



# IRK.500.. SERIES

**THYRISTOR / DIODE and  
THYRISTOR / THYRISTOR**

**SUPER MAGN-A-PAK™ Power Modules**

500 A

## Features

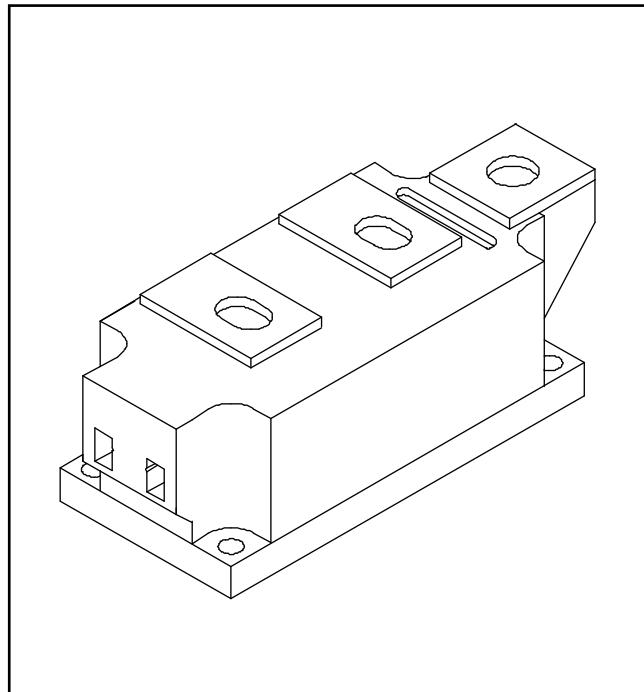
- High current capability
- 3000 V<sub>RMS</sub> isolating voltage with non-toxic substrate
- High surge capability
- Industrial standard package
- UL recognition pending

## Typical Applications

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

## Major Ratings and Characteristics

Parameters	IRK.500..	Units
I <sub>T(AV)</sub> or I <sub>F(AV)</sub> @ T <sub>C</sub>	500	A
I <sub>T(RMS)</sub> @ T <sub>C</sub>	900	A
I <sub>TSM</sub> or I <sub>FSM</sub> @ 50Hz @ 60Hz	17.8 18.7	KA
I <sup>2</sup> t @ 50Hz @ 60Hz	1591 1452	KA <sup>2</sup> s
I <sup>2</sup> √t	15910	KA <sup>2</sup> √s
V <sub>DRM</sub> /V <sub>RRM</sub> range	800 to 1600	V
T <sub>STG</sub> range	-40 to 150	°C
T <sub>J</sub> range	-40 to 130	°C



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## ELECTRICAL SPECIFICATIONS

### Voltage Ratings

Type number	Voltage Code	$V_{RRM}$ , maximum repetitive peak reverse voltage V	$V_{RSM}$ , maximum non-repetitive peak rev. voltage V	$I_{RRM}$ 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								
$I_{T(AV)}$ @ Case temperature	500	A	180° conduction, half sine wave	$t = 10ms$	No voltage reapplied						
	82	°C									
$I_{T(RMS)}$	900	A	180° conduction, half sine wave @ $T_C = 82^\circ C$								
$I_{TSM}$ $I_{FSM}$	17.8	KA	$t = 10ms$	100% $V_{RRM}$	Sinusoidal half wave, Initial $T_J = T_J$ max.						
	18.7										
	15.0		$t = 10ms$	reapplied							
	15.7		$t = 8.3ms$								
$I^2t$	1591	KA <sup>2</sup> s	$t = 10ms$	No voltage reapplied							
	1452		$t = 8.3ms$								
	1125		$t = 10ms$	100% $V_{RRM}$							
	1027		$t = 8.3ms$								
$I^2\sqrt{t}$	15910	KA <sup>2</sup> \sqrt{s}	t = 0.1 to 10ms, no voltage reapplied								
$V_{T(TO)1}$	0.85	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ max.								
$V_{T(TO)2}$	0.93		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ max.								
$r_{t1}$	0.36	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ max.								
$r_{t2}$	0.32		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ max.								
$V_{TM}$ $V_{FM}$	1.50	V	$I_{pk} = 1500A$ , $T_J = 25^\circ C$ , $t_p = 10ms$ sine pulse								
$I_H$	500	mA	$T_J = 25^\circ C$ , anode supply 12V resistive load								
$I_L$	1000										

### Switching

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

## Blocking

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

## Triggering

Parameter	IRK.500..	Units	Conditions
$P_{\text{GM}}$ Maximum peak gate power	10	W	$T_J = T_J \text{ max.}$ , $t_p \leq 5\text{ms}$
$P_{\text{G(AV)}}$ Maximum peak average gate power	2.0	W	$T_J = T_J \text{ max.}$ , $f = 50\text{Hz}$ , $d\% = 50$
+ $I_{\text{GM}}$ Maximum peak positive gate current	3.0	A	$T_J = T_J \text{ max.}$ , $t_p \leq 5\text{ms}$
+ $V_{\text{GM}}$ Maximum peak positive gate voltage	20	V	
- $V_{\text{GM}}$ Maximum peak negative gate voltage	5.0	V	
$I_{\text{GT}}$ Max. DC gate current required to trigger	200	mA	$T_J = 25^\circ\text{C}$ $V_{\text{ak}} 12\text{V}$
$V_{\text{GT}}$ DC gate voltage required to trigger	3.0	V	$T_J = 25^\circ\text{C}$ $V_{\text{ak}} 12\text{V}$
$I_{\text{GD}}$ DC gate current not to trigger	10	mA	$T_J = T_J \text{ max.}$
$V_{\text{GD}}$ 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	
$T_{\text{stg}}$ Max. storage temperature range	- 40 to 150		
$R_{\text{thJC}}$ Max. thermal resistance, junction to case	0.065	K/W	Per junction, DC operation
$R_{\text{thC-hs}}$ Max. thermal resistance, case to heatsink	0.02	K/W	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
T Mounting torque $\pm 10\%$ SMAP to heatsink busbar to SMAP	6 - 8 12 - 15		
wt Approximate weight	1500	g	
Case style	Super Magn-a-Pak		See outline table

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## $\Delta R_{thJC}$ Conduction

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

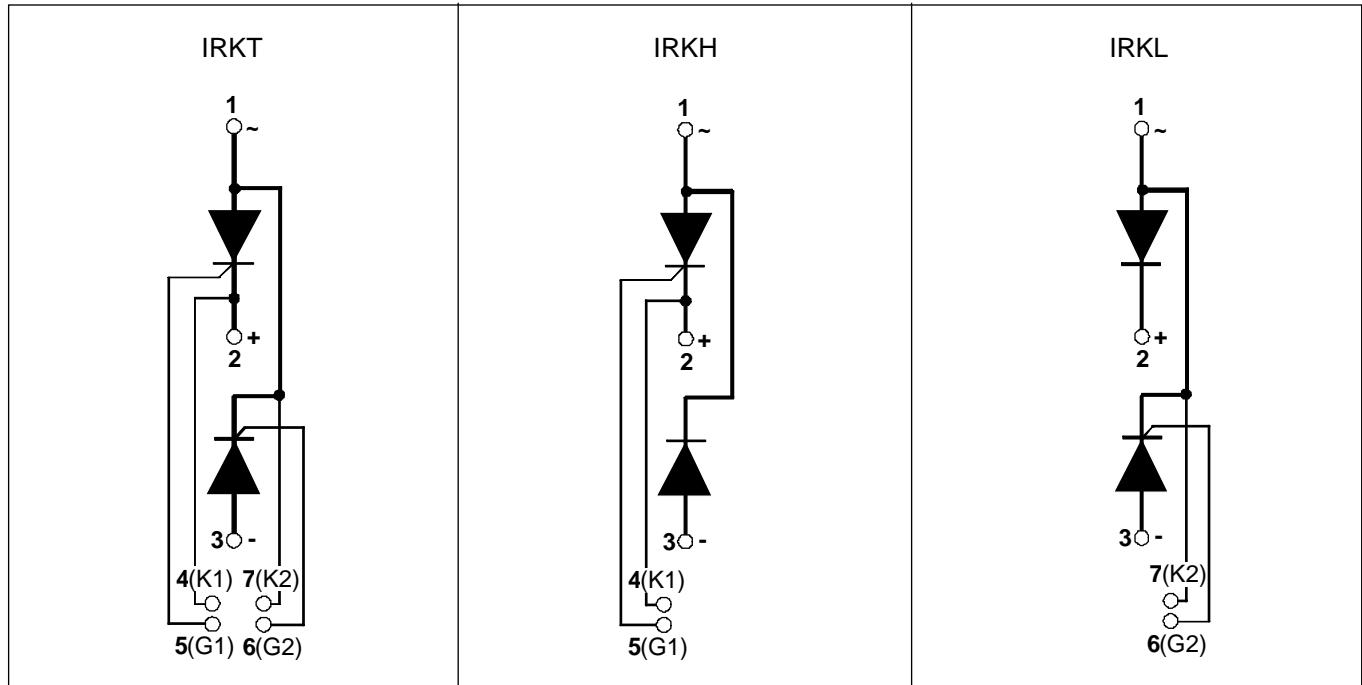
Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.009	0.006	K/W $T_J = T_{J\ max.}$	
120°	0.011	0.011		
90°	0.014	0.015		
60°	0.021	0.022		
30°	0.037	0.038		

## Ordering Information Table

Device Code				
	IRK	T	500	-
1				16
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



## Outline Table

