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May 2014

FQA32N20C

N-Channel QFET[®] MOSFET

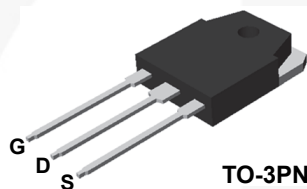
200 V, 32 A, 82 mΩ

Description

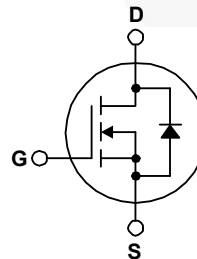
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 32 A, 200 V, $R_{DS(on)} = 82 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 16 \text{ A}$
- Low Gate Charge (Typ. 82.5 nC)
- Low Crss (Typ. 185 pF)
- 100% Avalanche Tested



TO-3PN



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

Symbol	Parameter	FQA32N20C	Unit
V_{DSS}	Drain-Source Voltage	200	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	32	A
	- Continuous ($T_C = 100^\circ\text{C}$)	20.4	A
I_{DM}	Drain Current - Pulsed (Note 1)	128	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	955	mJ
I_{AR}	Avalanche Current (Note 1)	32	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	20.4	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	204	W
	- Derate above 25°C	1.63	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	FQA32N20C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.61	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.24	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	$^\circ\text{C}/\text{W}$

FQA32N20C — N-Channel QFET[®] MOSFET

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA32N20C	FQA32N20C	TO-3PN	Tube	N/A	N/A	30 units

Electrical Characteristics T_c = 25°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 V, I _D = 250 μA	200	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	--	0.24	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 200 V, V _{GS} = 0 V	--	--	10	μA
		V _{DS} = 160 V, T _C = 125°C	--	--	100	μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30 V, V _{DS} = 0 V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30 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 = 16 A	--	0.068	0.082	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 16 A	--	20	--	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	--	1700	2220	pF
C _{oss}	Output Capacitance		--	400	520	pF
C _{rss}	Reverse Transfer Capacitance		--	185	245	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	V _{DD} = 100 V, I _D = 32 A, R _G = 25 Ω (Note 4)	--	25	60	ns
t _r	Turn-On Rise Time		--	270	550	ns
t _{d(off)}	Turn-Off Delay Time		--	245	500	ns
t _f	Turn-Off Fall Time		--	210	430	ns
Q _g	Total Gate Charge	V _{DS} = 160 V, I _D = 32 A, V _{GS} = 10 V (Note 4)	--	82.5	110	nC
Q _{gs}	Gate-Source Charge		--	10.5	--	nC
Q _{gd}	Gate-Drain Charge		--	44.5	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current	--	--	32	A	
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	128	A	
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 32 A	--	--	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 32 A, dI _F / dt = 100 A/μs	--	265	--	ns
Q _{rr}	Reverse Recovery Charge		--	2.73	--	μC

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. L = 1.4 mH, I_{AS} = 32 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 32 A, di/dt ≤ 300 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature.

Typical Performance Characteristics

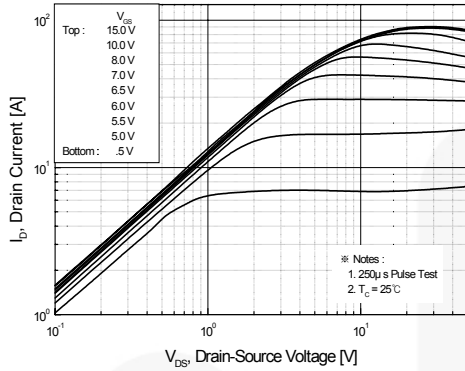


Figure 1. On-Region Characteristics

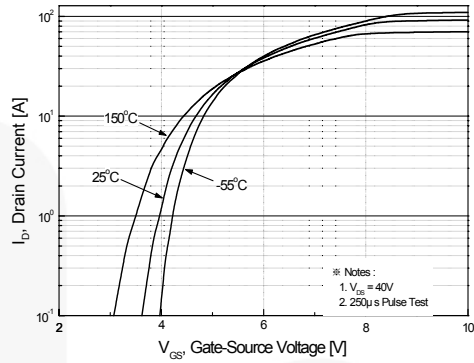


Figure 2. Transfer Characteristics

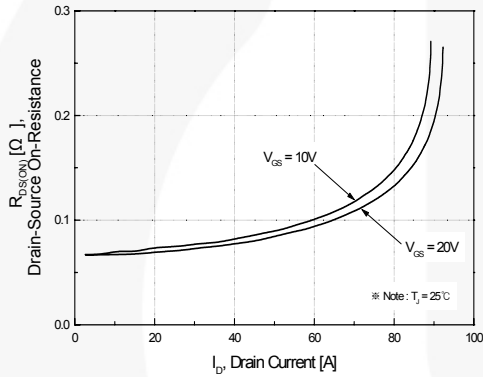


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

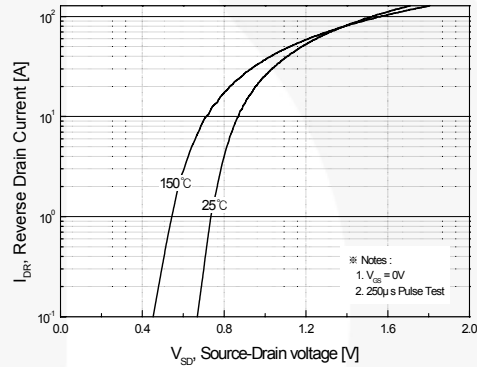


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

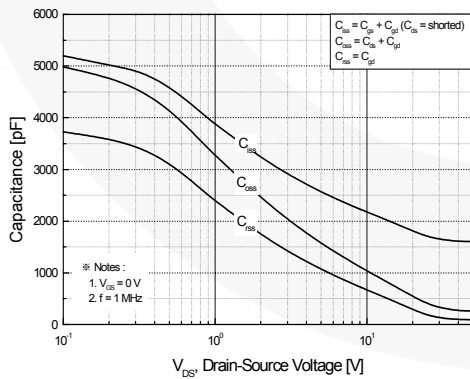


Figure 5. Capacitance Characteristics

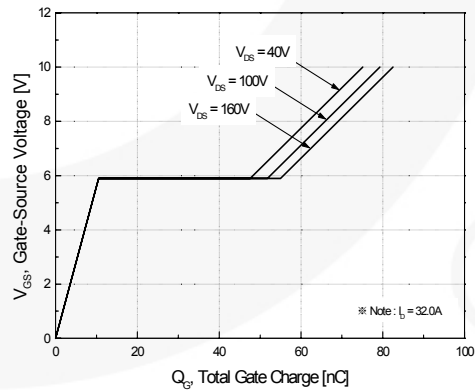


Figure 6. Gate Charge Characteristics

Typical Performance Characteristics (Continued)

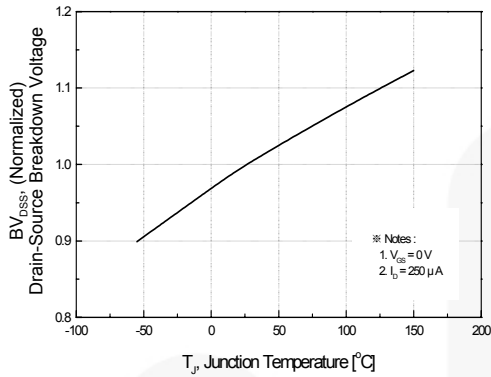


Figure 7. Breakdown Voltage Variation vs Temperature

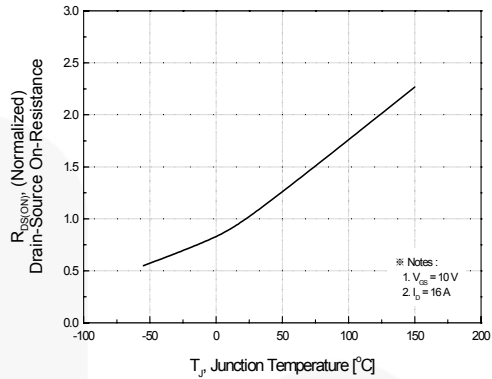


Figure 8. On-Resistance Variation vs Temperature

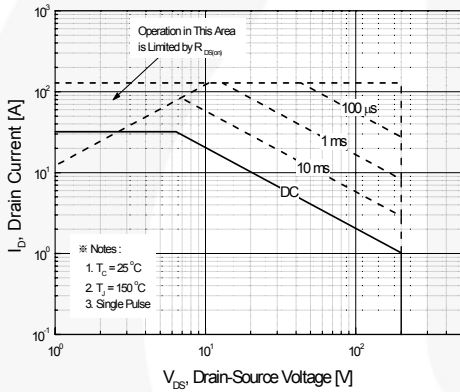


Figure 9. Maximum Safe Operating Area

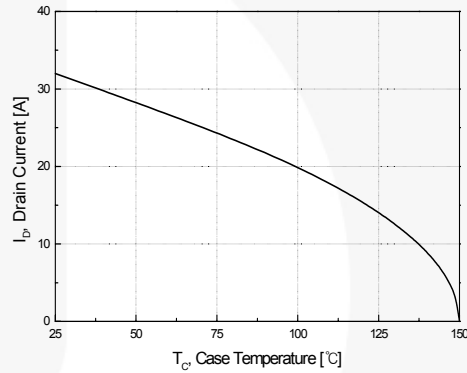


Figure 10. Maximum Drain Current vs Case Temperature

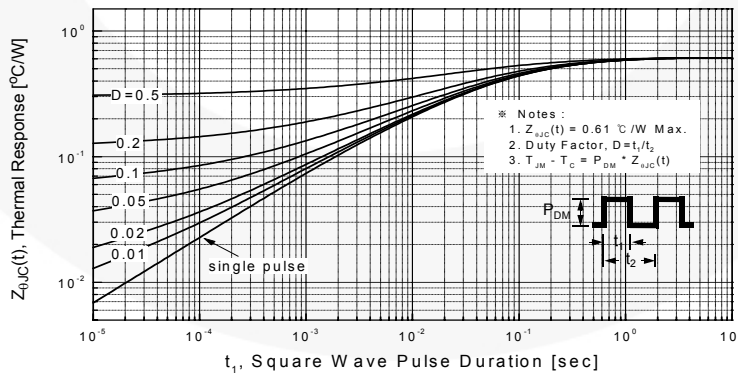


Figure 11. Transient Thermal Response Curve

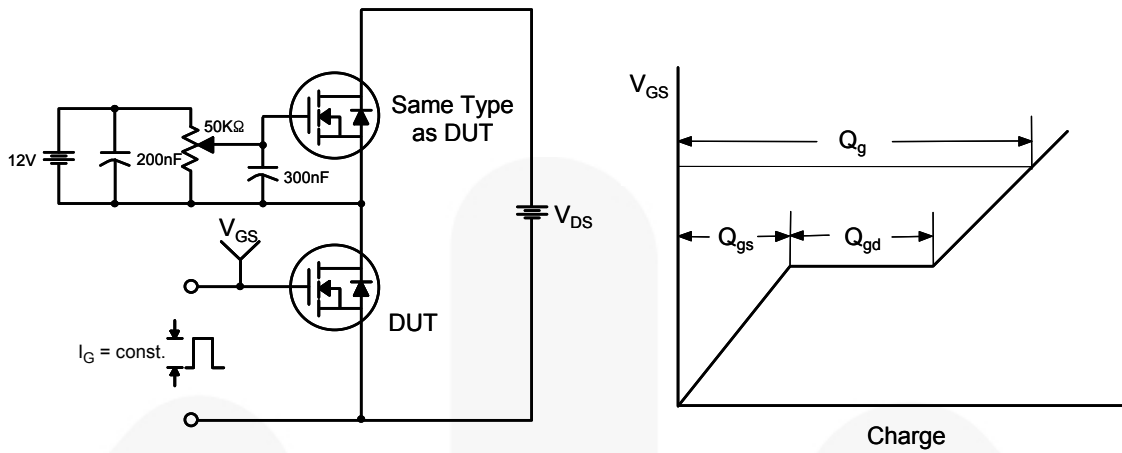


Figure 12. Gate Charge Test Circuit & Waveform

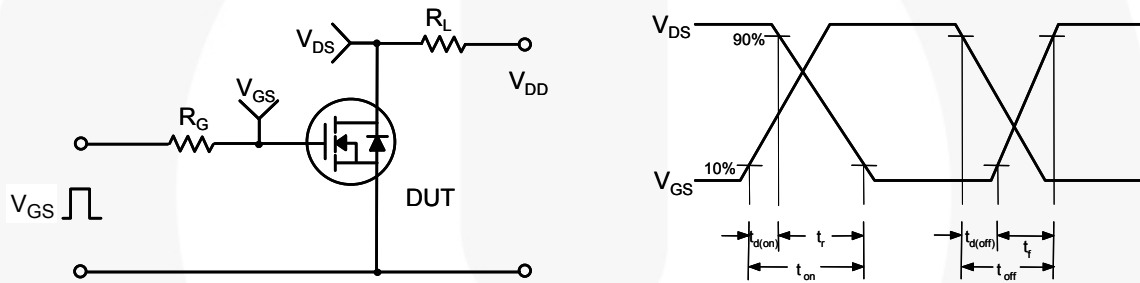


Figure 13. Resistive Switching Test Circuit & Waveforms

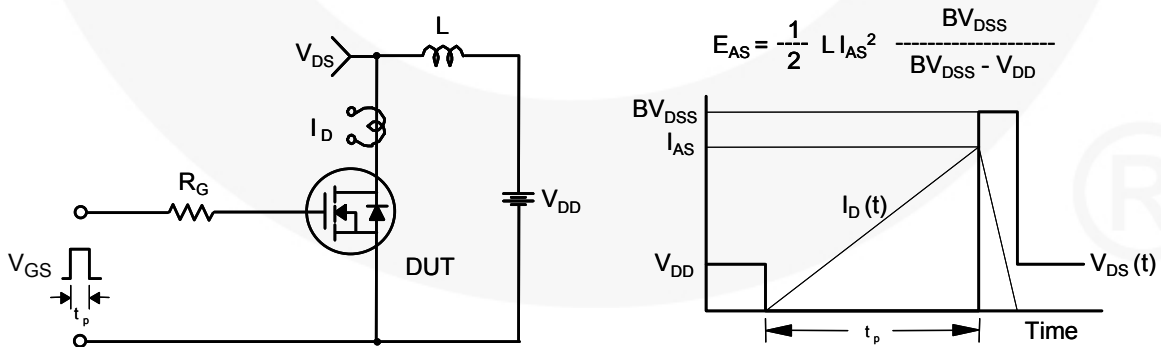


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

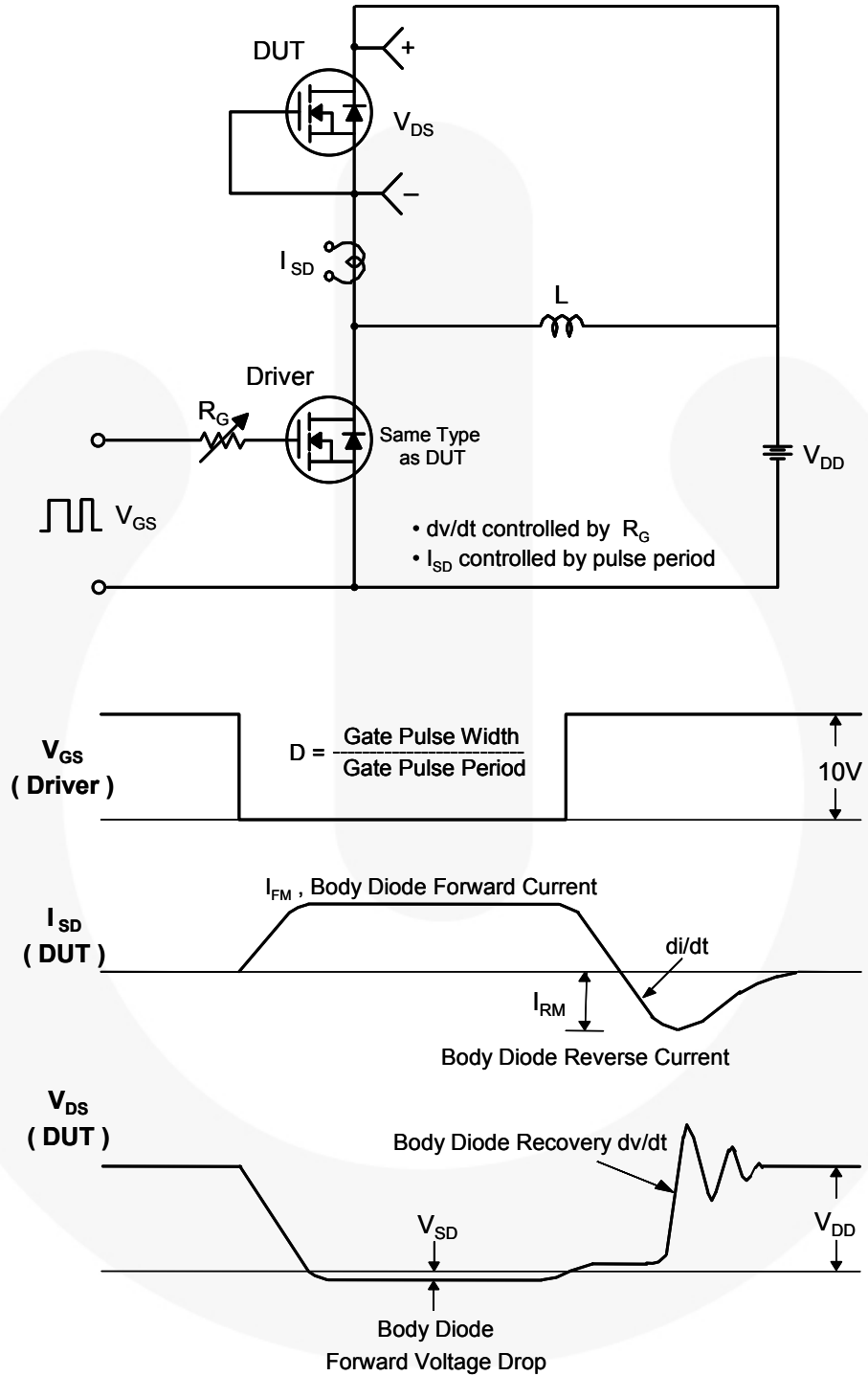
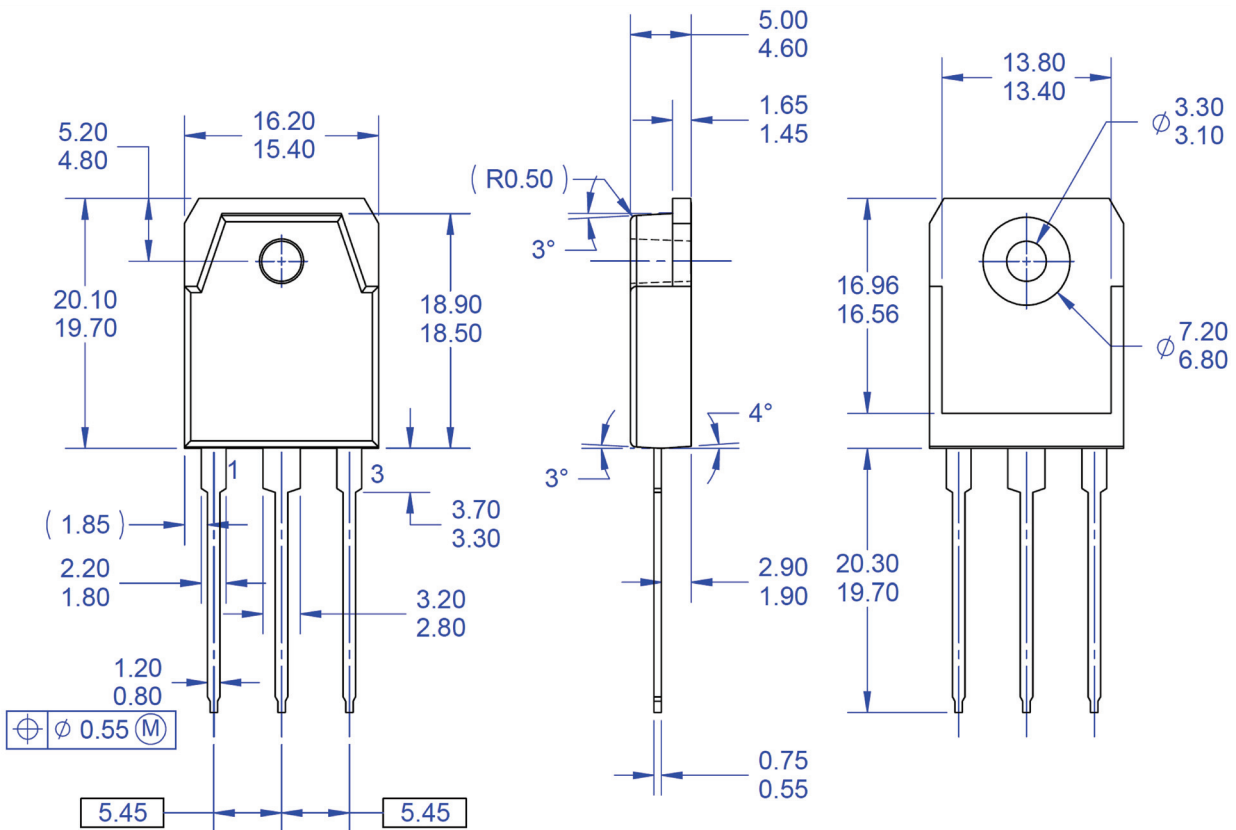


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
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- E) DRAWING FILE NAME: TO3PN03AREV1.
- F) FAIRCHILD SEMICONDUCTOR.

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

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