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March 2016

FDMA410NZT

Ultra Thin N-Channel 1.5 V PowerTrench[®] MOSFET

20 V, 9.5 A, 23 mΩ

Features

- 0.55mm max package height MicroFET 2x2mm Package
- Max $r_{DS(on)}$ = 23 mΩ at $V_{GS} = 4.5$ V, $I_D = 9.5$ A
- Max $r_{DS(on)}$ = 29 mΩ at $V_{GS} = 2.5$ V, $I_D = 8.0$ A
- Max $r_{DS(on)}$ = 36 mΩ at $V_{GS} = 1.8$ V, $I_D = 4.0$ A
- Max $r_{DS(on)}$ = 60 mΩ at $V_{GS} = 1.5$ V, $I_D = 2.0$ A
- HBM ESD protection level > 1.5 kV (Note 3)
- RoHS Compliant



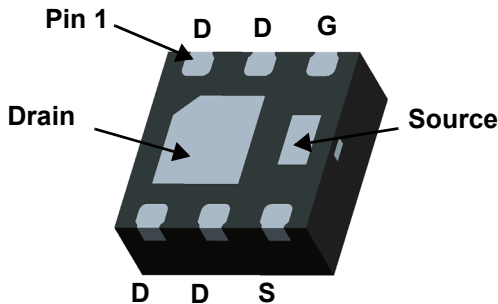
General Description

This Single N-Channel MOSFET has been designed using Fairchild Semiconductor's advanced Power Trench process to optimize the $r_{DS(ON)}$ @ $V_{GS} = 1.5$ V on special MicroFET leadframe.

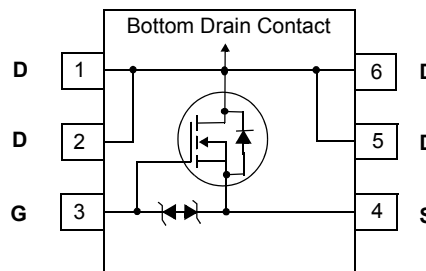
This design is similar to the FDMA410NZ, however it features our new advanced 0.55mm max 2x2 MLP package technology.

Applications

- Li-Ion Battery Pack
- Baseband Switch
- Load Switch
- DC-DC Conversion
- Mobile Device Switching



MicroFET 2X2 (Bottom View)



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

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	20	V
V_{GS}	Gate to Source Voltage	±8	V
I_D	-Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	9.5
	-Pulsed	(Note 4)	63
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	2.4
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1b)	0.9
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	(Note 1a)	52	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	145	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
410T	FDMA410NZT	MicroFET 2X2	7"	8 mm	3000 units

FDMA410NZT Ultra Thin N-Channel 1.5 V PowerTrench[®] MOSFET

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	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		15		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16\ \text{V}$, $V_{GS} = 0\ \text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 8\ \text{V}$, $V_{DS} = 0\ \text{V}$			± 10	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	0.4	0.8	1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-3		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 4.5\ \text{V}$, $I_D = 9.5\ \text{A}$		14	23	m Ω
		$V_{GS} = 2.5\ \text{V}$, $I_D = 8.0\ \text{A}$		18	29	
		$V_{GS} = 1.8\ \text{V}$, $I_D = 4.0\ \text{A}$		25	36	
		$V_{GS} = 1.5\ \text{V}$, $I_D = 2.0\ \text{A}$		35	60	
		$V_{GS} = 4.5\ \text{V}$, $I_D = 9.5\ \text{A}$, $T_J = 125\text{ }^\circ\text{C}$		21	32	
g_{FS}	Forward Transconductance	$V_{DD} = 5\ \text{V}$, $I_D = 9.5\ \text{A}$		36		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 10\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$		935	1310	pF
C_{oss}	Output Capacitance			122	170	pF
C_{rss}	Reverse Transfer Capacitance			84	118	pF
R_g	Gate Resistance	$f = 1\ \text{MHz}$	0.1	1.4	3.0	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 10\ \text{V}$, $I_D = 9.5\ \text{A}$, $V_{GS} = 4.5\ \text{V}$, $R_{GEN} = 6\ \Omega$		8.5	17	ns
t_r	Rise Time			3.0	10	ns
$t_{d(off)}$	Turn-Off Delay Time			27	44	ns
t_f	Fall Time			3.3	10	ns
Q_g	Total Gate Charge			10	14	nC
Q_{gs}	Gate to Source Charge	$V_{GS} = 4.5\ \text{V}$, $V_{DD} = 10\ \text{V}$, $I_D = 9.5\ \text{A}$		1.2		nC
Q_{gd}	Gate to Drain "Miller" Charge			2.0		nC

Drain-Source Diode Characteristics

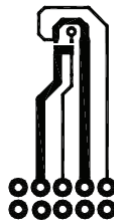
I_S	Maximum Continuous Drain-Source Diode Forward Current			2.0	A	
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_S = 2.0\ \text{A}$ (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 9.5\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		16	30	ns
Q_{rr}	Reverse Recovery Charge			4.5	10	nC

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a $1\ \text{in}^2$ pad 2 oz copper pad on a $1.5 \times 1.5\ \text{in.}$ board of FR-4 material. $R_{\theta JA}$ is determined by the user's board design.



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



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

2. Pulse Test: Pulse Width < 300 ms, 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. Pulsed I_D please refer to Fig.11 SOA curve for more details.

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

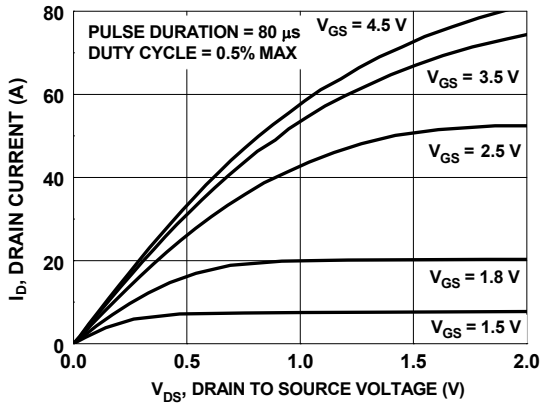


Figure 1. On Region Characteristics

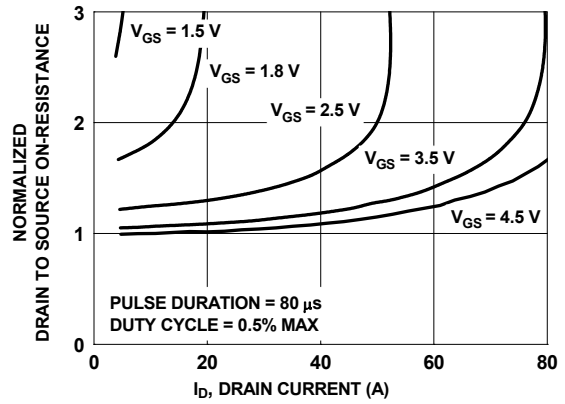


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

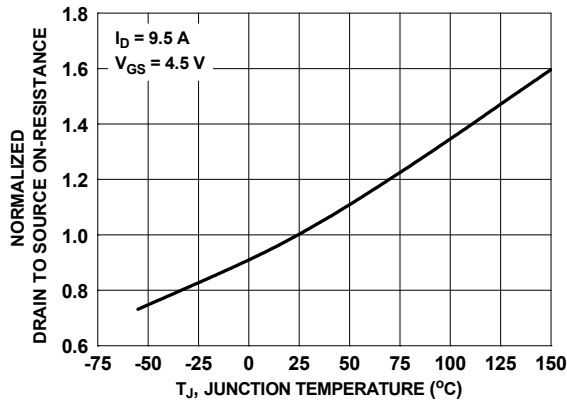


Figure 3. Normalized On Resistance vs Junction Temperature

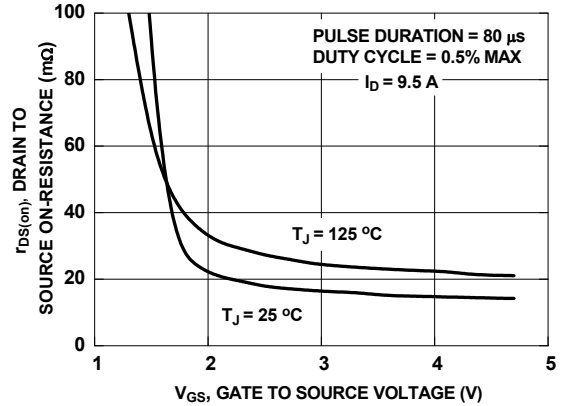


Figure 4. On-Resistance vs Gate to Source Voltage

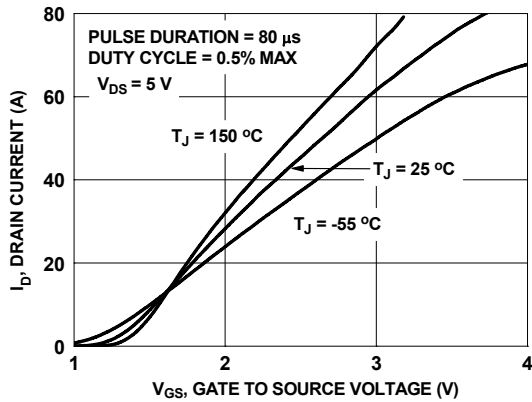


Figure 5. Transfer Characteristics

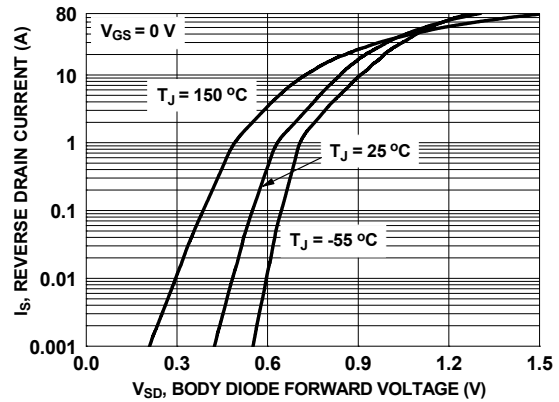


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

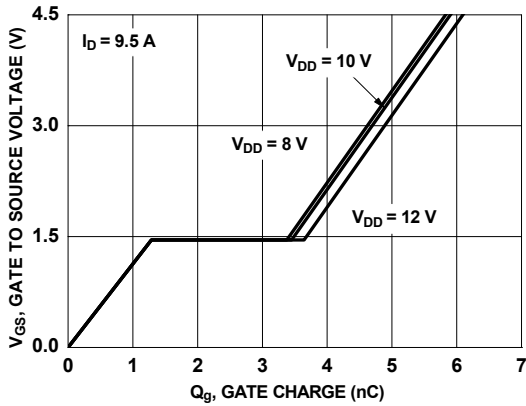


Figure 7. Gate Charge Characteristics

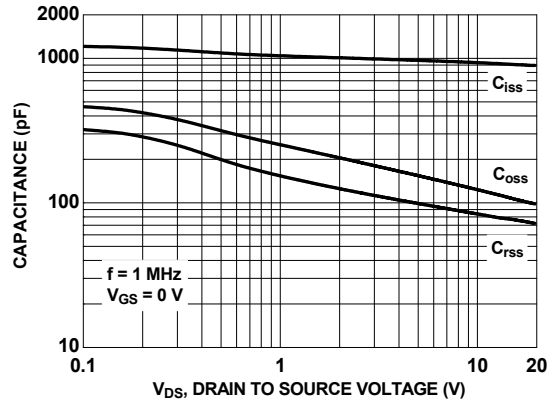


Figure 8. Capacitance vs Drain to Source Voltage

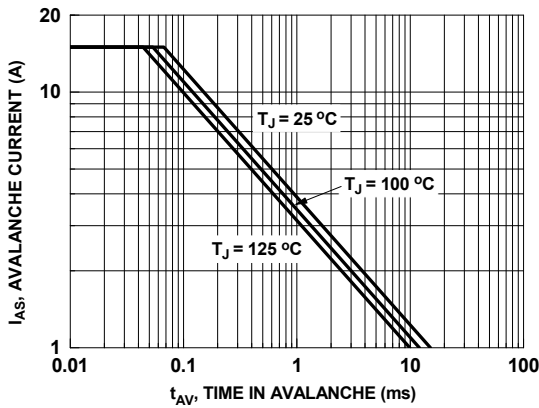


Figure 9. Unclamped Inductive Switching Capability

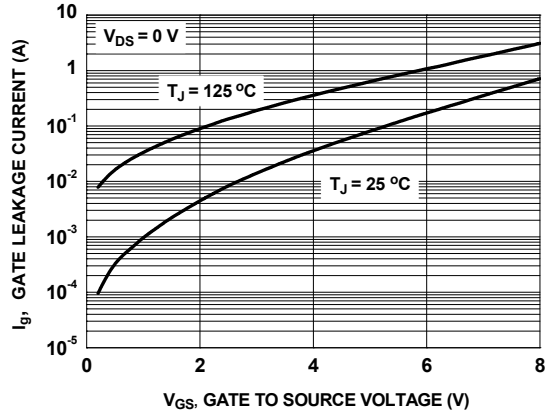


Figure 10. Gate Leakage Current vs Gate to Source Voltage

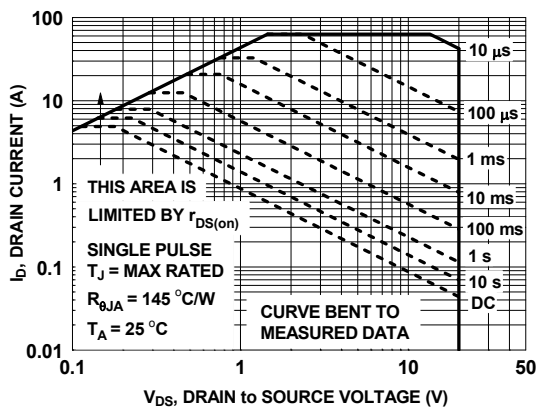


Figure 11. Forward Bias Safe Operating Area

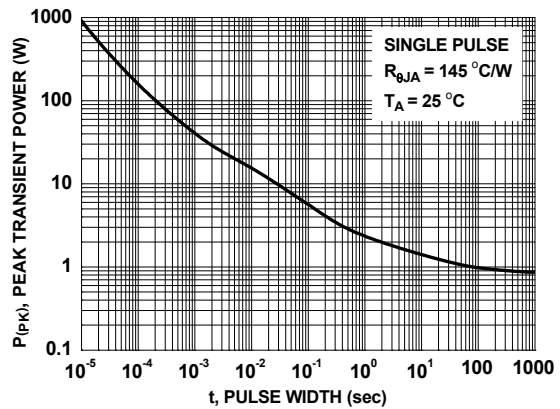


Figure 12. Single Pulse Maximum Power Dissipation

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

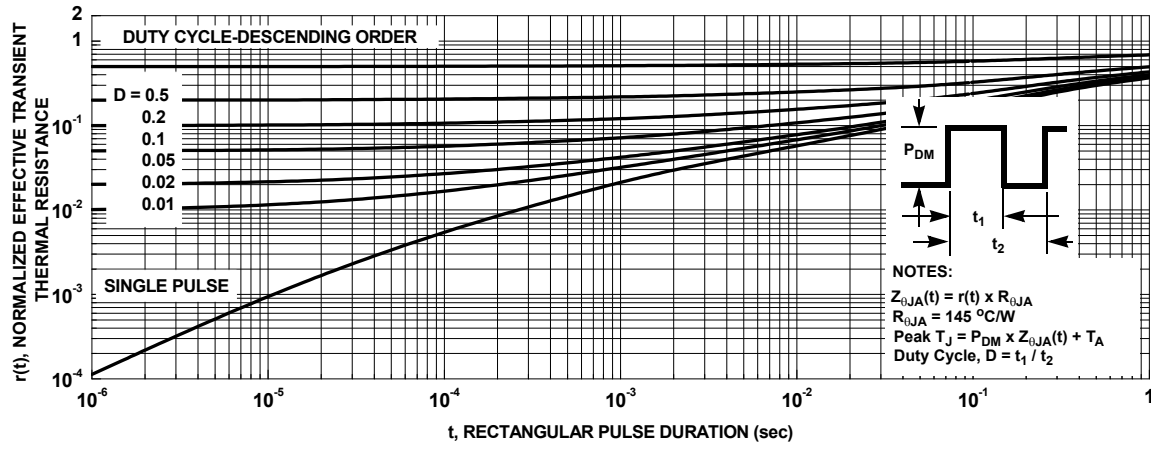
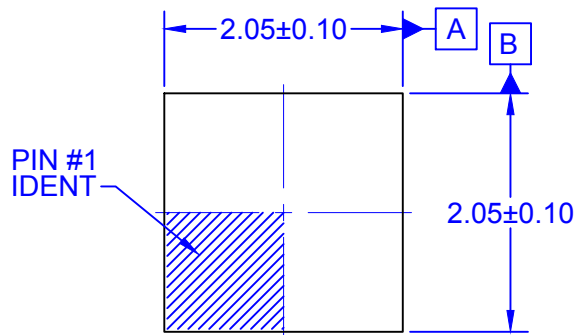
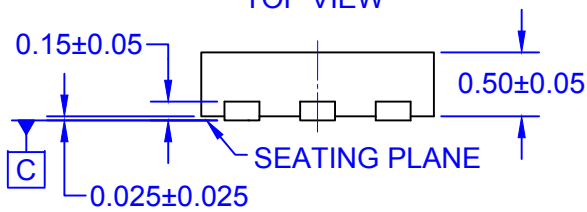


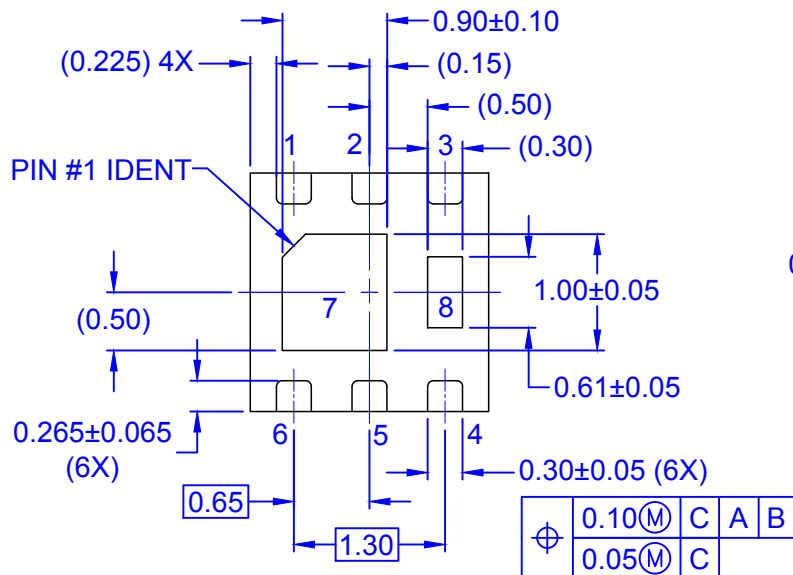
Figure 13. Junction-to-Case Transient Thermal Response Curve



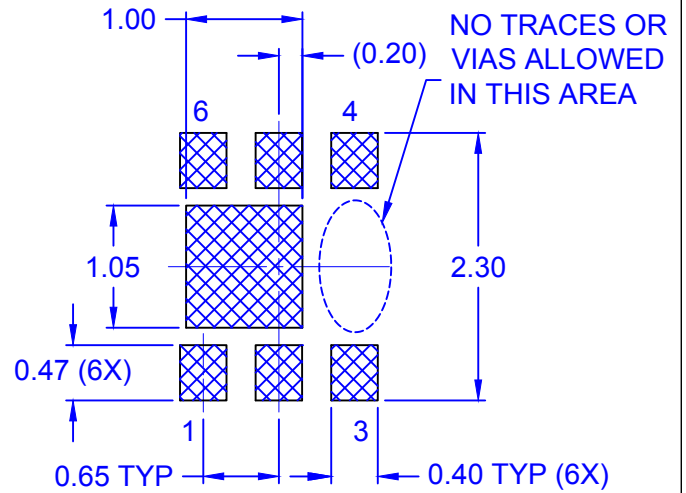
TOP VIEW



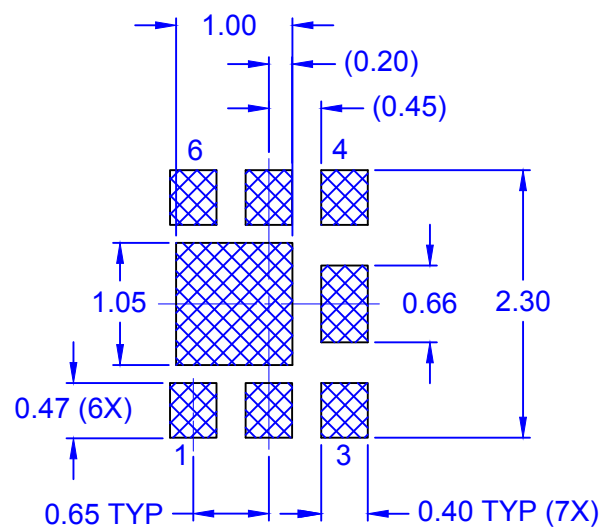
SIDE VIEW



BOTTOM VIEW



RECOMMENDED LAND PATTERN OPT 1



RECOMMENDED LAND PATTERN OPT 2

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- B. DIMENSIONS ARE IN MILLIMETERS.
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