

Bulletin I25152 rev. E 09/03

International IOR Rectifier

110/111RKI SERIES

PHASE CONTROL THYRISTORS

Stud Version

Features

- High current and high surge ratings
- Hermetic ceramic housing

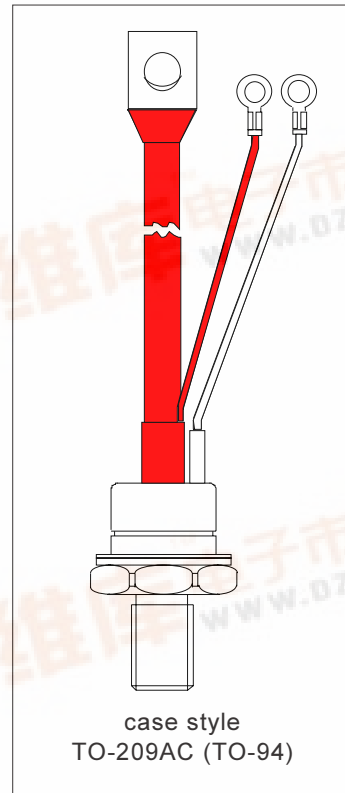
110A

Typical Applications

- DC motor controls
- Controlled DC power supplies
- AC controllers

Major Ratings and Characteristics

Parameters	110/111RKI	Units
$I_{T(AV)}$	110	A
@ T_C	90	°C
$I_{T(RMS)}$	172	A
I_{TSM}	@ 50Hz	2080
	@ 60Hz	2180
I^2t	@ 50Hz	21.7
	@ 60Hz	19.8
V_{DRM}/V_{RRM}	400 to 1200	V
t_q	typical 110	µs
T_J	- 40 to 140	°C



110/111RKI Series

Bulletin I25152 rev. E 09/03

International
IR Rectifier

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM} , max. repetitive peak and off-state voltage V	V_{RSM} , maximum non-repetitive peak voltage V	I_{DRM}/I_{RRM} max. @ $T_J = T_J$ max. mA
110/111RKI	40	400	500	20
	80	800	900	
	120	1200	1300	

On-state Conduction

Parameter	110/111RKI	Units	Conditions	
$I_{T(AV)}$ Max. average on-state current @ Case temperature	110	A	180° conduction, half sine wave	
	90	°C		
$I_{T(RMS)}$ Max. RMS on-state current	172	A	DC @ 83°C case temperature	
I_{TSM} Max. peak, one-cycle non-repetitive surge current	2080		t = 10ms	No voltage reappplied
	2180		t = 8.3ms	100% V_{RRM} reappplied
	1750		t = 10ms	Sinusoidal half wave, Initial $T_J = T_J$ max.
	1830	t = 8.3ms		
I^2t Maximum I^2t for fusing	21.7	KA ² s	t = 10ms	
	19.8		t = 8.3ms	
	15.3		t = 10ms	
	14.0		t = 8.3ms	
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	217	KA ² √s	t = 0.1 to 10ms, no voltage reappplied	
$V_{T(TO)1}$ Low level value of threshold voltage	0.82	V	(16.7% x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ max.	
$V_{T(TO)2}$ High level value of threshold voltage	1.02		($I > \pi$ x $I_{T(AV)}$), $T_J = T_J$ max.	
r_{t1} Low level value of on-state slope resistance	2.16	mΩ	(16.7% x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ max.	
r_{t2} High level value of on-state slope resistance	1.70		($I > \pi$ x $I_{T(AV)}$), $T_J = T_J$ max.	
V_{TM} Max. on-state voltage	1.57	V	$I_{pk} = 350A$, $T_J = T_J$ max., $t_p = 10ms$ sine pulse	
I_H Maximum holding current	200	mA	$T_J = 25^\circ C$, anode supply 6V resistive load	
I_L Typical latching current	400			

Switching

Parameter	110/111RKI	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	300	A/μs	Gate drive 20V, 20Ω, $t_r \leq 1\mu s$ $T_J = T_J$ max, anode voltage $\leq 80\% V_{DRM}$
t_d Typical delay time	1	μs	Gate current 1A, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ C$
t_q Typical turn-off time	110		$I_{TM} = 50A$, $T_J = T_J$ max., $di/dt = -5A/\mu s$, $V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 25Ω

Blocking

Parameter	110/111RKI	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/ μ s	$T_J = T_J$ max. linear to 80% rated V_{DRM}
I_{RRM}^{DRM} Max. peak reverse and off-state leakage current	20	mA	$T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied

Triggering

Parameter	110/111RKI	Units	Conditions
P_{GM} Maximum peak gate power	12	W	$T_J = T_J$ max, $t_p \leq 5$ ms
$P_{G(AV)}$ Maximum average gate power	3.0		$T_J = T_J$ max, $f = 50$ Hz, $d\% = 50$
I_{GM} Max. peak positive gate current	3.0	A	$T_J = T_J$ max, $t_p \leq 5$ ms
$+V_{GM}$ Maximum peak positive gate voltage	20	V	$T_J = T_J$ max, $t_p \leq 5$ ms
$-V_{GM}$ Maximum peak negative gate voltage	10		
I_{GT} DC gate current required to trigger	TYP.	MAX.	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 140^\circ\text{C}$ Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	180	-	
	80 40	120 -	
V_{GT} DC gate voltage required to trigger	2.5	-	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 140^\circ\text{C}$
	1.6	2	
	1	-	
I_{GD} DC gate current not to trigger	6.0	mA	$T_J = T_J$ max 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	

Thermal and Mechanical Specification

Parameter	110/111RKI	Units	Conditions
T_J Max. operating temperature range	-40 to 140	$^\circ\text{C}$	
T_{stg} Max. storage temperature range	-40 to 150		
R_{thJC} Max. thermal resistance, junction to case	0.27	K/W	DC operation
R_{thCS} Max. thermal resistance, case to heatsink	0.1		Mounting surface, smooth, flat and greased
T Mounting torque, $\pm 10\%$	15.5	Nm (lbf-in)	Non lubricated threads
	(137)		Lubricated threads
	14 (120)		
wt Approximate weight	130	g	
Case style	TO - 209AC (TO-94)		See Outline Table

110/111RKI Series

Bulletin I25152 rev. E 09/03

International
IR Rectifier

ΔR_{thJC} Conduction

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

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.043	0.031	K/W	$T_J = T_J \text{ max.}$
120°	0.052	0.053		
90°	0.066	0.071		
60°	0.096	0.101		
30°	0.167	0.169		

Ordering Information Table

<p>Device Code</p> <div style="display: flex; justify-content: center; align-items: center; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; background-color: #333; color: white;">11</div> <div style="border: 1px solid black; padding: 5px; background-color: #333; color: white;">1</div> <div style="border: 1px solid black; padding: 5px; background-color: #333; color: white;">RKI</div> <div style="border: 1px solid black; padding: 5px; background-color: #333; color: white;">120</div> </div> <div style="display: flex; justify-content: center; align-items: center; gap: 10px; margin-top: 5px;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">1</div> <div style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">2</div> <div style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">3</div> <div style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">4</div> </div>
<p>1 - $I_{T(AV)}$ rated average output current (rounded/10)</p> <p>2 - 0 = Eyelet terminals (Gate and Auxiliary Cathode Leads) 1 = Fast - on terminals (Gate and Auxiliary Cathode Leads)</p> <p>3 - Thyristor</p> <p>4 - Voltage code: Code x 10 = V_{RRM} (See Voltage Rating Table)</p>

Outline Table

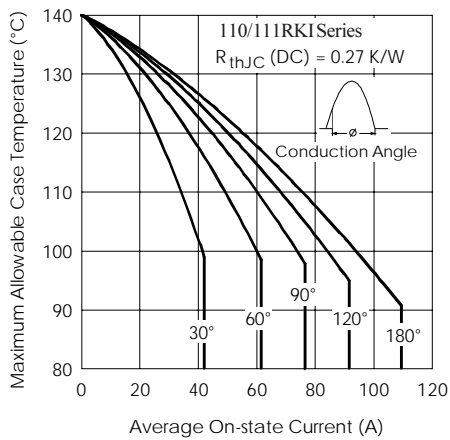
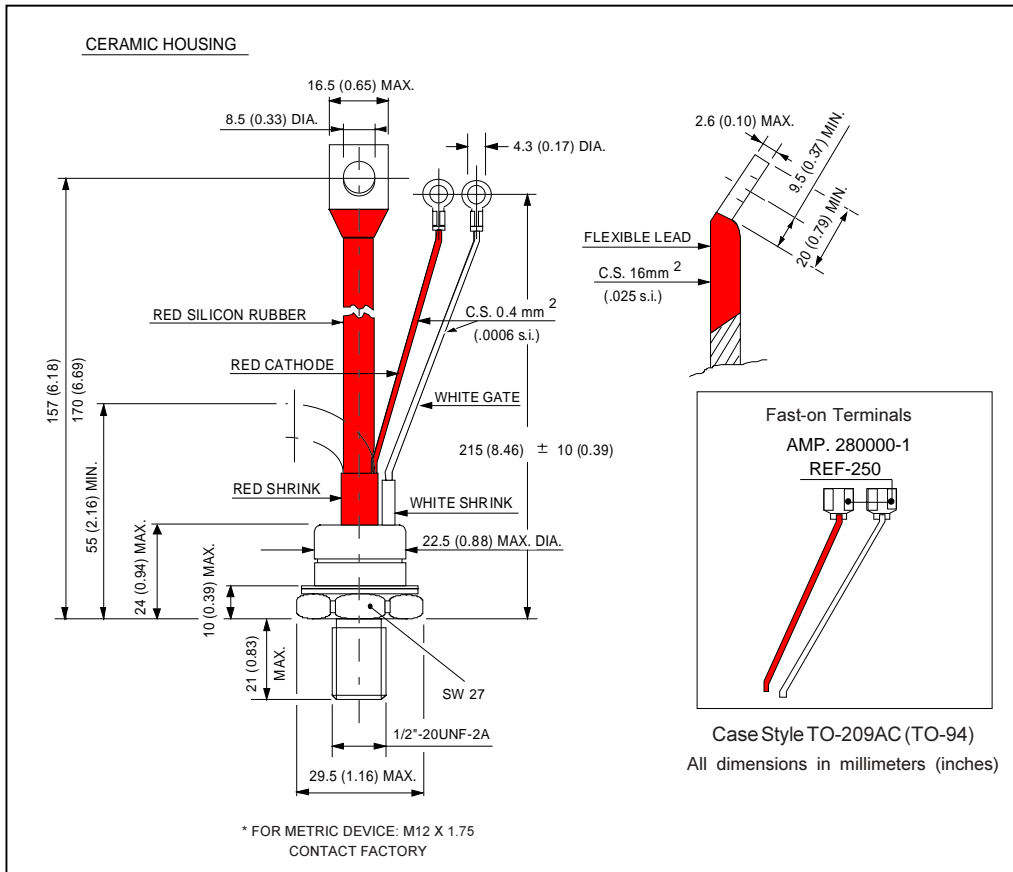


Fig. 1 - Current Ratings Characteristics

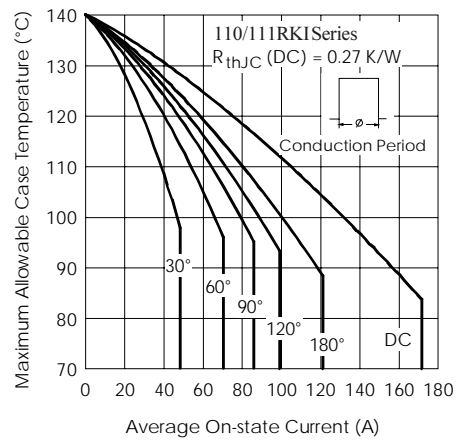


Fig. 2 - Current Ratings Characteristics

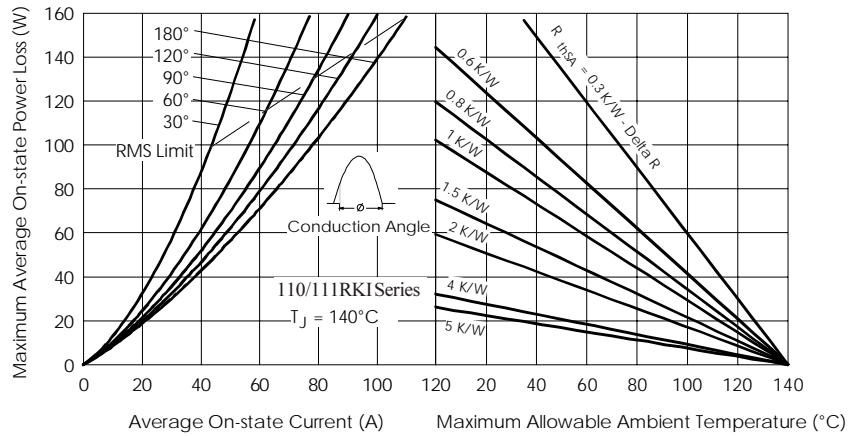


Fig. 3 - On-state Power Loss Characteristics

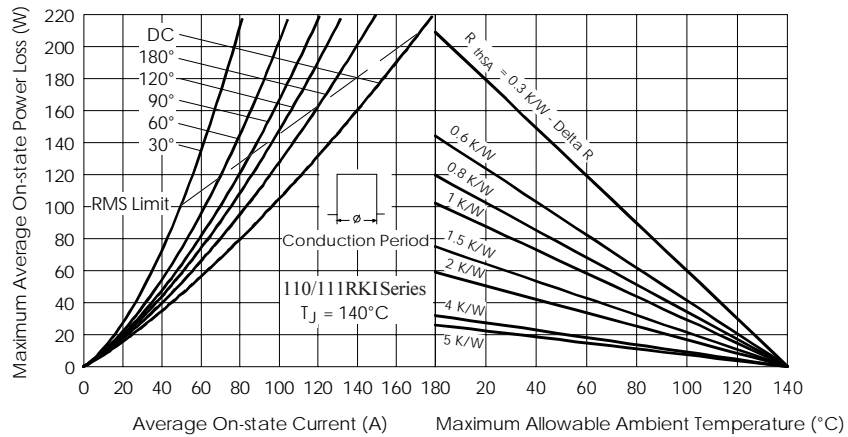


Fig. 4 - On-state Power Loss Characteristics

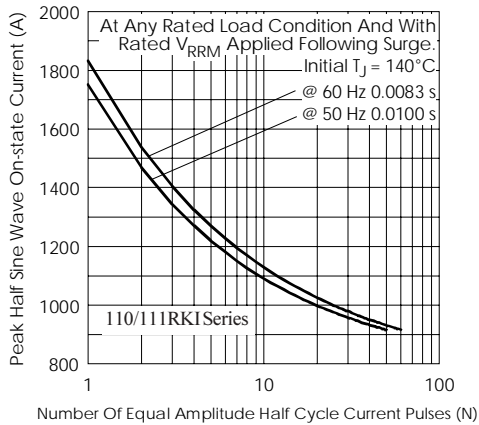


Fig. 5 - Maximum Non-Repetitive Surge Current

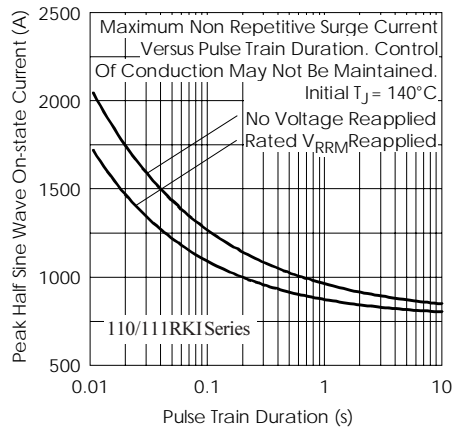


Fig. 6 - Maximum Non-Repetitive Surge Current

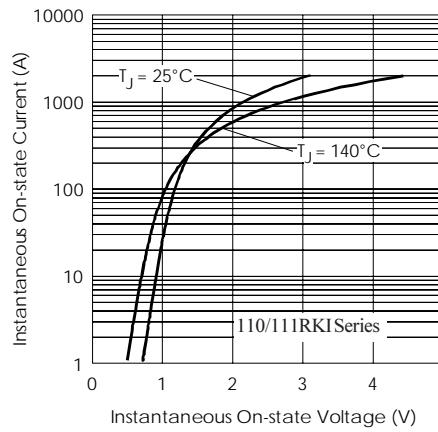


Fig. 7 - On-state Voltage Drop Characteristics

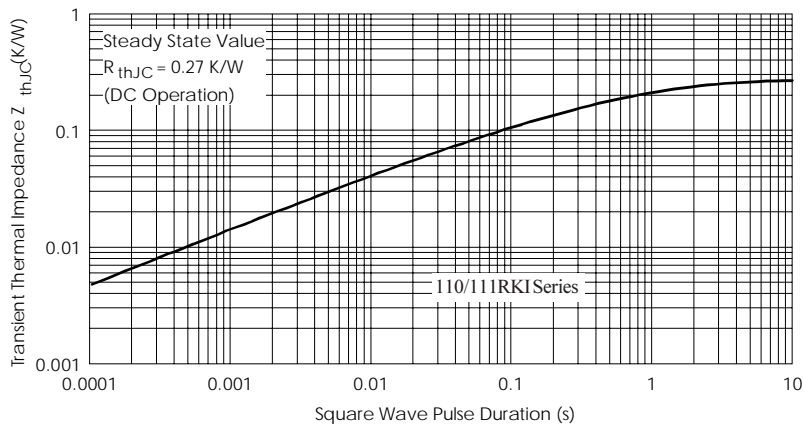


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

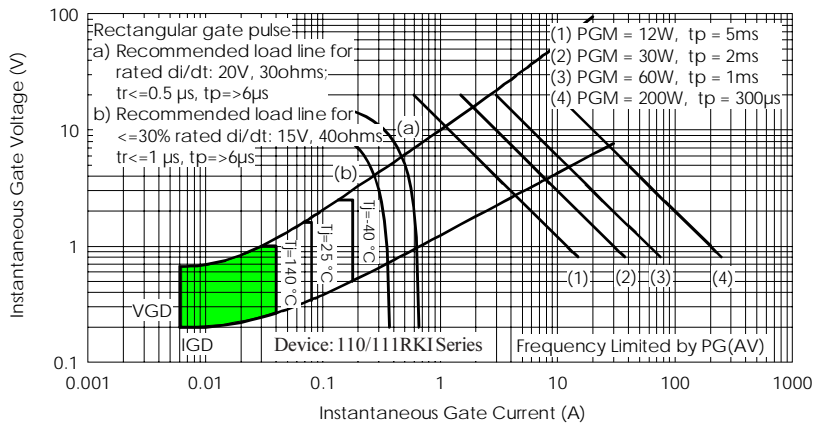


Fig. 9 - Gate Characteristics

110/111RKI Series

Bulletin I25152 rev. E 09/03

International
IOR Rectifier

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level.
Qualification Standards can be found on IR's Web site.

International
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309
Visit us at www.irf.com for sales contact information. 03 /03