

# FDP083N15A\_F102

## N-Channel PowerTrench® MOSFET

150V, 105A, 8.3mΩ

### Features

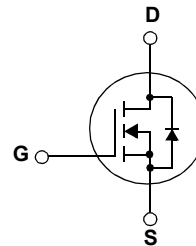
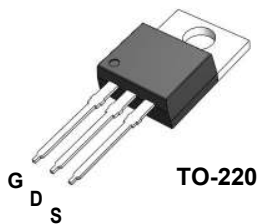
- $R_{DS(on)} = 6.85m\Omega$  (Typ.) @  $V_{GS} = 10V, I_D = 75A$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### 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

- DC to DC Converters
- Synchronous Rectification for Server/Telecom PSU
- Battery Charger
- AC motor drives and Uninterruptible Power Supplies
- Off-line UPS



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

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	150	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ C$ , Silicon Limited)	105
		- Continuous ( $T_C = 100^\circ C$ , Silicon Limited)	75
$I_{DM}$	Drain Current	- Pulsed (Note 1)	420
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	542
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	6.0
$P_D$	Power Dissipation	( $T_C = 25^\circ C$ )	231
		- Derate above $25^\circ C$	1.54
$T_J, T_{STG}$	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	0.65	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Description	Quantity
FDP083N15A	FDP083N15A_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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_C = 25^\circ\text{C}$	150	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.08	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 120\text{V}, T_C = 150^\circ\text{C}$	-	-	1 500	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	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	$V_{GS} = 10\text{V}, I_D = 75\text{A}$	-	6.85	8.30	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 75\text{A}$ (Note 4)	-	139	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	4645	6040	pF
$C_{oss}$	Output Capacitance		-	1445	1880	pF
$C_{riss}$	Reverse Transfer Capacitance		-	100	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 75\text{V}, I_D = 75\text{A}$ $V_{GS} = 10\text{V}$	-	64.5	84	nC
$Q_{gs}$	Gate to Source Gate Charge		-	19.1	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	8.7	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	13.5	-	nC
ESR	Equivalent Series Resistance(G-S)		Drain Open, $f=1\text{MHz}$	-	2.5	-

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{V}, I_D = 75\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 4.7\Omega$	-	22	54	ns
$t_r$	Turn-On Rise Time		-	58	126	ns
$t_{d(off)}$	Turn-Off Delay Time		-	61	132	ns
$t_f$	Turn-Off Fall Time		-	26	62	ns

### Drain-Source Diode Characteristics

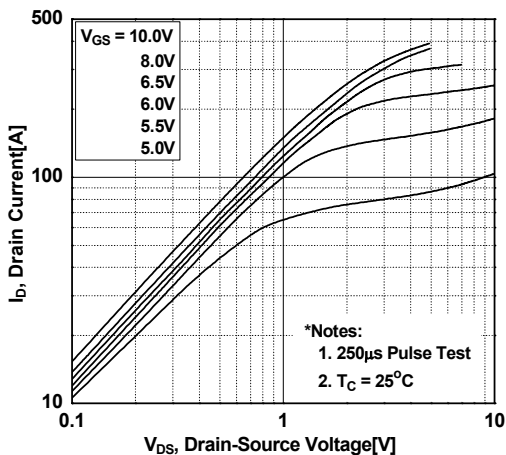
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	105	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	420	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 75\text{A}$	-	-	1.25	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 75\text{A}, V_{DD} = 120\text{V}$	-	96	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	268	-	nC

#### Notes:

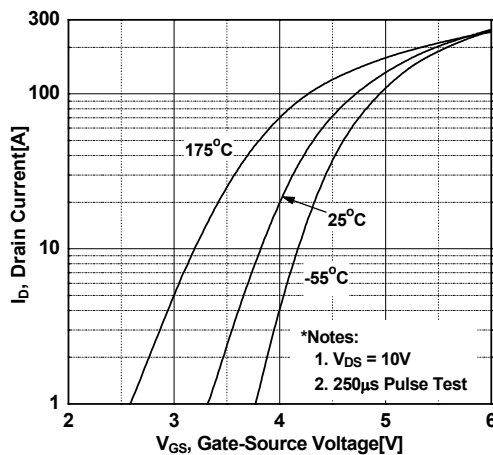
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{SD} = 19\text{A}$
3.  $I_{SD} \leq 75\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

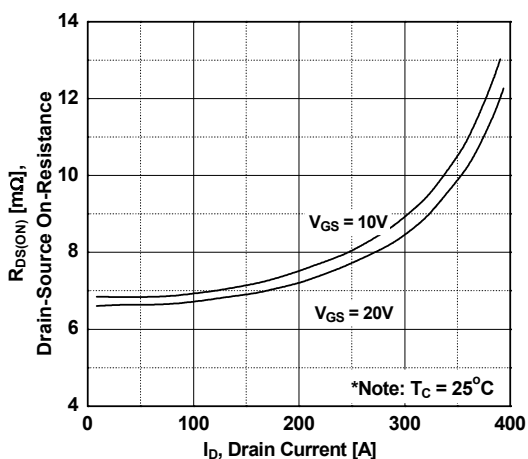
**Figure 1. On-Region Characteristics**



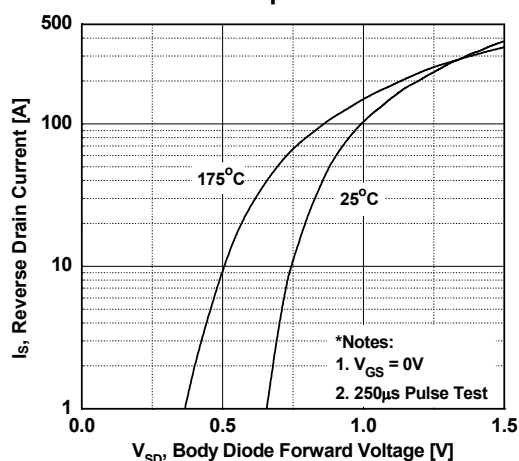
**Figure 2. Transfer Characteristics**



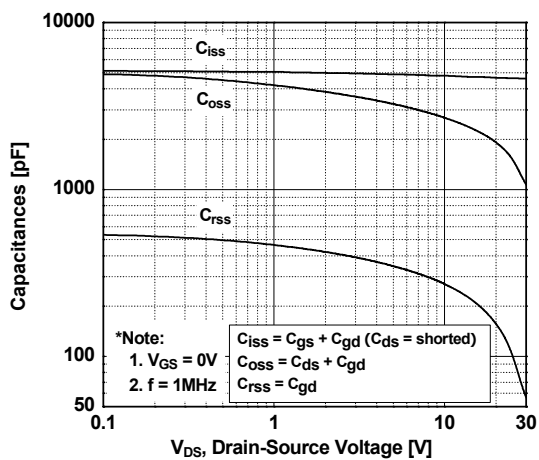
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



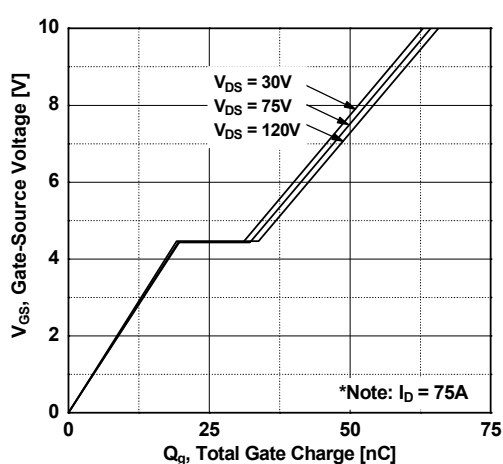
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

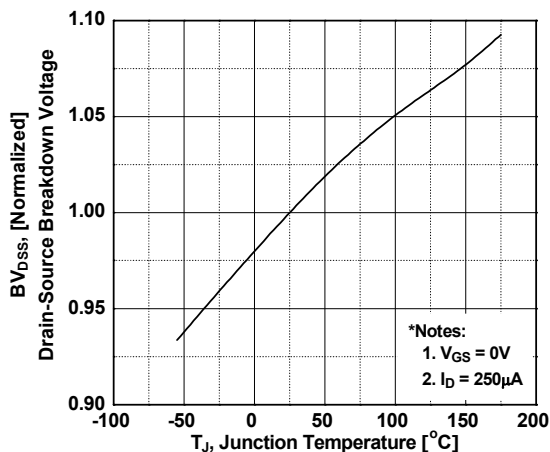


Figure 8. On-Resistance Variation vs. Temperature

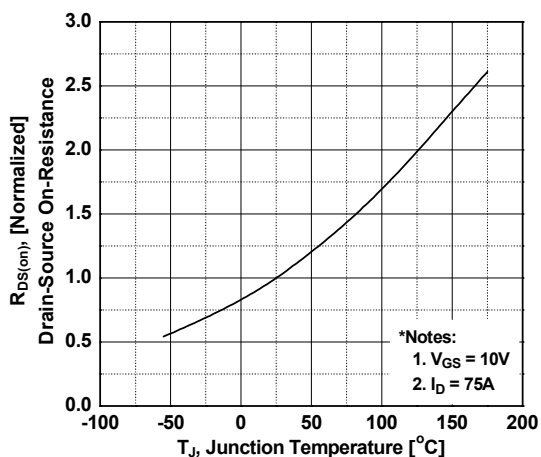


Figure 9. Maximum Safe Operating Area

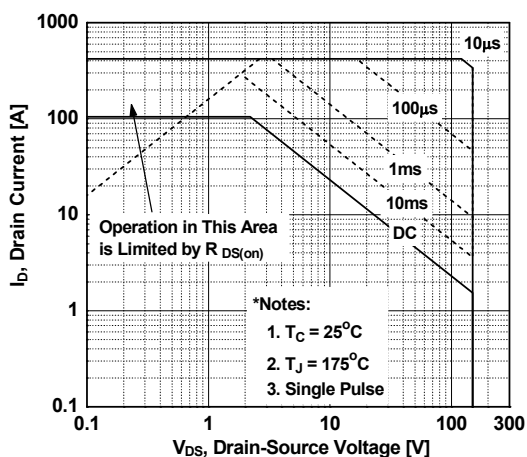


Figure 10. Maximum Drain Current vs. Case Temperature

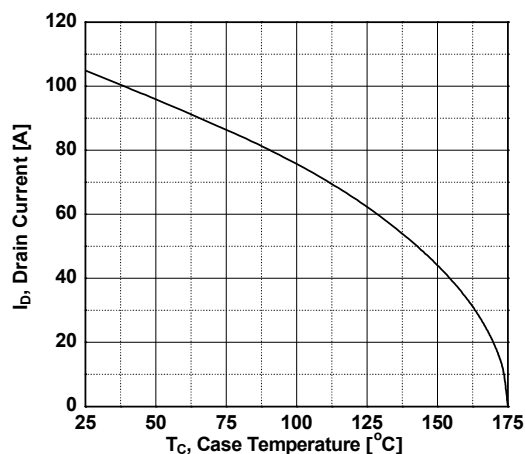
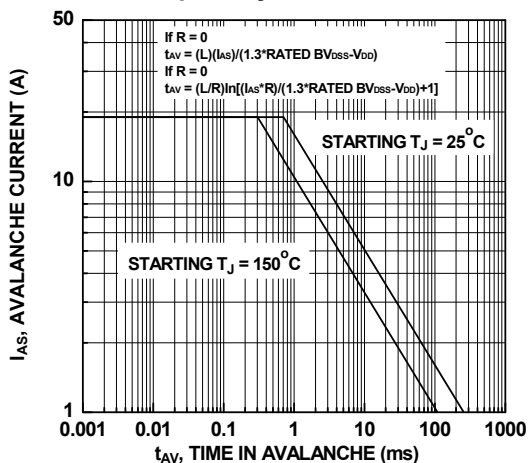
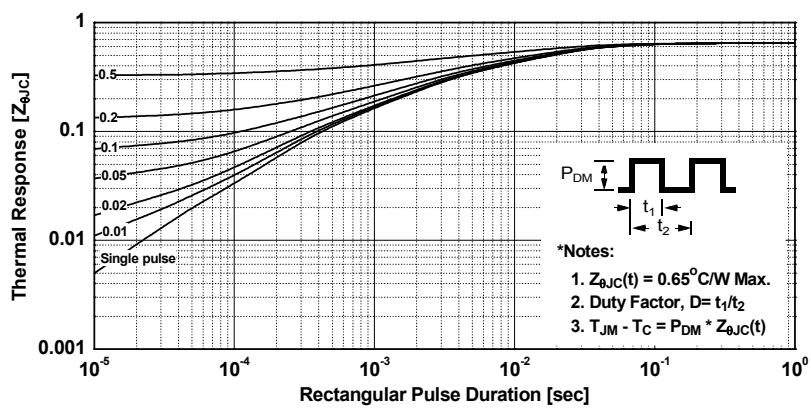


Figure 11. Unclamped Inductive Switching Capability

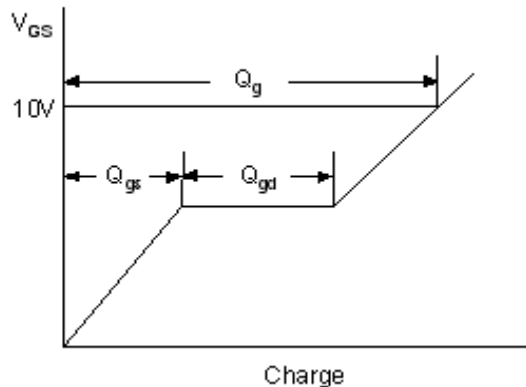
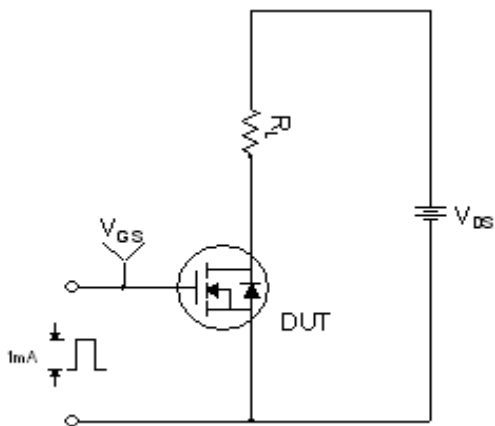


## Typical Performance Characteristics

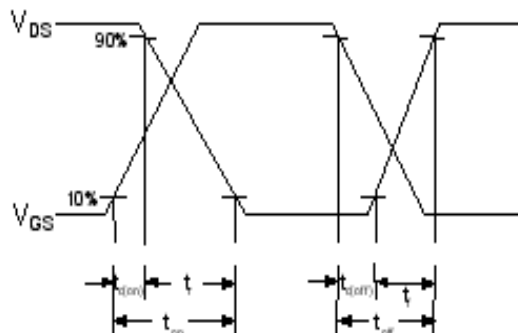
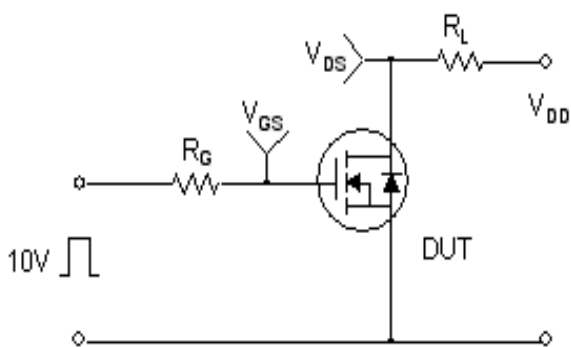
Figure 12. Transient Thermal Response Curve



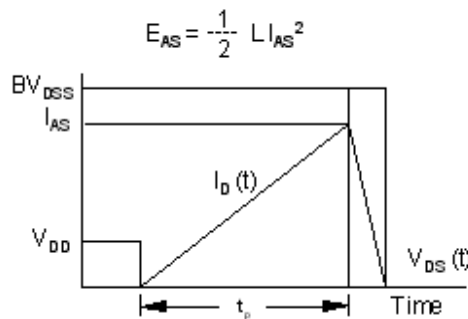
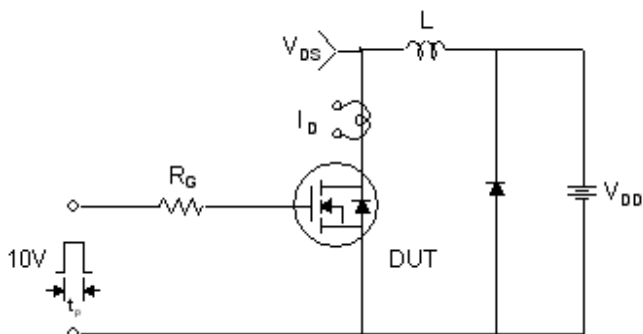
**Gate Charge Test Circuit & Waveform**



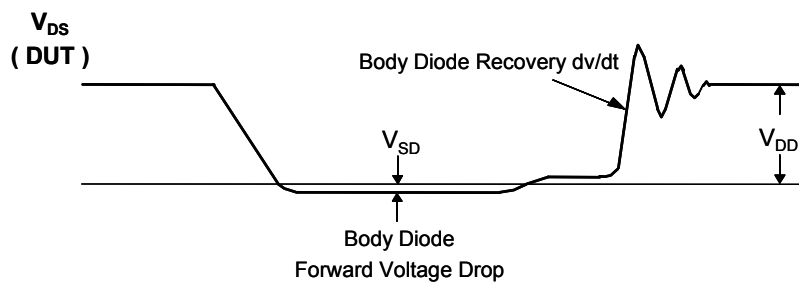
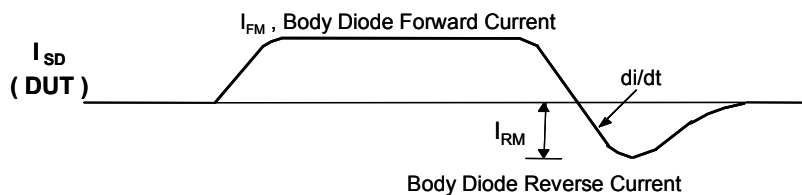
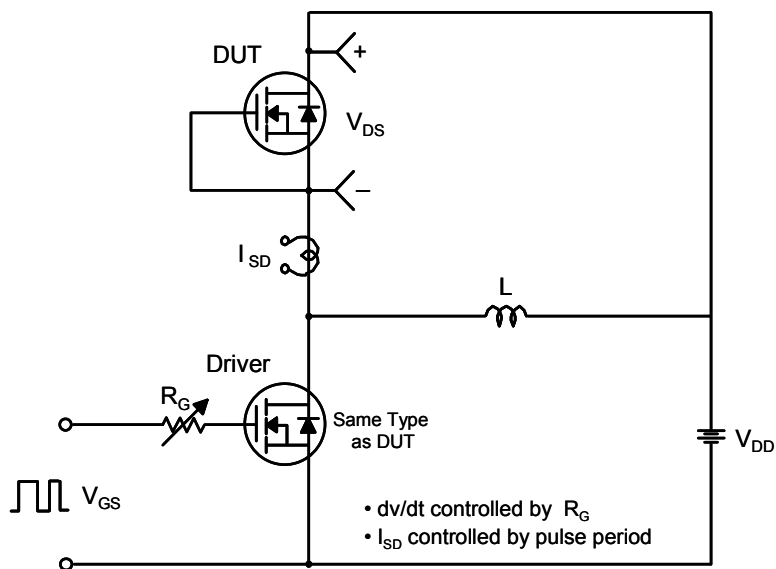
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

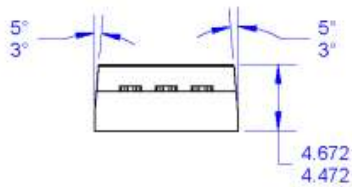
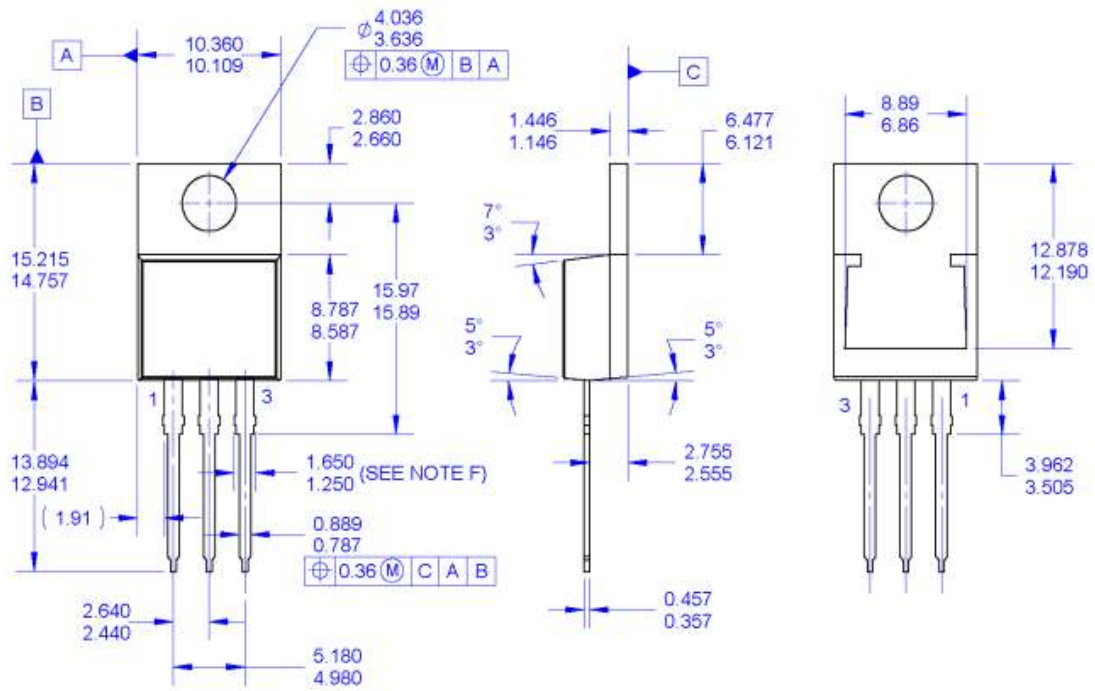


Peak Diode Recovery dv/dt Test Circuit & Waveforms



### 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

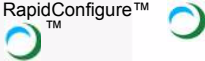


Dimensions in Millimeters





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| Auto-SPM™                | FRFET®                 | PowerTrench®  | The Right Technology for Your Success™  |
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| Build it Now™            | Green FPS™             | Programmable Active Droop™  | TinyBoost™  |
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| Current Transfer Logic™  | ISOPLANAR™             |  | TinyPower™  |
| DEUXPEED®                | MegaBuck™              | Saving our world, 1mW/W/kW at a time™   | TinyPWM™  |
| Dual Cool™               | MICROCOUPLER™          | SignalWise™   | TinyWire™   |
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| Fairchild Semiconductor® | Motion-SPM™            | SuperSOT™_3   | Ultra FRFET™  |
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| FETBench™                |                        | Sync-Lock™  |   |
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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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