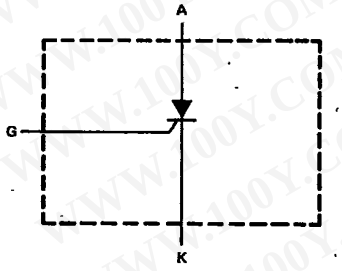
TIC106A, TIC106B, TIC106C, TIC106D, TIC106E, TIC106F, TIC106M
P-N-P-N SILICON REVERSE-BLOCKING TRIODE THYRISTORS

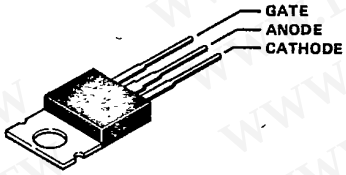
APRIL 1971 – REVISED OCTOBER 1984

- Silicon Controlled Rectifiers
- 50 V to 600 V
- 5 A DC
- 30 A Surge Current
- MAX I_{GT} of 200 A

device schematic



TO-220AB PACKAGE



THE ANODE IS IN ELECTRICAL CONTACT WITH THE MOUNTING TAB. THE GATE TERMINAL IS CONNECTED TO A "P" REGION.

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

	TIC106F	TIC106A	TIC106B	TIC106C
Repetitive peak off-state voltage, V_{DRM} (see Note 1)	50 V	100 V	200 V	300 V
Repetitive peak reverse voltage, V_{RRM}	50 V	100 V	200 V	300 V
Continuous on-state current at (or below) 80°C case temperature (see Note 2)	5 A			
Average on-state current (180° conduction angle) at (or below) 80°C case temperature (see Note 3)	3.2 A			
Surge on-state current (see Note 4)	30 A			
Peak positive gate current (pulse duration ≤ 300 μs)	0.2 A			
Peak gate power dissipation (pulse duration ≤ 300 μs)	1.3 W			
Average gate power dissipation (see Note 5)	0.3 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 kΩ.
2. These values apply for continuous d-c operation with resistive load. Above 80°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 80°C derate according to Figure 3.
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.

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

	TIC106D	TIC106E	TIC106M
Repetitive peak off-state voltage, V_{DRM} (see Note 1)	400 V	500 V	600 V
Repetitive peak reverse voltage, V_{RRM}	400 V	500 V	600 V
Continuous on-state current at (or below) 80°C case temperature (see Note 2)	5 A		
Average on-state current (180° conduction angle) at (or below) 80°C case temperature (see Note 3)	3.2 A		
Surge on-state current (see Note 4)	30 A		
Peak positive gate current (pulse duration ≤ 300 μs)	0.2 A		
Peak gate power dissipation (pulse duration ≤ 300 μs)	1.3 W		
Average gate power dissipation (see Note 5)	0.3 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 kΩ.
2. These values apply for continuous d-c operation with resistive load. Above 80°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 80°C derate according to Figure 3.
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.

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 = Rated V_{DRM},	R_{GK} = 1 kΩ,	T_C = 110°C			400	μA
I_{RRM}	Repetitive Peak Reverse Current	V_R = Rated V_{RRM},	I_G = 0,	T_C = 110°C			1	mA
I_{GT}	Gate Trigger Current	V_{AA} = 6 V,	R_L = 100 Ω,	$t_{w(g)} \geq 20$ μs		60	200	μA
V_{GT}	Gate Trigger Voltage	V_{AA} = 6 V, $t_{w(g)} \geq 20$ μs,	R_L = 100 Ω, T_C = −40°C	R_{GK} = 1 kΩ,			1.2	V
		V_{AA} = 6 V, $t_{w(g)} \geq 20$ μs,	R_L = 100 Ω,	R_{GK} = 1 kΩ,	0.4	0.6	1	
		V_{AA} = 6 V, $t_{w(g)} \geq 20$ μs,	R_L = 100 Ω, T_C = −110°C	R_{GK} = 1 kΩ,	0.2			
I_H	Holding Current	V_{AA} = 6 V,	R_{GK} = 1 kΩ,	Initiating I_T = 10 mA			5	mA
		V_{AA} = 6 V, T_C = −40°C	R_{GK} = 1 kΩ,	Initiating I_T = 10 mA,			8	
V_{TM}	Peak On-State Voltage	I_{TM} = 5 A,	See Note 6				1.7	V
dv/dt	Critical Rate of Rise of Off-State Voltage	V_D = Rated V_D,	R_{GK} = 1 kΩ,	T_C = 110°C		10		V/μs

NOTE 6: These parameters must be measured using pulse techniques, t_W = 300 μs, duty cycle ≤ 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	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			3.5	°C/W
$R_{\theta JA}$			62.5	

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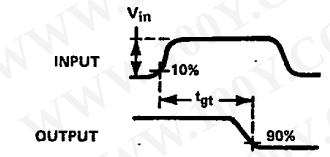
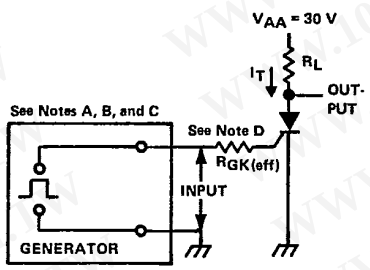
resistive-load switching characteristics at 25°C case temperature

	PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNIT
t_{gt}	Gate-Controlled Turn-On Time	V_{AA} = 30 V, V_{in} = 50 V,	R_L = 6 Ω, See Figure 1	$R_{GK(off)}$ = 5 kΩ,		1.75		μs
t_q	Circuit-Commutated Turn-Off Time	V_{AA} = 30 V, See Figure 2	R_L = 6 Ω,	I_{RM} ≈ 8 A,		7.7		

PARAMETER MEASUREMENT INFORMATION

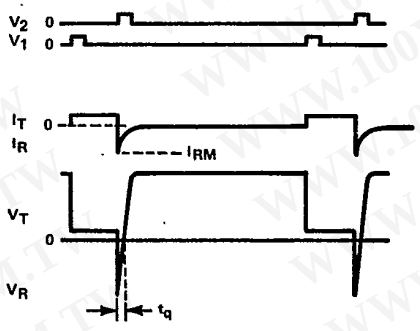


VOLTAGE WAVEFORMS

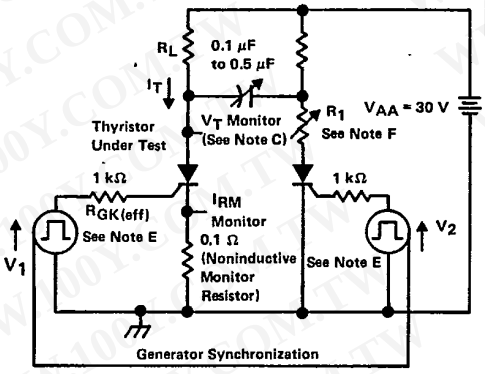


TEST CIRCUIT

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, $t_w \geq 20$ μs.
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 14$ ns, $R_{in} \geq 10$ MΩ, $C_{in} \leq 12$ 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 μs, duty cycle = 1 %. The pulse widths of V_1 and V_2 are ≥ 10 μs.
F. Resistor R_1 is adjusted for I_{RM} ≈ 8 A.

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THERMAL INFORMATION

AVERAGE ANODE FORWARD CURRENT DERATING CURVE

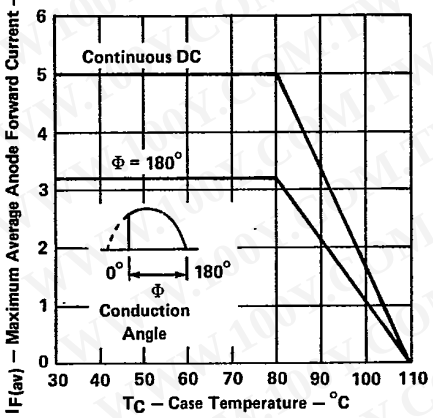

FIGURE 3

MAXIMUM CONTINUOUS ANODE POWER DISSIPATED vs CONTINUOUS ON-STATE CURRENT

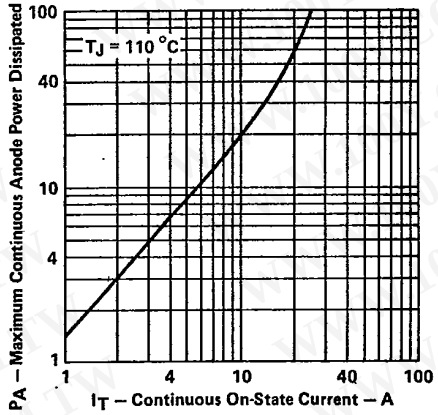

FIGURE 4

SURGE ON-STATE CURRENT vs CYCLES OF CURRENT DURATION

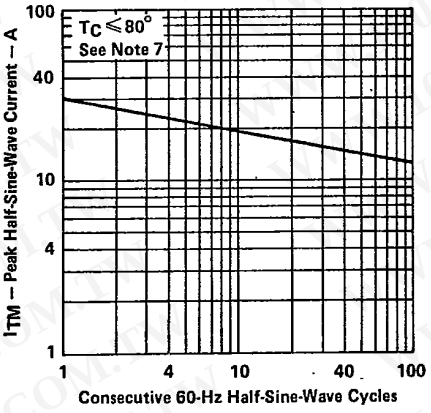

FIGURE 5

TRANSIENT THERMAL RESISTANCE vs CYCLES OF CURRENT DURATION

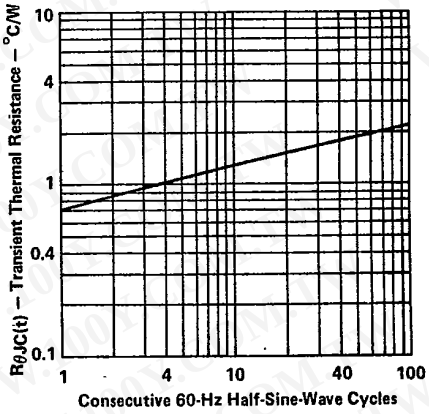

FIGURE 6

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

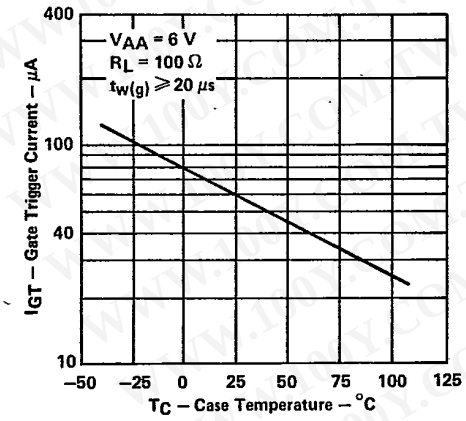

FIGURE 7

GATE TRIGGER VOLTAGE vs CASE TEMPERATURE

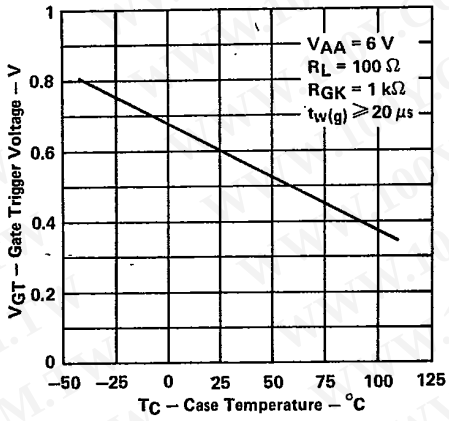

FIGURE 8

GATE FORWARD VOLTAGE vs GATE FORWARD CURRENT

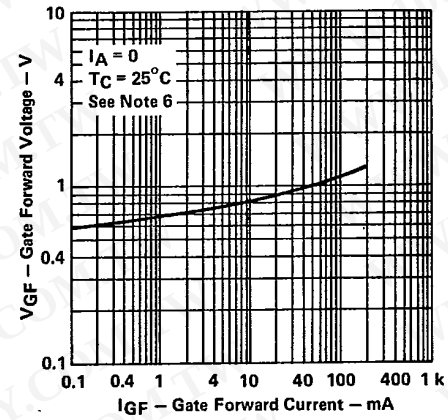

FIGURE 9

HOLDING CURRENT vs CASE TEMPERATURE

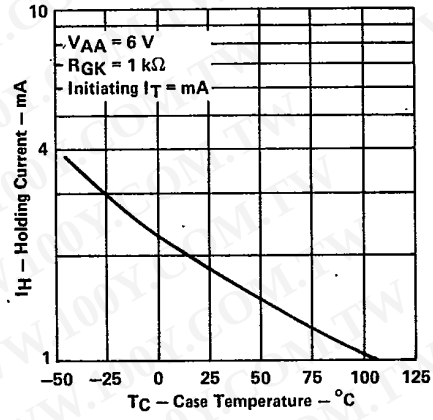

FIGURE 10

NOTE 6: These parameters must be measured using pulse techniques, t_w = 300 μs, duty cycle ⩽ 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

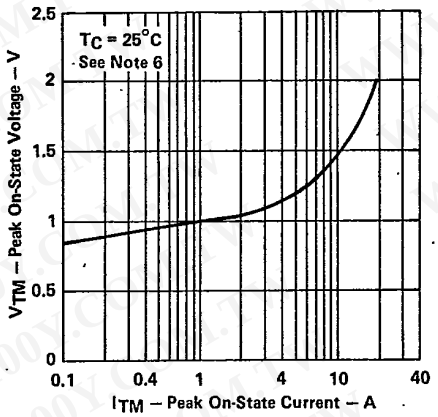

FIGURE 11

GATE-CONTROLLED TURN-ON TIME
vs
GATE CURRENT

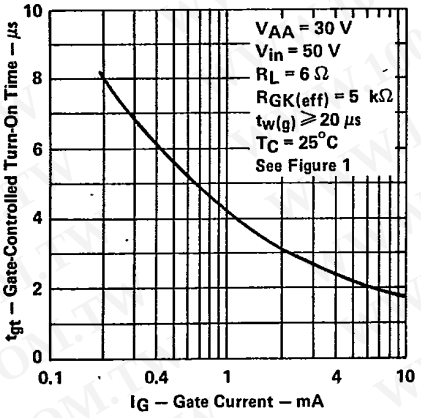

FIGURE 12

CIRCUIT-COMMUTATED TURN-OFF TIME
vs
CASE TEMPERATURE

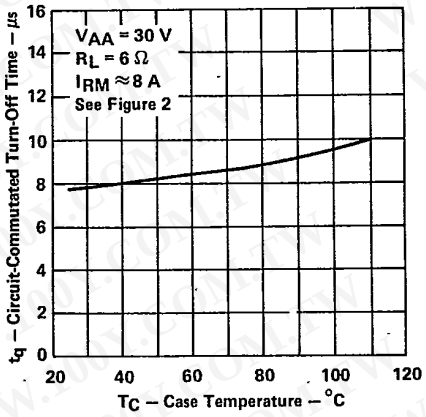

FIGURE 13

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