IRK. 500 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.500	Units
$I_{T(AV)}$	@ 85°C	540	A
$I_{T(RMS)}$		850	A
I_{TSM}	@ 50 Hz	15000	A
I^2t	@ 50 Hz	1125	kA^2s
V_{DRM} -V_{RRM}		Up to 1800	V
T_J		-40 to 130	°C

POWER MODULES

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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. @ 130°C mA
	04	400	500	100
	06	600	700	100
IRK.500	08	800	900	100
	10	1000	1100	100
	12	1200	1300	100
	14	1400	1500	100
	16	1600	1700	100
	18	1800	1900	100

ON-STATE CONDUCTION

	Parameters	IRK. 500	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current	540	A	180° conduction, half sine wave	
	@ Case temperature	85	°C		
$I_{T(RMS)}$	Max. RMS on-state current	850	A	as AC switch	
I_{TSM}	Max. peak, one cycle on-state, non-repetitive surge current	15000	A	t = 10ms	Sinusoidall half wave, Initial $T_J = T_J$ max.
I^2t	Maximum I^2t for fusing	1125	kA^2s	t = 10ms	Sinusoidal half wave, Initial $T_J = T_J$ max.
$V_{T(TO)}$	threshold voltage	0.92	V	$T_J = T_J$ max.	
r_t	on-state slope resistance	0.24	mΩ	$T_J = T_J$ max.	
V_{TM}	Max. on-state voltage drop	1.6	V	I_T = 1500A , 25°C	
I_H	Maximum holding current	500 max.	mA		
I_L	Max. latching current	2000 max.	mA	T_J=25°C RG=33Ω,	

SWITCHING

t_d	Delay Time	1.0	µs	T_J = 25°C	Gate current = 1A $dIg/_{dt}$ = 1A/µs
t_r	Rise Time	2.0	µs	T_J = 25°C	Vd = 0.67% V_{DRM}
t_q	Turn-Off Time	100 - 200	µs	$T_J = T_J$ max.	

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BLOCKING

	Parameter	IRK. 500		Units Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	T_J = 130°C, exponential to 67% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	100	mA	T_J = 130°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. 500	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	3.0	V	T_J = 25°C	
V_{GD}	DC gate voltage not to trigger	0.25 max	V	T_J = 130°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 = 130°C	
di/dt	Maximum critical rate of rise of turned-on current	100	A/µs	T_J = 130°C,	

THERMAL AND MECHANICAL SPECIFICATION

	Parameter	IRK. 500	Units	Conditions
T_J	Max. operating temperature range	-40 to 130	°C	
T_{stg}	Max. storage temperature range	-40 to 130		
R_{thJ-C}	Max. thermal resistance, junction to case	0.062	K/W	Per thyristor / per module
R_{thJ-C}	Max. thermal resistance, junction to heatsink	0.02	K/W	Per thyristor / per module
T	Mounting tourque, ±15%	5 (12)	Nm	to heatsink & to (terminals)

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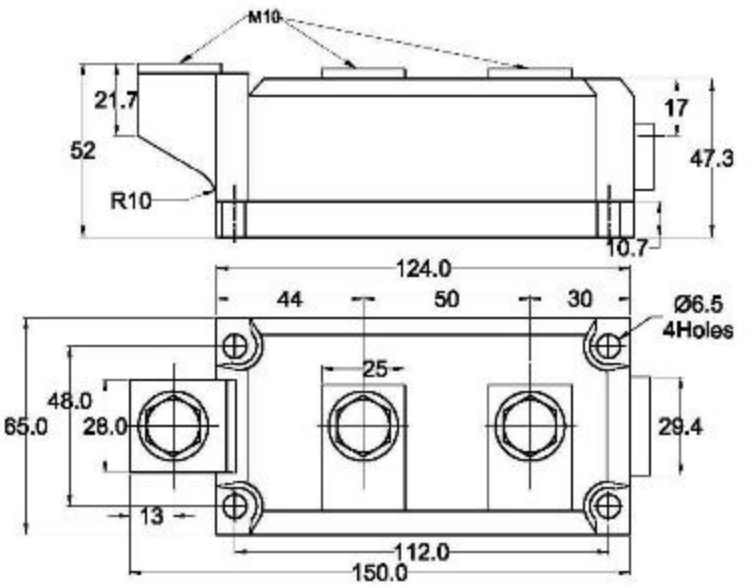
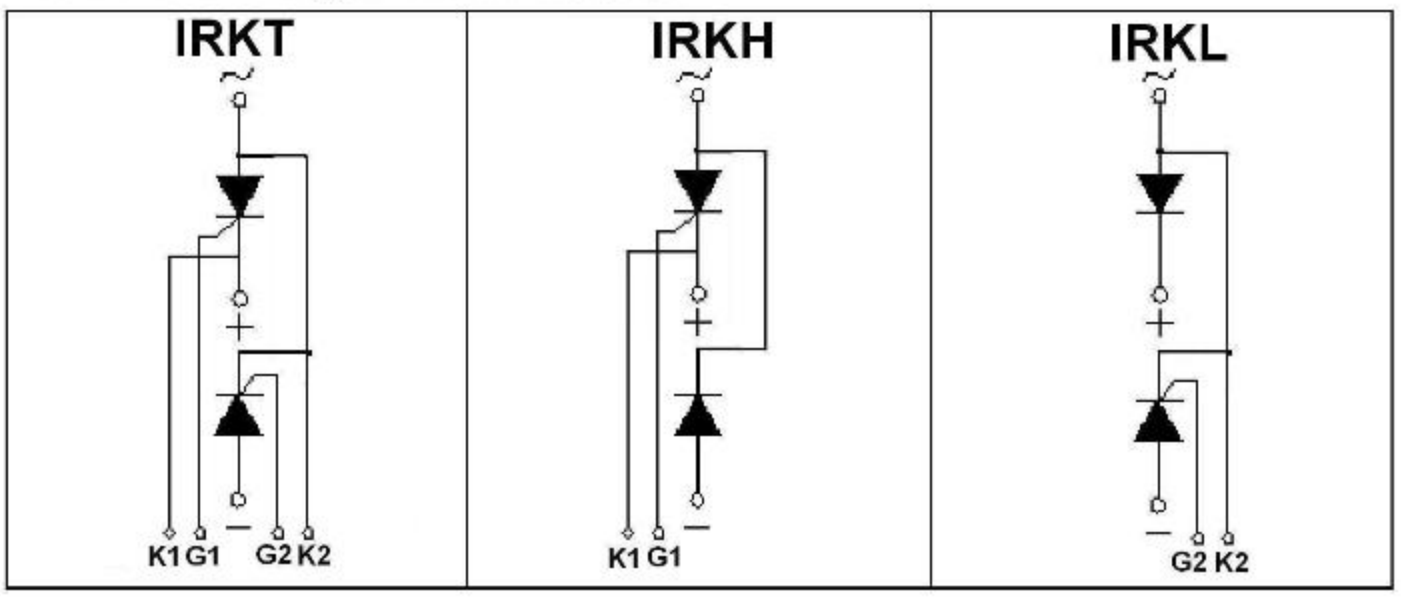
OUTLINE DIAGRAM



Circuit Configuration Table



Ordering Information Table

IRK	T	500	/	16
①	②	③		④

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

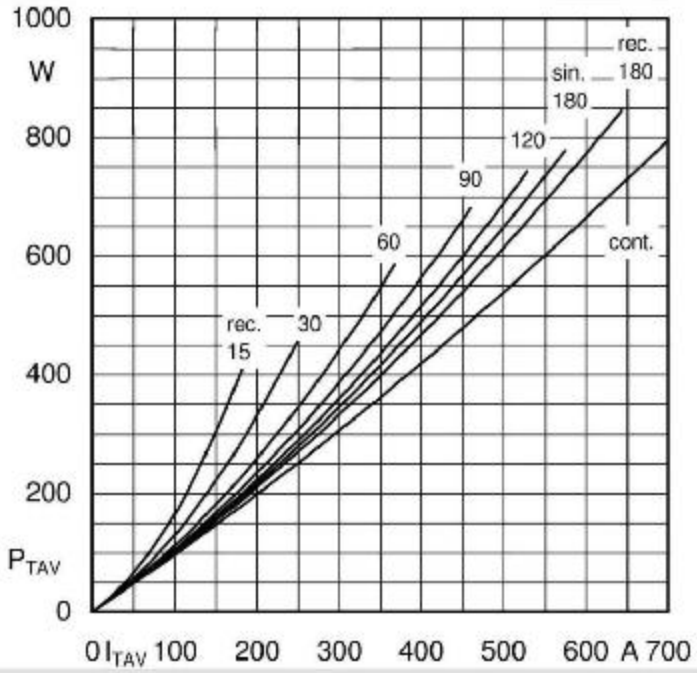


Fig. 1L Power dissipation per thyristor vs. on-state current

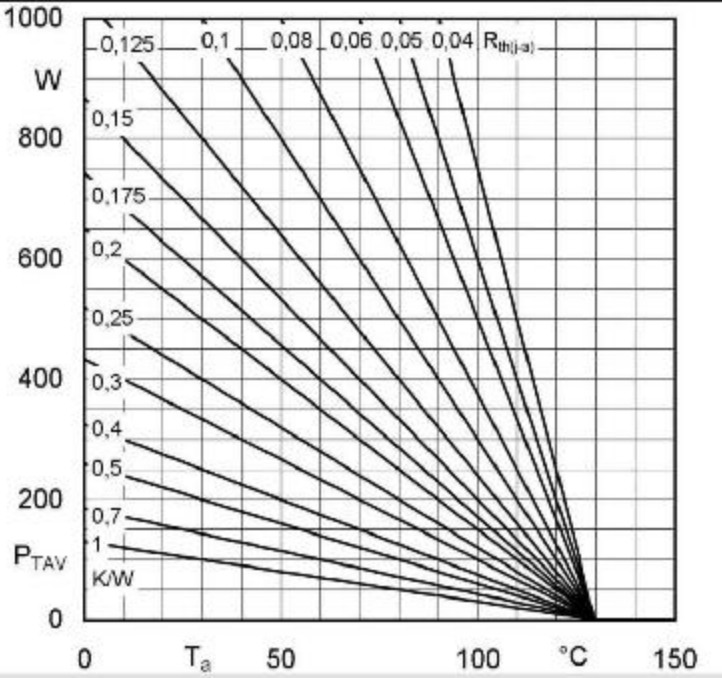


Fig. 1R Power dissipation per thyristor vs. ambient temp.

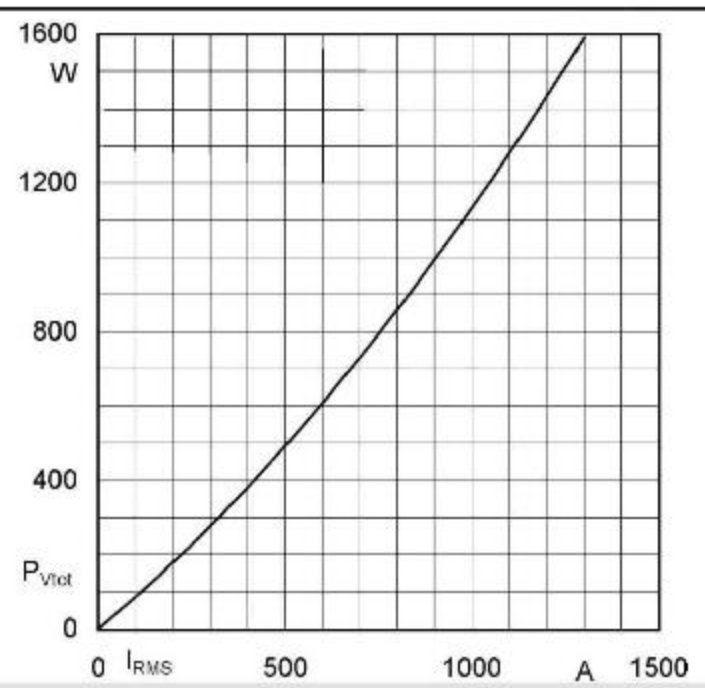


Fig. 2L Power dissipation per module vs. rms current

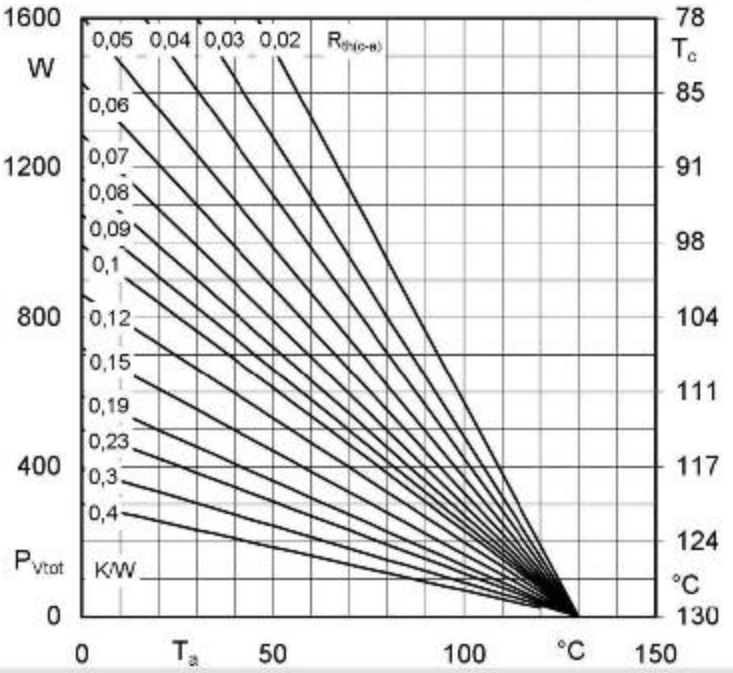


Fig. 2R Power dissipation per module vs. case temp.

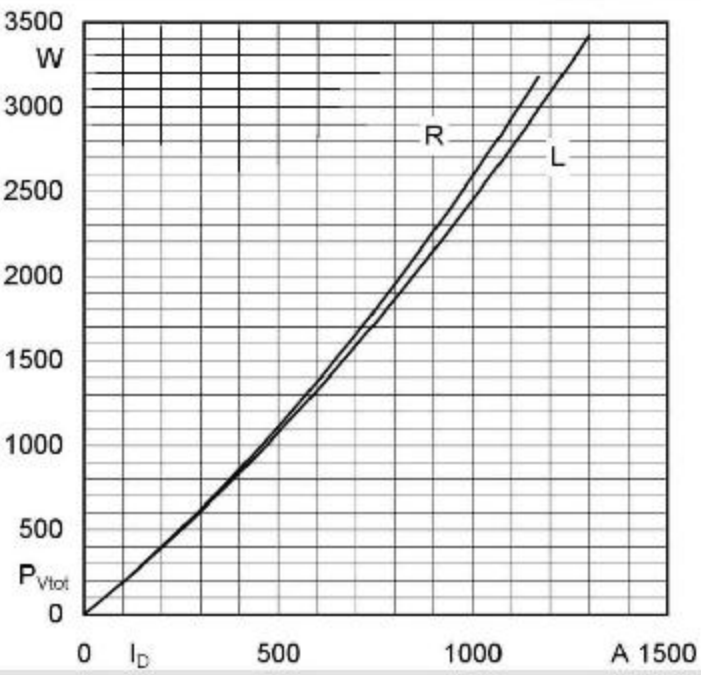


Fig. 3L Power dissipation of two modules vs. direct current

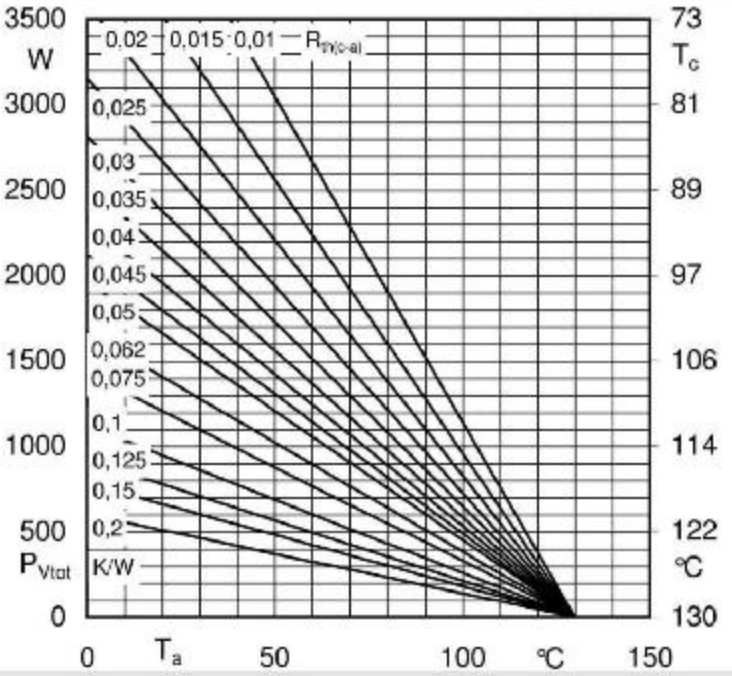


Fig. 3R Power dissipation of two modules vs. case temp.

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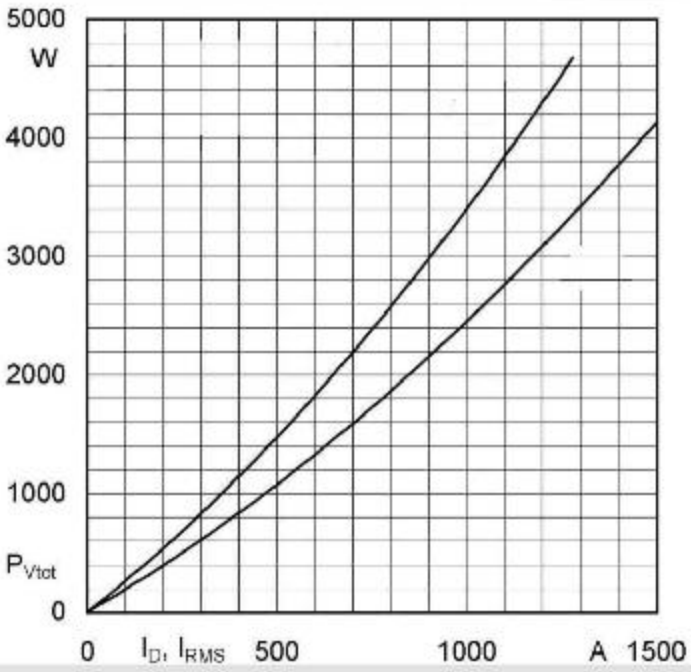

Fig. 4L Power dissipation of three modules vs. direct and rms current

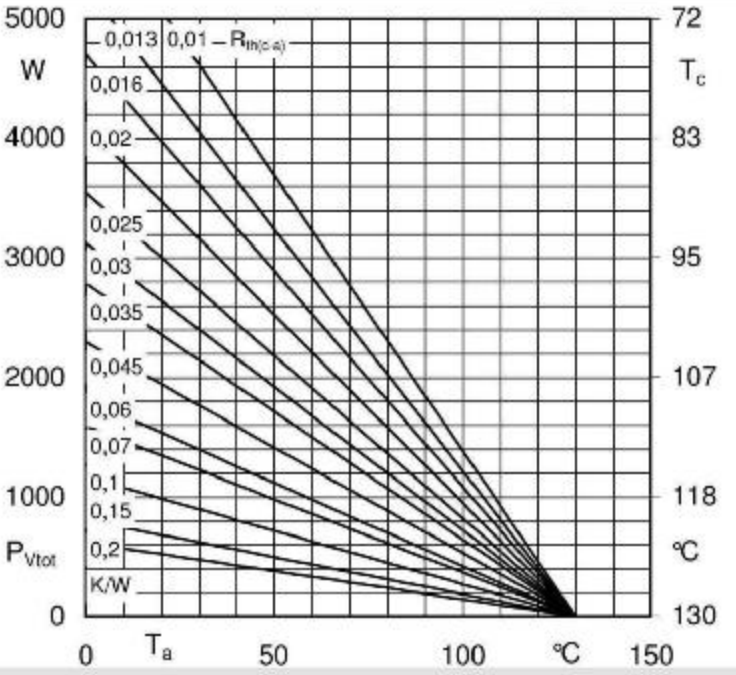

Fig. 4R Power dissipation of three modules vs. case temp.

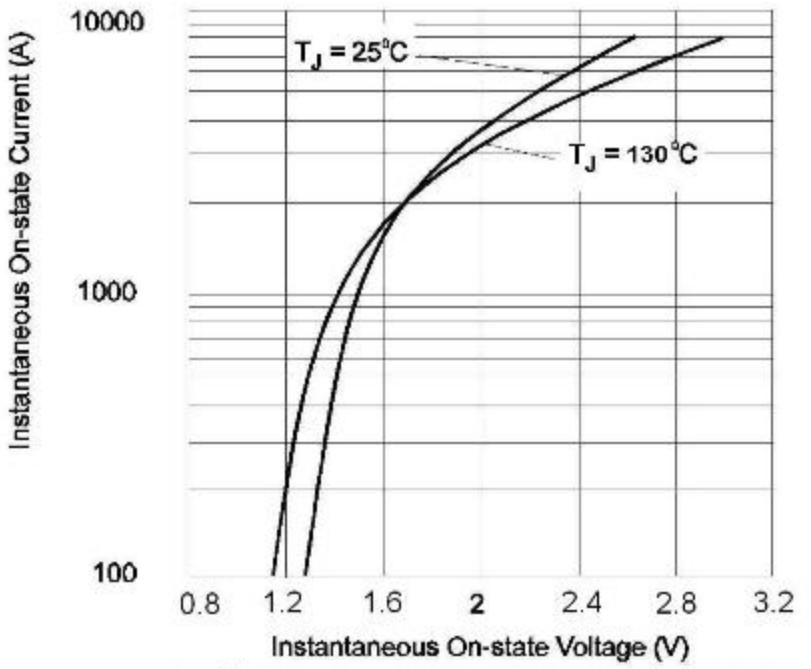

Fig. 5 - On-state Voltage Drop Characteristics

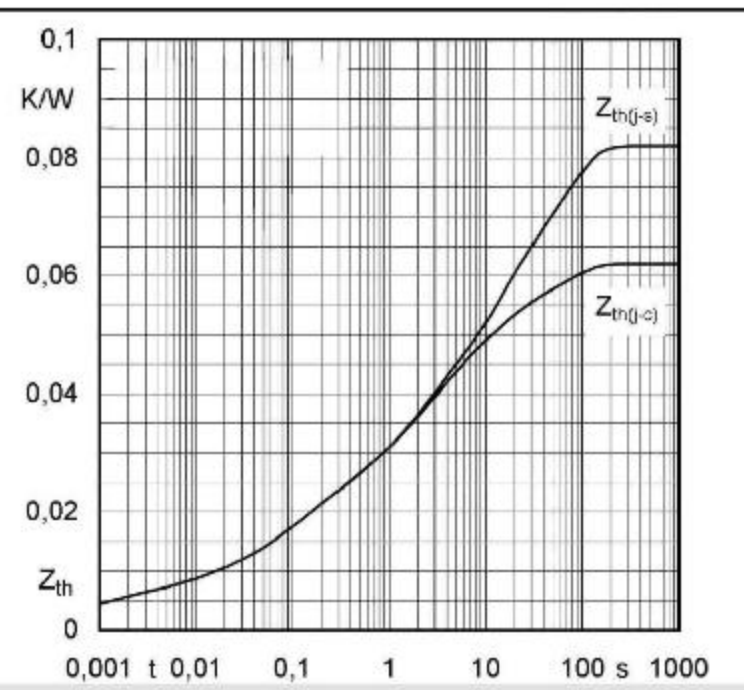

Fig. 6 Transient thermal impedance vs. time

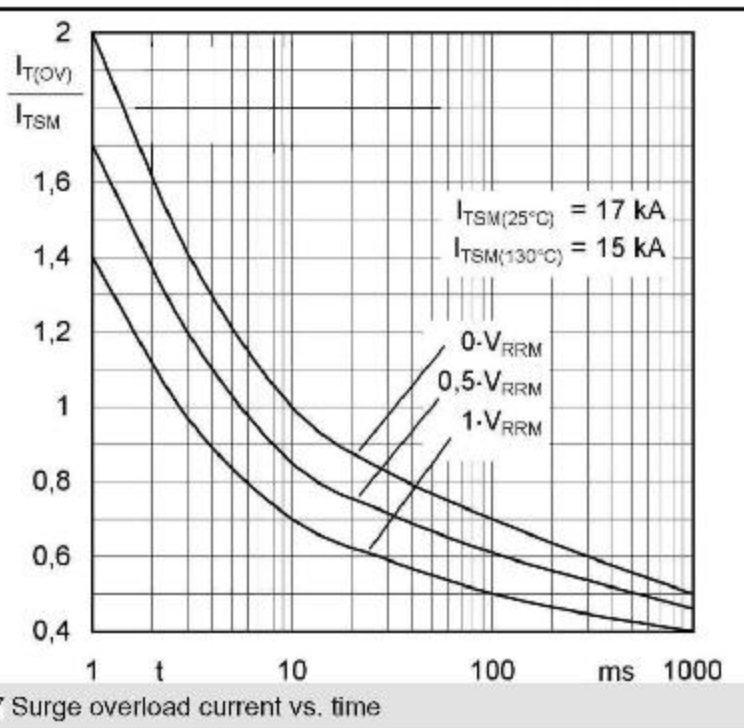

Fig. 7 Surge overload current vs. time

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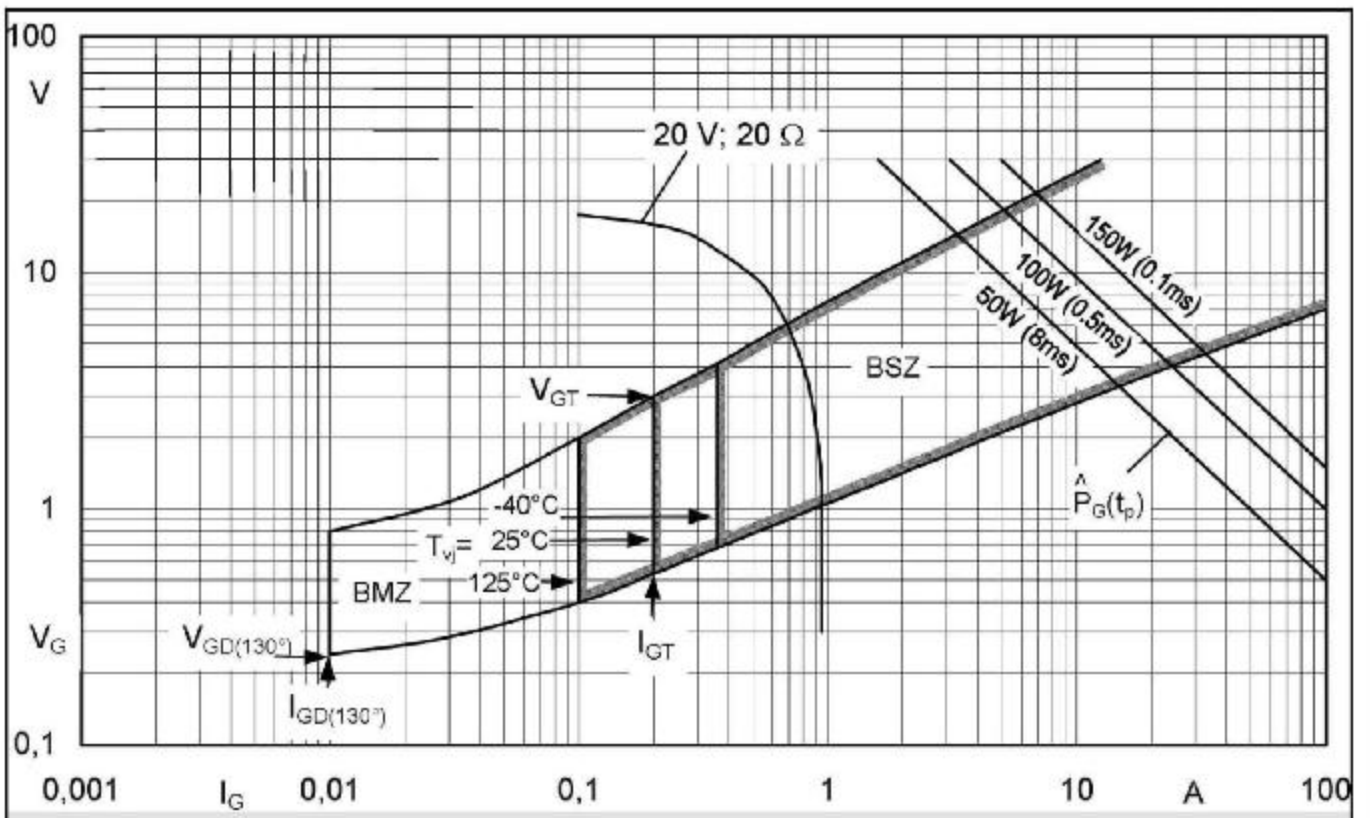

Fig. 8 Gate trigger characteristics