MILITARY SPECIFICATION

CV 7329-31

SEMICONDUCTOR DEVICE, REVERSE BLOCKING TRIODE THYRISTOR

Description:- This specification covers the detail requirements for a silicon, stud mounted, Controlled Rectifier, (P Type Trigger) and is in accordance with Specification K1007 Issue 3 except as otherwise stated.

Mechanical Dimensions and Outline:- Section B 10.3.1

Section D, Appendix 1 Drawing D.16

Connections:- Stud - Anode
No: 1 Terminal - Cathode
No: 2 Terminal - Trigger

Absolute Maximum Ratings:-

Maximum Voltage Ratings (Note A)

Device	Voltage
CV7329	100
CV7330	200
CV7331	300

Note A Maximum Peak Working Reverse Voltage and Maximum Forward Blocking Voltage. Applies to all waveforms including very short transients.

Rating	I_O	I_{DC}	I_{FRM}	P_T	P_T	V_{RT}	V_{FT}	i_T	I_{RRM}	T_{stg}	F
Unit	A	A	A	W	W	V	V	A	A	°C	kc/s
Min	-	-	-	-	-	-	-	-	-	-55	-
Max	10	14	100	5	1	5	10	2	20	100	3
Notes	B			C	D	E	F	G	H		J

Notes

B. Single phase half wave resistive load at 180° conduction angle. See Figure 1 for Derating curve.

C. Max. Peak Trigger Power.

D. Max. Mean Trigger Power.

E. Max. Peak Reverse Trigger Voltage.

F. Max. Peak Forward Trigger Voltage.

Notes (cont'd) G. Max. Peak Trigger Current.

H. Max. Recurrent Peak Reverse (Hole Storage) Current.

J. This rating is not an absolute one, but is the max. value at which the other ratings apply. At higher frequencies some derating may be required.

K. See Figure 2 for Surge Rating Curve.

L. Commercial Prototype CR10-101A Etc.,

Primary Electrical Characteristics:-

Characteristic	V_{fm}	I_H	V_{TT}	I_{TT}	T_d	T_r	T_{off}
Unit	V	mA	V	mA	µS	µS	µS
Min	-	1	.25	-	-	-	-
Max	2.0	100	3.75	100	2.5	4.0	30
Notes	1	2	3	3	4	4	5

Notes

1. At I_{fpk} = 32A
2. Holding Current (trigger open circuit)
3. Trigger voltage and current to initiate turn on. See figure 3 for triggering curve.
4. See Figure 4 for typical turn on characteristic curves.
5. See Figure 5 for typical turn off characteristic curves.

Reliability Assurance Requirements:- Under discussion.

Applicable Documents:- TVC information Sheets Nos. 9 and 10.

Requirements:-

Marking — The device shall be marked first with the CV number and then according to K1007 Issue 3, Section B1.3.4.

Quality Assurance Provisions:-

Destructive Test — The tests listed in Table 2 Group B Inspection Sub Groups 2 and 3 are considered destructive.

Group C Inspection — This inspection shall be conducted on the initial lot, and thereafter every ninety days or every fifth lot, whichever occurs first.

Preparation for Delivery:-

Packaging — The device shall be packed according to K1007 Issue 3 Section A1.2 (c) A1S Size 1.

Joint Services Catalogue Numbers:-

CV7329 = 5960-99-037-2895
CV7330 = 5960-99-037-2896
CV7331 = 5960-99-037-2897

This specification has been prepared by, and the Qualification Approval Authority is:-

Ministry of Aviation, Royal Radar Establishment, Malvern, England.

5th November 1963

TABLE 1 GROUP A INSPECTION

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Sym-bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 1			0.65	I				
Visual & Mechanical Inspection	5.1							
SUB GROUP 2			1.0	II				
Peak Forward Voltage Drop	9A.2	i_{fpk} = 32A f = 50 c.p.s Note 1			v_{fpk}		2.0	V
Forward Blocking leakage Current	9A.3	T_{amb} = 15°C - 30°C Blocking Voltage			I_s			
		CV7329 = 100V					5	mA
		CV7330 = 200V					5	mA
		CV7331 = 300V					5	mA
		Trigger open curcuit.						
Reverse Leakage Current	9A.5	T_{amb} = 15°C - 30°C Reverse Voltage			I_R			
		CV7329 = 100V					5	mA
		CV7330 = 200V					5	mA
		CV7331 = 300V					5	mA
Triggering Current and Voltage	9A.7	Peak Anode Cathode forward voltage= 5V f = 50 c.p.s T_{STUD} = 15° - 30°C						
		Trigger Current to Fire			I_T		100	mA
		Trigger Voltage to Fire			V_T	.25	2.5	V

GROUP A INSPECTION (Cont'd)

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 3			2.5	1				
Delay Time	9A10.2	Anode Cathode Forward Voltage = 24V. Load Current = 10A Trigger Voltage = 4.8V Trigger current impedance = 33ohms Note 1			t_d	-	2.5	µsec
Rise Time	9A10.3	As above for delay time			t_r	-	4.0	µsec
Turn off time	9A.10.4	Load Current = 10A Reapplied voltage = 12V. Rate of rise of reapplied voltage = 20V/µsec max. Trigger open circuit. Note 1.			t_{off}	-	20	µsec
SUB GROUP 4			4.0	1				
Peak Forward Leakage Current.	9A.4	T_{amb} = 100°C f = 50 c.p.s Peak Forward Voltage			i_{fpk}			
		CV7329 = 100V				-	10	mA
		CV7330 = 200V				-	10	mA
		CV7331 = 300V				-	10	mA
Peak Reverse Leakage Current	9A.5	T_{amb} = 100°C f = 50 c.p.s			i_{rpk}			

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GROUP A INSPECTION (Cont'd)

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
		CV7329 = 100V CV7330 = 200V CV7331 = 300V				- - -	10 10 10	mA mA mA
Reverse Trigger Leakage Current	9A.8	T_{amb} = 15°C - 30°C Trigger Voltage = -5V			I_{RT}	-	100	mA
Holding Current	9A.9	T_{amb} = 15°C - 30°C			I_H	1.0	100	mA

GROUP B INSPECTION

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 1			6.5	I_C				
Physical Dimensions	5.1	According to drawing						
SUB GROUP 2			4.0	1A				
Temperature cycling.	5.5	-55°C to +100°C						
Moisture Resistance	5.3.1							
SUB GROUP 3			4.0	I Note 3				
Vibration Fatigue	5.15.1							
SUB GROUP 4			6.5	1A				
Torque	5.12.1	30 lbs in.						
GROUPS 5 & 6								
Omitted								
SUB GROUP 7			4	1 Note 3				
High Temperature Life	6.2.1	Non Operating T_{stg} = + 100°C Duration = 1000 hrs.						
SUB GROUP 8			4.0	1A				
Operation Life	6.33.2	Max. Peak Working Reverse Voltage and Max. Forward Blocking Voltage CV7329 - 100V CV7330 - 200V CV7331 - 300V f = 50 c.p.s Note 2						

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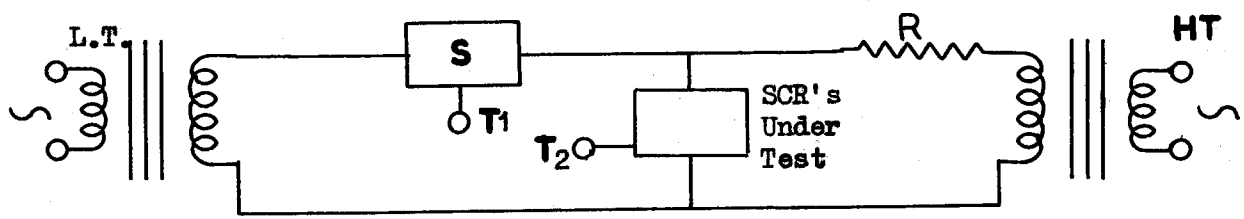
GROUP B INSPECTION (Cont'd)

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Symbol	LIMITS		Units
	K1007/NATO REF.	Specific Conditions				Min.	Max.	
Post Test End Points for Sub Groups 2,3,4,7 & 8								
Forward Blocking leakage current	9A.3	As in Group A Sub Group 2			I_s	-	6	mA
Reverse leakage current	9A.5	As in Group A Sub Group 2			I_R	-	6	mA
Trigger current and voltage	9A.7	As in Group A Sub Group 2			I_T	-	110	mA
					V_T	0.2	2.75	V

NOTES

1. Device mounted on a suitable heat sink to ensure T_{stud} is within the temperature range 15°C - 30°C.

2. Basic life test circuit:-
   Half Wave circuit.



R - Reverse current limiting resistor. T_1 & T_2 = Triggering signals.

S - may be a controlled rectifier.

The forward current shall not be less than the value corresponding to the chosen stud temperature and conduction angle (about 90°C) (See Fig 1 and D3).

The effectiveness of trigger control shall be demonstrated.

3. The maximum sample size shall be 125.

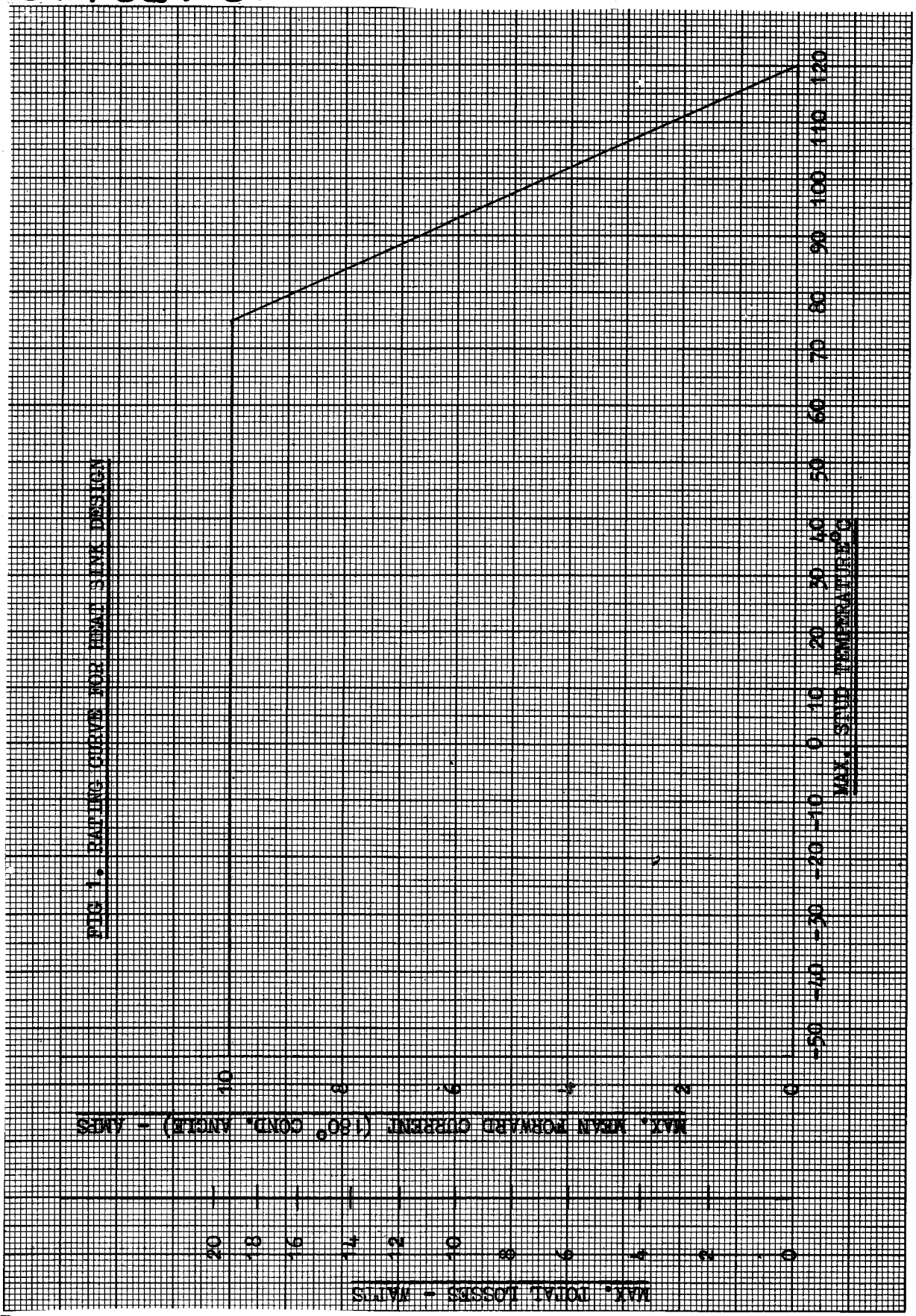


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Fig 2

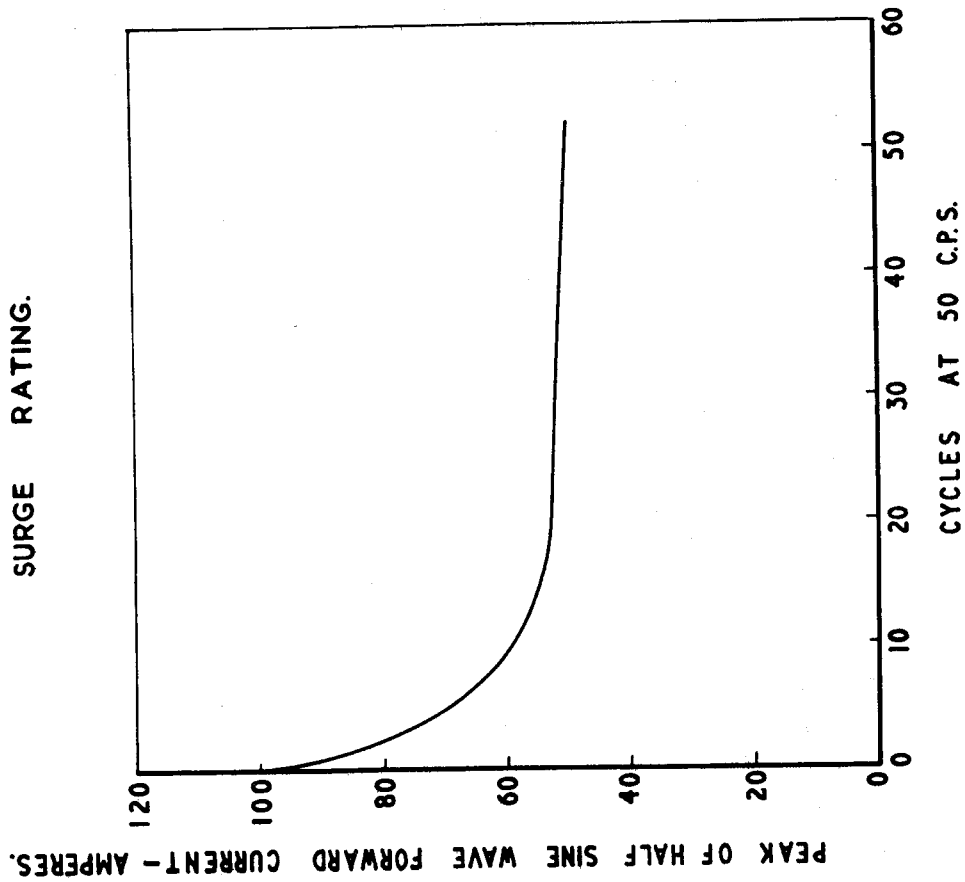

SURGE RATING.
PEAK OF HALF SINE WAVE FORWARD CURRENT - AMPERES.
120
100
80
60
40
20
0
0
10
20
30
40
50
60
CYCLES AT 50 C.P.S.

Fig 3

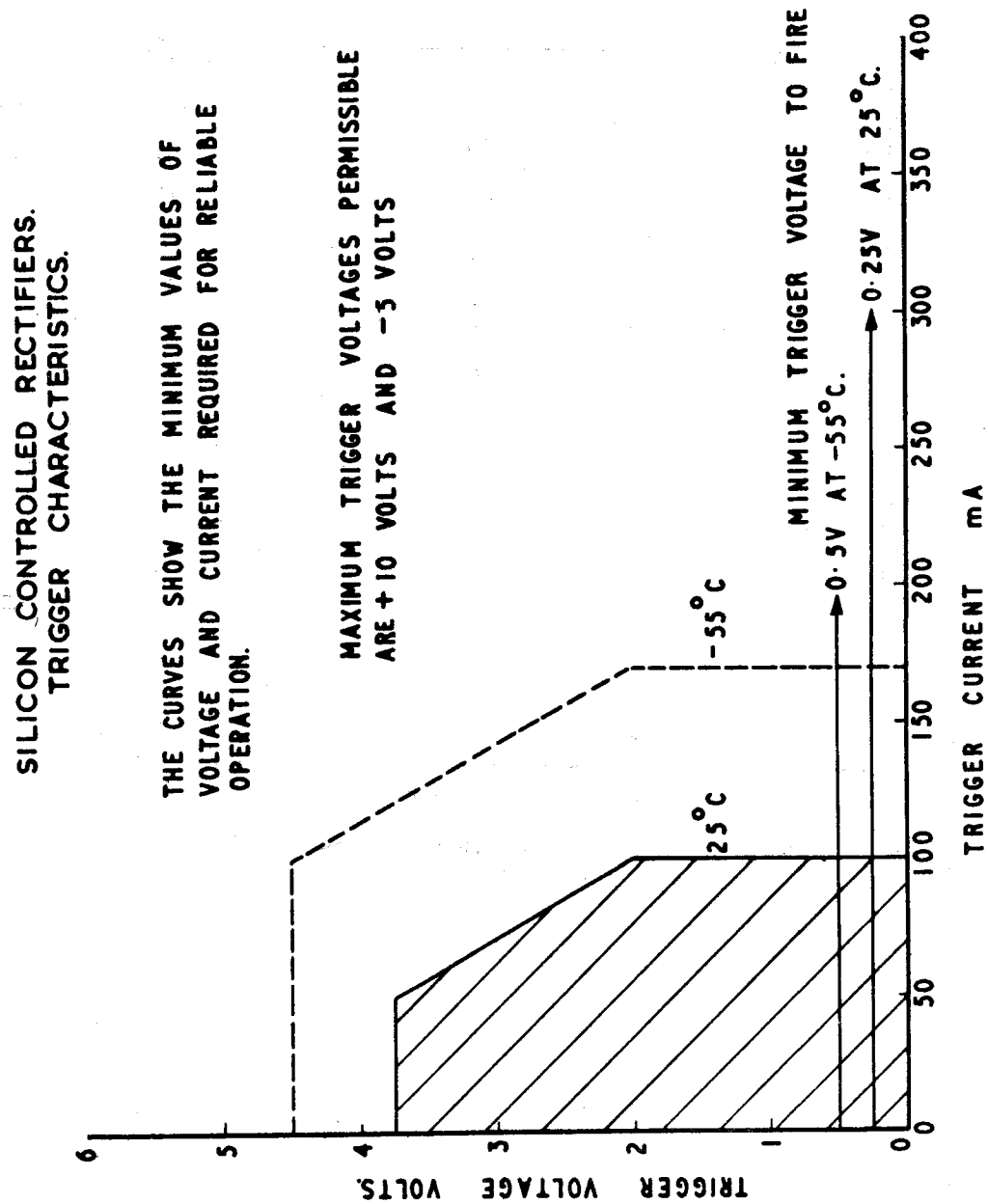

SILICON CONTROLLED RECTIFIERS.
TRIGGER CHARACTERISTICS.
THE CURVES SHOW THE MINIMUM VALUES OF VOLTAGE AND CURRENT REQUIRED FOR RELIABLE OPERATION.
MAXIMUM TRIGGER VOLTAGES PERMISSIBLE ARE +10 VOLTS AND -3 VOLTS
MINIMUM TRIGGER VOLTAGE TO FIRE
0·5V AT -55°C.
0·25V AT 25°C.
-55°C
25°C
TRIGGER VOLTAGE VOLTS.
TRIGGER CURRENT mA
0
1
2
3
4
5
6
0
50
100
150
200
250
300
350
400

FIG. 5
TYPICAL TURN-OFF CHARACTERISTICS

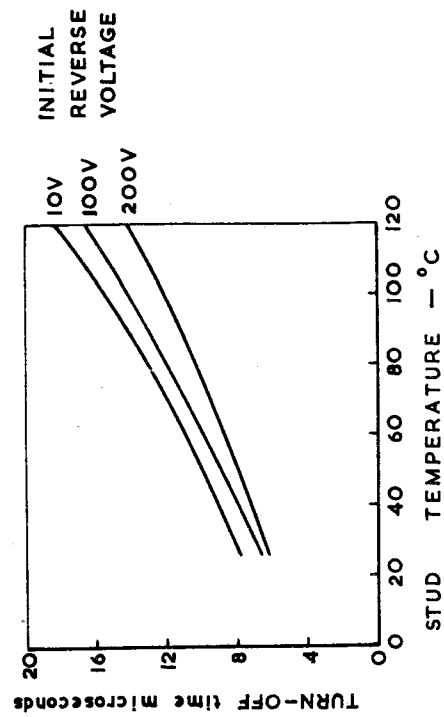
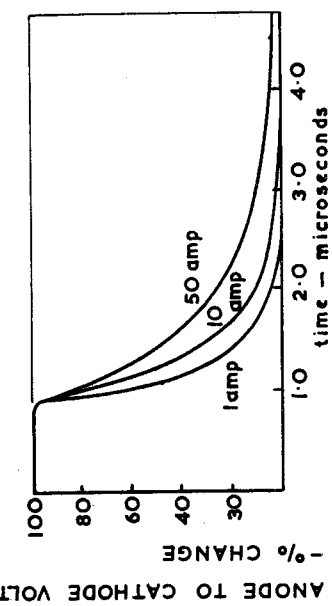


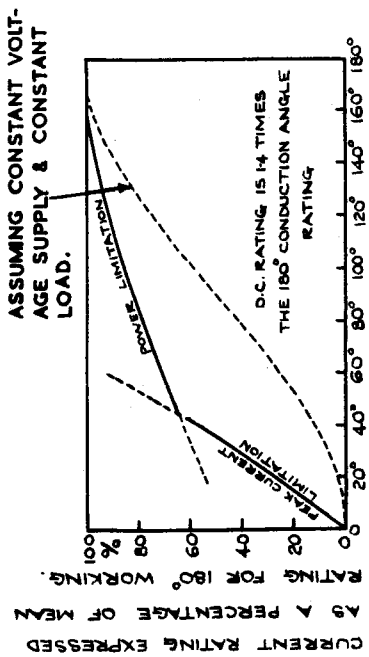
FIG. 4
TYPICAL TURN-ON CHARACTERISTICS



APPLICATION DATA

Fig. D3

NORMAL FALL OF MEAN CURRENT WITH VARIATION OF CONDUCTOR ANGLE ASSUMING CONSTANT VOLTAGE SUPPLY & CONSTANT LOAD.



MEAN CURRENT RATING AGAINST CONDUCTION ANGLE (SINGLE PHASE, SINUSOIDAL WORKING).

Fig. D1

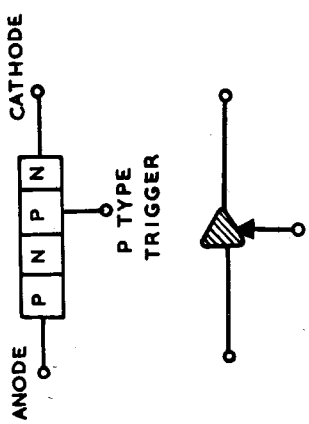


Fig. D2