

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.

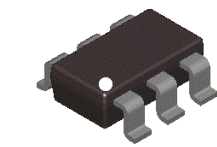
Applications

- Battery management/Charger Application
- DC/DC Conversion

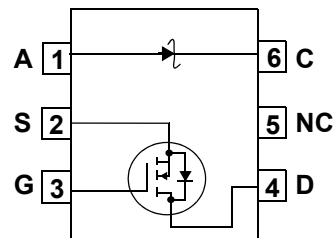


Features

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



Pin 1
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) – Pulsed | 3 | A |
| | | 12 | |
| P _D | Maximum Power Dissipation (Note 1a) (Note 1b) (Note 1c) | 0.96 | W |
| | | 0.90 | |
| | | 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 _{θJA} | Thermal Resistance, Junction-to-Ambient (Note 1a) | 130 | °C/W |
| R _{θJC} | 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

$T_A = 25^\circ\text{C}$ unless otherwise noted

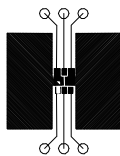
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|--|---------------------------|----------------|-----------------|----------------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain–Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 20 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, Referenced to 25°C | | 12 | | mV/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| I_{GSS} | Gate–Body Leakage | $V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$ | | | ± 100 | nA |
| On Characteristics (Note 2) | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 0.5 | 0.9 | 1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, Referenced to 25°C | | –3 | | mV/ $^\circ\text{C}$ |
| $R_{DS(on)}$ | Static Drain–Source On–Resistance | $V_{GS} = 4.5\text{ V}, I_D = 3\text{ A}$ $V_{GS} = 2.5\text{ V}, I_D = 2.5\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 3\text{ A}, T_J = 125^\circ\text{C}$ | | 56 73 78 | 70 95 106 | m Ω |
| $I_{D(on)}$ | On–State Drain Current | $V_{GS} = 4.5\text{ V}, V_{DS} = 5\text{ V}$ | 12 | | | A |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{ V}, I_D = 3\text{ A}$ | | 10 | | S |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ | | 355 | | pF |
| C_{oss} | Output Capacitance | | | 85 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 45 | | pF |
| R_G | Gate Resistance | $V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$ | | 2.0 | | Ω |
| Switching Characteristics (Note 2) | | | | | | |
| $t_{d(on)}$ | Turn–On Delay Time | $V_{DD} = 10\text{ V}, I_D = 1\text{ A}, V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$ | | 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 | $V_{DS} = 10\text{ V}, I_D = 3\text{ A}, V_{GS} = 4.5\text{ V}$ | | 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 | $V_{GS} = 0\text{ V}, I_S = 0.8\text{ A}$ (Note 2) | | | 1.2 | V |
| t_{rr} | Diode Reverse Recovery Time | $I_F = 3\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ | | 12 | | nS |
| Q_{rr} | Diode Reverse Recovery Charge | | | 3 | | nC |
| Schottky Diode Characteristic | | | | | | |
| I_R | Reverse Leakage | $V_R = 20\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 250 | μA |
| | | | $T_J = 100^\circ\text{C}$ | | 10 | mA |
| V_F | Forward Voltage | $I_F = 1\text{ A}$ | | 363 | 425 | mV |
| | | | $I_F = 2\text{ A}$ | 449 | 550 | |

Electrical Characteristics

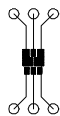
$T_A = 25^\circ\text{C}$ unless otherwise noted

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) 130 °C/W when mounted on a 0.125 in² pad of 2 oz. copper.



- b) 140 °C/W when mounted on a .004 in² pad of 2 oz copper



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

Scale 1 : 1 on letter size paper

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

Typical Characteristics

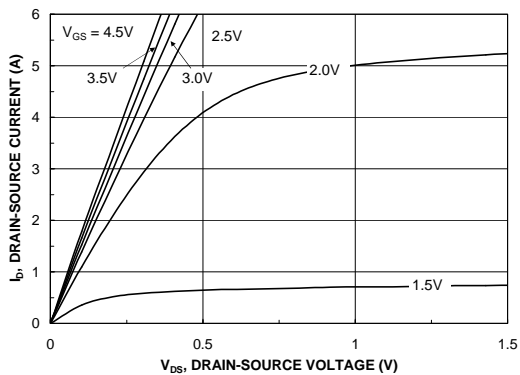


Figure 1. On-Region Characteristics.

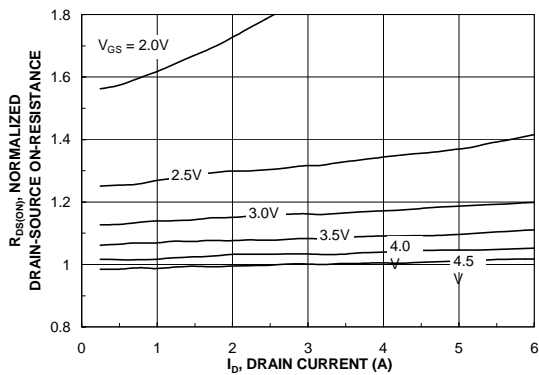


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

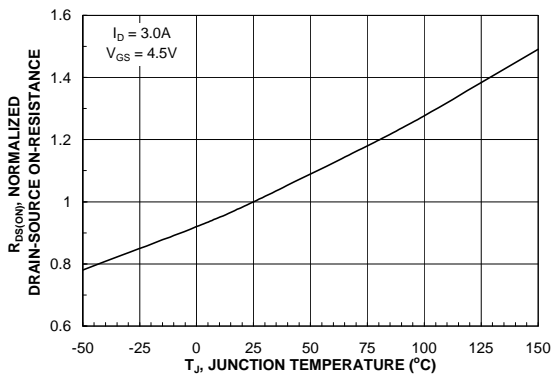


Figure 3. On-Resistance Variation with Temperature.

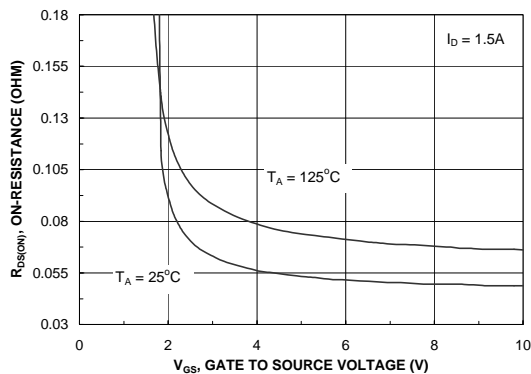


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

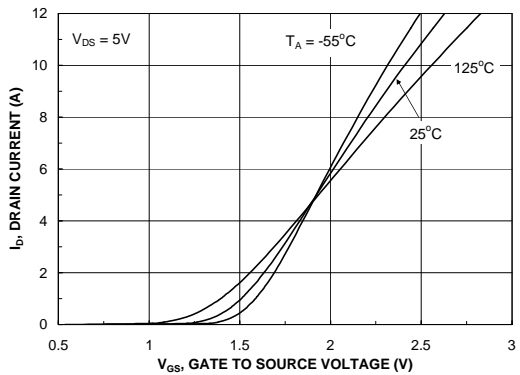


Figure 5. Transfer Characteristics.

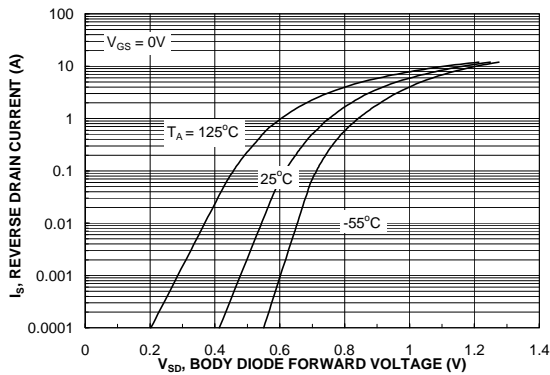


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

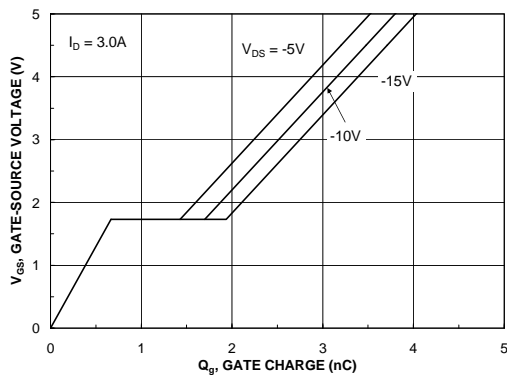


Figure 7. Gate Charge Characteristics.

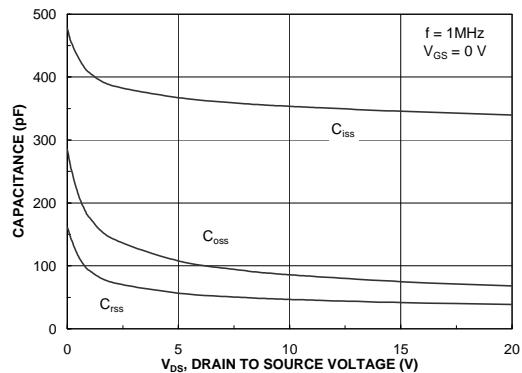


Figure 8. Capacitance Characteristics.

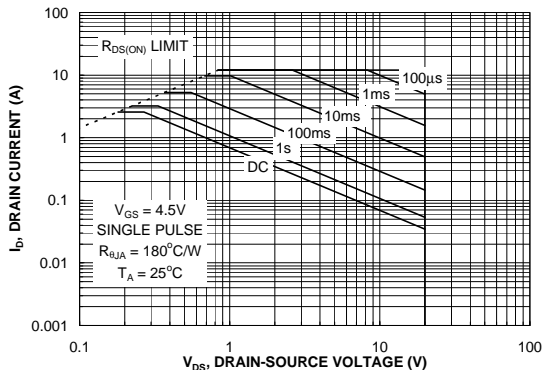


Figure 9. Schottky Diode Forward Voltage.

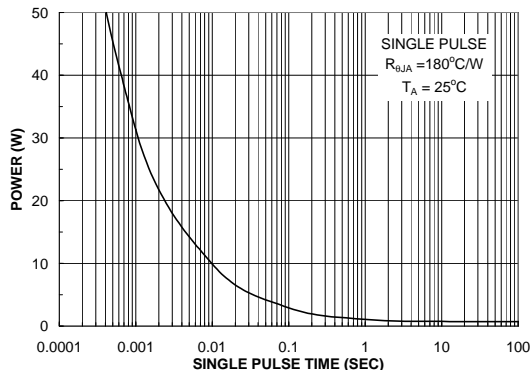


Figure 10. Schottky Diode Reverse Current.

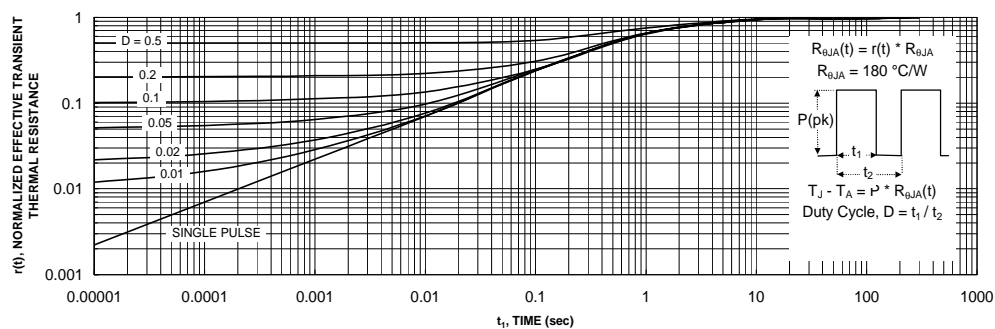


Figure 11. Transient Thermal Response Curve.

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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