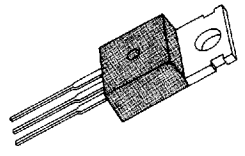
# IRF730/731/732/733
# IRFP330/331/332/333

## N-CHANNEL POWER MOSFETS

### FEATURES

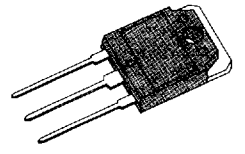
- Lower $R_{DS\ (ON)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

TO-220



IRF730/731/732/733

TO-3P



IRFP330/331/332/333

### PRODUCT SUMMARY

| Part Number | $V_{DS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| IRF730/IRFP330 | 400V | 1.0Ω | 5.5A |
| IRF731/IRFP331 | 350V | 1.0Ω | 5.5A |
| IRF732/IRFP332 | 400V | 1.5Ω | 4.5A |
| IRF733/IRFP333 | 350V | 1.5Ω | 4.5A |

### MAXIMUM RATINGS

| Characteristics | Symbol | IRF730 IRFP330 | IRF731 IRFP331 | IRF732 IRFP332 | IRF733 IRFP333 | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Voltage (1) | $V_{DSS}$ | 400 | 350 | 400 | 350 | Vdc |
| Drain-Gate Voltage ($R_{GS}$=1.0MΩ)(1) | $V_{DGR}$ | 400 | 350 | 400 | 350 | Vdc |
| Gate-Source Voltage | $V_{GS}$ | ±20 | | | | Vdc |
| Continuous Drain Current $T_C$=25°C | $I_D$ | 5.5 | 5.5 | 4.5 | 4.5 | Adc |
| Continuous Drain Current $T_C$=100°C | $I_D$ | 3.5 | 3.5 | 3.0 | 3.0 | Adc |
| Drain Current—Pulsed (3) | $I_{DM}$ | 32 | 32 | 18 | 18 | Adc |
| Gate Current—Pulsed | $I_{GM}$ | ±1.5 | | | | Adc |
| Single Pulsed Avalanche Energy (4) | $E_{AS}$ | 290 | | | | mJ |
| Avalanche Current | $I_{AS}$ | 5.5 | | | | A |
| Total Power Dissipation @ $T_C$=25°C<br>Derate above 25°C | $P_D$ | 75<br>0.6 | | | | Watts<br>W/°C |
| Operating and Storage Junction to Case | $T_J$, Tstg | −55 to 150 | | | | °C |
| Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds | $T_L$ | 300 | | | | °C |

**Notes:** (1) $T_J$=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse with limited by max. junction temperature
(4) L=17 mH, $V_{dd}$=50V, $R_G$=25Ω, Starting $T_j$=25°C

## ELECTRICAL CHARACTERISTICS ($T_C$=25°C unless otherwise specified)

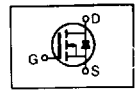
| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage<br>IRF730/IRFP330<br>IRF732/IRFP332 | 400 | — | — | V | $V_{GS}$=0V<br>$I_D$=250μA |
| | IRF731/IRFP331<br>IRF733/IRFP333 | 350 | — | — | V | |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS}$=$V_{GS}$, $I_D$=250μA |
| $I_{GSS}$ | Gate-Source Leakage Forward | — | — | 100 | nA | $V_{GS}$=20V |
| $I_{GSS}$ | Gate-Source Leakage Reverse | — | — | −100 | nA | $V_{GS}$=−20V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | — | — | 250 | μA | $V_{DS}$=Max. Rating, $V_{GS}$=0V |
| | | — | — | 1000 | μA | $V_{DS}$=Max. Rating×0.8, $V_{GS}$=0V, $T_C$=125°C |
| $I_{D(on)}$ | On-State Drain-Source Current (2)<br>IRF730/IRFP330<br>IRF731/IRFP331 | 5.5 | — | — | A | $V_{DS}$≥8.2V, $V_{GS}$=10V |
| | IRF732/IRFP332<br>IRF733/IRFP333 | 4.5 | — | — | A | |
| $R_{DS(on)}$ | Static Drain-Source On-State Resistance (2)<br>IRF730/IRFP330<br>IRF731/IRFP331 | — | 0.8 | 1.0 | Ω | $V_{GS}$=10V, $I_D$=3.0A |
| | IRF732/IRFP332<br>IRF733/IRFP333 | — | 1.0 | 1.5 | Ω | |
| $g_{fs}$ | Forward Transconductance (2) | 2.9 | 4.4 | — | ℧ | $V_{DS}$≥50V, $I_D$=3.0A |
| $C_{iss}$ | Input Capacitance | — | 780 | — | pF | $V_{GS}$=0V, $V_{DS}$=25V, f=1.0MHz |
| $C_{oss}$ | Output Capacitance | — | 99 | — | pF | |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 43 | — | pF | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 11 | 17 | ns | $V_{DD}$=0.5$BV_{DSS}$, $I_D$=5.5A, $Z_O$=12Ω<br>(MOSFET switching times are essentially independent of operating temperature) |
| $t_r$ | Rise Time | — | 19 | 29 | ns | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 37 | 56 | ns | |
| $t_f$ | Fall Time | — | 16 | 24 | ns | |
| $Q_g$ | Total Gate Charge<br>(Gate-Source Plus Gate-Drain) | — | 18 | 30 | nC | $V_{GS}$=10V, $I_D$=5.5A, $V_{DS}$=0.8 Max. Rating<br>(Gate charge is essentially independent of operating temperature.) |
| $Q_{gs}$ | Gate-Source Charge | — | 40 | — | nC | |
| $Q_{gd}$ | Gate-Drain ("Miller") Charge | — | 14 | — | nC | |

## THERMAL RESISTANCE

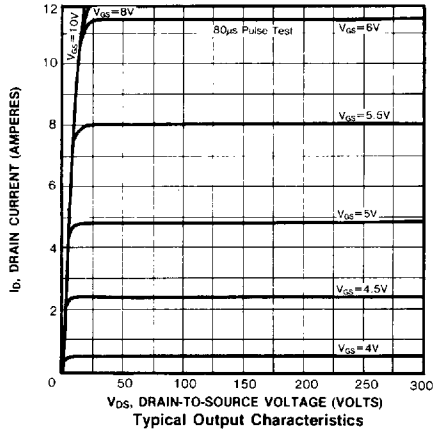
| Symbol | Characteristic | | IRF730-3 | IRFP330-3 | Unit | |
|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction-to-Case | MAX | 1.67 | 1.67 | K/W | |
| $R_{thCS}$ | Case-to-Sink | TYP | 0.50 | 0.24 | K/W | Mounting surface flat, smooth, and greased |
| $R_{thJA}$ | Junction-to-Ambient | MAX | 80 | 40 | K/W | Free Air Operation |

**Notes:** (1) $T_J$=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

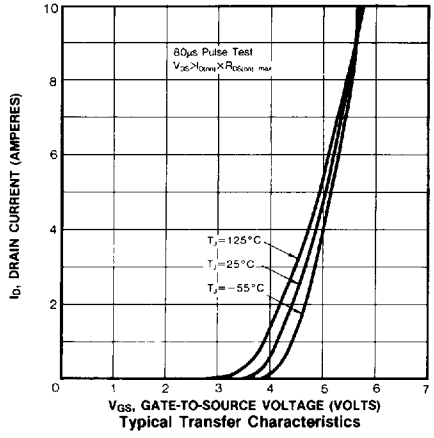
## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) IRF730/IRFP330 IRF731/IRFP331 | — | — | 5.5 | A | Modified MOSFET symbol showing the integral reverse P-N junction rectifier  |
| | IRF732/IRFP332 IRF733/IRFP333 | — | — | 4.5 | A | |
| $I_{SM}$ | Pulse Source Current(Body Diode)(3) IRF730/IRFP330/IRF330 IRF731/IRFP331/IRF331 | — | — | 22 | A | |
| | IRF732/IRFP332 IRF733/IRFP333 | — | — | 18 | A | |
| $V_{SD}$ | Diode Forward Voltage (2) IRF730/IRFP330 IRF731/IRFP331 | — | — | 1.8 | V | $T_C$=25°C, $I_S$=5.5A, $V_{GS}$=0V |
| | IRF732/IRFP332 IRF733/IRFP333 | — | — | 1.6 | V | $T_C$=25°C, $I_S$=4.5A, $V_{GS}$=0V |
| $t_{rr}$ | Reverse Recovery Time | — | 310 | 660 | ns | $T_j$=25°C, $I_F$=5.5A, $dI_F/dt$=100A/μS |

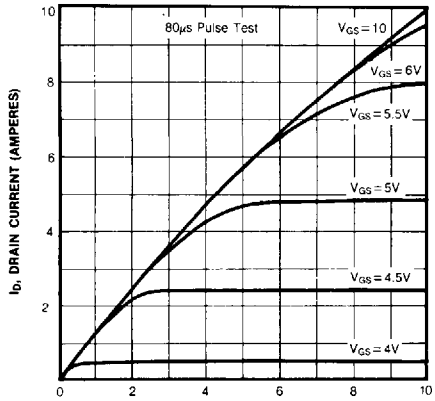
**Notes:** (1) $T_J$=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse with limited by max. junction temperature



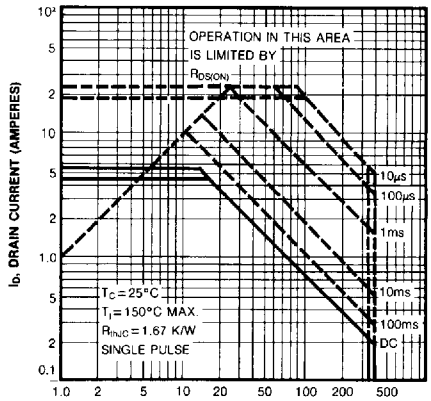
Typical Output Characteristics



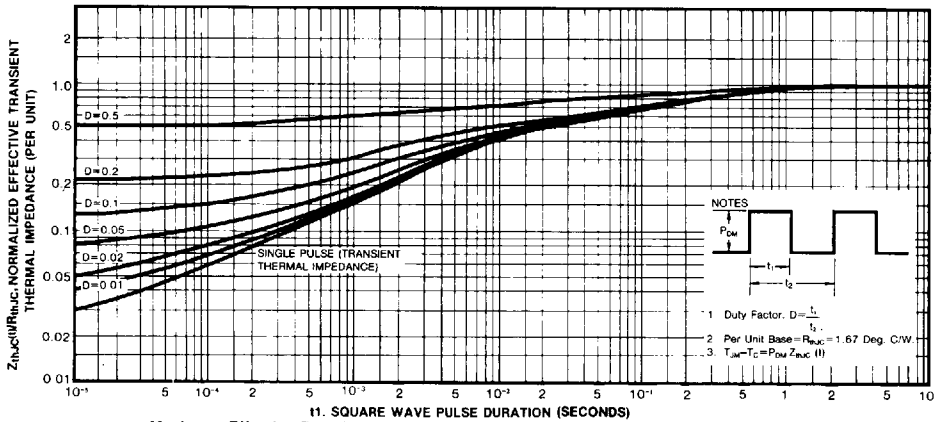
Typical Transfer Characteristics



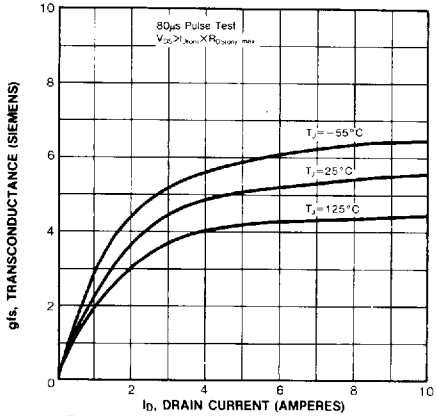

Typical Saturation Characteristics



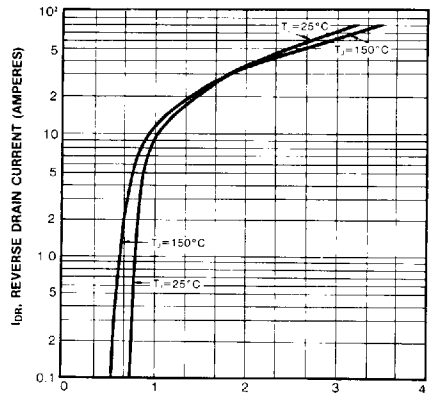

Maximum Safe Operating Area




Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration




Typical Transcounductance Vs. Drain Current




Typical Source—Drain Diode Forward Voltage

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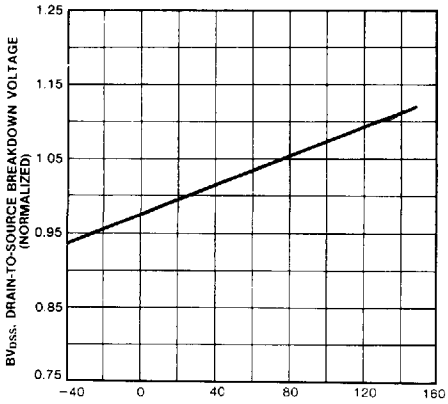
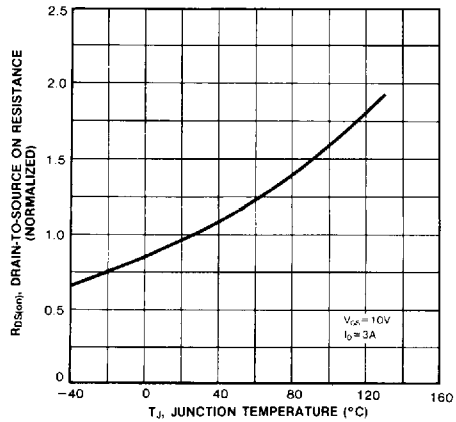
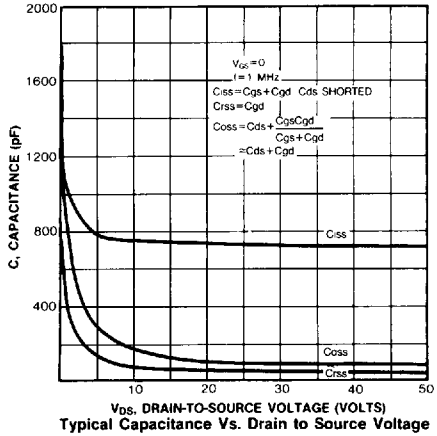


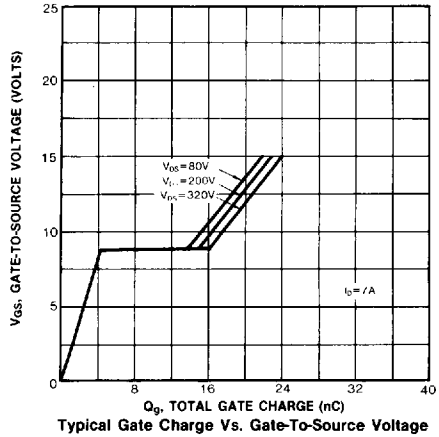

Breakdown Voltage Vs. Temperature



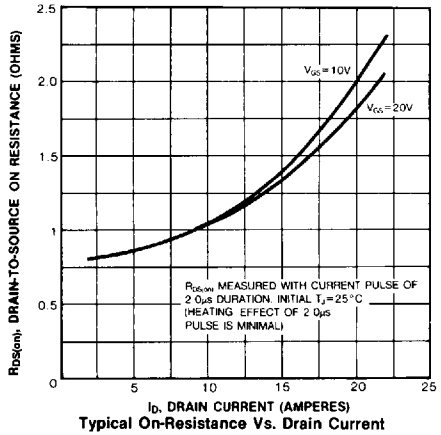

Normalized On-Resistance Vs. Temperature



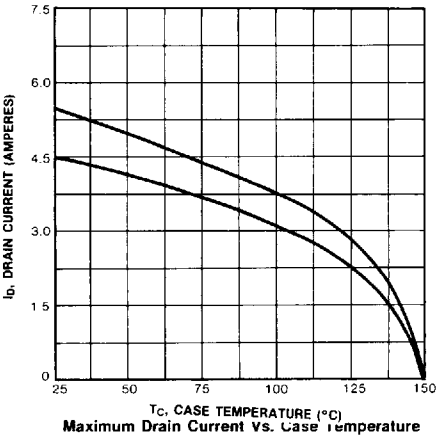

Typical Capacitance Vs. Drain to Source Voltage




Typical Gate Charge Vs. Gate-To-Source Voltage

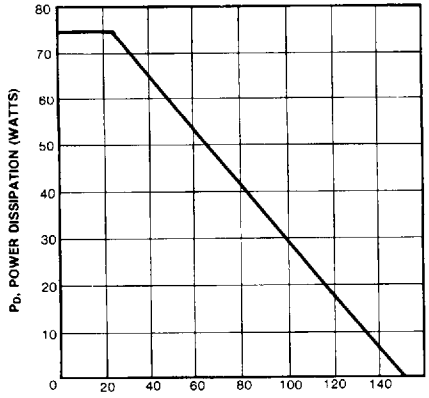



Typical On-Resistance Vs. Drain Current




Maximum Drain Current Vs. Case Temperature

SAMSUNG ELECTRONICS INC 67E D 7964142 0017304 710 SMGK




Power Vs. Temperature Derating Curve

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