



N-channel 250 V, 318 mΩ, 8 A STripFET™ II Power MOSFET in DPAK package

Datasheet — production data

Features

| Order code | V _{DSS} | R _{DS(on)} max. | I _D |
|------------|------------------|--------------------------|----------------|
| STD8NF25 | 250 V | < 420 mΩ | 8 A |

- 100% avalanche tested
- 175 °C junction temperature

Applications

- Switching applications
 - Automotive

Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

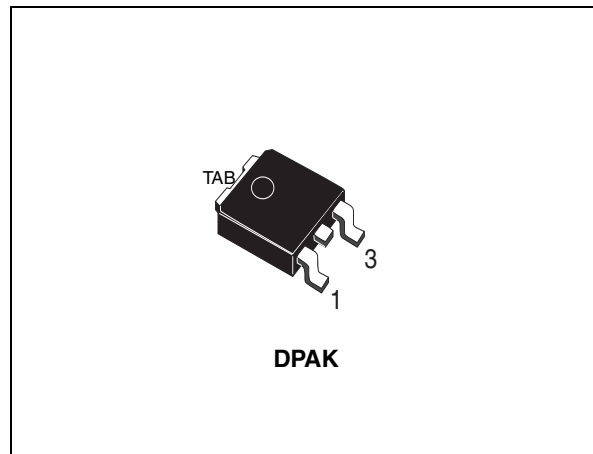


Figure 1. Internal schematic diagram

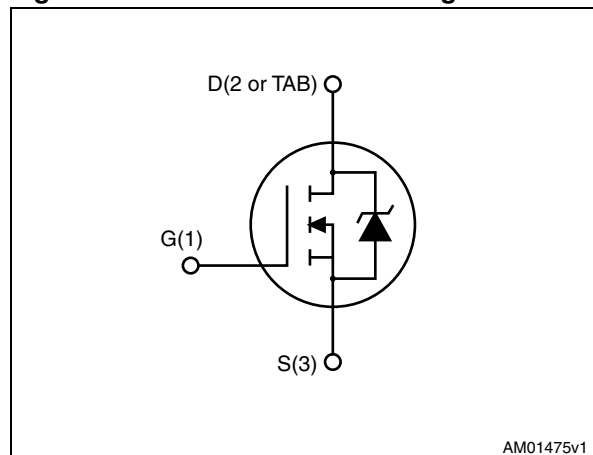


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|---------------|
| STD8NF25 | 8NF25 | DPAK | Tape and reel |

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|--------------------|---|------------|------------------|
| V_{DS} | Drain-source voltage | 250 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 8 | A |
| | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 6 | A |
| $I_{DM}^{(2)}$ | Drain current (pulsed) | 32 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 72 | W |
| T_J T_{stg} | Operating junction temperature Storage temperature | -55 to 175 | $^\circ\text{C}$ |

1. The value is rated according to R_{thj-c} .
2. Pulse is rated according to SOA.

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|----------------------------------|-------|--------------------|
| $R_{thj-case}$ | Thermal resistance junction-case | 2.08 | $^\circ\text{C/W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb | 50 | |

1. When mounted on 1inch² FR-4, 2 Oz copper board.

Table 4. Avalanche data

| Symbol | Parameter | Value | Unit |
|----------|--|-------|------|
| I_{AV} | Non-repetitive avalanche current | 8 | A |
| E_{AS} | Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 50\text{ V}$) | 110 | 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 | $I_D = 1\text{ mA}, V_{GS} = 0$ | 250 | - | | V |
| I_{DSS} | Zero gate voltage drain current ($V_{GS} = 0$) | $V_{DS} = 250\text{ V}$ $V_{DS} = 250\text{ V}, T_c = 125\text{ °C}$ | | - | 1 50 | μA μA |
| I_{GSS} | Gate body leakage current ($V_{DS} = 0$) | $V_{GS} = \pm 20\text{ V}$ | | - | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 2 | - | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}, I_D = 8\text{ A}$ | | 318 | 420 | m Ω |

Table 6. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|--|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$ | | 500 | | pF |
| C_{oss} | Output capacitance | | - | 90 | - | pF |
| C_{rss} | Reverse transfer capacitance | | | | 15 | |
| Q_g | Total gate charge | $V_{DD} = 200\text{ V}, I_D = 8\text{ A}$ | | 16 | | nC |
| Q_{gs} | Gate-source charge | $V_{GS} = 10\text{ V}$ | - | 3.5 | - | nC |
| Q_{gd} | Gate-drain charge | (see Figure 14) | | 8 | | nC |

Table 7. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 125\text{ V}, I_D = 4\text{ A},$ $R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ (see Figure 13 and Figure 18) | - | 13 | - | ns |
| t_r | Rise time | | | | 10 | |
| $t_{d(off)}$ | Turn-off delay time | | - | 26 | - | ns |
| t_f | Fall time | | | | 6 | |

Table 8. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|-------------------|---------|---------------|
| I_{SD} I_{SDM} | Source-drain current Source-drain current (pulsed) | | - | | 8 32 | A A |
| V_{SD} | Forward on voltage | $I_{SD}=8\text{ A}$, $V_{GS}=0\text{ V}$ | - | | 1.5 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse recovery time Reverse recovery charge Reverse recovery current | $I_{SD} = 8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 50\text{ V}$ (see Figure 15) | - | 115 470 8.5 | | ns nC A |
| t_{rr} Q_{rr} I_{RRM} | Reverse recovery time Reverse recovery charge Reverse recovery current | $I_{SD} = 8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 50\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15) | - | 130 580 9.5 | | ns nC A |

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

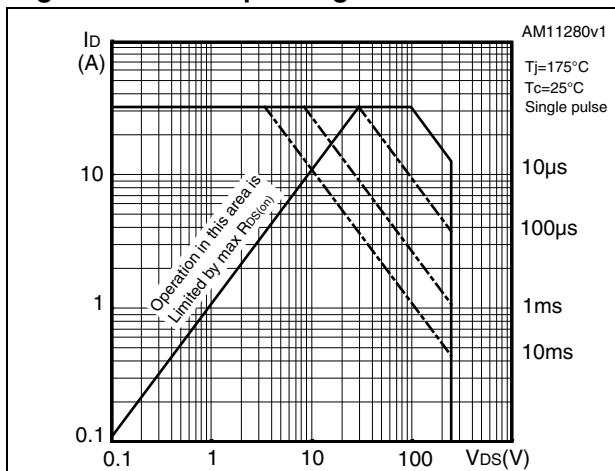


Figure 3. Thermal impedance

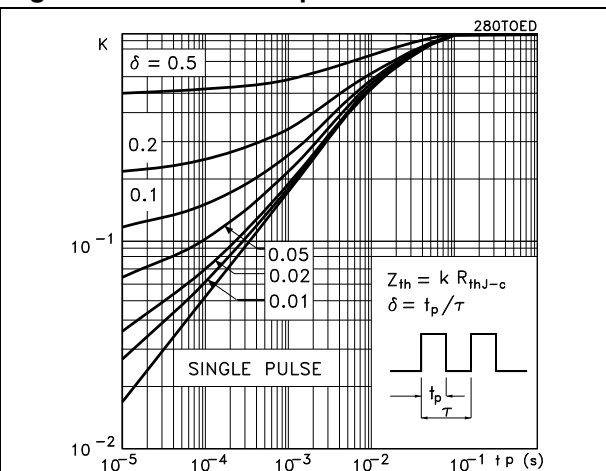


Figure 4. Output characteristics

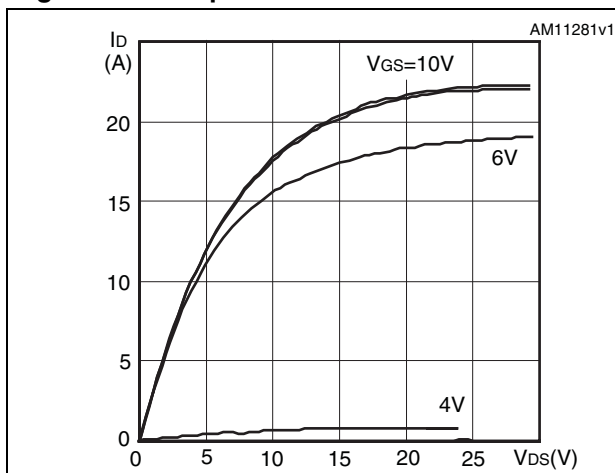


Figure 5. Transfer characteristics

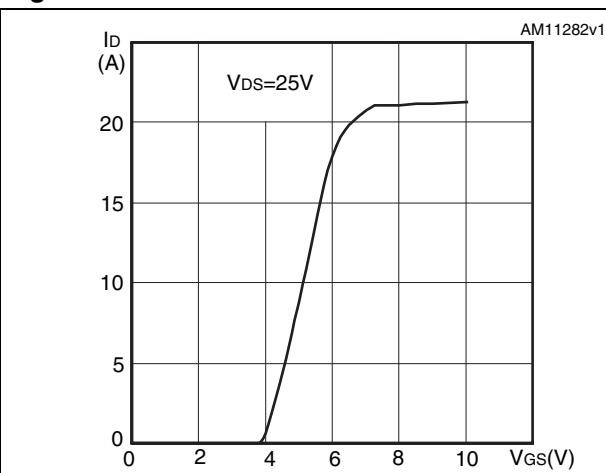


Figure 6. Normalized BV_{DSS} vs temperature

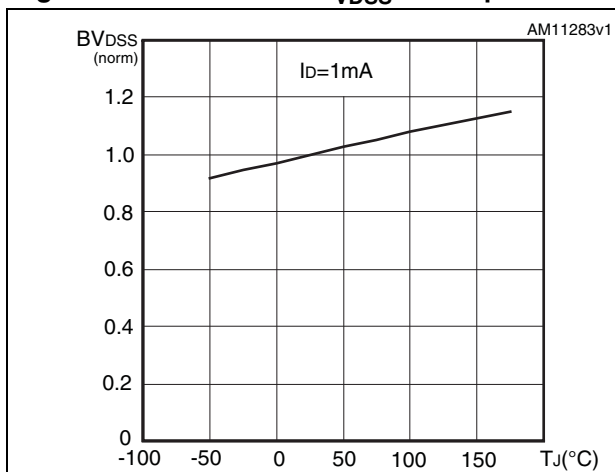


Figure 7. Static drain-source on-resistance

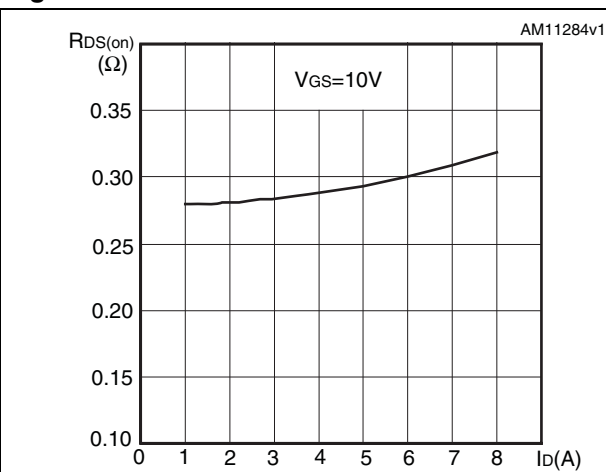


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

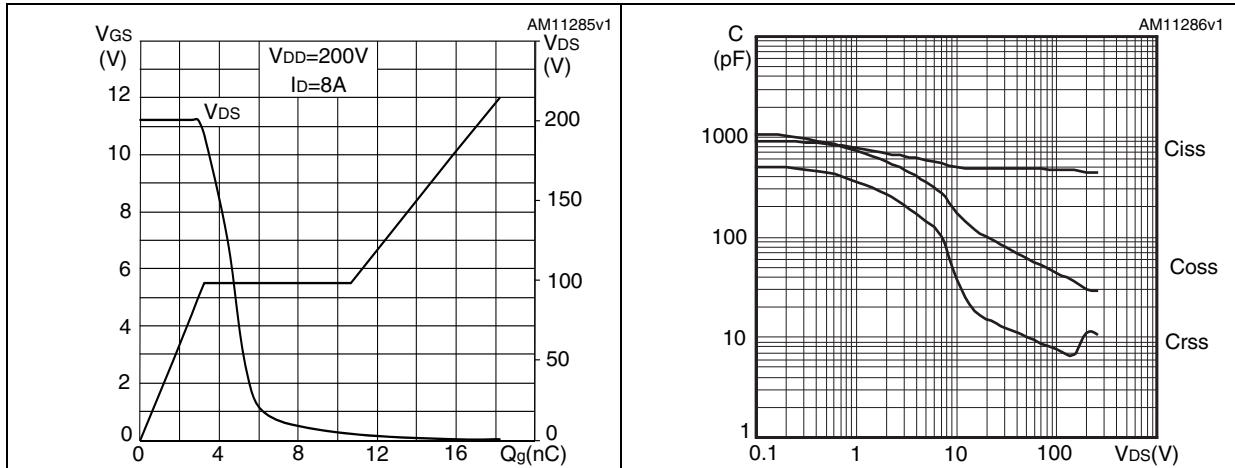


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

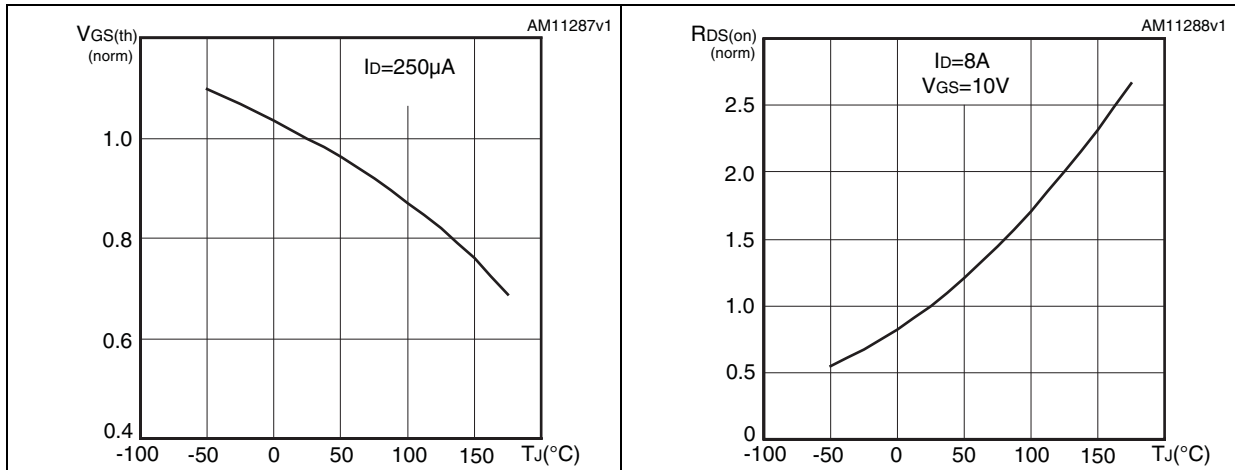
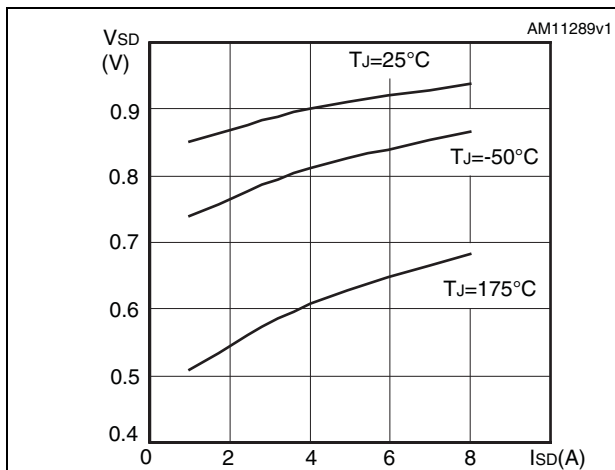


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load



Figure 14. Gate charge test circuit

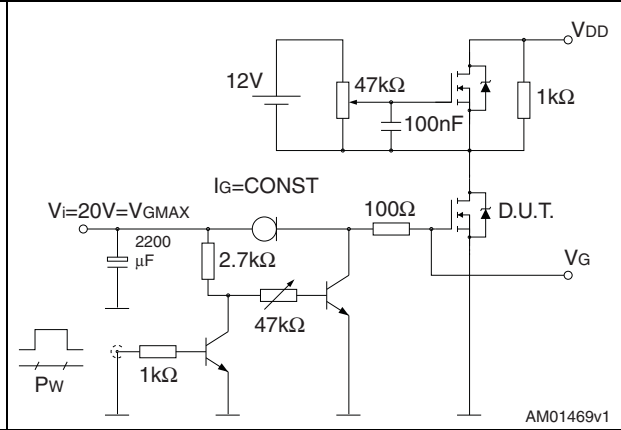


Figure 15. Test circuit for inductive load switching and diode recovery times

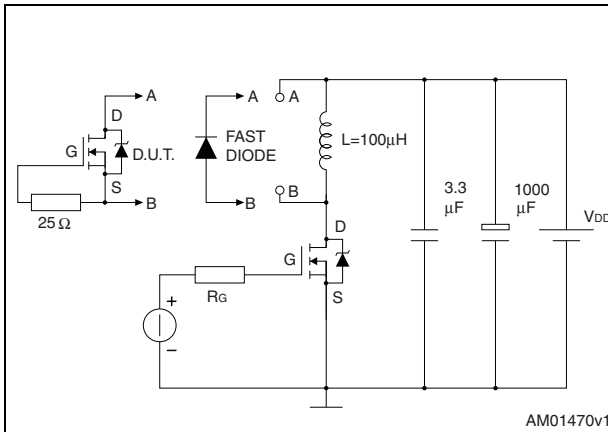


Figure 16. Unclamped inductive load test circuit

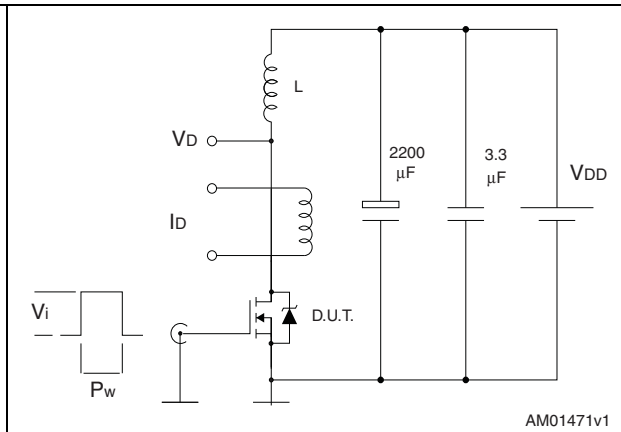


Figure 17. Unclamped inductive waveform

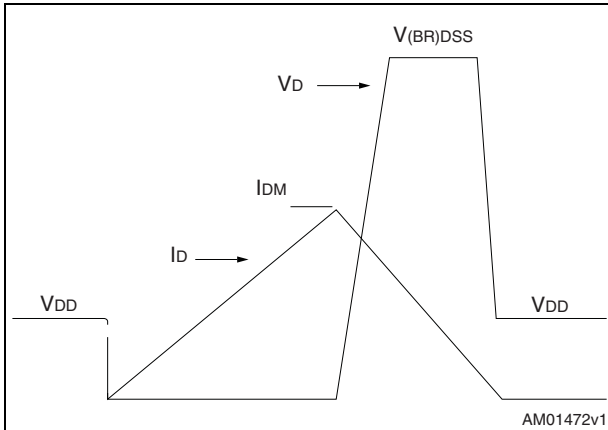
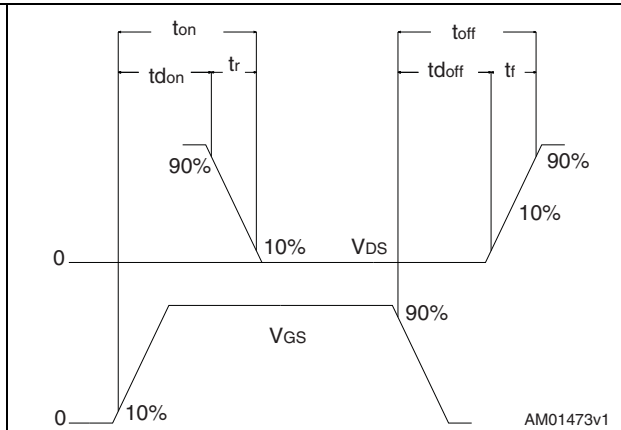


Figure 18. Switching time waveform



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.

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 | | 1.50 |
| L1 | | 2.80 | |
| L2 | | 0.80 | |
| L4 | 0.60 | | 1 |
| R | | 0.20 | |
| V2 | 0° | | 8° |

Figure 19. DPAK (TO-252) drawing

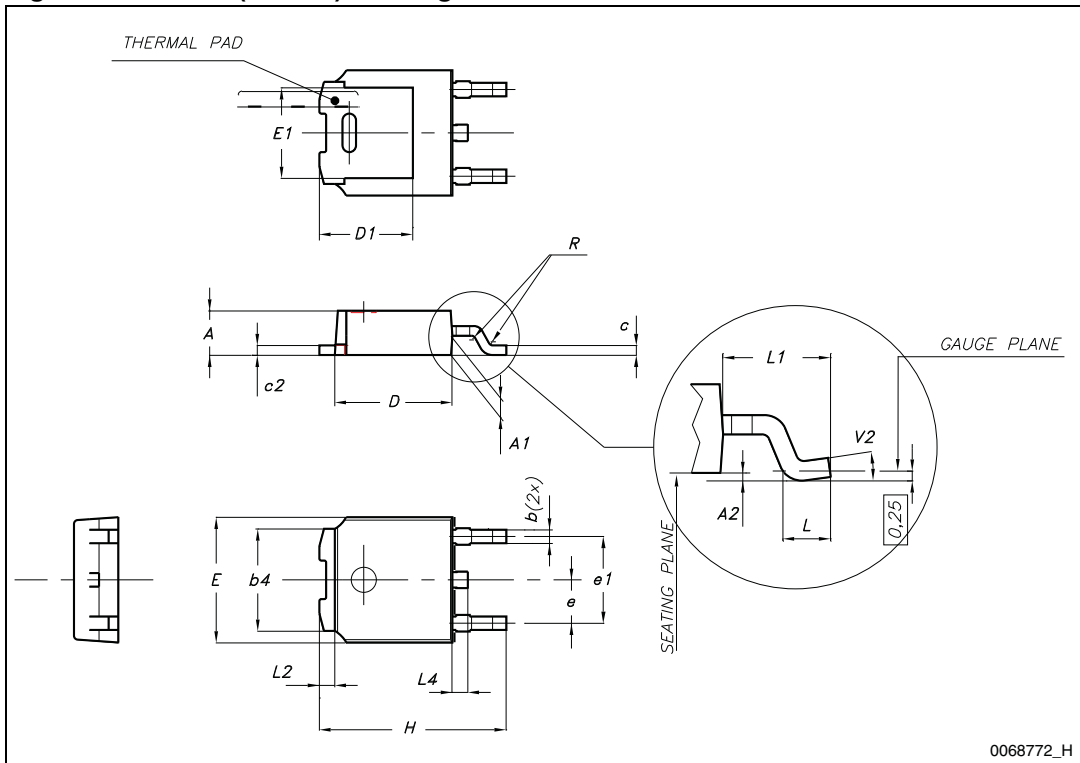
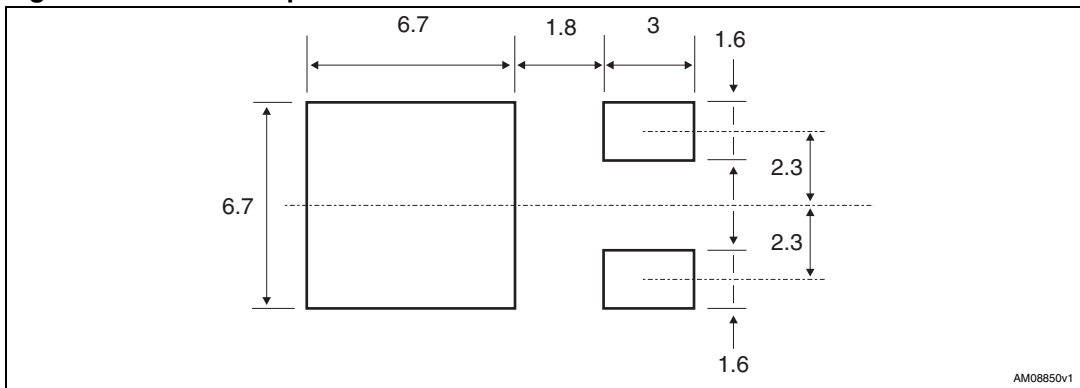


Figure 20. DPAK footprint^(a)



a. All dimensions are in millimeters.

5 Packaging mechanical data

Table 10. 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 |
| P2 | 1.9 | 2.1 | | | |
| R | 40 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 15.7 | 16.3 | | | |

Figure 21. Tape for DPAK (TO-252)

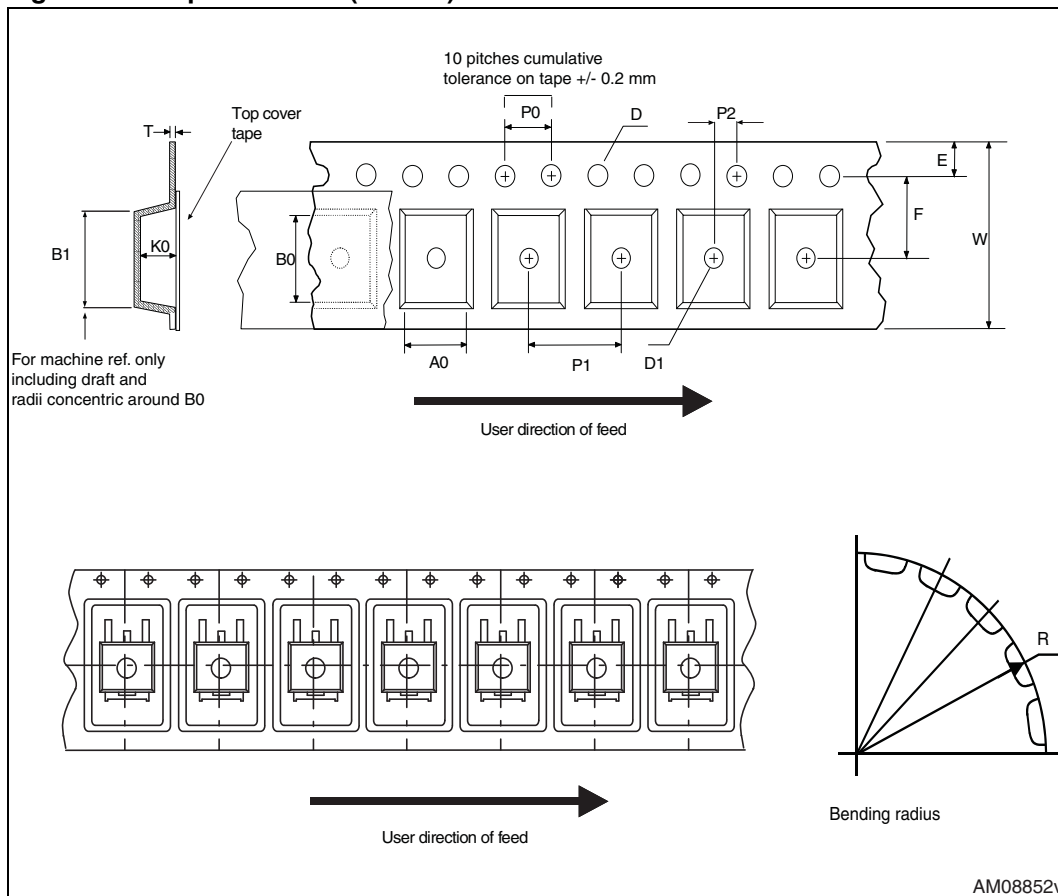
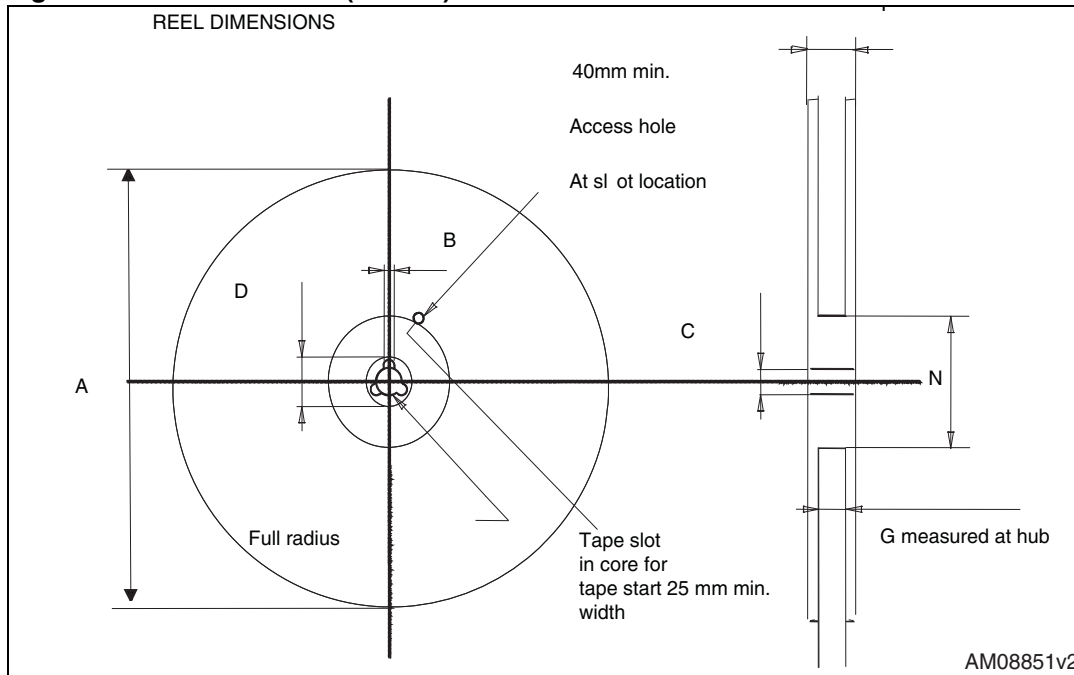


Figure 22. Reel for DPAK (TO-252)



6 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|-------------|----------|----------------|
| 26-Apr-2012 | 1 | First release. |

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