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FCH060N80 — N-Channel SuperFET® II MOSFET

FCH060N80

N-Channel SuperFET® II MOSFET

800 V, 58 A, 60 mΩ

Features

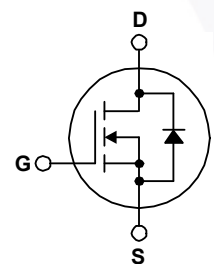
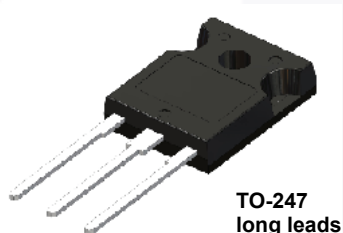
- Typ. $R_{DS(on)} = 54\text{ m}\Omega$
- 850 V @ $T_J = 150^\circ\text{C}$
- Ultra Low Gate Charge (Typ. $Q_g = 270\text{ nC}$)
- Low E_{OSS} (Typ. 23 μJ @ 400 V)
- Low Effective Output Capacitance (Typ. $C_{OSS(eff.)} = 981\text{ pF}$)
- 100% Avalanche Tested
- RoHS Compliant

Description

SuperFET® II MOSFET is Fairchild Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This technology is tailored to minimize conduction loss, provide superior switching performance, dv/dt rate and higher avalanche energy. Consequently, SuperFET II MOSFET is very suitable for the switching power applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications.

Applications

- AC-DC Power Supply
- LED Lighting



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

Symbol	Parameter	FCH060N80_F155	Unit
V_{DSS}	Drain to Source Voltage	800	V
V_{GSS}	Gate to Source Voltage	-DC	± 20
		-AC ($f > 1\text{ Hz}$)	± 30
I_D	Drain Current	-Continuous ($T_C = 25^\circ\text{C}$)	58
		-Continuous ($T_C = 100^\circ\text{C}$)	36.8
I_{DM}	Drain Current	- Pulsed (Note 1)	174
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	2317
I_{AR}	Avalanche Current	(Note 1)	11.6
E_{AR}	Repetitive Avalanche Energy	(Note 1)	50
dv/dt	MOSFET dv/dt		100
	Peak Diode Recovery dv/dt	(Note 3)	20
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	500
		- Derate above 25°C	4
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FCH060N80_F155	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, max.	0.25	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, max.	40	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH060N80_F155	FCH060N80	TO-247 G03	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	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	800	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{ mA}, \text{Referenced to } 25^\circ\text{C}$	-	0.8	-	$V/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 640\text{ V}, T_C = 125^\circ\text{C}$	-	-	25 250	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	$V_{GS} = V_{DS}, I_D = 5.8\text{ mA}$	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 29\text{ A}$	-	54	60	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 29\text{ A}$	-	68	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	11040	14685	pF
C_{oss}	Output Capacitance		-	298	395	pF
C_{riss}	Reverse Transfer Capacitance		-	10	-	pF
C_{oss}	Output Capacitance	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	147	-	pF
$C_{oss}(\text{eff.})$	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$	-	981	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 640\text{ V}, I_D = 58\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	-	270	350	nC
Q_{gs}	Gate to Source Gate Charge		-	54	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	100	-	nC
ESR	Equivalent Series Resistance	$f = 1\text{ MHz}$	-	0.78	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400\text{ V}, I_D = 58\text{ A}, V_{GS} = 10\text{ V}, R_g = 4.7\text{ }\Omega$ (Note 4)	-	55	120	ns
t_r	Turn-On Rise Time		-	73	156	ns
$t_{d(off)}$	Turn-Off Delay Time		-	213	436	ns
t_f	Turn-Off Fall Time		-	72	154	ns

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	58	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	174	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 58\text{ A}$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 58\text{ A}$	-	850	-	ns
Q_{rr}	Reverse Recovery Charge	$di/dt = 100\text{ A}/\mu\text{s}$	-	35	-	μC

Notes:

1. Repetitive rating: pulse width limited by maximum junction temperature
2. $I_{AS} = 11.6\text{ A}, V_{DD} = 50\text{ V}, R_g = 25\text{ }\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 58\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature typical characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

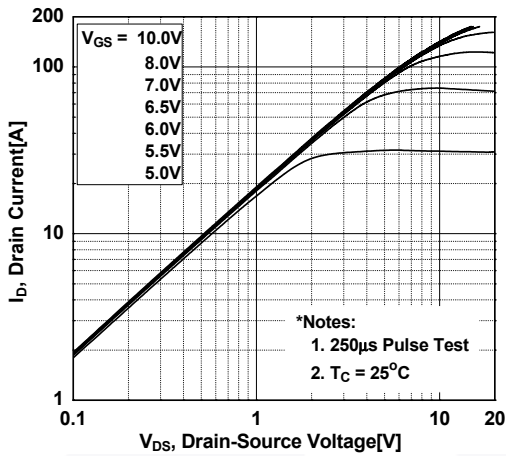


Figure 2. Transfer Characteristics

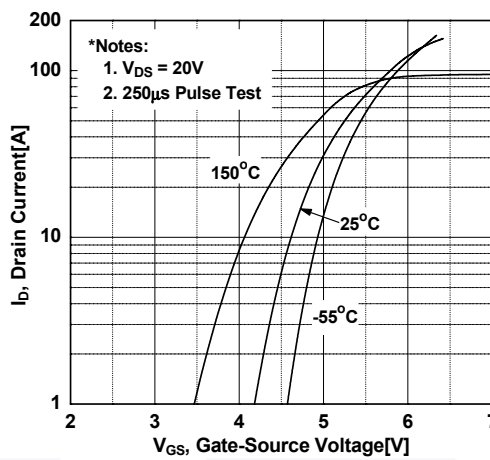


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

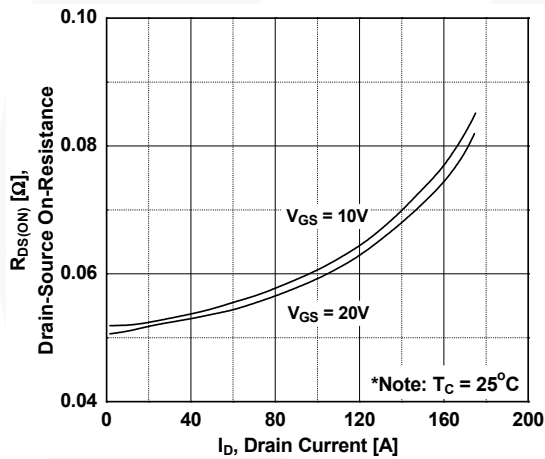


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

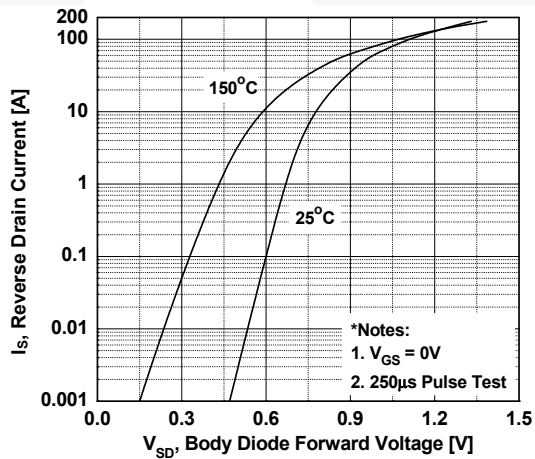


Figure 5. Capacitance Characteristics

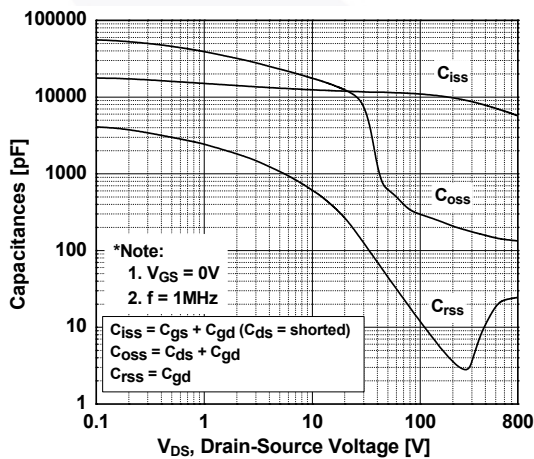
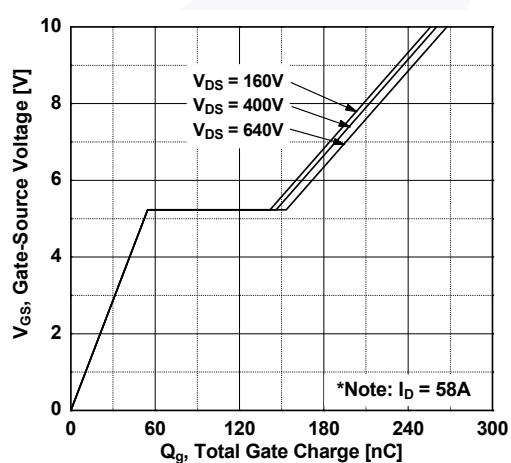


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

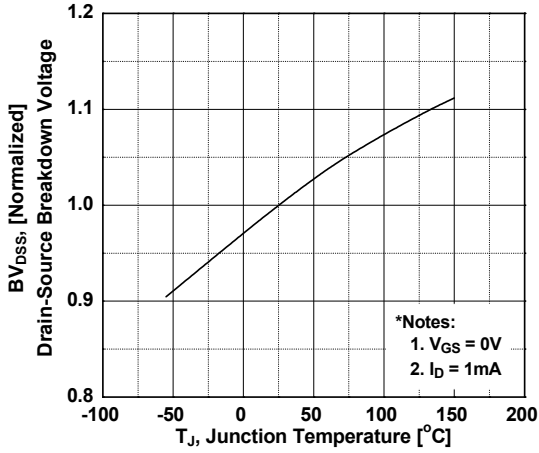


Figure 8. On-Resistance Variation vs. Temperature

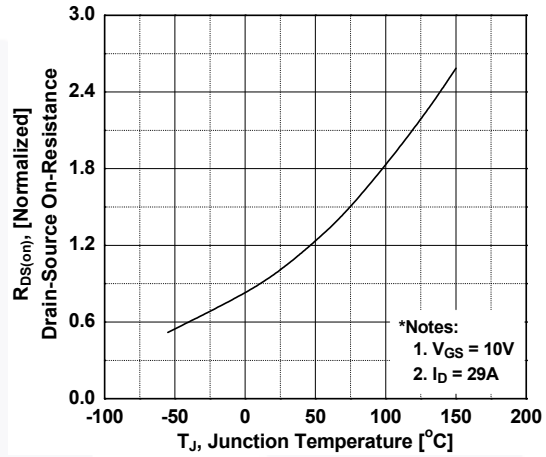


Figure 9. Maximum Safe Operating Area

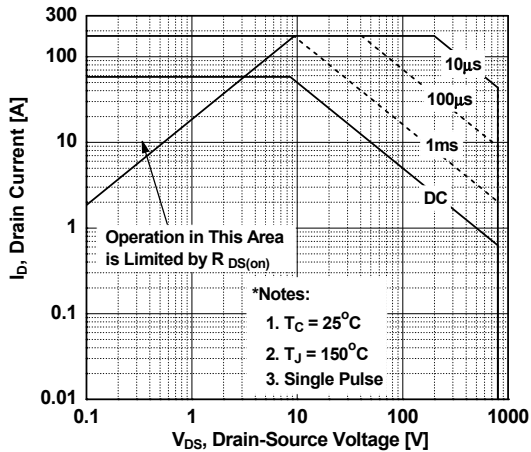


Figure 10. Maximum Drain Current vs. Case Temperature

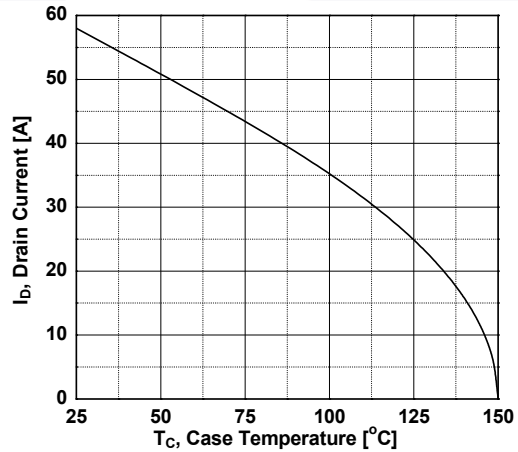
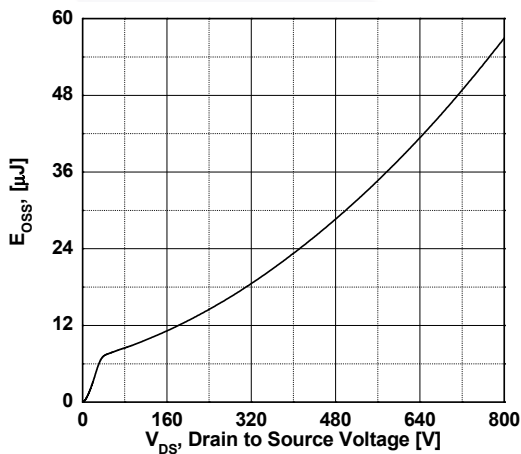


Figure 11. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve

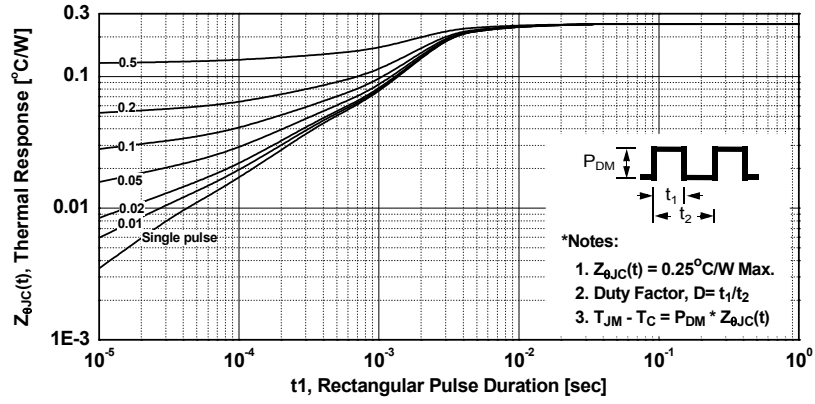


Figure 13. Gate Charge Test Circuit & Waveform

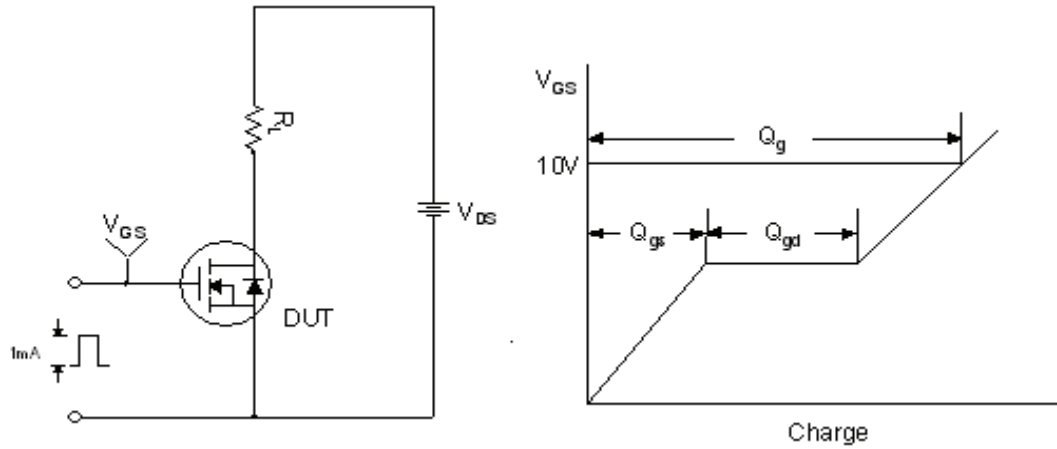


Figure 14. Resistive Switching Test Circuit & Waveforms

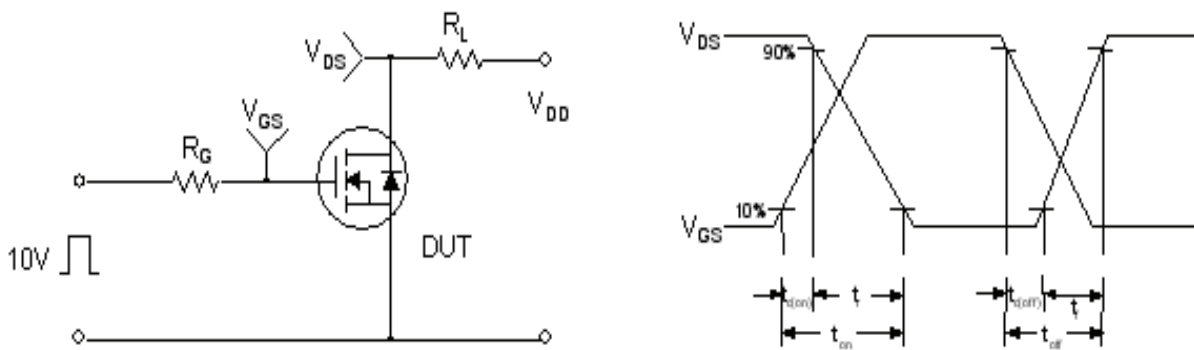


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

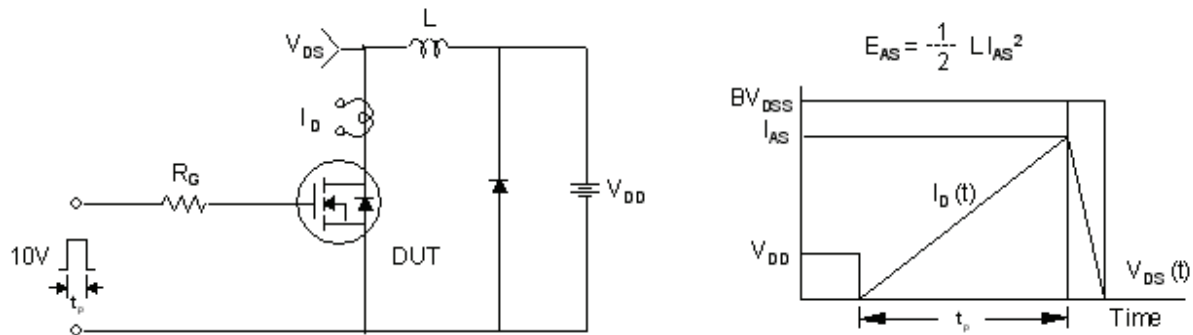
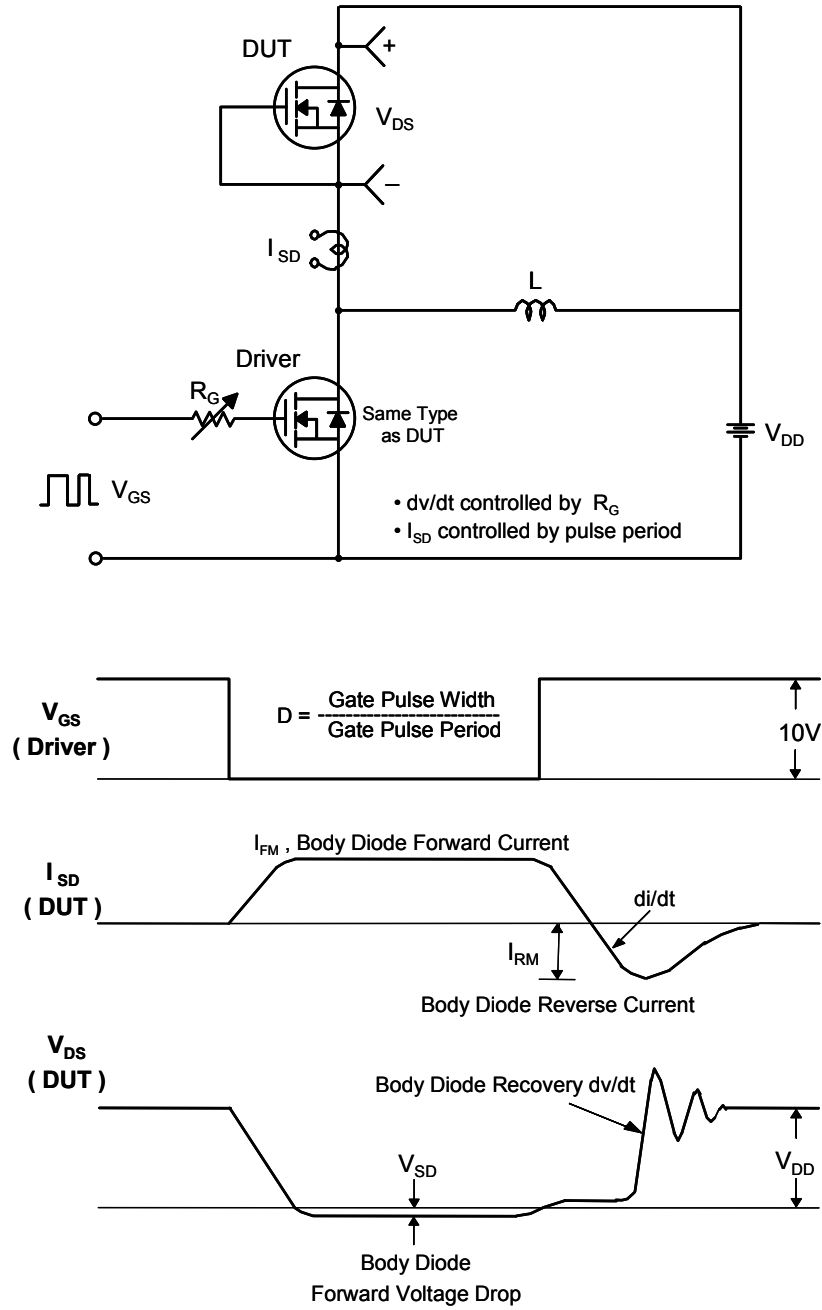
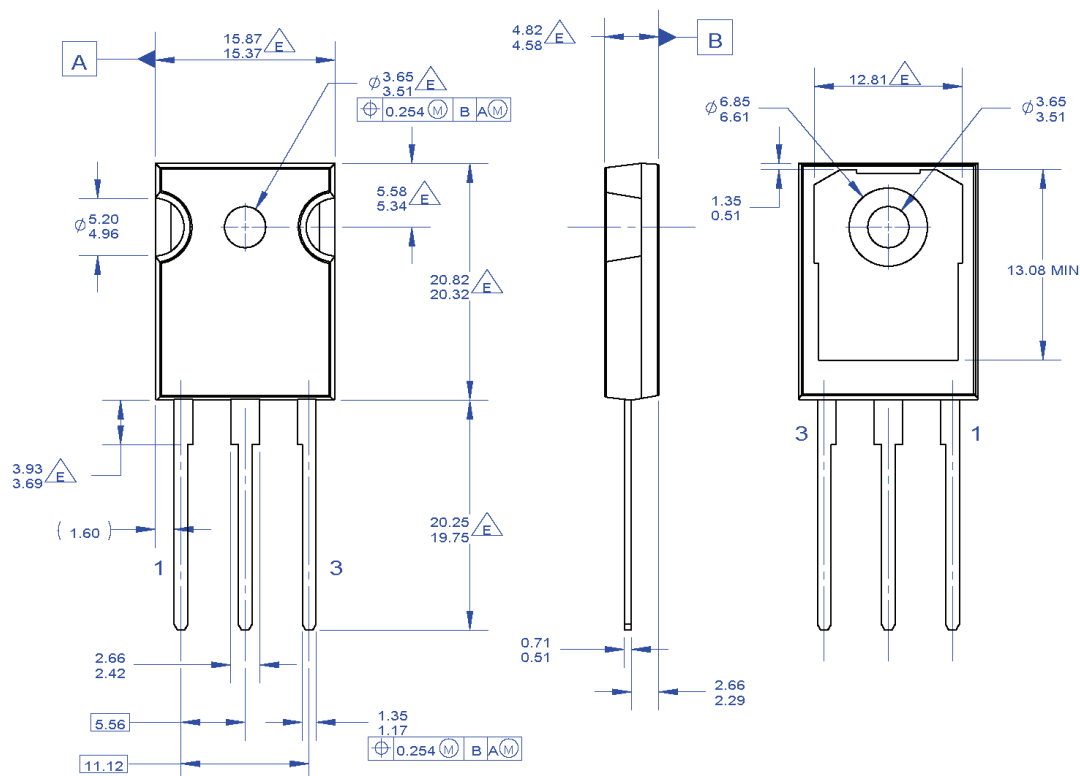


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Physical 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

- \triangle DOES NOT COMPLY JEDEC STANDARD VALUE
- F. DRAWING FILENAME: MKT-TO247G03_REV01

Figure 17. TO-247, MOLDED, 3 LEAD, JEDEC AB LONG LEADS (Active)

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