



June 2014

FQA11N90_F109

N-Channel QFET[®] MOSFET

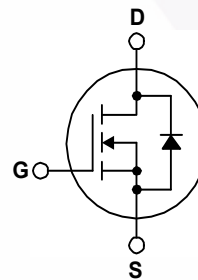
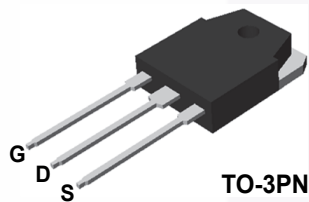
900 V, 11.4 A, 960 mΩ

Features

- 11.4 A, 900 V, $R_{DS(on)} = 960 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 5.7 \text{ A}$
- Low Gate Charge (Typ. 72 nC)
- Low C_{rss} (Typ. 30 pF)
- 100% Avalanche Tested
- RoHS compliant

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, active power factor correction (PFC), and electronic lamp ballasts.



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FQA11N90_F109	Unit
V_{DSS}	Drain to Source Voltage	900	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	11.4
		- Continuous ($T_C = 100^\circ\text{C}$)	7.2
I_{DM}	Drain Current - Pulsed (Note 1)	45.6	A
V_{GSS}	Gate to Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1000	mJ
I_{AR}	Avalanche Current (Note 1)	11.4	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	30	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.0	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate Above 25°C	300	W
		2.38	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FQA11N90_F109	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	0.42	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	40	$^\circ\text{C}/\text{W}$

FQA11N90_F109 — N-Channel QFET[®] MOSFET

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQA11N90	FQA11N90_F109	TO-3PN	Tube	N/A	30 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	900	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	1.0	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 900\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	μA
		$V_{DS} = 720\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 5.7\text{ A}$	--	0.75	0.96	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 5.7\text{ A}$	--	12	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	2700	3500	pF
C_{oss}	Output Capacitance		--	260	340	pF
C_{rss}	Reverse Transfer Capacitance		--	30	40	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 450\text{ V}, I_D = 11.4\text{ A},$ $R_G = 25\ \Omega$	--	65	140	ns
t_r	Turn-On Rise Time		--	135	280	ns
$t_{d(off)}$	Turn-Off Delay Time		--	165	340	ns
t_f	Turn-Off Fall Time		--	90	190	ns
Q_g	Total Gate Charge	$V_{DS} = 720\text{ V}, I_D = 11.4\text{ A},$ $V_{GS} = 10\text{ V}$	--	72	94	nC
Q_{gs}	Gate-Source Charge		--	16	--	nC
Q_{gd}	Gate-Drain Charge		--	35	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	11.4	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	45.6	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 11.4\text{ A}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 11.4\text{ A},$	--	850	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$	--	11.2	--	μC

Notes :

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. $L = 15\text{ mH}, I_{AS} = 11.4\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 11.4\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

Typical Characteristics

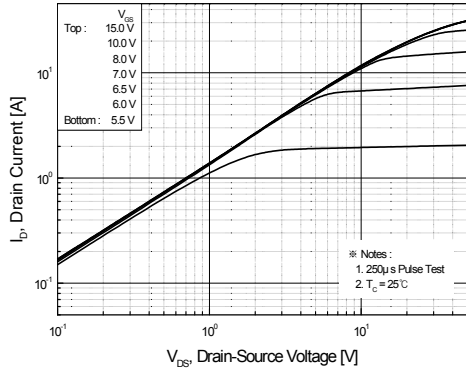


Figure 1. On-Region Characteristics

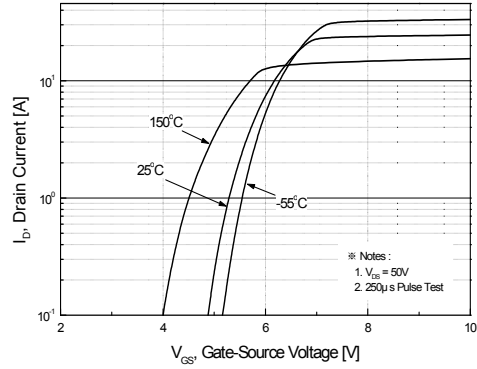


Figure 2. Transfer Characteristics

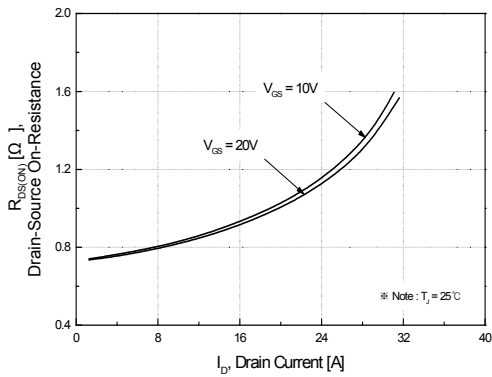


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

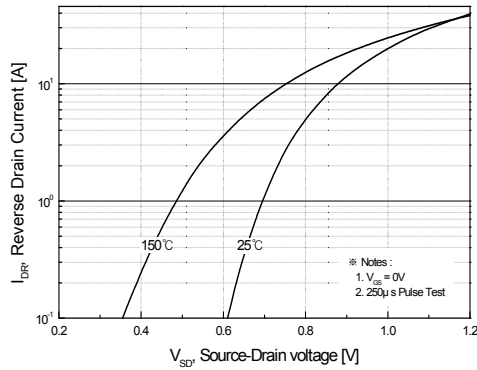


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

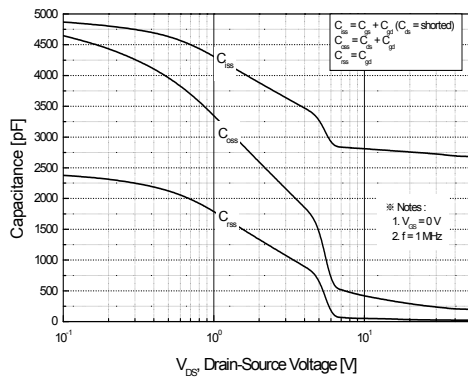


Figure 5. Capacitance Characteristics

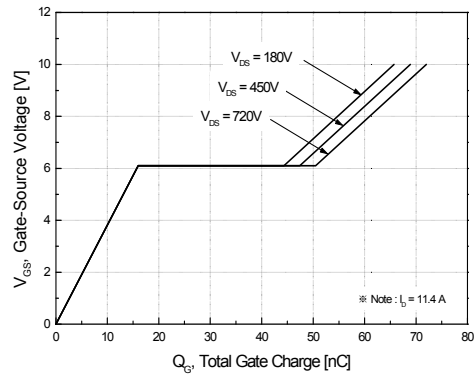


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

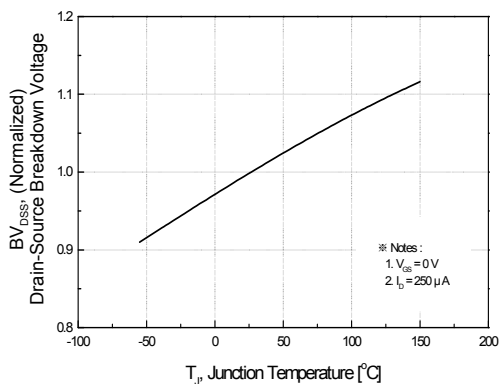


Figure 7. Breakdown Voltage Variation vs. Temperature

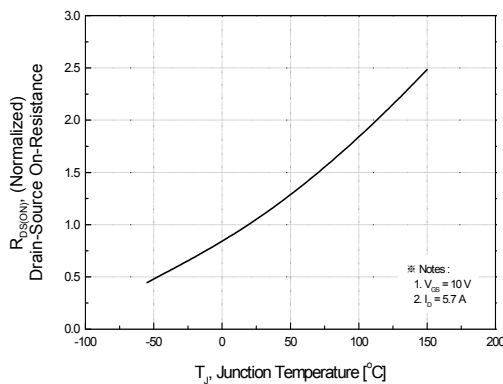


Figure 8. On-Resistance Variation vs. Temperature

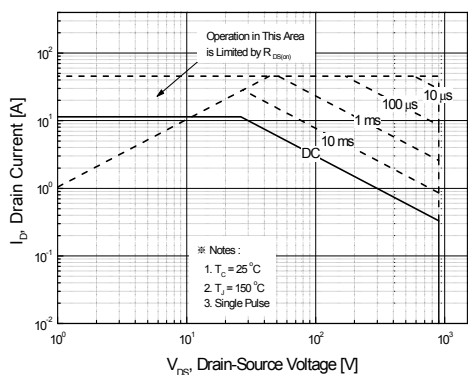


Figure 9. Maximum Safe Operating Area

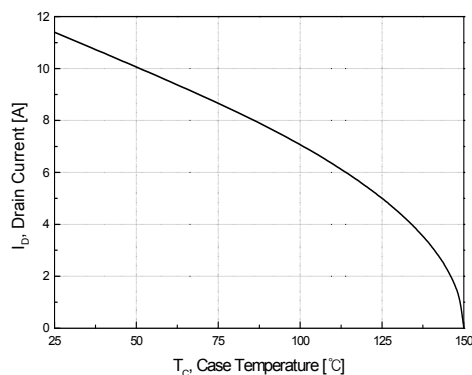


Figure 10. Maximum Drain Current vs. Case Temperature

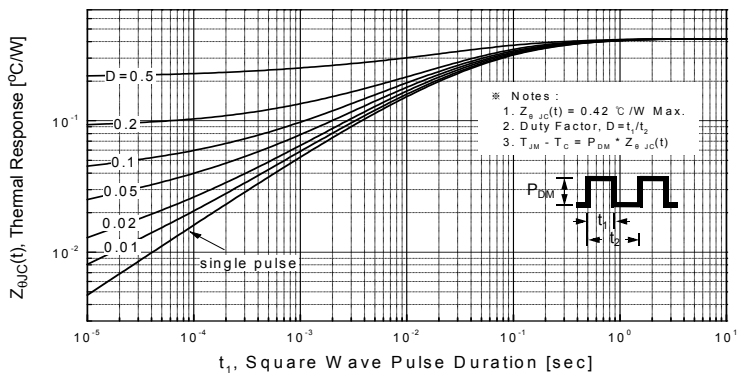


Figure 11. Transient Thermal Response Curve

Figure 12. Gate Charge Test Circuit & Waveform

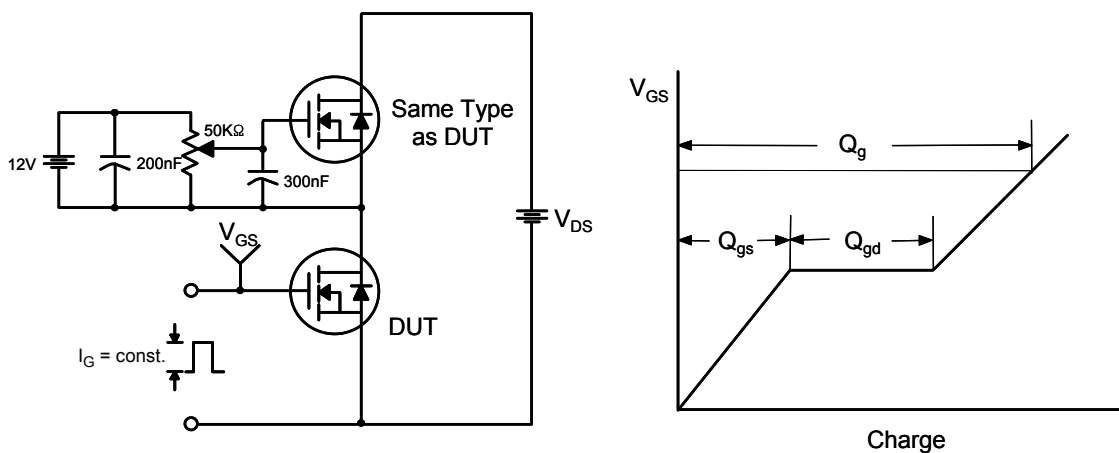


Figure 13. Resistive Switching Test Circuit & Waveforms

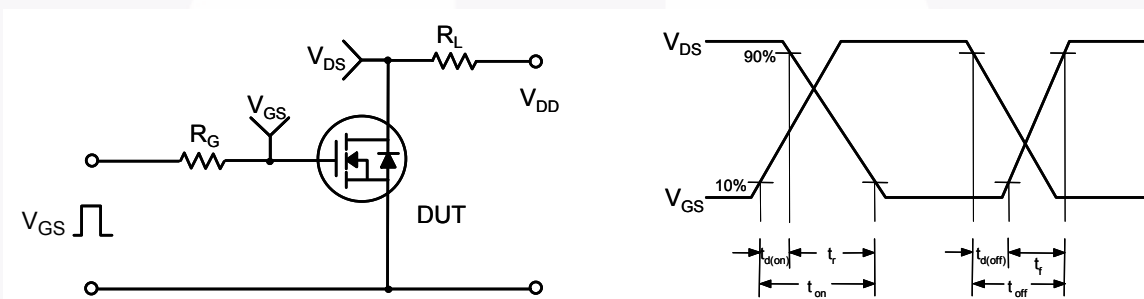


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

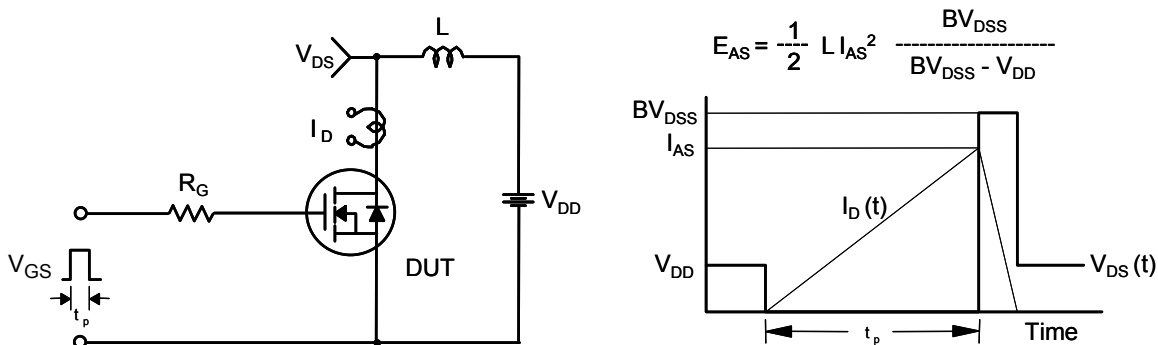
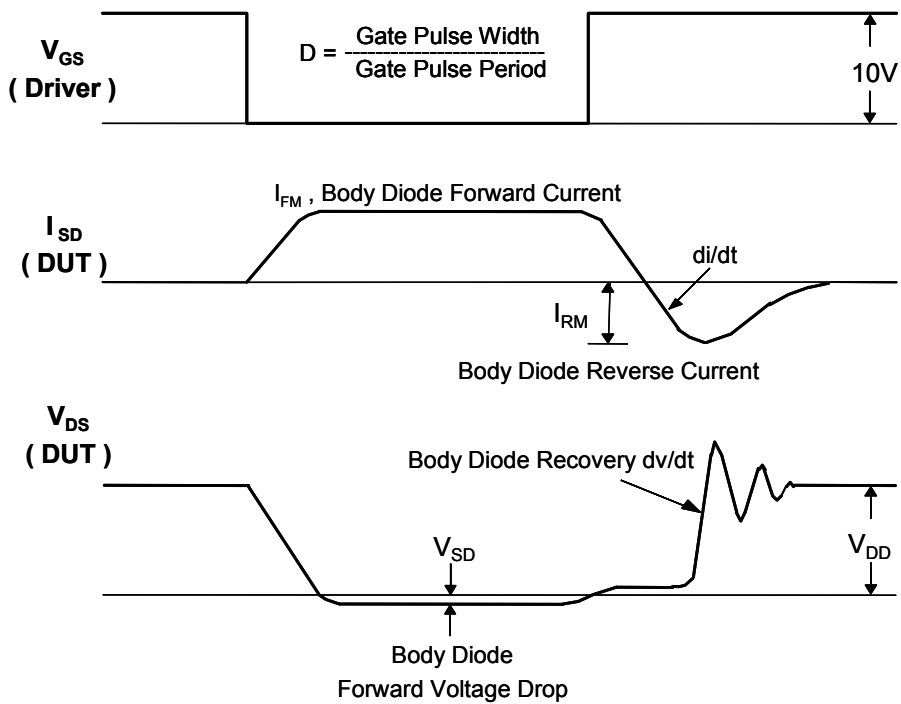
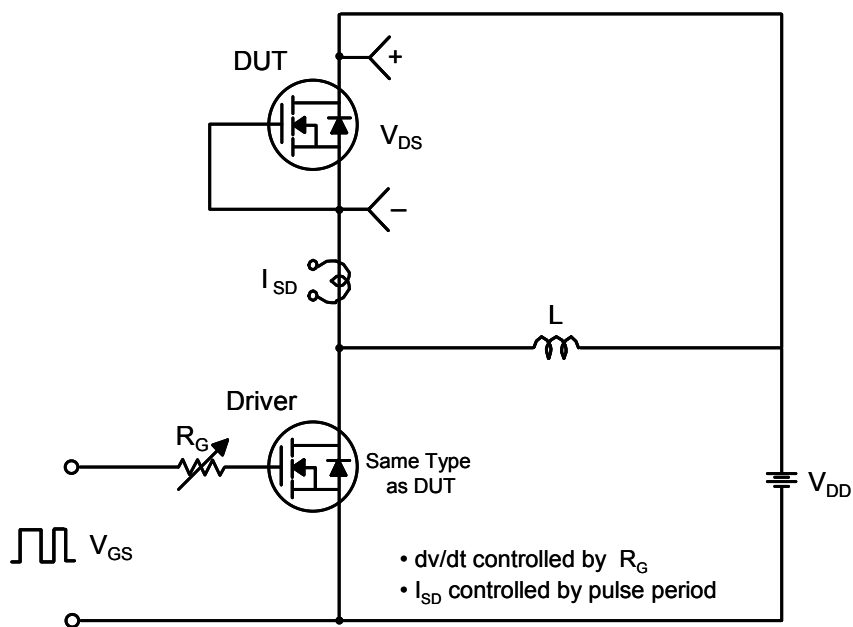
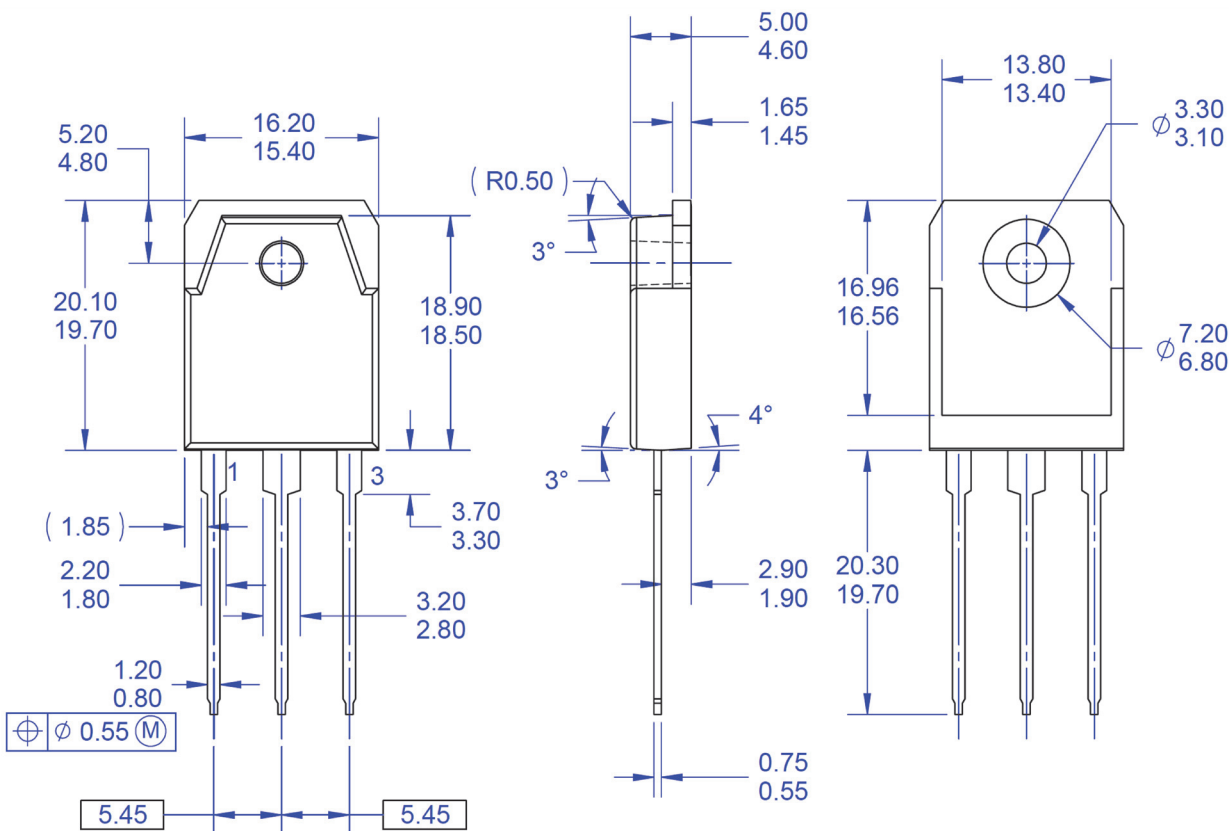


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) DRAWING FILE NAME: TO3PN03AREV1.
- F) FAIRCHILD SEMICONDUCTOR.

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

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Dimension in Millimeters



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