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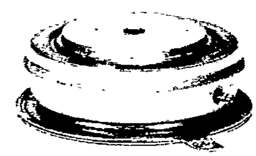
Data Sheet No. PD-3.066
T-25-20

INTERNATIONAL RECTIFIER IOR

865A RMS Fast Turn-Off Hockey Puk Thyristors

550PEF SERIES



Description

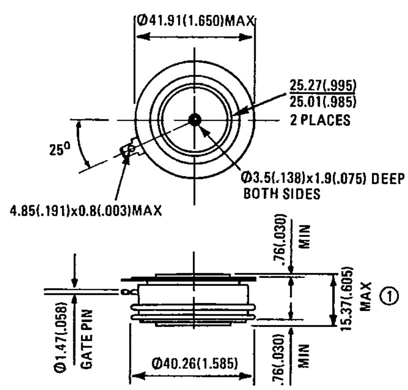
The 550PEF series of fast turn-off thyristors use centre amplified gate junction technology. These devices with their inherently fast switching characteristics combined with their excellent turn-off capabilities will find applications in inverters for UPS systems, AC motor drives, induction heating and choppers.

Features

- Centre Amplified Gate
- High di/dt and dv/dt capabilities
- High frequency operation
- Low switching losses
- High Surge capabilities
- Available up to 1200V V_{RRM}, V_{DRM}
- Fully characterised information
- Choice of turn-off time specification

Major ratings and characteristics

		550PEF......	Units
$I_{T(AV)}$		550	A
$I_{T(RMS)}$		865	A
I_{TSM}	50Hz	6300	A
	60Hz	6600	A
I^2t	50Hz	200,000	A^2s
	60Hz	181,000	A^2s
$I^2\sqrt{t}$		2 810 000	$A^2\sqrt{s}$
t_q		20	μs
V_{RRM}		100 to 1200	V
T_J		−40 to 125	°C



All dimensions in millimeters and (inches)
① - clamped dimension

ELECTRICAL SPECIFICATIONS

Forward conduction

Symbol	Parameter	550PEF......		Units	Conditions		
$I_{T(AV)}$	Average on-state current	550		A	180° conduction, half-sine wave, double side cooled, T_c = 55°C		
$I_{T(RMS)}$	Nominal continuous RMS on-state current	865		A			
I_{TRM}	Maximum peak repetitive on-state current	5090		A	30° sinusoidal conduction, T_c = 65°C		
	Mounting force ± 10%	8920(2000)	4460(1000)	N(lbf)			
I_{TSM}	Maximum peak, one cycle non repetitive on-state current	7500	7000	A	t = 10ms	No voltage reapplied	Sinusoidal half-wave Initial T_J = 125°C
		7850	7350	A	t = 8.3ms		
		6300	5900	A	t = 10ms	100% V_{RRM} reapplied	
		6600	6150	A	t = 8 3ms		
I^2t	Maximum I^2t for fusing	281 000	245 000	A^2s	t = 10ms	No voltage reapplied	Initial T_J = 125°C
		257 000	224 000	A^2s	t = 8 3ms		
		200 000	173 000	A^2s	t = 10ms	100% V_{RRM} reapplied	
		181 000	158 000	A^2s	t = 8 3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	2 810 000	2 450 000	$A^2\sqrt{s}$	t = 0.1 – 10ms, no voltage reapplied		
V_{TM}	Maximum peak on-state voltage	2.80		V	T_J = 25°C, 180° conduction, $I_{TM} = \pi \times I_{T(AV)}$ (1730A peak)		
di/dt	Maximum non-repetitive rate of rise of turned on current	800		A/µs	JEDEC STD RS 397, 5.2, 2.6. T_c = 125°C, V_{DM} = V_{DRM}, I_{TM}=1600A gate source 20V open circuit 20Ω, t_r=0.5µs, t_p= 20µs.		
I_H	Maximum holding current	600		mA	T_J = 25°C, anode supply = 6V, resistive load, gate open circuit		
I_L	Maximum latching current	1000		mA	T_J = 25°C, anode supply = 6V, resistive load		

Triggering

Symbol	Parameter	Value	Units	Conditions	
P_{GM}	Maximum peak gate power	10	W	t_p≥5ms	
$P_{G(AV)}$	Maximum average gate power	2	W		
I_{GM}	Maximum peak gate current	3	A		
V_{GM}	Maximum peak gate voltage	20	V		
$-V_{GM}$	Maximum peak negative gate voltage	5	V		
V_{GT}	Maximum gate voltage required to trigger	3.0	V	T_J = –40°C	Anode supply = 6V resistive load
		2.5	V	T_J = 25°C	
		1.7	V	T_J = 125°C	
I_{GT}	Maximum gate current required to trigger	400	mA	T_J = –40°C	Anode supply = 6V resistive load
		200	mA	T_J = 25°C	
		150	mA	T_J = 125°C	
V_{GD}	Maximum gate voltage that will not trigger	0.20	V	T_J = 125°C, rated V_{DRM} applied	

Switching

Symbol	Parameter	Value	Units	Conditions
t_d	Maximum delay time	0.96	µs	T_J = 25°C, V_D = 0.8 V_{DRM}, I_{TM} = 500A, gate source 20V open circuit, R_{source} = 20Ω, resistive load, t_r (pulse rise time) 0.5µs, t_p = 20µs
t_q	Turn-off time	See separate table		
$t_{q(diode)}$	Typical turn-off time with anti parallel diode	20% more than with VR≥50; see separate tables.	µs	T_J = 125°C, I_{TM} = 500A for 200µs, V_R = 1V, di/dt = –25 A/µs . reapplied dv/dt = 200V/µs linear to 0.8 V_{DRM}, V_g =0, R_{gk} =100Ω
Q_{rr}	Typical stored charge	47	µc	T_J = 125°C, I_{TM} = 400A, –di/dt = 100A/µs

Blocking

Symbol	Parameter	Value	Units	Conditions
dv/dt	Minimum critical rate of rise of off-state voltage	500	V/µs	T_J = 125°C, linear to 0.8 V_{DRM}, gate open circuit

Voltage ratings

Part number	V_{RRM}, maximum repetitive peak reverse voltage $V_g \leq 0$ T_J = –40°C to 125°C	V_{RSM}, maximum non-repetitive peak reverse voltage. T_J = 25 to 125°C	V_{DRM}, maximum repetitive peak off-state voltage, gate open circuit T_J = –40°C to 125°C	I_{RM}, I_{DM}, maximum peak reverse and off-state leakage current at V_{RRM}, V_{DRM}, T_J = 125°C, gate open circuit
	V	V	V	mA
550PEF10...	100	200	100	30
550PEF20...	200	300	200	30
550PEF40...	400	500	400	30
550PEF60...	600	700	600	30
550PEF80...	800	900	800	30
550PEF100...	1000	1100	1000	30
500PEF120...	1200	1300	1200	30

THERMAL AND MECHANICAL SPECIFICATIONS

			550PEF......		Units	Conditions
T_J	Junction operating temperature range		−40 to 125		°C	
T_{stg}	Storage temperature range		−40 to 150		°C	
R_{thJC}	Maximum thermal impedance, junction to case.	Single side cooled	0 08		K/W	DC Operation
		Double side cooled	0.04		K/W	
R_{thCS}	Maximum thermal resistance, one pole piece to one heat exchanger		0 04 (0 05)	0.03 (0 04)	K/W	Mounting surface smooth flat and greased (JEDEC STD RS-397, 7.9.4)
	Mounting force ± 10%		1000	2000	lbf	
			4460	8920	N	
W	Approximate weight		3		oz	
			85		g	

TURN-OFF TIME TABLE

Part number	Turn off code	tq Turn off time typical	tq Turn off time max	Units	Conditions	
550PEF...V..	20	17	20	μs	reapplied dv/dt = 20V/μs linear to 0 8 V_{DRM}	T_J = 125°C, I_{TM} = 500A for 200μs V_R = 50V $di/_{dt}$ = - 25A/μs V_g = 0V R_{gk} = 100Ω
	25	21	25	μs		
	30	26	30	μs		
550PEF. .W .	25	21	25	μs	reapplied dv/dt = 200V/μs linear to 0 8 V_{DRM}	
	30	26	30	μs		
	35	30	35	μs		

CODING

To complete code add $V_{RRM}/10$ and required turn-off code. i.e. for a 550PEF...... with V_{RRM} = 400V and t_q = 25μs with reapplied dv/dt = 200 V/μs complete part number is 550PEF40W25, but for 550PEF...... with same parameters except reapplied dv/dt = 20V/μs complete part number is 550PEF40V25.

INDEX TO GRAPHS

Graph Title — **Figure number**

Use of the Heatsink Selection Nomogram

These nomograms may be used to obtain rapidly the required sink to ambient thermal resistance for a particular application. The above example shows the method.

From the starting point A, the known average on-state current, proceed to point 'B', the operating conduction angle. At this point the maximum average power dissipation may be read off at C. If the maximum ambient temperature is known, proceed vertically from this figure at point E to cross the extension of line C–B at D. The thermal impedance may now be found by taking the lines on either side of point D and choosing the lower figure or by interpolation. The final figure is then found by subtracting the ΔR figure appropriate to the conduction angle in the right hand table.

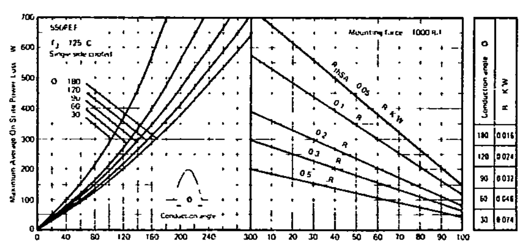


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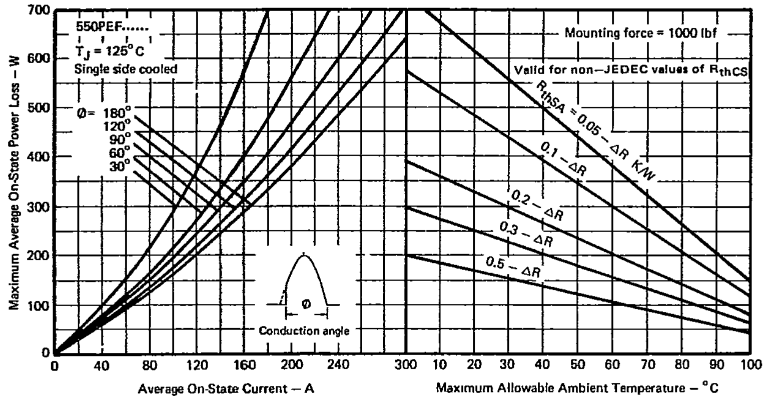
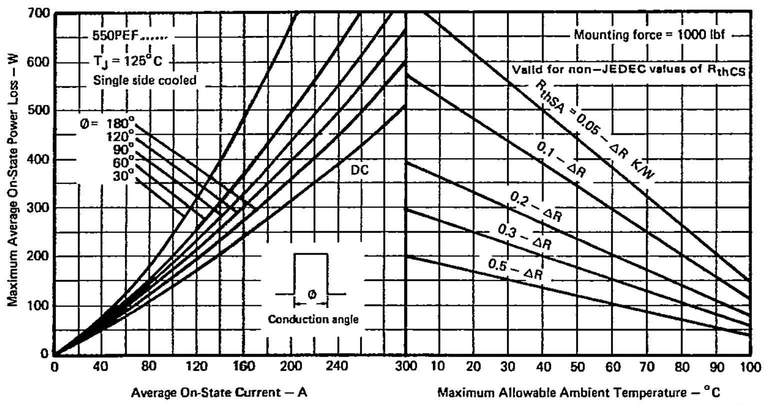
Fig. 1 — Current Ratings — sinusoidal waveforms, 50–400Hz



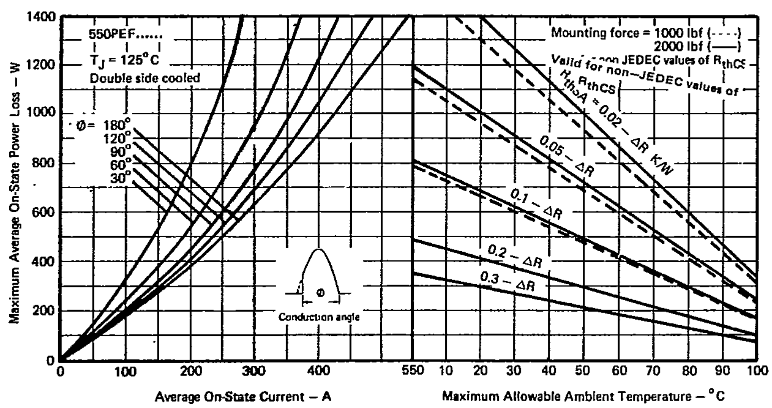
Conduction angle – Ø	ΔR – K/W
180°	0.016
120°	0.024
90°	0.032
60°	0.046
30°	0.074

Fig. 2 — Current Ratings — rectangular waveforms, 50–400Hz



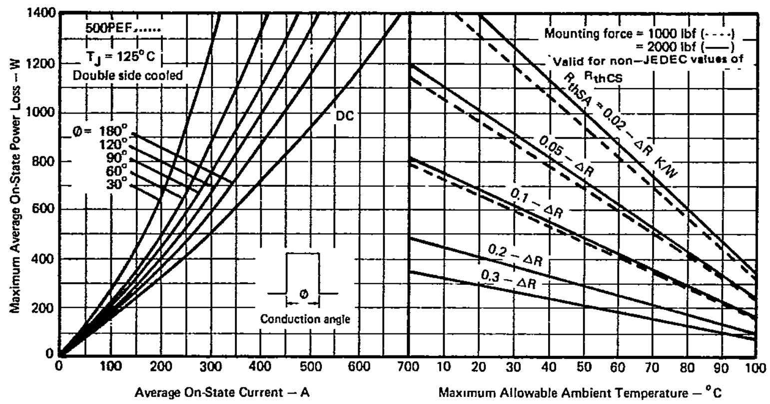
Conduction angle – Ø	ΔR – K/W
DC	0
180°	0.011
120°	0.016
90°	0.022
60°	0.030
30°	0.051

Fig. 3 — Current Ratings — sinusoidal waveforms, 50–400Hz



Conduction angle – Ø	ΔR – K/W
180°	0.008
120°	0.012
90°	0.016
60°	0.023
30°	0.037

Fig. 4 — Current Ratings — rectangular waveforms, 50—400Hz



Conduction angle – Ø	ΔR – K/W
DC	0
180°	.0056
120°	0.008
90°	0.011
60°	0.015
30°	0.025

Fig. 5 — Case Temperature Ratings

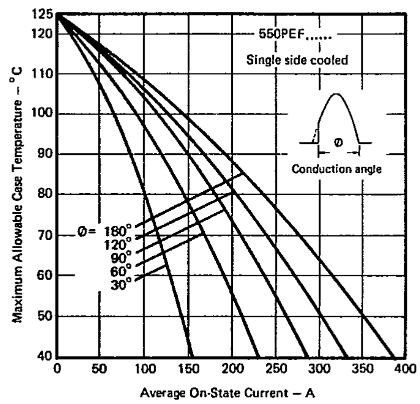


Fig. 6 — Case Temperature Ratings

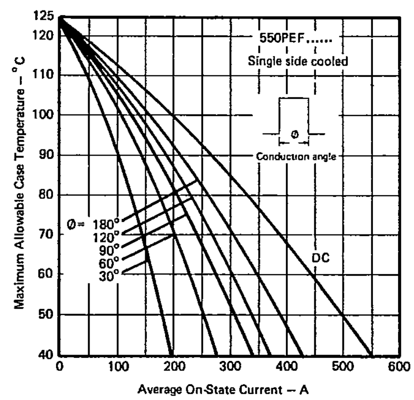


Fig. 7 — Case Temperature Ratings

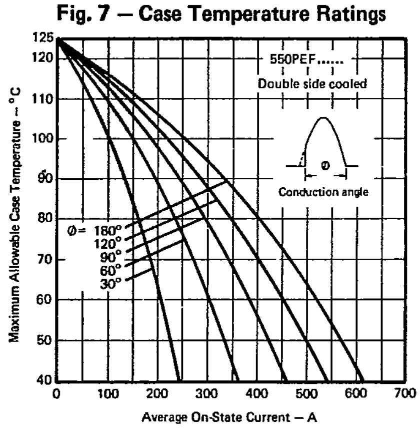


Fig. 8 — Case Temperature Ratings

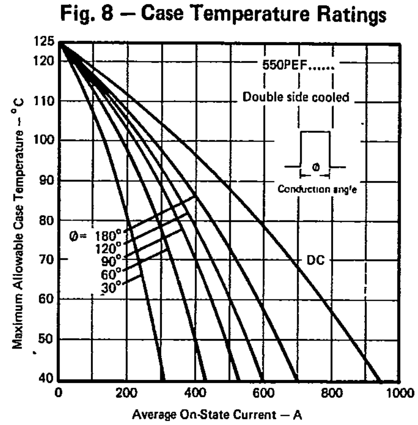


Fig. 9 — Power Loss Characteristics

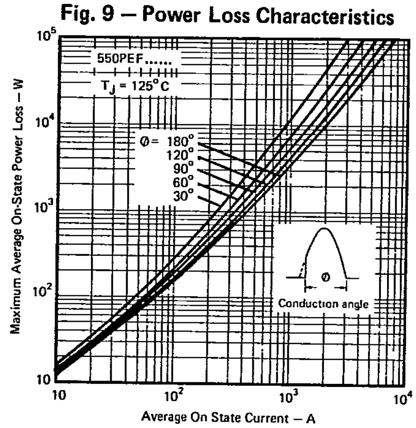


Fig. 10 — Power Loss Characteristics

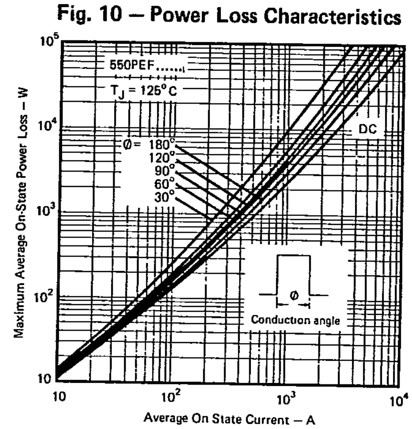


Fig. 11 — On State Characteristics

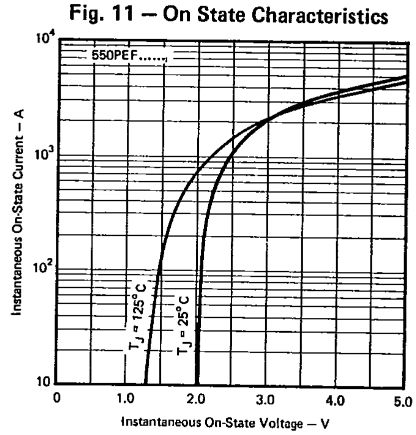


Fig. 12 — Energy Loss per Pulse Characteristics — sinusoidal waveforms

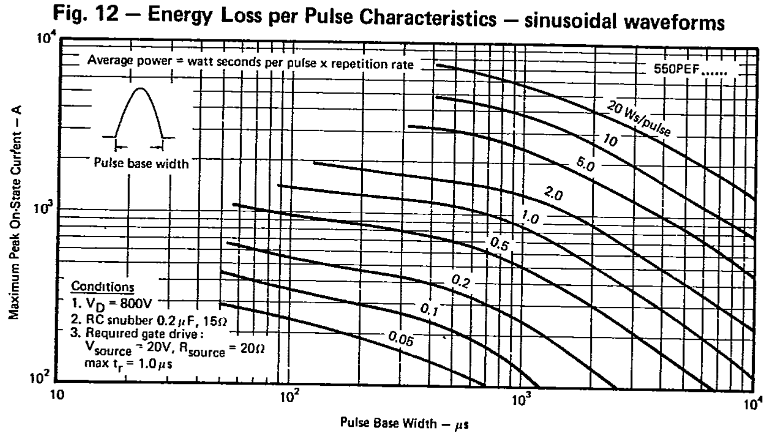


Fig. 13 — Energy Loss per Pulse Characteristics — trapezoidal waveforms

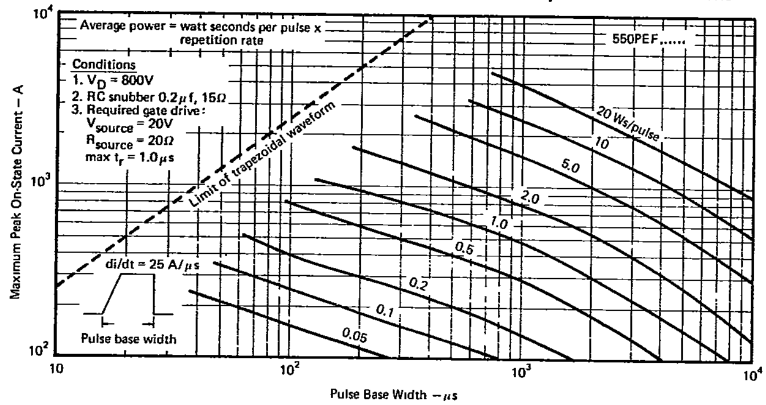


Fig. 14 — Energy Loss per Pulse Characteristics — trapezoidal waveforms

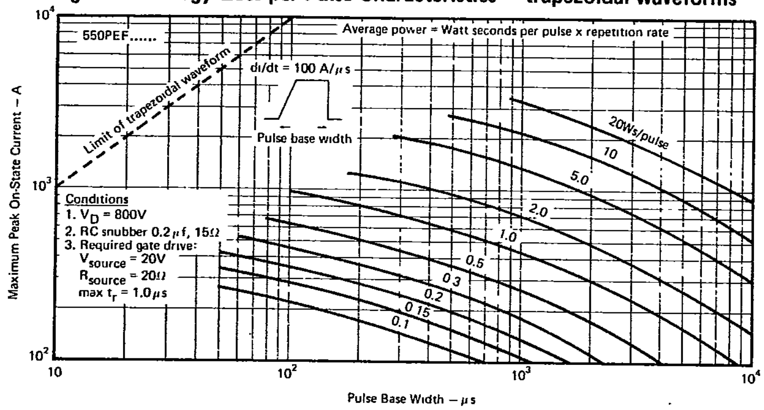


Fig. 15 — Peak On-State vs Pulse Width — sinusoidal waveforms

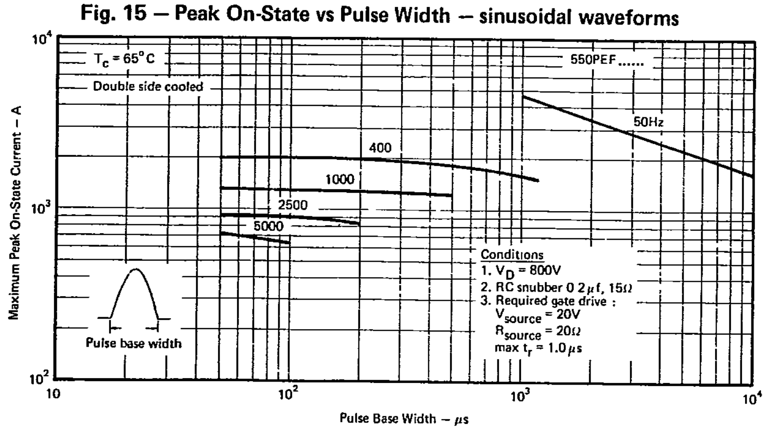


Fig. 16 – Peak On-State Current vs Pulse Width – sinusoidal waveforms

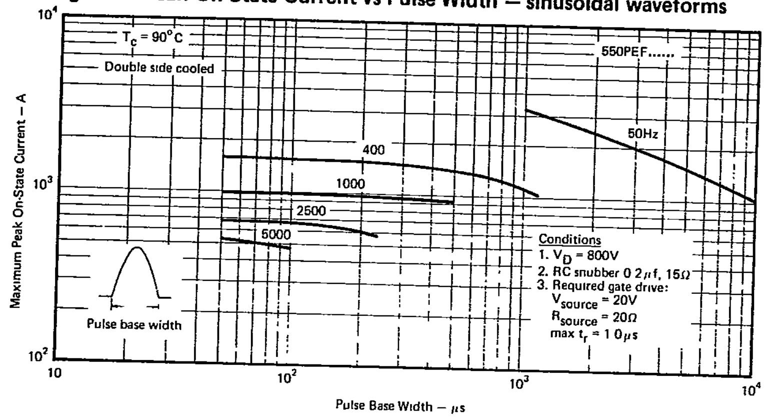


Fig. 17 – Peak On-State Current vs di/dt – trapezoidal waveforms

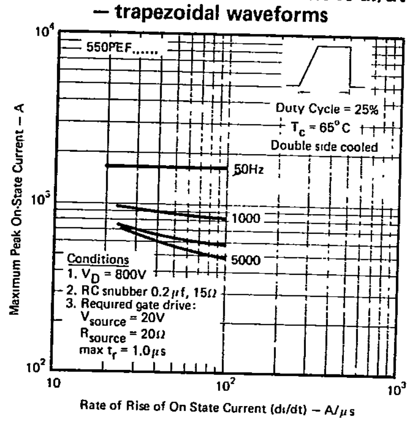


Fig. 18 – Peak On-State Current vs di/dt – trapezoidal waveforms

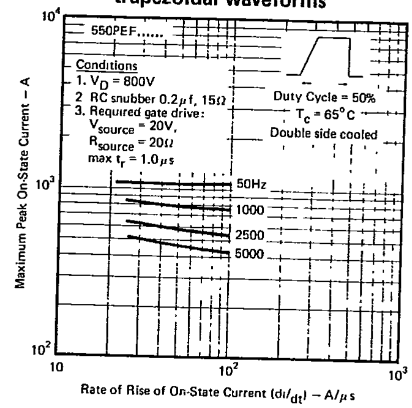


Fig. 19 – Peak On-State Current vs di/dt – trapezoidal waveforms

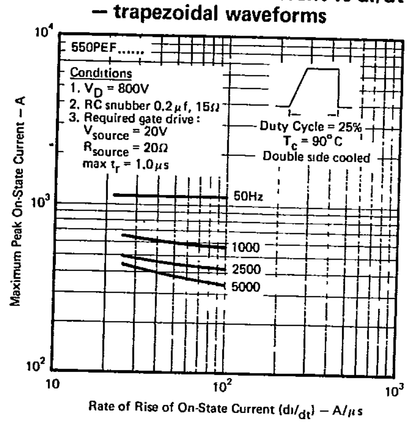


Fig. 20 – Peak On-State Current vs di/dt – trapezoidal waveforms

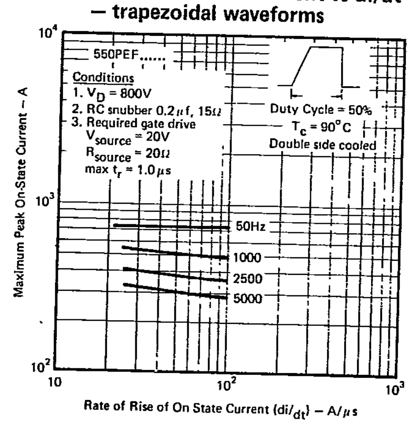


Fig. 21 — Peak On-State Current vs Frequency — sinusoidal waveforms

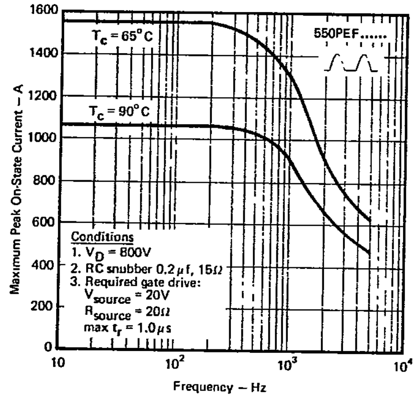


Fig. 22 — Peak On-State Current vs Frequency — trapezoidal waveforms

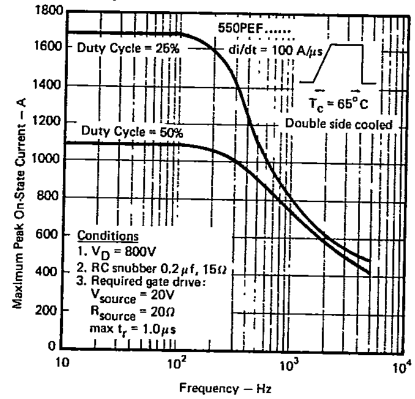


Fig. 23 — Peak On-State Current vs Frequency — trapezoidal waveforms

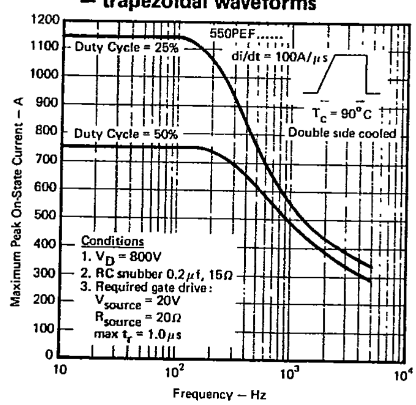


Fig. 24 — Gate Characteristics

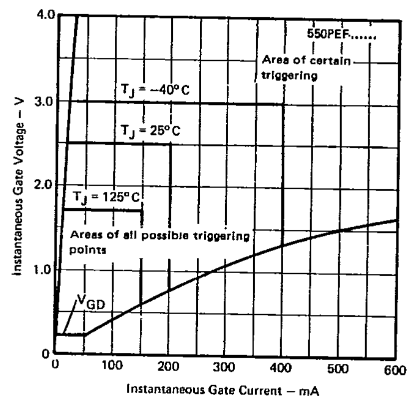


Fig. 25 — Transient Thermal Impedance

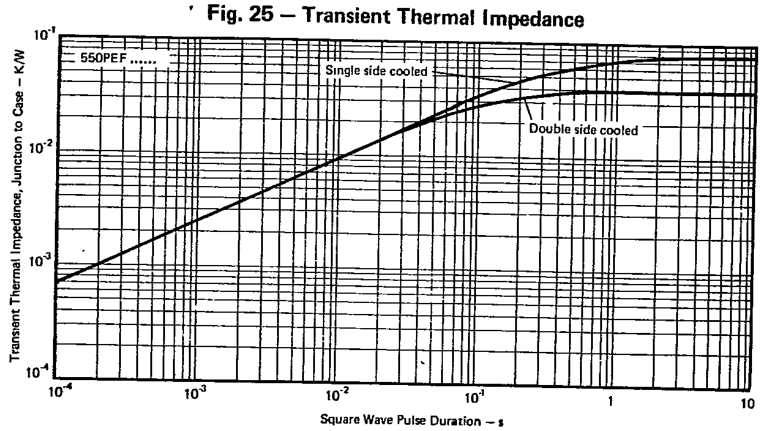


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Fig. 26 — Non-Repetitive Surge Ratings

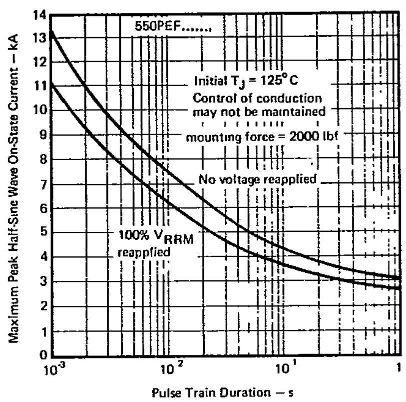


Fig. 27 — Non-Repetitive Surge Ratings

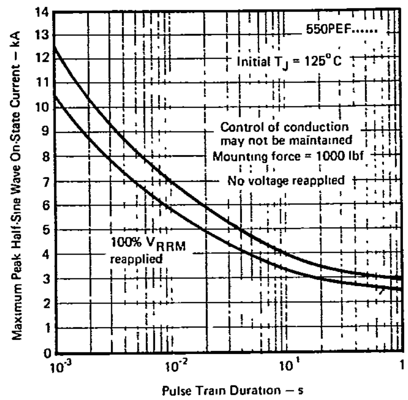


Fig. 28 — Typical Stored Charge Characteristics — sinusoidal waveforms

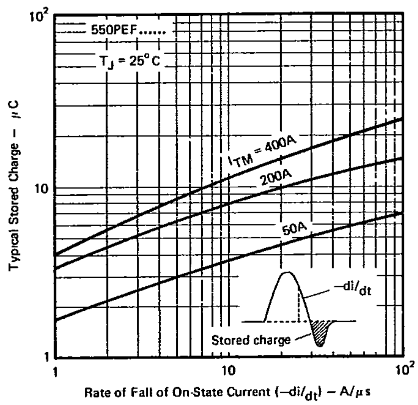
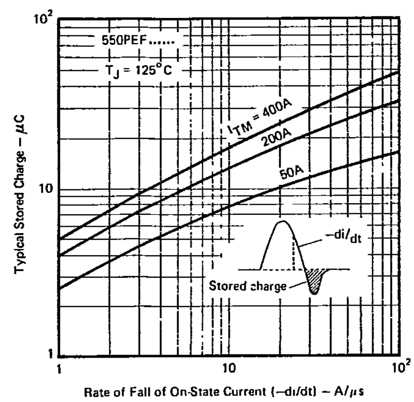


Fig. 29 — Typical Stored Charge Characteristics — sinusoidal waveforms



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