

International IR Rectifier

PD - 97107A

IRLR8715CPbF

Applications

- High Frequency Synchronous Buck Converters for Computer Processor Power
- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom

Benefits

- Very Low $R_{DS(on)}$ at 4.5V V_{GS}
- Ultra-Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current
- Lead-Free

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ max	Qg
25V	9.4mΩ	6.9nC



G	D	S
Gate	Drain	Source

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	25	V
V_{GS}	Gate-to-Source Voltage	± 20	
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	51 ④	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	36	
I_{DM}	Pulsed Drain Current ①	200	
P_D @ $T_C = 25^\circ\text{C}$	Maximum Power Dissipation ⑤	44	W
P_D @ $T_C = 100^\circ\text{C}$	Maximum Power Dissipation ⑤	22	
	Linear Derating Factor	0.29	W/°C
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑥	—	3.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ⑤⑥	—	50	
$R_{\theta JA}$	Junction-to-Ambient ⑥	—	110	

Notes ① through ⑥ are on page 10

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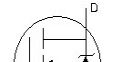
Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	25	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	17	—	mV/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	7.5	9.4	m Ω	$V_{GS} = 10V, I_D = 21A$ ③
		—	11.8	14.8		$V_{GS} = 4.5V, I_D = 17A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.9	2.35	V	$V_{DS} = V_{GS}, I_D = 25\mu A$
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-7.0	—	mV/ $^\circ\text{C}$	
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{DS} = 20V, V_{GS} = 0V$
		—	—	150		$V_{DS} = 20V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
g_{fs}	Forward Transconductance	46	—	—	S	$V_{DS} = 13V, I_D = 17A$
Q_g	Total Gate Charge	—	6.9	10	nC	$V_{DS} = 13V$ $V_{GS} = 4.5V$ $I_D = 17A$ See Fig.16
Q_{gs1}	Pre-Vth Gate-to-Source Charge	—	1.6	—		
Q_{gs2}	Post-Vth Gate-to-Source Charge	—	1.2	—		
Q_{gd}	Gate-to-Drain Charge	—	2.5	—		
Q_{godr}	Gate Charge Overdrive	—	1.6	—		
Q_{sw}	Switch Charge ($Q_{gs2} + Q_{gd}$)	—	3.7	—		
Q_{oss}	Output Charge	—	3.2	—	nC	$V_{DS} = 10V, V_{GS} = 0V$
R_G	Gate Resistance	—	2.2	3.8	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	7.2	—	ns	$V_{DD} = 13V, V_{GS} = 4.5V$ ③ $I_D = 17A$ Clamped Inductive Load
t_r	Rise Time	—	32	—		
$t_{d(off)}$	Turn-Off Delay Time	—	7.5	—		
t_f	Fall Time	—	3.9	—		
C_{iss}	Input Capacitance	—	830	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	220	—		$V_{DS} = 13V$
C_{rss}	Reverse Transfer Capacitance	—	120	—		$f = 1.0MHz$

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	27	mJ
I_{AR}	Avalanche Current ①	—	17	A
E_{AR}	Repetitive Avalanche Energy ①	—	4.4	mJ

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	51 ④	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	200		
V _{SD}	Diode Forward Voltage	—	—	1.0	V	T _J = 25°C, I _S = 17A, V _{GS} = 0V ③
t _{rr}	Reverse Recovery Time	—	7.8	12	ns	T _J = 25°C, I _F = 17A, V _{DD} = 13V
Q _{rr}	Reverse Recovery Charge	—	4.9	7.4	nC	di/dt = 300A/μs ③
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

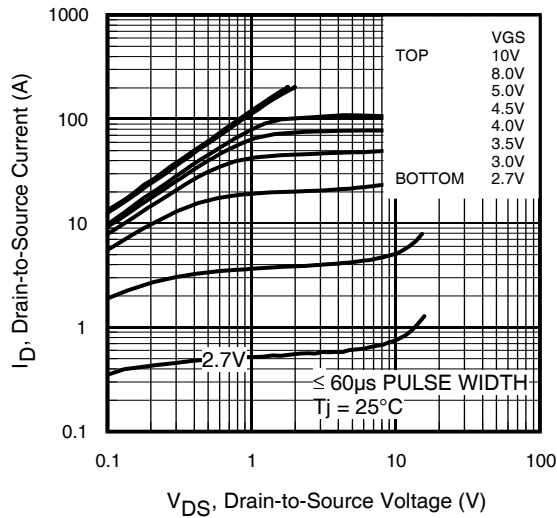


Fig 1. Typical Output Characteristics

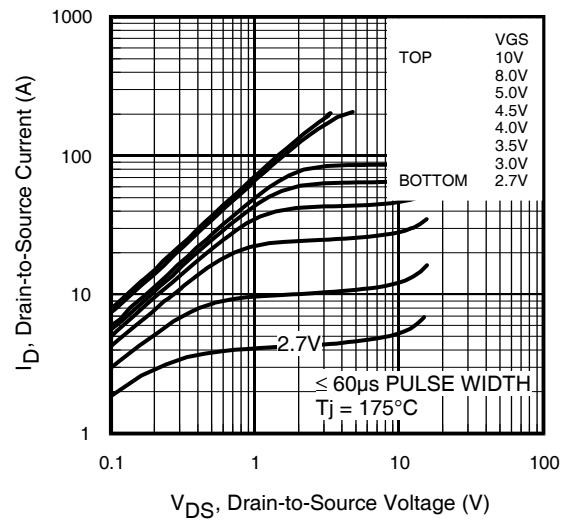


Fig 2. Typical Output Characteristics

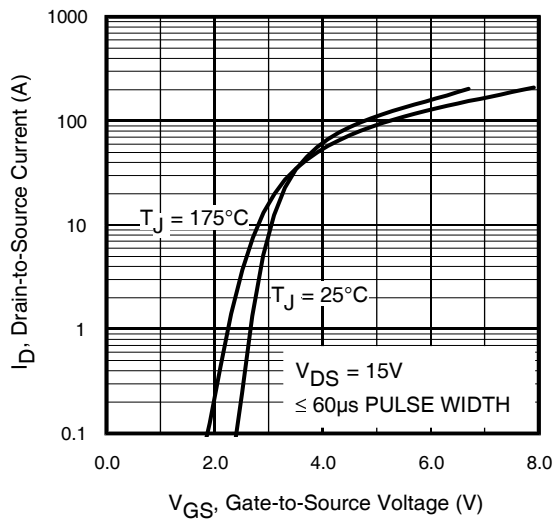


Fig 3. Typical Transfer Characteristics

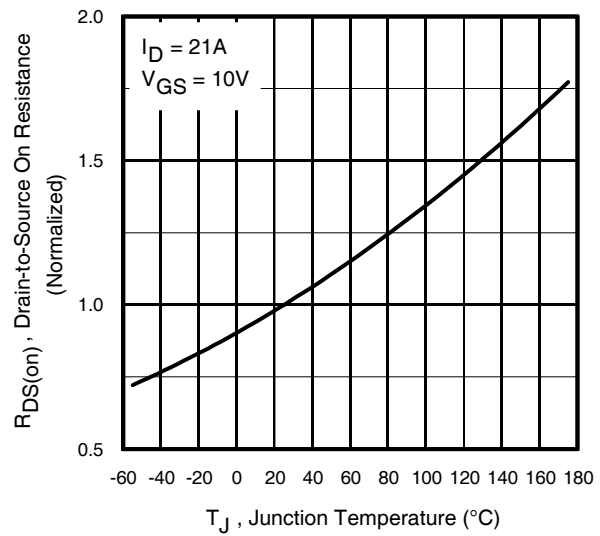
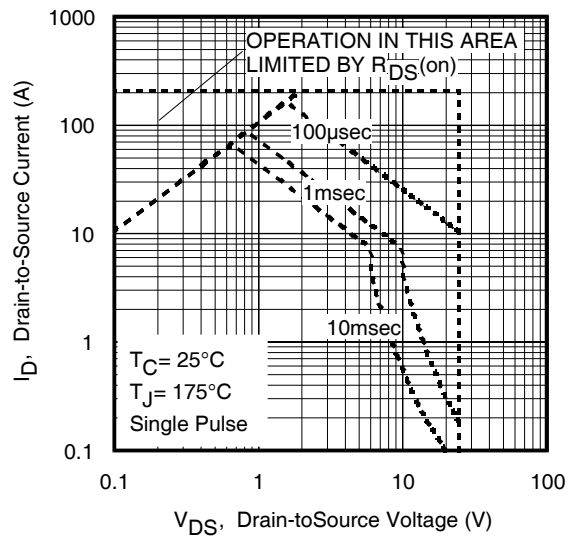
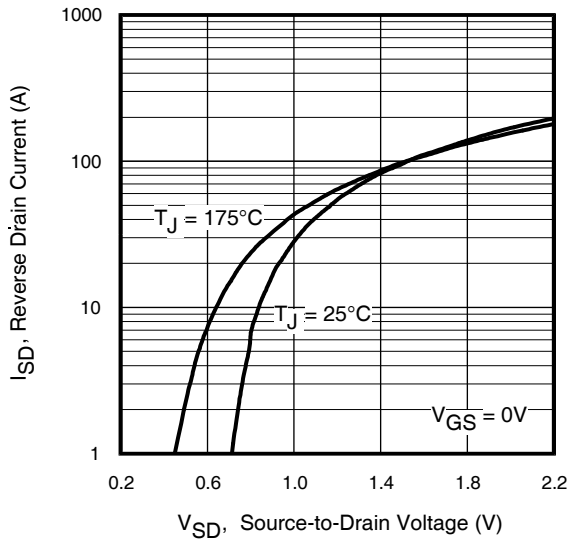
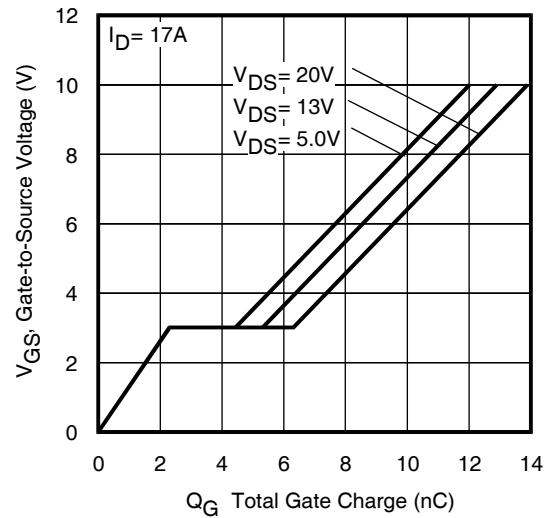
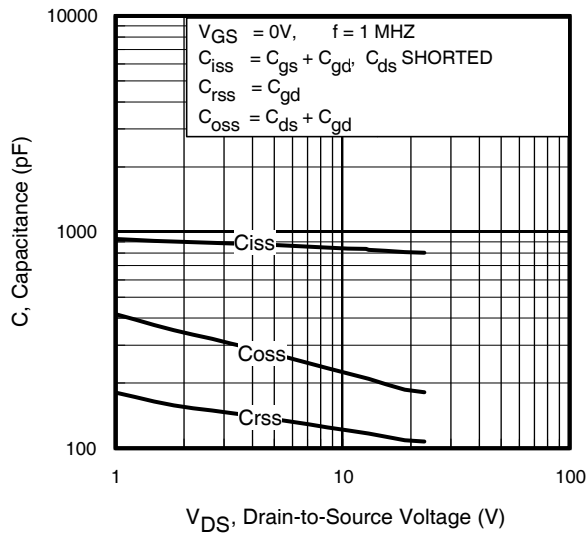


Fig 4. Normalized On-Resistance
Vs. Temperature

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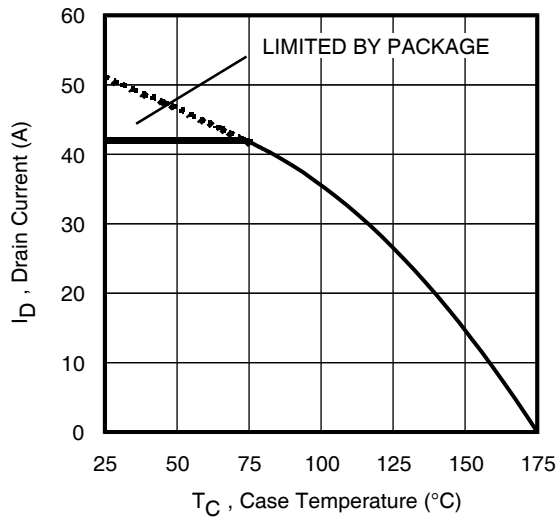


Fig 9. Maximum Drain Current Vs. Case Temperature

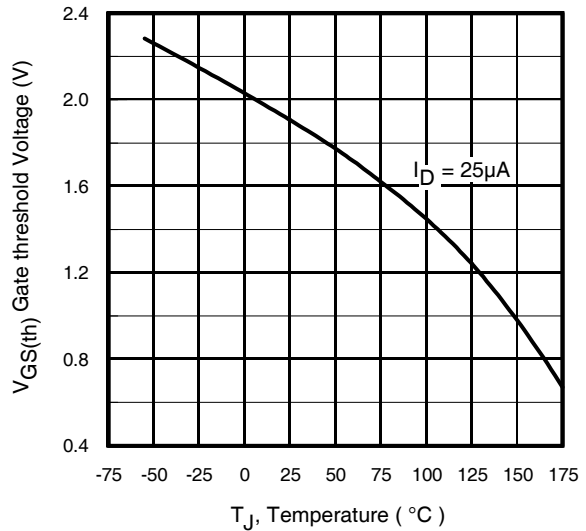


Fig 10. Threshold Voltage Vs. Temperature

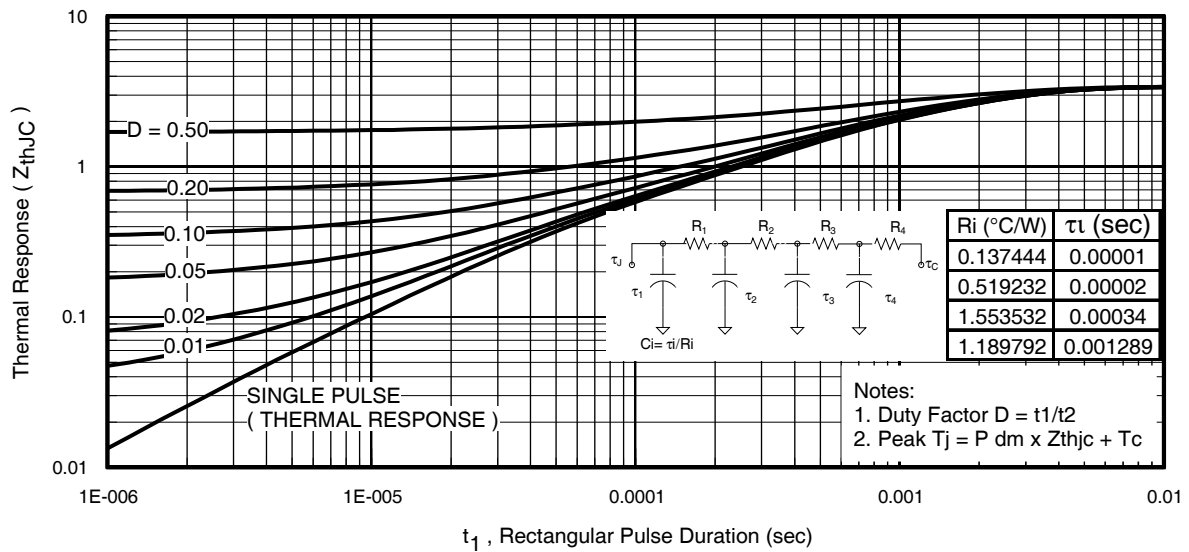


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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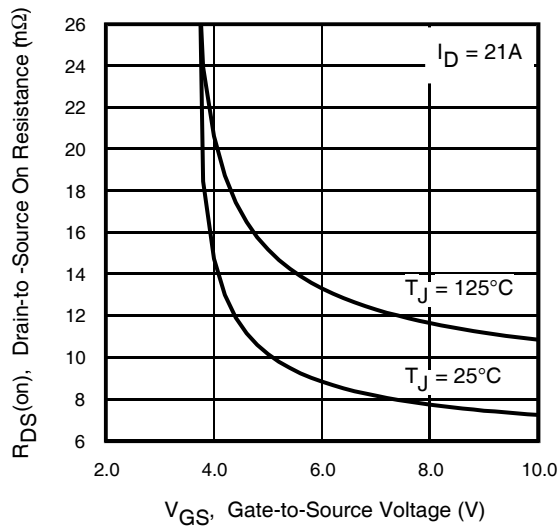


Fig 12. On-Resistance vs. Gate Voltage

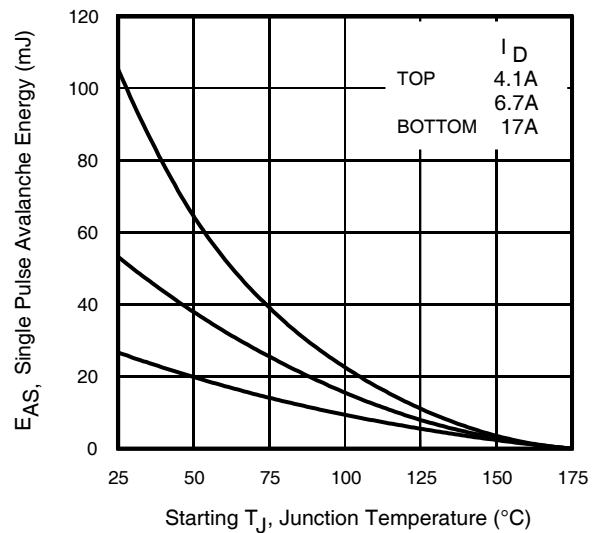


Fig 13. Maximum Avalanche Energy vs. Drain Current

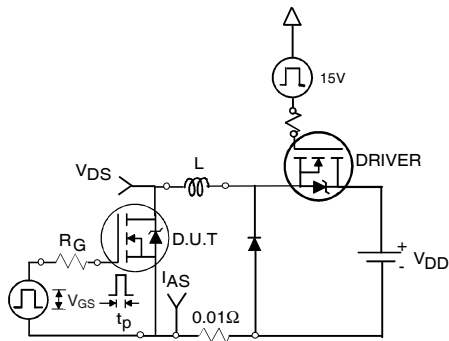


Fig 14a. Unclamped Inductive Test Circuit

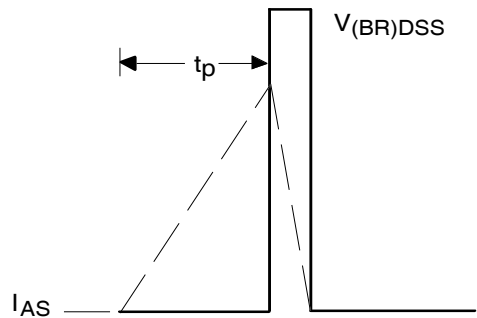


Fig 14b. Unclamped Inductive Waveforms

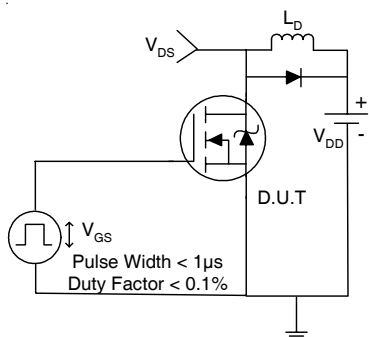


Fig 15a. Switching Time Test Circuit

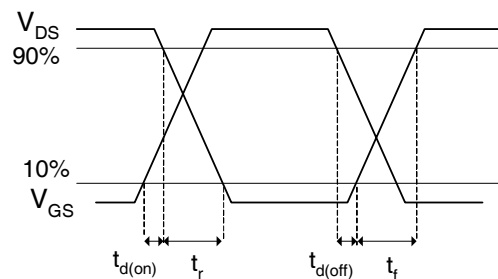


Fig 15b. Switching Time Waveforms
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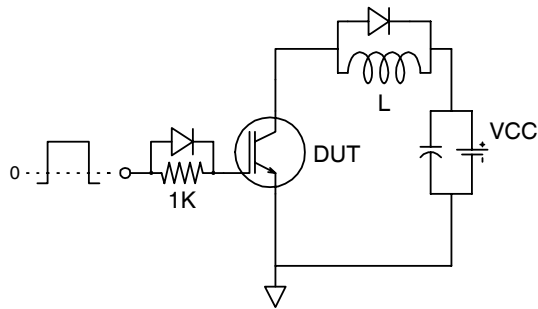


Fig 16a. Gate Charge Test Circuit

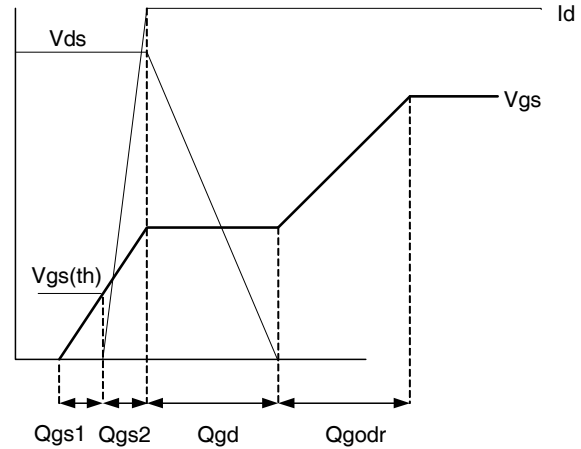
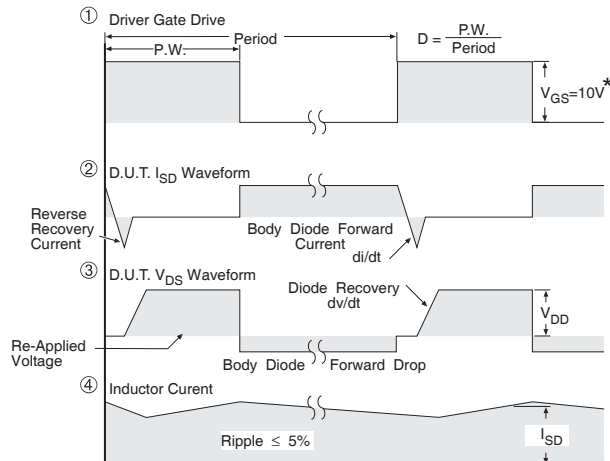
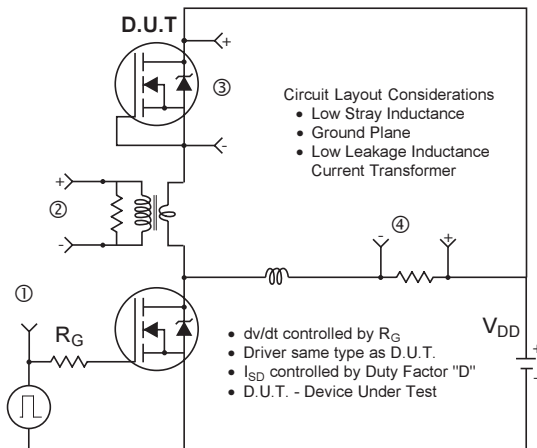


Fig 16b. Gate Charge Waveform



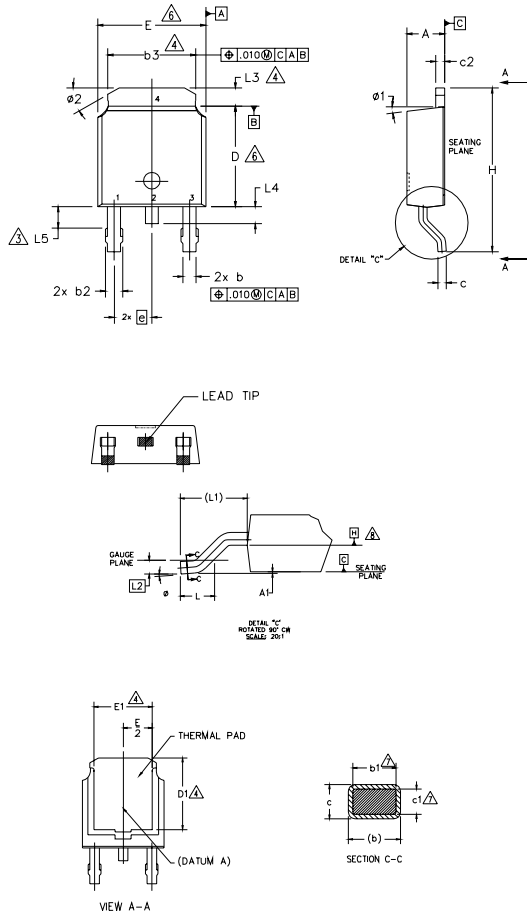
* $V_{GS} = 5V$ for Logic Level Devices

Fig 17. Peak Diode Recovery dv/dt Test Circuit for N-Channel
HEXFET® Power MOSFETs

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D-Pak (TO-252AA) Package Outline

International
IR Rectifier



NOTES:

- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2.- DIMENSIONS 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

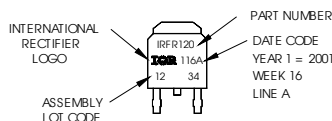
EXAMPLE: THIS IS AN IRLR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 2001
IN THE ASSEMBLY LINE "A"

Note: "P" in assembly line position
indicates "Lead-Free"
"P" in assembly line position indicates
"Lead-Free" qualification to the consumer-level

OR

INTERNATIONAL
RECTIFIER
LOGO

ASSEMBLY
LOT CODE



INTERNATIONAL
RECTIFIER
LOGO

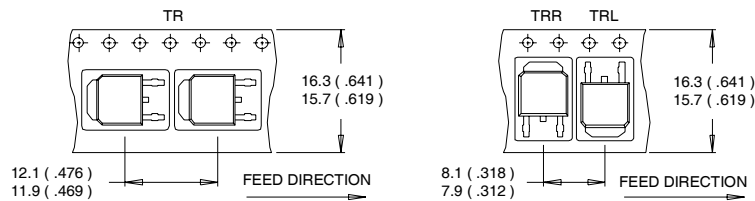
ASSEMBLY
LOT CODE



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

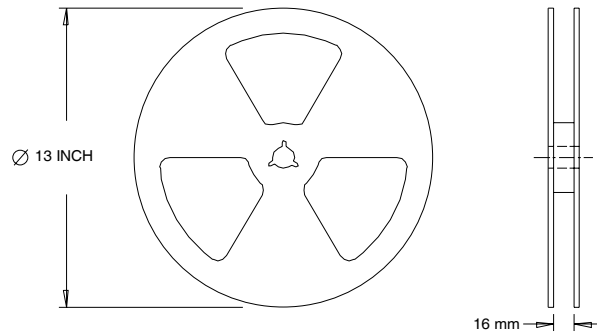
D-Pak (TO-252AA) Tape & Reel Information

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 $T_J = 25^\circ\text{C}$, $L = 0.19\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 17\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 42A.
- ⑤ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑥ R_θ is measured at T_J approximately at 90°C

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