THE DATASHEET OF

CPC1301GRTR

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IXYS
INTEGRATED CIRCUITS DIVISION

CPC1301
Optocoupler with High-Voltage Darlington Output

Parameter	Rating	Units
Breakdown Voltage - BV_{CEO}	350	V_P
Current Transfer Ratio - CTR	1000-8000	%

Features

- $5000V_{rms}$ Input/Output Isolation
- $350V_P$ Breakdown Voltage
- Small 4-Pin Package
- Surface Mount Tape & Reel Version Available

Applications

- Telecom Switching
- Tip/Ring Circuits
- Hook Switch
- Modem Switching (Laptop, Notebook, Pocket Size)
- Loop Detect
- Ringing Detect
- Current Sensing

Description

The CPC1301 is a unidirectional input optocoupler with a high-voltage Darlington output. Light output from the highly efficient infrared LED activates the optically coupled silicon NPN photo-Darlington output transistor. The input LED and the output transistor are separated by a $5000V_{rms}$ isolation barrier.

With a LED current of only 1mA, a current transfer ratio of 1000% to 8000% is guaranteed at the collector of the 350V Darlington output transistor.

The CPC1301's low input current, high current transfer ratio, high output voltage capability, and large isolation barrier rating make it ideal for many applications such as telecom, industrial, and power control.

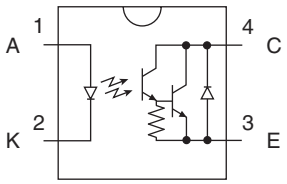
Approvals

- UL 1577 Approved Component: File E76270
- CSA Certified Component: Certificate 1172007
- EN 60950 Certified Component:
  TUV Certificate B 13 12 82667 003

Ordering Information

Part Number	Description
CPC1301G	4-Pin DIP (100/Tube)
CPC1301GR	4-Pin Surface Mount (100/Tube)
CPC1301GRTR	4-Pin Surface Mount (1000/Reel)

Pin Configuration



Pb RoHS e3

Absolute Maximum Ratings @ 25ºC

Parameter	Ratings	Units
Breakdown Voltage, BV_{CEO}	350	V_P
Reverse Input Voltage	5	V
Input Control Current	50	mA
Peak (10ms)	1	A
Input Power Dissipation [1]	150	mW
Phototransistor Power Dissipation [2]	150	mW
Isolation Voltage, Input to Output	5000	V_{rms}
Operational Temperature	-40 to +85	˚C
Storage Temperature	-40 to +125	˚C

[1] Derate linearly 1.33 mW / ºC
[2] Derate linearly 1.5 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.

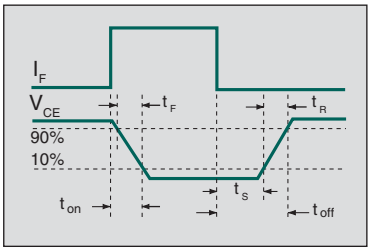
Typical values are characteristic of the device at +25°C, and are the result of engineering evaluations. They are provided for information purposes only, and are not part of the manfacturing testing requirements.

Electrical Characteristics @ 25ºC

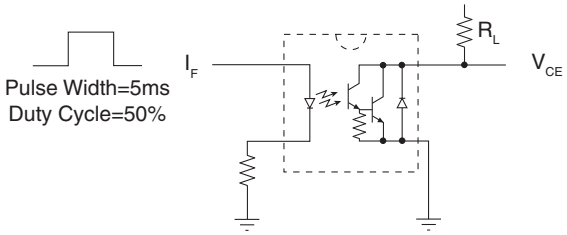
Parameters	Conditions	Symbol	Min	Typ	Max	Units
Output Characteristics						
Phototransistor Breakdown Voltage	I_{CEO}=100µA	BV_{CEO}	350	-	-	V_P
Emitter-Collector Breakdown Voltage	I_E=0.1mA	BV_{ECO}	0.3	-	-	V
Phototransistor Output (Dark) Current	V_{CEO}=200V, I_F=0mA	I_{CEO}	-	-	100	nA
Saturation Voltage	I_C=10mA, I_F=1mA	$V_{CE(Sat)}$	-	-	1	V
	I_C=100mA, I_F=10mA		-	-	1.2	
Current Transfer Ratio	I_F=1mA, V_{CE}=1V	CTR	1000	5500	8000	%
Output Capacitance	V_{CEO}=50V, f=1MHz	C_{OUT}	-	13	-	pF
Input Characteristics						
Input Control Current	I_C=10mA, V_{CE}=1V	I_F	-	0.07	1	mA
Input Voltage Drop	I_F=5mA	V_F	0.9	1.2	1.4	V
Input Reverse Current	V_R=5V	I_R	-	-	10	µA
Common Characteristics						
Input to Output Capacitance	-	$C_{I/O}$	-	3	-	pF

Switching Characteristics @ 25ºC

Characteristic	Symbol	Test Condition	Typ	Units
Rise Time	t_R	V_{CC}=10V, I_F=10mA, R_L=100Ω	40	µs
Fall Time	t_F		2.6	
Turn-On Time	t_{on}		2.75	
Storage Time	t_S		20	
Turn-Off Time	t_{off}		60	
Turn-On Time	t_{on}	V_{CC}=10V, I_F=16mA, R_L=180Ω	1	
Storage Time	t_S		40	
Turn-Off Time	t_{off}		80	

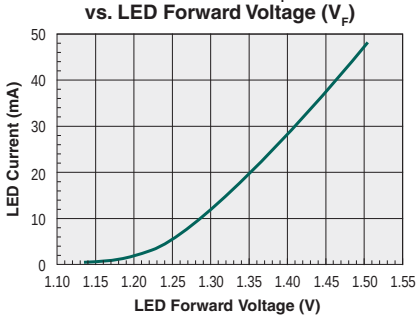


Switching Time Test Circuit

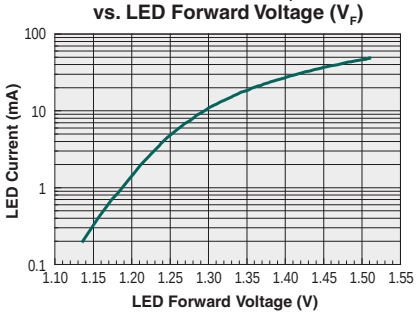


PERFORMANCE DATA @25°C (Unless Otherwise Noted)*

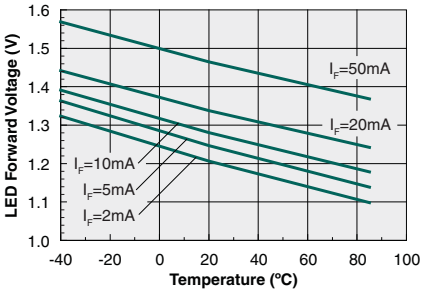
LED Current (I_F) vs. LED Forward Voltage (V_F)



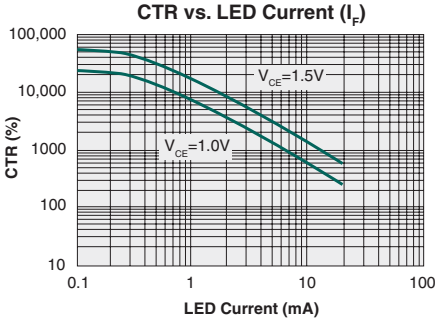
LED Current (I_F) vs. LED Forward Voltage (V_F)



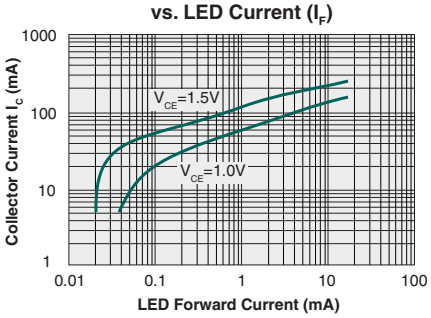
LED Forward Voltage vs. Temperature



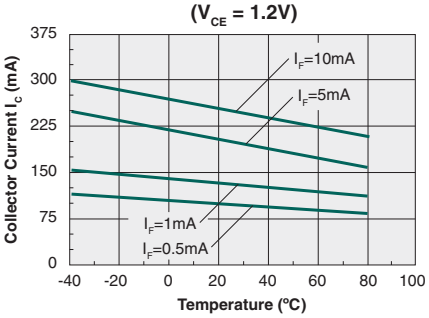
CTR vs. LED Current (I_F)



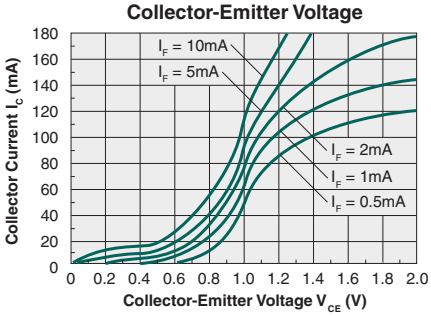
Collector Current vs. LED Current (I_F)



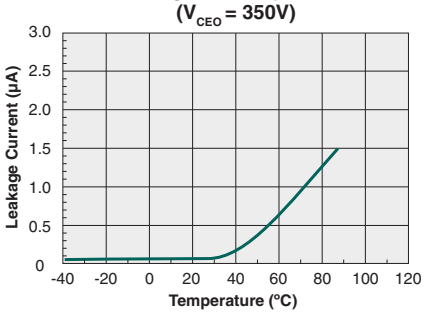
Collector Current vs. Temperature (V_{CE} = 1.2V)



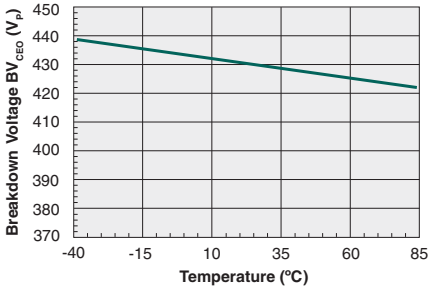
Collector Current vs. Collector-Emitter Voltage



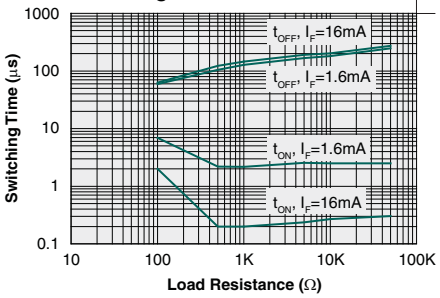
Leakage vs. Temperature (V_{CEO} = 350V)



Breakdown Voltage vs. Temperature



Switching Time vs. Load Resistance



*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. IXYS Integrated Circuits Division 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
CPC1301G	MSL 1
CPC1301GR	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 Classification Temperature (T_C) of this product and the maximum dwell time the body temperature of this device may be above (T_C - 5)°C. The classification temperature sets the Maximum Body Temperature allowed for this device during lead-free reflow processes. Additionally, for the CPC1301GR, the solder reflow profile given in Technical Brief TB-200 **"Pb-Free Solder Reflow Profile for Select Devices"** must be followed. For the through-hole device, CPC1301G, and any other processes, the guidelines of **J-STD-020** must be observed.

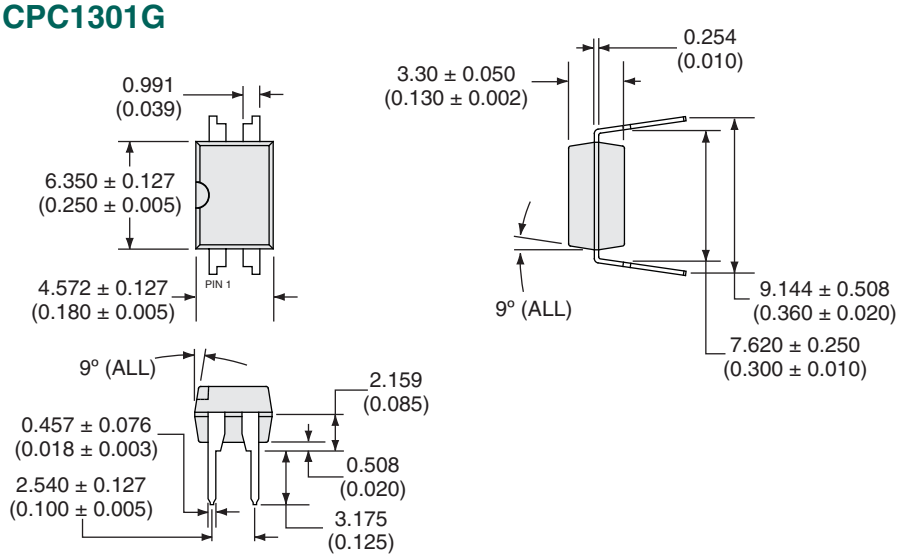
Device	Maximum Body Temperature (T_C)	Time
CPC1301GR	250°C	15 seconds

Board Wash

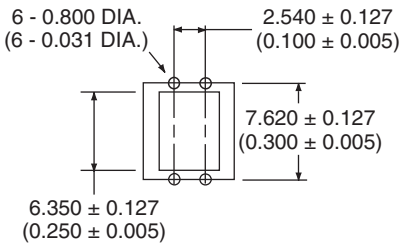
IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. Board washing to reduce or remove flux residue following the solder reflow process is acceptable provided proper precautions are taken to prevent damage to the device. These precautions include, but are not limited to: 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 flux or solvents that are Chlorine- or Fluorine-based.

MECHANICAL DIMENSIONS

CPC1301G

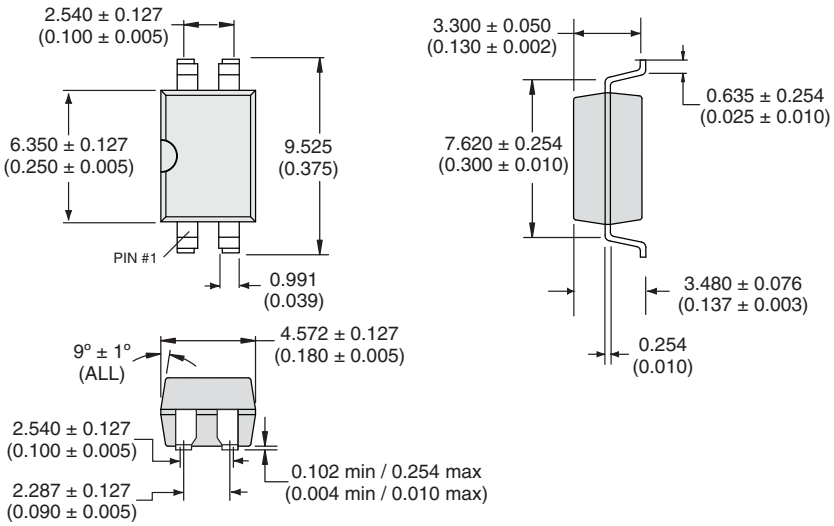


PC Board Pattern (Top View)

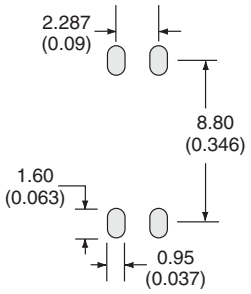


Dimensions
mm
(inches)

CPC1301GR

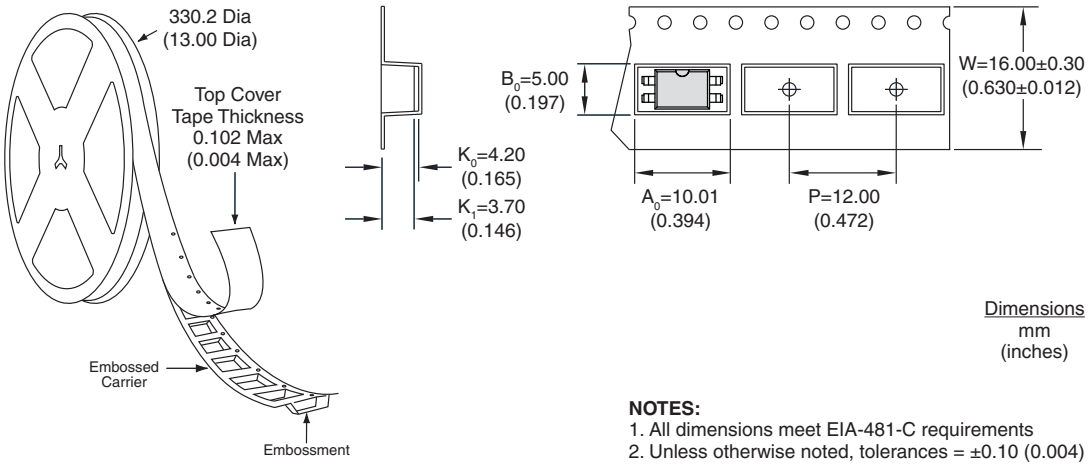


PCB Land Pattern



Dimensions
mm
(inches)

CPC1301GRTR Tape & Reel



NOTES:
1. All dimensions meet EIA-481-C requirements
2. Unless otherwise noted, tolerances = ±0.10 (0.004)

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