International
IOR Rectifier

勝 特 力 材 料 886-3-5753170
胜特力电子(上海) 86-21-34970699
胜特力电子(深圳) 86-755-83298787
Http://www.100y.com.tw

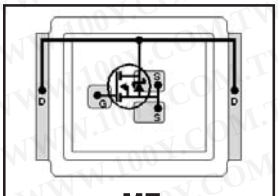
IRF6643TRPbF

DirectFET™ Power MOSFET ②

- RoHS Compliant ①
- Lead-Free (Qualified up to 260°C Reflow)
- Application Specific MOSFETs
- Ideal for High Performance Isolated Converter Primary Switch Socket
- Optimized for Synchronous Rectification
- Low Conduction Losses
- High Cdv/dt Immunity
- Dual Sided Cooling Compatible ①
- Compatible with existing Surface Mount Techniques ①

Typical values (unless otherwise specified)

V_{DSS}	V_{GS}	$R_{DS(on)}$
150V max	±20V max	29mΩ@ 10V
$Q_{g\ tot}$	Q_{gd}	$V_{gs(th)}$
39nC	11nC	4.0V



MZ

DirectFET™ ISOMETRIC

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

SH	SJ	SP		MZ	MN					

Description

The IRF6643PbF 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 an Micro8 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 IRF6643PbF is optimized for primary side sockets in forward and push-pull isolated DC-DC topologies, for 48V and 36V-60V input voltage range systems. 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 isolated DC-DC converters.

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	150	V
V_{GS}	Gate-to-Source Voltage	±20	
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V ③	6.2	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V ③	5.0	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V ④	35	
I_{DM}	Pulsed Drain Current ⑤	76	
E_{AS}	Single Pulse Avalanche Energy ⑥	50	mJ
I_{AR}	Avalanche Current ⑤	7.6	A

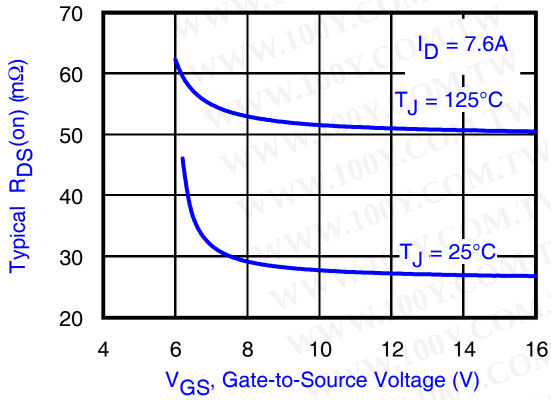


Fig 1. Typical On-Resistance vs. Gate Voltage

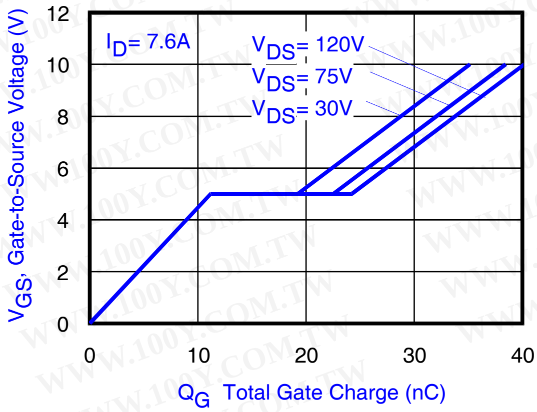


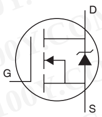
Fig 2. Typical Total Gate Charge vs. Gate-to-Source Voltage

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.
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 = 0.43mH, R_G = 25Ω, I_{AS} = 7.6A.

Electrical Characteristic @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	150	–––	–––	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.18	–––	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	29	34.5	mΩ	V_{GS} = 10V, I_D = 7.6A ⑦
$V_{GS(th)}$	Gate Threshold Voltage	3.0	4.0	4.9	V	V_{DS} = V_{GS}, I_D = 150μA
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	–––	-11	–––	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	20	μA	V_{DS} = 150V, V_{GS} = 0V
		–––	–––	250		V_{DS} = 120V, 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	16	–––	–––	S	V_{DS} = 10V, I_D = 7.6A
Q_g	Total Gate Charge	–––	39	55		
Q_{gs1}	Pre-Vth Gate-to-Source Charge	–––	9.6	–––		V_{DS} = 75V
Q_{gs2}	Post-Vth Gate-to-Source Charge	–––	2.2	–––	nC	V_{GS} = 10V
Q_{gd}	Gate-to-Drain Charge	–––	11	17		I_D = 7.6A
Q_{godr}	Gate Charge Overdrive	–––	16	–––		See Fig. 15
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	–––	13	–––		
Q_{oss}	Output Charge	–––	14	–––	nC	V_{DS} = 16V, V_{GS} = 0V
R_G	Gate Resistance	–––	0.8	–––	Ω	
$t_{d(on)}$	Turn-On Delay Time	–––	9.2	–––		V_{DD} = 75V, V_{GS} = 10V ⑦
t_r	Rise Time	–––	5.0	–––		I_D = 7.6A
$t_{d(off)}$	Turn-Off Delay Time	–––	13	–––	ns	Clamped Inductive Load
t_f	Fall Time	–––	4.4	–––		
C_{iss}	Input Capacitance	–––	2340	–––		V_{GS} = 0V
C_{oss}	Output Capacitance	–––	300	–––	pF	V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	–––	61	–––		f = 1.0MHz
C_{oss}	Output Capacitance	–––	1950	–––		V_{GS} = 0V, V_{DS} = 1.0V, f=1.0MHz
C_{oss}	Output Capacitance	–––	140	–––		V_{GS} = 0V, V_{DS} = 80V, f=1.0MHz

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode) T_J= 25°C	–––	–––	58		MOSFET symbol showing the
					A	
I_{SM}	Pulsed Source Current (Body Diode) ⑤	–––	–––	76		integral reverse p-n junction diode.
V_{SD}	Diode Forward Voltage	–––	–––	1.3	V	T_J = 25°C, I_S = 7.6A, V_{GS} = 0V ⑦
t_{rr}	Reverse Recovery Time	–––	67	100	ns	T_J = 25°C, I_F = 7.6A, V_{DD} = 50V
Q_{rr}	Reverse Recovery Charge	–––	190	280	nC	di/dt = 100A/μs ①

Notes:

⑤ Repetitive rating; pulse width limited by max. junction temperature.
⑦ Pulse width ≤ 400μs; duty cycle ≤ 2%.

Absolute Maximum Ratings

	Parameter	Max.	Units
P_D @T_A = 25°C	Power Dissipation ③	2.8	W
P_D @T_A = 70°C	Power Dissipation ③	1.8	
P_D @T_C = 25°C	Power Dissipation ④	89	
T_P	Peak Soldering Temperature	270	°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-40 to + 150	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient ③⑩	——	45	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑧⑩	12.5	——	
$R_{\theta JA}$	Junction-to-Ambient ⑨⑩	20	——	
$R_{\theta JC}$	Junction-to-Case ④⑩	——	1.4	
$R_{\theta J\text{-}PCB}$	Junction-to-PCB Mounted	1.0	——	

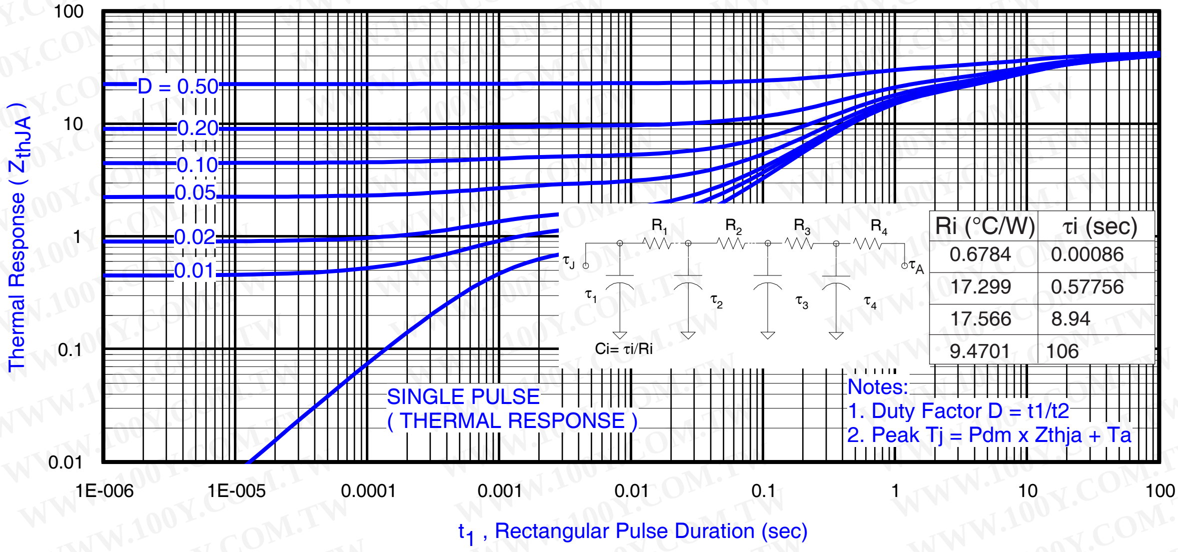
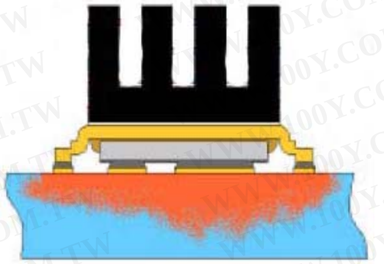


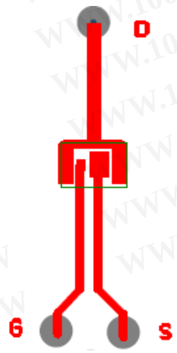
Fig 3. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient ①

Notes:

③ Surface mounted on 1 in. square Cu board, steady state.
④ T_C measured with thermocouple incontact with top (Drain) of part.
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)

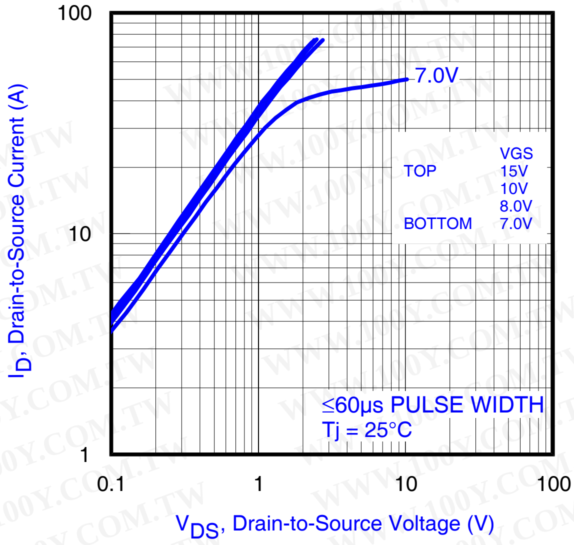


Fig 4. Typical Output Characteristics

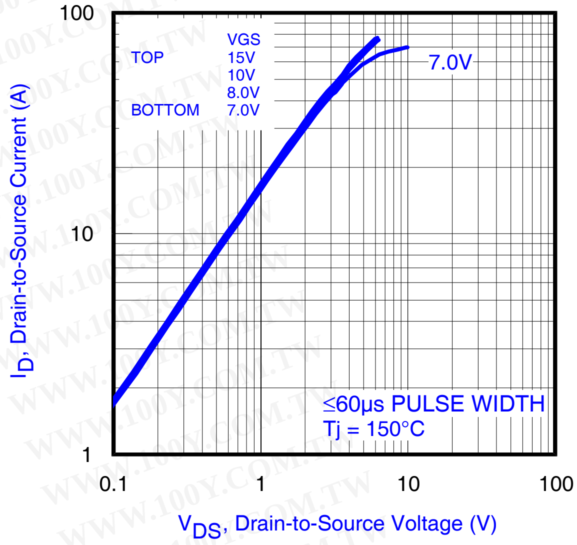


Fig 5. Typical Output Characteristics

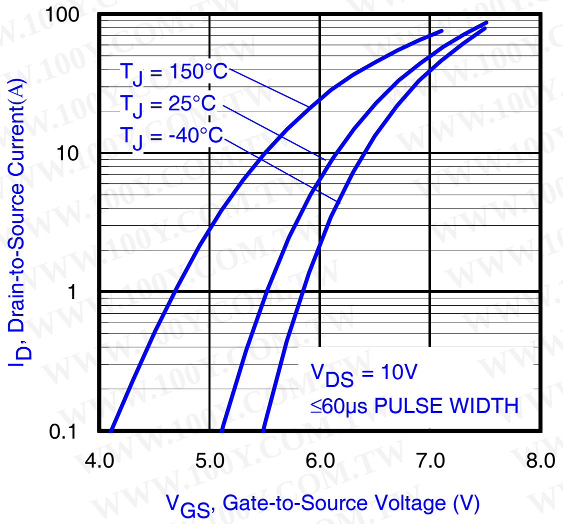


Fig 6. Typical Transfer Characteristics

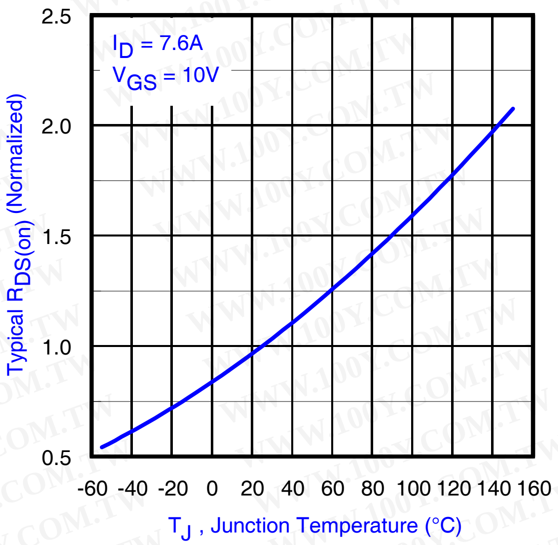


Fig 7. Normalized On-Resistance vs. Temperature

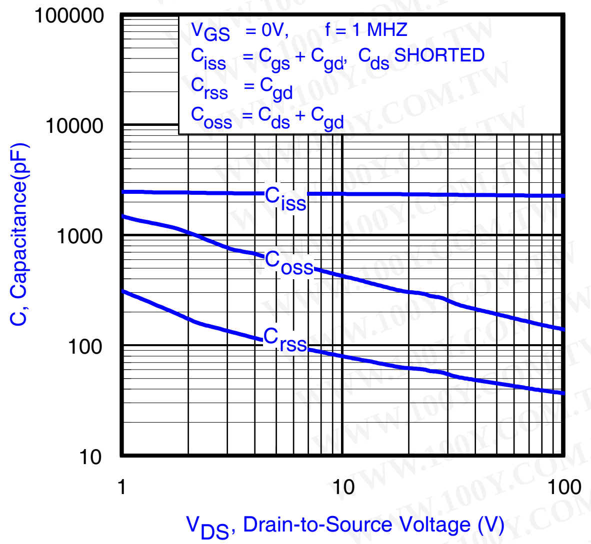


Fig 8. Typical Capacitance vs.Drain-to-Source Voltage

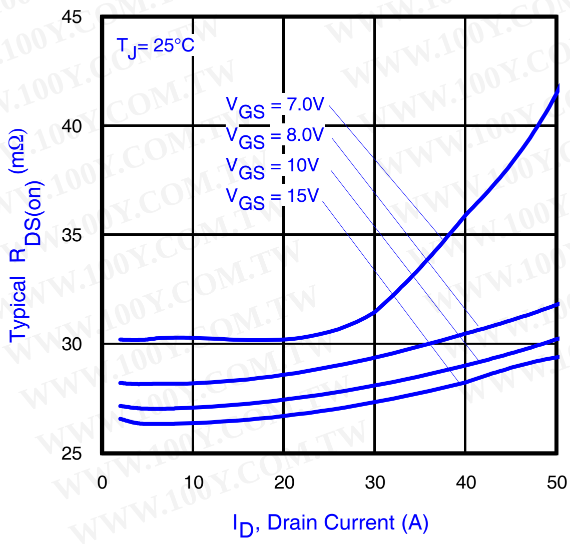


Fig 9. Typical On-Resistance vs. Drain Current

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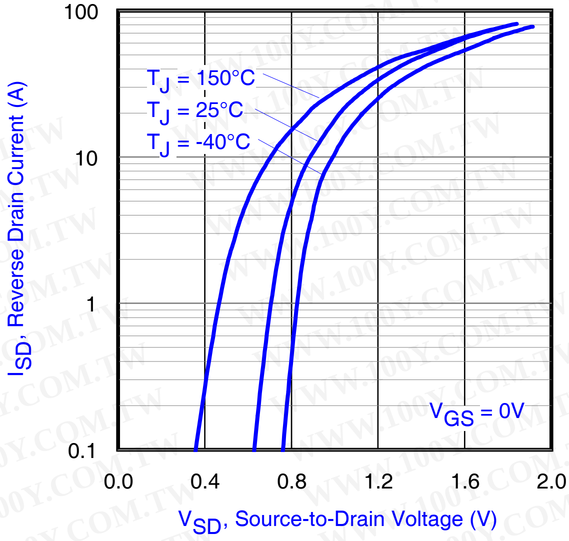


Fig 10. Typical Source-Drain Diode Forward Voltage

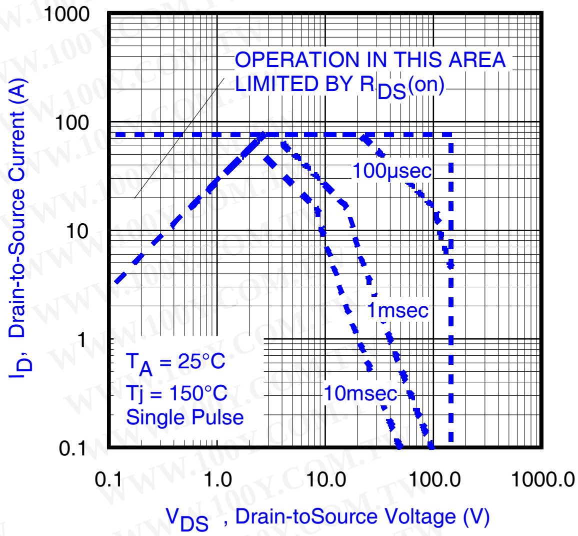


Fig11. Maximum Safe Operating Area

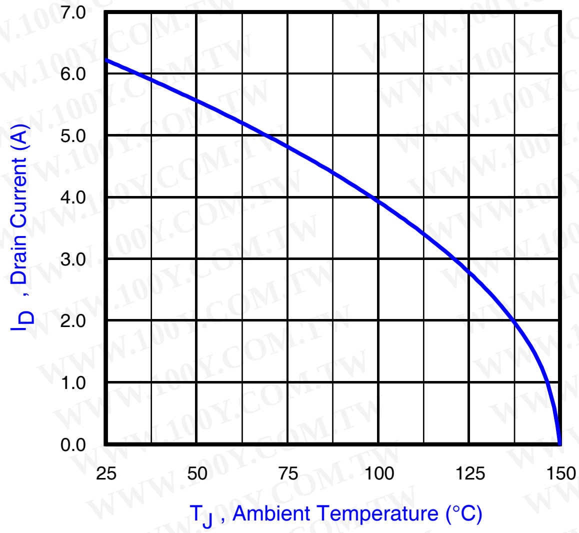


Fig 12. Maximum Drain Current vs. Ambient Temperature

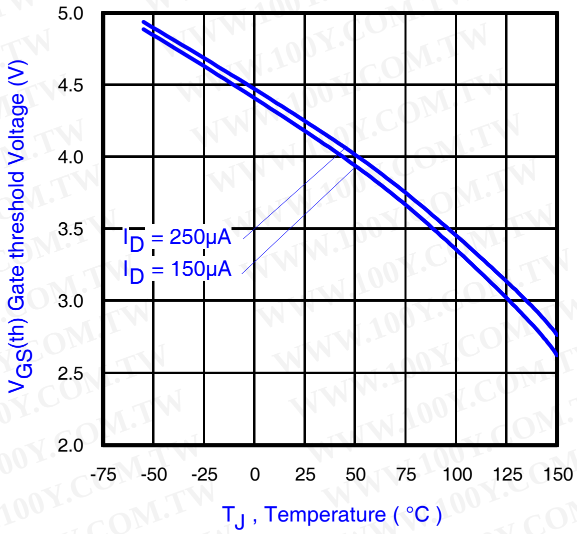


Fig 13. Typical Threshold Voltage vs. Junction Temperature

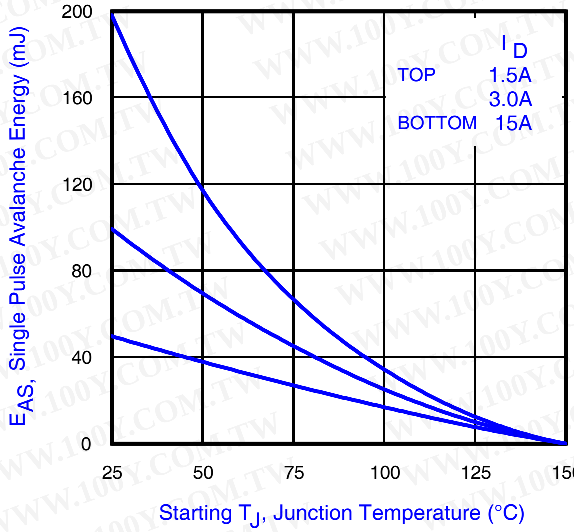


Fig 14. Maximum Avalanche Energy vs. Drain Current

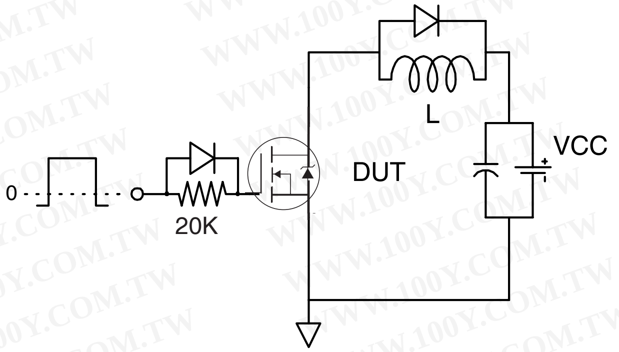


Fig 15a. Gate Charge Test Circuit

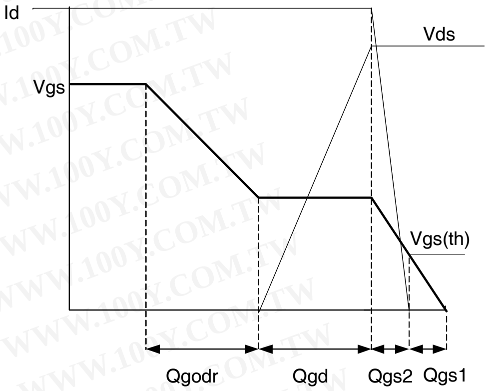


Fig 15b. Gate Charge Waveform

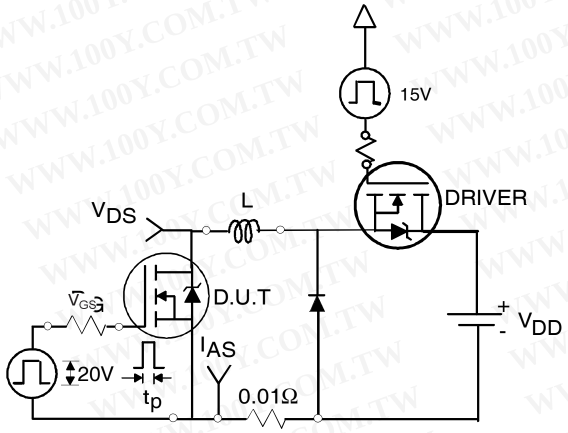


Fig 16a. Unclamped Inductive Test Circuit

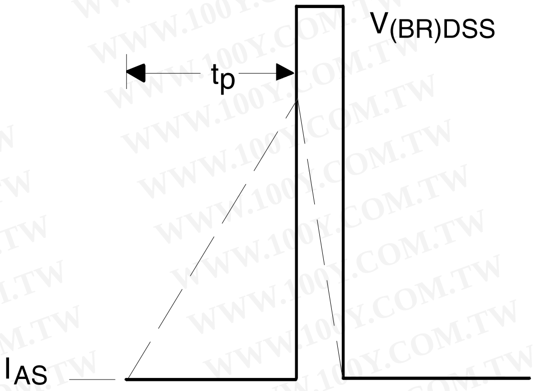


Fig 16b. Unclamped Inductive Waveforms

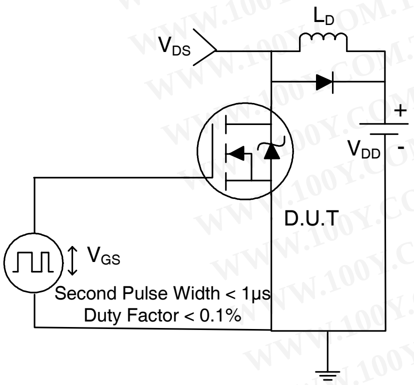


Fig 17a. Switching Time Test Circuit

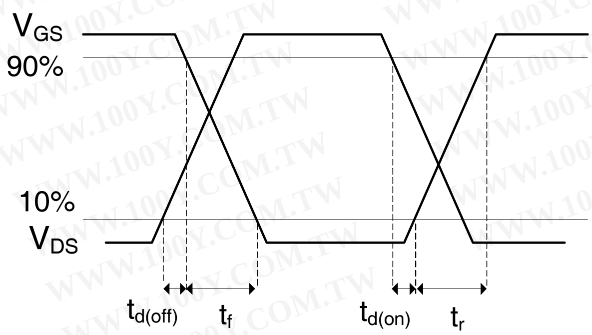


Fig 17b. Switching Time Waveforms

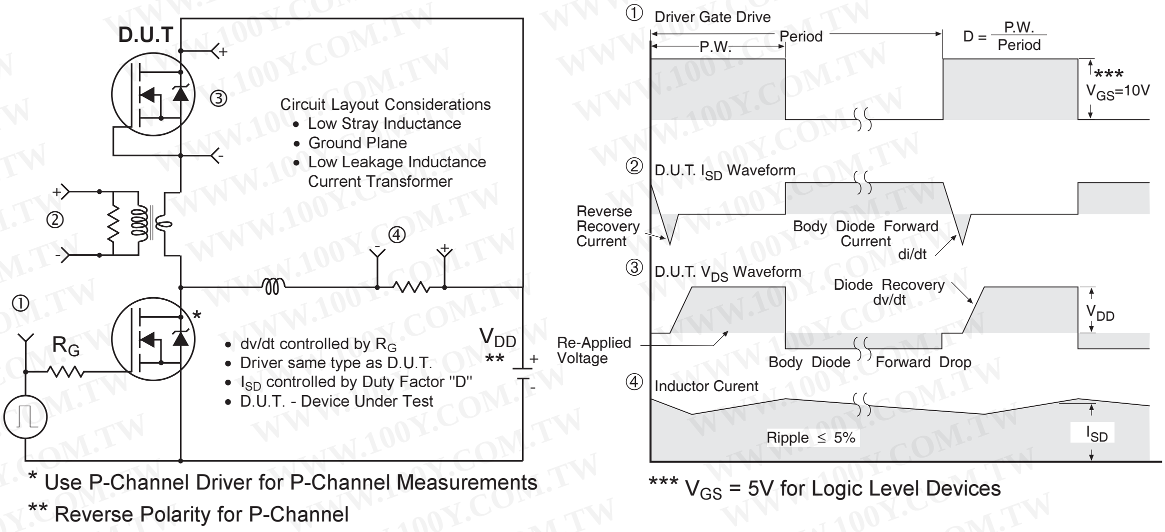
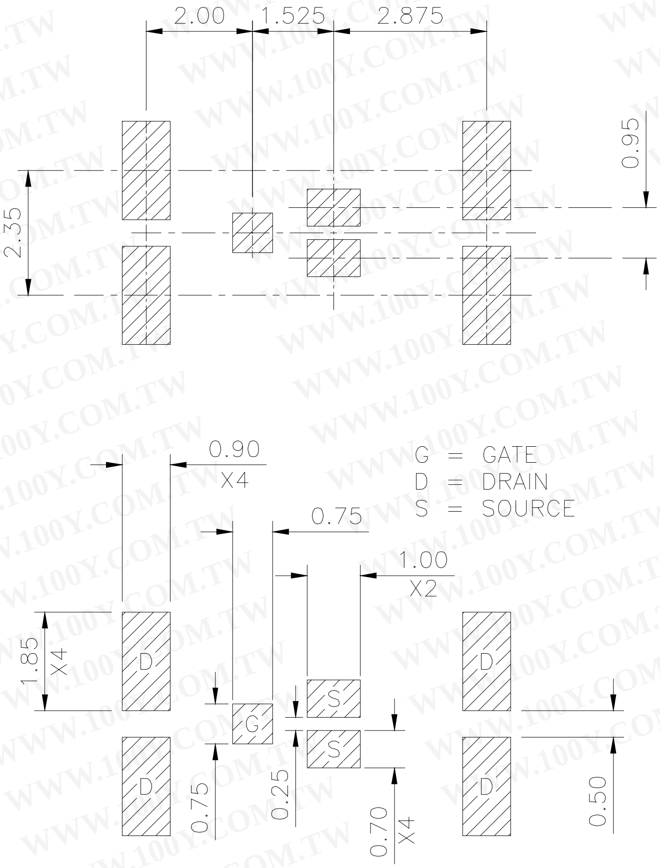


Fig 18. Diode Reverse Recovery Test Circuit for HEXFET® Power MOSFETs

DirectFET™ Substrate and PCB Layout, MZ Outline (Medium Size Can, Z-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.



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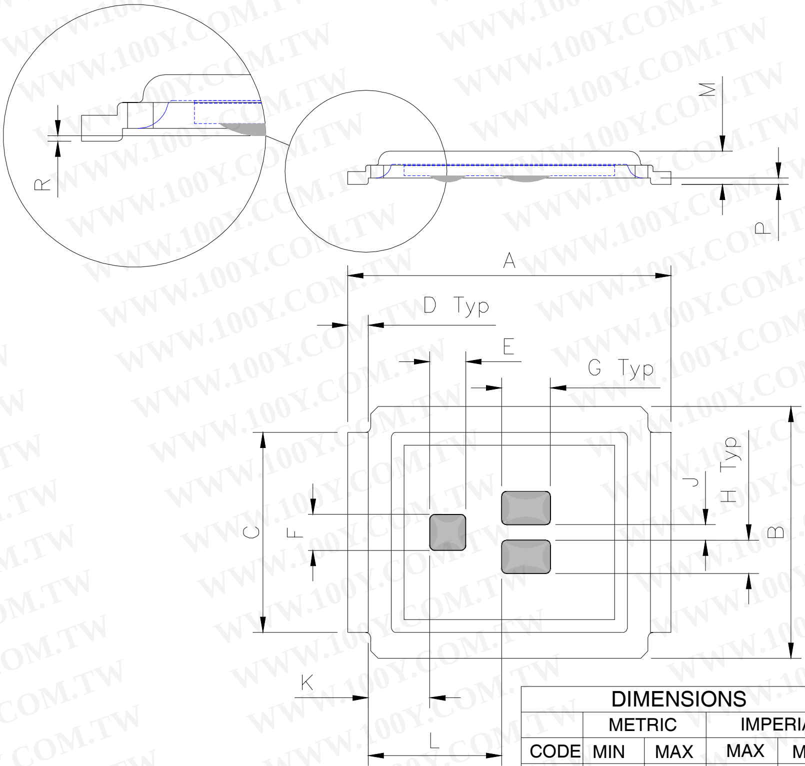
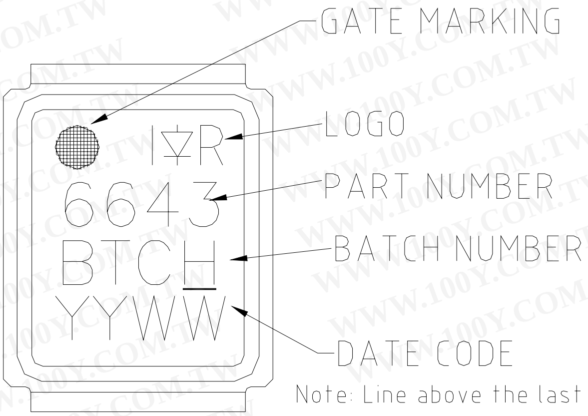
DirectFET™ Outline Dimension, MZ Outline (Medium Size Can, Z-Designation).

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				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MAX	MAX
A	6.25	6.35	0.246	0.250
B	4.80	5.05	0.189	0.201
C	3.85	3.95	0.152	0.156
D	0.35	0.45	0.014	0.018
E	0.68	0.72	0.027	0.028
F	0.68	0.72	0.027	0.028
G	0.93	0.97	0.037	0.038
H	0.63	0.67	0.025	0.026
J	0.28	0.32	0.011	0.013
K	1.13	1.26	0.044	0.050
L	2.53	2.66	0.100	0.105
M	0.616	0.676	0.0235	0.0274
R	0.020	0.080	0.0008	0.0031
P	0.08	0.17	0.003	0.007

DirectFET™ Part Marking



Note: Line above the last character of the date-code indicates "Lead-Free".

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

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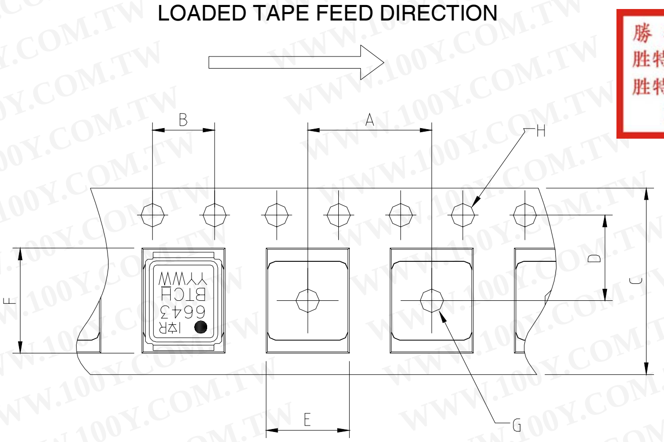
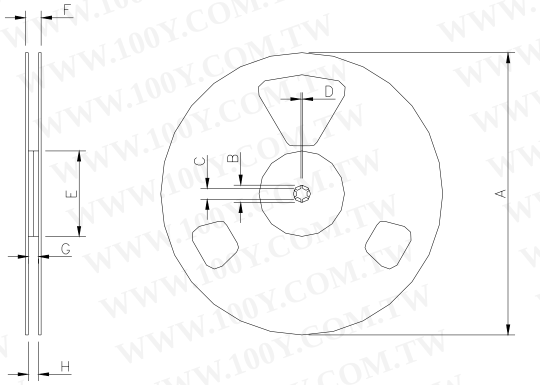


NOTE: CONTROLLING DIMENSIONS IN MM

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: Controlling dimensions in mm
Std reel quantity is 4800 parts. (ordered as IRF6643TRPBF). For 1000 parts on 7" reel, order IRF6643TR1PBF

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

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
IOR Rectifier

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