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June 2014

FQA140N10

N-Channel QFET® MOSFET

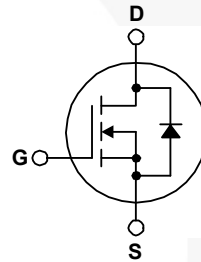
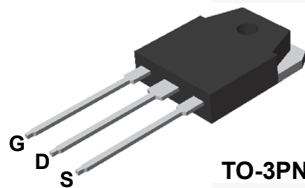
100 V, 140 A, 10 mΩ

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

- 140 A, 100 V, $R_{DS(on)} = 10 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 70 \text{ A}$
- Low Gate Charge (Typ. 220 nC)
- Low C_{rss} (Typ. 470 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



Absolute Maximum Ratings

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

Symbol	Parameter	FQA140N10	Unit
V_{DSS}	Drain-Source Voltage	100	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	140	A
		99	A
I_{DM}	Drain Current - Pulsed (Note 1)	560	A
V_{GSS}	Gate-Source Voltage	± 25	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1500	mJ
I_{AR}	Avalanche Current (Note 1)	140	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	37.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	375	W
		2.5	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	FQA140N10	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.4	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	$^\circ\text{C}/\text{W}$

FQA140N10 — N-Channel QFET® MOSFET

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA140N10	FQA140N10	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
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	--	0.08	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 64\text{ V}, T_C = 150^\circ\text{C}$	--	--	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	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 70\text{ A}$	--	0.008	0.01	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 30\text{ V}, I_D = 70\text{ A}$	--	80	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	6100	7900	pF
C_{oss}	Output Capacitance		--	2000	2600	pF
C_{rss}	Reverse Transfer Capacitance		--	420	550	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\text{ V}, I_D = 140\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 4)	--	75	160	ns
t_r	Turn-On Rise Time		--	940	1890	ns
$t_{d(off)}$	Turn-Off Delay Time		--	350	710	ns
t_f	Turn-Off Fall Time		--	360	730	ns
Q_g	Total Gate Charge	$V_{DS} = 64\text{ V}, I_D = 140\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 4)	--	220	285	nC
Q_{gs}	Gate-Source Charge		--	39	--	nC
Q_{gd}	Gate-Drain Charge		--	114	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	(Note 5)	--	--	140	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	560	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 140\text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 140\text{ A},$ $dI_F / dt = 100\text{ A}/\mu\text{s}$	--	140	--	ns
Q_{rr}	Reverse Recovery Charge		--	730	--	nC

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. $L = 0.115\text{ mH}$, $I_{AS} = 140\text{ A}$, $V_{DD} = 25\text{ V}$, $R_G = 25\text{ }\Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 140\text{ A}$, $dI/dt \leq 300\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.
5. Continuous drain current calculated by maximum junction temperature : limited by package.

Typical Characteristics

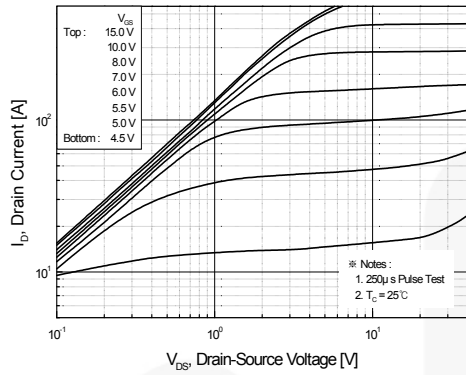


Figure 1. On-Region Characteristics

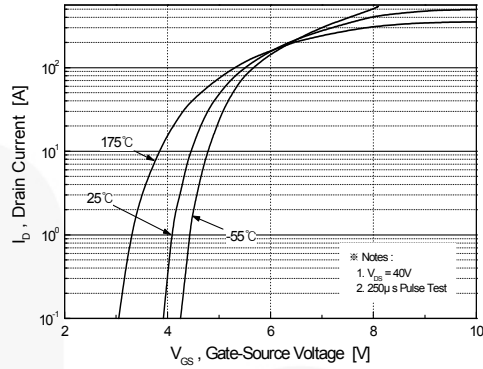


Figure 2. Transfer Characteristics

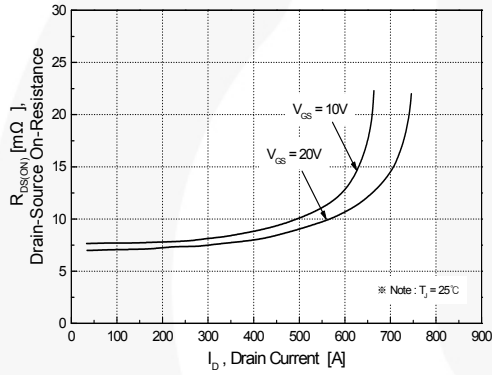


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

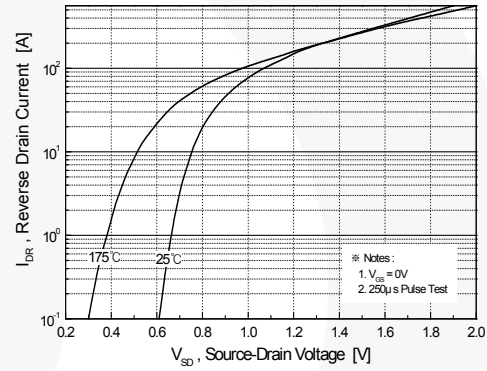


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

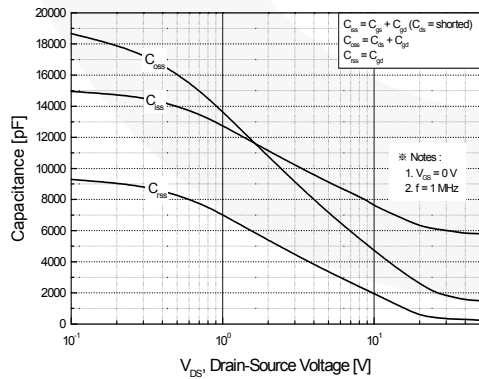


Figure 5. Capacitance Characteristics

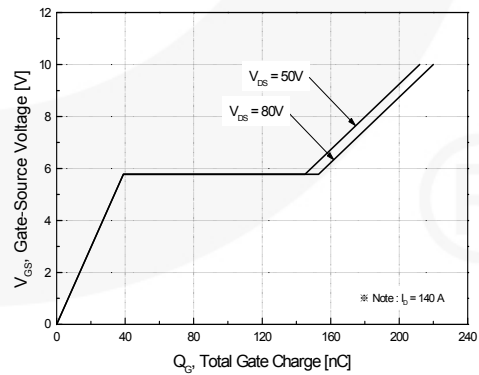


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

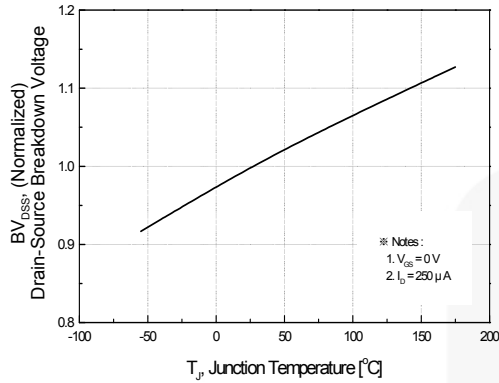


Figure 7. Breakdown Voltage Variation vs. Temperature

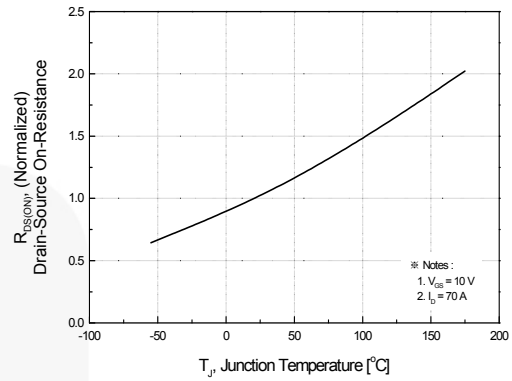


Figure 8. On-Resistance Variation vs. Temperature

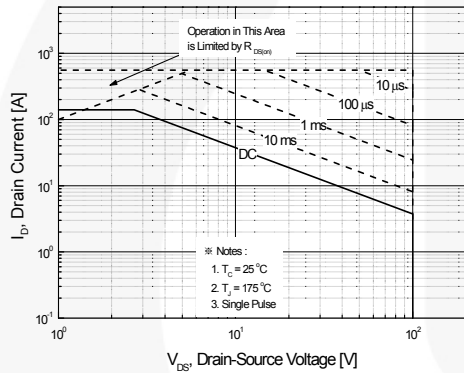


Figure 9. Maximum Safe Operating Area

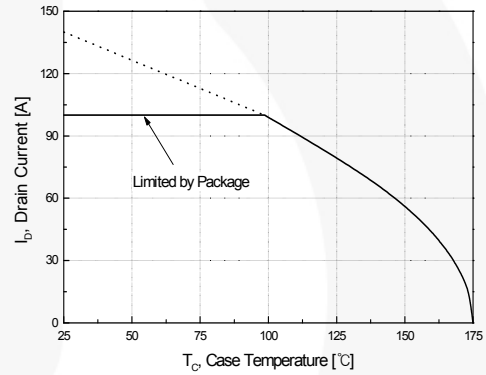


Figure 10. Maximum Drain Current vs. Case Temperature

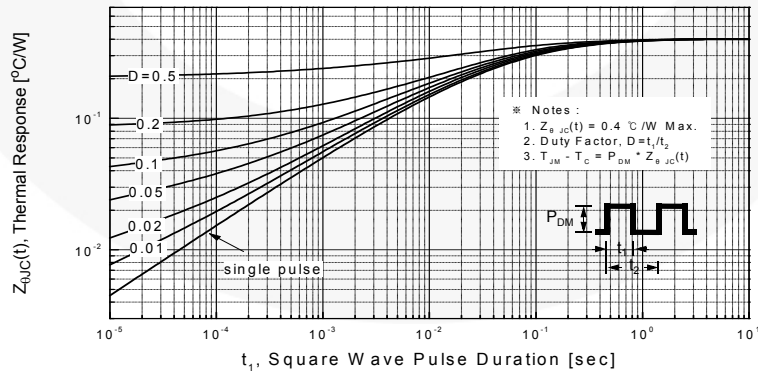


Figure 11. Transient Thermal Response Curve

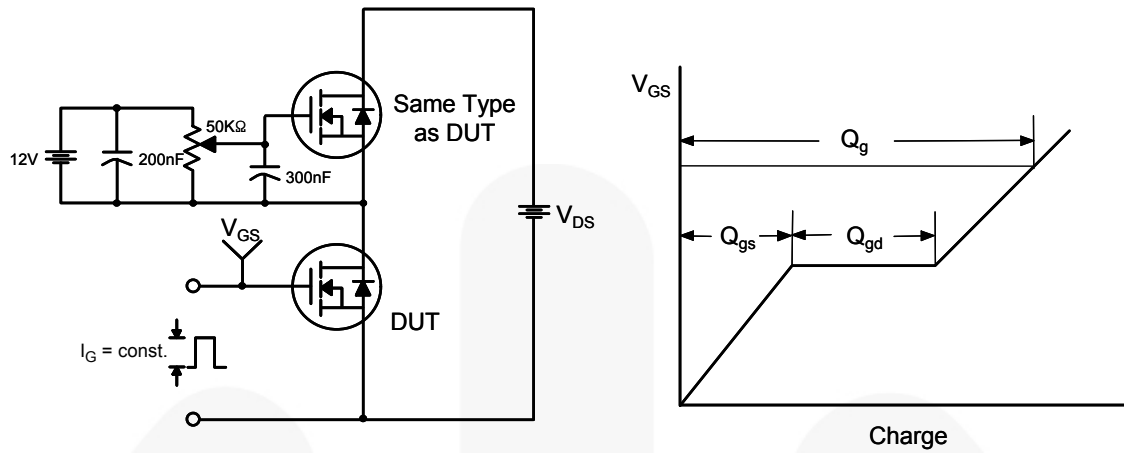


Figure 12. Gate Charge Test Circuit & Waveform

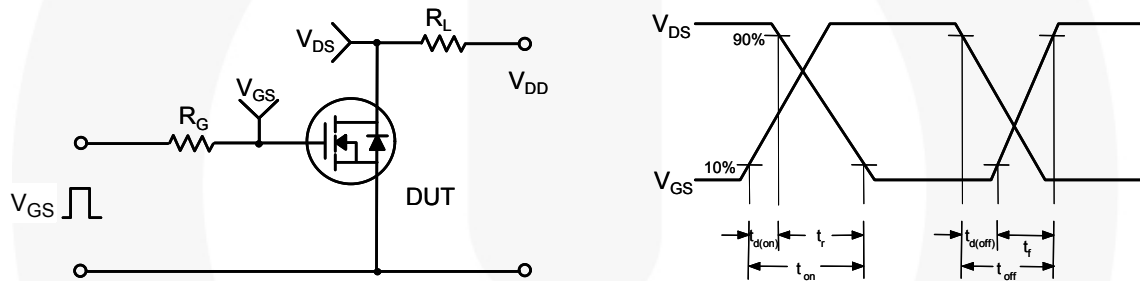


Figure 13. Resistive Switching Test Circuit & Waveforms

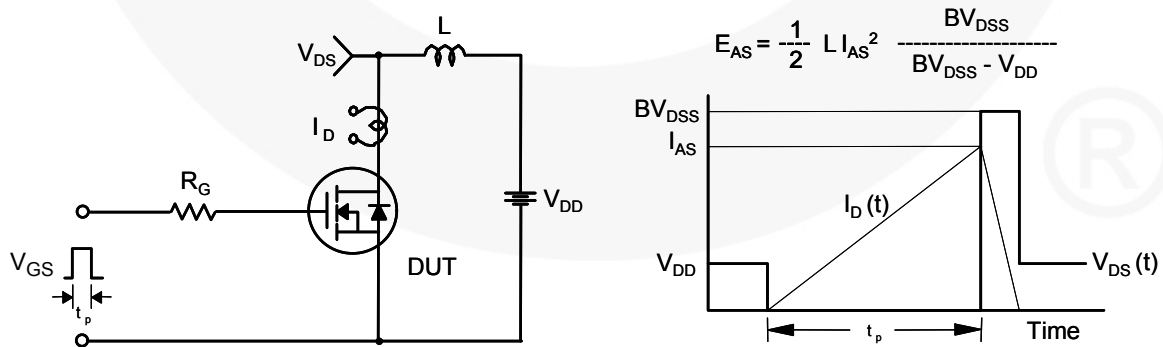


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

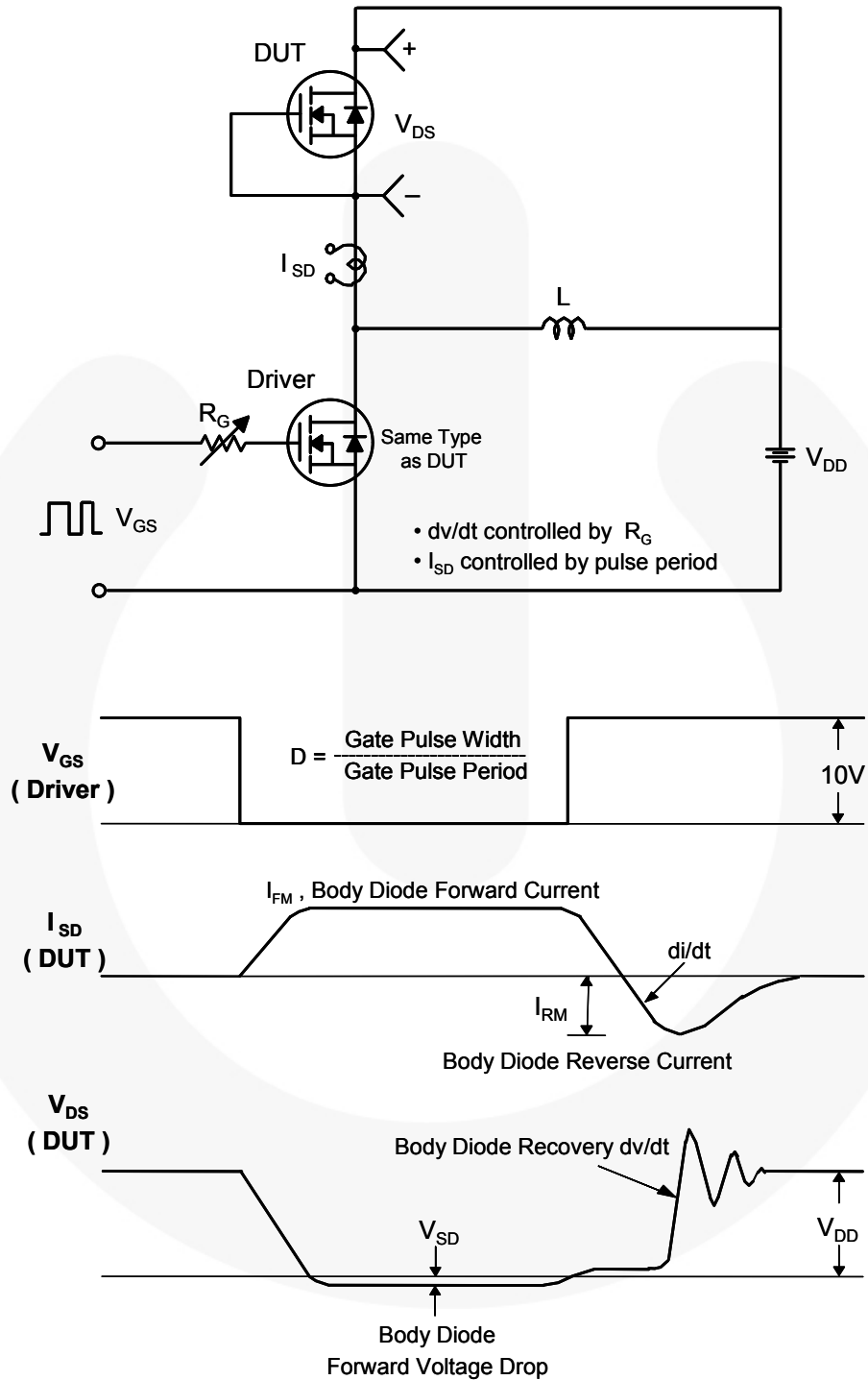
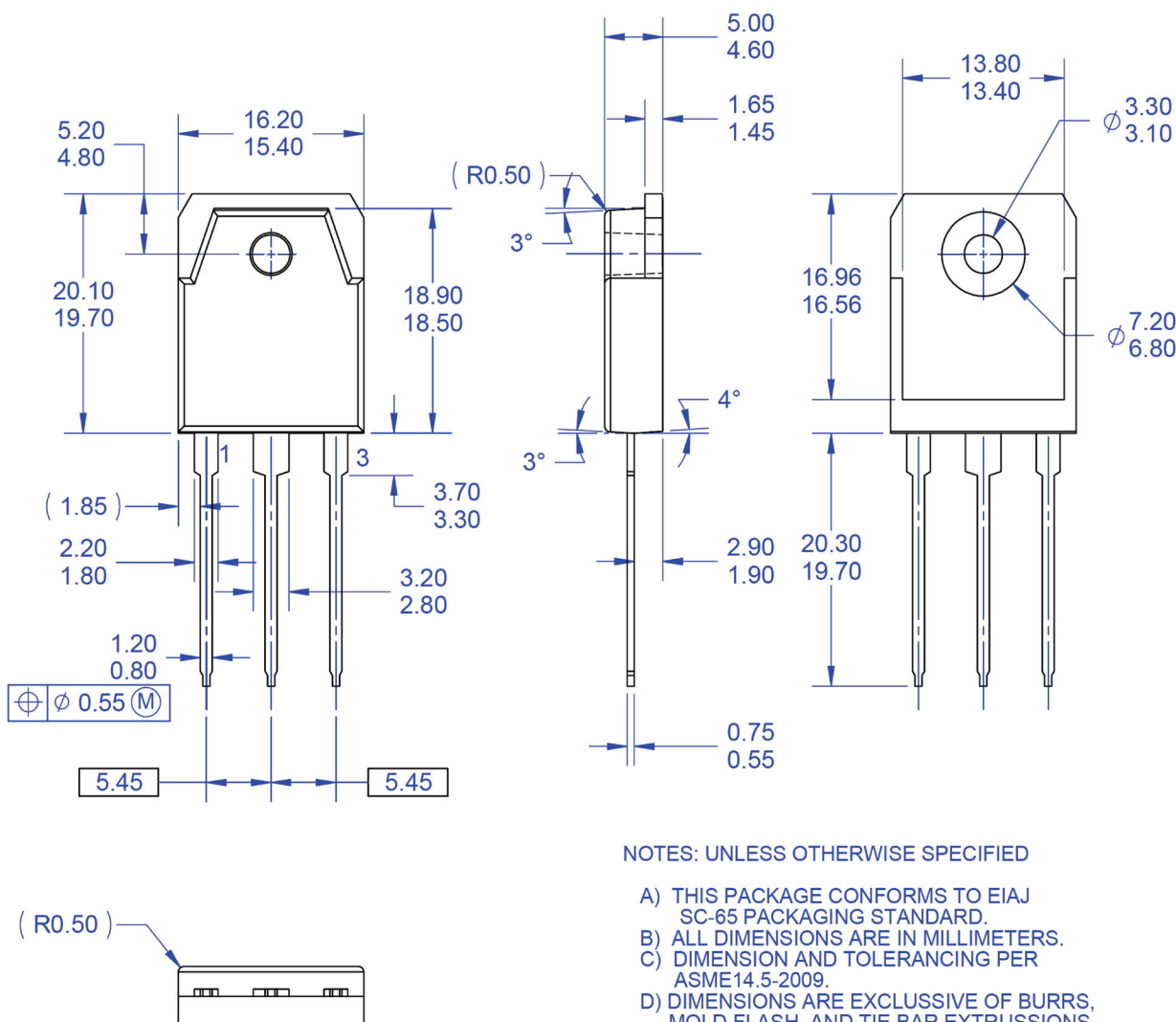


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

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

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