June 2014

# FDMA510PZ

## Single P-Channel PowerTrench® MOSFET

### –20V, –7.8A, 30mΩ

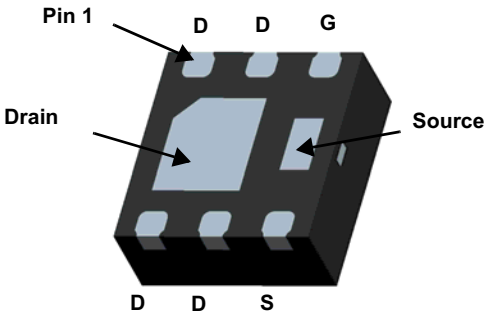
### Features

- Max $r_{DS(on)}$ = 30mΩ at $V_{GS}$ = –4.5V, $I_D$ = –7.8A
- Max $r_{DS(on)}$ = 37mΩ at $V_{GS}$ = –2.5V, $I_D$ = –6.6A
- Max $r_{DS(on)}$ = 50mΩ at $V_{GS}$ = –1.8V, $I_D$ = –5.5A
- Max $r_{DS(on)}$ = 90mΩ at $V_{GS}$ = –1.5V, $I_D$ = –2.0A
- Low profile - 0.8mm maximum - in the new package MicroFET 2X2 mm
- HBM ESD protection level > 3KV typical (Note 3)
- Free from halogenated compounds and antimony oxides
- RoHS Compliant

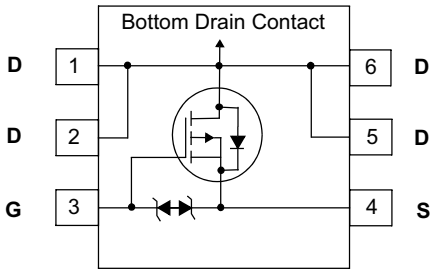
### General Description

This device is designed specifically for battery charge or load switching in cellular handset and other ultraportable applications. It features a MOSFET with low on-state resistance.

The MicroFET 2X2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.




MicroFET 2X2 (Bottom View)




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

| Symbol | Parameter | | Ratings | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | | –20 | V |
| $V_{GS}$ | Gate to Source Voltage | | ±8 | V |
| $I_D$ | Drain Current -Continuous | (Note 1a) | –7.8 | A |
| | -Pulsed | | –24 | |
| $P_D$ | Power Dissipation | (Note 1a) | 2.4 | W |
| | Power Dissipation | (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

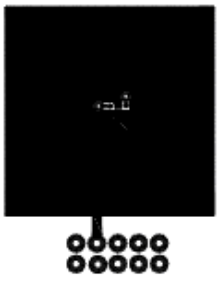
| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| 510 | FDMA510PZ | MicroFET 2X2 | 7” | 8mm | 3000units |

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

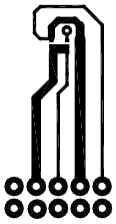
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = –250μA, $V_{GS}$ = 0V | –20 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = –250μA, referenced to 25°C | | –13 | | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = –16V, $V_{GS}$ = 0V | | | –1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±8V, $V_{DS}$ = 0V | | | ±10 | μA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = –250μA | –0.4 | –0.7 | –1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = –250μA, referenced to 25°C | | 3 | | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = –4.5V, $I_D$ = –7.8A | | 27 | 30 | mΩ |
| | | $V_{GS}$ = –2.5V, $I_D$ = –6.6A | | 34 | 37 | |
| | | $V_{GS}$ = –1.8V, $I_D$ = –5.5A | | 46 | 50 | |
| | | $V_{GS}$ = –1.5V, $I_D$ = –2.0A | | 60 | 90 | |
| | | $V_{GS}$ = –4.5V, $I_D$ = –7.8A ,$T_J$ = 125°C | | 36 | 40 | |
| $g_{FS}$ | Forward Transconductance | $V_{DD}$ = –5V, $I_D$ = –7.8A | | 26 | | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = –10V, $V_{GS}$ = 0V, f = 1MHz | | 1110 | 1480 | pF |
| $C_{oss}$ | Output Capacitance | | | 205 | 275 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 185 | 280 | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = –10V, $I_D$ = –7.8A, $V_{GS}$ = –4.5V, $R_{GEN}$ = 6Ω | | 7 | 14 | ns |
| $t_r$ | Rise Time | | | 9 | 18 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 125 | 200 | ns |
| $t_f$ | Fall Time | | | 64 | 103 | ns |
| $Q_g$ | Total Gate Charge | $V_{DD}$ = –5V, $I_D$ = –7.8A, $V_{GS}$ = –4.5V | | 19 | 27 | nC |
| $Q_{gs}$ | Gate to Source Charge | | | 2.1 | | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | | 4.2 | | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | | | –2 | A |
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = –2A | | –0.8 | –1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = –7.8A, di/dt = 100A/μs | | 66 | 106 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 44 | 71 | nC |

**Notes:**

1. $R_{\theta JA}$ is determined with the device mounted on a 1in$^2$ 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 < 300μs, Duty cycle < 2.0%.
3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

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

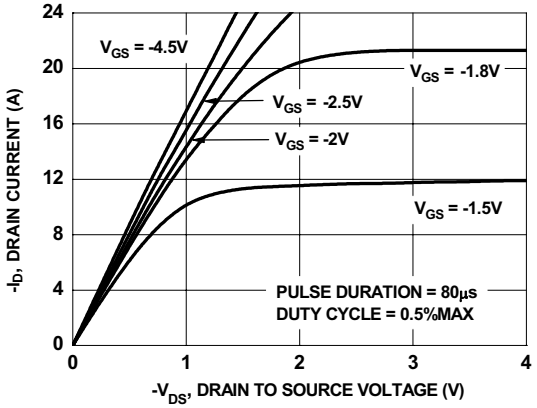



**Figure 1. On-Region Characteristics**

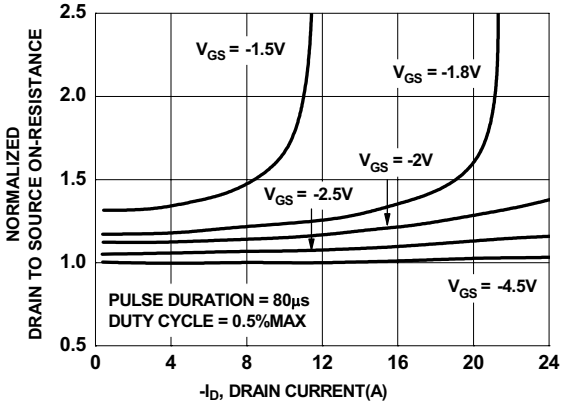



**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**

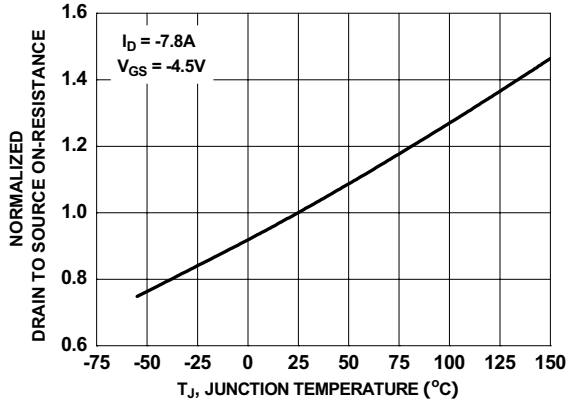



**Figure 3. Normalized On-Resistance vs Junction Temperature**

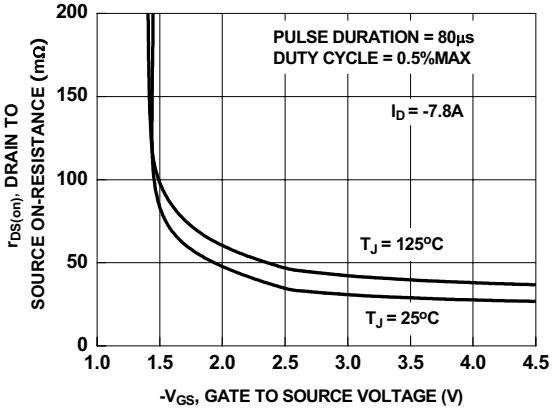



**Figure 4. On-Resistance vs Gate to Source Voltage**

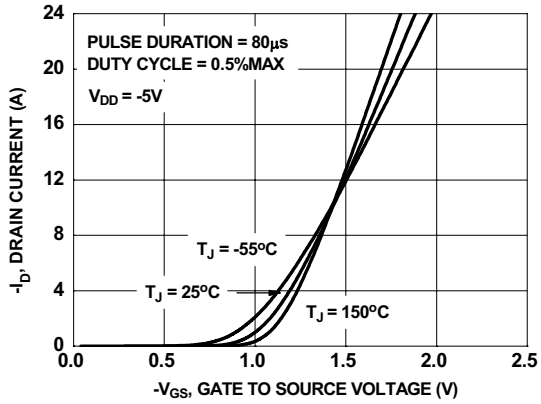



**Figure 5. Transfer Characteristics**

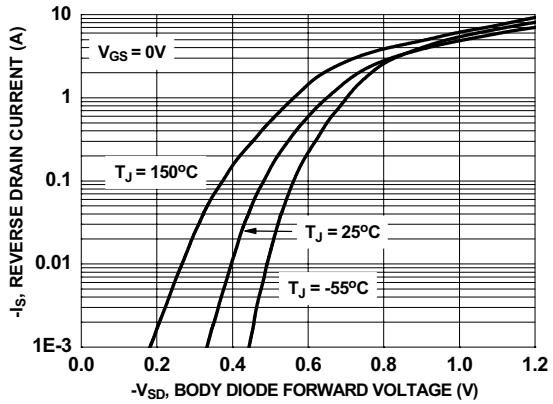



**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

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

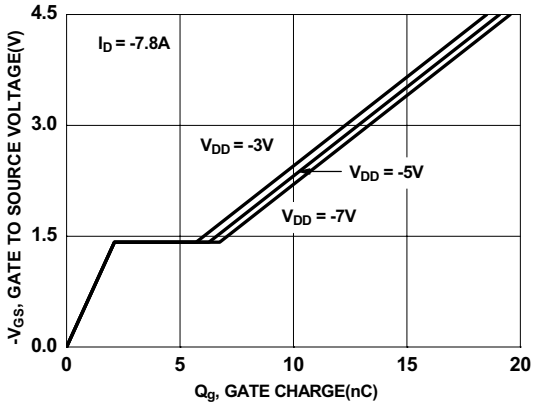



**Figure 7. Gate Charge Characteristics**

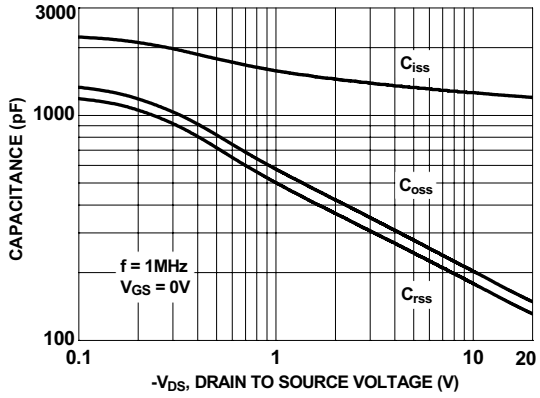



**Figure 8. Capacitance vs Drain to Source Voltage**

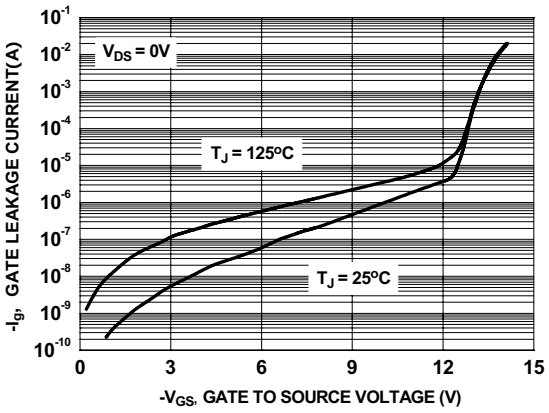



**Figure 9. Gate Leakage Current vs Gate to Source Voltage**

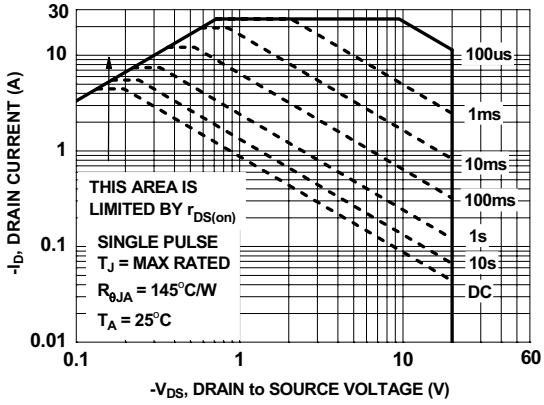



**Figure 10. Forward Bias Safe Operating Area**

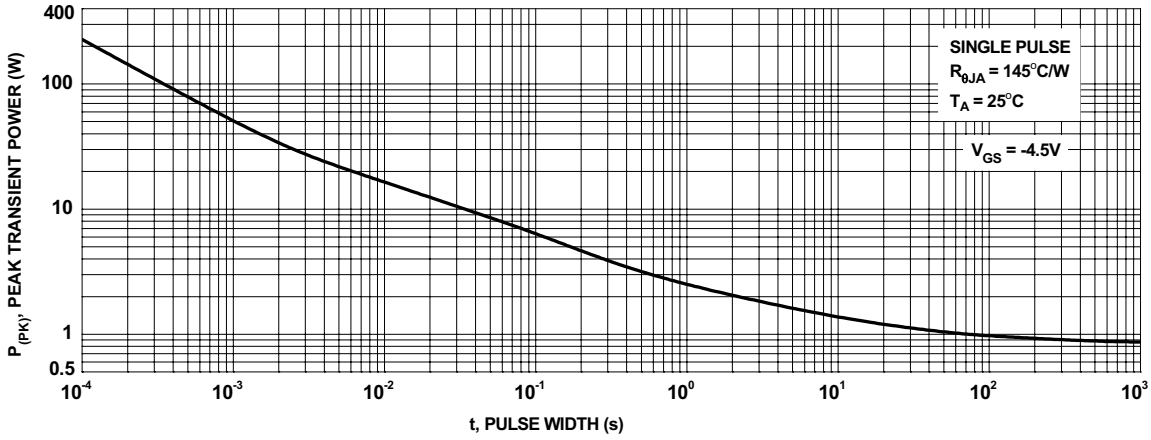



**Figure 11. Single Pulse Maximum Power Dissipation**

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

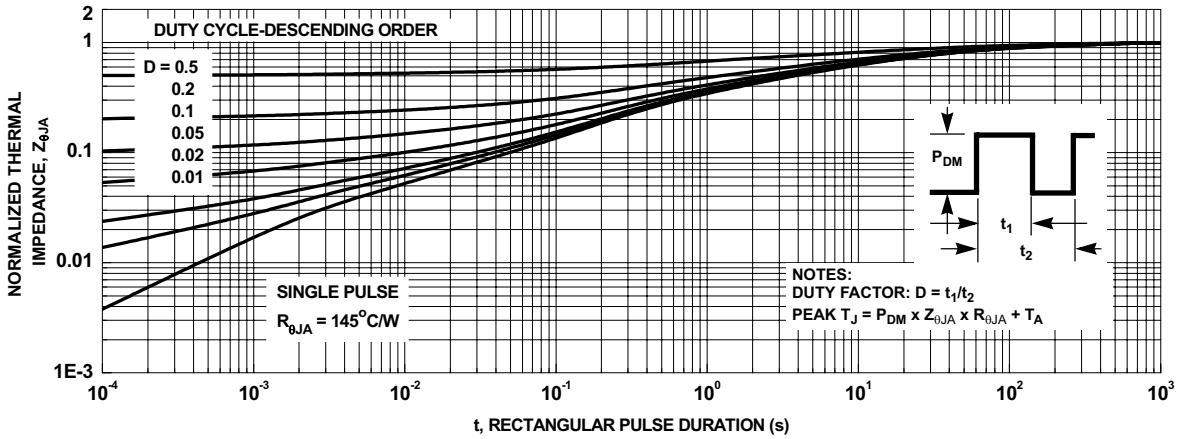
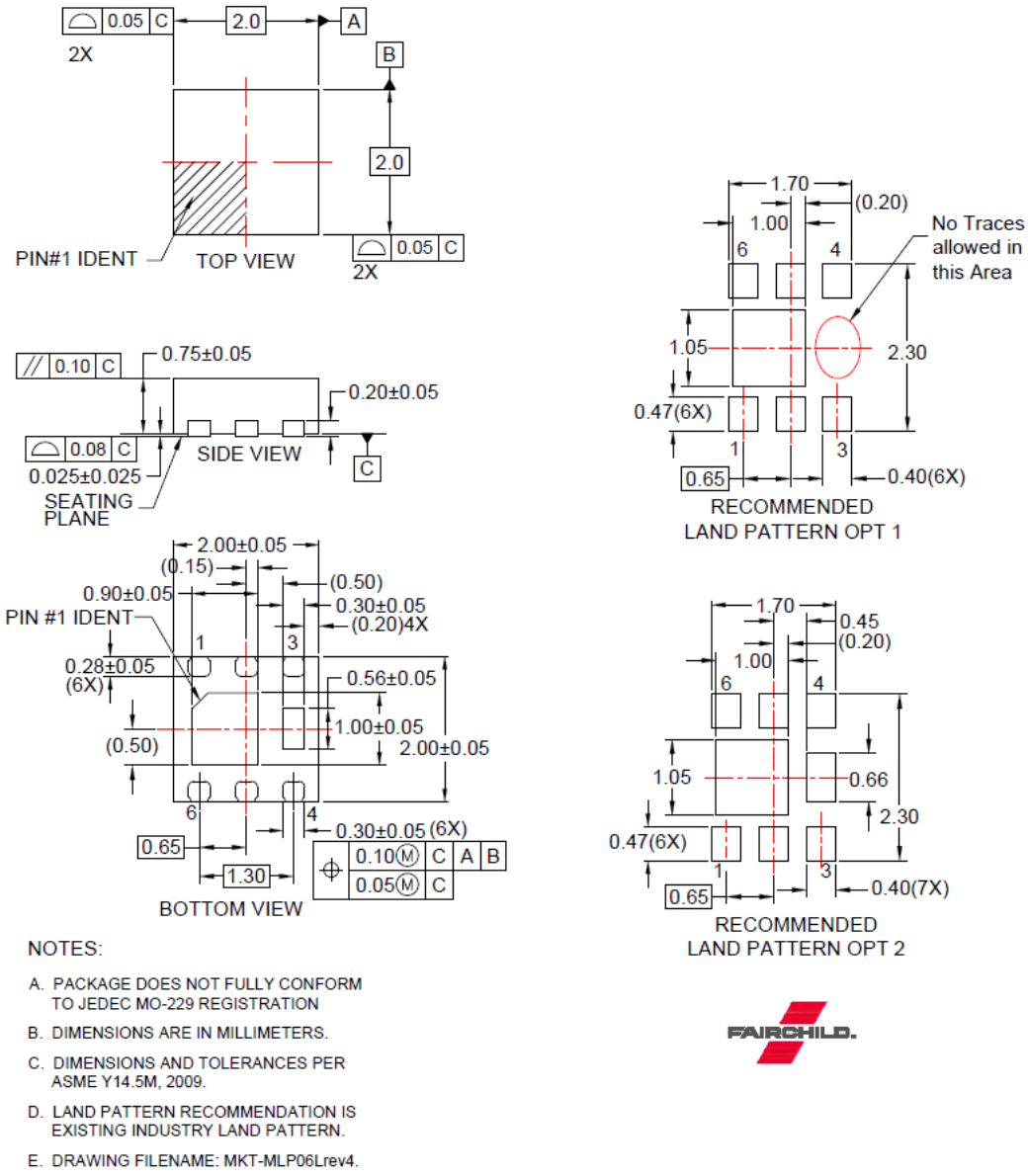



**Figure 12. Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout




NOTES:

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B. DIMENSIONS ARE IN MILLIMETERS.

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