

Fast turn-off Thyristor P0295WC12#

The data sheet on the subsequent pages of this document is a scanned copy of existing data for this product.
(Rating Report 83TR5 Issue 2)

This data reflects the old part number for this product which is: P200CH02-12. This part number must **NOT** be used for ordering purposes – please use the ordering particulars detailed below.

The limitations of this data are as follows:
Device only available for grade 12 (1200V V_{RRM}/V_{DRM})

Please use the following link to view an up to date outline drawing for this device
[Outline W8](#)

Where any information on the product matrix page differs from that in the following data, the product matrix must be considered correct

An electronic data sheet for this product is presently in preparation.

For further information on this product, please contact your local ASM or distributor.

Alternatively, please contact Westcode as detailed below.

Ordering Particulars			
P0295	WC	◆◆	#
Fixed Type Code	Fixed Outline Code	Voltage code $V_{DRM}/100$ 12	Fixed Turn-off Time Code D = 20 μ s, E = 25 μ s, F = 30 μ s
Typical Order Code: P0295WC12D, 14.4mm clamp height, 1200V V_{RRM}/V_{DRM} , 20 μ s t_q			

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QUALITY EVALUATION LABORATORY

Rating Report: 83TR 5 (Issue 2)

Date: 29th January, 1985

Origin:

Pages: 24

Capsule Thyristor Type P200CH02-H12

Written: B.W.P. Brown

Checked: *BWP*

Approved: *BWA*

The P200CH02-H12 series of thyristors are centre regenerative gate diffused devices in cold weld capsules, a 24 mm slice is employed.

Ratings and Characteristics

Ratings

Voltage Grades	: H02-H12
V_{DSM}	: 200-1200V
V_{RSM}	: 300-1300V
V_{DRM}, V_{RRM}	: 200-1200V
$I_T(AV)$; Single phase; 50Hz, 180° sinewave Double side cooled, $T_{HS} = 55^{\circ}C$; 85° Single side cooled, $T_{HS} = 85^{\circ}C$: 295A, 195A : 110A
$I_T(rms)$ Double side cooled, $T_{HS} = 25^{\circ}C$: 600A
I_T d.c. " " " $T_{HS} = 25^{\circ}C$: 480A
I_{TSM} : t = 10ms half sinewave; T_J (initial) = 125° $V_{RM} = 0.6V_{RRM}(MAX)$: 2700A
I_{TSM} : t = 10ms half sinewave; T_J (initial) = 125°; $V_{RM} \leq 10V$: 2970A
I^2t : t = 10ms; T_J (initial) = 125°; $V_{RM} = 0.6V_{RRM}(MAX)$: $36.5 \times 10^3 A^2 SEC$
I^2t : t = 10ms; T_J (initial) = 125°; $V_{RM} \leq 10V$: $44.1 \times 10^3 A^2 SEC$
I^2t : t = 3ms; T_J (initial) = 125°; $V_{RM} \leq 10V$: $32.4 \times 10^3 A^2 SEC$
di/dt : (Repetitive): T_J 125° Gate: 20V. 20 μ s Rise time 1 μ s	: 500A/ μ s
I_{FGM} : Anode positive with respect to cathode	: 18A
V_{FGM} : " " " " " "	: 12V
V_{RGM} :	: 5V
$P_G(AV)$:	: 1.5W
P_{GM} :	: 60W
V_{GD} :	: 0.25V
T_{HS} operating range	: -40° to 125°
T_{stg} Non-operating	: -40° to 150°

CONTENTS

	<u>Page</u>
Provisional ratings and characteristics	1, 2
Contents	3
Voltage grade table	4
Extension of voltage grades	4
2. <u>Introduction</u>	5
3. <u>Notes on the ratings</u>	
(a) Rate of rise of on-state current	5
(b) Square-wave ratings	5
(c) Duty cycle lines	5
(d) Maximum operating frequency	5
(e) Energy per pulse characteristics	5
4. <u>Reverse Recovery Loss</u>	
(a) Determination by Measurement	6
(b) Determination without Measurement	6
5. <u>Gate Drive</u>	7
6. <u>The DV/DT Suppression Network</u>	7
7. <u>Note 1</u> Reverse recovery loss by Measurement	7
Limit on-state Characteristic	8
Gate Characteristics	9,10
Transient Thermal Impedance	11
Surge Rating	12
Recovered Charge	13
Reverse Recovery Energy per Pulse	14
Square wave frequency rating 85°C Sink 500 A/uS	15
" " " " 55°C Sink "	16
" " " " 85°C Sink 100 A/uS	17
" " " " 55°C Sink "	18
Energy per pulse 500 A/uS	19
" " " 100 A/uS	20
Sine wave frequency ratings 85°C Sink	21
" " " " 55°C Sink	22
Sine wave energy per pulse	23
Outline drawing	24

Voltage Ratings

Voltage Grade 'H'	VDSM VDRM VRRM V	VRSM V	VD VR DC
02	200	300	140
03	300	400	210
04	400	500	260
06	600	700	420
08	800	900	560
10	1000	1100	700
12	1200	1300	810

Extension of Voltage Grades

This report is applicable to other and higher voltage grades when supply has been agreed by Sales/Production.

2. INTRODUCTION

The P200CH02-H12 thyristor series are diffused regenerative gate devices employing a 24 mm slice in cold weld housings.

3. NOTES ON THE RATINGS

a) Rate of rise of on-state current

The maximum un-primed rate of rise of on-state current must not exceed 1000A/uS at any time during turn-on on a non-repetitive basis. For repetitive performance the on-state rate of rise of current must not exceed 500A/uS at any time during turn-on. Note that these values of current rate of rise apply to the circuit external to the device and its specified snubber network and device current rates of rise will be higher.

b) Square wave ratings

These ratings are given for leading edge linear rates of rise of forward current of 100 and 500 A/uS.

c) Duty Cycle Lines

The 100% duty cycle line appears on all these ratings. These frequency ratings are presented in the form that all duty cycles may be represented by straight parallel lines.

d) Maximum operating frequency

The maximum operating frequency is set by the time required for the thyristor to turn off (t_q) and for the off-state voltage to reach full value (t_v), i.e.

$$f \text{ max.} = \frac{1}{t_{\text{pulse}} + t_q + t_v}$$

e) Energy per pulse characteristics

These curves enable rapid estimation of device dissipation to be obtained for conditions not covered by the frequency ratings.

Let E_p be the Energy per pulse for a given current and pulse width, in joules

Let R_{th} be the steady-state thermal resistance (junction to sink)

and T_{SINK} be the heat sink temperature

Then the average dissipation will be

$$W_{AV} = E_p \times f$$

and

$$T_{SINK} = 125 - W_{AV} \cdot R_{th}$$

4. REVERSE RECOVERY LOSS

On account of the number of circuit variables affecting reverse recovery voltage, no allowance for reverse recovery loss has been made in these ratings. The following procedure is recommended for use where it is necessary to include reverse recovery loss.

a) Determination by Measurement

From waveforms of recovery current obtained from a high frequency shunt (see Note 1) and reverse voltage present during recovery, an instantaneous reverse recovery loss waveform must be constructed. Let the area under this waveform be A joules per pulse. A new heat sink temperature can then be evaluated from:

$$T_{\text{SINK (new)}} = T_{\text{SINK (original)}} - A \left(\frac{r_t \cdot 10^6}{t} + R_{\text{th}} \times f \right)$$

$$\text{where } r_t = 1.64 \times 10^{-4} \sqrt{t}$$

t = duration of reverse recovery loss per pulse in microseconds

A = Area under reverse loss waveform per pulse in joules (W.S.)

f = rated frequency at the original heat sink temperature

The total dissipation is now given by

$$W_{\text{(TOT)}} = W_{\text{(original)}} + A \times f$$

b) Determination without Measurement

In circumstances where it is not possible to measure voltage and current conditions, or for design purposes, the additional losses may be estimated from curves on page 14. A typical R-C snubber network is connected across the thyristor to control the transient reverse voltage waveform.

Let E be the value of energy per reverse cycle in joules (curves on p. 14)

Let f be the operating frequency in Hz

$$\text{then } T_{\text{SINK new}} = T_{\text{SINK original}} - (E \times R_{\text{th}} \times f)$$

where $T_{\text{SINK new}}$ is the required maximum heat sink temperature

and $T_{\text{SINK original}}$ is the heat sink temperature given with the frequency ratings.

5. GATE DRIVE

The recommended gate drive is 20V, 20ohms with a short-circuit current rise time of not more than 1us. This gate drive must be applied when using the full di/dt capability of the device.

6. THE DV/DT SUPPRESSION NETWORK

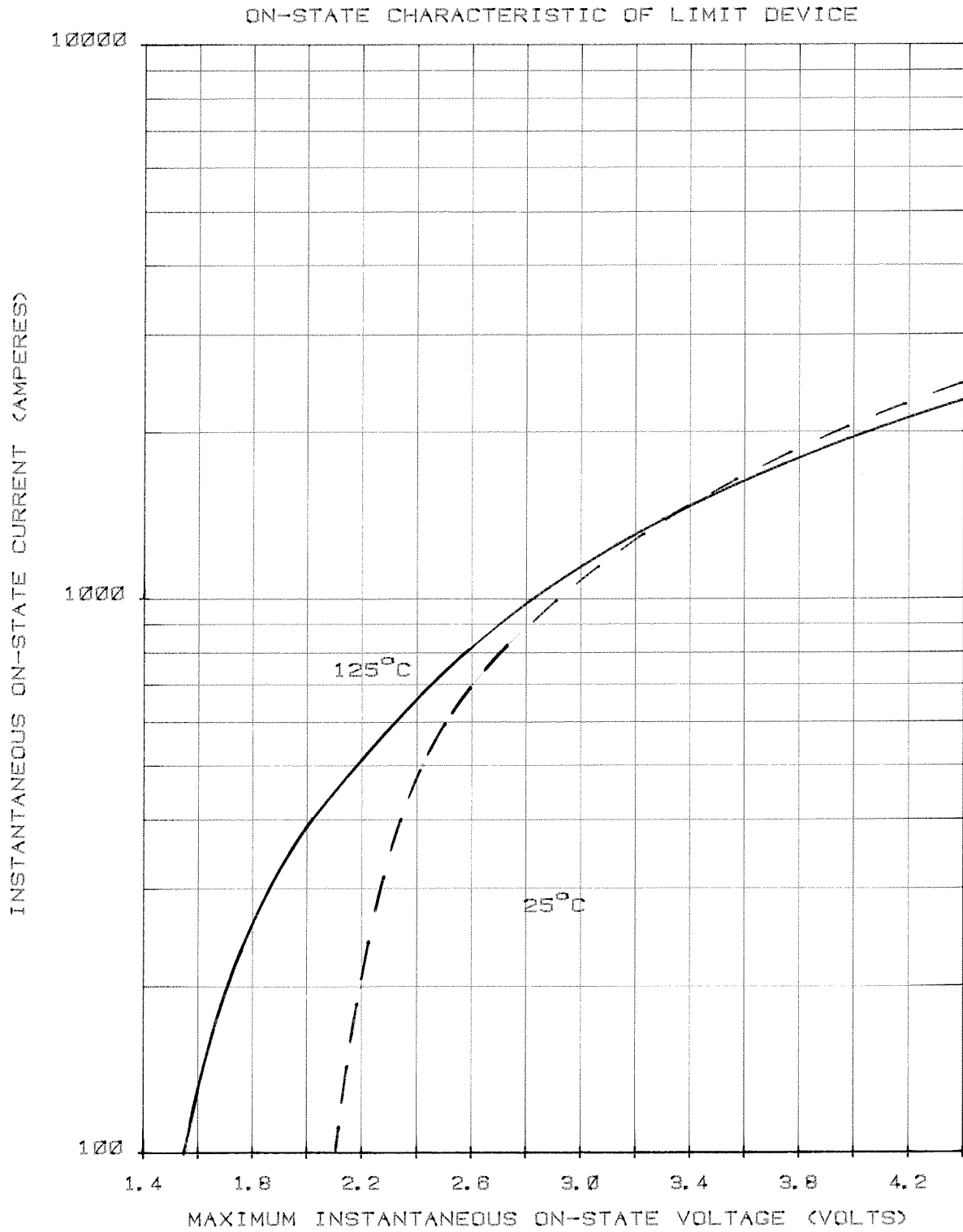
The effect of a conventional resistor-capacitor snubber of 0.22uF 22 ohms has been included in these ratings and all rating di/dt values apply to the circuit external to the thyristor and its suppression network.

7. NOTE 1

REVERSE RECOVERY LOSS BY MEASUREMENT

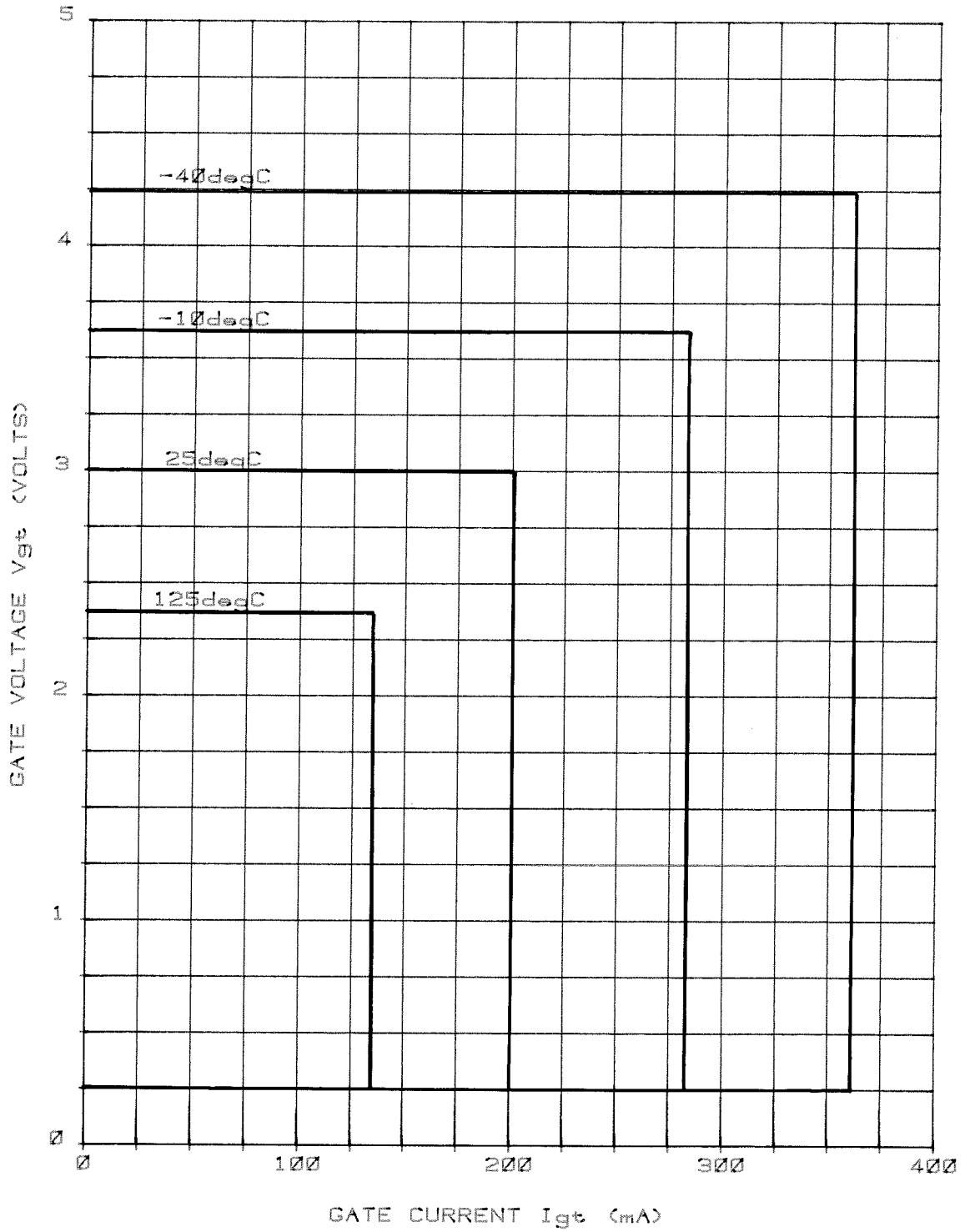
This thyristor has a low reverse recovered charge and peak reverse recovery current. When measuring the charge care must be taken to ensure that:

- a) a.c. coupled devices such as current transformers are not affected by prior passage of high amplitude forward current.
- b) The measuring oscilloscope has adequate dynamic range - typically 100 screen heights - to cope with the initial forward current without overload.

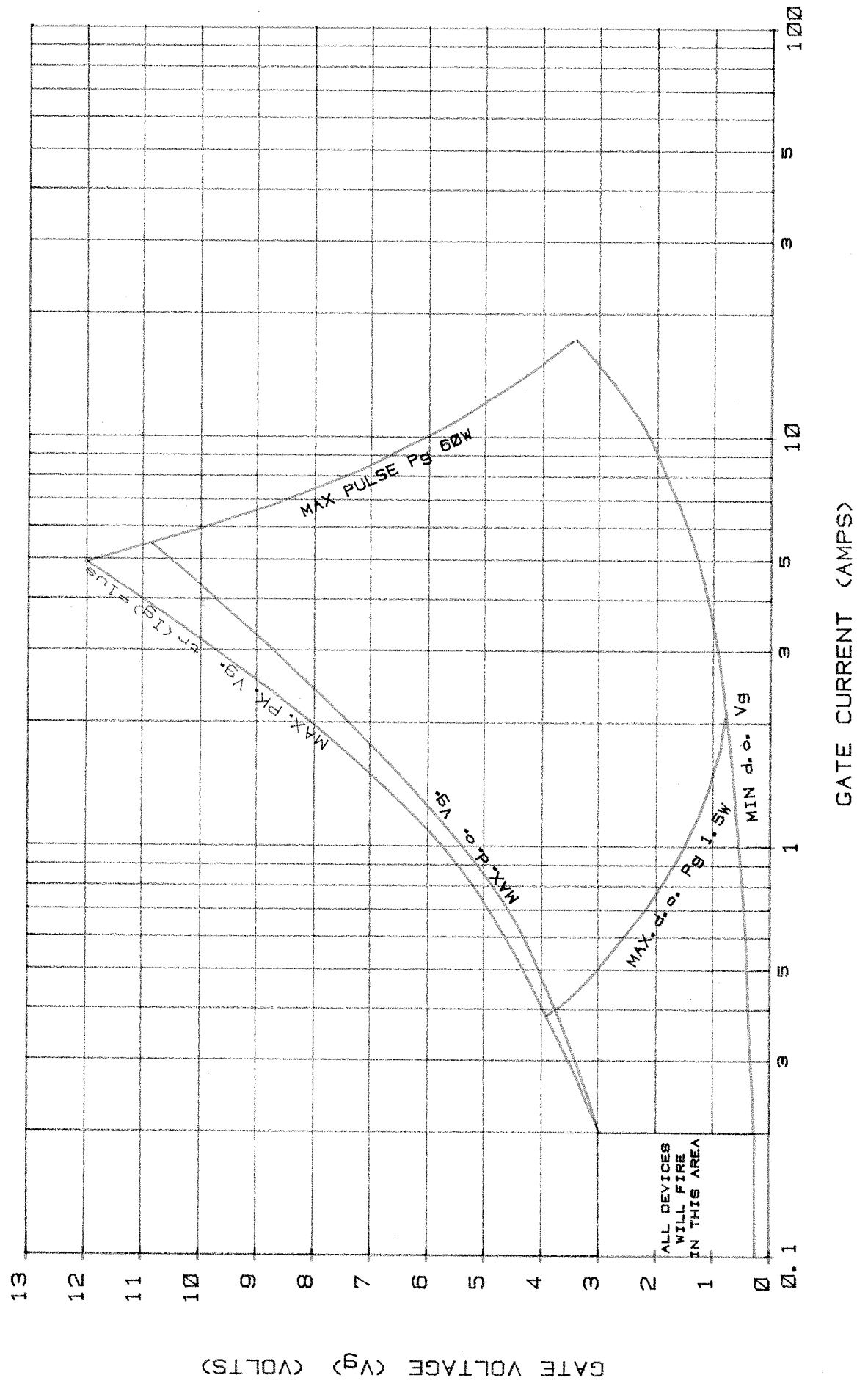


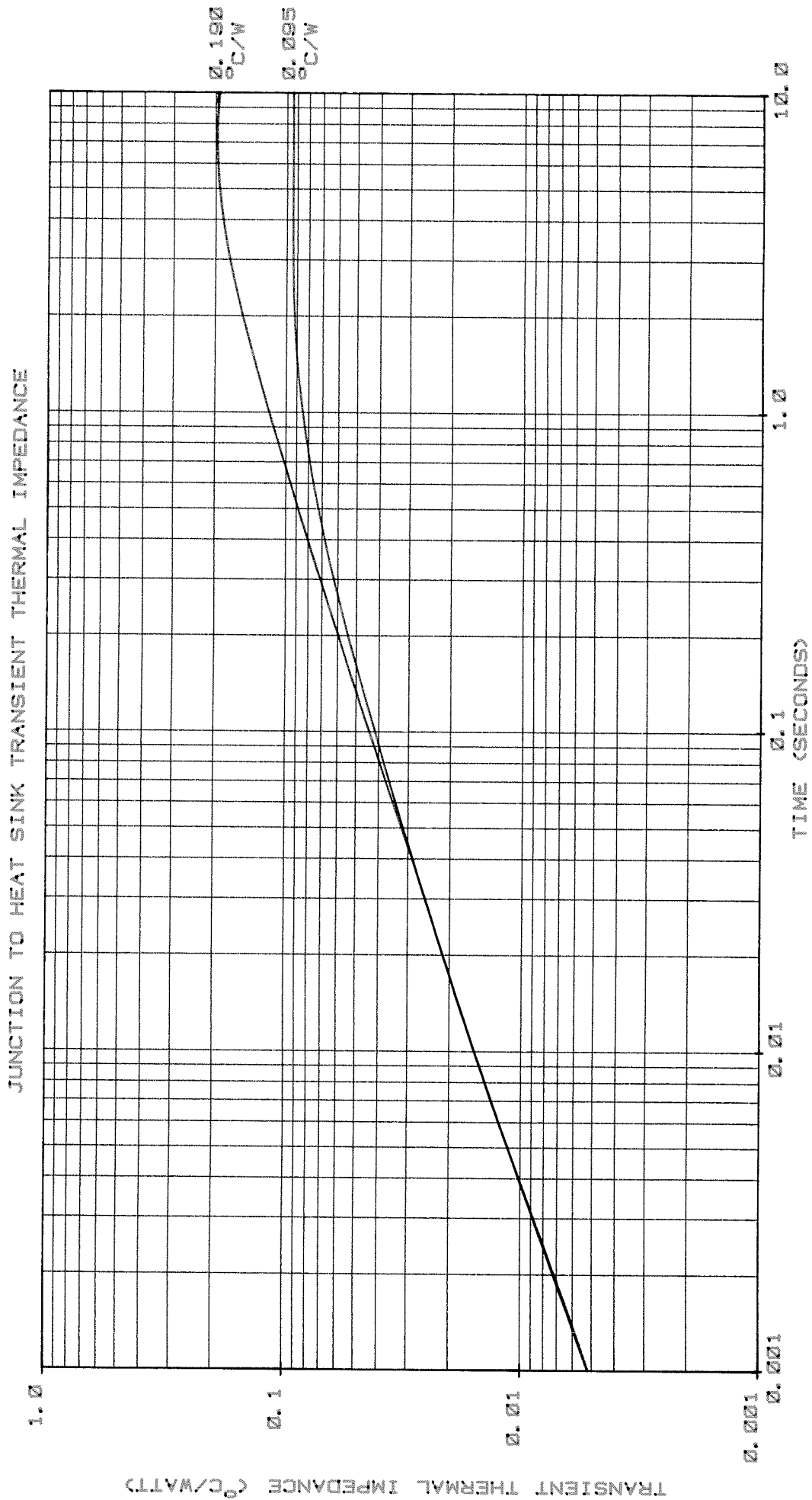
GATE TRIGGERING CHARACTERISTICS

(TRIGGER POINTS OF ALL THYRISTORS LIE IN THE AREAS SHOWN)



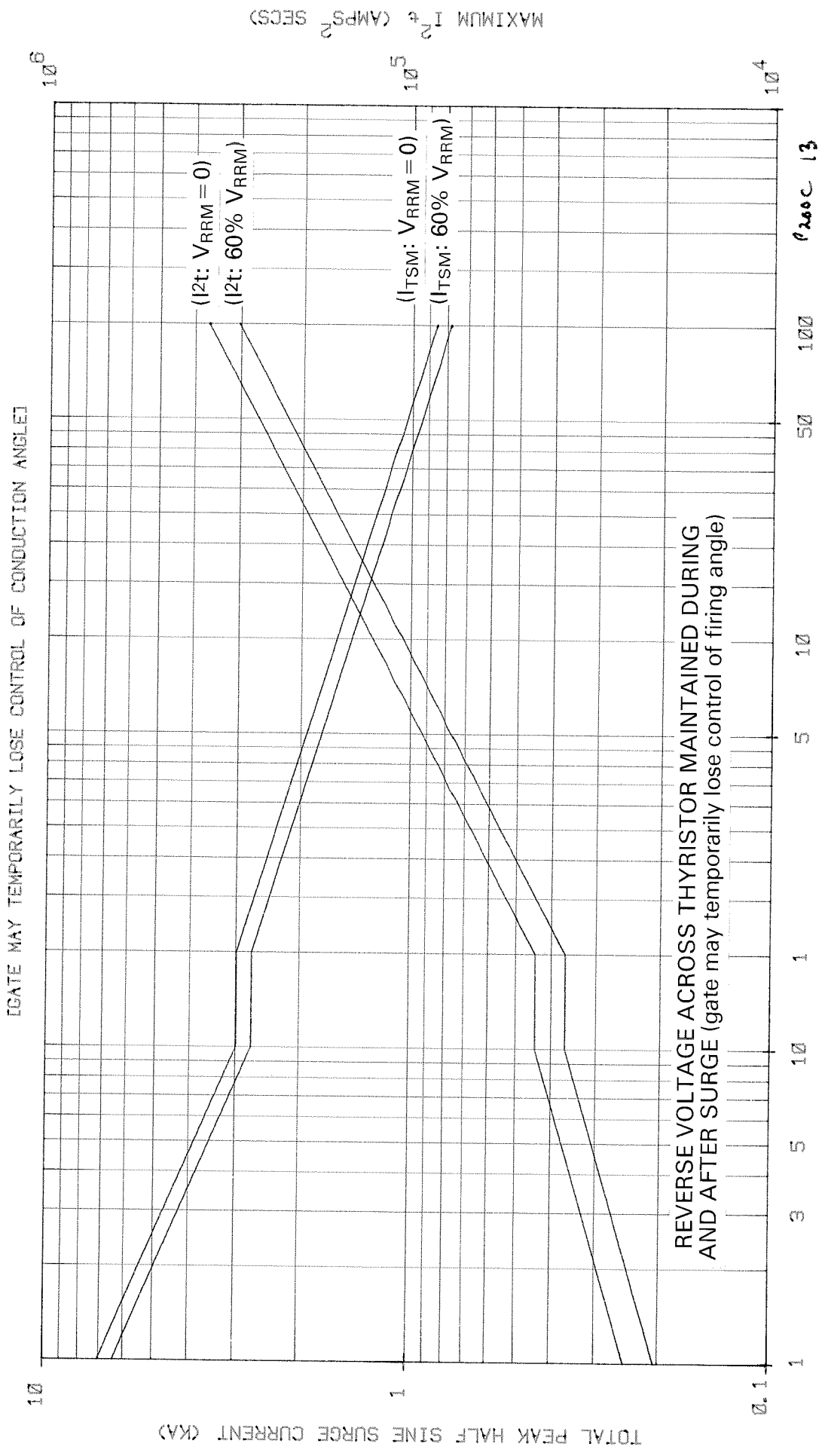
GATE CHARACTERISTICS AT 25°C JUNCTION TEMPERATURE





TRANSIENT THERMAL IMPEDANCE (°C/WATT)

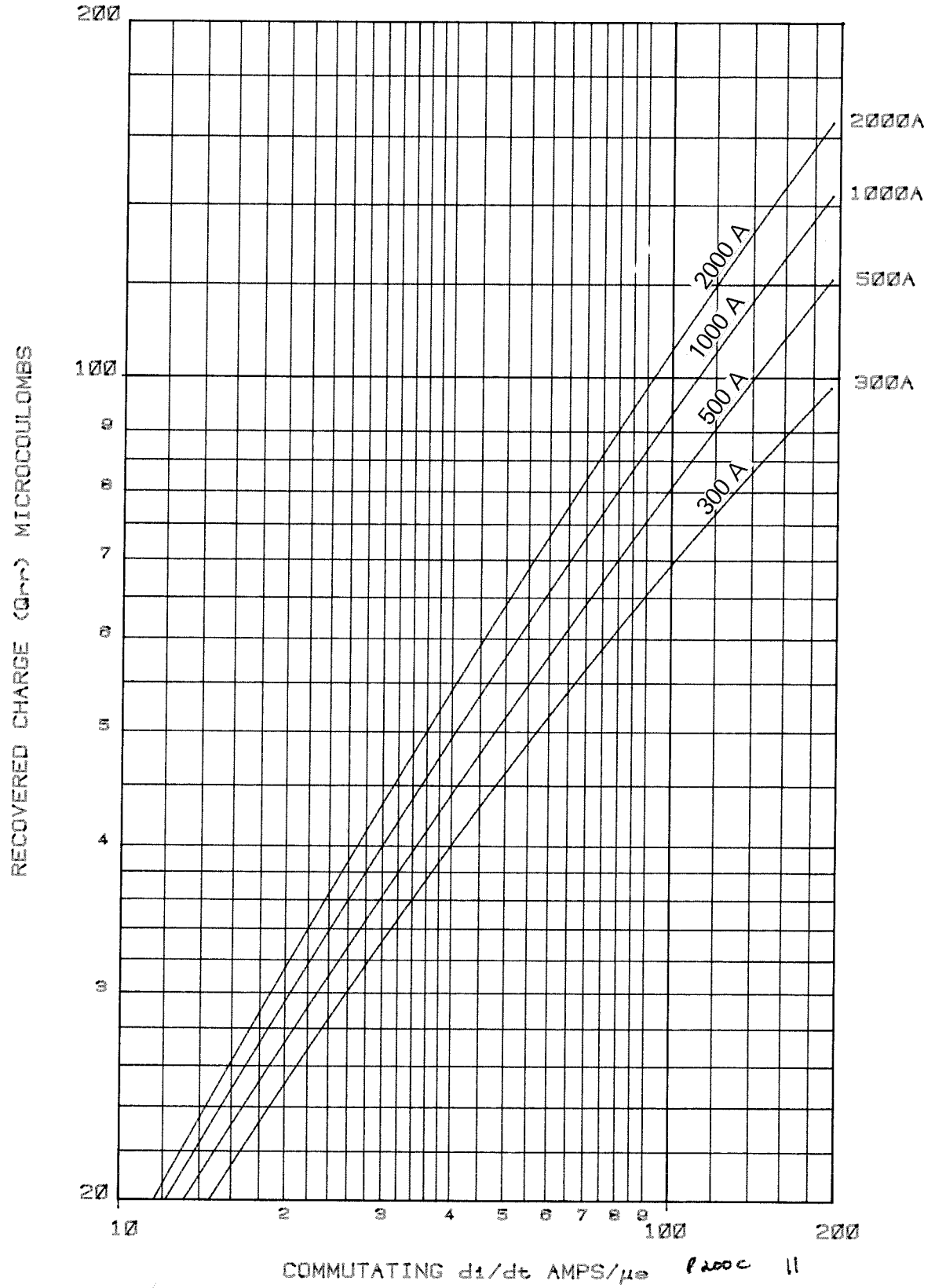
MAXIMUM NON REPETITIVE SURGE CURRENT AT INITIAL JUNCTION TEMPERATURE 125°C



DURATION OF SURGE (cycles at 50 Hz)

DURATION OF SURGE (ms)

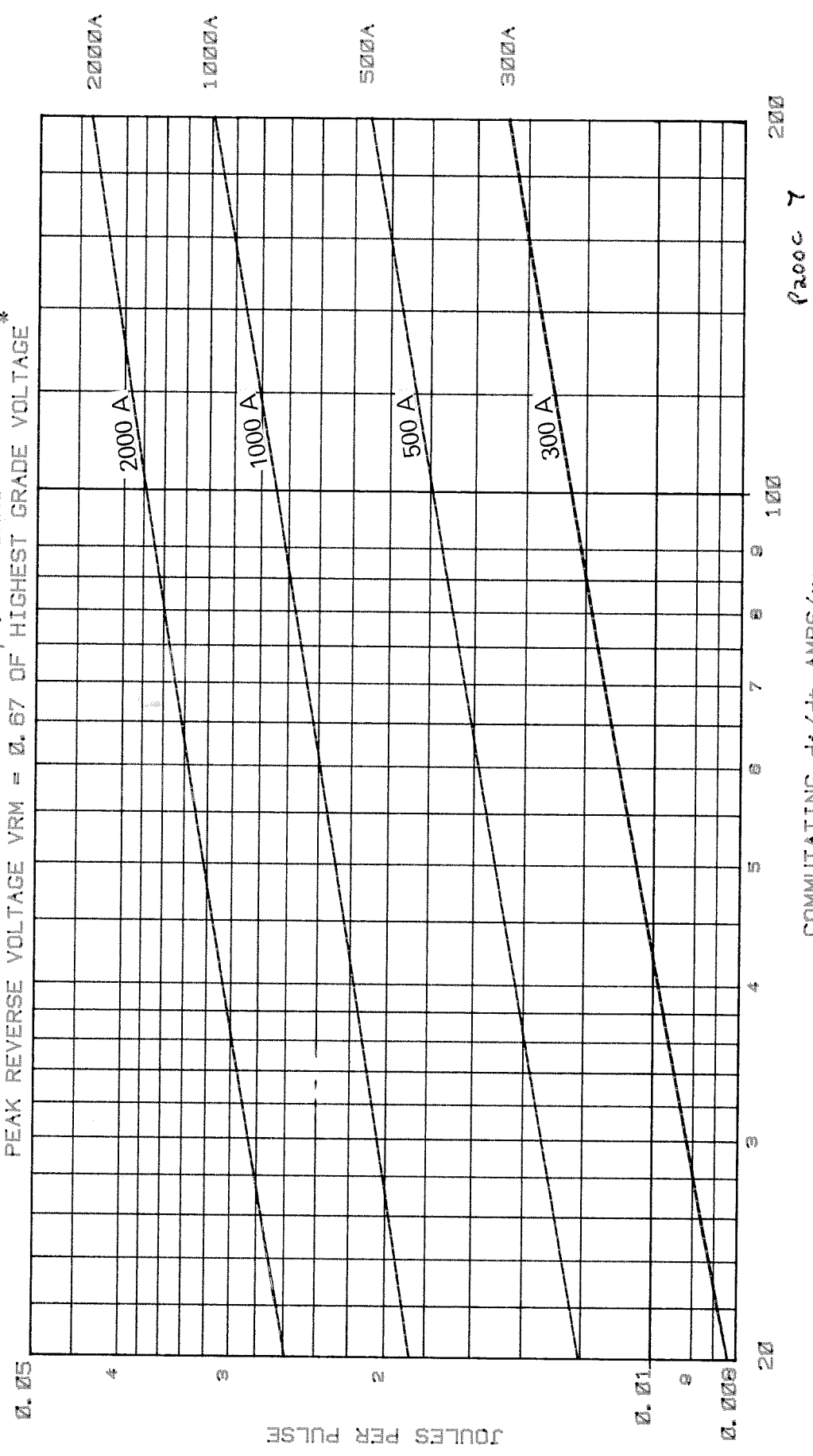
TYPICAL RECOVERED CHARGE AT 125°C JUNCTION TEMPERATURE



COMMUTATING di/dt AMPS/μs P200C/11

MAXIMUM REVERSE RECOVERY ENERGY LOSS PER PULSE, 125°C JUNCTION TEMPERATURE

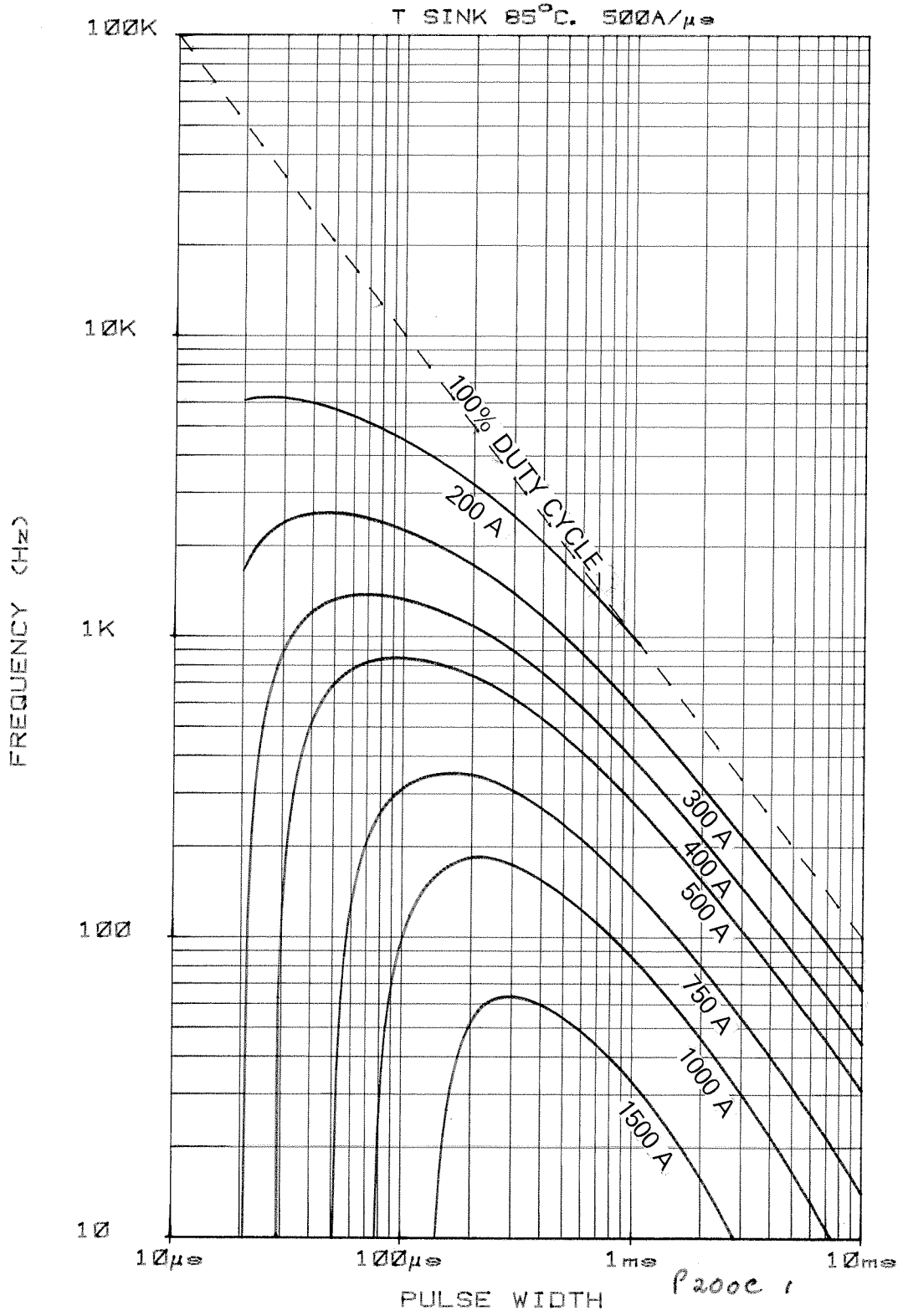
SNUBBER CONNECTED 0.22μF, 22 OHMS
PEAK REVERSE VOLTAGE VRM = 0.67 OF HIGHEST GRADE VOLTAGE*



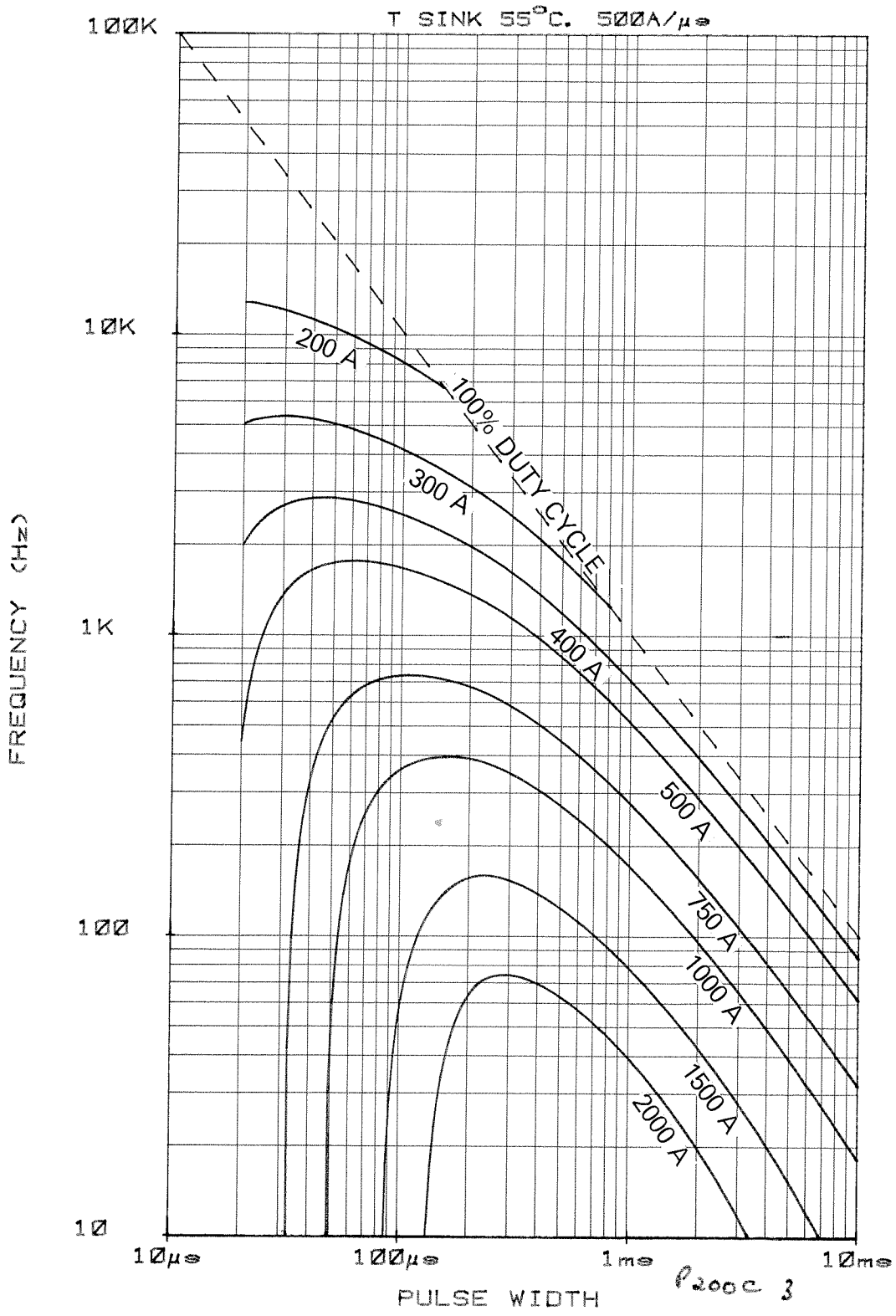
COMMUTATING di/dt AMPS/μs

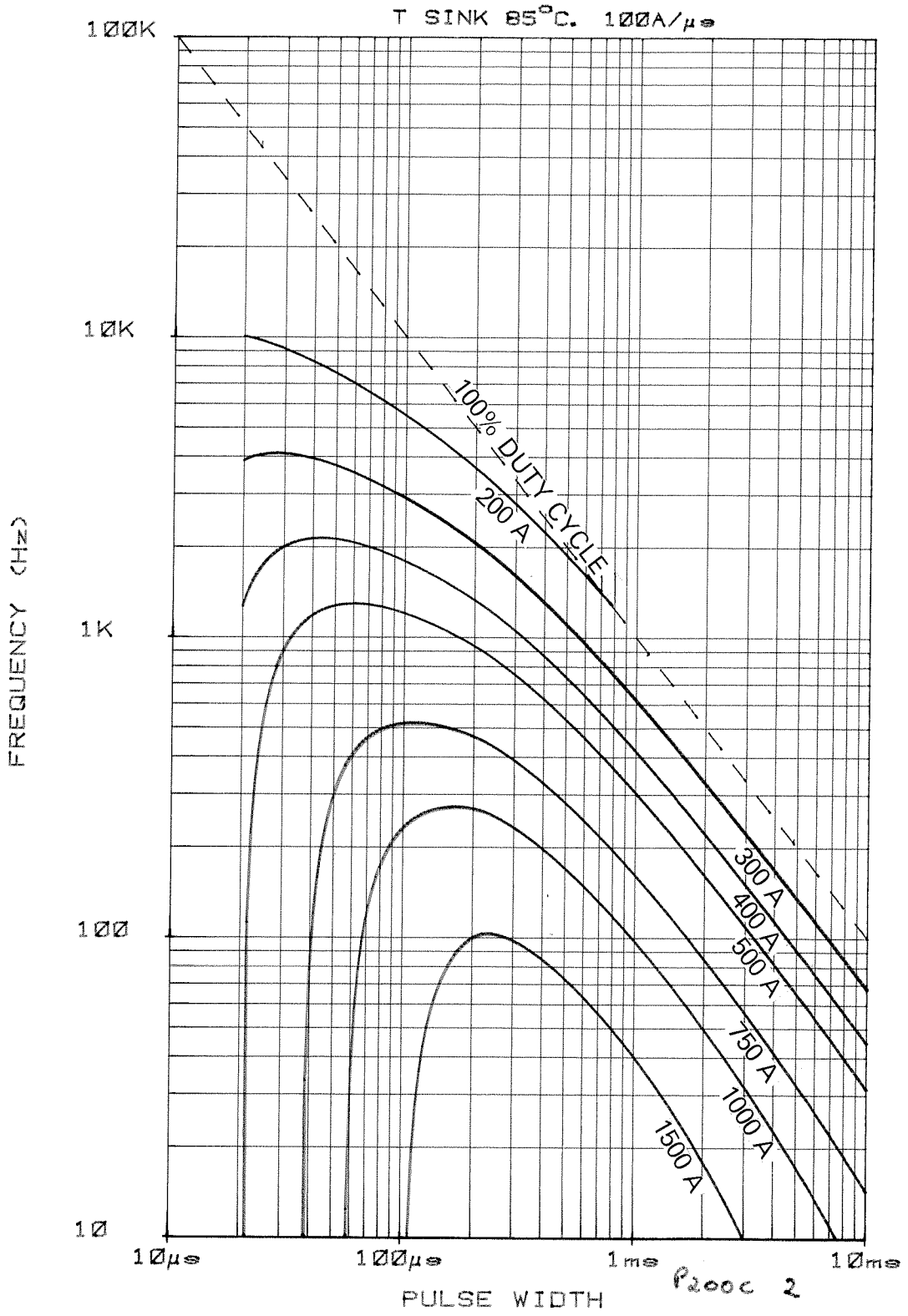
* NOTE: ENERGY PER PULSE SHOULD BE ADJUSTED PRO RATA WITH APPLIED PEAK RECOVERY VOLTAGE

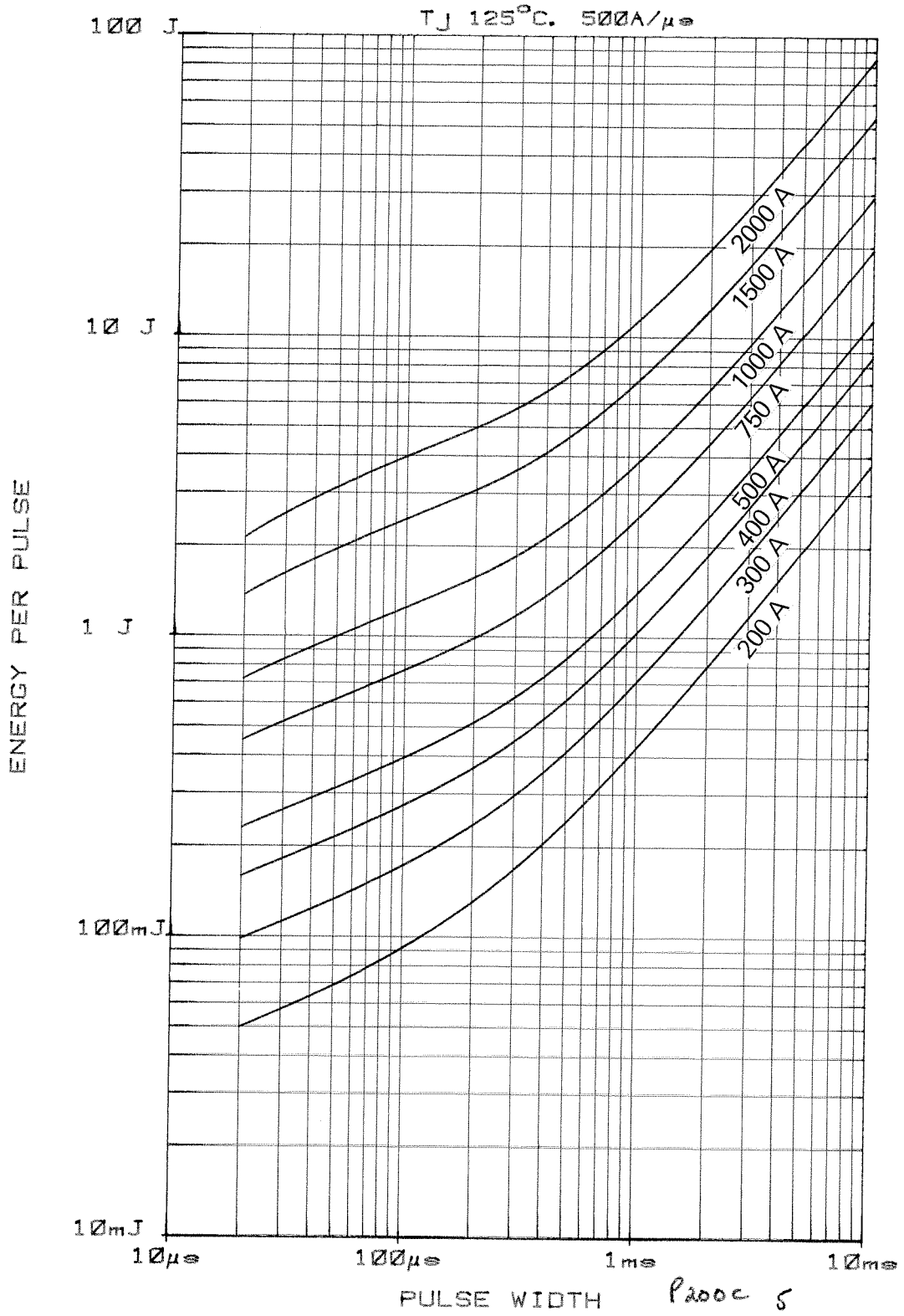
P200C '1



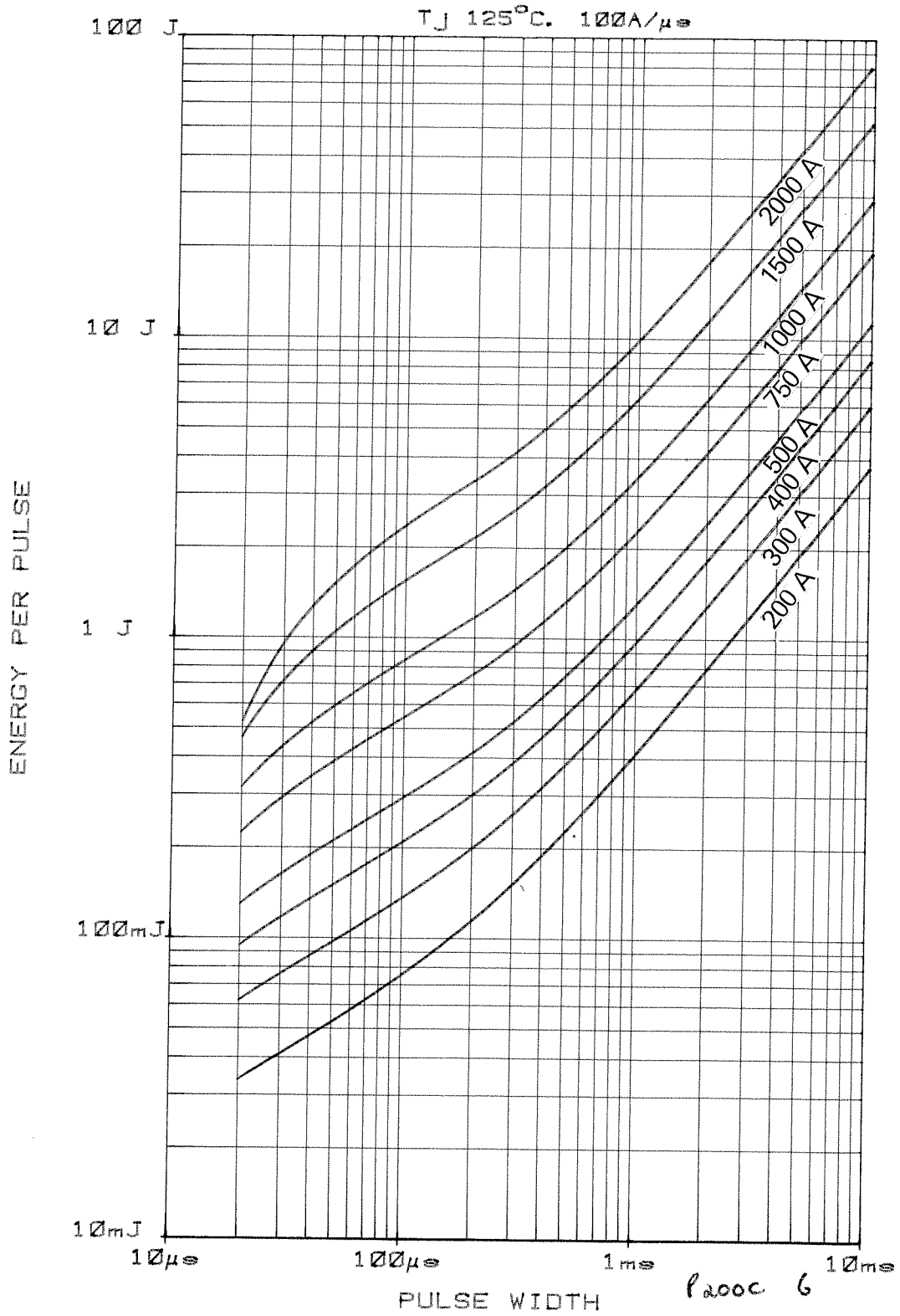
P200C 13

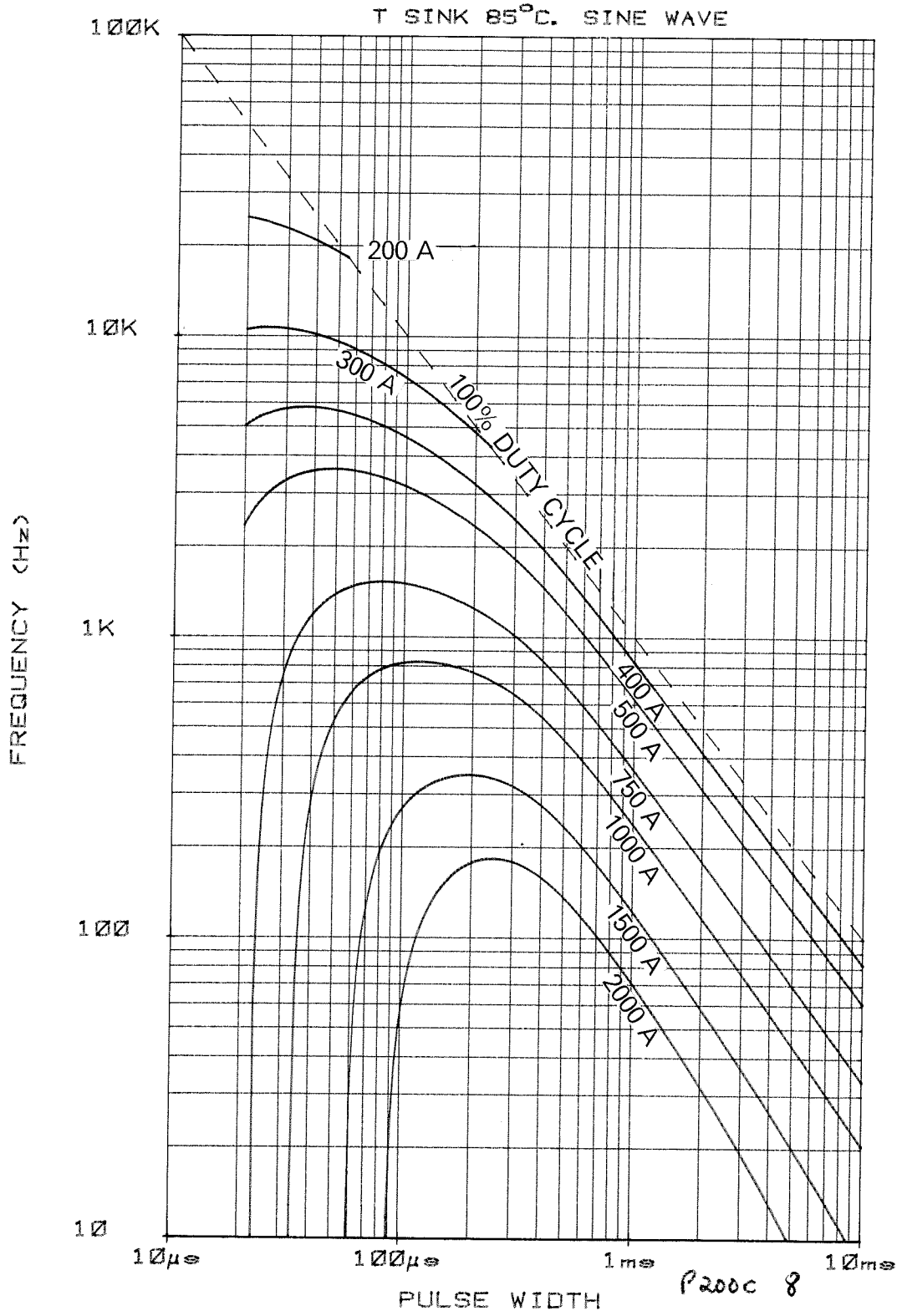


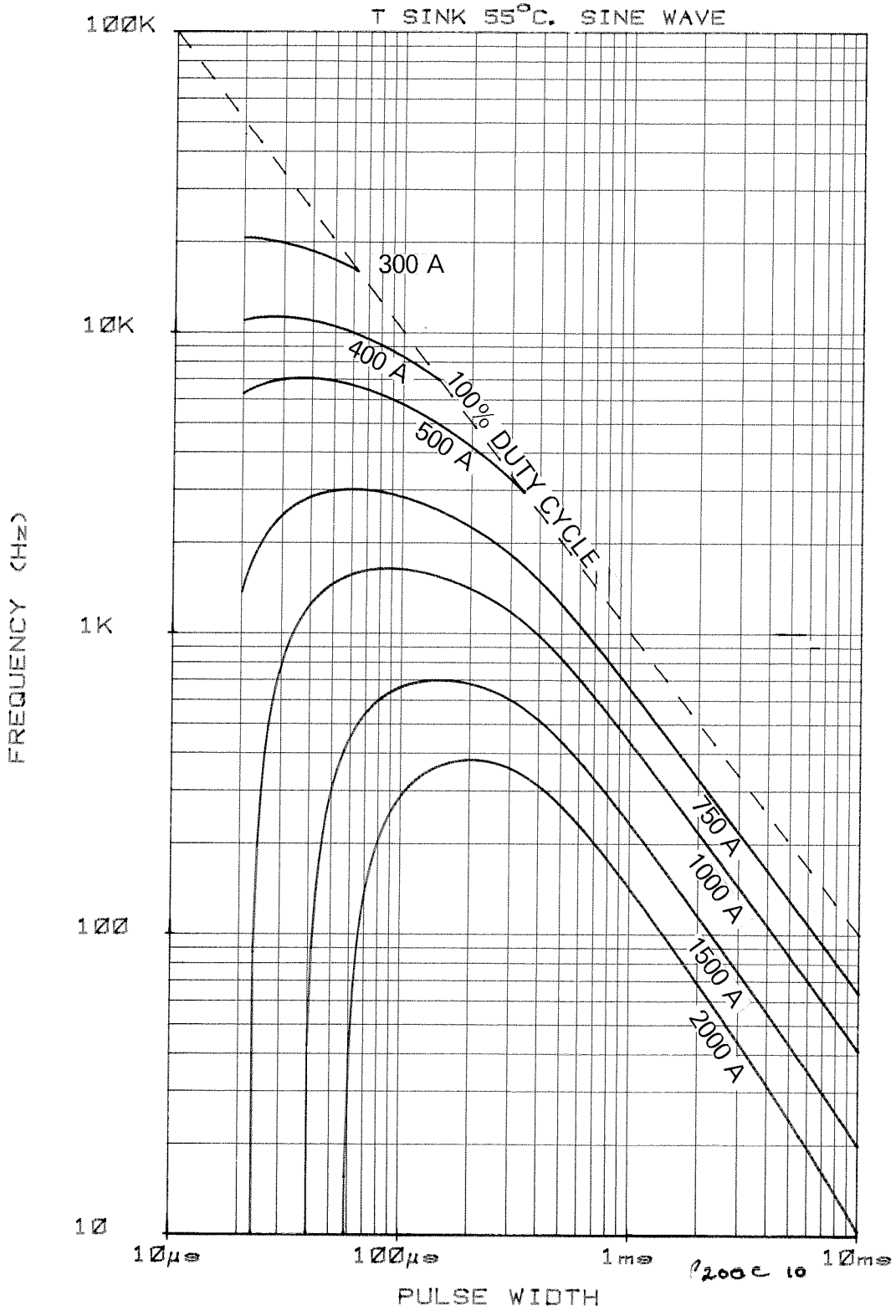




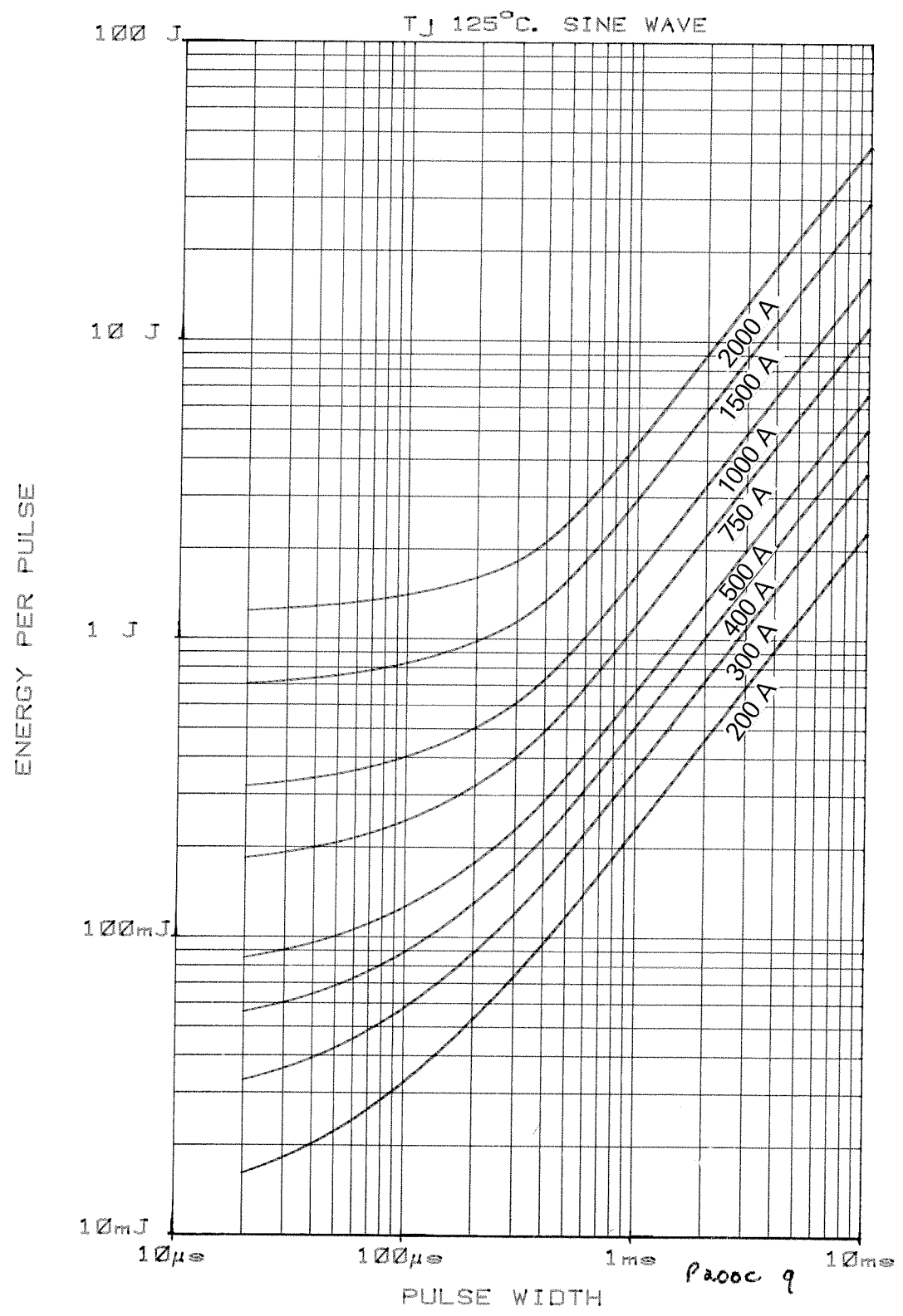
P2000/6







P200C19



SCALE	1/1
DRN	<i>[Signature]</i>
CHKD	<i>[Signature]</i>
APPD	
	GEG-1
	CS 1
	QA 1
	LP 2
	HP 2
S	G
S	NI

INTERNATIONAL OUTLINE No. **TO-200AB**

WEIGHT. **70 GRAMS.**

FINISH. **NICKEL PLATE.**

- 24 -

DEVICE MARKING INCLUDES MONOGRAM, TYPE No., SPEC. No. AND POLARITY SYMBOL.

DEVICE MOUNTING: CLAMPING FORCE TO BE APPLIED ON $\frac{1}{2}$ OF LOCATION HOLES AND BE EVENLY DISTRIBUTED OVER AREA OF CONTACT. FLAT TOL ON SURFACES TO WHICH DEVICE IS CLAMPED TO BE 0.04 WIDE.

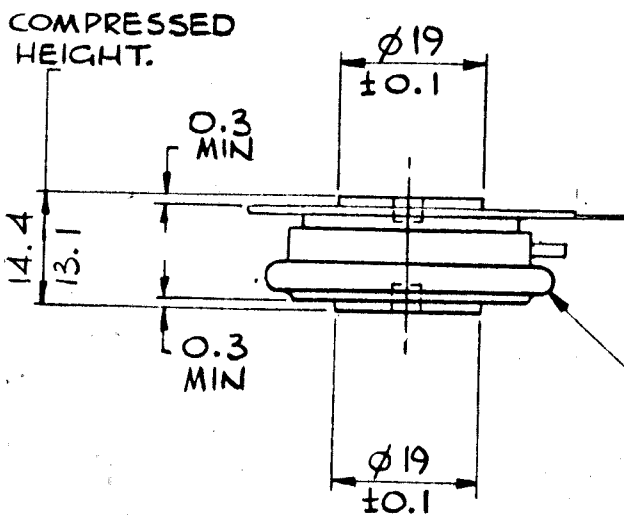
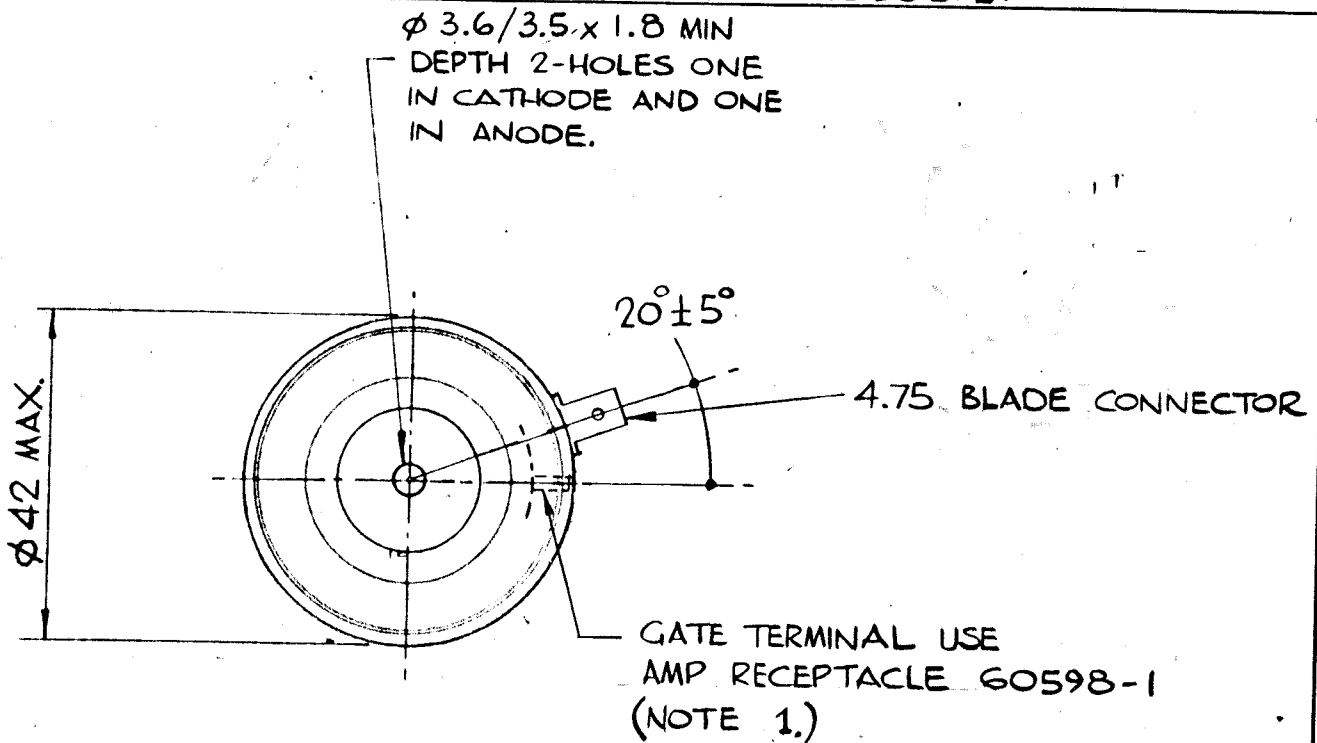
CLAMPING FORCE = **330 - 550 kgf.**

NOTE 1. 300mm LONG GATE LEADS ARE AVAILABLE IF REQD.

G.A. DRG. No. **159B100H100-H110. 103B211. 103B212.**

N086C
N105C
N140C
N170C
N195C
N275C

TYPE NUMBER
P070C P205C
P086C P214C
P095C P215C
P105C P270C
P200C
P202C
P204C
P100C



CREEP PATH OVER CONVOLUTION = 8 MIN.

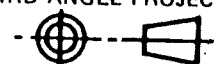
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THIRD ANGLE PROJECTION



DIMNS. IN MILLIMETRES

DRG. No.

101A212

ISS	REVISIONS
1	9.9.76 P118
2	P304 17.5.78 REDRAWN. φ19 WAS φ29. 0.3 ADDED. 15.2/14. WAS 15.2/12.5. LEADS ADDED.
3	M613 14.6.78 LEAD COLOURS CHANGED.
4	M636 7.8.78 LEADS DELETED
5	11.9.78 CLAMP FORCE WAS 500 - 1200 kgf. φ42 WAS φ43 NOTE 1 ADDED. 14.35/13.08 WAS 15.2/14.
6	19.9.78 14.4/13.1 WAS 14.35/13.08
7	30.10.78 M670 TYPE NO ADDED
8	17.9.79 M773 550 kgf WAS 700 kgf