



# STP80NF70

N-channel 68 V, 0.0082  $\Omega$ , 98 A, TO-220  
STripFET™ II Power MOSFET

## Features

| Type      | V <sub>DSS</sub> | R <sub>DS(on) max</sub> | I <sub>D</sub> |
|-----------|------------------|-------------------------|----------------|
| STP80NF70 | 68 V             | < 0.0098 $\Omega$       | 98 A           |

- Exceptional dv/dt capability
- 100% avalanche tested

## Application

- Switching applications

## Description

The STP80NF70 is a N-channel Power MOSFET realized with STMicroelectronics unique STripFET™ process. It has specifically been designed to minimize input capacitance and gate charge. The device is therefore suitable in advanced high-efficiency switching applications.

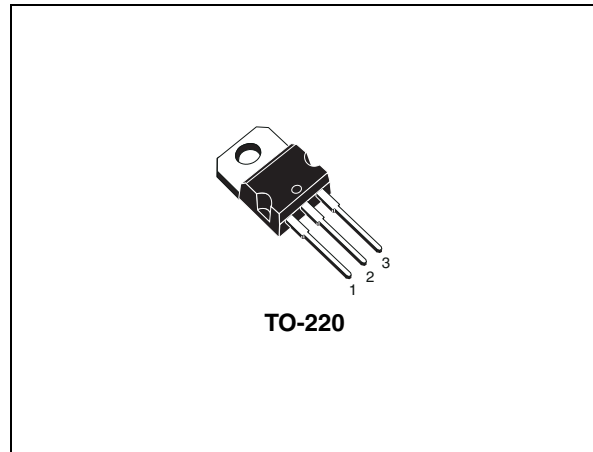


Figure 1. Internal schematic diagram

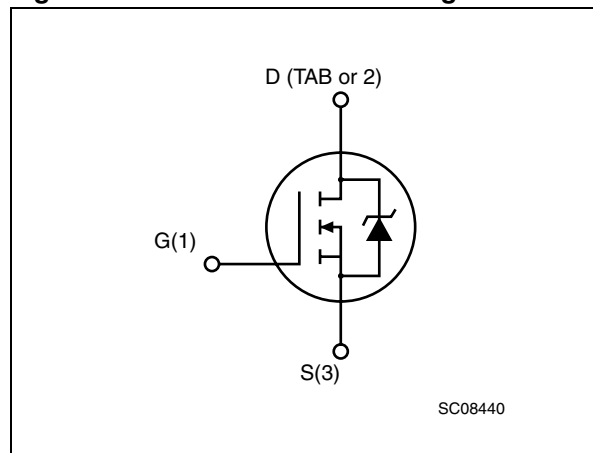


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|-----------|
| STP80NF70  | 80NF70  | 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 ( $V_{GS} = 0$ )                           | 68         | V                   |
| $V_{GS}$       | Gate-source voltage   | $\pm 20$   | V                   |
| $I_D$          | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$  | 98         | A                   |
| $I_D$          | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 68         | A                   |
| $I_{DM}^{(1)}$ | Drain current (pulsed)  | 392        | A                   |
| $P_{TOT}$      | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$           | 190        | W                   |
|                | Derating factor   | 1.27       | W/ $^\circ\text{C}$ |
| $dv/dt^{(2)}$  | Peak diode recovery voltage slope                               | 13         | V/ns                |
| $E_{AS}^{(3)}$ | Single pulse avalanche energy                                   | 700        | mJ                  |
| $T_{stg}$      | Storage temperature   | -55 to 175 | $^\circ\text{C}$    |
| $T_J$          | Operating junction temperature                                  |            |                     |

1. Pulse width limited by safe operating area.
2.  $I_{SD} \leq 80\text{ A}$ ,  $di/dt \leq 300\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq T_{JMAX}$ .
3. Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 40\text{ A}$ ,  $V_{DD} = 34\text{ V}$ .

**Table 3. Thermal data**

| Symbol         | Parameter   | Value | Unit                      |
|----------------|---|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max                          | 0.79  | $^\circ\text{C}/\text{W}$ |
| $R_{thj-amb}$  | Thermal resistance junction-ambient max                       | 62.5  | $^\circ\text{C}/\text{W}$ |
| $T_l$          | Maximum lead temperature for soldering purpose <sup>(1)</sup> | 300   | $^\circ\text{C}$          |

1. 1.6 mm from case for 10 sec.

## 2 Electrical characteristics

( $T_{CASE}=25^{\circ}C$  unless otherwise specified).

**Table 4. On/off states**

| Symbol        | Parameter  | Test conditions   | Min. | Typ.   | Max.      | Unit               |
|---------------|--|---|------|--------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage                   | $I_D = 250 \mu A, V_{GS} = 0$   | 68   |        |           | V                  |
| $I_{DSS}$     | Zero gate voltage drain current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max rating},$<br>$V_{DS} = \text{Max rating @ } 125^{\circ}C$ |      |        | 1<br>10   | $\mu A$<br>$\mu A$ |
| $I_{GSS}$     | Gate body leakage current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20 V$   |      |        | $\pm 100$ | nA                 |
| $V_{GS(th)}$  | Gate threshold voltage                           | $V_{DS} = V_{GS}, I_D = 250 \mu A$  | 2    | 3      | 4         | V                  |
| $R_{DS(on)}$  | Static drain-source on resistance                | $V_{GS} = 10 V, I_D = 40 A$   |      | 0.0082 | 0.0098    | $\Omega$           |

**Table 5. Dynamic**

| Symbol         | Parameter                    | Test conditions                                     | Min. | Typ. | Max. | Unit    |         |
|----------------|------------------------------|---|------|------|------|---------|---------|
| $g_{fs}^{(1)}$ | Forward transconductance     | $V_{DS} = 15 V, I_D = 40 A$                         | -    | 60   | -    | S       |         |
| $C_{iss}$      | Input capacitance            | $V_{DS} = 25 V, f = 1 \text{ MHz},$<br>$V_{GS} = 0$ | -    | 2550 | -    | $\mu F$ |         |
| $C_{oss}$      | Output capacitance           |   |      | 550  |      |         | $\mu F$ |
| $C_{rss}$      | Reverse transfer capacitance |   |      | 175  |      |         | $\mu F$ |
| $Q_g$          | Total gate charge            | $V_{DD} = 34 V, I_D = 80 A$<br>$V_{GS} = 10 V$      | -    | 75   | -    | nC      |         |
| $Q_{gs}$       | Gate-source charge           |   |      | 17   |      |         | nC      |
| $Q_{gd}$       | Gate-drain charge            |   |      | 30   |      |         | nC      |

1. Pulsed: pulse duration=300 $\mu s$ , duty cycle 1.5%.

**Table 6. Switching times**

| Symbol       | Parameter           | Test conditions   | Min. | Typ. | Max. | Unit |    |
|--------------|---------------------|---|------|------|------|------|----|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 34 V, I_D = 40 A,$<br>$R_G = 4.7 \Omega, V_{GS} = 10 V$<br><i>Figure 13 on page 9</i> | -    | 17   | -    | ns   |    |
| $t_r$        | Rise time           |   |      | 60   |      |      | ns |
| $t_{d(off)}$ | Turn-off delay time |   |      | 90   |      |      | ns |
| $t_f$        | Fall time           |   |      | 75   |      |      | ns |

Table 7. Source drain diode

| Symbol                            | Parameter  | Test conditions   | Min. | Typ.             | Max. | Unit          |
|-----------------------------------|--|---|------|------------------|------|---------------|
| $I_{SD}$                          | Source-drain current   |   | -    |                  | 98   | A             |
| $I_{SDM}^{(1)}$                   | Source-drain current (pulsed)  |   | -    |                  | 392  | A             |
| $V_{SD}^{(2)}$                    | Forward on voltage   | $I_{SD} = 80 \text{ A}, V_{GS} = 0$   | -    |                  | 1.5  | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse recovery time<br>Reverse recovery charge<br>Reverse recovery current | $I_{SD} = 80 \text{ A},$<br>$di/dt = 100 \text{ A}/\mu\text{s},$<br>$V_{DD} = 25 \text{ V}, T_J = 150 \text{ }^\circ\text{C}$<br><i>Figure 15 on page 9</i> | -    | 70<br>160<br>4.7 |      | ns<br>nC<br>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

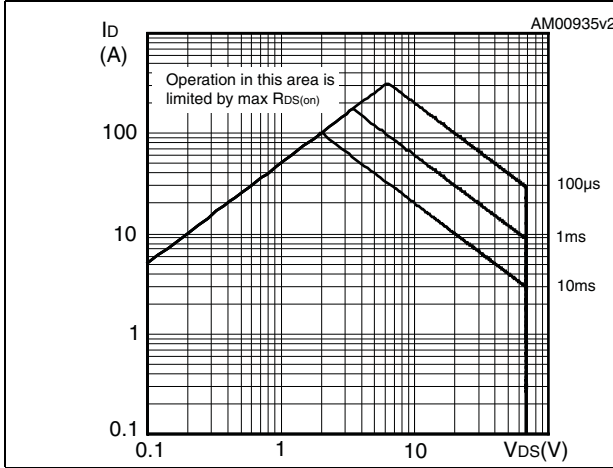


Figure 3. Thermal impedance

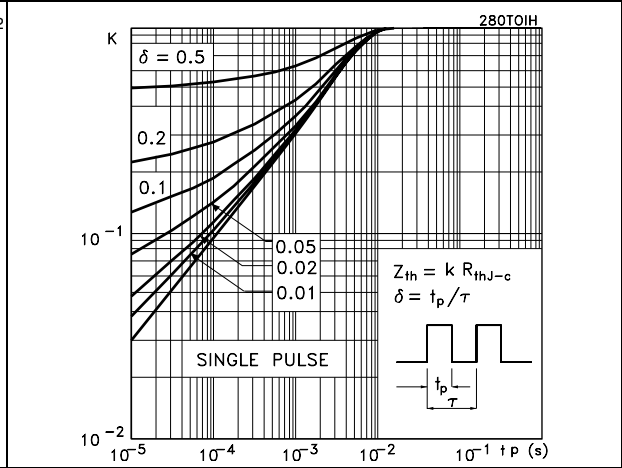


Figure 4. Output characteristics

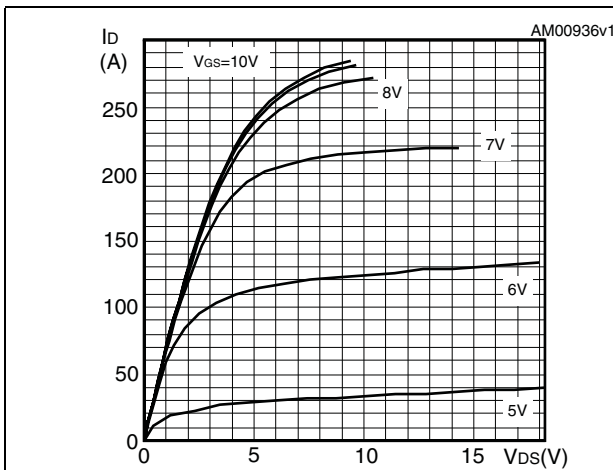


Figure 5. Transfer characteristics

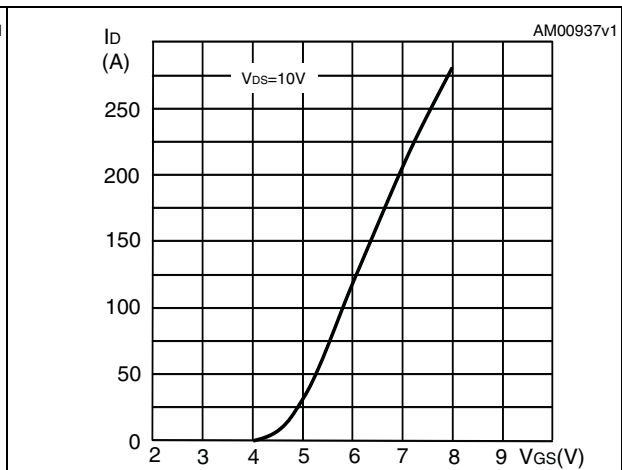


Figure 6. Normalized  $BV_{DSS}$  vs temperature      Figure 7. Static drain-source on resistance

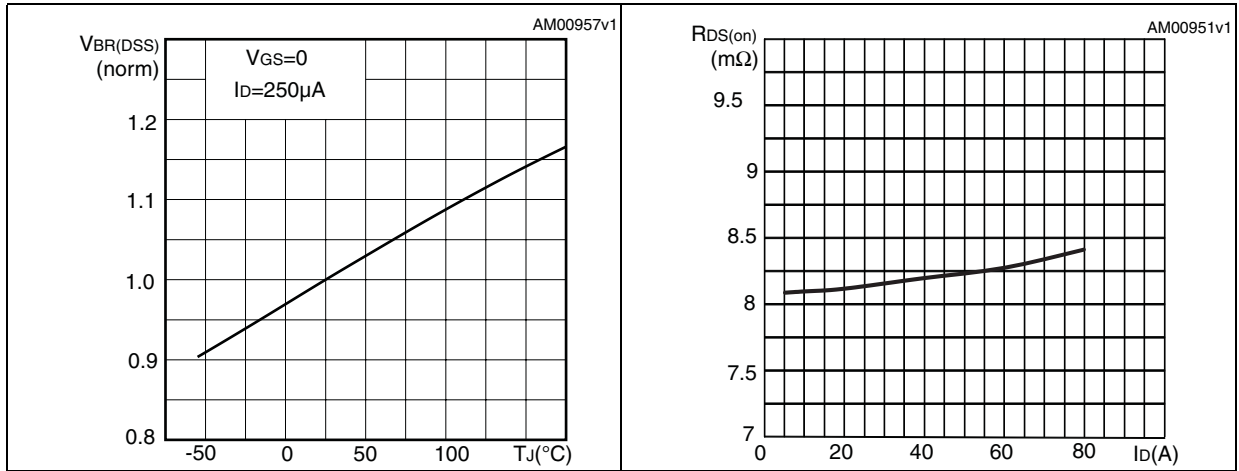


Figure 8. Gate charge vs gate-source voltage      Figure 9. Capacitance variations

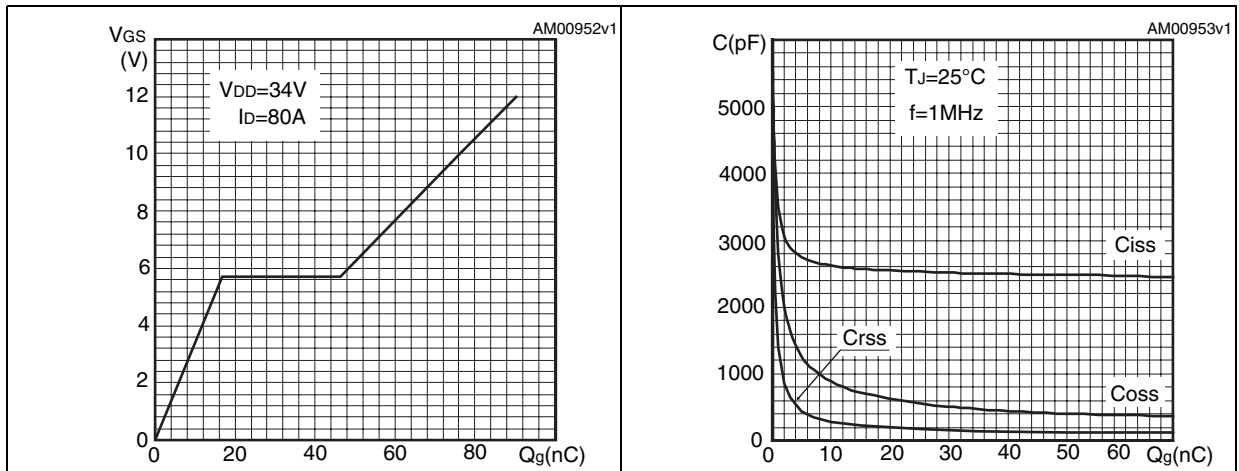


Figure 10. Normalized gate threshold voltage vs temperature      Figure 11. Normalized on resistance vs temperature

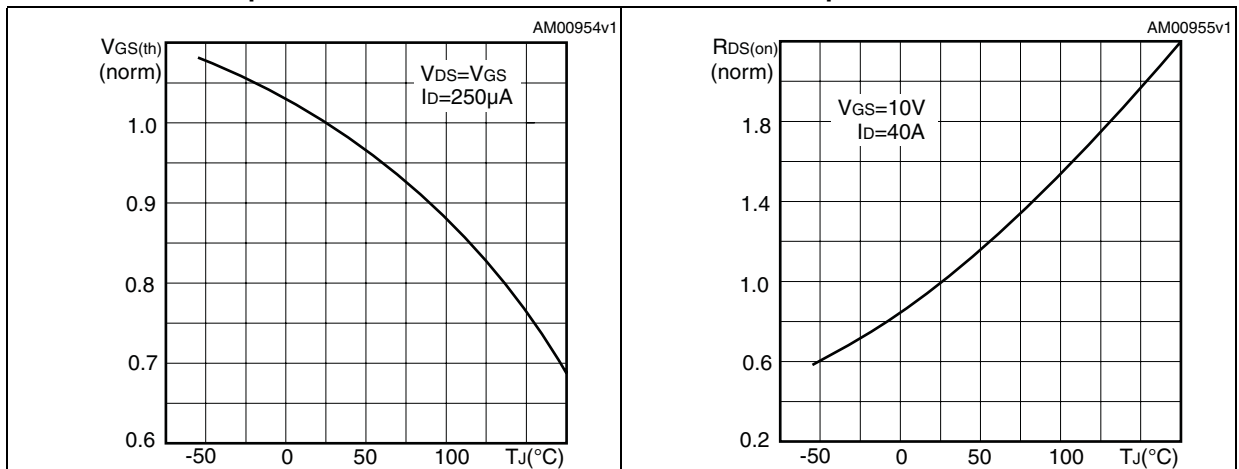
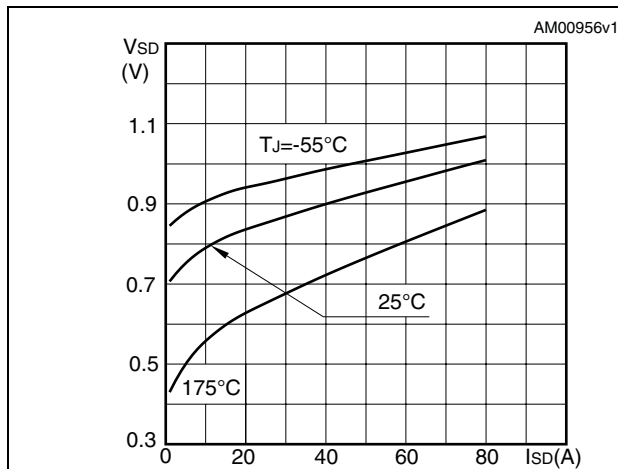


Figure 12. Source-drain diode forward characteristics





### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

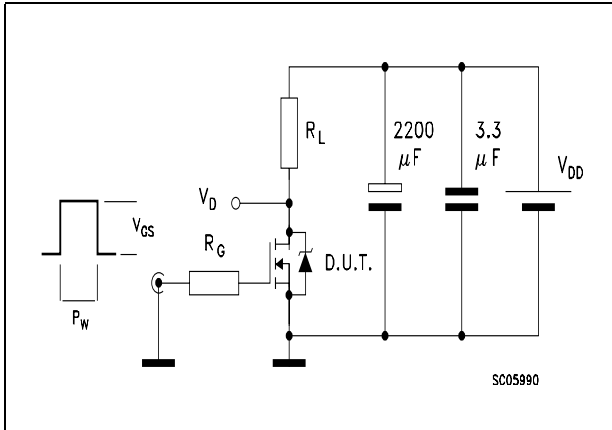


Figure 14. Gate charge test circuit

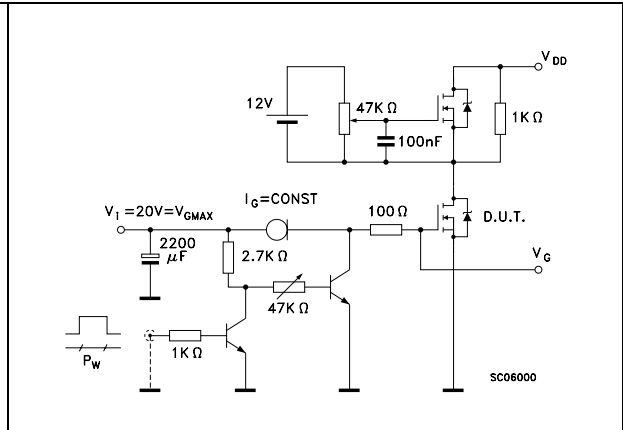


Figure 15. Test circuit for inductive load switching and diode recovery times

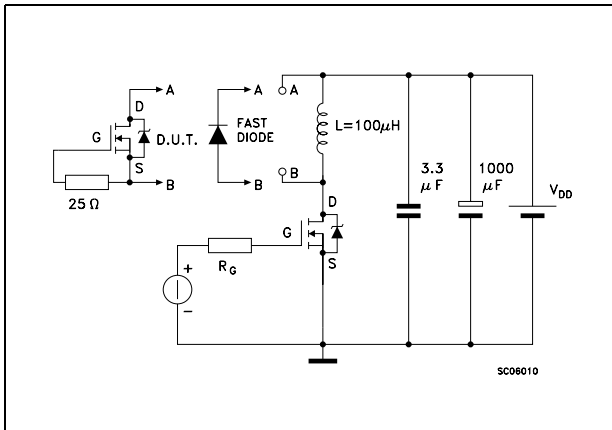


Figure 16. Unclamped inductive load test circuit

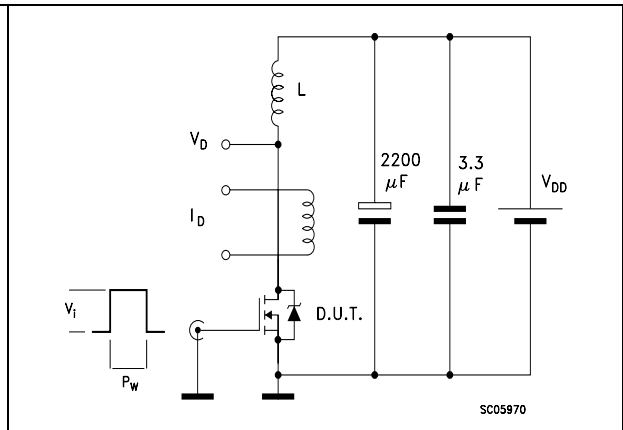
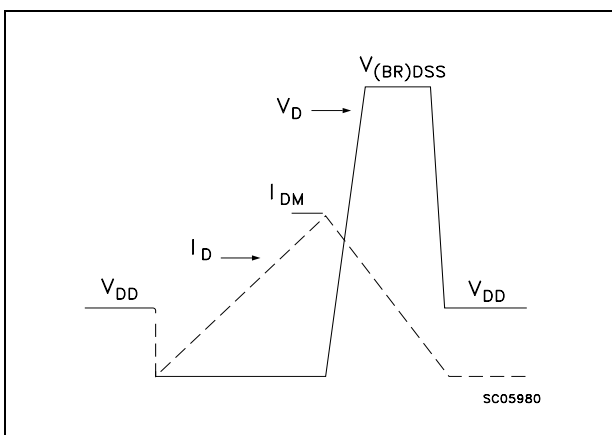


Figure 17. Unclamped inductive waveform

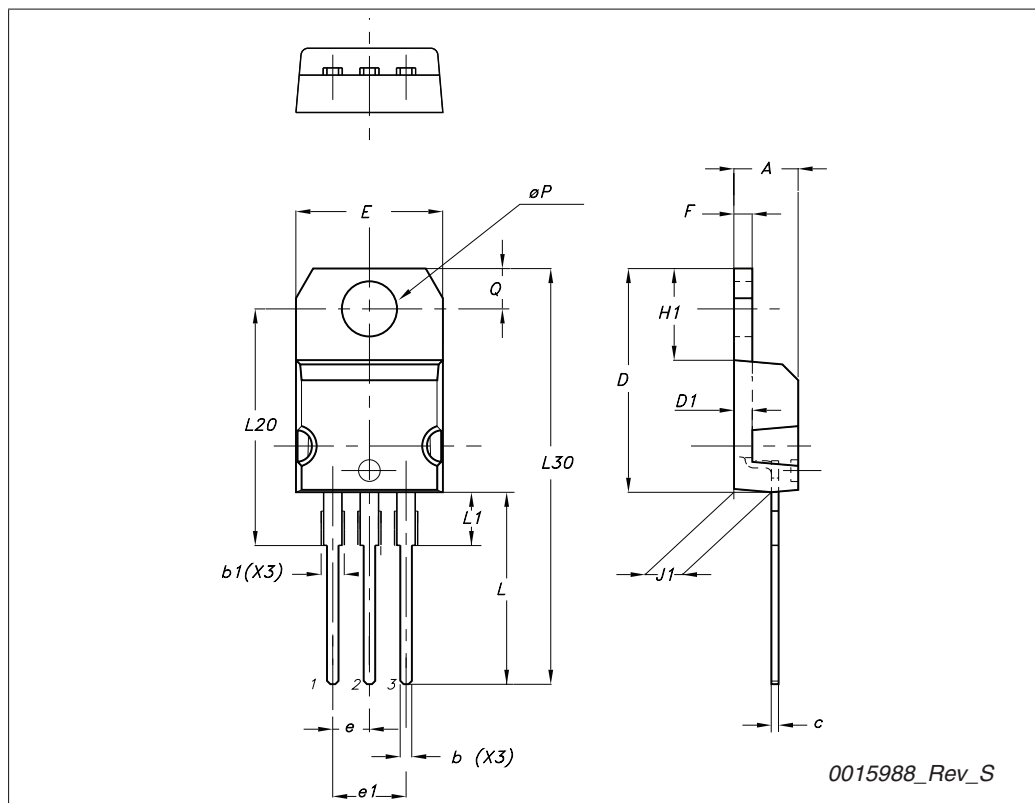


## 4 Package mechanical data

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 is an ST trademark.

## 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 |       |
| ∅P  | 3.75  |       | 3.85  |
| Q   | 2.65  |       | 2.95  |



## 5 Revision history

**Table 8. Document revision history**

| Date        | Revision | Changes        |
|-------------|----------|----------------|
| 11-Jun-2010 | 1        | First release. |

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