

N-channel 100 V, 0.0036 Ω typ., 65 A, STripFET™ F7 Power MOSFET in a TO-220FP package

Datasheet – production data

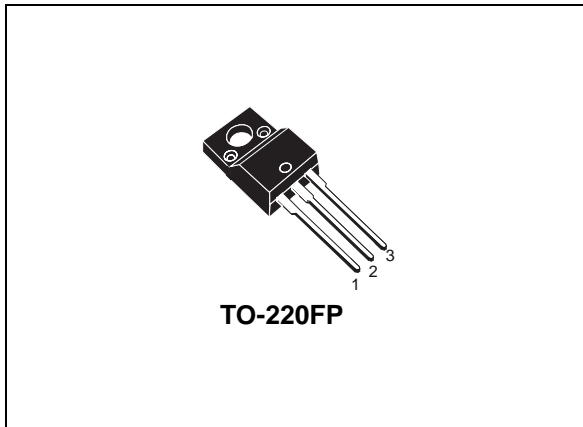
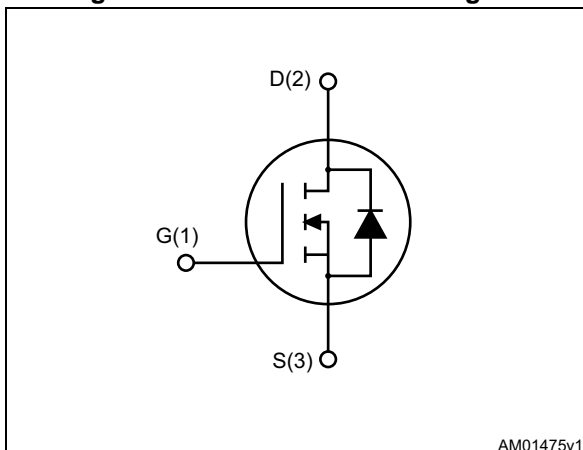


Figure 1. Internal schematic diagram



Features

| Order code | V _{DS} | R _{DS(on)max} | I _D | P _{TOT} |
|-------------|-----------------|------------------------|----------------|------------------|
| STF150N10F7 | 100 V | 0.0042 Ω | 65 A | 35 W |

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- 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 | Packaging |
|-------------|----------|----------|-----------|
| STF150N10F7 | 150N10F7 | TO-220FP | Tube |

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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 $T_C = 25\text{ }^\circ\text{C}$ | 65 | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 45 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) $T_C = 25\text{ }^\circ\text{C}$ | 260 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 35 | W |
| $E_{AS}^{(2)}$ | Single pulse avalanche energy | 495 | mJ |
| T_J | Operating junction temperature | -55 to 175 | $^\circ\text{C}$ |
| T_{stg} | Storage temperature | | $^\circ\text{C}$ |

1. Pulse width is limited by safe operating area

2. Starting $T_j=25\text{ }^\circ\text{C}$, $I_D=30\text{ A}$, $V_{DD}=50\text{ V}$

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|----------------|---|-------|--------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max | 4.29 | $^\circ\text{C/W}$ |
| $R_{thj-amb}$ | Thermal resistance junction-ambient max | 62.5 | $^\circ\text{C/W}$ |

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 | $V_{GS} = 0, I_D = 250\ \mu A$ | 100 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0, V_{DS} = 100\ V$ | | | 1 | μA |
| | | $V_{GS} = 0, V_{DS} = 100\ V, T_C = 125\text{ °C}$ | | | 100 | μA |
| I_{GSS} | Gate-body leakage current | $V_{DS} = 0, V_{GS} = +20\ V$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}, I_D = 250\ \mu A$ | 2.5 | | 4.5 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\ V, I_D = 55\ A$ | | 0.0036 | 0.0042 | Ω |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|---|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 50\ V, f = 1\ MHz, V_{GS} = 0$ | - | 8115 | - | pF |
| C_{oss} | Output capacitance | | - | 1510 | - | pF |
| C_{riss} | Reverse transfer capacitance | | - | 67 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 50\ V, I_D = 65\ A, V_{GS} = 10\ V$ (see Figure 14) | - | 117 | - | nC |
| Q_{gs} | Gate-source charge | | - | 47 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 26 | - | nC |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 50\ V, I_D = 55\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see Figure 13) | - | 33 | - | ns |
| t_r | Rise time | | - | 57 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 72 | - | ns |
| t_f | Fall time | | - | 33 | - | ns |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain current | | - | | 65 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 260 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 65 \text{ A}, V_{GS} = 0$ | - | | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 65 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 80 \text{ V}, T_J = 150 \text{ }^\circ\text{C}$ (see Figure 15) | - | 70 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 165 | | nC |
| I_{RRM} | Reverse recovery current | | - | 4.7 | | 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

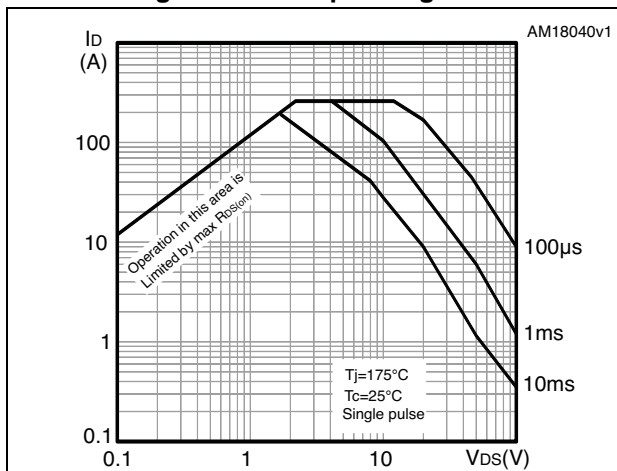


Figure 3. Thermal impedance

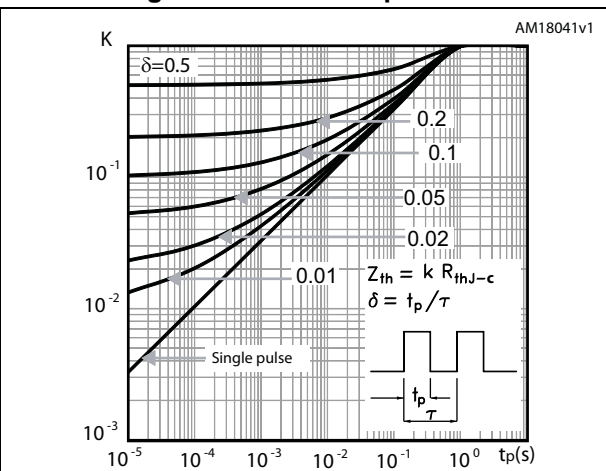


Figure 4. Output characteristics

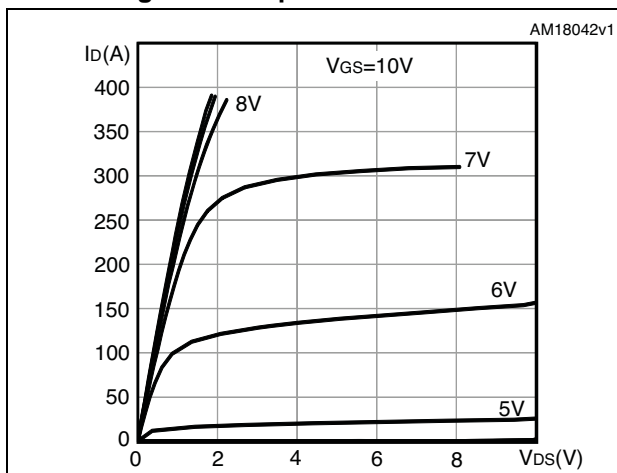


Figure 5. Transfer characteristics

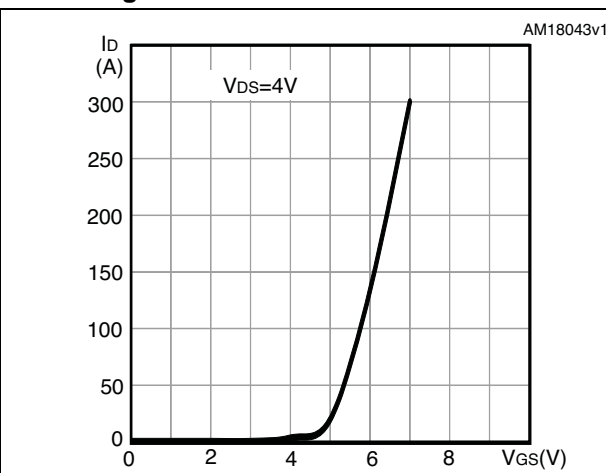


Figure 6. Gate charge vs gate-source voltage

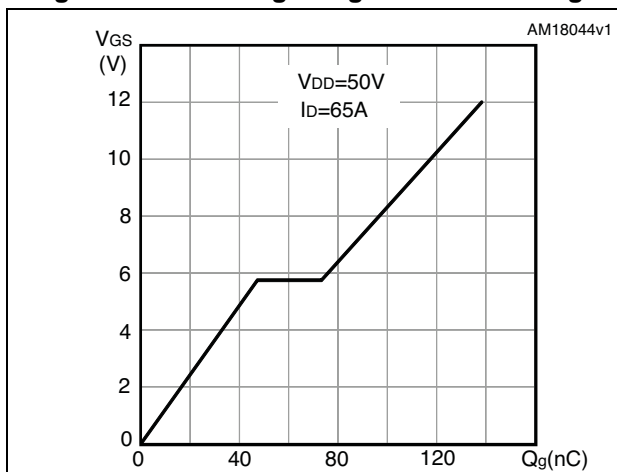


Figure 7. Static drain-source on-resistance

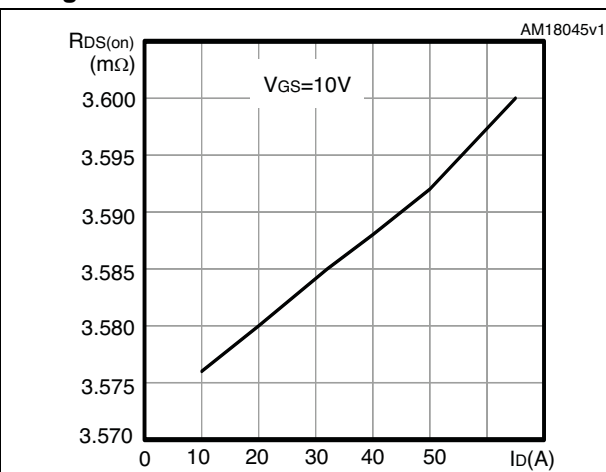


Figure 8. Capacitance variations

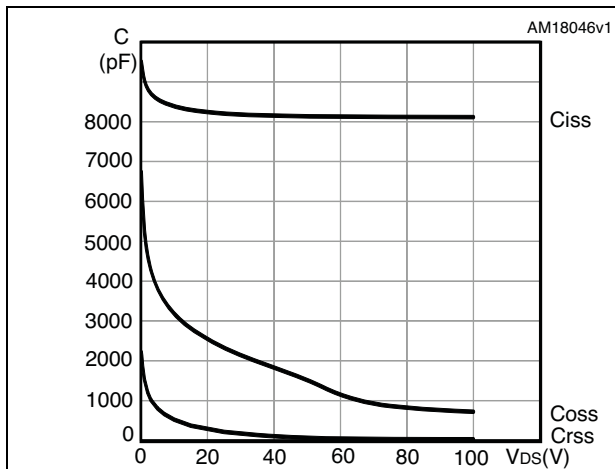


Figure 9. Normalized gate threshold voltage vs temperature

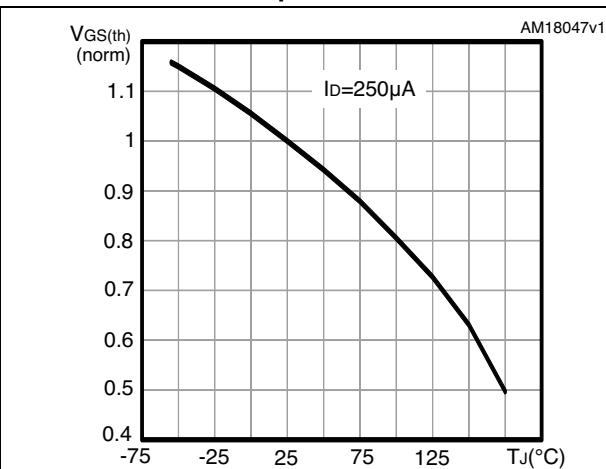


Figure 10. Normalized on-resistance vs temperature

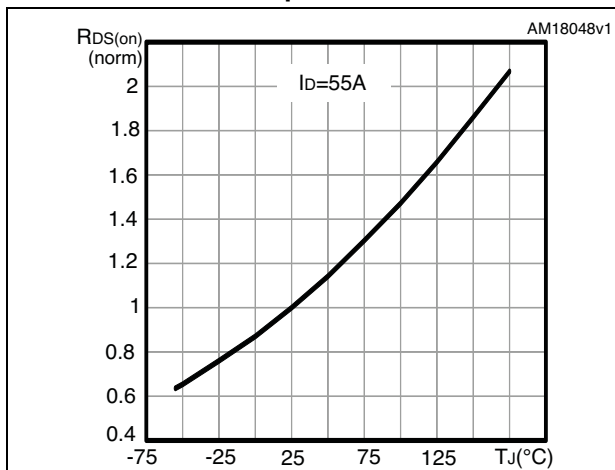


Figure 11. Normalized V_{DS} vs temperature

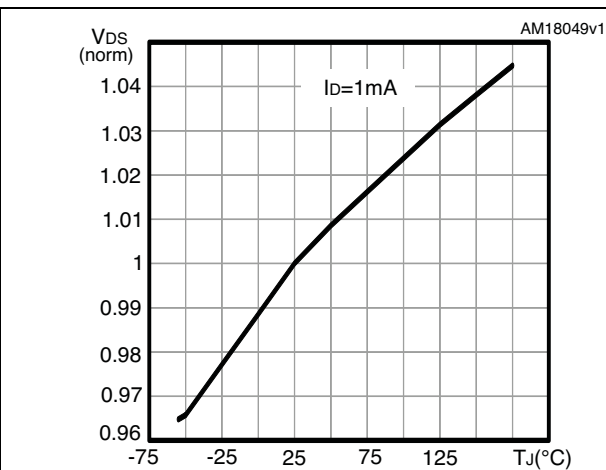
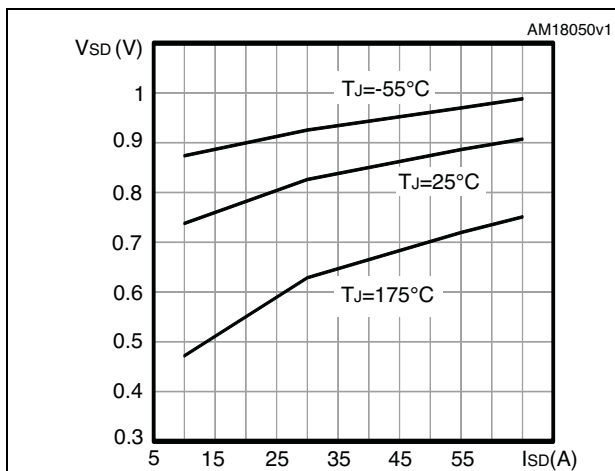


Figure 12. Source-drain diode forward characteristics



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



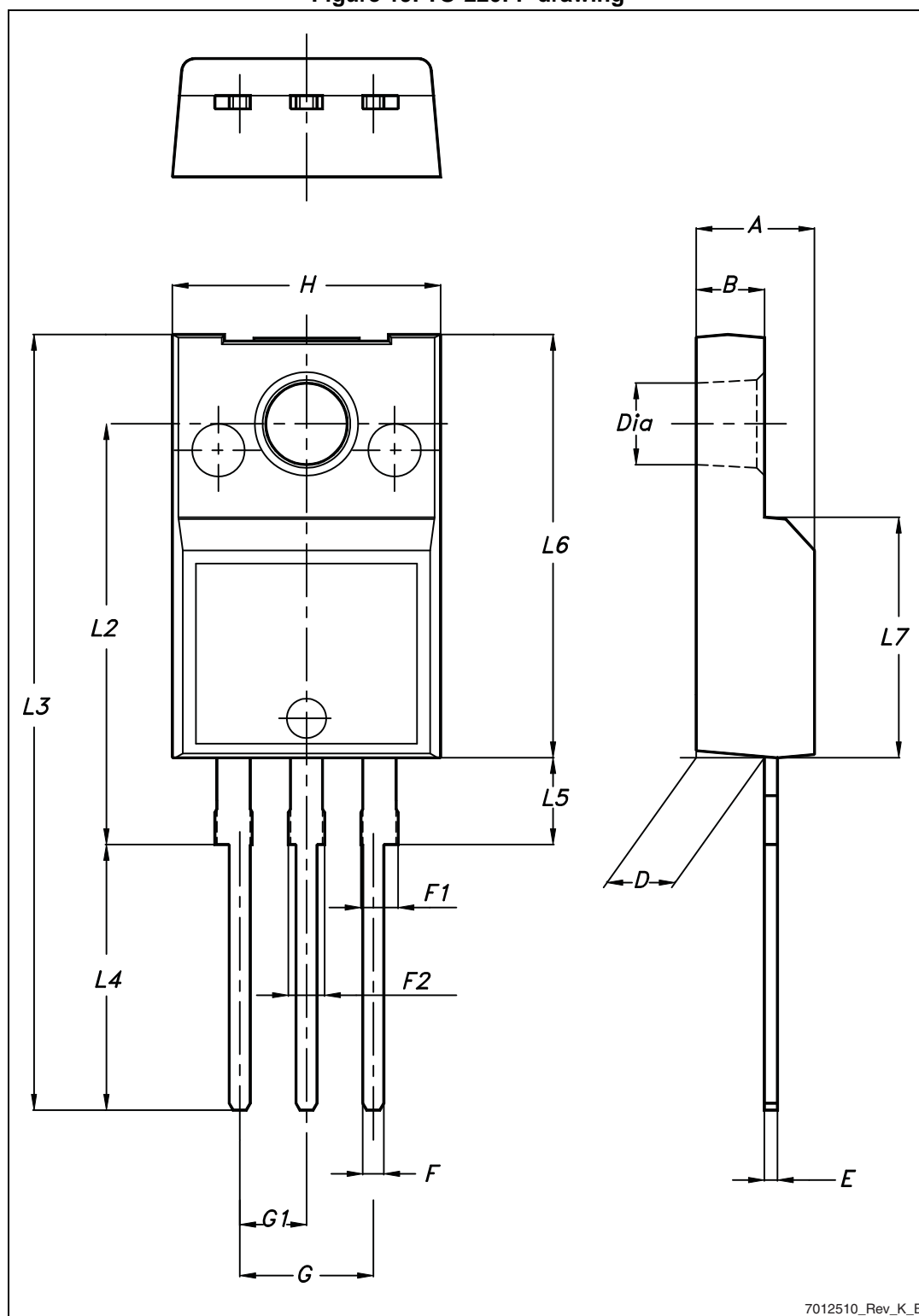
Figure 18. Switching time waveform



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.

Figure 19. TO-220FP drawing



7012510_Rev_K_B

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 |

5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 22-Jan-2014 | 1 | First release. |
| 22-Aug-2014 | 2 | Updated title, features and description in cover page. Updated Figure 3: Thermal impedance . |

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