January 2004

FDFC3N108

N-Channel 1.8V Specified PowerTrench® MOSFET with Schottky Diode

General Description

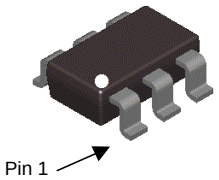
This N-Channel 1.8V specified MOSFET uses Fairchild's advanced low voltage PowerTrench process. It is combined with a low forward drop Schottky that is isolated from the MOSFET, providing a compact power solution for battery power management and DC/DC converter applications.

Applications

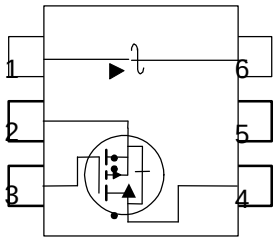
- Battery management/Charger Application
- DC/DC Conversion

Features

- 3 A, 20 V $R_{DS(ON)}$ = 70 mΩ @ V_{GS} = 4.5 V
  $R_{DS(ON)}$ = 95 mΩ @ V_{GS} = 2.5 V
- Low gate charge
- High performance trench technology for extremely low $R_{DS(ON)}$



SuperSOT™-6



MOSFET Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		20	V
V_{GSS}	Gate-Source Voltage		±12	V
I_D	Drain Current – Continuous	(Note 1a)	3	A
	– Pulsed		12	
P_D	Maximum Power Dissipation	(Note 1a)	0.96	W
		(Note 1b)	0.90	
		(Note 1c)	0.70	
T_J, T_{stg}	Operating and Storage Junction Temperature Range		–55 to +150	°C

Schottky Diode Maximum Ratings

V_{RRM}	Repetitive Peak reverse voltage	20	V
I_O	Average Forward Current	2.0	A

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	130	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	60	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.108	FDFC3N108	7''	8mm	3000 units

Electrical Characteristics

T_A = 25°C unless otherwise noted

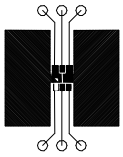
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		12		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V			1	µA
I_{GSS}	Gate–Body Leakage	V_{GS} = ±12 V, V_{DS} = 0 V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	0.5	0.9	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		–3		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 4.5 V, I_D = 3 A V_{GS} = 2.5 V, I_D = 2.5 A V_{GS} = 4.5 V, I_D = 3 A, T_J=125°C		56 73 78	70 95 106	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 4.5 V, V_{DS} = 5 V	12			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 3 A		10		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz		355		pF
C_{oss}	Output Capacitance			85		pF
C_{rss}	Reverse Transfer Capacitance			45		pF
R_G	Gate Resistance	V_{GS} = 15 mV, f = 1.0 MHz		2.0		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 10 V, I_D = 1 A, V_{GS} = 4.5 V, R_{GEN} = 6 Ω		6	12	ns
t_r	Turn–On Rise Time			7	14	ns
$t_{d(off)}$	Turn–Off Delay Time			20	36	ns
t_f	Turn–Off Fall Time			1	2	ns
Q_g	Total Gate Charge	V_{DS} = 10V, I_D = 3 A, V_{GS} = 4.5 V		3.5	4.9	nC
Q_{gs}	Gate–Source Charge			0.7		nC
Q_{gd}	Gate–Drain Charge			1.0		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				0.8	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.8 A (Note 2)			1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 3 A, d_{iF}/d_t = 100 A/µs		12		nS
Q_{rr}	Diode Reverse Recovery Charge			3		nC
Schottky Diode Characteristic						
I_R	Reverse Leakage	V_R = 20V, T_J = 25 °C			250	µA
		V_R = 20V, T_J = 100 °C			10	mA
V_F	Forward Voltage	I_F = 1A		363	425	mV
		I_F = 2A		449	550	

Electrical Characteristics

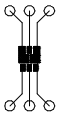
T_A = 25°C unless otherwise noted

Notes:

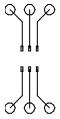
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 130 °C/W when mounted on a 0.125 in^2 pad of 2 oz. copper.



b) 140 °C/W when mounted on a .004 in^2 pad of 2 oz copper

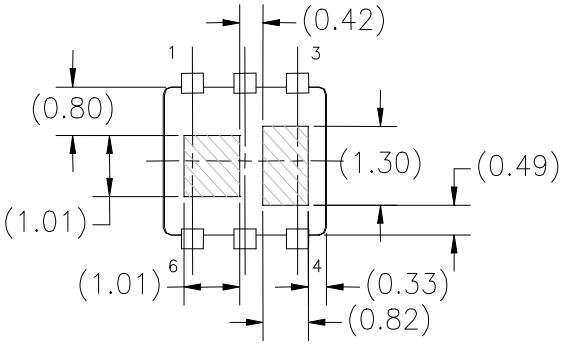


c) 180 C°/W when mounted on a minimum pad.

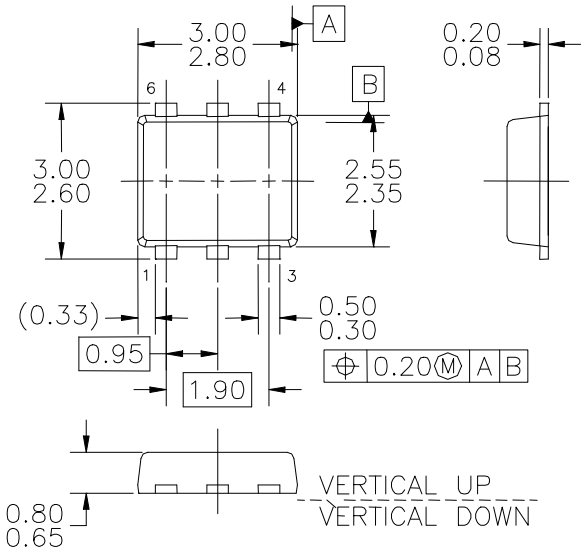
Scale 1 : 1 on letter size paper

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

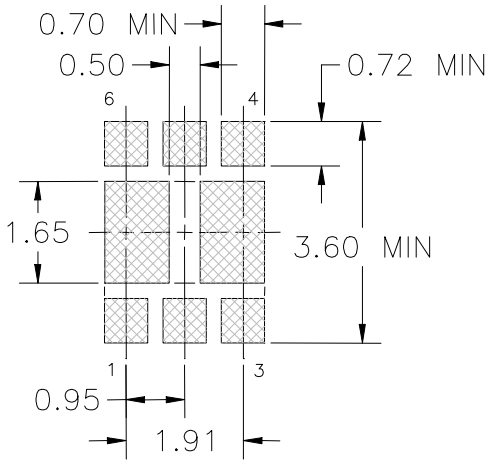
Dimensional Outline and Pad Layout



Bottom View



Top View



Recommended Landing Pattern

NOTES: UNLESS OTHERWISE SPECIFIED

ALL DIMENSIONS ARE IN MILLIMETERS.

Typical Characteristics

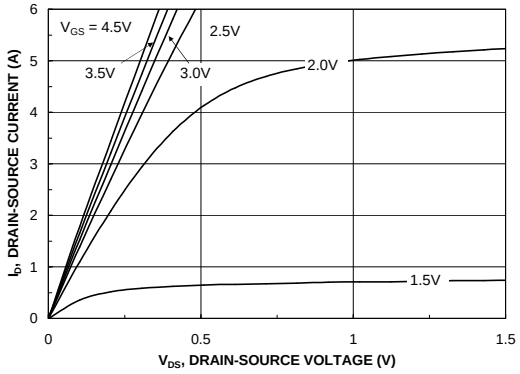


Figure 1. On-Region Characteristics.

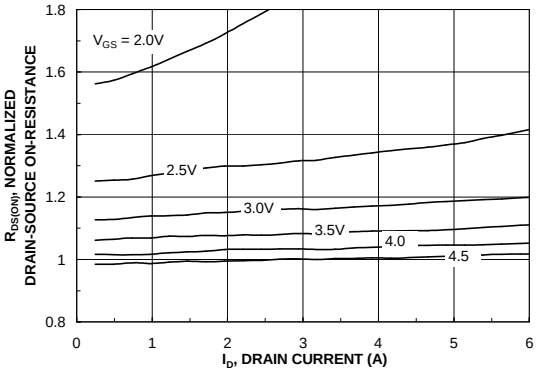


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

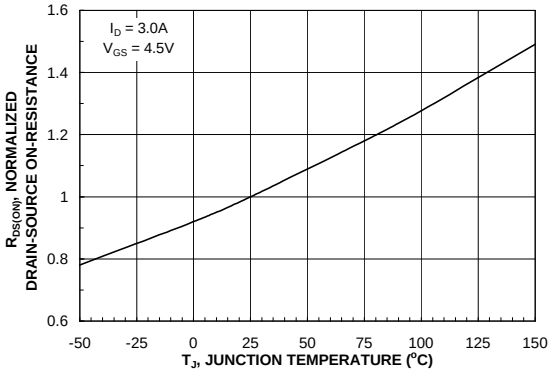


Figure 3. On-Resistance Variation with Temperature.

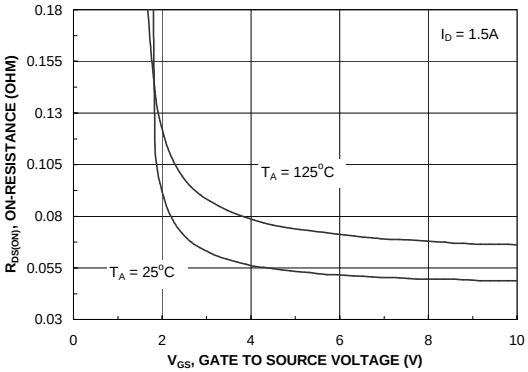


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

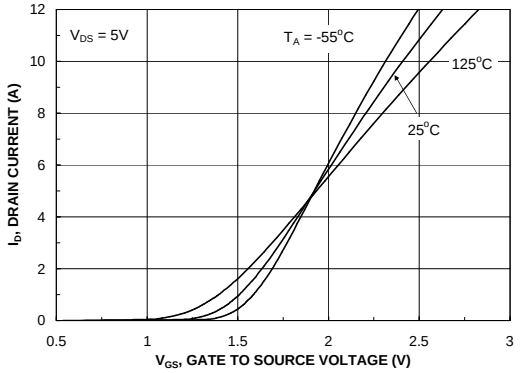


Figure 5. Transfer Characteristics.

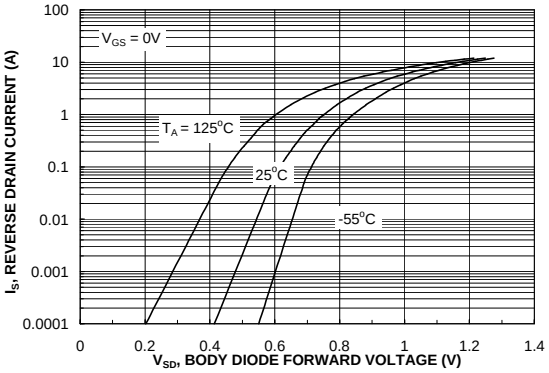


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

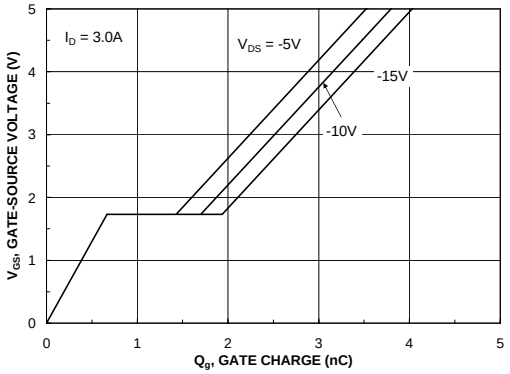


Figure 7. Gate Charge Characteristics.

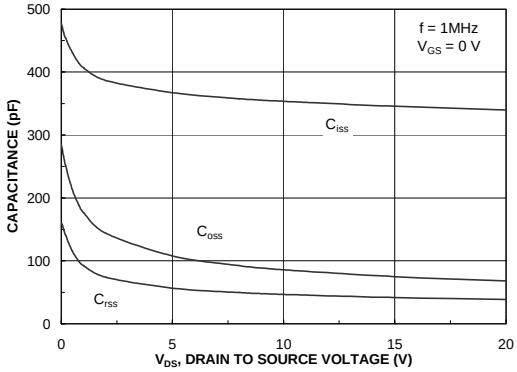


Figure 8. Capacitance Characteristics.

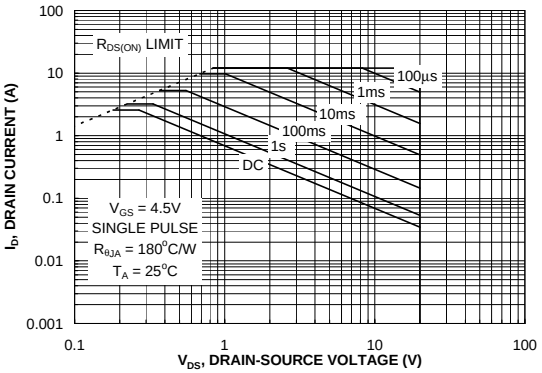


Figure 9. Schottky Diode Forward Voltage.

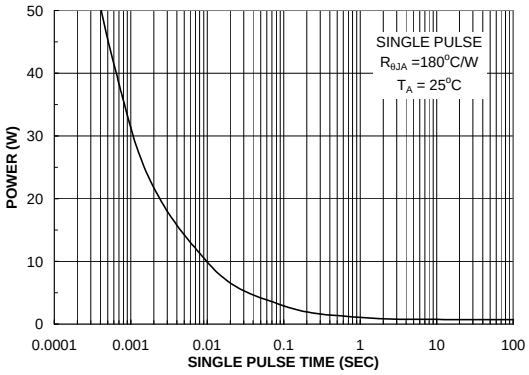


Figure 10. Schottky Diode Reverse Current.

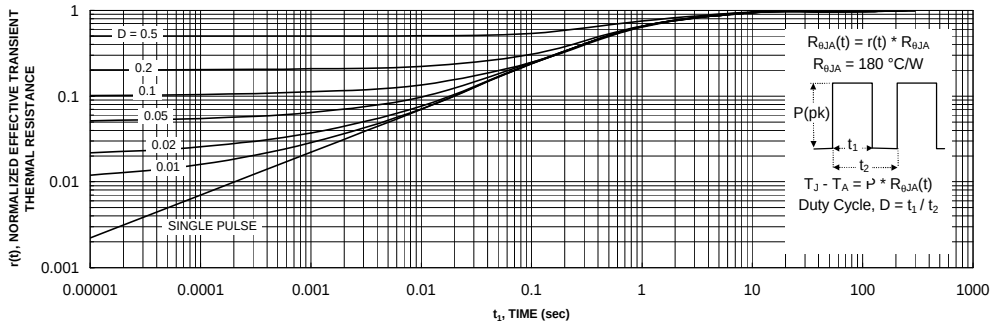


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b
Transient thermal response will change depending on the circuit board design.

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