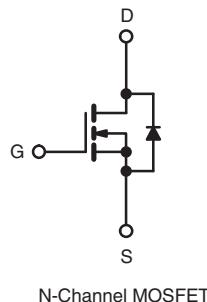
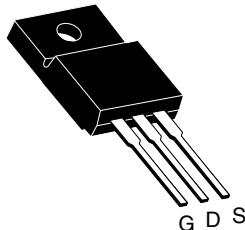


Power MOSFET

| PRODUCT SUMMARY | | |
|----------------------------|------------------------|-----|
| V _{DS} (V) | 400 | |
| R _{DS(on)} (Ω) | V _{GS} = 10 V | 1.8 |
| Q _g (Max.) (nC) | 20 | |
| Q _{gs} (nC) | 3.3 | |
| Q _{gd} (nC) | 11 | |
| Configuration | Single | |

TO-220 FULLPAK


ORDERING INFORMATION

| | |
|----------------|-----------------------------|
| Package | TO-220 FULLPAK |
| Lead (Pb)-free | IRFI720GPbF SiHFI720G-E3 |
| SnPb | IRFI720G SiHFI720G |

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

| PARAMETER | SYMBOL | LIMIT | UNIT |
|---|-----------------------------------|-------------|----------|
| Drain-Source Voltage | V _{DS} | 400 | V |
| Gate-Source Voltage | V _{GS} | ± 20 | |
| Continuous Drain Current | I _D | 2.6 | A |
| | | 1.7 | |
| Pulsed Drain Current ^a | I _{DM} | 10 | |
| Linear Derating Factor | | 0.24 | W/°C |
| Single Pulse Avalanche Energy ^b | E _{AS} | 150 | mJ |
| Repetitive Avalanche Current ^a | I _{AR} | 2.6 | A |
| Repetitive Avalanche Energy ^a | E _{AR} | 3.0 | mJ |
| Maximum Power Dissipation | P _D | 30 | W |
| Peak Diode Recovery dV/dt ^c | dV/dt | 4.0 | V/ns |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | -55 to +150 | °C |
| Soldering Recommendations (Peak Temperature) ^d | for 10 s | 300 | |
| Mounting Torque | | 10 | lbf · in |
| | | 1.1 | N · m |

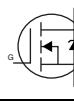
Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- V_{DD} = 50 V, starting T_J = 25 °C, L = 38 mH, R_G = 25 Ω, I_{AS} = 2.6 A (see fig. 12).
- I_{SD} ≤ 3.3 A, dI/dt ≤ 65 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °C.
- 1.6 mm from case.



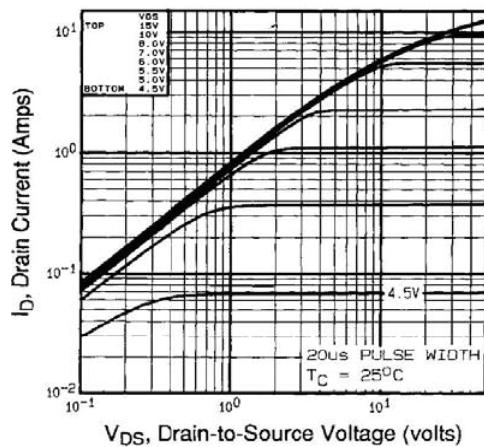
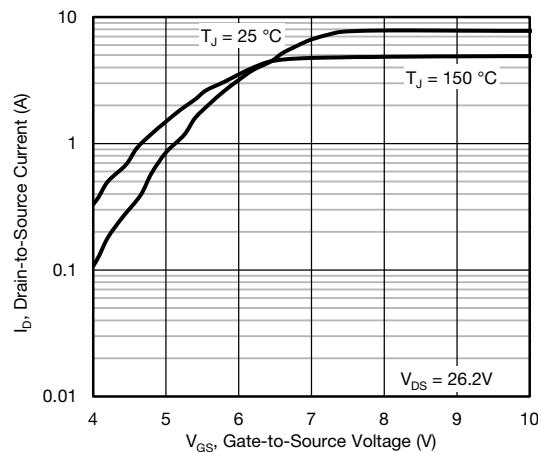
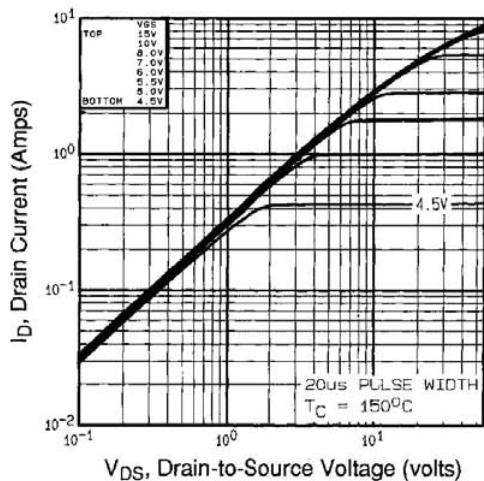
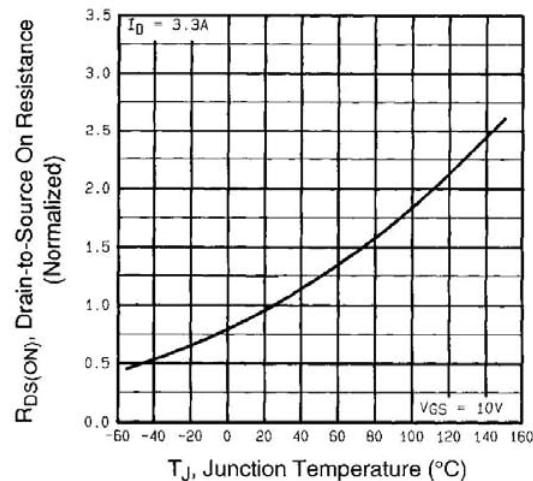
RoHS* Available

| THERMAL RESISTANCE RATINGS | | | | |
|-----------------------------------|------------|------|------|------|
| PARAMETER | SYMBOL | TYP. | MAX. | UNIT |
| Maximum Junction-to-Ambient | R_{thJA} | - | 65 | |
| Maximum Junction-to-Case (Drain) | R_{thJC} | - | 4.1 | °C/W |

| SPECIFICATIONS ($T_J = 25$ °C, unless otherwise noted) | | | | | | | |
|--|---------------------|---|---|------|------|-----------|----------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0$ V, $I_D = 250$ μ A | | 400 | - | - | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | Reference to 25 °C, $I_D = 1$ mA | | - | 0.51 | - | V/°C |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = 250$ μ A | | 2.0 | - | 4.0 | V |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 20$ V | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 400$ V, $V_{GS} = 0$ V | | - | - | 25 | |
| | | $V_{DS} = 320$ V, $V_{GS} = 0$ V, $T_J = 125$ °C | | - | - | 250 | μ A |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS} = 10$ V | $I_D = 1.6$ A ^b | - | - | 1.8 | Ω |
| Forward Transconductance | g_{fs} | $V_{DS} = 50$ V, $I_D = 1.6$ A ^b | | 1.5 | - | - | S |
| Dynamic | | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1.0$ MHz, see fig. 5 | | - | 410 | - | pF |
| Output Capacitance | C_{oss} | | | - | 120 | - | |
| Reverse Transfer Capacitance | C_{rss} | | | - | 47 | - | |
| Drain to Sink Capacitance | C | $f = 1.0$ MHz | | - | 12 | - | |
| Total Gate Charge | Q_g | $V_{GS} = 10$ V | $I_D = 3.3$ A, $V_{DS} = 320$ V, see fig. 6 and 13 ^b | - | - | 20 | nC |
| Gate-Source Charge | Q_{gs} | | | - | - | 3.3 | |
| Gate-Drain Charge | Q_{gd} | | | - | - | 11 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 200$ V, $I_D = 3.3$ A, $R_G = 18$ Ω , $R_D = 56$ Ω , see fig. 10 ^b | | - | 10 | - | ns |
| Rise Time | t_r | | - | 14 | - | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 30 | - | | |
| Fall Time | t_f | | - | 13 | - | | |
| Internal Drain Inductance | L_D | Between lead, 6 mm (0.25") from package and center of die contact |  | - | 4.5 | - | nH |
| Internal Source Inductance | L_S | | | - | 7.5 | - | |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous Source-Drain Diode Current | I_S | MOSFET symbol showing the integral reverse p - n junction diode |  | - | - | 2.6 | A |
| Pulsed Diode Forward Current ^a | I_{SM} | | | - | - | 10 | |
| Body Diode Voltage | V_{SD} | $T_J = 25$ °C, $I_S = 2.6$ A, $V_{GS} = 0$ V ^b | | - | - | 1.6 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $T_J = 25$ °C, $I_F = 3.3$ A, $dI/dt = 100$ A/ μ s ^b | | - | 300 | 600 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | - | 1.5 | 3.0 | μ C |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D) | | | | | |

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. Pulse width ≤ 300 μ s; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^{\circ}\text{C}$

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics, $T_C = 150\text{ }^{\circ}\text{C}$

Fig. 4 - Normalized On-Resistance vs. Temperature

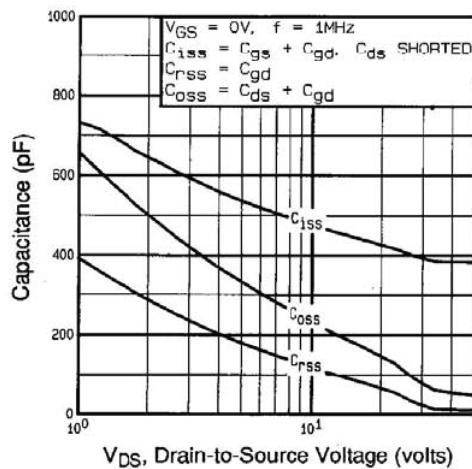


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

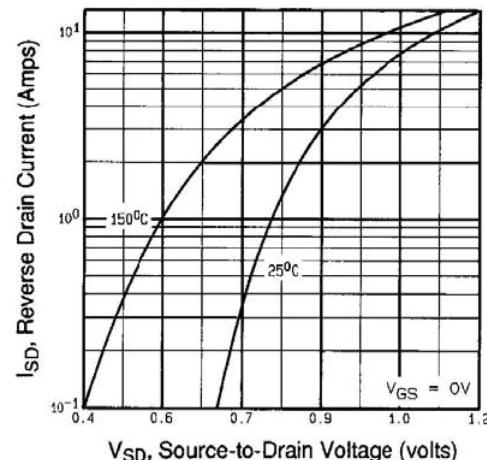


Fig. 7 - Typical Source-Drain Diode Forward Voltage

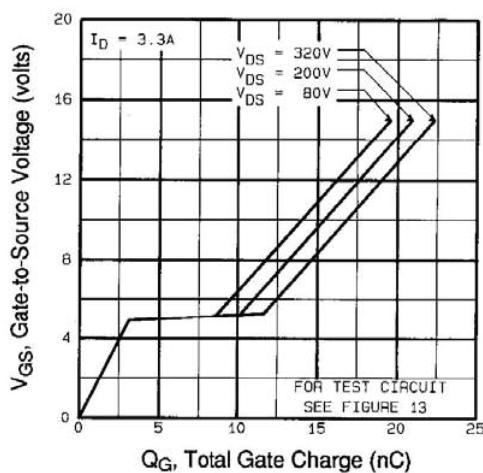


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

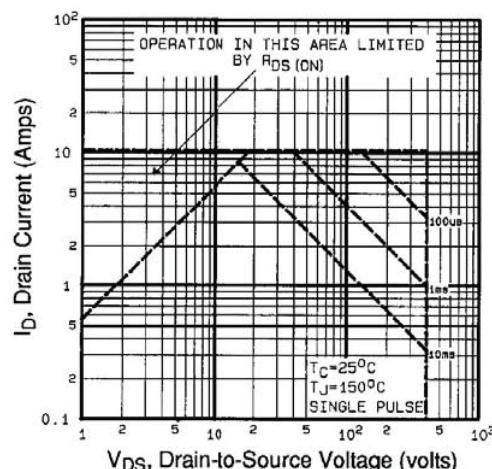


Fig. 8 - Maximum Safe Operating Area

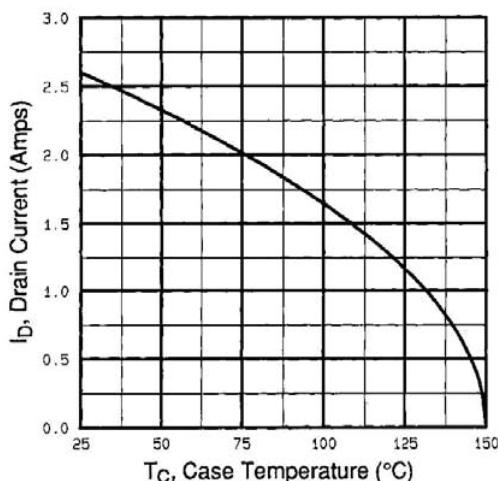


Fig. 9 - Maximum Drain Current vs. Case Temperature

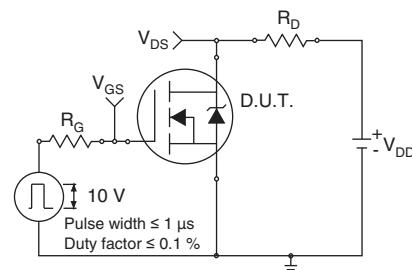


Fig. 10a - Switching Time Test Circuit

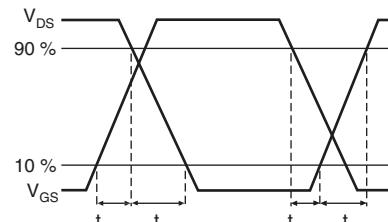


Fig. 10b - Switching Time Waveforms

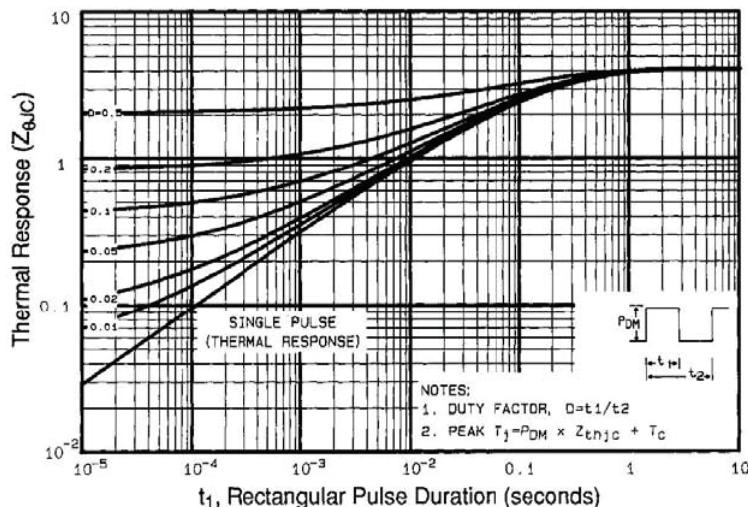


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

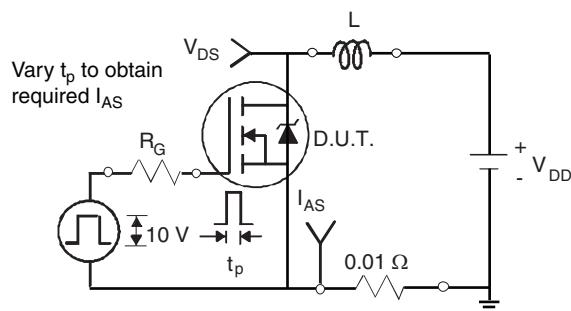


Fig. 12a - Unclamped Inductive Test Circuit

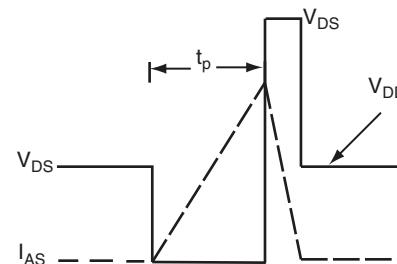


Fig. 12b - Unclamped Inductive Waveforms

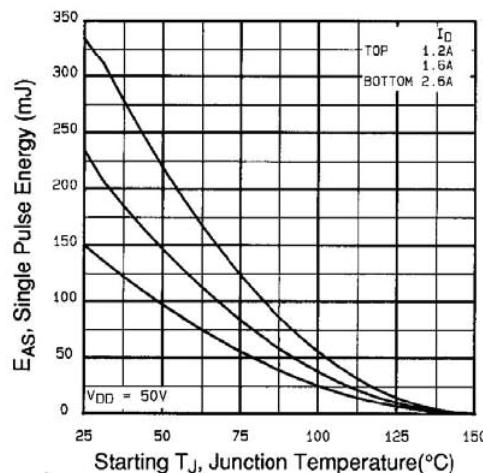


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

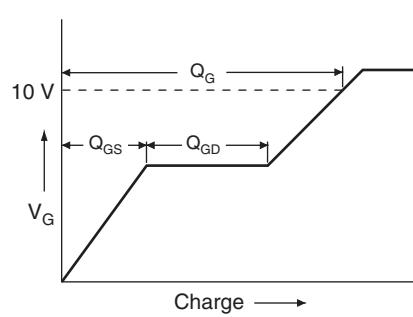


Fig. 13a - Basic Gate Charge Waveform

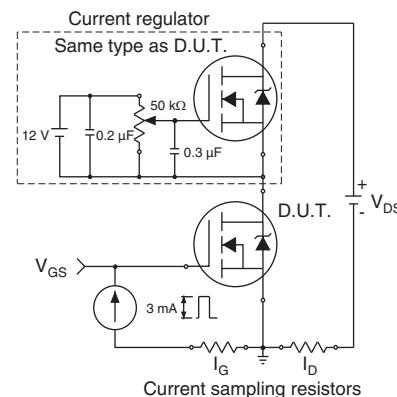


Fig. 13b - Gate Charge Test Circuit

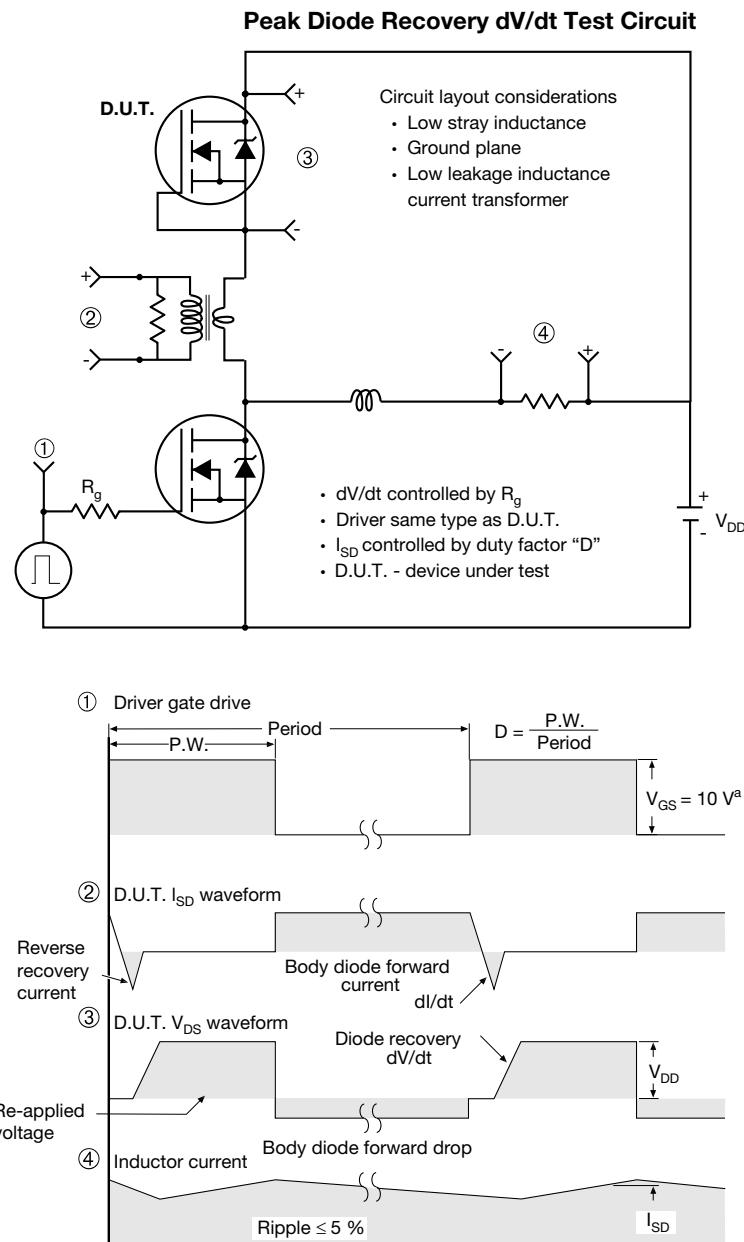


Fig. 14 - For N-Channel

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