



April 2015

# FDP083N15A

## N-Channel PowerTrench<sup>®</sup> MOSFET

150 V, 117 A, 8.3 mΩ

### Features

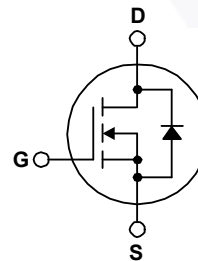
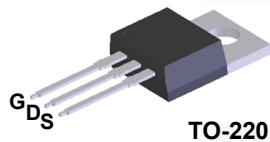
- $R_{DS(on)} = 6.85 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge,  $Q_G = 64.5 \text{ nC}$  (Typ.)
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's PowerTrench<sup>®</sup> process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDP083N15A_F102	Unit
$V_{DSS}$	Drain to Source Voltage	150	V
$V_{GSS}$	Gate to Source Voltage	- DC	$\pm 20$
		- AC ( $f > 1 \text{ Hz}$ )	$\pm 30$
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)	117
		- Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited)	83
$I_{DM}$	Drain Current	- Pulsed (Note 1)	468
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	542
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	6
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	294
		- Derate Above $25^\circ\text{C}$	1.96
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FDP083N15A_F102	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.51	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

FDP083N15A — N-Channel PowerTrench<sup>®</sup> MOSFET

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDP083N15A_F102	FDP083N15A	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 to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}, T_C = 25^\circ\text{C}$	150	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	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	$V_{DS} = 10 \text{ V}, I_D = 75 \text{ A}$	-	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
$C_{iss}$	Input Capacitance	$V_{DS} = 7.5 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$	-	4570	6040	pF
$C_{oss}$	Output Capacitance		-	460	1880	pF
$C_{riss}$	Reverse Transfer Capacitance		-	20	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 120 \text{ V}, I_D = 75 \text{ A},$ $V_{GS} = 10 \text{ V}$	-	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		(Note 4)	-	13.5	-
ESR	Equivalent Series Resistance(G-S)	$f = 1 \text{ MHz}$	-	2.5	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75 \text{ V}, I_D = 75 \text{ A},$ $V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	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		(Note 4)	-	26	62

### Drain-Source Diode Characteristics

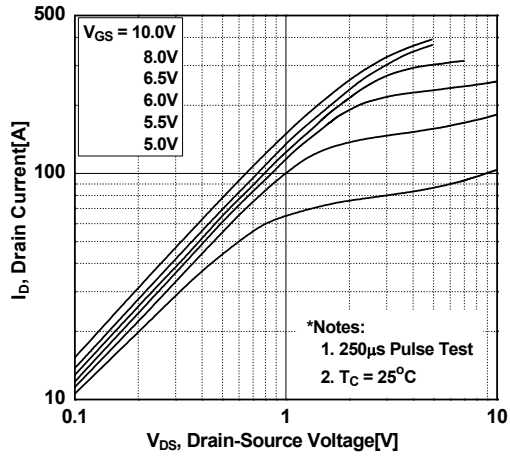
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	117	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	468	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 75 \text{ A}$	-	-	1.25	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 75 \text{ A},$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	-	96	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	268	-	nC

#### Notes:

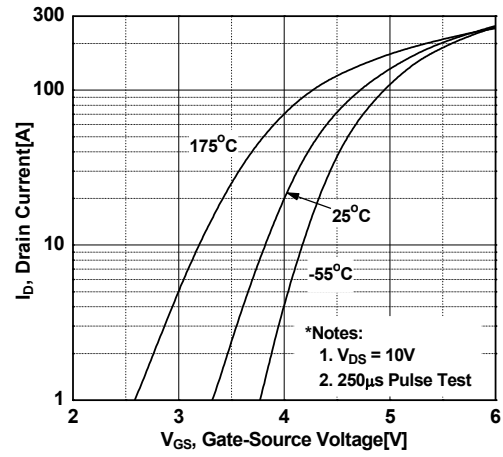
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3 \text{ mH}$ ,  $I_{SD} = 19 \text{ A}$ .
3.  $I_{SD} \leq 75 \text{ A}$ ,  $di/dt \leq 200 \text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

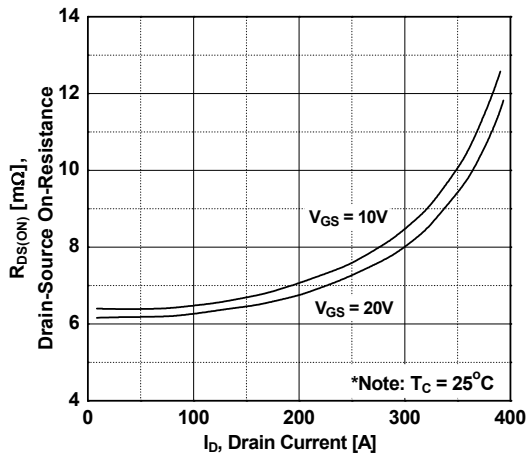
**Figure 1. On-Region Characteristics**



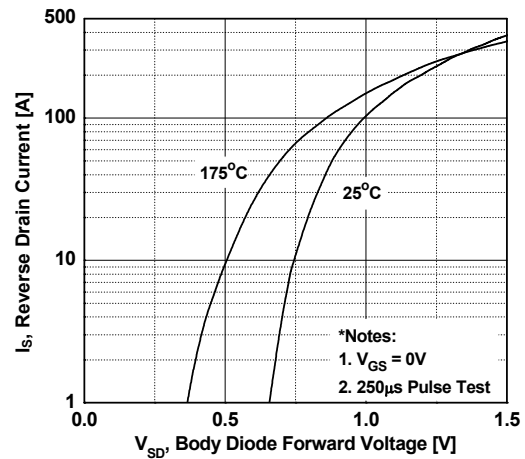
**Figure 2. Transfer Characteristics**



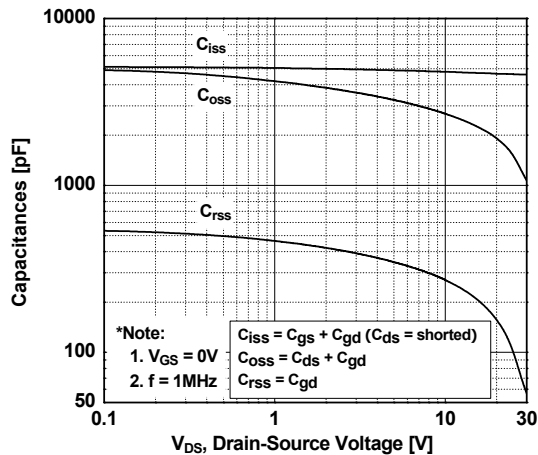
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



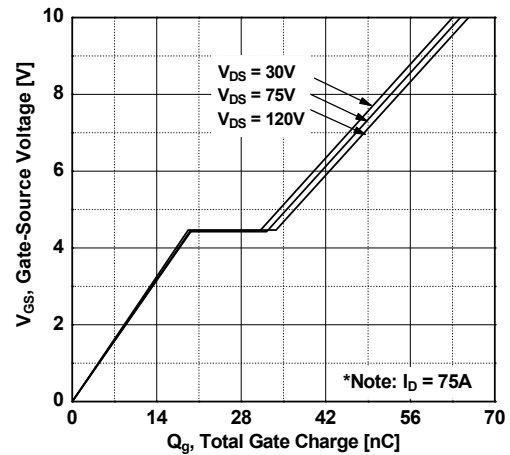
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

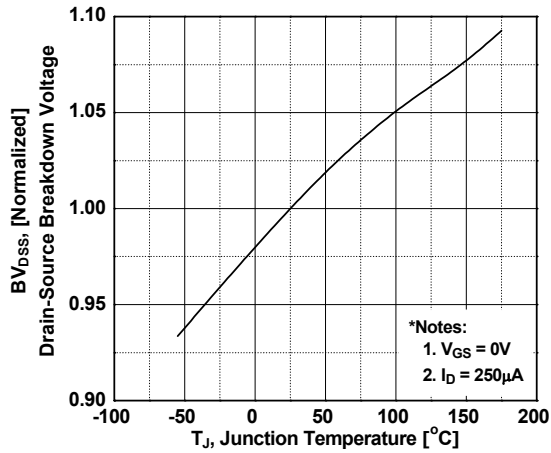


Figure 8. On-Resistance Variation vs. Temperature

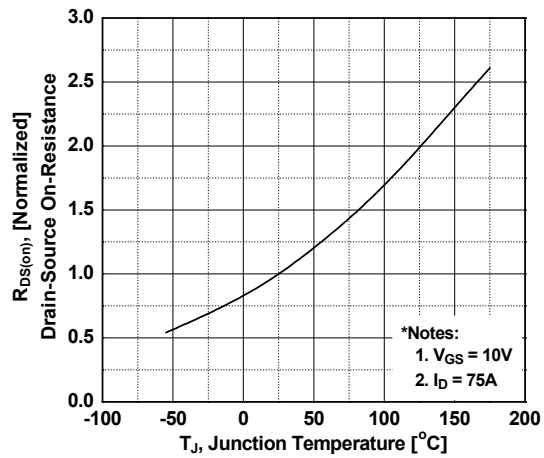


Figure 9. Maximum Safe Operating Area

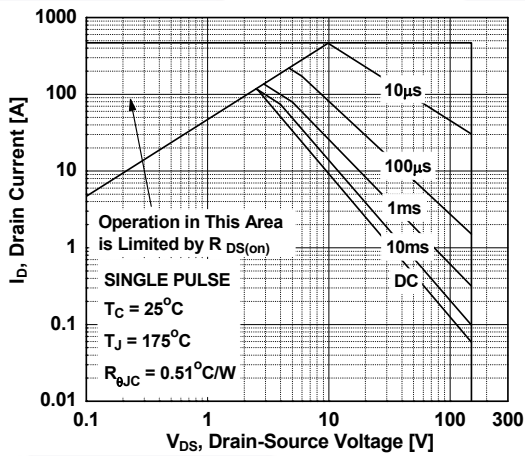


Figure 10. Maximum Drain Current vs. Case Temperature

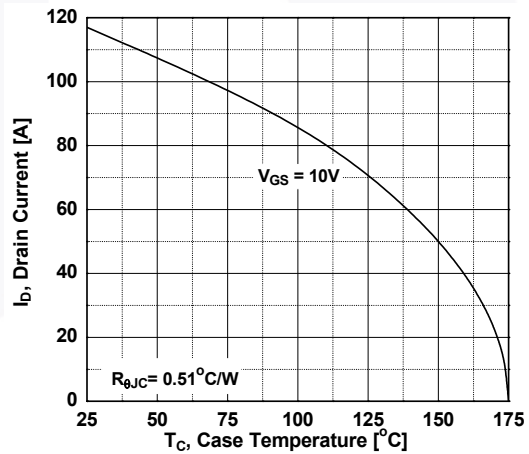
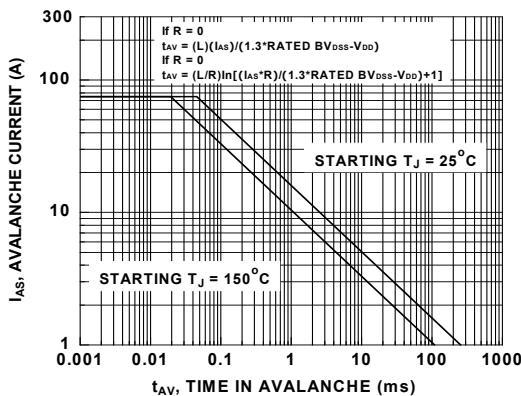
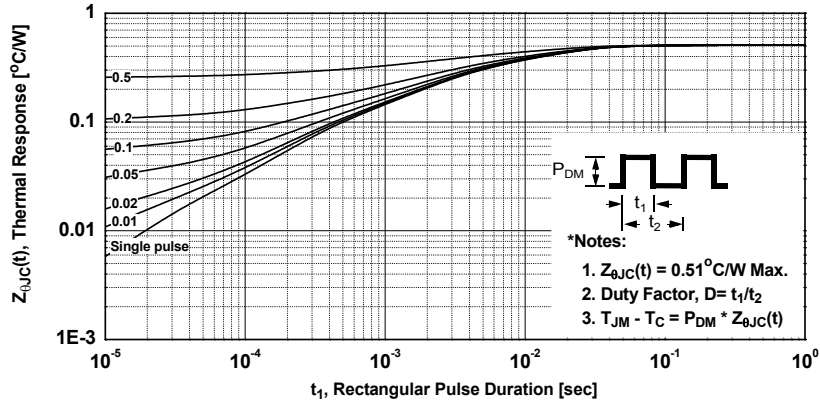


Figure 11. Unclamped Inductive Switching Capability



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



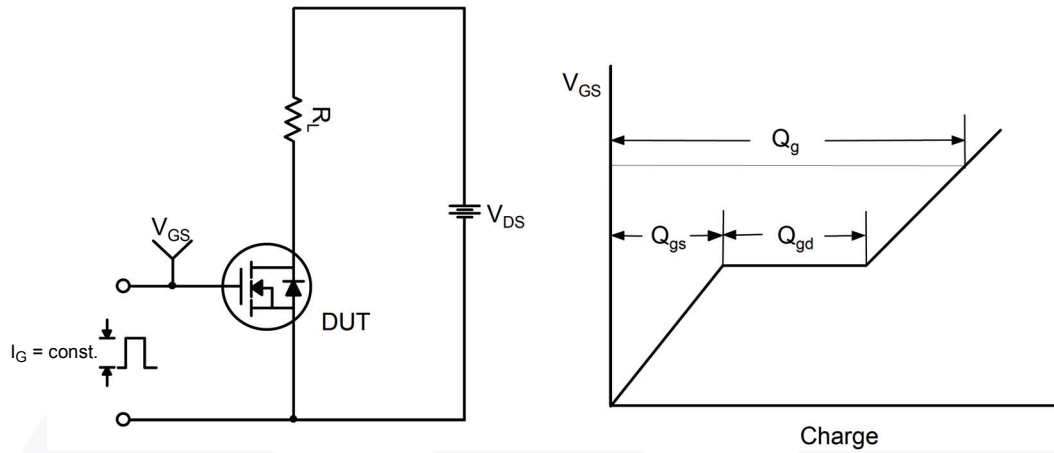


Figure 13. Gate Charge Test Circuit & Waveform



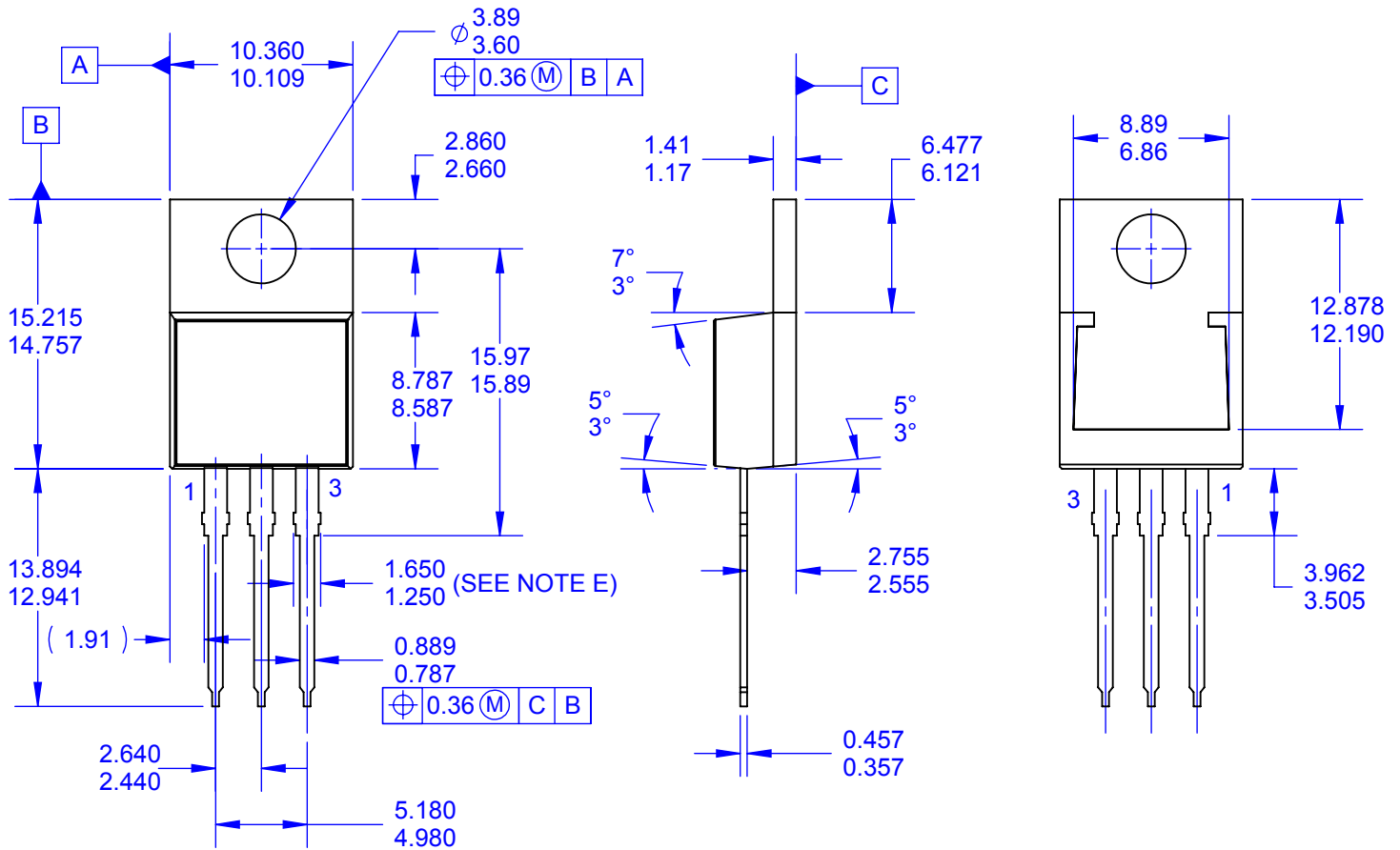
Figure 14. Resistive Switching Test Circuit & Waveforms



Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms



Figure 16. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms



NOTES:






- A. PACKAGE REFERENCE: JEDEC TO220 VARIATION AB
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. MAX WIDTH FOR F102 DEVICE = 1.35mm.
- F. DRAWING FILE NAME: TO220T03REV4.
- G. FAIRCHILD SEMICONDUCTOR.





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