

**NOTICE: This product is export controlled**

The **SP245-03** is an advanced high-voltage current-controlled thyristor packaged in a **JEDEC TO-247 (5L)** package.

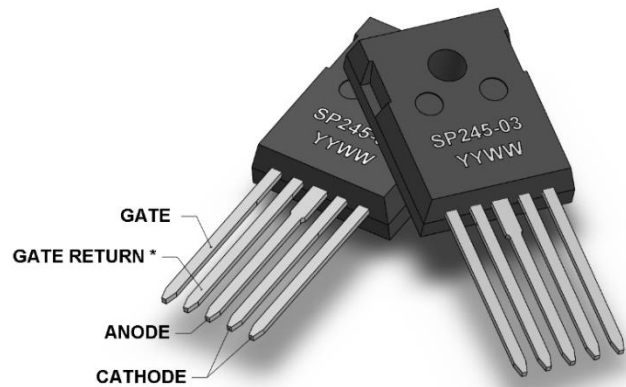
Like all Solidtron products, the internal semiconductor employs high cell density and an advanced high voltage termination design to achieve high peak current capability, low conduction loss, low off-state leakage, negligible turn-on delay jitter, and high turn-on  $dI/dt$  capability. It is ideally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

The **JEDEC TO-247 (5L)** package is an industry standard package in which the semiconductor is attached to a copper header utilizing 92.5Pb/5Sn/2.5Ag solder. The top of the chip is joined to the appropriate leads using a combination of 0.005" and 0.010" aluminum wire bonds. It is then molded with Hysol MG15F-0140 compound and its leads are tinned with 63Sn/10Pb solder.

The **SP245-03** replaces the SMCTAA32N14A10. Like its predecessor, it is intended to replace triggered spark gaps of similar voltage and current ratings.

### Key Product Features

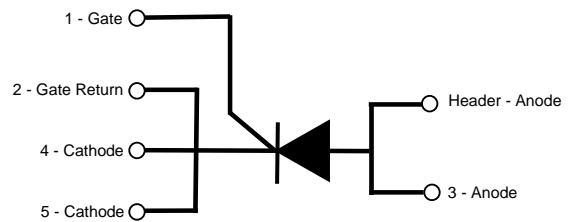
- 1400V Repetitive Off-State Voltage
- $V_{GK} = 0V = OFF$
- 100 kA/ $\mu s$   $dI/dt$  capability
- Low Turn-on and Conduction Losses
- < 100nSec Turn-on Delay Time
- 3.5kA Repetitive Surge Current



\*The **Gate Return** lead provides a dedicated connection directly to the cathode of the semiconductor die. Internally, this connection consists of a single 0.005" aluminum bond wire.

Although it is not mandatory with CCS Devices that the Gate return lead be used as an independent gate driver return path, its use in this fashion may reduce  $V=L*dI/dt$  induced stress on other gate driver components.

**Due to the small diameter of its internal wire bond connection, using this pin (pin2) as an additional cathode connection is highly discouraged.**



**Table 1. Maximum Ratings**

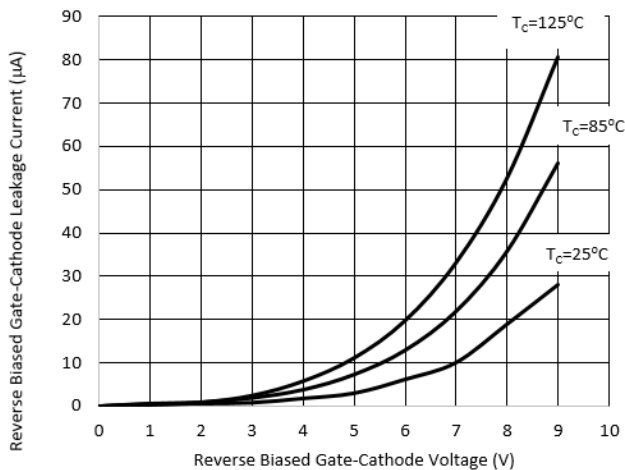
	Symbol	Value	Units
Repetitive Peak Off-State Voltage (Note 1.)	$V_{DRM}$	1400	V
Repetitive Peak Reverse Voltage	$V_{RRM}$	-10	V
Off-State Rate of Change of Voltage Immunity ( $V_D=1400V$ )	$dv/dt$	1000	V/ $\mu$ Sec
Peak Non-Repetitive Surge Current (1/2 Sinusoid Pulse Duration =/ $<300nSec$ )	$I_{TSM}$	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/ $\mu$ Sec
Repetitive Capacitor Discharge Event Integral (Underdamped LCR Circuit) (Note 2.)	$I^2t_{REPETITIVE}$	2.0	A <sup>2</sup> sec
Critical Capacitor Discharge Event Integral (Underdamped LCR Circuit) (Note 2.)	$I^2t_{CRITICAL}$	TBD	A <sup>2</sup> sec
Continuous Gate-Cathode Reverse Voltage	$V_{GKS}$	-9	V
Forward Peak Gate Current (10 $\mu$ 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		220	$^{\circ}C$
Storage Temperature Range (See Moisture Sensitivity & Solderability Cautions)		-55 to +150	$^{\circ}C$

Note 1. Repetitive Peak Off-State Voltage rating is limited by the external lead clearance of this package

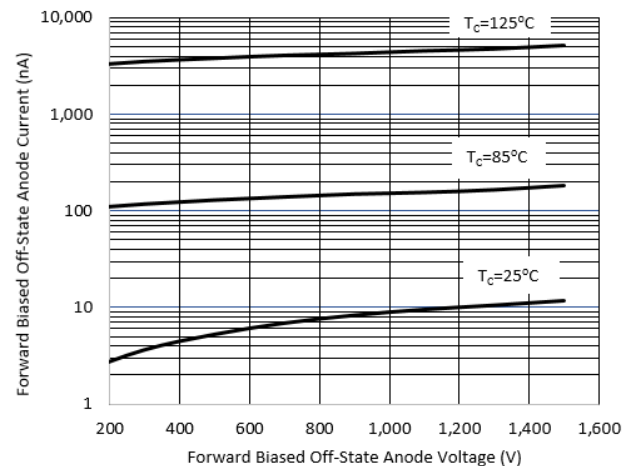
Note 2. See Application Notes

**Table 2. Electrical Characteristics**

Parameter	Symbol	Test Conditions	Measurements				
			Min	Typ	Max	Units	
Anode to Cathode Breakdown Voltage	$V_{BR}$	$V_{GK} = 0V, I_D = 100\mu A, T_C \leq 125^\circ C$	1400			V	
Anode-Cathode Forward Off-State Current <i>See Figure 2.</i>	$I_{DRM}$	$V_{GK} = 0V, V_D = 1400V$	$T_C = -55^\circ C$			60	nA
			$T_C = 25^\circ C$		11	100	nA
			$T_C = 85^\circ C$		180	1000	nA
			$T_C = 125^\circ C$		5	10	$\mu A$
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		$\mu A$
			$T_C = 85^\circ C$		57		$\mu A$
			$T_C = 125^\circ C$		80		$\mu A$
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	2	$\mu A$
			$T_C = 85^\circ C$		1.9	4	$\mu A$
			$T_C = 125^\circ C$		2.4	6	$\mu A$
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	$\mu A$	
Turn-on Delay Time	$t_{d(ON)}$	0.15 $\mu F$ 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 <sup>2</sup> sec	
Peak Anode Current	$I_{DM}$	$R_S = 0.010\Omega = CVR$		3.2		kA	

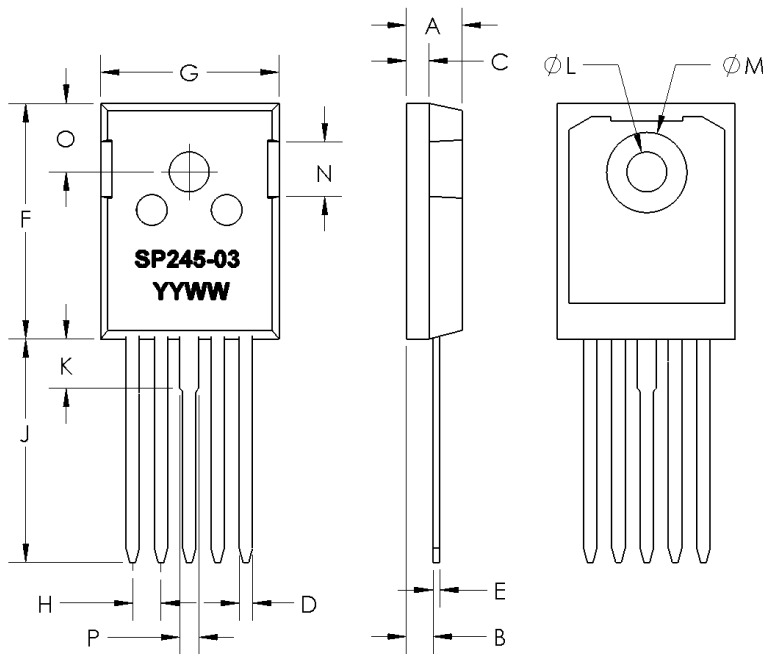


**Figure 1.** Typical Reverse Biased Gate-Cathode Leakage Characteristic



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

### Markings and Dimensions



#### DIMENSIONS ARE IN INCHES

DIMENSION	MIN.	MAX.
A	0.185	0.209
B	0.087	0.102
C	0.059	0.098
D	0.04	0.055
E	0.016	0.031
F	0.819	0.845
G	0.62	0.64
H	0.096	0.104
J	0.78	0.8
K	0.167	0.177
L	0.138	0.144
M		0.291
N	0.17	0.216
O	0.242	
P	0.065	0.07

#### PART NUMBER

SP = SILICON POWER  
245 = CHIP TYPE  
-03 = PACKAGE TYPE

#### DATE CODE

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

### ESD Sensitivity



**THIS PRODUCT SHOULD BE HANDLED AS AN ESD SENSITIVE DEVICE.** OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES IN ALL ASSEMBLY AND TEST AREAS (REF. JESD625).

**IMPROPER HANDLING OF THIS DEVICE MAY PERMANENTLY DAMAGE THE DEVICE AND RENDER IT UNUSABLE.**

### Product Qualifications/Certifications/Classifications

Planned or Underway

- Solderability per IPC J-STD-002
- ESD-HBM (Human Body Model) classification per Mil-STD-883
- ESD-CDM (Charged Device Model) classification per ANSI/ESDA/JEDEC/JS-002-2014

### Application Notes

Topics Under Development

- Capacitor Discharge Event Integral ( $I^2t$ )
- Triggering a CCS Device - Theory of Operation
- Gate Driver design for the CCS Device
  - Circuits & Critical Layout Considerations

**Table 3. Typical Application Parameters**

	Value	Units
Off-State Anode Voltage (<1 hour)	1250	V
Repetitive Peak Forward Anode Current (1/2 Cycle Pulse Width = 160nSec)	2700	A
Repetitive Peak Reverse Anode Current (1/2 Cycle Pulse Width = 160nSec)	2200	A
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

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