

N-channel 250 V, 0.29 Ω typ., 8 A STripFET™ II Power MOSFET in IPAK package

Datasheet - production data

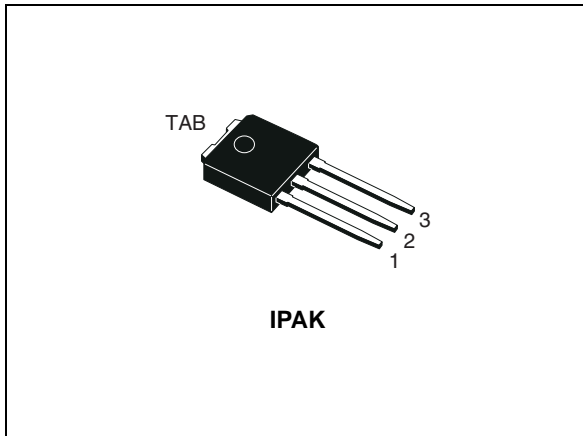
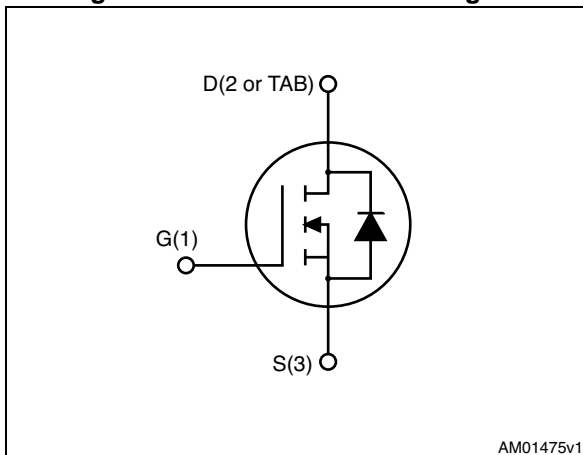


Figure 1. Internal schematic diagram



Features

| Order code | V_{DSS} | $R_{DS(on)}$ max. | I_D |
|------------|-----------|-------------------|-------|
| STU7NF25 | 250 V | 0.42 Ω | 8 A |

- 100% avalanche tested
- 175 °C junction temperature

Applications

- Switching applications

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.

Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|-----------|
| STU7NF25 | 7NF25 | IPAK | Tube |

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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 | 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 |
| $I_{DM}^{(1)}$ | 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. Pulse width limited by safe operating area.

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|----------------|-------------------------------------|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case | 2.08 | $^\circ\text{C}/\text{W}$ |
| $R_{thj-amb}$ | Thermal resistance junction-amb max | 100 | |

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 °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 mA, V _{GS} = 0 | 250 | - | | V |
| I _{DSS} | Zero gate voltage drain current (V _{GS} = 0) | V _{DS} = 250 V V _{DS} = 250 V, T _c =125 °C | | - | 1 50 | μA μA |
| I _{GSS} | Gate body leakage current (V _{DS} = 0) | V _{GS} = ±20 V | | - | ±100 | nA |
| V _{GS(th)} | Gate threshold voltage | V _{DS} = V _{GS} , I _D = 250 μA | 2 | - | 4 | V |
| R _{DS(on)} | Static drain-source on-resistance | V _{GS} = 10 V, I _D = 4 A | | 0.29 | 0.42 | Ω |

Table 6. Dynamic

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

Table 7. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------|---------------------|---|------|------|------|------|
| t _{d(on)} | Turn-on delay time | V _{DD} =125 V, I _D =4 A, R _G =4.7 Ω, V _{GS} =10 V (see Figure 13 and Figure 18) | - | 13 | - | ns |
| t _r | Rise time | | - | 10 | - | ns |
| t _{d(off)} | Turn-off delay time | | - | 26 | - | ns |
| t _f | Fall time | | - | 6 | - | ns |

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} | Reverse recovery time | $I_{SD} = 8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 50\text{ V}$ (see Figure 15) | - | 115 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 470 | | nC |
| I_{RRM} | Reverse recovery current | | - | 8.5 | | A |
| t_{rr} | Reverse recovery time | $I_{SD} = 8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 50\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15) | - | 130 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 580 | | nC |
| I_{RRM} | Reverse recovery current | | - | 9.5 | | A |

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

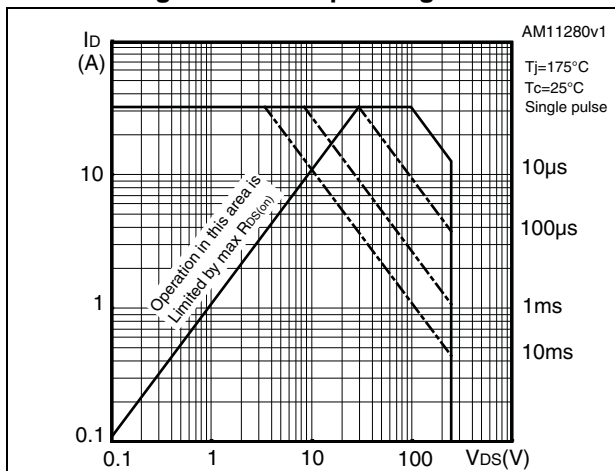


Figure 3. Thermal impedance

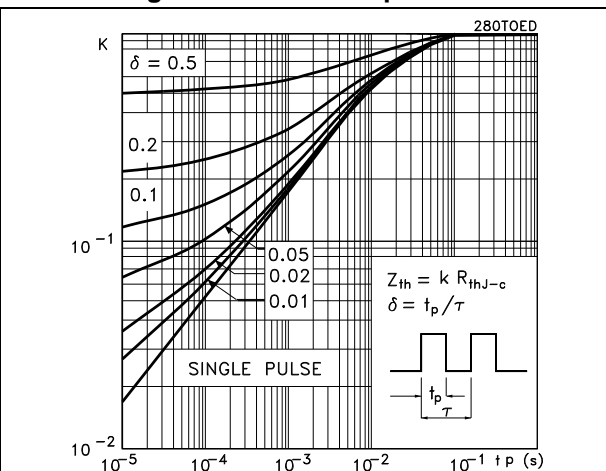


Figure 4. Output characteristics

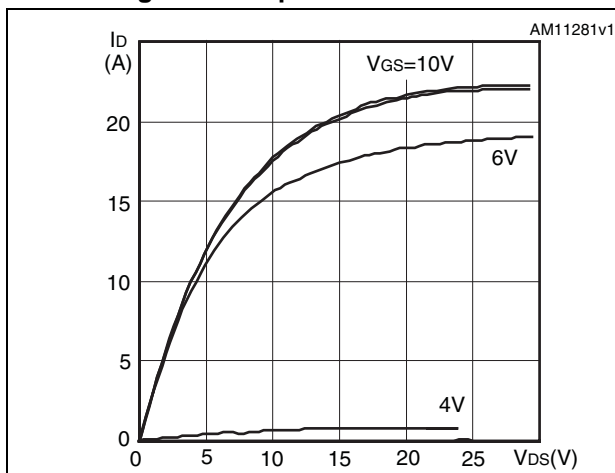


Figure 5. Transfer characteristics

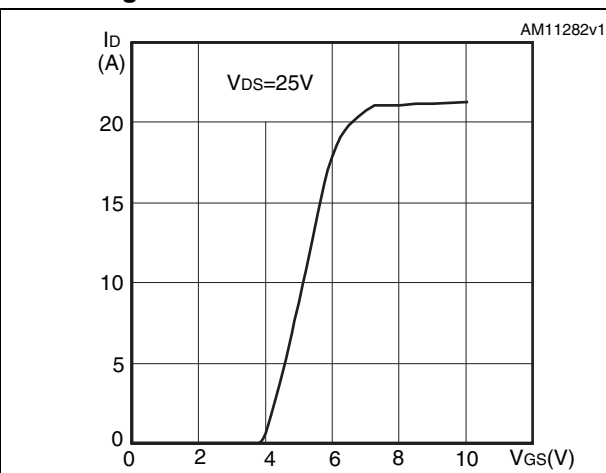


Figure 6. Normalized BV_{DSS} vs temperature

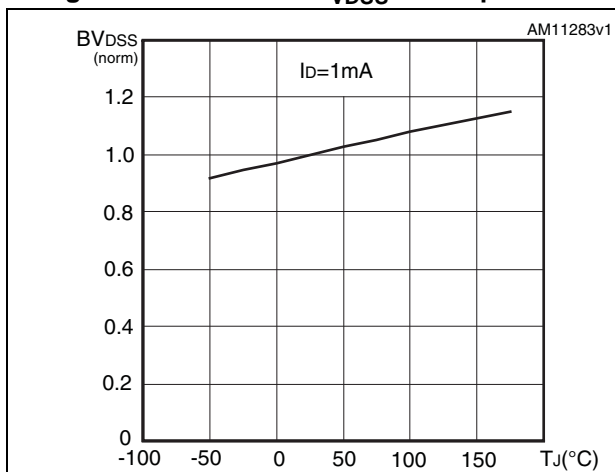


Figure 7. Static drain-source on-resistance

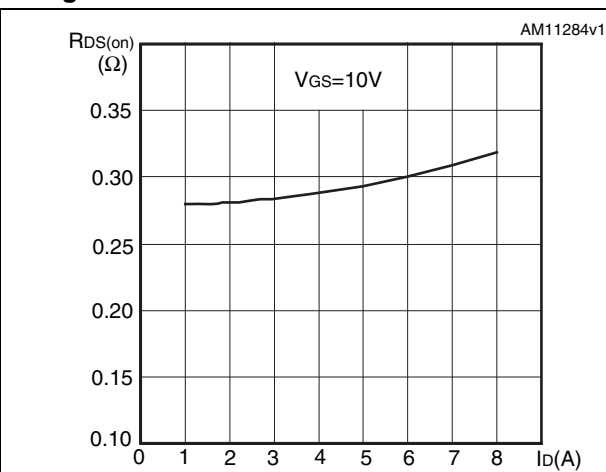


Figure 8. Gate charge vs gate-source voltage

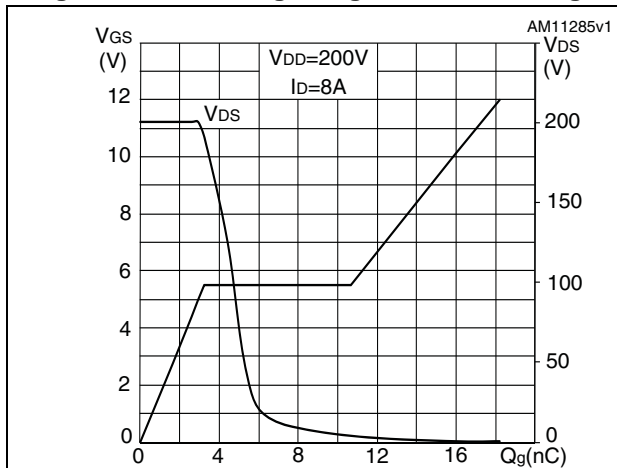


Figure 9. Capacitance variations

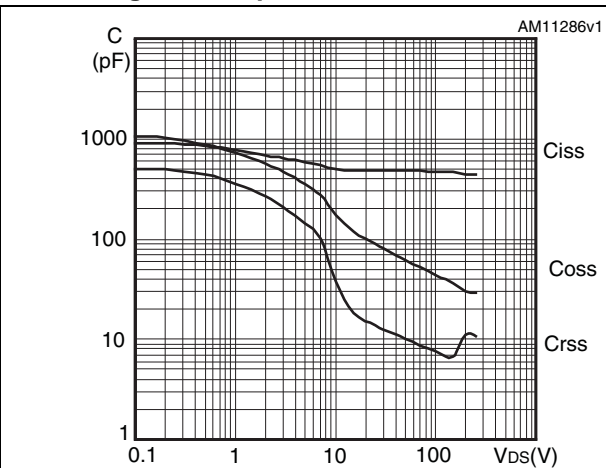


Figure 10. Normalized gate threshold voltage vs temperature

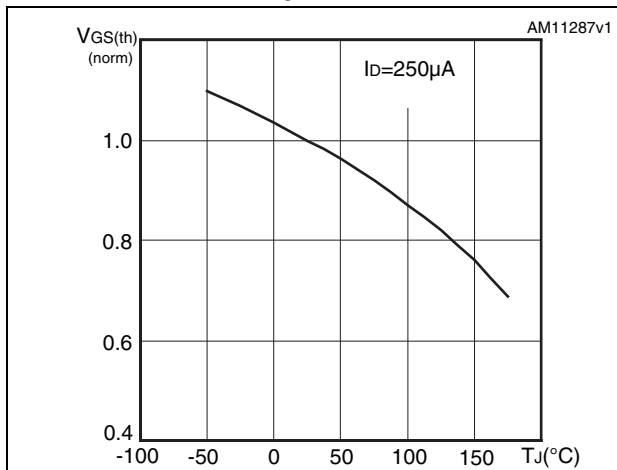


Figure 11. Normalized on resistance vs temperature

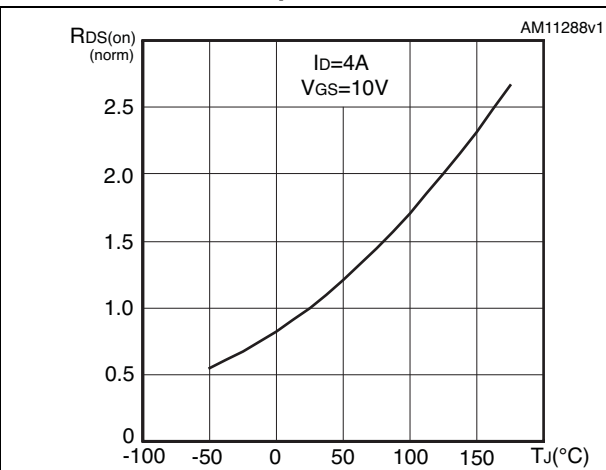
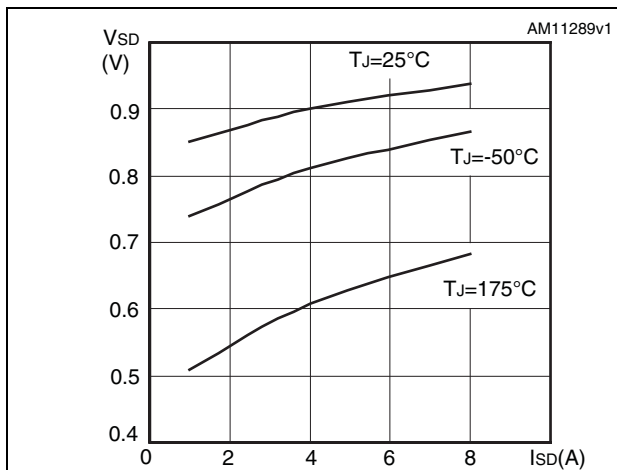


Figure 12. Source-drain diode forward characteristics



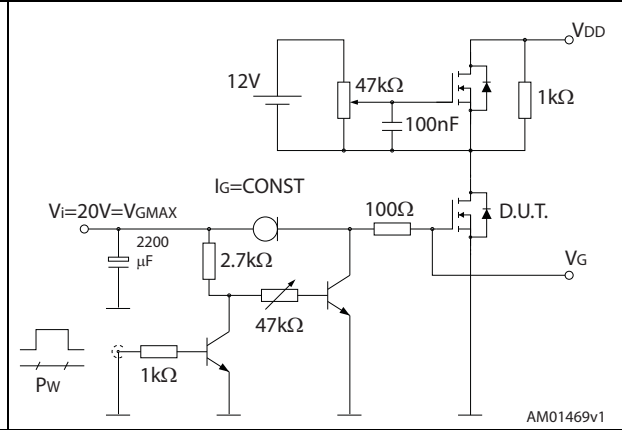
3 Test circuits

Figure 13. Switching times test circuit for resistive load



AM01468v1

Figure 14. Gate charge test circuit



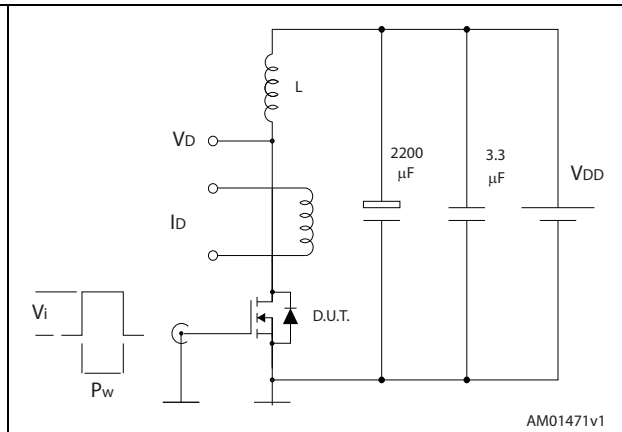
AM01469v1

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



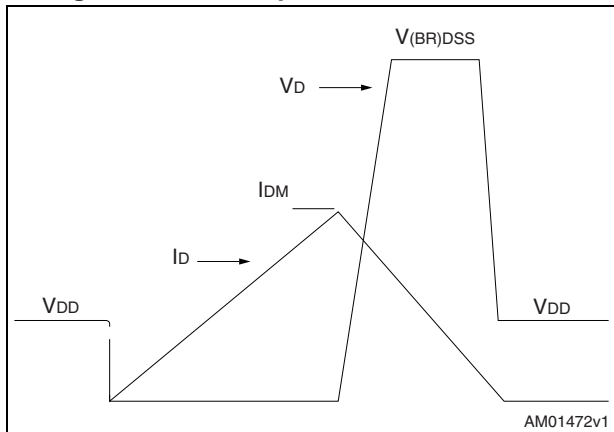
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Figure 16. Unclamped inductive load test circuit



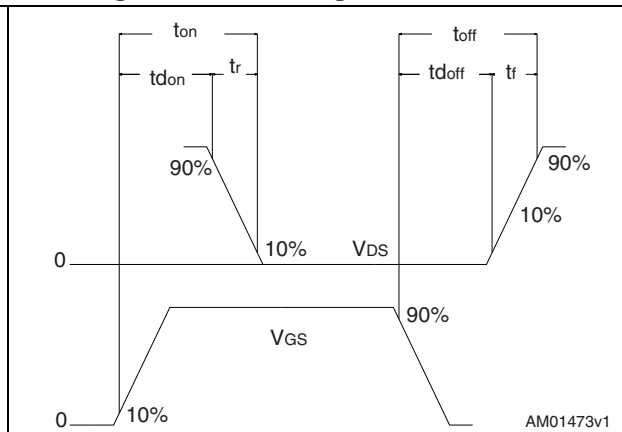
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Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1

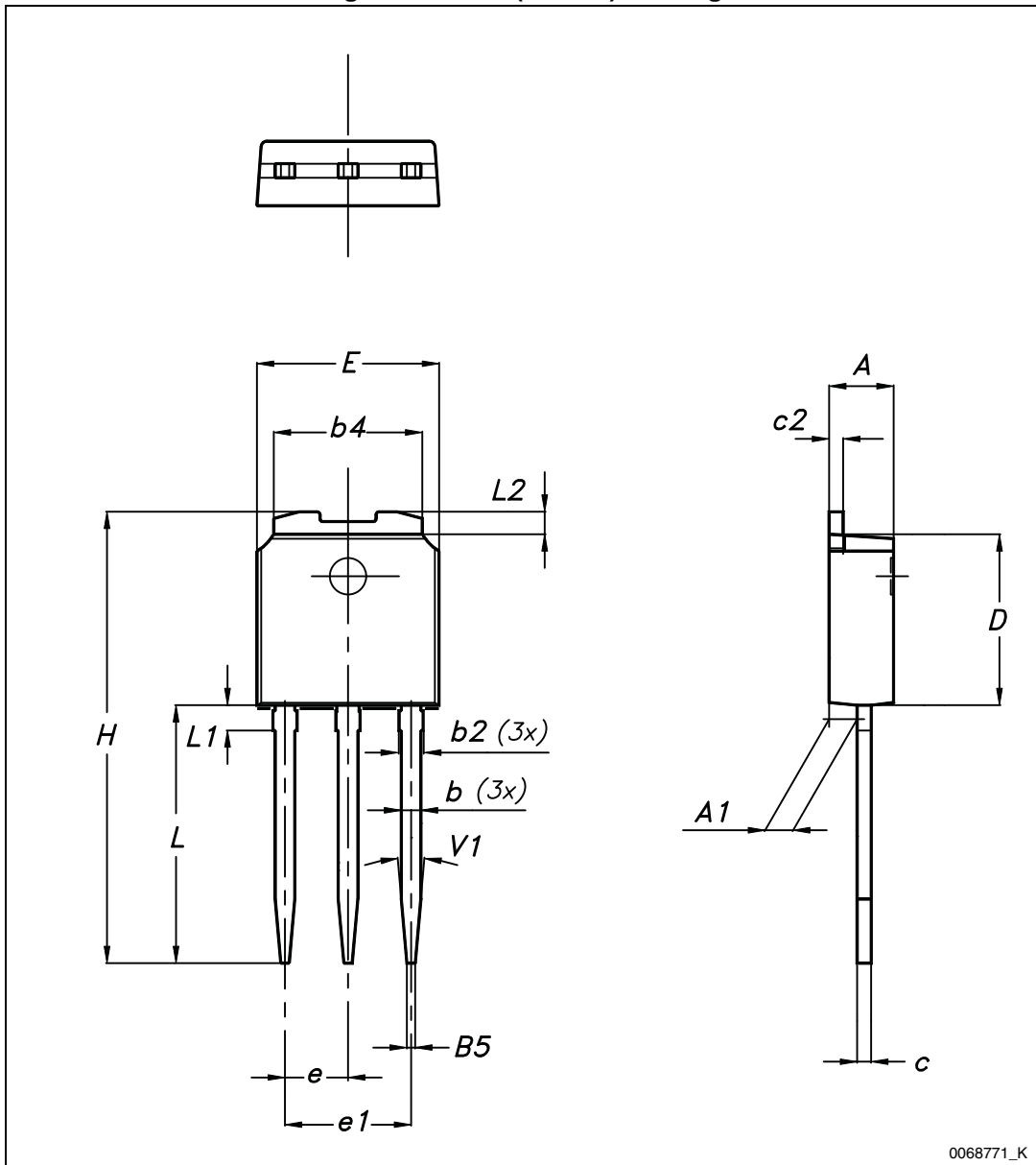
4 Package mechanical data

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. IPAK (TO-251) mechanical data

| DIM | mm. | | |
|-----|------|-------|------|
| | min. | typ. | max. |
| A | 2.20 | | 2.40 |
| A1 | 0.90 | | 1.10 |
| b | 0.64 | | 0.90 |
| b2 | | | 0.95 |
| b4 | 5.20 | | 5.40 |
| B5 | | 0.30 | |
| c | 0.45 | | 0.60 |
| c2 | 0.48 | | 0.60 |
| D | 6.00 | | 6.20 |
| E | 6.40 | | 6.60 |
| e | | 2.28 | |
| e1 | 4.40 | | 4.60 |
| H | | 16.10 | |
| L | 9.00 | | 9.40 |
| L1 | 0.80 | | 1.20 |
| L2 | | 0.80 | 1.00 |
| V1 | | 10° | |

Figure 19. IPAK (TO-251) drawing



0068771_K

5 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|----------------|
| 24-Jul-2013 | 1 | First release. |

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