

International Rectifier

- RoHS Compliant and Halogen Free ①
- Low Profile (<0.7 mm)
- Dual Sided Cooling Compatible ①
- Ultra Low Package Inductance
- Optimized for High Frequency Switching ①
- Ideal for CPU Core DC-DC Converters
- Optimized for Control FET application ①
- Low Conduction and Switching Losses
- Compatible with existing Surface Mount Techniques ①
- 100% R_g tested

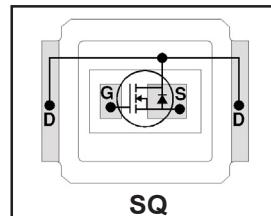
IRF6721SPbF

IRF6721STRPbF

DirectFET™ Power MOSFET ②

Typical values (unless otherwise specified)

V _{DSS}	V _{GS}	R _{DS(on)}	R _{DS(on)}		
30V max	±20V max	5.1mΩ@ 10V	8.5mΩ@ 4.5V		
Q _{g tot}	Q _{gd}	Q _{gs2}	Q _{rr}	Q _{oss}	V _{gs(th)}
11nC	3.7nC	1.3nC	19nC	7.9nC	1.9V



DirectFET™ ISOMETRIC

Applicable DirectFET Outline and Substrate Outline (see p.7,8 for details) ①

SQ	SX	ST	MQ	MX	MT	MP		
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Description

The IRF6721SPbF 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 the footprint of a MICRO-8 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, improving previous best thermal resistance by 80%.

The IRF6721SPbF balances both low resistance and low charge along with ultra low package inductance to reduce both conduction and switching losses. The reduced total losses make this product ideal for high efficiency DC-DC converters that power the latest generation of processors operating at higher frequencies. The IRF6721SPbF has been optimized for parameters that are critical in synchronous buck operating from 12 volt bus converters including R_{ds(on)} and gate charge to minimize losses.

Absolute Maximum Ratings

	Parameter	Max.	Units
V _{DS}	Drain-to-Source Voltage	30	V
V _{GS}	Gate-to-Source Voltage	±20	
I _D @ T _A = 25°C	Continuous Drain Current, V _{GS} @ 10V ③	14	
I _D @ T _A = 70°C	Continuous Drain Current, V _{GS} @ 10V ③	11	A
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V ④	60	
I _{DM}	Pulsed Drain Current ⑤	110	
E _{AS}	Single Pulse Avalanche Energy ⑥	62	mJ
I _{AR}	Avalanche Current ⑤	11	A

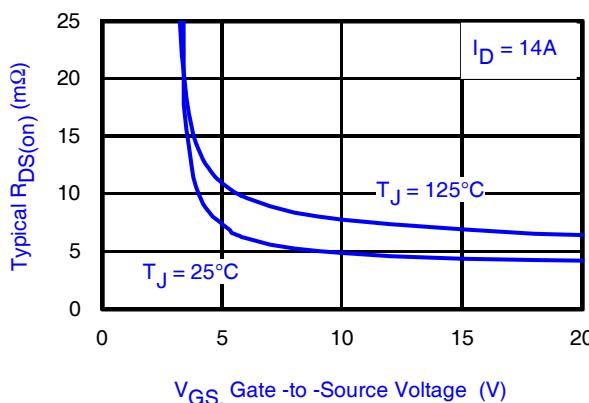


Fig 1. Typical On-Resistance vs. Gate Voltage

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.

www.irf.com

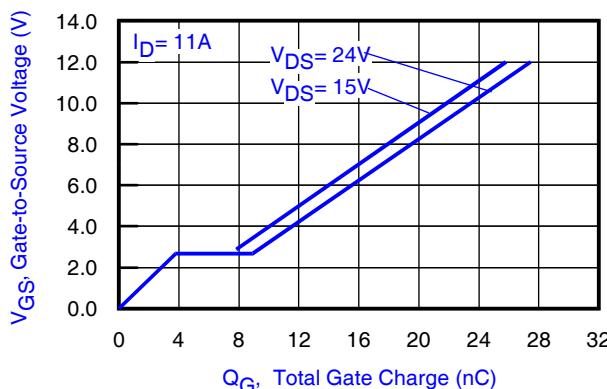


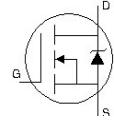
Fig 2. Typical Total Gate Charge vs. Gate-to-Source Voltage

- ④ T_C measured with thermocouple mounted to top (Drain) of part.
- ⑤ Repetitive rating; pulse width limited by max. junction temperature.
- ⑥ Starting T_J = 25°C, L = 1.1mH, R_G = 25Ω, I_{AS} = 11A.

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{\text{GS}} = 0\text{V}, I_D = 250\mu\text{A}$
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	22	—	mV/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{\text{DS}(\text{on})}$	Static Drain-to-Source On-Resistance	—	5.1	7.3	m Ω	$V_{\text{GS}} = 10\text{V}, I_D = 14\text{A}$ ⑦
		—	8.5	10.9		$V_{\text{GS}} = 4.5\text{V}, I_D = 11\text{A}$ ⑦
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	1.4	1.9	2.4	V	$V_{\text{DS}} = V_{\text{GS}}, I_D = 25\mu\text{A}$
$\Delta V_{\text{GS}(\text{th})}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-6.3	—	mV/ $^\circ\text{C}$	
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{\text{DS}} = 24\text{V}, V_{\text{GS}} = 0\text{V}$
		—	—	150		$V_{\text{DS}} = 24\text{V}, V_{\text{GS}} = 0\text{V}, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{\text{GS}} = 20\text{V}$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{\text{GS}} = -20\text{V}$
g_{fs}	Forward Transconductance	25	—	—	S	$V_{\text{DS}} = 15\text{V}, I_D = 11\text{A}$
Q_g	Total Gate Charge	—	11	17	nC	$V_{\text{DS}} = 15\text{V}$ $V_{\text{GS}} = 4.5\text{V}$ $I_D = 11\text{A}$ See Fig. 15
$Q_{\text{gs}1}$	Pre-V _{th} Gate-to-Source Charge	—	2.9	—		
$Q_{\text{gs}2}$	Post-V _{th} Gate-to-Source Charge	—	1.3	—		
Q_{gd}	Gate-to-Drain Charge	—	3.7	—		
Q_{godr}	Gate Charge Overdrive	—	3.1	—		
Q_{sw}	Switch Charge ($Q_{\text{gs}2} + Q_{\text{gd}}$)	—	4.9	—		
Q_{oss}	Output Charge	—	7.9	—	nC	$V_{\text{DS}} = 16\text{V}, V_{\text{GS}} = 0\text{V}$
R_G	Gate Resistance	—	2.1	3.7	Ω	
$t_{\text{d}(\text{on})}$	Turn-On Delay Time	—	7.8	—	ns	$V_{\text{DD}} = 15\text{V}, V_{\text{GS}} = 4.5\text{V}$ ⑦ $I_D = 11\text{A}$ $R_G = 1.8\Omega$ See Fig. 17
t_r	Rise Time	—	8.9	—		
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time	—	9.3	—		
t_f	Fall Time	—	5.3	—		
C_{iss}	Input Capacitance	—	1430	—	pF	$V_{\text{GS}} = 0\text{V}$ $V_{\text{DS}} = 15\text{V}$ $f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	370	—		
C_{rss}	Reverse Transfer Capacitance	—	140	—		

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	52	A	MOSFET symbol showing the integral reverse p-n junction diode. 
	Pulsed Source Current (Body Diode) ⑤	—	—	110		
V_{SD}	Diode Forward Voltage	—	0.80	1.0	V	$T_J = 25^\circ\text{C}, I_S = 11\text{A}, V_{\text{GS}} = 0\text{V}$ ⑦
t_{rr}	Reverse Recovery Time	—	17	26	ns	$T_J = 25^\circ\text{C}, I_F = 11\text{A}$ $dI/dt = 230\text{A}/\mu\text{s}$ ⑦
Q_{rr}	Reverse Recovery Charge	—	19	29	nC	

Notes:

⑦ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.

Absolute Maximum Ratings

	Parameter	Max.	Units
P _D @ T _A = 25°C	Power Dissipation ③	2.2	W
P _D @ T _A = 70°C	Power Dissipation ③	1.4	
P _D @ T _C = 25°C	Power Dissipation ④	42	
T _P	Peak Soldering Temperature	270	°C
T _J	Operating Junction and Storage Temperature Range	-40 to + 150	
T _{STG}			

Thermal Resistance

	Parameter	Typ.	Max.	Units
R _{0JA}	Junction-to-Ambient ③⑩	—	58	
R _{0JA}	Junction-to-Ambient ⑥⑩	12.5	—	
R _{0JA}	Junction-to-Ambient ⑨⑩	20	—	°C/W
R _{0JC}	Junction-to-Case ④⑩	—	3.0	
R _{0J-PCB}	Junction-to-PCB Mounted	1.0	—	
	Linear Derating Factor ⑤	0.017	—	W/°C

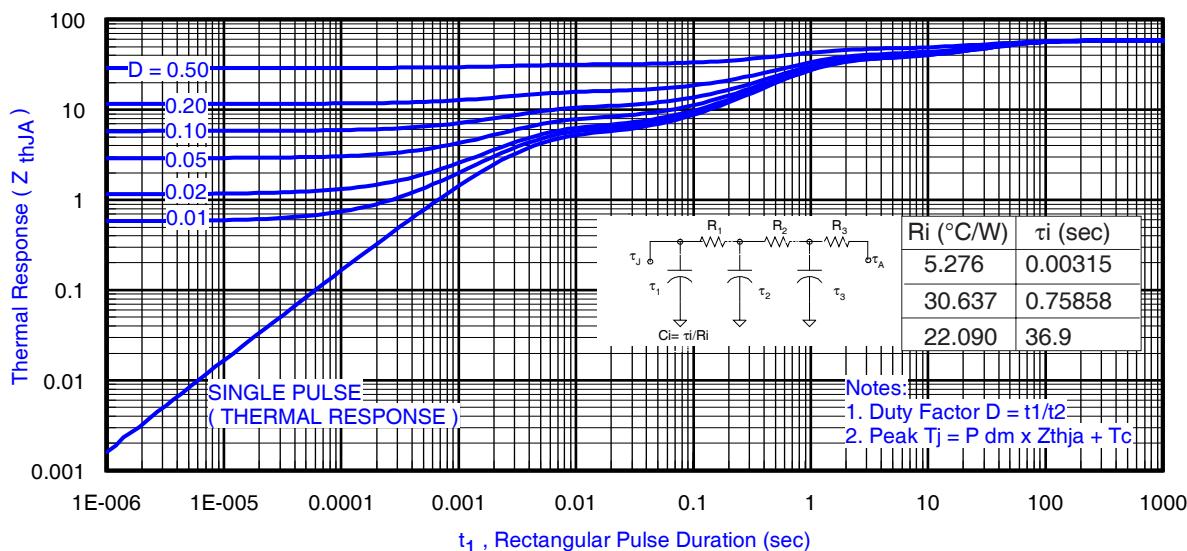


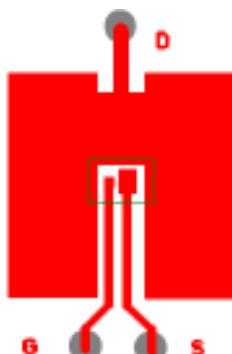
Fig 3. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient ③

Notes:

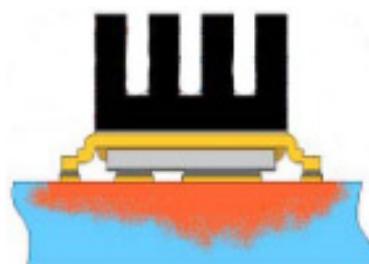
⑧ Used double sided cooling , mounting pad with large heatsink.

⑩ R₀ is measured at T_J of approximately 90°C.

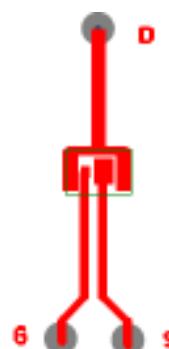
⑨ Mounted on minimum footprint full size board with metalized back and with small clip heatsink.



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



⑨ Mounted to a PCB with small clip heatsink (still air)



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

IRF6721SPbF

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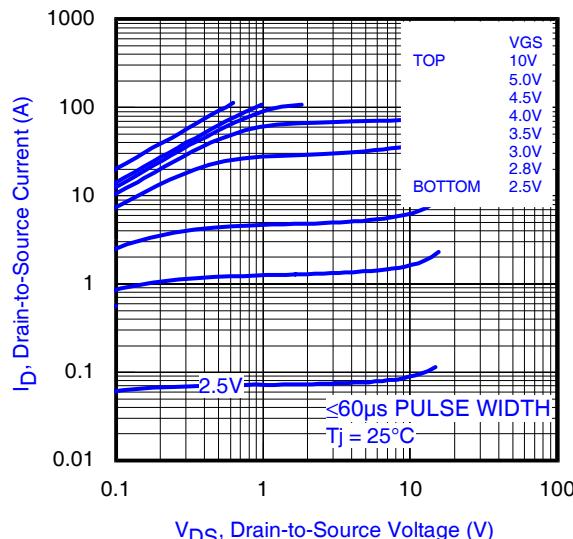


Fig 4. Typical Output Characteristics

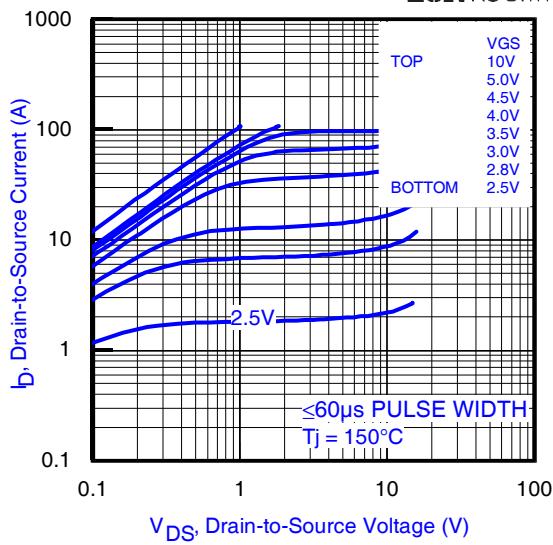


Fig 5. Typical Output Characteristics

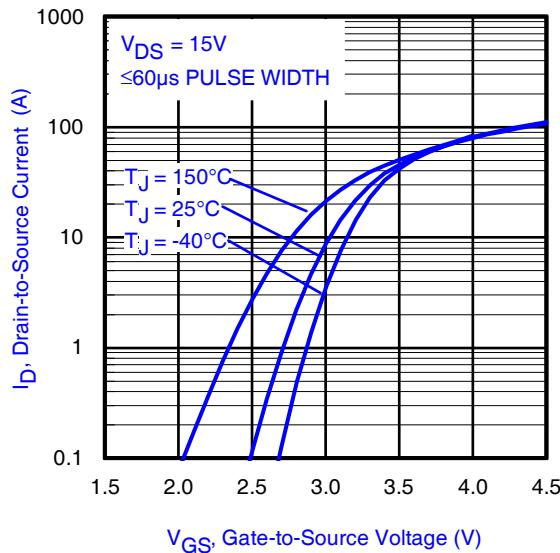


Fig 6. Typical Transfer Characteristics

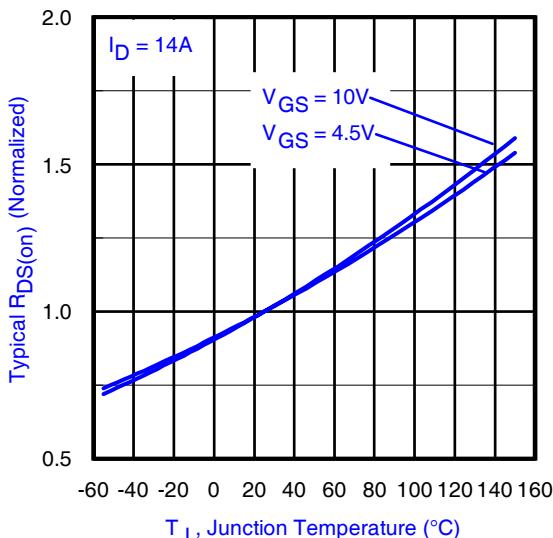


Fig 7. Normalized On-Resistance vs. Temperature

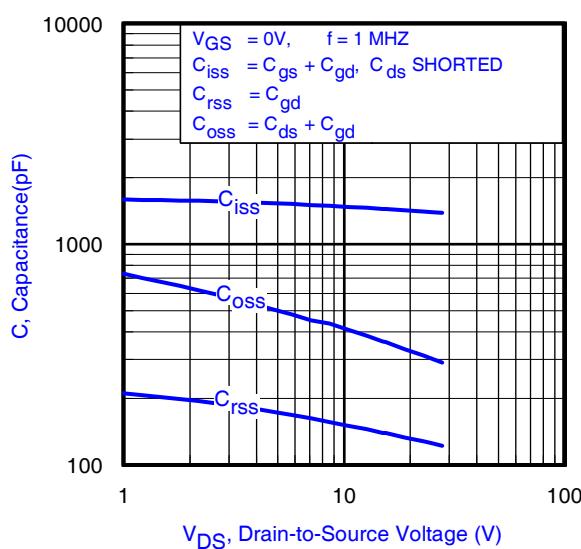


Fig 8. Typical Capacitance vs. Drain-to-Source Voltage

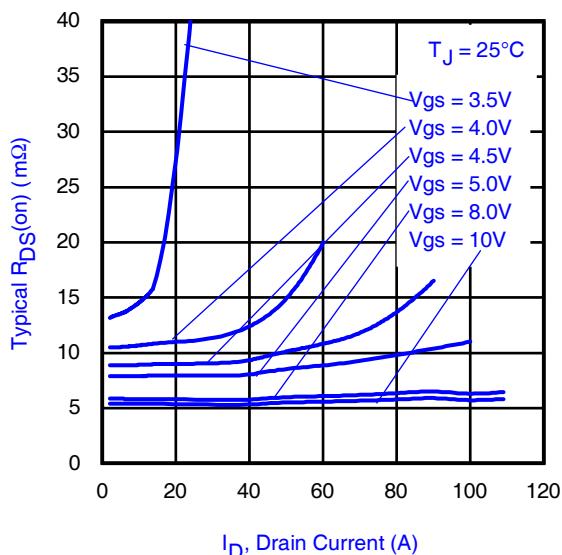


Fig 9. Typical On-Resistance vs. Drain Current and Gate Voltage

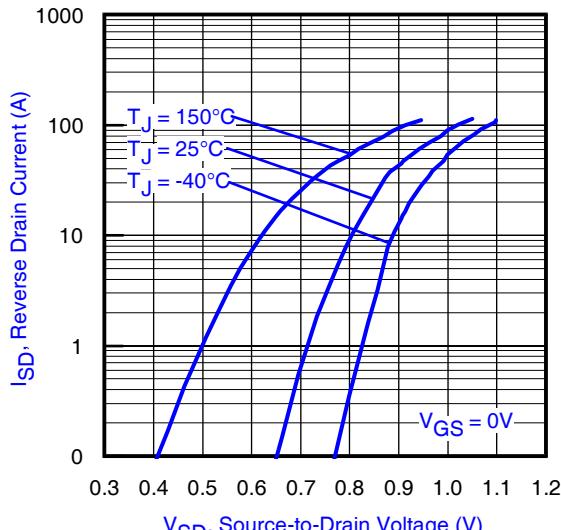


Fig 10. Typical Source-Drain Diode Forward Voltage

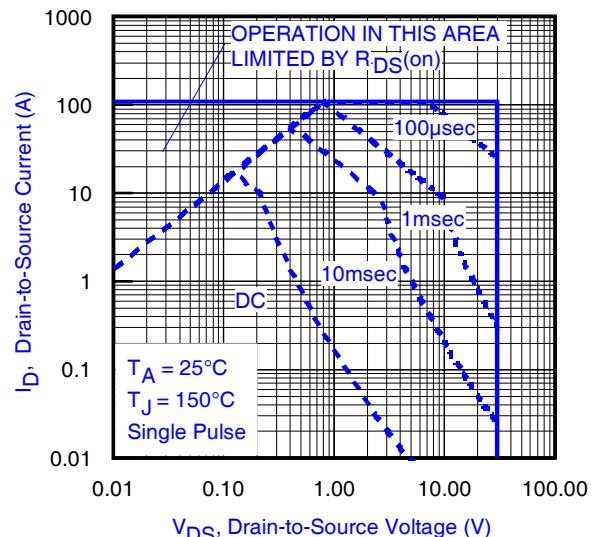


Fig 11. Maximum Safe Operating Area

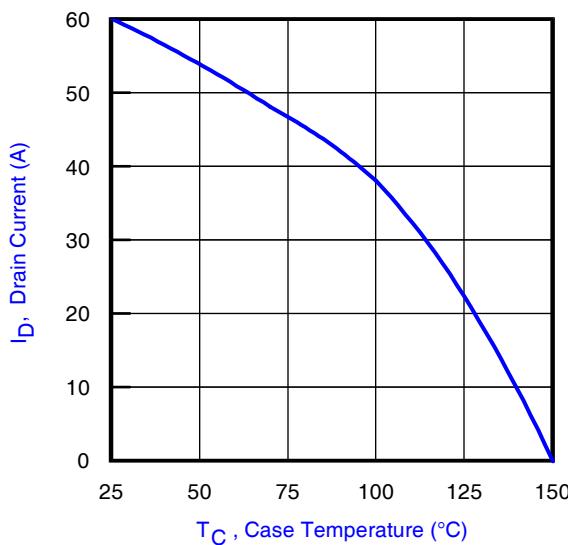


Fig 12. Maximum Drain Current vs. Case Temperature

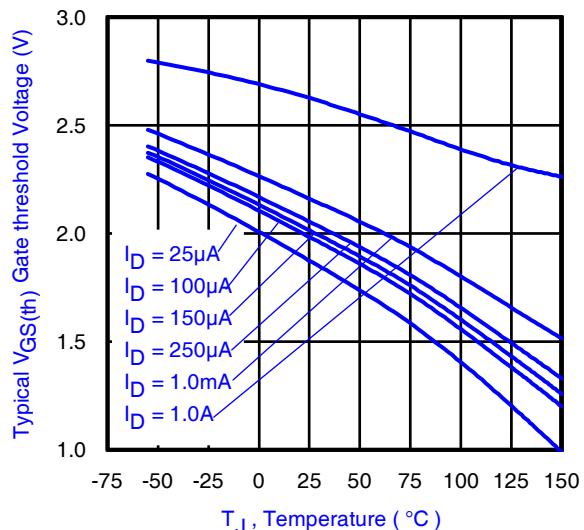


Fig 13. Typical Threshold Voltage vs. Junction Temperature

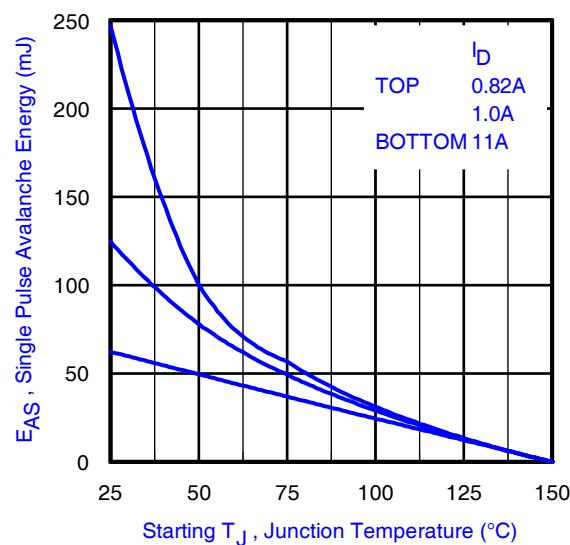


Fig 14. Maximum Avalanche Energy vs. Drain Current

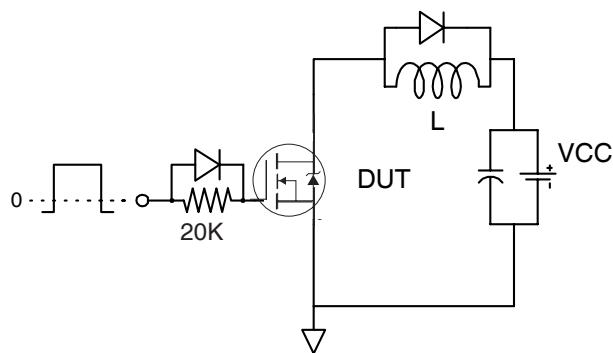


Fig 15a. Gate Charge Test Circuit

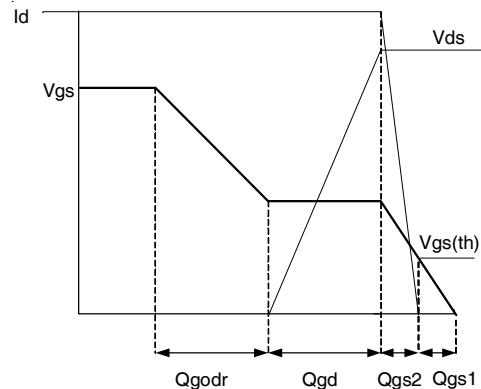


Fig 15b. Gate Charge Waveform

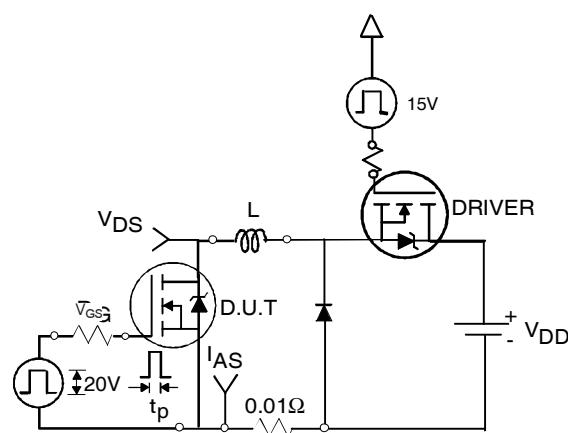


Fig 16a. Unclamped Inductive Test Circuit

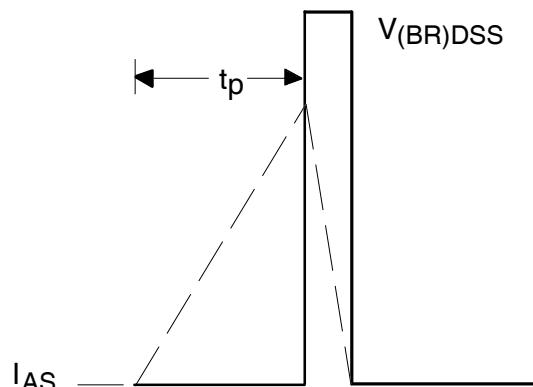


Fig 16b. Unclamped Inductive Waveforms

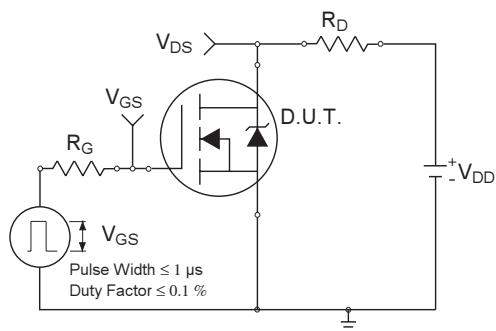


Fig 17a. Switching Time Test Circuit

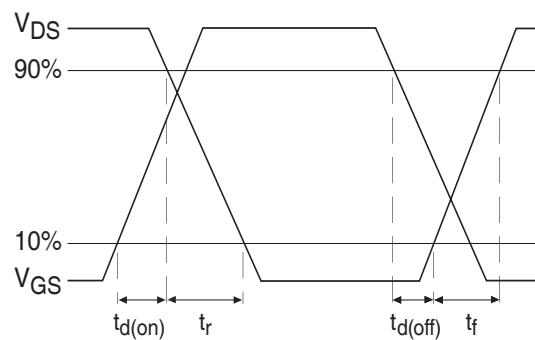


Fig 17b. Switching Time Waveforms

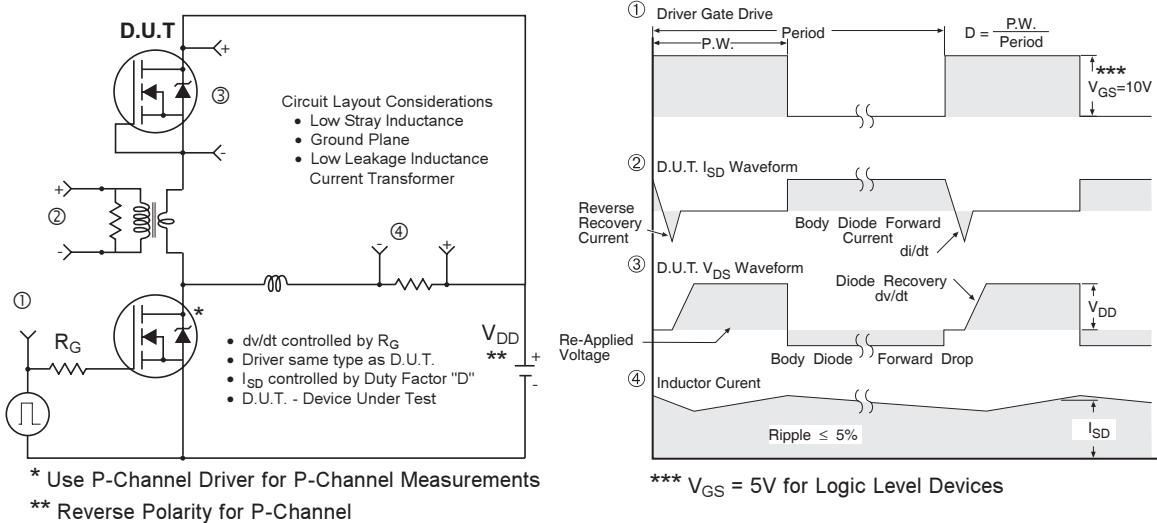
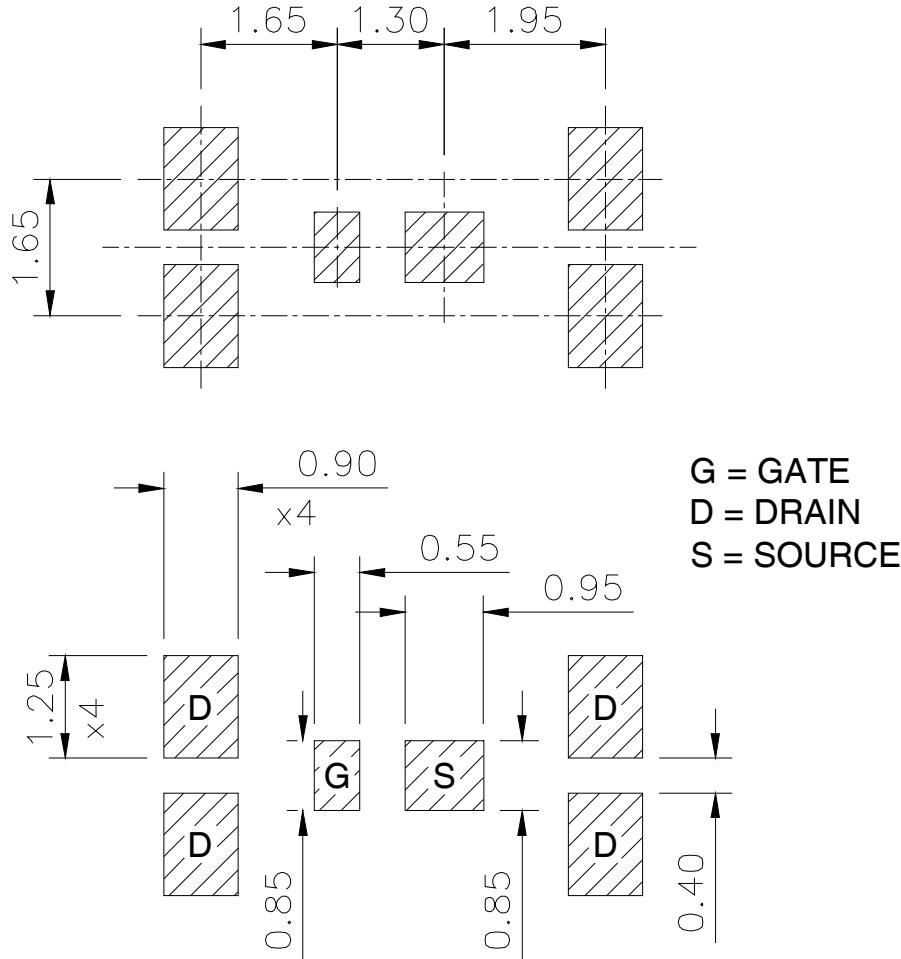


Fig 18. Diode Reverse Recovery Test Circuit for HEXFET® Power MOSFETs

DirectFET™ Board Footprint, SQ Outline (Small Size Can, Q-Designation).

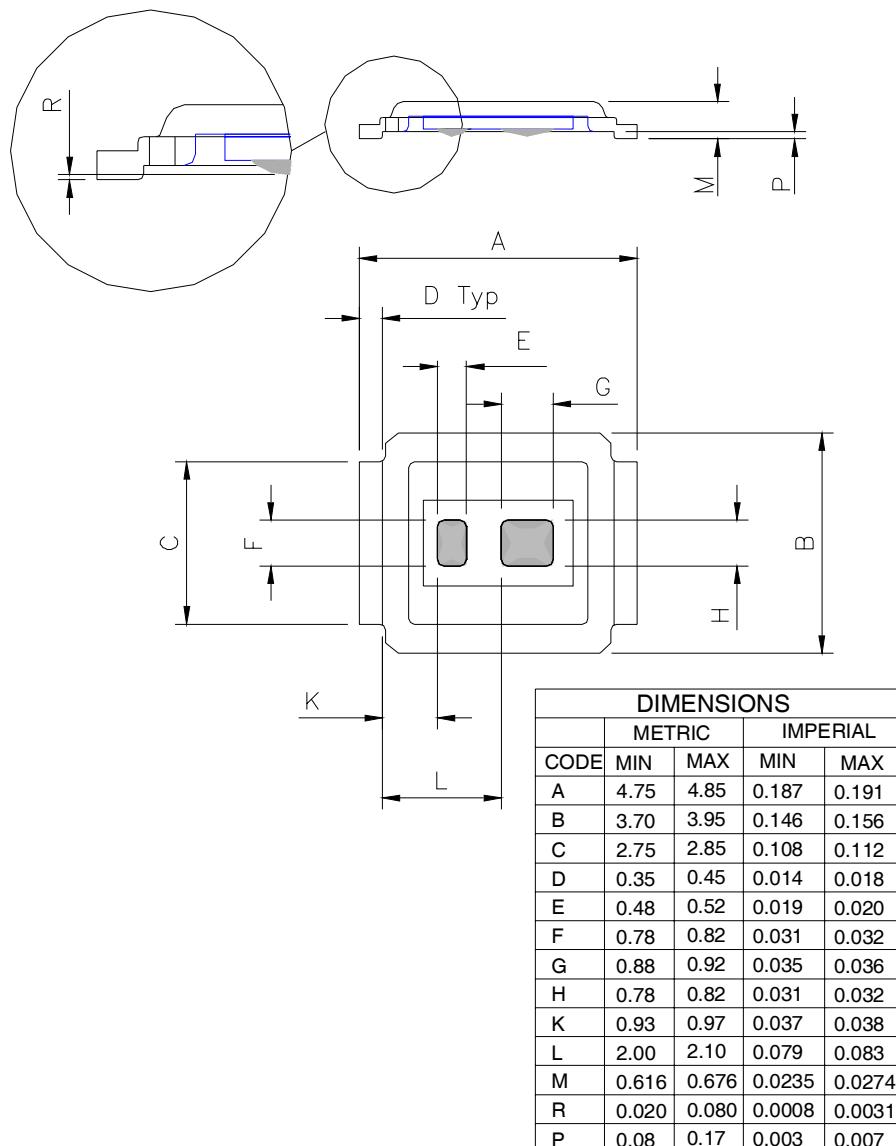
Please see DirectFET application note AN-1035 for all details regarding the assembly of DirectFET.

This includes all recommendations for stencil and substrate designs.

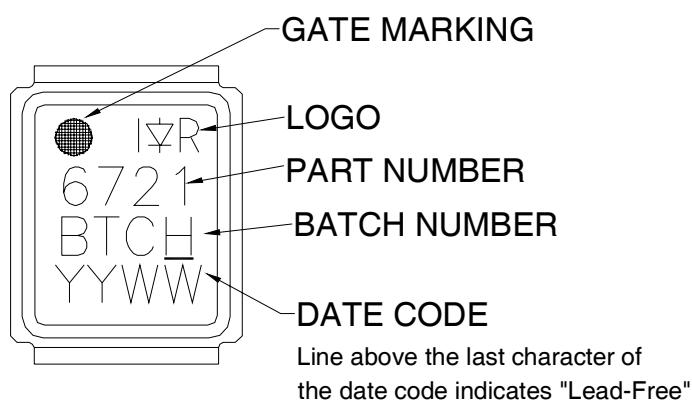


DirectFET™ Outline Dimension, SQ Outline (Small Size Can, Q-Designation).

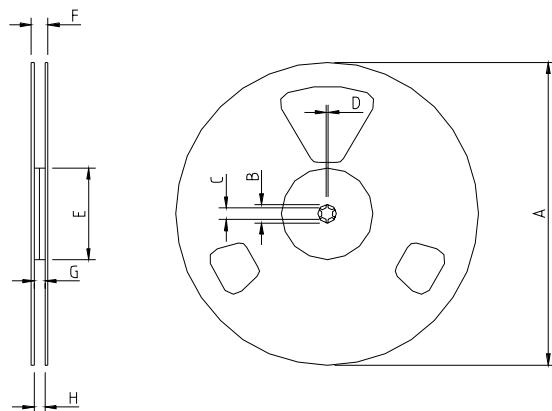
Please see DirectFET application note AN-1035 for all details regarding the assembly of DirectFET. This includes all recommendations for stencil and substrate designs.



DirectFET™ Part Marking



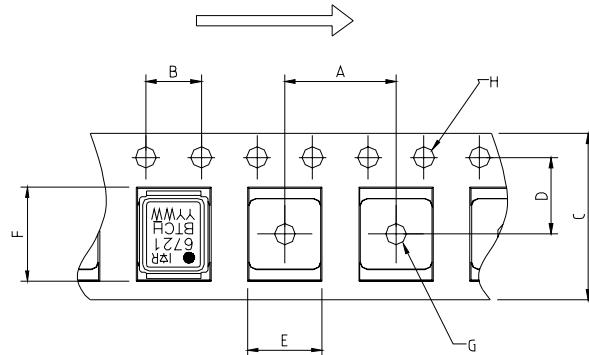
DirectFET™ Tape & Reel Dimension (Showing component orientation).



NOTE: Controlling dimensions in mm
Std reel quantity is 4800 parts. (ordered as IRF6721STRPBF). For 1000 parts on 7" reel, order IRF6721STR1PBF

REEL DIMENSIONS								
STANDARD OPTION (QTY 4800)				TR1 OPTION (QTY 1000)				
CODE	METRIC	MIN	MAX	IMPERIAL	METRIC	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							
CODE	METRIC	MIN	MAX	IMPERIAL	METRIC	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			

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.

International
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
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- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.