

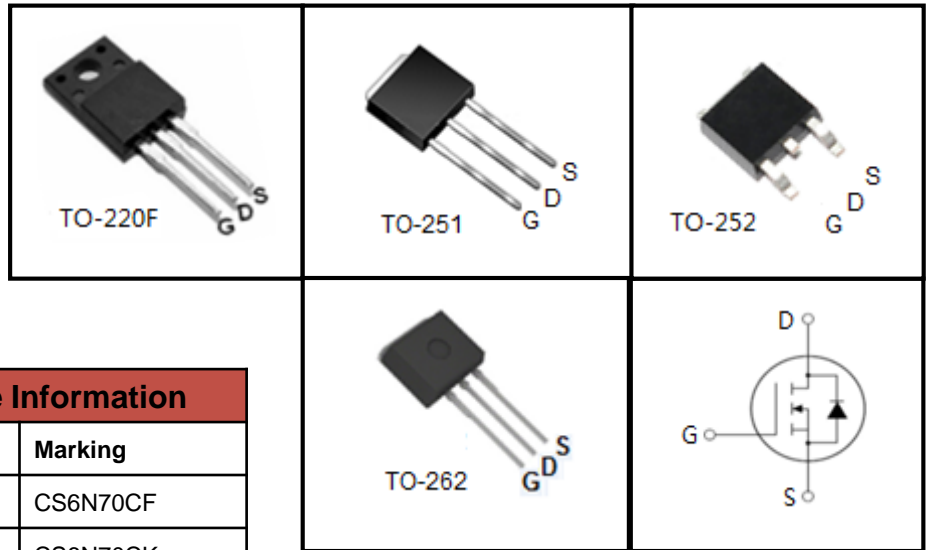
700V N-Channel MOSFET

FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



Device Marking and Package Information

| Device | Package | Marking |
|----------|---------|----------|
| CS6N70CF | TO-220F | CS6N70CF |
| CS6N70CK | TO-262 | CS6N70CK |
| CS6N70CU | TO-251 | CS6N70CU |
| CS6N70CD | TO-252 | CS6N70CD |

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

| Parameter | Symbol | Value | | | | Unit |
|--|----------------|----------|--------|--------|--------|------------------|
| | | TO-220F | TO-262 | TO-251 | TO-252 | |
| Drain-Source Voltage ($V_{GS} = 0V$) | V_{DSS} | 700 | | | | V |
| Continuous Drain Current | I_D | 6 | | | | A |
| Pulsed Drain Current (note1) | I_{DM} | 24 | | | | A |
| Gate-Source Voltage | V_{GSS} | ± 30 | | | | V |
| Single Pulse Avalanche Energy (note2) | E_{AS} | 139.4 | | | | mJ |
| Avalanche Current (note1) | I_{AR} | 5.28 | | | | A |
| Repetitive Avalanche Energy (note1) | E_{AR} | 83.6 | | | | mJ |
| Power Dissipation ($T_C = 25^\circ\text{C}$) | P_D | 63 | 97 | | | W |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55~+150 | | | | $^\circ\text{C}$ |

Thermal Resistance

| Parameter | Symbol | Value | | | | Unit |
|---|------------|---------|--------|--------|--------|------|
| | | TO-220F | TO-251 | TO-252 | TO-220 | |
| Thermal Resistance, Junction-to-Case | R_{thJC} | 1.98 | 1.29 | | | K/W |
| Thermal Resistance, Junction-to-Ambient | R_{thJA} | 62.5 | 60 | | | |

| Specifications $T_J = 25^{\circ}\text{C}$, unless otherwise noted | | | | | | |
|---|---------------|--|-------|-------|-----------|----------|
| Parameter | Symbol | Test Conditions | Value | | | Unit |
| | | | Min. | Typ. | Max. | |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$ | 700 | -- | -- | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 700V, V_{GS} = 0V, T_J = 25^{\circ}\text{C}$ | -- | -- | 1 | μA |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 30V$ | -- | -- | ± 100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 3.0 | -- | 4.0 | V |
| Drain-Source On-Resistance (Note3) | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 3.0A$ | -- | 1.3 | 1.6 | Ω |
| Dynamic | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 1.0\text{MHz}$ | -- | 883.2 | -- | pF |
| Output Capacitance | C_{oss} | | -- | 87 | -- | |
| Reverse Transfer Capacitance | C_{rss} | | -- | 12 | -- | |
| Total Gate Charge | Q_g | $V_{DD} = 560V, I_D = 6.0A,$ $V_{GS} = 10V$ | -- | 29.5 | -- | nC |
| Gate-Source Charge | Q_{gs} | | -- | 4.2 | -- | |
| Gate-Drain Charge | Q_{gd} | | -- | 15.2 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD} = 350V, I_D = 6.0A,$ $R_G = 25\Omega$ | -- | 39.7 | -- | ns |
| Turn-on Rise Time | t_r | | -- | 20.2 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 134.5 | -- | |
| Turn-off Fall Time | t_f | | -- | 34.9 | -- | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Body Diode Current | I_S | $T_C = 25^{\circ}\text{C}$ | -- | -- | 6 | A |
| Pulsed Diode Forward Current | I_{SM} | | -- | -- | 24 | |
| Body Diode Voltage | V_{SD} | $T_J = 25^{\circ}\text{C}, I_{SD} = 3.0A, V_{GS} = 0V$ | -- | -- | 1.4 | V |
| Reverse Recovery Time | t_{rr} | $V_{GS} = 0V, I_S = 6.0A,$ $di_F/dt = 100A/\mu s$ | -- | 633 | -- | ns |
| Reverse Recovery Charge | Q_{rr} | | -- | 1.8 | -- | μC |

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=10\text{mH}, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 1\%$

Typical Characteristics $T_J = 25^{\circ}\text{C}$, unless otherwise noted

Figure 1. Output Characteristics ($T_J = 25^{\circ}\text{C}$)

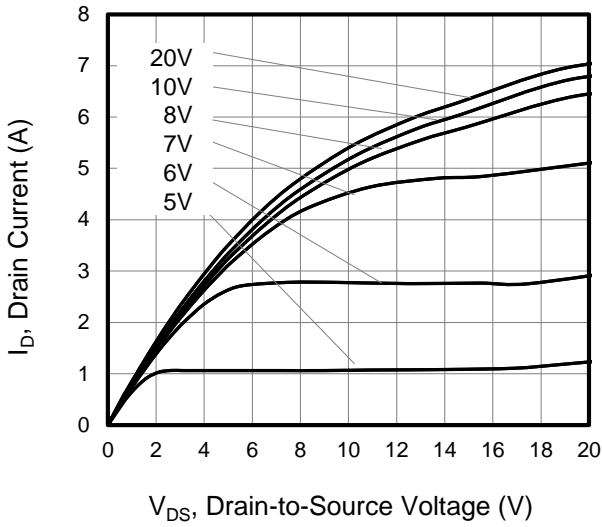


Figure 2. Body Diode Forward Voltage

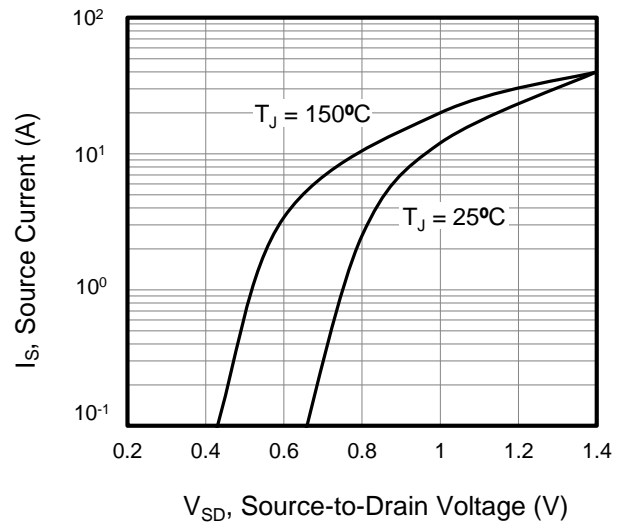


Figure 3. Drain Current vs. Temperature

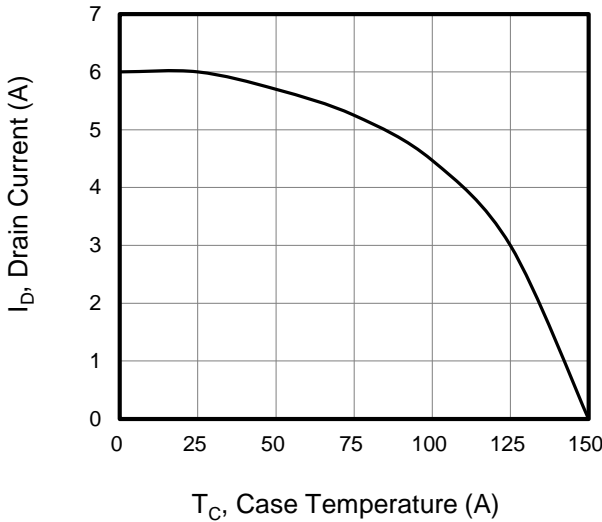


Figure 4. BV_{DSS} Variation vs. Temperature

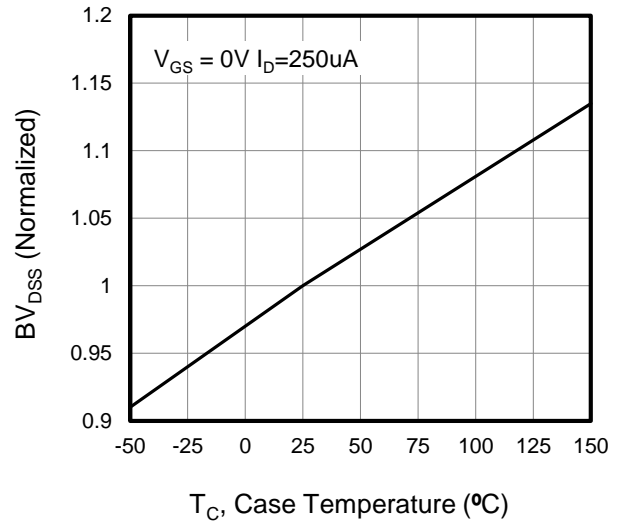


Figure 5. Transfer Characteristics

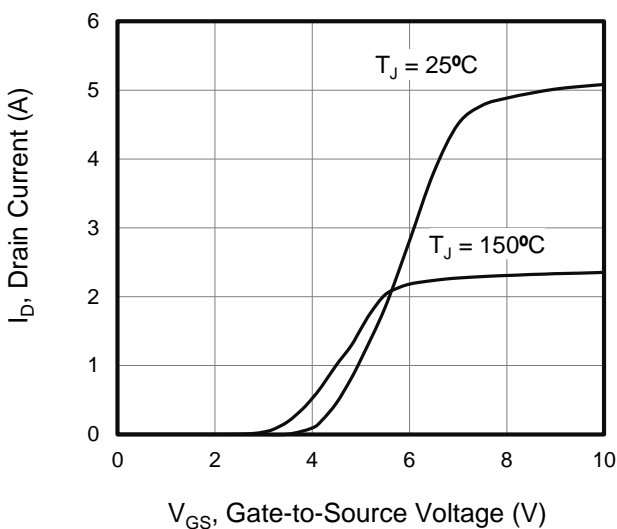
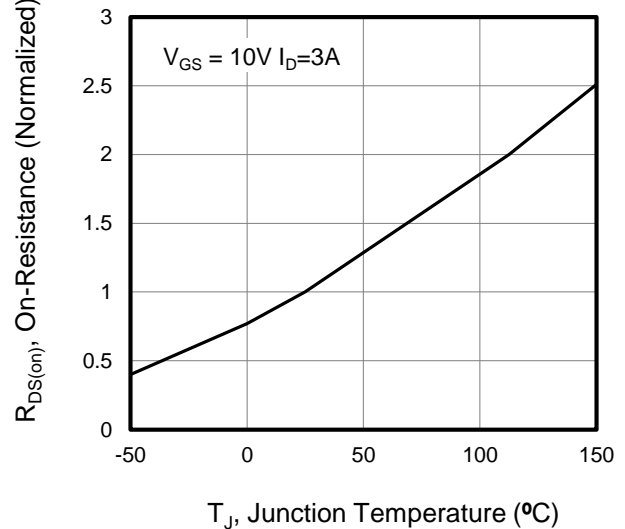


Figure 6. On-Resistance vs. Temperature



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Capacitance

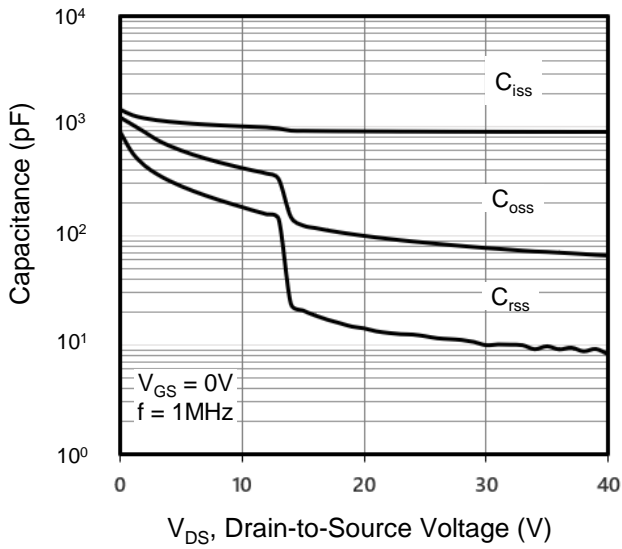


Figure 8. Gate Charge

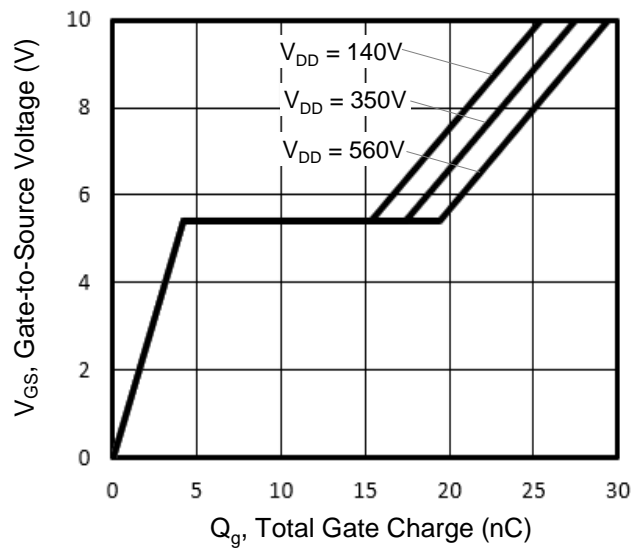


Figure 9. Transient Thermal Impedance

TO-262,TO-251,TO-252

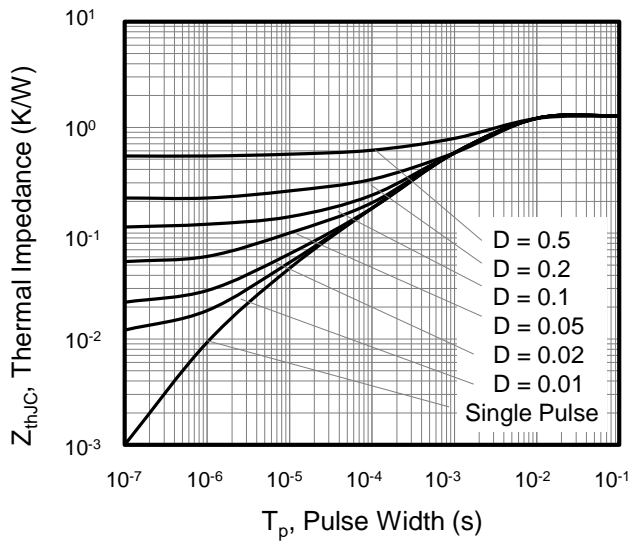


Figure 10. Transient Thermal Impedance

TO-220F

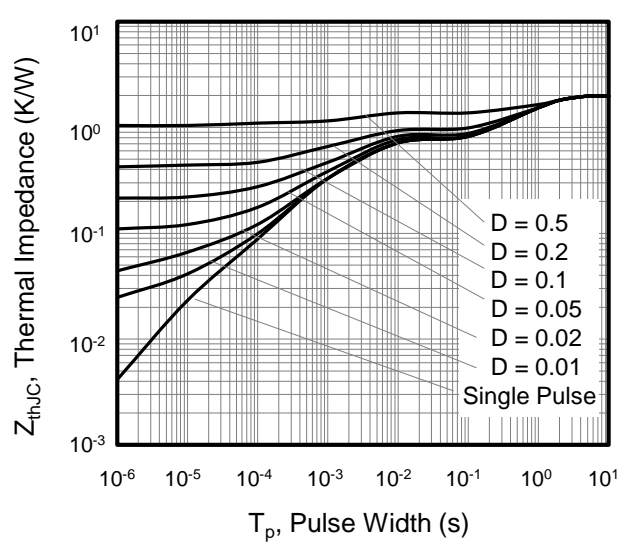


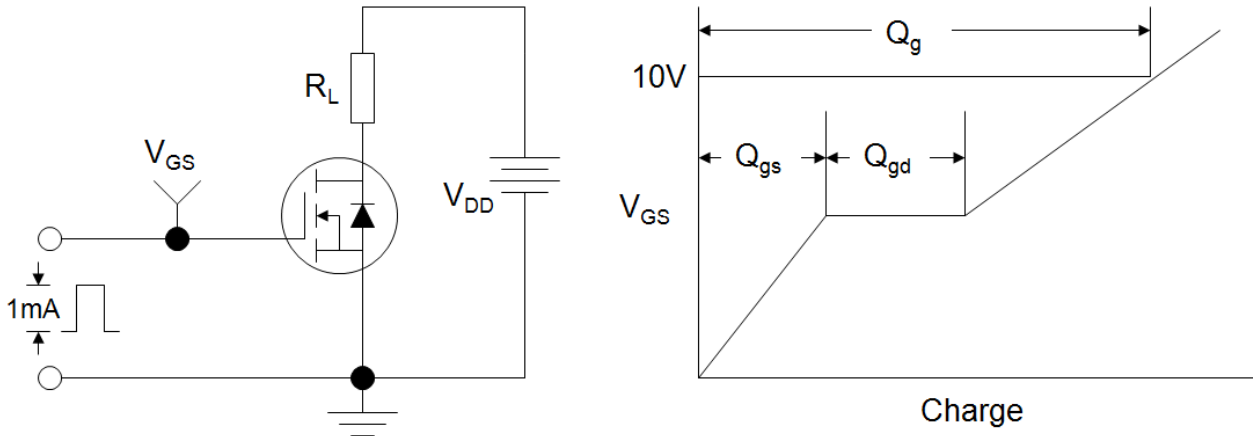
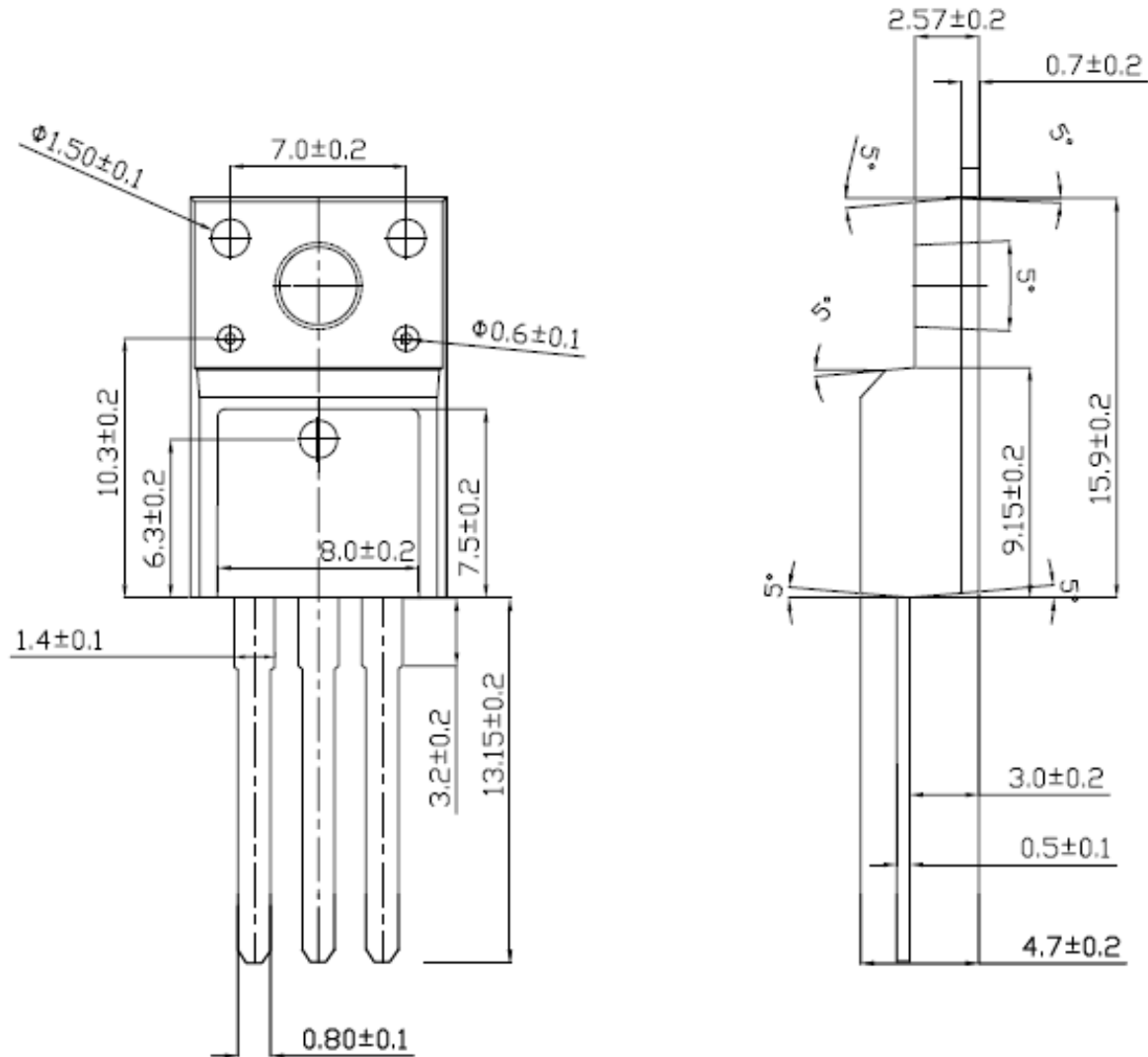
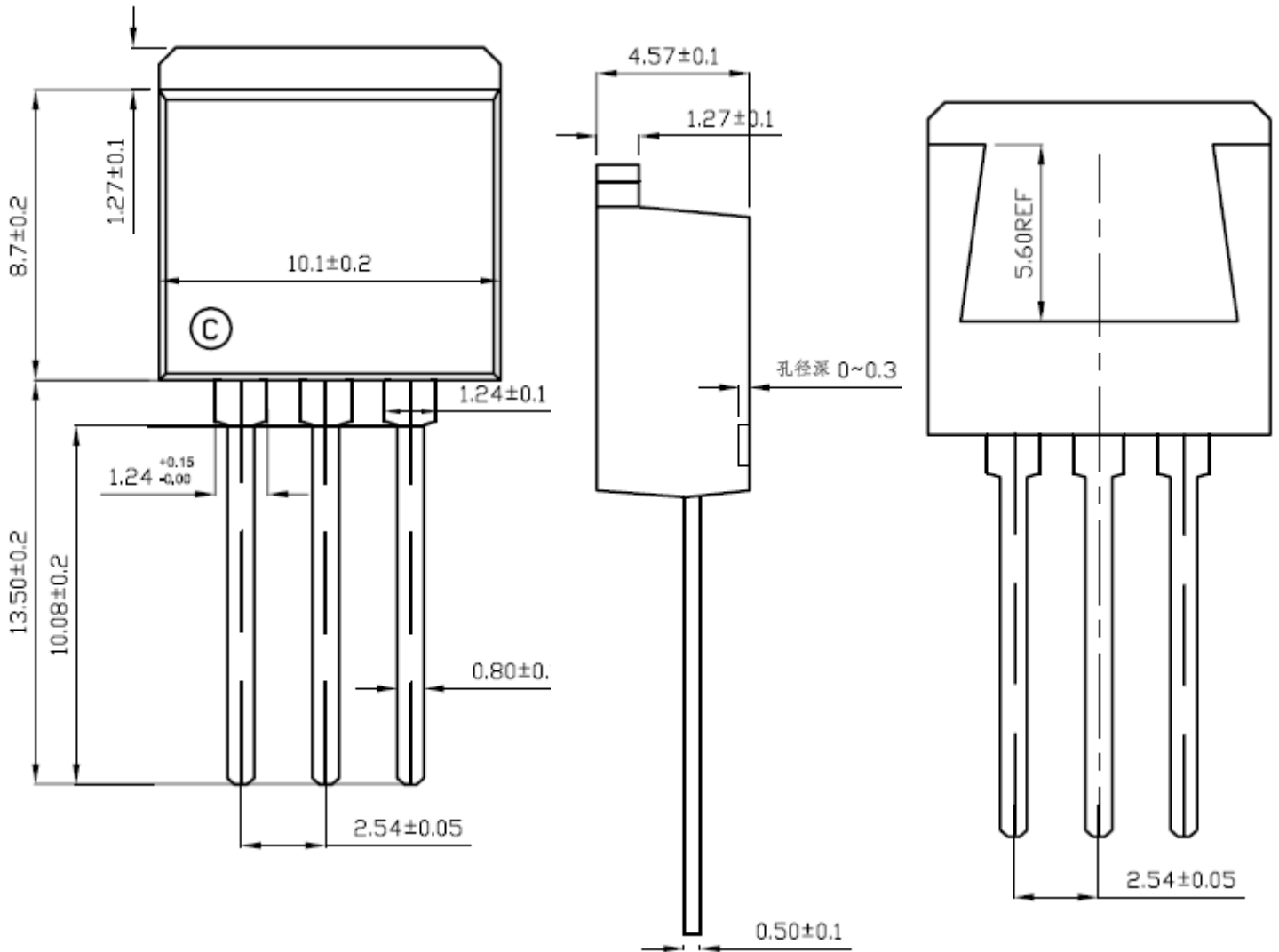
Figure A: Gate Charge Test Circuit and Waveform

Figure B: Resistive Switching Test Circuit and Waveform

Figure C: Unclamped Inductive Switching Test Circuit and Waveform

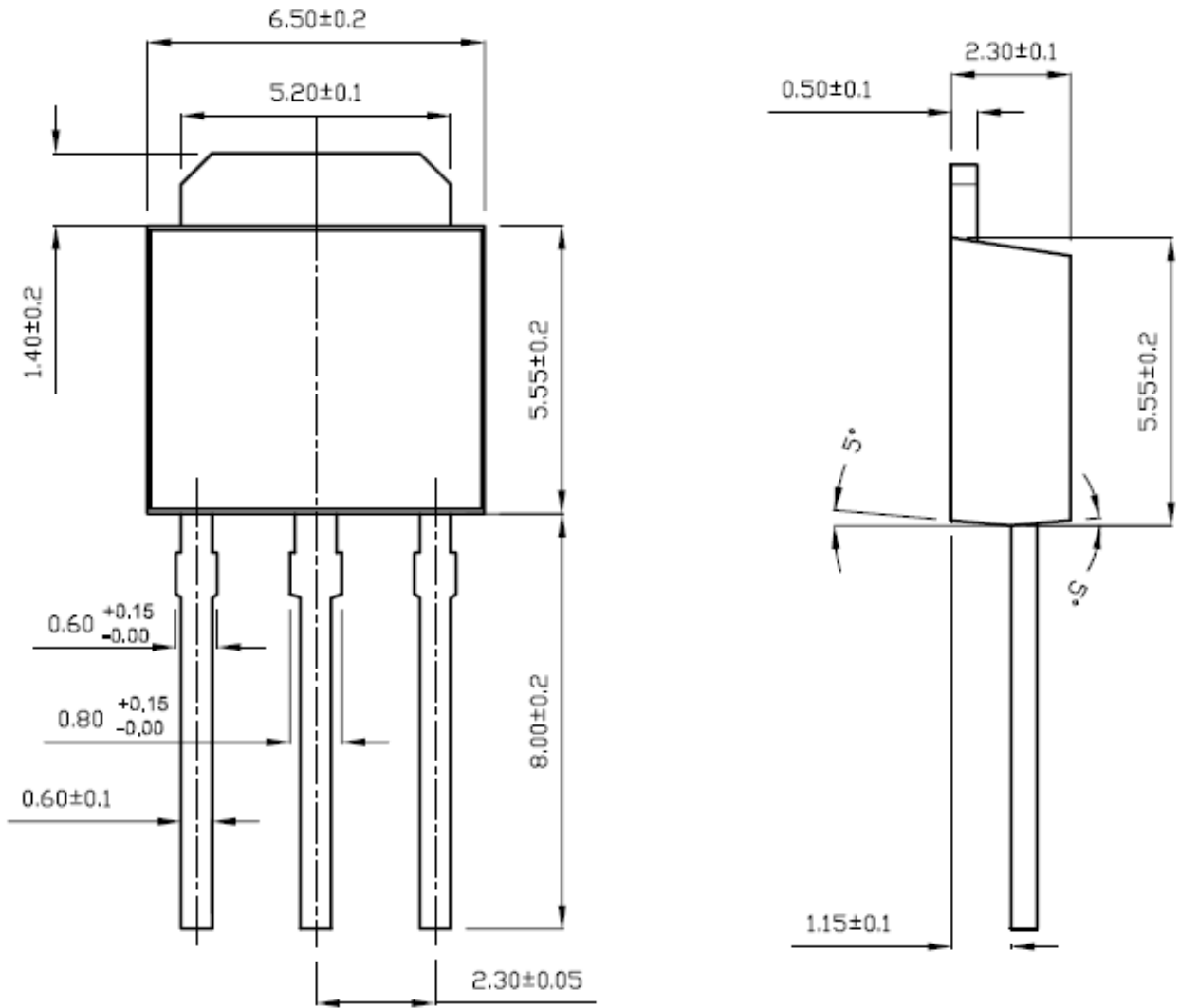

TO-220F



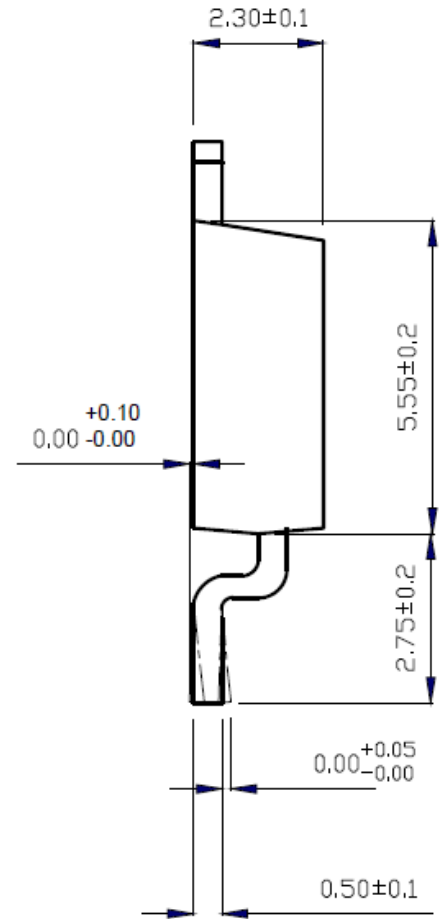
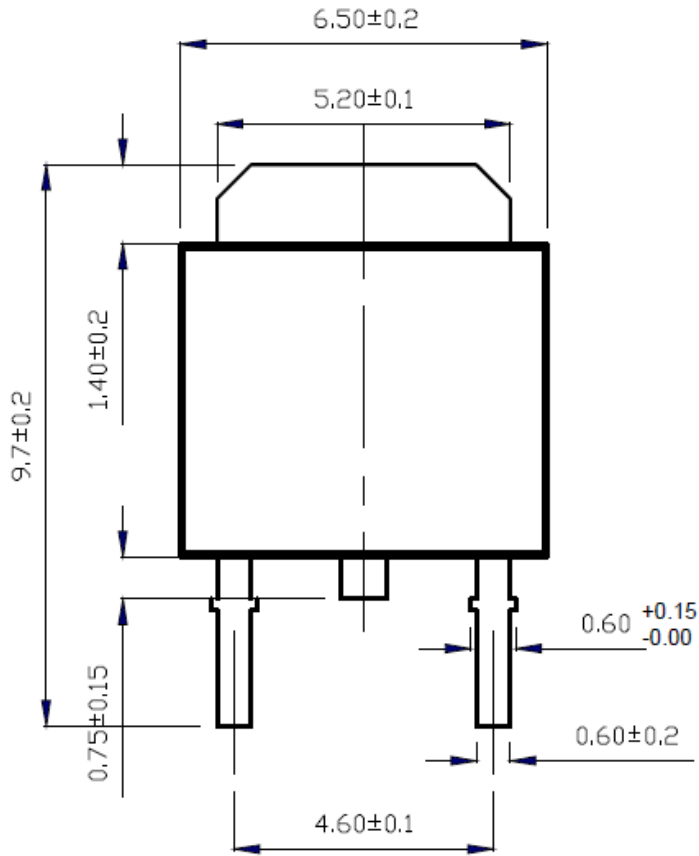
TO-262



TO-251



TO-252



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