

SERIES TIC116, TIC126

P-N-P-N SILICON REVERSE-BLOCKING TRIODE THYRISTORS

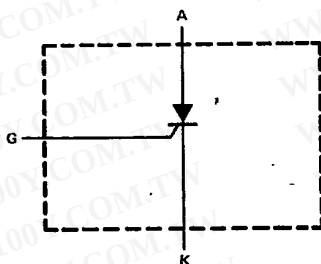
T-25-15

APRIL 1971 - REVISED OCTOBER 1984

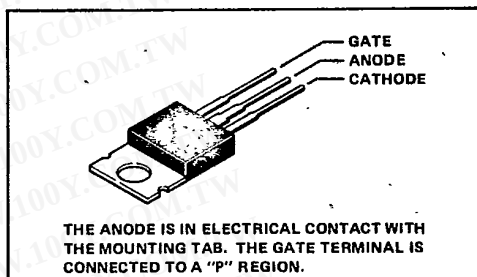
- Silicon Controlled Rectifiers
- 50 V to 600 V
- 8 A and 12 A DC
- 80 A and 100 A Surge Current
- Max IGT of 20 mA

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device schematic



TO-220AB PACKAGE



absolute maximum ratings at 25°C case temperature (unless otherwise noted)

	SUFFIX	SERIES	
		TIC116	TIC126
Repetitive peak off-state voltage, V_{DRM} (see Note 1) Repetitive peak reverse voltage, V_{RRM}	F	50 V	50 V
	A	100 V	100 V
	B	200 V	200 V
	C	300 V	300 V
	D	400 V	400 V
	E	500 V	500 V
Continuous on-state current at (or below) 70°C case temperature (see Note 2)	M	600 V	600 V
		8 A	12 A
Average on-state current (180° conduction angle) at (or below) 70°C case temperature (see Note 3)		5 A	7.5 A
Surge on-state current (see Note 4)		80 A	100 A
Peak positive gate current (pulse duration $\leq 300 \mu s$)		3 A	
Peak gate power dissipation (pulse duration $\leq 300 \mu s$)		5 W	
Average gate power dissipation (see Note 5)		1 W	
Operating case temperature range		-40 °C to 110 °C	
Storage temperature range		-40 °C to 125 °C	
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds		230 °C	

- NOTES:
1. These values apply when the gate-cathode resistance $R_{GK} = 1 \text{ k}\Omega$.
 2. These values apply for continuous d-c operation with resistive load. Above 70°C derate according to Figure 3.
 3. This value may be applied continuously under single-phase 50-Hz half-sine-wave operation with resistive load. Above 70°C derate according to Figure 9.
 4. This value applies for one 50-Hz half-sine-wave when the device is operating at (or below) rated values of peak reverse voltage and on-state current. Surge may be repeated after the device has returned to original thermal equilibrium.
 5. This value applies for a maximum averaging time of 20 ms.

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electrical characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_{DRM} Repetitive Peak Off-State Current	$V_D = \text{Rated } V_{DRM}, R_{GK} = 1 \text{ k}\Omega, T_C = 100^\circ\text{C}$			2	mA
I_{RRM} Repetitive Peak Reverse Current	$V_R = \text{Rated } V_{RRM}, I_G = 0, T_C = 110^\circ\text{C}$			2	
I_{GT} Gate Trigger Current	$V_{AA} = 6 \text{ V}, R_L = 100 \Omega, t_{w(g)} \geq 20 \mu\text{s}$		5	20	mA
V_{GT} Gate Trigger Voltage	$V_{AA} = 6 \text{ V}, R_{GK} = 1 \text{ k}\Omega, T_C = 40^\circ\text{C}$			2.5	
	$V_{AA} = 6 \text{ V}, R_L = 100 \Omega, t_{w(g)} \geq 20 \mu\text{s}, R_{GK} = 1 \text{ k}\Omega$		0.8	1.5	V
	$V_{AA} = 6 \text{ V}, R_L = 100 \Omega, t_{w(g)} \geq 20 \mu\text{s}, R_{GK} = 1 \text{ k}\Omega, T_C = 110^\circ\text{C}$		0.2		
	$V_{AA} = 6 \text{ V}, R_{GK} = 1 \text{ k}\Omega, T_C = 110^\circ\text{C}$				
I_H Holding Current	$V_{AA} = 6 \text{ V}, R_{GK} = 1 \text{ k}\Omega, \text{Initiating } I_T = 100 \text{ mA}, T_C = -40^\circ\text{C}$			70	mA
	$V_{AA} = 6 \text{ V}, R_{GK} = 1 \text{ k}\Omega, \text{Initiating } I_T = 100 \text{ mA}$			40	
V_{TM} Peak On-State Voltage	$I_{TM} = 8 \text{ A}, \text{See Note 6}, \text{SERIES TIC116}$			1.7	
	$I_{TM} = 12 \text{ A}, \text{See Note 6}, \text{SERIES TIC126}$			1.4	
dv/dt Critical Rate of Rise of Off-State Voltage	$V_D = \text{Rated } V_D, I_G = 0, T_C = 110^\circ\text{C}$		100		V/ μs

NOTE 6: These parameters must be measured using pulse techniques, $t_w = 300 \mu\text{s}$, duty cycle $\leq 2\%$. Voltage-sensing contacts, separate from the current-carrying contacts, are located within 3,2 mm (1/8 inch) from the device body.

thermal characteristics

PARAMETER	SERIES TIC116			SERIES TIC126			UNIT
	MIN	TYP	MAX	MIN	TYP	MAX	
$R_{\theta JC}$			3			2.4	$^\circ\text{C/W}$
$R_{\theta JA}$			62.5			62.5	

resistive-load switching characteristics at 25°C case temperature

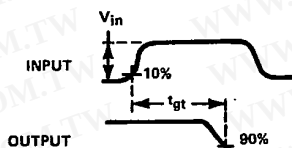
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{gt} Gate-Controlled Turn-On Time	$V_{AA} = 30 \text{ V}, V_{in} = 20 \text{ V}, R_L = 6 \Omega, R_{GK(off)} = 100 \Omega, \text{See Figure 1}$		0.8		μs
t_q Circuit-Commutated Turn-Off Time	$V_{AA} = 30 \text{ V}, R_L = 6 \Omega, I_{RM} = 10 \text{ A}, \text{See Figure 2}$		11		

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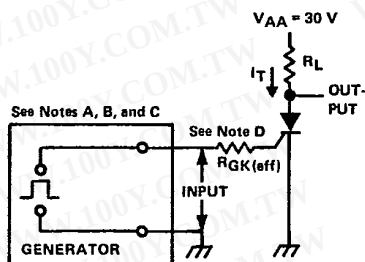
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T-2S-15

PARAMETER MEASUREMENT INFORMATION

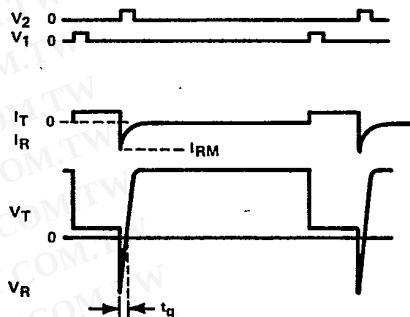


VOLTAGE WAVEFORMS

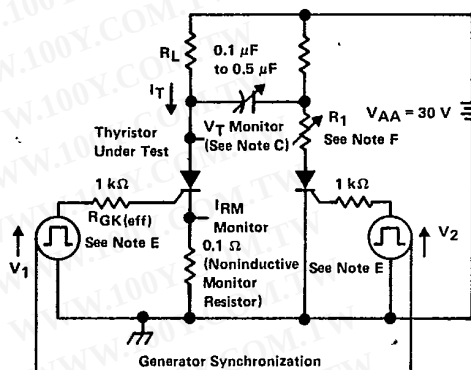


TEST CIRCUIT

FIGURE 1. GATE-CONTROLLED TURN-ON TIME



WAVEFORMS



TEST CIRCUIT

FIGURE 2. CIRCUIT-COMMUTATED TURN-OFF TIME

- NOTES: A. V_{in} is measured with gate and cathode terminals open.
 B. The input waveform of Figure 1 has the following characteristics: $t_r \leq 40$ ns, $t_w \geq 20$ μ s.
 C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 14$ ns, $R_{in} \geq 10$ M Ω , $C_{in} \leq 12$ pF.
 D. $R_{GK}(eff)$ includes the total resistance of the generator and the external resistor.
 E. Pulse generators for V_1 and V_2 are synchronized to provide an anode current waveform with the following characteristics: $t_w = 50$ to 300 μ s, duty cycle = 1%. The pulse duration of V_1 and V_2 are ≥ 10 μ s.
 F. Resistor R_1 is adjusted for $I_{RM} \approx 10$ A.

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THERMAL INFORMATION

**AVERAGE ON-STATE CURRENT
 DERATING CURVE**

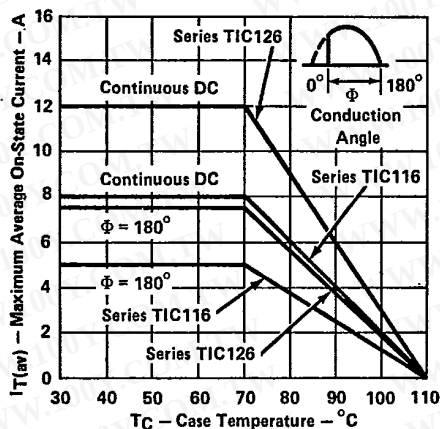


FIGURE 3

**MAXIMUM CONTINUOUS ANODE POWER
 DISSIPATED**

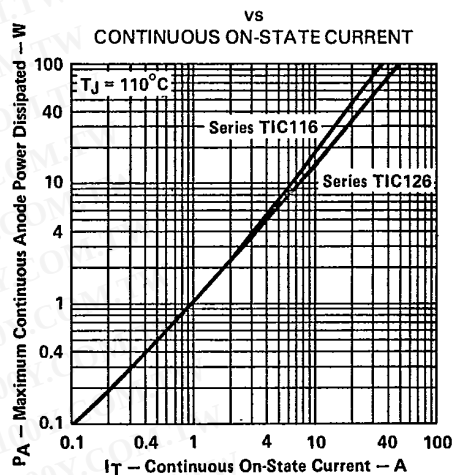


FIGURE 4

**SURGE ON-STATE CURRENT
 vs
 CYCLES OF CURRENT DURATION**

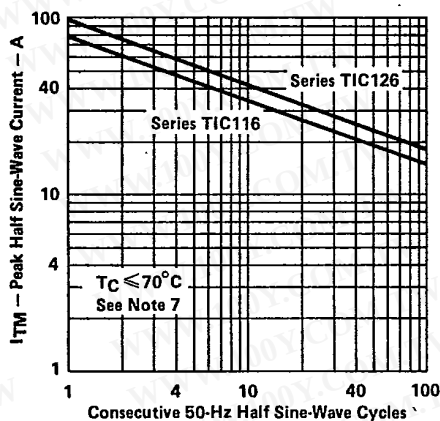


FIGURE 5

**TRANSIENT THERMAL RESISTANCE
 vs
 CYCLES OF CURRENT DURATION**

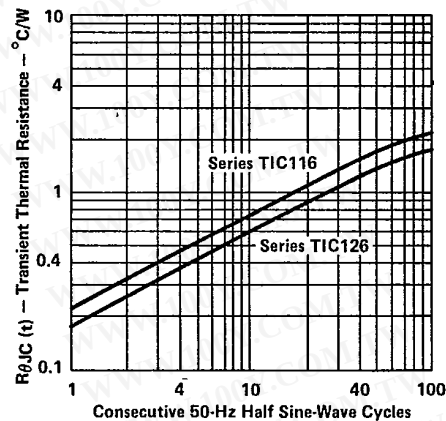


FIGURE 6

NOTE 7: This curve shows the maximum number of cycles of surge current for which gate control is guaranteed provided the device is initially at nonoperating thermal equilibrium.

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TYPICAL CHARACTERISTICS

**GATE TRIGGER CURRENT
vs
CASE TEMPERATURE**

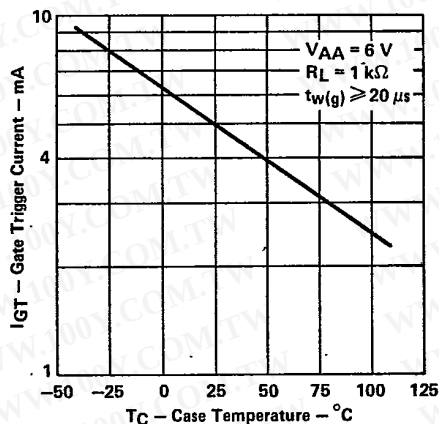


FIGURE 7

**GATE TRIGGER VOLTAGE
vs
CASE TEMPERATURE**

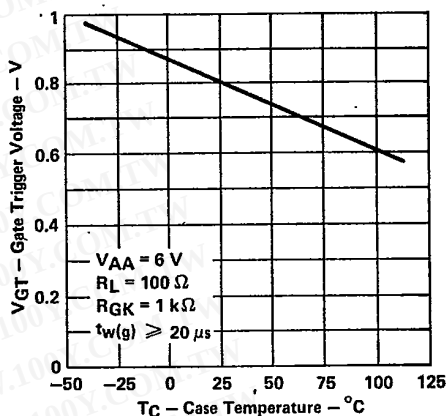


FIGURE 8

**GATE FORWARD VOLTAGE
vs
GATE FORWARD CURRENT**

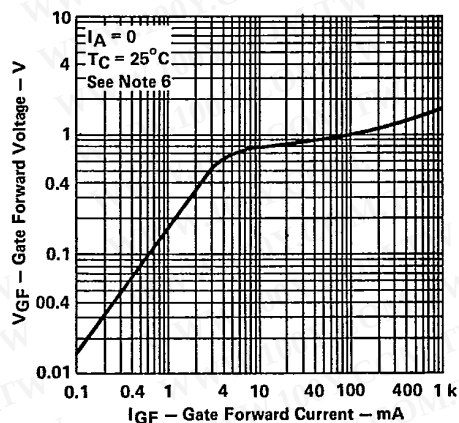


FIGURE 9

**HOLDING CURRENT
vs
CASE TEMPERATURE**

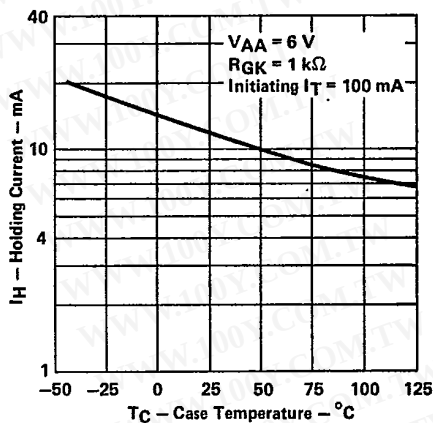


FIGURE 10

NOTE 6: These parameters must be measured using pulse techniques, $t_w = 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$. Voltage-sensing contacts, separate from the current-carrying contacts, are located within 3.2 mm (1/8 inch) from the device body.

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TYPICAL CHARACTERISTICS

PEAK ON-STATE VOLTAGE
vs
PEAK ON-STATE CURRENT

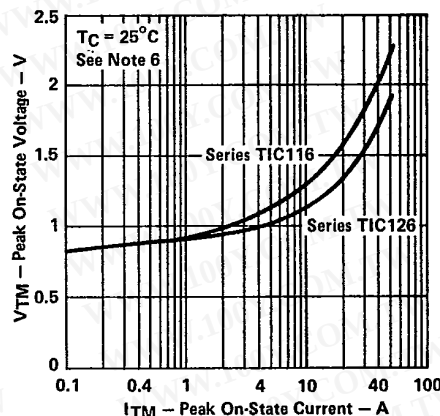


FIGURE 11

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GATE-CONTROLLED TURN-ON TIME
vs
GATE CURRENT

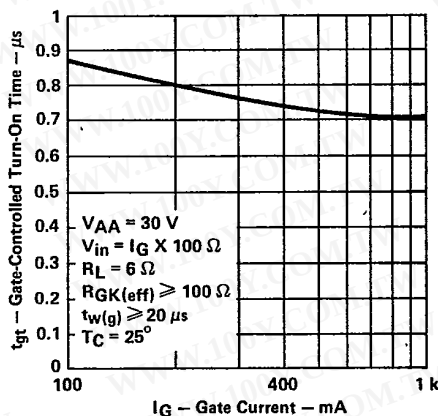


FIGURE 12

CIRCUIT-COMMUTATED TURN-OFF TIME
vs
CASE TEMPERATURE

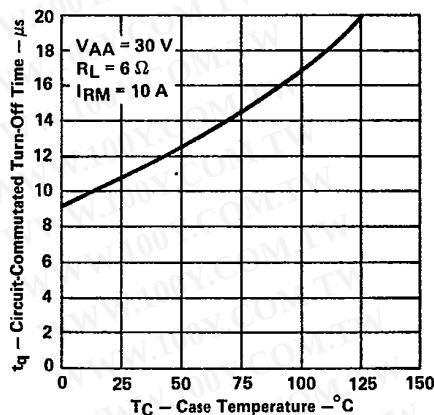


FIGURE 13

NOTE 6: These parameters must be measured using pulse techniques, $t_w = 300\ \mu\text{s}$, duty cycle $\leq 2\%$. Voltage-sensing contacts, separate from the current-carrying contacts, are located within 3.2 mm (1/8 inch) from the device body.