International
IOR Rectifier

SERIES IRK.F72

FAST SCR / DIODE and SCR / SCR

INT-A-PAK™ Power Modules

71A

Features

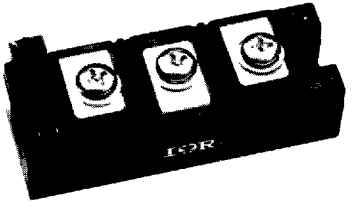
- Fast turn-off thyristor
- Fast recovery diode
- High surge capability
- Electrically isolated baseplate
- 3000 V_{RMS} isolating voltage
- Industrial standard package

Description

These series of INT-A-pak modules are intended for applications such as self-commutated inverters, DC choppers, electronic welders, induction heating and others where fast switching characteristics are required.

Major Ratings and Characteristics

Parameters	Value	Units
$I_{T(AV)}$	71	A
@ T_C	90	°C
$I_{T(RMS)}$	158	A
I_{TSM} @ 50Hz	2100	A
@ 60Hz	2200	A
I^2t @ 50Hz	21.6	kA^2s
@ 60Hz	19.8	kA^2s
$I^2\sqrt{t}$	216	$kA^2\sqrt{s}$
V_{TM}	2.40	V
V_{RRM}/V_{DRM}	600 to 1200	V
t_q range	18 to 25	µs
t_{rr} (diode)	2 max	µs
T_J	-40 to 125	°C
V_{INS}	3000	V



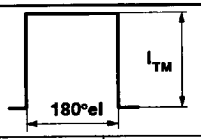
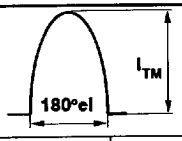
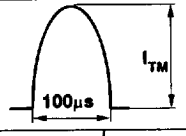
ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number (*)	Voltage code	V_{RRM}, maximum repetitive peak reverse voltage V	V_{DRM}, maximum repetitive peak off-state voltage V	I_{RRM} I_{DRM} max @125°C mA
IRKT/H/L/U/V/K/NF72	06	600	600	30
IRKT/H/L/U/V/K/NF72	08	800	800	30
IRKT/H/L/U/V/K/NF72	10	1000	1000	30
IRKT/H/L/U/V/K/NF72	12	1200	1200	30

(*) Refer to Ordering Information Table to complete Part number

Current Carrying Capacity

Frequency f							Units
50Hz	140	230	220	345	1860	2590	A
400Hz	170	280	250	406	900	1290	A
2500Hz	135	210	210	330	320	470	A
5000Hz	115	180	205	310	205	310	A
10000Hz	85	140	165	235	-	-	A
Recovery voltage Vr	50	50	50	50	50	50	V
Voltage before turn-on Vd	80% V_{DRM}		80% V_{DRM}		80% V_{DRM}		V
Rise of on-state current di/dt	50	50	-	-	-	-	A/µs
Case temperature	90	60	90	60	90	60	°C
Equivalent values for RC circuit	22Ω/0.15µF		22Ω/0.15µF		22Ω/0.15µF		

On-state Conduction

	Parameters	Values	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	71	A	180° sinusoidal conduction Max. case temperature T_C = 90°C		
$I_{T(RMS)}$	Maximum RMS current	158	A	T_C = 90°C, as AC switch		
I_{TSM}	Maximum peak one half cycle non repetitive surge current	2100	A	10ms	No voltage reapplied	Sinusoidal half Wave Initial T_J=125°C
		2200	A	8.3ms		
		1750	A	10ms	100% V_{RRM} reapplied	Sinusoidal half Wave Initial T_J=125°C
		1830	A	8.3ms		
I^2t	Maximum I^2t for fusing	21.6	kA^2s	10ms	No voltage reapplied	Initial T_J=125°C
		19.8	kA^2s	8.3ms		
		15.3	kA^2s	10ms	100% V_{RRM} reapplied	Initial T_J=125°C
		14.0	kA^2s	8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	216	$kA^2\sqrt{s}$	t=0 to 10ms, no voltage reapplied		Initial T_J=125°C

On-state Conduction

	Parameters	Values	Units	Conditions
V_{TM}	Max. peak on-state voltage	2.40	V	I_T=350A (peak) half sine wave, T_J=$T_J$max. tp=10ms
$V_{T(TO)1}$	Low level value of threshold voltage	1.28	V	T_J=125°C ($16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$)
$V_{T(TO)2}$	High level value of threshold voltage	1.32	V	T_J=125°C ($\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}$)
r_{t1}	Low level value of on-state slope resistance	3.20	mΩ	T_J=125°C ($16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$)
r_{t2}	High level value of on-state slope resistance	3.00	mΩ	T_J=125°C ($\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}$)
I_H	Maximum holding current	600	mA	T_J=25°C, I_T>30 A
I_L	Latching current	1000	mA	T_J=25°C, V_A=12V, Ra=6Ω, Ig=1A

Triggering

	Parameters	Values	Units	Conditions
P_{GM}	Maximum peak gate power	40	W	f = 50 Hz, d% = 50
$P_{G(AV)}$	Maximum average gate power	5	W	T_J=125°C, f = 50 Hz, d% = 50
I_{GM}	Maximum peak gate current	5	A	T_J=125°C, tp ≤ 5ms
$-V_{GM}$	Maximum peak negative gate voltage	5	V	T_J=125°C, tp ≤ 5ms
V_{GT}	Maximum gate voltage required to fire all devices	3	V	T_J=25°C, V_A = 12V, Ra = 6Ω
I_{GT}	Maximum gate current required to fire all devices	200	mA	T_J=25°C, V_A = 12V, Ra = 6Ω
V_{GD}	Maximum gate voltage	0.25	V	T_J=125°C, rated V_{DRM} applied
I_{GD}	Maximum gate current that will not trigger any device	20	mA	T_J=125°C, rated V_{DRM} applied

Blocking

dv/dt	Maximum critical rate of rise of off-state voltage	400	V/µs	T_J=125°C linear to 80% V_{DRM} (*)
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	30	mA	T_J=125°C rated V_{DRM}, V_{RRM} applied
V_{INS}	RMS isolation voltage	3000	V	50 Hz, circuit to base, T_J=25°C, 1s

(*) *Contact factory for other selections*

Switching

		P	K	J		
t_q	Maximum turn-off time	18	20	25	µs	I_T = 350A, T_J=125°C $-di/dt$ = 25 A/µs V_R= 50V dv/dt = 50 V/µs linear to 80% V_{DRM}
t_{rr}	Maximum recovery time	2			µs	I_T = 350A, $-di/dt$ = 25 A/µs, V_R= 50V, T_J= 25°C
di/dt	Max. non-repetitive rate of rise	800			A/µs	Gate drive 20V, 20Ω, tr ≤ 1 µs, V_D= 80% V_{DRM} T_J=125°C

Thermal and Mechanical Specifications

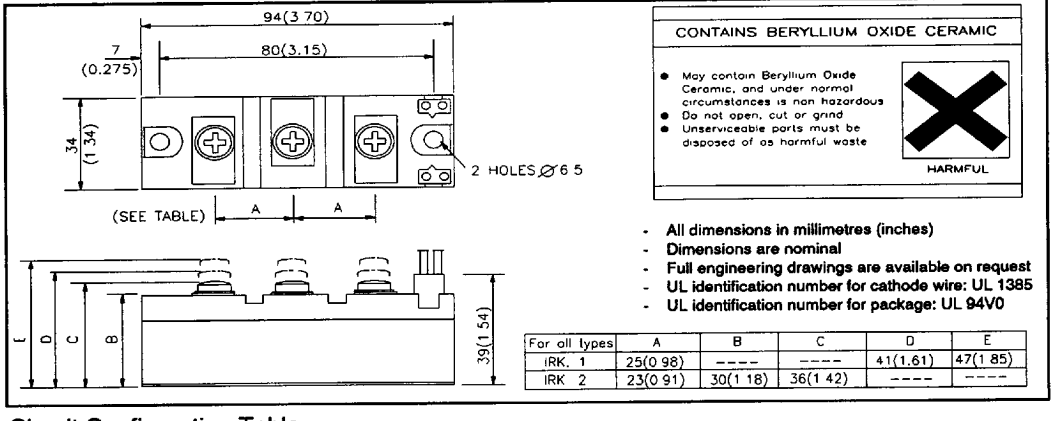
T_J	Junction temperature range	-40 to 125	°C	
T_{stg}	Storage temperature range	-40 to 150	°C	
R_{thJC}	Internal thermal resistance, junction to case	0.25	K/W	DC operation per junction
R_{thC-S}	Thermal resistance case to sink	0.035	K/W	Mounting surface flat and greased - Per module
T	Mounting torque, ±10%	4 to 6	Nm	A mounting compound is recommended. The torque should be rechecked after a period of about 3 hours to allow for the spread of the compound. Use of cable lugs is not recommended, busbars should be used and restrained during tightening. Threads must be lubricated with a compound.
	INT-A-pak to heatsink	35 to 53	lb * in	
	Busbar to INT-A-pak	4 to 6	Nm	
		35 to 53	lb * in	
wt	Approximate weight	500/17.8	g/oz	
	Case style	INT-A-pak		

ΔR Conduction (per Junction)

(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.016	0.011	K/W	T_J = 125°C
120°	0.019	0.020	K/W	
90°	0.024	0.026	K/W	
60°	0.035	0.037	K/W	
30°	0.060	0.060	K/W	

Outline Table



CONTAINS BERYLLIUM OXIDE CERAMIC

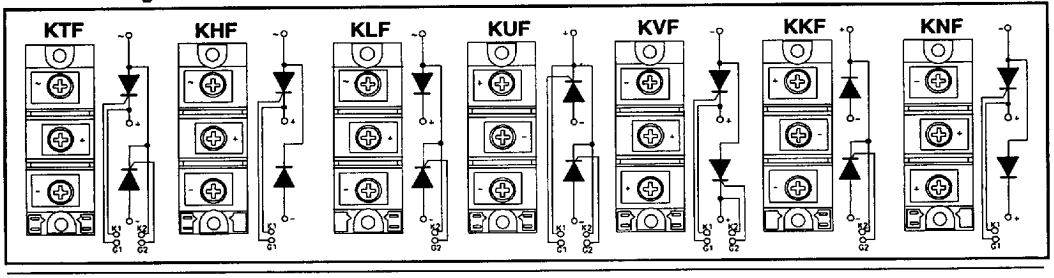
- May contain Beryllium Oxide Ceramic, and under normal circumstances is non hazardous
- Do not open, cut or grind
- Unserviceable parts must be disposed of as harmful waste

HARMFUL

- All dimensions in millimetres (inches)
- Dimensions are nominal
- Full engineering drawings are available on request
- UL identification number for cathode wire: UL 1385
- UL identification number for package: UL 94V0

For all types	A	B	C	D	E
IRK. 1	25(0.98)	----	----	41(1.61)	47(1.85)
IRK. 2	23(0.91)	30(1.18)	36(1.42)	----	----

Circuit Configuration Table



Ordering Information Table INTERNATIONAL RECTIFIER 65E D

Device Code

IRK	T	F	7	2	-	12	H	J
①	②	③	④	⑤		⑥	⑦	⑧

1 - Module type
2 - Circuit configuration (See Circuit Configuration Table)
3 - Fast SCR
4 - Current rating: Code x 10 = $I_{T(AV)}$
5 - 1 = option with spacers and longer terminal screws
    2 = option with standard terminal screws
6 - Voltage code: Code x 100 = V_{RRM}
7 - dv/dt code (See table)
8 - tq code (See table)

dv/dt	
C	= 20V/µs
D	= 50V/µs
E	= 100V/µs
F	= 200V/µs
G	= 300V/µs
H	= 400V/µs

tq	
P	≤ 18µs
K	≤ 20µs
J	≤ 25µs

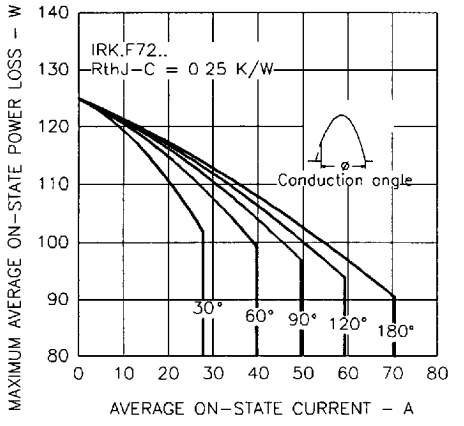


Fig. 1 - Current Ratings Characteristics

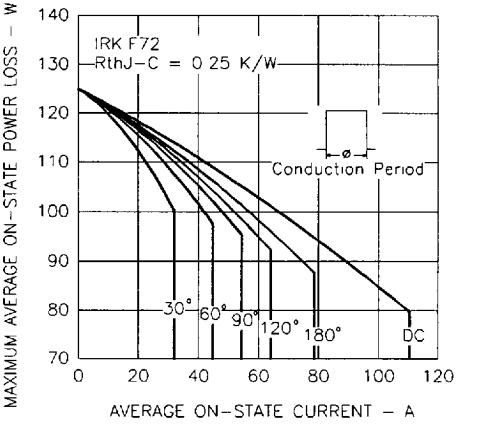


Fig. 2 - Current Ratings Characteristics

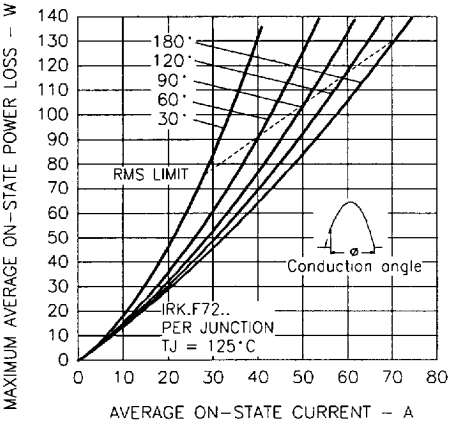


Fig. 3 - On-state Power Loss Characteristics

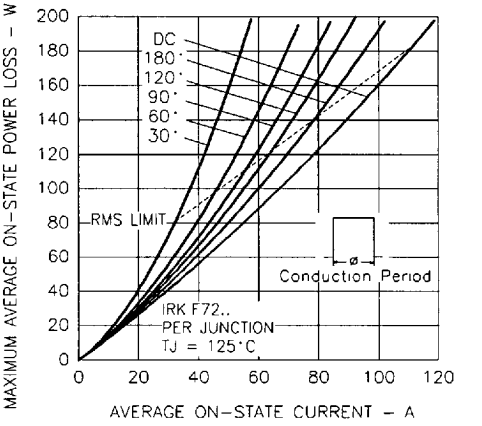


Fig. 4 - On-state Power Loss Characteristics

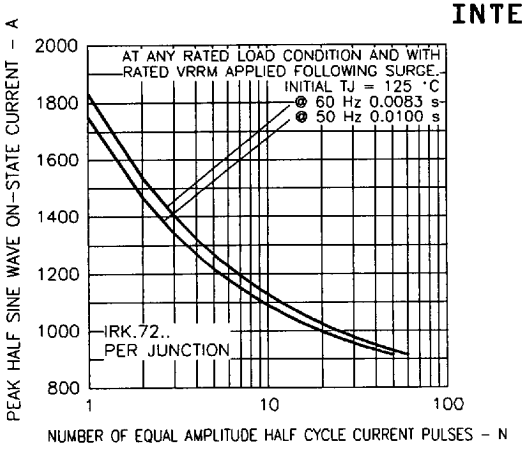


Fig. 5 - Maximum Non-Repetitive Surge Current

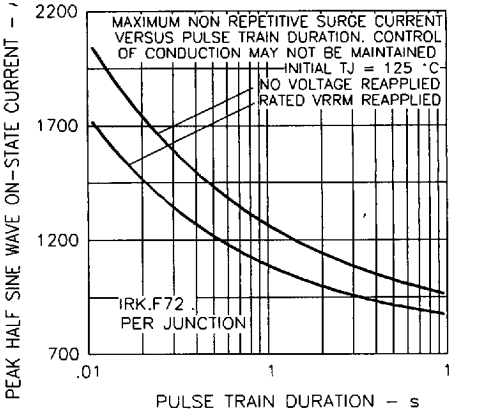


Fig. 6 - Maximum Non-Repetitive Surge Current

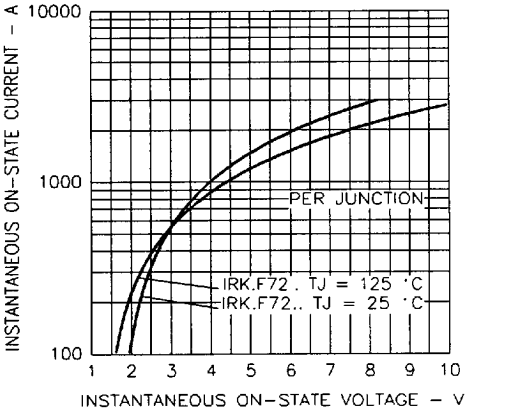


Fig. 7 - On-state Voltage Drop Characteristics

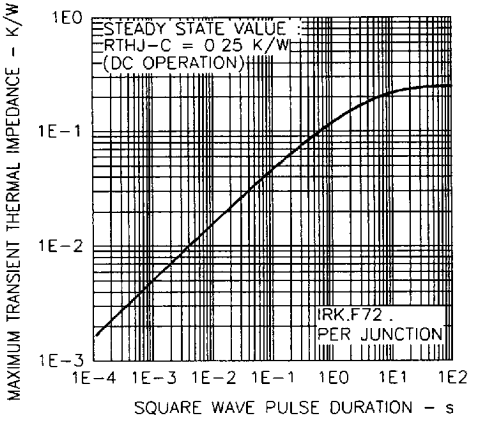


Fig. 8 - Thermal Impedance ZthJC Characteristics

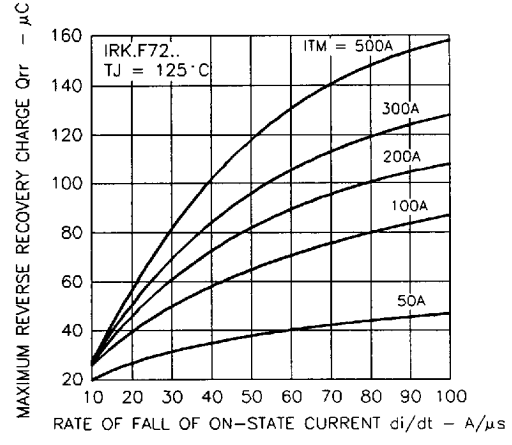


Fig. 9 - Reverse Recovery Charge Characteristics (Thyristor)

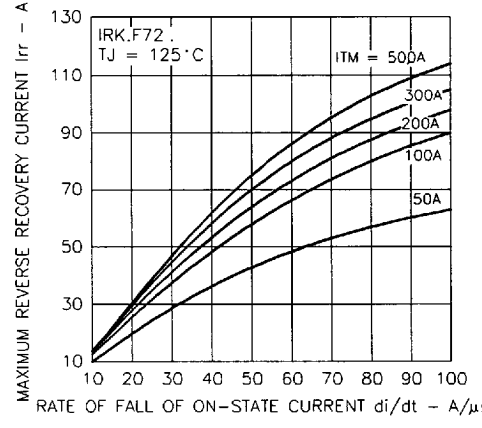


Fig. 10 - Reverse Recovery Current Characteristics (Thyristor)

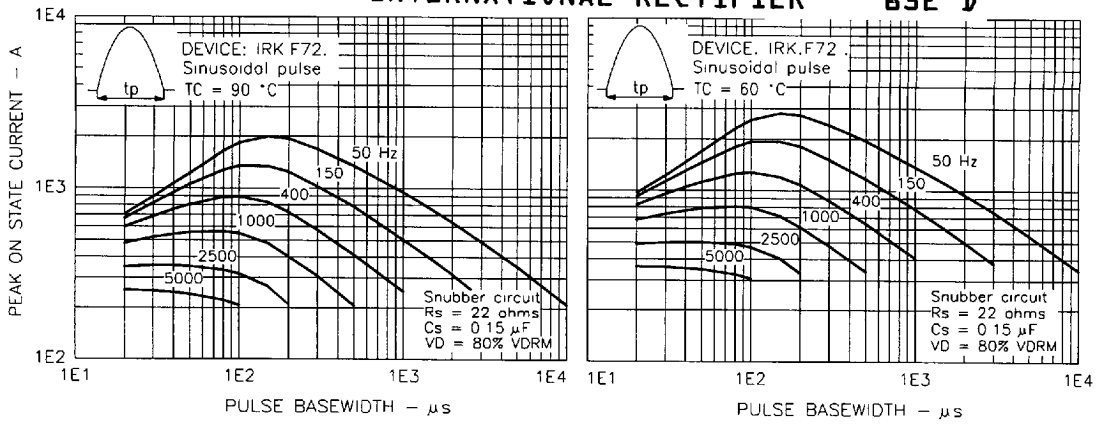


Fig. 11 - Frequency Characteristics

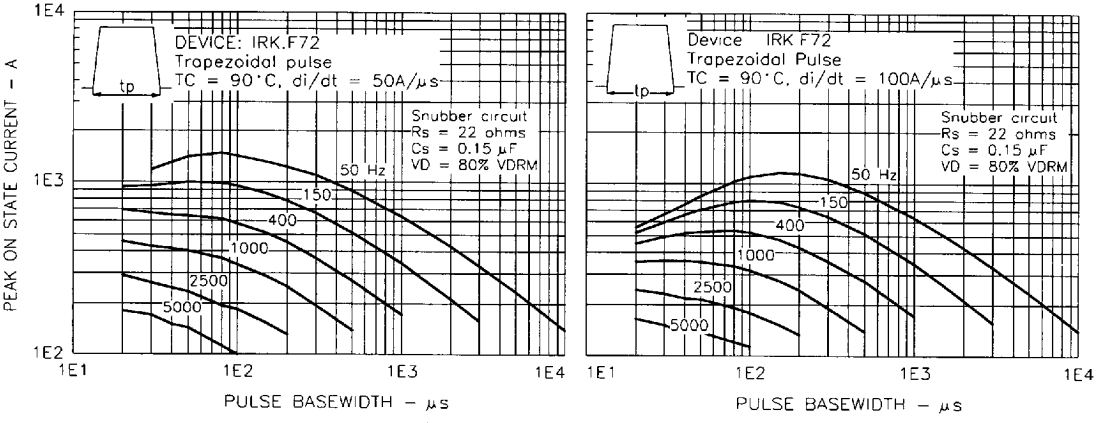


Fig. 12 - Frequency Characteristics

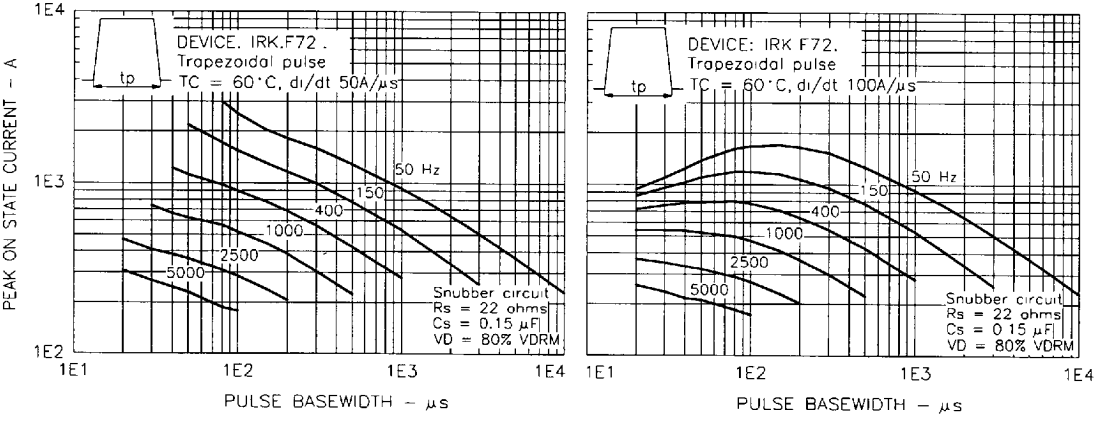


Fig. 13 - Frequency Characteristics

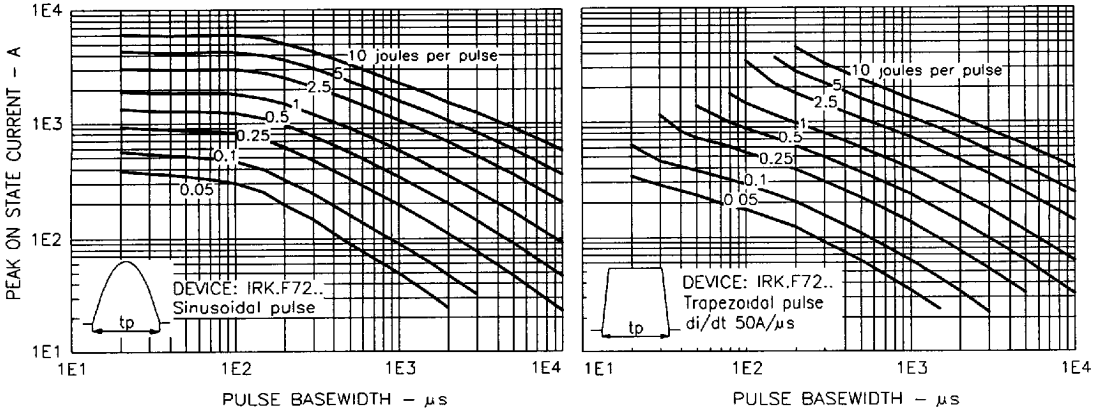


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

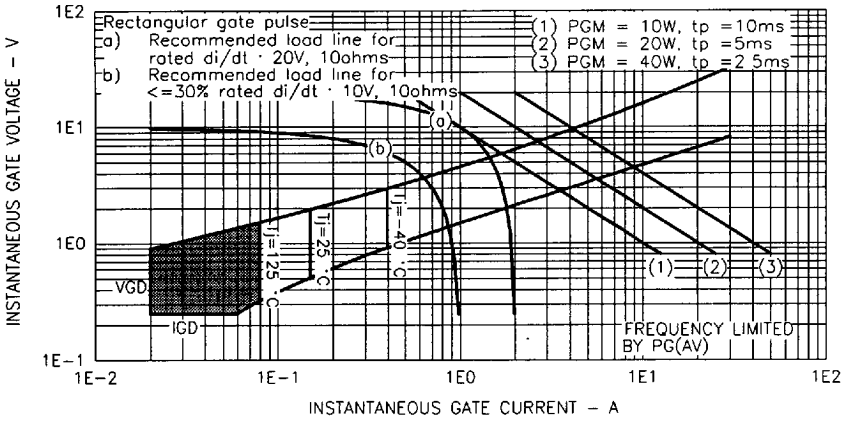


Fig. 15 - Gate Characteristics