

Parameter	Rating	Units
Blocking Voltage	1000	V _P
Load Current		A _{DC}
With 5°C/W Heat Sink	2.45	
No Heat Sink	1.0	
On-resistance (Max)	1.25	Ω
R _{θJC}	0.3	°C/W

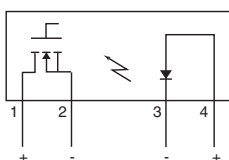
Features

- 100% Solid State
- Compact ISOPLUS-264 Power Package
- Low Thermal Resistance (0.3°C/W)
- 2.45A_{DC} 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 new family, the CPC1788 single-pole, normally open (1-Form-A) DC Solid State Relay employs optically coupled MOSFET technology to provide 2500V_{rms} of input to output isolation.

The output is constructed with an efficient MOSFET switch and photovoltaic die that uses Clare's patented OptoMOS architecture while the input 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 DC switching applications.

The unique ISOPLUS-264 package pioneered by IXYS allows solid state relays to achieve the highest load current and power ratings. This package features an IXYS unique process where the silicon chips are soft soldered onto the Direct Copper Bond (DCB) substrate instead of the usual 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 (0.3°C/W).

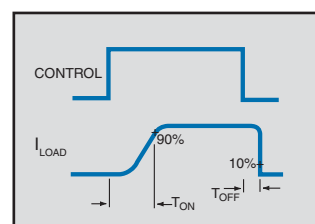
Approvals

- UL 508 Recognized Component: File # E69938

Ordering Information

Part Number	Description
CPC1788J	ISOPLUS-264 (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 _{DC}
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	-	-	12	A _P
Continuous	No Heat Sink				1	A _{DC}
Continuous	T _C =25°C				10.3	
Continuous	T _C =99°C	I _{L(99)}			1.2	
On-Resistance ²	I _F =10mA, I _L =1A	R _{ON}	-	1.0	1.25	Ω
Off-State Leakage Current	V _L =1000V _P	I _{LEAK}	-	-	1	μA
Switching Speeds						
Turn-On	I _F =20mA, V _L =10V	T _{ON}	-	2.85	20	ms
Turn-Off		T _{OFF}	-	0.11	5	
Output Capacitance	V=25V, f=1MHz	C _{OUT}	-	640	-	pF
Input Characteristics T_A=25°C						
Input Control Current ³	I _L =1A	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 heatsinking.

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)	-	$R_{\theta JC}$	-	-	0.3	°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 KU 1-159, phase change thermal interface material KU-ALC 5, and transistor clip KU 4-499/1. This combination provided an approximate junction-to-ambient thermal resistance of 12.5°C/W.

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) = 0.3°C/W

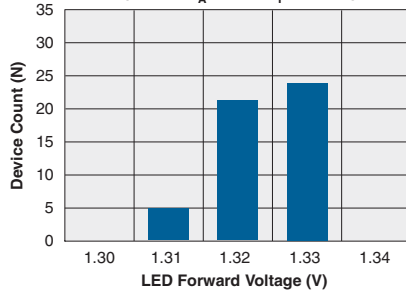
$R_{\theta CA}$ = Thermal Resistance of Heat Sink & Thermal Interface Material, Case to Ambient (°C/W)

$P_{D(99)}$ = Maximum power dissipation with case temperature held at 99°C = 3.33W

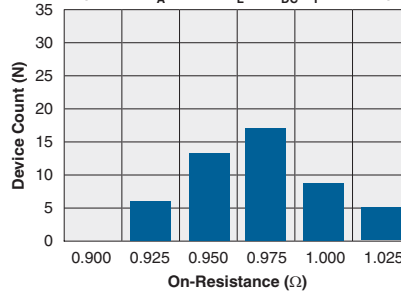
* Elevated junction temperature reduces semiconductor lifetime.

PERFORMANCE DATA*

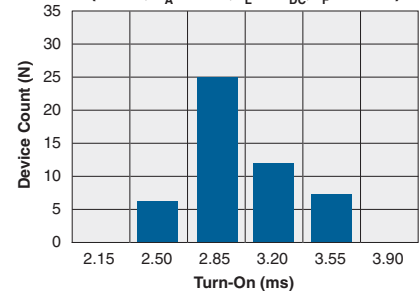
CPC1788
 Typical LED Forward Voltage Drop
 (N=50, $T_A=25^\circ\text{C}$, $I_F=10\text{mA}$)



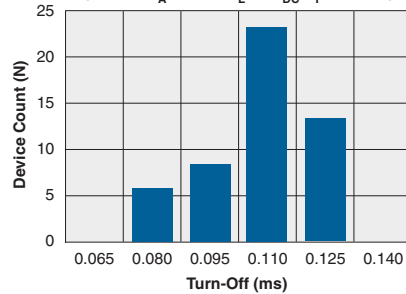
CPC1788
 Typical On-Resistance Distribution
 (N=50, $T_A=25^\circ\text{C}$, $I_L=1\text{A}_{DC}$, $I_F=10\text{mA}$)



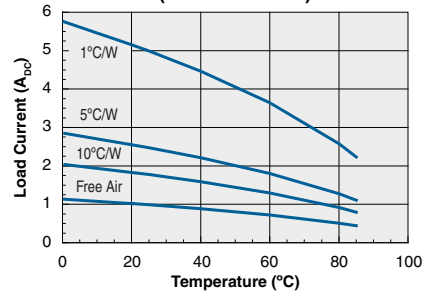
CPC1788
 Typical Turn-On Time
 (N=50, $T_A=25^\circ\text{C}$, $I_L=1\text{A}_{DC}$, $I_F=20\text{mA}$)



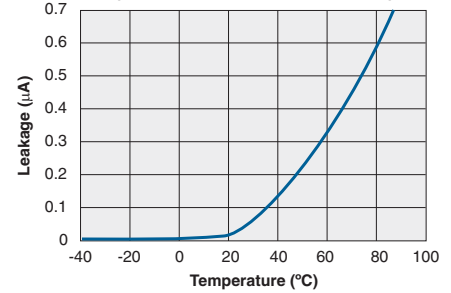
CPC1788
 Typical Turn-Off Time
 (N=50, $T_A=25^\circ\text{C}$, $I_L=1\text{A}_{DC}$, $I_F=20\text{mA}$)



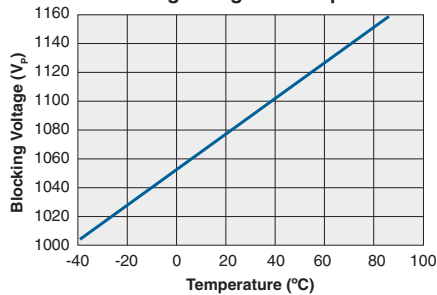
CPC1788
 Maximum Load Current vs. Temperature
 (With Heat Sink)



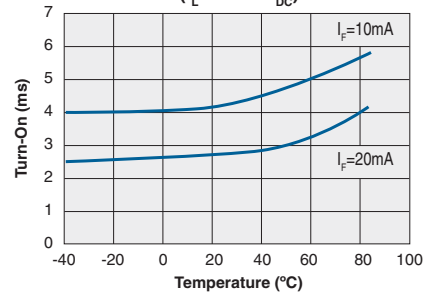
CPC1788
 Typical Leakage vs. Temperature
 at Maximum Rated Voltage
 (Measured Across Pins 1 & 2)



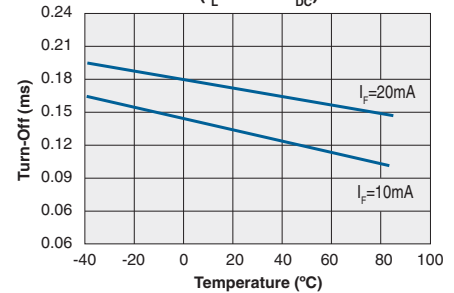
CPC1788
 Blocking Voltage vs. Temperature



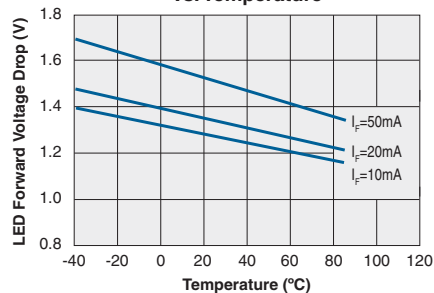
CPC1788
 Typical Turn-On vs. Temperature
 ($I_L=250\text{mA}_{DC}$)



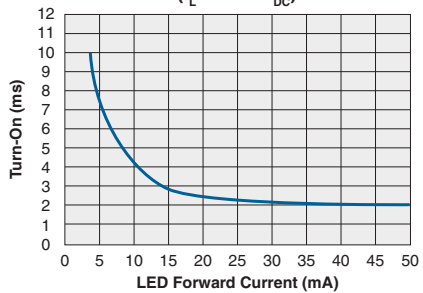
CPC1788
 Typical Turn-Off vs. Temperature
 ($I_L=250\text{mA}_{DC}$)



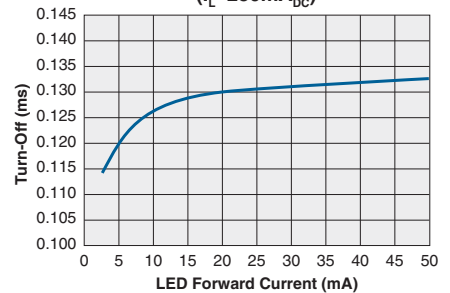
CPC1788
 Typical LED Forward Voltage Drop
 vs. Temperature



CPC1788
 Typical Turn-On vs. LED Forward Current
 ($I_L=250\text{mA}_{DC}$)



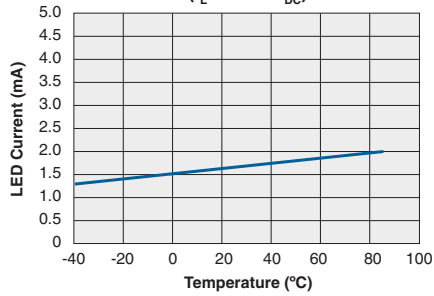
CPC1788
 Typical Turn-Off vs. LED Forward Current
 ($I_L=250\text{mA}_{DC}$)



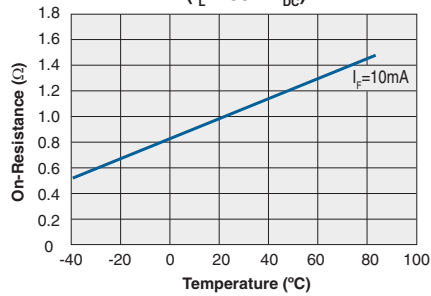
*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

PERFORMANCE DATA*

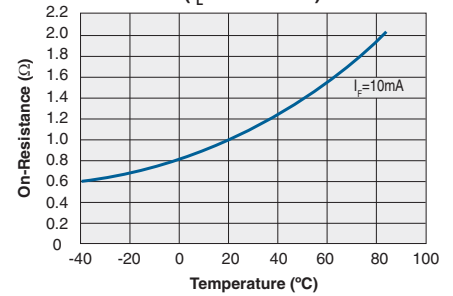
CPC1788
Typical I_F for Switch Operation
vs. Temperature
($I_L=250\text{mA}_{\text{DC}}$)



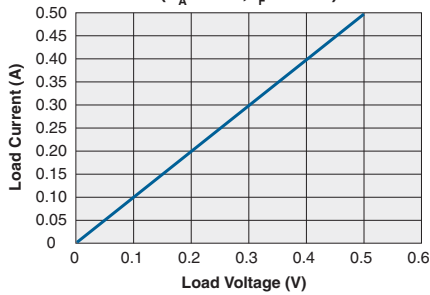
CPC1788
Typical On-Resistance vs. Temperature
($I_L=250\text{mA}_{\text{DC}}$)



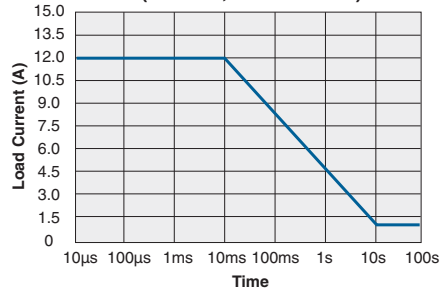
CPC1788
Typical On-Resistance vs. Temperature
($I_L=\text{Max Rated}$)



CPC1788
Typical Load Current vs. Load Voltage
($T_A=25^\circ\text{C}$, $I_F=10\text{mA}$)



CPC1788
Energy Rating Curve
(Free Air, No 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.

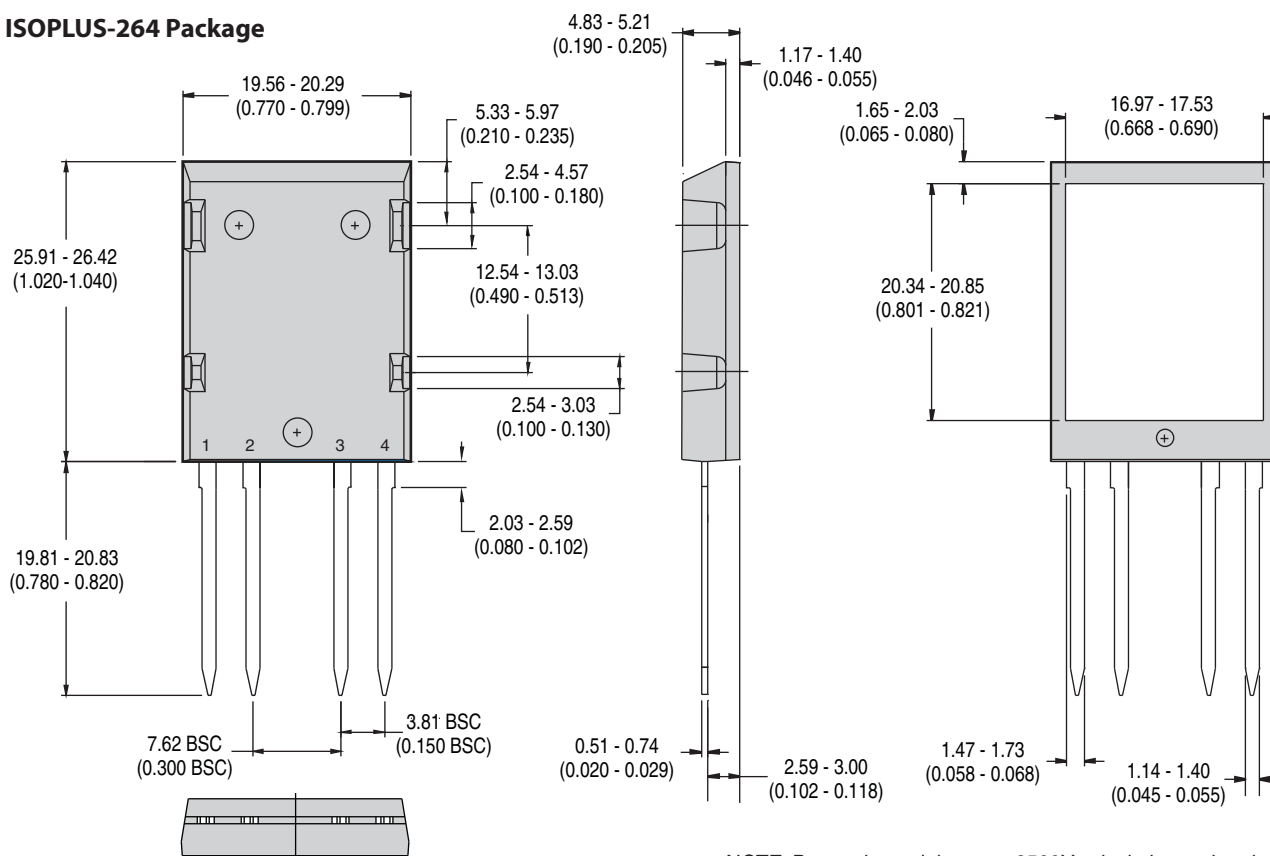
Soldering

Washing

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



ISOPLUS-264 Package



NOTE: Bottom heat sink meets 2500V_{rms} isolation to the pins.

DIMENSIONS
MIN - MAX mm
(MIN - MAX inches)

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