Ruttonsha International Rectifier Ltd.

PHASE CONTROL THYRISTORS

HOCKEY PUCK VERSION

Type : 1160 PK 340 To 420

1160A

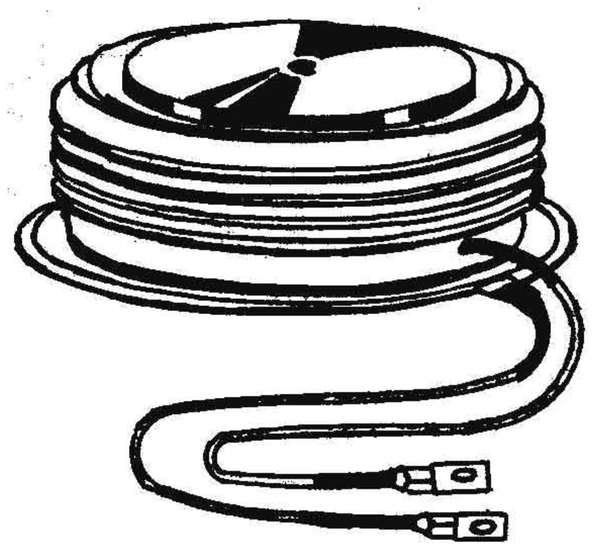
Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case (K-PUK)
- High profile hockey-puk

Typical Applications

- D C motor controls
- Controlled D C power supplies
- A C controllers

1160 PK (K - PUK)



Major Ratings and Characteristics :-

PARAMETERS		1160 PK	UNITS
$I_{T(AV)}$		1160	A
	@T_{hs}	55	°C
$I_{T(RMS)}$		2268	A
	@T_{hs}	25	°C
I_{TSM}	@50Hz	14.5	KA
I^2t	@50Hz	1050	KA^2s
$I^2\sqrt{t}$		10500	$KA^2\sqrt{s}$
V_{DRM}	/ V_{RRM}	3400 to 4200	V
T_q	typical	700	µs
T_J		- 40 to 125	°C

ELECTRICAL SPECIFICATIONS 1160PK Series

Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM}, max repetitive peak and off-state voltage V	V_{RSM},maximum non-repetitive peak voltage V	I_{DRM}/I_{RRM} max. @ $T_J = T_J$ max. mA
1160 PK	340	3400	3500	100
	360	3600	3700	
	380	3800	3900	
	400	4000	4100	
	420	4200	4300	

On - state Conduction

	Parameter	1160 PK	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current	1160	A	180° conduction, half sine wave	
	@ Heatsink temperature	55	°C	double side cooled	
$I_{T(RMS)}$	Max RMS on-state current	2268	A	DC@25°C heatsink temperature double side cooled	
I_{TSM}	Max. peak, one-cycle non-repetitive surge current	14.5	KA	t = 10 ms	Sinusoidal half wave, Initial $T_J=T_J$ max.
I^2t	Maximum I^2t for fusing	1050	KA^2s	t = 10 ms	
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	10500	$KA^2\sqrt{s}$	t = 0.1 to 10 ms, no voltage reapplied	
V_{TO}	Threshold voltage	1.10	V	$T_J=T_J$ max	
r_{t1}	On-state slope resistance	0.45	mΩ	$T_J=T_J$ max.	
V_{TM}	Max. on state voltage drop	2.15	V	I_{PK} = 1830 A, T_J= 125°C, t_P = 10 ms sine pulse	
I_H	Maximum holding current	600	mA	T_J = 25°C , anode supply 12 V resistive load	
I_L	Typical latching current	1000			

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Switching

	Parameter	1160PK	Units	Conditions
di/dt	Max. non-repetitive rate of rise of turned-on current	100	A/µs	Gate drive 20V, 20Ω , $t_r \leq 1\mu s$ $T_J = T_J$ max. anode voltage ≤ 80% V_{DRM}
t_d	Typical delay time	0.6	µs	Gate current 2A, di_g/dt =10A/µs I_T = 1500A V_d = 0.67% V_{DRM} , T_J = 25° C
t_q	Turn-off time	700	A/µs	I_{TM}= 1000A, $T_J = T_J$ max. di/dt = 10A/µs ,V_R = 50V dv/dt = 20V/µs, Gate OV 100 Ω, t_p = 1000µs Vdr = 80% V_{DRM}

Blocking

	Parameter	1160PK	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	$T_J = T_J$ max. linear to 80% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	100	µs	$T_J = T_J$ max. rated V_{DRM} /V_{RRM} applied

Triggering

	Parameter	1160PK	Units	Conditions
P_{GM}	Maximum peak gate power	30	W	$T_J = T_J$ max., $t_p \leq 5$ ms
$P_{G(AV)}$	Maximum average gate power	3	W	$T_J = T_J$ max., f = 50Hz, d% = 50
I_{GM}	Max. peak positive gate current	3.0	A	$T_J = T_J$ max., $t_p \leq 5$ ms
$+V_{GM}$	Maximum peak positive gate voltage	20	V	$T_J = T_J$ max., $t_p \leq 5$ ms
$-V_{GM}$	Maximum peak negative gate voltage	5.0		
I_{GT}	DC gate voltage required to trigger	300	mA	T_J = 25°C
V_{GT}	DC gate voltage required to trigger	3.0	V	T_J = 25°C

Max.required gate trigger/ current/voltage are the lowest value which will trigger all units 12 V anode-to-cathode applied

I_{GD}	DC gate current not to trigger	10	mA	$T_J = T_J$ max.	Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied
V_{GD}	DC gate voltage not to trigger	0.25	V		

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Thermal and Mechanical Specifications

	Parameter	1160 PK	Units	Conditions
T_J	Max.operating temperature range	- 40 to 125	°C	
T_{stg}	Max.storage temperature range	- 40 to 150		
R_{thJ-hs}	Max. thermal resistance, junction to heatsink	0.022	K/W	DC operation double side cooled
R_{thC-hs}	Max. thermal resistance, case to heatsink	0.003	K/W	DC operation double side cooled
F	Mounting force, ± 10%	24500 (2500)	N (Kg.)	
wt	Approximate weight	425	g	
	Case style	A-24(K-PUK)		See Outline Table

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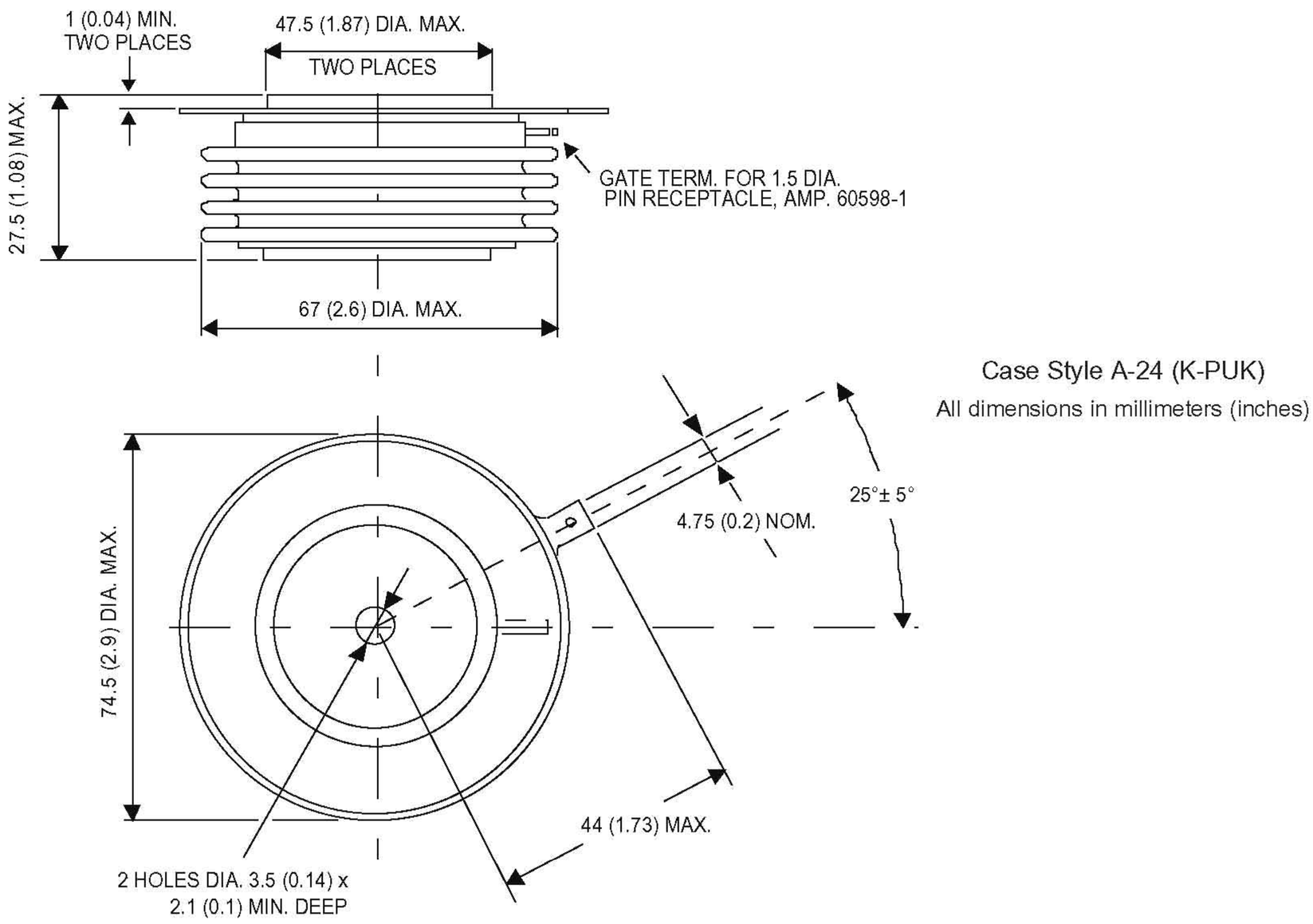
Outline Table



Case Style A-24 (K-PUK)

All dimensions in millimeters (inches)

CREPAGE DESTANCE 28.88 (1.137) MIN.
STRIKE DISTANCE 17.99 (0.708) MIN.

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Figure 1 - On-state characteristics of Limit device

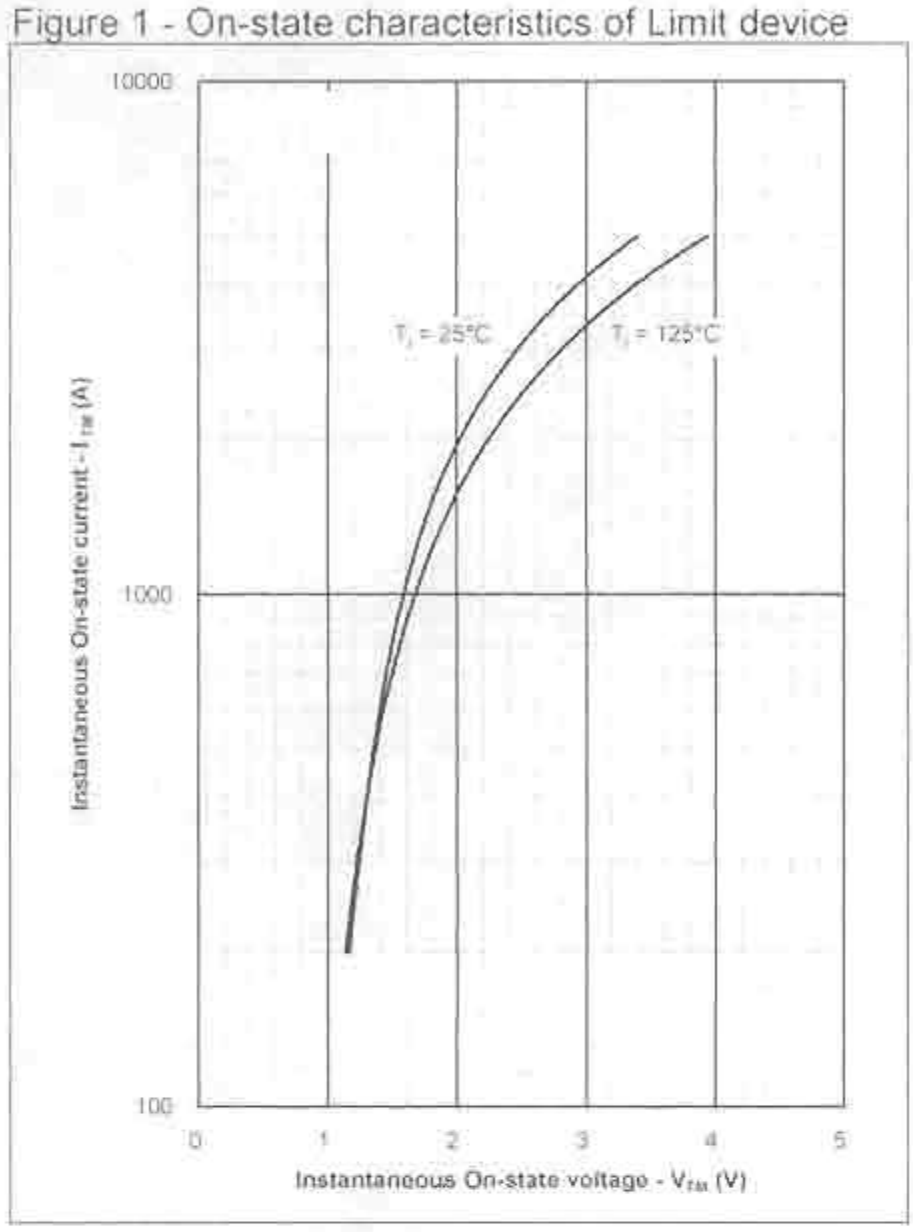

Figure 2 - Transient thermal impedance

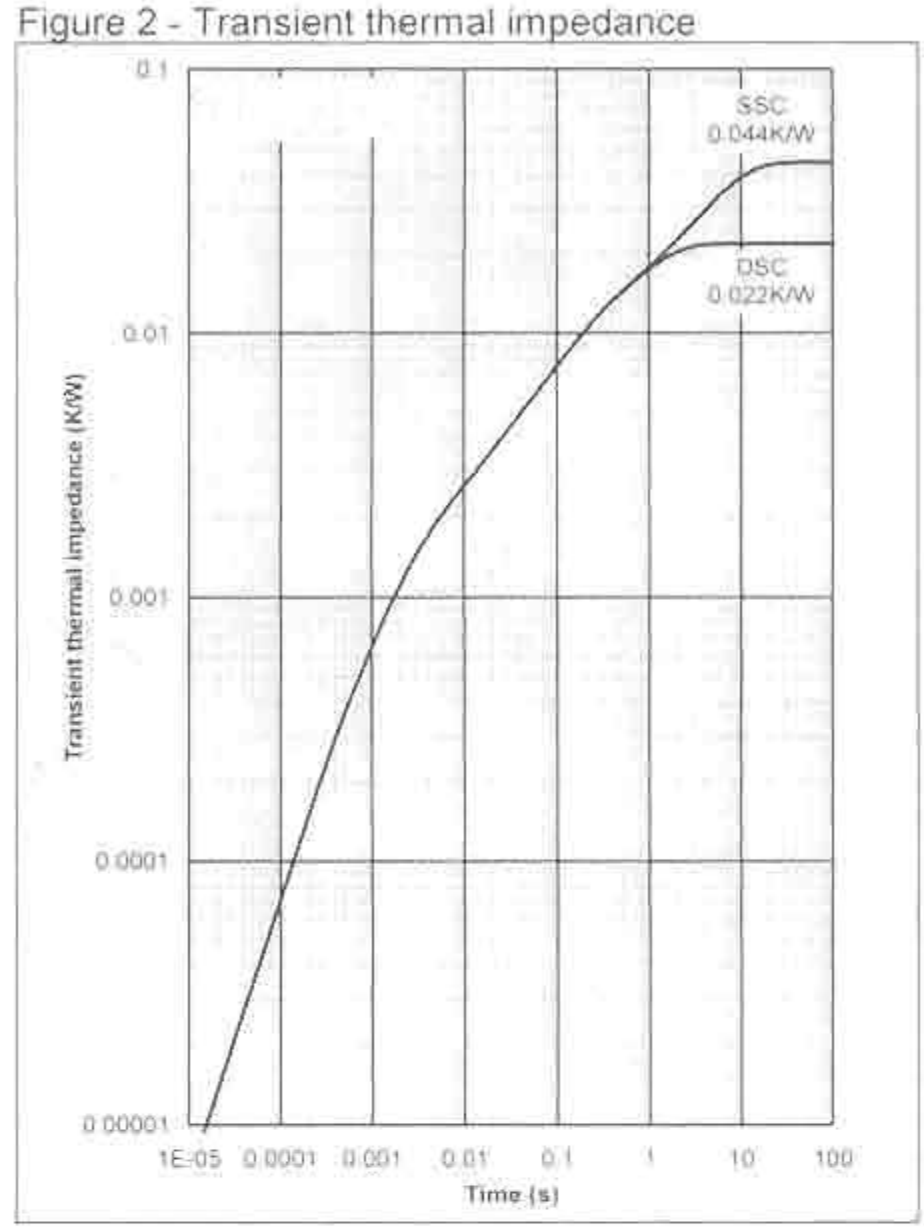

Figure 3 - Gate characteristics - Trigger limits

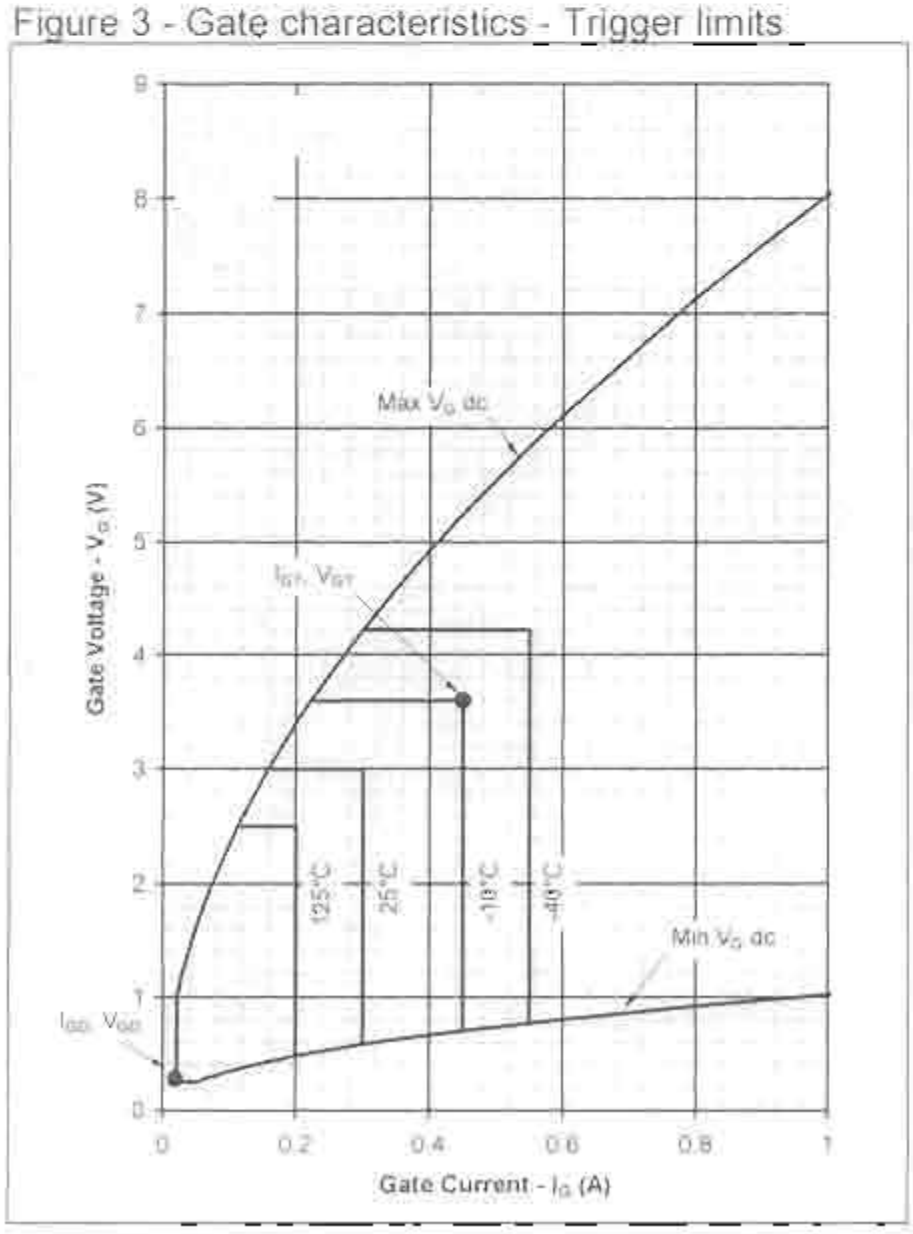

Figure 4 - Gate characteristics - Power curves

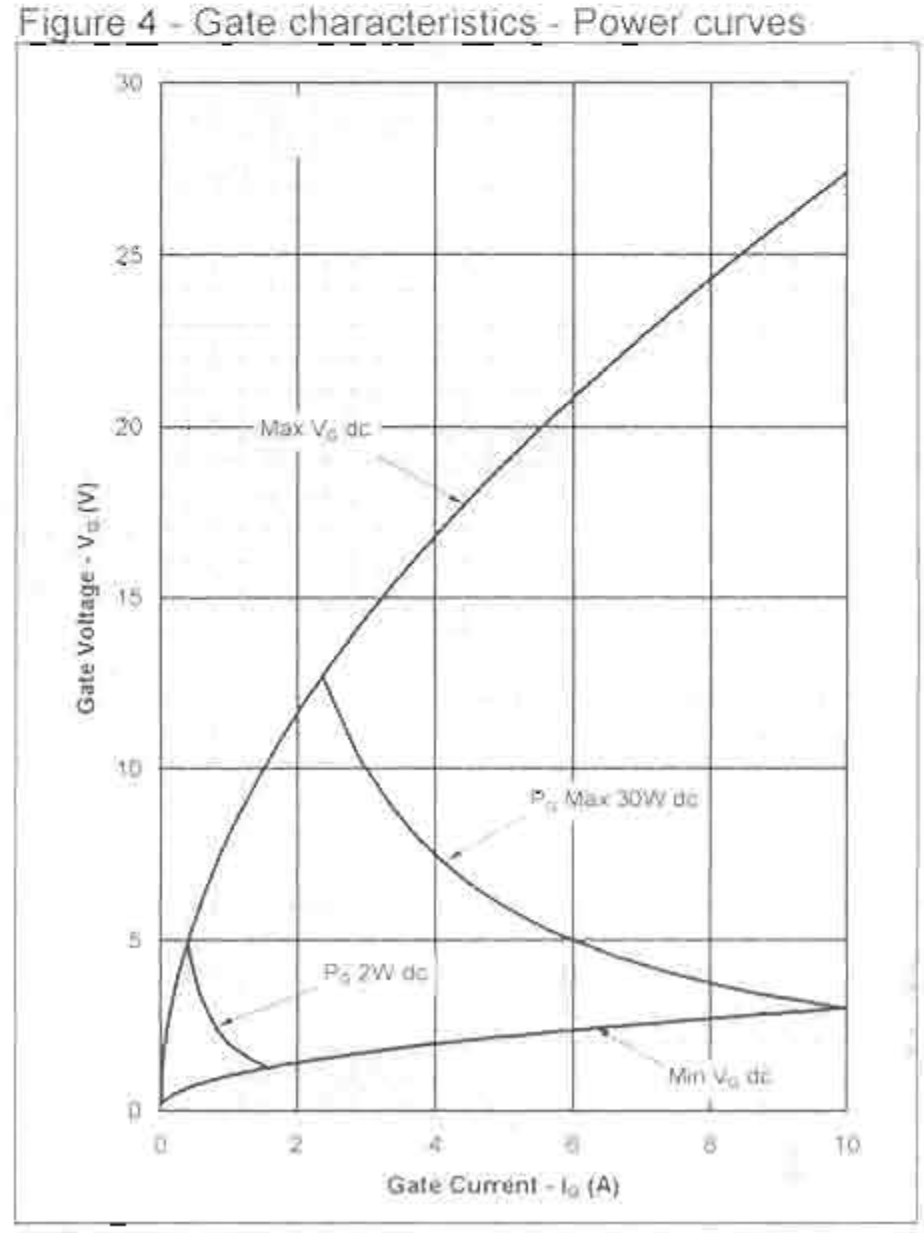

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Figure 5 - Total recovered charge, Q_{rr}

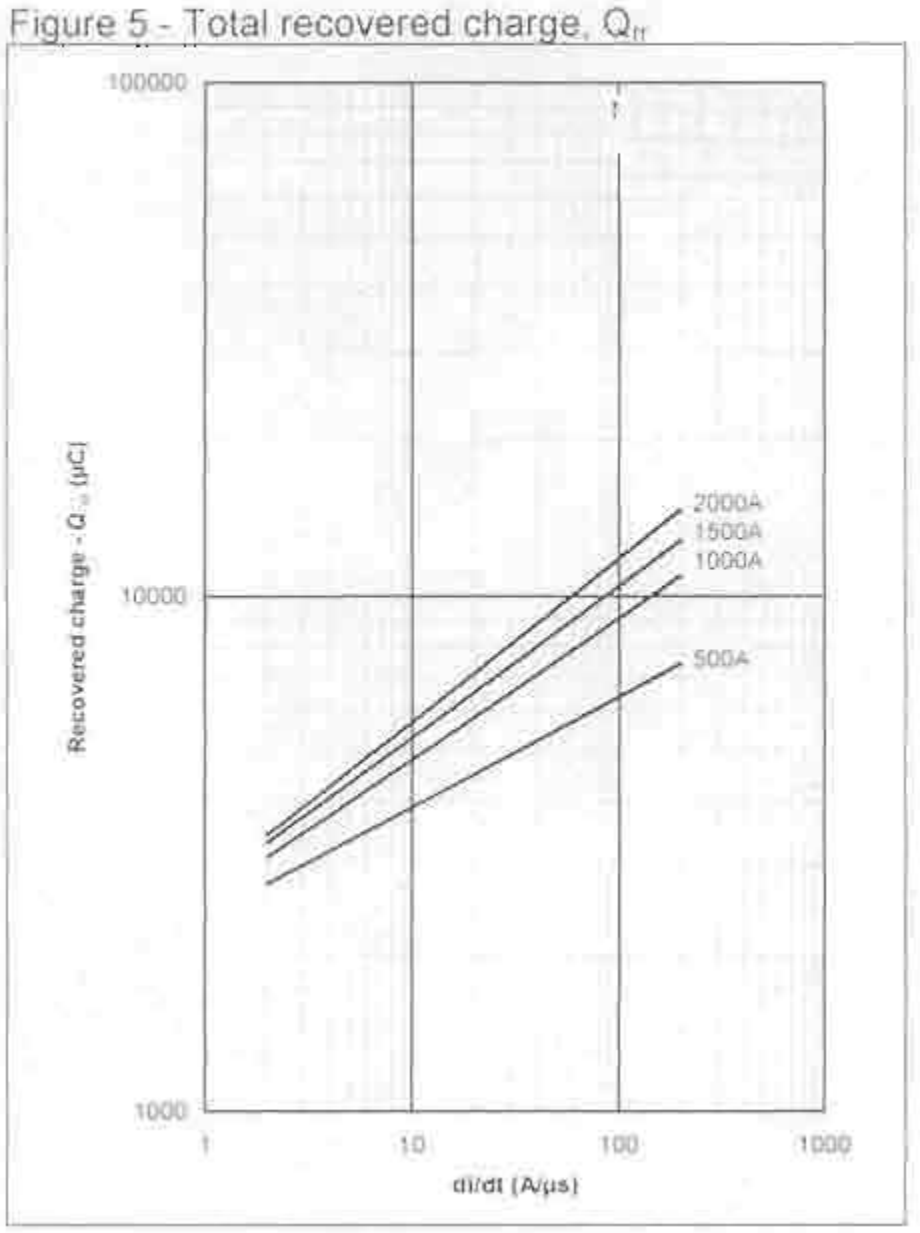

Figure 6 - Recovered charge, Q_{rr} (50% chord)

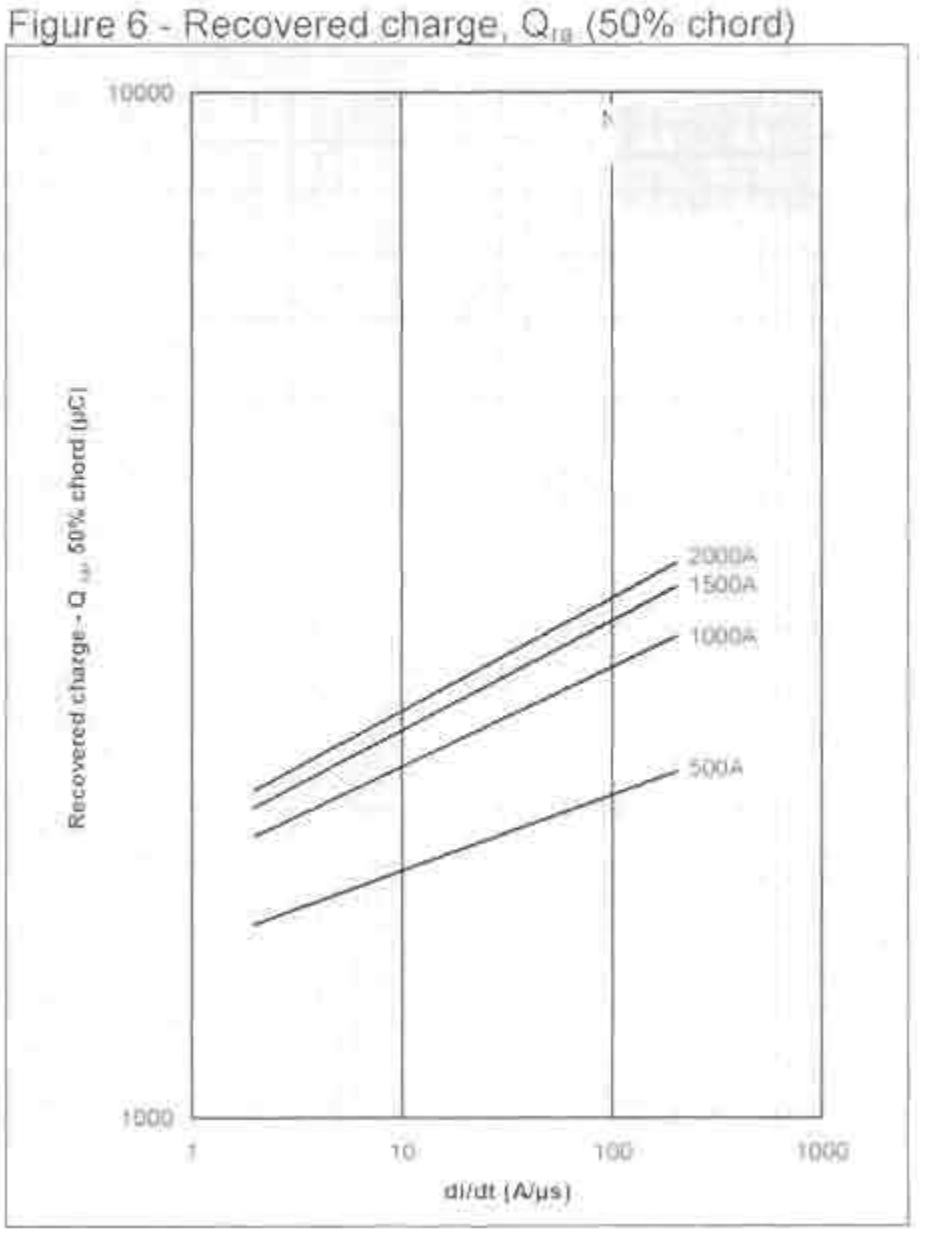

Figure 7 - Peak reverse recovery current, I_{rm}

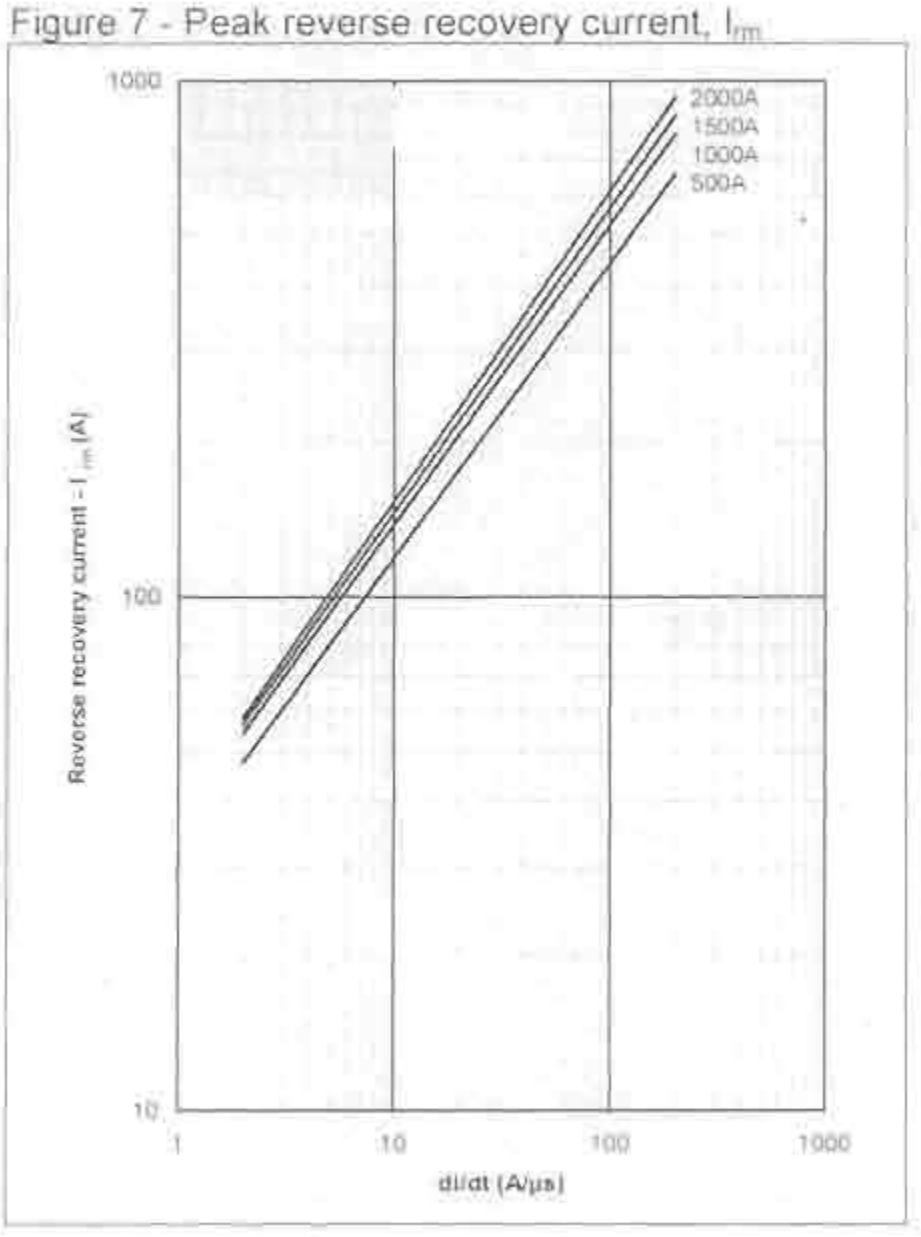

Figure 8 - Maximum recovery time, t_{rr} (50% chord)

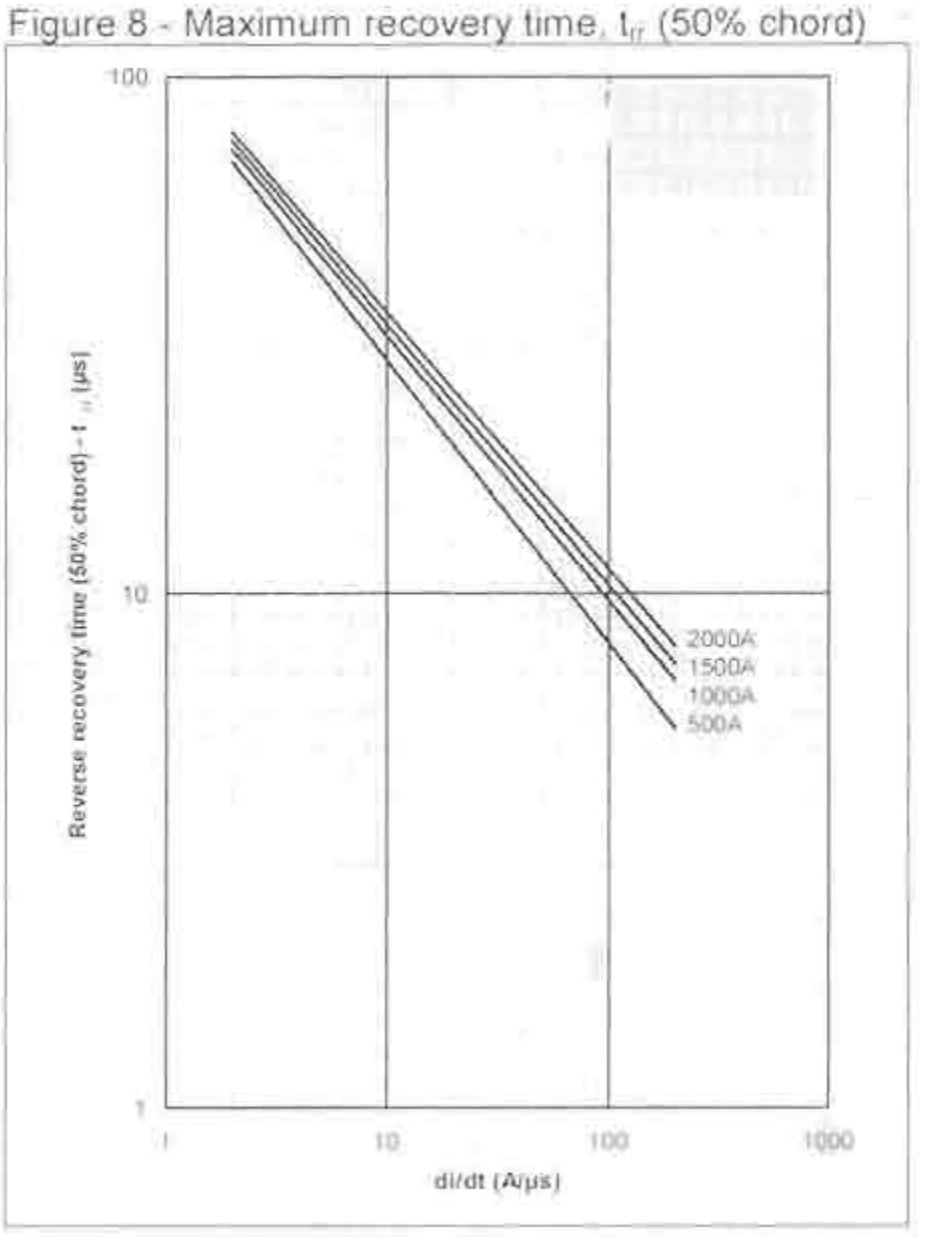

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Figure 9 – On-state current vs. Power dissipation – Double Side Cooled (Sine wave)

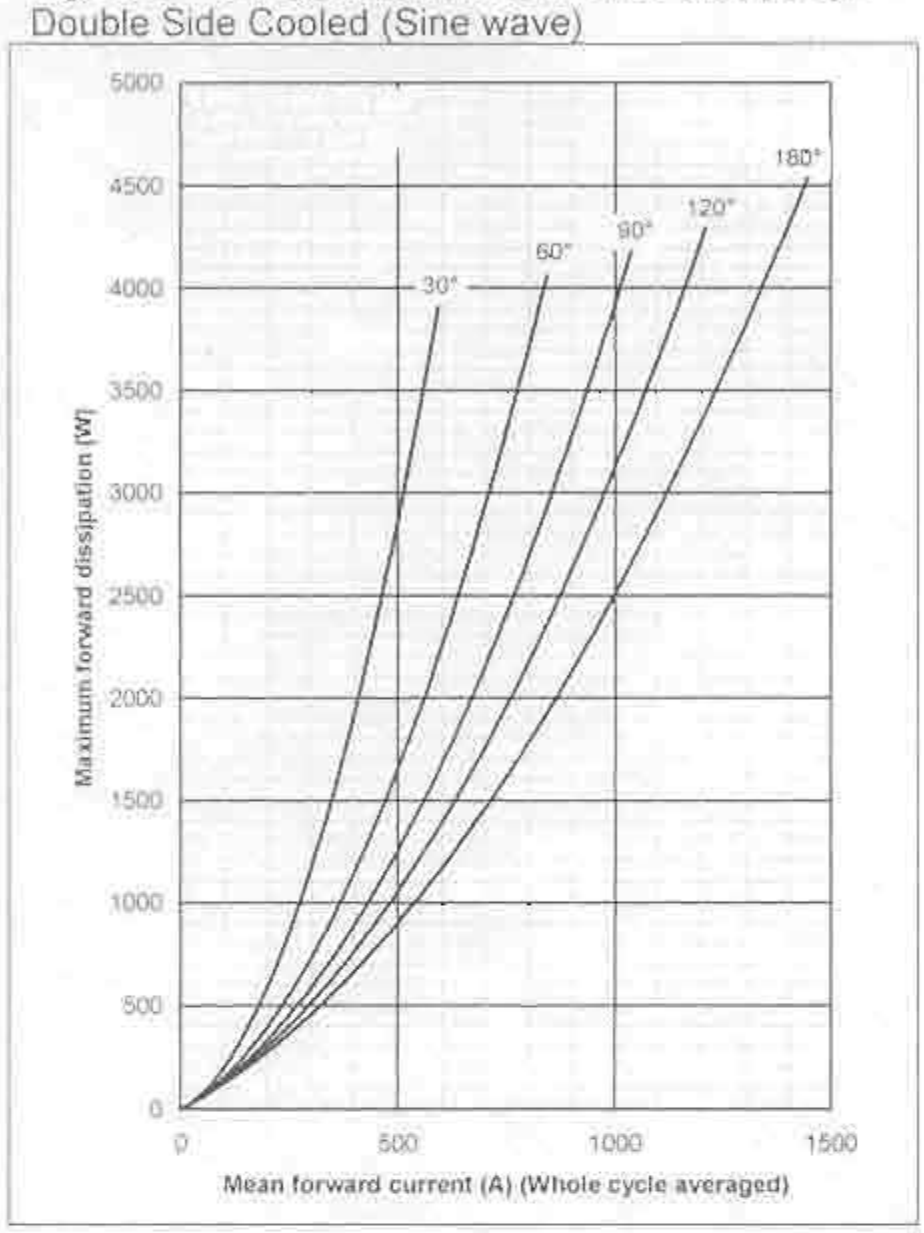

Figure 10 – On-state current vs. Heatsink temperature - Double Side Cooled (Sine wave)

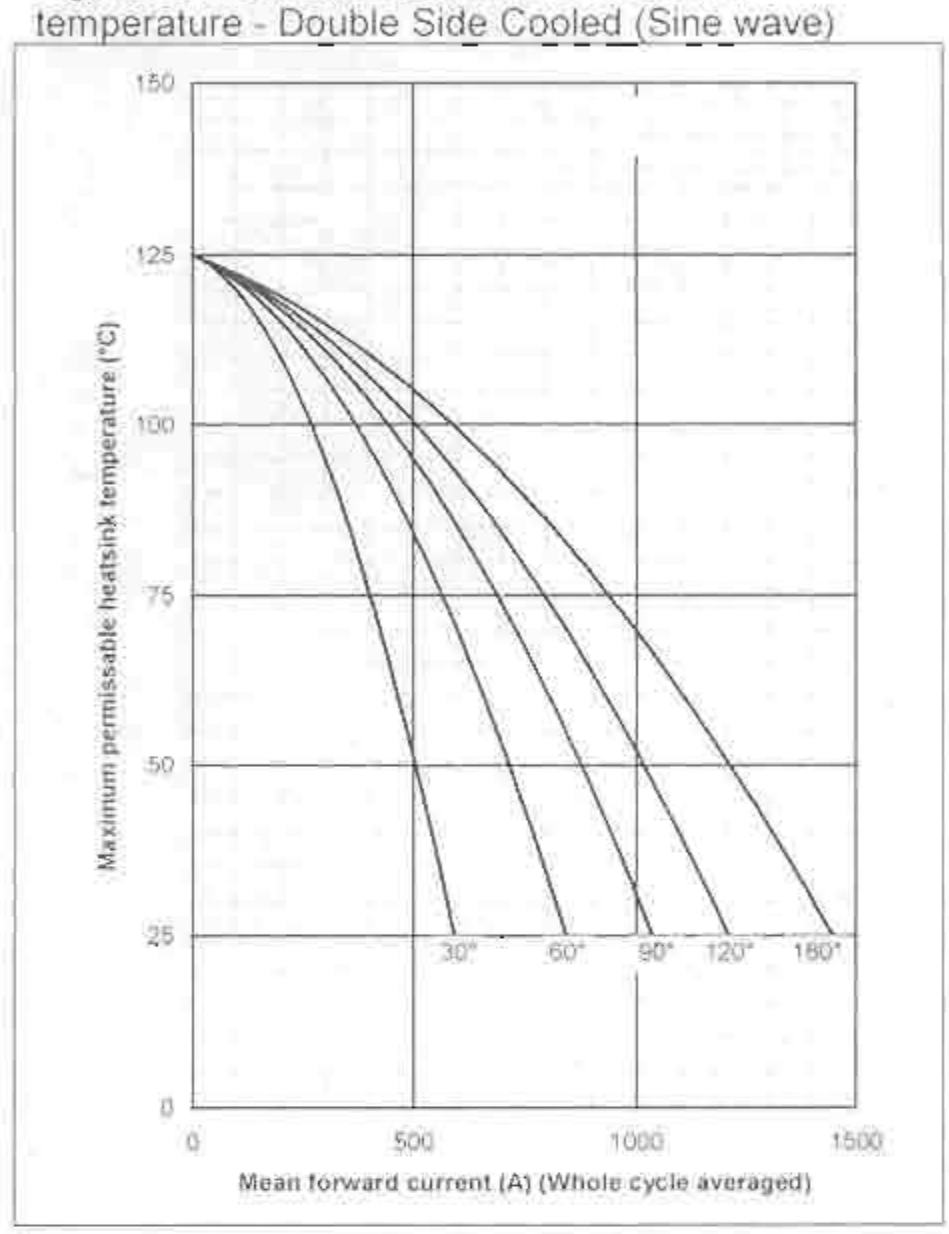

Figure 11 – On-state current vs. Power dissipation – Double Side Cooled (Square wave)

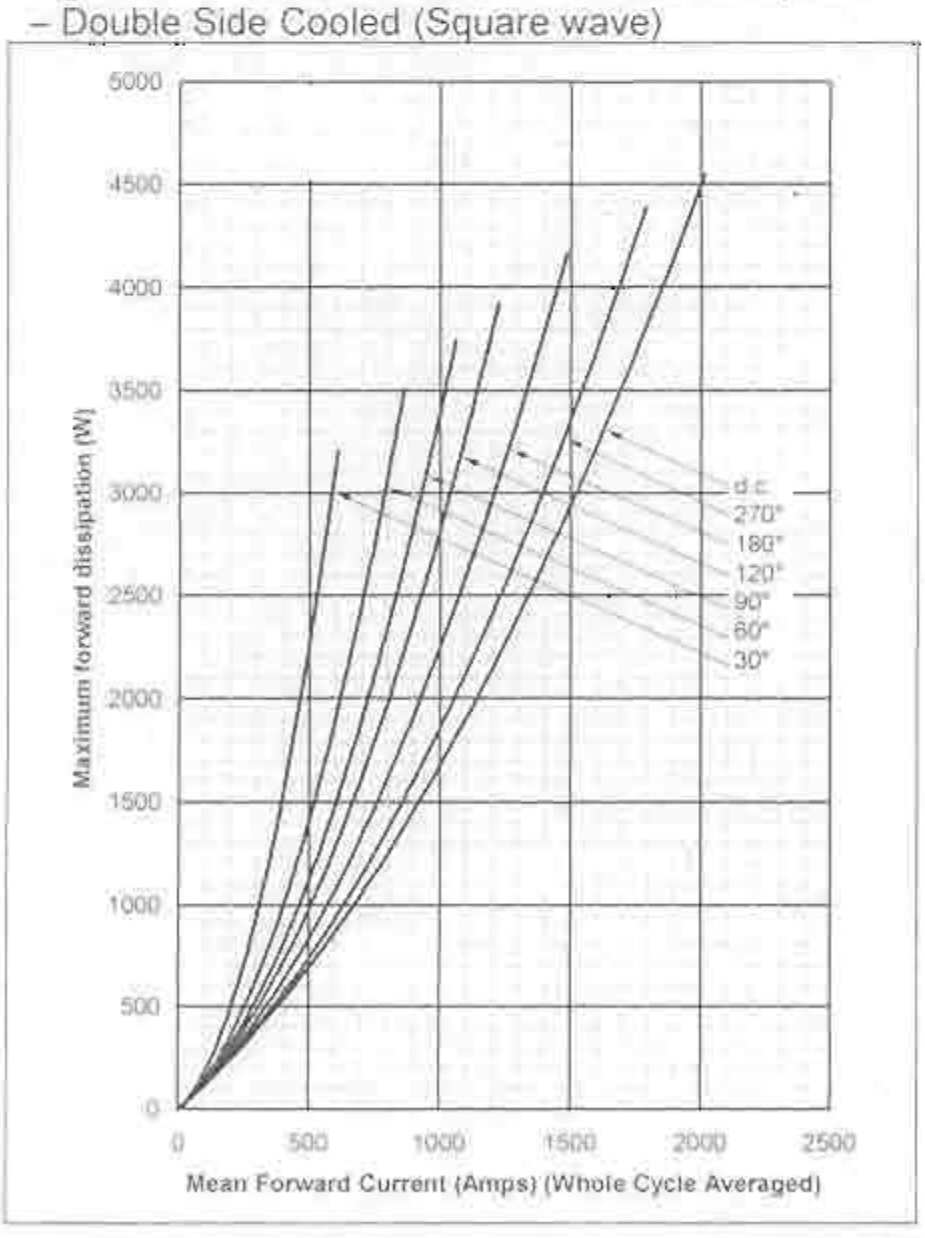

Figure 12 – On-state current vs. Heatsink temperature – Double Side Cooled (Square wave)

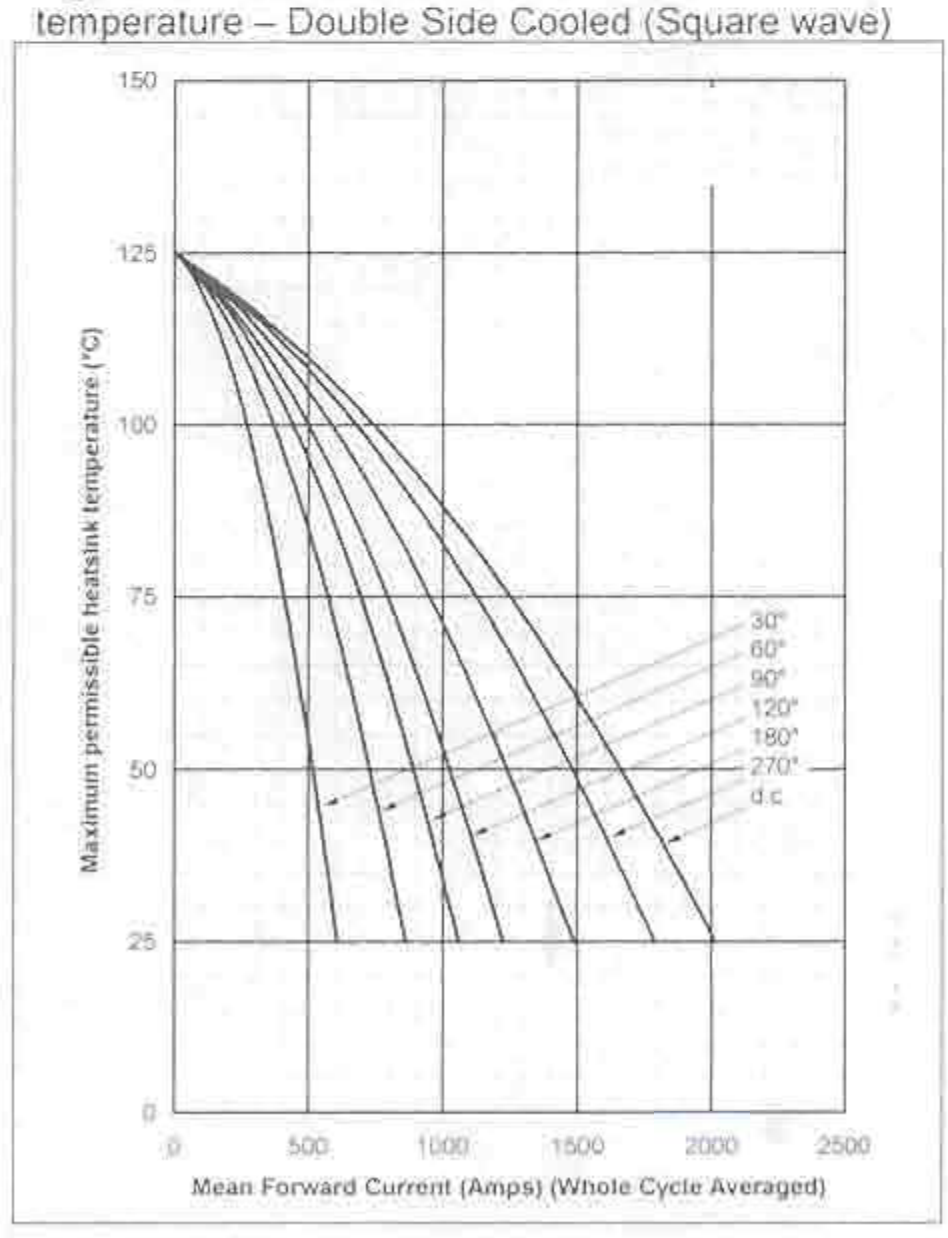

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Figure 13 – On-state current vs. Power dissipation – Single Side Cooled (Sine wave)

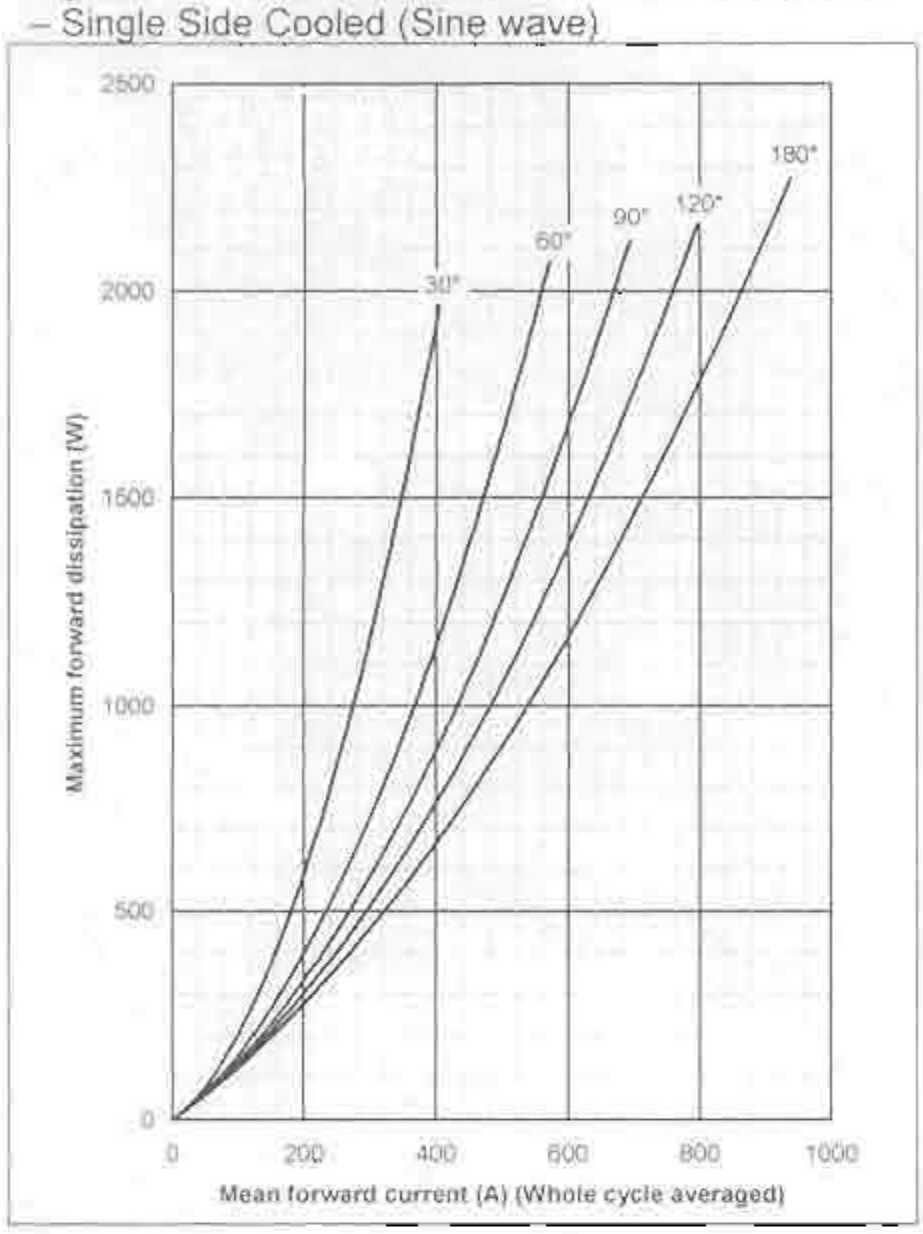

Figure 14 – On-state current vs. Heatsink temperature – Single Side Cooled (Sine wave)

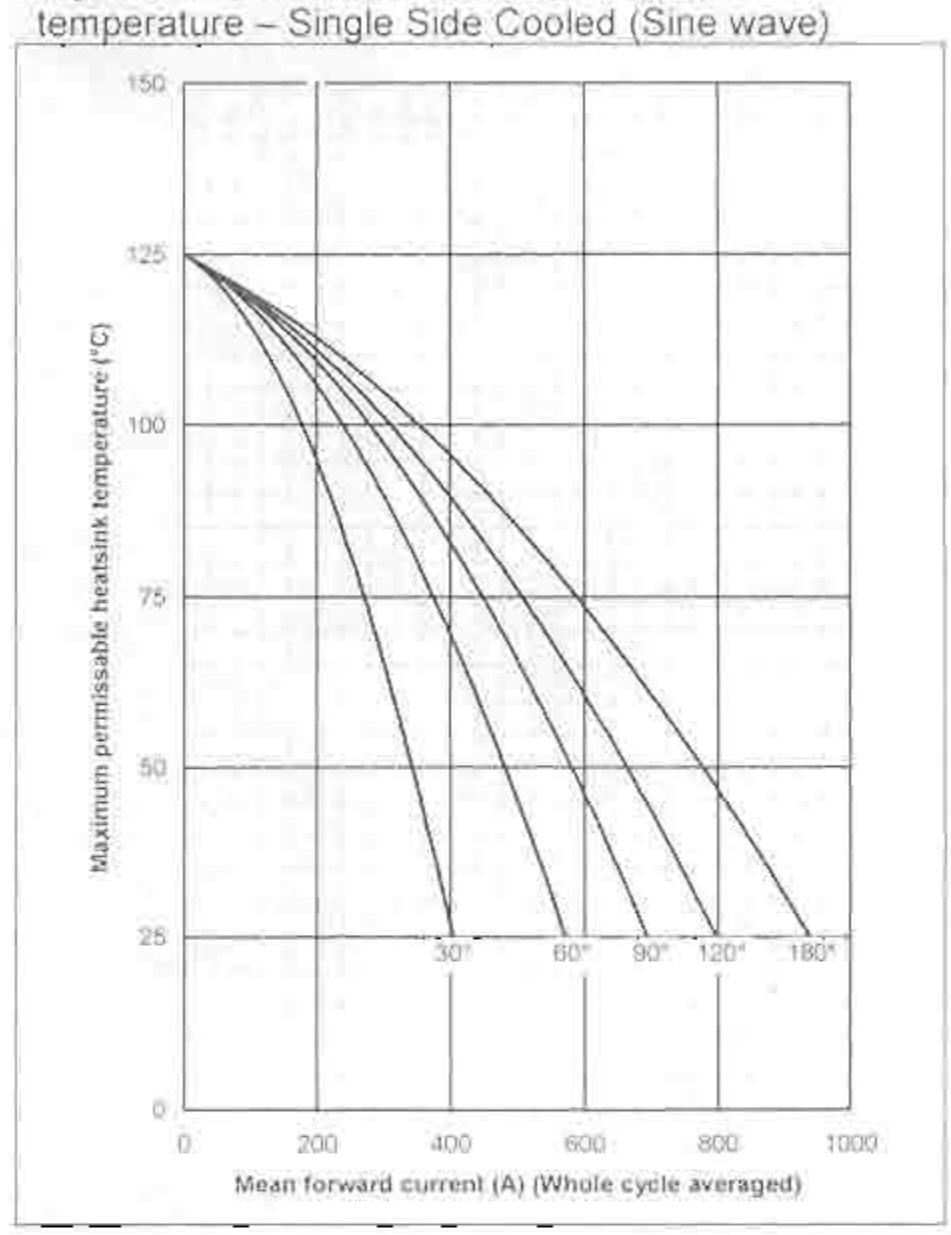

Figure 15 – On-state current vs. Power dissipation – Single Side Cooled (Square wave)

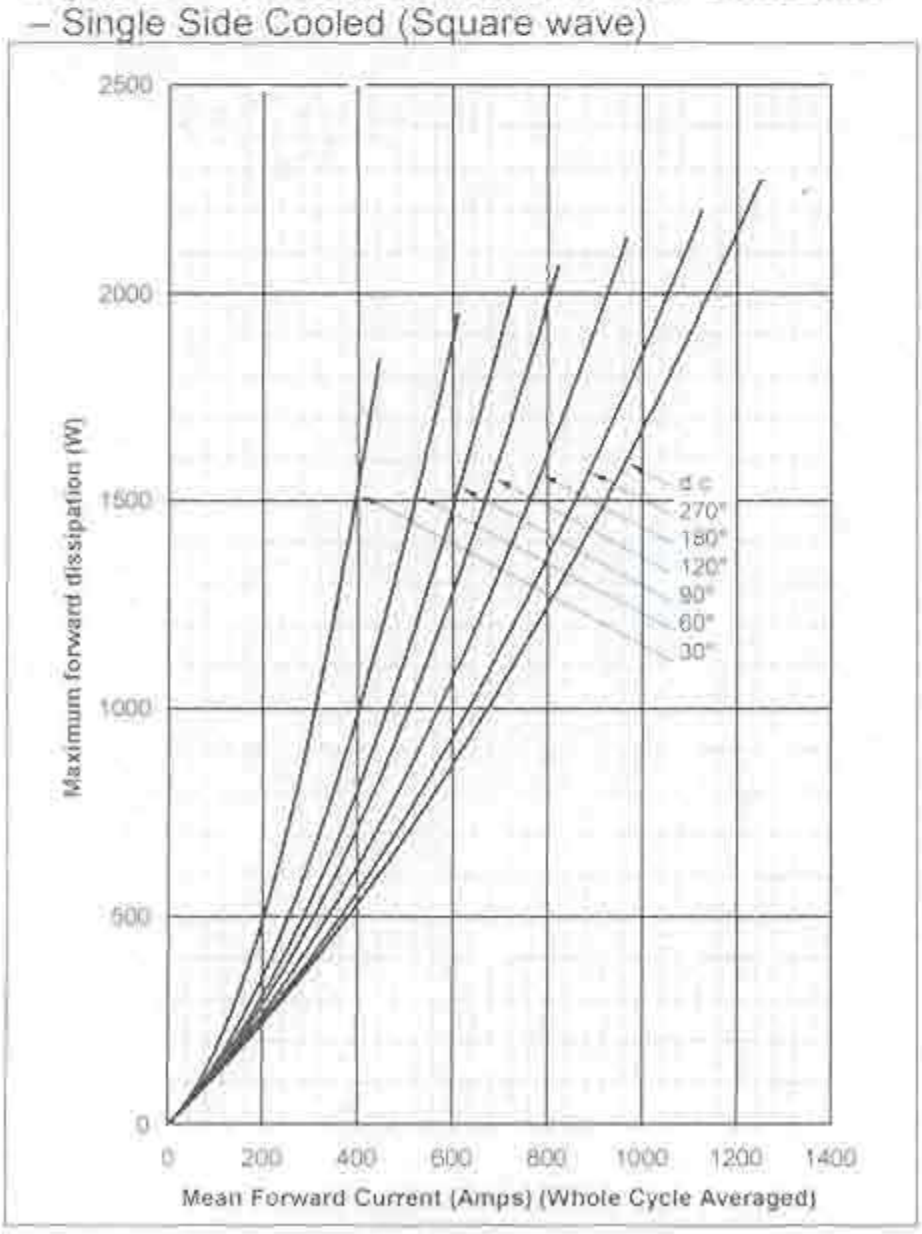

Figure 16 – On-state current vs. Heatsink temperature – Single Side Cooled (Square wave)

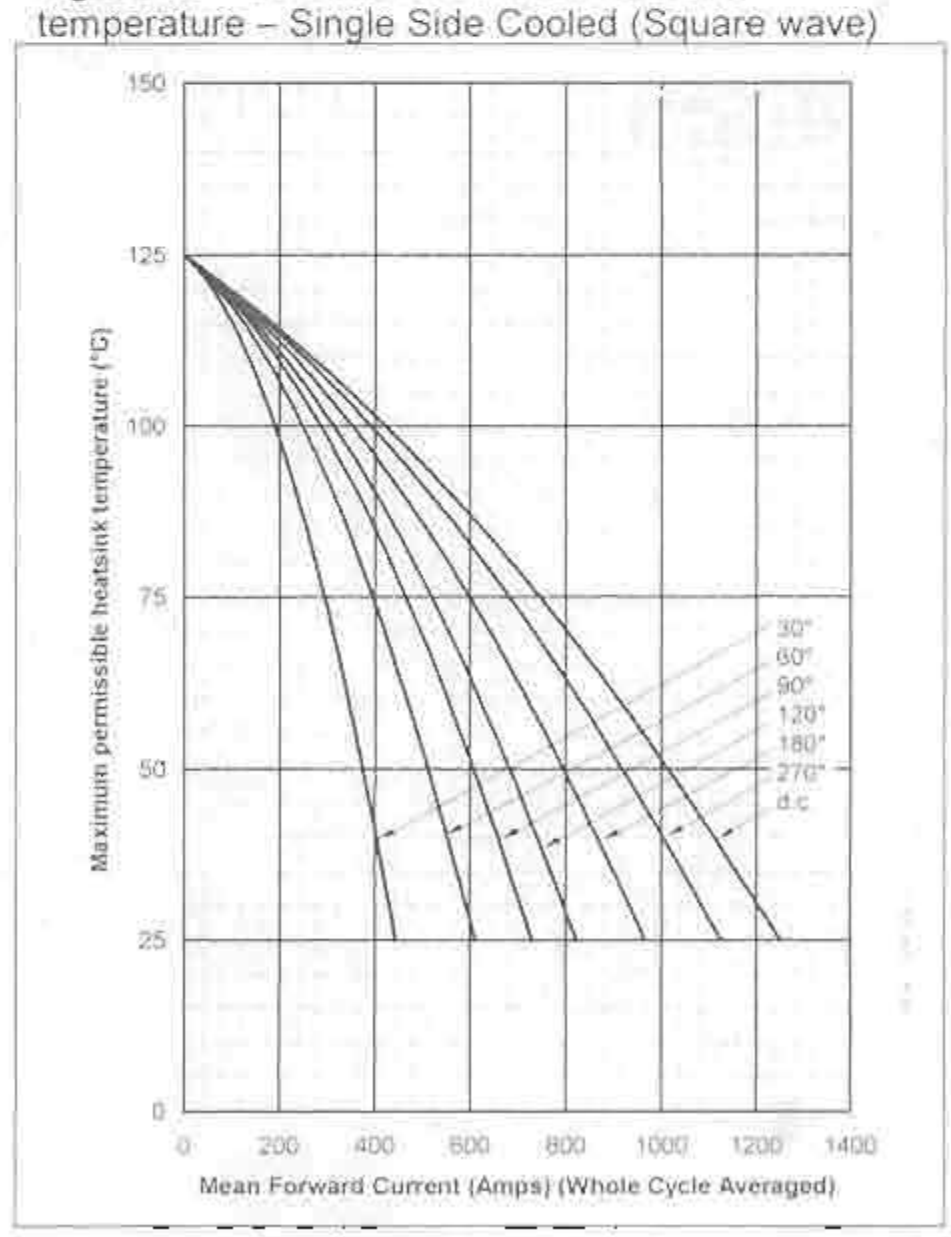

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Figure 17 - Maximum surge and I^2t Ratings