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July 2014

FDFMA2N028Z

Integrated N-Channel PowerTrench® MOSFET and Schottky Diode

20V, **3.7A**, **68m**Ω

Features

MOSFET

- Max $r_{DS(on)}$ = 68m Ω at V_{GS} = 4.5V, I_D = 3.7A
- Max $r_{DS(on)}$ = 86m Ω at V_{GS} = 2.5V, I_D = 3.3A
- HBM ESD protection level > 2kV (Note 3)

Schottky

- V_E < 0.37V @ 500mA
- Low profile 0.8 mm maximum in the new package MicroFET 2x2 mm
- RoHS Compliant

General Description

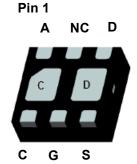
This device is designed specifically as a single package solution for a boost topology in cellular handset and other ultra-portable applications. It features a MOSFET with low on-state resistance, and an independently connected schottky diode with low forward voltage.

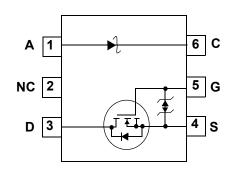
The MicroFET 2x2 package offers exceptional thermal performance for its physical size and is well suited to switching and linear mode applications.

Application

■ DC - DC Conversion







MicroFET 2X2

MOSFET Maximum Ratings T_J = 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	
	Drain Current -Continuous	(Note 1a)	3.7		
ID	-Pulsed		6	Α	
В	Power Dissipation	(Note 1a)	1.4	W	
P_{D}	Power Dissipation	(Note 1b)	0.7	VV	
T _J , T _{STG}	Operating and Storage Junction Temperature Range -55 to		-55 to +150	°C	
V_{RR}	Schottky Repetitive Peak Reverse Voltage		20	V	
Io	Schottky Average Forward Current		2	Α	

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	86	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	173	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1c)	86	C/VV
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1d)	140	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.N28	FDFMA2N028Z	Z MicroFET 2X2 7" 8mm		8mm	3000 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Chara	octeristics					
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	20			V
$\frac{\Delta BV_{DS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _D = 250μA, referenced to 25°C		15		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 16V, V _{GS} = 0V			1	μΑ
I _{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 12V, V_{DS} = 0V$			±10	μΑ
	cteristics					-

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	0.6	1.0	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μ A, referenced to 25°C		-4		mV/°C
		$V_{GS} = 4.5V, I_D = 3.7A$		37	68	
r _{DS(on)}	r _{DS(on)} Static Drain to Source On Resistance	$V_{GS} = 2.5V, I_D = 3.3A$		50	86	mΩ
	$V_{GS} = 4.5V$, $I_D = 3.7A$, $T_J = 125$ °C		53	90		
9 _{FS}	Forward Trans conductance	$V_{DS} = 10V, I_D = 3.7A$		16		S

Dynamic Characteristics

С	iss	Input Capacitance	\\ -40\\\\\ -0\\	340	455	pF
С	oss	Output Capacitance	V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz	80	110	pF
С	rss	Reverse Transfer Capacitance	I = 1.0IVIHZ	60	90	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		8	16	ns
t _r	Rise Time	$V_{DD} = 10V, I_{D} = 1A$ $V_{GS} = 4.5V, R_{GEN} = 6\Omega$	8	16	ns
t _{d(off)}	Turn-Off Delay Time	$V_{GS} = 4.5V, R_{GEN} = 6.22$	14	26	ns
t _f	Fall Time		3	6	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{DS} = 10V I_D = 3.7A$	4	6	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DS} = 10V I_D = 3.7A$ $V_{GS} = 4.5V$	0.7		nC
Q_{gd}	Gate to Drain "Miller" Charge		1.1		nC

Drain-Source Diode Characteristics

Is	Maximum Continuous Drain-Source Diode Forward Current				1.1	Α
V_{SD}	Source to Drain Diode Forward Voltage	V _{GS} = 0V, I _S = 1.1A (Note 2)		0.7	1.2	V
t _{rr}	Reverse Recovery Time	1 = 2.74 di/dt = 1004/		11		ns
Q _{rr}	Reverse Recovery Charge	I _F = 3.7A, di/dt = 100A/μs			nC	

Schottky Diode Characteristics

V_{R}	Reverse Voltage	I _R = 1mA	T _J = 25°C	20			V
Deverse Leekens	V = 20V	T _J = 25°C		30	300	μΑ	
^I R	Reverse Leakage	V _R = 20V	$T_J = 125$ °C		10	45	mA
	V Forward Voltage	I _F = 500mA	T _J = 25°C		0.32	0.37	V
V _F		IF - 300IIIA	$T_J = 125$ °C		0.21	0.26	
V _F Forward Voltage	1 - 10	T _J = 25°C		0.37	0.435	V	
		I _F = 1A	$T_J = 125$ °C		0.28	0.33	

Electrical Characteristics T_J = 25°C unless otherwise noted

- Notes:

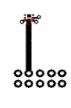
 1: R_{0JA} is determined with the device mounted on a 1in² pad 2 oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{0JC} is guaranteed by design while R_{0JA} is determined by the user's board design.

 (a) MOSFET R_{0JA} = 86°C/W when mounted on a 1in² pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB.

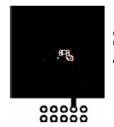
 - (b) MOSFET $R_{\theta JA}$ = 173°C/W when mounted on a minimum pad of 2 oz copper.
 - (c) Schottky $R_{\theta JA} = 86^{\circ}$ C/W when mounted on a 1in² pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB.
 - (d) Schottky R_{0JA} = 140°C/W when mounted on a minimum pad of 2 oz copper.



a)86°C/W when mounted on a 1in² pad of 2 oz copper.



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



c)86°C/W when mounted on a 1in² pad of 2 oz copper.



d)140°C/W when mounted on a minimum pad of 2 oz copper.

- 2: Pulse Test: Pulse Width < 300μ s, Duty cycle < 2.0%.
- 3. The diode connected between the gate and source serves only protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics T_J = 25°C unless otherwise noted

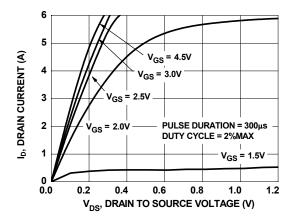


Figure 1. On-Region Characteristics

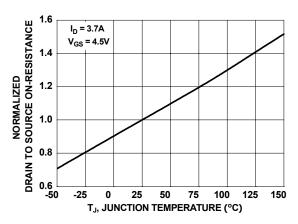


Figure 3. Normalized On-Resistance vs Junction Temperature

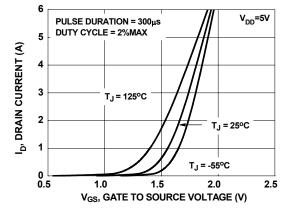


Figure 5. Transfer Characteristics

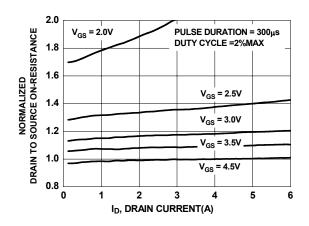


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

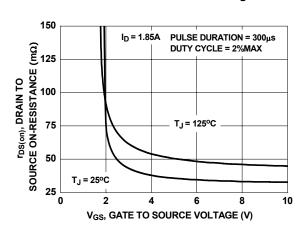


Figure 4. On-Resistance vs Gate to Source Voltage

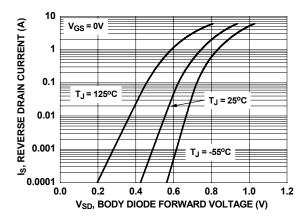


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

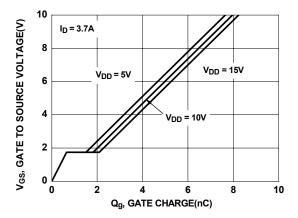


Figure 7. Gate Charge Characteristics

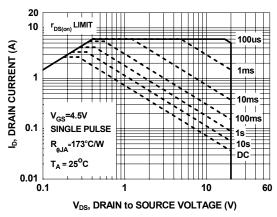


Figure 9. Forward Bias Safe Operating Area

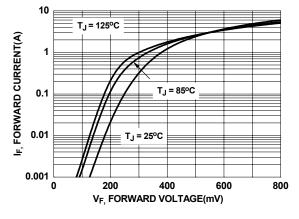


Figure 11. Schottky Diode Forward Current

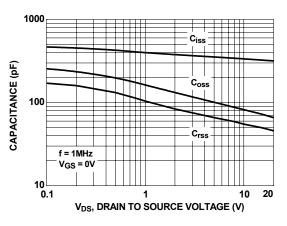


Figure 8. Capacitance Characteristics

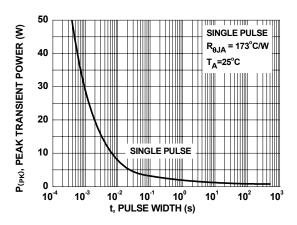


Figure 10. Single Pulse Maximum Power Dissipation

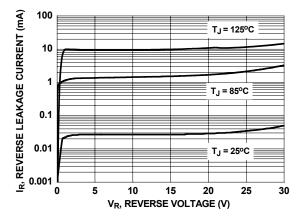


Figure 12. Schottky Diode Reverse Current

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

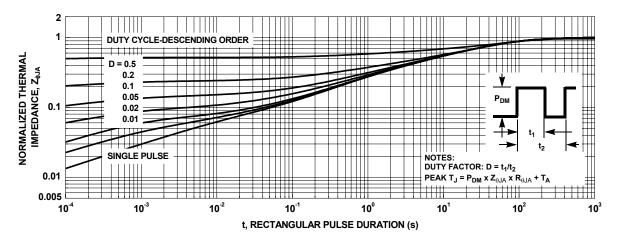
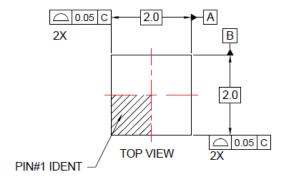
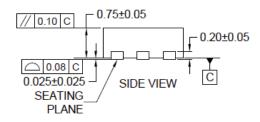
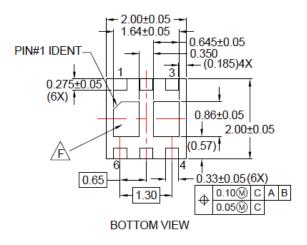


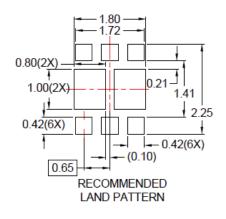
Figure 13. Transient Thermal Response Curve

Dimensional Outline and Pad Layout









NOTES:

- A. CONFORM TO JADEC REGISTRATIONS MO-229, VARIATION VCCC, EXCEPT WHERE NOTED.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
- E. DRAWING FILENAME: MKT-UMLP16Erev4
- F. NON-JEDEC DUAL DAP



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