

FCP36N60N

N-Channel MOSFET

600V, 36A, 90mΩ

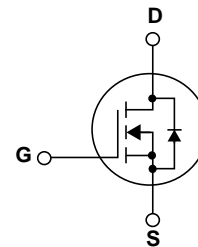
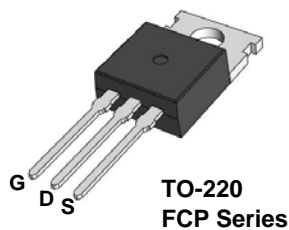
Features

- $R_{DS(on)} = 81m\Omega$ (Typ.) @ $V_{GS} = 10V, I_D = 18A$
- Ultra low gate charge (Typ. $Q_g = 86nC$)
- 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 R_{sp} , 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.



MOSFET Maximum Ratings $T_C = 25^\circ C$ 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 ($T_C = 25^\circ C$)	36
		-Continuous ($T_C = 100^\circ C$)	22.7
I_{DM}	Drain Current	- Pulsed (Note 1)	108
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1800
I_{AR}	Avalanche Current		12
E_{AR}	Repetitive Avalanche Energy		3.12
dv/dt	MOSFET dv/dt Ruggedness		100
	Peak Diode Recovery dv/dt (Note 3)		20
P_D	Power Dissipation	($T_C = 25^\circ C$)	312
		- Derate above $25^\circ C$	2.6
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ C$

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FCP36N60N	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.4	$^\circ C/W$
$R_{\theta CS}$	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 $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 1\text{mA}, V_{GS} = 0\text{V}, T_C = 25^\circ\text{C}$	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{mA}, \text{Referenced to } 25^\circ\text{C}$	-	0.7	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 480\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 480\text{V}, V_{GS} = 0\text{V}, T_C = 125^\circ\text{C}$	-	-	10 100	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 18\text{A}$	-	81	90	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 40\text{V}, I_D = 18\text{A}$	-	41	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	3595	4785	pF
C_{oss}	Output Capacitance		-	149	200	pF
C_{rss}	Reverse Transfer Capacitance		-	4	6	pF
C_{oss}	Output Capacitance	$V_{DS} = 380\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	80	-	pF
$C_{oss,eff.}$	Effective Output Capacitance	$V_{DS} = 0\text{V to } 380\text{V}, V_{GS} = 0\text{V}$	-	361	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380\text{V}, I_D = 18\text{A},$ $V_{GS} = 10\text{V}$ (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	$V_{DD} = 380\text{V}, I_D = 18\text{A}$ $R_G = 4.7\Omega$ (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	$V_{GS} = 0\text{V}, I_{SD} = 18\text{A}$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 18\text{A}$	-	574	-	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	10	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 12\text{A}, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 36\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} = 380\text{V}, \text{Starting } T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

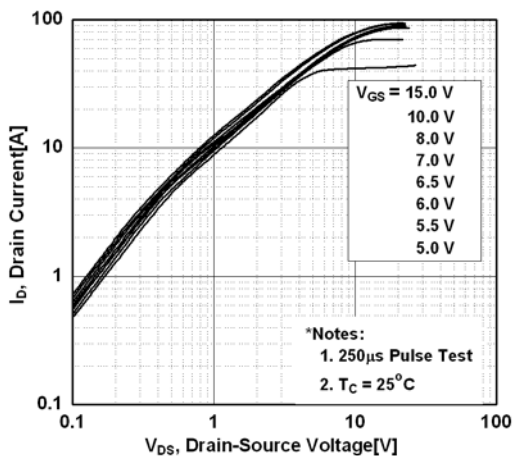


Figure 2. Transfer Characteristics

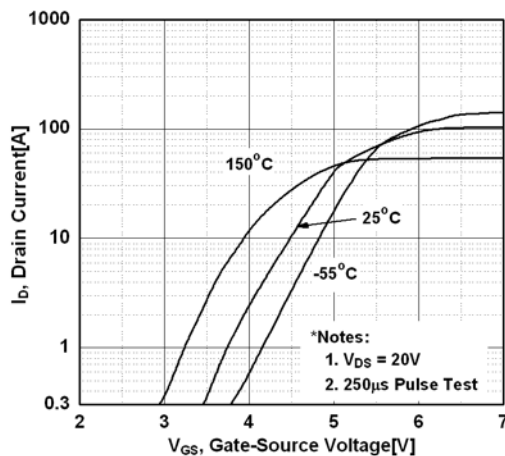


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

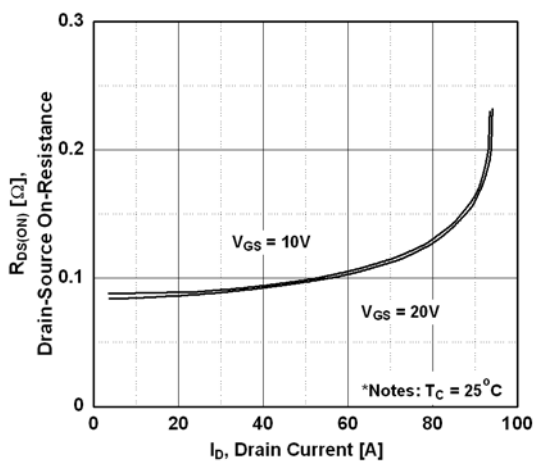


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

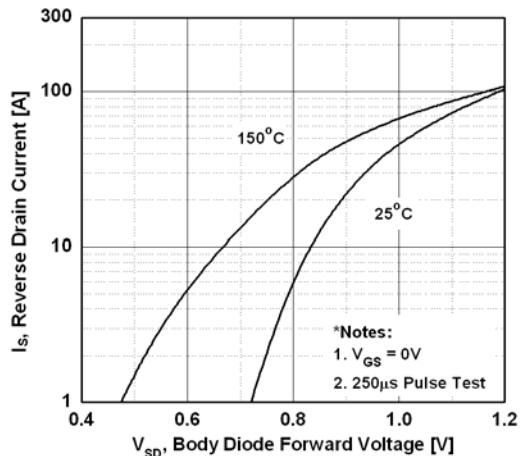


Figure 5. Capacitance Characteristics

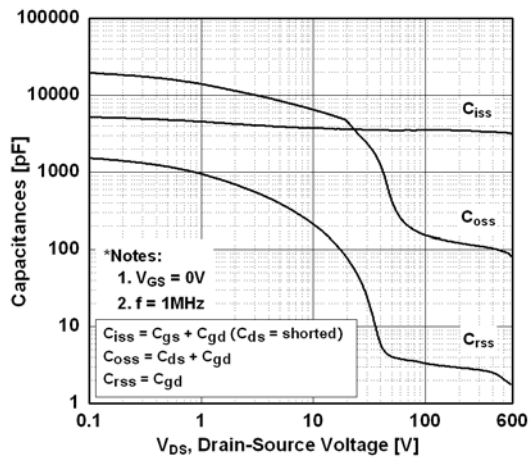
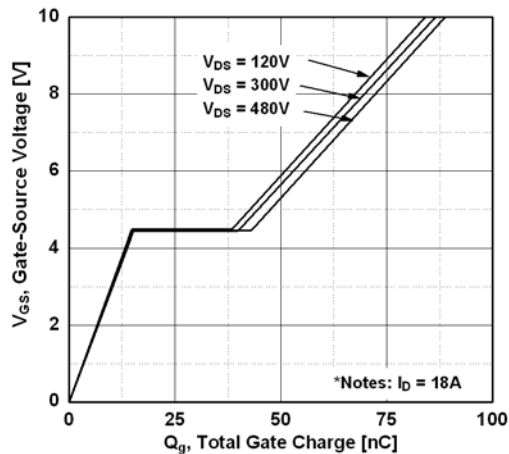


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

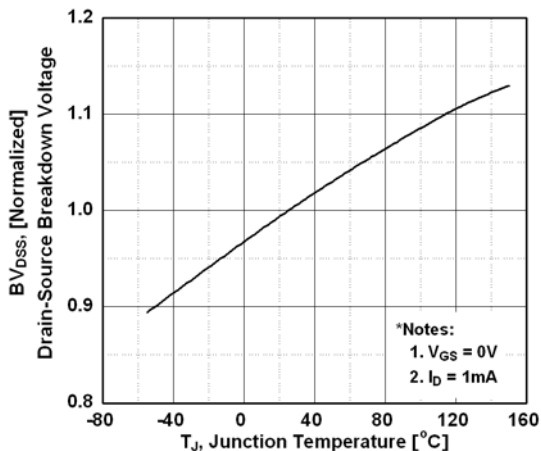


Figure 8. On-Resistance Variation vs. Temperature

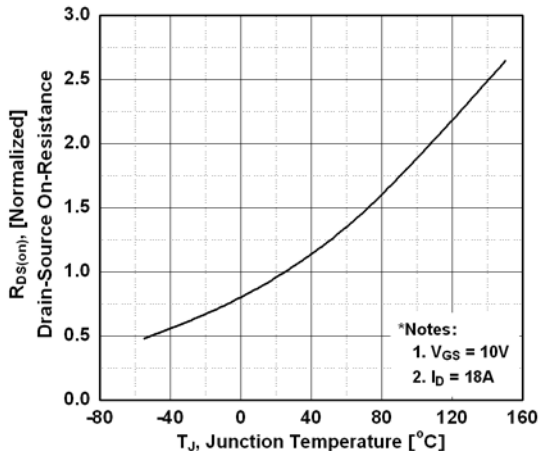


Figure 9. Maximum Safe Operating Area

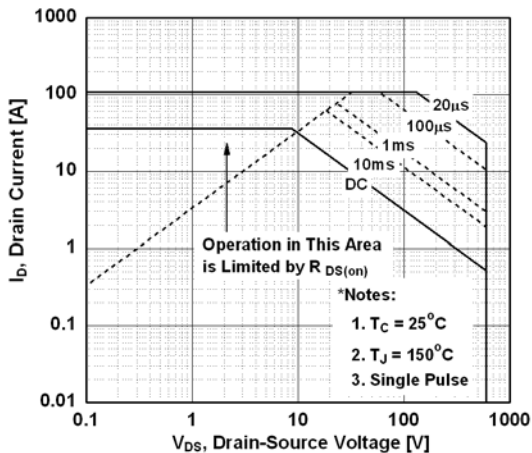


Figure 10. Maximum Drain Current vs. Case Temperature

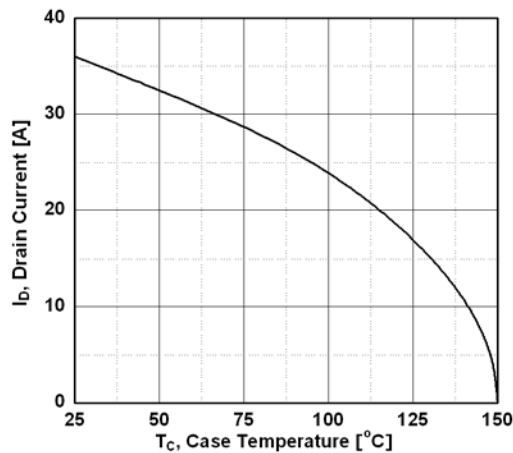
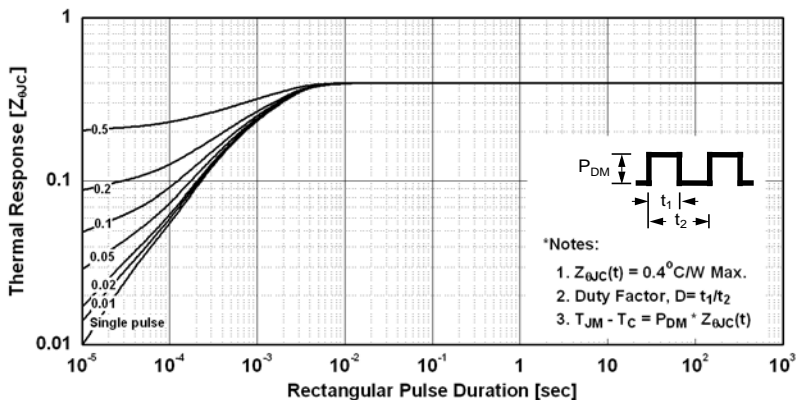
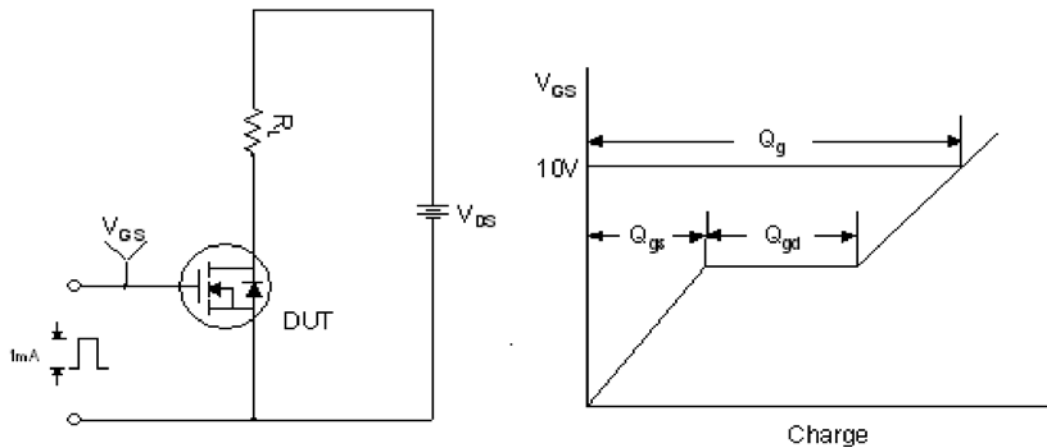


Figure 11. Transient Thermal Response Curve



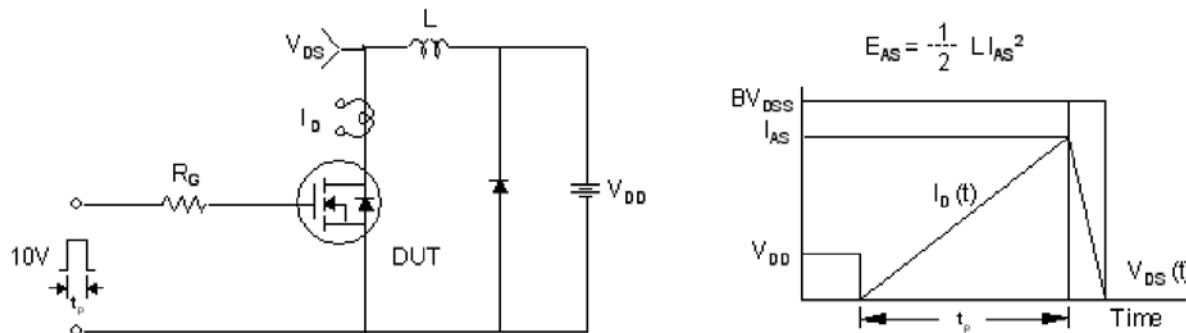
Gate Charge Test Circuit & Waveform



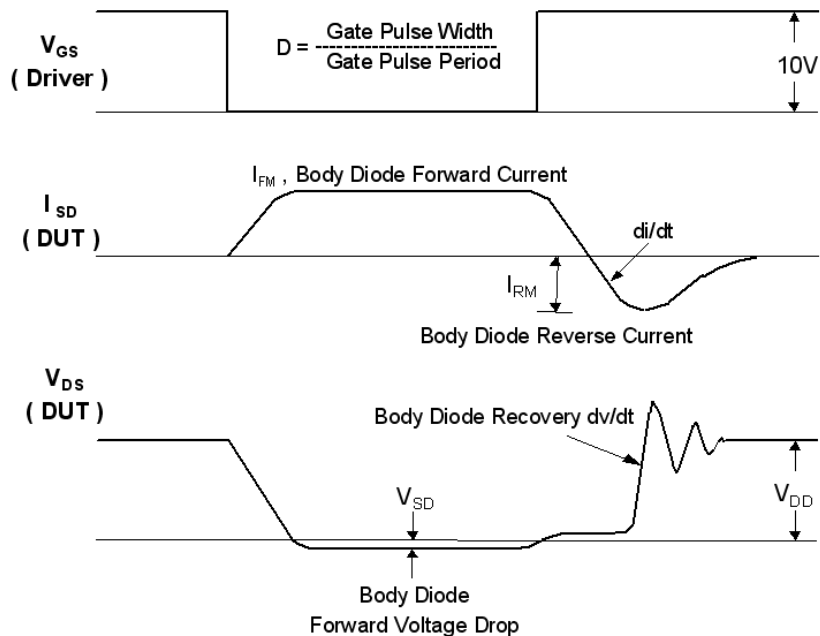
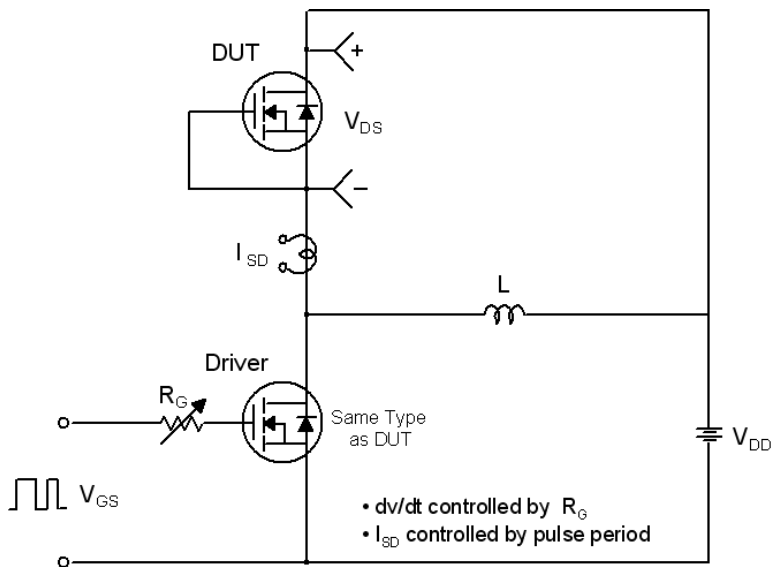
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

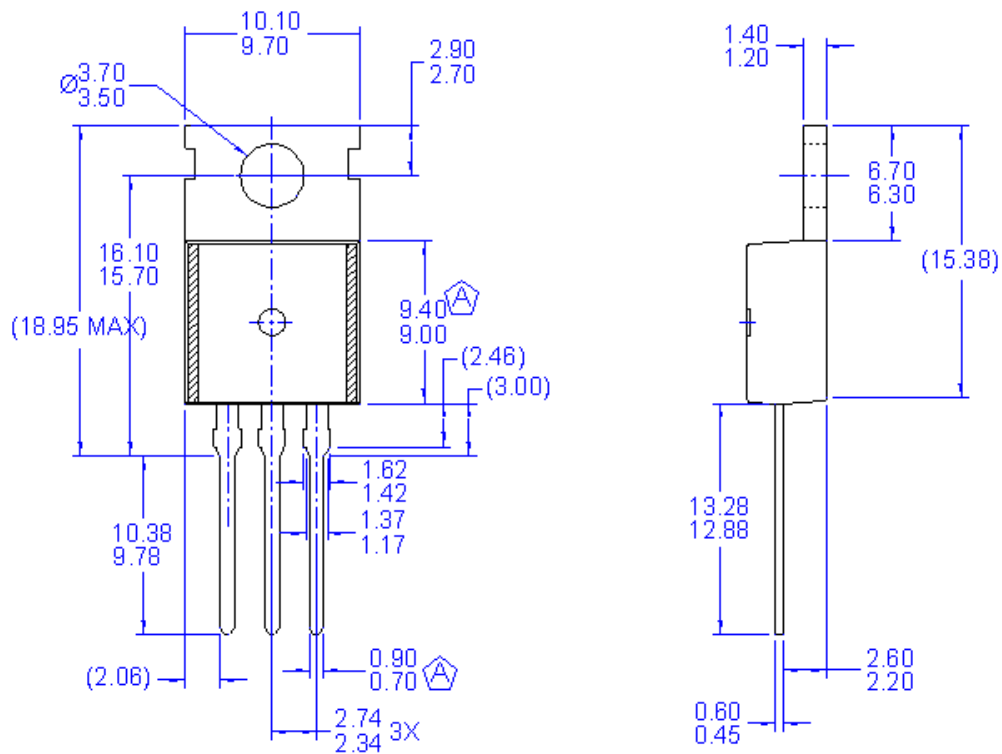


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220






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

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