# STFI260N6F6

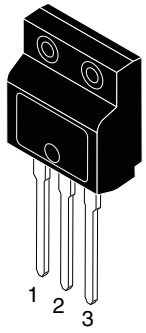
## N-channel 60 V, 0.0024 Ω, 80 A STripFET™ VI DeepGATE™ Power MOSFET in I²PAKFP package

**Datasheet — preliminary data**

## Features

| Order codes | $V_{DSS}$ | $R_{DS(on)}$ max | $I_D$ |
|---|---|---|---|
| STFI260N6F6 | 60 V | < 0.003 Ω | 80 A |

- Fully insulated and low profile package with increased creepage path from pin to heatsink plate
- Low gate charge
- Very low on-resistance
- High avalanche ruggedness

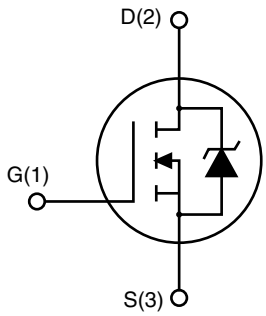



**I²PAKFP (TO-281)**

## Application

- Switching applications

**Figure 1. Internal schematic diagram**




## Description

This device is an N-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

**Table 1. Device summary**

| Order codes | Marking | Package | Packaging |
|---|---|---|---|
| STFI260N6F6 | 260N6F6 | I²PAK (TO-281) | Tube |

# Contents

# 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 °C | 80(1) | A |
| $I_D$ | Drain current (continuous) at $T_C$ = 100 °C | 80(1) | A |
| $I_{DM}$ (1) | Drain current (pulsed) | 320 | A |
| $P_{TOT}$ | Total dissipation at $T_C$ = 25 °C | 41.7 | W |
| | Derating factor | 0.28 | W/°C |
| $T_{stg}$ | Storage temperature | - 55 to 175 | °C |
| $T_j$ | Operating junction temperature | | |

1. Current limited by package.

**Table 3. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal resistance junction-case max | 3.6 | °C/W |
| $R_{thj\text{-}a}$ | Thermal resistance junction-ambient max | 62.5 | °C/W |
| $T_l$ | Maximum lead temperature for soldering purpose | 300 | °C |

# 2 Electrical characteristics

($T_{CASE}$ = 25 °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 µA | 60 | | | V |
| $I_{DSS}$ | Zero gate voltage Drain current ($V_{GS}$ = 0) | $V_{DS}$ = 60 V<br>$V_{DS}$ = 60 V, $T_C$=125 °C | | | 1<br>100 | µA<br>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, $I_D$ = 60 A | | 2.4 | 3 | mΩ |

**Table 5. Dynamic**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 25 V, f = 1 MHz, $V_{GS}$ = 0 | - | 11400 | - | pF |
| $C_{oss}$ | Output capacitance | | | 1100 | | pF |
| $C_{rss}$ | Reverse transfer capacitance | | | 400 | | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 30 V, $I_D$ = 120 A, $V_{GS}$ = 10 V *(see Figure 14)* | - | 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 V, $I_D$ = 60 A $R_G$ = 4.7 Ω $V_{GS}$ = 10 V *(see Figure 13)* | - | 31.4 | - | ns |
| $t_r$ | Rise time | | | 165 | | ns |
| $t_{d(off)}$ | Turn-off-delay time | | - | 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 A, $V_{GS}$ = 0 | - | | 1.1 | V |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse recovery time<br>Reverse recovery charge<br>Reverse recovery current | $I_{SD}$ = 120 A, $V_{DD}$ = 48 V<br>di/dt = 100 A/µs,<br>$T_j$ = 150 °C<br>*(see Figure 15)* | - | 55.6<br>116<br>3.8 | | ns<br>nC<br>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**

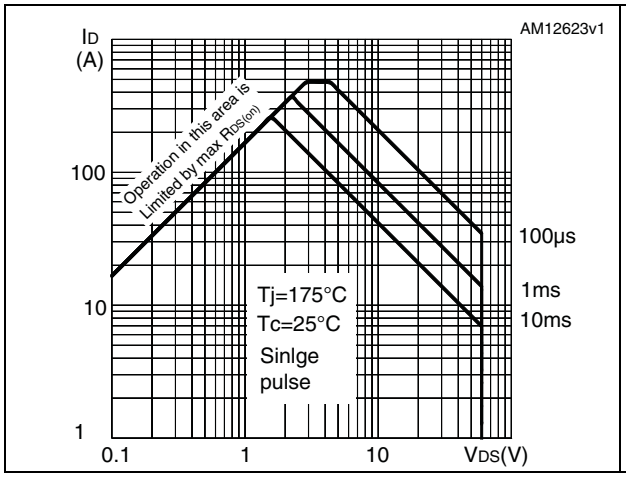



**Figure 3. Thermal impedance**

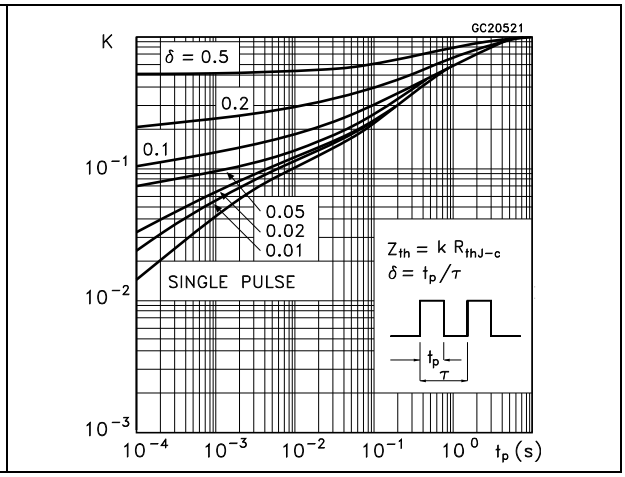



**Figure 4. Output characteristics**

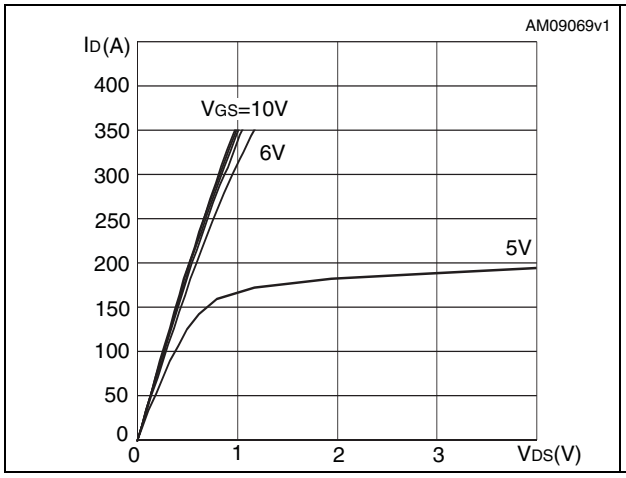



**Figure 5. Transfer characteristics**

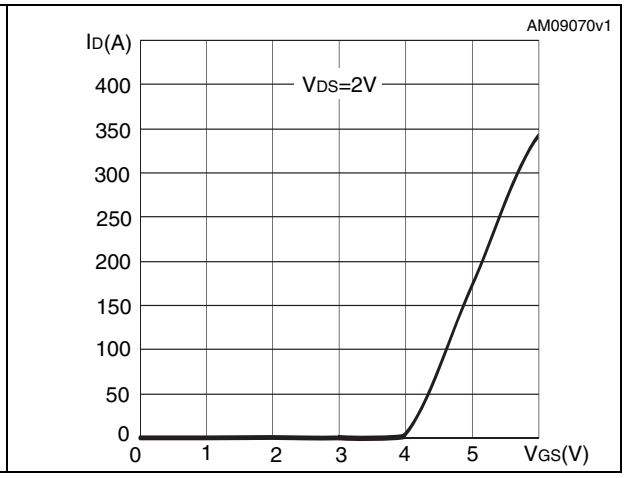



**Figure 6. Normalized $B_{VDSS}$ vs. temperature**

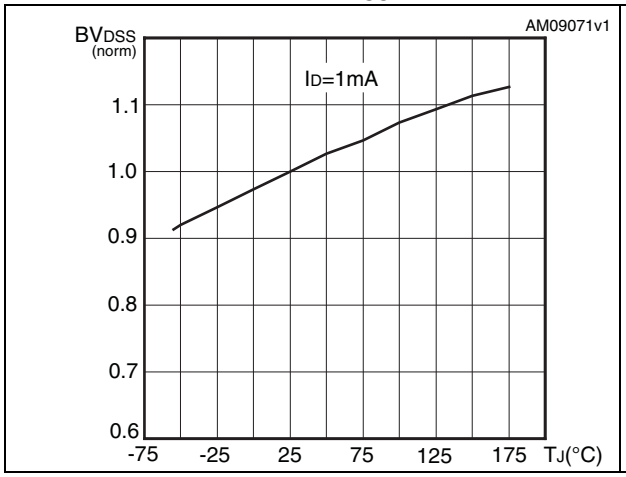



**Figure 7. Static drain-source on-resistance**

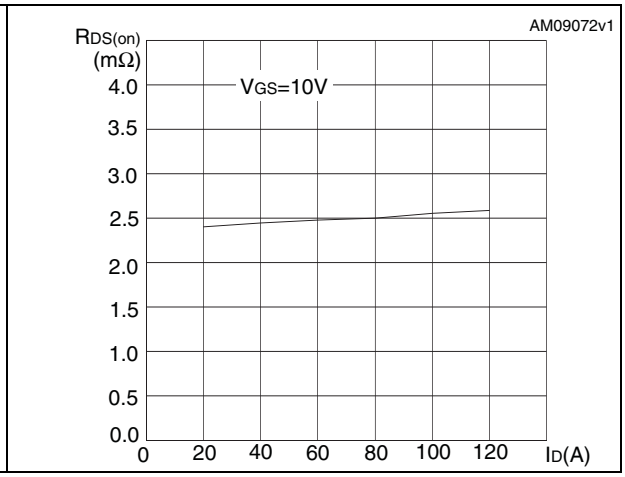


**Figure 8. Gate charge vs. gate-source voltage**

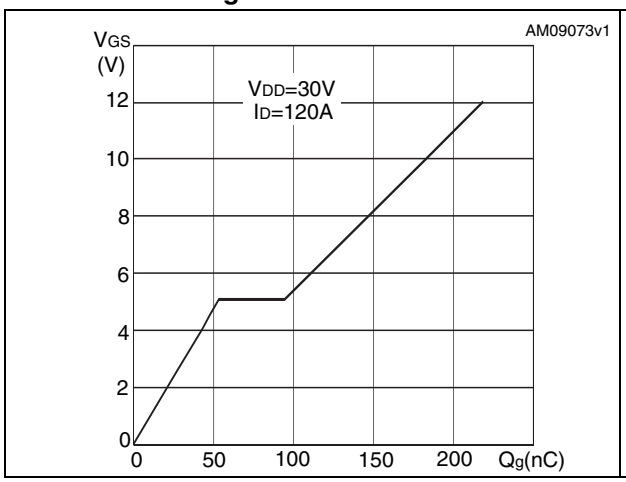



**Figure 9. Capacitance variations**

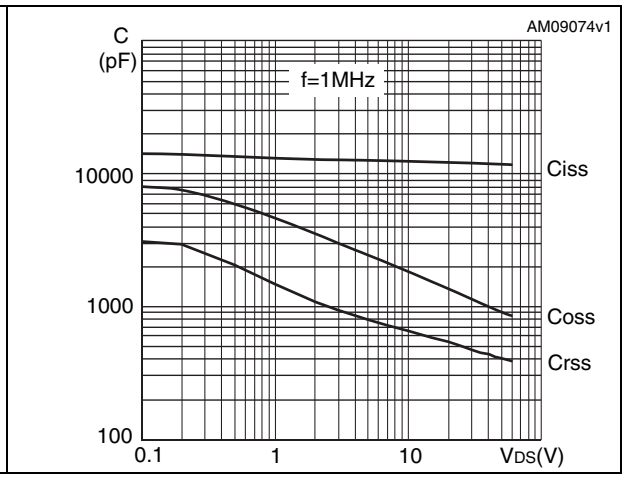



**Figure 10. Normalized gate threshold voltage vs. temperature**

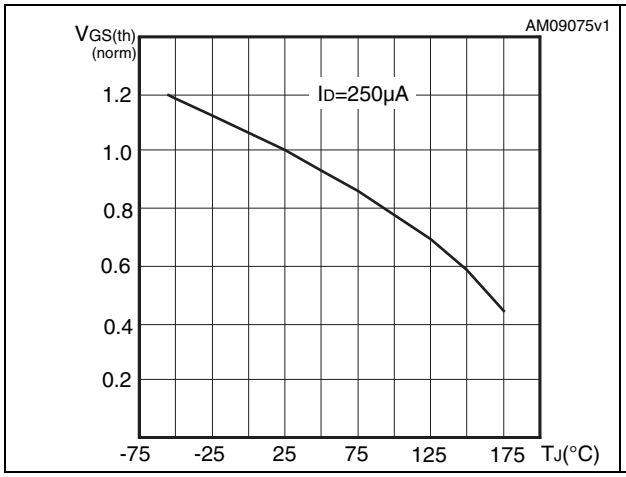



**Figure 11. Normalized on-resistance vs. temperature**

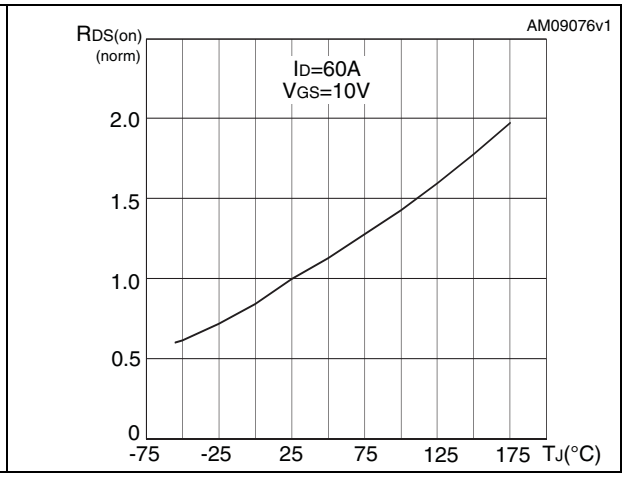
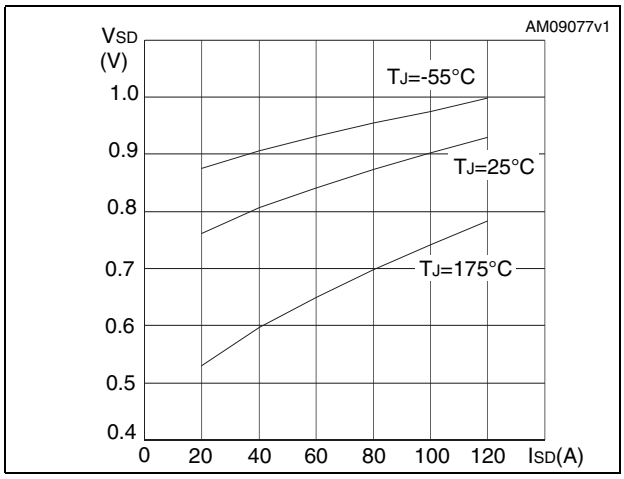



**Figure 12. Source-drain diode forward characteristics**



# 3 Test circuits

**Figure 13. Switching times test circuit for resistive load**

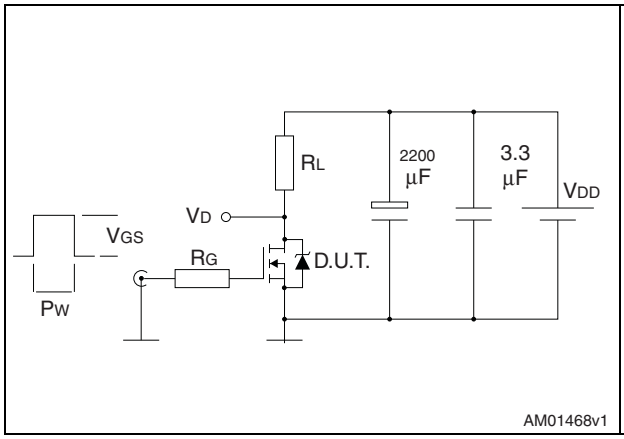



**Figure 14. Gate charge test circuit**

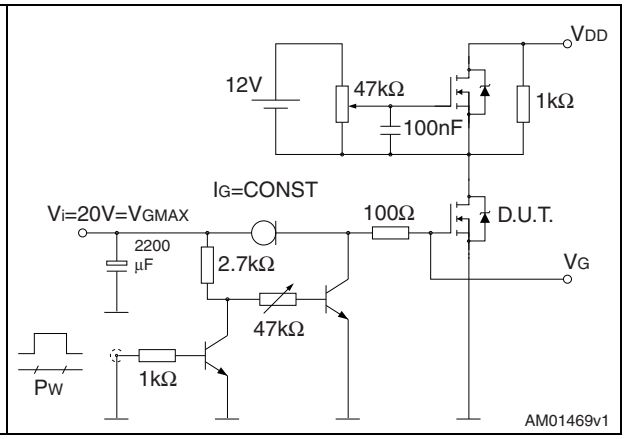



**Figure 15. Test circuit for inductive load switching and diode recovery times**

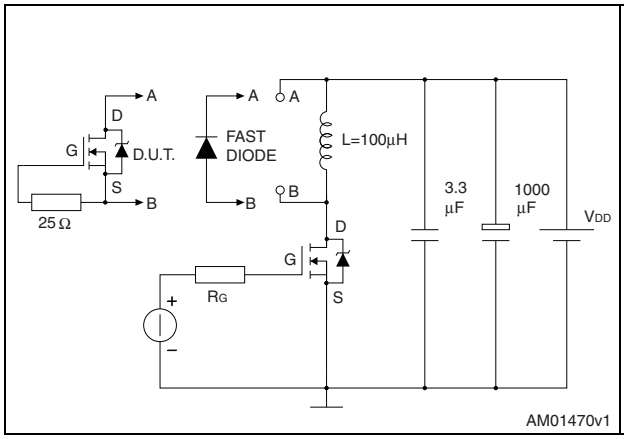



**Figure 16. Unclamped inductive load test circuit**

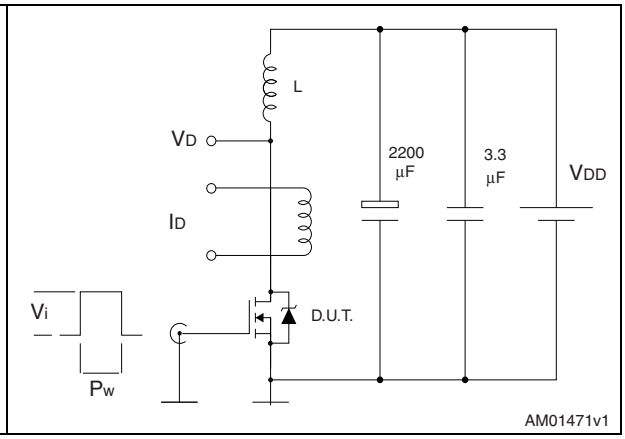



**Figure 17. Unclamped inductive waveform**

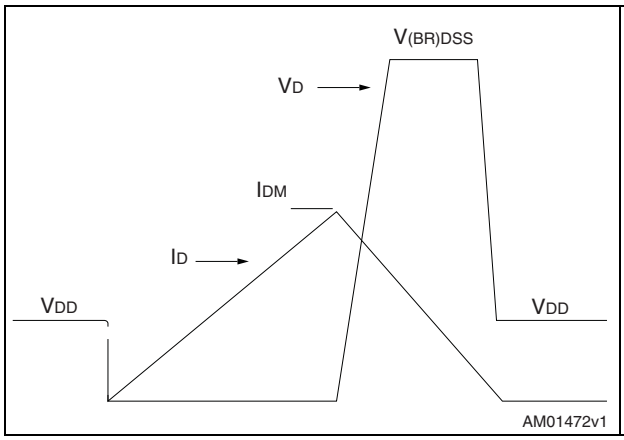
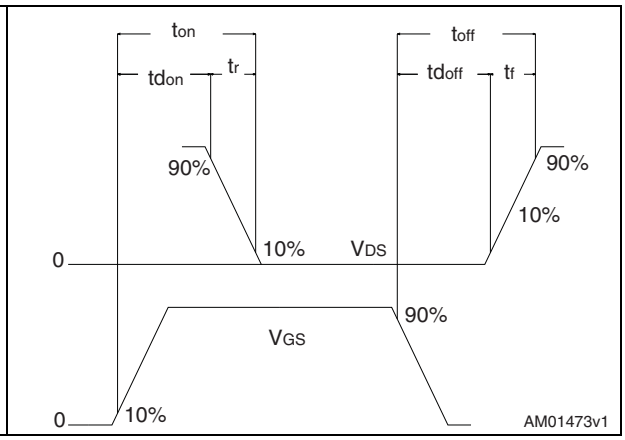



**Figure 18. Switching time waveform**



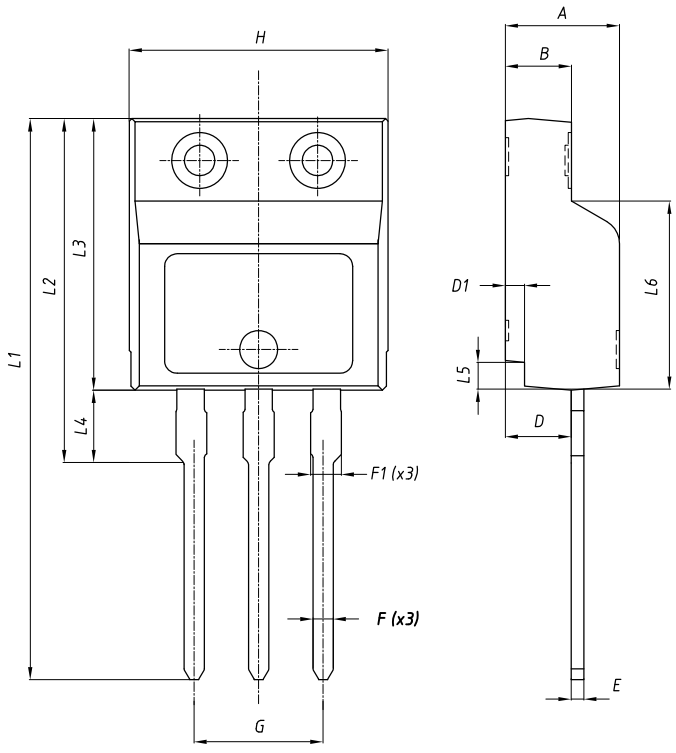
# 4 Package mechanical data

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.

Table 8. $I^2PAKFP$ (TO-281) mechanical data

| Dim. | mm | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 |
| B | 2.50 | | 2.70 |
| D | 2.50 | | 2.75 |
| D1 | 0.65 | | 0.85 |
| E | 0.45 | | 0.70 |
| F | 0.75 | | 1.00 |
| F1 | | | 1.20 |
| G | 4.95 | - | 5.20 |
| H | 10.00 | | 10.40 |
| L1 | 21.00 | | 23.00 |
| L2 | 13.20 | | 14.10 |
| L3 | 10.55 | | 10.85 |
| L4 | 2.70 | | 3.20 |
| L5 | 0.85 | | 1.25 |
| L6 | 7.30 | | 7.50 |

Figure 19. $I^2PAKFP$ (TO-281) drawing



# 5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 13-Apr-2012 | 1 | First release. |

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