

Pb Free Plating Product

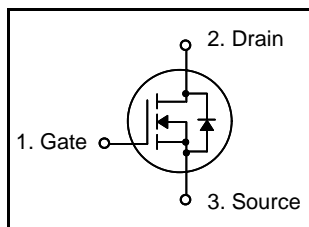
## IRF840PBF



8.8A,500V Heatsink N-Channel Type Power MOSFET

### Features

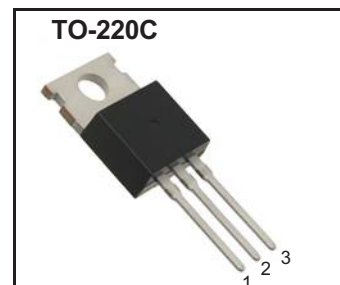
- $R_{DS(on)}$  (Max 0.85  $\Omega$  )@ $V_{GS}=10V$
- Gate Charge (Typical 35nC)
- Improved dv/dt Capability
- High ruggedness
- 100% Avalanche Tested



$BV_{DSS} = 500V$   
 $R_{DS(ON)} = 0.85 \text{ ohm}$   
 $I_D = 8.8A$

### General Description

This N-channel enhancement mode field-effect power transistor using THINKI Semiconductor advanced planar stripe, DMOS technology intended for off-line switch mode power supply. Also, especially designed to minimize  $r_{ds(on)}$  and high rugged avalanche characteristics. The TO-220C pkg is well suited for adaptor power unit and small power inverter application.



### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain to Source Voltage	500	V
$I_D$	Continuous Drain Current(@ $T_C = 25^\circ C$ )	8.8	A
	Continuous Drain Current(@ $T_C = 100^\circ C$ )	5.5	A
$I_{DM}$	Drain Current Pulsed (Note 1)	35.2	A
$V_{GS}$	Gate to Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	559	mJ
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	13.7	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5	V/ns
$P_D$	Total Power Dissipation(@ $T_C = 25^\circ C$ )	137	W
	Derating Factor above 25 $^\circ C$	1.1	W/ $^\circ C$
$T_{STG}, T_J$	Operating Junction Temperature & Storage Temperature	- 55 ~ 150	$^\circ C$
$T_L$	Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds.	300	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	Value			Units
		Min.	Typ.	Max.	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	-	0.91	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case to Sink	-	0.5	-	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	62	$^\circ C/W$

## Electrical Characteristics (T<sub>C</sub> = 25 °C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250uA	500	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature coefficient	I <sub>D</sub> = 250uA, referenced to 25 °C	-	0.48	-	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> = 500V, V <sub>GS</sub> = 0V	-	-	1	uA
		V <sub>DS</sub> = 400V, T <sub>C</sub> = 125 °C	-	-	10	uA
I <sub>GSS</sub>	Gate-Source Leakage, Forward	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V	-	-	100	nA
	Gate-source Leakage, Reverse	V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V	-	-	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250uA	2.0	-	4.0	V
R <sub>DS(ON)</sub>	Static Drain-Source On-state Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.4A	-	0.65	0.85	Ω
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25V, f = 1MHz	-	1173	-	pF
C <sub>oss</sub>	Output Capacitance		-	122	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	31	-	
<b>Dynamic Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = 250V, I <sub>D</sub> = 8.8A, R <sub>G</sub> = 50Ω * see fig. 13. (Note 4, 5)	-	12	34	ns
t <sub>r</sub>	Rise Time		-	25	60	
t <sub>d(off)</sub>	Turn-off Delay Time		-	45	100	
t <sub>f</sub>	Fall Time		-	18	46	
Q <sub>g</sub>	Total Gate Charge		-	35	46	
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 8.8A	-	6	-	
Q <sub>gd</sub>	Gate-Drain Charge(Miller Charge)	* see fig. 12. (Note 4, 5)	-	14	-	

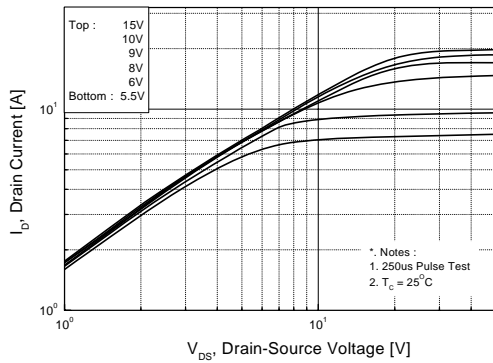
## Source-Drain Diode Ratings and Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
I <sub>S</sub>	Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	-	-	8.8	A
I <sub>SM</sub>	Pulsed Source Current		-	-	35.2	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = 8.8A, V <sub>GS</sub> = 0V	-	-	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> = 8.8A, V <sub>GS</sub> = 0V, di <sub>F</sub> /dt = 100A/us	-	330	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	3.3	-	uC

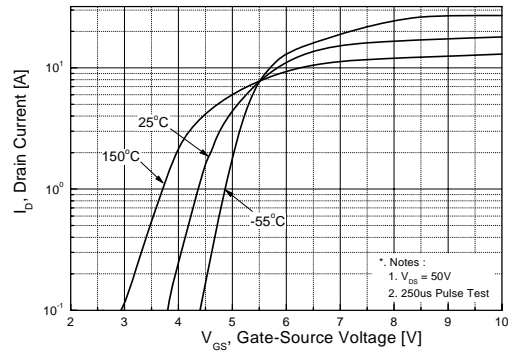
### \* NOTES

1. Repeativity rating : pulse width limited by junction temperature
2. L = 13mH, I<sub>AS</sub> = 8.8A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 50Ω, Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ 8.8A, di/dt ≤ 300A/us, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
4. Pulse Test : Pulse Width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially independent of operating temperature.

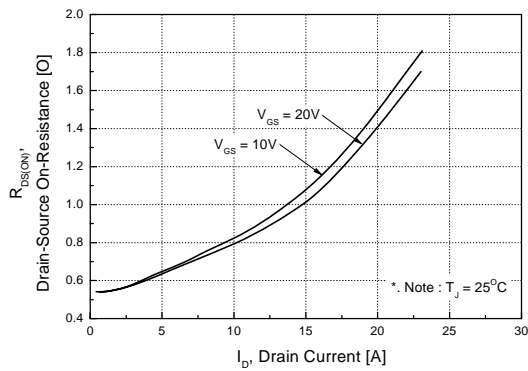
**Fig 1. On-State Characteristics**



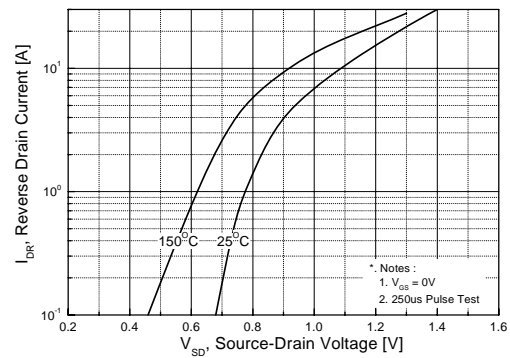
**Fig 2. Transfer Characteristics**



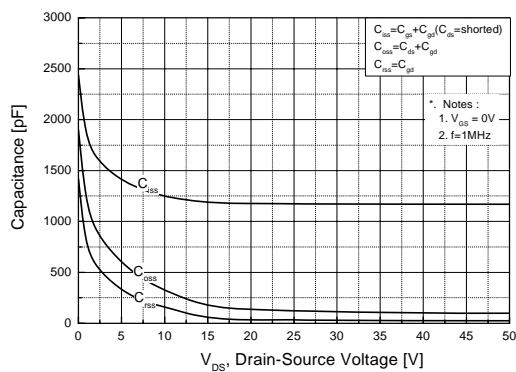
**Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage**



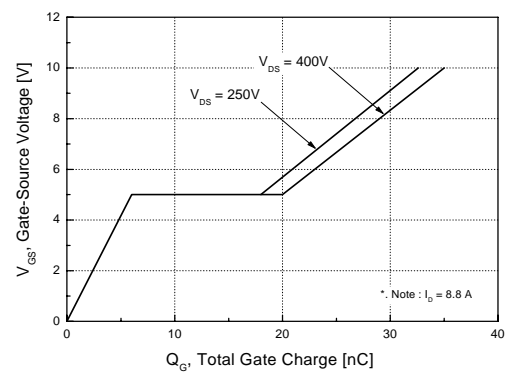
**Fig 4. On State Current vs. Allowable Case Temperature**



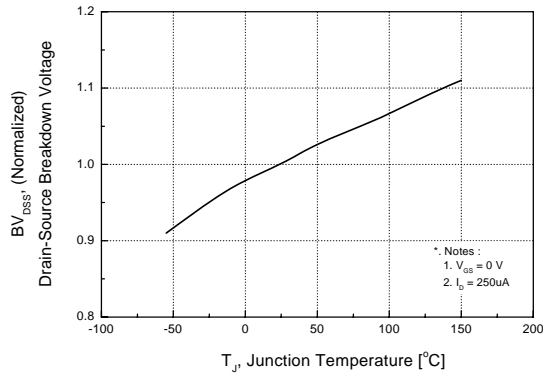
**Fig 5. Capacitance Characteristics**



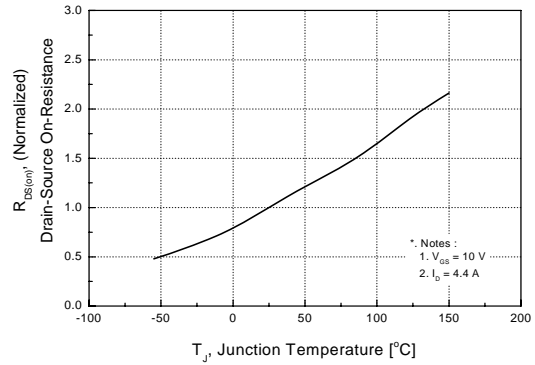
**Fig 6. Gate Charge Characteristics**



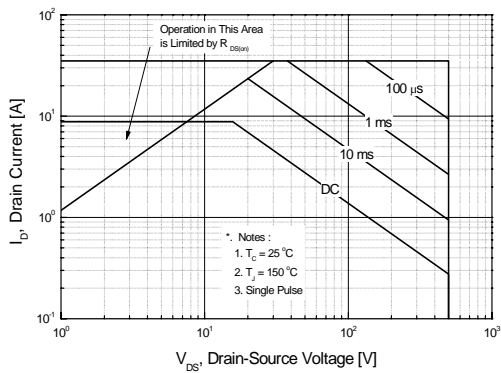
**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**



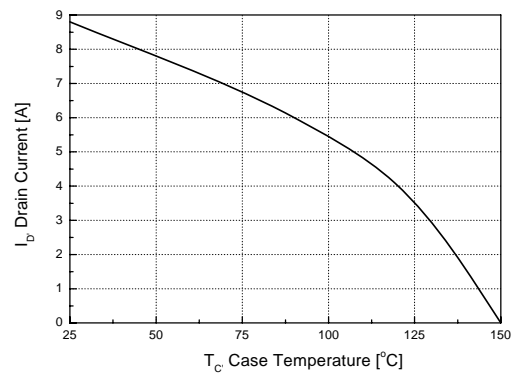
**Fig 8. On-Resistance Variation**



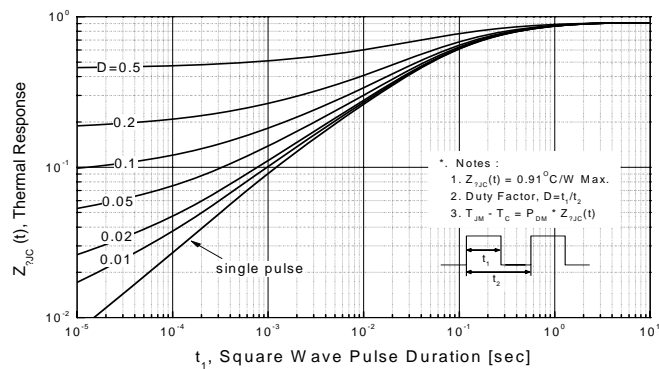
**Fig 9. Maximum Safe Operating Area**



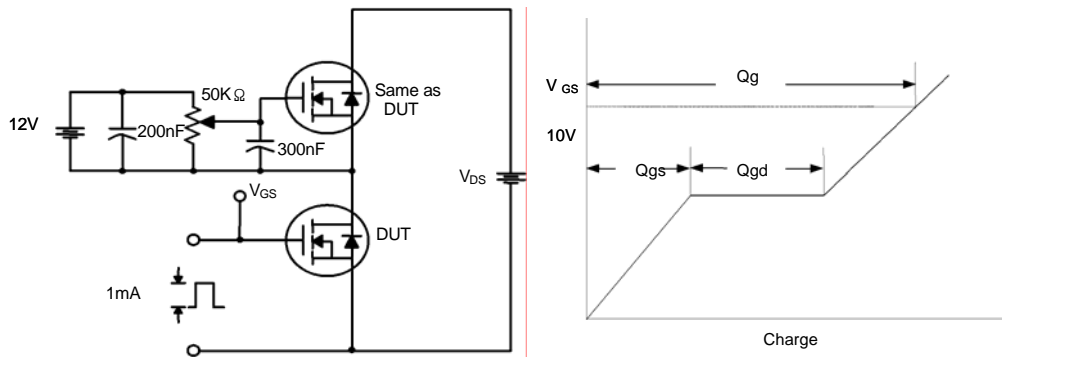
**Fig 10. Maximum Drain Current vs. Case Temperature**



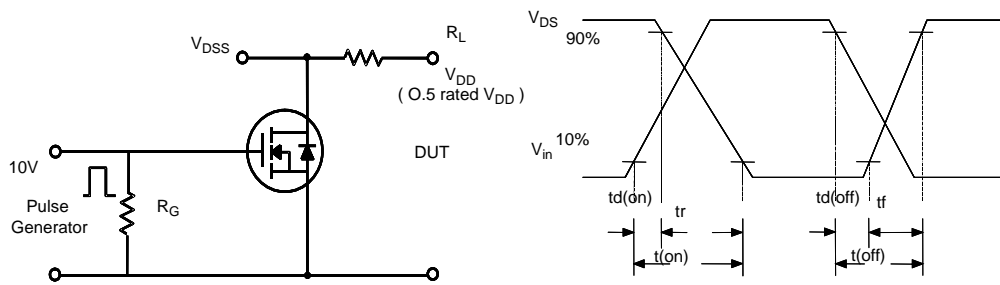
**Fig 11. Transient Thermal Response Curve**



**Fig. 12. Gate Charge Test Circuit & Waveforms**



**Fig 13. Switching Time Test Circuit & Waveforms**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**

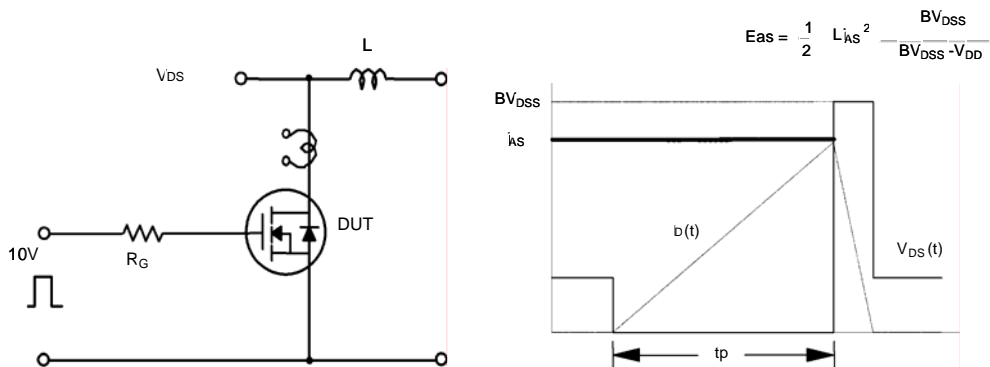


Fig. 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

