Ruttonsha International Rectifier Ltd.

POWER MODULES

IRK.136 SERIES

High Voltage Thyristor/Diode and Thyristor/Thyristor

FEATURES

- Electrically isolated case style.
- 3600 V_{RMS} isolating voltage.
- Industrial standard package.
- Simplified mechanical designs, rapid assembly.
- High surge capability.
- Large creepage distances.
- Aluminium case.

DESCRIPTION

These IRK series of Power Modules use power thyristors/diodes in four basic configurations. The semiconductors are electrically isolated from the metal case, 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		IRK136	Units
$I_{T(AV)}$	2 x 90°	130	A
$I_{T(RMS)}$		270	A
I_{TSM}	t = 10 ms	5000	A
I^2t	2 x 90°	125	KA^2s
V_{RRM}		800	V
V_{ISOL}		3600	V
T_J		-40 to 125	°C

IRK.136 SERIES

ELECTRICAL SPECIFICATION

VOLTAGE RATINGS

Type Number	Voltage Code	V_{RRM} / V_{DRM}, max. repetitive peak reverse and off-state voltage blocking voltage V	V_{RSM}, max. non-repetitive peak reverse voltage V	I_{DRM} / I_{RRM} max. @ 130°C mA
IRK.136	14	1400	1500	50
	16	1600	1700	50
	18	1800	1900	50
	20	2000	2100	50
	22	2200	2300	50
	24	2400	2500	50
	26	2600	2700	50

ON-STATE CONDUCTION

	Parameters	IRK.136	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current	130	A	180° conduction, half sine wave	
	@ Case temperature	85	°C		
$I_{T(RMS)}$	Max. RMS on-state current	213	A	as AC switch	
I_{TSM}	Max. peak, one cycle on-state, non-repetitive surge current	3200	A	t = 10ms	Sinusoidall half wave. Initial $T_J = T_J$ max.
I^2t	Maximum I^2t for fusing	51.5	kA^2s	t = 10ms	Sinusoidal half wave, Initial $T_J = T_J$ max.
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	515	$kA^2\sqrt{s}$	t = 0.1 to 10ms. No voltage reapplied.	
$V_{T(TO)1}$	Threshold voltage	0.98	V	$T_J = T_J$ max.	
r_{t1}	On-state slope resistance	1.62	mΩ	$T_J = T_J$ max.	
V_{TM}	Max. on-state voltage drop	1.66	V	$I_{TM} = \pi \times I_{T(AV)}$, $T_J = T_J$ max., 180° conduction AV. power = $V_{T(TO)} \times I_{T(AV)} + r_t \times (I_{T(RMS)})^2$	
I_H	Maximum holding current	500	mA	Anode supply = 12V, initial I_T = 30A, T_J = 25°C	
I_L	Max. latching current	300	mA	Anode supply = 12V, resistive load = 1Ω, gate pulse : 10V, 100µs, T_J = 25°C	

SWITCHING

t_d	Typical delay time	2.0	µs	T_J = 25°C	Gate current = 1A $dIg/_{dt}$ = 1A/µs
t_r	Typical rise time	3.0	µs	T_J = 25°C	Vd = 0.67% V_{DRM}
t_q	Typical turn-off time	50-150	µs	I_{TM} = 300A; dI/dt = 15A/µs; $T_J = T_J$ max.: Vr = 50V; dV/dt = 20V/µs; Gate 0V, 100ohm	

IRK.136 SERIES

BLOCKING

	Parameter	136		Units Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	T_J = 125°C, exponential to 67% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	50	mA	T_J = 125°C, rated V_{DRM}/V_{RRM} applied
V_{INS}	RMS isolation voltage	3000	V	50Hz, Circuit to base, all terminal shorted, 25°C, 1sec

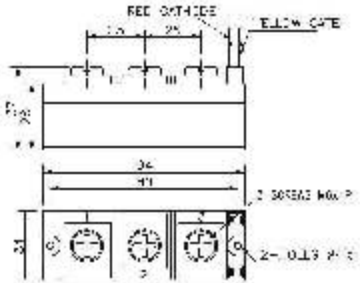
TRIGGERING

	Parameter	136	Units	Conditions
P_{GM}	Maximum peak gate power	5	W	T_J = 125°C, $t_p \leq$ 5ms
$P_{G(AV)}$	Maximum average gate power	1.0		T_J = 125°C, f= 50Hz, d% = 50
I_{GM}	Max. peak positive gate current	2.0	A	T_J = 125°C, t_p < 5ms
V_{GM}	Max. peak positive gate voltage	20	V	T_J = 125°C, t_p < 5ms
$-V_{GM}$	Max. peak negative gate voltage	5.0		
I_{GT}	DC gate current required to trigger	200	mA	T_J = 25°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	2.0	V	T_J = 25°C
V_{GD}	DC gate voltage not to trigger	0.25	V	T_J = 125°C — Max. gate current / voltage not to trigger the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied
I_{GD}	DC gate current not to trigger	10	mA	T_J = 125°C
di/dt	Maximum critical rate of rise of turned-on current	100	A/µs	T_J = 125°C, I_{TM}=100A, rated V_{DRM} applied

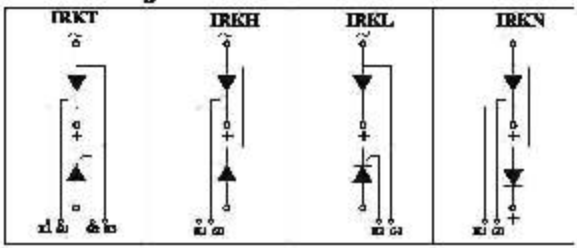
THERMAL AND MECHANICAL SPECIFICATION

	Parameter	136	Units	Conditions
T_J	Max. operating temperature range	-40 to 125	°C	
T_{stg}	Max. storage temperature range	-40 to 125		
R_{thJC}	Max. thermal resistance, junction to case	0.20	K/W	Perjunction, DC operation
R_{thCS}	Max. thermal resistance, junction to heatsink	0.035	K/W	Mountingsurfaceflat,smooth and greased
T	Mounting torque, ±10%	4 to 6	Nm	For Module to heatsink and busbar to Module
wt	Approximate weight	500	g	
	Case style	INTA-A-PAK		

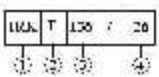
OUTLINE DIAGRAM



Circuit Configuration Table



Ordering Information Table



① - Module type
② - Circuit configuration (See Circuit Configuration table)
③ - Current Code
④ - Voltage Code (See Voltage Ratings table)

POWER MODULES

IRK.136 Series

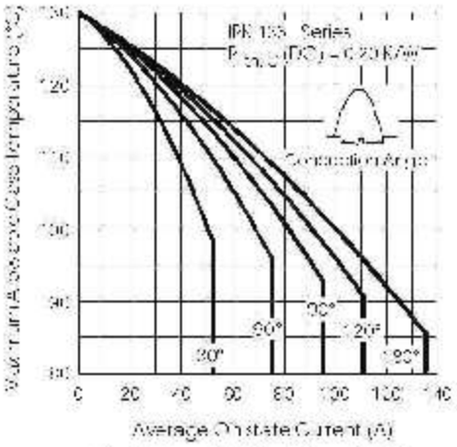


Fig. 1 - Current Ratings Characteristics

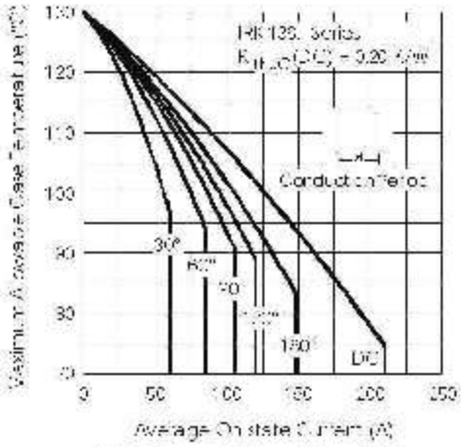


Fig. 2 - Current Ratings Characteristics

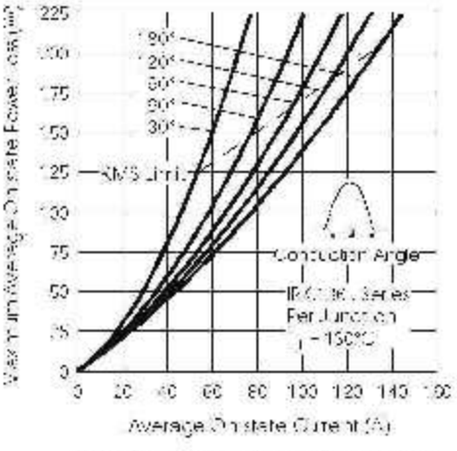


Fig. 3 - On-state Power Loss Characteristics

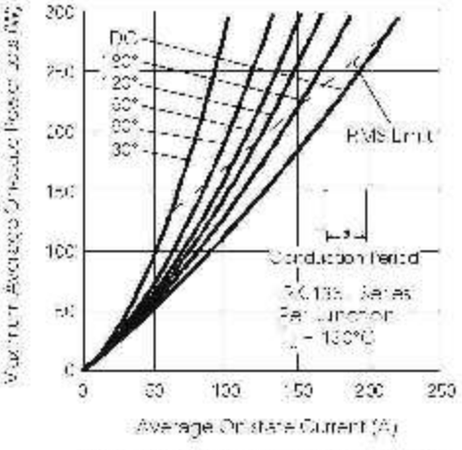


Fig. 4 - On-state Power Loss Characteristics

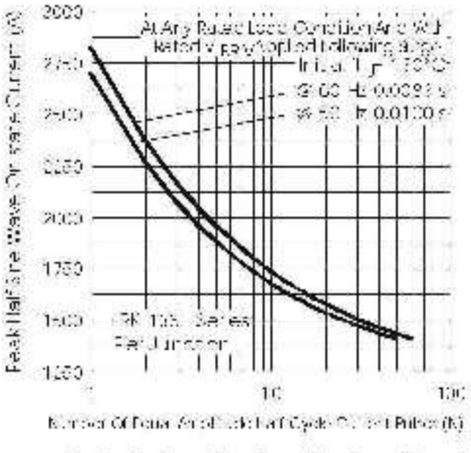


Fig. 5 - Maximum Non-Repetitive Surge Current

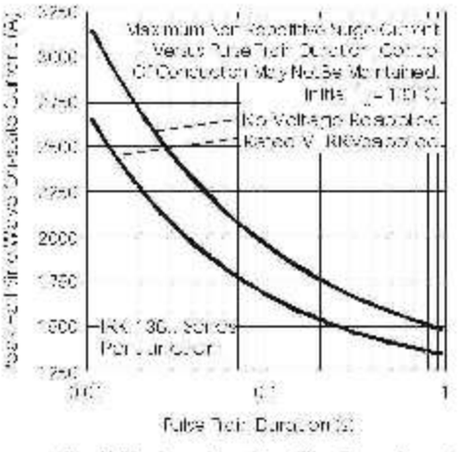


Fig. 6 - Maximum Non-Repetitive Surge Current

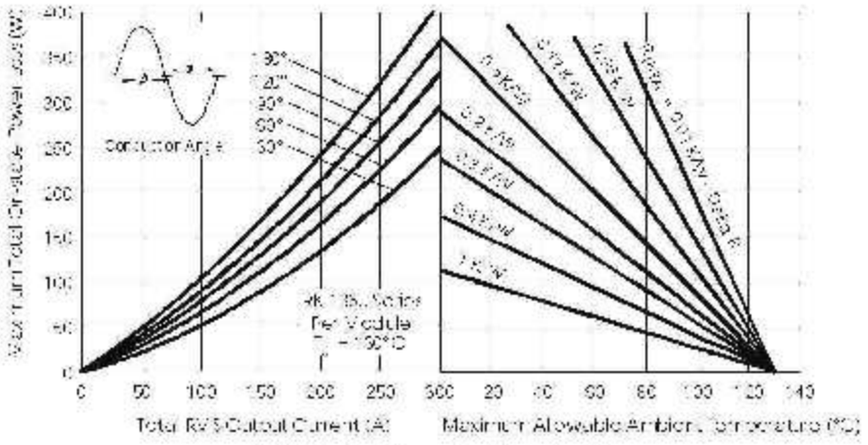


Fig. 7 - On-state Power Loss Characteristics

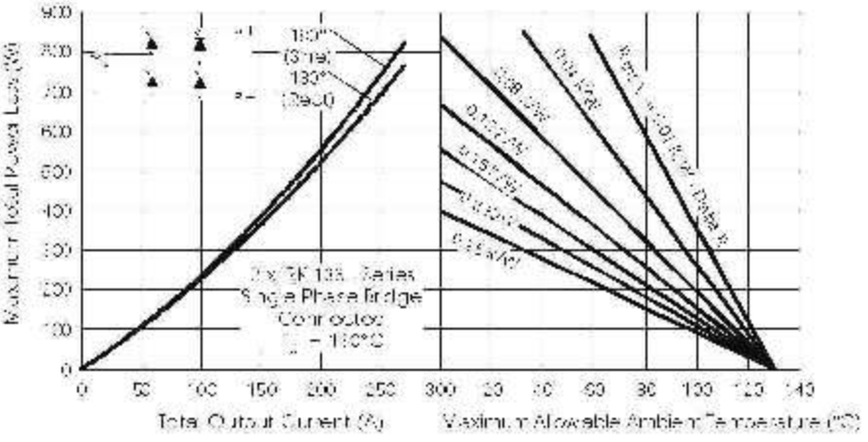


Fig. 8 - On-state Power Loss Characteristics

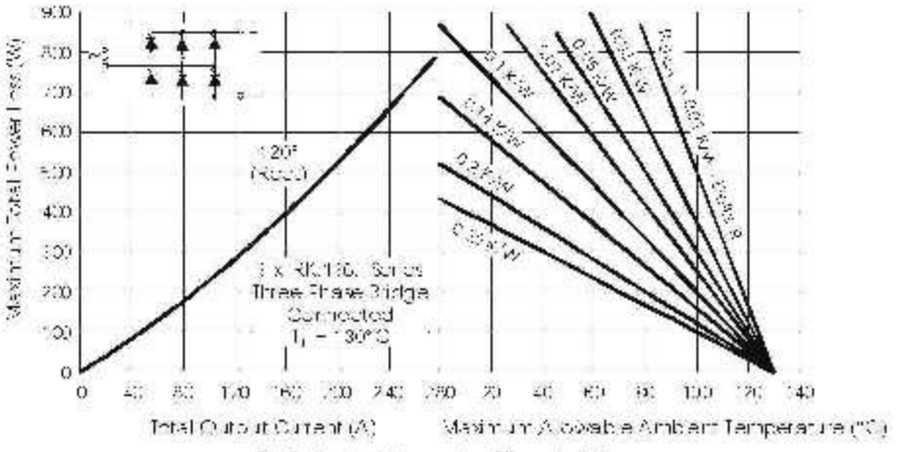


Fig. 9 - On-state Power Loss Characteristics

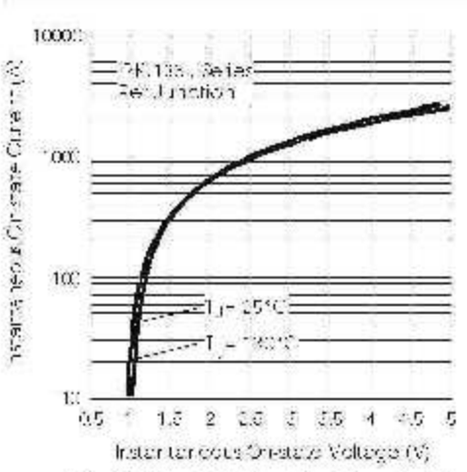


Fig. 10 - On-state Voltage Drop Characteristics

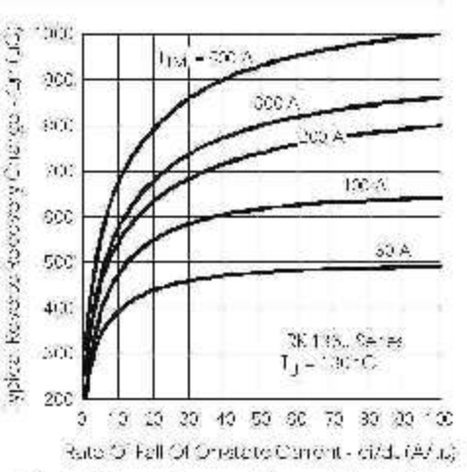


Fig. 11 - Reverse Recovery Charge Characteristics

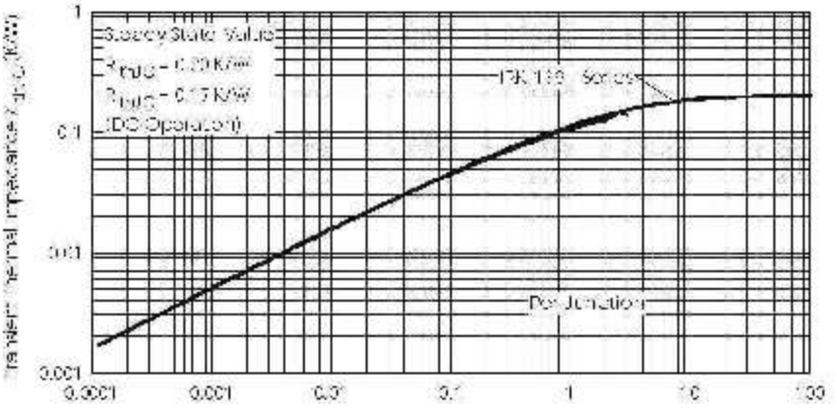


Fig.12 - Thermal Impedance Z_{thJC} Characteristics

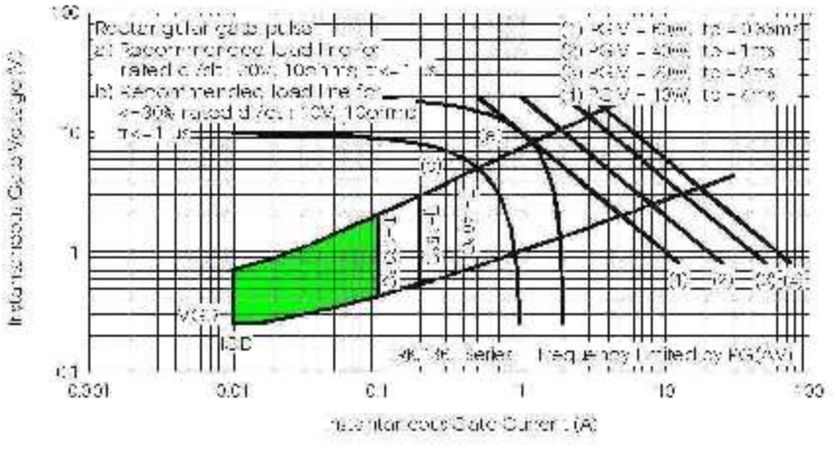


Fig. 13 - Gate Characteristics