Ruttonsha International Rectifier Ltd.

RUTTONSHA

POWER MODULES

IRK.1000 SERIES
High Voltage Thyristor/Diode and Thyristor/Thyristor

FEATURES

- *Electrically isolated base plate.*
- *3500 V_{RMS} isolating voltage.*
- *Industrial standard package.*
- *Simplified mechanical designs, rapid assembly.*
- *High surge capability.*
- *Large creepage distances.*
- *Beryllium oxide substrate.*

DESCRIPTION

These IRK series of Power Modules use power thyristors/ diodes in four basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. They can be interconnected to form single phase or three phase bridges or as AC-switches when modules are connected in anti-parallel.

These modules are intended for general purpose applications such as battery chargers, welders and plating equipment.

MAJOR RATINGS & CHARACTERISTICS

Parameters		IRK.1000	Units
$I_{T(AV)}$	@ 77 ^{0}C	1000	A
$I_{T(RMS)}$		1570	A
I_{TSM}	@ 50 Hz	32	kA
I^2t	@ 50 Hz	5120	kA^2s
V_{DRM} -V_{RRM}		Up to 1200	V
T_J		-40 to 125	^{0}C

ELECTRICAL SPECIFICATION

VOLTAGE RATINGS

Type Number	Voltage Code	V_{RRM} max. repetitive peak reverse voltage blocking voltage V	V_{RSM}, max. non-repetitive peak reverse voltage V	I_{RD} max. @ 140°C mA
IRK 1000	10	1000	1100	150
	12	1200	1300	150

ON-STATE CONDUCTION

	Parameters	IRK.1000	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current	1000	A	180° conduction, half sine wave Double side cooled	
	@ Case temperature	77	°C		
$I_{T(RMS)}$	Max. RMS on-state current	1570	A		
I_{TSM}	Max. peak, one cycle on-state, non-repetitive surge current	32	A	t = 10ms	180° half-sine wave ; 50Hz (t_p=10ms); single pulse; V_D=V_R = 0 V; Gate pulse: I_G=I_{FGM}, V_G=20V; t_{GP}= 500 µs; di_G/dt=1A/µs
I^2t	Maximum I^2t for fusing	5120	kA^2s	t = 10ms	180° half-sine wave ; 50Hz (t_p=10ms); single pulse; V_D=V_R = 0 V; Gate pulse: I_G=I_{FGM}, V_G=20V; t_{GP}= 500 µs; di_G/dt=1A/µs
$V_{T(TO)}$	threshold voltage max.	0.90	V	T_J = T_J max.	
r_t	on-state slope resistance max.	0.04	mΩ	T_J = T_J max.	
V_{TM}	Max. on-state voltage drop	1.25	V	I_T = 3140A , 25°C	
I_H	Maximum holding current	500 max.	mA	T_J =25°C V_D= 12V, Gate Open	
I_L	Max. latching current	1500 max.	mA	V_D= 12V, tp= 500µs V_G = 20r I_G= I_{FGM} T_J =25°C dig/dt = 1A/µs	

SWITCHING

t_d	Delay Time	2.0	µs	T_J = 25°C Gate current = 1A $dIg/_{DT}$=1A/µs I_G= I_{FGM} Vd = 0.4 % V_{DRM} I_{TM}= $I_{T(AV)}$ V_G=20V, t_{GP} =500µs, dig/dt= 1A/µs.
t_q	Turn-Off Time max.	200	µs	dvD/dt = 50 V/µs I_{TM}=$I_{T(AV)}$ dir/dt = 10A/µs VR=100V, V_D=0.67 V_{DRM} T_J = T_J max.

IRK.1000 SERIES

BLOCKING

	Parameter	1000		Units Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	$T_J = T_J$ max. V_D =0.67 V_{DRM} Gate Open
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	150	mA	$T_J = T_J$ max. rated V_{DRM}/V_{RRM} applied
V_{INS}	RMS isolation voltage	3500	V	50Hz,Circuit to base, all terminal shorted,25°C,1sec

TRIGGERING

	Parameter	1000	Units	Conditions
I_{FGM}	Peak forwedrd gate current	8	A	$T_J = T_J$ max.
V_{RGM}	Peak reveres gate voltage	5	V	$T_J = T_J$ max.
P_G	Gate power dissipation	4	W	$T_J = T_J$ max. for DC gate current
I_{GT}	DC gate current required to trigger	250	mA	T_J = 25°C V_D =12V, I_D =3A
V_{GT}	DC gate voltage required to trigger	2.5	V	
V_{GD}	DC gate voltage not to trigger	min. 0.25	V	$T_J = T_J$ max. V_D = 0.67 V_{DRM}
I_{GD}	DC gate current not to trigger	min. 10.0	mA	
di/dt	Maximum critical rate of rise of turned-on current	400	A/µs	$T_J = T_J$ max. V_D = 0.67 V_{DRM} I_{TM} =2 $I_{T(AV)}$

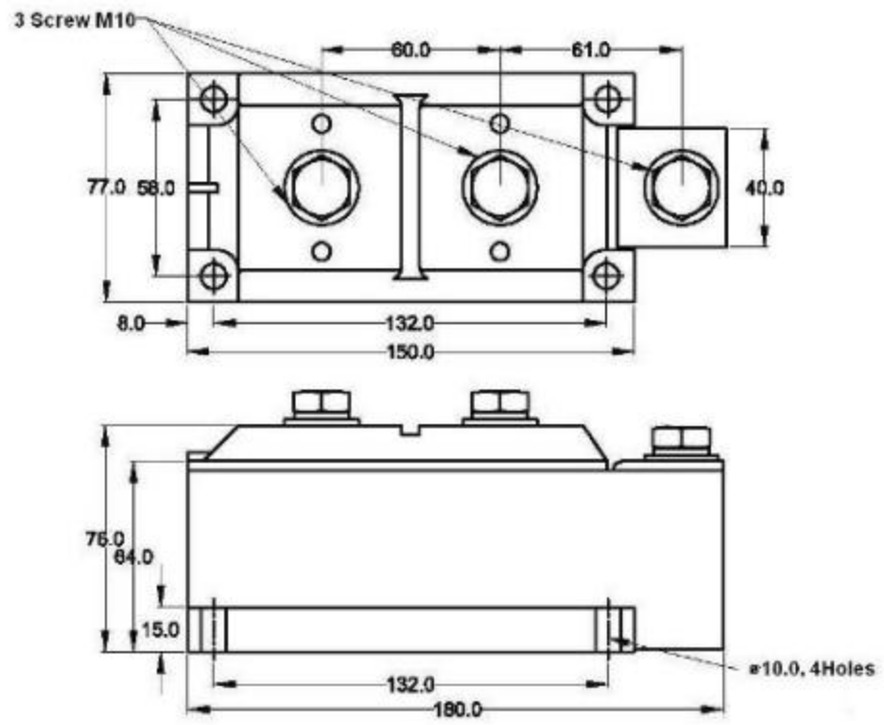
THERMAL AND MECHANICAL SPECIFICATION

	Parameter	1000	Units	Conditions
T_J	Max. operating temperature range	-40 to 140	°C/W	
T_{stg}	Max. storage temperature range	-40 to 125		
R_{thJ-C}	Max. thermal resistance, junction to case	0.0250/0.0500	°C/W	Per module / per arm.
R_{thC-h}	Max. thermal resistance, case to heatsink	0.0080/0.0160	°C/W	Per module / per arm.
T	Mounting tourque, ±15%	9 (18)	Nm	To heatsink & to (terminal)
W	Weight	3500	gm.	

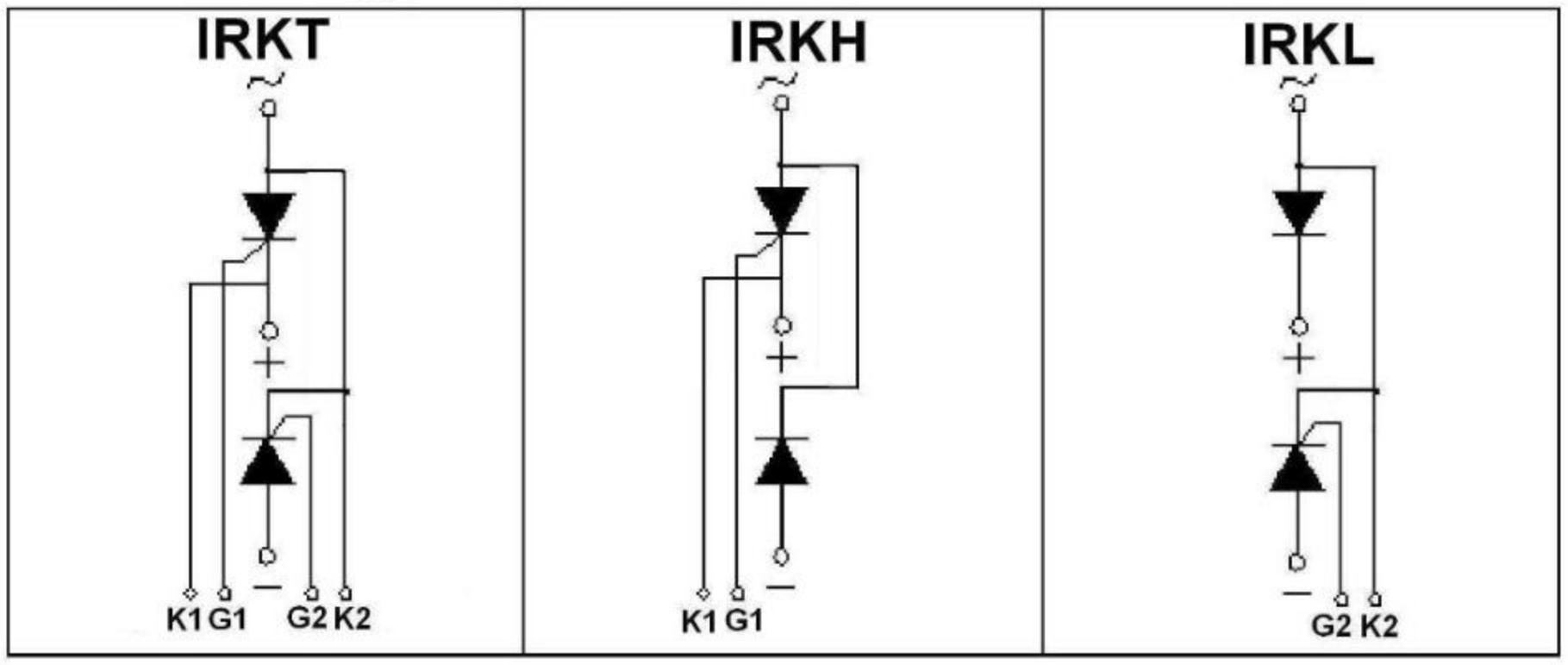
POWER MODULES

IRK.1000 SERIES

OUTLINE DIAGRAM



Circuit Configuration Table



Ordering Information Table

IRK	T	1000	/	12
①	②	③		④

① - **Module type**

② - **Circuit configuration (See Circuit Configuration table)**

③ - **Current Code**

④ - **Voltage Code (See Voltage Ratings table)**

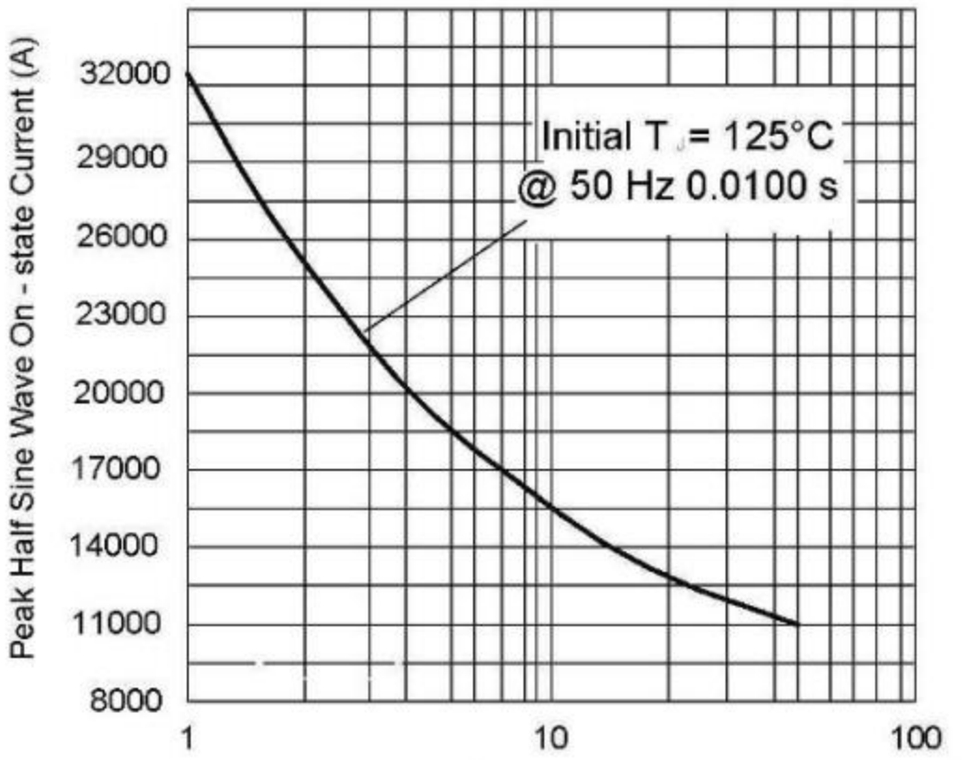


Fig. 1 - Maximum Non - Repetitive Surge Current

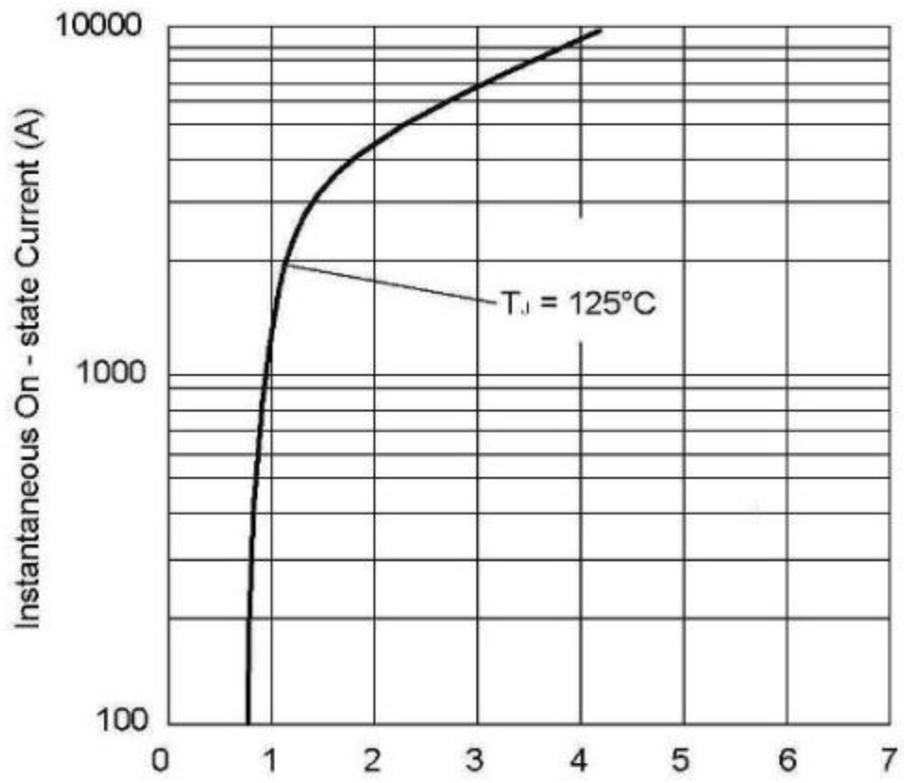


Fig. 2 - On - state Voltage Drop Characteristics

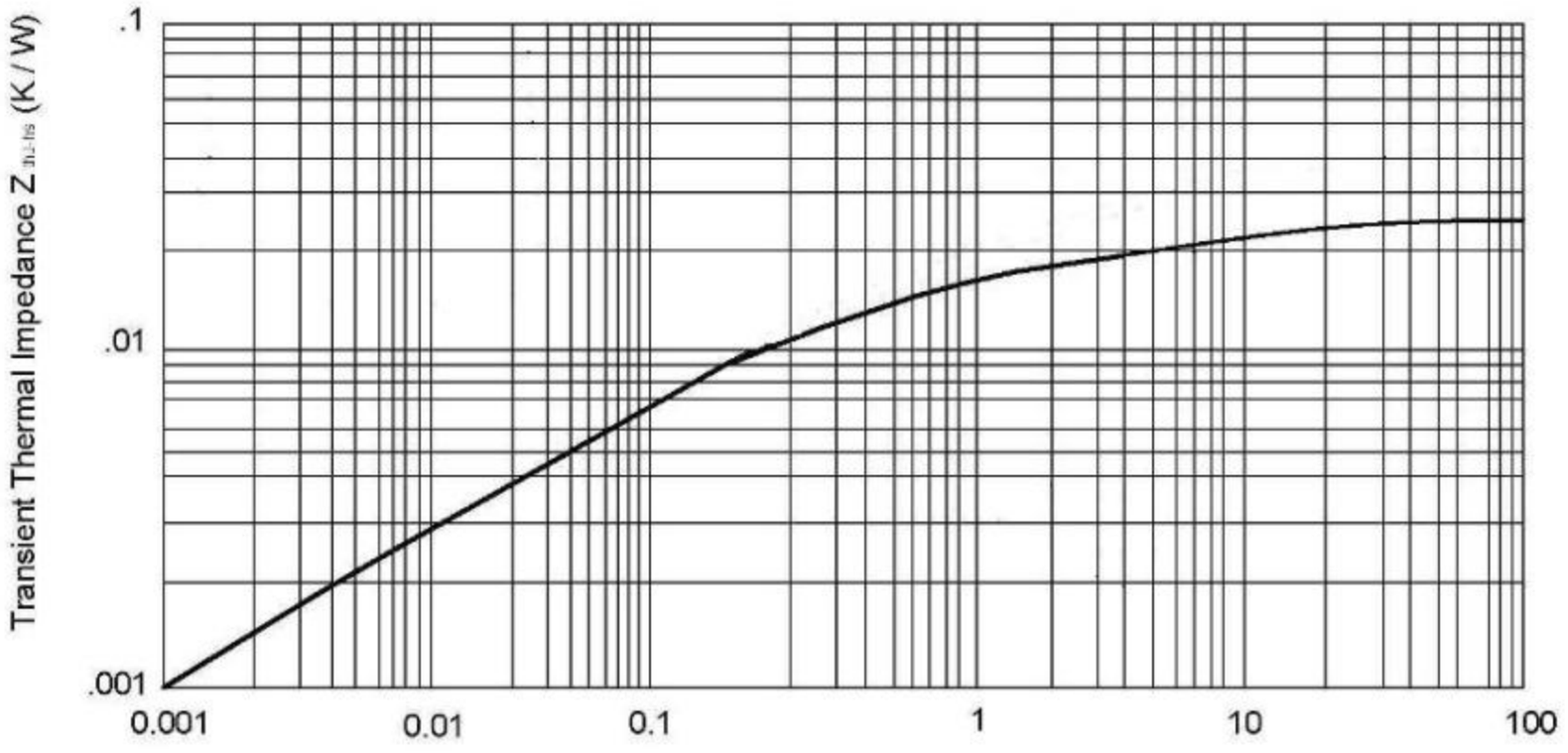


Fig. 3 - Thermal Impedance Z thJ - hs Characteristics

Last update : Sept.2007