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**FQA90N08****N-Channel QFET® MOSFET****80 V, 90 A, 16 mΩ**

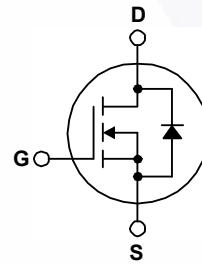
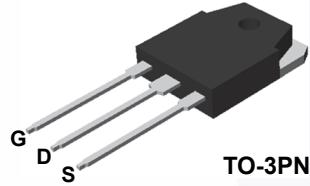
June 2014

**FQA90N08 — N-Channel QFET® MOSFET****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, 80 V,  $R_{DS(on)} = 16 \text{ mΩ}$  (Max) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 45 \text{ A}$
- Low Gate Charge (Typ. 84 nC)
- Low  $C_{rss}$  (Typ. 200 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating

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

Symbol	Parameter	FQA90N08	Unit
$V_{DSS}$	Drain-Source Voltage	80	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)	A
$V_{GSS}$	Gate-Source Voltage	$\pm 25$	V
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	mJ
$I_{AR}$	Avalanche Current	(Note 1)	A
$E_{AR}$	Repetitive Avalanche Energy	(Note 1)	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	214	W
	- Derate above $25^\circ\text{C}$	1.43	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	FQA90N08	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.7	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	$^\circ\text{C}/\text{W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQA90N08	FQA90N08	TO-3PN	-	-	30

## Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### Off Characteristics

$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	80	--	--	V
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.1	--	$\text{V}/^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 100 \text{ V}$ , $V_{\text{GS}} = 0 \text{ V}$	--	--	1	$\mu\text{A}$
		$V_{\text{DS}} = 80 \text{ V}$ , $T_C = 150^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{\text{GSSF}}$	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 25 \text{ V}$ , $V_{\text{DS}} = 0 \text{ V}$	--	--	100	nA
$I_{\text{GSSR}}$	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -25 \text{ V}$ , $V_{\text{DS}} = 0 \text{ V}$	--	--	-100	nA

### On Characteristics

$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$ , $I_D = 250 \mu\text{A}$	2.0	--	4.0	V
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}$ , $I_D = 45 \text{ A}$	--	0.012	0.016	$\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}} = 30 \text{ V}$ , $I_D = 45 \text{ A}$	--	52	--	S

### Dynamic Characteristics

$C_{\text{iss}}$	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}$ , $V_{\text{GS}} = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$	--	2500	3250	pF
$C_{\text{oss}}$	Output Capacitance		--	900	1170	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		--	200	260	pF

### Switching Characteristics

$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 40 \text{ V}$ , $I_D = 90 \text{ A}$ , $R_G = 25 \Omega$	--	30	70	ns
$t_r$	Turn-On Rise Time		--	360	730	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	100	210	ns
$t_f$	Turn-Off Fall Time		--	160	330	ns
$Q_g$	Total Gate Charge	$V_{\text{DS}} = 64 \text{ V}$ , $I_D = 90 \text{ A}$ , $V_{\text{GS}} = 10 \text{ V}$	--	84	110	nC
$Q_{\text{gs}}$	Gate-Source Charge		--	17	--	nC
$Q_{\text{gd}}$	Gate-Drain Charge		--	42	--	nC

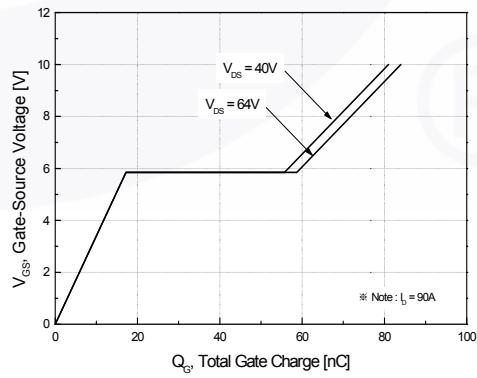
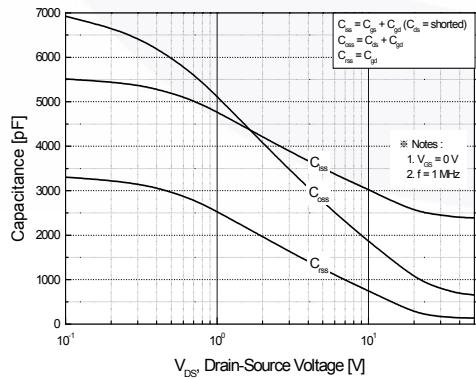
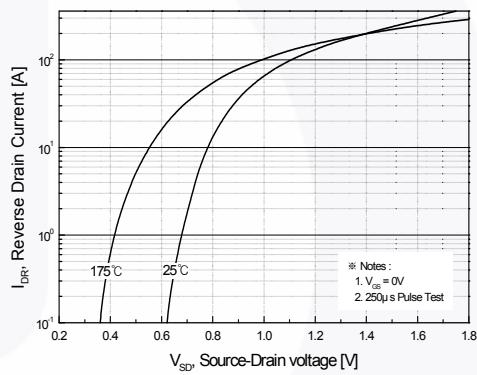
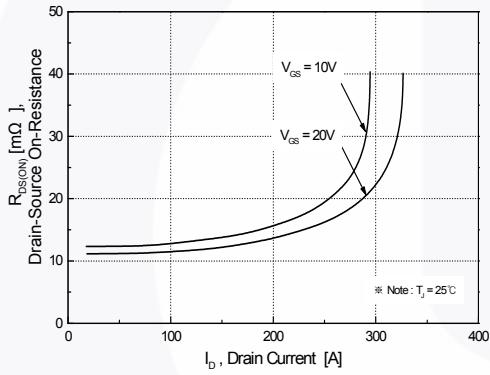
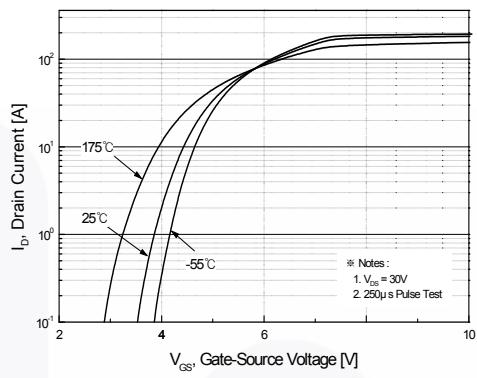
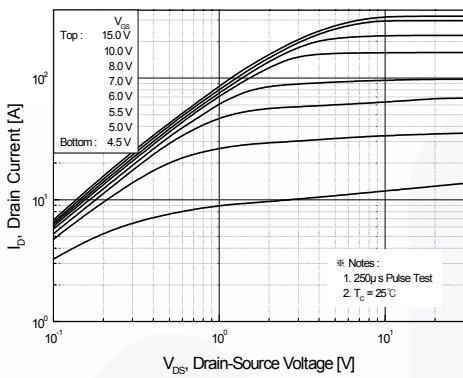
### Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	90	A
$I_{\text{SM}}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	360	A
$V_{\text{SD}}$	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}$ , $I_S = 90 \text{ A}$	--	--	1.5
$t_{\text{rr}}$	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}$ , $I_S = 90 \text{ A}$ , $dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	87	--
$Q_{\text{rr}}$	Reverse Recovery Charge		--	265	--

#### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 0.23\text{mH}$ ,  $I_{AS} = 90\text{A}$ ,  $V_{DD} = 25\text{V}$ ,  $R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 90\text{A}$ ,  $dI/dt \leq 300\text{A}/\mu\text{s}$ ,  $V_{DD} \leq \text{BV}_{\text{DSS}}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature

## Typical Characteristics



## Typical Characteristics (Continued)

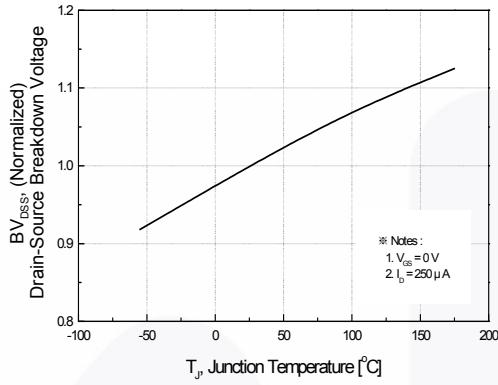


Figure 7. Breakdown Voltage Variation vs. Temperature

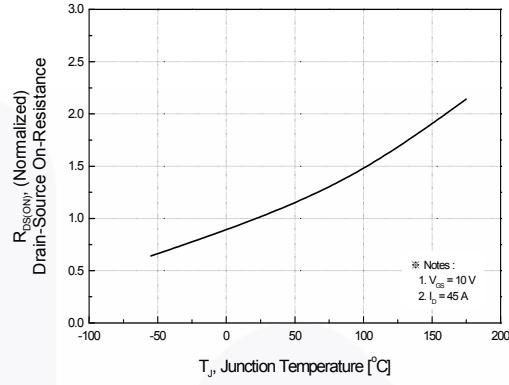


Figure 8. On-Resistance Variation vs. Temperature

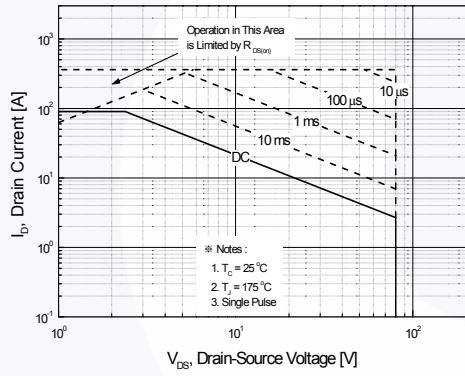


Figure 9. Maximum Safe Operating Area

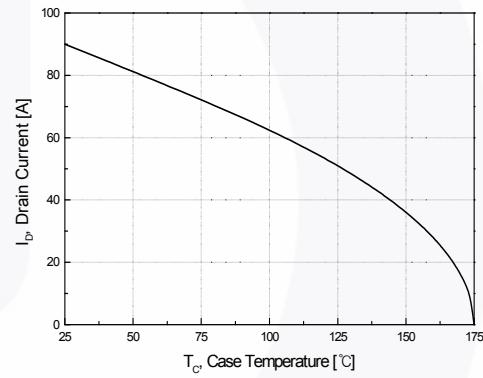


Figure 10. Maximum Drain Current vs. Case Temperature

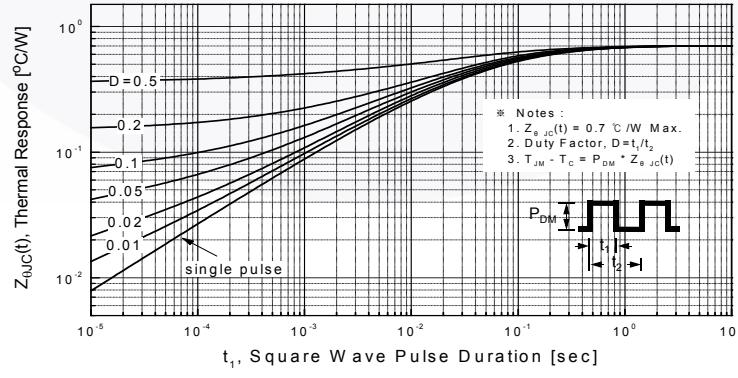


Figure 11. Transient Thermal Response Curve

Figure 12. Gate Charge Test Circuit & Waveform

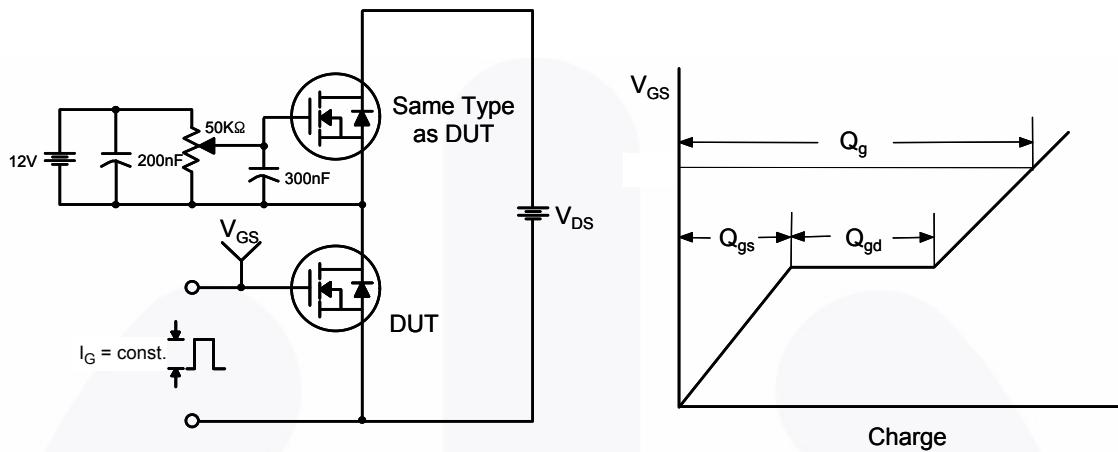


Figure 13. Resistive Switching Test Circuit & Waveforms

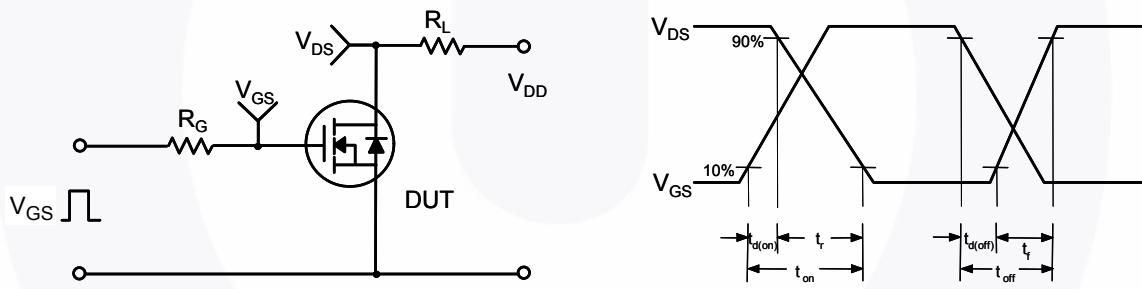


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

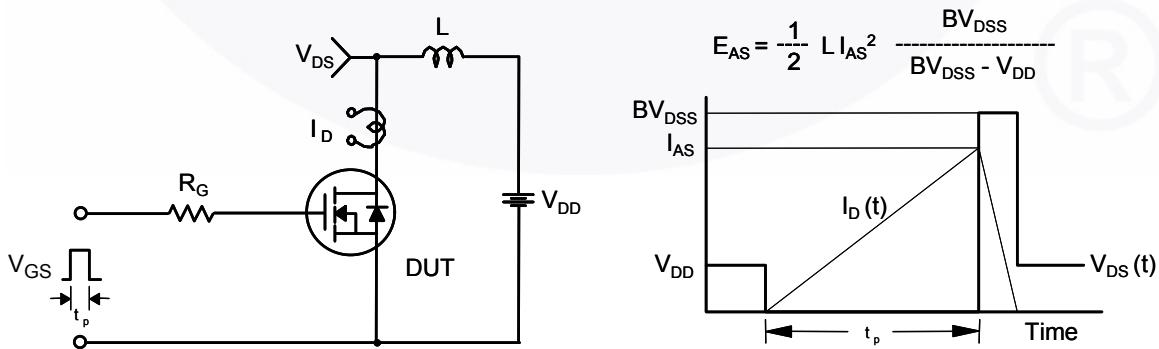
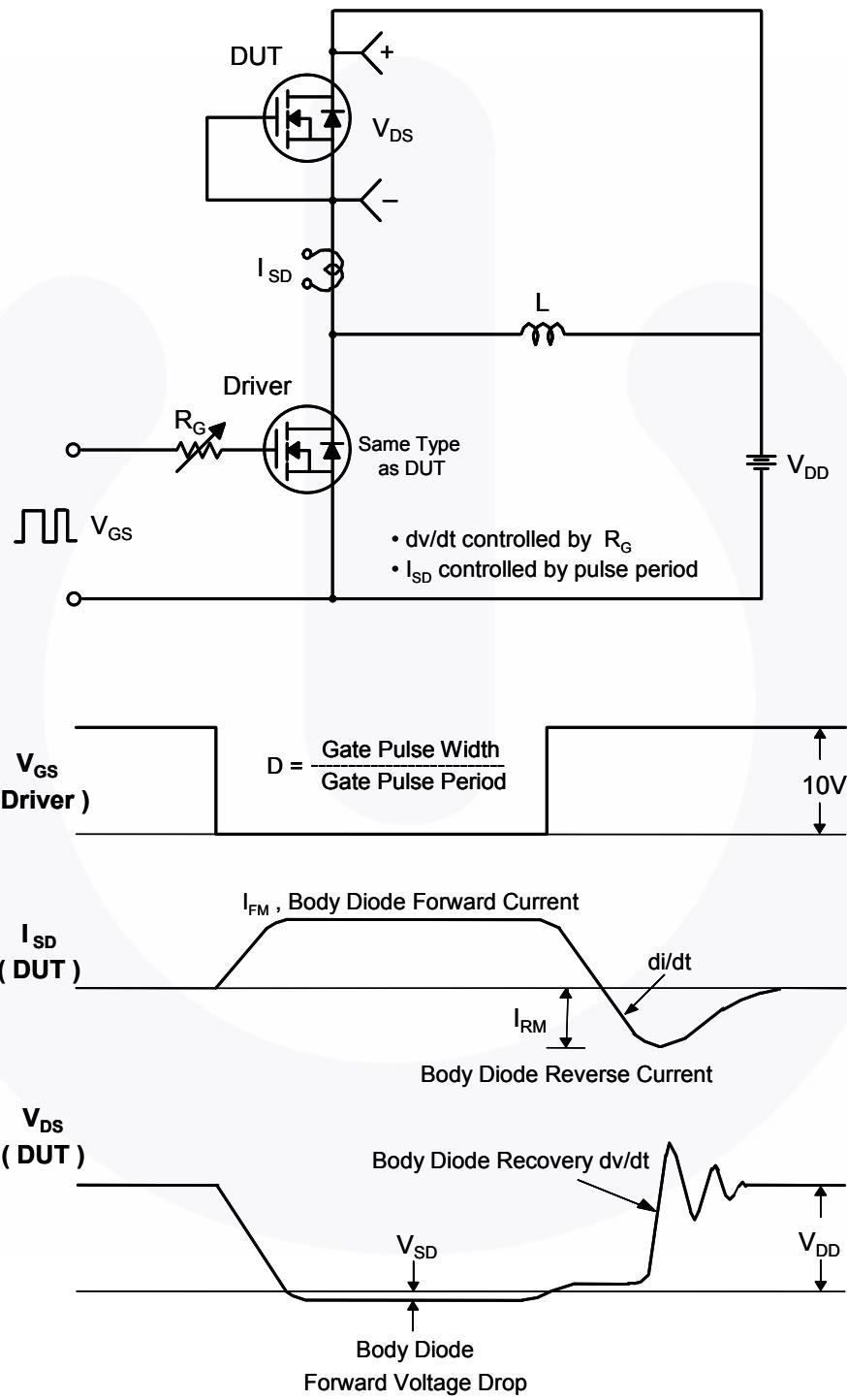
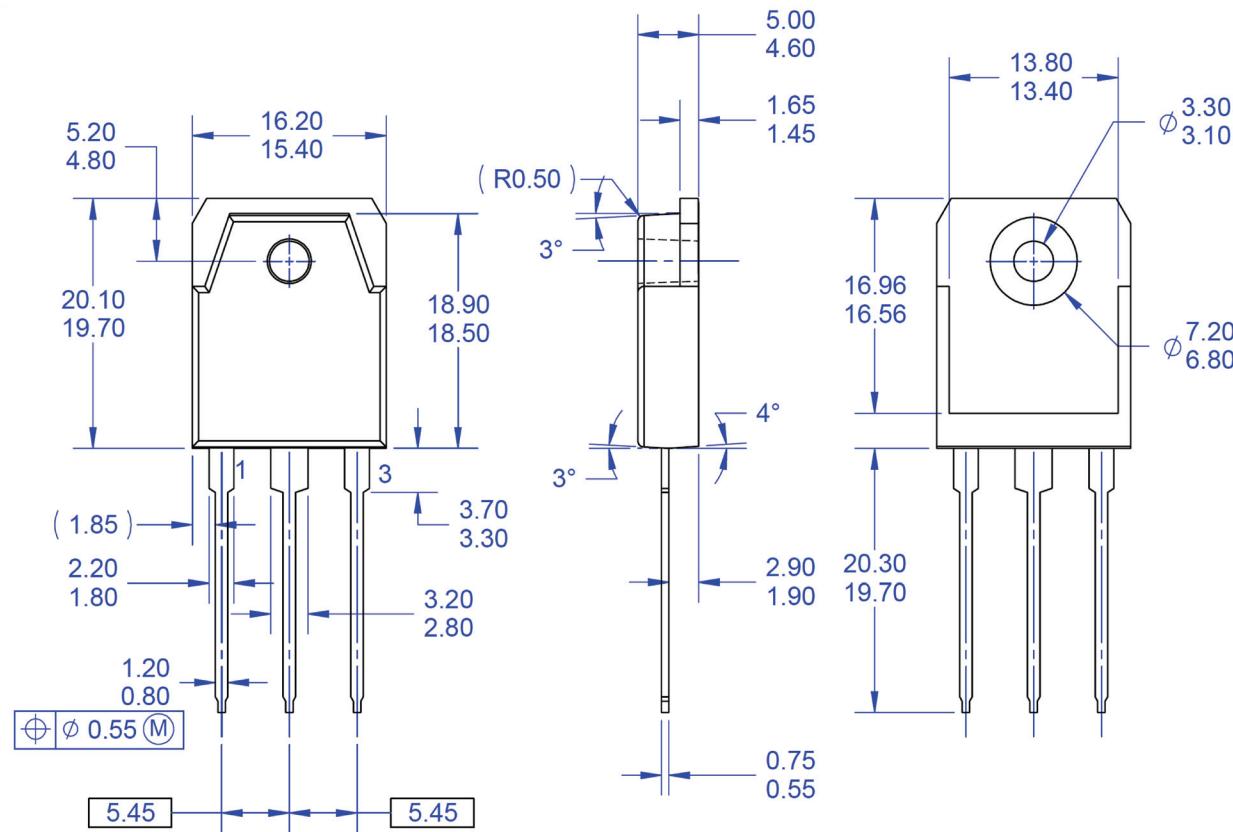


Figure 15. Peak Diode Recovery dv/dt Test Circuit &amp; Waveforms



## Mechanical Dimensions



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

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