

## Silicon Controlled Rectifier

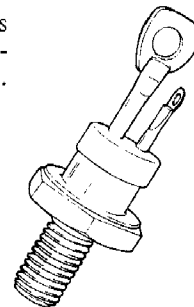
**C137**

**35A RMS max., 500-1200 Volts,  
 125° C max. Junction Temperature**

The C137 series of silicon controlled rectifiers are reverse blocking triode thyristor semiconductor devices for use in medium power switching and phase control (50 to 400 Hz) applications requiring blocking voltages up to 1200 volts, and average load current (single-phase, 180° conduction angle) up to 22 amperes.

Special features of these SCR's:

- No peak forward voltage limitation
- Minimum dv/dt rating of 100 volts/ $\mu$ sec.
- Maximum di/dt rating of 150 amps/ $\mu$ sec when switching from 600 volts
- High surge current capability for overcurrent protection.



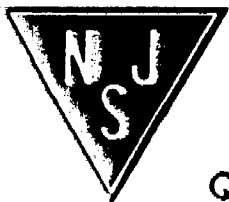
### MAXIMUM ALLOWABLE RATINGS

Type	Repetitive Peak Off-State Voltage, $V_{DRM}^{(1) (2)}$ $T_C = -65^\circ\text{C to } +125^\circ\text{C}$	Repetitive Peak Reverse Voltage $V_{RRM}^{(1) (2)}$ $T_C = -65^\circ\text{C to } +125^\circ\text{C}$	Non-repetitive Peak Off-State and Reverse Voltage $V_{DSM}$ and $V_{RSM}^{(1) (3)}$ $T_C = -65^\circ\text{C to } +125^\circ\text{C}$
C137E	500 Volts	500 Volts	600 Volts
C137M	600 Volts	600 Volts	720 Volts
C137S	700 Volts	700 Volts	840 Volts
C137N	800 Volts	800 Volts	960 Volts
C137T	900 Volts	900 Volts	1080 Volts
C137P	1000 Volts	1000 Volts	1200 Volts
C137PB	1200 Volts	1200 Volts	1400 Volts

(1) Values apply for gate terminal open-circuited, (Negative gate bias is permissible.)

(2) Maximum case-to-ambient thermal resistance for which maximum  $V_{DRM}$  and  $V_{RRM}$  ratings apply equals 5.0°C per watt for full sine wave or full-wave rectified sinusoidal voltage waveform, (3.0°C per watt is maximum case-to-ambient thermal resistance for pure dc voltage waveform.)

(3) Half sine wave voltage pulse, 10 millisecond maximum duration.



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**Quality Semi-Conductors**

RMS On-State Current, $I_T(RMS)$ . . . . .	35 Amperes (all conduction angles)
Average On-State Current, $I_T(AV)$ . . . . .	Depends on conduction angle (See Charts 3 and 5)
Critical Rate-of-Rise of On-State Current, $di/dt$ : (4)	
Gate triggered operation . . . . .	(See Chart 6)
Switching from 1001 volts min. to 1200 volts max. . . . .	75 Amperes per microsecond
801 volts min. to 1000 volts max. . . . .	100 Amperes per microsecond
601 volts min. to 800 volts max. . . . .	125 Amperes per microsecond
600 volts max. . . . .	150 Amperes per microsecond
Breakover voltage triggered operation . . . . .	10 Amperes per microsecond
Peak One Cycle Surge (non-rep) On-State Current, $I_{TSM}$ . . . . .	360 Amperes
$I_{T1}$ (for fusing), for time = 1.0 milliseconds (See Chart 9) . . . . .	300 Ampere <sup>2</sup> seconds
for time = 8.3 milliseconds (See Chart 9) . . . . .	540 Ampere <sup>2</sup> seconds
Peak Gate Power Dissipation, $P_{GM}$ . . . . .	60 Watts for 500 microseconds
Average Gate Power Dissipation, $P_{G(AV)}$ . . . . .	1.0 Watts
Peak Negative Gate Voltage, $V_{GM}$ . . . . .	10 Volts
Storage Temperature, $T_{STG}$ . . . . .	-65°C to +150°C
Operating Temperature, $T_J$ . . . . .	-65°C to +125°C
Maximum Stud Torque . . . . .	30 Lb-in (35 Kg-cm)

(4)  $di/dt$  rating is established in accordance with EIA Standards Proposal No. 1101, Section 5.2.2.6. Off-state (blocking) voltage capability may be temporarily lost immediately after each current pulse for duration less than the period of the applied pulse repetition rate. The pulse repetition rate for this test is 60 Hz. The duration of the JEDEC  $di/dt$  test condition is 300 pulses minimum at 60 Hz.

C137		CHARACTERISTICS			
Test	Symbol	Min.	Max.	Units	Test Conditions
Peak Off-State or Reverse Current (1) (2)	$I_{DRM}$ or $I_{RRM}$	-	4.0	mA	$T_C = -65^\circ\text{C to } +125^\circ\text{C}$  $V_{DRM} = V_{RRM} = 500$ Volts Peak 600 700 800 900 1000 1200
D.C. Gate Trigger Current	$I_{GT}$	-	40	mAdc	$T_C = +25^\circ\text{C}, V_D = 6$ Vdc, $R_L = 12$ ohms - 80 $T_C = -65^\circ\text{C}, V_D = 12$ Vdc, $R_L = 12$ ohms
D.C. Gate Trigger Voltage	$V_{GT}$	-	2.2	Vdc	$T_C = +25^\circ\text{C}, V_D = 6$ Vdc, $R_L = 12$ ohms - 3.0 $T_C = -65^\circ\text{C}, V_D = 12$ Vdc, $R_L = 12$ ohms 0.25 - $T_C = +125^\circ\text{C}$ , Rated $V_{DRM}$ , $R_L = 1000$ ohms
Peak On-State Voltage	$V_{TM}$	-	2.3	Volts	$T_C = +25^\circ\text{C}, I_{TM} = 70$ A peak, 1 msec wide pulse. Duty cycle $\leq 2\%$ .
Holding Current	$I_H$	-	100	mAdc	Anode supply = 24 Vdc, Gate supply = 10 V, 20 ohms. Initial Forward Current Pulse = 0.5 A, 0.1 to 10.0 msec wide. $T_C = +25^\circ\text{C}$ - 200 $T_C = -65^\circ\text{C}$
Critical Rate of Rise of Off-state Voltage. (Higher values may cause device switching.)	$dv/dt$	100	-	Volts/ $\mu\text{sec}$	$T_C = +125^\circ\text{C}$ , Rated $V_{DRM}$ , Gate open circuited.
Thermal Resistance	$R\theta_{JC}$	-	1.0	$^\circ\text{C/watt}$	Junction-to-case, dc
Circuit Commutated Turn-Off Time	$t_q$	-	(3)	$\mu\text{sec}$	$T_C = 125^\circ\text{C}, I_{TM} = 10$ A Peak Rectangular Current Pulse, 50 $\mu\text{sec}$ duration, $DI/DT < 10$ Amps per microsecond, Commutation Rate $\leq 5$ A per $\mu\text{sec}$ , $PRV =$ Rated $V_{RRM}$ Volts max. Reverse Voltage at end of Turn-Off Time interval = 15 volts. Repetition Rate = 60 PPS. Rate of Rise of Re-applied Off-State Voltage ( $dv/dt$ ) = 100V/ $\mu\text{sec}$ . Off-State Voltage = Rated $V_{DRM}$ Volts. Gate Bias during Turn-Off Time interval = 0 Volts, 100 ohms.

**NOTES:**

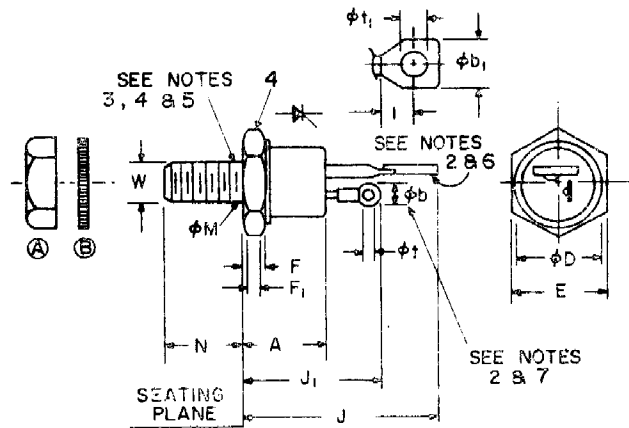
- (1) Values apply for gate terminal open-circuited, (Negative gate bias is permissible.)
- (2) Maximum case-to-ambient thermal resistance for which maximum  $V_{DRM}$  and  $V_{BRM}$  ratings apply equals 5.0°C per watt for full sine wave or full-wave rectified sinusoidal voltage waveform. (3.0°C per watt is maximum case-to-ambient thermal resistance for pure dc voltage waveform.)
- (3) Turn-off time is not 100% factory tested. Special selections are available upon request. Consult factory. The test conditions shown represent standard factory test conditions for special selections.

**NOTES:**

1. Complete threads to extend within 2½ threads of seating plane. Diameter of unthreaded portion, .249" (6.32MM) Maximum, .220" (5.59MM) Minimum.
2. Angular orientation of these terminals is undefined.
3. ¼-28 UNF-2A. Maximum pitch diameter of plated threads shall be basic pitch diameter .2268" (5.76MM), minimum pitch diameter .2225" (5.66MM), reference: screw thread standards for Federal Service 1957, Handbook H28, 1957, P1.
4. A chamfer (or undercut) on one or both ends of hexagonal portions is optional.
5. Case is anode connection.
6. Large terminal is cathode connection.
7. Small terminal is gate connection.
8. Insulating kit available upon request.
- A. ¼-28 steel nut, Ni. plated, .178 min. thk.
- B. Ext. tooth lockwasher, steel, Ni. plated, .023 min. thk.

**OUTLINE DRAWING**

(COMPLIES WITH JEDEC TC-48)



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	.330	.505	8.38	12.83	
φb	.115	.140	2.92	3.55	2
φb1	.210	.300	5.33	7.62	2
φD		.544		13.82	
E	.544	.562	13.82	14.27	
F	.113	.200	2.87	5.08	4
F1	.060		1.52		
J		1.193		30.30	
J1		.875		22.23	
I	.120		3.05		
φM					1
N	.422	.453	10.72	11.51	
φt	.060	.075	1.52	1.91	
φh	.125	.165	3.18	4.19	
W					3