



ON Semiconductor®

FQA13N80-F109

N-Channel QFET® MOSFET

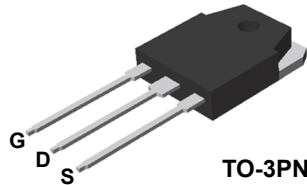
800 V, 12.6 A, 750 mΩ

Description

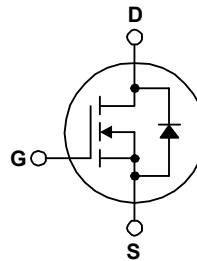
This N-Channel enhancement mode power MOSFET is produced using ON Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength.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

Features

- 12.6 A, 800 V, $R_{DS(on)} = 750 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 6.3 \text{ A}$
- Low Gate Charge (Typ. 68 nC)
- Low C_{rss} (Typ. 30 pF)
- 100% Avalanche Tested



TO-3PN



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

Symbol	Parameter	FQA13N80-F109	Unit
V_{DSS}	Drain-Source Voltage	800	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	12.6	A
	- Continuous ($T_C = 100^\circ\text{C}$)	8.0	A
I_{DM}	Drain Current - Pulsed (Note 1)	50.4	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1100	mJ
I_{AR}	Avalanche Current (Note 1)	12.6	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 ($T_C = 25^\circ\text{C}$)	300	W
	- Derate above 25°C	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 purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FQA13N80_F109	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.42	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.24	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA13N80-F109	FQA13N80	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
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	800	--	--	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.95	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	μA
		$V_{DS} = 640\text{ V}, T_c = 125^\circ\text{C}$	--	--	100	μA
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
On Characteristics						
$V_{GS(th)}$	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	$V_{GS} = 10\text{ V}, I_D = 6.3\text{ A}$	--	0.58	0.75	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 6.3\text{ A}$	--	13	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$	--	2700	3500	pF
C_{oss}	Output Capacitance		--	275	360	pF
C_{rss}	Reverse Transfer Capacitance		--	30	39	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400\text{ V}, I_D = 12.6\text{ A}$, $R_G = 25\ \Omega$ (Note 4)	--	60	130	ns
t_r	Turn-On Rise Time		--	150	310	ns
$t_{d(off)}$	Turn-Off Delay Time		--	155	320	ns
t_f	Turn-Off Fall Time		--	110	230	ns
Q_g	Total Gate Charge	$V_{DS} = 640\text{ V}, I_D = 12.6\text{ A}$, $V_{GS} = 10\text{ V}$ (Note 4)	--	68	88	nC
Q_{gs}	Gate-Source Charge		--	15	--	nC
Q_{gd}	Gate-Drain Charge		--	32	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	12.6	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	50.4	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 12.6\text{ A}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 12.6\text{ A}$, $di_F / dt = 100\text{ A}/\mu\text{s}$	--	850	--	ns
Q_{rr}	Reverse Recovery Charge		--	11.3	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 13\text{ mH}, I_{AS} = 12.6\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 12.6\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature

Typical Characteristics

Figure 1. On-Region Characteristics

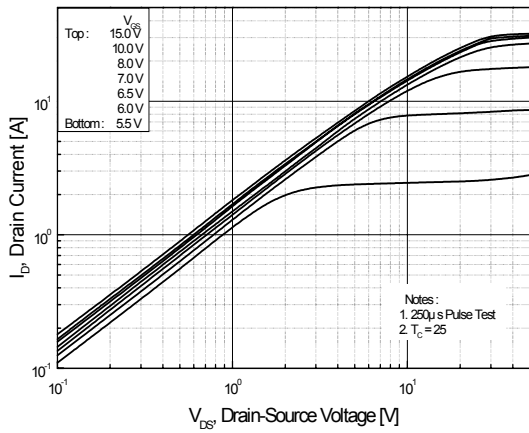


Figure 2. Transfer Characteristics

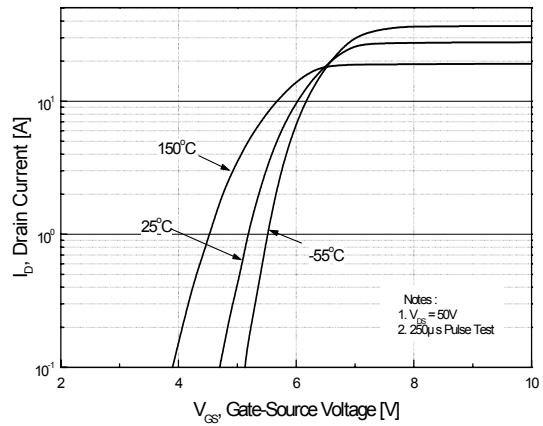


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

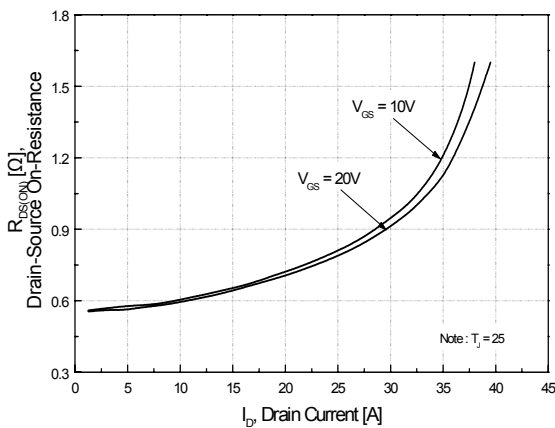


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

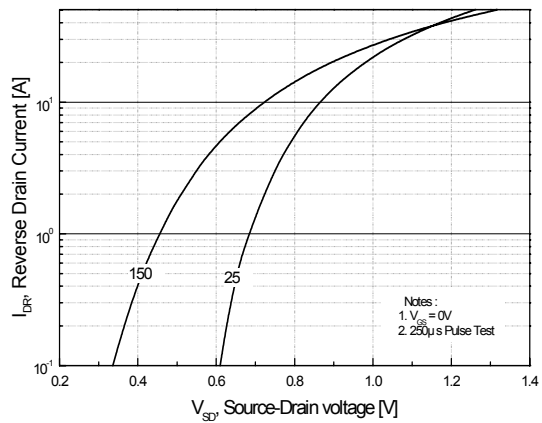


Figure 5. Capacitance Characteristics

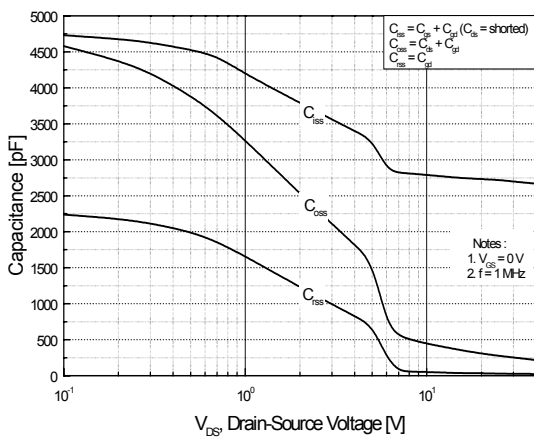
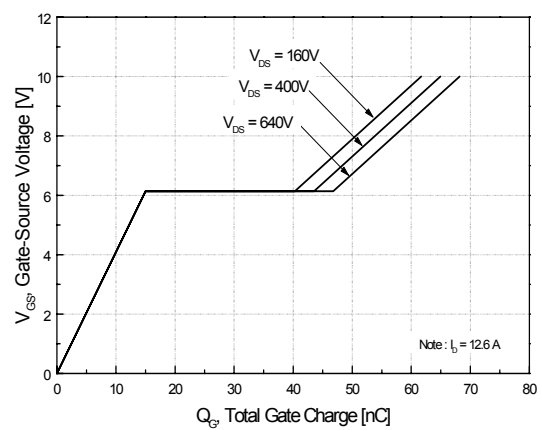


Figure 6. Gate Charge Characteristics



Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

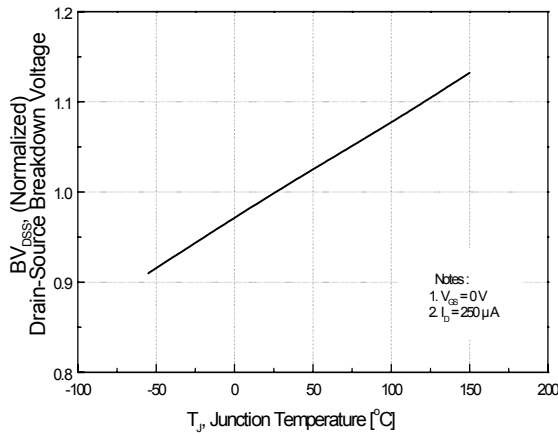


Figure 8. On-Resistance Variation vs. Temperature

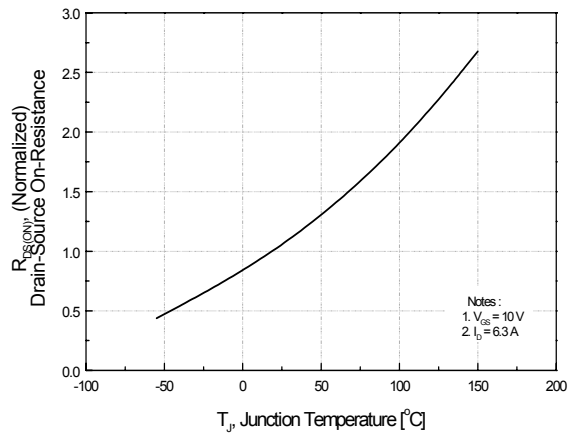


Figure 9. Maximum Safe Operating Area

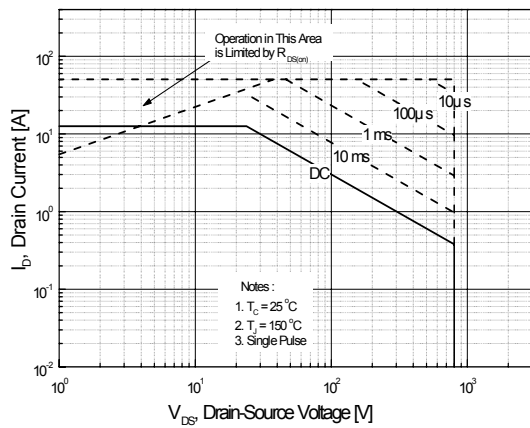


Figure 10. Maximum Drain Current vs. Case Temperature

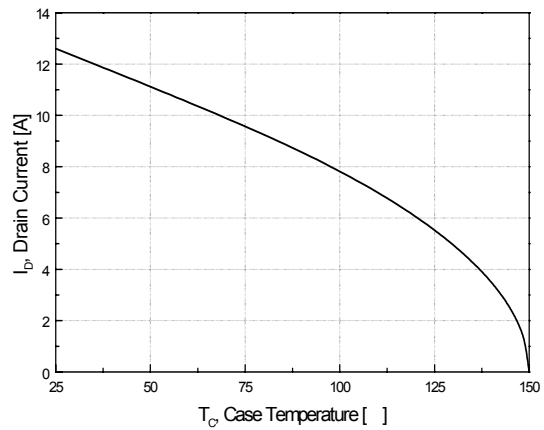
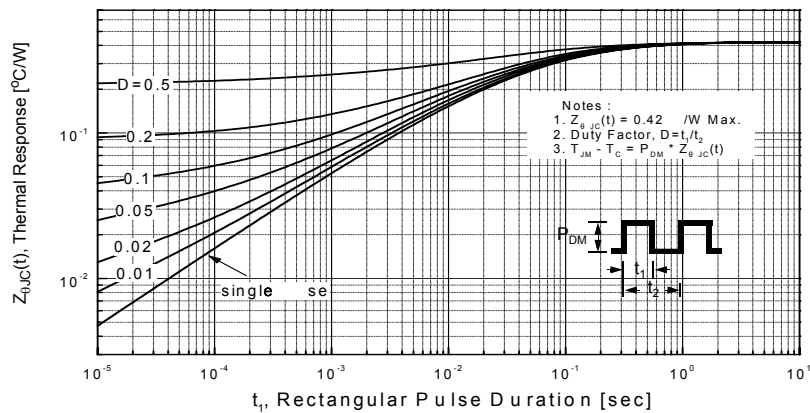


Figure 11. Transient Thermal Response Curve



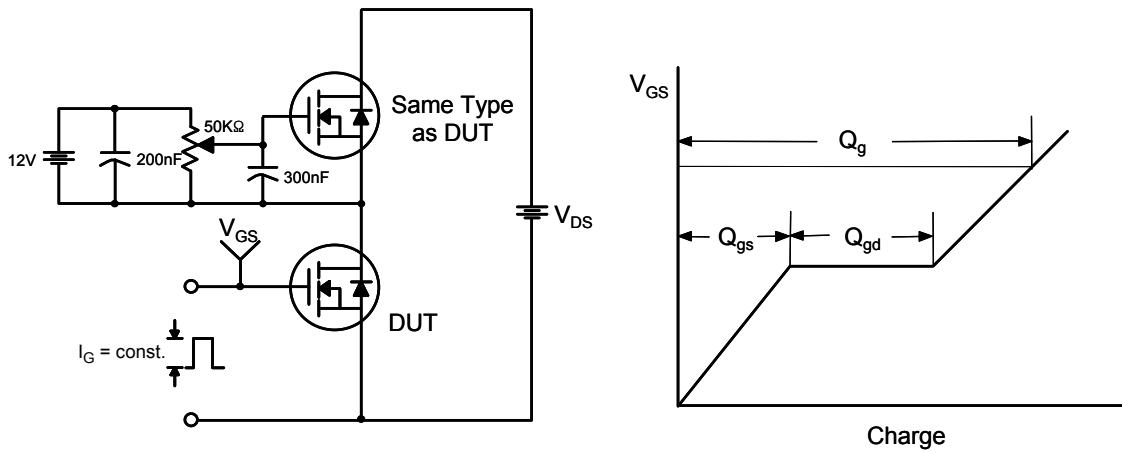


Figure 12. Gate Charge Test Circuit & Waveform

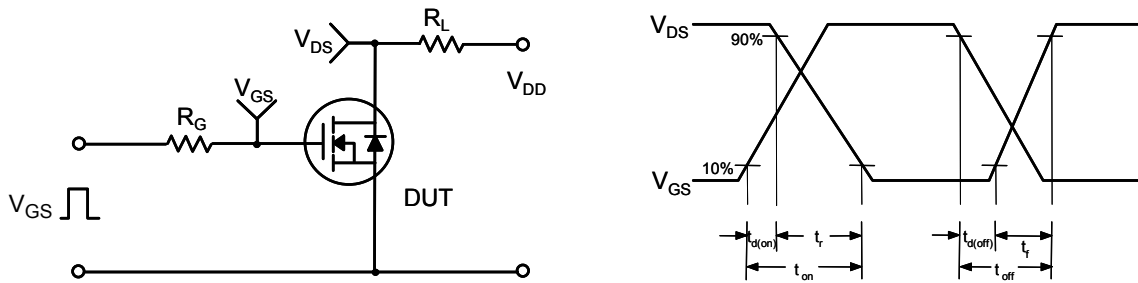


Figure 13. Resistive Switching Test Circuit & Waveforms

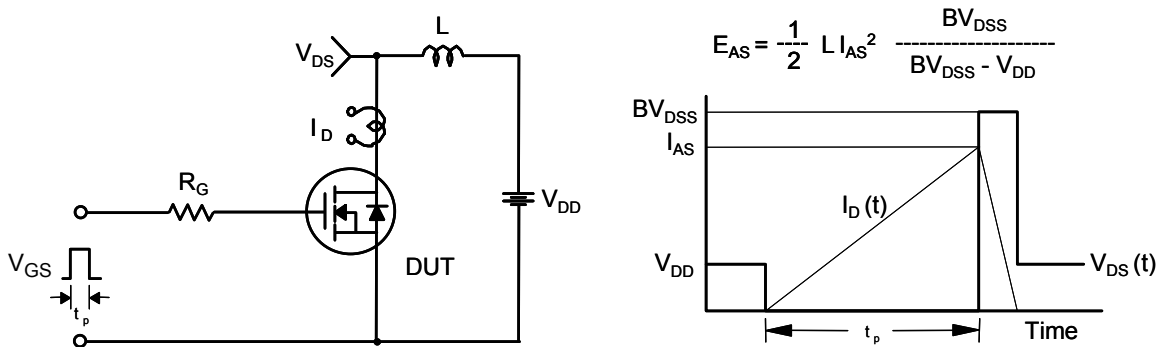


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

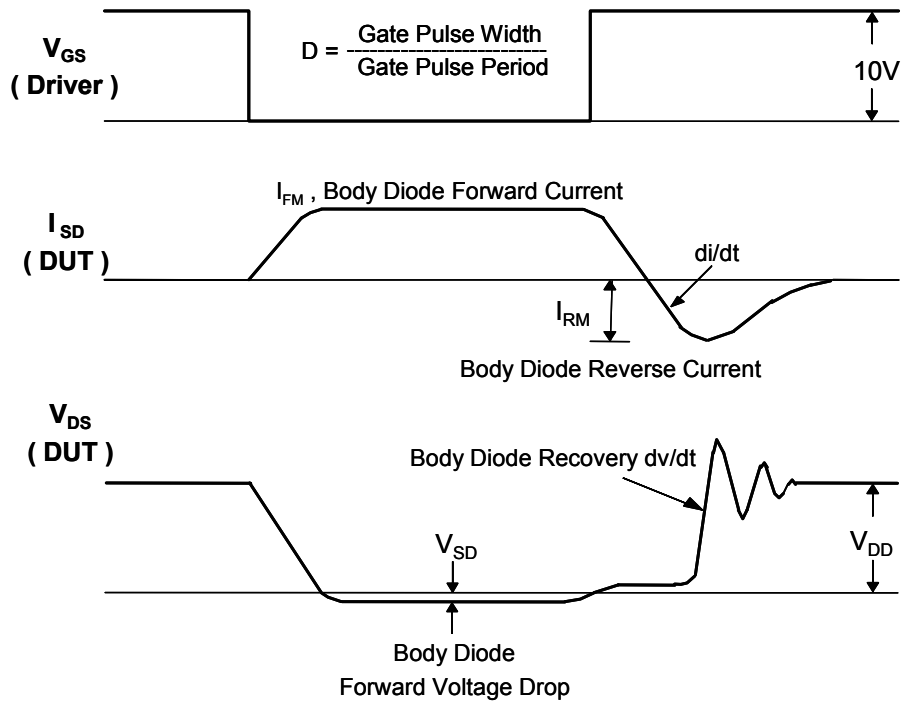
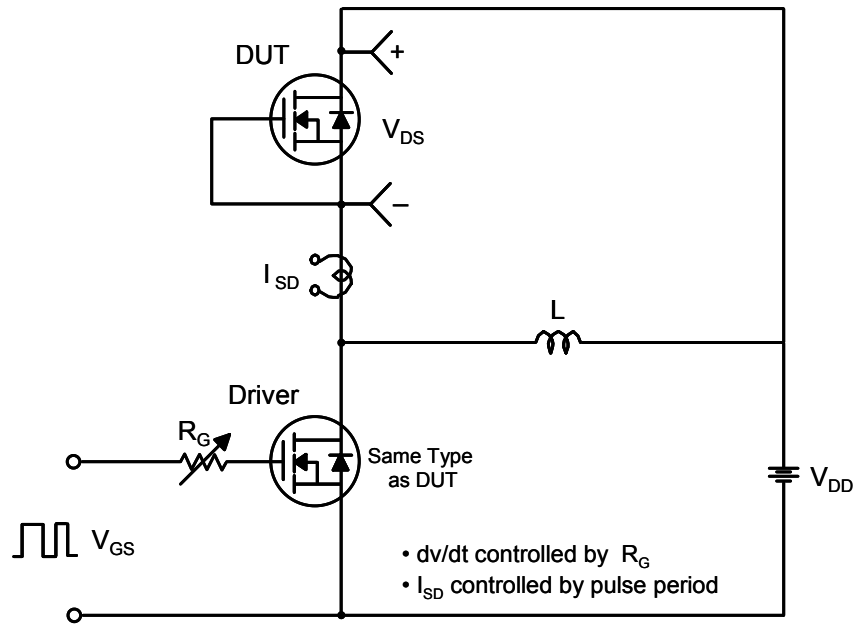
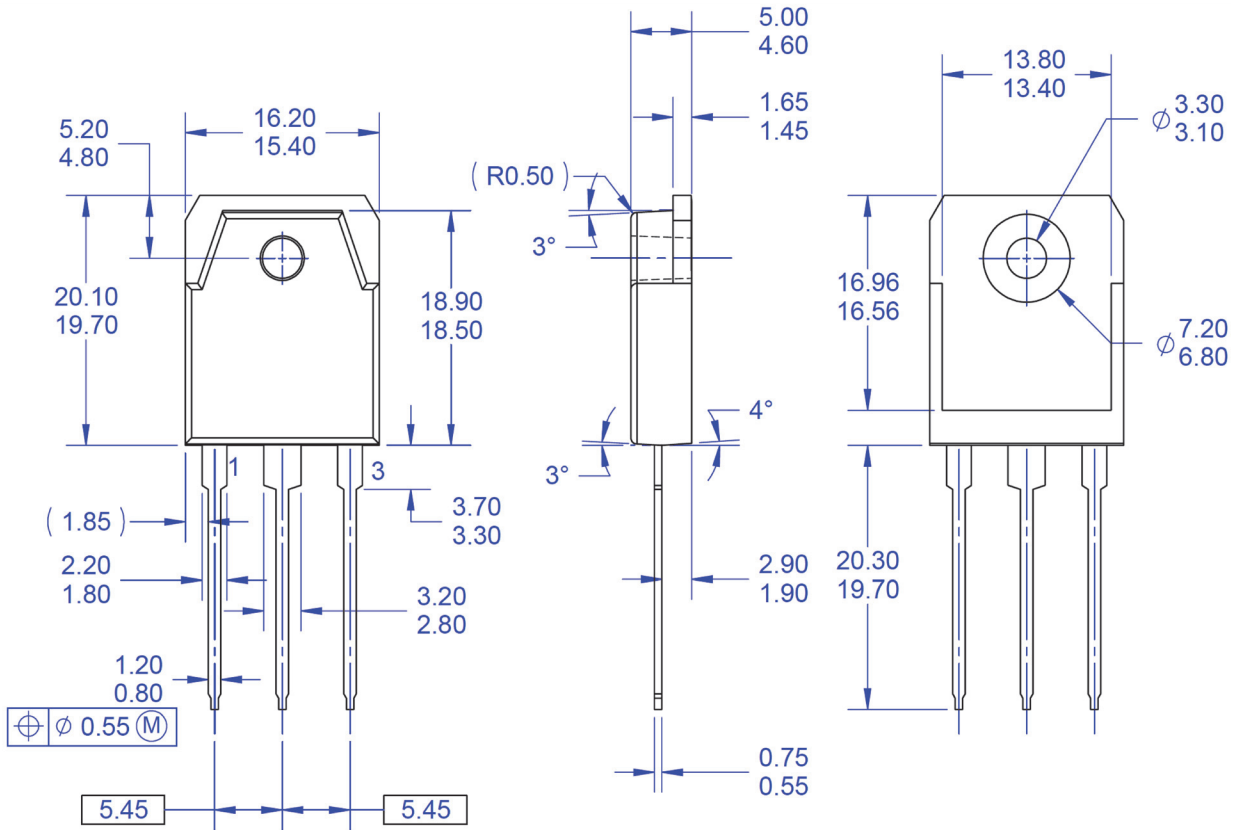


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSION AND TOLERANCING PER ASME14.5-2009.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- DRAWING FILE NAME: TO3PN03AREV1.
- FAIRCHILD SEMICONDUCTOR.

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

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