

# FDH055N15A

## N-Channel PowerTrench® MOSFET

150V, 167A, 5.9mΩ

### Features

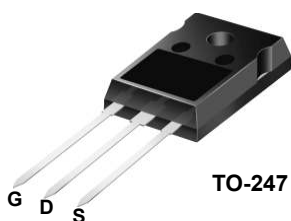
- $R_{DS(on)} = 4.8m\Omega$  (Typ.)@  $V_{GS} = 10V, I_D = 120A$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Description

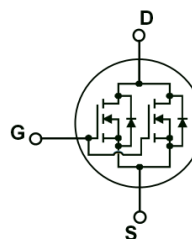
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Application

- DC to DC Converters
- Synchronous Rectification for Server/Telecom PSU
- Battery Charger
- AC motor drives and Uninterruptible Power Supplies
- Off-line UPS



TO-247



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

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	150	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)	167*
		- Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited)	118
		- Continuous ( $T_C = 25^\circ\text{C}$ , Package Limited)	156
$I_{DM}$	Drain Current	- Pulsed (Note 1)	668
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2,6)	835
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	429
		- Derate above $25^\circ\text{C}$	2.86
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

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

### Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.35	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case to Heat Sink (Typical)	0.24	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	

## Package Marking and Ordering Information

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

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	150	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.1	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 120\text{V}, T_C = 150^\circ\text{C}$	-	-	1 500	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 120\text{A}$	-	4.8	5.9	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 120\text{A}$ (Note 4)	-	219	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 75\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	7100	9445	pF
$C_{oss}$	Output Capacitance		-	664	885	pF
$C_{rss}$	Reverse Transfer Capacitance		-	23	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 75\text{V}, V_{GS} = 0\text{V}$	-	1159	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 75\text{V}, I_D = 120\text{A}$ $V_{GS} = 10\text{V}$ (Note 4,5)	-	92	120	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)		Drain Open	-	1.2	-

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{V}, I_D = 120\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 4.7\Omega$ (Note 4,5)	-	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

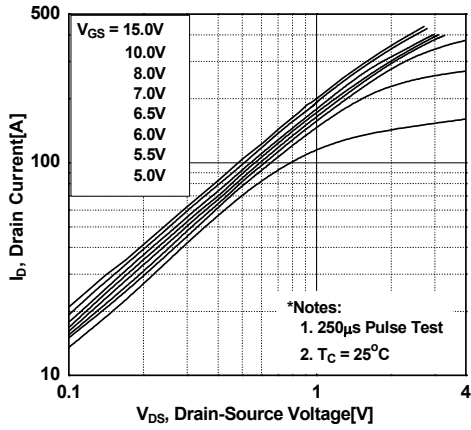
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	167*	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	668	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 120\text{A}$	-	-	1.25	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 120\text{A}, V_{DS} = 75\text{V}$	-	105	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$ (Note 4)	-	342	-	nC

#### Notes:

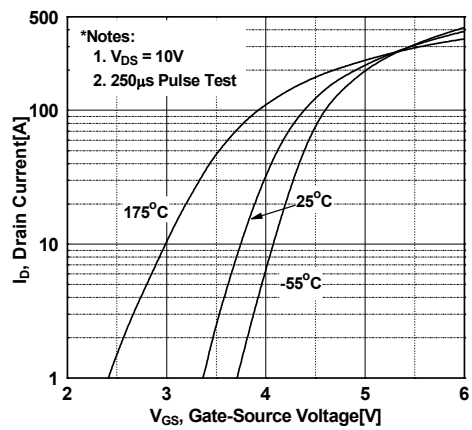
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 23.6\text{A}$ .
3.  $I_{SD} \leq 120\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$ .
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
5. Essentially Independent of Operating Temperature Typical Characteristics.
6. Single Pulsed Avalanche Energy per Die.

## Typical Performance Characteristics

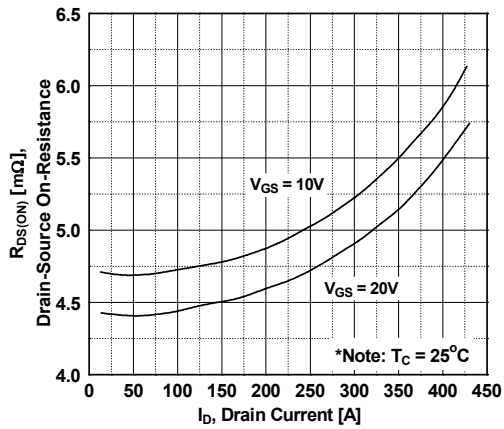
**Figure 1. On-Region Characteristics**



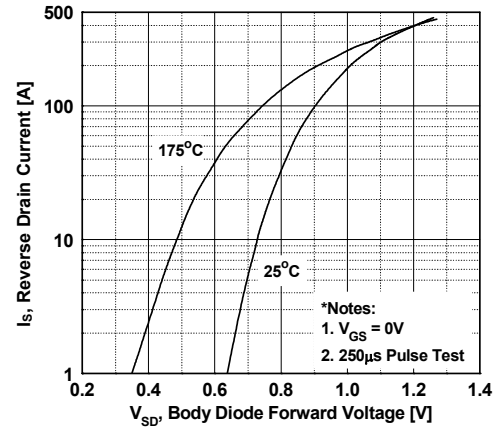
**Figure 2. Transfer Characteristics**



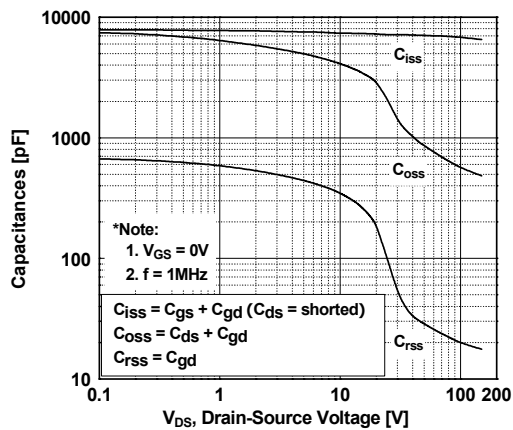
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



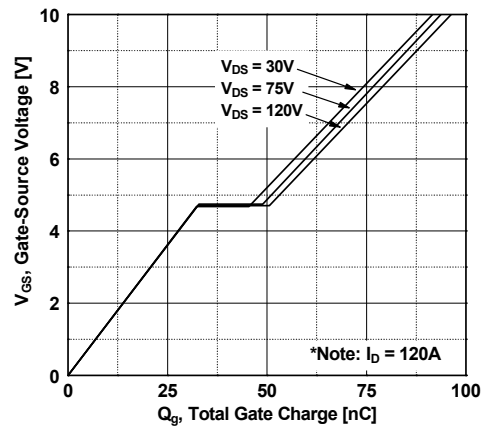
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

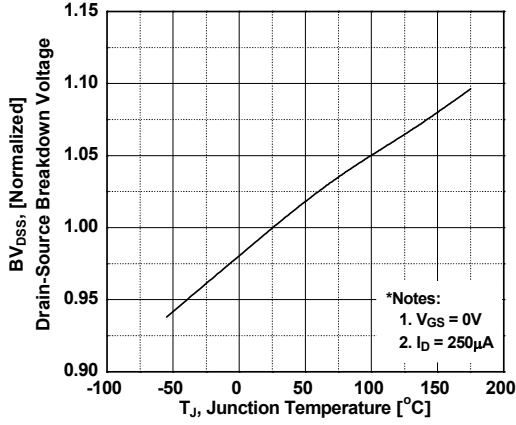


Figure 8. On-Resistance Variation vs. Temperature

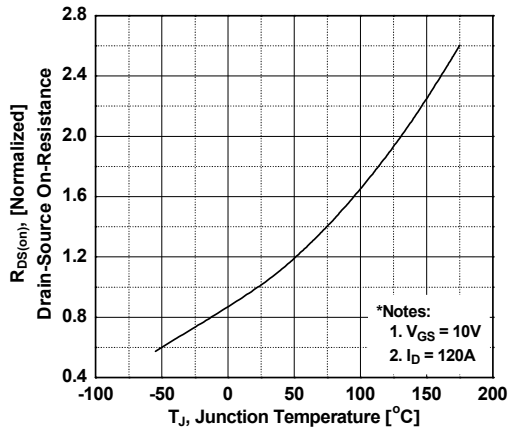


Figure 9. Maximum Safe Operating Area

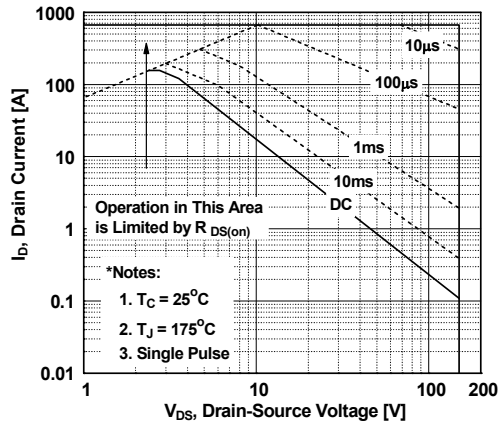


Figure 10. Maximum Drain Current vs. Case Temperature

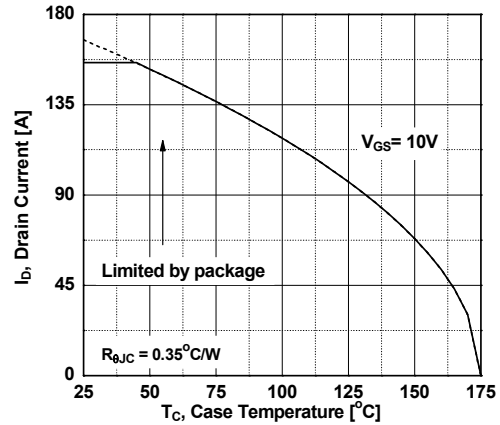
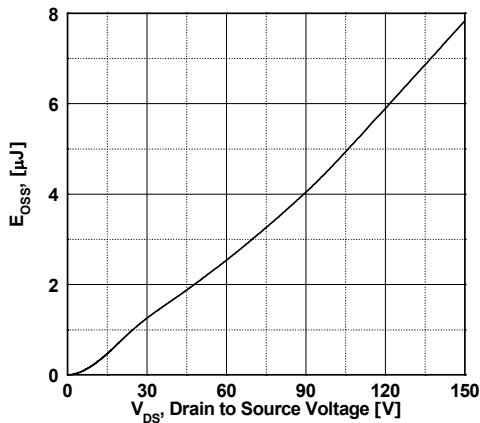
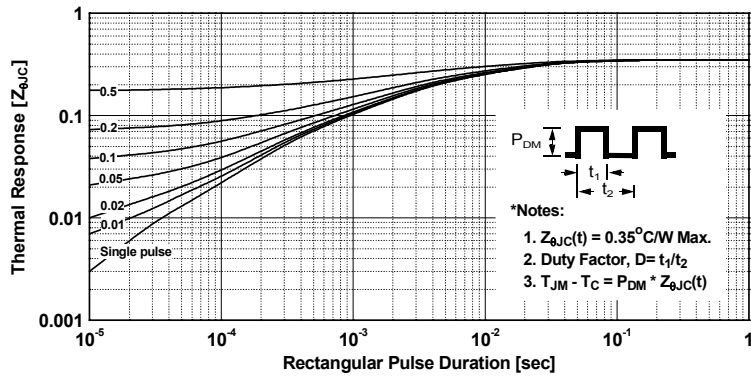


Figure 11. E\_oss vs. Drain to Source Voltage

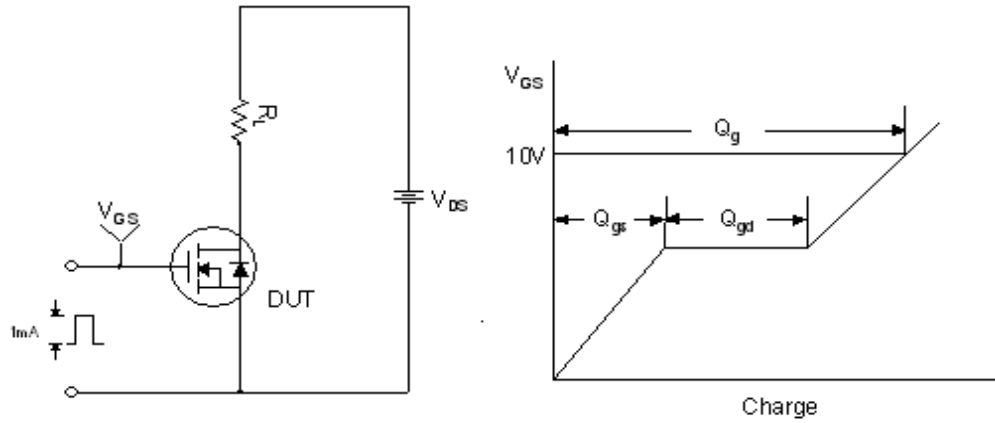


Typical Performance Characteristics (Continued)

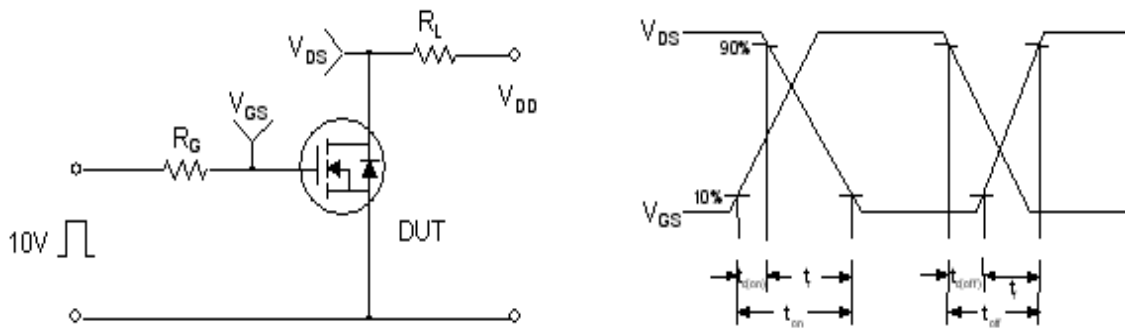
Figure 12. Transient Thermal Response Curve



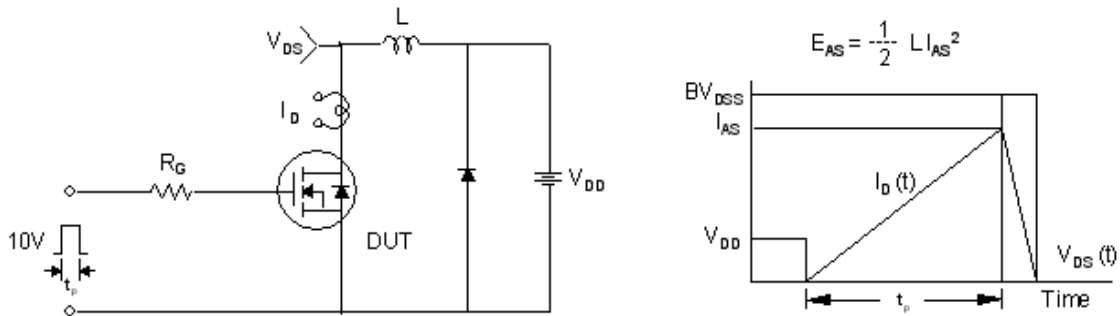
**Gate Charge Test Circuit & Waveform**



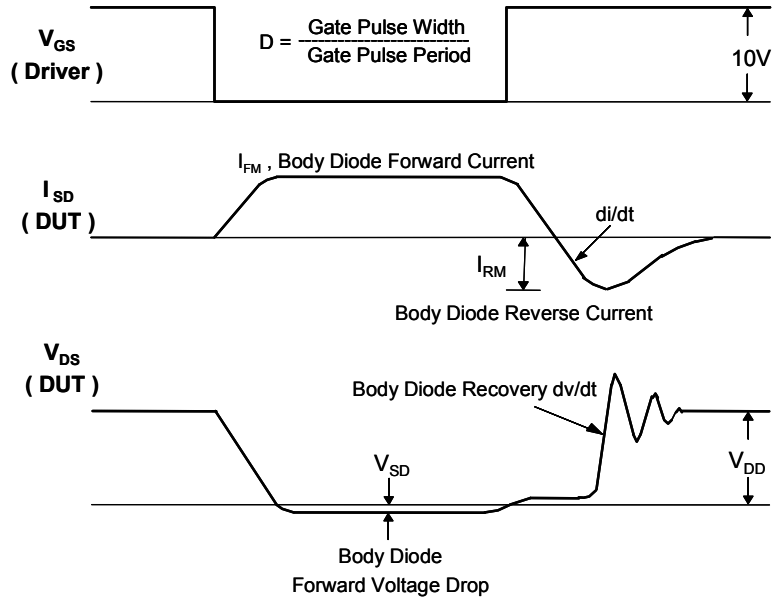
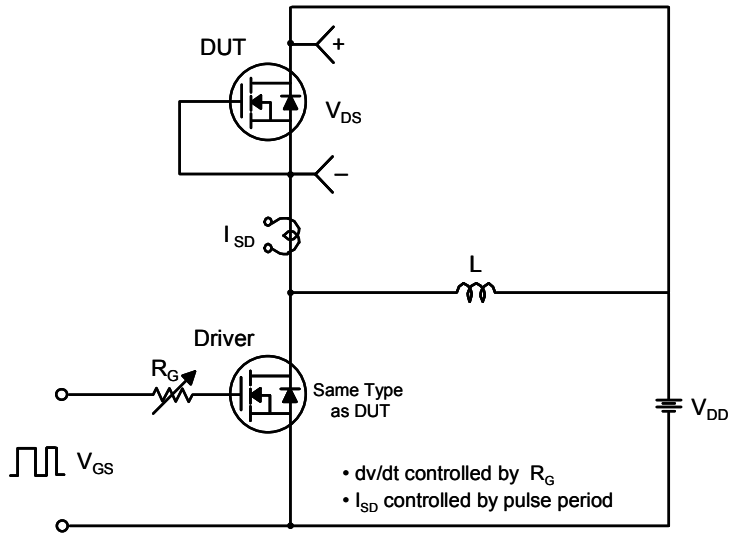
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

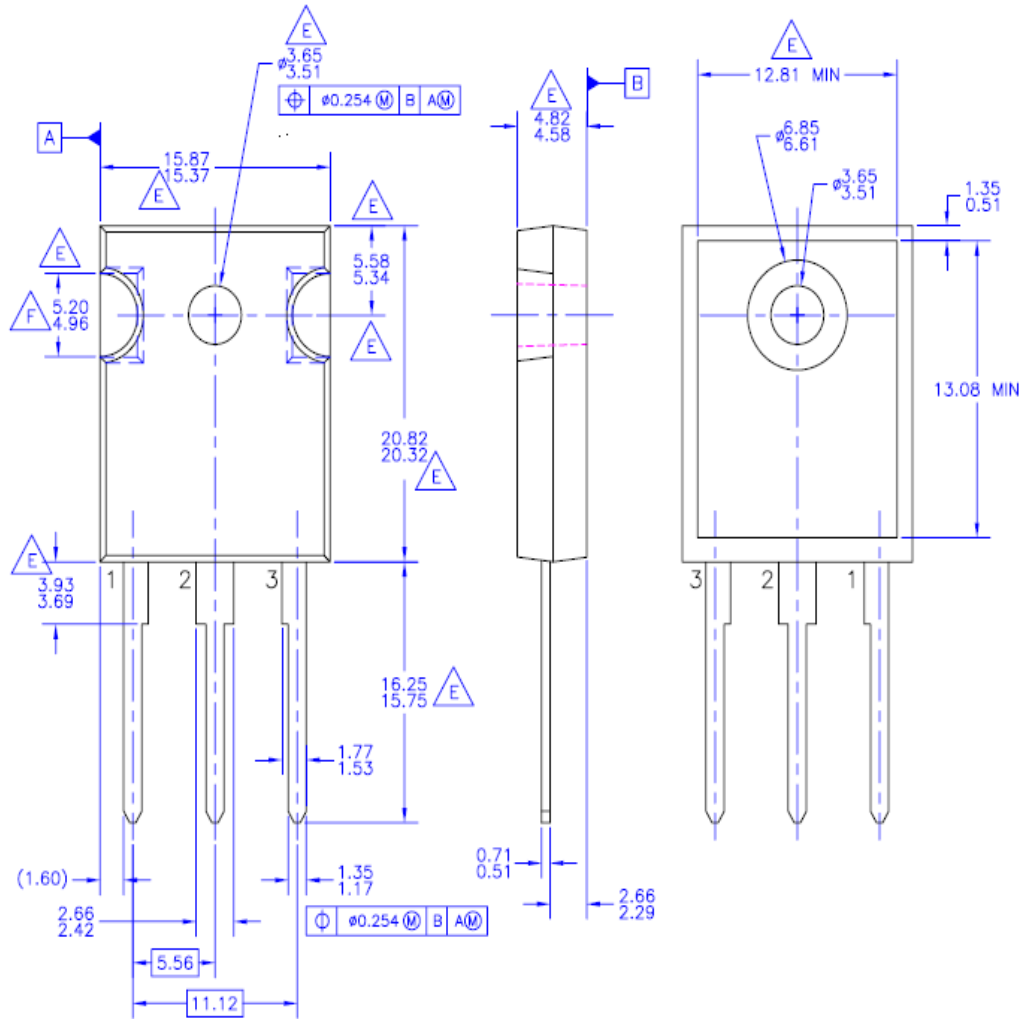


Peak Diode Recovery dv/dt Test Circuit & Waveforms



**Mechanical Dimensions**

**TO-247-3L**



- NOTES: UNLESS OTHERWISE SPECIFIED
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  - C. ALL DIMENSIONS ARE IN MILLIMETERS.
  - D. DRAWING CONFORMS TO ASME Y14.5- 1994
  - $\text{E}$ . DOES NOT COMPLY JEDEC STANDARD VALUE
  - $\text{F}$ . NOTCH MAY BE SQUARE
  - G. DRAWING FILENAME: MKT-TO247A03\_REV02






Dimensions in Millimeters





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