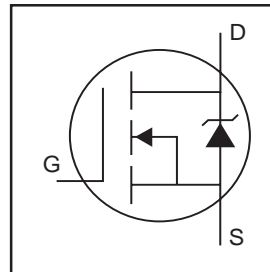


Features

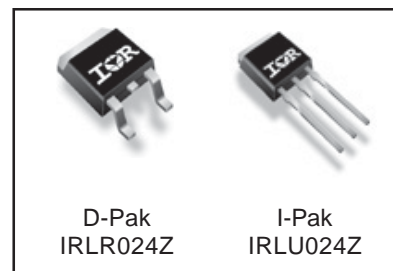
- Logic Level
- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free



| |
|--------------------------|
| $V_{DSS} = 55V$ |
| $R_{DS(on)} = 58m\Omega$ |
| $I_D = 16A$ |

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.



Absolute Maximum Ratings

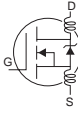
| | Parameter | Max. | Units |
|------------------------------|--|--------------------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited) | 16 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 11 | |
| I_{DM} | Pulsed Drain Current ① | 64 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 35 | W |
| | Linear Derating Factor | 0.23 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 16 | V |
| E_{AS} (Thermally limited) | Single Pulse Avalanche Energy ② | 25 | mJ |
| E_{AS} (Tested) | Single Pulse Avalanche Energy Tested Value ③ | 25 | |
| I_{AR} | Avalanche Current ④ | 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 | | |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|-----------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case | — | 4.28 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB mount) ② | — | 40 | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | 110 | |

HEXFET® is a registered trademark of International Rectifier.

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

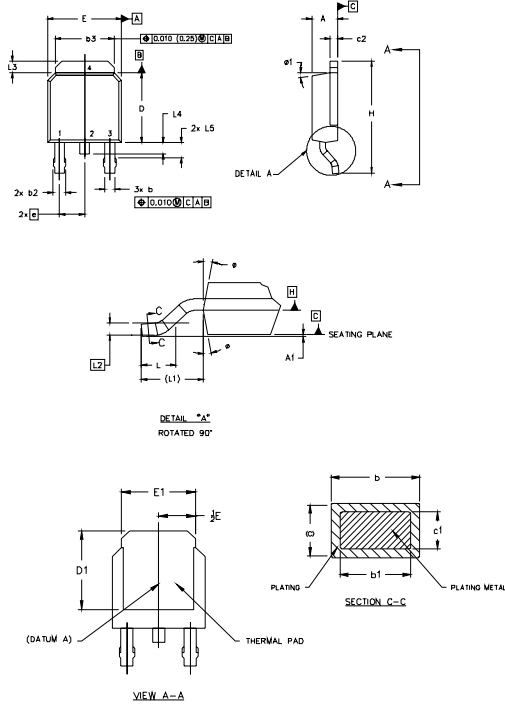
| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|--|--------------------------------------|------|-------|------|-------|---|
| V _{(BR)DSS} | Drain-to-Source Breakdown Voltage | 55 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| ΔV _{(BR)DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | — | 0.053 | — | V/°C | Reference to 25°C, I _D = 1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 46 | 58 | mΩ | V _{GS} = 10V, I _D = 9.6A ③ |
| | | — | — | 80 | | V _{GS} = 5.0V, I _D = 5.0A ③ |
| | | — | — | 100 | | V _{GS} = 4.5V, I _D = 3.0A ③ |
| V _{GS(th)} | Gate Threshold Voltage | 1.0 | — | 3.0 | V | V _{DS} = V _{GS} , I _D = 250μA |
| g _{fs} | Forward Transconductance | 7.4 | — | — | S | V _{DS} = 25V, I _D = 9.6A |
| 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°C |
| I _{GSS} | Gate-to-Source Forward Leakage | — | — | 200 | nA | V _{GS} = 16V |
| | Gate-to-Source Reverse Leakage | — | — | -200 | | V _{GS} = -16V |
| Q _g | Total Gate Charge | — | 6.6 | 9.9 | nC | I _D = 5.0A |
| Q _{gs} | Gate-to-Source Charge | — | 1.6 | — | | V _{DS} = 44V |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | — | 3.9 | — | | V _{GS} = 5.0V ③ |
| t _{d(on)} | Turn-On Delay Time | — | 8.2 | — | ns | V _{DD} = 28V |
| t _r | Rise Time | — | 43 | — | | I _D = 5.0A |
| t _{d(off)} | Turn-Off Delay Time | — | 19 | — | | R _G = 28 Ω |
| t _f | Fall Time | — | 16 | — | | V _{GS} = 5.0V 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 | — | 380 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 62 | — | | V _{DS} = 25V |
| C _{rss} | Reverse Transfer Capacitance | — | 39 | — | | f = 1.0MHz |
| C _{oss} | Output Capacitance | — | 180 | — | | V _{GS} = 0V, V _{DS} = 1.0V, f = 1.0MHz |
| C _{oss} | Output Capacitance | — | 50 | — | | V _{GS} = 0V, V _{DS} = 44V, f = 1.0MHz |
| C _{oss eff.} | Effective Output Capacitance | — | 81 | — | | V _{GS} = 0V, V _{DS} = 0V to 44V ④ |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|---|--|------|------|-------|---|
| I _S | Continuous Source Current (Body Diode) | — | — | 16 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | 64 | | |
| V _{SD} | Diode Forward Voltage | — | — | 1.3 | V | T _J = 25°C, I _S = 9.6A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 16 | 24 | ns | T _J = 25°C, I _F = 9.6A, V _{DD} = 28V |
| Q _{rr} | Reverse Recovery Charge | — | 11 | 17 | nC | di/dt = 100A/μs ③ |
| t _{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



- NOTES:
- 1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
 - 2.0 DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
 - 3.0 LEAD DIMENSION UNCONTROLLED IN L5
 - 4.0 DIMENSION D1 AND E1 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD
 - 5.0 SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 [0.127] AND .010 [0.2540] FROM THE LEAD TIP.
 - 6.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
 - 7.0 OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

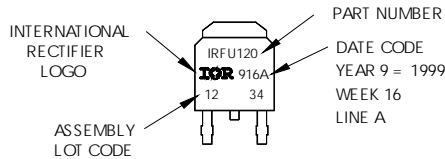
| SYMBOL | DIMENSIONS | | | | NOTES |
|--------|-------------|-------|-----------|-------|-------|
| | MILLIMETERS | | INCHES | | |
| | MIN. | MAX. | MIN. | MAX. | |
| A | 2.18 | 2.39 | .086 | .094 | |
| A1 | | 0.13 | | .005 | |
| b | 0.64 | 0.89 | .025 | .035 | 5 |
| b1 | 0.64 | 0.79 | .025 | 0.031 | 5 |
| b2 | 0.76 | 1.14 | .030 | .045 | |
| b3 | 4.95 | 5.46 | .195 | .215 | |
| c | 0.46 | 0.61 | .018 | .024 | 5 |
| c1 | 0.41 | 0.56 | .016 | .022 | 5 |
| c2 | .046 | 0.89 | .018 | .035 | 5 |
| D | 5.97 | 6.22 | .235 | .245 | 6 |
| D1 | 5.21 | - | .205 | - | 4 |
| E | 6.35 | 6.73 | .250 | .265 | 6 |
| E1 | 4.32 | - | .170 | - | 4 |
| e | 2.29 | | .090 BSC | | |
| H | 9.40 | 10.41 | .370 | .410 | |
| L | 1.40 | 1.78 | .055 | .070 | |
| L1 | 2.74 REF. | | .106 REF. | | |
| L2 | 0.051 BSC | | .020 BSC | | |
| L3 | 0.89 | 1.27 | .035 | .050 | |
| L4 | | 1.02 | | .040 | |
| L5 | 1.14 | 1.52 | .045 | .060 | 3 |
| e | 0" | 10" | 0" | 10" | |
| e1 | 0" | 15" | 0" | 15" | |

- LEAD ASSIGNMENTS
- HEXFET
- 1.- GATE
 - 2.- DRAIN
 - 3.- SOURCE
 - 4.- DRAIN
- IGBTs, CoPACK
- 1.- GATE
 - 2.- COLLECTOR
 - 3.- EMITTER
 - 4.- COLLECTOR

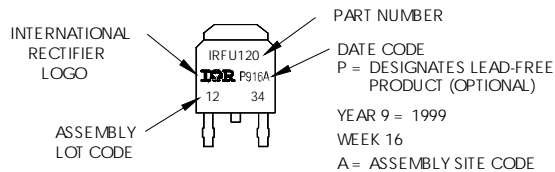
D-Pak (TO-252AA) Part Marking Information

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"

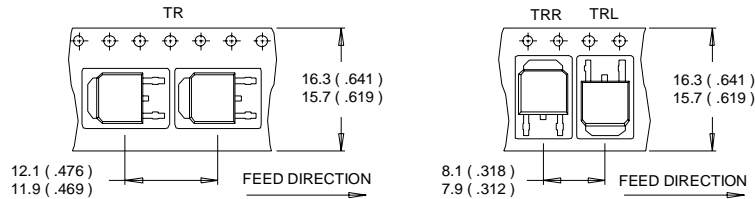


OR

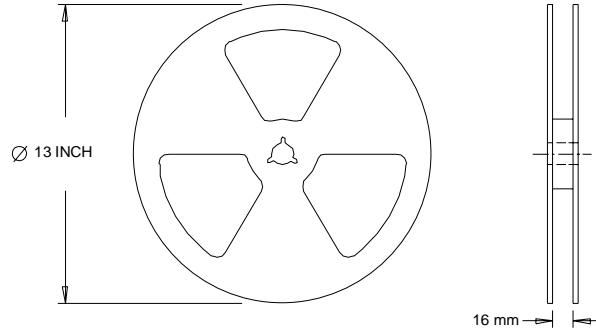


D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



- 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 $T_J = 25^\circ\text{C}$, $L = 0.54\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 9.6\text{A}$, $V_{GS} = 10\text{V}$. 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 of approximately 90°C .

Data and specifications subject to change without notice.
 This product has been designed and qualified for the Automotive [Q101] market.
 Qualification Standards can be found on IR's Web site.