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FDP8440

N-Channel PowerTrench® MOSFET

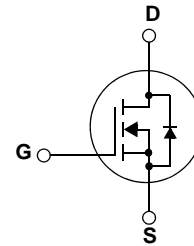
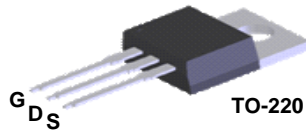
40 V, 277 A, 2.2 mΩ

Features

- $R_{DS(on)} = 1.64 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 80 \text{ A}$
- $Q_{g(tot)} = 345 \text{ nC}$ (Typ.) @ $V_{GS} = 10 \text{ V}$
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- RoHS Compliant

Applications

- Power Tools
- Motor Drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit



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

| Symbol | Parameter | | FDP8440 | Unit |
|----------------|--|--|---------------------|--------------------------|
| V_{DSS} | Drain to Source Voltage | | 40 | V |
| V_{GSS} | Gate to Source Voltage | | ± 20 | V |
| I_D | Drain Current | <ul style="list-style-type: none"> - Continuous ($T_C = 25^\circ\text{C}$, Silicon Limited) - Continuous ($T_C = 100^\circ\text{C}$, Silicon Limited) - Continuous ($T_C = 25^\circ\text{C}$, Package Limited) | 277* 196* 100 | A |
| I_{DM} | Drain Current | - Pulsed (Note 1) | 500 | A |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | | 1682 | mJ |
| P_D | Power Dissipation | ($T_C = 25^\circ\text{C}$) - Derate above 25°C | 306 2.04 | W W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | | -55 to +175 | $^\circ\text{C}$ |
| T_L | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | | 300 | $^\circ\text{C}$ |

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 100A.

Thermal Characteristics

| | | | |
|-----------------|---|------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 0.49 | $^\circ\text{C/W}$ |
| $R_{\theta CS}$ | Thermal Resistance, Case to Sink (Typ.) | 0.5 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. | 62.5 | $^\circ\text{C/W}$ |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|---------|---------|-----------|------------|----------|
| FDP8440 | FDP8440 | TO-220 | N/A | N/A | 50units |

Electrical Characteristics T_C = 25°C unless otherwise noted

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|--|-----------------------------------|---|---|-------|-------|------|----|
| Off Characteristics | | | | | | | |
| BV _{DSS} | Drain to Source Breakdown Voltage | V _{GS} = 0V, I _D = 250μA | 40 | -- | -- | V | |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 32V V _{GS} = 0V | -- | -- | 1 | μA | |
| | | T _C = 150°C | -- | -- | 250 | μA | |
| I _{GSS} | Gate to Body Leakage Current | V _{GS} = ±20V | -- | -- | ±100 | nA | |
| On Characteristics | | | | | | | |
| V _{GS(th)} | Gate to Source Threshold Voltage | V _{DS} = V _{GS} , I _D = 250μA | 1 | -- | 3 | V | |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 4.5V, I _D = 80A | -- | 1.88 | 2.4 | mΩ | |
| | | V _{GS} = 10V, I _D = 80A | -- | 1.64 | 2.2 | | |
| | | V _{GS} = 10V, I _D = 80A, T _C = 175°C | -- | 3.00 | 4.4 | | |
| Dynamic Characteristics | | | | | | | |
| C _{iss} | Input Capacitance | V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz | -- | 18600 | 24740 | pF | |
| C _{oss} | Output Capacitance | | -- | 1840 | 2450 | pF | |
| C _{rss} | Reverse Transfer Capacitance | | -- | 1400 | 2100 | pF | |
| R _G | Gate Resistance | V _{GS} = 0.5V, f = 1MHz | -- | 1.1 | -- | Ω | |
| Q _{g(tot)} | Total Gate Charge at 10V | V _{GS} = 0V to 10V | V _{DD} = 20V I _D = 80A I _g = 1.0mA | -- | 345 | 450 | nC |
| Q _{g(2)} | Threshold Gate Charge | V _{GS} = 0V to 2V | | -- | 32.5 | -- | nC |
| Q _{gs} | Gate to Source Gate Charge | | | -- | 49 | -- | nC |
| Q _{gs2} | Gate Charge Threshold to Plateau | | | -- | 16.5 | -- | nC |
| Q _{gd} | Gate to Drain “Miller” Charge | | | -- | 74 | -- | nC |
| Switching Characteristics (V _{GS} = 10V) | | | | | | | |
| t _{ON} | Turn-On Time | V _{DD} = 20V, I _D = 80A V _{GS} = 10V, R _{GEN} = 7Ω | -- | 175 | 360 | ns | |
| t _{d(on)} | Turn-On Delay Time | | -- | 43 | 95 | ns | |
| t _r | Rise Time | | -- | 130 | 275 | ns | |
| t _{d(off)} | Turn-Off Delay Time | | -- | 435 | 875 | ns | |
| t _f | Fall Time | | -- | 290 | 590 | ns | |
| t _{OFF} | Turn-Off Time | | -- | 730 | 1470 | ns | |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | | |
| V _{SD} | Source to Drain Diode Voltage | I _{SD} = 80A | -- | -- | 1.25 | V | |
| | | I _{SD} = 40A | -- | -- | 1.0 | V | |
| t _{rr} | Reverse Recovery Time | I _{SD} = 75A, dI _{SD} /dt = 100A/μs | -- | 59 | -- | ns | |
| Q _{RR} | Reverse Recovery Charge | I _{SD} = 75A, dI _{SD} /dt = 100A/μs | -- | 77 | -- | nC | |

NOTES:

1: Pulse width limited by maximum junction temperature.

2: Starting T_J = 25°C, L = 1mH, I_{AS} = 58A, V_{DD} = 36V, V_{GS} = 10V.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

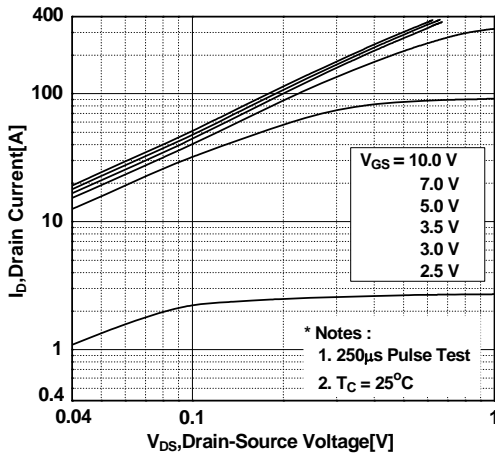


Figure 2. Transfer Characteristics

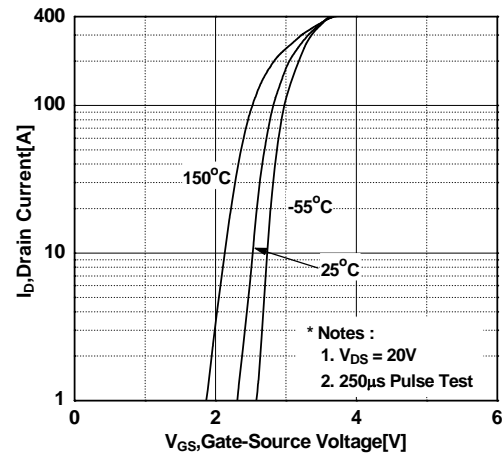


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

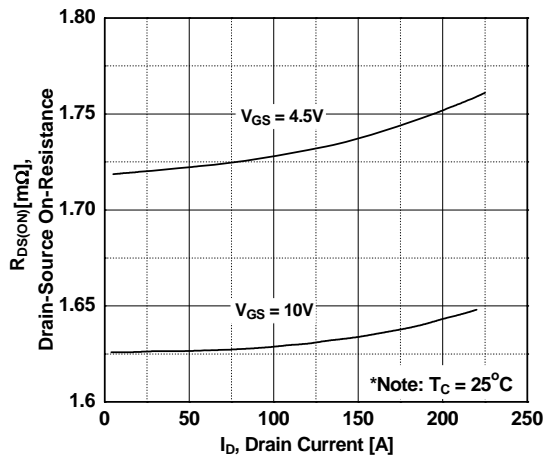


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

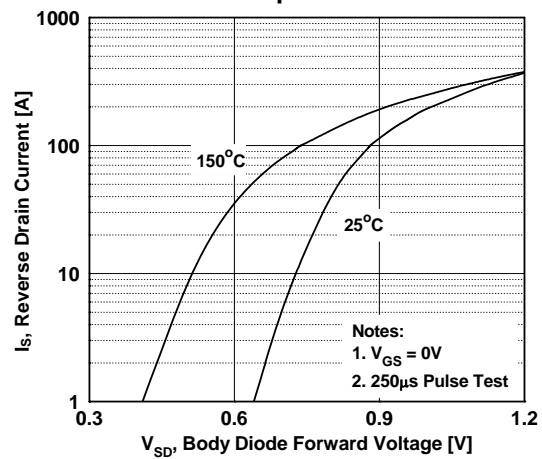


Figure 5. Capacitance Characteristics

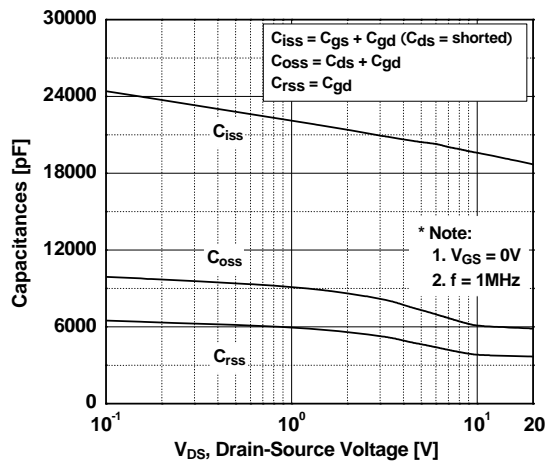
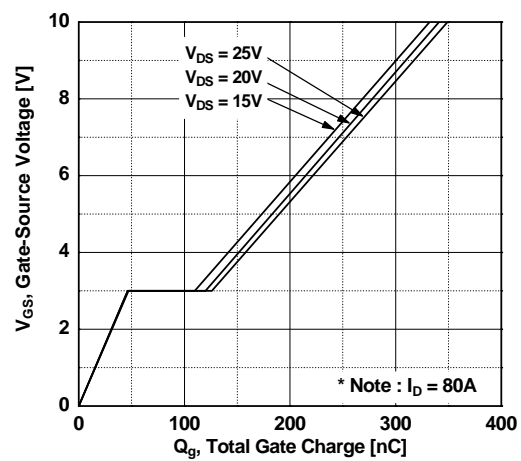


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

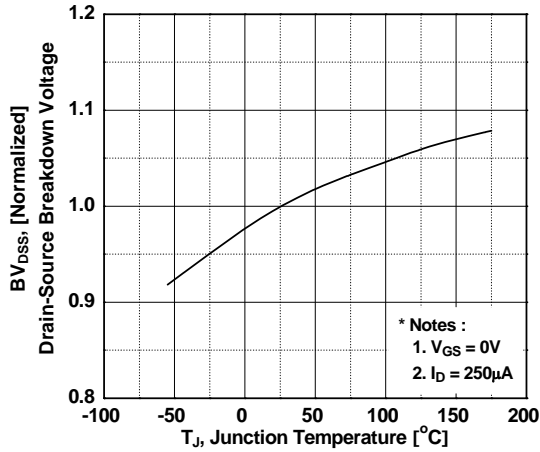


Figure 8. On-Resistance Variation vs. Temperature

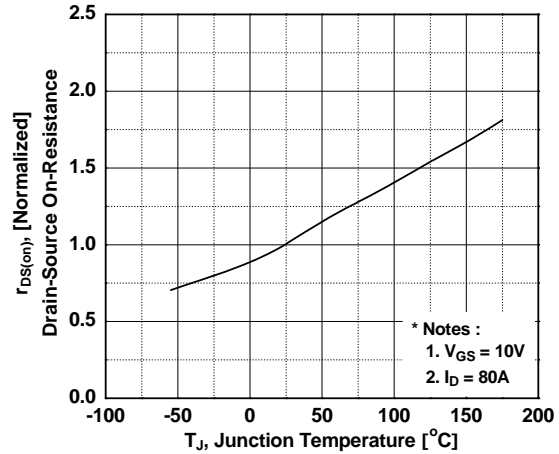


Figure 9. Unclamped Inductive Switching Capability

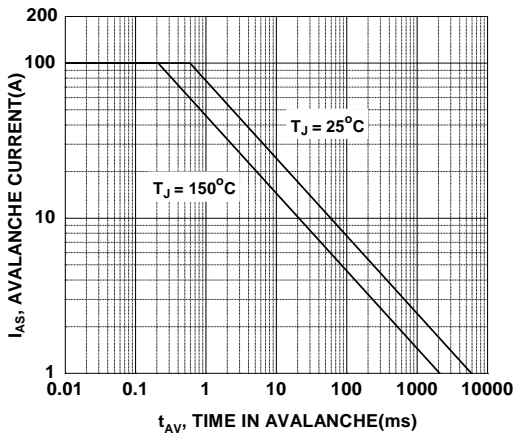


Figure 10. Safe Operating Area

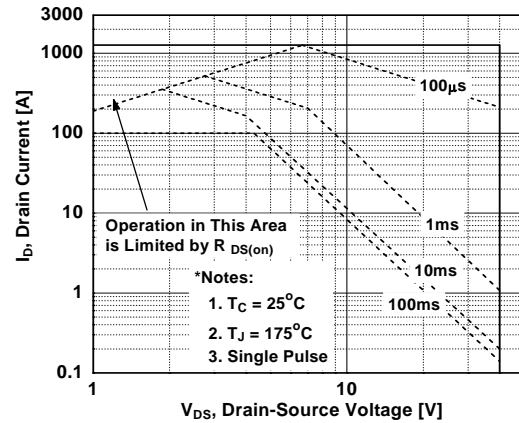
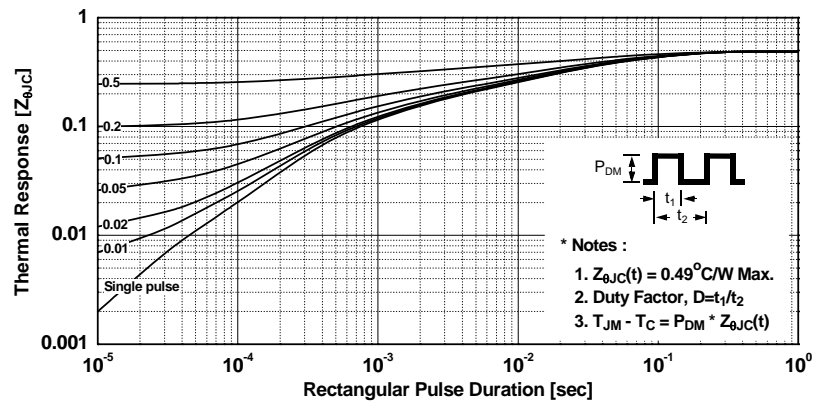


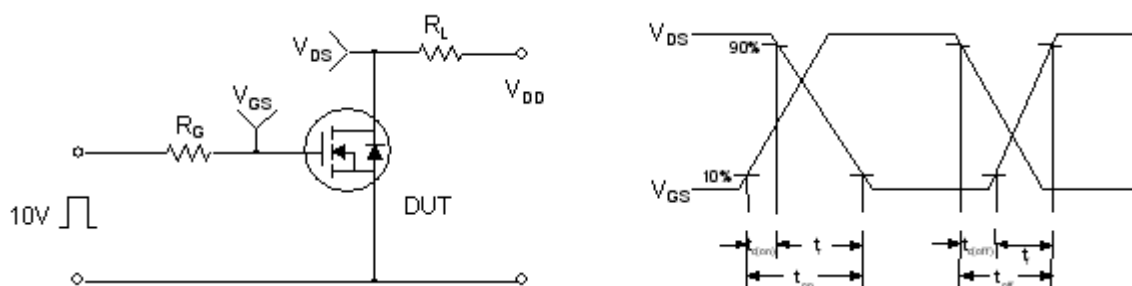
Figure 11. Transient Thermal Response Curve



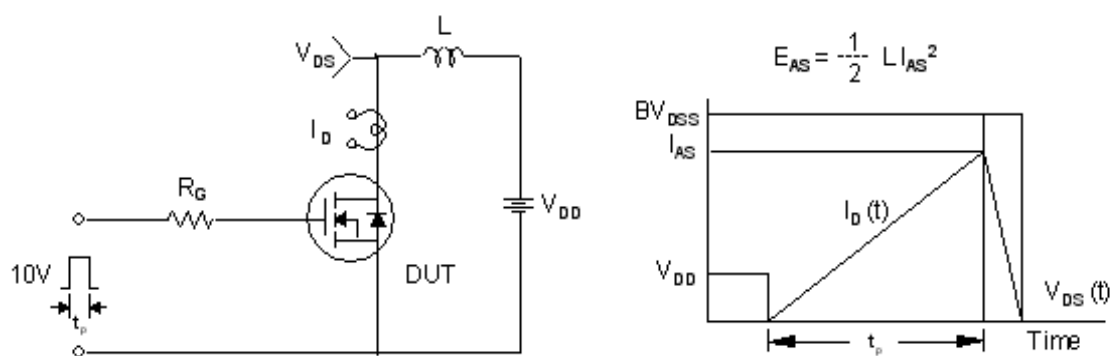
Gate Charge Test Circuit & Waveform



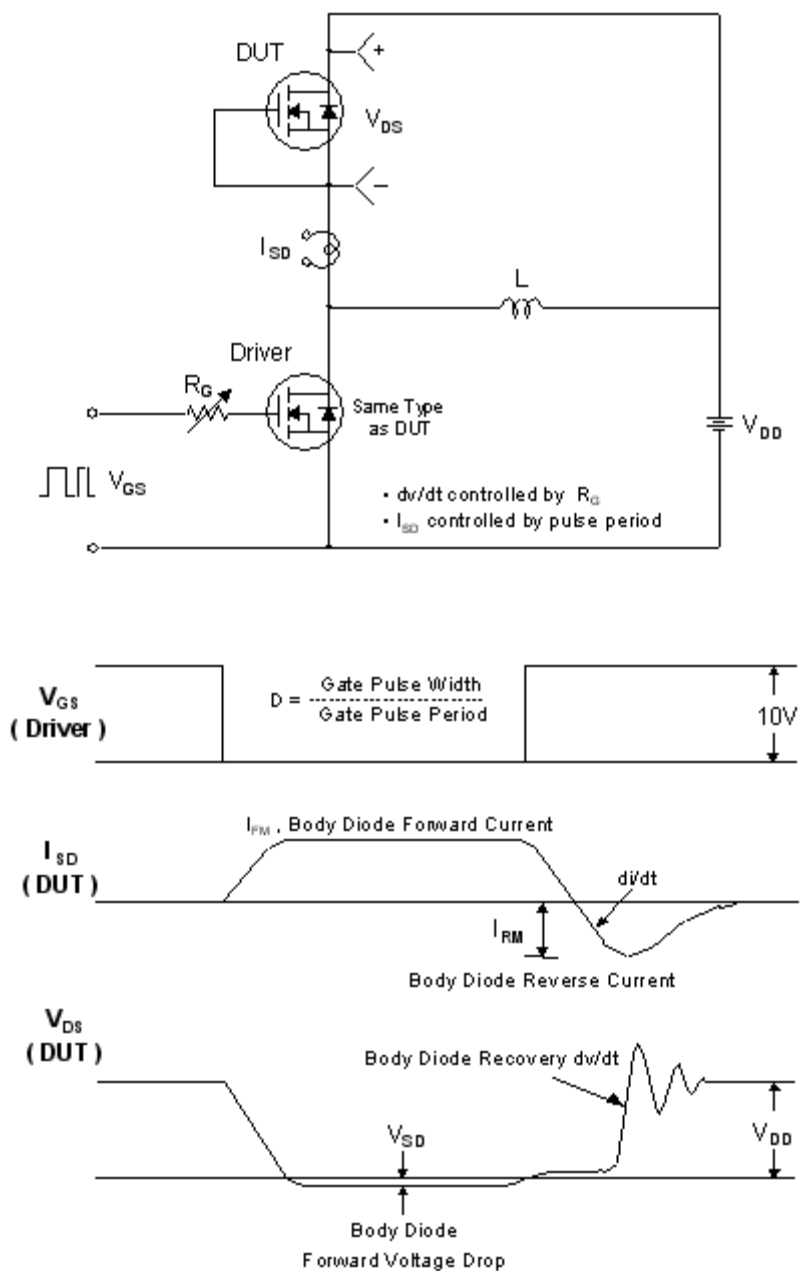
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

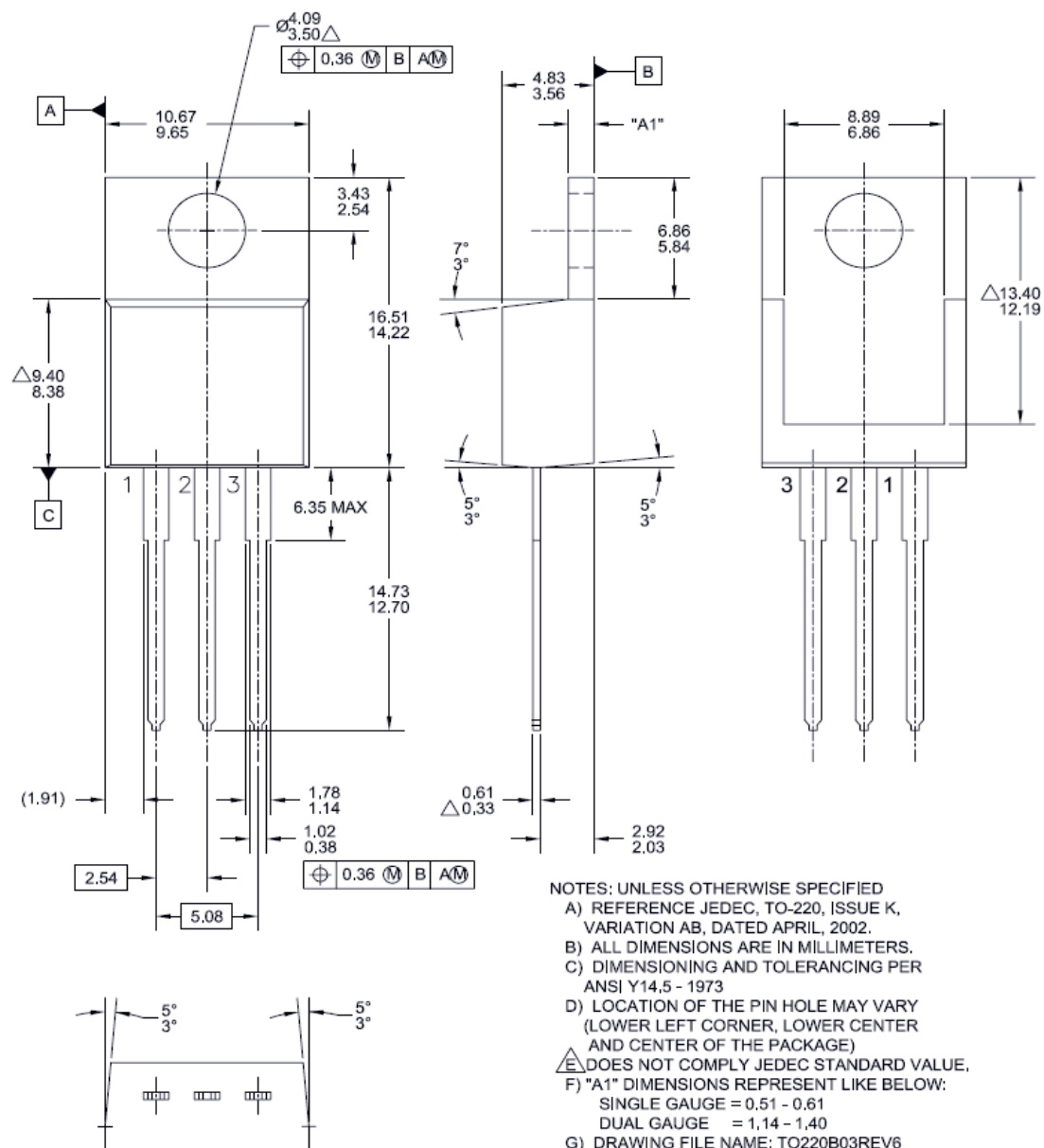


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220B03





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