



STL66DN3LLH5

Dual N-channel 30 V, 5.9 mΩ, 20 A STripFET™ V Power MOSFET
in PowerFLAT™ 5x6 double island package

Datasheet — production data

Features

| Type | V _{DSS} | R _{DS(on)} max | I _D |
|--------------|------------------|----------------------------|---------------------|
| STL66DN3LLH5 | 30 V | < 6.5 mΩ | 20 A ⁽¹⁾ |

1. The value is rated according to R_{thj-pcb}

- Logic level V_{GS(th)}
- 175 °C junction temperature

Applications

- Switching applications
- Automotive

Description

This device is an N-channel Power MOSFET developed using STMicroelectronics' STripFET™V technology. The device has been optimized to achieve very low on-state resistance, contributing to an FOM that is among the best in its class.



Figure 1. Internal schematic diagram

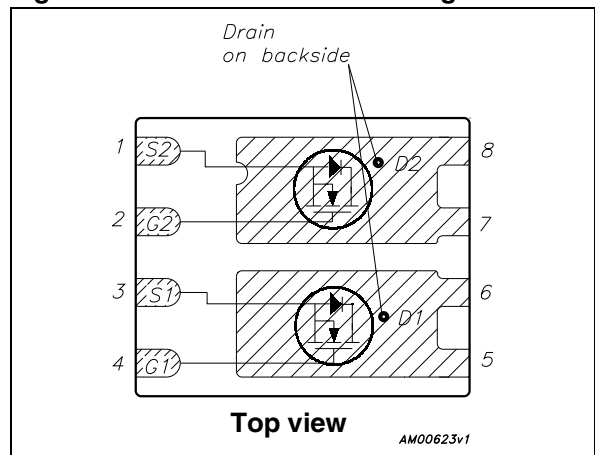


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|--------------|-----------|------------------------------|---------------|
| STL66DN3LLH5 | 66DN3LLH5 | PowerFLAT™ 5x6 double island | Tape and reel |

Contents

1 **Electrical ratings** 3

2 **Electrical characteristics** 4

 2.1 Electrical characteristics (curves) 6

3 **Test circuits** 8

4 **Package mechanical data** 9

5 **Packaging mechanical data** 12

6 **Revision history** 14



1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|--------------------|---|------------|------------------|
| V_{DS} | Drain-source voltage | 30 | V |
| V_{GS} | Gate-source voltage | ± 22 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 25^\circ\text{C}$ | 78.5 | A |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 100^\circ\text{C}$ | 55.5 | A |
| I_D | Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$ | 20 | A |
| I_D | Drain current (continuous) at $T_{pcb} = 100^\circ\text{C}$ | 14.2 | A |
| $I_{DM}^{(2),(3)}$ | Drain current (pulsed) | 80 | A |
| P_{TOT} | Total dissipation at $T_C = 25^\circ\text{C}$ | 72 | W |
| P_{TOT} | Total dissipation at $T_{pcb} = 25^\circ\text{C}$ | 4.7 | W |
| T_J T_{stg} | Operating junction temperature Storage temperature | -55 to 175 | $^\circ\text{C}$ |

1. Specified by design. Not subject to production test.
2. Pulse width limited by safe operating area
3. When mounted on FR-4 board of 1inch², 2oz Cu, $t < 10$ sec

Table 3. Thermal resistance

| Symbol | Parameter | Value | Unit |
|---------------------|----------------------------------|-------|--------------------|
| $R_{thj-case}$ | Thermal resistance junction-case | 2.08 | $^\circ\text{C/W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb | 32 | $^\circ\text{C/W}$ |

1. When mounted on FR-4 board of 1inch², 2oz Cu, $t < 10$ sec

Table 4. Avalanche data

| Symbol | Parameter | Value | Unit |
|----------------|---|-------|------|
| I_{AV} | Not-repetitive avalanche current, (pulse width limited by T_J max) | 18.5 | A |
| $E_{AS}^{(1)}$ | Single pulse avalanche energy (starting $T_J = 25^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 24$ V) | 270 | mJ |

1. Per channel.

2 Electrical characteristics

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

Table 5. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|--|---|------|------------|------------|--------------------------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage ($V_{GS} = 0$) | $I_D = 250\text{ }\mu\text{A}$ | 30 | | | V |
| I_{DSS} | Zero gate voltage drain current ($V_{GS} = 0$) | $V_{DS} = 30\text{ V}$, $V_{DS} = 30\text{ V}$, $T_C = 125\text{ °C}$ | | | 1 100 | μA nA |
| I_{GSS} | Gate body leakage current ($V_{DS} = 0$) | $V_{GS} = \pm 22\text{ V}$ | | | ± 10 | μA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 1 | | 3 | V |
| $R_{DS(on)}$ | Static drain-source on resistance | $V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$ $V_{GS} = 4.5\text{ V}$, $I_D = 10\text{ A}$ | | 5.9 7.1 | 6.5 7.9 | $\text{m}\Omega$ $\text{m}\Omega$ |

Table 6. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|---|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$ | - | 1500 | - | pF |
| C_{oss} | Output capacitance | | | 230 | | pF |
| C_{rss} | Reverse transfer capacitance | | | 23 | | pF |
| Q_g | Total gate charge | $V_{DD} = 15\text{ V}$, $I_D = 19\text{ A}$ | - | 12 | - | nC |
| Q_{gs} | Gate-source charge | $V_{GS} = 4.5\text{ V}$ | | 5 | | nC |
| Q_{gd} | Gate-drain charge | (see Figure 14) | | 4.4 | | nC |

Table 7. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 15\text{ V}$, $I_D = 9.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13) | - | 8.8 | - | ns |
| t_r | Rise time | | | 18 | | ns |
| $t_{d(off)}$ | Turn-off delay time | | | 26 | | ns |
| t_f | Fall time | | | 4 | | ns |

Table 8. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|--|------|------|------|------|
| I_{SD} | Source-drain current | | - | | 20 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 80 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 19\text{ A}$, $V_{GS}=0$ | - | | 1.1 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 19\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=25\text{ V}$, $T_j=150\text{ }^{\circ}\text{C}$ | - | 24 | | ns |
| Q_{rr} | Reverse recovery charge | | | 12 | | nC |
| I_{RRM} | Reverse recovery current | | | 1.8 | | 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

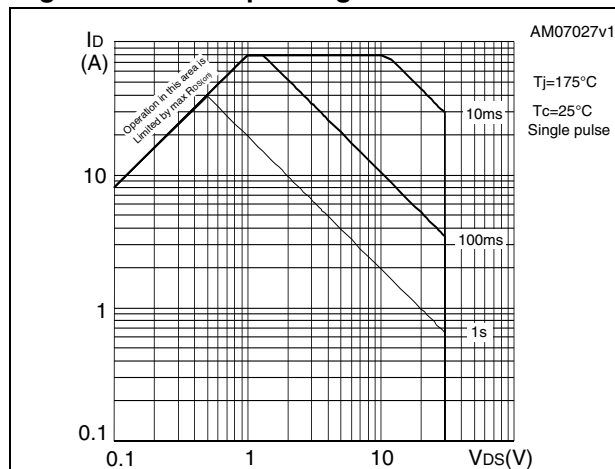


Figure 3. Thermal impedance

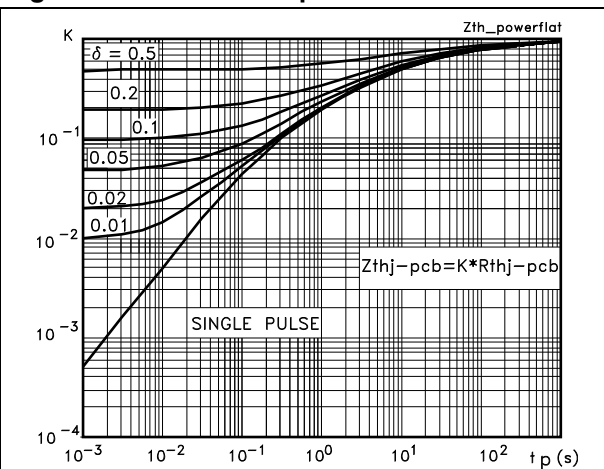


Figure 4. Output characteristics

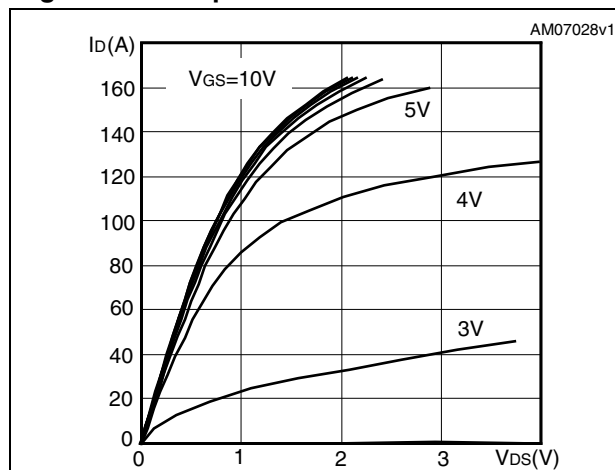


Figure 5. Transfer characteristics

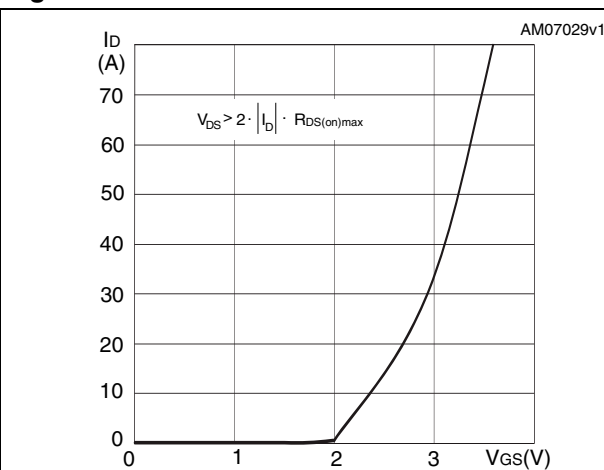
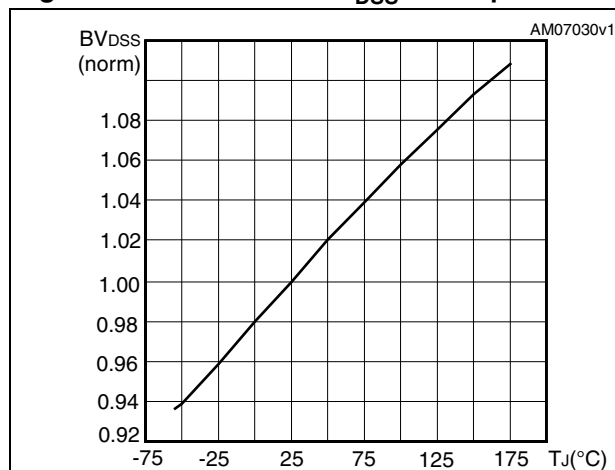
Figure 6. Normalized BV_{DSS} vs temperature

Figure 7. Static drain-source on resistance

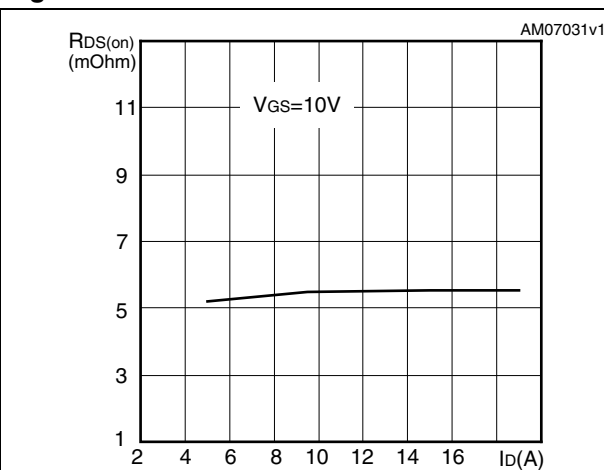
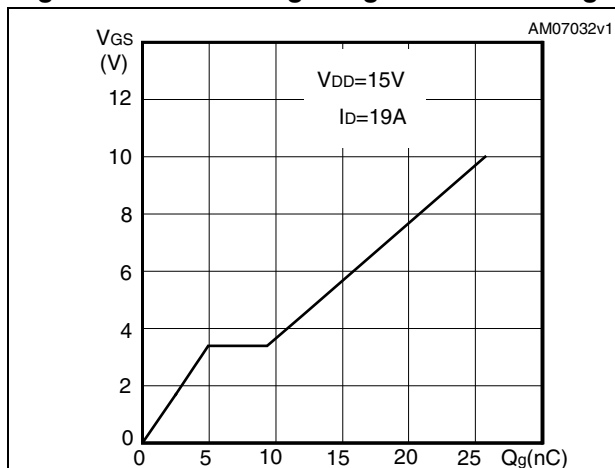
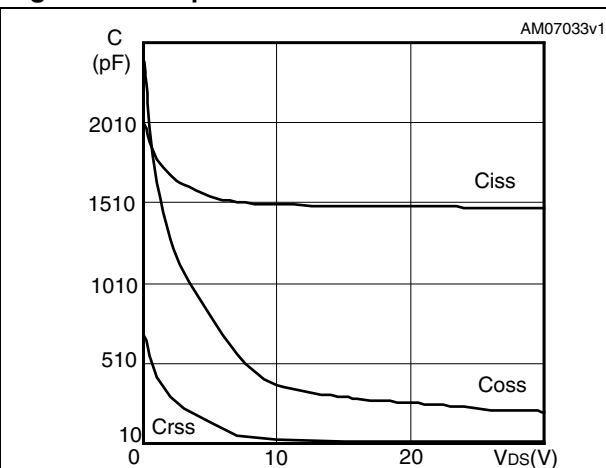
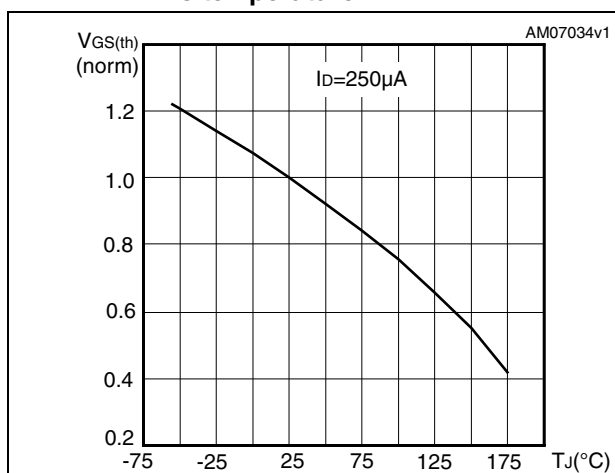
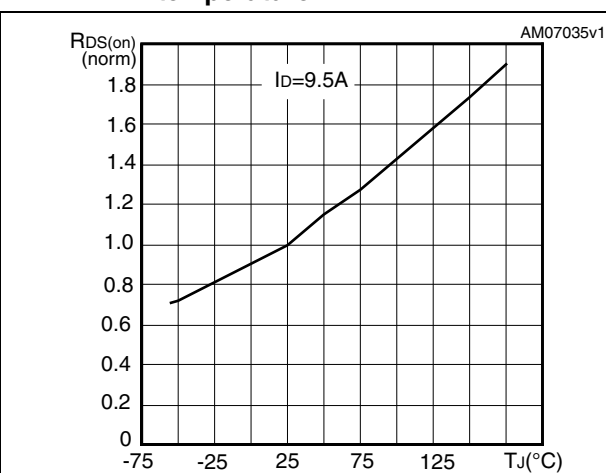
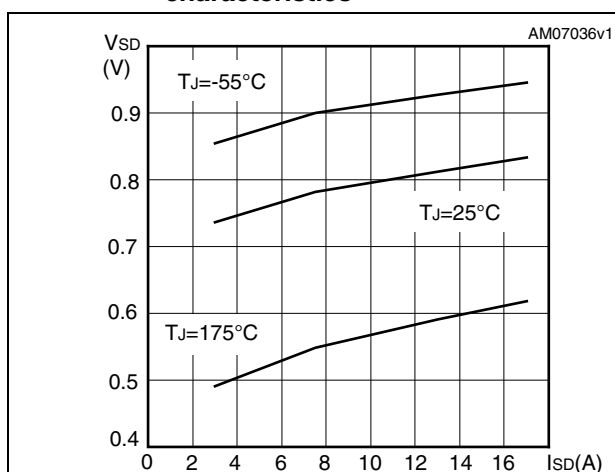


Figure 8. Gate charge vs gate-source voltage**Figure 9. Capacitance variations****Figure 10. Normalized gate threshold voltage vs temperature****Figure 11. Normalized on resistance vs temperature****Figure 12. Source-drain diode forward characteristics**

3 Test circuits

Figure 13. Switching times test circuit for resistive load

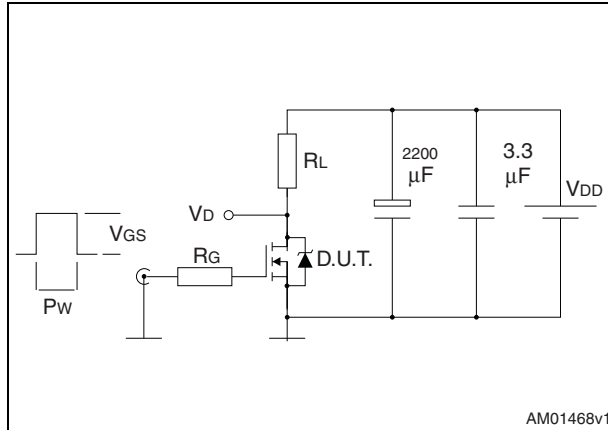


Figure 14. Gate charge test circuit

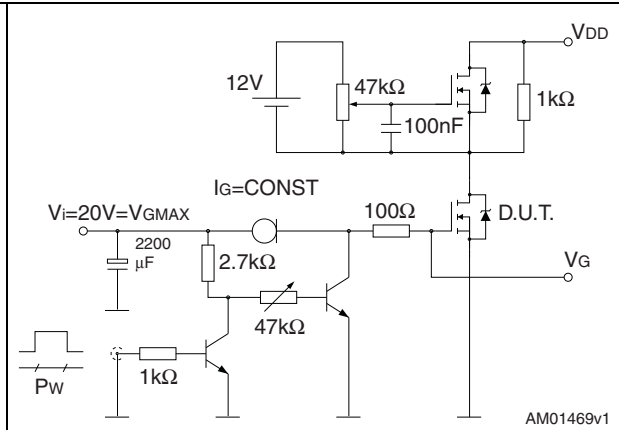


Figure 15. Test circuit for inductive load switching and diode recovery times

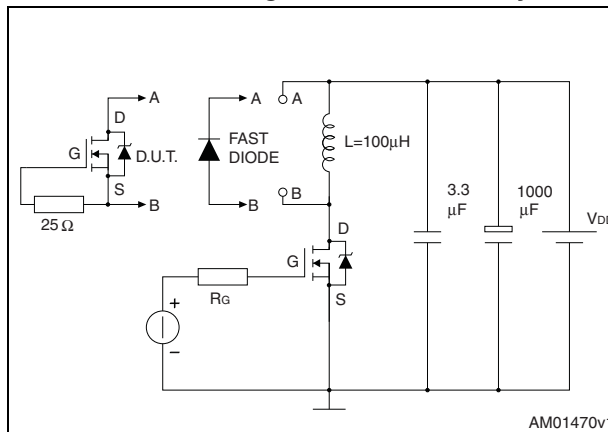


Figure 16. Unclamped inductive load test circuit

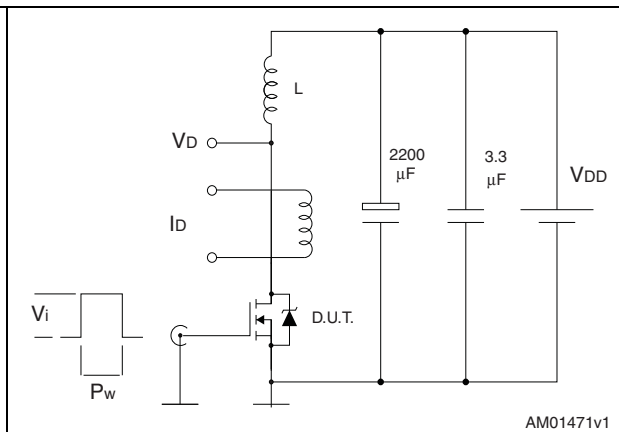


Figure 17. Unclamped inductive waveform

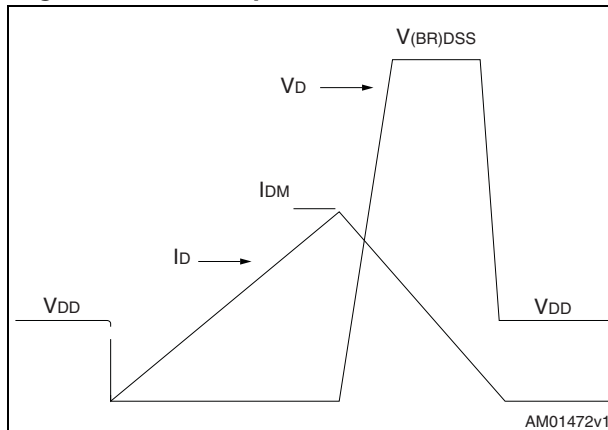
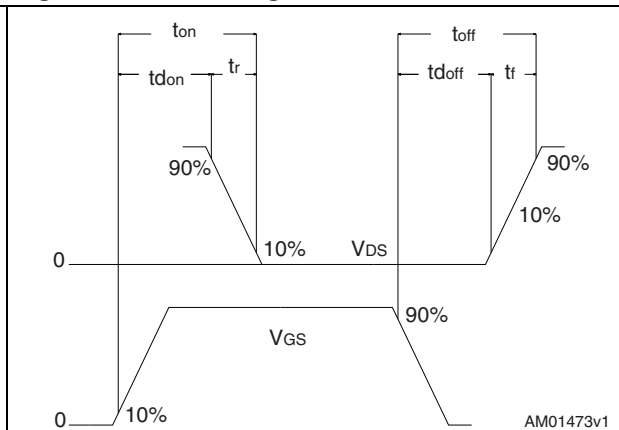


Figure 18. Switching time waveform



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 9. PowerFLAT™ 5x6 double island (clip) mechanical data

| Ref. | Dimensions (mm) | | |
|------|-----------------|------|-------|
| | Min. | Typ. | Max. |
| A | 0.80 | | 1.00 |
| A1 | 0.02 | | 0.05 |
| A2 | | 0.25 | |
| b | 0.30 | | 0.50 |
| D | | 5.20 | |
| E | | 6.15 | |
| D2 | 1.68 | | 1.88 |
| E2 | 3.50 | | 3.70 |
| D3 | 1.68 | | 1.88 |
| E3 | 3.50 | | 3.70 |
| E4 | 0.55 | | 0.75 |
| e | | 1.27 | |
| L | 0.725 | | 1.025 |
| K | 1.05 | | 1.35 |

Figure 19. PowerFLAT™ 5x6 double island (clip) drawing

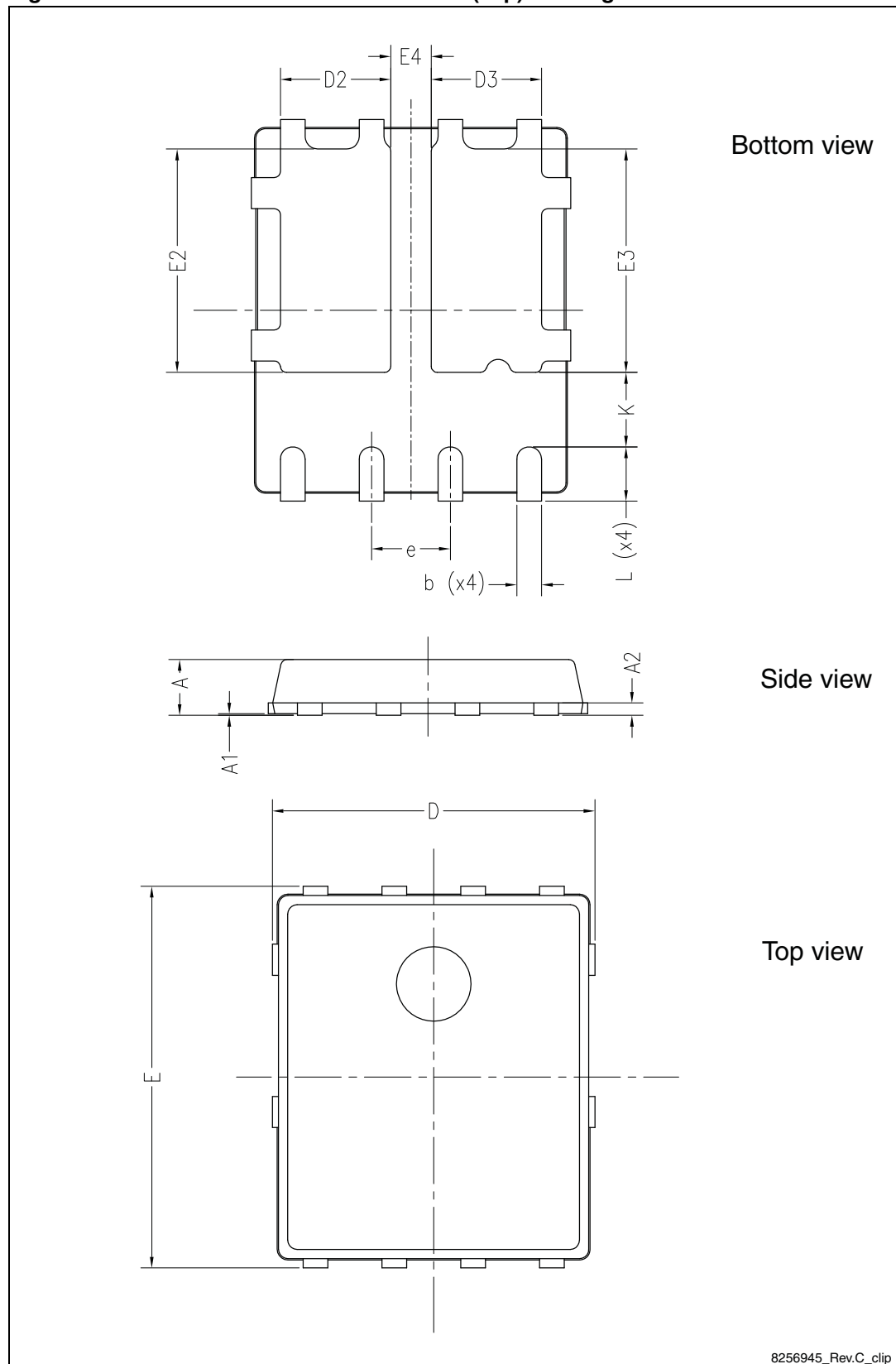
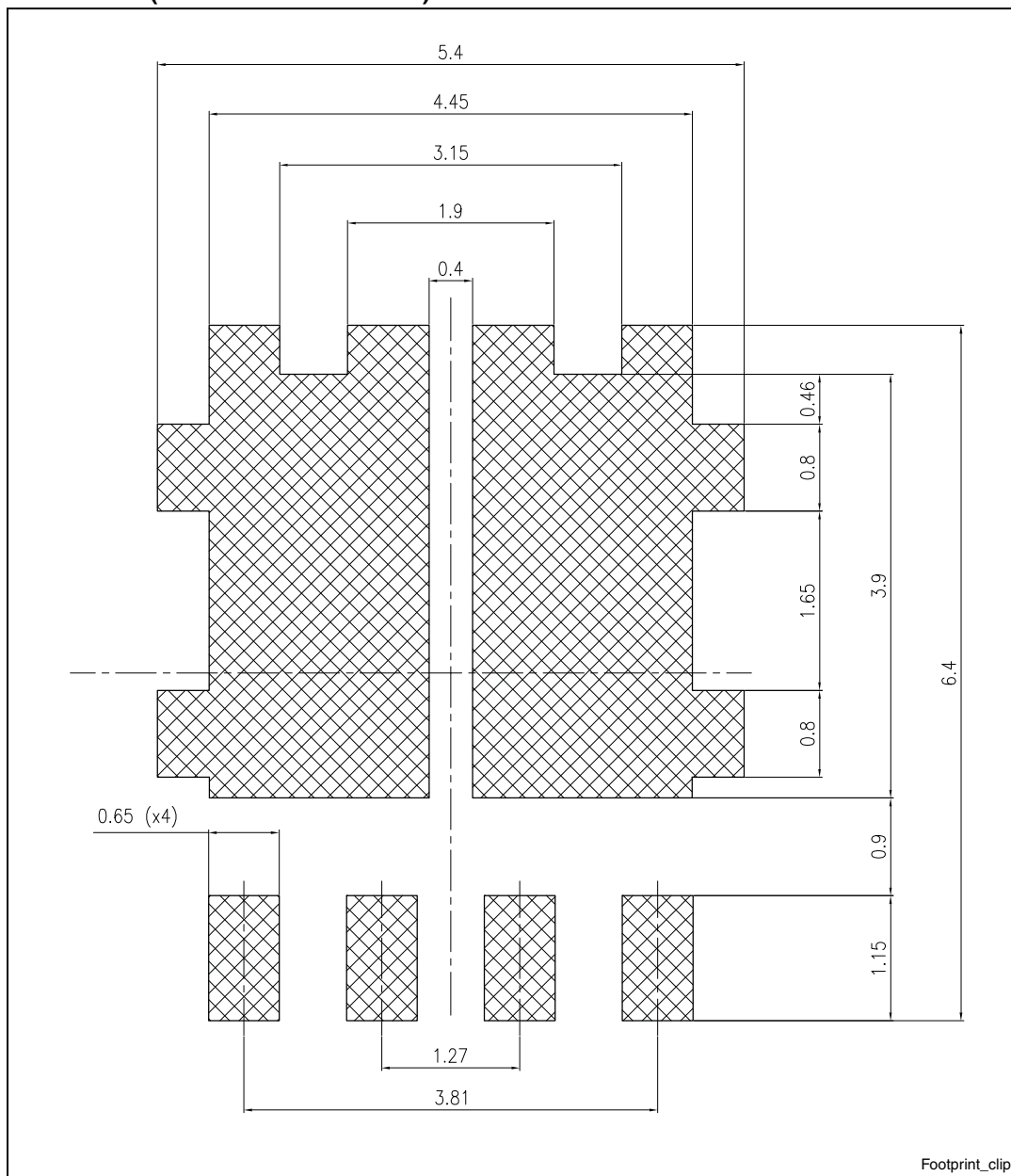


Figure 20. PowerFLAT™ 5x6 double island (clip) drawing recommended footprint (dimensions are in mm)



5

Figure 21. PowerFLAT™ 5x6 tape

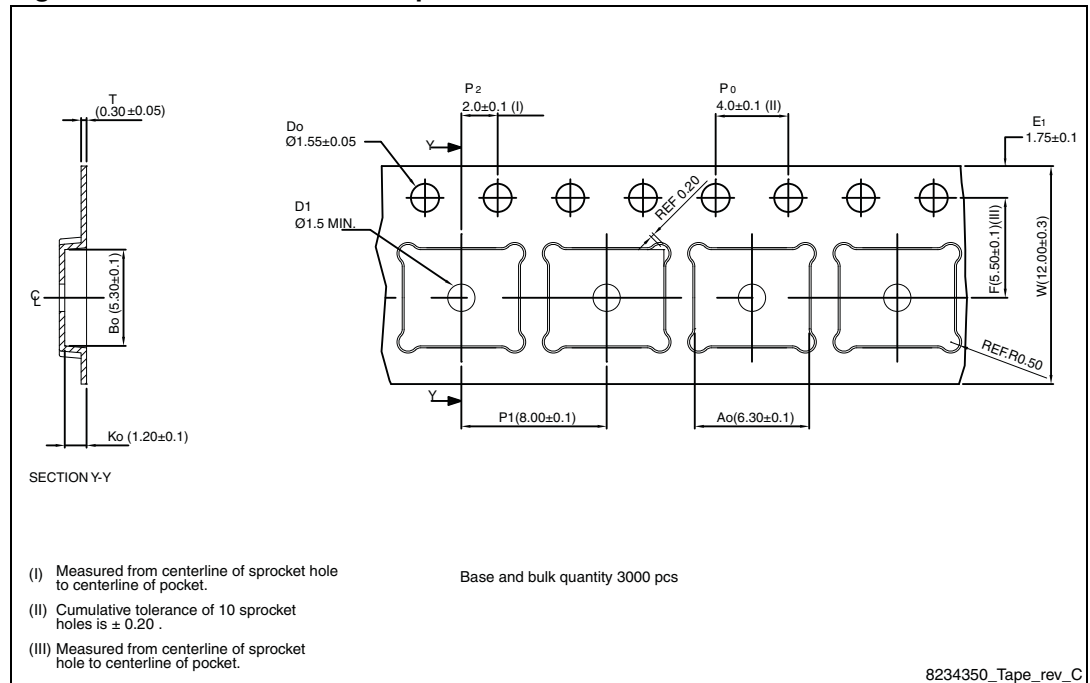


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape.

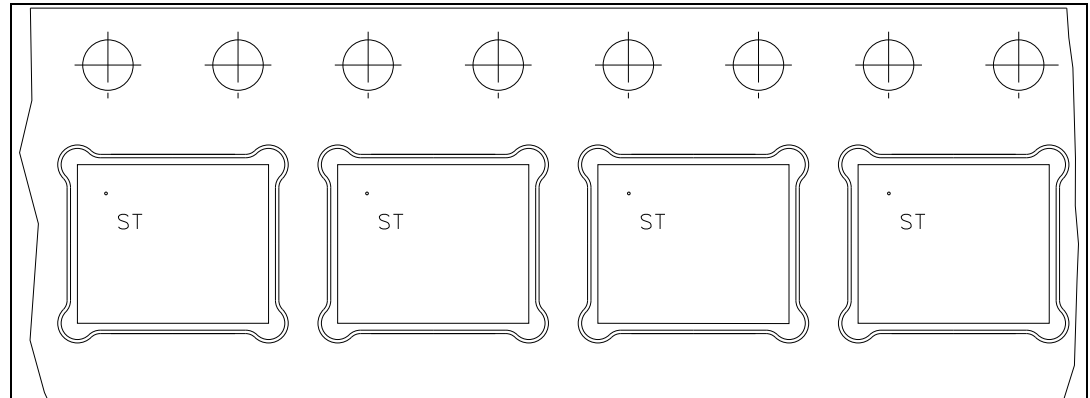
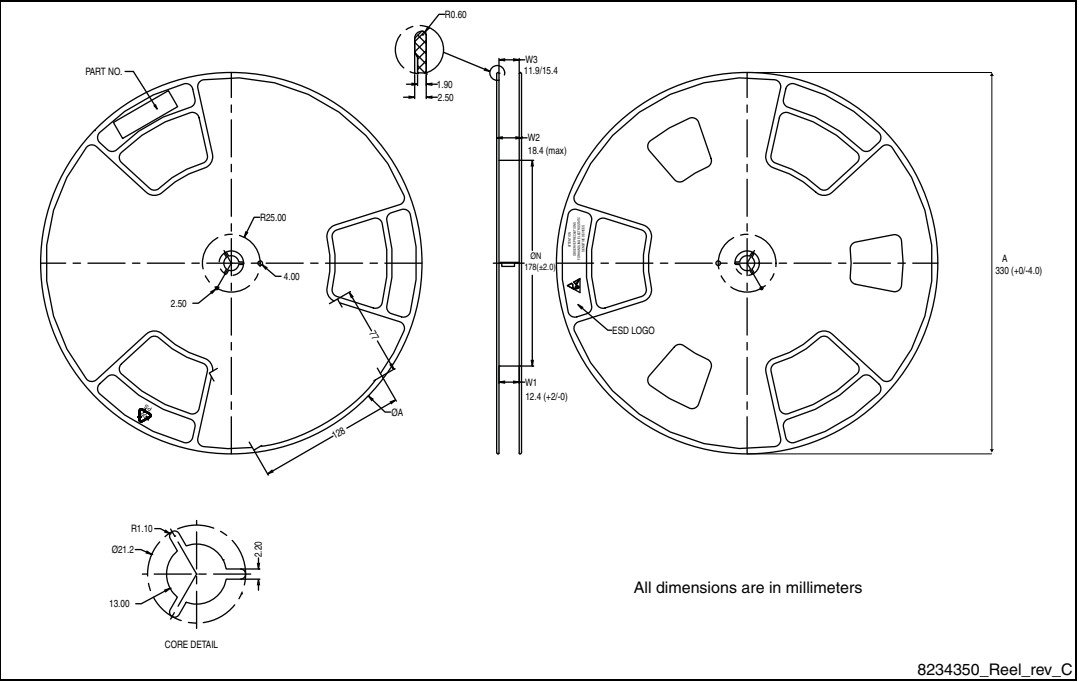


Figure 23. PowerFLAT™ 5x6 reel



6 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 12-Oct-2011 | 1 | First release. |
| 14-Mar-2012 | 2 | Document status changed from preliminary data to production data. Inserted Section 5: Packaging mechanical data . Minor text changes. |

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