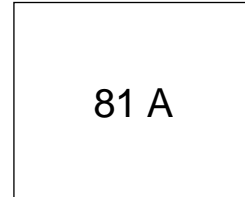


IRK.F82.. SERIES

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

INT-A-pak™ Power Modules



Features

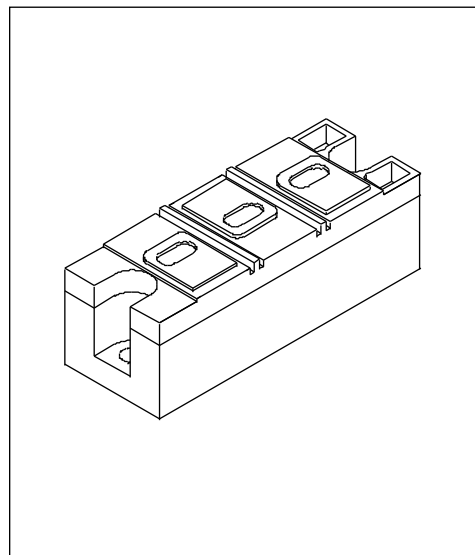
- Fast turn-off thyristor
- Fast recovery diode
- High surge capability
- Electrically isolated baseplate
- 3000 V_{RMS} isolating voltage
- Industrial standard package
- UL E78996 approved

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} | upto 800 | V |
| T_J range | -40 to 125 | °C |



IRK.F82.. Series

Bulletin I27103 rev. A 09/97

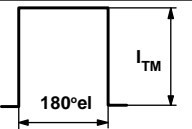
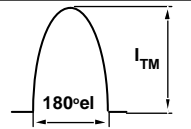
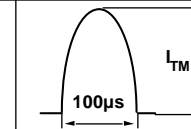
International
 Rectifier

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 |
|----------------------------------|---|-----|---|-----|--|------|------------------|
| | 160 | 265 | 250 | 400 | 2240 | 3100 | |
| 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 | $^\circ\text{C}$ |
| Equivalent values for RC circuit | 22 Ω /0.15 μF | | 22 Ω /0.15 μF | | 22 Ω /0.15 μF | | |

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 | $^\circ\text{C}$ | |
| $I_{T(RMS)}$ 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 reappplied |
| | 2300 | | t = 8.3ms reappplied |
| | 1850 | | t = 10ms 100% V_{RRM} reappplied |
| | 1950 | | t = 8.3ms reappplied |
| I^2t Maximum I^2t for fusing | 24.2 | KA ² s | t = 10ms No voltage reappplied |
| | 22.1 | | t = 8.3ms reappplied |
| | 17.1 | | t = 10ms 100% V_{RRM} reappplied |
| | 15.6 | | t = 8.3ms reappplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 242 | KA ² $\sqrt{\text{s}}$ | t = 0 to 10ms, no voltage reappplied |
| $V_{T(TO)1}$ Low level value of threshold voltage | 1.20 | V | (16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ max. |
| $V_{T(TO)2}$ High level value of threshold voltage | 1.24 | | ($I > \pi \times I_{T(AV)}$), $T_J = T_J$ max. |
| r_{T1} Low level value of on-state slope resistance | 2.18 | mW | (16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ max. |
| r_{T2} High level value of on-state slope resistance | 2.00 | | ($I > \pi \times I_{T(AV)}$), $T_J = T_J$ max. |
| V_{TM} Maximum on-state voltage drop | 1.96 | V | $I_{pk} = 350\text{A}$, $T_J = T_J$ max., $t_p = 10\text{ms}$ sine pulse |
| I_H Maximum holding current | 600 | mA | $T_J = 25^\circ\text{C}$, $I_T > 30\text{A}$ |
| 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/μs | Gate drive 20V, 20Ω, tr ≤ 1ms, V _D = 80% V _{DRM} T _J = 25°C |
| t _{rr} Maximum recovery time | 2 | μs | I _{TM} = 350A, di/dt = -25A/μs, V _R = 50V, T _J = 25°C |
| t _q Maximum turn-off time | N 10 | L 15 μs | I _{TM} = 350A, T _J = 125°C, di/dt = -25A/μs, V _R = 50V, dv/dt = 400V/μs linear to 80% V _{DRM} |

Blocking

| Parameter | IRK.F82.. | Units | Conditions |
|---|-----------|-------|--|
| dv/dt Maximum critical rate of rise of off-state voltage | 1000 | V/μs | T _J = 125°C., exponential to = 67% V _{DRM} |
| V _{INS} RMS isolation voltage | 3000 | V | 50 Hz, circuit to base, T _J = 25°C, t = 1 s |
| I _{RRM} Maximum peak reverse and off-state leakage current I _{DRM} | 30 | mA | T _J = 125°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°C, f = 50Hz, d% = 50 |
| I _{GM} Maximum peak positive gate current | 5 | A | T _J = 125°C, t _p ≤ 5ms |
| -V _{GM} Maximum peak negative gate voltage | 5 | V | |
| I _{GT} Max. DC gate current required to trigger | 200 | mA | T _J = 25°C, V _{ak} 12V, Ra = 6 |
| V _{GT} DC gate voltage required to trigger | 3 | V | |
| I _{GD} DC gate current not to trigger | 20 | mA | T _J = 125°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 | °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 _{thC-hs} Max. thermal resistance, case to heatsink | 0.035 | K/W | Mounting surface flat and greased Per module |
| T Mounting torque ± 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) | Nm (lb*in) g (oz) | |

IRK.F82.. Series

Bulletin I27103 rev. A 09/97

International
IR 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° | 0.016 | 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 | | | | | | | | | |
|-------------|--|----------|----------|----------|----------|----------|----------|----------|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 8 | |
| IRK | T | F | 8 | 2 | - | 08 | H | L | N |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 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

- All dimensions in millimeters (inches)
- Dimensions are nominal
- Full engineering drawings are available on request
- UL identification number for gate and cathode wire: UL 1385
- UL identification number for package: UL 94V0

| For all types | A | B | C | D | E |
|---------------|-----------|-----------|-----------|-----------|-----------|
| IRK...1 | 25 (0.98) | ---- | ---- | 41 (1.61) | 47 (1.85) |
| IRK...2 | 23 (0.91) | 30 (1.18) | 36 (1.42) | ---- | ---- |

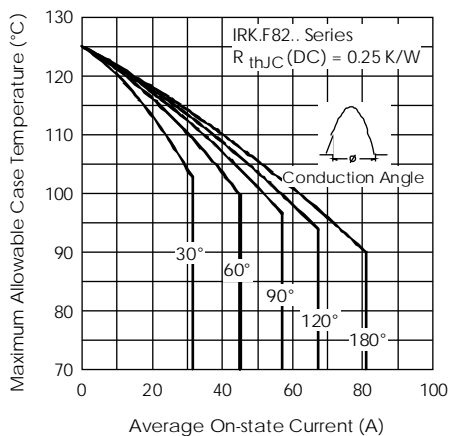


Fig. 1 - Current Ratings Characteristics

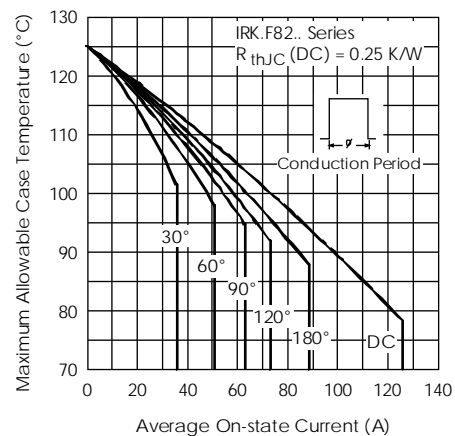


Fig. 2 - Current Ratings Characteristics

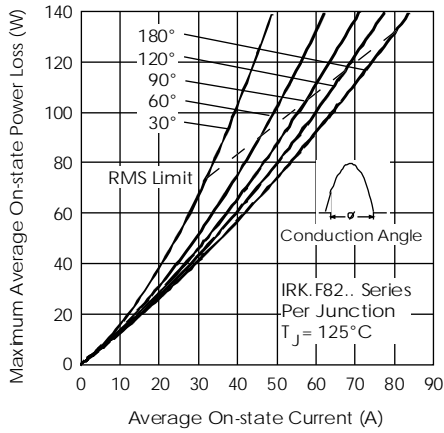


Fig. 3 - On-state Power Loss Characteristics

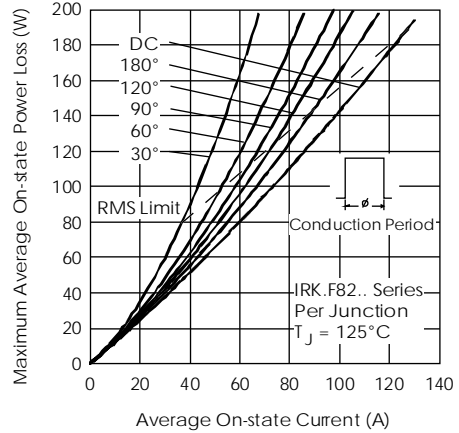


Fig. 4 - On-state Power Loss Characteristics

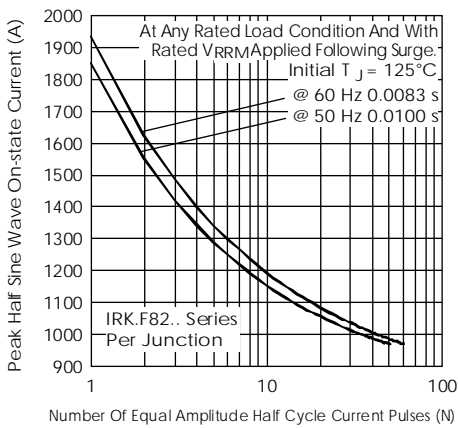


Fig. 5 - Maximum Non-Repetitive Surge Current

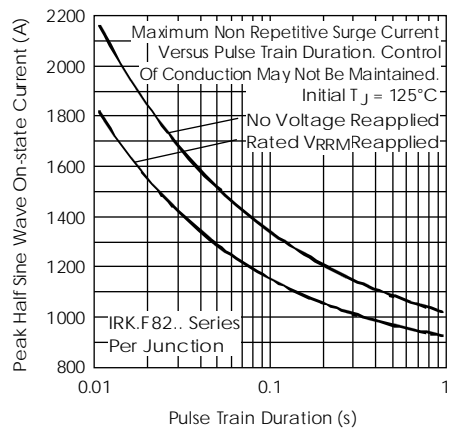


Fig. 6 - Maximum Non-Repetitive Surge Current

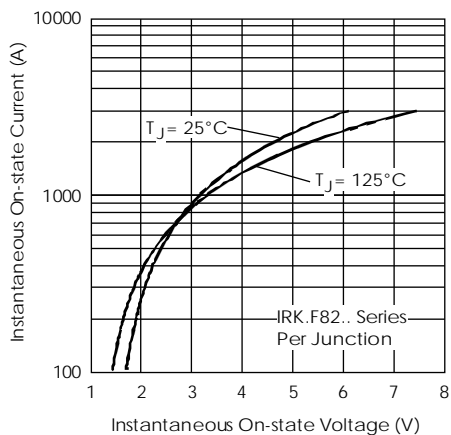


Fig. 7 - On-state Voltage Drop Characteristics

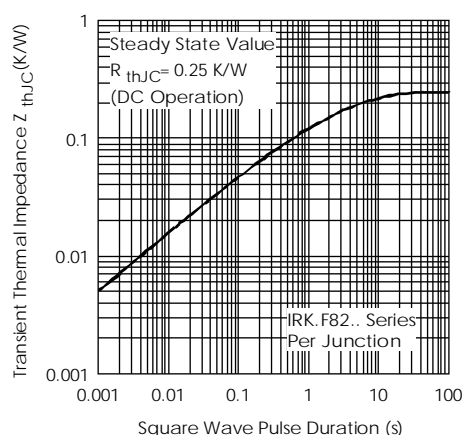


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

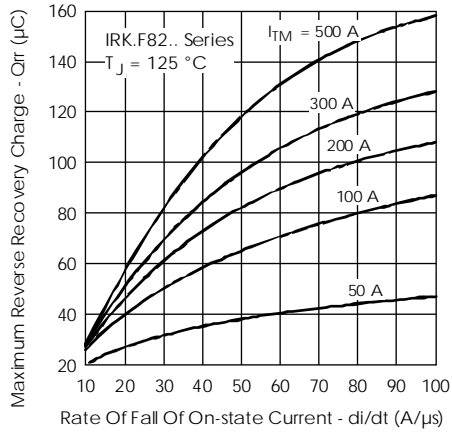


Fig. 9 - Reverse Recovery Charge Characteristic

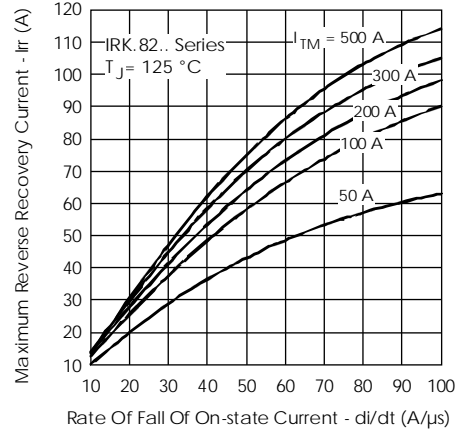


Fig. 10 - Reverse Recovery Current Characteristic

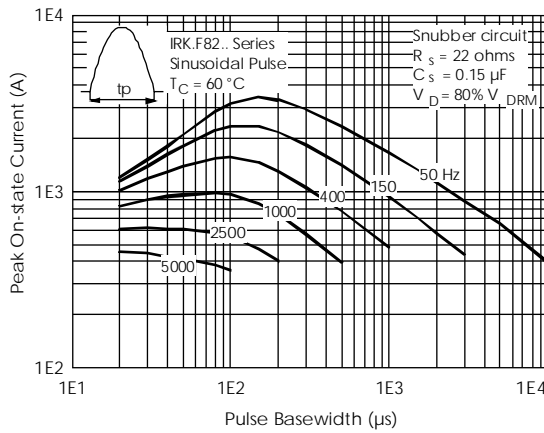


Fig. 11 - Frequency Characteristics

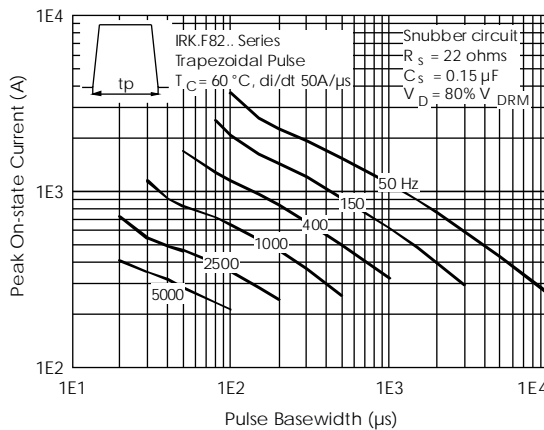
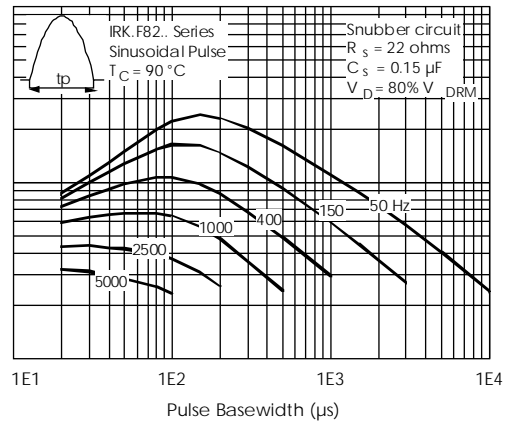
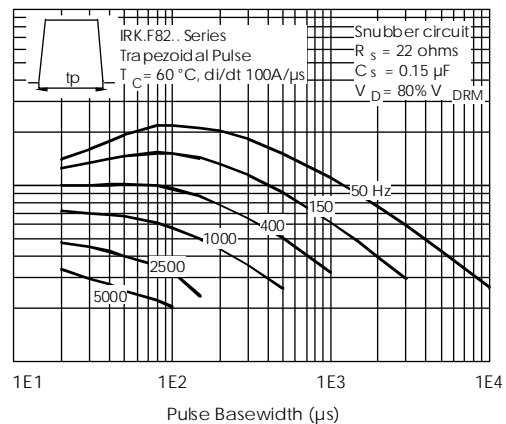


Fig. 12 - Frequency Characteristics



IRK.F82.. Series

Bulletin I27103 rev. A 09/97

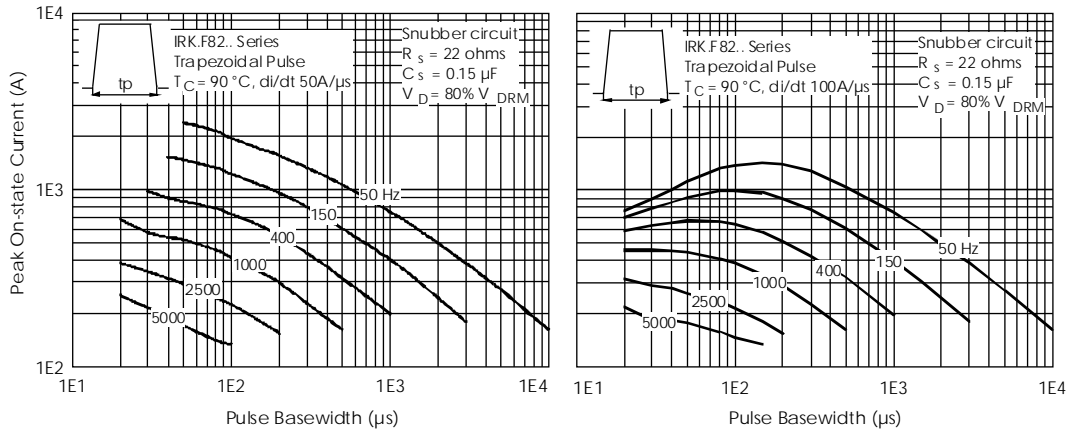


Fig. 13 - Frequency Characteristics

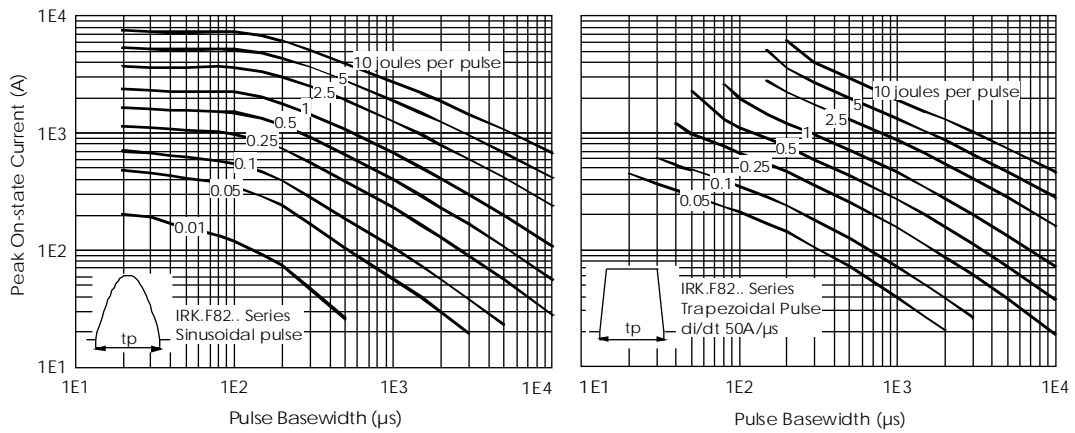


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

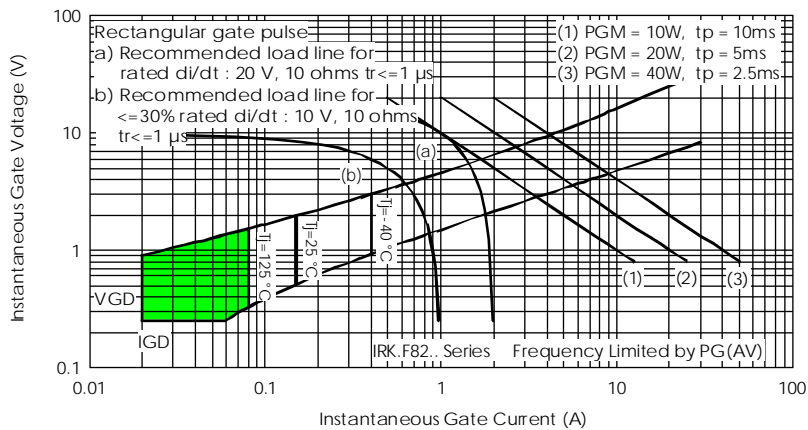


Fig. 15 - Gate Characteristics