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April 2014

# FQA11N90C\_F109

## N-Channel QFET<sup>®</sup> MOSFET

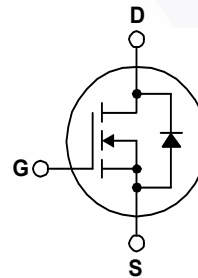
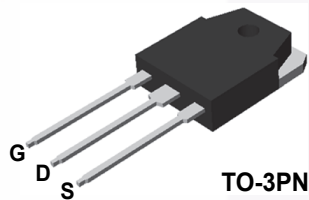
900 V, 11.0 A, 1.1  $\Omega$

### Features

- 11 A, 900 V,  $R_{DS(on)} = 1.1 \Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 5.5 \text{ A}$
- Low Gate Charge (Typ. 60 nC)
- Low Crss (Typ. 23 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	FQA11N90C_F109	Unit
$V_{DSS}$	Drain to Source Voltage	900	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	11.0
		- Continuous ( $T_C = 100^\circ\text{C}$ )	6.9
$I_{DM}$	Drain Current - Pulsed (Note 1)	44.0	A
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	960	mJ
$I_{AR}$	Avalanche Current (Note 1)	11.0	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 $25^\circ\text{C}$	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, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FQA11N90C_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	$^\circ\text{C}/\text{W}$

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA11N90C_F109	FQA11N90C	TO-3PN	Tube	N/A	N/A	30 units

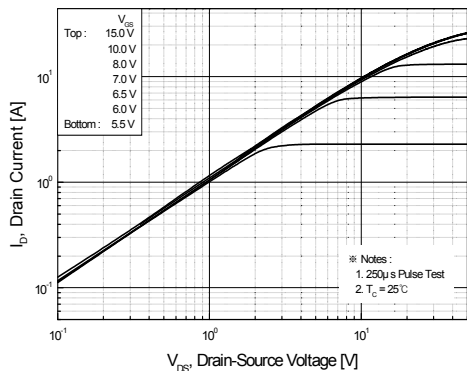
## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	900	--	--	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	1.02	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 900\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	$\mu\text{A}$
		$V_{DS} = 720\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	$\mu\text{A}$
$I_{GSSF}$	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
<b>On Characteristics</b>						
$V_{GS(th)}$	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	$V_{GS} = 10\text{ V}, I_D = 5.5\text{ A}$	--	0.91	1.1	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 5.5\text{ A}$	--	9.0	--	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	2530	3290	pF
$C_{oss}$	Output Capacitance		--	215	280	pF
$C_{rss}$	Reverse Transfer Capacitance		--	23	30	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 450\text{ V}, I_D = 11.0\text{ A},$ $R_G = 25\ \Omega$	--	60	130	ns
$t_r$	Turn-On Rise Time		--	130	270	ns
$t_{d(off)}$	Turn-Off Delay Time		--	130	270	ns
$t_f$	Turn-Off Fall Time		(Note 4)	--	85	180
$Q_g$	Total Gate Charge	$V_{DS} = 720\text{ V}, I_D = 11.0\text{ A},$ $V_{GS} = 10\text{ V}$	--	60	80	nC
$Q_{gs}$	Gate-Source Charge		--	13	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4)	--	25	--
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		--	--	11.0	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		--	--	44.0	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 11.0\text{ A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 11.0\text{ A},$	--	1000	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$	--	17.0	--	$\mu\text{C}$

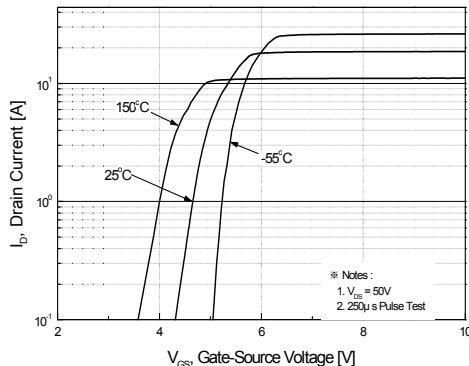
### Notes :

1. Repetitive rating : pulse width limited by maximum junction temperature.
2.  $L = 15\text{ mH}, I_{AS} = 11.0\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 11.0\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature.

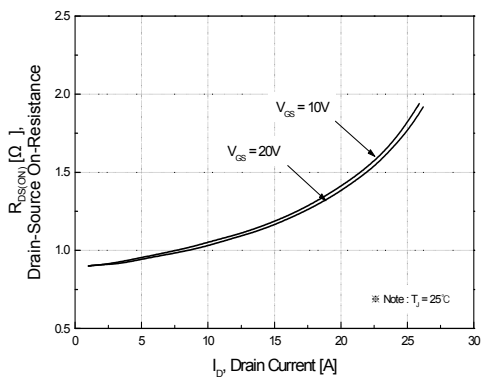
## Typical Characteristics



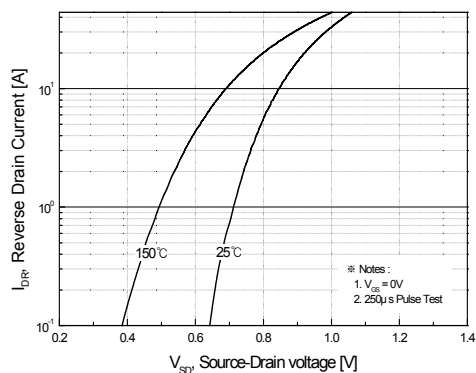
**Figure 1. On-Region Characteristics**



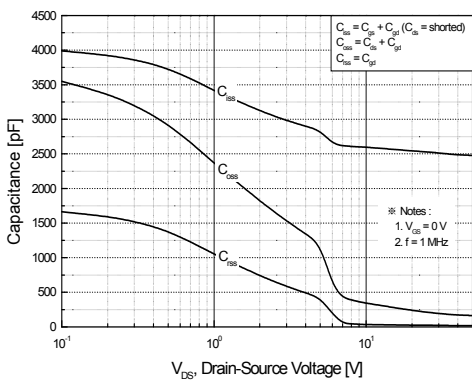
**Figure 2. Transfer Characteristics**



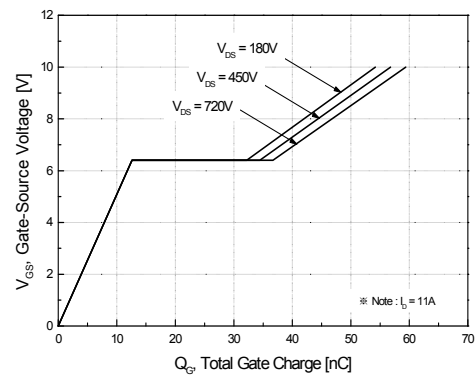
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



**Figure 4. Body Diode Forward Voltage Variation with Source Current**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**

Typical Characteristics (Continued)

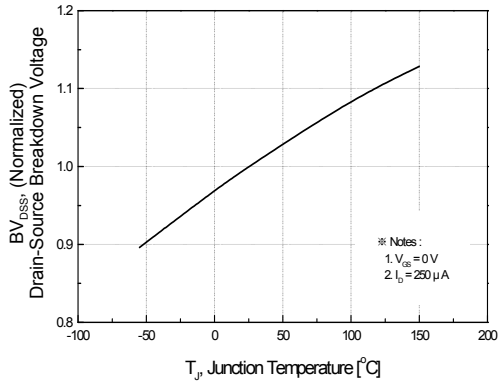


Figure 7. Breakdown Voltage Variation

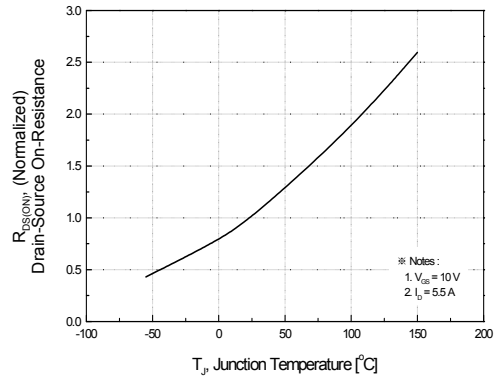


Figure 8. On-Resistance Variation

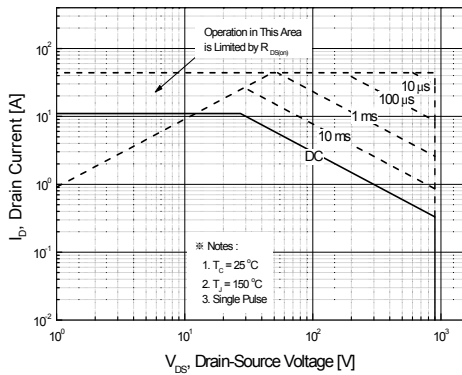


Figure 9. Maximum Safe Operating Area

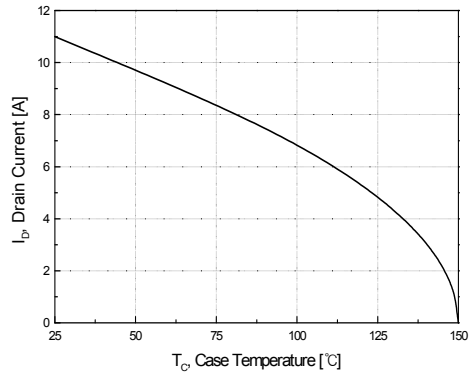


Figure 10. Maximum Drain Current vs Case Temperature

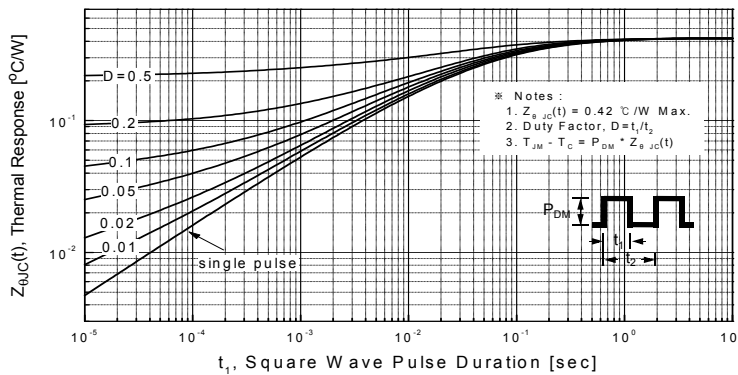
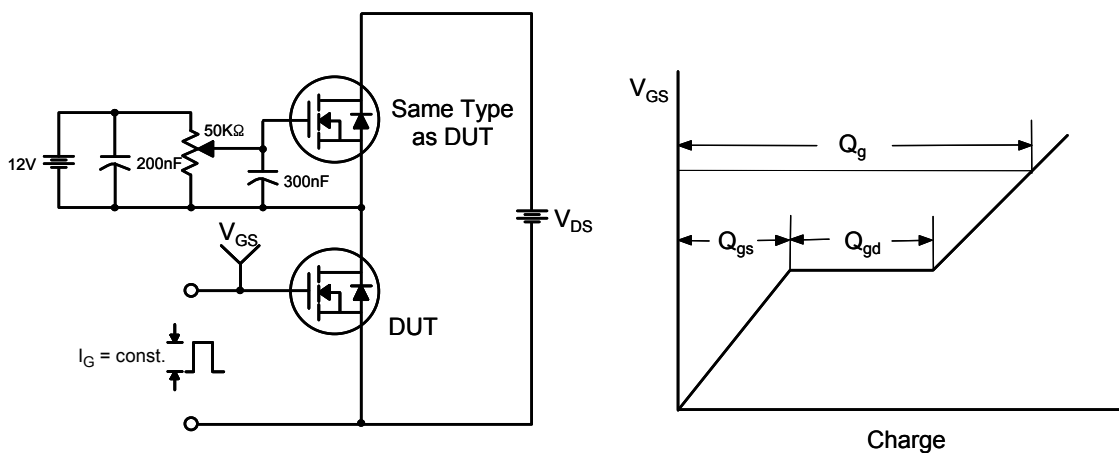
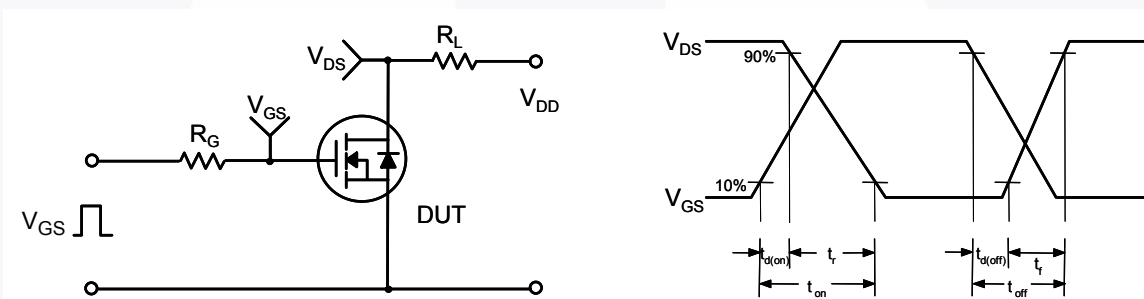


Figure 11. Transient Thermal Response Curve

**Figure 12. Gate Charge Test Circuit & Waveform**



**Figure 13. Resistive Switching Test Circuit & Waveforms**



**Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms**

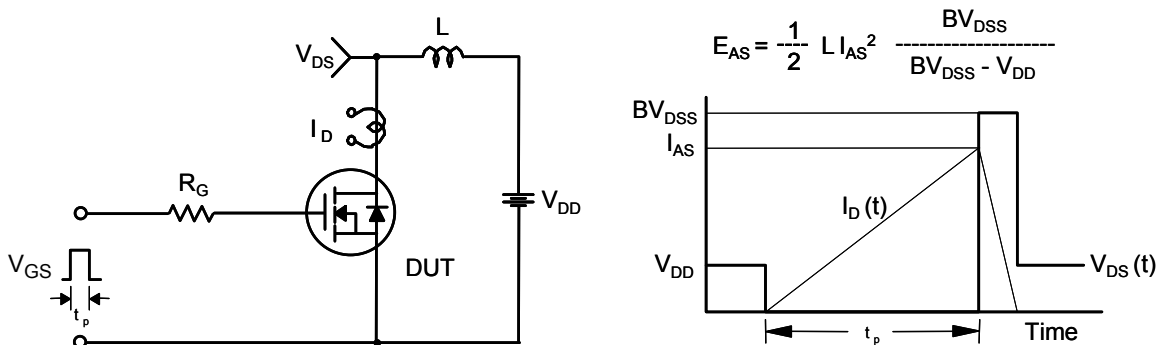
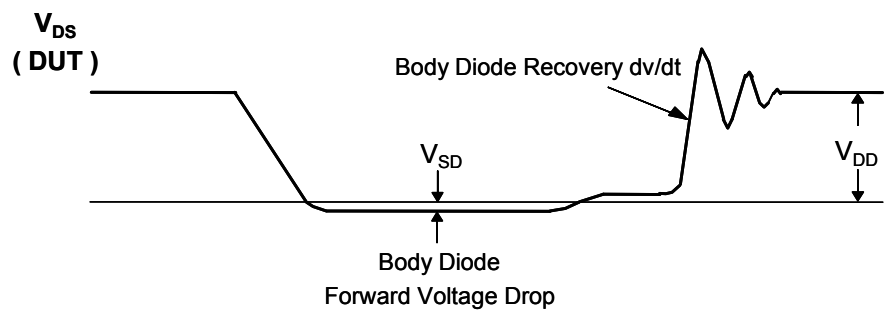
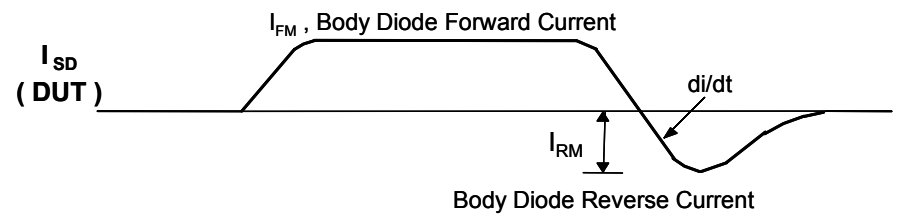
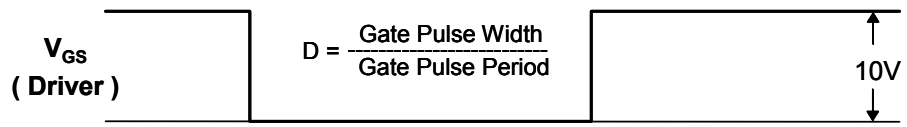
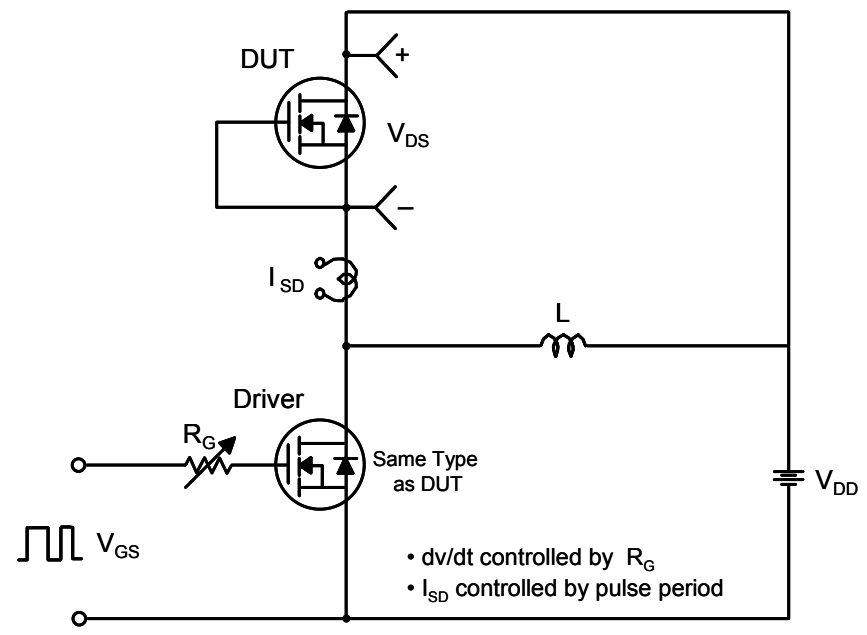
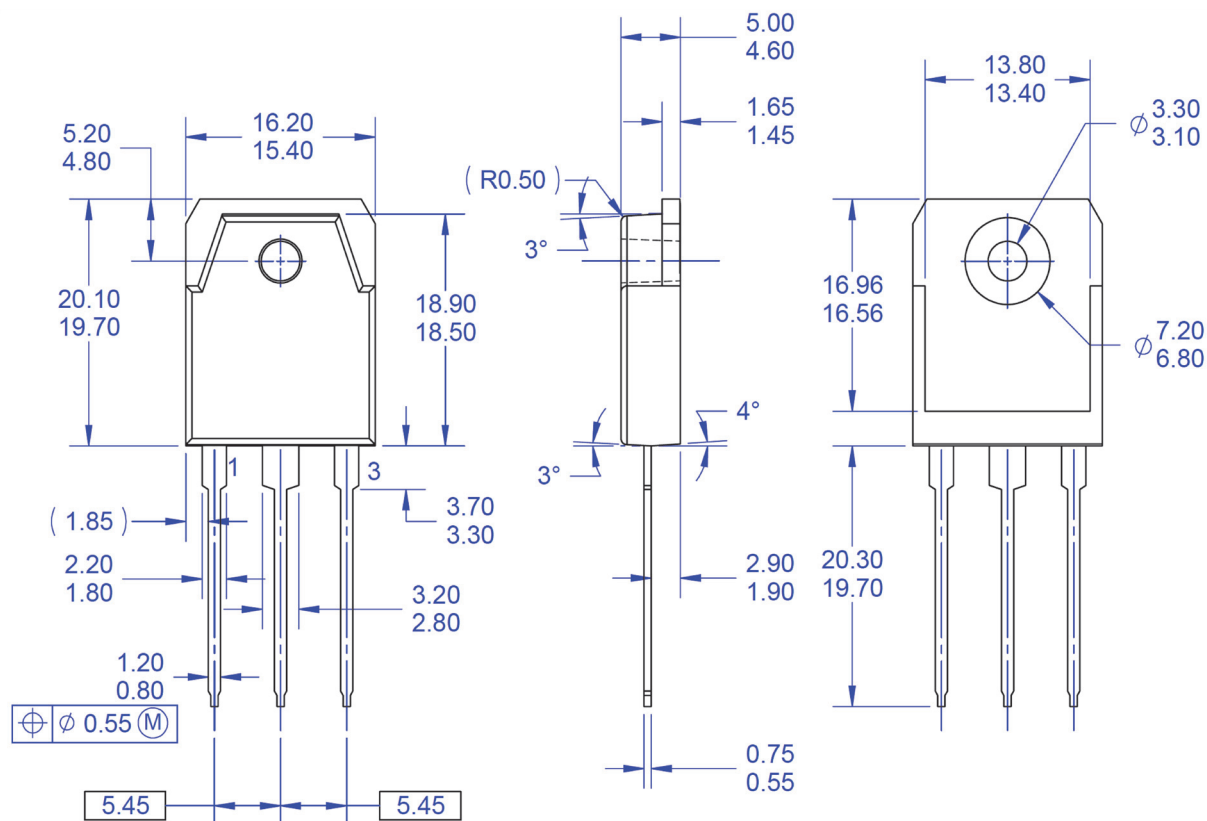


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

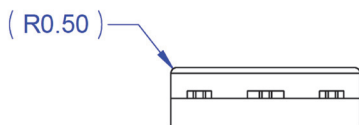


## Mechanical Dimensions



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- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
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**Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65**

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