FAIRCHILD

SEMICONDUCTOR®

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FDC855N

Single N-Channel, Logic Level, PowerTrench® MOSFET
30V, 6.1A, 27mΩ

Features

- Max $r_{DS(on)}$ = 27mΩ at V_{GS} = 10V, I_D = 6.1A

- Max $r_{DS(on)}$ = 36mΩ at V_{GS} = 4.5V, I_D = 5.3A

- SuperSOT™ -6 package: small footprint (72% smaller than standard SO-8; low profile (1mm thick).

- RoHS Compliant

General Description

This N-Channel Logic Level MOSFET is an efficient solution for low voltage and battery powered applications. Utilizing Fairchild Semiconductor's advanced PowerTrench® process, this device possesses minimized on-state resistance to optimize the power consumption. They are ideal for applications where in-line power loss is critical.

Application

- Power Management in Notebook, Hard Disk Drive

SuperSOT™-6

Pin 1
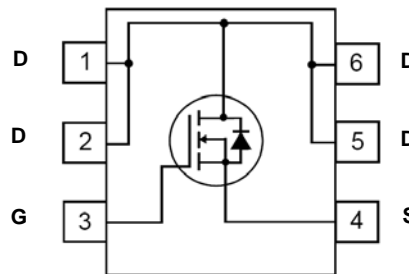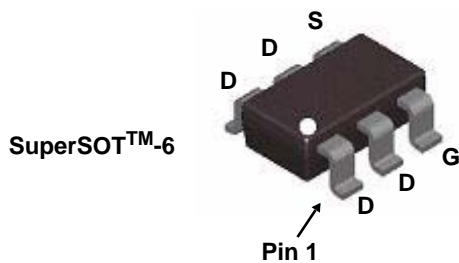
MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous	T_A = 25°C	(Note 1a)	6.1	A
	-Pulsed			20	
P_D	Power Dissipation (Steady State)		(Note 1a)	1.6	W
	Power Dissipation (Steady State)		(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		(Note 1)	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
.855	FDC855N	SuperSOT-6	7"	8 mm	3000 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250µA, V_{GS} = 0V	30			V
$\dfrac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C		24		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 24V,			1	µA
		T_C = 125°C			250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250µA	1.0	2.0	3.0	V
$\dfrac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C		-6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 6.1A		20.7	27.0	mΩ
		V_{GS} = 4.5V, I_D = 5.3A		28.2	36.0	
		V_{GS} = 10V, I_D = 6.1A, T_J =125°C		30.1	39.3	
g_{FS}	Forward Transconductance	V_{DD} = 10V, I_D = 6.1A		20		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		493	655	pF
C_{oss}	Output Capacitance			108	145	pF
C_{rss}	Reverse Transfer Capacitance			62	95	pF
R_g	Gate Resistance	f = 1MHz		1.0		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 6.1A, V_{GS} = 10V, R_{GEN} = 6Ω		6	12	ns
t_r	Rise Time			2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			14	23	ns
t_f	Fall Time			2	10	ns
Q_g	Total Gate Charge at 10V	V_{GS}=0V to 10V, V_{DD} = 15V, I_D = 6.1A		9.2	13	nC
Q_g	Total Gate Charge at 5V	V_{GS} = 0V to 5V		4.9	7.0	nC
Q_{gs}	Gate to Source Charge			1.7		nC
Q_{gd}	Gate to Drain "Miller" Charge			3.1		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 1.3A (Note 2)		0.80	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 6.1A, di/dt = 100A/µs		17	31	ns
Q_{rr}	Reverse Recovery Charge			6	12	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 $R_{\theta CA}$ is determined by the user's board design.

a. 78°C/W when mounted on a 1 in^2 pad of 2 oz copper.

b. 156°C/W when mounted on a minimum pad of 2 oz copper.

2: Pulse Test: Pulse Width < 300 µs, Duty Cycle < 2.0%.

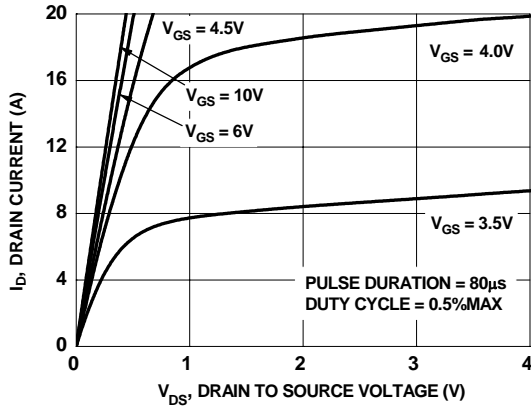## Typical Characteristics T_J = 25°C unless otherwise noted

Figure 1. On-Region Characteristics

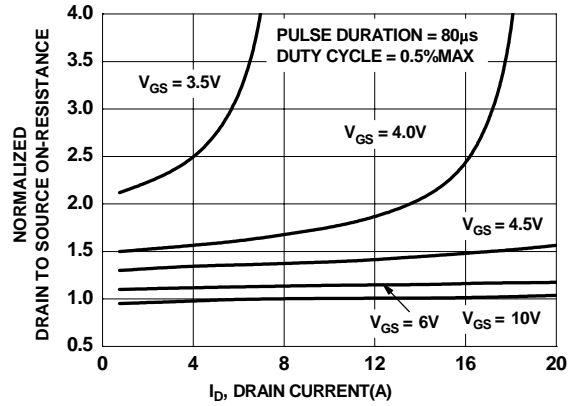V_{GS} = 4.5V
V_{GS} = 4.0V
V_{GS} = 10V
V_{GS} = 6V
V_{GS} = 3.5V
PULSE DURATION = 80µs
DUTY CYCLE = 0.5%MAX
I_D, DRAIN CURRENT (A)
V_{DS}, DRAIN TO SOURCE VOLTAGE (V)

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

PULSE DURATION = 80µs
DUTY CYCLE = 0.5%MAX
V_{GS} = 3.5V
V_{GS} = 4.0V
V_{GS} = 4.5V
V_{GS} = 6V
V_{GS} = 10V
NORMALIZED DRAIN TO SOURCE ON-RESISTANCE
I_D, DRAIN CURRENT(A)
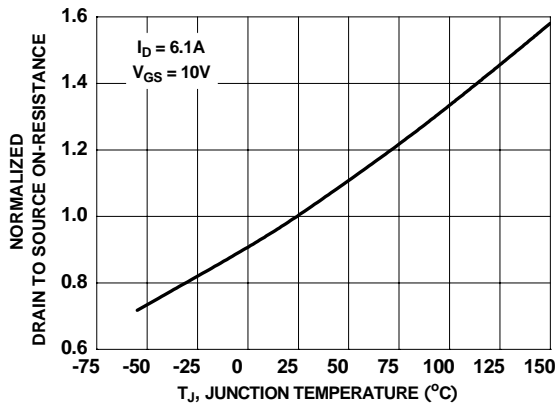
Figure 3. Normalized On-Resistance vs Junction Temperature

I_D = 6.1A
V_{GS} = 10V
NORMALIZED DRAIN TO SOURCE ON-RESISTANCE
T_J, JUNCTION TEMPERATURE (°C)
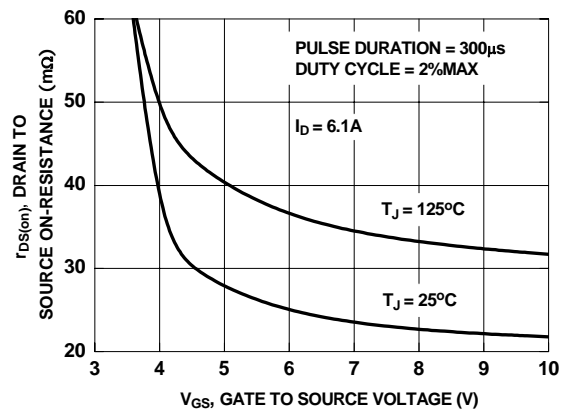
Figure 4. On-Resistance vs Gate to Source Voltage

PULSE DURATION = 300µs
DUTY CYCLE = 2%MAX
I_D = 6.1A
T_J = 125°C
T_J = 25°C
$r_{DS(on)}$, DRAIN TO SOURCE ON-RESISTANCE (mΩ)
V_{GS}, GATE TO SOURCE VOLTAGE (V)
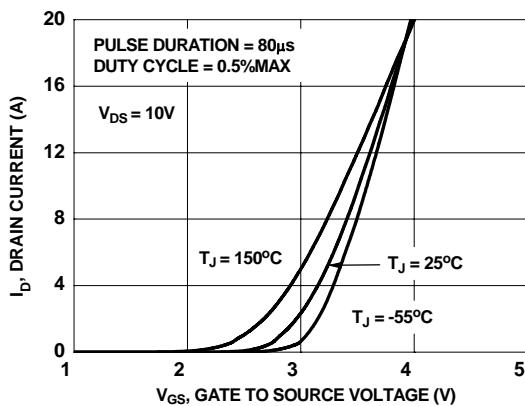
Figure 5. Transfer Characteristics

PULSE DURATION = 80µs
DUTY CYCLE = 0.5%MAX
V_{DS} = 10V
T_J = 150°C
T_J = 25°C
T_J = -55°C
I_D, DRAIN CURRENT (A)
V_{GS}, GATE TO SOURCE VOLTAGE (V)
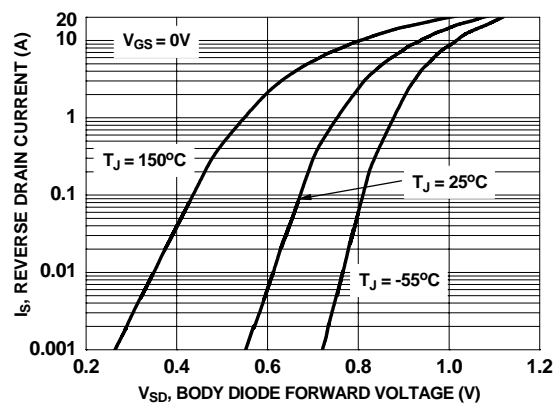
Figure 6. Source to Drain Diode Forward Voltage vs Source Current

V_{GS} = 0V
T_J = 150°C
T_J = 25°C
T_J = -55°C
I_S, REVERSE DRAIN CURRENT (A)
V_{SD}, BODY DIODE FORWARD VOLTAGE (V)

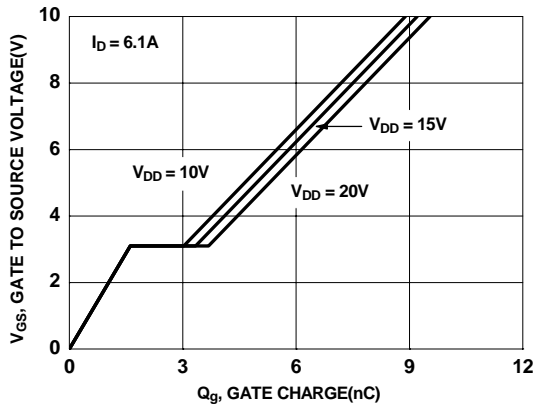## Typical Characteristics $T_J = 25°C$ unless otherwise noted

Figure 7. Gate Charge Characteristics
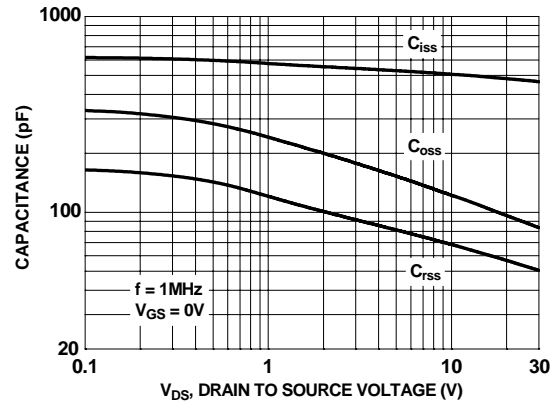

Figure 8. Capacitance vs Drain to Source Voltage
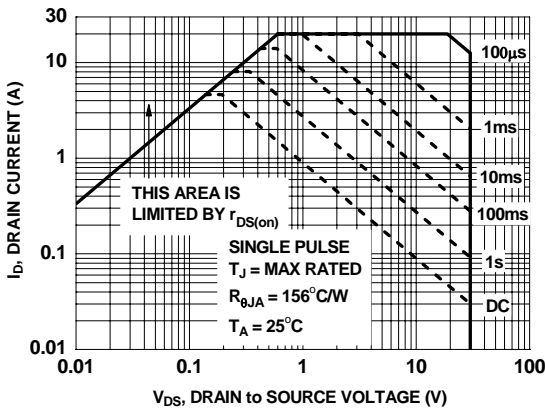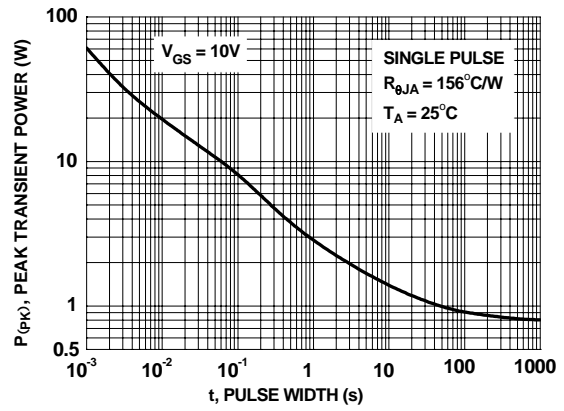

Figure 9. Forward Bias Safe Operating Area
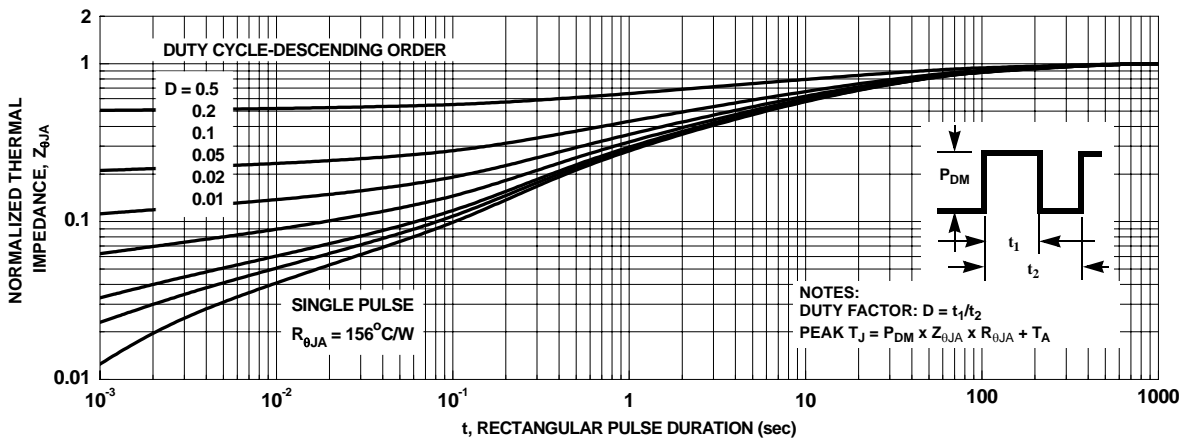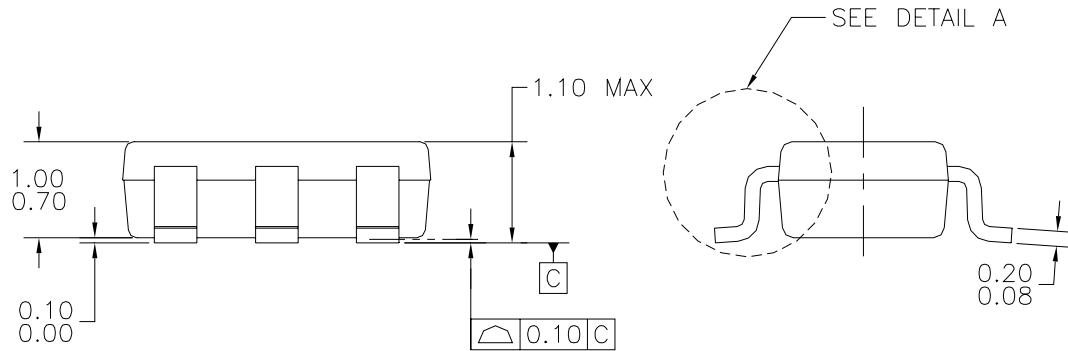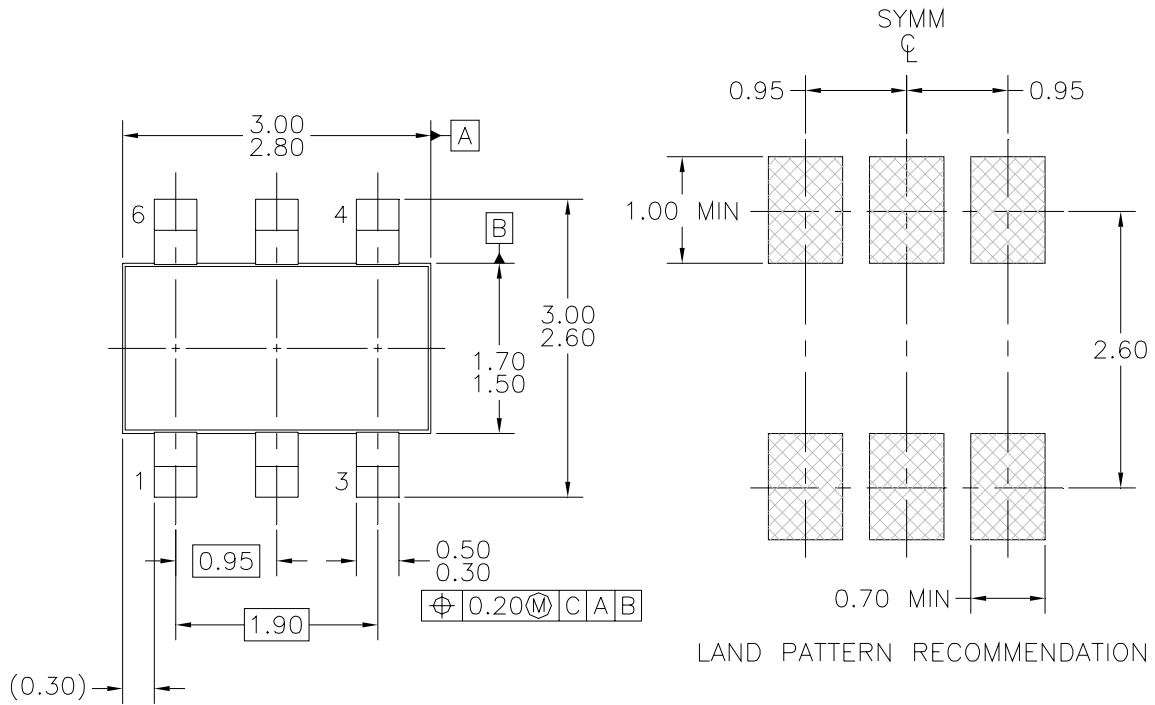

Figure 10. Single Pulse Maximum Power Dissipation

Figure 11. Transient Thermal Response Curve

Dimensional Outline and Pad Layout

3.00
2.80 A

6   4   B

3.00
2.60

1.70
1.50

1   3

0.95

0.50
0.30

⊕ 0.20 (M) C A B

1.90

(0.30)

SYMM
C_L

0.95   0.95

1.00 MIN

2.60

0.70 MIN

LAND PATTERN RECOMMENDATION

1.10 MAX

1.00
0.70

0.10
0.00

C

△ 0.10 C

SEE DETAIL A

0.20
0.08

GAGE PLANE

0.25

8°
0°

0.55
0.35

SEATING PLANE

0.60 REF

DETAIL A
SCALE: 50X
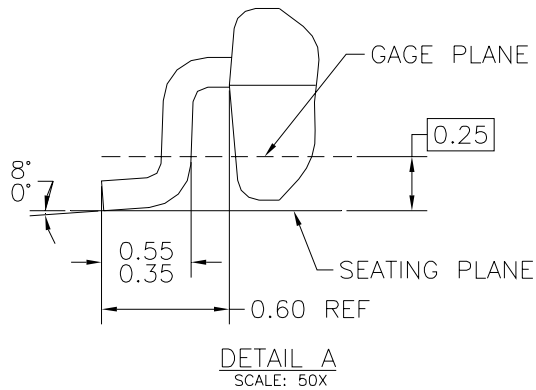
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