

# FDD8586/FDU8586

## N-Channel PowerTrench® MOSFET

20V, 35A, 5.5mΩ

### Features

- Max  $r_{DS(on)}$  = 5.5mΩ at  $V_{GS} = 10V$ ,  $I_D = 35A$
- Max  $r_{DS(on)}$  = 8.5mΩ at  $V_{GS} = 4.5V$ ,  $I_D = 33A$
- Low gate charge:  $Q_{g(TOT)} = 34nC(Typ)$ ,  $V_{GS} = 10V$
- Low gate resistance
- 100% Avalanche tested
- RoHS compliant

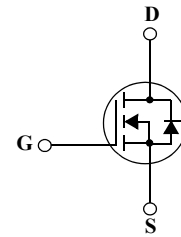
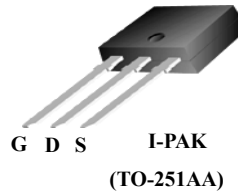
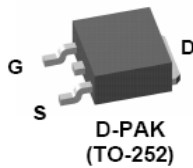


### General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $r_{DS(on)}$  and fast switching speed.

### Application

- Vcore DC-DC for Desktop Computers and Servers
- VRM for Intermediate Bus Architecture



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	20	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous (Package Limited)	35	A
	-Continuous (Die Limited)	93	
	-Pulsed (Note 1)	354	
$E_{AS}$	Single Pulse Avalanche Energy (Note 2)	144	mJ
$P_D$	Power Dissipation	77	W
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to 175	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case TO-252, TO-251	1.94	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO-252, TO-251	100	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO-252, 1in <sup>2</sup> copper pad area	52	°C/W

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD8586	FDD8586	TO-252AA	13"	12mm	2500 units
FDU8586	FDU8586	TO-251AA	N/A(Tube)	N/A	75 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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		14.6		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$ $T_J = 150^\circ\text{C}$			1 250	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$			$\pm 100$	nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1.2	1.6	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-6.7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 35\text{A}$		4.0	5.5	m $\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 33\text{A}$		5.7	8.5	
		$V_{GS} = 10\text{V}, I_D = 35\text{A}$ $T_J = 175^\circ\text{C}$		6.5	8.9	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 35\text{A}$		175		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		1865	2480	pF
$C_{oss}$	Output Capacitance			550	730	pF
$C_{rss}$	Reverse Transfer Capacitance			335	445	pF
$R_g$	Gate Resistance		$f = 1\text{MHz}$	1.2		$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 10\text{V}, I_D = 35\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 10\Omega$		9	18	ns
$t_r$	Rise Time			11	20	ns
$t_{d(off)}$	Turn-Off Delay Time			47	75	ns
$t_f$	Fall Time			25	40	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 0\text{V}$ to 10V	$V_{DD} = 10\text{V}$ $I_D = 35\text{A}$ $I_g = 1.0\text{mA}$	34	48	nC
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{GS} = 0\text{V}$ to 5V		16	22	nC
$Q_{gs}$	Gate to Source Gate Charge			3.2		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			5.9		nC

**Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 35\text{A}$		0.89	1.25	V
		$V_{GS} = 0\text{V}, I_S = 15\text{A}$		0.82	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 35\text{A}, di/dt = 100\text{A}/\mu\text{s}$		30	45	ns
$Q_{rr}$	Reverse Recovery Charge	$I_F = 35\text{A}, di/dt = 100\text{A}/\mu\text{s}$		23	35	nC

**Notes:**

- 1: Pulse time < 300 $\mu\text{s}$ , Duty cycle = 2%.
- 2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.3\text{mH}$ ,  $I_{AS} = 31\text{A}$ ,  $V_{DD} = 18\text{V}$ ,  $V_{GS} = 10\text{V}$ .

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

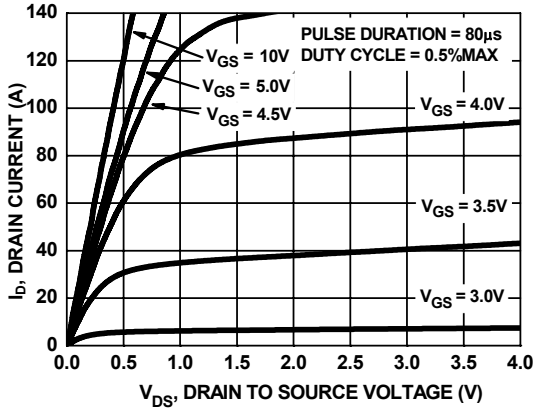


Figure 1. On Region Characteristics

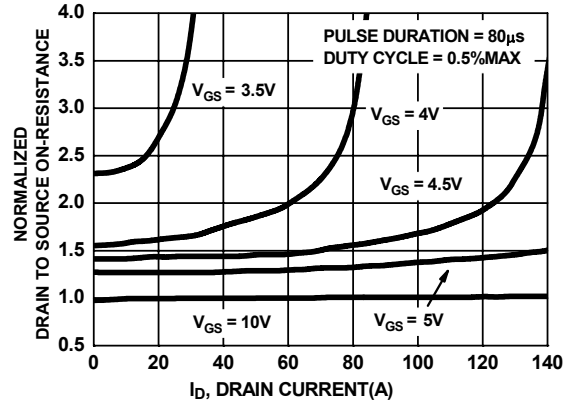


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

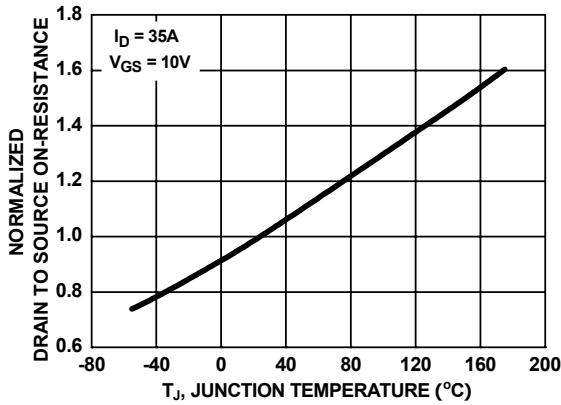


Figure 3. Normalized On Resistance vs Junction Temperature

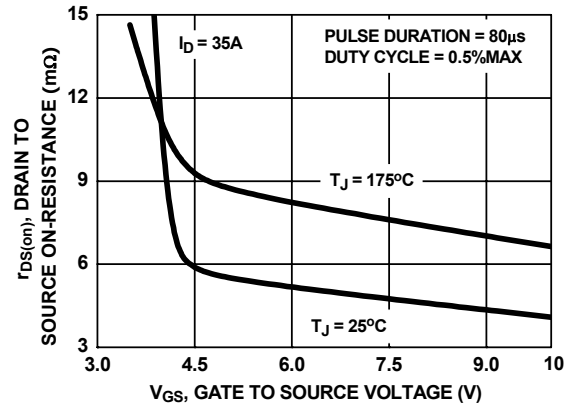


Figure 4. On-Resistance vs Gate to Source Voltage

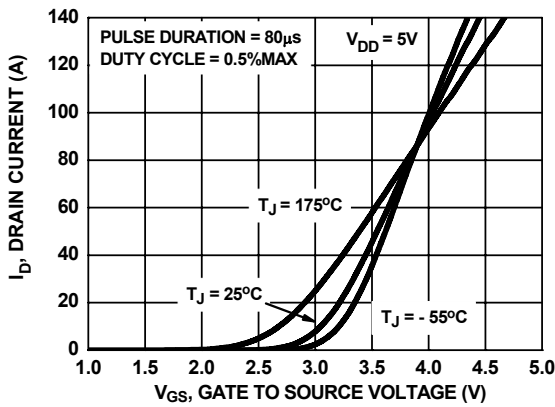


Figure 5. Transfer Characteristics

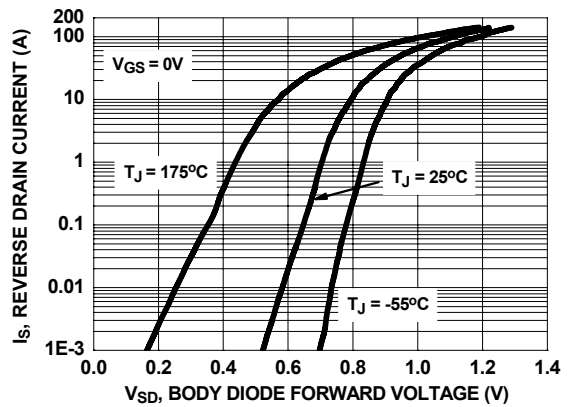


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

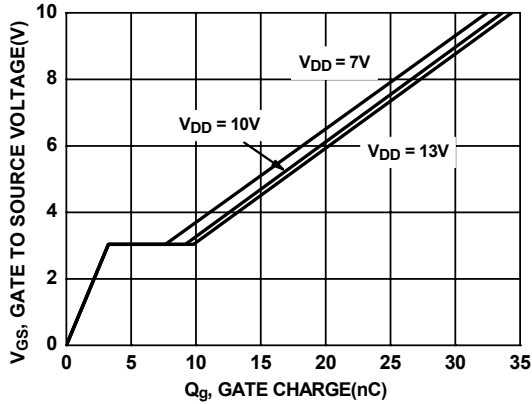


Figure 7. Gate Charge Characteristics

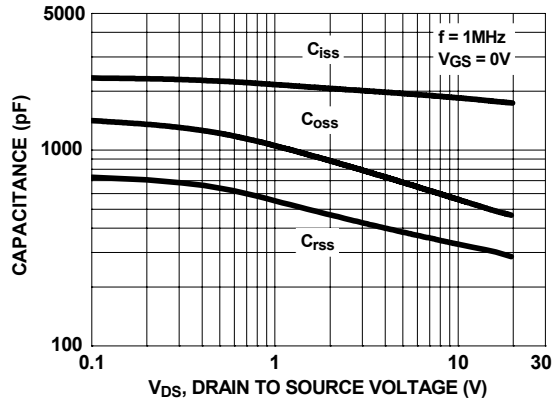


Figure 8. Capacitance vs Drain to Source Voltage

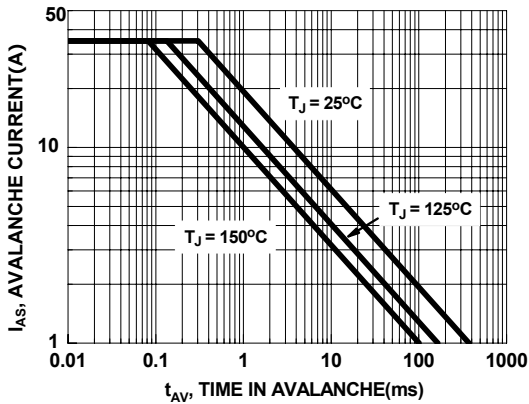


Figure 9. Unclamped Inductive Switching Capability

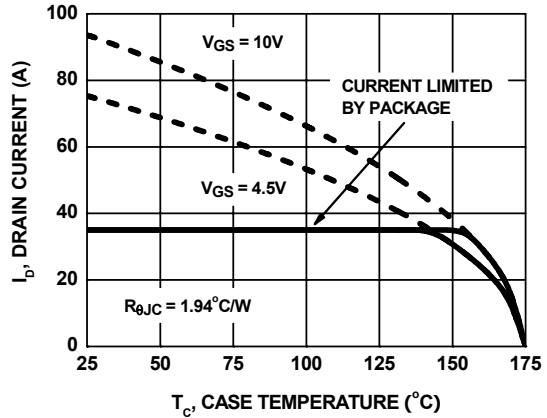


Figure 10. Maximum Continuous Drain Current vs Case Temperature

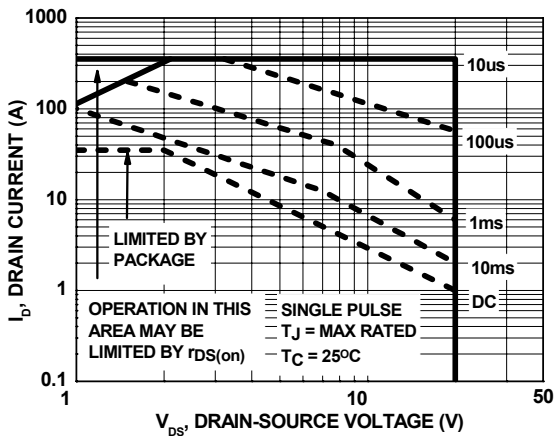


Figure 11. Forward Bias Safe Operating Area

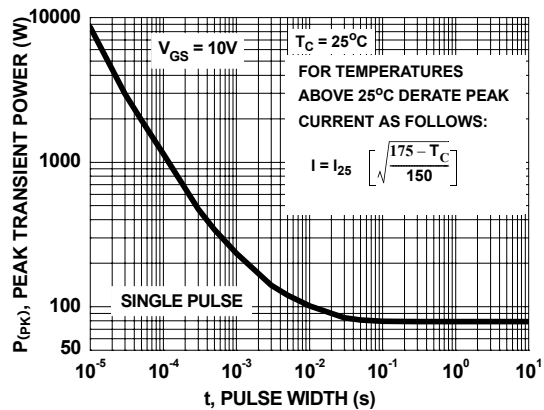


Figure 12. Single Pulse Maximum Power Dissipation

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

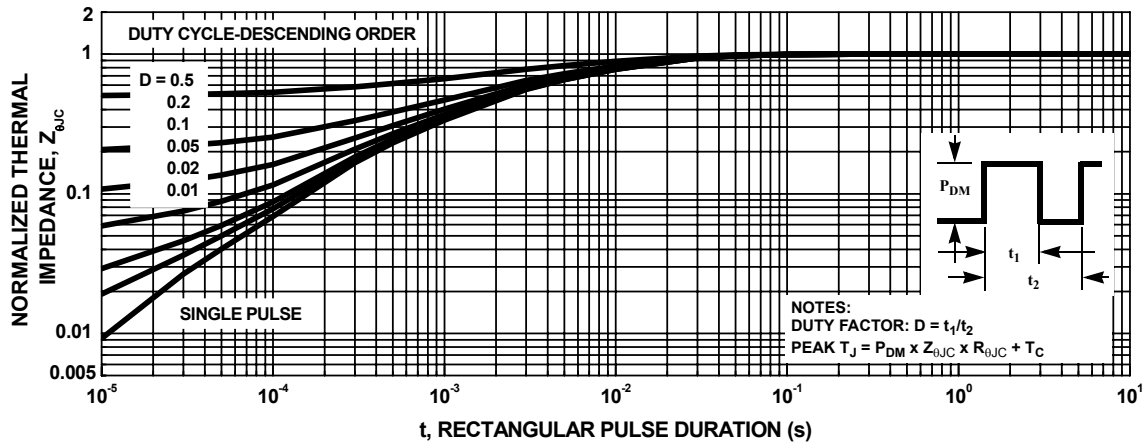


Figure 13. Transient Thermal Response Curve

**FDD8586/FDU8586 N-Channel PowerTrench<sup>®</sup> MOSFET**

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