INTERNATIONAL RECTIFIER IOR

81RKI & 111RKI SERIES

125/170 Amp RMS High Power Thyristors

Description

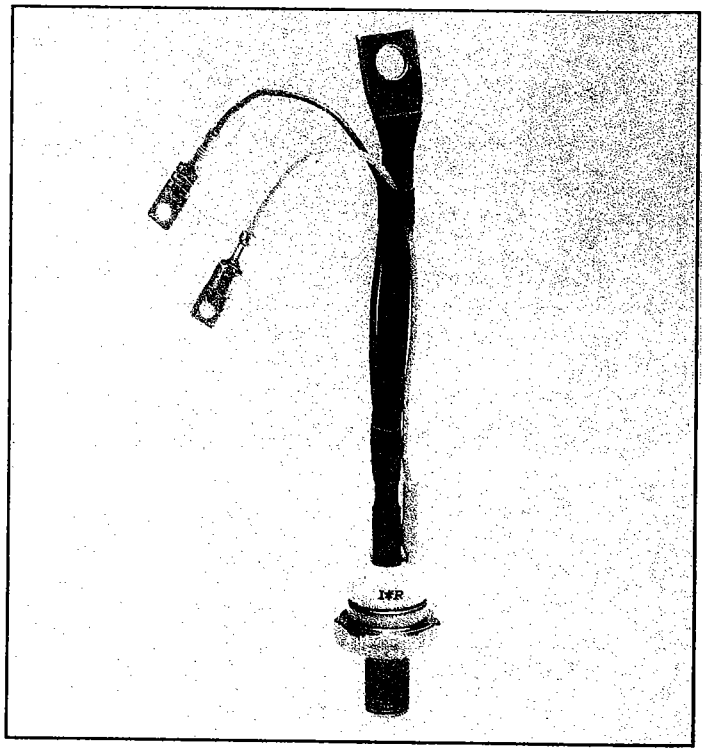
These series of high power thyristors are intended for general purpose phase control applications in converters, battery chargers regulated power supplies, motor drives and temperature control circuits

Features

- High current and high surge ratings
- dv/dt = 1000V/µs option
- Ceramic housing
- Types up to 1200V V_{RRM} - V_{DRM}
- di/dt = 300A/µs

Major ratings and characteristics

Parameter		81RKI	111RKI	Units
$I_{T(AV)}$		80	110	A
$I_{T(RMS)}$		125	172	A
I_{TSM}	@50Hz	1600	1750	A
	@60Hz	1700	1830	A
I^2t	@50Hz	12800	15300	A^2s
	@60Hz	11700	14000	A^2s
V_{DRM}, V_{RRM}		100 to 1200		V
T_J		-40 to 140		°C



ELECTRICAL SPECIFICATIONS

Voltage ratings

Type number	Voltage Code	V_{RRM}, V_{DRM} max. peak reverse and off-state voltage gate open circuit $T_J = T_J$ Max.	V_{RSM}, maximum non-repetitive peak reverse voltage $T_J = T_J$ Max.	I_{DM} max peak off-state current @ rated V_{RRM} $T_J = T_J$ Max.
	-	(V)	(V)	(mA)
81RKI10 111RKI10	10	100	150	20
81RKI20 111RKI20	20	200	300	20
81RKI40 111RKI40	40	400	500	20
81RKI60 111RKI60	60	600	700	20
81RKI80 111RKI80	80	800	900	20
81RKI100 111RKI100	100	1000	1100	20
81RKI120 111RKI120	120	1200	1300	20

On-state Conduction

Parameters		81RKI	111RKI	Units	Conditions	
$I_{T(AV)}$	Maximum average on-state current	80	110	A	180° Sine Conduction angle, T_J 140°C - T_C 90°C	
$I_{T(RMS)}$	Maximum RMS on-state current	125	172	A		
I_{TSM}	Maximum peak, one cycle	1600	1750	A	t = 10ms	100% V_{RRM} reapplied
	non-repetitive surge current	1700	1830	A	t = 8.3ms	
	Sinusoidal half wave	1900	2080	A	t = 10ms	No voltage reapplied
	Initial $T_J = T_J$ 140°C	1990	2180	A	t = 8.3ms	
I^2t	Maximum I^2t for fusing	12800	15300	A^2s	t = 10ms	100% V_{RRM} reapplied
		11700	14000	A^2s	t = 8.3ms	
		18100	21700	A^2s	t = 10ms	No voltage reapplied
		16500	19800	A^2s	t = 8.3ms	
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	181000	217000	$A^2\sqrt{s}$	I^2t for time $t_x = I^2\sqrt{t} \times \sqrt{t_x}$; $0.1 <= t_x <= 10ms$	
$V_{T(TO)}$	High-level of threshold voltage	1.23	1.02	V	T_J=140°C, $(\pi \times I_{(AV)} < I < 20 \times \pi \times I_{(AV)})$	
$V_{T(TO)2}$	Low-level of threshold voltage	1.02	0.82	V	T_J=140°C, $(16.7\% \times \pi \times I_{(AV)} < I < \pi \times I_{(AV)})$	
r_{t1}	High-level of on-state slope resistance	2.11	1.70	mΩ	T_J=140°C, $(\pi \times I_{(AV)} < I < 20 \times \pi \times I_{(AV)})$	
r_{t2}	Low-level of on-state slope resistance	2.82	2.16	mΩ	T_J=140°C, $(16.7\% \times \pi \times I_{(AV)} < I < \pi \times I_{(AV)})$	
V_{TM}	Maximum on-state voltage	1.6	1.5	V	T_J = 25 °C, $I_{TM} = \pi \times I_{T(AV)}$	
I_H	Maximum holding current	150	150	mA	T_J = 25 °C, Anode supply 6V resistive load	
I_L	Maximum latching current	400	400	mA	T_J = 25 °C, Anode supply 6V resistive load	

Switching

Parameters		81RKI/111RKI	Units	Conditions
dI/dt	Max. non-repetitive rate of rise of turned-on current	300	A/µs	T_J=140°C, V_{DRM} = rated V_{DRM} I_{TM} = 2 x dI/dt
t_d	Typical delay time	1	µs	T_J=25°C, V_{DM} = rated V_{DRM}, I_{TM} = 50A dc resistive circuit. Gate pulse: 10V, 25Ω source, tp = 6 µs, tr = 0.1 µs
t_q	Typical turn-off time	110	µs	T_J=140°C, I_{TM} = 50A, commutating dI/dt = -5A/µs min. V_R during turn-off interval 50V Gate bias: 0V, 25Ω, dv/dt = 20 linear to rated V_{DRM}

Blocking

Parameters		81RKI/111RKI	Units	Conditions
$dv/_{dt}$	Minimum critical rate of rise of off-state voltage	500	V/µs	T_J=140°C, linear to 80% rated V_{DRM}

Triggering

Parameters		81RKI/111RKI		Units	Conditions	
P_{GM}	Maximum peak gate power	12		W	tp ≤ 5 ms	
$P_{G(AV)}$	Maximum average gate power	3.0		W		
I_{GM}	Maximum peak positive gate current	3.0		A		
$+V_{GM}$	Maximum peak positive gate voltage	20		V		
$-V_{GM}$	Maximum peak negative gate voltage	10		V		
		MIN.	MAX.			
I_{GT}	DC gate current required to trigger	25	100	mA	T_J = 25°C	Max. required gate trigger current is the
		-	60	mA	T_J = 125°C	lowest value which will trigger all units
		-	270	mA	T_J = -40°C	with ±6V anode-to-cathode
V_{GT}	Maximum DC gate voltage required to trigger	-	2.5	V	T_J = 25°C	Max. required gate trigger voltage is the
		-	1.5	V	T_J = 125°C	lowest value which will trigger all units
		-	3.5	V	T_J = -40°C	with 6V anode-to-cathode
V_{GD}	Max. DC gate voltage not to trigger	-	0.25	V	T_J=125°C. Max. gate voltage/current not to trigger is the maximum value which will not trigger any unit with rated V_{DRM} anode-to-cathode.	
I_{GD}	Max. DC gate current not to trigger	-	6.0	mA		

Thermal and Mechanical Specifications

Parameters		81RKI	111RKI	Units	Conditions
T_J	Max. operating temperature range	-40 to 140		°C	
T_{stg}	Max. storage temperature range	-40 to 150		°C	
R_{thJC}	Max. thermal resistance junction to case	0.35	0.27	K/W	DC operation
R_{thCS}	Max. thermal resistance, case to heatsink	0.1		K/W	Mounting surface, smooth, flat and greased
wt	Approximate weight	120		g	
T	Mounting Torque ± 10%	110 (13)		lbf in (Nm)	Lubricated threads
		140 (16)		lbf in (Nm)	Non-lubricated threads
	Case style	Similar to JEDEC TO-209AC (TO-94)			

ΔR_{th} Conduction (per junction)

(The following table shows the increment of thermal resistance R_{thJ-C} when devices operate at different conduction angles than DC.)

Conduction angle	Sinusoidal conduction		Rectangular conduction		Units	Conditions
	81RKI	111RKI	81RKI	111RKI		
180°	0.042	0.043	0.030	0.031	K/W	$T_J = T_J$ max.
120°	0.051	0.052	0.053	0.053	K/W	
90°	0.066	0.066	0.072	0.071	K/W	
60°	0.097	0.096	0.102	0.101	K/W	
30°	0.167	0.167	0.169	0.169	K/W	

ORDERING INFORMATION TABLE

Device Code

8	1	RKI	120	M	S90
(1)	(2)	(3)	(4)	(5)	(6)

1 - $I_{T(AV)}$ — 8 = 80 A avg; 11 = 110 A avg

2 - Terminal designator — 0 = Eyelet terminals; 1 = Fast-on terminals; 2 = Flag terminals

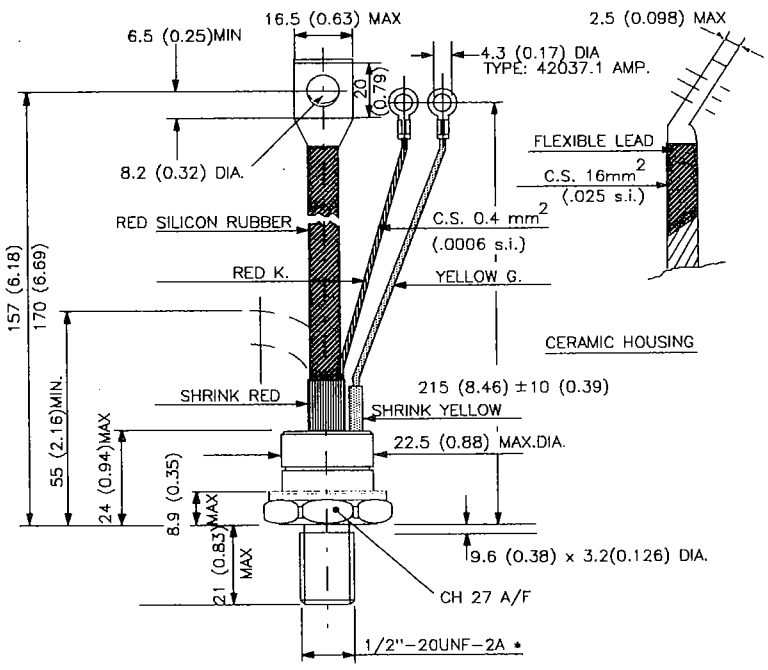
3 - Thyristor type

4 - Voltage code (See Voltage ratings table)

5 - No code = 1/2"-20 UNF-2A THREAD
Code M = M12 x 1.75 THREAD

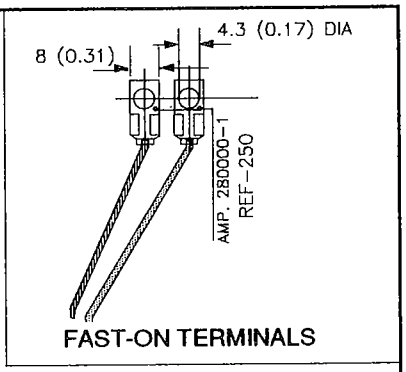
6 - $dv/_{dt}$ code — No code = 500 V/µs; S90 = 1000 V/µs

OUTLINE TABLE

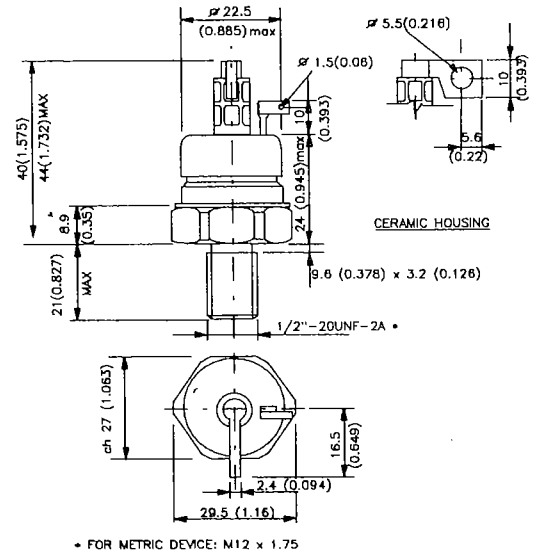


* FOR METRIC DEVICE : M12 x 1.75

Similar to JEDEC TO-209 AC (TO-94)



FAST-ON TERMINALS



* FOR METRIC DEVICE: M12 x 1.75

Similar to JEDEC TO-208 AD (TO-83)

- *All dimensions in millimetres (inches)*
- *Dimensions are nominal*
- *Full engineering drawings are available on request*

Fig. 1 - CURRENT RATINGS CHARACTERISTICS

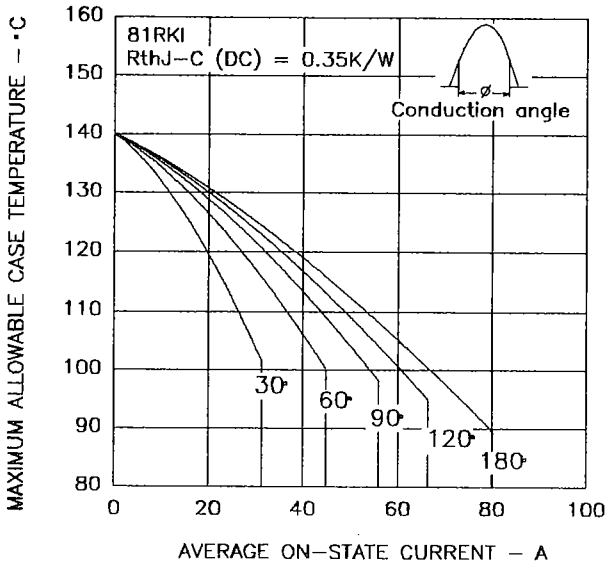


Fig. 2 - CURRENT RATINGS CHARACTERISTICS

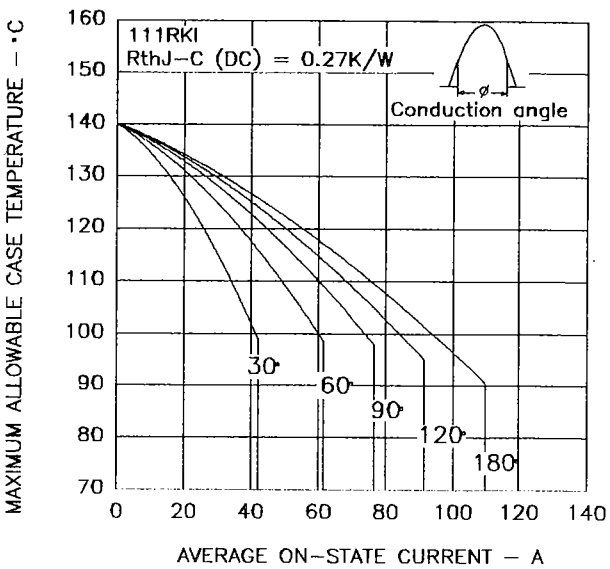


Fig. 3 - CURRENT RATINGS CHARACTERISTICS

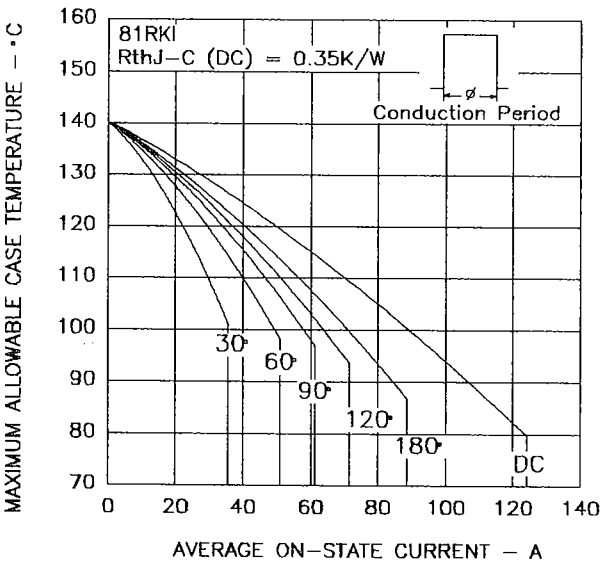


Fig. 4 - CURRENT RATINGS CHARACTERISTICS

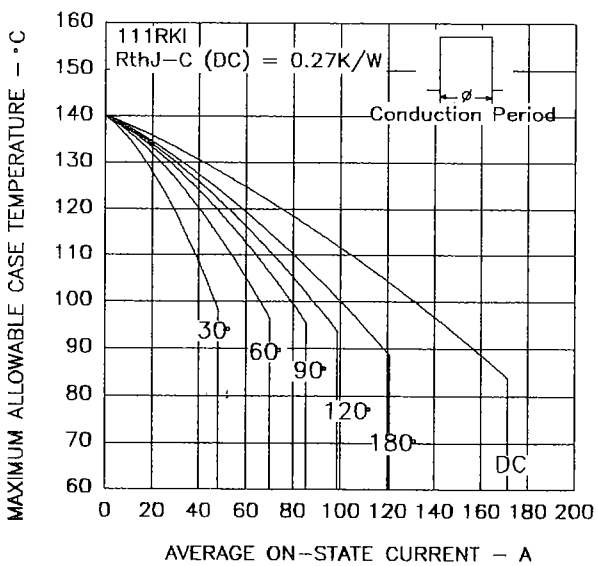


Fig. 5 - ON-STATE POWER LOSS CHARACTERISTICS

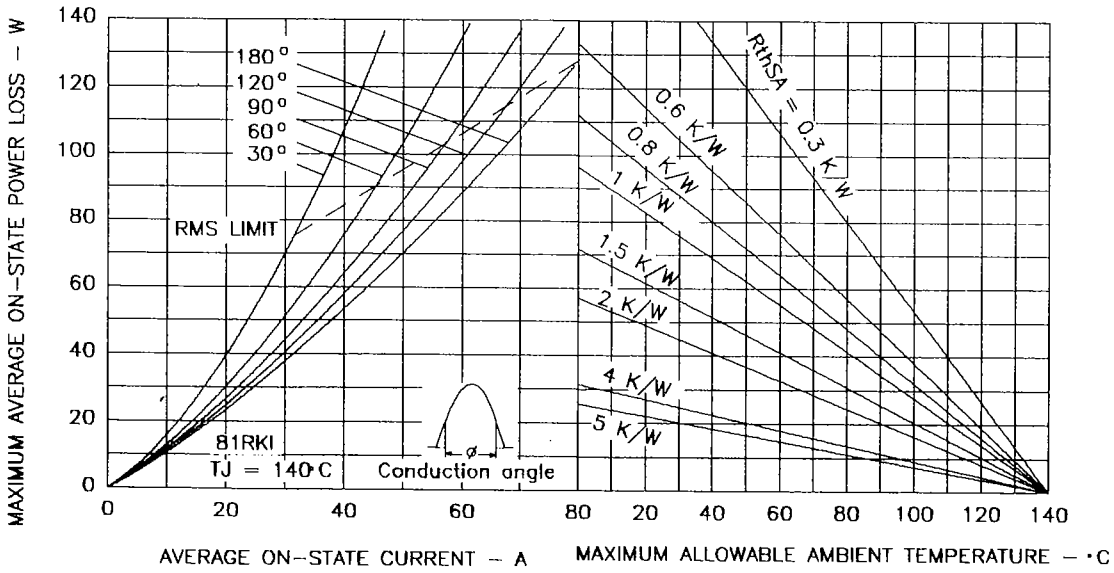


Fig. 6 - ON-STATE POWER LOSS CHARACTERISTICS

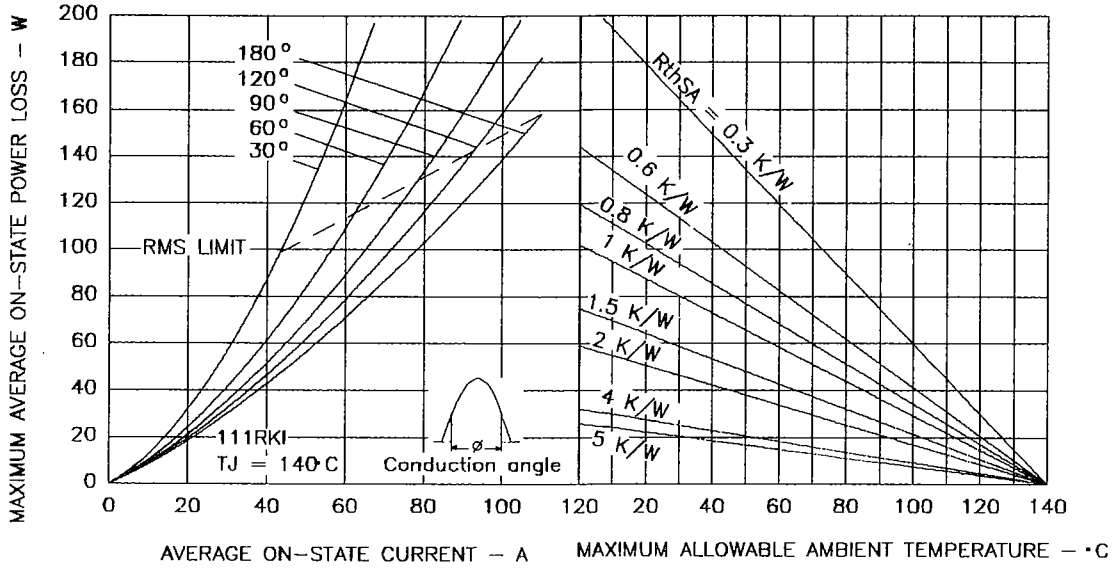


Fig. 7 - ON-STATE POWER LOSS CHARACTERISTICS

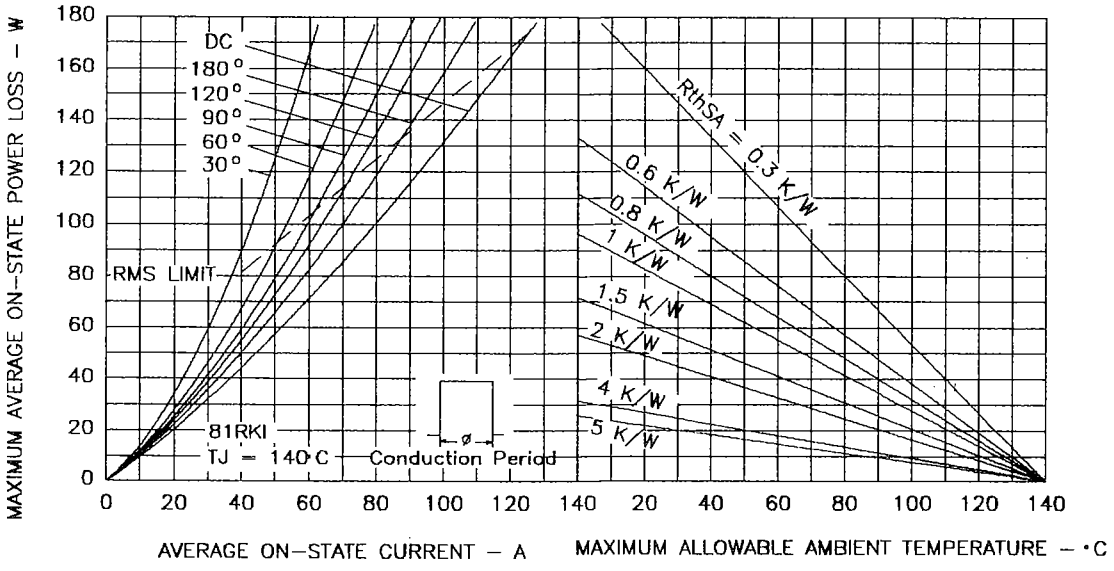


Fig. 8 - ON-STATE POWER LOSS CHARACTERISTICS

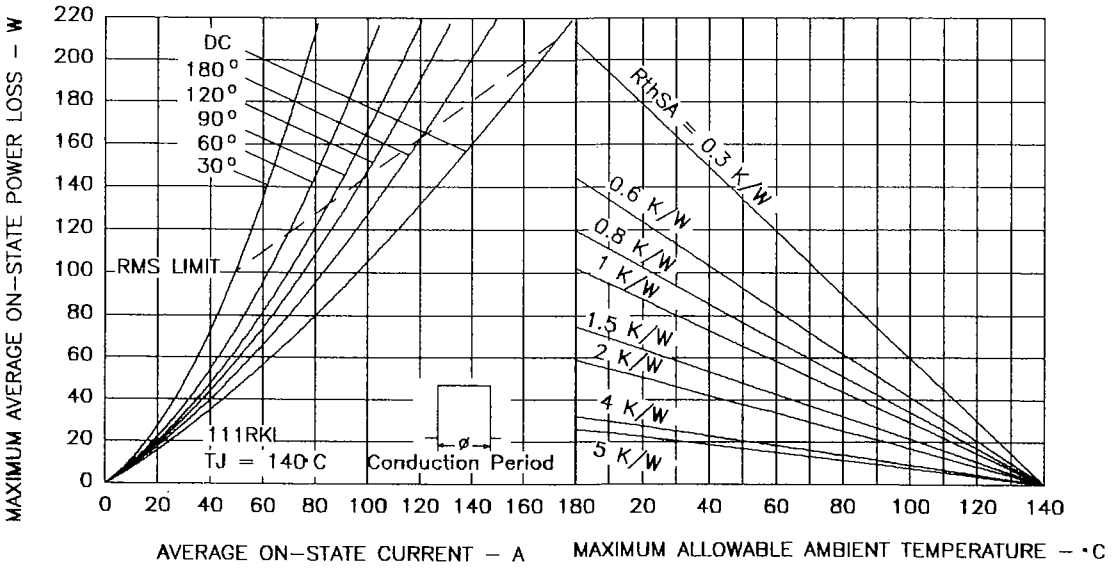


Fig. 9 - MAXIMUM NON-REPETITIVE SURGE CURRENT

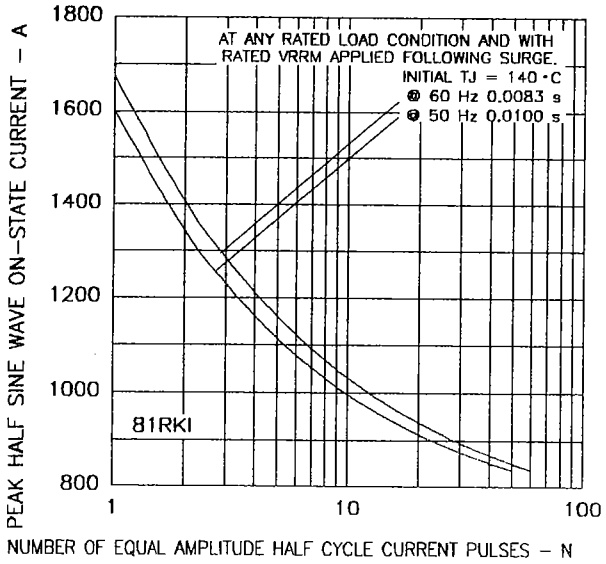


Fig. 10 - MAXIMUM NON-REPETITIVE SURGE CURRENT

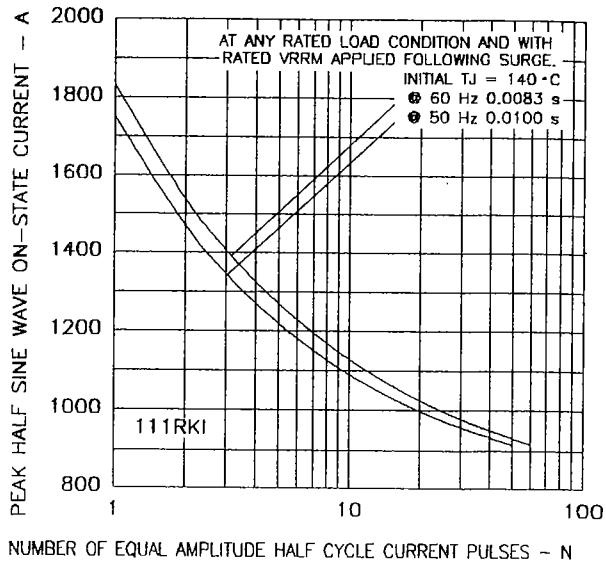


Fig. 11 - MAXIMUM NON-REPETITIVE SURGE CURRENT

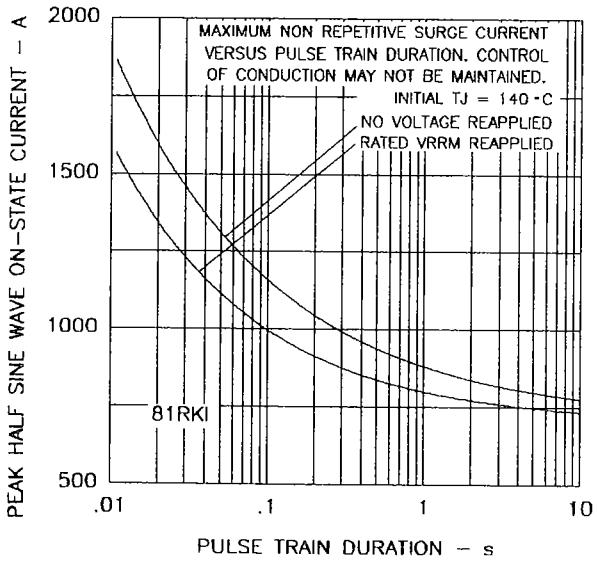


Fig. 12 - MAXIMUM NON-REPETITIVE SURGE CURRENT

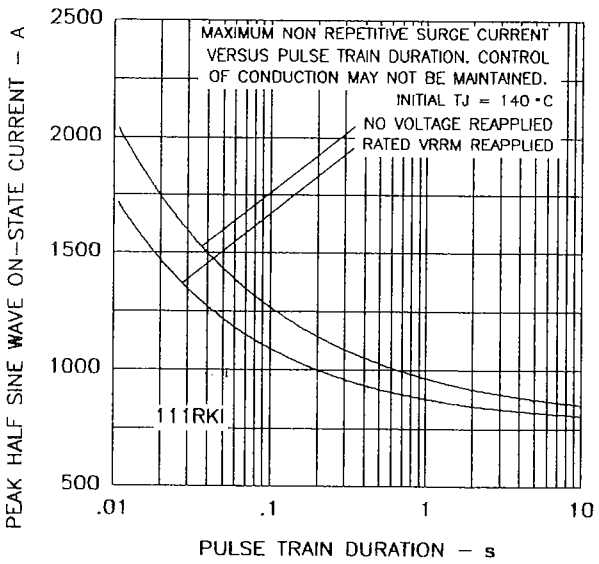


Fig. 13 - ON-STATE VOLTAGE DROP CHARACTERISTICS

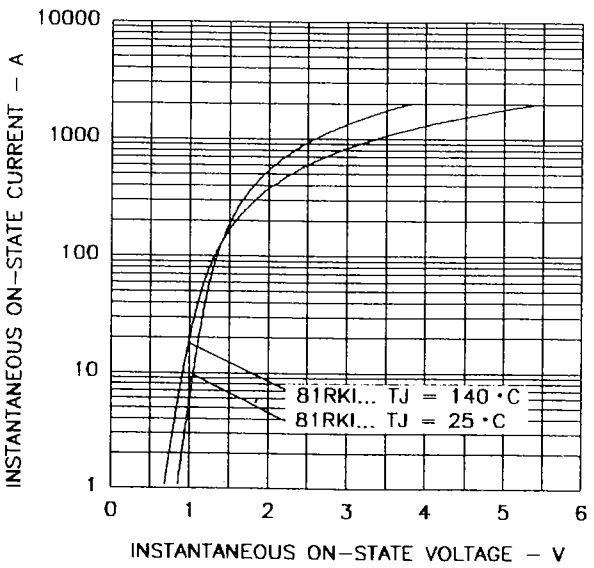


Fig. 14 - ON-STATE VOLTAGE DROP CHARACTERISTICS

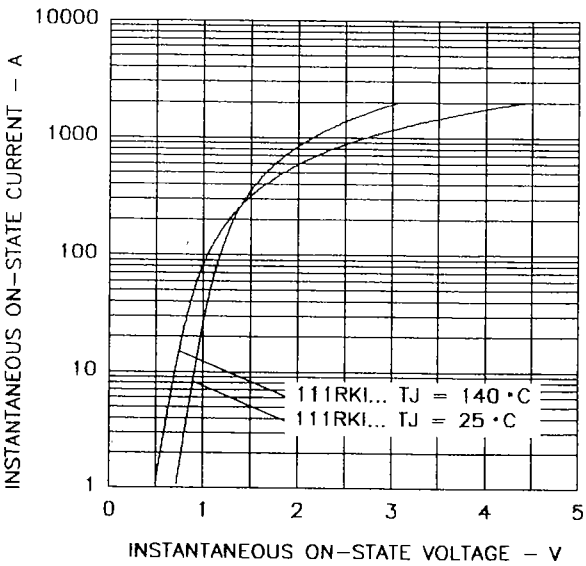


Fig. 15 - THERMAL IMPEDANCE Zthjc CHARACTERISTICS

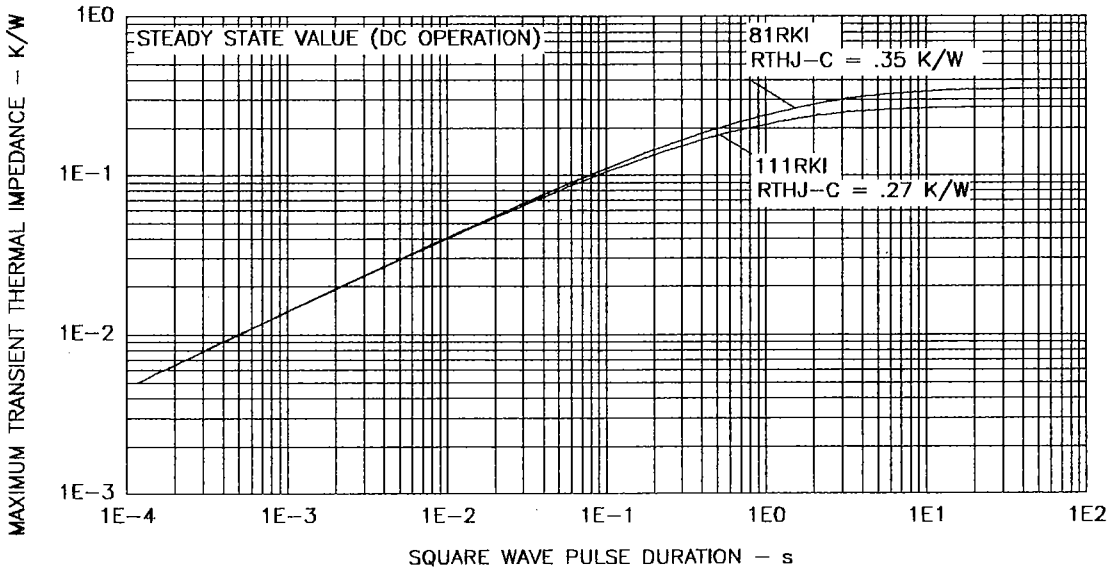
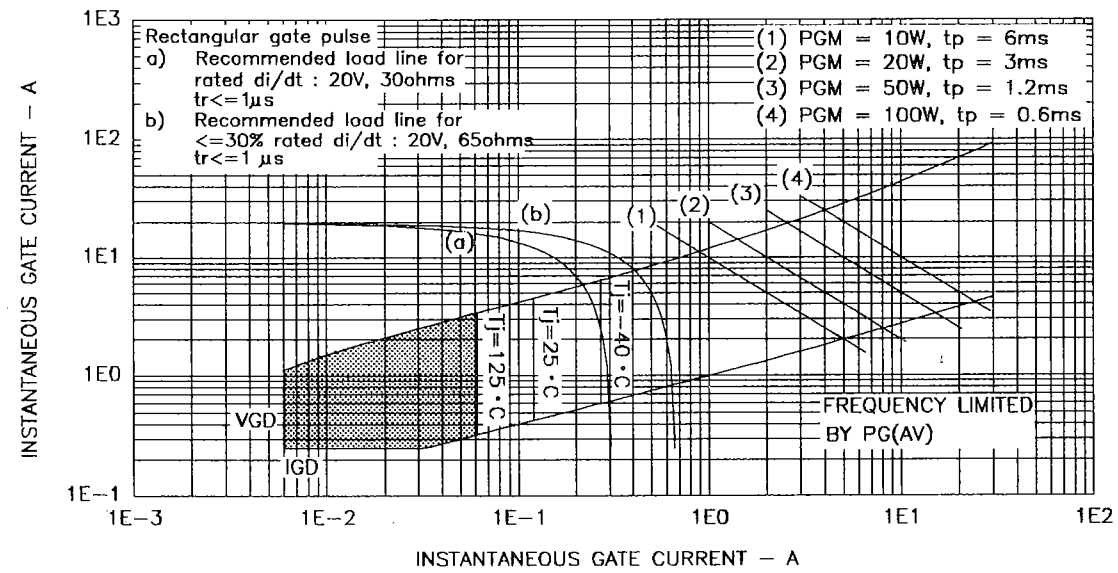


Fig. 16 - GATE CHARACTERISTICS



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