Bulletin I27099 rev. C 03/01

International
IOR Rectifier

IRK.F200.. SERIES

FAST THYRISTOR/ DIODE and THYRISTOR/ THYRISTOR

MAGN-A-pak™ Power Modules

200 A

Features

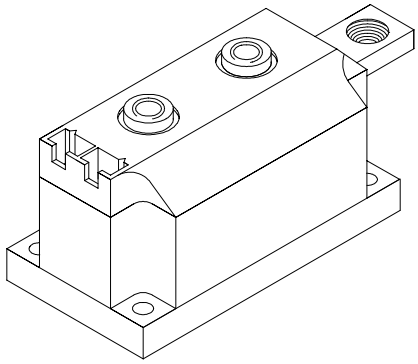
- Fast turn-off thyristor
- Fast recovery diode
- High surge capability
- Electrically isolated baseplate
- 3000 V_{RMS} isolating voltage
- Industrial standard package
- UL E78996 approved

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^2s
	@60Hz	265	KA^2s
$I^2\sqrt{t}$		2900	$KA^2\sqrt{s}$
t_q		20 and 25	µs
t_{rr}		2	µs
V_{DRM}/V_{RRM}		up to 1200	V
T_J	range	-40 to 125	°C

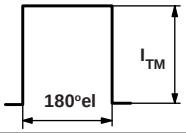
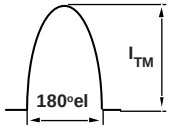
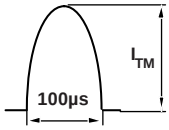


ELECTRICAL SPECIFICATIONS

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°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	200	A	180° conduction, half sine wave		
	@ Case temperature	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 reapplied	Sinusoidal half wave, Initial T_J = 125°C
		8000		t = 8.3ms		
		6400		t = 10ms	100% V_{RRM} reapplied	
		6700		t = 8.3ms		
I^2t	Maximum I^2t for fusing	290	KA^2s	t = 10ms	No voltage reapplied	
		265		t = 8.3ms		
		205		t = 10ms	100% V_{RRM} reapplied	
		187		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	2900	$KA^2\sqrt{s}$	t = 0 to 10ms, no voltage reapplied		
$V_{T(TO)1}$	Low level value of threshold voltage	1.18	V	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J = T_J max.		
$V_{T(TO)2}$	High level value of threshold voltage	1.25		(I > π x $I_{T(AV)}$), T_J = T_J max.		
r_{t1}	Low level value of on-state slope resistance	0.74	mW	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J = T_J max.		
r_{t2}	High level value of on-state slope resistance	0.70		(I > π x $I_{T(AV)}$), 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, Ra = 6Ω, Ig = 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	µs	

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} I_{DRM}	Maximum peak reverse and off-state leakage current	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, $t_p \leq$ 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	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 recommendd, busbars should be used and restrained during tightening. Threads must be lubricated with a compound
		busbar to MAP	4 - 6 (35 - 53)	(lb*in)	
wt	Approximate weight		500 (17.8)	g (oz)	

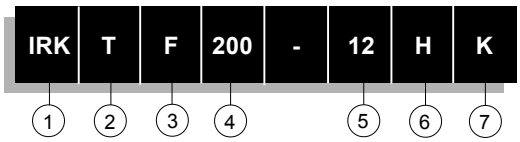
ΔR_{thJC} Conduction

(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°C
120°	0.010	0.011		
90°	0.014	0.015		
60°	0.020	0.020		
30°	0.032	0.033		

Ordering Information Table

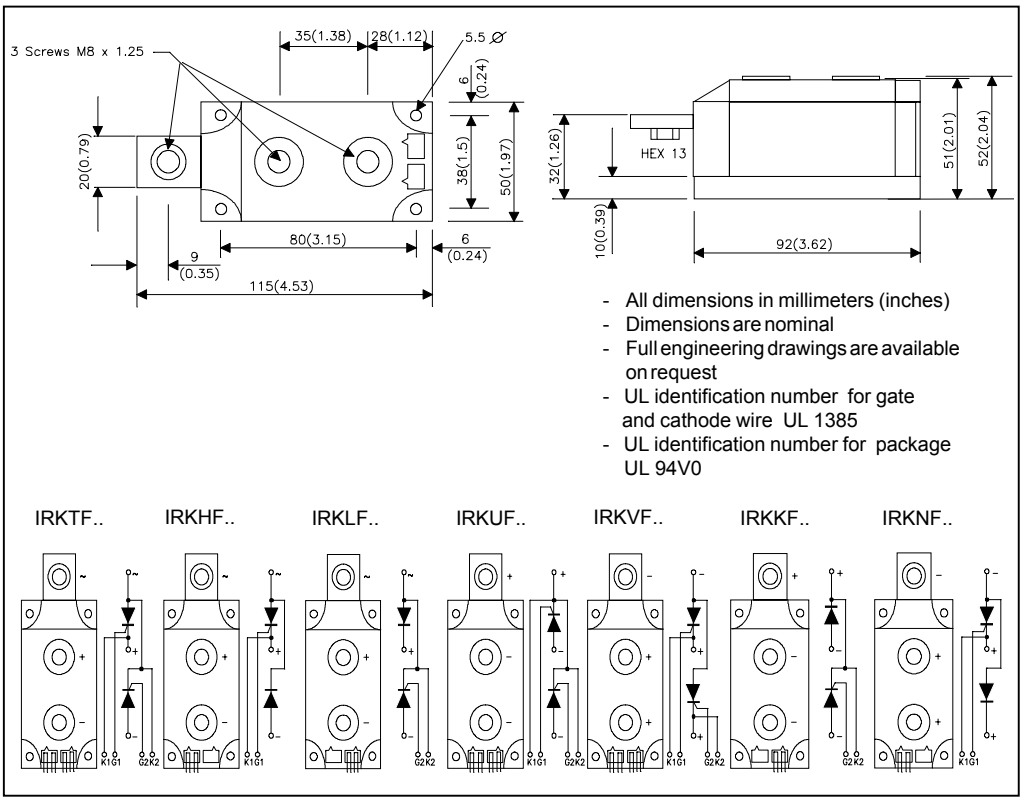
Device Code



- ■ - Module type
- **2** - Circuit configuration
- ■ - Fast SCR
- ■ - Current rating $I_{T(AV)}$ 10 rounded
- ■ - Voltage code Code 100 V_{RRM} (See Voltage Ratings Table)
- ■ - dv/dt code H ≤ 400V/µs
- ■ - t_q code K ≤ 20µs
  J ≤ 25µs

NOTE: To order the Optional Hardware see Bulletin I27900

Outline Table



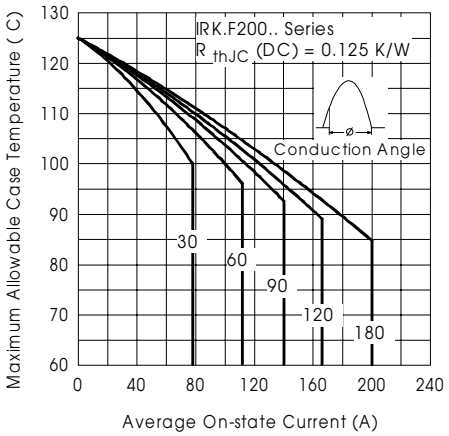


Fig. 1 - Current Ratings Characteristics

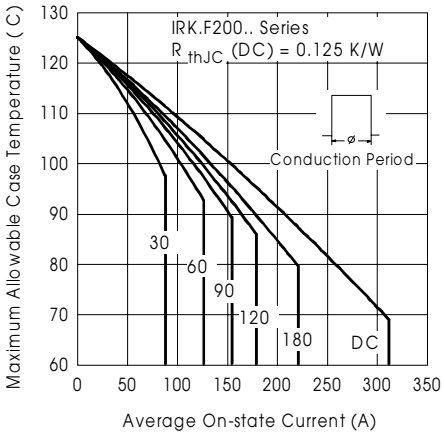


Fig. 2 - Current Ratings Characteristics

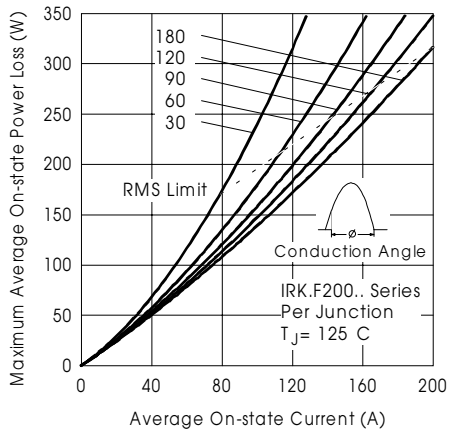


Fig. 3 - n-state Power Loss Characteristics

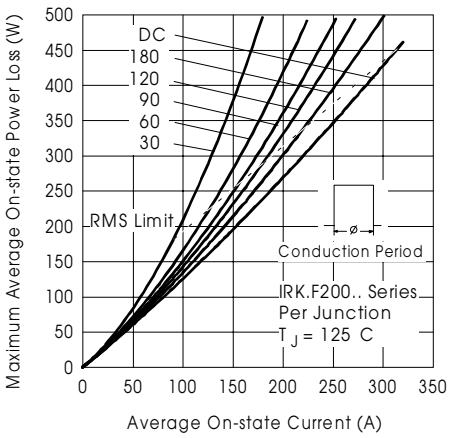


Fig. 4 - n-state Power Loss Characteristics

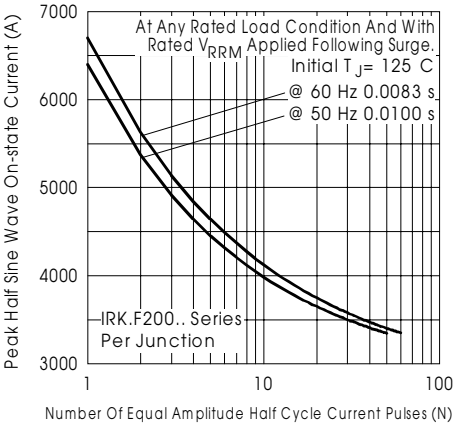


Fig. 5 - Ma imum Non-Repetitive Surge Current

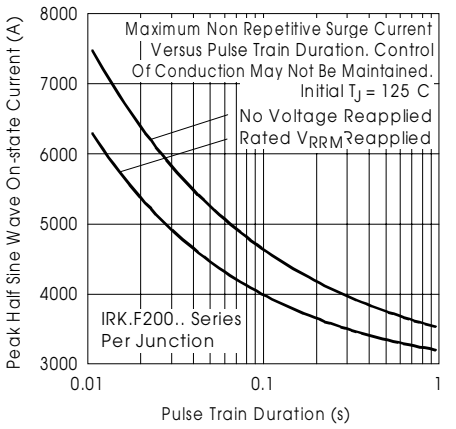


Fig. 6 - Ma imum Non-Repetitive Surge Current

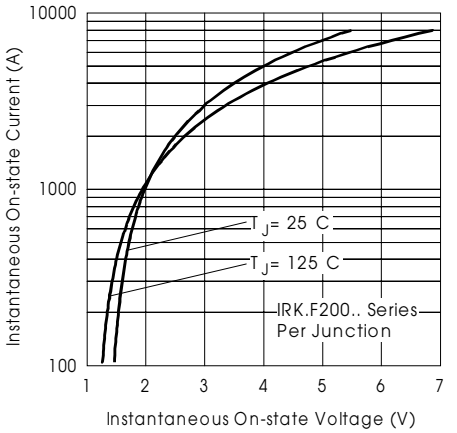


Fig. 7 - n-state Voltage Drop Characteristics

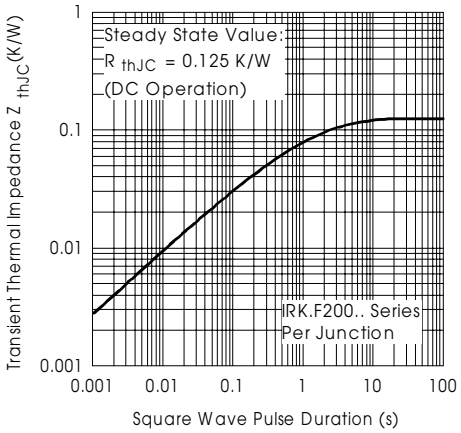


Fig. 8 - Thermal Impedance $_{thJC}$ Characteristics

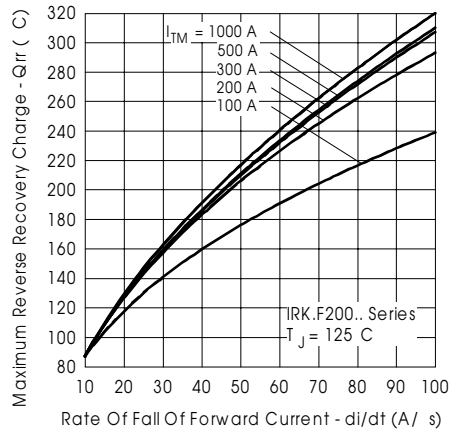


Fig. 9 - Reverse Recovery Charge Characteristics

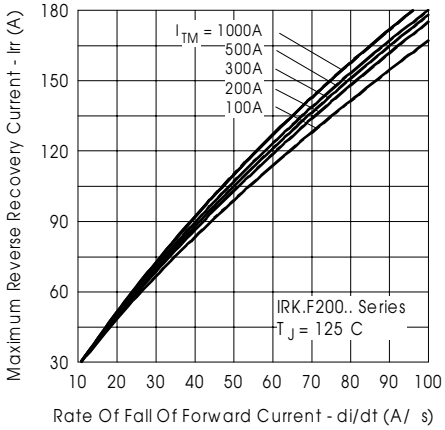


Fig. 10 - Reverse Recovery Current Characteristics

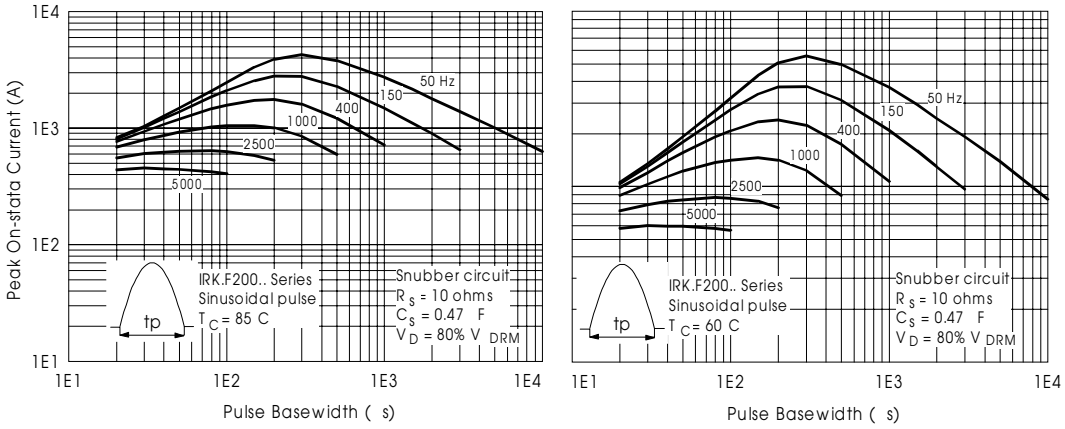


Fig. 11 - Frequency Characteristics

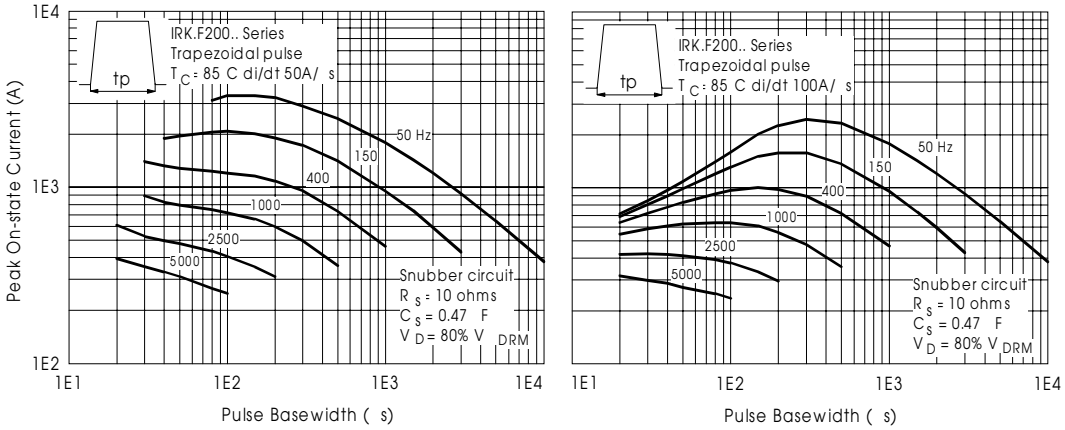


Fig. 12 - Frequency Characteristics

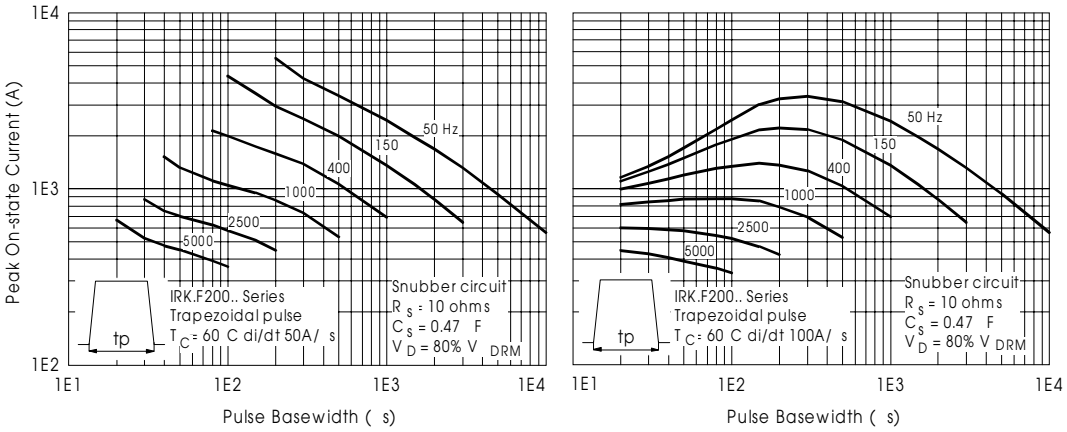


Fig. 13 - Frequency Characteristics

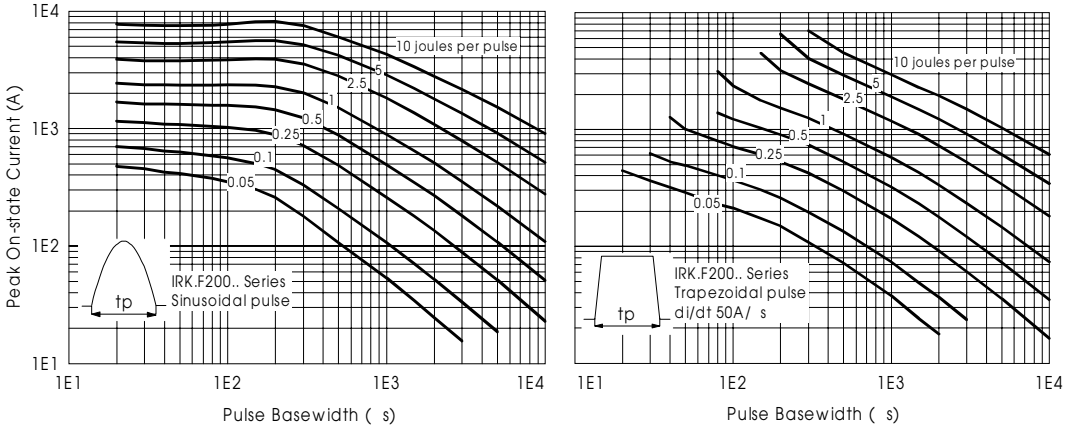


Fig. 14 - Ma imum n-state Energy Power Loss Characteristics

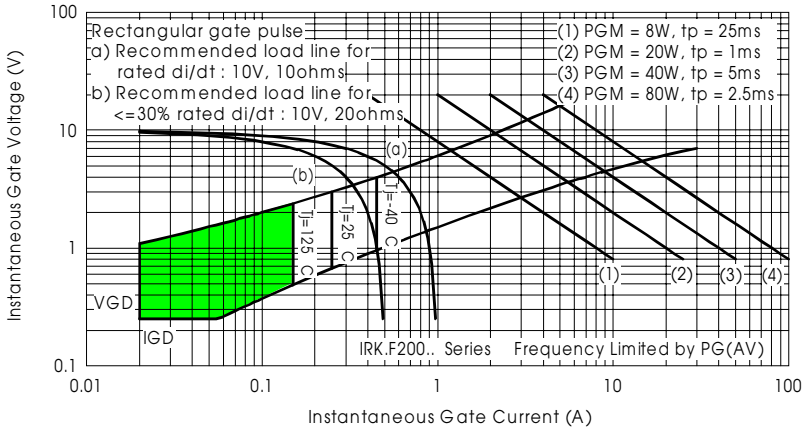


Fig. 15 - Gate Characteristics

littlediode
COMPONENTS FOR ALL

Littlediode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

LittleDiode.com

Looking forward to providing you with the best possible service.