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ON Semiconductor®

FDP053N08B

N-Channel PowerTrench® MOSFET 80 V, 120 A, 5.3 mΩ

Features

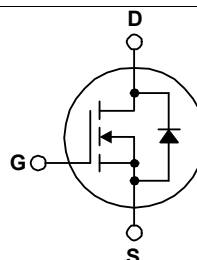
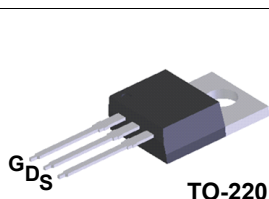
- $R_{DS(on)} = 4.2 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 75 \text{ A}$
- Low FOM $R_{DS(on)} \cdot Q_G$
- Low Reverse-Recovery Charge, $Q_{rr} = 62.5 \text{ nC}$
- Soft Reverse-Recovery Body Diode
- Enables High Efficiency in Synchronous Rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

Description

This N-Channel MOSFET is produced using ON 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



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDP053N08B	Unit
V_{DSS}	Drain to Source Voltage	80	V
V_{GSS}	Gate to Source Voltage	± 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°C	0.97
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	$^\circ\text{C}$

* Package limitation current is 75A.

Thermal Characteristics

Symbol	Parameter	FDP053N08B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.03	$^\circ\text{C/W}$
$R_{\theta JA}$	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
FDP053N08B-F102	FDP053N08B	TO-220	Tube	N/A	N/A	50 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
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	-	0.089	-	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64\ \text{V}$, $V_{GS} = 0\ \text{V}$ $V_{DS} = 64\ \text{V}$, $T_C = 150^\circ\text{C}$	-	-	1 500	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$	-	-	± 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	$V_{GS} = 10\ \text{V}$, $I_D = 75\ \text{A}$	-	4.2	5.3	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\ \text{V}$, $I_D = 75\ \text{A}$	-	100	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 40\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	-	4480	5960	pF
C_{oss}	Output Capacitance		-	740	985	pF
C_{rss}	Reverse Transfer Capacitance		-	20.5	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 40\ \text{V}$, $V_{GS} = 0\ \text{V}$	-	1333	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 40\ \text{V}$, $I_D = 75\ \text{A}$, $V_{GS} = 10\ \text{V}$	-	65.4	85	nC
Q_{gs}	Gate to Source Gate Charge		-	26.7	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	15.3	-	nC
$V_{plateau}$	Gate Plateau Voltage		-	6.0	-	V
Q_{sync}	Total Gate Charge Sync.	$V_{DS} = 0\ \text{V}$, $I_D = 37.5\ \text{A}$	-	52.4	-	nC
Q_{oss}	Output Charge	$V_{DS} = 40\ \text{V}$, $V_{GS} = 0\ \text{V}$	-	64.2	-	nC
ESR	Equivalent Series Resistance (G-S)	$f = 1\ \text{MHz}$	-	1.2	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\ \text{V}$, $I_D = 75\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_G = 4.7\ \Omega$	-	32	74	ns
t_r	Turn-On Rise Time		-	30	70	ns
$t_{d(off)}$	Turn-Off Delay Time		-	44	98	ns
t_f	Turn-Off Fall Time		-	16	42	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	120*	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	480	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} = 40 V, I _{SD} = 75 A, dI _F /dt = 100 A/μs	-	59.3	-	ns
Q _{rr}	Reverse Recovery Charge		-	62.5	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $L = 3\ \text{mH}$, $I_{AS} = 15.6\ \text{A}$, 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

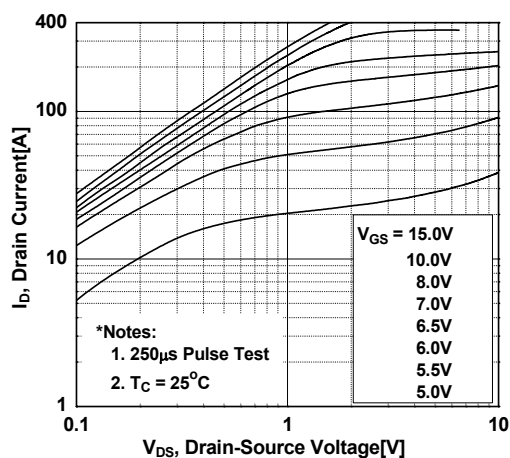


Figure 2. Transfer Characteristics

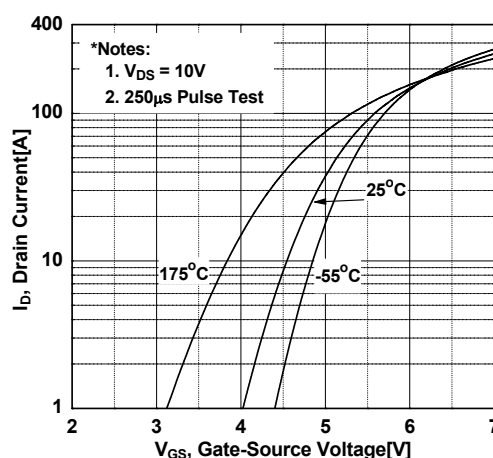


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

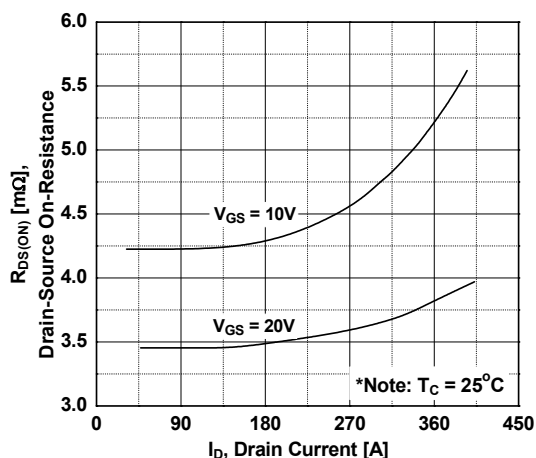


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

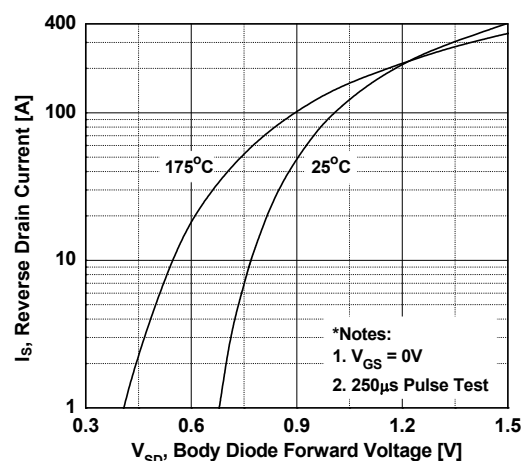


Figure 5. Capacitance Characteristics

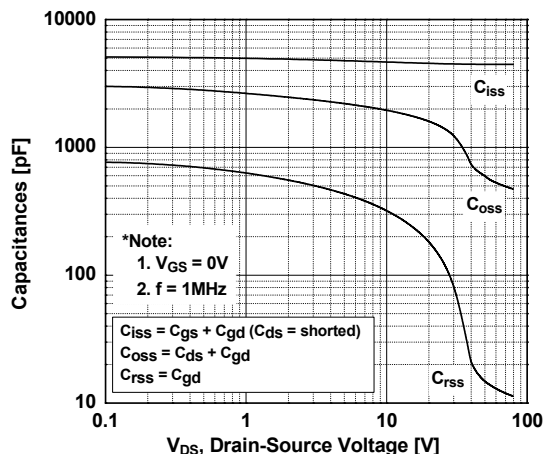
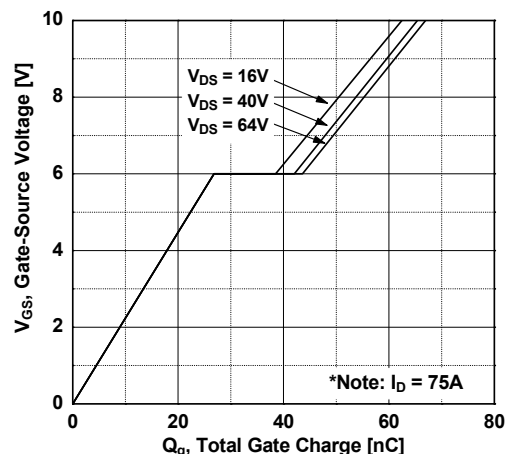


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

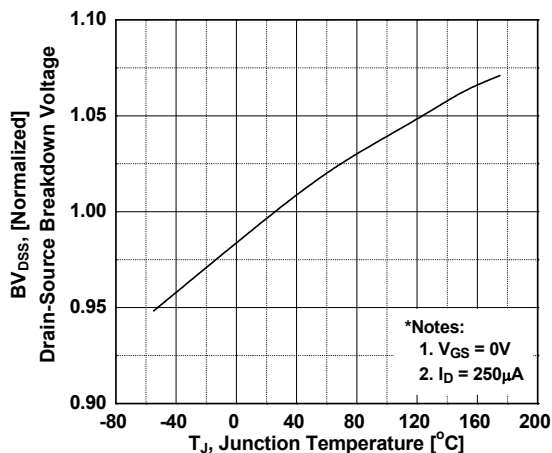


Figure 8. On-Resistance Variation vs. Temperature

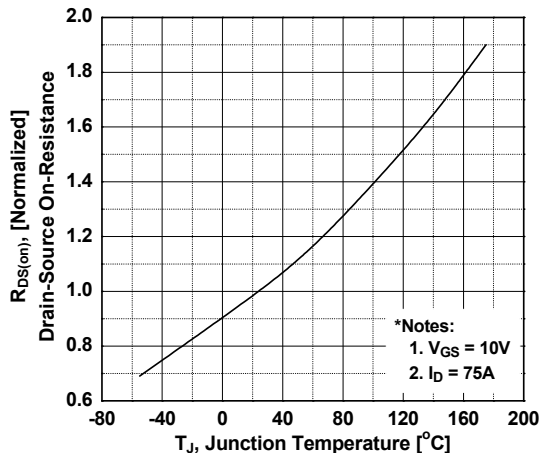


Figure 9. Maximum Safe Operating Area

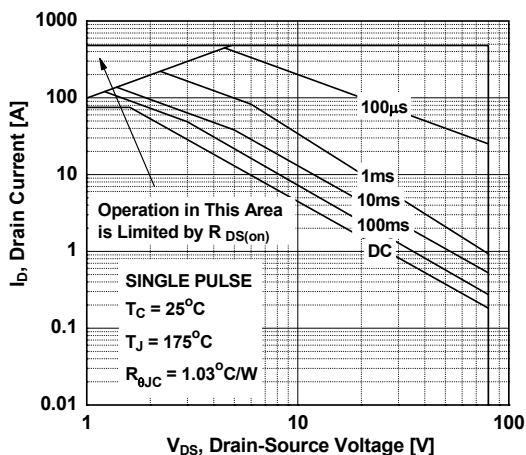


Figure 10. Maximum Drain Current vs. Case Temperature

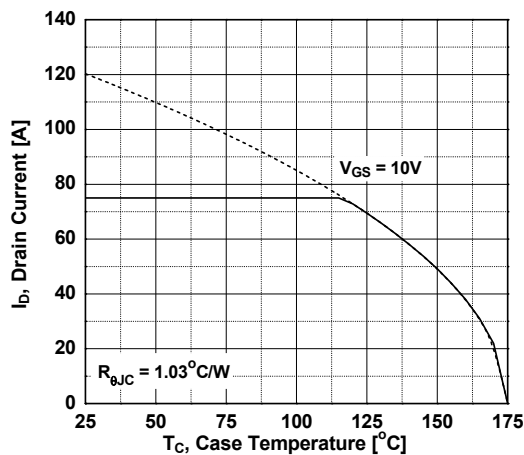


Figure 11. E_oss vs. Drain to Source Voltage

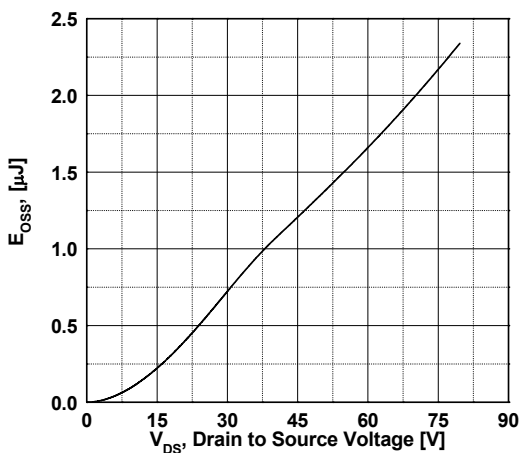
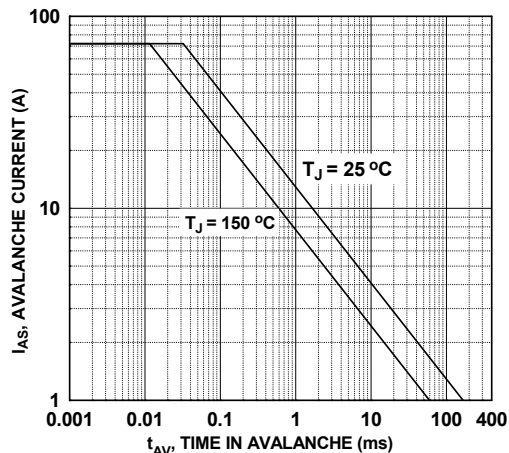
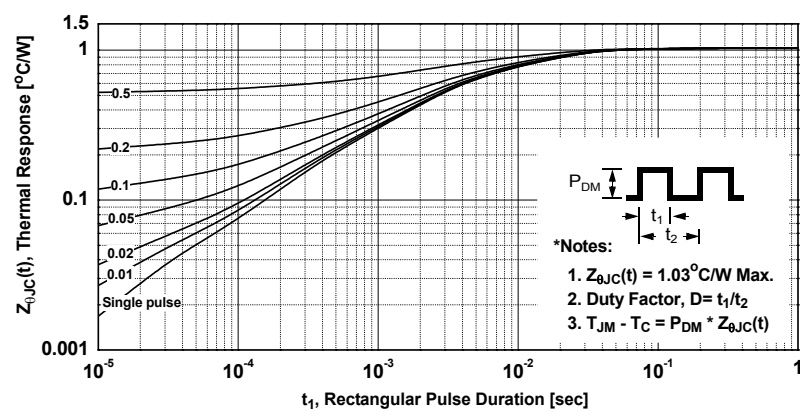


Figure 12. Unclamped Inductive Switching Capability



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve



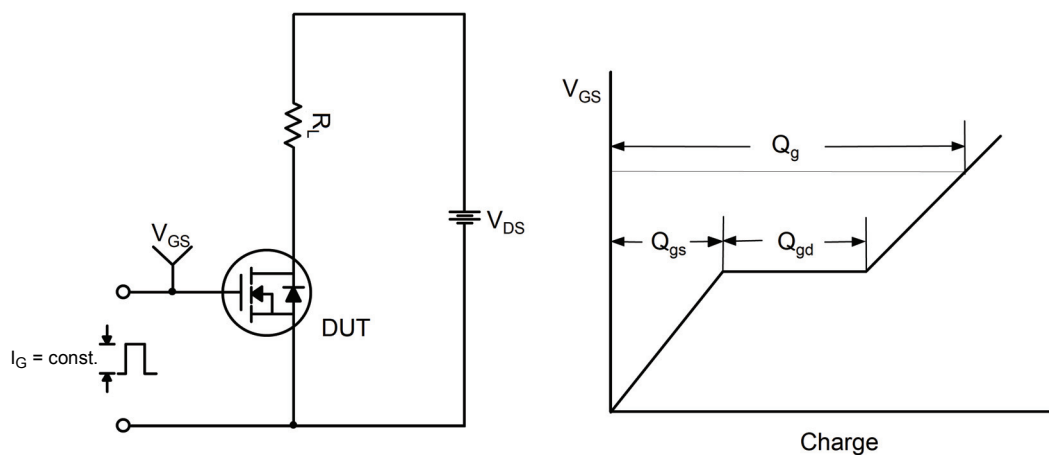


Figure 14. Gate Charge Test Circuit & Waveform

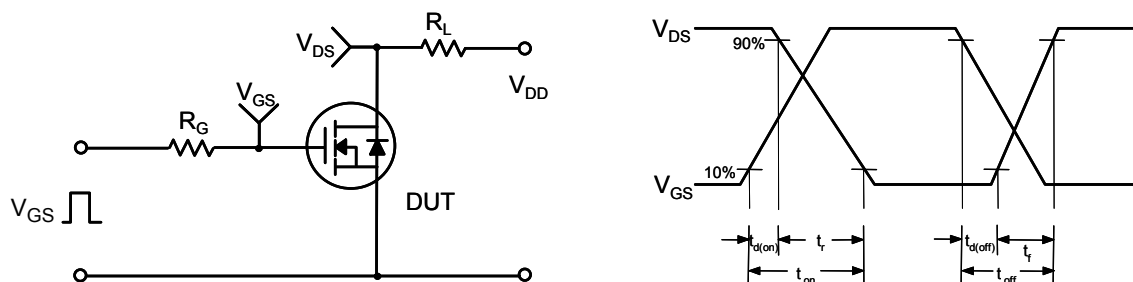


Figure 15. Resistive Switching Test Circuit & Waveforms



Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

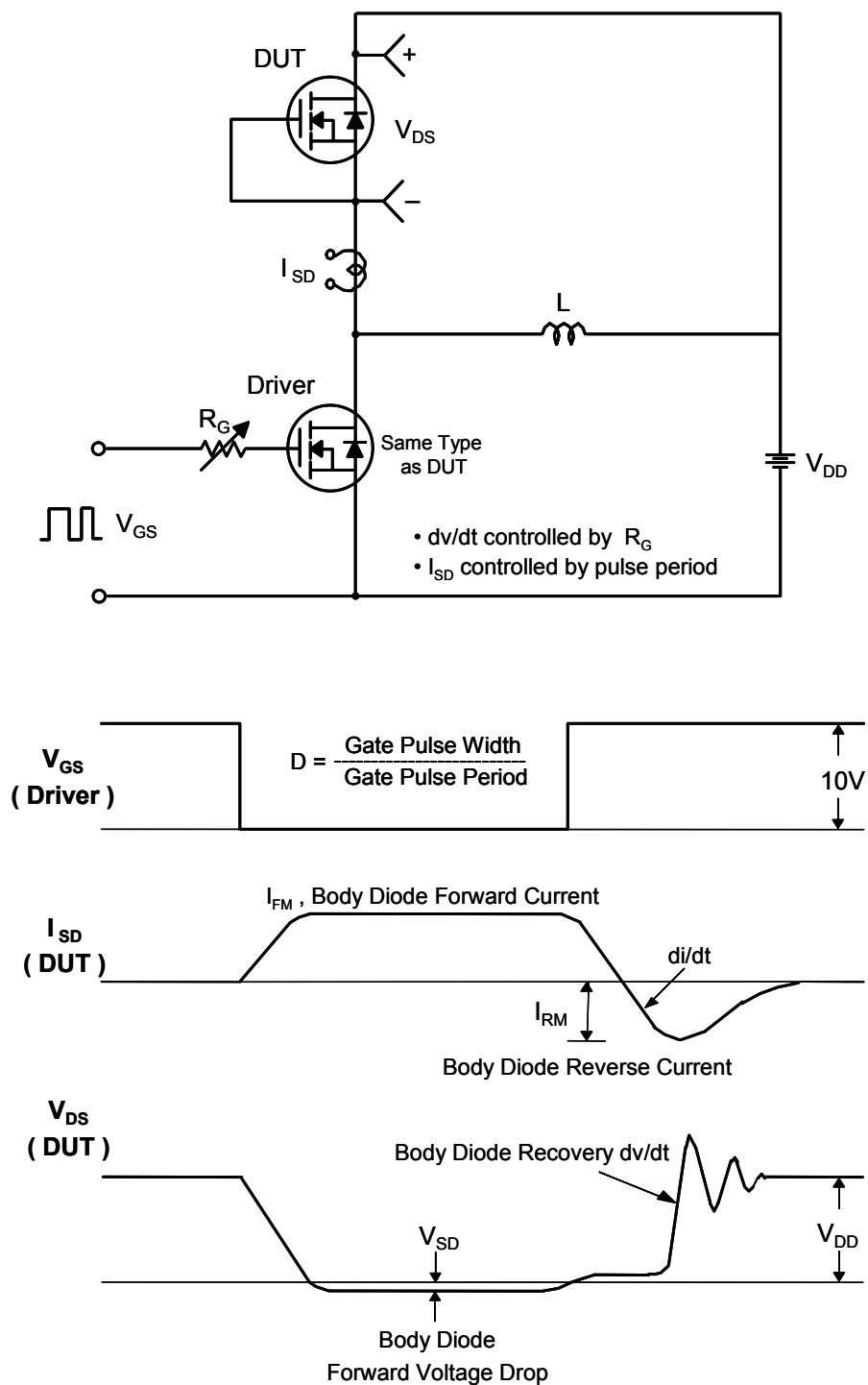


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

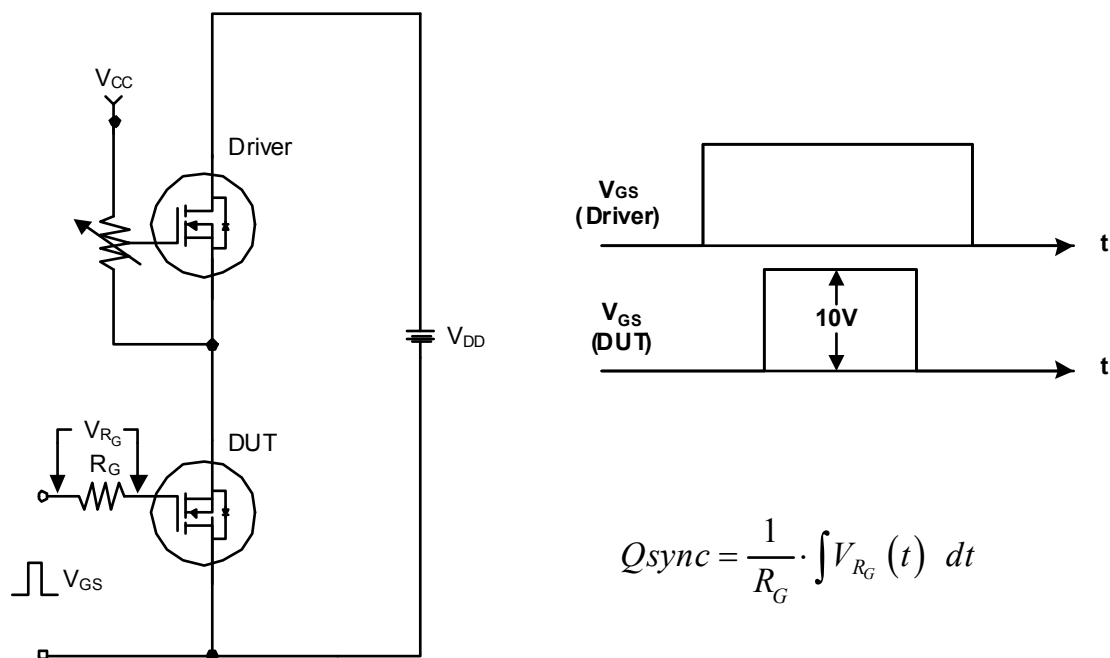
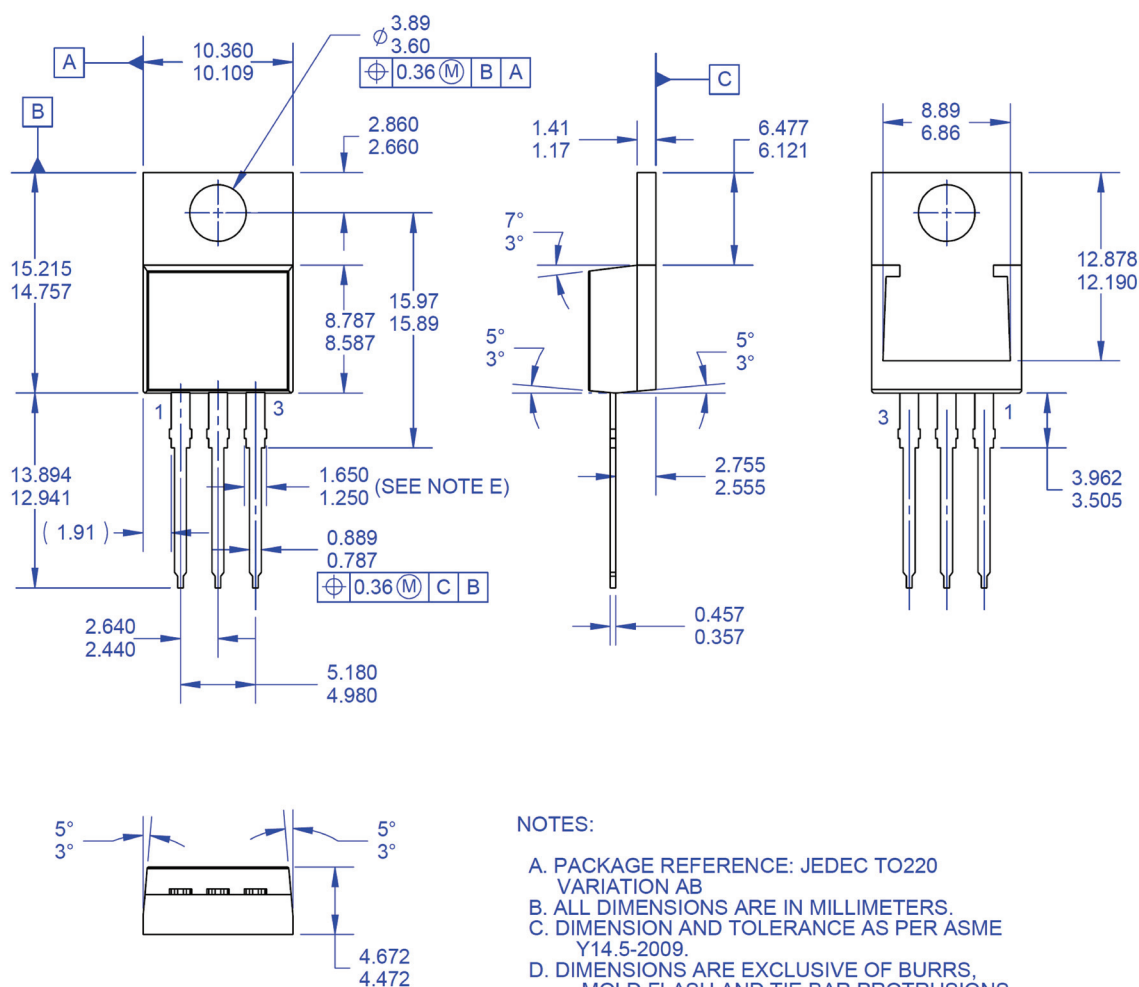


Figure 18. Total Gate Charge Q_{sync} . Test Circuit & Waveforms

Mechanical Dimensions



- A. PACKAGE REFERENCE: JEDEC TO220 VARIATION AB
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. MAX WIDTH FOR F102 DEVICE = 1.35mm.
- F. DRAWING FILE NAME: TO220T03REV4.

Figure 19. TO-220, Molded, 3-Lead, Jedec Variation AB

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