

# FDP083N15A\_F102

## N-Channel PowerTrench® MOSFET

150V, 105A, 8.3mΩ

### Features

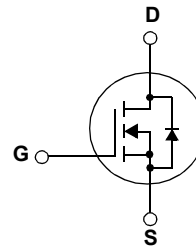
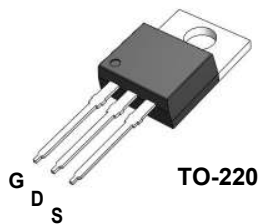
- $R_{DS(on)} = 6.85m\Omega$  (Typ.) @  $V_{GS} = 10V$ ,  $I_D = 75A$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### 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)  | A     |
|                |                                                                              | - Continuous ( $T_C = 100^\circ C$ , Silicon Limited) |       |
| $I_{DM}$       | Drain Current                                                                | - Pulsed (Note 1)                                     | A     |
| $E_{AS}$       | Single Pulsed Avalanche Energy                                               | (Note 2)                                              | mJ    |
| $dv/dt$        | Peak Diode Recovery $dv/dt$                                                  | (Note 3)                                              | V/ns  |
| $P_D$          | Power Dissipation                                                            | ( $T_C = 25^\circ C$ )                                | W     |
|                |                                                                              | - Derate above $25^\circ C$                           | W/°C  |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                                      | -55 to +175                                           | °C    |
| $T_L$          | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300                                                   | °C    |

\*Package limitation current is 120A.

### Thermal Characteristics

| Symbol          | Parameter                               | Ratings | Units |
|-----------------|-----------------------------------------|---------|-------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case    | 0.65    | °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 |
|--------|-----------|-----------------|------|------|------|-------|
|--------|-----------|-----------------|------|------|------|-------|

### 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 | -         | $V/^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 120\text{V}$ , $V_{GS} = 0\text{V}$                            | -   | -    | 1         | $\mu\text{A}$      |
|                                      |                                           | $V_{DS} = 120\text{V}$ , $T_C = 150^\circ\text{C}$                       | -   | -    | 500       |                    |
| $I_{GSS}$                            | 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                 | $V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$<br>$f = 1\text{MHz}$   | - | 4645 | 6040 | pF       |
| $C_{oss}$    | Output Capacitance                |                                                                     | - | 1445 | 1880 | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance      |                                                                     | - | 100  | -    | pF       |
| $Q_{g(tot)}$ | Total Gate Charge at 10V          | $V_{DS} = 75\text{V}$ , $I_D = 75\text{A}$<br>$V_{GS} = 10\text{V}$ | - | 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  | -    | $\Omega$ |

### Switching Characteristics

|              |                     |                                                                                             |   |    |     |    |
|--------------|---------------------|---------------------------------------------------------------------------------------------|---|----|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 75\text{V}$ , $I_D = 75\text{A}$<br>$V_{GS} = 10\text{V}$ , $R_{GEN} = 4.7\Omega$ | - | 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 <sub>S</sub>  | Maximum Continuous Drain to Source Diode Forward Current |                                                                                                      | - | -   | 105  | A  |
| I <sub>SM</sub> | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                                      | - | -   | 420  | A  |
| V <sub>SD</sub> | Drain to Source Diode Forward Voltage                    | V <sub>GS</sub> = 0V, I <sub>SD</sub> = 75A                                                          | - | -   | 1.25 | V  |
| t <sub>rr</sub> | Reverse Recovery Time                                    | V <sub>GS</sub> = 0V, I <sub>SD</sub> = 75A, V <sub>DD</sub> = 120V<br>dI <sub>F</sub> /dt = 100A/μs | - | 96  | -    | ns |
| Q <sub>rr</sub> | 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. 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

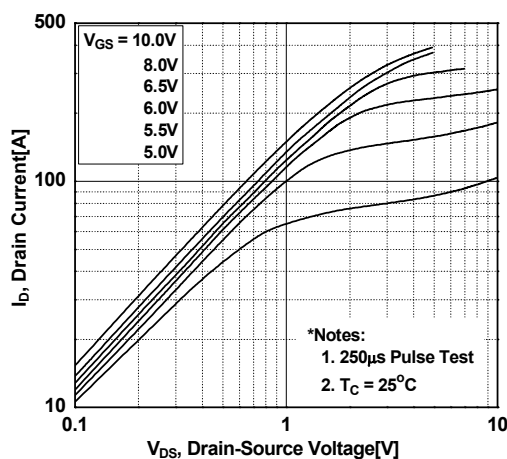


Figure 2. Transfer Characteristics

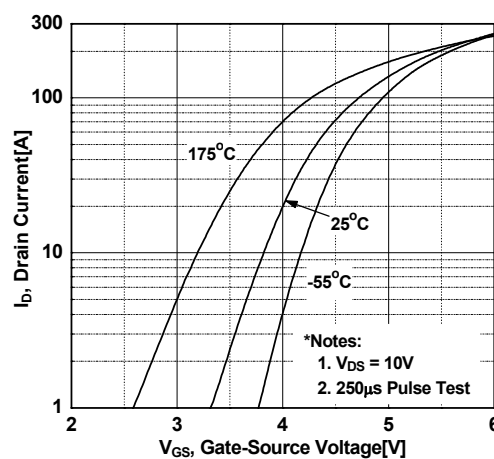


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

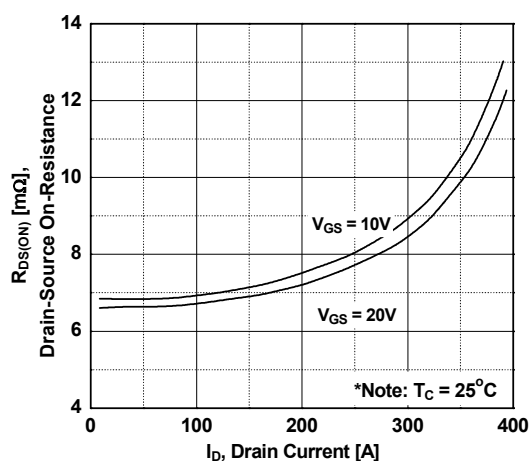


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

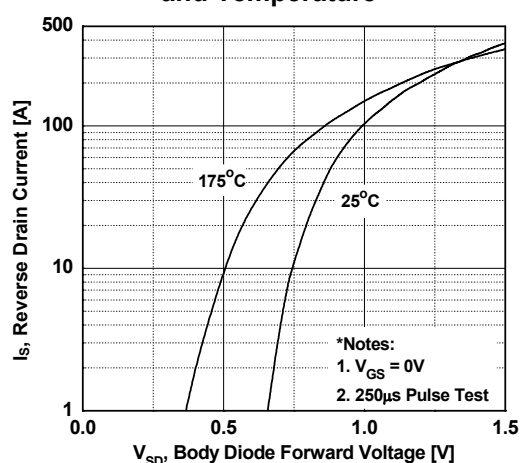


Figure 5. Capacitance Characteristics

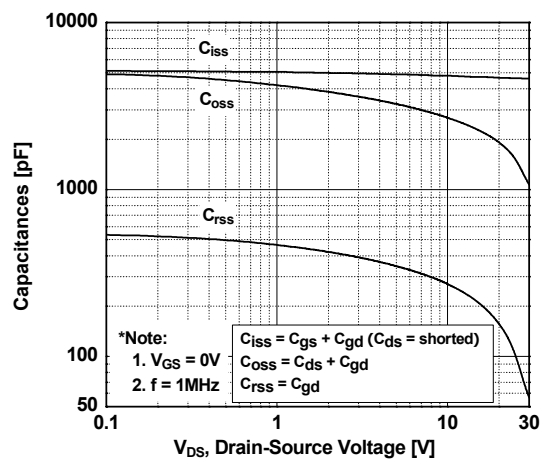
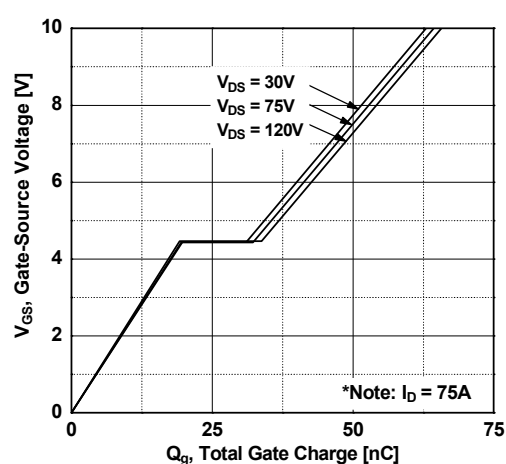
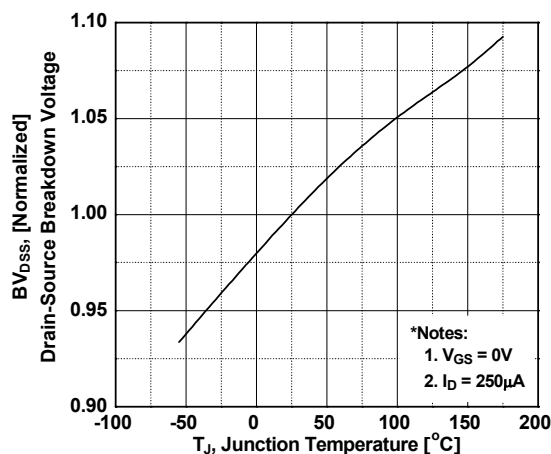


Figure 6. Gate Charge Characteristics

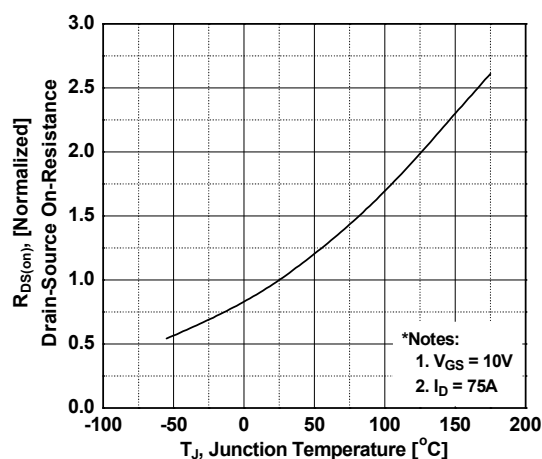


## Typical Performance Characteristics (Continued)

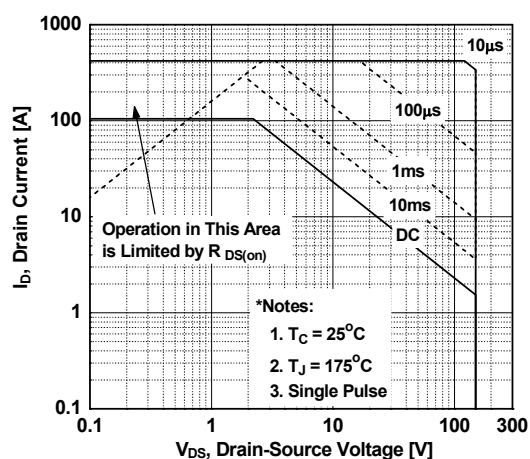
**Figure 7. Breakdown Voltage Variation vs. Temperature**



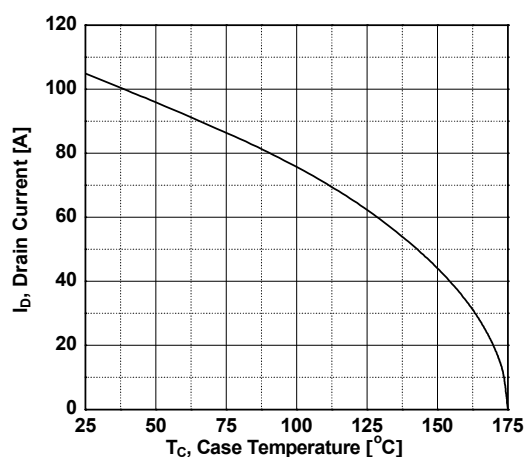
**Figure 8. On-Resistance Variation vs. Temperature**



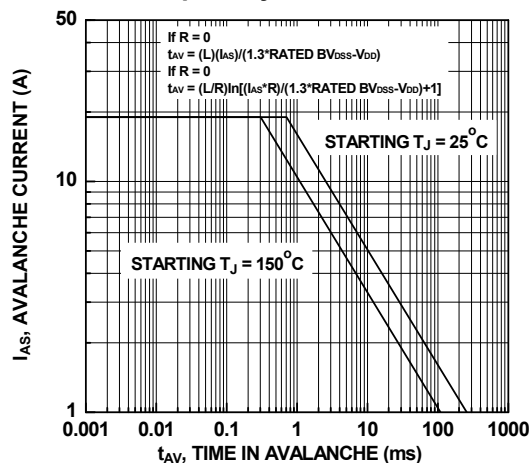
**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**

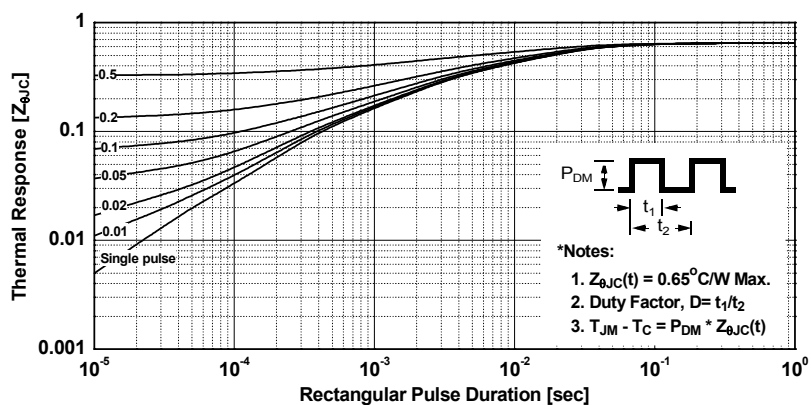


**Figure 11. Unclamped Inductive Switching Capability**

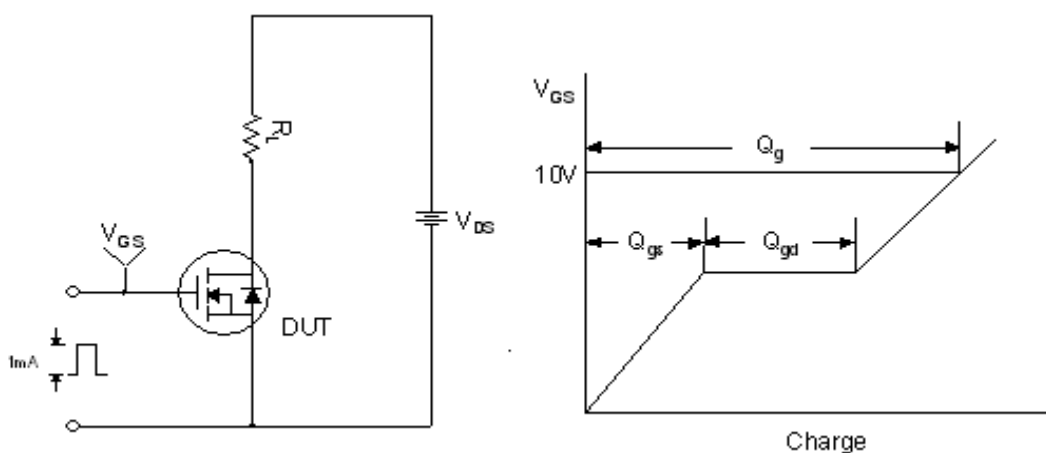


## Typical Performance Characteristics

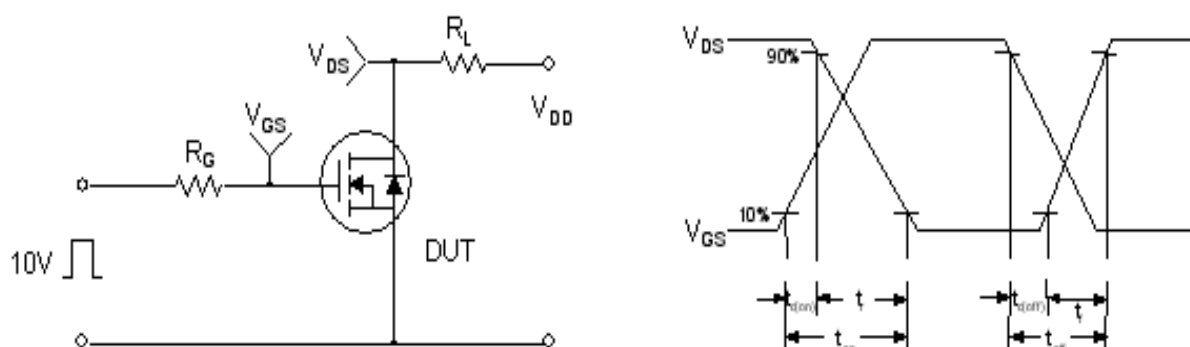
Figure 12. Transient Thermal Response Curve



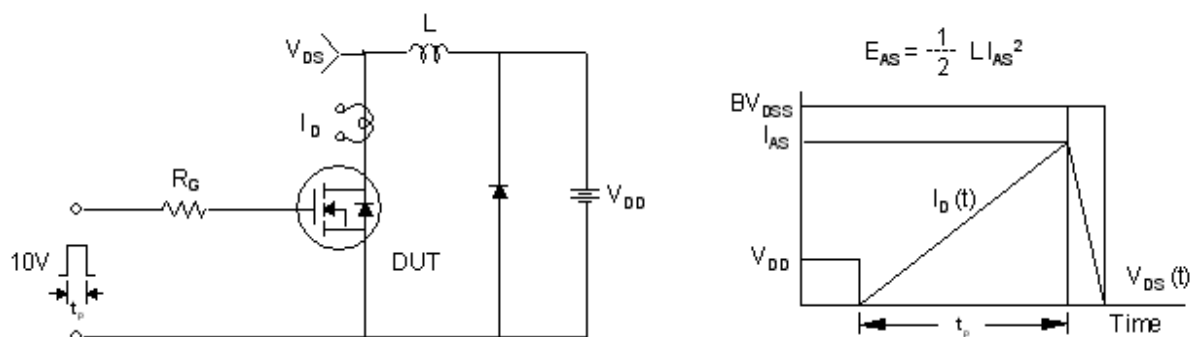
**Gate Charge Test Circuit & Waveform**



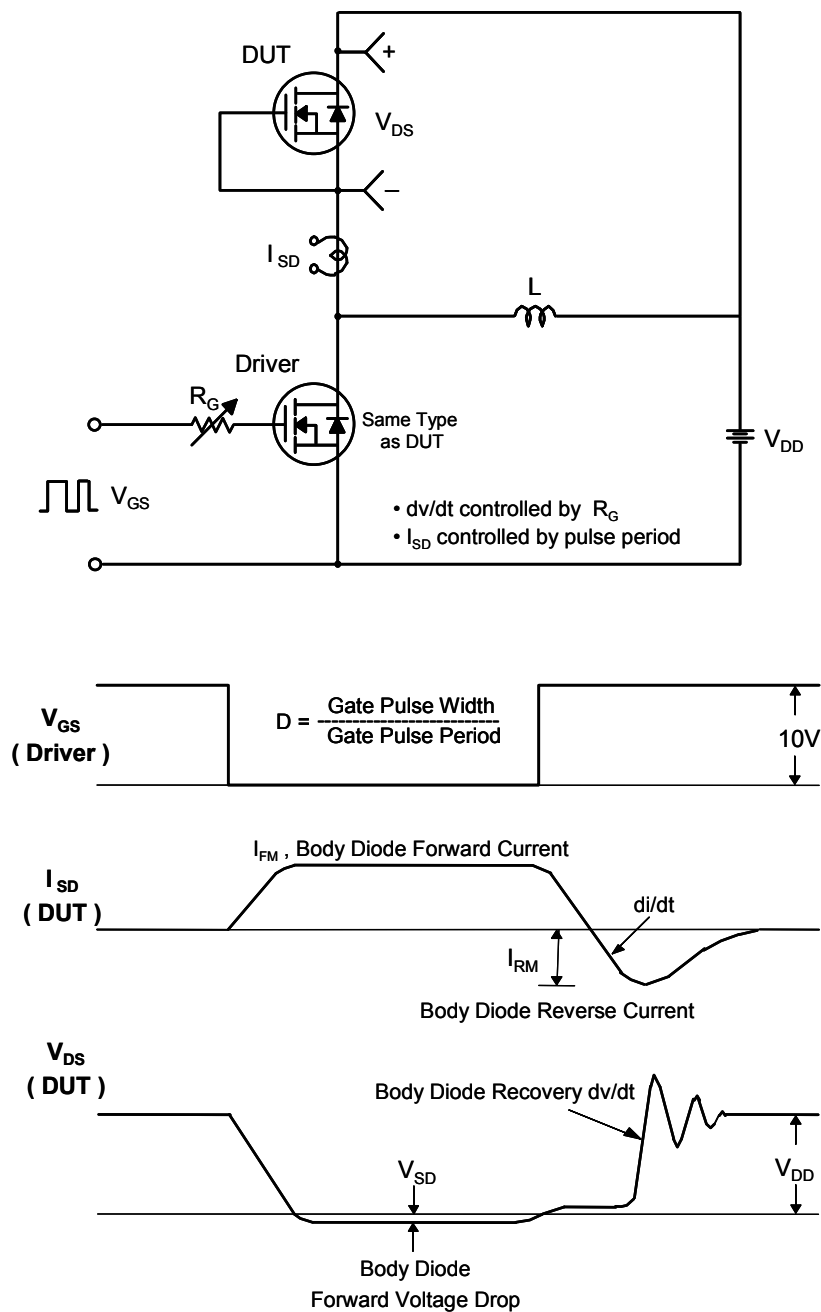
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

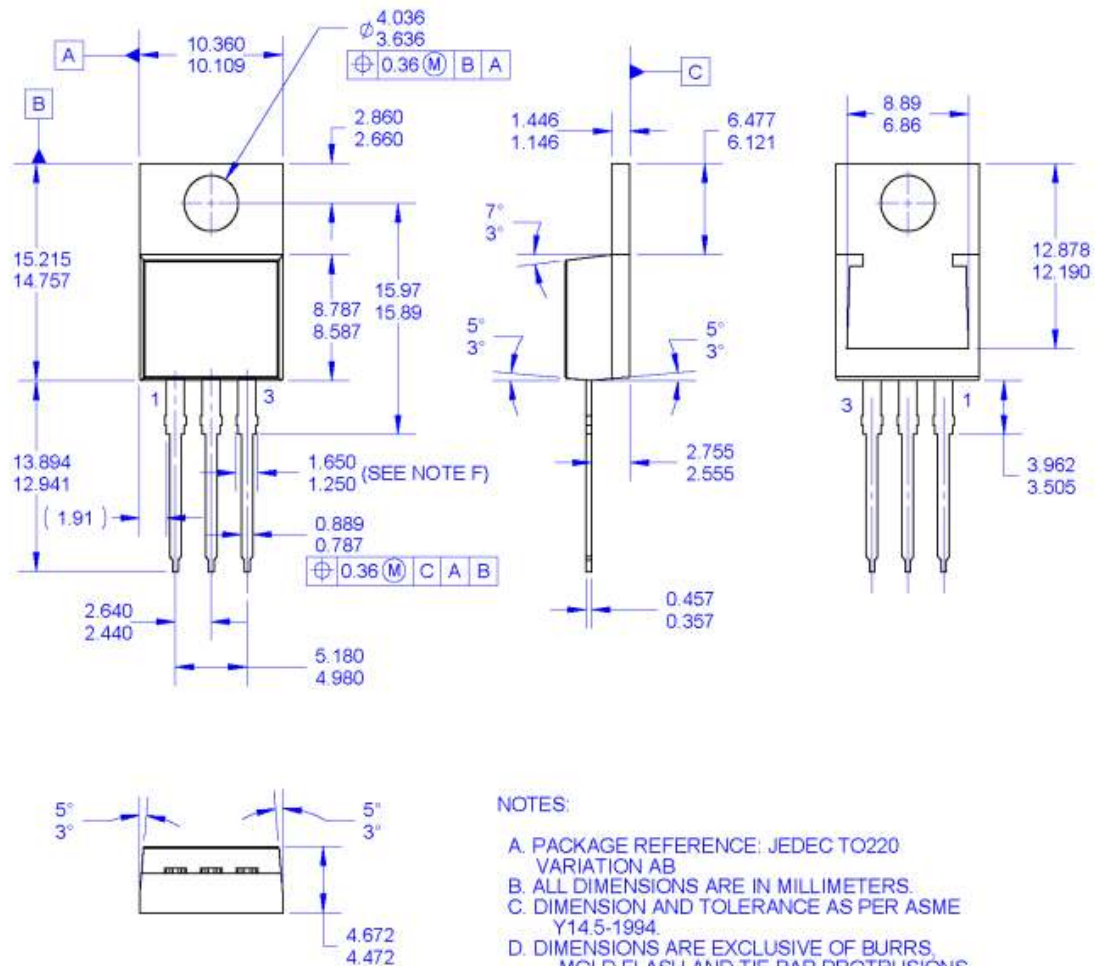


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

### TO-220 (F102: Trimmed Leads)



#### NOTES:

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

Dimensions in Millimeters



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