



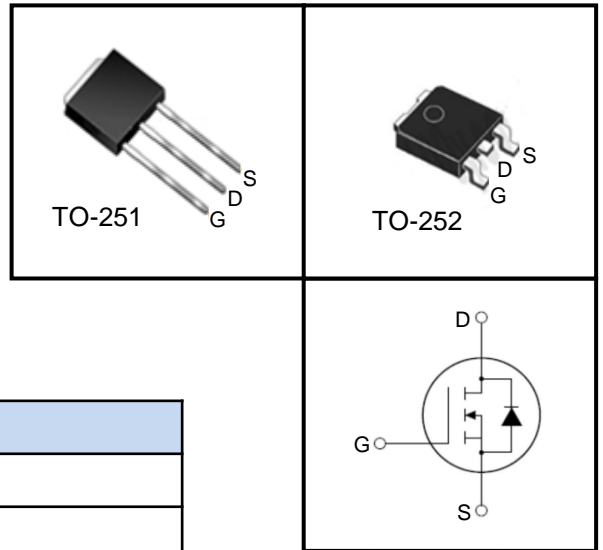
600V Super-Junction Power MOSFET

FEATURES

- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- RoHS compliant

APPLICATIONS

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



| Device Marking and Package Information | | |
|--|---------|---------|
| Device | Package | Marking |
| TPU60R2K2A | TO-251 | 60R2K2A |
| TPD60R2K2A | TO-252 | 60R2K2A |

| Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted | | | | |
|--|----------------|----------|--------|------------------|
| Parameter | Symbol | Value | | Unit |
| | | TO-251 | TO-252 | |
| Drain-Source Voltage ($V_{GS} = 0\text{V}$) | V_{DSS} | 600 | | V |
| Continuous Drain Current | I_D | 2.3 | | A |
| Pulsed Drain Current (note1) | I_{DM} | 6.9 | | A |
| Gate-Source Voltage | V_{GSS} | ± 30 | | V |
| Single Pulse Avalanche Energy (note2) | E_{AS} | 5 | | mJ |
| Avalanche Current (note1) | I_{AR} | 2.3 | | A |
| Repetitive Avalanche Energy (note1) | E_{AR} | 0.05 | | mJ |
| Power Dissipation ($T_C = 25^\circ\text{C}$) | P_D | 30 | | W |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55~+150 | | $^\circ\text{C}$ |

| Thermal Resistance | | | | |
|---|------------|--------|--------|------|
| Parameter | Symbol | Value | | Unit |
| | | TO-251 | TO-252 | |
| Thermal Resistance, Junction-to-Case | R_{thJC} | 4.1 | | K/W |
| Thermal Resistance, Junction-to-Ambient | R_{thJA} | 75 | | |



| Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted | | | | | | |
|--|---------------|--|-------|------|-----------|----------|
| Parameter | Symbol | Test Conditions | Value | | | Unit |
| | | | Min. | Typ. | Max. | |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$ | 600 | -- | -- | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 600V, V_{GS} = 0V, T_J = 25^\circ\text{C}$ | -- | -- | 1 | μA |
| | | $V_{DS} = 600V, V_{GS} = 0V, T_J = 150^\circ\text{C}$ | -- | -- | 100 | |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 30V$ | -- | -- | ± 100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2.5 | -- | 3.5 | V |
| Drain-Source On-Resistance (Note3) | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 1A$ | -- | 1.93 | 2.16 | Ω |
| Forward Transconductance (Note3) | g_{fs} | $V_{DS} = 10V, I_D = 2A$ | -- | 2 | -- | S |
| Dynamic | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0V,$ $V_{DS} = 50V,$ $f = 1.0\text{MHz}$ | -- | 300 | -- | μF |
| Output Capacitance | C_{oss} | | -- | 115 | -- | |
| Reverse Transfer Capacitance | C_{rss} | | -- | 3.5 | -- | |
| Total Gate Charge | Q_g | $V_{DD} = 480V, I_D = 2A,$ $V_{GS} = 10V$ | -- | 6.5 | -- | nC |
| Gate-Source Charge | Q_{gs} | | -- | 1 | -- | |
| Gate-Drain Charge | Q_{gd} | | -- | 3 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD} = 300V, I_D = 2A,$ $R_G = 25\Omega$ | -- | 9 | 23 | ns |
| Turn-on Rise Time | t_r | | -- | 25 | 55 | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 19 | 46 | |
| Turn-off Fall Time | t_f | | -- | 16 | 38 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Body Diode Current | I_S | $T_C = 25^\circ\text{C}$ | -- | -- | 2.3 | A |
| Pulsed Diode Forward Current | I_{SM} | | -- | -- | 6.9 | |
| Body Diode Voltage | V_{SD} | $T_J = 25^\circ\text{C}, I_{SD} = 2A, V_{GS} = 0V$ | -- | 0.95 | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $V_R = 480V, I_F = I_S,$ $di_F/dt = 100A/\mu s$ | -- | 210 | -- | ns |
| Reverse Recovery Charge | Q_{rr} | | -- | 1 | -- | μC |
| Peak Reverse Recovery Current | I_{rrm} | | -- | 8 | -- | A |

Notes

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



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

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

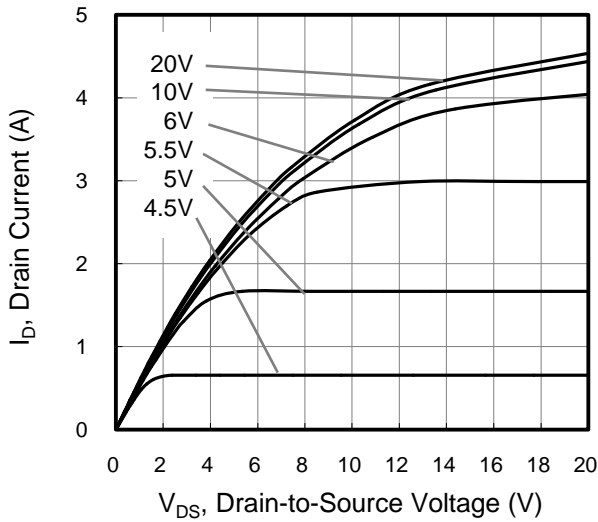


Figure 2. Output Characteristics ($T_J = 150^\circ\text{C}$)

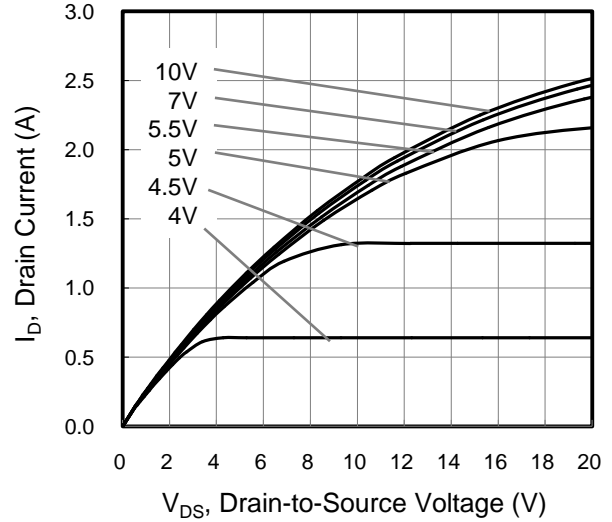


Figure 3. On-Resistance vs. Drain Current

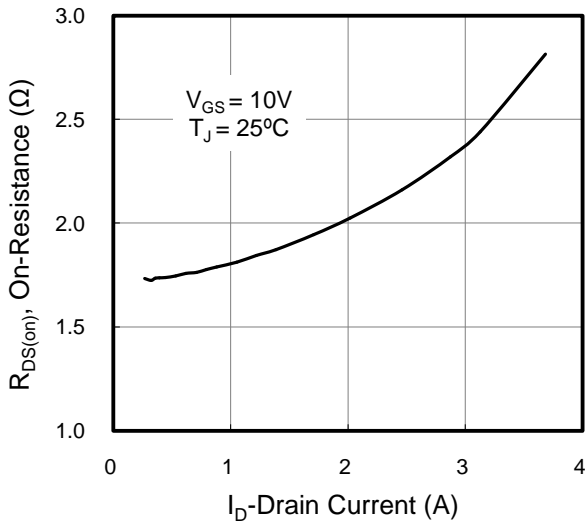


Figure 4. On-Resistance vs. Temperature

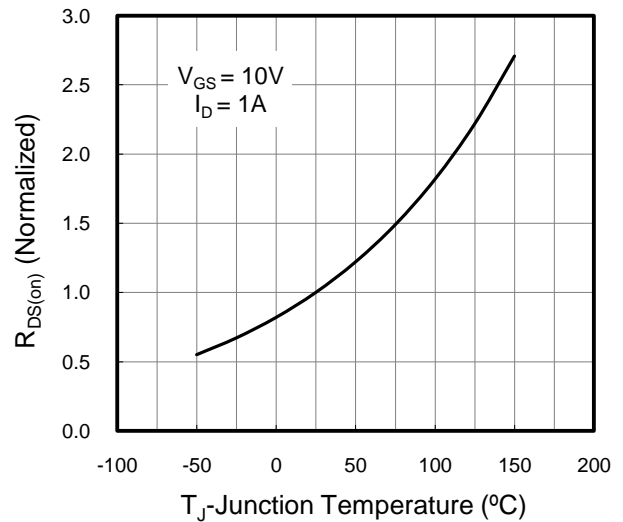


Figure 5. Transfer Characteristics

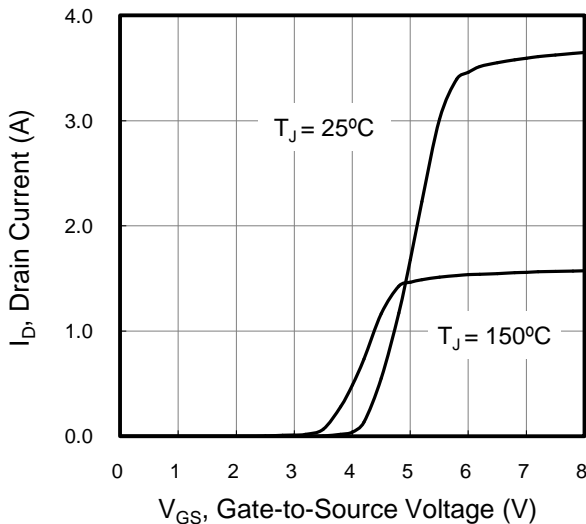
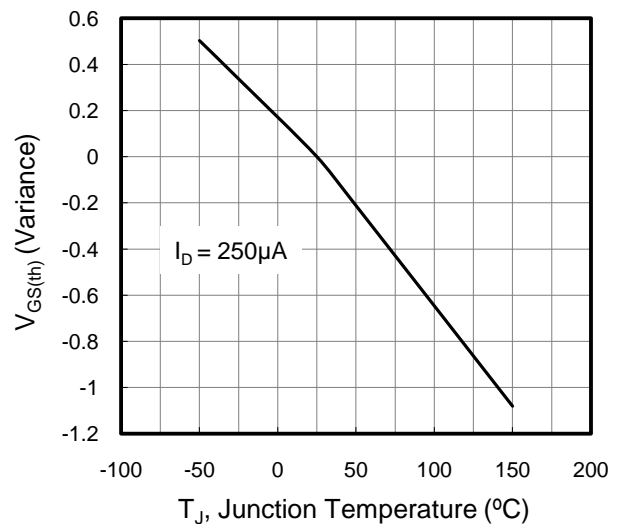


Figure 6. Threshold Voltage vs. Temperature





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

Figure 7. Capacitance

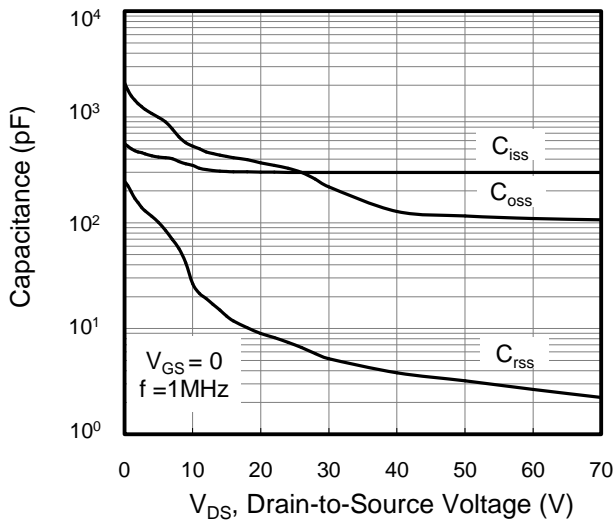


Figure 8. Gate Charge

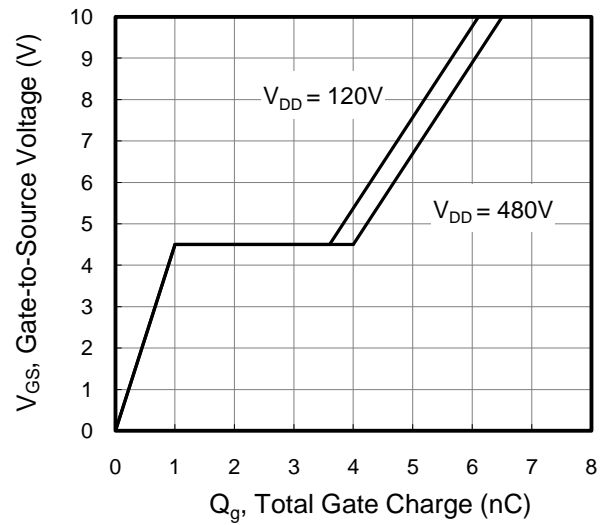


Figure 9. Body Diode Forward Voltage

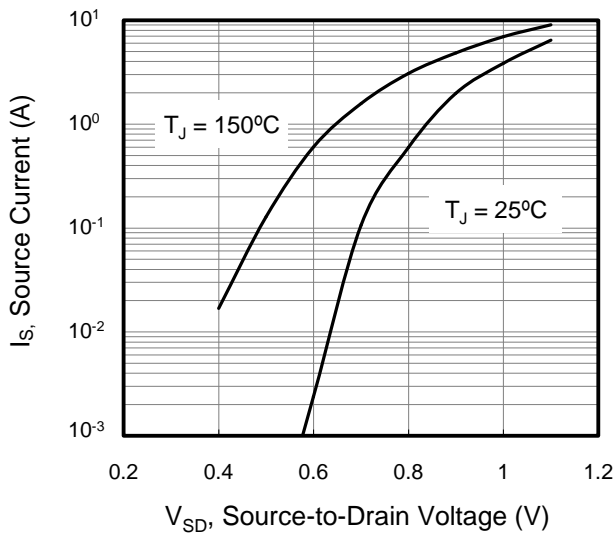


Figure 10. Transient Thermal Impedance

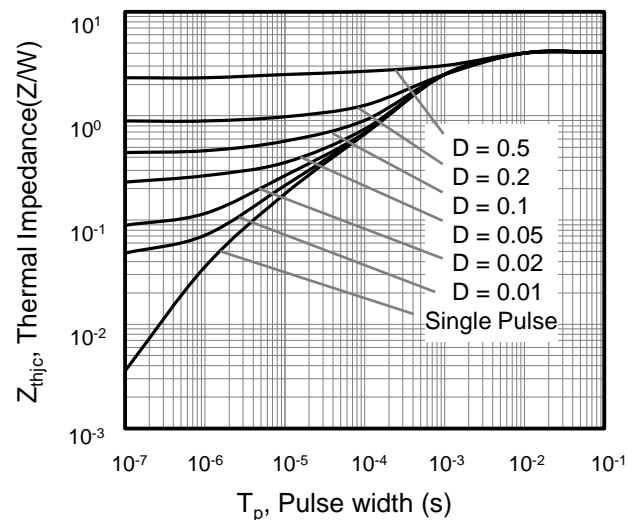




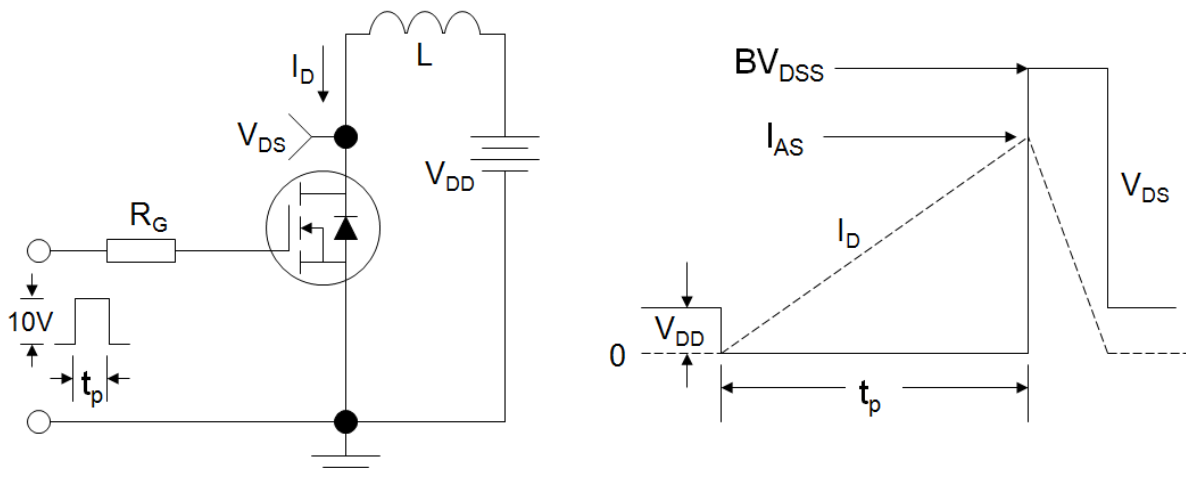
Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

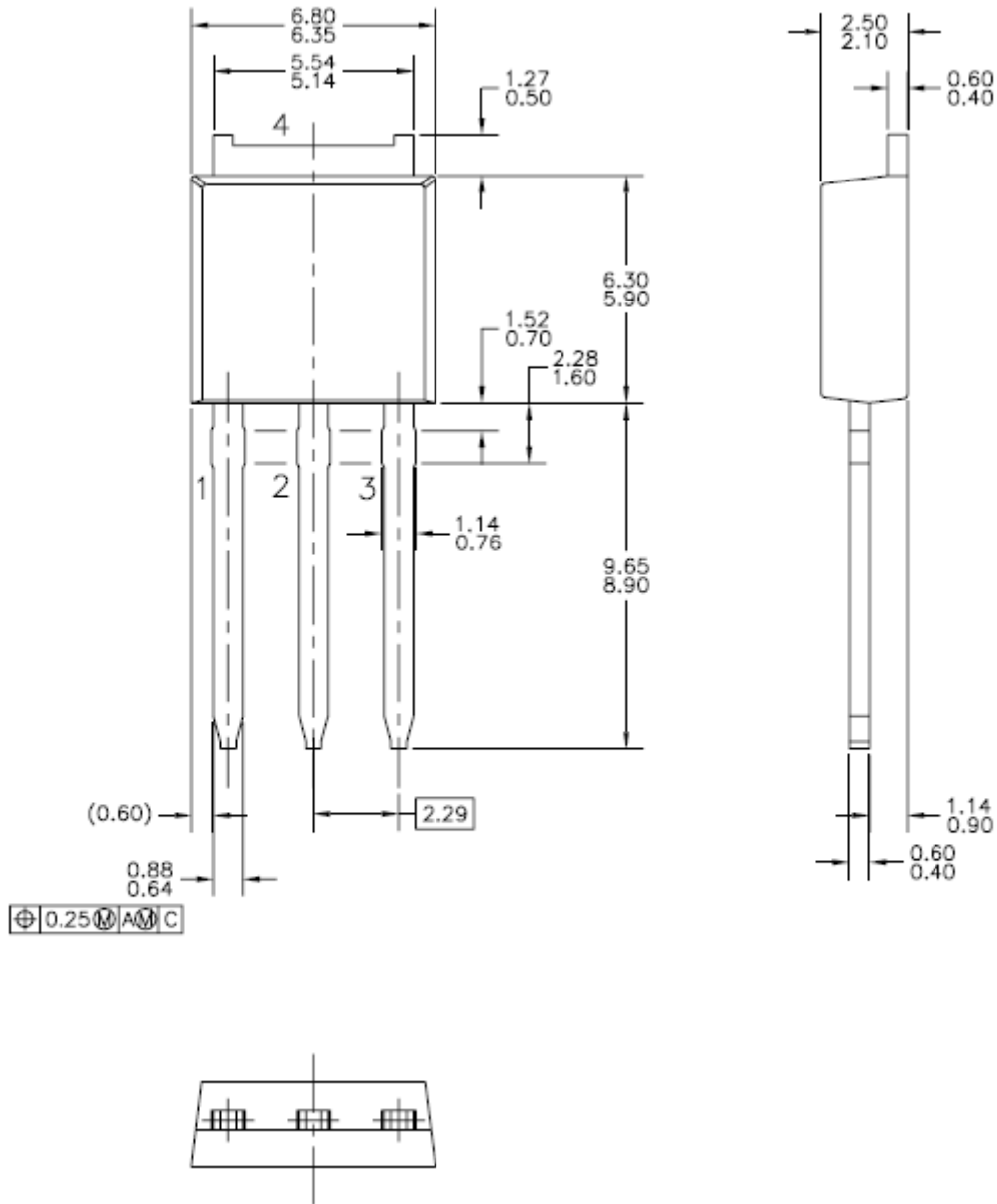


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



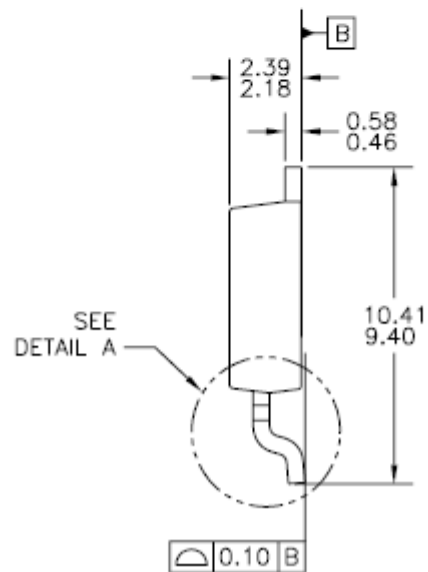
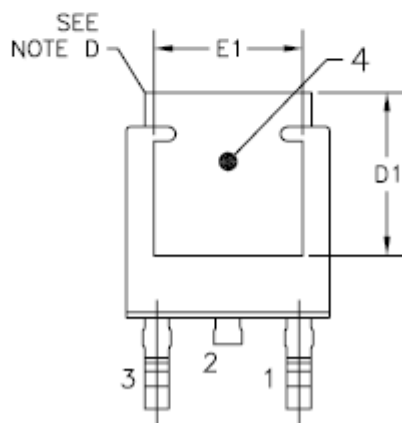
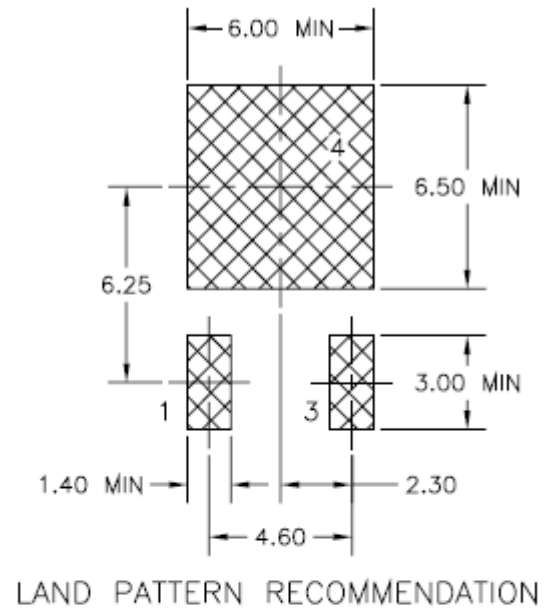
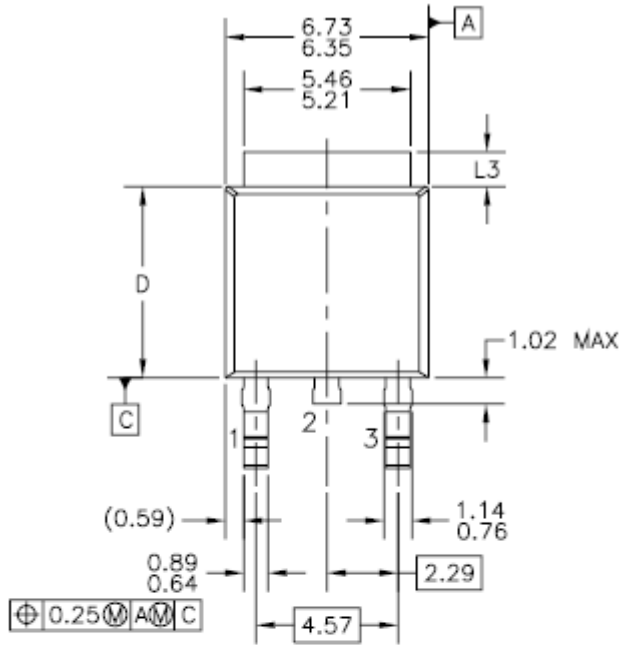


TO-251





TO-252





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