

SLF65R600E7 / SLD65R600E7

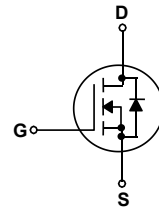
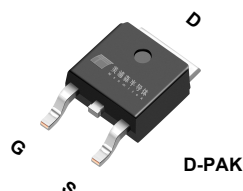
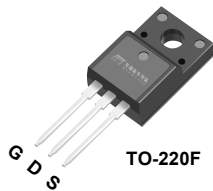
650V N-Channel Multi-EPI Super-JMOSFET

General Description

This Power MOSFET is produced using Msemitek's advanced Superjunction MOSFET technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies.

Features

- 8A, 650V, $R_{DS(on)Typ} = 510m\Omega @ V_{GS} = 10V$
- Low gate charge (typ. $Q_g = 10.1nC$)
- High ruggedness
- Ultra fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings

$T_C = 25^\circ C$ unless otherwise noted

| Symbol | Parameter | SLF65R600E7 / SLD65R600E7 | | Units |
|----------------|---|---------------------------|------|---------------|
| V_{DSS} | Drain-Source Voltage | 650 | | V |
| I_D | Drain Current - Continuous ($T_C = 25^\circ C$) - Continuous ($T_C = 100^\circ C$) | 8* | | A |
| | | 4.8* | | A |
| I_{DM} | Drain Current - Pulsed (Note 1) | 24* | | A |
| V_{GSS} | Gate-Source Voltage | ± 30 | | V |
| EAS | Single Pulsed Avalanche Energy (Note 2) | 22 | | mJ |
| I_{AR} | Avalanche Current (Note 1) | 1.9 | | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 0.61 | | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 20 | | V/ns |
| | MOSFET dv/dt | 100 | | |
| P_D | Power Dissipation ($T_C = 25^\circ C$) | 24 | 69 | W |
| | - Derate above $25^\circ C$ | 0.19 | 0.56 | W/ $^\circ C$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | | $^\circ C$ |
| T_L | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 260 | | $^\circ C$ |

* Drain current limited by maximum junction temperature.

Thermal Characteristics

| Symbol | Parameter | SLF65R600E7 / SLD65R600E7 | | Units |
|-----------------|---|---------------------------|------|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 5.2 | 1.8 | $^\circ C/W$ |
| $R_{\theta JS}$ | Thermal Resistance, Case-to-Sink Typ. | - | - | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | 62.5 | $^\circ C/W$ |

Package Marking

| Part Number | Top Marking | Package | Packing Method | MOQ | QTY |
|-------------|-------------|---------|----------------|------|-------|
| SLF65R600E7 | SLF65R600E7 | T0-220F | Tube | 1000 | 5000 |
| SLD65R600E7 | SLD65R600E7 | T0-252 | Tape | 2500 | 25000 |

Electrical Characteristics

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

Off Characteristics

| | | | | | | |
|------------|------------------------------------|--|-----|-----|------|---------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}$ | 650 | -- | -- | V |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}, T_J = 150^\circ\text{C}$ | 650 | -- | -- | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$ | -- | -- | 1 | μA |
| | | $V_{DS} = 480\text{ V}, T_C = 125^\circ\text{C}$ | -- | 2.1 | -- | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | -100 | nA |

On Characteristics

| | | | | | | |
|--------------|-----------------------------------|--|-----|-----|-----|------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ | 2.5 | -- | 4.5 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$ | -- | 510 | 600 | m Ω |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|---|----|-----|----|----|
| C_{iss} | Input Capacitance | $V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{MHz}$ | -- | 383 | -- | pF |
| C_{oss} | Output Capacitance | | -- | 20 | -- | pF |
| C_{rss} | Reverse Transfer Capacitance | | -- | -- | -- | pF |

Switching Characteristics

| | | | | | | |
|--------------|---------------------|--|----|------|----|----------|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS} = 400\text{ V}, I_D = 2.5\text{ A}, R_G = 10\ \Omega, V_{GS} = 10\text{ V}$ (Note 4, 5) | -- | 6 | -- | ns |
| t_r | Turn-On Rise Time | | -- | 7 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 26 | -- | ns |
| t_f | Turn-Off Fall Time | | -- | 13 | -- | ns |
| Q_g | Total Gate Charge | $V_{DS} = 400\text{ V}, I_D = 2.5\text{ A}, V_{GS} = 10\text{ V}$ (Note 4, 5) | -- | 10.1 | -- | nC |
| Q_{gs} | Gate-Source Charge | | -- | 2.1 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | -- | 4.9 | -- | nC |
| R_G | Gate Resistance | $f = 1\text{MHz}$ | | 0.7 | | Ω |

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|----------|---|---|----|-----|-----|---------------|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | -- | -- | 8 | A | |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | -- | -- | 24 | A | |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 2.5\text{ A}$ | -- | -- | 1.2 | V |
| t_{rr} | Reverse Recovery Time | $V_{DD} = 400\text{ V}, I_S = 2.5\text{ A}, dI_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4) | -- | 173 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | | -- | 1.1 | -- | μC |

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS} = 1.9\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 2.5\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq 400$, 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

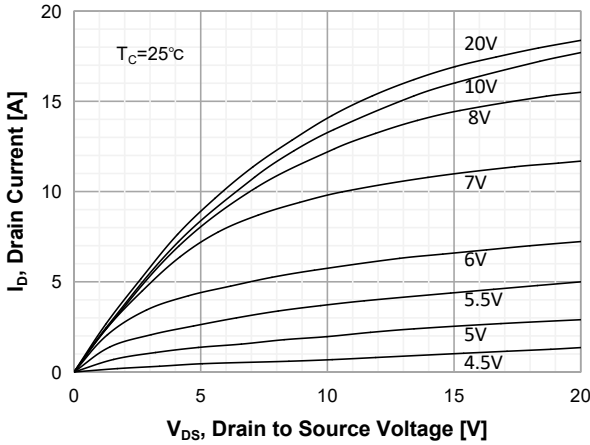


Figure 1. On-Region Characteristics

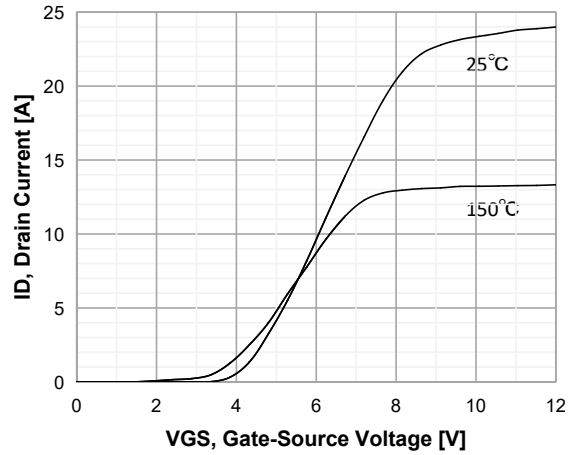


Figure 2. Transfer Characteristics

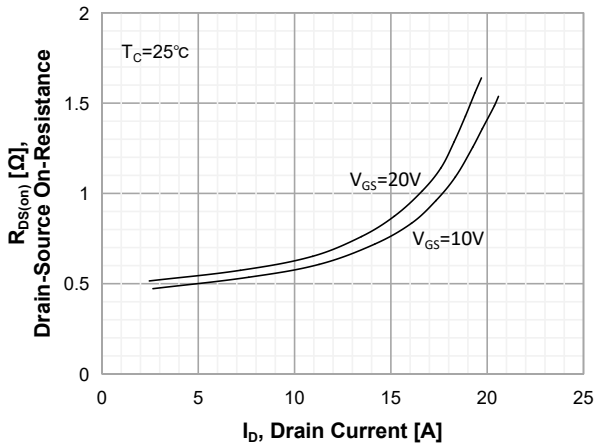


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

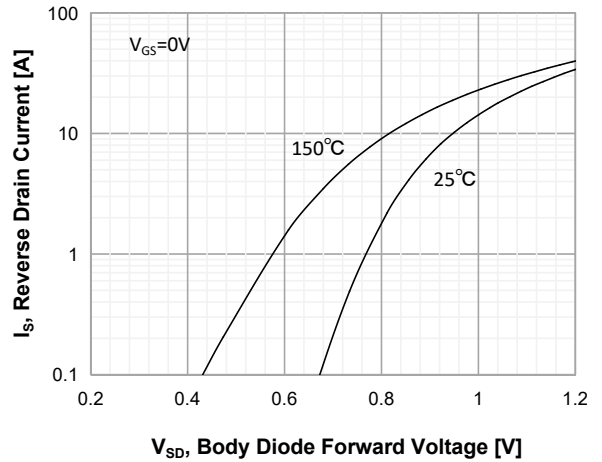


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

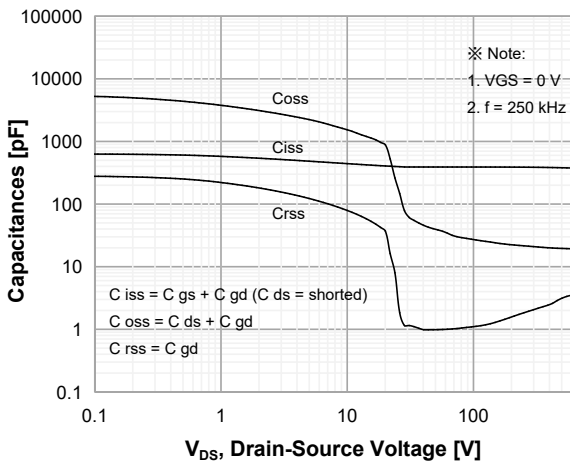


Figure 5. Capacitance Characteristics

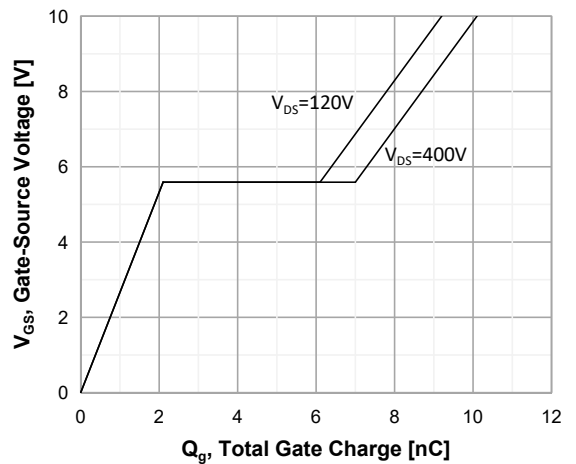


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

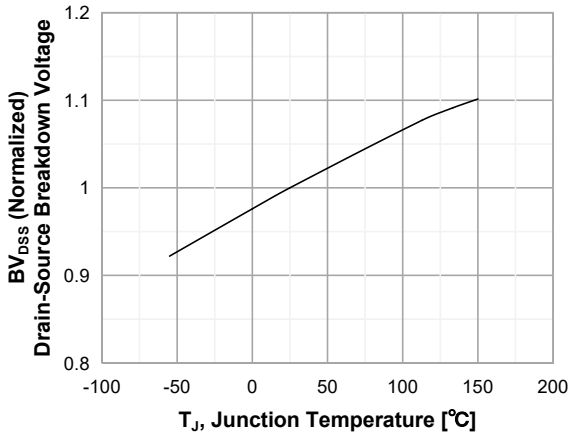


Figure 7. Breakdown Voltage Variation vs Temperature

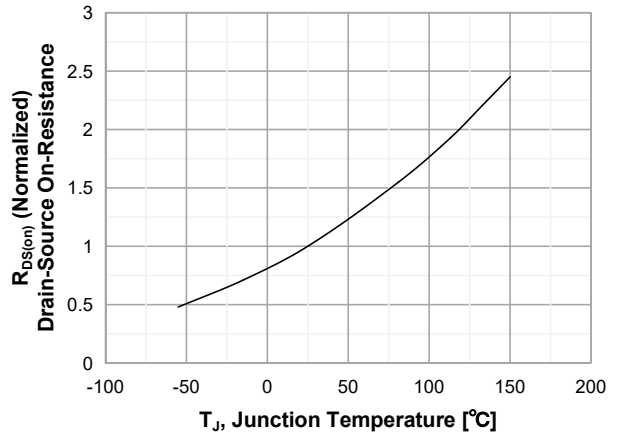


Figure 8. On-Resistance Variation vs Temperature

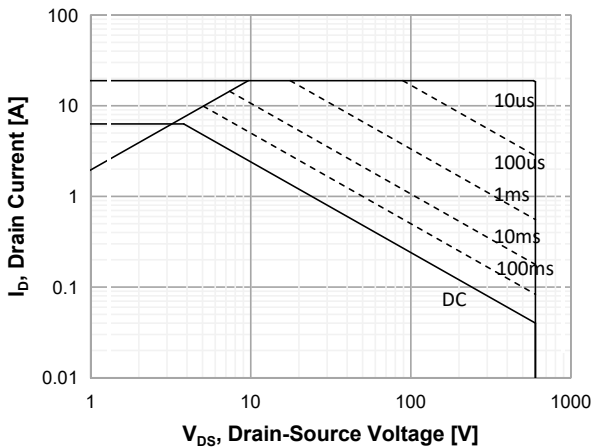


Figure 9. Maximum Safe Operating Area

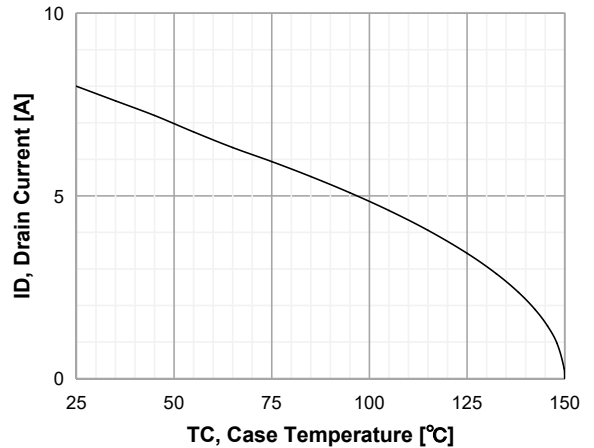


Figure 10. Maximum Drain Current vs. Case Temperature

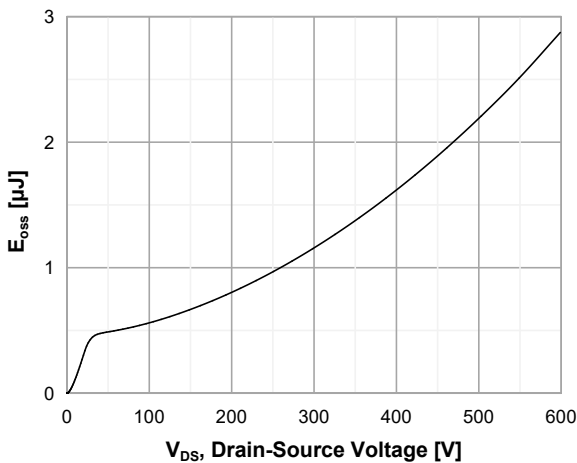


Figure 11. E_{oss} vs. Drain to Source Voltage

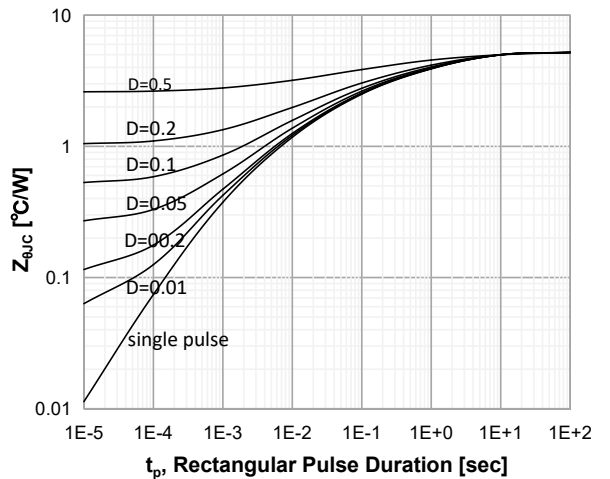
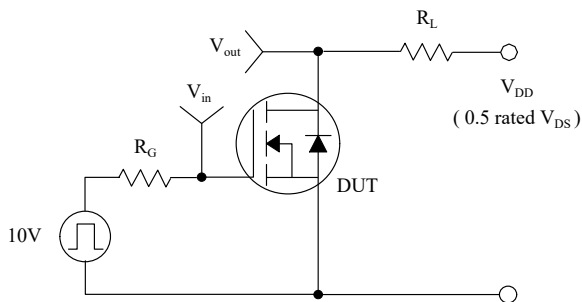


Figure 12. Transient Thermal Response Curve

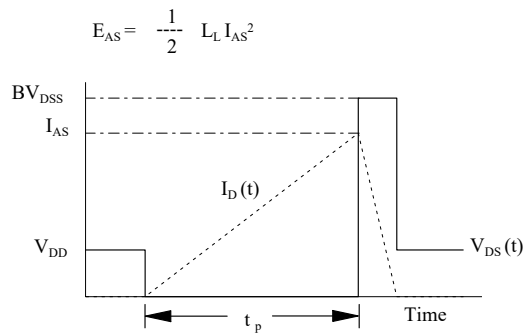
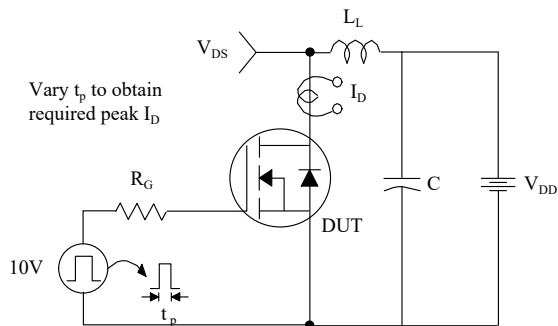
Gate Charge Test Circuit & Waveform



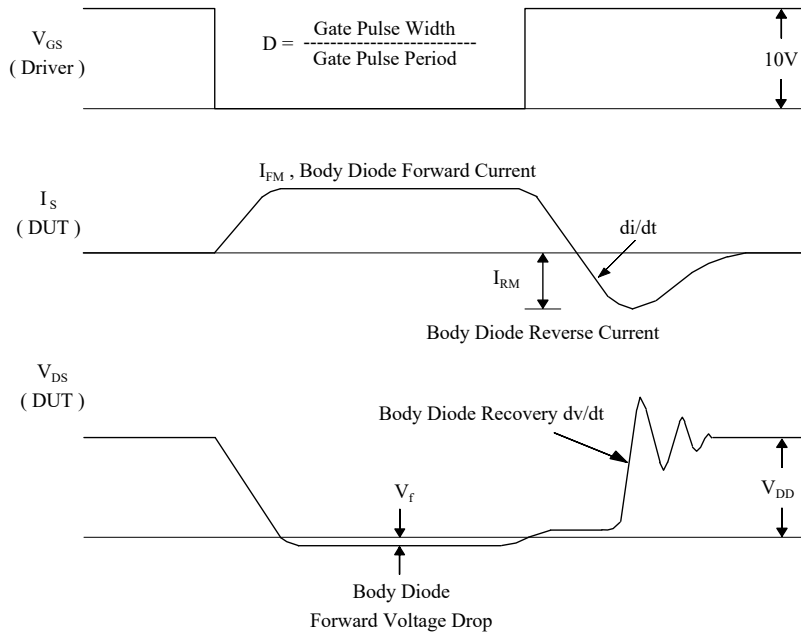
Resistive Switching Test Circuit & Waveforms



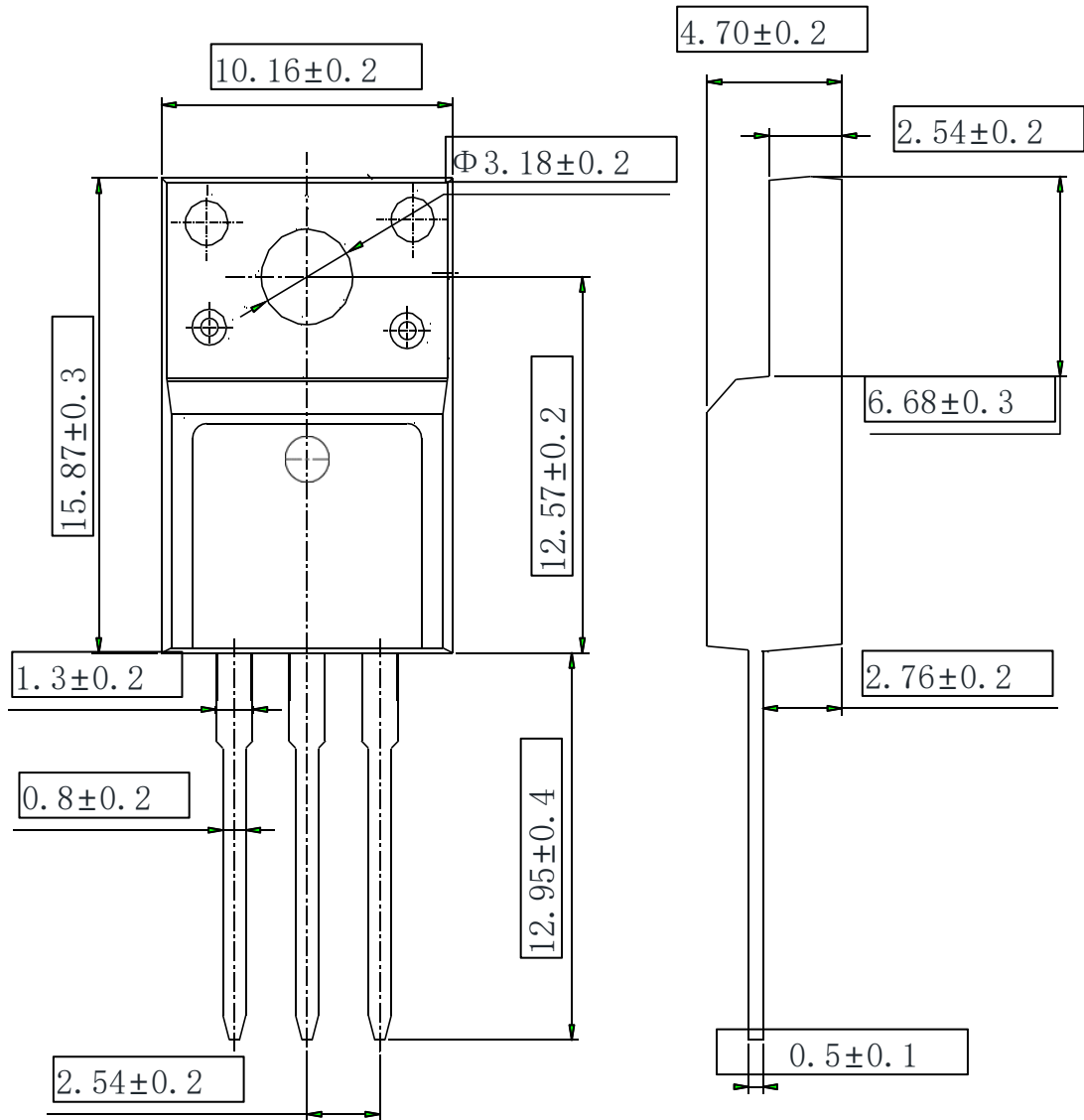
Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



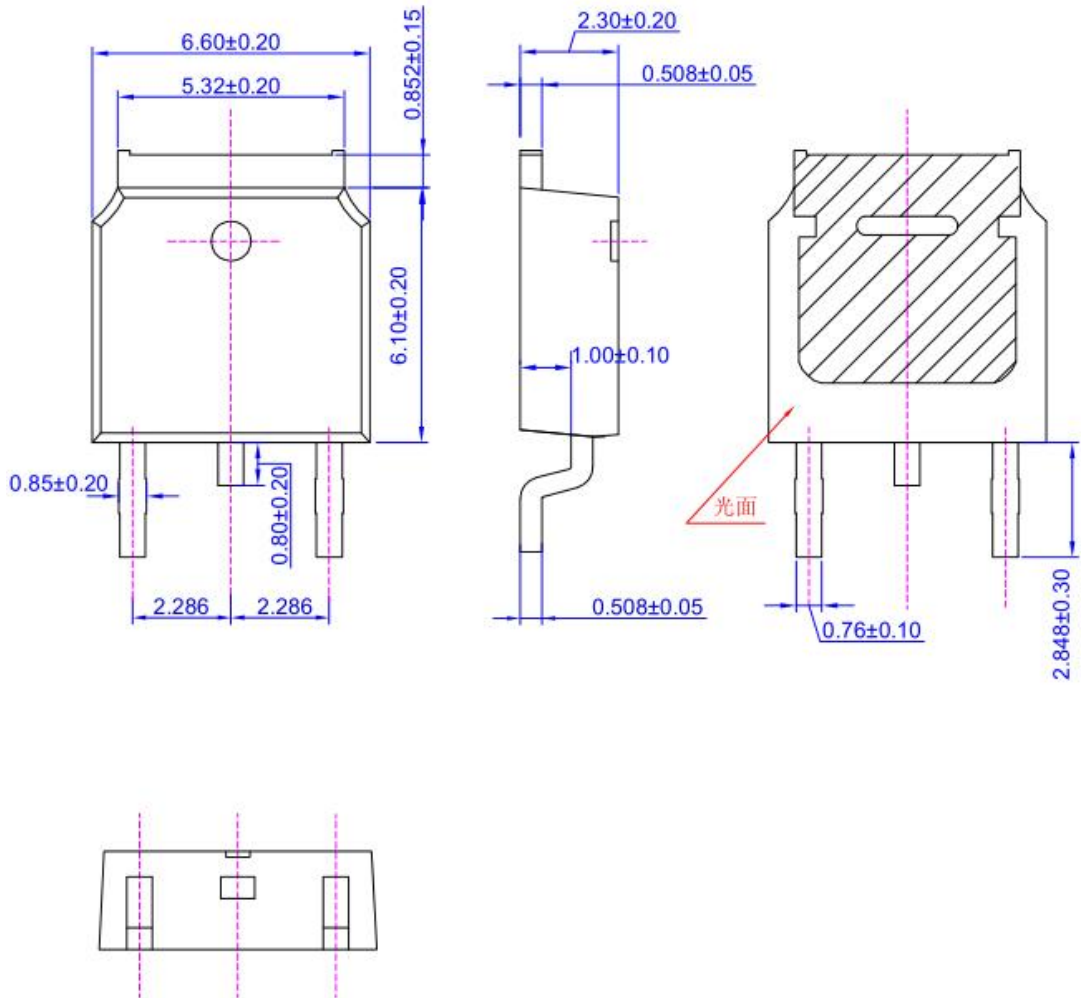
TO-220F OUTLINE



NOTE:

- 1 The plastic package is not marked as smooth surface $Ra=0.1$; Subglossy surface $Ra=0.8$
2. Undeclared tolerance ± 0.15 , Unmarked fillet $R_{max}=0.25$

TO-252 OUTLINE



NOTE:

- 1The plastic package is not marked as smooth surface $R_a=0.1$; Subglossy surface $R_a=0.8$
- 2.Undeclared tolerance ± 0.25 , Unmarked fillet $R_{max}=0.25$

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