



ON Semiconductor®

FDH055N15A

N-Channel PowerTrench® MOSFET

150 V, 167 A, 5.9 mΩ

Features

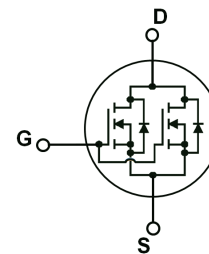
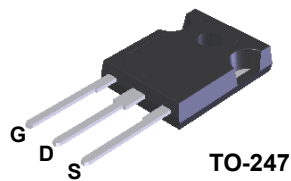
- $R_{DS(on)} = 4.8 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 120 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using 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
- Micro Solar Inverter



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

Symbol	Parameter	FDH055N15A	Unit
V_{DSS}	Drain to Source Voltage	150	V
V_{GSS}	Gate to Source Voltage	- DC	± 20
		- AC (f > 1 Hz)	± 30
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$, Silicon Limited)	167*
		- Continuous ($T_C = 100^\circ\text{C}$, Silicon Limited)	118
		- Continuous ($T_C = 25^\circ\text{C}$, Package Limited)	156
I_{DM}	Drain Current - Pulsed (Note 1)	668	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	835	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.0	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)		429
		- Derate Above 25°C	2.86
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 156 A.

Thermal Characteristics

Symbol	Parameter	FDH055N15A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.35	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDH055N15A	FDH055N15A	TO-247	Tube	N/A	N/A	30 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	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	150	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	-	0.1	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 120 \text{ V}, T_C = 150^\circ\text{C}$	-	-	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	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 120 \text{ A}$	-	4.8	5.9	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 120 \text{ A}$	-	219	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$	-	7100	9445	pF
C_{oss}	Output Capacitance		-	664	885	pF
C_{rss}	Reverse Transfer Capacitance		-	23	35	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}$	-	1159	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 75 \text{ V}, I_D = 120 \text{ A},$ $V_{GS} = 10 \text{ V}$	-	92	-	nC
Q_{gs}	Gate to Source Gate Charge		-	31	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	15	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		(Note 4)	-	16	-
ESR	Equivalent Series Resistance(G-S)	$f = 1 \text{ MHz}$	-	1.2	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75 \text{ V}, I_D = 120 \text{ A},$ $V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	35	80	ns
t_r	Turn-On Rise Time		-	67	144	ns
$t_{d(off)}$	Turn-Off Delay Time		-	71	152	ns
t_f	Turn-Off Fall Time		(Note 4)	-	21	52

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	167*	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	668	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 120 \text{ A}$	-	-	1.25	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 120 \text{ A}, V_{DS} = 75 \text{ V},$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	-	105	-	ns
Q_{rr}	Reverse Recovery Charge	$V_{GS} = 0 \text{ V}, I_{SD} = 120 \text{ A}, V_{DS} = 75 \text{ V},$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	-	342	-	nC
Q_{rr}	Reverse Recovery Charge	$V_{GS} = 0 \text{ V}, I_{SD} = 30 \text{ A}, V_{DS} = 75 \text{ V},$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	-	348	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. Starting $T_J = 25^\circ\text{C}$, $L = 3 \text{ mH}$, $I_{AS} = 23.6 \text{ A}$.
3. $I_{SD} \leq 120 \text{ A}$, $di/dt \leq 200 \text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

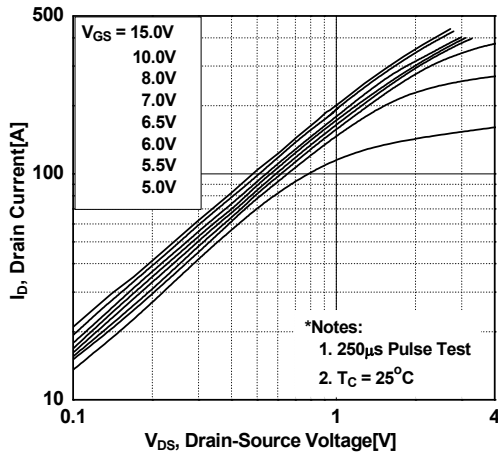


Figure 2. Transfer Characteristics

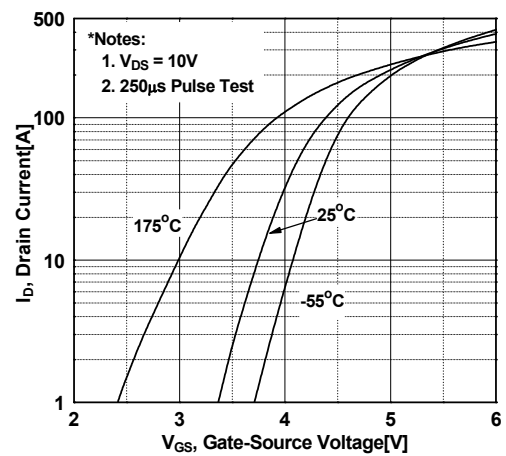


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

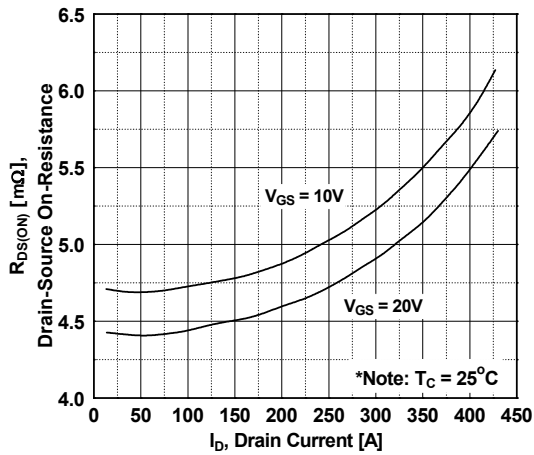


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

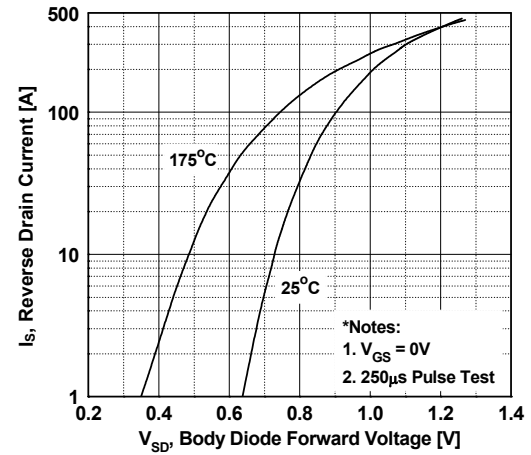


Figure 5. Capacitance Characteristics

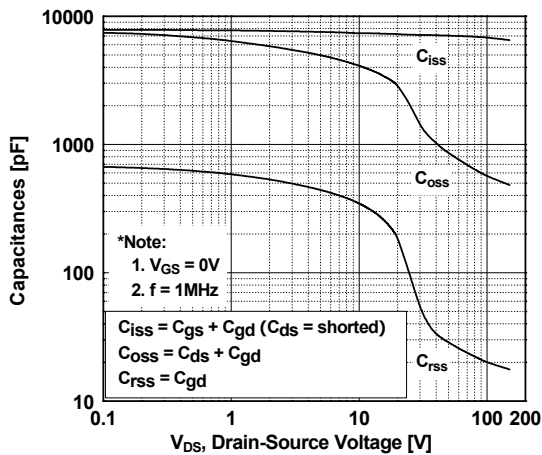
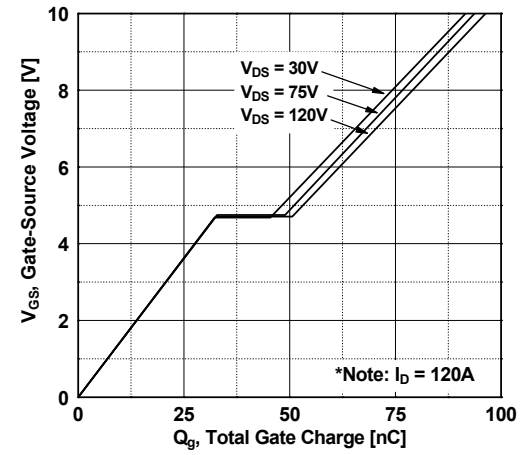


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

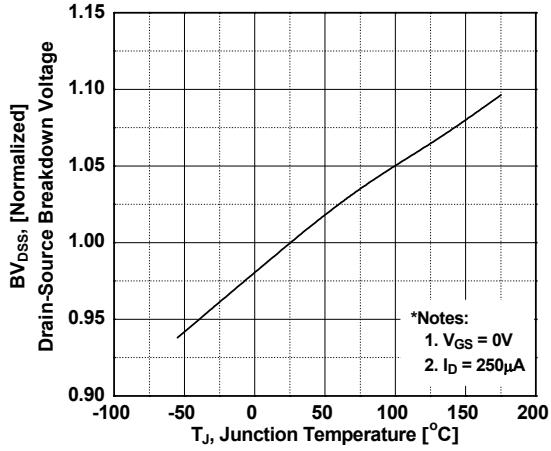


Figure 8. On-Resistance Variation vs. Temperature

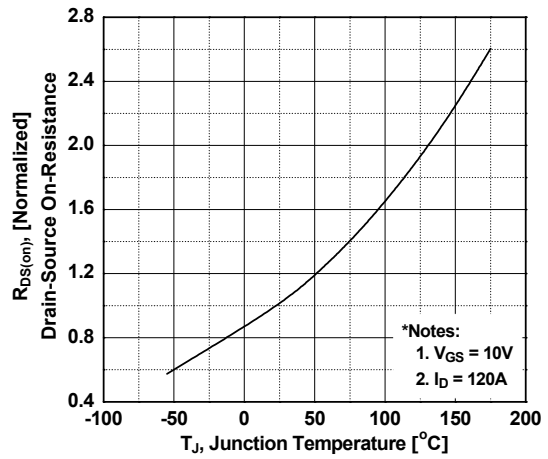


Figure 9. Maximum Safe Operating Area

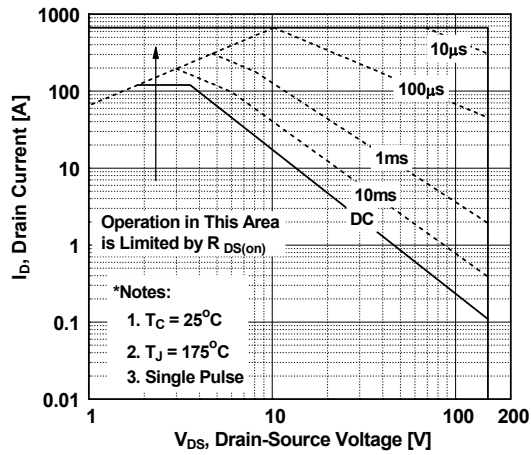


Figure 10. Maximum Drain Current vs. Case Temperature

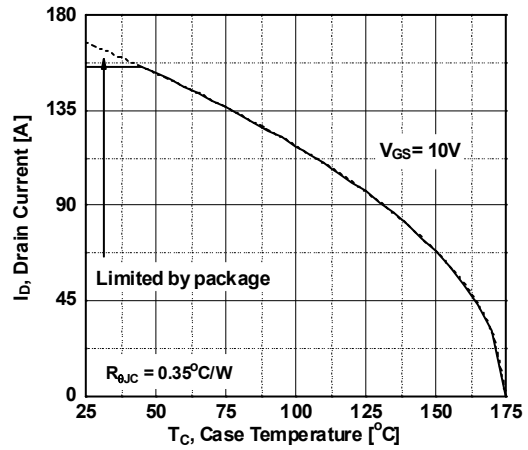
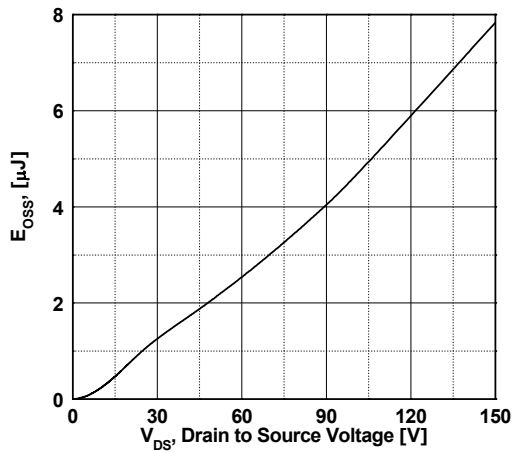
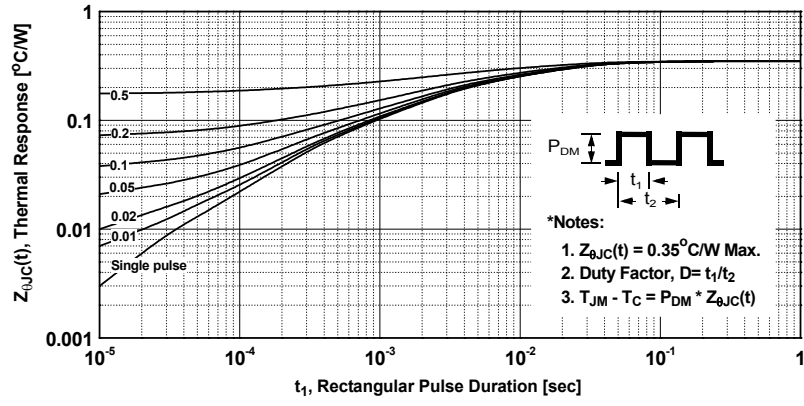


Figure 11. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



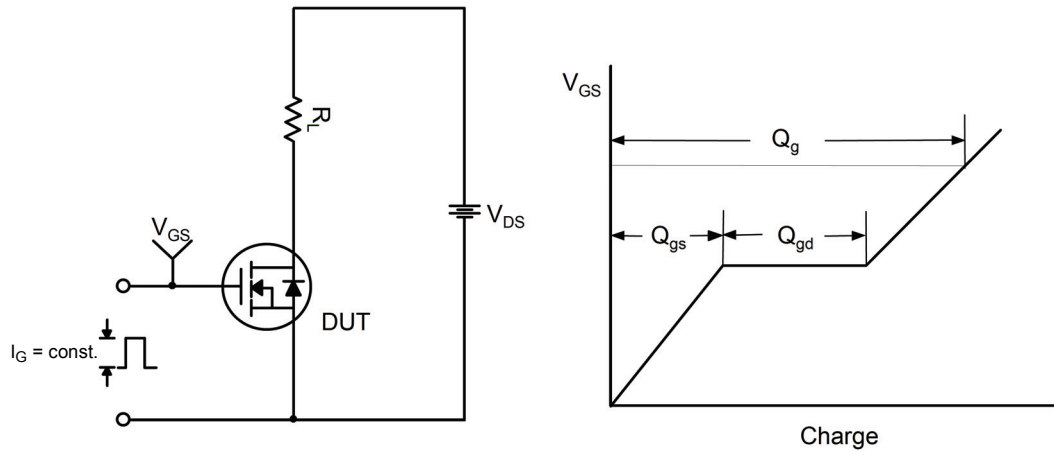


Figure 13. Gate Charge Test Circuit & Waveform

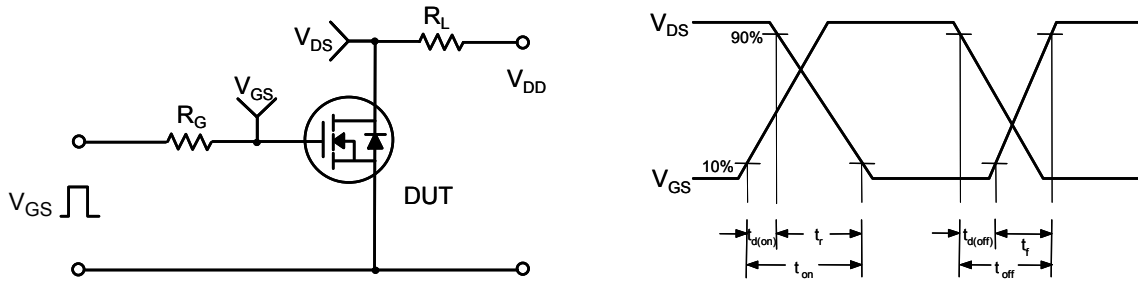


Figure 14. Resistive Switching Test Circuit & Waveforms



Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

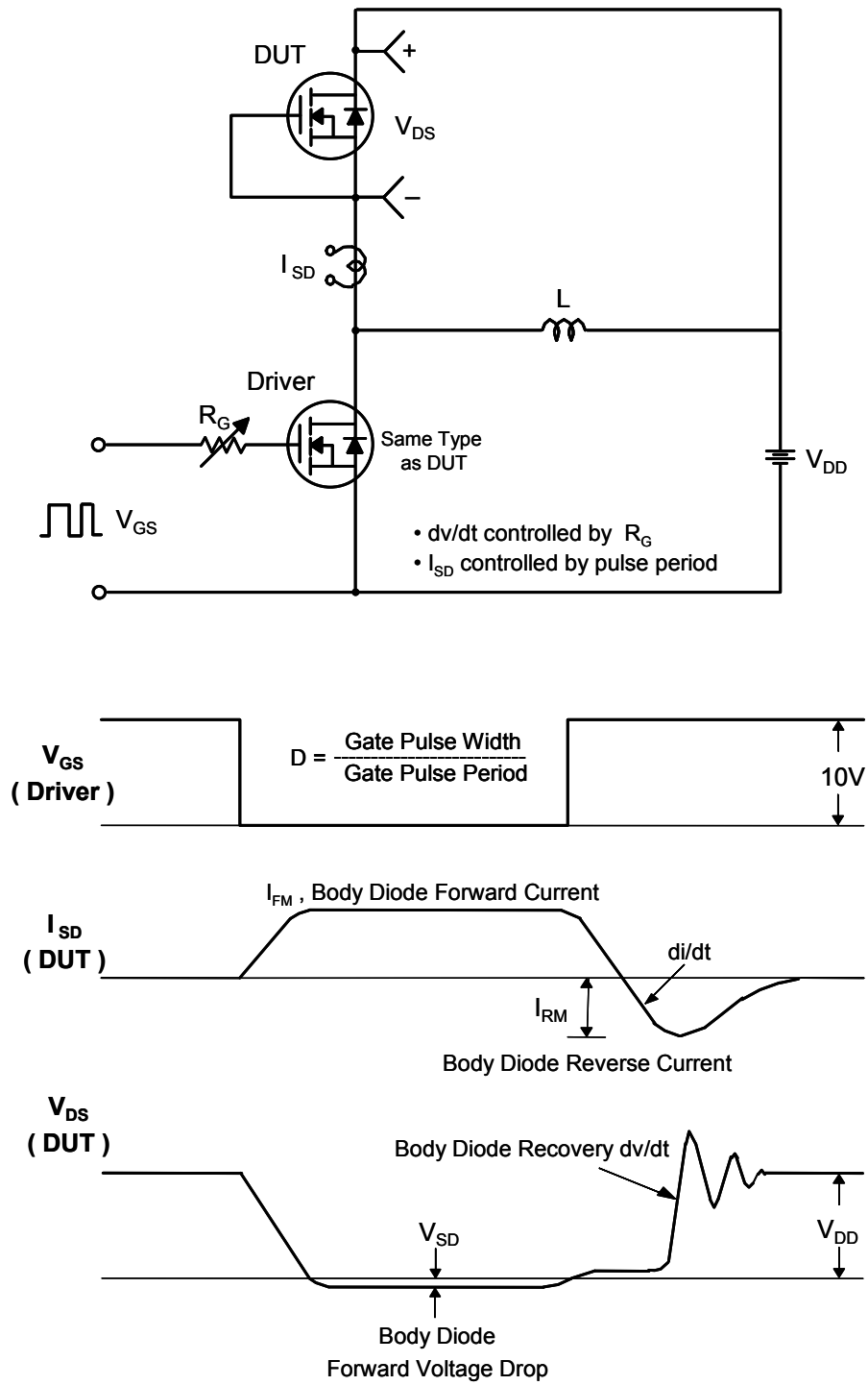
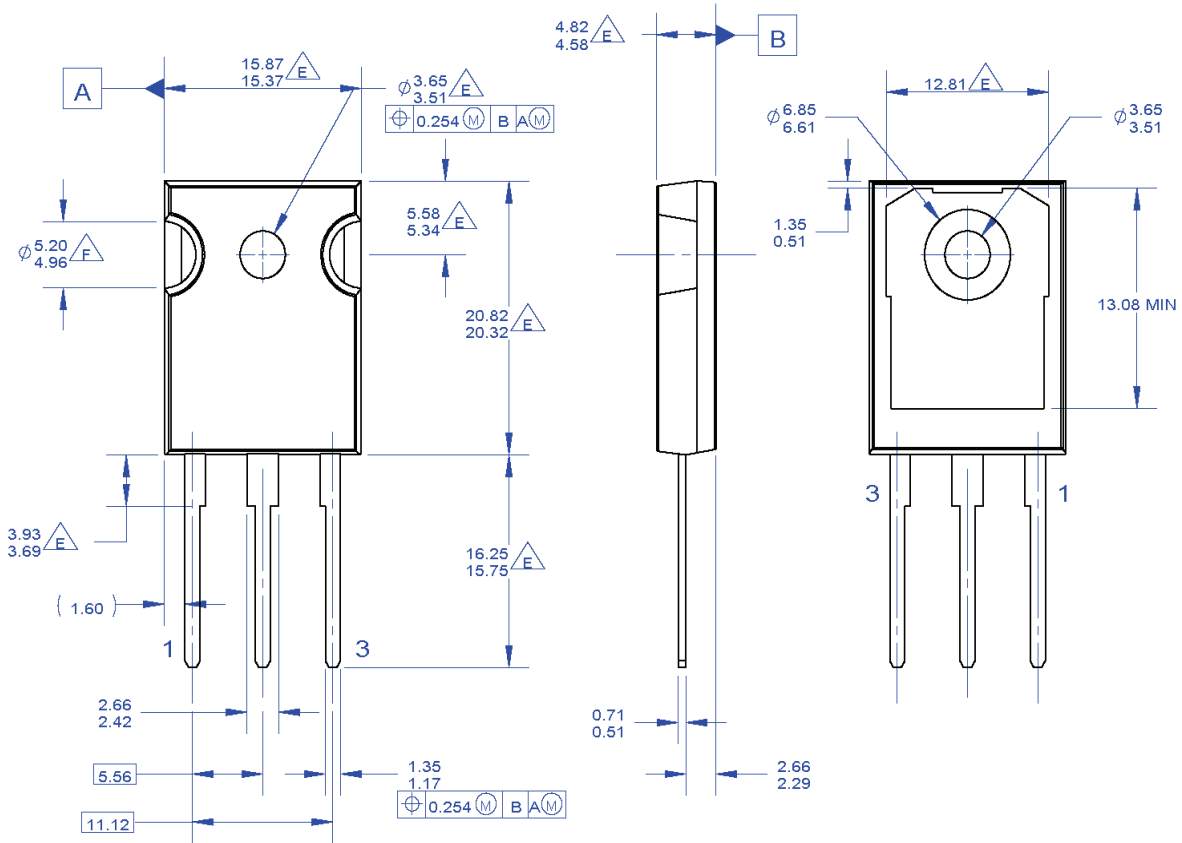


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DRAWING CONFORMS TO ASME Y14.5 - 1994

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NOTCH MAY BE SQUARE

G. DRAWING FILENAME: MKT-TO247A03_REV03

Figure 17. TO-247, Molded, 3-Lead, Jedec Variation AB

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