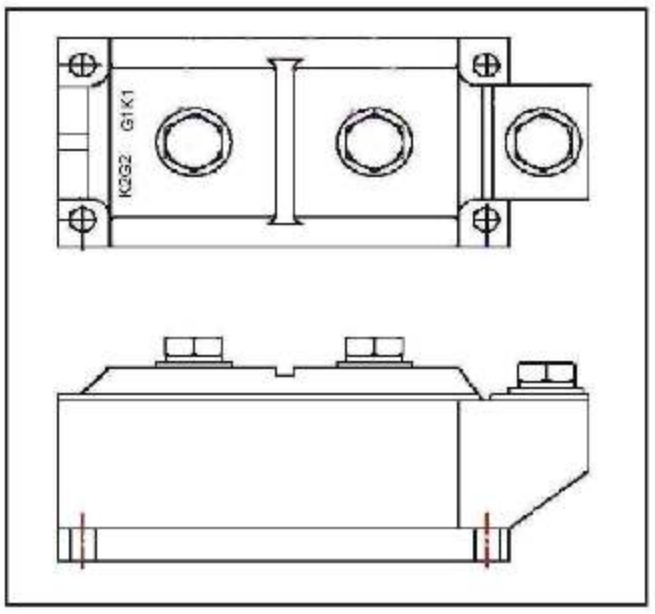
Ruttonsha International Rectifier Ltd.

POWER MODULES

IRK. 240 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.*
- *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 240	Units
$I_{T(AV)}$	@ 85°C	240	A
$I_{T(RMS)}$		700	A
I_{TSM}	@ 50 Hz	5400	A
I^2t	@ 50 Hz	146	kA^2s
V_{DRM} -V_{RRM}		2800 to 3600	V
T_J		-40 to 125	°C

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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 240	28	2800 / 2800	2900	250
	30	3000 / 3000	3100	
	32	3200 / 3200	3300	
	34	3400 / 3400	3500	
	36	3600 / 3600	3700	

ON-STATE CONDUCTION

	Parameters	IRK 240	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current	240	A	180° conduction, half sine wave	
	@ Case temperature	85	°C		
$I_{T(RMS)}$	Max. RMS on-state current	700	A	as AC switch	
I_{TSM}	Max. peak, one cycle on-state, non-repetitive surge current	5400	A	t = 10ms	Sinusoidall half wave, Initial $T_J = T_J$ max.
I^2t	Maximum I^2t for fusing	146	kA^2s	t = 10ms	Sinusoidal half wave, Initial $T_J = T_J$ max.
$V_{T(TO)}$	Max. threshold voltage	1.17	V	$T_J = T_J$ max.	
r_t	Max. on-state slope resistance	1.70	mΩ	$T_J = T_J$ max.	
V_{TM}	Max. on-state voltage drop	3.43	V	I_T= 1200A, 25°C	
I_H	Maximum holding current	300 max.	mA	T_J=25°C	
I_L	Max. latching current	1500 max.	mA	T_J=25°C RG=33Ω	

SWITCHING

t_d	Delay Time	4.5	µs	T_J = 25°C	Gate current = 1A $dIg/_{dt}$ =a/µs Vd = 0.67% V_{DRM}
t_r	Rise Time	2.0	µs	T_J = 25°C	
t_q	Turn-Off Time	350	µs	$T_J = T_J$ max. $I_{TM}=T_T(AV)$, V_{RM}=100V V_{DM}=0.67 V_{DRM}, $dVD/_{dt}$=20V/µs - $di/_{dt}$ = 10A/µs	

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BLOCKING

	Parameter	IRK 240		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	250	mA	T_J = 125°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	IRK 240	Units	Conditions	
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	0.20 max	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 max	mA	T_J = 125°C	
di/dt	Maximum critical rate of rise of turned-on current	100	A/µs	T_J = 125°C,	IGM=1A, diG/dt = 1A/µs

THERMAL AND MECHANICAL SPECIFICATION

	Parameter	IRK 240	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	0.078	°C/W	Per junction
R_{thC-S}	Max. thermal resistance, case to heatsink	0.02	°C/W	Per junction
T	Mounting tourque, ±15%	6 (12)	Nm	To heatsink (To terminal)

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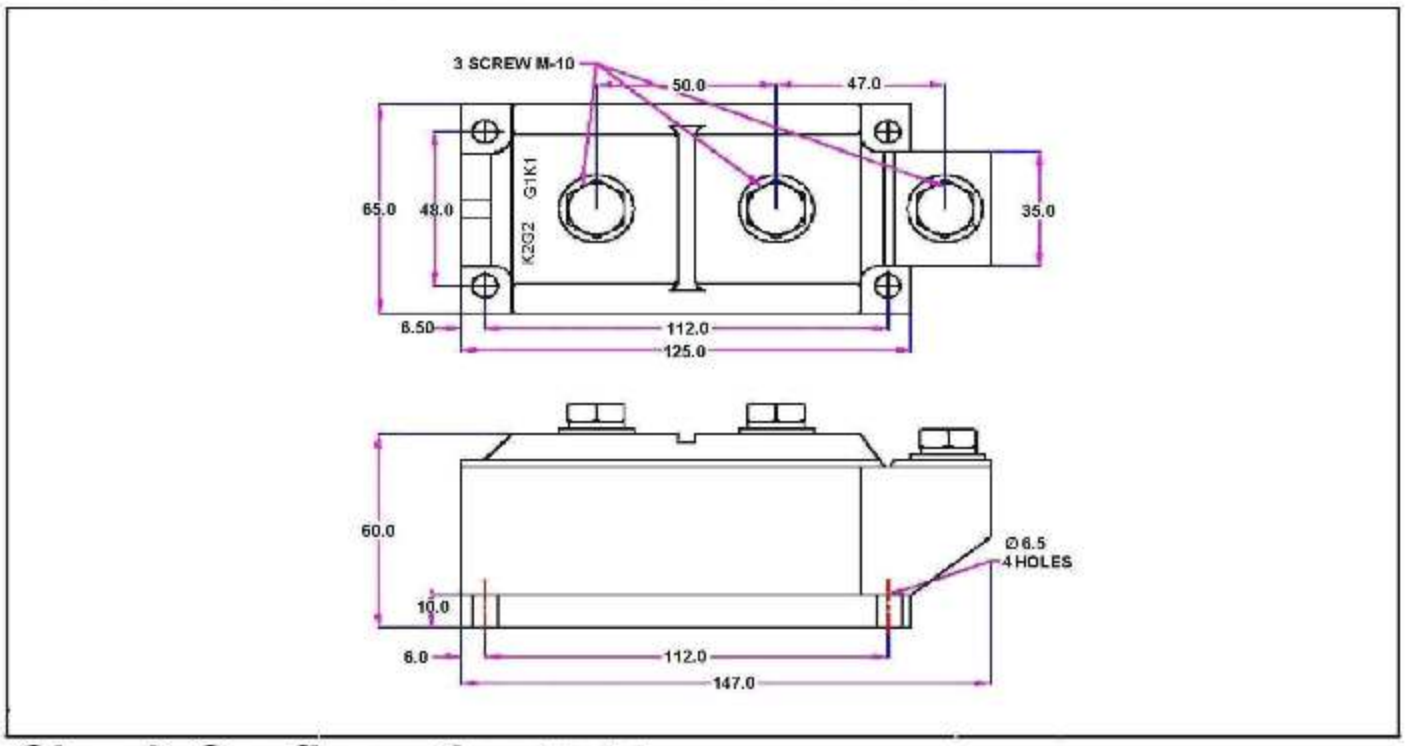
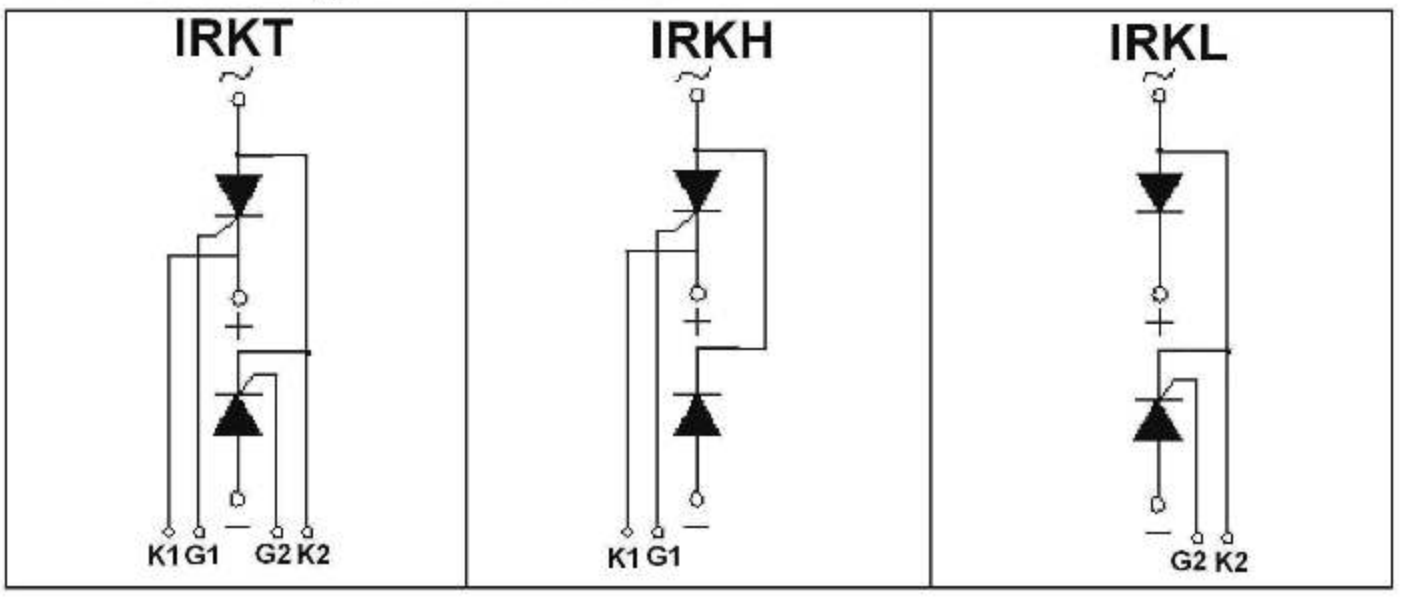
OUTLINE DIAGRAM DIMENSIONS AS PER SEMIKRON



Circuit Configuration Table

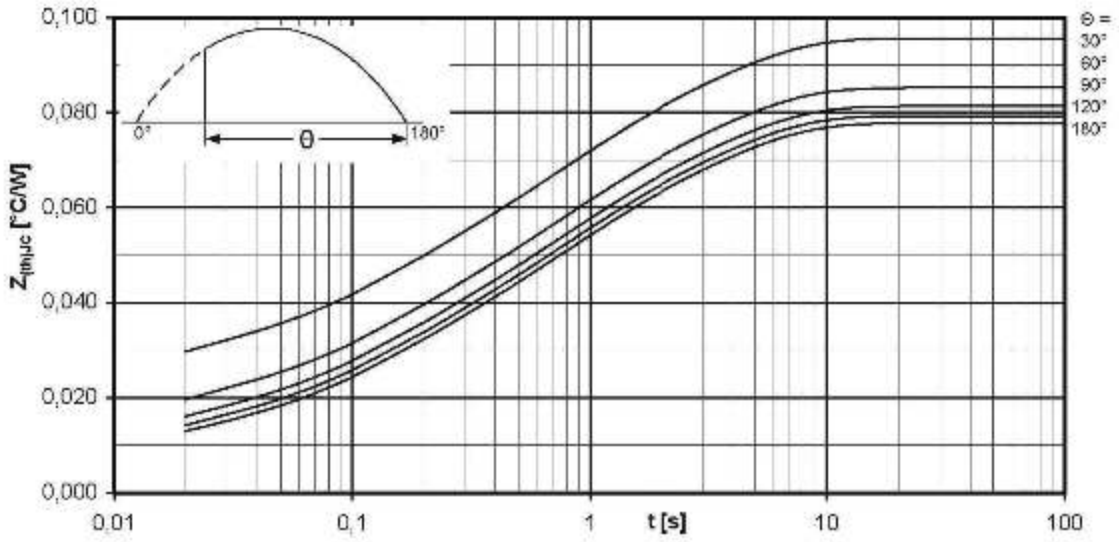


Ordering Information Table

IRK	T	240	/	36
①	②	③		④

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

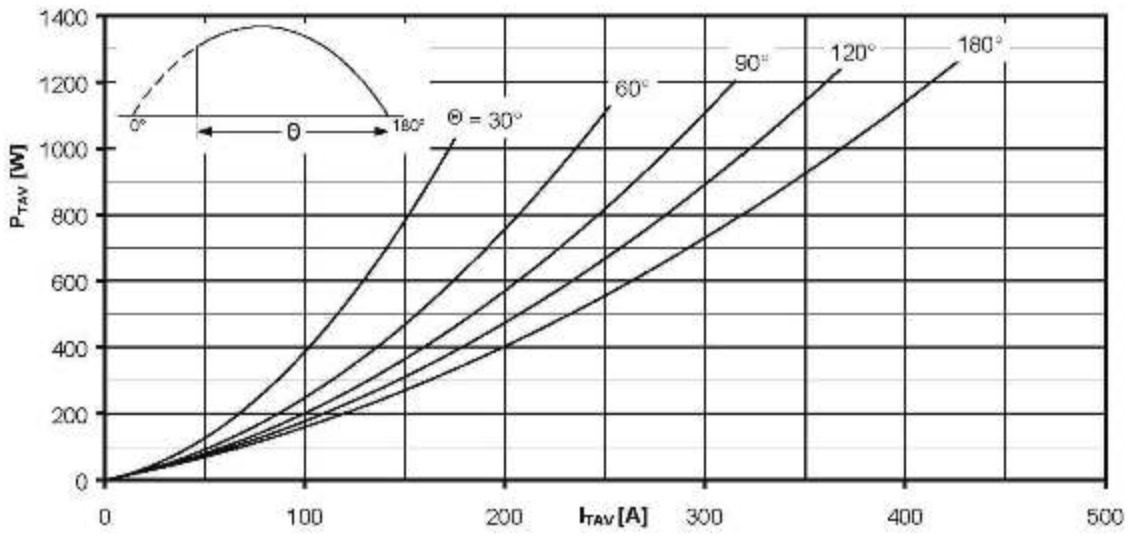
IRK. 240 SERIES



Transient thermal impedance per arm Z_{thJC} = f(t)

Sinusoidal current

Current conduction angle Θ

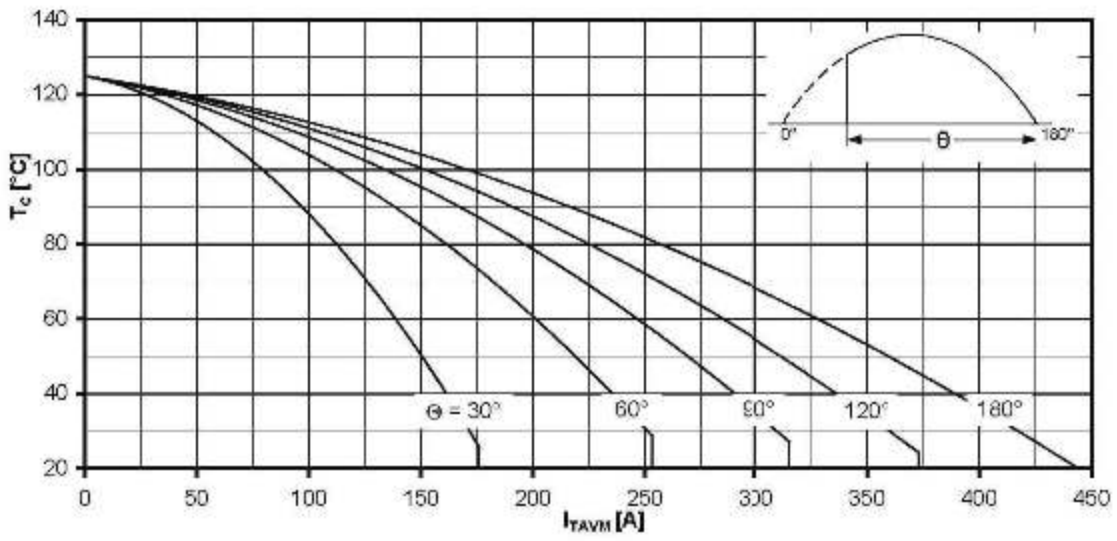


On-state power loss per arm P_{TAV} = f(I_{TAV})

Sinusoidal current Current load per arm

Calculation base P_{TAV} (switching losses should be considered separately)

Parameter: Current conduction angle Θ

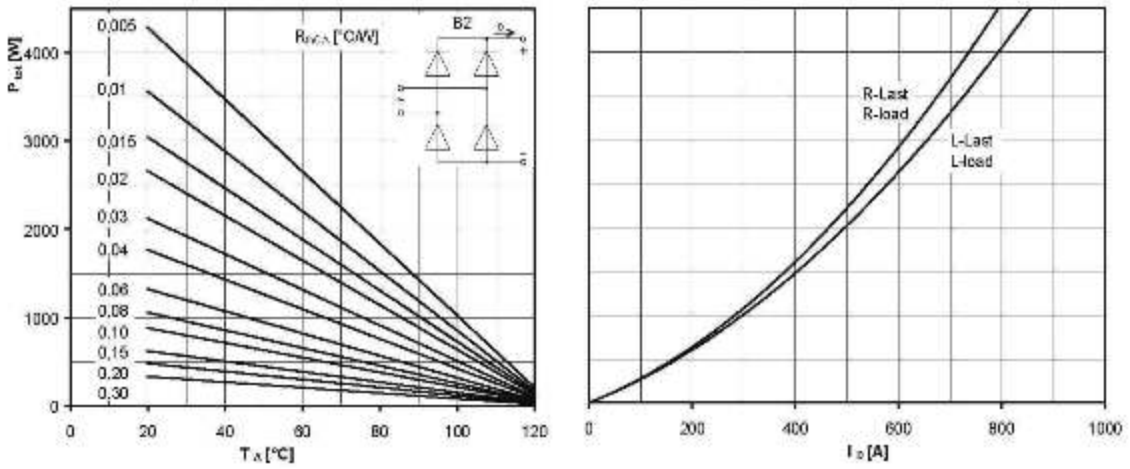


Maximum allowable case temperature T_C = f(I_{TAVM})

Sinusoidal current Current load per arm

Calculation base P_{TAV} (switching losses should be consicered separately)

Parameter: Current conduction angle Θ

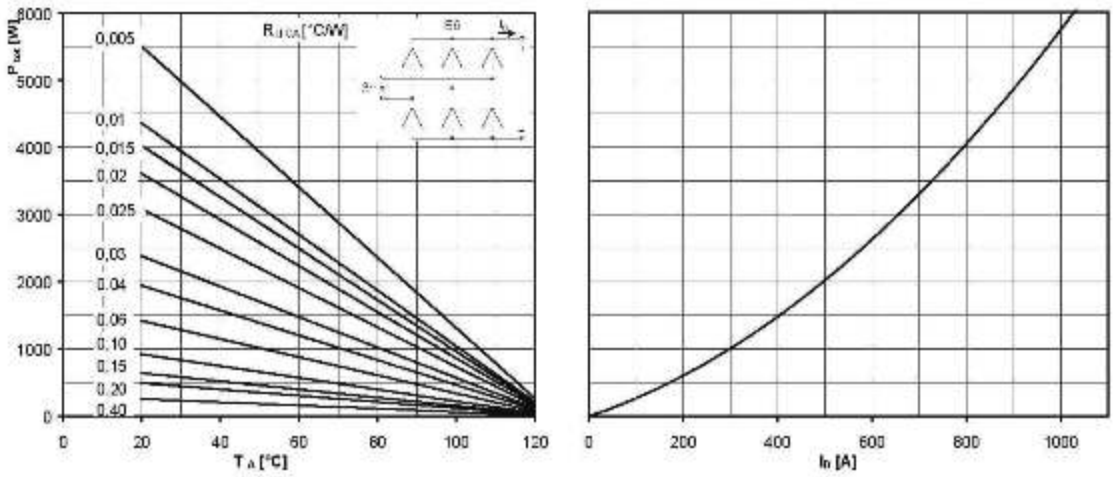


Maximum rated output current I_D

Two-pulse bridge circuit

Total power dissipation at circuit P_{tot}

Parameter: Thermal resistance cases to ambient R_{thCA}



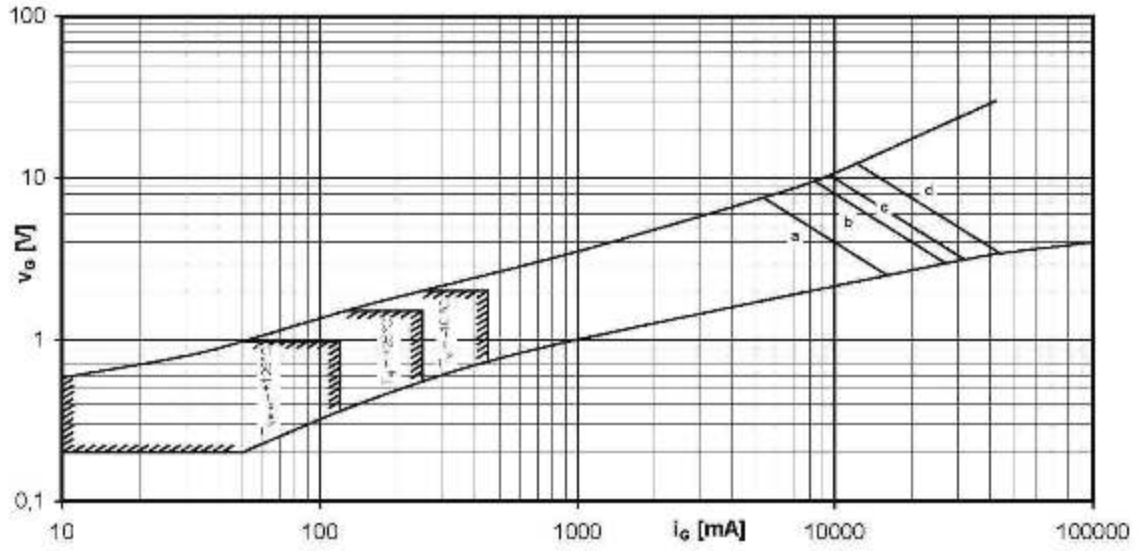
Maximum rated output current I_D

Six-pulse bridge circuit

Total power dissipation at circuit P_{tot}

Parameter: Thermal resistance cases to ambient R_{thCA}

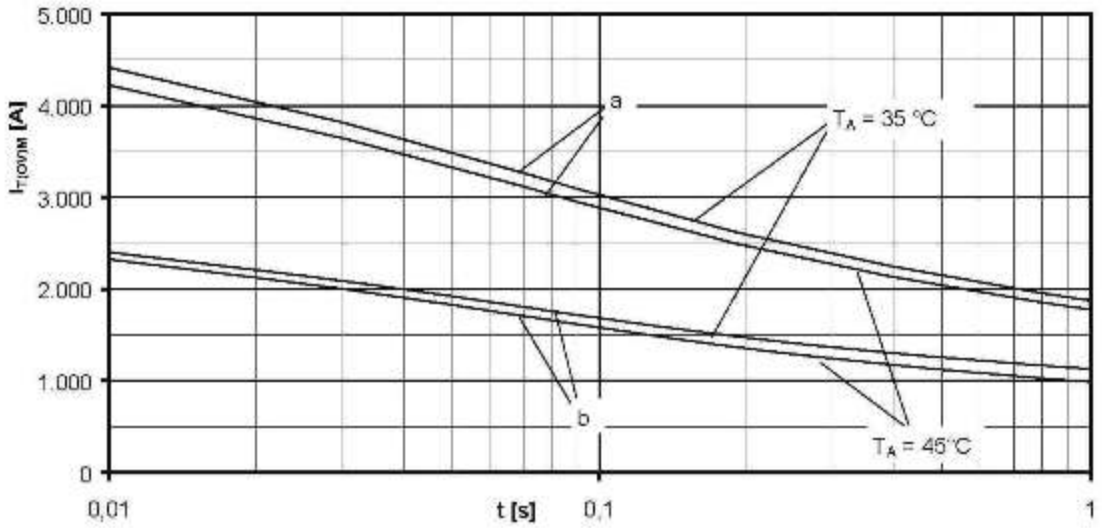
IRK. 240 SERIES



Gate characteristic $v_G = f(i_G)$ with triggering area for $V_D = 6$ V

Maximum rated peak gate power dissipation $P_{GM} = f(t_p)$:

a - 40 W/10ms b - 60 W/1ms c - 100 W/0,5ms d – 150 W/0,1ms



Maximum overload on-state current $I_{T(OV)M} = f(t)$, $v_{RM} = 0,8\ V_{RRM}$

No-load conditions

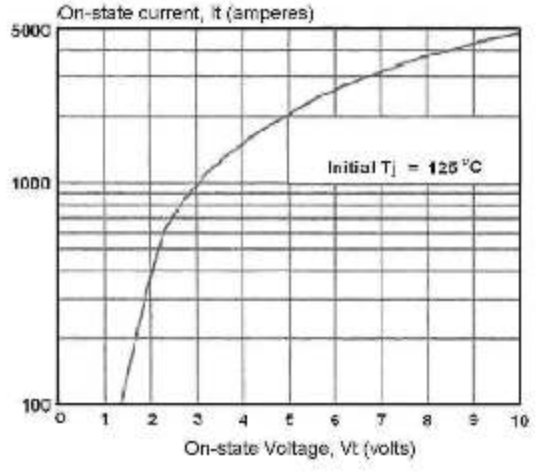
after load with I_{TAV}

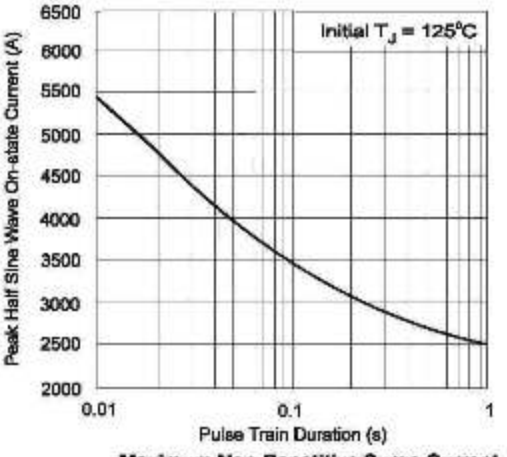
Forced air cooling

Natural air cooling

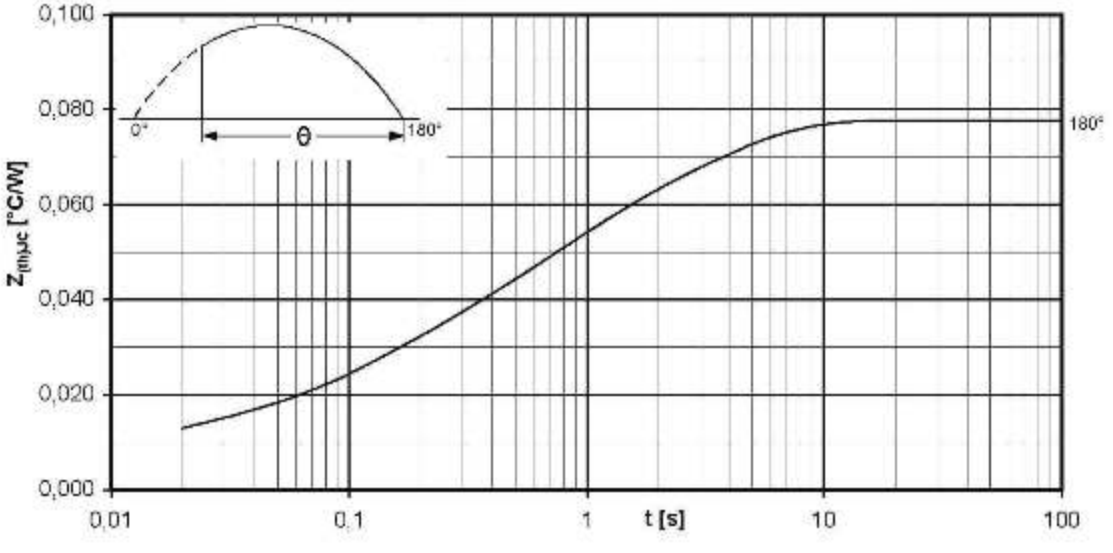
IRK. 240 SERIES

ON-STATE CHARACTERISTIC





Maximum Non-Repetitive Surge Current



Transient thermal impedance per arm Z_{thJC} = f(t)

Sinusoidal current