SMCT AA32N14A10

Advanced Pulse Power Device

N-MOS VCS, TO-247

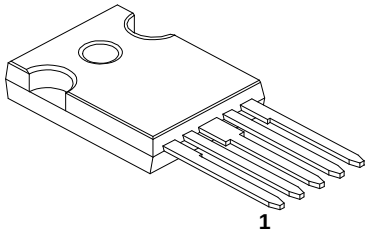
Description

This voltage controlled Solidtron (VCS) discharge switch utilizes an n-type MOS-Controlled Thyristor mounted in a five leaded TO-247 plastic package.

The VCS features the high peak current capability and low On-state voltage drop common to SCR thyristors combined with extremely high dI/dt capability. This semiconductor is intended for the control of high power circuits with the use of very small amounts of input energy and is ideally suited for capacitor discharge applications.

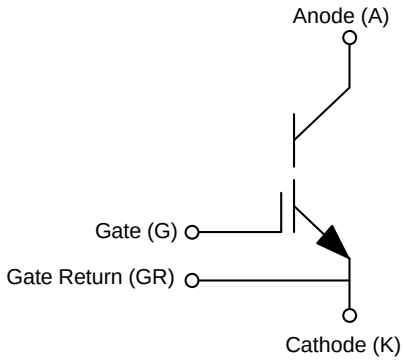
The industry standard TO-247 package allows for assembly of the Solidtron using automated insertion equipment.

Package



5 Lead TO-247

Schematic Symbol



Features

- 1400V Peak Off-State Voltage
- 32A Continuous Rating
- 4kA Surge Current Capability
- >100kA/uSec dI/dt Capability
- <100nSec Turn-On Delay
- Low On-State Voltage
- MOS Gated Control
- Low Inductance Package

Absolute Maximum Ratings

	SYMBOL	VALUE	UNITS
Peak Off-State Voltage	V_{DRM}	1400	V
Peak Reverse Voltage	V_{RRM}	-5	V
Off-State Rate of Change of Voltage Immunity	dv/dt	5000	V/uSec
Continuous Anode Current at 110°C	I_{A110}	32	A
Repetitive Peak Anode Current (Pulse Width=1uSec)	I_{ASM}	4000	A
Rate of Change of Current	dI/dt	150	kA/uSec
Continuous Gate-Cathode Voltage	V_{GKS}	+/-20	V
Peak Gate-Cathode Voltage	V_{GKM}	+/-25	V
Minimum Negative Gate-Cathode Voltage Required for Garanteed Off-State	$V_{GK(OFF-MIN)}$	-5	V
Maximum Junction Temperature	T_{JM}	150	°C
Maximum Soldering Temperature (Installation)		260	°C

This **SILICON POWER** product is protected by one or more of the following U.S. Patents:

5,521,436	5,446,316	5,105,536	5,209,390	4,958,211	5,206,186	4,857,983	5,082,795	4,644,637
5,585,310	5,557,656	5,777,346	5,139,972	5,111,268	5,757,036	4,888,627	4,980,741	4,374,389
5,248,901	5,564,226	5,446,316	5,103,290	5,260,590	5,777,346	4,912,541	4,941,026	4,750,666
5,366,932	5,517,058	5,577,656	5,028,987	5,350,935	5,995,349	5,424,563	4,927,772	4,429,011
5,497,013	4,814,283	5,473,193	5,304,847	5,640,300	4,801,985	5,399,892	4,739,387	5,293,070
5,532,635	5,135,890	5,166,773	5,569,957	5,184,206	4,476,671	5,468,668	4,648,174	

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Performance Characteristics T_J=25°C unless otherwise specified

Parameters	Symbol	Test Conditions		Measurements Min.	Typ.	Max.	Units
Anode to Cathode Breakdown Voltage	$V_{(BR)}$	V_{GK}=-5, I_A=1mA		1400			V
Anode-Cathode Off-State Current	i_D	V_{GE}=-5V, V_{AK}=1200V	T_C=25°C		<10	100	uA
			T_C=150°C		250	1000	uA
Gate-Cathode Turn-On Threshold Voltage	$V_{GK(TH)}$	V_{AK}=V_{GK}, I_{AK}=1mA			0.7		V
Gate-Cathode Leakage Current	$I_{GK(lkg)}$	V_{GK}=+/-20V				500	nA
Anode-Cathode On-State Voltage	V_T	I_T=32A, V_{GK}=+5V	T_C=25°C		1.5	2.0	V
		(See Figures 1,2 & 3)	T_C=150°C		1.3	1.5	V
Input Capacitance	C_{ISS}				6		nF
Turn-on Delay Time	$t_{D(ON)}$	0.2uF Capacitor Discharge			50	100	nS
Rate of Change of Current	dI/dt	T_J=25°C, V_{GK}= -5V to +5V			75		kA/uSec
Peak Anode Current	I_P	V_{AK}=800V, RG=4.7Ω			3500		A
Discharge Event Energy	E_{DIS}	L_S= 7nH (See Figures 4,5 & 6)			32		mJ
Turn-on Delay Time	$t_{D(ON)}$	0.2uF Capacitor Discharge			50	100	nS
Rate of Change of Current	dI/dt	T_J=150°C, V_{GK}= -5V to +5V			110		kA/uSec
Peak Anode Current	I_P	V_{AK}=1200V, RG=4.7Ω		4000			A
Discharge Event Energy	E_{DIS}	L_S= 7nH (See Figures 4,5 & 6)			70		mJ
Junction to Case Thermal Resistance	$R_{\theta JC}$	Anode (bottom) side cooled (Note 1.)			0.08		°C/W

Typical Performance Curves (unless otherwise specified)

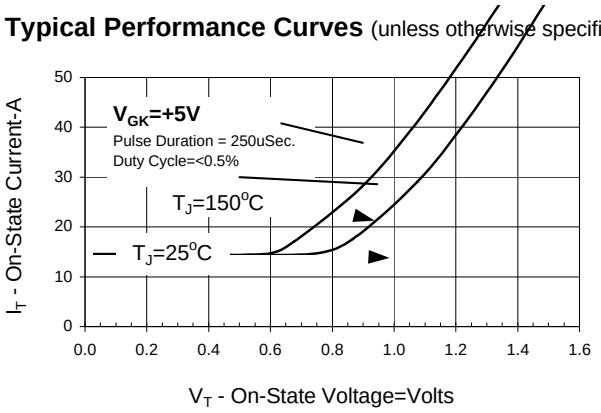


Figure 1. On-State Characteristics

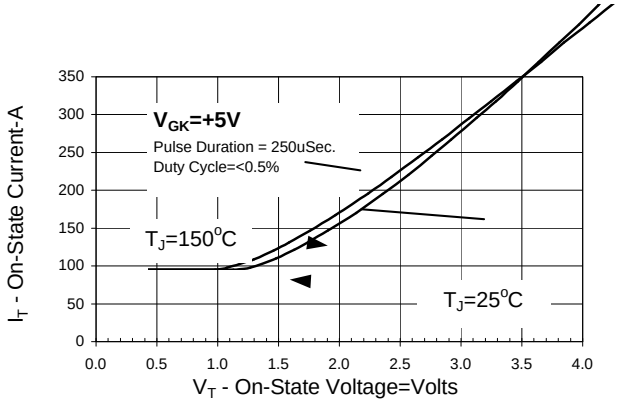


Figure 2. On-State Characteristics

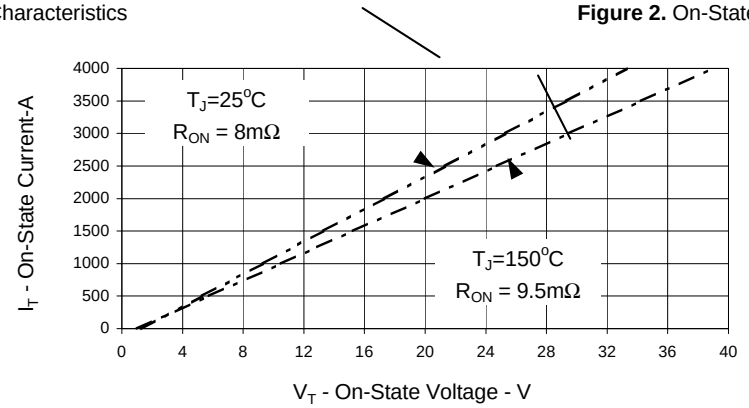


Figure 3. Predicted High Current On-State Characteristics

Typical Performance Curves (Continued)

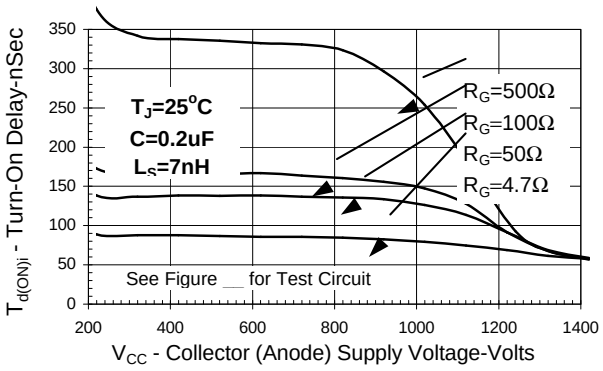


Figure 4. Turn-On Delay Characteristics
R_G=4.7Ω - 500Ω, T_J=25°C

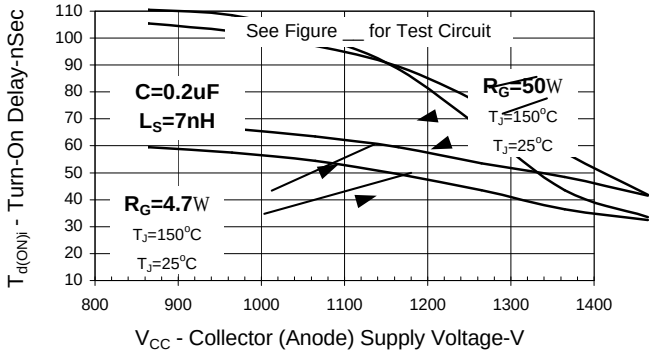


Figure 5. Turn-On Delay Characteristics
R_G=4.7Ω & 50Ω, T_J=25°C & 150°C

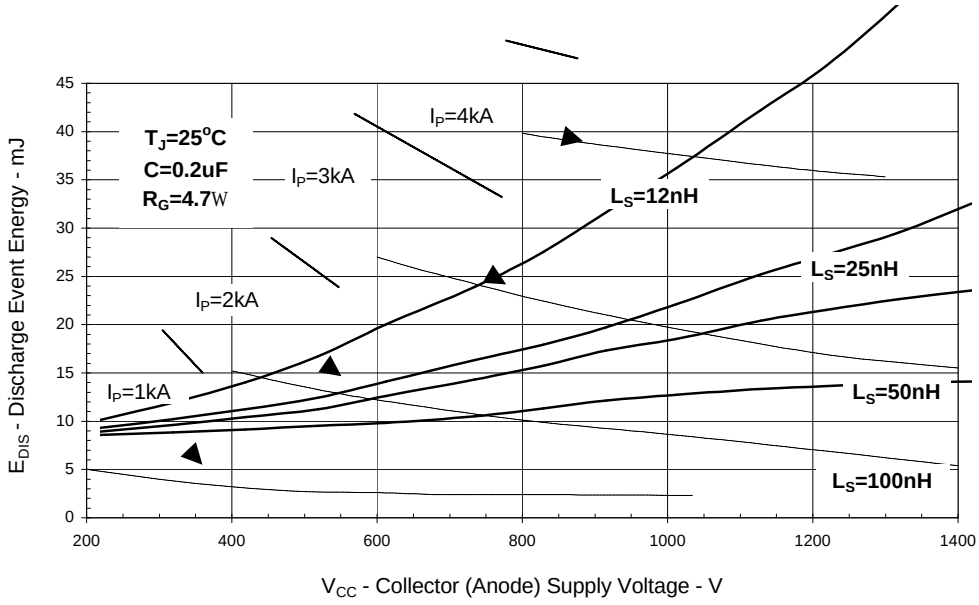
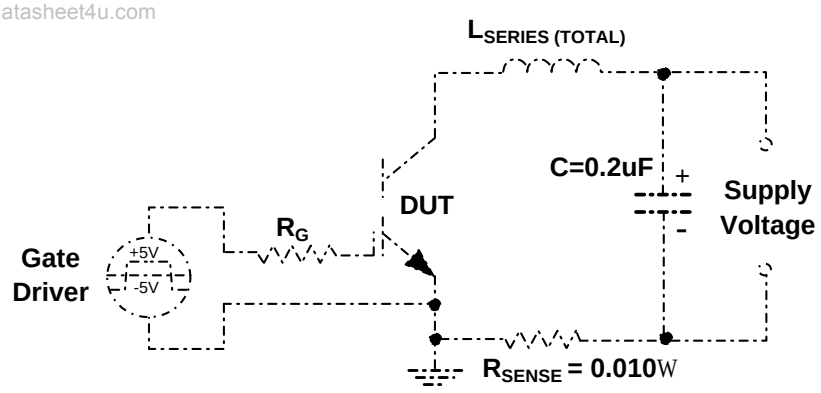


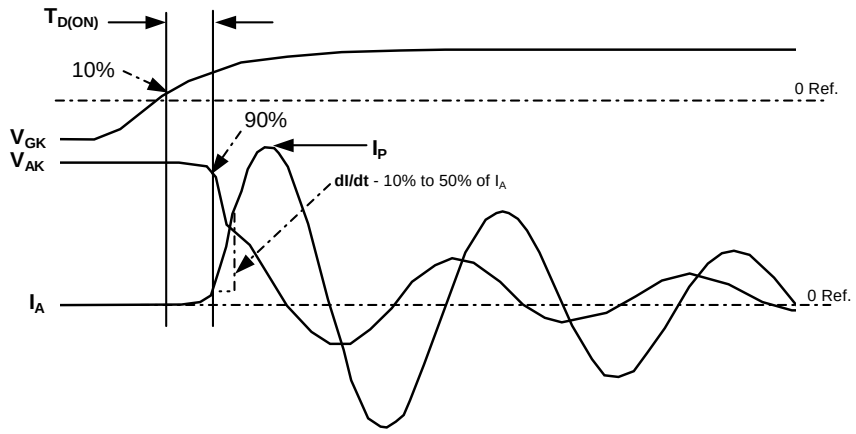
Figure 6. 0.2uF Discharge Pulse Performance Characteristics (See Figure 9.)

Test Circuit and Waveforms



- $L_{SERIES(TOTAL)}$ is caculated using $1 / (f\ 2\pi)^2 C$ where f = frequency of I_A (See Figure 10)
- R_{SENSE} is a calibrated Current Viewing Resistor (CVR)

Figure 9. 0.2uF Pulsed Discharge Circuit Schematic



- The waveform shown is representative of one produced using a very low inductance circuit (<10nH).
- V_{GK} is held positive until I_A oscillations have ended (I_A=0).

Figure 10. 0.2uF Pulsed Discharge Circuit Waveforms

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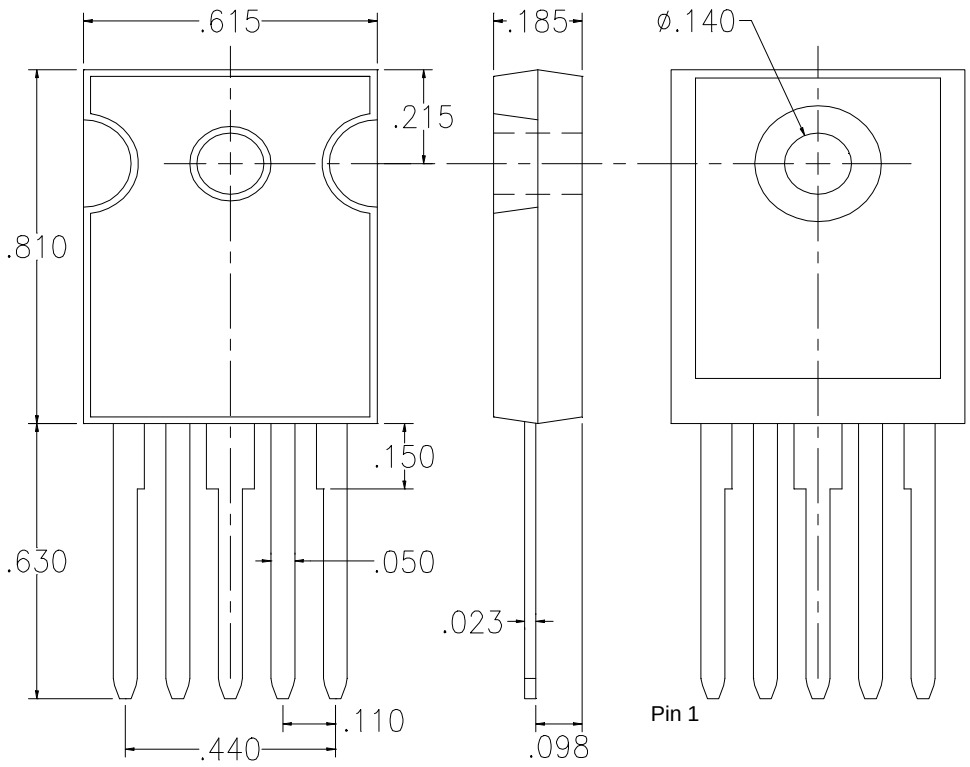
Application Notes

A1. Use of Gate Return

The VCS was designed for high di/dt applications. An independent cathode connection for use as "gate return" is provided on pin 2 to minimize the effects of rapidly changing Anode-Cathode current on the Gate control voltage, (V=L*di/dt). It is therefore, critcal that the user utilize the Gate Return as the point at which the gate driver reference (return) is attached to the VCS device.

Packaging and Handling



Pin 1 : Gate
Pin 2 : Gate return
Pin 3 : Anode
Pin 4 : Cathode
Pin 5 : Cathode

As with all MOS gated devices, proper handling procedures must be observed to prevent electrostatic discharge which may result in permanant damage to the gate of the device