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July 2014

## FDFMA2N028Z

### Integrated N-Channel PowerTrench® MOSFET and Schottky Diode

**20V, 3.7A, 68mΩ**

#### Features

##### MOSFET

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

##### Schottky

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



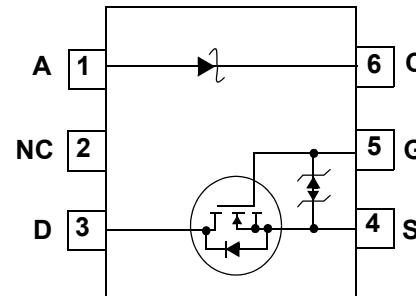
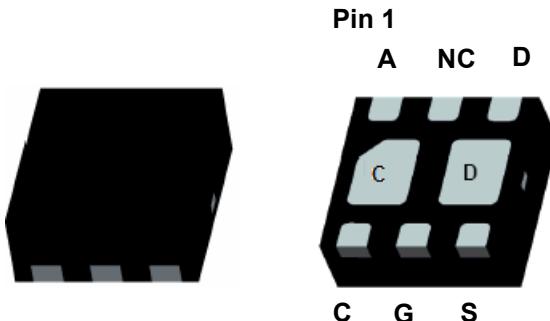
#### General Description

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 $T_J = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	20	V
$V_{GS}$	Gate to Source Voltage	$\pm 12$	V
$I_D$	Drain Current -Continuous (Note 1a)	3.7	A
	-Pulsed	6	
$P_D$	Power Dissipation (Note 1a)	1.4	W
	Power Dissipation (Note 1b)	0.7	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C
$V_{RR}$	Schottky Repetitive Peak Reverse Voltage	20	V
$I_O$	Schottky Average Forward Current	2	A

#### Thermal Characteristics

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

#### Package Marking and Ordering Information

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

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

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

$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	20			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		15		$\text{mV}^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$			1	$\mu\text{A}$
$I_{\text{GSS}}$	Gate to Source Leakage Current	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$			$\pm 10$	$\mu\text{A}$

**On Characteristics**

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	0.6	1.0	1.5	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-4		$\text{mV}^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 4.5\text{V}, I_D = 3.7\text{A}$		37	68	$\text{m}\Omega$
		$V_{GS} = 2.5\text{V}, I_D = 3.3\text{A}$		50	86	
		$V_{GS} = 4.5\text{V}, I_D = 3.7\text{A}, T_J = 125^\circ\text{C}$		53	90	
$g_{FS}$	Forward Trans conductance	$V_{DS} = 10\text{V}, I_D = 3.7\text{A}$		16		s

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$		340	455	pF
$C_{oss}$	Output Capacitance			80	110	pF
$C_{rss}$	Reverse Transfer Capacitance			60	90	pF

**Switching Characteristics**

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

**Drain-Source Diode Characteristics**

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	$V_{GS} = 0\text{V}, I_S = 1.1\text{A}$ (Note 2)			1.1	A
$V_{SD}$	Source to Drain Diode Forward Voltage			0.7	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 3.7\text{A}, di/dt = 100\text{A}/\mu\text{s}$		11		ns
$Q_{rr}$	Reverse Recovery Charge			2		nC

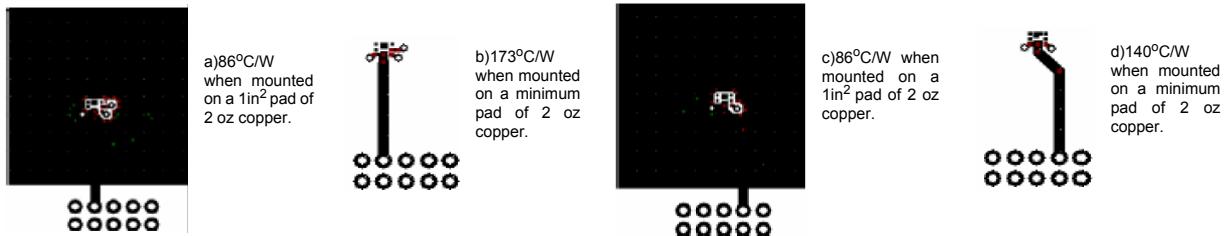
**Schottky Diode Characteristics**

$V_R$	Reverse Voltage	$I_R = 1\text{mA}$	$T_J = 25^\circ\text{C}$	20			V
$I_R$	Reverse Leakage	$V_R = 20\text{V}$	$T_J = 25^\circ\text{C}$		30	300	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		10	45	mA
$V_F$	Forward Voltage	$I_F = 500\text{mA}$	$T_J = 25^\circ\text{C}$		0.32	0.37	V
			$T_J = 125^\circ\text{C}$		0.21	0.26	
		$I_F = 1\text{A}$	$T_J = 25^\circ\text{C}$		0.37	0.435	
			$T_J = 125^\circ\text{C}$		0.28	0.33	

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

### Notes:

1:  $R_{\text{thJA}}$  is determined with the device mounted on a  $1\text{in}^2$  pad 2 oz. copper pad on a  $1.5 \times 1.5$  in. board of FR-4 material.  $R_{\text{thJC}}$  is guaranteed by design while  $R_{\text{thJA}}$  is determined by the user's board design.  
 (a) MOSFET  $R_{\text{thJA}} = 86^\circ\text{C}/\text{W}$  when mounted on a  $1\text{in}^2$  pad of 2 oz copper,  $1.5'' \times 1.5'' \times 0.062''$  thick PCB.  
 (b) MOSFET  $R_{\text{thJA}} = 173^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.  
 (c) Schottky  $R_{\text{thJA}} = 86^\circ\text{C}/\text{W}$  when mounted on a  $1\text{in}^2$  pad of 2 oz copper,  $1.5'' \times 1.5'' \times 0.062''$  thick PCB.  
 (d) Schottky  $R_{\text{thJA}} = 140^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.



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

3. The diode connected between the gate and source serves only protection against ESD. No gate overvoltage rating is implied.

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

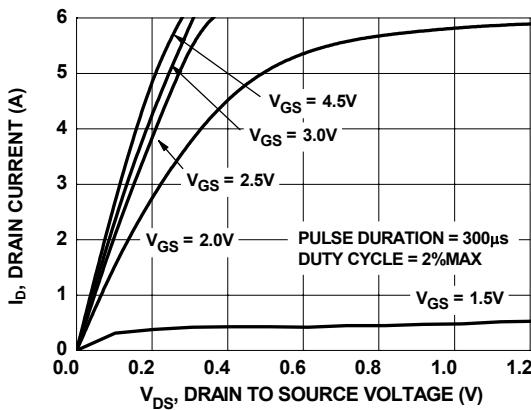


Figure 1. On-Region Characteristics

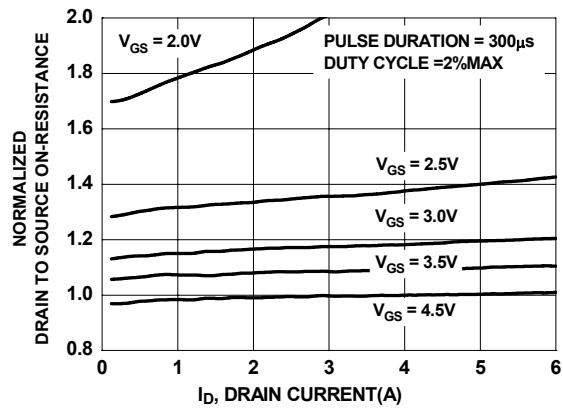


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

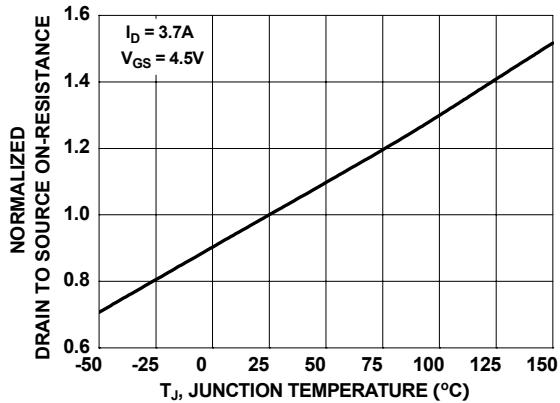


Figure 3. Normalized On-Resistance vs Junction Temperature

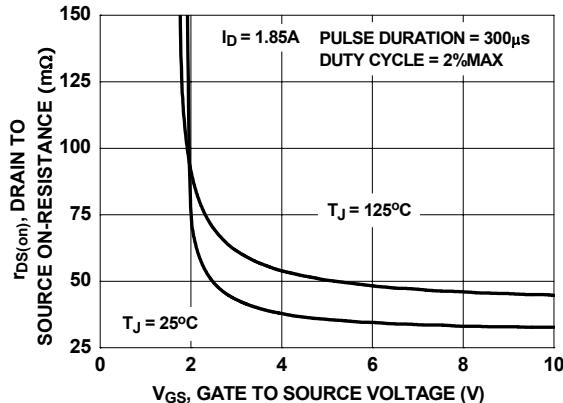


Figure 4. On-Resistance vs Gate to Source Voltage

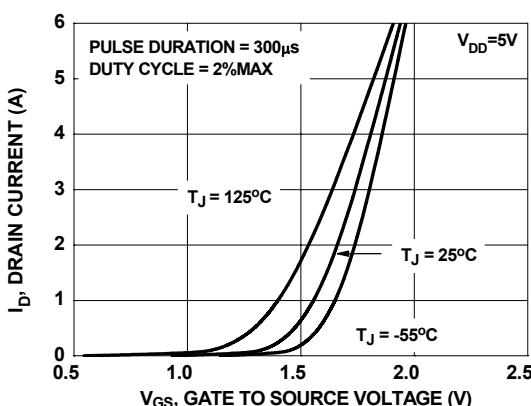


Figure 5. Transfer Characteristics

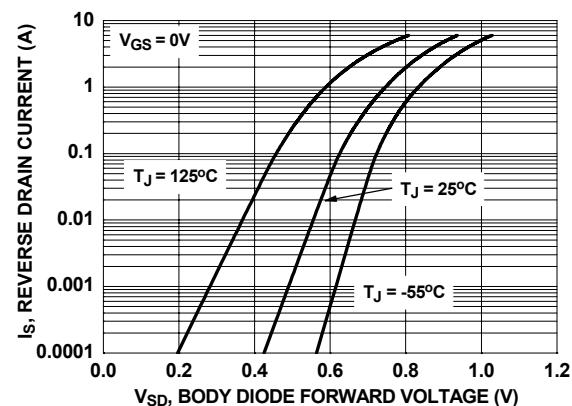


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

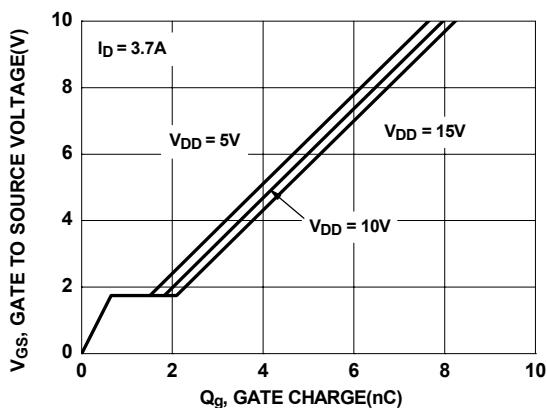


Figure 7. Gate Charge Characteristics

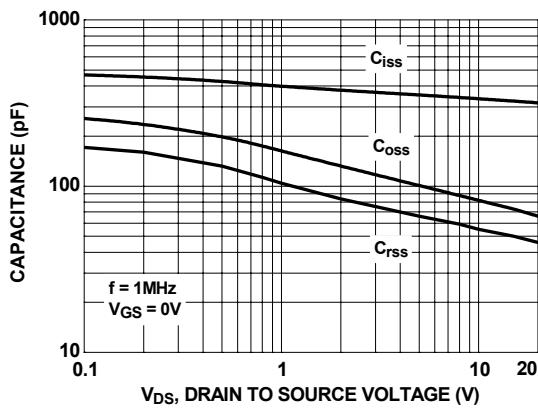


Figure 8. Capacitance Characteristics

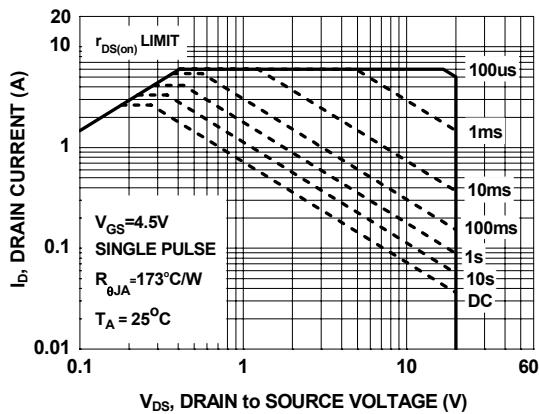


Figure 9. Forward Bias Safe Operating Area

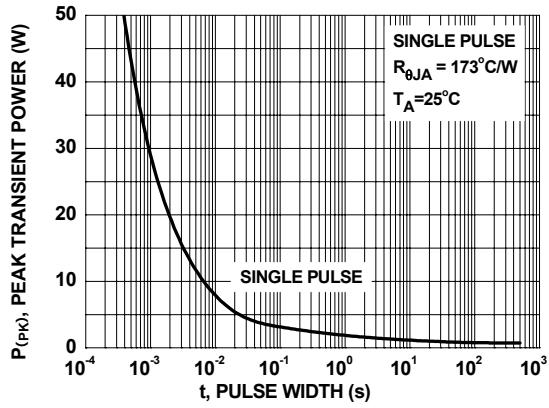


Figure 10. Single Pulse Maximum Power Dissipation

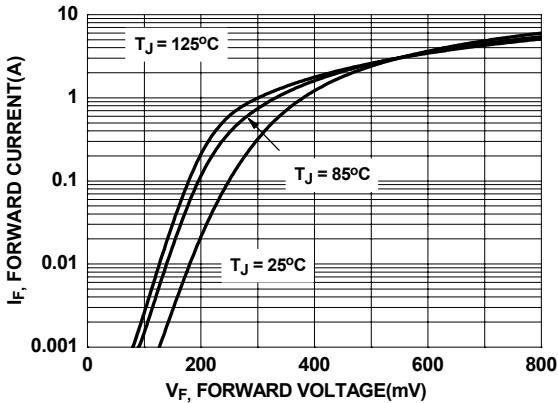


Figure 11. Schottky Diode Forward Current

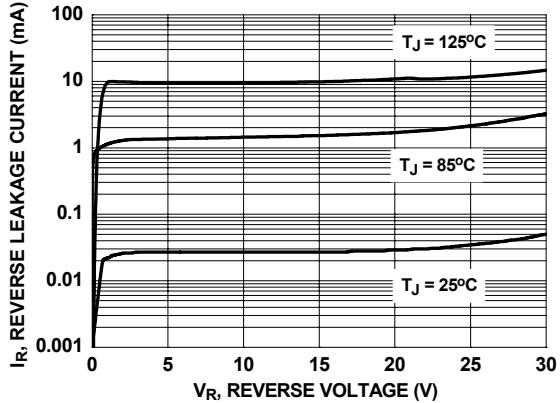


Figure 12. Schottky Diode Reverse Current

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

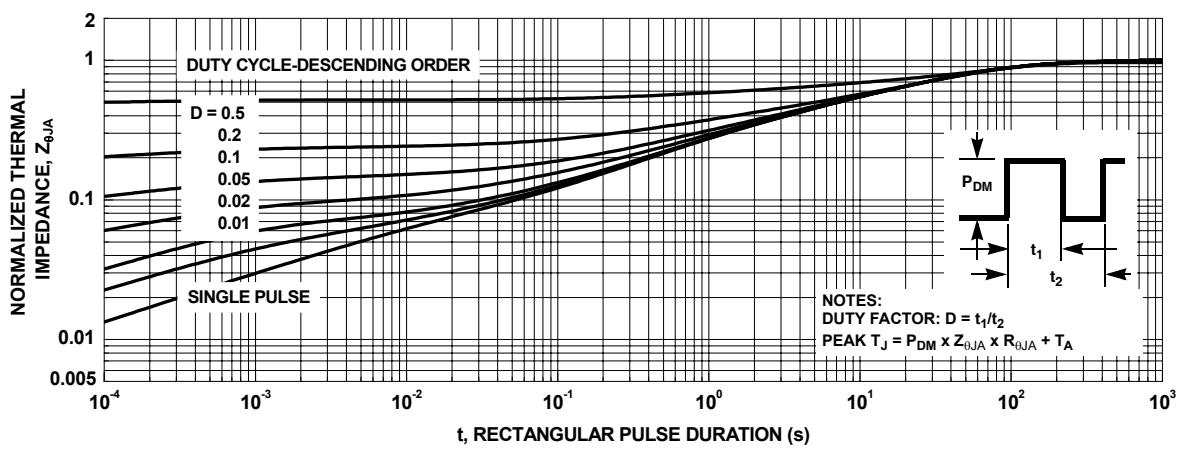
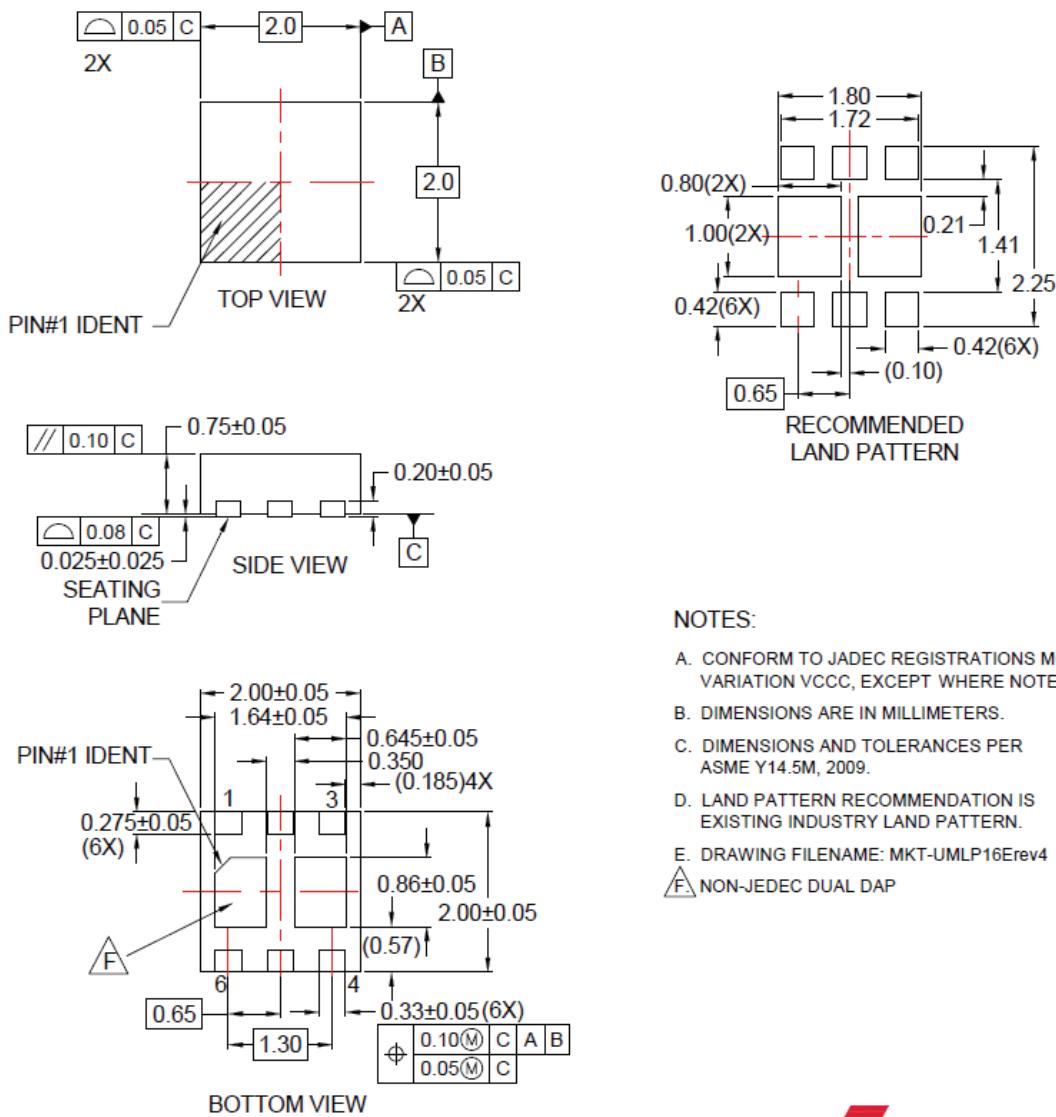


Figure 13. Transient Thermal Response Curve

## Dimensional Outline and Pad Layout



### NOTES:

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

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- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибутором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибутором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А