



STI400N4F6, STP400N4F6

N-channel 40 V, 120 A STripFET™ VI DeepGATE™
Power MOSFET in I²PAK and TO-220 packages

Datasheet – preliminary data

Features

| Order codes | V _{DSS} | R _{DS(on)} max | I _D |
|--------------------------|------------------|-------------------------|----------------------|
| STI400N4F6 STP400N4F6 | 40 V | < 1.7 mΩ | 120 A ⁽¹⁾ |

1. Limited by package

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

Applications

- 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.

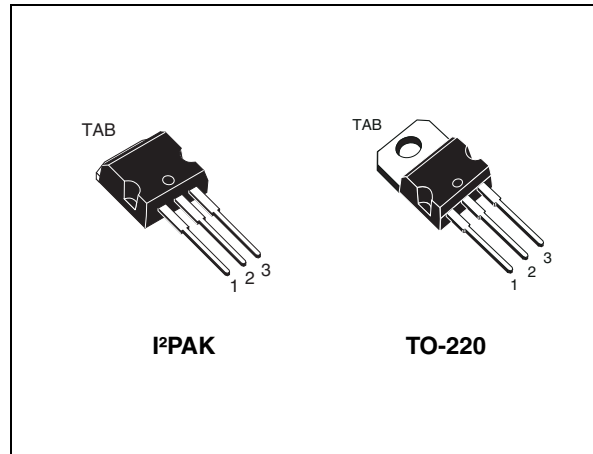
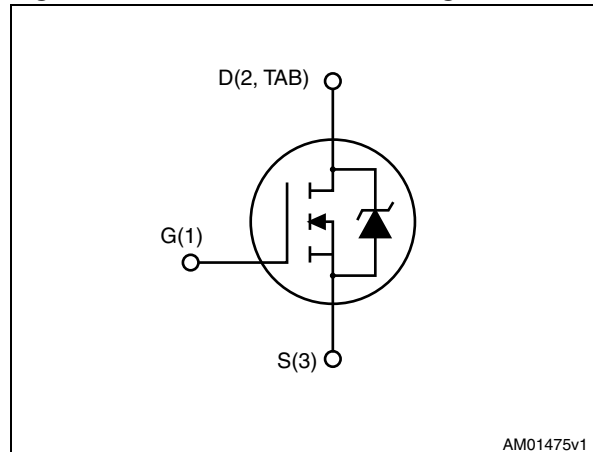


Figure 1. Internal schematic diagram



AM01475v1

Table 1. Device summary

| Order codes | Marking | Package | Packaging |
|-------------|---------|--------------------|-----------|
| STI400N4F6 | 400N4F6 | I ² PAK | Tube |
| STP400N4F6 | | TO-220 | |

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|---|-------------|---------------------|
| V_{DS} | Drain-source voltage | 40 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 120 | A |
| $I_D^{(1)}$ | 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 ($V_{GS} = 0$) | $I_D = 250\ \mu\text{A}$ | 40 | | | V |
| I_{DSS} | Zero gate voltage Drain current ($V_{GS} = 0$) | $V_{DS} = 40\ \text{V}$ $V_{DS} = 40\ \text{V}, T_C = 125\text{ °C}$ | | | 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 | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 3 | | 4.5 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\ \text{V}, I_D = 60\ \text{A}$ | | TBD | 1.7 | m Ω |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|--|------|-------|------|------|
| C_{iss} | Input capacitance | | | 20000 | | pF |
| C_{oss} | Output capacitance | $V_{DS} = 25\ \text{V}, f = 1\ \text{MHz},$ $V_{GS} = 0$ | - | 1740 | - | pF |
| C_{rss} | Reverse transfer capacitance | | | 1305 | | pF |
| Q_g | Total gate charge | | | 377 | | nC |
| Q_{gs} | Gate-source charge | $V_{DD} = 20\ \text{V}, I_D = 120\ \text{A},$ $V_{GS} = 10\ \text{V}$ | - | TBD | - | nC |
| Q_{gd} | Gate-drain charge | | | TBD | | nC |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 20\ \text{V}, I_D = 60\ \text{A}$ $R_G = 4.7\ \Omega, V_{GS} = 10\ \text{V}$ | - | TBD | - | ns |
| t_r | Rise time | | | | | |
| $t_{d(off)}$ | Turn-off-delay time | | - | TBD | - | ns |
| t_f | Fall time | | | | | |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max | Unit |
|-----------------|-------------------------------|---|------|------|-----|------|
| $I_{SD}^{(1)}$ | 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 | $I_{SD} = 120 \text{ A}, V_{DD} = 32 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s},$ $T_j = 150 \text{ }^\circ\text{C}$ | - | TBD | | ns |
| Q_{rr} | Reverse recovery charge | | | | | nC |
| I_{RRM} | Reverse recovery current | | | | | A |

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

3 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 2. I²PAK (TO-262) drawing

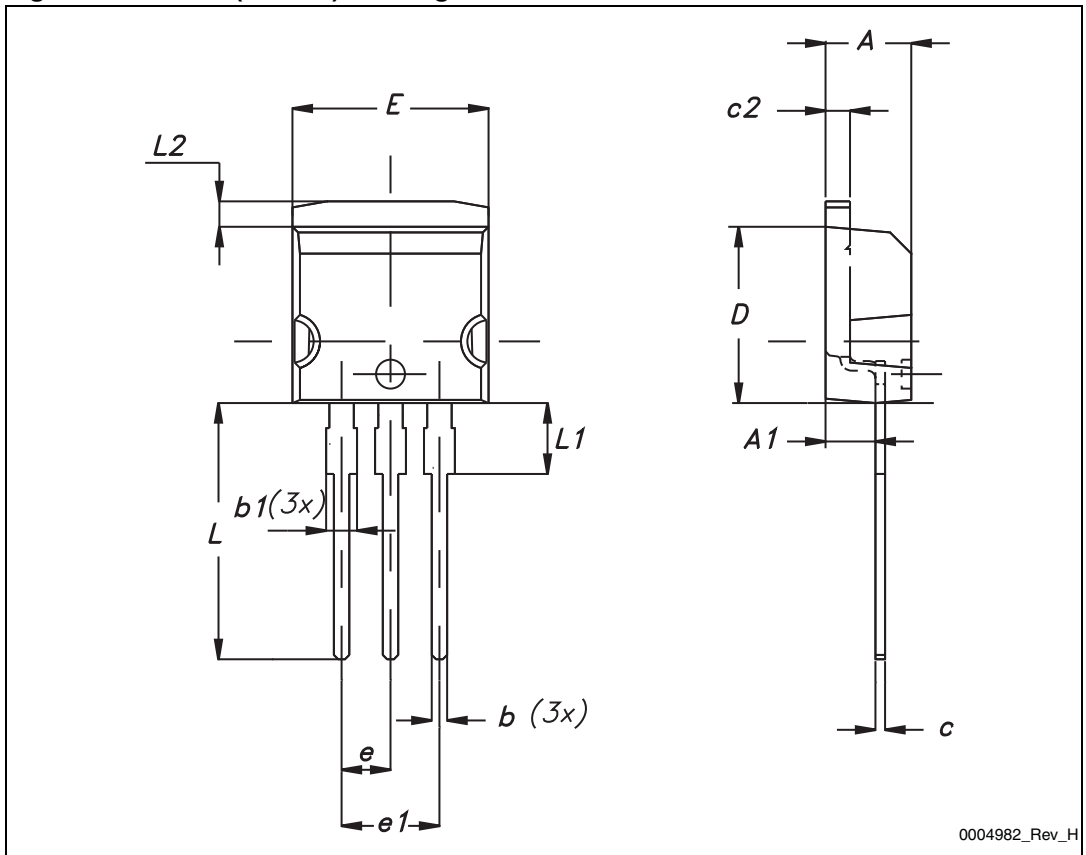
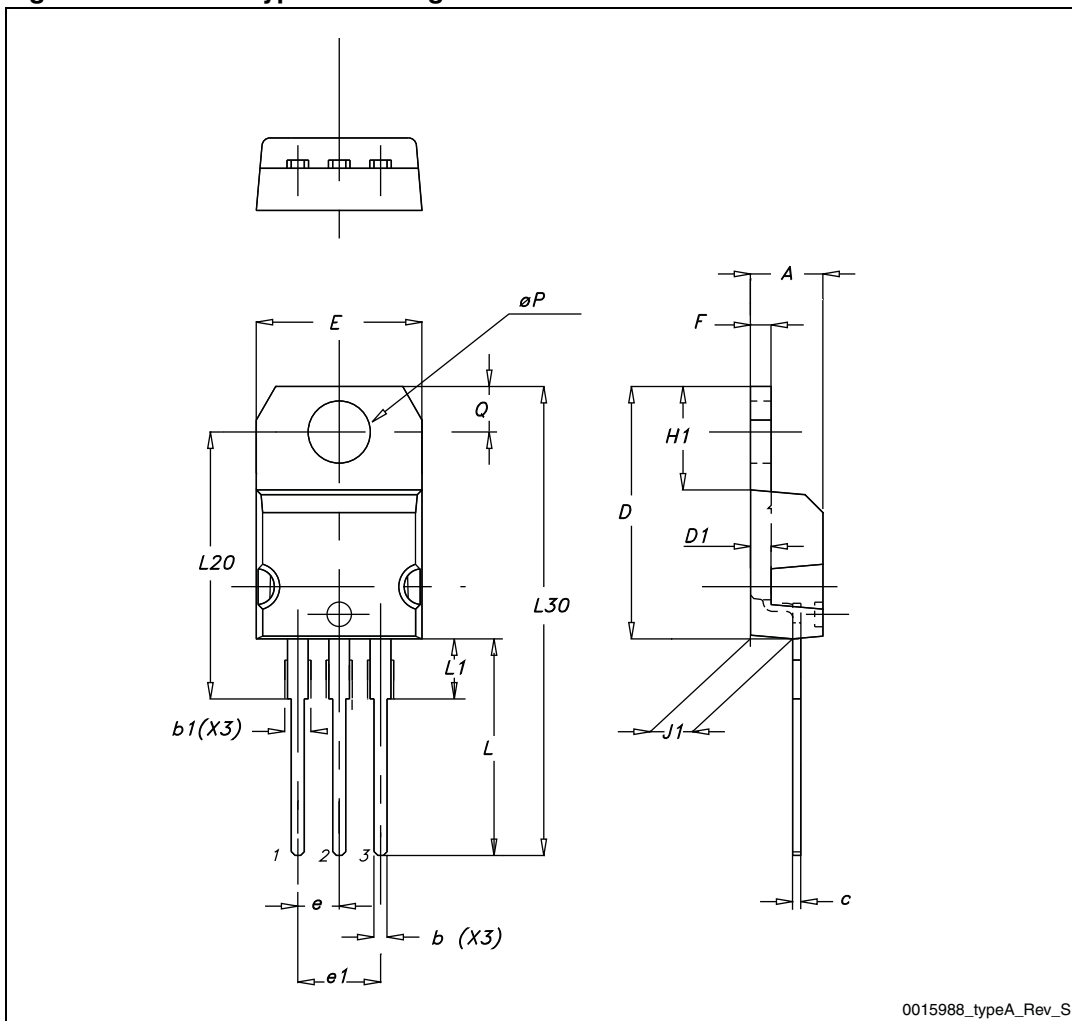


Table 9. TO-220 type A mechanical data

| 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 |

Figure 3. TO-220 type A drawing



4 Revision history

Table 10. Document revision history

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

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