Ruttonsha International Rectifier Ltd.

RUTTONSHA

POWER MODULES

IRK.650 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.*650*	Units
$I_{T(AV)}$	@ 85°C	650	A
$I_{T(RMS)}$		1020	A
I_{TSM}	@ 50 Hz	14000	KA
I^2t	@ 50 Hz	980	kA^2s
V_{DRM} -V_{RRM}		Up to 1200	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. @ 130°C mA
IRK.650	10	1000	1100	70
	12	1200	1300	70

ON-STATE CONDUCTION

	Parameters	IRK. 650	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current	650	A	180° conduction, half sine wave	
	@ Case temperature	85	°C		
$I_{T(RMS)}$	Max. RMS on-state current	1020	A	as AC switch	
I_{TSM}	Max. peak, one cycle on-state, non-repetitive surge current	14000	KA	t = 10ms	180° half sine wave singel pulse $V_D = V_R = 0$ Gate pulse $I_G = I_{FGM}$ V_G =20V tp=500 µs dig/dt = 1A/µs
I^2t	Maximum I^2t for fusing	980	kA^2s	t = 10ms	
$V_{T(TO)}$	Threshold voltage	0.85	V	$T_J = T_J$ max.	
r_t	On-state slope resistance	0.10	mΩ	$T_J = T_J$ max.	
V_{TM}	Max. on-state voltage drop	1.4	V	I_T= 1978A , 25°C	
I_H	Maximum holding current	300 max.	mA		
I_L	Max. latching current	1000 max.	mA	T_J=25°C V_D =12V Gate Open	

SWITCHING

t_d	Delay Time	2.0	µs	T_J = 25°C	Gate current = $dIg/_{dt}$ = 1A/µs Vd = 0.4 V_{DRM} tp = 500 µs
t_q	Turn-Off Time	160	µs	$T_J = T_J$ max. dv/dt= 50V/µs $I_{TM} = T_{T(AV)}$ di/dt =10A/µs V_R =100V V_D = 0.67 V_{DRM}	

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BLOCKING

	Parameter	650		Units Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	T_J = 140°C, exponential to 67% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	70	mA	T_J = 140°C, 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	650	Units	Conditions
I_{FGM}	Peak Forwerd gate current	8	A	T_J = T_J max.
V_{FGM}	Peak revers gate voltage	5	V	T_J = T_J max.
P_G	Gate power disspation	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_{GT}	DC gate voltage required to trigger	2.5	V	
V_{GD}	DC gate voltage not to trigger	0.25 max	V	T_J = T_JMax. V_D = 0.67 V_{DEM}
I_{GD}	DC gate current not to trigger	10.0 max	mA	
di/dt	Maximum critical rate of rise of turned-on current	100	A/µs	T_J = Tj Max.

THERMAL AND MECHANICAL SPECIFICATION

	Parameter	650	Units	Conditions
T_J	Max. operating temperature range	-40 to 140	°C	
T_{stg}	Max. storage temperature range	-40 to 125		
$R_{thJ\,C}$	Max. thermal resistance, junction to case	0.065	°C/W	Per module / Per Arm
$R_{thJ\,C}$	Max. thermal resistance, case to heatsink	0.020	°C/W	Per module / Per Arm
T	Mounting tourque, ±15%	6 (12)	Nm	to heatsink & to (terminals)
W	Weight	1500	gm	

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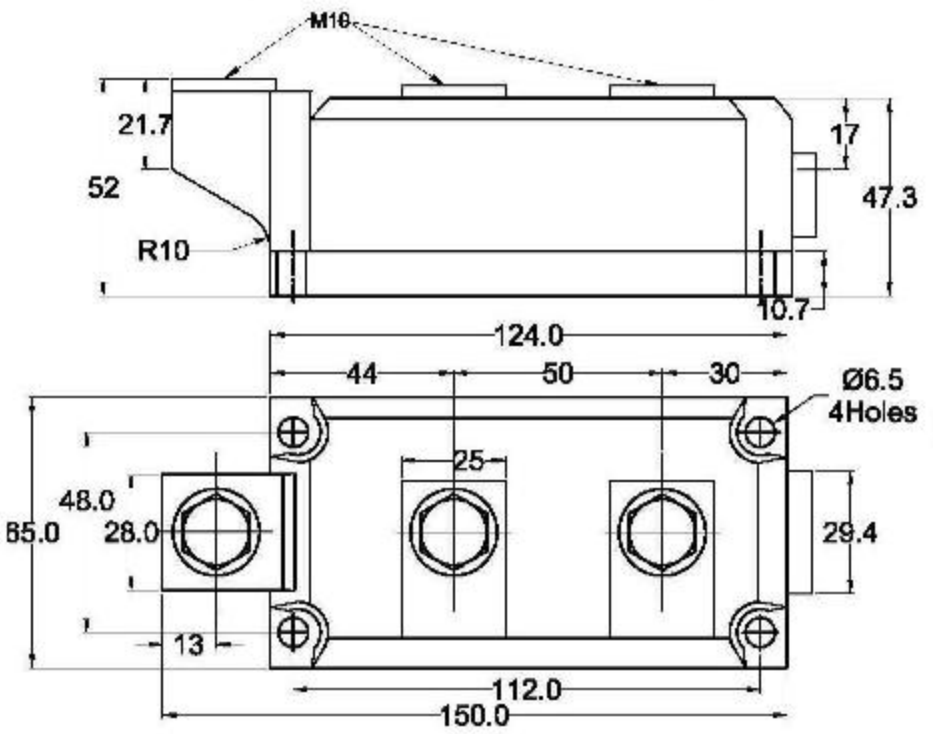
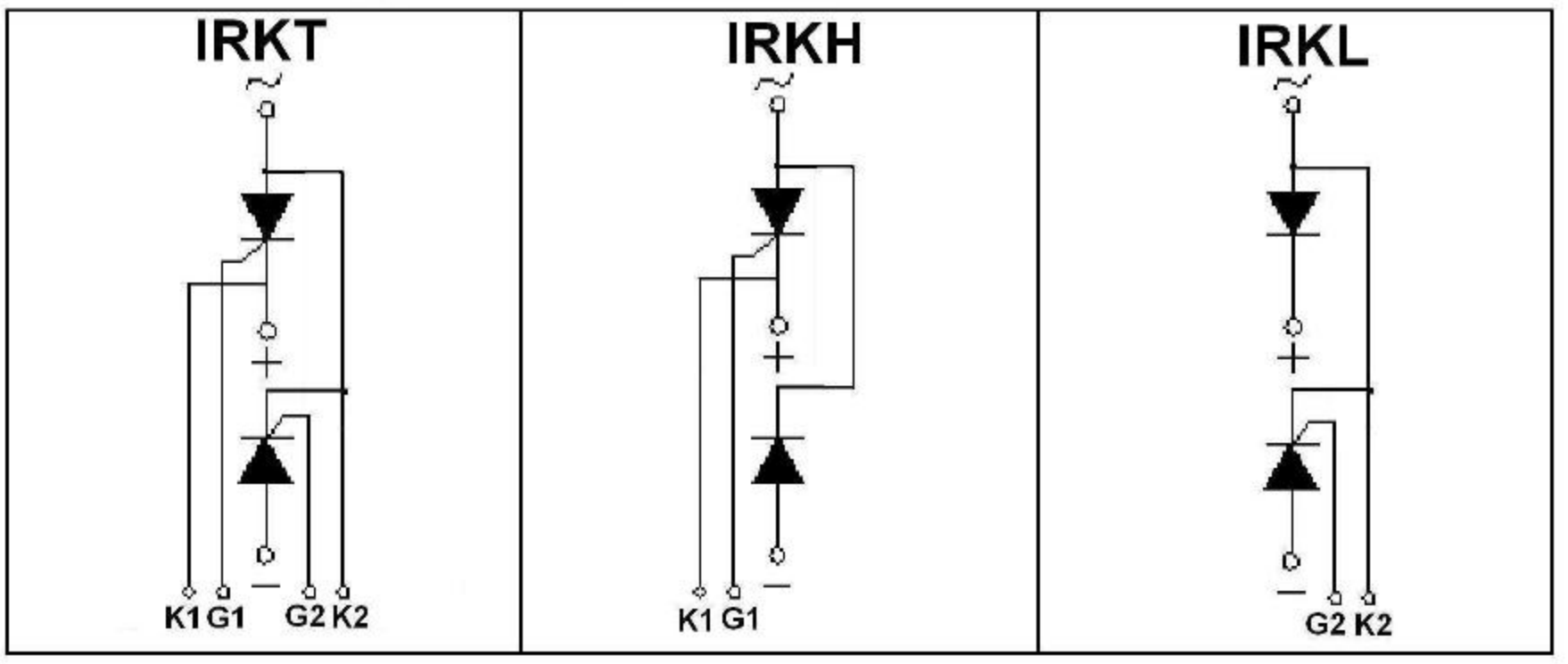
OUTLINE DIAGRAM



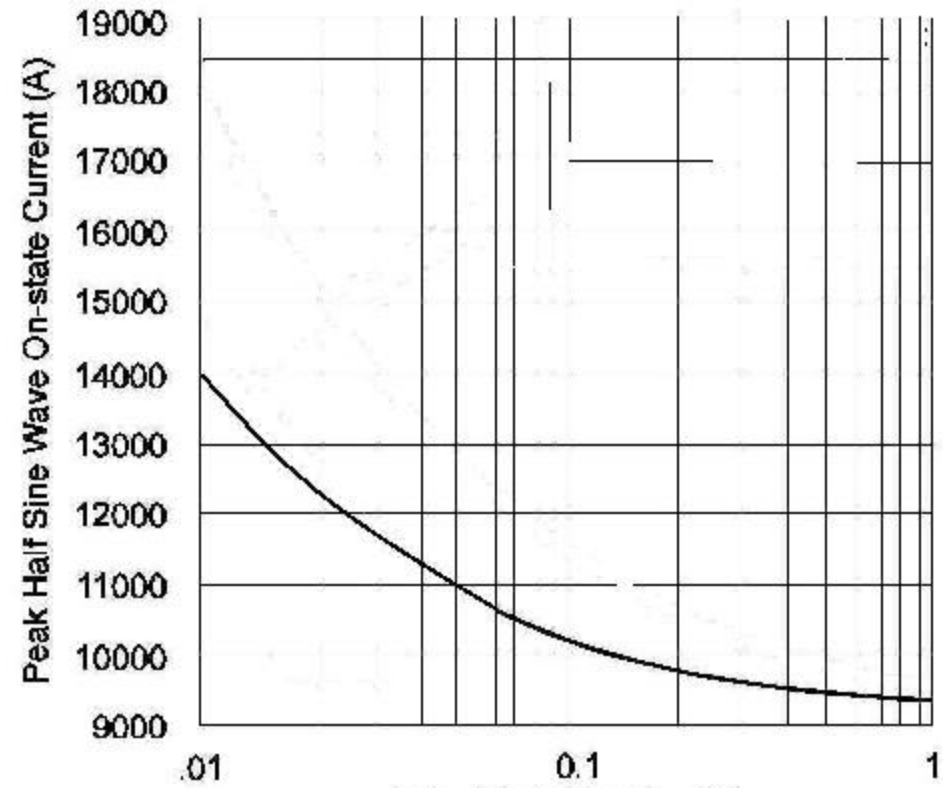
Circuit Configuration Table



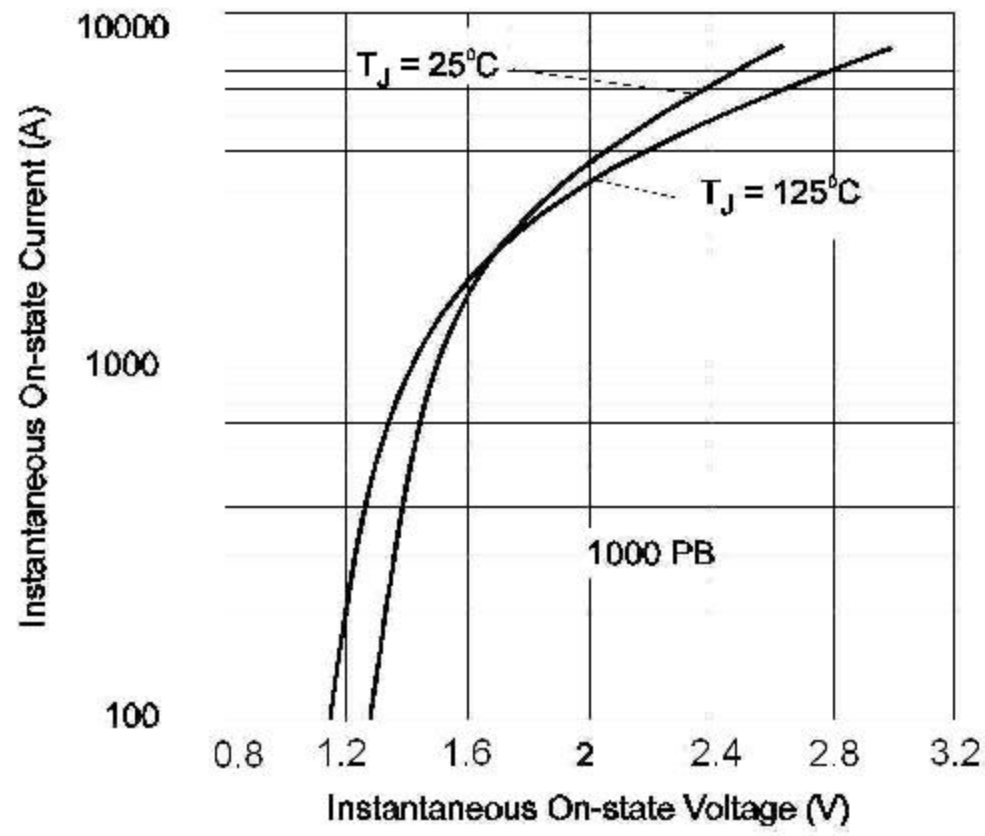
Ordering Information Table

IRK	T	650	/	12
①	②	③		④

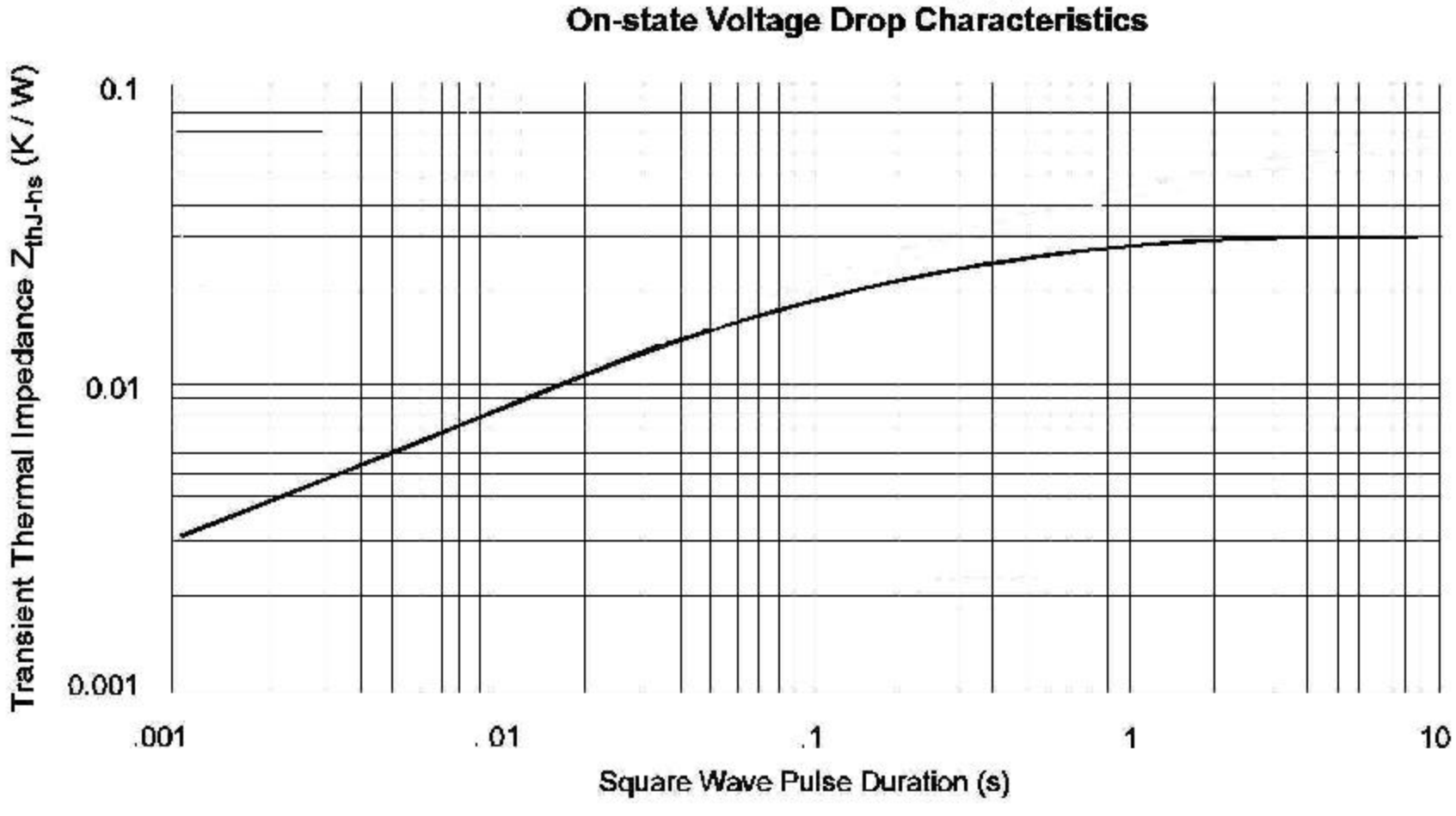
① - Module type
② - Circuit configuration (See Circuit Configuration table)
③ - Current Code
④ - Voltage Code (See Voltage Ratings table)



Maximum Non-Repetitive Surge Current



On-state Voltage Drop Characteristics



Thermal Impedance Z_{thJC} Characteristics