

FDP039N08B_F102

N-Channel PowerTrench® MOSFET

80V, 171A, 3.9mΩ

Features

- $R_{DS(on)} = 3.16m\Omega$ (Typ.) @ $V_{GS} = 10V, I_D = 100A$
- Low FOM $R_{DS(on)} * Q_G$
- Low reverse recovery charge, Q_{rr}
- Soft reverse recovery body diode
- Enables highly efficiency in synchronous rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

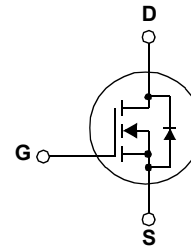
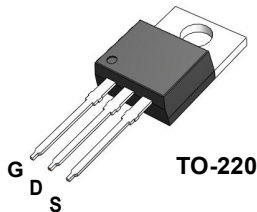


Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

- Synchronous Rectification for Server / Telecom PSU
- Battery Charger and Battery Protection Circuit
- DC motor drives and Uninterruptible Power Supplies
- Micro Solar Inverter



MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted*

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	80	V
V_{GSS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ C$, Silicon Limited)	171*
		- Continuous ($T_C = 25^\circ C$, Package Limited)	120
		- Continuous ($T_C = 100^\circ C$, Silicon Limited)	121
I_{DM}	Drain Current	- Pulsed (Note 1)	684
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	547
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0
P_D	Power Dissipation	($T_C = 25^\circ C$)	214
		- Derate above $25^\circ C$	1.43
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ C$

* Package limitation current is 120A.

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.7	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Description	Quantity
FDP039N08B	FDP039N08B_F102	TO-220	F102: Trimmed Leads	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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	80	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	-	0.089	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 64\text{V}, T_C = 150^\circ\text{C}$	-	-	1 500	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 100\text{A}$	-	3.16	3.9	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 100\text{A}$	-	180	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	7105	9450	pF
C_{oss}	Output Capacitance		-	1110	1475	pF
C_{rss}	Reverse Transfer Capacitance		-	30	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$	-	1656	-	pF
$Q_g(tot)$	Total Gate Charge at 10V	$V_{DS} = 40\text{V}, I_D = 100\text{A}$ $V_{GS} = 10\text{V}$	-	102	133	nC
Q_{gs}	Gate to Source Gate Charge		-	39.9	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	20.6	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		(Note 4)	-	22	-
ESR	Equivalent Series Resistance (G-S)	$f = 1\text{MHz}$	-	2.2	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\text{V}, I_D = 100\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 4.7\Omega$	-	36	82	ns
t_r	Turn-On Rise Time		-	49	108	ns
$t_{d(off)}$	Turn-Off Delay Time		-	71	152	ns
t_f	Turn-Off Fall Time		(Note 4)	-	29	68

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	171*	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	684	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 100\text{A}$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{V}, V_{DD} = 40\text{V}, I_{SD} = 100\text{A}$	-	70.1	-	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	87.9	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 3\text{mH}, I_{AS} = 19.1\text{A}$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 100\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

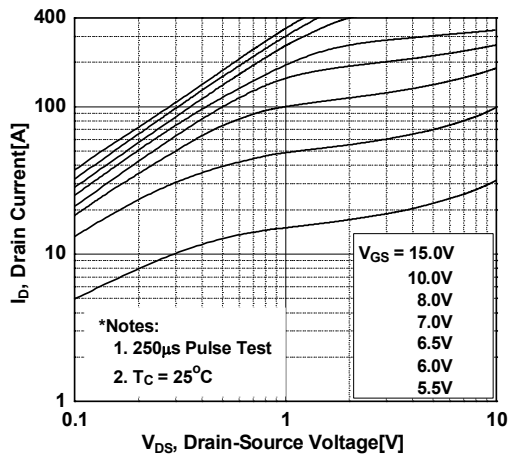


Figure 2. Transfer Characteristics

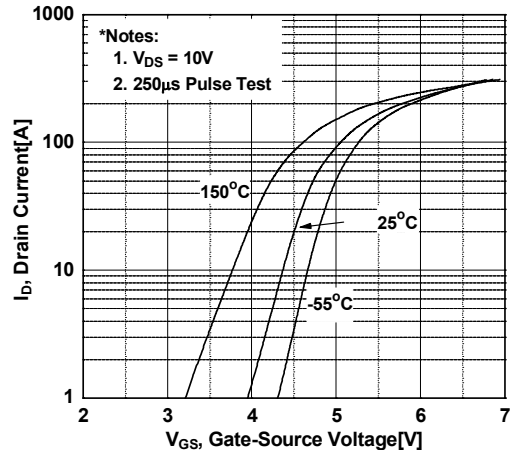


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

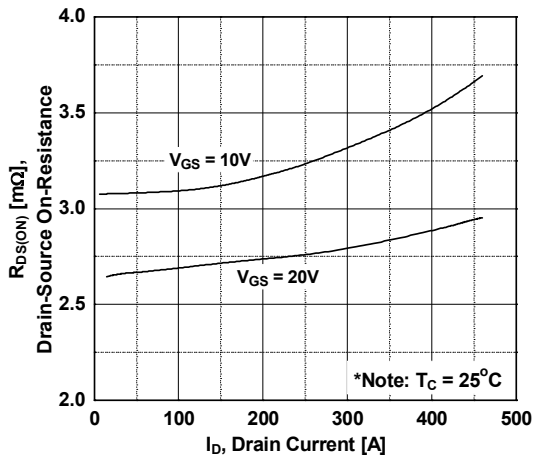


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

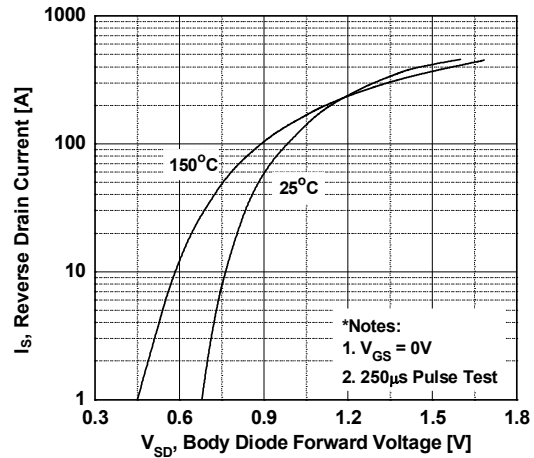


Figure 5. Capacitance Characteristics

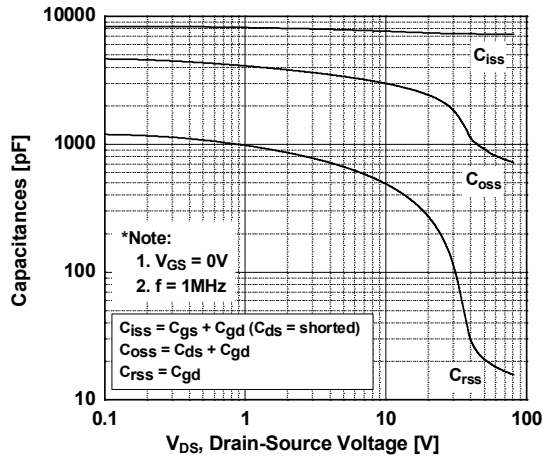
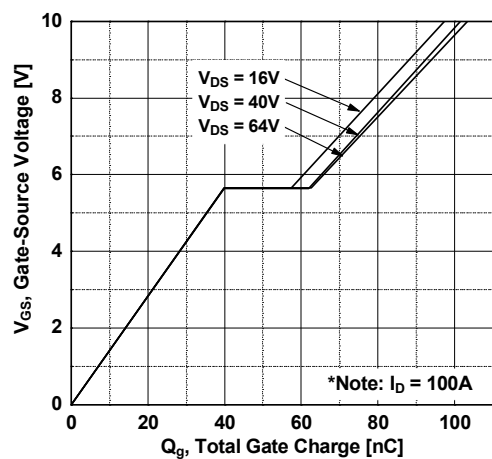


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

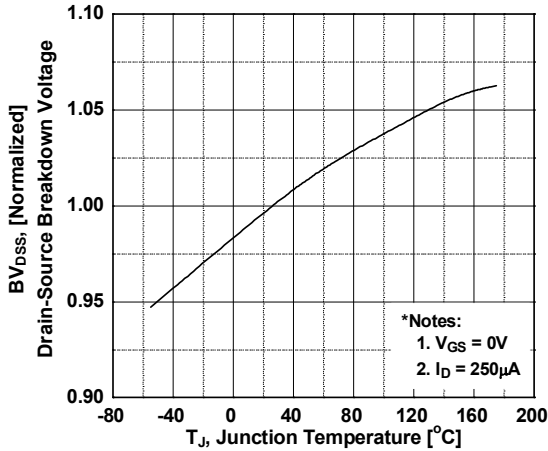


Figure 8. On-Resistance Variation vs. Temperature

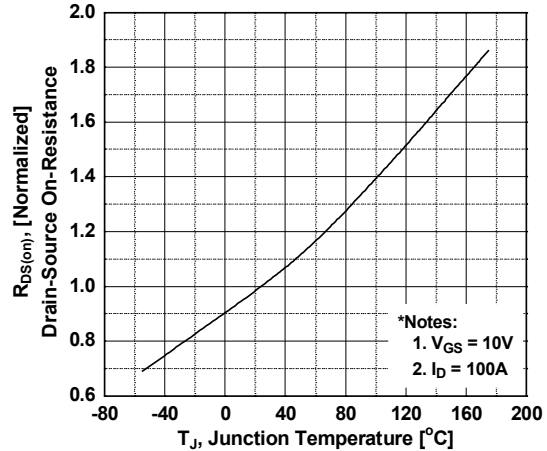


Figure 9. Maximum Safe Operating Area vs. Case Temperature

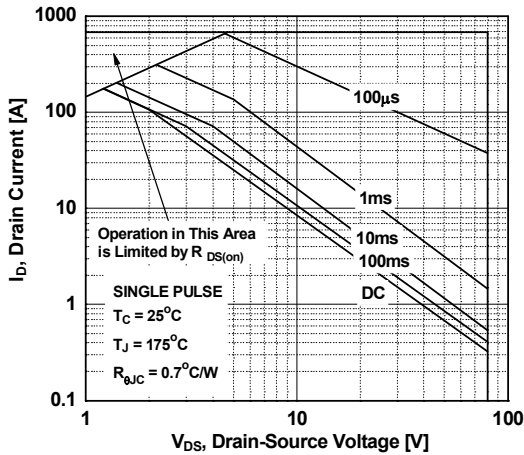


Figure 10. Maximum Drain Current

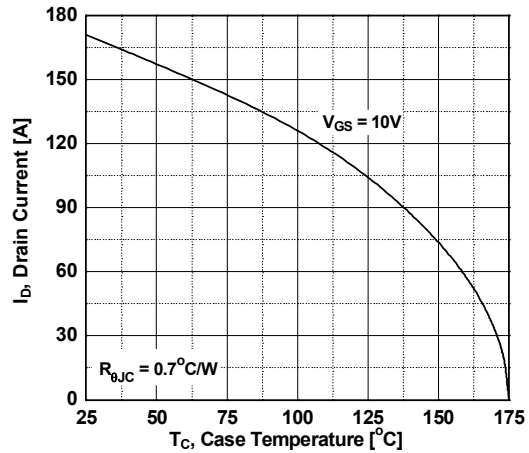


Figure 11. E_oss vs. Drain to Source Voltage

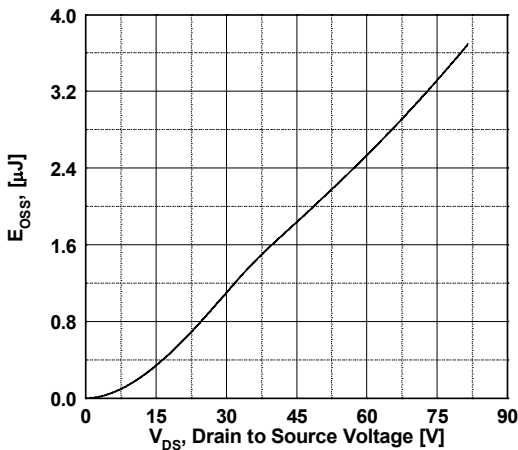
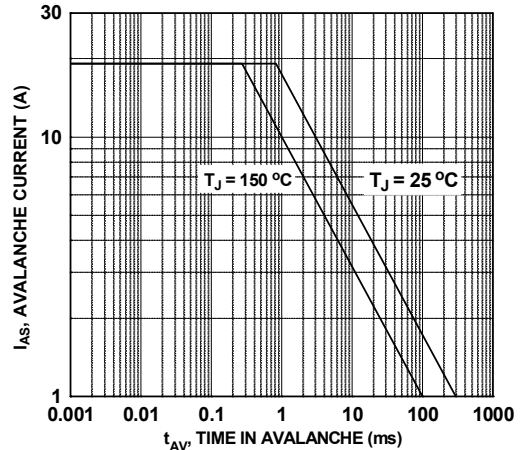
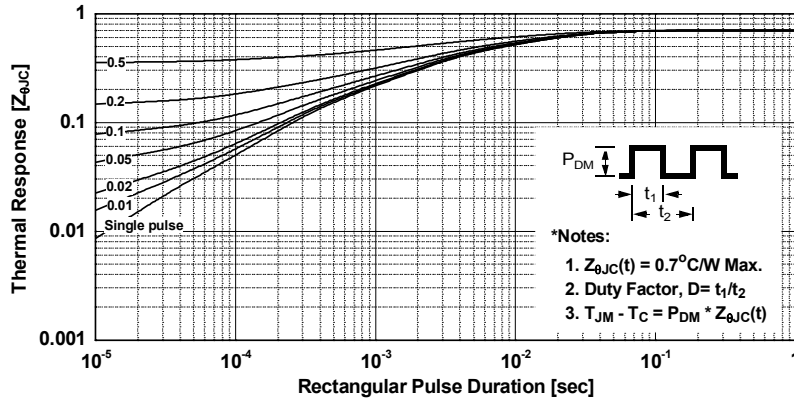


Figure 12. Unclamped Inductive Switching Capability

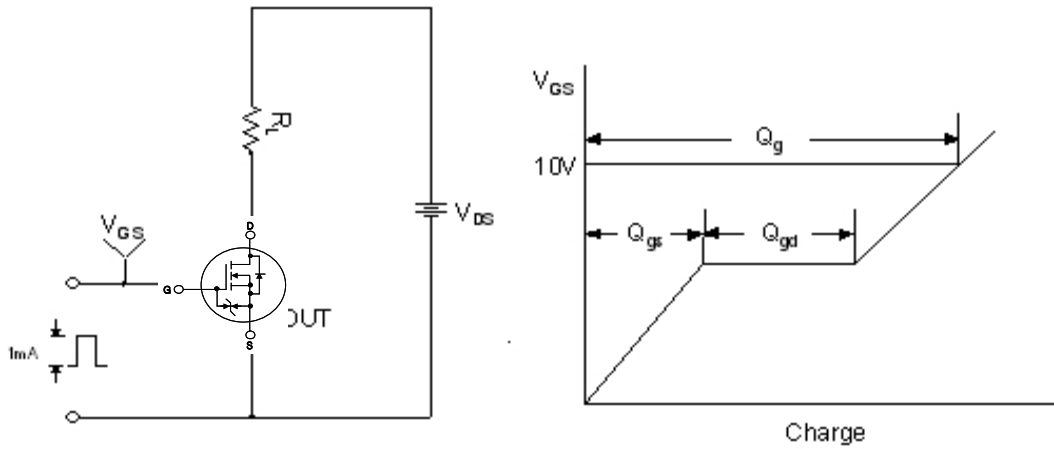


Typical Performance Characteristics (Continued)

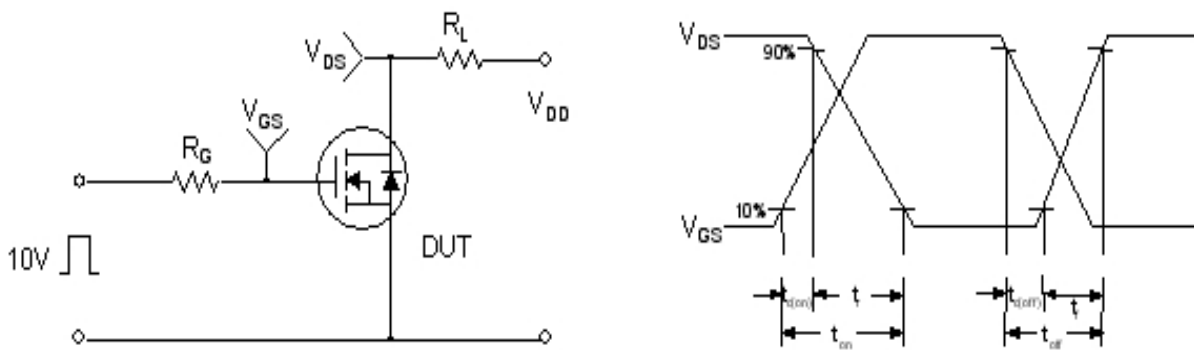
Figure 13. Transient Thermal Response Curve



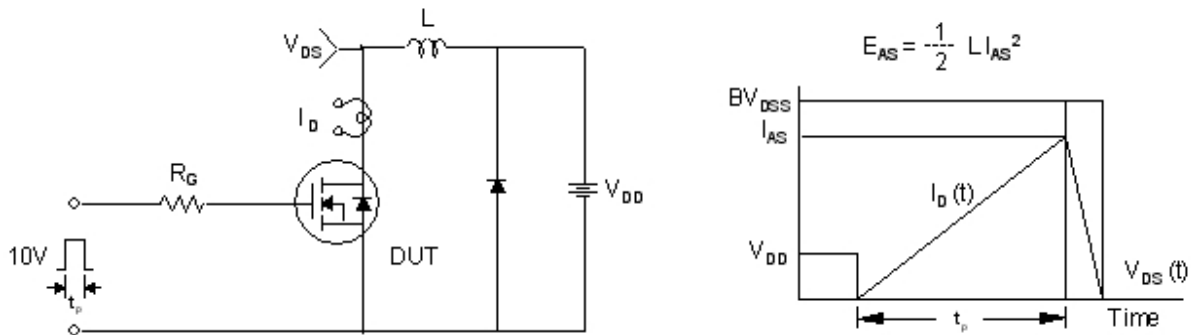
Gate Charge Test Circuit & Waveform



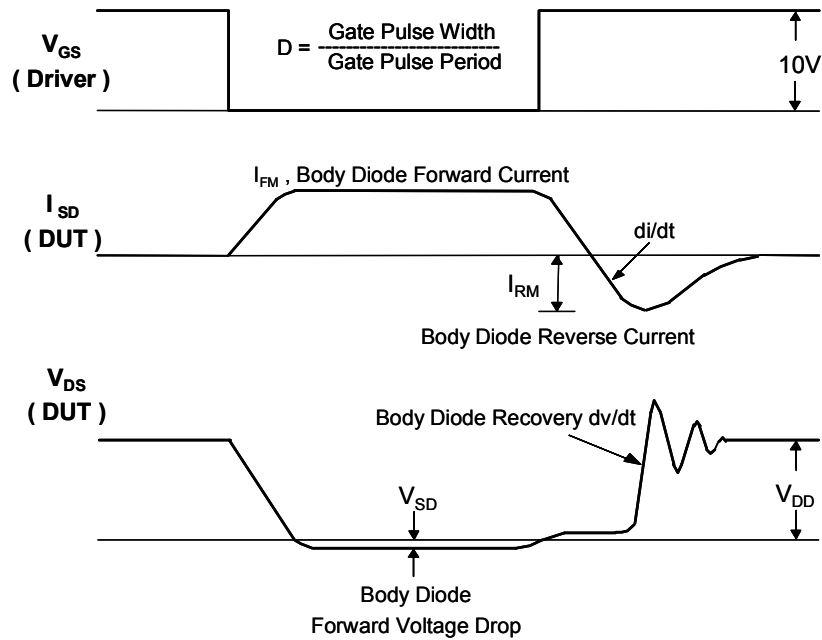
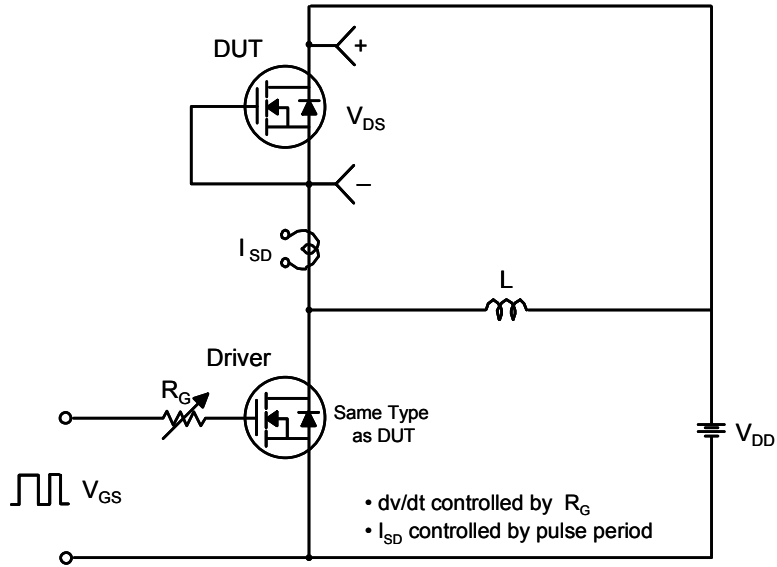
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

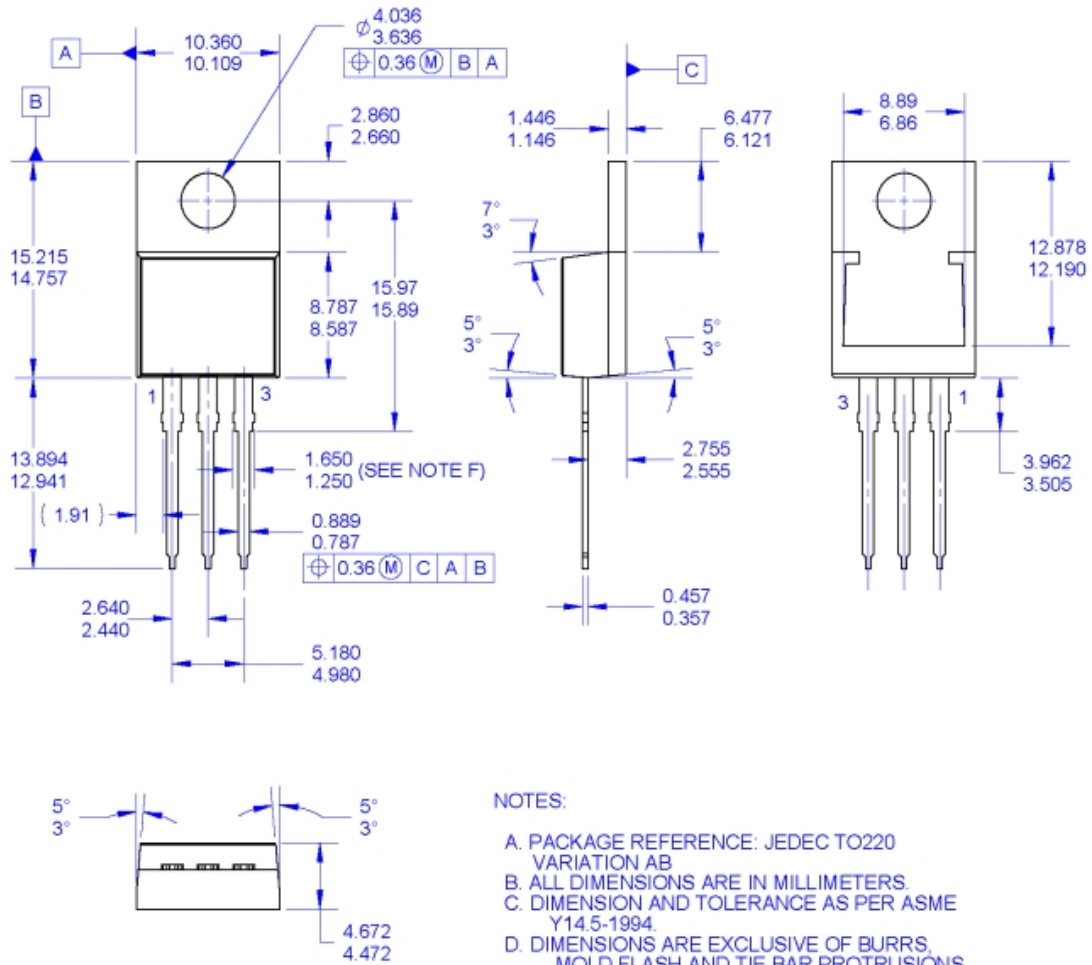


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220
(F102: Trimmed Leads)



NOTES:

- A. PACKAGE REFERENCE: JEDEC TO220 VARIATION AB
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. THIS PACKAGE IS FSZZ INTERNAL PRODUCTION AND INTENDED FOR DELTA CUSTOMER ONLY.
- F. MAX WIDTH FOR F102 DEVICE = 1.35mm.
- G. DRAWING FILE NAME: TO220T03REV2

Dimensions in Millimeters



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