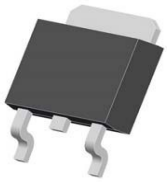
KERSEMI ELECTRONIC CO.,LTD.

IRFR3410
IRFU3410

D-Pak
IRFR3410

I-Pak
IRFU3410



Applications

- High frequency DC-DC converters

Benefits

- Low Gate-to-Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective C_{OSS} to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current

V_{DSS}	$R_{DS(on)}$ max	I_D
100V	**39mΩ**	**31A⑥**

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	100	V
V_{GS}	Gate-to-Source Voltage	± 20	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	31⑥	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	22	
I_{DM}	Pulsed Drain Current①	125	
P_D @T_C = 25°C	Maximum Power Dissipation	110	W
P_D @T_A = 25°C	Maximum Power Dissipation	3.0	
	Linear Derating Factor	0.71	mW°C
dv/dt	Peak Diode Recovery dv/dt ③	15	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)*	——	40	
$R_{\theta JA}$	Junction-to-Ambient	——	110	

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	——	0.11	——	V/°C	Reference to 25°C, I_D = 1mA ④
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	34	39	mΩ	V_{GS} = 10V, I_D = 18A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	——	4.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{DSS}	Drain-to-Source Leakage Current	——	——	20	μA	V_{DS} = 100V, V_{GS} = 0V
		——	——	250		V_{DS} = 80V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	200	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-200		V_{GS} = -20V

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	33	——	——	S	V_{DS} = 25V, I_D = 18A
Q_g	Total Gate Charge	——	37	56	nC	I_D = 18A
Q_{gs}	Gate-to-Source Charge	——	10	——		V_{DS} = 50V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	11	——		V_{GS} = 10V, ④
$t_{d(on)}$	Turn-On Delay Time	——	12	——	ns	V_{DD} = 50V
t_r	Rise Time	——	27	——		I_D = 18A
$t_{d(off)}$	Turn-Off Delay Time	——	40	——		R_G = 9.1Ω
t_f	Fall Time	——	13	——		V_{GS} = 10V ④
C_{iss}	Input Capacitance	——	1690	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	220	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	26	——		f = 1.0MHz
C_{oss}	Output Capacitance	——	1640	——		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	——	130	——		V_{GS} = 0V, V_{DS} = 80V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	——	250	——		V_{GS} = 0V, V_{DS} = 0V to 80V ⑤

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	——	140	mJ
I_{AR}	Avalanche Current①	——	18	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	31⑥	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	125		
V_{SD}	Diode Forward Voltage	——	——	1.3	V	T_J = 25°C, I_S = 18A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	——	84	——	ns	T_J = 25°C, I_F = 18A
Q_{rr}	Reverse RecoveryCharge	——	260	——	nC	di/dt = 100A/μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

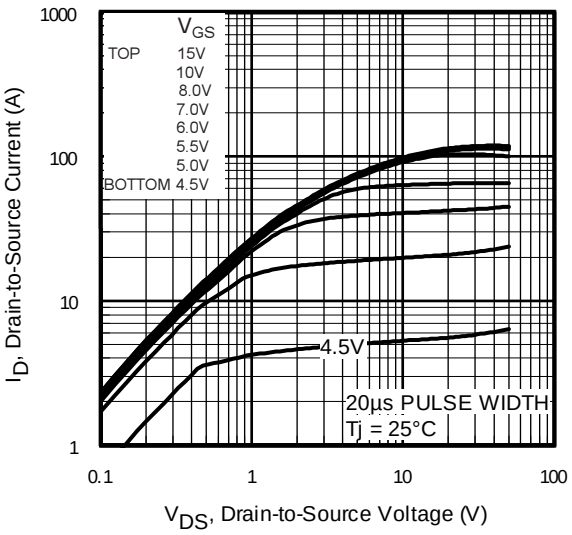


Fig 1. Typical Output Characteristics

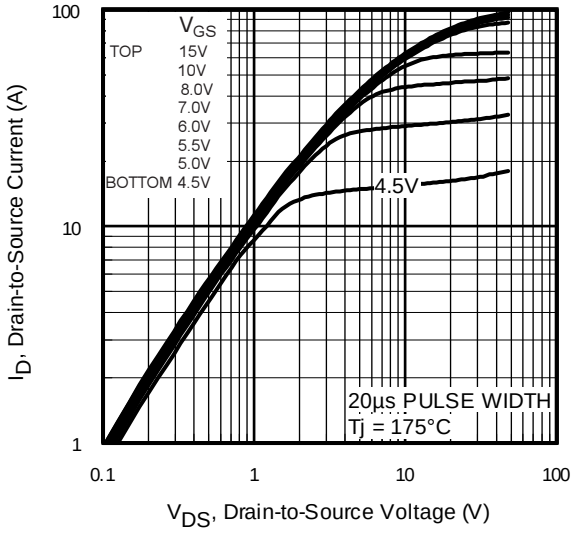


Fig 2. Typical Output Characteristics

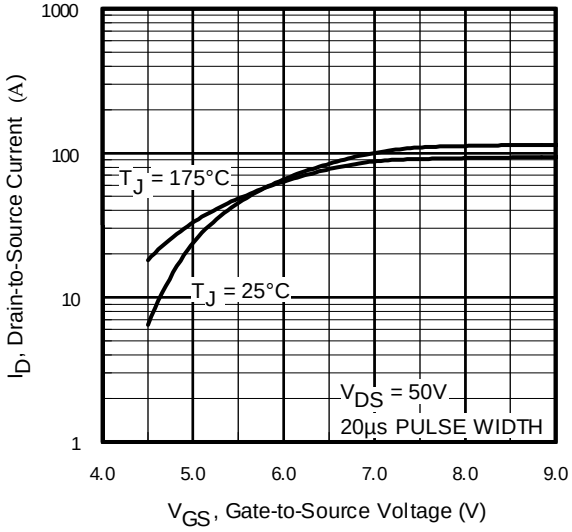


Fig 3. Typical Transfer Characteristics

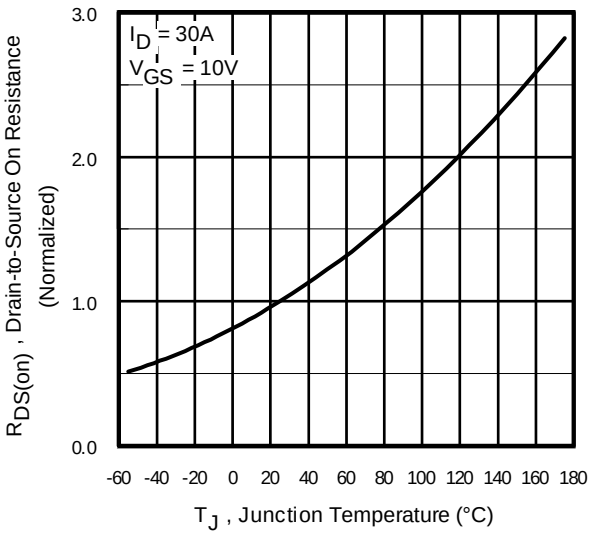


Fig 4. Normalized On-Resistance Vs. Temperature

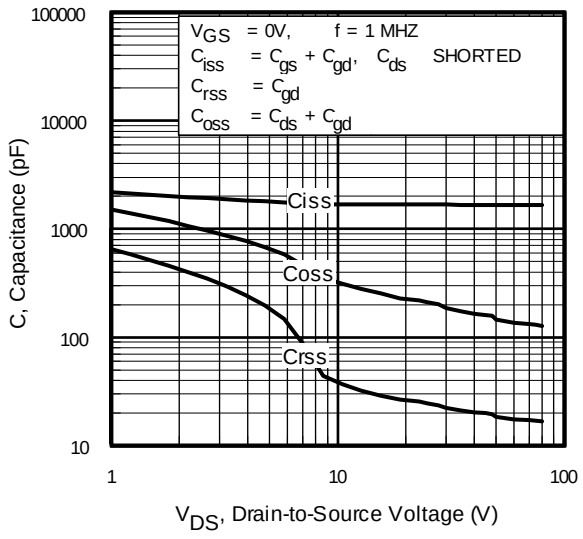


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

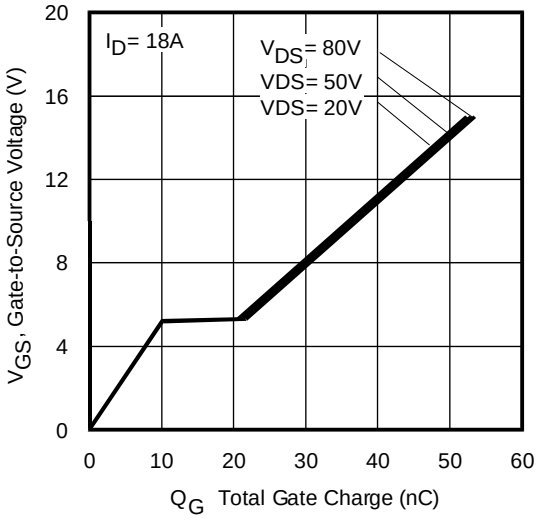


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

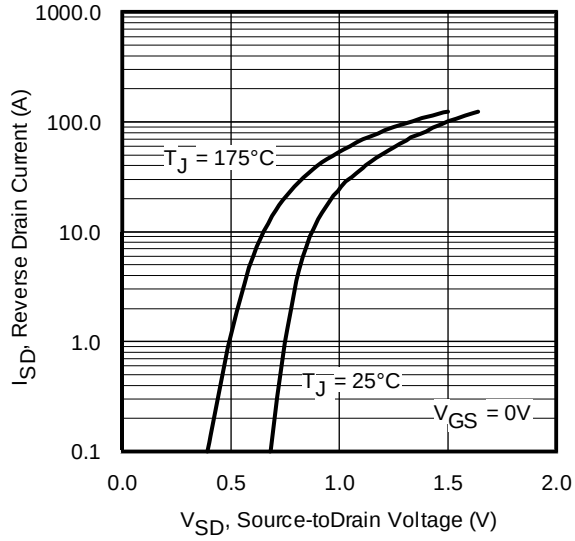


Fig 7. Typical Source-Drain Diode Forward Voltage

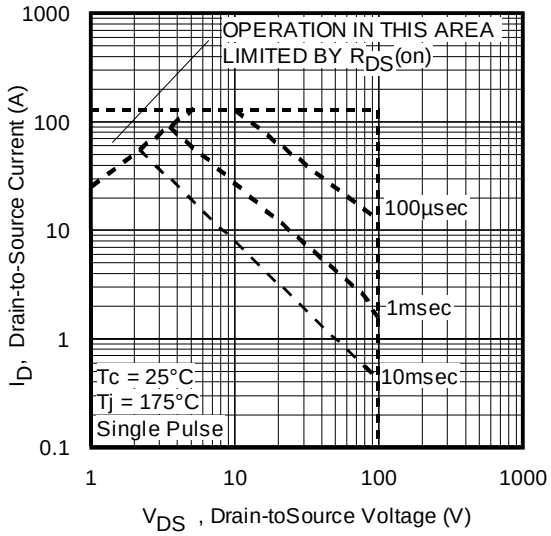


Fig 8. Maximum Safe Operating Area

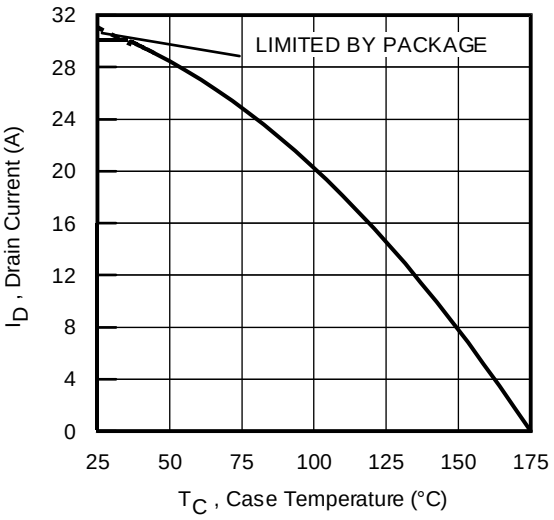


Fig 9. Maximum Drain Current Vs. Case Temperature

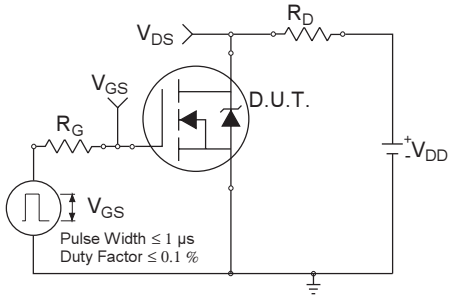


Fig 10a. Switching Time Test Circuit

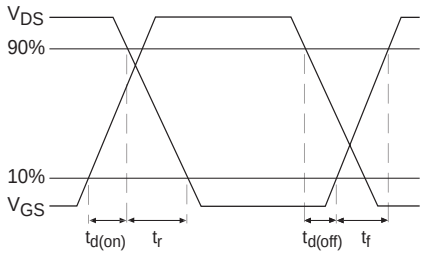


Fig 10b. Switching Time Waveforms

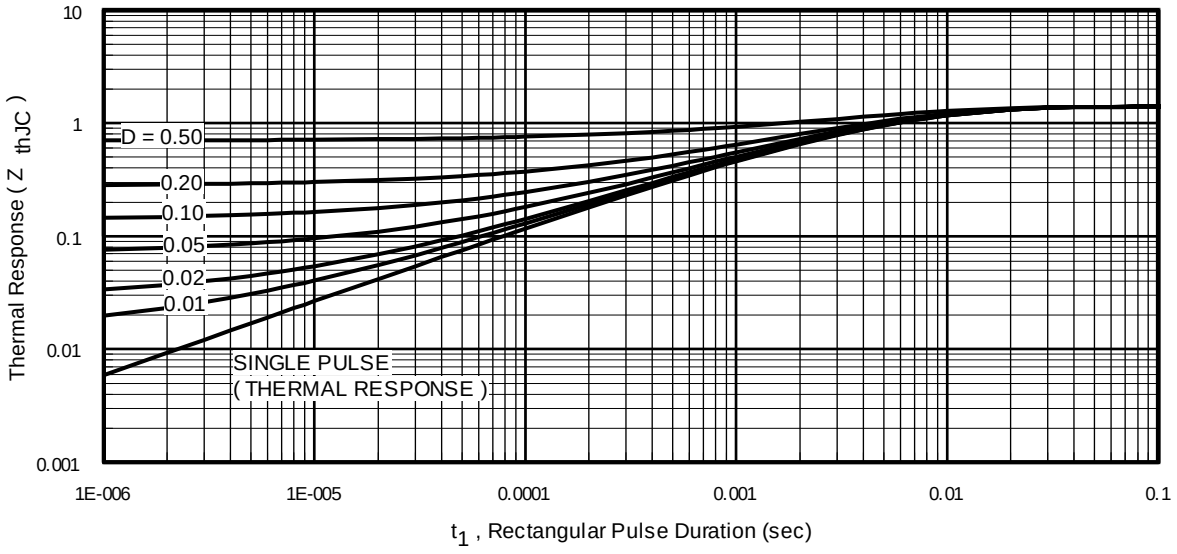


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

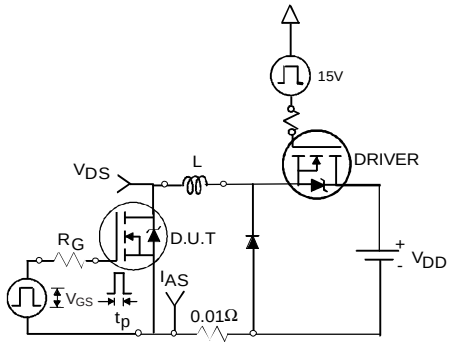


Fig 12a. Unclamped Inductive Test Circuit

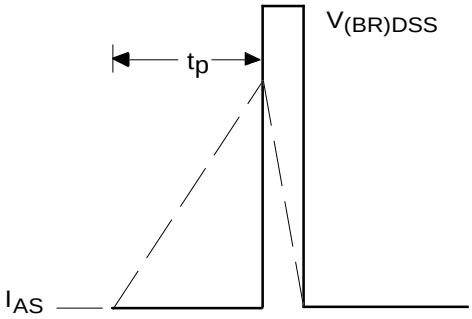


Fig 12b. Unclamped Inductive Waveforms

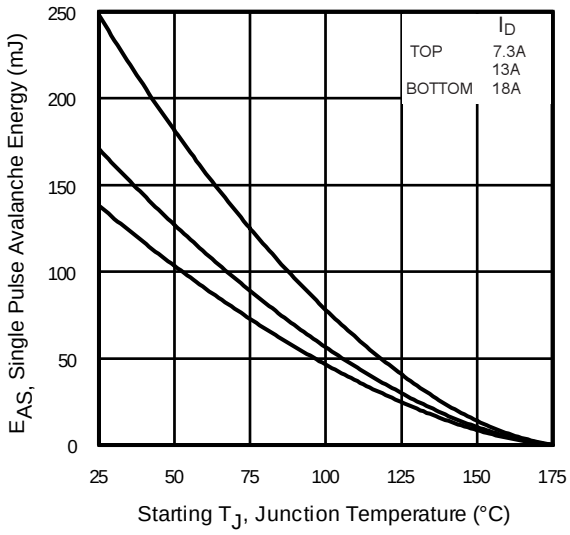


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

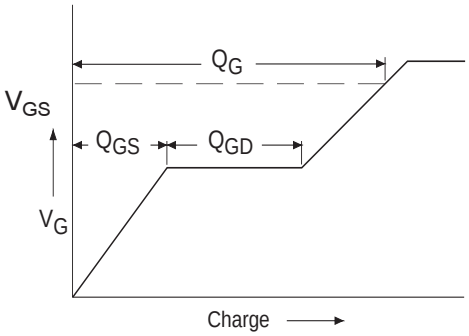


Fig 13a. Basic Gate Charge Waveform

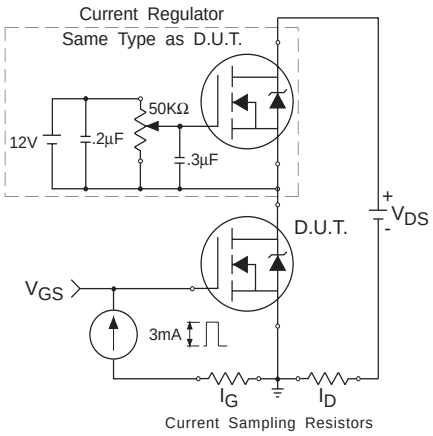


Fig 13b. Gate Charge Test Circuit

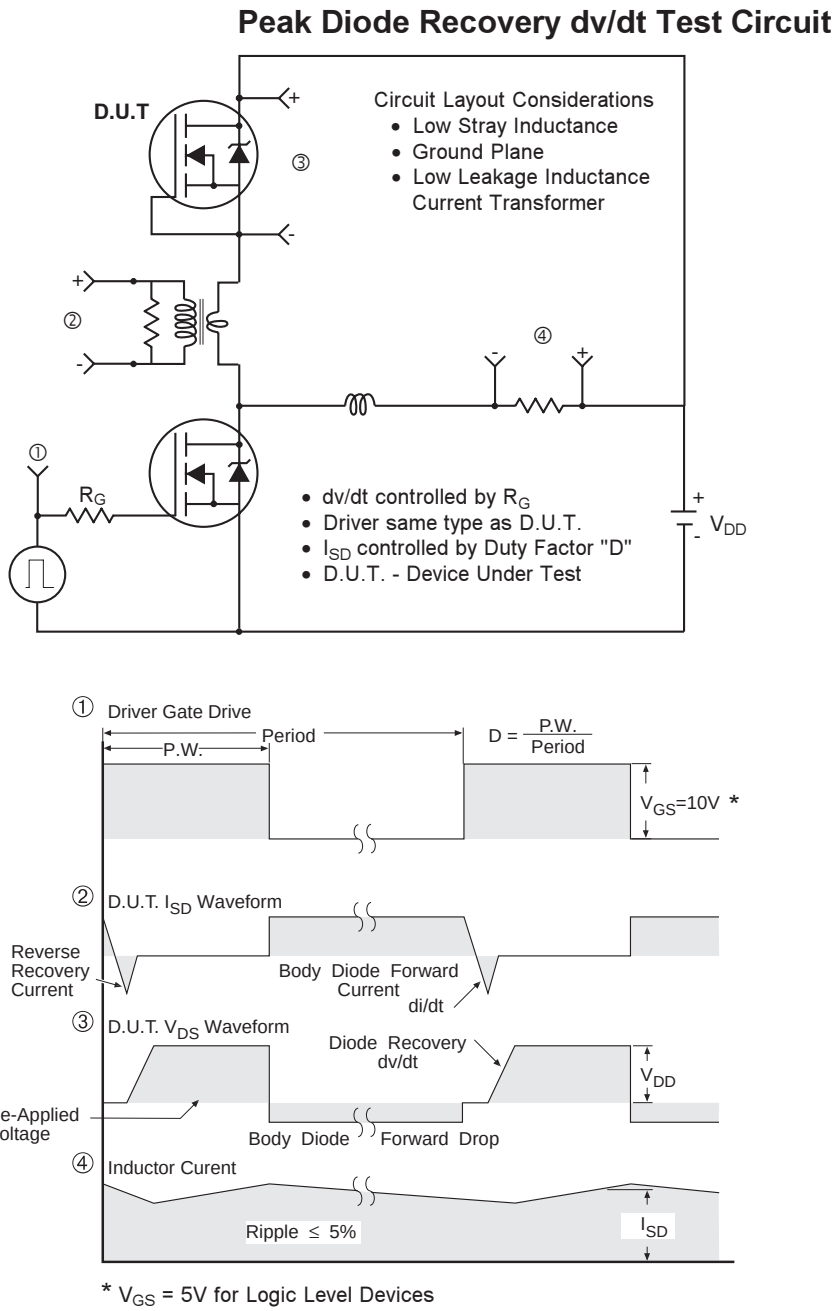
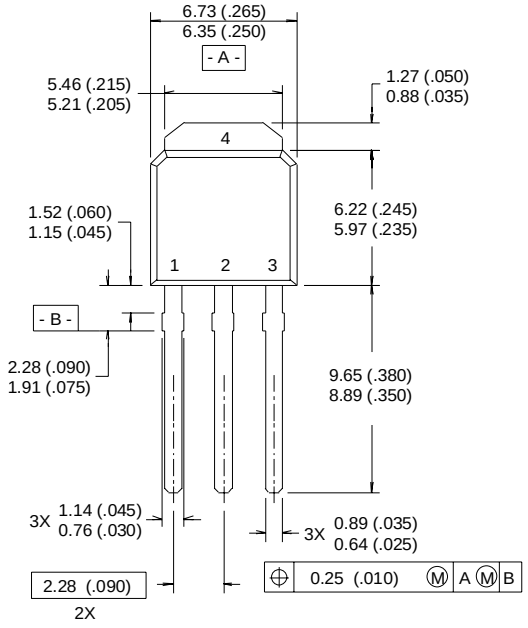
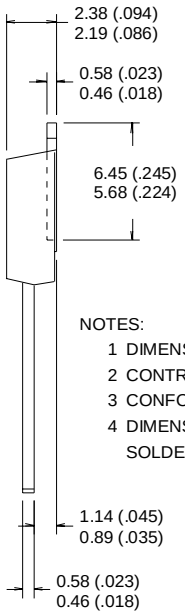


Fig 14. For N-Channel HEXFET® Power MOSFETs

TO-251AA (I-Pak) Package Outline

Dimensions are shown in millimeters (inches)



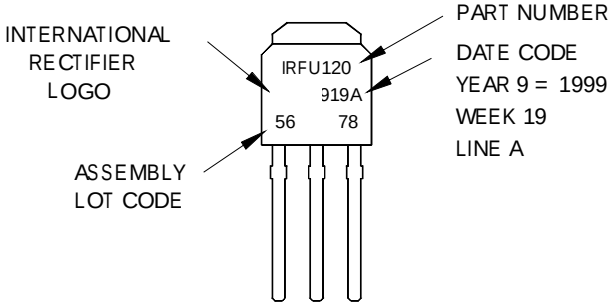


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

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).

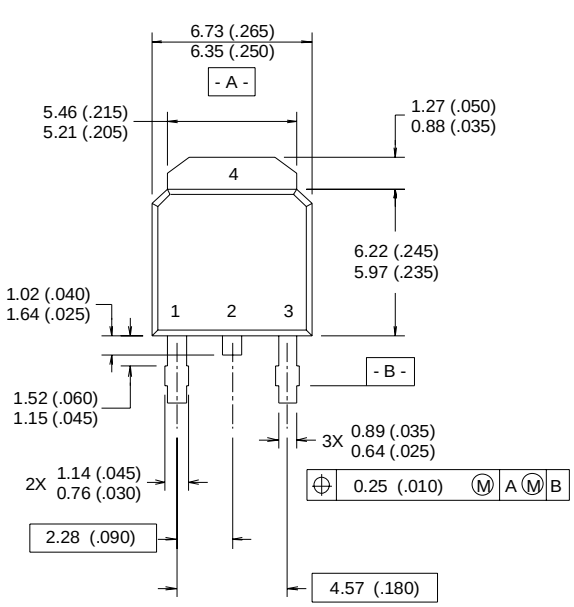
TO-251AA (I-Pak) Part Marking Information

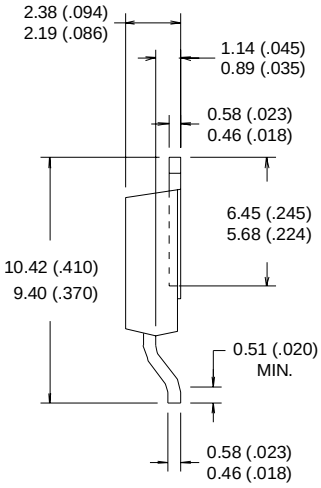
EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 5678
ASSEMBLED ON WW 19, 1999
IN THE ASSEMBLY LINE "A"



TO-252AA (D-Pak) Package Outline

Dimensions are shown in millimeters (inches)



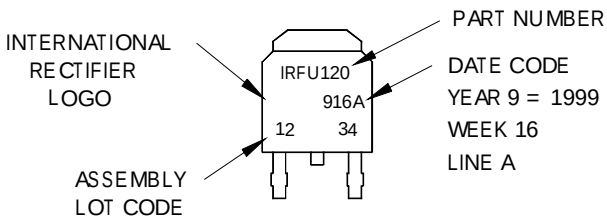


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

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).

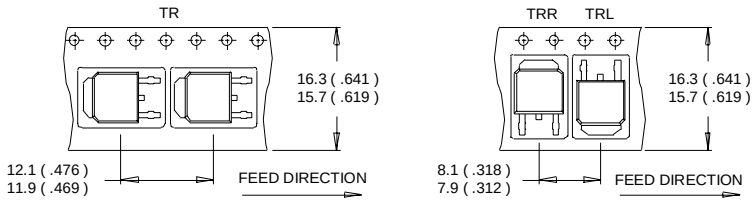
TO-252AA (D-Pak) Part Marking Information

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

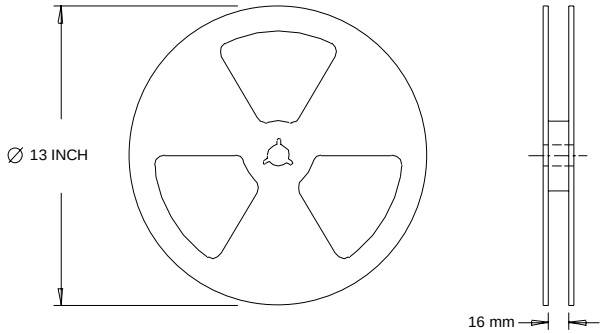


D-Pak (TO-252AA) Tape & Reel Information

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.

② Starting T_J = 25°C, L = 0.85mH R_G = 25Ω, I_{AS} = 18A.

③ I_{SD} ≤ 18A, di/dt ≤ 360A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°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.