

Triacs

SC141, SC146 Series

File Number **1167**

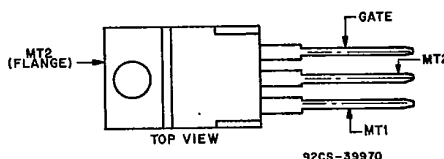
6-A and 10-A Silicon Triacs

Three-Lead Plastic Types for Power-Control and Power-Switching Applications

Features:

- 800 V, 125 Deg. C T_J operating
- High dv/dt and di/dt capability
- Low switching losses
- High pulse current capability
- Low forward and reverse leakage
- Silicon oxide glass multilayer passivation system
- Advanced unisurface construction
- Precise ion implanted diffusion source

TERMINAL DESIGNATIONS



JEDEC TO-220AB

The RCA-SC141 and SC146 series triacs are gate-controlled full-wave silicon switches.

These devices are designed to switch from an off-state to an on-state for either polarity of applied voltage with positive or negative gate triggering voltages. They have an on-state current rating of 6-A at $T_C = 75^\circ\text{C}$ (SC141 series) and 10-A at $T_C = 80^\circ\text{C}$ (SC146 series) and repetitive off-state voltage ratings, of 200, 400, 500, 600, and 800 volts.

All devices utilize the JEDEC TO-220AB (VERSAWATT) plastic package.

MAXIMUM RATINGS, Absolute-Maximum Values:

	SC141B SC146B	SC141D SC146D	SC141E SC146E	SC141M SC146M	SC141N SC146N	
$V_{DRM}^* T_J = -40 \text{ to } 125^\circ\text{C}$	200	400	500	600	800	V
$I_{TRMS1} \theta = 360^\circ$:						
For SC141 series, $T_C = 75^\circ\text{C}$			6			A
For SC146 series, $T_C = 80^\circ\text{C}$			10			A
For other conditions			See Fig. 4			
I_{TSM}^{\dagger} :						
For one full cycle of applied principal voltage, at current and temperature shown above for I_T (RMS):						
60 Hz (sinusoidal)		80		120		A
50 Hz (sinusoidal)		75		110		A
For more than one cycle of applied principal voltage			See Fig. 5			
di/dt :			70			A/ μs
$V_D = V_{DRM}$, $I_G = 200 \text{ mA}$, $t_r = 0.1 \mu\text{s}$						
I^2t [At T_C shown for I_{TRMS1} , half-sine wave]:						A^2s
$t = 10 \text{ ms}$		25		70		A^2s
$t = 2.5 \text{ ms}$		17		45		A^2s
$t = 0.5 \text{ ms}$		10		25		A^2s
I_{GT1}^{\ddagger} :						
For $1 \mu\text{s}$ max.			4			A
P_{GM} (For $1 \mu\text{s}$ max., $I_{GT1} \leq 4 \text{ A}$)			10			W
P_{GWM}			0.5			W
T_{stg}			-40 to 125			$^\circ\text{C}$
T_C			-40 to 125			$^\circ\text{C}$
T_T (During soldering for 10 s max.)			230			$^\circ\text{C}$

*For either polarity of main terminal 2 voltage (V_{MT2}) with reference to main terminal 1.
 †For either polarity of gate voltage (V_G) with reference to main terminal 1.

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ELECTRICAL CHARACTERISTICS
At Maximum Ratings Unless Otherwise Specified, and at Indicated Temperatures

CHARACTERISTIC	LIMITS For All Types Except as Specified			UNITS
	Min.	Typ.	Max.	
I_{DROM}^{\bullet} $V_{DROM} = \text{Max. rated value, } T_C = 25^{\circ}\text{C}$ $= 125^{\circ}\text{C}$	-	-	0.1 0.5	mA
V_{TM}^{\bullet} $T_C = 25^{\circ}\text{C, } i_T = 8.5 \text{ A (peak SC141 series)}$ $= 14 \text{ A (peak SC146 series)}$	-	-	1.83 1.65	V
I_{HO}^{\bullet} Gate open, initial principal current = 500 mA (dc) $v_D = 12 \text{ V, } T_C = 25^{\circ}\text{C}$ $= -40^{\circ}\text{C}$	-	-	50 100	mA
I_L^{\bullet} $R_{GK} = 100 \Omega, t_W = 50 \mu\text{s, } t_r = t_f = 5 \mu\text{s, } f = 1 \text{ kHz,}$ $T_C = 25^{\circ}\text{C}$				
Mode V_{MT2} V_G				
1+ + +	-	-	100	
111- - -	-	-	100	
1- + -	-	-	200	
$T_C = -40^{\circ}\text{C}$				
1+ + +	-	-	200	
111- - -	-	-	200	
1- + -	-	-	400	
dv/dt^{\bullet} (Commutating) $v_D = V_{DROM}, I_T(\text{RMS}) = \text{Max. rated value,}$ $di/dt = 3.2 \text{ A/ms, } T_C = 80^{\circ}\text{C}$ SC141 series $di/dt = 5.4 \text{ A/ms, } T_C = 80^{\circ}\text{C}$ SC146 series	4	-	-	V/ μs
dv/dt^{\bullet} (Off-State) $v_D = V_{DROM}, T_C = 100^{\circ}\text{C, Exponential voltage rise}$ SC141 series SC146 series	30 100	100 250	- -	
$I_{GT}^{\bullet\bullet}$ $v_D = 12 \text{ V (dc)}$ $T_C = 25^{\circ}\text{C}$				mA
$R_L - \Omega$ Mode V_{MT2} V_G				
100 1+ + +	-	-	50	
100 111- - -	-	-	50	
50 1- + -	-	-	50	
$T_C = -40^{\circ}\text{C}$				
50 1+ + +	-	-	80	
50 111- - -	-	-	80	
25 1- + -	-	-	80	
$V_{GT}^{\bullet\bullet}$ $v_D = 12 \text{ V (dc)}$ $T_C = 25^{\circ}\text{C}$				V
$R_L - \Omega$ Mode V_{MT2} V_G				
100 1+ + +	-	-	2.5	
100 111- - -	-	-	2.5	
50 1- + -	-	-	2.5	
$T_C = -40^{\circ}\text{C}$				
50 1+ + +	-	-	3.5	
50 111- - -	-	-	3.5	
25 1- + -	-	-	3.5	

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ELECTRICAL CHARACTERISTICS (Cont'd)
At Maximum Ratings Unless Otherwise Specified, and at Indicated Temperatures

CHARACTERISTIC	LIMITS For All Types Except as Specified			UNITS
	Min.	Typ.	Max.	
V_{GD}^* $v_D = V_{DROM}, R_L = 1k\Omega, T_C = 100^\circ C$ (For all triggering modes)	0.2	-	-	V
t_{gt} $v_D = V_{DROM}, I_G = 80 mA, t_r = 0.1 \mu s, i_T = 25 A$ (peak), $T_C = 25^\circ C$	-	1.6	2.5	μs

Thermal Characteristics					
$R_{\theta JC}$	SC141 series	-	-	3.0	$^\circ C/W$
	SC146 series	-	-	2.2	
$R_{\theta JA}$		-	-	75	
$R_{\theta JC}(ac)^*$ During ac current conduction	SC141 series	-	-	2.22	
	SC146 series	-	-	1.5	

- For either polarity of main terminal 2 voltage (V_{MT2}) with reference to main terminal 1.
- For either polarity of gate voltage (V_G) with reference to main terminal 1.
- * This characteristic is useful in the calculation of junction-temperature rise above T_C for ac current conduction and applies for a 50 or 60 Hz full sine wave of current. It can be calculated with the following formula:

$$\text{Apparent thermal resistance} = \frac{T_{J(max.)} - T_C}{P_T(AV)}$$

where: $T_{J(max.)}$ = maximum junction temperature
 T_C = case temperature
 $P_T(AV)$ = average on-state power

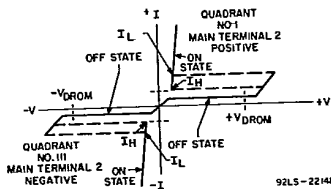


Fig. 1 - Principal voltage-current characteristic.

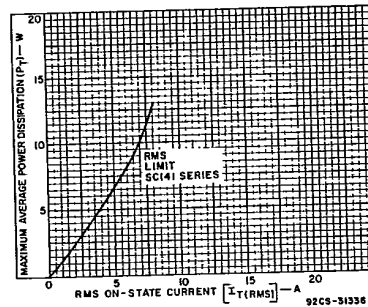


Fig. 2 - Power dissipation as a function of on-state current for SC141 series.

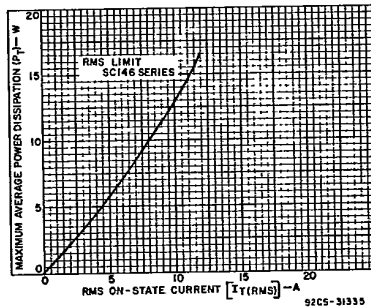


Fig. 3 - Power dissipation as a function of on-state current for SC146 series.

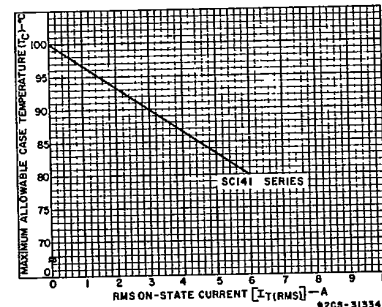


Fig. 4 - Maximum allowable case-temperature as a function of on-state current for SC141 series.

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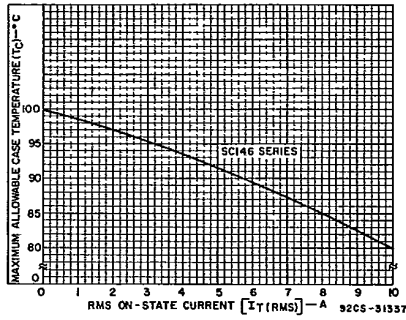


Fig. 5 - Maximum allowable case-temperature as a function of on-state current for SC146 series.

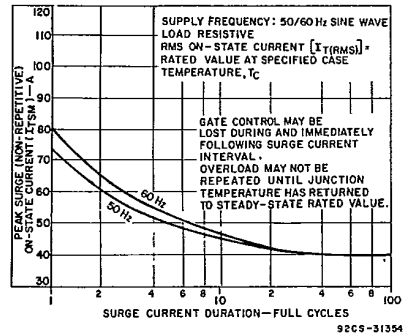


Fig. 6 - Peak surge on-state current as a function of surge current duration for SC141 series.

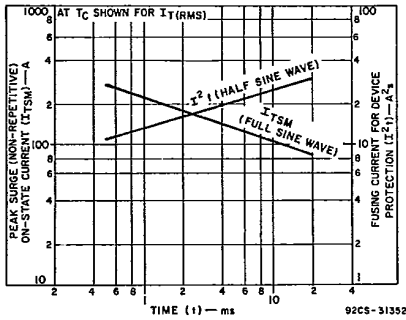


Fig. 7 - Peak surge on-state current and fusing current as a function of time for SC141 series.

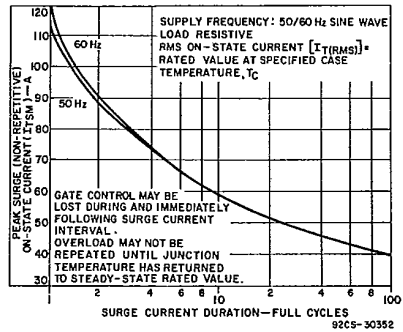


Fig. 8 - Peak surge on-state current as a function of surge current duration for SC146 series.

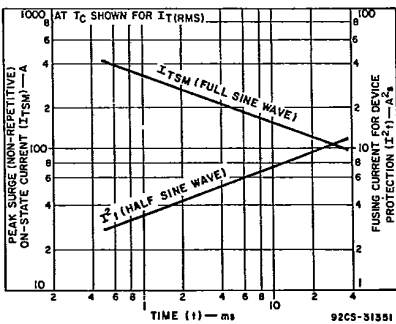


Fig. 9 - Peak surge on-state current and fusing current as a function of time for SC146 series.

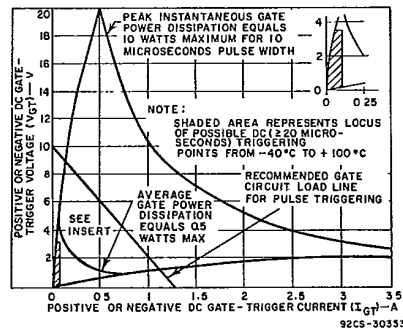


Fig. 10 - Gate pulse characteristics for all triggering modes.

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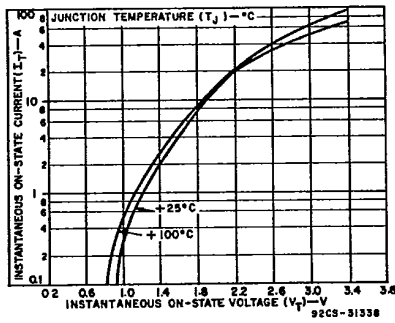


Fig. 11 - On-state current as a function of on-state voltage for SC141 series.

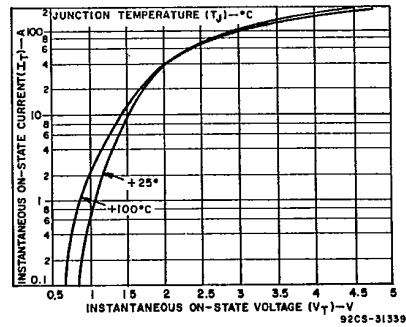


Fig. 12 - On-state current as a function of on-state voltage for SC146 series.

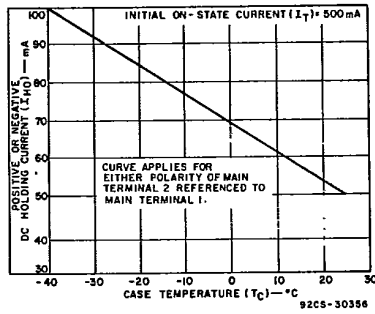


Fig. 13 - DC holding current as a function of case temperature.

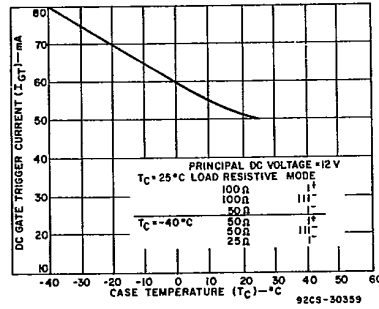


Fig. 14 - DC gate trigger current as a function of case temperature.

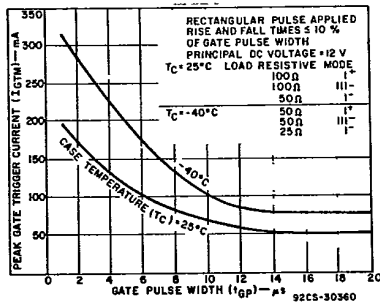


Fig. 15 - Peak gate trigger current as a function of gate pulse width.

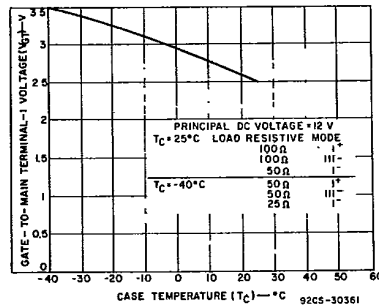


Fig. 16 - DC gate-trigger voltage as a function of case temperature.

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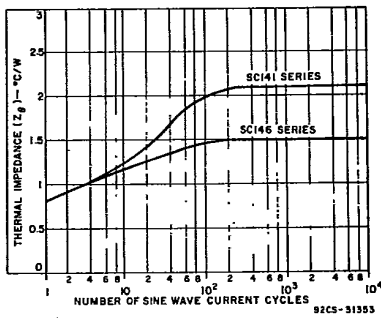


Fig. 17 - Thermal impedance as a function of sine-wave current cycles.

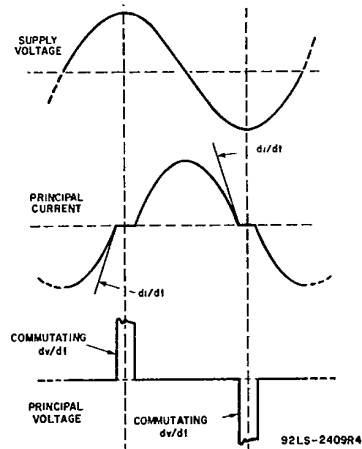


Fig. 18 - Relationship between supply voltage and principal current (inductive load) showing reference points for definition of commutating voltage (dv/dt).

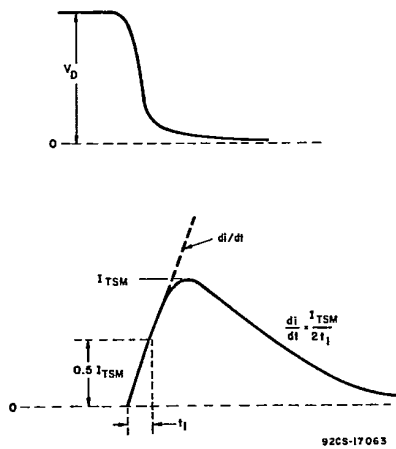


Fig. 19 - Rate-of-change of on-state current with time (defining di/dt).

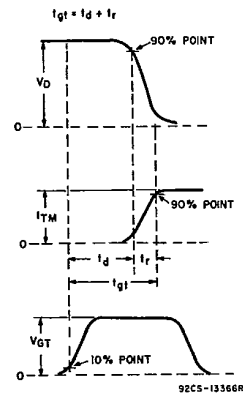


Fig. 20 - Relationship between off-state voltage, on-state current, and gate-trigger voltage showing reference points for definition of turn-on time (t_{gt}).