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June 2014

FQP3N80C / FQPF3N80C

N-Channel QFET[®] MOSFET

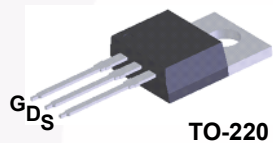
800 V, 3.0 A, 4.8 Ω

Features

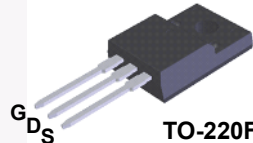
- 3.0 A, 800 V, $R_{DS(on)} = 4.8 \Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 1.5 \text{ A}$
- Low Gate Charge (Typ. 13 nC)
- Low C_{rss} (Typ. 5.5 pF)
- 100% Avalanche Tested

Description

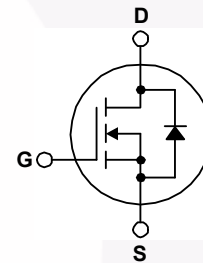
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength.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



TO-220



TO-220F



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

Symbol	Parameter	FQP3N80C	FQPF3N80C	Unit
V_{DSS}	Drain to Source Voltage	800		V
I_D	Drain Current	-Continuous ($T_C = 25^\circ\text{C}$)	3	3 *
		-Continuous ($T_C = 100^\circ\text{C}$)	1.9	1.9 *
I_{DM}	Drain Current - Pulsed (Note 1)	12	12 *	A
V_{GSS}	Gate to Source Voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	320		mJ
I_{AR}	Avalanche Current (Note 1)	3		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	10.7		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	107	39	W
		0.85	0.31	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		$^\circ\text{C}$

*Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	FQP3N80C	FQPF3N80C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	1.17	3.2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	62.5	62.5	$^\circ\text{C}/\text{W}$

FQP3N80C / FQPF3N80C — N-Channel QFET[®] MOSFET

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP3N80C	FQP3N80C	TO-220	Tube	Tube	N/A	50 units
FQPF3N80C	FQPF3N80C	TO-220F	Tube	Tube	N/A	50 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
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	1	--	$\text{V}/^\circ\text{C}$
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	$V_{GS} = 10\text{ V}, I_D = 1.5\text{ A}$	--	4.0	4.8	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 1.5\text{ A}$	--	3	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	--	543	705	pF
C_{oss}	Output Capacitance		--	54	70	pF
C_{riss}	Reverse Transfer Capacitance		--	5.5	7.5	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400\text{ V}, I_D = 3\text{ A}, R_G = 25\ \Omega$	--	15	40	ns
t_r	Turn-On Rise Time		--	43.5	95	ns
$t_{d(off)}$	Turn-Off Delay Time		--	22.5	55	ns
t_f	Turn-Off Fall Time		(Note 4)	--	32	75
Q_g	Total Gate Charge	$V_{DS} = 640\text{ V}, I_D = 3\text{ A}, V_{GS} = 10\text{ V}$	--	13	16.5	nC
Q_{gs}	Gate-Source Charge		--	3.4	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4)	--	5.8	--
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	3.0	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	12	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 3.0\text{ A}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 3.0\text{ A}, di_F / dt = 100\text{ A}/\mu\text{s}$	--	642	--	ns
Q_{rr}	Reverse Recovery Charge		--	4.0	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. $L = 67\text{ mH}, I_{AS} = 3.0\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 3\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

Typical Characteristics

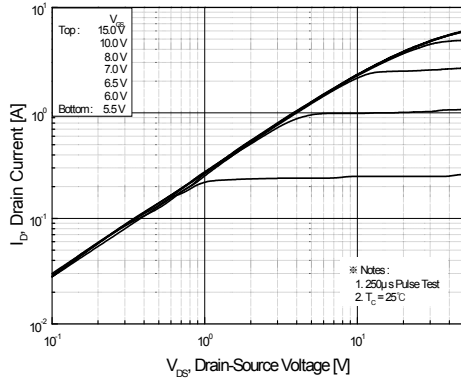


Figure 1. On-Region Characteristics

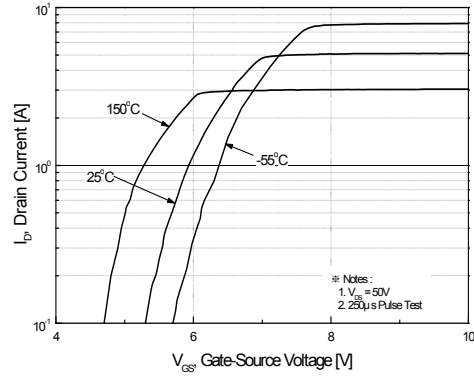


Figure 2. Transfer Characteristics

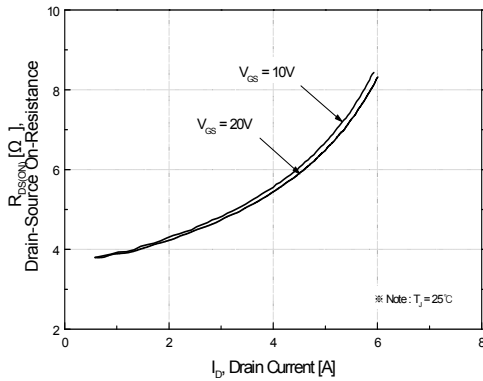


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

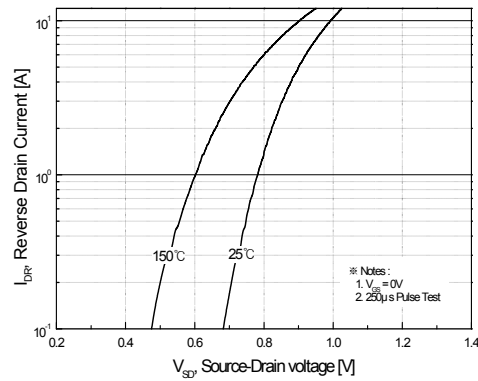


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

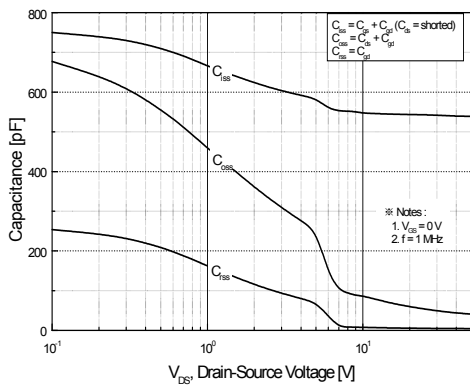


Figure 5. Capacitance Characteristics

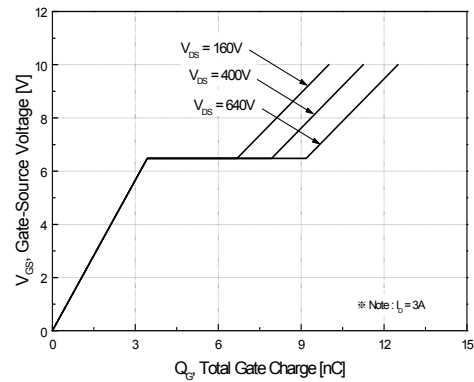


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

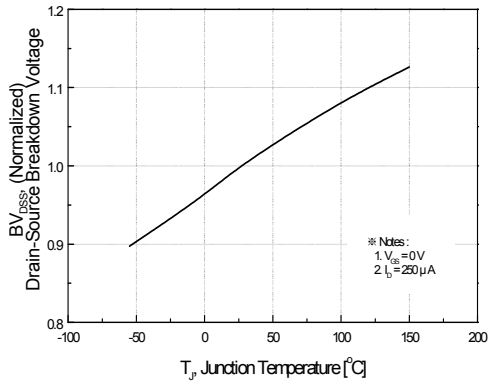


Figure 7. Breakdown Voltage Variation vs Temperature

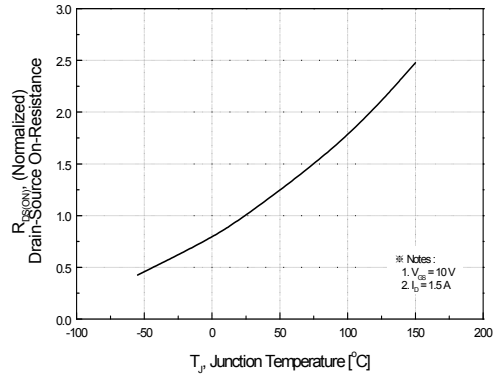


Figure 8. On-Resistance Variation vs Temperature

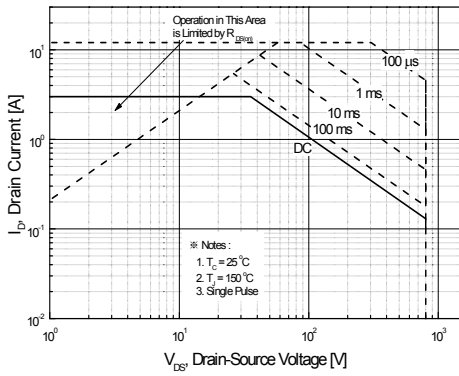


Figure 9-1. Maximum Safe Operating Area for FQP3N80C

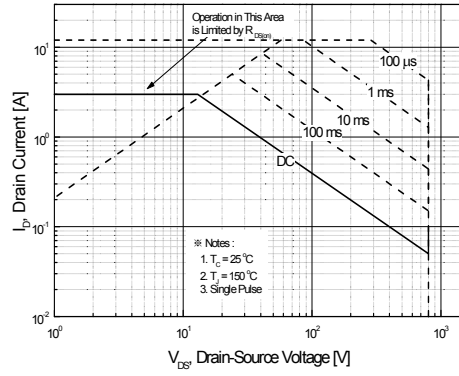


Figure 9-2. Maximum Safe Operating Area for FQPF3N80C

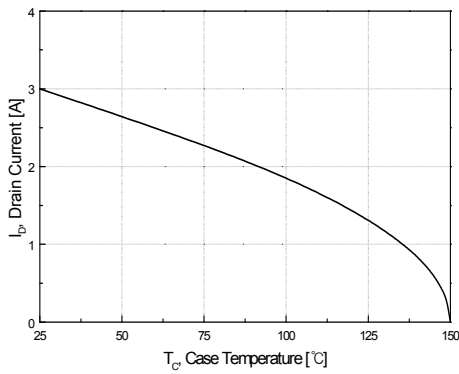


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

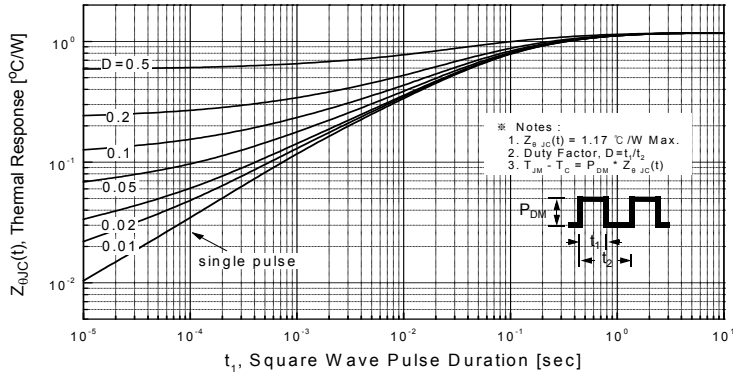


Figure 11-1. Transient Thermal Response Curve for FQP3N80C

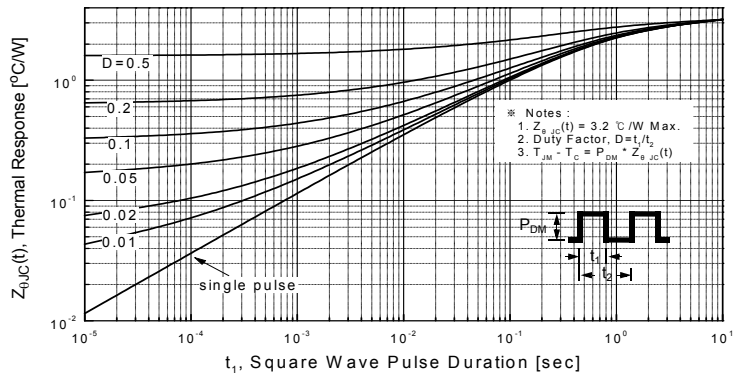


Figure 11-2. Transient Thermal Response Curve for FQPF3N80C

Figure 12. Gate Charge Test Circuit & Waveform

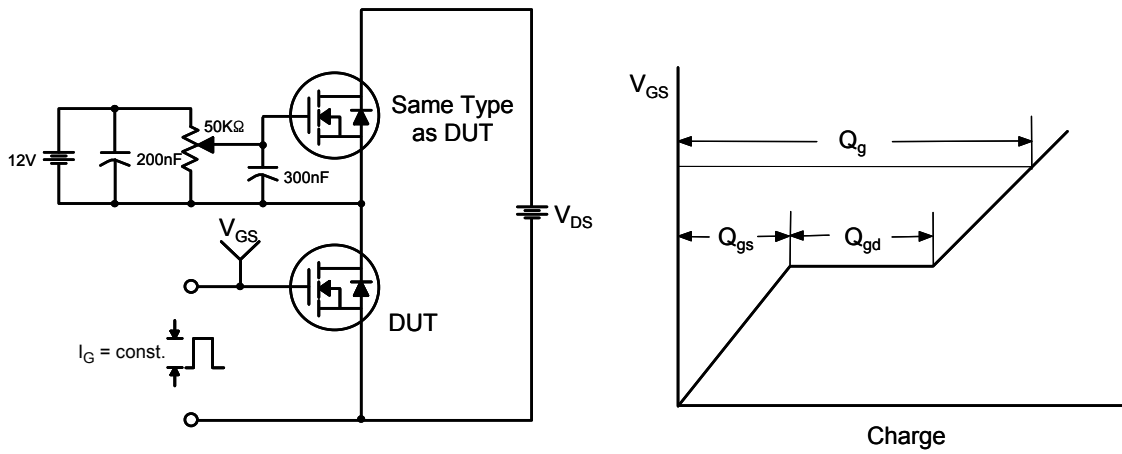


Figure 13. Resistive Switching Test Circuit & Waveforms

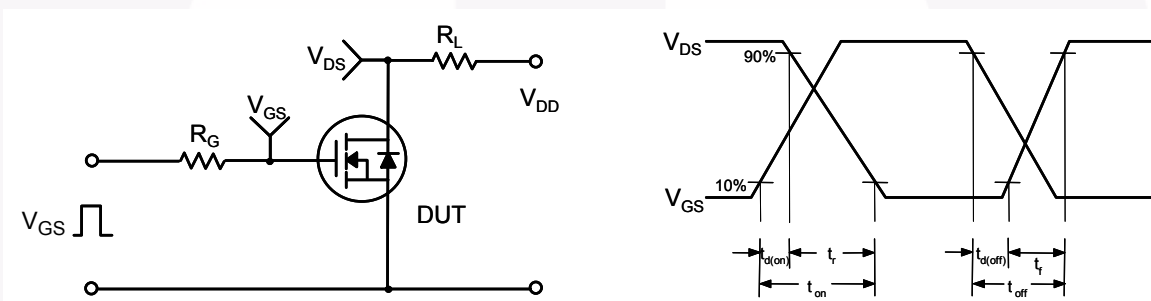


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

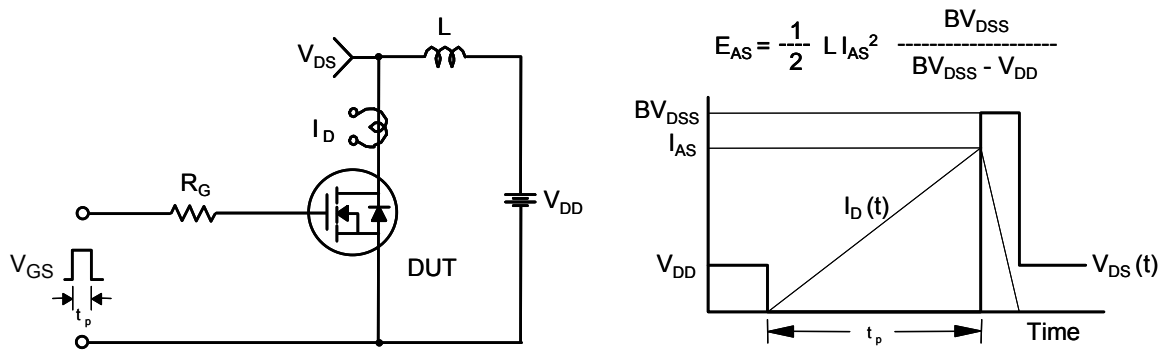
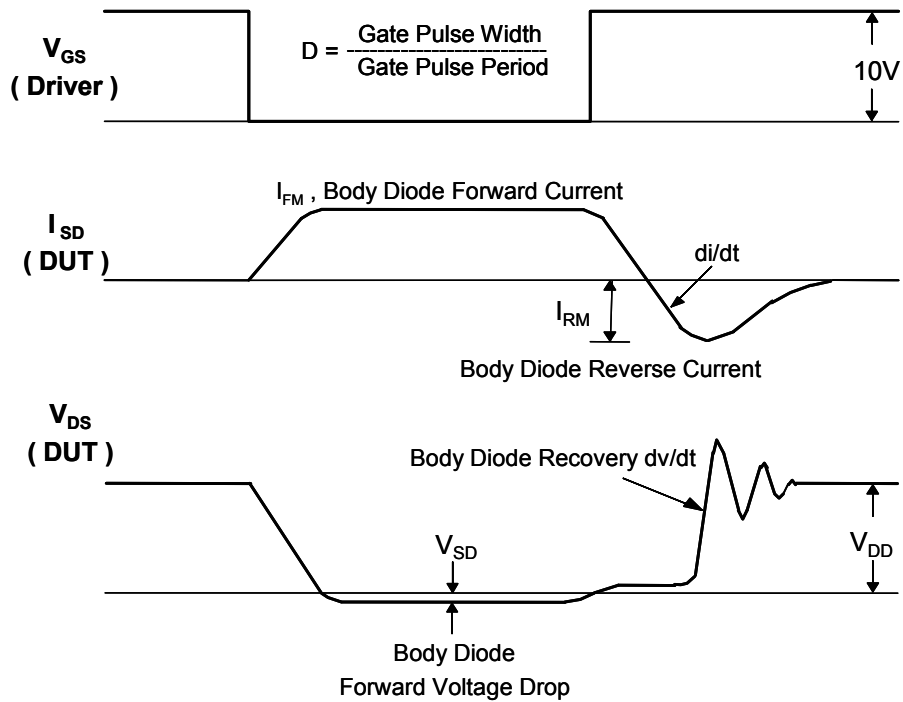
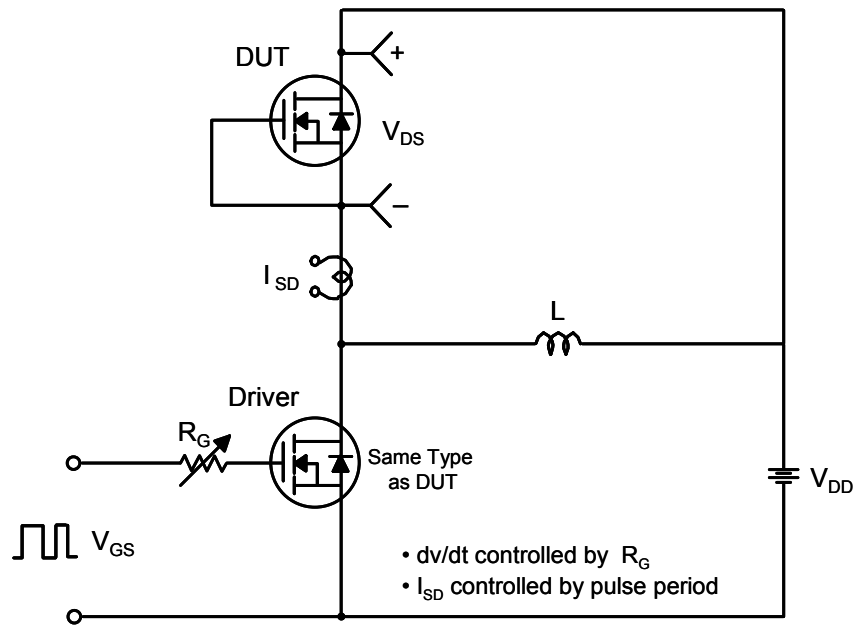
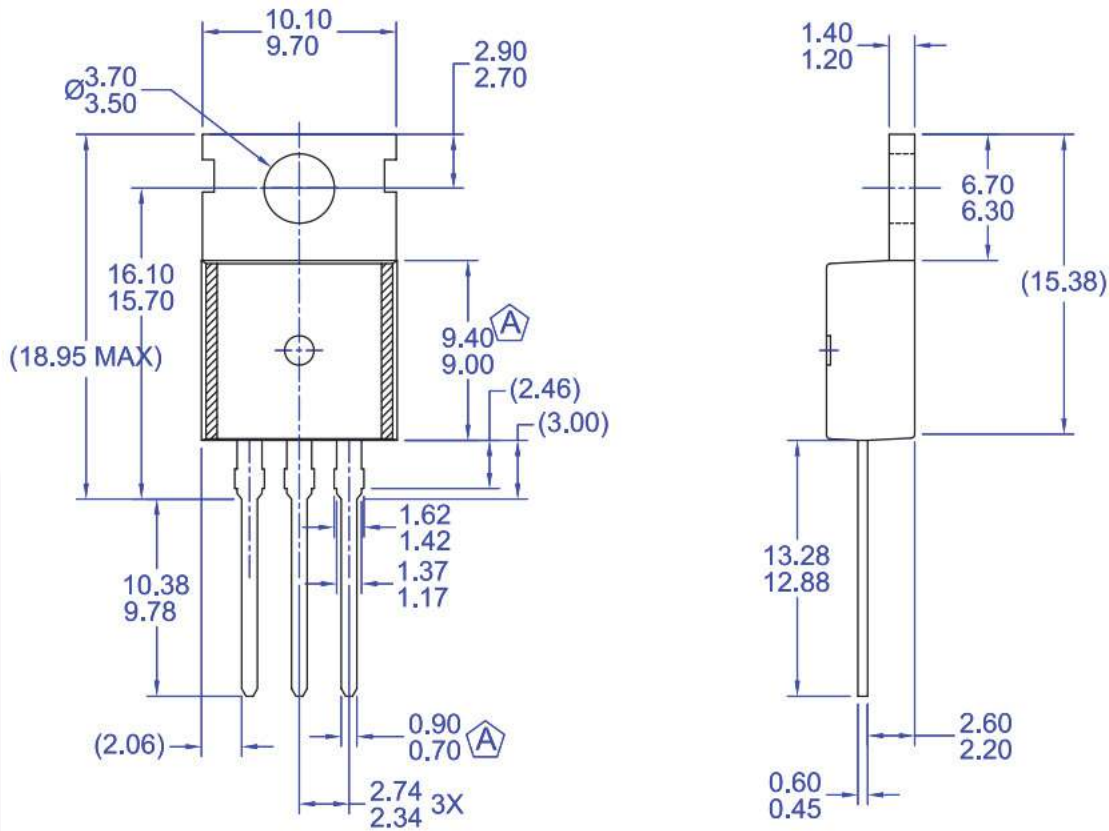


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions



NOTES:

- A) CONFORMS TO JEDEC TO-220 VARIATION AB EXCEPT WHERE NOTED
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D) DRAWING FILE/REVISION: MKT-TO220Y03REV1

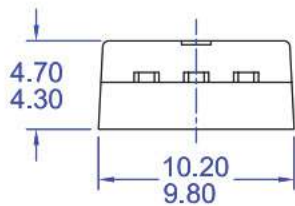


Figure 16. TO220, Molded, 3-Lead, Jedec Variation AB

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Mechanical Dimensions

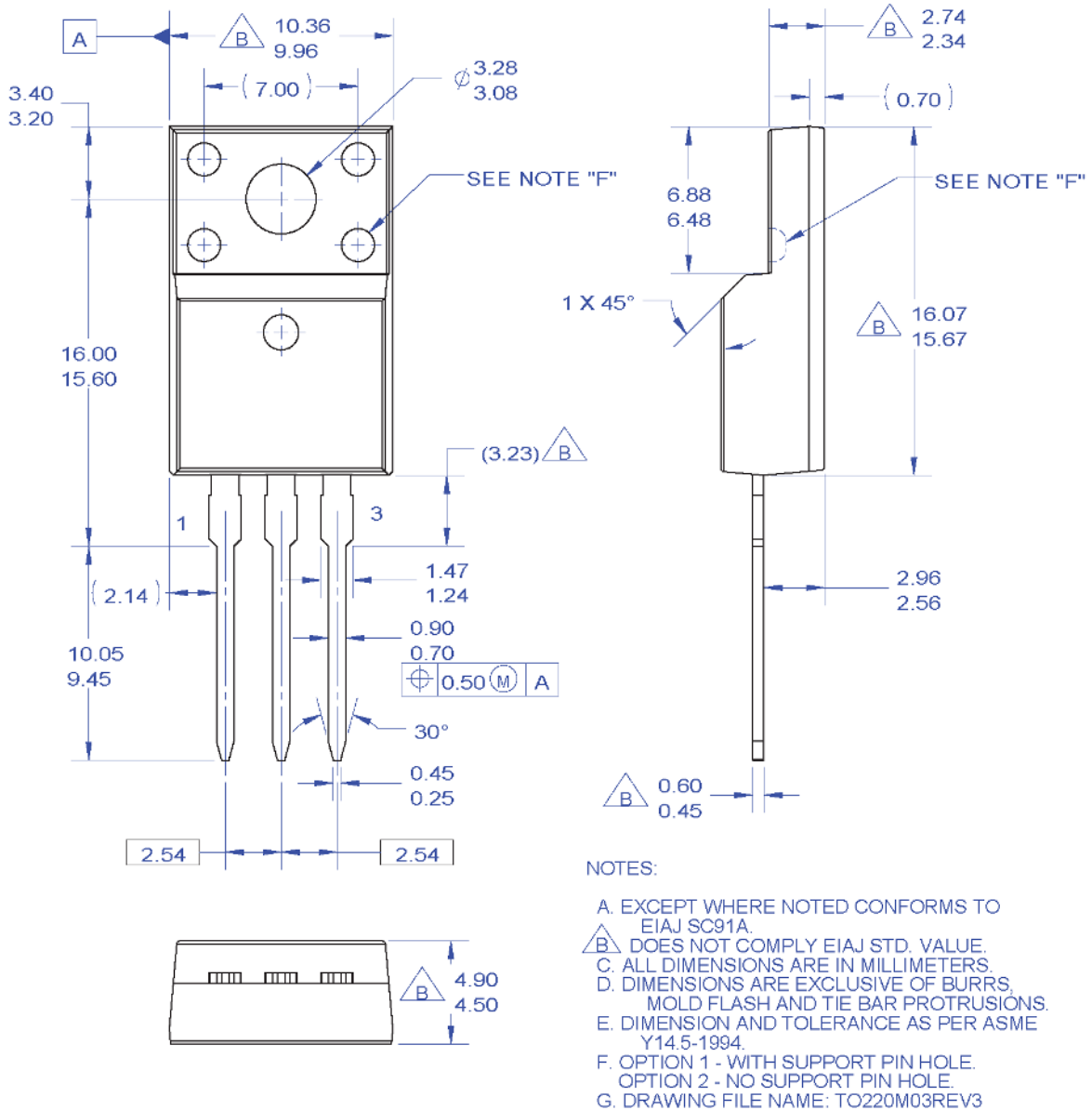


Figure 17. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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