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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

March 2015

# FDPF770N15A

## N-Channel PowerTrench® MOSFET

**150 V, 10 A, 77 mΩ**

### Features

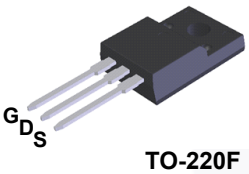
- $R_{DS(on)}$ = 60 mΩ (Typ.) @ $V_{GS}$ = 10 V, $I_D$ = 10 A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Description

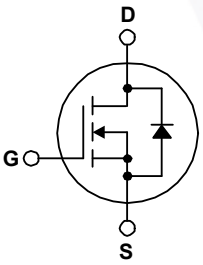
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Consumer Appliances
- LED TV
- Synchronous Rectification for ATX / Sever / Telecom PSU
- Uninterruptible Power Supply
- Micro Solar Inverter




TO-220F




### Absolute Maximum Ratings $T_C$ = 25°C unless otherwise noted.

| Symbol | Parameter | | FDPF770N15A | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | | 150 | V |
| $V_{GSS}$ | Gate to Source Voltage | - DC | ±20 | V |
| | | - AC (f > 1 Hz) | ±30 | |
| $I_D$ | Drain Current | - Continuous ($T_C$ = 25°C,Silicon Limited) | 10 | A |
| | | - Continuous ($T_C$ = 100°C,Silicon Limited) | 7 | |
| $I_{DM}$ | Drain Current | - Pulsed (Note 1) | 40 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy | (Note 2) | 35 | mJ |
| dv/dt | Peak Diode Recovery dv/dt | (Note 3) | 6.0 | V/ns |
| $P_D$ | Power Dissipation | ($T_C$ = 25°C) | 21 | W |
| | | - Derate Above 25°C | 0.17 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | -55 to +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds | | 300 | °C |

### Thermal Characteristics

| Symbol | Parameter | FDPF770N15A | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 5.9 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. | 62.5 | |

## Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|---|
| FDPF770N15A | FDPF770N15A | TO-220F | Tube | N/A | N/A | 50 units |

## Electrical Characteristics $T_C = 25^oC$ unless otherwise noted.

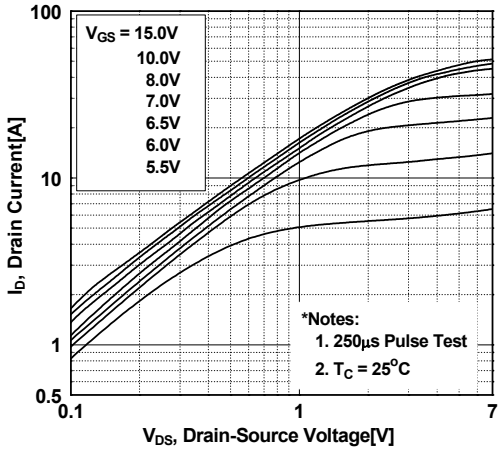
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = 0 V | 150 | - | - | V |
| $\Delta BV_{DSS}$ / $\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | - | 0.1 | - | V/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 120 V, $V_{GS}$ = 0 V | - | - | 1 | μA |
| | | $V_{DS}$ = 120 V, $T_C$ = 125°C | - | - | 500 | |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | 2.0 | - | 4.0 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 10 A | - | 60 | 77 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 10 V, $I_D$ = 10 A | - | 15 | - | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 75 V, $V_{GS}$ = 0 V, f = 1 MHz | - | 575 | 765 | pF |
| $C_{oss}$ | Output Capacitance | | - | 64 | 85 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 3.9 | - | pF |
| $C_{oss(er)}$ | Energy Related Output Capacitance | $V_{DS}$ = 75 V, $V_{GS}$ = 0 V | | 113 | - | pF |
| $Q_{g(tot)}$ | Total Gate Charge at 10V | $V_{DS}$ = 75 V, $I_D$ = 10 A, $V_{GS}$ = 10 V (Note 4) | - | 8.6 | 11.2 | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | | 3.2 | - | nC |
| $Q_{gs2}$ | Gate Charge Threshold to Plateau | | - | 1.2 | - | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | - | 1.9 | - | nC |
| ESR | Equivalent Series Resistance (G-S) | f = 1 MHz | - | 0.5 | - | Ω |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 75 V, $I_D$ = 10 A, $V_{GS}$ = 10 V, $R_G$ = 4.7 Ω (Note 4) | - | 12 | 34 | ns |
| $t_r$ | Turn-On Rise Time | | - | 8 | 26 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 15 | 40 | ns |
| $t_f$ | Turn-Off Fall Time | | - | 3 | 16 | ns |
| **Drain-Source Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 10 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 40 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$ = 0 V, $I_{SD}$ = 10 A | - | - | 1.25 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0 V, $I_{SD}$ = 10 A, $V_{DD}$ = 75 V, $dI_F/dt$ = 100 A/μs | - | 59 | - | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 124 | - | nC |

**Notes:**

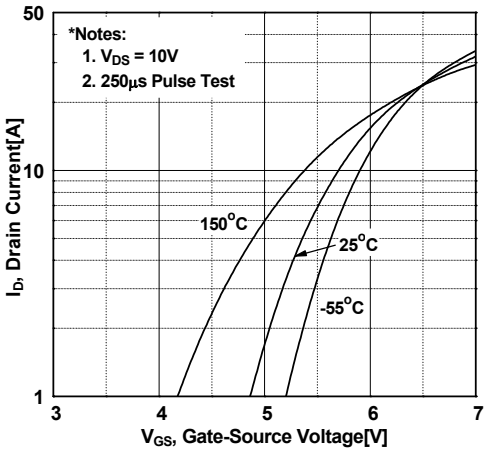
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. Starting $T_J$ = 25°C, L = 3 mH, $I_{SD}$ = 4.8 A.
3. $I_{SD}$ ≤ 10 A, di/dt ≤ 200 A/μs, $V_{DD}$ ≤ $BV_{DSS}$, starting $T_J$ = 25°C.
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

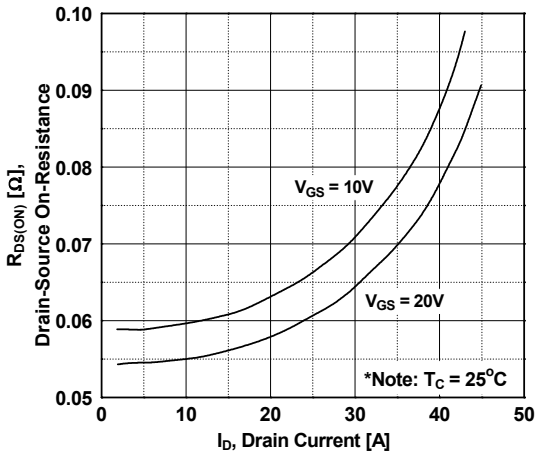
### Figure 1. On-Region Characteristics



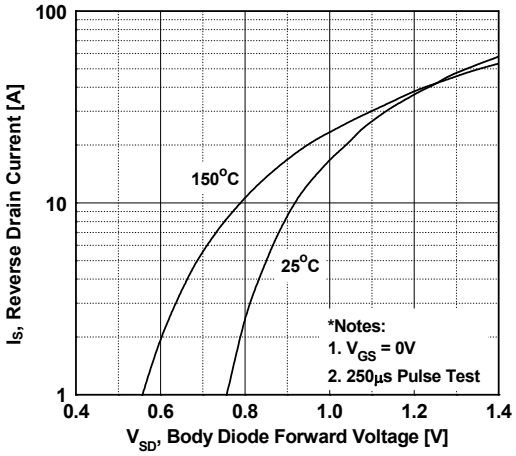

### Figure 2. Transfer Characteristics



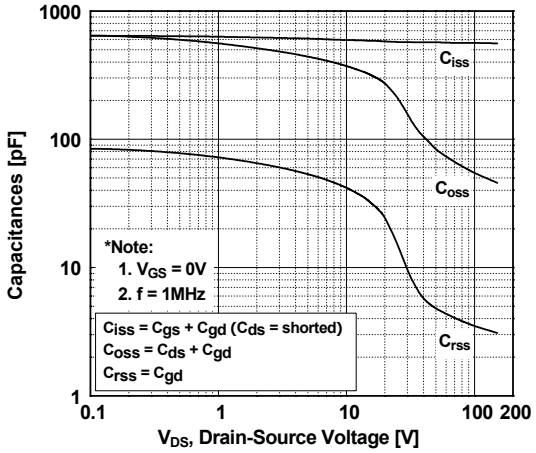

### Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage



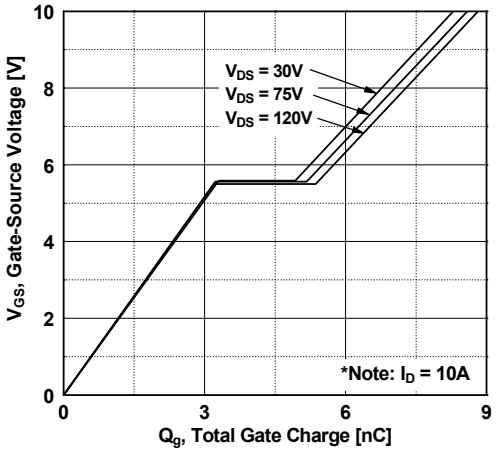

### Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature




### Figure 5. Capacitance Characteristics




### Figure 6. Gate Charge Characteristics



## Typical Performance Characteristics (Continued)

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

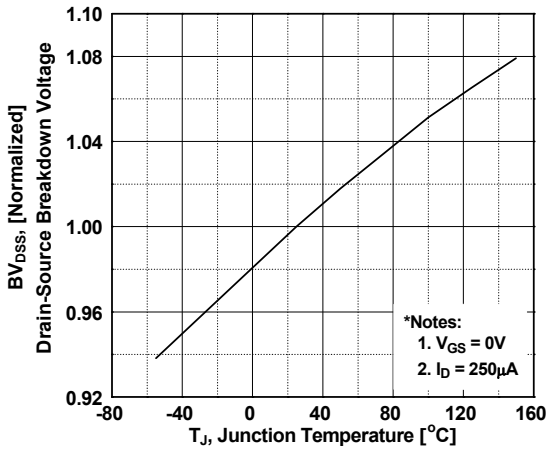



**Figure 8. On-Resistance Variation vs. Temperature**

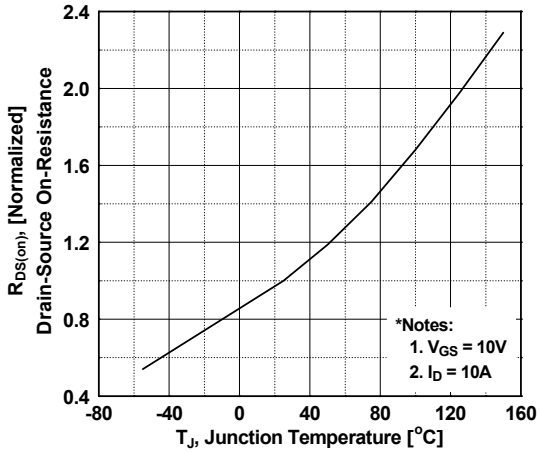



**Figure 9. Maximum Safe Operating Area**

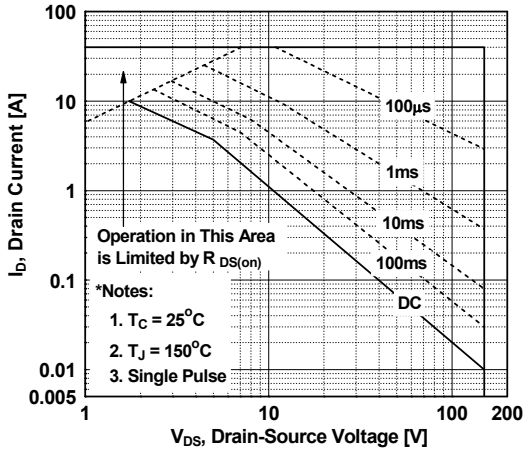



**Figure 10. Maximum Drain Current vs. Case Temperature**

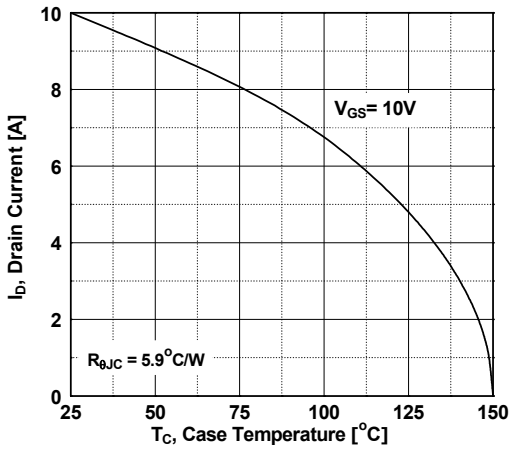
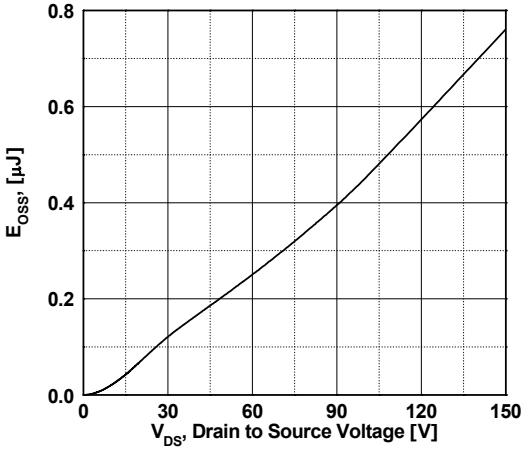
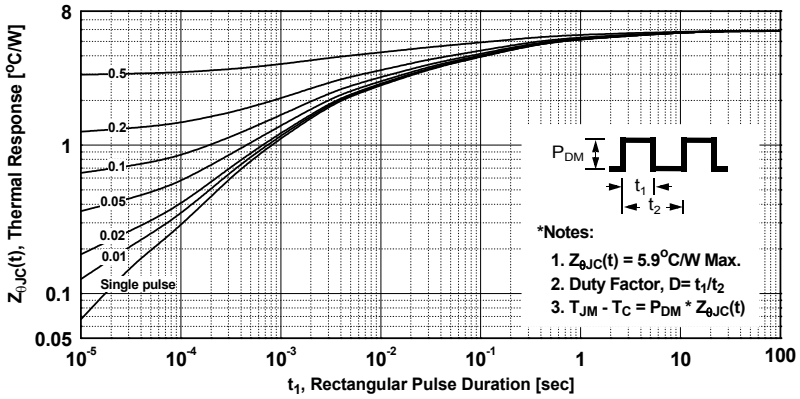



**Figure 11. Eoss vs. Drain to Source Voltage**



## Typical Performance Characteristics (Continued)

**Figure 12. Transient Thermal Response Curve**



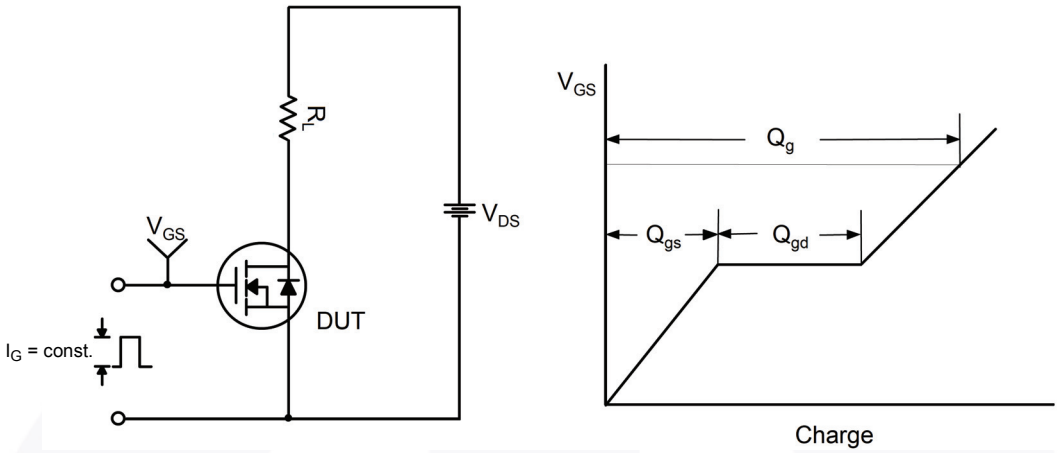



**Figure 13. Gate Charge Test Circuit & Waveform**

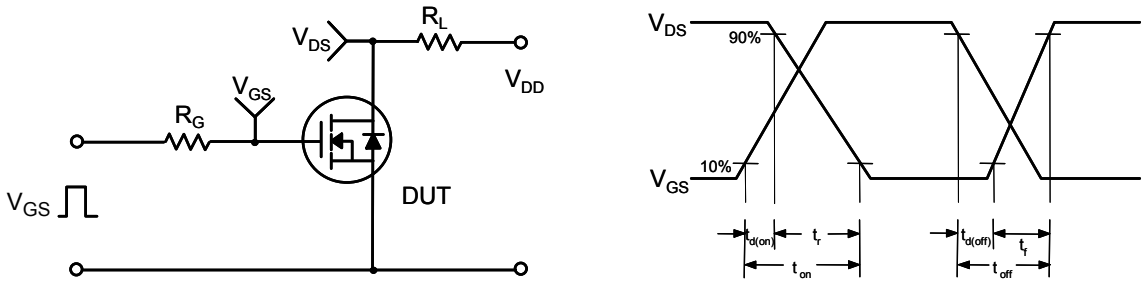



**Figure 14. Resistive Switching Test Circuit & Waveforms**

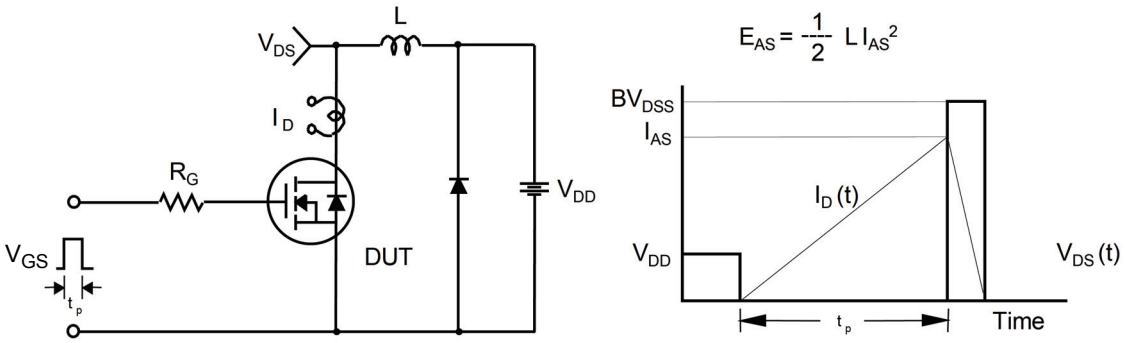



**Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms**

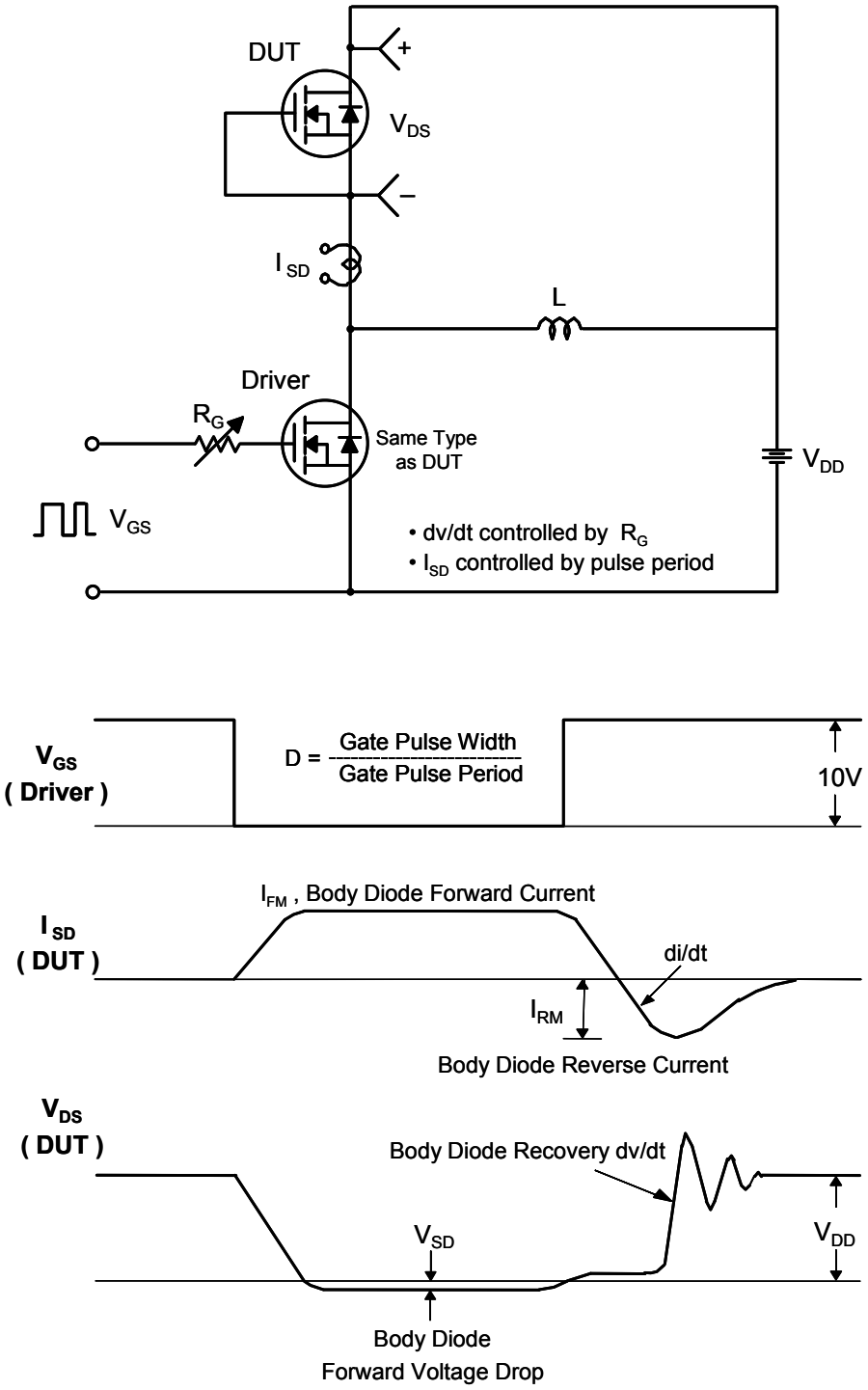
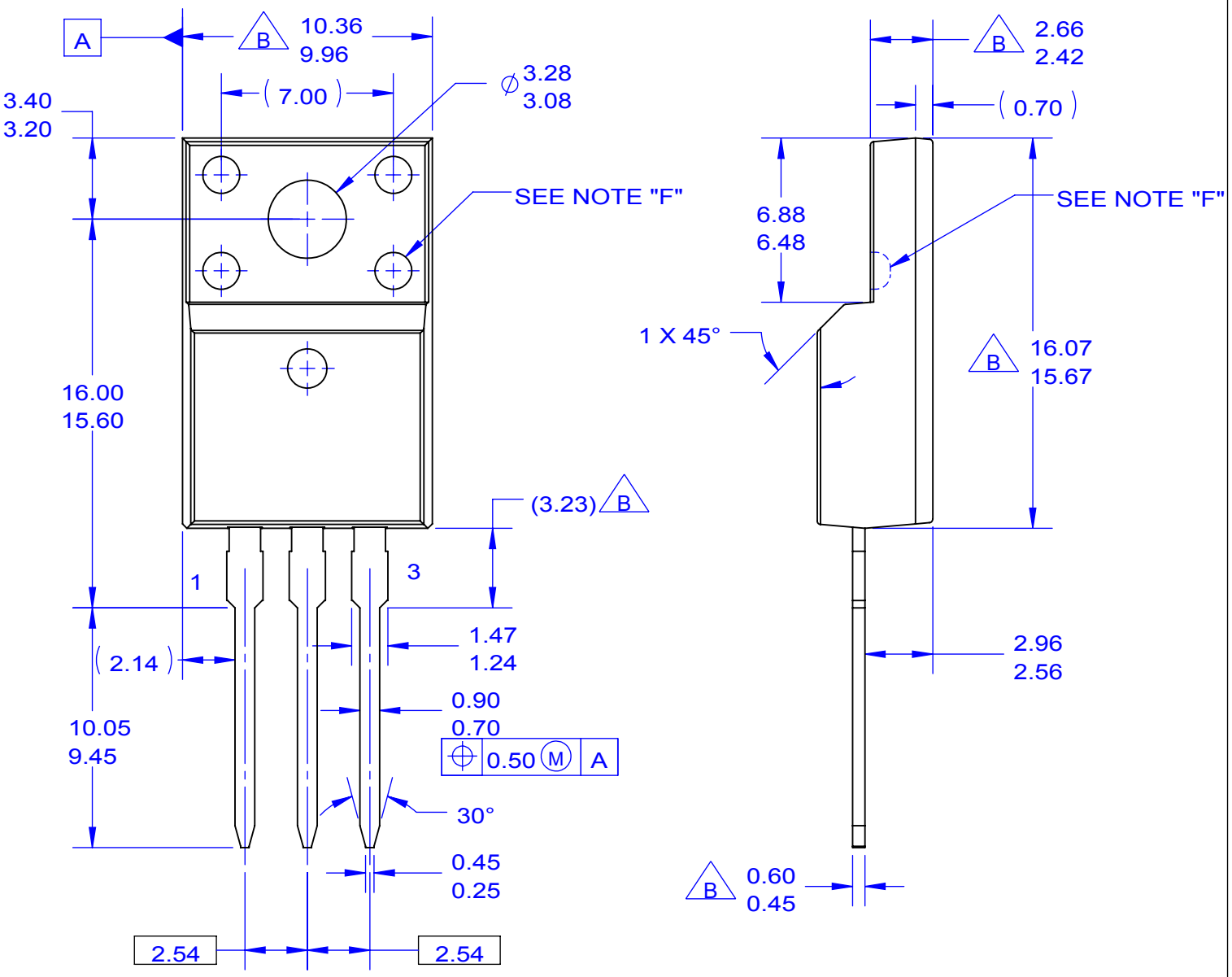
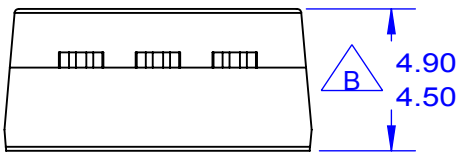



**Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms**

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NOTES:

A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
B DOES NOT COMPLY EIAJ STD. VALUE.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
F. OPTION 1 - WITH SUPPORT PIN HOLE.
OPTION 2 - NO SUPPORT PIN HOLE.
G. DRAWING FILE NAME: TO220M03REV5

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