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FAIRCHILD SEMICONDUCTOR®

November 2013

FDP023N08B

N-Channel PowerTrench® MOSFET

75 V, 242 A, 2.35 mΩ

Features

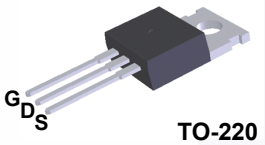
- $R_{DS(on)}$ = 1.96 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 75 A
- Low FOM $R_{DS(on)}$*Q_G
- Low Reverse Recovery Charge, Q_{rr}
- Soft Reverse Recovery Body Diode
- Enables Highly Efficiency in Synchronous Rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

Description

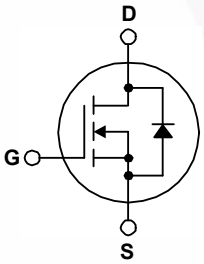
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- DC motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverte



TO-220



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

Symbol	Parameter		FDP023N08B_F102	Unit
V_{DSS}	Drain to Source Voltage		75	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current	- Continuous (T_C = 25°C, Silicon Limited)	242*	A
		- Continuous (T_C = 100°C, Silicon Limited)	171*	
		- Continuous (T_C = 25°C, Package Limited)	120	
I_{DM}	Drain Current	- Pulsed (Note 1)	968	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	961	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6	V/ns
P_D	Power Dissipation	(T_C = 25°C)	245	W
		- Derate Above 25°C	1.64	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

* Package limitation current is 120A.

Thermal Characteristics

Symbol	Parameter	FDP023N08B_F102	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.61	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDP023N08B_F102	FDP023N08B	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25^oC$ 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} = 0V, $T_C = 25^oC$	75	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25^oC	-	0.35	-	V/^{o}C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 60 V, $T_C = 150^oC$	-	-	500	
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	-	3.8	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 75 A	-	1.96	2.35	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 75 A	-	185	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 37.5 V, V_{GS} = 0 V, f = 1 MHz	-	10350	13765	pF
C_{oss}	Output Capacitance		-	1855	2465	pF
C_{rss}	Reverse Transfer Capacitance		-	46.8	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	V_{DS} = 37.5 V, V_{GS} = 0 V	-	3290	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 37.5 V, I_D = 100 A, V_{GS} = 10 V (Note 4)	-	150	195	nC
Q_{gs}	Gate to Source Gate Charge		-	50.3	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	31.7	-	nC
$V_{plateau}$	Gate Plateau Volatge		-	4.9	-	V
Q_{sync}	Total Gate Charge Sync.	V_{DS} = 0 V, I_D = 50 A	-	127.4	-	nC
Q_{oss}	Output Charge	V_{DS} = 37.5 V, V_{GS} = 0 V	-	146.2	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 37.5 V, I_D = 100 A, V_{GS} = 10 V, R_G = 4.7 Ω (Note 4)	-	41	92	ns
t_r	Turn-On Rise Time		-	71	151	ns
$t_{d(off)}$	Turn-Off Delay Time		-	111	232	ns
t_f	Turn-Off Fall Time		-	56	122	ns
ESR	Equivalent Series Resistance (G-S)	f = 1 MHz	-	2.23	-	Ω
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	242*	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	968	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 75 A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, V_{DD}=37.5 V, I_{SD} = 100 A, dI_F/dt = 100 A/μs	-	79.3	-	ns
Q_{rr}	Reverse Recovery Charge		-	114	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 3 mH, I_{AS} = 25.32 A, starting T_J = 25°C.
3. $I_{SD} \le$ 100 A, di/dt ≤ 200 A/μs, $V_{DD} \le BV_{DSS}$, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

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Typical Performance Characteristics

Figure 1. On-Region Characteristics

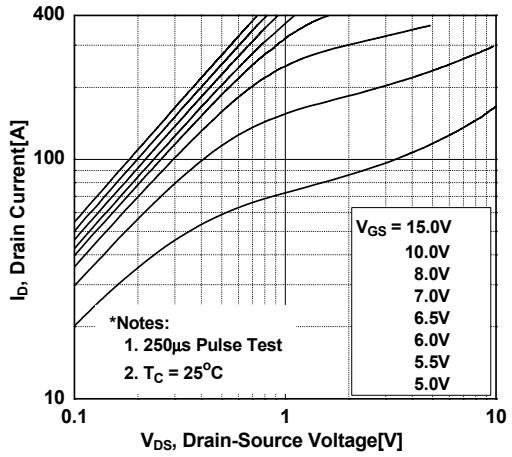


Figure 2. Transfer Characteristics

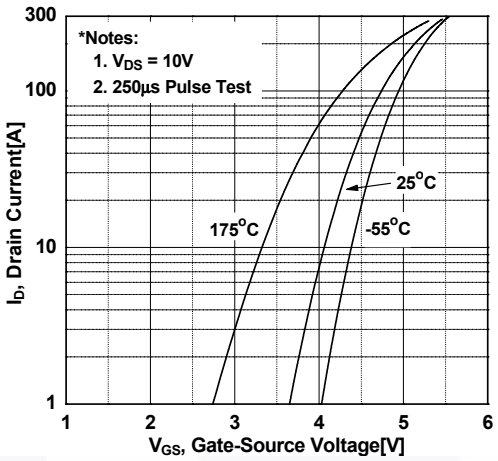


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

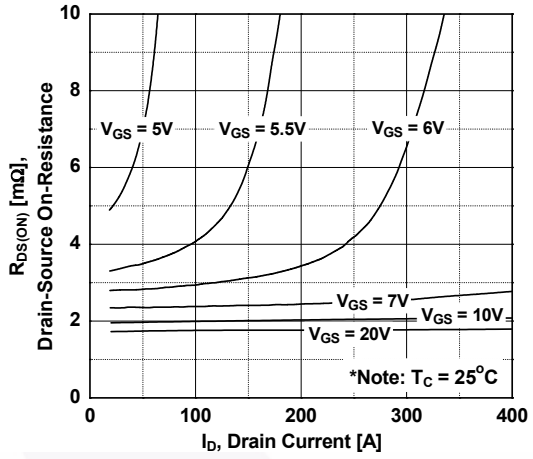


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

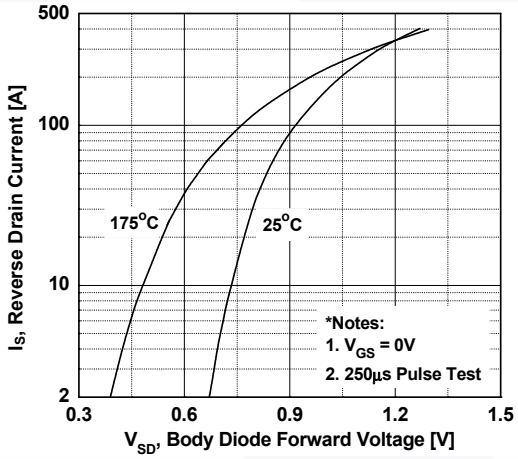


Figure 5. Capacitance Characteristics

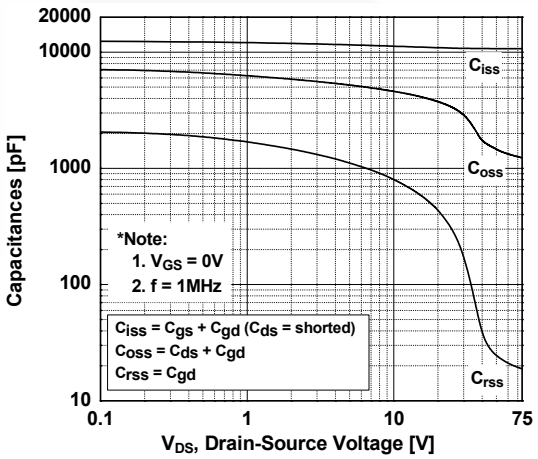
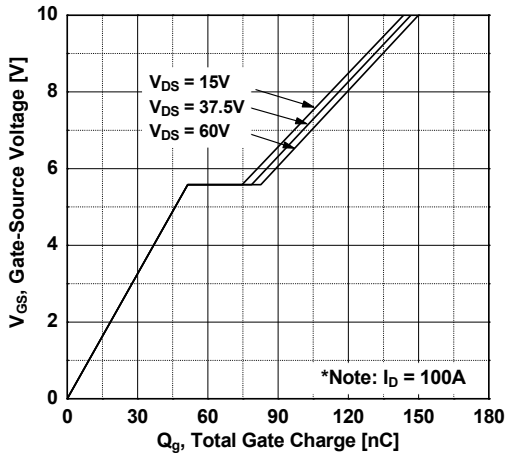


Figure 6. Gate Charge Characteristics



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Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

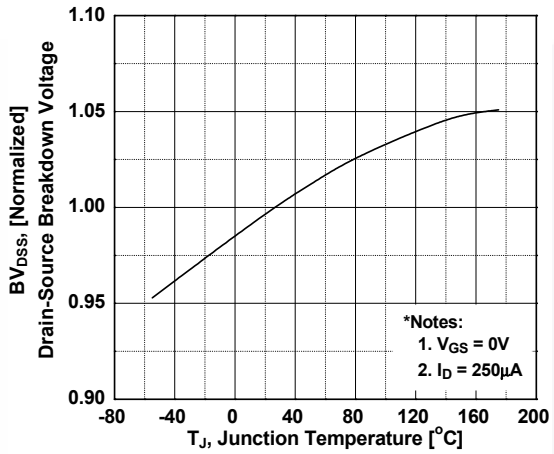


Figure 8. On-Resistance Variation vs. Temperature

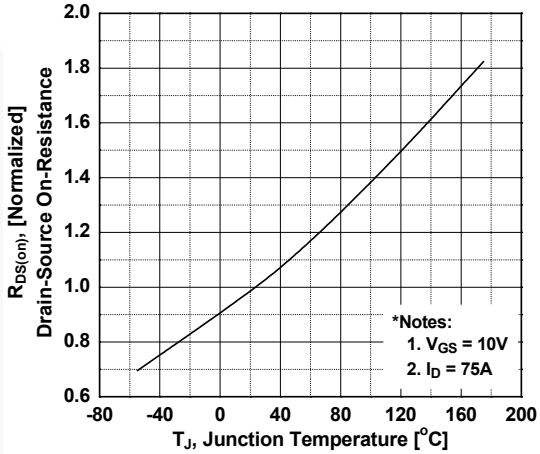


Figure 9. Maximum Safe Operating Area

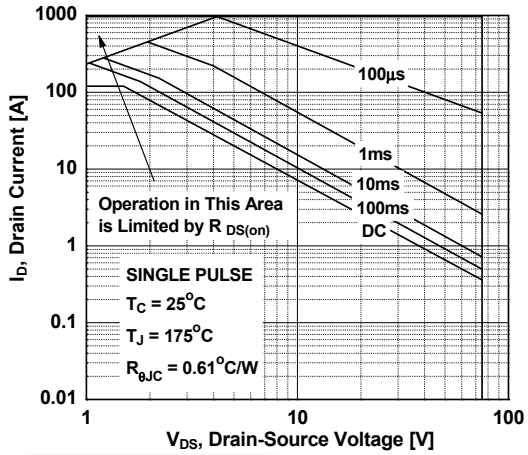


Figure 10. Maximum Drain Current vs. Case Temperature

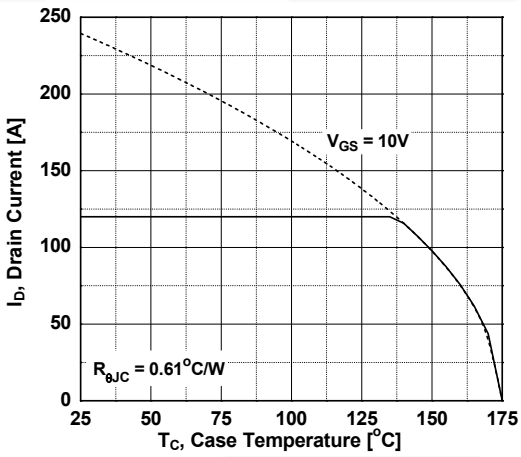


Figure 11. Eoss vs. Drain to Source Voltage

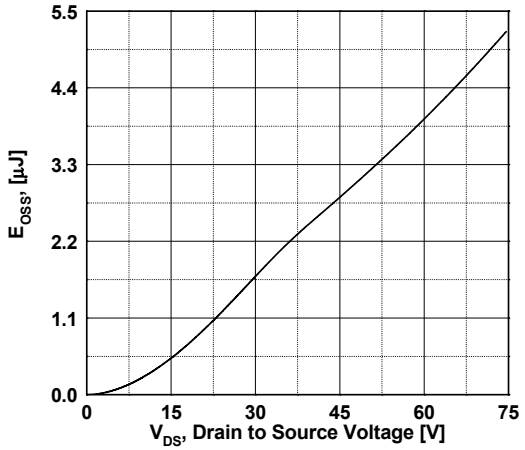
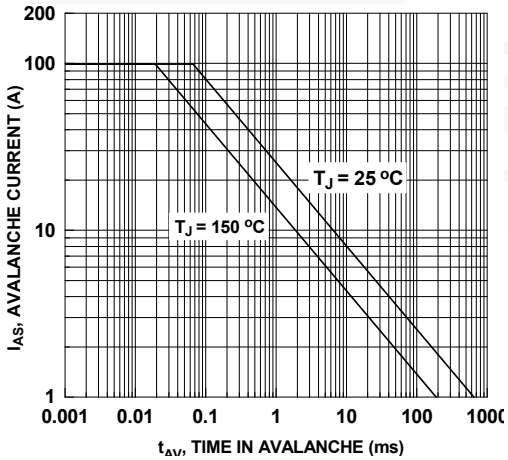


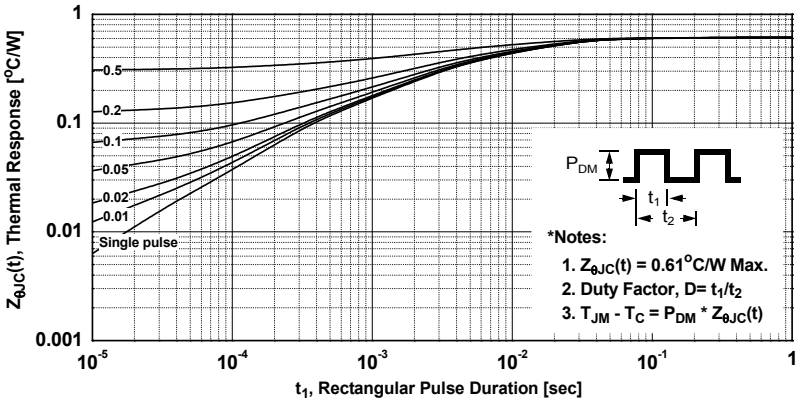
Figure 12. Unclamped Inductive Switching Capability



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Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve



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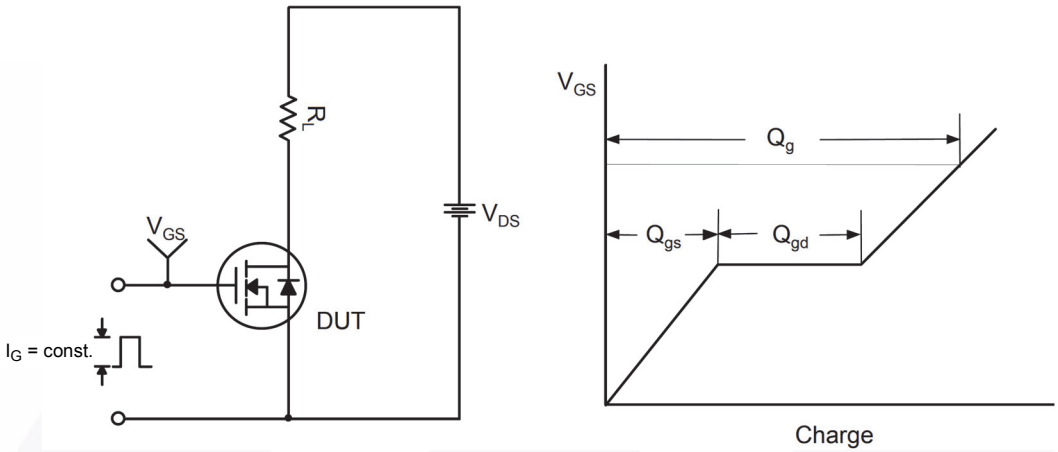


Figure 14. Gate Charge Test Circuit & Waveform

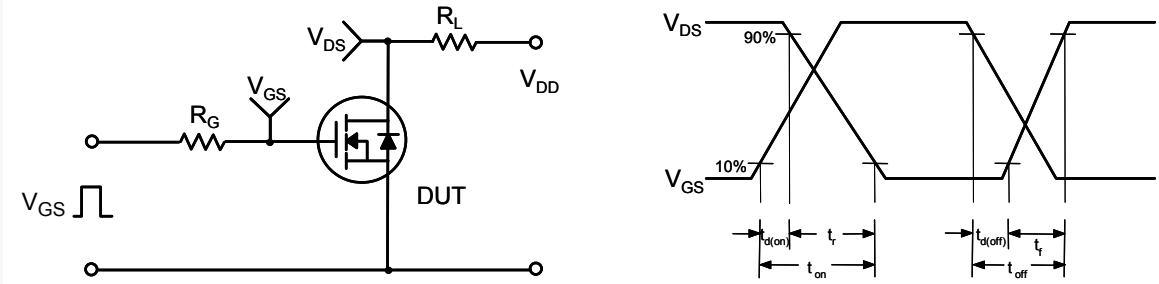


Figure 15. Resistive Switching Test Circuit & Waveforms

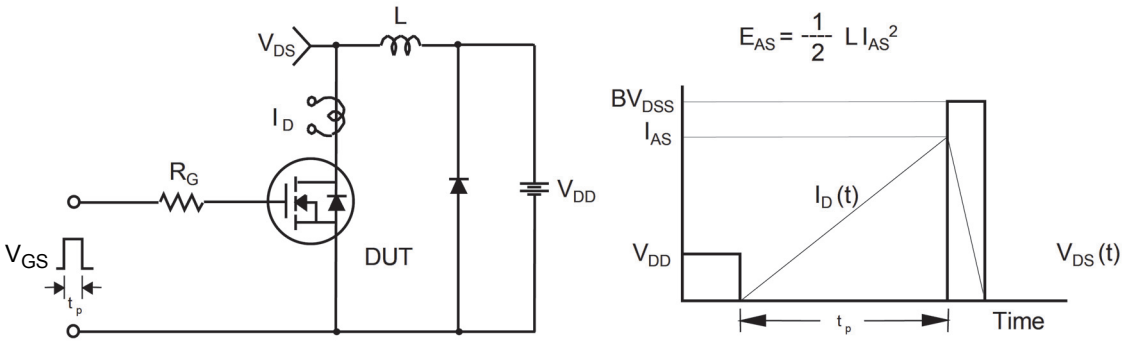


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

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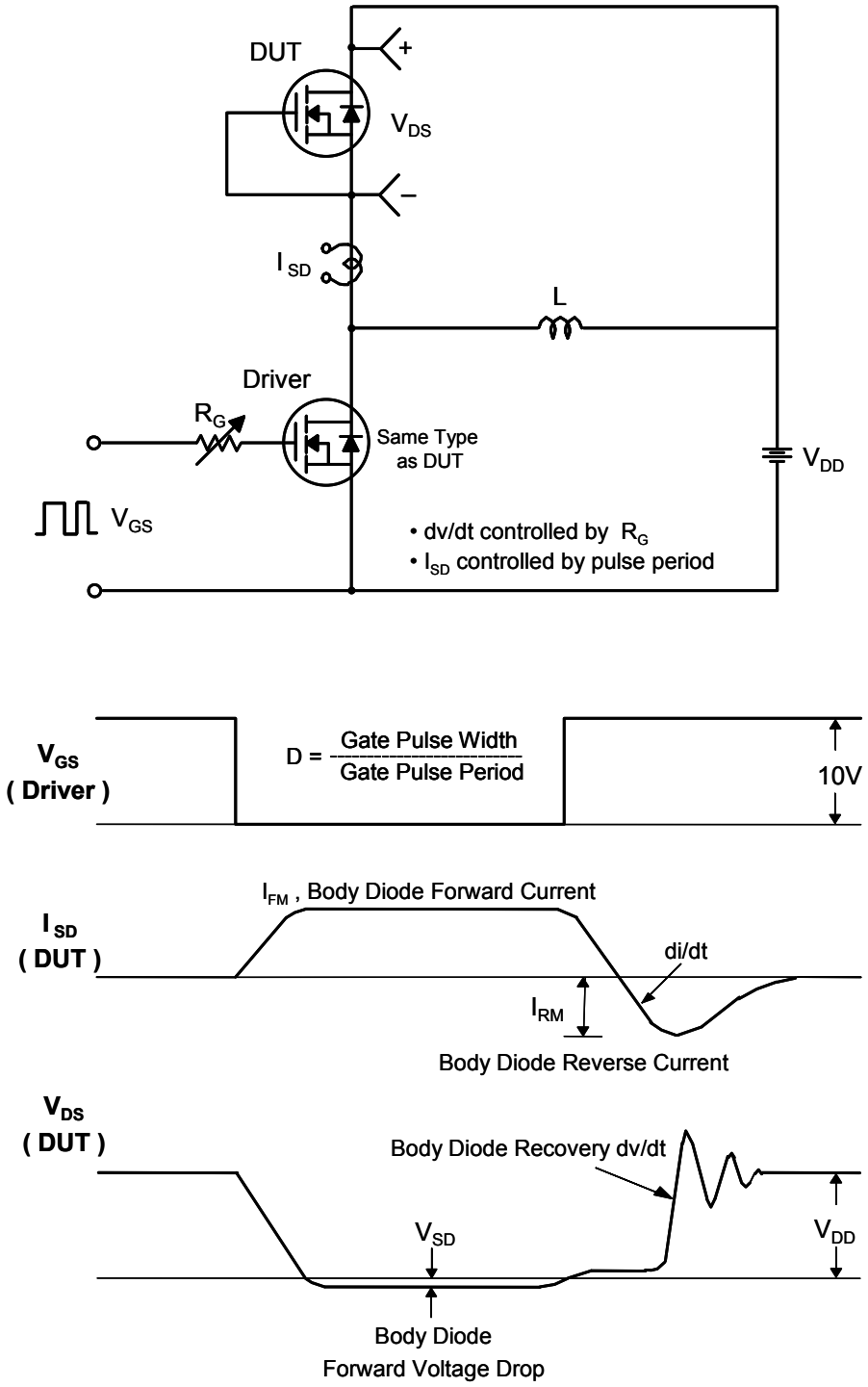


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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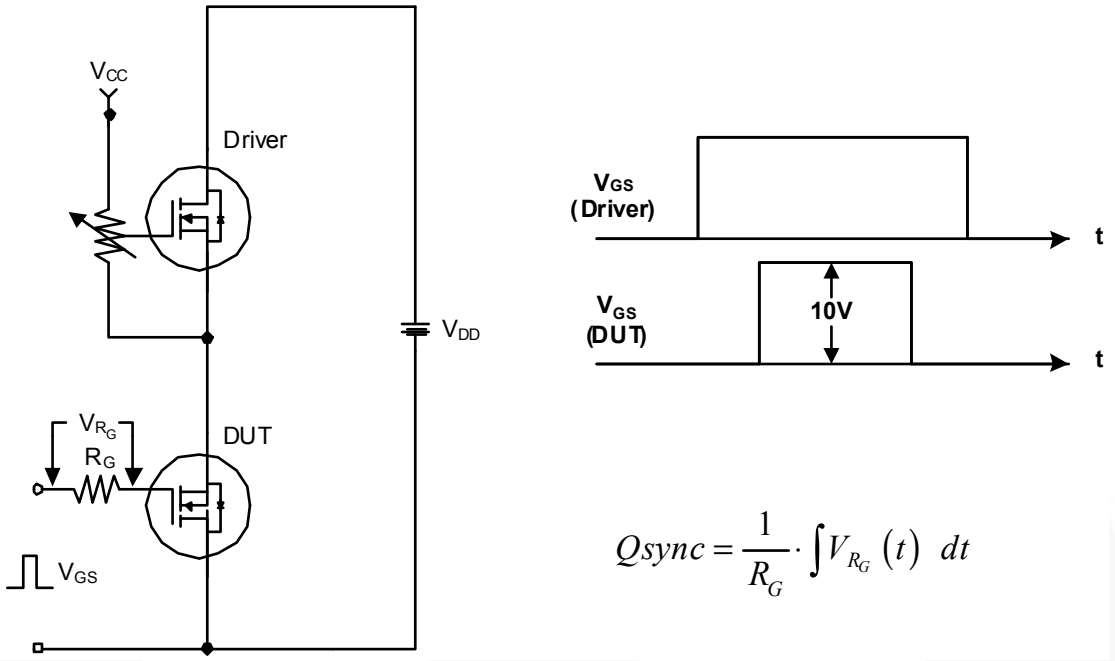


Figure 18. Total Gate Charge Qsync. Test Circuit & Waveforms

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Mechanical Dimensions

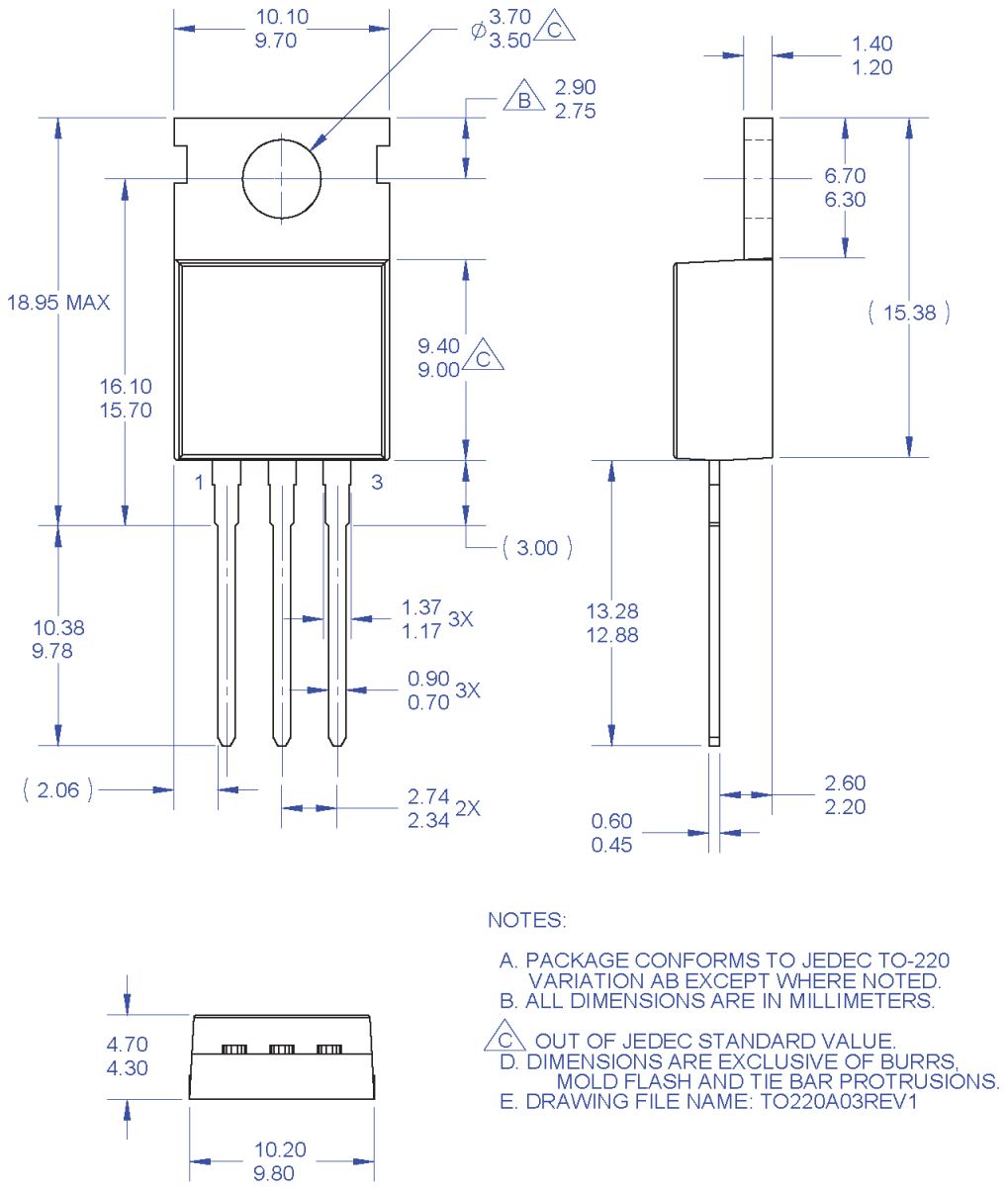


Figure 19. TO220, Molded, 3-Lead, Jedec Variation AB, Non Jedec F102

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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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