

THYRISTOR / DIODE and THYRISTOR / THYRISTOR

SUPER MAGN-A-pak™ Power Modules

Features

- High current capability
- 3000 V_{RMS} isolating voltage with non-toxic substrate
- High surge capability
- Industrial standard package
- UL E78996 approved 

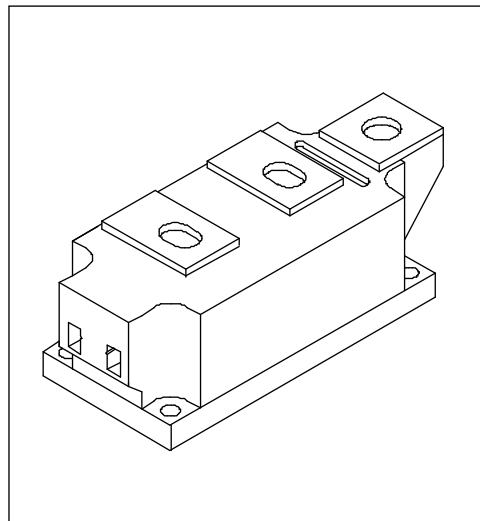
500 A

Typical Applications

- Motor starters
- DC motor controls - AC motor controls
- Uninterruptable power supplies

Major Ratings and Characteristics

Parameters	IRK.500..	Units
$I_{T(AV)}$ or $I_{F(AV)}$	500	A
@ T_C	82	°C
$I_{T(RMS)}$	785	A
@ T_C	82	°C
I_{TSM} or I_{FSM} @ 50Hz	17.8	KA
@ 60Hz	18.7	KA
I^2t @ 50Hz	1591	KA ² s
@ 60Hz	1452	KA ² s
$I^2\sqrt{t}$	15910	KA ² √s
V_{DRM}/V_{RRM} range	800 to 1600	V
T_{STG} range	-40 to 150	°C
T_J range	-40 to 130	°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. @ $T_J = T_J$ max. mA
IRK.500..	08	800	900	100
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

On-state Conduction

Parameter	IRK.500..	Units	Conditions
$I_{T(AV)}$ Maximum average on-state current	500	A	180° conduction, half sine wave
$I_{F(AV)}$ @ Case temperature	82	°C	
$I_{T(RMS)}$ Maximum RMS on-state current	785	A	180° conduction, half sine wave @ $T_C = 82^\circ\text{C}$
I_{TSM} Maximum peak, one-cycle, non-repetitive surge current	17.8	KA	t = 10ms No voltage
	18.7		t = 8.3ms reappplied
	15.0		t = 10ms 100% V_{RRM}
	15.7		t = 8.3ms reappplied
I^2t Maximum I^2t for fusing	1591	KA²s	t = 10ms No voltage
	1452		t = 8.3ms reappplied
	1125		t = 10ms 100% V_{RRM}
	1027		t = 8.3ms reappplied
I^2/t Maximum I^2/t for fusing	15910	KA²/s	t = 0.1 to 10ms, no voltage reappplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.85	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.
$V_{T(TO)2}$ High level value of threshold voltage	0.93		$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max.
r_{t1} Low level value of on-state slope resistance	0.36	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.
r_{t2} High level value of on-state slope resistance	0.32		$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max.
V_{TM} Maximum on-state or forward voltage drop	1.50	V	$I_{pk} = 1500\text{A}$, $T_J = 25^\circ\text{C}$, $t_p = 10\text{ms}$ sine pulse
I_H Maximum holding current	500	mA	$T_J = 25^\circ\text{C}$, anode supply 12V resistive load
I_L Typical latching current	1000		

Switching

Parameter	IRK.500..	Units	Conditions
di/dt Maximum rate of rise of turned-on current	1000	A/μs	$T_J = T_J$ max., $I_{TM} = 400\text{A}$, V_{DRM} applied
t_d Typical delay time	2.0	μs	Gate current 1A, $di_g/dt = 1\text{A}/\mu\text{s}$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ\text{C}$
t_q Typical turn-off time	200	μs	$I_{TM} = 750\text{A}$, $T_J = T_J$ max, $di/dt = -60\text{A}/\mu\text{s}$, $V_R = 50\text{V}$, $dv/dt = 20\text{V}/\mu\text{s}$, Gate 0 V 100Ω

Blocking

Parameter	IRK.500..	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	1000	V/ μ s	$T_J = 130^\circ\text{C}$., linear to $V_D = 80\% V_{DRM}$
V_{INS} RMS isolation voltage	3000	V	$t = 1 \text{ s}$
I_{RRM} Maximum peak reverse and off-state leakage current I_{DRM}	100	mA	$T_J = T_J \text{ max.}$, rated V_{DRM}/V_{RRM} applied

Triggering

Parameter	IRK.500..	Units	Conditions
P_{GM} Maximum peak gate power	10	W	$T_J = T_J \text{ max.}$, $t_p \leq 5 \text{ ms}$
$P_{G(AV)}$ Maximum peak average gate power	2.0	W	$T_J = T_J \text{ max.}$, $f = 50 \text{ Hz}$, $d\% = 50$
$+I_{GM}$ Maximum peak positive gate current	3.0	A	$T_J = T_J \text{ max.}$, $t_p \leq 5 \text{ ms}$
$+V_{GM}$ Maximum peak positive gate voltage	20	V	
$-V_{GM}$ Maximum peak negative gate voltage	5.0	V	
I_{GT} Max. DC gate current required to trigger	200	mA	$T_J = 25^\circ\text{C}$ $V_{ak} 12 \text{ V}$
V_{GT} DC gate voltage required to trigger	3.0	V	$T_J = 25^\circ\text{C}$ $V_{ak} 12 \text{ V}$
I_{GD} DC gate current not to trigger	10	mA	$T_J = T_J \text{ max.}$
V_{GD} DC gate voltage not to trigger	0.25	V	

Thermal and Mechanical Specifications

Parameter	IRK.500..	Units	Conditions
T_J Max. junction operating temperature range	- 40 to 130	°C	
T_{stg} Max. storage temperature range	- 40 to 150		
R_{thJC} Max. thermal resistance, junction to case	0.065	K/W	Per junction, DC operation
R_{thC-hs} Max. thermal resistance, case to heatsink	0.02	K/W	
T Mounting torque $\pm 10\%$ SMAP to heatsink busbar to SMAP	6 - 8	Nm	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound
	12 - 15		
wt Approximate weight	1500	g	
Case style	SUPER MAGN-A-pak		See outline table

IRK.500.. Series

Bulletin I27401 rev. A 09/97

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	$T_J = T_{J \text{ max.}}$
120°	0.011	0.011		
90°	0.014	0.015		
60°	0.021	0.022		
30°	0.037	0.038		

Ordering Information Table

Device Code

IRK	T	500	-	16
①	②	③		④

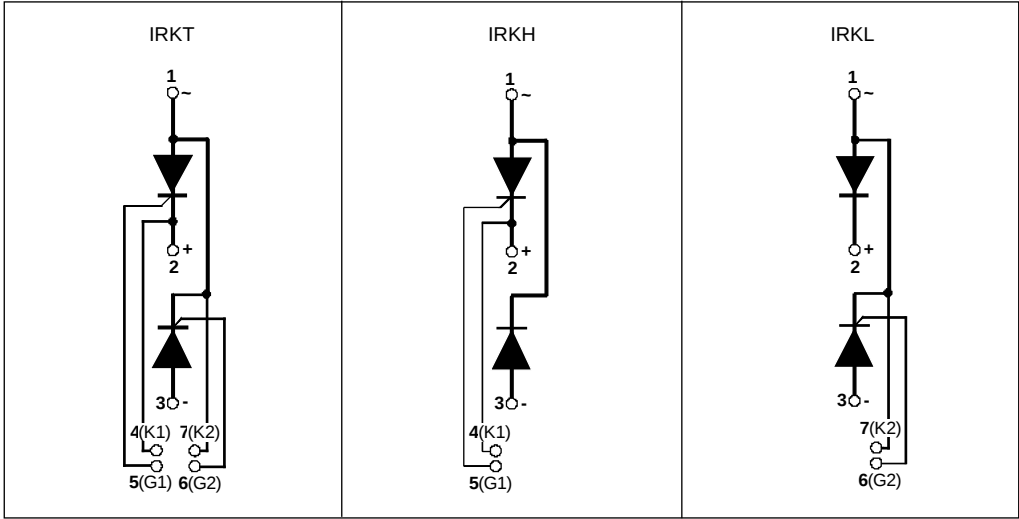
1 - Module type

2 - Circuit configuration (See Circuit Configurations Table)

3 - Current rating

4 - Voltage code: Code x 100 = V_{RRM} (See Voltage Ratings Table)

Circuit Configurations Table



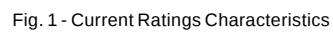
NOTE: To order the Optional Hardware see Bulletin I27900

All dimensions in millimeters (inches)

Technical drawing of a mechanical part showing three views: front, top, and side. The front view shows a rectangular block with two M10 holes, a central slot, and a base. The top view shows the layout of the holes and the base. The side view shows the profile of the part. Dimensions are given in millimeters and inches.

Dimensions (mm) and (inches):

- Overall width: 149.0 (5.87)
- Overall height: 52 (2.05)
- Top view dimensions:
 - Left hole to left edge: 31.0 (1.22)
 - Distance between holes: 50.0 (1.97)
 - Right hole to right edge: 44.0 (1.73)
 - Left hole to center: 26.0 (0.98)
 - Right hole to center: 26.0 (0.98)
 - Center to right edge: 112.0 (4.41)
 - Left hole to right edge: 124.0 (4.88)
 - Left hole to left edge: 1.0 (0.039)
- Side view dimensions:
 - Overall width: 36.4 (1.44)
 - Overall height: 20.1 (0.78)
 - Fast-on tabs: 2.8 x 0.8 (0.11 x 0.03)
 - Distance between tabs: 4.5 (0.20)



IRK.500.. Series

Bulletin I27401 rev. A 09/97

International
IR Rectifier

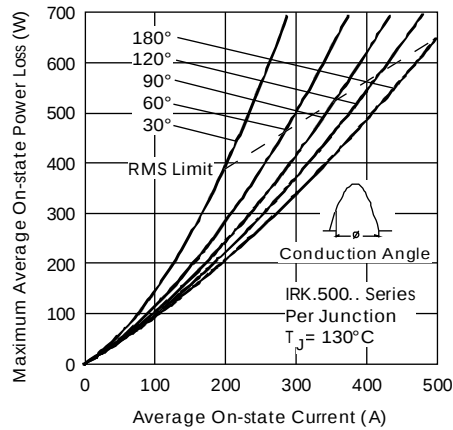


Fig. 3 - On-state Power Loss Characteristics

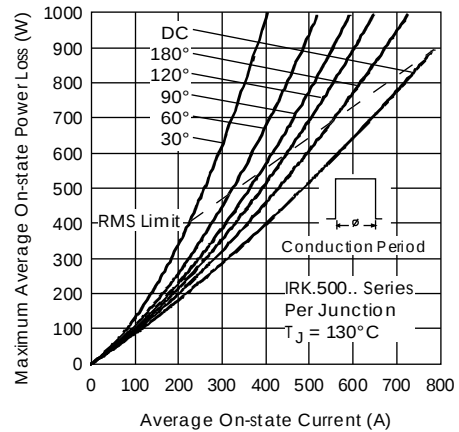


Fig. 4 - On-state Power Loss Characteristics

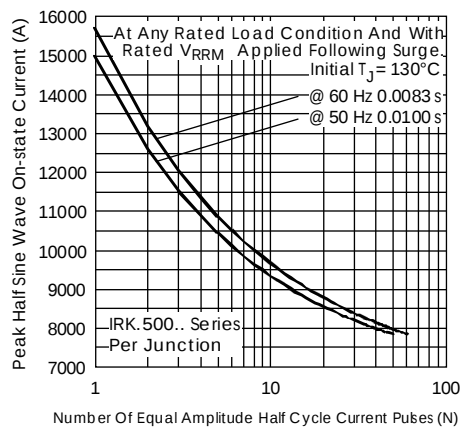


Fig. 5 - Maximum Non-Repetitive Surge Current

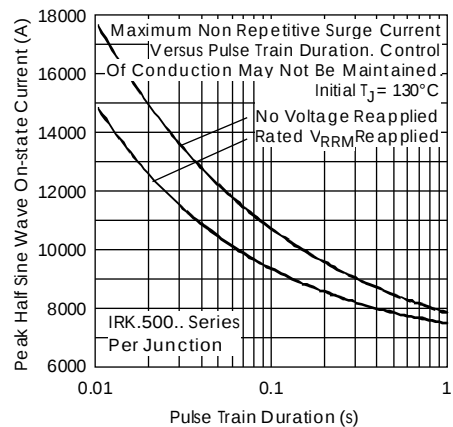


Fig. 6 - Maximum Non-Repetitive Surge Current

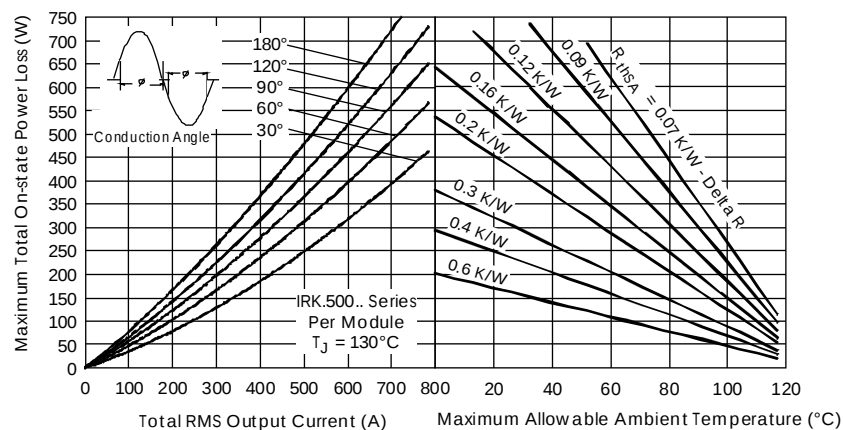


Fig. 7 - On-state Power Loss Characteristics

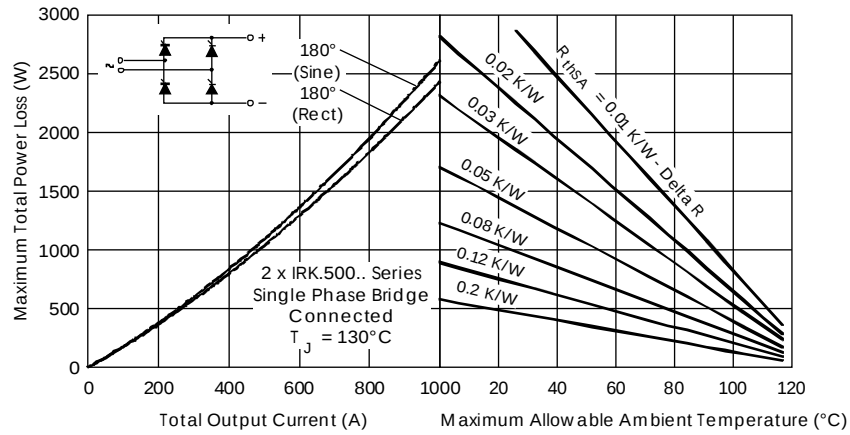


Fig. 8 - On-state Power Loss Characteristics

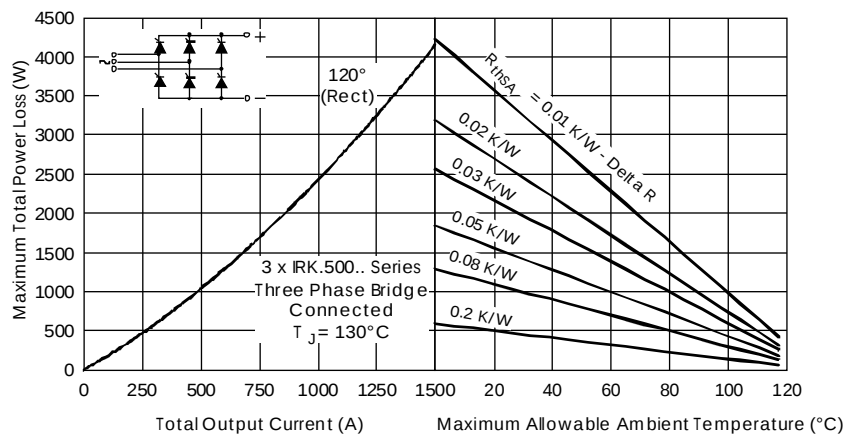


Fig. 9 - On-state Power Loss Characteristics

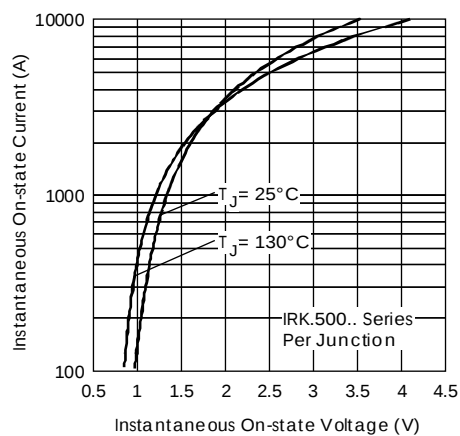


Fig. 10 - On-state Voltage Drop Characteristics

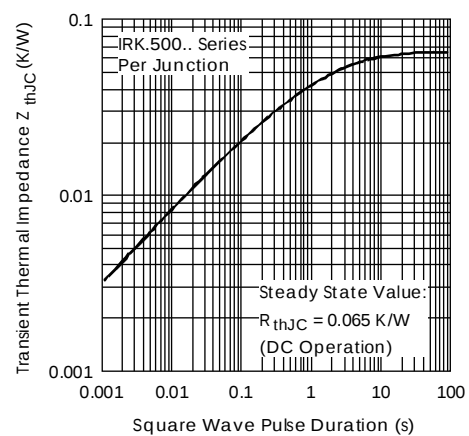


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

IRK.500.. Series

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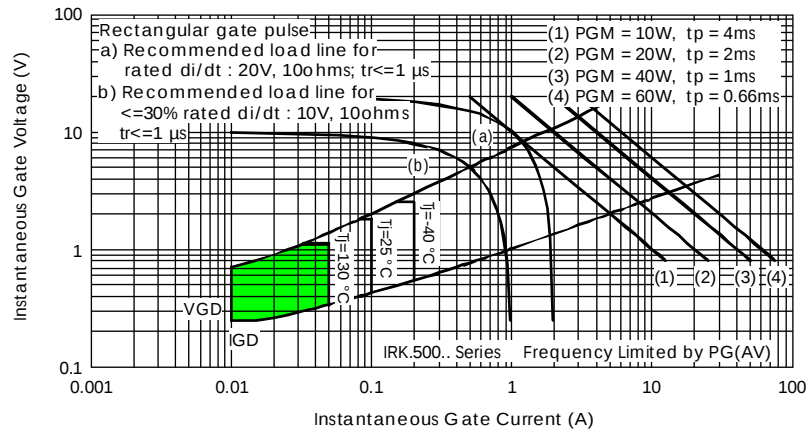


Fig. 12 - Gate Characteristics