PD - 96433A

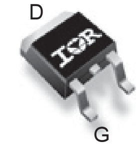
International
IOR Rectifier

IRFR825TRPbF

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ typ.	Trr typ.	I_D
500V	1.05Ω	92ns	6.0A

Applications
- Zero Voltage Switching SMPS
- Uninterruptible Power Supplies
- Motor Control applications



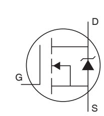
D-Pak
IRFR825TRPbF

Features and Benefits
- Fast body diode eliminates the need for external diodes in ZVS applications.
- Lower Gate charge results in simpler drive requirements.
- Higher Gate voltage threshold offers improved noise immunity.

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	6.0	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	3.9	
I_{DM}	Pulsed Drain Current ①	24	
P_D @T_C = 25°C	Power Dissipation	119	W
	Linear Derating Factor	1.0	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery dv/dt ③	9.9	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	6.0	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	24		
V_{SD}	Diode Forward Voltage	—	—	1.2	V	T_J = 25°C, I_S = 6.0A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	92	138	ns	T_J = 25°C, I_F = 6.0A
		—	152	228		T_J = 125°C, di/dt = 100A/μs ④
Q_{rr}	Reverse Recovery Charge	—	167	251	nC	T_J = 25°C, I_S = 6.0A, V_{GS} = 0V ④
		—	292	438		T_J = 125°C, di/dt = 100A/μs ④
I_{RRM}	Reverse Recovery Current	—	3.6	5.4	A	T_J = 25°C, I_S = 6.0A, V_{GS} = 0V di/dt = 100A/μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes ① through ⑦ are on page 2

12/19/12

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	500	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.33	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	1.05	1.3	Ω	V_{GS} = 10V, I_D = 3.7A ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	——	5.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{DSS}	Drain-to-Source Leakage Current	——	——	25	μA	V_{DS} = 500V, V_{GS} = 0V
		——	——	2.0	mA	V_{DS} = 400V, V_{GS} = 0V, T_J = 125°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
gfs	Forward Transconductance	7.5	——	——	S	V_{DS} = 50V, I_D = 3.7A
Q_g	Total Gate Charge	——	——	34	nC	I_D = 6.0A
Q_{gs}	Gate-to-Source Charge	——	——	11		V_{DS} = 400V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	——	14		V_{GS} = 10V, See Fig.14a &14b ④
$t_{d(on)}$	Turn-On Delay Time	——	8.5	——	ns	V_{DD} = 250V
t_r	Rise Time	——	25	——		I_D = 6.0A
$t_{d(off)}$	Turn-Off Delay Time	——	30	——		R_G =7.5Ω
t_f	Fall Time	——	20	——		V_{GS} = 10V, See Fig. 15a & 15b ④
C_{iss}	Input Capacitance	——	1346	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	76	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	15	——		ƒ = 1.0KHz, See Fig. 5
C_{oss}	Output Capacitance	——	1231	——		V_{GS} = 0V, V_{DS} = 1.0V, ƒ = 1.0MHz
C_{oss}	Output Capacitance	——	25	——		V_{GS} = 0V, V_{DS} = 400V, ƒ = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	——	51	——		V_{GS} = 0V,V_{DS} = 0V to 400V ⑤
C_{oss} eff. (ER)	Effective Output Capacitance (Energy Related)	——	43	——		

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	——	178	mJ
I_{AR}	Avalanche Current ①	——	3	A
E_{AR}	Repetitive Avalanche Energy ①	——	11.9	mJ

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case⑥	——	1.05	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ⑦	——	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 = 40mH, R_G = 25Ω,I_{AS} = 3.0A. (See Figure 13).
③ I_{SD} = 6.0A, di/dt ≤ 416A/μs, $V_{DD}V_{(BR)DSS}$,T_J ≤ 150°C.
④ Pulse width ≤ 300μs; duty cycle ≤ 2%.
⑤ C_{oss} eff. is a fixed capacitance that gives the same charging timeas C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}. C_{oss} eff.(ER) is a fixed capacitance that stores the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.
⑥ R_θ is measured at T_J approximately 90°C
⑦ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniquea refer to applocation note # AN- 994 echniques refer to application note #AN-994.

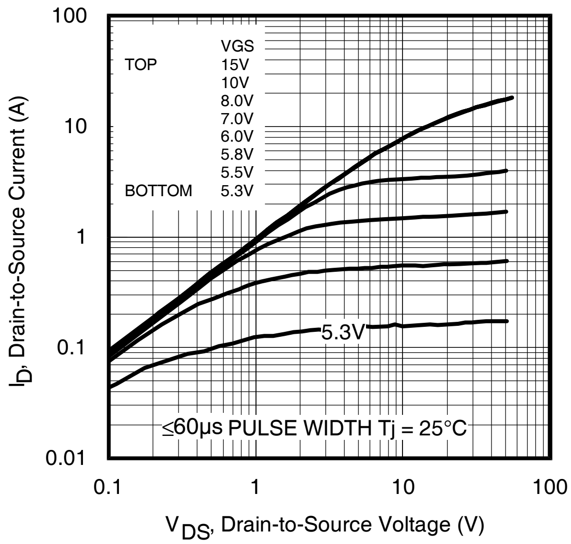


Fig 1. Typical Output Characteristics

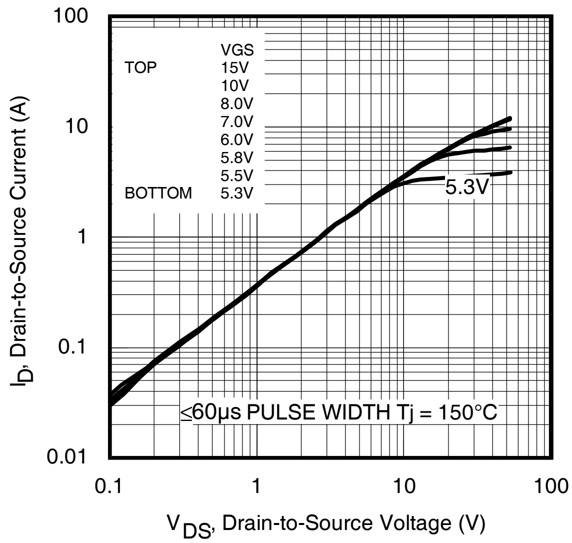


Fig 2. Typical Output Characteristics

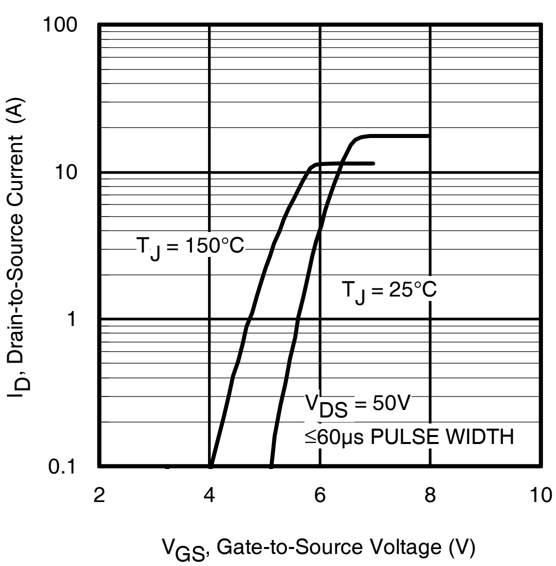


Fig 3. Typical Transfer Characteristics

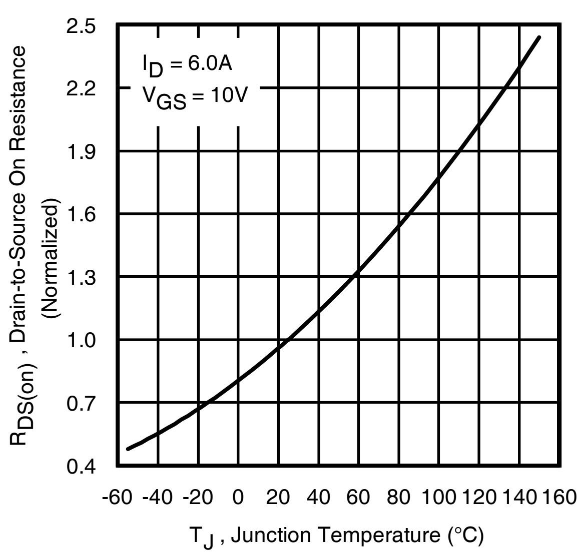


Fig 4. Normalized On-Resistance Vs. Temperature

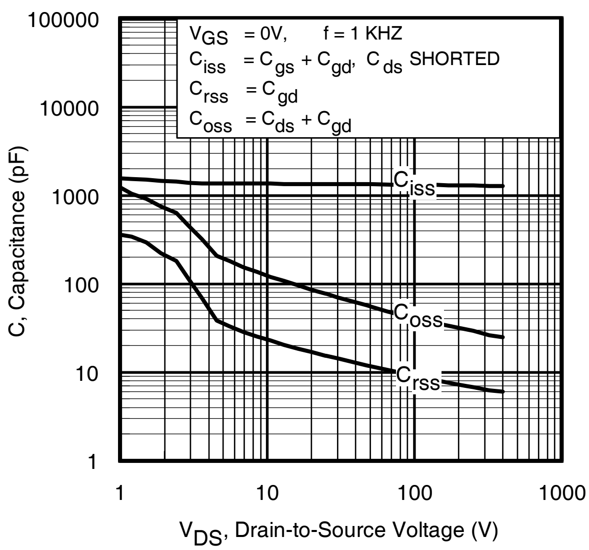


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

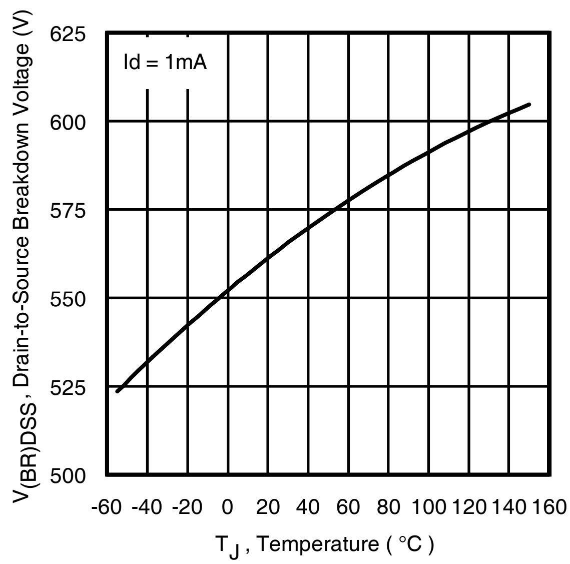
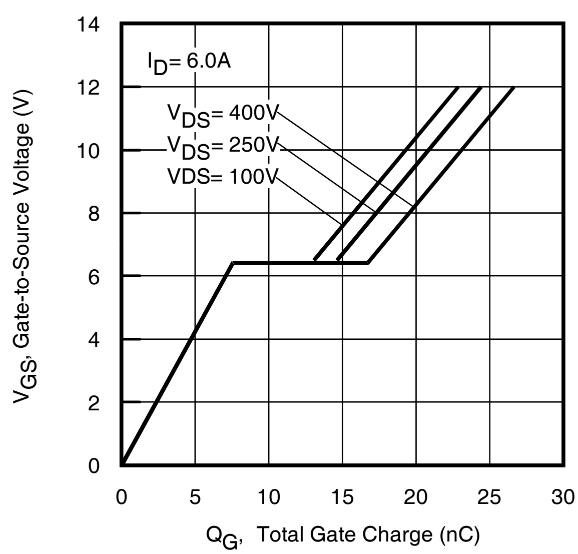
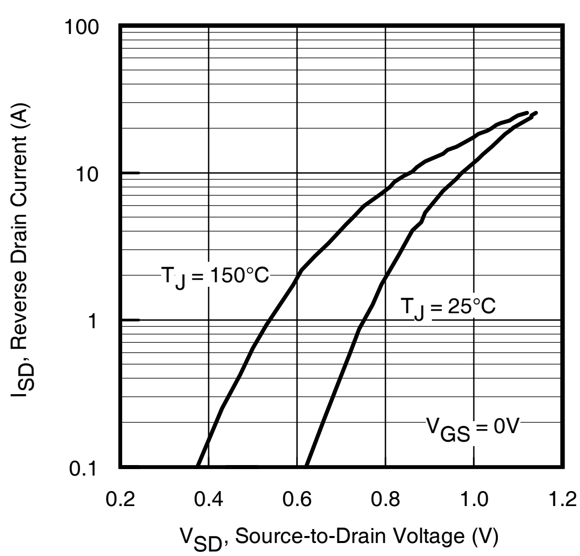


Fig 6. Typ. Breadown Voltage vs. Temperature





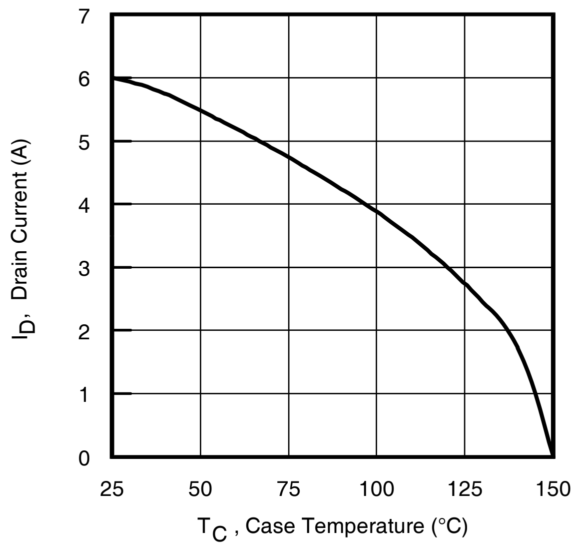


Fig 9. Maximum Drain Current Vs. Case Temperature

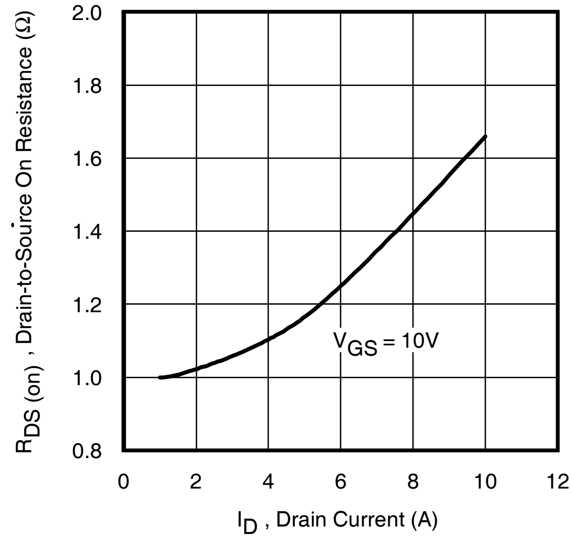


Fig 9. Typical Rdson Vs. Drain Current

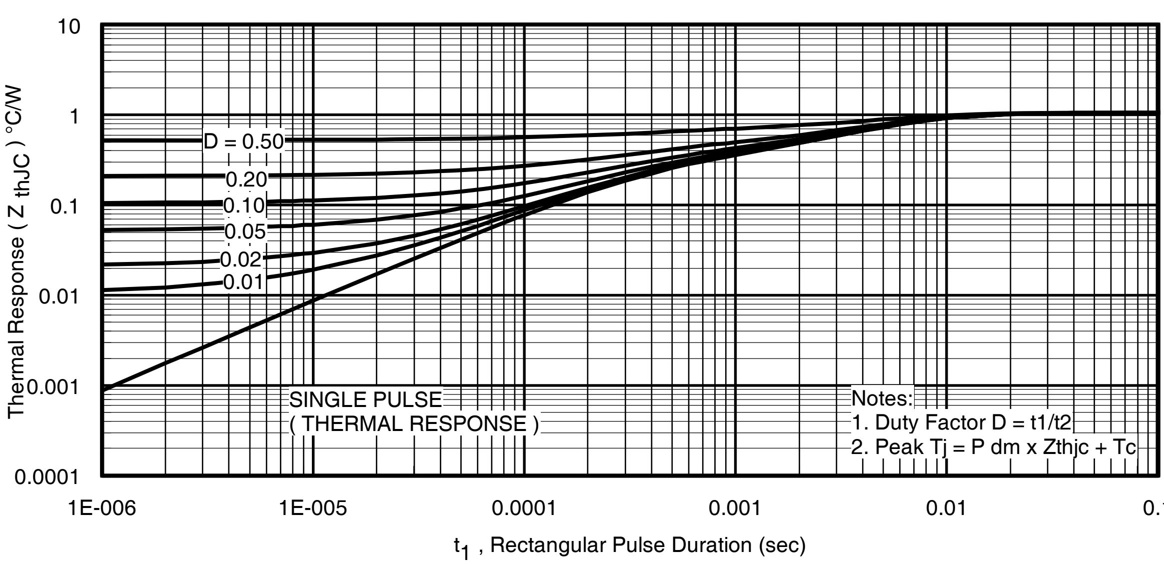


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

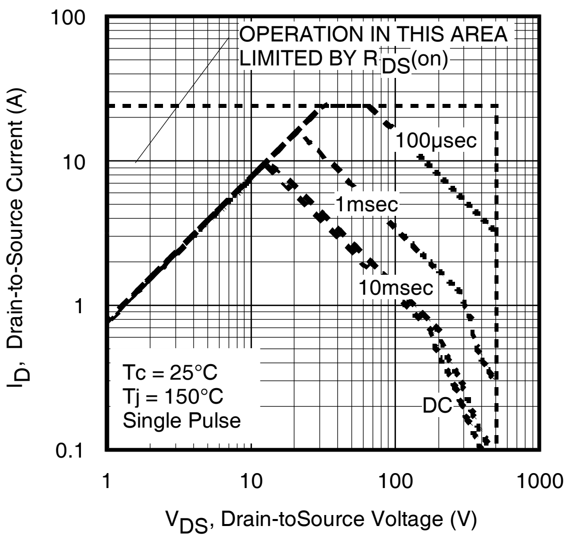


Fig 12. Maximum Safe Operating Area

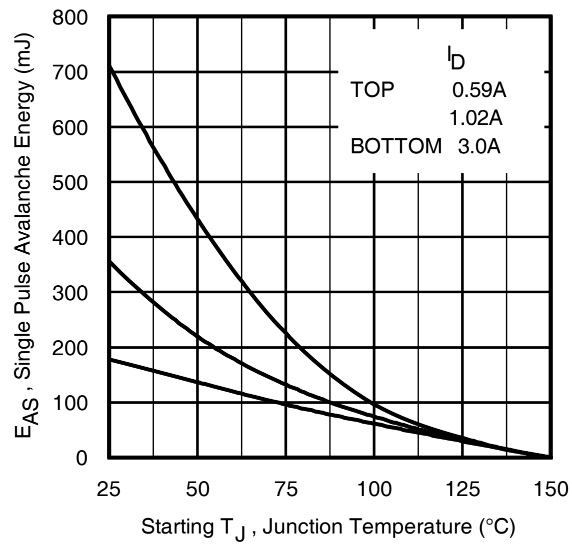


Fig 13. Maximum Avalanche Energy vs. Drain Current

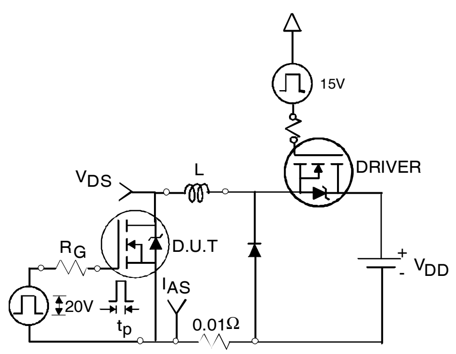


Fig 13a. Unclamped Inductive Test Circuit

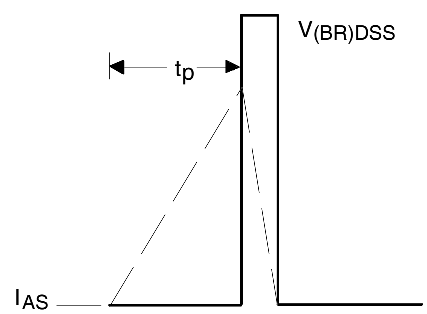


Fig 13b. Unclamped Inductive Waveforms

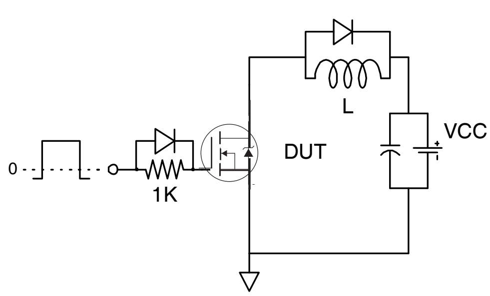


Fig 14a. Gate Charge Test Circuit

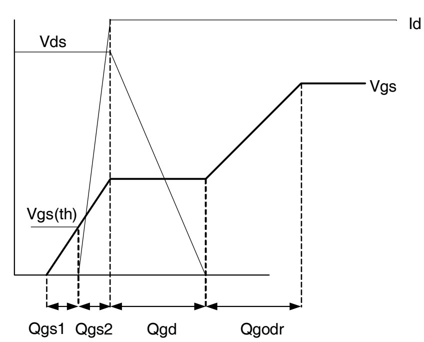


Fig 14b. Gate Charge Waveform

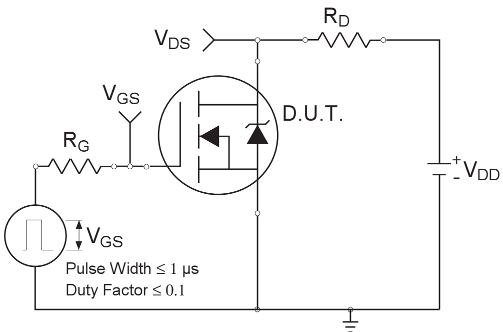


Fig 15a. Switching Time Test Circuit

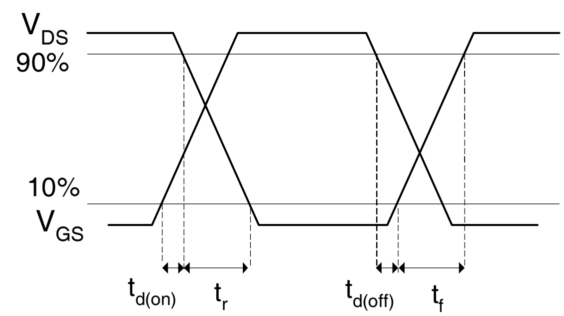
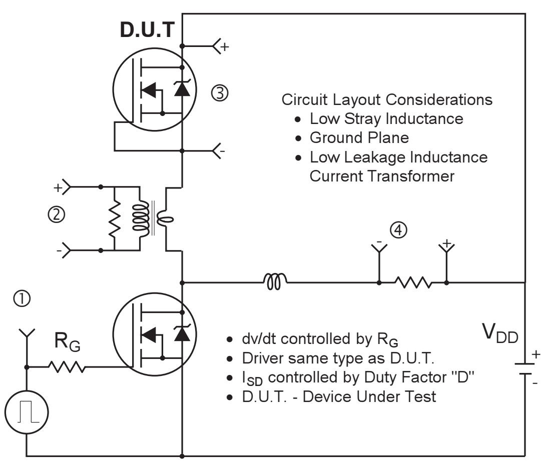
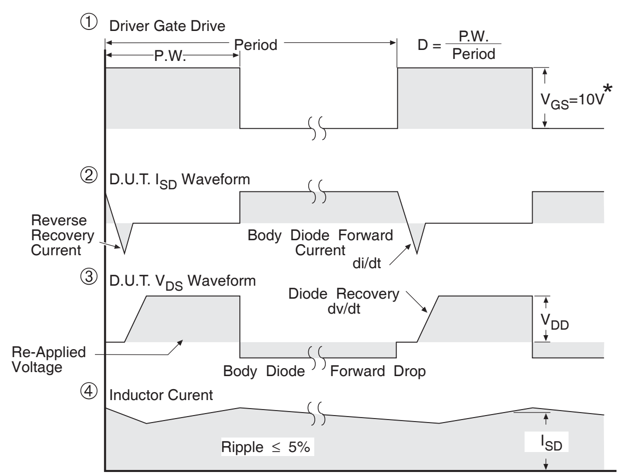


Fig 15b. Switching Time Waveforms



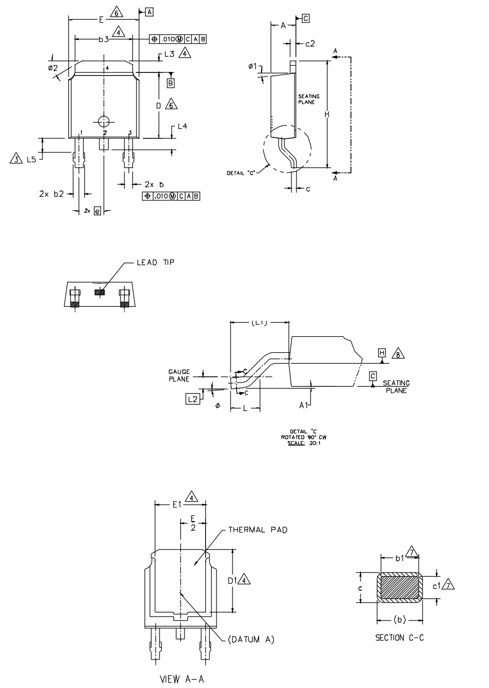


* V_{GS} = 5V for Logic Level Devices

Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2.- DIMENSION ARE SHOWN IN INCHES [MILLIMETERS].
3.- LEAD DIMENSION UNCONTROLLED IN L5.
4.- DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
5.- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.
6.- DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
7.- DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
8.- DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
9.- 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	
b1	0.65	0.79	.025	.031	7
b2	0.76	1.14	.030	.045	
b3	4.95	5.46	.195	.215	4
c	0.46	0.61	.018	.024	
c1	0.41	0.56	.016	.022	7
c2	0.46	0.89	.018	.035	
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 BSC		.090 BSC		
H	9.40	10.41	.370	.410	
L	1.40	1.78	.055	.070	
L1	2.74 BSC		.108 REF.		
L2	0.51 BSC		.020 BSC		
L3	0.89	1.27	.035	.050	4
L4	–	1.02	–	.040	
L5	1.14	1.52	.045	.060	3
ø	0°	10°	0°	10°	
ø1	0°	15°	0°	15°	
ø2	25°	35°	25°	35°	

LEAD ASSIGNMENTS

HEXFET

1.- GATE
2.- DRAIN
3.- SOURCE
4.- DRAIN

IGBT & CoPAK

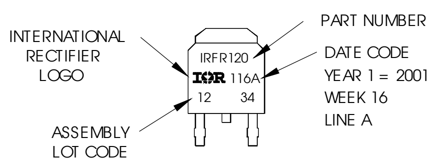
1.- GATE
2.- COLLECTOR
3.- EMITTER
4.- COLLECTOR

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

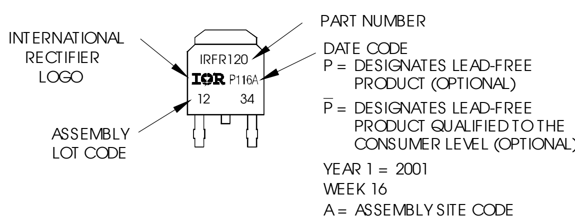
EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 2001
IN THE ASSEMBLY LINE "A"

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

"$\overline{\text{P}}$" in assembly line position indicates "Lead-Free" qualification to the consumer-level



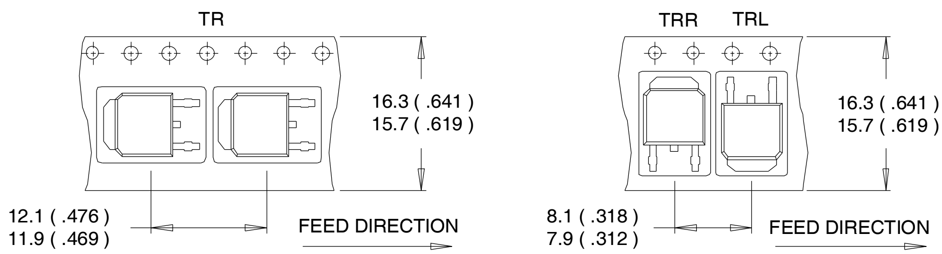
OR



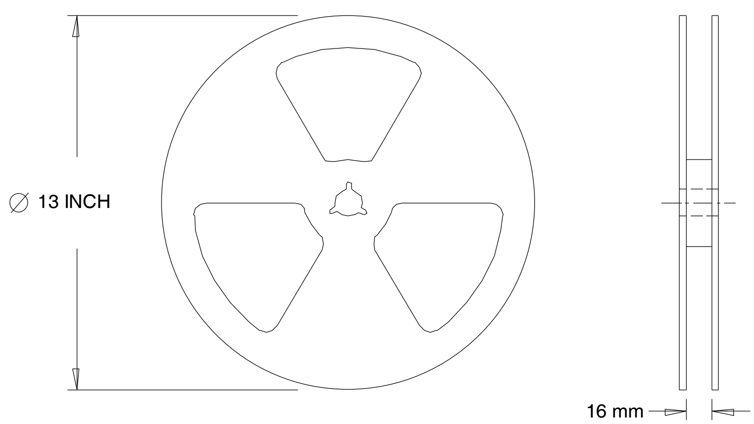
Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

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

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Visit us at www.irf.com for sales contact information.12/2012

IMPORTANT NOTICE

WARNINGS