Soft Recovery Diode
Types M0437WC080 to M0437WC140

The data sheet on the subsequent pages of this document is a scanned copy of existing data for this product.
(Rating Report 80NR1 Issue 3)

This data reflects the old part number for this product which is: SM02-14CXC170.
This part number must **NOT** be used for ordering purposes – please use the ordering particulars detailed below.

Limitations of this data are as follows:
This device is only available for grades 08 to 14 (800V to 1400V V_{RRM})

The following link will direct you to the appropriate outline drawing
Outline W1

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			
M0437	WC	♦♦	0
Fixed Type Code	Fixed Outline Code	Voltage code V_{RRM}/100 08-14	Fixed Code
Typical Order Code: M0437WC140, 14mm clamp height, 1400V V_{RRM}			

QUALITY EVALUATION LABORATORY

Rating Report: 80NR1 (Issue 3) Date: 18th November, 1991

Origin: Pages: 22

Diode Type SM02-14CXC170

Written by: M.W. Dunlop Checked: M.W.D Approved: B.R.H

This diode consists of a diffused, fast recovery 24 mm diameter silicon slice mounted in a cold weld capsule housing. This Report supersedes Rating report 80NR1: (Issue 2).

Ratings

Voltage Grades	: 02-14
V_{RSM}	: 300-1500V
V_{RRM}	: 200-1400V
$I_{F(AV)}$: Single phase; 50 Hz, 180° half sinewave; (Converter Ratings)	:
Double Side Cooled T_{HSE} = 55°C, 100°C	: 438A, 202A
Single Side Cooled T_{HS} = 100°C	: 114A
$I_{F(rms)}$ T_{HS} = 25°C)	: 880A
I_F T_{HS} = 25°C) Double side cooled	: 727A
I_{FSM} : t = 10ms half sinewave; T_J (initial) = 125°C ; V_{RM} = 0.6$V_{RRM(MAX)}$	: 4500A
I_{FSM} : t = 10ms half sinewave; T_J (initial) = 125°C ; V_{RM} 10V	: 4950A
I^2t : t = 10ms; T_J (initial = 125°C ; V_{RM} = 0.6V_{RRM} (MAX)	: 1.01 x $10^5 A^2$
I^2t : t = 10ms; T_J (initial) = 125°C; $V_{RM} \leq$ 10V	: 1.22 x $10^5 A^2$
I^2t : t = 3ms; T_J (initial = 125°C ; $V_{RM} \leq$ 10V	: 0.91 x $10^5 A^2$
T_{HS} Operating Ramge	: -40 to +125
T_{stg}; Non-operating	: -40 to +150

Characteristics

(Maximum values unless stated otherwise)

V_O : T_J = 125°C	: 1.02V
r_s : T_J = 125°C	: 0.7mohms
V_{FM} : I_{FM} = 635A T_{VJ} = 125°C	: 1.46V
R_{th}(J-HS) Double side cooled	: 0.09°C/W
Single side cooled	: 0.18°C/W
I_{RRM} : T_J = 125°C V_{RM} = $V_{RRM(MAX)}$	: 20mA
Q_{rr} : I_{FM} = 550A ; dI/dt = 40A/uS (50% chord value)	:
V_{RM} = 50V T_{VJ} = 125°C	: 75uC
t_{rr} (conditions as above)	: 3uS
Mounting Force	: 330-550kg.f
Outline Drawing	: 10A241
JEDEC No.	: DO200AA

CONTENTS

CHANGES TO 80NR1 (Issue 2)

Voltage Grade increased from 12 to 14.

Voltage Ratings

Voltage Class	V_{RRM} V	V_{RSM} V
02	200	300
04	400	500
06	600	700
08	800	900
10	1000	1100
12	1200	1300
14	1400	1500

This Report is applicable to higher or lower voltage grades when supply has been agreed by Sales/Production.

2.0 INTRODUCTION

The diode series comprises fast recovery cold-weld capsules with all diffused silicon slices. All these diodes have controlled reverse recovery characteristics with good "S" factors.

3.0 NOTES ON THE RATINGS

(a) Square wave ratings

These ratings are given for leading edge linear rates of rise of forward current of 200 and 100A/uS

(b) Energy per pulse characteristics

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

Let: Ep be the Energy per pulse for a given current and pulse width, in joules.

Then $W_{AV} = Ep \times f.$

and $T_{SINK} = T_{J(MAX)} - W_{AV} R_{th}$

4.0 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:

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

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

$$W_{(TOT)} = W_{(original)} + Axf$$

NOTE 1

REVERSE RECOVERY LOSS BY MEASUREMENT

This device 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.

(c) Measurement of reverse recovery voltage waveform should be carried out with an appropriate snubber of 0.1uF and 10 ohms in series connected across diode anode to cathode.

(b) Design Method

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 12.

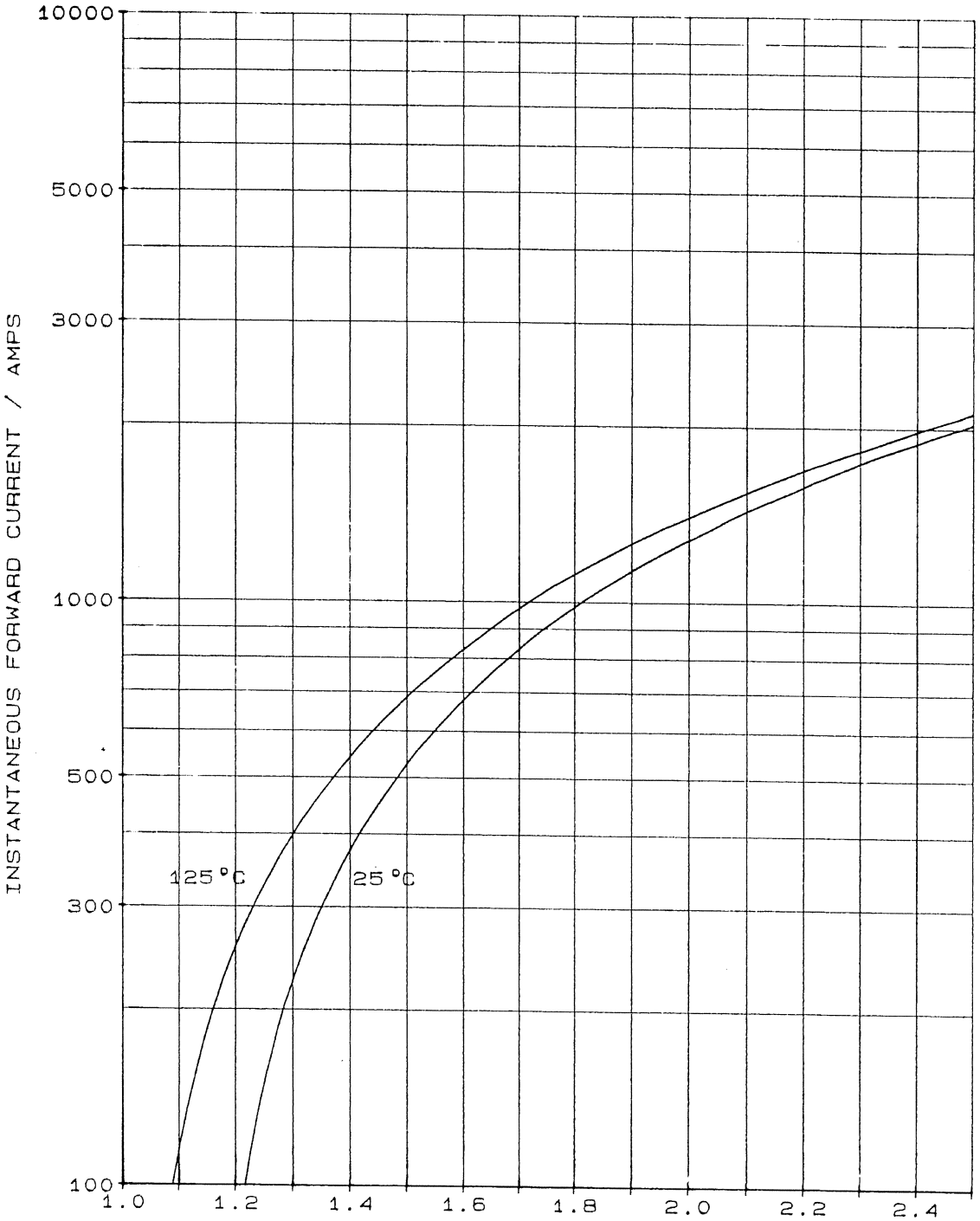
Let E be the value of energy per reverse cycle in joules (curves on page 12)

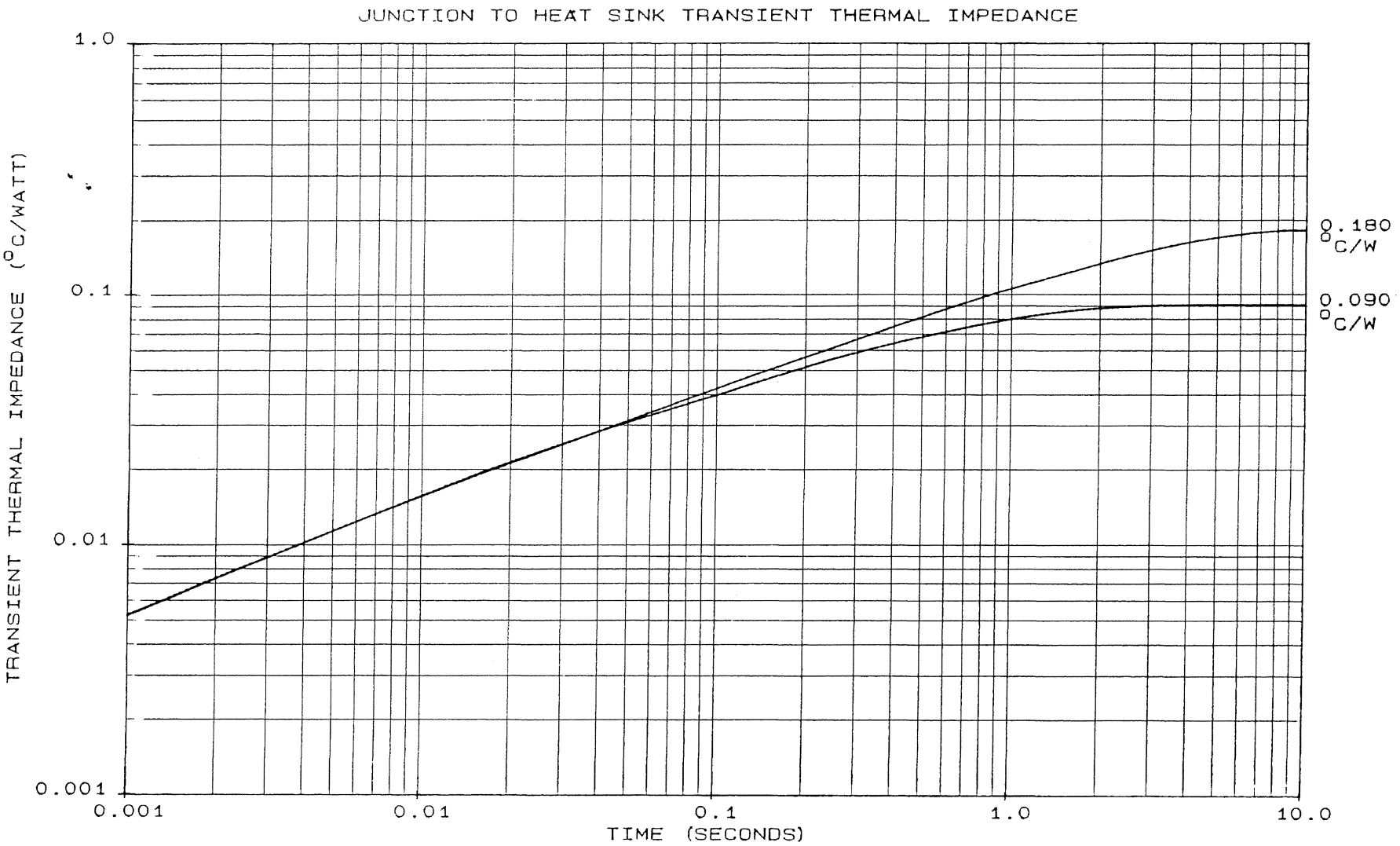
Let f be the operating frequency in Hz

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

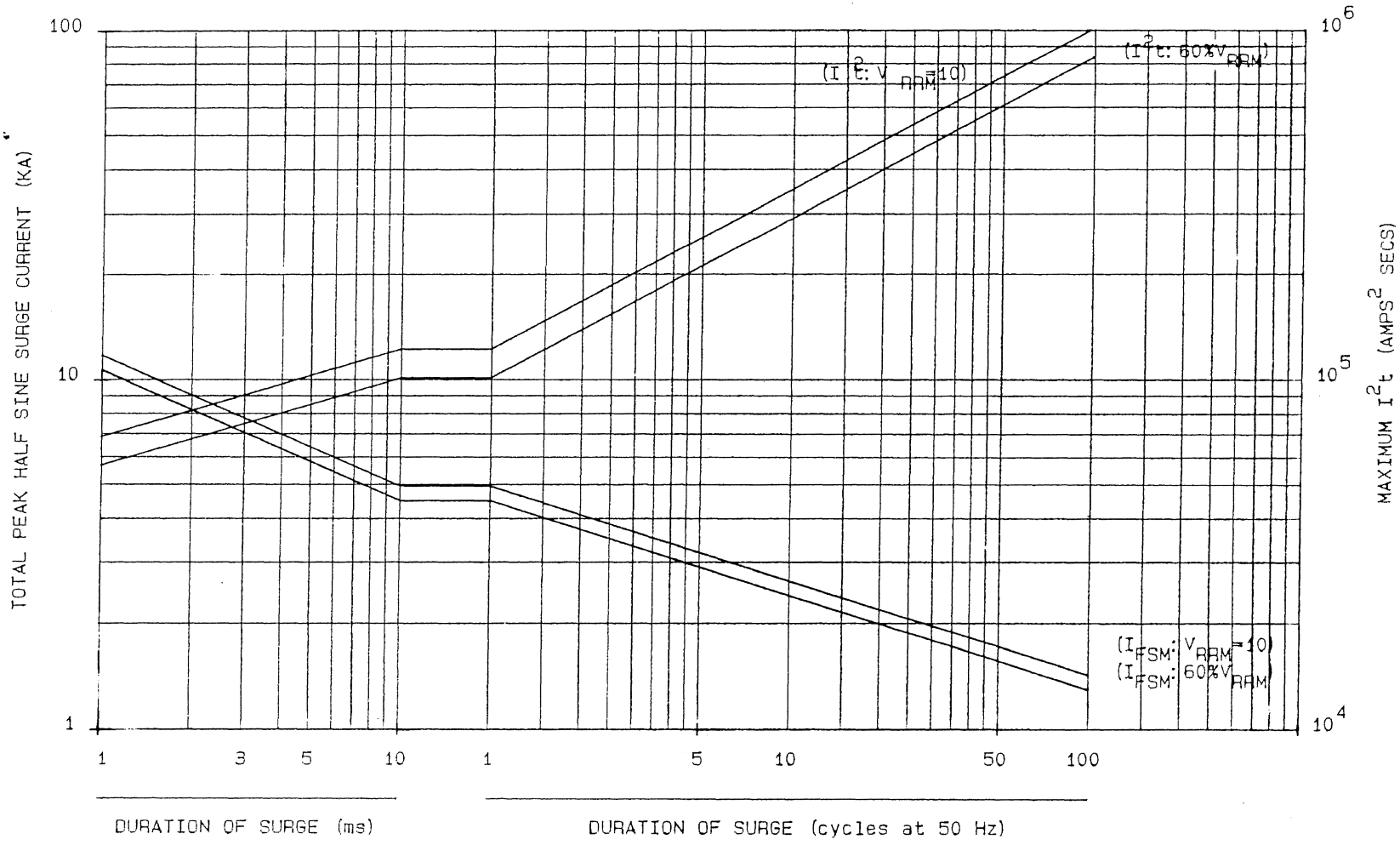
Where T_{SINK} new is the required maximum heat sink temperature and T_{SINK} original is the heat sink temperature given with the frequency ratings.

FORWARD CHARACTERISTIC OF LIMIT DEVICE

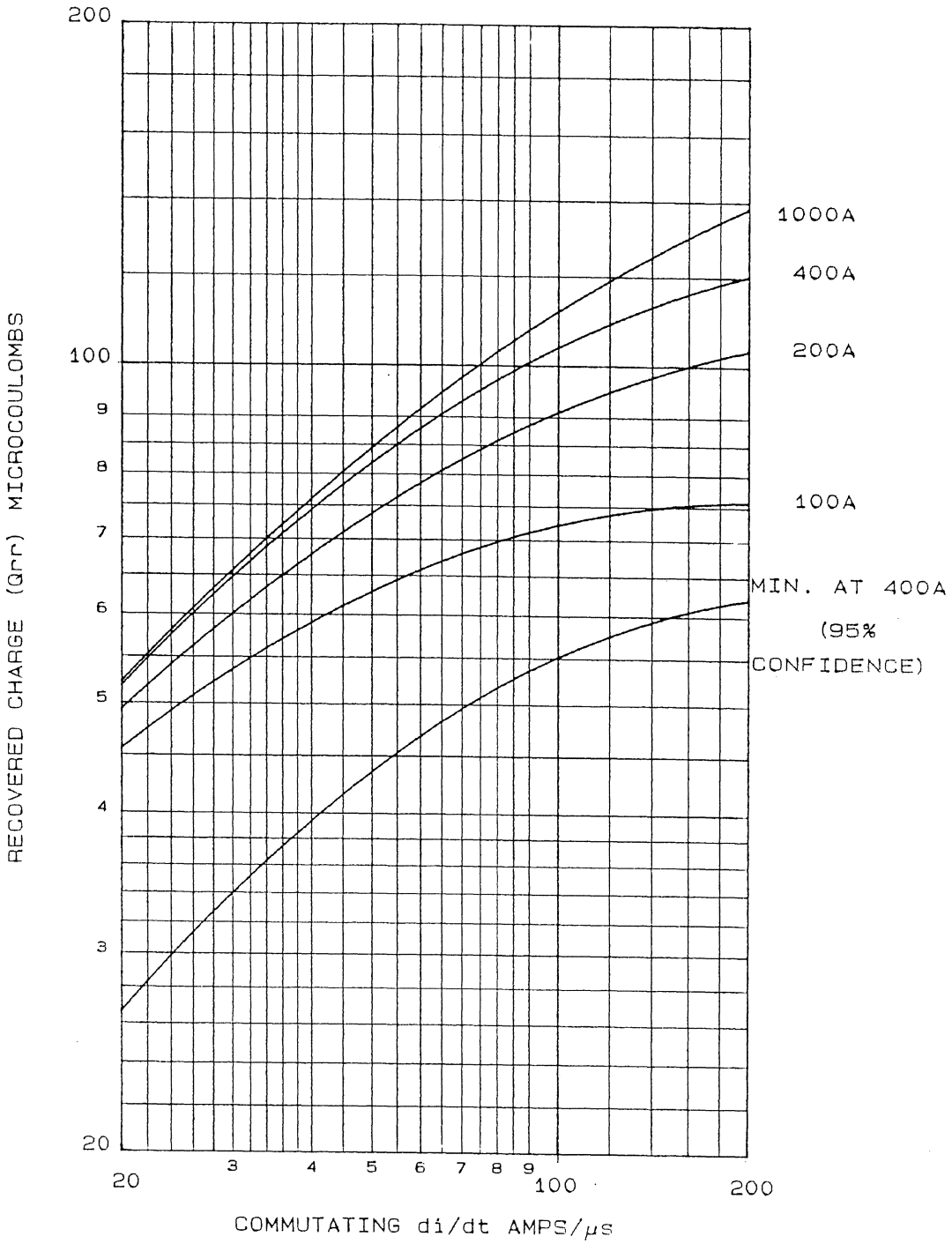


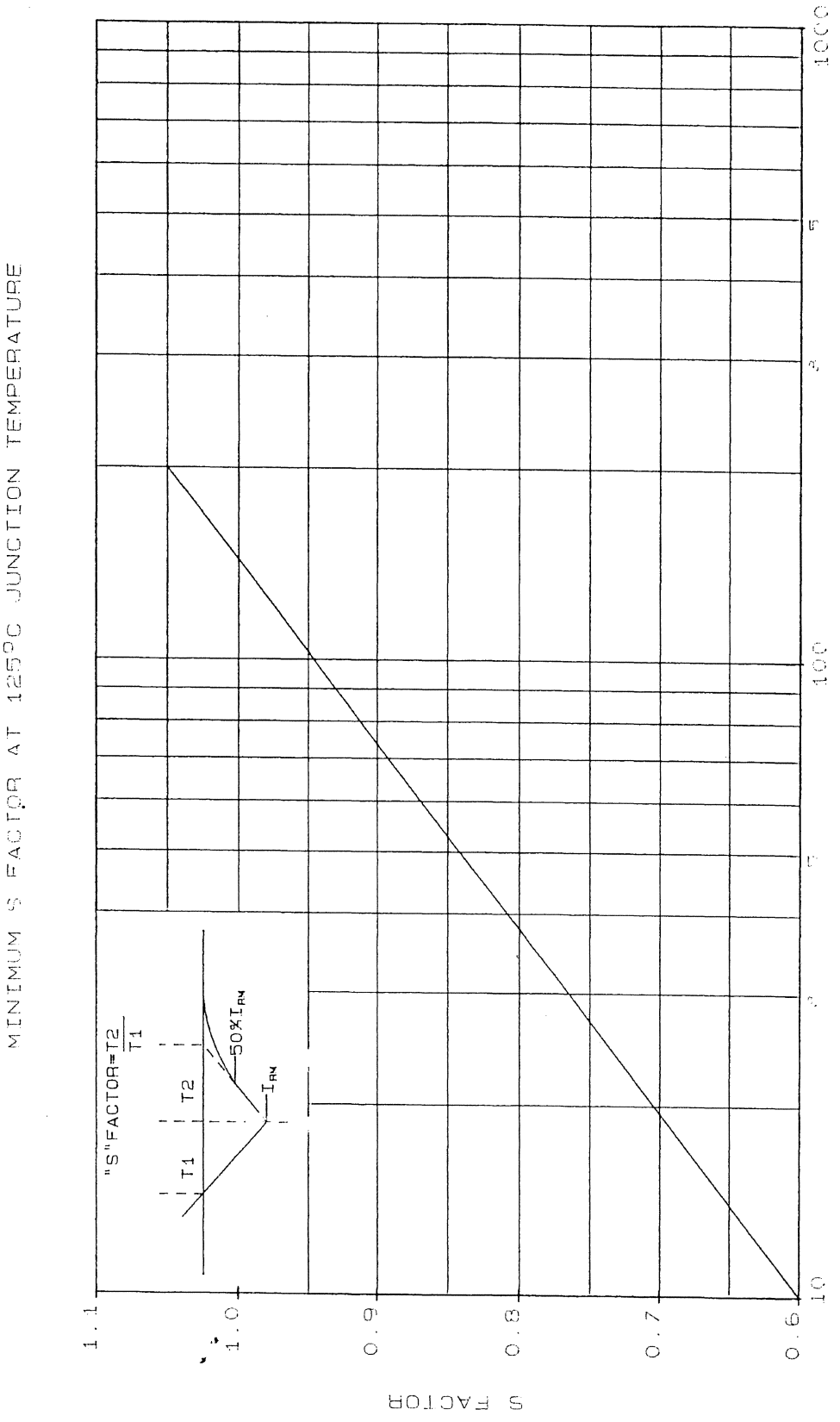

JUNCTION TO HEAT SINK TRANSIENT THERMAL IMPEDANCE
TRANSIENT THERMAL IMPEDANCE (°C/WATT)
1.0
0.1
0.01
0.001
0.001
0.01
0.1
1.0
10.0
TIME (SECONDS)
0.180 °C/W
0.090 °C/W

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



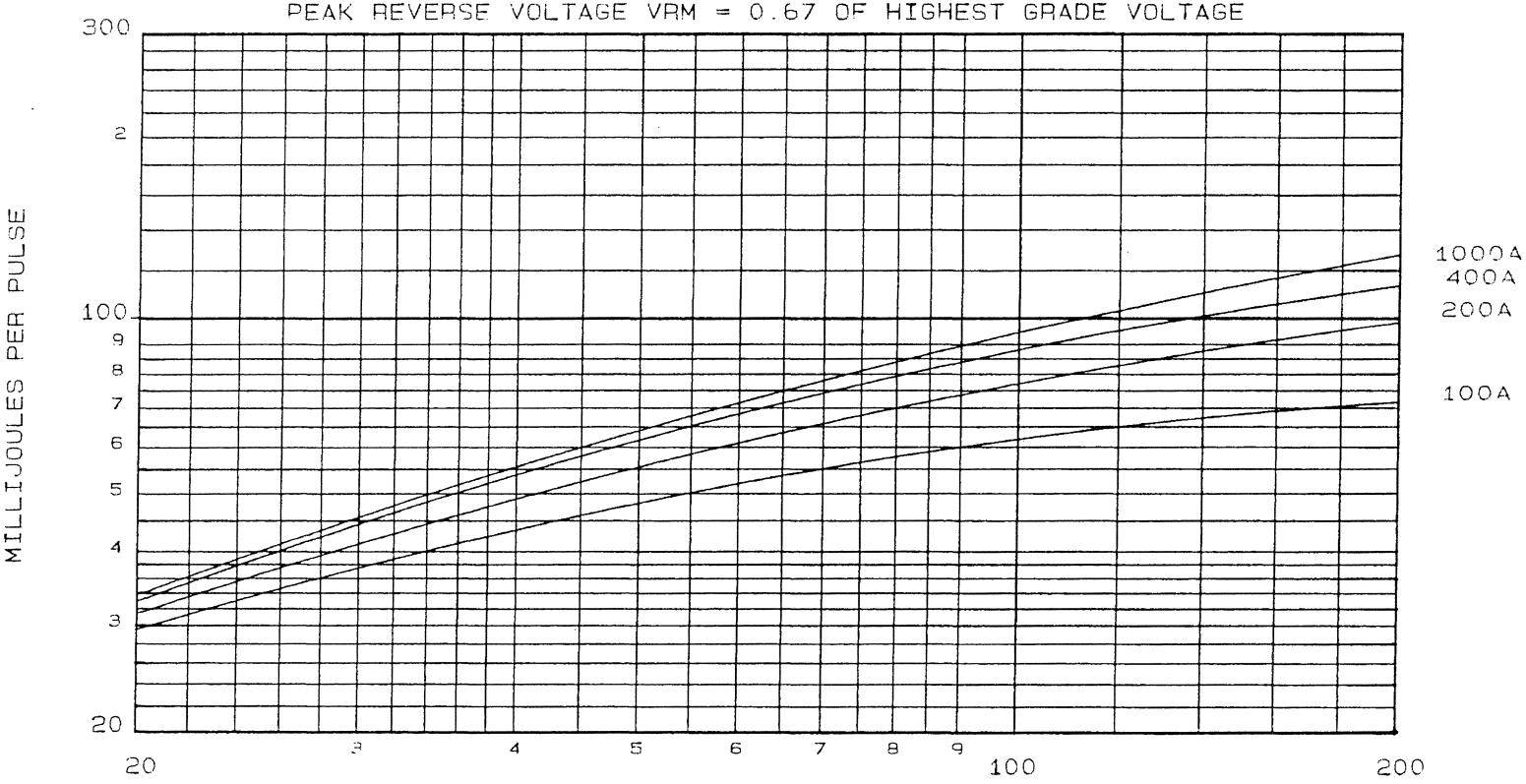
MAXIMUM RECOVERED CHARGE AT 125°C JUNCTION TEMPERATURE



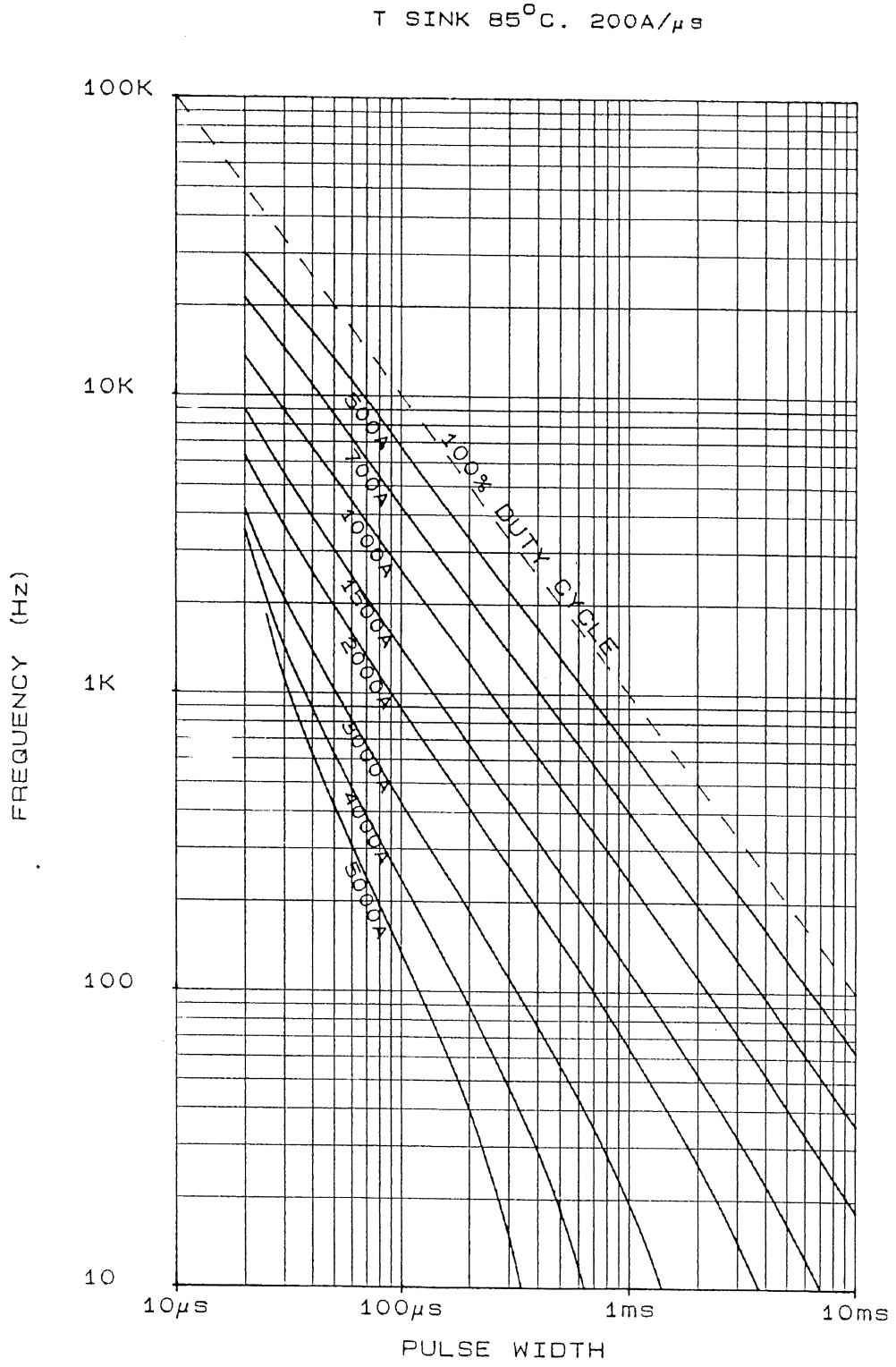

MINIMUM 'S' FACTOR AT 125°C JUNCTION TEMPERATURE
S FACTOR
1.1
1.0
0.9
0.8
0.7
0.6
10
100
1000
RECOVERED CHARGE μC
"S" FACTOR = T2/T1
T1
T2
50%IRM
IRM

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

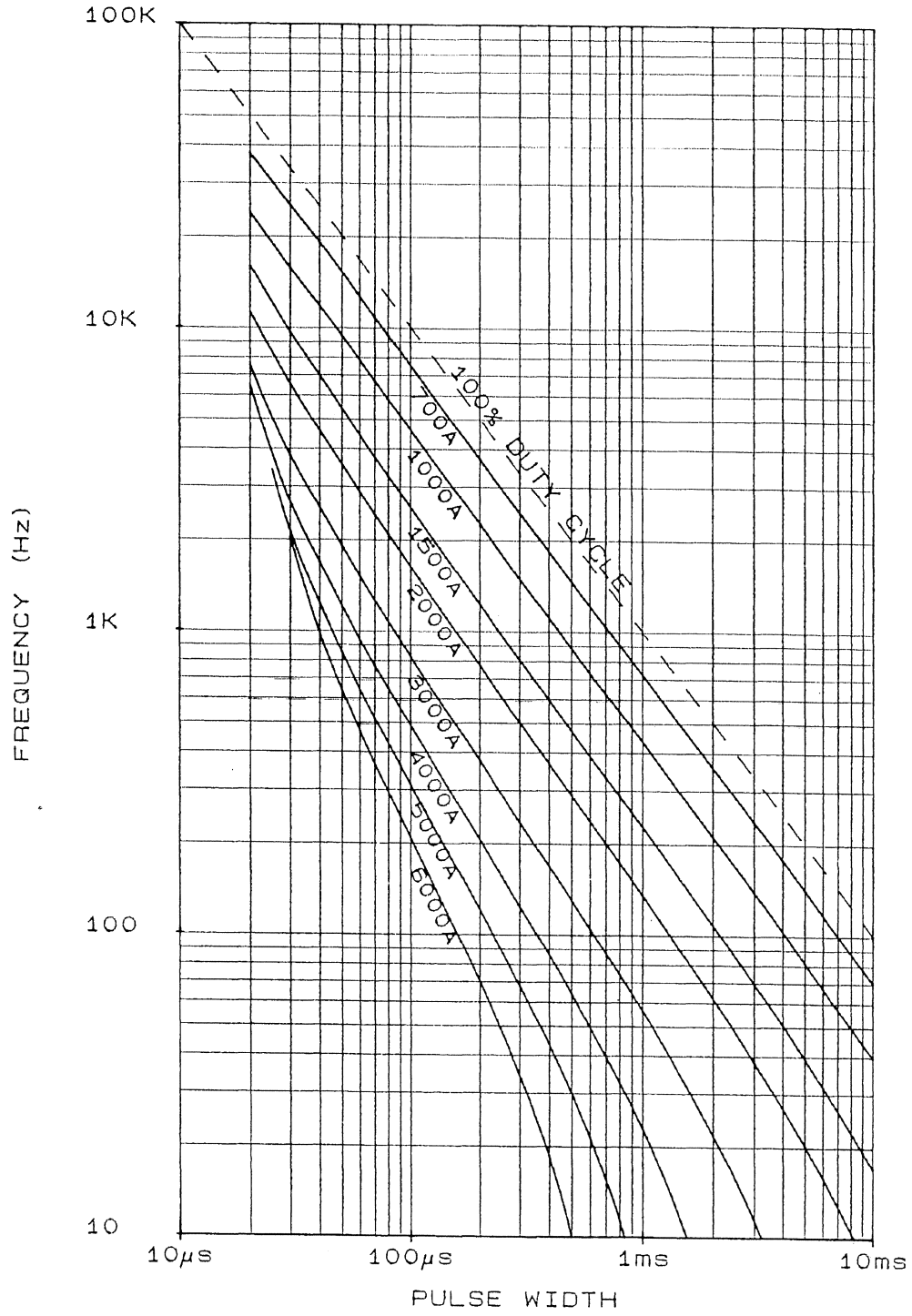
SNUBBER CONNECTED 0.10μF, 10 OHMS
PEAK REVERSE VOLTAGE VRM = 0.67 OF HIGHEST GRADE VOLTAGE*

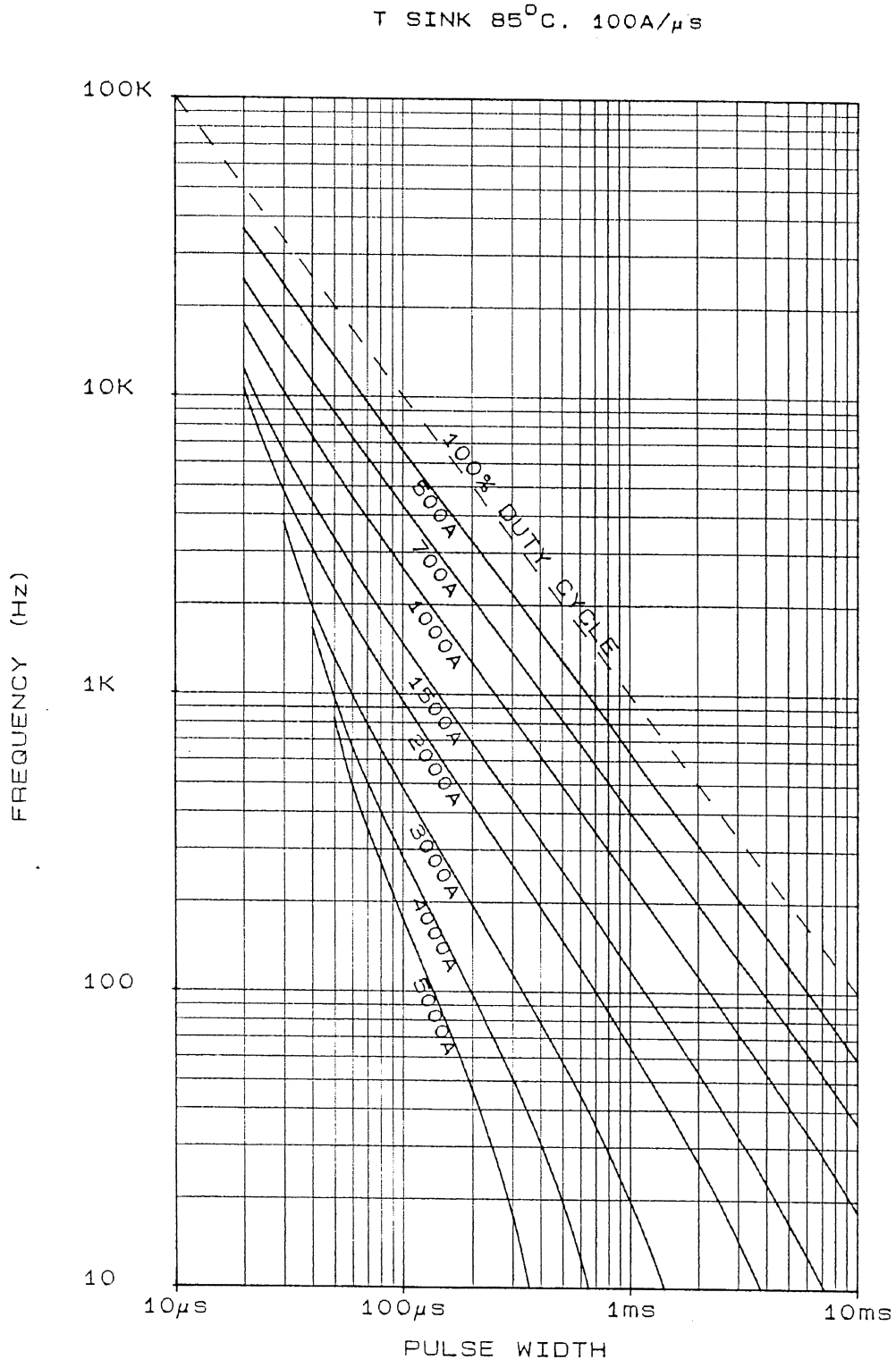


*NOTE: ENERGY PER PULSE SHOULD BE ADJUSTED PRO RATA WITH APPLIED PEAK RECOVERY VOLTAGE

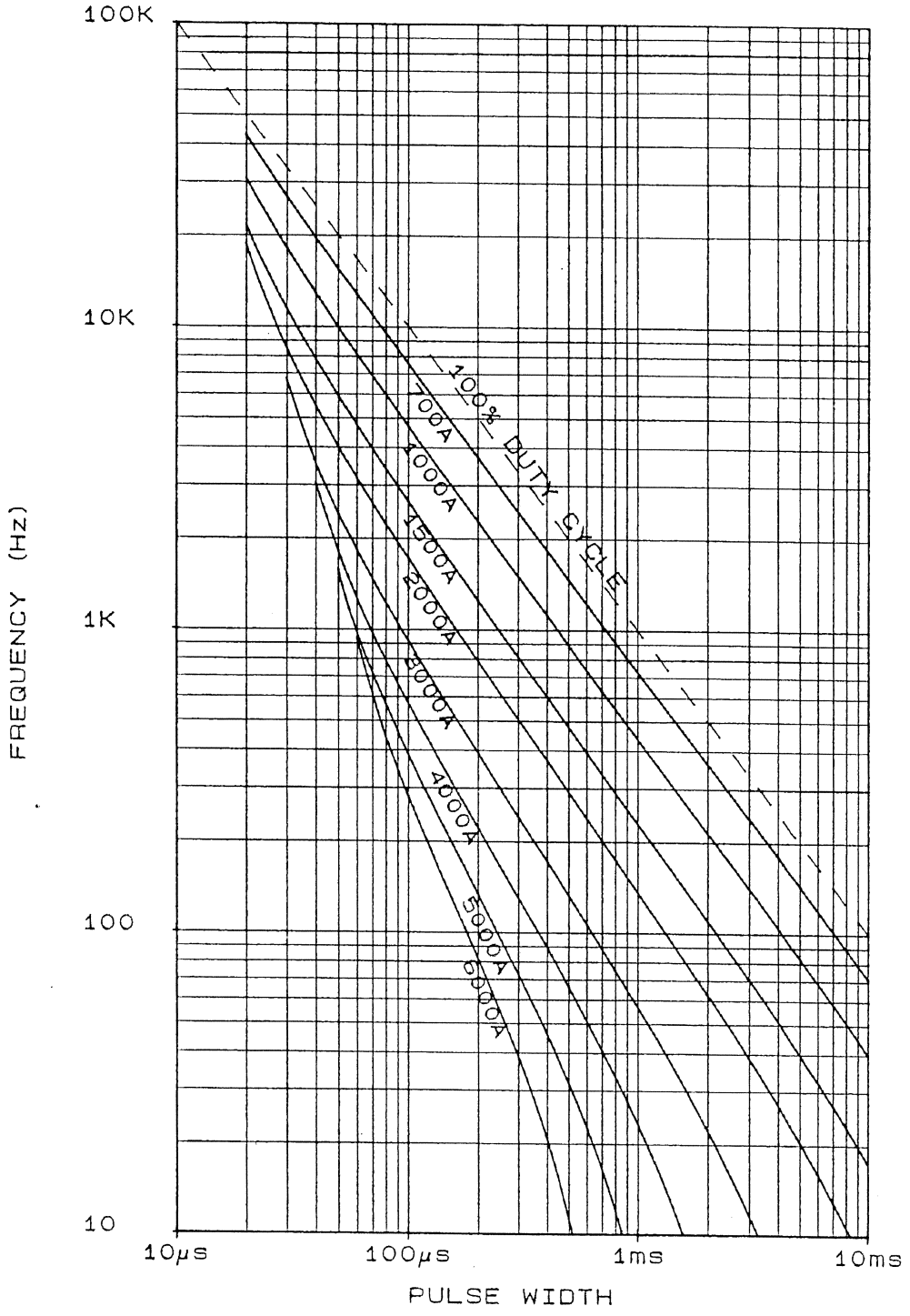

T SINK 85°C. 200A/μs
100K
10K
1K
100
10
FREQUENCY (Hz)
10μs
100μs
1ms
10ms
PULSE WIDTH
100% DUTY CYCLE
500A
700A
1000A
1500A
2000A
3000A
4000A
5000A

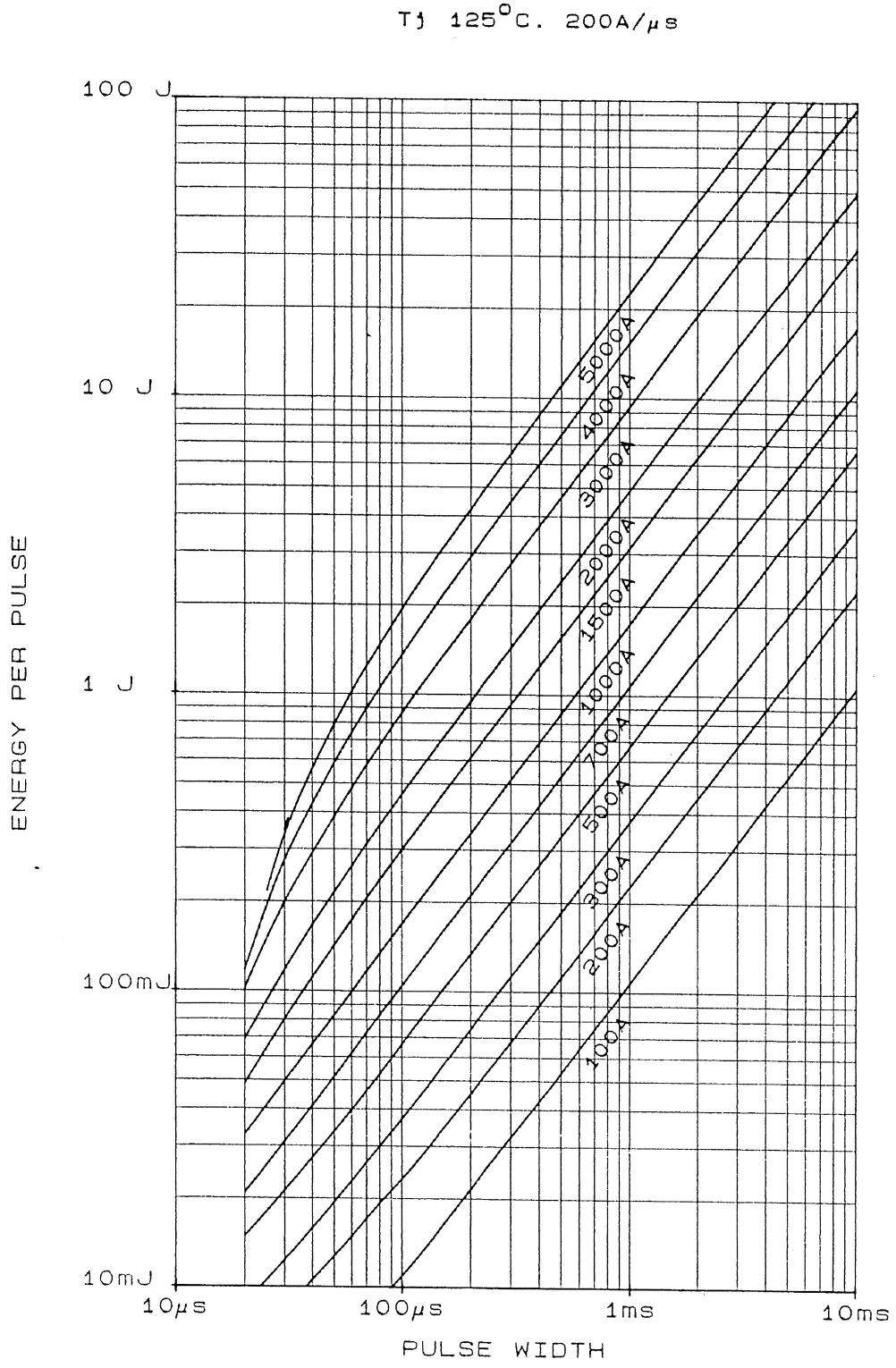
T SINK 55°C. 200A/μs



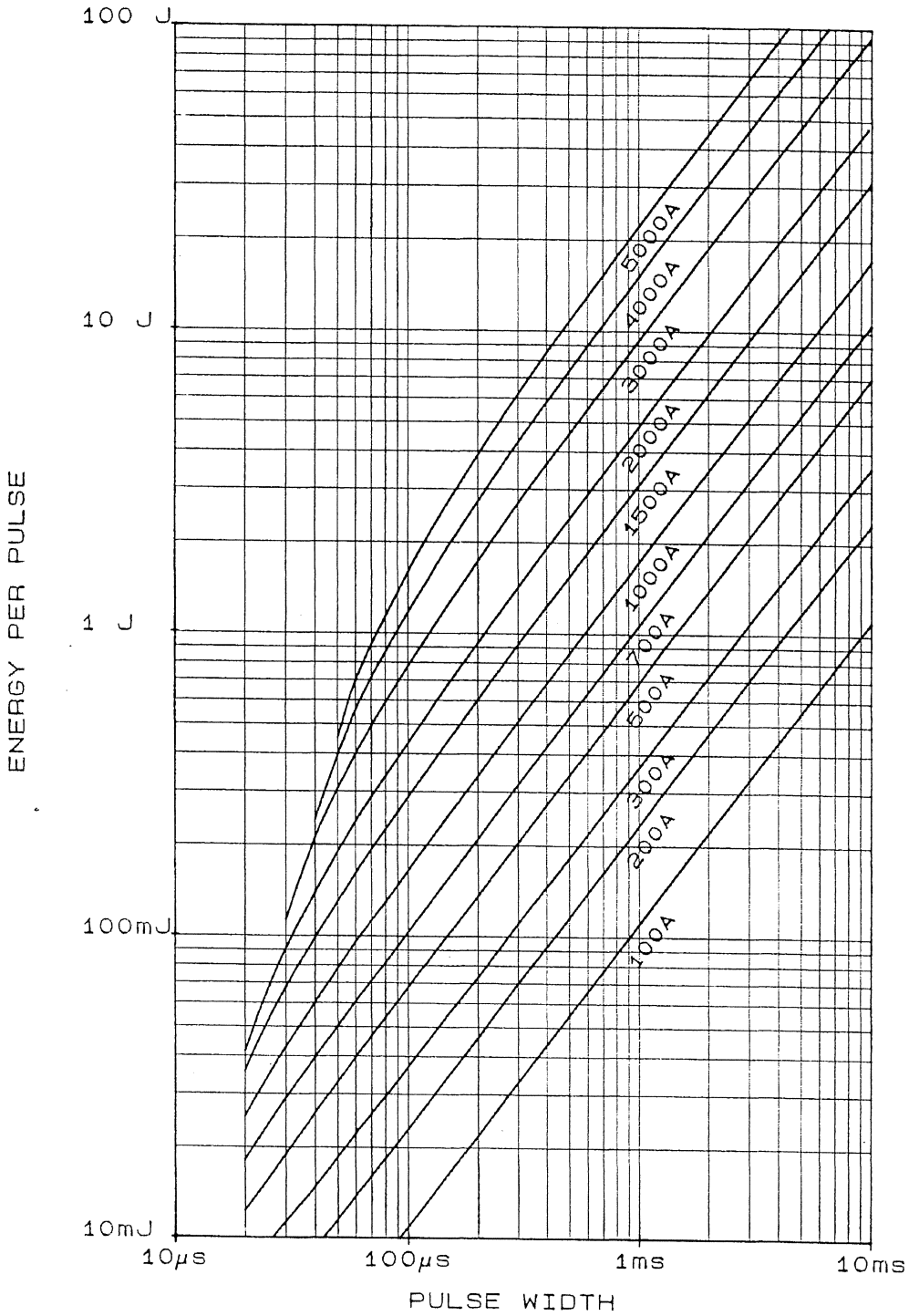

T SINK 85°C. 100A/μs
100K
10K
1K
100
10
FREQUENCY (Hz)
100% DUTY CYCLE
500A
700A
1000A
1500A
2000A
3000A
4000A
5000A
10μs
100μs
1ms
10ms
PULSE WIDTH

T SINK 55°C. 100A/μs

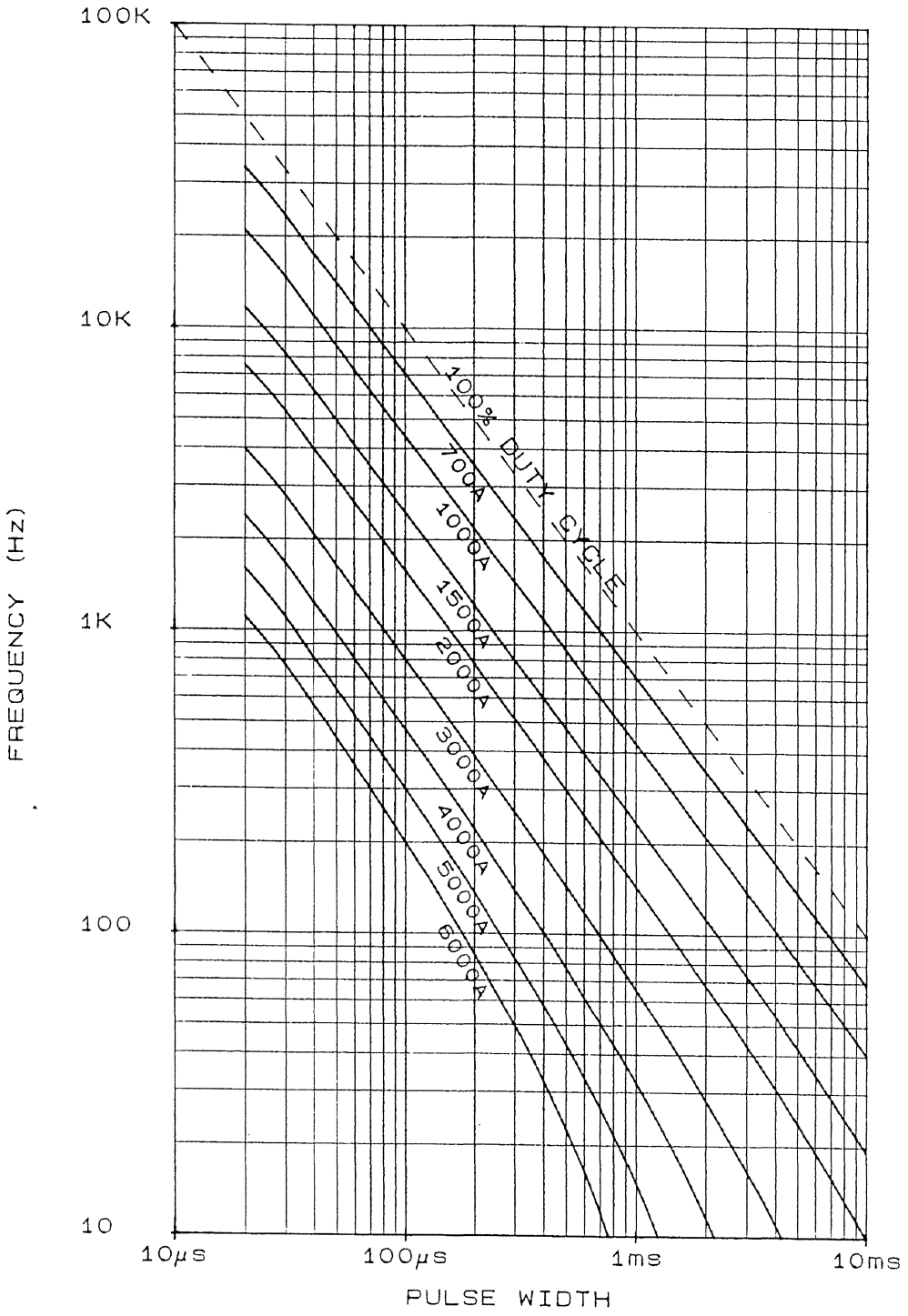


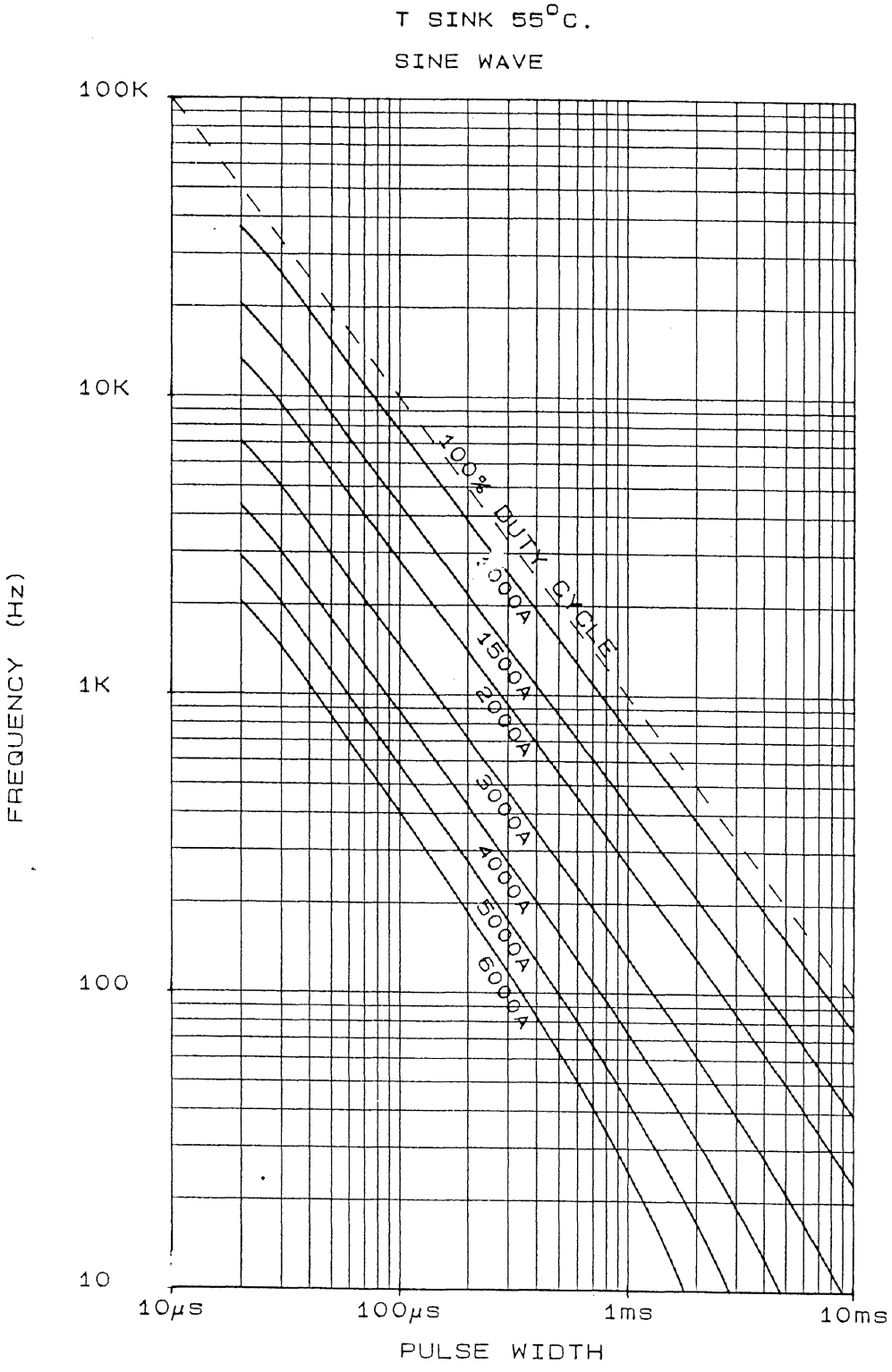

Tj 125°C. 200A/μs
100 J
10 J
1 J
100mJ
10mJ
ENERGY PER PULSE
5000A
4000A
3000A
2000A
1600A
1000A
700A
500A
300A
200A
100A
10μs
100μs
1ms
10ms
PULSE WIDTH

Tj 125°C. 100A/μs

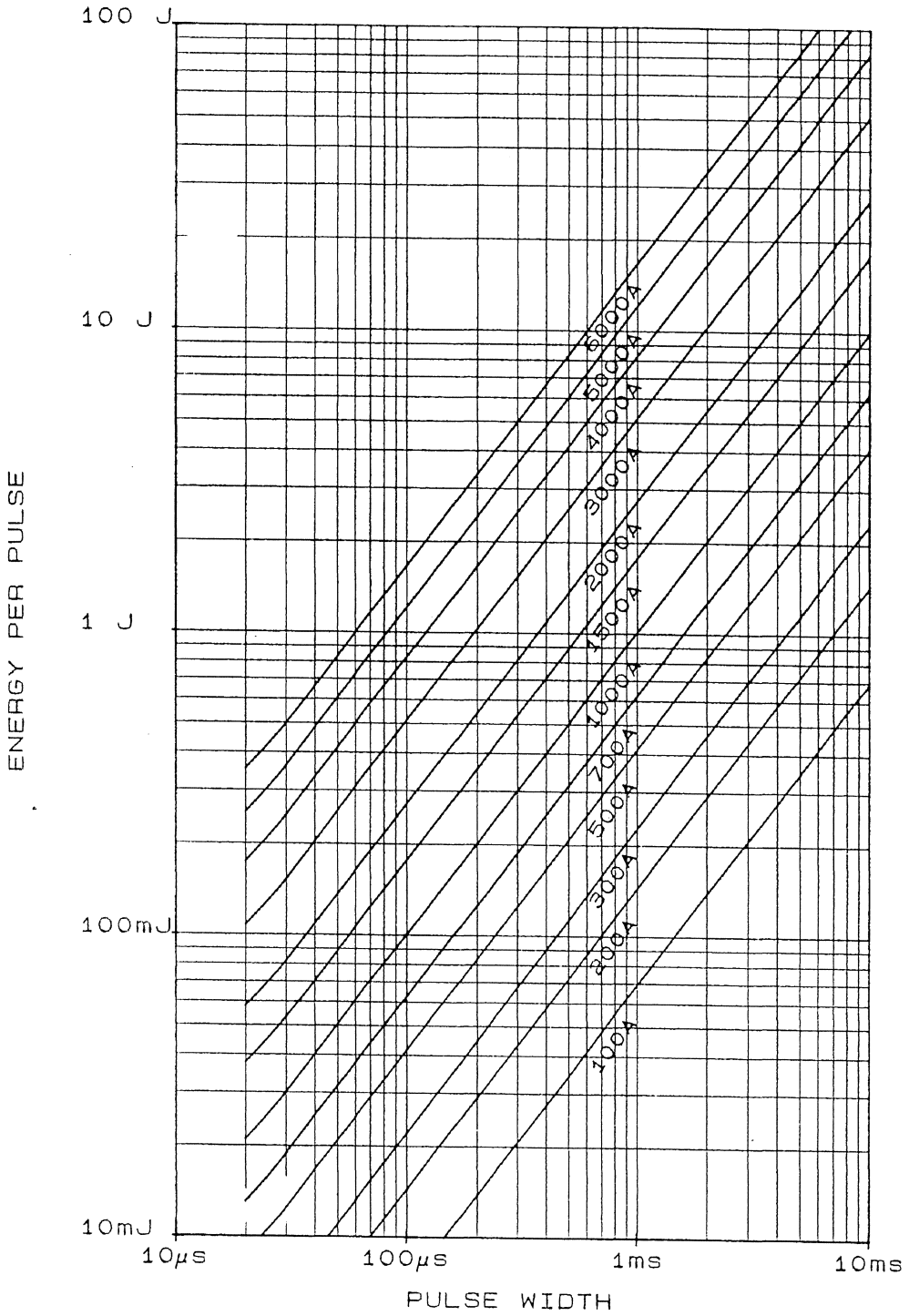


T SINK 85°C. SINE WAVE




T SINK 55°C.
SINE WAVE
100K
10K
1K
100
10
FREQUENCY (Hz)
100% DUTY CYCLE
1000A
1500A
2000A
3000A
4000A
5000A
6000A
10μs
100μs
1ms
10ms
PULSE WIDTH

Tj 125°C. SINE WAVE



INTERNATIONAL OUTLINE No. DO-200AA - 22 -

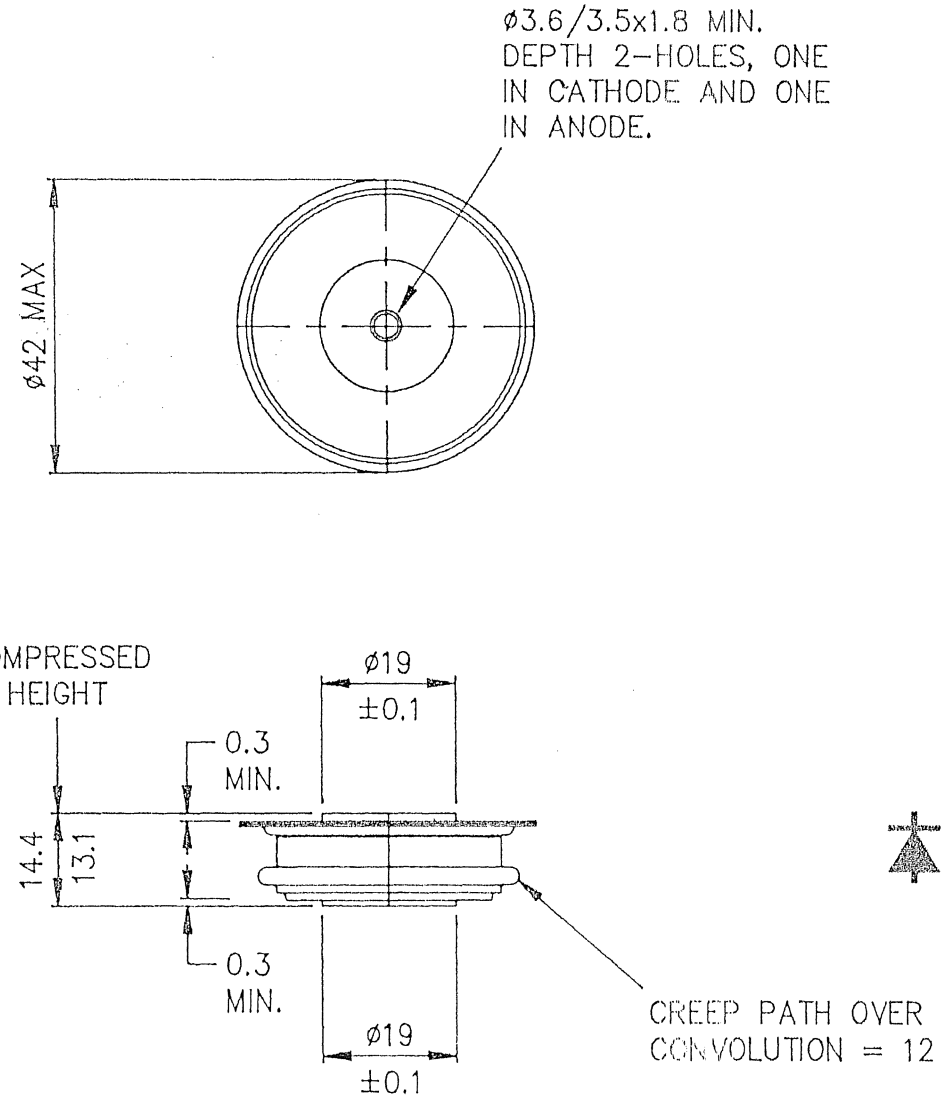
G.A. DWG No. 159B100H100-H110.

WEIGHT. 70 GRAMS

FINISH. NICKEL PLATE

DEVICE MOUNTING: CLAMPING FORCE TO BE APPLIED ON CENTRE LINE 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 = 330-550kgf.

TYPE NUMBER	
CXC300	CXC134
CXC320	CXC144
CXC380	CXC170
CXC400	CXC174
CXC470	



ISS	REVISIONS
10	10-09-90 REDRAWN ON CAD HDN

SCALE 1/1 ISS

DRAWN HDN 10

THIRD ANGLE PROJECTION.

DWG. COMPLIES WITH BS 308.

DIMNS. IN MILLIMETRES.

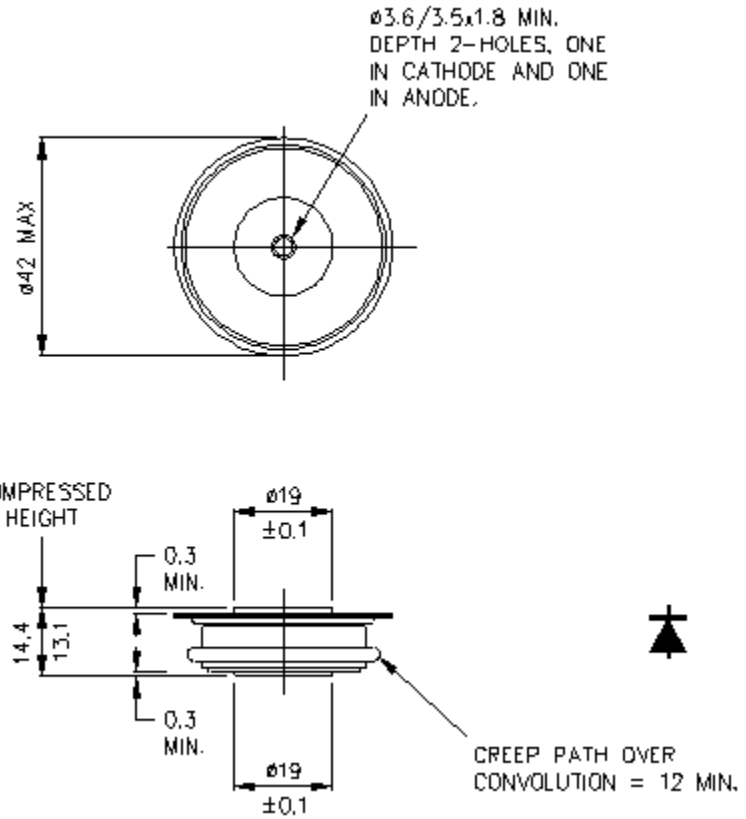
DWG No. 100A241

WESTCODE SEMICONDUCTORS LTD.,
P.O. BOX 57, CHIPPENHAM, WILTSHIRE, SN15 1JL, ENGLAND.
TEL 0249 654141. TELEX 44751 WESCDE G. TELEFAX 0249 659448.

Drawing Number – W1

Outline Number – 100A241

WESTCODE
An IXYS Company



Weight 70g

Westcode Customer Services email: wsl.sales@westcode.com **Telephone: +44 (0)1249 444524 Fax: +44 (0)1249 659448**