Soft Recovery Diode
Types M0759Y#040 to M0759Y#160

The data sheet on the subsequent pages of this document is a scanned copy of existing data for this product.
(Rating Report 83NR8 Issue 2)

This data reflects the old part number for this product which is: SM02-16CXC190.
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 no longer available for grade 02 (200V V_{RRM})
Only 'C' outline drawing (W2) in datasheet

The following links will direct you to the appropriate outline drawings
Outline W2 – Standard 14.5mm clamp height capsule
Outline W3 – 26mm clamp height capsule

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			
M0759	Y#	♦♦	**0**
Fixed Type Code	YC – 14.5mm clamp height YH – 26mm clamp height	Voltage code V_{RRM}/100 04-16	Fixed Code
Typical Order Code: M0759YC120, 14.5mm clamp height, 1200V V_{RRM}			

QUALITY EVALUATION LABORATORY

Rating Report: 83NR8 (Issue 2) Date: 1st July, 1986

Origin: Pages: 22

Diode Type SM02-16CXC190

Written by: Checked: Approved:

The CXC190 series of diffused fast recovery diodes is based on a 30 mm diameter slice housed in a cold weld capsule. Alternative ratings are included in this Report for use with either the single or double side cooling beam clamp (400Kg.f), or the single side cooling box clamp assembly (365Kg.f) in addition to the full pressure ratings up to 1000Kg.f. This Report supersedes Rating Report 83NR8 Issue 1.

Ratings

Voltage Grades			: 2-16
V_{RSM}			: 300-1700V
V_{RRM}			: 200-1600V
$I_{F(AV)}$:	Single phase, 50 Hz, 180° Sinewave	Minimum mounting force = 530Kg.f	:
	Double side cooled, T_{HS} = 55°C; 100°C		: 760A, 345A
	Single side cooled, T_{HS} = 100°C		: 190A
$I_{F(rms)}$	Double side cooled, T_{HS} = 25°C		: 1,540A
$I_{F(d.c)}$	Double side cooled, T_{HS} = 25°C		: 1,245A
$I_{F(AV)}$;	Single phase, 50 Hz, 180°C Sinewave	Minimum mounting force = 365Kg.f	:
	Double side cooled, T_{HS} = 55°C, 100°C		: 645A, 286A
	Single side cooled, T_{HS} = 100°C		: 165A
$I_{F(rms)}$	Double side cooled, T_{HS} = 25°C		: 1,310A
$I_{F(d.c)}$	Double side cooled, T_{HS} = 25°C		: 1,050A
I_{FSM}	: t = 10ms half sinewave; T_J (initial) = 125°C; $V_{RM} = 0.6V_{RRM(MAX)}$		: 9,500A
I_{FSM}	: t = 10ms half sinewave; T_J (initial) = 125°C; $V_{RM} \leq 10V$		: 10,450A
I^2t	: t = 10ms; T_J (initial) = 125°C; $V_{RM} = 0.6V_{RRM(MAX)}$		: $0.45 \times 10^6 A^2$SECS
I^2t	: t = 10ms; T_J (initial) = 125°C; $V_{RM} \leq 10V$		: $0.546 \times 10^6 A^2$SECS
I^2t	: t = 3ms; T_J (initial) = 125°C; $V_{RM} \leq 10V$		: $0.404 \times 10^6 A^2$SECS
T_{HS} Operating range			: -40 to +125°C
T_{stg} : Non-operating			: -40 to +150°C

Characteristics

(Maximum values unless stated otherwise)

V_0 : T_J = 125°C		:	1.13V
r_s : T_J = 125°C		:	0.38mohms
V_{FM} : I_{FM} = 1500A T_{VJ} = 125°C		:	1.7V
R_{th}(J-HS) Double side cooled, mounting force	(365-530Kg.f)	:	0.0625°C/W
	(530-1000Kg.f)	:	0.05°C/W
Single side cooled, mounting force	(365-530Kg.f)	:	0.125°C/W
	(530-1000Kg.f)	:	0.1°C/W
I_{RRM} : T_J = 125°C V_{RM} = $V_{RRM(MAX)}$		:	50mA
Q_{rr} : I_{FM} = 550A; dI/dt = 40A/uS		:	55uC
V_{RM} = 50V T_{VJ} = 125°C		:	
t_{rr} (conditions as above)		:	3uS
Mounting force		:	365-1000Kg.f
Outline Drawing		:	100A291
JEDEC No.		:	DO200AA

CONTENTS

CHANGES TO RATING REPORT 83NR8

Page 12 E_r v dI/dt curve redrawn

Page 13 Omitted.

Pages 1, 4 Voltage grades revised

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
15	1500	1600
16	1600	1700

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 100 and 200A/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:

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

$$\text{where } r_t = 1.13 \times 10^{-4} \sqrt{t}$$

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

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

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 5 ohms in series connected across diode anode to cathode.

(b) Design Method

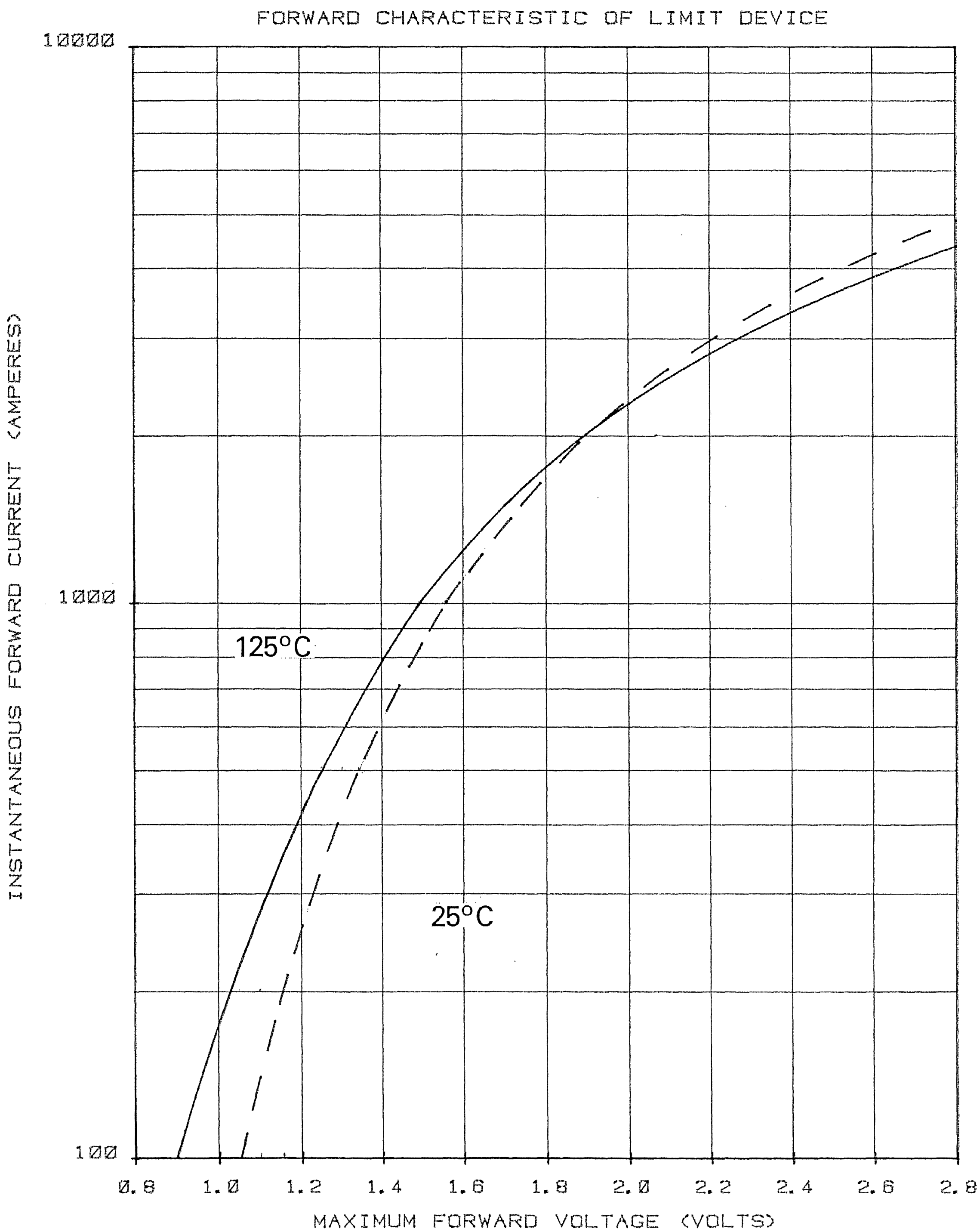
In circumstances where it is not possible to measure voltage and current conditions, or for design purposes, the additional losses may be estimated from curves on page 12.

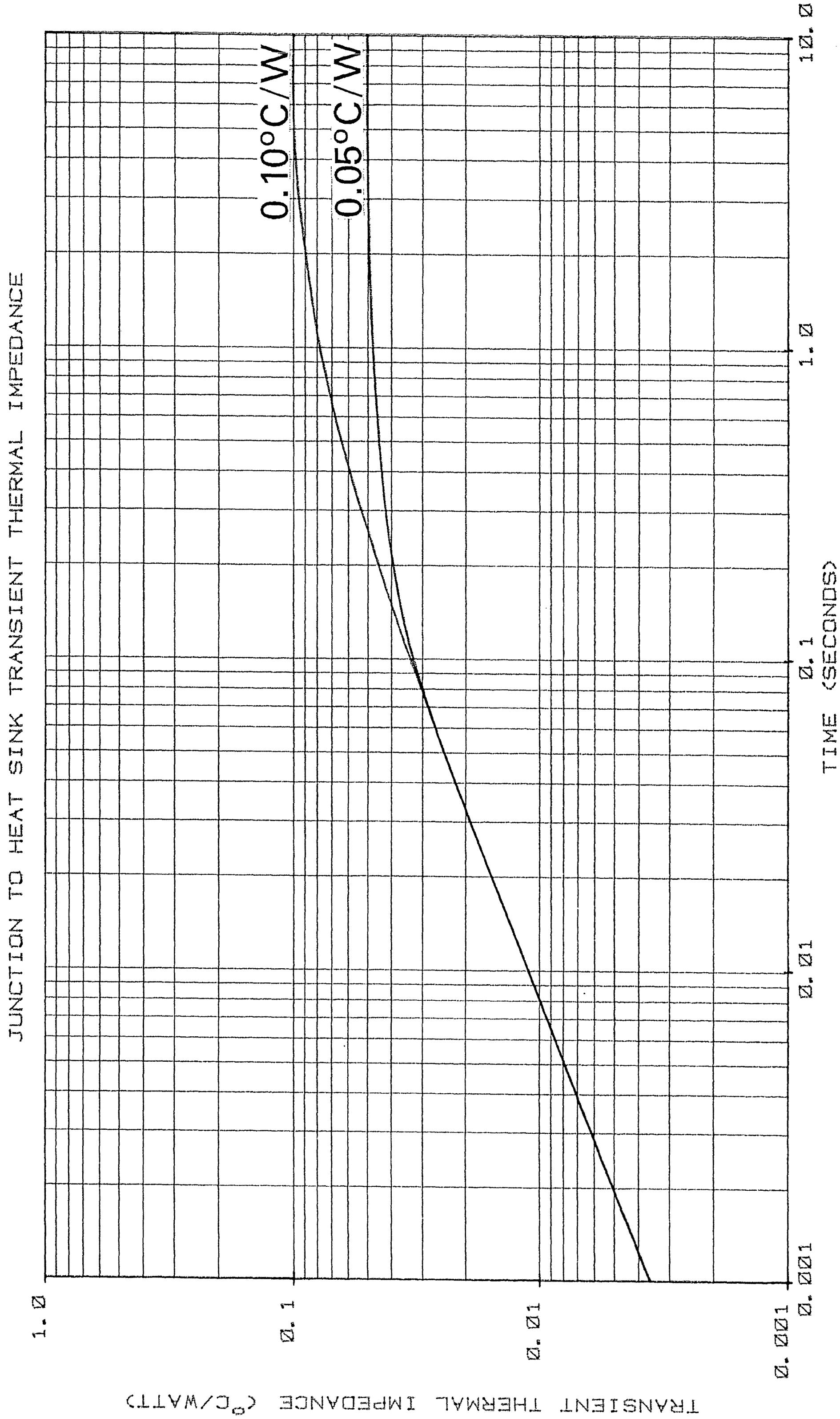
Let E be the value of energy per reverse cycle in joules (curves on page 12)

Let f be the operating frequency in Hz

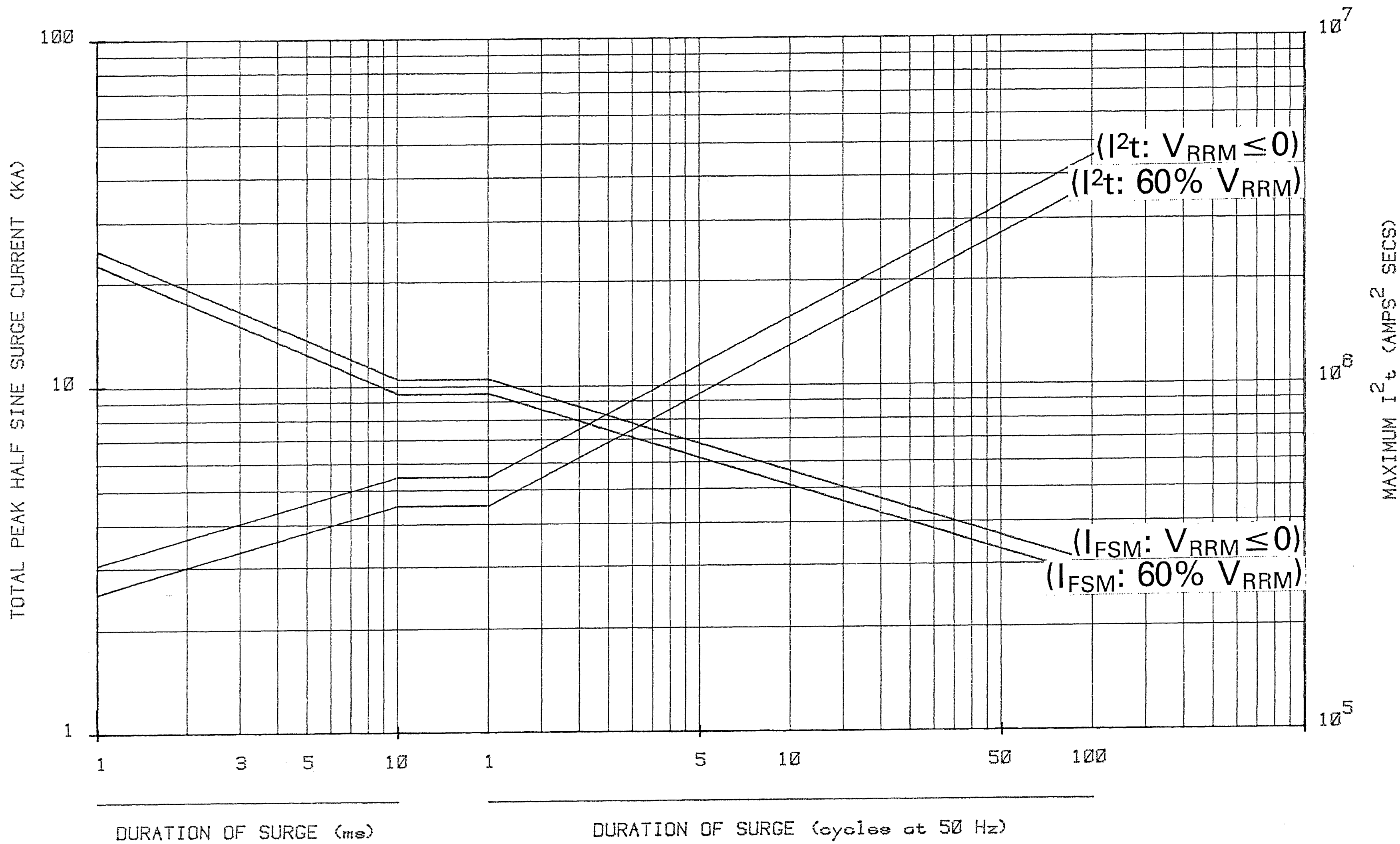
Then $T_{SINK}(new) = T_{SINK}(original) - E \times R_{th} \times f$

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.

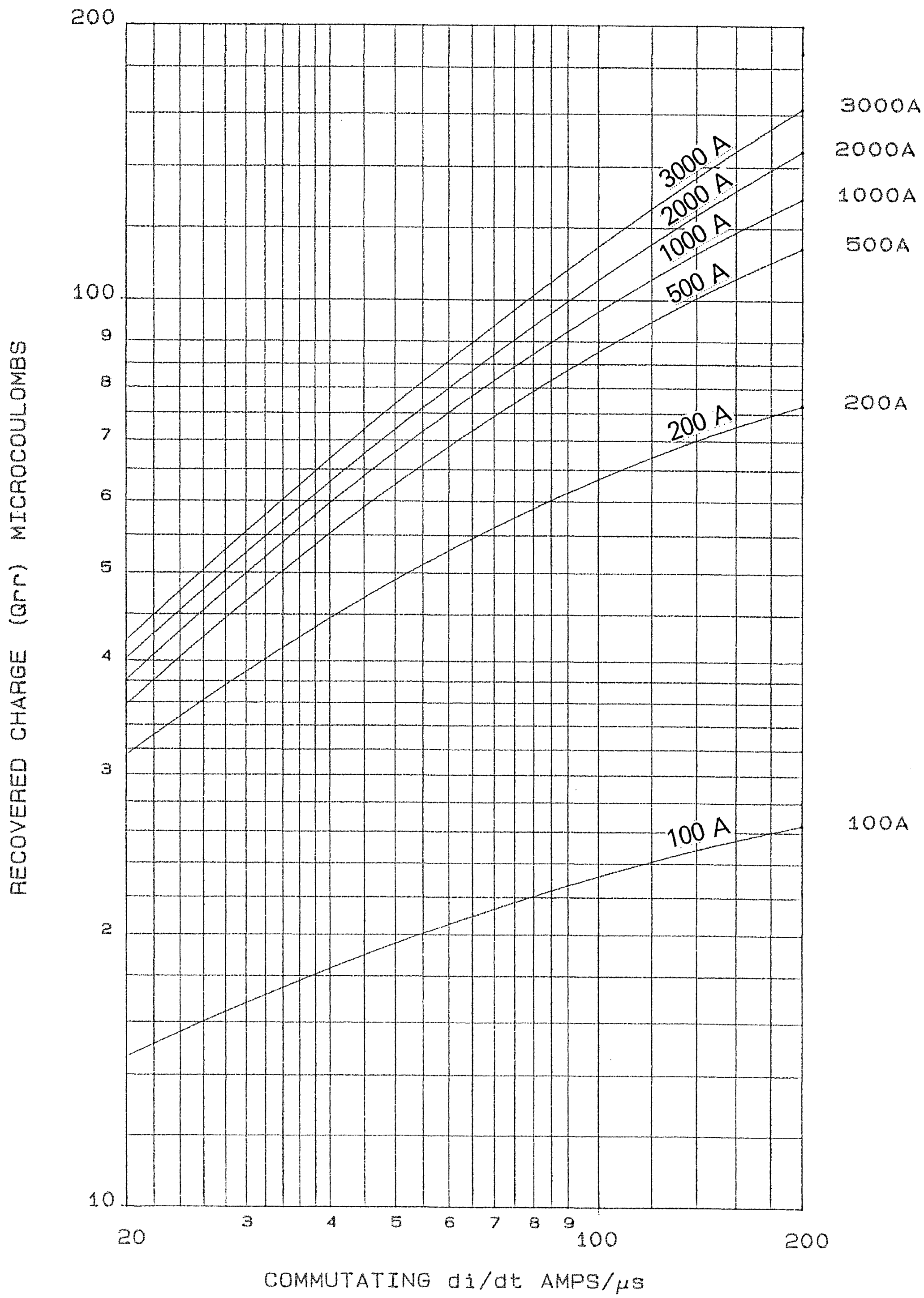

FORWARD CHARACTERISTIC OF LIMIT DEVICE
10000
1000
100
INSTANTANEOUS FORWARD CURRENT (AMPERES)
125°C
25°C
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
MAXIMUM FORWARD VOLTAGE (VOLTS)


JUNCTION TO HEAT SINK TRANSIENT THERMAL IMPEDANCE
0.10°C/W
0.05°C/W
TRANSIENT THERMAL IMPEDANCE (°C/WATT)
1.0
0.1
0.01
0.001
TIME (SECONDS)
0.001
0.01
0.1
1.0
10.0

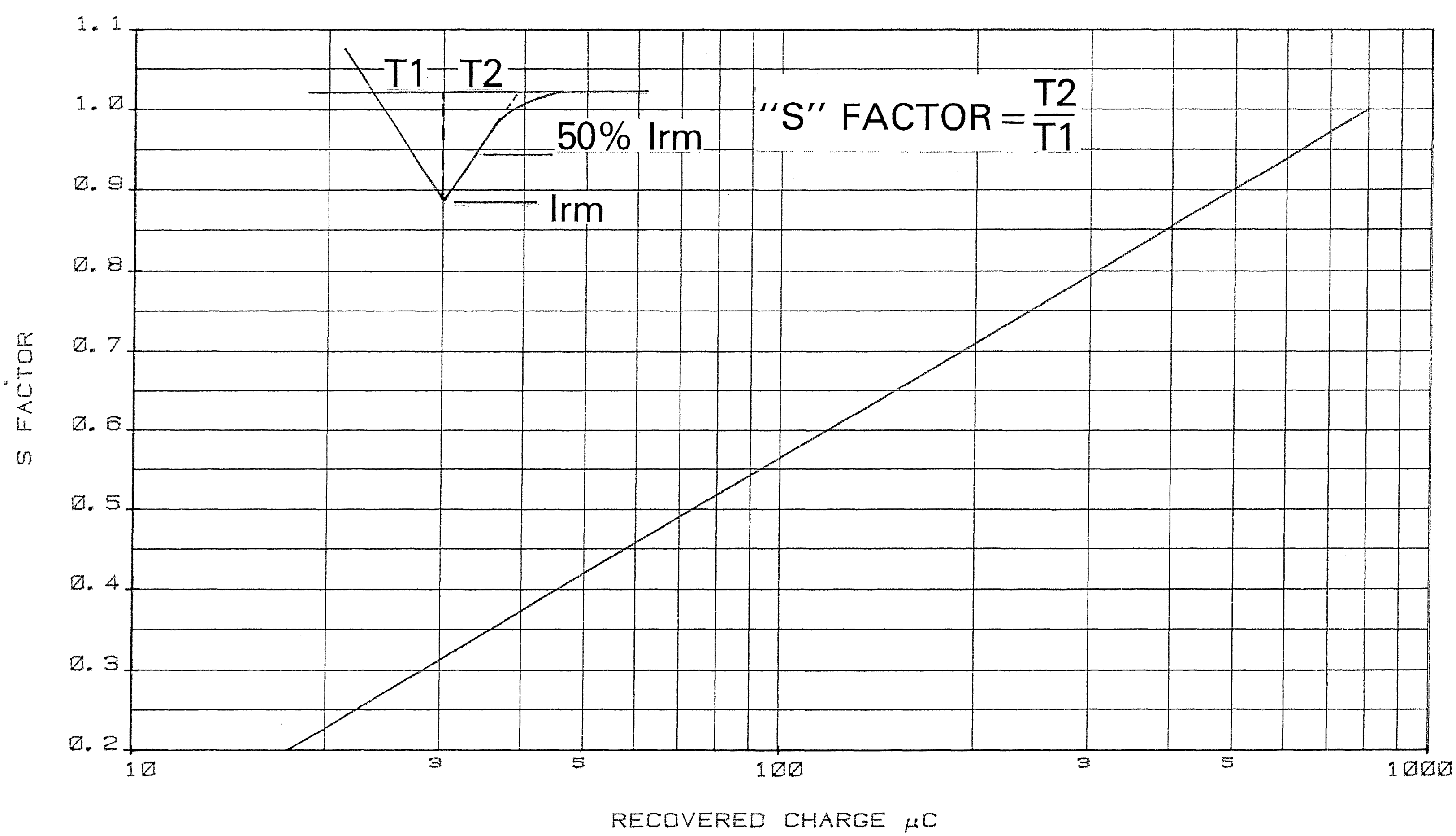
MAXIMUM NON REPETITIVE SURGE CURRENT AT INITIAL JUNCTION TEMPERATURE 125°C



MAXIMUM RECOVERED CHARGE AT 125°C JUNCTION TEMPERATURE



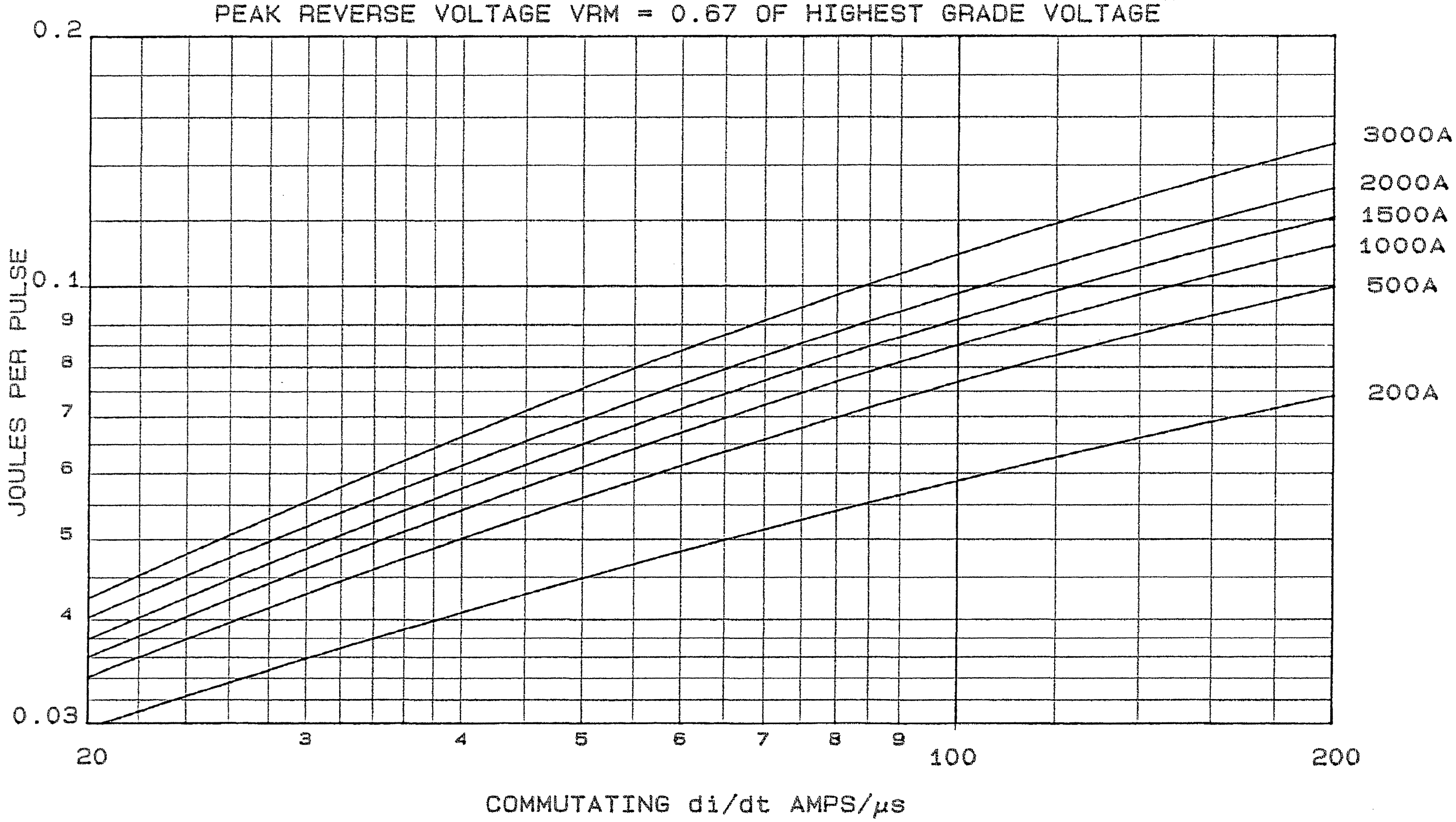
MINIMUM S FACTOR AT 125°C JUNCTION TEMPERATURE



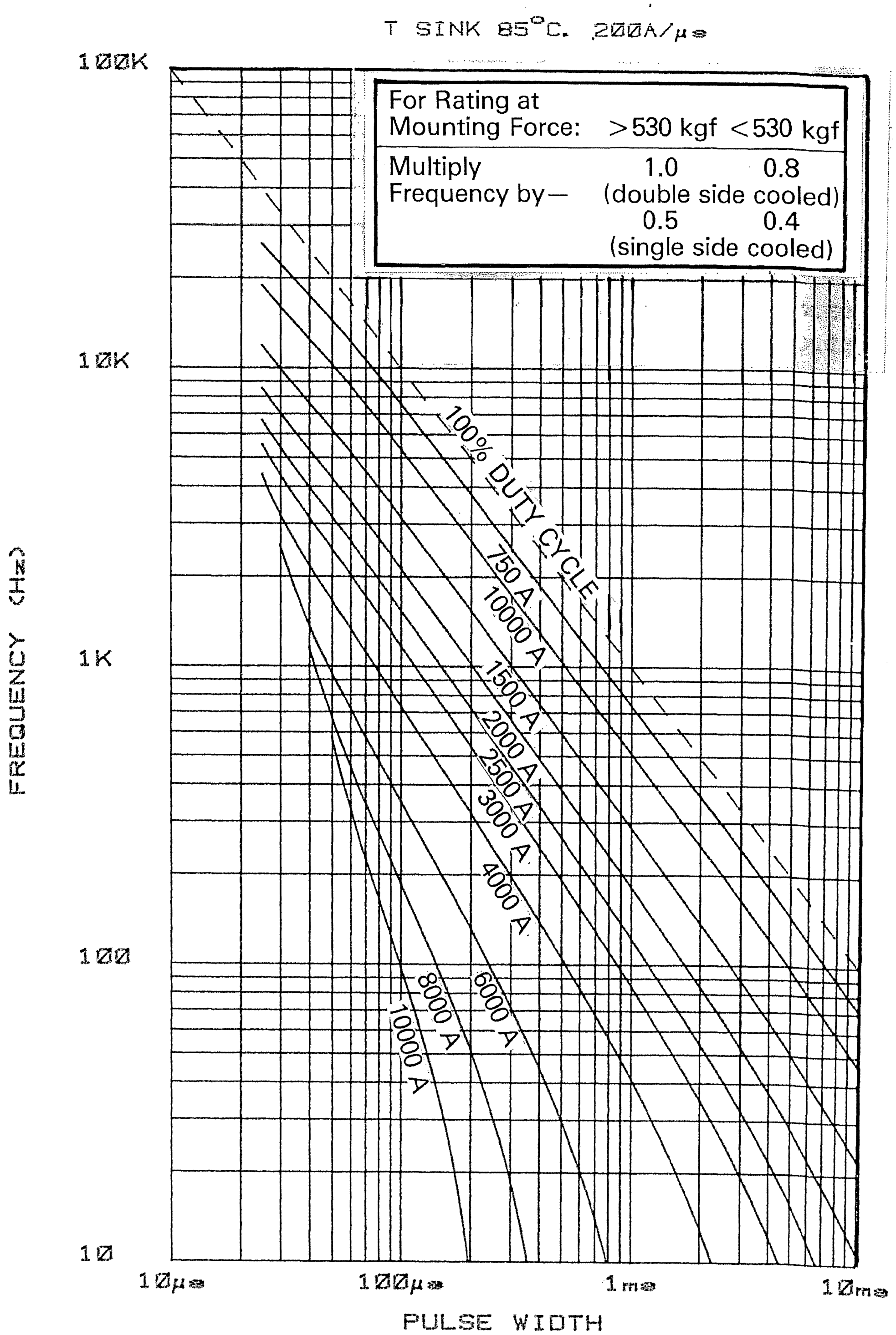
MAXIMUM REVERSE RECOVERY ENERGY LOSS PER PULSE, 125°C JUNCTION TEMPERATURE

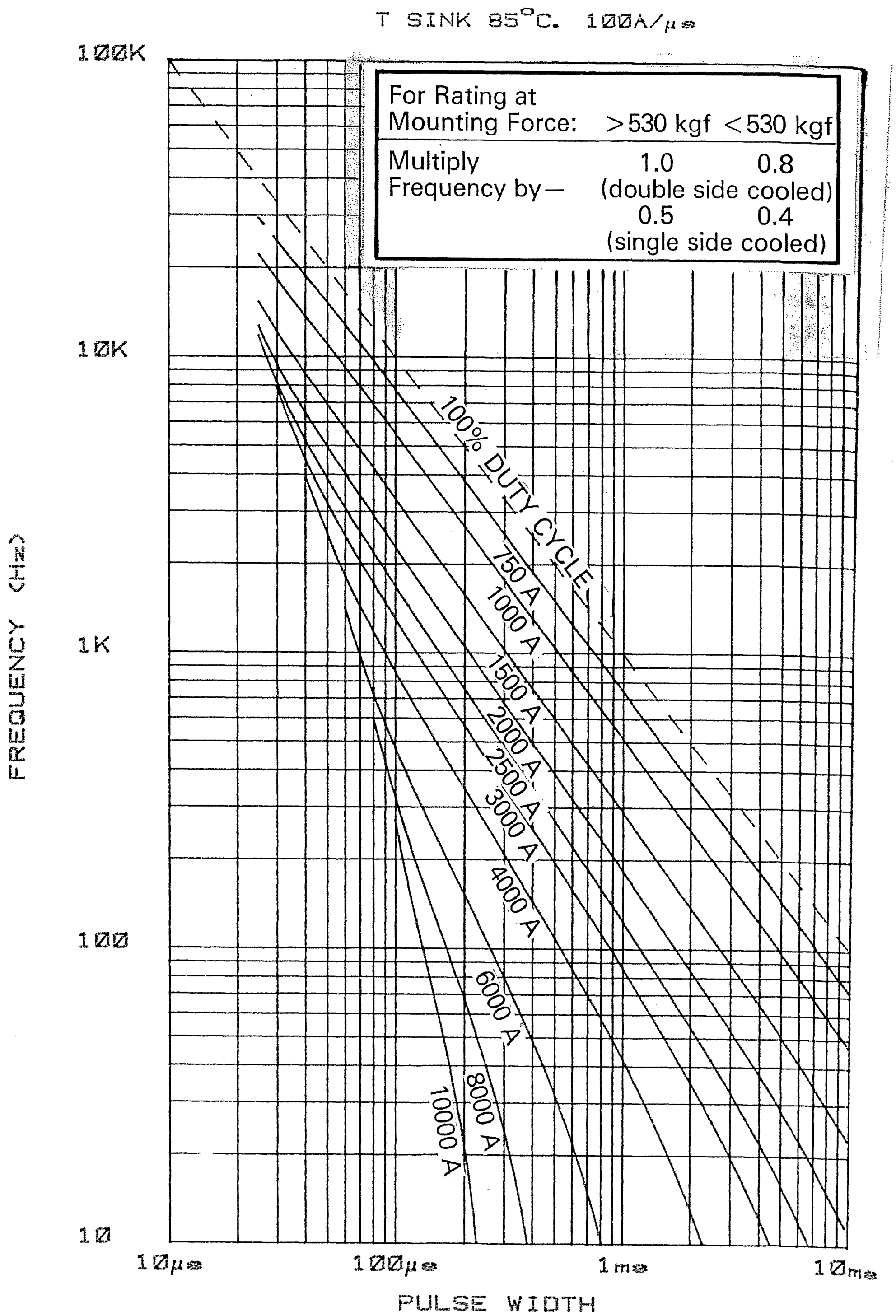
SNUBBER CONNECTED 0.10μF, 5 OHMS

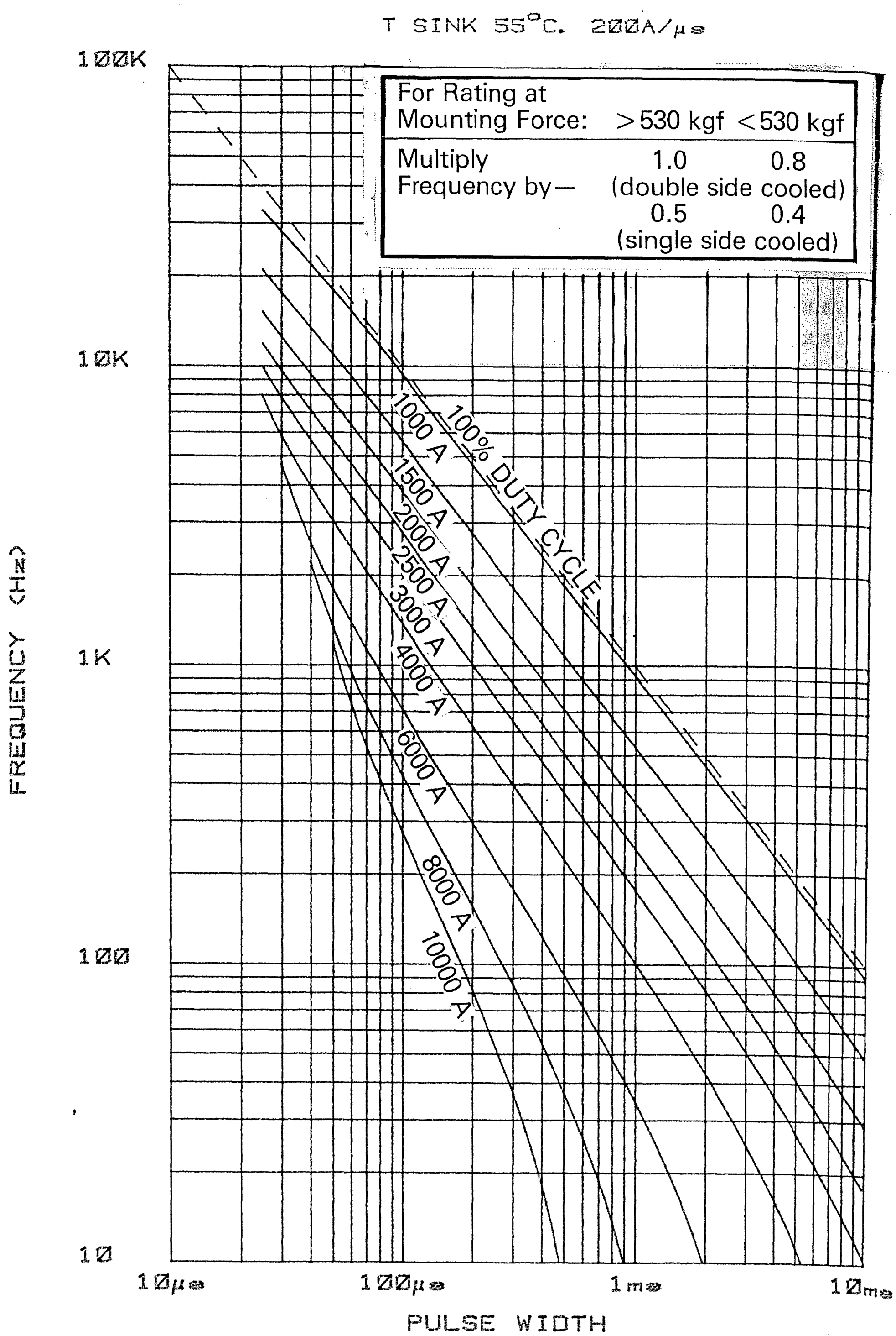
PEAK REVERSE VOLTAGE VRM = 0.67 OF HIGHEST GRADE VOLTAGE*

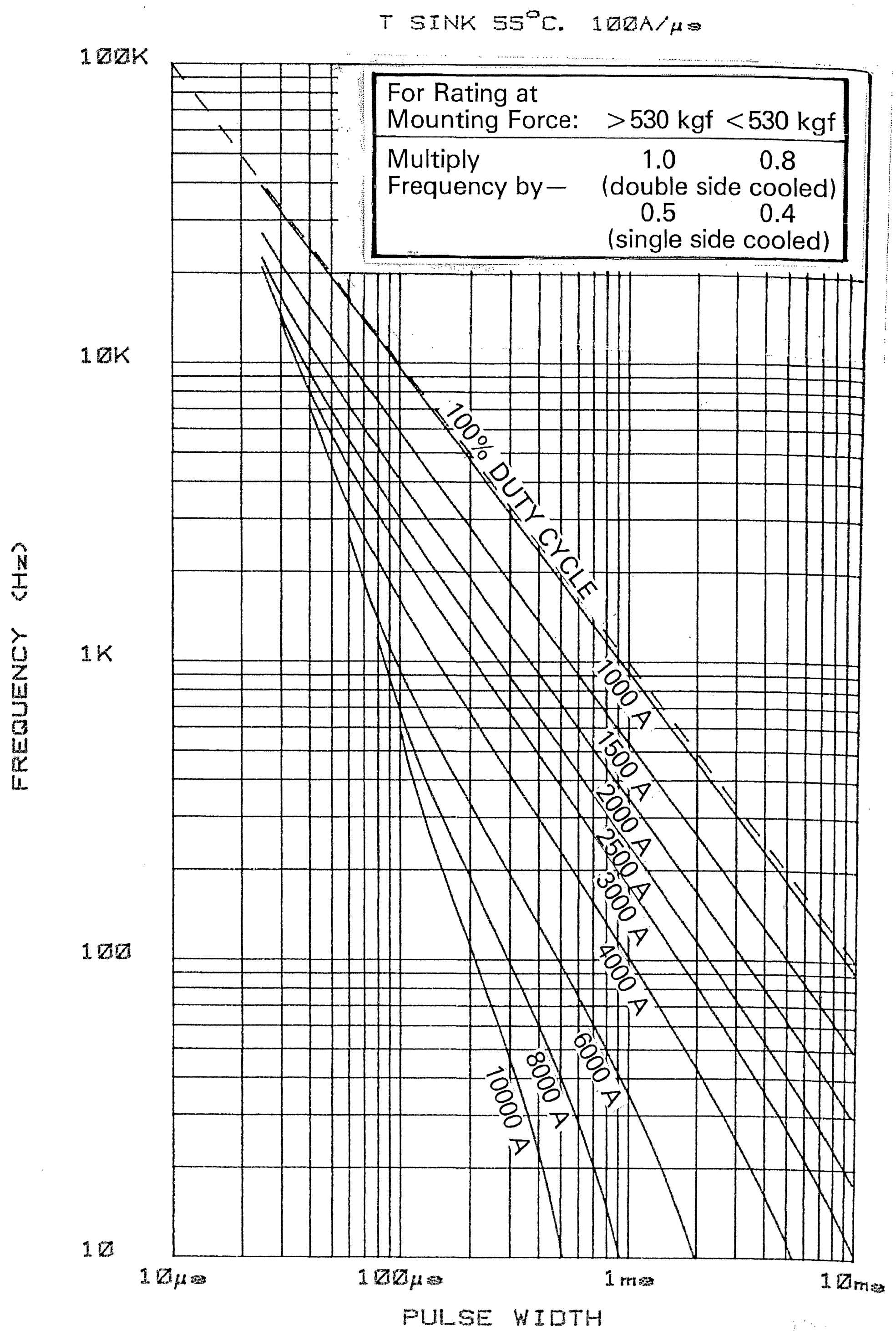


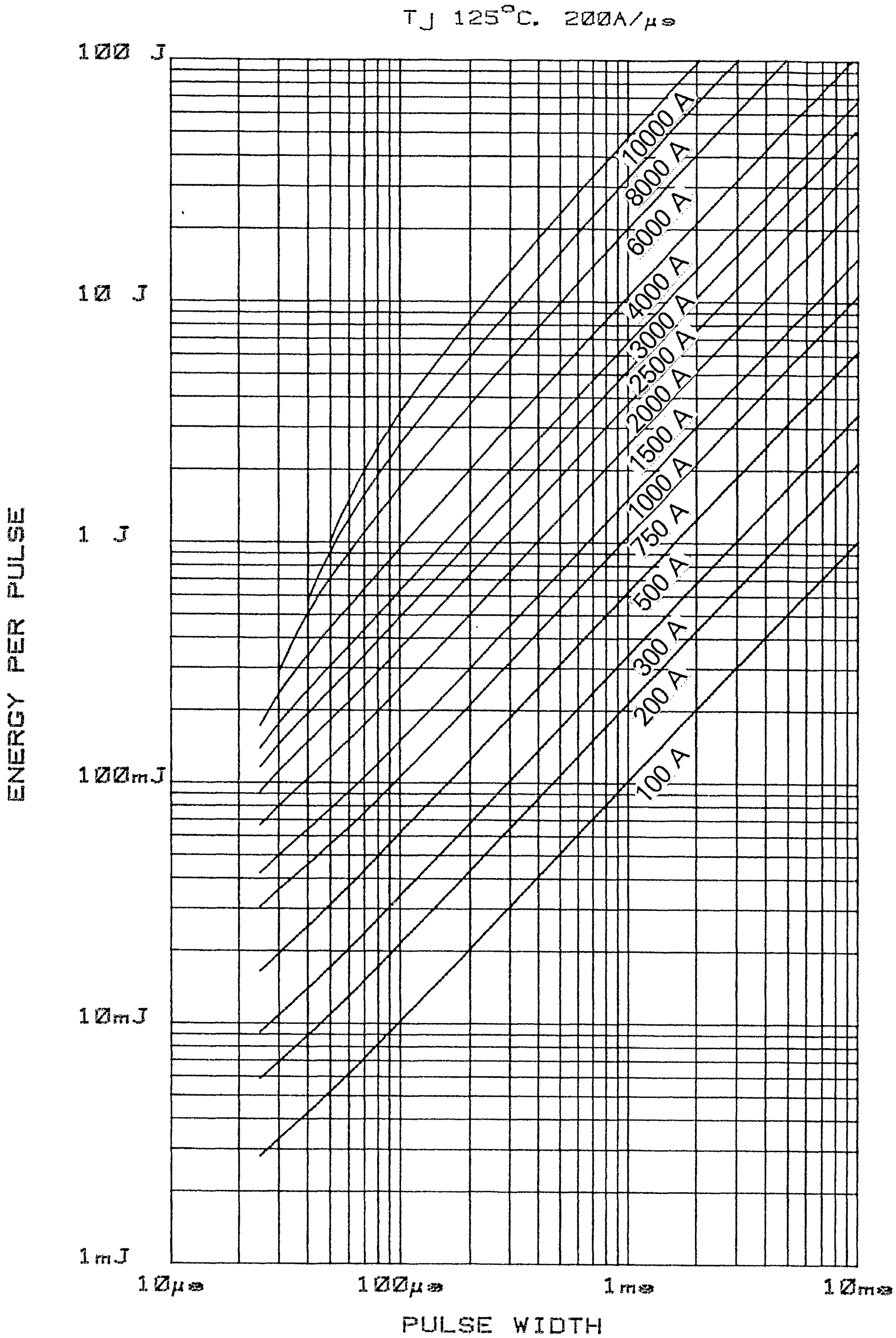
*NOTE: ENERGY PER PULSE SHOULD BE ADJUSTED PRO RATA WITH APPLIED PEAK RECOVERY VOLTAGE

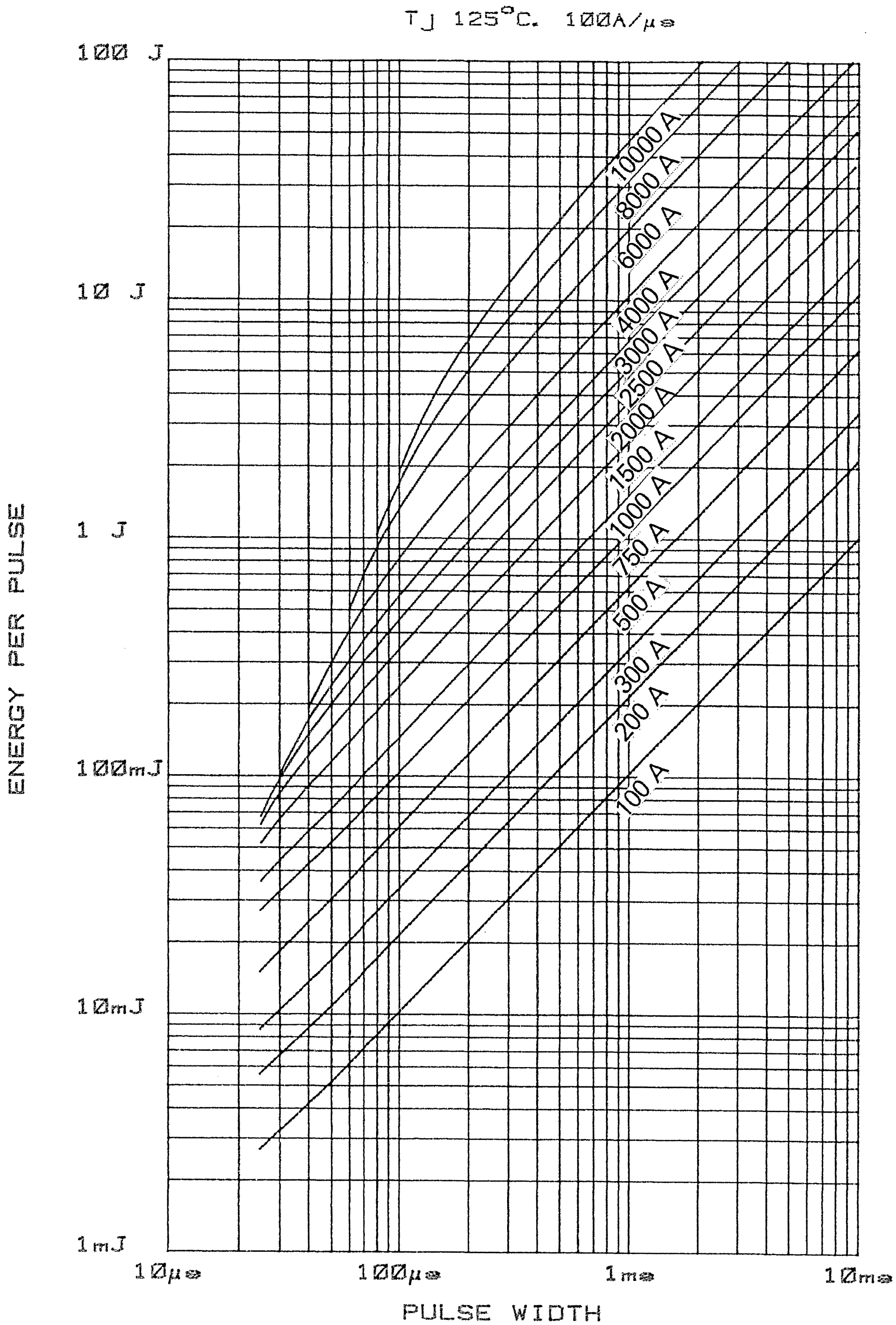

T SINK 85°C. 200A/μs
For Rating at
Mounting Force: >530 kgf <530 kgf
Multiply
Frequency by— 1.0 0.8
(double side cooled)
0.5 0.4
(single side cooled)
100% DUTY CYCLE
750 A
10000 A
1500 A
2000 A
2500 A
3000 A
4000 A
6000 A
8000 A
10000 A
100K
10K
1K
100
10
FREQUENCY (Hz)
10μs
100μs
1ms
10ms
PULSE WIDTH

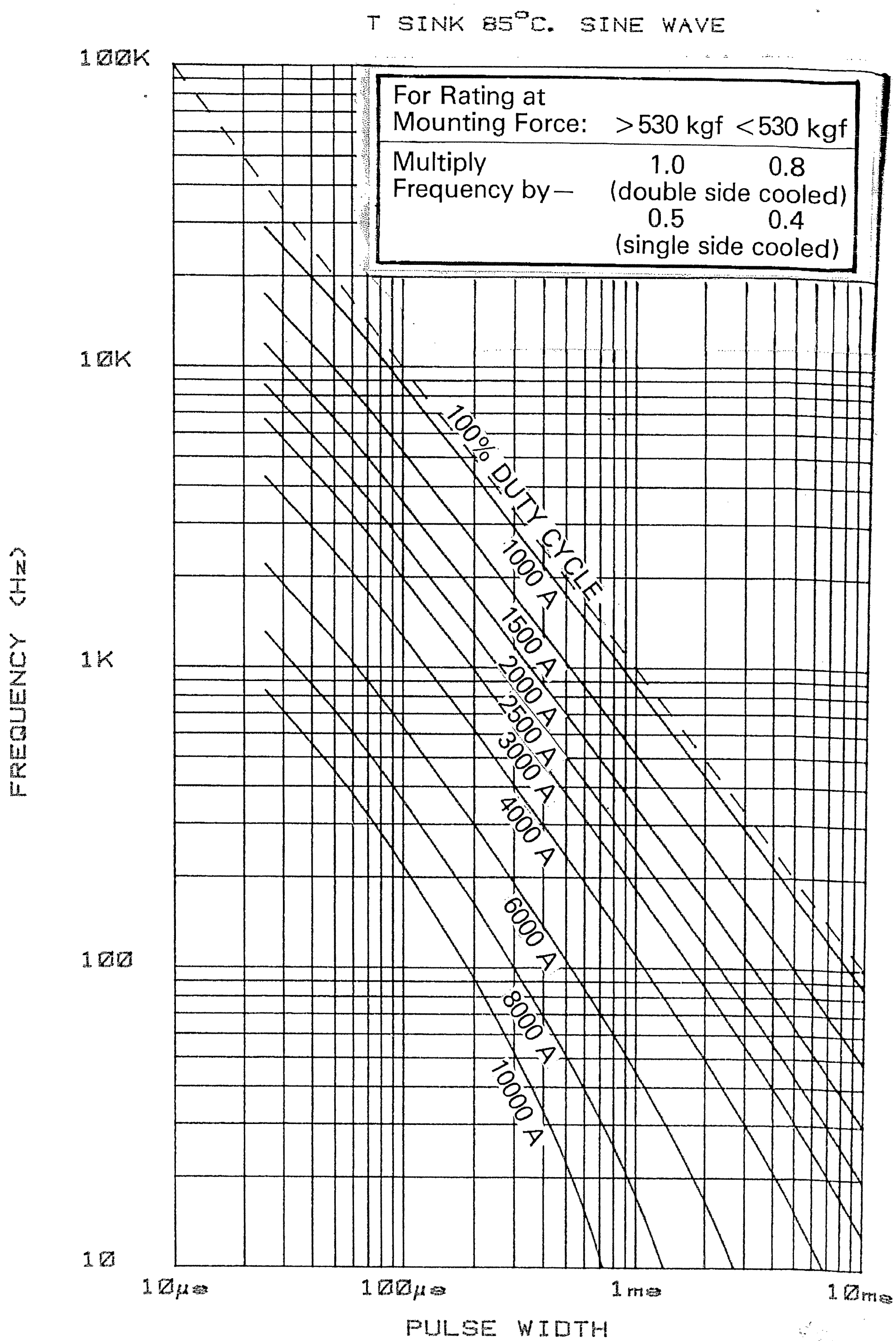

T SINK 85°C. 100A/μs
For Rating at
Mounting Force: >530 kgf <530 kgf
Multiply
Frequency by— 1.0 0.8
(double side cooled)
0.5 0.4
(single side cooled)
100K
10K
1K
100
10
FREQUENCY (Hz)
10μs
100μs
1ms
10ms
PULSE WIDTH
100% DUTY CYCLE
750 A
1000 A
1500 A
2000 A
2500 A
3000 A
4000 A
6000 A
8000 A
10000 A

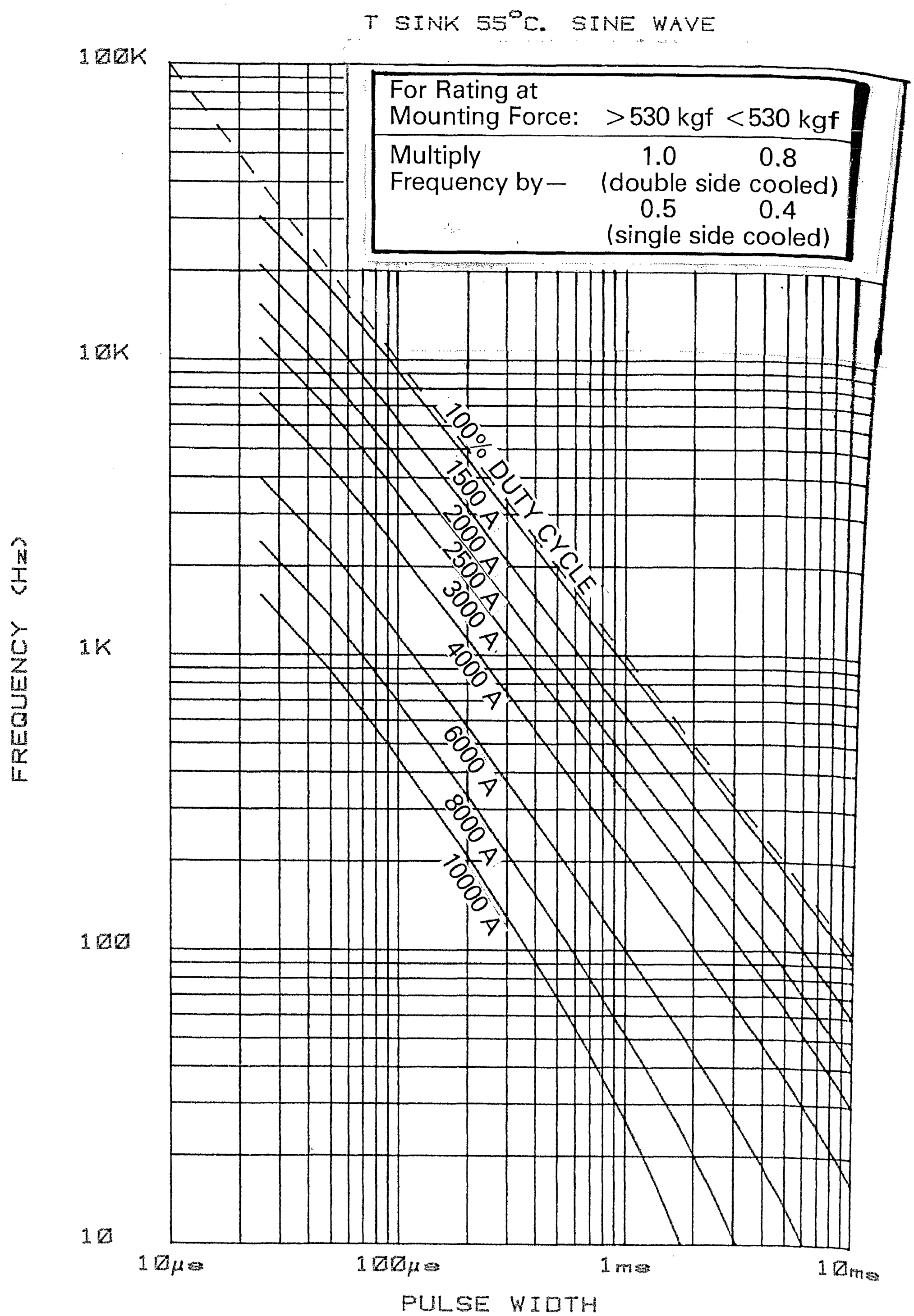

T SINK 55°C. 200A/μs
For Rating at
Mounting Force: >530 kgf <530 kgf
Multiply
Frequency by— 1.0 0.8
(double side cooled)
0.5 0.4
(single side cooled)
100K
10K
1K
100
10
FREQUENCY (Hz)
100% DUTY CYCLE
1000 A
1500 A
2000 A
2500 A
3000 A
4000 A
6000 A
8000 A
10000 A
10μs
100μs
1ms
10ms
PULSE WIDTH

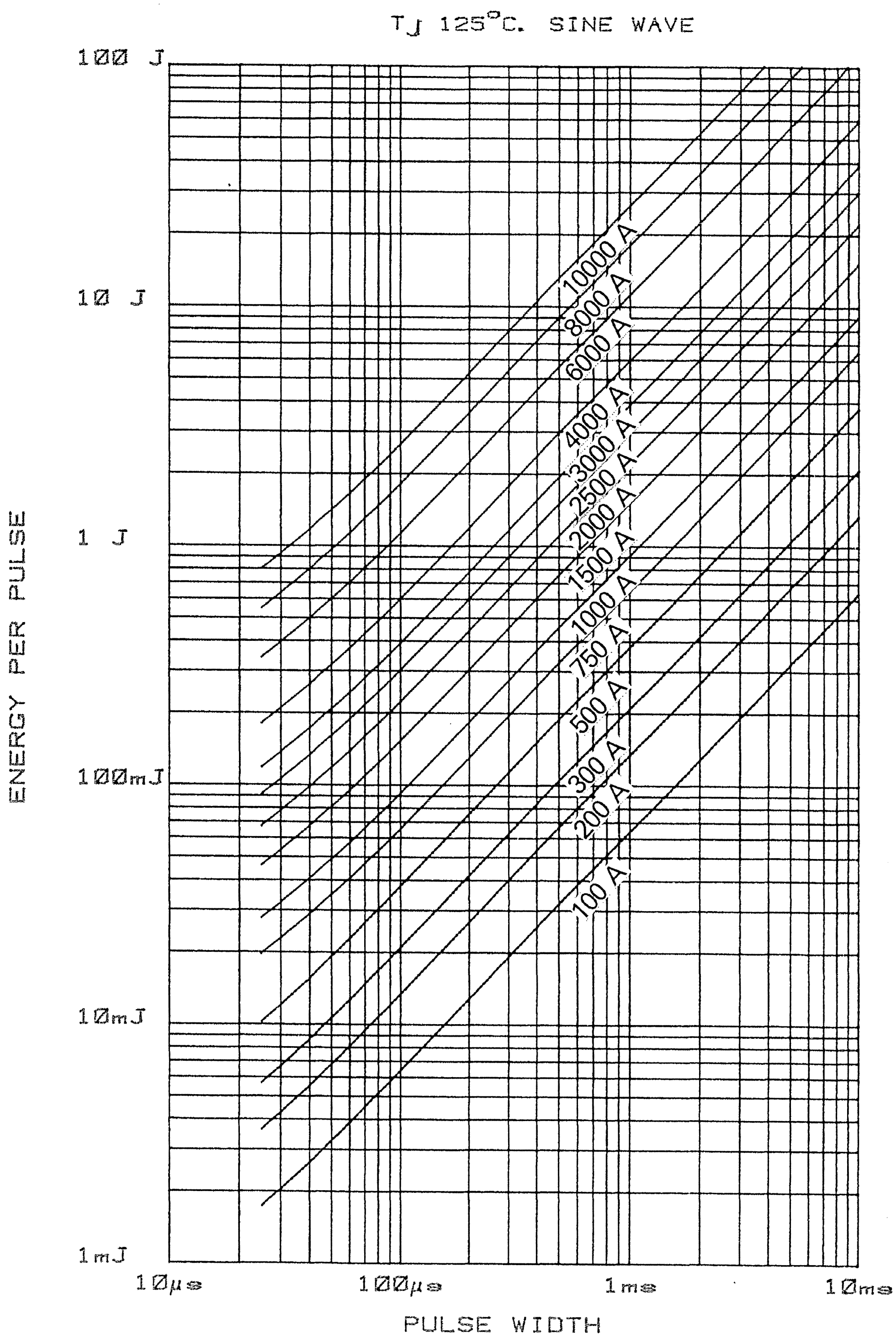

T SINK 55°C. 100A/μs
For Rating at
Mounting Force: >530 kgf <530 kgf
Multiply
Frequency by— 1.0 0.8
(double side cooled)
0.5 0.4
(single side cooled)
100K
10K
1K
100
10
FREQUENCY (Hz)
10μs
100μs
1ms
10ms
PULSE WIDTH
100% DUTY CYCLE
1000 A
1500 A
2000 A
2500 A
3000 A
4000 A
6000 A
8000 A
10000 A


TJ 125°C. 200A/μs
100 J
10 J
1 J
100mJ
10mJ
1mJ
ENERGY PER PULSE
10μs
100μs
1ms
10ms
PULSE WIDTH
10000 A
8000 A
6000 A
4000 A
3000 A
2500 A
2000 A
1500 A
1000 A
750 A
500 A
300 A
200 A
100 A


TJ 125°C. 100A/μs
100 J
10 J
1 J
100mJ
10mJ
1mJ
ENERGY PER PULSE
10μs
100μs
1ms
10ms
PULSE WIDTH
10000 A
8000 A
6000 A
4000 A
3000 A
2500 A
2000 A
1500 A
1000 A
750 A
500 A
300 A
200 A
100 A


T SINK 85°C. SINE WAVE
For Rating at Mounting Force: >530 kgf <530 kgf
Multiply Frequency by— 1.0 0.8 (double side cooled) 0.5 0.4 (single side cooled)
100% DUTY CYCLE
1000 A
1500 A
2000 A
2500 A
3000 A
4000 A
6000 A
8000 A
10000 A
FREQUENCY (Hz)
100K
10K
1K
100
10
PULSE WIDTH
10μs
100μs
1ms
10ms


T SINK 55°C. SINE WAVE
For Rating at
Mounting Force: >530 kgf <530 kgf
Multiply
Frequency by— 1.0 0.8
(double side cooled)
0.5 0.4
(single side cooled)
100% DUTY CYCLE
1500 A
2000 A
2500 A
3000 A
4000 A
6000 A
8000 A
10000 A
100K
10K
1K
100
10
FREQUENCY (Hz)
10μs
100μs
1ms
10ms
PULSE WIDTH


TJ 125°C. SINE WAVE
100 J
10 J
1 J
100mJ
10mJ
1mJ
ENERGY PER PULSE
10µs
100µs
1ms
10ms
PULSE WIDTH
10000 A
8000 A
6000 A
4000 A
3000 A
2500 A
2000 A
1500 A
1000 A
750 A
500 A
300 A
200 A
100 A

SCALE	1/1
DRN	
CHKD	
APPD	
	A
S	NI

INTERNATIONAL OUTLINE No. DO-200AA

WEIGHT. 90 GRAMS.

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

DEVICE MOUNTING: CLAMPING FORCE TO BE APPLIED ON ℄ 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.

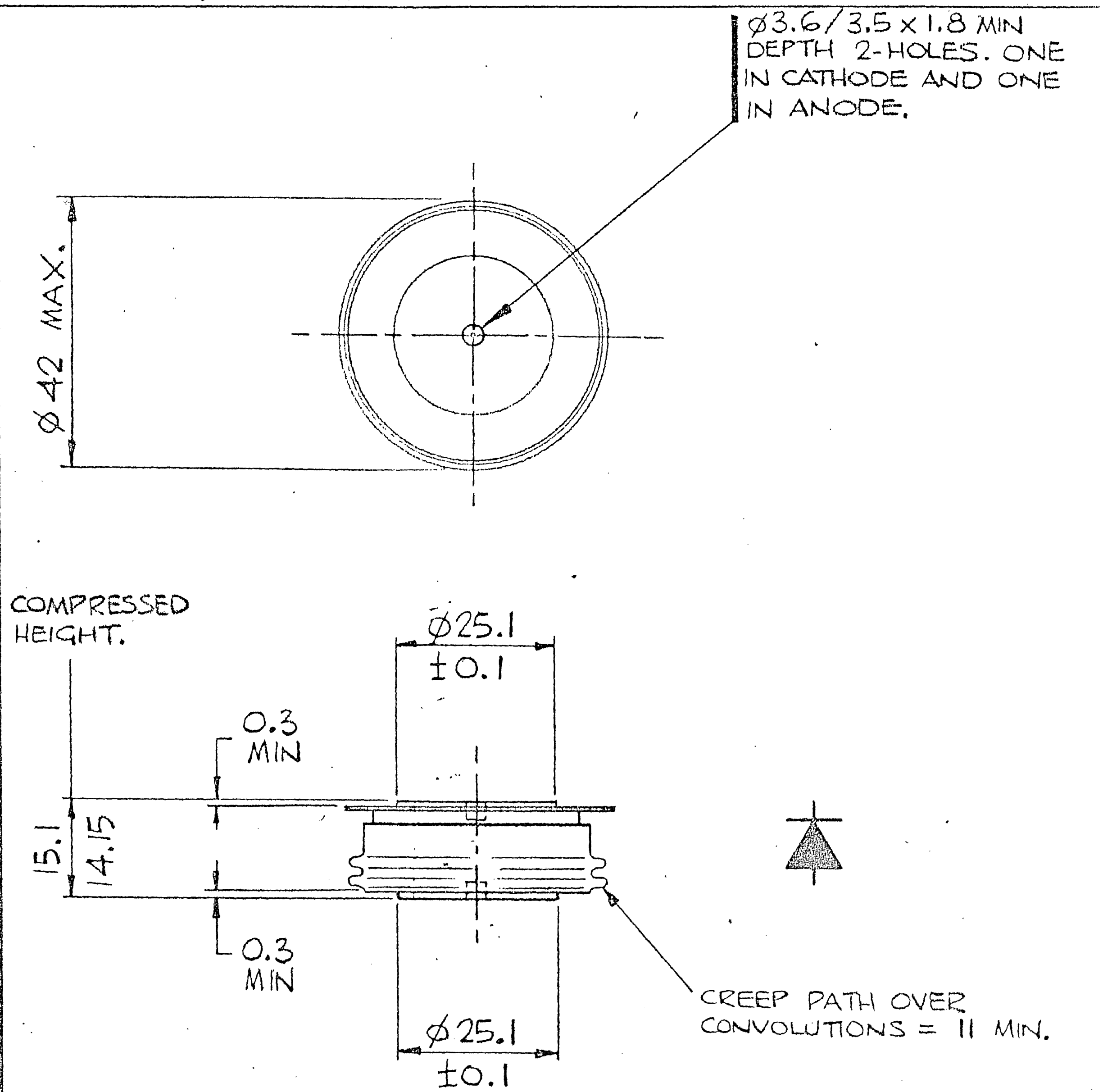
CLAMPING FORCE 365 - 530 kgf. / 530 - 1000 kgf. } SEE RATING REPORTS FOR DOUBLE TIER THERMAL RESISTANCE RATINGS.

SUITABLE CLAMPS: BOX TYPE 101A226B, POWER CLAMP 101A260 SERIES.

G.A. DRG. No. 159B100H124

TYPE NUMBER

CXC190



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CHIPPENHAM, WILTSHIRE, SN15 1JD, ENGLAND.

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THIRD ANGLE PROJECTION

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REVISIONS

ISS	
1	6.3.80 P351
2	15.9.83 M1177 MTG & LOAD DETAILS & CLAMP DETAILS ADDED.

Drawing Number – W2
Outline Number – 100A291

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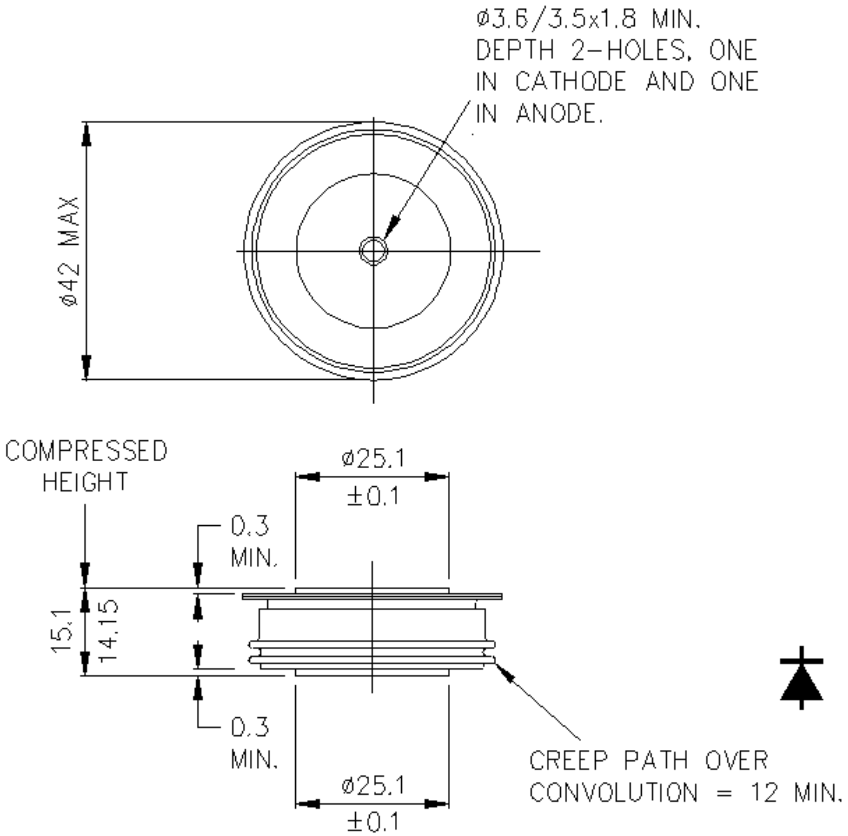

Weight 80g

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

Drawing Number – W3
Outline Number – 100A317

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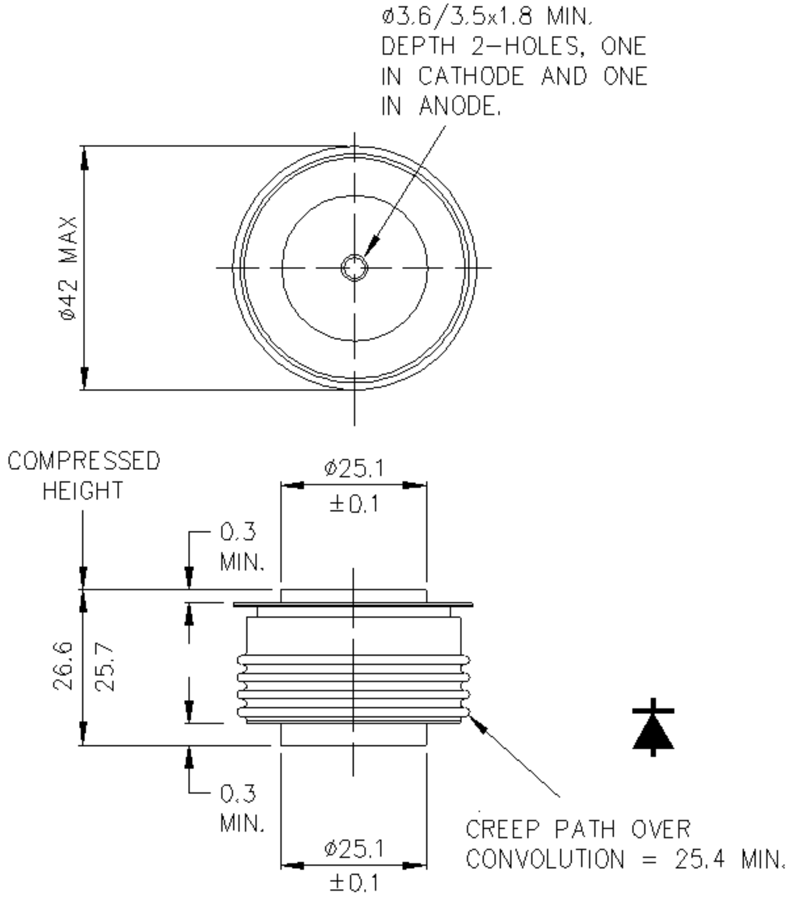

Weight 140g

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