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# FDMA1430JP

## Integrated P-Channel PowerTrench<sup>®</sup> MOSFET and BJT -30 V, -2.9 A, 90 mΩ

### Features

- Max  $r_{DS(on)}$  = 90 mΩ at  $V_{GS} = -4.5$  V,  $I_D = -2.9$  A
- Max  $r_{DS(on)}$  = 130 mΩ at  $V_{GS} = -2.5$  V,  $I_D = -2.6$  A
- Max  $r_{DS(on)}$  = 170 mΩ at  $V_{GS} = -1.8$  V,  $I_D = -1.7$  A
- Max  $r_{DS(on)}$  = 240 mΩ at  $V_{GS} = -1.5$  V,  $I_D = -1$  A
- Low profile - 0.8 mm maximum - in the new package MicroFET 2x2
- HBM ESD protection level > 2 kV typical (Note 3)
- RoHS Compliant

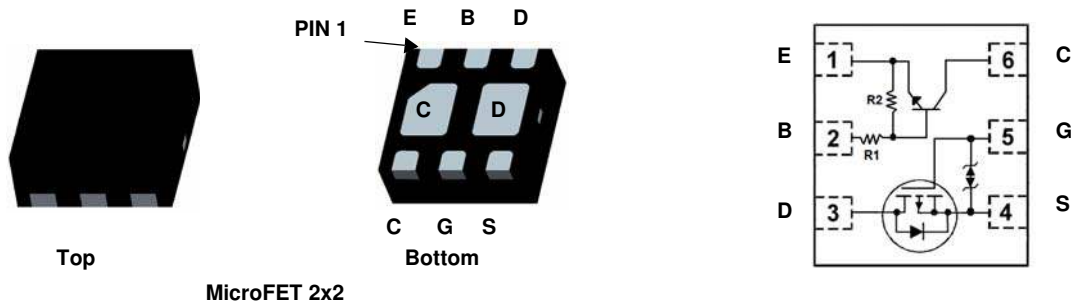


### General Description

This device is designed specifically as a single package solution for loadswitching in cellular handset and other ultra-portable applications. It features a 50 V NPN BJT and a 30 V P-ch Trench MOSFET in the space saving MicroFET 2x2 package that offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

### Application

- Loadswitching



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	-30	V
$V_{GS}$	Gate to Source Voltage	$\pm 8$	V
$I_D$	Drain Current -Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	-2.9
	-Pulsed		-12
$V_{CBO}$	Collector-Base Voltage	(Note 4)	50
$V_{CEO}$	Collector-Emitter Voltage	(Note 5)	50
$V_{EBO}$	Emitter-Base Voltage		10
$I_C$	Collector Current		100
$P_C$	Collector Power Dissipation		200
$T_J$	Junction Temperature		150
$P_D$	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	1.5
		$T_A = 25^\circ\text{C}$ (Note 1b)	0.7
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient(MOSFET)	(Note 1a)	86	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient(MOSFET)	(Note 1b)	173	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
143	FDMA1430JP	MicroFET 2x2	7"	8 mm	5000 units

**Electrical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = -250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-23		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -24\text{ V}$ , $V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 8\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 1$	$\mu\text{A}$

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = -250\text{ }\mu\text{A}$	-0.4	-0.6	-1	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		2.4		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -4.5\text{ V}$ , $I_D = -2.9\text{ A}$		67	90	m $\Omega$
		$V_{GS} = -2.5\text{ V}$ , $I_D = -2.6\text{ A}$		81	130	
		$V_{GS} = -1.8\text{ V}$ , $I_D = -1.7\text{ A}$		98	170	
		$V_{GS} = -1.5\text{ V}$ , $I_D = -1\text{ A}$		114	240	
		$V_{GS} = -4.5\text{ V}$ , $I_D = -2.9\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		102	133	
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{ V}$ , $I_D = -2.9\text{ A}$		11		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = -15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		438	580	pF
$C_{oss}$	Output Capacitance			47	70	pF
$C_{rss}$	Reverse Transfer Capacitance			41	60	pF

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -15\text{ V}$ , $I_D = -1\text{ A}$ , $V_{GS} = -4.5\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		4.8	10	ns
$t_r$	Rise Time			4.4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			67	107	ns
$t_f$	Fall Time			21	33	ns
$Q_g$	Total Gate Charge		$V_{DD} = -15\text{ V}$ , $I_D = -2.9\text{ A}$ , $V_{GS} = -4.5\text{ V}$		7.2	10
$Q_{gs}$	Gate to Source Charge			0.7		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			1.6		nC

**Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = -1.1\text{ A}$ (Note 2)		-0.7	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = -2.9\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		16	29	ns
$Q_{rr}$	Reverse Recovery Charge			5	10	nC

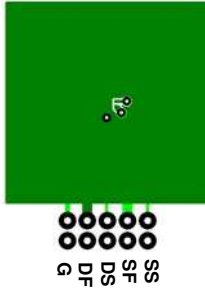
**BJT Characteristics**

$I_{CBO}$	Collector Cut-off Current	$V_{CB} = 40\text{ V}$ , $I_E = 0\text{ A}$			0.1	$\mu\text{A}$
$h_{FE}$	DC Current Gain	$V_{CE} = 5\text{ V}$ , $I_C = 5\text{ mA}$	68			
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$			0.3	V
$f_T$	Current Gain Bandwidth Product	$V_{CE} = 10\text{ V}$ , $I_C = 5\text{ mA}$		250		MHz
$C_{ob}$	Output Capacitance	$V_{CB} = 10\text{ V}$ , $I_E = 0\text{ A}$ , $f = 1\text{ MHz}$		3.7		pF
$V_I(off)$	Input Off Voltage	$V_{CE} = 5\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$	0.5			V
$V_I(on)$	Input On Voltage	$V_{CE} = 0.2\text{ V}$ , $I_C = 5\text{ mA}$			1.3	V
R1	Input Resistor			4.7		k $\Omega$
R1/R2	Resistor Ratio			0.1		

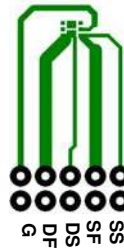
## Electrical Characteristics

**Notes:**

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



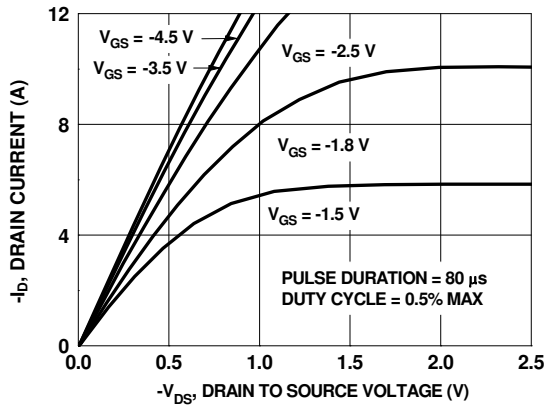
a. 86 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



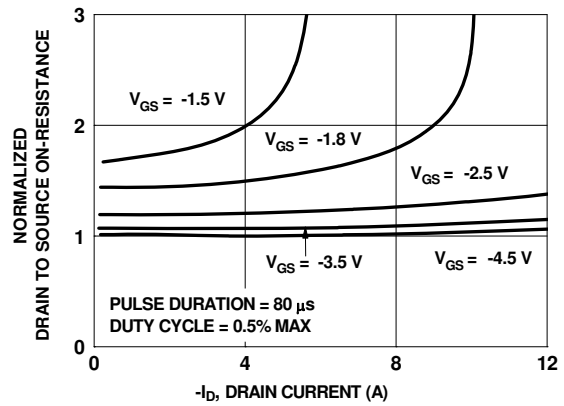
b. 173 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test : Pulse Width < 300 us, 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.
4. Guaranteed by  $I_{cbo}$
5. Guaranteed by  $I_{ceo}$

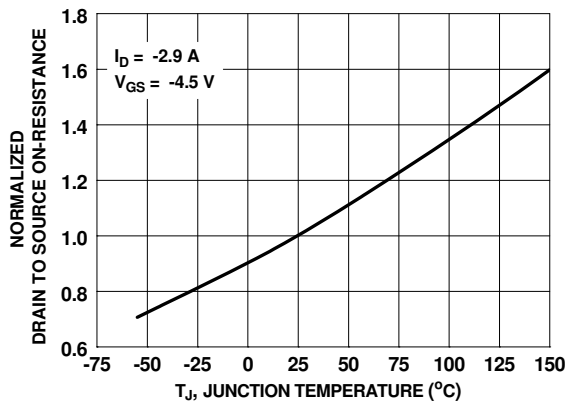
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



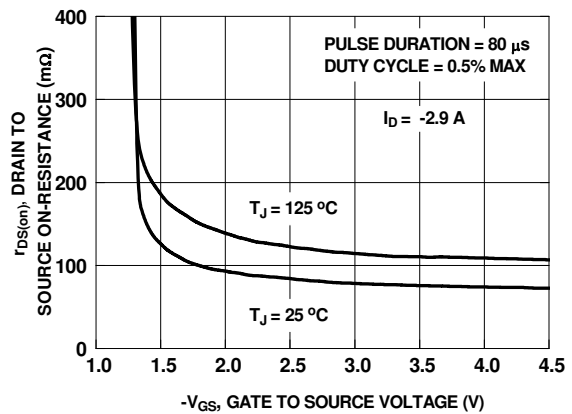
**Figure 1. On-Region Characteristics**



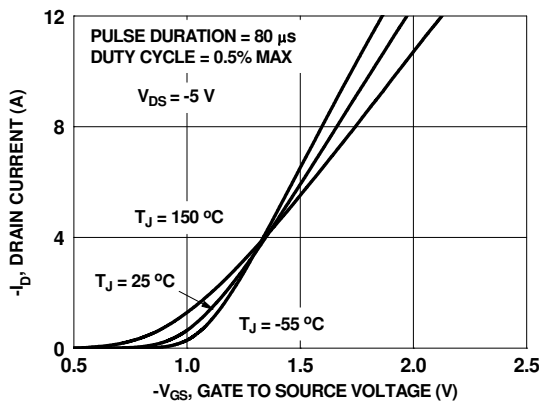
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



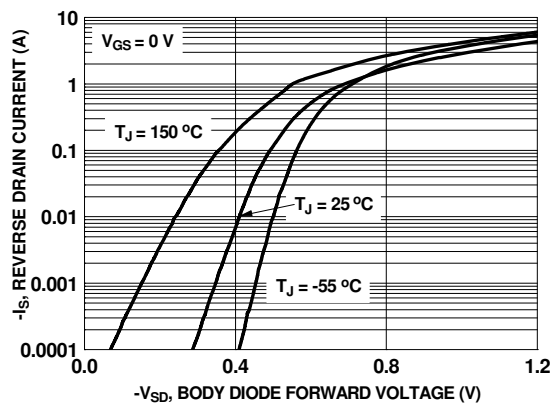
**Figure 3. Normalized On-Resistance vs Junction Temperature**



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

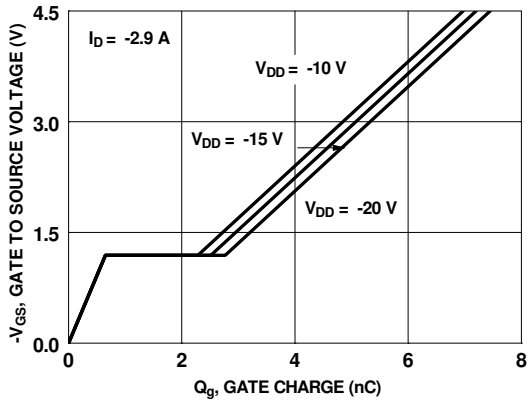


**Figure 5. Transfer Characteristics**

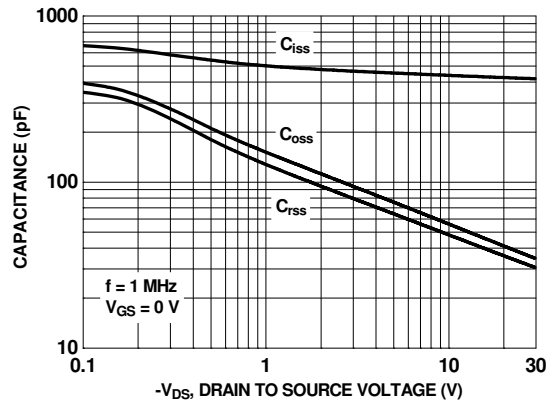


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

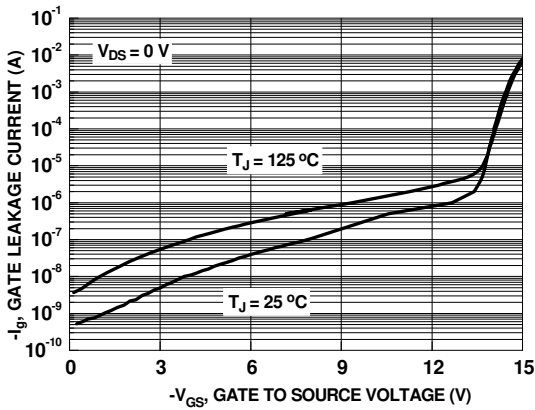
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



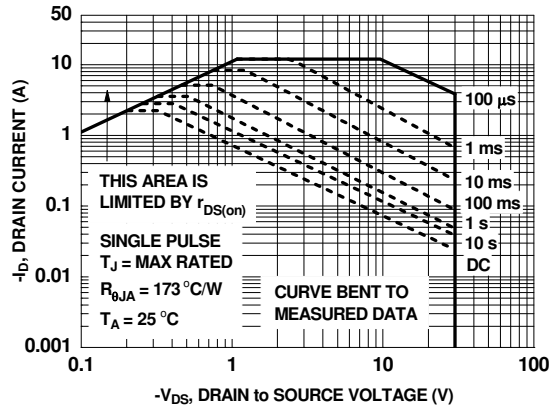
**Figure 7. Gate Charge Characteristics**



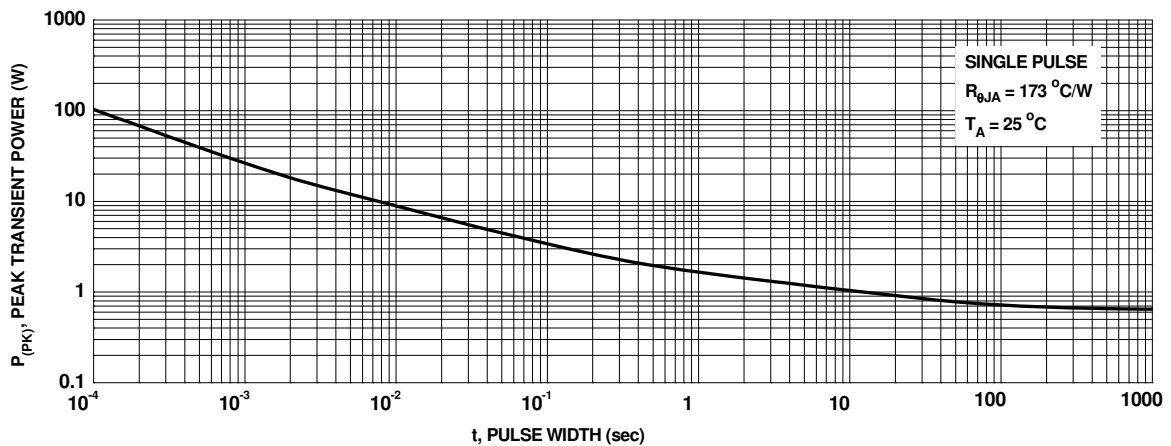
**Figure 8. Capacitance vs Drain to Source Voltage**



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

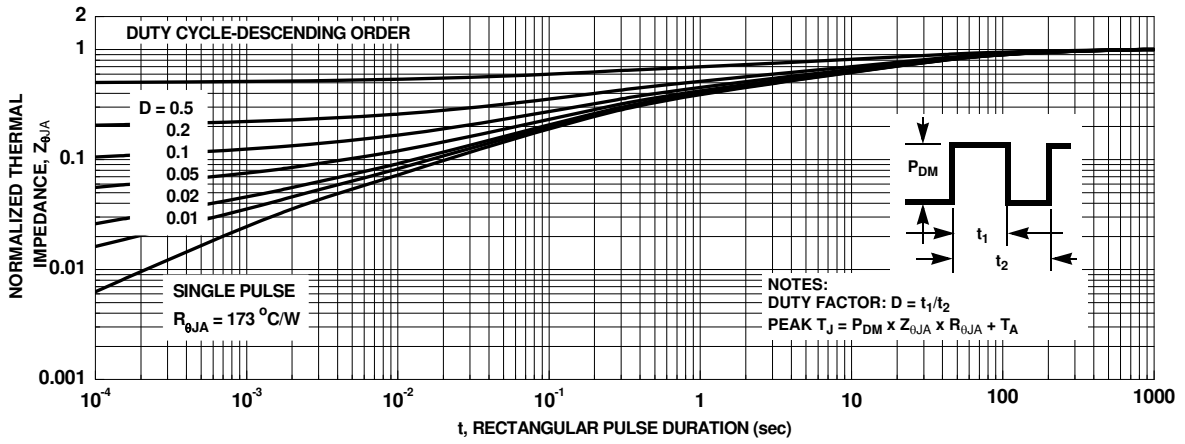


**Figure 10. Forward Bias Safe Operating Area**



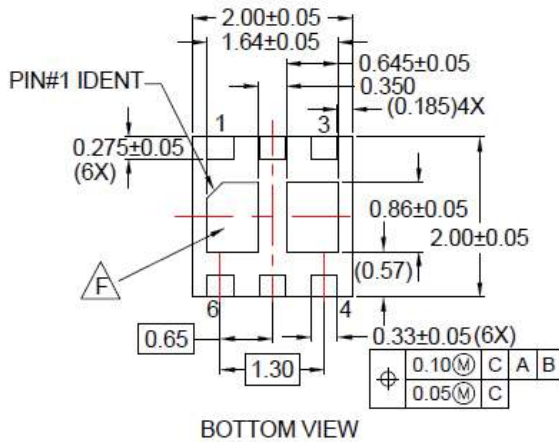
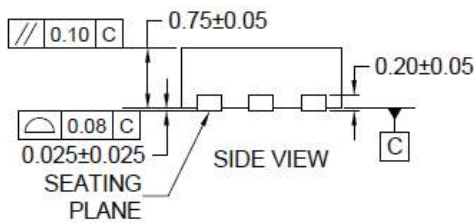
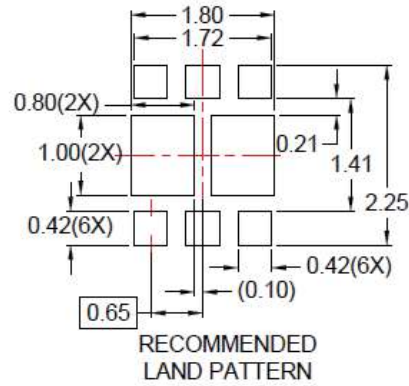
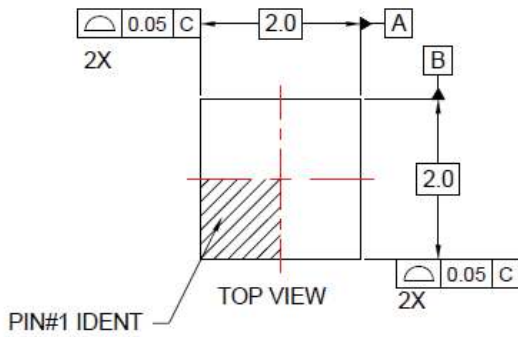
**Figure 11. Single Pulse Maximum Power Dissipation**

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



**Figure 12. Junction-to-Ambient Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout



### NOTES:

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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
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