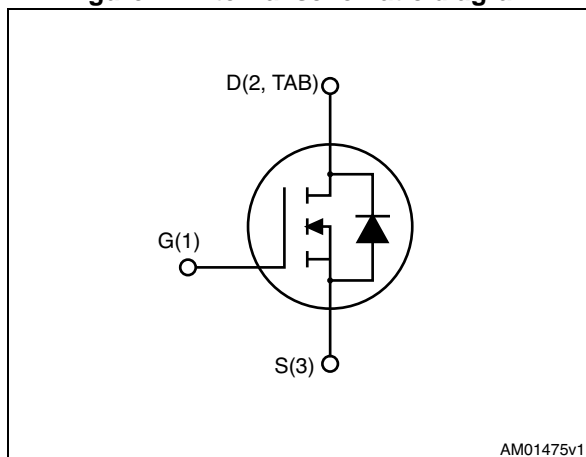


Figure 1. Internal schematic diagram



Features

| Order codes | V _{DS} | R _{DS(on)} max | I _D | P _{TOT} |
|-------------|-----------------|----------------------------|----------------|------------------|
| STB100N10F7 | 100 V | 0.008 Ω | 80 A | 120 W |
| STD100N10F7 | | | 80 A | 120 W |
| STF100N10F7 | | | 45 A | 30 W |
| STP100N10F7 | | | 80 A | 150 W |

- Ultra low on-resistance
- 100% avalanche tested

Applications

- Switching applications

Description

These devices utilize the 7th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Table 1. Device summary

| Order codes | Marking | Packages | Packaging |
|-------------|----------|--------------------|---------------|
| STB100N10F7 | 100N10F7 | D ² PAK | Tape and reel |
| STD100N10F7 | | DPAK | Tape and reel |
| STF100N10F7 | | TO-220FP | Tube |
| STP100N10F7 | | TO-220 | Tube |

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | | | Unit |
|---------------------------------|---|------------|-------------------|---------------------------|------|
| | | DPAK | TO-220FP | TO-220 D ² PAK | |
| V _{DS} | Drain-source voltage | 100 | | | V |
| V _{GS} | Gate-source voltage | ± 20 | | | V |
| I _D | Drain current (continuous) at T _C = 25 °C | 80 | 45 ⁽¹⁾ | 80 | A |
| I _D | Drain current (continuous) at T _C = 100 °C | 62 | 32 ⁽¹⁾ | 70 | A |
| I _{DM} ⁽²⁾ | Drain current (pulsed) | 320 | 180 | 320 | A |
| P _{TOT} ⁽¹⁾ | Total dissipation at T _C = 25 °C | 120 | 30 | 150 | W |
| T _J | Operating junction temperature | -55 to 175 | | | °C |
| T _{stg} | Storage temperature | | | | °C |

1. This value is limited by package.
2. Pulse width limited by safe operating area.

Table 3. Thermal resistance

| Symbol | Parameter | Value | | | | Unit |
|-------------------------------------|-------------------------------------|--------------------|------|----------|--------|------|
| | | D ² PAK | DPAK | TO-220FP | TO-220 | |
| R _{thj-case} | Thermal resistance junction-case | 1 | 1.25 | 5 | 1 | °C/W |
| R _{thj-amb} | Thermal resistance junction-ambient | | | 62.50 | | °C/W |
| R _{thj-pcb} ⁽¹⁾ | Thermal resistance junction-pcb | 30 | 50 | | | °C/W |

1. When mounted on FR-4 board of 1inch², 2oz Cu, t < 10 sec

Table 4. Avalanche characteristics

| Symbol | Parameter | Value | Unit |
|-----------------|---|-------|------|
| E _{AS} | Single pulse avalanche energy (T _J = 25 °C, L = 3.5 mH, I _{AS} = 15 A, V _{DD} = 50 V, V _{GS} = 10 V) | 400 | mJ |

2 Electrical characteristics

($T_{CASE}=25\text{ °C}$ unless otherwise specified)

Table 5. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|--|--|------|--------|----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage ($V_{GS}=0$) | $I_D = 250\ \mu A$ | 100 | | - | V |
| I_{DSS} | Zero gate voltage drain current ($V_{GS}=0$) | $V_{DS} = 100\text{ V}$ $V_{DS} = 100\text{ V}; T_C=125\text{ °C}$ | | | 1 100 | μA μA |
| I_{GSS} | Gate body leakage current ($V_{DS}=0$) | $V_{GS} = 20\text{ V}$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}=V_{GS}, I_D = 250\ \mu A$ | 2.5 | | 4.5 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | For D ² PAK, DPAK and TO-220 $V_{GS}=10\text{ V}, I_D=40\text{ A}$ For TO-220-FP $V_{GS}=10\text{ V}, I_D=22.5\text{ A}$ | | 0.0068 | 0.008 | Ω |

Table 6. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|--|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS}=50\text{ V}, f=1\text{ MHz}, V_{GS}=0$ | - | 4369 | - | pF |
| C_{oss} | Output capacitance | | - | 823 | - | pF |
| C_{rss} | Reverse transfer capacitance | | - | 36 | - | pF |
| Q_g | Total gate charge | $V_{DD}=50\text{ V}, I_D=80\text{ A}$ | - | 61 | - | nC |
| Q_{gs} | Gate-source charge | $V_{GS}=10\text{ V}$ | - | 26 | - | nC |
| Q_{gd} | Gate-drain charge | Figure 18 | - | 13 | - | nC |

Table 7. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}=50\text{ V}, I_D=40\text{ A}, R_G=4.7\ \Omega, V_{GS}=10\text{ V}$ Figure 17 | - | 27 | - | ns |
| t_r | Rise time | | - | 40 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 46 | - | ns |
| t_f | Fall time | | - | 15 | - | ns |

Table 8. Source drain diode

| Symbol | Parameter | Test conditions | Min | Typ. | Max | Unit |
|-----------------|-------------------------------|--|-----|------|-----|------|
| I_{SD} | Source-drain current | | - | | 80 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 320 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 80 \text{ A}$, $V_{GS}=0$ | - | | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 80 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD}=80 \text{ V}$, $T_j=150 \text{ }^\circ\text{C}$ | - | 77 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 146 | | nC |
| I_{RRM} | Reverse recovery current | | - | 4 | | A |

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for DPAK

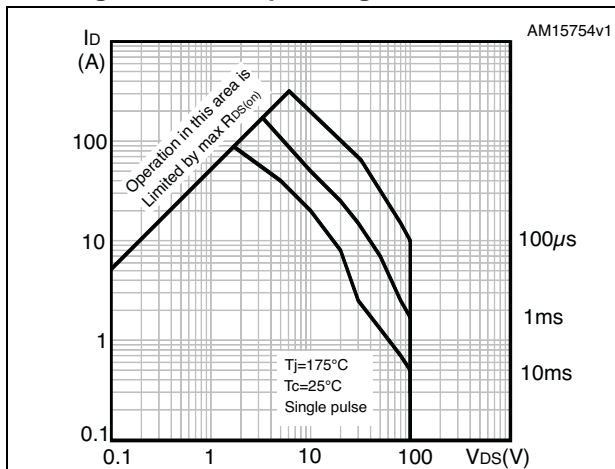


Figure 3. Thermal impedance for DPAK

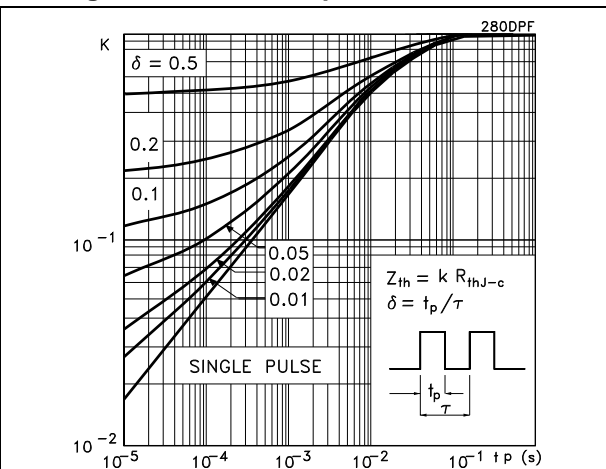


Figure 4. Safe operating area for TO-220FP

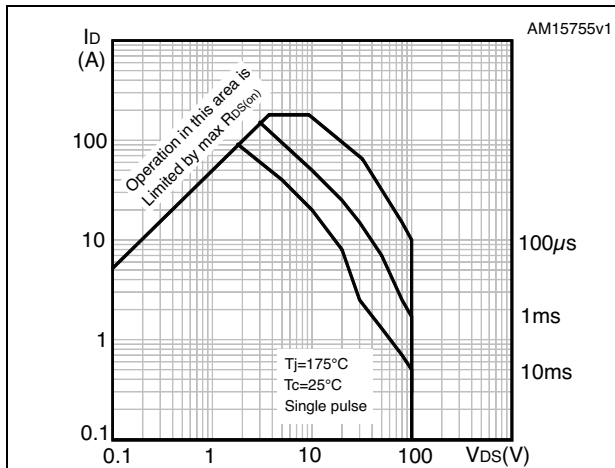


Figure 5. Thermal impedance for TO-220FP

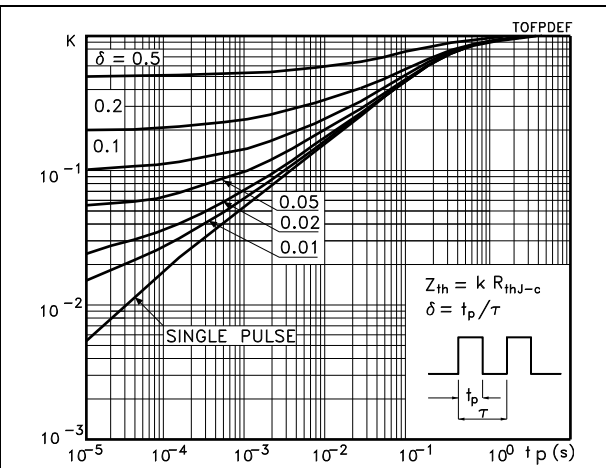


Figure 6. Safe operating area for D²PAK and TO-220

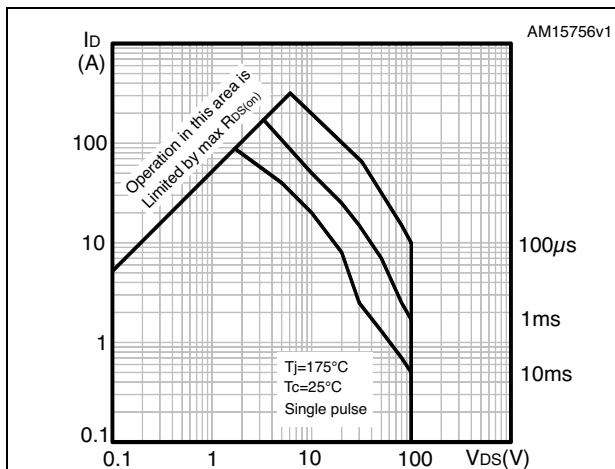


Figure 7. Thermal impedance for D²PAK and TO-220

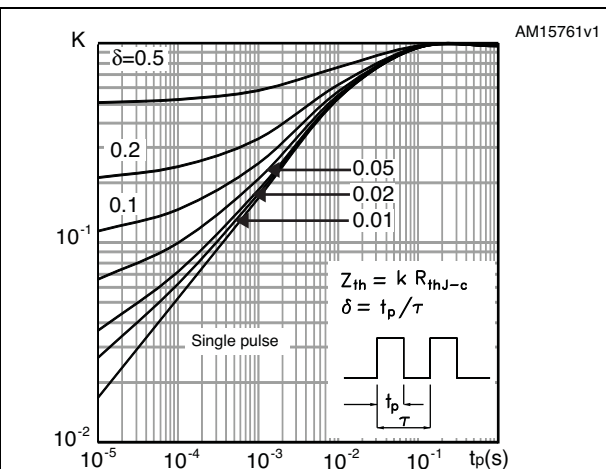


Figure 8. Output characteristics

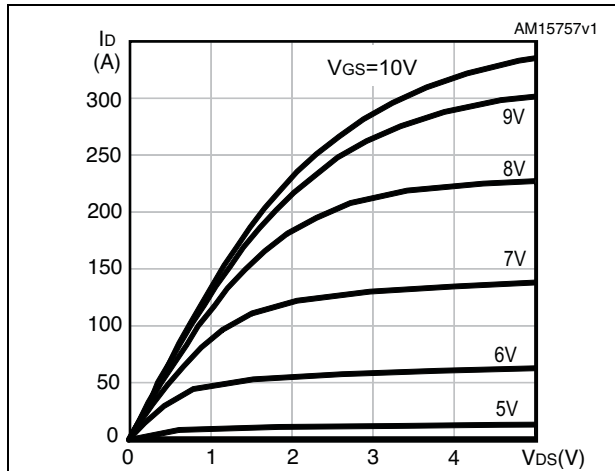


Figure 9. Transfer characteristics

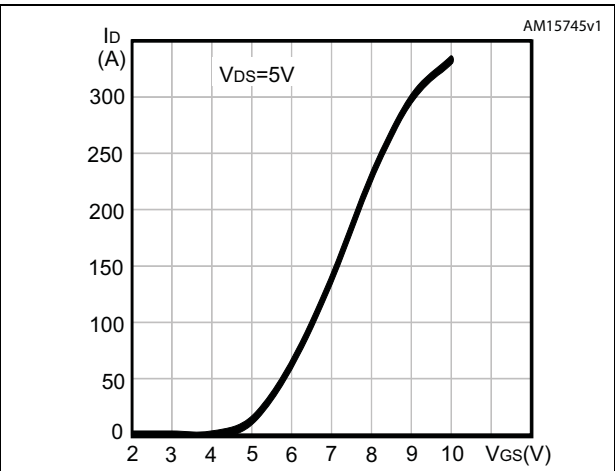


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

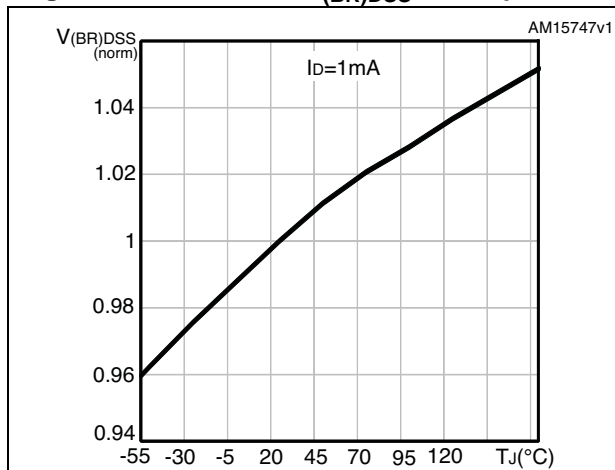


Figure 11. Static drain-source on-resistance

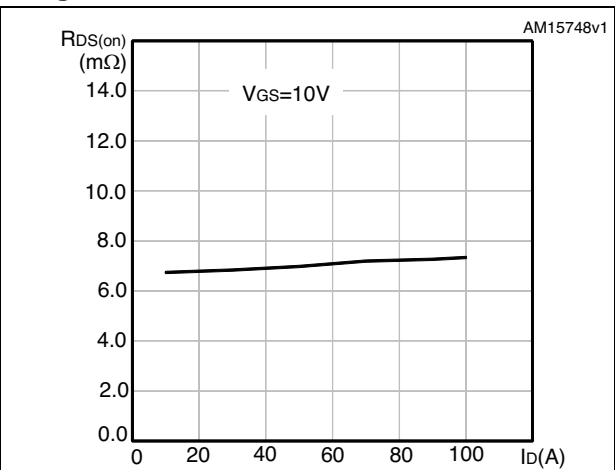


Figure 12. Gate charge vs gate-source voltage

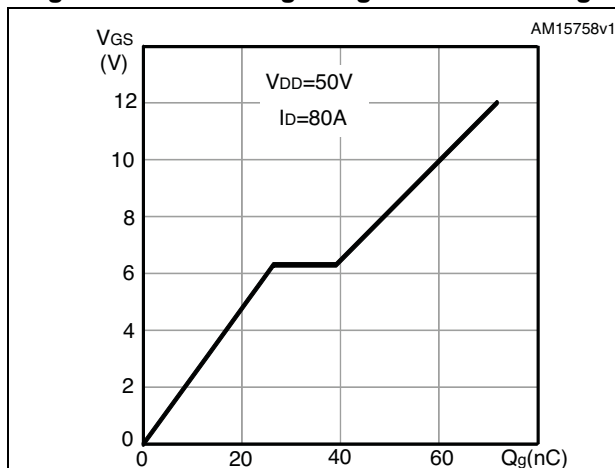


Figure 13. Capacitance variations

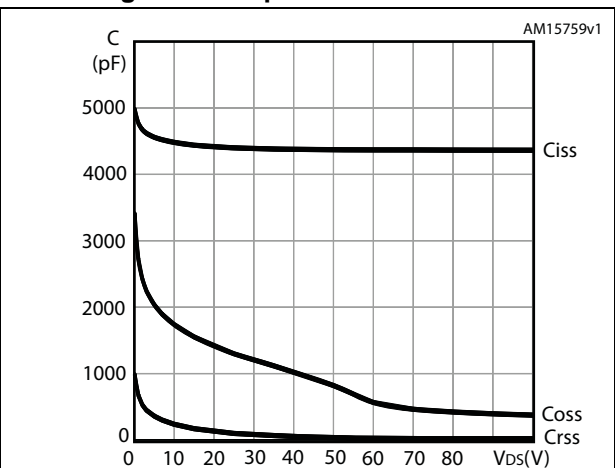


Figure 14. Normalized gate threshold voltage vs temperature

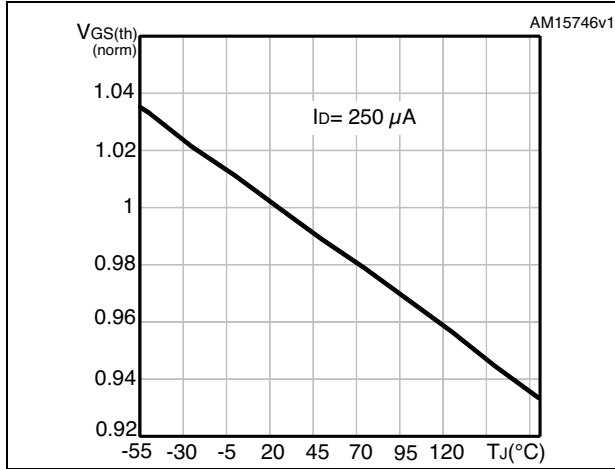


Figure 15. Normalized on-resistance vs temperature

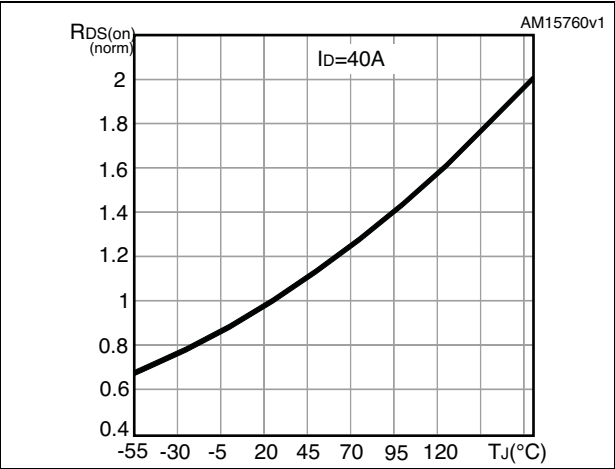
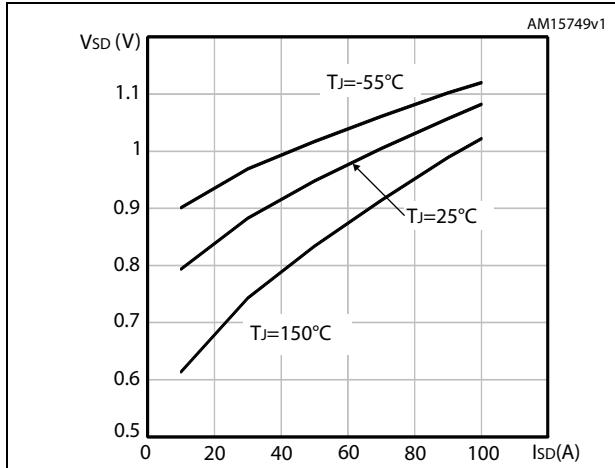


Figure 16. Source-drain diode forward characteristics



3 Test circuits

Figure 17. Switching times test circuit for resistive load



Figure 18. Gate charge test circuit

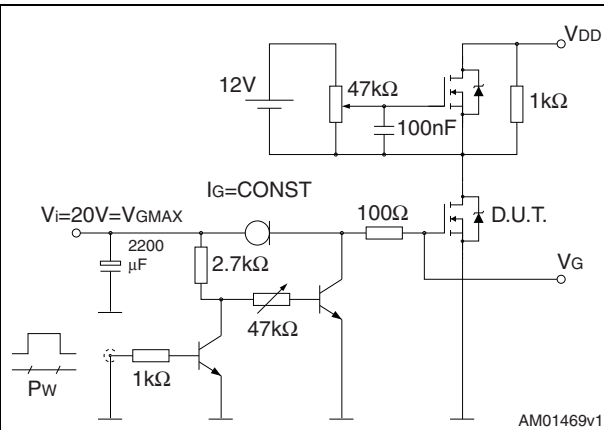


Figure 19. Test circuit for inductive load switching and diode recovery times

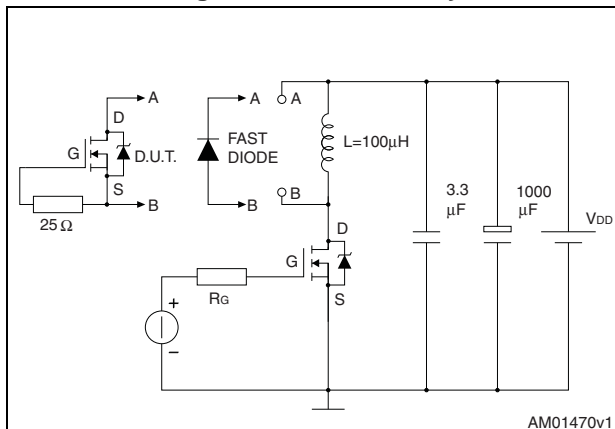


Figure 20. Unclamped inductive load test circuit

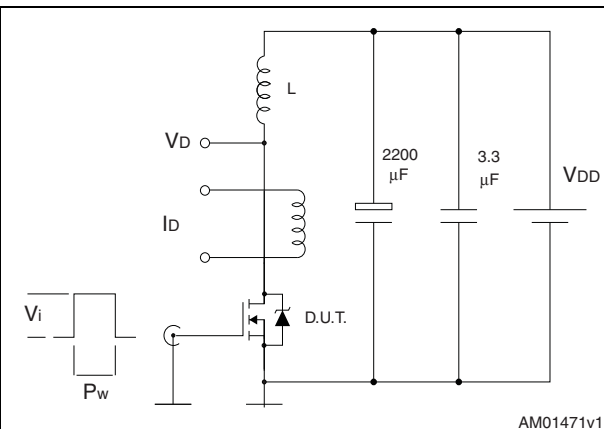


Figure 21. Unclamped inductive waveform

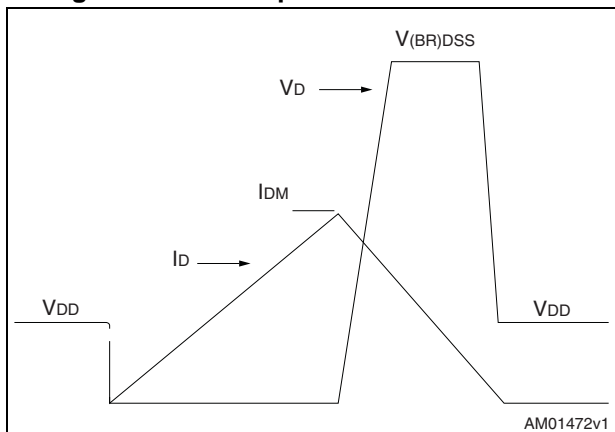
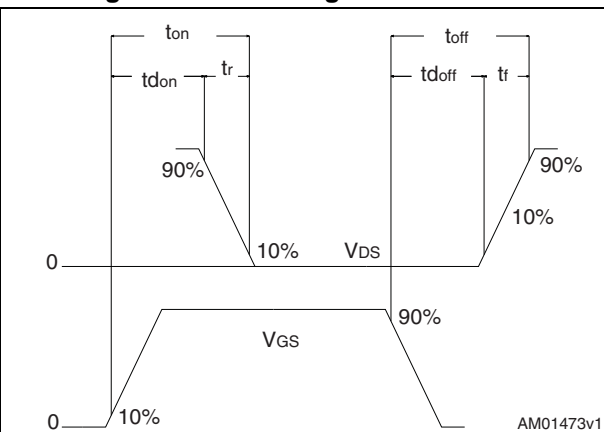


Figure 22. Switching time waveform



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Figure 23. D²PAK (TO-263) drawing

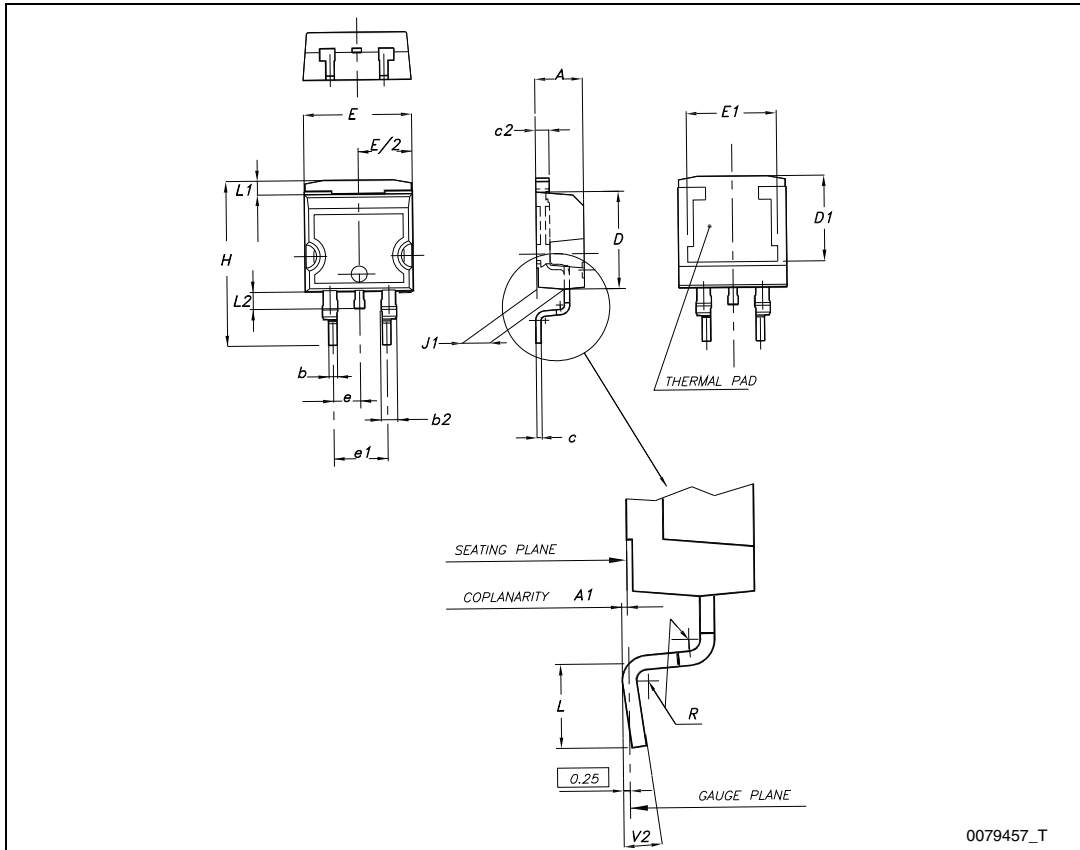
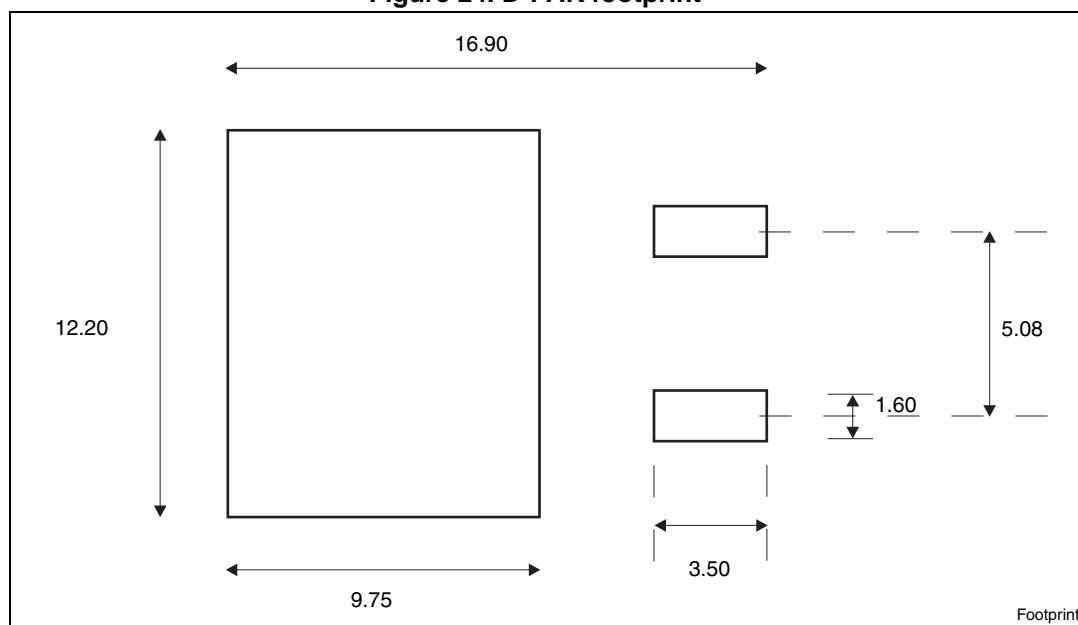


Figure 24. D²PAK footprint^(a)

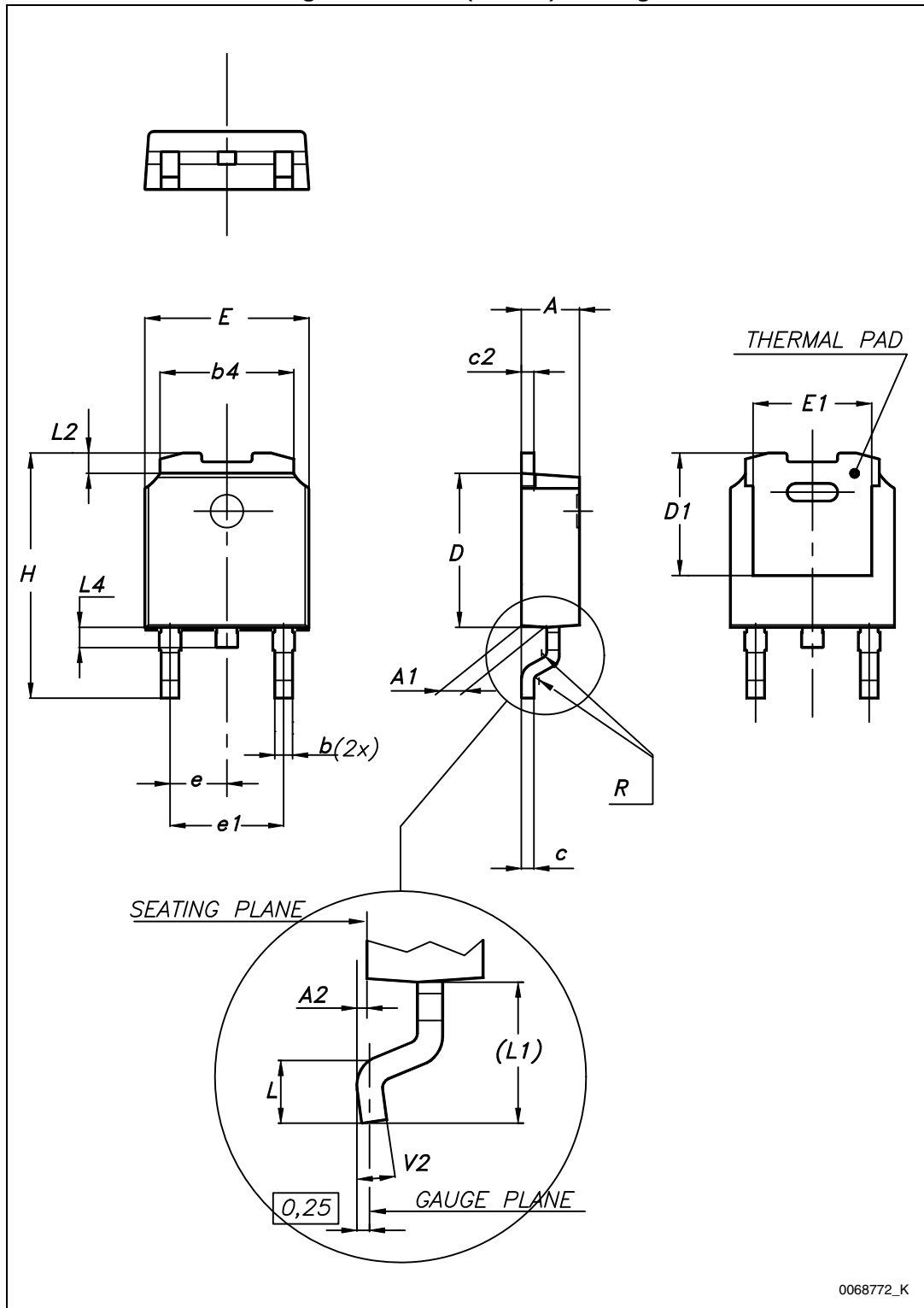


a. All dimension are in millimeters

Table 9. DPAK (TO-252) mechanical data

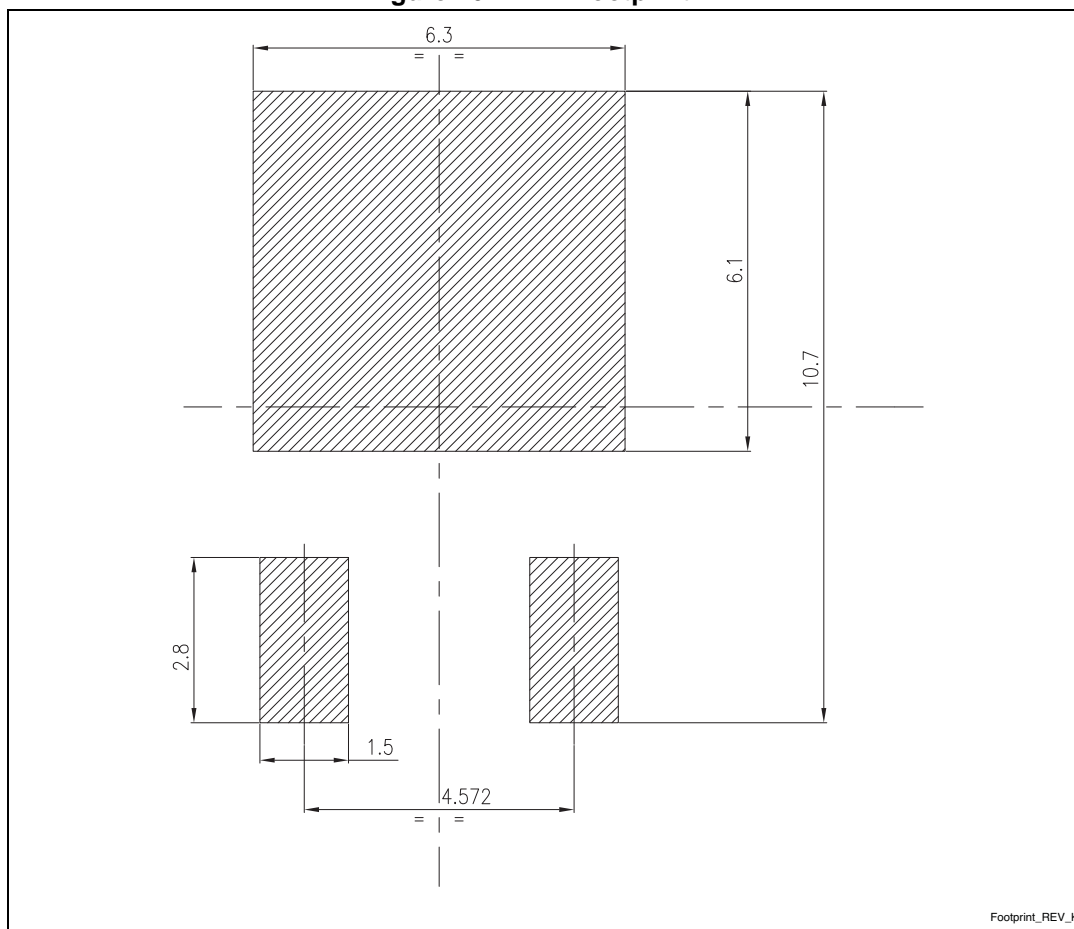
| Dim. | mm | | |
|------|------|------|-------|
| | Min. | Typ. | Max. |
| A | 2.20 | | 2.40 |
| A1 | 0.90 | | 1.10 |
| A2 | 0.03 | | 0.23 |
| b | 0.64 | | 0.90 |
| b4 | 5.20 | | 5.40 |
| c | 0.45 | | 0.60 |
| c2 | 0.48 | | 0.60 |
| D | 6.00 | | 6.20 |
| D1 | | 5.10 | |
| E | 6.40 | | 6.60 |
| E1 | | 4.70 | |
| e | | 2.28 | |
| e1 | 4.40 | | 4.60 |
| H | 9.35 | | 10.10 |
| L | 1.00 | | 1.50 |
| (L1) | | 2.80 | |
| L2 | | 0.80 | |
| L4 | 0.60 | | 1.00 |
| R | | 0.20 | |
| V2 | 0° | | 8° |

Figure 25. DPAK (TO-252) drawing



0068772_K

Figure 26. DPAK footprint (b)



Footprint_REV_K

b. All dimensions are in millimeters

Table 10. TO-220FP mechanical data

| Dim. | mm | | |
|------|------|------|------|
| | Min. | Typ. | Max. |
| A | 4.4 | | 4.6 |
| B | 2.5 | | 2.7 |
| D | 2.5 | | 2.75 |
| E | 0.45 | | 0.7 |
| F | 0.75 | | 1 |
| F1 | 1.15 | | 1.70 |
| F2 | 1.15 | | 1.70 |
| G | 4.95 | | 5.2 |
| G1 | 2.4 | | 2.7 |
| H | 10 | | 10.4 |
| L2 | | 16 | |
| L3 | 28.6 | | 30.6 |
| L4 | 9.8 | | 10.6 |
| L5 | 2.9 | | 3.6 |
| L6 | 15.9 | | 16.4 |
| L7 | 9 | | 9.3 |
| Dia | 3 | | 3.2 |

Figure 27. TO-220FP drawing

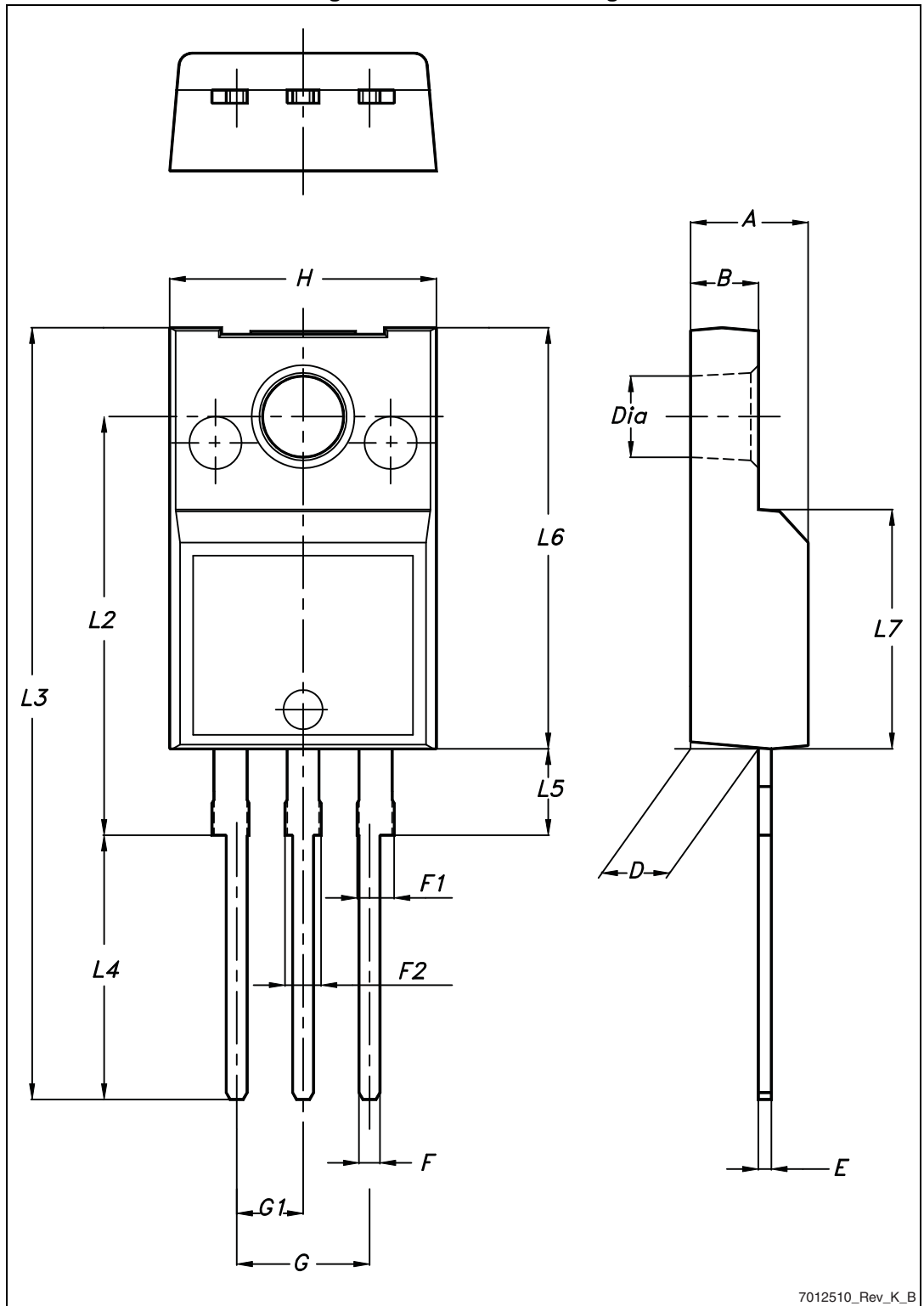
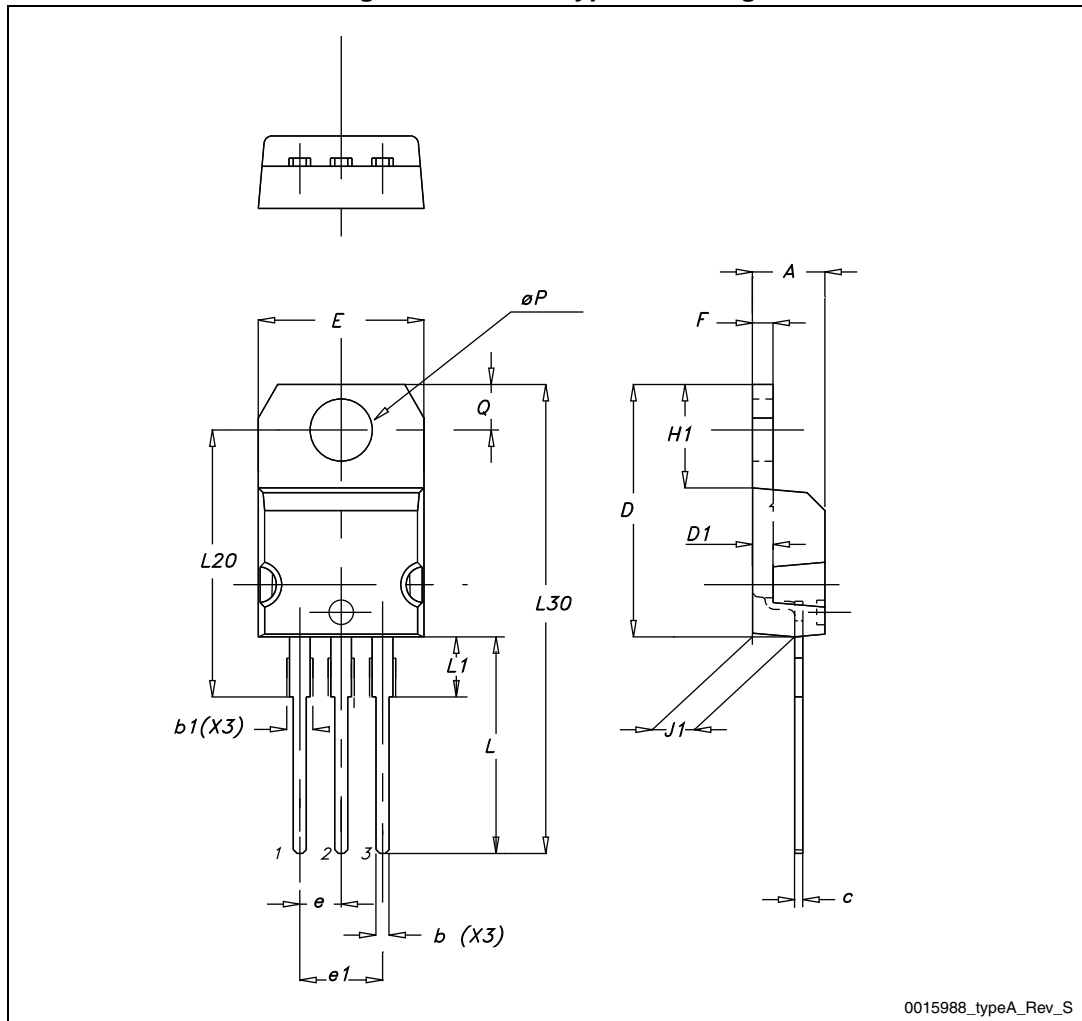


Table 11. TO-220 type A mechanical data

| Dim. | mm | | |
|------|-------|-------|-------|
| | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 |
| b | 0.61 | | 0.88 |
| b1 | 1.14 | | 1.70 |
| c | 0.48 | | 0.70 |
| D | 15.25 | | 15.75 |
| D1 | | 1.27 | |
| E | 10 | | 10.40 |
| e | 2.40 | | 2.70 |
| e1 | 4.95 | | 5.15 |
| F | 1.23 | | 1.32 |
| H1 | 6.20 | | 6.60 |
| J1 | 2.40 | | 2.72 |
| L | 13 | | 14 |
| L1 | 3.50 | | 3.93 |
| L20 | | 16.40 | |
| L30 | | 28.90 | |
| ØP | 3.75 | | 3.85 |
| Q | 2.65 | | 2.95 |

Figure 28. TO-220 type A drawing



5 Packaging mechanical data

Table 12. D²PAK (TO-263) tape and reel mechanical data

| Tape | | | Reel | | |
|------|------|------|------|----------|------|
| Dim. | mm | | Dim. | mm | |
| | Min. | Max. | | Min. | Max. |
| A0 | 10.5 | 10.7 | A | | 330 |
| B0 | 15.7 | 15.9 | B | 1.5 | |
| D | 1.5 | 1.6 | C | 12.8 | 13.2 |
| D1 | 1.59 | 1.61 | D | 20.2 | |
| E | 1.65 | 1.85 | G | 24.4 | 26.4 |
| F | 11.4 | 11.6 | N | 100 | |
| K0 | 4.8 | 5.0 | T | | 30.4 |
| P0 | 3.9 | 4.1 | | | |
| P1 | 11.9 | 12.1 | | Base qty | 1000 |
| P2 | 1.9 | 2.1 | | Bulk qty | 1000 |
| R | 50 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 23.7 | 24.3 | | | |

Table 13. DPAK (TO-252) tape and reel mechanical data

| Tape | | | Reel | | |
|------|------|------|------|-----------|------|
| Dim. | mm | | Dim. | mm | |
| | Min. | Max. | | Min. | Max. |
| A0 | 6.8 | 7 | A | | 330 |
| B0 | 10.4 | 10.6 | B | 1.5 | |
| B1 | | 12.1 | C | 12.8 | 13.2 |
| D | 1.5 | 1.6 | D | 20.2 | |
| D1 | 1.5 | | G | 16.4 | 18.4 |
| E | 1.65 | 1.85 | N | 50 | |
| F | 7.4 | 7.6 | T | | 22.4 |
| K0 | 2.55 | 2.75 | | | |
| P0 | 3.9 | 4.1 | | Base qty. | 2500 |
| P1 | 7.9 | 8.1 | | Bulk qty. | 2500 |

Table 13. DPAK (TO-252) tape and reel mechanical data (continued)

| Tape | | | Reel | | |
|------|------|------|------|------|------|
| Dim. | mm | | Dim. | mm | |
| | Min. | Max. | | Min. | Max. |
| P2 | 1.9 | 2.1 | | | |
| R | 40 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 15.7 | 16.3 | | | |

Figure 29. Tape

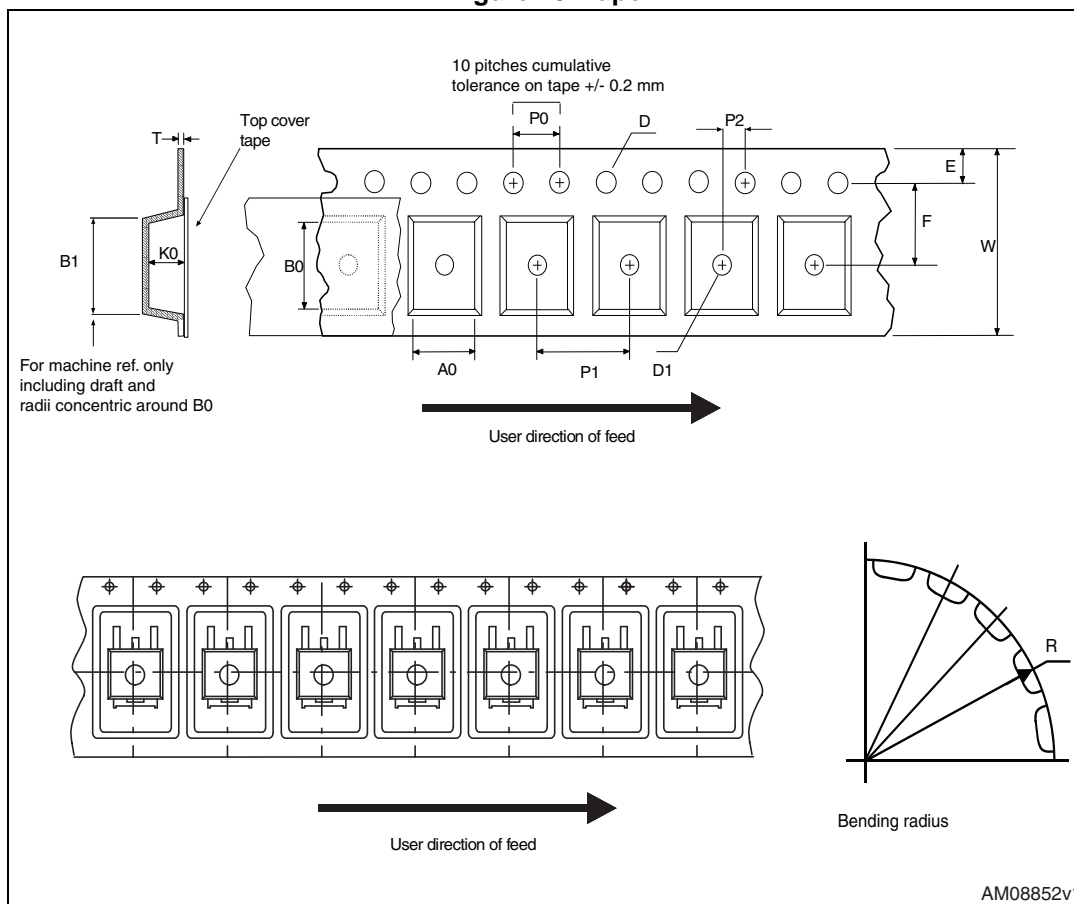
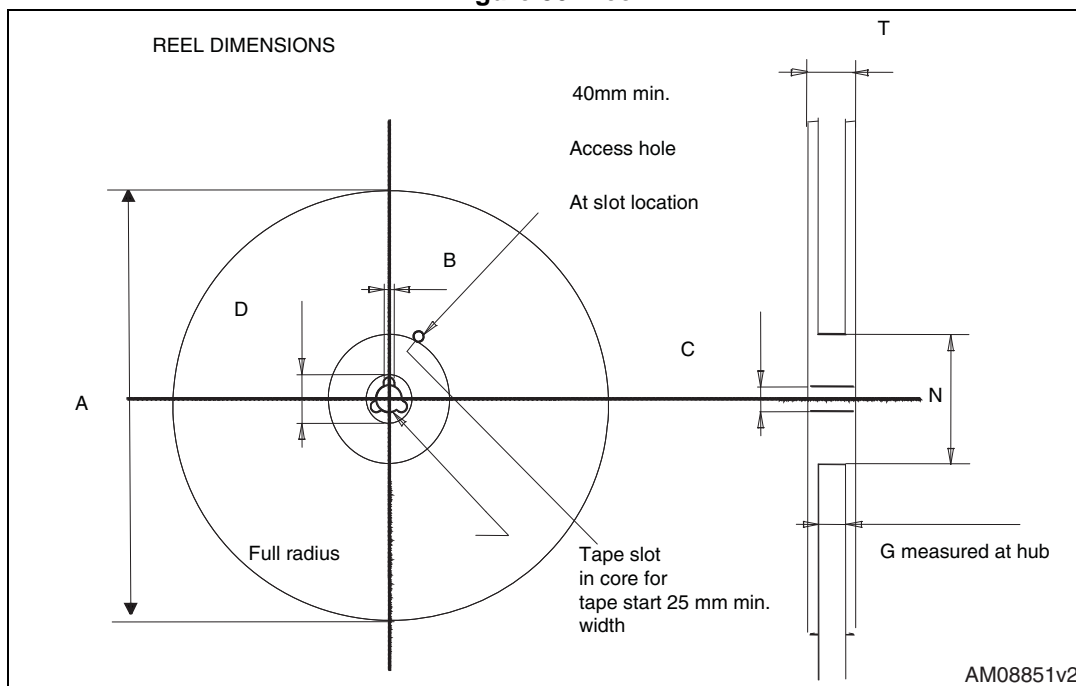


Figure 30. Reel



6 Revision history

Table 14. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 05-Oct-2012 | 1 | First release. |
| 07-Feb-2013 | 2 | <ul style="list-style-type: none"> – Inserted device in TO-220FP. – Updated title and features on the cover page, Table 1: Device summary, Table 2: Absolute maximum ratings, Table 3: Thermal resistance and Table 5: On/off states accordingly. – Updated Table 6: Dynamic, Table 7: Switching times, Table 8: Source drain diode and Section 4: Package mechanical data. – Added Section 5: Packaging mechanical data. |
| 29-Apr-2013 | 3 | <ul style="list-style-type: none"> – Modified: the entire typical values in Table 6, t_f typical value in Table 7, V_{SD} and typical values for t_{rr}, q_{rr}, I_{RRM} – Inserted: Table 4: Avalanche characteristics and Section 2.1: Electrical characteristics (curves) – Minor text changes |
| 25-Nov-2013 | 4 | <ul style="list-style-type: none"> – Inserted device in D²PAK. – Updated title and features on the cover page, Table 1: Device summary, Table 2: Absolute maximum ratings, Table 3: Thermal resistance and Table 5: On/off states accordingly. – Updated Table 6: Dynamic, Section 4: Package mechanical data and Section 5: Packaging mechanical data. |

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