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# FDB3502

## N-Channel Power Trench® MOSFET

### 75V, 14A, 47mΩ

#### Features

- Max  $r_{DS(on)}$  = 47mΩ at  $V_{GS} = 10V$ ,  $I_D = 6A$
- 100% UIL Tested
- RoHS Compliant

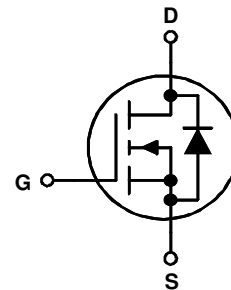
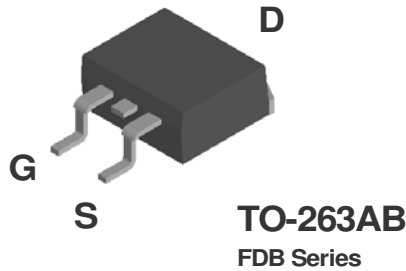


#### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench® process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

#### Application

- Synchronous rectifier



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	75	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous (Package limited) $T_C = 25^\circ\text{C}$	14	A
	-Continuous (Silicon limited) $T_C = 25^\circ\text{C}$	22	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	6	
	-Pulsed	40	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	54	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	41	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (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	3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	40	

#### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB3502	FDB3502	TO-263AB	330 mm	24 mm	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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	75			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		70		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{V}, V_{DS} = 60\text{V}$ ,			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

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.5	3.8	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-10		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 6\text{A}$ $V_{GS} = 10\text{V}, I_D = 6\text{A}, T_J = 125^\circ\text{C}$		37 63	47 80	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DD} = 10\text{V}, I_D = 6\text{A}$		13		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V},$ $f = 1\text{MHz}$		615	815	pF
$C_{oss}$	Output Capacitance			75	105	pF
$C_{riss}$	Reverse Transfer Capacitance			35	40	pF
$R_g$	Gate Resistance	$f = 1\text{MHz}$		1.5		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\text{V}, I_D = 6\text{A},$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$		9	17	ns
$t_r$	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			13	22	ns
$t_f$	Fall Time			3	10	ns
$Q_g$	Total Gate Charge at 10V			11	15	nC
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 40\text{V}$ $I_D = 6\text{A}$		4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			3		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 2.6\text{A}$ (Note 2)		0.78	1.2	V
		$V_{GS} = 0\text{V}, I_S = 6\text{A}$ (Note 2)		0.83	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 6\text{A}, di/dt = 100\text{A}/\mu\text{s}$		25	41	ns
$Q_{rr}$	Reverse Recovery Charge			17	32	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  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 6\text{A}$ ,  $V_{DD} = 75\text{V}$ ,  $V_{GS} = 10\text{V}$ .

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

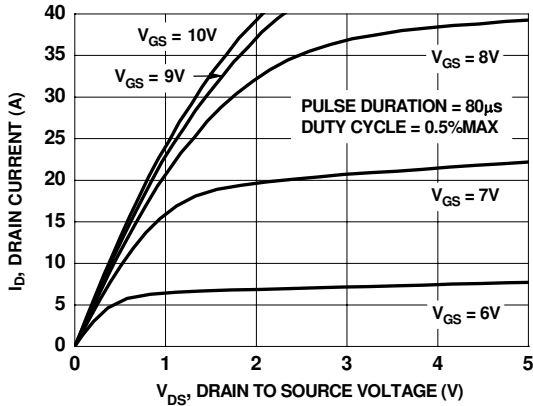


Figure 1. On-Region Characteristics

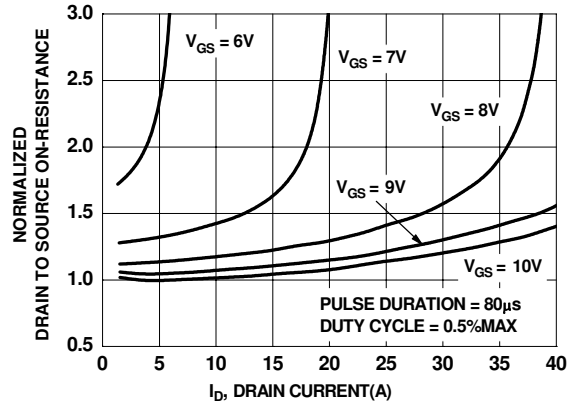


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

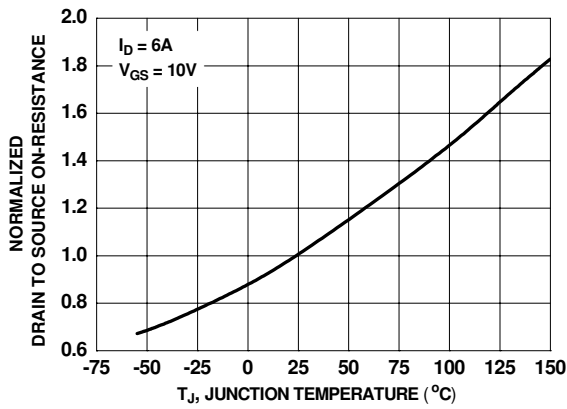


Figure 3. Normalized On-Resistance vs Junction Temperature

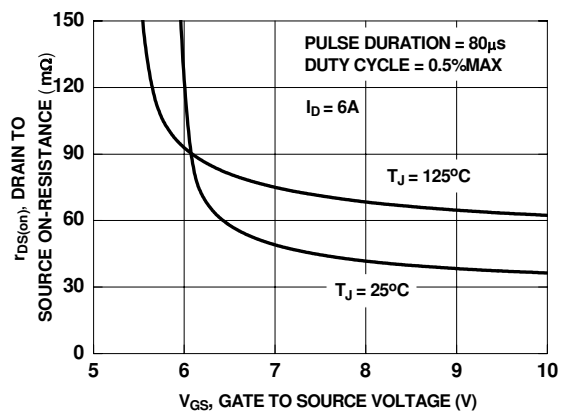


Figure 4. On-Resistance vs Gate to Source Voltage

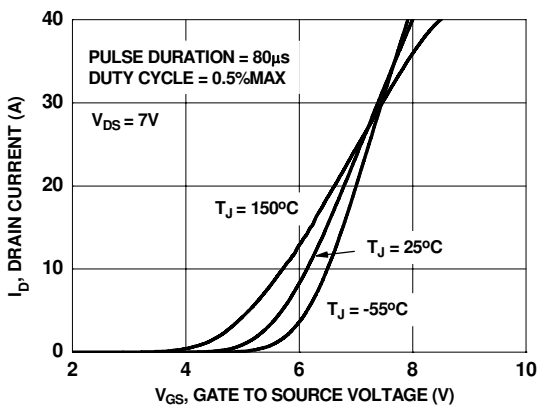


Figure 5. Transfer Characteristics

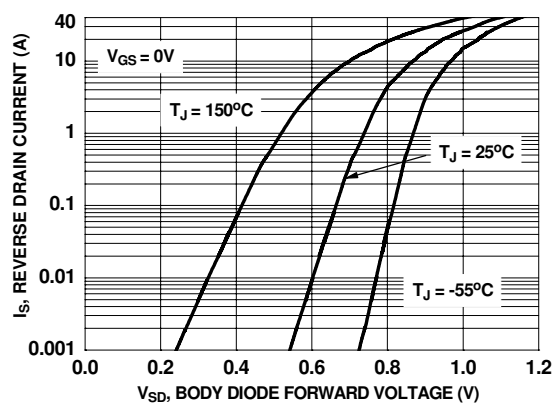
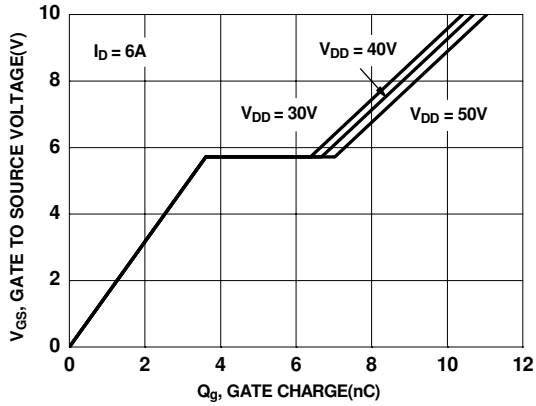
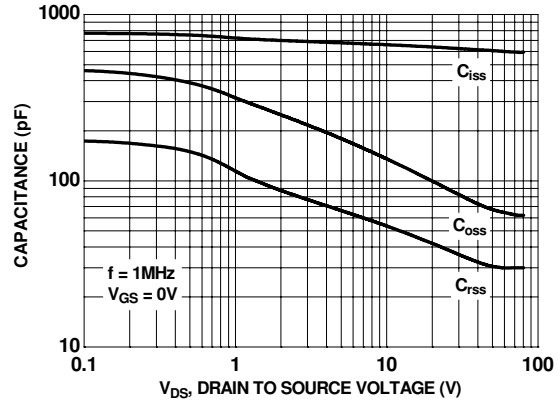


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

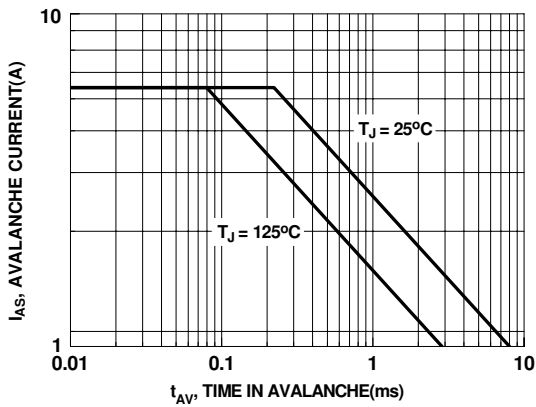
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



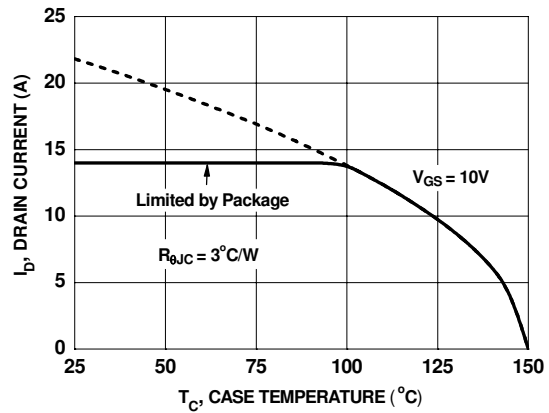
**Figure 7. Gate Charge Characteristics**



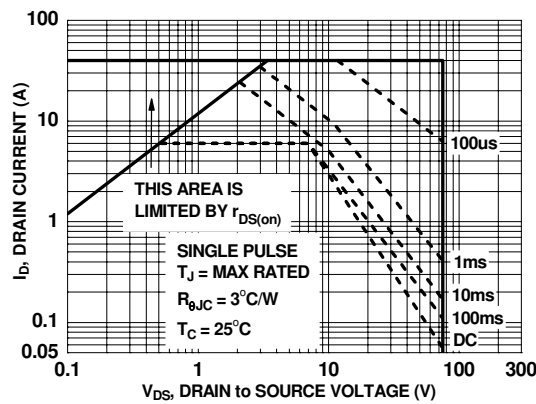
**Figure 8. Capacitance vs Drain to Source Voltage**



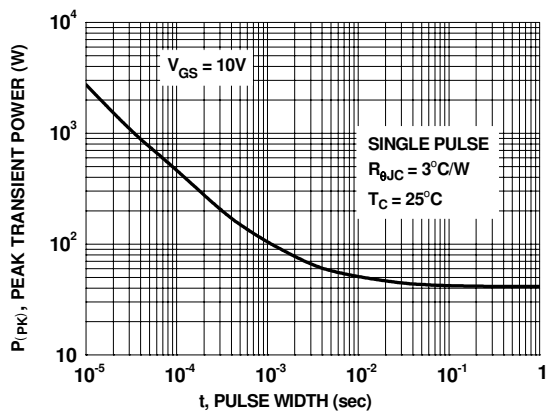
**Figure 9. Unclamped Inductive Switching Capability**



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

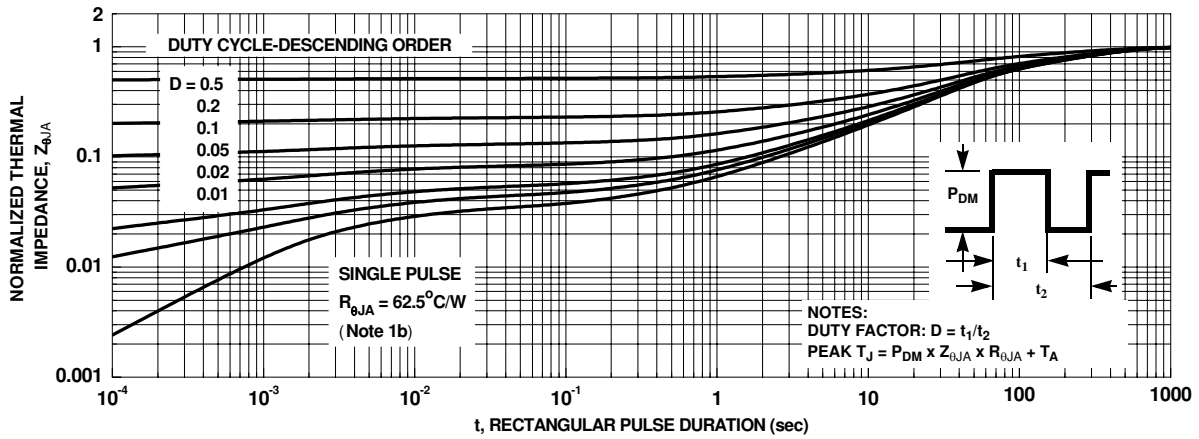
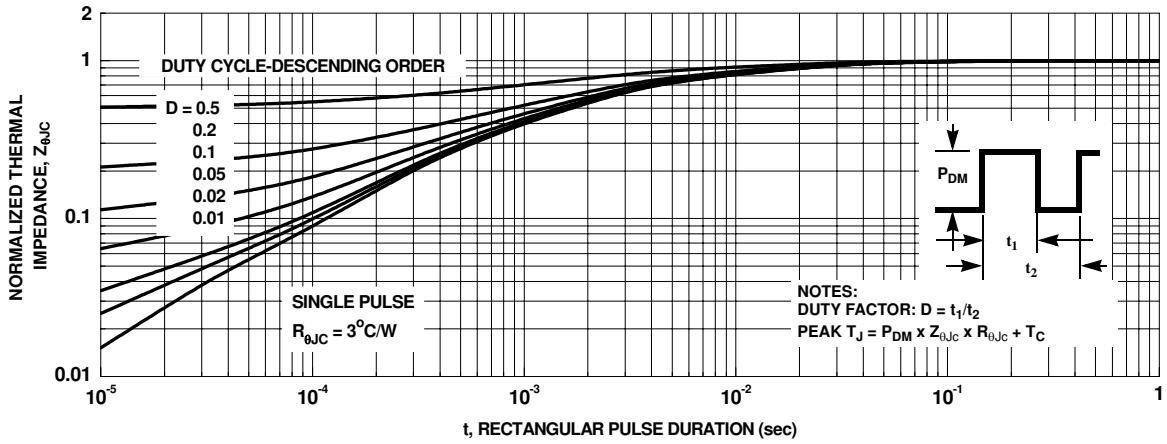


**Figure 11. Forward Bias Safe Operating Area**



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





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





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