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November 2013

FDB44N25

N-Channel UniFETTM MOSFET 250 V, 44 A, 69 m Ω

Features

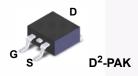
- $R_{DS(on)}$ = 69 m Ω (Max.) @ V_{GS} = 10 V, I_D = 22 A
- Low Gate Charge (Typ. 47 nC)
- Low C_{rss} (Typ. 60 pF)
- 100% Avalanche Tested

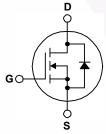
Applications

- PDP TV
- · Lighting
- · Uninterruptible Power Supply
- · AC-DC Power Supply

Description

UniFETTM MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.





Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

| Symbol | Parameter | | | FDB44N25 | Unit |
|----------------------------------|--|---|-------------------|-------------|--------|
| V _{DSS} | Drain-Source Voltage | | | 250 | V |
| I _D | Drain Current | - Continuous (T _C = 25°C) - Continuous (T _C = 100°C) | | 44 26.4 | A A |
| I _{DM} | Drain Current | - Pulsed | - Pulsed (Note 1) | | Α |
| V _{GSS} | Gate-Source voltage | | | ±30 | V |
| E _{AS} | Single Pulsed Avalanche Energy | | (Note 2) | 2055 | mJ |
| I _{AR} | Avalanche Current | | (Note 1) | 44 | Α |
| E _{AR} | Repetitive Avalanche Energy | | (Note 1) | 30.7 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (No | | (Note 3) | 4.5 | V/ns |
| P_{D} | Power Dissipation | (T _C = 25°C) - Derate Above 25°C | | 307 2.45 | W/°C |
| T _{J,} T _{STG} | Operating and Storage Temperature Range | | | -55 to +150 | °C |
| TL | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds | | | 300 | °C |

Thermal Characteristics

| Symbol | Parameter | FDB44N25 | Unit |
|-----------------|---|----------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max. | 0.41 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (1 in ² Pad of 2-oz Copepr), Max. 40 | | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambien (Minimum Pad of 2-oz Copper), Max. | 62.5 | |

Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|----------|---------------------|----------------|-----------|------------|-----------|
| FDB44N25TM | FDB44N25 | D ² -PAK | Tape and Reel | 330 mm | 24 mm | 800 units |

Electrical Characteristics $T_C = 25^{\circ}C$ unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Тур. | Max | Unit |
|---|---|---|------|-------|---------|----------|
| Off Charac | Off Characteristics | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} = 0 V, I _D = 250 μA | 250 | | | V |
| ΔBV _{DSS} / ΔT _J | Breakdown Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C | | 0.25 | | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 250 V, V _{GS} = 0 V V _{DS} = 200 V, T _C = 125°C | | | 1 10 | μA μA |
| I _{GSSF} | Gate-Body Leakage Current, Forward | V _{GS} = 30 V, V _{DS} = 0 V | | | 100 | nA |
| I _{GSSR} | Gate-Body Leakage Current, Reverse | V _{GS} = -30 V, V _{DS} = 0 V | | | -100 | nA |
| On Charac | teristics | | | | | |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 250 μA | 3.0 | | 5.0 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 10 V, I _D = 22 A | | 0.058 | 0.069 | Ω |
| 9 _{FS} | Forward Transconductance | V _{DS} = 40 V, I _D = 22 A | | 32 | | S |
| Dynamic C | : haracteristics | | | | | |
| C _{iss} | Input Capacitance | V _{DS} = 25 V, V _{GS} = 0 V, | | 2210 | 2870 | pF |
| C _{oss} | Output Capacitance | f = 1 MHz | | 450 | 585 | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 60 | 90 | pF |
| Switching | Characteristics | | | | | |
| t _{d(on)} | Turn-On Delay Time | V _{DD} = 125 V, I _D = 44 A, | | 55 | 120 | ns |
| t _r | Turn-On Rise Time | $V_{GS} = 10 \text{ V}, R_G = 25 \Omega$ | | 400 | 810 | ns |
| t _{d(off)} | Turn-Off Delay Time | | | 85 | 180 | ns |
| t _f | Turn-Off Fall Time | (Note 4) | | 115 | 240 | ns |
| Q_g | Total Gate Charge | V _{DS} = 200 V, I _D = 44 A, | / | 47 | 61 | nC |
| Q _{gs} | Gate-Source Charge | V _{GS} = 10 V | | 18 | | nC |
| Q_{gd} | Gate-Drain Charge | (Note 4) | / | 24 | | nC |
| Drain-Sour | ce Diode Characteristics and Maximur | n Ratings | | | | |
| I _S | Maximum Continuous Drain-Source Diode Forward Current | | | | 44 | Α |
| I _{SM} | Maximum Pulsed Drain-Source Diode Forward Current | | | | 176 | Α |
| V_{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0 V, I _S = 44 A | | | 1.4 | V |
| t _{rr} | Reverse Recovery Time | V _{GS} = 0 V, I _S = 44 A, | - | 195 | | ns |
| Q _{rr} | Reverse Recovery Charge | dl _F /dt =100 A/μs | | 1.8 | | μС |

Notes:

 $^{{\}it 1. Repetitive\ rating: pulse-width\ limited\ by\ maximum\ junction\ temperature.}$

^{2.} L = 1.7 mH, I_{AS} = 44 A, V_{DD} = 50 V, R_{G} = 25 Ω , starting T_{J} = 25°C.

^{3.} $I_{SD} \le 44$ A, di/dt ≤ 200 A/ μ s, $V_{DD} \le BV_{DSS}$, starting T_J = 25°C.

^{4.} Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

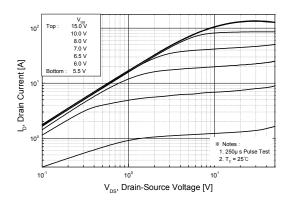


Figure 2. Transfer Characteristics

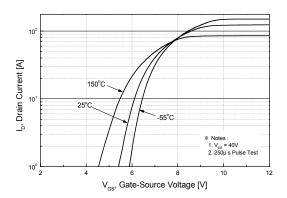
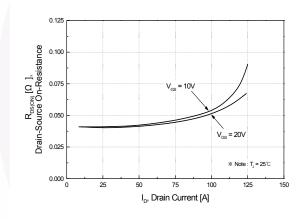


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue



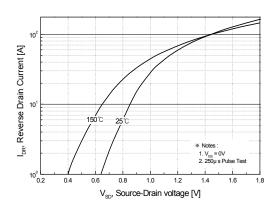


Figure 5. Capacitance Characteristics

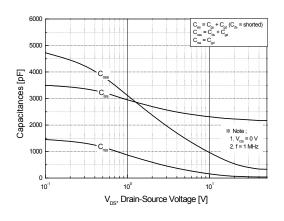
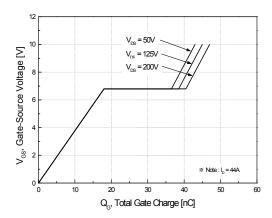


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

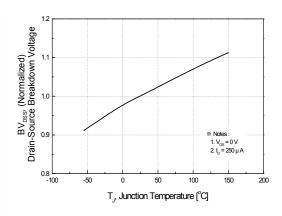


Figure 8. On-Resistance Variation vs. Temperature

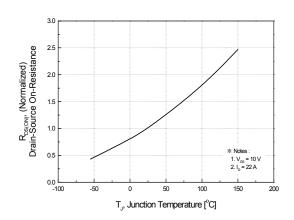


Figure 9. Maximum Safe Operating Area

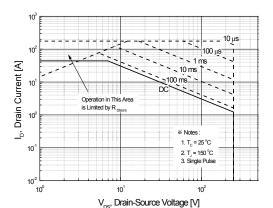


Figure 10. Maximum Drain Current vs. Case Temperature

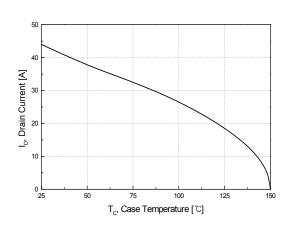
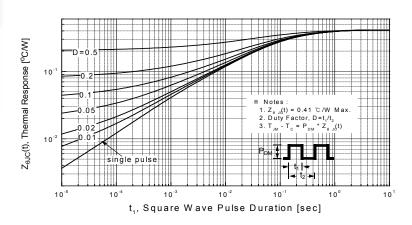


Figure 11. Transient Thermal Response Curve



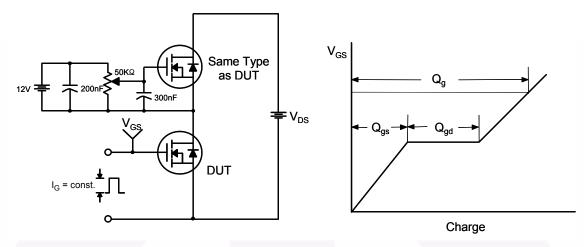


Figure 12. Gate Charge Test Circuit & Waveform

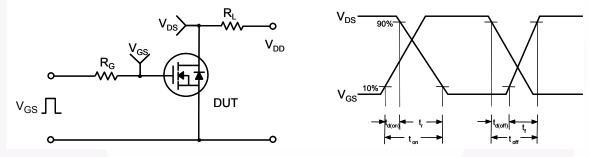


Figure 13. Resistive Switching Test Circuit & Waveforms

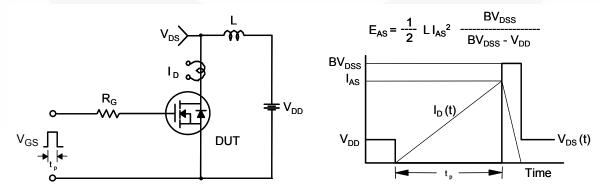


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

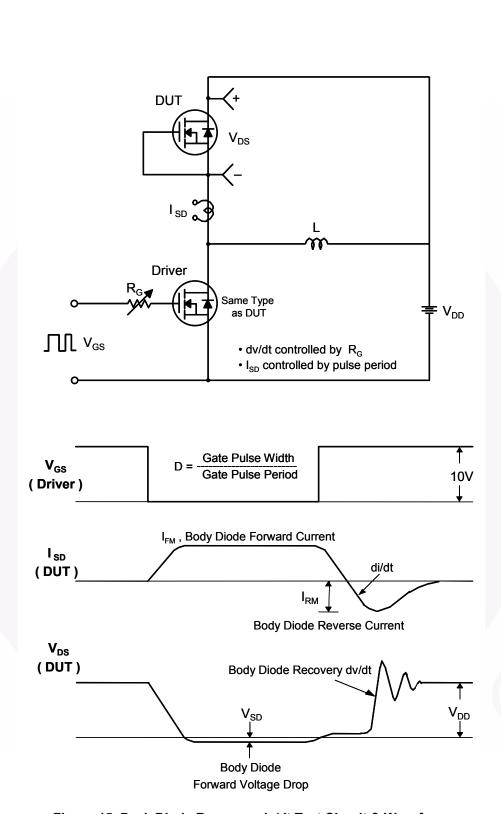


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

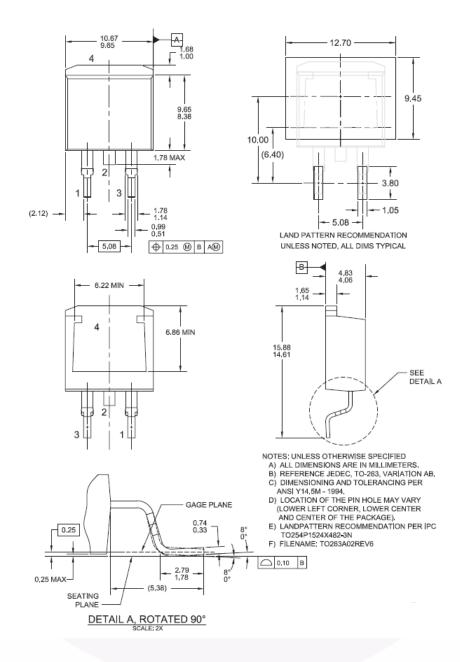


Figure 16. TO263 (D²PAK), Molded, 2-Lead, Surface Mount

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