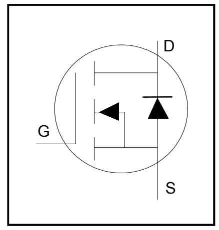
HEXFET® Power MOSFET

Application

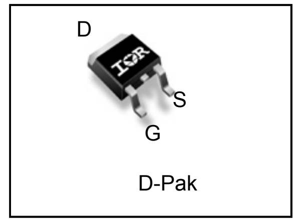
- Optimized for UPS/Inverter Applications
- Low Voltage Power Tools



V_{DSS}	30	V
$R_{DS(on)}$ max (@ V_{GS} = 10V)	2.2	mΩ
(@ V_{GS} = 4.5V)	3.1	
Qg (typical)	40	nC
I_D (Silicon Limited)	179①	A
I_D (Package Limited)	90A	

Benefits

- Fully Characterized Avalanche Voltage and Current
- Lead-Free, RoHS Compliant



G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFR8314PbF	D-Pak	Tape and Reel	2000	IRFR8314TRPbF

Absolute Maximum Rating

Symbol	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 20	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	179①	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	127①	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Package Limited)	90	
I_{DM}	Pulsed Drain Current ②	357	
P_D @T_C = 25°C	Maximum Power Dissipation	125	W
P_D @T_C = 100°C	Maximum Power Dissipation	63	W
	Linear Derating Factor	0.83	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑤	——	1.2	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ⑦	——	50	
$R_{\theta JA}$	Junction-to-Ambient	——	110	

Notes ① through ⑦ are on page 9

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	18	——	mV/°C	Reference to 25°C, I_D = 1mA ②
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	1.6	2.2	mΩ	V_{GS} = 10V, I_D = 90A ④
		——	2.6	3.1		V_{GS} = 4.5V, I_D = 72A ④
$V_{GS(th)}$	Gate Threshold Voltage	1.2	1.7	2.2	V	V_{DS} = V_{GS}, I_D = 100μA
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	——	-7.0	——	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	——	——	1.0	μA	V_{DS} =24 V, V_{GS} = 0V
		——	——	150		V_{DS} =24V,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
gfs	Forward Transconductance	189	——	——	S	V_{DS} = 15V, I_D =72A
Q_g	Total Gate Charge	——	36	54	nC	
Q_{gs1}	Pre-Vth Gate-to-Source Charge	——	10	——		V_{DS} = 15V
Q_{gs2}	Post-Vth Gate-to-Source Charge	——	7.7	——		V_{GS} = 4.5V
Q_{gd}	Gate-to-Drain Charge	——	10	——		I_D = 72A
Q_{godr}	Gate Charge Overdrive	——	8.3	——		
Q_{sw}	Switch Charge (Qgs2 + Qgd)	——	20	——		
R_G	Gate Resistance	——	2.0	——	Ω	
$t_{d(on)}$	Turn-On Delay Time	——	19	——	ns	V_{DD} = 15V
t_r	Rise Time	——	98	——		I_D = 72A
$t_{d(off)}$	Turn-Off Delay Time	——	28	——		R_G= 1.8Ω
t_f	Fall Time	——	30	——		V_{GS} = 4.5V ④
C_{iss}	Input Capacitance	——	4945	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	908	——		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	——	493	——		ƒ = 1.0MHz

Avalanche Characteristics

$E_{AS\ (Thermally\ limited)}$	Single Pulse Avalanche Energy ③	180	mJ
$E_{AS\ (tested)}$	Single Pulse Avalanche Energy Tested Value ⑥	279	
I_A	Avalanche Current	72	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode) ②	——	——	179①	A	MOSFET symbol showing the
I_{SM}	Pulsed Source Current (Body Diode) ②	——	——	357		integral reverse p-n junction diode.
V_{SD}	Diode Forward Voltage	——	——	1.0	V	T_J = 25°C,I_S = 72A,V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	——	31	47	ns	T_J = 25°C I_F = 72A ,V_{DD}=15V
Q_{rr}	Reverse Recovery Charge	——	87	130	nC	di/dt = 360A/μs ④

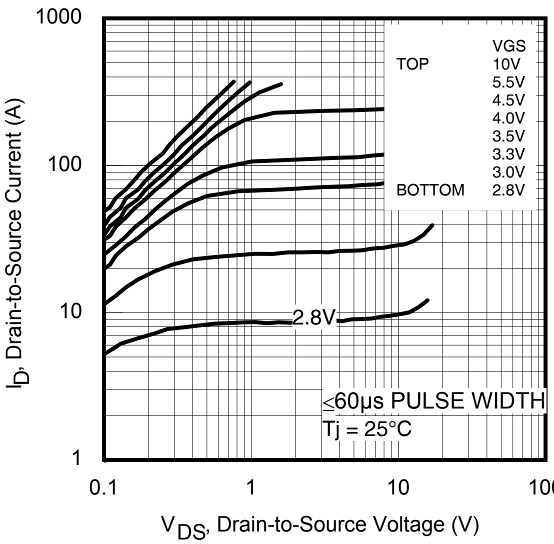


Fig 1. Typical Output Characteristics

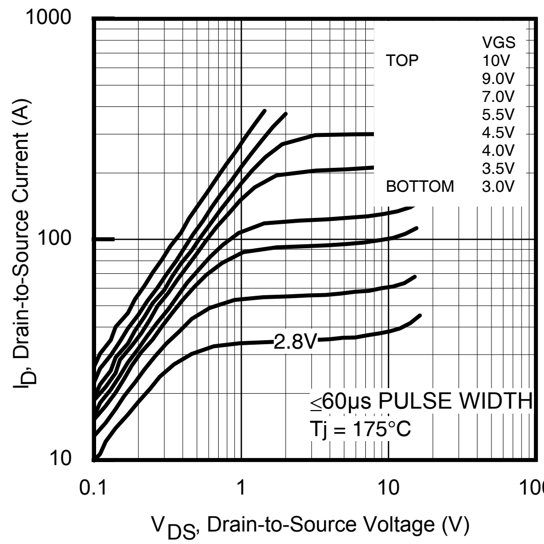


Fig 2. Typical Output Characteristics

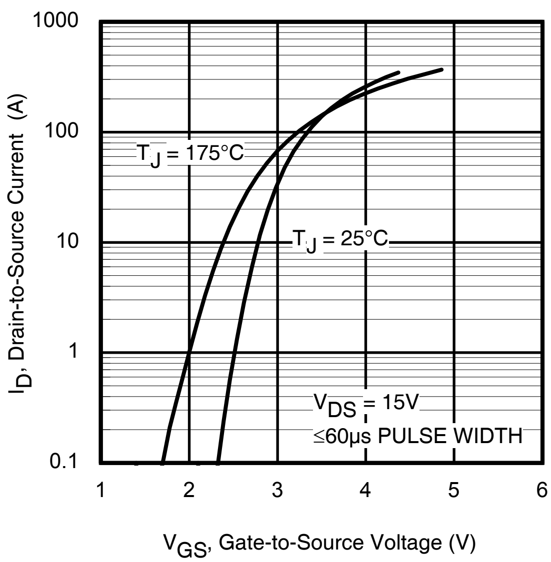


Fig 3. Typical Transfer Characteristics

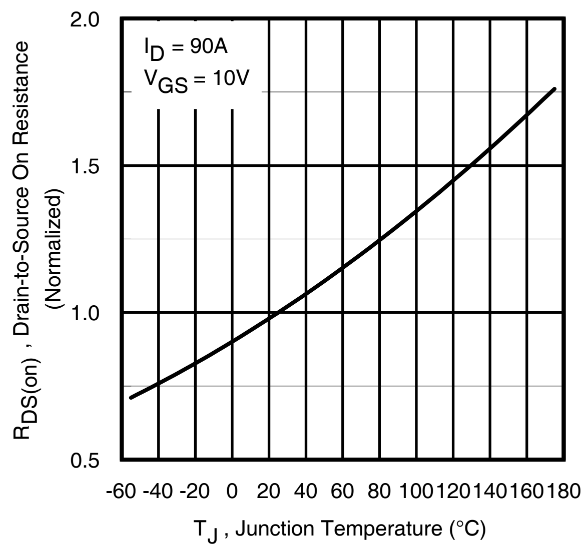


Fig 4. Normalized On-Resistance vs. Temperature

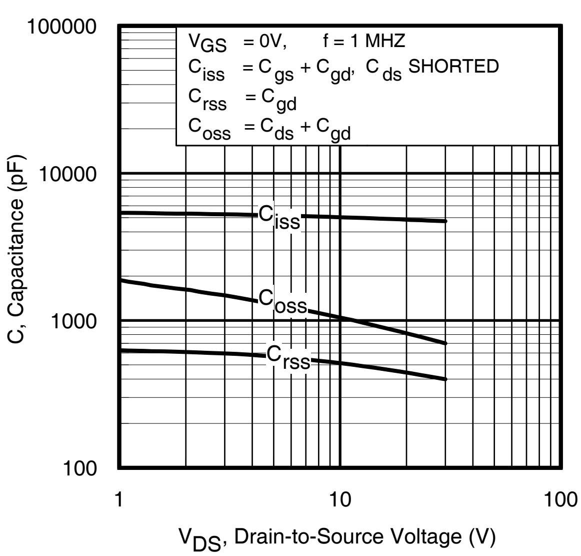


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

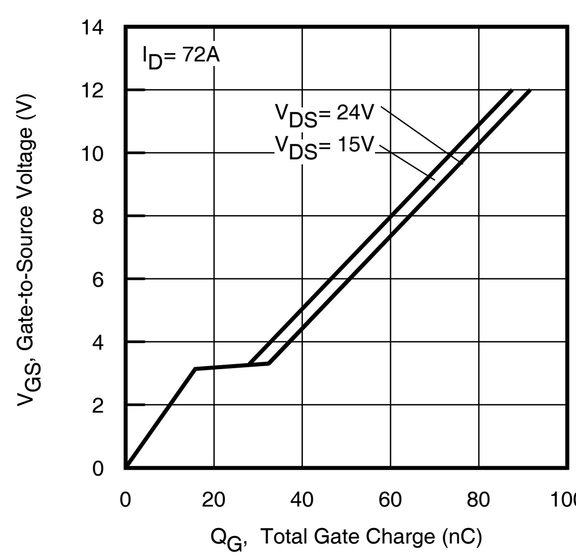


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

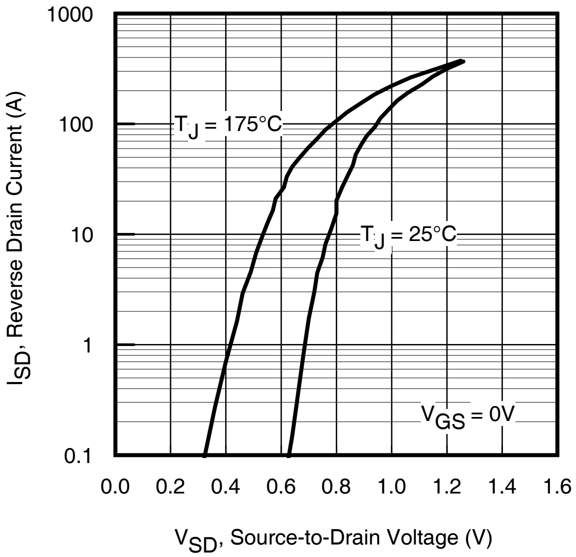


Fig 7. Typical Source-Drain Diode Forward Voltage

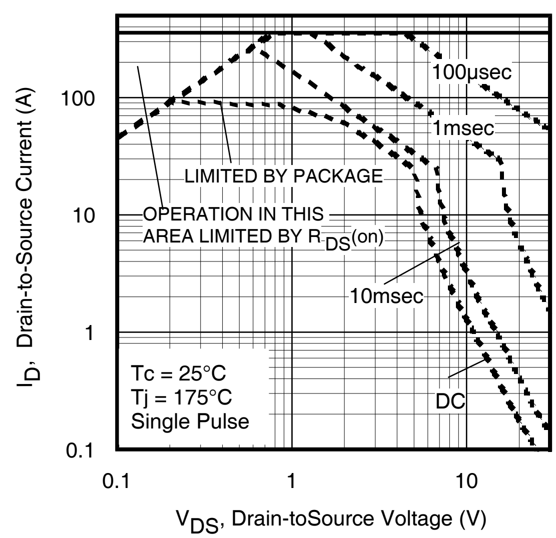


Fig 8. Maximum Safe Operating Area

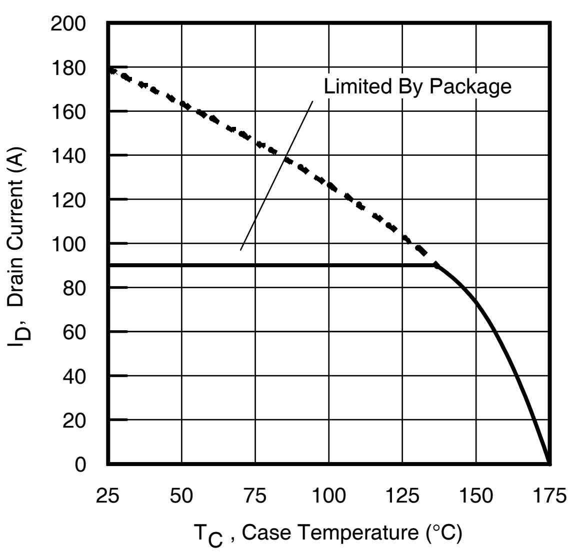


Fig 9. Maximum Drain Current vs. Case Temperature

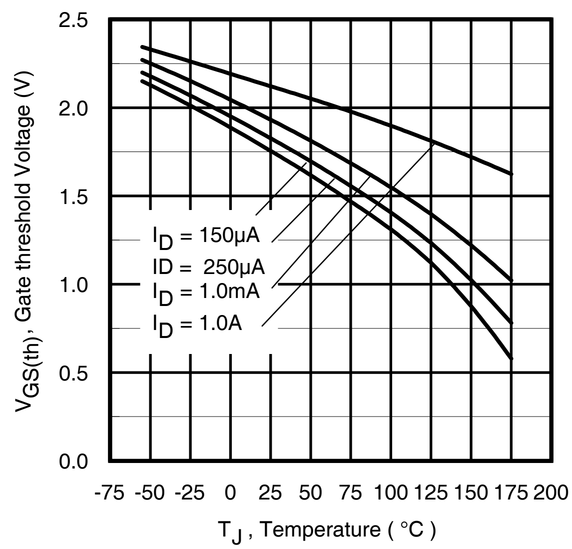


Fig 10. Threshold Voltage vs. Temperature

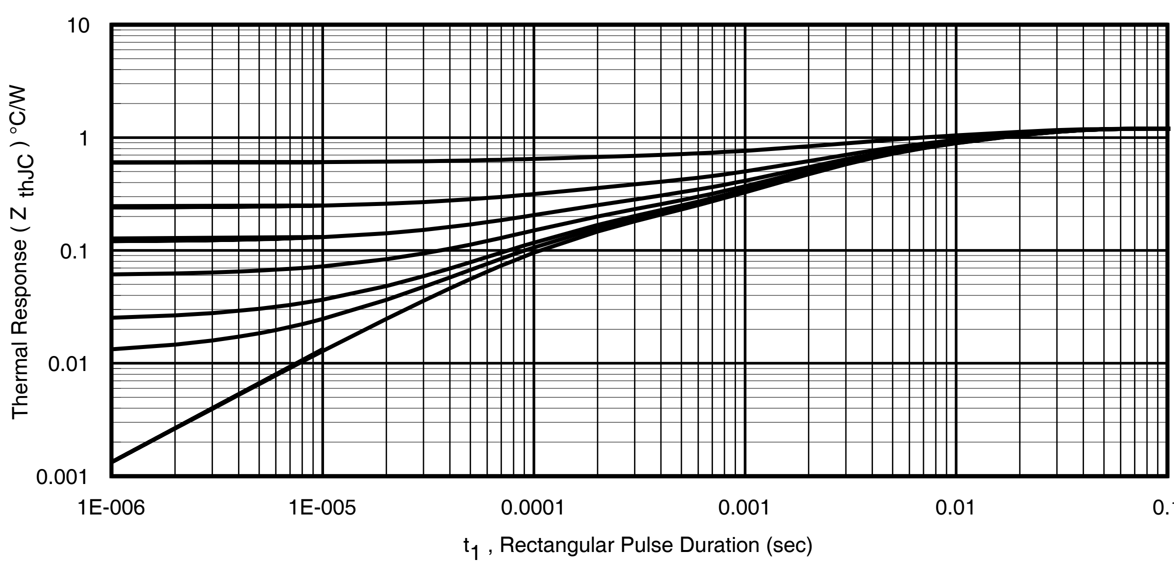


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

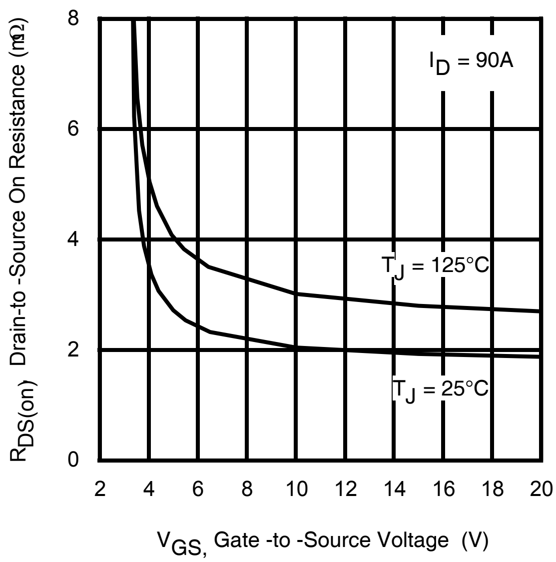


Fig 12. Typical On-Resistance vs. Gate Voltage

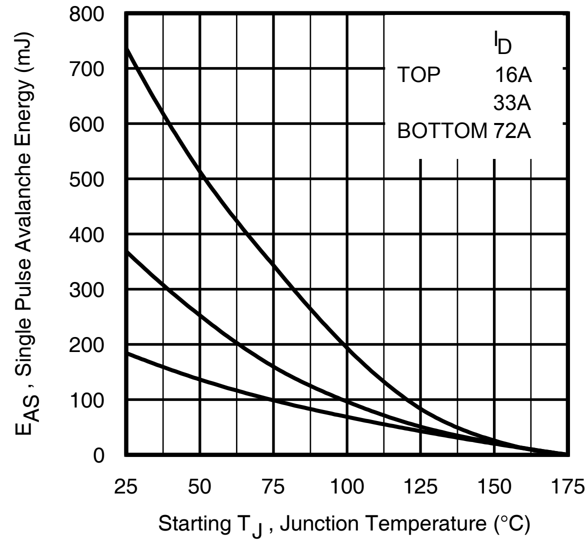


Fig 13. Maximum Avalanche Energy vs. Drain Current

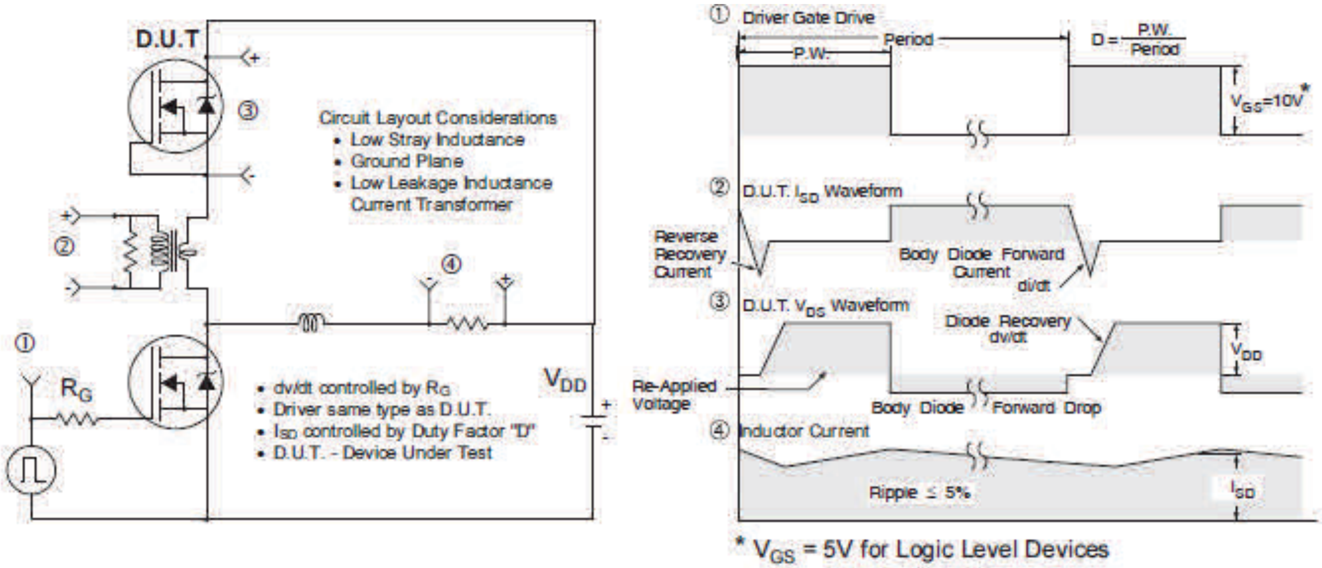


Fig 14. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

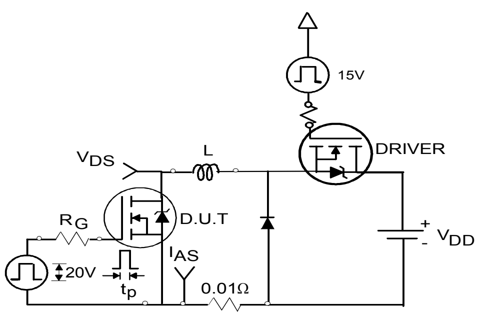


Fig 15a. Unclamped Inductive Test Circuit

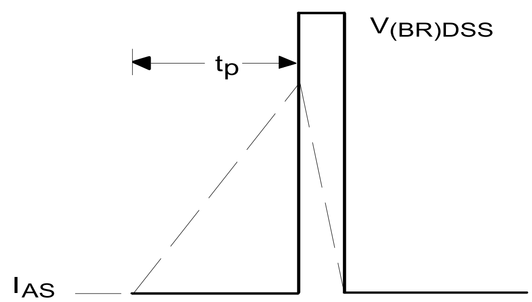


Fig 15b. Unclamped Inductive Waveforms

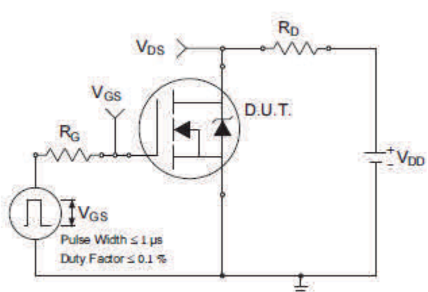


Fig 16a. Switching Time Test Circuit

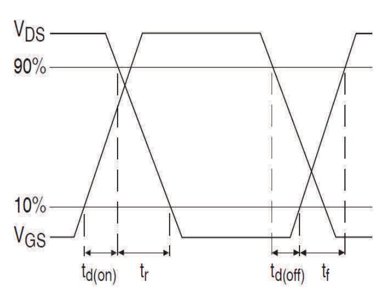


Fig 16b. Switching Time Waveforms

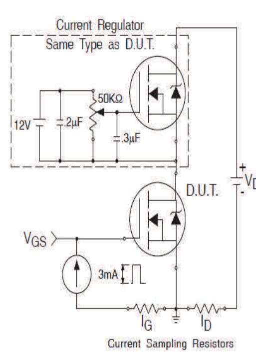


Fig 17a. Gate Charge Test Circuit

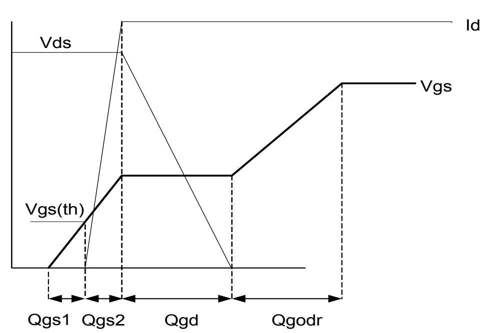
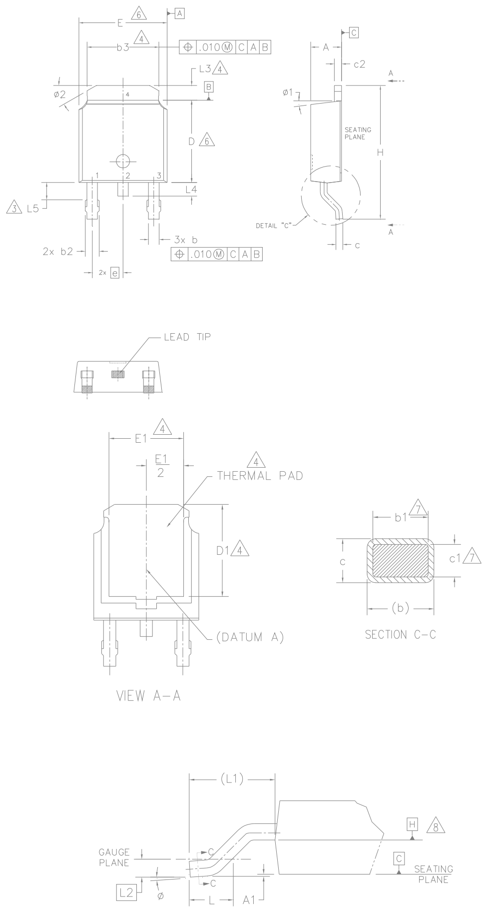


Fig 17b. Gate Charge Waveform

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 .006 [0.15] 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	0.64	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

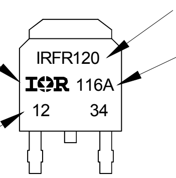
EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 2001
IN THE ASSEMBLY LINE "A"

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

"P̄" in assembly line position indicates "Lead-Free" qualification to the consumer-level

INTERNATIONAL RECTIFIER LOGO

ASSEMBLY LOT CODE



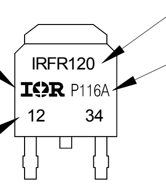
PART NUMBER

DATE CODE
YEAR 1 = 2001
WEEK 16
LINE A

OR

INTERNATIONAL RECTIFIER LOGO

ASSEMBLY LOT CODE

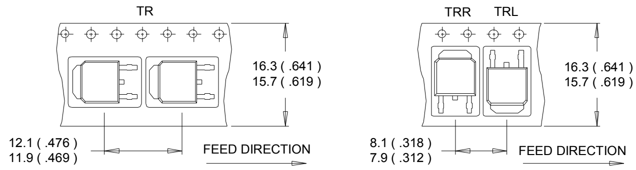


PART NUMBER

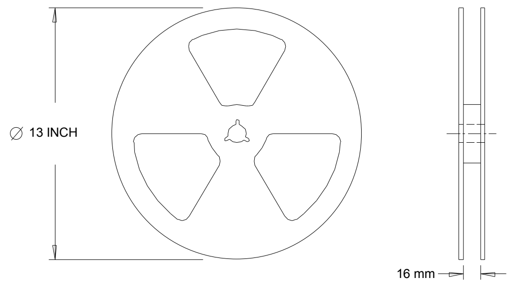
DATE CODE
P = DESIGNATES LEAD-FREE PRODUCT (OPTIONAL)
P̄ = DESIGNATES LEAD-FREE PRODUCT QUALIFIED TO THE CONSUMER LEVEL (OPTIONAL)
YEAR 1 = 2001
WEEK 16
A = ASSEMBLY SITE CODE

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.

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

Qualification Information†

Qualification Level	Industrial (per JEDEC JESD47F) ††	
Moisture Sensitivity Level	D-Pak	MSL1
RoHS Compliant	Yes	

† Qualification standards can be found at International Rectifier's web site: http://www.irf.com/product-info/reliability/

†† Applicable version of JEDEC standard at the time of product release.

Notes:

① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 90A by source bonding technology. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements. (Refer to AN-1140)

② Repetitive rating; pulse width limited by max. junction temperature.

③ Limited by T_{Jmax}, starting T_J = 25°C, L = 0.07mH, R_G = 50Ω, I_{AS} = 72A, V_{GS} =10V.

④ Pulse width ≤ 400μs; duty cycle ≤ 2%.

⑤ R_θ is measured at T_J approximately 90°C.

⑥ This value determined from sample failure population, starting T_J =25°C, L=0.07mH, R_G = 50Ω, I_{AS} = 72A, V_{GS} =10V.

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.please refer to application note to AN-994: http://www.irf.com/technical-info/appnotes/an-994.pdf

Revision History

Date	Comments
07/01/2014	The Device is active without bulk part which is removed from Table on page 1

International Rectifier

IR WORLD HEADQUARTERS: 101N Sepulveda Blvd, El Segundo, California 90245, USA

To contact International Rectifier, please visit http://www.irf.com/whoto-call/

