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FAIRCHILD SEMICONDUCTOR®

April 2007

UltraFET™

FDA2712

N-Channel UltraFET Trench MOSFET

250V, 64A, 34mΩ

Features

- $R_{DS(on)}$ = 29.2mΩ @V_{GS} = 10 V, I_D = 40A
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

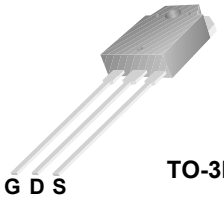
Description

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.

Applications

- PDP application

100% LEAD-FREE IMPLEMENTATION



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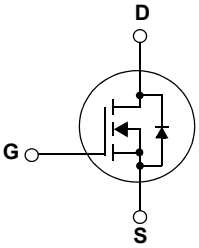


MOSFET Maximum Ratings

Symbol	Parameter			Ratings	Units
V_{DSS}	Drain to Source Voltage			250	V
V_{GSS}	Gate to Source Voltage			±30	V
I_D	Drain Current	-Continuous (T_C = 25°C)		64	A
		-Continuous (T_C = 100°C)		44	
I_{DM}	Drain Current	- Pulsed	(Note 1)	240	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	245	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	4.5	V/ns
P_D	Power Dissipation	(T_C = 25°C)		357	W
		- Derate above 25°C		2.85	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.35	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	

Package Marking and Ordering Information $T_C = 25^oC$ unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDA2712	FDA2712	TO-3PN	N/A	N/A	30

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$, $T_J = 25^oC$	250	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25^oC	-	0.2	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 250V$, $V_{GS} = 0V$	-	-	1	μA
		$V_{DS} = 250V$, $V_{GS} = 0V$, $T_J = 125^oC$	-	-	500	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20V$, $V_{DS} = 0V$	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	3.0	3.9	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 40A$	-	29.2	34	mΩ
g_{FS}	Forward Transconductance	$V_{DS} = 10V$, $I_D = 40A$ (Note 4)	-	43	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$, f = 1MHz	-	7650	10175	pF
C_{oss}	Output Capacitance		-	550	735	pF
C_{rss}	Reverse Transfer Capacitance		-	105	155	pF
Q_g	Total Gate Charge at 10V	$V_{DS} = 125V$, $I_D = 80A$, $V_{GS} = 10V$ (Note 4, 5)	-	99	129	nC
Q_{gs}	Gate to Source Gate Charge		-	46	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	21	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125V$, $I_D = 80A$, $V_{GS} = 10V$, $R_{GEN} = 25\Omega$ (Note 4, 5)	-	128	266	ns
t_r	Turn-On Rise Time		-	371	751	ns
$t_{d(off)}$	Turn-Off Delay Time		-	143	295	ns
t_f	Turn-Off Fall Time		-	210	429	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	80	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	240	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0V$, $I_{SD} = 80A$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_{SD} = 80A$, $dI_F/dt = 100A/\mu s$ (Note 4)	-	175	-	ns
Q_{rr}	Reverse Recovery Charge		-	1.17	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 1mH, $I_{AS} = 22.2A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25°C$
3. $I_{SD} \le 80A$, $di/dt \le 200A/\mu s$, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25°C$
4. Pulse Test: Pulse width $\le 300\mu s$, Duty Cycle $\le 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

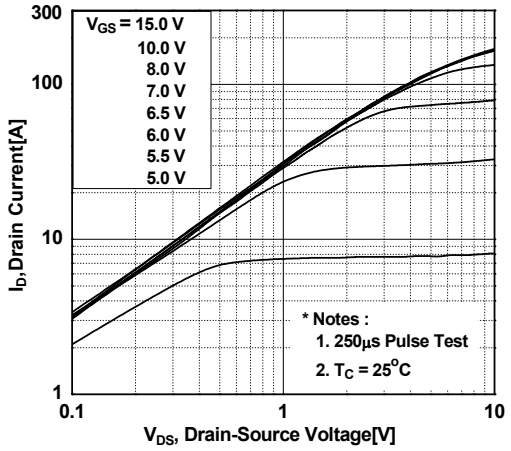


Figure 2. Transfer Characteristics

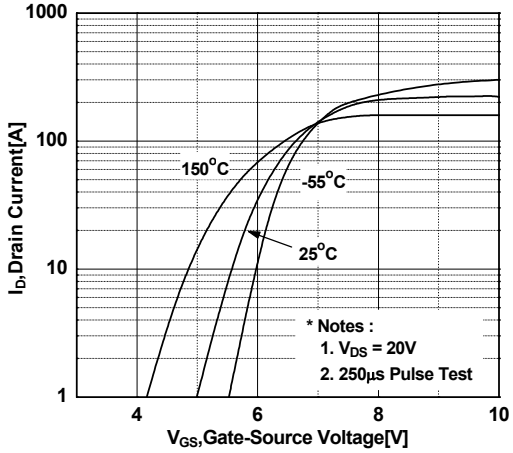


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

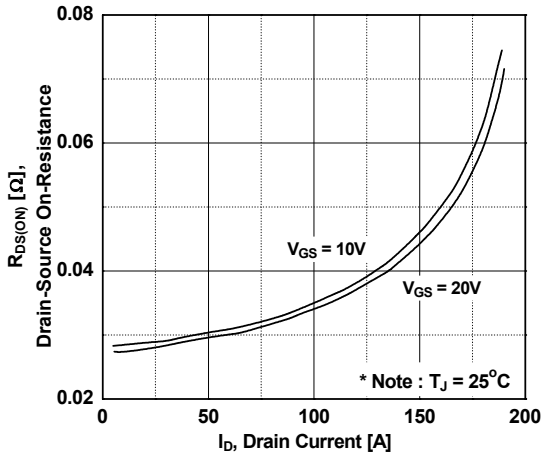


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

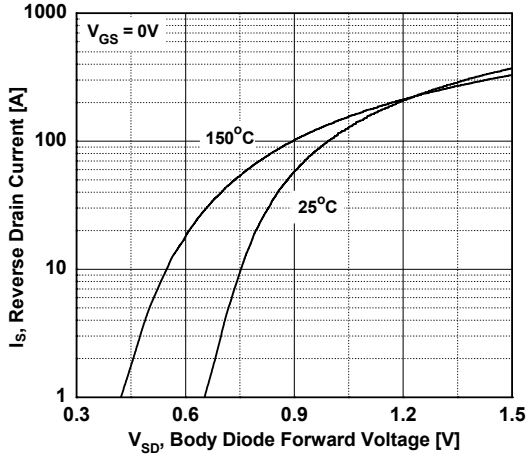


Figure 5. Capacitance Characteristics

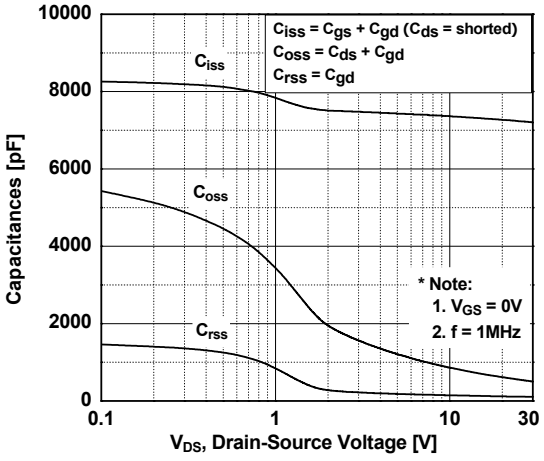
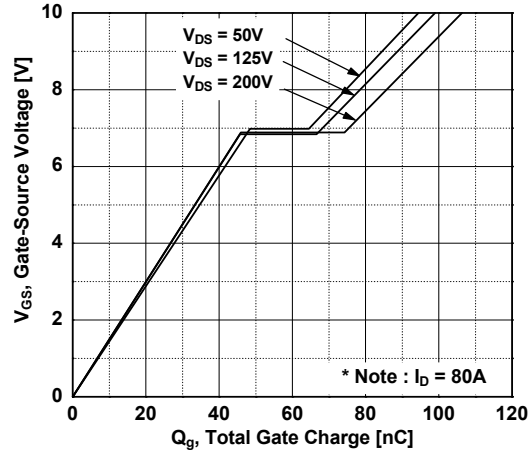


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

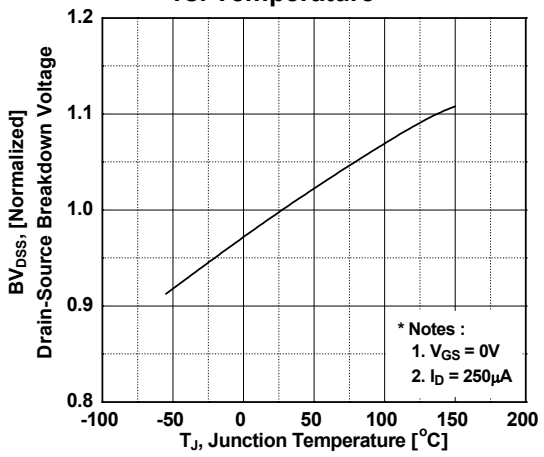


Figure 8. On-Resistance Variation vs. Temperature

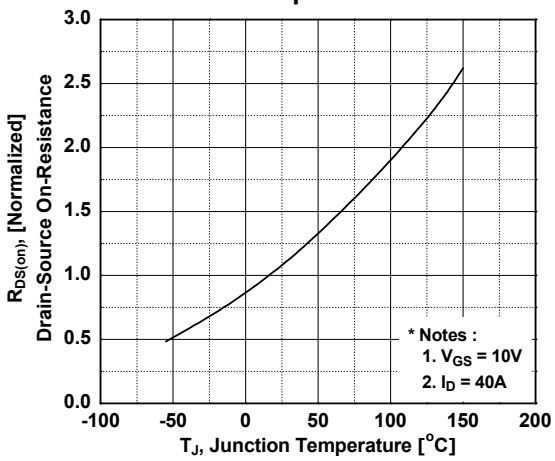


Figure 9. Maximum Safe Operating Area

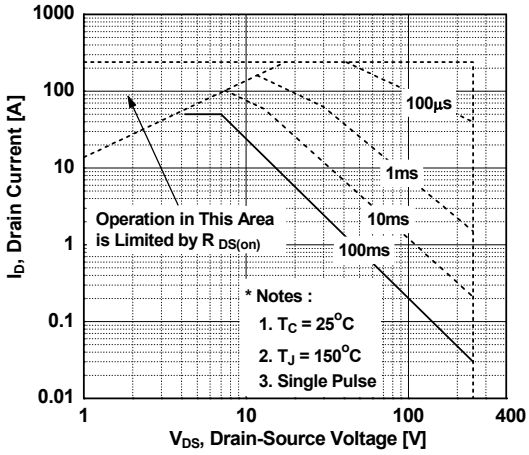


Figure 10. Maximum Drain Current vs. Case Temperature

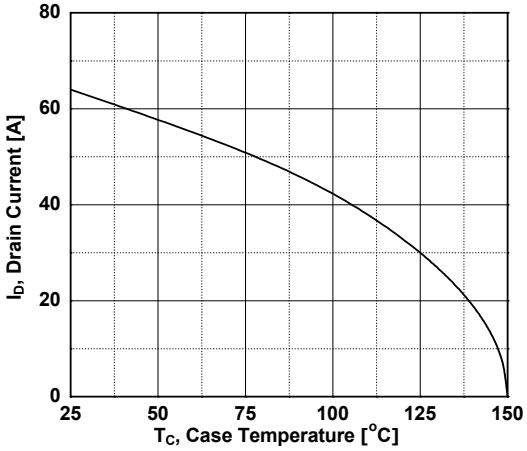
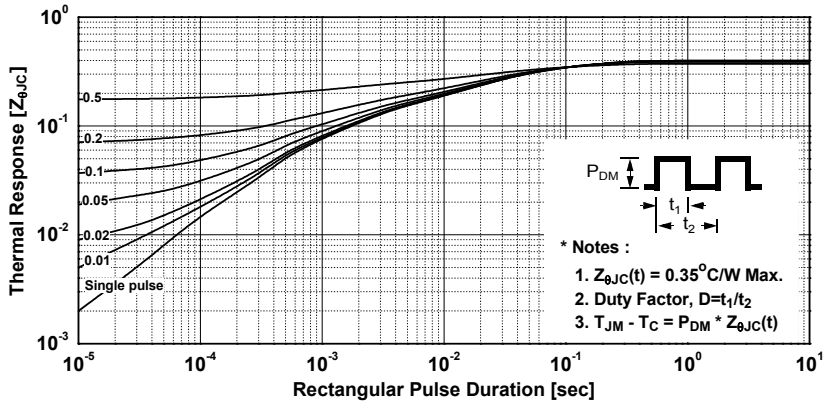
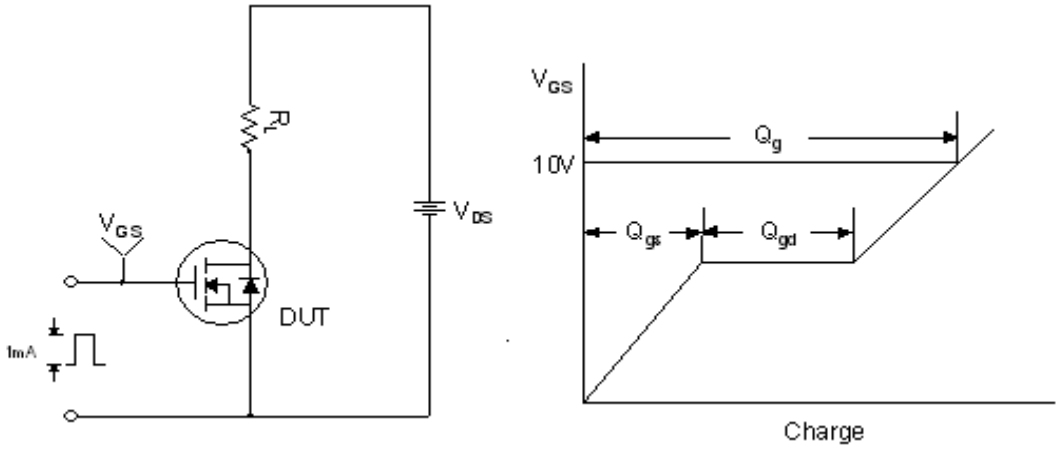


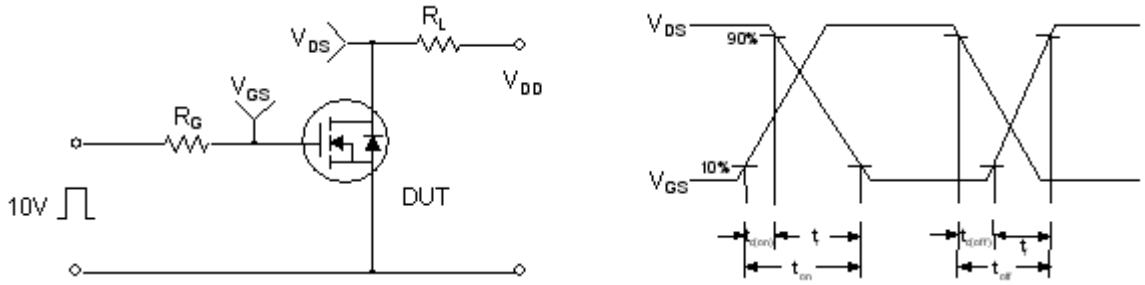
Figure 11. Transient Thermal Response Curve



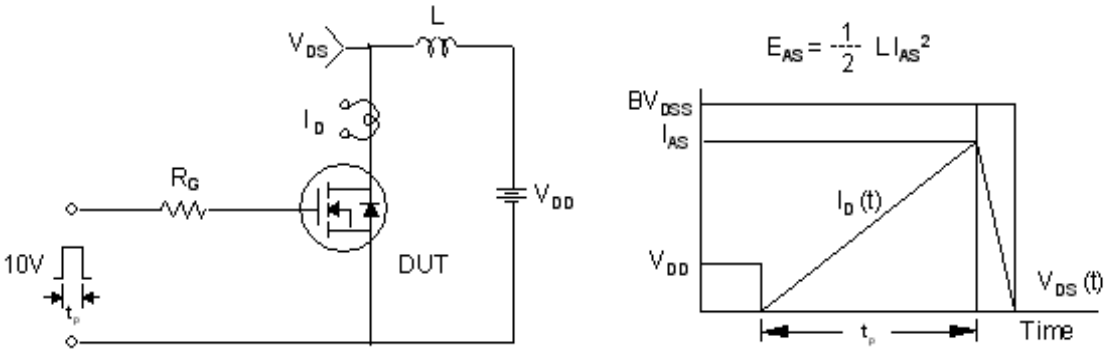
Gate Charge Test Circuit & Waveform



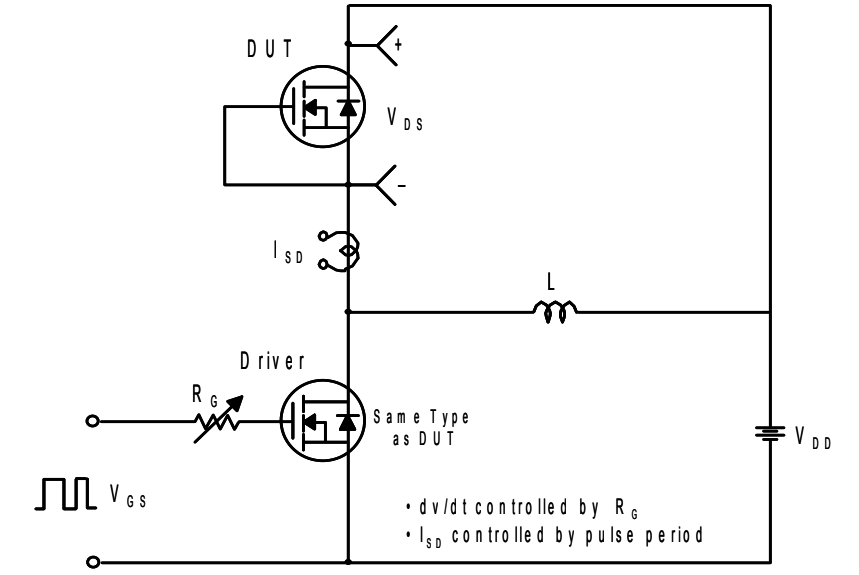
Resistive Switching Test Circuit & Waveforms

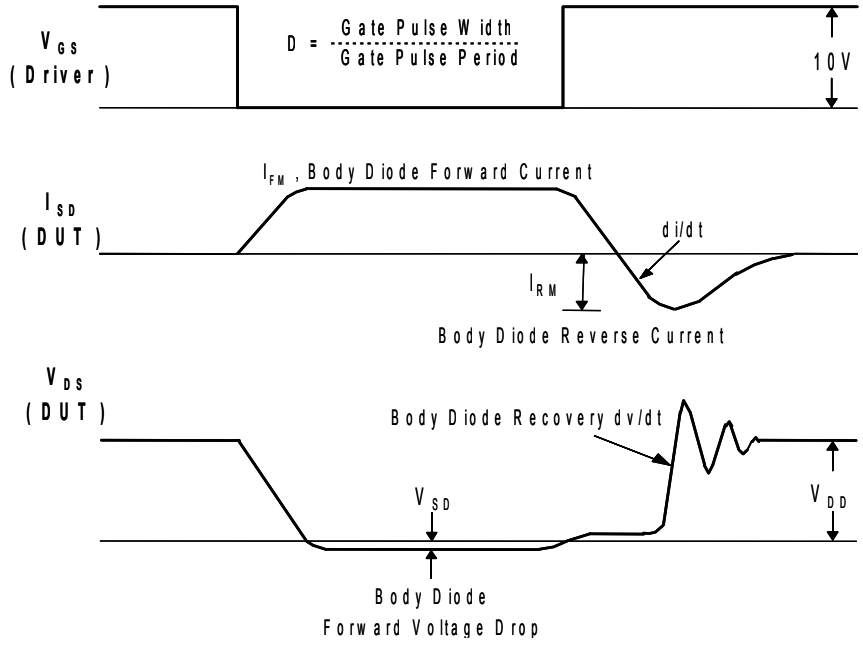


Unclamped Inductive Switching Test Circuit & Waveforms



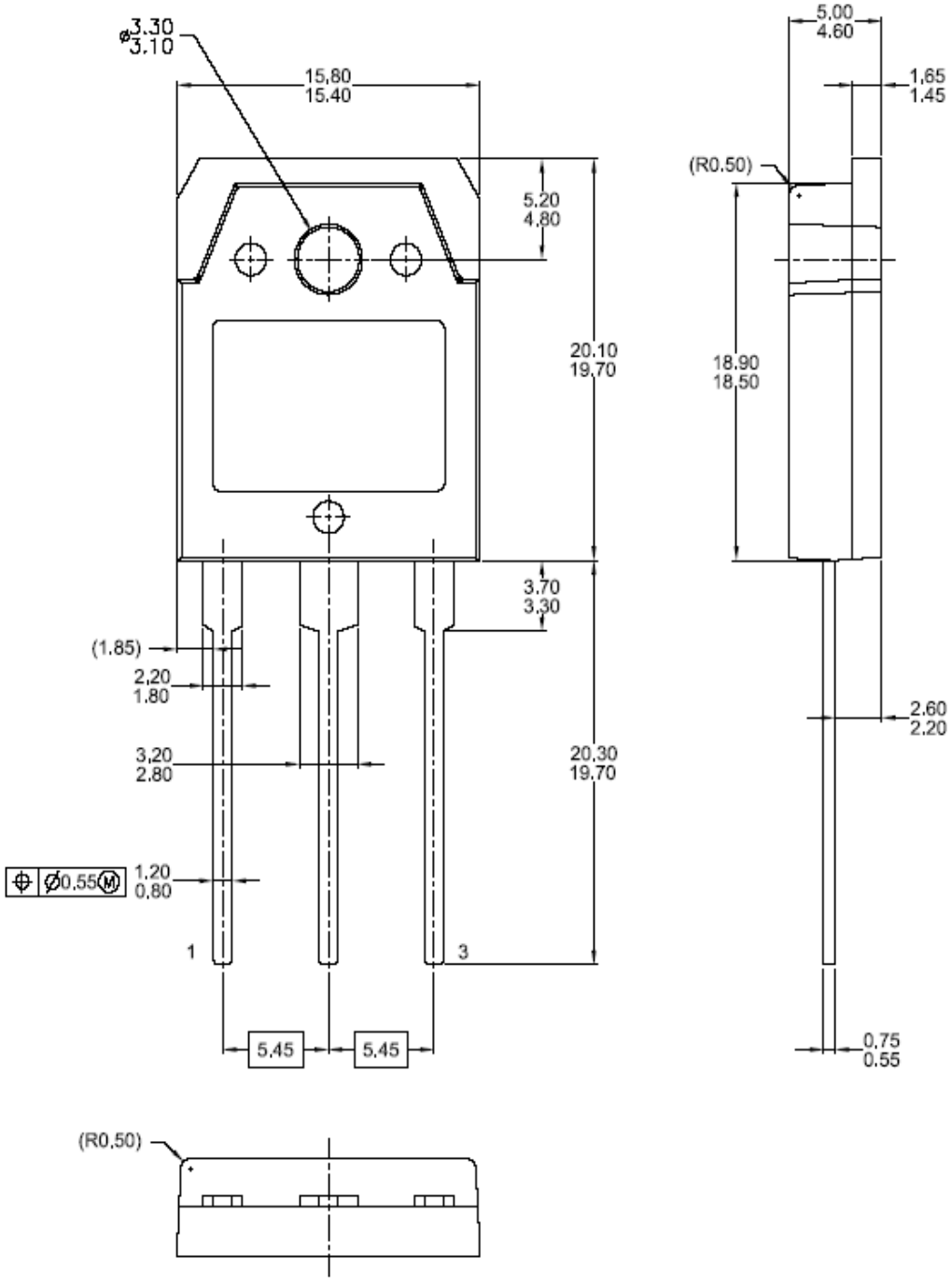
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

TO-3PN



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