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# FQP4N80

## N-Channel QFET® MOSFET

800 V, 3.9 A, 3.6 Ω

### 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.

### Features

- 3.9 A, 800 V,  $R_{DS(on)} = 3.6 \Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 1.95 \text{ A}$
- Low Gate Charge (Typ. 19 nC)
- Low  $C_{rss}$  (Typ. 8.6 pF)
- 100% Avalanche Test



### Absolute Maximum Ratings

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

Symbol	Parameter	FQP4N80	Unit
$V_{DS}$	Drain-Source Voltage	800	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )	3.9	A
	- Continuous ( $T_C = 100^\circ\text{C}$ )	2.47	A
	Drain Current - Pulsed (Note 1)	15.6	A
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	460	mJ
$I_{AR}$	Avalanche Current (Note 1)	3.9	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	13	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)	4.0	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	130	W
	- Derate above $25^\circ\text{C}$	1.04	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	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FQP4N80	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.96	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP4N80	FQP4N80	TO-220	Tube	N/A	N/A	50 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	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	800	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.95	--	V/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	--	--	2	$\mu\text{A}$
		$V_{DS} = 640\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSSF}$	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	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 3.9\text{ A}$	--	2.8	3.6	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 3.9\text{ A}$	--	3.8	--	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	--	680	880	pF
$C_{oss}$	Output Capacitance	1.0 MHz	--	75	100	pF
$C_{rss}$	Reverse Transfer Capacitance		--	8.6	12	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}, I_D = 3.9\text{ A}, R_G = 25\text{ }\Omega$ (Note 4)	--	16	40	ns
$t_r$	Turn-On Rise Time		--	45	100	ns
$t_{d(off)}$	Turn-Off Delay Time		--	35	80	ns
$t_f$	Turn-Off Fall Time		--	35	80	ns
$Q_{gs}$	Gate-Source Charge	$V_{DS} = 640\text{ V}, I_D = 3.9\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	--	19	25	nC
$Q_{gd}$	Gate-Drain Charge		--	4.2	--	nC
			--	9.1	--	nC

### Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current		--	--	3.9	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		--	--	15.6	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 3.9\text{ A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 3.9\text{ A},$	--	575	--	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F / dt = 100\text{ A}/\mu\text{s}$	--	3.65	--	$\mu\text{C}$

#### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2.  $L = 57\text{ mH}, I_{AS} = 3.9\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\text{ }\Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 3.9\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature.

## Typical Characteristics

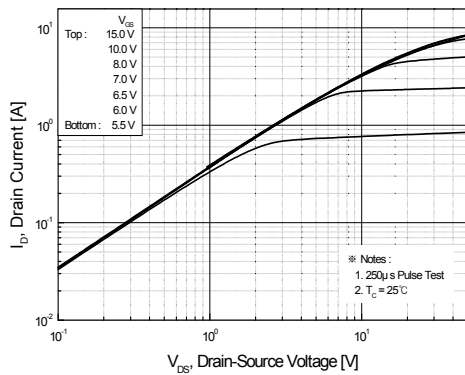


Figure 1. On-Region Characteristics

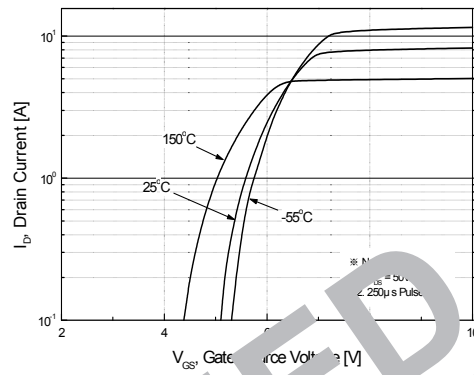


Figure 2. Transfer Characteristics

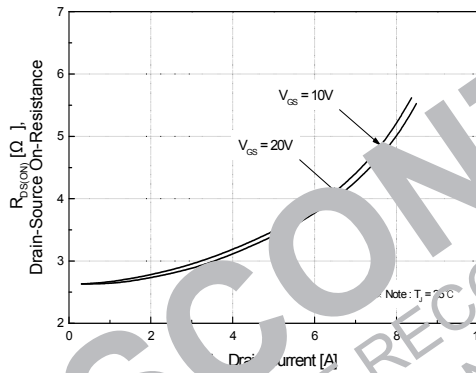


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

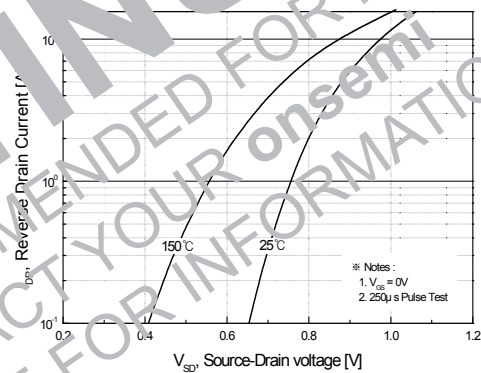


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

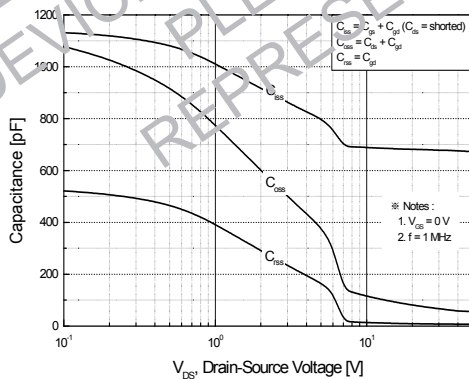


Figure 5. Capacitance Characteristics

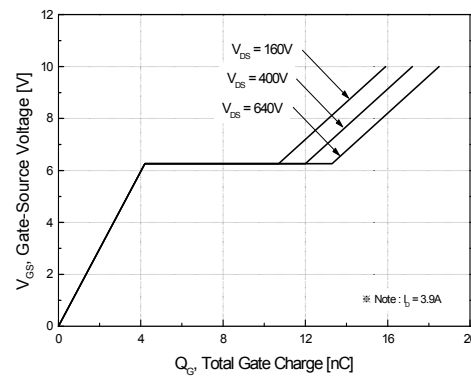


Figure 6. Gate Charge Characteristics

## Typical Characteristics (continued)

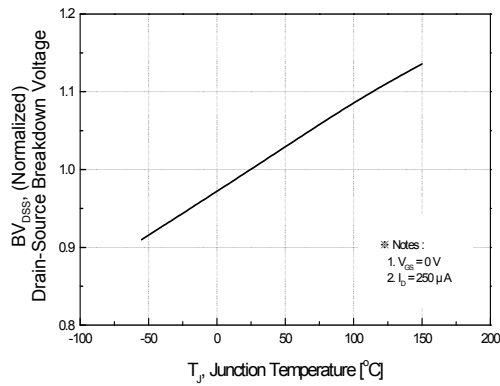


Figure 7. Breakdown Voltage Variation vs. Temperature

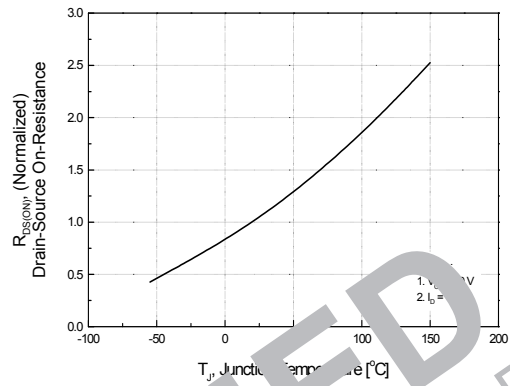


Figure 8. On-Resistance Variation vs. Temperature

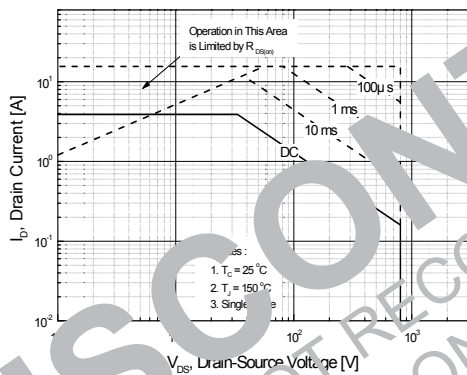


Figure 9. Maximum Safe Operating Area

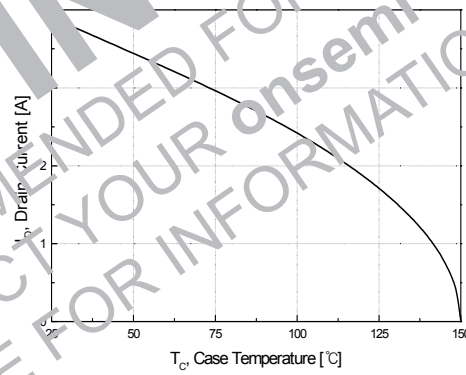


Figure 10. Maximum Drain Current vs. Case Temperature

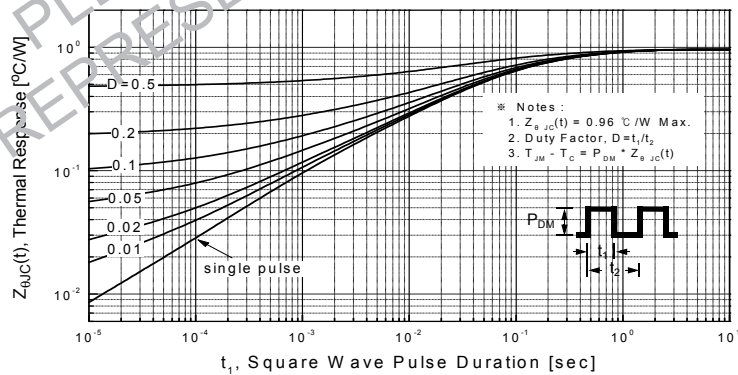
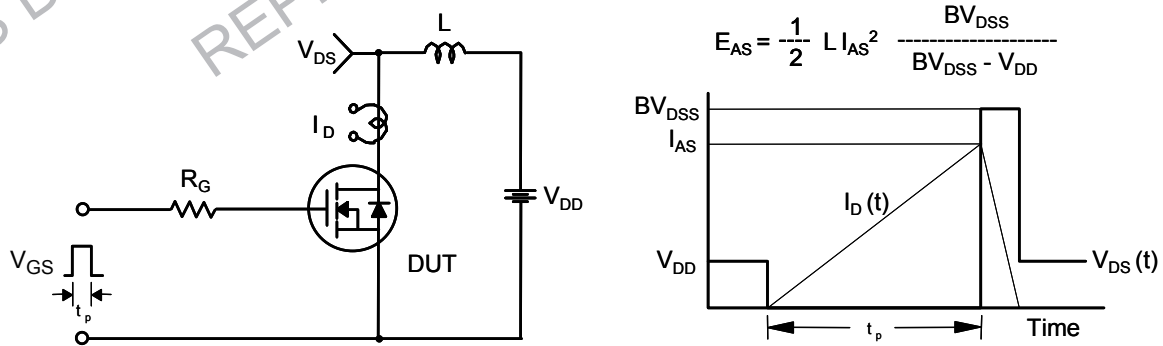
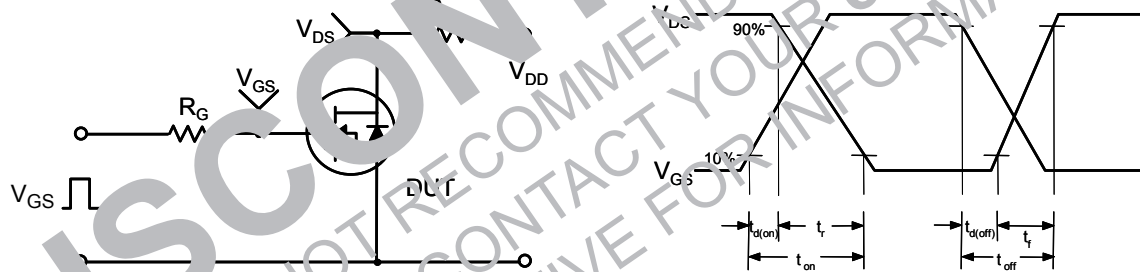
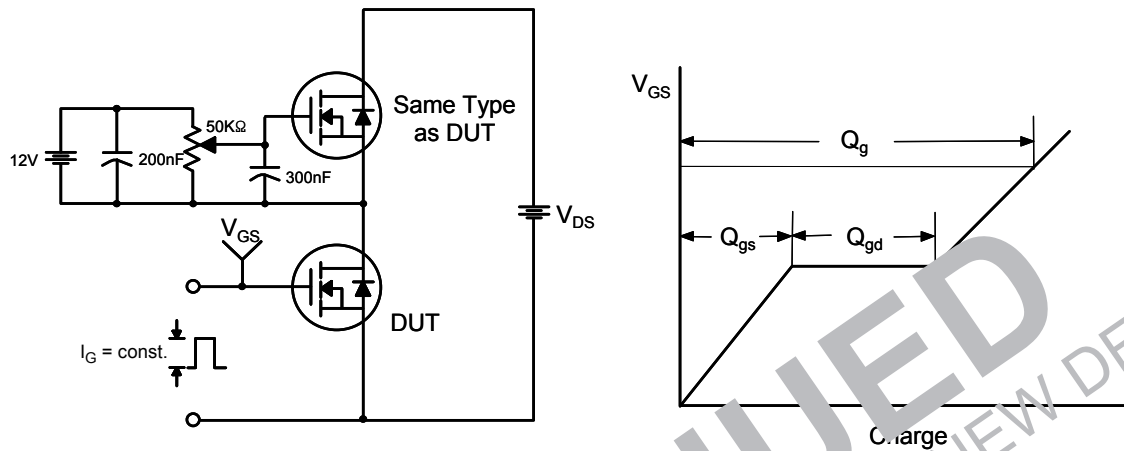
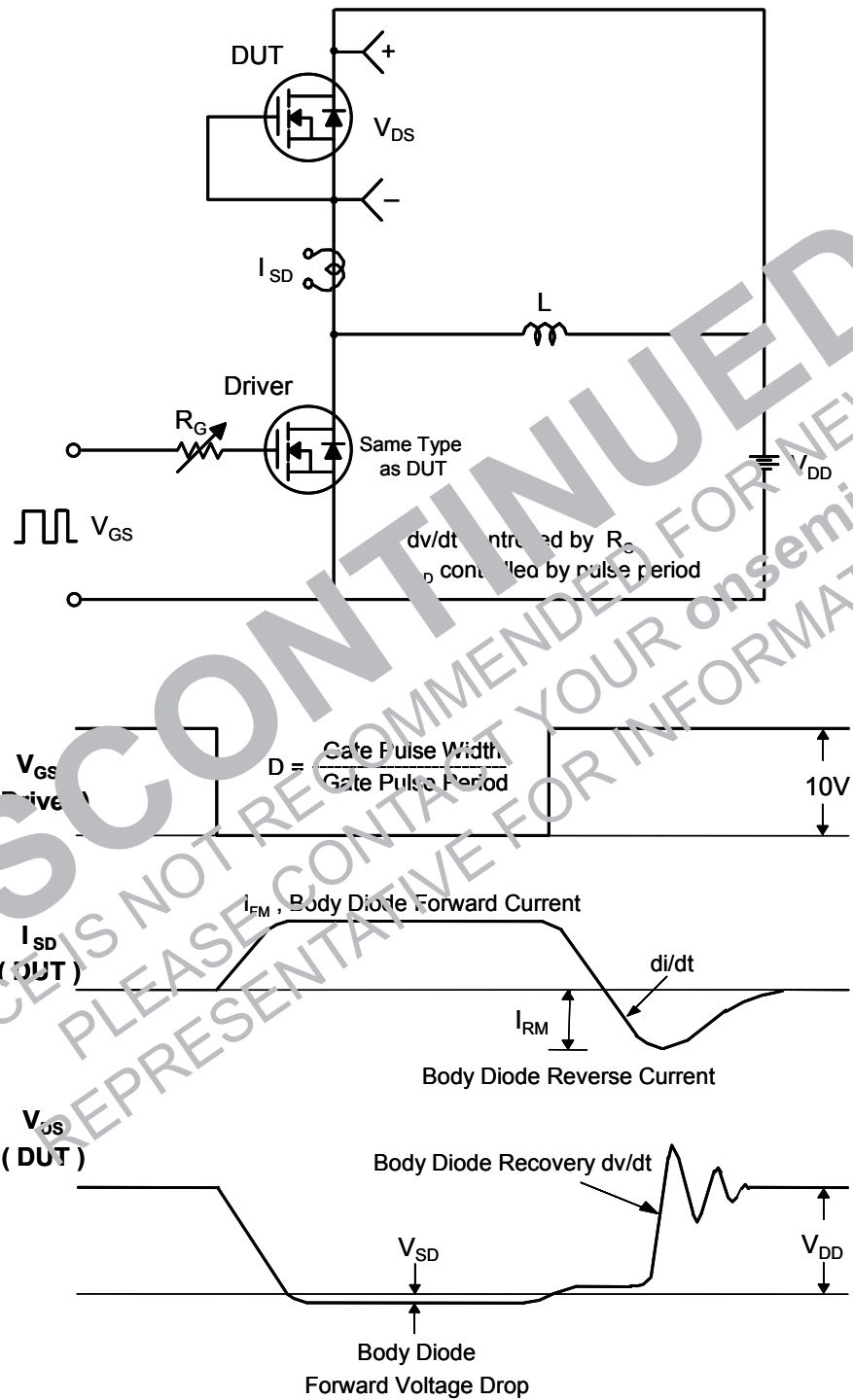


Figure 11. Transient Thermal Response Curve







## Mechanical Dimensions

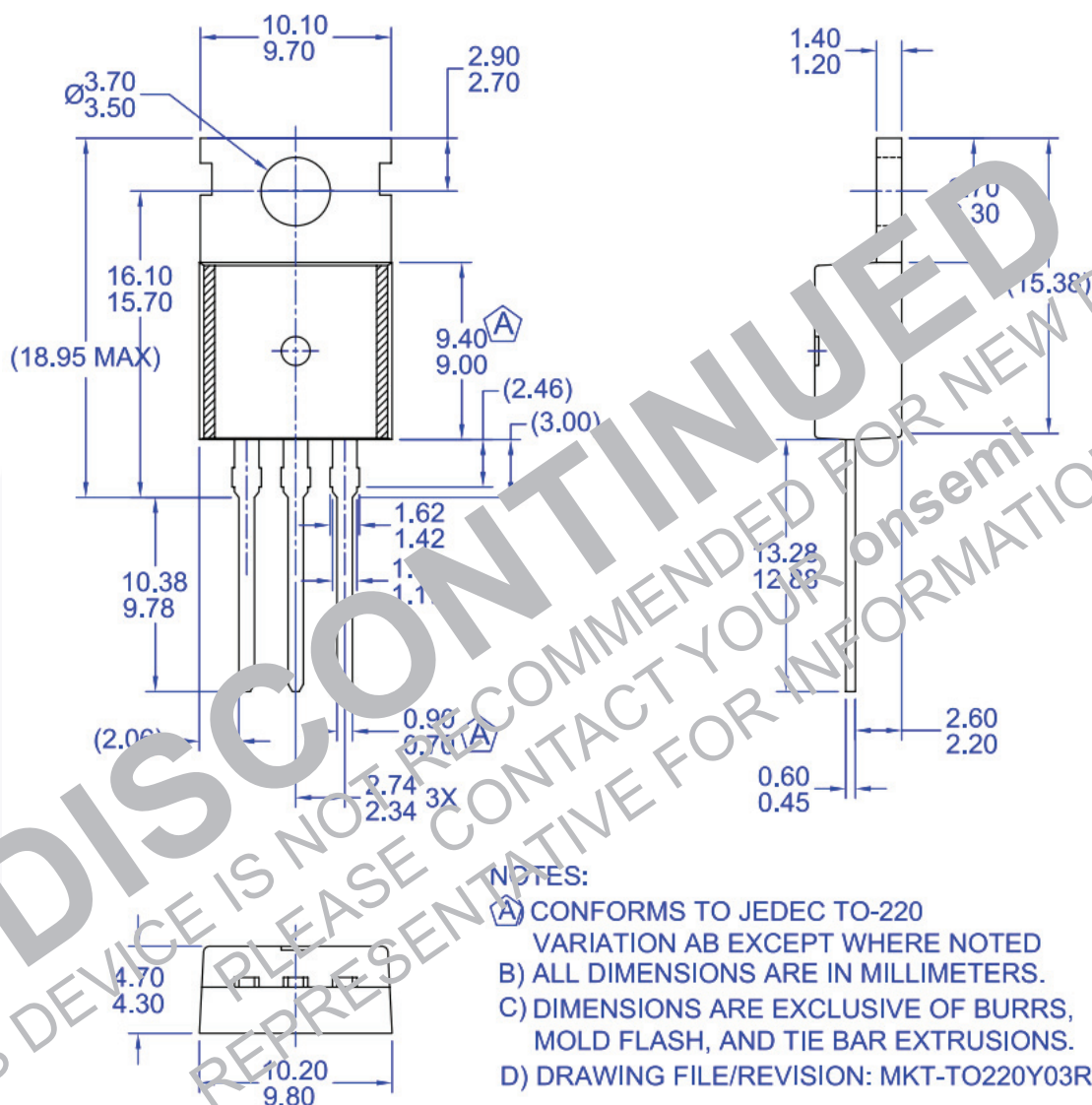


Figure 16. TO220, Molded, 3-Lead, Jedec Variation AB

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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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Rev. 166

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