

3875081 G E SOLID STATE
Silicon Controlled Rectifiers

01E 17672 D T-25-17

2N3650, 2N3651, 2N3652, 2N3653, S7410M

File Number 408

35-A Silicon Controlled Rectifiers

For Inverter Applications

Features

- Fast turn-off time — 15 μ s max.
- High di/dt and dv/dt capabilities
- Low thermal resistance

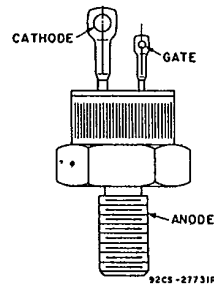
RCA-2N3650 to 2N3653, inclusive, and the S7410M* are all-diffused silicon controlled rectifiers (reverse-blocking triode thyristors) intended for high-speed switching applications such as power inverters, switching regulators, and high-current pulse applications. They feature fast turn-off, high dv/dt, and high di/dt characteristics and may be used at frequencies up to 25 kHz.

The 2N3650 to 2N3653 have forward and reverse off-state voltage ratings of 100, 200, 300, and 400 volts, respectively. Type S7410M has a forward and reverse off-state voltage rating of 600 volts.

These SCR's employ a hermetic JEDEC TO-208AA package.

*Formerly RCA Type No. S7430M.

TERMINAL DESIGNATIONS



JEDEC TO-208AA

MAXIMUM RATINGS, Absolute-Maximum Values

	2N3650	2N3651	2N3652	2N3653	S7410M	
*V _{RSOM} ▲	150	300	400	500	700	V
V _{OSOM} ▲	150	300	400	500	700	V
*V _{RPM} ▲	100	200	300	400	600	V
*V _{DRM} ▲	100	200	300	400	600	V
I _{TRMS} (T _C = 40° C, θ = 180°)	35					A
I _{TRM} (T _C + 40° C, θ = 180°)	25					A
I _{TM} :	For one full cycle of applied principal voltage 60-Hz (Rectangular wave-pw = 5 ms, t _r = 50 μ s), T _C = 40° C					
*di/dt:	180					A
V _D = V _{DRM} , I _{GT} = 200 mA, t _r = 0.1 μ s (See Fig. 13)	400					A/ μ s
I ² t:	T _J = -65 to 120° C, T = 1 to 8.3 ms					
*P _{GM} *:	40					W
*P _{GM(AV)} *:	Averaging time = 10 ms maximum					
	1					W
*T _{stg} ■	-65 to 150					°C
T _C ■	-65 to 120					°C
T _r :	During soldering for 10 s maximum (terminal and case)					
	225					°C
τ_s :	Recommended					
	35					in-lbf
	0.4					kgf-m
	50					in-lbf
	0.57					kgf-m

* In accordance with JEDEC registration data format (JS-14, RDF-1) filed for the JEDEC (2N series) types.

▲ These values do not apply if there is a positive gate signal. Gate must be open or negatively biased.

■ Any product of gate current and gate voltage which results in a gate power less than the maximum is permitted.

■ For temperature measurement reference point, see Dimensional Outline.

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ELECTRICAL CHARACTERISTICS

At Maximum Ratings Unless Otherwise Specified and at Indicated Case Temperature (T_C)

CHARACTERISTIC	LIMITS			UNITS
	FOR ALL TYPES Except as Specified			
	MIN.	TYP.	MAX.	
I_{DOM} or I_{ROM} : $V_D = V_{DROM}$ or $V_R = V_{RROM}$, $T_C = 120^\circ C$				
2N3650, 2N3651	-	2	6*	mA
2N3652	-	2	5.5*	
2N3653	-	2	4*	
S7410M	-	-	3	
v_T : $i_T = 25$ A (peak), $T_C = 25^\circ C$	-	1.5	2.05*	V
i_{HO} : $T_C = 25^\circ C$	-	75	150	mA
$T_C = -65^\circ C$	-	150	350*	
* dv/dt : $V_D = V_{DROM}$, exponential voltage rise, $T_C = 120^\circ C$ (See Fig 14)	200	-	-	V/ μs
I_{GT} : $V_D = 6$ V (dc), $R_L = 4 \Omega$, $T_C = 25^\circ C$	-	80	180	mA
$V_D = 6$ V (dc), $R_L = 2 \Omega$, $T_C = -65^\circ C$	-	150	500*	
V_{GT} : $V_D = 6$ V (dc), $R_L = 4 \Omega$, $T_C = 25^\circ C$	-	1.5	3	V
* $V_D = 6$ V (dc), $R_L = 200 \Omega$, $T_C = 120^\circ C$	0.25	-	-	
$V_D = 6$ V (dc), $R_L = 2 \Omega$, $T_C = -65^\circ C$	-	2	4.5*	
* t_q : Rectangular Pulse $V_{DX} = V_{DROM}$, $i_T = 10$ A, pulse duration = 50 μs , $dv/dt = 200$ V/ μs , $-di/dt = 5$ A/ μs , $I_{GT} = 200$ mA at turn-on, $V_{RX} = 15$ V minimum, $V_{GK} = 0$ V at turn-off, $T_C = 120^\circ C$ (See Figs. 15 & 16)	-	-	15	μs
Sinusoidal Pulse $V_{DX} = V_{DROM}$, $i_T = 100$ A, pulse duration = 2 μs , $dv/dt = 200$ V/ μs , $V_{RX} = 30$ V minimum, $V_{GK} = 0$ at turn-off, $T_C = 115^\circ C$ (See Figs. 17 & 18)	-	-	15	
$R_{\theta JC}$	-	0.85	1.7*	$^\circ C/W$

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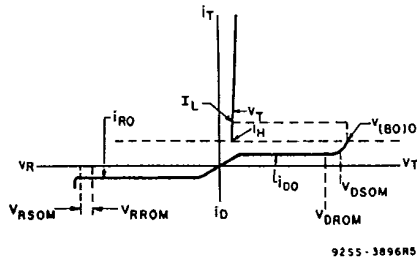


Fig. 1 - Principal voltage-current characteristic.

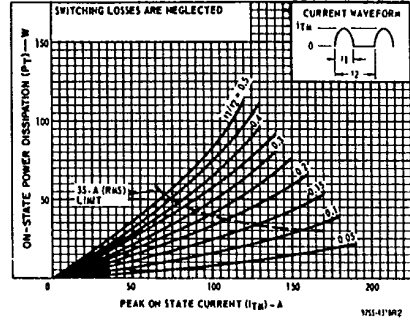


Fig. 2 - Power dissipation vs. peak on-state current.

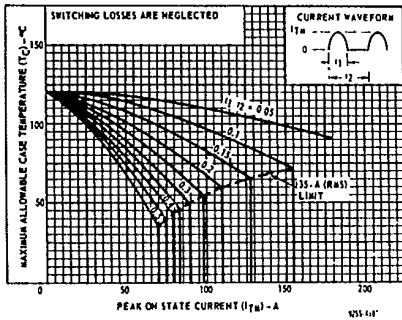


Fig. 3 - Maximum allowable case-temperature vs. peak on-state current.

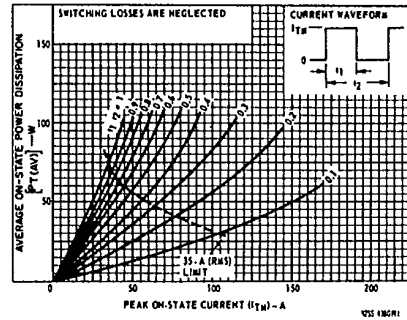


Fig. 4 - Power dissipation vs. peak on-state current.

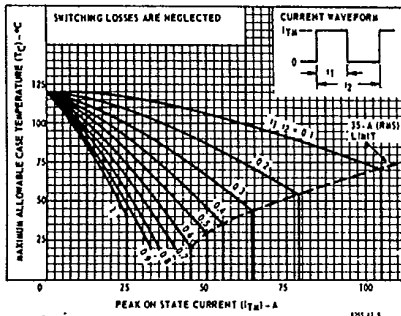


Fig. 5 - Maximum allowable case-temperature vs. peak on-state current.

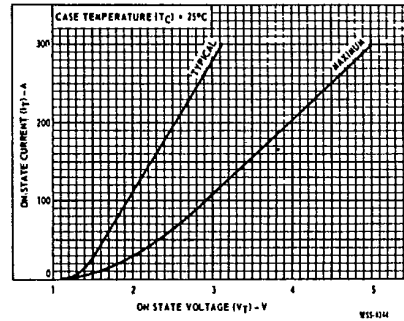


Fig. 6 - Variation of on-state with on-state voltage.

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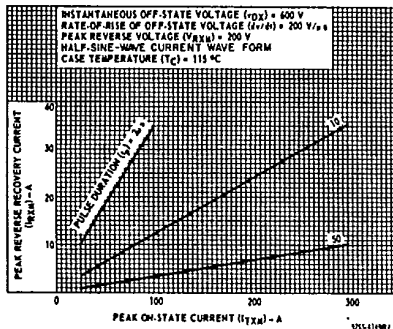


Fig. 7 — Typical variation of peak reverse-recovery current with peak on-state current (half-sine-wave pulse).

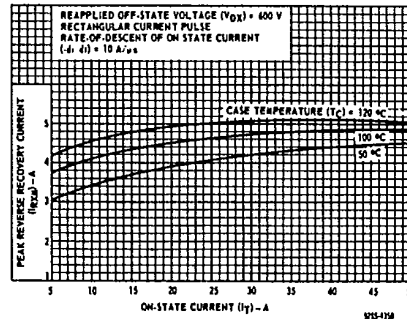


Fig. 8 — Typical variation of peak reverse-recovery current with on-state current (rectangular pulse).

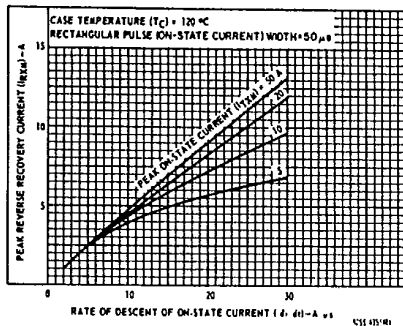


Fig. 9 — Typical variation of peak reverse-recovery current with rate-of-descent of on-state current (rectangular pulse).

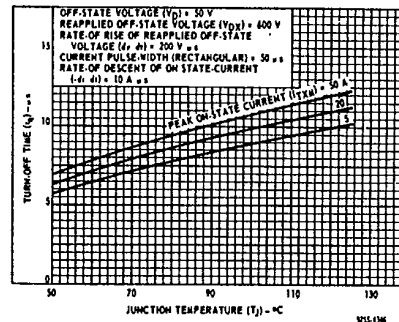


Fig. 10 — Typical variation of turn-off time with junction temperature (rectangular pulse).

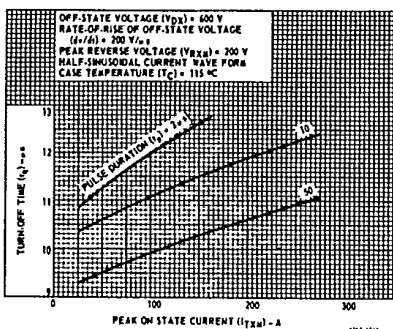


Fig. 11 — Typical variation of turn-off time with peak on-state current (half-sine-wave pulse).

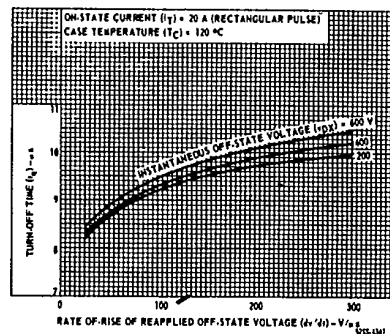


Fig. 12 — Typical variation of turn-off time with rate-of-rise of reapplied off-state voltage (rectangular pulse).

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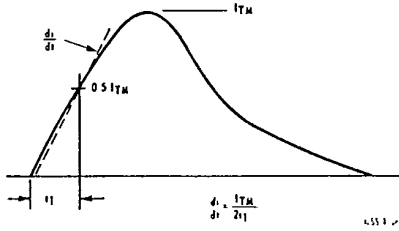


Fig. 13 — Rate-of-change of on-state current with time (defining di/dt).

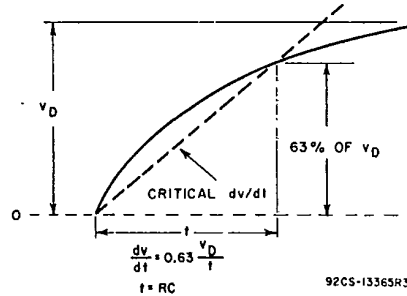


Fig. 14 — Rate-of-rise of off-state voltage with time (defining dv/dt).

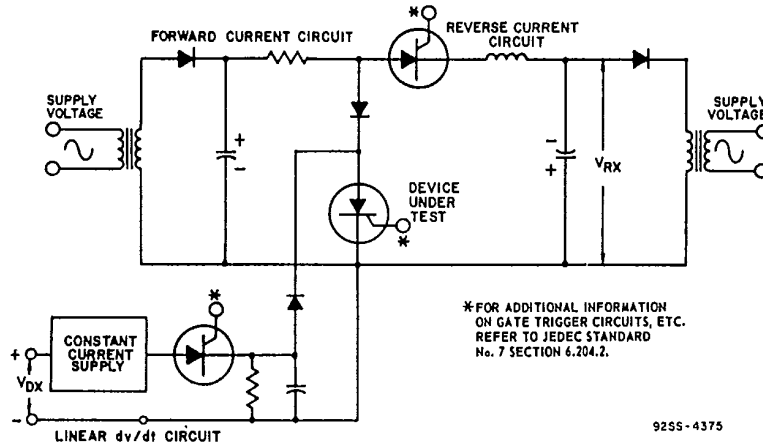


Fig. 15 — Circuit used to measure turn-off time (t_q), rectangular pulse.

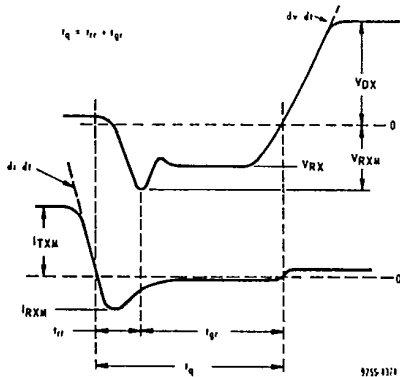


Fig. 16 — Relationship between off-state voltage, reverse voltage, on-state current, and reverse current showing reference points defining turn-off time (t_q), rectangular pulse.

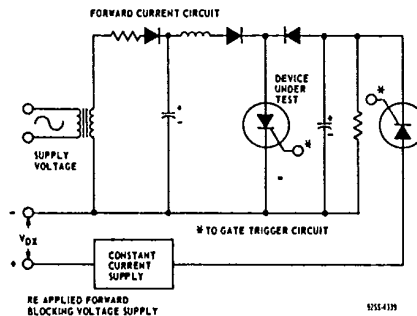


Fig. 17 — Circuit used to measure turn-off time (t_q) half-sine-wave pulse.

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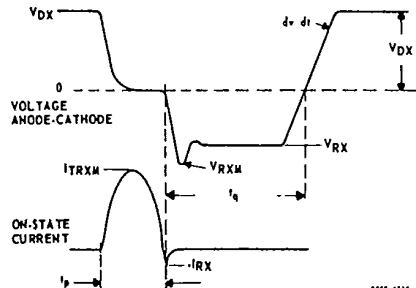


Fig. 18 — Relationship between off-state voltage, reverse voltage, on state current, and reverse current showing reference points for specification of turn-off time (t_0), half-sine-wave pulse.

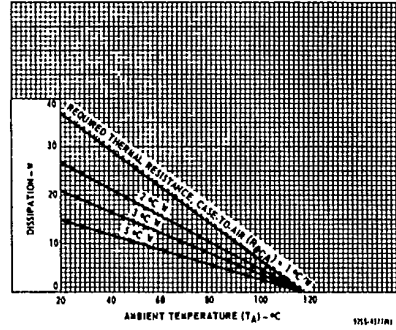


Fig. 19 — Heat sink guidance.

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