FAIRCHILD SEMICONDUCTOR®

April 2013

FQA13N80_F109

N-Channel QFET® MOSFET

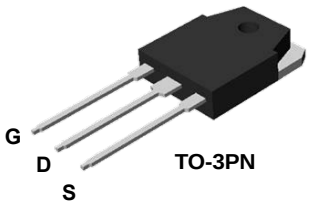
800 V, 12.6 A, 750 mΩ

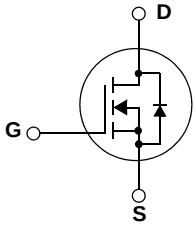
Features

- 12.6 A, 800 V, $R_{DS(on)}$ = 750 mΩ (Max.) @ V_{GS} = 10 V
  I_D = 6.8 A
- Low Gate Charge (Typ. 68 nC)
- Low Crss (Typ. 30 pF)
- 100% Avalanche Tested

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.





Absolute Maximum Ratings

Symbol	Parameter		FQA13N80_F109	Unit
V_{DSS}	Drain-Source Voltage		800	V
I_D	Drain Current - Continuous (T_C = 25°C)		12.6	A
	- Continuous (T_C = 100°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°C)		300	W
	- Derate above 25°C		2.38	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

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

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Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQA13N80	FQA13N80_F109	TO-3PN	--	--	30

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	800	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.95	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 800 V, V_{GS} = 0 V	--	--	10	μA
		V_{DS} = 640 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	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 6.3A	--	0.58	0.75	Ω
g_{FS}	Forward Transconductance	V_{DS} = 50 V, I_D = 6.3A (Note 4)	--	13	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 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 V, I_D = 12.6A, R_G = 25 Ω (Note 4, 5)	--	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 V, I_D = 12.6A, V_{GS} = 10 V (Note 4, 5)	--	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 V, I_S =12.6A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 12.6 A, dI_F / dt = 100 A/μs (Note 4)	--	850	--	ns
Q_{rr}	Reverse Recovery Charge		--	11.3	--	μC

NOTES:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 13mH, I_{AS} =12.6A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 12.6A, di/dt ≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

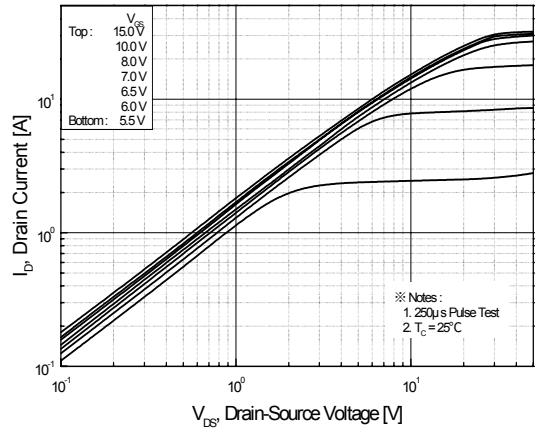


Figure 2. Transfer Characteristics

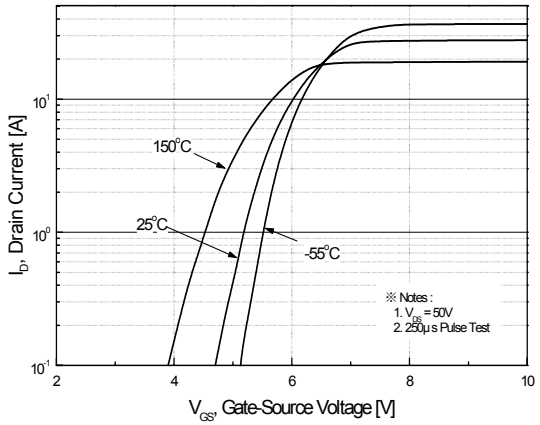


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

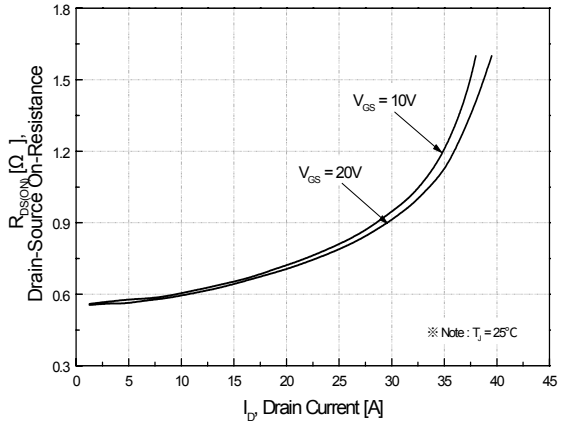


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

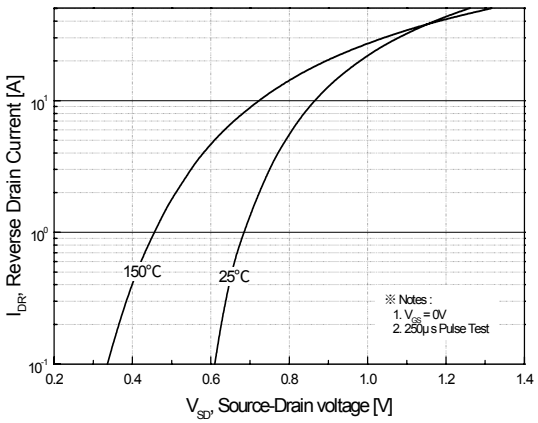


Figure 5. Capacitance Characteristics

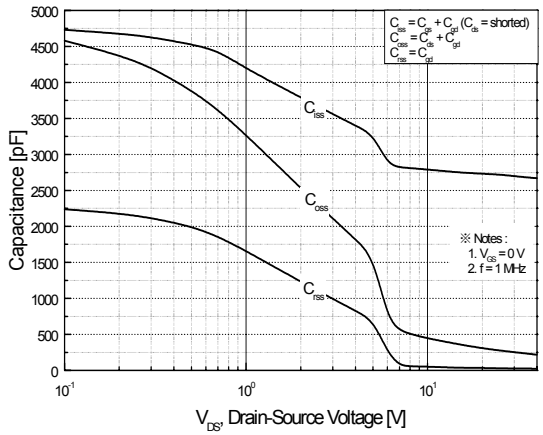
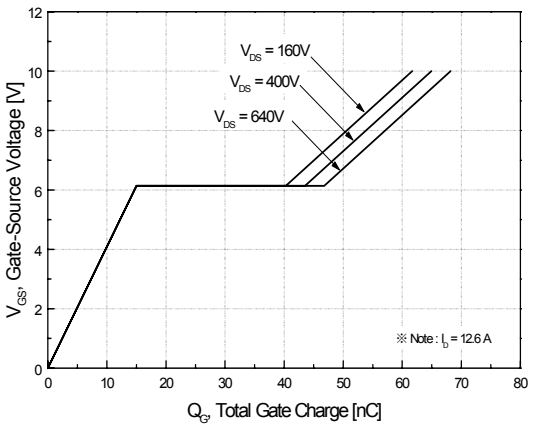


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

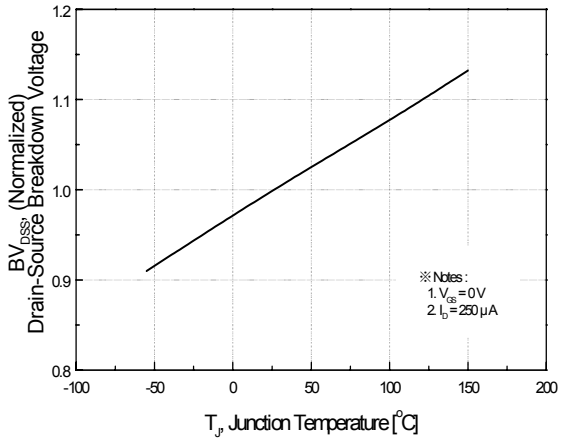


Figure 8. On-Resistance Variation vs. Temperature

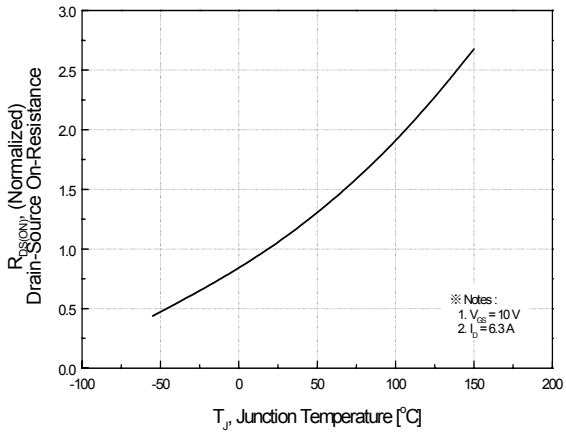


Figure 9. Maximum Safe Operating Area

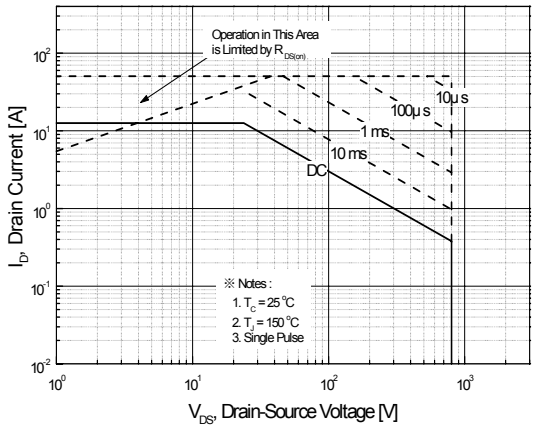


Figure 10. Maximum Drain Current vs. Case Temperature

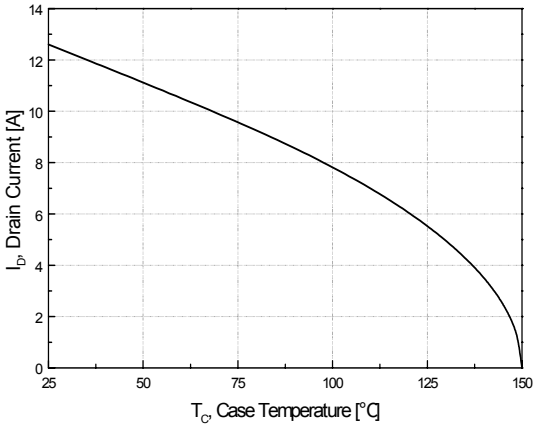
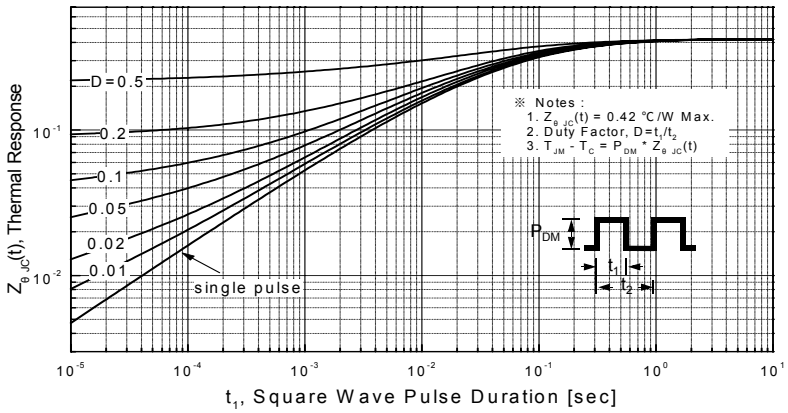
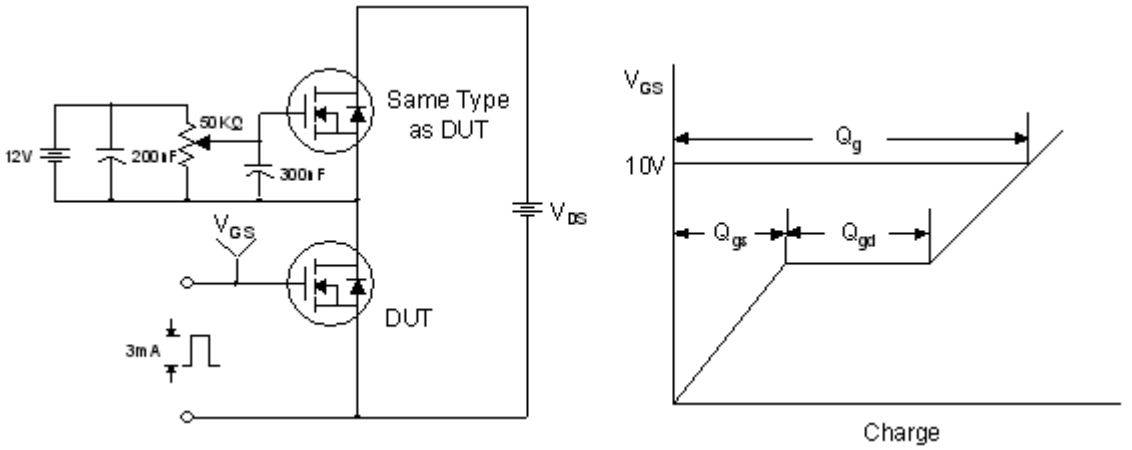


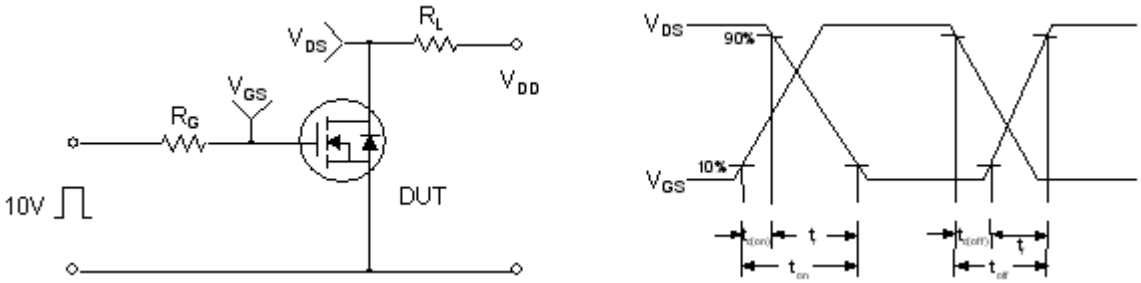
Figure 11. Transient Thermal Response Curve



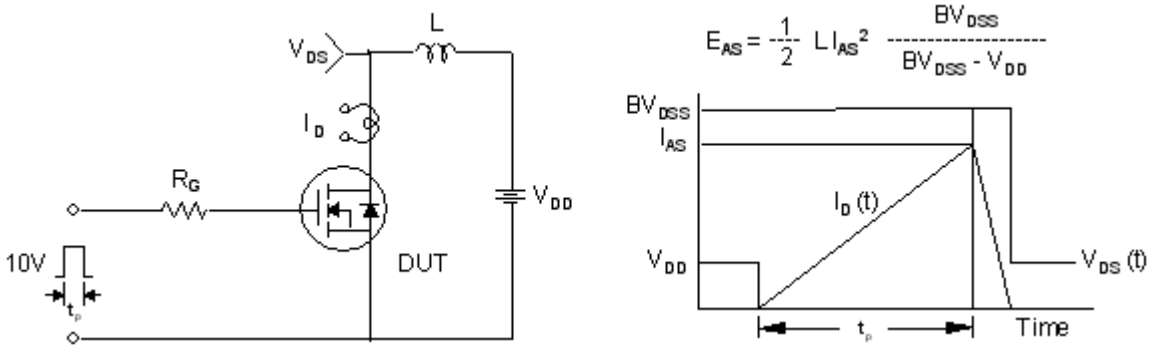
Gate Charge Test Circuit & Waveform



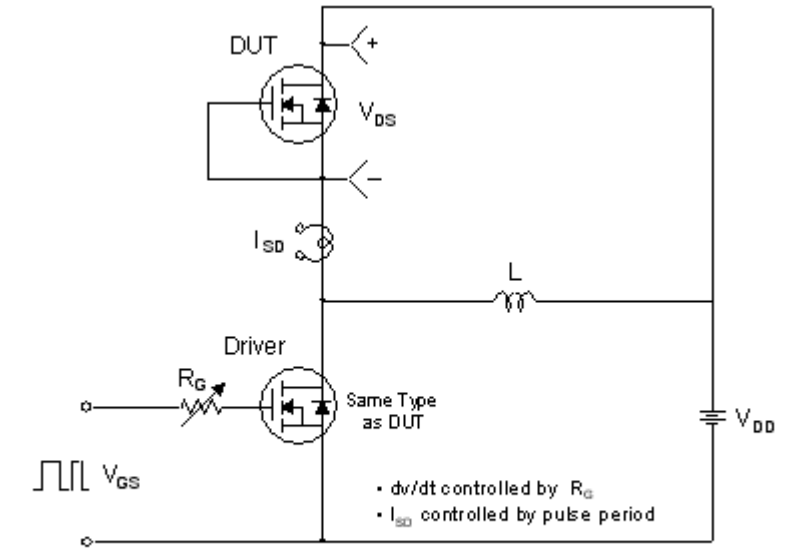
Resistive Switching Test Circuit & Waveforms

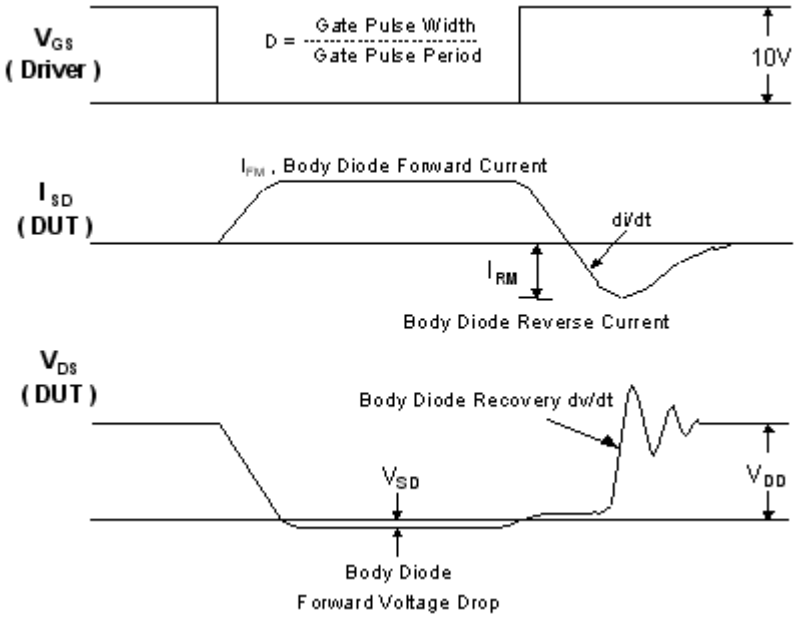


Unclamped Inductive Switching Test Circuit & Waveforms



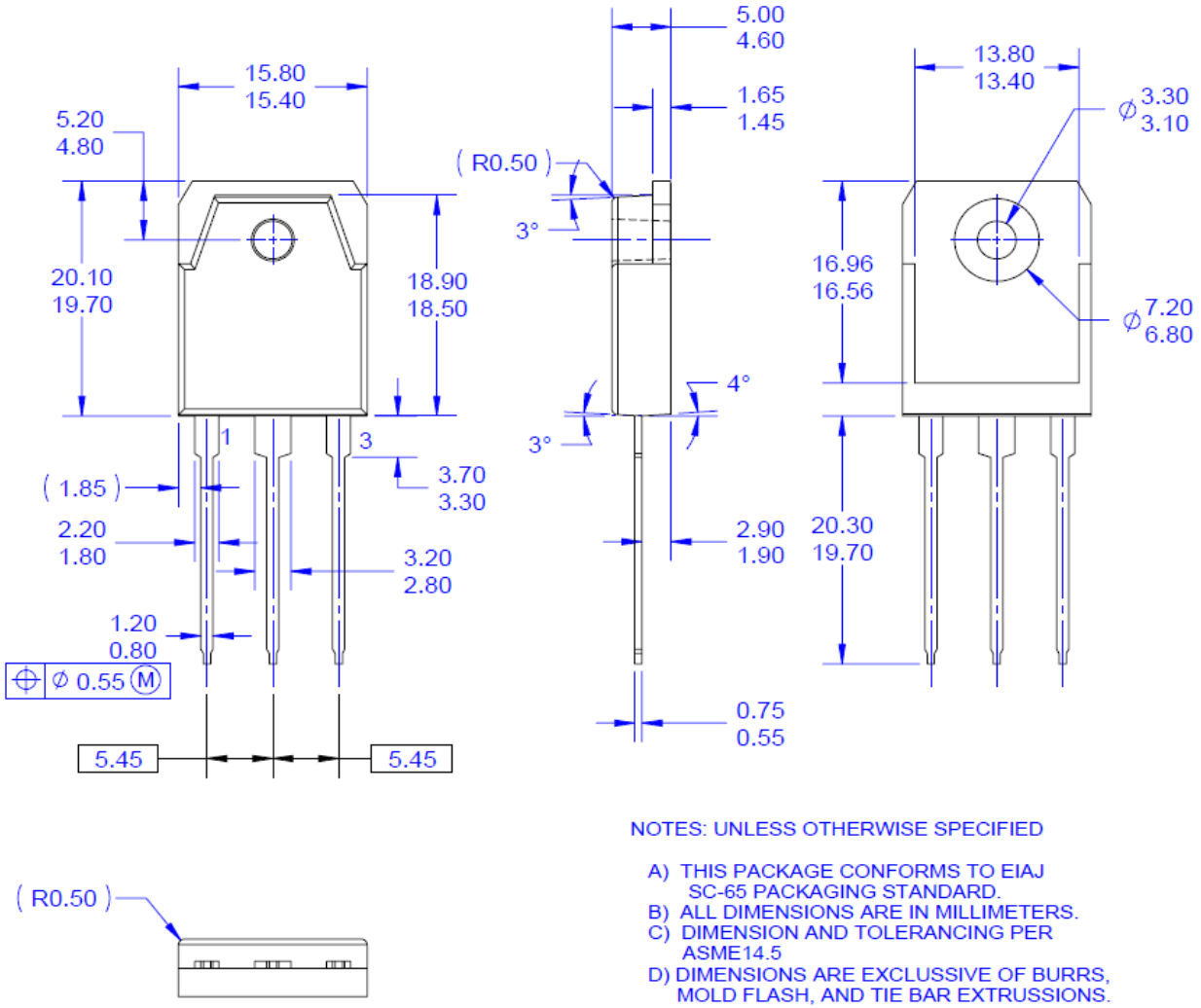
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

TO-3PN



NOTES: UNLESS OTHERWISE SPECIFIED

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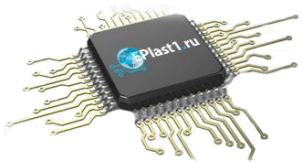
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