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FQP32N20C / FQPF32N20C

N-Channel QFET® MOSFET

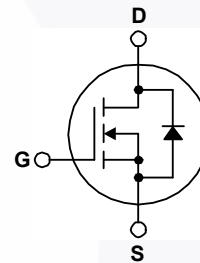
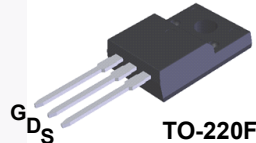
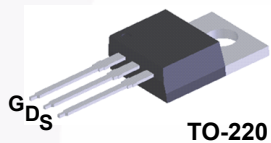
200 V, 28 A, 82 mΩ

Features

- 28 A, 200 V, $R_{DS(on)} = 82 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 14 \text{ A}$
- Low Gate Charge (Typ. 82.5 nC)
- Low C_{rss} (Typ. 185 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.



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

Symbol	Parameter	FQP32N20C	FQPF32N20C	Unit
V_{DSS}	Drain to Source Voltage	200		V
I_D	Drain Current	-Continuous ($T_C = 25^\circ\text{C}$)	28.0	28.0 *
		-Continuous ($T_C = 100^\circ\text{C}$)	17.8	17.8 *
I_{DM}	Drain Current - Pulsed (Note 1)	112	112 *	A
V_{GSS}	Gate to Source Voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	955		mJ
I_{AR}	Avalanche Current (Note 1)	28.0		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	15.6		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	156	50	W
		1.25	0.4	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 Purpose, 1/8" from Case for 5 Seconds	300		$^\circ\text{C}$

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FQP32N20C	FQPF32N20C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	0.8	2.51	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	62.5	62.5	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQP32N20C	FQP32N20C	TO-220	Tube	N/A	50 units
FQPF32N20C	FQPF32N20C	TO-220F	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	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	200	--	--	V	
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.24	--	$\text{V}/^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	μA	
		$V_{DS} = 160\text{ V}, T_C = 125^\circ\text{C}$	--	--	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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 14\text{ A}$	--	0.068	0.082	Ω	
g_{FS}	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 14\text{ A}$	--	20	--	S	
Dynamic Characteristics							
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	--	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	$V_{DD} = 100\text{ V}, I_D = 32\text{ A}, R_G = 25\ \Omega$	--	25	60	ns	
t_r	Turn-On Rise Time		--	270	550	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4)	--	245	500	ns
t_f	Turn-Off Fall Time		(Note 4)	--	210	430	ns
Q_g	Total Gate Charge	$V_{DS} = 160\text{ V}, I_D = 32\text{ A}, V_{GS} = 10\text{ V}$	--	82.5	110	nC	
Q_{gs}	Gate-Source Charge		(Note 4)	--	10.5	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4)	--	44.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	28	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	112	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 28\text{ A}$	--	--	1.5	V	
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 32\text{ A}, di_F / dt = 100\text{ A}/\mu\text{s}$	--	265	--	ns	
Q_{rr}	Reverse Recovery Charge		--	2.73	--	μC	

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. $L = 1.4\text{ mH}, I_{AS} = 32\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 28\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

Typical Characteristics

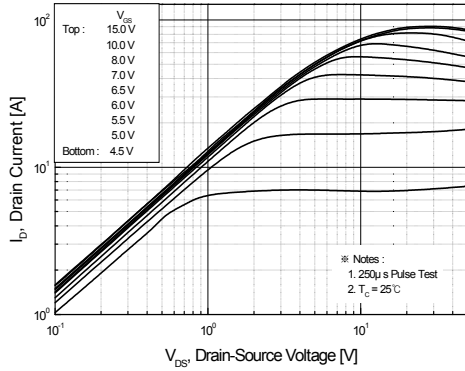


Figure 1. On-Region Characteristics

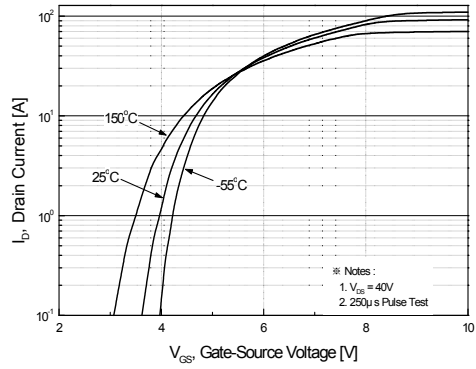


Figure 2. Transfer Characteristics

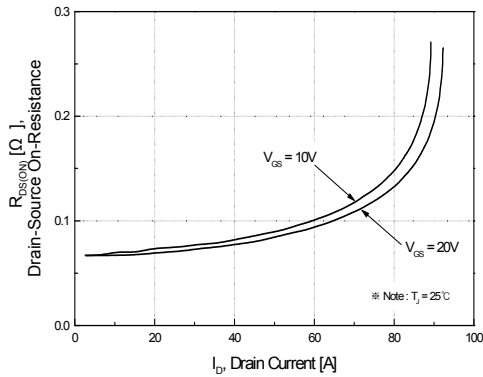


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

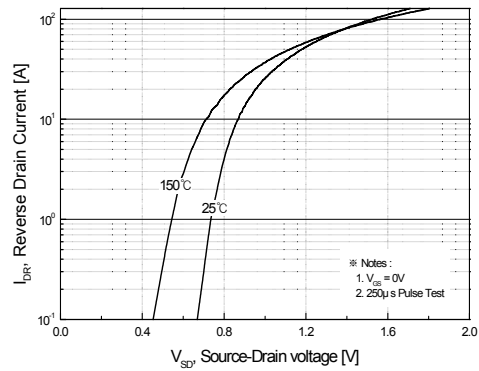


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

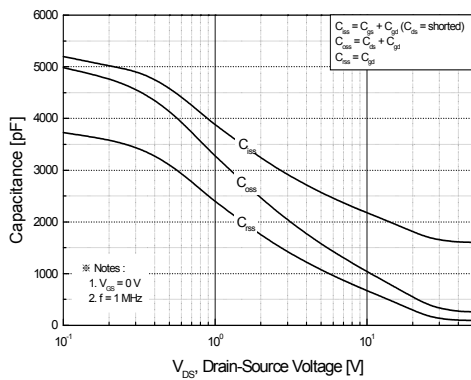


Figure 5. Capacitance Characteristics

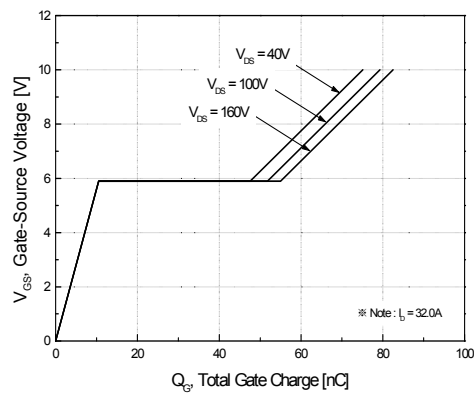


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

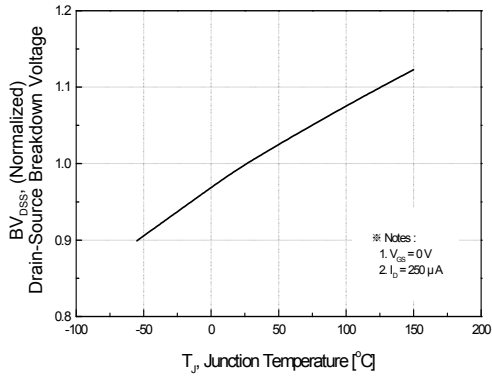


Figure 7. Breakdown Voltage Variation vs Temperature

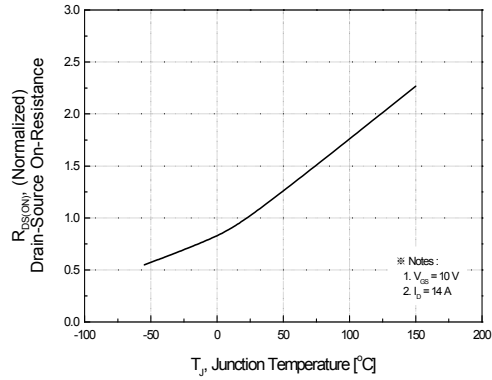


Figure 8. On-Resistance Variation vs Temperature

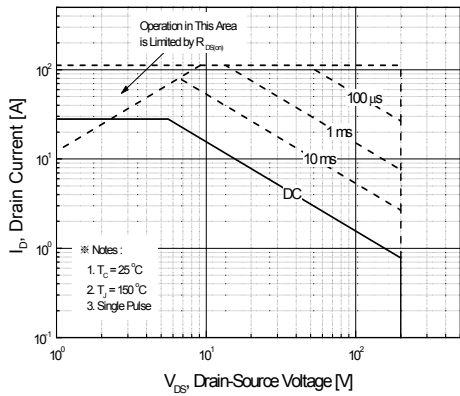


Figure 9-1. Maximum Safe Operating Area for FQP32N20C

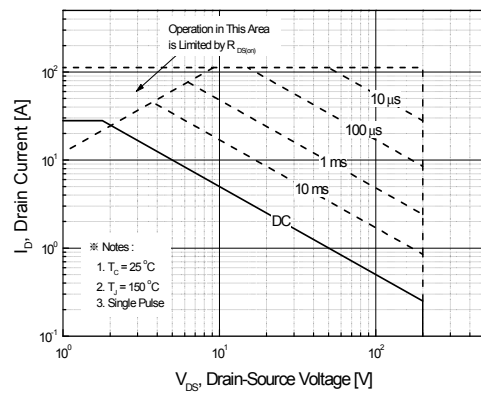


Figure 9-2. Maximum Safe Operating Area for FQPF32N20C

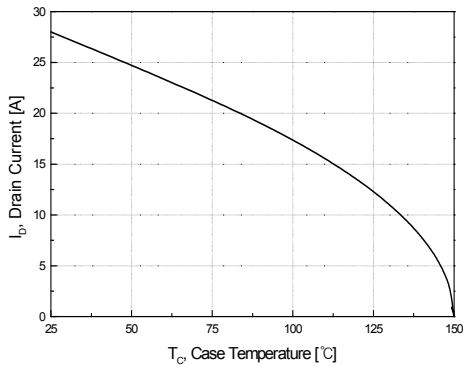


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

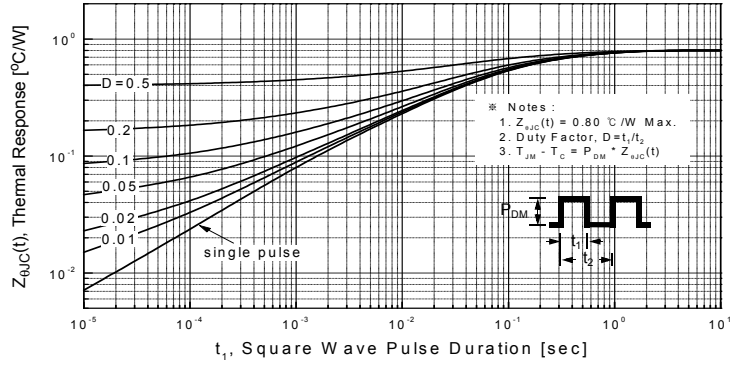


Figure 11-1. Transient Thermal Response Curve for FQP32N20C

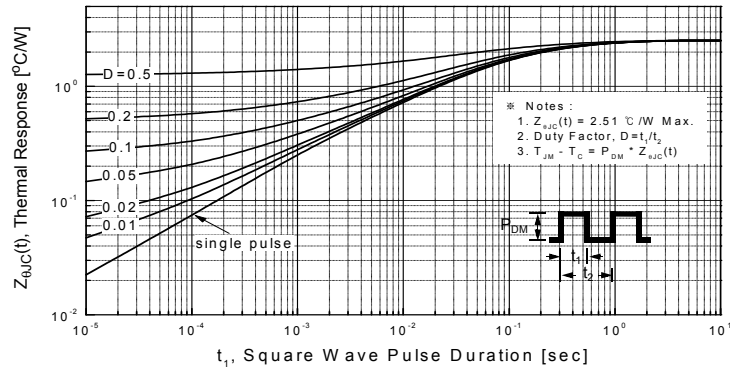


Figure 11-2. Transient Thermal Response Curve for FQPF32N20C

Figure 12. Gate Charge Test Circuit & Waveform

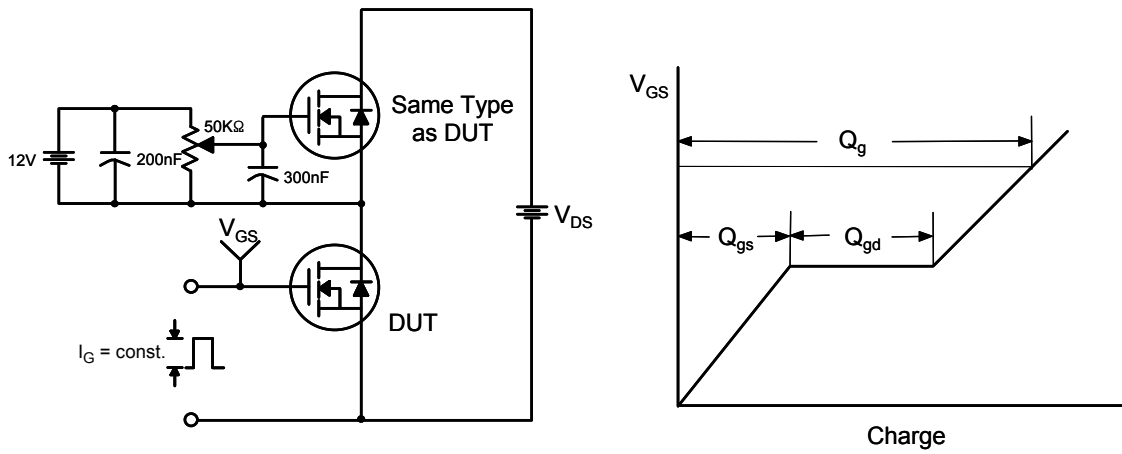


Figure 13. Resistive Switching Test Circuit & Waveforms

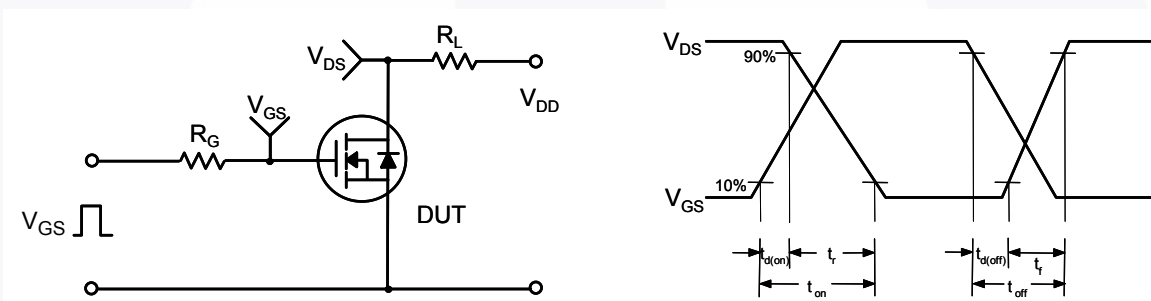


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

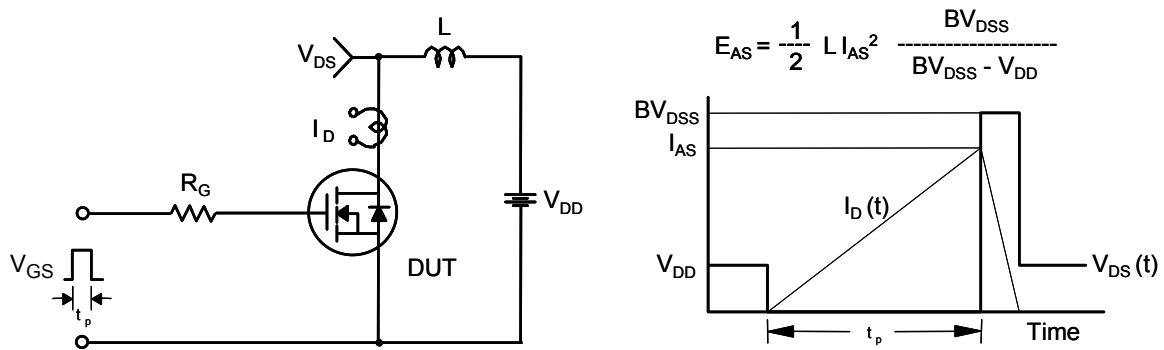
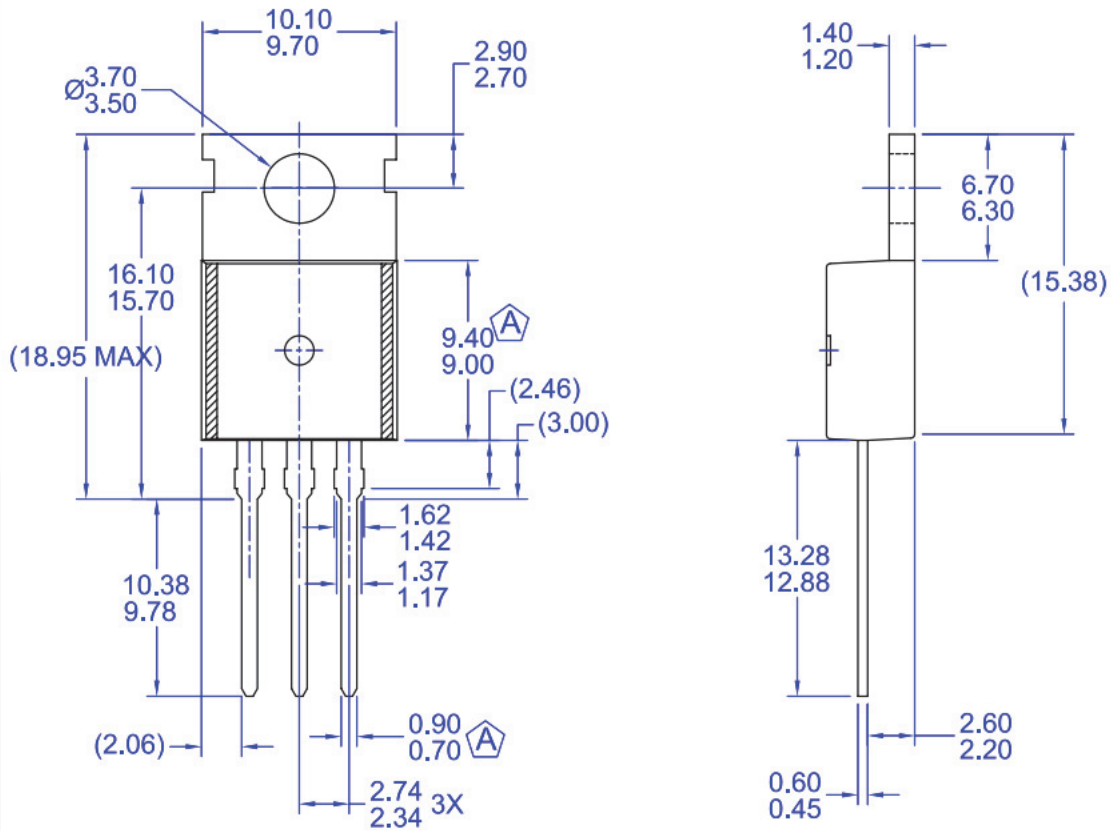


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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



NOTES:

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- B. DOES NOT COMPLY EIAJ STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- F. OPTION 1 - WITH SUPPORT PIN HOLE.
OPTION 2 - NO SUPPORT PIN HOLE.
- G. DRAWING FILE NAME: TO220M03REV3

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

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