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ON Semiconductor®

FDPF18N20FT-G

N-Channel UniFET™ FRFET® MOSFET

200 V, 18 A, 140 m

Features

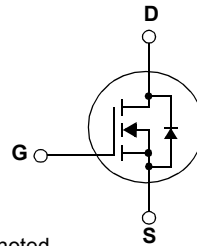
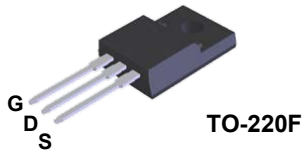
- $R_{DS(on)} = 129\text{ m}\Omega$ (Typ.) @ $V_{GS} = 10\text{ V}$, $I_D = 9\text{ A}$
- Low Gate Charge (Typ. 20 nC)
- Low C_{rss} (Typ. 24 pF)
- 100% Avalanche Tested
- Improve dv/dt Capability
- RoHS Compliant

Applications

- LCD/LED TV
- Consumer Appliances
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

Description

UniFET™ MOSFET is ON Semiconductor®'s high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. The body diode's reverse recovery performance of UniFET FRFET® has been enhanced by lifetime control. Its t^r is less than 100nsec and the reverse dv/dt immunity is 15V/ns while normal planar MOSFETs have over 200nsec and 4.5V/nsec respectively. Therefore, it can remove additional component and improve system reliability in certain applications in which the performance of MOSFET's body diode is significant. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.



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

| Symbol | Parameter | FDPF18N20FT-G | Unit |
|----------------|--|---|------------------|
| V_{DSS} | Drain to Source Voltage | 200 | V |
| V_{GSS} | Gate to Source Voltage | ± 30 | V |
| I_D | Drain Current | -Continuous ($T_C = 25^\circ\text{C}$) | 18* |
| | | -Continuous ($T_C = 100^\circ\text{C}$) | 10.8* |
| I_{DM} | Drain Current | - Pulsed (Note 1) | 72* |
| E_{AS} | Single Pulsed Avalanche Energy | (Note 2) | 324 |
| I_{AR} | Avalanche Current | (Note 1) | 18 |
| E_{AR} | Repetitive Avalanche Energy | (Note 1) | 10 |
| dv/dt | Peak Diode Recovery dv/dt | (Note 3) | 4.5 |
| P_D | Power Dissipation | ($T_C = 25^\circ\text{C}$) | 35 |
| | | - Derate above 25°C | 0.27 |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | $^\circ\text{C}$ |
| T_L | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300 | $^\circ\text{C}$ |

*Drain current limited by maximum junction temperature

Thermal Characteristics

| Symbol | Parameter | FDPF18N20FT-G | Unit |
|-----------------|---|---------------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 3.6 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta CS}$ | Thermal Resistance, Case to Sink, Typ. | 0.5 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. | 62.5 | |

FDPF18N20FT-G N-Channel UniFET™ FRFET® MOSFET

Package Marking and Ordering Information $T_C = 25^\circ\text{C}$ unless otherwise noted

| Device Marking | Device | Package | Eco Status | Reel Size | Tape Width | Quantity |
|----------------|--------------|---------|------------|-----------|------------|----------|
| FDPF18N20FT | FDPF18N20F-G | TO-220F | Green/RoHS | - | - | 50 |

Electrical Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|------|------|------|------|
|--------|-----------|-----------------|------|------|------|------|

Off Characteristics

| | | | | | | |
|--------------------------------------|---|---|-----|-----|-----------|---------------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$ | 200 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, Referenced to 25°C | - | 0.2 | - | $\text{V}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 200\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 160\text{V}, T_C = 125^\circ\text{C}$ | - | - | 10 100 | μA |
| I_{GSS} | Gate to Body Leakage Current | $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ | - | - | ± 100 | nA |

On Characteristics

| | | | | | | |
|--------------|--------------------------------------|---|-----|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | 3.0 | - | 5.0 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10\text{V}, I_D = 9\text{A}$ | - | 0.12 | 0.14 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 20\text{V}, I_D = 9\text{A}$ (Note 4) | - | 13.6 | - | S |

Dynamic Characteristics

| | | | | | | |
|--------------|-------------------------------|---|---|-----|------|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ | - | 885 | 1180 | pF |
| C_{oss} | Output Capacitance | | - | 200 | 270 | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 24 | 35 | pF |
| $Q_{g(tot)}$ | Total Gate Charge at 10V | $V_{DS} = 160\text{V}, I_D = 18\text{A}$ $V_{GS} = 10\text{V}$ (Note 4, 5) | - | 20 | 26 | nC |
| Q_{gs} | Gate to Source Gate Charge | | - | 5 | - | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | - | 9 | - | nC |

Switching Characteristics

| | | | | | | |
|--------------|---------------------|--|---|----|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 100\text{V}, I_D = 18\text{A}$ $R_G = 25\Omega$ (Note 4, 5) | - | 16 | 40 | ns |
| t_r | Turn-On Rise Time | | - | 50 | 110 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 50 | 110 | ns |
| t_f | Turn-Off Fall Time | | - | 40 | 90 | ns |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|--|--|---|-----|-----|----|
| I_S | Maximum Continuous Drain to Source Diode Forward Current | - | - | 18 | A | |
| I_{SM} | Maximum Pulsed Drain to Source Diode Forward Current | - | - | 72 | A | |
| V_{SD} | Drain to Source Diode Forward Voltage | $V_{GS} = 0\text{V}, I_{SD} = 18\text{A}$ | - | - | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0\text{V}, I_{SD} = 18\text{A}$ | - | 80 | - | ns |
| Q_{rr} | Reverse Recovery Charge | $di/dt = 100\text{A}/\mu\text{s}$ (Note 4) | - | 240 | - | nC |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 2\text{mH}, I_{AS} = 18\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 18\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, 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

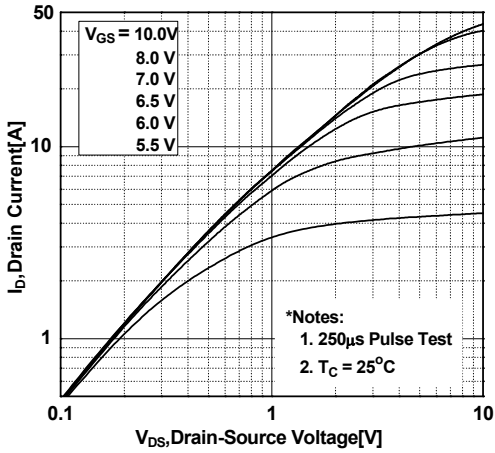


Figure 2. Transfer Characteristics

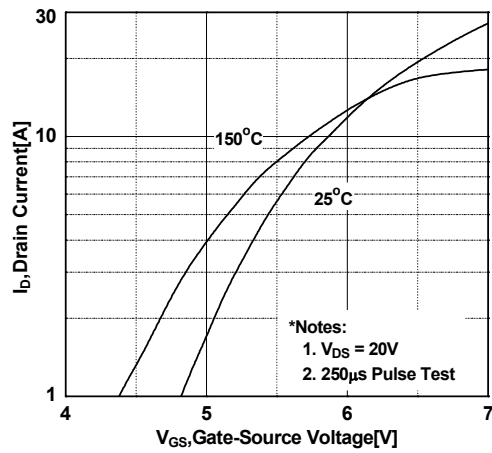


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

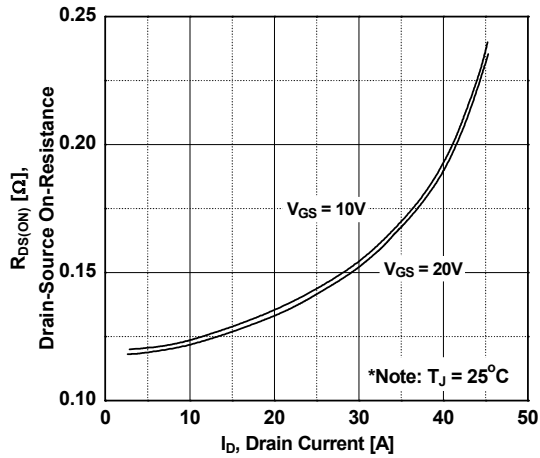


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

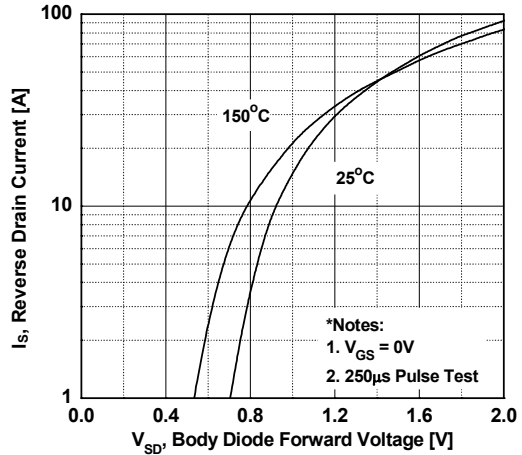


Figure 5. Capacitance Characteristics

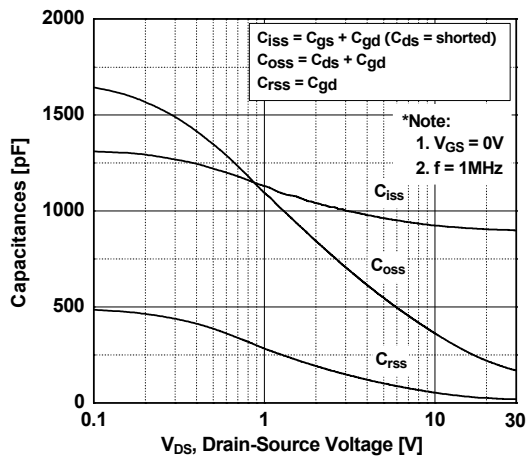
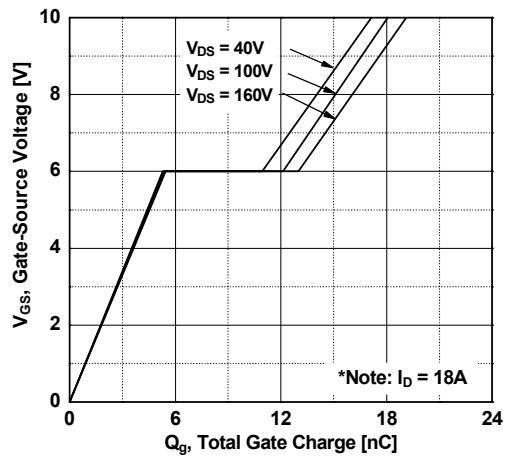


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

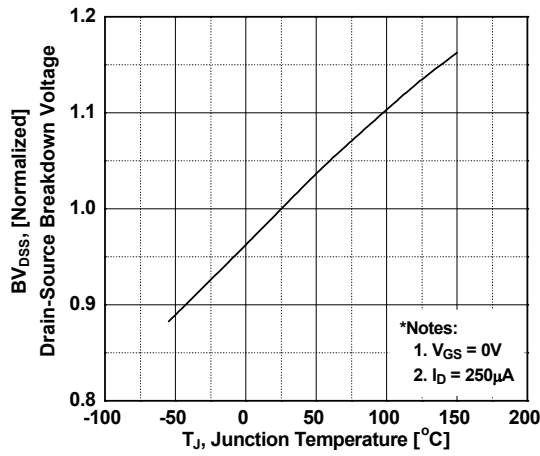


Figure 8. Maximum Safe Operating Area - FDP18N20F

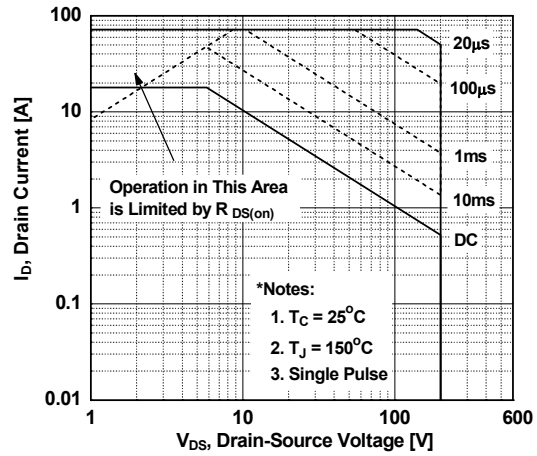


Figure 9. Maximum Drain Current vs. Case Temperature

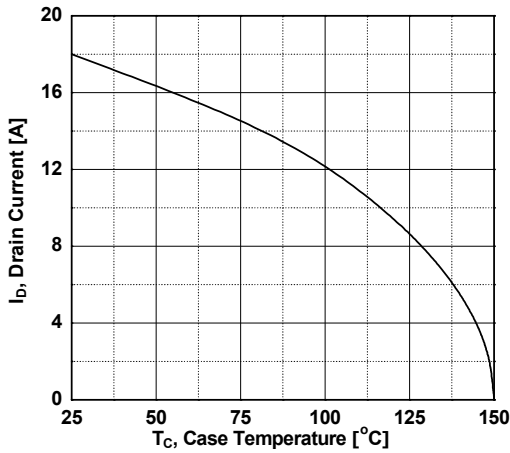
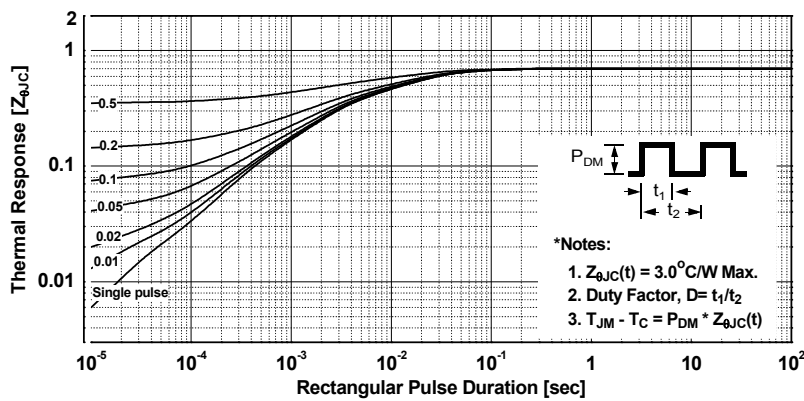
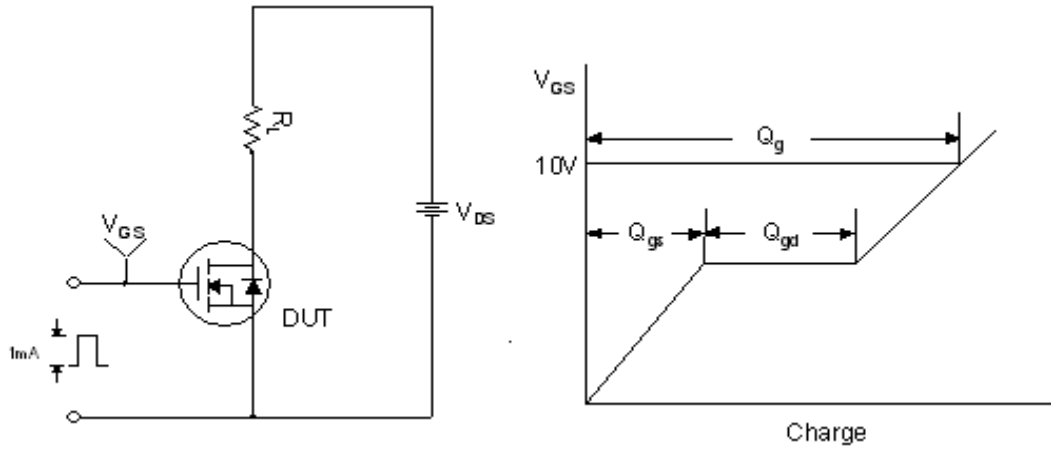


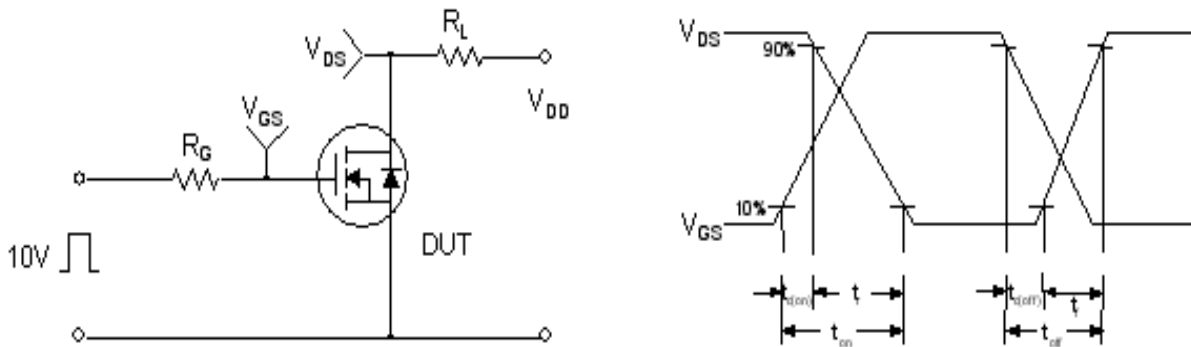
Figure 10. Transient Thermal Response Curve - FDP18N20F



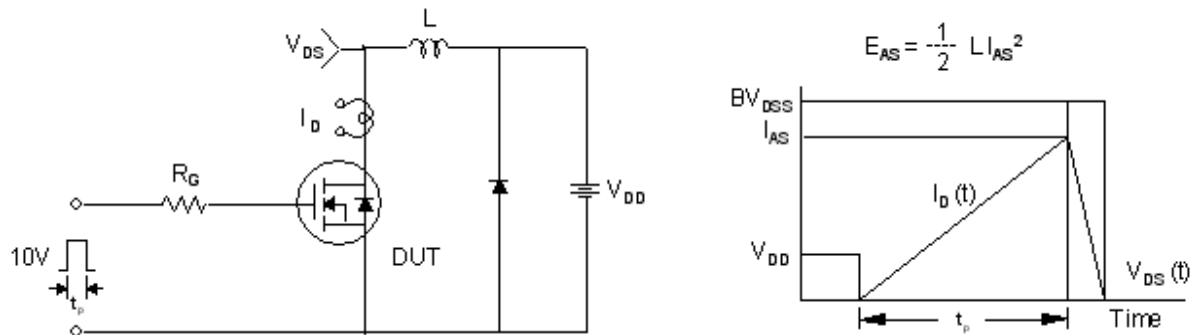
Gate Charge Test Circuit & Waveform



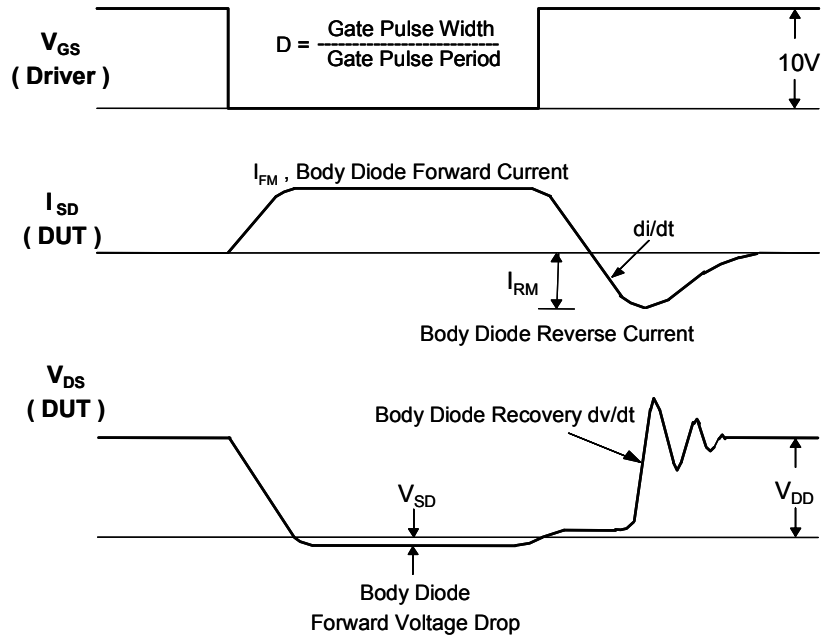
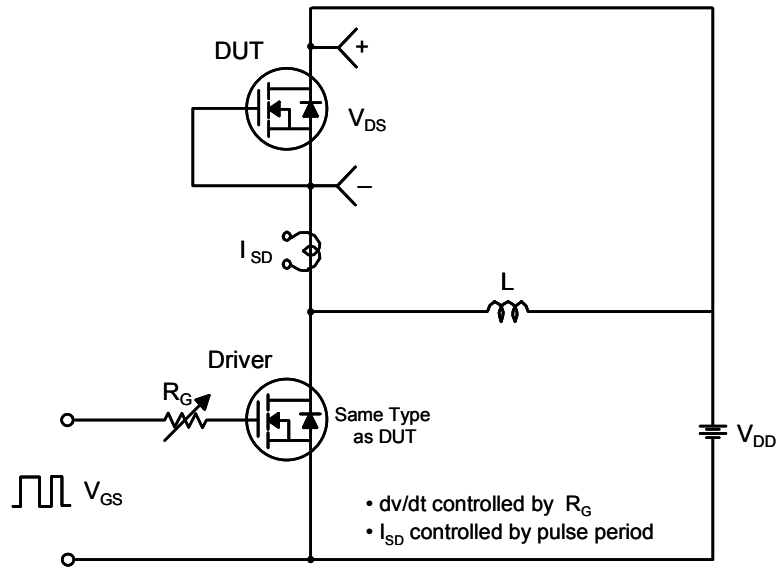
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

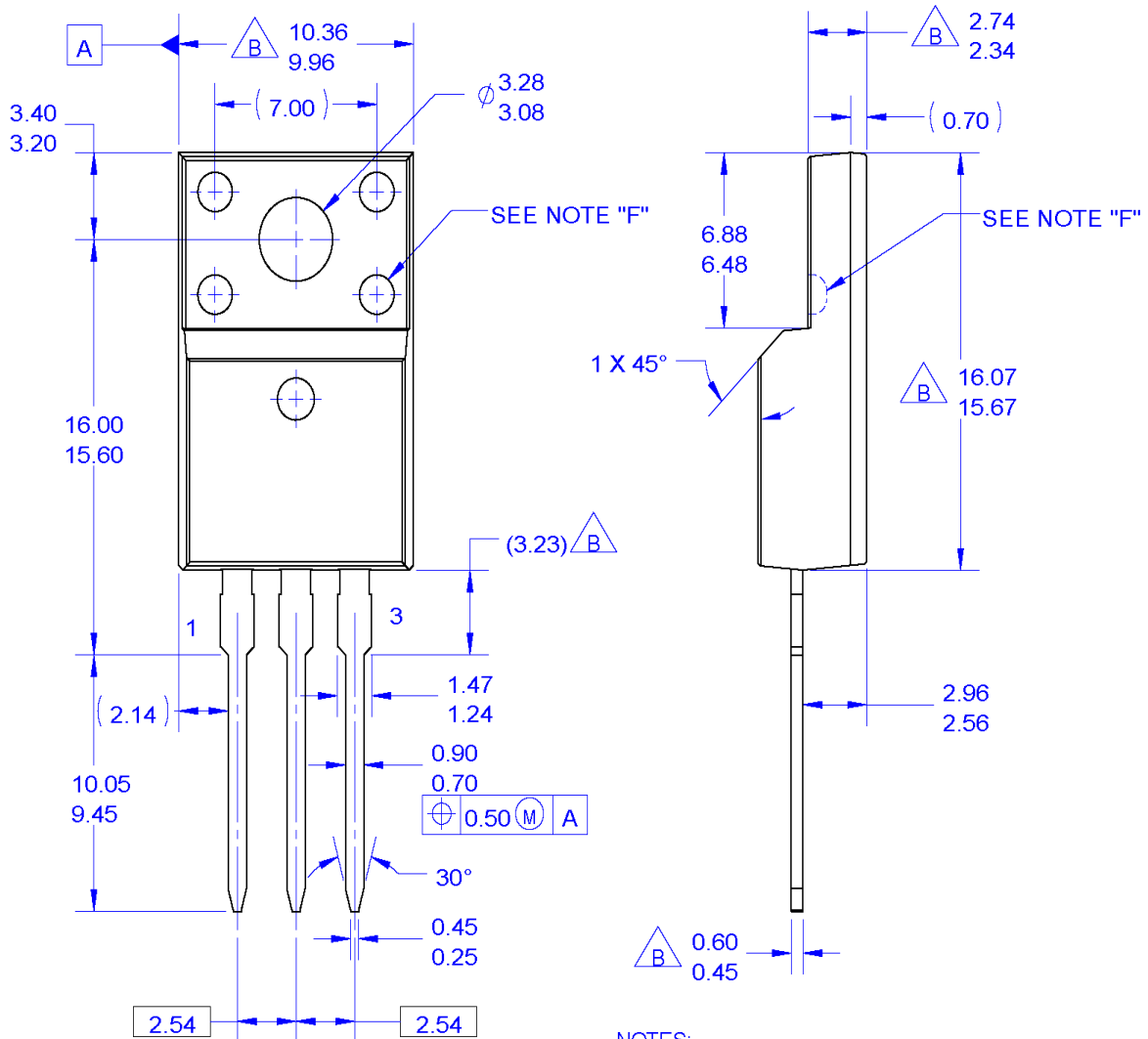


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220M03



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: TO220M03REV3

Dimensions in Millimeters

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