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FAIRCHILD SEMICONDUCTOR®

November 2013

FCH47N60N

N-Channel SupreMOS® MOSFET

600 V, 47 A, 62 mΩ

Features

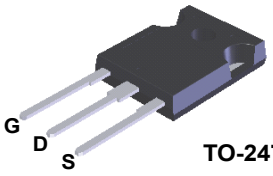
- 650 V @ T_J = 150°C
- R_{DS}(on) = 51.5 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 23.5 A
- Ultra Low Gate Charge (Typ. Q_g = 115 nC)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)}$ = 511 pF)
- 100% Avalanche Tested
- RoHS Compliant

Application

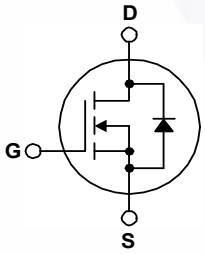
- Solar Inverter
- AC-DC Power Supply

Description

The SupreMOS® MOSFET is Fairchild Semiconductor's next generation of high voltage super-junction (SJ) technology employing a deep trench filling process that differentiates it from the conventional SJ MOSFETs. This advanced technology and precise process control provides lowest Rsp on-resistance, superior switching performance and ruggedness. SupreMOS MOSFET is suitable for high frequency switching power converter applications such as PFC, server/telecom power, FPD TV power, ATX power, and industrial power applications.



TO-247



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

Symbol	Parameter		FCH47N60N	Unit
V_{DSS}	Drain to Source Voltage		600	V
V_{GSS}	Gate to Source Voltage		±30	V
I_D	Drain Current	- Continuous (T_C = 25°C)	47	A
		- Continuous (T_C = 100°C)	29.7	
I_{DM}	Drain Current	- Pulsed (Note 1)	141	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	3068	mJ
I_{AR}	Avalanche Current	(Note 1)	15.7	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	3.7	mJ
dv/dt	MOSFET dv/dt		100	V/ns
	Peak Diode Recovery dv/dt	(Note 3)	20	V/ns
P_D	Power Dissipation	(T_C = 25°C)	368	W
		- Derate above 25°C	2.94	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FCH47N60N	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.34	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH47N60N	FCH47N60N	TO-247	Tube	N/A	N/A	30 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 = 1 mA, V_{GS} = 0 V, $T_C = 25^oC$	600	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 1 mA, Referenced to 25^oC	-	0.78	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 480 V, V_{GS} = 0 V	-	-	10	μA
		V_{DS} = 480 V, V_{GS} = 0 V, $T_C = 125^oC$	-	-	100	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2	-	4	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 23.5 A	-	51.5	62.0	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 23.5 A	-	56	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 100 V, V_{GS} = 0 V, f = 1 MHz	-	5037	6700	pF
C_{oss}	Output Capacitance		-	200	270	pF
C_{rss}	Reverse Transfer Capacitance		-	2.5	4.0	pF
C_{oss}	Output Capacitance	V_{DS} = 380 V, V_{GS} = 0 V, f = 1 MHz	-	108	-	pF
$C_{oss(eff.)}$	Effective Output Capacitance	V_{DS} = 0 V to 380 V, V_{GS} = 0 V	-	511	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 380 V, I_D = 23.5 A, V_{GS} = 10 V (Note 4)	-	115	151	nC
Q_{gs}	Gate to Source Gate Charge		-	21	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	34	-	nC
ESR	Equivalent Series Resistance(G-S)	f = 1 MHz	-	0.9	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 380 V, I_D = 23.5 A, R_G = 4.7 Ω (Note 4)	-	11	32	ns
t_r	Turn-On Rise Time		-	9	28	ns
$t_{d(off)}$	Turn-Off Delay Time		-	135	280	ns
t_f	Turn-Off Fall Time		-	22	54	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	47	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	141	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 23.5 A	-	-	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 23.5 A, dI_F/dt = 100 A/μs	-	495	-	ns
Q_{rr}	Reverse Recovery Charge		-	12	-	μC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. I_{AS} = 15.7 A, R_G = 25 Ω, starting T_J = 25°C.
3. $I_{SD} \le 47$ A, di/dt ≤ 200 A/μs, $V_{DD} \le 380$ V, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

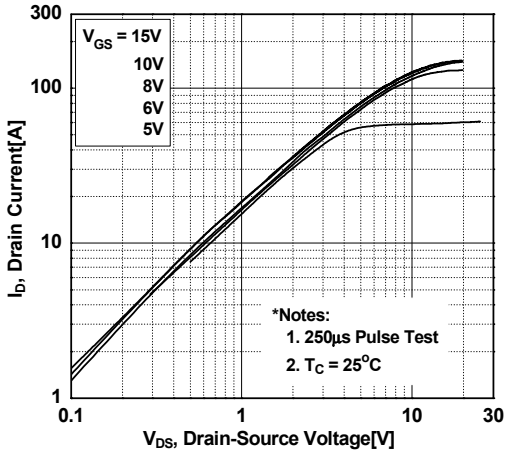


Figure 2. Transfer Characteristics

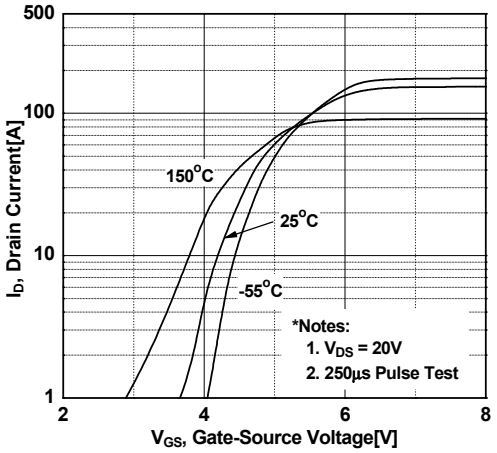


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

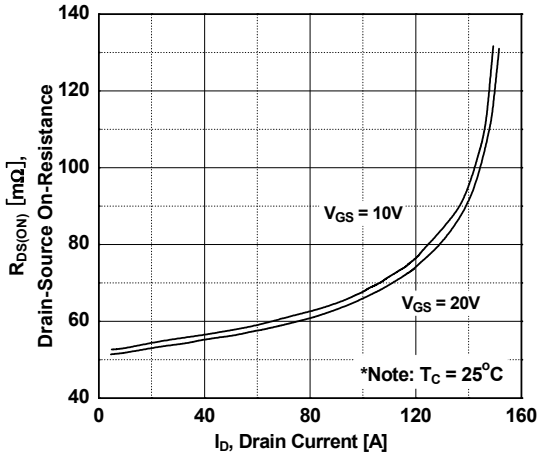


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

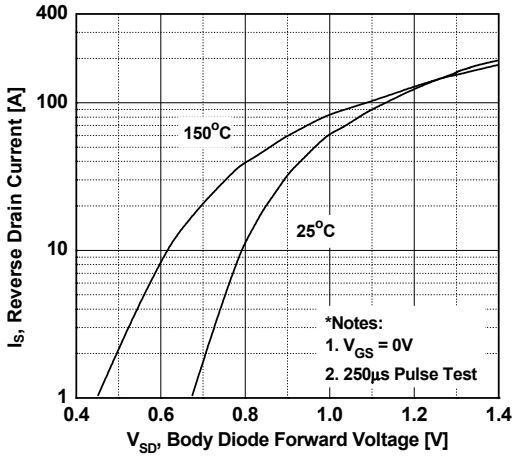


Figure 5. Capacitance Characteristics

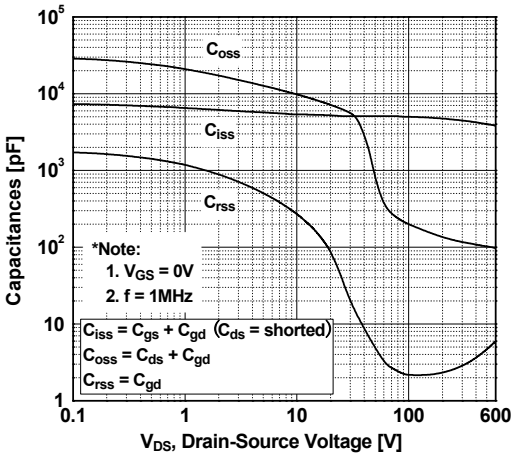
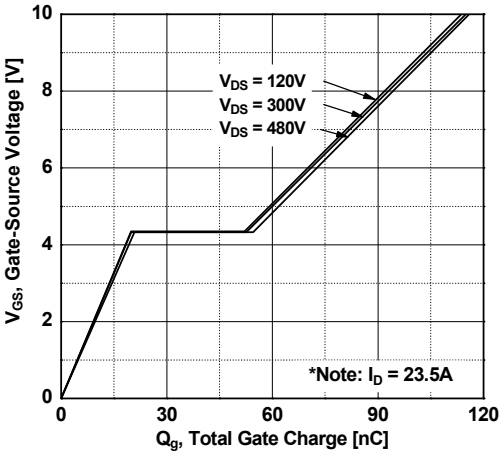


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

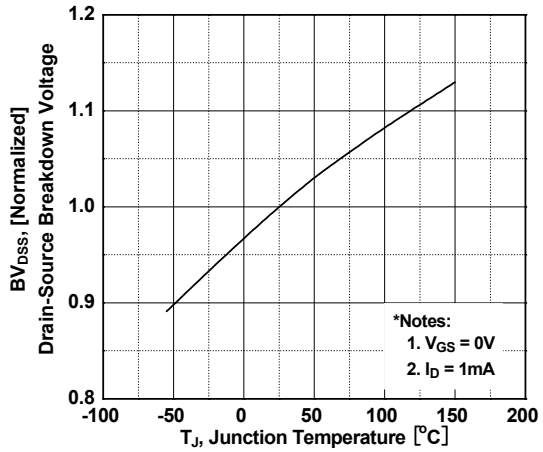


Figure 8. On-Resistance Variation vs. Temperature

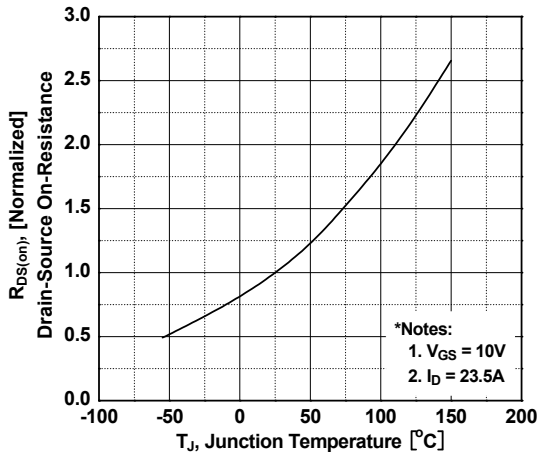


Figure 9. Maximum Safe Operating Area

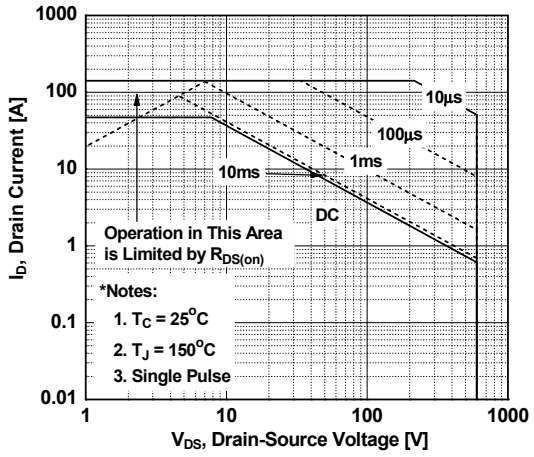


Figure 10. Maximum Drain Current vs. Case Temperature

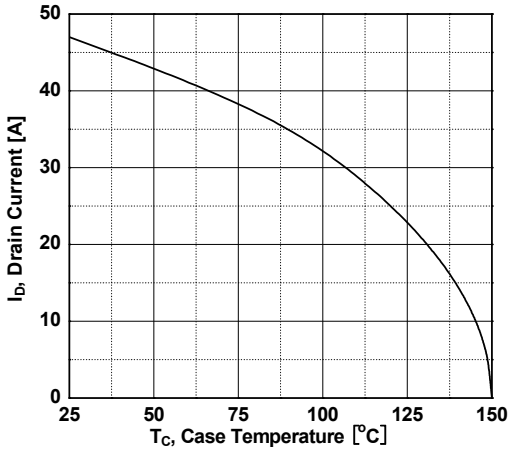
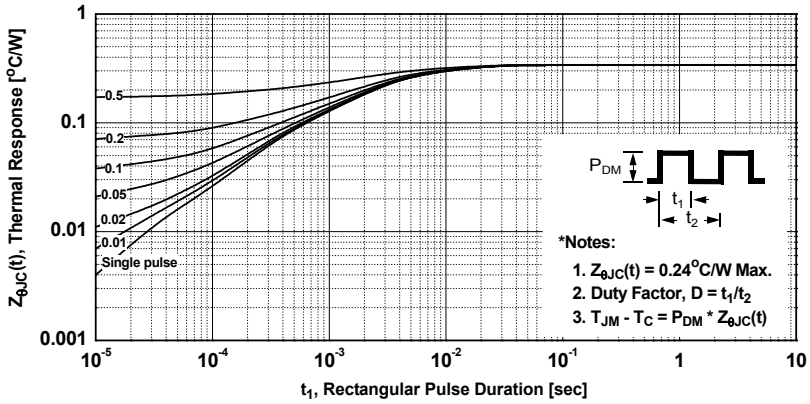


Figure 11. Transient Thermal Response Curve



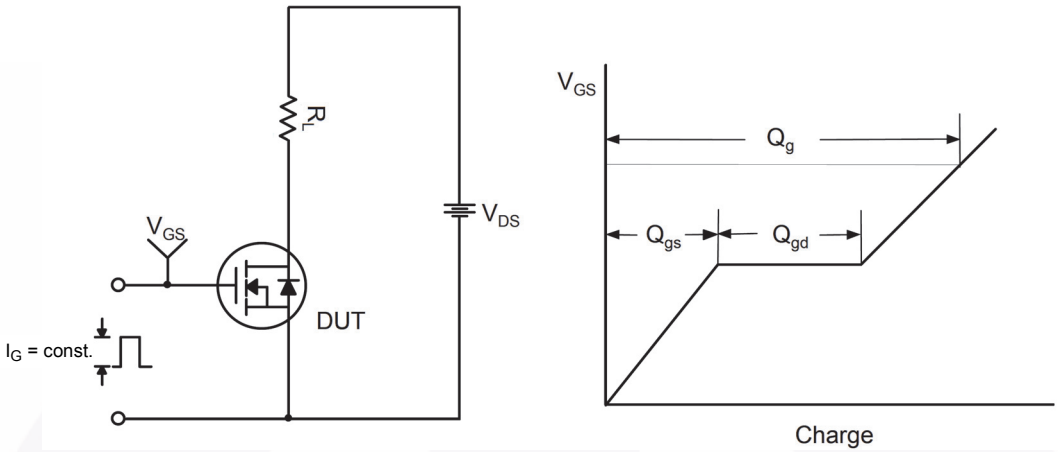


Figure 12. Gate Charge Test Circuit & Waveform

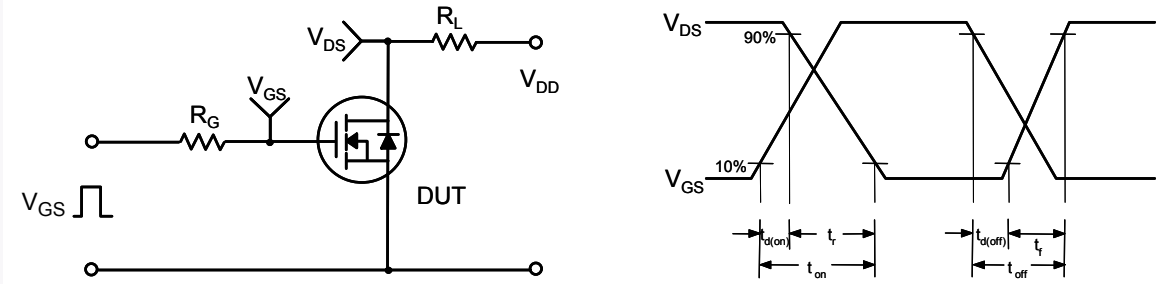


Figure 13. Resistive Switching Test Circuit & Waveforms

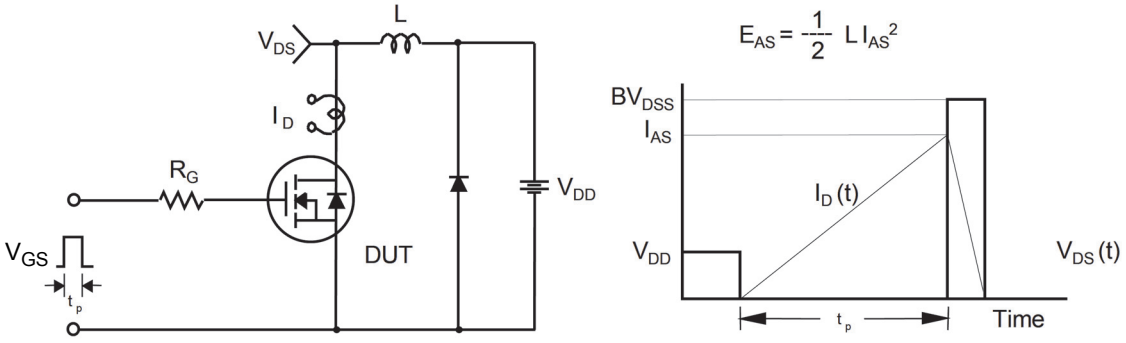


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

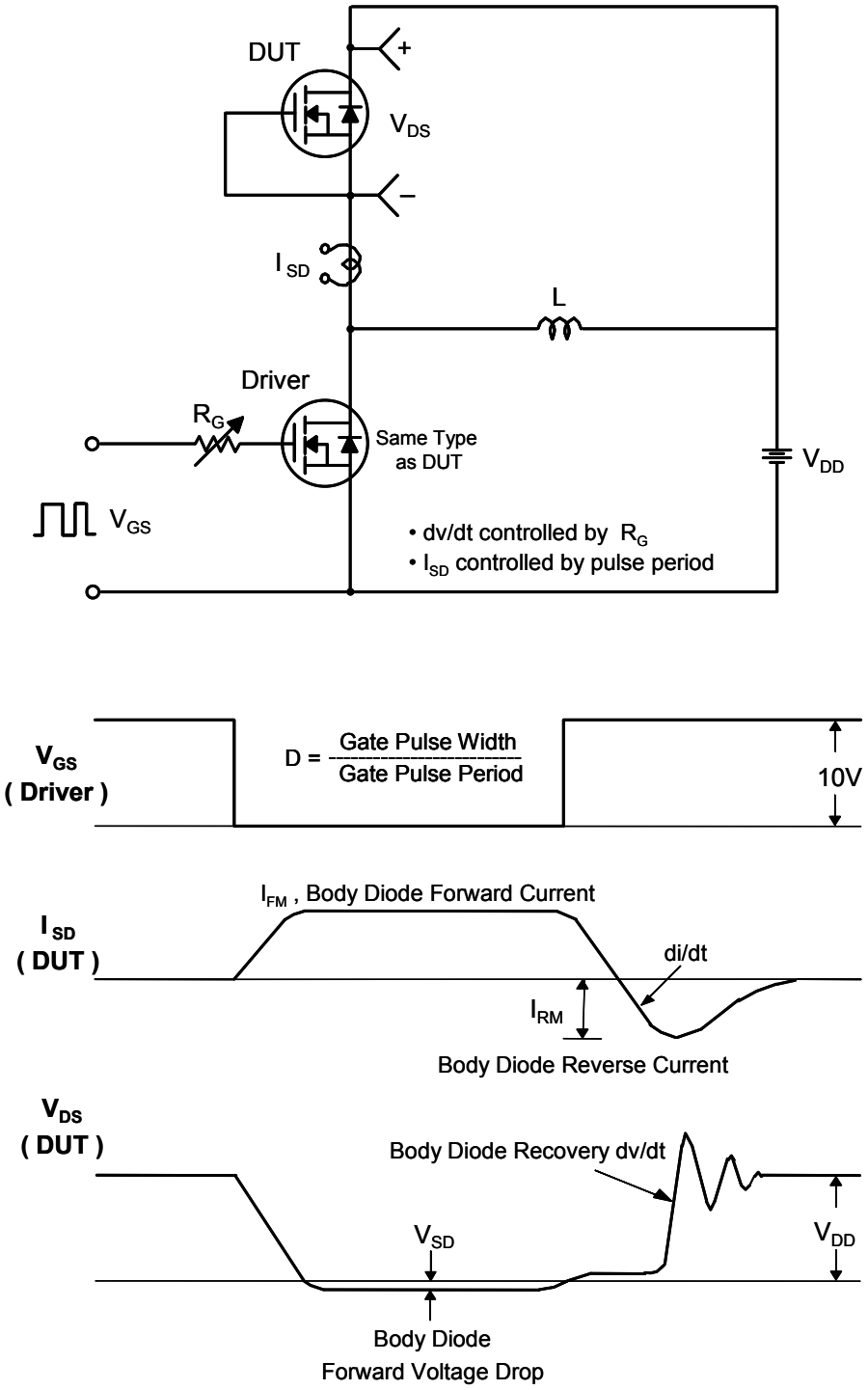
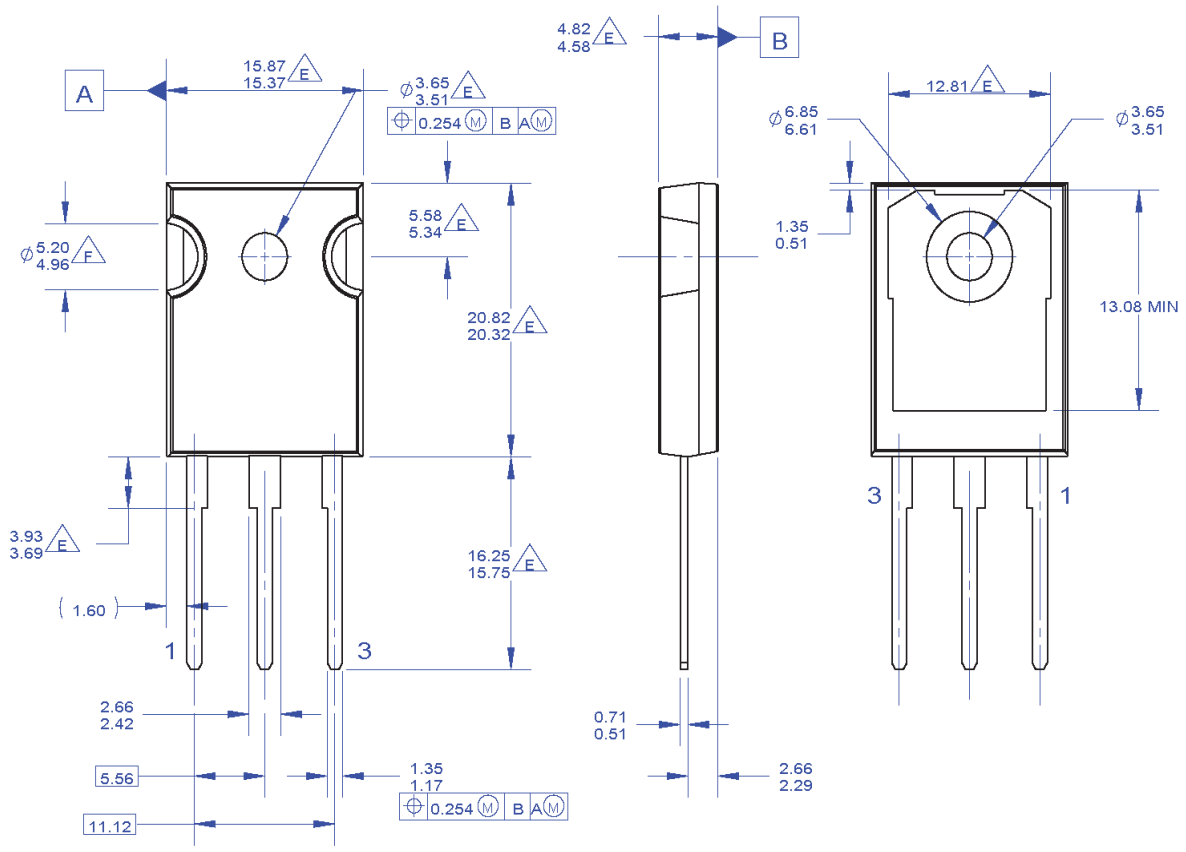


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



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Figure 16. TO-247, Molded, 3-Lead, Jedec Variation AB

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