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June 2014

# FDB024N08BL7

## N-Channel PowerTrench<sup>®</sup> MOSFET

80 V, 229 A, 2.4 m $\Omega$

### Features

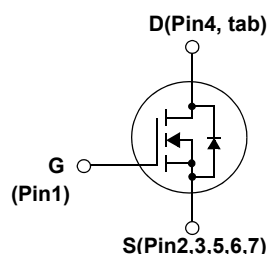
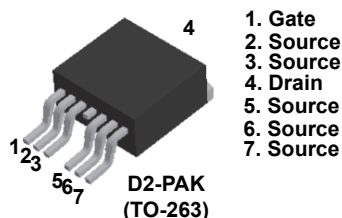
- $R_{DS(on)} = 1.7 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 100 \text{ A}$
- Low FOM  $R_{DS(on)} \cdot Q_G$
- Low Reverse Recovery Charge,  $Q_{rr} = 112 \text{ nC}$
- Soft Reverse Recovery Body Diode
- Enables Highly Efficiency in Synchronous Rectification
- Fast Switching Speed
- RoHS Compliant
- Qualified according to JEDEC Standards JESD22-A113F and IPC/JEDEC J-STD-020D.1

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench<sup>®</sup> 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	FDB024N08BL7	Unit
$V_{DSS}$	Drain to Source Voltage	80	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)	A
		- Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited)	
		- Continuous ( $T_C = 25^\circ\text{C}$ , Package Limited)	
$I_{DM}$	Drain Current	- Pulsed (Note 1)	A
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	W
		- Derate Above $25^\circ\text{C}$	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

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

### Thermal Characteristics

Symbol	Parameter	FDB024N08BL7	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.61	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDB024N08BL7	FDB024N08B	D2PAK-7L	Tape and Reel	330 mm	24 mm	800 units

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	80	-	-	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	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 64\ \text{V}$ , $V_{GS} = 0\ \text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 64\ \text{V}$ , $T_C = 150^\circ\text{C}$	-	-	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	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 100\ \text{A}$	-	1.7	2.4	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 100\ \text{A}$	-	227	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 40\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	-	10170	13530	pF
$C_{oss}$	Output Capacitance		-	1670	2220	pF
$C_{rss}$	Reverse Transfer Capacitance		-	35	-	pF
$C_{oss(er)}$	Engry Related Output Capacitance	$V_{DS} = 40\ \text{V}$ , $V_{GS} = 0\ \text{V}$	-	3025	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 40\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 100\ \text{A}$	-	137	178	nC
$Q_{gs}$	Gate to Source Gate Charge		-	56	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	25	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	28	-	nC
ESR	Equivalent Series Resistance (G-S)	$f = 1\ \text{MHz}$	-	2.4	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\ \text{V}$ , $I_D = 100\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_G = 4.7\ \Omega$	-	47	104	ns
$t_r$	Turn-On Rise Time		-	66	142	ns
$t_{d(off)}$	Turn-Off Delay Time		-	87	184	ns
$t_f$	Turn-Off Fall Time		-	41	92	ns

### Drain-Source Diode Characteristics

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	229*	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	916	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 100 A	-	-	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, V <sub>DD</sub> = 40 V, I <sub>SD</sub> = 100 A,	-	80	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> /dt = 100 A/μs	-	112	-	nC

#### Notes:

1. Repetitive rating: pulse width limited by maximum junction temperature.
2.  $L = 3\ \text{mH}$ ,  $I_{AS} = 24.72\ \text{A}$ ,  $R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 100\ \text{A}$ ,  $di/dt \leq 200\ \text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

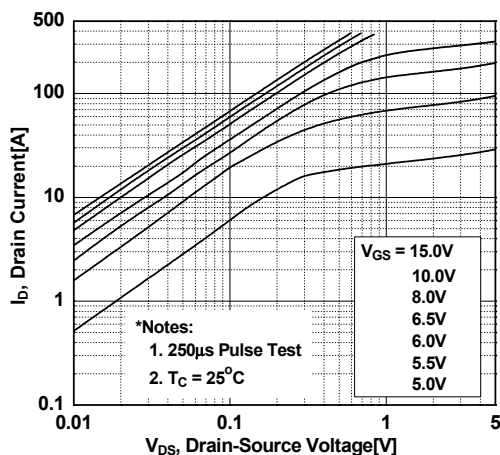


Figure 2. Transfer Characteristics

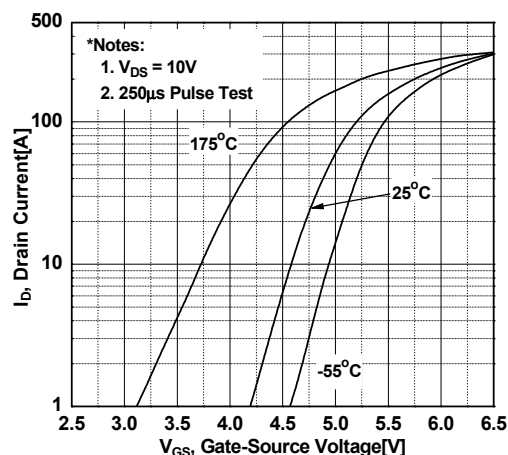


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

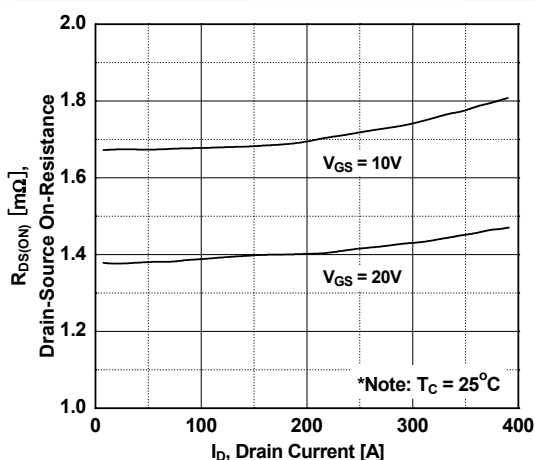


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

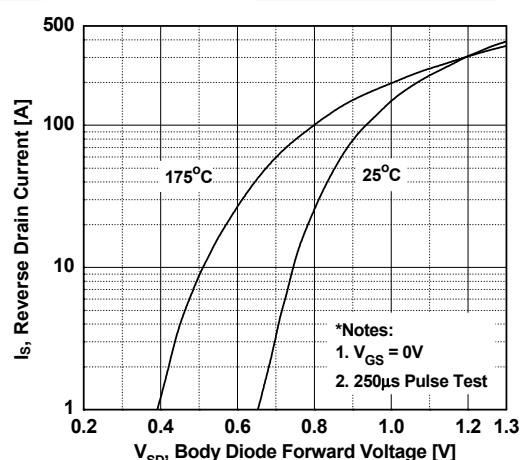


Figure 5. Capacitance Characteristics

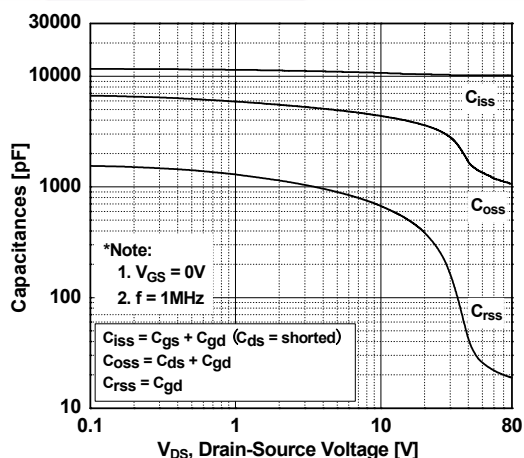
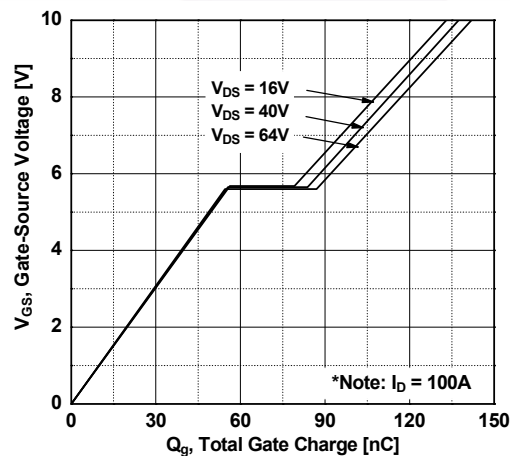


Figure 6. Gate Charge Characteristics



## Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

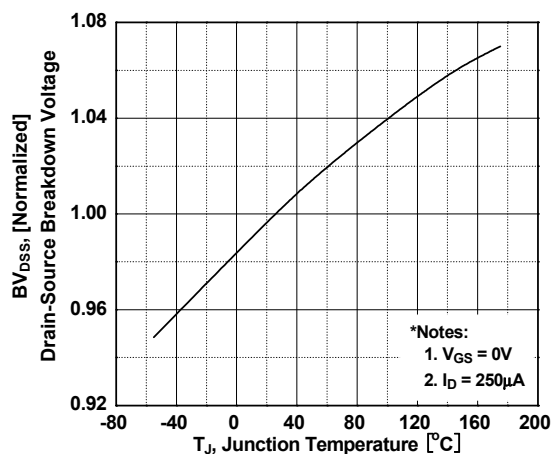


Figure 8. On-Resistance Variation vs. Temperature

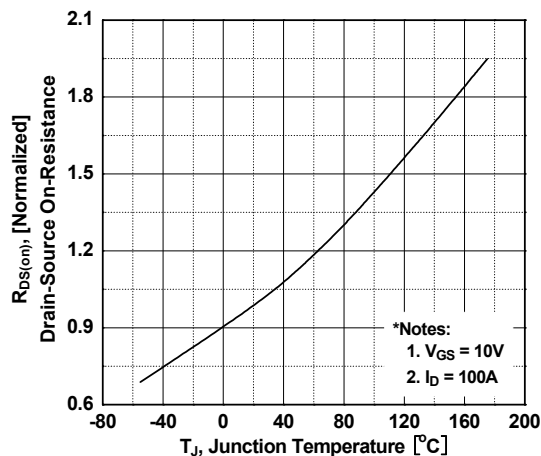


Figure 9. Maximum Safe Operating Area

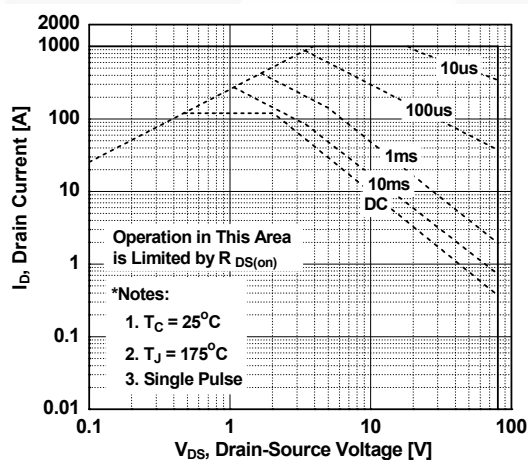


Figure 10. Maximum Drain Current vs. Case Temperature

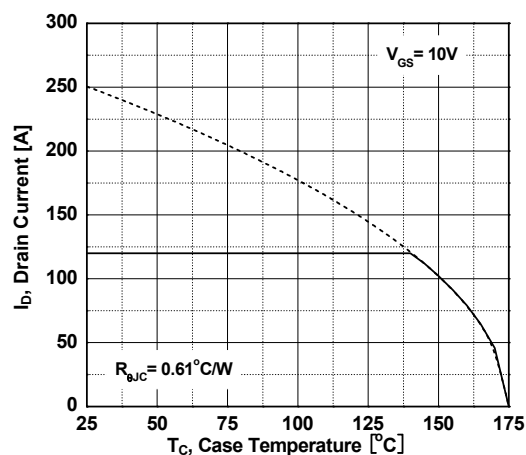


Figure 11. E\_oss vs. Drain to Source Voltage

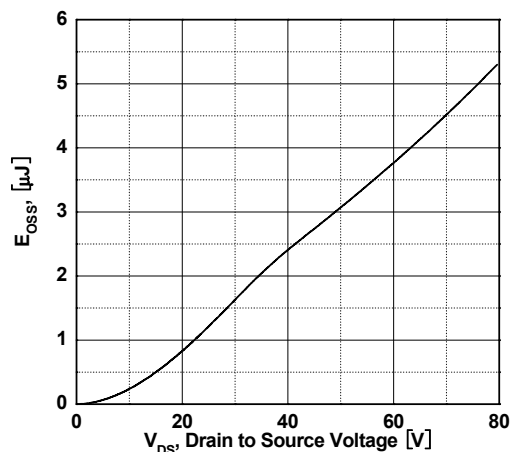
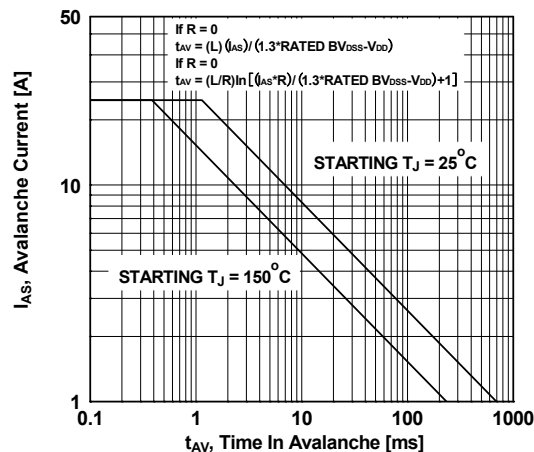
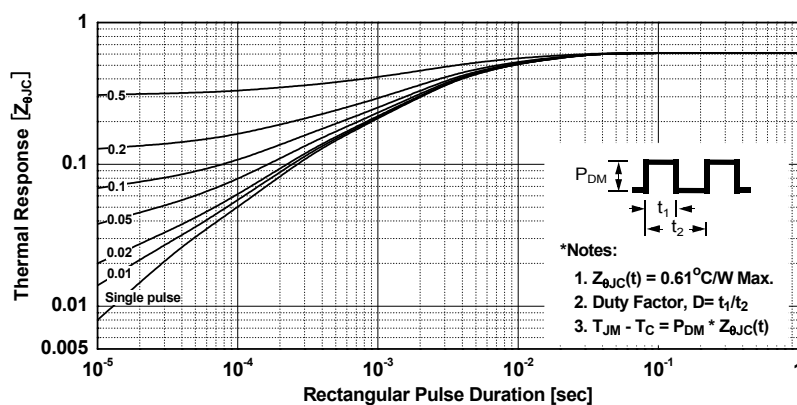


Figure 12. Unclamped Inductive Switching Capability

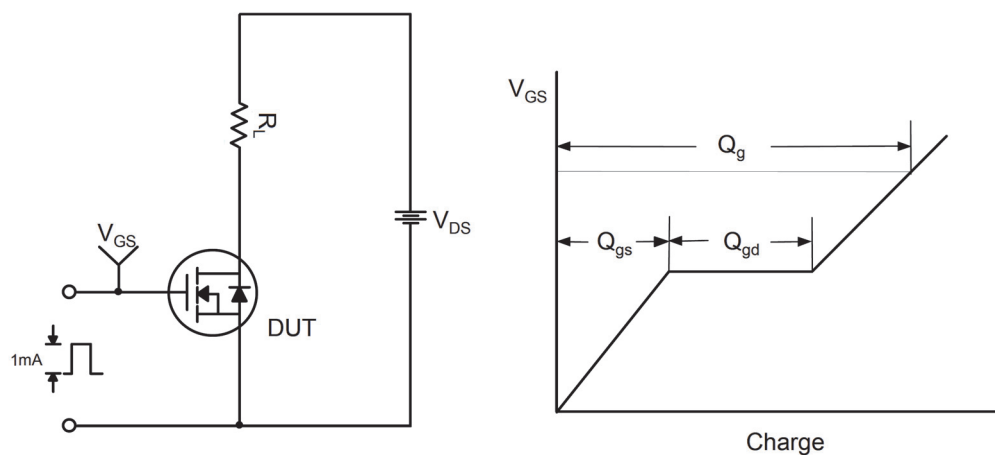


## Typical Performance Characteristics (Continued)

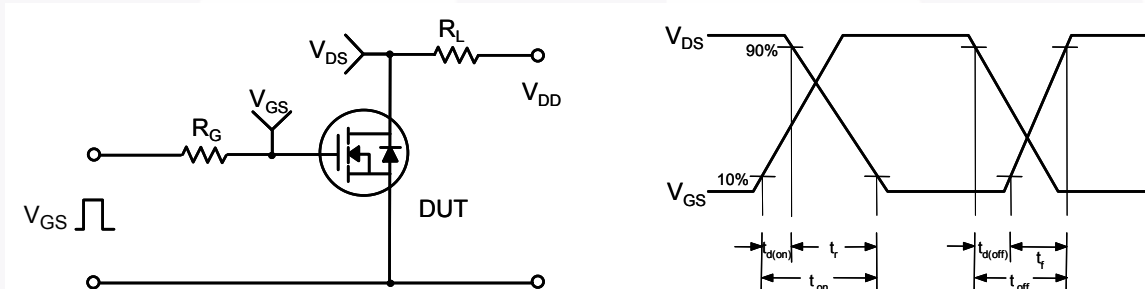
Figure 12. Transient Thermal Response Curve



**Figure 13. Gate Charge Test Circuit & Waveform**



**Figure 14. Resistive Switching Test Circuit & Waveforms**



**Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms**

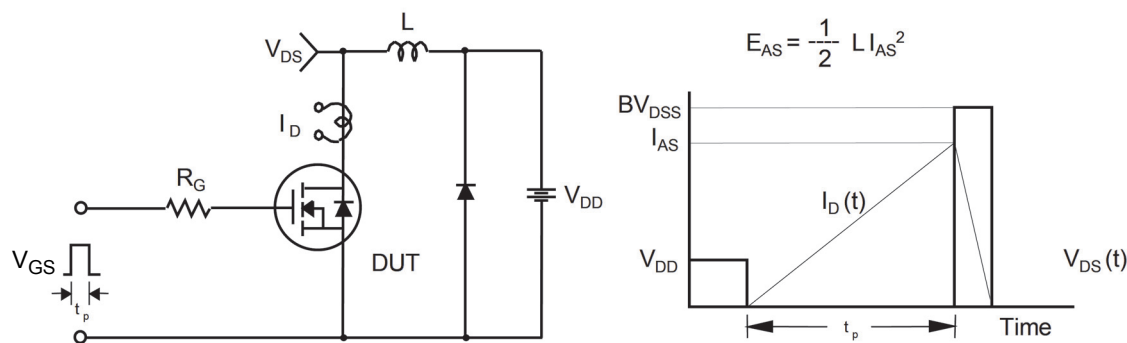
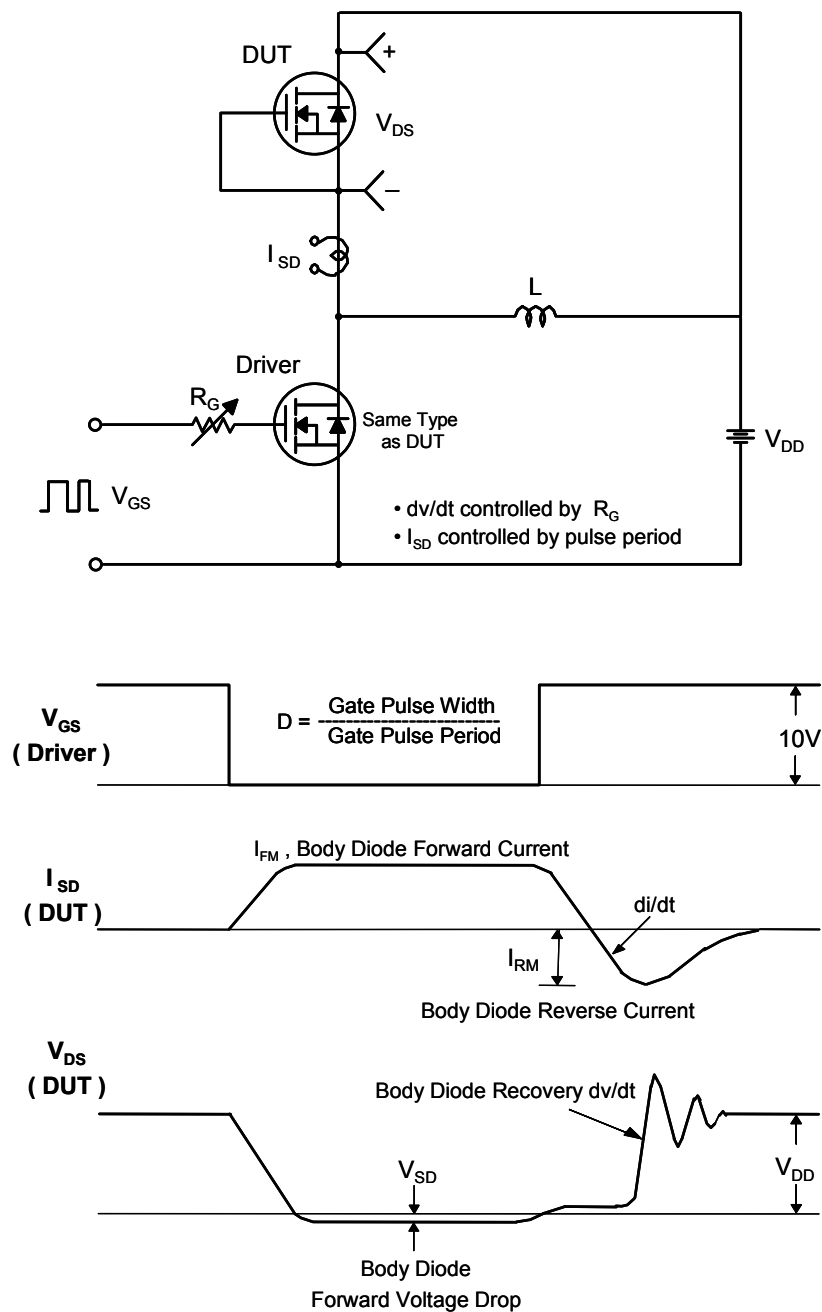
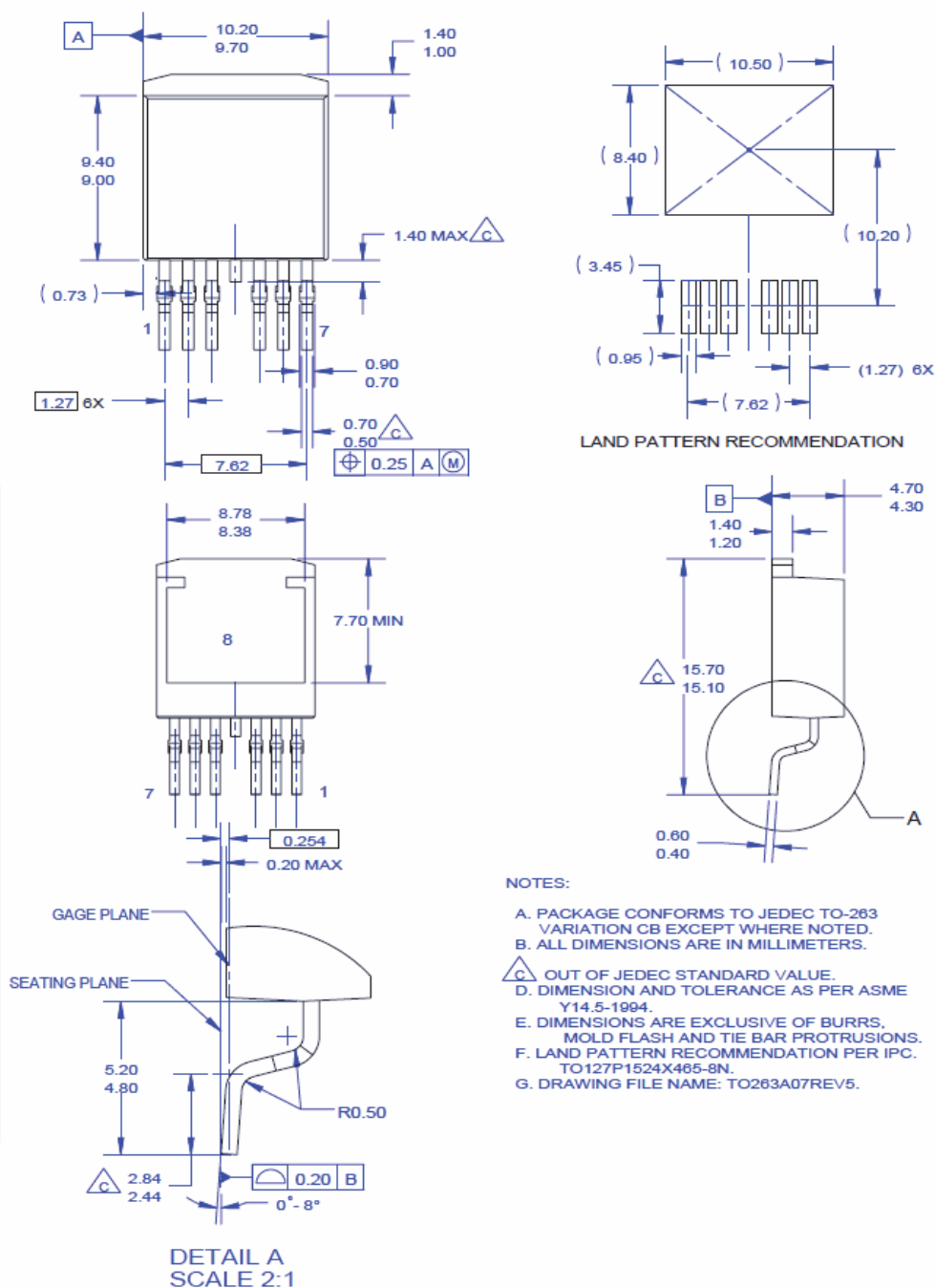


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms





## Mechanical Dimensions

Figure 17. TO263 (D<sup>2</sup>PAK), Molded, 7-Lead, Surface Mount


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