FAIRCHILD SEMICONDUCTOR®

November 2010

SupreMOS^{TM}

FCP36N60N
N-Channel MOSFET
600V, 36A, 90mΩ

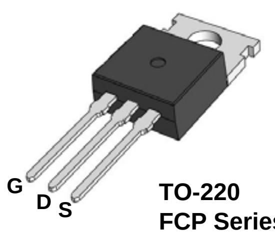
Features

- $R_{DS(on)}$ = 81mΩ (Typ.)@ V_{GS} = 10V, I_D = 18A
- Ultra low gate charge (Typ. Qg = 86nC)
- Low effective output capacitance
- 100% avalanche tested
- RoHS compliant

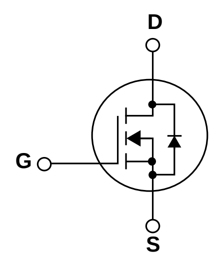
Description

The SupreMOS MOSFET, Fairchild's next generation of high voltage super-junction MOSFETs, employs a deep trench filling process that differentiates it from preceding multi-epi based technologies. By utilizing this advanced technology and precise process control, SupreMOS provides world class Rsp, superior switching performance and ruggedness.

This SupreMOS MOSFET fits the industry's AC-DC SMPS requirements for PFC, server/telecom power, FPD TV power, ATX power, and industrial power applications.



TO-220
FCP Series



MOSFET Maximum Ratings $T_C = 25^oC$ unless otherwise noted*

Symbol	Parameter		FCP36N60N	Units
V_{DSS}	Drain to Source Voltage		600	V
V_{GSS}	Gate to Source Voltage		±30	V
I_D	Drain Current	-Continuous ($T_C = 25^oC$)	36	A
		-Continuous ($T_C = 100^oC$)	22.7	
I_{DM}	Drain Current	- Pulsed (Note 1)	108	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		1800	mJ
I_{AR}	Avalanche Current		12	A
E_{AR}	Repetitive Avalanche Energy		3.12	mJ
dv/dt	MOSFET dv/dt Ruggedness		100	V/ns
	Peak Diode Recovery dv/dt (Note 3)		20	V/ns
P_D	Power Dissipation	($T_C = 25^oC$)	312	W
		- Derate above 25^oC	2.6	W/^{o}C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	^{o}C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	^{o}C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FCP36N60N	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.4	^{o}C/W
$R_{\theta CS}$	Thermal Resistance, Case to Heat Sink (Typical)	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCP36N60N	FCP36N60N	TO-220	-	-	50

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 1mA, V_{GS} = 0V, T_C = 25^{o}C	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 1mA, Referenced to 25^{o}C	-	0.7	-	V/^{o}C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 480V, V_{GS} = 0V	-	-	10	μA
		V_{DS} = 480V, V_{GS} = 0V, T_C = 125^{o}C	-	-	100	μA
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 250μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 18A	-	81	90	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 40V, I_D = 18A	-	41	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 100V, V_{GS} = 0V f = 1MHz	-	3595	4785	pF
C_{oss}	Output Capacitance		-	149	200	pF
C_{rss}	Reverse Transfer Capacitance		-	4	6	pF
C_{oss}	Output Capacitance	V_{DS} = 380V, V_{GS} = 0V, f = 1MHz	-	80	-	pF
C_{oss}eff.	Effective Output Capacitance	V_{DS} = 0V to 380V, V_{GS} = 0V	-	361	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 380V, I_D = 18A, V_{GS} = 10V (Note 4)	-	86	112	nC
Q_{gs}	Gate to Source Gate Charge		-	15.4	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	26.4	-	nC
ESR	Equivalent Series Resistance (G-S)	Drain Open	-	1	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 380V, I_D = 18A R_G = 4.7Ω (Note 4)	-	23	56	ns
t_r	Turn-On Rise Time		-	22	54	ns
$t_{d(off)}$	Turn-Off Delay Time		-	94	198	ns
t_f	Turn-Off Fall Time		-	4	18	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	36	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	108	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 18A	-	-	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 18A dI_F/dt = 100A/μs	-	574	-	ns
Q_{rr}	Reverse Recovery Charge			10	-	μC

Notes:
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 12A, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 36A, di/dt ≤ 200A/μs, V_{DD} = 380V, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

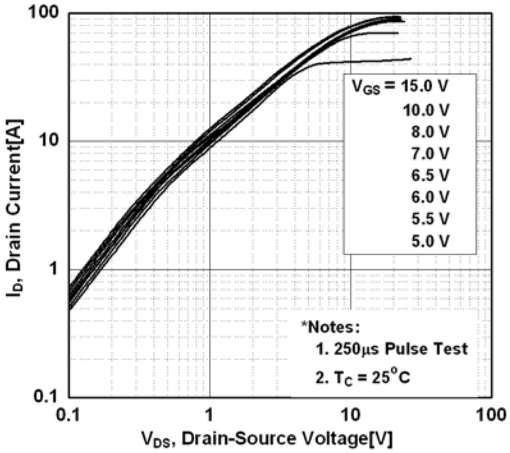


Figure 2. Transfer Characteristics

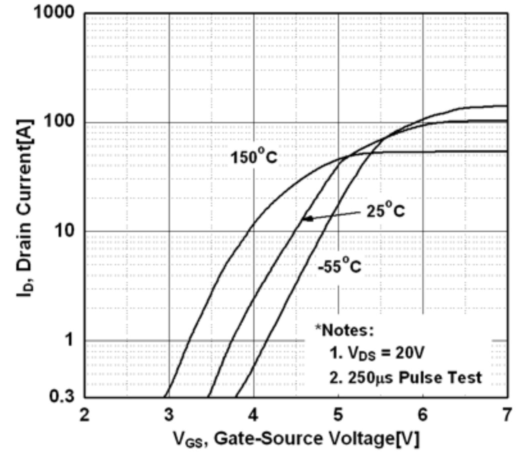


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

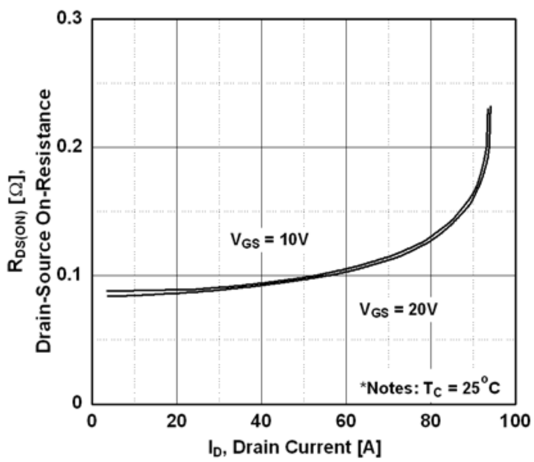


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

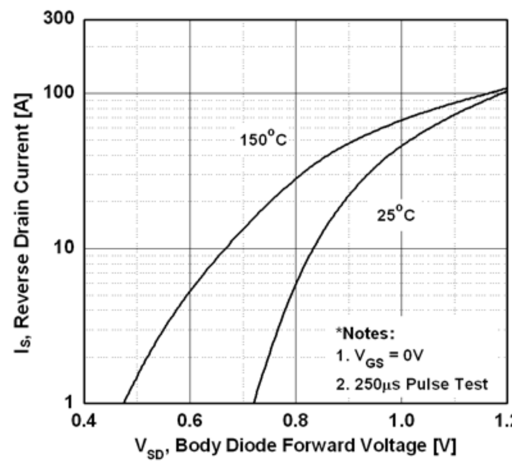


Figure 5. Capacitance Characteristics

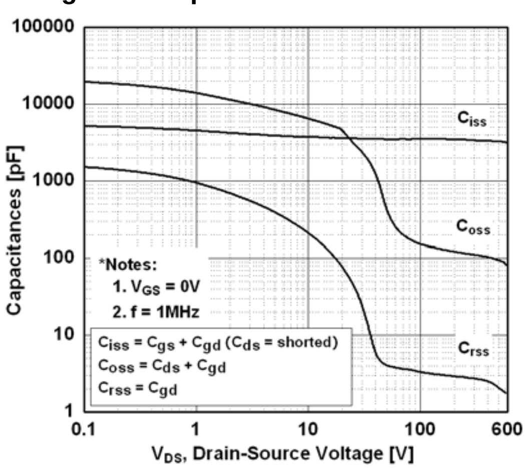
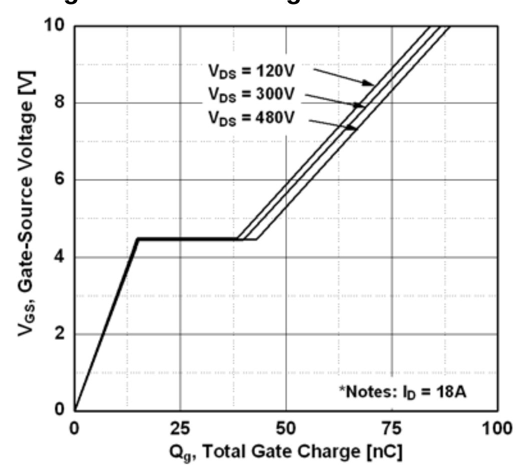


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

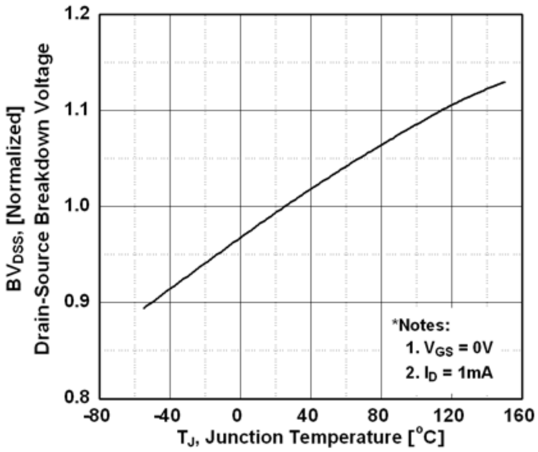


Figure 8. On-Resistance Variation vs. Temperature

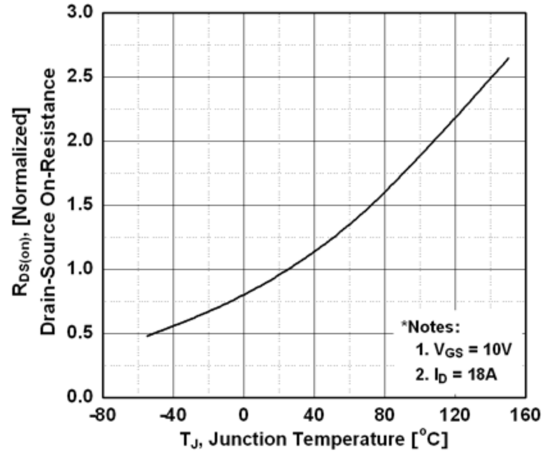


Figure 9. Maximum Safe Operating Area

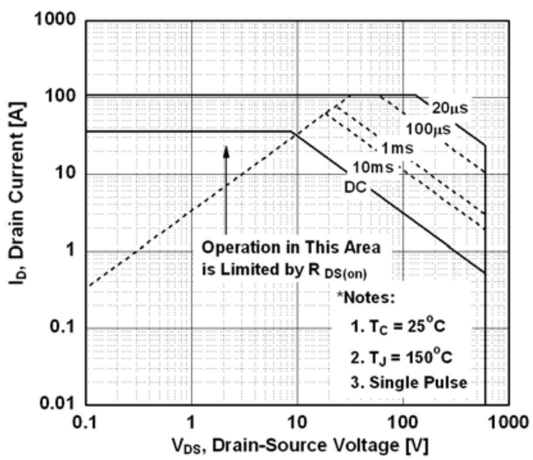


Figure 10. Maximum Drain Current vs. Case Temperature

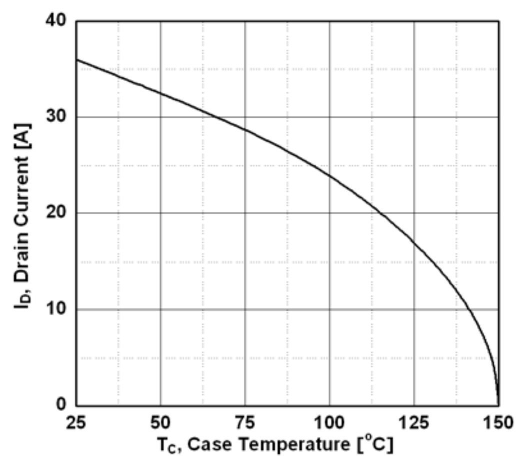
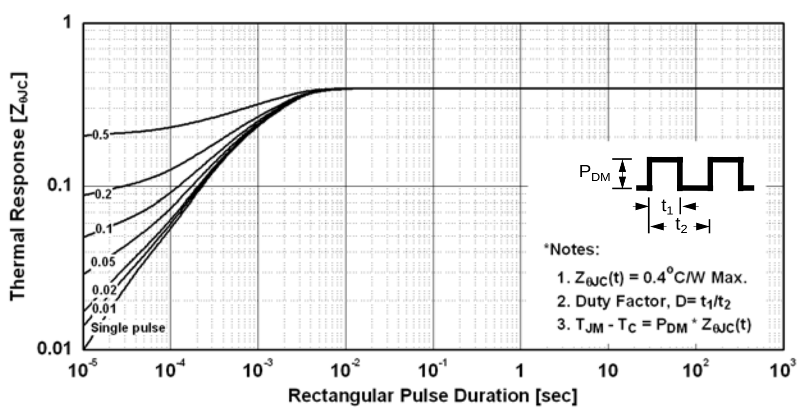
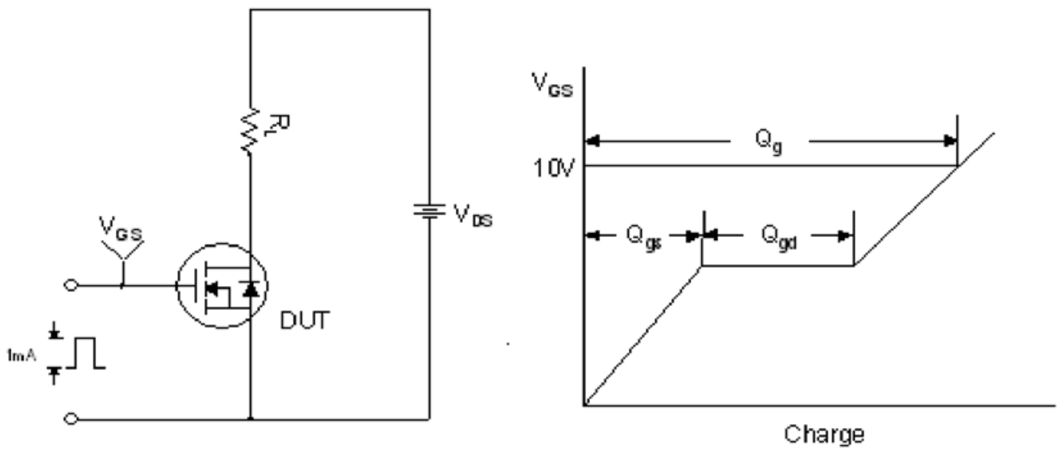


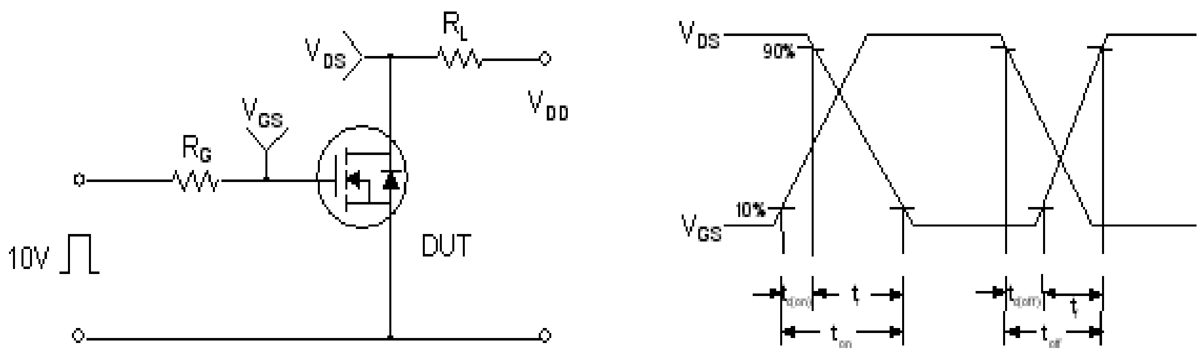
Figure 11. Transient Thermal Response Curve



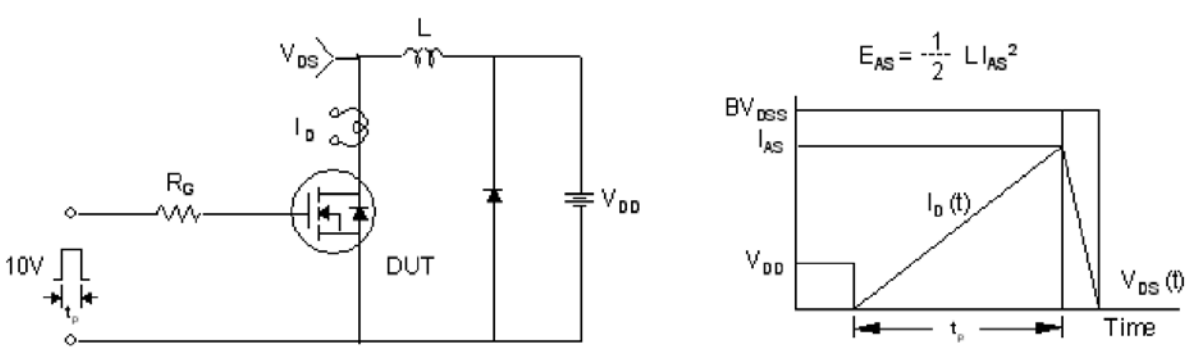
Gate Charge Test Circuit & Waveform



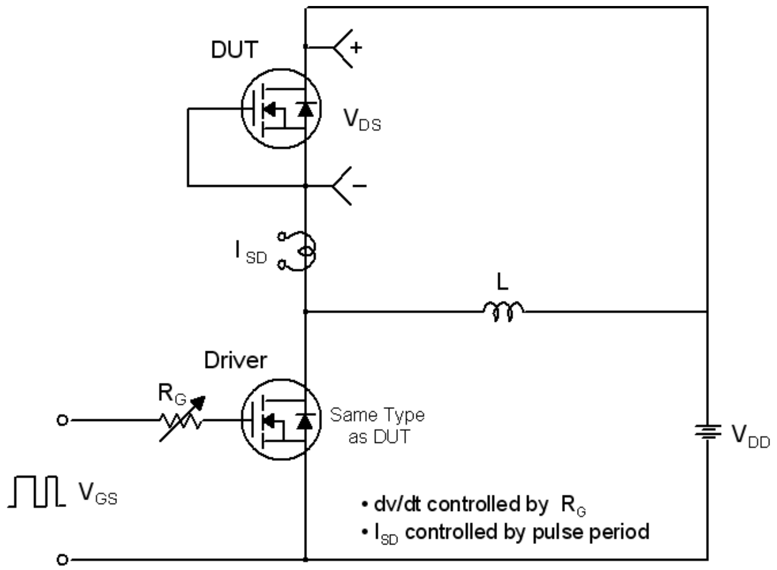
Resistive Switching Test Circuit & Waveforms

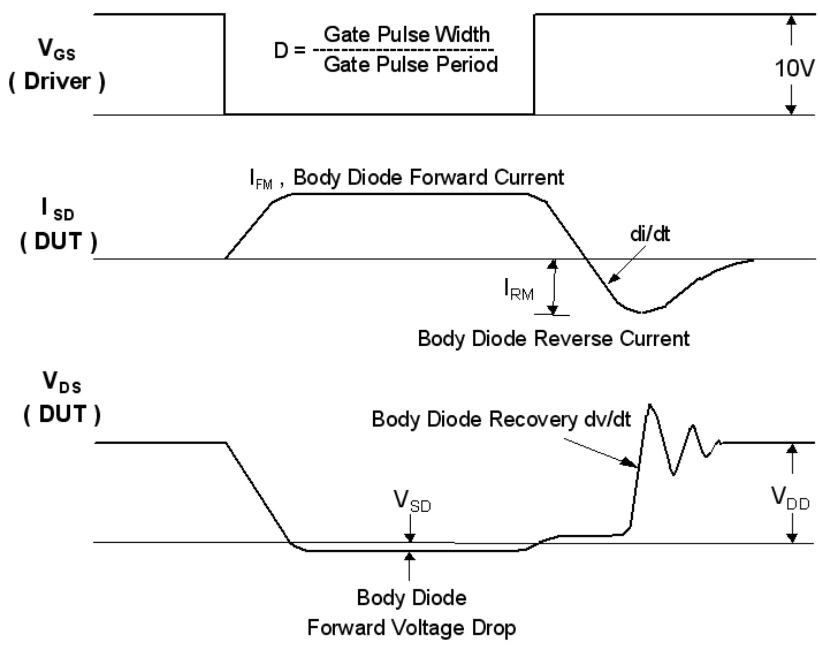


Unclamped Inductive Switching Test Circuit & Waveforms



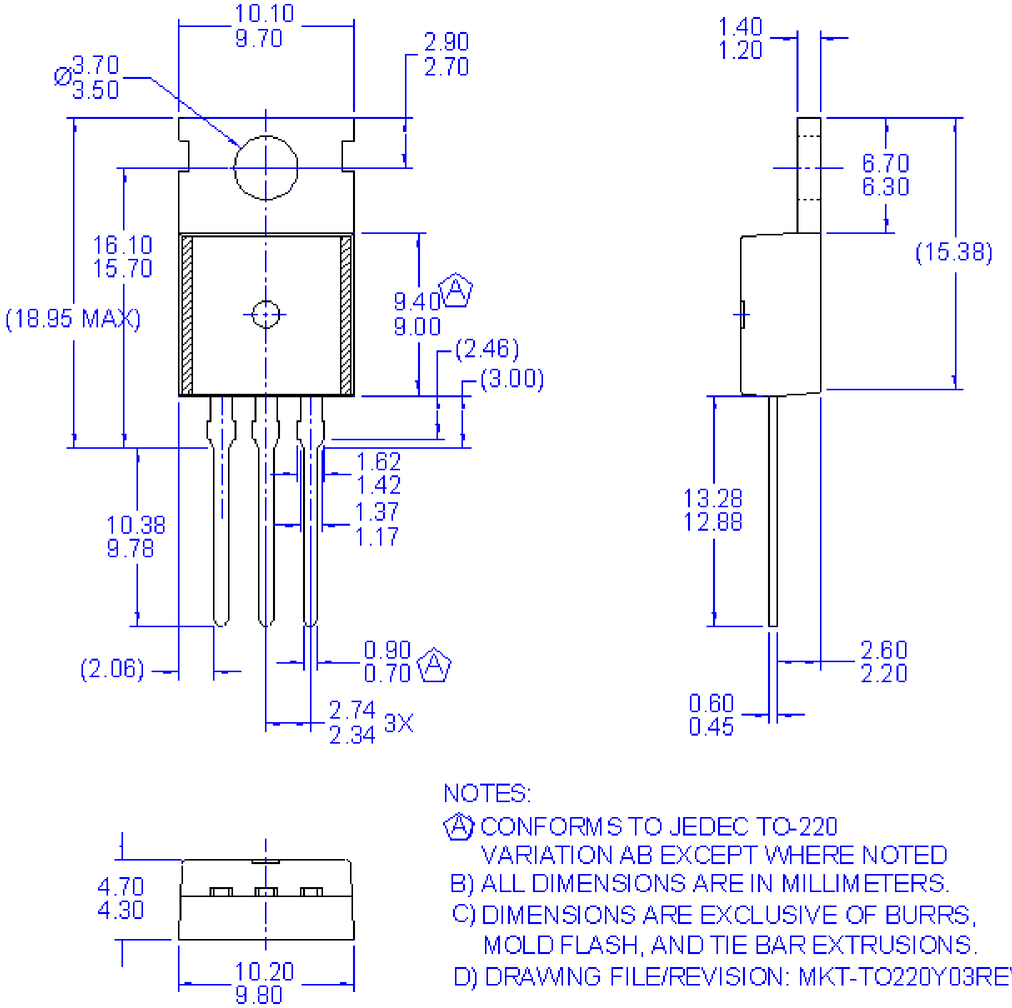
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

TO-220



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