

FAST SCR / DIODE and SCR / SCR

INT-A-PAK™ Power Modules

Features

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

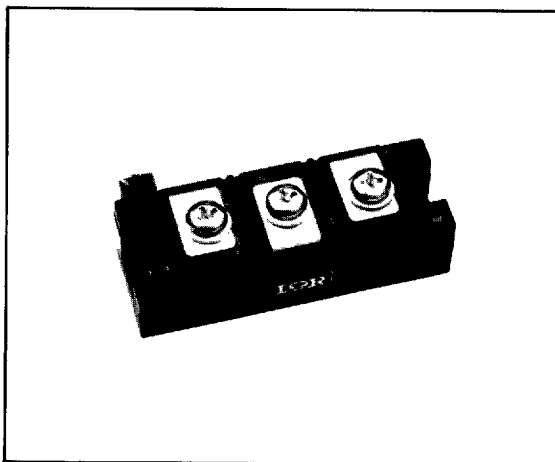
112A

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
$I_{T(AV)}$	112	A
@ T_C	90	°C
$I_{T(RMS)}$	250	A
I_{TSM} @ 50Hz	3090	A
@ 60Hz	3237	A
I^2t @ 50Hz	47.8	kA ² s
@ 60Hz	43.6	kA ² s
I^2/t	478	kA ² /s
V_{TM}	1.77	V
V_{RRM}/V_{DRM}	200 to 800	V
t_q range	10 to 20	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/NF112	02	200	200	30
IRKT/H/L/U/V/K/NF112	04	400	400	30
IRKT/H/L/U/V/K/NF112	06	600	600	30
IRKT/H/L/U/V/K/NF112	08	800	800	30

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

Current Carrying Capacity

Frequency f				Units			
50Hz	220	220	350	550	2060	2900	A
400Hz	285	285	425	695	1230	1785	A
2500Hz	205	205	350	550	460	552	A
5000Hz	175	170	295	448	295	448	A
10000Hz	125	120	230	337	-	-	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/µ s
Case temperature	90	60	90	60	90	60	°C
Equivalent values for RC circuit	47Ω/0.22 µF		47Ω/0.22 µF		47Ω/0.22 µF		

On-state Conduction

Parameters		Values	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	112	A	180° sinusoidal conduction Max. case temperature $T_c = 90^{\circ}\text{C}$		
$I_{T(RMS)}$	Maximum RMS current	250	A	$T_c = 90^{\circ}\text{C}$, as AC switch		
I_{TSM}	Maximum peak one half cycle non repetitive surge current	3090	A	10ms	No voltage reappplied	Sinusoidal half Wave Initial $T_J = 125^{\circ}\text{C}$
		3237	A	8.3ms		
		2600	A	10ms	100% V_{RRM} reappplied	Sinusoidal half Wave Initial $T_J = 125^{\circ}\text{C}$
		2720	A	8.3ms		
I^2t	Maximum I^2t for fusing	47.8	kA^2s	10ms	No voltage reappplied	Initial $T_J = 125^{\circ}\text{C}$
		43.6	kA^2s	8.3ms		
		33.8	kA^2s	10ms	100% V_{RRM} reappplied	Initial $T_J = 125^{\circ}\text{C}$
		30.8	kA^2s	8.3ms		
I^2t	Maximum I^2t for fusing	478	kA^2/s	t=0 to 10ms, no voltage reappplied Initial $T_J = 125^{\circ}\text{C}$		

INTERNATIONAL RECTIFIER

65E D

On-state Conduction

Parameters	Values	Units	Conditions
V_{TM} Max. peak on-state voltage	1.77	V	$I_T = 350A$ (peak) half sine wave, $T_J = T_{J,max}$, $t_p = 10ms$
$V_{T(TO)1}$ Low level value of threshold voltage	1.19	V	$T_J = 125^\circ C$ ($16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$)
$V_{T(TO)2}$ High level value of threshold voltage	1.43	V	$T_J = 125^\circ C$ ($\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}$)
r_{11} Low level value of on-state slope resistance	1.67	m Ω	$T_J = 125^\circ C$ ($16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$)
r_{12} High level value of on-state slope resistance	1.12	m Ω	$T_J = 125^\circ C$ ($\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}$)
I_H Maximum holding current	600	mA	$T_J = 25^\circ C$, $I_T > 30A$
I_L Latching current	1000	mA	$T_J = 25^\circ C$, $V_A = 12V$, $R_a = 6\Omega$, $I_g = 1A$

Triggering

Parameters	Values	Units	Conditions
P_{GM} Maximum peak gate power	60	W	$f = 50$ Hz, $d\% = 50$
$P_{G(AV)}$ Maximum average gate power	10	W	$T_J = 125^\circ C$, $f = 50$ Hz, $d\% = 50$
I_{GM} Maximum peak gate current	10	A	$T_J = 125^\circ C$, $t_p \leq 5ms$
$-V_{GM}$ Maximum peak negative gate voltage	5	V	$T_J = 125^\circ C$, $t_p \leq 5ms$
V_{GT} Maximum gate voltage required to fire all devices	3	V	$T_J = 25^\circ C$, $V_A = 12V$, $R_a = 6\Omega$
I_{GT} Maximum gate current required to fire all devices	200	mA	$T_J = 25^\circ C$, $V_A = 12V$, $R_a = 6\Omega$
V_{GD} Maximum gate voltage	0.25	V	$T_J = 125^\circ C$, rated V_{DRM} applied
I_{GD} Maximum gate current that will not trigger any device	20	mA	$T_J = 125^\circ C$, rated V_{DRM} applied

Blocking

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

(*) Contact factory for other selections

Switching

t_q Maximum turn-off time	N	M	L	P	K		$I_T = 350A$, $T_J = 125^\circ C$ $-di/dt = 25 A/\mu s$ $V_R = 50V$ $dv/dt = 50 V/\mu s$ linear to $80\% V_{DRM}$
	10	12	15	18	20	μs	
t_{rr} Maximum recovery time	2					μs	$I_T = 350A$, $-di/dt = 25 A/\mu s$, $V_R = 50V$, $T_J = 25^\circ C$
di/dt Max. non-repetitive rate of rise	800					A/ μs	Gate drive 20V, 20Ω , $t_r \leq 1\mu s$, $V_D = 80\% V_{DRM}$ $T_J = 125^\circ C$

Thermal and Mechanical Specifications

INTERNATIONAL RECTIFIER

65E D

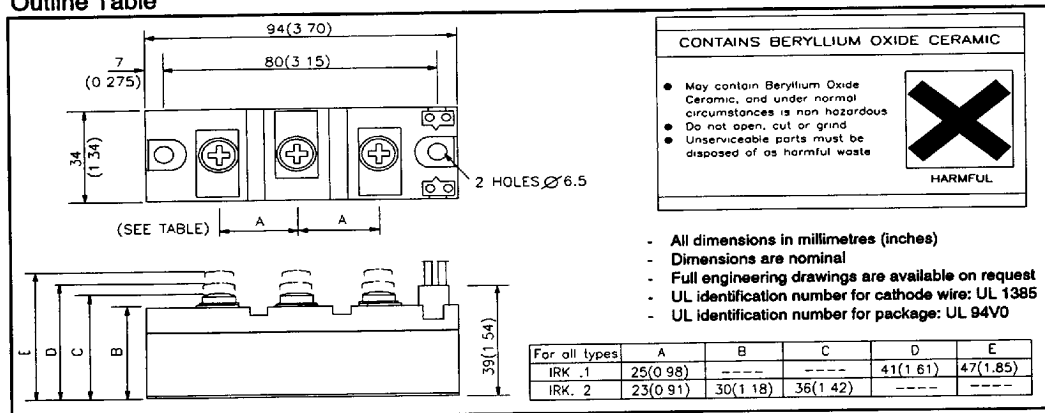
T_J	Junction temperature range	-40 to 125	°C	
T_{stg}	Storage temperature range	-40 to 150	°C	
R_{thJC}	Internal thermal resistance, junction to case	0.170	K/W	DC operation per junction
R_{thCS}	Thermal resistance case to sink	0.035	K/W	Mounting surface flat and greased - Per module
T	Mounting torque, $\pm 10\%$	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.
		35 to 53	lb * in	
		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)

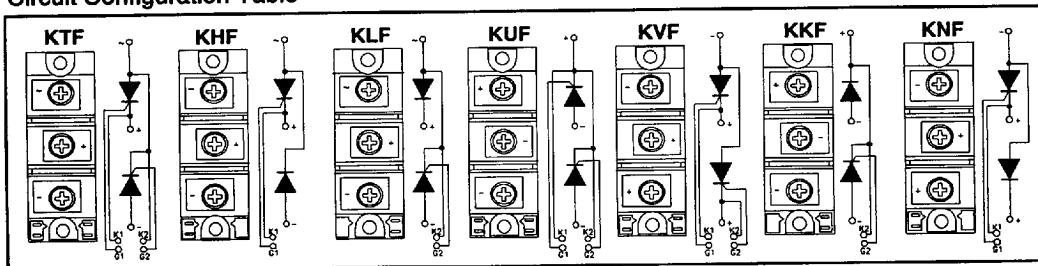
(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.015	0.012	K/W	$T_J = 125^\circ\text{C}$
120°	0.018	0.020	K/W	
90°	0.024	0.027	K/W	
60°	0.036	0.037	K/W	
30°	0.060	0.060	K/W	

Outline Table



Circuit Configuration Table



Ordering Information Table

INTERNATIONAL RECTIFIER

65E D

Device Code

IRK	T	F	11	2	-	08	D	M
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/ μ s
D = 50V/ μ s
E = 100V/ μ s
F = 200V/ μ s
G = 300V/ μ s
H = 400V/ μ s

tq
N $\leq$ 10 μ s
M $\leq$ 12 μ s
L $\leq$ 15 μ s
P $\leq$ 18 μ s
K $\leq$ 20 μ s

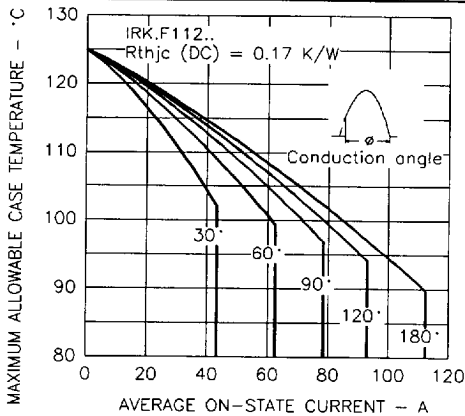


Fig. 1 - Current Ratings Characteristics

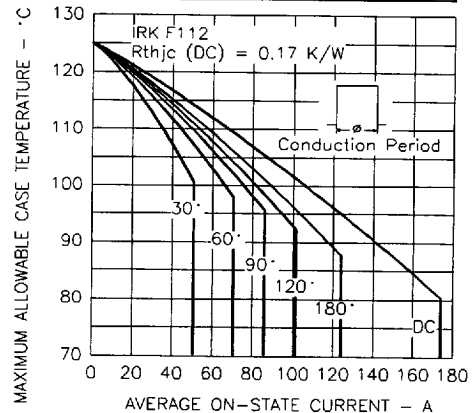


Fig. 2 - Current Ratings Characteristics

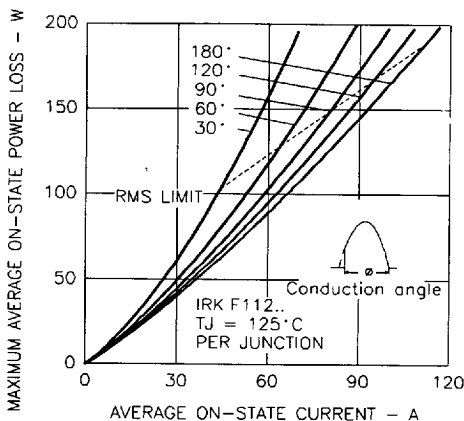


Fig. 3 - On-state Power Loss Characteristics

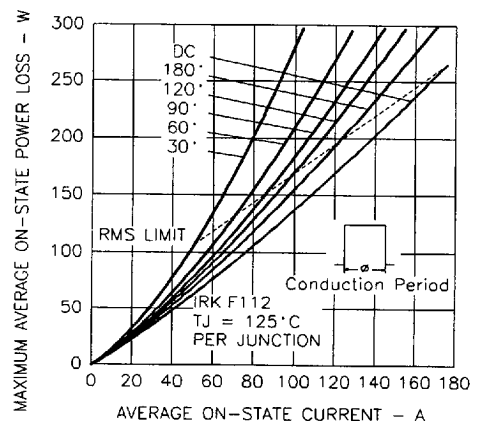


Fig. 4 - On-state Power Loss Characteristics

INTERNATIONAL RECTIFIER

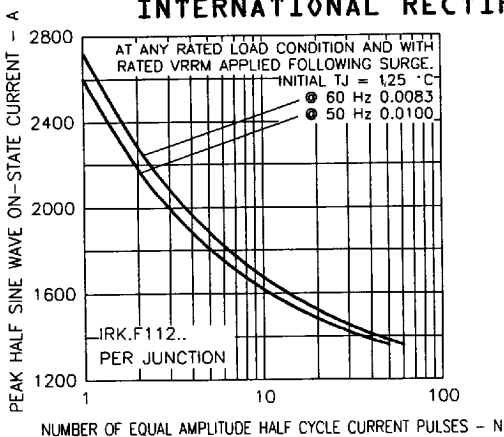


Fig. 5 - Maximum Non-Repetitive Surge

6SE D

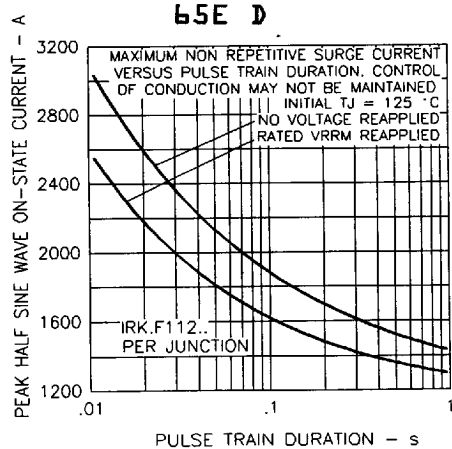


Fig. 6 - Maximum Non-Repetitive Surge

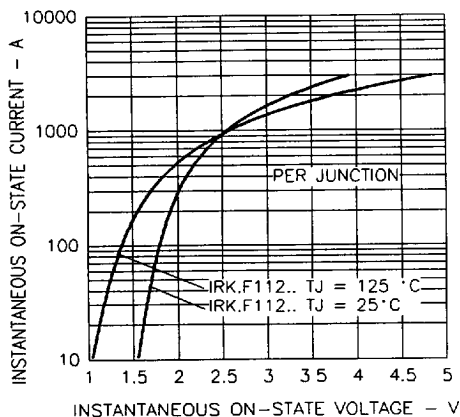


Fig. 7 - On-State Voltage Drop Characteristics

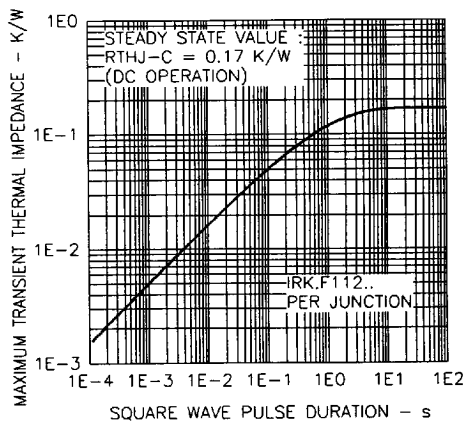
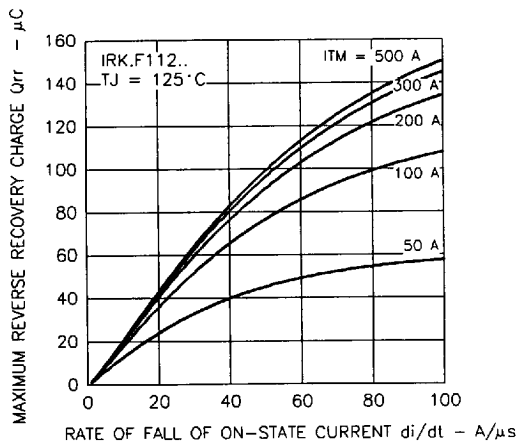
Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

Fig. 9 - Reverse Recovery Charge Characteristics (Thyristor)

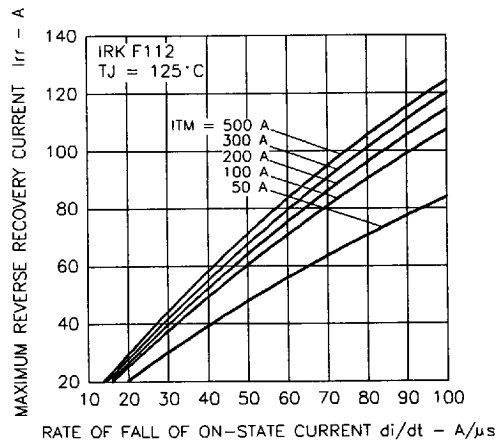


Fig. 10 - Reverse Recovery Current Characteristics (Thyristor)

INTERNATIONAL RECTIFIER

B5E D

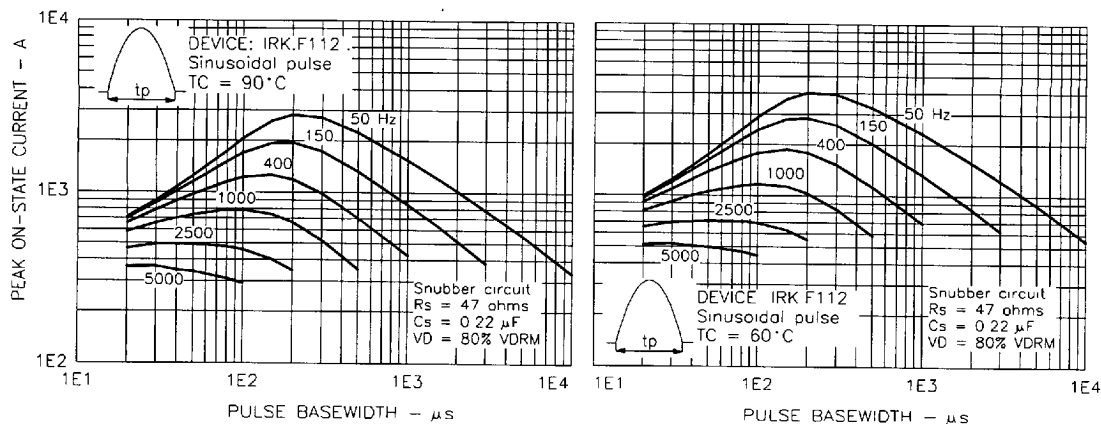


Fig. 11 - Frequency Characteristics

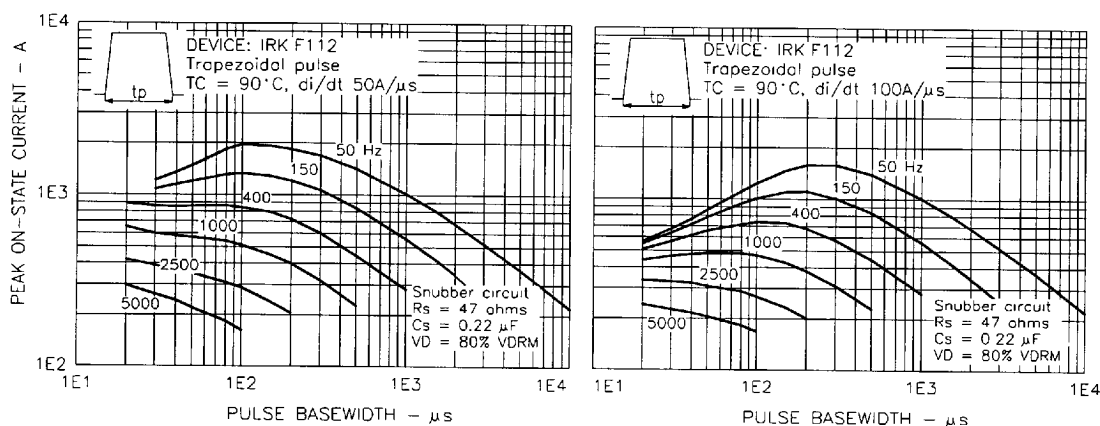


Fig. 12 - Frequency Characteristics

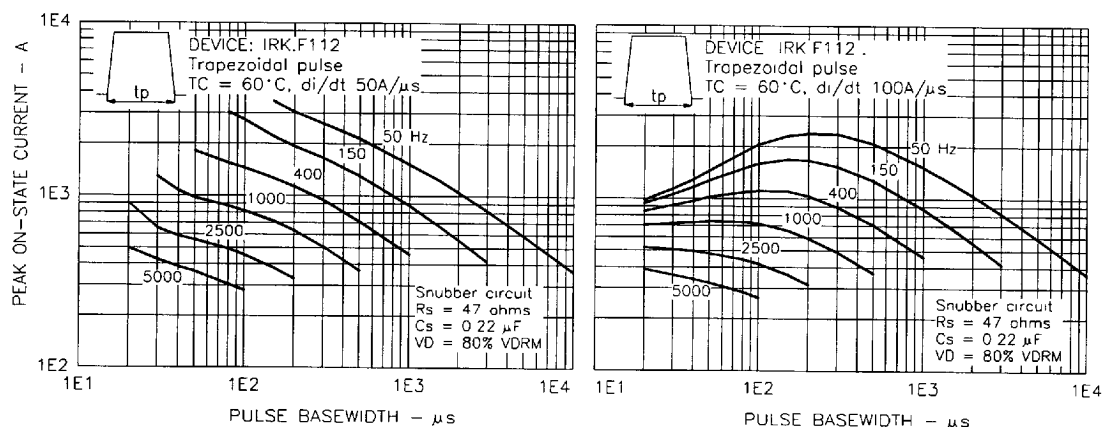


Fig. 13 - Frequency Characteristics

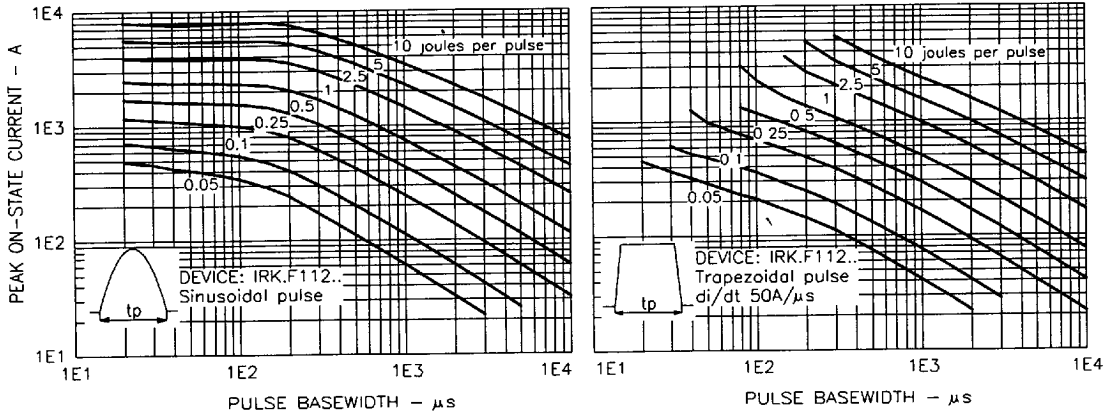


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

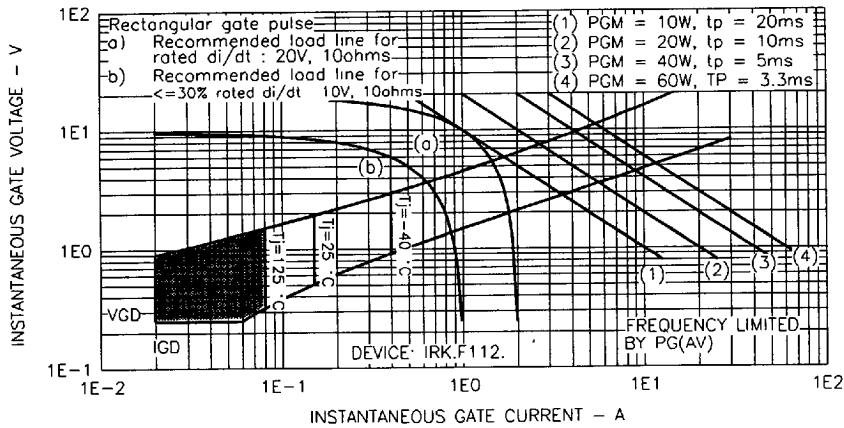


Fig. 15 - Gate Characteristics