

N-channel 100 V, 0.0036  $\Omega$  typ., 110 A, STripFET™ F7  
Power MOSFETs in I<sup>2</sup>PAK and TO-220 packages

Datasheet – production data

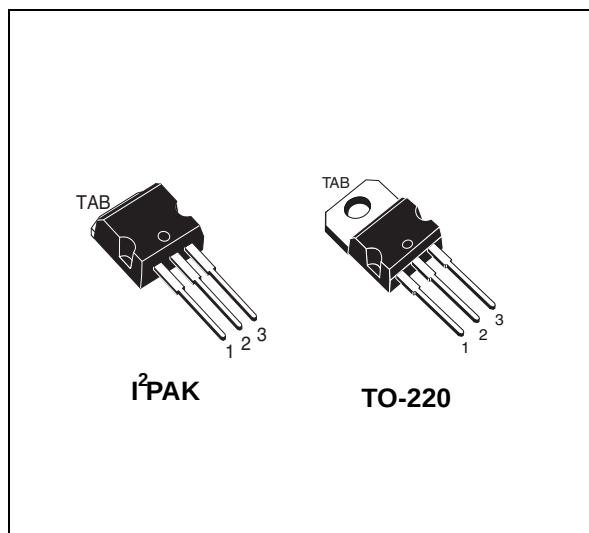
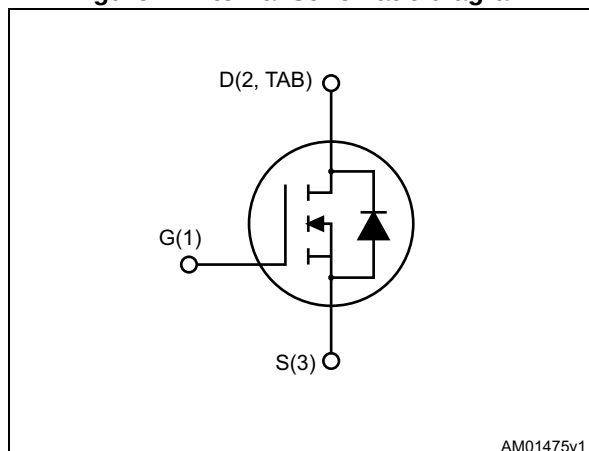


Figure 1. Internal schematic diagram



## Features

| Order codes | V <sub>DS</sub> | R <sub>DS(on)</sub> max | I <sub>D</sub> | P <sub>TOT</sub> |
|-------------|-----------------|-------------------------|----------------|------------------|
| STI150N10F7 | 100 V           | 0.0042 $\Omega$         | 110 A          | 250 W            |
| STP150N10F7 |                 |                         |                |                  |

- Among the lowest R<sub>DS(on)</sub> on the market
- Excellent figure of merit (FoM)
- Low Crss/Ciss ratio for EMI immunity
- High avalanche ruggedness

## Applications

- Switching applications

## Description

These N-channel Power MOSFETs utilize 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.

Table 1. Device summary

| Order codes | Marking  | Package            | Packaging |
|-------------|----------|--------------------|-----------|
| STI150N10F7 | 150N10F7 | I <sup>2</sup> PAK | Tube      |
| STP150N10F7 |          | TO-220             |           |

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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                                              | $\pm 20$   | V                  |
| $I_D$          | Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$  | 110        | A                  |
| $I_D$          | Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$ | 110        | A                  |
| $I_{DM}^{(1)}$ | Drain current (pulsed)                                            | 440        | A                  |
| $P_{TOT}$      | Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$           | 250        | W                  |
| $E_{AS}^{(2)}$ | Single pulse avalanche energy                                     | 495        | mJ                 |
| $T_J$          | Operating junction temperature                                    | -55 to 175 | $^{\circ}\text{C}$ |
| $T_{stg}$      | Storage temperature                                               |            | $^{\circ}\text{C}$ |

1. Pulse width is limited by safe operating area

2. Starting  $T_J=25\text{ }^{\circ}\text{C}$ ,  $I_D=30\text{ A}$ ,  $V_{DD}=50\text{ V}$

**Table 3. Thermal data**

| Symbol         | Parameter                               | Value | Unit                 |
|----------------|-----------------------------------------|-------|----------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max    | 0.6   | $^{\circ}\text{C/W}$ |
| $R_{thj-amb}$  | Thermal resistance junction-ambient max | 62.5  | $^{\circ}\text{C/W}$ |

## 2 Electrical characteristics

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

**Table 4. On /off states**

| Symbol        | Parameter                         | Test conditions                                          | Min. | Typ.   | Max.   | Unit          |
|---------------|-----------------------------------|----------------------------------------------------------|------|--------|--------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage    | $V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$               | 100  |        |        | V             |
| $I_{DSS}$     | Zero gate voltage drain current   | $V_{GS} = 0, V_{DS} = 100\text{ V}$                      |      |        | 1      | $\mu\text{A}$ |
|               |                                   | $V_{GS} = 0, V_{DS} = 100\text{ V}, T_C = 125\text{ °C}$ |      |        | 100    | $\mu\text{A}$ |
| $I_{GSS}$     | Gate-body leakage current         | $V_{DS} = 0, V_{GS} = +20\text{ V}$                      |      |        | 100    | nA            |
| $V_{GS(th)}$  | Gate threshold voltage            | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$          | 2.5  |        | 4.5    | V             |
| $R_{DS(on)}$  | Static drain-source on-resistance | $V_{GS} = 10\text{ V}, I_D = 55\text{ A}$                |      | 0.0036 | 0.0042 | $\Omega$      |

**Table 5. Dynamic**

| Symbol    | Parameter                    | Test conditions                                                                                      | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|------------------------------------------------------------------------------------------------------|------|------|------|------|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 50\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$                                                 | -    | 8115 | -    | pF   |
| $C_{oss}$ | Output capacitance           |                                                                                                      | -    | 1510 | -    | pF   |
| $C_{rss}$ | Reverse transfer capacitance |                                                                                                      | -    | 67   | -    | pF   |
| $Q_g$     | Total gate charge            | $V_{DD} = 50\text{ V}, I_D = 110\text{ A}, V_{GS} = 10\text{ V}$<br>(see <a href="#">Figure 14</a> ) | -    | 117  | -    | nC   |
| $Q_{gs}$  | Gate-source charge           |                                                                                                      | -    | 47   | -    | nC   |
| $Q_{gd}$  | Gate-drain charge            |                                                                                                      | -    | 26   | -    | nC   |

**Table 6. Switching times**

| Symbol       | Parameter           | Test conditions                                                                                                              | Min. | Typ. | Max. | Unit |
|--------------|---------------------|------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 50\text{ V}, I_D = 55\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$<br>(see <a href="#">Figure 13</a> ) | -    | 33   | -    | ns   |
| $t_r$        | Rise time           |                                                                                                                              | -    | 57   | -    | ns   |
| $t_{d(off)}$ | Turn-off delay time |                                                                                                                              | -    | 72   | -    | ns   |
| $t_f$        | Fall time           |                                                                                                                              | -    | 33   | -    | 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            | $I_{SD} = 110\text{ A}$ , $V_{GS} = 0$                                                                                                                         | -    |      | 1.2  | V    |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 110\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 80\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$<br>(see <a href="#">Figure 15</a> ) | -    | 70   |      | ns   |
| $Q_{rr}$        | Reverse recovery charge       |                                                                                                                                                                | -    | 165  |      | nC   |
| $I_{RRM}$       | Reverse recovery current      |                                                                                                                                                                | -    | 4.7  |      | A    |

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

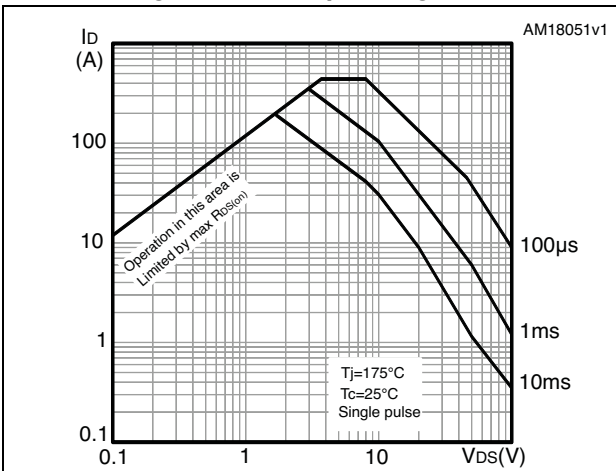


Figure 3. Thermal impedance

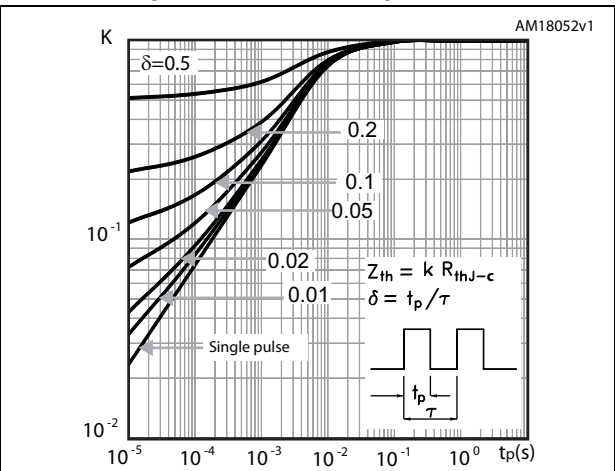


Figure 4. Output characteristics

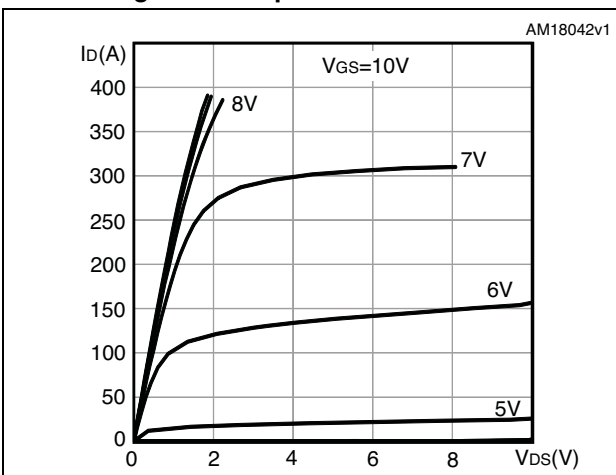


Figure 5. Transfer characteristics

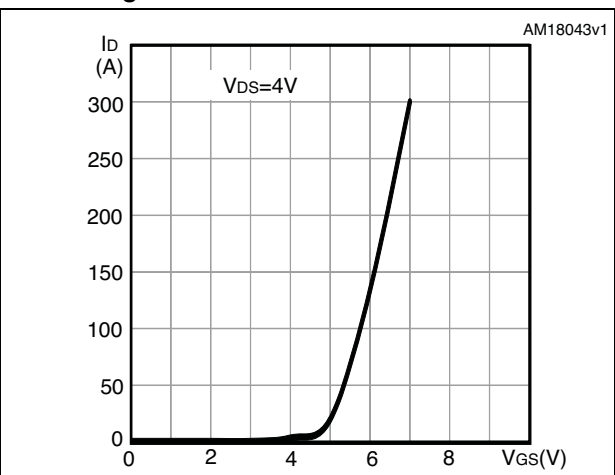


Figure 6. Gate charge vs gate-source voltage

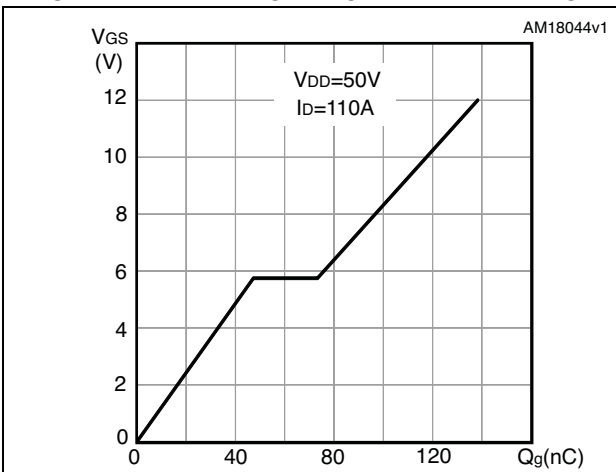


Figure 7. Static drain-source on-resistance

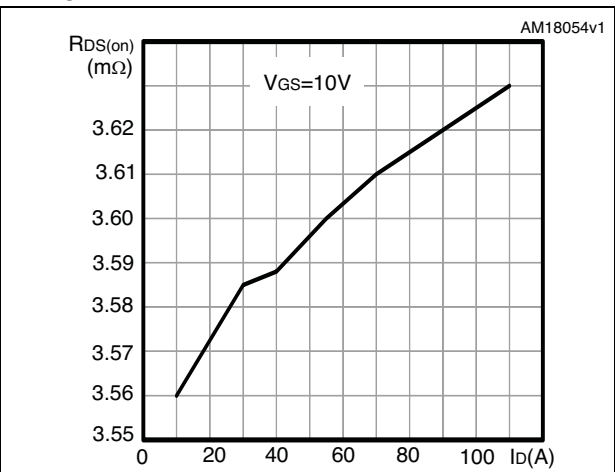


Figure 8. Capacitance variations

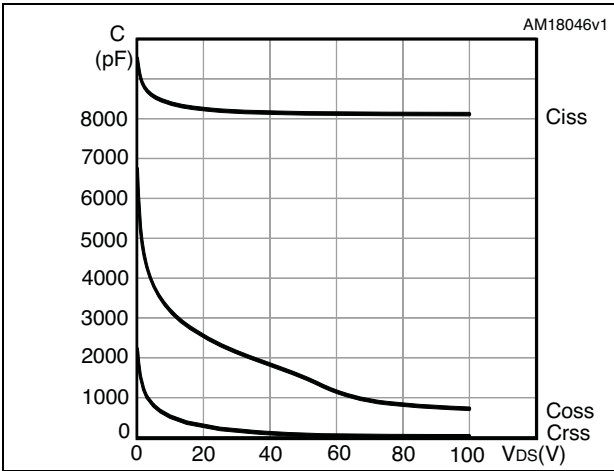


Figure 9. Normalized gate threshold voltage vs temperature

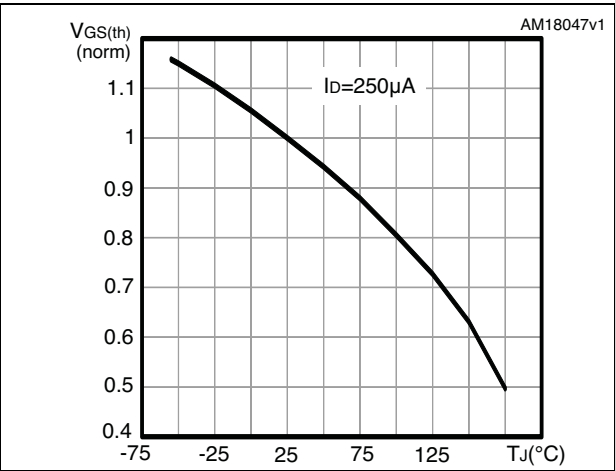


Figure 10. Normalized on-resistance vs temperature

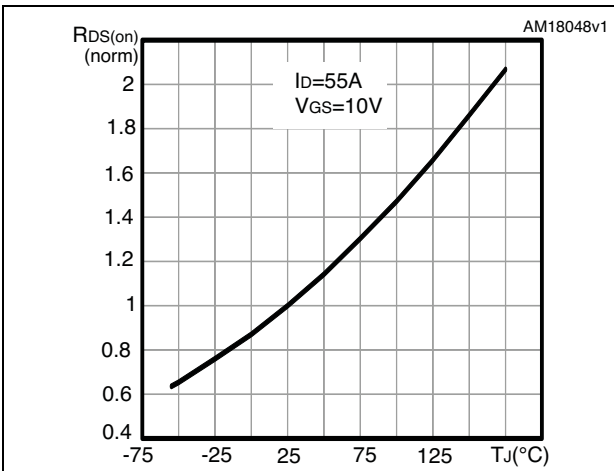


Figure 11. Normalized  $V_{(BR)DSS}$  vs temperature

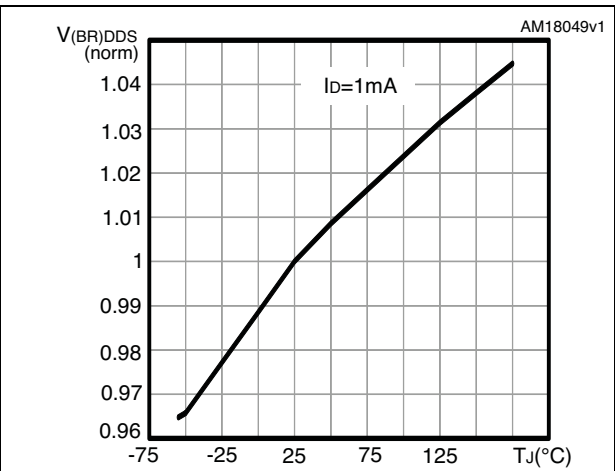
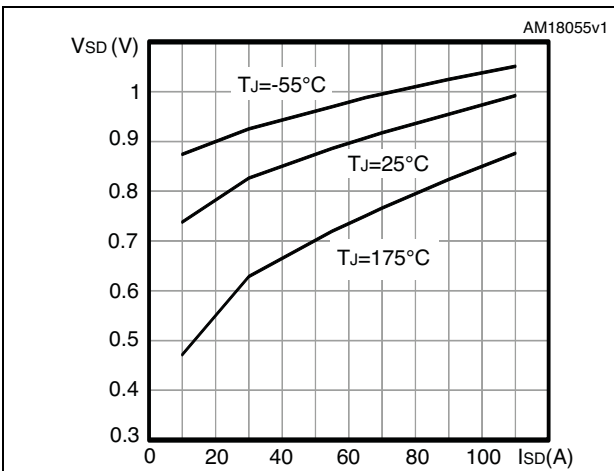
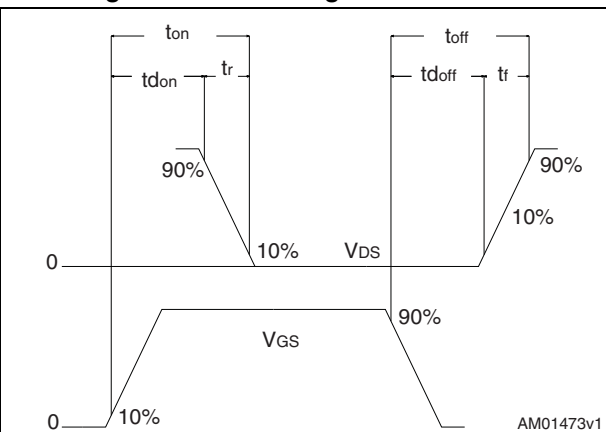
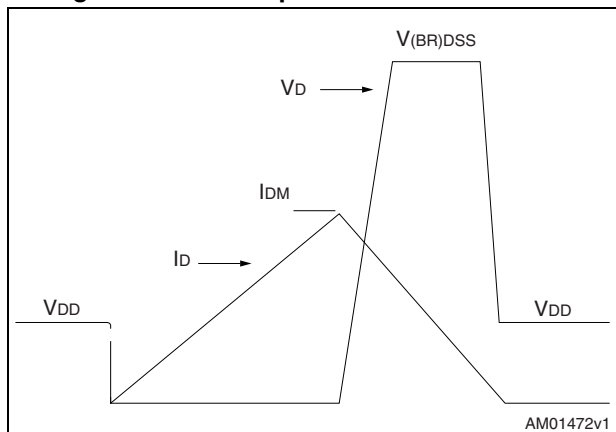
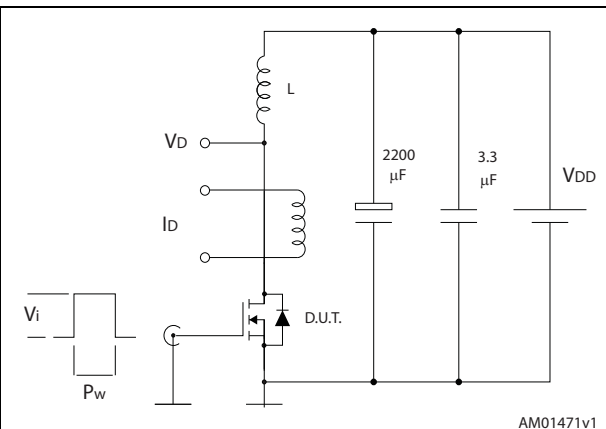
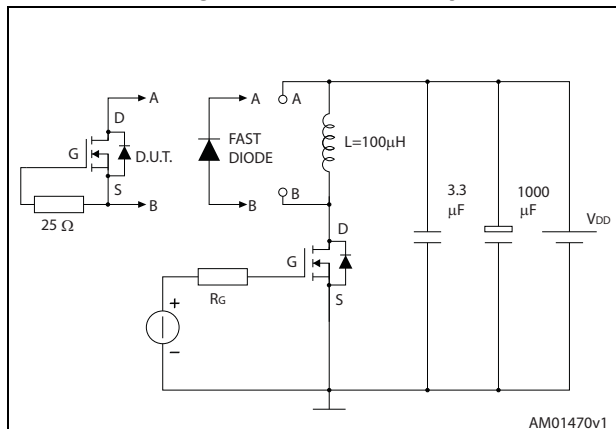
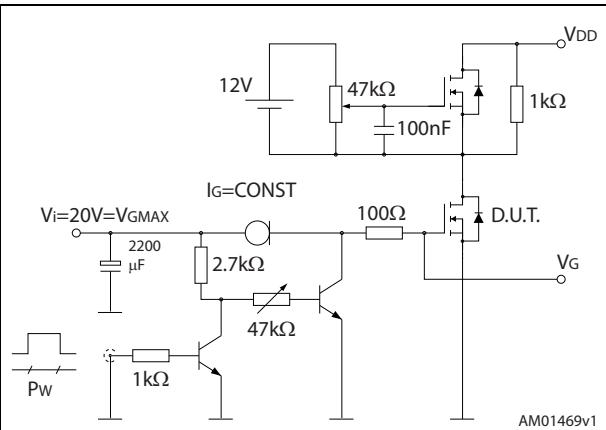
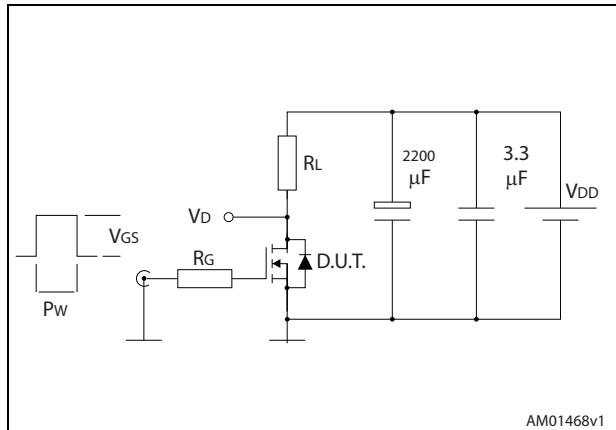


Figure 12. Source-drain diode forward characteristics





## 4 Package mechanical data

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

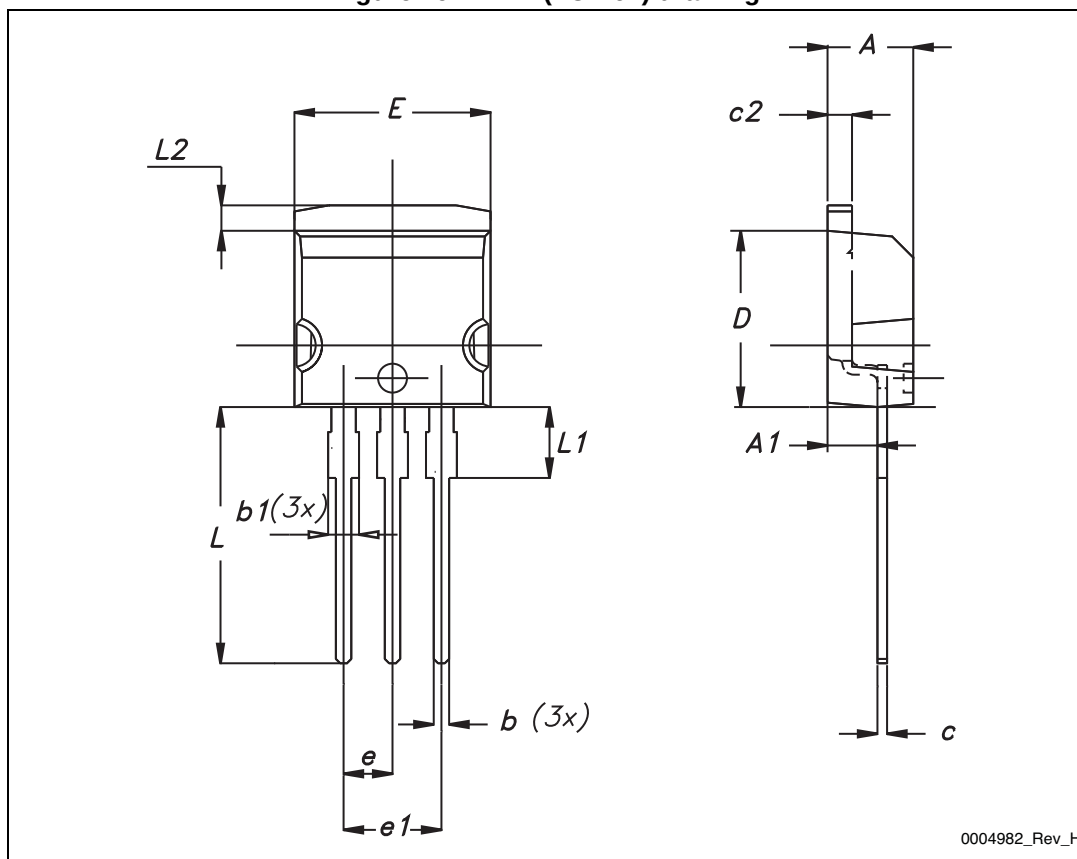
Figure 19. I<sup>2</sup>PAK (TO-262) drawing

Table 8. I<sup>2</sup>PAK (TO-262) mechanical data

| DIM. | mm.  |     |       |
|------|------|-----|-------|
|      | min. | typ | max.  |
| A    | 4.40 |     | 4.60  |
| A1   | 2.40 |     | 2.72  |
| b    | 0.61 |     | 0.88  |
| b1   | 1.14 |     | 1.70  |
| c    | 0.49 |     | 0.70  |
| c2   | 1.23 |     | 1.32  |
| D    | 8.95 |     | 9.35  |
| e    | 2.40 |     | 2.70  |
| e1   | 4.95 |     | 5.15  |
| E    | 10   |     | 10.40 |
| L    | 13   |     | 14    |
| L1   | 3.50 |     | 3.93  |
| L2   | 1.27 |     | 1.40  |

Figure 20. TO-220 type A drawing

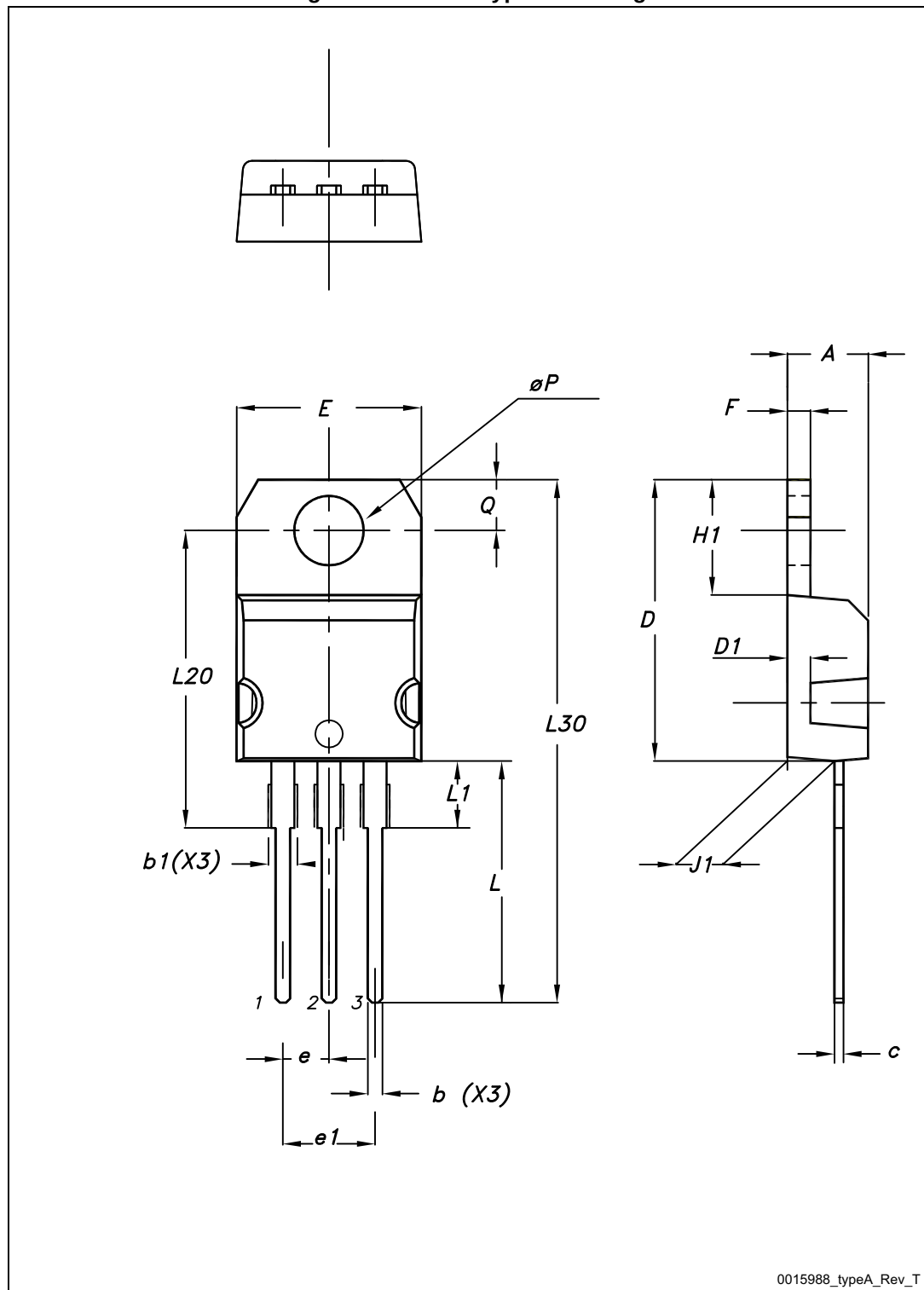


Table 9. TO-220 type A mechanical data

| 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 10. Document revision history

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16-Apr-2013 | 1        | First release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 22-Jan-2014 | 2        | <ul style="list-style-type: none"> <li>– The part number STH150N10F7-2 has been moved to a separate datasheet</li> <li>– Added: I<sup>2</sup>PAK package</li> <li>– Modified: <a href="#">Figure 1</a></li> <li>– Modified: I<sub>D</sub> and I<sub>DM</sub> values in <a href="#">Table 2</a></li> <li>– Modified: R<sub>thj-case</sub> value in <a href="#">Table 3</a></li> <li>– Modified: R<sub>DS(on)</sub> values in <a href="#">Table 4</a></li> <li>– Modified: V<sub>SD</sub>, I<sub>D</sub> and the entire typical values in <a href="#">Table 5</a>, <a href="#">6</a> and <a href="#">7</a></li> <li>– Updated: <a href="#">Figure 13</a>, <a href="#">14</a>, <a href="#">15</a> and <a href="#">16</a></li> <li>– Updated: <a href="#">Section 4: Package mechanical data</a></li> <li>– Added: <a href="#">Section 2.1: Electrical characteristics (curves)</a></li> <li>– Minor text changes</li> </ul> |
| 24-Feb-2014 | 3        | <ul style="list-style-type: none"> <li>– Datasheet status promoted from preliminary data to production data</li> <li>– Modified: <a href="#">Figure 10</a></li> <li>– Minor text changes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 20-Aug-2014 |          | <ul style="list-style-type: none"> <li>– Updated title, features and description in cover page.</li> <li>– Added E<sub>AS</sub> parameter in <a href="#">Table 2: Absolute maximum ratings</a>.</li> <li>– Minor text changes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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