

AUTOMOTIVE MOSFET

IRFR1010ZPbF
IRFU1010ZPbF

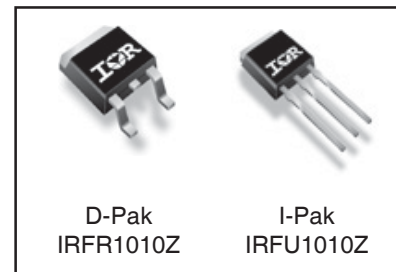
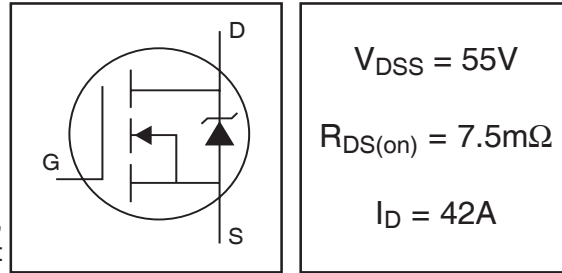
Features

- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free

Description

Specifically designed for Automotive applications, this HEXFET® Power MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in Automotive applications and a wide variety of other applications.

HEXFET® Power MOSFET



Absolute Maximum Ratings

| | Parameter | Max. | Units |
|------------------------------|--|--------------------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited) | 91 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 65 | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited) | 42 | |
| I_{DM} | Pulsed Drain Current ① | 360 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 140 | W |
| | Linear Derating Factor | 0.9 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| E_{AS} (Thermally limited) | Single Pulse Avalanche Energy② | 110 | mJ |
| E_{AS} (Tested) | Single Pulse Avalanche Energy Tested Value ③ | 220 | |
| I_{AR} | Avalanche Current ① | See Fig.12a, 12b, 15, 16 | A |
| E_{AR} | Repetitive Avalanche Energy ⑤ | | mJ |
| T_J | Operating Junction and | -55 to + 175 | °C |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case) | |
| | Mounting Torque, 6-32 or M3 screw | 10 lbf•in (1.1N•m) | |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case ⑥ | --- | 1.11 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB mount) ⑦ ⑧ | --- | 40 | |
| $R_{\theta JA}$ | Junction-to-Ambient ⑧ | --- | 110 | |

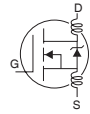
HEXFET® is a registered trademark of International Rectifier.

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International
IR Rectifier

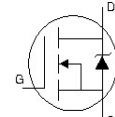
Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------------------|--------------------------------------|------|-------|------|-------|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 55 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.051 | — | V/°C | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 5.8 | 7.5 | mΩ | $V_{GS} = 10V, I_D = 42A$ ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS} = V_{GS}, I_D = 100\mu A$ |
| g_{fs} | Forward Transconductance | 31 | — | — | S | $V_{DS} = 25V, I_D = 42A$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 20 | μA | $V_{DS} = 55V, V_{GS} = 0V$ |
| | | — | — | 250 | | $V_{DS} = 55V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 200 | nA | $V_{GS} = 20V$ |
| | Gate-to-Source Reverse Leakage | — | — | -200 | | $V_{GS} = -20V$ |
| Q_g | Total Gate Charge | — | 63 | 95 | nC | $I_D = 42A$ |
| Q_{gs} | Gate-to-Source Charge | — | 17 | — | | $V_{DS} = 44V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | 23 | — | | $V_{GS} = 10V$ ③ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 17 | — | ns | $V_{DD} = 28V$ |
| t_r | Rise Time | — | 76 | — | | $I_D = 42A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 42 | — | | $R_G = 7.6\ \Omega$ |
| t_f | Fall Time | — | 48 | — | | $V_{GS} = 10V$ ③ |
| L_D | Internal Drain Inductance | — | 4.5 | — | nH | Between lead, 6mm (0.25in.) from package and center of die contact |
| L_S | Internal Source Inductance | — | 7.5 | — | | |
| C_{iss} | Input Capacitance | — | 2840 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 470 | — | | $V_{DS} = 25V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 250 | — | | $f = 1.0\text{MHz}$ |
| C_{oss} | Output Capacitance | — | 1630 | — | | $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$ |
| C_{oss} | Output Capacitance | — | 360 | — | | $V_{GS} = 0V, V_{DS} = 44V, f = 1.0\text{MHz}$ |
| $C_{oss\ eff.}$ | Effective Output Capacitance | — | 560 | — | | $V_{GS} = 0V, V_{DS} = 0V\ \text{to}\ 44V$ ④ |

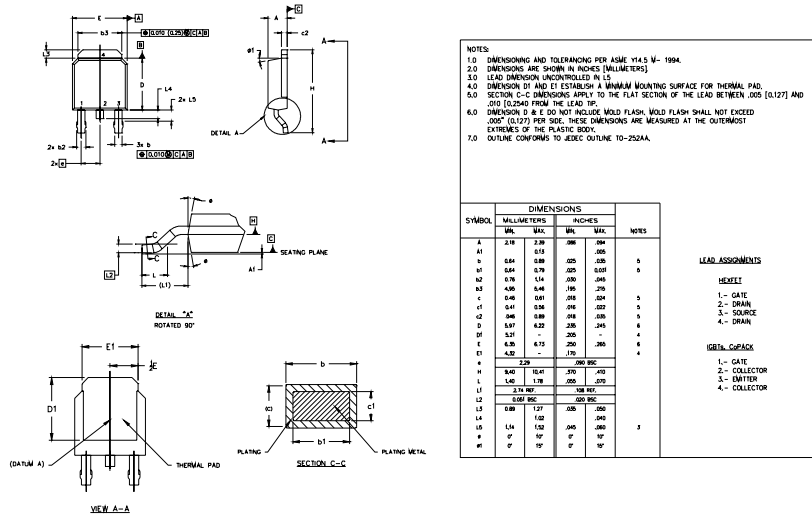


Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|---|---|------|------|-------|---|
| I_S | Continuous Source Current (Body Diode) | — | — | 42 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 360 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.3 | V | $T_J = 25^\circ\text{C}, I_S = 42A, V_{GS} = 0V$ ③ |
| t_{rr} | Reverse Recovery Time | — | 24 | 36 | ns | $T_J = 25^\circ\text{C}, I_F = 42A, V_{DD} = 28V$ |
| Q_{rr} | Reverse Recovery Charge | — | 20 | 30 | nC | $di/dt = 100A/\mu s$ ③ |
| t_{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D) | | | | |



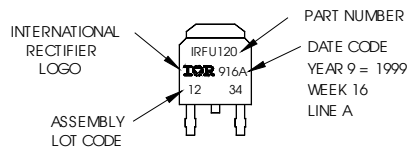
D-Pak (TO-252AA) Package Outline



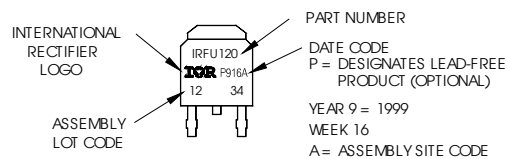
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 1999
IN THE ASSEMBLY LINE "A"

Note: "P" in assembly line position
indicates "Lead-Free"

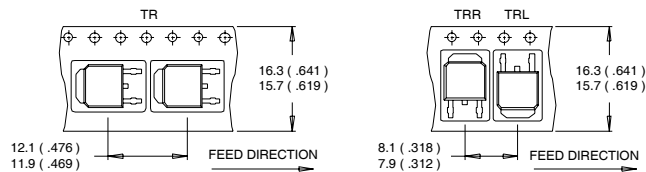


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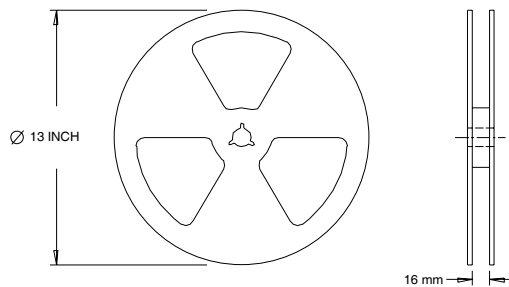


D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters



- NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
 2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
 3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



- NOTES :
1. OUTLINE CONFORMS TO EIA-481.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11).
- ② Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 0.13\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 42\text{A}$, $V_{GS} = 10\text{V}$. Part not recommended for use above this value.
- ③ Pulse width $\leq 1.0\text{ms}$; duty cycle $\leq 2\%$.
- ④ C_{OSS} eff. is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 80% V_{DSS} .
- ⑤ Limited by T_{Jmax} , see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.
- ⑥ This value determined from sample failure population. 100% tested to this value in production.
- ⑦ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994
- ⑧ R_θ is measured at T_J approximately 90°C

Data and specifications subject to change without notice.
 This product has been designed for the Automotive [Q101] market.