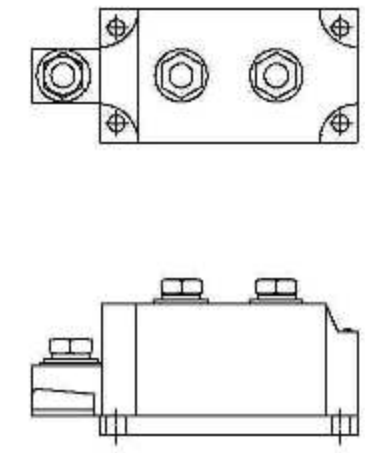
Ruttonsha International Rectifier Ltd.

POWER MODULES

IRK.160 SERIES
High Voltage Thyristor/Diode and Thyristor/Thyristor

FEATURES

- *Electrically isolated base plate.*
- *3000 V_{RMS} isolating voltage.*
- *Industrial standard package.*
- *Simplified mechanical designs, rapid assembly.*
- *High surge capability.*
- *Large creepage distances.*
- *Aluminum Nitride*



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 160	Units
$I_{T(AV)}$	@ 85°C	160	A
$I_{T(RMS)}$		251	A
I_{TSM}	@ 50 Hz	4000	A
I^2t	@ 50 Hz	80	kA^2s
V_{DRM} -V_{RRM}		2000 to 3600	V
T_J		-40 to 125	°C

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. @ 125°C mA
IRK 160	20	2000/2000	2100	50
	24	2400/2400	2500	50
	28	2800/2800	2900	50
	32	3200/3200	3300	50
	36	3600/3600	3700	50

ON-STATE CONDUCTION

	Parameters	IRK 160	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current	160	A	180° conduction, half sine wave	
	@ Case temperature	85	°C		
$I_{T(RMS)}$	Max. RMS on-state current	251	A		
I_{TSM}	Max. peak, one cycle on-state, non-repetitive surge current	4000	A	t = 10ms	Sinusoidall half wave, Initial $T_J = T_J$ max.
I^2t	Maximum I^2t for fusing	80	kA^2s	t = 10ms	
$V_{T(TO)}$	Threshold voltage	1.2	V	$T_J = T_J$ max.	
r_t	On-state slope resistance	2.3	mΩ	$T_J = T_J$ max.	
V_{TM}	Max. on-state voltage drop	2.6	V	I_{TM} = 1000A, $T_J = T_J$ 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	1000	mA	Anode supply = 12V, resistive load = 1Ω, gate pulse : 10V, 100µs, T_J = 25°C	

SWITCING

t_d	Typical delay time	1.0	1.0	1.0	µs	T_J = 25°C	Gate current = 1A $dIg/_{dt}$ = 1A/µs
t_r	Typical rise time	2.0	2.0	2.0	µs	T_J = 25°C	Vd = 0.67% V_{DRM}
t_q	Typical turn-off time	250			µs	I_{TM} = 300A; dI/dt = 15A/µs; $T_J = T_J$ max.: Vr = 50V; dV/dt = 20V/µs; Gate 0V, 100ohm	

IRK 160 SERIES

BLOCKING

	Parameter	IRK 160		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,1Min.

TRIGGERING

	Parameter	IRK 160	Units	Conditions	
P_{GM}	Maximum peak gate power	10.0	W	T_J = 125°C, $t_p \leq$ 5ms	
$P_{G(AV)}$	Maximum average gate power	2.0		T_J = 125°C, f= 50Hz, d% = 50	
I_{GM}	Max. peak positive gate current	3.0	A	T_J = 125°C, $t_p \leq$ 5ms	
$+V_{GM}$	Max. peak positive gate voltage	20	V	T_J = 125°C, $t_p \leq$ 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	10.0	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}=400A ,rated V_{DRM} applied

THERMAL AND MECHANICAL SPECIFICATION

	Parameter	IRK 185	Units	Conditions
T_J	Max. operating temperature range	-40 to 125	°C	
T_{stg}	Max. storage temperature range	-40 to 130		
R_{thJ-C}	Max. thermal resistance, junction to case	0.125	K/W	Per Arm
R_{thJ-C}	Max. thermal resistance, Case to heatsink	0.04	K/W	Per Arm
T	Mounting tourque, ±10%	4 to 6 8 to 10	Nm	For Module to heatsink Busbar to Module
w t	Approximate weight	800	g	
	Case style	MAGN-A-PAK		

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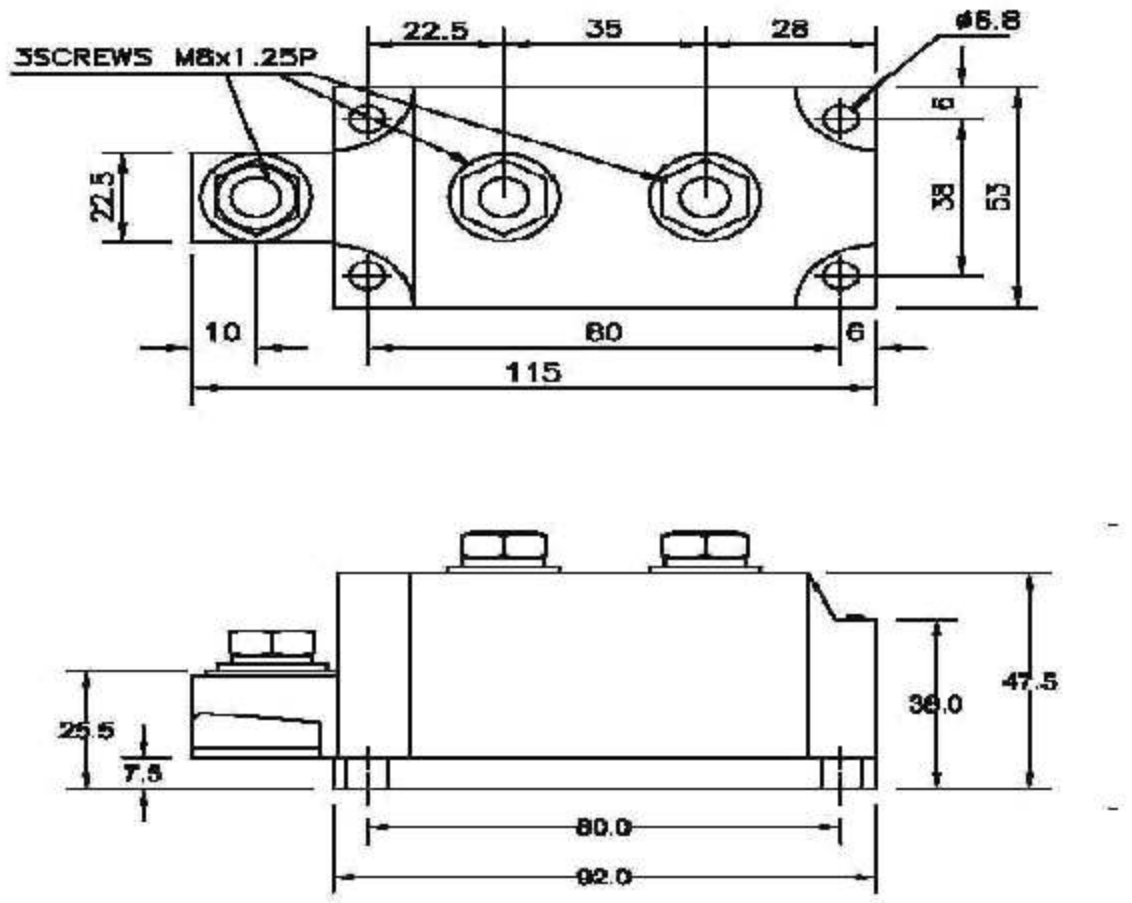
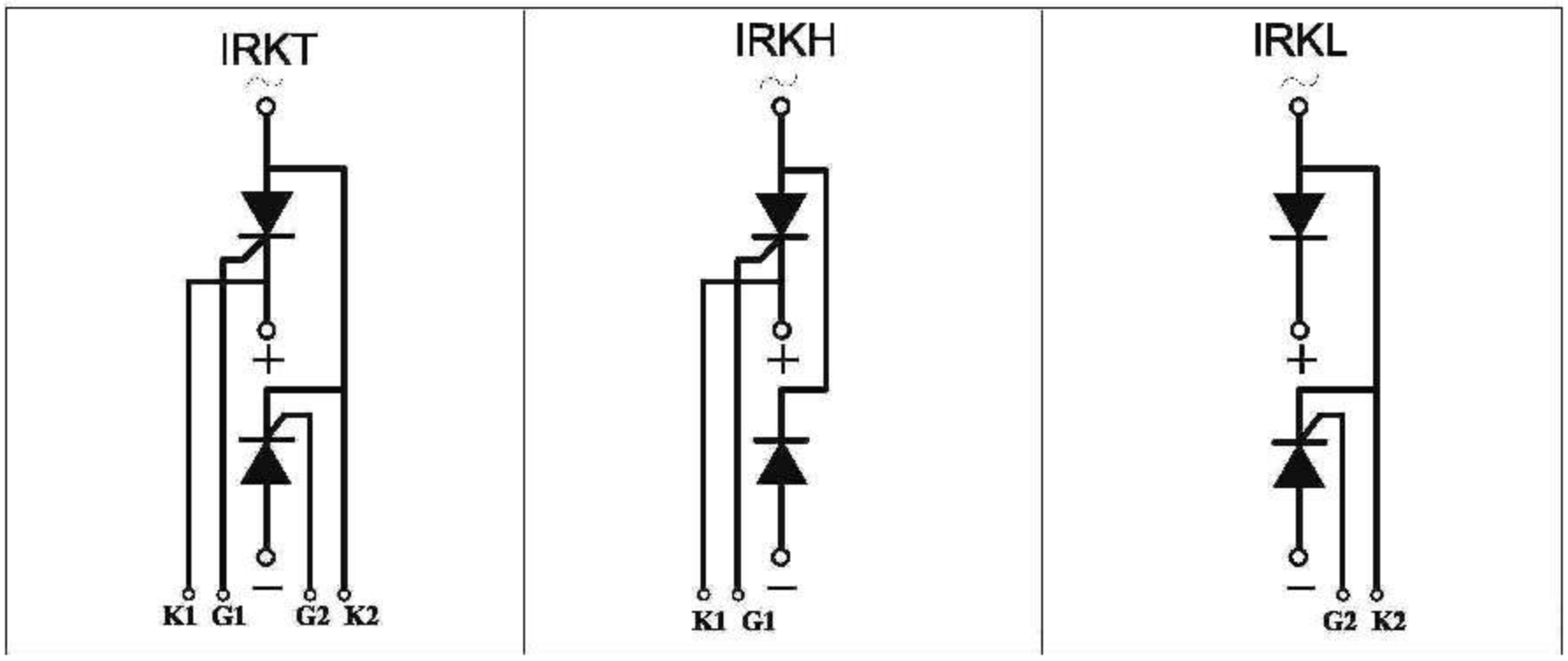
OUTLINE DIAGRAM



Circuit Configuration Table



Ordering Information Table

IRK	T	160	/	36
	②	③		④

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