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June 2014

FQA70N15

N-Channel QFET[®] MOSFET

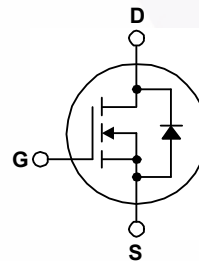
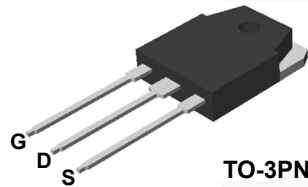
150 V, 70 A, 28 mΩ

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

- 70 A, 100 V, $R_{DS(on)} = 28 \text{ m}\Omega$ (Max)@ $V_{GS} = 10 \text{ V}$, $I_D = 35 \text{ A}$
- Low Gate Charge (Typ. 135 nC)
- Low Crss (Typ. 135 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



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

Symbol	Parameter	FQA70N15	Unit
V_{DSS}	Drain-Source Voltage	150	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	70	A
		50	A
I_{DM}	Drain Current - Pulsed (Note 1)	280	A
V_{GSS}	Gate-Source Voltage	± 25	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1000	mJ
I_{AR}	Avalanche Current (Note 1)	70	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	33	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.0	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	330	W
		2.2	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	FQA70N15	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.45	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	$^\circ\text{C}/\text{W}$

FQA70N15 — N-Channel QFET[®] MOSFET

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQA70N15	FQA70N15	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

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	150	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.15	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 150\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 120\text{ V}, T_C = 150^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 35\text{ A}$	--	0.023	0.028	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 35\text{ A}$	--	48	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	4150	5400	pF
C_{oss}	Output Capacitance		--	840	1100	pF
C_{rss}	Reverse Transfer Capacitance		--	135	175	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{ V}, I_D = 70\text{ A},$ $R_G = 25\ \Omega$	--	60	130	ns	
t_r	Turn-On Rise Time		--	420	850	ns	
$t_{d(off)}$	Turn-Off Delay Time		--	340	690	ns	
t_f	Turn-Off Fall Time		(Note 4)	--	290	590	ns
Q_g	Total Gate Charge	$V_{DS} = 120\text{ V}, I_D = 70\text{ A},$ $V_{GS} = 10\text{ V}$	--	135	175	nC	
Q_{gs}	Gate-Source Charge		(Note 4)	--	25	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4)	--	65	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	70	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	280	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 70\text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 70\text{ A},$	--	150	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$	--	0.67	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 0.34\text{ mH}, I_{AS} = 70\text{ A}, V_{DD} = 25\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 70\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} = BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature

Typical Characteristics

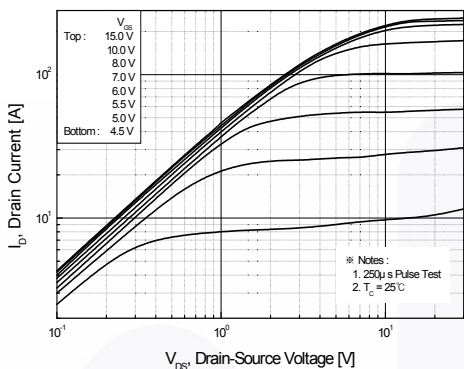


Figure 1. On-Region Characteristics

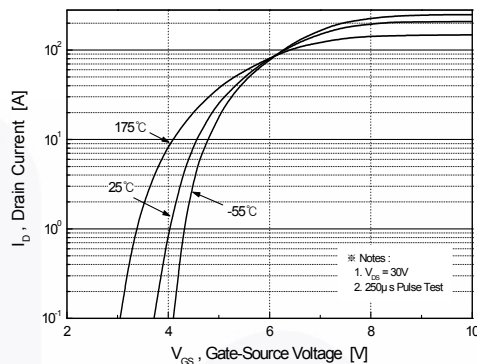


Figure 2. Transfer Characteristics

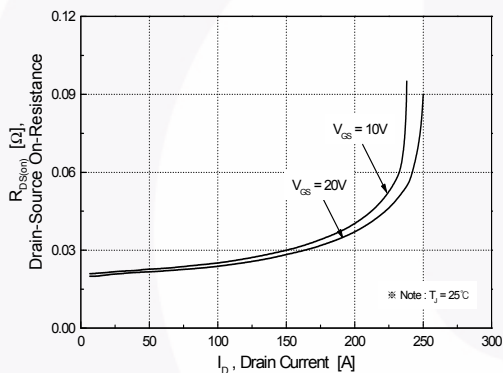


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

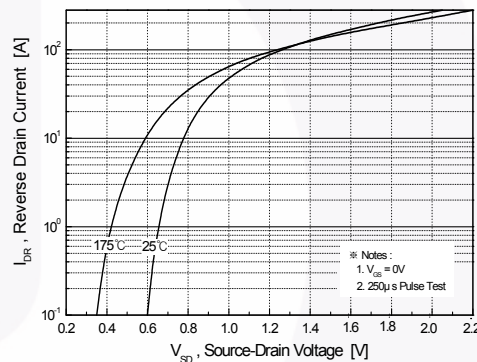


Figure 4. Body Diode Forward Voltage Variation vs. Source Current

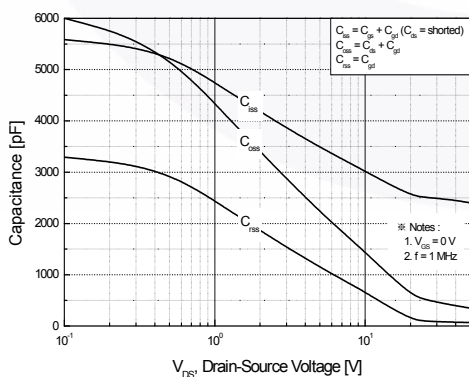


Figure 5. Capacitance Characteristics

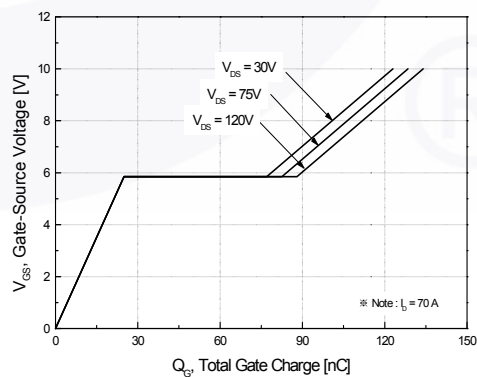


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

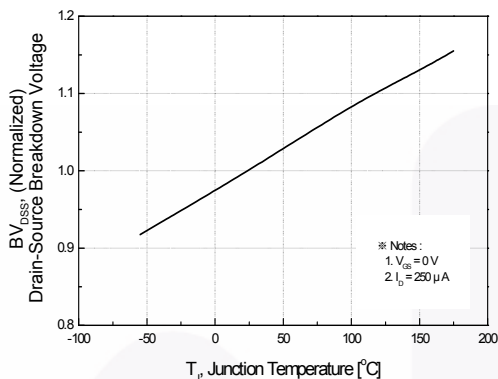


Figure 7. Breakdown Voltage Variation vs. Temperature

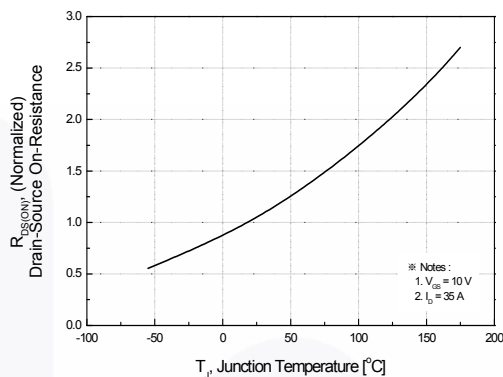


Figure 8. On-Resistance Variation vs. Temperature

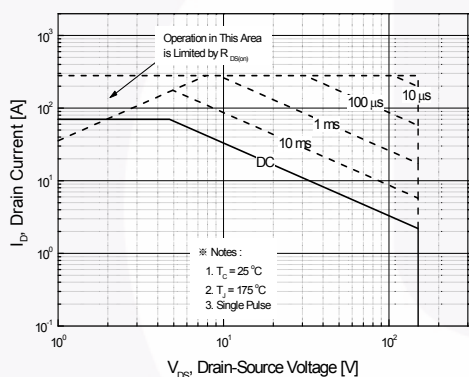


Figure 9. Maximum Safe Operating Area

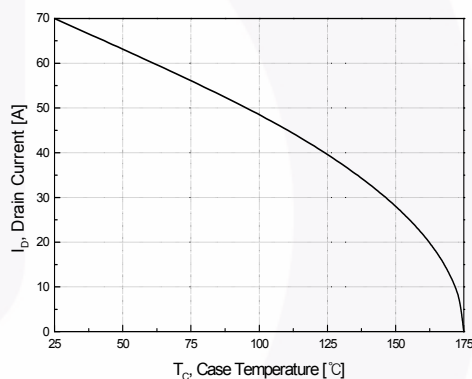


Figure 10. Maximum Drain Current vs. Case Temperature

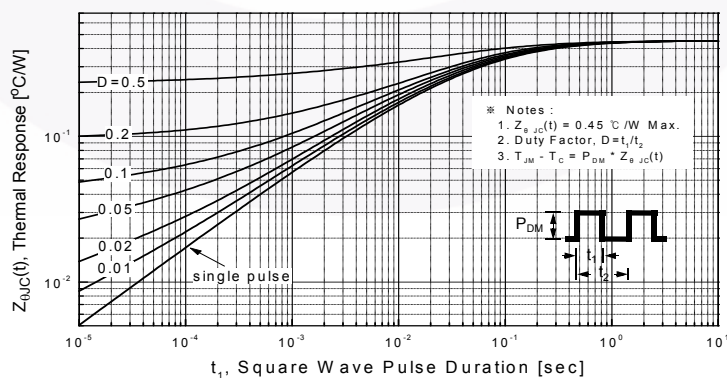


Figure 11. Transient Thermal Response Curve

Figure 12. Gate Charge Test Circuit & Waveform

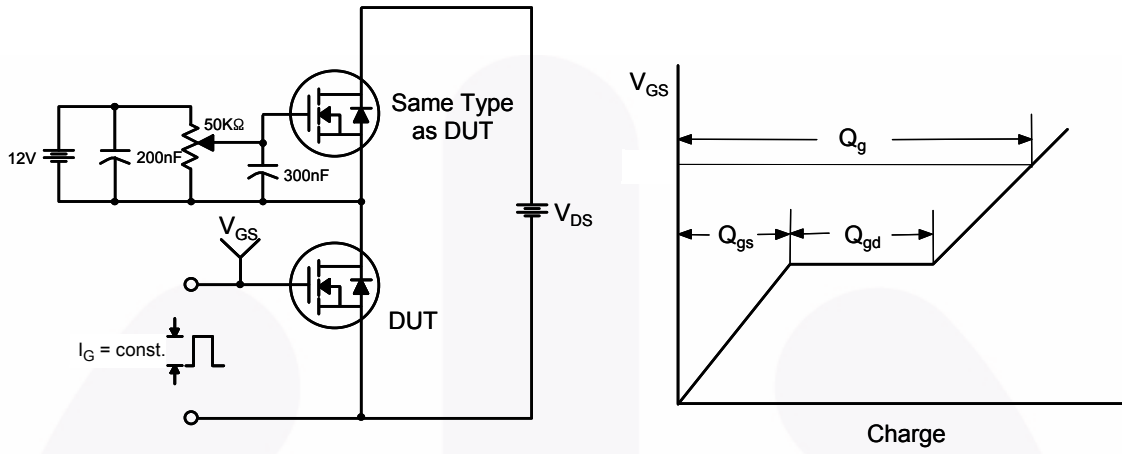


Figure 13. Resistive Switching Test Circuit & Waveforms

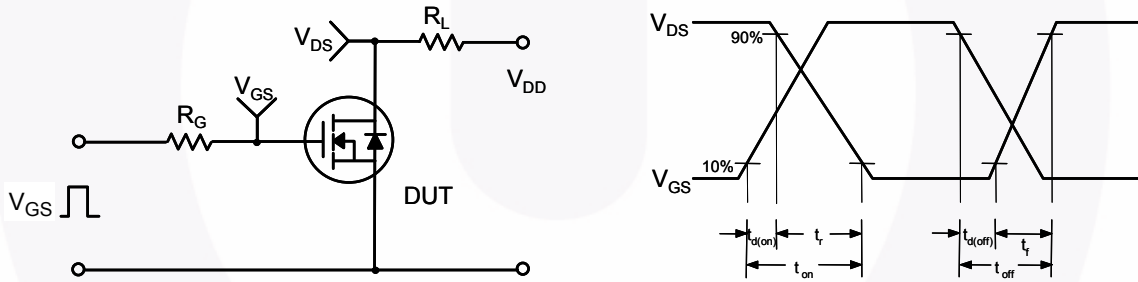


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

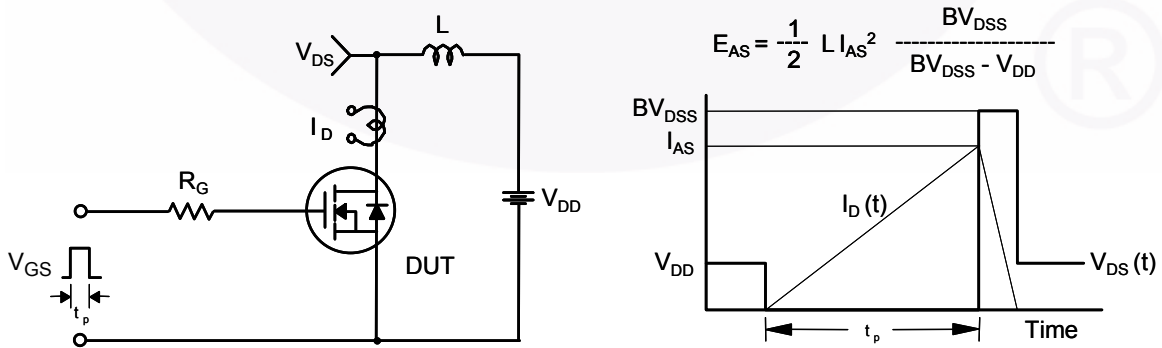
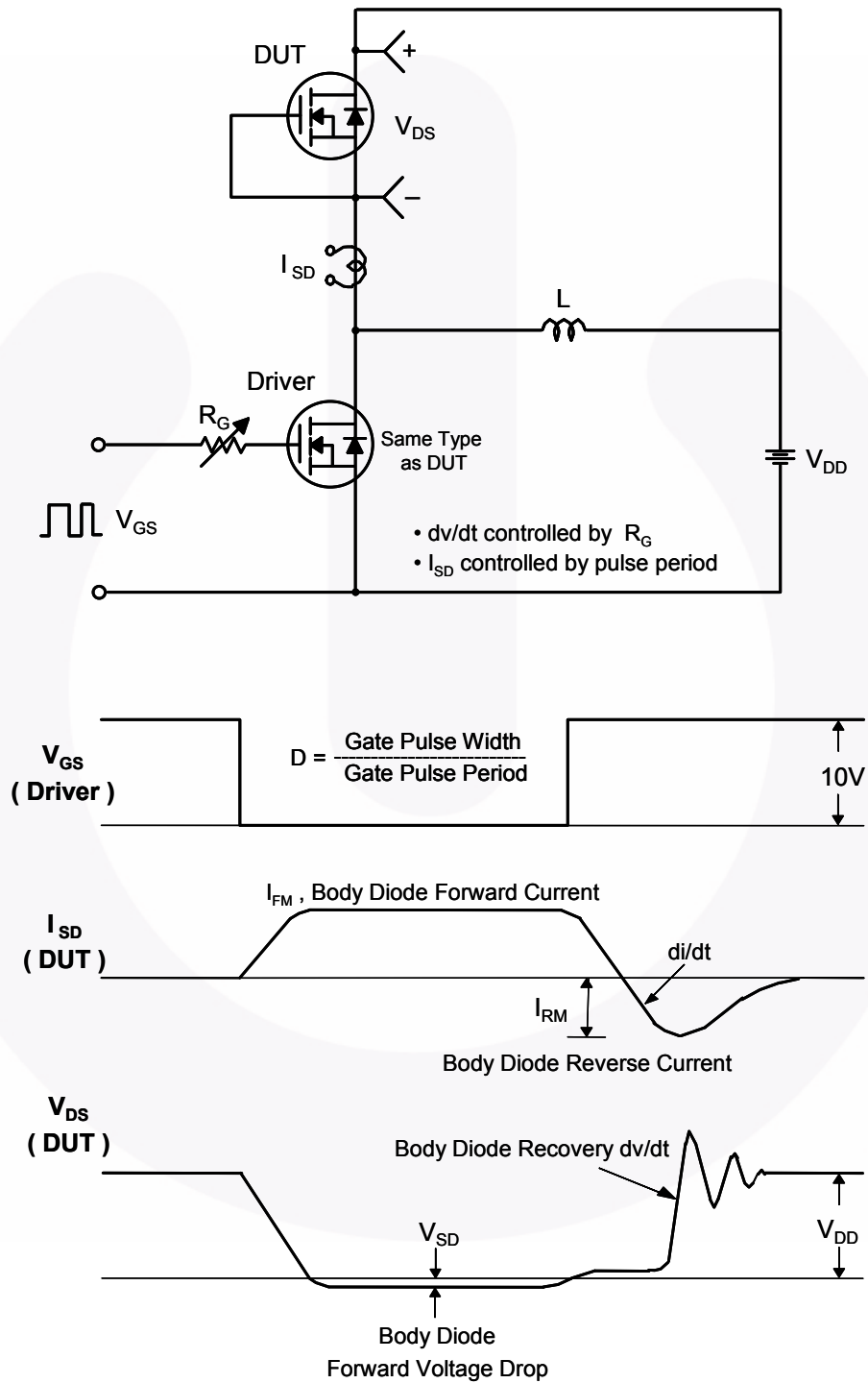
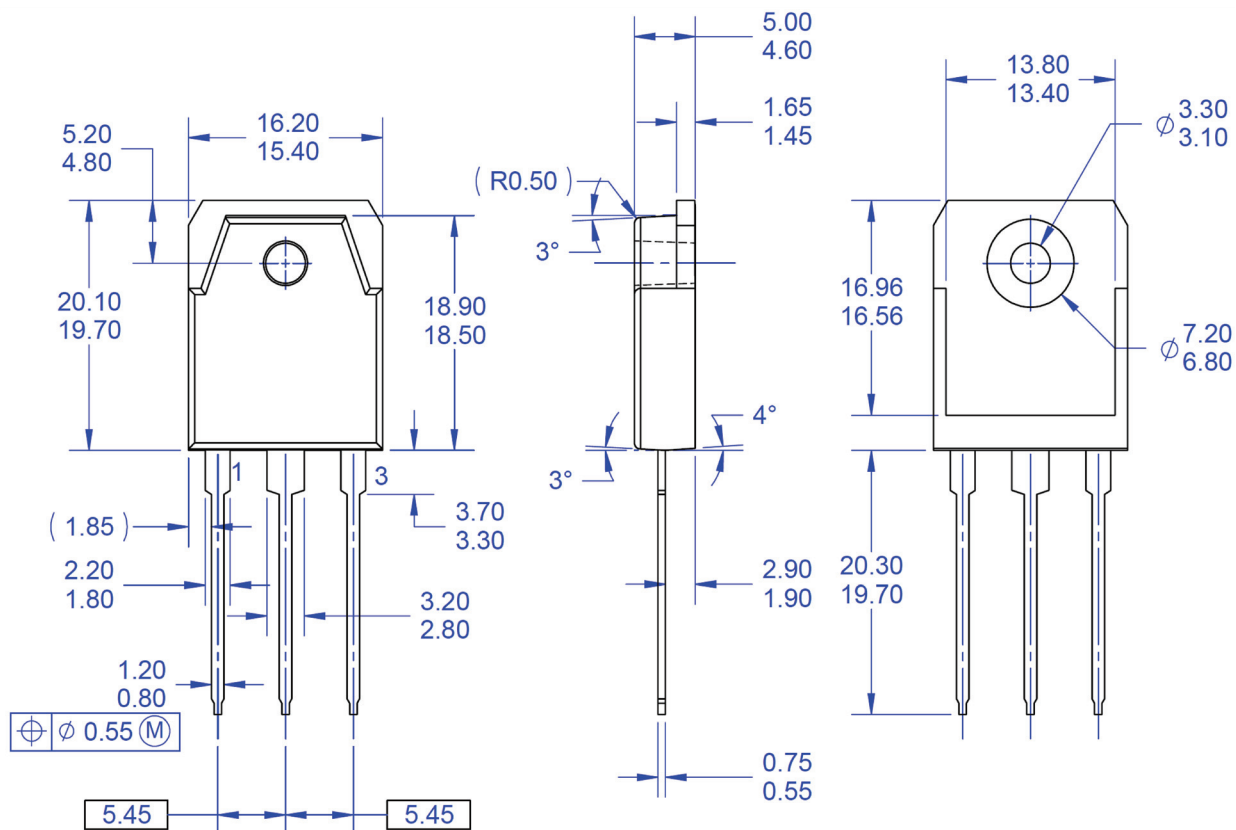


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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.

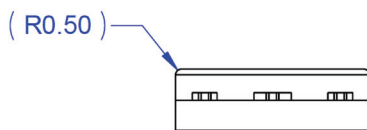


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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