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# FDC8878

## N-Channel PowerTrench<sup>®</sup> MOSFET

30 V, 8.0 A, 16 mΩ

### Features

- Max  $r_{DS(on)}$  = 16 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 8.0\text{ A}$
- Max  $r_{DS(on)}$  = 18 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 7.5\text{ A}$
- High performance trench technology for extremely low  $r_{DS(on)}$
- Fast switching speed
- RoHS Compliant

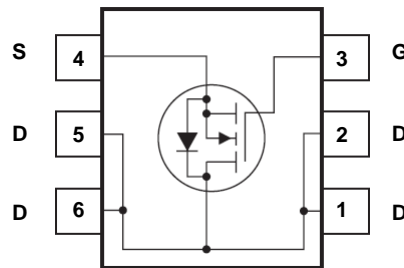
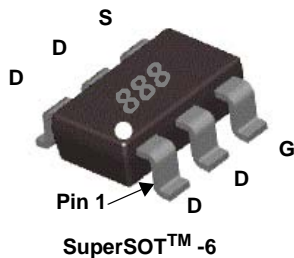


### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench<sup>®</sup> process that has been optimized for  $r_{DS(on)}$ , switching performance.

### Applications

- Primary Switch



### MOSFET Maximum Ratings $T_A = 25\text{ °C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage (Note 3)	±20	V
$I_D$	Drain Current -Continuous (Package limited) $T_C = 25\text{ °C}$	8.0	A
	-Continuous $T_A = 25\text{ °C}$ (Note 1a)	8.0	
	-Pulsed	32	
$P_D$	Power Dissipation (Note 1a)	1.6	W
	Power Dissipation (Note 1b)	0.8	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	30	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	78	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.888	FDC8878	SSOT-6	7"	8 mm	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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}, V_{GS} = 0\ \text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		13		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\ \text{V}, V_{GS} = 0\ \text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current, Forward	$V_{GS} = 20\ \text{V}, V_{DS} = 0\ \text{V}$			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	3.0	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/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}, I_D = 8.0\ \text{A}$		12	16	m $\Omega$
		$V_{GS} = 4.5\ \text{V}, I_D = 7.5\ \text{A}$		14	18	
		$V_{GS} = 10\ \text{V}, I_D = 8.0\ \text{A}, T_J = 125^\circ\text{C}$		16	21	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\ \text{V}, I_D = 8.0\ \text{A}$	43			S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\ \text{V}, V_{GS} = 0\ \text{V},$ $f = 1\ \text{MHz}$		782	1040	pF
$C_{oss}$	Output Capacitance			318	425	pF
$C_{rss}$	Reverse Transfer Capacitance			40	60	pF
$R_g$	Gate Resistance			1.2		$\Omega$

### Switching Characteristics

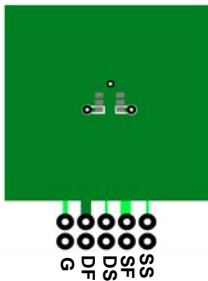
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\ \text{V}, I_D = 8\ \text{A},$ $V_{GS} = 10\ \text{V}, R_{GEN} = 6\ \Omega$		6	12	ns
$t_r$	Rise Time			2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			17	30	ns
$t_f$	Fall Time			2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V to } 10\ \text{V}$	$V_{DD} = 15\ \text{V}$ $I_D = 8\ \text{A}$	13	18	nC
	Total Gate Charge	$V_{GS} = 0\ \text{V to } 4.5\ \text{V}$		6	9	nC
$Q_{gs}$	Total Gate Charge			1.7		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.0		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = 8.0\ \text{A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 8.0\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		22	35	ns
$Q_{rr}$	Reverse Recovery Charge			7	14	nC

#### NOTES:

- $R_{\theta JA}$  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  $R_{\theta CA}$  is determined by the user's board design.



a.  $78^\circ\text{C}/\text{W}$  when mounted on a  $1\ \text{in}^2$  pad of 2 oz copper



b.  $175^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

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

- As an N-ch device, the negative  $V_{gs}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

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

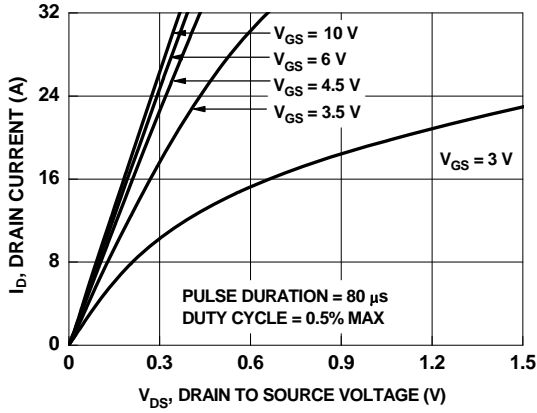


Figure 1. On Region Characteristics

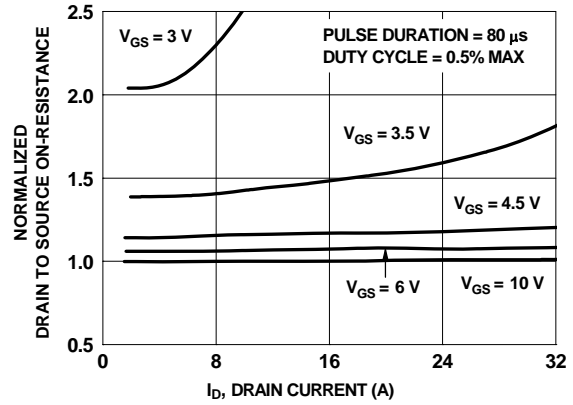


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

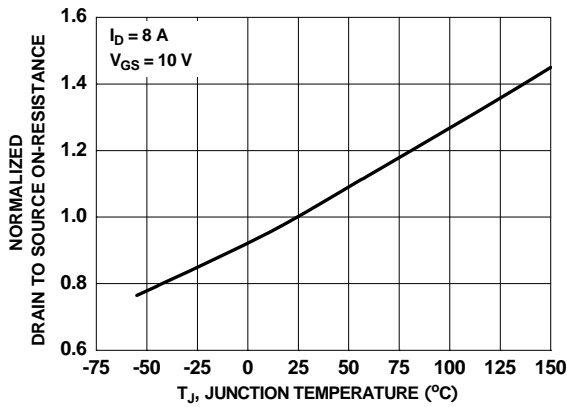


Figure 3. Normalized On Resistance vs Junction Temperature

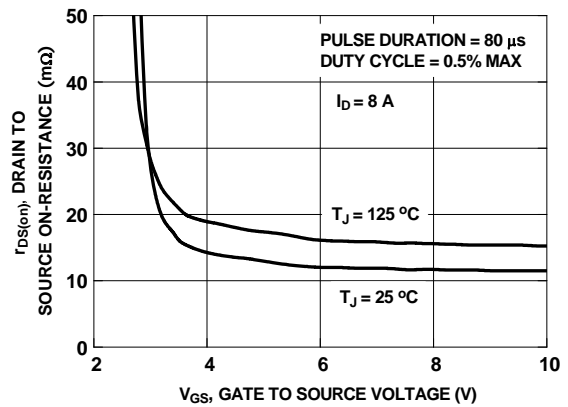


Figure 4. On-Resistance vs Gate to Source Voltage

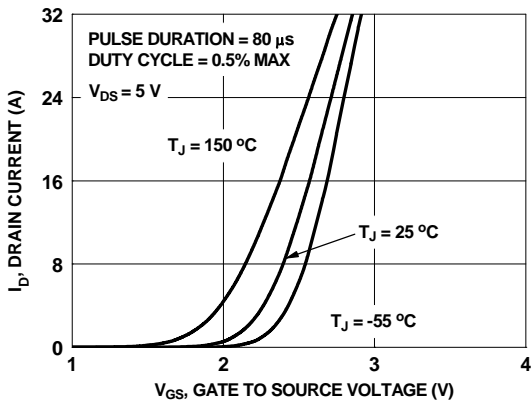


Figure 5. Transfer Characteristics

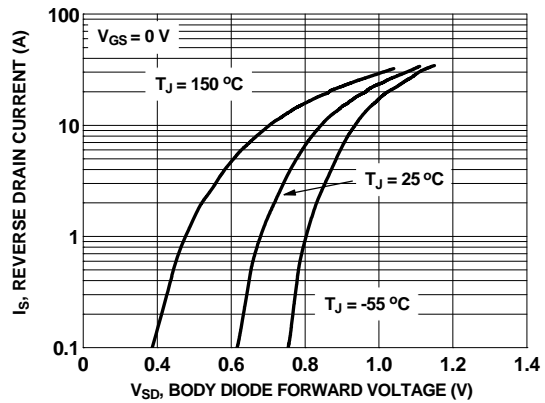
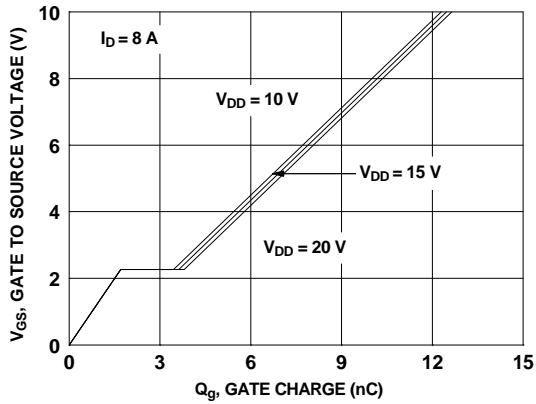
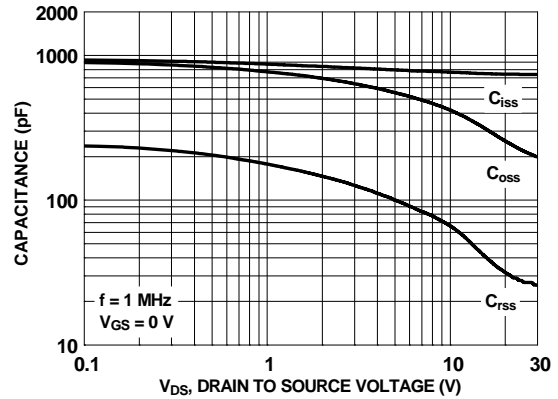


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

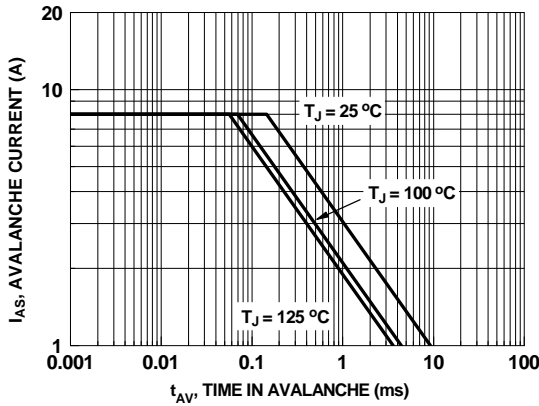
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



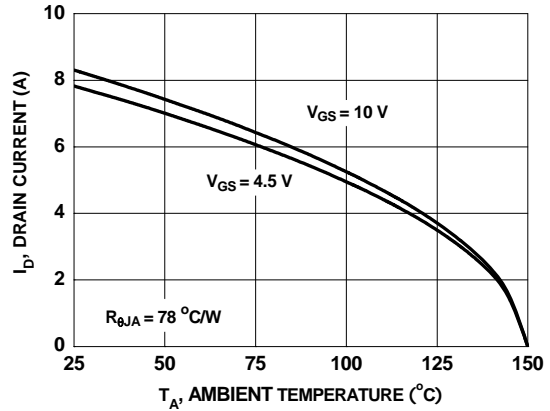
**Figure 7. Gate Charge Characteristics**



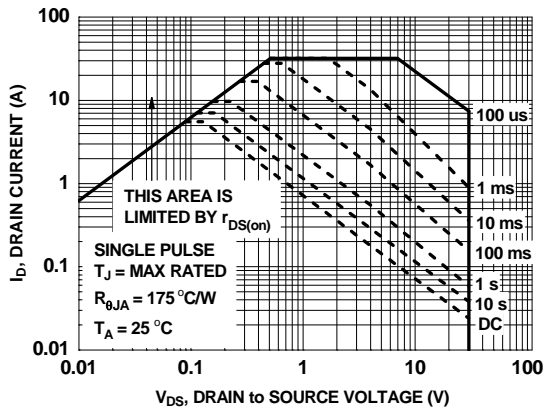
**Figure 8. Capacitance vs Drain to Source Voltage**



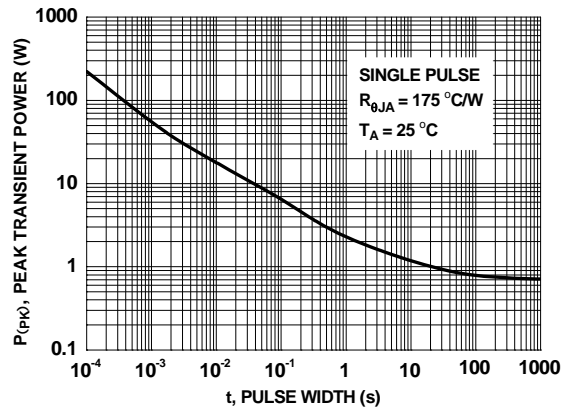
**Figure 9. Unclamped Inductive Switching Capability**



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

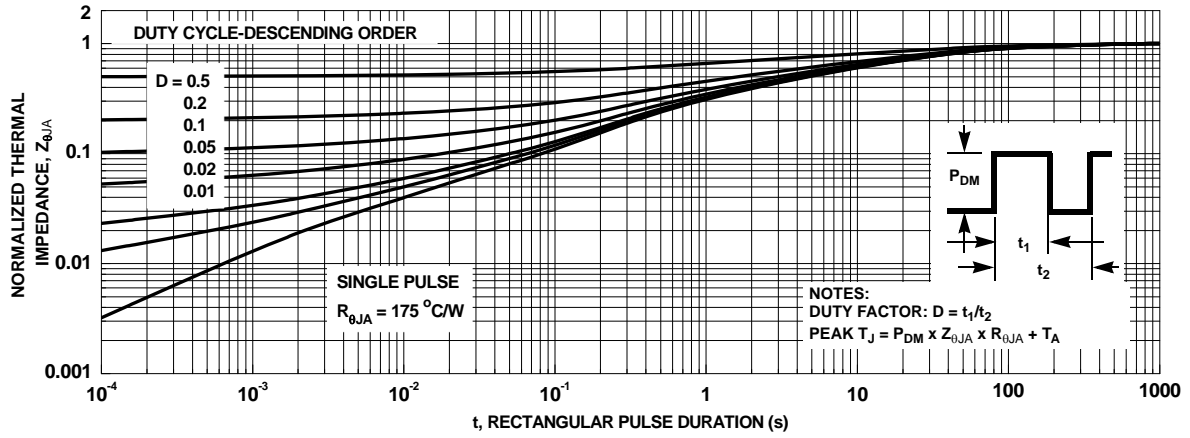


**Figure 11. Forward Bias Safe Operating Area**

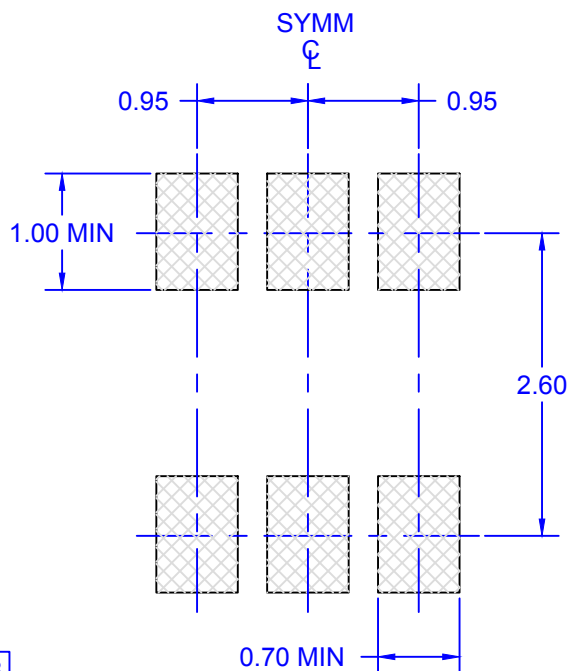
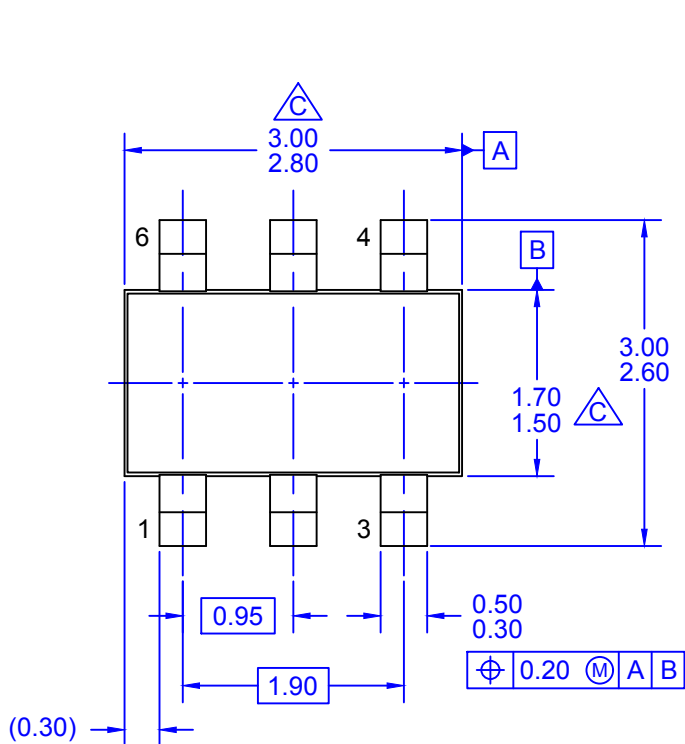


**Figure 12. Single Pulse Maximum Power Dissipation**

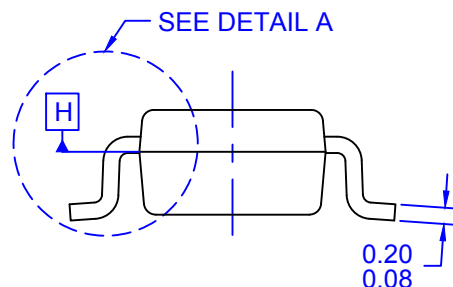
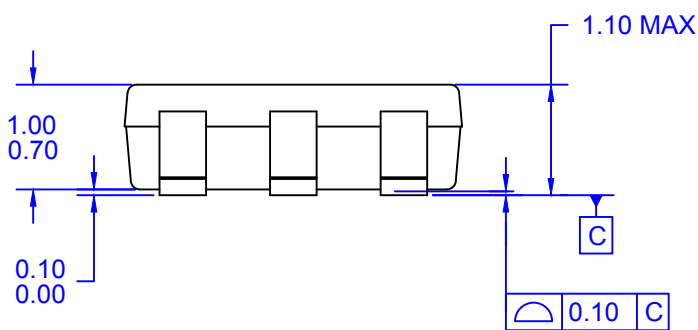
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



**Figure 13. Junction-to-Ambient Transient Thermal Response Curve**



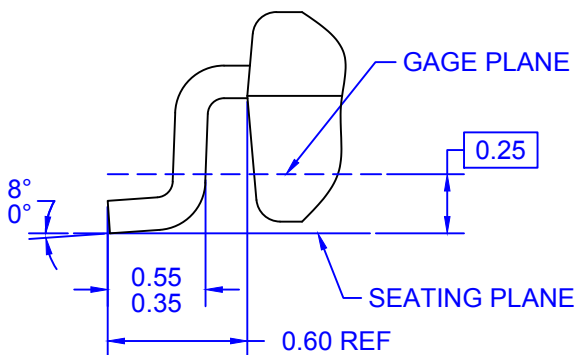
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