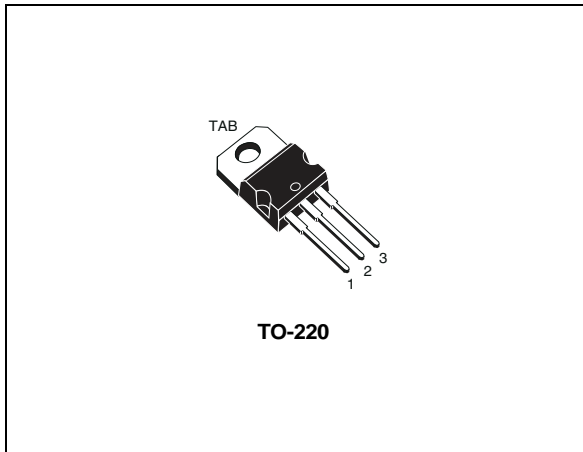


N-channel 100 V, 2.85 mΩ typ., 110 A STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data



Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D |
|-------------|-----------------|--------------------------|----------------|
| STP240N10F7 | 100 V | 3.2 mΩ | 110 A |

- Ultra low on-resistance
- 100% avalanche tested

Applications

- High current switching applications

Description

This N-channel Power MOSFET utilizes the STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Figure 1. Internal schematic diagram

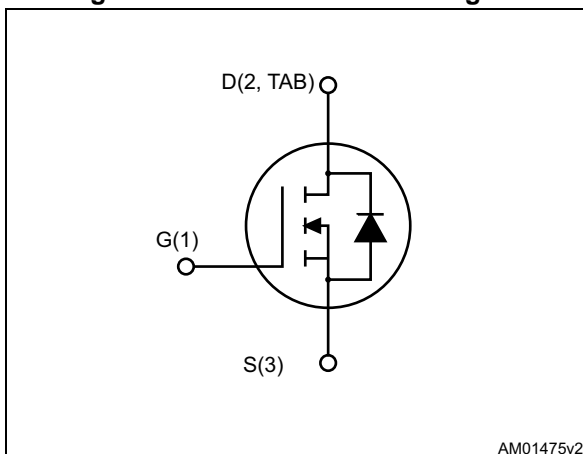


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|-------------|----------|---------|-----------|
| STP240N10F7 | 240N10F7 | TO-220 | Tube |

Contents

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|--|-------------|------------------|
| V_{DS} | Drain-source voltage | 100 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 25^\circ\text{C}$ | 110 | A |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C=100^\circ\text{C}$ | 110 | A |
| $I_{DM}^{(2)}$ | Drain current (pulsed) | 440 | A |
| P_{TOT} | Total dissipation at $T_C = 25^\circ\text{C}$ | 300 | W |
| $E_{AS}^{(3)}$ | Single pulse avalanche energy | 500 | mJ |
| T_j | Operating junction temperature | - 55 to 175 | $^\circ\text{C}$ |
| T_{stg} | Storage temperature | | |

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. Starting $T_j=25^\circ\text{C}$, $I_d=45\text{A}$, $V_{dd}=50\text{V}$

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|----------------|---|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case | 0.5 | $^\circ\text{C}/\text{W}$ |
| $R_{thj-amb}$ | Thermal resistance junction-ambient max | 62.5 | $^\circ\text{C}/\text{W}$ |

2 Electrical characteristics

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

Table 4. 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 | $V_{GS} = 0, V_{DS} = 100\ V$ | | | 1 | μA |
| | | $V_{GS} = 0, V_{DS} = 100\ V, T_C = 125\text{ °C}$ | | | 100 | μA |
| I_{GSS} | Gate body leakage current | $V_{DS} = 0, V_{GS} = +20\ V$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}, I_D = 250\ \mu A$ | 2.5 | | 4.5 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\ V, I_D = 60\ A$ | | 2.85 | 3.2 | m Ω |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|--|------|-------|------|------|
| C_{iss} | Input capacitance | $V_{GS} = 0, V_{DS} = 25\ V, f = 1\ MHz$ | - | 11550 | - | pF |
| C_{oss} | Output capacitance | | - | 2950 | - | pF |
| C_{riss} | Reverse transfer capacitance | | - | 217 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 50\ V, I_D = 110\ A,$ | - | 160 | - | nC |
| Q_{gs} | Gate-source charge | $V_{GS} = 10\ V$ | - | 48 | - | nC |
| Q_{gd} | Gate-drain charge | (see Figure 14) | - | 38 | - | nC |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 50\ V, I_D = 90\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see Figure 13 , Figure 18) | - | 49 | - | ns |
| t_r | Rise time | | - | 139 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 110 | - | ns |
| t_f | Fall time | | - | 112 | - | ns |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|--|------|------|------|------|
| I_{SD} | Source-drain current | | - | | 110 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 440 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $V_{GS}=0$, $I_{SD}=110$ A | - | | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_{SD}=110$ A, $di/dt = 100$ A/ μ s, $V_{DD}=80$ V, $T_j=150^\circ$ C (see Figure 15) | - | 108 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 315 | | nC |
| I_{RRM} | Reverse recovery current | | - | 5.8 | | A |

1. Pulse width limited by safe operating area.
2. Pulse duration = 300 μ s, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

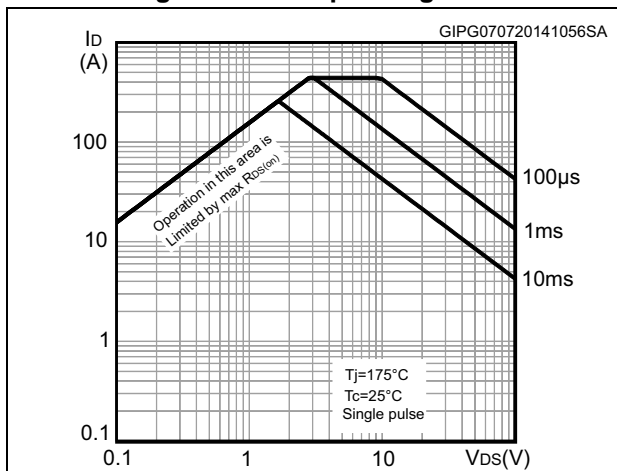


Figure 3. Thermal impedance

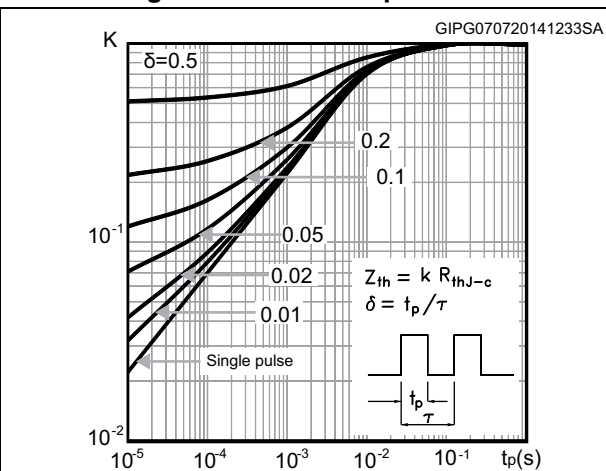


Figure 4. Output characteristics

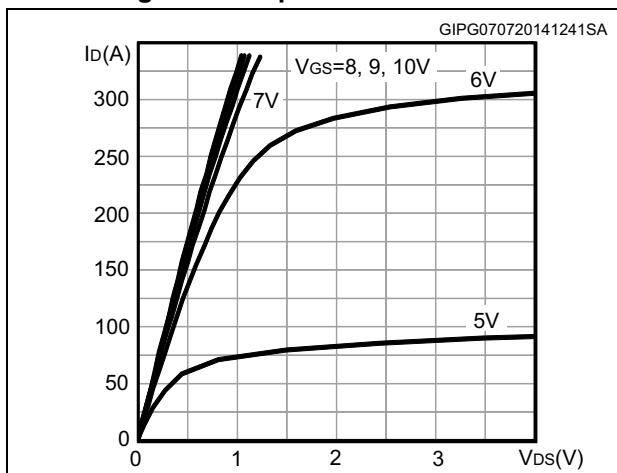


Figure 5. Transfer characteristics

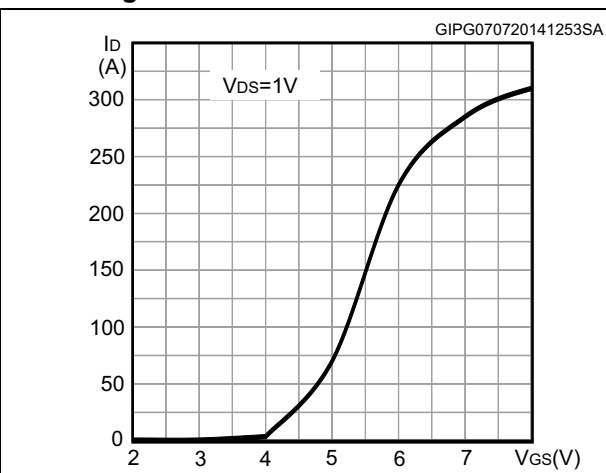


Figure 6. Gate charge vs gate-source voltage

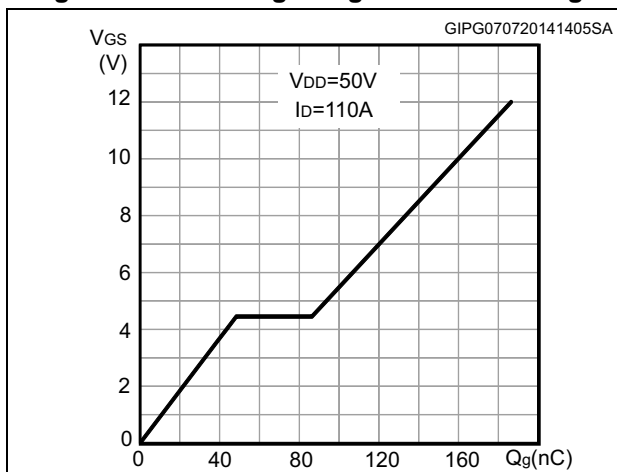


Figure 7. Static drain-source on-resistance

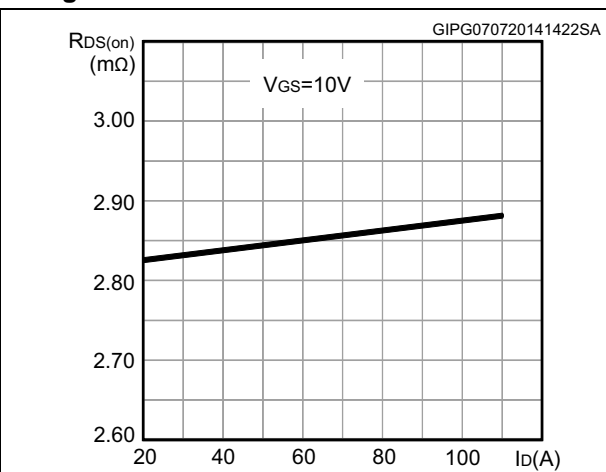


Figure 8. Capacitance variations

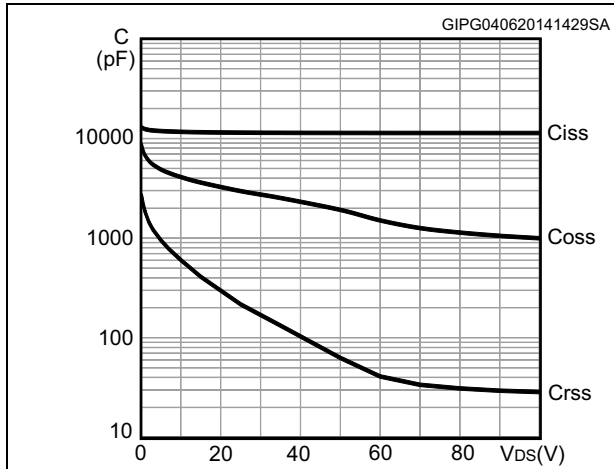


Figure 9. Normalized gate threshold voltage vs temperature

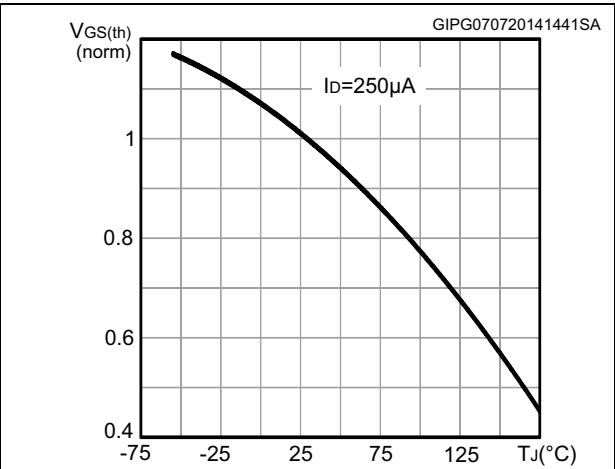


Figure 10. Normalized on-resistance vs temperature

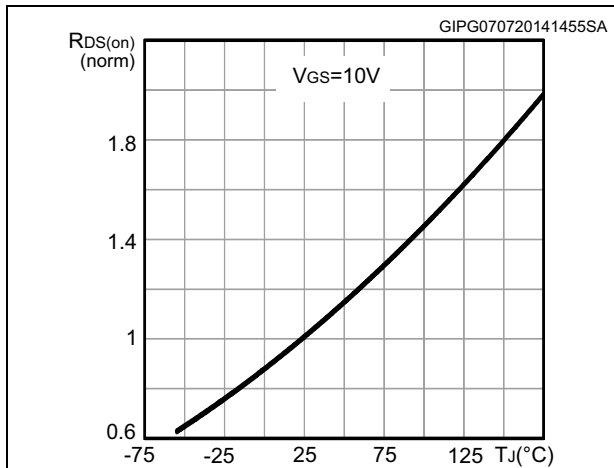


Figure 11. Normalized V_{(BR)DSS} vs temperature

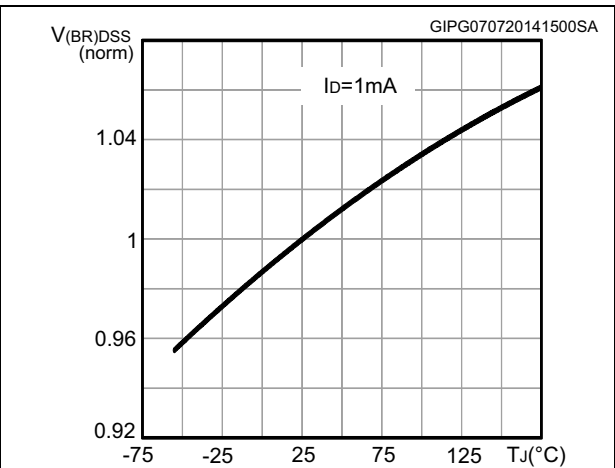
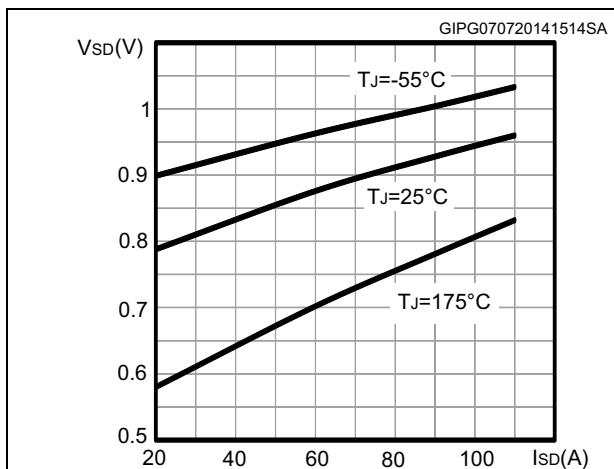


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

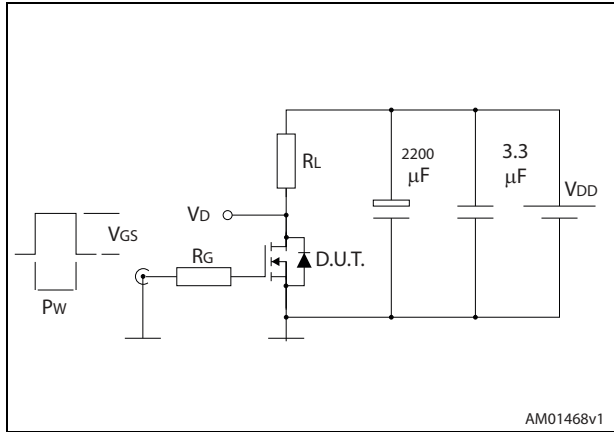


Figure 14. Gate charge test circuit

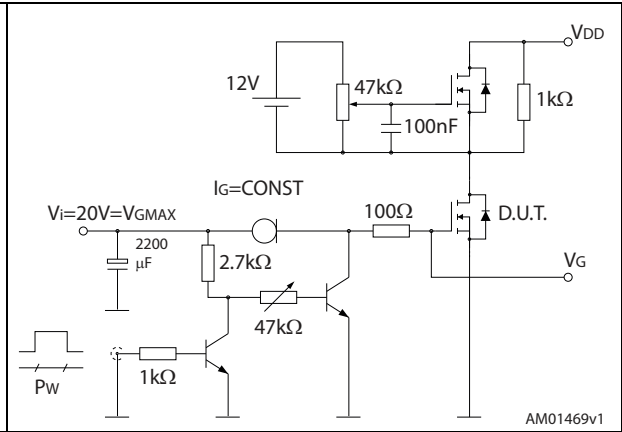


Figure 15. Test circuit for inductive load switching and diode recovery times

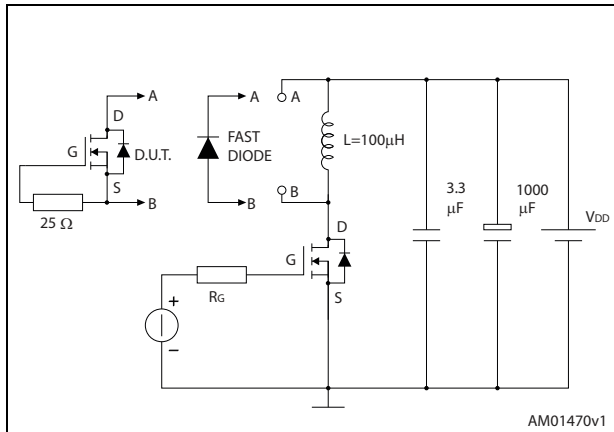


Figure 16. Unclamped inductive load test circuit

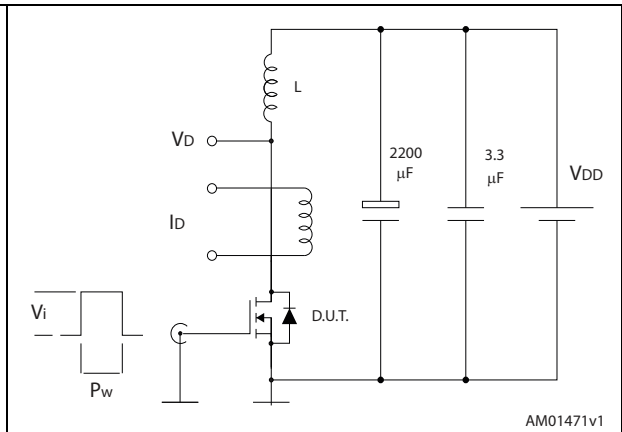


Figure 17. Unclamped inductive waveform

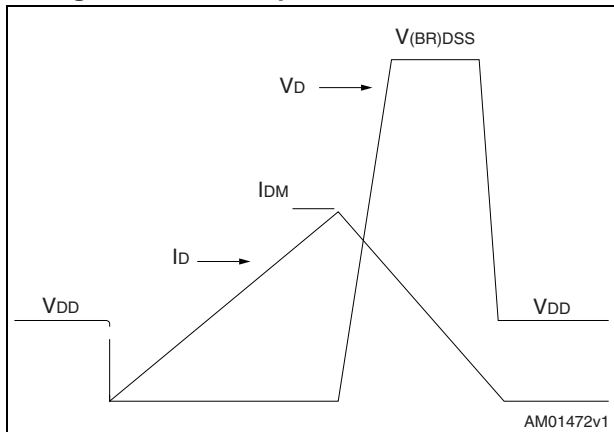
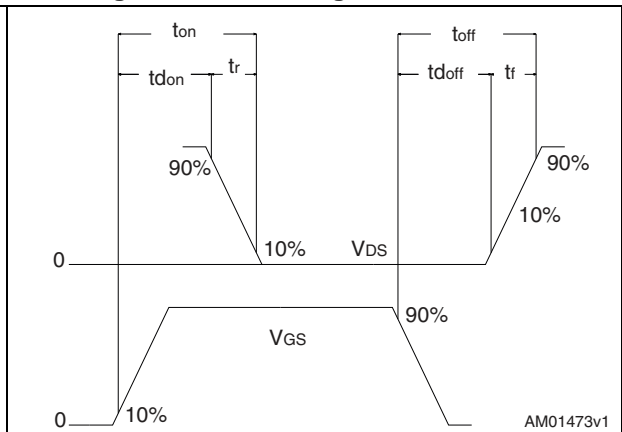


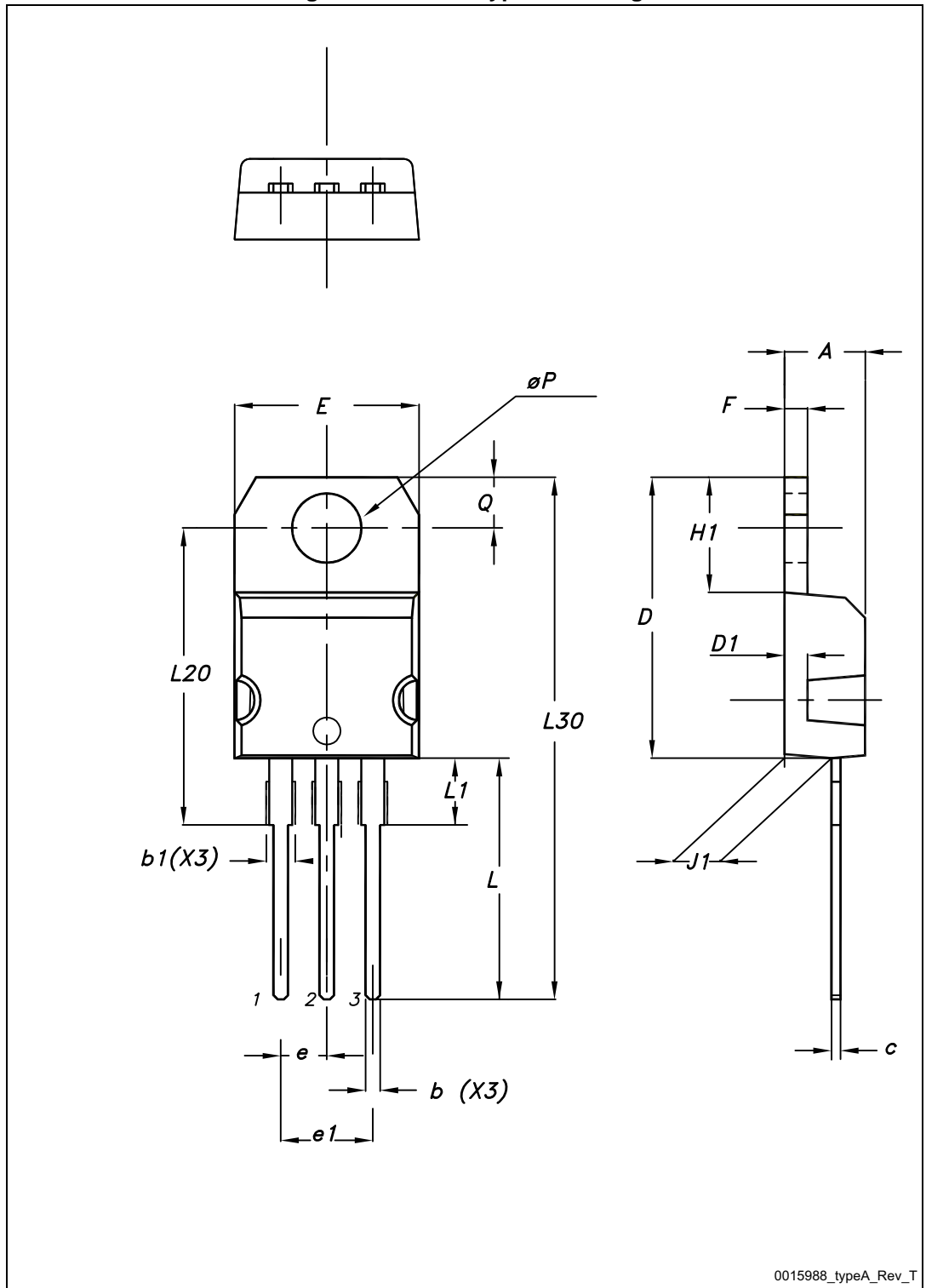
Figure 18. Switching time waveform



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.

Figure 19. TO-220 type A drawing



0015988_typeA_Rev_T

Table 8. 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 |

5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 19-Nov-2012 | 1 | Initial version. |
| 08-Oct-2013 | 2 | Updated $V_{GS(th)}$ typical value in Table 4: On/off states . |
| 14-Jul-2014 | 3 | <ul style="list-style-type: none"> – Document status promoted from preliminary data to production data – Modified: title – Modified: I_D values in cover page – Modified: I_D and I_{DM} values in Table 2 – Added: E_{AS} value and note 3 in Table 2 – Modified: I_{DSS}, I_{GSS} and $V_{GS(th)}$ values in Table 4 – Modified: the entire typical values in Table 5 and 6 – Modified: max values and I_{SD} values – Added: Section 2.1: Electrical characteristics (curves) – Updated: Section 4: Package mechanical data – Minor text changes |

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