FAIRCHILD SEMICONDUCTOR®

January 2012

# FDMA7632

## Single N-Channel PowerTrench® MOSFET

### 30 V, 9 A, 19 mΩ

## Features

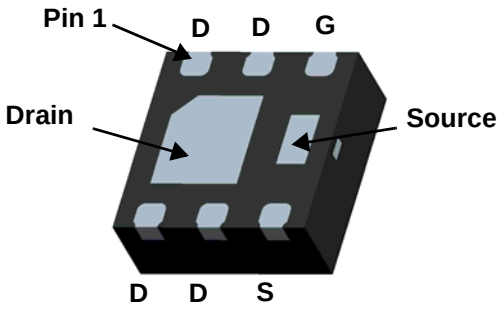
- Max $r_{DS(on)}$ = 19 mΩ at $V_{GS}$ = 10 V, $I_D$ = 9 A
- Max $r_{DS(on)}$ = 30 mΩ at $V_{GS}$ = 4.5 V, $I_D$ = 7 A
- Low Profile - 0.8 mm maximum - in the new package MicroFET 2x2 mm
- Free from halogenated compounds and antimony oxides
- RoHS compliant

## General Description

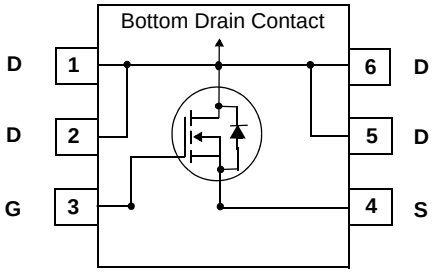
This device has been designed to provide maximum efficiency and thermal performance for synchronous buck converters. The low $r_{DS(on)}$ and gate charge provide excellent switching performance.

## Application

- DC – DC Buck Converters




MicroFET 2X2 (Bottom View)




## MOSFET Maximum Ratings $T_A$ = 25 °C unless otherwise noted

| Symbol | Parameter | | | Ratings | Units |
|---|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | | | 30 | V |
| $V_{GSS}$ | Gate to Source Voltage | | | ±20 | V |
| $I_D$ | Drain Current -Continuous | $T_A$ = 25 °C | (Note 1a) | 9 | A |
| | -Pulsed | | | 24 | |
| $P_D$ | Power Dissipation | $T_A$ = 25 °C | (Note 1a) | 2.4 | W |
| | Power Dissipation | $T_A$ = 25 °C | (Note 1b) | 0.9 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | | –55 to +150 | °C |

### Thermal Characteristics

| | | | | |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 52 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1b) | 145 | |

### Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| 632 | FDMA7632 | MicroFET 2x2 | 7 ” | 12 mm | 3000 units |

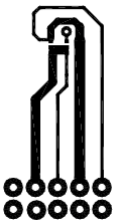
## Electrical Characteristics $T_J$ = 25 °C unless otherwise noted

| 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 | 30 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25 °C | | 16 | | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V | | | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | | | 100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | 1.0 | 2.1 | 3.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25 °C | | –6 | | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 9 A | | 14 | 19 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 7 A | | 20 | 30 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 9 A, $T_J$ = 125 °C | | 19 | 25 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 9 A | | 35 | | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1.0 MHz | | 570 | 760 | pF |
| $C_{oss}$ | Output Capacitance | | | 195 | 260 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 25 | 40 | pF |
| $R_g$ | Gate Resistance | | | 1.5 | | Ω |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 15 V, $I_D$ = 9 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | | 6 | 12 | ns |
| $t_r$ | Rise Time | | | 2 | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 14 | 25 | ns |
| $t_f$ | Fall Time | | | 2 | 10 | ns |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 10 V, $V_{DD}$ = 15 V, $I_D$ = 9 A | | 9.3 | 13 | nC |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 4.5 V, $V_{DD}$ = 15 V, $I_D$ = 9 A | | 4.4 | 6 | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | $V_{DD}$ = 15 V, $I_D$ = 9 A | | 1.9 | | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | $V_{DD}$ = 15 V, $I_D$ = 9 A | | 1.5 | | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | | | 2 | A |
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 2 A (Note 2) | | 0.8 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 9 A, di/dt = 100 A/μs | | 18 | 32 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 5 | 10 | nC |

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 $in^2$ pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

a. 52 °C/W when mounted on a 1 $in^2$ pad of 2 oz copper.



b. 145 °C/W when mounted on a minimum pad of 2 oz copper.

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

## Typical Characteristics $T_J$ = 25°C unless otherwise noted

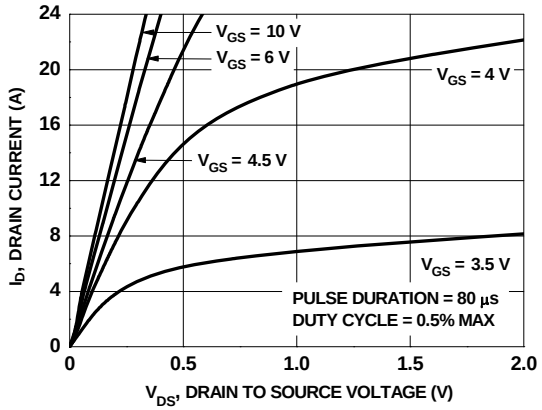



**Figure 1. On-Region Characteristics**

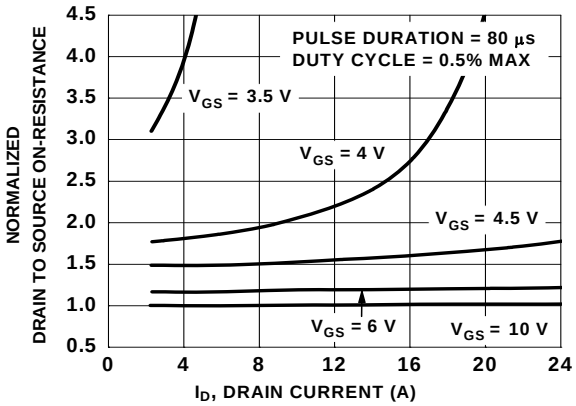



**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**

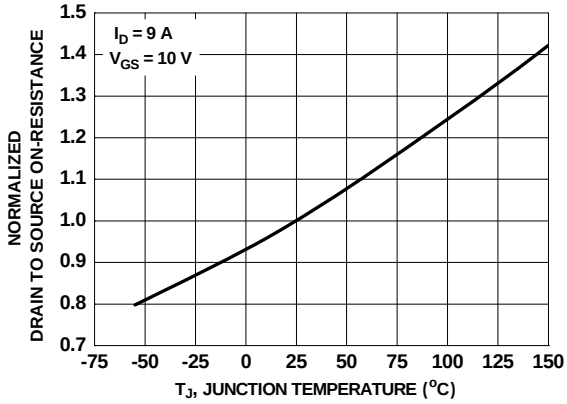



**Figure 3. Normalized On-Resistance vs Junction Temperature**

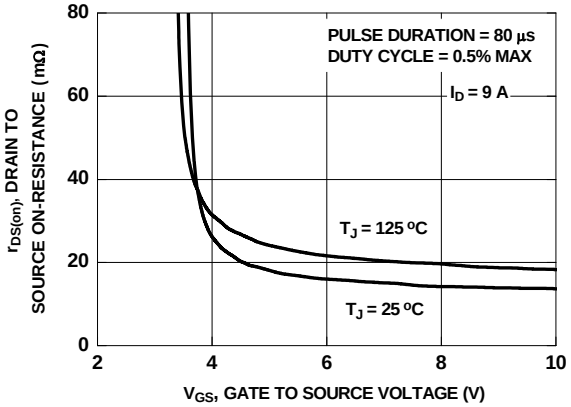



**Figure 4. On-Resistance vs Gate to Source Voltage**

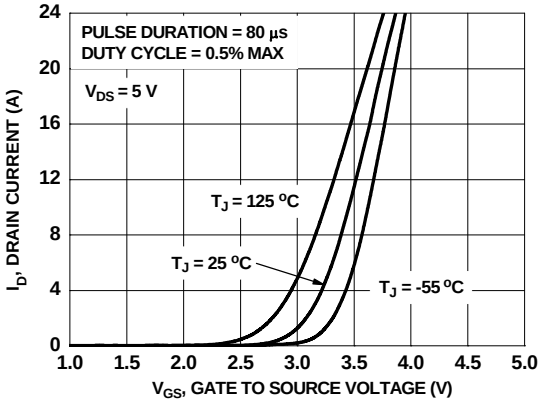



**Figure 5. Transfer Characteristics**

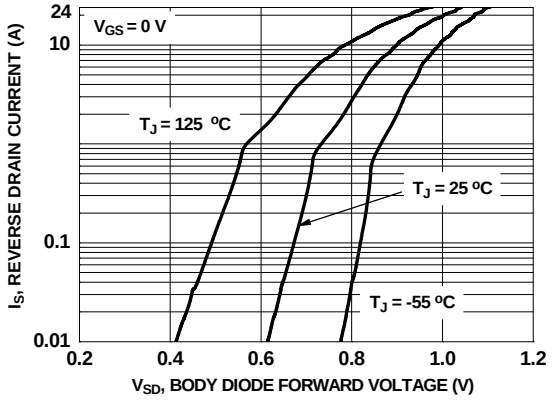



**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

## Typical Characteristics $T_J$ = 25°C unless otherwise noted

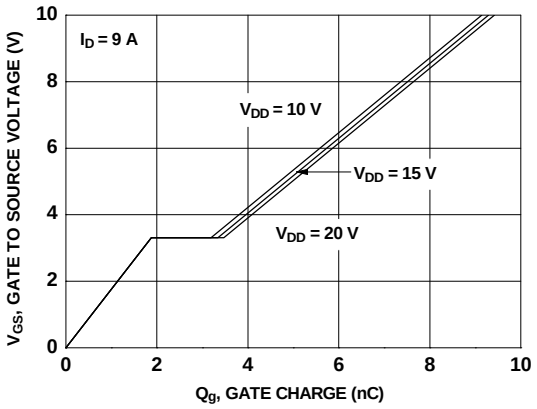



**Figure 7. Gate Charge Characteristics**

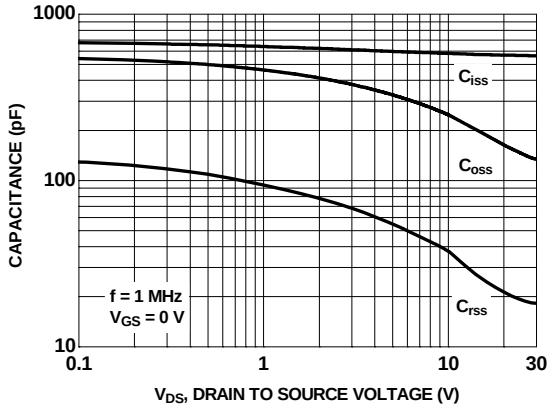



**Figure 8. Capacitance vs Drain to Source Voltage**

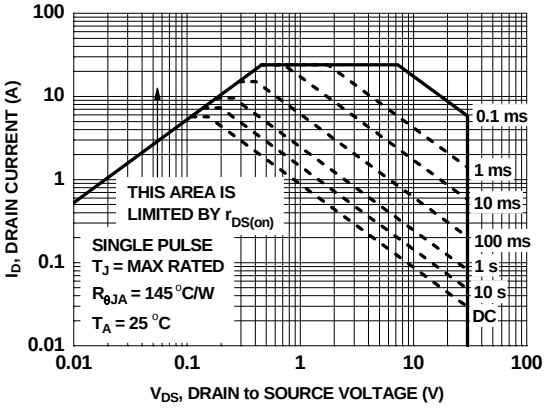



**Figure 9. Forward Bias Safe Operating Area**

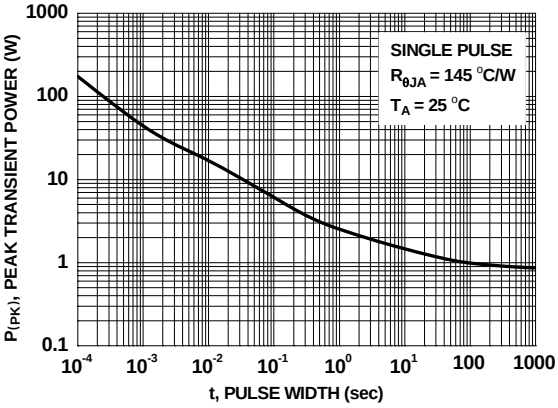



**Figure 10. Single Pulse Maximum Power Dissipation**

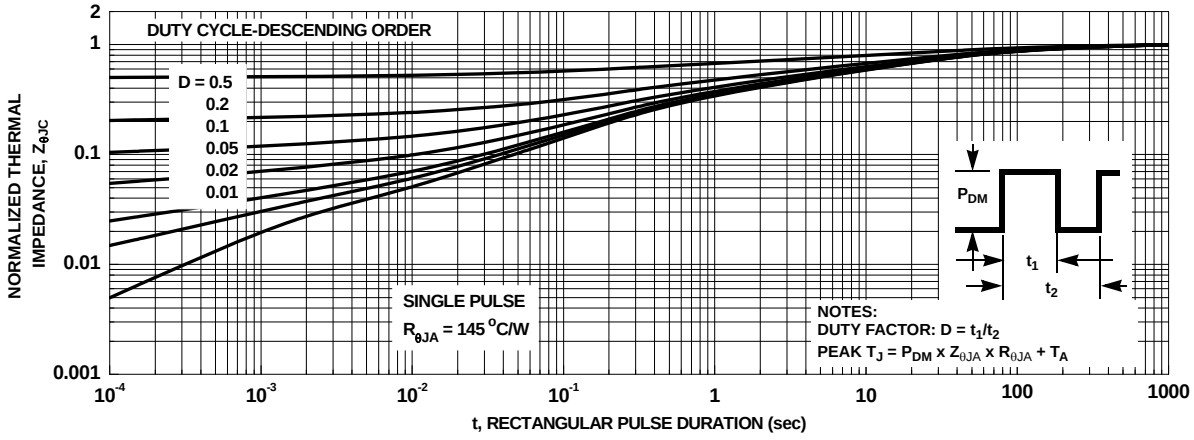
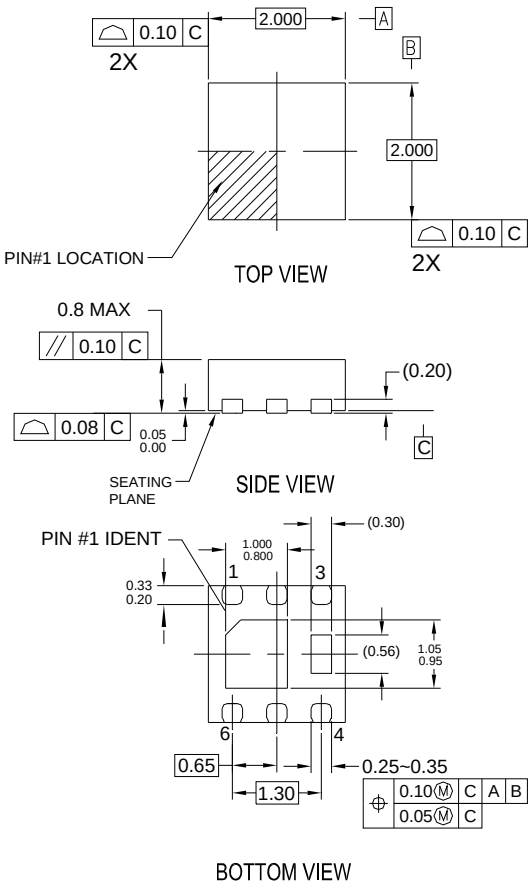
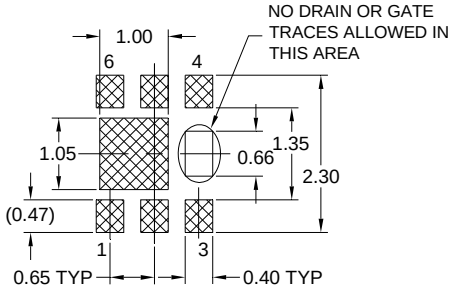


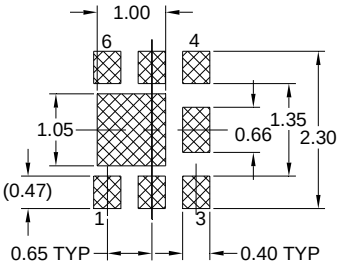

**Figure 11. Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout




RECOMMENDED LAND PATTERN OPT 1




RECOMMENDED LAND PATTERN OPT 2

NOTES:

A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-229 DATED AUG/2003

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