4855452 INTERNATIONAL RECTIFIER 55C 04843 D

Data Sheet No. PD-3.176

T-25-15

INTERNATIONAL RECTIFIER IOR

10RIF,16RIF,20RIF SERIES

16A,25A,32A RMS Medium Power Fast Turn-off Thyristors

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Major Ratings and Characteristics

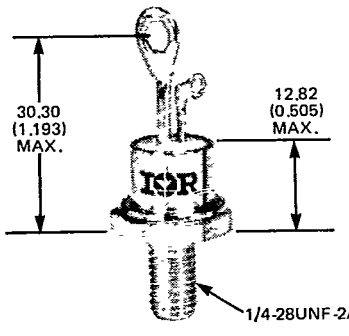
		10RIF	16RIF	20RIF	Units
$I_{T(AV)}$ @ T_C		10	16	20	A
		85	85	85	°C
I_{TSM}	50Hz	100	200	250	A
	60Hz	105	209	261	A
I^2t	50Hz	50	200	312	A^2s
	60Hz	46	183	285	A^2s
$I^2\sqrt{t}$		707	2828	4412	$A^2\sqrt{s}$
Max. t_q range		10 to 40			μs
V_{RRM} range		100 to 1200			V
T_J		−40 to 125			°C

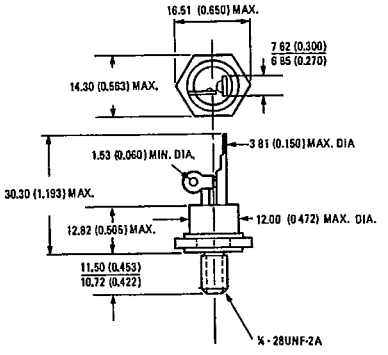
Description/Features

The 10RIF, 16RIF and 20RIF series of fast turn-off thyristors are suitable for applications such as inverters, switch mode power supplies and choppers.

- Fully characterised data.
- High surge capability.
- Available up to 1200V V_{DRM}, V_{RRM}.
- Turn-off time as short as 10μs.

CASE STYLES AND DIMENSIONS





Conforms to JEDEC outline TO-208AA (TO-48)
Dimensions in Millimetres and (Inches)

10RIF, 16RIF, 20RIF Series

T-25-15

Voltage ratings

Part number			V_{RRM}, max. repetitive peak reverse voltage $V_g \leq 0$	V_{RSM}, max. non-repetitive peak reverse voltage	V_{DRM}, max. repetitive peak off-state voltage, gate open circuit	I_{RM}, I_{DM}, max. peak reverse and off-state leakage current at V_{RRM}, V_{DRM}, $T_J = 125^oC$, gate open circuit
			V	V	V	mA
10RIF10W..	16RIF10W..	20RIF10W..	100	150	100	10
10RIF20W..	16RIF20W..	20RIF20W..	200	300	200	10
10RIF40W..	16RIF40W..	20RIF40W..	400	500	400	10
10RIF60W..	16RIF60W..	20RIF60W..	600	700	600	10
10RIF80W..	16RIF80W..	20RIF80W..	800	900	800	10
10RIF100W..	16RIF100W..	20RIF100W..	1000	1100	1000	10
10RIF120W..	16RIF120W..	20RIF120W..	1200	1300	1200	10

Forward Conduction

		10RIF	16RIF	20RIF	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	10	16	20	A	180° conduction, half-sine wave, $T_C = 85^oC$		
$I_{T(RMS)}$	Max. continuous RMS on-state current	16	25	32	A			
I_{TSM}	Max. peak, one cycle non-repetitive on-state current	100	200	250	A	t = 10ms	100% V_{RRM} reapplied	Sinusoidal half-wave. $T_J = 125^oC$
		105	209	261	A	t = 8.3ms		
		119	238	297	A	t = 10ms	No voltage reapplied	
		124	249	311	A	t = 8.3ms		
I^2t	Max. I^2t capability for fusing	50	200	312	A^2s	t = 10ms	100% V_{RRM} reapplied	Initial $T_J = 125^oC$
		46	183	285	A^2s	t = 8.3ms		
	Max. I^2t capability for individual device fusing	71	283	441	A^2s	t = 10ms	No voltage reapplied	
		65	258	403	A^2s	t = 8.3ms		
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ capability, for individual device fusing	707	2828	4412	$A^2\sqrt{s}$	t = 0.1 – 10ms, no voltage reapplied		
V_{TM}	Max. peak on-state voltage	2.0	2.0	2.0	V	$T_J = 25^oC$, 180° conduction, $I_{TM} = \pi \times I_{T(AV)}$		
di/dt	Max. non-repetitive rate-of-rise of turned on current	200			A/μs	600V	$T_J = 125^oC$, V_{DM} = 0.67 rated V_{DRM}, I_{TM} = 2 x rated di/dt, I_g = 250mA, $t_r \leq 0.5$ μs. For repetitive value use 40% non-repetitive. Per JEDEC Standard RS-397, 5.2.2.6.	
		180			A/μs	800V		
		160			A/μs	1000V		
		150			A/μs	1200V		
$V_{T(TO)}$	Max. value of threshold voltage	1.310	1.240	1.180	V	$T_J = 125^oC$		
r_T	Max. value of on-state slope resistance	15.89	13.63	11.84	mΩ			
I_H	Max. holding current	100			mA	$T_J = 25^oC$, anode supply = 6V, resistive load, gate open circuited		
I_L	Max. latching current	200			mA	$T_J = 25^oC$, anode supply = 6V, resistive load		

Triggering

P_{GM}	Max. peak gate power	8	W			
$P_{G(AV)}$	Max. average gate power	2.0	W			
I_{GM}	Max. peak gate current	1.5	A			
$-V_{GM}$	Max. peak negative gate voltage	10	V			
V_{GT}	Max. gate voltage required to trigger	3	V	$T_J = -40^oC$	Anode supply = 6V resistive load	
		2	V	$T_J = 25^oC$		
		1	V	$T_J = 125^oC$		
I_{GT}	Max. gate current required to trigger	90	mA	$T_J = -40^oC$	Anode supply = 6V resistive load	
		60	mA	$T_J = 25^oC$		
		35	mA	$T_J = 125^oC$		

T-25-15

Triggering (continued)

V_{GD}	Max. gate voltage that will not trigger	0.2	V	T_J = 125°C, rated V_{DRM} applied
I_{GD}	Max. gate current that will not trigger	2.0	mA	T_J = 125°C, rated V_{DRM} applied

Switching

$t_d + t_r$	Typical turn-on time	0.9	µs	T_J = 25°C, V_D = 0.8 V_{DRM}, I_{TM} = $I_{T(AV)}$, resistive load I_g = 250mA, $t_r < 0.5$ µs, $t_p > 6$ µs
t_q	Max. turn-off time	see separate table		See Page A-51.

Blocking

dv/dt	Min. critical rate-of-rise of off-state voltage	500	V/µs	T_J = 125°C, exponential to 0.67 rated V_{DRM}, gate open circuited

THERMAL AND MECHANICAL SPECIFICATIONS

			10RIF	16RIF	20RIF	Units	Conditions
T_J	Junction operating temperature range		-40 to 125			°C	
T_{stg}	Storage temperature range		-40 to 150			°C	
R_{thJC}	Max. thermal resistance, junction-to-case		1.95	1.15	0.92	K/W	DC Operation
R_{thCS}	Max. thermal resistance, case-to-heatsink		0.35			K/W	Mounting surface flat, smooth and greased.
T	Mounting torque ± 10%	to nut	20(27.5)			lbf.in	Lubricated threads
			0.23(0.32)			kgf.m	
			2.3(3.1)			Nm	(Non-lubricated threads)
		to device	25			lbf.in	Lubricated threads
			0.29			kgf.m	
			2.8			Nm	
wt	Approximate weight		0.49			oz	
			14			g	
	Case style		TO-208AA (TO-48)				JEDEC

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MAXIMUM TURN-OFF TIME TABLE

t_q	Units	t_q code	max. V_{DRM}, V_{RRM}	Conditions
10	µs	10	600V	T_J = 125°C, I_{TM} = rated $I_{T(AV)}$ for > 200 µs, -di/dt = 10 A/µs, V_R = 100V, reapplied dv/dt = 200 V/µs exponential to 0.67 V_{DRM}
15	µs	15	600V	
20	µs	20	1000V	
40	µs	40	1200V	

T-25-15

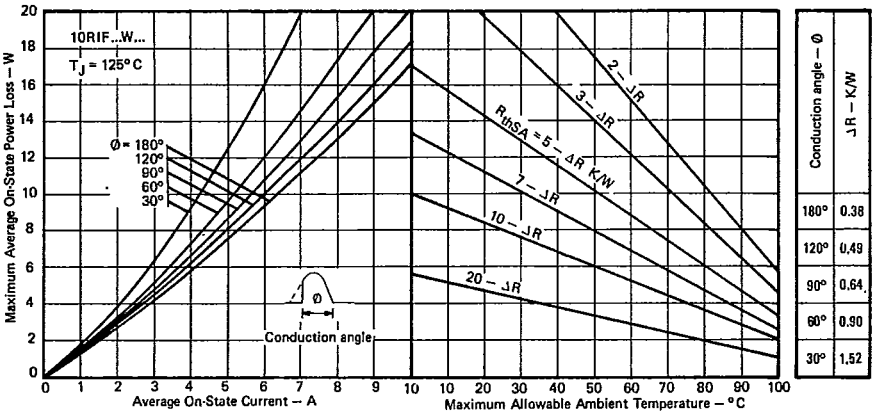

Fig. 1 – Current Ratings (Sinusoidal Waveforms, 50–400 Hz), 10RIF Series.

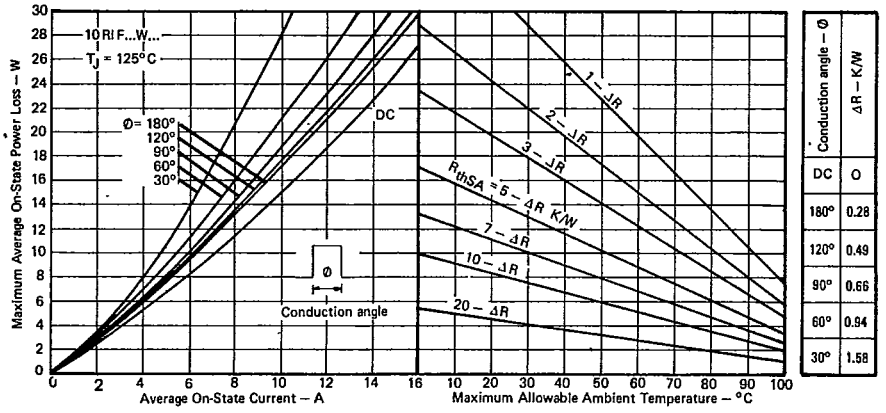

Fig. 2 – Current Ratings (Sinusoidal Waveforms, 50–400 Hz), 10RIF Series.

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T-25-15

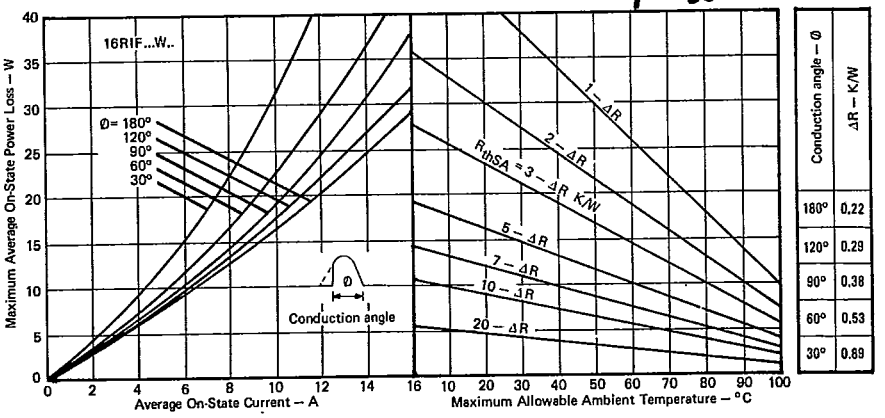

Fig. 3 – Current Ratings (Sinusoidal Waveforms, 50–400 Hz), 16RIF Series.

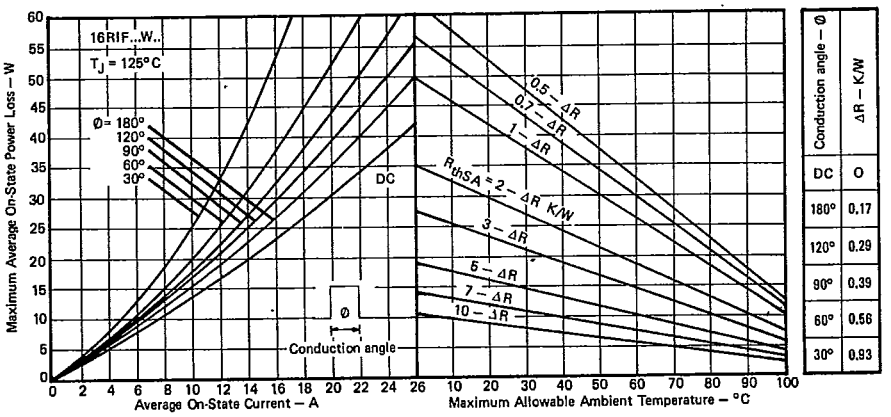

Fig. 4 – Current Ratings (Rectangular Waveforms, 50–400 Hz), 16RIF Series.

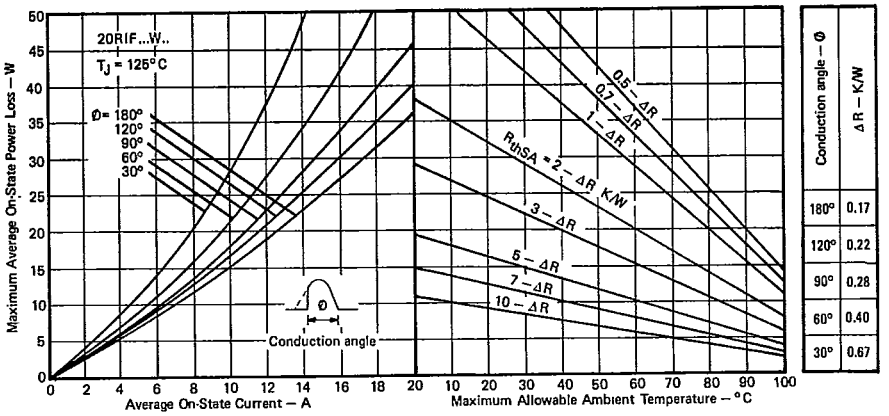

Fig. 5 – Current Ratings (Sinusoidal Waveforms, 50–400 Hz), 20RIF Series.

T-25-15

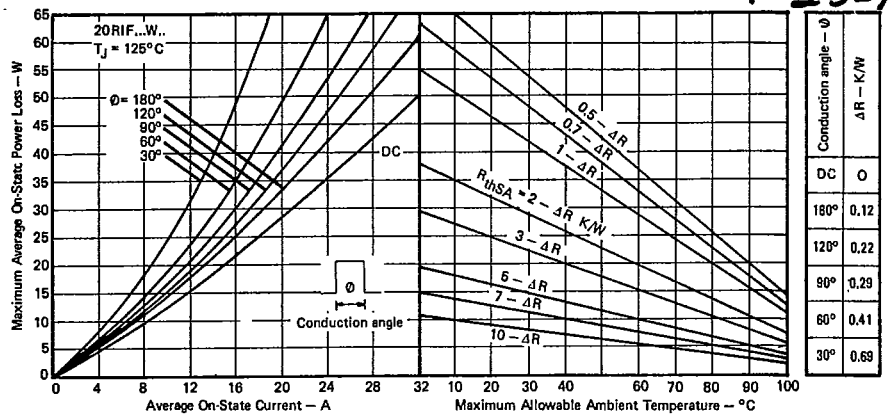

Fig. 6 – Current Ratings (Rectangular Waveforms, 50–400 Hz), 20RIF Series.

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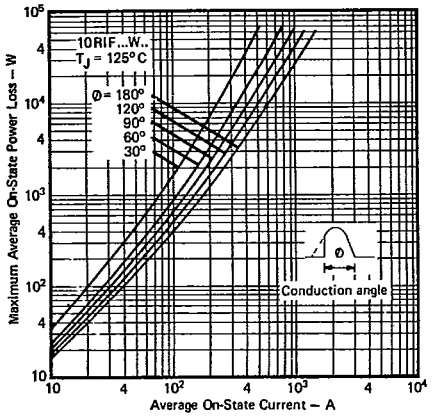

Fig. 7 – High Level Power Loss Characteristics – (Sinusoidal Current Waveform), 10RIF Series.

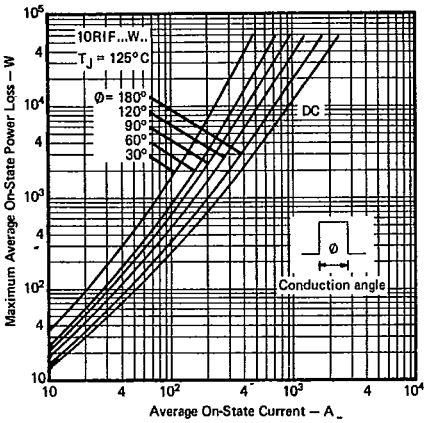

Fig. 8 – High Level Power Loss Characteristics – (Rectangular Current Waveform), 10RIF Series.)

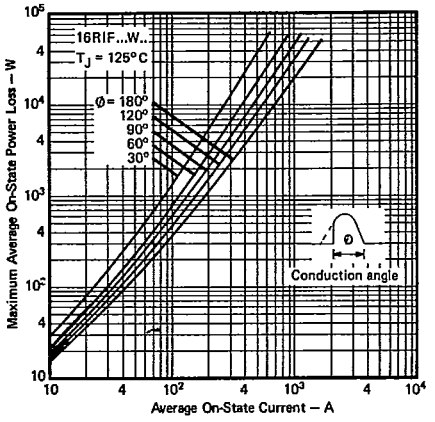

Fig. 9 – High Level Power Loss Characteristics – (Sinusoidal Current Waveform), 16RIF Series.

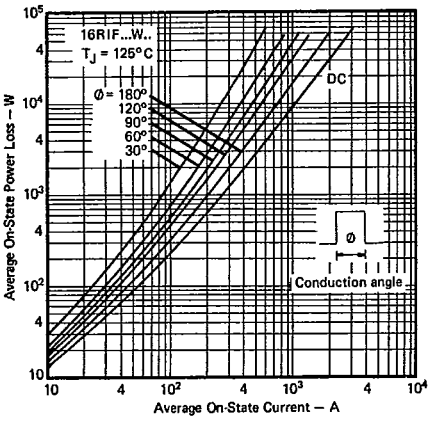

Fig. 10 – High Level Power Loss Characteristics – (Rectangular Current Waveform), 16RIF Series.

10RIF, 16RIF, 20RIF Series

T-25-15

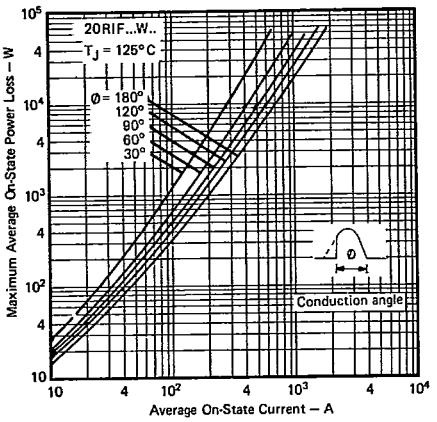

Fig. 11 – High Level Power Loss Characteristics – (Sinusoidal Current Waveform), 20RIF Series.

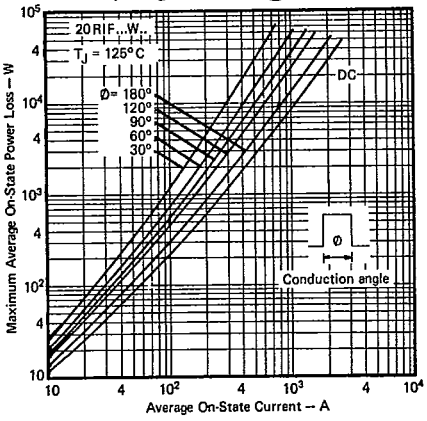

Fig. 12 – High Level Power Loss Characteristics – (Rectangular Current Waveform), 20RIF Series.

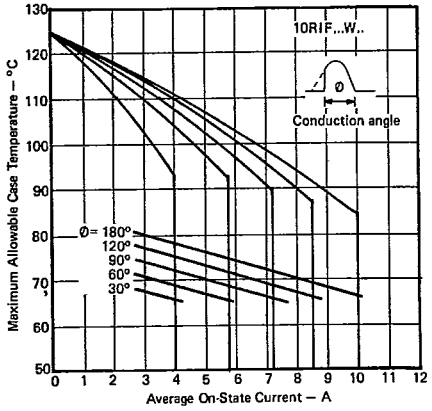

Fig. 13 – Case Temperature Ratings – (Sinusoidal Current Waveform), 10RIF Series.

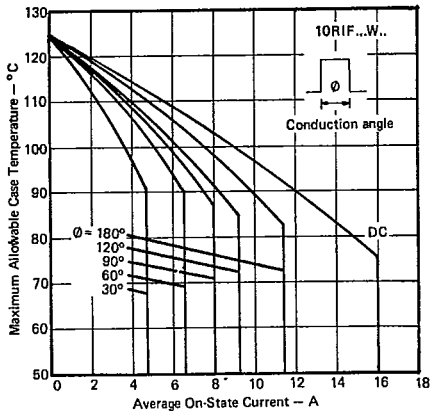

Fig. 14 – Case Temperature Ratings – (Rectangular Current Waveform), 10RIF Series.

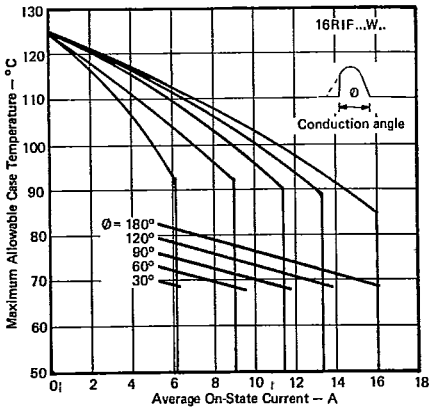

Fig. 15 – Case Temperature Ratings – (Sinusoidal Current Waveform), 16RIF Series.

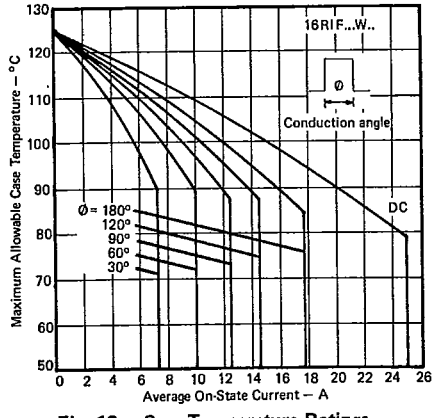

Fig. 16 – Case Temperature Ratings – (Rectangular Current Waveform), 16RIF Series.

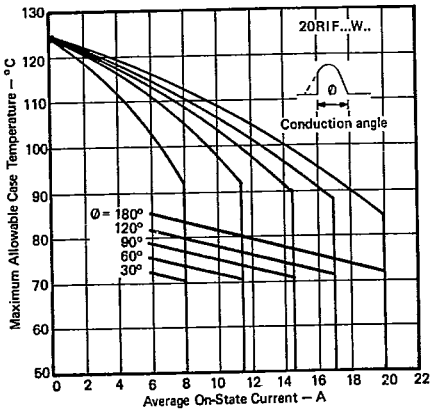

Fig. 17 – Case Temperature Ratings – (Sinusoidal Current Waveform), 20RIF Series.

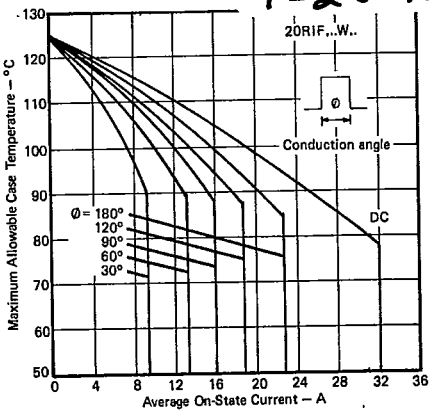

Fig. 18 – Case Temperature Ratings – (Rectangular Current Waveform), 20RIF Series.

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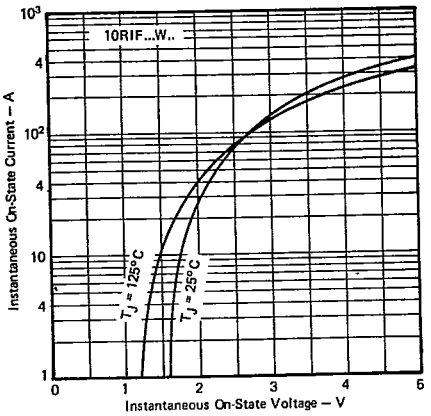

Fig. 19 – On-State Characteristics, 10RIF Series.

Fig. 20

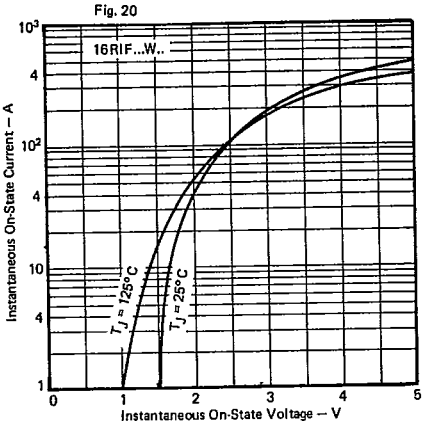

Fig. 20 – On-State Characteristics, 16RIF Series.

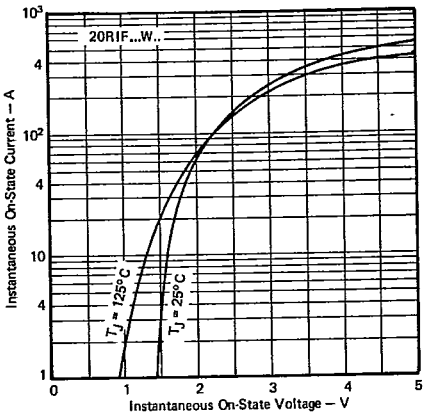

Fig. 21 – On-State Characteristics, 20RIF Series.

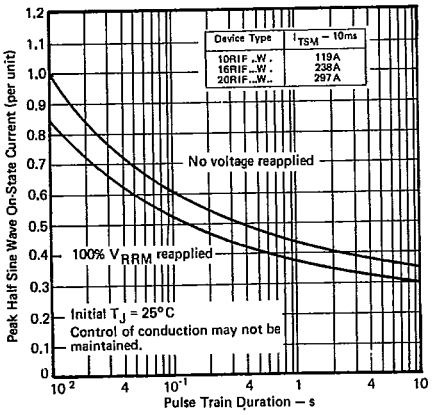

Fig. 22 – Non-Repetitive Surge Ratings, All Series.

T-25-15

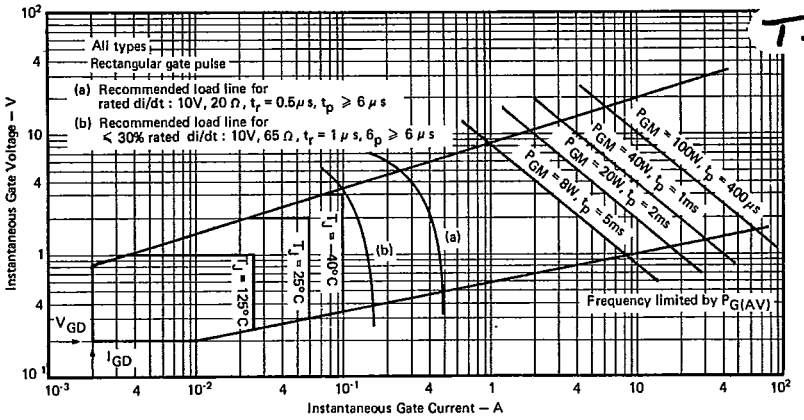

Fig. 23 – Gate Characteristics, All Series.

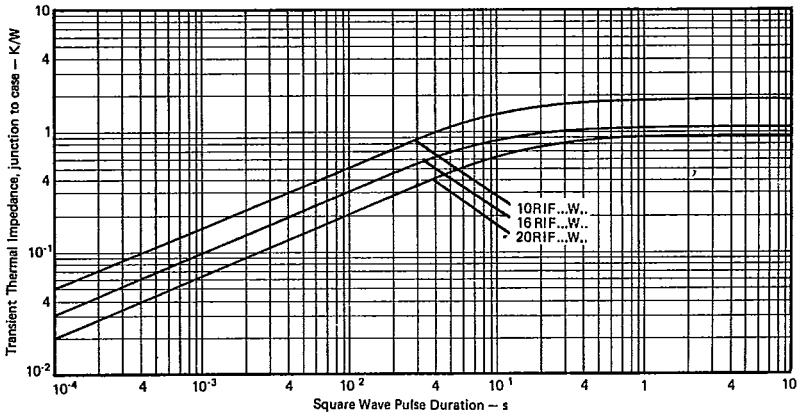

Fig. 24 – Transient Thermal Impedance Characteristics, All Series.

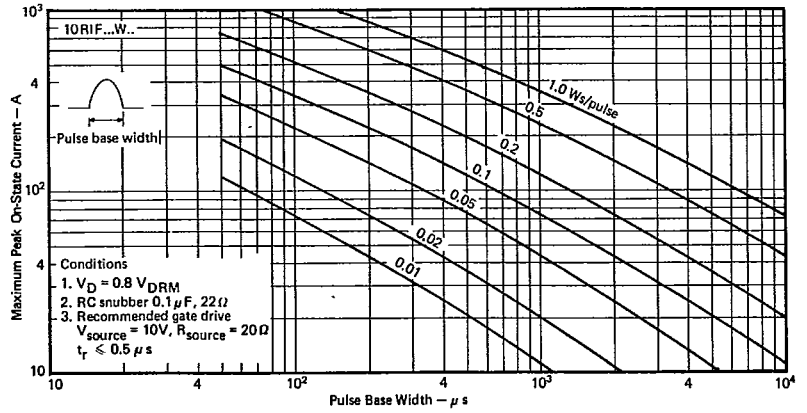

Fig. 25 – Energy Loss per Pulse Characteristics – (Sinusoidal Current Waveform), 10RIF Series.

T-25-15

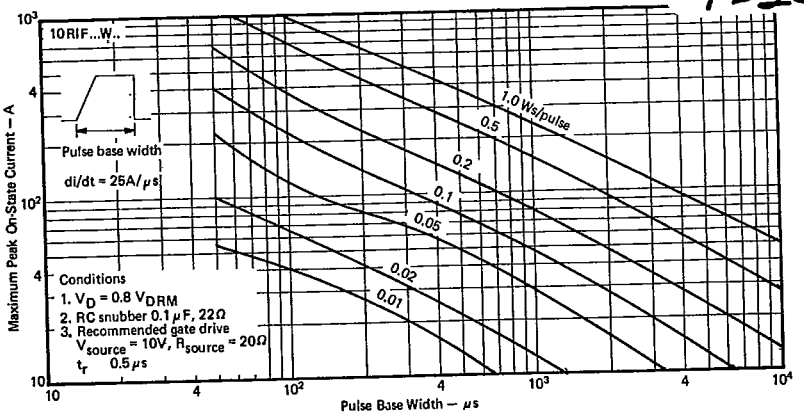

Fig. 26 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform) di/dt = 25 A/μs, 10RIF Series.

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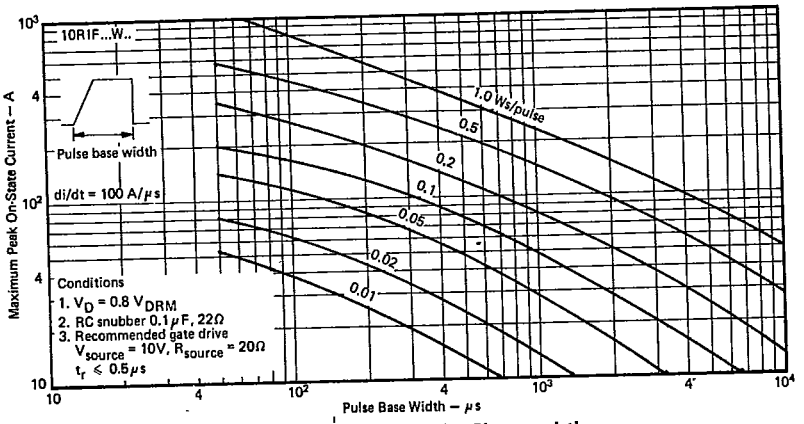

Fig. 27 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform) di/dt = 100 A/μs, 10RIF Series.

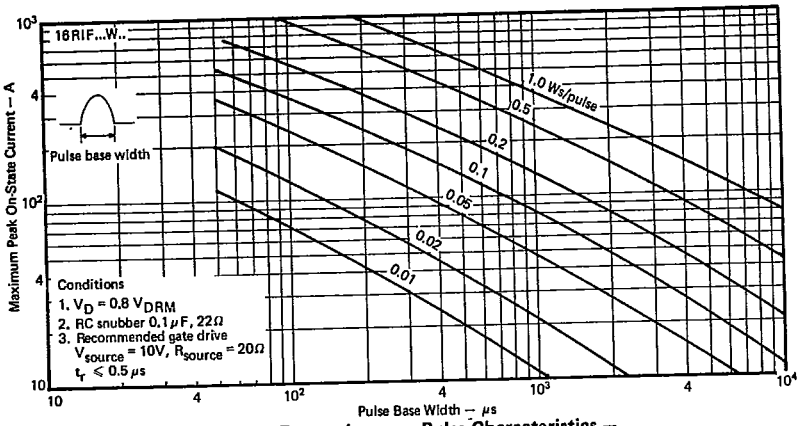

Fig. 28 – Energy Loss per Pulse Characteristics – (Sinusoidal Current Waveform), 16RIF Series.

T-25-15

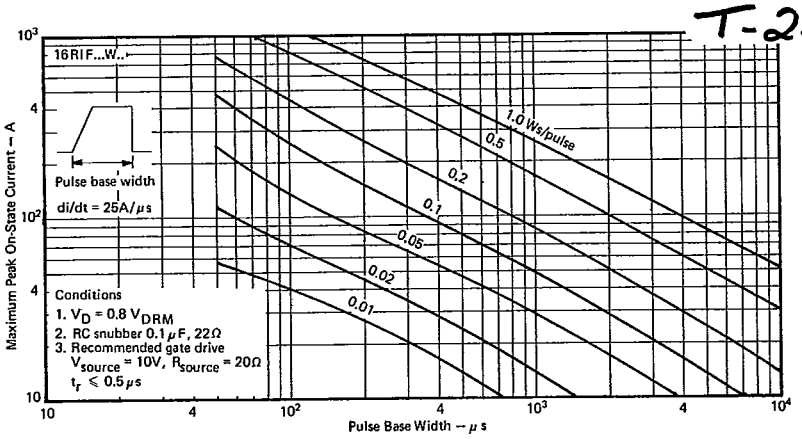

Fig. 29 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform) di/dt = 25 A/μs, 16RIF Series.

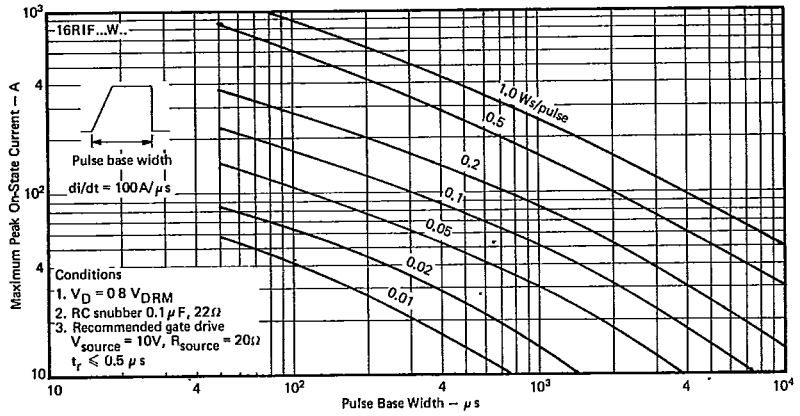

Fig. 30 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform) di/dt = 100 A/μs, 16RIF Series.

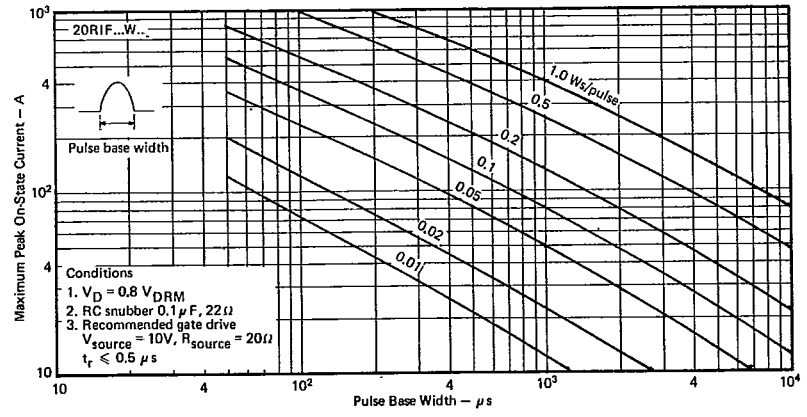

Fig. 31 – Energy Loss per Pulse Characteristics – (Sinusoidal Current Waveform), 20RIF Series.

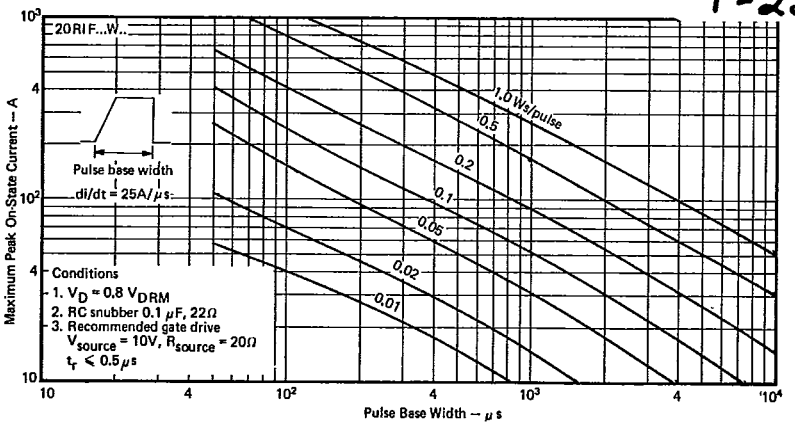

Fig. 32 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform) di/dt = 25 A/μs, 20RIF Series.

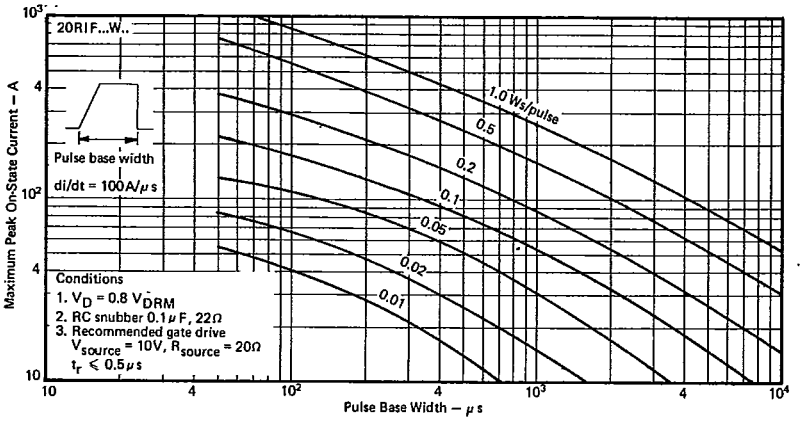

Fig. 33 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform) di/dt = 100 A/μs, 20RIF Series.

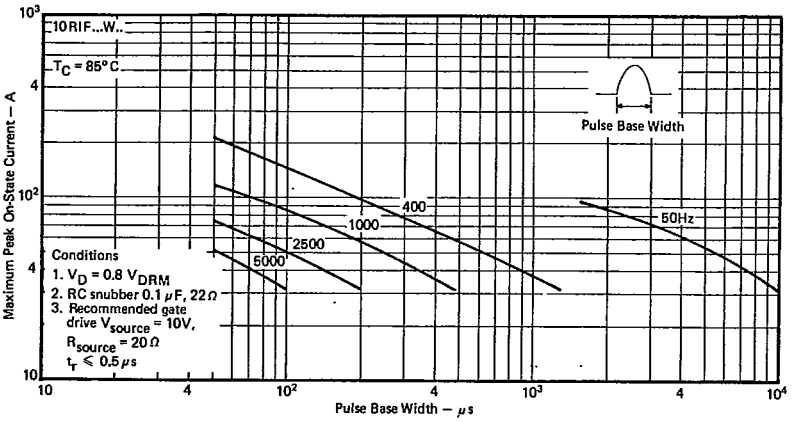

Fig. 34 – Peak On-State Current Vs. Pulse Width – (Sinusoidal Current Waveform), 10RIF Series.

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T-25-15

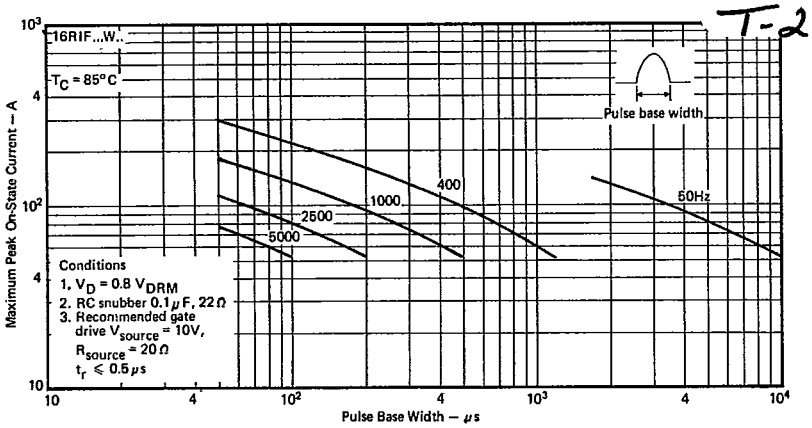

Fig. 35 – Peak On-State Current Vs. Pulse Width – (Sinusoidal Current Waveform), 16RIF Series.

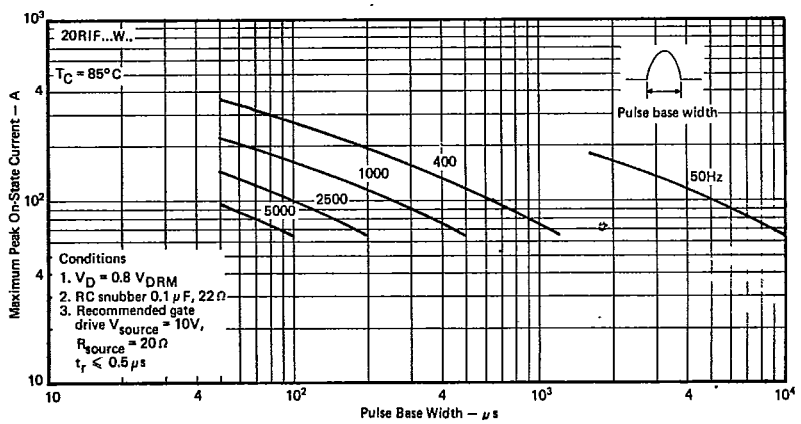

Fig. 36 – Peak On-State Current Vs. Pulse Width – (Sinusoidal Current Waveform), 20RIF Series.

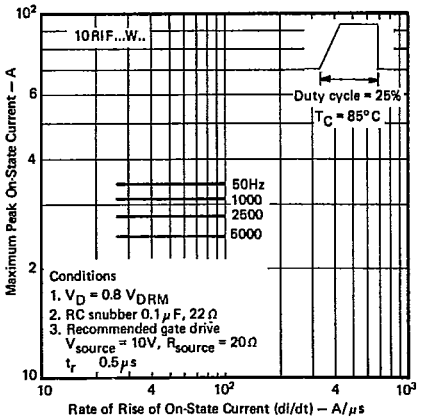

Fig. 37 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform) Duty Cycle = 25%, 10RIF Series.

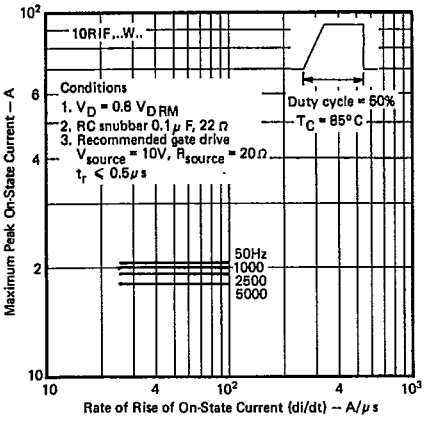

Fig. 38 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform) Duty Cycle = 50%, 10RIF Series.

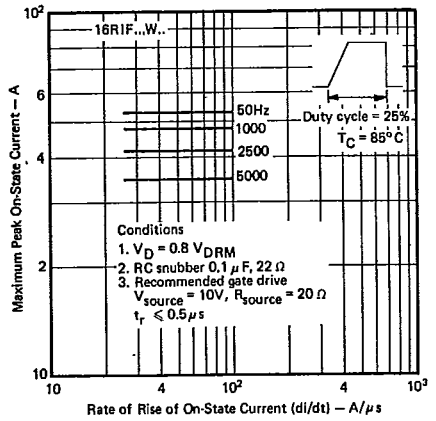

Fig. 39 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform) Duty Cycle = 25%, 16RIF Series.

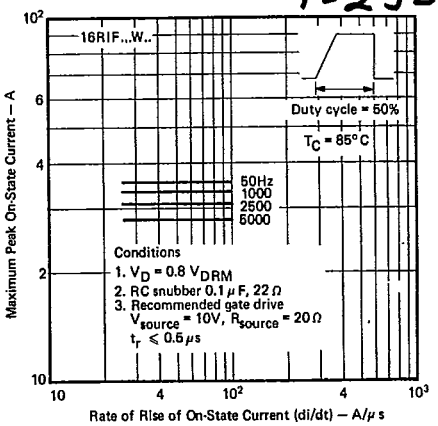

Fig. 40 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform) Duty Cycle = 50%, 16RIF Series.

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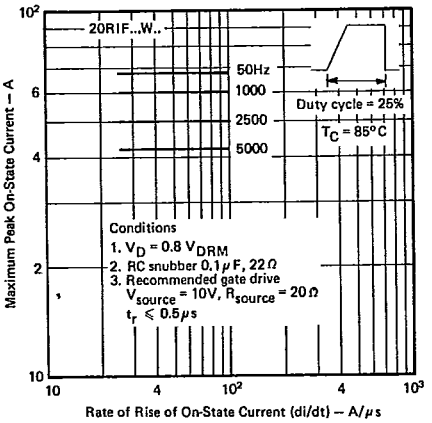

Fig. 41 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform) Duty Cycle = 25%, 20RIF Series.

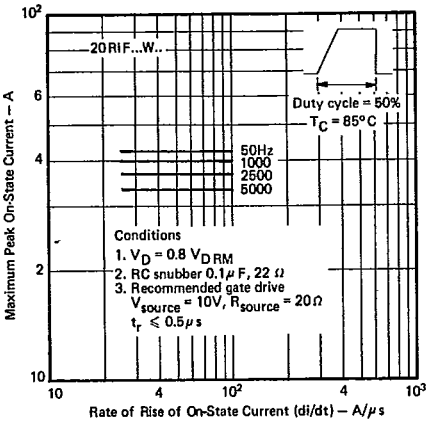

Fig. 42 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform) Duty Cycle = 50%, 20RIF Series.

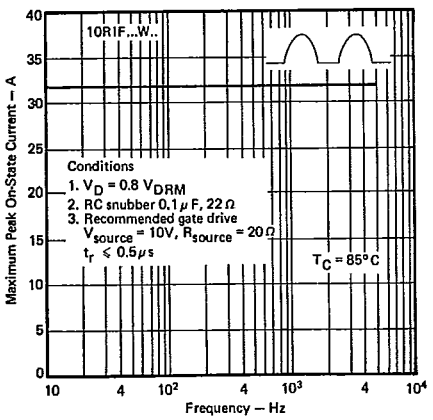

Fig. 43 – Peak On-State Current Vs. Frequency (Sinusoidal Current Waveform), 10RIF Series.

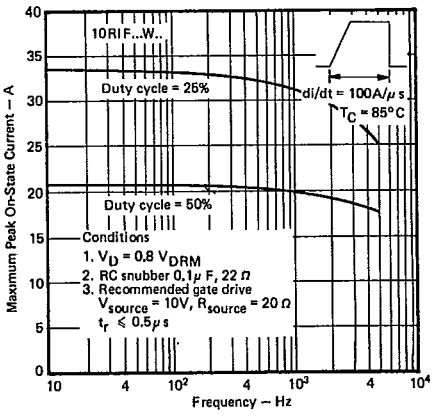

Fig. 44 – Peak On-State Current Vs. Frequency (Trapezoidal Current Waveform), 10RIF Series.

10RIF, 16RIF, 20RIF Series

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T-25-15

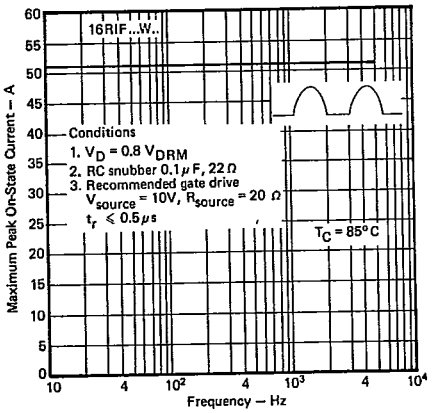

Fig. 45 – Peak On-State Current Vs. Frequency (Sinusoidal Current Waveform), 16RIF Series.

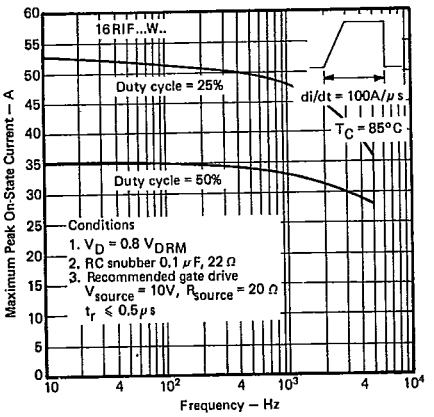

Fig. 46 – Peak On-State Current Vs. Frequency (Trapezoidal Current Waveform), 16RIF Series.

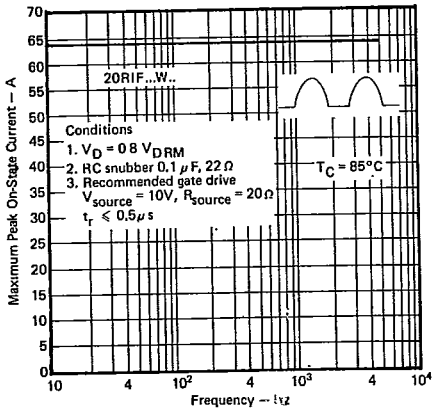

Fig. 47 – Peak On-State Current Vs. Frequency (Sinusoidal Current Waveform), 20RIF Series.

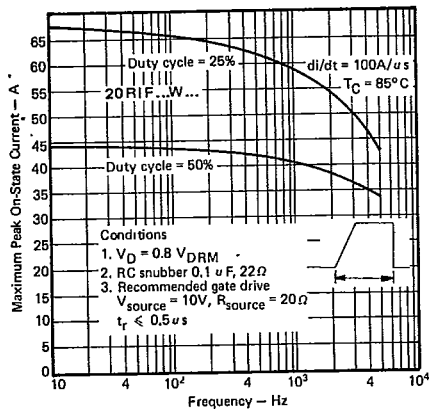

Fig. 48 – Peak On-State Current Vs. Frequency (Trapezoidal Current Waveform), 20RIF Series.