FAIRCHILD™

June 2014

FDMA520PZ

## Single P-Channel PowerTrench® MOSFET
–20V, –7.3A, 30mΩ

Features

- Max $r_{DS(on)}$ = 30mΩ at V_{GS} = –4.5V, I_D = –7.3A

- Max $r_{DS(on)}$ = 53mΩ at V_{GS} = –2.5V, I_D = –5.5A

- 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.
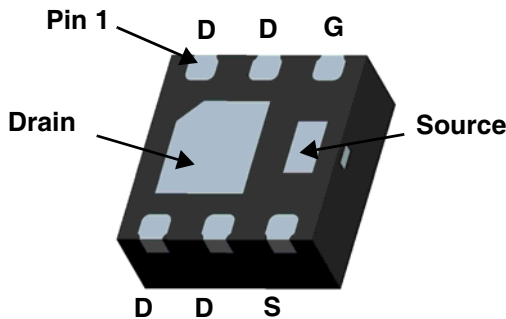
MicroFET 2X2 (Bottom View)
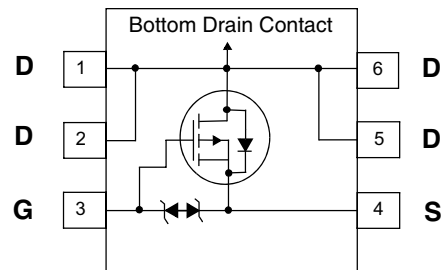
MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		–20	V
V_{GS}	Gate to Source Voltage		±12	V
I_D	Drain Current -Continuous	(Note 1a)	–7.3	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
520	FDMA520PZ	MicroFET 2X2	7''	8mm	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	$I_D = -250\mu A$, $V_{GS} = 0V$	−20			V
$\dfrac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu A$, referenced to 25°C		−8.4		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16V$, $V_{GS} = 0V$			−1	µA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm12V$, $V_{DS} = 0V$			±10	µA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\mu A$	−0.6	−1.1	−1.5	V
$\dfrac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\mu A$, referenced to 25°C		3.5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -4.5V$, $I_D = -7.3A$		26	30	mΩ
		$V_{GS} = -2.5V$, $I_D = -5.5A$		42	53	
		$V_{GS} = -4.5V$, $I_D = -7.3A$,$T_J = 125°C$		36	55	
g_{FS}	Forward Transconductance	$V_{DS} = -5V$, $I_D = -7.3A$		22		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = -10V$, $V_{GS} = 0V$, f = 1MHz		1235	1645	pF
C_{oss}	Output Capacitance			255	340	pF
C_{rss}	Reverse Transfer Capacitance			225	340	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10V$, $I_D = -7.3A$ $V_{GS} = -4.5V$, $R_{GEN} = 6\Omega$		10	20	ns
t_r	Rise Time			29	47	ns
$t_{d(off)}$	Turn-Off Delay Time			83	133	ns
t_f	Fall Time			74	119	ns
Q_g	Total Gate Charge	$V_{DD} = -5V$, $I_D = -7.3A$ $V_{GS} = -4.5V$		14	20	nC
Q_{gs}	Gate to Source Gate Charge			2.9		nC
Q_{gd}	Gate to Drain "Miller" Charge			4.4		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	$I_F = -7.3A$, di/dt = 100A/µs		30	45	ns
Q_{rr}	Reverse Recovery Charge			22	33	nC

Notes:
1: $R_{\theta JA}$ 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.
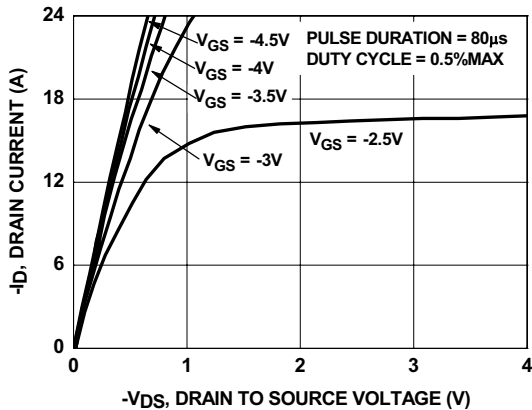

a. 52°C/W when mounted on a 1 in^2 pad of 2 oz copper
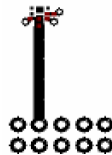
b.145°C/W when mounted on a minimum pad of 2 oz copper

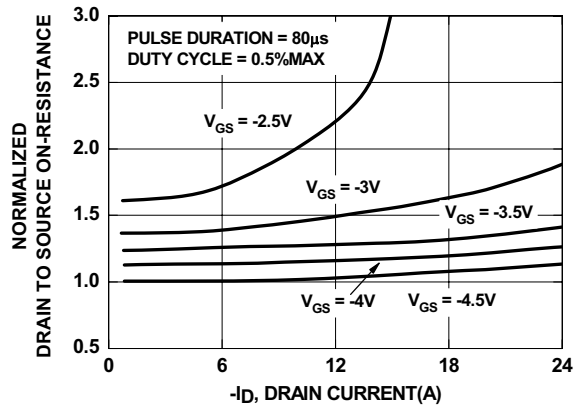**2:** Pulse Test: Pulse Width < 300µs, Duty cycle < 2.0%.
3: The diode connected between the gate and the source serves only as protection against ESD. No gate overvoltage rating is implied.
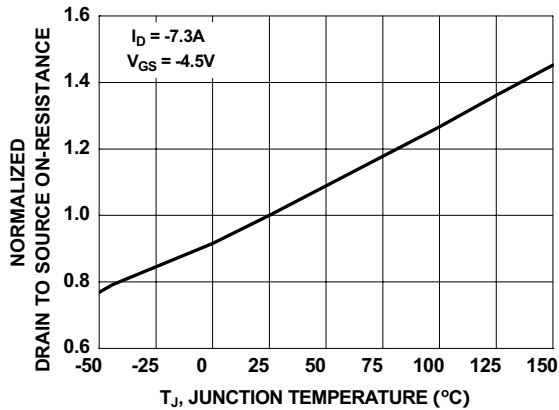
Typical Characteristics T_J = 25°C unless otherwise noted

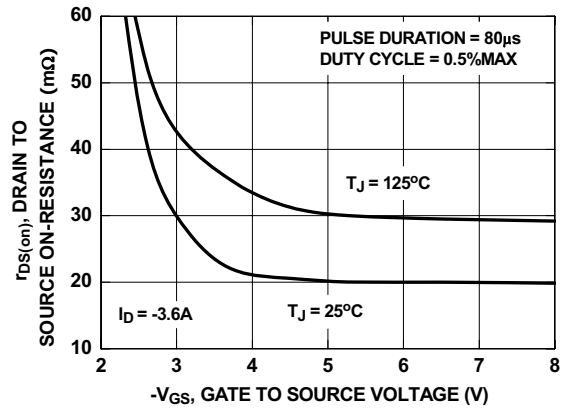**Figure 1. On-Region Characteristics**

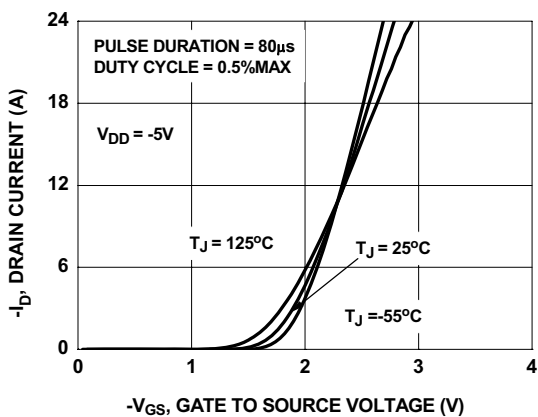PULSE DURATION = 80μs
DUTY CYCLE = 0.5%MAX

V_{GS} = -4.5V
V_{GS} = -4V
V_{GS} = -3.5V
V_{GS} = -2.5V
V_{GS} = -3V

-I_D, DRAIN CURRENT (A)

-V_{DS}, DRAIN TO SOURCE VOLTAGE (V)

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

PULSE DURATION = 80μs
DUTY CYCLE = 0.5%MAX

V_{GS} = -2.5V
V_{GS} = -3V
V_{GS} = -3.5V
V_{GS} = -4V
V_{GS} = -4.5V

NORMALIZED DRAIN TO SOURCE ON-RESISTANCE

-I_D, DRAIN CURRENT(A)

Figure 3. Normalized On-Resistance vs Junction Temperature

I_D = -7.3A
V_{GS} = -4.5V

NORMALIZED DRAIN TO SOURCE ON-RESISTANCE

T_J, JUNCTION TEMPERATURE (°C)

Figure 4. On-Resistance vs Gate to Source Voltage

PULSE DURATION = 80μs
DUTY CYCLE = 0.5%MAX

T_J = 125°C
I_D = -3.6A
T_J = 25°C

$r_{DS(on)}$, DRAIN TO SOURCE ON-RESISTANCE (mΩ)

-V_{GS}, GATE TO SOURCE VOLTAGE (V)

Figure 5. Transfer Characteristics

PULSE DURATION = 80μs
DUTY CYCLE = 0.5%MAX

V_{DD} = -5V

T_J = 125°C
T_J = 25°C
T_J = -55°C

-I_D, DRAIN CURRENT (A)

-V_{GS}, GATE TO SOURCE VOLTAGE (V)
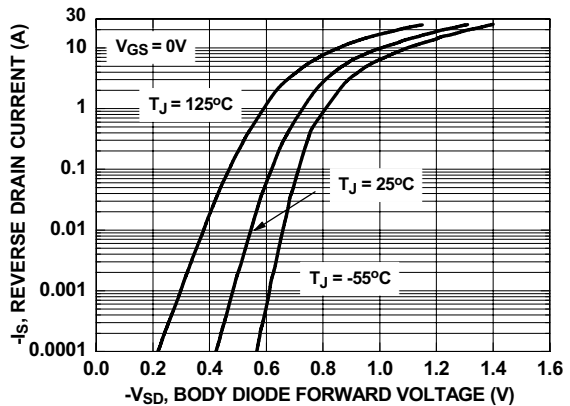
Figure 6. Source to Drain Diode Forward Voltage vs Source Current

V_{GS} = 0V
T_J = 125°C
T_J = 25°C
T_J = -55°C

-I_S, REVERSE DRAIN CURRENT (A)

-V_{SD}, BODY DIODE FORWARD VOLTAGE (V)

Typical Characteristics T_J = 25°C unless otherwise noted
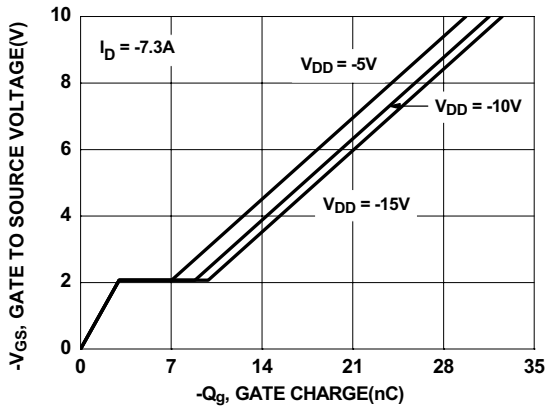
Figure 7. Gate Charge Characteristics
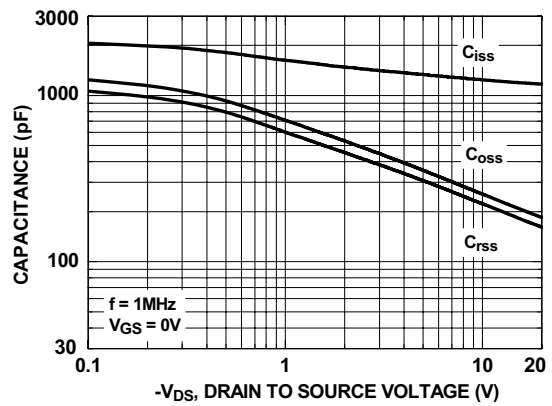
Figure 8. Capacitance vs Drain to Source Voltage
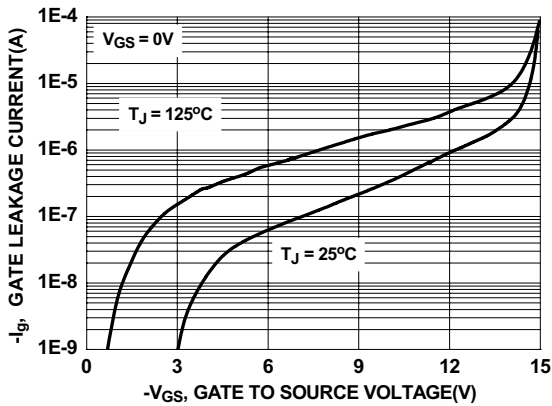
Figure 9. Gate Leakage Current vs Gate to Source Voltage
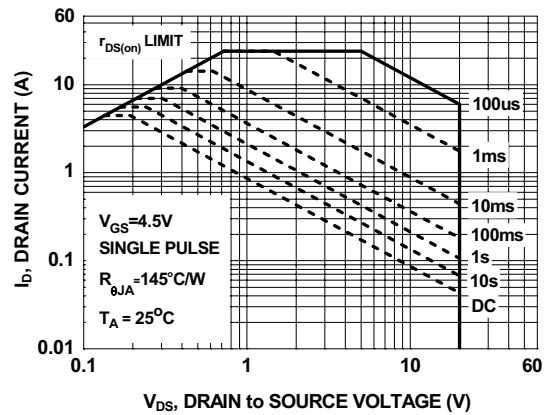
Figure 10. Forward Bias Safe Operating Area
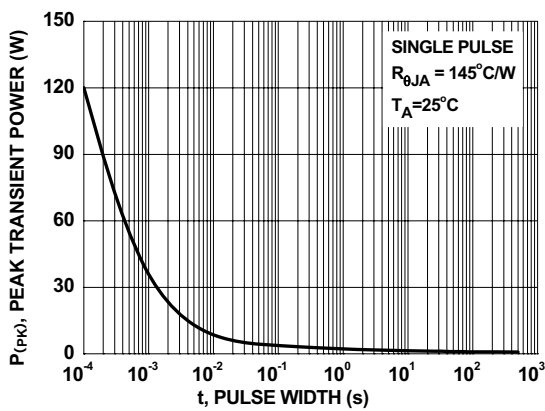
Figure 11. Single Pulse Maximum Power Dissipation
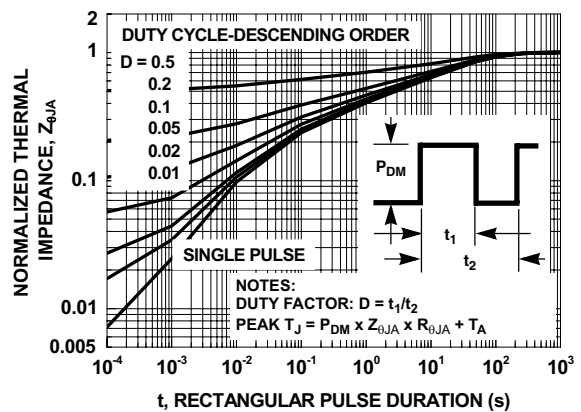
Figure 12. Transient Thermal Response Curve

Dimensional Outline and Pad Layout

TOP VIEW

0.05 C 2X
2.0 → A
B
2.0
0.05 C 2X
PIN#1 IDENT

SIDE VIEW

0.10 C
0.75±0.05
0.20±0.05
0.08 C
0.025±0.025
SEATING PLANE

BOTTOM VIEW

2.00±0.05
(0.15)
0.90±0.05
(0.50)
0.30±0.05
(0.20)4X
PIN #1 IDENT
0.28±0.05 (6X)
0.56±0.05
1.00±0.05
2.00±0.05
(0.50)
0.65
1.30
0.30±0.05 (6X)
0.10 (M) C A B
0.05 (M) C

RECOMMENDED LAND PATTERN OPT 1

1.70
(0.20)
1.00
No Traces allowed in this Area
6   4
1.05   2.30
0.47(6X)
1   3
0.65   0.40(6X)

RECOMMENDED LAND PATTERN OPT 2

1.70
0.45
(0.20)
1.00
6   4
1.05   0.66
2.30
0.47(6X)
1   3
0.65   0.40(7X)

NOTES:

A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC MO-229 REGISTRATION

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

E. DRAWING FILENAME: MKT-MLP06Lrev4.

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Rev. I68