RUTTONSHA

Ruttonsha International Rectifier Ltd.

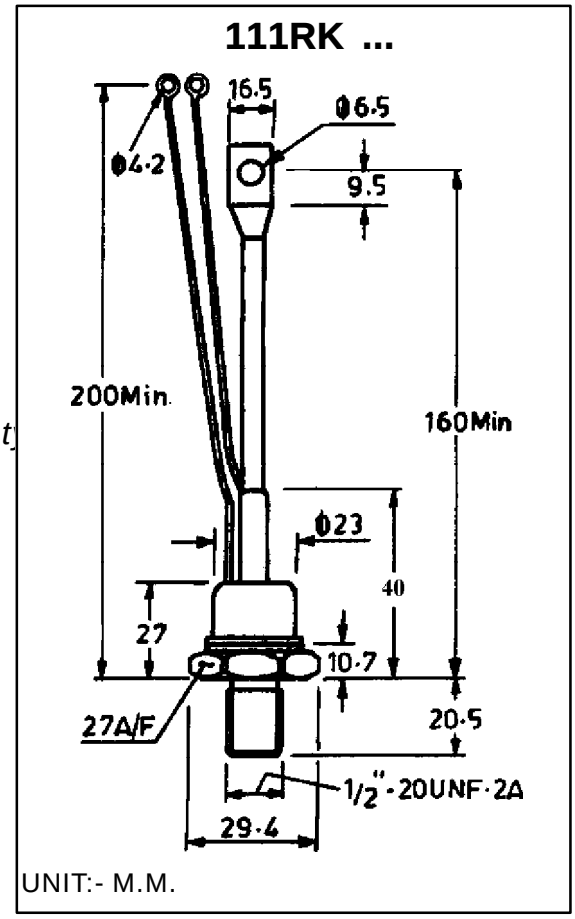
SILICON CONTROLLED RECTIFIERS

111RK SERIES
Power Silicon Controlled Rectifiers
170 Amp RMS SCRs

Types : 111RK10 TO 111RK160

FEATURES

- *All diffused series.*
- *International Standard Case TO-209 AC (TO-94).*
- *Threaded studs UNF 1/2'' - 20 UNF 2A.*
- *High di/dt and dv/dt capabilities.*
- *Reliable blocking at elevated temperature.*
- *High surge current rating 2700 A.*
- *High I^2t capability 36400 A^2Sec.*
- *Excellent dynamic characteristics.*
- *Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling.*



THERMAL MECHANICAL SPECIFICATIONS

R_{thjc}	Maximum thermal resistance junction to case	0.195K/W
R_{thcs}	Contact thermal resistance case-to-sink	0.08K/W
T_J	Junction operating temp. range	-40^{0}C to +125^{0}C
T_{stg}	Storage temperature range	-40^{0}C to +150^{0}C
	Mounting torque (Non-lubricated threads)	14.0Nm. Min. 15.5Nm. Max.
	Approximate weight	130 gms.

ELECTRICAL RATINGS

TYPE 111RK		10	20	40	60	80	100	120	140	160
V_{DRM}	Max. repetitive peak off state voltage (V)	100	200	400	600	800	1000	1200	1400	1600
V_{RRM}	Max. repetitive peak reverse voltage (V)	100	200	400	600	800	1000	1200	1400	1600
V_{RSM}	Max. non-repetitive peak reverse voltage (V)	150	300	500	700	900	1100	1300	1500	1700
I_{RM} & I_{DM}	Max. peak reverse & off state current @ rated V_{DRM} & V_{RRM} 125^{0}C -mA	20	20	20	20	20	20	20	20	20

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ELECTRICAL SPECIFICATION

ON-STATE CONDITION

	Parameter	111RK	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	110	A	180^{0}C conduction, half sine wave		
	@ case temperature	90	^{0}C			
$I_{T(RMS)}$	Max. RMS on-state current	175	A			
I_{TSM}	Max. peak one cycle non-repetitive surge current	2700		t = 10ms	No voltage reapplied	Sinusodial half wave, Initial $T_J = T_J$ max.
		2270		t = 10ms	100% V_{RRM} reapplied	
I^2t	Maximum I^2t for fusing	36.4	kA^{2}s	t = 10ms	No voltage reapplied	
		25.8		t = 10ms	100% V_{RRM} reapplied	
I^2t	Maximum I^2t for fusing	364	kA^{2}s	t = 0.1 to 10ms. No voltage reapplied.		
$V_{T(TO)1}$	Low level value of threshold voltage	0.90	V	(16.7% x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	0.92		(π x $I_{F(AV)}$ < I < 20 x π x $I_{F(AV)}$), $T_J = T_J$ max.		
r_{t1}	Low level value of on state slope resistance	1.79	mΩ	(16.7% x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max.		
r_{t2}	High level value of on state slope resistance	1.81		(π x $I_{F(AV)}$ < I < 20 x π x $I_{F(AV)}$), $T_J = T_J$ max.		
V_{TM}	Max. on state voltage	1.52	V	I_{pk} = 350A, T_J = 125^{0}C, t_p = 10ms sine pulse		
I_H	Maximum holding current	300	mA	T_J = 25^{0}C, anode supply 12V resistive load		
I_L	Latching current	600				

TRIGGERING

	Parameter	111RK		Units	Conditions	
P_{GM}	Maximum peak gate power	5		W	T_J = 125^{0}C, $t_p \leq$ 5ms	
$P_{G(AV)}$	Maximum average gate power	1			T_J = 125^{0}C, f= 50Hz, d% = 50	
I_{GM}	Max. peak positive gate current	2.0		A	T_J = 125^{0}C, $t_p \leq$ 5ms	
$+V_{GM}$	Max. peak positive gate voltage	20		V	T_J = 125^{0}C, $t_p \leq$ 5ms	
$-V_{GM}$	Max. peak negative gate voltage	5.0				
		TYP.	MAX.			
I_{GT}	DC gate current required to trigger	180 90 40	-- 150 --	mA	T_J = -40^{0}C T_J = 25^{0}C T_J = 125^{0}C	Max. required gate trigger / current / voltage are the lowest value which will trigger all units 12V anode-to-cathode applied.
V_{GT}	DC gate voltage required to trigger	2.9 1.8 1.2	-- 3.0 --	V	T_J = -40^{0}C T_J = 25^{0}C T_J = 125^{0}C	
I_{GD}	DC gate current not to trigger	10		mA	T_J = 125^{0}C	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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Switching

	Parameter	111RK	Units	Conditions
di/dt	Max non-repetitive rate of rise of turned-on current	500	A/µs	Gate drive 20V, 20Ω , tr≤ 1µs T_J – 125°C, anode voltage ≤ 80% V_{DRM}
t_d	Typical delay time	2.0	µs	Gate current 1A, di_g/dt - 1A/µs V_d - 0.67% V_{DRM}' T_J - 25°C
t_q	Typical turn-off time	100	µs	I_{TM} - 100A, T_J - 125°C, di/dt - 10A/µs, V_R - 50V dv/dt - 20V/µs, Gate 0V 100Ω , t_p - 500 µs

Blocking

	Parameter	111RK	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	400	V/µs	T_J - 125°C, linear to 80% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	20	mA	T_J - 125°C, rated V_{DRM} / V_{RRM} applied

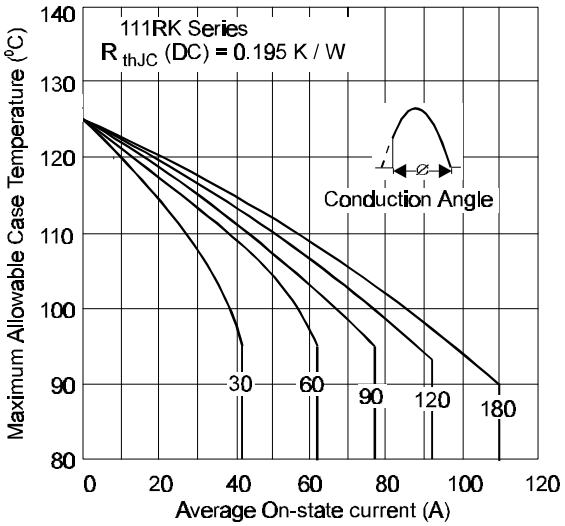

Fig. 1 - Current Ratings Characteristics

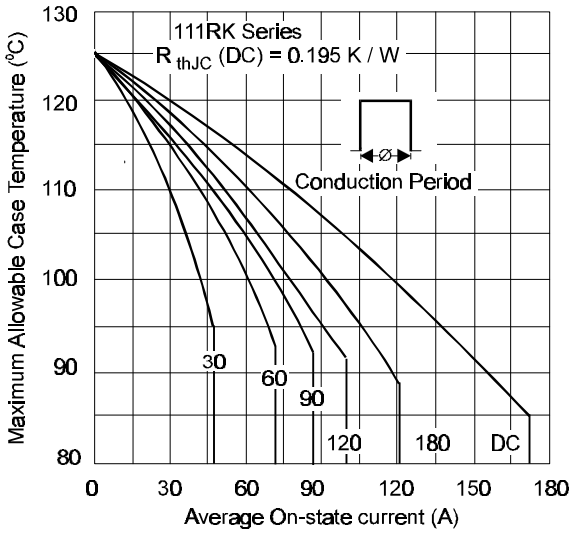

Fig. 2 - Current Ratings Characteristics

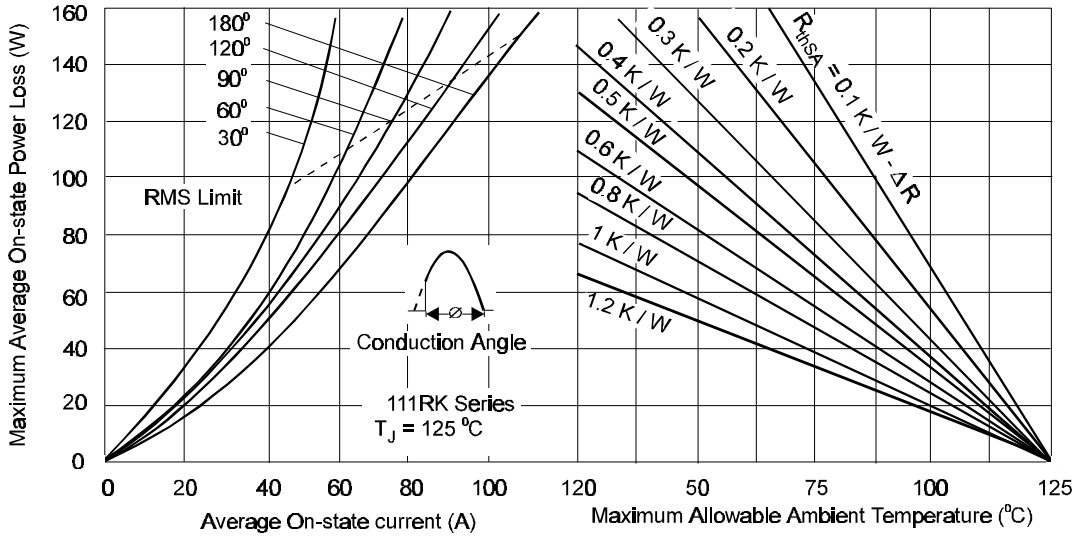

Fig. 3 - On-state Power Loss Characteristics

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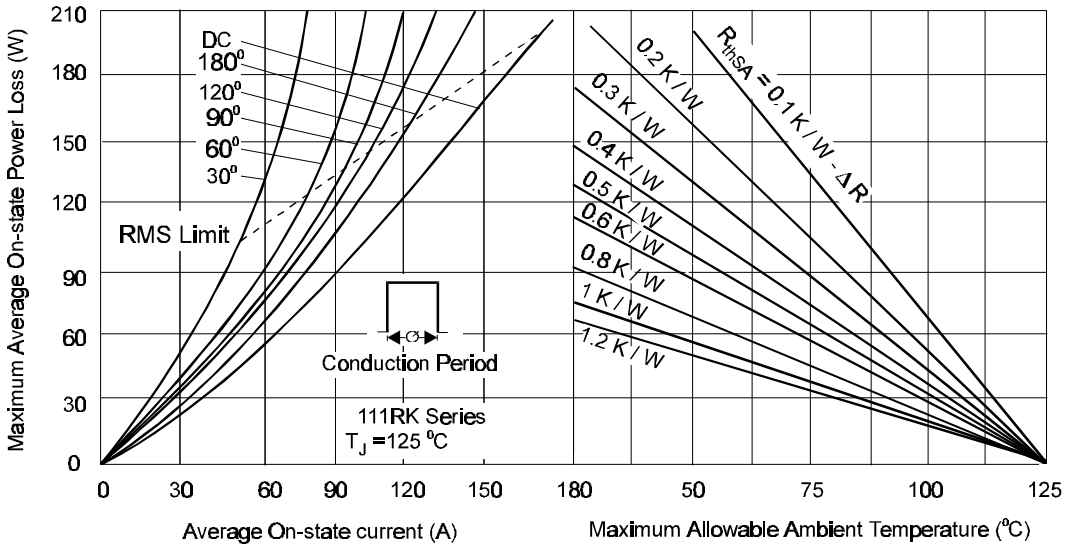

Fig.4 - On-state Power Loss Characteristics

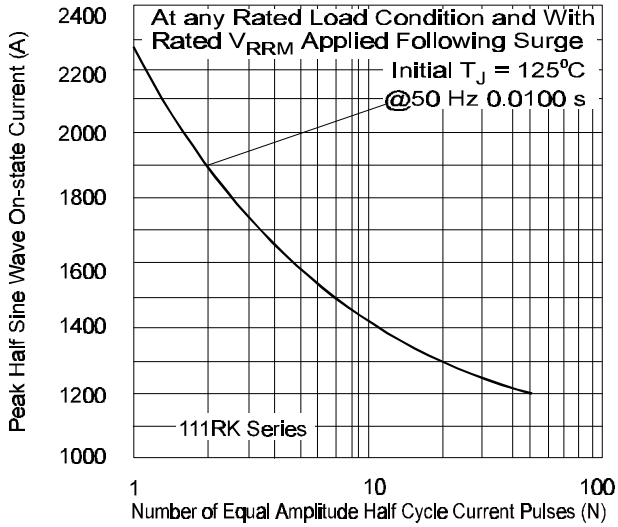

Fig. 5 - Maximum Non-Repetitive Surge Current

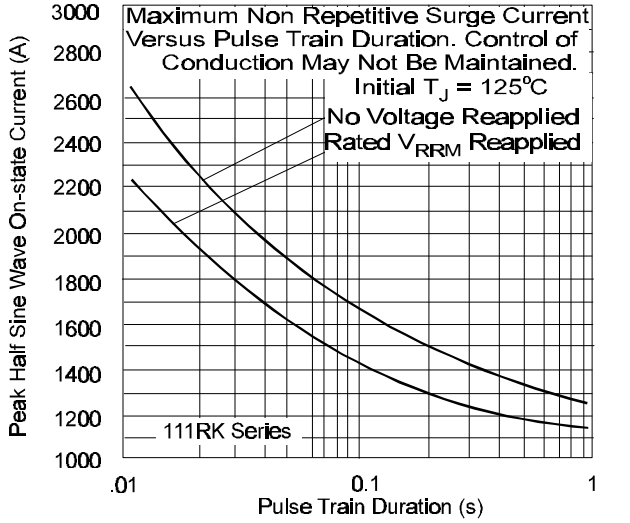

Fig. 6 - Maximum Non-Repetitive Surge Current

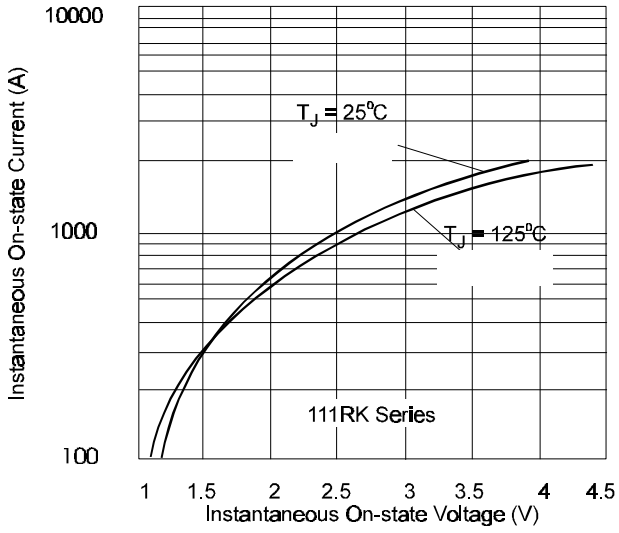

Fig. 7 - On-state Voltage Drop Characteristics

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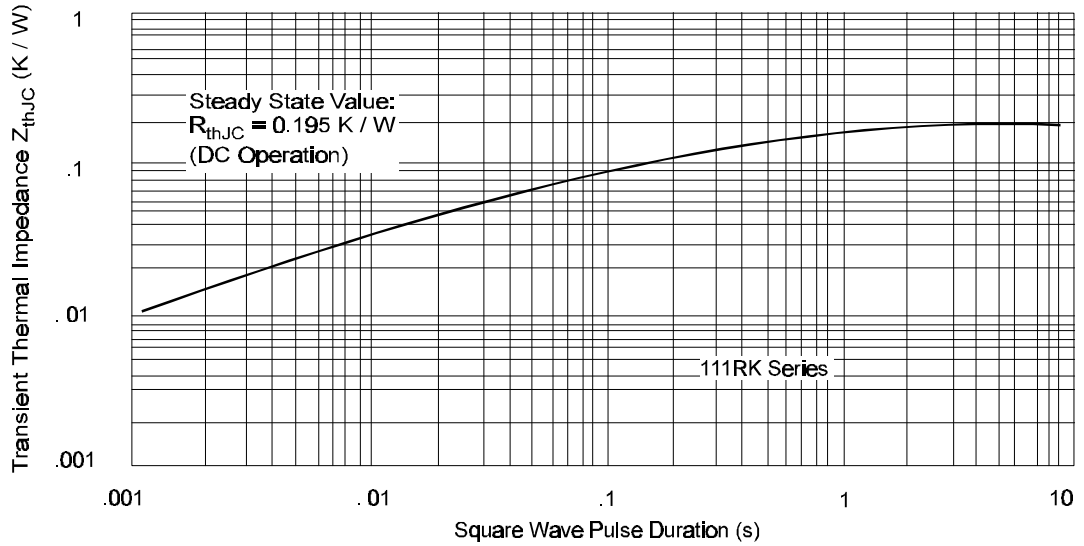

Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

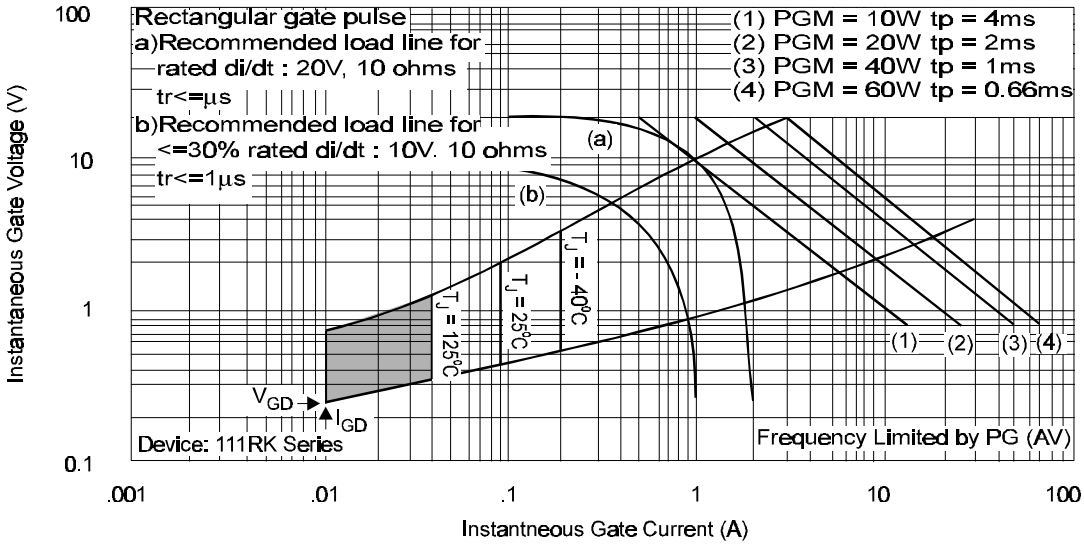

Fig. 9 - Gate Characteristics

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