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October 2015

FDN86501LZ

N-Channel Shielded Gate PowerTrench® MOSFET

60 V, 2.6 A, 116 mΩ

Features

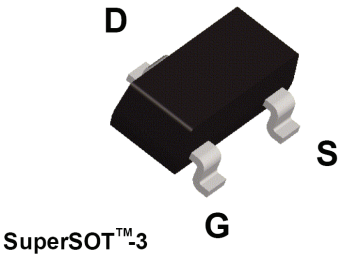
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 116 mΩ at V_{GS} = 10 V, I_D = 2.6 A
- Max $r_{DS(on)}$ = 173 mΩ at V_{GS} = 4.5 V, I_D = 2.1 A
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- Fast switching speed
- 100% UIL tested
- RoHS Compliant

General Description

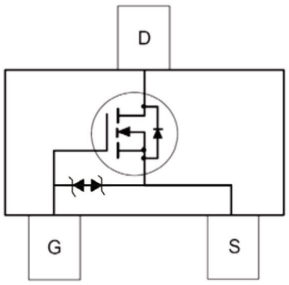
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for $r_{DS(on)}$, switching performance and ruggedness.

Applications

- Primary DC-DC Switch
- Load Switch



SuperSOT™-3



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted.

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		60	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	-Continuous	(Note 1a)	2.6	A
	-Pulsed	(Note 4)	24	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	6	mJ
P_D	Power Dissipation	(Note 1a)	1.5	W
	Power Dissipation	(Note 1b)	0.6	
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)	75	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	80	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
8650	FDN86501LZ	SSOT-3	7 ”	8 mm	3000 units

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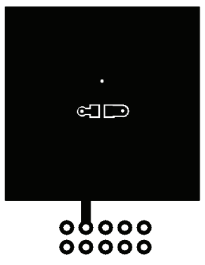
Electrical Characteristics T_J = 25 °C unless otherwise noted.

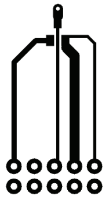
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		68		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.0	1.9	2.4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 2.6 A		89	116	mΩ
		V_{GS} = 4.5 V, I_D = 2.1 A		121	173	
		V_{GS} = 10 V, I_D = 2.6 A, T_J = 125 °C		152	198	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 2.6 A		8		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz		236	335	pF
C_{oss}	Output Capacitance			77	110	pF
C_{rss}	Reverse Transfer Capacitance			4.9	10	pF
R_g	Gate Resistance		0.1	0.8	2.0	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 2.6 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		4.4	10	ns
t_r	Rise Time			1.2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			9.6	20	ns
t_f	Fall Time			1.2	10	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 30 V, I_D = 2.6 A		3.8	5.4	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 4.5 V; V_{DD} = 30 V, I_D = 2.6 A		1.9	2.7	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 30 V, I_D = 2.6 A		0.7		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 30 V, I_D = 2.6 A		0.6		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.6 A (Note 2)		0.9	1.3	V
t_{rr}	Reverse Recovery Time	I_F = 2.6 A, di/dt = 100 A/μs		31	50	ns
Q_{rr}	Reverse Recovery Charge			19	31	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) 80 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 180 °C/W when mounted on a minimum pad.

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

3. E_{AS} of 6 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 2 A, V_{DD} = 60 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 9 A.

4. Pulsed Id please refer to Fig 11 SOA graph for more details.

Typical Characteristics T_J = 25 °C unless otherwise noted.

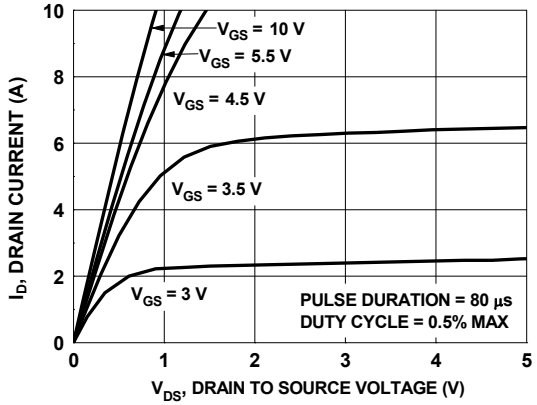


Figure 1. On Region Characteristics

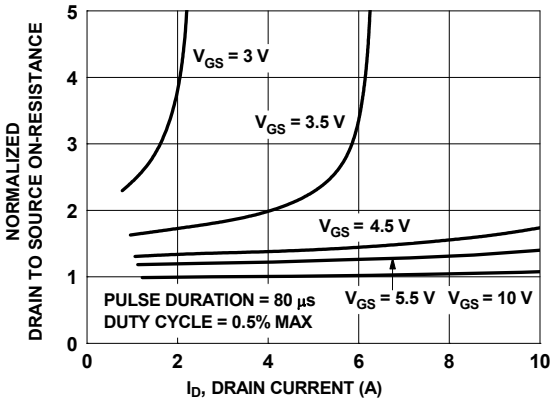


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

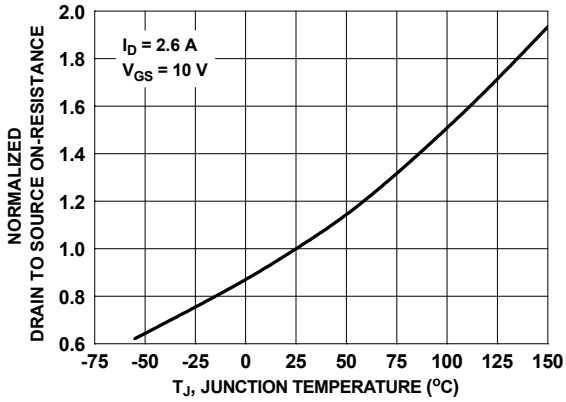


Figure 3. Normalized On Resistance vs. Junction Temperature

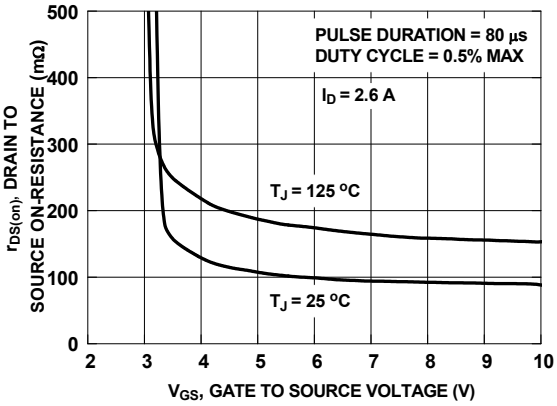


Figure 4. On-Resistance vs. Gate to Source Voltage

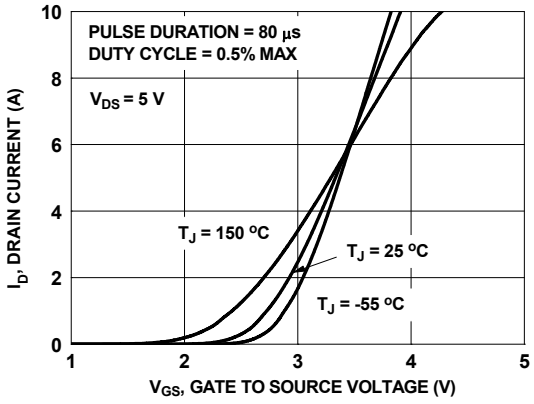


Figure 5. Transfer Characteristics

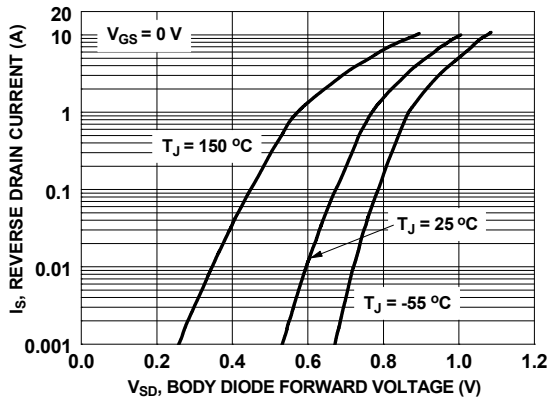


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

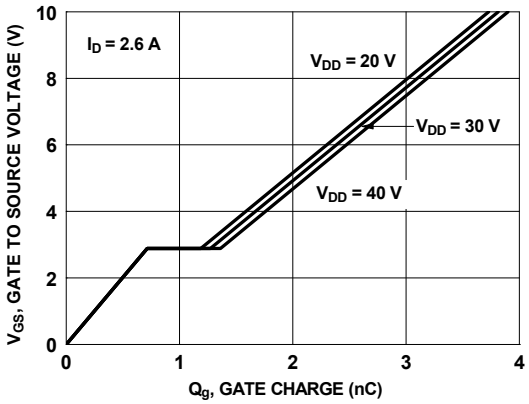


Figure 7. Gate Charge Characteristics

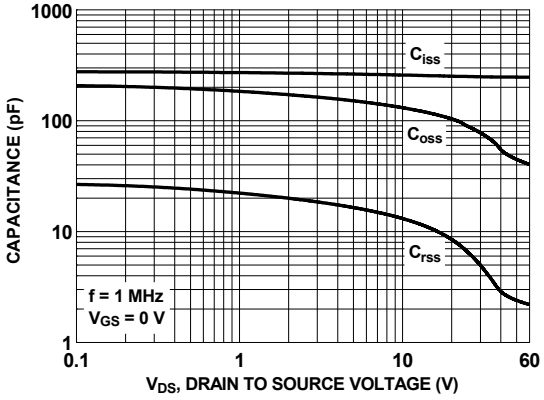


Figure 8. Capacitance vs. Drain to Source Voltage

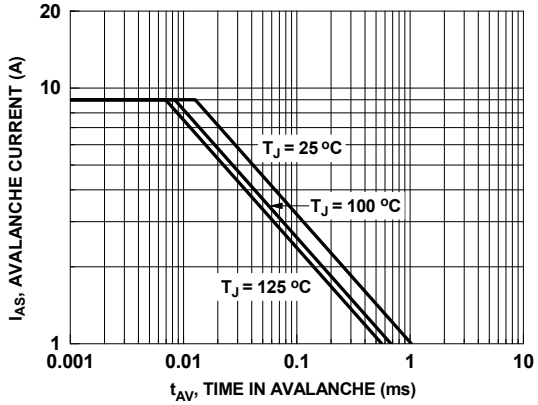


Figure 9. Unclamped Inductive Switching Capability

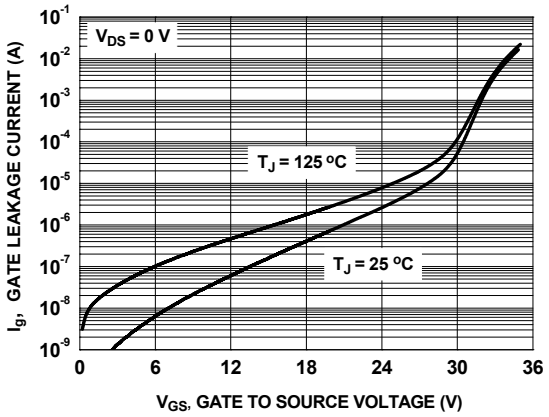


Figure 10. Gate Leakage Current vs. Gate to Source Voltage

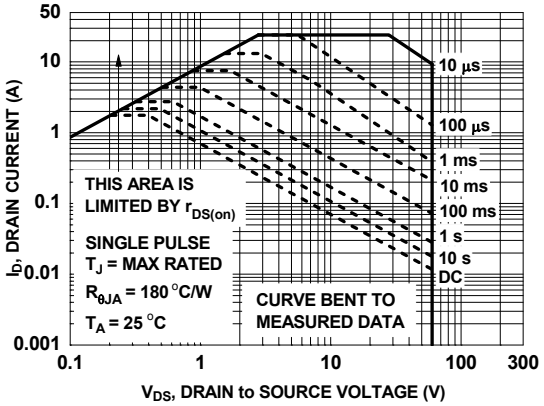


Figure 11. Forward Bias Safe Operating Area

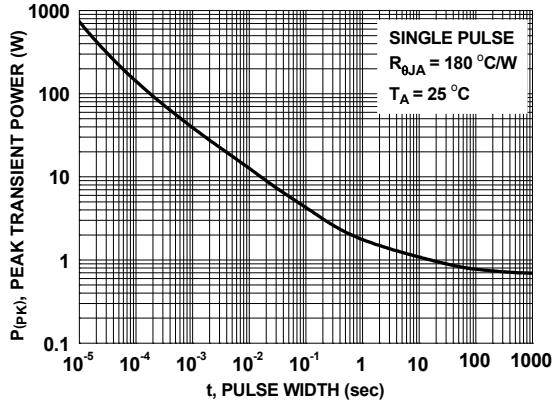


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

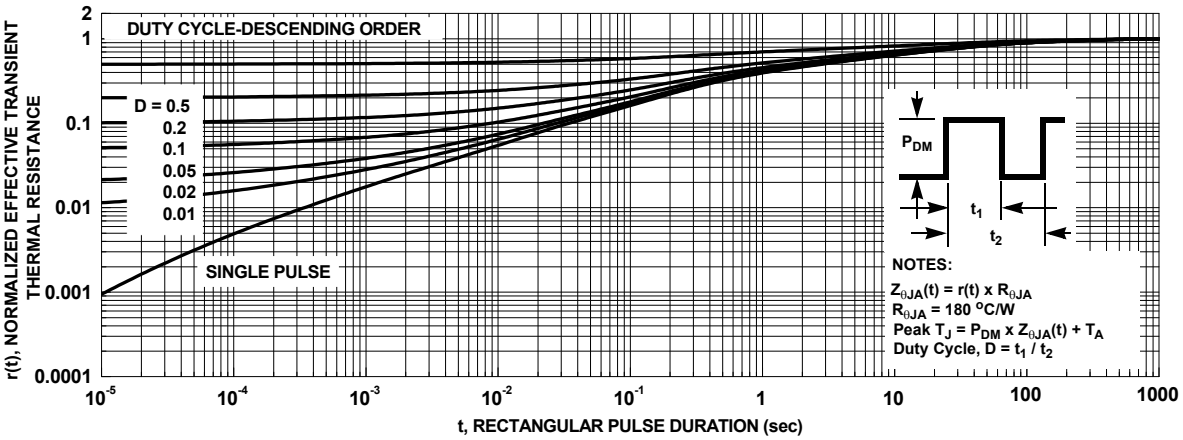
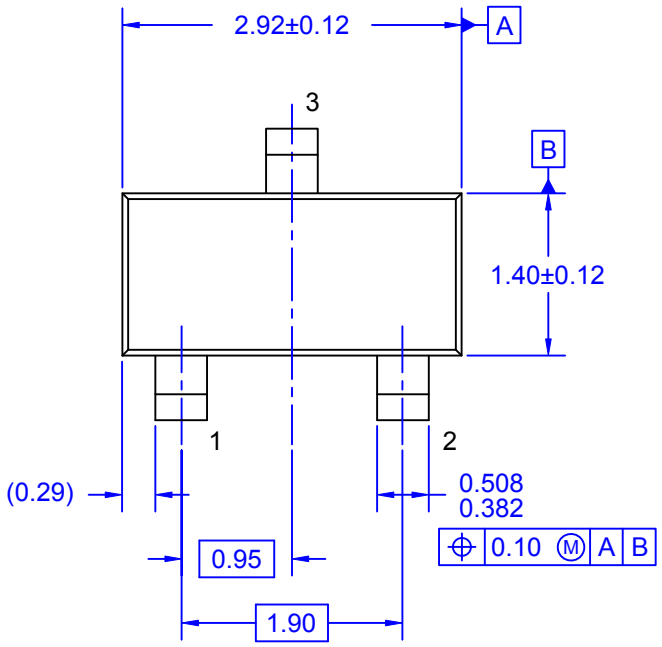
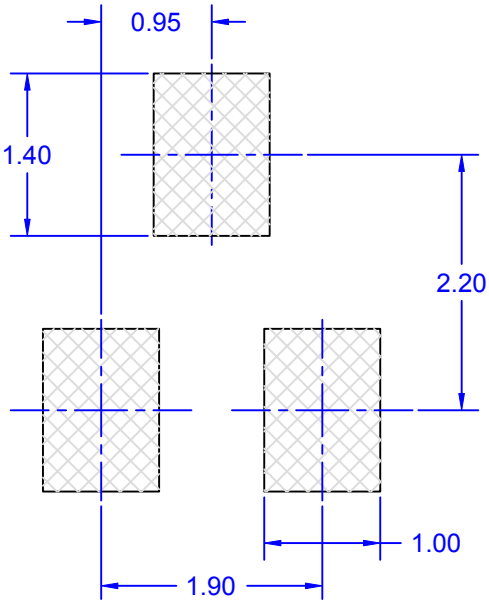
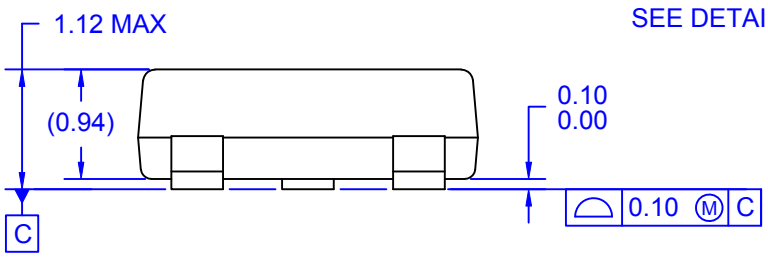


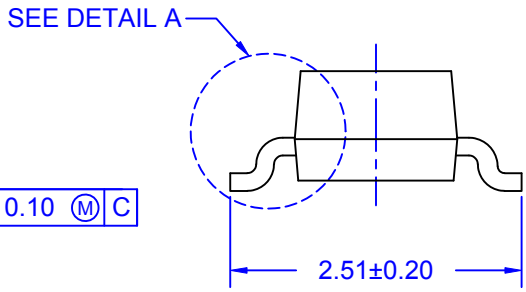
Figure 13. Junction-to-Ambient Transient Thermal Response Curve

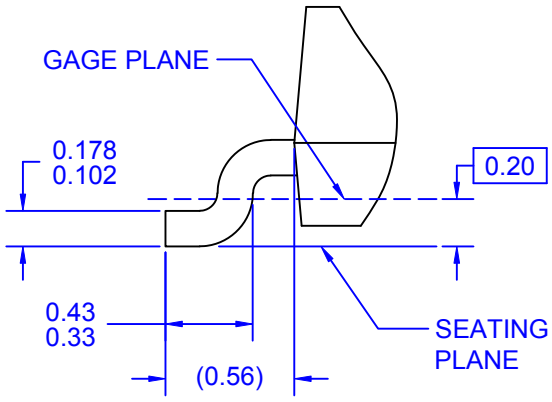




LAND PATTERN RECOMMENDATION







DETAIL A

SCALE: 50:1

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