

4855452 INTERNATIONAL RECTIFIER

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Data Sheet No. PD-3.178

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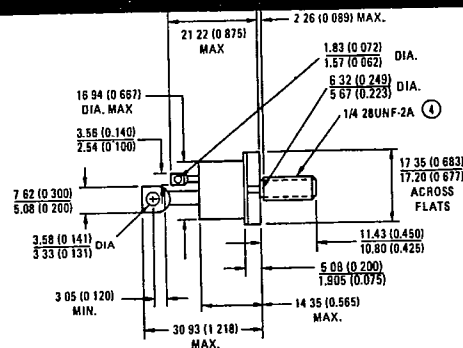
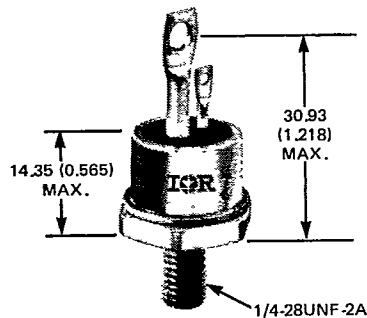
40RIF, 50RIF SERIES**63A, 80A RMS Medium Power
Fast Turn-off Thyristors****A****Major Ratings and Characteristics**

	40RIF	50RIF	Units
$I_T(AV)$ @ —	40	50	A
T_C	85	85	°C
I_{TSM} 50Hz	700	1000	A
60Hz	733	1047	A
I^2_t 50Hz	2450	5000	A ² s
60Hz	2237	4564	A ² s
$I^2\sqrt{t}$	34648	70711	A ² $\sqrt{s}$
t_q range	10 to 40		μs
V_{RRM} range	100 to 1200		V
T_J	-40 to 125		°C

Description/Features

The 40RIF and 50RIF 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 10 μs .

CASE STYLES AND DIMENSIONS

All Dimensions in Millimeters and (Inches)

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40RIF, 50RIF Series

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ELECTRICAL SPECIFICATIONS

Voltage ratings

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Part number		V _{RRM} , max. repetitive peak reverse voltage V _g ≤ 0	V _{RSM} , max. non-repetitive peak reverse voltage t _p ≤ 5 ms	V _{DRM} , max. repetitive peak off-state voltage, gate open circuited	I _{RM} , I _{DM} , max. peak reverse and off-state leakage current at rated V _{RRM} , V _{DRM} , T _J = 125°C, gate open circuited
		V	V	V	mA
40RIF10W..	50RIF10W..	100	150	100	15
40RIF20W..	50RIF20W..	200	300	200	15
40RIF40W..	50RIF40W..	400	500	400	15
40RIF60W..	50RIF60W..	600	700	600	15
40RIF80W..	50RIF80W..	800	900	800	15
40RIF100W..	50RIF100W..	1000	1100	1000	15
40RIF120W..	50RIF120W..	1200	1300	1200	15

Forward Conduction

Forward Conduction				Conditions			
		40RIF	50RIF	Units			
I _T (AV)	Max. average on-state current	40	50	A	180° conduction, half-sine wave, T _C = 85°C		
I _T (RMS)	Max. continuous RMS on-state current	63	80	A			
I _{TSM}	Max. peak, one cycle non-repetitive on-state current	700	1000	A	t = 10ms	100% rated V _{RRM} reapplied	Sinusoidal half-wave. Initial T _J = 125°C.
		733	1047	A	t = 8.3ms		
		832	1189	A	t = 10ms	No voltage reapplied	
		871	1245	A	t = 8.3ms		
I ² t	Max. I ² t capability for fusing	2450	5000	A ² s	t = 10ms	100% rated V _{RRM} reapplied	Initial T _J = 125°C.
		2237	4564	A ² s	t = 8.3ms		
	Max. I ² t for individual device fusing	3465	7071	A ² s	t = 10ms	No voltage reapplied	
		3163	6455	A ² s	t = 8.3ms		
I ² √t	Max. I ² √t capability for individual device fusing	34,648	70,711	A ² √s	t = 0.1 – 10ms, no voltage reapplied		
V _{TM}	Max. peak on-state voltage	2.40	2.0	V	T _J = 25°C, 180° conduction, I _{TM} = π x rated I _T (AV)		
di/dt	Max. non-repetitive rate-of-rise of turned on current	200		A/μs	600V	T _J = 125°C.	
		180		A/μs	800V	I _{TM} = 2 x rated di/dt, I _g = 250mA, t _r ≤ 9.5 μs.	
		160		A/μs	1000V	For repetitive value use 40% non-repetitive.	
		150		A/μs	1200V	Per JEDEC standard RS-397, 5.2.2.6.	
V _T (TO)	Max. value of threshold voltage	1.463	1.310	V	T _J = 125°C		
r _T	Max. value of on-state slope resistance	6.49	4.19	mΩ			
I _H	Max. holding current	200		mA	T _J = 25°C, anode supply = 6V, resistive load, gate open circuit		
I _L	Max. latching current	400		mA	T _J = 25°C, anode supply = 6V, resistive load		

Triggering

P _{GM} Max. peak gate power	10	W	t _p ≤ 5ms	
P _G (AV) Max. average gate power	2.5	W		
I _{GM} Max. peak gate current	5.0	A	t _p ≤ 5ms	
-V _{GM} Max. DC peak negative gate voltage	10	V		
V _{GT} Max. DC gate voltage required to trigger	4.0	V	T _J = -40°C	Anode supply = 6V resistive load
	2.5	V	T _J = 25°C	
	1.5	V	T _J = 125°C	
I _{GT} Max. DC gate current required to trigger	250	mA	T _J = -40°C	Anode supply = 6V resistive load
	150	mA	T _J = 25°C	
	80	mA	T _J = 125°C	



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Triggering (continued)

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V _{GD}	Max. DC gate voltage that will not trigger	0.2	V	T _J = 125°C, rated V _{DRM} applied
I _{GD}	Max. DC gate current that will not trigger	5.0	mA	T _J = 125°C, rated V _{DRM} applied

Switching

t _d + t _r	Typical turn-on time	0.9	μs	T _J = 125°C, V _D = 0.8 rated 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		

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 circuit
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THERMAL AND MECHANICAL SPECIFICATIONS

		40RIF	50RIF	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 resistance junction to case	0.35		K/W	DC Operation
R _{thCS}	Maximum thermal resistance case to heatsink	0.25		K/W	Mounting surface flat, smooth and greased
T	Mounting torque ± 10% to nut	20(27.5)		lbf-in	Lubricated (non-lubricated) threads
		0.23(3.2)		kgf-in	
		2.3(3.1)		N-m	
	to device	25		lbf-in	
		0.29		kgf-in	
		2.8		N-m	
wt	Approximate weight	1.0		oz	
		28		g	
	Case style	TO-208AC(TO-65)			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 = 10A/μs, V _R = 100V, reapplied dv/dt = 200V/μs exponential to 0.67 rated V _{DRM}
15	μs	15	600V	
20	μs	20	1000V	
40	μs	40	1200V	

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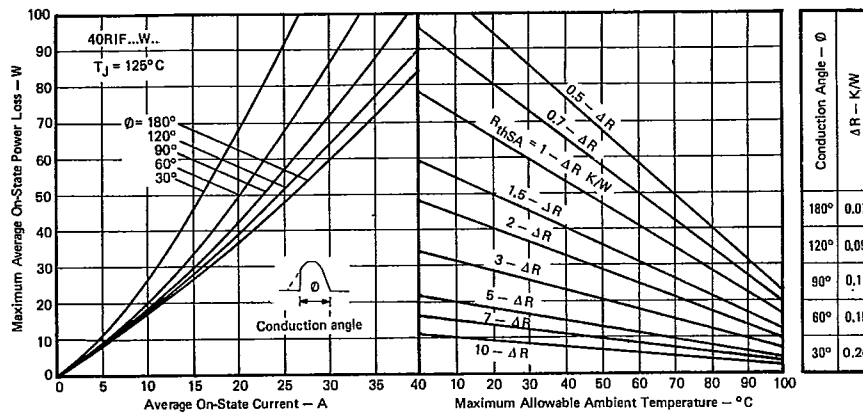


Fig. 1 - Current Ratings (Sinusoidal Waveforms, 50-400 Hz), 10RIF Series.

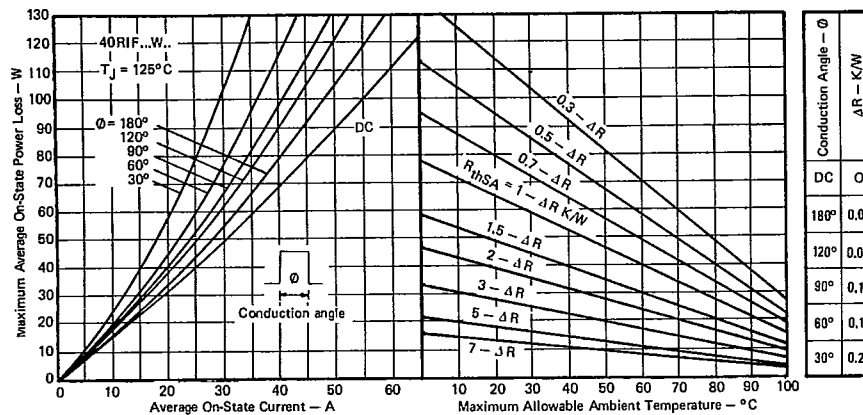


Fig. 2 - Current Ratings (Sinusoidal Waveforms, 50-400 Hz), 40RIF Series.

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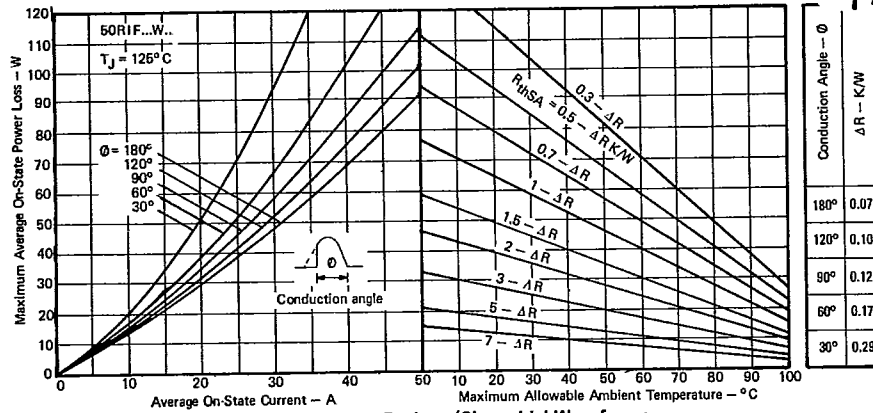


Fig. 3 - Current Ratings (Sinusoidal Waveforms, 50-400 Hz), 50RIF Series.

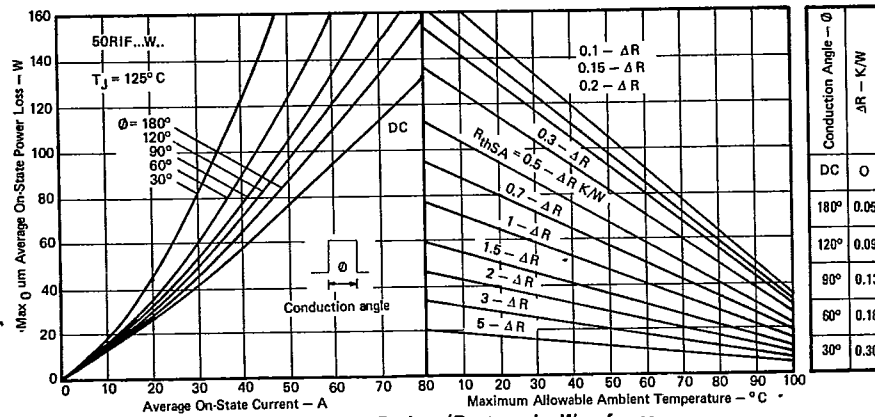


Fig. 4 - Current Ratings (Rectangular Waveforms, 50-400 Hz), 50RIF Series.

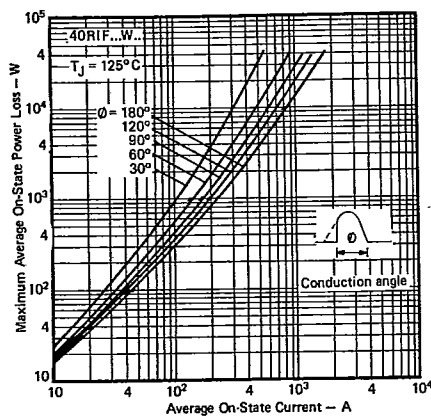


Fig. 5 - High Level Power Loss Characteristics - Sinusoidal Current Waveform, 40RIF Series.

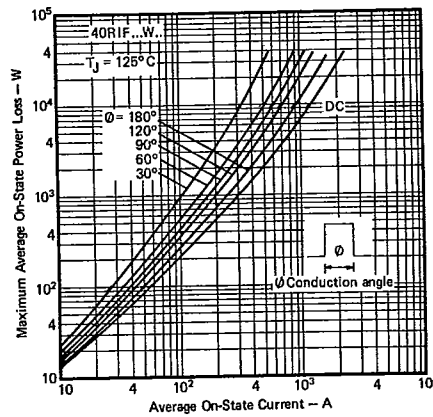


Fig. 6 - High Level Power Loss Characteristics - Rectangular Current Waveform, 40RIF Series.

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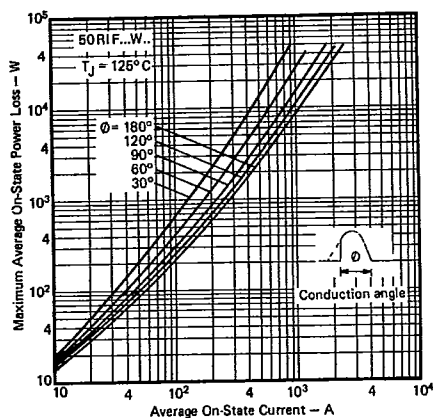
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Fig. 7 - High Level Power Loss Characteristics - (Sinusoidal Current Waveform), 50RIF Series.

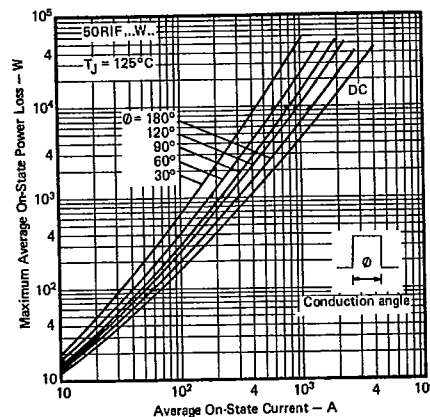


Fig. 8 - High Level Power Loss Characteristics - (Rectangular Current Waveform), 50RIF Series.

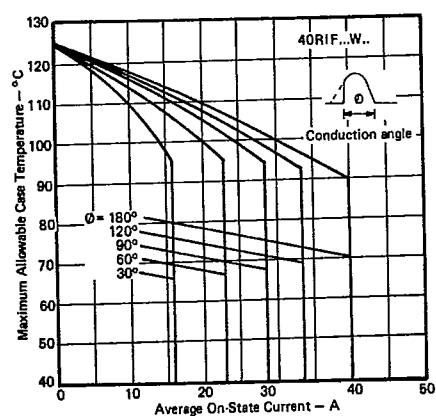


Fig. 9 - Case Temperature Ratings - (Sinusoidal Current Waveform), 40RIF Series.

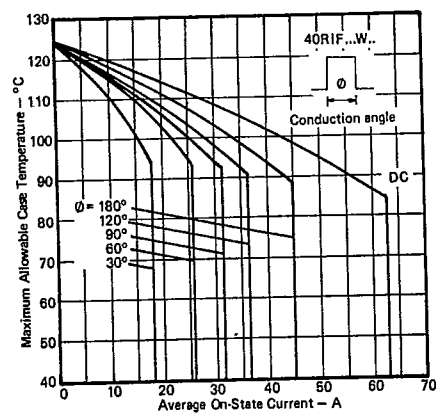


Fig. 10 - Case Temperature Ratings - (Rectangular Current Waveform), 40RIF Series.

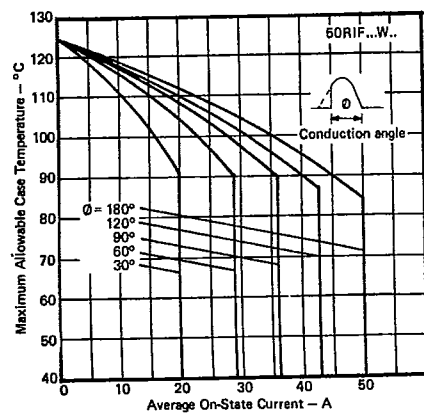


Fig. 11 - Case Temperature Ratings - (Sinusoidal Current Waveform), 50RIF Series.

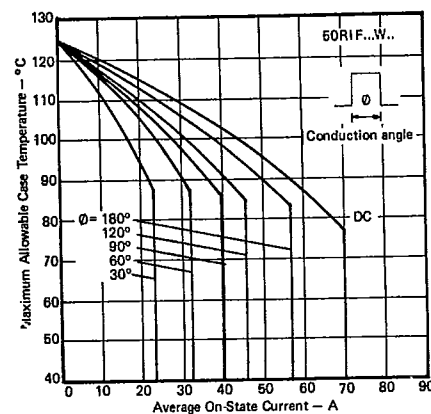


Fig. 12 - Case Temperature Ratings - (Rectangular Current Waveform), 50RIF Series.

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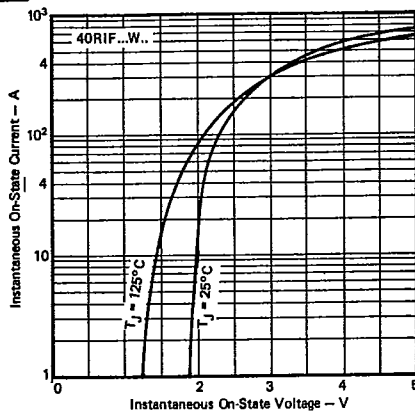


Fig. 13 - On-State Characteristics, 40RIF Series.

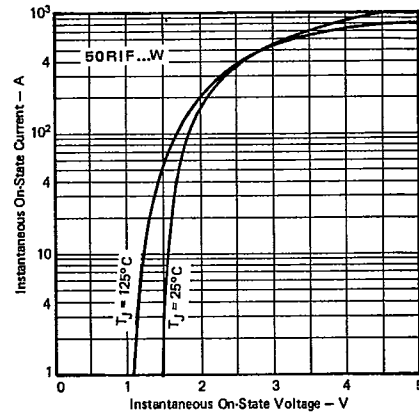


Fig. 14 - On-State Characteristics, 50RIF Series.

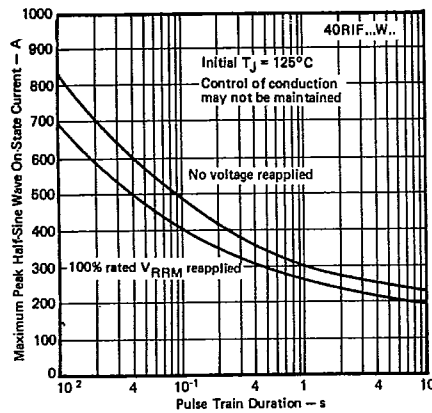


Fig. 15 - Non-repetitive Surge Ratings, 40RIF Series.

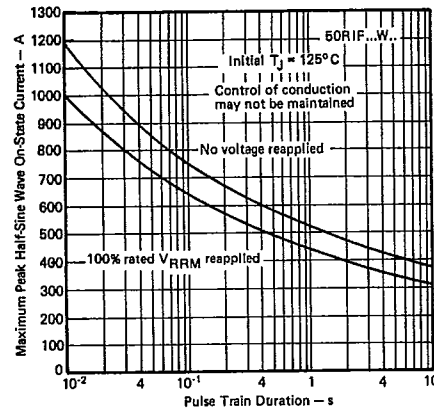


Fig. 16 - Non-repetitive Surge Ratings, 50RIF Series.

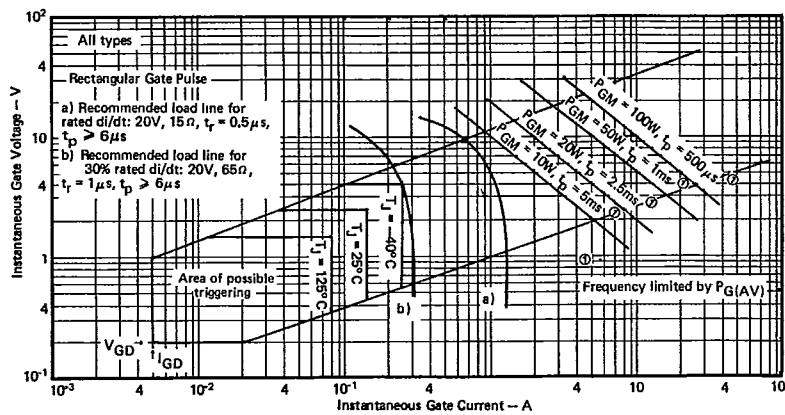


Fig. 17 - Gate Characteristics, All Series.

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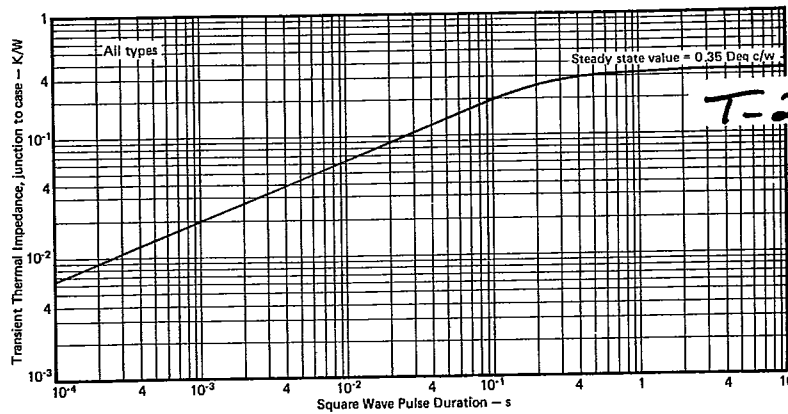
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Fig. 18 - Transient Thermal Impedance, All Series.

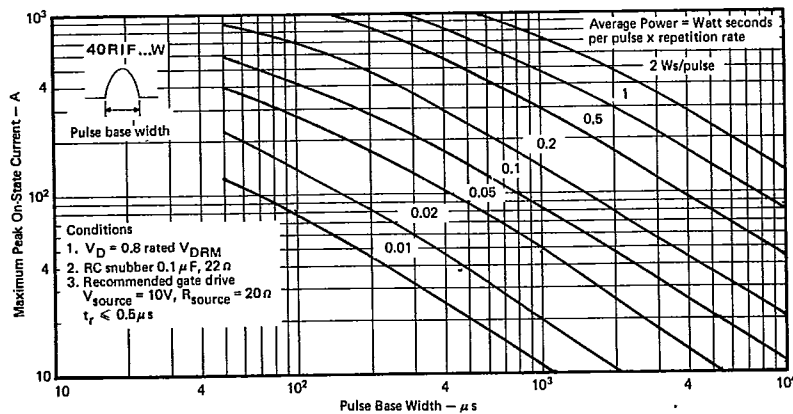
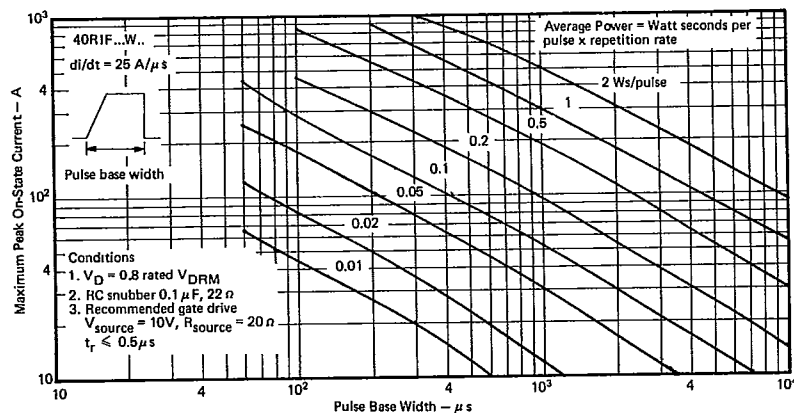


Fig. 19 - Energy Loss per Pulse Characteristics - (Sinusoidal Current Waveform), 40RIF Series.

Fig. 20 - Energy Loss per Pulse Characteristics - (Trapezoidal Current Waveform), 40RIF Series. $di/dt = 25A/\mu s$.

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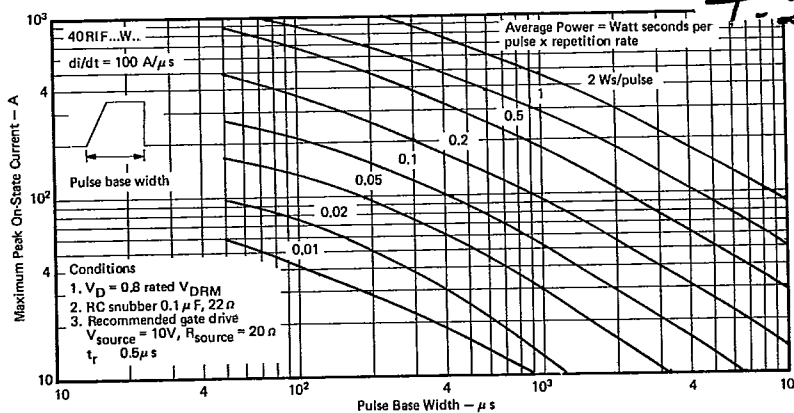
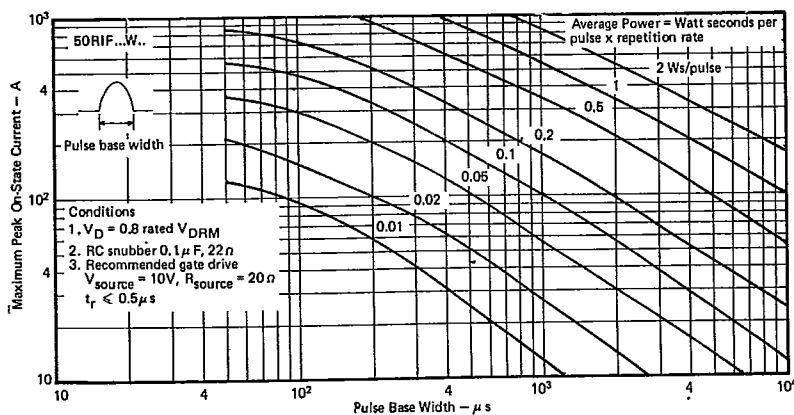
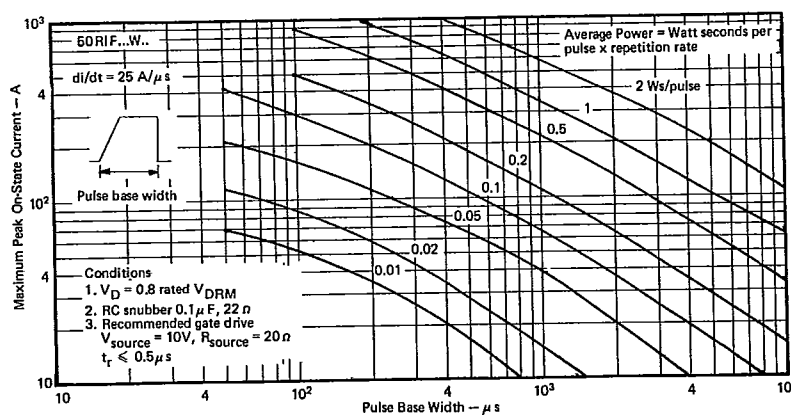
Fig. 21 — Energy Loss per Pulse Characteristics — (Trapezoidal Current Waveform), 40RIF Series.
 $di/dt = 100\text{A}/\mu\text{s}$.

Fig. 22 — Energy Loss per Pulse Characteristics — (Sinusoidal Current Waveform), 50RIF Series.

Fig. 23 — Energy Loss per Pulse Characteristics — (Trapezoidal Current Waveform), 50RIF Series.
 $di/dt = 25\text{A}/\mu\text{s}$.

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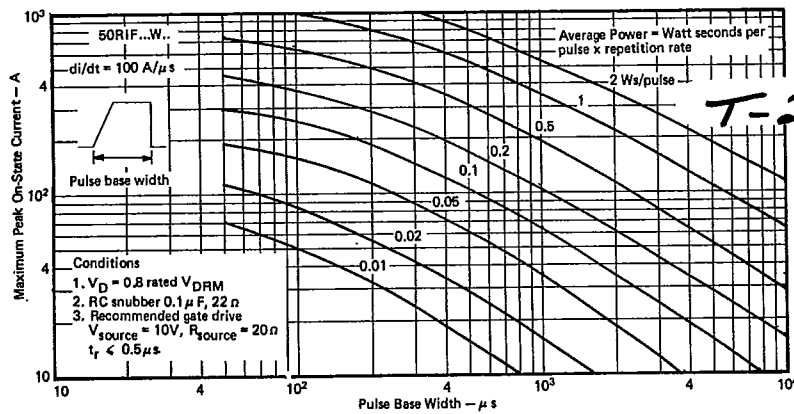
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Fig. 24 - Energy Loss per Pulse Characteristics -
(Trapezoidal Current Waveform), 50RIF Series.
 $di/dt = 100\text{A}/\mu\text{s}$.

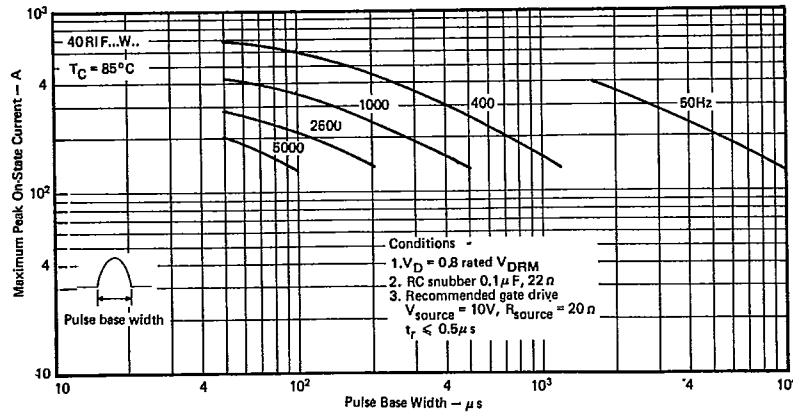


Fig. 25 - Peak On-State Current Vs. Pulse Width -
(Sinusoidal Current Waveform), 40RIF Series.

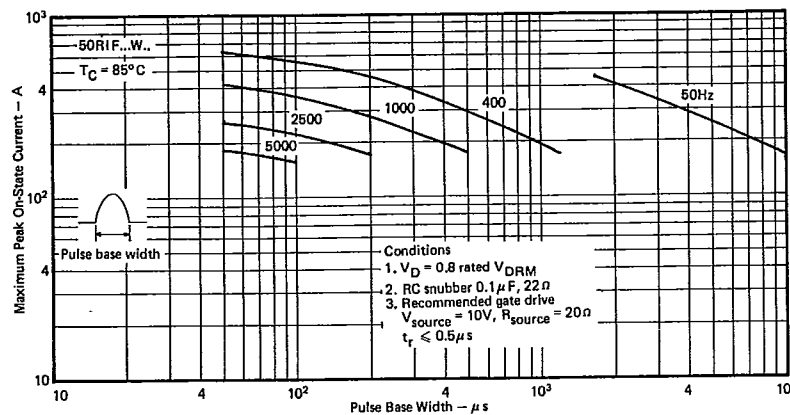


Fig. 26 - Peak On-State Current Vs. Pulse Width -
(Sinusoidal Current Waveform), 50RIF Series.

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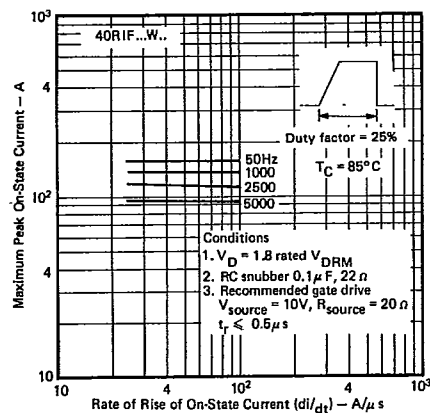
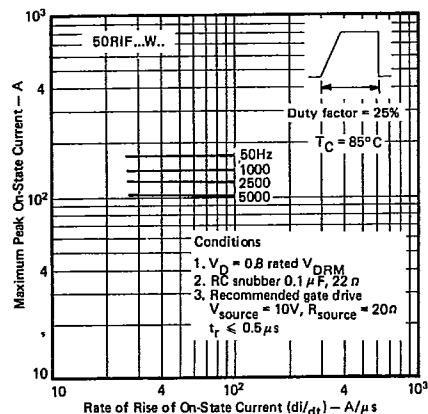
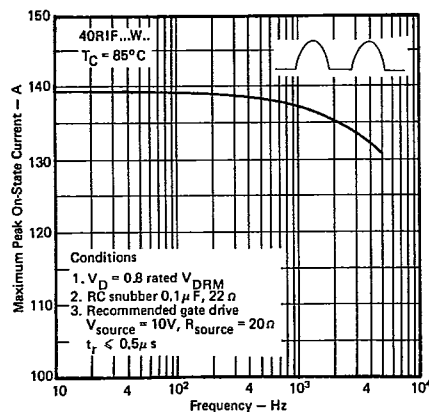
IR INTERNATIONAL RECTIFIERFig. 27 — Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 40RIF Series. Duty Factor = 25%.Fig. 29 — Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 50RIF Series. Duty Factor = 25%.

Fig. 31 — Peak On-State Current Vs. Frequency (Sinusoidal Current Waveform), 40RIF Series.

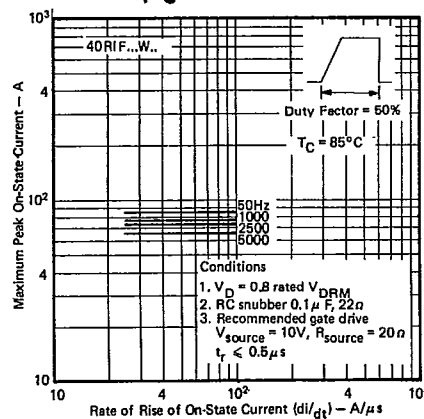
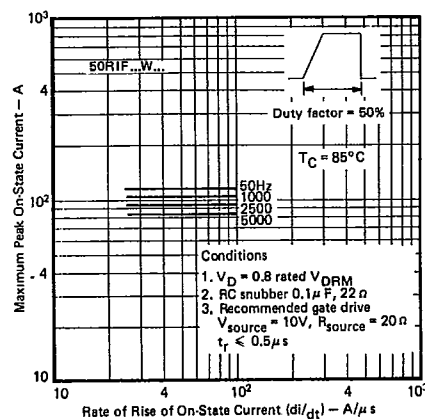
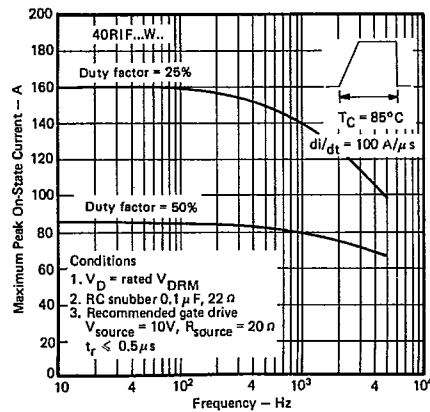
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T-25-15 40RIF, 50RIF SeriesFig. 28 — Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 40RIF Series. Duty Factor = 50%.Fig. 30 — Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 50RIF Series. Duty Factor = 50%.

Fig. 32 — Peak On-State Current Vs. Frequency (Trapezoidal Current Waveform), 40RIF Series.

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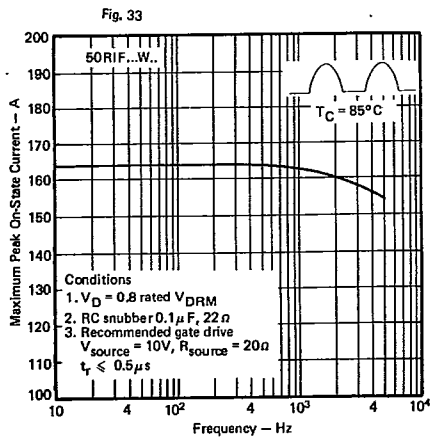


Fig. 33 - Peak On-State Current Vs. Frequency (Sinusoidal Current Waveform), 50RIF Series.

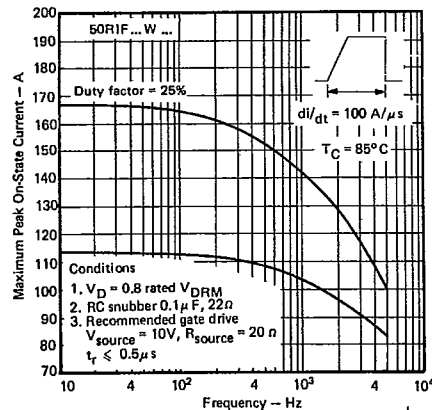


Fig. 34 - Peak On-State Current Vs. Frequency (Trapezoidal Current Waveform), 50RIF Series.