

FDT3N40

N-Channel UniFET™ MOSFET

400 V, 2.0 A, 3.4

Features

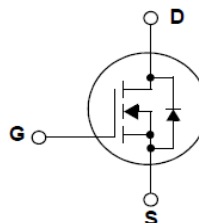
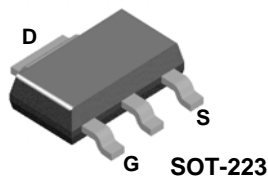
- $R_{DS(on)} = 3.4 \Omega$ (Max.) @ $V_{GS} = 10 V, I_D = 1.0 A$
- Low Gate Charge (Typ. 4.5 nC)
- Low C_{rss} (Typ. 3.7 pF)
- 100% Avalanche Tested

Applications

- LCD/LED TV
- Lighting
- Uninterruptible Power Supply

Description

UniFET™ MOSFET is Fairchild 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. 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.



Absolute Maximum Ratings

| Symbol | Parameter | FDT3N40 | Unit |
|----------------|----------------------------------------------------------------------------------------------|----------------|--------------------|
| V_{DSS} | Drain-Source Voltage | 400 | V |
| I_D | Drain Current - Continuous ($T_C = 25^\circ C$) - Continuous ($T_C = 100^\circ C$) | 2.0 * 1.2 * | A |
| I_{DM} | Drain Current - Pulsed (Note 1) | 8.0 * | A |
| V_{GSS} | Gate-Source voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 46 | mJ |
| I_{AR} | Avalanche Current (Note 1) | 2 | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 0.2 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 4.5 | V/ns |
| P_D | Power Dissipation ($T_C = 25^\circ C$) - Derate above $25^\circ C$ | 2 0.02 | W W/ $^\circ C$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | $^\circ C$ |
| T_L | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300 | $^\circ C$ |

* Drain current limited by maximum junction temperature

Thermal Characteristics

| Symbol | Parameter | FDT3N40 | Unit |
|-------------------|---------------------------------------|---------|--------------|
| $R_{\theta JA}$ * | Thermal Resistance, Case-to-Sink Typ. | 60 | $^\circ C/W$ |

* Surface Mounted on JESD51-3 Board, $T < 0.1$ sec.

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|-----------|---------|-----------|------------|----------|
| FDT3N40 | FDT3N40TF | SOT-223 | 330mm | 12mm | 4000 |

Electrical Characteristics T_C = 25°C unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max | Unit |
|---------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------|------|------|---------|----------|
| Off Characteristics | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} = 0V, I _D = 250μA | 400 | -- | -- | V |
| ΔBV _{DSS} / ΔT _J | Breakdown Voltage Temperature Coefficient | I _D = 250μA, Referenced to 25°C | -- | 0.4 | -- | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 400V, V _{GS} = 0V V _{DS} = 320V, T _C = 125°C | -- | -- | 1 10 | μA μA |
| I _{GSSF} | Gate-Body Leakage Current, Forward | V _{GS} = 30V, V _{DS} = 0V | -- | -- | 100 | nA |
| I _{GSSR} | Gate-Body Leakage Current, Reverse | V _{GS} = -30V, V _{DS} = 0V | -- | -- | -100 | nA |
| On Characteristics | | | | | | |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 250μA | 3.0 | -- | 5.0 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 10V, I _D = 1A | -- | 2.8 | 3.4 | Ω |
| g _{FS} | Forward Transconductance | V _{DS} = 40V, I _D = 1A (Note 4) | -- | 2 | -- | S |
| Dynamic Characteristics | | | | | | |
| C _{iss} | Input Capacitance | V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz | -- | 173 | 225 | pF |
| C _{oss} | Output Capacitance | | -- | 30 | 40 | pF |
| C _{rss} | Reverse Transfer Capacitance | | -- | 3.7 | 6 | pF |
| Switching Characteristics | | | | | | |
| t _{d(on)} | Turn-On Delay Time | V _{DD} = 200V, I _D = 2A R _G = 25Ω (Note 4, 5) | -- | 10 | 30 | ns |
| t _r | Turn-On Rise Time | | -- | 30 | 70 | ns |
| t _{d(off)} | Turn-Off Delay Time | | -- | 10 | 30 | ns |
| t _f | Turn-Off Fall Time | | -- | 25 | 60 | ns |
| Q _g | Total Gate Charge | V _{DS} = 320V, I _D = 2A V _{GS} = 10V (Note 4, 5) | -- | 4.5 | 6 | nC |
| Q _{gs} | Gate-Source Charge | | -- | 1.2 | -- | nC |
| Q _{gd} | Gate-Drain Charge | | -- | 2 | -- | nC |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| I _S | Maximum Continuous Drain-Source Diode Forward Current | | -- | -- | 2 | A |
| I _{SM} | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 8 | A |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0V, I _S = 2A | -- | -- | 1.4 | V |
| t _{rr} | Reverse Recovery Time | V _{GS} = 0V, I _S = 2A di _F /dt = 100A/μs (Note 4) | -- | 210 | -- | ns |
| Q _{rr} | Reverse Recovery Charge | | -- | 0.75 | -- | μC |

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 10mH, I_{AS} = 2A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 2A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

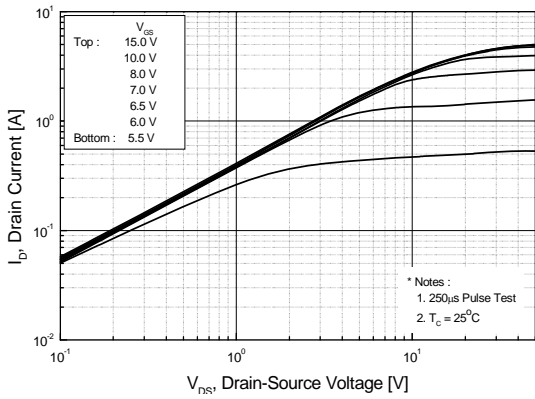


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

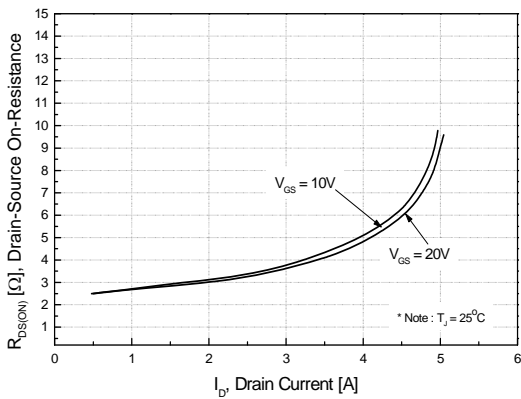


Figure 5. Capacitance Characteristics

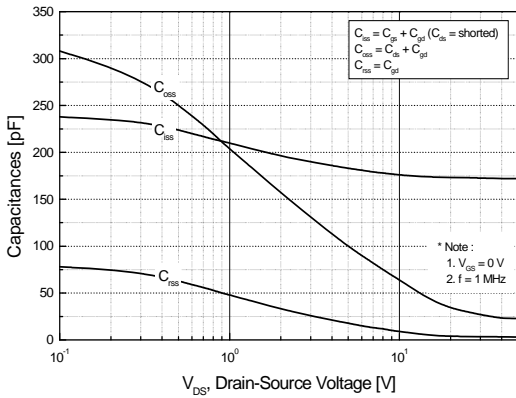


Figure 2. Transfer Characteristics

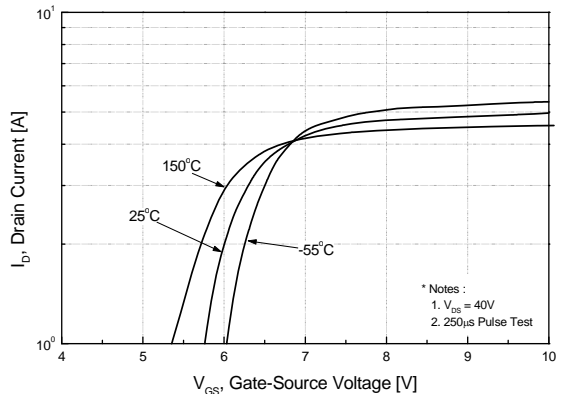


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

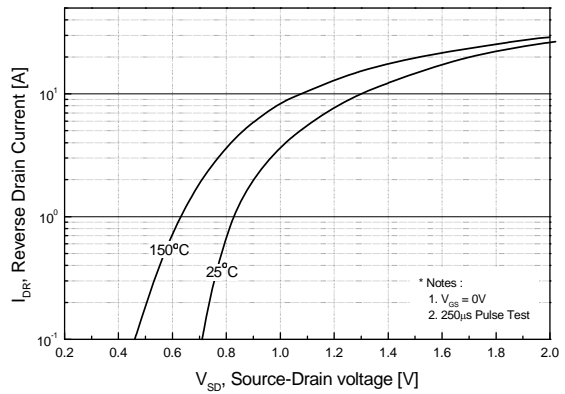
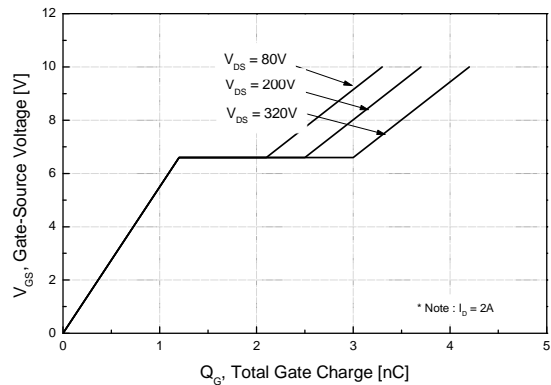


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

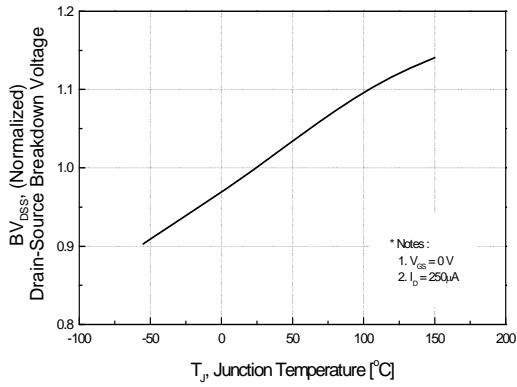


Figure 8. On-Resistance Variation vs. Temperature

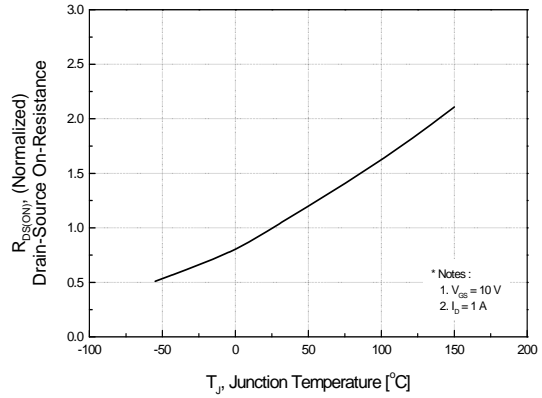


Figure 9. Maximum Safe Operating Area

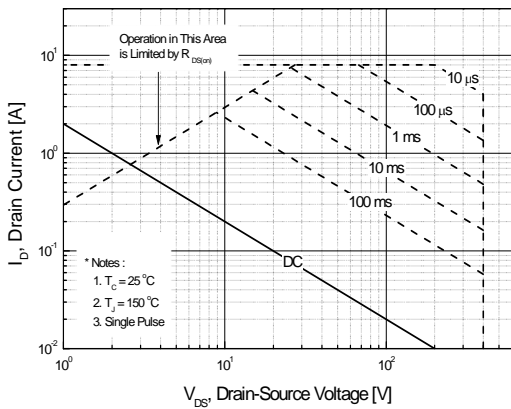


Figure 10. Maximum Drain Current vs. Case Temperature

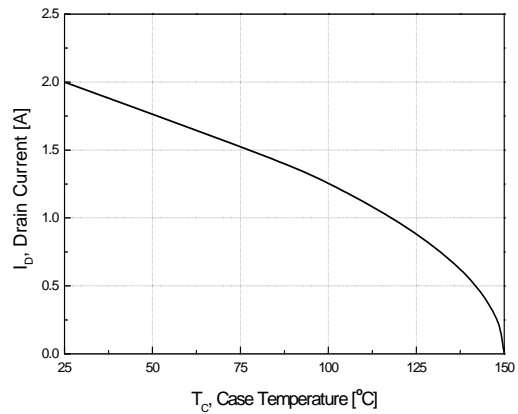
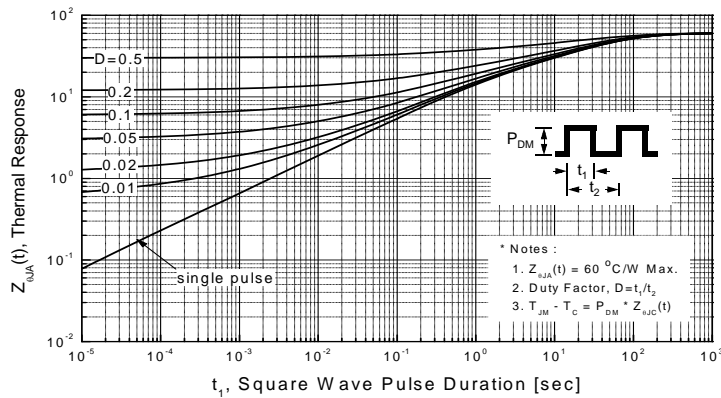
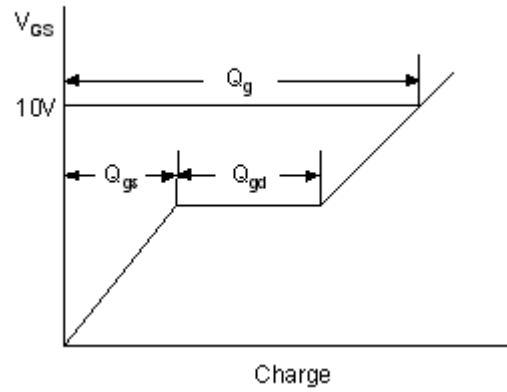
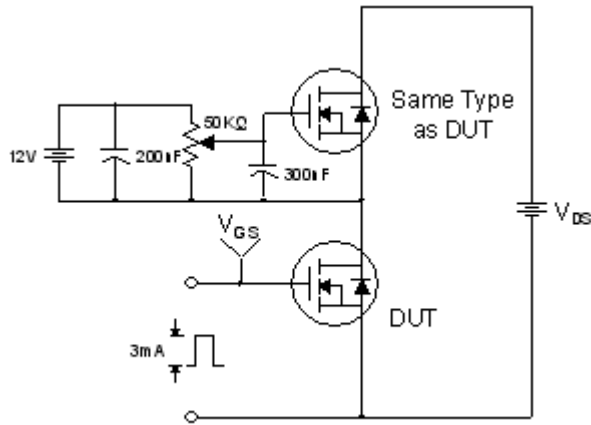


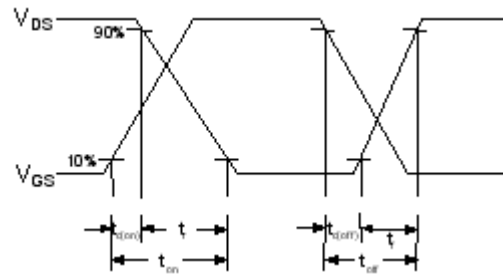
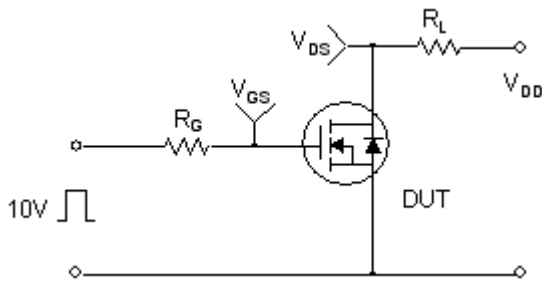
Figure 11. Transient Thermal Response Curve



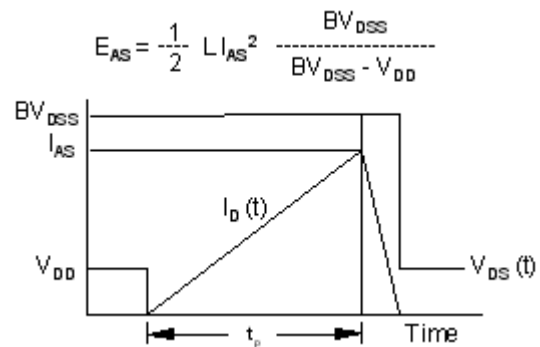
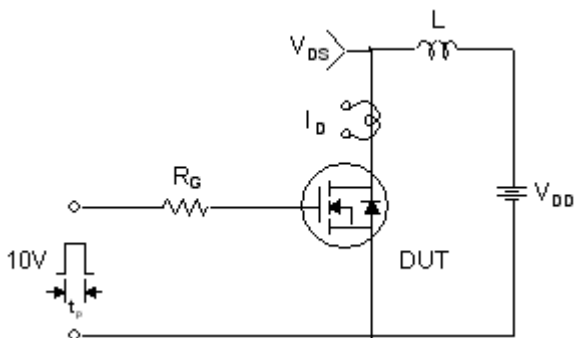
Gate Charge Test Circuit & Waveform



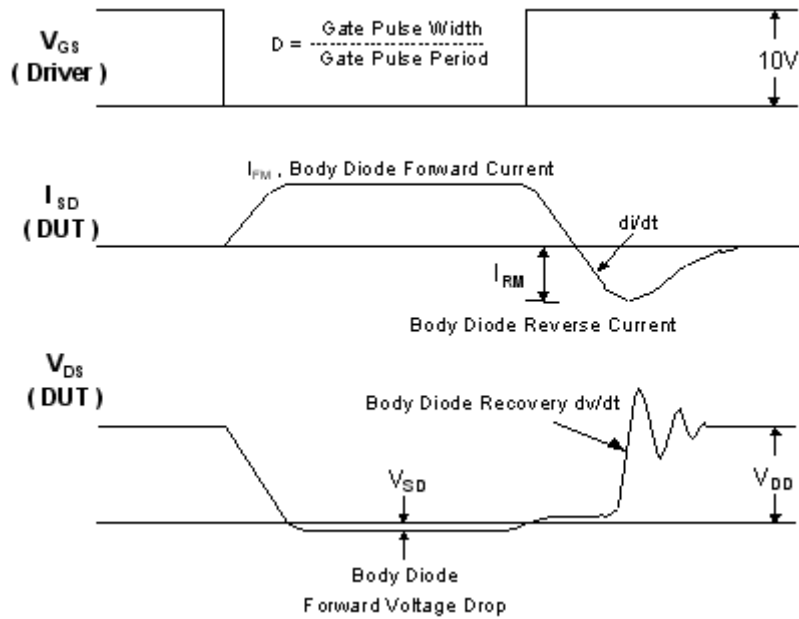
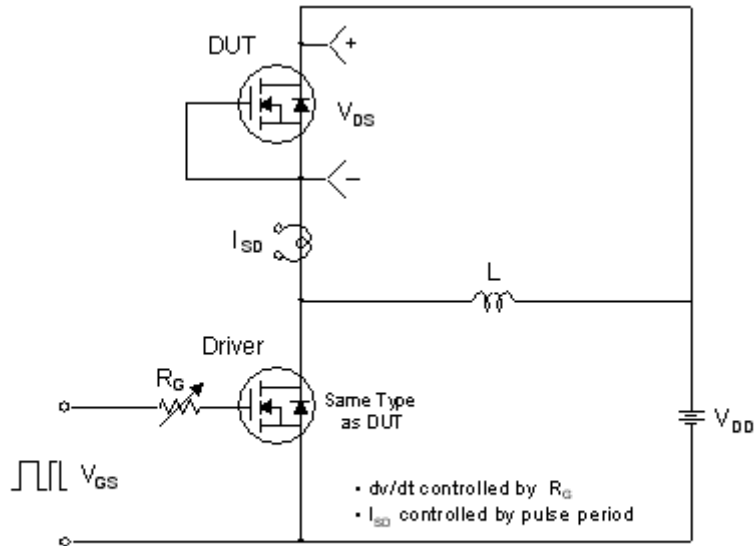
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

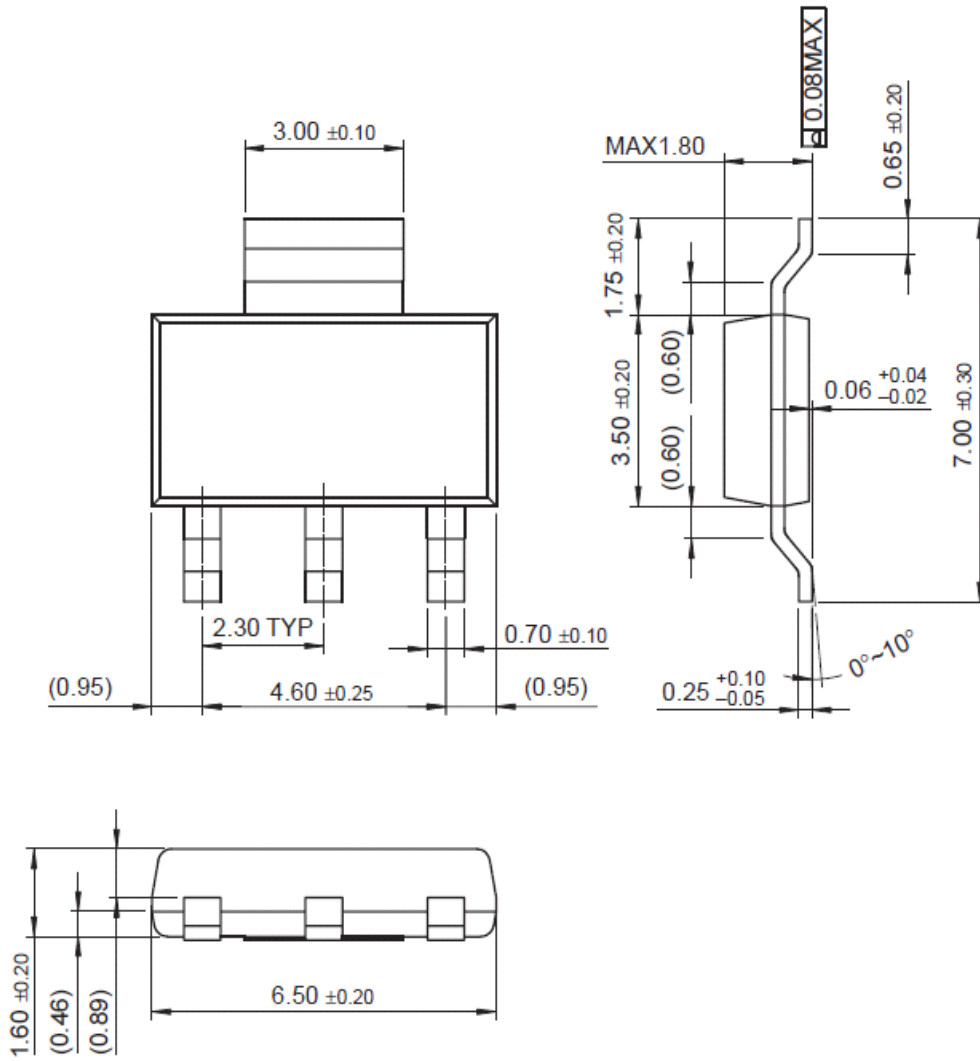


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions


SOT-223





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