

IRK.F200.. SERIES

**FAST THYRISTOR/ DIODE and
THYRISTOR/THYRISTOR**

MAGN-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
- UL E78996 approved 

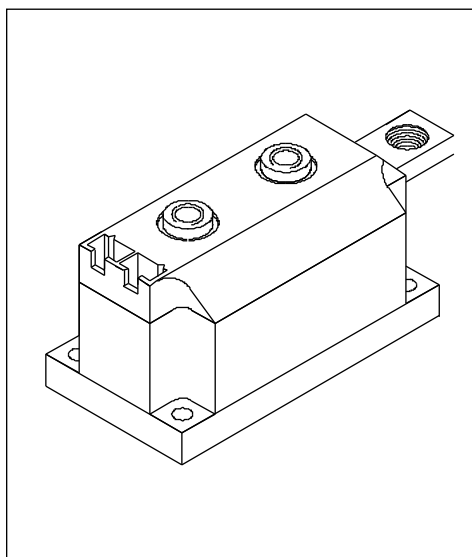
200 A

Description

These series of MAGN-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	IRK.F200..	Units
$I_{T(AV)}$	200	A
@ T_C	85	°C
$I_{T(RMS)}$	444	A
I_{TSM} @ 50Hz	7600	A
@ 60Hz	8000	A
I^2t @ 50Hz	290	KA ² s
@ 60Hz	265	KA ² s
$I^2\sqrt{t}$	2900	KA ² √s
t_q	20 and 25	μs
t_{rr}	2	μs
V_{DRM}/V_{RRM}	upto 1200	V
T_J range	-40 to 125	°C



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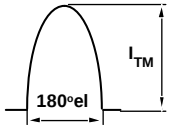
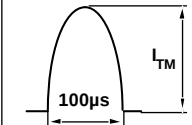
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ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{RRM}/V_{DRM} , maximum repetitive peak reverse voltage V	V_{RSM} , maximum non-repetitive peak rev. voltage V	I_{RRM}/I_{DRM} max. @ $T_J = 125^\circ\text{C}$ mA
IRK.F200-	08	800	800	50
	12	1200	1200	

Current Carrying Capacity

Frequency f							Units
50Hz	380	560	630	850	2460	3180	A
400Hz	460	690	710	1060	1570	2080	A
2500Hz	310	450	530	760	630	860	A
5000Hz	250	360	410	560	410	560	A
10000Hz	180	280	300	410	-	-	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	85	60	85	60	85	60	°C
Equivalent values for RC circuit	10Ω/0.47µF		10Ω/0.47µF		10Ω/0.47µF		

On-state Conduction

Parameter		IRK.F200..	Units	Conditions			
I _{T(AV)}	Maximum average on-state current @ Case temperature	200	A	180° conduction, half sine wave			
		85	°C				
I _{T(RMS)}	Maximum RMS current	444	A	as AC switch			
I _{TSM}	Maximum peak, one-cycle, non-repetitive surge current	7600	A	t = 10ms	No voltage	Sinusoidal half wave, Initial T _j = 125°C	
		t = 8.3ms		reapplied			
		t = 10ms		100% V _{RRM}			
		t = 8.3ms		reapplied			
I ² t	Maximum I ² t for fusing	290	KA ² s	t = 10ms	No voltage		
		265		t = 8.3ms	reapplied		
		205		t = 10ms	100% V _{RRM}		
		187		t = 8.3ms	reapplied		
I ² √t	Maximum I ² √t for fusing	2900	KA ² /s	t = 0 to 10ms, no voltage reapplied			
V _{T(TO)1}	Low level value of threshold voltage	1.18	V	(16.7% × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _j = T _j max.			
V _{T(TO)2}	High level value of threshold voltage	1.25		(I > π × I _{T(AV)}), T _j = T _j max.			
r _{t1}	Low level value of on-state slope resistance	0.74	mW	(16.7% × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _j = T _j max.			
r _{t2}	High level value of on-state slope resistance	0.70		(I > π × I _{T(AV)}), T _j = T _j max.			
V _{TM}	Maximum on-state voltage drop	1.73	V	I _{pk} = 600A, T _j = T _j max., t _p = 10ms sine pulse			
I _H	Maximum holding current	600	mA	T _j = 25°C, I _T > 30 A			
I _L	Typical latching current	1000	mA	T _j = 25°C, V _A = 12V, R _a = 6Ω, I _g = 1A			

Switching

Parameter	IRK.F200..	Units	Conditions
di/dt Maximum non-repetitive rate of rise	800	A/μs	Gate drive 20V, 20Ω, tr ≤ 1ms, V _D = 80% V _{DRM} T _J = 25°C
t _{rr} Maximum recovery time	2	μs	I _{TM} = 350A, di/dt = -25A/μs, V _R = 50V, T _J = 25°C
t _q Maximum turn-off time	K	J	I _{TM} = 750A, T _J = 125°C, di/dt = -25A/μs, V _R = 50V, dv/dt = 400V/μs linear to 80% V _{DRM}
	20	25	

Blocking

Parameter	IRK.F200..	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	1000	V/μs	T _J = 125°C., exponential to = 67% V _{DRM}
V _{INS} RMS isolation voltage	3000	V	50 Hz, circuit to base, T _J = 25°C, t = 1 s
I _{RRM} Maximum peak reverse and off-state leakage current I _{DRM}	50	mA	T _J = 125°C, rated V _{DRM} /V _{RRM} applied

Triggering

Parameter	IRK.F200..	Units	Conditions
P _{GM} Maximum peak gate power	60	W	f = 50 Hz, d% = 50
P _{G(AV)} Maximum peak average gate power	10	W	T _J = 125°C, f = 50Hz, d% = 50
I _{GM} Maximum peak positive gate current	10	A	T _J = 125°C, t _p ≤ 5ms
- V _{GM} Maximum peak negative gate voltage	5	V	
I _{GT} Max. DC gate current required to trigger	200	mA	T _J = 25°C, V _{ak} 12V, Ra = 6
V _{GT} DC gate voltage required to trigger	3	V	
I _{GD} DC gate current not to trigger	20	mA	T _J = 125°C, rated V _{DRM} applied
V _{GD} DC gate voltage not to trigger	0.25	V	

Thermal and Mechanical Specifications

Parameter	IRK.F200..	Units	Conditions
T _J Max. junction operating temperature range	- 40 to 125	°C	
T _{stg} Max. storage temperature range	- 40 to 150		
R _{thJC} Max. thermal resistance, junction to case	0.125	K/W	Per junction, DC operation
R _{thC-hs} Max. thermal resistance, case to heatsink	0.025	K/W	Mounting surface flat and greased Per module
T Mounting torque ± 10% MAP to heatsink busbar to MAP	4 - 6 (35 - 53)	Nm	A mounting compound is recommended. The torque should be rechecked after a period of 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
	4 - 6 (35 - 53)	(lb*in)	
wt Approximate weight	500 (17.8)	g (oz)	

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ΔR_{thJC} Conduction

(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°	0.009	0.006	K/W	$T_J = 125^\circ\text{C}$
120°	0.010	0.011		
90°	0.014	0.015		
60°	0.020	0.020		
30°	0.032	0.033		

Ordering Information Table

Device Code

IRK	T	F	200	-	12	H	K	N
①	②	③	④		⑤	⑥	⑦	⑧

- 1** - Module type
- 2** - Circuit configuration
- 3** - Fast SCR
- 4** - Current rating: $I_{T(AV)} \times 10$ rounded
- 5** - Voltage code: Code $\times 100 = V_{RRM}$ (See Voltage Ratings Table)
- 6** - dv/dt code: $H \leq 400V/\mu s$
- 7** - t_q code: $K \leq 20\mu s$
 $J \leq 25\mu s$
- 8** - None = Standard devices
N = Aluminum nitride substrate

NOTE: To order the Optional Hardware see Bulletin I27900

Outline Table

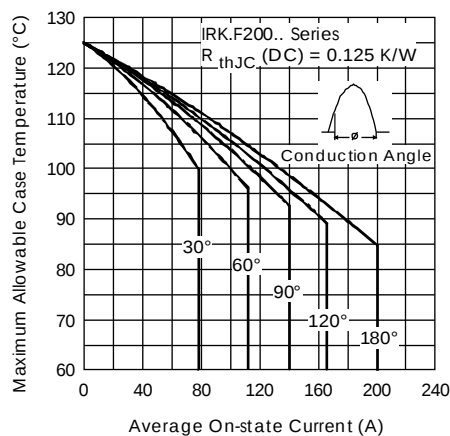
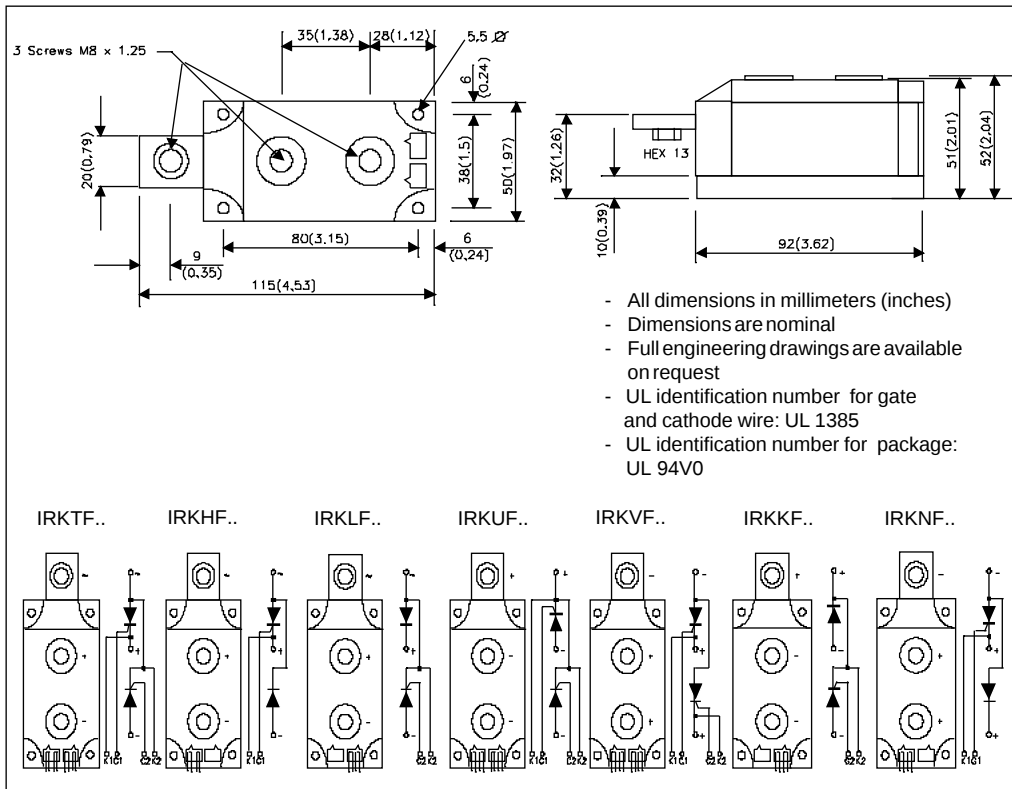


Fig. 1 - Current Ratings Characteristics

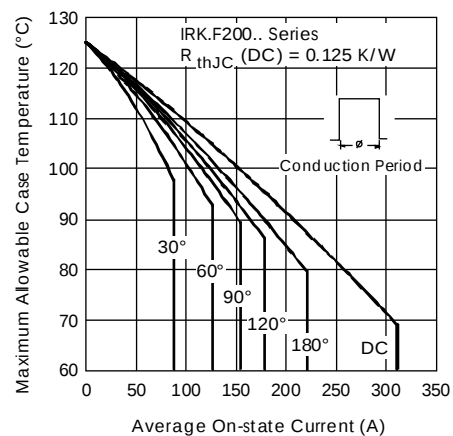


Fig. 2 - Current Ratings Characteristics

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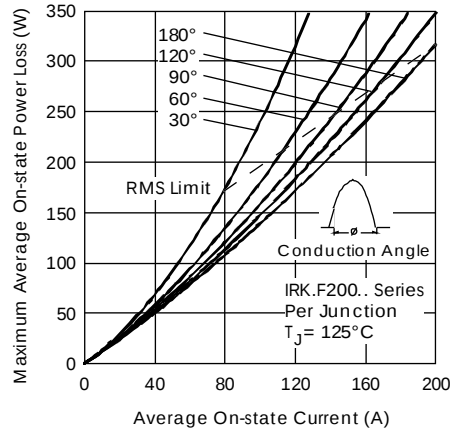


Fig. 3 - On-state Power Loss Characteristics

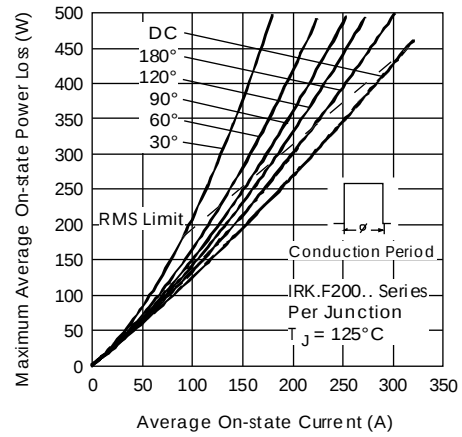


Fig. 4 - On-state Power Loss Characteristics

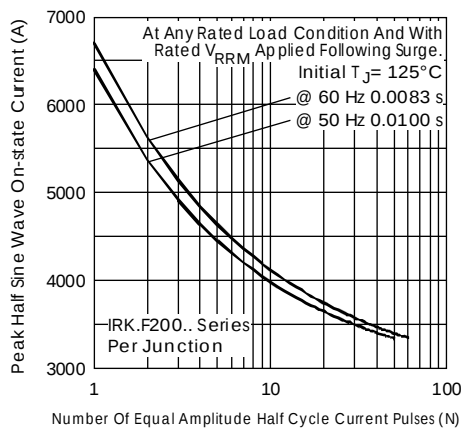


Fig. 5 - Maximum Non-Repetitive Surge Current

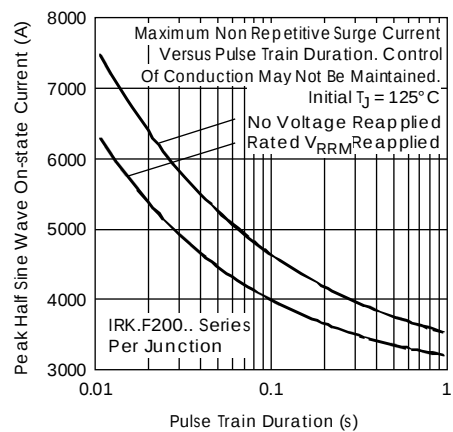


Fig. 6 - Maximum Non-Repetitive Surge Current

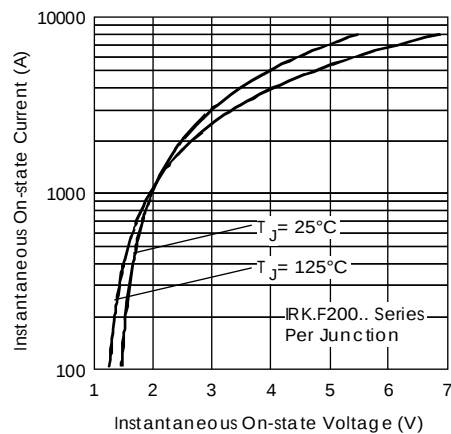


Fig. 7 - On-state Voltage Drop Characteristics

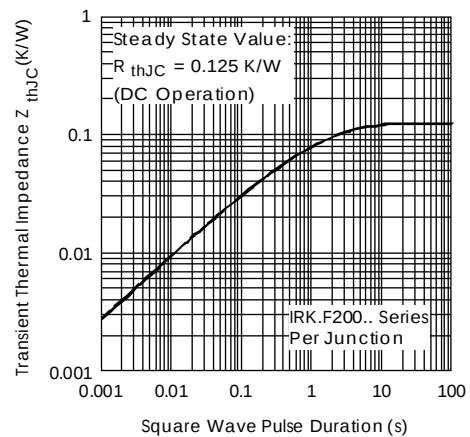


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

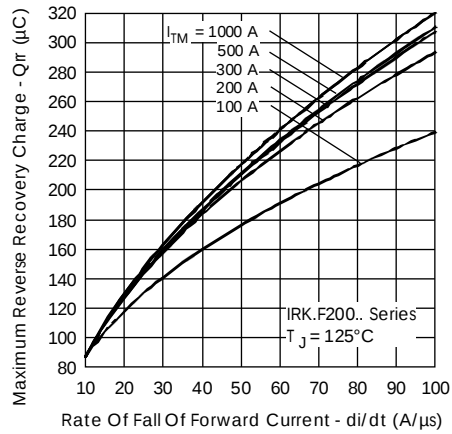


Fig. 9 - Reverse Recovery Charge Characteristics

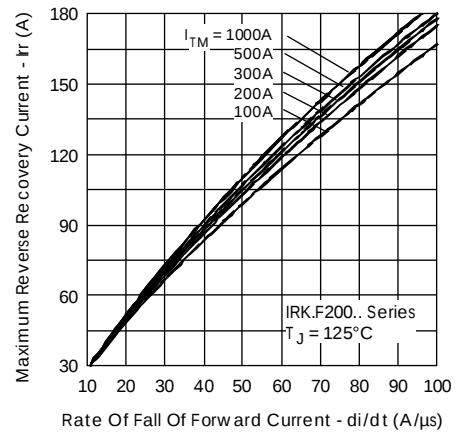


Fig. 10 - Reverse Recovery Current Characteristics

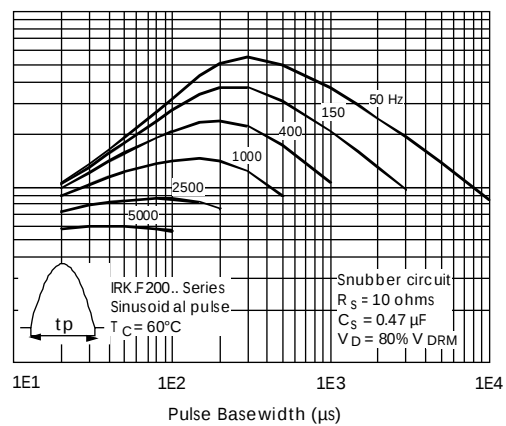
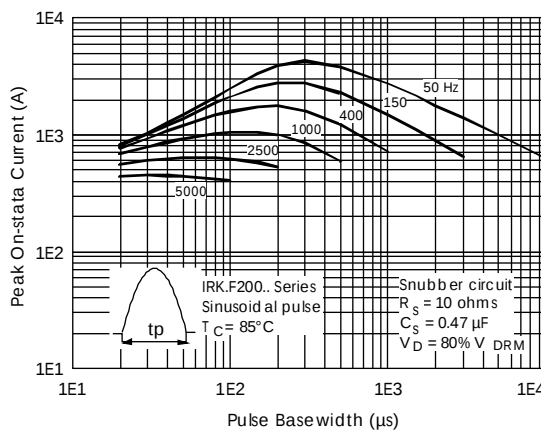


Fig. 11 - Frequency Characteristics

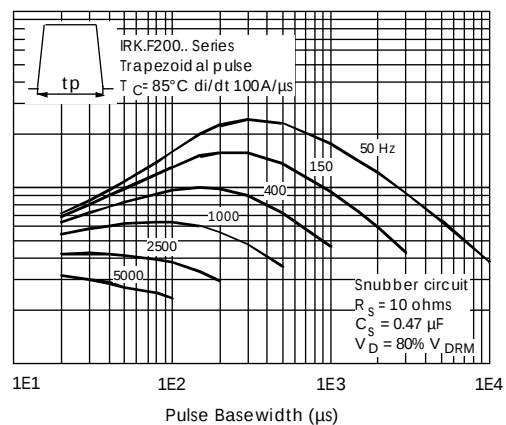
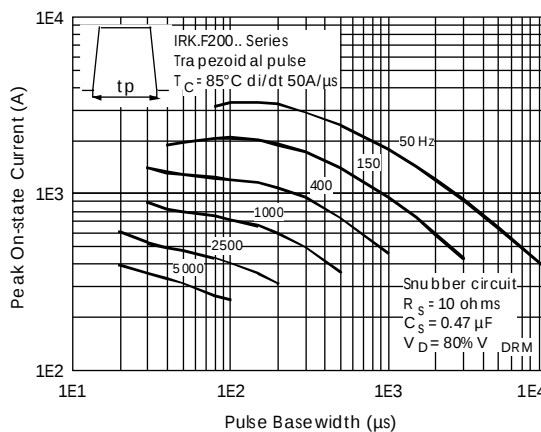


Fig. 12 - Frequency Characteristics

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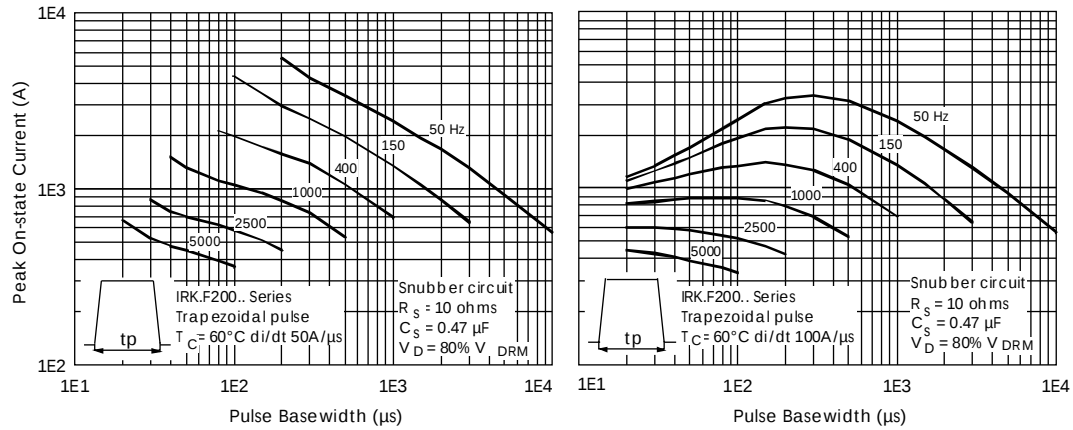


Fig. 13 - Frequency Characteristics

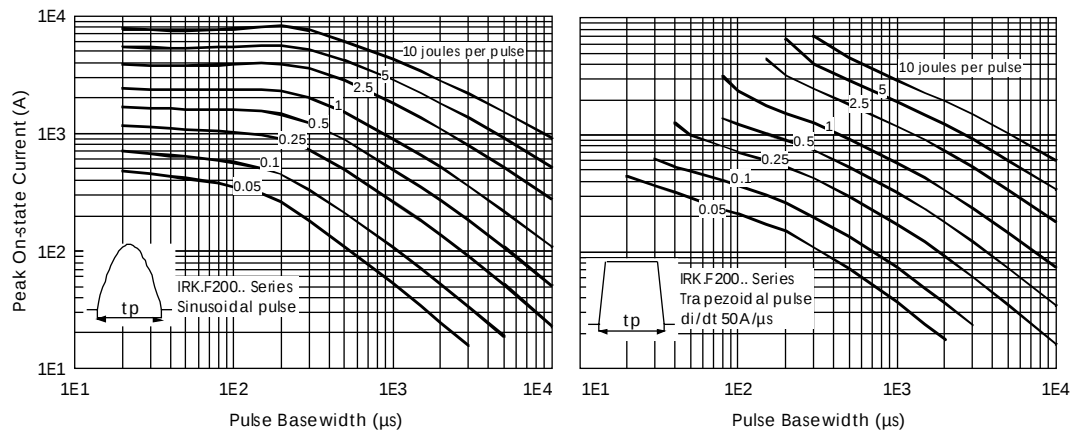


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

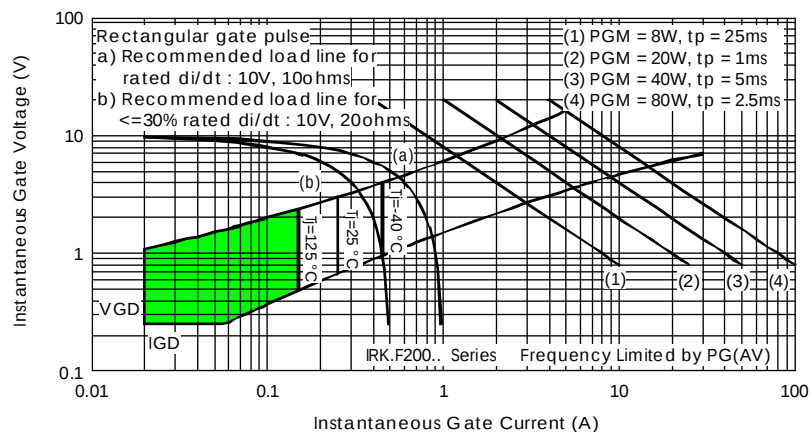


Fig. 15 - Gate Characteristics