

# FDA8440

## N-Channel PowerTrench® MOSFET

### 40V, 100A, 2.1mΩ



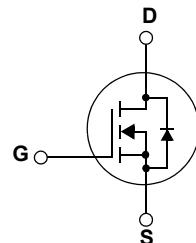
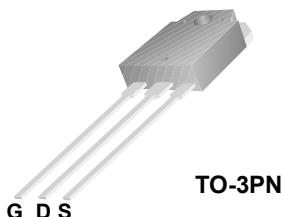
#### Features

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



#### Application

- Automotive Engine Control
- Powertrain Management
- Motors, Solenoids
- Electronic Steering
- Integrated Starter/ Alternator
- Distributed Power Architectures and VRMs
- Primary Switch for 12V systems



#### MOSFET Maximum Ratings

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

Symbol	Parameter	Ratings	Units
$V_{DSS}$	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	0.49	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2)	40	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDA8440	FDA8440	TO-3PN	N/A	N/A	30units

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

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

## NOTES:

1: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1\text{mH}$ ,  $\text{I}_{\text{AS}} = 58\text{A}$ ,  $\text{V}_{\text{DD}} = 36\text{V}$ ,  $\text{V}_{\text{GS}} = 10\text{V}$ .

2: Pulse width = 100s

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

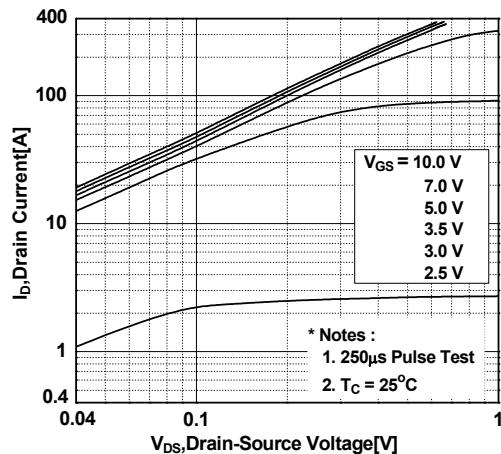


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

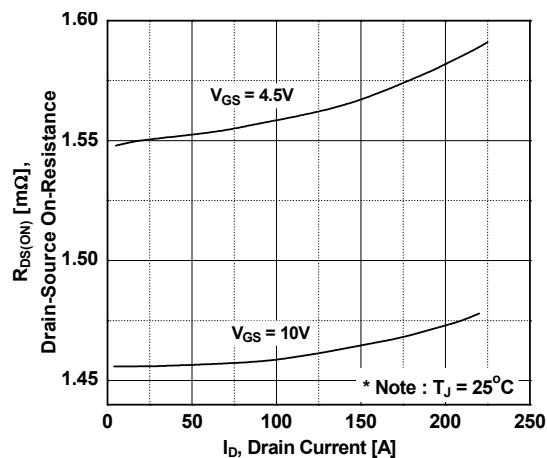


Figure 5. Capacitance Characteristics

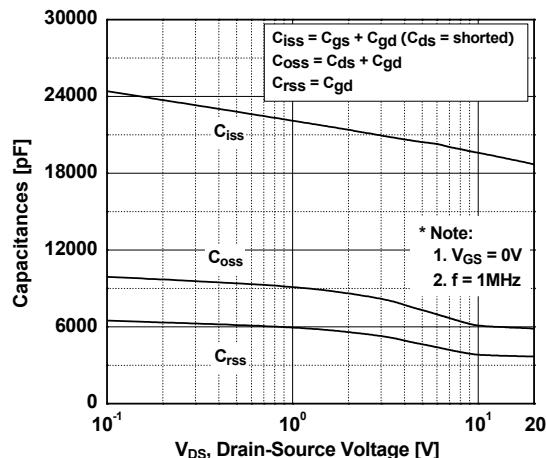


Figure 2. Transfer Characteristics

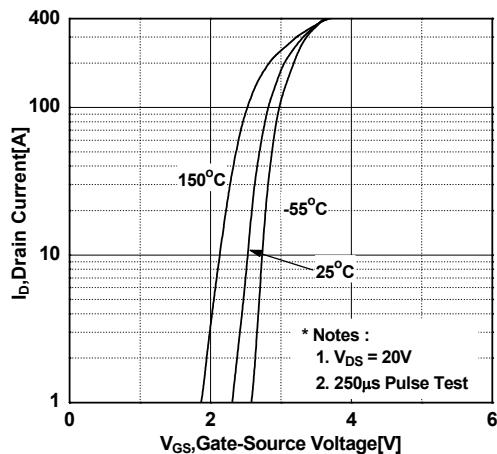


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

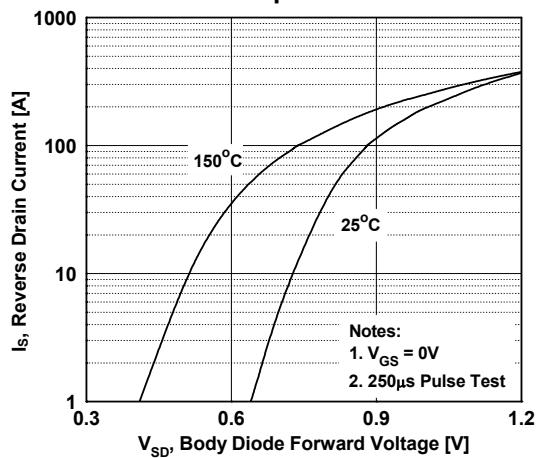
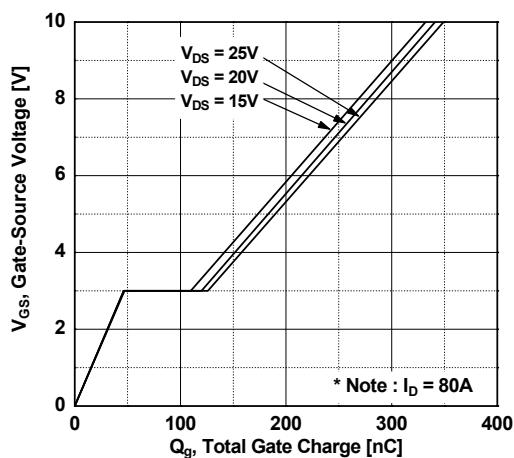
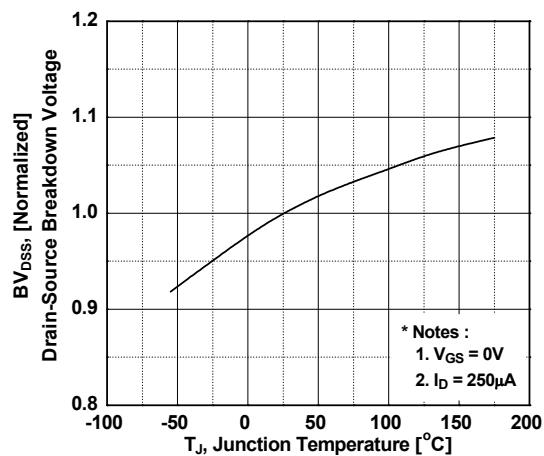


Figure 6. Gate Charge Characteristics

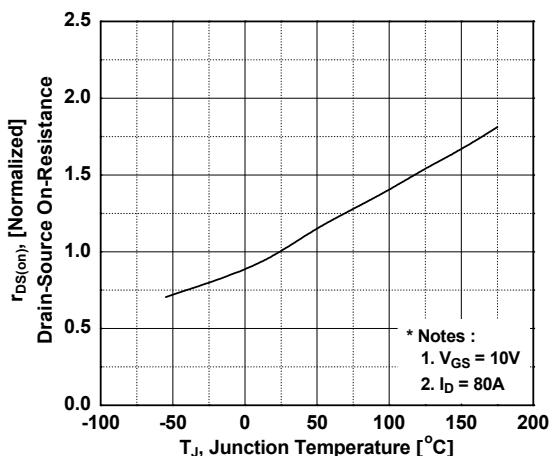


## Typical Performance Characteristics (Continued)

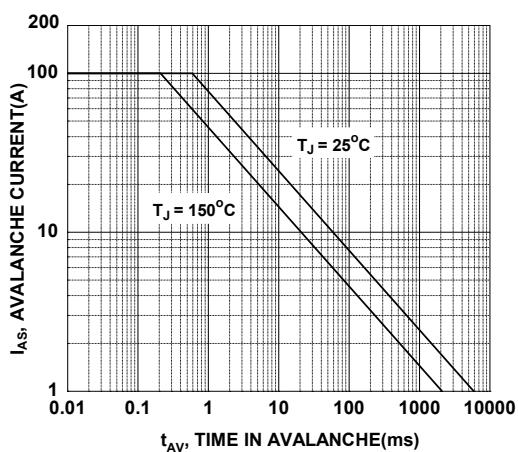
**Figure 7. Breakdown Voltage Variation vs. Temperature**



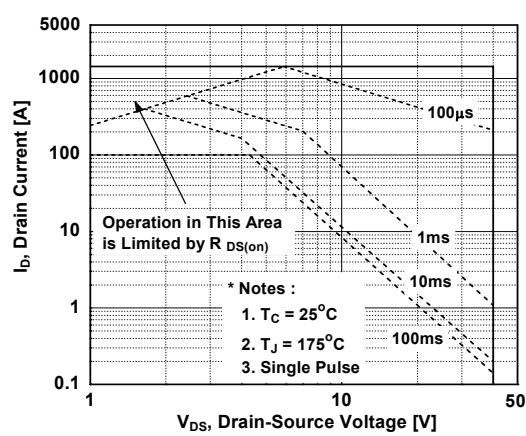
**Figure 8. On-Resistance Variation vs. Temperature**



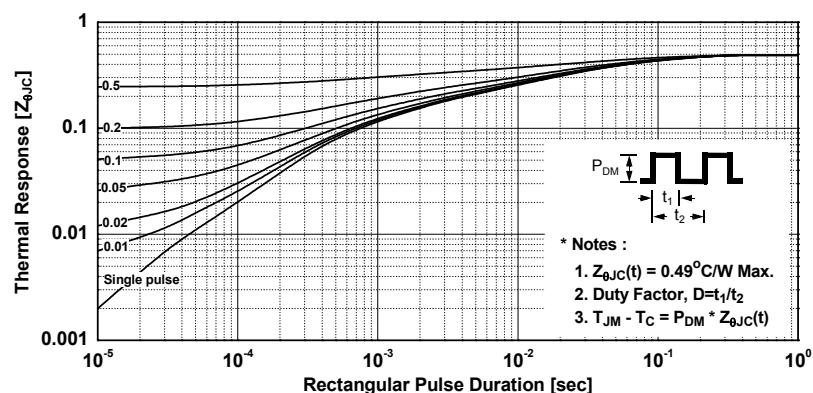
**Figure 9. Unclamped Inductive Switching Capability**



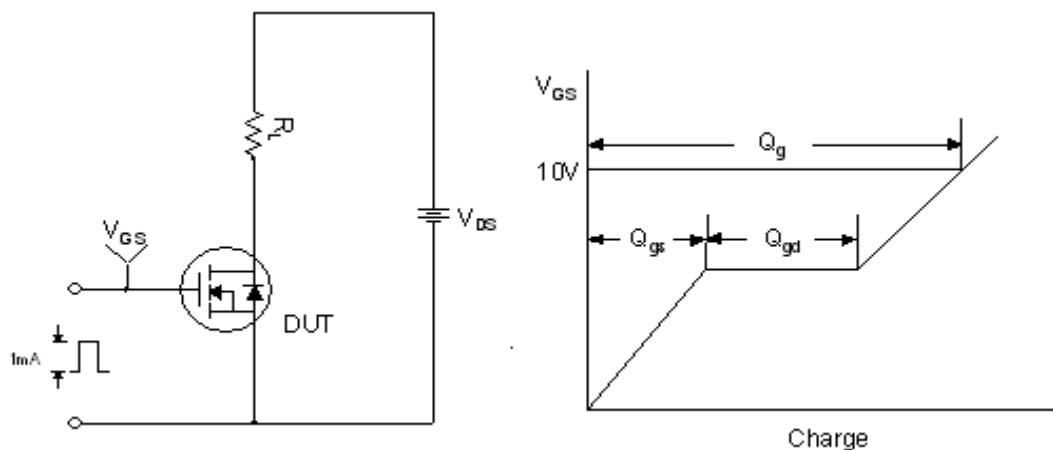
**Figure 10. Safe Operating Area**



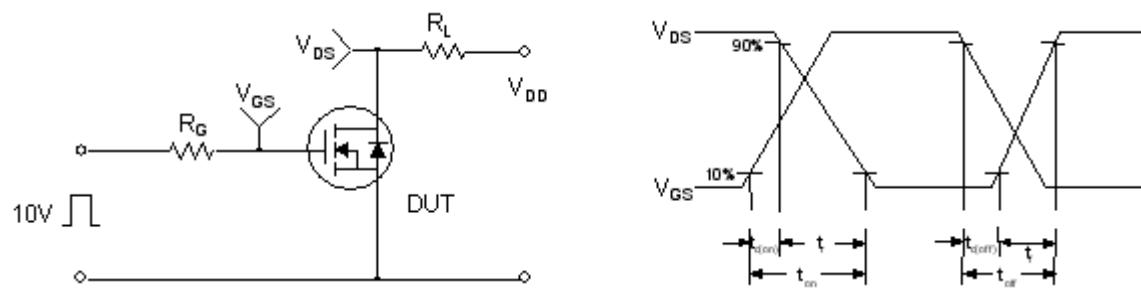
**Figure 11. Transient Thermal Response Curve**



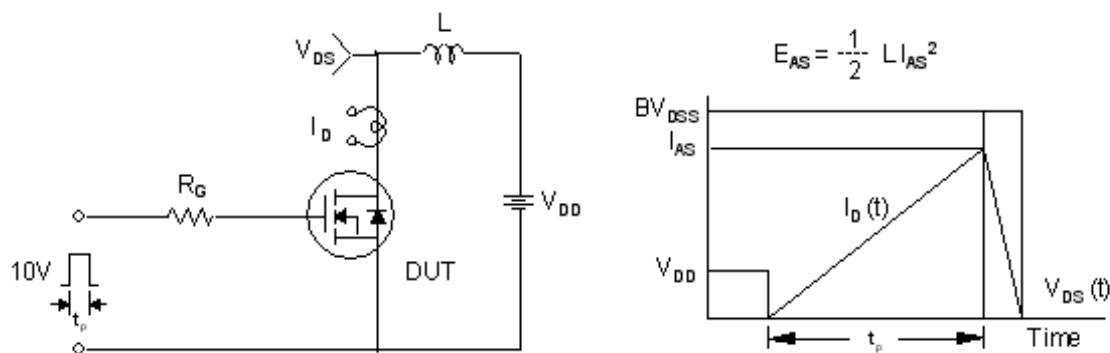
Gate Charge Test Circuit & Waveform



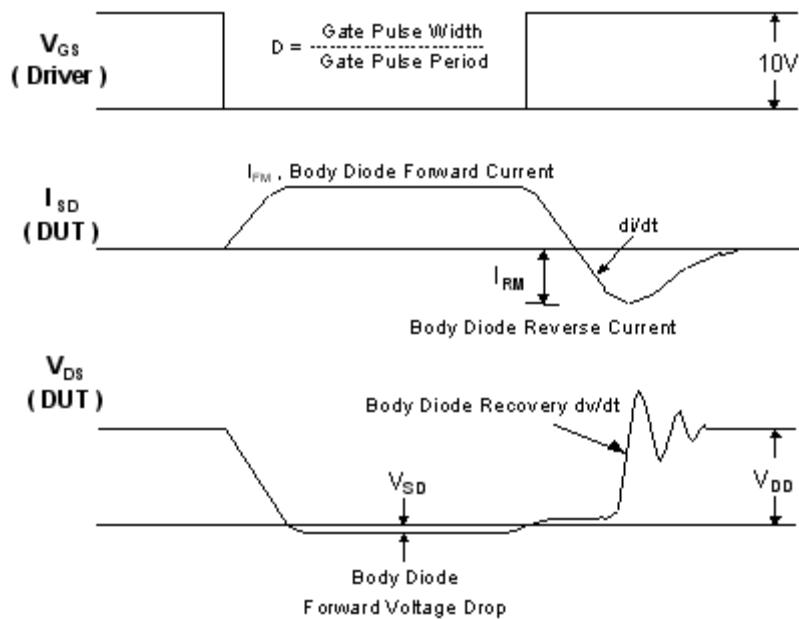
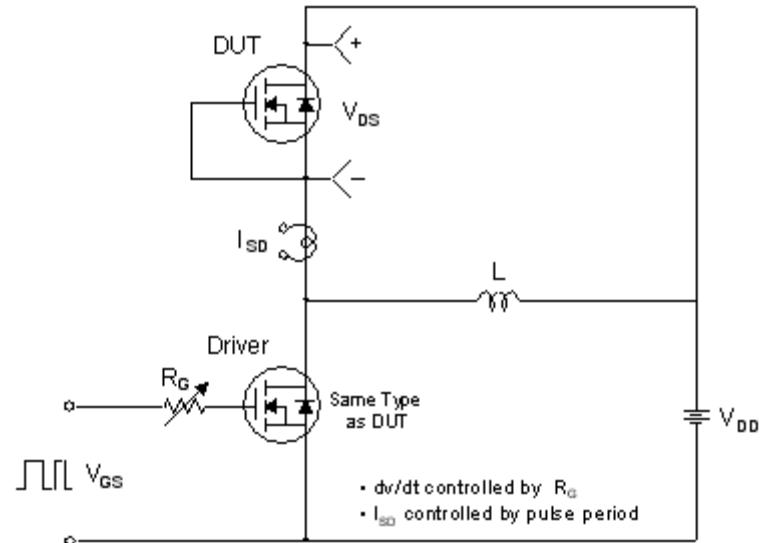
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

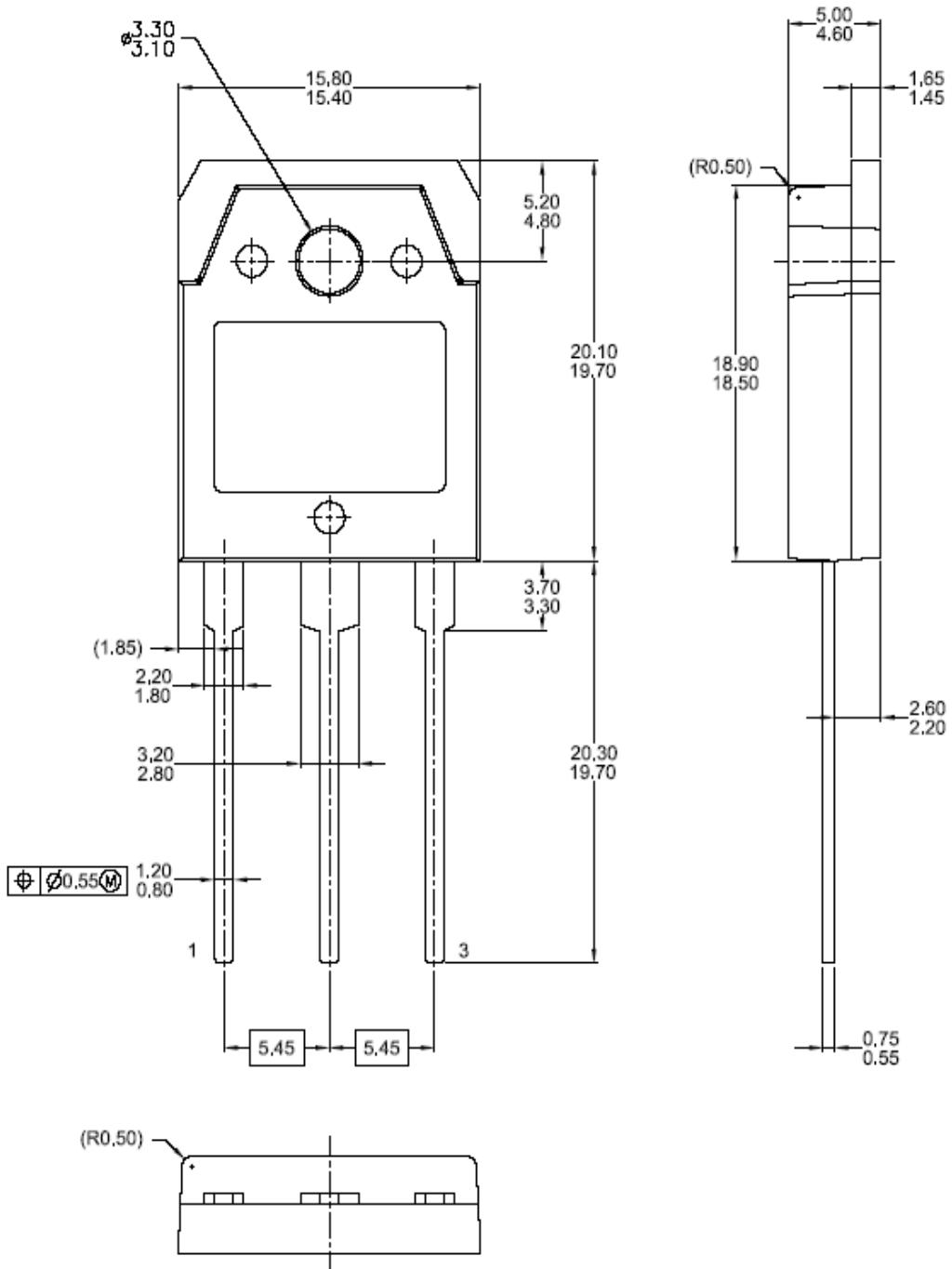


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

## TO-3PN



Dimensions in Millimeters



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