PD - 94373

International
IOR Rectifier

SMPS MOSFET

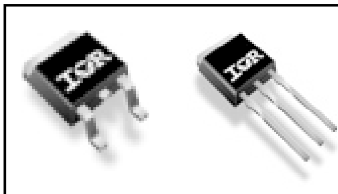
IRFR3412
IRFU3412

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ max	I_D
100V	**0.025Ω**	**48A⑥**

Applications
- Switch Mode Power Supply (SMPS)
- Motor Drive
- Bridge Converters
- All Zero Voltage Switching

Benefits
- Low Gate Charge Qg results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Enhanced Body Diode dv/dt Capability

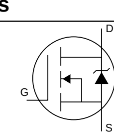


D-Pak IRFR3412 | I-Pak IRFU3412

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	48⑥	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	34⑥	
I_{DM}	Pulsed Drain Current ①	190	
P_D @T_C = 25°C	Power Dissipation	140	W
	Linear Derating Factor	0.95	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery dv/dt ③	6.4	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 second	300(1.6mm from case)	
	Mounting torqe, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	48⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	190		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 29A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	68	100	ns	T_J = 125°C, I_F = 29A
Q_{rr}	Reverse RecoveryCharge	—	160	240	nC	di/dt = 100A/μs ④
I_{RRM}	Reverse RecoveryCurrent	—	4.5	6.8	A	
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

1/22/02

Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	——	——	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.10	——	V/°C	Reference to 25°C, I_D = 1mA ⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	——	0.025	Ω	V_{GS} = 10V, I_D = 29A ④
$V_{GS(th)}$	Gate Threshold Voltage	3.5	——	5.5	V	V_{DS} = V_{GS}, I_D = 250µA
I_{DSS}	Drain-to-Source Leakage Current	——	——	1.0	µA	V_{DS} = 95V, V_{GS} = 0V
		——	——	250		V_{DS} = 80V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-100		V_{GS} = -20V

Dynamic @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	25	——	——	S	V_{DS} = 50V, I_D = 29A
Q_g	Total Gate Charge	——	59	89	nC	I_D = 29A
Q_{gs}	Gate-to-Source Charge	——	21	32		V_{DS} = 50V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	17	26		V_{GS} = 10V, ④
$t_{d(on)}$	Turn-On Delay Time	——	19	——	ns	V_{DD} = 50V
t_r	Rise Time	——	68	——		I_D = 29A
$t_{d(off)}$	Turn-Off Delay Time	——	44	——		R_G = 6.8Ω
t_f	Fall Time	——	37	——		V_{GS} = 10V ④
C_{iss}	Input Capacitance	——	3430	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	270	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	150	——		ƒ = 1.0MHz
C_{oss}	Output Capacitance	——	1040	——		V_{GS} = 0V, V_{DS} = 1.0V, ƒ = 1.0MHz
C_{oss}	Output Capacitance	——	170	——		V_{GS} = 0V, V_{DS} = 80V, ƒ = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	——	270	——		V_{GS} = 0V, V_{DS} = 0V to 80V ⑤

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	——	160	mJ
I_{AR}	Avalanche Current①	——	29	A
E_{AR}	Repetitive Avalanche Energy①	——	14	mJ

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	1.05	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)*	——	50	
$R_{\theta JA}$	Junction-to-Ambient	——	110	

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See Fig. 11)

② Starting T_J = 25°C, L = 0.38mH, R_G = 25Ω, I_{AS} = 29A, (See Figure 12a)

③ $I_{SD} \leq$ 29A, di/dt ≤ 420A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 150°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

⑤ 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}

⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.

* When mounted on 1" square PCB (FR-4 or G-10 Material) .
For recommended footprint and soldering techniques refer to application note #AN-994

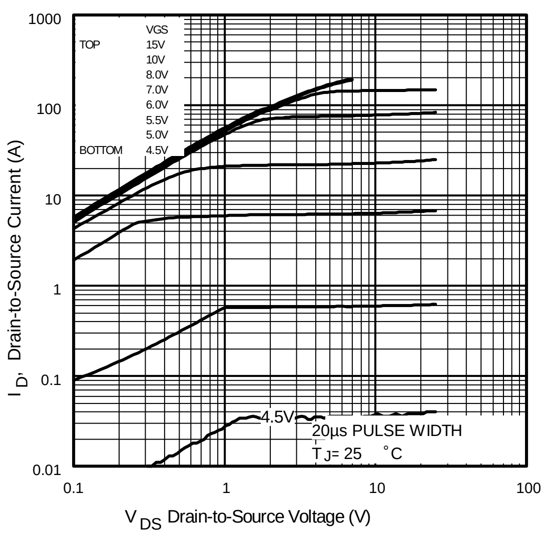


Fig 1. Typical Output Characteristics

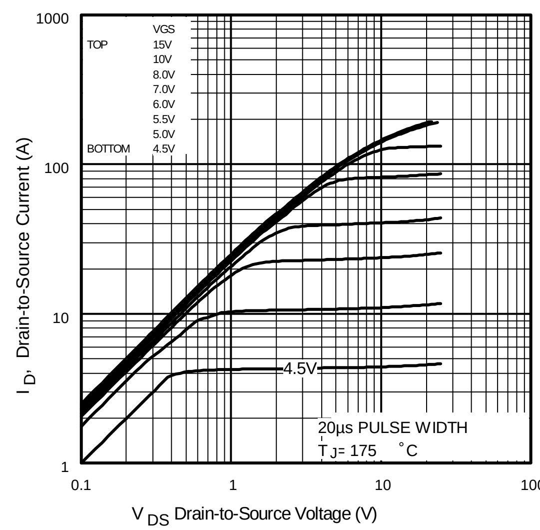


Fig 2. Typical Output Characteristics

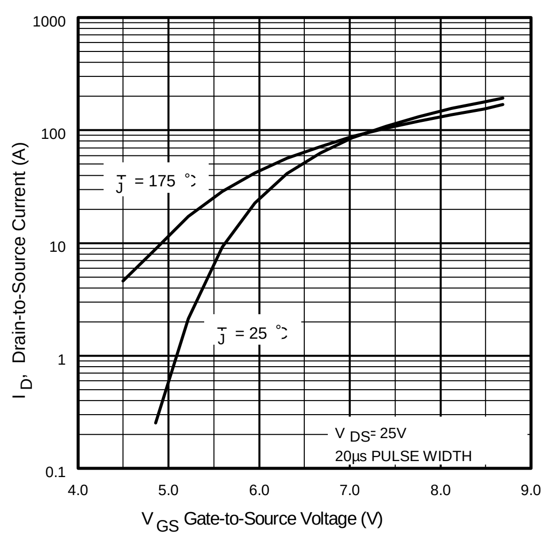


Fig 3. Typical Transfer Characteristics

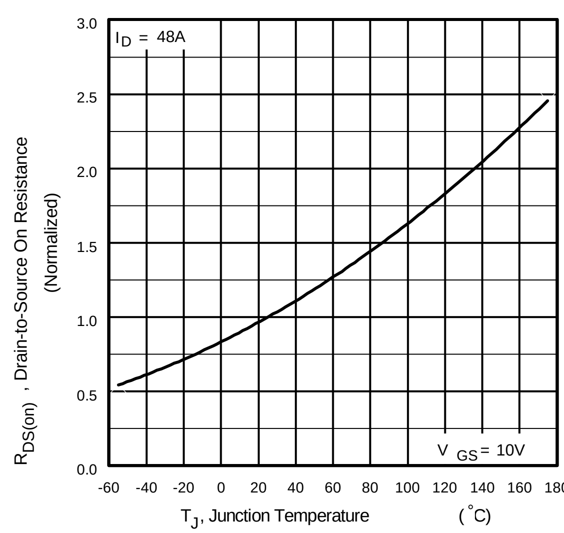


Fig 4. Normalized On-Resistance
Vs. Temperature

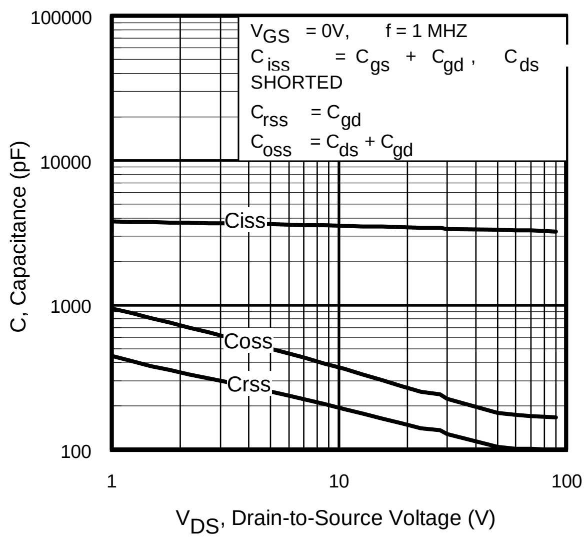


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

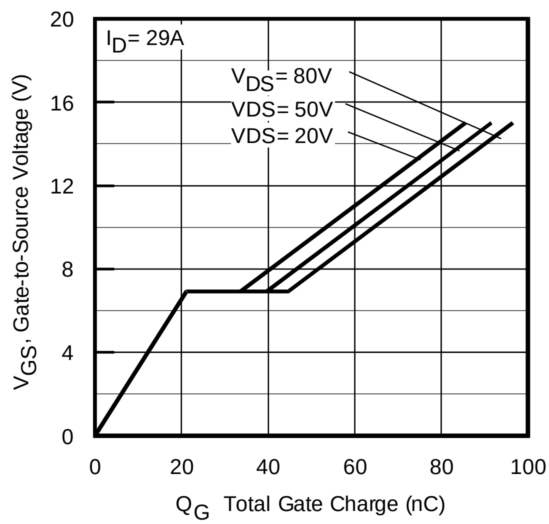


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

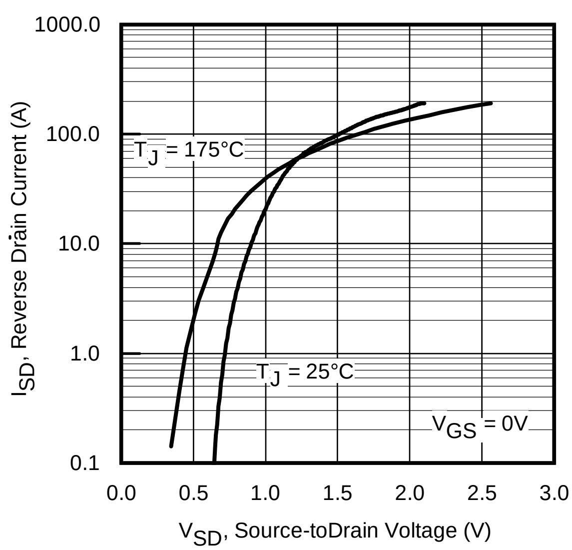


Fig 7. Typical Source-Drain Diode Forward Voltage

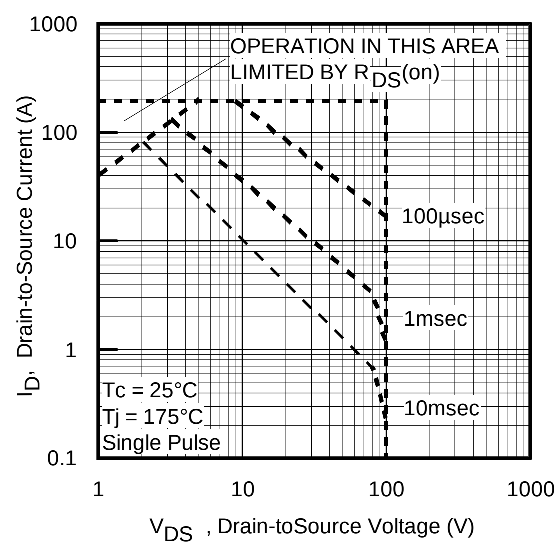


Fig 8. Maximum Safe Operating Area

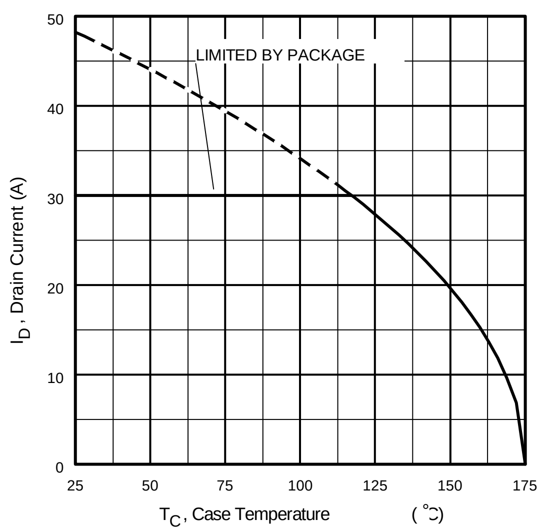


Fig 9. Maximum Drain Current Vs. Case Temperature

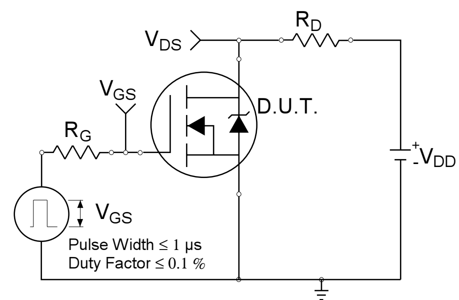


Fig 10a. Switching Time Test Circuit

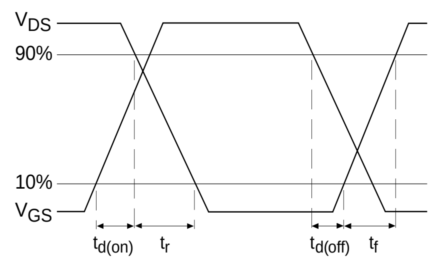


Fig 10b. Switching Time Waveforms

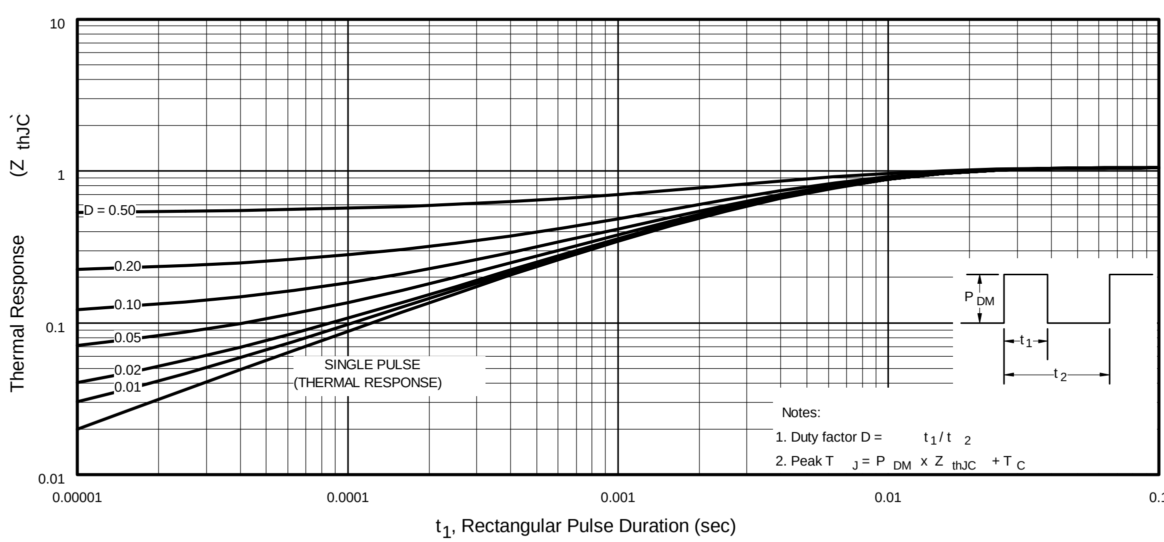


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

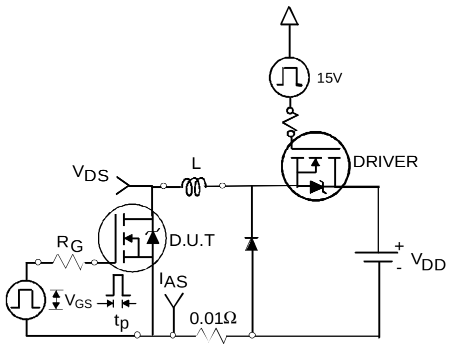


Fig 12a. Unclamped Inductive Test Circuit

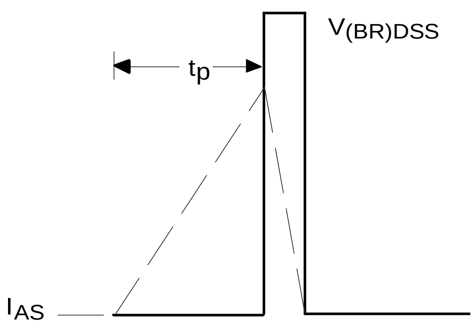


Fig 12b. Unclamped Inductive Waveforms

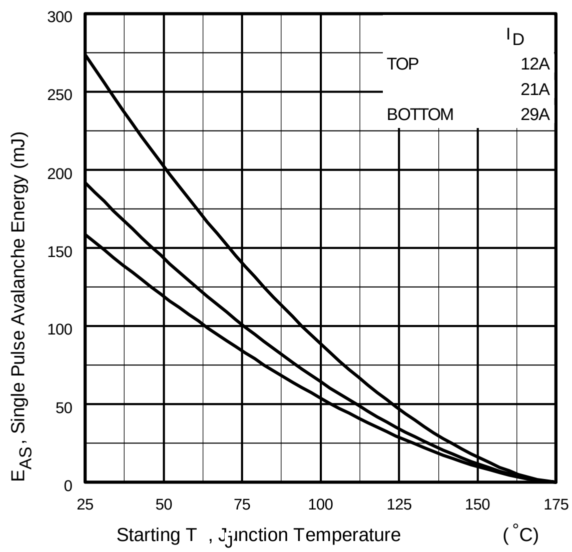


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

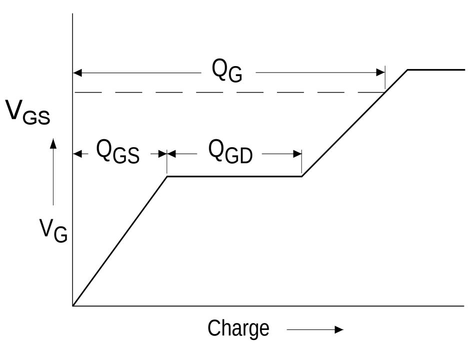


Fig 13a. Basic Gate Charge Waveform

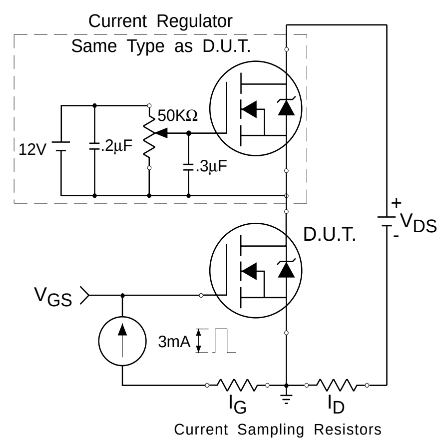
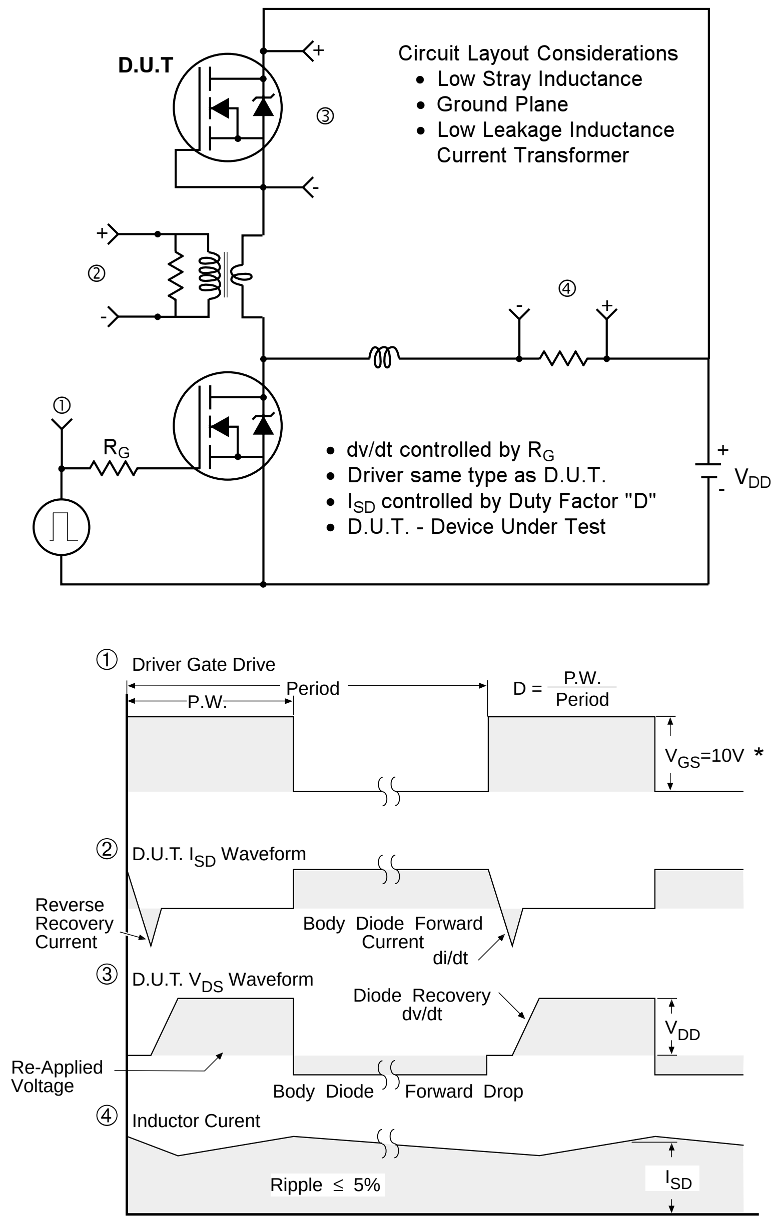


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit

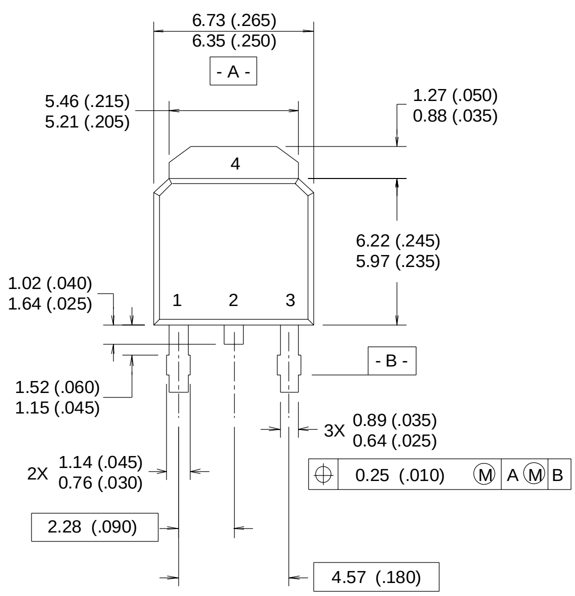


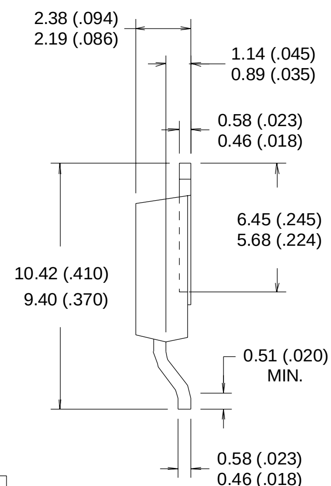
* V_{GS} = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

TO-252AA (D-Pak) Package Outline

Dimensions are shown in millimeters (inches)



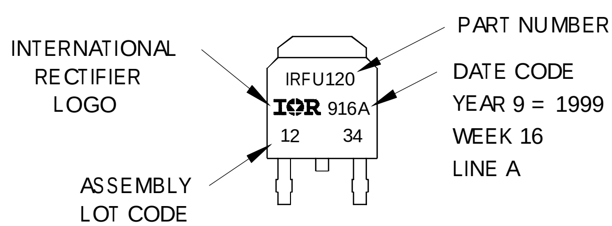


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

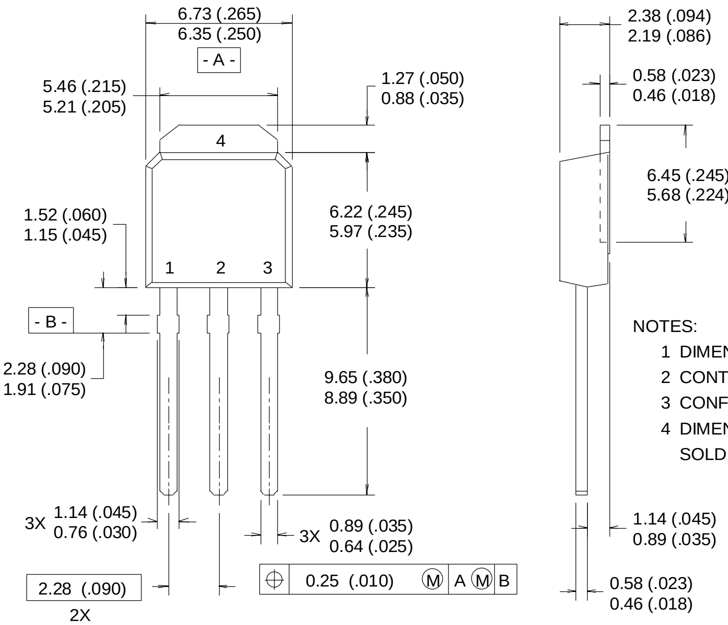
TO-252AA (D-Pak) Part Marking Information

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



TO-251AA (I-Pak) Package Outline

Dimensions are shown in millimeters (inches)

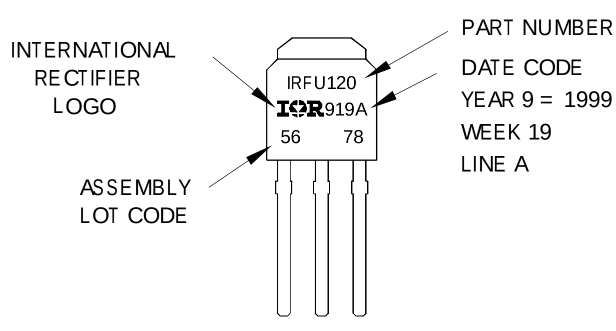


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

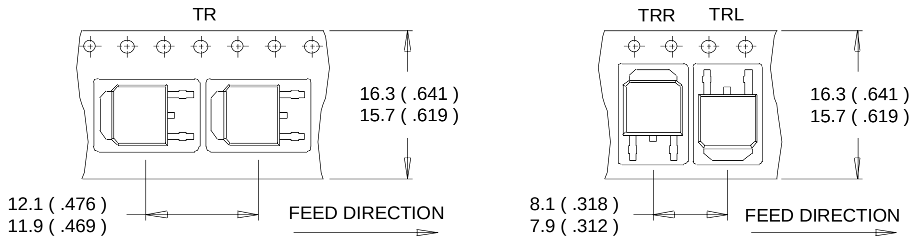
TO-251AA (I-Pak) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 5678
ASSEMBLED ON WW 19, 1999
IN THE ASSEMBLY LINE "A"

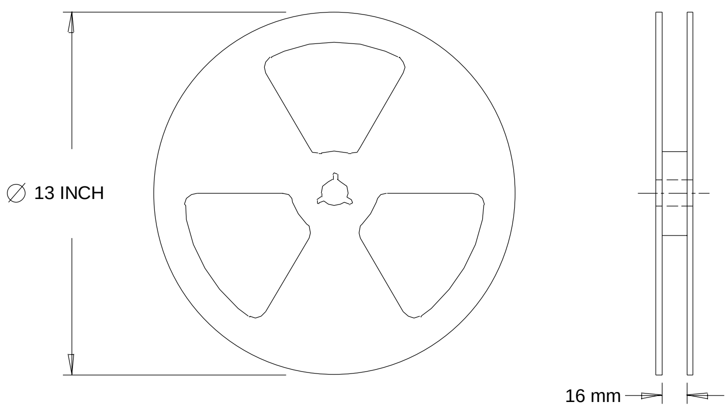


D-Pak (TO-252AA) Tape & Reel Information

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.

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

International
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.1/02