

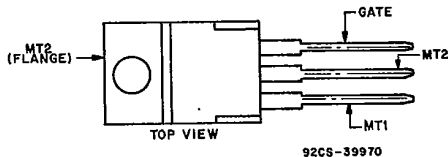
6-A and 10-A Silicon Triacs

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
- Sipos 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}^* $T_J = -40$ to 125°C	200	400	500	600	800	V
$I_{T(RMS)}$ $\theta = 360^\circ$:				6		A
For SC141 series, $T_C = 75^\circ\text{C}$				10		A
For SC146 series, $T_C = 80^\circ\text{C}$				See Fig. 4		
For other conditions						
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
$V_D = V_{DRM}$, $I_G = 200$ mA, $t_r = 0.1$ μs						
I^2t [At T_C shown for $I_{T(RMS)}$, half-sine wave]:						
$t = 10$ ms		25			70	A ² s
2.5 ms		17			45	A ² s
0.5 ms		10			25	A ² s
I_{GTM}^{\ddagger} :						
For 1 μs max.				4		A
P_{GM} (For 1 μs max., $I_{GTM} \leq 4$ A)				10		W
$P_{GM(M)}$				0.5		W
T_{stg}				-40 to 125		$^\circ\text{C}$
T_C				-40 to 125		$^\circ\text{C}$
T_f (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.

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	mA	
	—	—	0.5		
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	V	
	—	—	1.65		
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	mA	
	—	—	100		
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				V/ μs	
	4	—	—		
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	—		
$I_{GT}^{\bullet\bullet}$ $v_D = 12 \text{ V (dc)}$ $T_C = 25^{\circ}\text{C}$	$R_L - \Omega$	Mode	V_{MT2}	V_G	mA
	100	1+	+	+	
	100	111-	—	—	
	50	1-	+	—	
$T_C = -40^{\circ}\text{C}$					
	50	1+	+	+	
	50	111-	—	—	
	25	1-	+	—	
	—	—	—	—	50
	—	—	—	—	50
	—	—	—	—	50
	—	—	—	—	80
	—	—	—	—	80
	—	—	—	—	80
$V_{GT}^{\bullet\bullet}$ $v_D = 12 \text{ V (dc)}$ $T_C = 25^{\circ}\text{C}$	$R_L - \Omega$	Mode	V_{MT2}	V_G	V
	100	1+	+	+	
	100	111-	—	—	
	50	1-	+	—	
$T_C = -40^{\circ}\text{C}$					
	50	1+	+	+	
	50	111-	—	—	
	25	1-	+	—	
	—	—	—	—	2.5
	—	—	—	—	2.5
	—	—	—	—	2.5
	—	—	—	—	3.5
	—	—	—	—	3.5
	—	—	—	—	3.5

SC141, SC146 Series

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}^{\bullet} $V_D = V_{DROM}$, $R_L = 1k\Omega$, $T_C = 100^{\circ}C$ (For all triggering modes)	0.2	—	—	V
t_{gt} $V_D = V_{DROM}$, $I_G = 80$ mA, $t_r = 0.1$ μs , $i_T = 25$ 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

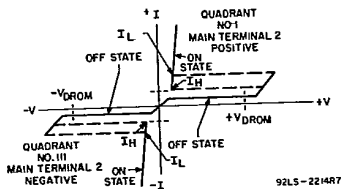


Fig. 1 — Principal voltage-current characteristic.

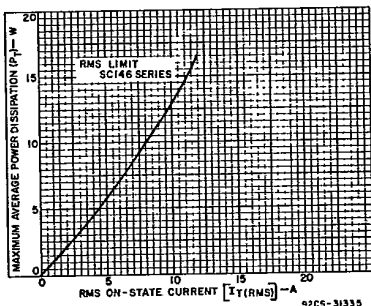


Fig. 3 — Power dissipation as a function of on-state current for SC146 series.

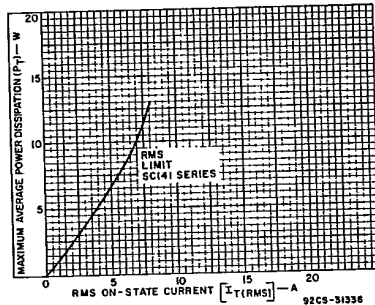


Fig. 2 — Power dissipation as a function of on-state current for SC141 series.

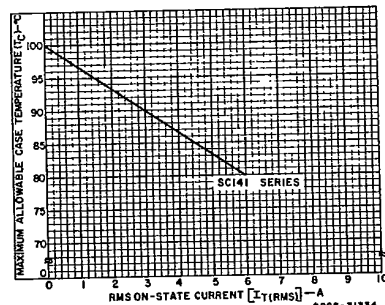


Fig. 4 — Maximum allowable case-temperature as a function of on-state current for SC141 series.

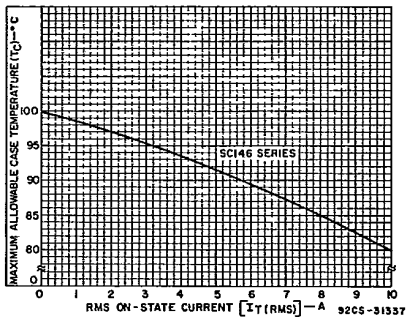


Fig. 5 - Maximum allowable case-temperature as a function of on-state current for SC146 series.

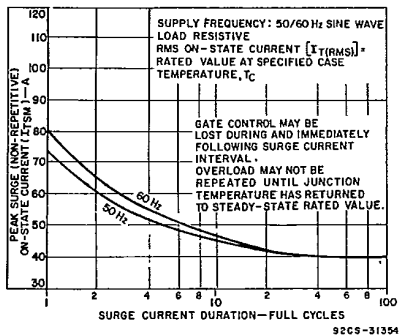


Fig. 6 - Peak surge on-state current as a function of surge current duration for SC141 series.

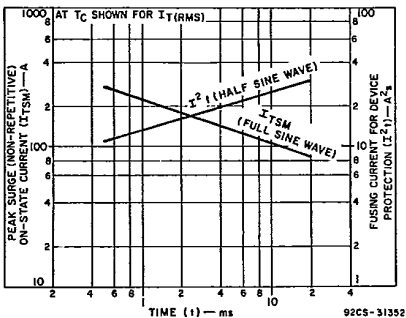


Fig. 7 - Peak surge on-state current and fusing current as a function of time for SC141 series.

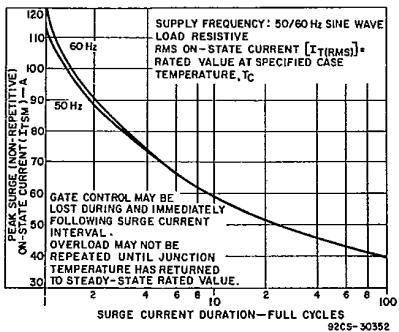


Fig. 8 - Peak surge on-state current as a function of surge current duration for SC146 series.

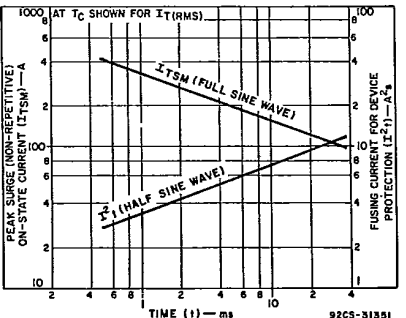


Fig. 9 - Peak surge on-state current and fusing current as a function of time for SC146 series.

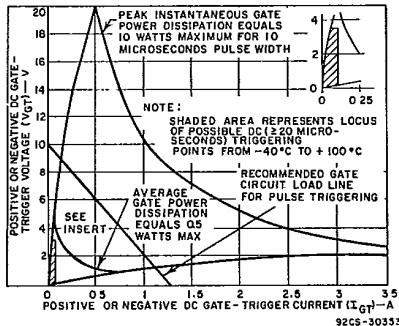


Fig. 10 - Gate pulse characteristics for all triggering modes.

SC141, SC146 Series

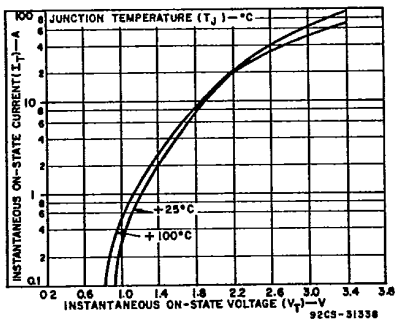


Fig. 11 — On-state current as a function of on-state voltage for SC141 series.

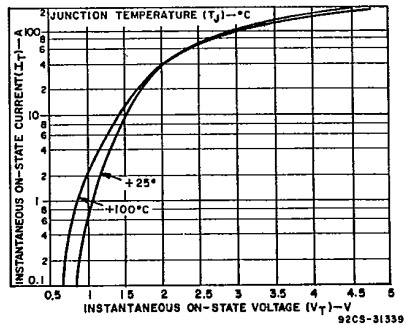


Fig. 12 — On-state current as a function of on-state voltage for SC146 series.

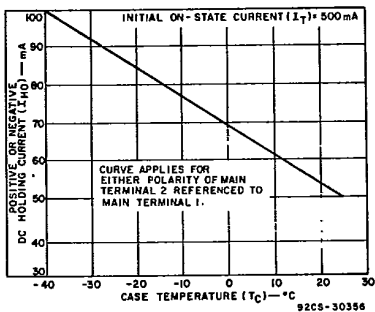


Fig. 13 — DC holding current as a function of case temperature.

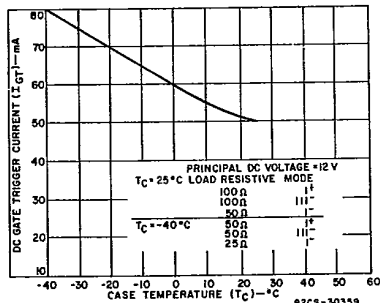


Fig. 14 — DC gate trigger current as a function of case temperature.

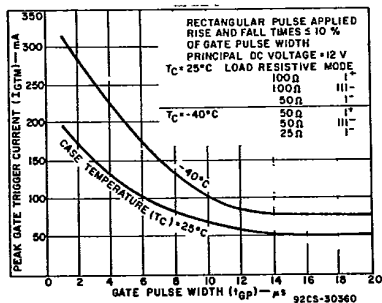


Fig. 15 — Peak gate trigger current as a function of gate pulse width.

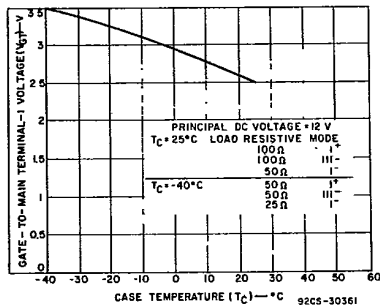


Fig. 16 — DC gate-trigger voltage as a function of case temperature.

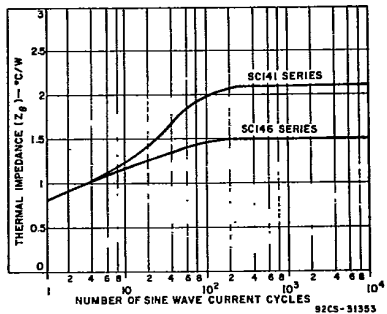


Fig. 17 — Thermal impedance as a function of sine-wave current cycles.

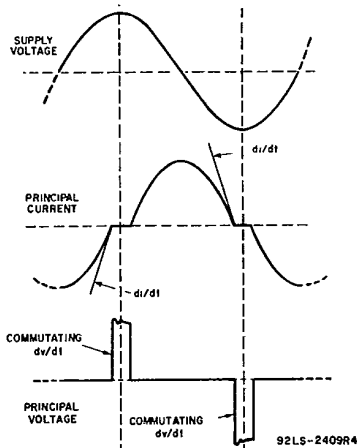


Fig. 18 — Relationship between supply voltage and principal current (inductive load) showing reference points for definition of commutating voltage (dv/dt).

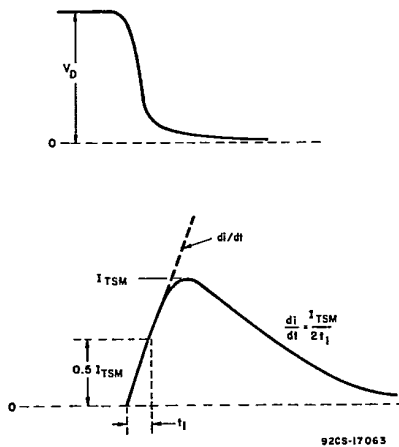


Fig. 19 — Rate-of-change of on-state current with time (defining di/dt).

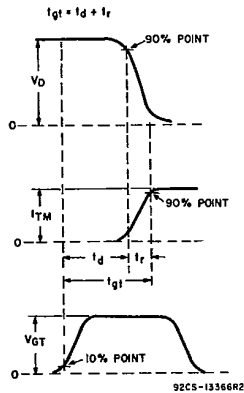


Fig. 20 — Relationship between off-state voltage, on-state current, and gate-trigger voltage showing reference points for definition of turn-on time (t_{gt}).