

N-channel 100 V, 0.02 Ω typ., 24 A STripFET™ F7 Power MOSFET in a TO-220FP package

Datasheet - production data

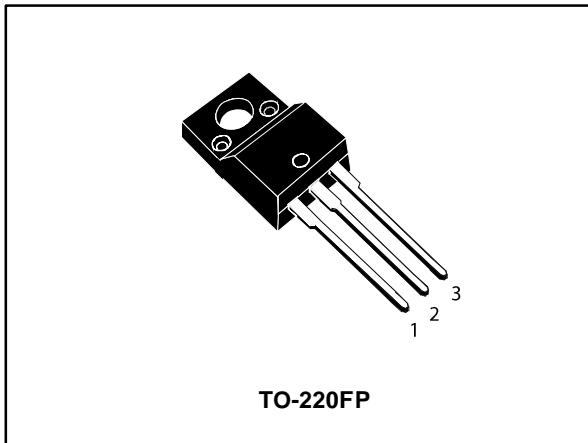
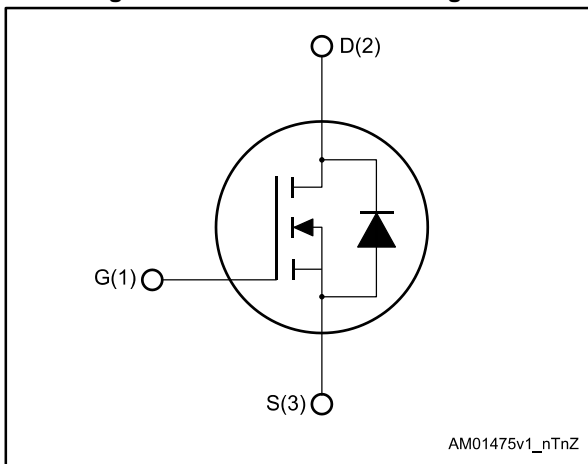


Figure 1: Internal schematic diagram



Features

- Among the lowest $R_{DS(on)}$ on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

| Order code | Marking | Package | Packing |
|------------|---------|----------|---------|
| STF30N10F7 | 30N10F7 | 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 ⁽¹⁾ | Drain current (continuous) at T _C = 25 °C | 24 | A |
| I _D ⁽¹⁾ | Drain current (continuous) at T _C = 100 °C | 16 | A |
| I _{DM} ⁽¹⁾⁽²⁾ | Drain current (pulsed) | 96 | A |
| P _{TOT} | Total dissipation at T _C = 25 °C | 25 | W |
| V _{ISO} | Insulation withstand voltage (RMS) from all three leads to external heat sink (t=1 s; T _C =25 °C) | 2500 | V |
| T _J | Operating junction temperature range | -55 to 175 | °C |
| T _{stg} | Storage temperature range | | |

Notes:

⁽¹⁾Current is limited by package.

⁽²⁾Pulse width limited by safe operating area.

Table 3: Thermal data

| 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

($T_C = 25\text{ °C}$ unless otherwise specified)

Table 4: On /off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|--|------|------|-------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$ | 100 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$ | | | 1 | μA |
| | | $V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $T_C = 125\text{ °C}^{(1)}$ | | | 100 | μA |
| I_{GSS} | Gate-body leakage current | $V_{DS} = 0\text{ V}$, $V_{GS} = +20\text{ V}$ | | | 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 | $V_{GS} = 10\text{ V}$, $I_D = 16\text{ A}$ | | 0.02 | 0.024 | Ω |

Notes:

⁽¹⁾Defined by design, not subject to production test

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|---|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 1270 | - | pF |
| C_{oss} | Output capacitance | | - | 290 | - | pF |
| C_{rss} | Reverse transfer capacitance | | - | 24 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 50\text{ V}$, $I_D = 32\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior") | - | 19 | - | nC |
| Q_{gs} | Gate-source charge | | - | 9 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 4.5 | - | nC |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 50\text{ V}$, $I_D = 16\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times") | - | 12 | - | ns |
| t_r | Rise time | | - | 17.5 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 22 | - | ns |
| t_f | Fall time | | - | 5.6 | - | ns |

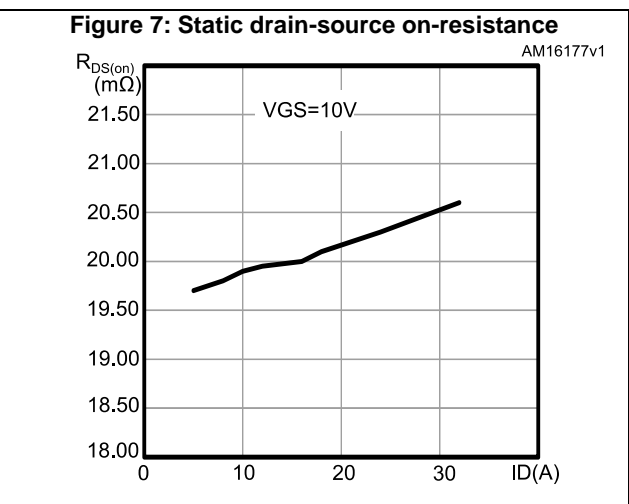
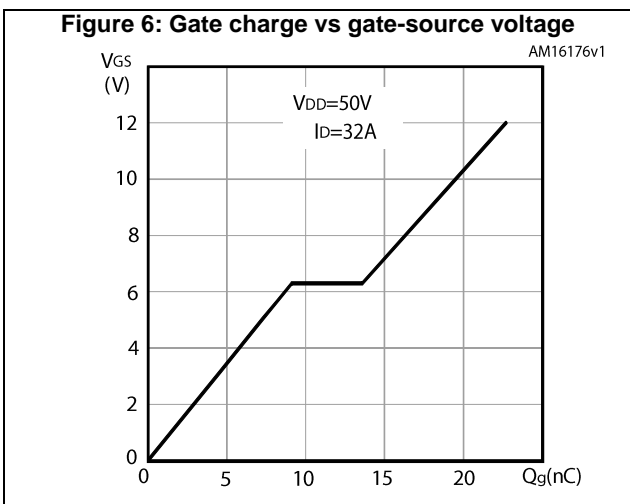
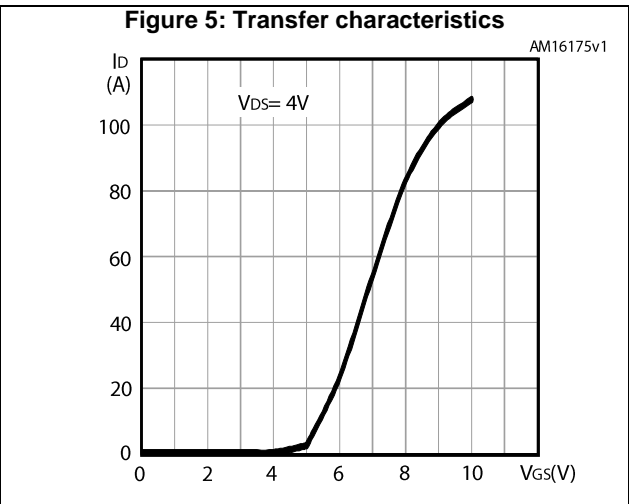
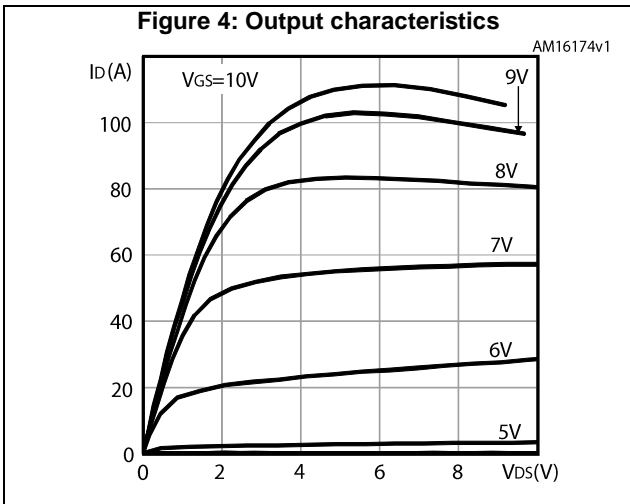
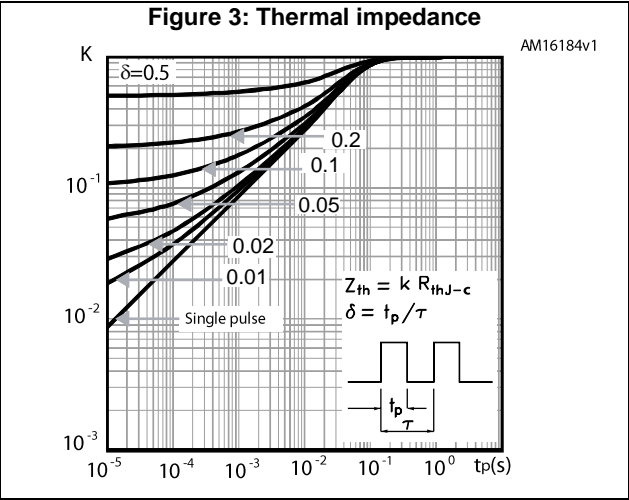
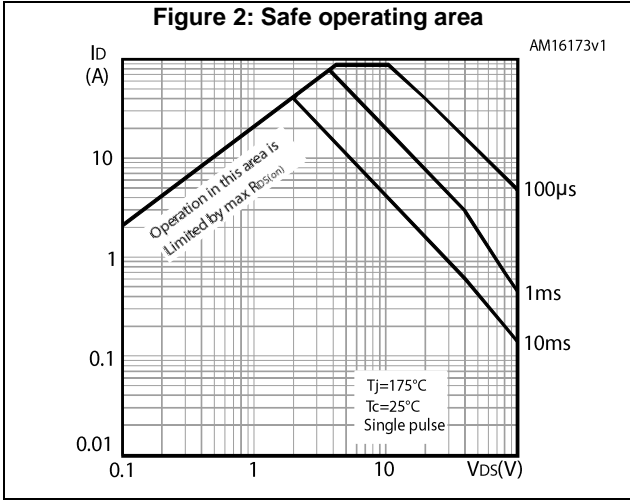
Table 7: Source-drain diode

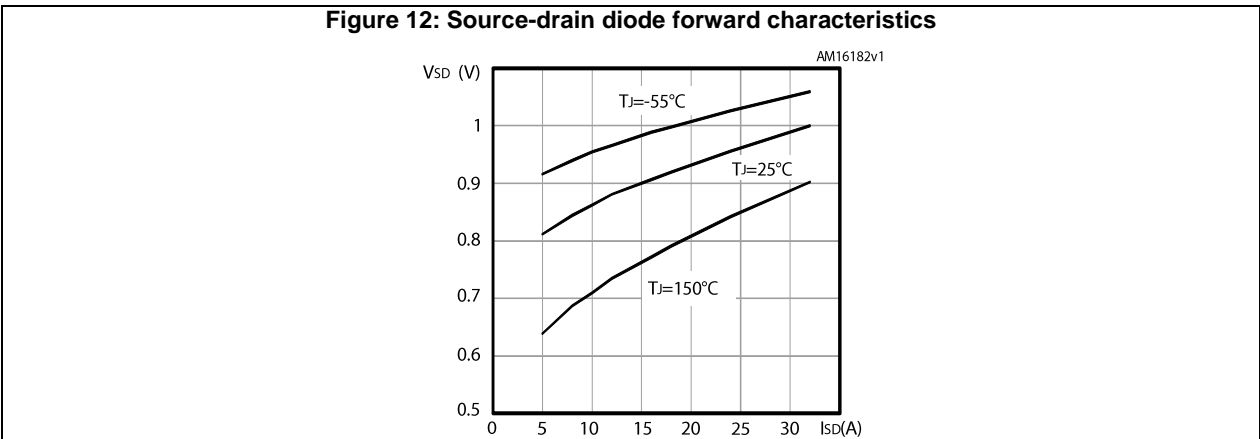
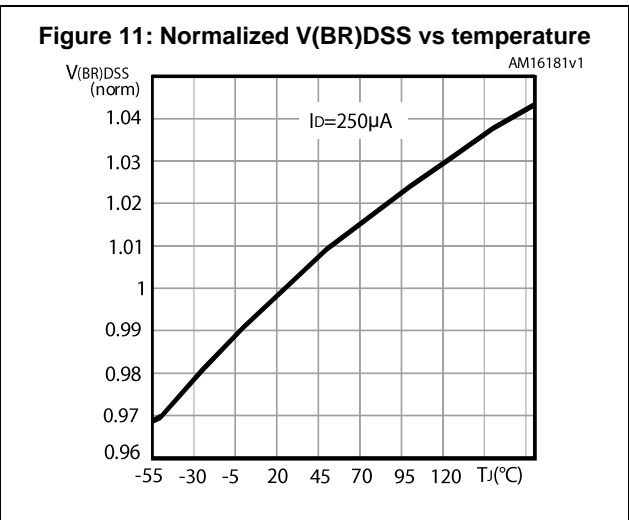
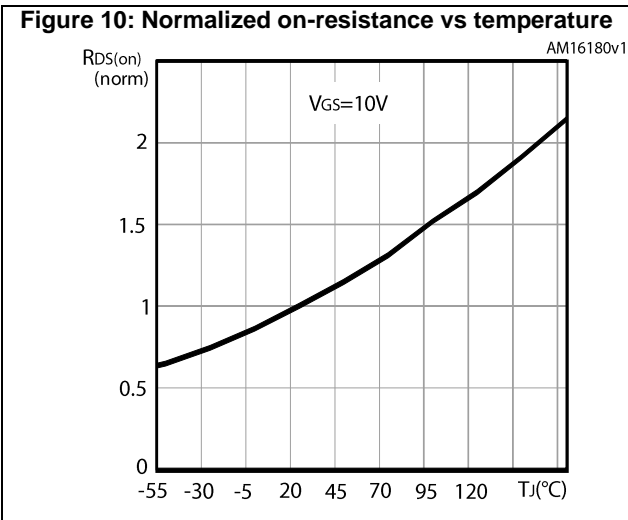
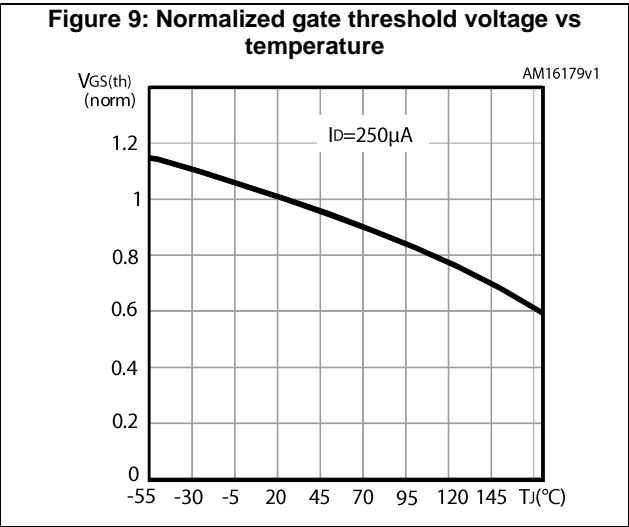
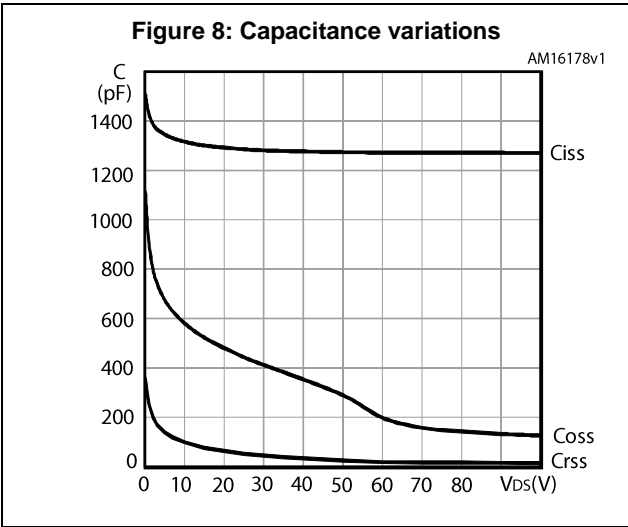
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|---|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $I_{SD} = 24 \text{ A}$, $V_{GS} = 0$ | - | | 1.1 | V |
| I_{rr} | Reverse recovery time | $I_{SD} = 24 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ | - | 41 | | ns |
| Q_{rr} | Reverse recovery charge | $V_{DD} = 80 \text{ V}$, $T_J = 150 \text{ }^\circ\text{C}$, (see Figure 15: "Test circuit for inductive load switching and diode recovery times") | - | 47 | | nC |
| I_{RRM} | Reverse recovery current | | - | 2.3 | | A |

Notes:

(1) Pulsed: pulse duration = 300 μs , duty cycle 1.5%.

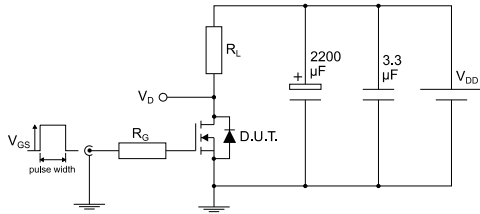
2.1 Electrical characteristics (curves)





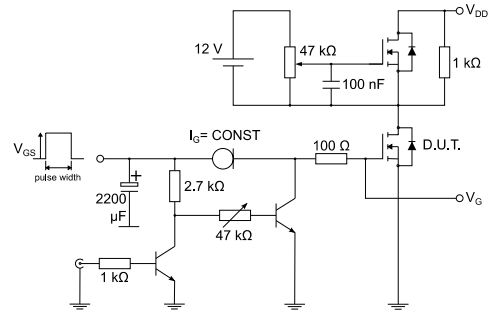
3 Test circuits

Figure 13: Test circuit for resistive load switching times



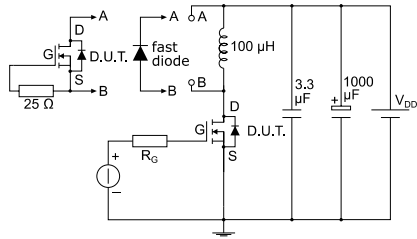
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Figure 14: Test circuit for gate charge behavior



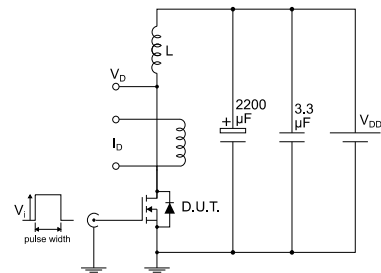
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Figure 15: Test circuit for inductive load switching and diode recovery times



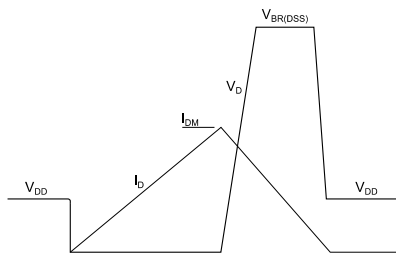
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Figure 16: Unclamped inductive load test circuit



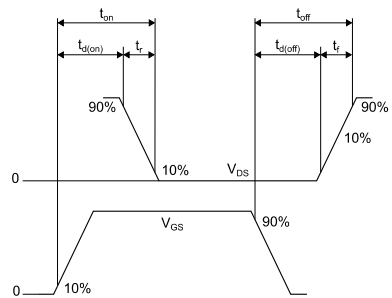
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Figure 17: Unclamped inductive waveform



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Figure 18: Switching time waveform



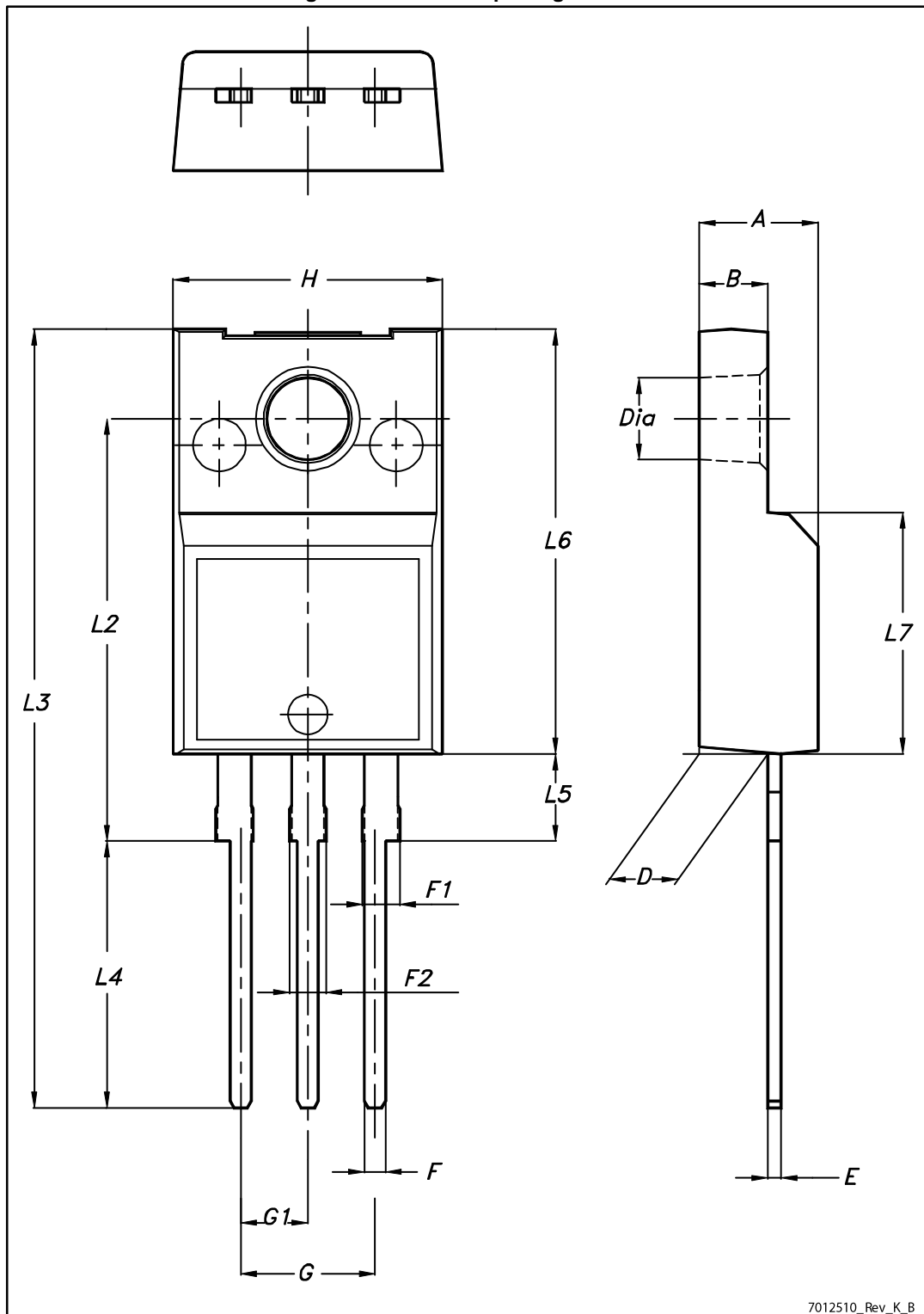
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4 Package information

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.

4.1 TO-220FP type A package information

Figure 19: TO-220FP package outline



7012510_Rev_K_B

Table 8: TO-220FP package 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 |

5 Revision history

Table 9: Document revision history

| Date | Revision | Changes |
|-------------|----------|----------------|
| 15-Sep-2016 | 1 | First release. |

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