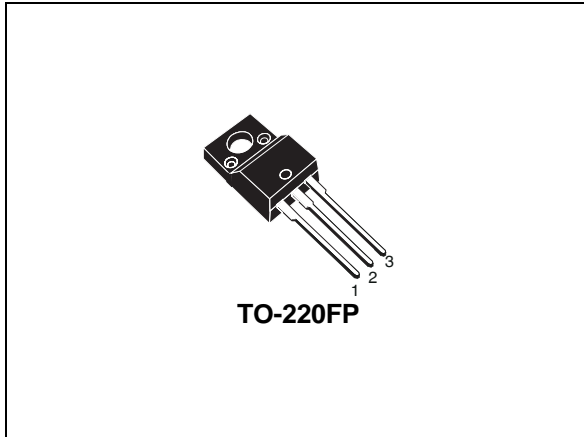


N-channel 100 V, 0.0145 Ω typ., 30 A, STripFET™ VII DeepGATE™ Power MOSFET in a TO-220FP package

Datasheet - production data



Features

| Order code | V _{DS} | R _{DS(on)} max. ⁽¹⁾ | I _D | P _{TOT} |
|------------|-----------------|---|----------------|------------------|
| STF45N10F7 | 100 V | 0.018 Ω | 30 A | 25 W |

1. @ V_{GS} = 10 V

- Ultra low on-resistance
- 100% avalanche tested

Applications

- Switching applications

Description

This device utilizes the 7th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Figure 1. Internal schematic diagram

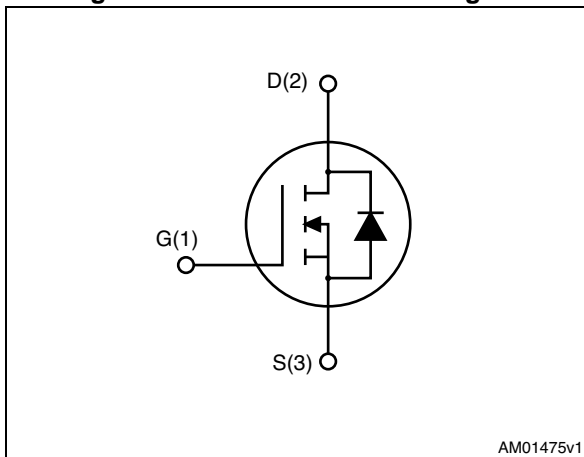


Table 1. Device summary

| Order codes | Marking | Package | Packaging |
|-------------|---------|----------|-----------|
| STF45N10F7 | 45N10F7 | TO-220FP | Tube |

Contents

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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 | 20 | V |
| I_D | Drain current (continuous) at $T_C = 25\text{ °C}$ | 30 | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ °C}$ | 21.4 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 120 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ °C}$ | 25 | W |
| V_{ISO} | Insulation withstand voltage (RMS) from all three leads to external heat sink ($t=1\text{ s}; T_C=25\text{ °C}$) | 2500 | V |
| T_J | Operating junction temperature | -55 to 175 | °C |
| T_{stg} | Storage temperature | | °C |

1. Pulse width limited by safe operating area.

Table 3. Thermal resistance

| Symbol | Parameter | Value | Unit |
|----------------|-------------------------------------|-------|------|
| $R_{thj-case}$ | Thermal resistance junction-case | 6 | °C/W |
| $R_{thj-amb}$ | Thermal resistance junction-ambient | 62.5 | °C/W |

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 ($V_{GS} = 0$) | $I_D = 1\text{ mA}$ | 100 | | - | V |
| I_{DSS} | Zero gate voltage drain current ($V_{GS} = 0$) | $V_{DS} = 100\text{ V}$ | | | 10 | μA |
| | | $V_{DS} = 100\text{ V}; T_C = 125\text{ °C}$ | | | 100 | μA |
| 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 | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}$ | | 0.0145 | 0.018 | Ω |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|--|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 50\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$ | - | 1640 | - | pF |
| C_{oss} | Output capacitance | | - | 360 | - | pF |
| C_{riss} | Reverse transfer capacitance | | - | 25 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 50\text{ V}, I_D = 30\text{ A}$ | - | 25 | - | nC |
| Q_{gs} | Gate-source charge | $V_{GS} = 10\text{ V}$ | - | 5.1 | - | nC |
| Q_{gd} | Gate-drain charge | Figure 14 | - | 12.2 | - | nC |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 50\text{ V}, I_D = 15\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ Figure 13 | - | 15 | - | ns |
| t_r | Rise time | | - | 17 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 24 | - | ns |
| t_f | Fall time | | - | 8 | - | ns |

Table 7. Source-drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain current | | - | | 30 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 120 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 30 \text{ A}, V_{GS} = 0$ | - | | 1.1 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 30 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 80 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$ | - | 53 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 67 | | nC |
| I_{RRM} | Reverse recovery current | | - | 2.5 | | A |

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration=300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

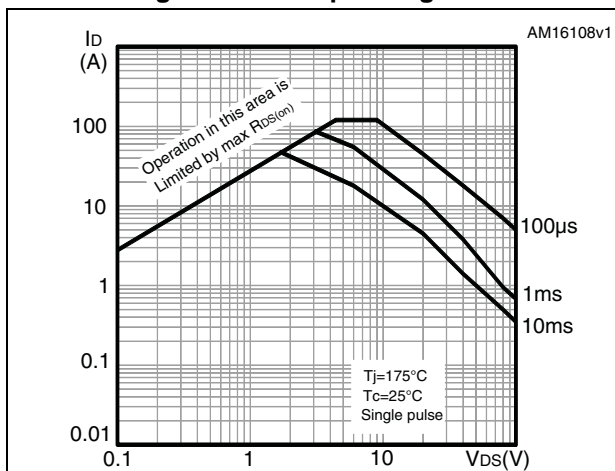


Figure 3. Thermal impedance

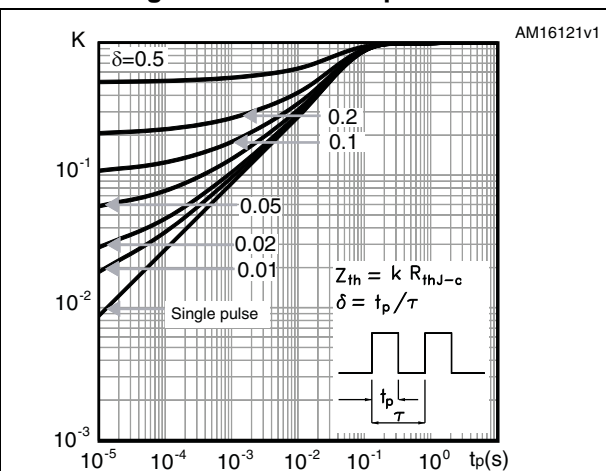


Figure 4. Output characteristics

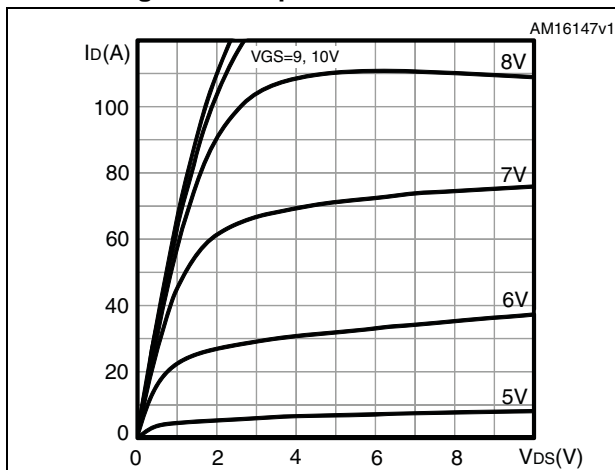


Figure 5. Transfer characteristics

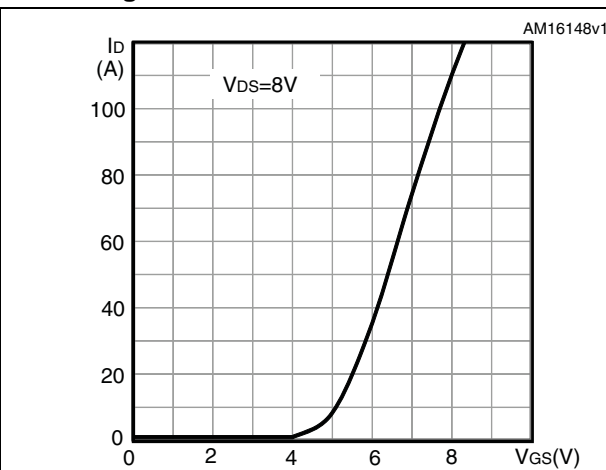


Figure 6. Gate charge vs gate-source voltage

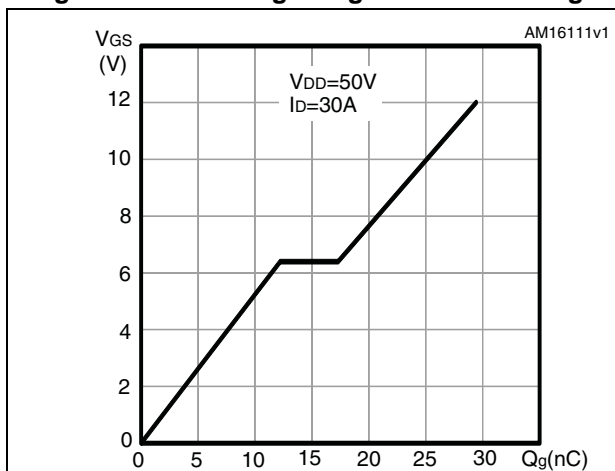


Figure 7. Static drain-source on-resistance

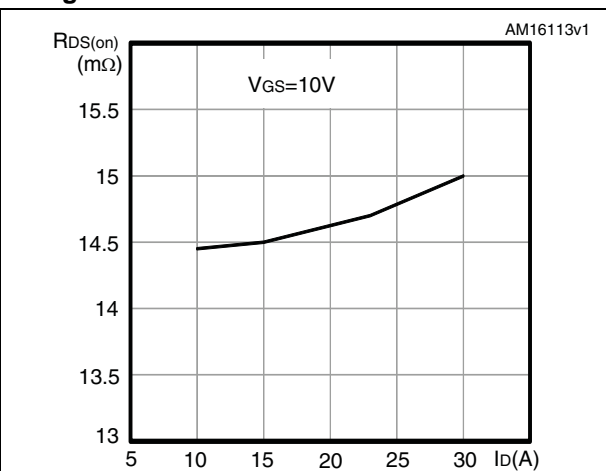


Figure 8. Capacitance variations

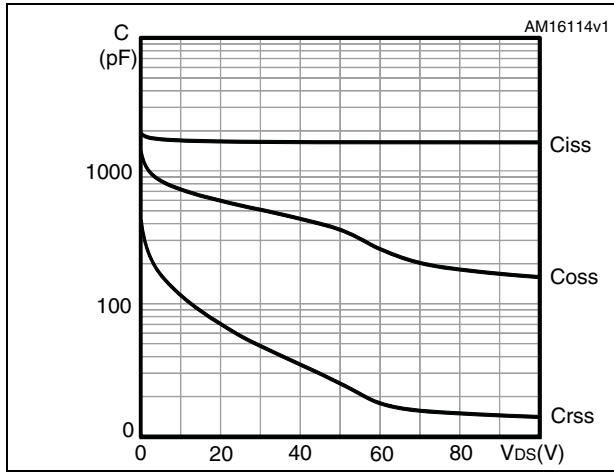


Figure 9. Normalized gate threshold voltage vs temperature

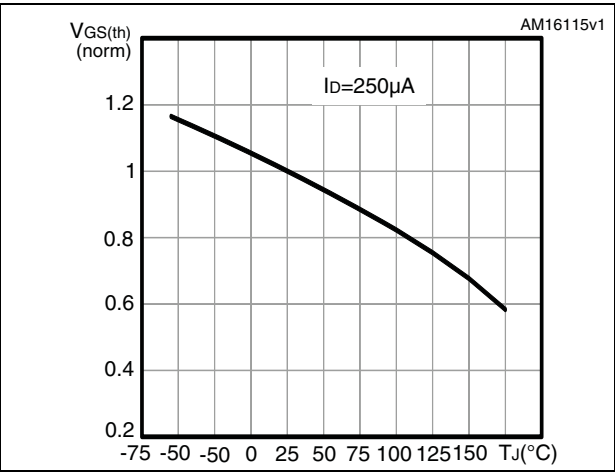


Figure 10. Normalized on-resistance vs temperature

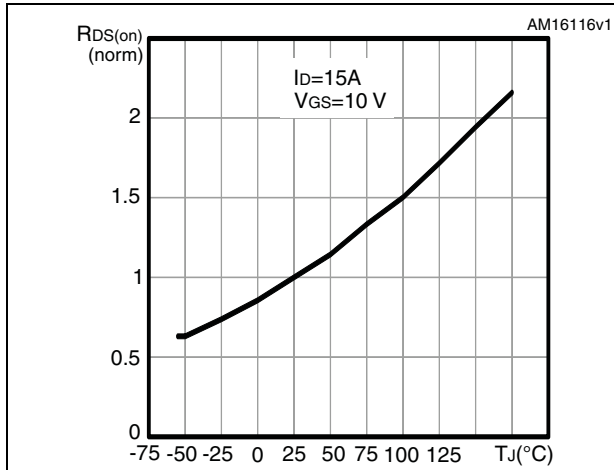


Figure 11. Normalized V(BR)DS vs temperature

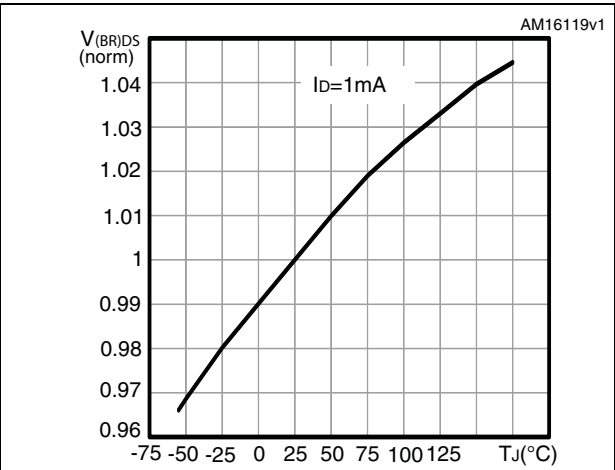
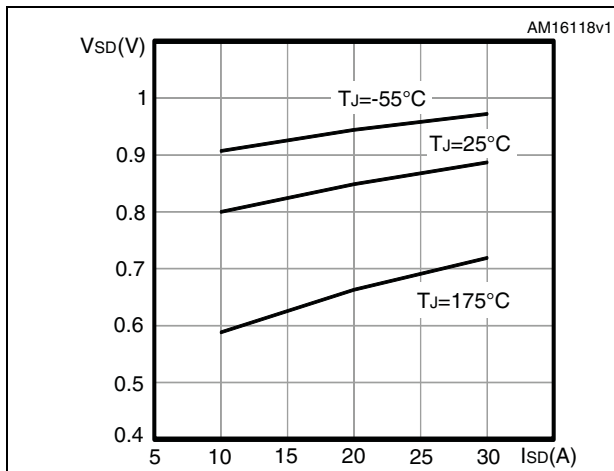


Figure 12. Source-drain diode forward characteristics



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



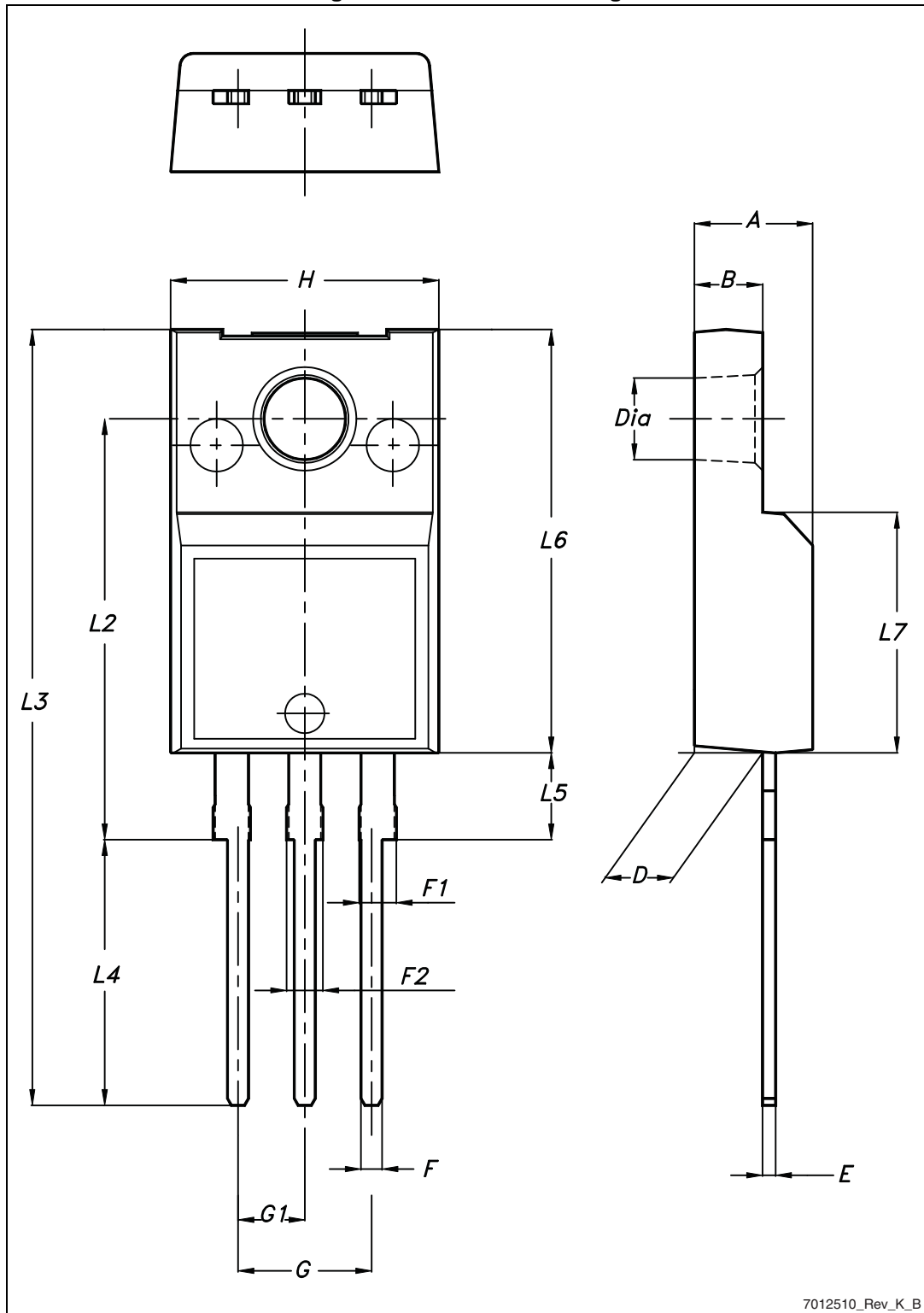
4 Package mechanical data

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. TO-220FP mechanical data

| Dim. | mm | | |
|------|------|------|------|
| | Min. | Typ. | Max. |
| A | 4.4 | | 4.6 |
| B | 2.5 | | 2.7 |
| D | 2.5 | | 2.75 |
| E | 0.45 | | 0.7 |
| F | 0.75 | | 1 |
| F1 | 1.15 | | 1.70 |
| F2 | 1.15 | | 1.70 |
| G | 4.95 | | 5.2 |
| G1 | 2.4 | | 2.7 |
| H | 10 | | 10.4 |
| L2 | | 16 | |
| L3 | 28.6 | | 30.6 |
| L4 | 9.8 | | 10.6 |
| L5 | 2.9 | | 3.6 |
| L6 | 15.9 | | 16.4 |
| L7 | 9 | | 9.3 |
| Dia | 3 | | 3.2 |

Figure 19. TO-220FP drawing



7012510_Rev_K_B

5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 03-Dec-2012 | 1 | First release. |
| 06-Dec-2012 | 2 | Minor text changes The part number STH110N10F7-2 has been moved to a separate datasheet The part number STP110N10F7 has been moved to a separate datasheet |
| 11-Nov-2013 | 3 | Document status promoted from preliminary to production data. |

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