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# FDMA8051L

## Single N-Channel PowerTrench® MOSFET

40 V, 10 A, 14 mΩ

### Features

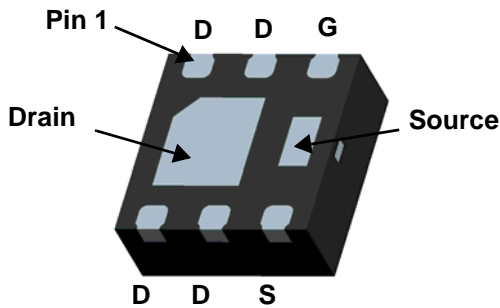
- Max  $r_{DS(on)}$  = 14 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 10\text{ A}$
- Max  $r_{DS(on)}$  = 18 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 8.5\text{ A}$
- Low Profile - 0.8 mm maximum in the new package MicroFET 2x2 mm
- Free from halogenated compounds and antimony oxides
- RoHS Compliant

### General Description

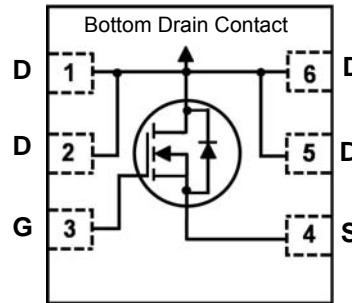
This device has been designed to provide maximum efficiency and thermal performance for synchronous buck converters. The low  $r_{DS(on)}$  and gate charge provide excellent switching performance.

### Application

- DC – DC Buck Converters



MicroFET 2X2 (Bottom View)



### MOSFET Maximum Ratings $T_A = 25\text{ °C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	40	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous $T_A = 25\text{ °C}$ (Note 1a)	10	A
	-Pulsed (Note 3)	80	
$P_D$	Power Dissipation $T_A = 25\text{ °C}$ (Note 1a)	2.4	W
	Power Dissipation $T_A = 25\text{ °C}$ (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
051	FDMA8051L	MicroFET 2X2	7"	8 mm	3000 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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		22		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			100	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.0	1.6	3.0	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 $25\text{ }^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 10\text{ A}$		11	14	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 8.5\text{ A}$		14	18	
		$V_{GS} = 10\text{ V}$ , $I_D = 10\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		15	19	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\text{ V}$ , $I_D = 10\text{ A}$		35		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		901	1260	pF
$C_{oss}$	Output Capacitance			251	350	pF
$C_{rss}$	Reverse Transfer Capacitance			16	25	pF
$R_g$	Gate Resistance		0.1	0.6	1.8	$\Omega$

### Switching Characteristics

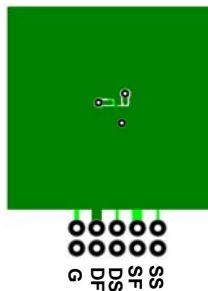
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\text{ V}$ , $I_D = 10\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		6.4	13	ns
$t_r$	Rise Time			1.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			17	31	ns
$t_f$	Fall Time			1.8	10	ns
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		14	20
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$	$V_{DD} = 20\text{ V}$ , $I_D = 10\text{ A}$	6.4	9.0	nC
$Q_{gs}$	Gate to Source Charge			2.4	3.7	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			1.8	2.5	nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 2\text{ A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\text{ V}$ , $I_S = 10\text{ A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 10\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		23	37	ns
$Q_{rr}$	Reverse Recovery Charge			6.7	14	nC

#### NOTES:

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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  $R_{\theta JA}$  is determined by the user's board design.



a. 52  $^\circ\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b. 145  $^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.

3. Pulsed  $I_D$  limited by junction temperature,  $t_d \leq 100\text{ }\mu\text{s}$ , please refer to SOA curve for more details.

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

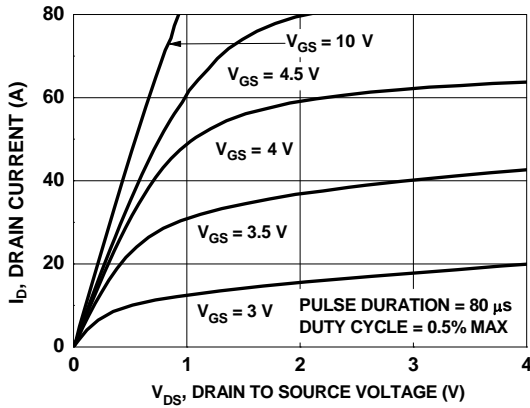


Figure 1. On-Region Characteristics

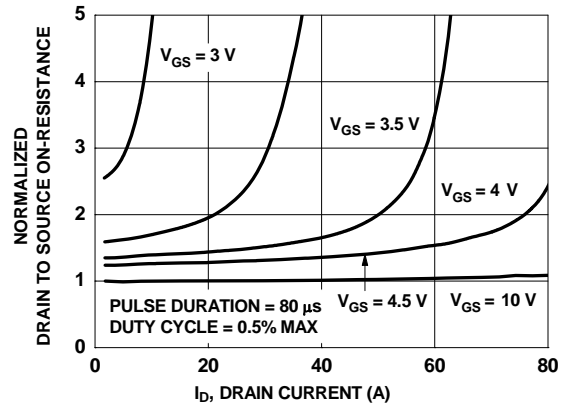


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

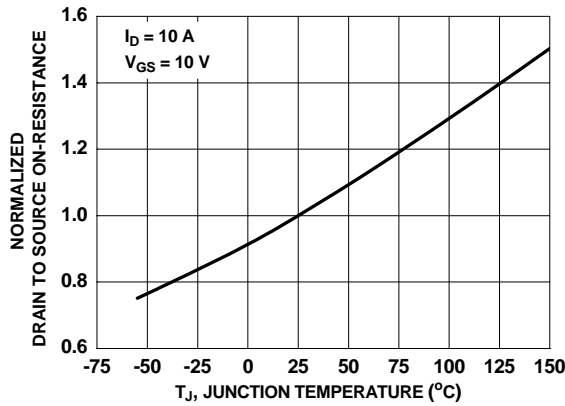


Figure 3. Normalized On-Resistance vs Junction Temperature

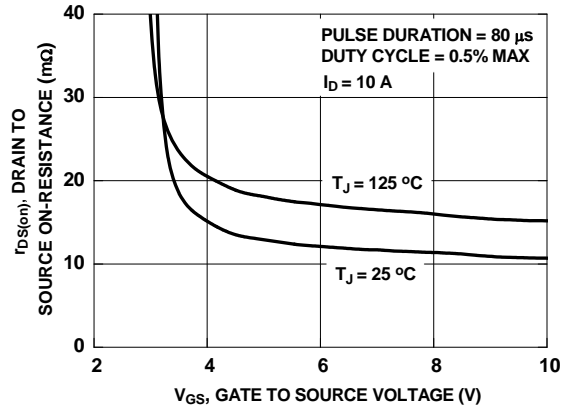


Figure 4. On-Resistance vs Gate to Source Voltage

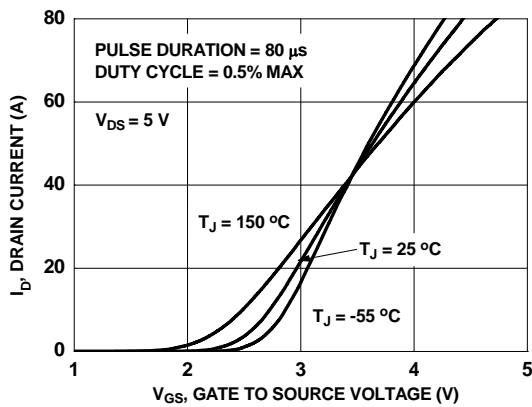


Figure 5. Transfer Characteristics

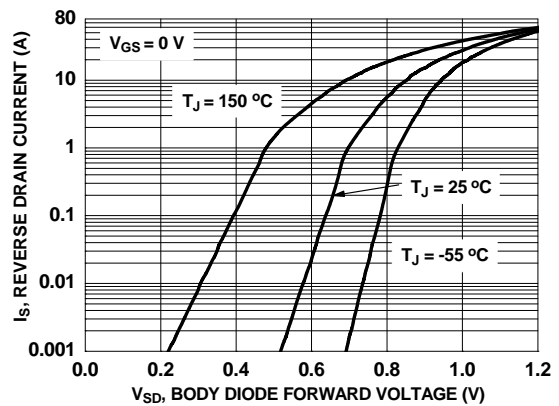
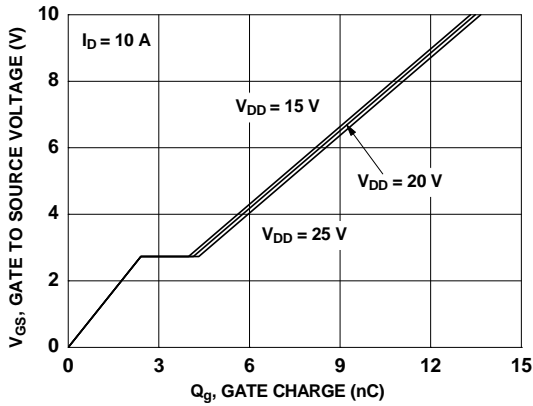
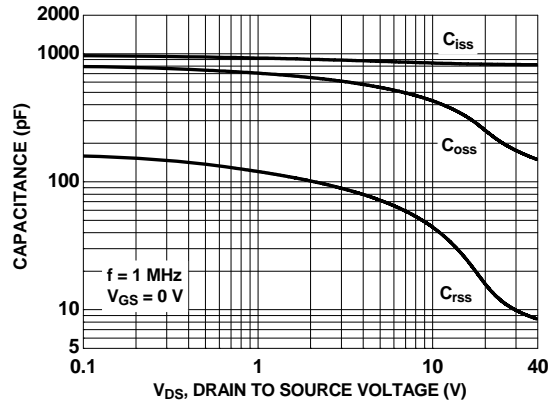


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

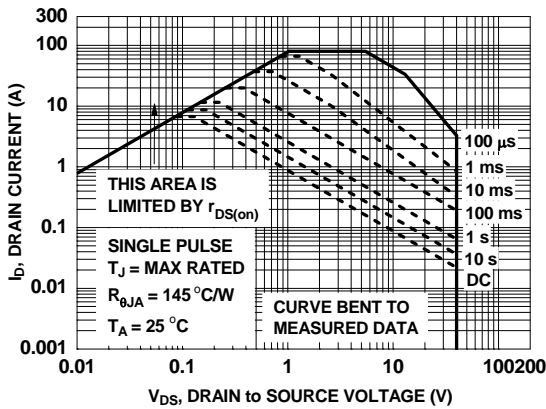
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



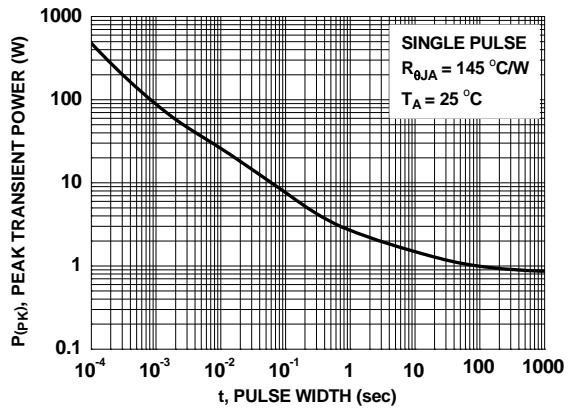
**Figure 7. Gate Charge Characteristics**



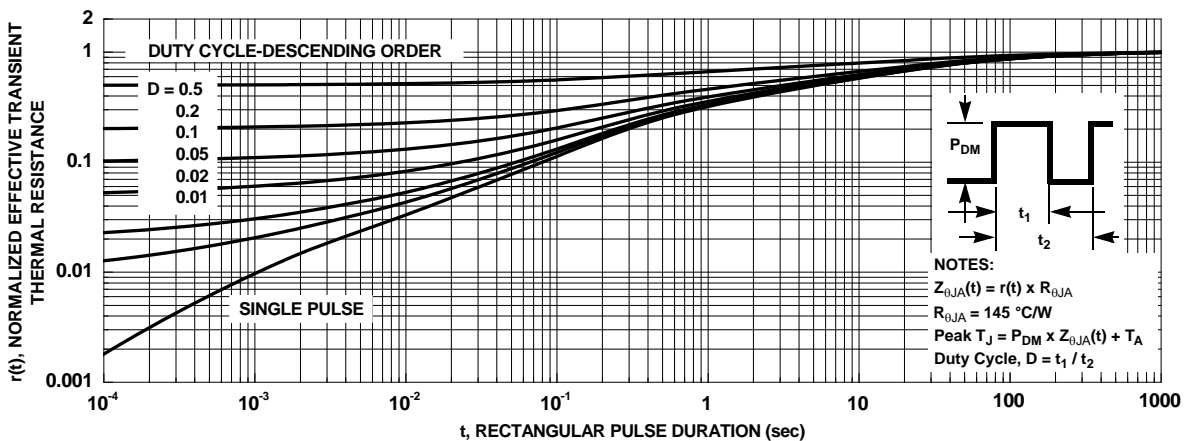
**Figure 8. Capacitance vs Drain to Source Voltage**



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

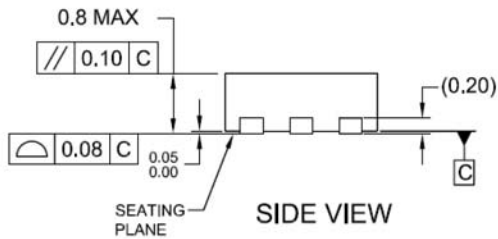
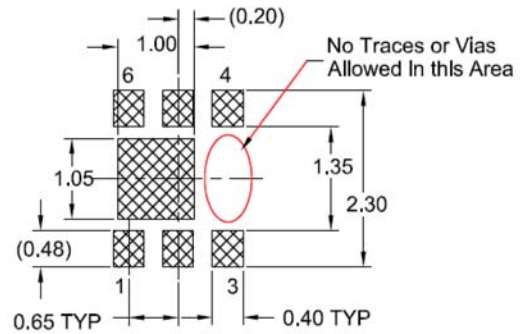
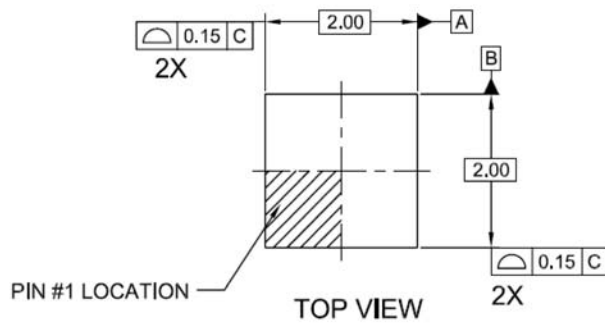


**Figure 10. Single Pulse Maximum Power Dissipation**

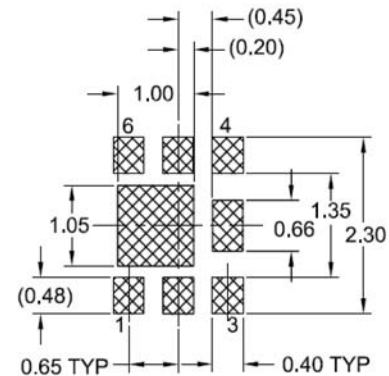
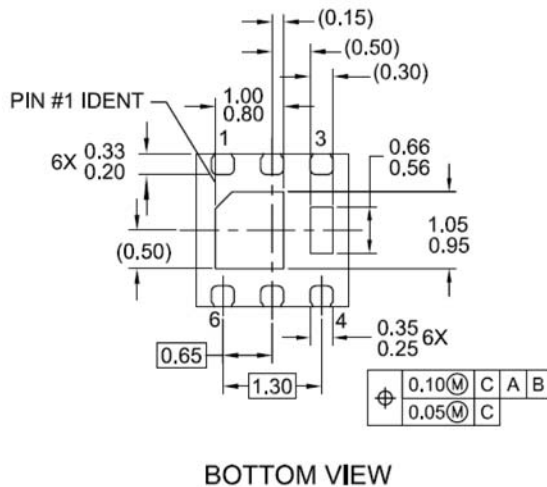


**Figure 11. Single Pulse Junction-to-Ambient Transient Thermal Response Curve**

### 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
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. DRAWING FILENAME:



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