Fast Recovery Diode
M1242NC260 to M1242NC360

The data sheet on the subsequent pages of this document is a scanned copy of existing data for this product.
(Rating Report 85NR2 Issue 1)

This data reflects the old part number for this product which is: SM26-36CXC824. This part number must **NOT** be used for ordering purposes – please use the ordering particulars detailed below.

Please use the following link to view an up to date outline drawing for this device
Outline W5

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

M1242	NC	♦♦	**0**
Fixed Type Code	Fixed Outline Code	Voltage code V_{DRM}/100 26-36	Fixed Code
Typical Order Code: M1242NC260, 27.7mm clamp height, 2600V V_{RRM}			

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QUALITY AND EVALUATION LABORATORY

Rating Report No: 85NR2 Issue 1 **Date: 5th July 1996**

Origin: Q.E.L. **Pages: 22**

Diode Capsule Type : SM26-36CXC824

Written by: M Baker **Checked:** Kitchen. **Approved:**

This diode consists of a diffused 50 mm diameter silicon slice, reference FFMFC, mounted in a cold weld capsule.

Ratings

Voltage Grades) A blocking voltage derating factor) of 0.13% per deg. Celsius is applicable	:	26 - 36
V_{RSM}) to this device for T_j below 25°C)	:	2700 - 3700 V
V_{RRM})	:	2600 - 3600 V
$I_{F(AV)}$: Single phase: 50 Hz, 180° half sinewave;		
Double Side Cooled T_{HS} = 55 °C, 100 °C	:	1243 A, 600 A
Single Side Cooled T_{HS} = 100 °C	:	348 A
$I_{F(rms)}$ T_{HS} = 25°C)) Double side cooled	:	2465 A
I_F T_{HS} = 25°C)	:	2108 A
I_{FSM} : t = 10ms half sinewave; $T_{J\ (initial)}$ = 125 °C V_{RM} = 0.6$V_{RRM(MAX)}$	:	16.4 kA
I_{FSM} : t = 10ms half sinewave; $T_{J\ (initial)}$ = 125 °C V_{RM} ≤10V	:	18.0 kA
I^2t : t = 10ms; T_J (initial) = 125 °C; V_{RM} = 0.6$V_{RRM(MAX)}$	:	1.34 x $10^6 A^2s$
I^2t : t = 10ms; T_J (initial) = 125 °C; V_{RM} ≤ 10V	:	1.62 x $10^6 A^2s$
I^2t : t = 3ms; T_J (initial) = 125 °C; V_{RM} ≤ 10V	:	1.20 x $10^6 A^2s$
T_{HS}: Operating Range	:	-40 To +125 °C
T_{stg} : Non-operating	:	-40 To +150 °C

Characteristics

(Maximum values unless otherwise stated)

V_o	: 1.27 V
r_s	: 0.420 mΩ
A : $T_J = 25^oC$	:
B : $T_J = 25^oC$	:
C : $T_J = 25^oC$	:
D : $T_J = 25^oC$	:
A)	:
B) $V_F = A + B.\ln(i_F) + C.i_F + D\sqrt{i_F}$	:
C)	:
D)	:
V_{FM} at I_{FM} = 2200 A	: 2.20 V
$R_{th(J-HS)}$ Double side cooled) Steady-state d.c. and	: 0.022 K/W
Single side cooled) 1 ϕ a.c. resistive load.	: 0.044 K/W
I_{RRM} : at $V_{RRM(MAX)}$	: 60 mA
V_{fr} : at di_F/dt =	: ---

Reverse recovery at I_{FM} = 1000 A; tp = 1000 μs
diR/dt = 60 A/μs; VRM = 50 V

Q_{RR} (total area)	: ---
Q_{RA} (50% chord)	: 810 μC
t_{rr} (50% chord)	: 8 μs
I_{RM}	: ---
Mounting Force	: 19 - 26 kN (1900 - 2600 kg.f)
Outline Drawing	: 100A249
JEDEC Outline No.	: DO-200AC

NOTE: All characteristics are at $T_{VJ} = T_{Jmax}$ operating unless stated otherwise.

CONTENTS

Changes to Pages 1,2 &3

Page 1 Re-issued: Mean currents
Page 2 Re-issued: Thermal impedance
Page 3 Re-issued: Modification list added
Page 8 Re-issued: New Plot
Page 22 Re-issued: New O/L Drawing

Voltage Ratings

Voltage Class	V_{RRM} V	V_{RSM} V
26	2600	2700
28	2800	2900
30	3000	3100
32	3200	3300
34	3400	3500
36	3600	3700

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 500A/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 $r_t = 4.11 \times 10^{-5} \sqrt{t}$

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 .22 uF and 10ohms in series connected across diode anode to cathode.

(b) Design Method

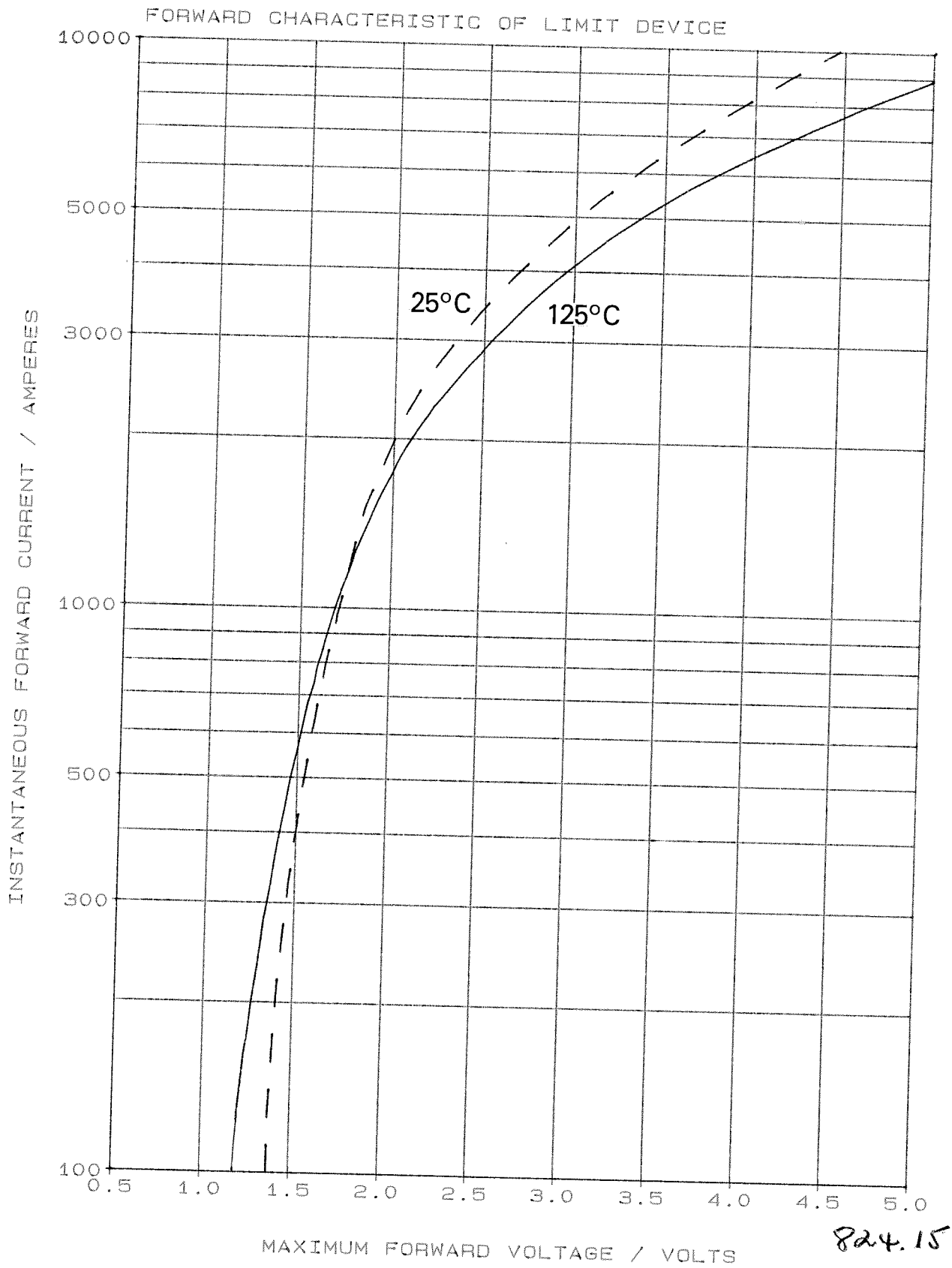
In circumstances where it is not possible to measure voltage and current conditions, or for design purposes, the additional losses may be estimated from curves on page 12

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

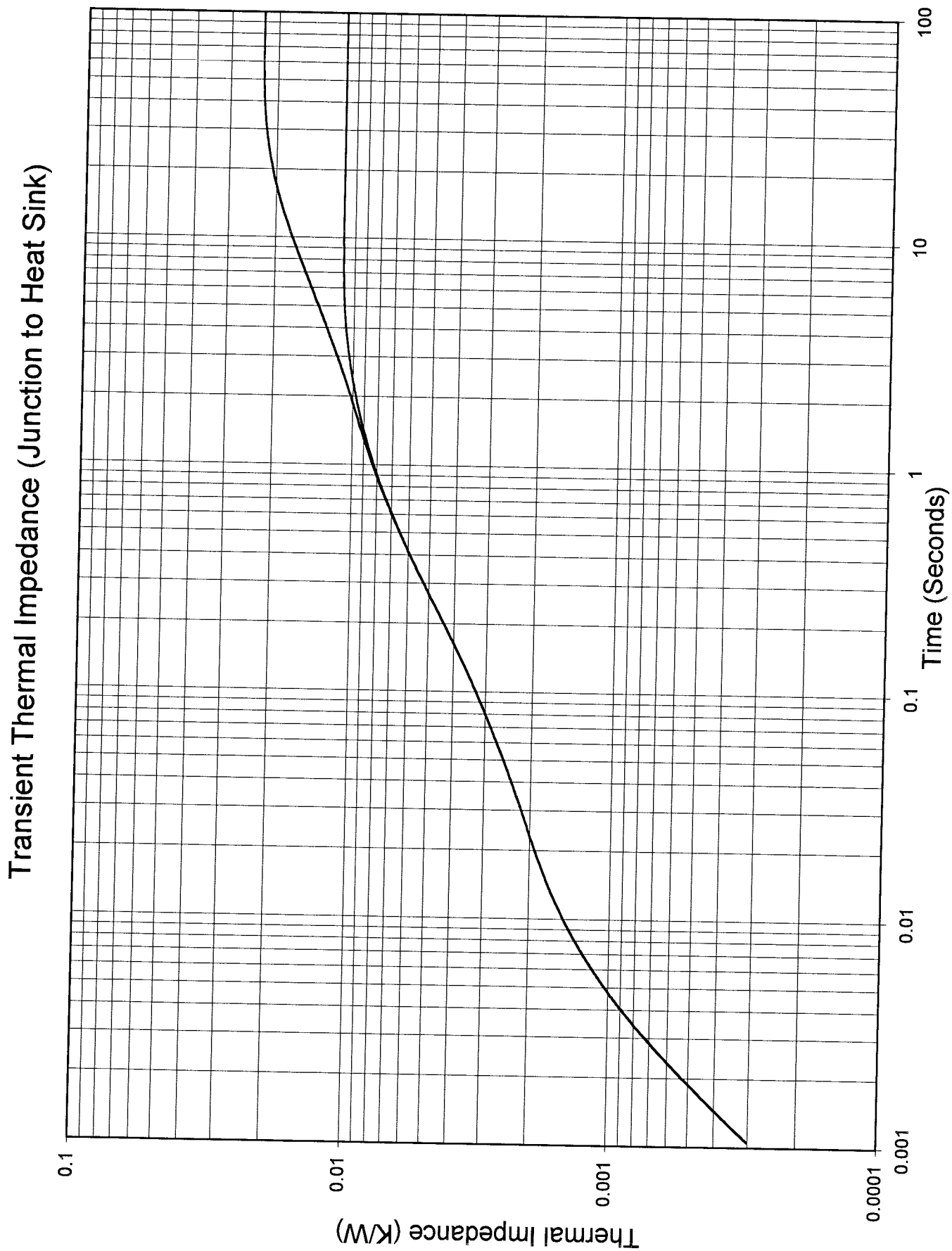
Let f be the operating frequency in Hz

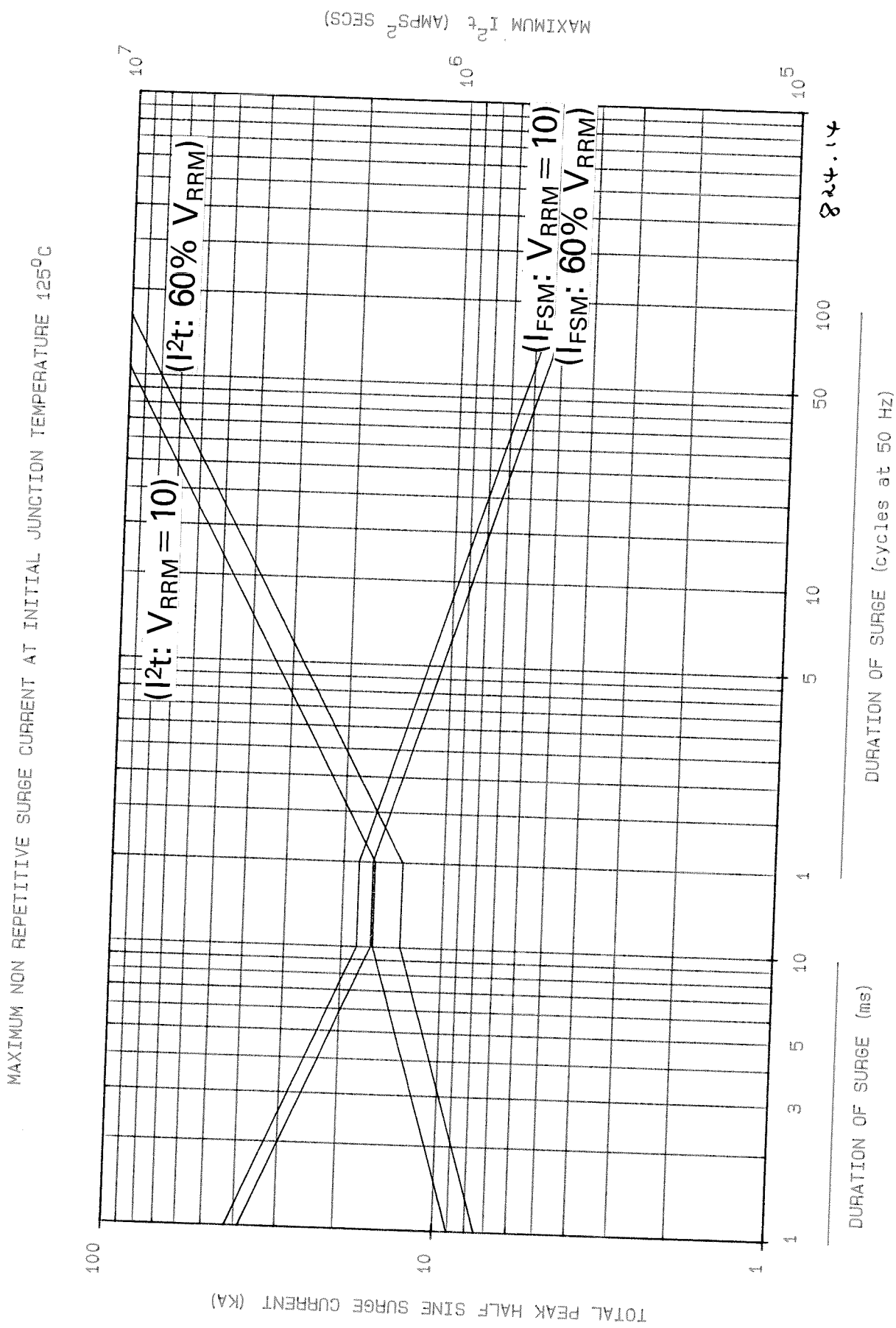
Then $T_{SINK}^{(new)} = T_{SINK}(original) - E \times R_{th} \times f$

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.

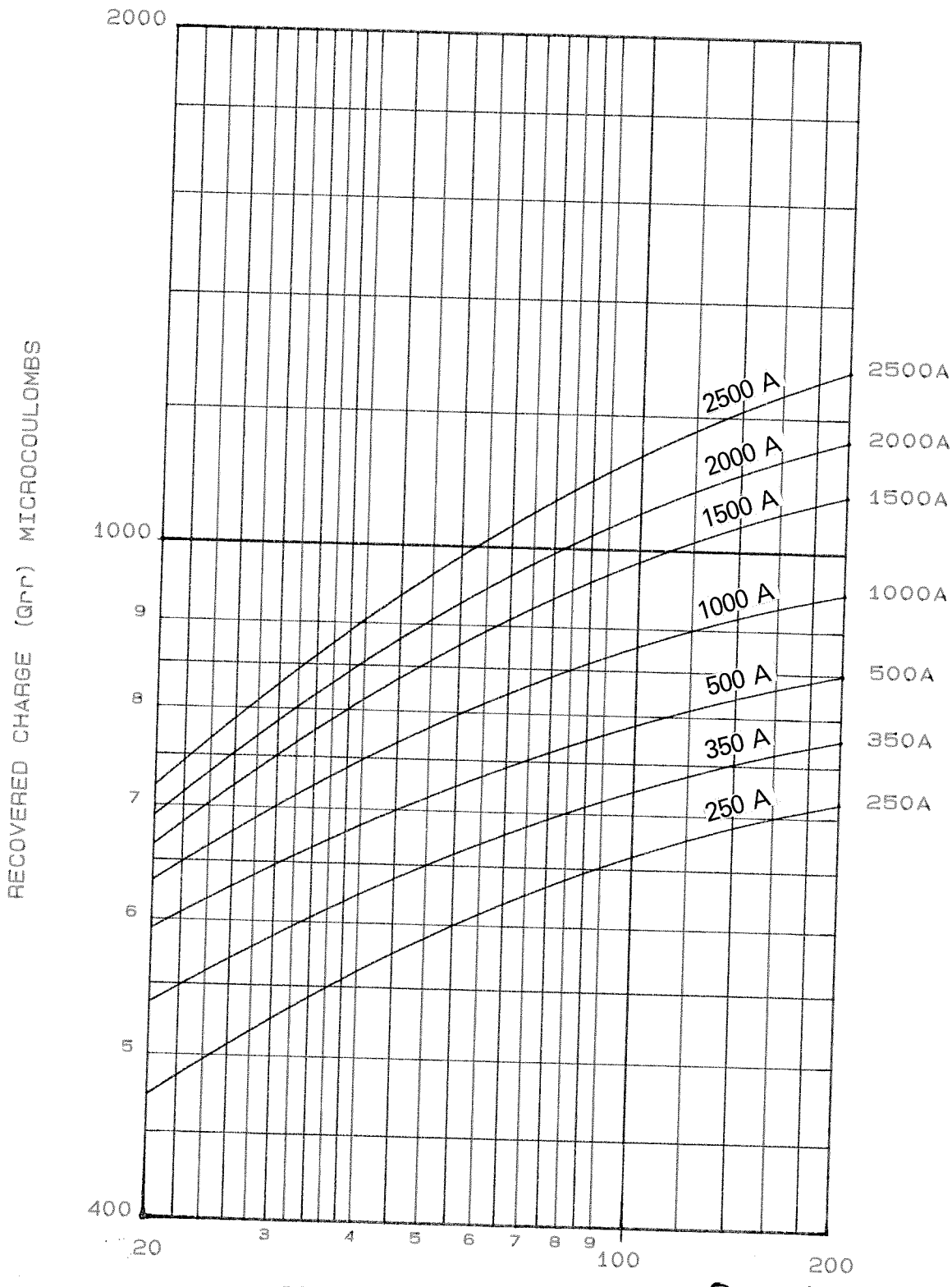

FORWARD CHARACTERISTIC OF LIMIT DEVICE
INSTANTANEOUS FORWARD CURRENT / AMPERES
10000
5000
3000
1000
500
300
100
25°C
125°C
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
MAXIMUM FORWARD VOLTAGE / VOLTS

824.15

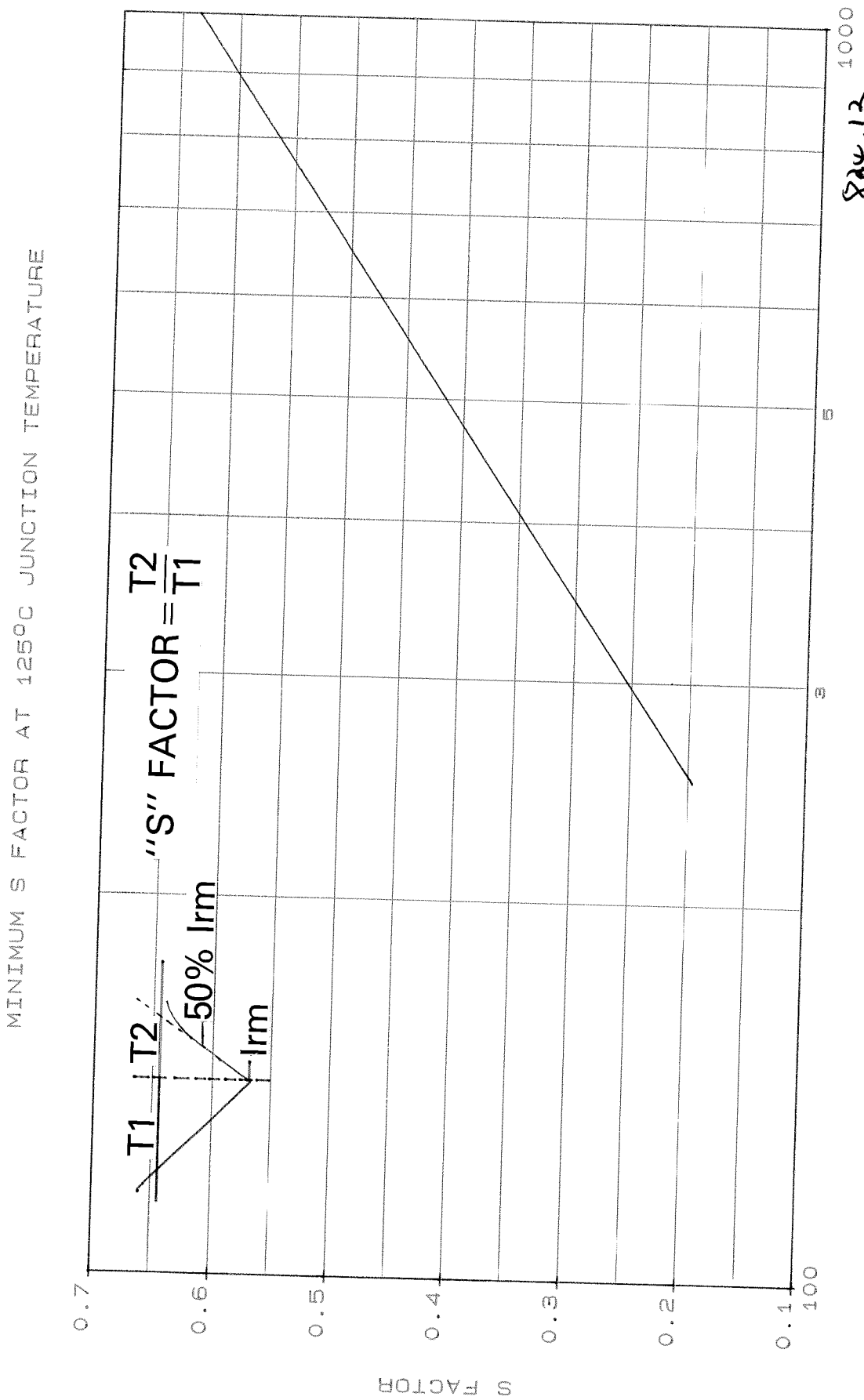

Transient Thermal Impedance (Junction to Heat Sink)
0.022 K/W
S.S.C
0.011 K/W
D.S.C
Thermal Impedance (K/W)
0.1
0.01
0.001
0.0001
Time (Seconds)
0.001
0.01
0.1
1
10
100


MAXIMUM NON REPETITIVE SURGE CURRENT AT INITIAL JUNCTION TEMPERATURE 125°C
MAXIMUM I²t (AMPS² SECS)
10⁷
10⁶
10⁵
(I²t: V_RRM = 10)
(I²t: 60% V_RRM)
(I_FSM: V_RRM = 10)
(I_FSM: 60% V_RRM)
100
10
1
TOTAL PEAK HALF SINE SURGE CURRENT (KA)
1
3
5
10
1
5
10
50
100
DURATION OF SURGE (ms)
DURATION OF SURGE (cycles at 50 Hz)

MAXIMUM RECOVERED CHARGE AT 125°C JUNCTION TEMPERATURE

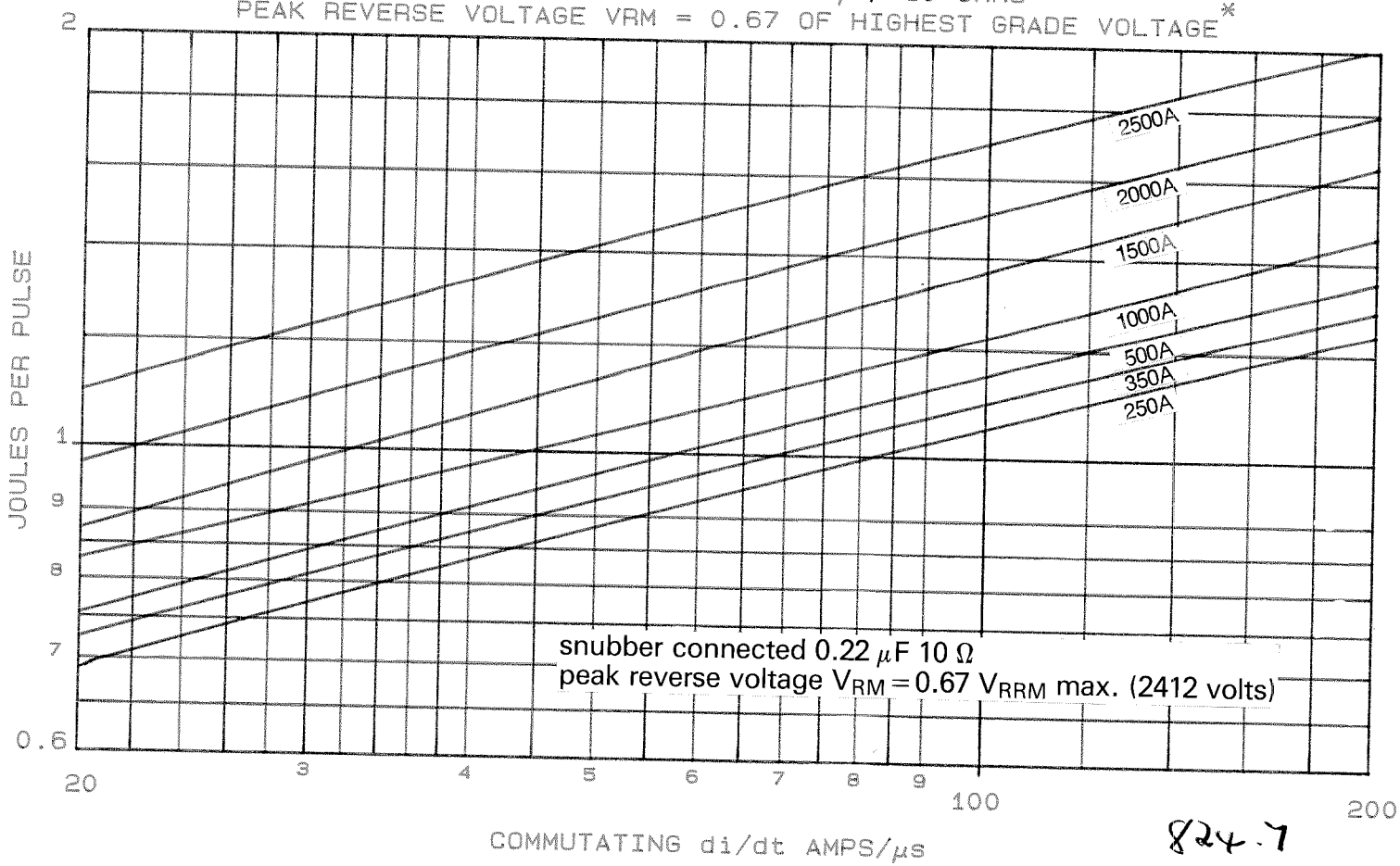


824.11


MINIMUM S FACTOR AT 125°C JUNCTION TEMPERATURE
S FACTOR
0.7
0.6
0.5
0.4
0.3
0.2
0.1
100
10
1000
RECOVERED CHARGE μC
"S" FACTOR = T2/T1
T1
T2
50% Irm
Irm
824.12

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

SNUBBER CONNECTED 0.22μF, 10 OHMS
PEAK REVERSE VOLTAGE VRM = 0.67 OF HIGHEST GRADE VOLTAGE*

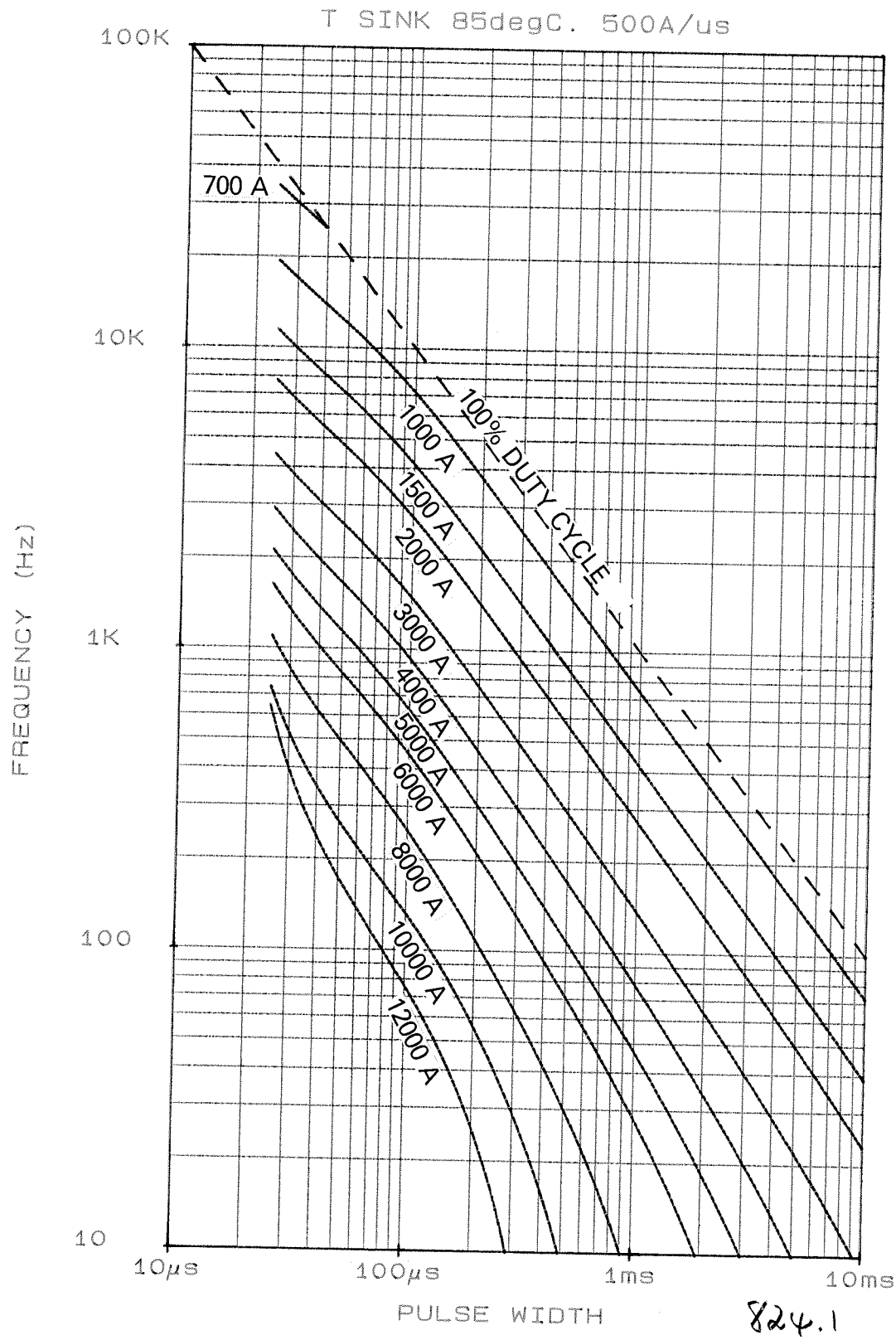


2500 A
2000 A
1500 A
1000A
500A
350A
250A

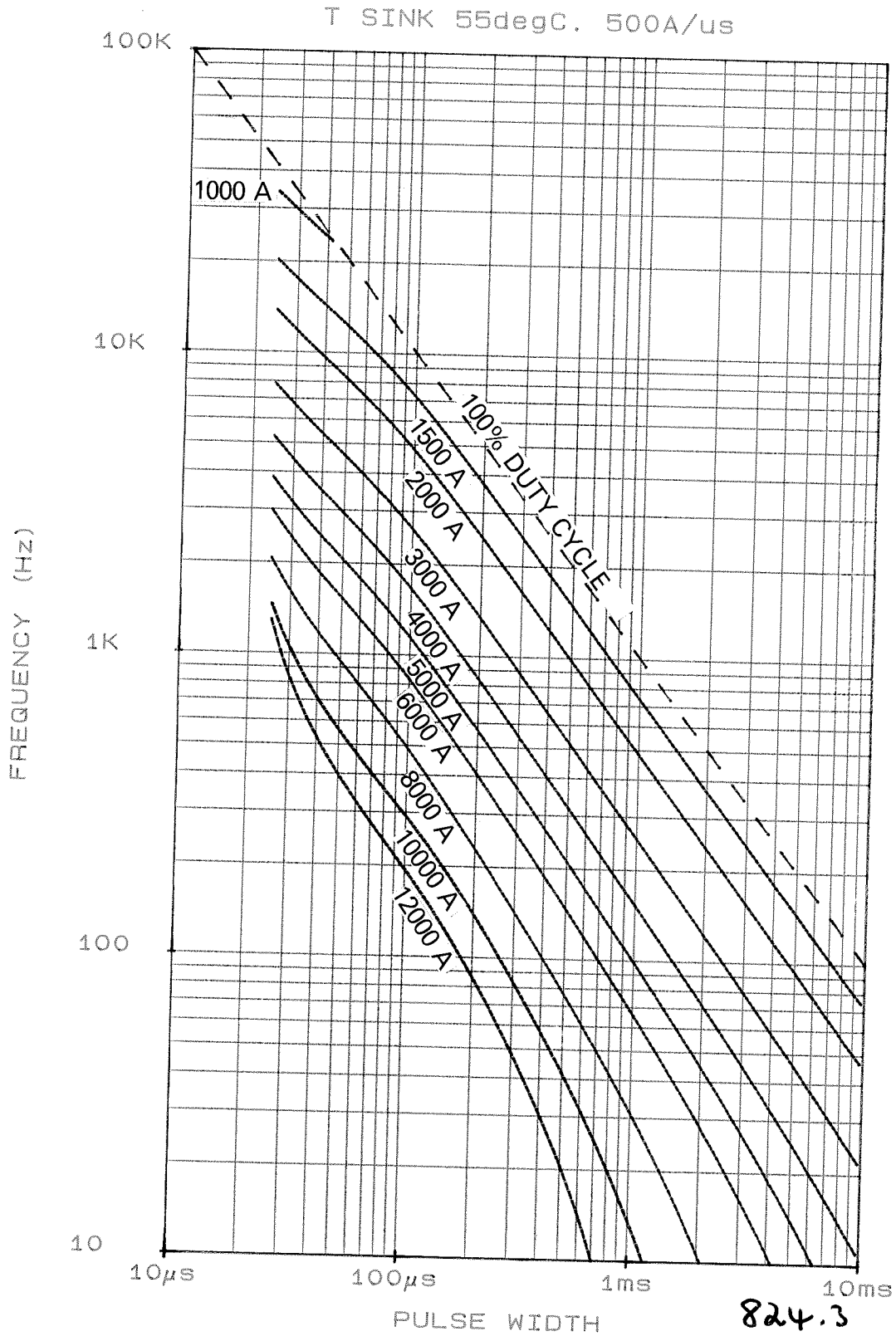
824.7

- 12 -

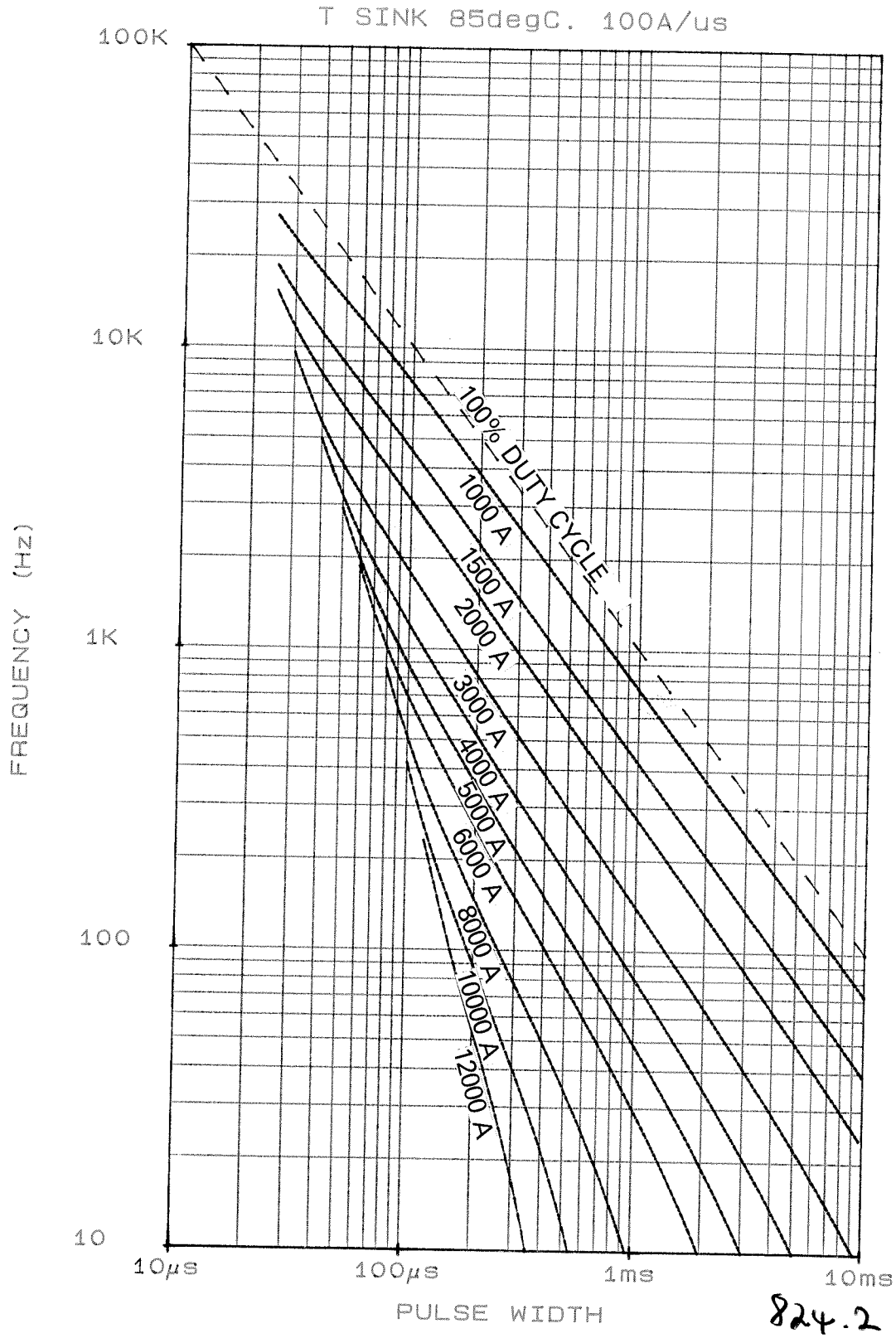
* NOTE: ENERGY PER PULSE SHOULD BE ADJUSTED PRO RATA WITH APPLIED PEAK RECOVERY VOLTAGE


T SINK 85degC. 500A/us
100K
10K
1K
100
10
FREQUENCY (Hz)
700 A
100% DUTY CYCLE
1000 A
1500 A
2000 A
3000 A
4000 A
5000 A
6000 A
8000 A
10000 A
12000 A
10µs
100µs
1ms
10ms
PULSE WIDTH

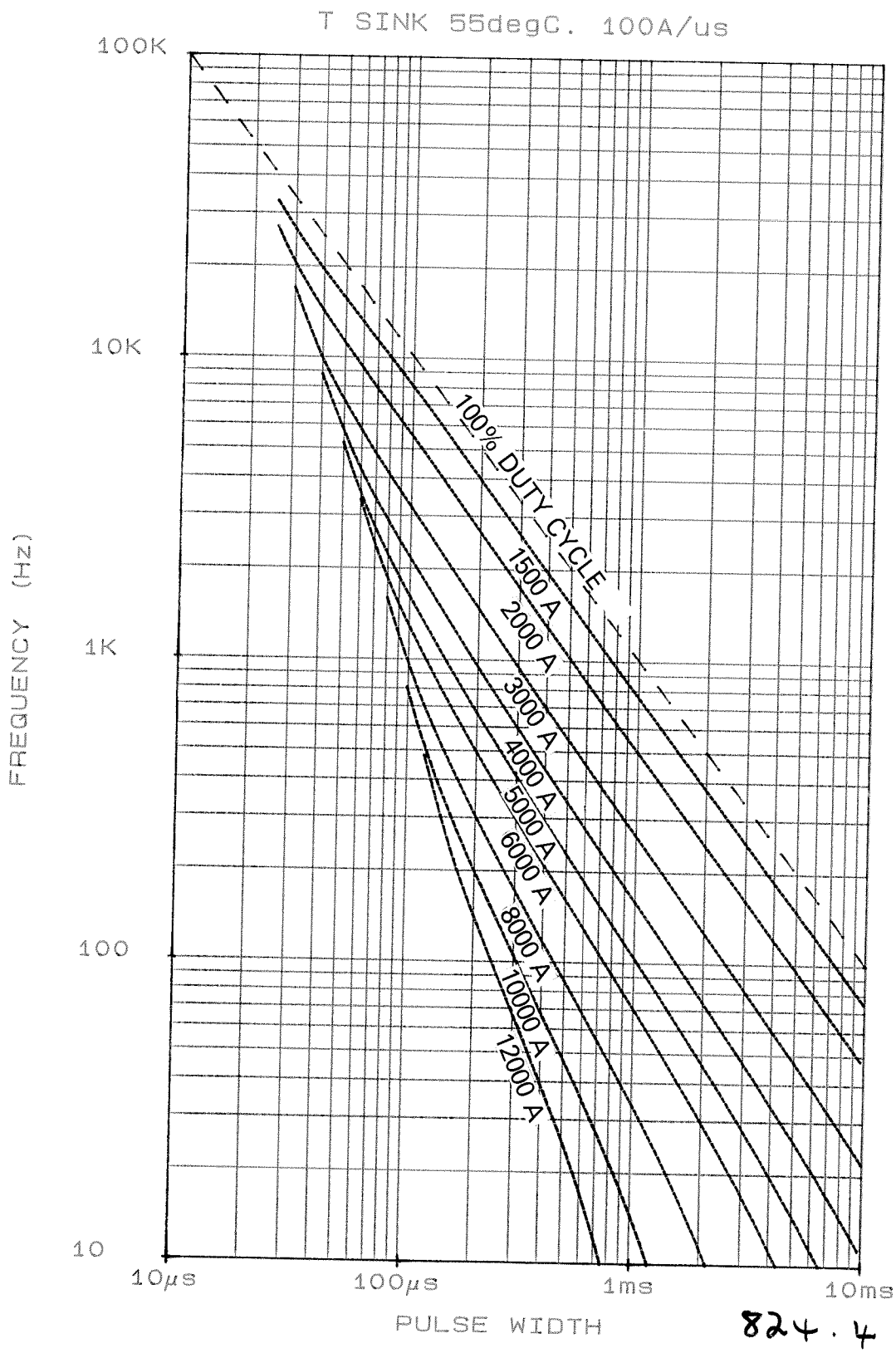
824.1


T SINK 55degC. 500A/us
100K
10K
1K
100
10
FREQUENCY (Hz)
1000 A
100% DUTY CYCLE
1500 A
2000 A
3000 A
4000 A
5000 A
6000 A
8000 A
10000 A
12000 A
10µs
100µs
1ms
10ms
PULSE WIDTH

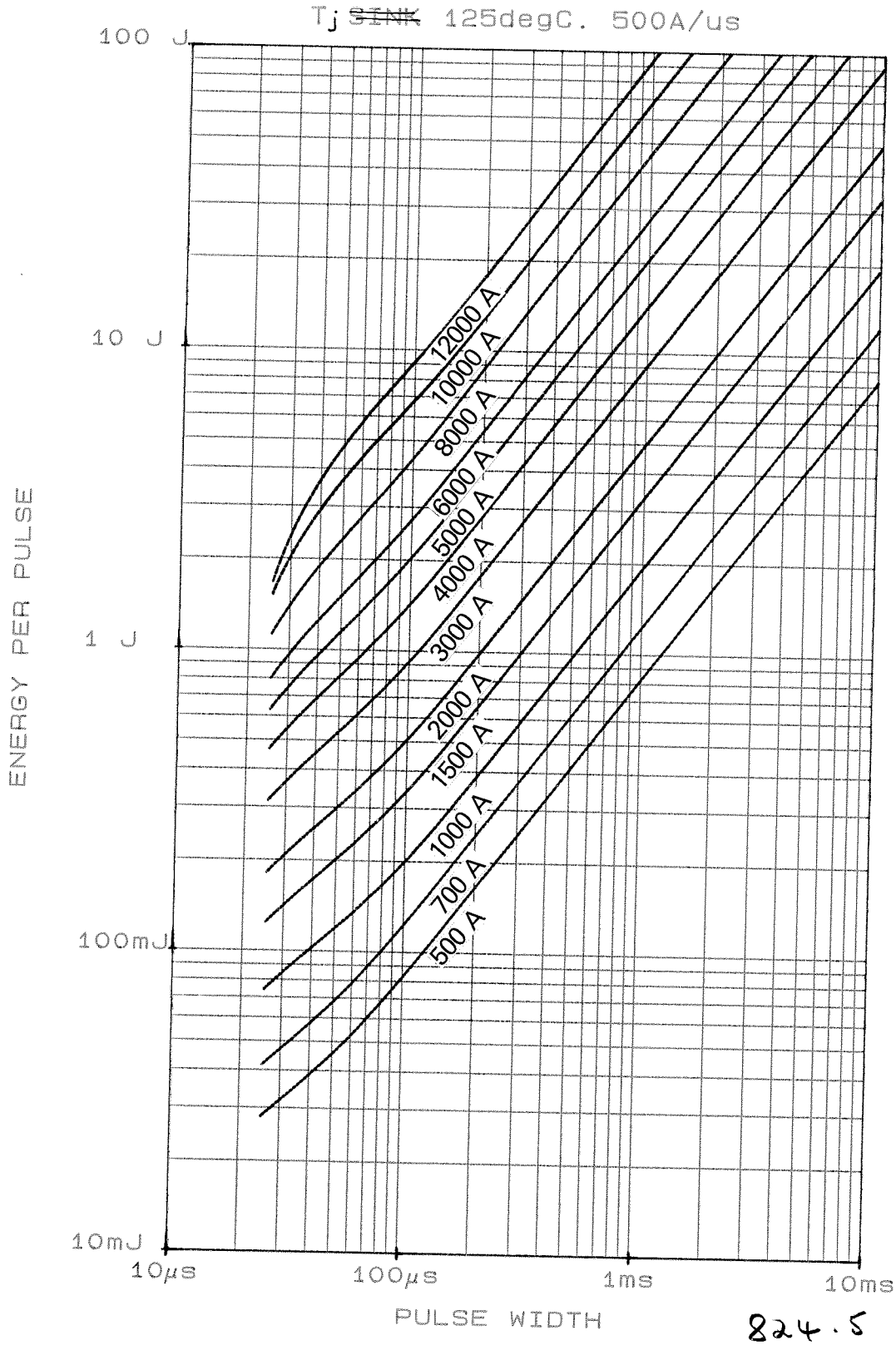
824.3


T SINK 85degC. 100A/us
100K
10K
1K
100
10
FREQUENCY (Hz)
100% DUTY CYCLE
1000 A
1500 A
2000 A
3000 A
4000 A
5000 A
6000 A
8000 A
10000 A
12000 A
10µs
100µs
1ms
10ms
PULSE WIDTH

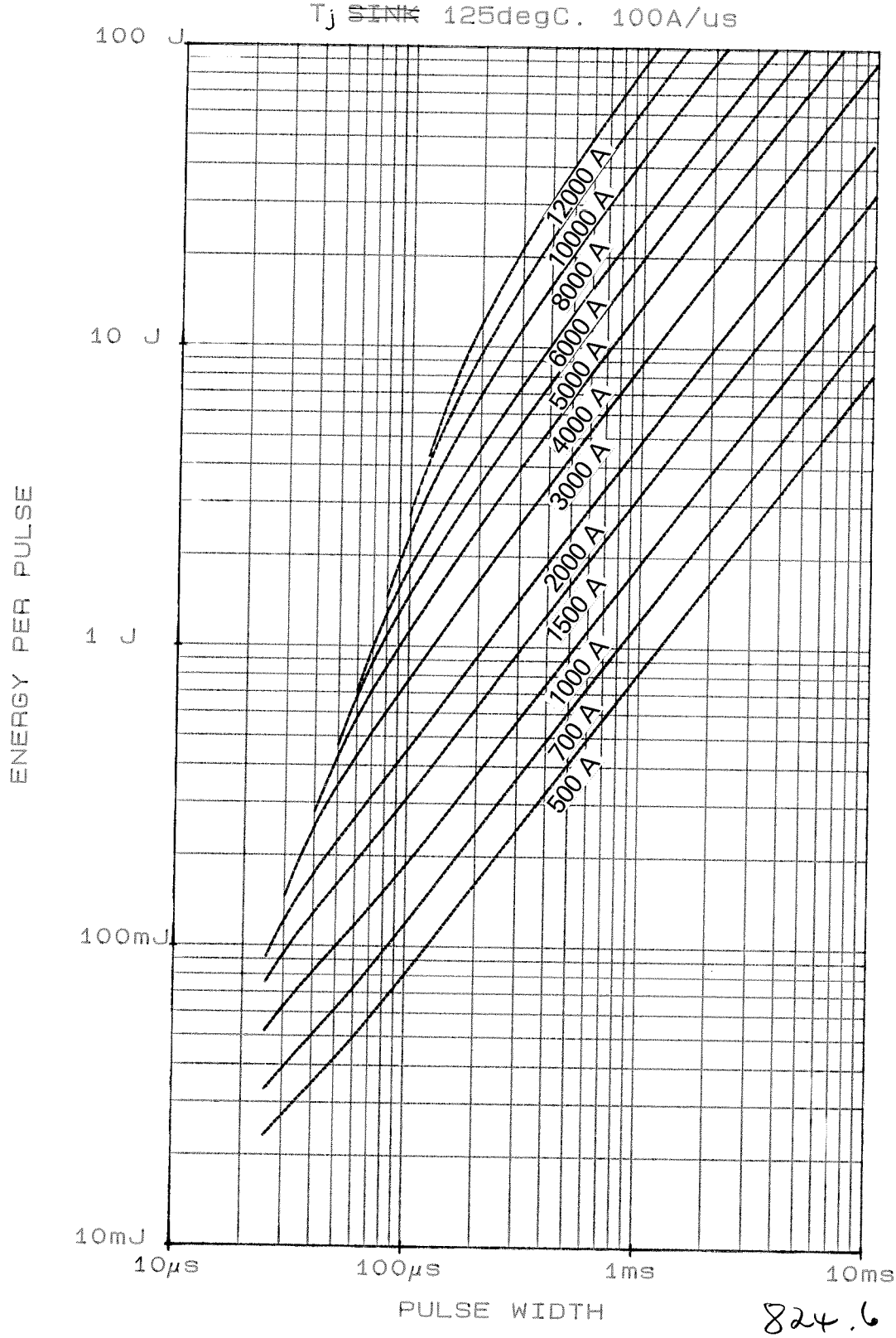
824.2


T SINK 55degC. 100A/us
100K
10K
1K
100
10
FREQUENCY (Hz)
100% DUTY CYCLE
1500 A
2000 A
3000 A
4000 A
5000 A
6000 A
8000 A
10000 A
12000 A
10µs
100µs
1ms
10ms
PULSE WIDTH

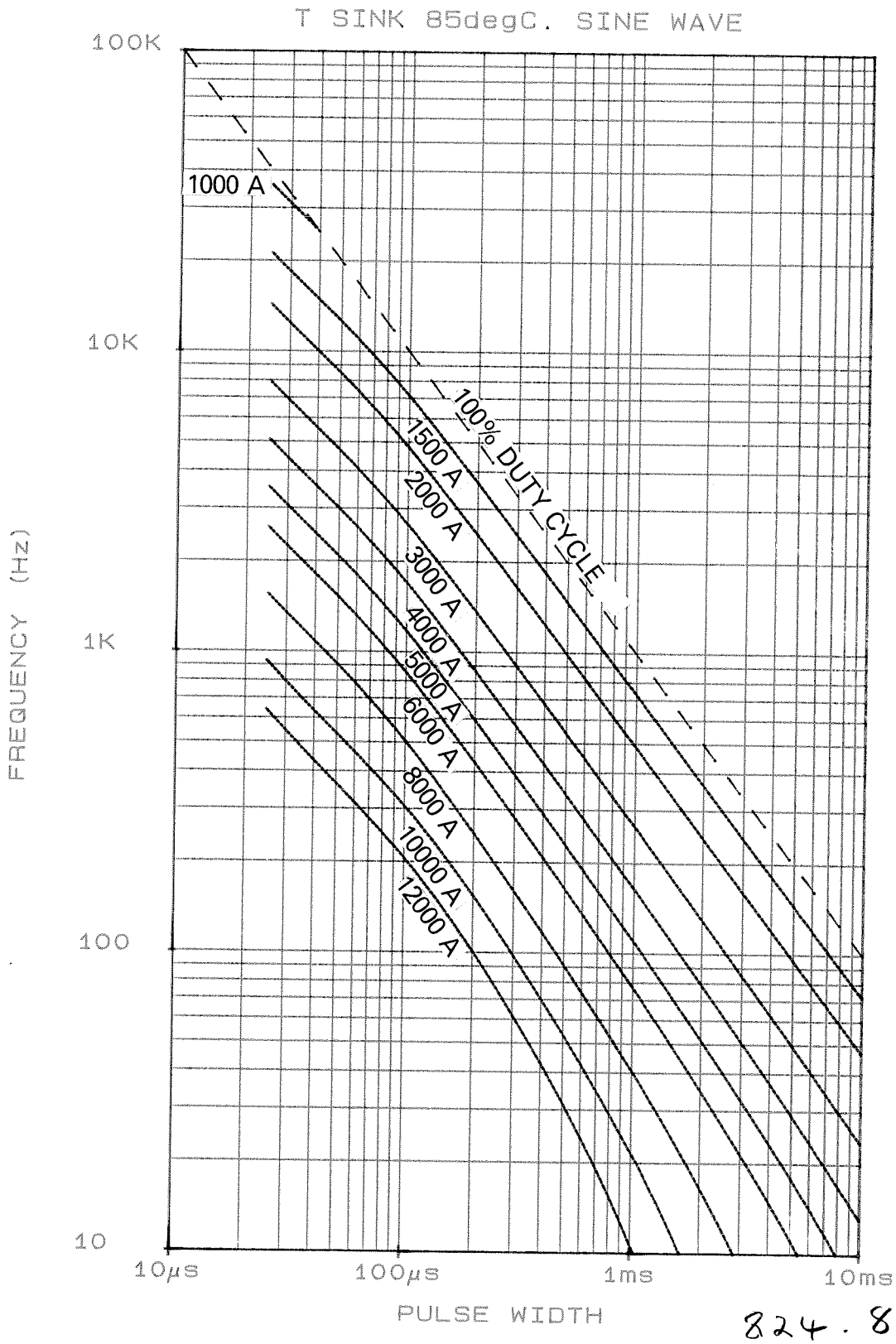
824.4


Tj ~~SINK~~ 125degC. 500A/us
100 J
10 J
1 J
100mJ
10mJ
ENERGY PER PULSE
12000 A
10000 A
8000 A
6000 A
5000 A
4000 A
3000 A
2000 A
1500 A
1000 A
700 A
500 A
10µs
100µs
1ms
10ms
PULSE WIDTH

824.5

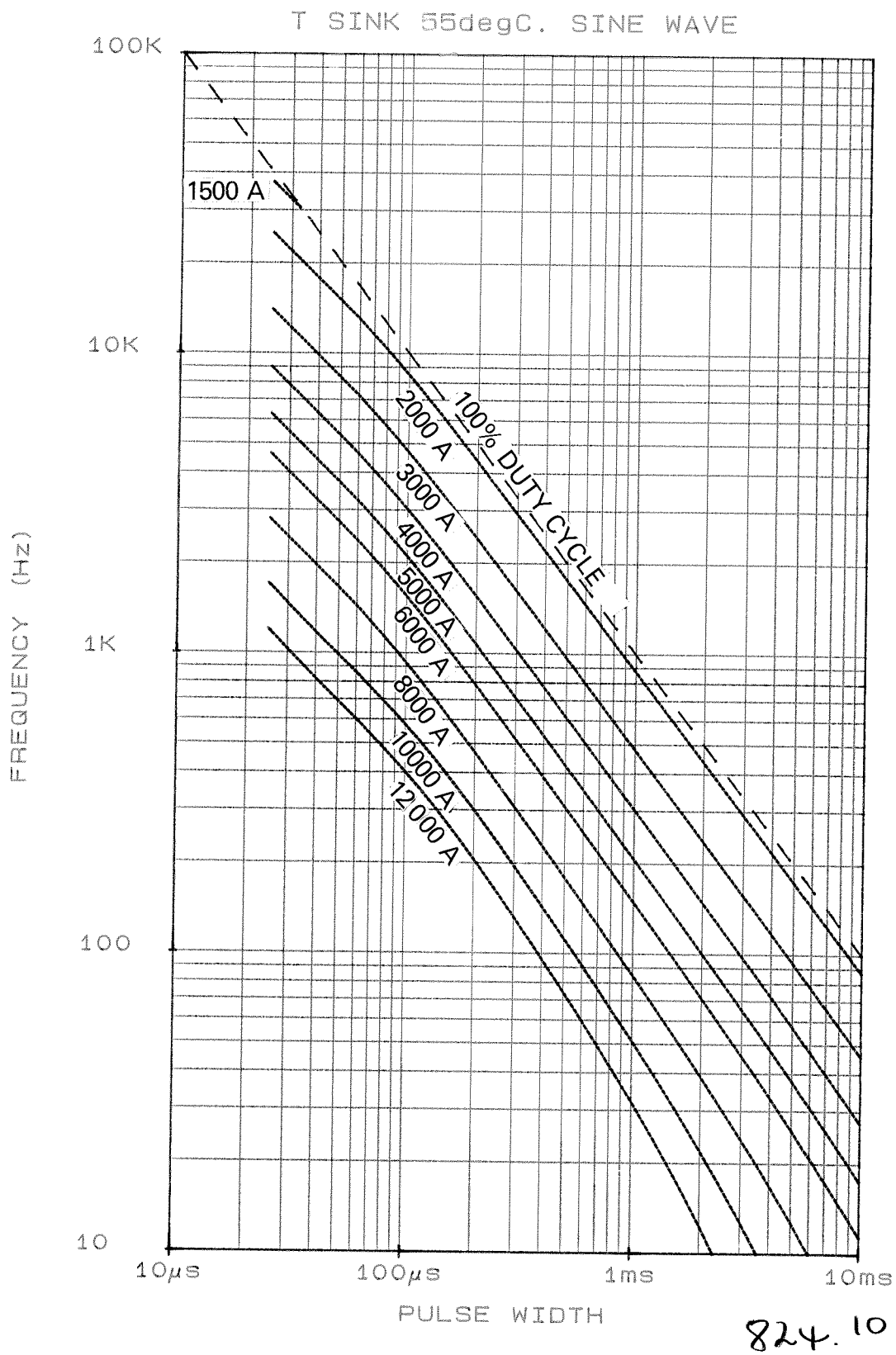

Tj SINK 125degC. 100A/us
100 J
10 J
1 J
100mJ
10mJ
ENERGY PER PULSE
12000 A
10000 A
8000 A
6000 A
5000 A
4000 A
3000 A
2000 A
1500 A
1000 A
700 A
500 A
10µs
100µs
1ms
10ms
PULSE WIDTH

824.6

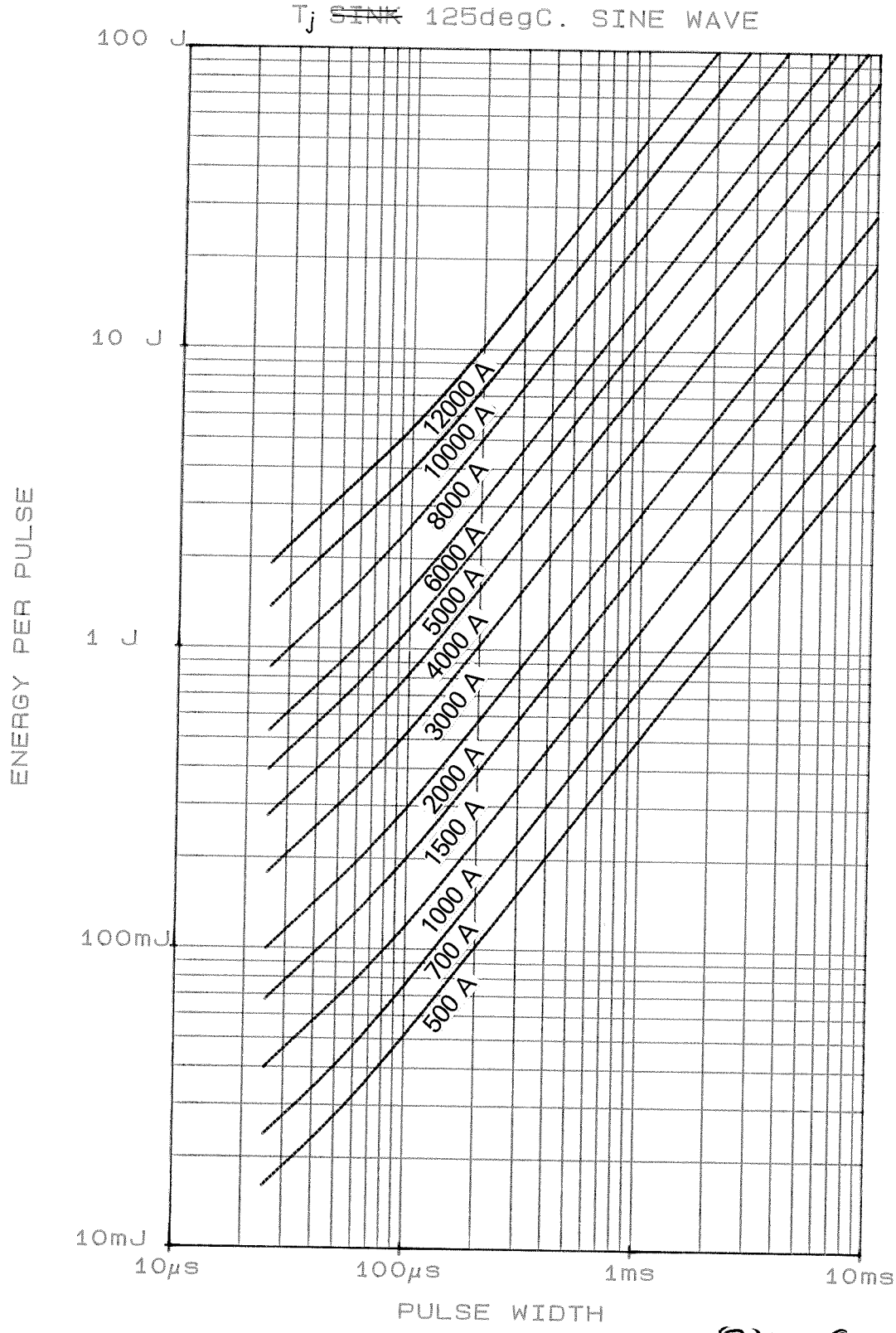

T SINK 85degC. SINE WAVE
100K
10K
1K
100
10
FREQUENCY (Hz)
1000 A
100% DUTY CYCLE
1500 A
2000 A
3000 A
4000 A
5000 A
6000 A
8000 A
10000 A
12000 A
10µs
100µs
1ms
10ms
PULSE WIDTH

824.8

824 Fig 10



824.10


T_j ~~SINK~~ 125degC. SINE WAVE
100 J
10 J
1 J
100mJ
10mJ
ENERGY PER PULSE
12000 A
10000 A
8000 A
6000 A
5000 A
4000 A
3000 A
2000 A
1500 A
1000 A
700 A
500 A
10μs
100μs
1ms
10ms
PULSE WIDTH

824. 9

SCALE	1/1
DRN	
CHKD	
APPD	
	~~GEO~~ 1
	CS 1
	QA 1
	LP 2
	HP 2
	6
S	NI

INTERNATIONAL OUTLINE No. DO-200AC

WEIGHT. 510 GRAMS.

FINISH. NICKEL PLATE.

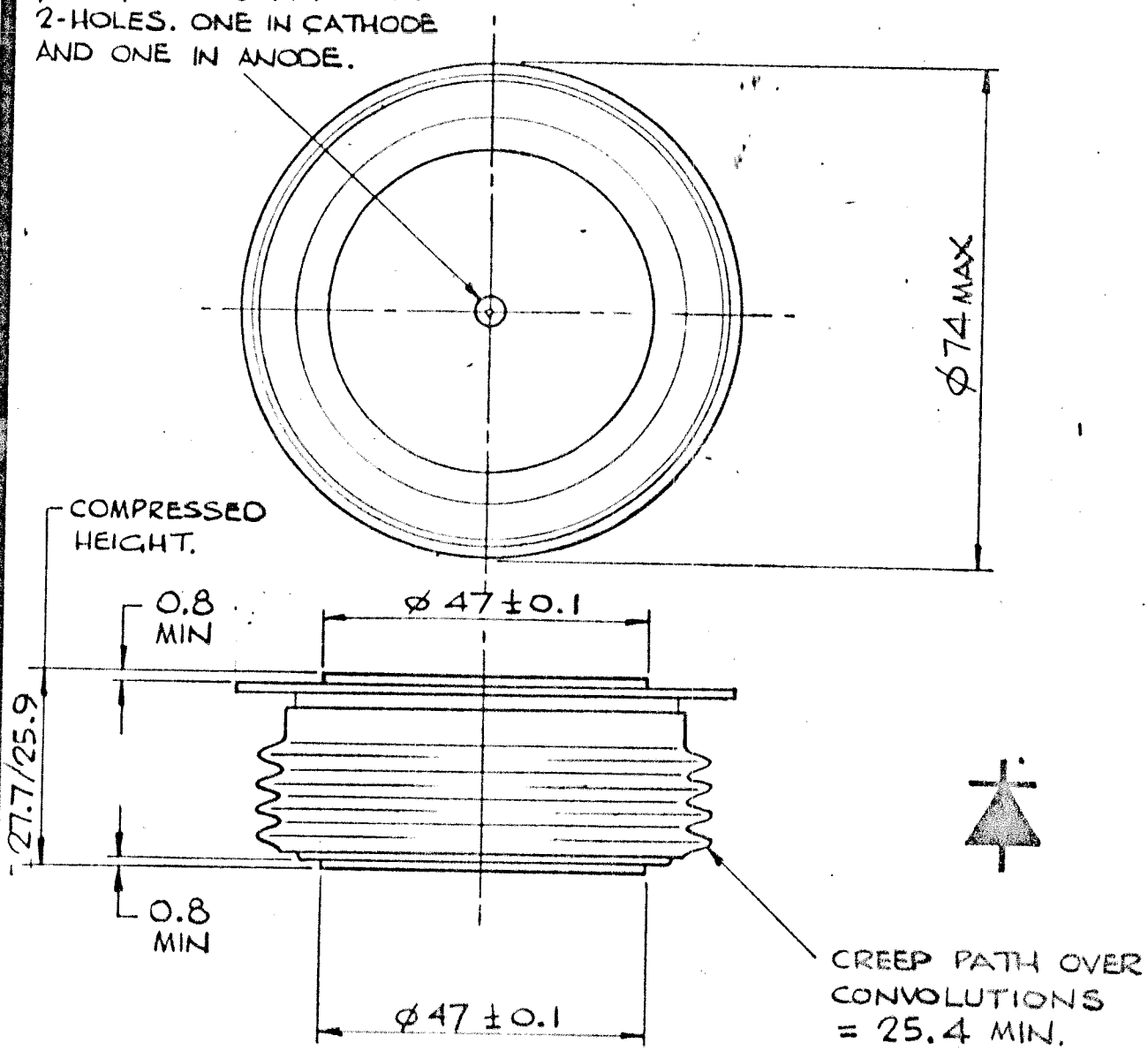
DEVICE MARKING INCLUDES MONOGRAM, TYPE No., SPEC. No. AND POLARITY SYMBOL.

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 1900 - 2600 kgf.

TYPE NUMBER	
CXC 680	CXC924
CXC 820	CXC624
CXC 950	CXC824
CXC 14C	
CXC 990	
CXC 850	

G.A. DRG. No. 159B100H301 - H310



WESTINGHOUSE BRAKE AND SIGNAL CO. LTD.
CHIPPENHAM, WILTSHIRE, SN15 1JD, ENGLAND.

WESTCODE ® SEMICONDUCTORS

THIRD ANGLE PROJECTION

DIMNS. IN MILLIMETRES

DRG. No. 100A249

ISS	REVISIONS	
1	15.5.78 P304	
2	12.9.78 ϕ74 WAS ϕ75	JB
3	30.10.78 M670 TYPE Nº ADDED	JB