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April 2014



# FDA8440

## N-Channel Logic Level PowerTrench<sup>®</sup> MOSFET

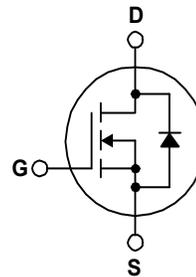
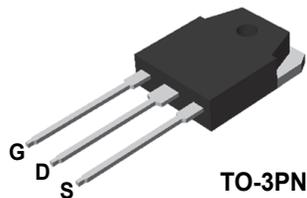
40 V, 100 A, 2.1 mΩ

### Features

- $R_{DS(on)} = 1.46 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$
- $Q_{G(tot)} = 345 \text{ nC}$  (Typ.) @  $V_{GS} = 10 \text{ V}$
- Low Miller Charge
- Low  $Q_{rr}$  Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- 160 A Guarantee for 2 sec
- RoHS Compliant

### Application

- Power tools
- Motor drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit



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

Symbol	Parameter	FDA8440	Unit
$V_{DSS}$	Drain to Source Voltage	40	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_C = 155^\circ\text{C}$ )	100	A
	- Continuous ( $T_A = 25^\circ\text{C}$ , $V_{GS} = 10 \text{ V}$ , $R_{\theta JA} = 40^\circ\text{C/W}$ )	30	A
	- Pulsed	500	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 1)	1682	mJ
$P_D$	Power dissipation	306	W
	Derate above $25^\circ\text{C}$	2.04	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.49	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. (Note 2)	40	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDA8440	FDA8440	TO-3PN	Tube	N/A	N/A	30 units

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted

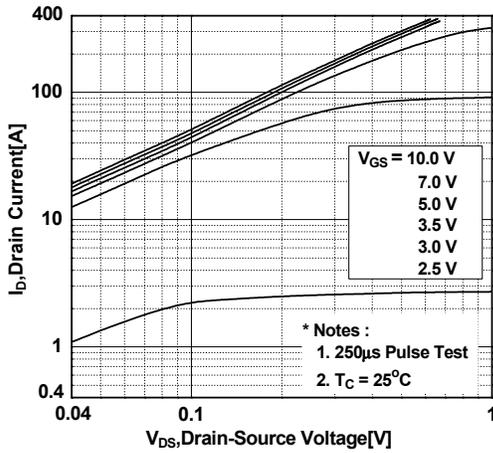
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	40	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32 V	--	--	1	μA
		V <sub>GS</sub> = 0 V, T <sub>C</sub> = 150°C	--	--	250	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>GS</sub> = ±20 V	--	--	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1	--	3	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 80 A	--	1.56	2.2	mΩ
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 80 A	--	1.46	2.1	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 80 A, T <sub>C</sub> = 175°C	--	2.82	4.1	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	--	18600	24740	pF
C <sub>oss</sub>	Output Capacitance		--	1840	2450	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	1400	2100	pF
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0.5 V, f = 1 MHz	--	1.1	--	Ω
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 0 V to 10 V	--	345	450	nC
Q <sub>g(2)</sub>	Threshold Gate Charge	V <sub>GS</sub> = 0 V to 2 V	--	32.5	--	nC
Q <sub>gs</sub>	Gate to Source Gate Charge	V <sub>DD</sub> = 20 V I <sub>D</sub> = 80 A I <sub>g</sub> = 1.0 mA	--	49	--	nC
Q <sub>gs2</sub>	Gate Charge Threshold to Plateau		--	16.5	--	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		--	74	--	nC
<b>Switching Characteristics</b>						
t <sub>ON</sub>	Turn-On Time	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 80 A V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 7 Ω	--	175	360	ns
t <sub>d(on)</sub>	Turn-On Delay Time		--	43	95	ns
t <sub>r</sub>	Rise Time		--	130	275	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	435	875	ns
t <sub>f</sub>	Fall Time		--	290	590	ns
t <sub>OFF</sub>	Turn-Off Time		--	730	1470	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
V <sub>SD</sub>	Source to Drain Diode Voltage	I <sub>SD</sub> = 80 A	--	--	1.25	V
		I <sub>SD</sub> = 40 A	--	--	1.0	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 75 A, dI <sub>SD</sub> /dt = 100 A/μs	--	59	--	ns
Q <sub>RR</sub>	Reverse Recovery Charge	I <sub>SD</sub> = 75 A, dI <sub>SD</sub> /dt = 100 A/μs	--	77	--	nC

### NOTES:

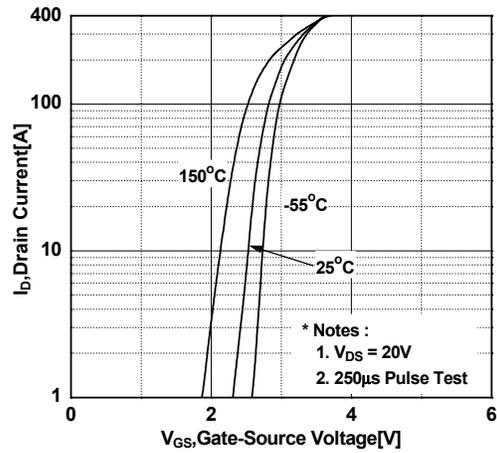
- Starting T<sub>J</sub> = 25°C, L = 1 mH, I<sub>AS</sub> = 58 A, V<sub>DD</sub> = 36 V, V<sub>GS</sub> = 10 V.
- Pulse width = 100 s.

## Typical Performance Characteristics

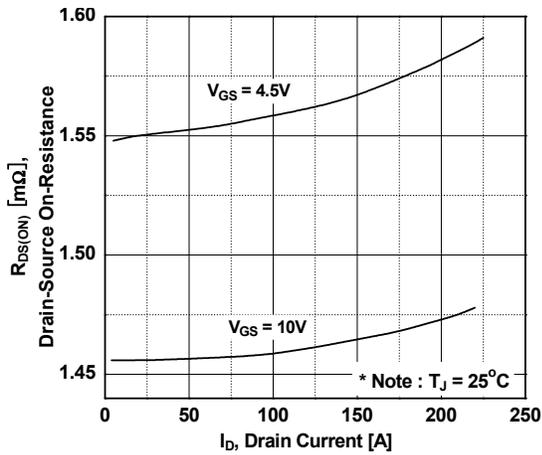
**Figure 1. On-Region Characteristics**



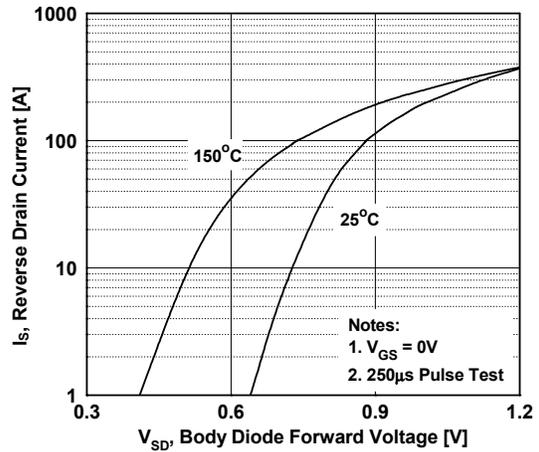
**Figure 2. Transfer Characteristics**



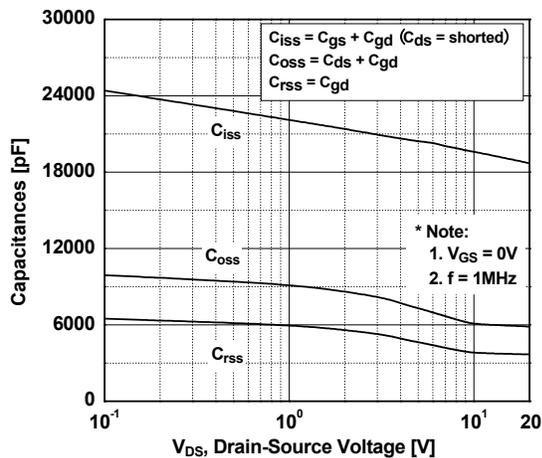
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



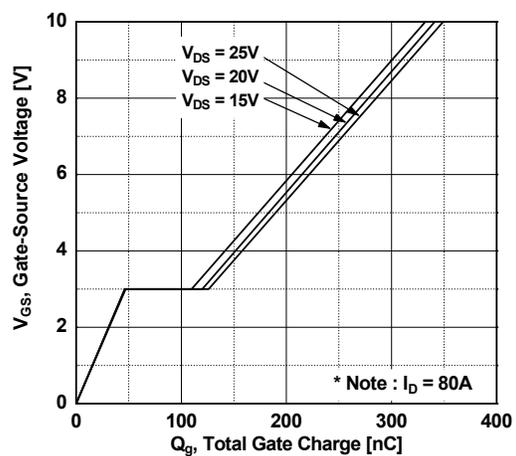
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

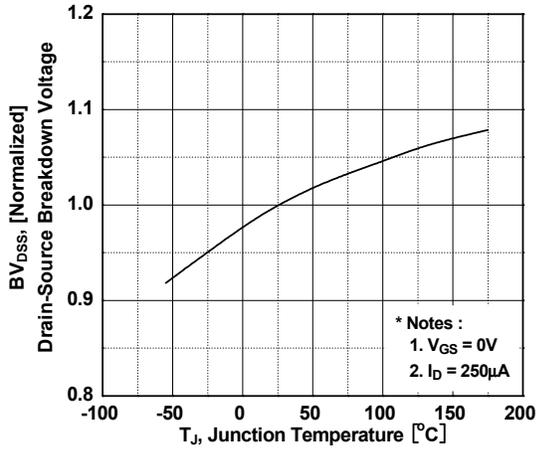


Figure 8. On-Resistance Variation vs. Temperature

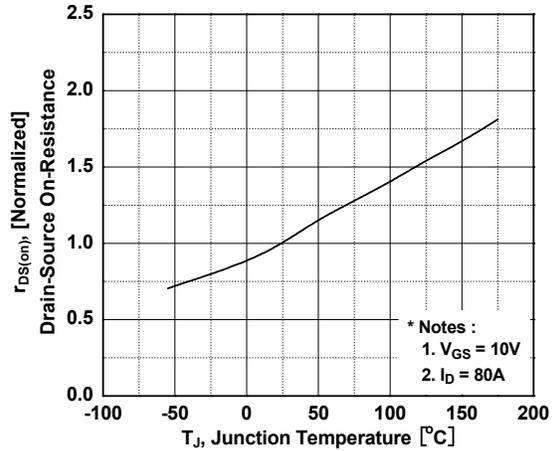


Figure 9. Unclamped Inductive Switching Capability

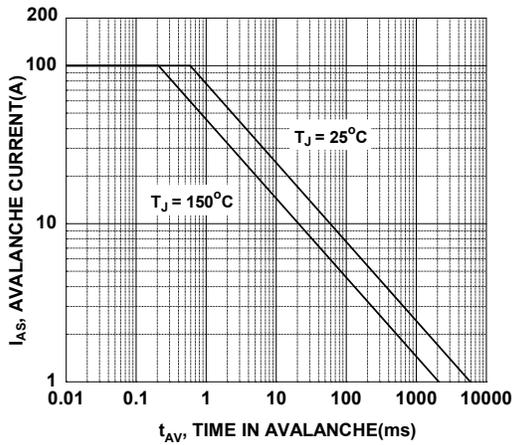


Figure 10. Safe Operating Area

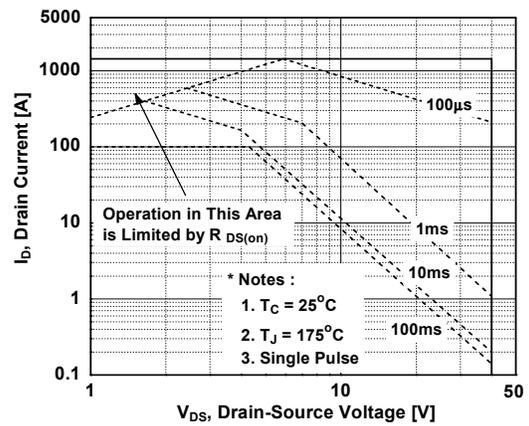
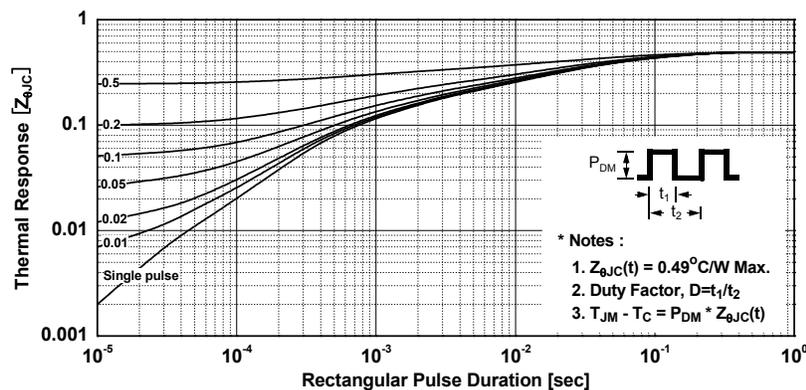


Figure 11. Transient Thermal Response Curve



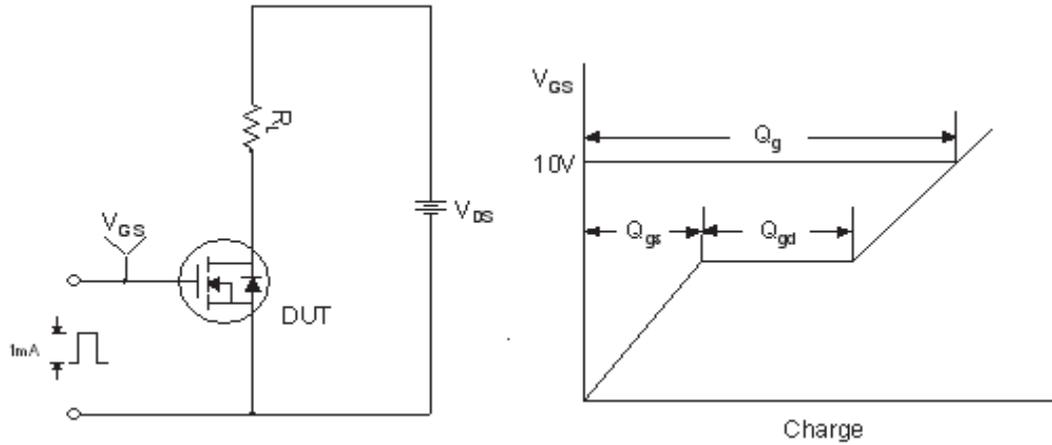


Figure 12. Gate Charge Test Circuit & Waveform

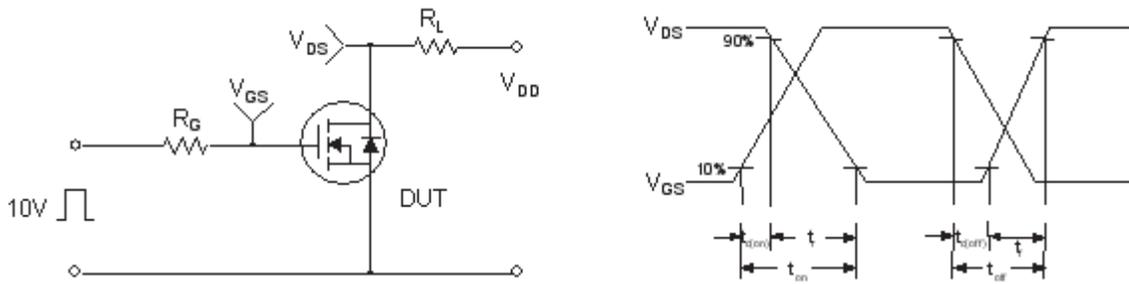


Figure 13. Resistive Switching Test Circuit & Waveforms

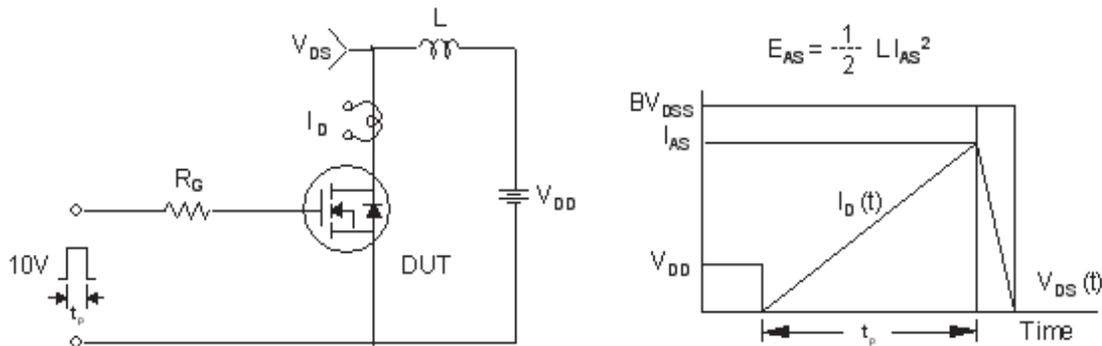


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

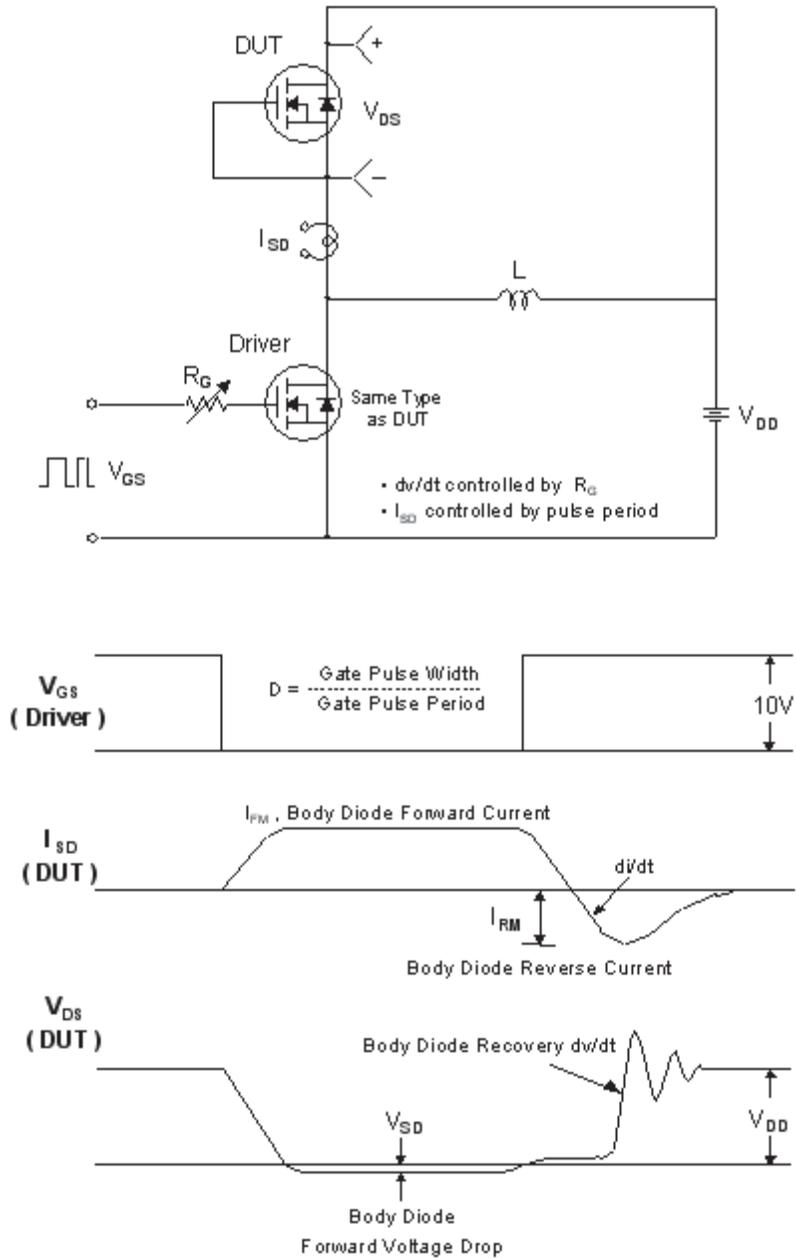
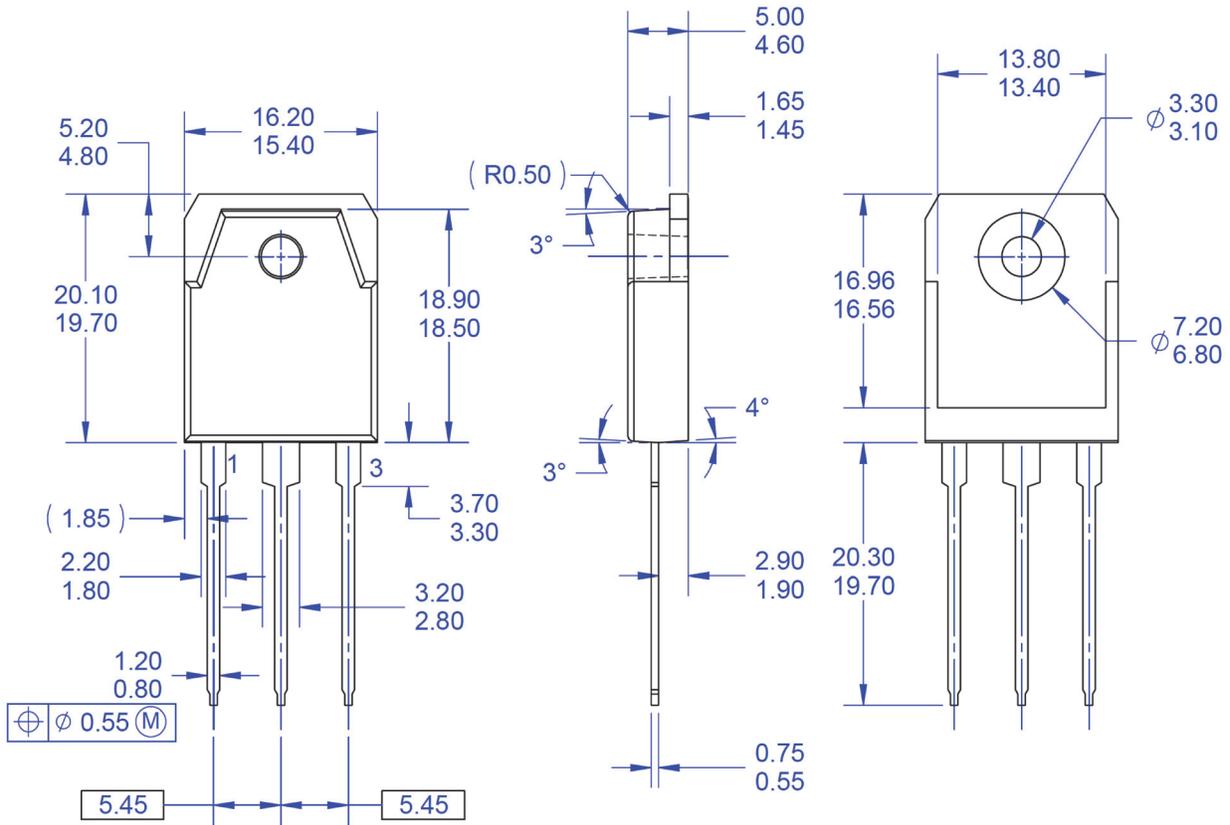


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## Mechanical Dimensions



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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
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- E) DRAWING FILE NAME: TO3PN03AREV1.
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**Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65**

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