FAIRCHILD SEMICONDUCTOR®

March 2013

FDH055N15A

N-Channel PowerTrench® MOSFET

150 V, 167 A, 5.9 mΩ

Features

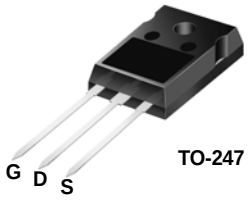
- $R_{DS(on)}$ = 4.8 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 120 A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

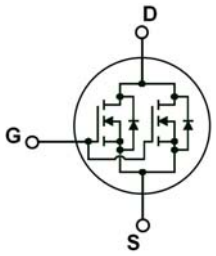
This N-Channel MOSFET is produced using Fairchild Semiconductor®'s advance PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter



TO-247



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FDH055N15A	Unit
V_{DSS}	Drain to Source Voltage		150	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current	- Continuous (T_C = 25°C, Silicon Limited)	167*	A
		- Continuous (T_C = 100°C, Silicon Limited)	118	
		- Continuous (Tc = 25°C, Package Limited)	156	
I_{DM}	Drain Current	- Pulsed (Note 1)	668	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2,5)	835	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0	V/ns
P_D	Power Dissipation	(T_C = 25°C)	429	W
		- Derate above 25°C	2.86	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C

*Calculated continuous current based on maximum allowable junction temperature, Package limitation current is 156A.

Thermal Characteristics

Symbol	Parameter	FDH055N15A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.35	°C/W
$R_{\theta CS}$	Thermal Resistance, Case to Heat Sink, Typical	0.24	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDH055N15A	FDH055N15A	TO-247	-	-	30

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 = 250μA, V_{GS} = 0V	150	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.1	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 120V, T_C = 150°C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 120A	-	4.8	5.9	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 120A	-	219	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75V, V_{GS} = 0V, f = 1MHz	-	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} = 75V, V_{GS} = 0V	-	1159	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 75V, I_D = 120A, V_{GS} = 10V (Note 4)	-	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		-	16	-	nC
ESR	Equivalent Series Resistance(G-S)	f= 1MHz	-	1.2	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75V, I_D = 120A, V_{GS} = 10V, R_{GEN} = 4.7Ω (Note 4)	-	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		-	21	52	ns
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} = 0V, I_{SD} = 120A	-	-	1.25	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 120A, V_{DS} = 75V, dI_F/dt = 100A/μs	-	105	-	ns
Q_{rr}	Reverse Recovery Charge		-	342	-	nC
Q_{rr}	Reverse Recovery Charge	V_{GS} = 0V, I_{SD} = 30A, V_{DS} = 75V, dI_F/dt = 100A/μs	-	348	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Starting T_J = 25°C, L = 3 mH, I_{AS} = 23.6 A.
3. $I_{SD} \le$ 120A, di/dt ≤ 200A/μs, $V_{DD} \le BV_{DSS}$, Starting T_J = 25°C.
4. Essentially Independent of Operating Temperature Typical Characteristics.
5. Single Pulsed Avalanche Energy per Die.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

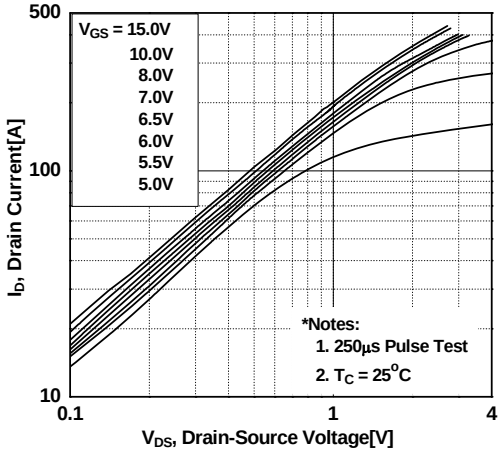


Figure 2. Transfer Characteristics

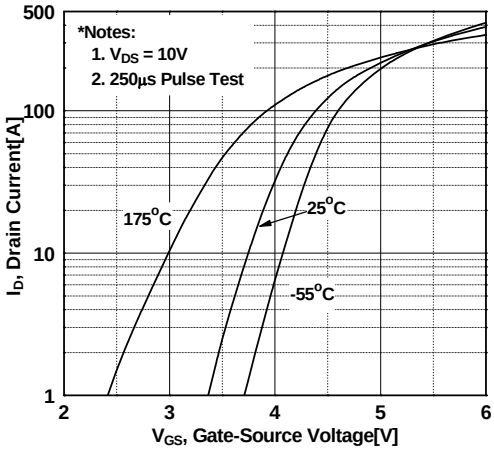


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

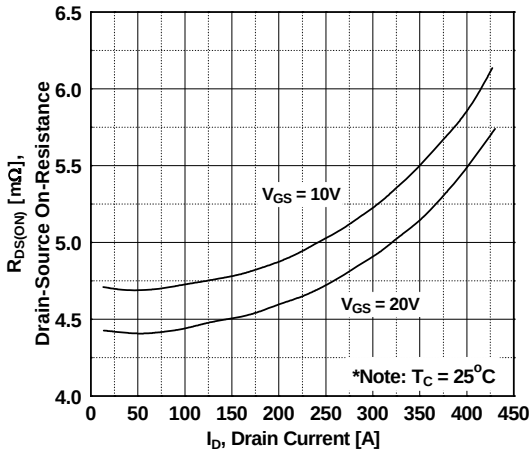


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

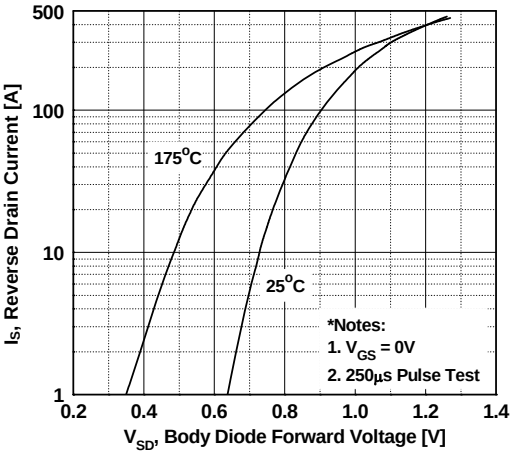


Figure 5. Capacitance Characteristics

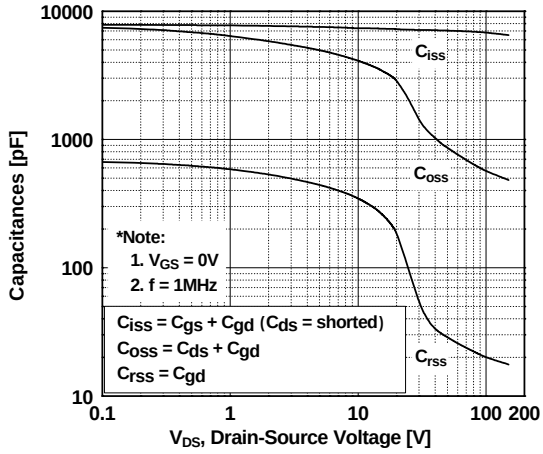
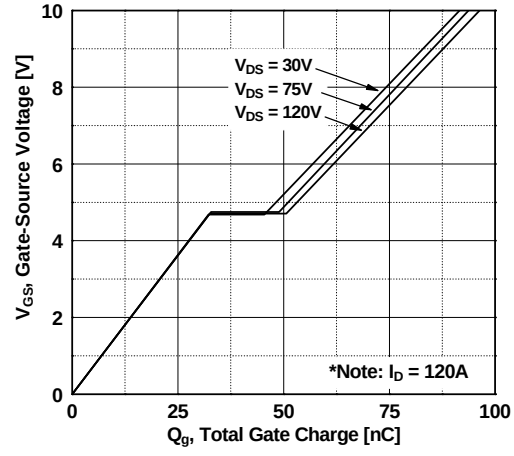


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

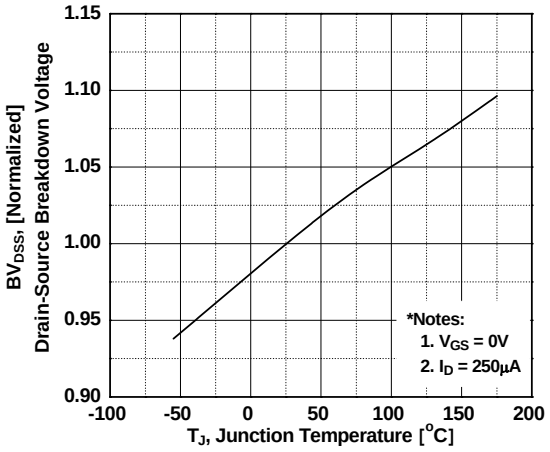


Figure 8. On-Resistance Variation vs. Temperature

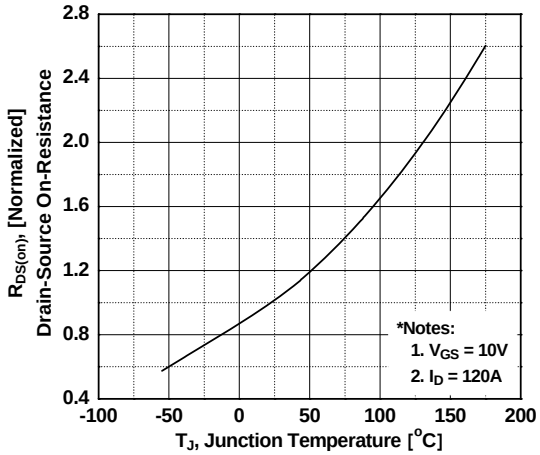


Figure 9. Maximum Safe Operating Area

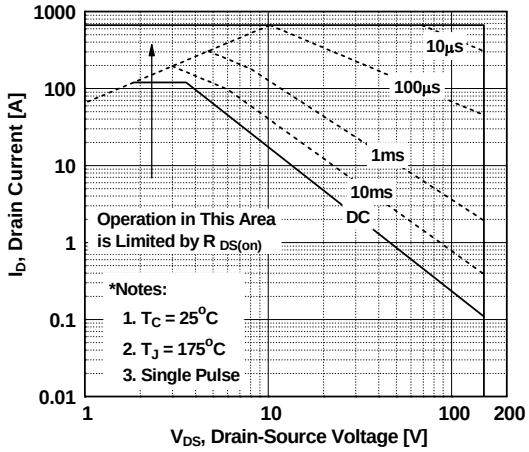


Figure 10. Maximum Drain Current vs. Case Temperature

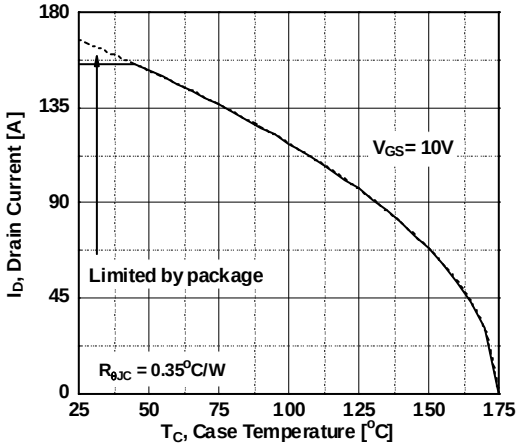
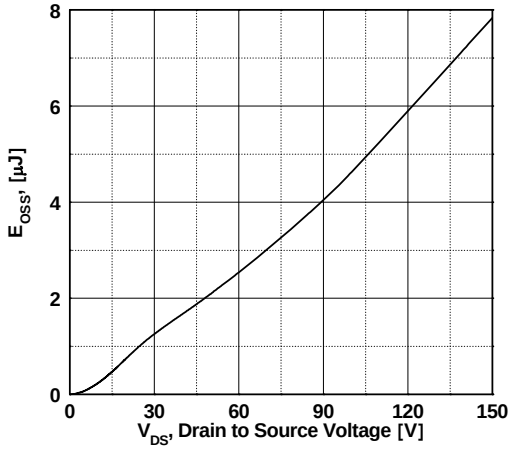
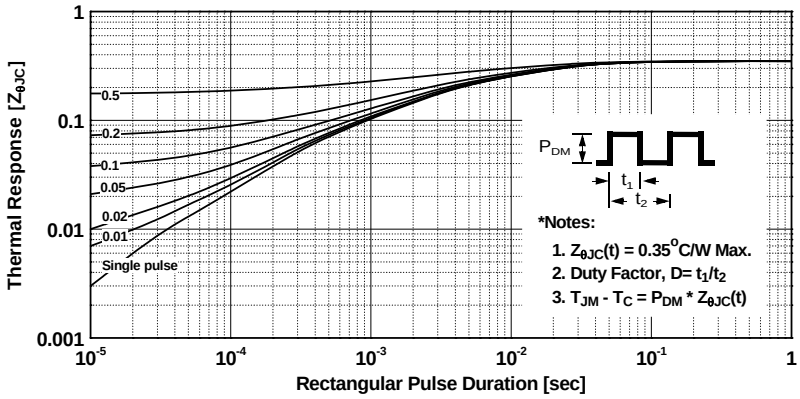


Figure 11. Eoss vs. Drain to Source Voltage

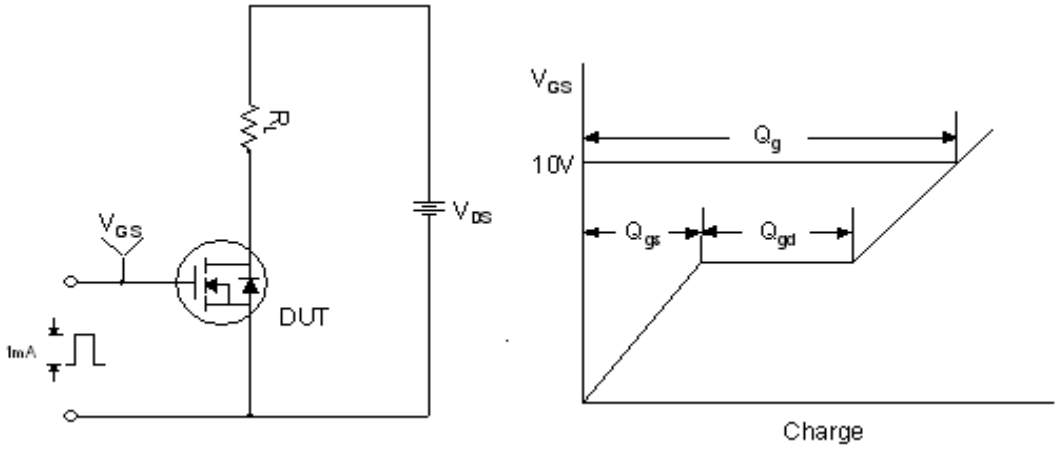


Typical Performance Characteristics (Continued)

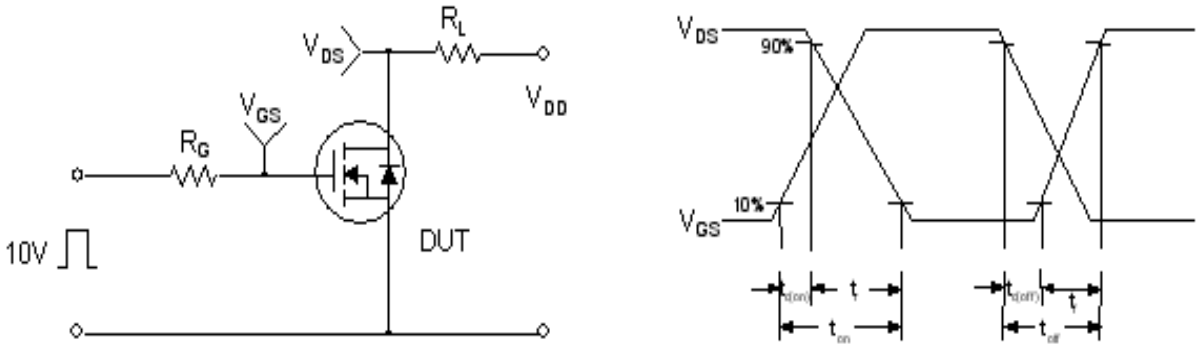
Figure 12. Transient Thermal Response Curve



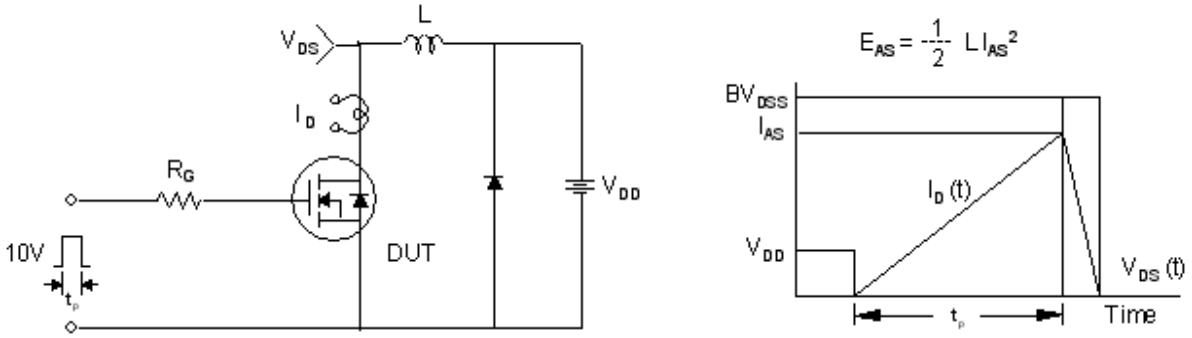
Gate Charge Test Circuit & Waveform



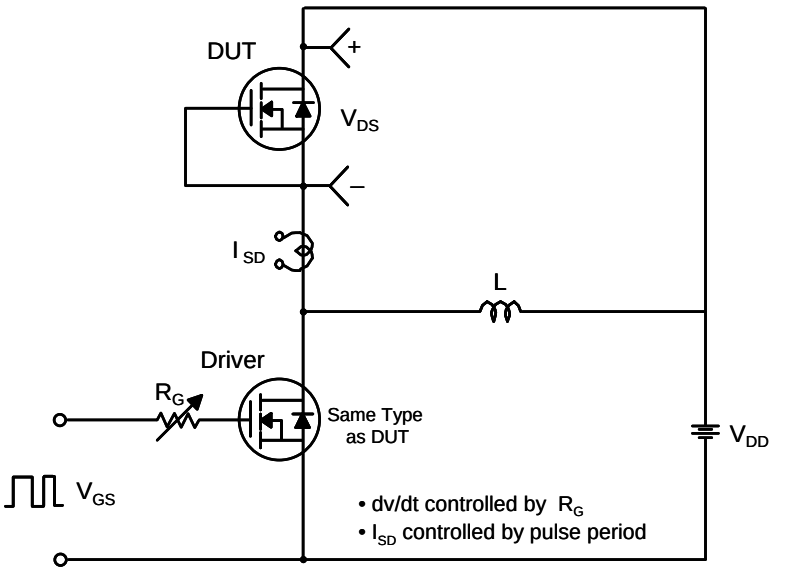
Resistive Switching Test Circuit & Waveforms

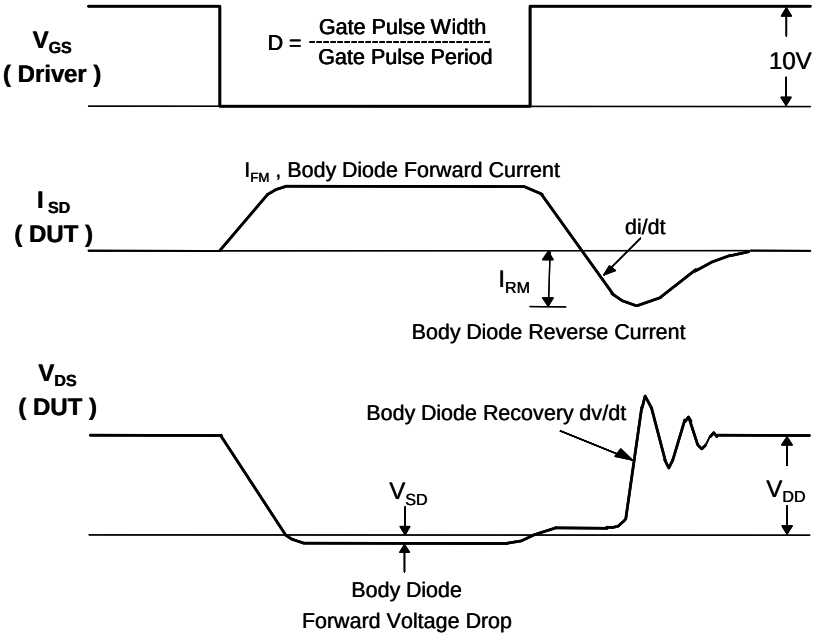


Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

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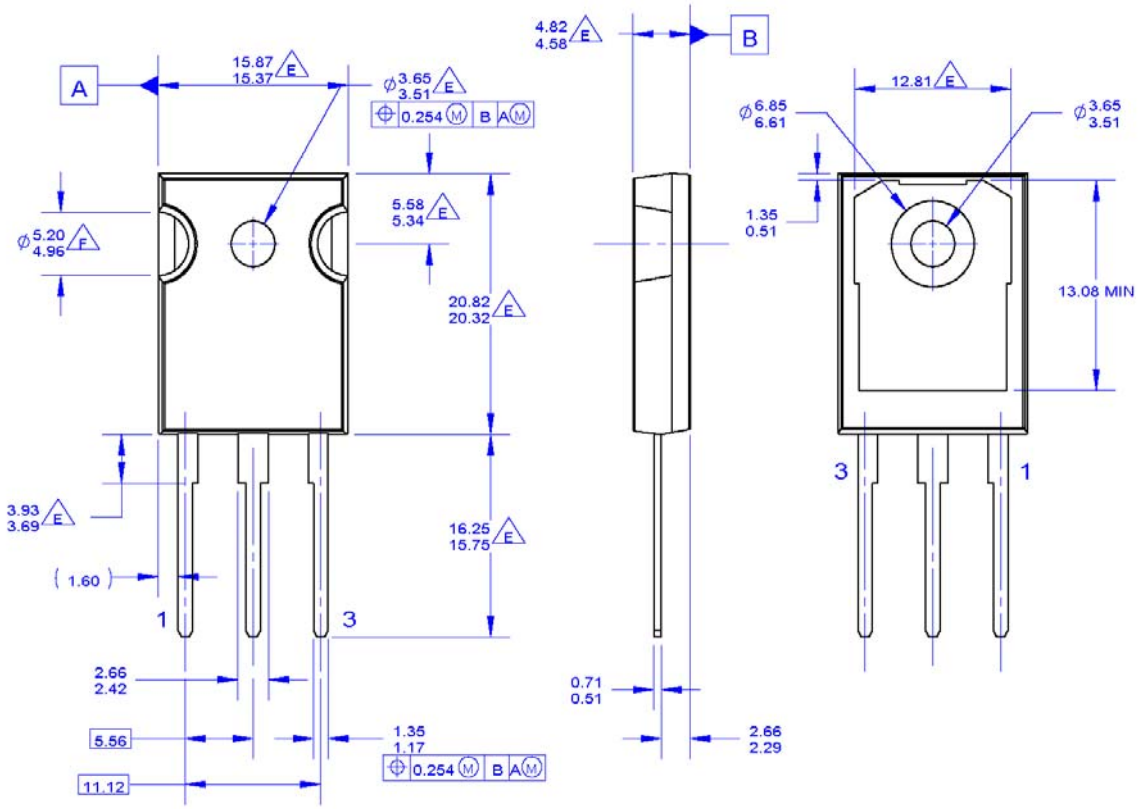

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Dimensions in Millimeters

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