FAIRCHILD SEMICONDUCTOR®

November 2006

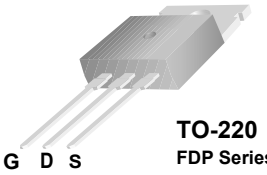
# FDP5800
# N-Channel Logic Level PowerTrench® MOSFET
**60V,80A, 6mΩ**

## Features

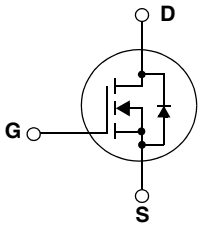
- $R_{DS(on)}$ = 4.6mΩ (Typ.), $V_{GS}$ = 10V, $I_D$ = 80A
- High performance trench technology for extermly low Rdson
- Low gate Charge
- High power and current handing capability
- RoHs Compliant

## Applications

- Motor/ Body Load Control
- Power Train Management
- Injection Systems
- DC-AC Converters and UPS




**TO-220**
**FDP Series**




## MOSFET Maximum Ratings $T_C$ = 25°C unless otherwise noted*

| Symbol | Parameter | | Ratings | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | 60 | V |
| $V_{GSS}$ | Gate-Source Voltage | | ±20 | V |
| $I_D$ | Drain Current | -Continuous ($T_C$ = 25°C) | 80 | A |
| | | -Continuous ($T_C$ = 100°C) | 80* | A |
| | | -Continuous ($T_A$ = 25°C) | 14 | A |
| $I_{DM}$ | Drain Current - Pulsed | | 320 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy (Note 1) | | 652 | mJ |
| $P_D$ | Power Dissipation ($T_C$ = 25°C)<br>- Derate above 25°C | | 242<br>1.61 | W<br>W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | -55 to +175 | °C |

*Drain current limited by package

## Thermal Characteristics

| | | | |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance , Junction to Case | 0.62 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance , Junction to Ambient, 1in$^2$ copper pad area | 43 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance , Junction to Ambient | 62.5 | °C/W |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDP5800 | FDP5800 | TO220 | -- | -- | 50 |

## Electrical Characteristics $T_C$= 25°C unless otherwise noted

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $B_{VDSS}$ | Drain-Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V, $T_J$ =25°C | 60 | -- | -- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 48V, $V_{GS}$ = 0V | -- | -- | 1 | μA |
| | | $V_{DS}$ = 48V, $V_{GS}$ = 0V, $T_J$ = 150°C | -- | -- | 500 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current, Forward | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | -- | -- | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 1.0 | -- | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-Source On Resistance | $V_{GS}$ = 10V , $I_D$ = 80A | -- | 4.6 | 6.0 | mΩ |
| | | $V_{GS}$ =4.5V , $I_D$ = 80A | -- | 5.9 | 7.2 | mΩ |
| | | $V_{GS}$ = 5V , $I_D$ = 80A | -- | 5.6 | 7.0 | mΩ |
| | | $V_{GS}$ =10V, $I_D$ = 80A, $T_J$ = 175°C | -- | 10.4 | 12.6 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 15V,$V_{GS}$ = 0V, f = 1MHz | -- | 6890 | 9160 | pF |
| $C_{oss}$ | Output Capacitance | | -- | 750 | 1000 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 295 | 445 | pF |
| $R_G$ | Gate Resistance | $V_{GS}$ = 0.5V, f = 1MHz | -- | 1.2 | -- | Ω |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V | $V_{GS}$ = 0V to 10V, $V_{DS}$ = 30V, $I_D$ = 80A, $I_g$ = 1mA | -- | 112 | 145 | nC |
| $Q_{g(TH)}$ | Total Gate Charge at 5V | $V_{GS}$ = 0V to 5V | -- | 58 | -- | nC |
| $Q_{g(TH)}$ | Threshold Gate Charge | $V_{GS}$ = 0V to 1V | -- | 7.0 | -- | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | -- | 23 | -- | nC |
| $Q_{gs2}$ | Gate Charge Threshold to Plateau | | -- | 13 | -- | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | -- | 18 | -- | nC |
| **Switching Characteristics ($V_{GS}$ = 10V)** | | | | | | |
| $t_{ON}$ | Turn-On Time | $V_{DD}$ = 30V, $I_D$ = 80A, $V_{GS}$ = 10V, $R_{GEN}$ = 1.5Ω | -- | 37 | 85 | ns |
| $t_{d(on)}$ | Turn-On Delay Time | | -- | 18 | 46 | ns |
| $t_r$ | Turn-On Rise Time | | -- | 19 | 47 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 55 | 120 | ns |
| $t_f$ | Turn-Off Fall Time | | -- | 9 | 28 | ns |
| $t_{OFF}$ | Turn-Off Time | | -- | 64 | 138 | ns |
| **Drain-Source Diode Characteristics** | | | | | | |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_{SD}$ = 80A | -- | -- | 1.25 | V |
| | | $V_{GS}$ = 0V, $I_{SD}$ = 40A | -- | -- | 1.0 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0V, $I_{SD}$ = 60A, $dI_F/dt$ = 100A/μs | -- | 58 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 106 | -- | nC |

**Notes:**
1: L = 1mH, $I_{AS}$ = 36A, $V_{DD}$ = 54V, $V_{GS}$ = 10V, $R_G$ = 25Ω, Starting $T_J$ = 25°C

## Typical Performance Characteristics

**Figure 1. On-Region Characteristics**

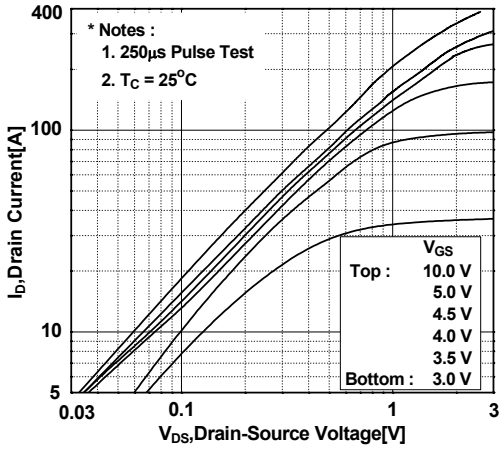



**Figure 2. Transfer Characteristics**

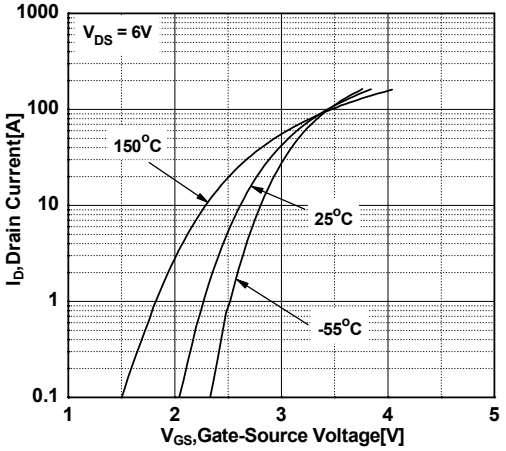



**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**

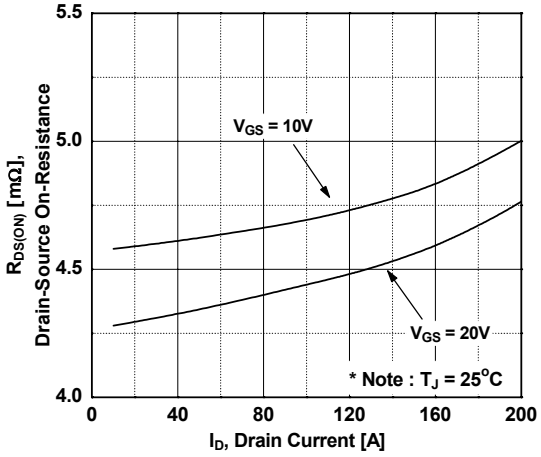



**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue**

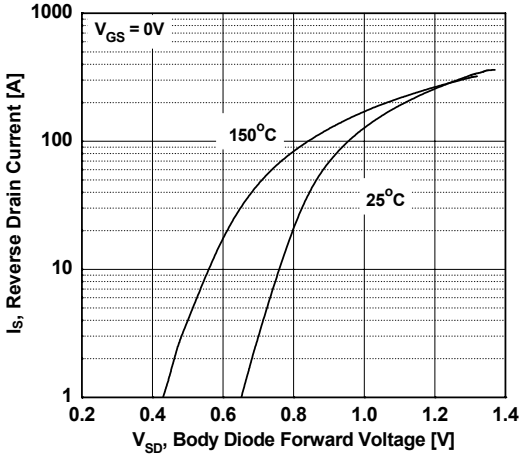



**Figure 5. Capacitance Characteristics**

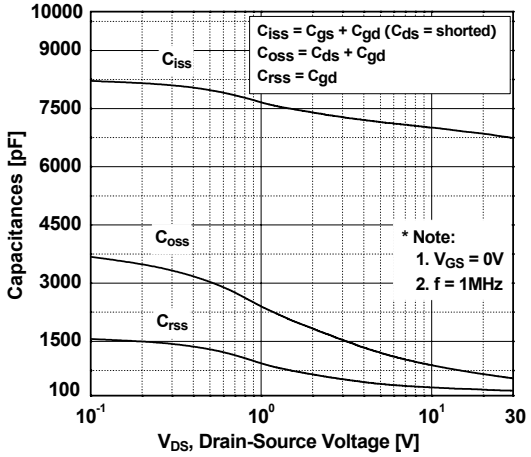
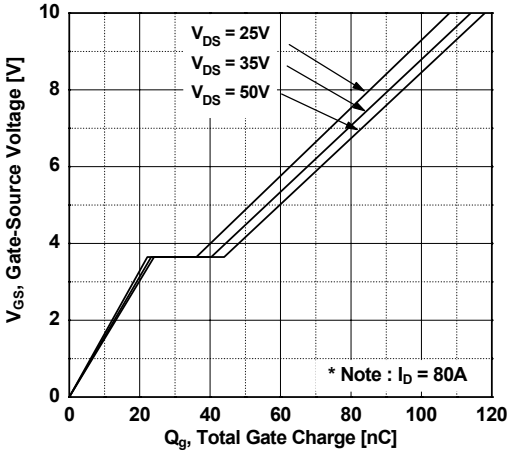



**Figure 6. Gate Charge Characteristics**



## Typical Performance Characteristics (Continued)

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

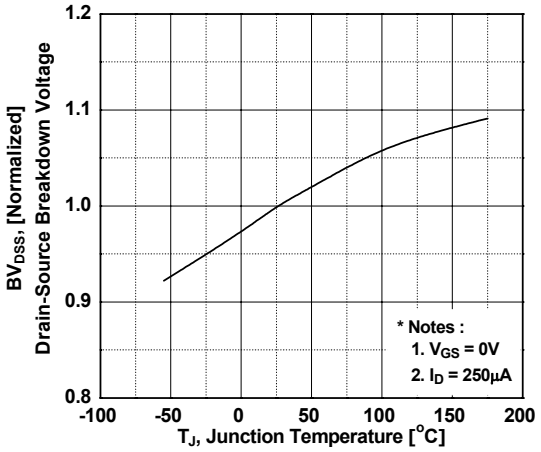



**Figure 8. On-Resistance Variation vs. Temperature**

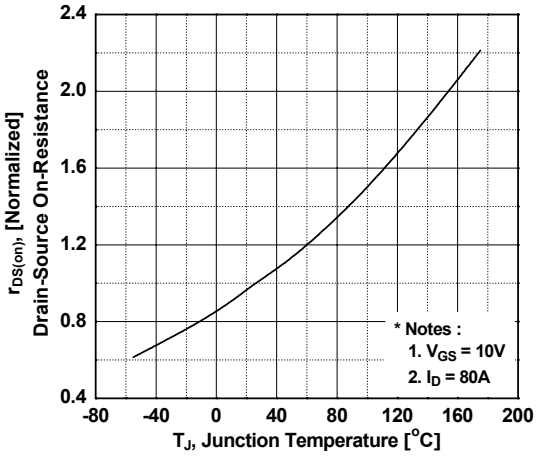



**Figure 9. Maximum Safe Operating Area**

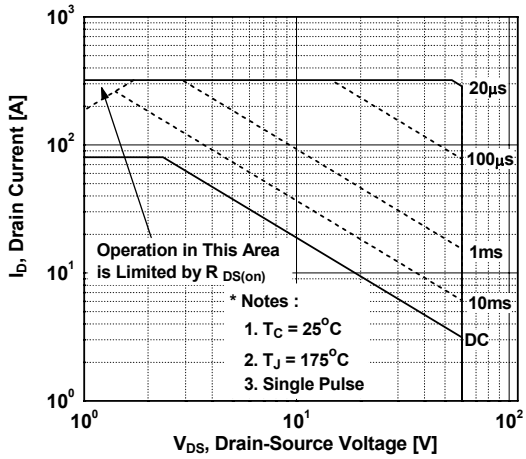



**Figure 10. Maximum Drain Current vs. Case Temperature**

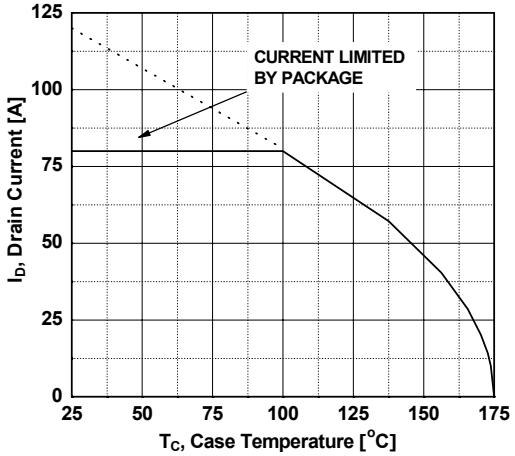
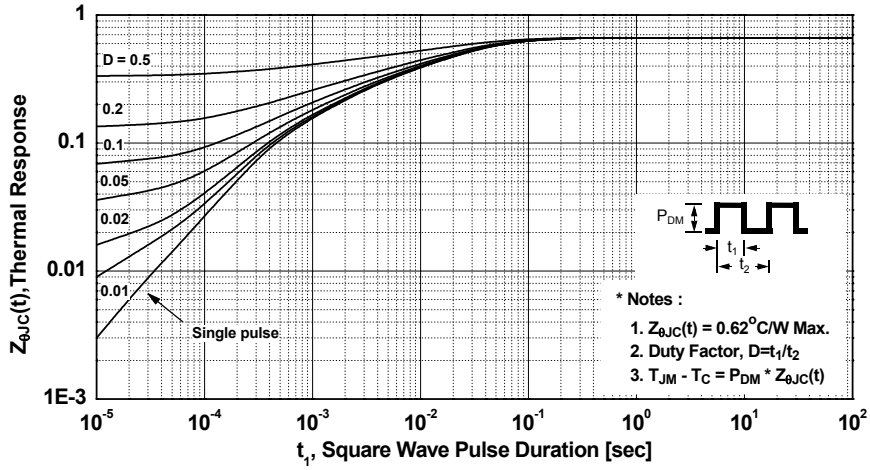
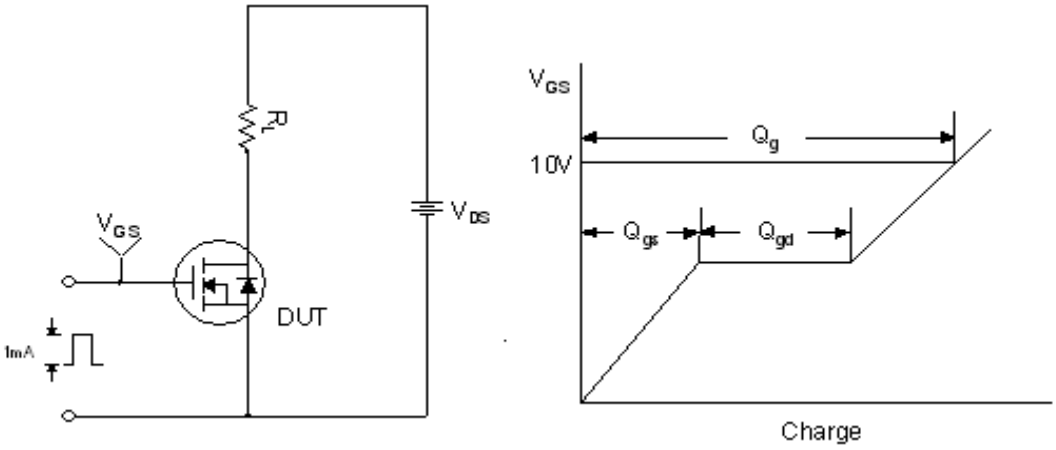


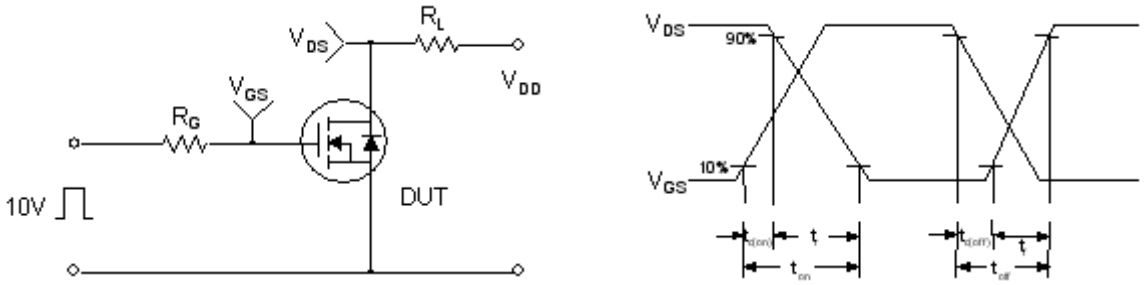

**Figure 11. Transient Thermal Response Curve**



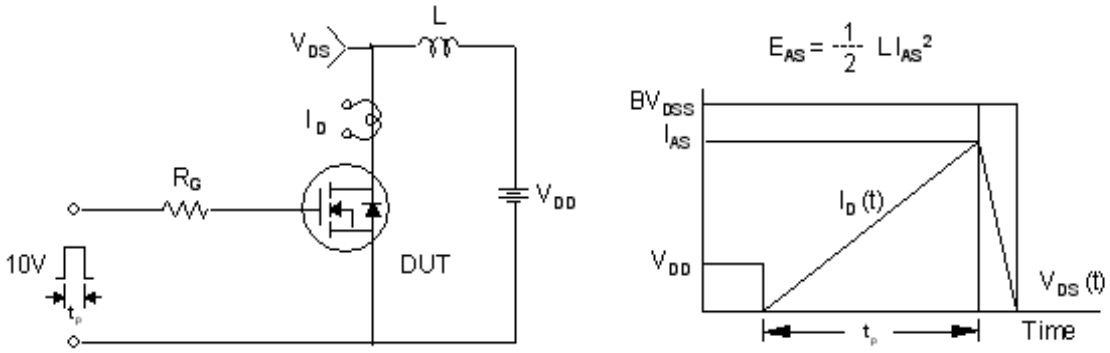
**Gate Charge Test Circuit & Waveform**



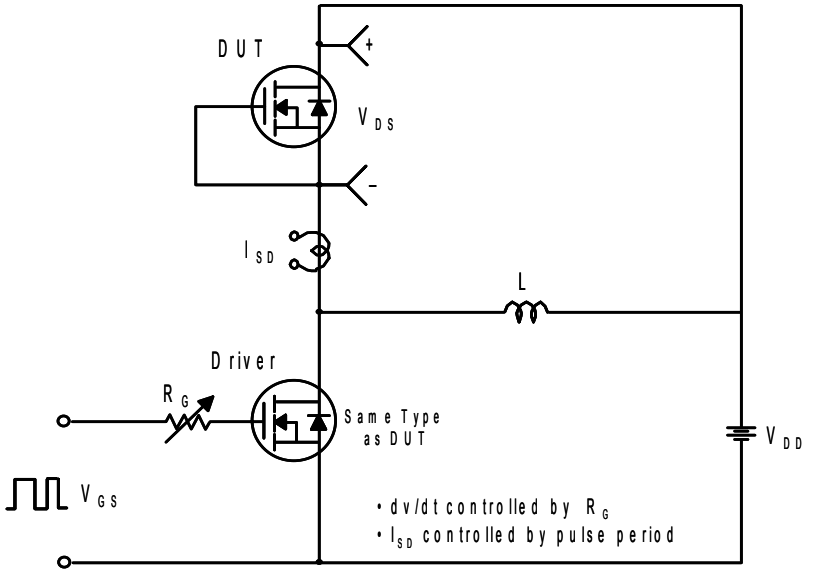

**Resistive Switching Test Circuit & Waveforms**

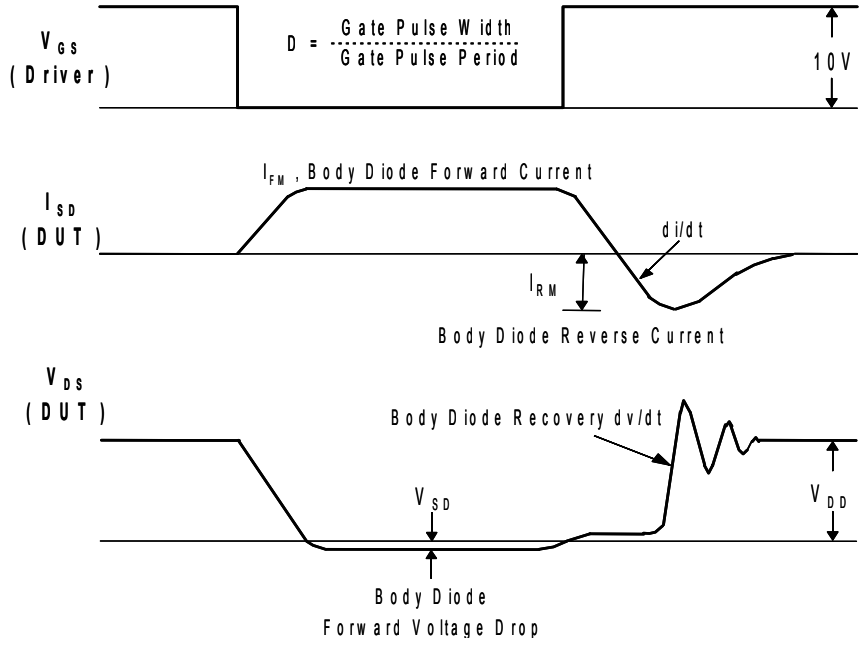



**Unclamped Inductive Switching Test Circuit & Waveforms**



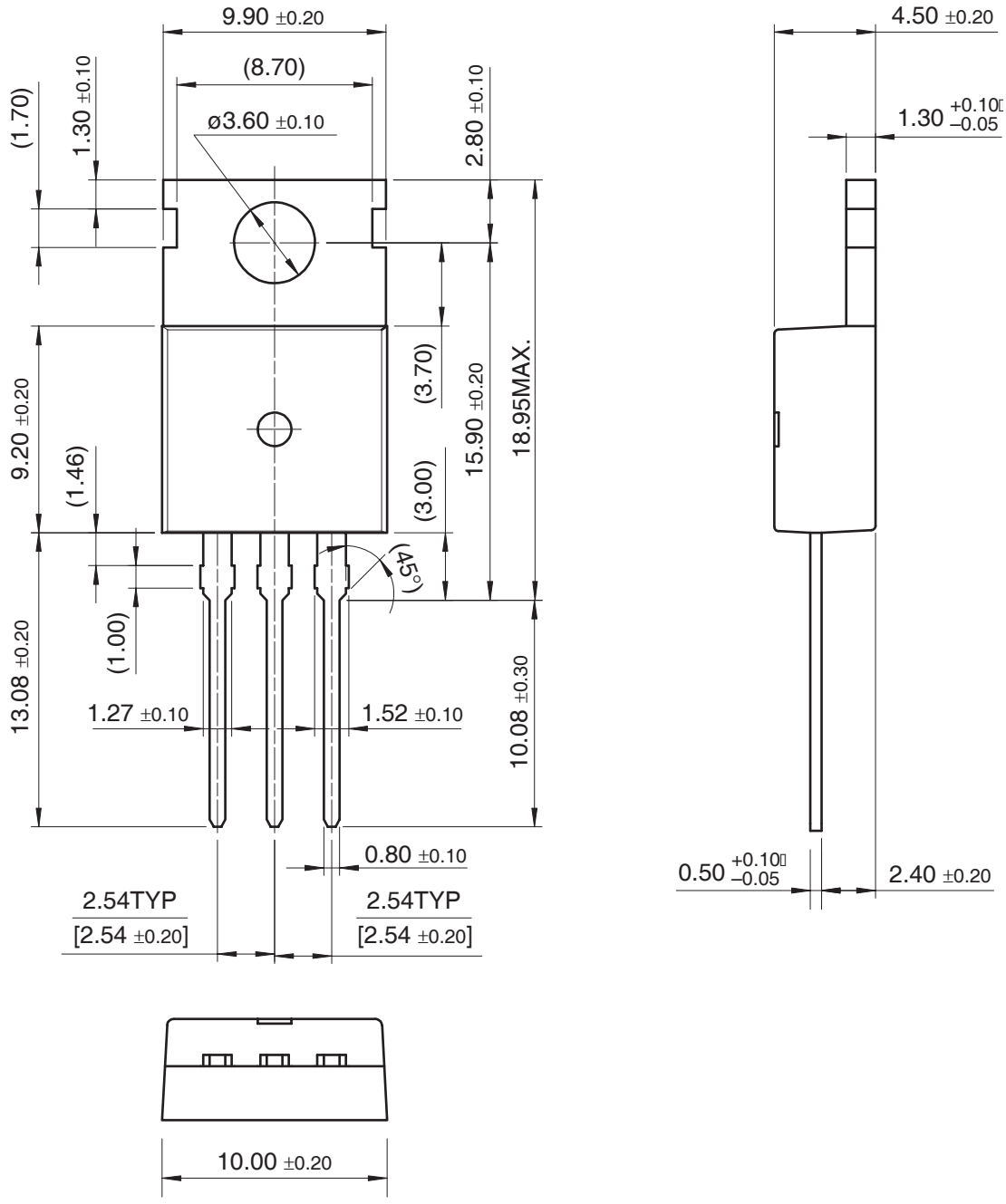
**Peak Diode Recovery dv/dt Test Circuit & Waveforms**



## Mechanical Dimensions

TO-220



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