



# STL10DN15F3

N-channel 150 V, 0.20  $\Omega$  typ., 2.8 A STripFET™ III Power MOSFET  
in a PowerFLAT™ 5x6 double island package

Datasheet — production data

## Features

| Order code  | $V_{DS}@T_{Jmax}$ | $R_{DS(on)max}$ | $I_D$ |
|-------------|-------------------|-----------------|-------|
| STL10DN15F3 | 150 V             | <0.22 $\Omega$  | 2.8 A |

- Improved die-to-footprint ratio
- Very low profile package (1 mm max)
- Very low thermal resistance
- Low on-resistance

## Applications

- Switching applications

## Description

This device is an N-channel enhancement mode Power MOSFET produced using STMicroelectronics' STripFET™ III technology, which is specifically designed to minimize on-resistance and gate charge to provide superior switching performance.

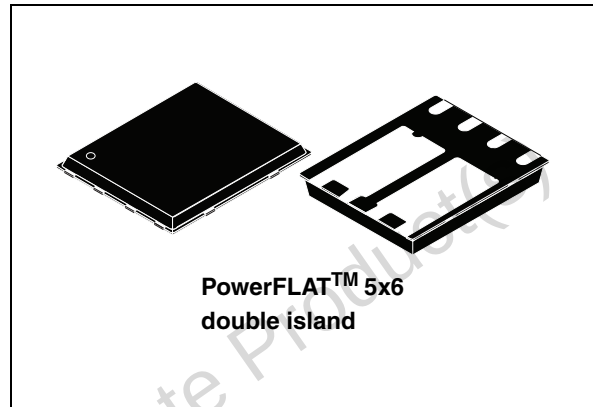


Figure 1. Internal schematic diagram

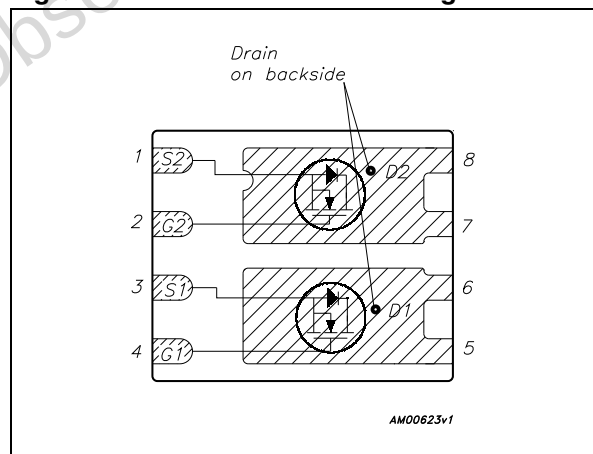


Table 1. Device summary

| Order code  | Marking  | Package                      | Packaging     |
|-------------|----------|------------------------------|---------------|
| STL10DN15F3 | 10DN15F3 | PowerFLAT™ 5x6 double island | Tape and reel |

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Obsolete Product(s) - Obsolete Product(s)



# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol             | Parameter                                                           | Value      | Unit             |
|--------------------|---------------------------------------------------------------------|------------|------------------|
| $V_{DS}$           | Drain-source voltage                                                | 150        | V                |
| $V_{GS}$           | Gate-source voltage                                                 | $\pm 20$   | V                |
| $I_D^{(1)}$        | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$      | 10         | A                |
| $I_D^{(2)}$        | Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$  | 2.8        | A                |
| $I_D^{(1)}$        | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$     | 6.25       | A                |
| $I_D^{(2)}$        | Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$ | 1.8        | A                |
| $I_{DM}^{(3)}$     | Drain current (pulsed)                                              | 11.2       | A                |
| $P_{TOT}^{(1)}$    | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$               | 50         | W                |
| $P_{TOT}^{(2)}$    | Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$           | 3.5        | W                |
| $T_J$<br>$T_{stg}$ | Operating junction temperature<br>Storage temperature               | -55 to 150 | $^\circ\text{C}$ |

1. The value is rated according  $R_{thj-c}$
2. The value is rated according  $R_{thj-pcb}$
3. Pulse width limited by safe operating area

**Table 3. Thermal resistance**

| Symbol              | Parameter                        | Value | Unit               |
|---------------------|----------------------------------|-------|--------------------|
| $R_{thj-case}$      | Thermal resistance junction-case | 2.5   | $^\circ\text{C/W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb  | 35    | $^\circ\text{C/W}$ |

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu,  $t < 10\text{ sec}$

**Table 4. Avalanche data**

| Symbol   | Parameter                                                                                                          | Value | Unit |
|----------|--------------------------------------------------------------------------------------------------------------------|-------|------|
| $I_{AS}$ | Avalanche current repetitive or not repetitive,<br>(pulse width limited by $T_{j\text{ Max}}$ )                    | 1.4   | A    |
| $E_{AS}$ | Single pulse avalanche energy<br>(starting $T_J=25\text{ }^\circ\text{C}$ , $I_D=I_{AS}$ , $V_{DD}=120\text{ V}$ ) | 150   | mJ   |

## 2 Electrical characteristics

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

**Table 5. On/off states**

| Symbol        | Parameter                                        | Test conditions                                                                          | Min. | Typ. | Max.      | Unit                           |
|---------------|--------------------------------------------------|------------------------------------------------------------------------------------------|------|------|-----------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage                   | $I_D = 1\text{ mA}$ , $V_{GS} = 0$                                                       | 150  |      |           | V                              |
| $I_{DSS}$     | Zero gate voltage drain current ( $V_{GS} = 0$ ) | $V_{DS} = 150\text{ V}$ ,<br>$V_{DS} = 150\text{ V}$ , $T_c=125\text{ }^{\circ}\text{C}$ |      |      | 1<br>10   | $\mu\text{A}$<br>$\mu\text{A}$ |
| $I_{GSS}$     | Gate body leakage current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20\text{ V}$                                                               |      |      | $\pm 100$ | nA                             |
| $V_{GS(th)}$  | Gate threshold voltage                           | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                       | 2    |      | 4         | V                              |
| $R_{DS(on)}$  | Static drain-source on resistance                | $V_{GS} = 10\text{ V}$ , $I_D = 1.4\text{ A}$                                            |      | 0.20 | 0.22      | $\Omega$                       |

**Table 6. Dynamic**

| Symbol    | Parameter                    | Test conditions                                               | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|---------------------------------------------------------------|------|------|------|------|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ ,<br>$V_{GS} = 0$ | -    | 330  | -    | pF   |
| $C_{oss}$ | Output capacitance           |                                                               |      | 60   |      | pF   |
| $C_{rss}$ | Reverse transfer capacitance |                                                               |      | 15   |      | pF   |
| $Q_g$     | Total gate charge            | $V_{DD} = 75\text{ V}$ , $I_D = 2.8\text{ A}$                 | -    | 9.5  | -    | nC   |
| $Q_{gs}$  | Gate-source charge           | $V_{GS} = 10\text{ V}$                                        |      | 1.5  |      | nC   |
| $Q_{gd}$  | Gate-drain charge            | (see Figure 14)                                               |      | 4.3  |      | nC   |

**Table 7. Switching times**

| Symbol       | Parameter           | Test conditions                                                                                                          | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 75\text{ V}$ , $I_D = 1.4\text{ A}$ ,<br>$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$<br>(see Figure 13) | -    | 5.5  | -    | ns   |
| $t_r$        | Rise time           |                                                                                                                          |      | 2.4  |      | ns   |
| $t_{d(off)}$ | Turn-off delay time |                                                                                                                          |      | 16.1 |      | ns   |
| $t_f$        | Fall time           |                                                                                                                          |      | 5.5  |      | ns   |

**Table 8. Source drain diode**

| Symbol          | Parameter                     | Test conditions                                                                                                                      | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{SD}$        | Source-drain current          |                                                                                                                                      | -    |      | 2.8  | A    |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) |                                                                                                                                      | -    |      | 11.2 | A    |
| $V_{SD}^{(2)}$  | Forward on voltage            | $I_{SD} = 2.8 \text{ A}$ , $V_{GS} = 0$                                                                                              | -    |      | 1.3  | V    |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 2.8 \text{ A}$ ,<br>$di/dt = 100 \text{ A}/\mu\text{s}$ ,<br>$V_{DD} = 120 \text{ V}$ , $T_j = 150 \text{ }^\circ\text{C}$ | -    | 73.5 |      | ns   |
| $Q_{rr}$        | Reverse recovery charge       |                                                                                                                                      |      | 210  |      | nC   |
| $I_{RRM}$       | Reverse recovery current      |                                                                                                                                      |      | 5.7  |      | A    |

1. Pulse width limited by safe operating area

2. Pulsed: pulse duration=300 $\mu$ s, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

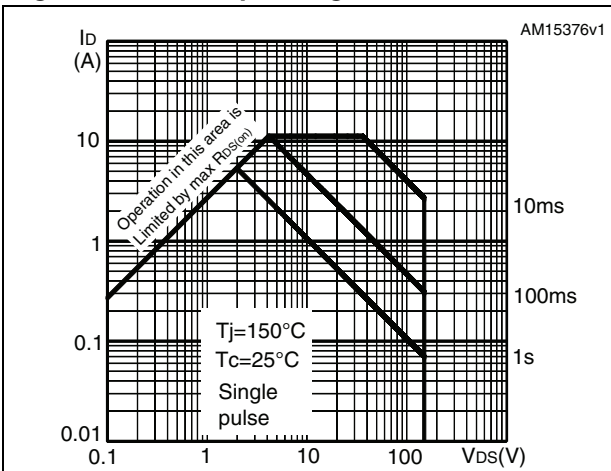


Figure 3. Thermal impedance

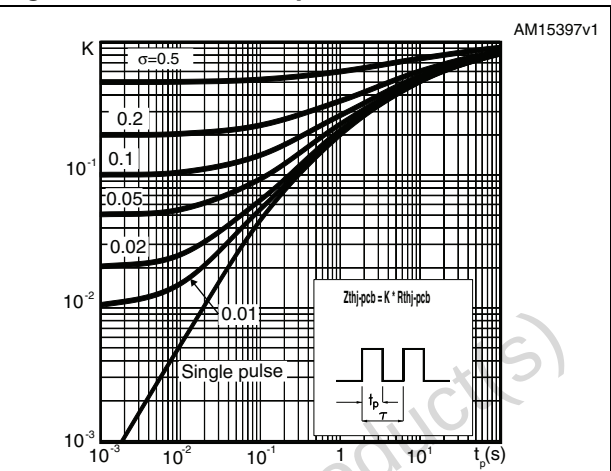


Figure 4. Output characteristics

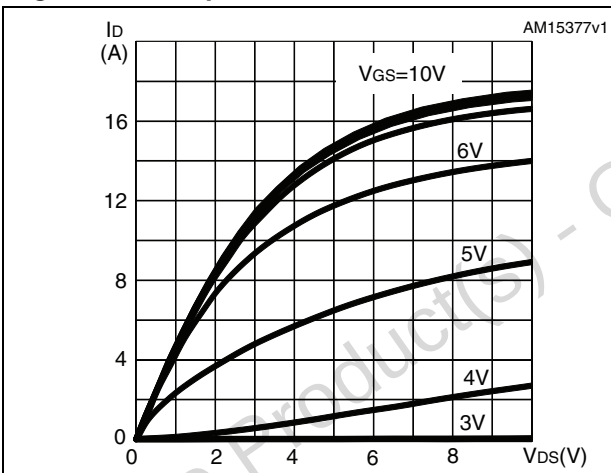


Figure 5. Transfer characteristics

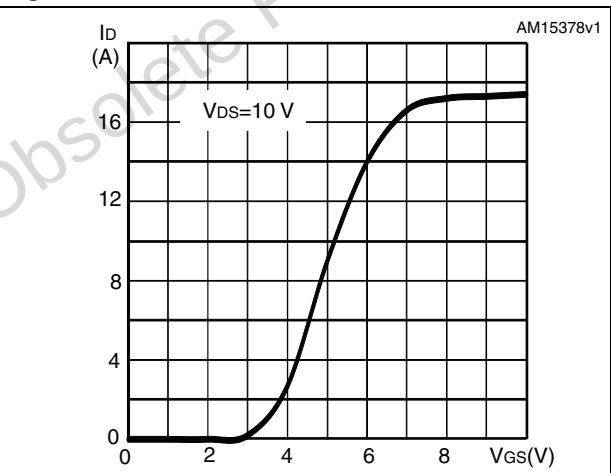


Figure 6. Gate charge vs gate-source voltage

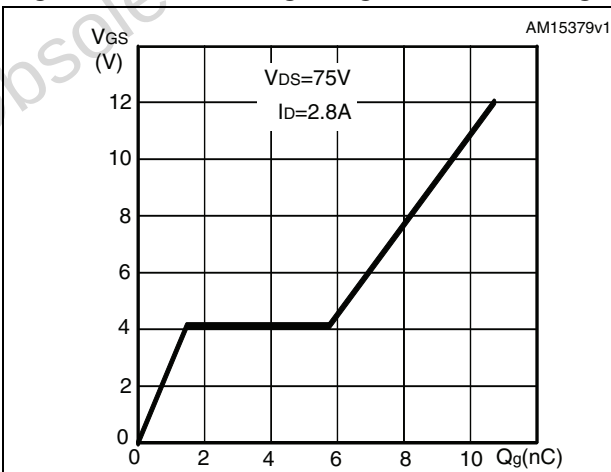


Figure 7. Static drain-source on-resistance

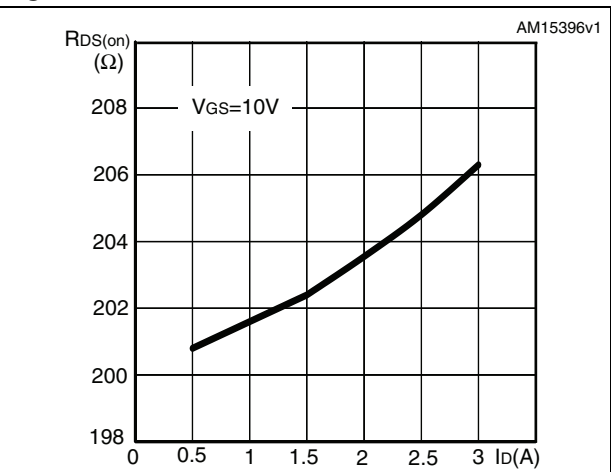


Figure 8. Capacitance variations

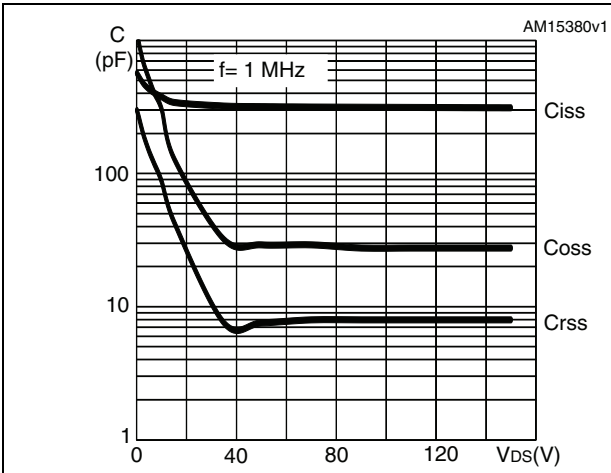


Figure 9. Normalized on-resistance vs temperature

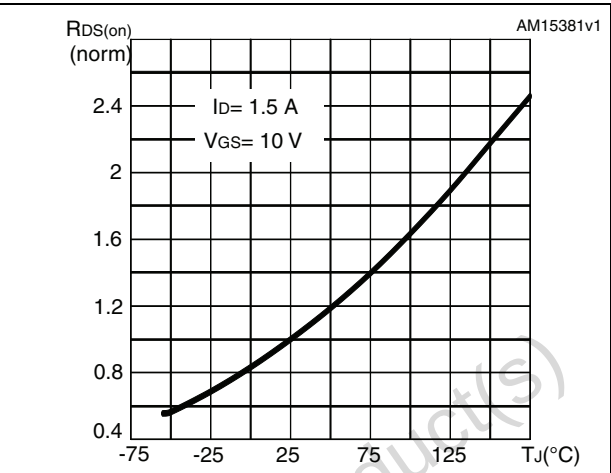


Figure 10. Normalized gate threshold voltage vs temperature

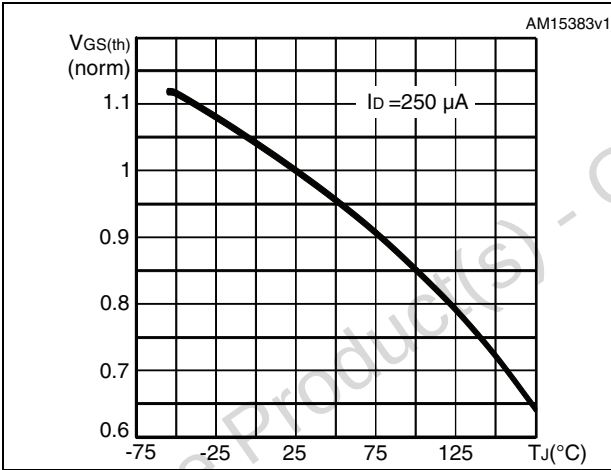


Figure 11. Normalized BVDS vs temperature

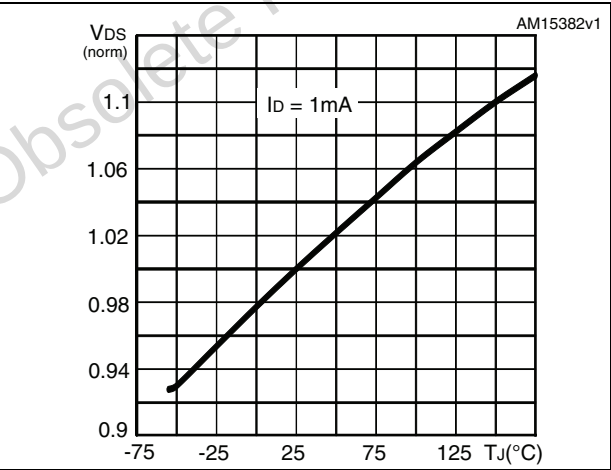
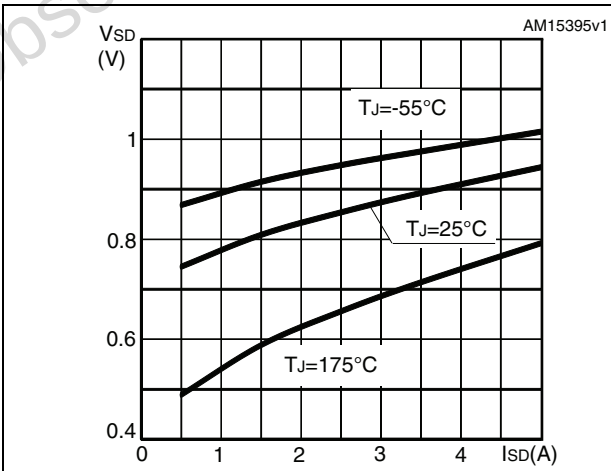


Figure 12. Source-drain diode forward characteristics





## 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](http://www.st.com). ECOPACK® is an ST trademark.

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**Table 9. PowerFLAT™ 5x6 - 8 leads dual pad (ribbon) 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 - 8 leads dual pad drawing (dimensions are in mm)

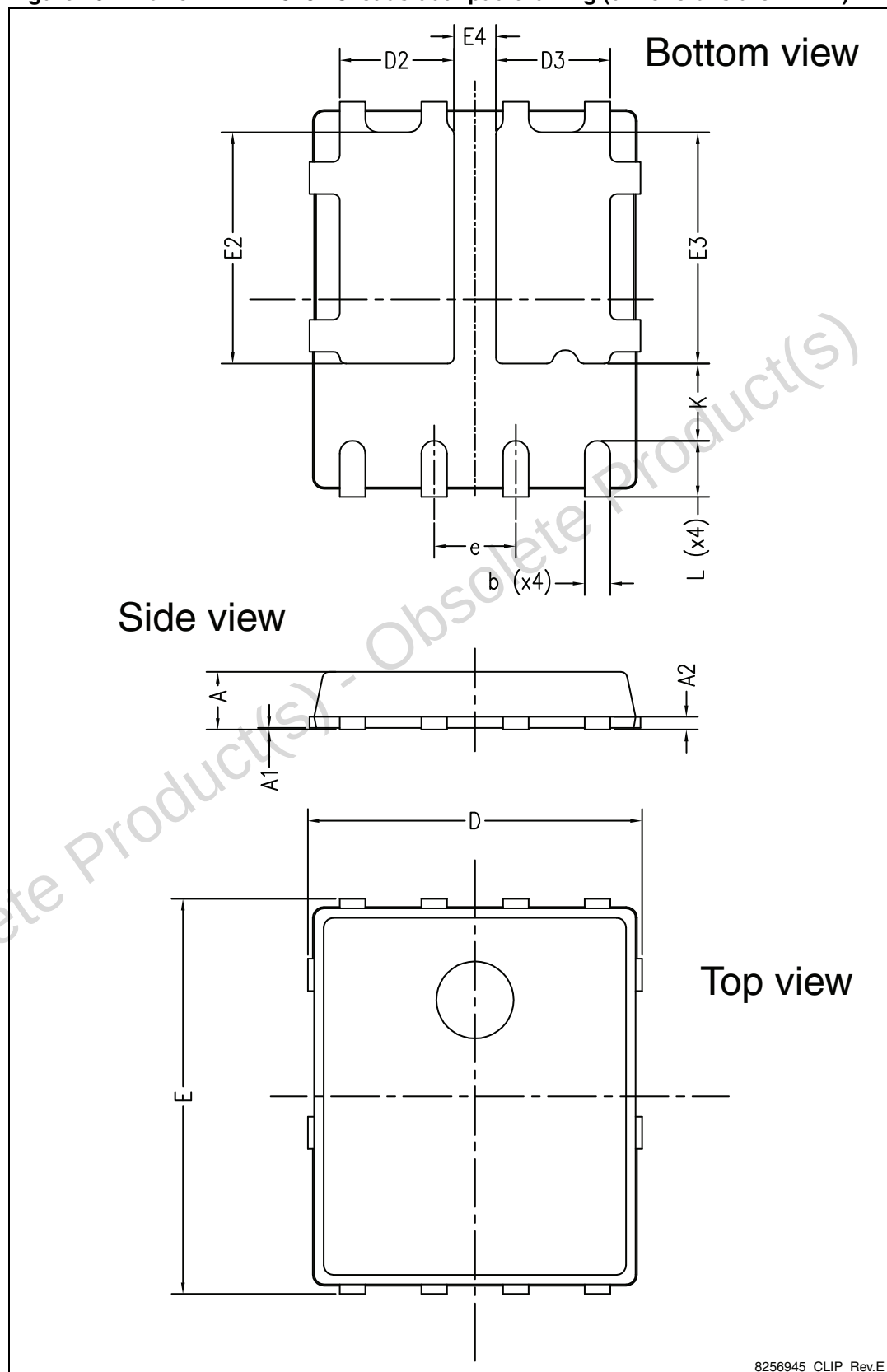
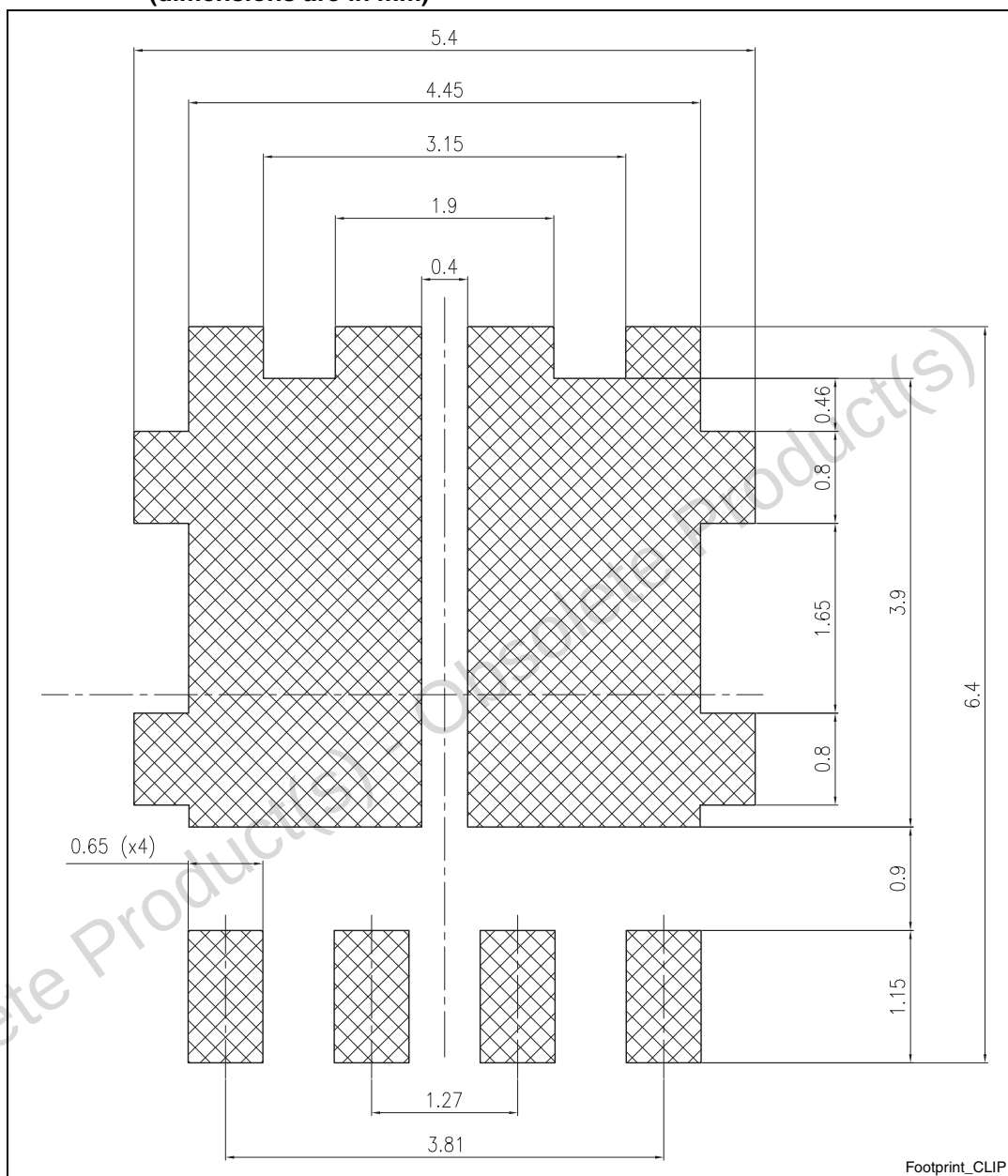


Figure 20. PowerFLAT™ 5x6 - 8 leads dual pad drawing recommended footprint  
(dimensions are in mm)



## 5 Revision history

Table 10. Document revision history

| Date        | Revision | Changes                                                                                                                                                                                                                  |
|-------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 27-Sep-2012 | 1        | First release.                                                                                                                                                                                                           |
| 15-Oct-2012 | 2        | <ul style="list-style-type: none"><li>– <math>R_{thj-case}</math> has been updated in table 3</li><li>– Updated <a href="#">Section 4: Package mechanical data</a>.</li><li>– Minor text changes on cover page</li></ul> |

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