CPC1986
i4-PAC™ Power Relay

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

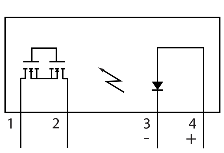
Features

- 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



RoHS 2002/95/EC

e3

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).

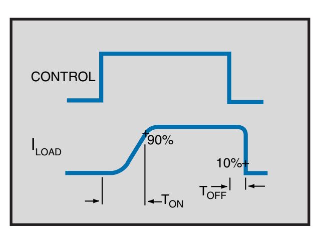
Approvals

- UL recognized component: File # E69938
- Certified to: UL 508

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

Electrical absolute maximum ratings are at 25°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 Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Output Characteristics	**T_A=25°C**					
Load Current [1]						
Peak	t ≤ 10ms	I_L	-	-	10	A_P
Continuous	No Heat Sink				0.65	A_{rms}
Continuous	T_C=25°C				6.5	
Continuous	T_C=99°C	$I_{L(99)}$			0.75	
On-Resistance [2]	I_L = 1A, I_F=10mA	R_{ON}	-	2.4	3	Ω
Off-State Leakage Current	V_L=1000V	I_{LEAK}	-	-	1	µA
Switching Speeds						
Turn-On	I_F=20mA, V_L=10V	T_{ON}	-	-	20	ms
Turn-Off		T_{OFF}	-	-	5	
Output Capacitance	V=25V, f=1MHz	C_{OUT}	-	330	-	pF
Input Characteristics	**T_A=25°C**					
Input Control Current [3]	I_L=120mA	I_F	-	-	10	mA
Input Dropout Current	-	I_F	0.6	-	-	mA
Input Voltage Drop	I_F=5mA	V_F	0.9	1.2	1.4	V
Reverse Input Current	V_R=5V	I_R	-	-	10	µA
Common Characteristics	**T_A=25°C**					
Capacitance Input to Output	-	$C_{I/O}$	-	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 60ºC) 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

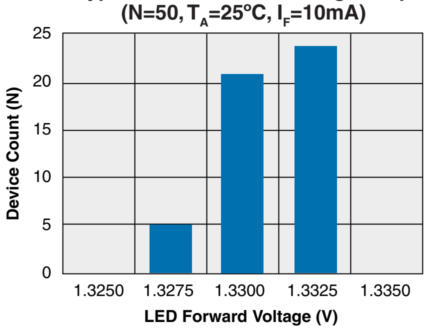
$$R_{\theta CA} = \frac{(T_J - T_A)\, I_{L(99)}^{\,2} \cdot R_{\theta JC}}{I_L^{\,2}} - R_{\theta JC}$$

T_J = Junction Temperature (°C), $T_J \leq 100°C$ *
T_A = Ambient Temperature (°C)
$I_{L(99)}$ = Load Current with Case Temperature @ 99°C (A_{rms})
I_L = Desired Operating Load Current (A_{rms}), $I_L \leq I_{L(MAX)}$
$R_{\theta JC}$ = 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)

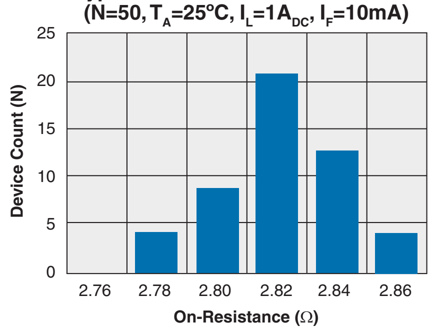
* Elevated junction temperature reduces semiconductor lifetime.

PERFORMANCE DATA*

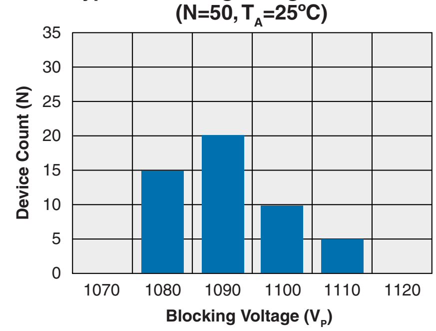
CPC1986
Typical LED Forward Voltage Drop
(N=50, T_A=25°C, I_F=10mA)



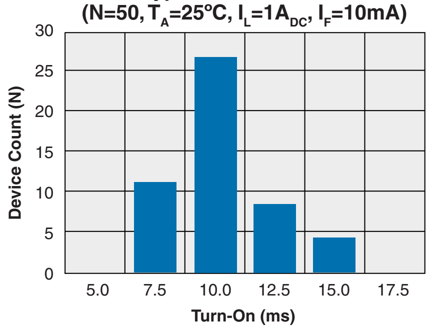
CPC1986
Typical On-Resistance Distribution
(N=50, T_A=25°C, I_L=1A_{DC}, I_F=10mA)



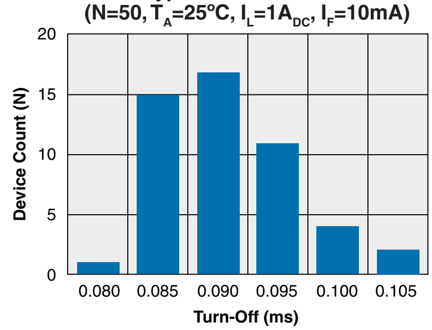
CPC1986
Typical Blocking Voltage Distribution
(N=50, T_A=25°C)



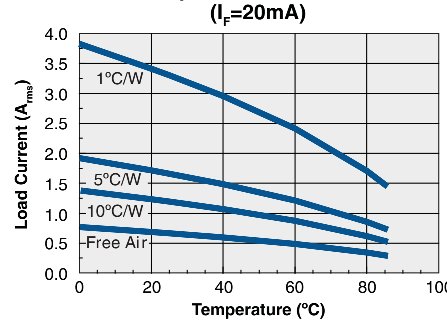
CPC1986
Typical Turn-On Time
(N=50, T_A=25°C, I_L=1A_{DC}, I_F=10mA)



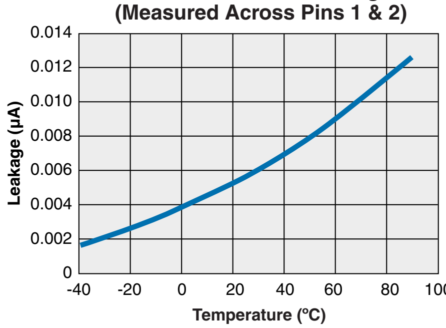
CPC1986
Typical Turn-Off Time
(N=50, T_A=25°C, I_L=1A_{DC}, I_F=10mA)



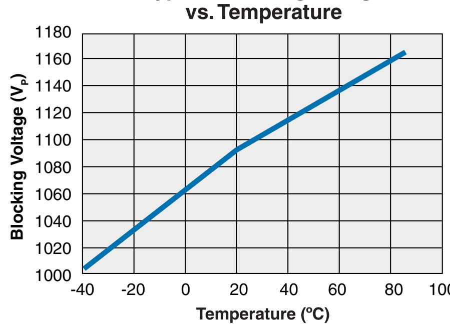
CPC1986
Maximum Load Current
vs. Temperature with Heat Sink
(I_F=20mA)



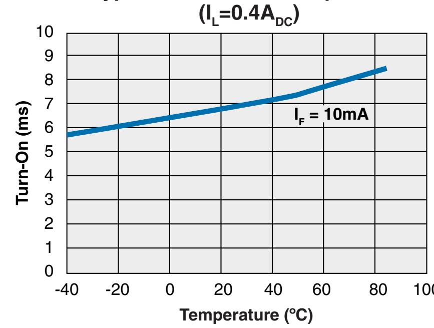
CPC1986
Typical Leakage vs. Temperature
at Maximum Rated Voltage
(Measured Across Pins 1 & 2)



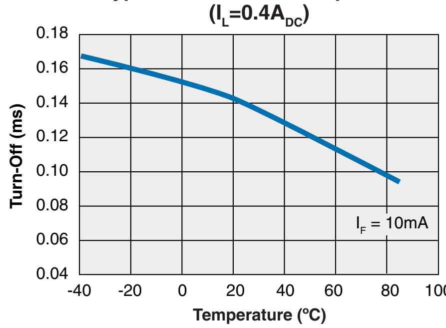
CPC1986
Typical Blocking Voltage
vs. Temperature



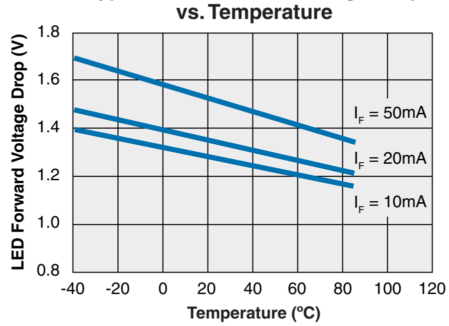
CPC1986
Typical Turn-On vs. Temperature
(I_L=0.4A_{DC})



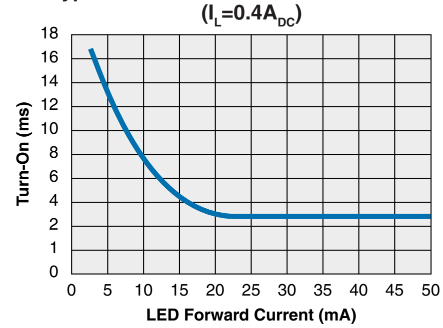
CPC1986
Typical Turn-Off vs. Temperature
(I_L=0.4A_{DC})



CPC1986
Typical LED Forward Voltage Drop
vs. Temperature



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

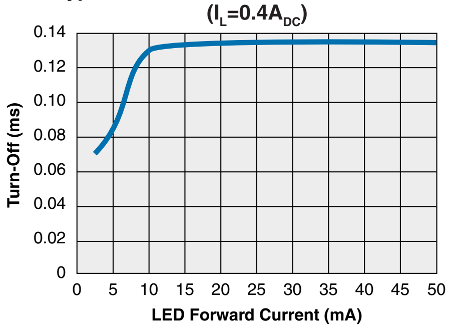


Unless otherwise specified, all performance data was acquired without the use of a heat sink.

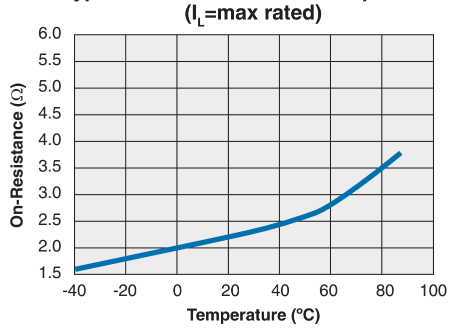
*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

PERFORMANCE DATA*

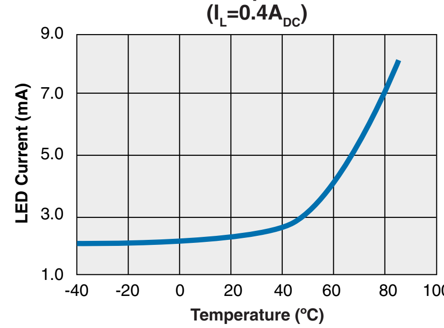
CPC1986
Typical Turn-Off vs. LED Forward Current
(I_L=0.4A_{DC})



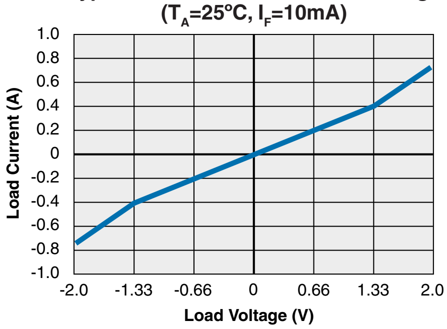
CPC1986
Typical On-Resistance vs. Temperature
(I_L=max rated)



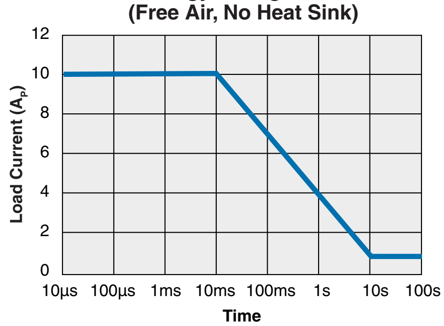
CPC1986
Typical I_F for Switch Operation
vs. Temperature
(I_L=0.4A_{DC})



CPC1986
Typical Load Current vs. Load Voltage
(T_A=25ºC, I_F=10mA)



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



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*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

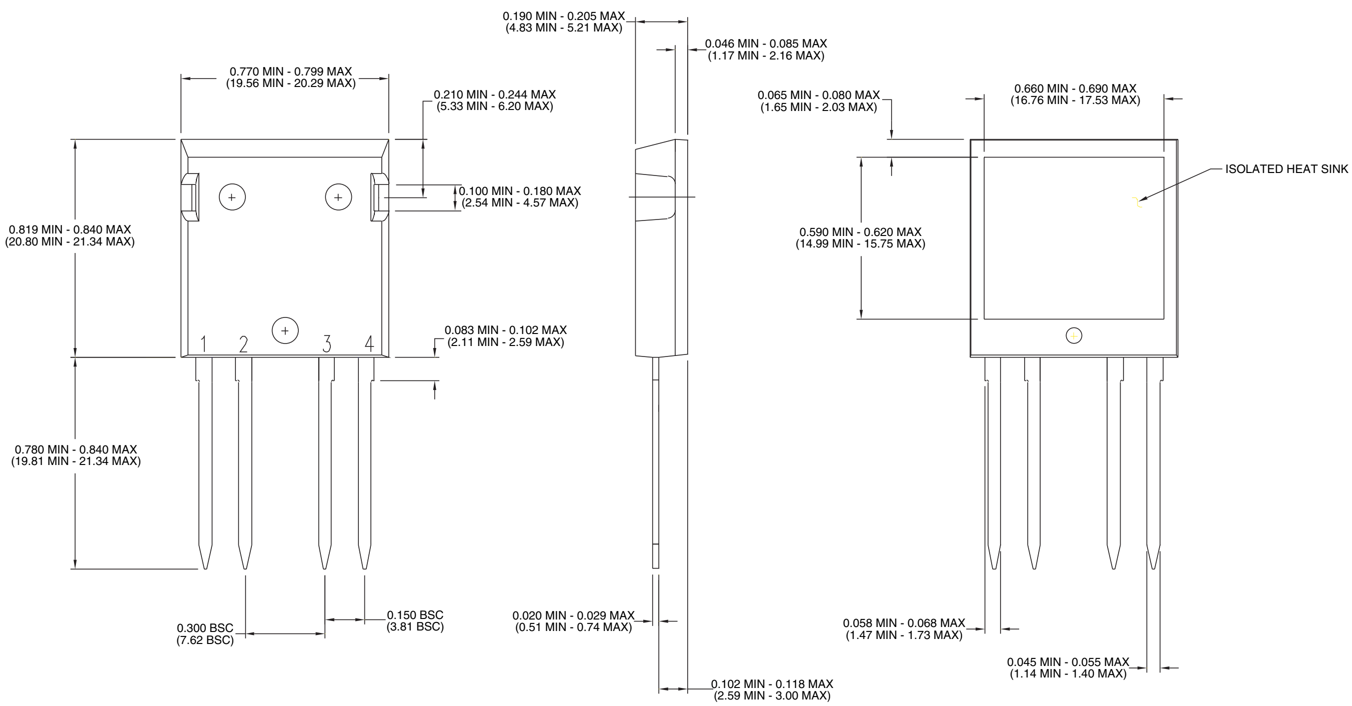
Soldering

For proper assembly, the component must be processed in accordance with the current revision of IPC/JEDEC standard J-STD-020. Failure to follow the recommended guidelines may cause permanent damage to the device resulting in impaired performance and/or a reduced lifetime expectancy.

Washing

Clare does not recommend ultrasonic cleaning or the use of chlorinated solvents.

MECHANICAL DIMENSIONS



NOTE: Bottom heatsink meets 2500V_{rms} isolation to the other pins.

Dimensions
inches
(mm)

For additional information please visit our website at: www.clare.com

Specification: DS-CPC1986-R04

3/22/07