

FQA90N15 / FQA90N15_F109

N-Channel QFET MOSFET

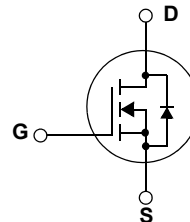
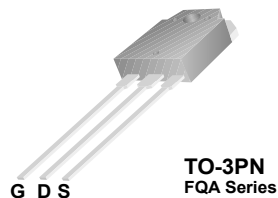
150 V, 90 A, 18 mΩ

Description

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

Features

- 90 A, 150 V, $R_{DS(on)} = 18 \text{ m}\Omega$ (Max) @ $V_{GS} = 10 \text{ V}$, $I_D = 45 \text{ A}$
- Low Gate Charge (typical 220 nC)
- Low C_{rss} (typical 200 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



Absolute Maximum Ratings

Symbol	Parameter	FQA90N15_F109	Unit
V_{DSS}	Drain-Source Voltage	150	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	90	A
	- Continuous ($T_C = 100^\circ\text{C}$)	63.5	A
I_{DM}	Drain Current - Pulsed (Note 1)	360	A
V_{GSS}	Gate-Source Voltage	± 25	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1400	mJ
I_{AR}	Avalanche Current (Note 1)	90	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	37.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.0	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	375	W
	- Derate above 25°C	2.5	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	0.4	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink	0.24	--	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQA90N15	FQA90N15_F109	TO-3PN	--	--	30

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	150	--	--	V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	--	0.15	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 150 V, V _{GS} = 0 V	--	--	1	μA
		V _{DS} = 120 V, T _C = 125°C	--	--	10	μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 25 V, V _{DS} = 0 V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -25 V, V _{DS} = 0 V	--	--	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	2.0	--	4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 45 A	--	0.014	0.018	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 45 A (Note 4)	--	68	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	--	6700	8700	pF
C _{oss}	Output Capacitance		--	1400	1800	pF
C _{rss}	Reverse Transfer Capacitance		--	200	260	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 75 V, I _D = 90A, R _G = 25 Ω (Note 4, 5)	--	105	220	ns
t _r	Turn-On Rise Time		--	760	1500	ns
t _{d(off)}	Turn-Off Delay Time		--	470	950	ns
t _f	Turn-Off Fall Time		--	410	830	ns
Q _g	Total Gate Charge	V _{DS} = 120 V, I _D = 90A, V _{GS} = 10 V (Note 4, 5)	--	220	285	nC
Q _{gs}	Gate-Source Charge		--	43	--	nC
Q _{gd}	Gate-Drain Charge		--	110	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	90	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	360	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 90 A	--	--	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 90 A, dI _F / dt = 100 A/μs (Note 4)	--	175	--	ns
Q _{rr}	Reverse Recovery Charge		--	0.97	--	μC

NOTES:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 0.29mH, I_{AS} = 90A, V_{DD} = 25V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 90A, di/dt ≤ 300A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

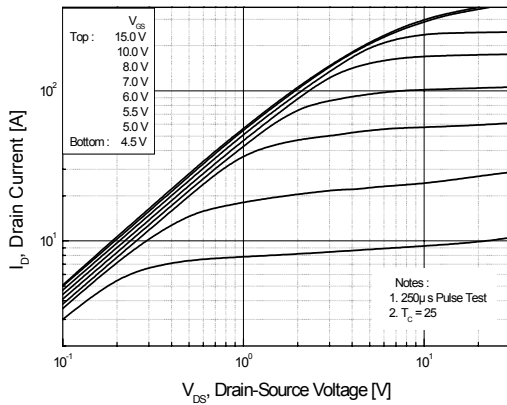


Figure 2. Transfer Characteristics

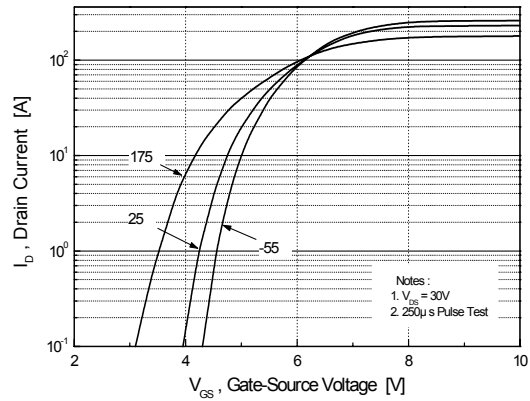


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

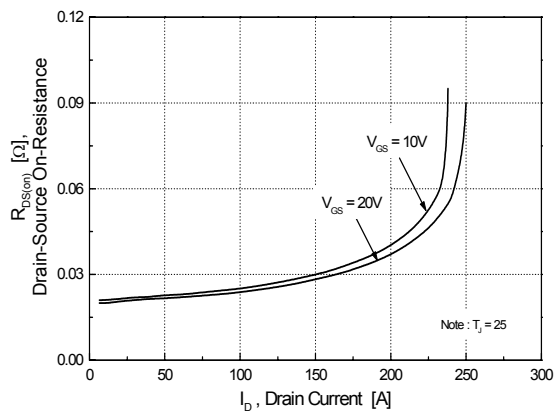


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

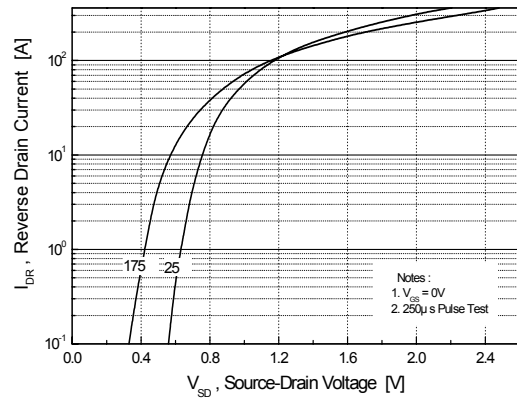


Figure 5. Capacitance Characteristics

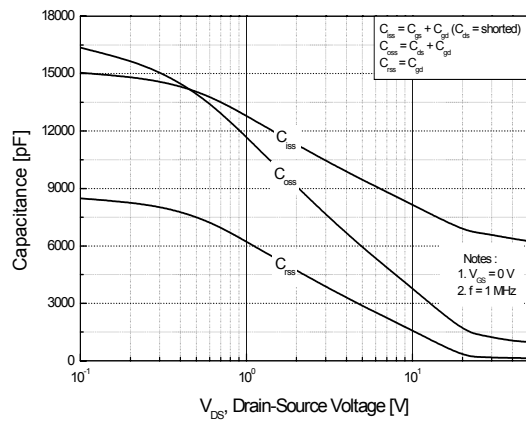
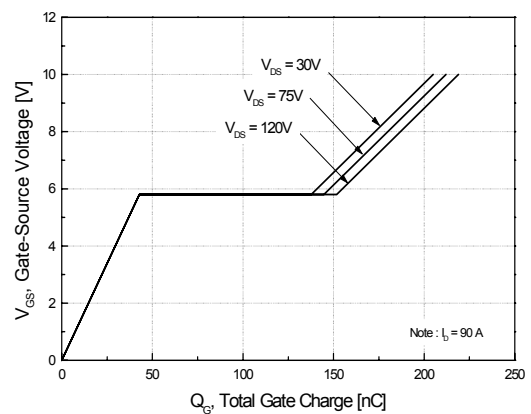


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

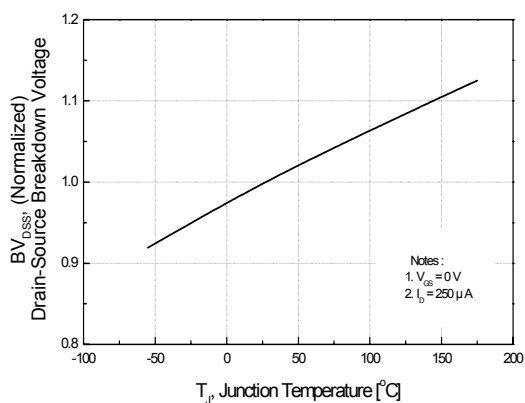


Figure 8. On-Resistance Variation vs. Temperature

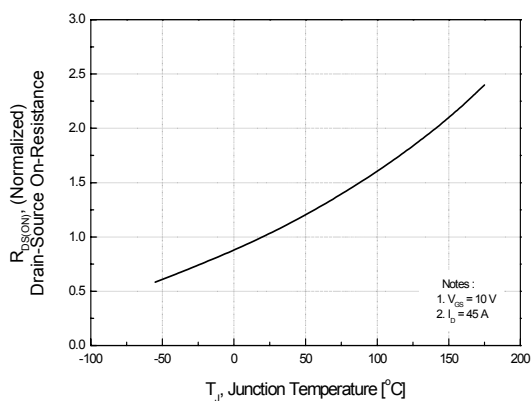


Figure 9. Maximum Safe Operating Area

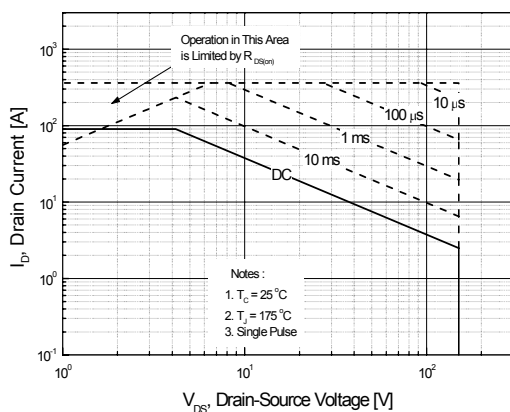


Figure 10. Maximum Drain Current vs. Case Temperature

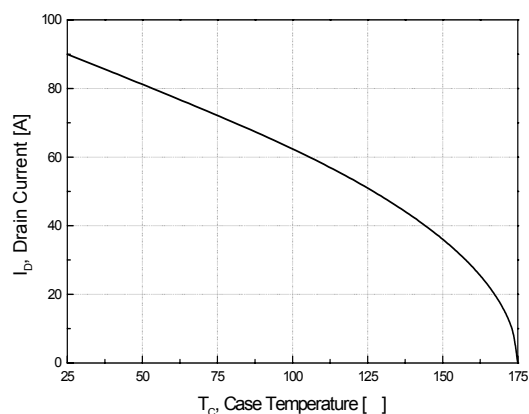
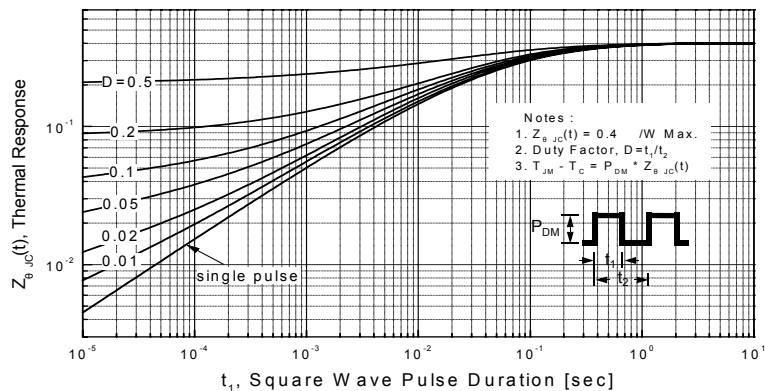
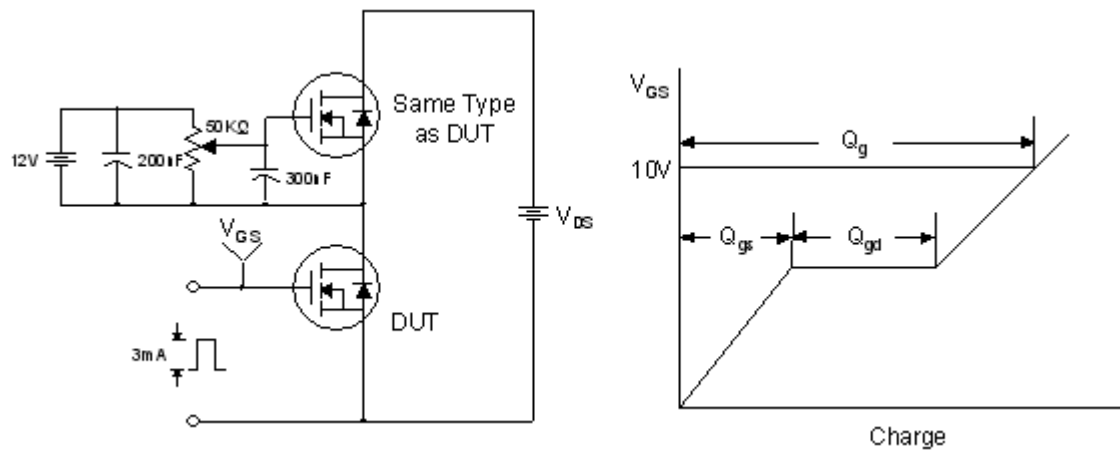


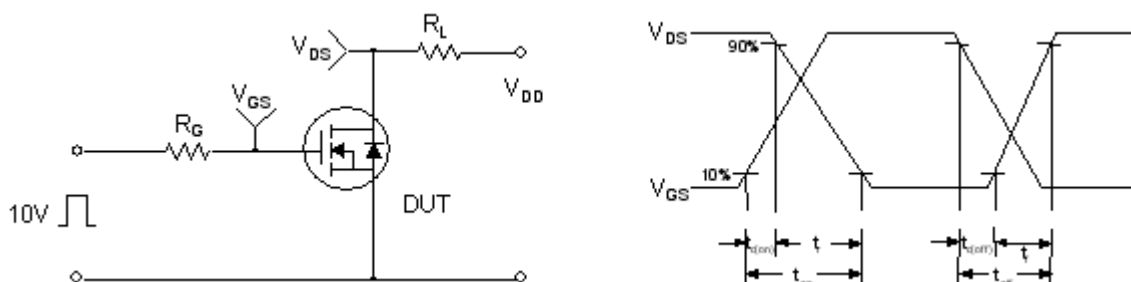
Figure 11. Transient Thermal Response Curve



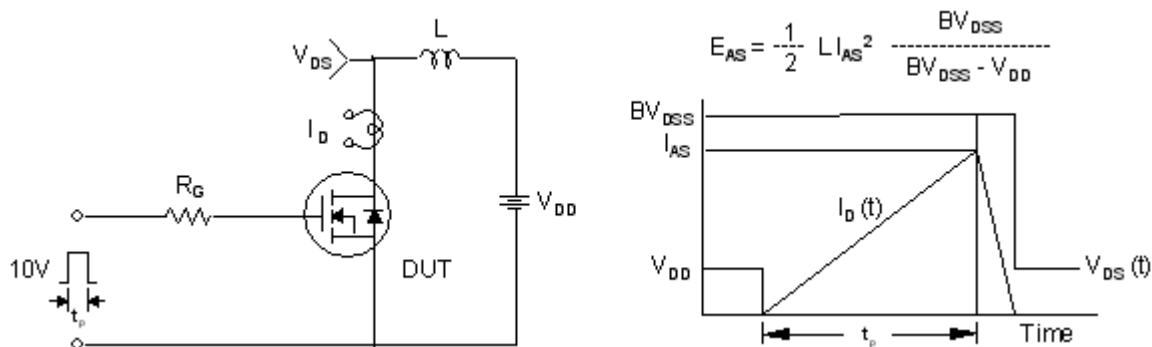
Gate Charge Test Circuit & Waveform

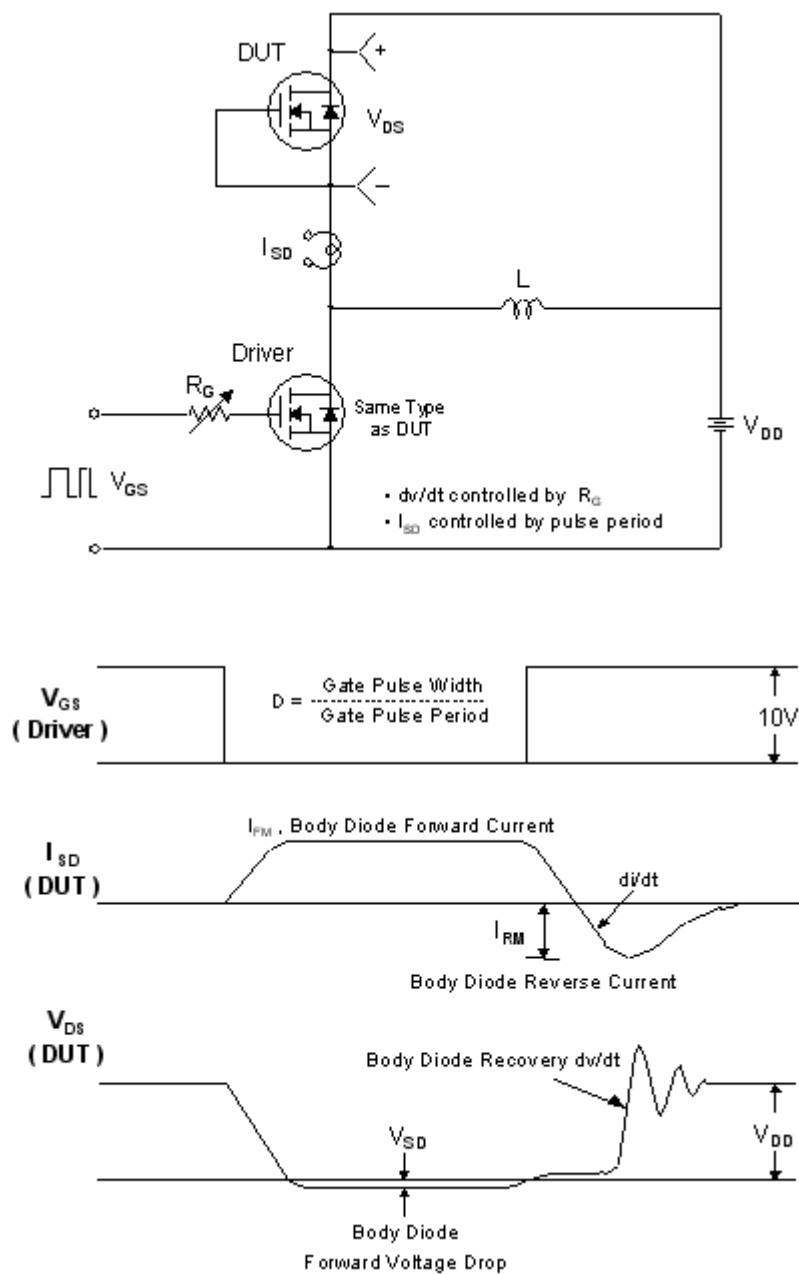


Resistive Switching Test Circuit & Waveforms



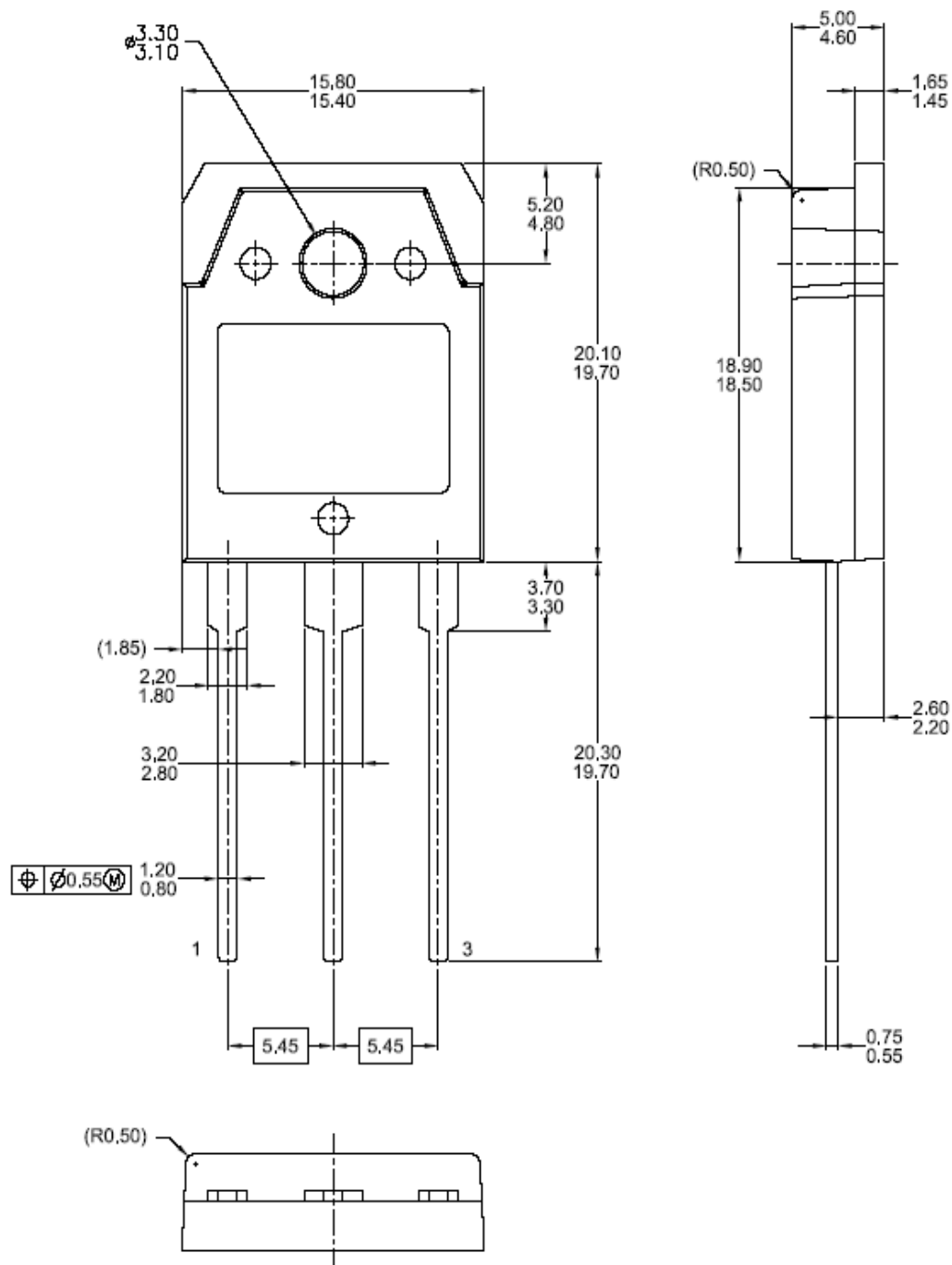
Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions


TO-3PN



Dimensions in Millimeters

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