



THE DATASHEET OF FDFS6N303



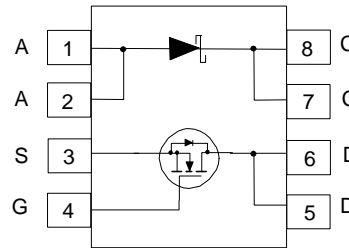
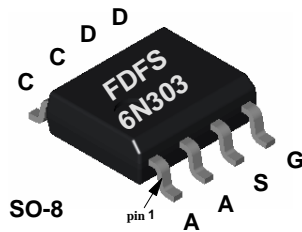
FDFS6N303 N-Channel MOSFET with Schottky Diode

General Description

The FDFS6N303 incorporates a high cell density MOSFET and low forward drop (0.35V) Schottky diode into a single surface mount power package. The MOSFET and Schottky diode are isolated inside the package. The general purpose pinout has been chosen to maximize flexibility and ease of use. This product is particularly suited for switching applications such as DC/DC buck, boost, synchronous, and non-synchronous converters where the MOSFET is driven as low as 4.5V and fast switching, high efficiency and small PCB footprint is desirable.

Features

- 6 A, 30 V. $R_{DS(ON)} = 0.035 \Omega @ V_{GS} = 10 \text{ V}$.
 $R_{DS(ON)} = 0.055 \Omega @ V_{GS} = 4.5 \text{ V}$.
- $V_F < 0.28 \text{ V @ } 0.1 \text{ A}$
 $V_F < 0.42 \text{ V @ } 3 \text{ A}$
 $V_F < 0.50 \text{ V @ } 6 \text{ A}$.
- Schottky and MOSFET incorporated into single power surface mount SO-8 package.
- General purpose pinout for design flexibility.
- Ideal for DC/DC converter applications.



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

| Symbol | Parameter | FDFS6N303 | Units |
|----------------|--|------------|------------------|
| V_{DSS} | Drain-Source Voltage | 30 | V |
| V_{GSS} | Gate-Source Voltage | ± 20 | V |
| I_D | Drain Current - Continuous (Note 1a) | 6 | A |
| | - Pulsed | 30 | |
| P_D | Power Dissipation for Dual Operation | 2 | W |
| | Power Dissipation for Single Operation (Note 1a) | 1.6 | |
| | (Note 1c) | 0.9 | |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |

Schottky Diode Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | FDFS6N303 | Units |
|-----------|-----------------------------------|-----------|-------|
| V_{RRM} | Repetitive Peak Reverse Voltage | 30 | V |
| I_O | Average Forward Current (Note 1a) | 2 | A |

Electrical Characteristics (T_A = 25 °C unless otherwise noted)

MOSFET ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---------------------|-----------------------------------|--|-----|-------|-------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} = 0 V, I _D = 250 μA | 30 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 24 V, V _{GS} = 0 V | | | 1 | μA |
| | | T _J = 125°C | | | 20 | μA |
| I _{GSSF} | Gate - Body Leakage, Forward | V _{GS} = 20 V, V _{DS} = 0 V | | | 100 | nA |
| I _{GSSR} | Gate - Body Leakage, Reverse | V _{GS} = -20 V, V _{DS} = 0 V | | | -100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 250 μA | 1 | 1.7 | 3 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 10 V, I _D = 6 A | | 0.025 | 0.035 | Ω |
| | | V _{GS} = 4.5 V, I _D = 4.8 A | | 0.043 | 0.055 | |
| g _{FS} | Forward Transconductance | V _{DS} = 10 V, I _D = 6 A | | 12 | | S |
| I _{D(on)} | On-State Drain Current | V _{GS} = 10 V, V _{DS} = 5 V | 15 | | | A |
| C _{iss} | Input Capacitance | V _{DS} = 15 V, V _{GS} = 0 V, | | 350 | | pF |
| C _{oss} | Output Capacitance | f = 1.0 MHz | | 220 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 80 | | pF |
| Q _g | Total Gate Charge | V _{DS} = 15 V, I _D = 6 A, V _{GS} = 10 V | | 12 | 17 | nC |
| t _{D(on)} | Turn - On Delay Time | V _{DD} = 10 V, I _D = 1 A, | | 7.5 | 15 | ns |
| t _r | Turn - On Rise Time | V _{GS} = 4.5 V, R _{GEN} = 6 Ω | | 12 | 25 | ns |
| t _{D(off)} | Turn - Off Delay Time | | | 13 | 25 | ns |
| t _f | Turn - Off Fall Time | | | 6 | 15 | ns |

MOSFET DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

| | | | | | | |
|-----------------|---|--|--|-----|-----|---|
| I _S | Maximum Continuous Drain-Source Diode Forward Current | | | | 1.3 | A |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0 V, I _S = 1.3 A (Note 2) | | 0.8 | 1.2 | V |

SCHOTTKY DIODE CHARACTERISTICS

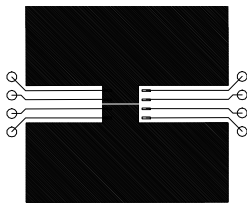
| | | | | | | |
|----------------|---------------------------|------------------------|----|--|-----|----|
| B _V | Reverse Breakdown Voltage | I _R = 1 mA | 30 | | | V |
| I _R | Reverse Leakage | V _R = 30 V | | | 0.5 | mA |
| V _F | Forward Voltage | I _F = 0.1 A | | | 280 | mV |
| | | I _F = 3 A | | | 420 | |
| | | I _F = 6 A | | | 500 | |

THERMAL CHARACTERISTICS

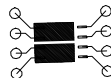
| | | | | | | |
|------------------|---|-----------|--|----|--|------|
| R _{θJA} | Thermal Resistance, Junction-to-Ambient | (Note 1a) | | 78 | | °C/W |
| R _{θJC} | Thermal Resistance, Junction-to-Case | (Note 1) | | 40 | | °C/W |

Notes:

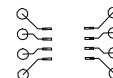
- R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design.



a. 78°C/W on a 0.5 in² pad of 2oz copper.



b. 125°C/W on a 0.02 in² pad of 2oz copper.



c. 135°C/W on a 0.003 in² pad of 2oz copper.

- Scale 1 : 1 on letter size paper
 2. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.

Typical Electrical Characteristics

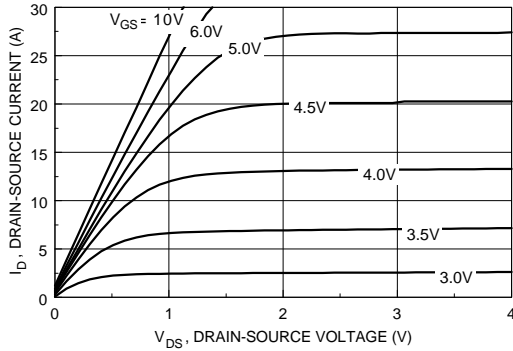


Figure 1. On-Region Characteristics.

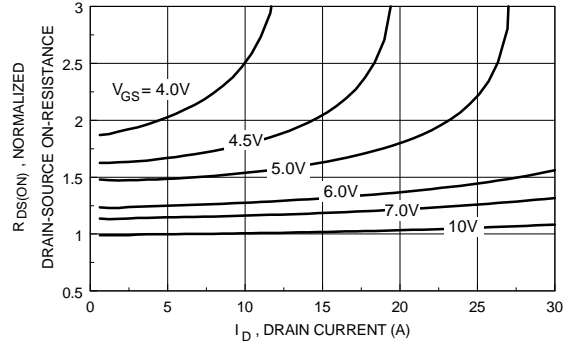


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

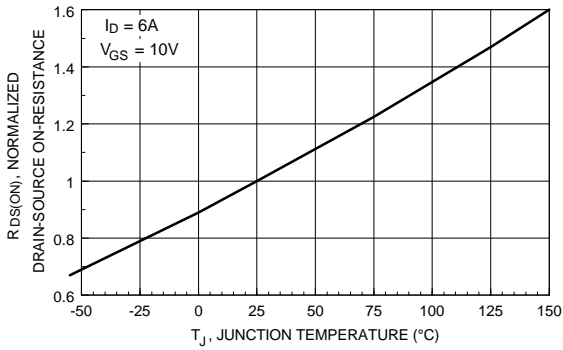


Figure 3. On-Resistance Variation with Temperature.

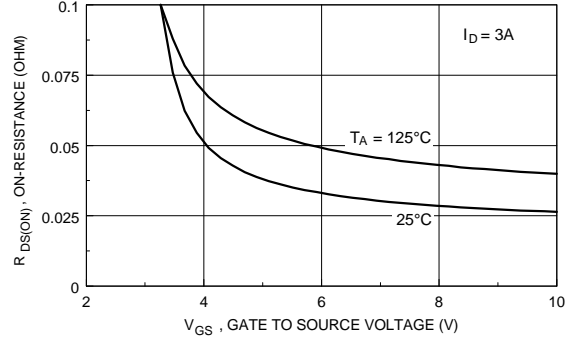


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

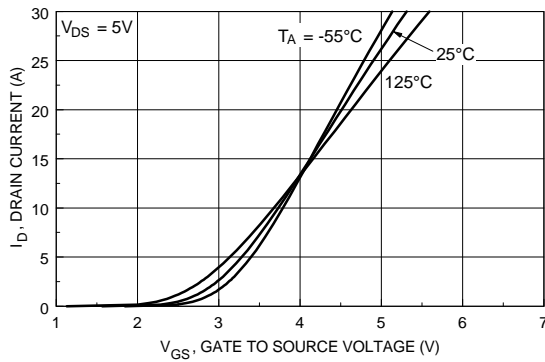


Figure 5. Transfer Characteristics.

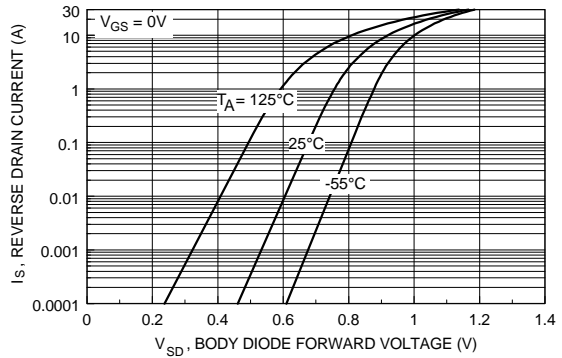


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Fet And Schottky Electrical Characteristics

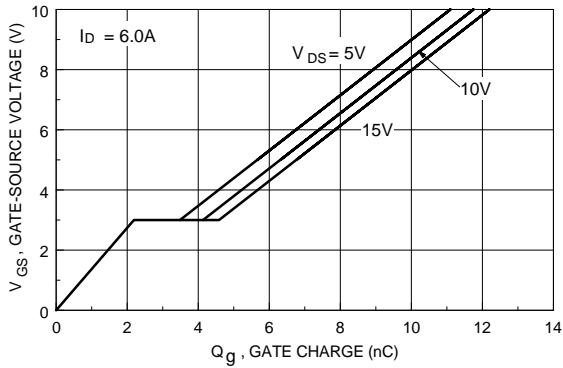


Figure 7. Gate Charge Characteristics.

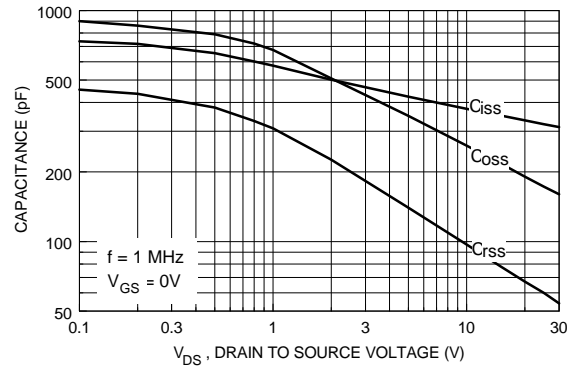


Figure 8. Capacitance Characteristics.

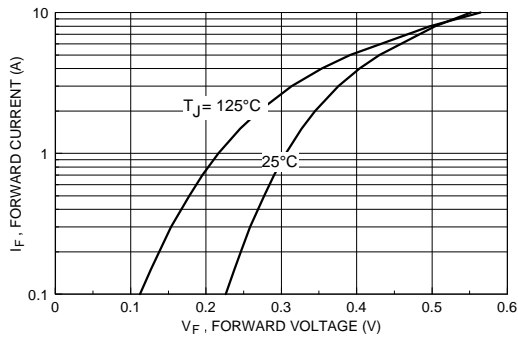


Figure 9. Schottky Diode Forward Voltage.

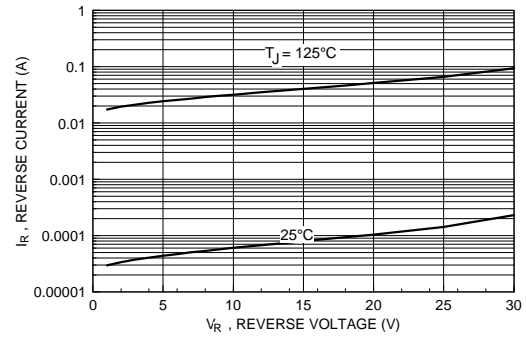


Figure 10. Schottky Diode Reverse Current.

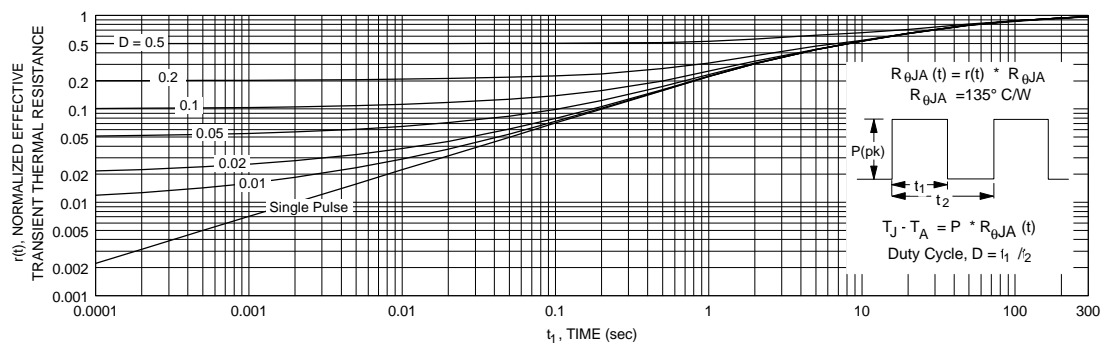


Figure 11. Transient Thermal Response Curve.

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

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