

# IRLR8711CPbF

## Applications

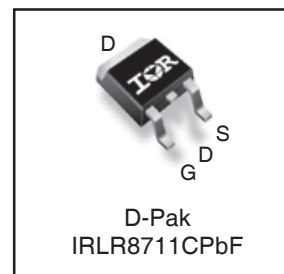
- High Frequency Synchronous Buck Converters for Computer Processor Power
- High Frequency Isolated DC-DC Converters with Synchronous Rectification

HEXFET® Power MOSFET

$V_{DS}$	$R_{DS(on)}$ max	Qg
25V	5.6mΩ	13nC

## Benefits

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



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, $V_{GS} @ 10\text{V}$	84 <sup>④</sup>	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	60 <sup>④</sup>	
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	340	
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation <sup>⑤</sup>	68	W
$P_D @ T_C = 100^\circ\text{C}$	Maximum Power Dissipation <sup>⑤</sup>	34	
	Linear Derating Factor	0.45	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 <sup>⑥</sup>	—	2.2	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) <sup>⑤⑥</sup>	—	50	
$R_{\theta JA}$	Junction-to-Ambient <sup>⑥</sup>	—	110	

Notes <sup>①</sup> through <sup>⑥</sup> are on page 10

## 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	—	16	—	mV/°C	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	4.5	5.6	mΩ	$V_{GS} = 10V, I_D = 21A$ ③
		—	6.2	7.8		$V_{GS} = 4.5V, I_D = 17A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	$V_{DS} = V_{GS}, I_D = 50\mu A$
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-6.3	—	mV/°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	86	—	—	S	$V_{DS} = 13V, I_D = 17A$
$Q_g$	Total Gate Charge	—	13	20	nC	$V_{DS} = 13V$ $V_{GS} = 4.5V$ $I_D = 17A$ See Fig.16
$Q_{gs1}$	Pre-Vth Gate-to-Source Charge	—	3.0	—		
$Q_{gs2}$	Post-Vth Gate-to-Source Charge	—	1.9	—		
$Q_{gd}$	Gate-to-Drain Charge	—	4.3	—		
$Q_{godr}$	Gate Charge Overdrive	—	3.8	—		
$Q_{sw}$	Switch Charge ( $Q_{gs2} + Q_{gd}$ )	—	6.2	—		
$Q_{oss}$	Output Charge	—	6.4	—	nC	$V_{DS} = 10V, V_{GS} = 0V$
$R_G$	Gate Resistance	—	1.5	3.4	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	9.7	—	ns	$V_{DD} = 13V, V_{GS} = 4.5V$ ③ $I_D = 17A$ Clamped Inductive Load
$t_r$	Rise Time	—	29	—		
$t_{d(off)}$	Turn-Off Delay Time	—	10	—		
$t_f$	Fall Time	—	4.4	—		
$C_{iss}$	Input Capacitance	—	1640	—	pF	$V_{GS} = 0V$ $V_{DS} = 13V$ $f = 1.0MHz$
$C_{oss}$	Output Capacitance	—	430	—		
$C_{riss}$	Reverse Transfer Capacitance	—	210	—		

## Avalanche Characteristics

	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②	—	47	mJ
$I_{AR}$	Avalanche Current ①	—	17	A
$E_{AR}$	Repetitive Avalanche Energy ①	—	6.8	mJ

## Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	84 ④	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	340		
$V_{SD}$	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 17A, V_{GS} = 0V$ ③
$t_{rr}$	Reverse Recovery Time	—	13	20	ns	$T_J = 25^\circ\text{C}, I_F = 17A, V_{DD} = 13V$
$Q_{rr}$	Reverse Recovery Charge	—	8.0	12	nC	$di/dt = 300A/\mu s$ ③
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

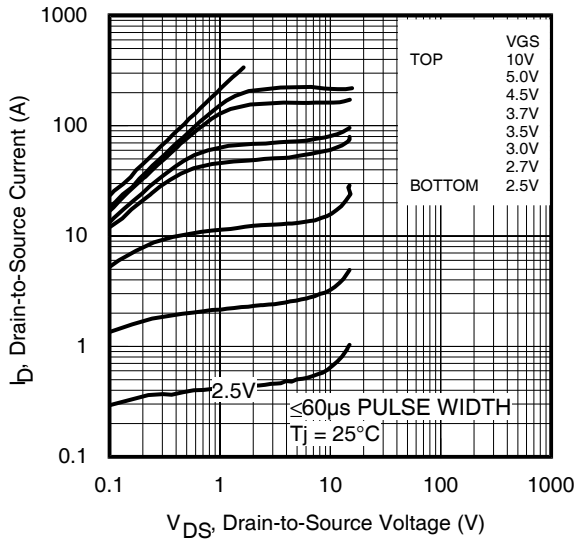


Fig 1. Typical Output Characteristics

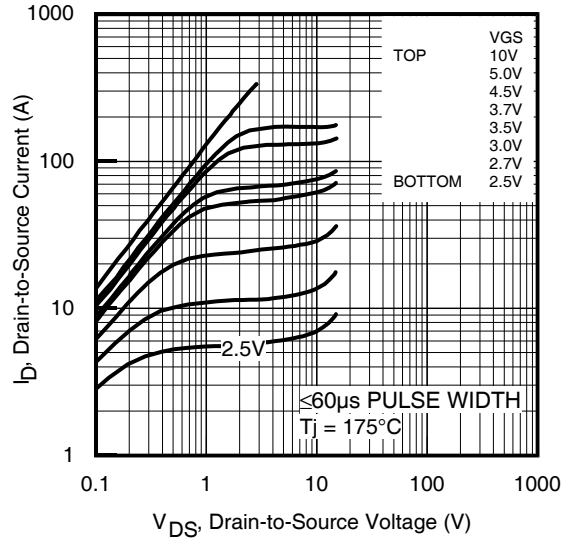


Fig 2. Typical Output Characteristics

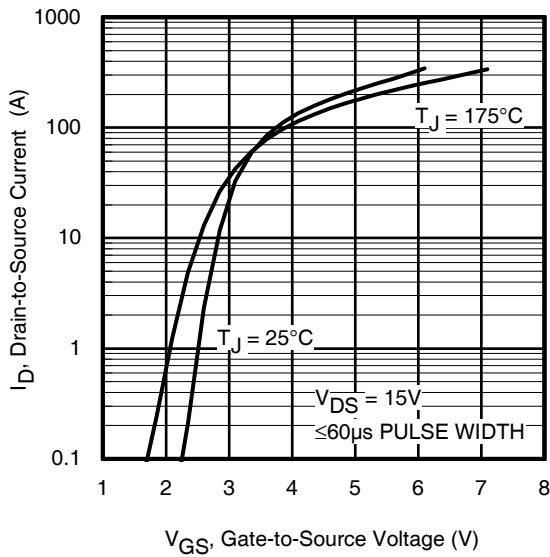


Fig 3. Typical Transfer Characteristics

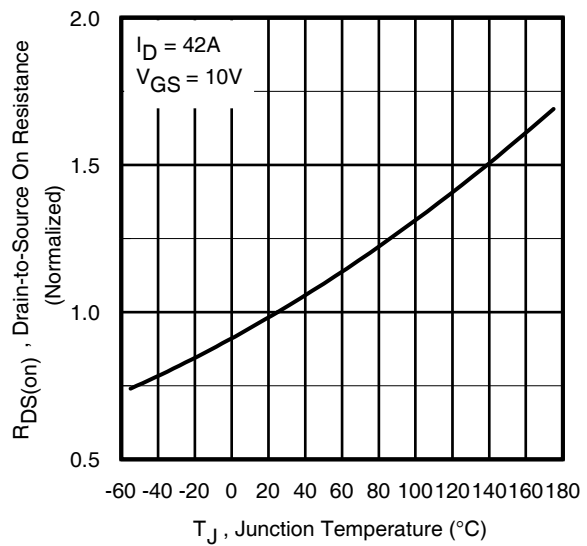
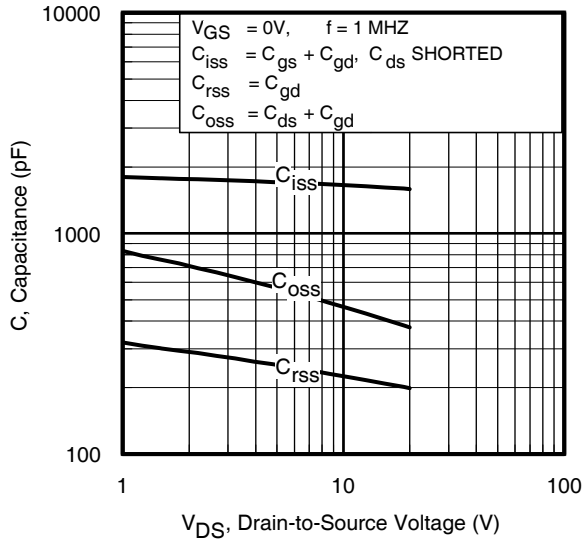
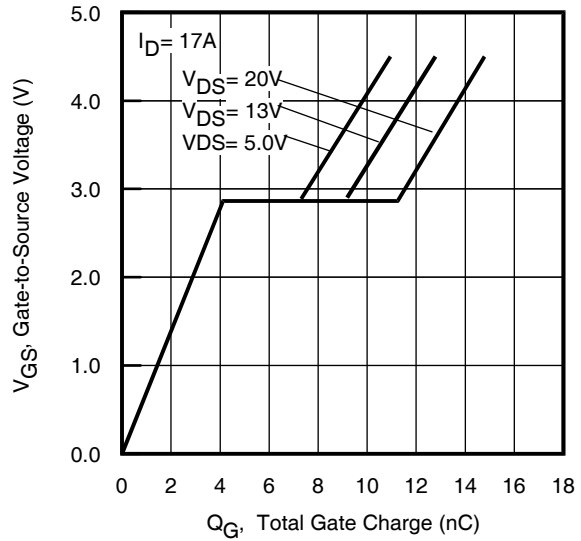


Fig 4. Normalized On-Resistance vs. Temperature

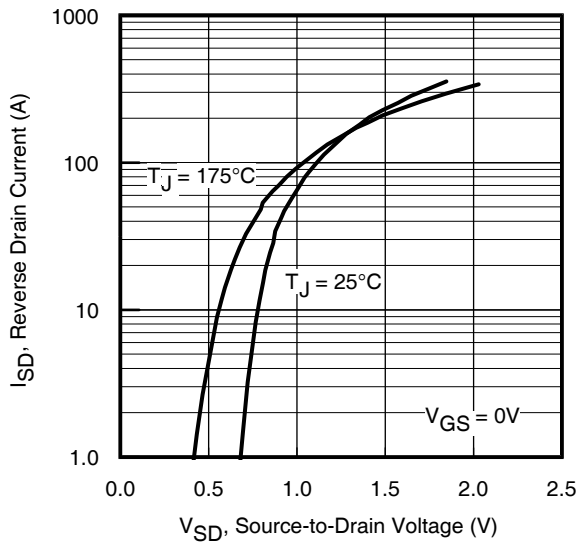
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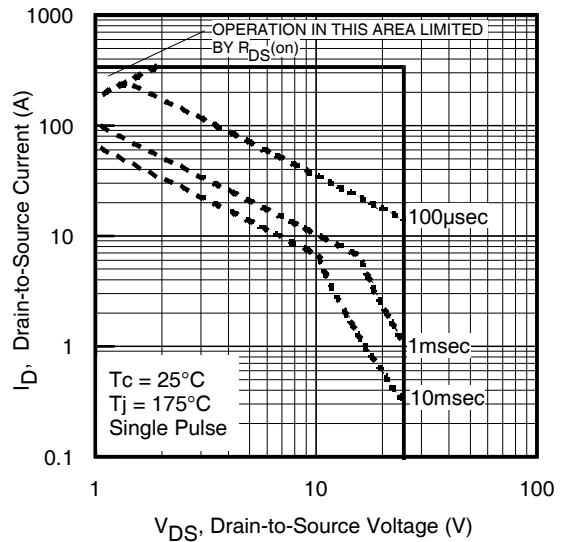
**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage



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



**Fig 7.** Typical Source-Drain Diode Forward Voltage



**Fig 8.** Maximum Safe Operating Area

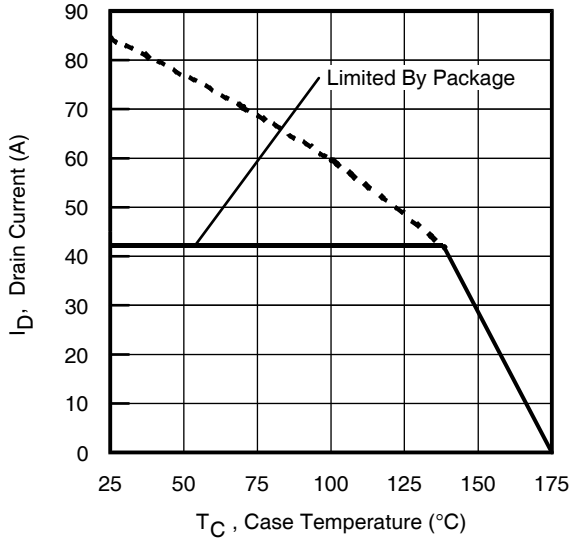


Fig 9. Maximum Drain Current vs. Case Temperature

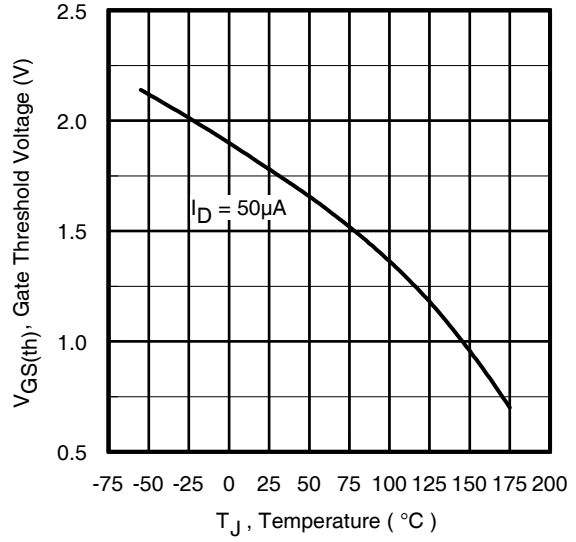


Fig 10. Threshold Voltage vs. Temperature

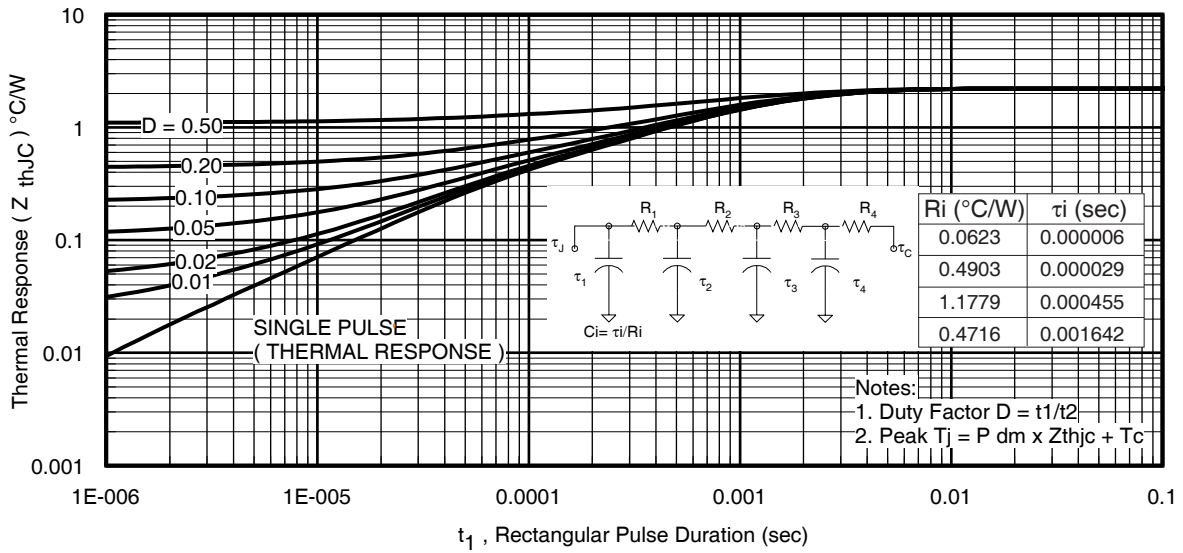
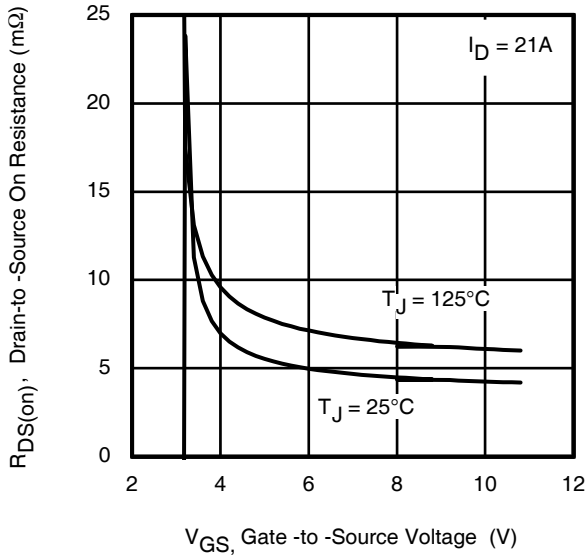


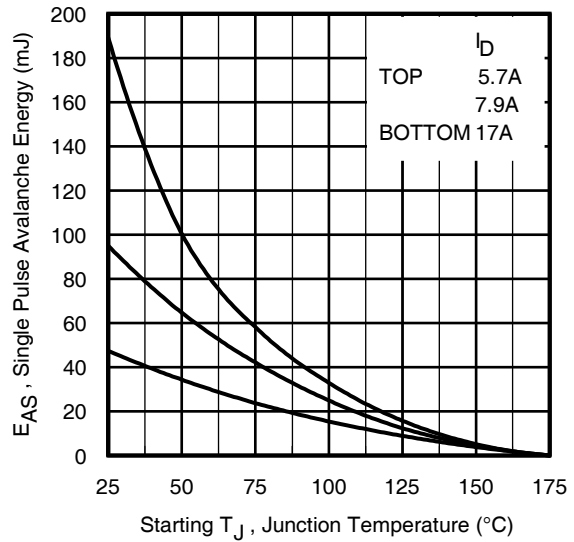
Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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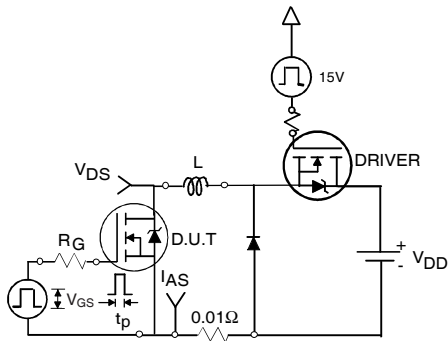
International  
**IR** Rectifier



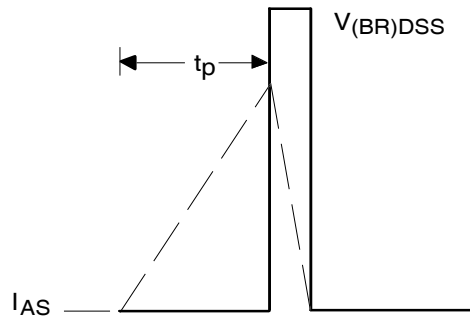
**Fig 12.** On-Resistance vs. Gate Voltage



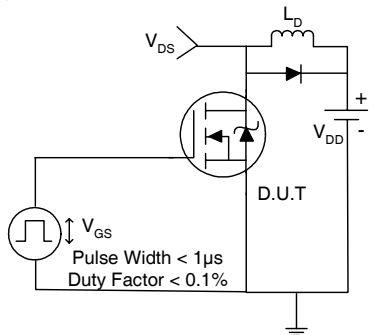
**Fig 13.** Maximum Avalanche Energy vs. Drain Current



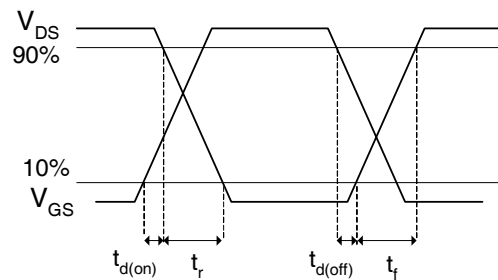
**Fig 14a.** Unclamped Inductive Test Circuit



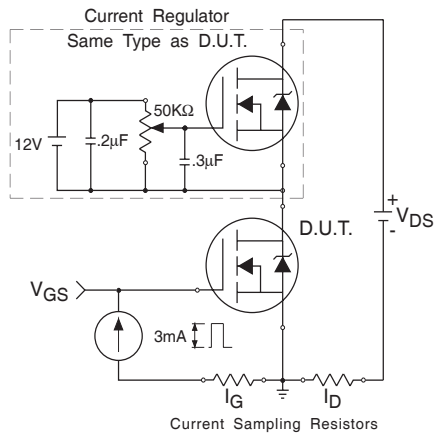
**Fig 14b.** Unclamped Inductive Waveforms



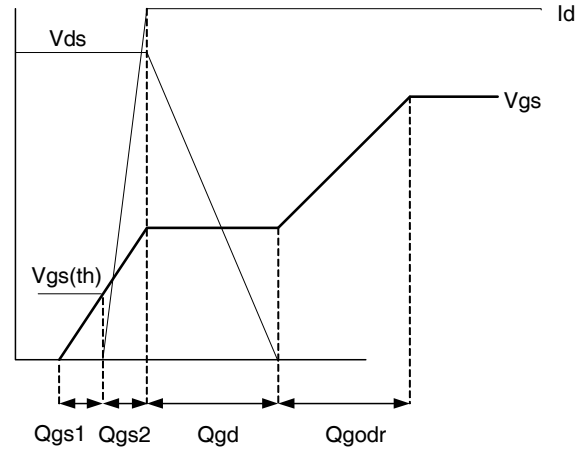
**Fig 15a.** Switching Time Test Circuit



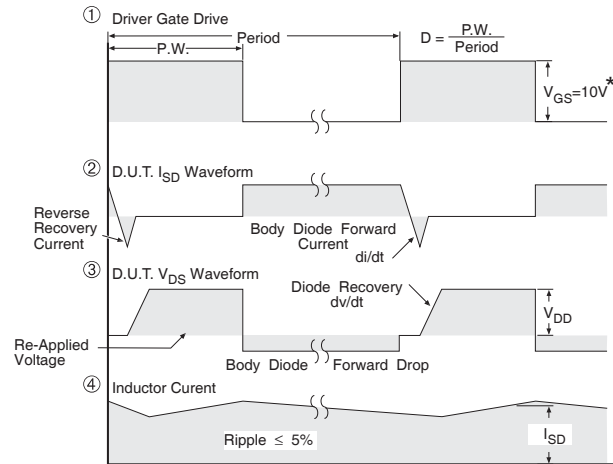
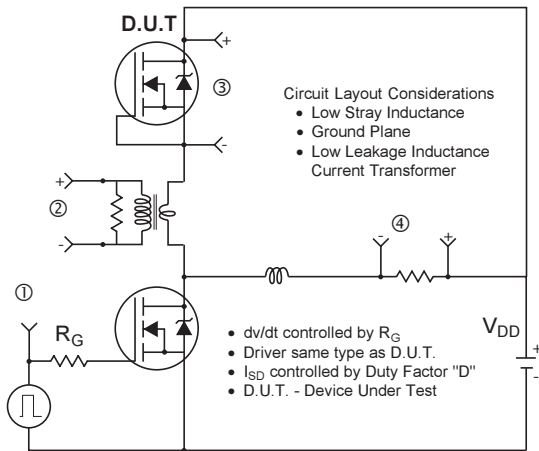
**Fig 15b.** Switching Time Waveforms



**Fig 16a.** Gate Charge Test Circuit



**Fig 16b.** Gate Charge Waveform



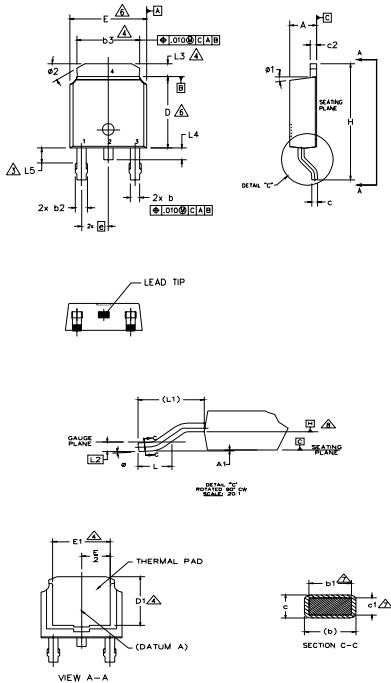
\*  $V_{GS} = 5V$  for Logic Level Devices

**Fig 17.** Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET<sup>®</sup> Power MOSFETs

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## 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**

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

**IGBT & CoPAK**

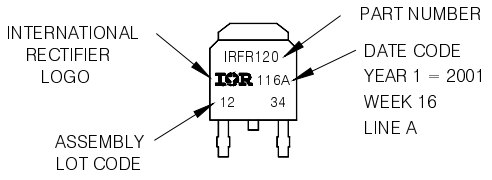
- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER
- 4.- COLLECTOR

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

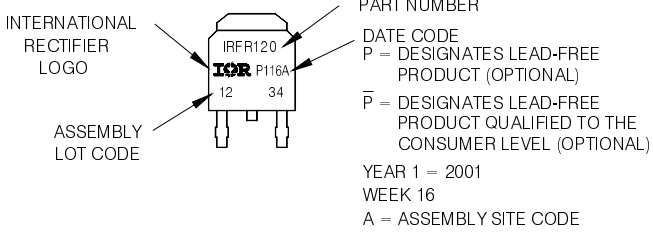
EXAMPLE: THIS IS AN IRFR120  
WITH ASSEMBLY  
LOT CODE 1234  
ASSEMBLED ON WW 16, 2001  
IN THE ASSEMBLY LINE 'A'

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

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



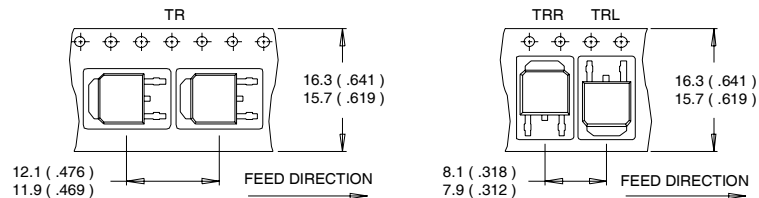
OR



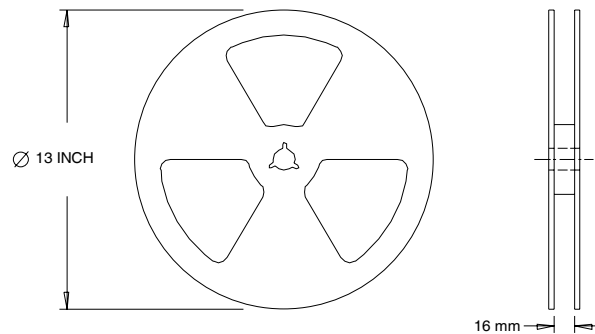


## D-Pak (TO-252AA) Tape & Reel Information

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  $T_J = 25^\circ\text{C}$ ,  $L = 0.34\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 17\text{A}$ .
- 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  $R_\theta$  is measured at  $T_J$  approximately at  $90^\circ\text{C}$ .

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.

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