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April 2014



FDA8440

N-Channel Logic Level PowerTrench® MOSFET

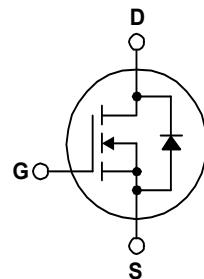
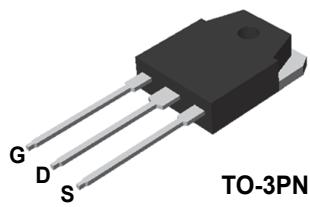
40 V, 100 A, 2.1 mΩ

Features

- $R_{DS(on)} = 1.46 \text{ mΩ}$ (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	± 20	V
I_D	Drain Current - Continuous ($T_C = 155^\circ\text{C}$)	100	A
	- Continuous ($T_A = 25^\circ\text{C}$, $V_{GS} = 10 \text{ V}$, $R_{θJA} = 40^\circ\text{C/W}$)	30	A
	- Pulsed	500	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 1)	mJ
P_D	Power dissipation	306	W
	Derate above 25°C	2.04	W/ $^\circ\text{C}$
T_J , T_{STG}	Operating and Storage Temperature	-55 to +175	$^\circ\text{C}$

Thermal Characteristics

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

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

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
Off Characteristics							
BV_{DSS}	Drain to Source Breakdown Voltage	$\text{V}_{\text{GS}} = 0 \text{ V}$, $\text{I}_D = 250 \mu\text{A}$	40	--	--	V	
I_{DSS}	Zero Gate Voltage Drain Current	$\text{V}_{\text{DS}} = 32 \text{ V}$ $\text{V}_{\text{GS}} = 0 \text{ V}$	--	--	1	μA	
I_{GSS}	Gate to Body Leakage Current	$\text{V}_{\text{GS}} = \pm 20 \text{ V}$	--	--	250	μA	
On Characteristics							
$\text{V}_{\text{GS(th)}}$	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		
		$\text{V}_{\text{GS}} = 10 \text{ V}$, $\text{I}_D = 80 \text{ A}$, $T_C = 175^\circ\text{C}$	--	2.82	4.1		
Dynamic Characteristics							
C_{iss}	Input Capacitance	$\text{V}_{\text{DS}} = 25 \text{ V}$, $\text{V}_{\text{GS}} = 0 \text{ V}$, $f = 1 \text{ MHz}$	--	18600	24740	pF	
C_{oss}	Output Capacitance		--	1840	2450	pF	
C_{rss}	Reverse Transfer Capacitance		--	1400	2100	pF	
R_G	Gate Resistance	$\text{V}_{\text{GS}} = 0.5 \text{ V}$, $f = 1 \text{ MHz}$	--	1.1	--	Ω	
$\text{Q}_{\text{g(tot)}}$	Total Gate Charge at 10V	$\text{V}_{\text{GS}} = 0 \text{ V}$ to 10 V	--	345	450	nC	
$\text{Q}_{\text{g(2)}}$	Threshold Gate Charge	$\text{V}_{\text{GS}} = 0 \text{ V}$ to 2 V	$\text{V}_{\text{DD}} = 20 \text{ V}$ $\text{I}_D = 80 \text{ A}$ $\text{I}_g = 1.0 \text{ mA}$	--	32.5	--	nC
Q_{gs}	Gate to Source Gate Charge	--		49	--	nC	
Q_{gs2}	Gate Charge Threshold to Plateau	--		16.5	--	nC	
Q_{gd}	Gate to Drain "Miller" Charge	--		74	--	nC	
Switching Characteristics							
t_{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	
$t_{\text{d(on)}}$	Turn-On Delay Time		--	43	95	ns	
t_r	Rise Time		--	130	275	ns	
$t_{\text{d(off)}}$	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	$\text{I}_{\text{SD}} = 80 \text{ A}$	--	--	1.25	V	
		$\text{I}_{\text{SD}} = 40 \text{ A}$	--	--	1.0	V	
t_{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	
Q_{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 = 100 s.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

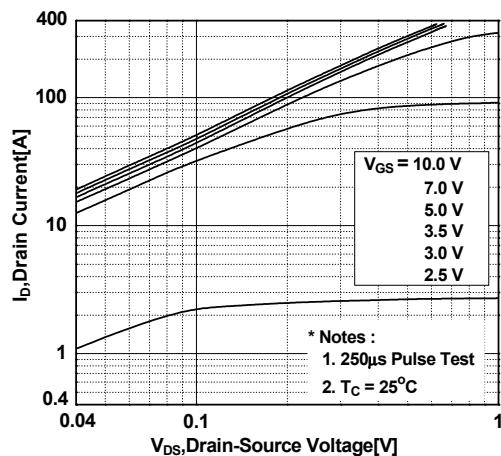


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

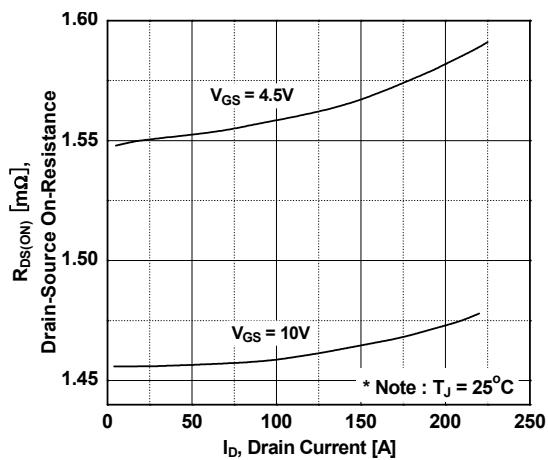


Figure 5. Capacitance Characteristics

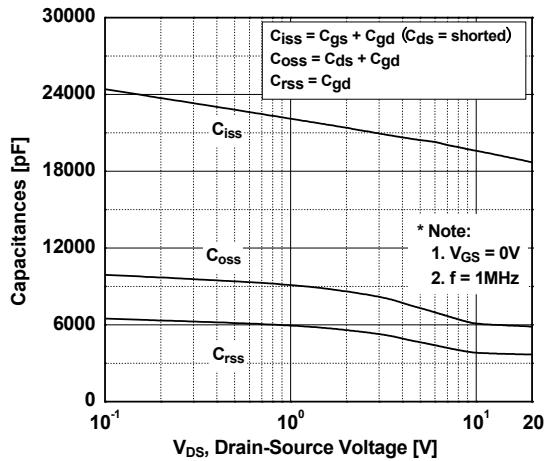


Figure 2. Transfer Characteristics

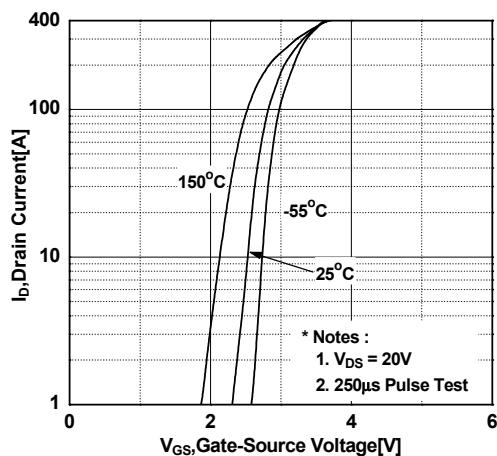


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

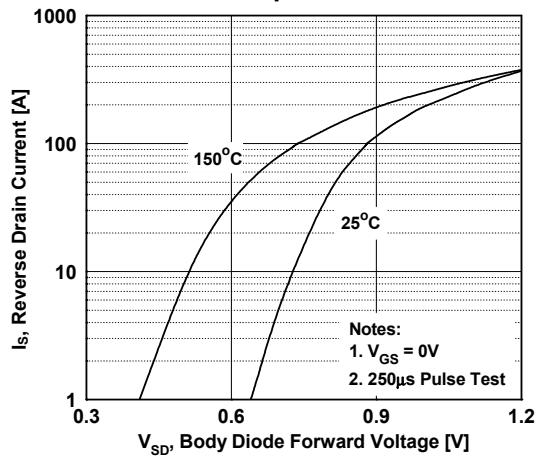
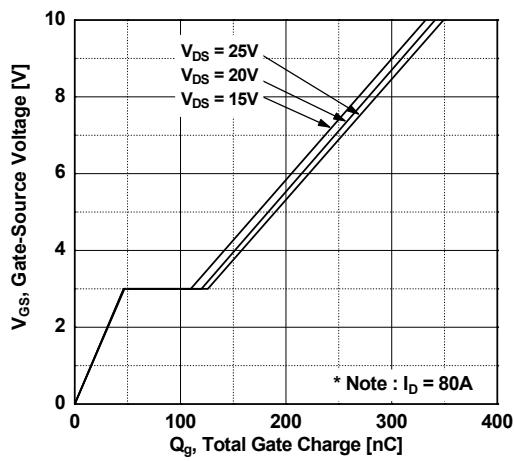


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

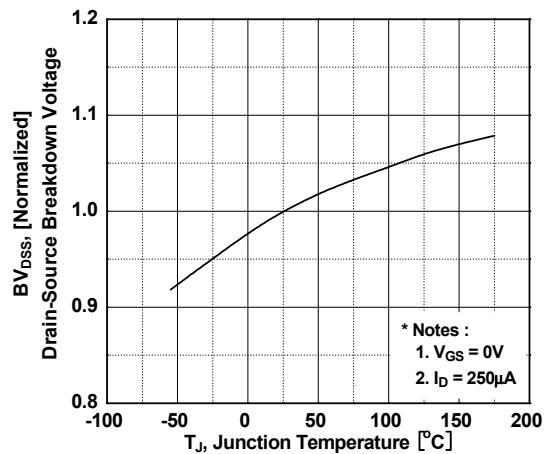


Figure 8. On-Resistance Variation vs. Temperature

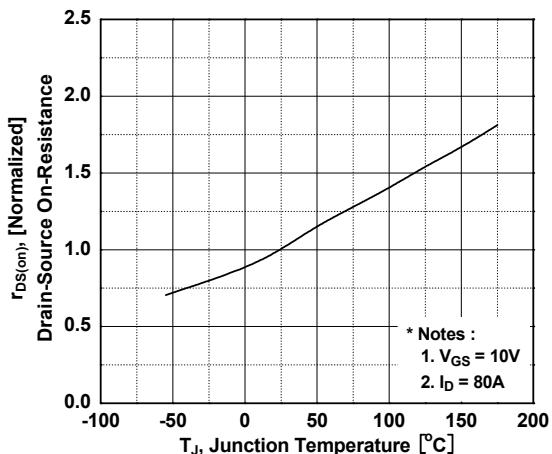


Figure 9. Unclamped Inductive Switching Capability

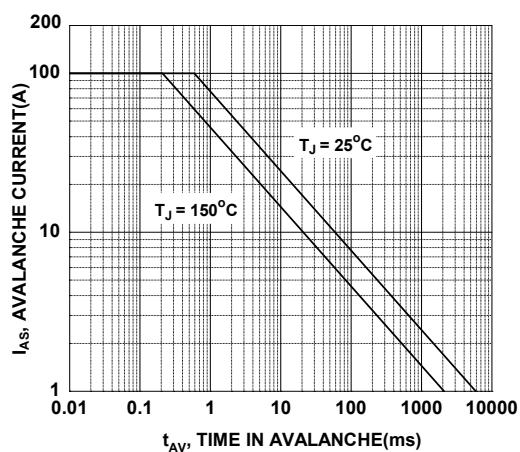


Figure 10. Safe Operating Area

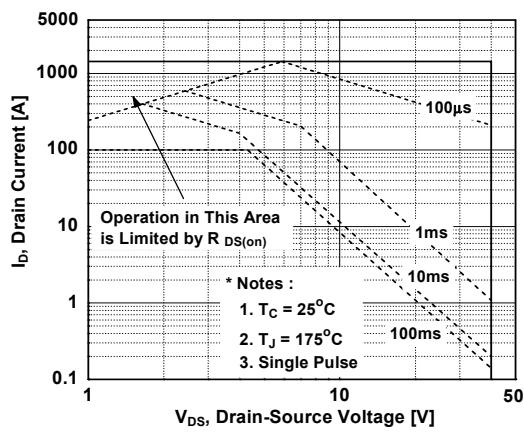
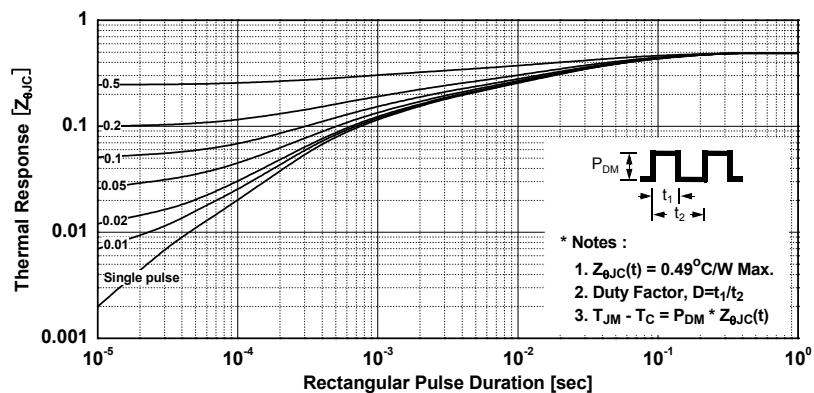


Figure 11. Transient Thermal Response Curve



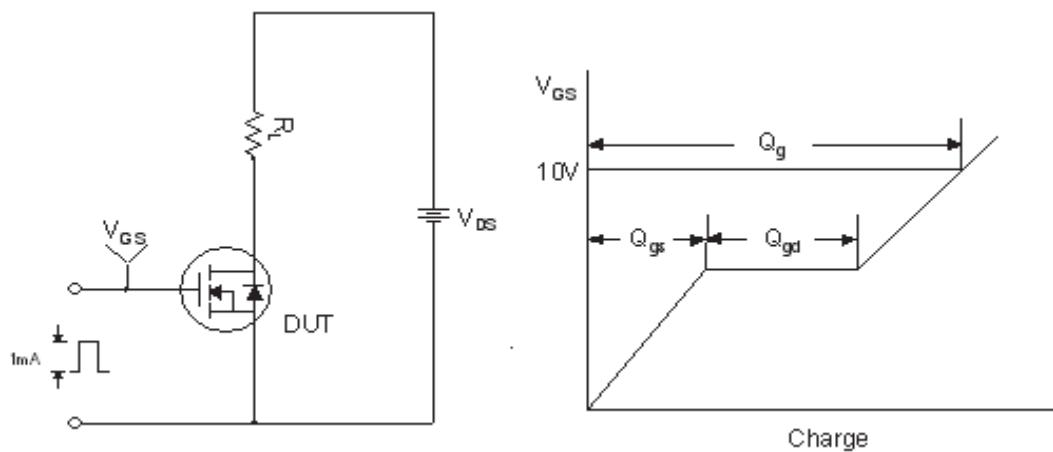


Figure 12. Gate Charge Test Circuit & Waveform

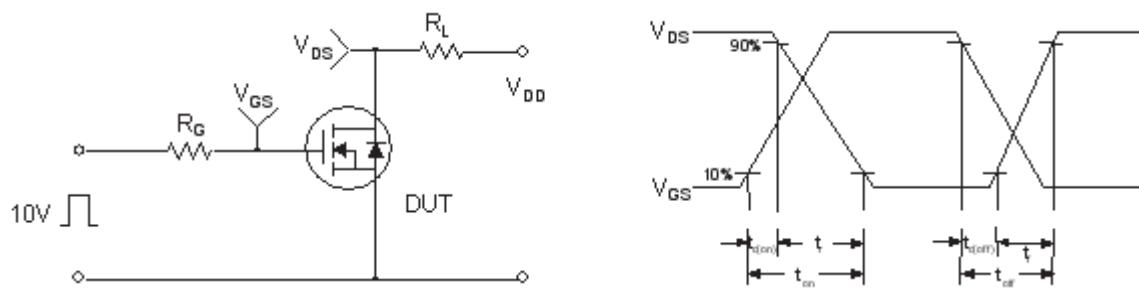


Figure 13. Resistive Switching Test Circuit & Waveforms

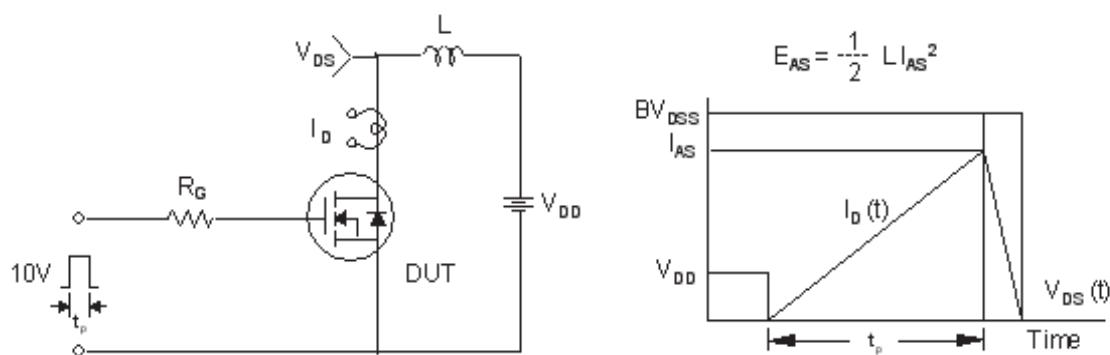


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

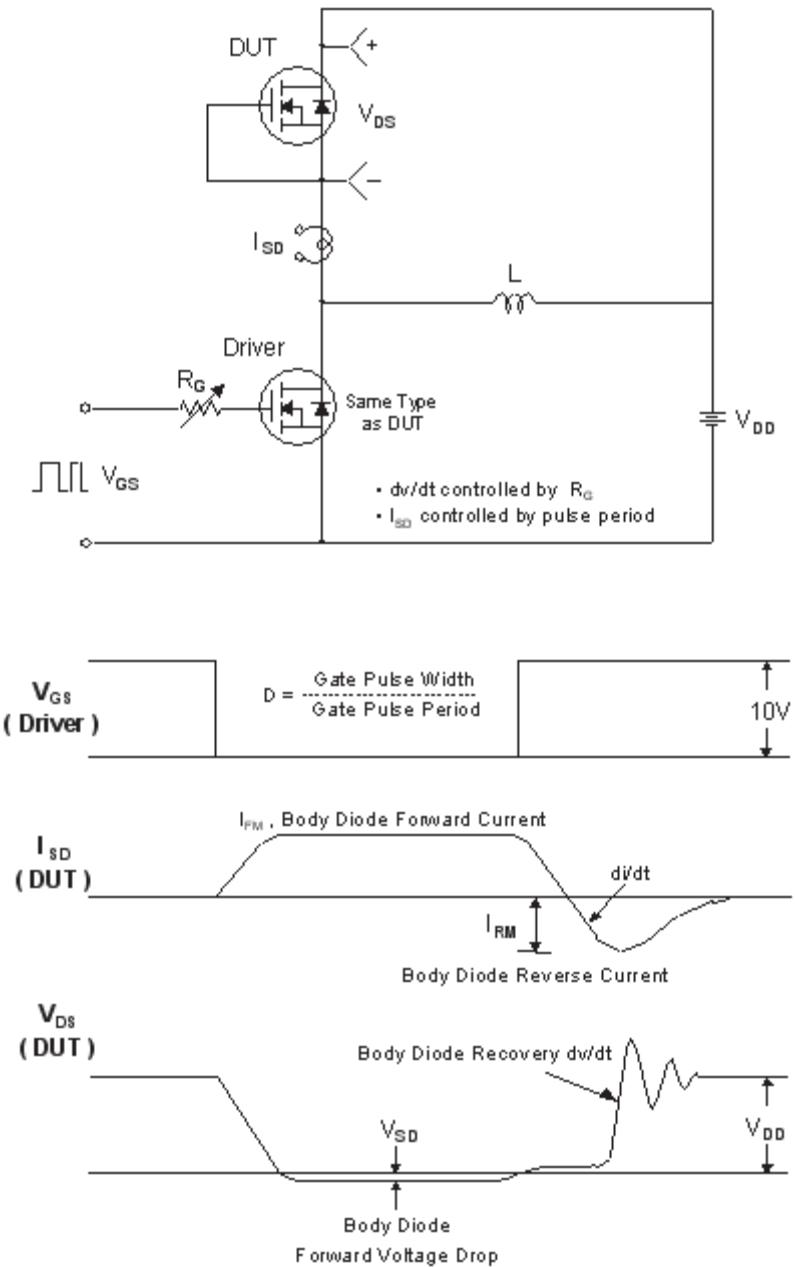
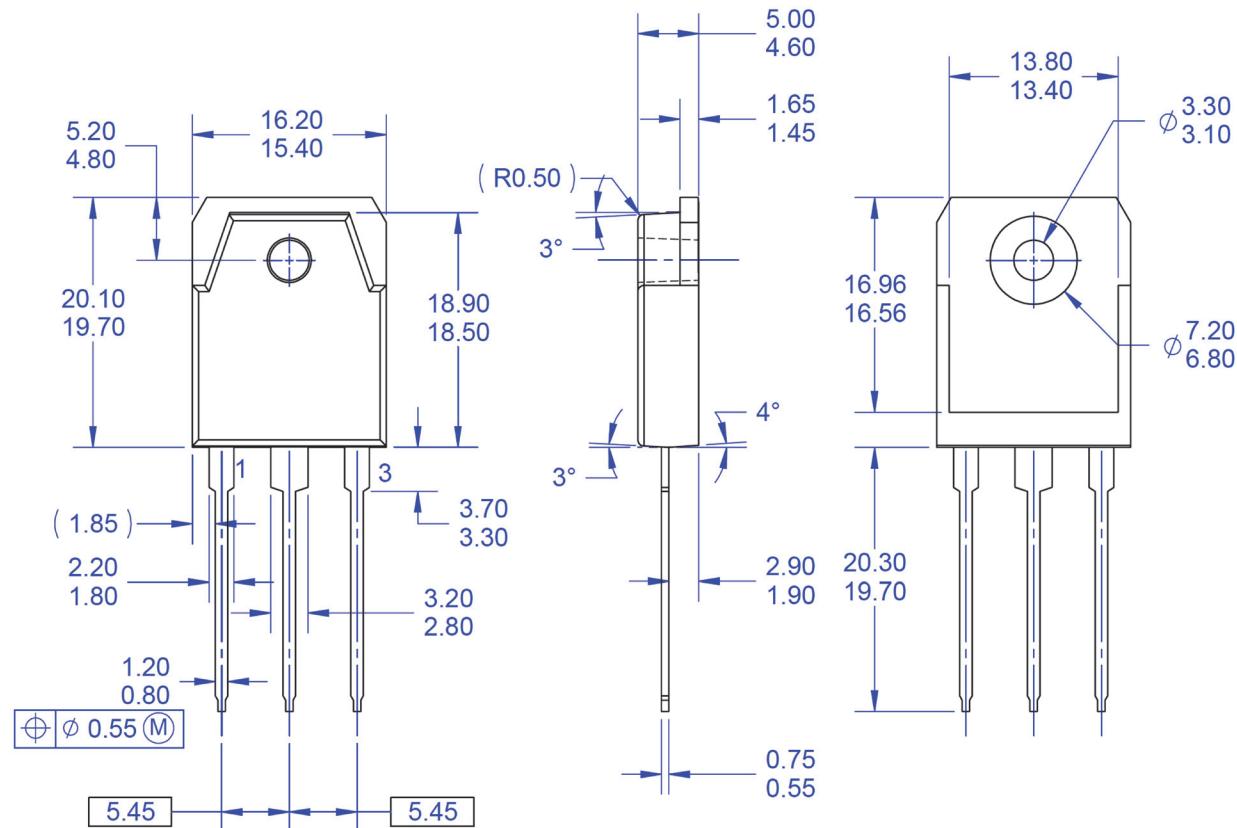


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

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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.
- F) FAIRCHILD SEMICONDUCTOR.

Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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