


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 

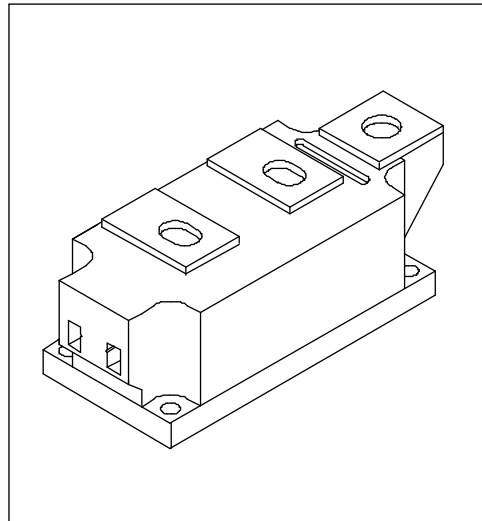
500 A

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 $I_{F(AV)}$ @ Case temperature | 500 82 | A °C | 180° conduction, half sine wave |
| $I_{T(RMS)}$ Maximum RMS on-state current | 785 | A | 180° conduction, half sine wave @ $T_C = 82^\circ\text{C}$ |
| I_{TSM} Maximum peak, one-cycle, I_{FSM} 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 | KA ² s | 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 | KA ² /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 V_{FM} 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/μs | T _J = 130°C., linear to V _D = 80% V _{DRM} |
| V _{INS} RMS isolation voltage | 3000 | V | t = 1 s |
| I _{RRM} Maximum peak reverse and off-state leakage current I _{DRM} | 100 | mA | T _J = T _J 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 max., t _p ≤ 5ms |
| P _{G(AV)} Maximum peak average gate power | 2.0 | W | T _J = T _J max., f = 50Hz, d% = 50 |
| + I _{GM} Maximum peak positive gate current | 3.0 | A | T _J = T _J max., t _p ≤ 5ms |
| + 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°C V _{ak} 12V |
| V _{GT} DC gate voltage required to trigger | 3.0 | V | T _J = 25°C V _{ak} 12V |
| I _{GD} DC gate current not to trigger | 10 | mA | T _J = T _J 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 ± 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

International
IRF Rectifier

ΔR_{thJC} Conduction

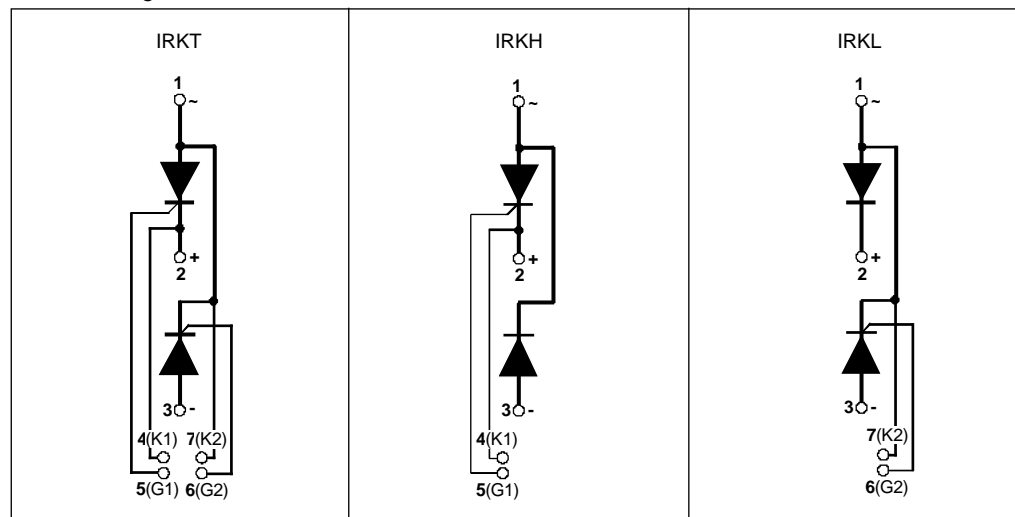
(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

| 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 | | | | |
|-------------|--|-----|---|----|
| 1 | 2 | 3 | 4 | |
| IRK | T | 500 | - | 16 |
| 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

Outline Table

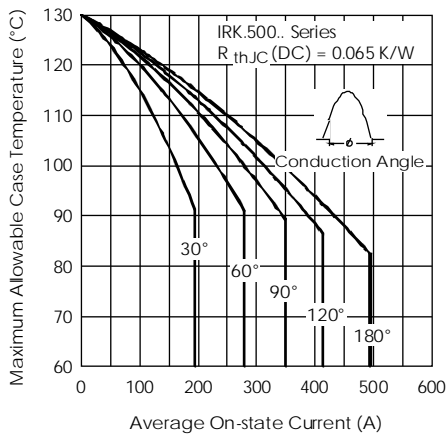
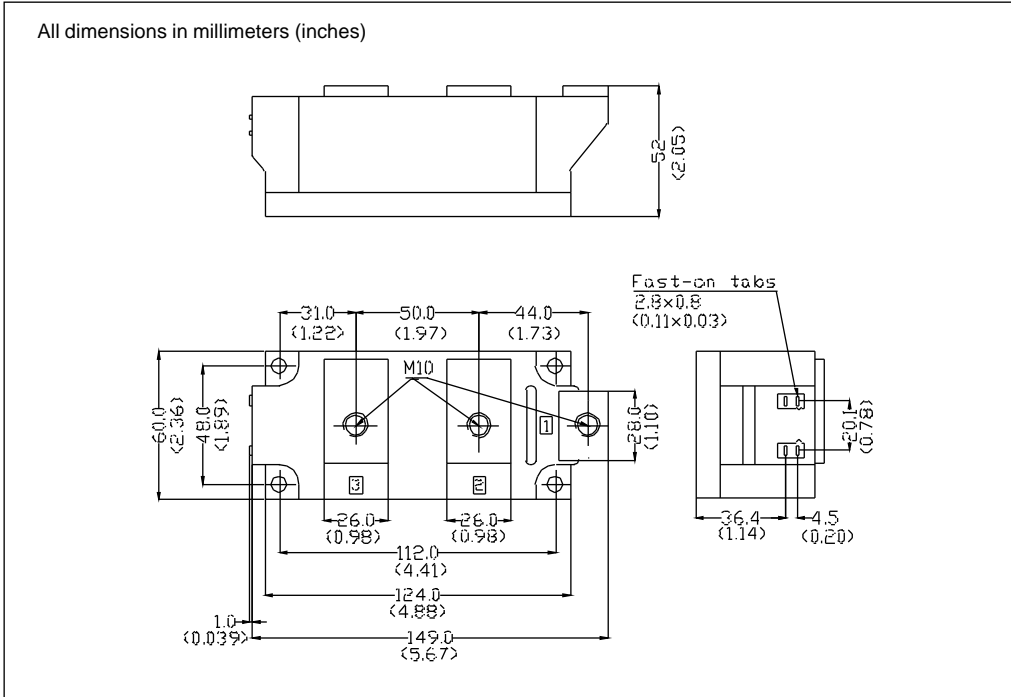


Fig. 1 - Current Ratings Characteristics

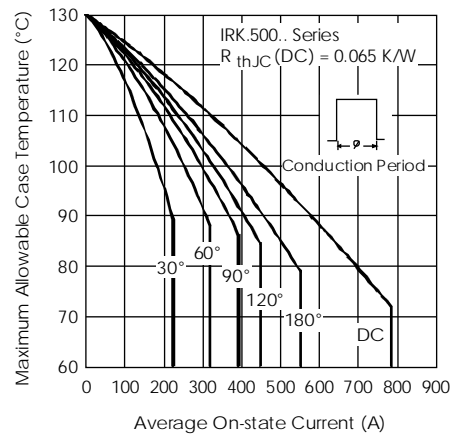


Fig. 2 - Current Ratings Characteristics

IRK.500.. Series

Bulletin I27401 rev. A 09/97

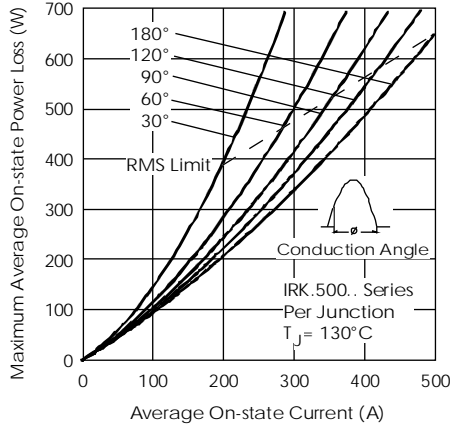


Fig. 3 - On-state Power Loss Characteristics

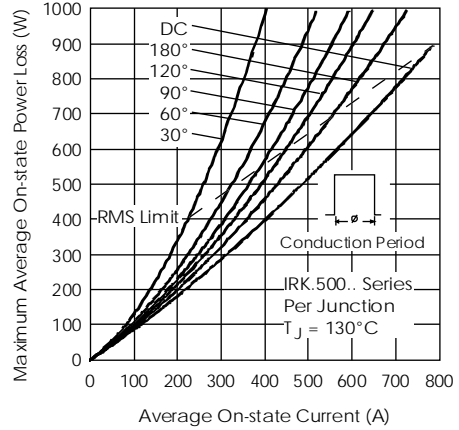


Fig. 4 - On-state Power Loss Characteristics

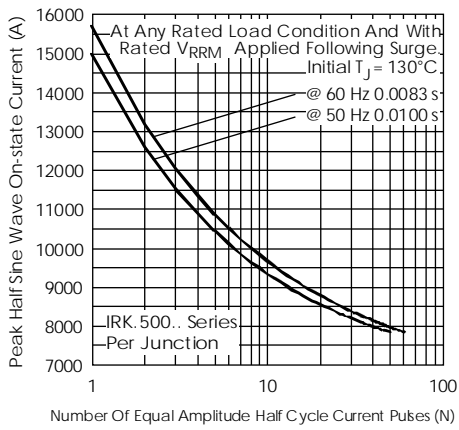


Fig. 5 - Maximum Non-Repetitive Surge Current

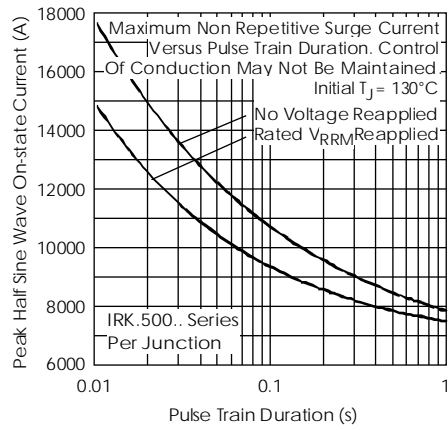


Fig. 6 - Maximum Non-Repetitive Surge Current

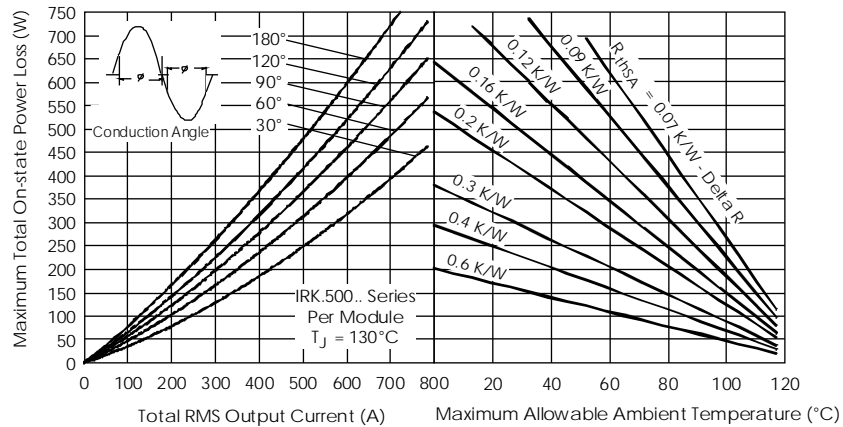


Fig. 7 - On-state Power Loss Characteristics

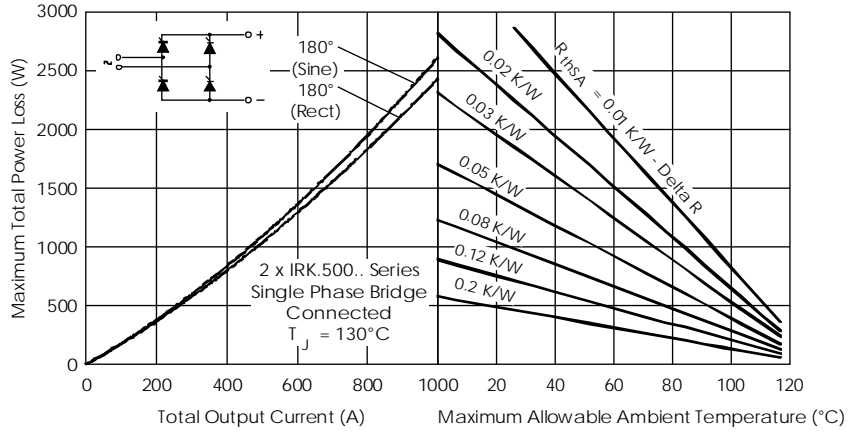


Fig. 8 - On-state Power Loss Characteristics

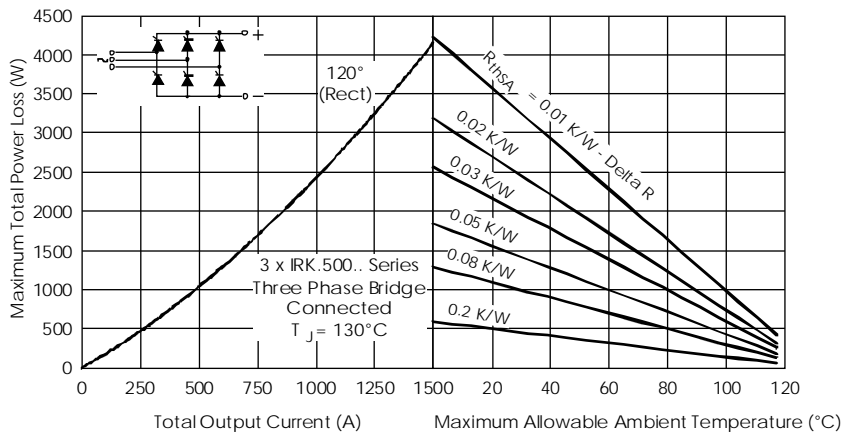


Fig. 9 - On-state Power Loss Characteristics

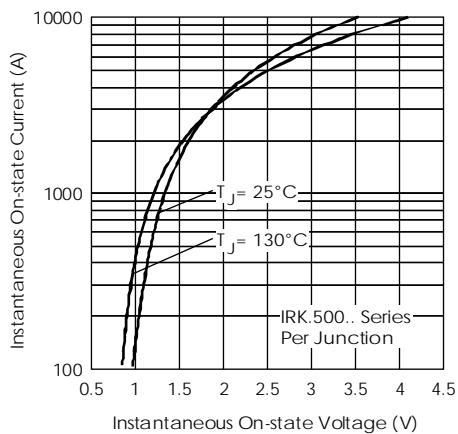


Fig. 10 - On-state Voltage Drop Characteristics

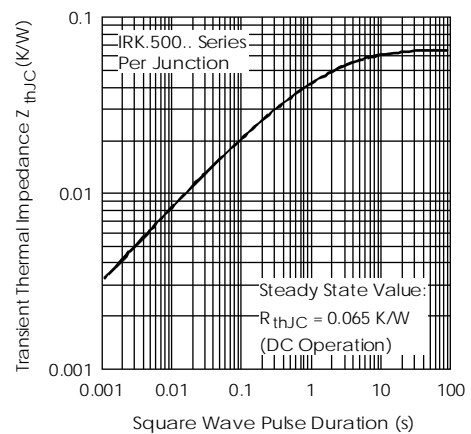


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

IRK.500.. Series

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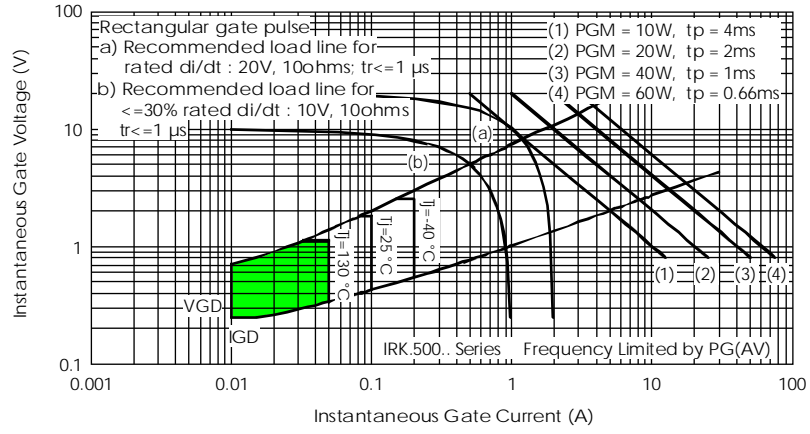


Fig. 12 - Gate Characteristics