

## FDMC8878

# N-Channel Power Trench® MOSFET

30V, 16.5A, 14mΩ

### Features

- Max  $r_{DS(on)}$  = 14mΩ at  $V_{GS} = 10V$ ,  $I_D = 9.6A$
- Max  $r_{DS(on)}$  = 17mΩ at  $V_{GS} = 4.5V$ ,  $I_D = 8.7A$
- Low Profile - 1mm max in Power 33
- RoHS Compliant

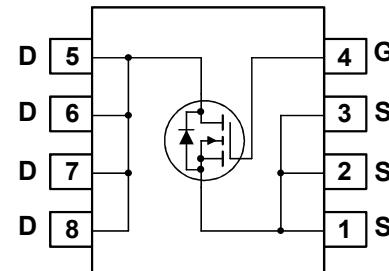
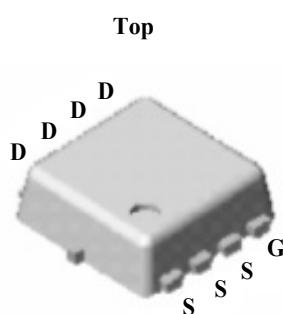
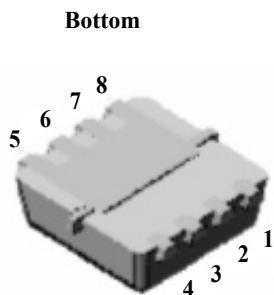


### General Description

This N-Channel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced Power Trench process. It has been optimized for power management applications.

### Application

- DC - DC Conversion



Power 33

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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous (Package limited) $T_C = 25^\circ C$	16.5	A
	-Continuous (Silicon limited) $T_C = 25^\circ C$	38	
	-Continuous $T_A = 25^\circ C$ (Note 1a)	9.6	
	-Pulsed	60	
$P_D$	Power Dissipation $T_C = 25^\circ C$	31	W
	Power Dissipation $T_A = 25^\circ C$ (Note 1a)	2.1	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	60	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC8878	FDMC8878	Power 33	7"	8mm	3000 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

$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	30			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		20		$\text{mV}/^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$ , $V_{GS} = 0\text{V}$			1	$\mu\text{A}$
$I_{\text{GSS}}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			100	$\text{nA}$

### On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.7	3	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-5.7		$\text{mV}/^\circ\text{C}$
$r_{DS(\text{on})}$	Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 9.6\text{A}$		9.6	14.0	
		$V_{GS} = 4.5\text{V}, I_D = 8.7\text{A}$		12.1	17.0	$\text{m}\Omega$
		$V_{GS} = 10\text{V}, I_D = 9.6\text{A}, T_J = 125^\circ\text{C}$		13.5	20.0	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 9.6\text{A}$		35		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$		925	1230	pF
$C_{oss}$	Output Capacitance			190	255	pF
$C_{rss}$	Reverse Transfer Capacitance			120	180	pF
$R_g$	Gate Resistance	$f = 1\text{MHz}$		1.1		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 9.6\text{A}$ $V_{GS} = 10\text{V}, R_{\text{GEN}} = 6\Omega$		8	16	ns
$t_r$	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			20	36	ns
$t_f$	Fall Time			3	10	ns
$Q_{g(\text{TOT})}$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DD} = 15\text{V}$ , $I_D = 9.6\text{A}$		18	26	nC
$Q_{gs}$	Gate to Source Gate Charge			2.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			3.9		nC

### Drain-Source Diode Characteristics

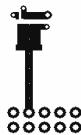
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 9.6\text{A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 9.6\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$		23	35	ns
$Q_{rr}$	Reverse Recovery Charge				14	21

#### Notes:

1:  $R_{\text{thJA}}$  is determined with the device mounted on a  $1\text{in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5$  in. board of FR-4 material.  $R_{\text{thJC}}$  is guaranteed by design while  $R_{\text{thCA}}$  is determined by the user's board design.



a.  $60^\circ\text{C}/\text{W}$  when mounted on a  $1\text{in}^2$  pad of 2 oz copper



b.  $135^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

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

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

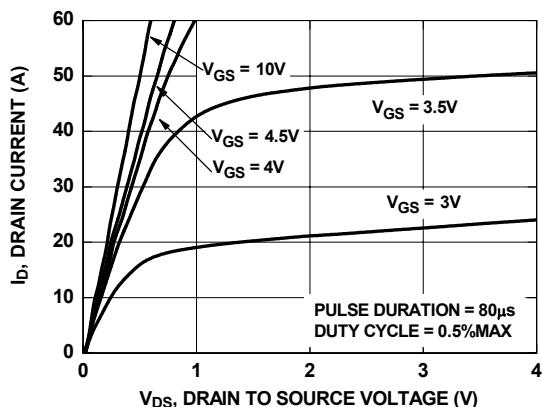


Figure 1. On-Region Characteristics

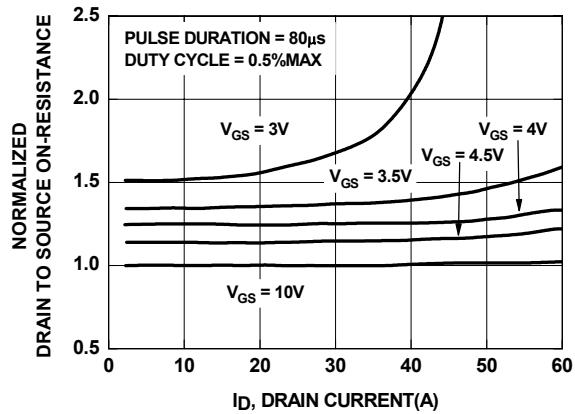


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

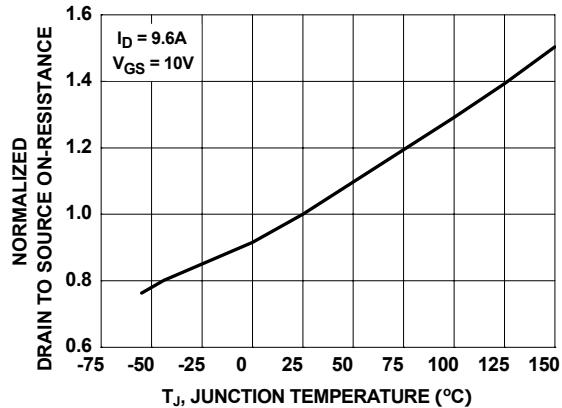


Figure 3. Normalized On-Resistance vs Junction Temperature

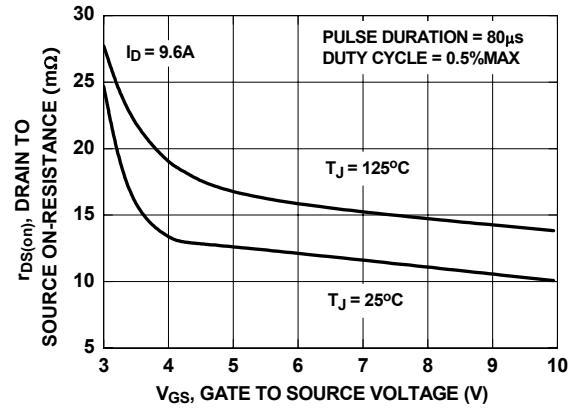


Figure 4. On-Resistance vs Gate to Source Voltage

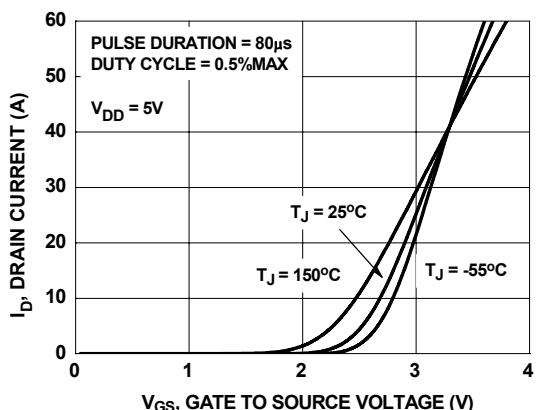


Figure 5. Transfer Characteristics

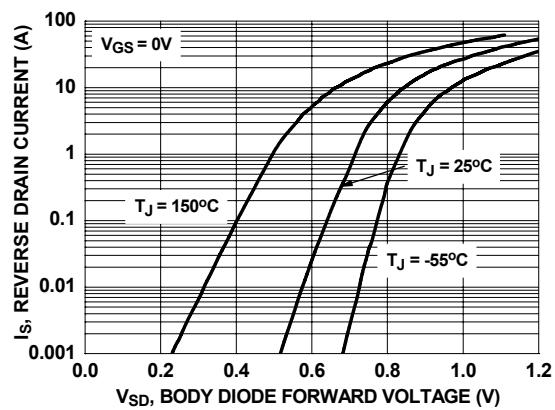
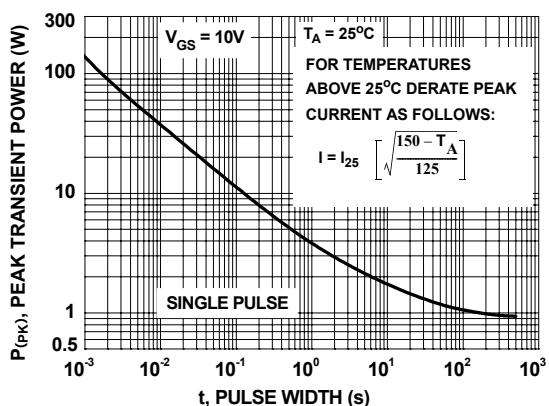
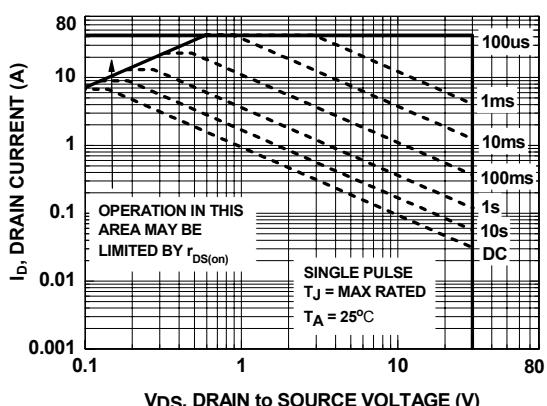
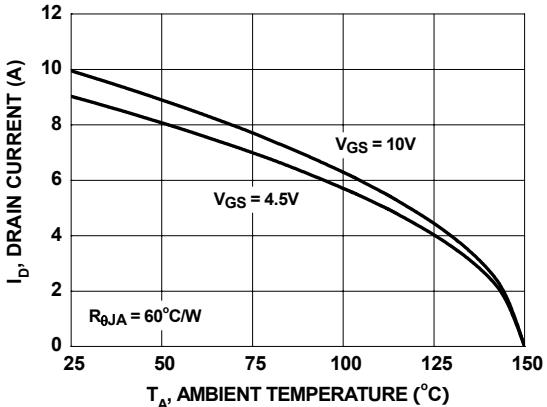
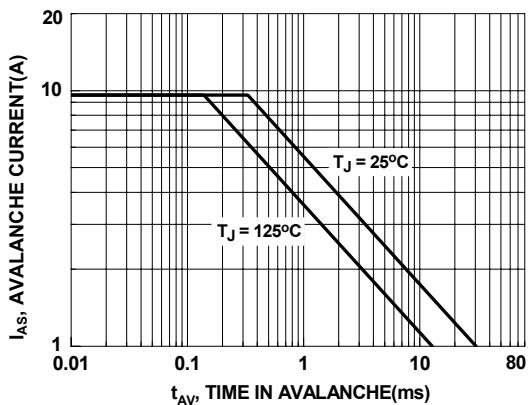
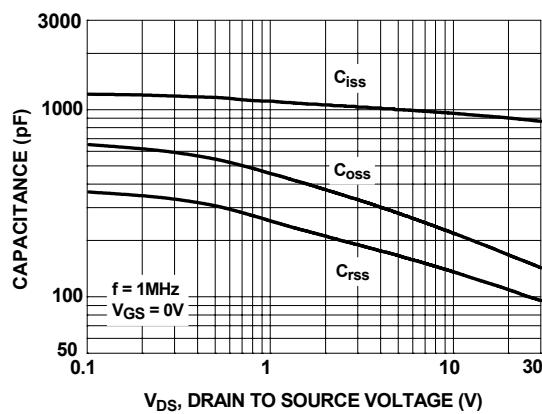
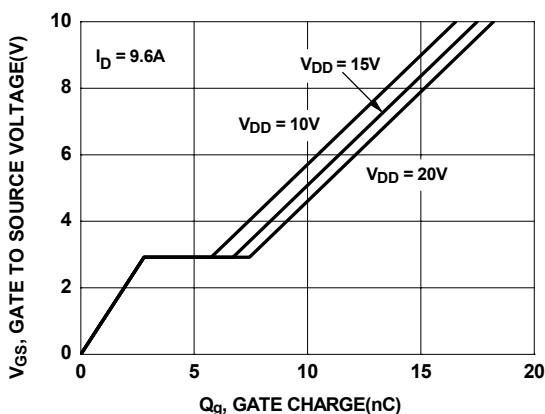


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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



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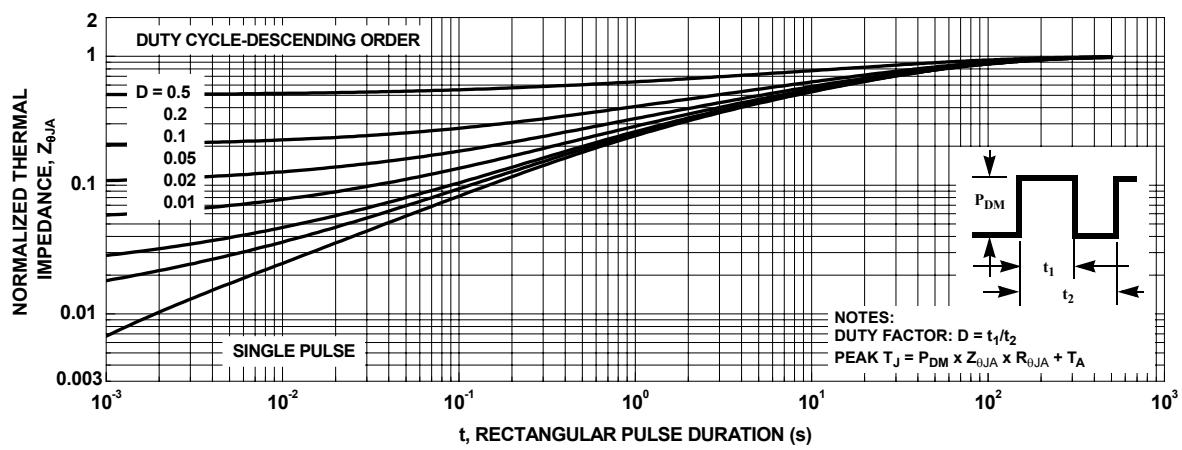
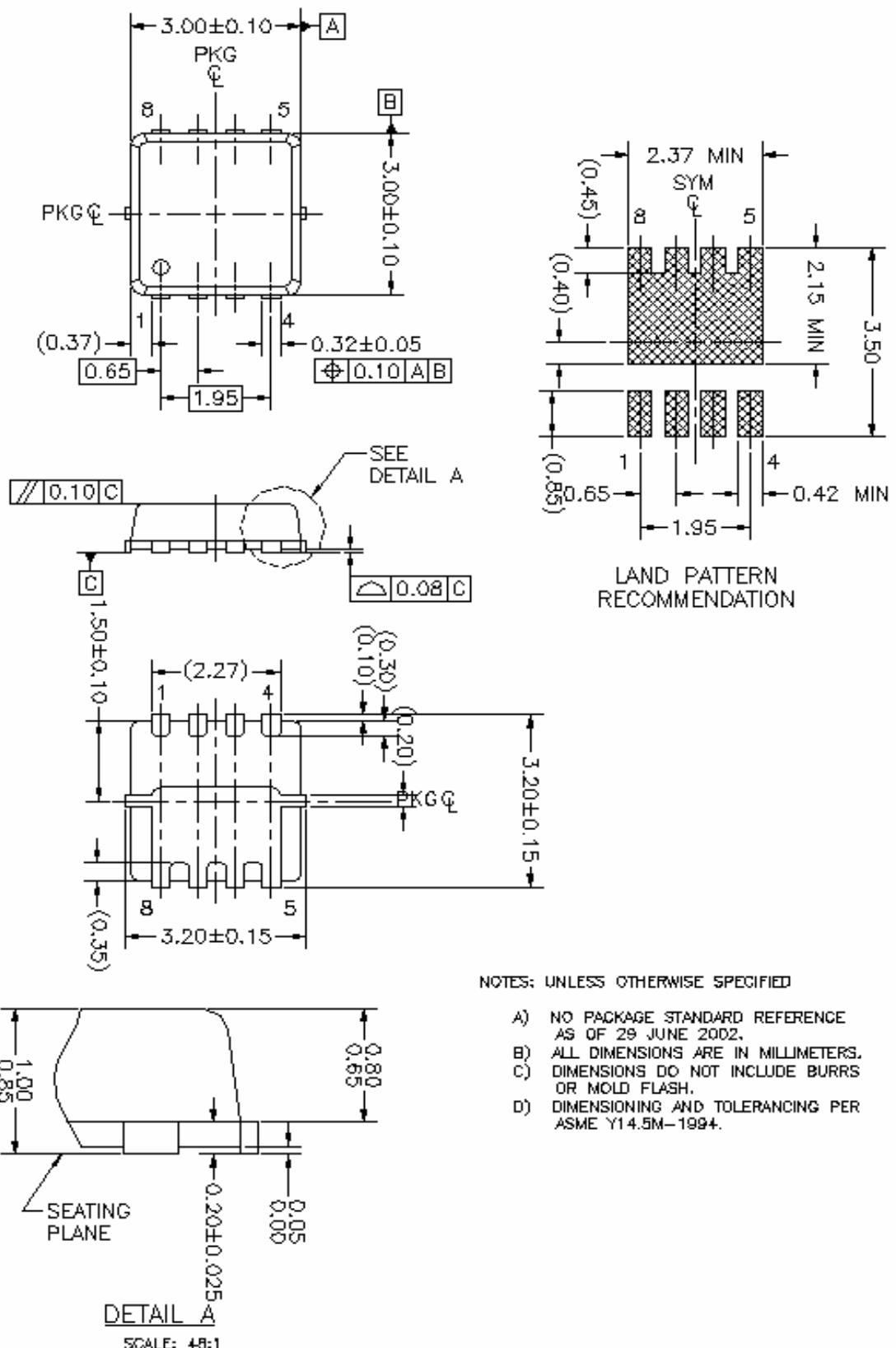


Figure 13. Transient Thermal Response Curve

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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
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