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FAIRCHILD SEMICONDUCTOR®

November 2013

FCH47N60N

N-Channel SupreMOS® MOSFET

600 V, 47 A, 62 mΩ

Features

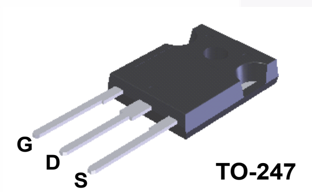
- 650 V @ T_J = 150°C
- $R_{DS}(on)$ = 51.5 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 23.5 A
- Ultra Low Gate Charge (Typ. Q_g = 115 nC)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)}$ = 511 pF)
- 100% Avalanche Tested
- RoHS Compliant

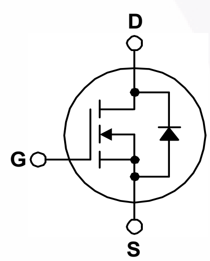
Application

- 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.





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^{o}C	600	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 1 mA, Referenced to 25^{o}C	-	0.78	-	V/^{o}C
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^{o}C	-	-	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. $I_{SD} \leq$ 47 A, di/dt $\leq$ 200 A/µs, $V_{DD} \leq$ 380 V, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

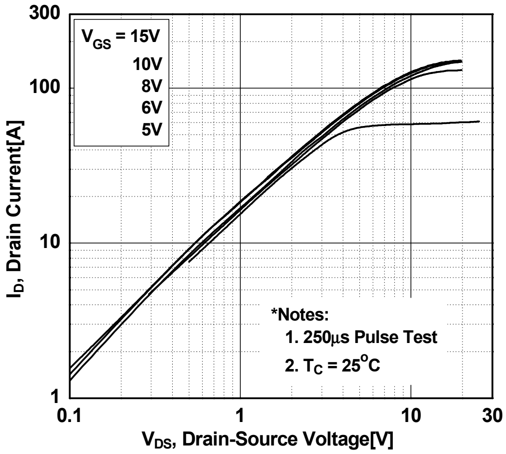


Figure 2. Transfer Characteristics

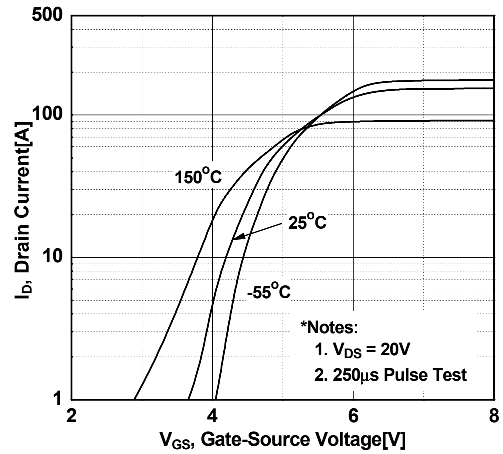


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

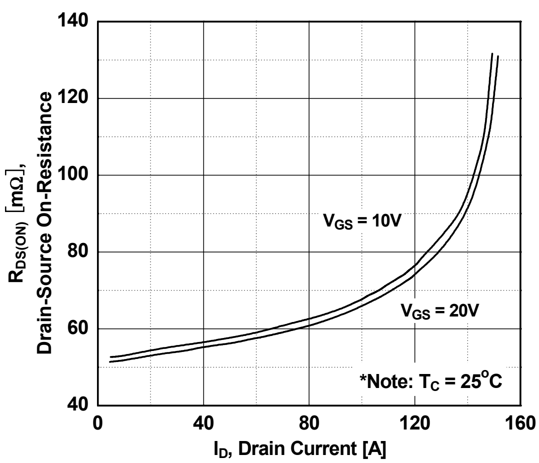


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

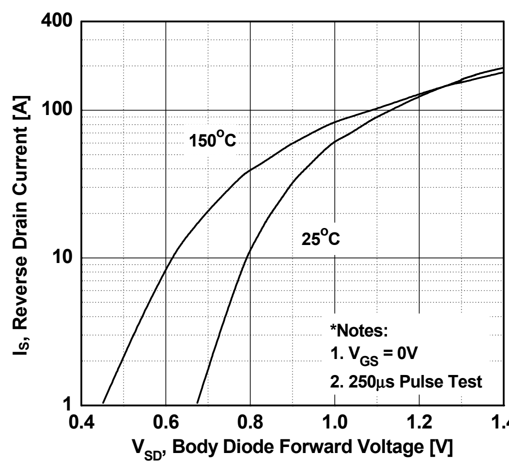


Figure 5. Capacitance Characteristics

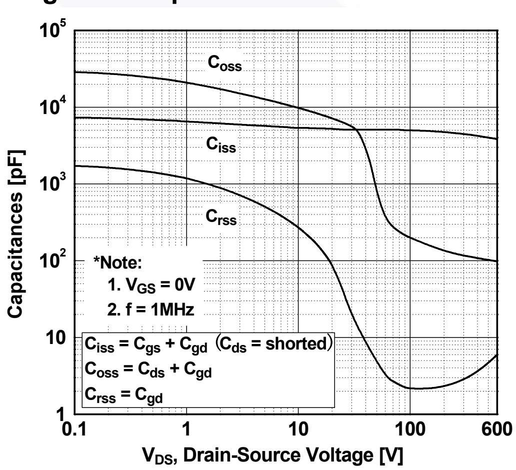
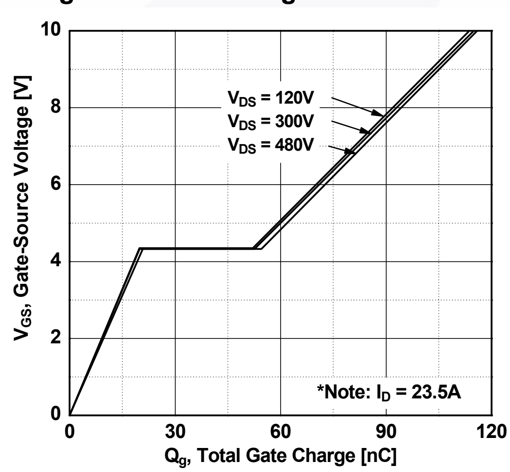


Figure 6. Gate Charge Characteristics



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Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

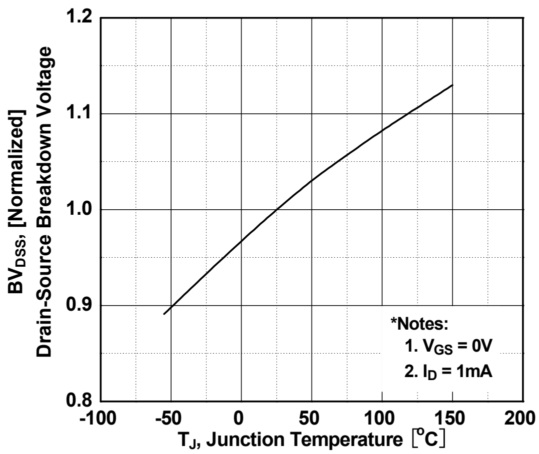


Figure 8. On-Resistance Variation vs. Temperature

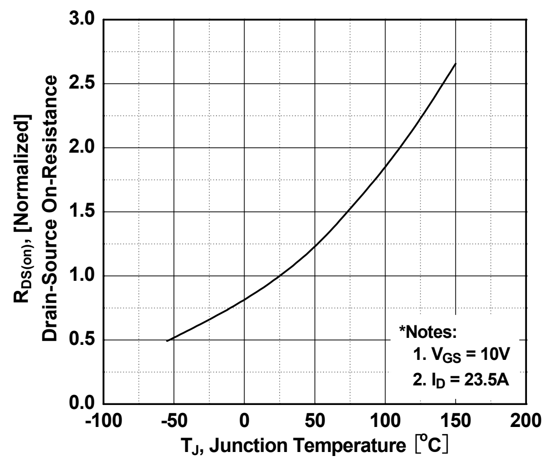


Figure 9. Maximum Safe Operating Area

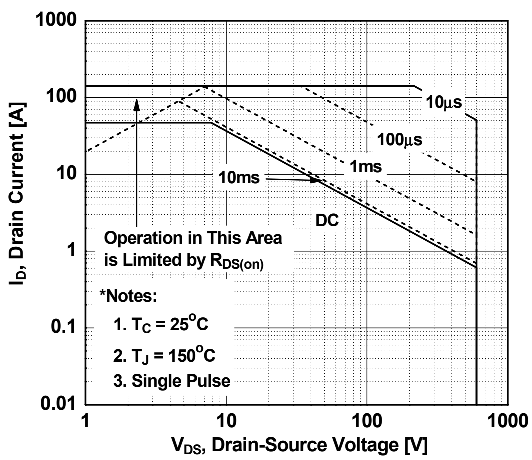


Figure 10. Maximum Drain Current vs. Case Temperature

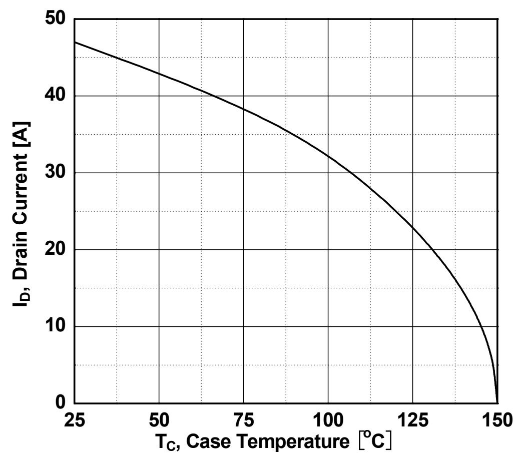
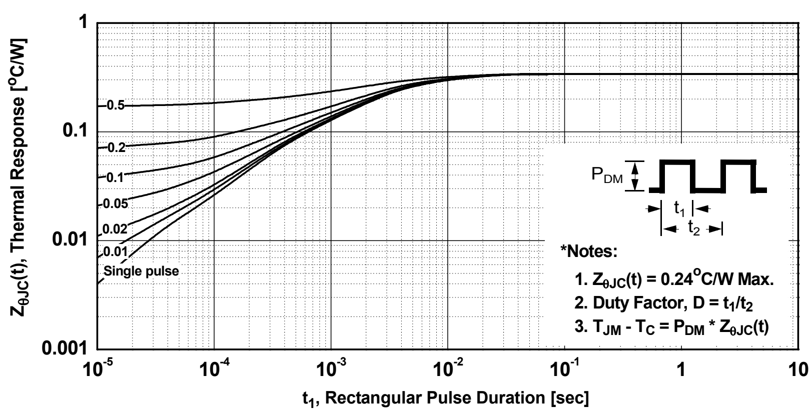


Figure 11. Transient Thermal Response Curve



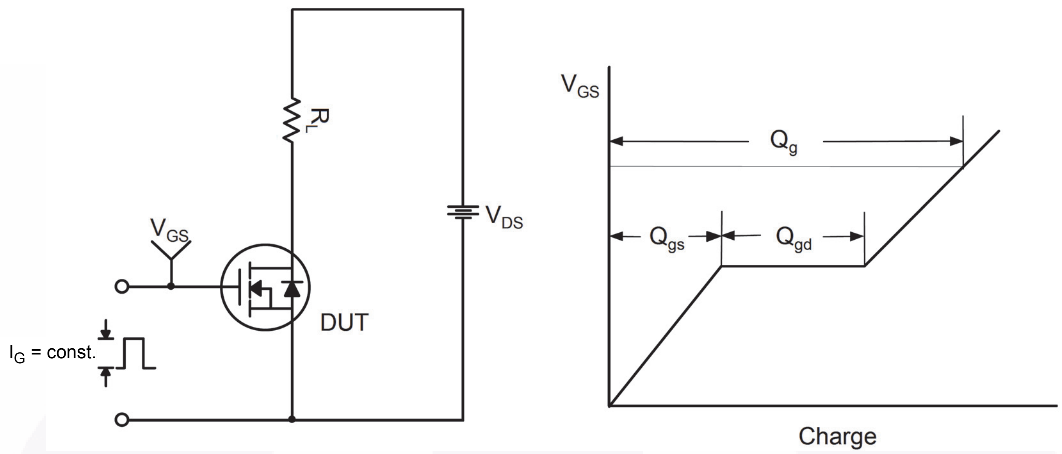


Figure 12. Gate Charge Test Circuit & Waveform

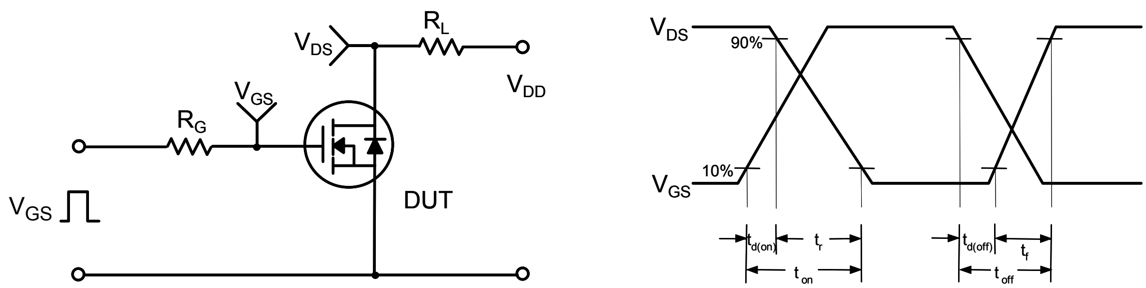


Figure 13. Resistive Switching Test Circuit & Waveforms

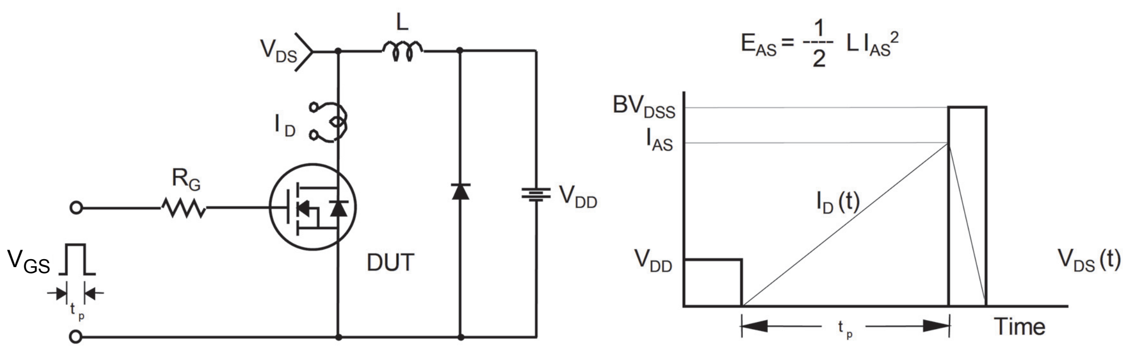


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

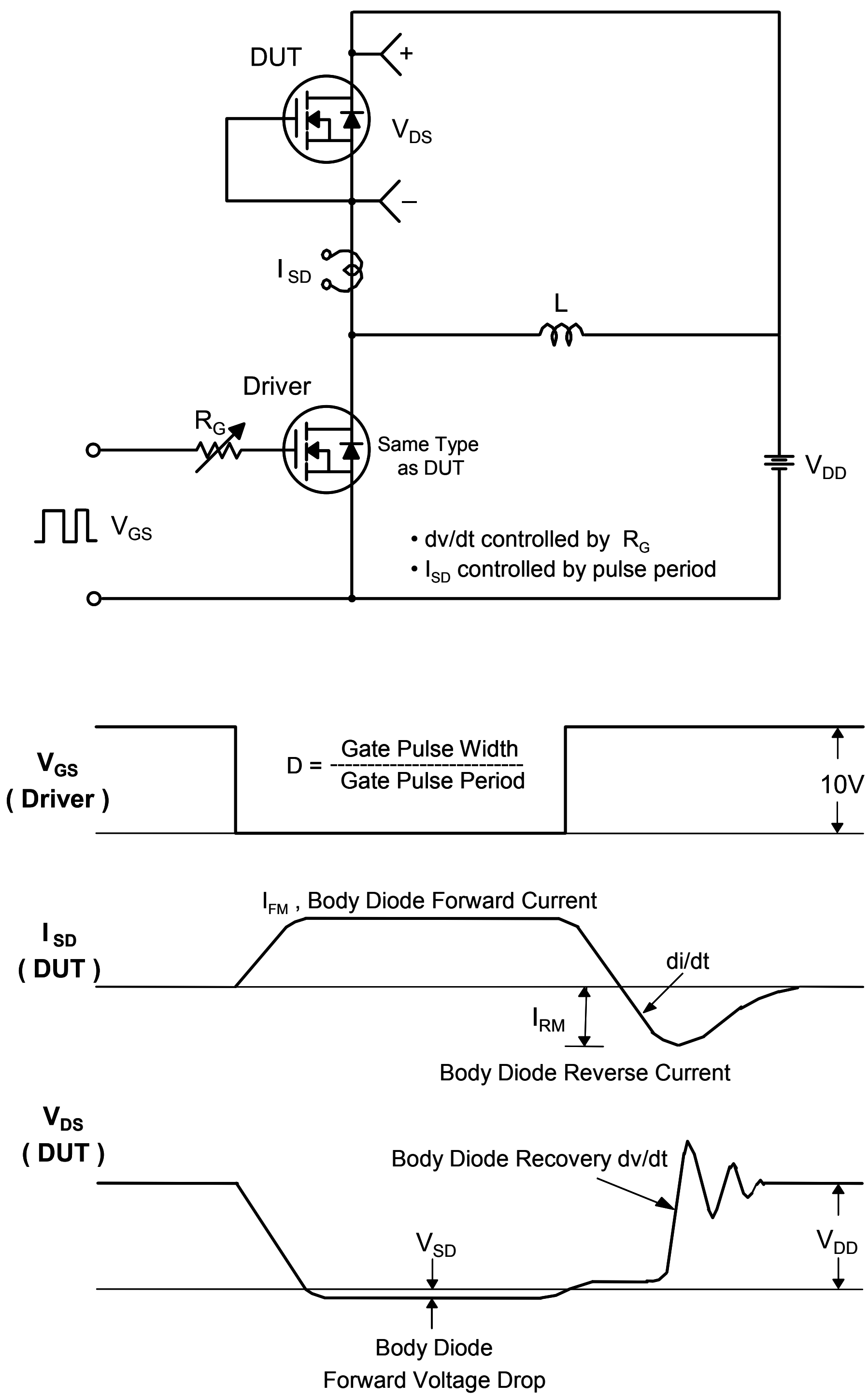


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

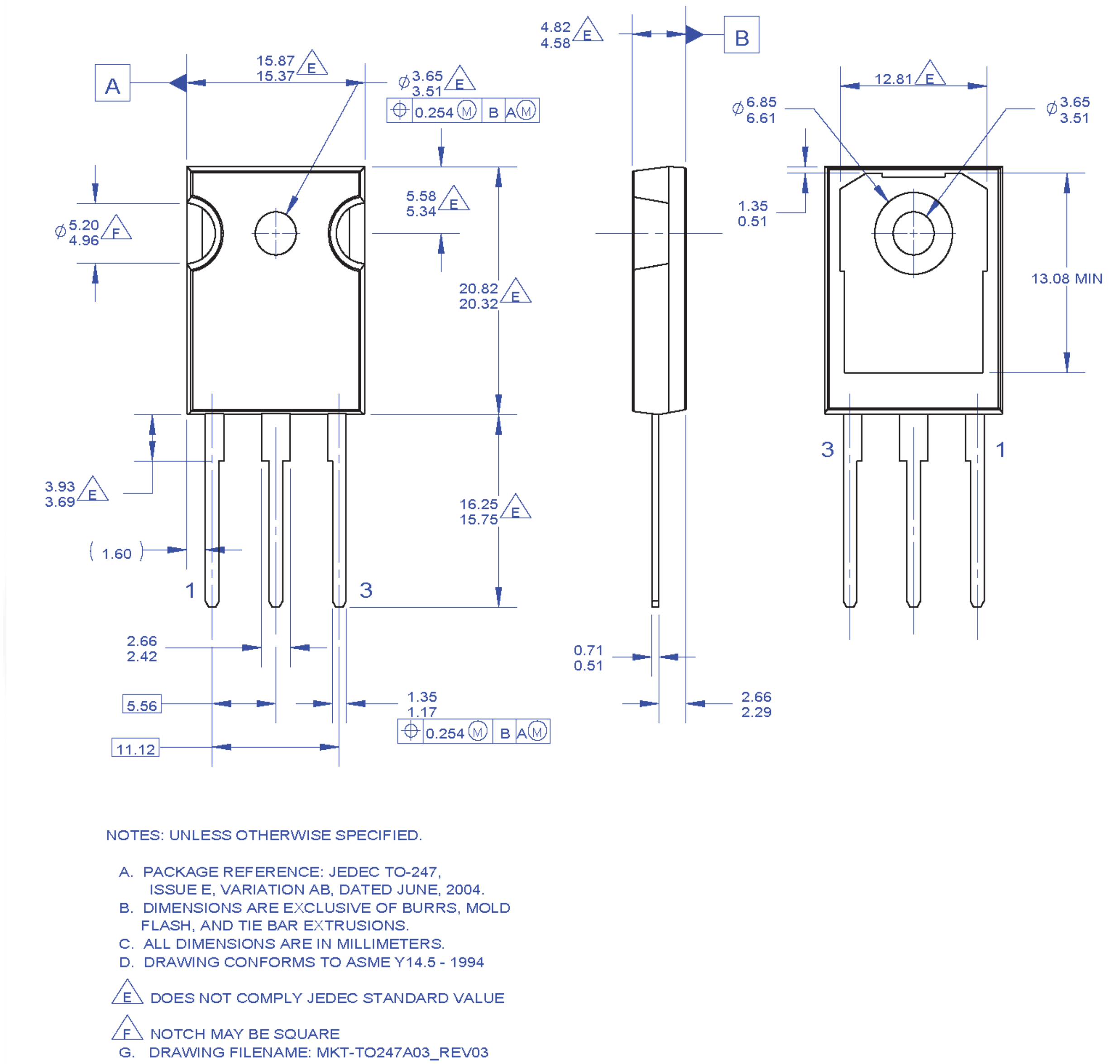


Figure 16. TO-247, Molded, 3-Lead, Jedec Variation AB

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