

# FDC8884

## N-Channel Power Trench® MOSFET 30 V, 6.5 A, 23 mΩ

### Features

- Max  $r_{DS(on)}$  = 23 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 6.5\text{ A}$
- Max  $r_{DS(on)}$  = 30 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 6.0\text{ A}$
- High performance trench technology for extremely low  $r_{DS(on)}$
- Fast switching speed
- RoHS Compliant

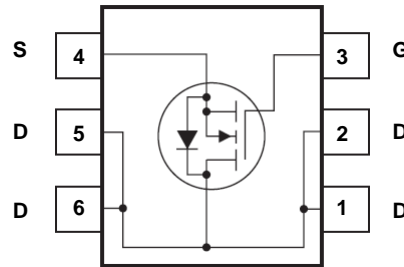
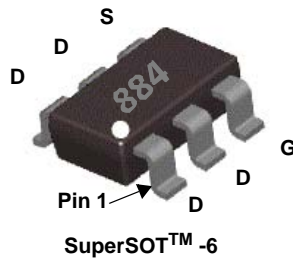


### General Description

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

### Application

- 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)	6.5	
	-Pulsed	25	
$P_D$	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
.884	FDC8884	SSOT-6	7"	8 mm	3000 units

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		18		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	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.2	1.9	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 6.5\text{ A}$		19	23	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 6.0\text{ A}$		25	30	
		$V_{GS} = 10\text{ V}$ , $I_D = 6.5\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		25	30	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\text{ V}$ , $I_D = 6.5\text{ A}$		24		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		348	465	pF
$C_{oss}$	Output Capacitance			135	180	pF
$C_{rss}$	Reverse Transfer Capacitance			16	25	pF
$R_g$	Gate Resistance			1.2		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$ , $I_D = 6.5\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		5	10	ns
$t_r$	Rise Time			1	10	ns
$t_{d(off)}$	Turn-Off Delay Time			11	19	ns
$t_f$	Fall Time			1	10	ns
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		5.3	7.4
	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$	$V_{DD} = 15\text{ V}$ $I_D = 6.5\text{ A}$	2.5	3.5	nC
$Q_{gs}$	Total Gate Charge			1.0		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			0.8		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 6.5\text{ A}$ (Note 2)		0.86	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 6.5\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		14	22	ns
$Q_{rr}$	Reverse Recovery Charge			3	10	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.  $78\text{ }^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



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

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

3. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

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

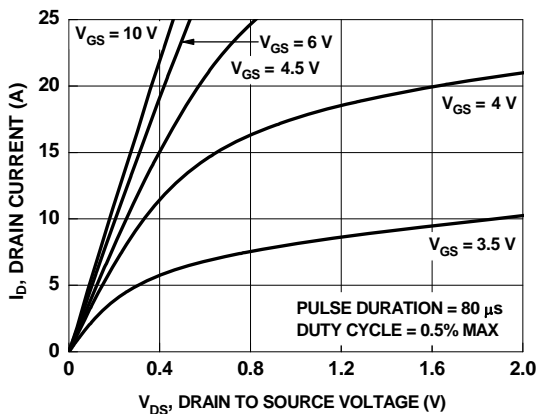


Figure 1. On Region Characteristics

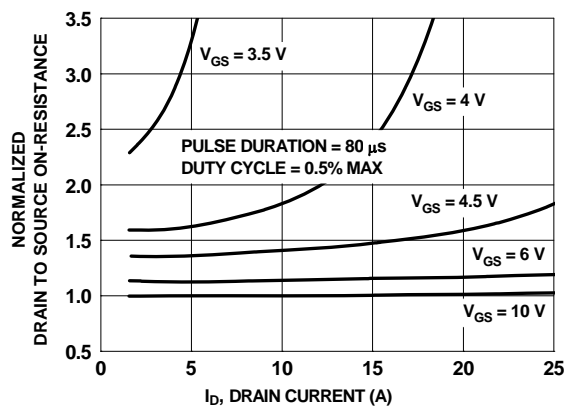


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

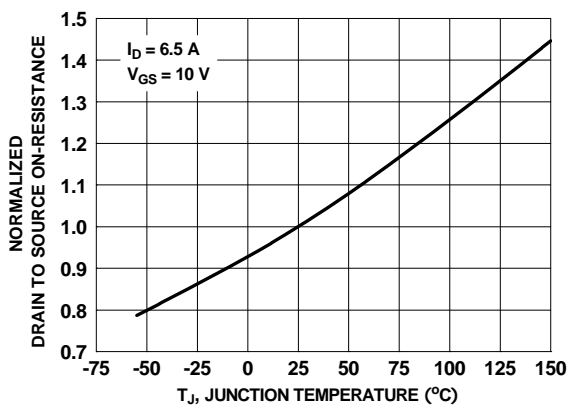


Figure 3. Normalized On Resistance vs Junction Temperature

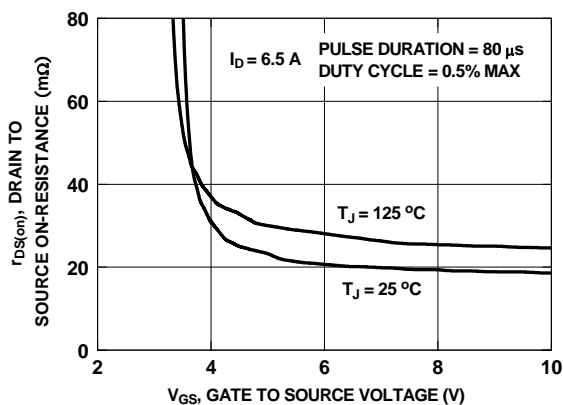


Figure 4. On-Resistance vs Gate to Source Voltage

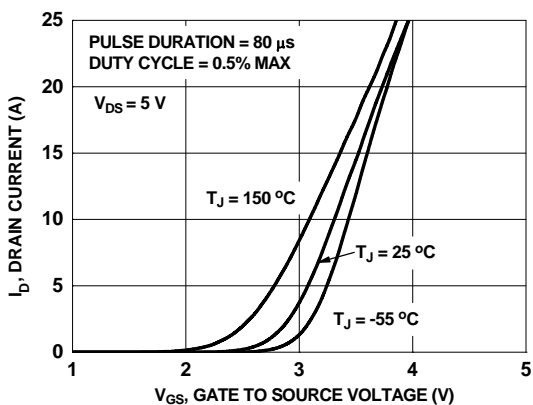


Figure 5. Transfer Characteristics

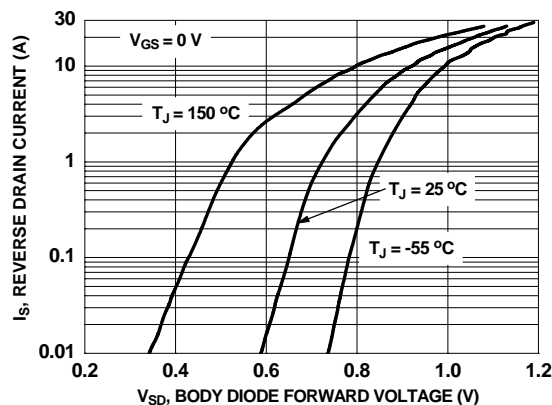
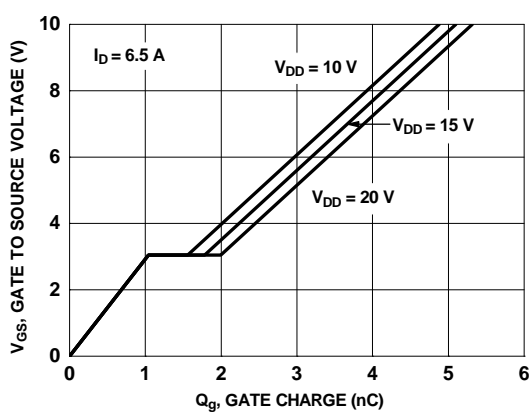
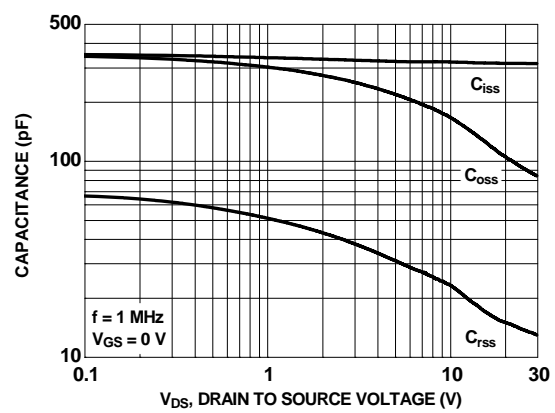


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

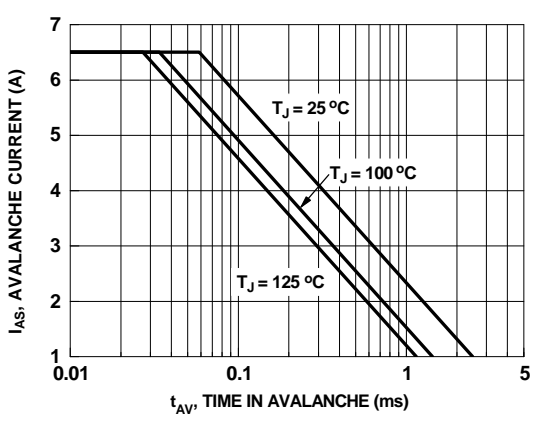
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



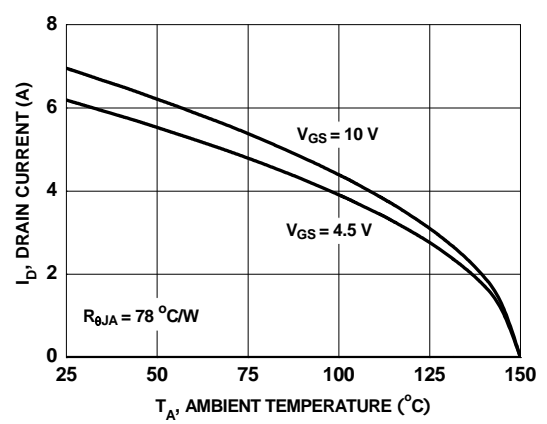
**Figure 7. Gate Charge Characteristics**



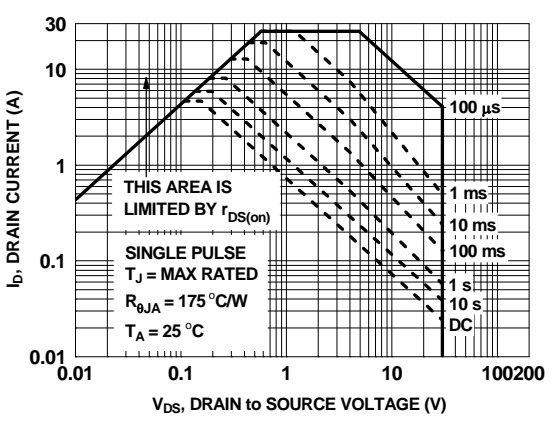
**Figure 8. Capacitance vs Drain to Source Voltage**



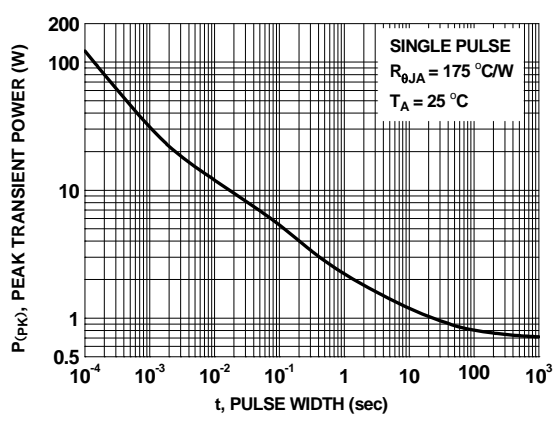
**Figure 9. Unclamped Inductive Switching Capability**



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

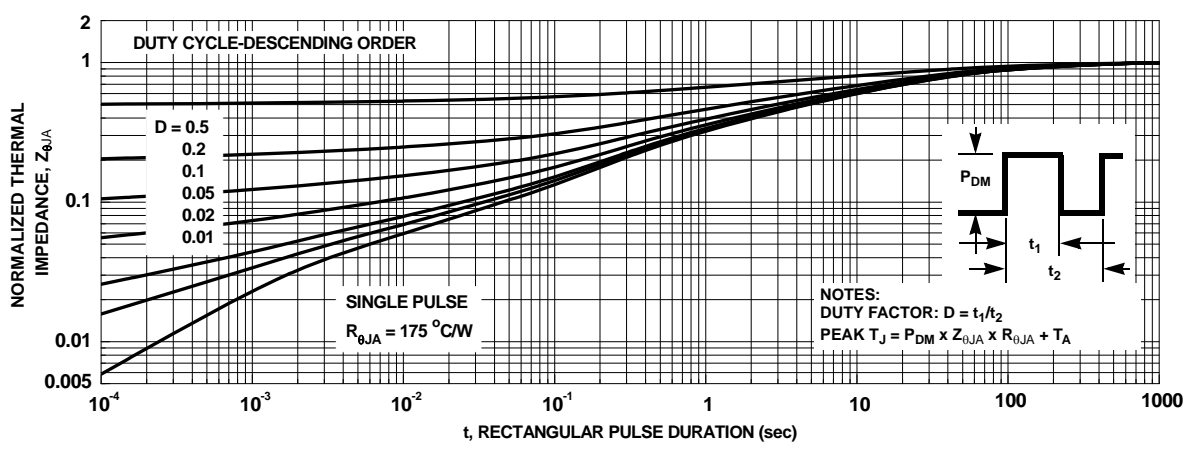


**Figure 11. Forward Bias Safe Operating Area**



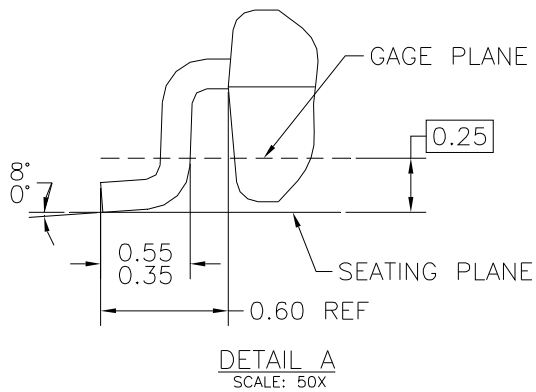
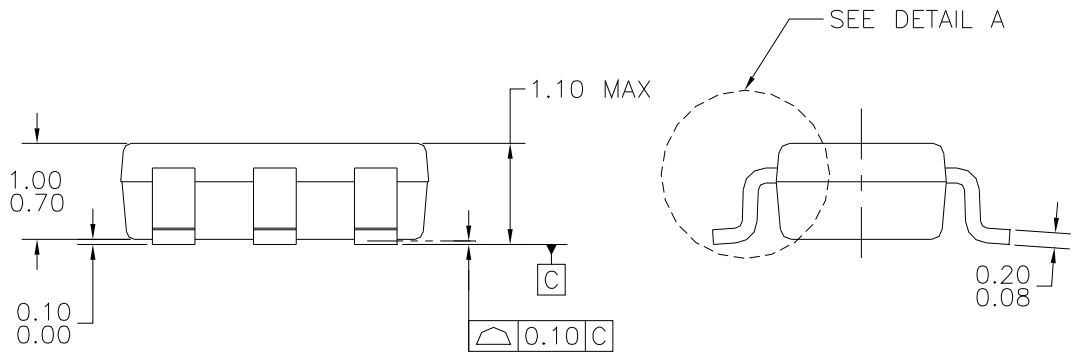
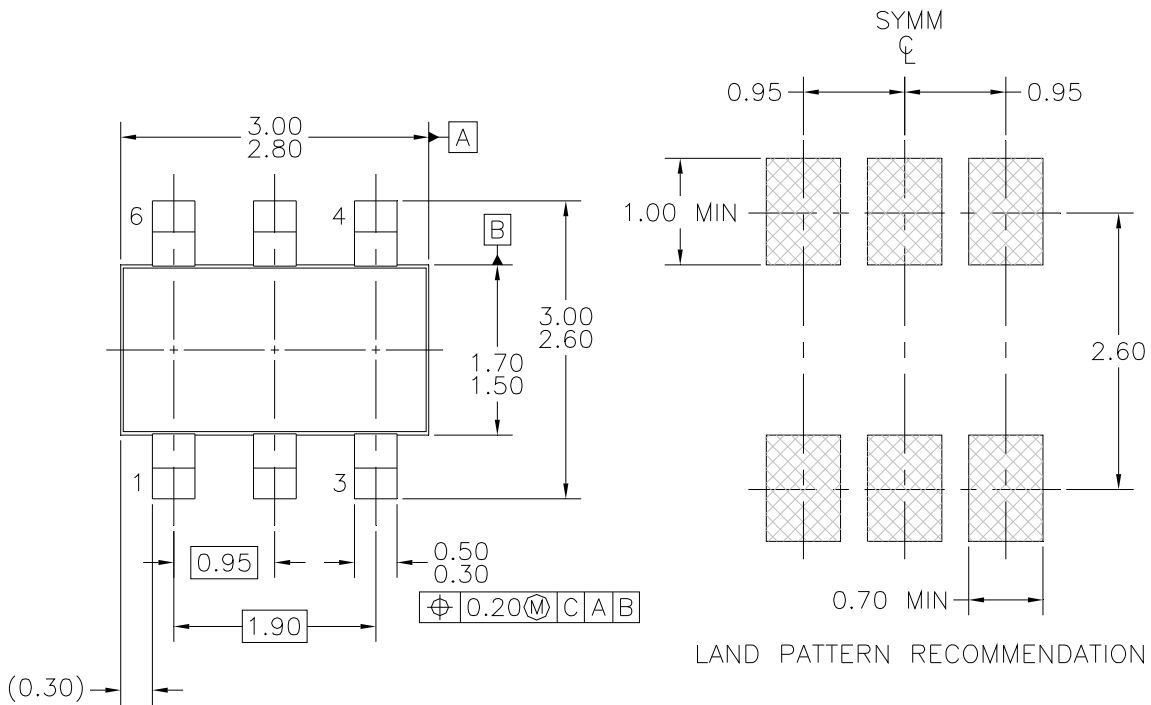
**Figure 12. Single Pulse Maximum Power Dissipation**

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



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

### Dimensional Outline and Pad Layout




NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC MO-193. VAR. AA, ISSUE C, DATED JANUARY 2000.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.



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