

IRK.F82.. SERIES

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

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
- UL E78996 approved 

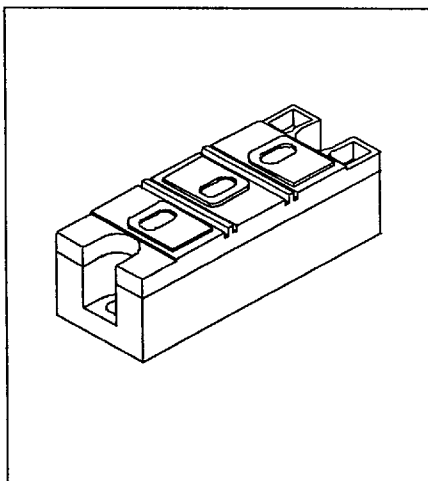
81 A

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	IRK.F82..	Units
$I_{T(AV)}$	81	A
@ T_C	90	°C
$I_{T(RMS)}$	180	A
I_{TSM}		
@ 50Hz	2200	A
@ 60Hz	2300	A
I^2t		
@ 50Hz	24.2	KA ² s
@ 60Hz	22.1	KA ² s
$I^2\sqrt{t}$	242	KA ² √s
t_q range	10 and 15	μs
t_{rr}	2	μs
V_{DRM}/V_{RRM}	upto800	V
T_J range	-40to125	°C



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Bulletin I27103 rev. A 09/97

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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.F82..	04	400	400	30
	08	800	800	

Current Carrying Capacity

Frequency f				Units			
50Hz	160	265	250	400	2240	3100	A
400Hz	200	320	290	475	1070	1550	A
2500Hz	150	240	260	400	370	550	A
5000Hz	135	215	235	355	235	355	A
10000Hz	90	160	190	275	-	-	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

Parameter	IRK.F82..	Units	Conditions		
$I_{T(AV)}$ Maximum average on-state current ● Case temperature	81	A	180° conduction, half sine wave		
	90	°C			
$I_{T(RMS)}$ Maximum RMS current	180	A	$T_C = 90^\circ\text{C}$, as AC switch		
I_{TSM} Maximum peak, one-cycle, non-repetitive surge current	2200	A	t = 10ms	No voltage	Sinusoidal half wave, Initial $T_J = 125^\circ\text{C}$
	2300		t = 8.3ms	reapplied	
	1850		t = 10ms	100% V_{RPM}	
	1950		t = 8.3ms	reapplied	
I^2t Maximum I^2t for fusing	24.2	KA ² s	t = 10ms	No voltage	Initial $T_J = 125^\circ\text{C}$
	22.1		t = 8.3ms	reapplied	
	17.1		t = 10ms	100% V_{RPM}	
	15.6		t = 8.3ms	reapplied	
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	242	KA ² /s	t = 0 to 10ms, no voltage reapplied		
$V_{T(TO1)}$ Low level value of threshold voltage	1.20	V	(16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$, $T_J = T_J \text{ max.}$		
$V_{T(TO2)}$ High level value of threshold voltage	1.24	V	(I $> \pi \times I_{T(AV)}$, $T_J = T_J \text{ max.}$		
r_{11} Low level value of on-state slope resistance	2.18	mW	(16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$, $T_J = T_J \text{ max.}$		
r_{12} High level value of on-state slope resistance	2.00		(I $> \pi \times I_{T(AV)}$, $T_J = T_J \text{ max.}$		
V_{TM} Maximum on-state voltage drop	1.96	V	$I_{pk} = 350\text{A}$, $T_J = T_J \text{ max.}$, $t_p = 10\text{ms}$ sine pulse		
I_H Maximum holding current	600	mA	$T_J = 25^\circ\text{C}$, $I_r > 30\text{ A}$		
I_L Typical latching current	1000	mA	$T_J = 25^\circ\text{C}$, $V_A = 12\text{V}$, $R_a = 6\Omega$, $I_g = 1\text{A}$		

Switching

Parameter	IRK.F82..	Units	Conditions
di/dt Maximum non-repetitive rate of rise	800	A/ μ s	Gate drive 20V, 20 Ω , $t_r \leq 1$ ms, $V_D = 80\% V_{DRM}$ $T_J = 25^\circ\text{C}$
t_{rr} Maximum recovery time	2	μ s	$I_{TM} = 350\text{A}$, $di/dt = -25\text{A}/\mu\text{s}$, $V_R = 50\text{V}$, $T_J = 25^\circ\text{C}$
t_q Maximum turn-off time	N 10	L 15 μ s	$I_{TM} = 350\text{A}$, $T_J = 125^\circ\text{C}$, $di/dt = -25\text{A}/\mu\text{s}$, $V_R = 50\text{V}$, $dv/dt = 400\text{V}/\mu\text{s}$ linear to $80\% V_{DRM}$

Blocking

Parameter	IRK.F82..	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	1000	V/ μ s	$T_J = 125^\circ\text{C}$., exponential to $= 67\% V_{DRM}$
V_{INS} RMS isolation voltage	3000	V	50 Hz, circuit to base, $T_J = 25^\circ\text{C}$, $t = 1$ s
I_{RRM} Maximum peak reverse and off-state leakage current I_{DRM}	30	mA	$T_J = 125^\circ\text{C}$, rated V_{DRM}/V_{RRM} applied

Triggering

Parameter	IRK.F82..	Units	Conditions
P_{GM} Maximum peak gate power	40	W	$f = 50$ Hz, $d\% = 50$
$P_{G(AV)}$ Maximum peak average gate power	2	W	$T_J = 125^\circ\text{C}$, $f = 50\text{Hz}$, $d\% = 50$
I_{GM} Maximum peak positive gate current	5	A	$T_J = 125^\circ\text{C}$, $t_p \leq 5\text{ms}$
$-V_{GM}$ Maximum peak negative gate voltage	5	V	
I_{GT} Max. DC gate current required to trigger	200	mA	$T_J = 25^\circ\text{C}$, $V_{AK} = 12\text{V}$, $R_a = 6$
V_{GT} DC gate voltage required to trigger	3	V	
I_{GD} DC gate current not to trigger	20	mA	$T_J = 125^\circ\text{C}$, rated V_{DRM} applied
V_{GD} DC gate voltage not to trigger	0.25	V	

Thermal and Mechanical Specifications

Parameter	IRK.F82..	Units	Conditions
T_J Max. junction operating temperature range	-40 to 125	$^\circ\text{C}$	
T_{stg} Max. storage temperature range	-40 to 150		
R_{thJC} Max. thermal resistance, junction to case	0.25	K/W	Per junction, DC operation
R_{thCH} Max. thermal resistance, case to heatsink	0.035	K/W	Mounting surface flat and greased Per module
T Mounting torque $\pm 10\%$	IAP to heatsink	4 - 6 (35 - 53)	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
	busbar to IAP	4 - 6 (35 - 53)	
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°	0.016	0.011	K/W	$T_j = 125^\circ\text{C}$
120°	0.019	0.020		
90°	0.024	0.026		
60°	0.035	0.037		
30°	0.060	0.060		

Ordering Information Table

Device Code								
IRK	T	F	8	2	-	08	H	L 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	- 1 = option with spacers and longer terminal screws 2 = option with standard terminal screws							
6	- Voltage code: Code $\times 100 = V_{RRM}$ (See Voltage Ratings Table)							
7	- dv/dt code: $H \leq 400\text{V}/\mu\text{s}$							
8	- t_q code: $N \leq 10\mu\text{s}$ $L \leq 15\mu\text{s}$							
9	- None = Standard devices N = Aluminum nitride substrate							

NOTE: To order the Optional Hardware see Bulletin I27900

Outline Table

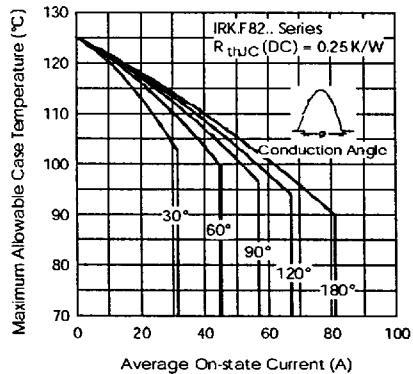
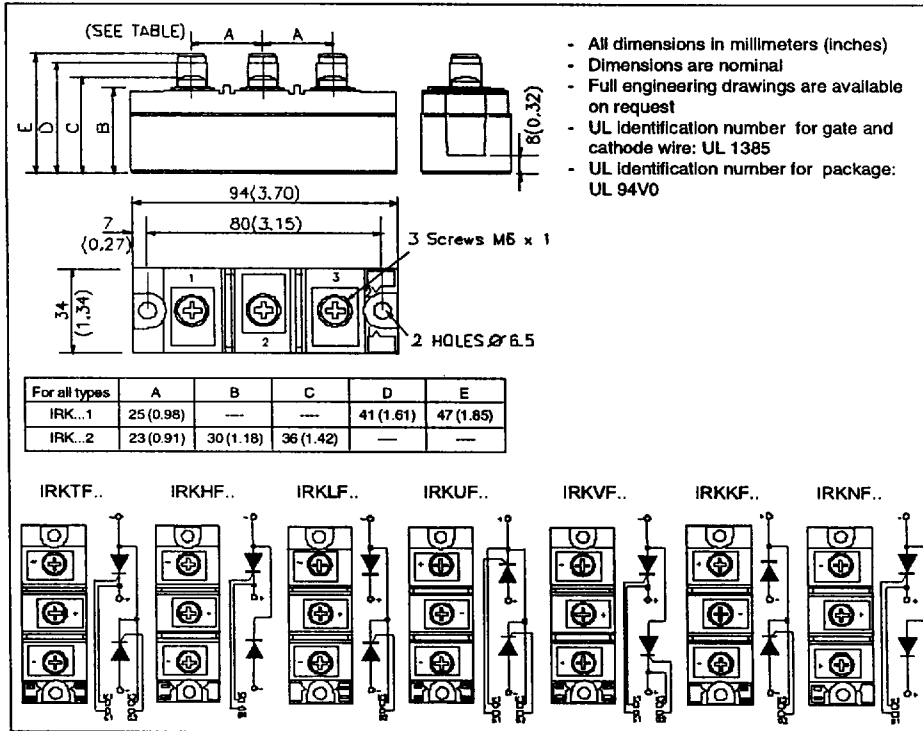


Fig. 1 - Current Ratings Characteristics

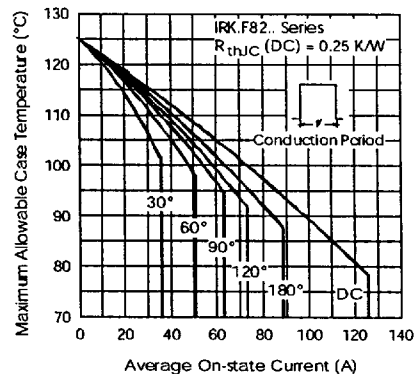


Fig. 2 - Current Ratings Characteristics

IRK.F82.. Series

Bulletin I27103 rev. A 09/97

International
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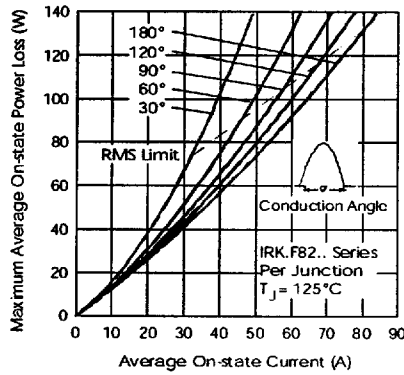


Fig. 3 - On-state Power Loss Characteristics

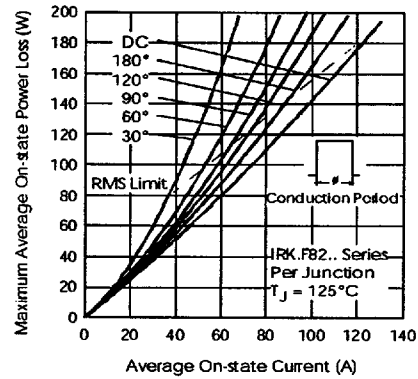


Fig. 4 - On-state Power Loss Characteristics

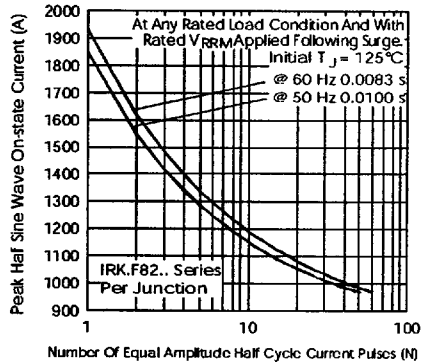


Fig. 5 - Maximum Non-Repetitive Surge Current

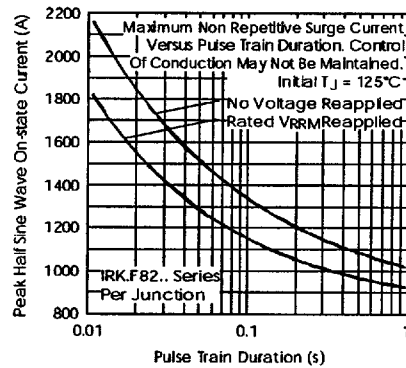


Fig. 6 - Maximum Non-Repetitive Surge Current

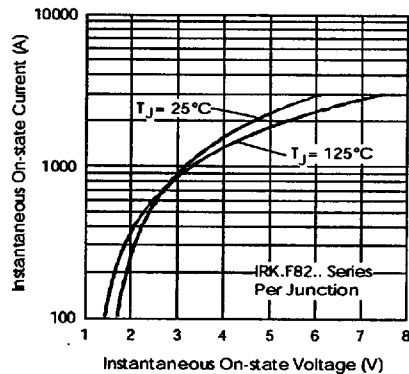


Fig. 7 - On-state Voltage Drop Characteristics

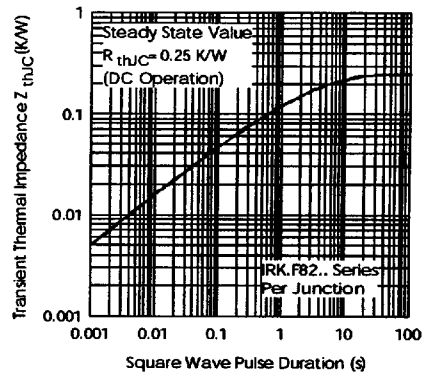


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

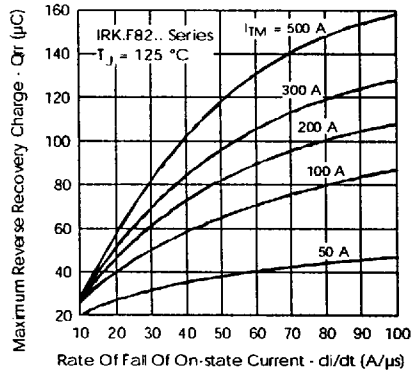


Fig. 9 - Reverse Recovery Charge Characteristic

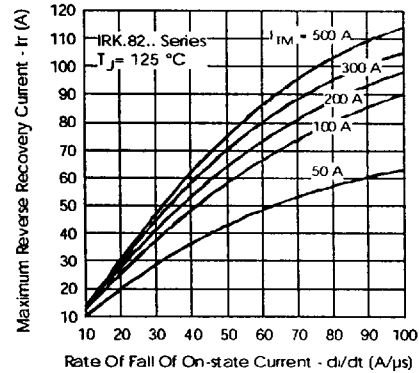


Fig. 10 - Reverse Recovery Current Characteristic

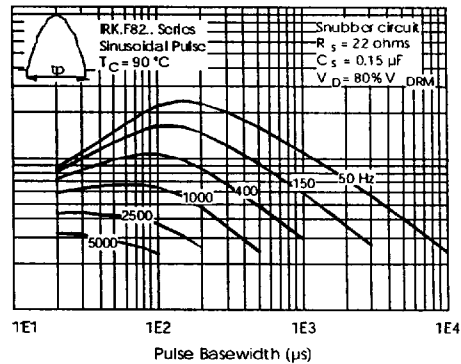
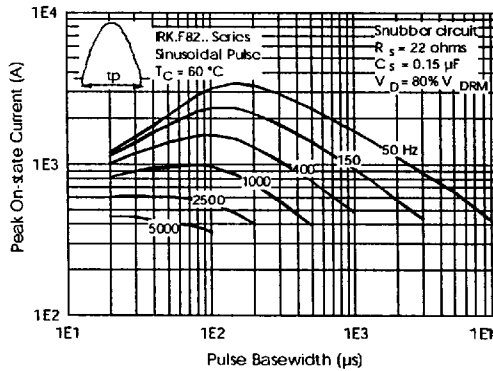


Fig. 11 - Frequency Characteristics

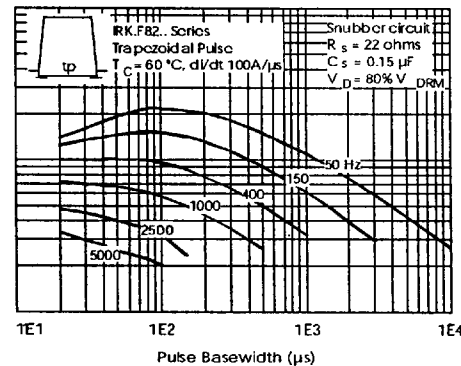
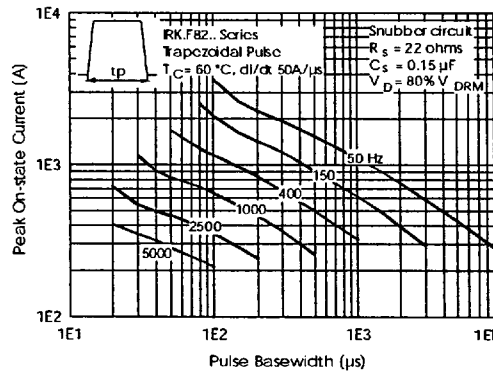


Fig. 12 - Frequency Characteristics

IRK.F82.. Series

Bulletin I27103 rev. A 09/97

International
IR Rectifier

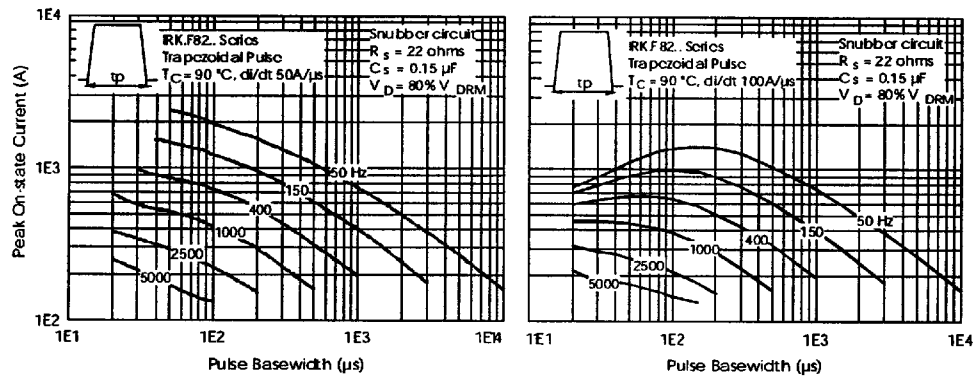


Fig. 13 - Frequency Characteristics

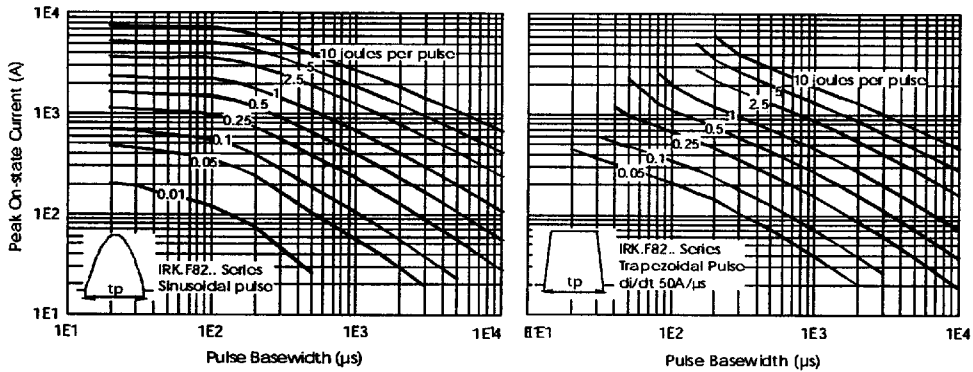


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

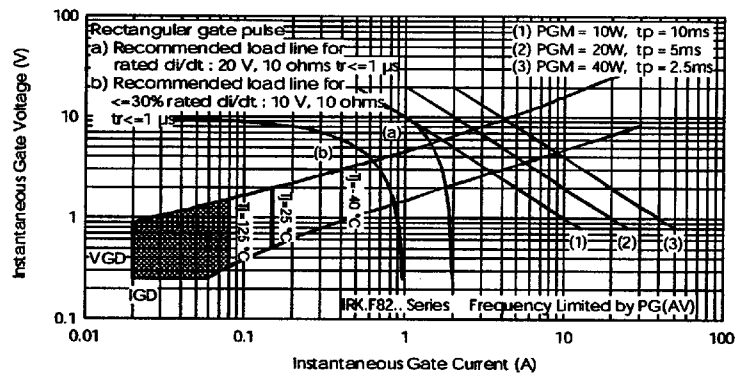


Fig. 15 - Gate Characteristics