPC1986
Typical Load Current vs. Load Voltage
($T_A = 25^\circ\text{C}$, $I_F = 10\text{mA}$)



CPC1986
Energy Rating Curve
(Free Air, No Heat Sink)



Unless otherwise specified, all performance data was acquired without the use of a heat sink.

*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.

Soldering

Washing



i4-PAC Package



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Specification: DS-CPC1986-R05
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7/18/08