

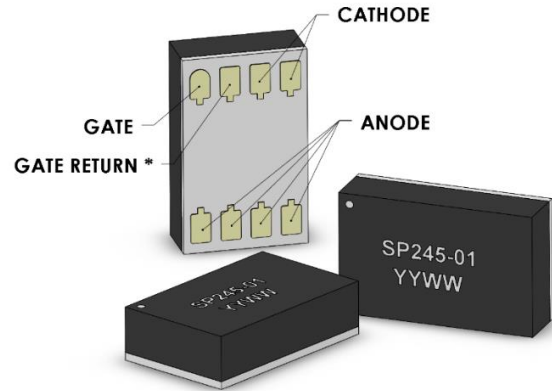
NOTICE: This product is export controlled

The **SP245-01** is an advanced high-voltage current-controlled thyristor packaged in a **C-Pak** SMT package.

Like all Solidtron products, the internal semiconductor employs high cell density and an advanced planer termination design to achieve high peak current capability, low conduction loss, low off-state leakage, negligible turn-on delay jitter, and most importantly, extremely high turn-on dI/dt capability. It is ideally suited for a wide variety of capacitor discharge applications requiring precise timing and rapid energy transfer capability.

The **C-Pak** is a custom surface mount package in which the semiconductor is attached to a metalized ceramic substrate using 90Pb10Sn solder, wire bonded using 0.010" aluminum wire bonds, and then encapsulated using Hysol FP4653 epoxy. The **C-Pak** is specifically designed to be compliant with IPC 2221 Section 6.3 Electrical Clearance (any elevation).

The **SP245-01** is intended to replace triggered spark gaps of similar voltage and current ratings.



*The **Gate Return** pad provides a dedicated connection directly to the cathode of the semiconductor die. This connection consists of a single 0.010" aluminum bond wire.

Using the Gate Return pad as an independent gate driver return path reduces $V=L \cdot dI/dt$ induced stress on the gate driver components.

With C-Pak Solidtron devices, the Gate Return pad may, alternatively, be used as an additional Cathode pad; however, its internal connection possesses only 40% of the Ft capability of each of the other Cathode pads. Using it in this fashion must be qualified by the customer for their specific application.

Key Product Features

- 1500V Repetitive Off-State Voltage
- $V_{GK} = 0V = OFF$
- 100 kA/ μs dI/dt capability
- Low Turn-on and Conduction Losses
- < 100nSec Turn-on Delay Time
- 3.5kA Repetitive Surge Current

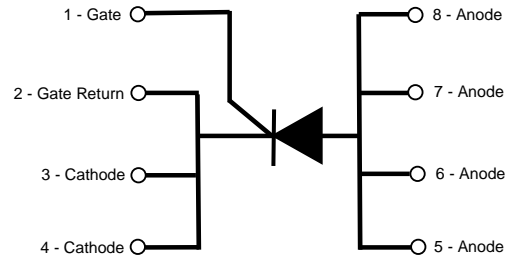


Table 1. Maximum Ratings

	Symbol	Value	Units
Repetitive Peak Off-State Voltage	V_{DRM}	1500	V
Repetitive Peak Reverse Voltage	V_{RRM}	-10	V
Off-State Rate of Change of Voltage Immunity ($V_D=1500V$)	dv/dt	1000	V/ μ Sec
Peak Non-Repetitive Surge Current (1/2 Sinusoid Pulse Duration =/ $<300nSec$)	I_{TSM}	4000	A
Peak Repetitive Surge Current (1/2 Sinusoid Pulse Duration =/ $<300nSec$)	I_{TRM}	3500	A
Rate of Change of Current	dI/dt	100	kA/ μ Sec
Critical Capacitor Discharge Event Integral (Underdamped LCR Circuit) (Note 1.)	$I^2t_{CRITICAL}$	TBD	A ² sec
Repetitive Capacitor Discharge Event Integral (Underdamped LCR Circuit) (Note 1.)	$I^2t_{REPETITIVE}$	2	A ² sec
Continuous Gate-Cathode Reverse Voltage	V_{GKS}	-9	V
Forward Peak Gate Current (10 μ Sec Duration)	I_{GM}	10	A
Required Off-State Gate-Cathode Voltage	V_{GDM}	0	V
Operating Junction Temperature Range	T_J	-55 to +125	$^{\circ}C$
Maximum Soldering Installation Temperature (See Moisture Sensitivity Caution)		220	$^{\circ}C$
Storage Temperature Range (See Moisture Sensitivity & Solderability Cautions)		-55 to +150	$^{\circ}C$

Note 1. See Application Notes

Table 2. Electrical Characteristics

Parameter	Symbol	Test Conditions	Measurements				
			Min	Typ	Max	Units	
Anode to Cathode Breakdown Voltage	V_{BR}	$V_{GK} = 0V, I_D = 100\mu A, T_C \leq 125^\circ C$	1500			V	
Anode-Cathode Forward Off-State Current <i>See Figure 2.</i>	I_{DRM}	$V_{GK} = 0V, V_D = 1500V$	$T_C = -55^\circ C$		60	nA	
			$T_C = 25^\circ C$		10	100	nA
			$T_C = 85^\circ C$		190	1000	nA
			$T_C = 125^\circ C$		5	10	μA
Reverse Bias Gate-Cathode Breakdown Voltage	V_{GRRM}	$I_{GM} = 150\mu A, T_C \leq 125^\circ C$	9	10		V	
Nine Volt Reverse Bias Gate-Cathode Leakage Current <i>See Figure 1.</i>	I_{GM}	$V_{GK} = -9V$	$T_C = 25^\circ C$		28	μA	
			$T_C = 85^\circ C$		57	μA	
			$T_C = 125^\circ C$		80	μA	
Two Volt Reverse Bias Gate-Cathode Leakage Current <i>See Figure 1.</i>	I_{GM}	$V_{GK} = -2V$	$T_C = 25^\circ C$		0.8	μA	
			$T_C = 85^\circ C$		1.9	μA	
			$T_C = 125^\circ C$		2.4	μA	
Gate Trigger Voltage	V_{GT}	$V_D = 12V, I_D = 1mA$	$T_C = 25^\circ C$	450	500	mV	
			$T_C = 85^\circ C$	250	350	mV	
			$T_C = 125^\circ C$	200	250	mV	
Gate Trigger Current	I_{GT}	$V_D = 12V, I_D = 1mA, T_C \leq 125^\circ C$			100	μA	
Turn-on Delay Time	$t_{d(ON)}$	0.15 μF Capacitor Discharge,		30	60	nSec	
Rate of Change of Current	dI/dt	$T_C = 25^\circ C, I_{GT} = 500mA,$		65		$kA/\mu sec$	
Capacitor Discharge Event Integral	I^2t	$V_{DD} = 1200V, L_S = 15nH,$		1.38		A^2sec	
Peak Anode Current	I_{DM}	$R_S = 0.010\Omega = CVR$		3.2		kA	

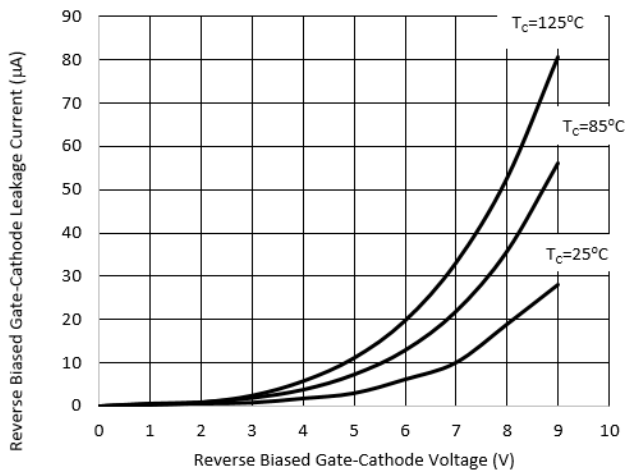


Figure 1. Typical Reverse Biased Gate-Cathode Leakage Characteristic

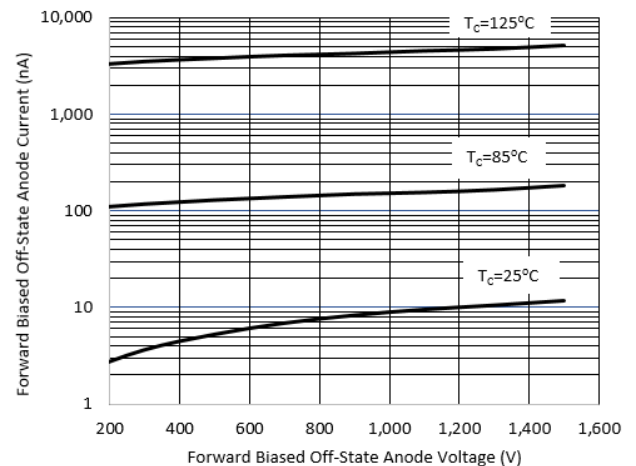


Figure 2. Typical Forward Biased Off-State Anode-Cathode Leakage Characteristic

ESD Sensitivity

The **SP245-01** have been tested IAW **MIL-STD-883 ESD-HBM (Human Body Model)** to +/-2000V (**MIL-STD-1686 Class 2**).

The **SP245-01** have been tested IAW **ANSI/ESDA/JEDEC/JS-002-2014 for ESD-CDM (Charged Device Model)** to +/-1500V (**MIL-STD-1686 Class C5**).

Moisture Sensitivity

The **SP245-01** has been tested IAW **IPC/JEDEC J-STD-020** and are classified as **MSL Level 5A**.

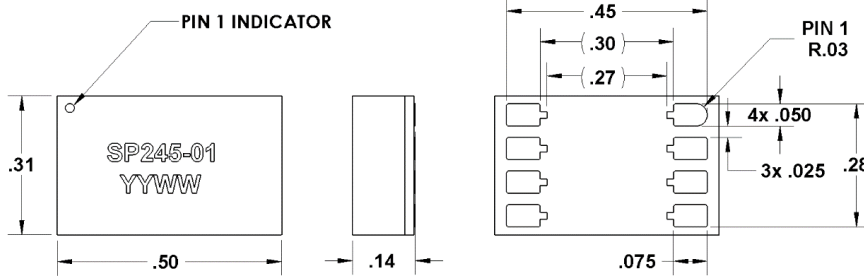
In accordance with **IPC/JEDEC J-STD-033**, **C-Pak** products are dry-baked then packed in a Moisture Barrier Bag (MBB) containing desiccant and a Humidity Indicator Card (HIC). When the Moisture Barrier Bag is opened or compromised refer to **IPC/JEDEC J-STD-033** for proper HIC interpretation, floor life and storage procedures.

Although **IPC/JEDEC J-STD-033** prescribes specific dry-baking temperatures and times, caution is advised as additional baking of **C-Pak** SMD packages may cause oxidation and/or intermetallic growth of the terminations which may result in solderability problems during board installation. The temperature and time for baking this SMD package should, therefore, be limited with solderability considerations in mind. If available, **it is highly recommended C-Paks be baked in a nitrogen or vacuum oven to limit exposure to oxygen during the baking process.**

Solderability

The component pads of the **C-Pak** consist of electrolytic copper IAW MIL-C-14550 (Class 2) plated with $\geq 80\mu\text{in}$ (Typical $150\mu\text{in}$) of autocatalytic nickel that is then plated with $2-4\mu\text{in}$ of immersion gold. *Although gold plated*, due to nickel diffusing into and through the gold surface during processing, **the product pads are subject to oxidation** if handled or stored inappropriately. Prolonged exposure to circumstances known to promote nickel oxidation should be avoided; otherwise, solderability of the **C-Pak** will be compromised.

Markings and Dimensions



DIMENSIONS ARE IN INCHES

TOLERANCES UNLESS OTHERWISE NOTED:
TWO PLACE DECIMAL +/- 0.010"
THREE PLACE DECIMAL +/- 0.004"

PART NUMBER

SP = SILICON POWER
245 = CHIP TYPE
-01 = PACKAGE TYPE

DATE CODE

YY = LAST 2 DIGITS OF CALENDAR YEAR
WW = WORK WEEK

Ordering Information

Be certain to specify the complete part number and description listed in Table 3. when requesting a quotation or placing an order.

Table 3. Ordering Information

Part Number	Description	Qty per Tray
SP245-01	Solid State Initiator Firing Switch, C-Pak, Ni/Au pad finish	40

Application Notes

Available

- [Triggering CCS Devices](#)
- [SolidTRON Trigger Example](#)
- [SolidTRON Test Circuit Discussion](#)

Under Development

- Gate Driver designs for CCS Devices
 - Suggested Circuits & Critical Layout Considerations

Table 4. Typical Application Parameters

	Value	Units
Off-State Anode Voltage (<1 hour)	1250	V
Repetitive Peak Forward Anode Current (1/2 Cycle Pulse Width = 160nSec)	2.7	kA
Repetitive Peak Reverse Anode Current (1/2 Cycle Pulse Width = 160nSec)	2.2	kA
Off-State Rate of Change of Voltage (dv/dt) immunity	≤200	V/mSec
Operational Case Temperature	-55 to 85	°C
Rate of Change of Anode Current (dI/dt)	65	kA/μSec
Peak Forward Gate Current (≤20uSec pulse)	500	mA
Event Repetition Rate	<1	Hz

Legal Notice

Silicon Power Corporation makes no warranty or guarantee regarding the suitability of this product for any specific application nor does **Silicon Power Corporation** assume any liability associated with the use of this product. Silicon Power specifically disclaims any and all liability; including without limitation, incidental, consequential or collateral damages incurred while using this product.

Silicon Power Corporation reserves the right to make changes to this product to improve reliability, manufacturability, usability, function or design. Changes may include but are not limited to: materials, material sources, manufacturing processes, manufacturing equipment, parts vendors, service vendors and documentation. Although **Silicon Power Corporation** will make a reasonable effort to notify customers of changes to this product, notification of changes is not guaranteed.

Parameters and specifications listed within this datasheet will vary in different applications, conditions or environments not specifically addressed. Use of this product within an application must be validated by the customer's technical expert(s).

This product is not designed, intended or authorized for use in applications intended to save or sustain life, specifically those in which the failure of this product could create a situation where personal injury or loss of life may result. Should a customer purchase or use this product for any such unintended and unauthorized application, the customer shall indemnify and hold **Silicon Power Corporation** and its officers, employees, subsidiaries, affiliates and distributors harmless regarding all claims, costs, damages and expenses associated with any claim of personal injury or death associated with unauthorized use even if such a claim alleges **Silicon Power Corporation** was negligent regarding the design or manufacture of this product.

End users of this product shall comply with all applicable DOD, ITAR, EAR, USML laws and regulations.