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FAIRCHILD SEMICONDUCTOR®

November 2013

FDMS015N04B

N-Channel PowerTrench® MOSFET

40 V, 100 A, 1.5 mΩ

Features

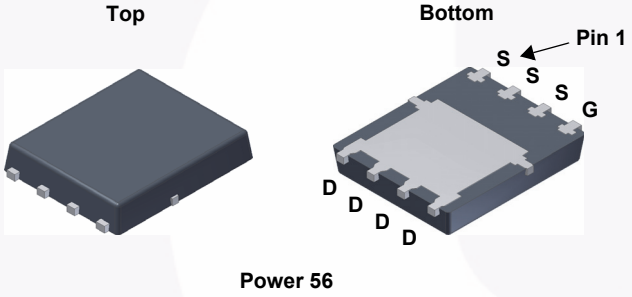
- $R_{DS(on)}$ = 1.13 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 50 A
- Advanced Package and Silicon Combination for Low $R_{DS(on)}$ and High Efficiency
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

Description

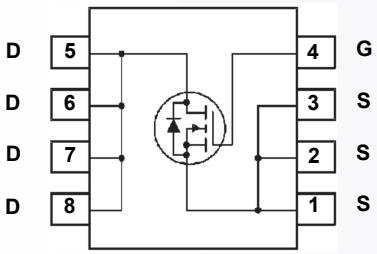
This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

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



Power 56



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter			FDMS015N04B	Unit
V_{DSS}	Drain to Source Voltage			40	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)		100	A
		- Continuous (T_A = 25°C)	(Note 1a)	31.3	
I_{DM}	Drain Current	- Pulsed	(Note 2)	400	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 3)	526	mJ
P_D	Power Dissipation	(T_C = 25°C)		104	W
		(T_A = 25°C)	(Note 1a)	2.5	W
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C

Thermal Characteristics

Symbol	Parameter		FDMS015N04B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.		1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	(Note 1a)	50	

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Package Marking and Ordering Information

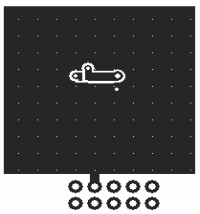
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS015N04B	FDMS015N04B	Power 56	13 ”	12 mm	3000 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

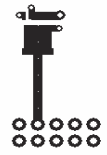
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	40	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	37	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32 V, V_{GS} = 0 V	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 50 A	-	1.13	1.5	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 50 A	-	171	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz	-	6560	8725	pF
C_{oss}	Output Capacitance		-	2795	3720	pF
C_{rss}	Reverse Transfer Capacitance		-	162	-	pF
C_{oss}(er)	Energy Releted Output Capacitance	V_{DS} = 20 V, V_{GS} = 0 V	-	3896	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 20 V, I_D = 50 A, V_{GS} = 0 V to 10 V	-	91	118	nC
Q_{gs}	Gate to Source Gate Charge		-	26	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	9	-	nC
Q_{gd}	Gate to Drain “Miller” Charge	(Note 4)	-	16	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	1.4	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 20 V, I_D = 50 A, V_{GS} = 10 V, R_G = 4.7 Ω	-	34	78	ns
t_r	Turn-On Rise Time		-	24	58	ns
$t_{d(off)}$	Turn-Off Delay Time		-	71	152	ns
t_f	Turn-Off Fall Time	(Note 4)	-	26	62	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	100	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	400	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 50 A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 50 A, dI_F/dt = 100 A/μs	-	78	-	ns
Q_{rr}	Reverse Recovery Charge		-	90	-	nC

Notes:

1.$R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a 1.5 x 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. 50 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Repetitive rating: pulse-width limited by maximum junction temperature.

3. L = 3 mH, I_{AS} = 18.72 A, starting T_J = 25°C.

4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

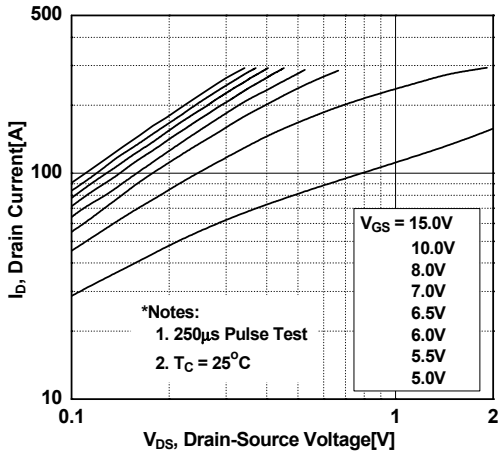


Figure 2. Transfer Characteristics

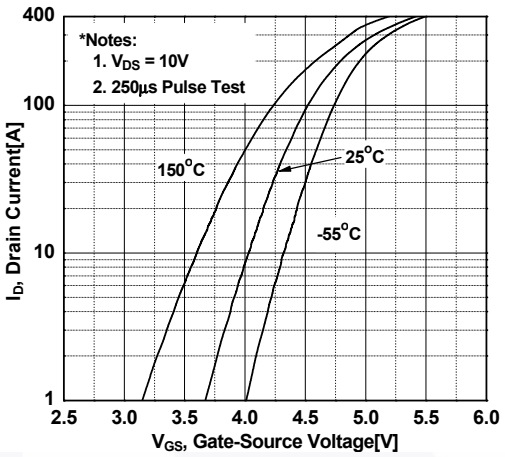


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

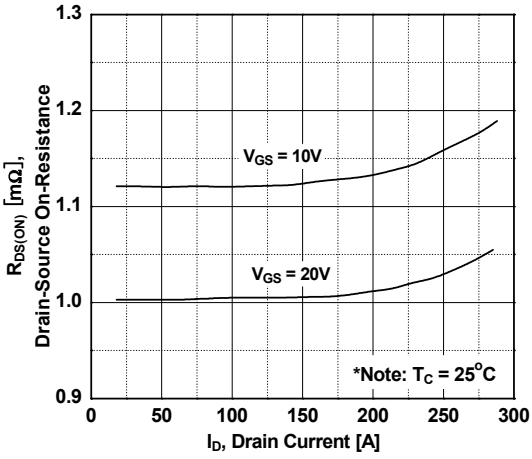


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

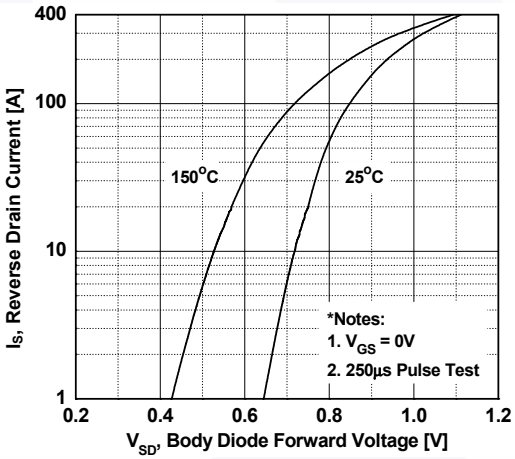


Figure 5. Capacitance Characteristics

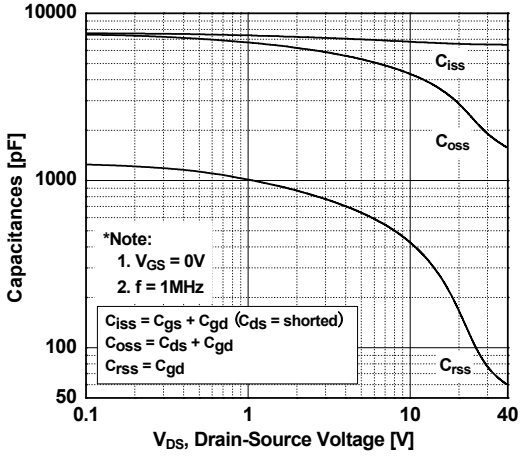
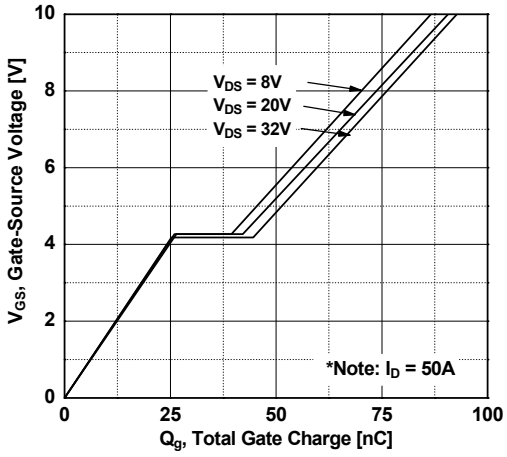


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

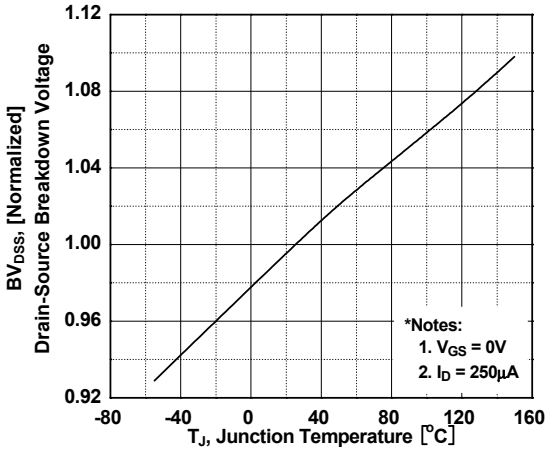


Figure 8. On-Resistance Variation vs. Temperature

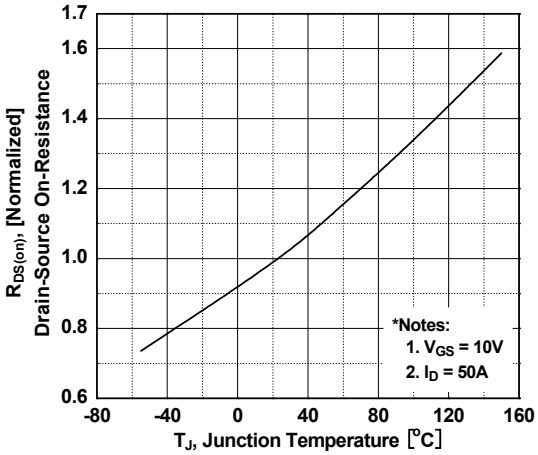


Figure 9. Maximum Safe Operating Area

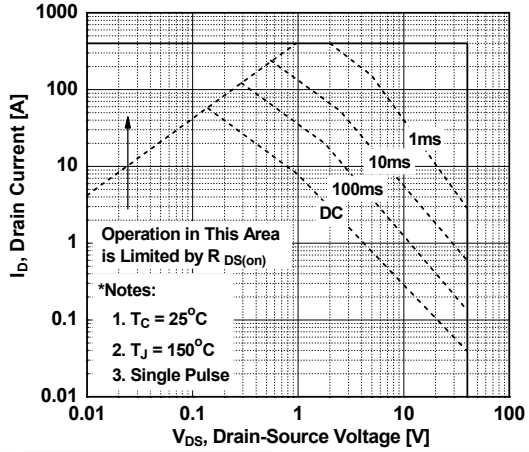


Figure 10. Maximum Drain Current vs. Case Temperature

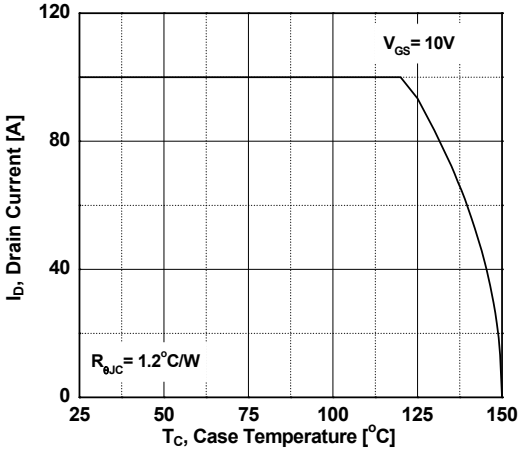


Figure 11. Eoss vs. Drain to Source Voltage

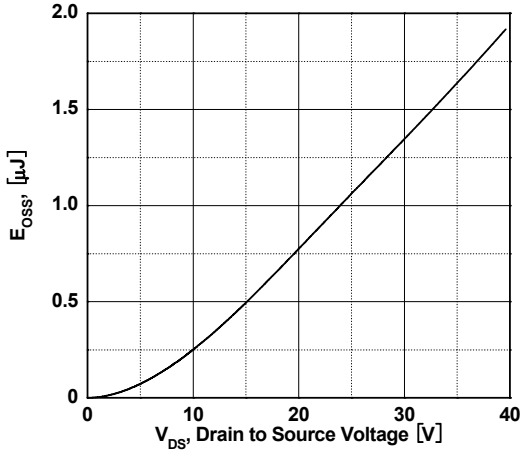
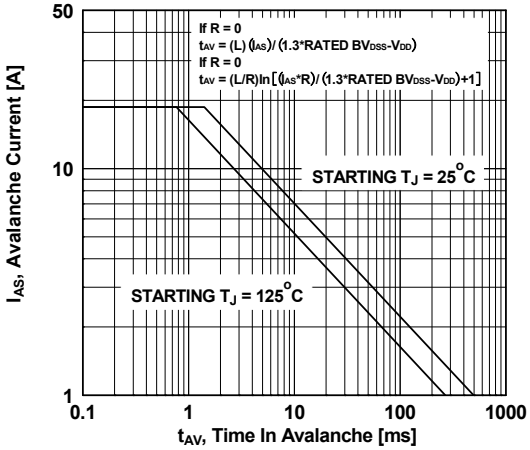


Figure 12. Unclamped Inductive Switching Capability



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve

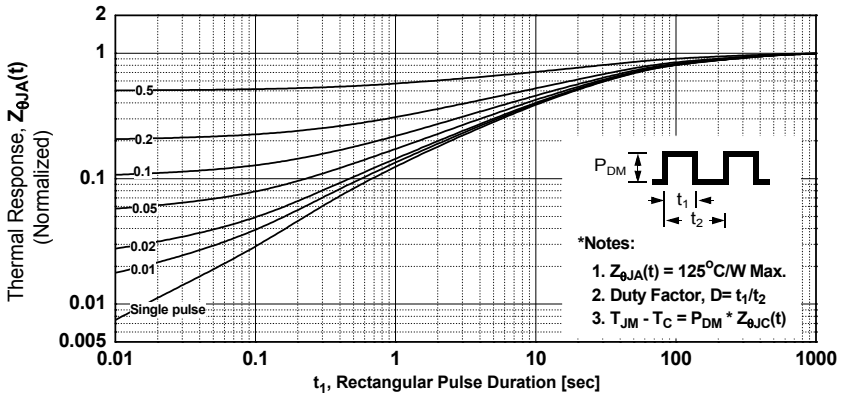


Figure 14. Gate Charge Test Circuit & Waveform

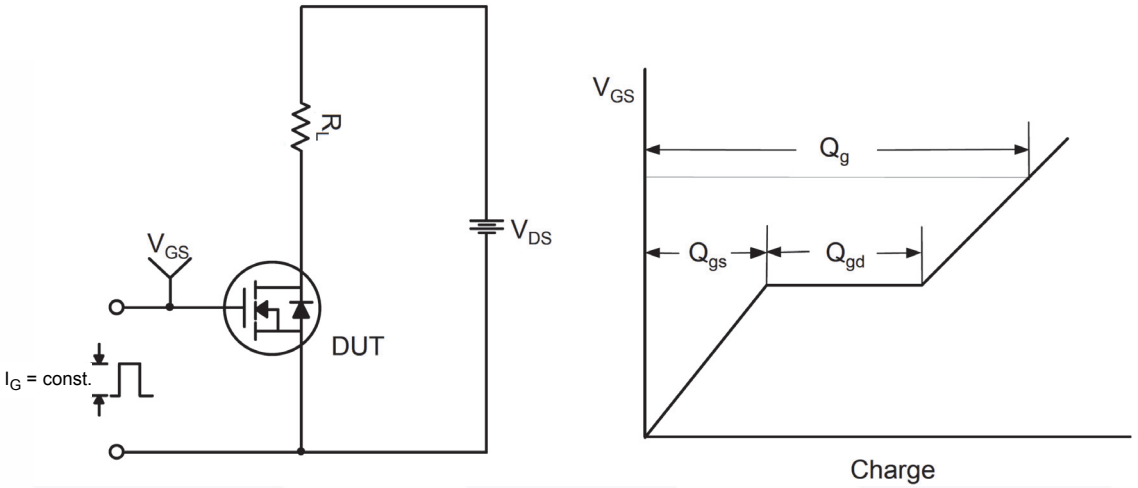


Figure 15. Resistive Switching Test Circuit & Waveforms

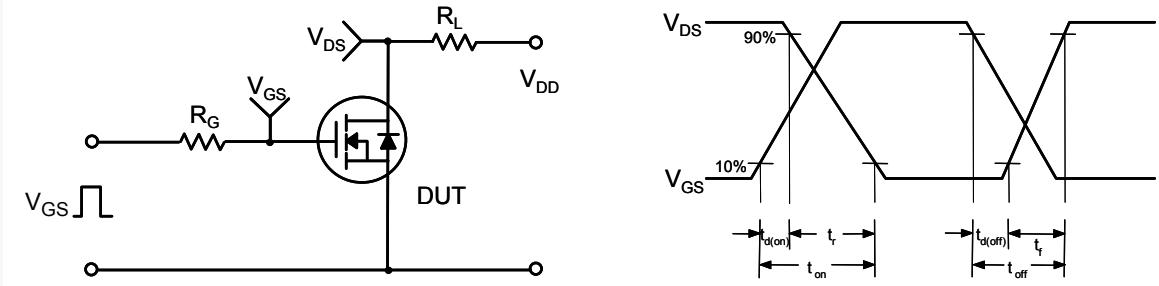


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

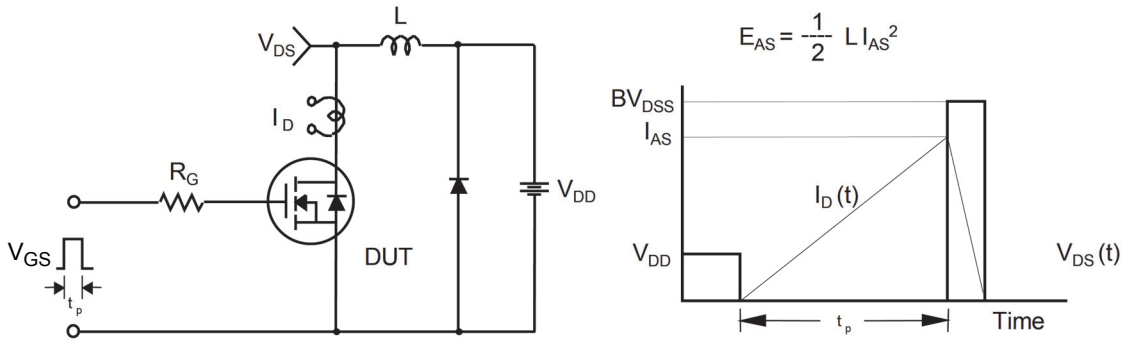
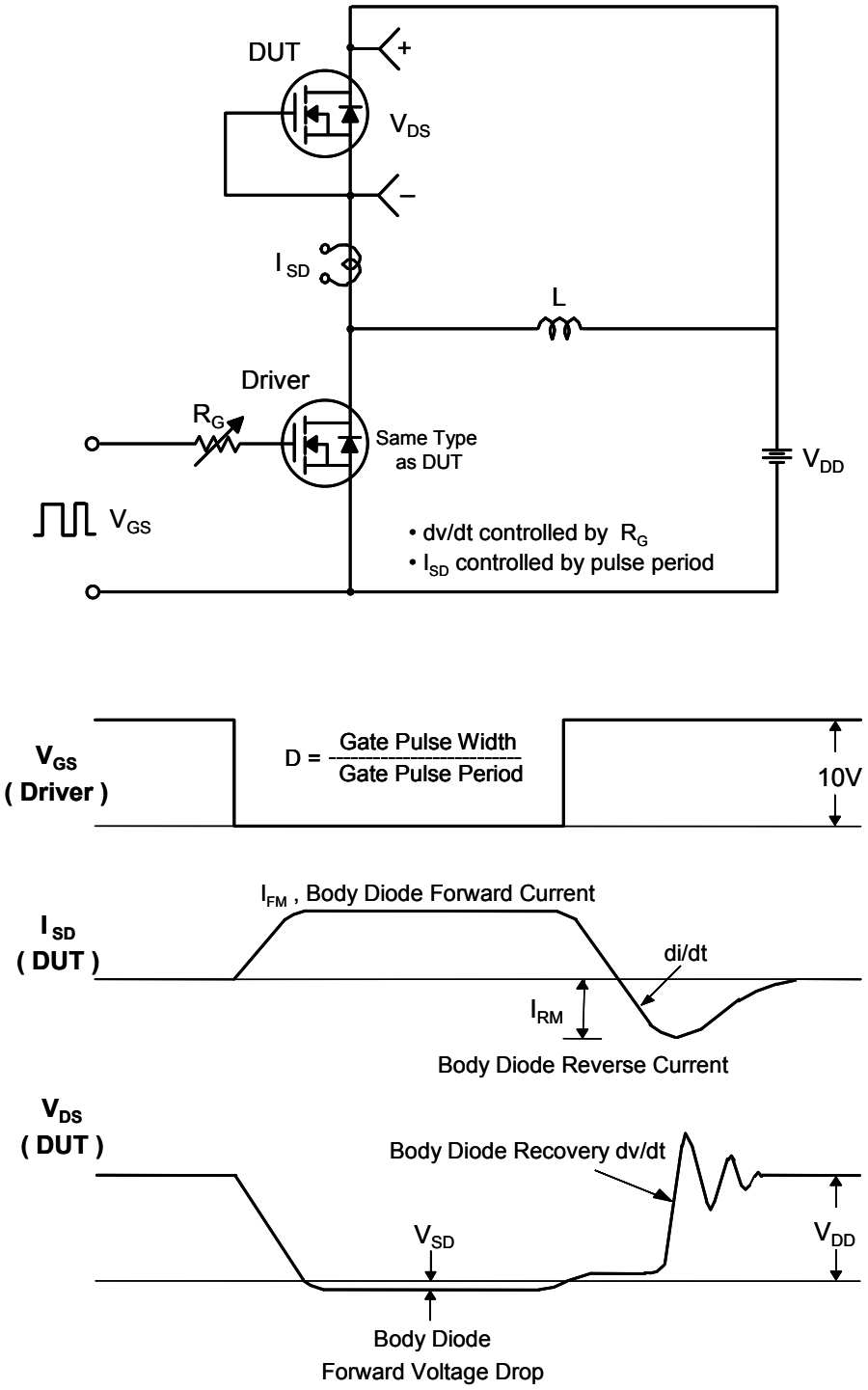
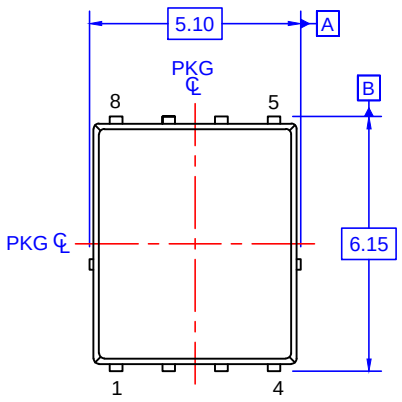


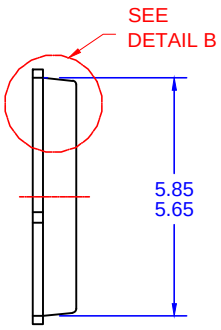
Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

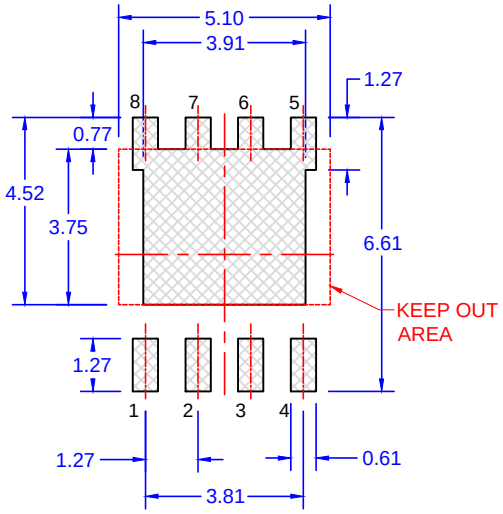


PQFN8 5X6, 1.27P
CASE 483AE
ISSUE A

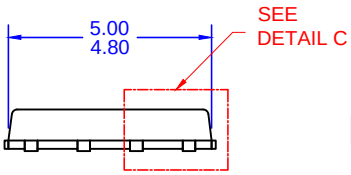


TOP VIEW

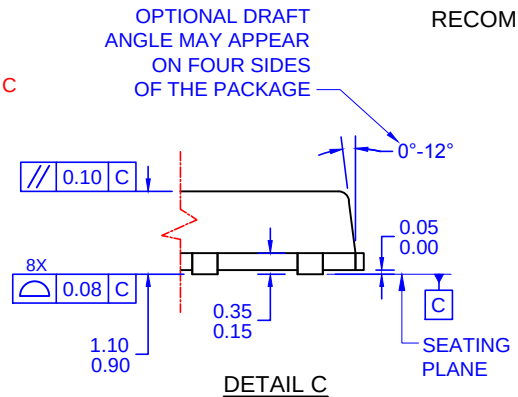




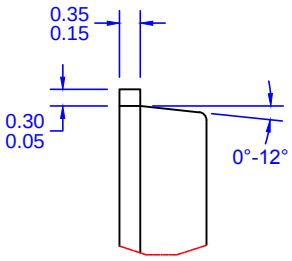
LAND PATTERN
RECOMMENDATION



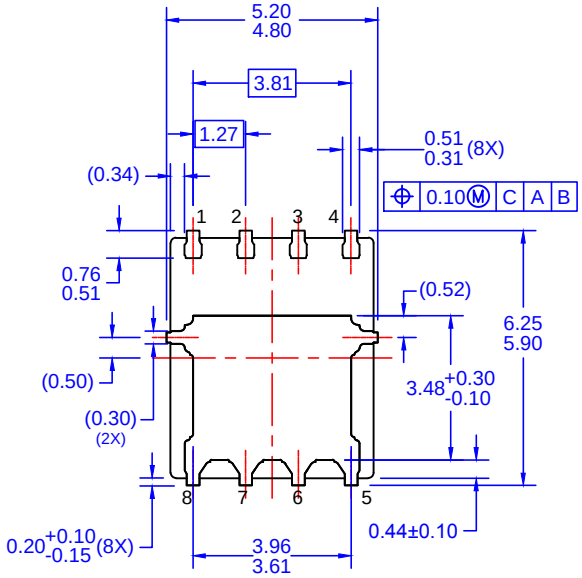
SIDE VIEW



DETAIL C
SCALE: 2:1



DETAIL B
SCALE: 2:1



BOTTOM VIEW

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B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
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