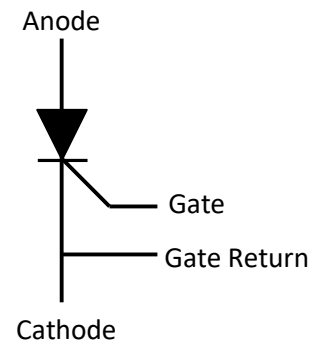
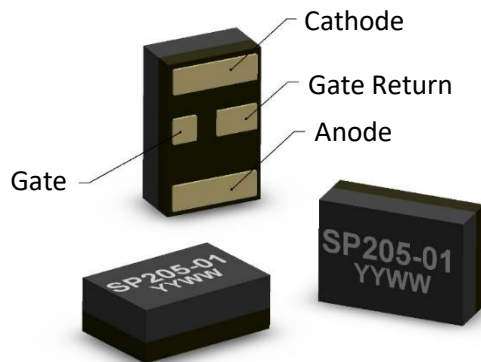


SP205-01 / SP205-01T**Solidtron™ Solid State Initiator Firing Switch, F-Pak****NOTICE:** This product is export controlled**Description**

The **Solidtron™ SP205-01** is an ultra-fast high-voltage thyristor packaged in an **F-Pak** custom SMT package. The SP205-01T is identical to the SP205-01 with the exception that its pads have been robotically tinned with 63Sn-37Pb solder prior to final testing.

As with all Solidtron™ products, the core semiconductor employs high cell density and an advanced termination design to achieve high peak current capability, low turn-on & conduction loss, very low off-state leakage, negligible turn-on delay jitter, and extremely high turn-on di/dt capability.

The F-Pak is an application-specific surface mount package in which the semiconductor is “flip-chip” soldered onto a multilayer high temperature PCB substrate. The F-Pak uses no wire bonds. Instead, the anode is connected to the PCB substrate using a soldered copper lug. The assembly is then epoxy underfilled and encapsulated using Hysol FP4651 epoxy.

The F-Pak offers a very small footprint and low inductance interface that allows for high volume installation using conventional SMT handling equipment. This product is specifically intended for use as an initiator firing switch and is a superior alternative to triggered spark gaps.

Features

- 1500V Repetitive Off-State Voltage
- Off-State Leakage Current $\leq 1.0\mu\text{A}$ @ 1500V @ 85°C
- VGK = 0V = OFF-STATE
- 120 kA/ μs di/dt capability
- Low Turn-on and Conduction Losses
- 3kA Repetitive Surge Current

Applications

- LEEFI detonators
- Electronic Safe and Arm Devices
- Ignition Safety Devices
- Firing Modules
- Capacitor Discharge Units

Solidtron™ SP205-01 / SP205-01T

Table 1. Maximum Ratings

	Symbol	Value	Units
Repetitive Peak Off-State Anode Voltage	V_{DRM}	1500	V
Repetitive Peak Reverse Anode Voltage	V_{RRM}	-10	V
Off-State Rate of Change of Voltage Immunity ($V_D=1500V$)	dv/dt	1000	V/ μ Sec
Non-Repetitive Surge Current (1/2 Sinusoid, Pulse Duration $\leq 200nSec$)	I_{TSM}	3500	A
Repetitive Surge Current (1/2 Sinusoid, Pulse Duration $\leq 200nSec$)	I_{TRM}	3000	A
Rate of Change of Current	di/dt	120	kA/ μ Sec
Critical Capacitor Discharge Event Integral (Underdamped LCR Circuit)	$I^2t_{CRITICAL}$	1.18	A ² sec
Repetitive Capacitor Discharge Event Integral (Underdamped LCR Circuit)	$I^2t_{REPETITIVE}$	1.0	A ² sec
Repetitive Peak Reverse Gate Blocking Voltage	V_{RGM}	-5	V
Forward Gate Current ($\leq 10\mu$ Sec Duration, Square Waveform)	I_{GM}	10	A
Operating Junction Temperature Range	T_J	-55 to +125	°C
Maximum Guaranteed Off-State Gate Voltage		0	V
Maximum Soldering Installation Temperature (See Moisture Sensitivity Caution)		220	°C
Storage Temperature Range (See Moisture Sensitivity & Solderability Cautions)		-55 to +150	°C

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 1.</i>	I_{DRM}	$V_{GK}= 0V, V_D=1500V$	$T_C=-55^\circ C$		80	nA	
			$T_C=25^\circ C$		12	100	nA
			$T_C=85^\circ C$		120	1000	nA
			$T_C=125^\circ C$		3.5	15	μA
Reverse Bias Gate-Cathode Breakdown Voltage	V_{GRRM}	$I_{GM}=500\mu A, T_C \leq 125^\circ C$	5			V	
Four Volt Reverse Bias Gate-Cathode Leakage Current	I_{GM}	$V_{GK}= -4V$	$T_C=25^\circ C$		250	μA	
			$T_C=85^\circ C$		300	μA	
			$T_C=125^\circ C$		350	μA	
Two Volt Reverse Bias Gate-Cathode Leakage Current	I_{GM}	$V_{GK}= -2V$	$T_C=25^\circ C$		60	μA	
			$T_C=85^\circ C$		75	μA	
			$T_C=125^\circ C$		100	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	$t_{d(ON)}$	0.10 μ F Capacitor Discharge, $T_C=25^\circ C, I_{GT}= 500mA,$ $V_{DD}=1200V, L_S=15nH,$ $R_S=0.010\Omega=CVR$		30	60	nSec	
Rate of Change of Current	di/dt			65		kA/ μ sec	
Capacitor Discharge Event Integral	I^2t			0.92		A ² sec	
Peak Anode Current	I_{DM}			2.7		kA	

Solidtron™ SP205-01 / SP205-01T

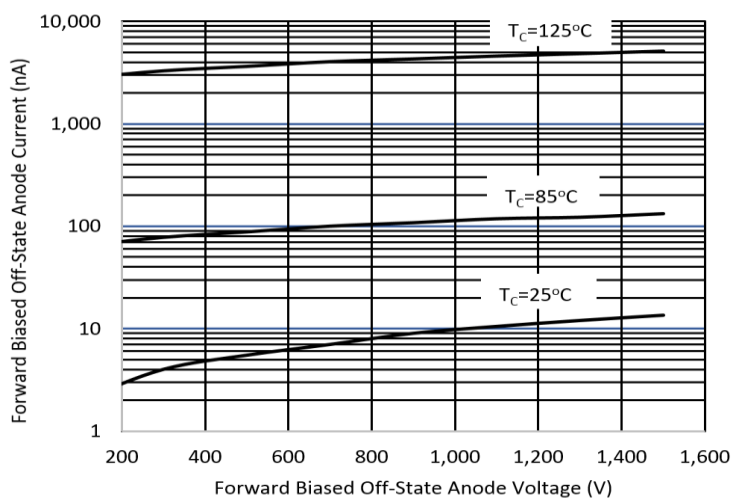


Figure 1. Typical Forward Biased Off-State Anode-Cathode Leakage Characteristic

Usage

The Gate Return pad provides a dedicated connection directly to the cathode of the semiconductor die. Using the Gate Return pad as an independent gate driver return path reduces $V=L \cdot di/dt$ stress on the gate driver components. The Gate Return pad of this product may, alternatively, be used as an additional Cathode connection; however, using it in this fashion must be qualified by the customer for their specific application.

ESD Sensitivity

The **SP205-01/SP205-01T** have been tested IAW **MIL-STD-883 ESD-HBM (Human Body Model)** to **+/-2000V (Class 1C)**.

The **SP205-01/SP205-01T** have been tested IAW **ANSI/ESDA/JEDEC/JS-002-2014** for **ESD-CDM (Charged Device Model)** to **+/-1500V (Class C5)**.

Moisture Sensitivity

The **SP205-01/SP205-01T** have been tested IAW **IPC/JEDEC J-STD-020** and are classified as **MSL Level 4**.

In accordance with **IPC/JEDEC J-STD-033**, **F-Pak** products are dry-baked and immediately 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 **F-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 recommended F-Paks be baked in a nitrogen or vacuum oven to limit exposure to oxygen during the baking process.

Solderability

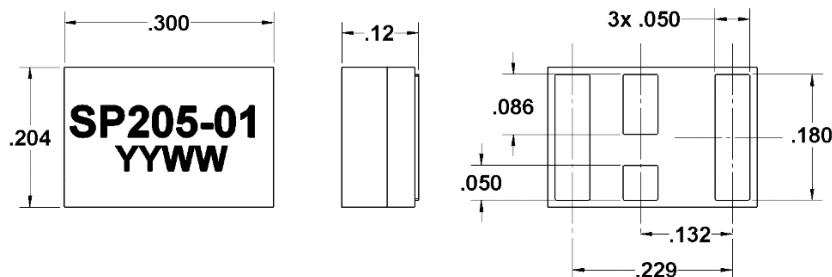
SP205-01 - Although the component pads appear to be gold plated, exposure to high process temperatures within the manufacturing process have accelerated the diffusion of the underlying nickel into and through the thin exterior gold surface, therefore, rendering the pads **subject to oxidation growth** if exposed to circumstances which promote nickel oxidation. Such circumstances should be avoided; otherwise, solderability of the **SP205-01** will be compromised.

Solidtron™ SP205-01 / SP205-01T

Solderability (Continued)

SP205-01T – Prior to final electrical testing, the component pads of the **SP205-01T** are **robotically tinned with 63Sn–37Pb solder**. Thickness and coverage is in accordance with **MIL-PRF-38535**. Please note that PbSn solder is also subject to oxidation growth; however, at a slower rate than the underlying nickel. Conventional handling and storage practices associated with components having 63Sn-37Pb tinned leads may be applied.

Markings and Dimensions



DIMENSIONS ARE IN INCHES

TOLERANCES UNLESS OTHERWISE NOTED:
TWO PLACE DECIMAL +/- 0.010"
THREE PLACE DECIMAL +/- 0.005"

PART NUMBER

SP = SOLIDTRON™ PRODUCT
205 = CHIP TYPE
-01 = PACKAGE TYPE

DATE CODE

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

NOTE: The “T” in Part Number SP205-01T **WILL NOT** be marked on the plastic package of the component itself. The presence of solder on its pads, rather than gold plating, is the only differentiating characteristic between the SP205-01 and the SP205-01T. Shipping trays, Moisture Barrier Bags and other packing labels WILL include the “T” as the final digit of the Part Number.

About Excelitas Technologies

Excelitas Technologies® is a photonics technology leader focused on delivering innovative, high-performance, market-driven solutions to meet the lighting, optronics, detection and optical technology needs of our OEM customers. Serving a vast array of applications across biomedical, scientific, safety, security, consumer products, semiconductor, industrial manufacturing, defense and aerospace sectors, Excelitas stands committed to enabling our customers’ success in their end-markets. Our photonics team consists of 7,000 professionals working across North America, Europe and Asia, to serve our customers worldwide.

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