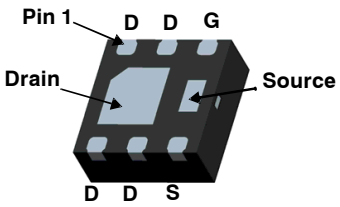
MOSFET – Single N-Channel, POWERTRENCH®

40 V, 10 A, 14 mΩ

FDMA8051L



MicroFET 2x2
(WDFN6 2x2, 0.65P)
CASE 511DB

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.

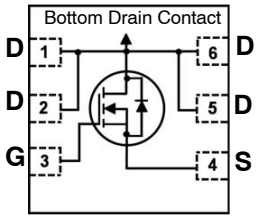
Features

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

Application

- DC–DC Buck Converters

ELECTRICAL CONNECTION



Single N-Channel MOSFET

MARKING DIAGRAM

&Z	= Assembly Plant Code
&2	= Numeric Date Code
&K	= Lot Code
051	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current – Continuous T_A = 25°C (Note 1a)	10	A
	– Pulsed (Note 3)	80	
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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	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	Shipping†
051	FDMA8051L	MicroFET 2x2	3000 Units/ Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

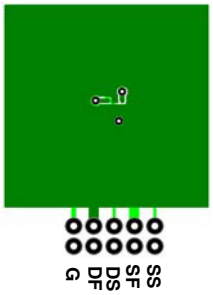
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C		22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32 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	1.6	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		−5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 10 A		11	14	mΩ
		V_{GS} = 4.5 V, I_D = 8.5 A		14	18	
		V_{GS} = 10 V, I_D = 10 A, T_J = 125°C		15	19	
g_{FS}	Forward Transconductance	V_{DD} = 5 V, I_D = 10 A		35		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz		901	1260	pF
C_{oss}	Output Capacitance			251	350	
C_{rss}	Reverse Transfer Capacitance			16	25	
R_g	Gate Resistance	f = 1 MHz	0.1	0.6	1.8	Ω
SWITCHING CHARACTERISTICS						
$td_{(on)}$	Turn – On Delay Time	V_{DD} = 20 V, I_D = 10 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		6.4	13	ns
t_r	Rise Time			1.8	10	
$t_{D(off)}$	Turn – Off Delay Time			17	31	
t_f	Fall Time			1.8	10	
Q_g	Total Gate Charge	V_{GS} = 0V to 10 V		14	20	nC
Q_g	Total Gate Charge	V_{GS} = 0V to 4.5 V		6.4	9.0	
Q_{gs}	Total Gate Charge	V_{DD} = 20 V, i_D = 10 A		2.4	3.7	
Q_{gd}	Gate to Source Charge			1.8	2.5	
DRAIN−SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2 A (Note 2)		0.7	1.2	V
		V_{GS} = 0 V, I_S = 10 A (Note 2)		0.8	1.2	
t_{rr}	Reverse Recovery Time	I_F = 10 A, di/dt = 100 A/μs		23	37	ns
Q_{rr}	Reverse Recovery Charge			6.7	14	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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 × 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°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%.
3. Pulsed I_D limited by junction temperature, td<= 100 μS, please refer to SOA curve for more details.

TYPICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

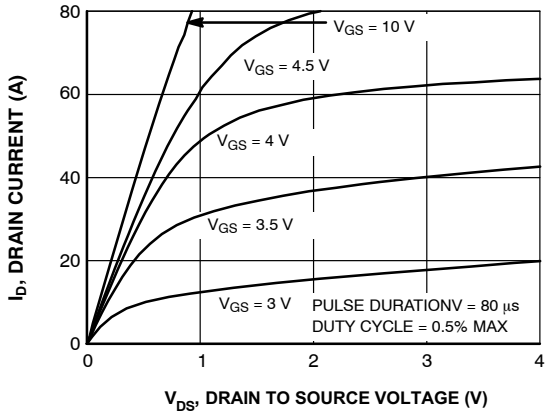


Figure 1. On Region Characteristics

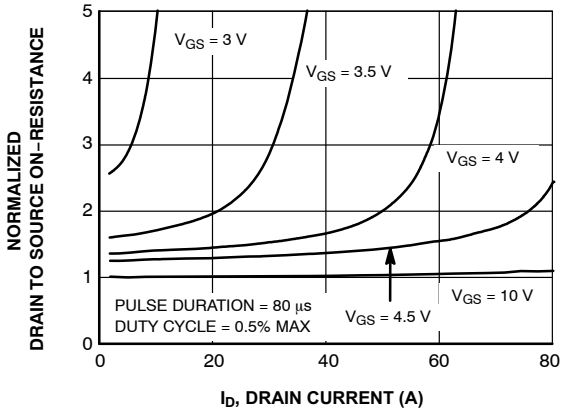


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

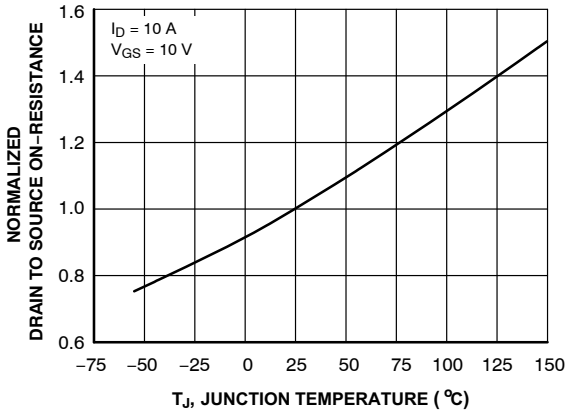


Figure 3. Normalized On Resistance vs. Junction Temperature

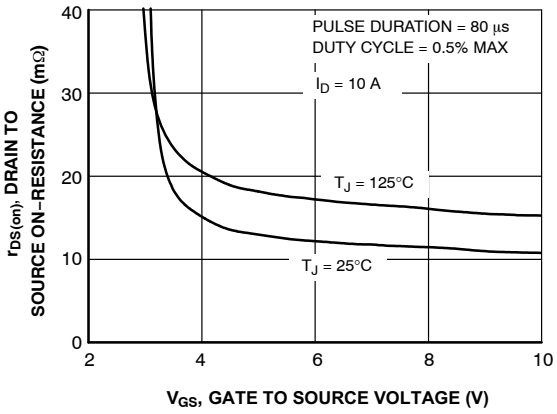


Figure 4. On−Resistance vs. Gate to Source Voltage

TYPICAL CHARACTERISTICS T_J = 25°C unless otherwise noted (continued)

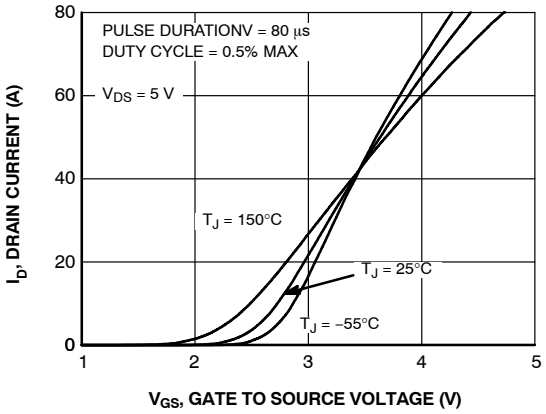


Figure 5. Transfer Characteristics

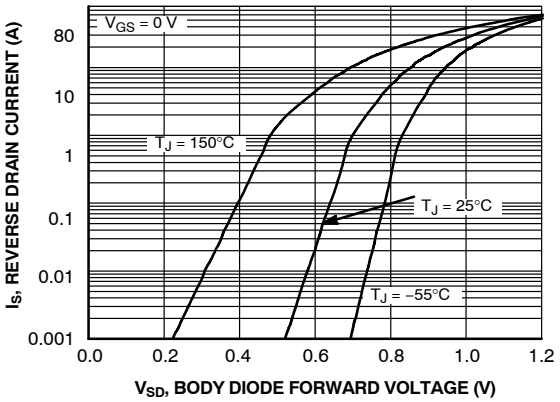


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

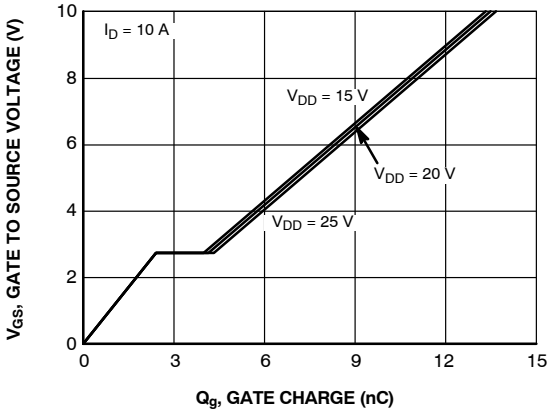


Figure 7. Gate Charge Characteristics

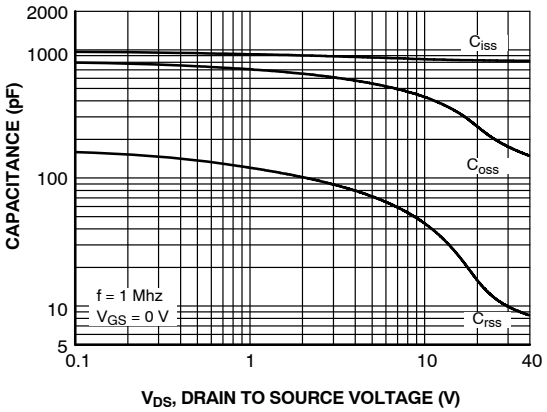


Figure 8. Capacitance vs. Drain to Source Voltage

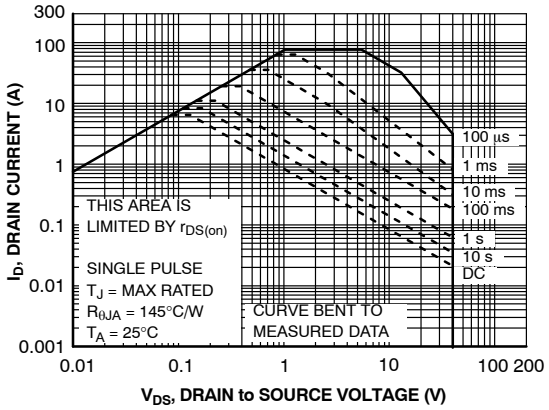


Figure 9. Forward Bias Safe Operating Area

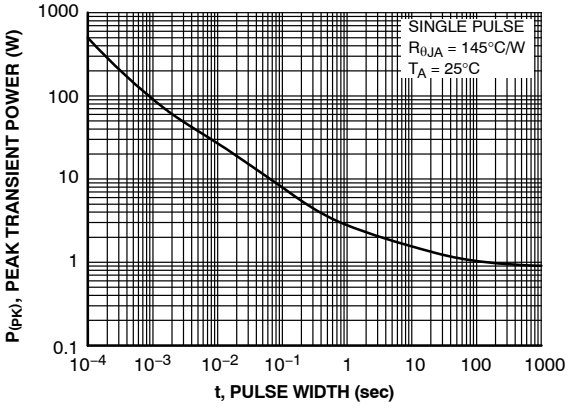


Figure 10. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS T_J = 25°C unless otherwise noted (continued)

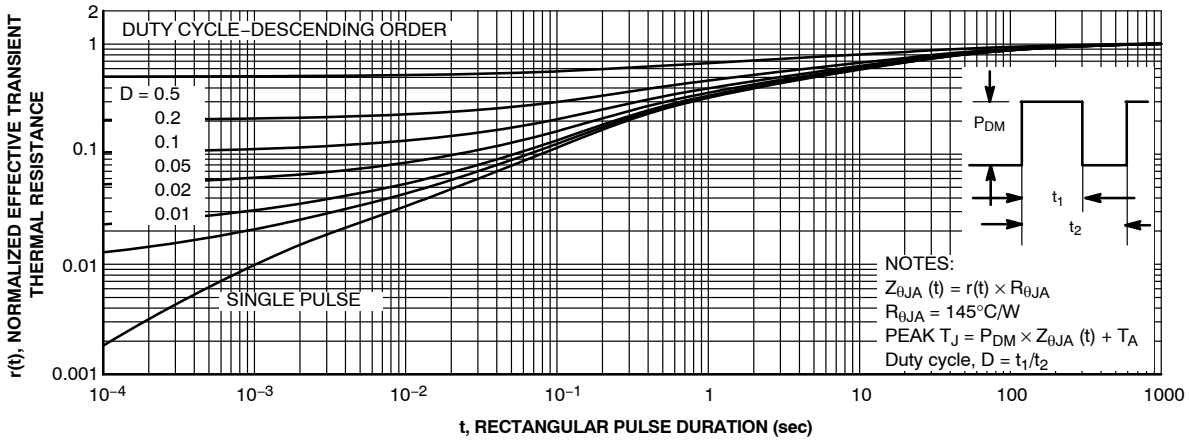
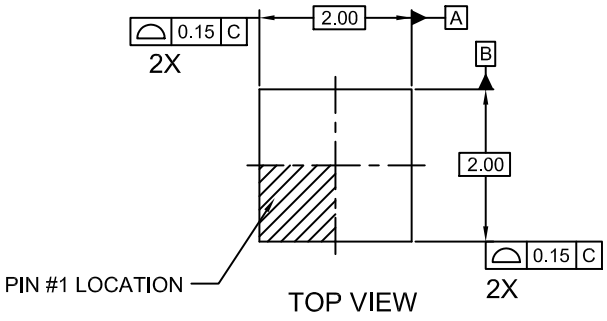
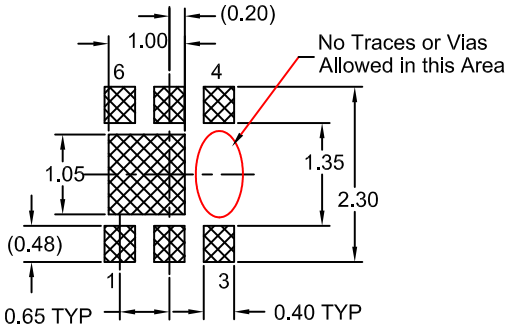


Figure 11. Single Pulse Junction−to−Ambient Transient Thermal Response Curve

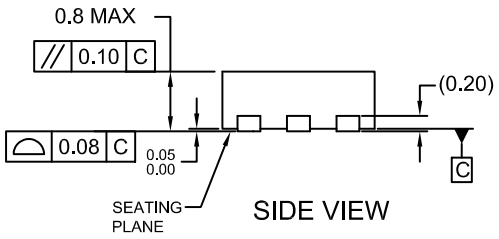
WDFN6 2x2, 0.65P
CASE 511DB
ISSUE O

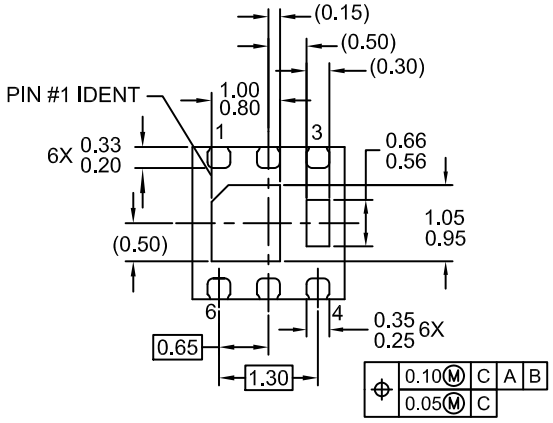
DATE 31 AUG 2016



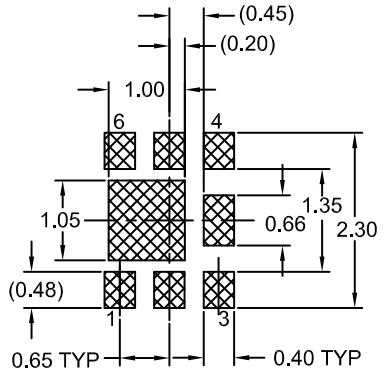


RECOMMENDED LAND PATTERN OPT 1





BOTTOM VIEW



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

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