

# MOSFET – N-Channel, POWERTRENCH®

20 V, 16.5 A, 5 mΩ

## FDMC8554

### General Description

This N-Channel MOSFET is a rugged gate version of onsemi's advanced Power Trench process. It has been optimized for power management applications.

### Features

- Max  $R_{DS(on)}$  = 5 mΩ at  $V_{GS}$  = 10 V,  $I_D$  = 16.5 A
- Max  $R_{DS(on)}$  = 6.4 mΩ at  $V_{GS}$  = 4.5 V,  $I_D$  = 14 A
- Low Profile – 1 mm Max in Power 33
- This Device is Pb-Free, Halide Free and is RoHS Compliant

### Applications

- DC-DC Conversion

### ABSOLUTE MAXIMUM RATINGS ( $T_A$ = 25°C unless otherwise noted.)

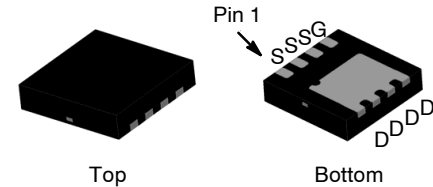
Symbol	Parameter	Value	Unit
$V_{DS}$	Drain to Source Voltage	20	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current		A
	– Continuous $T_C = 25^\circ\text{C}$	16.5	
	– Continuous (Note 1a) $T_A = 25^\circ\text{C}$	16.5	
	– Pulsed	36	
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	41	W
	Power Dissipation (Note 1a) $T_A = 25^\circ\text{C}$	2.0	
$T_J, T_{STG}$	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 ( $T_A$ = 25°C unless otherwise noted.)

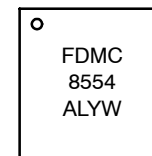
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	60	°C/W

$V_{DS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
20 V	5 mΩ @ 10 V	16.5 A
	6.4 mΩ @ 4.5 V	



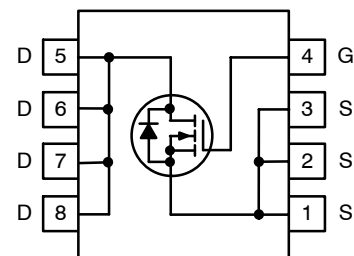
WDFN8 3.3x3.3, 0.65P  
CASE 511DH

### MARKING DIAGRAM



FDMC8554 = Device Code  
A = Assembly Site  
L = Wafer Lot Number  
YW = Assembly Start Week

### PIN ASSIGNMENT



N-Channel MOSFET

### ORDERING INFORMATION

Device	Package	Shipping†
FDMC8554	WDFN8 (Pb-Free, Halide Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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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
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$	–	15.7	–	mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 16\ \text{V}$ , $V_{GS} = 0\ \text{V}$	–	–	1	$\mu\text{A}$
		$V_{DS} = 16\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $T_J = 125^\circ\text{C}$	–	–	100	
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$	–	–	$\pm 100$	nA

**ON CHARACTERISTICS**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	1.0	1.8	3.0	V
$\Delta V_{GS(th)} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$	–	–6.1	–	mV/ $^\circ\text{C}$
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 16.5\ \text{A}$	–	3.6	5.0	m $\Omega$
		$V_{GS} = 4.5\ \text{V}$ , $I_D = 14\ \text{A}$	–	4.6	6.4	
		$V_{GS} = 10\ \text{V}$ , $I_D = 16.5\ \text{A}$ , $T_J = 125^\circ\text{C}$	–	5.4	7.1	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\ \text{V}$ , $I_D = 16.5\ \text{A}$	–	62	–	S

**DYNAMIC CHARACTERISTICS**

$C_{iss}$	Input Capacitance	$V_{DS} = 10\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	–	2540	3380	pF
$C_{oss}$	Output Capacitance		–	795	1060	pF
$C_{rss}$	Reverse Transfer Capacitance		–	510	765	pF
$R_g$	Gate Resistance	$f = 1\ \text{MHz}$	–	1.2	–	$\Omega$

**SWITCHING CHARACTERISTICS**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 10\ \text{V}$ , $I_D = 16.5\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$	–	13	24	ns
$t_r$	Rise Time		–	10	20	ns
$t_{d(off)}$	Turn-Off Delay Time		–	32	51	ns
$t_f$	Fall Time		–	7	14	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{DD} = 10\ \text{V}$ , $I_D = 16.5\ \text{A}$	–	44	62	nC
$Q_{g(TOT)}$	Total Gate Charge at 4.5V		–	24	34	nC
$Q_{gs}$	Gate to Source Gate Charge		–	8.5	–	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		–	10	–	nC

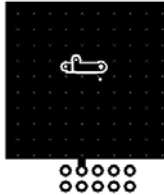
**DRAIN-SOURCE DIODE CHARACTERISTICS**

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$ , $I_S = 16.5\ \text{A}$ (Note 2)	–	0.8	1.3	V
$t_{rr}$	Reverse Recovery Time	$I_F = 16.5\ \text{A}$ , $di/dt = 100\ \text{A}/\mu\text{s}$	–	31	47	ns
$Q_{rr}$	Reverse Recovery Charge		–	22	33	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:**

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a)  $60^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b)  $135^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

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

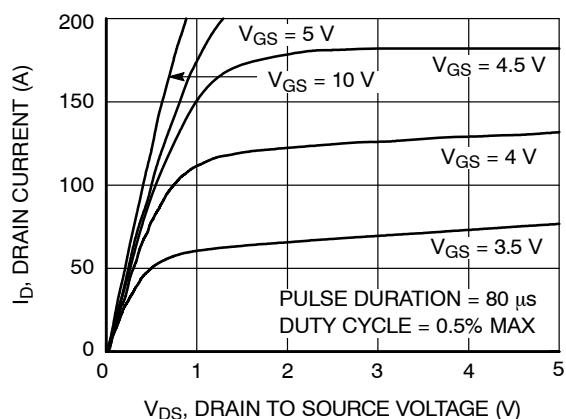
TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Figure 1. On Region Characteristics

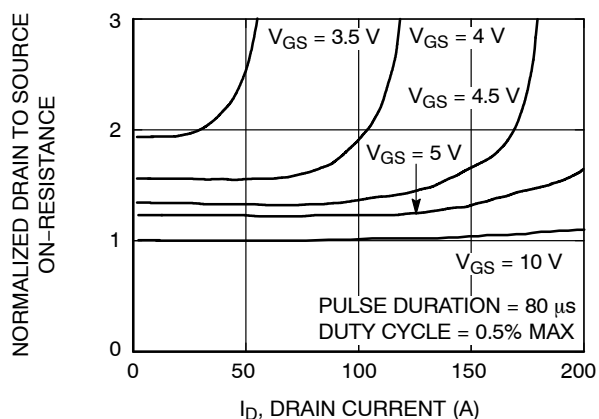


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

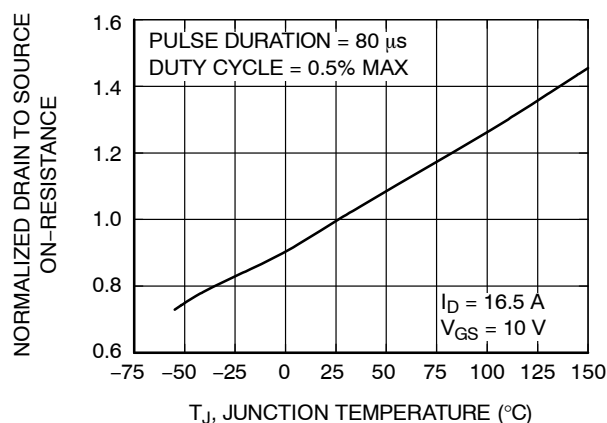


Figure 3. Normalized On Resistance vs. Junction Temperature

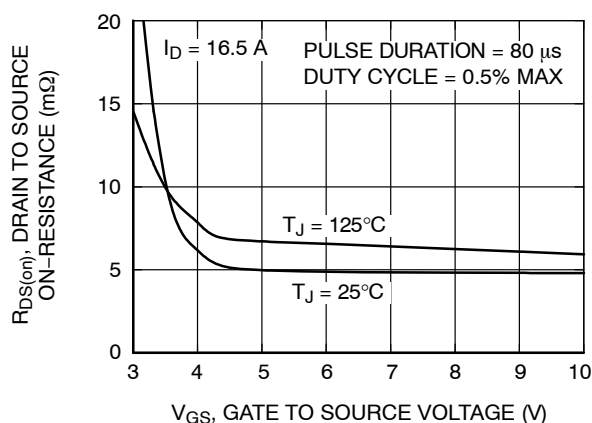


Figure 4. On-Resistance vs. Gate to Source Voltage

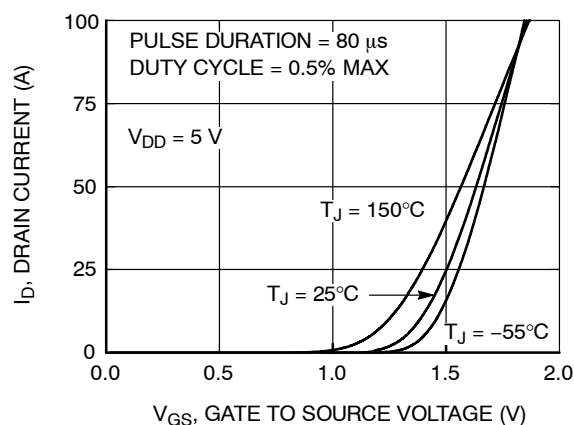


Figure 5. Transfer Characteristics

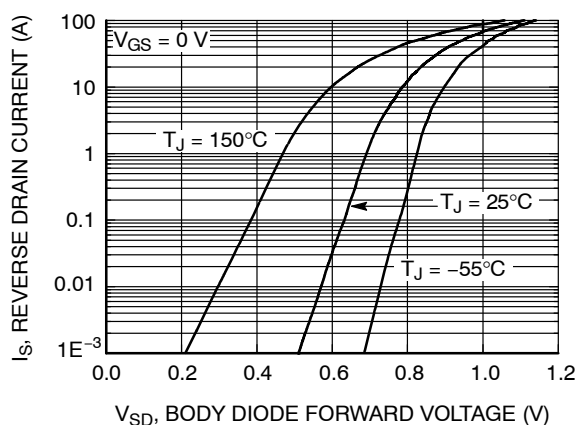


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

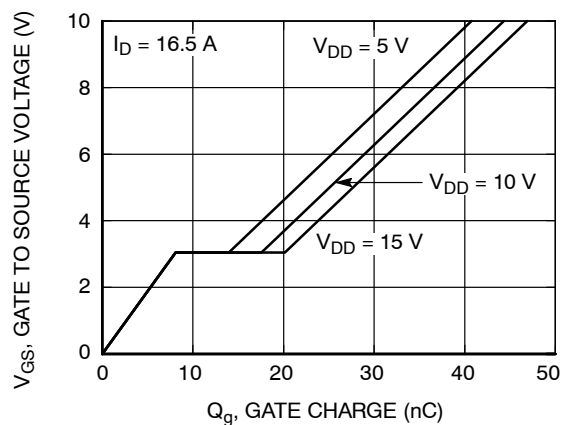
TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

Figure 7. Gate Charge Characteristics

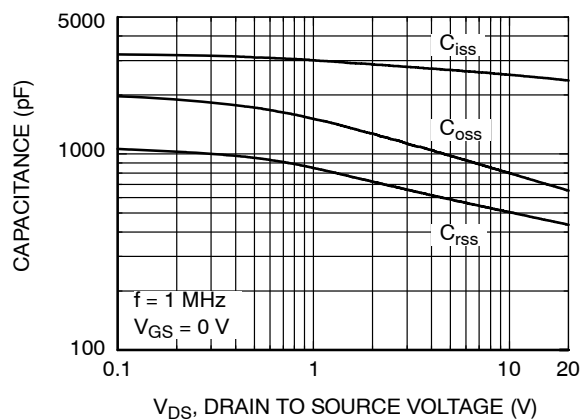


Figure 8. Capacitance vs. Drain to Source Voltage

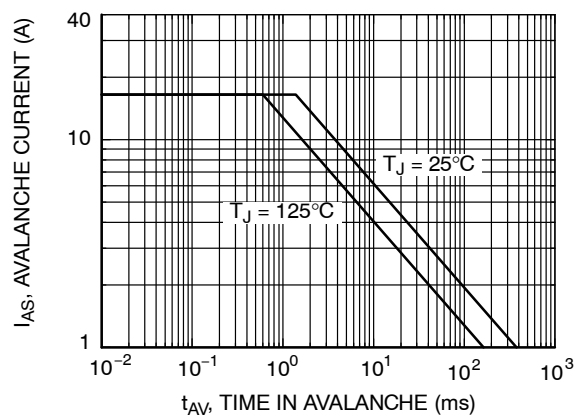


Figure 9. Unclamped Inductive Switching Capability

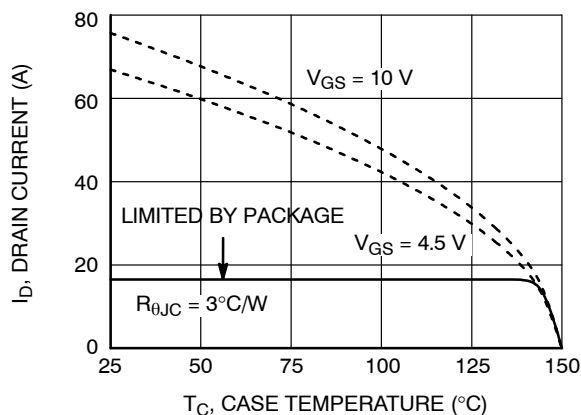


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

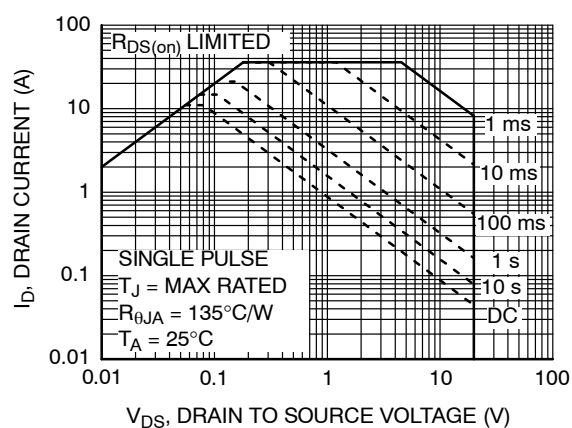


Figure 11. Forward Bias Safe Operating Area

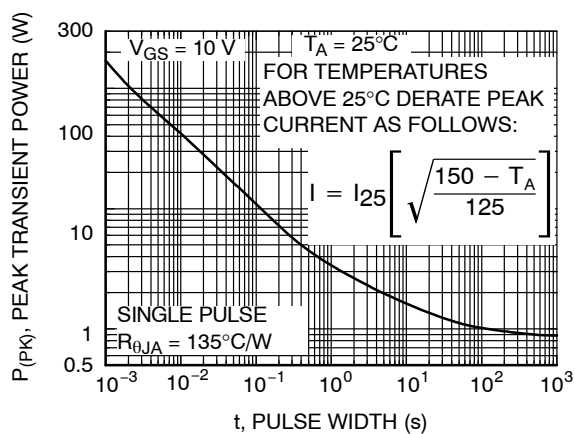


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

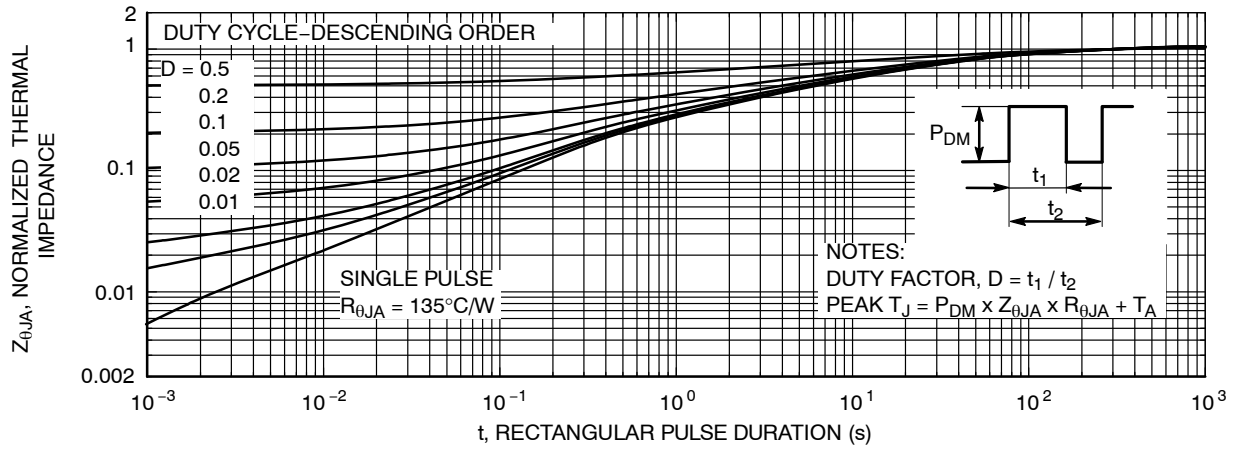
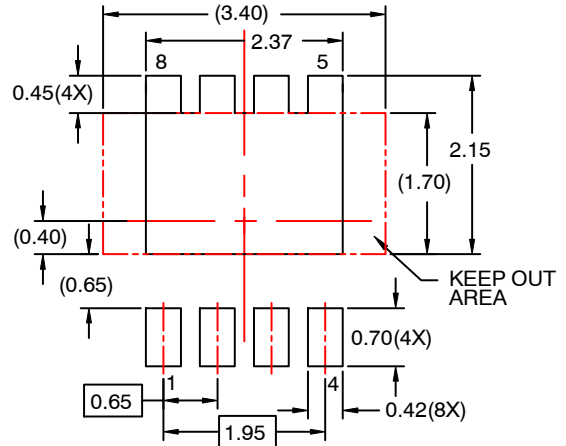
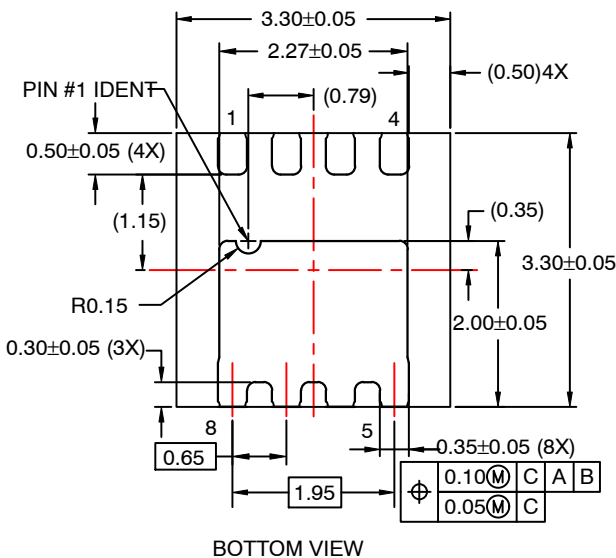
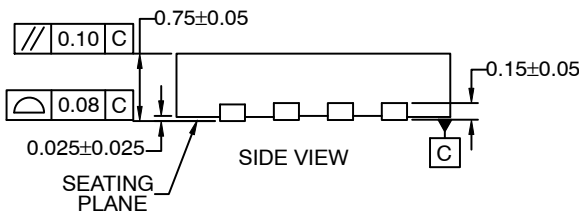
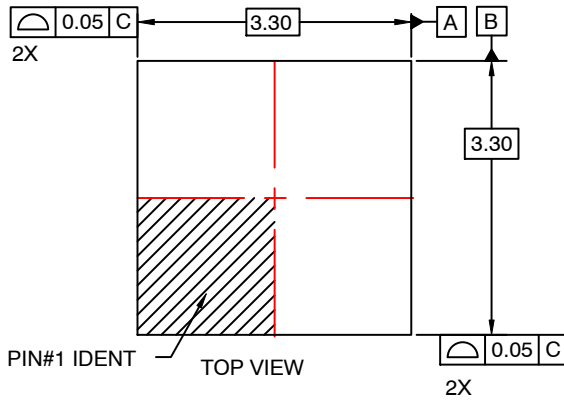


Figure 13. Transient Thermal Response Curve

**WDFN8 3.3x3.3, 0.65P**  
**CASE 511DH**  
**ISSUE O**

DATE 31 JUL 2016



**RECOMMENDED LAND PATTERN**

**NOTES:**

- A. DOES NOT CONFORM TO JEDEC REGISTRATION MO-229
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

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