

# FDB8447L

## 40V N-Channel PowerTrench® MOSFET

40V, 50A, 8.5mΩ

### Features

- Max  $r_{DS(on)}$  = 8.5mΩ at  $V_{GS} = 10V$ ,  $I_D = 14A$
- Max  $r_{DS(on)}$  = 11mΩ at  $V_{GS} = 4.5V$ ,  $I_D = 11A$
- Fast Switching
- RoHS Compliant

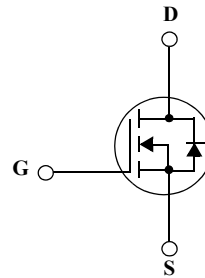
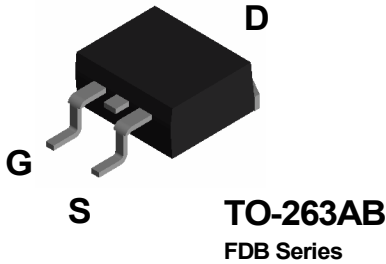


### General Description

This N-Channel MOSFET has been produced using Fairchild Semiconductor's proprietary PowerTrench® technology to deliver low  $r_{DS(on)}$  and optimized  $BV_{DSS}$  capability to offer superior performance benefit in the application.

### Application

- Inverter
- Power Supplies



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

Symbol	Parameter	Conditions	Rated Value	Units
$V_{DS}$	Drain to Source Voltage		40	V
$V_{GS}$	Gate to Source Voltage		±20	V
$I_D$	Drain Current -Continuous (Package limited)	$T_C = 25^\circ\text{C}$	50	A
	-Continuous (Silicon limited)	$T_C = 25^\circ\text{C}$ (Note 1)	66	
	-Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	15	
	-Pulsed		100	
$E_{AS}$	Drain-Source Avalanche Energy	(Note 3)	153	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	60	W
	Power Dissipation	(Note 1a)	3.1	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range		-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	2.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	40	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB8447L	FDB8447L	TO-263AB	330mm	24mm	800 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		35		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			$\pm 100$	nA

### On Characteristics (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 14\text{A}$		7.4	8.5	m $\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 11\text{A}$		8.7	11.0	
		$V_{GS} = 10\text{V}, I_D = 14\text{A}, T_J = 125^\circ\text{C}$		10.8	12.4	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 14\text{A}$		58		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		1970	2620	pF
$C_{oss}$	Output Capacitance			250	335	pF
$C_{rss}$	Reverse Transfer Capacitance			150	225	pF
$R_g$	Gate Resistance	$f = 1\text{MHz}$		1.0		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\text{V}, I_D = 14\text{A}, V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$		11	20	ns
$t_r$	Rise Time			6	12	ns
$t_{d(off)}$	Turn-Off Delay Time			28	45	ns
$t_f$	Fall Time			4	10	ns
$Q_{g(TOT)}$	Total Gate Charge, $V_{GS} = 10\text{V}$	$V_{DD} = 20\text{V}, I_D = 14\text{A}, V_{GS} = 10\text{V}$		37	52	nC
$Q_{g(TOT)}$	Total Gate Charge, $V_{GS} = 5\text{V}$			20	28	nC
$Q_{gs}$	Gate to Source Gate Charge			6		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			7		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 14\text{A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 14\text{A}, di/dt = 100\text{A}/\mu\text{s}$		28	42	ns
$Q_{rr}$	Reverse Recovery Charge			24	36	nC

#### Notes:

1:  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.

- a.  $40^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper
- b.  $62.5^\circ\text{C}/\text{W}$  when mounted on a minimum pad.

2: Pulse Test: Pulse Width  $< 300\mu\text{s}$ , Duty cycle  $< 2.0\%$ .

3: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1\text{mH}$ ,  $I_{AS} = 17.5\text{A}$ ,  $V_{DD} = 40\text{V}$ ,  $V_{GS} = 10\text{V}$ .

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted

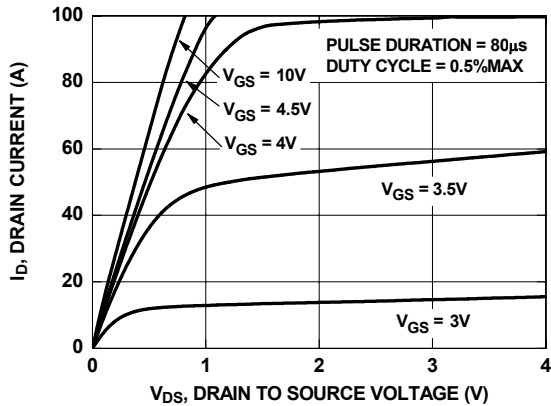


Figure 1. On Region Characteristics

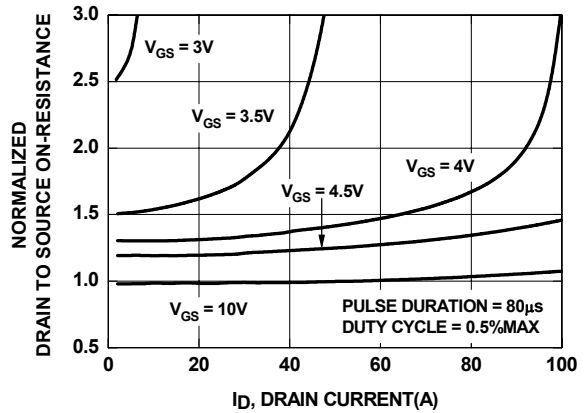


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

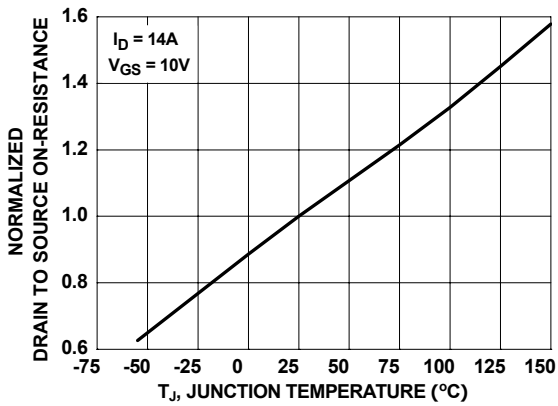


Figure 3. Normalized On Resistance vs Junction Temperature

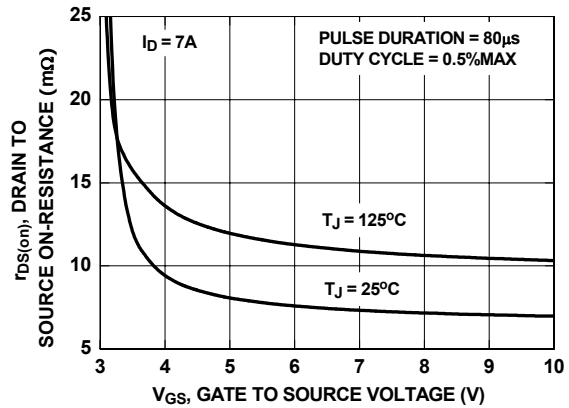


Figure 4. On-Resistance vs Gate to Source Voltage

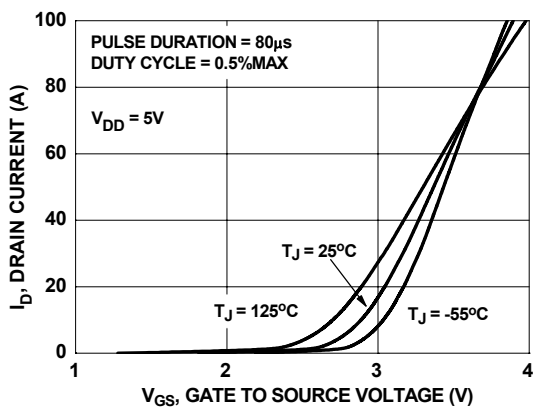


Figure 5. Transfer Characteristics

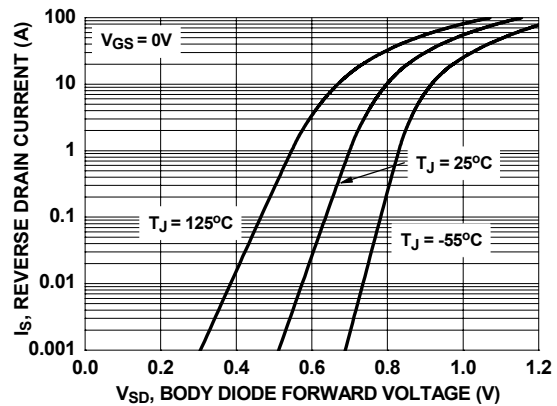
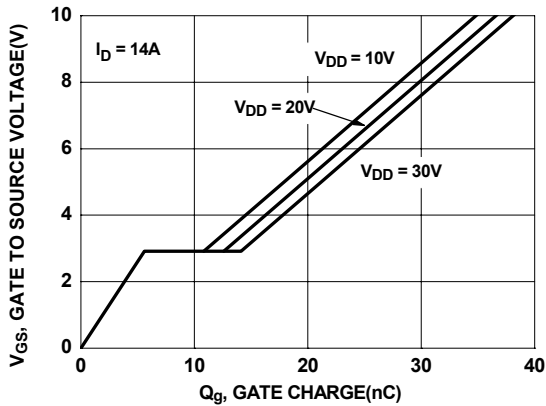
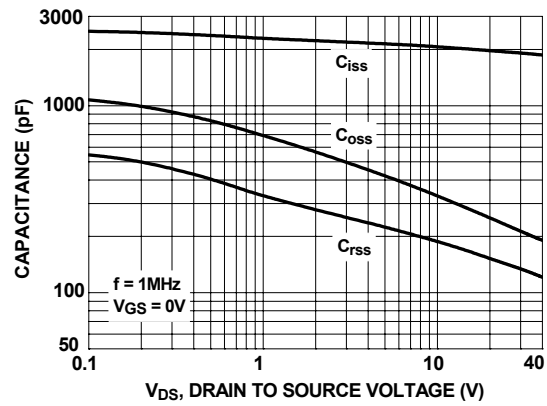


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

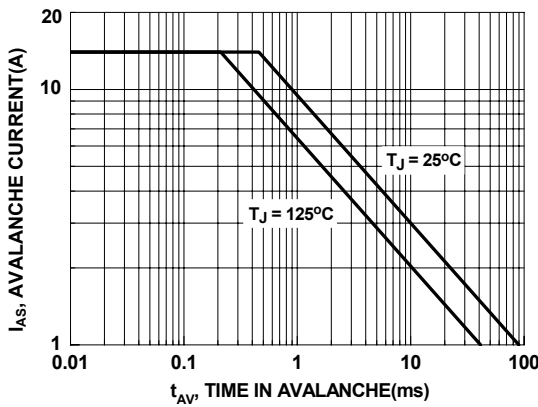
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



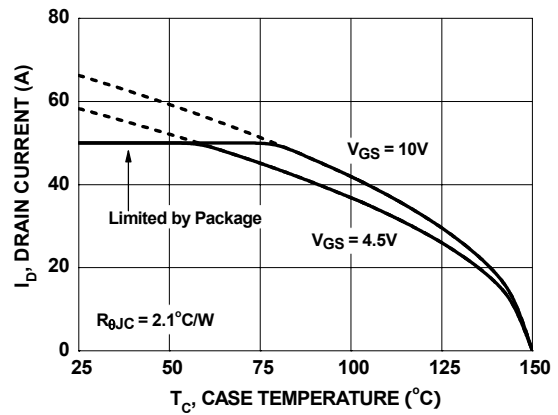
**Figure 7. Gate Charge Characteristics**



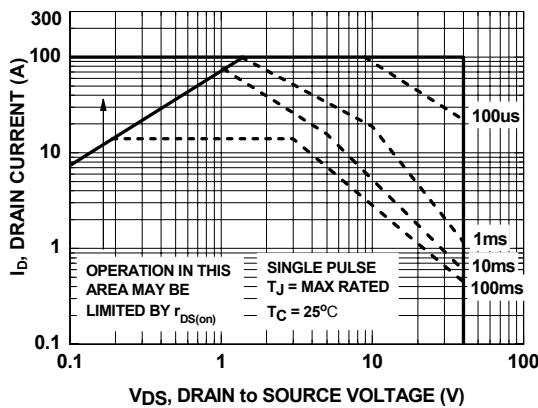
**Figure 8. Capacitance vs Drain to Source Voltage**



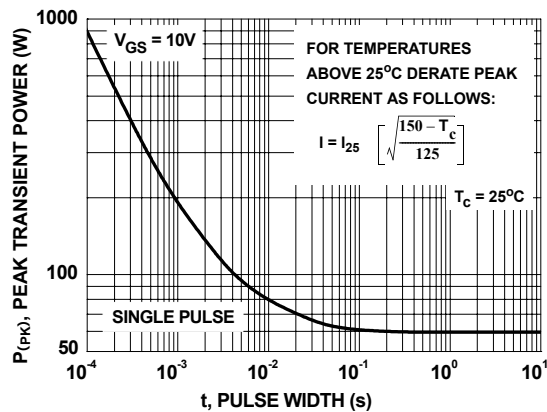
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

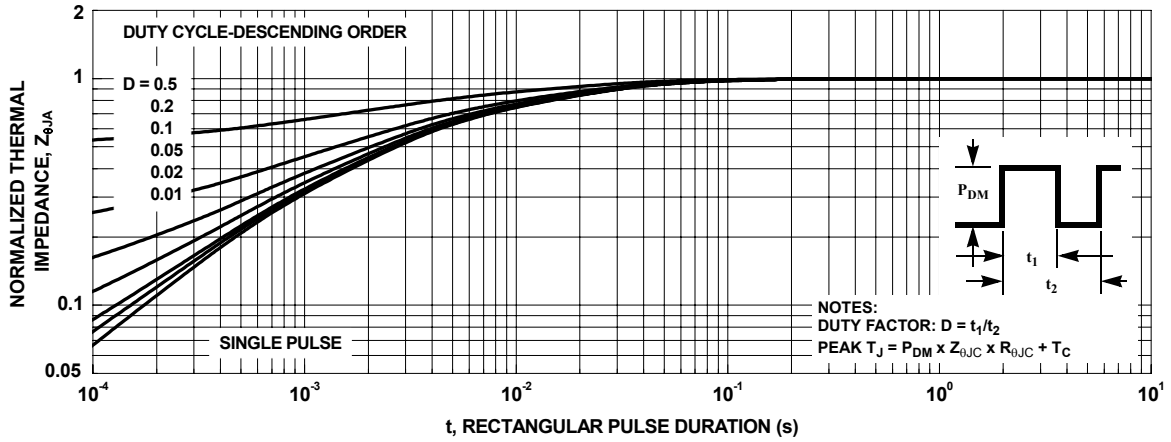


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted




**Figure 13. Transient Thermal Response Curve**



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