

# FDB031N08

## N-Channel PowerTrench® MOSFET

75 V, 235 A, 3.1 mΩ

### Features

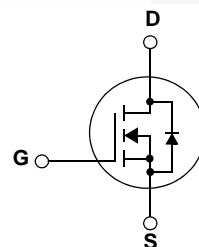
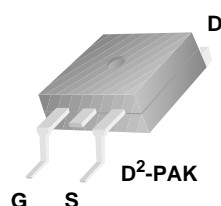
- $R_{DS(on)} = 2.4 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies



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

Symbol	Parameter	FDB031N08	Unit
$V_{DSS}$	Drain to Source Voltage	75	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current <ul style="list-style-type: none"> <li>- Continuous (<math>T_C = 25^\circ\text{C}</math>, Silicon Limited)</li> <li>- Continuous (<math>T_C = 100^\circ\text{C}</math>, Silicon Limited)</li> <li>- Continuous (<math>T_C = 25^\circ\text{C}</math>, Package Limited)</li> </ul>	235*	A
		165*	A
		120	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	940	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	1995	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)	5.5	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	375	W
		2.5	W/°C
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	°C
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

\*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

### Thermal Characteristics

Symbol	Parameter	FDB031N08	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

**Package Marking and Ordering Information**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB031N08	FDB031N08	D <sup>2</sup> -PAK	330mm	24mm	800

**Electrical Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$ , $T_C = 25^\circ\text{C}$	75	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.05	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 75\text{V}$ , $V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 75\text{V}$ , $T_C = 150^\circ\text{C}$	-	-	500	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}$ , $I_D = 75\text{A}$	-	2.4	3.1	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}$ , $I_D = 75\text{A}$	-	180	-	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	11400	15160	pF
$C_{oss}$	Output Capacitance		-	1360	1810	pF
$C_{rss}$	Reverse Transfer Capacitance		-	595	800	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 60\text{V}$ , $I_D = 75\text{A}$ $V_{GS} = 10\text{V}$ (Note 4)	-	169	220	nC
$Q_{gs}$	Gate to Source Gate Charge		-	60	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	47	-	nC

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 37.5\text{V}$ , $I_D = 75\text{A}$ $R_{GEN} = 25\Omega$ , $V_{GS} = 10\text{V}$ (Note 4)	-	230	470	ns
$t_r$	Turn-On Rise Time		-	191	392	ns
$t_{d(off)}$	Turn-Off Delay Time		-	335	680	ns
$t_f$	Turn-Off Fall Time		-	121	252	ns

**Drain-Source Diode Characteristics**

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	235	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	940	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 75A	-	-	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 75A dI <sub>F</sub> /dt = 100A/μs	-	53	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	77	-	nC

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 0.71\text{mH}$ ,  $I_{AS} = 75\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 75\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

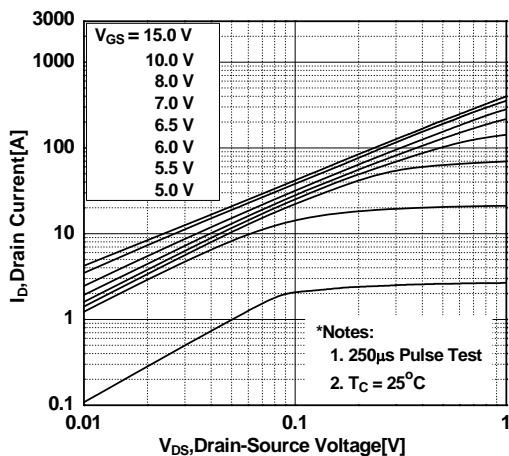


Figure 2. Transfer Characteristics

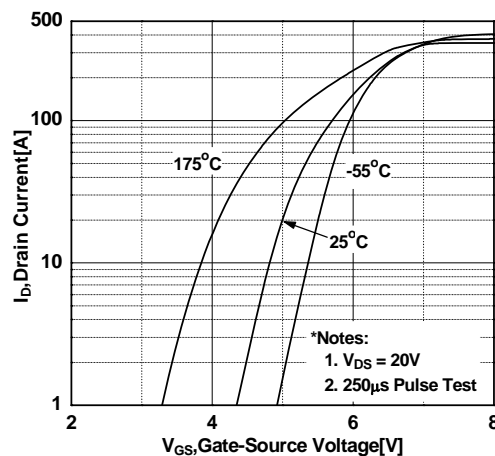


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

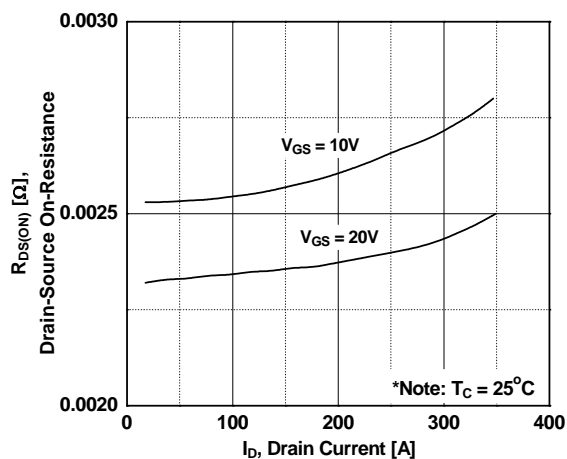


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

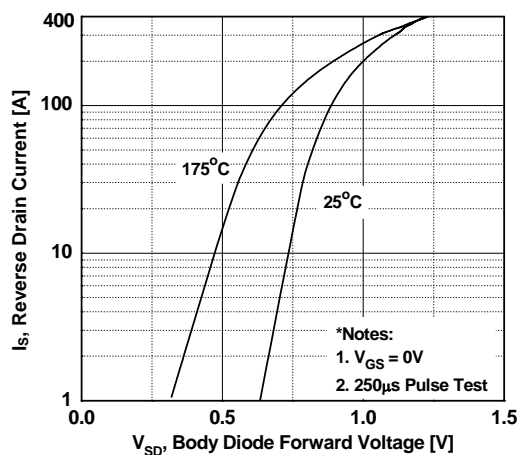


Figure 5. Capacitance Characteristics

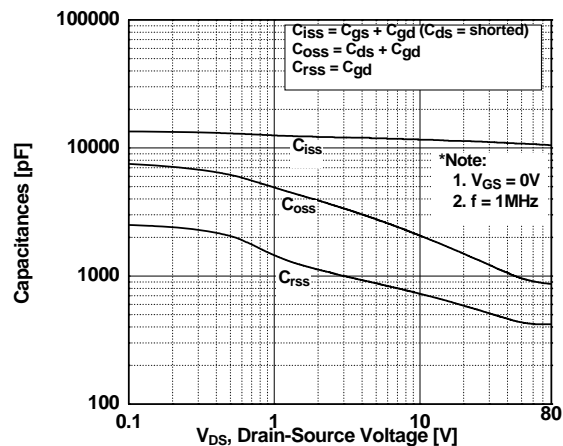
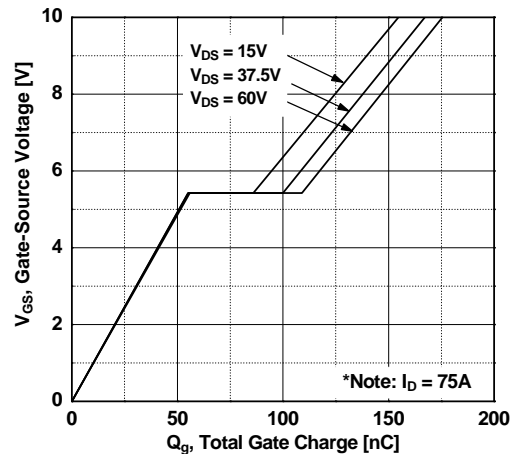


Figure 6. Gate Charge Characteristics



## Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

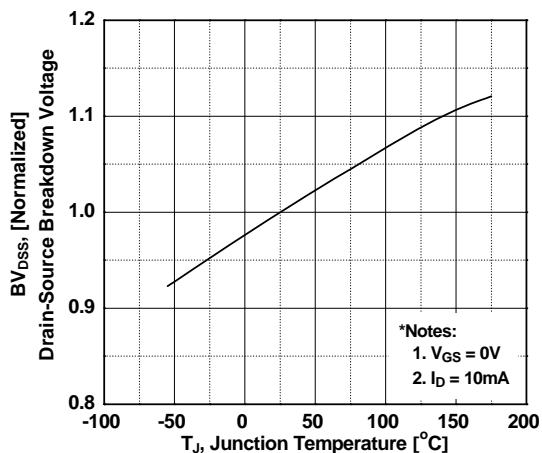


Figure 8. On-Resistance Variation vs. Temperature

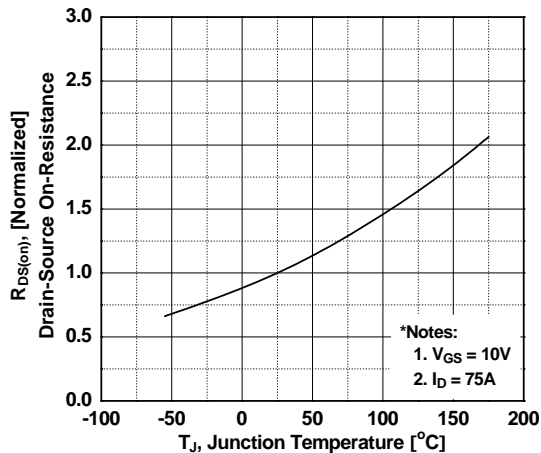


Figure 9. Maximum Safe Operating Area

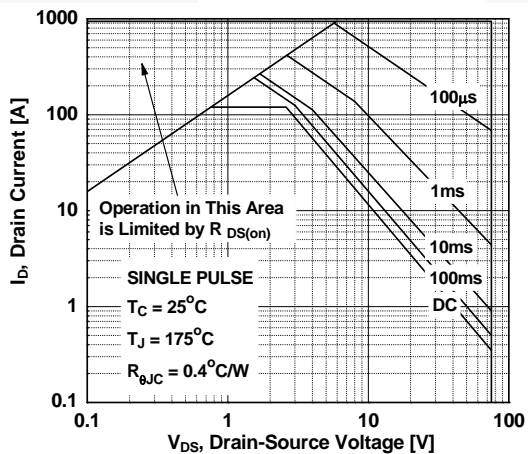


Figure 10. Maximum Drain Current vs. Case Temperature

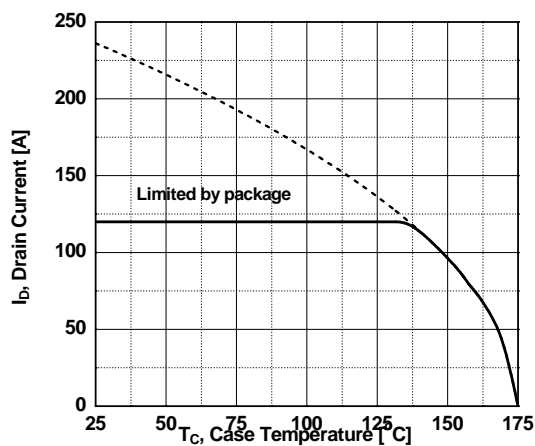
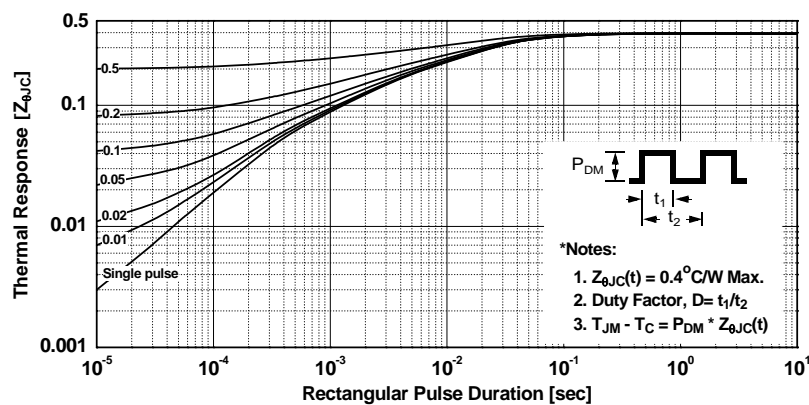
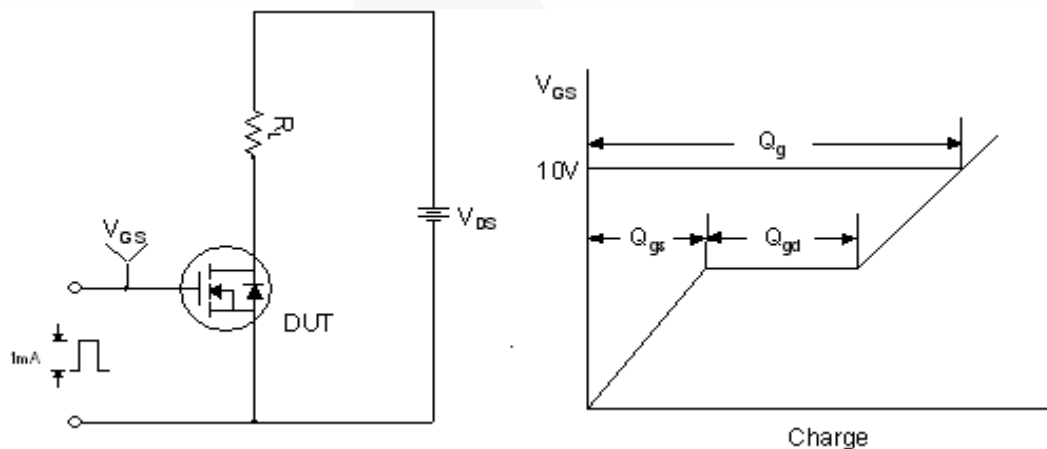


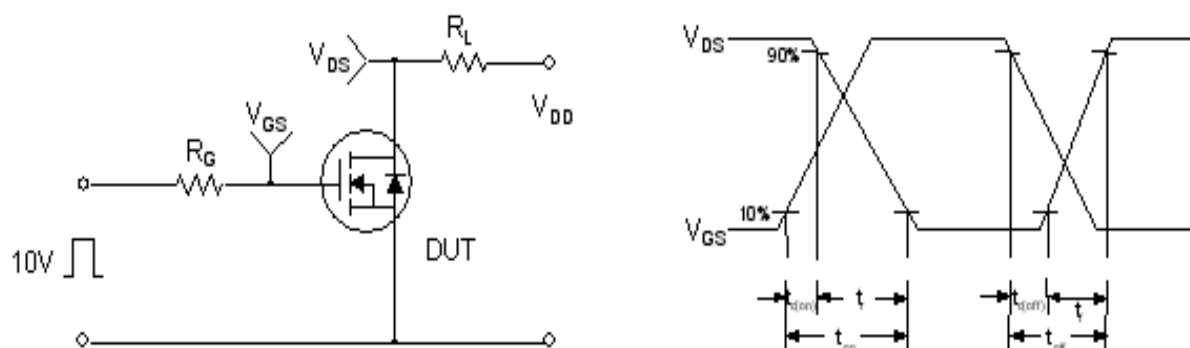
Figure 11. Transient Thermal Response Curve



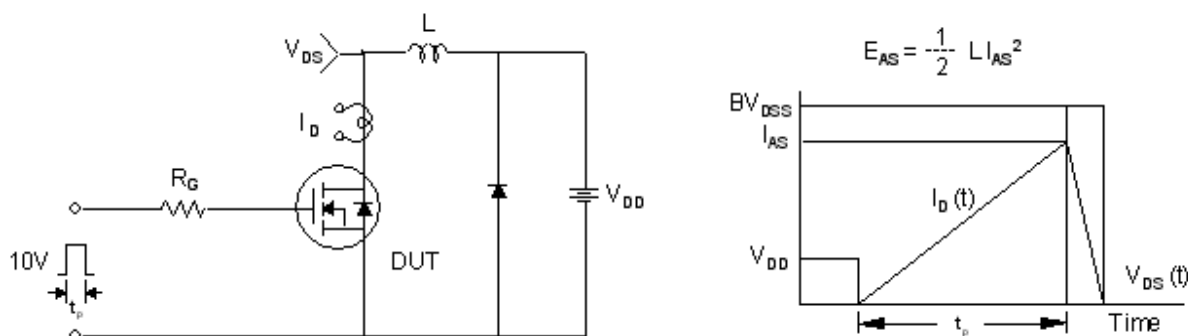
**Figure 12. Gate Charge Test Circuit & Waveform**



**Figure 13. Resistive Switching Test Circuit & Waveforms**



**Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms**



## Recovery $dv/dt$ Test

## Physical Dimensions

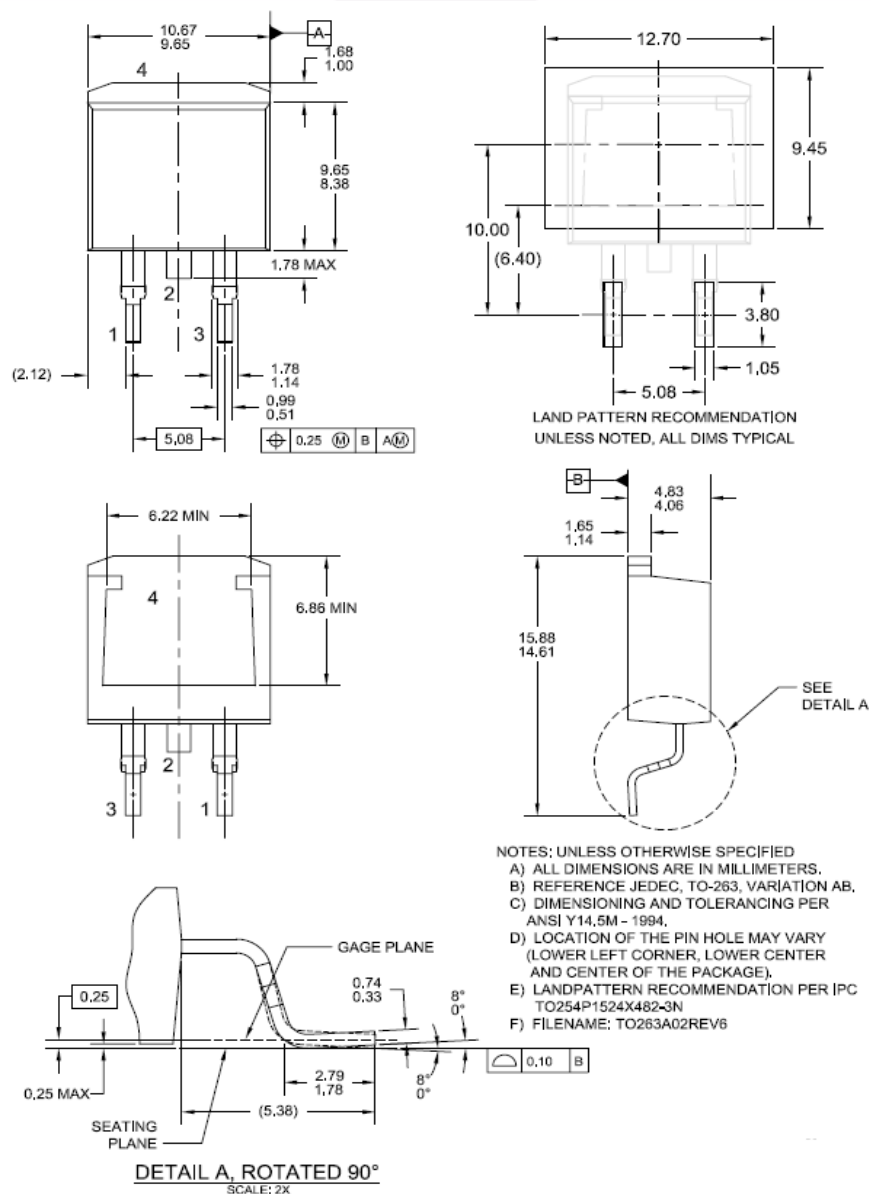


Figure 16. 2LD, JEDEC TO263, VARIATION AB, SURFACE MOUNT

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