


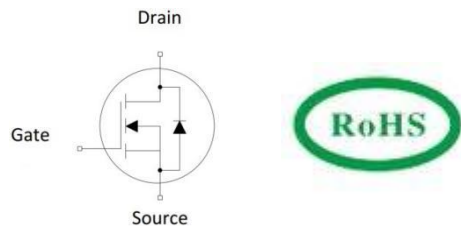


N-channel 700V, 4A, 1.0Ω Super-Junction Power MOSFET

| | | | | | | | | | |
|--|--|------------------------------|------|------------------|------|-------|------|-------------|--------|
| <p>Description</p> <p>Super-junction power MOSFET is a revolutionary technology for high voltage power MOSFET , designed according to the SJ principle. The resulting device has extremely low on resistance,making it especially suitable for applications which require superior power density and outstanding efficiency.</p> <p>Features</p> <ul style="list-style-type: none"> ◆ Very low FOM $R_{DS(on)} \times Q_g$ ◆ 100% UIS tested ◆ RoHS compliant <p>Applications</p> <ul style="list-style-type: none"> ◆ Power factor correction (PFC). ◆ Switched mode power supplies (SMPS). ◆ Uninterrupted power supply (UPS). | <p>Product Summary</p> <table> <tr> <td>$V_{DS} @ T_{j,25^{\circ}C}$</td> <td>700V</td> </tr> <tr> <td>$R_{DS(on),max}$</td> <td>1.0Ω</td> </tr> <tr> <td>I_D</td> <td>4.0A</td> </tr> <tr> <td>$Q_{g,typ}$</td> <td>9.1 nC</td> </tr> </table> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  TO-252 </div> <div style="text-align: center;">  TO-251 </div> <div style="text-align: center;">  TO-220F </div> </div> <div style="text-align: center; margin-top: 20px;">  <p>N-Channel MOSFET</p> </div> | $V_{DS} @ T_{j,25^{\circ}C}$ | 700V | $R_{DS(on),max}$ | 1.0Ω | I_D | 4.0A | $Q_{g,typ}$ | 9.1 nC |
| $V_{DS} @ T_{j,25^{\circ}C}$ | 700V | | | | | | | | |
| $R_{DS(on),max}$ | 1.0Ω | | | | | | | | |
| I_D | 4.0A | | | | | | | | |
| $Q_{g,typ}$ | 9.1 nC | | | | | | | | |

Marking information

| Product | Package | Marking | Packing method |
|-------------|---------|-------------|----------------|
| RMA70R1K0SN | TO-252 | RMA70R1K0SN | Reel |
| RMG70R1K0SN | TO-251 | RMG70R1K0SN | Tube |
| RMC70R1K0SN | TO-220F | RMC70R1K0SN | Tube |

Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|----------------|-------------|------|
| Drain-Source Voltage | V_{DSS} | 700 | V |
| Continuous drain current ($T_C = 25^{\circ}C$) ($T_C = 100^{\circ}C$) | I_D | 4 | A |
| | | 2.5 | A |
| Pulsed drain current ¹⁾ | I_{DM} | 12 | A |
| Gate-Source voltage | V_{GSS} | ± 30 | V |
| Avalanche energy, single pulse ²⁾ | E_{AS} | 50 | mJ |
| Avalanche current, repetitive ³⁾ | I_{AR} | 0.9 | A |
| Power Dissipation TO-252 /TO-251 ($T_C = 25^{\circ}C$) - Derate above 25°C | P_D | 37 | W |
| | | 0.3 | W/°C |
| Power Dissipation TO-220F ($T_C = 25^{\circ}C$) - Derate above 25°C | P_D | 30 | W |
| | | 0.24 | W/°C |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | °C |
| Continuous diode forward current | I_S | 4 | A |
| Diode pulse current | $I_{S,pulse}$ | 12 | A |

Thermal Characteristics

| Parameter | Symbol | Value | | Unit |
|--|-------------------|--------------|---------|-----------------------------|
| | | TO252/TO-251 | TO-220F | |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 2.8 | 4.4 | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62 | 73 | $^{\circ}\text{C}/\text{W}$ |
| Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s) | T_{sold} | 260 | 260 | $^{\circ}\text{C}$ |

Electrical Characteristics $T_c = 25^{\circ}\text{C}$ unless otherwise noted

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|--------------------------------------|----------------------|--|------|------|------|---------------|
| Static characteristics | | | | | | |
| Drain-source breakdown voltage | BV_{DSS} | $V_{\text{GS}}=0\text{ V}, I_{\text{D}}=250\mu\text{A}$ | 700 | - | - | V |
| Gate threshold voltage | $V_{\text{GS(th)}}$ | $V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=250\mu\text{A}$ | 2.5 | | 4.0 | V |
| Drain cut-off current | I_{DSS} | $V_{\text{DS}}=700\text{ V}, V_{\text{GS}}=0\text{ V},$ $T_j = 25^{\circ}\text{C}$ $T_j = 125^{\circ}\text{C}$ | - | - | 1 | μA |
| Gate leakage current, Forward | I_{GSSF} | $V_{\text{GS}}=30\text{ V}, V_{\text{DS}}=0\text{ V}$ | - | - | 100 | nA |
| Gate leakage current, Reverse | I_{GSSR} | $V_{\text{GS}}=-30\text{ V}, V_{\text{DS}}=0\text{ V}$ | - | - | -100 | nA |
| Drain-source on-state resistance | $R_{\text{DS(on)}}$ | $V_{\text{GS}}=10\text{ V}, I_{\text{D}}=2\text{ A}$ $T_j = 25^{\circ}\text{C}$ | - | 0.88 | 1.0 | Ω |
| Dynamic characteristics | | | | | | |
| Input capacitance | C_{iss} | $V_{\text{DS}} = 100\text{ V}, V_{\text{GS}} = 0\text{ V},$ $f = 1\text{MHz}$ | - | 315 | - | pF |
| Output capacitance | C_{oss} | | - | 27 | - | |
| Reverse transfer capacitance | C_{rss} | | - | 1.2 | - | |
| Turn-on delay time | $t_{\text{d(on)}}$ | $V_{\text{DD}} = 400\text{V}, I_{\text{D}} = 2\text{A}$ $R_{\text{G}} = 25\Omega, V_{\text{GS}}=10\text{V}$ | - | 9.4 | - | ns |
| Rise time | t_r | | - | 22.6 | - | |
| Turn-off delay time | $t_{\text{d(off)}}$ | | - | 36.4 | - | |
| Fall time | t_f | | - | 25.4 | - | |
| Gate charge characteristics | | | | | | |
| Gate to source charge | Q_{gs} | $V_{\text{DD}}=560\text{ V}, I_{\text{D}}=2\text{A},$ $V_{\text{GS}}=0\text{ to }10\text{ V}$ | - | 2.1 | - | nC |
| Gate to drain charge | Q_{gd} | | - | 4.0 | - | |
| Gate charge total | Q_{g} | | - | 9.1 | - | |
| Gate plateau voltage | V_{plateau} | | - | 5.5 | - | V |
| Reverse diode characteristics | | | | | | |
| Diode forward voltage | V_{SD} | $V_{\text{GS}}=0\text{ V}, I_{\text{F}}=2\text{A}$ | - | 0.85 | - | V |
| Reverse recovery time | t_{rr} | $V_{\text{R}}=50\text{ V}, I_{\text{F}}=2\text{A},$ $dI_{\text{F}}/dt=100\text{ A}/\mu\text{s}$ | - | 159 | - | ns |
| Reverse recovery charge | Q_{rr} | | - | 0.93 | - | μC |
| Peak reverse recovery current | I_{rrm} | | - | 11.2 | - | A |

Notes:

- Limited by maximum junction temperature, maximum duty cycle is 0.75.
- $I_{\text{AS}} = 1\text{A}, V_{\text{DD}} = 50\text{V},$ Starting $T_j = 25^{\circ}\text{C}.$

Electrical Characteristics Diagrams

Figure 1. Output Characteristics

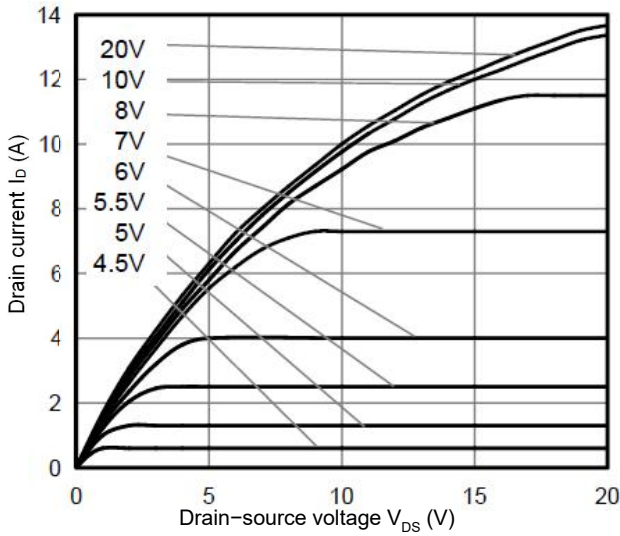


Figure 2. Transfer Characteristics

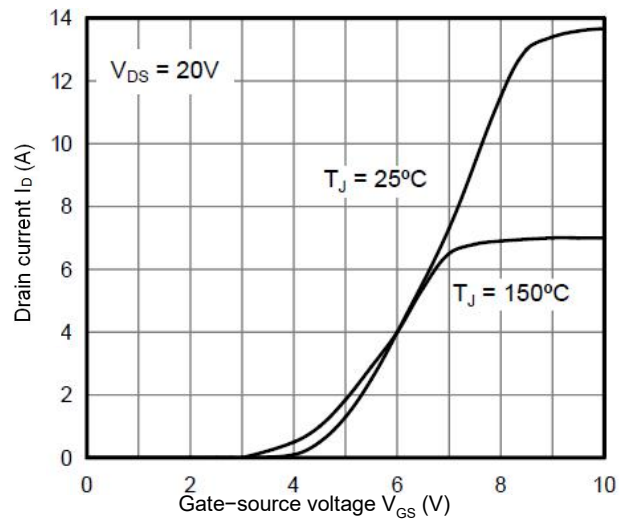


Figure 3. On-Resistance vs. Drain Current

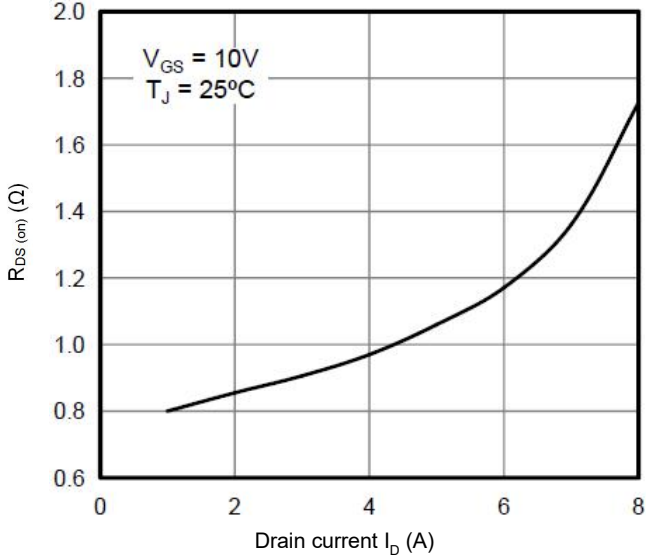


Figure 4. Capacitance Characteristics

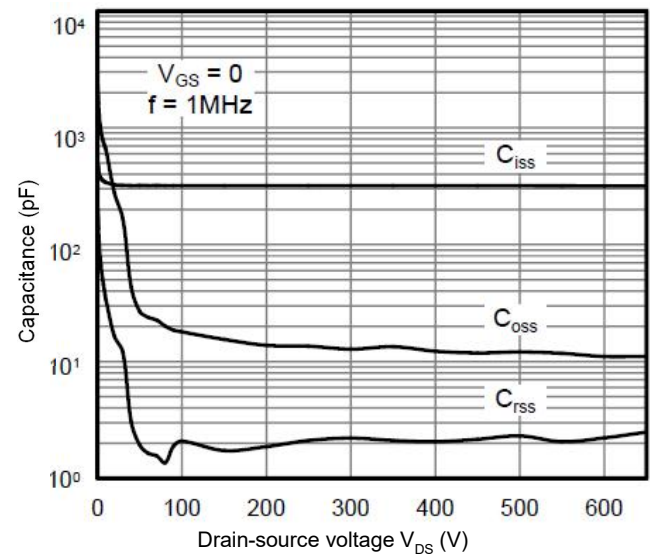


Figure 5. Gate Charge Characteristics

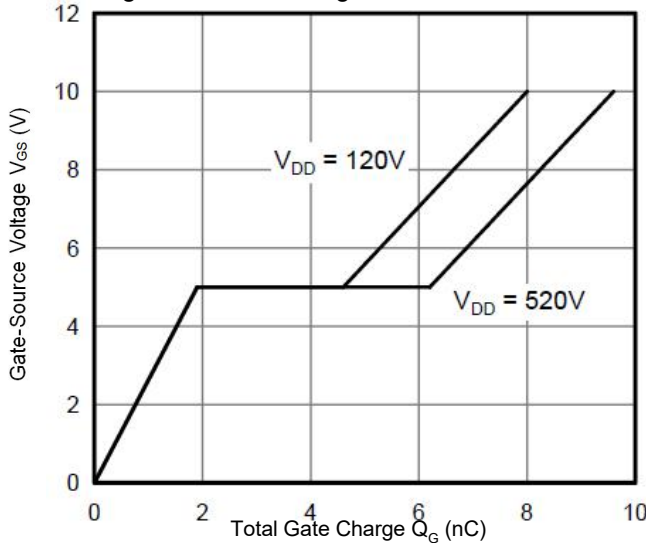


Figure 6. Body Diode Forward Voltage

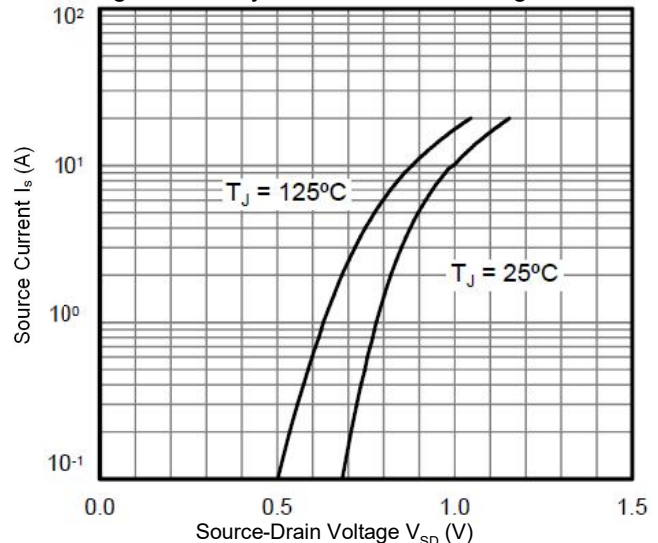


Figure 7. Breakdown Voltage vs. Temperature

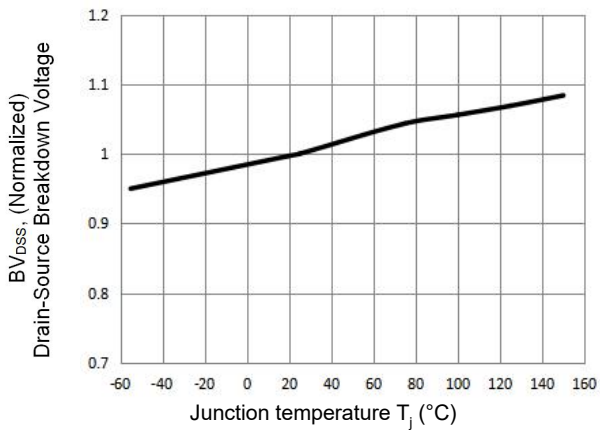


Figure 8. On-Resistance vs. Temperature

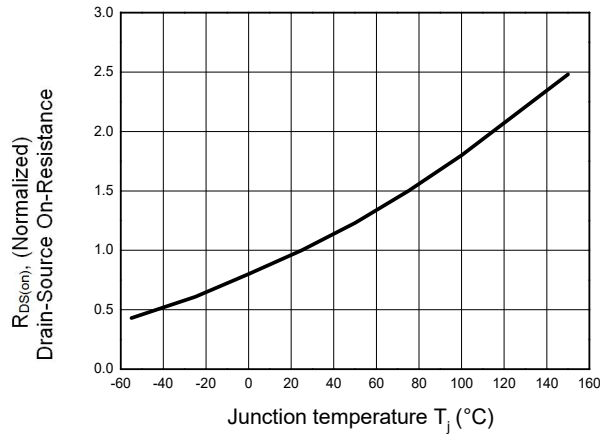


Figure 9. Maximum Safe Operating Area
TO-252/TO-251

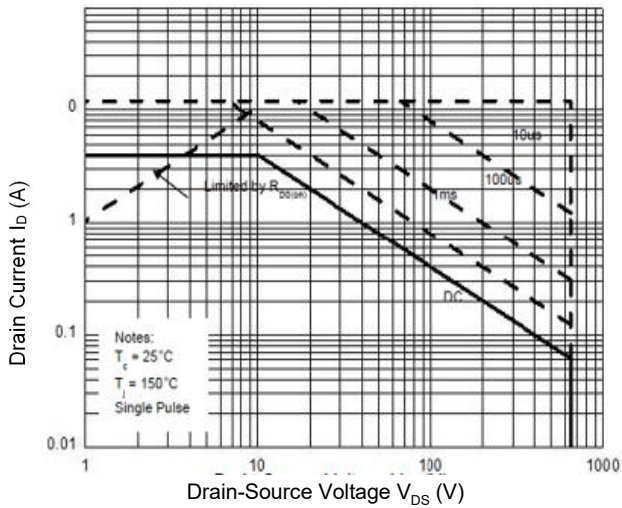
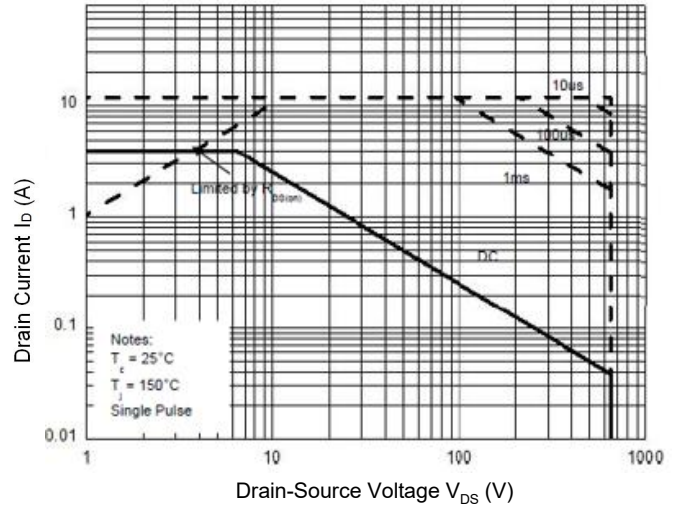
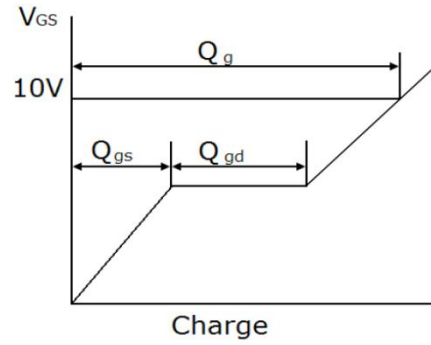
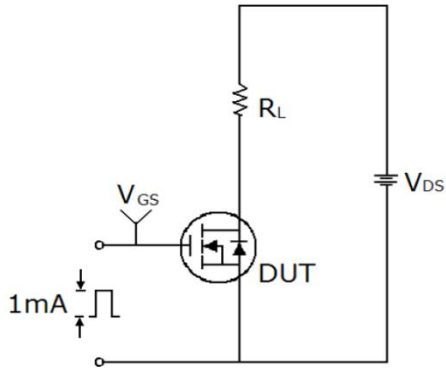


Figure 10. Maximum Safe Operating Area
TO-220F

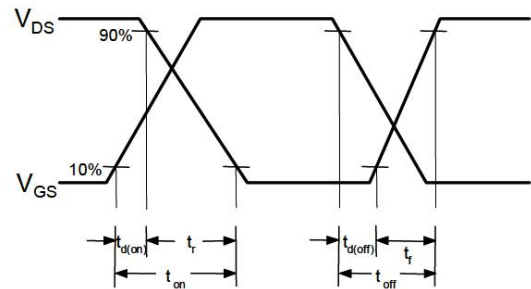
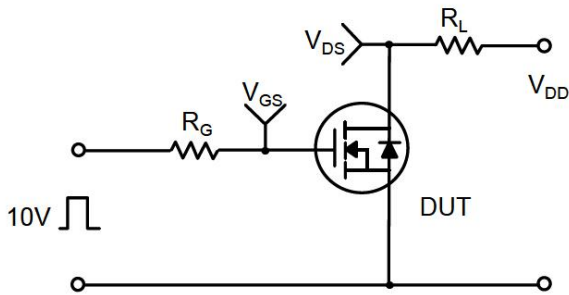


Test Circuits

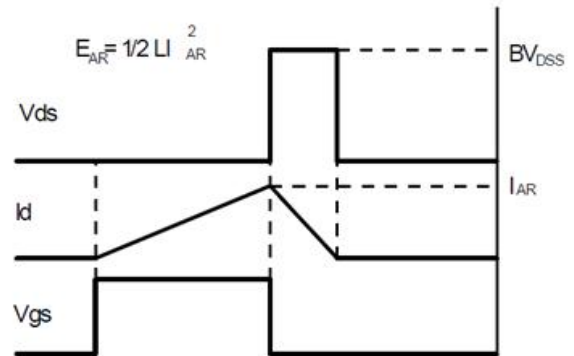
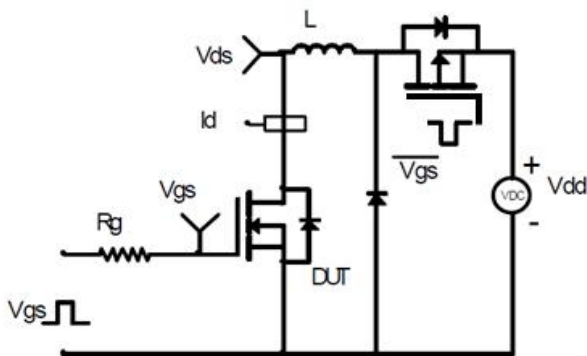
Gate Charge Test Circuit & Waveform



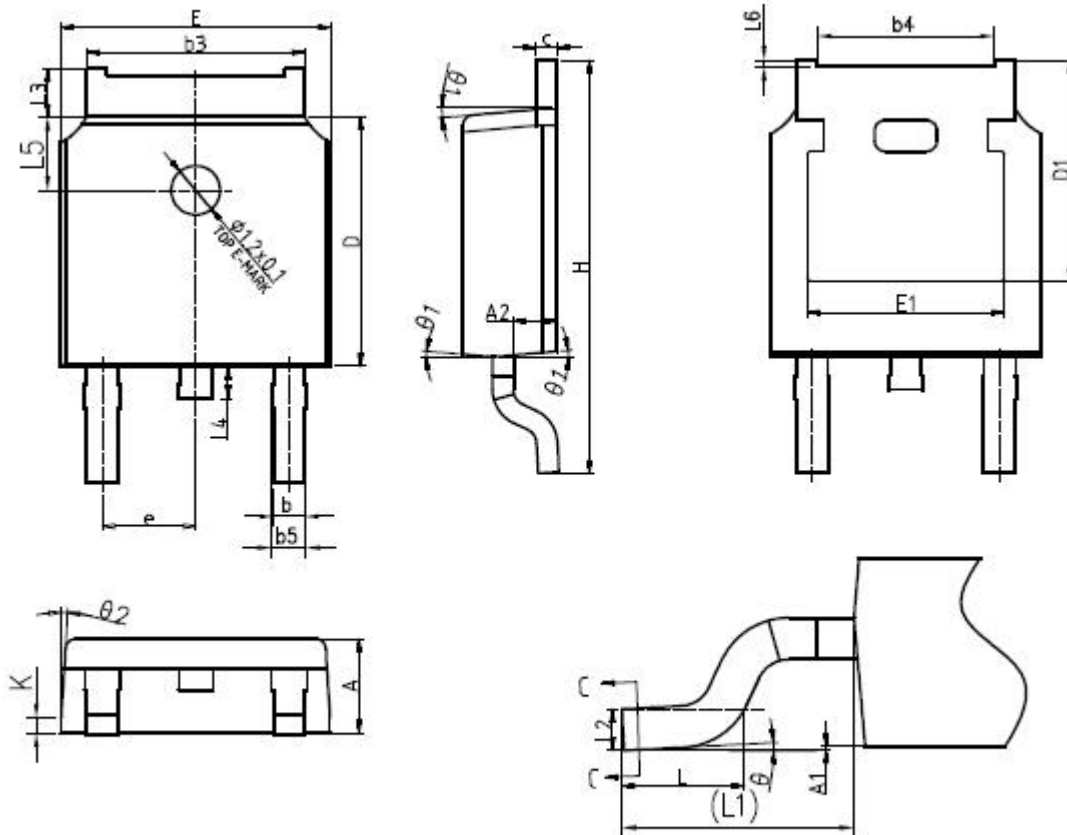
Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Mechanical Dimensions for TO-252

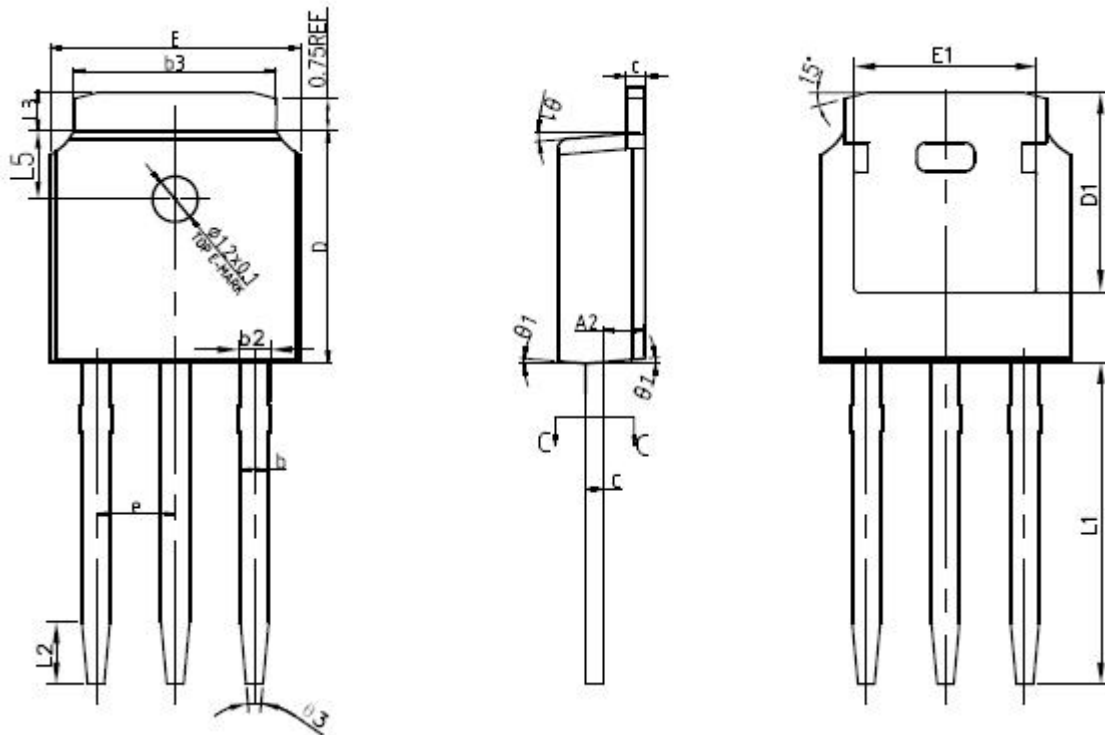


单位: mm

| SYMBOL | mm | | |
|--------|---------|------|------|
| | MIN | NOM | MAX |
| *A | 2.20 | 2.30 | 2.38 |
| *A1 | 0.00 | - | 0.10 |
| A2 | 0.97 | 1.07 | 1.17 |
| *b | 0.72 | 0.78 | 0.85 |
| b1 | 0.71 | 0.76 | 0.81 |
| *b3 | 5.23 | 5.33 | 5.46 |
| b4 | 4.27 | 4.32 | 4.37 |
| b5 | 0.72 | 0.88 | 0.93 |
| *c | 0.47 | 0.53 | 0.58 |
| c1 | 0.46 | 0.51 | 0.56 |
| *D | 6.00 | 6.10 | 6.20 |
| D1 | 5.30REF | | |

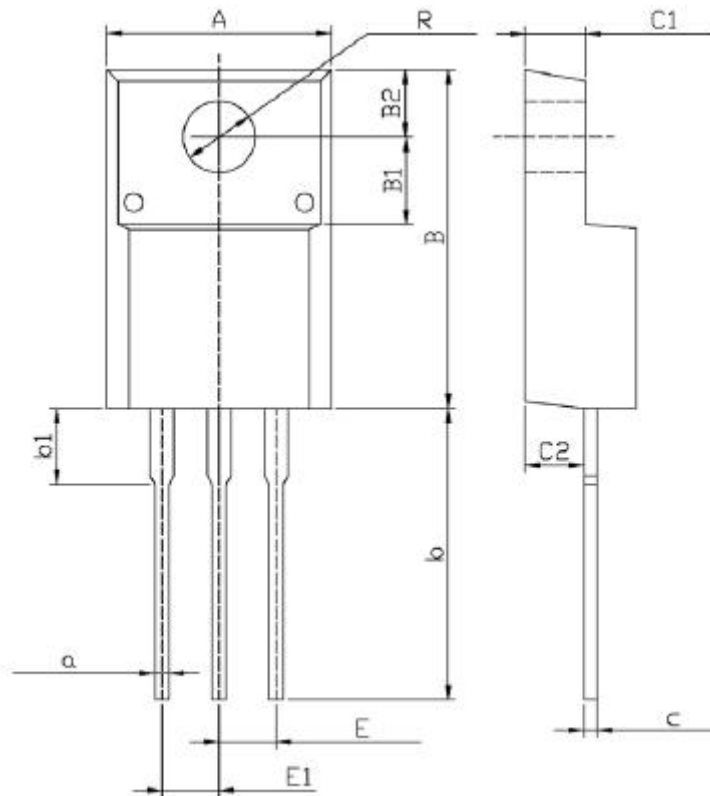
| | | | |
|--------------|----------|-------|-------|
| *E | 6.50 | 6.60 | 6.70 |
| E1 | 4.70 | 4.83 | 4.92 |
| *e | 2.286BSC | | |
| L | 1.40 | 1.50 | 1.70 |
| L1 | 2.90REF | | |
| L2 | 0.51BSC | | |
| *L3 | 0.90 | - | 1.25 |
| *L4 | 0.60 | 0.80 | 1.00 |
| L5 | 1.70 | 1.80 | 1.90 |
| L6 | 0 | 0.047 | 0.123 |
| θ | 0° | - | 8° |
| * $\theta 1$ | 5° | 7° | 9° |
| $\theta 2$ | 5° | 7° | 9° |
| K | 0.40REF | | |

Mechanical Dimensions for TO-251



| SYMBOL | MM | | |
|--------------|----------|------|------|
| | MIN | NOM | MAX |
| *A | 2.20 | 2.30 | 2.38 |
| *A2 | 0.97 | 1.07 | 1.17 |
| *b | 0.72 | 0.78 | 0.85 |
| b1 | 0.71 | 0.76 | 0.81 |
| *b2 | 0.72 | 0.88 | 0.95 |
| *b3 | 5.23 | 5.33 | 5.46 |
| *c | 0.47 | 0.53 | 0.58 |
| c1 | 0.46 | 0.51 | 0.56 |
| *D | 6.00 | 6.10 | 6.20 |
| D1 | 5.30REF | | |
| *E | 6.50 | 6.60 | 6.70 |
| E1 | 4.70 | 4.83 | 4.92 |
| *e | 2.286BSC | | |
| *L1 | 9.20 | 9.40 | 9.60 |
| L2 | 1.25 | 1.35 | 1.45 |
| *L3 | 0.90 | 1.02 | 1.25 |
| L5 | 1.70 | 1.80 | 1.90 |
| * $\theta 1$ | 5° | 7° | 9° |
| $\theta 2$ | 5° | 7° | 9° |
| $\theta 3$ | 11° | 13° | 15° |
| K | 0.40REF | | |

Mechanical Dimensions for TO-220F



| Symbol | Dimensions In Millimeters | | Symbol | Dimensions In Millimeters | |
|--------|---------------------------|------|--------|---------------------------|------|
| | Min | Max | | Min | Max |
| C | 4.3 | 4.7 | b1 | 2.9 | 3.9 |
| A | 9.7 | 10.3 | a | 0.55 | 0.75 |
| B | 14.7 | 15.3 | E | 2.29 | 2.79 |
| B1 | 3.8 | 4.0 | E1 | 2.29 | 2.79 |
| B2 | 2.9 | 3.1 | C1 | 2.5 | 2.9 |
| R | 3.0 | 3.4 | C2 | 2.5 | 2.7 |
| b | 12.5 | 13.5 | c | 0.5 | 0.7 |