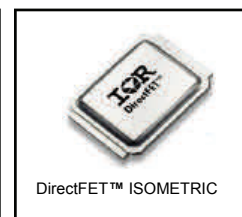
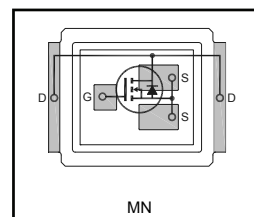


DirectFET® Power MOSFET ②
Typical values (unless otherwise specified)

Applications and Benefits

- Ideal for High Performance Isolated Converter Primary Switch
- Optimized for Synchronous Rectification
- [RoHS Compliant, Halogen Free](#) ②
- [Lead-Free \(Qualified up to 260°C Reflow\)](#) ①
- Low Conduction Losses
- High Cdv/dt Immunity
- Low Profile (<0.7mm)
- [Dual Sided Cooling Compatible](#) ①
- [Compatible with existing Surface Mount Techniques](#) ①
- Industrial Qualified

V_{DSS}	V_{GS}	R_{DS(on)}
100V min	±20V max	5.3mΩ @ 10V
Q_{g tot}	Q_{gd}	V_{gs(th)}
36nC	13nC	2.9V



Applicable DirectFET® Outline and Substrate Outline ①

				MN						
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Item	Description	Unit	Quantity	Unit Price	Total Price
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90	...	...	...	...	

The IRF1717MTRPbF combines the latest HEXFET® Power MOSFET Silicon technology with the advanced DirectFET® packaging to achieve the lowest on-state resistance in a package that has a footprint smaller than a D2PAK and only 0.7 mm profile. The DirectFET® package is compatible with existing layout geometries used in power applications, PCB assembly equipment and vapor phase, infra-red or convection soldering techniques, when [application note AN-1035](#) is followed regarding the manufacturing methods and processes. The DirectFET® package allows dual sided cooling to maximize thermal transfer in power systems.

The IRF7171MTRPbF is optimized for high frequency switching and synchronous rectification applications. The reduced total losses in the device coupled with the high level of thermal performance enables high efficiency and low temperatures, which are key for system reliability improvements, and makes this device ideal for high performance power converters.

Ordering Information

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRF7171MTRPbF	DirectFET® Medium Can	Tape and Reel	4800	IRF7171MTRPbF

Absolute Maximum Ratings

	Parameter	Max.	Units
V _{GS}	Gate-to-Source Voltage	±20	V
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V (Silicon Limited)④	93	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V (Silicon Limited)④	59	
I _D @ T _A = 25°C	Continuous Drain Current, V _{GS} @ 10V (Silicon Limited)③	15	
I _{DM}	Pulsed Drain Current⑤	330	
E _{AS}	Single Pulse Avalanche Energy ⑥	86	mJ
I _{AR}	Avalanche Current ⑥	56	A

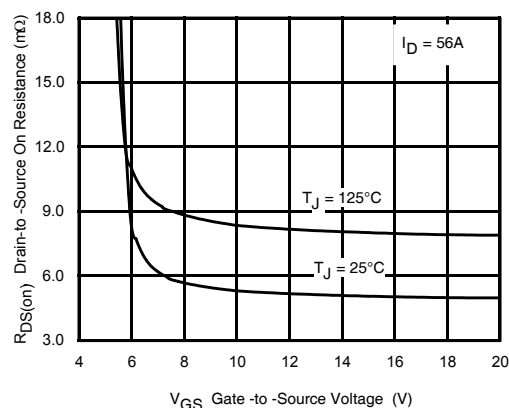


Fig 1. Typical On-Resistance vs. Gate Voltage

Notes

- ① Click on this section to link to the appropriate technical paper.
- ② Click on this section to link to the DirectFET® Website.
- ③ Surface mounted on 1 in. square Cu board, steady state.

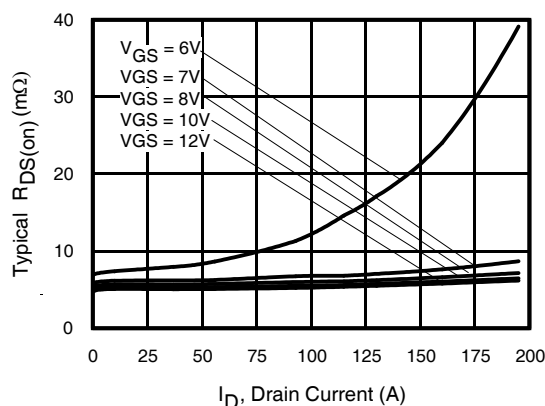


Fig 2. Typical On-Resistance vs. Drain Current

- ④ TC measured with thermocouple mounted to top (Drain) of part.
 ⑤ Repetitive rating; pulse width limited by max. junction temperature.
 ⑥ Starting $T_J = 25^\circ\text{C}$, $L = 55\mu\text{H}$, $R_G = 50\Omega$, $I_{AS} = 56\text{A}$.

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	100	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	40	—	mV/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	5.3	6.5	m Ω	$V_{GS} = 10V, I_D = 56A$ ⑦
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	3.6	V	$V_{DS} = V_{GS}, I_D = 150\mu A$
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	—	-6.2	—	mV/ $^\circ\text{C}$	
I_{DSS}	Drain-to-Source Leakage Current	—	—	1	μA	$V_{DS} = 80V, V_{GS} = 0V$
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	80	—	—	S	$V_{DS} = 10V, I_D = 56A$
Q_g	Total Gate Charge	—	36	54	nC	$V_{DS} = 50V$ $V_{GS} = 10V$ $I_D = 56A$ See Fig.8
Q_{gs1}	Pre- V_{th} Gate-to-Source Charge	—	6.9	—		
Q_{gs2}	Post- V_{th} Gate-to-Source Charge	—	2.4	—		
Q_{gd}	Gate-to-Drain Charge	—	13	—		
Q_{godr}	Gate Charge Overdrive	—	13.7	—		
Q_{sw}	Switch Charge ($Q_{gs2} + Q_{gd}$)	—	15.4	—		
Q_{oss}	Output Charge	—	120	—		$V_{DS} = 50V, V_{GS} = 0V$
R_G	Gate Resistance	—	1.0	—	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	9.3	—	ns	$V_{DD} = 50V, V_{GS} = 10V$ ⑦ $I_D = 56A$ $R_G = 1.8\Omega$
t_r	Rise Time	—	27	—		
$t_{d(off)}$	Turn-Off Delay Time	—	15	—		
t_f	Fall Time	—	20	—		
C_{iss}	Input Capacitance	—	2160	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	970	—		$V_{DS} = 50V$
C_{rss}	Reverse Transfer Capacitance	—	60	—		$f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	4660	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	580	—		$V_{GS} = 0V, V_{DS} = 80V, f = 1.0\text{MHz}$

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	95	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ⑤	—	—	330		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 56A, V_{GS} = 0V$ ⑦
t_{rr}	Reverse Recovery Time	—	66	—	ns	$T_J = 25^\circ\text{C}, I_F = 56A, V_{DD} = 50V$ $di/dt = 100A/\mu s$ ⑦
Q_{rr}	Reverse Recovery Charge	—	126	—	nC	

Notes:

⑤ Repetitive rating; pulse width limited by max. junction temperature.

 ⑦ Pulse width $\leq 400\mu s$; duty cycle $\leq 2\%$

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
P _D @T _C = 25°C	Power Dissipation ④	104	W
P _D @T _C = 100°C	Power Dissipation ④	42	
P _D @T _A = 25°C	Power Dissipation ③	2.8	
T _P	Peak Soldering Temperature	270	°C
T _J	Operating Junction and	-55 to + 150	
T _{STG}	Storage Temperature Range		

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient ③	—	45	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient ⑧	12.5	—	
$R_{\theta JA}$	Junction-to-Ambient ⑨	20	—	
$R_{\theta JC}$	Junction-to-Can ④ ⑩	—	1.2	
$R_{\theta JA-PCB}$	Junction-to-PCB Mounted	1.0	—	

Notes:

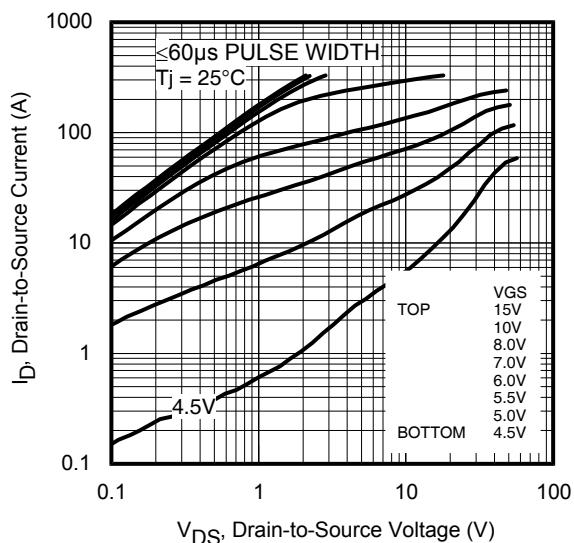
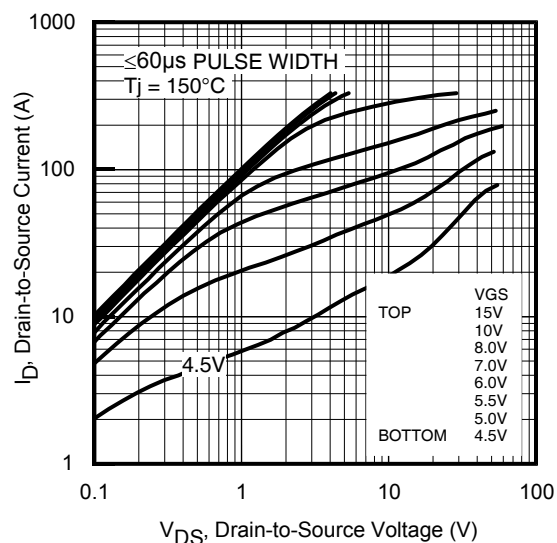
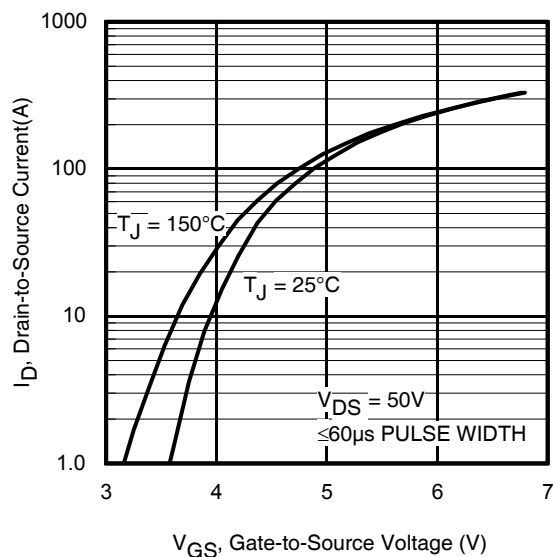
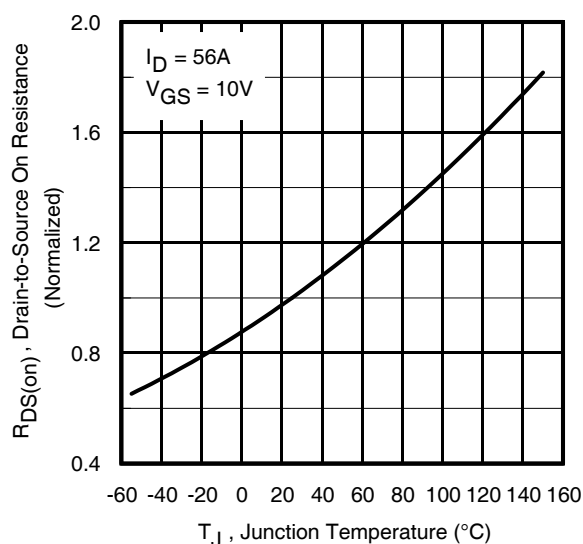
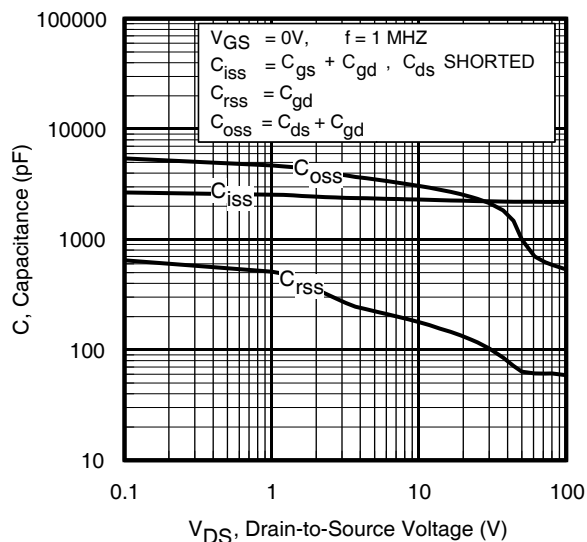
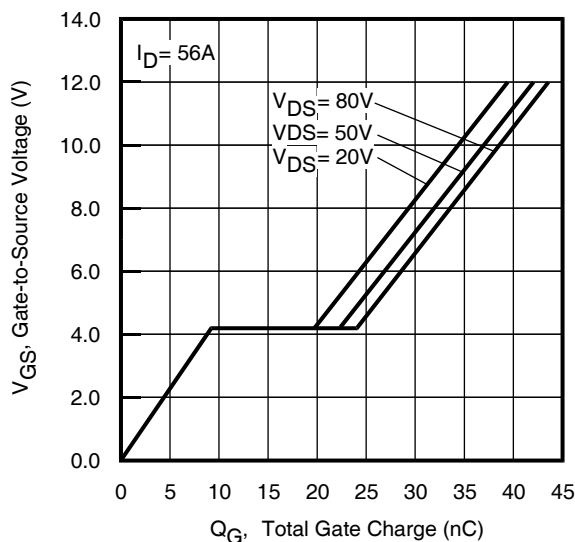
③ Surface mounted on 1 in. square Cu board, steady state.

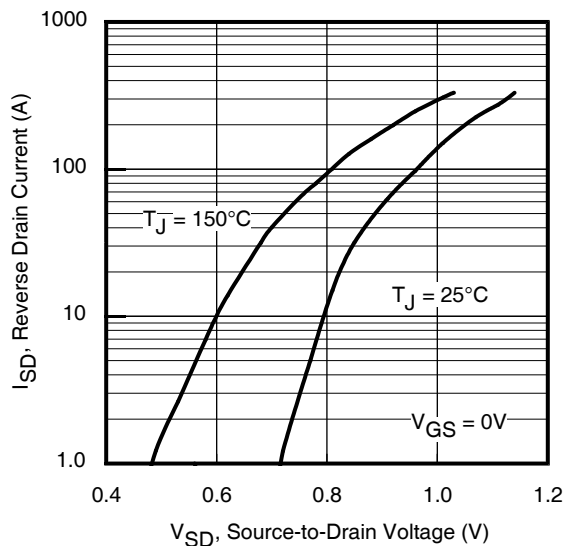
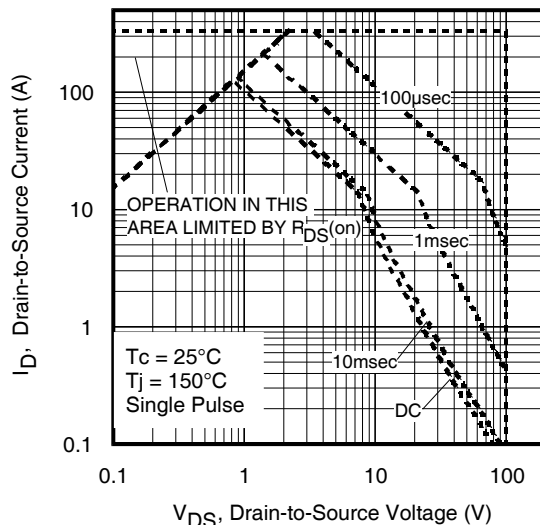
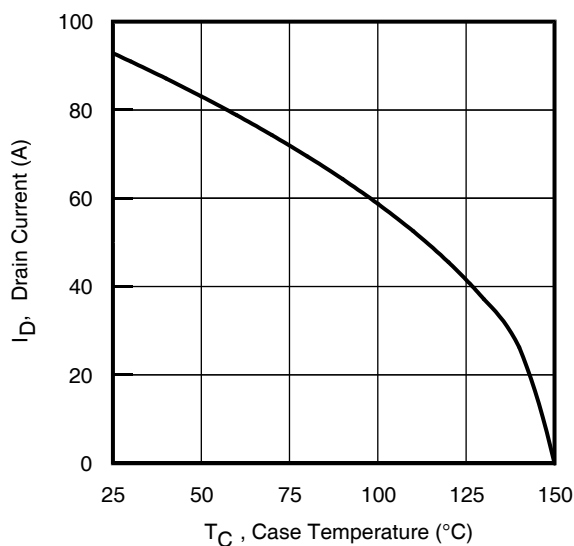
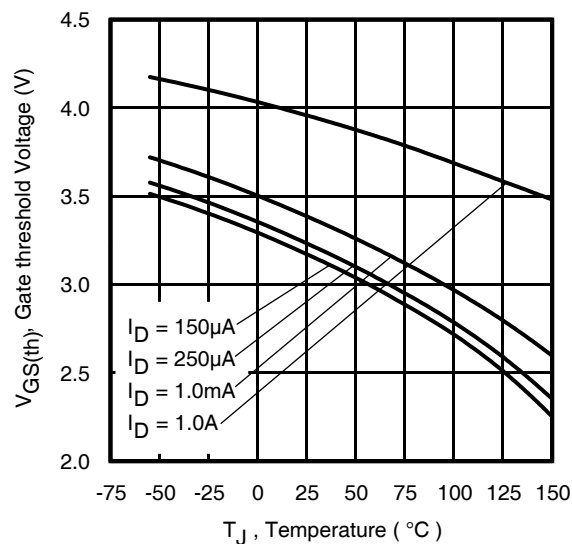
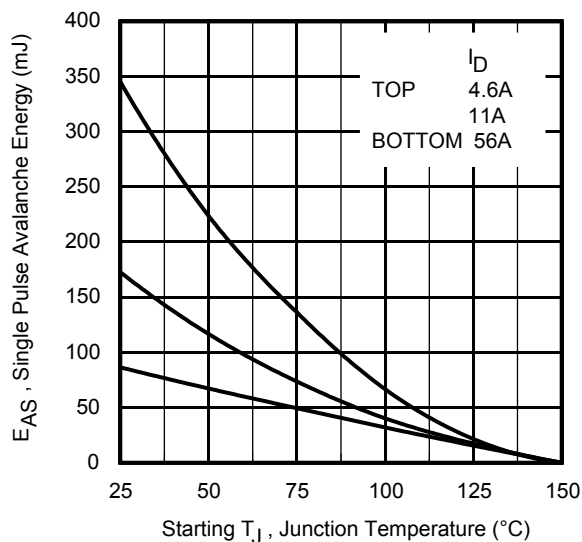
④ T_C measured with thermocouple in contact with top (Drain) of part.

⑧ Used double sided cooling, mounting pad with large heat sink.

⑨ Mounted on minimum footprint full size board with metalized back and with small clip heat sink.

⑩ R_{θ} is measured at T_J of approximately 90°C .


Fig 3. Typical Output Characteristics

Fig 4. Typical Output Characteristics

Fig 5. Typical Transfer Characteristics

Fig 6. Normalized On-Resistance vs. Temperature

Fig 7. Typical Capacitance vs. Drain-to-Source Voltage

Fig 8. Typical Gate Charge vs. Gate-to-Source Voltage


Fig 9. Typical Source-Drain Diode Forward Voltage

Fig 10. Maximum Safe Operating Area

Fig 11. Maximum Drain Current vs. Case Temperature

Fig 12. Typical Threshold Voltage vs. Junction Temperature

Fig 13. Maximum Avalanche Energy vs. Drain Current

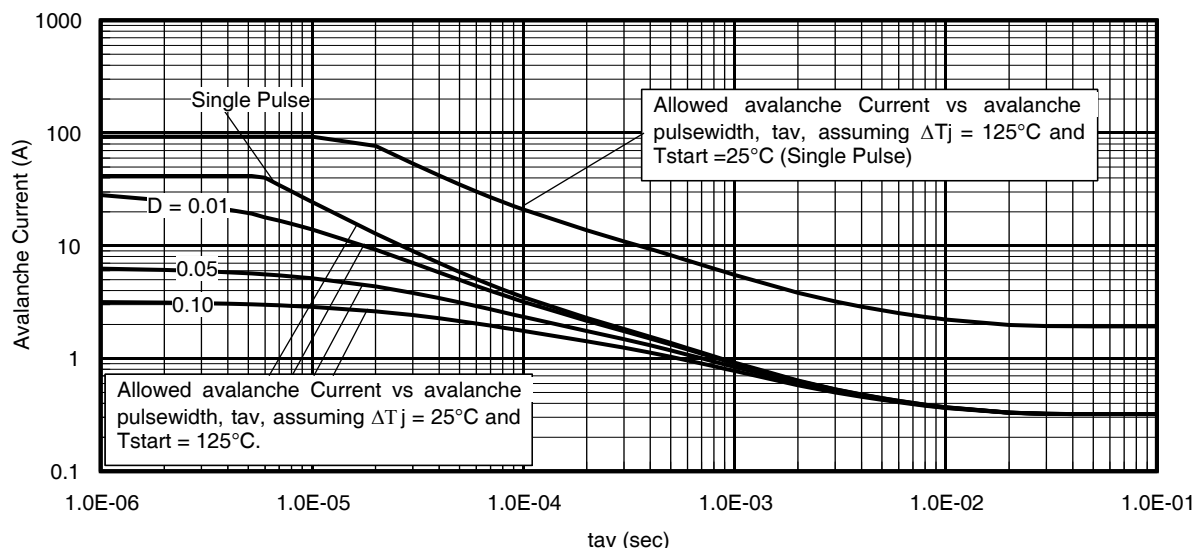


Fig 14. Typical Avalanche Current vs. Pulse Width

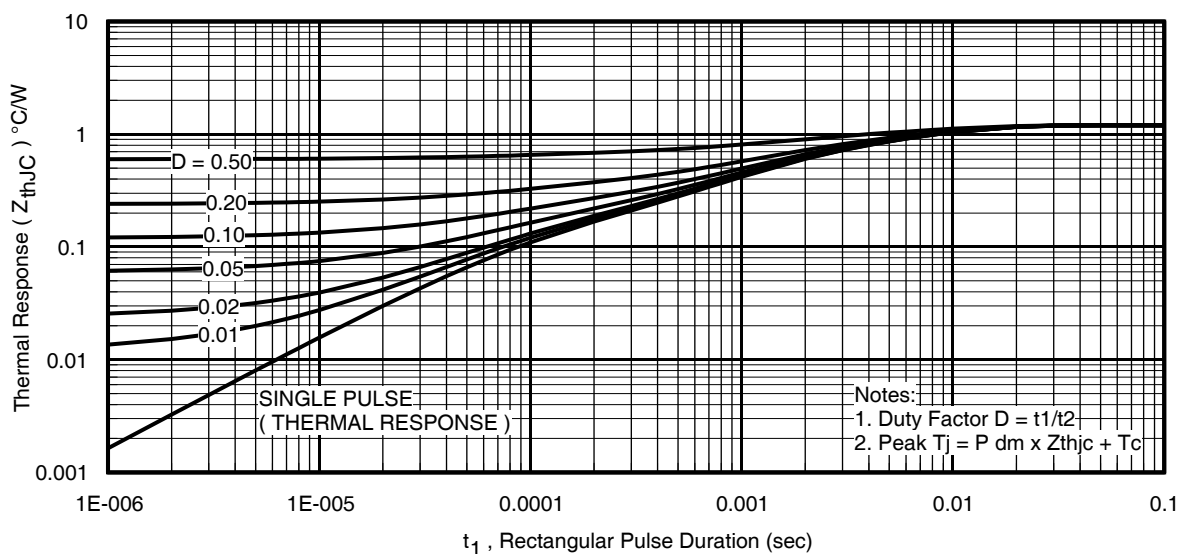
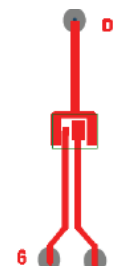
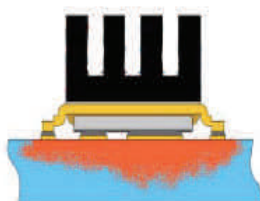
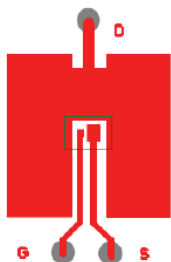


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Notes:

- ③ Surface mounted on 1 in. square Cu board, steady state.
- ④ T_c measured with thermocouple incontact with top (Drain) of part.
- ⑤ Repetitive rating; pulse width limited by max. junction temperature.

- ⑧ Used double sided cooling, mounting pad with large heatsink.
- ⑨ Mounted on minimum footprint full size board with metalized back and with small clip heatsink.
- ⑩ R_θ is measured at T_j of approximately 90°C.



③ Surface mounted on 1 in. square Cu board (still air).

⑨ Mounted on minimum footprint full size board with metalized back and with small clip heatsink (still air)

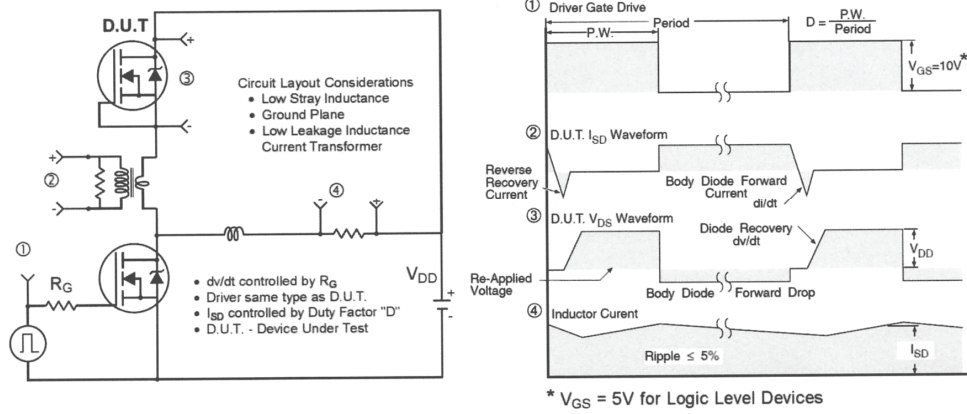


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

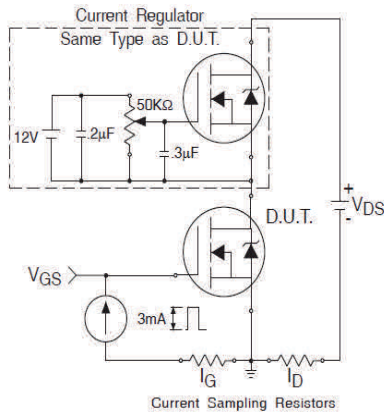


Fig 17a. Gate Charge Test Circuit

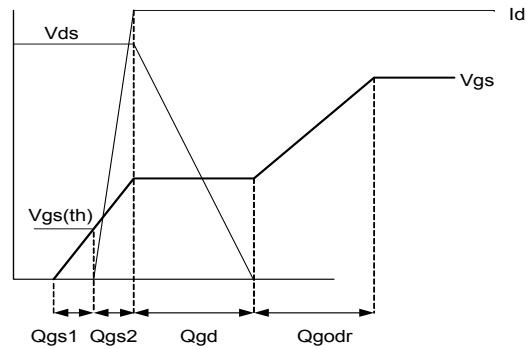


Fig 17b. Gate Charge Waveform

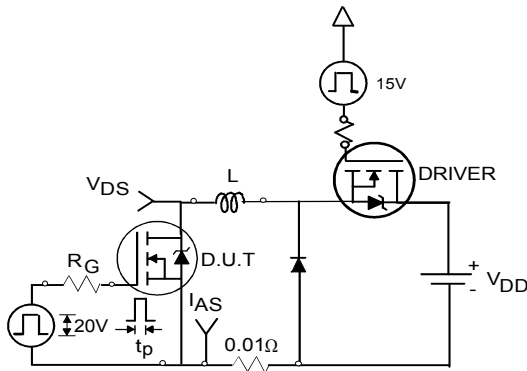


Fig 18a. Unclamped Inductive Test Circuit

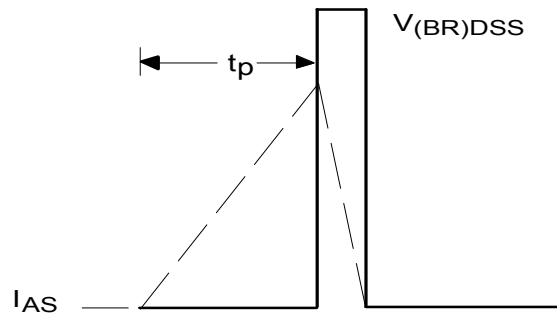


Fig 18b. Unclamped Inductive Waveforms

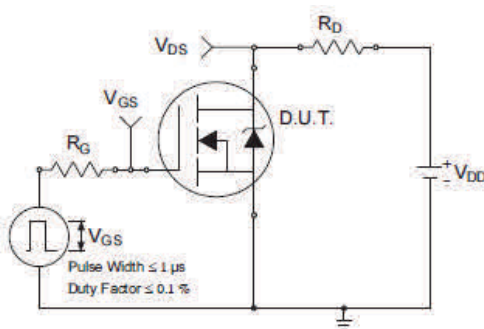


Fig 19a. Switching Time Test Circuit

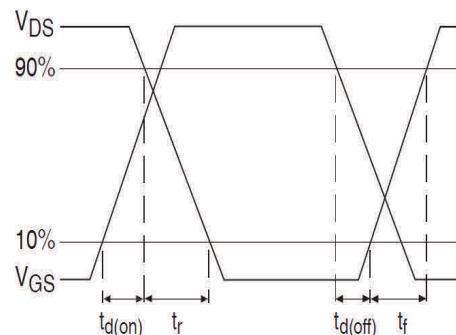
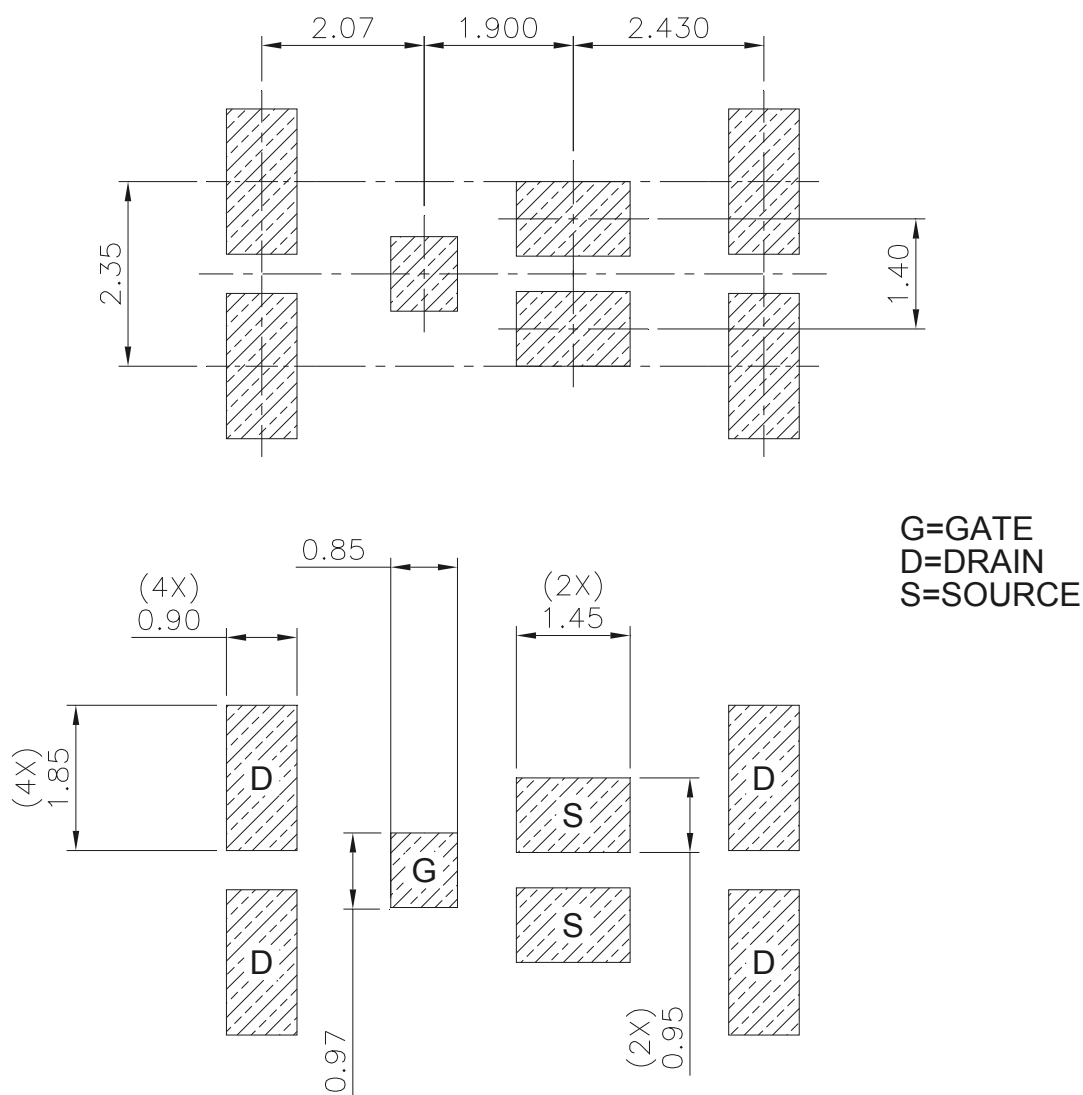


Fig 19b. Switching Time Waveforms

DirectFET® Board Footprint, MN Outline

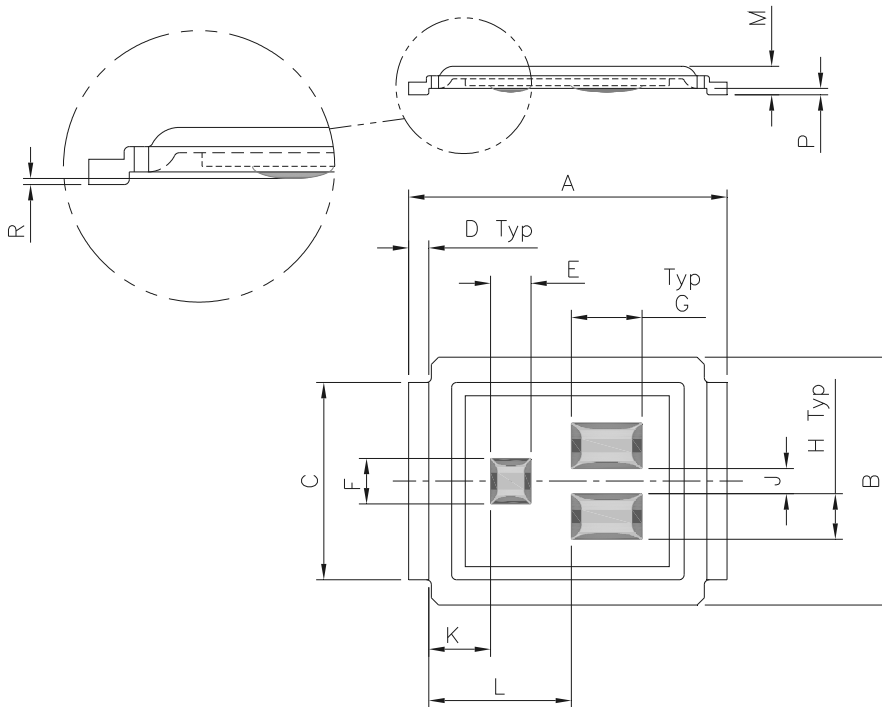
Please see DirectFET® application note [AN-1035](#) for all details regarding the assembly of DirectFET®. This includes all recommendations for stencil and substrate designs.



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

DirectFET® Outline Dimension, MN Outline (Medium Size Can, N-Designation).

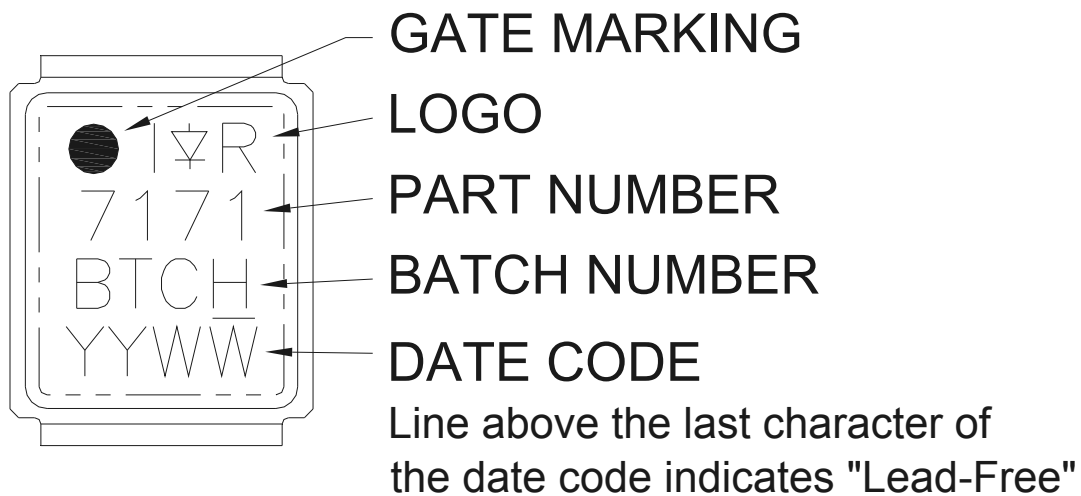
Please see DirectFET® application note [AN-1035](#) for all details regarding the assembly of DirectFET®. This includes all recommendations for stencil and substrate designs.



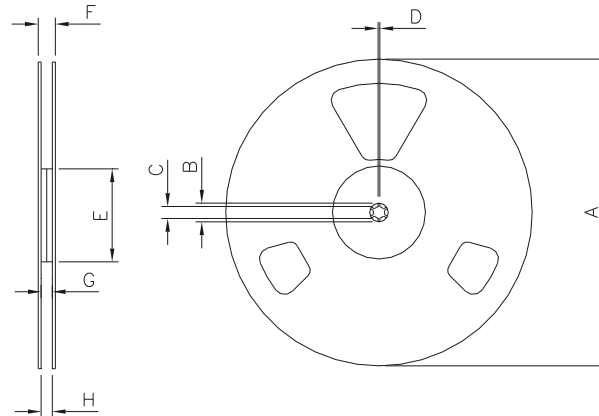
DIMENSIONS				
CODE	METRIC		IMPERIAL	
	MIN	MAX	MIN	MAX
A	6.25	6.35	0.246	0.250
B	4.80	5.05	0.189	0.199
C	3.85	3.95	0.152	0.156
D	0.35	0.45	0.014	0.018
E	0.78	0.82	0.031	0.032
F	0.88	0.92	0.035	0.036
G	1.38	1.42	0.054	0.056
H	0.88	0.92	0.035	0.036
J	0.48	0.52	0.019	0.020
K	1.17	1.27	0.046	0.050
L	2.77	2.87	0.109	0.113
M	0.535	0.595	0.021	0.023
R	0.02	0.08	0.0008	0.0031
P	0.08	0.17	0.003	0.007

Dimensions are shown in millimeters (inches)

DirectFET® Part Marking



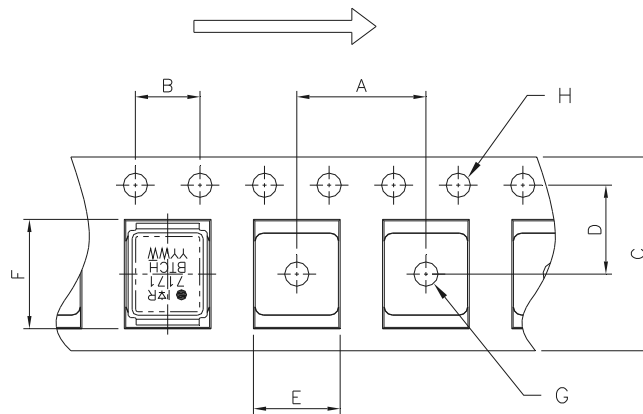
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

DirectFET® Tape & Reel Dimension (Showing component orientation).


NOTE: Controlling dimensions in mm
Std reel quantity is 4800 parts. (ordered as IRF7171MTRPbF). For 1000 parts on 7" reel, order IRF7171MTR1PbF

REEL DIMENSIONS								
STANDARD OPTION (QTY 4800)					TR1 OPTION (QTY 1000)			
	METRIC		IMPERIAL		METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
A	330.0	N.C	12.992	N.C	177.77	N.C	6.9	N.C
B	20.2	N.C	0.795	N.C	19.06	N.C	0.75	N.C
C	12.8	13.2	0.504	0.520	13.5	12.8	0.53	0.50
D	1.5	N.C	0.059	N.C	1.5	N.C	0.059	N.C
E	100.0	N.C	3.937	N.C	58.72	N.C	2.31	N.C
F	N.C	18.4	N.C	0.724	N.C	13.50	N.C	0.53
G	12.4	14.4	0.488	0.567	11.9	12.01	0.47	N.C
H	11.9	15.4	0.469	0.606	11.9	12.01	0.47	N.C

LOADED TAPE FEED DIRECTION



NOTE: CONTROLLING DIMENSIONS IN MM

DIMENSIONS				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX
A	7.90	8.10	0.311	0.319
B	3.90	4.10	0.154	0.161
C	11.90	12.30	0.469	0.484
D	5.45	5.55	0.215	0.219
E	5.10	5.30	0.201	0.209
F	6.50	6.70	0.256	0.264
G	1.50	N.C	0.059	N.C
H	1.50	1.60	0.059	0.063

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

Qualification Information[†]

Qualification Level	Industrial ^{†† *}	
Moisture Sensitivity Level	DirectFET [®] Medium Can	MSL1 (per JEDEC J-STD-020D ^{†††})
RoHS Compliant	Yes	

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

†† Higher qualification ratings may be available should the user have such requirements.

Please contact your International Rectifier sales representative for further information:

<http://www.irf.com/whoto-call/salesrep/>

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

* Industrial qualification standards except autoclave test conditions.

Revision History

Date	Comment
12/3/2014	- Updated $R_{\theta JA}$ from "60°C/W" to "45°C/W" on page 3. - Updated $I_D @ T_A$ and $P_D @ T_A$ based on $R_{\theta JA}$ corrected on page 1 & page 3.
3/25/2015	Added "FastIRFET" on page 1.

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