



March 2007

FDA8440

N-Channel PowerTrench® MOSFET

40V, 100A, 2.1mΩ

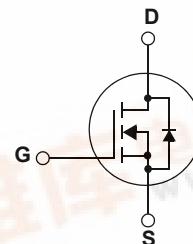
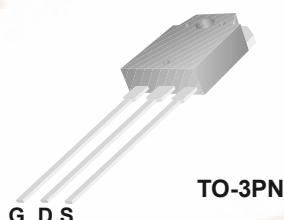
Features

- $R_{DS(on)} = 1.46\text{m}\Omega$ (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	± 20	V
I_D	Drain Current - Continuous ($T_C = 145^\circ\text{C}$)	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)	mJ
P_D	Power dissipation	250	W
	Derate above 25°C	1.67	$\text{mW}/^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature	-55 to +175	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.6	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 2)	$^\circ\text{C/W}$



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
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$V_{\text{GS}} = 0\text{V}$, $I_D = 250\mu\text{A}$	40	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 32\text{V}$ $V_{\text{GS}} = 0\text{V}$	--	--	1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{\text{GS}} = \pm 20\text{V}$	--	--	± 100	nA
On Characteristics						
$V_{\text{GS}(\text{th})}$	Gate to Source Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = 250\mu\text{A}$	1	--	3	V
$R_{\text{DS}(\text{on})}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 4.5\text{V}$, $I_D = 80\text{A}$	--	1.56	2.2	$\text{m}\Omega$
		$V_{\text{GS}} = 10\text{V}$, $I_D = 80\text{A}$	--	1.46	2.1	
		$V_{\text{GS}} = 10\text{V}$, $I_D = 80\text{A}$, $T_C = 175^\circ\text{C}$	--	2.82	4.1	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{\text{DS}} = 25\text{V}$, $V_{\text{GS}} = 0\text{V}$, $f = 1.0\text{MHz}$	--	18600	24740	pF
C_{oss}	Output Capacitance		--	1840	2450	pF
C_{rss}	Reverse Transfer Capacitance		--	1400	2100	pF
R_G	Gate Resistance	$V_{\text{GS}} = 0.5\text{V}$, $f = 1\text{MHz}$	--	1.1	--	Ω
$Q_{\text{g}(\text{tot})}$	Total Gate Charge at 10V	$V_{\text{GS}} = 0\text{V}$ to 10V	--	345	450	nC
$Q_{\text{g}(2)}$	Threshold Gate Charge	$V_{\text{GS}} = 0\text{V}$ to 2V	$V_{\text{DD}} = 20\text{V}$ $I_D = 80\text{A}$ $I_g = 1.0\text{mA}$	32.5	--	nC
Q_{gs}	Gate to Source Gate Charge	49		--	nC	
$Q_{\text{gs}2}$	Gate Charge Threshold to Plateau	42		--	nC	
Q_{gd}	Gate to Drain "Miller" Charge	74		--	nC	
Switching Characteristics ($V_{\text{GS}} = 10\text{V}$)						
t_{ON}	Turn-On Time	$V_{\text{DD}} = 20\text{V}$, $I_D = 80\text{A}$ $V_{\text{GS}} = 10\text{V}$, $R_{\text{GEN}} = 7\Omega$	--	175	360	ns
$t_{\text{d}(\text{on})}$	Turn-On Delay Time		--	43	95	ns
t_r	Rise Time		--	130	275	ns
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time		--	435	875	ns
t_f	Fall Time		--	290	590	ns
t_{OFF}	Turn-Off Time		--	730	1470	ns
Drain-Source Diode Characteristics and Maximum Ratings						
V_{SD}	Source to Drain Diode Voltage	$I_{\text{SD}} = 80\text{A}$	--	--	1.25	V
		$I_{\text{SD}} = 40\text{A}$	--	--	1.0	V
t_{rr}	Reverse Recovery Time	$I_{\text{SD}} = 75\text{A}$, $dI_{\text{SD}}/dt = 100\text{A}/\mu\text{s}$	--	59	--	ns
Q_{RR}	Reverse Recovery Charge	$I_{\text{SD}} = 75\text{A}$, $dI_{\text{SD}}/dt = 100\text{A}/\mu\text{s}$	--	77	--	nC

NOTES:

1: Starting $T_J = 25^\circ\text{C}$, $L = 200\mu\text{H}$, $I_{AS} = 64\text{A}$, $V_{\text{DD}} = 36\text{V}$, $V_{\text{GS}} = 10\text{V}$.

2: Pulse width = 100s

Typical Performance Characteristics

Figure 1. On-Region Characteristics

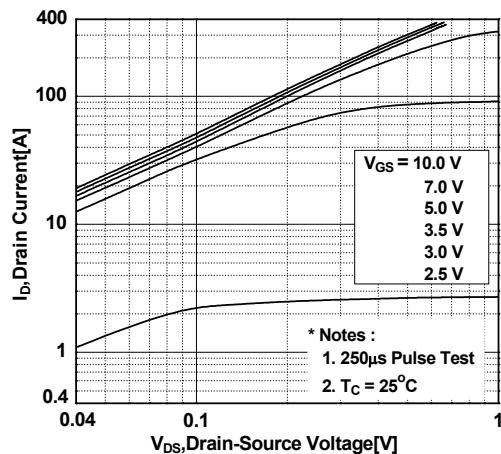


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

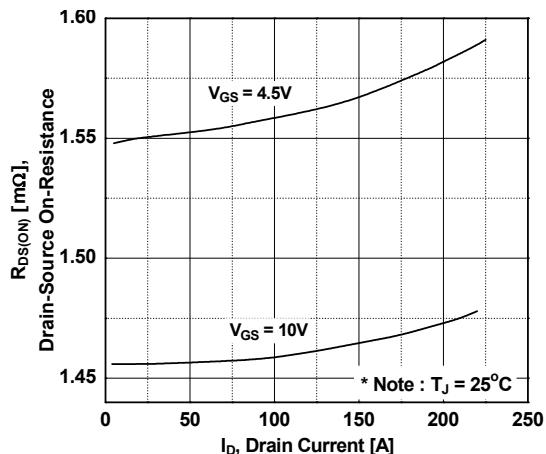


Figure 5. Capacitance Characteristics

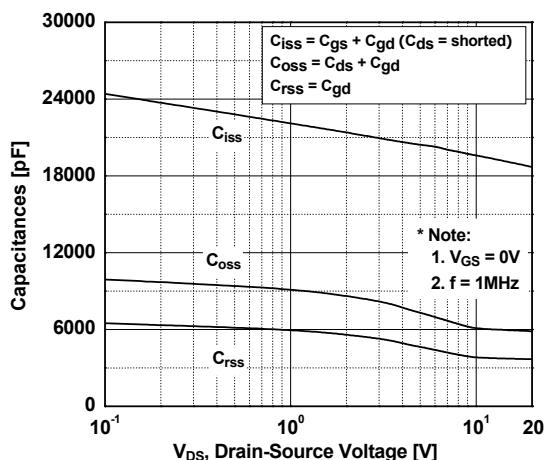


Figure 2. Transfer Characteristics

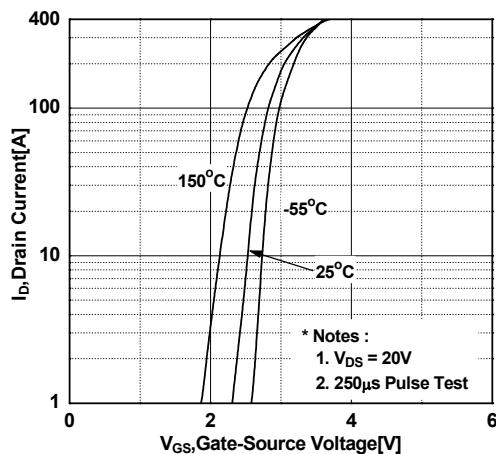


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

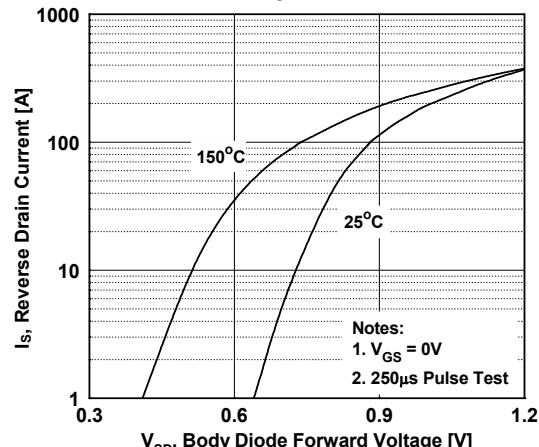
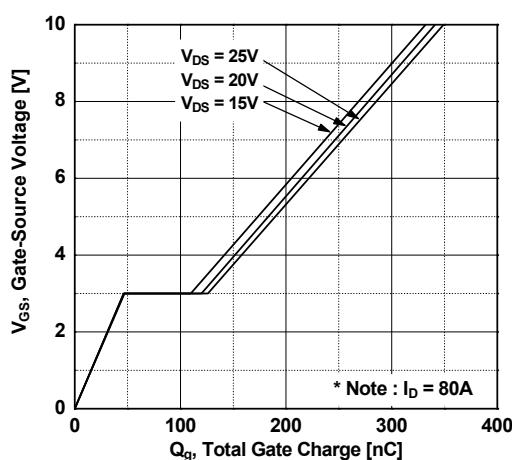


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

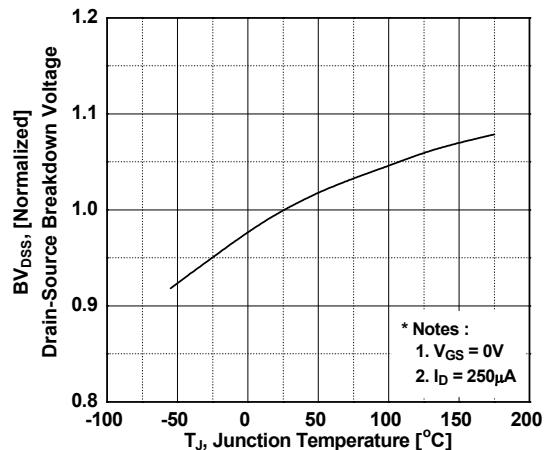


Figure 8. On-Resistance Variation vs. Temperature

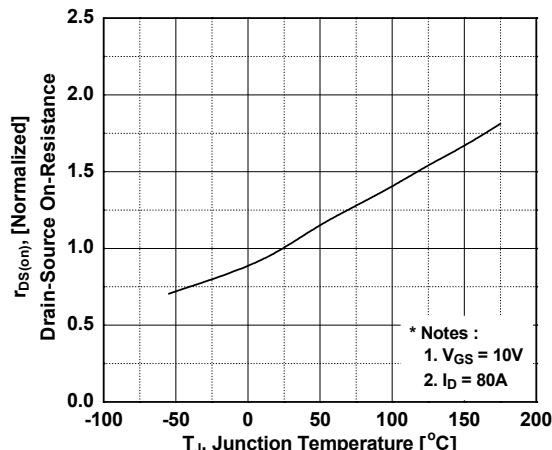


Figure 9. Unclamped Inductive Switching Capability

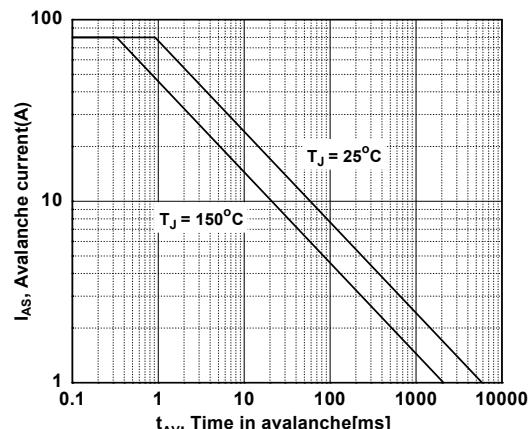


Figure 10. Safe Operating Area

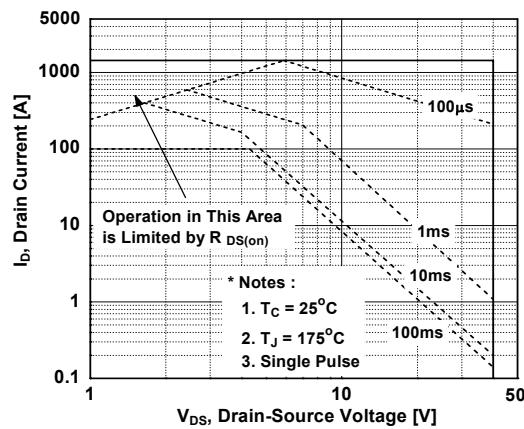
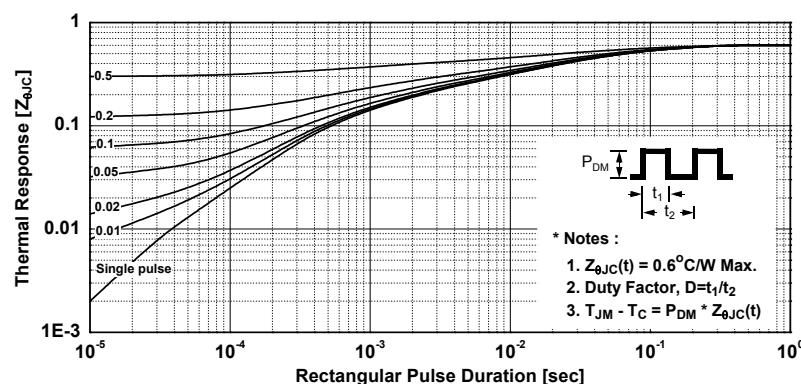
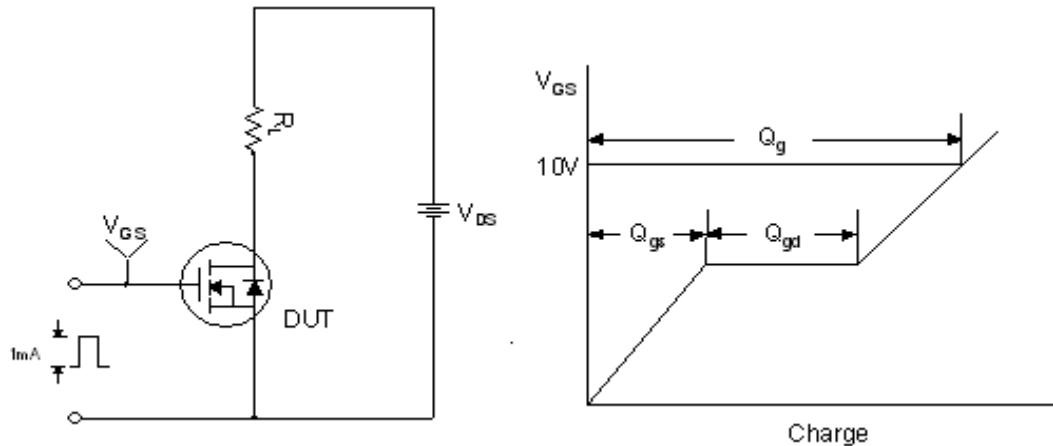


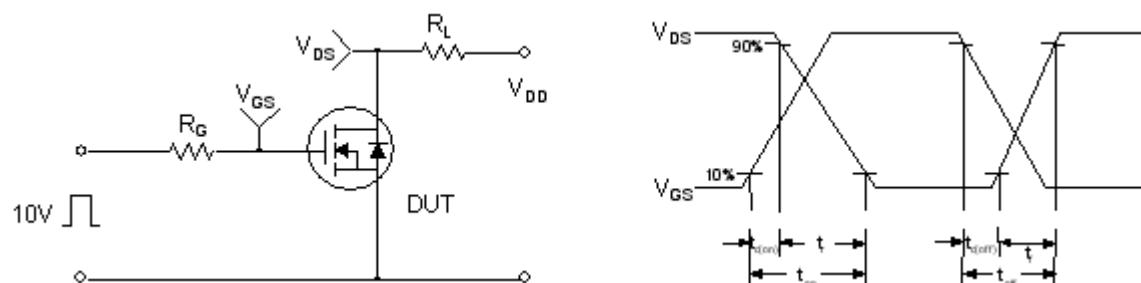
Figure 11. Transient Thermal Response Curve



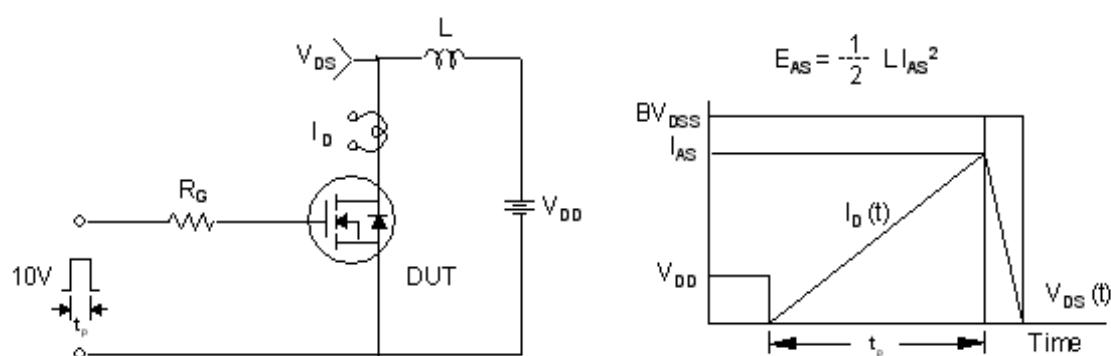
Gate Charge Test Circuit & Waveform



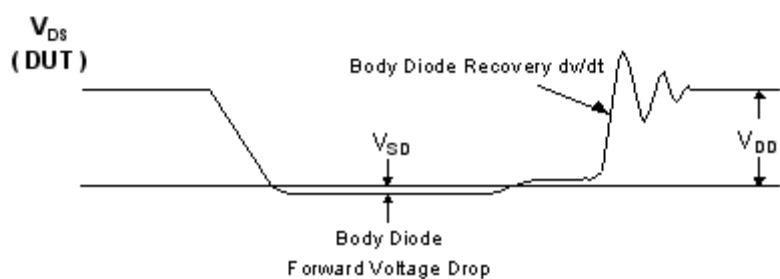
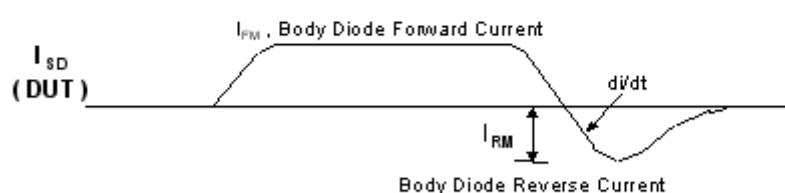
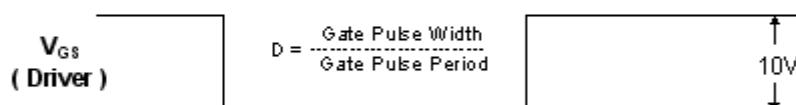
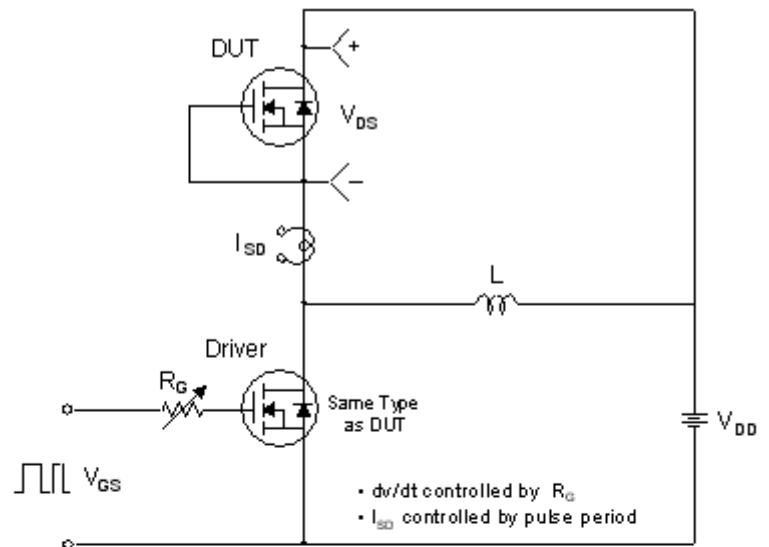
Resistive Switching Test Circuit & Waveforms

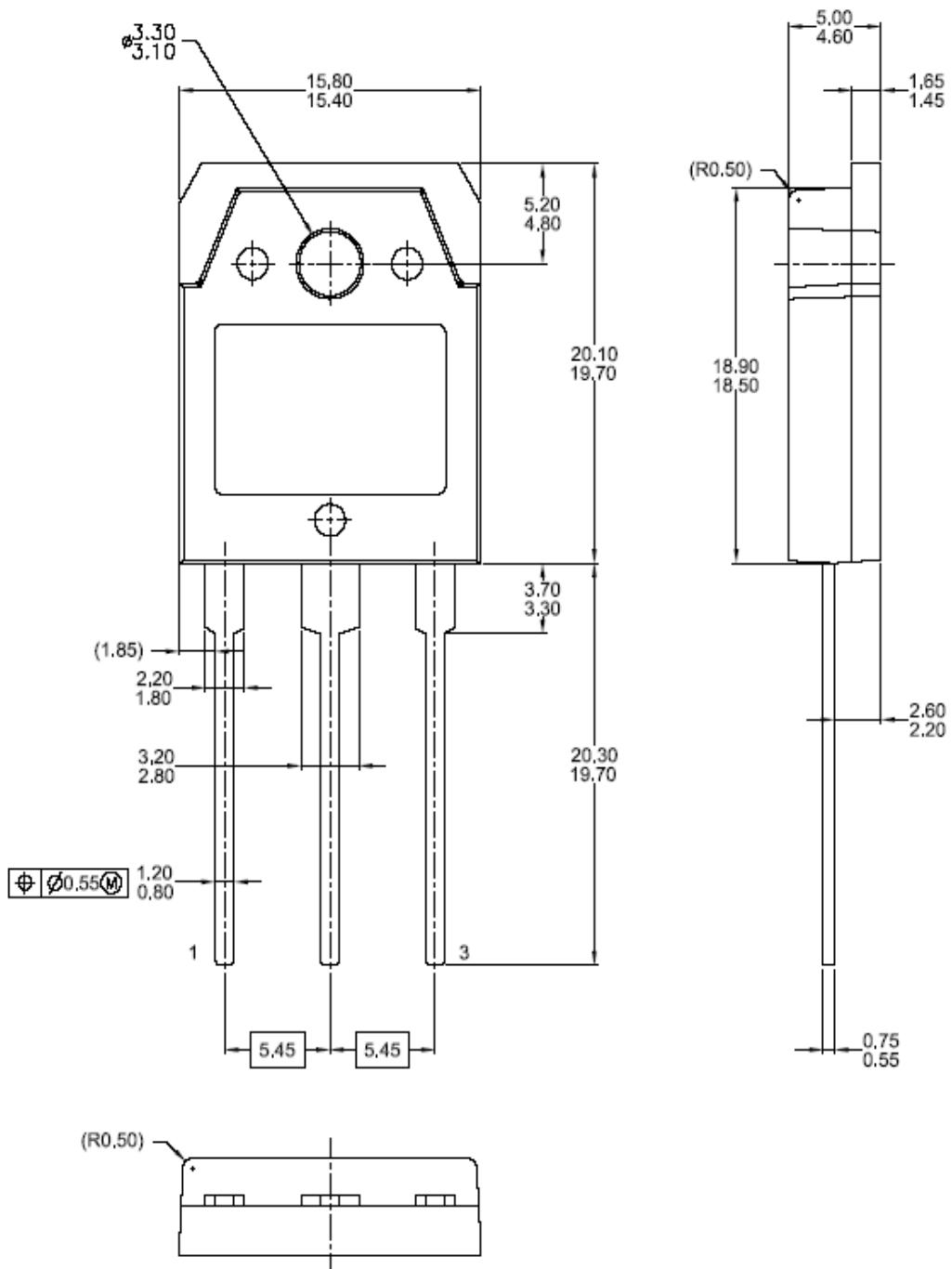


Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions**TO-3PN**

Dimensions in Millimeters



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