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FAIRCHILD

April 2016

FCH085N80

N-Channel SuperFET® II MOSFET

800 V, 46 A, 85 mΩ

Features

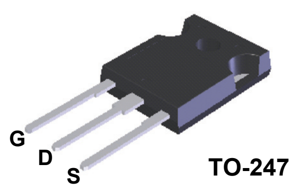
- Typ. $R_{DS(on)}$ = 67 mΩ
- 850 V @ T_J = 150°C
- Ultra Low Gate Charge (Typ. Q_g = 196 nC)
- Low E_{OSS}(Typ. 18 uJ @ 400 V)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)}$ = 568 pF)
- 100% Avalanche Tested
- RoHS Compliant

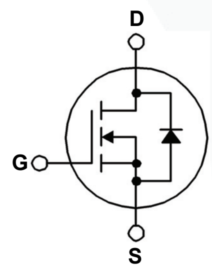
Applications

- AC-DC Power Supply
- LED Lighting

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.





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

Symbol	Parameter		FCH085N80_F155	Unit
V_{DSS}	Drain to Source Voltage		800	V
V_{GSS}	Gate to Source Voltage	- DC	±20	V
		- AC (f > 1 Hz)	±30	
I_D	Drain Current	- Continuous (T_C = 25°C)	46	A
		- Continuous (T_C = 100°C)	29	
I_{DM}	Drain Current	- Pulsed (Note 1)	138	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		1701	mJ
I_{AR}	Avalanche Current (Note 1)		9.2	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		4.4	mJ
dv/dt	MOSFET dv/dt		100	V/ns
	Peak Diode Recovery dv/dt (Note 3)		20	
P_D	Power Dissipation	(T_C = 25°C)	446	W
		- Derate Above 25°C	3.5	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	FCH085N80_F155	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.28	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40.0	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH085N80_F155	FCH085N80	TO-247 G03	Tube	N/A	N/A	30 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA, T_J = 25°C	800	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 1 mA, Referenced to 25°C	-	0.8	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 800 V, V_{GS} = 0 V	-	-	25	μA
		V_{DS} = 640 V, V_{GS} = 0 V, T_C = 125°C	-	-	250	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 4.6 mA	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 23 A	-	67	85	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 23 A	-	55	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	V_{DS} = 100 V, V_{GS} = 0 V, f = 1 MHz	-	8140	10825	pF
C_{oss}	Output Capacitance		-	255	340	pF
C_{rss}	Reverse Transfer Capacitance		-	10	-	pF
C_{oss}	Output Capacitance	V_{DS} = 480 V, V_{GS} = 0 V, f = 1 MHz		1000		pF
$C_{oss(eff.)}$	Effective Output Capacitance	V_{DS} = 0 V to 480 V, V_{GS} = 0 V	-	728	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 640 V, I_D = 46 A, V_{GS} = 10 V (Note 4)	-	196	255	nC
Q_{gs}	Gate to Source Gate Charge		-	40	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	72	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	0.8	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 400 V, I_D = 46 A, V_{GS} = 10 V, R_g = 4.7 Ω (Note 4)	-	45	100	ns
t_r	Turn-On Rise Time		-	55	120	ns
$t_{d(off)}$	Turn-Off Delay Time		-	160	330	ns
t_f	Turn-Off Fall Time		-	35	80	ns

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	46	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	138	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 46 A	-	-	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 46 A, dI_F/dt = 100 A/μs	-	800	-	ns
Q_{rr}	Reverse Recovery Charge		-	32	-	μC

Notes:

1. Repetitive rating: pulse width limited by maximum junction temperature.
2. I_{AS} = 9.2 A, V_{DD} = 50 V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 46 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

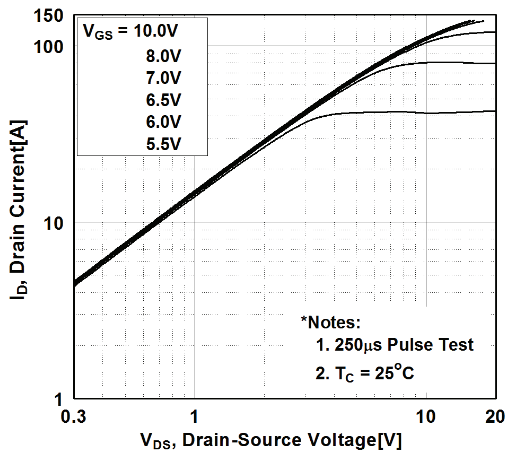


Figure 2. Transfer Characteristics

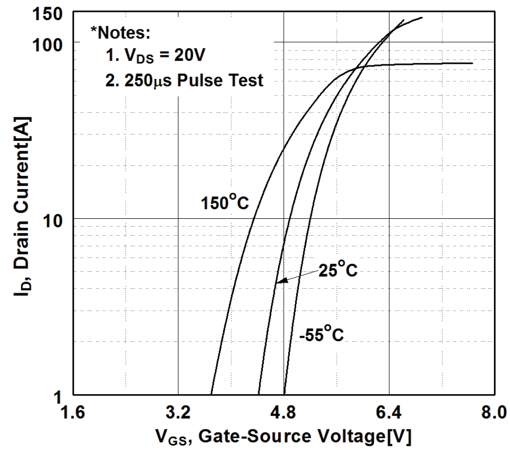


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

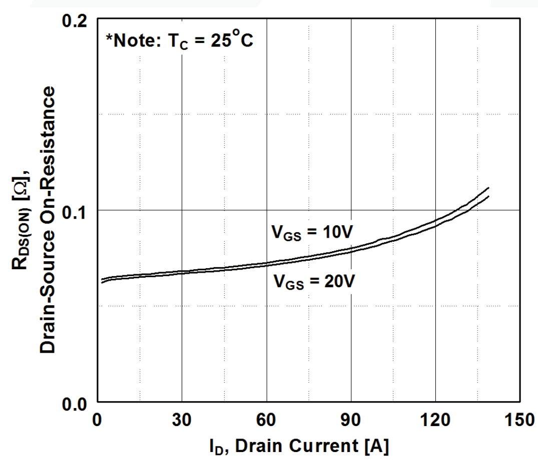


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

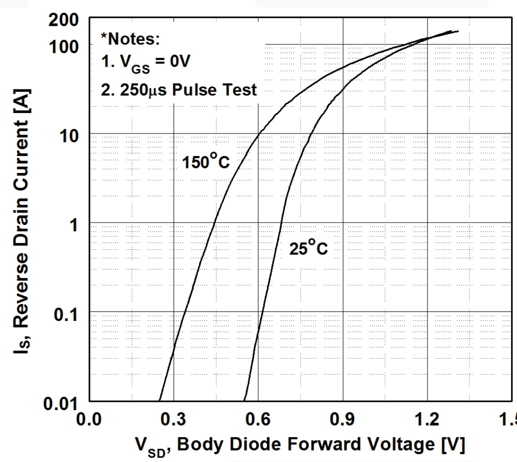


Figure 5. Capacitance Characteristics

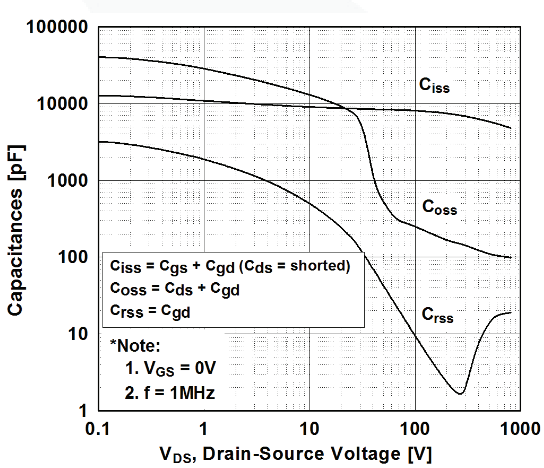
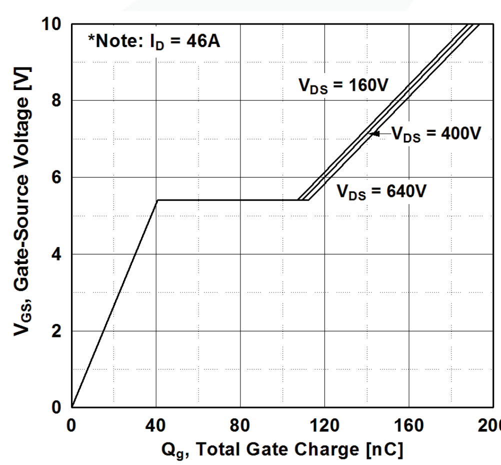


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

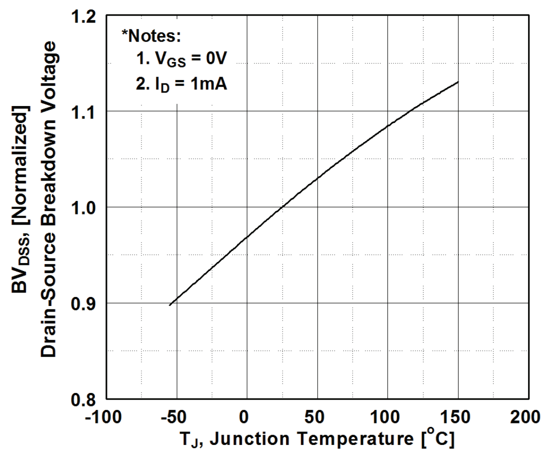


Figure 8. On-Resistance Variation vs. Temperature

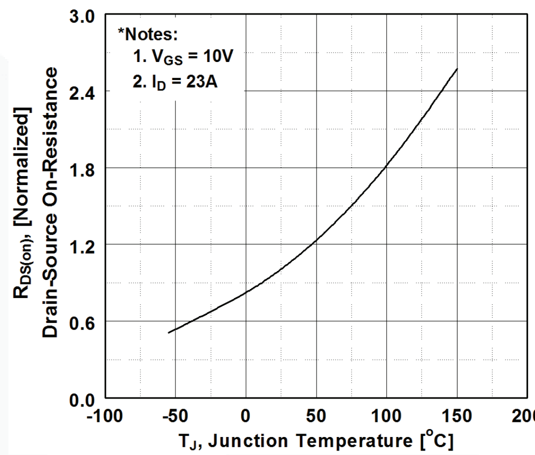


Figure 9. Maximum Safe Operating Area

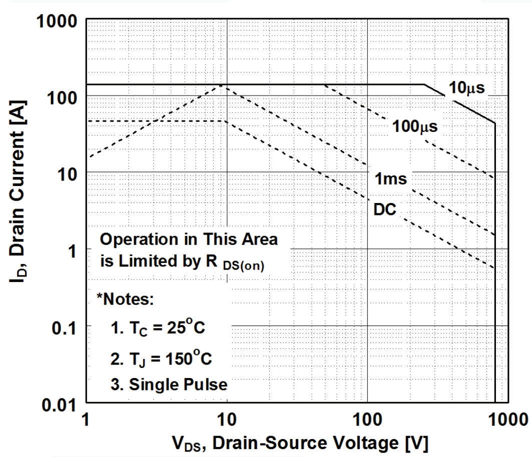


Figure 10. Maximum Drain Current vs. Case Temperature

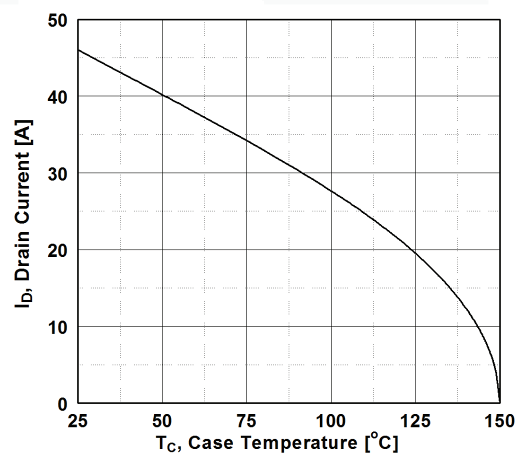
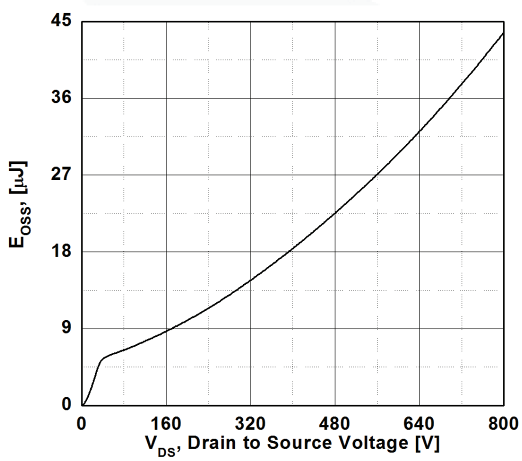


Figure 11. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve

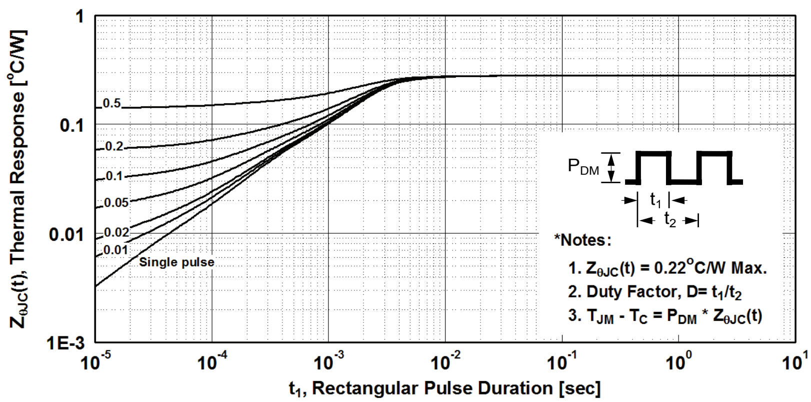


Figure 13. Gate Charge Test Circuit & Waveform

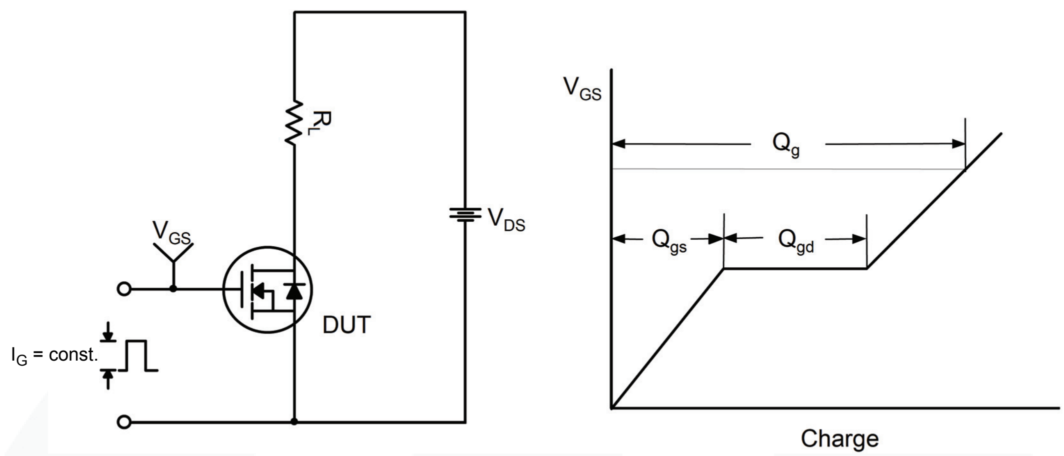


Figure 14. Resistive Switching Test Circuit & Waveforms

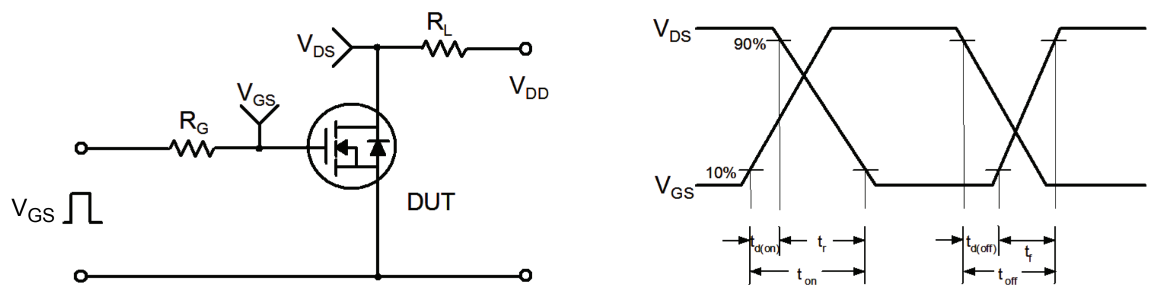


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

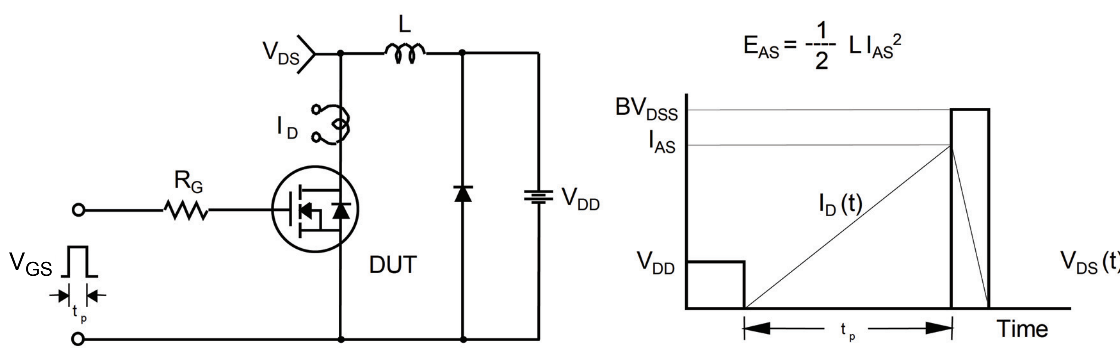
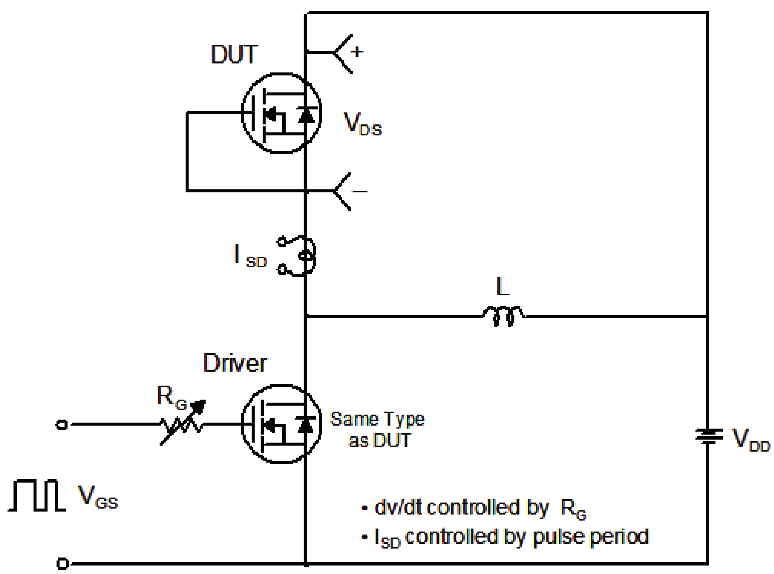
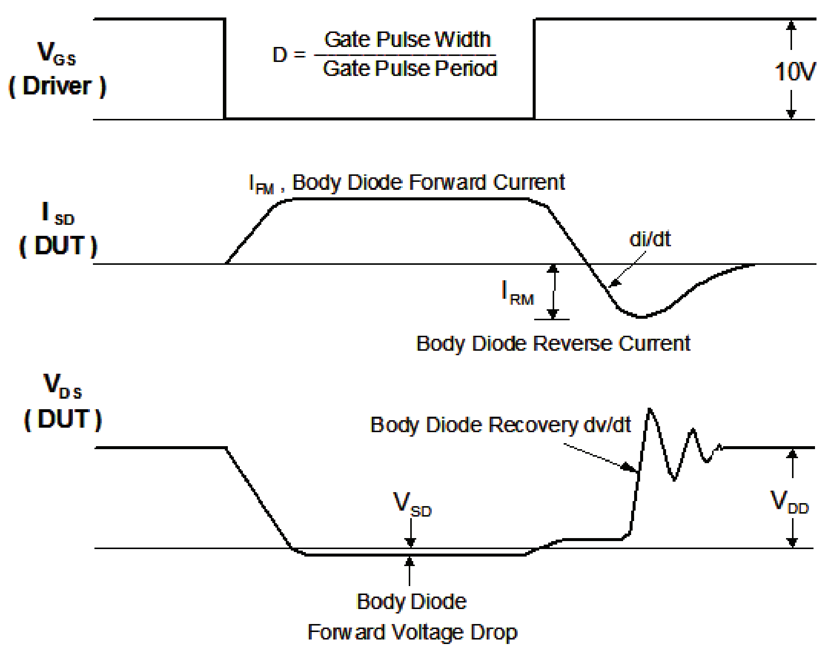


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms





Physical Dimensions

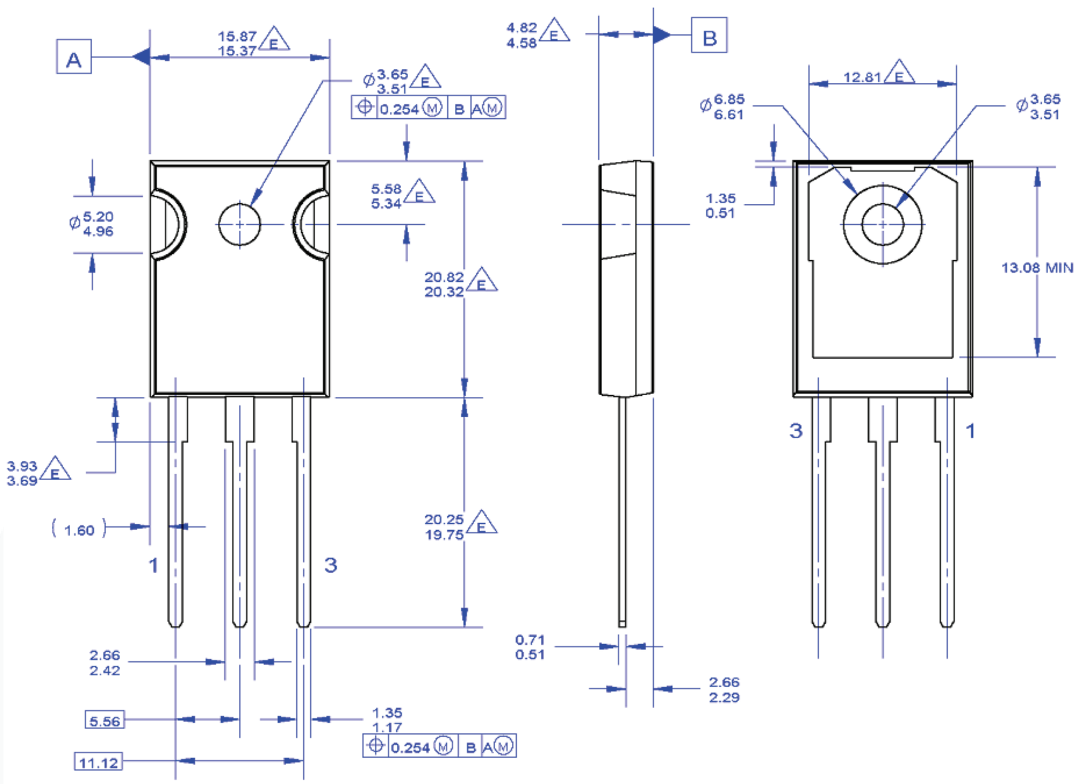


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Figure 17. TO-247,MOLDED,3 LEAD,JEDEC AB LONG LEADS (Active)

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