

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
- High voltage ratings up to 2000V
- Industrial standard package
- UL recognition pending

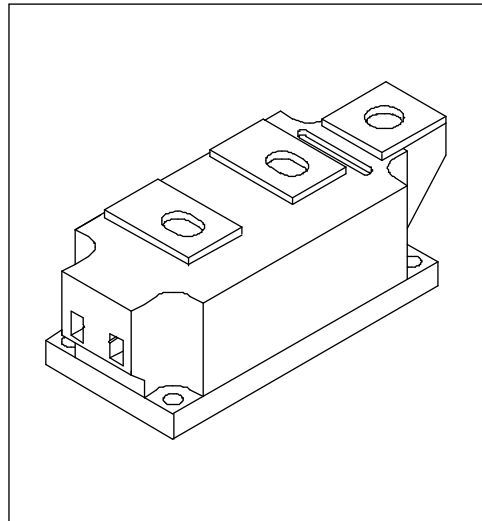
430 A

Typical Applications

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

Major Ratings and Characteristics

| Parameters | IRK.430.. | Units |
|-------------------------------|--------------|--------------------|
| $I_{T(AV)}$ or $I_{F(AV)}$ | 430 | A |
| @ T_C | 82 | °C |
| $I_{T(RMS)}$ | 675 | A |
| @ T_C | 82 | °C |
| I_{TSM} or I_{FSM} @ 50Hz | 15.7 | KA |
| @ 60Hz | 16.4 | KA |
| I^2t @ 50Hz | 1232 | KA ² s |
| @ 60Hz | 1125 | KA ² s |
| $I^2\sqrt{t}$ | 12320 | KA ² √s |
| V_{DRM}/V_{RRM} range | 1600 to 2000 | 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.430.. | 16 | 1600 | 1700 | 100 |
| | 18 | 1800 | 1900 | |
| | 20 | 2000 | 2100 | |

On-state Conduction

| Parameter | IRK.430.. | Units | Conditions |
|--|-----------|--------------------|--|
| $I_{T(AV)}$ Maximum average on-state current @ Case temperature | 430 | A | 180° conduction, half sine wave |
| $I_{F(AV)}$ | 82 | °C | |
| $I_{T(RMS)}$ Maximum RMS on-state current | 675 | A | 180° conduction, half sine wave @ $T_C = 82^\circ\text{C}$ |
| I_{TSM} Maximum peak, one-cycle, non-repetitive surge current I_{FSM} | 15.7 | KA | t = 10ms No voltage |
| | 16.4 | | t = 8.3ms reapplied |
| | 13.2 | | t = 10ms 100% V_{RRM} |
| | 13.8 | | t = 8.3ms reapplied |
| I^2t Maximum I^2t for fusing | 1232 | KA ² s | t = 10ms No voltage |
| | 1125 | | t = 8.3ms reapplied |
| | 871 | | t = 10ms 100% V_{RRM} |
| | 795 | | t = 8.3ms reapplied |
| I^2/t Maximum I^2/t for fusing | 12320 | KA ² /s | t = 0.1 to 10ms, no voltage reapplied |
| $V_{T(TO)1}$ Low level value of threshold voltage | 0.96 | 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 | 1.06 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max. |
| r_{t1} Low level value of on-state slope resistance | 0.51 | 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 | 0.45 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max. |
| V_{TM} Maximum on-state or forward voltage drop V_{FM} | 1.65 | 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.430.. | 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.430.. | 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} I_{DRM} Maximum peak reverse and off-state leakage current | 100 | mA | $T_J = T_J \text{ max.}$., rated V_{DRM}/V_{RRM} applied |

Triggering

| Parameter | IRK.430.. | 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.430.. | 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.430.. Series

Bulletin I27400 rev. A 09/97

International
IRF Rectifier

ΔR_{thJC} Conduction

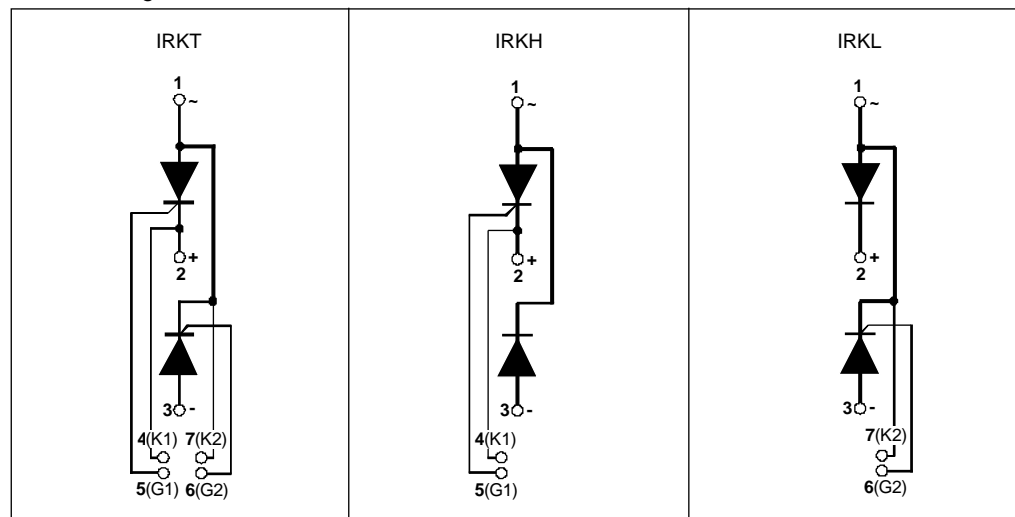
(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

| 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 | 430 | - | 20 |
| 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

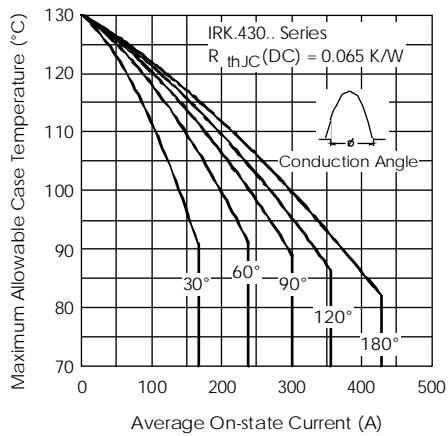
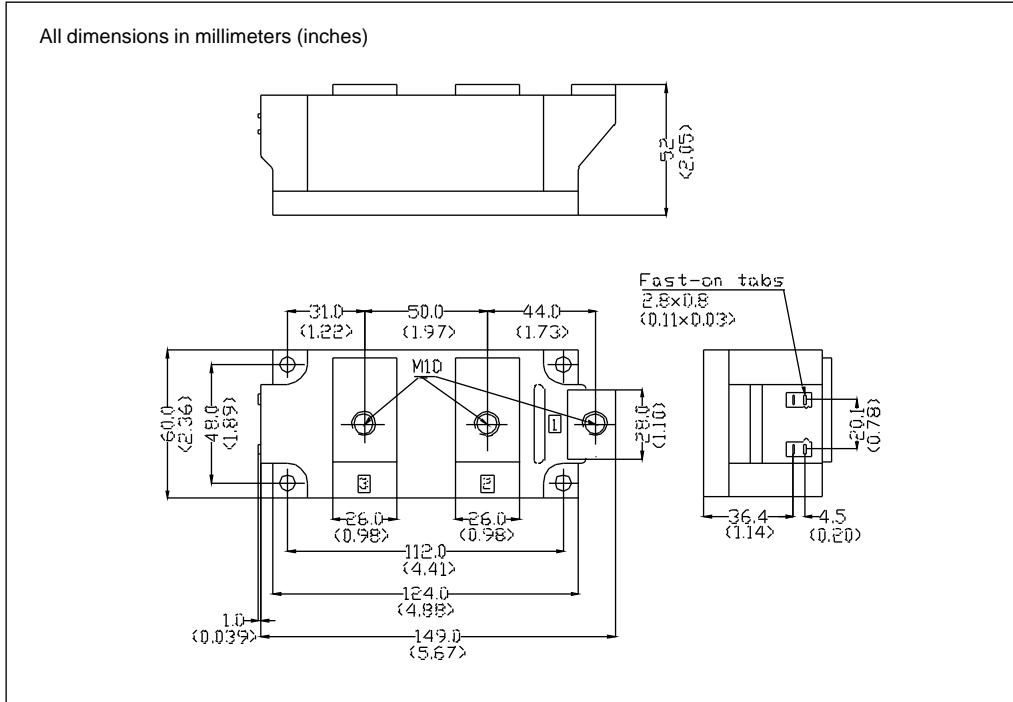


Fig. 1 - Current Ratings Characteristics

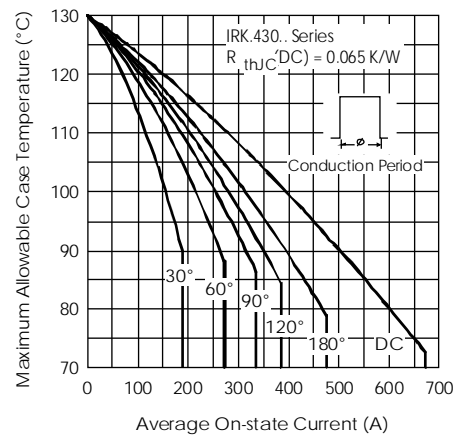


Fig. 2 - Current Ratings Characteristics

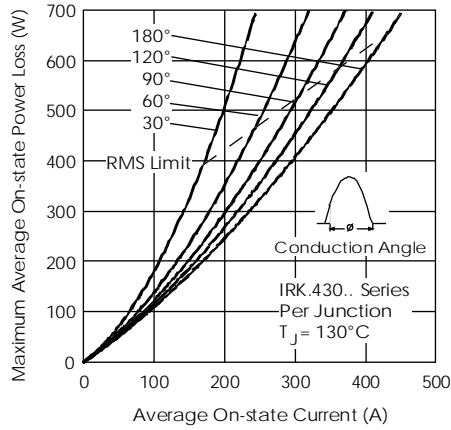


Fig. 3 - On-state Power Loss Characteristics

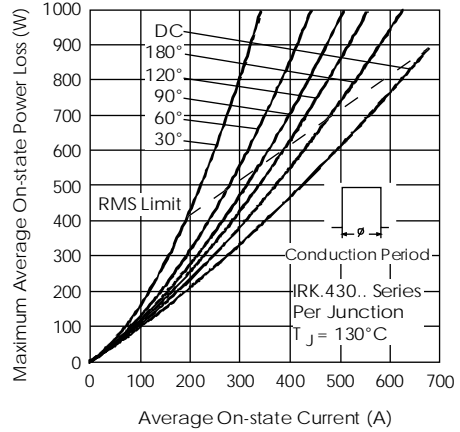


Fig. 4 - On-state Power Loss Characteristics

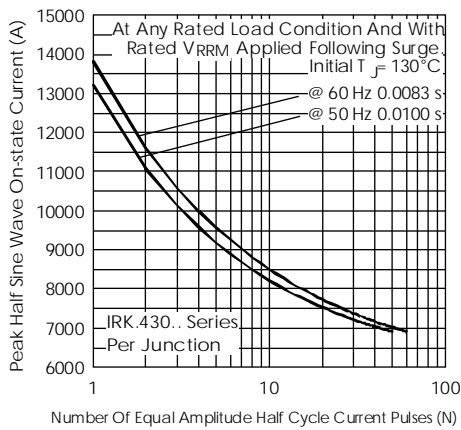


Fig. 5 - Maximum Non-Repetitive Surge Current

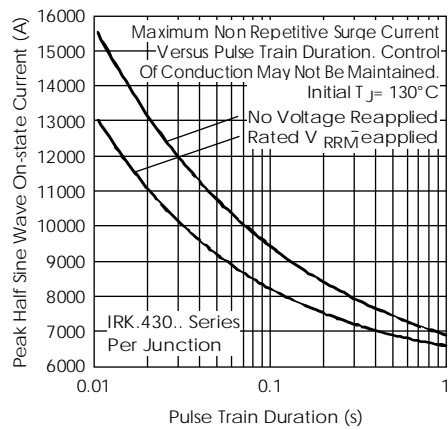


Fig. 6 - Maximum Non-Repetitive Surge Current

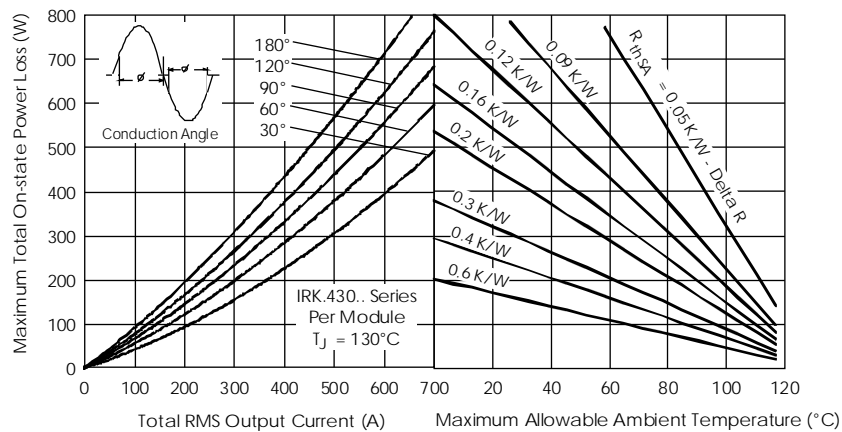


Fig. 7 - On-state Power Loss Characteristics

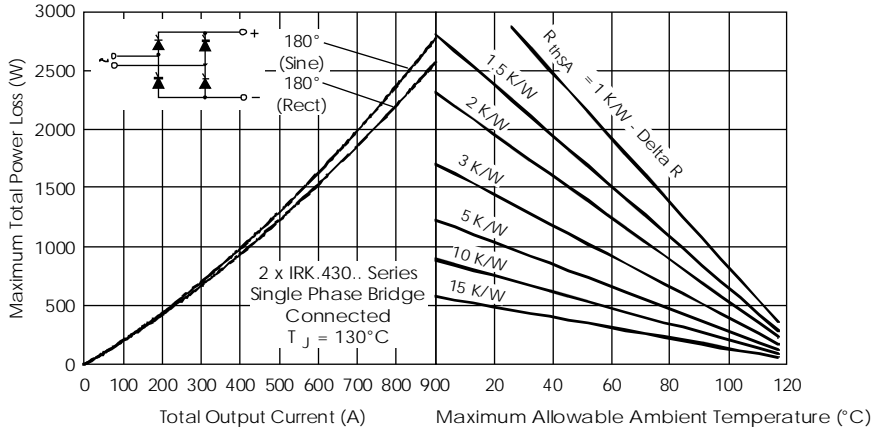


Fig. 8 - On-state Power Loss Characteristics

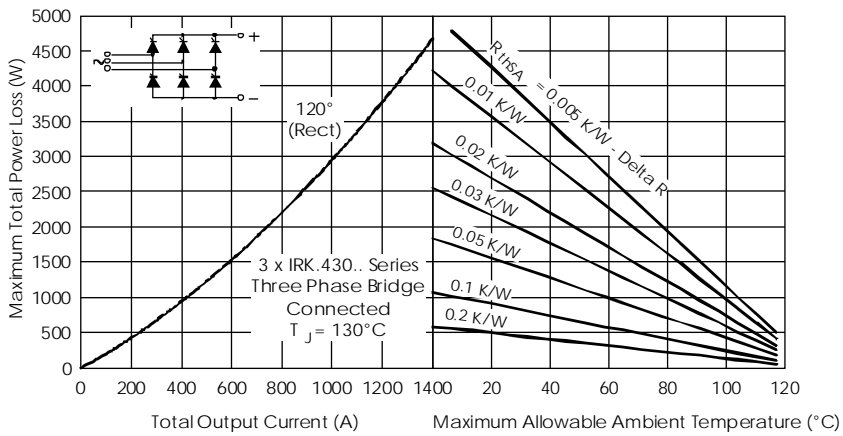


Fig. 9 - On-state Power Loss Characteristics

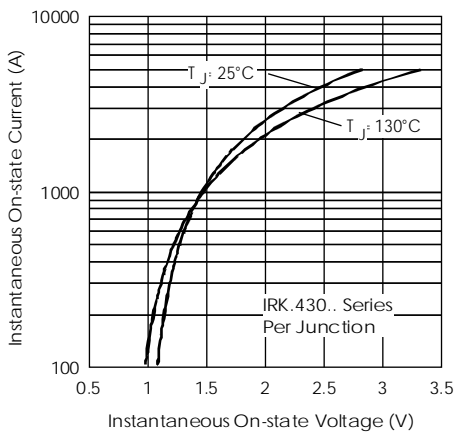


Fig. 10 - On-state Voltage Drop Characteristics

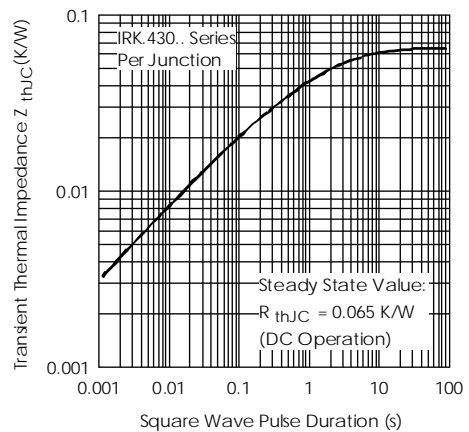


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

IRK.430.. Series

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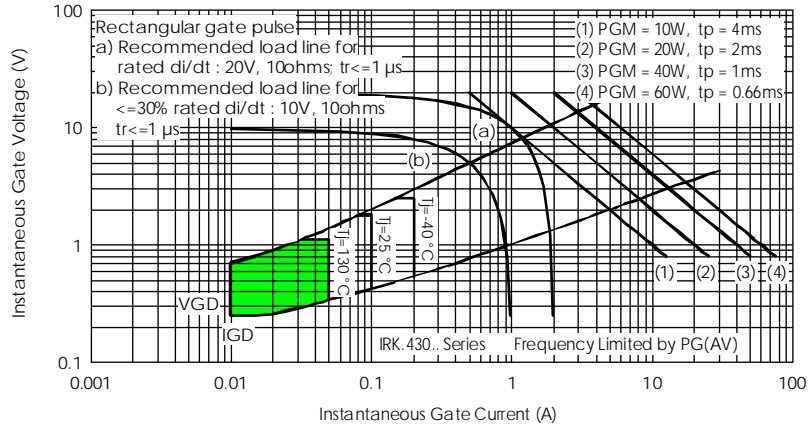


Fig. 12 - Gate Characteristics