



STI260N6F6 STP260N6F6

N-channel 60 V, 0.0024 Ω , 120 A STripFET™ VI DeepGATE™
Power MOSFET in TO-220 and I²PAK packages

Features

| Order codes | V _{DSS} | R _{DS(on)} max | I _D |
|--------------------------|------------------|-------------------------|----------------|
| STI260N6F6 STP260N6F6 | 60 V | < 0.003 Ω | 120 A |

- Low gate charge
- Very low on-resistance
- High avalanche ruggedness

Application

- Switching applications

Description

These devices are N-channel Power MOSFETs developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFETs exhibits the lowest R_{DS(on)} in all packages.

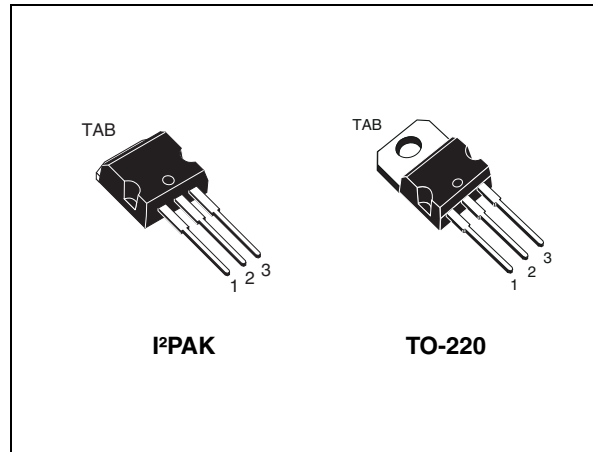


Figure 1. Internal schematic diagram

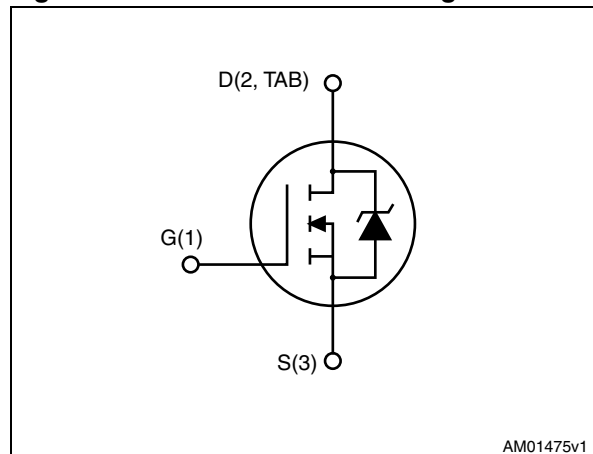


Table 1. Device summary

| Order codes | Marking | Package | Packaging |
|-------------|---------|--------------------|-----------|
| STI260N6F6 | 260N6F6 | I ² PAK | Tube |
| STP260N6F6 | | TO-220 | |

Contents

| | | |
|----------|---|-----------|
| 1 | Electrical ratings | 3 |
| 2 | Electrical characteristics | 4 |
| | 2.1 Electrical characteristics (curves) | 6 |
| 3 | Test circuits | 8 |
| 4 | Package mechanical data | 9 |
| 5 | Revision history | 13 |

1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|---|-------------|---------------------|
| V_{DS} | Drain-source voltage | 60 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| I_D | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 120 | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 120 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 480 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 300 | W |
| | Derating factor | 2 | W/ $^\circ\text{C}$ |
| T_{stg} | Storage temperature | - 55 to 175 | $^\circ\text{C}$ |
| T_j | Operating junction temperature | | |

1. Current limited by package.

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|----------------|--|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max | 0.5 | $^\circ\text{C}/\text{W}$ |
| R_{thj-a} | Thermal resistance junction-ambient max | 62.5 | $^\circ\text{C}/\text{W}$ |
| T_l | Maximum lead temperature for soldering purpose | 300 | $^\circ\text{C}$ |

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 ($V_{GS} = 0$) | $I_D = 250\ \mu A$ | 60 | | | V |
| I_{DSS} | Zero gate voltage Drain current ($V_{GS} = 0$) | $V_{DS} = 60\text{ V}$ $V_{DS} = 60\text{ V}, T_C = 125\text{ °C}$ | | | 1 100 | 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 | $V_{DS} = V_{GS}, I_D = 250\ \mu A$ | 2 | | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}, I_D = 60\text{ A}$ | | 2.4 | 3 | m Ω |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|---|------|-------|------|------|
| C_{iss} | Input capacitance | | | 11400 | | pF |
| C_{oss} | Output capacitance | $V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0$ | - | 850 | - | pF |
| C_{rss} | Reverse transfer capacitance | | | 368 | | pF |
| Q_g | Total gate charge | $V_{DD} = 30\text{ V}, I_D = 120\text{ A},$ $V_{GS} = 10\text{ V}$ <i>(see Figure 14)</i> | | 183 | | nC |
| Q_{gs} | Gate-source charge | | - | 53 | - | nC |
| Q_{gd} | Gate-drain charge | | | 41 | | nC |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|-------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 30\text{ V}, I_D = 60\text{ A}$ $R_G = 4.7\ \Omega, V_{GS} = 10\text{ V}$ <i>(see Figure 13)</i> | - | 31.4 | - | ns |
| t_r | Rise time | | - | 165 | - | ns |
| $t_{d(off)}$ | Turn-off-delay time | $V_{DD} = 30\text{ V}, I_D = 60\text{ A}$ $R_G = 4.7\ \Omega, V_{GS} = 10\text{ V}$ <i>(see Figure 13)</i> | - | 144.4 | - | ns |
| t_f | Fall time | | - | 62.6 | - | ns |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max | Unit |
|-----------------|-------------------------------|--|------|------|-----|------|
| I_{SD} | Source-drain current | | - | | 120 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 480 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 120 \text{ A}, V_{GS} = 0$ | - | | 1.1 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 120 \text{ A}, V_{DD} = 48 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s}$, $T_j = 150 \text{ }^\circ\text{C}$ <i>(see Figure 15)</i> | - | 55.6 | | ns |
| Q_{rr} | Reverse recovery charge | | | 116 | | nC |
| I_{RRM} | Reverse recovery current | | | 3.8 | | A |

1. Current limited by package.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

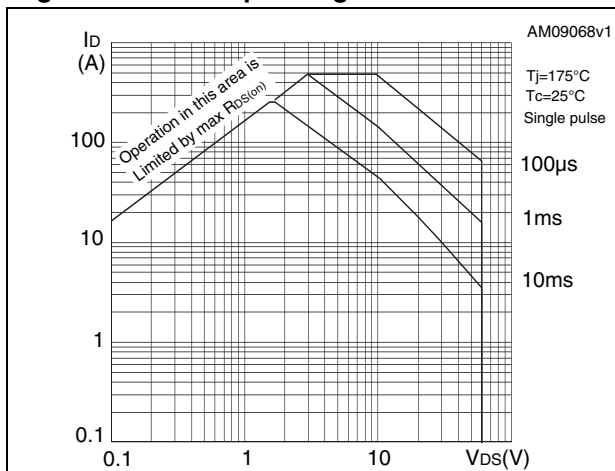


Figure 3. Thermal impedance

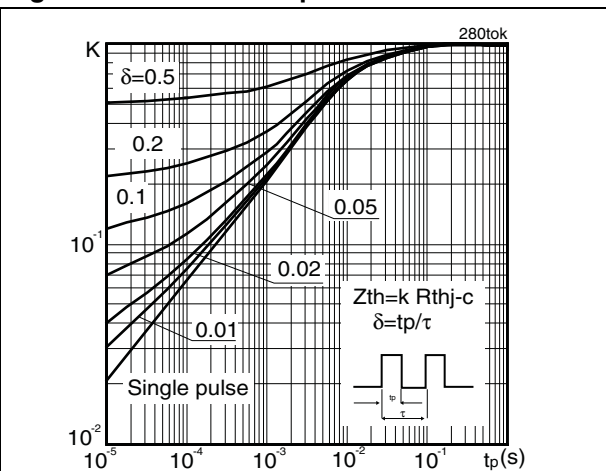


Figure 4. Output characteristics

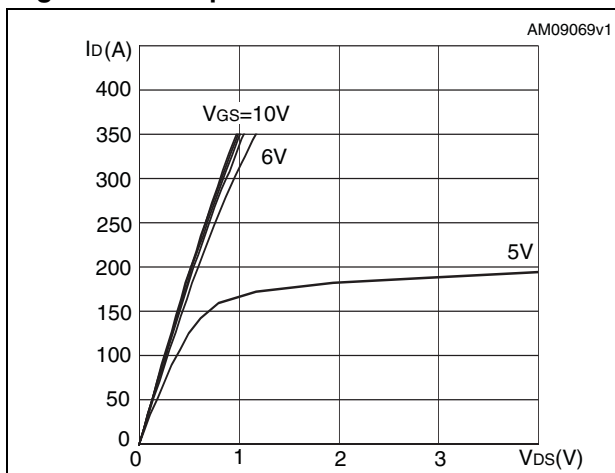


Figure 5. Transfer characteristics

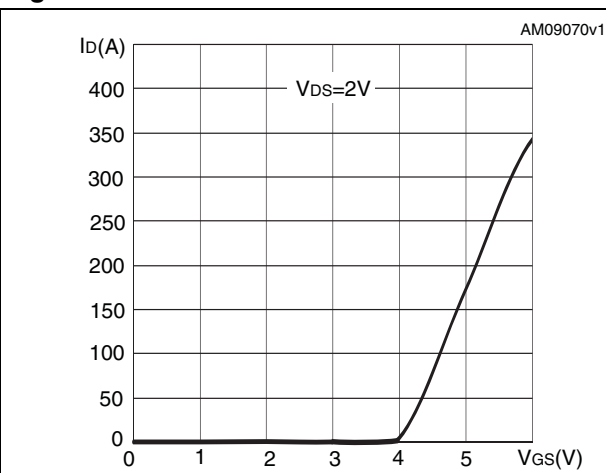


Figure 6. Normalized $B_{V_{DSS}}$ vs. temperature

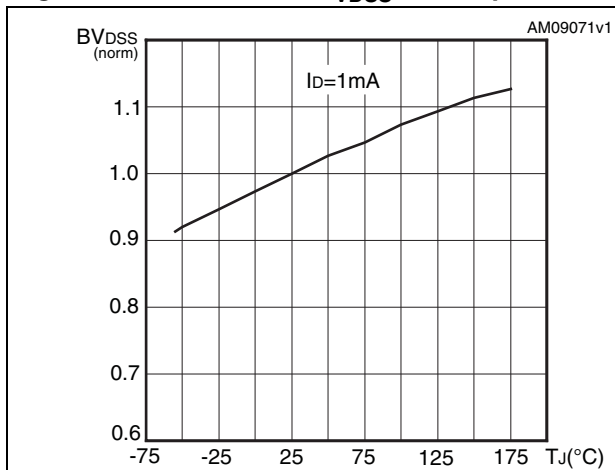


Figure 7. Static drain-source on resistance

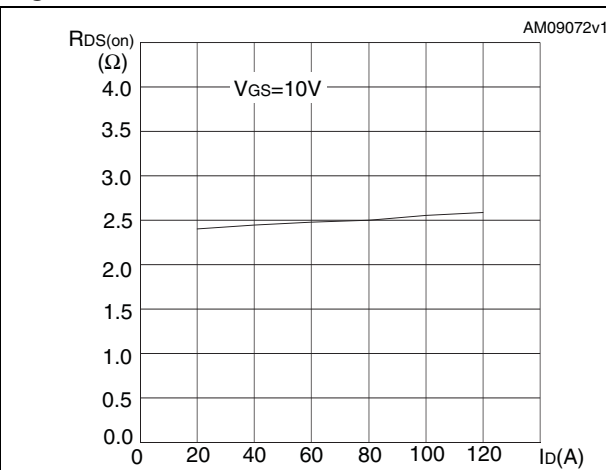


Figure 8. Gate charge vs. gate-source voltage

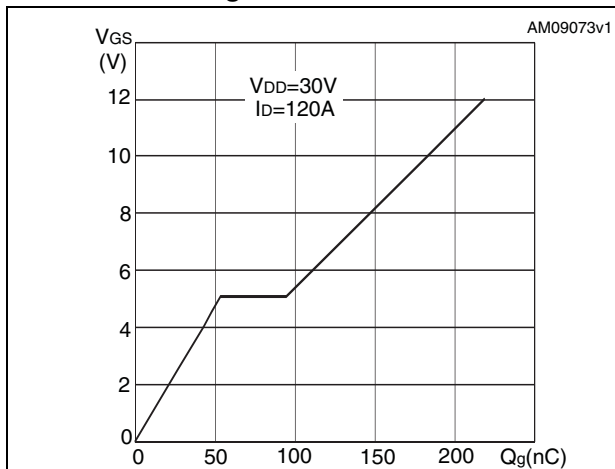


Figure 9. Capacitance variations

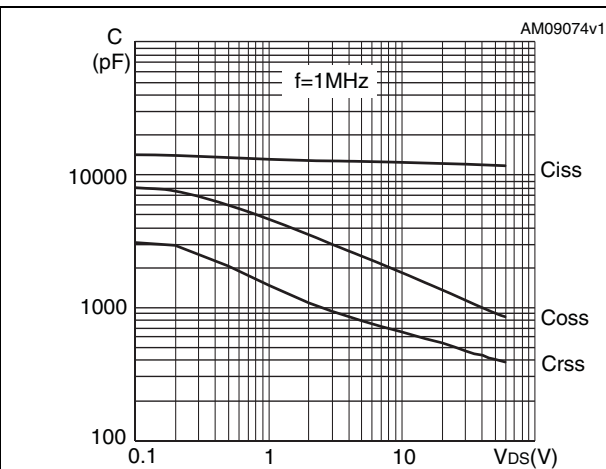


Figure 10. Normalized gate threshold voltage vs. temperature

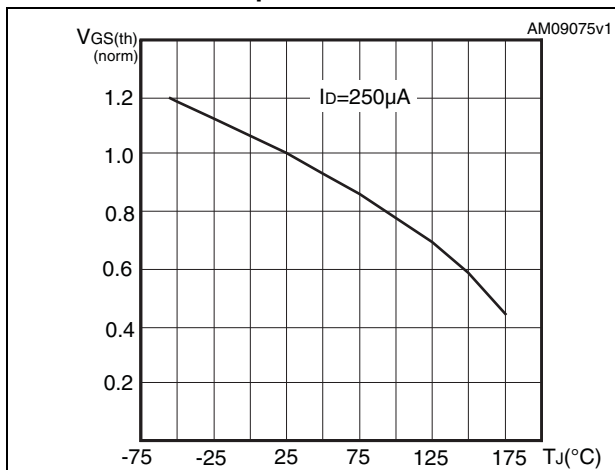


Figure 11. Normalized on resistance vs. temperature

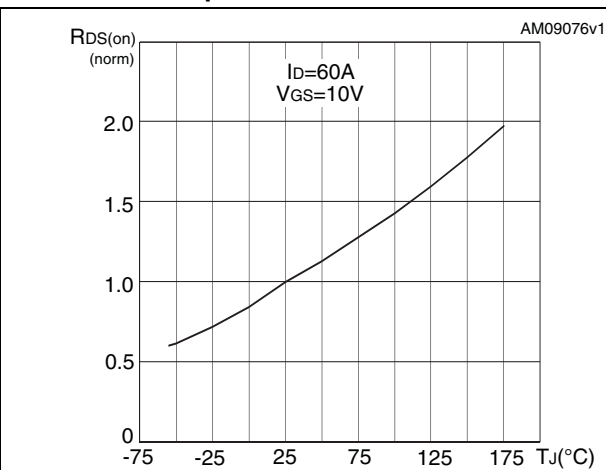
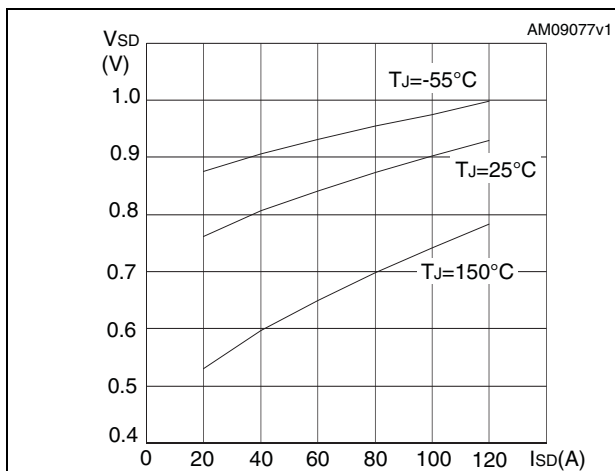


Figure 12. Source-drain diode forward characteristics



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



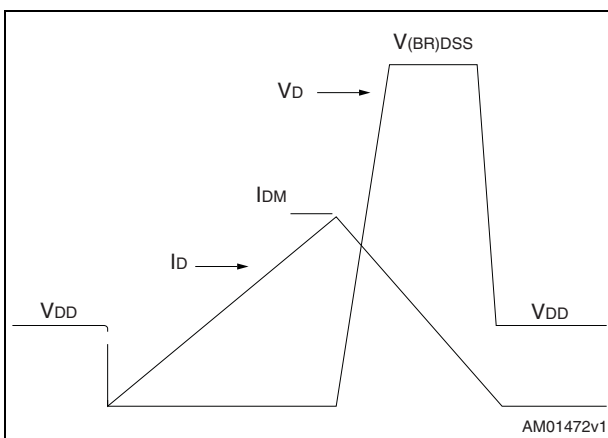
AM01470v1

Figure 16. Unclamped inductive load test circuit



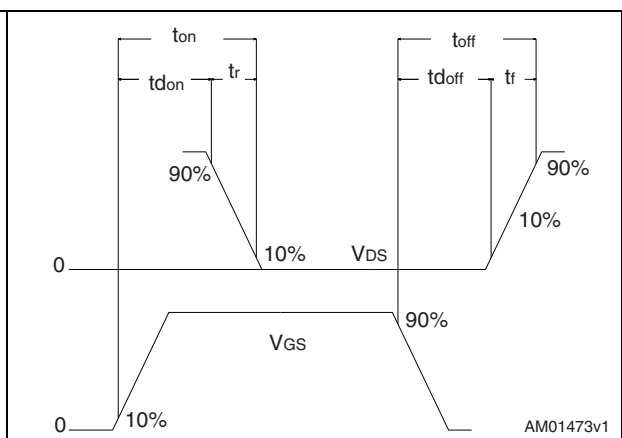
AM01471v1

Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1

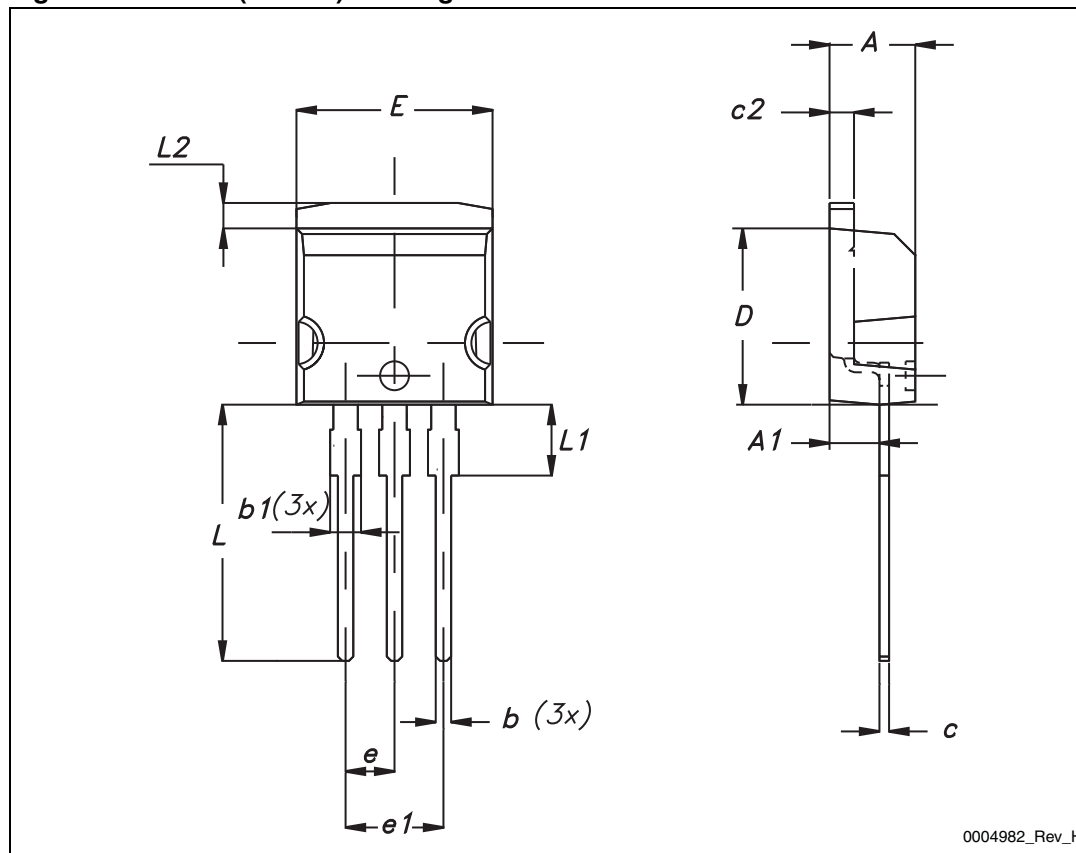
4 Package mechanical data

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 8. I²PAK (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 19. I²PAK (TO-262) drawing

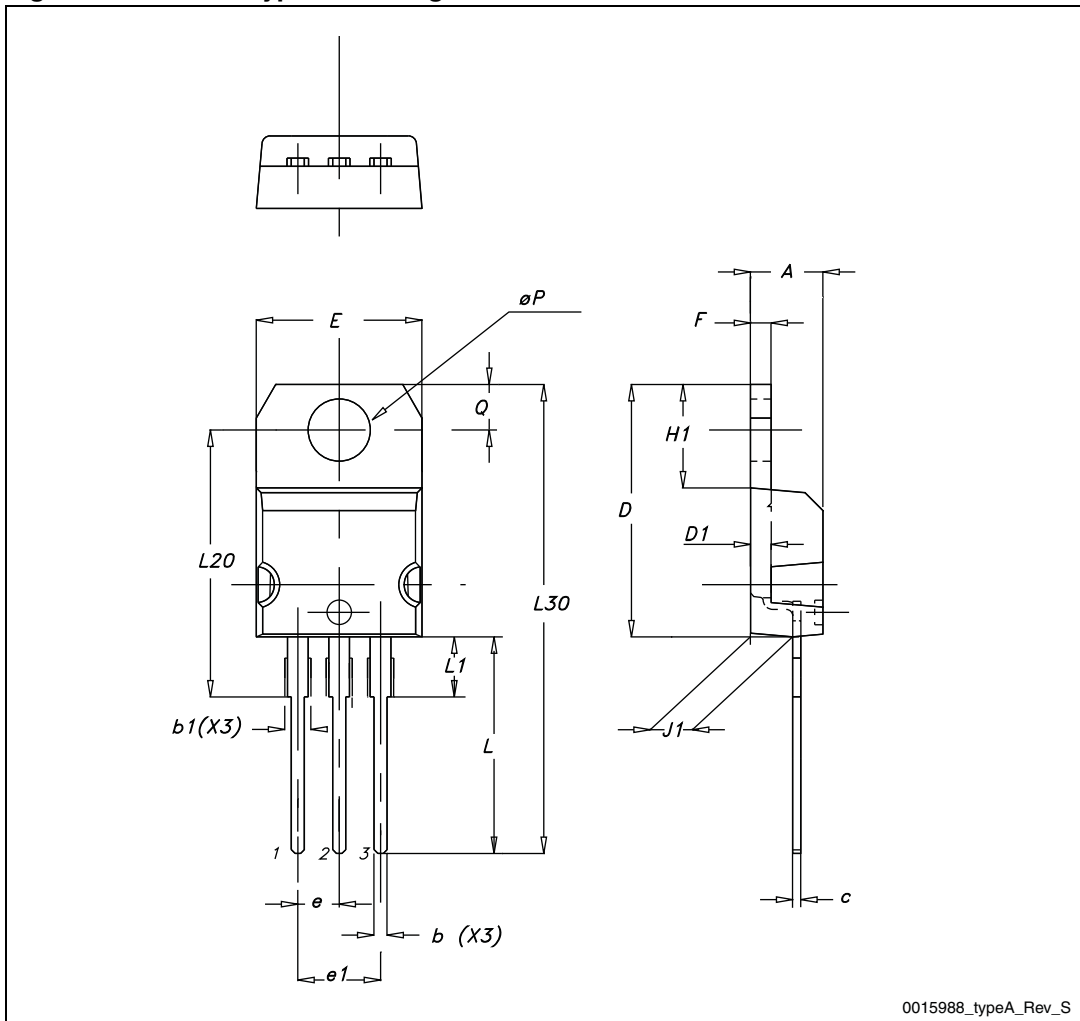


0004982_Rev_H

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 |

Figure 20. TO-220 type A drawing



0015988_typeA_Rev_S

5 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 07-May-2010 | 1 | First release. |
| 18-Apr-2011 | 2 | Document status promoted from preliminary data to datasheet. |
| 27-Apr-2011 | 3 | <i>Device summary</i> has been updated. |
| 05-Oct-2011 | 4 | <i>Table 2: Absolute maximum ratings</i> has been updated. Minor text changes. |
| 13-Jan-2012 | 5 | Updated <i>Table 2: Absolute maximum ratings</i> . |

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