IRK. 280 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.*
- *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.280	Units
$I_{T(AV)}$	@ 79 °C	280	A
$I_{T(RMS)}$		440	A
I_{TSM}	@ 50 Hz	7500	A
I^2t	@ 50 Hz	281	kA^2s
V_{DRM} -V_{RRM}		Up to 2200	V
T_J		-40 to 125	°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. @ 125°C mA
	04	400	500	60
	06	600	700	60
IRK.280	08	800	900	60
	10	1000	1100	60
	12	1200	1300	60
	14	1400	1500	60
	16	1600	1700	60
	18	1800	1900	60
	20	2000	2100	60
	22	2200	2300	60

I-STATE CONDUCTION

	Parameters	IRK.280	Units	Conditions	
$I_{T(AV)}$	Max. average on-state current @ Case temperature	280	A	180° Conduction,half sine wave	
		79	°C		
$I_{T(RMS)}$	Max. RMS on – state current	440	A	as AC switch	
I_{TSM}	Max. peak, one cycle on – state, non – repetitive	7500	A	T=10ms	Sinusoidal half wave,Initial T_J= T_J max.
I^2t	Maximum I^2t for fusing	281	kA^2s	T= 10ms	Sinusoidal half wave,Initial T_J= T_J max.
V_T	Threshold Voltage	0.90	V	T_J=T_J max.	
r_t	On State slope resistance	0.75	mΩ	T_J=T_J max.	
V_{TM}	Max. on – state voltage drop	1.55	V	I_T=800 A R.T 180° conduction AV.power = $V_{T(TO)}$ X $I_{T(AV)}$+r_tX($I_{T(RMS)}$)^2	
I_H	Maximum holding current	500max	mA	Anode supply = 12V, initial I_T = 30A, T_J=25°C	
I_L	Max. Latching current	2000max	mA	Anode supply = 12V, resistive load = 1Ω, Gate pulse: 10V, 100 µs, T_J=25°C	

SWITCHING

t_d	Typical delay time	1.0	µs	T_J=25°C	Gate current = 1A dig/dt = 1A/ µs
t_r	Typical rise time	2.0	µs	T_J=25°C	Vd = 0.67% V_{DRM}
t_q	Typical turn – off time	150	µs	I_{TM} = 300 A; dI/dt = 15A/ µs; T_J= T_J max.; Vr=50V; dv/dt = 20V/ µs; Gate OV, 100ohm	

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BLOCKING

	Parameter	280		Units	Conditions
dv/dt	Maximum critical rate of rise of off – state voltage	500	V/µs	T_J = 125^{0}C, exponential to 67% rated V_{DRM}	
I_{RRM} I_{DRM}	Max. peak reverse and off – state leakage current	60	mA	T_J = 125^{0}C, rated V_{DRM}/ V_{RRM} applied	
V_{INS}	RMS isolation voltage	3000	V	50H_Z,Circuit to base, all terminal shorted, 25^{0}C, 1Min	

TRIGGERING

	Parameter	280	Units	Units Conditions
I_{GT}	DC gate current required to trigger	MAX 200	mA	T_J=25^{0}C Max. required gate trigger/current/ voltage are the lowest value which will trigger all unit 12V anode – to cathode applied.
V_{GT}	DC gate voltage required to trigger	3.0		T_J=25^{0}C
V_{GD}	DC gate voltage not to trigger	0.25	V	T_J=125^{0}C Max. gate current/ voltage not to trigger the max. value which will not trigger any
I_{GD}	DC gate current not to trigger	10.0	mA	T_J=125^{0}C unit with rated V_{DRM} anode-to-cathode applied
di/dt	Maximum critical rate of rise of turned – on current	100	A/ µs	T_J=125^{0}C, ITM=400A,rated V_{DRM} applied

THERMAL AND MECHANICAL SPECIFICATION

	Parameter	280	Units	Units Conditions
T_J	Max. operating temperature range	-40 to 125	^{0}C	
T_{stg}	Max. storage temperature range	-40 to 125		
Rthj-C	Max. thermal resistance, junction to case	0.111	K/W	Perjunction, DC operation
Rthj-C	Max. thermal resistance, junction To heatsink	0.02	K/W	Mounting sufaceflat, smooth and greased
T	Mounting tourque, ±10%	4 to 6 (8 to 10)	Nm	For Module to heatsink and (busbar to module)
Wt	Appoximate weight	600	g	
	Case style	MAG-A-PAK		

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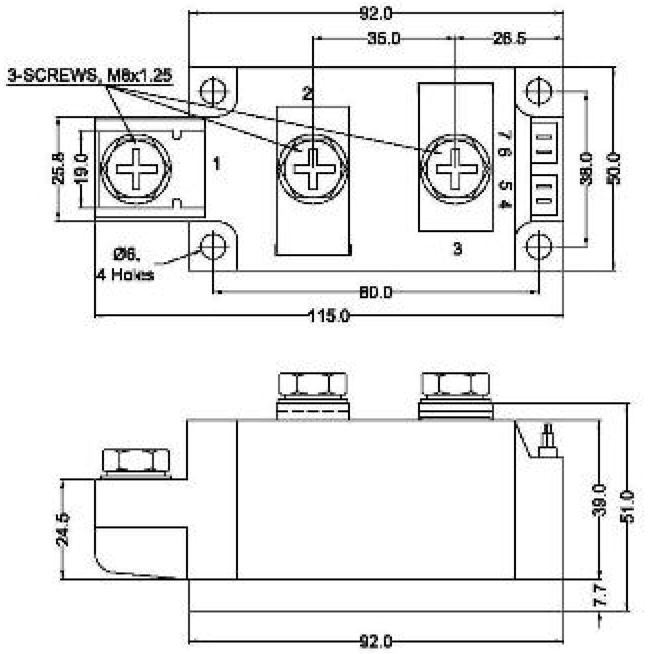
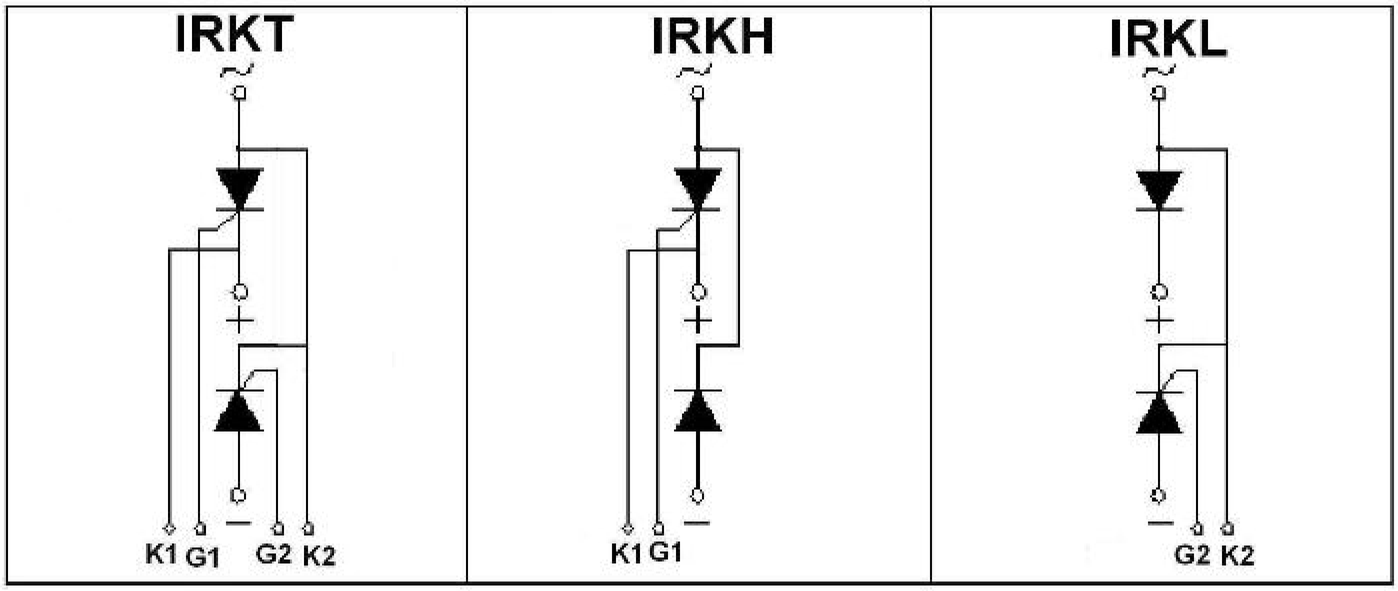
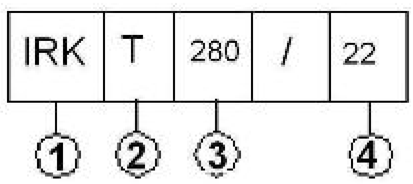
OUTLINE DIAGRAM



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)

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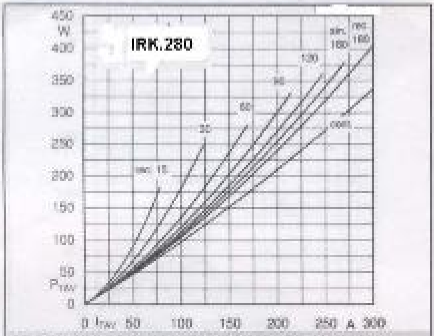

Fig. 1L Power dissipation per thyristor vs. on-state current

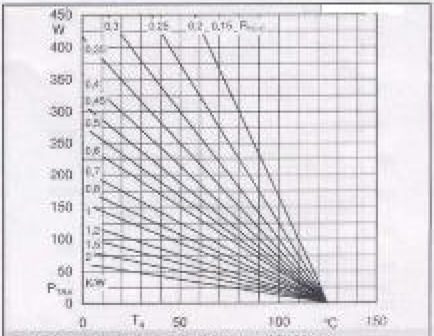

Fig. 1R Power dissipation per thyristor vs. ambient temp.

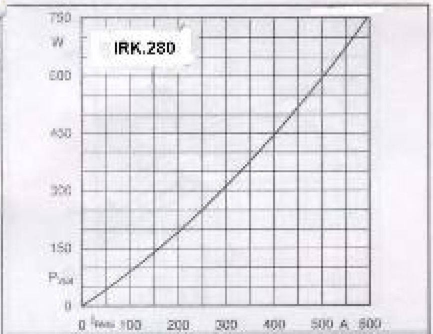

Fig. 2L Power dissipation per module vs. rms current

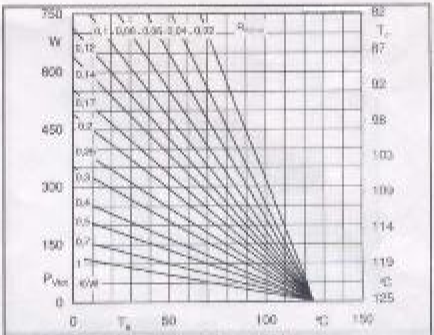

Fig. 2R Power dissipation per module vs. case temp.

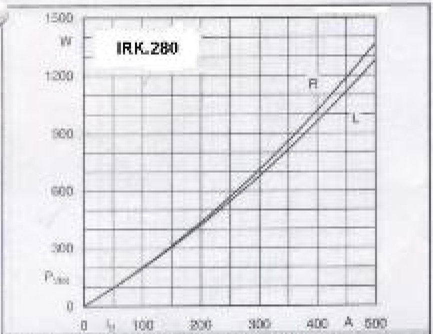

Fig. 3L Power dissipation of two modules vs. direct current

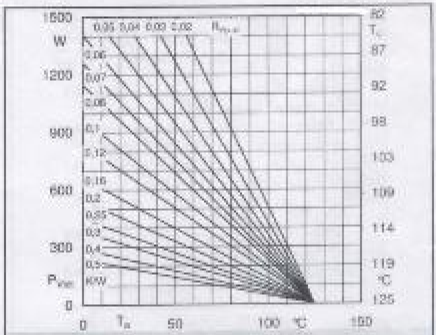

Fig. 3R Power dissipation of two modules vs. case temp.

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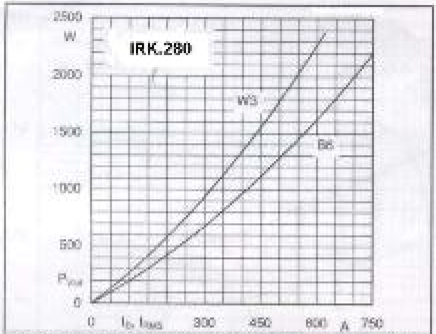

Fig. 4L Power dissipation of three modules vs. direct and rms current

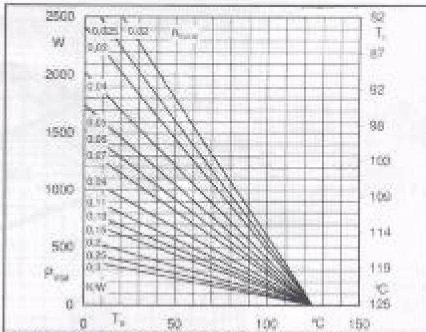

Fig. 4R Power dissipation of three modules vs. case temp.

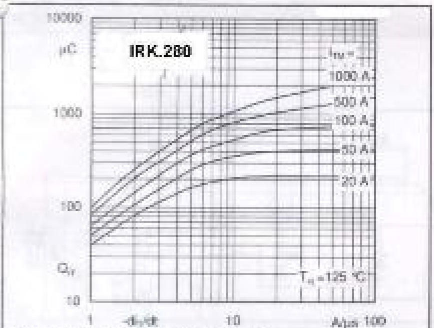

Fig. 5 Recovered charge vs. current decrease

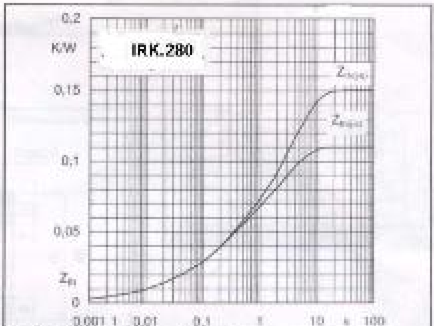

Fig. 6 Transient thermal impedance vs. time

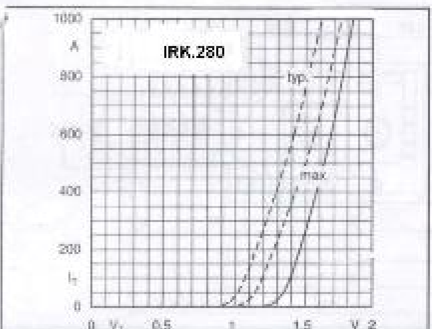

Fig. 7 On-state characteristics

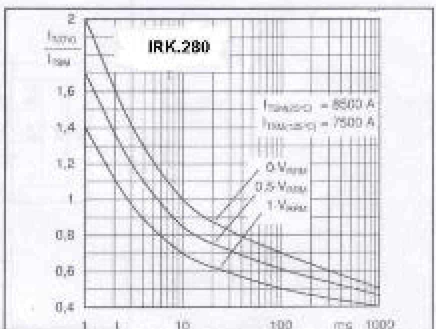

Fig. 8 Surge overload current vs. time

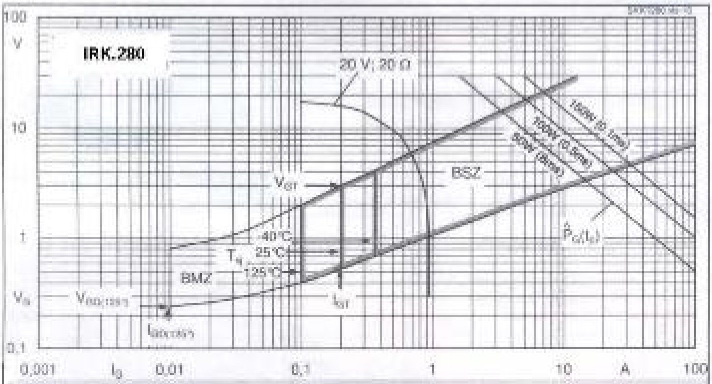

Fig. 9 Gate trigger characteristics