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# FDB088N08

## N-Channel PowerTrench® MOSFET

75 V, 85 A, 8.8 mΩ

### Features

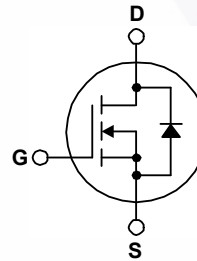
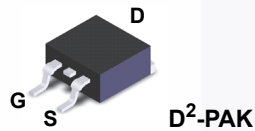
- $R_{DS(on)} = 7.3 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- 100% Internal  $R_G$  Screening for Easy Paralleling Operation
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDB088N08	Unit
$V_{DSS}$	Drain to Source Voltage	75	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)	85
		- Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited)	60
		- Continuous ( $T_C = 25^\circ\text{C}$ , Package Limited)	120
$I_{DM}$	Drain Current - Pulsed (Note 1)	340	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	309	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)	10	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	160
		- Derate above $25^\circ\text{C}$	1.06
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FDB088N08	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.94	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	62.5	
		Thermal Resistance, Junction to Ambient (1 in <sup>2</sup> Pad of 2-oz Copper), Max.	40

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDB088N08	FDB088N08	D <sup>2</sup> -PAK	Tape and Reel	330 mm	24 mm	800 units

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}, T_C = 25^\circ\text{C}$	75	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.07	-	V/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 75 \text{ V}, T_C = 150^\circ\text{C}$	-	-	500	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 75 \text{ A}$	-	7.3	8.8	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 37.5 \text{ A}$	-	300	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	4960	6595	pF
$C_{oss}$	Output Capacitance		-	355	470	pF
$C_{rss}$	Reverse Transfer Capacitance		-	200	300	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 60 \text{ V}, I_D = 75 \text{ A}, V_{GS} = 10 \text{ V}$ (Note 4)	-	91	118	nC
$Q_{gs}$	Gate to Source Gate Charge		-	22	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	28	-	nC
$R_G$	Gate Resistance		$f = 1 \text{ MHz}$	-	-	4

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 37.5 \text{ V}, I_D = 75 \text{ A}, R_G = 25 \Omega, V_{GS} = 10 \text{ V}$ (Note 4)	-	45	100	ns
$t_r$	Turn-On Rise Time		-	158	326	ns
$t_{d(off)}$	Turn-Off Delay Time		-	244	498	ns
$t_f$	Turn-Off Fall Time		-	102	214	ns

### Drain-Source Diode Characteristics

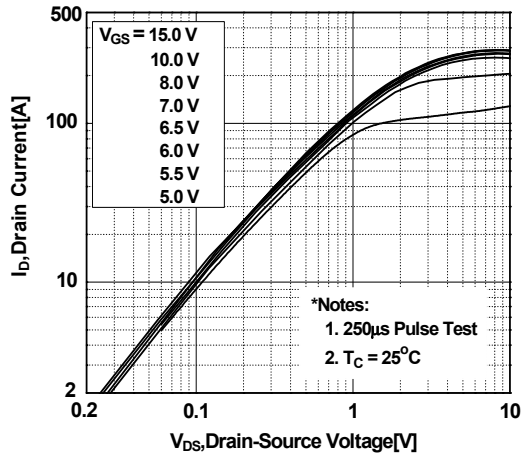
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	85	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	340	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 75 \text{ A}$	-	-	1.25	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 75 \text{ A}, di_F/dt = 100 \text{ A}/\mu\text{s}$	-	41.1	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	80.7	-	nC

#### Notes:

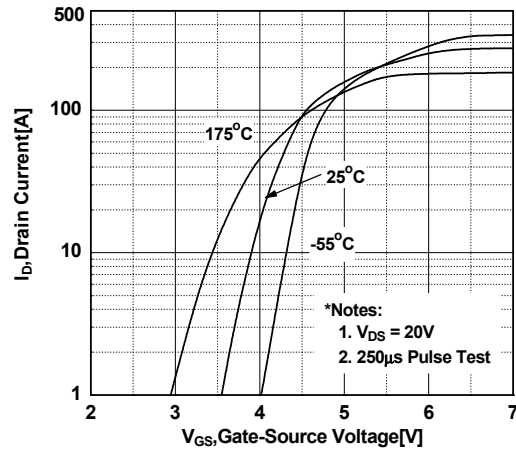
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 0.11 \text{ mH}, I_{AS} = 75 \text{ A}, V_{DD} = 50 \text{ V}, R_G = 25 \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 75 \text{ A}, di/dt \leq 200 \text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

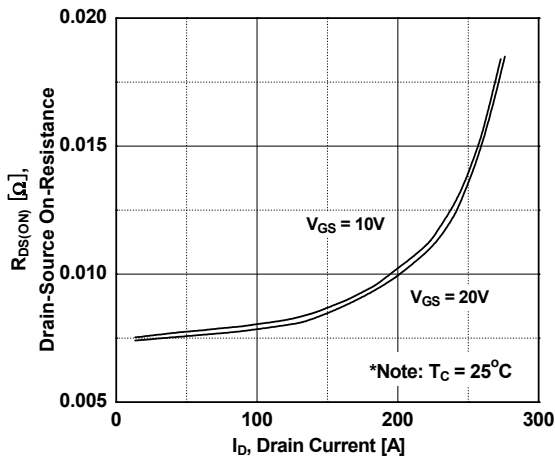
**Figure 1. On-Region Characteristics**



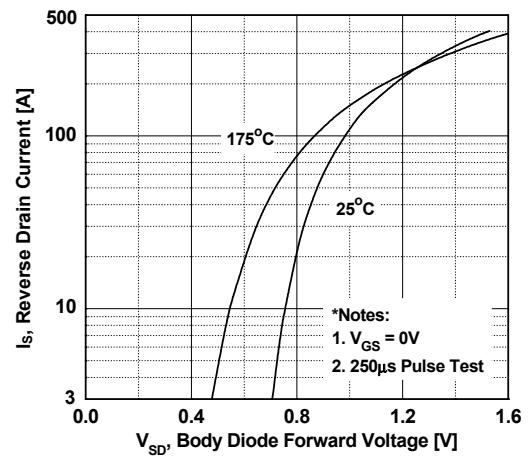
**Figure 2. Transfer Characteristics**



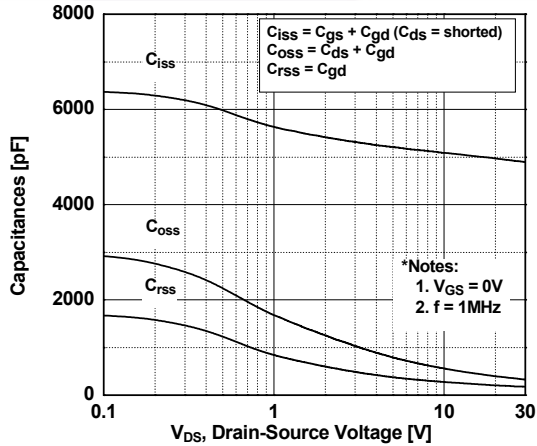
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



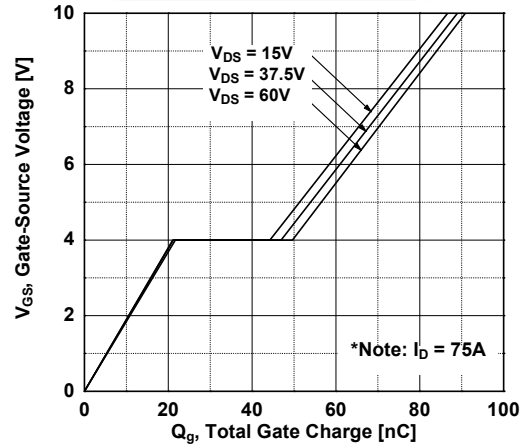
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

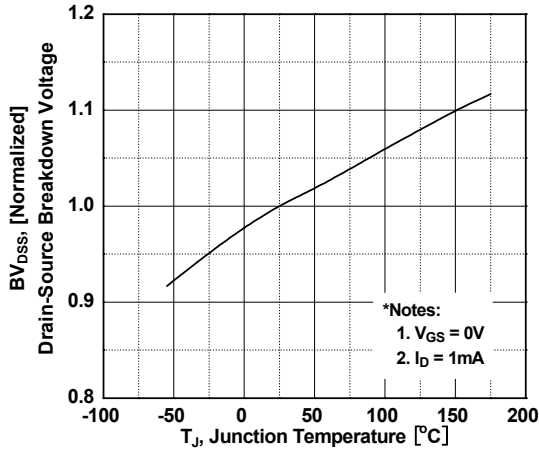


Figure 8. On-Resistance Variation vs. Temperature

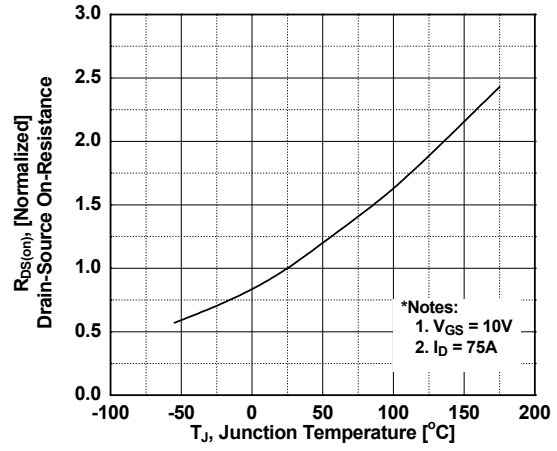


Figure 9. Maximum Safe Operating Area

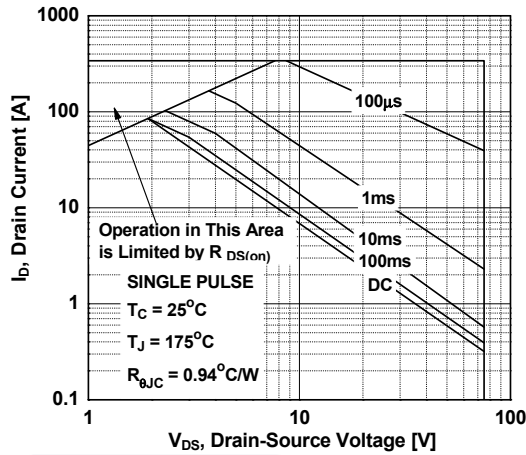


Figure 10. Maximum Drain Current vs. Case Temperature

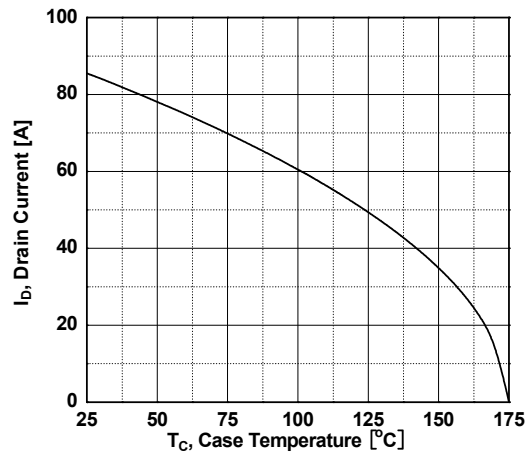
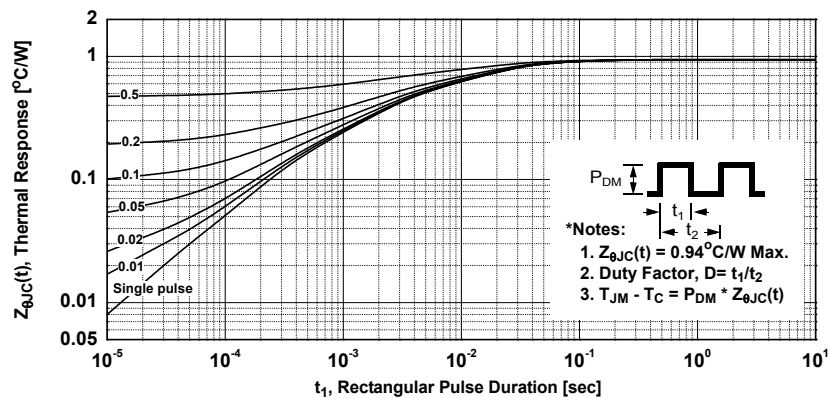
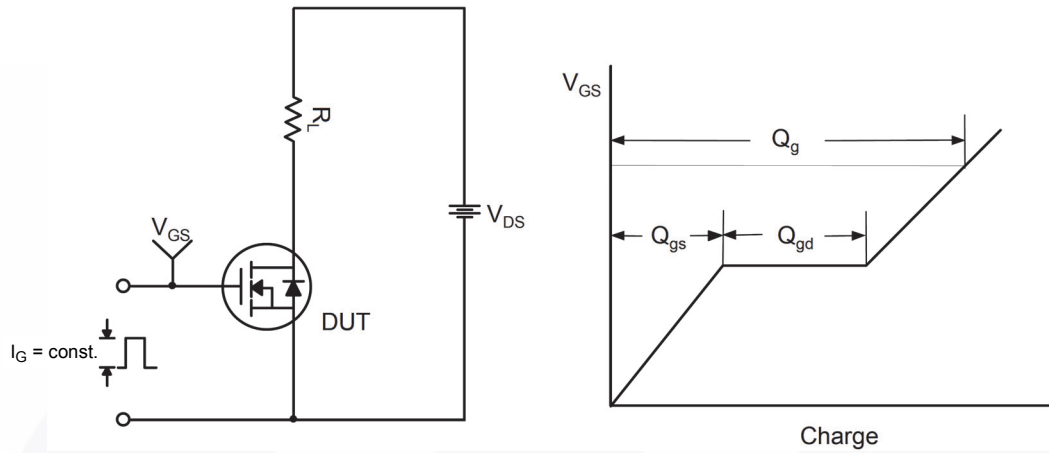


Figure 11. Transient Thermal Response Curve





**Figure 12. Gate Charge Test Circuit & Waveform**



**Figure 13. Resistive Switching Test Circuit & Waveforms**

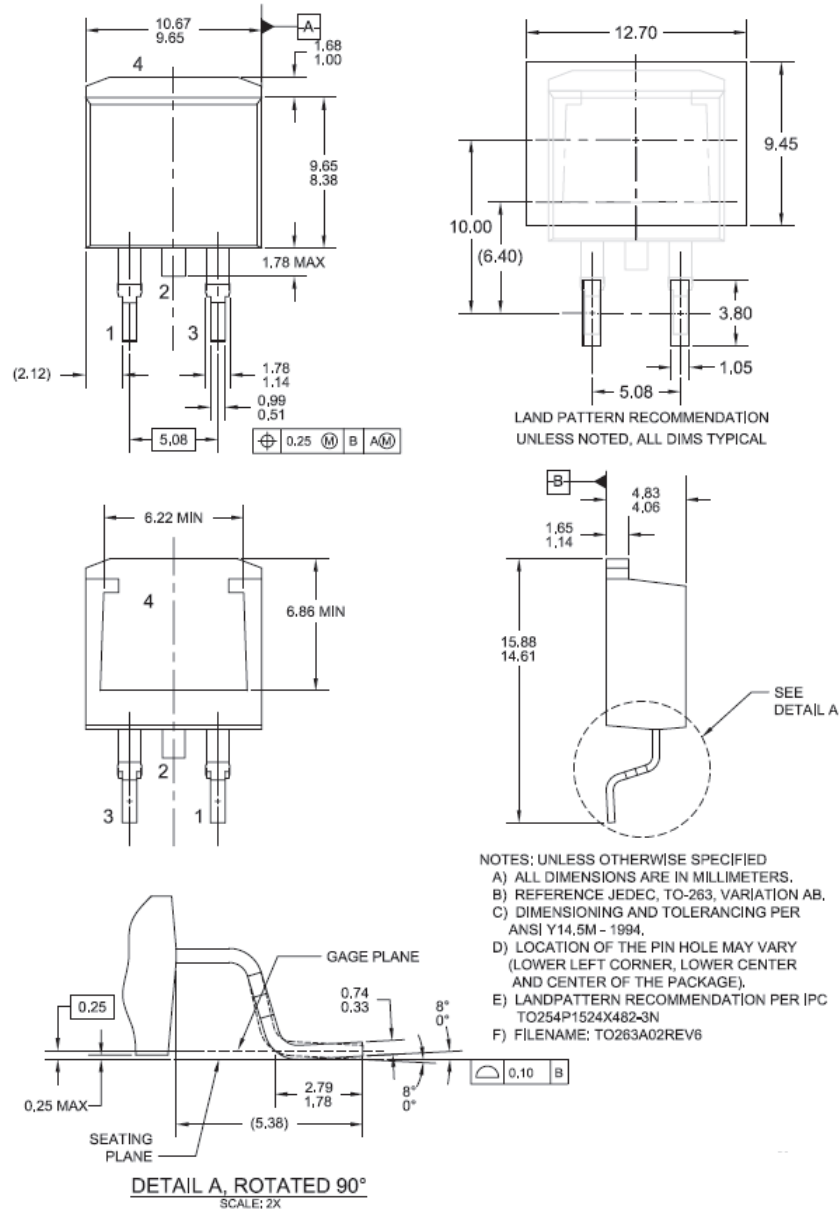


**Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms**



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

## Mechanical Dimensions



**Figure 16. TO263 (D<sup>2</sup>PAK), Molded, 2-Lead, Surface Mount**

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