



# BUK9Q19-100L

100 V, 19 mOhm logic level N-channel MOSFET in MLPAK33

5 June 2025

Product data sheet

## 1. General description

Logic level N-channel MOSFET in a small MLPAK33-WF package using Trench12 technology. This product has been designed and qualified to meet AEC-Q101 requirements delivering high performance and endurance.

## 2. Features and benefits

- Logic-level compatible
- Trench12 MOSFET technology
- Efficient switching with soft body-diode recovery
- Automotive qualified to AEC-Q101 at 175°C
- Side-wettable flanks for robust solder joints and automatic optical inspection

## 3. Applications

- LED lighting
- DC-to-DC conversion
- Solenoid, motor and other load switching
- Circuit protection

## 4. Quick reference data

Table 1. Quick reference data

| Symbol                         | Parameter                        | Conditions                                                                                                                                        |     | Min | Typ | Max  | Unit |
|--------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|------|
| $V_{DS}$                       | drain-source voltage             | $25\text{ °C} \leq T_j \leq 175\text{ °C}$                                                                                                        |     | -   | -   | 100  | V    |
| $I_D$                          | drain current                    | $V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 2</a>                                                                         | [1] | -   | -   | 34   | A    |
| $P_{tot}$                      | total power dissipation          | $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 1</a>                                                                                                  |     | -   | -   | 48   | W    |
| <b>Static characteristics</b>  |                                  |                                                                                                                                                   |     |     |     |      |      |
| $R_{DS(on)}$                   | drain-source on-state resistance | $V_{GS} = 10\text{ V}$ ; $I_D = 6.5\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>                                                    |     | -   | 15  | 19.5 | mΩ   |
| <b>Dynamic characteristics</b> |                                  |                                                                                                                                                   |     |     |     |      |      |
| $Q_{GD}$                       | gate-drain charge                | $I_D = 6.5\text{ A}$ ; $V_{DS} = 50\text{ V}$ ; $V_{GS} = 10\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a> |     | -   | 3.9 | -    | nC   |

[1] 34 A Continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                       | Graphic symbol                                                                                |
|-----|--------|-------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | S      | source      | <br>MLPAK33 (SOT8002-3) | <br>mbb076 |
| 2   | S      | source      |                                                                                                          |                                                                                               |
| 3   | S      | source      |                                                                                                          |                                                                                               |
| 4   | G      | gate        |                                                                                                          |                                                                                               |
| 5   | D      | drain       |                                                                                                          |                                                                                               |
| 6   | D      | drain       |                                                                                                          |                                                                                               |
| 7   | D      | drain       |                                                                                                          |                                                                                               |
| 8   | D      | drain       |                                                                                                          |                                                                                               |

6. Ordering information

Table 3. Ordering information

| Type number                  | Package |                                                                                                                                                   |                           |
|------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                              | Name    | Description                                                                                                                                       | Version                   |
| <a href="#">BUK9Q19-100L</a> | MLPAK33 | plastic thermal enhanced surface mounted package with side-wettable flanks (SWF); mini leads; 8 terminals; pitch 0.65 mm; 3.3 x 3.3 x 0.8 mm body | <a href="#">SOT8002-3</a> |

7. Marking

Table 4. Marking codes

| Type number  | Marking code |
|--------------|--------------|
| BUK9Q19-100L | 8AT          |

8. Limiting values

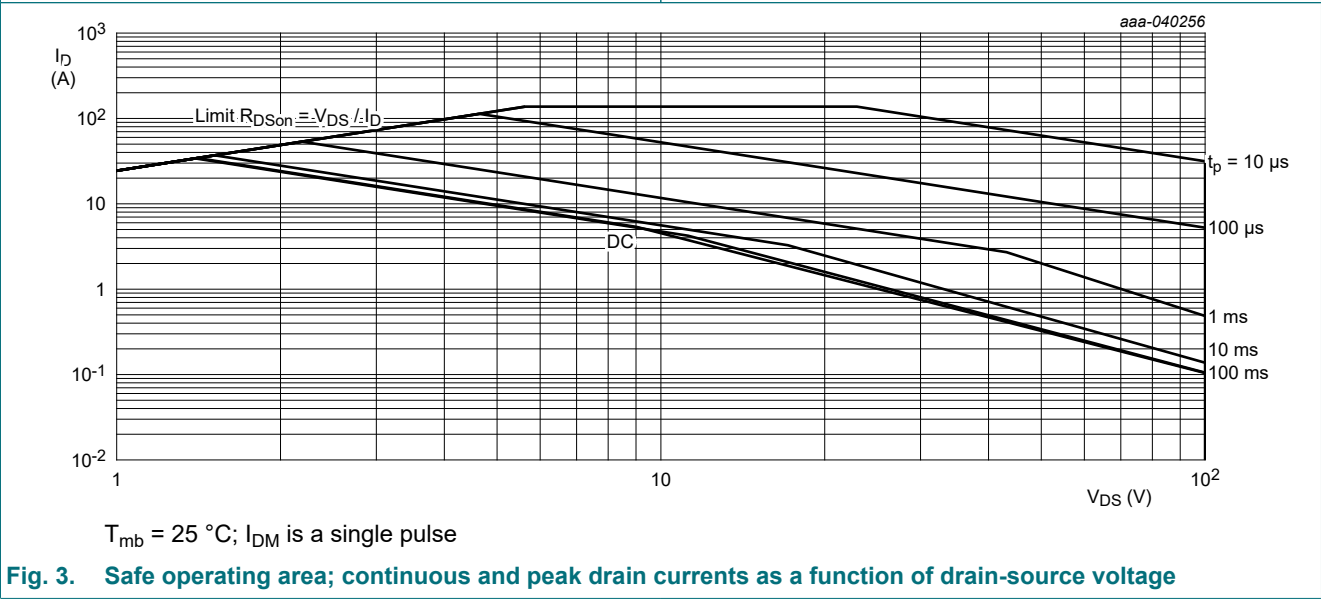
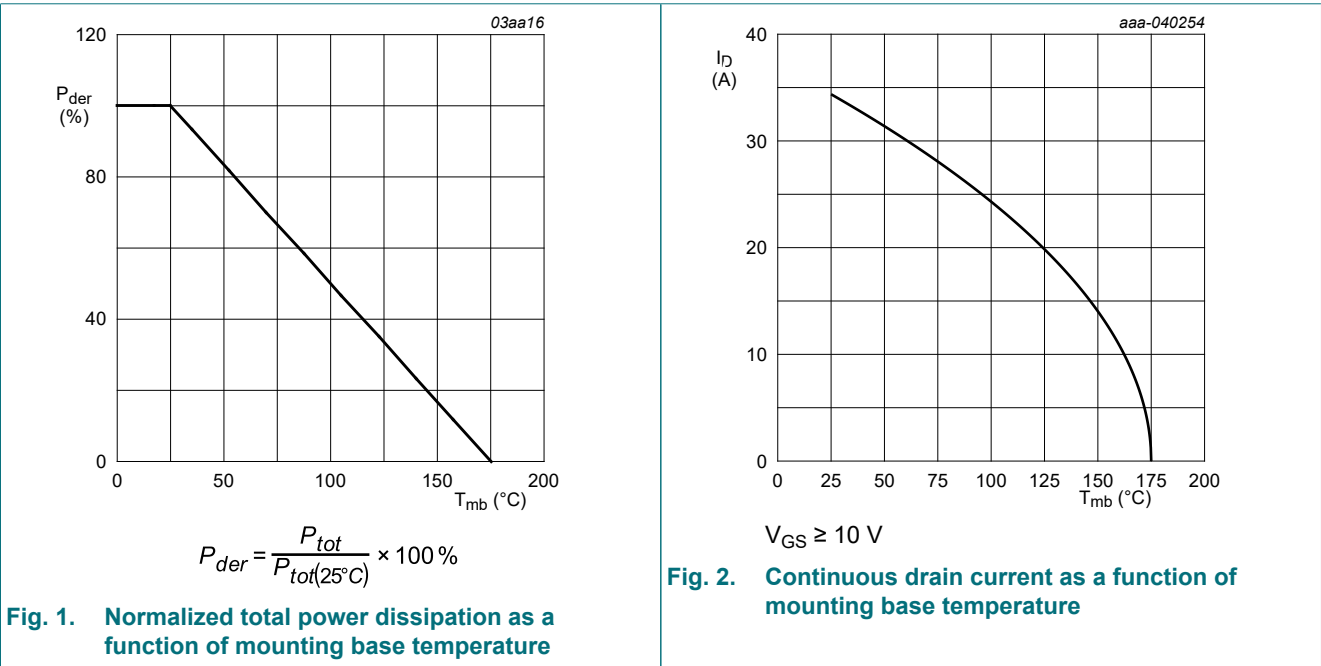
Table 5. Limiting values

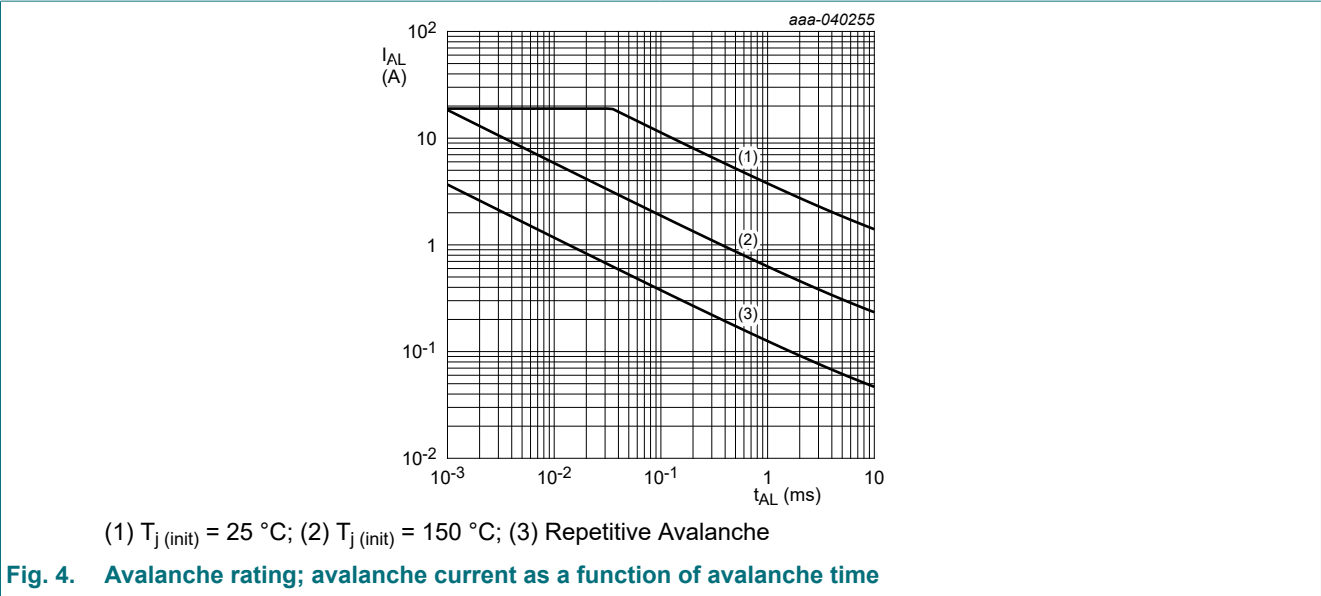
In accordance with the Absolute Maximum Rating System (IEC 60134). Tj = 25 °C unless otherwise specified.

| Symbol             | Parameter               | Conditions                                                               |     | Min | Max | Unit |
|--------------------|-------------------------|--------------------------------------------------------------------------|-----|-----|-----|------|
| V <sub>DS</sub>    | drain-source voltage    | 25 °C ≤ Tj ≤ 175 °C                                                      |     | -   | 100 | V    |
| V <sub>GS</sub>    | gate-source voltage     |                                                                          |     | -20 | 20  | V    |
| P <sub>tot</sub>   | total power dissipation | T <sub>mb</sub> = 25 °C; <a href="#">Fig. 1</a>                          |     | -   | 48  | W    |
| I <sub>D</sub>     | drain current           | V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; <a href="#">Fig. 2</a>  | [1] | -   | 34  | A    |
|                    |                         | V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 100 °C; <a href="#">Fig. 2</a> |     | -   | 24  | A    |
| I <sub>DM</sub>    | peak drain current      | pulsed; tp ≤ 10 μs; T <sub>mb</sub> = 25 °C; <a href="#">Fig. 3</a>      |     | -   | 137 | A    |
| T <sub>stg</sub>   | storage temperature     |                                                                          |     | -55 | 175 | °C   |
| Tj                 | junction temperature    |                                                                          |     | -55 | 175 | °C   |
| Source-drain diode |                         |                                                                          |     |     |     |      |
| IS                 | source current          | T <sub>mb</sub> = 25 °C                                                  |     | -   | 34  | A    |
| ISM                | peak source current     | pulsed; tp ≤ 10 μs; T <sub>mb</sub> = 25 °C                              |     | -   | 137 | A    |

| Symbol               | Parameter                                    | Conditions                                                                                                                                                                                                       |         | Min | Max  | Unit |
|----------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|------|------|
| Avalanche ruggedness |                                              |                                                                                                                                                                                                                  |         |     |      |      |
| $E_{DS(AL)S}$        | non-repetitive drain-source avalanche energy | $I_D = 18.9\text{ A}$ ; $V_{sup} \leq 100\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 10\text{ V}$ ; $T_{J(\text{init})} = 25\text{ }^\circ\text{C}$ ; unclamped; $t_p = 34\text{ }\mu\text{s}$ ; Fig. 4 | [2] [3] | -   | 42.8 | mJ   |
| $I_{AS}$             | non-repetitive avalanche current             | $V_{sup} \leq 100\text{ V}$ ; $V_{GS} = 10\text{ V}$ ; $T_{J(\text{init})} = 25\text{ }^\circ\text{C}$ ; $R_{GS} = 50\text{ }\Omega$ ; Fig. 4                                                                    | [2] [3] | -   | 18.9 | A    |

- [1] 34 A Continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.
- [2] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
- [3] Refer to application note AN10273 for further information.



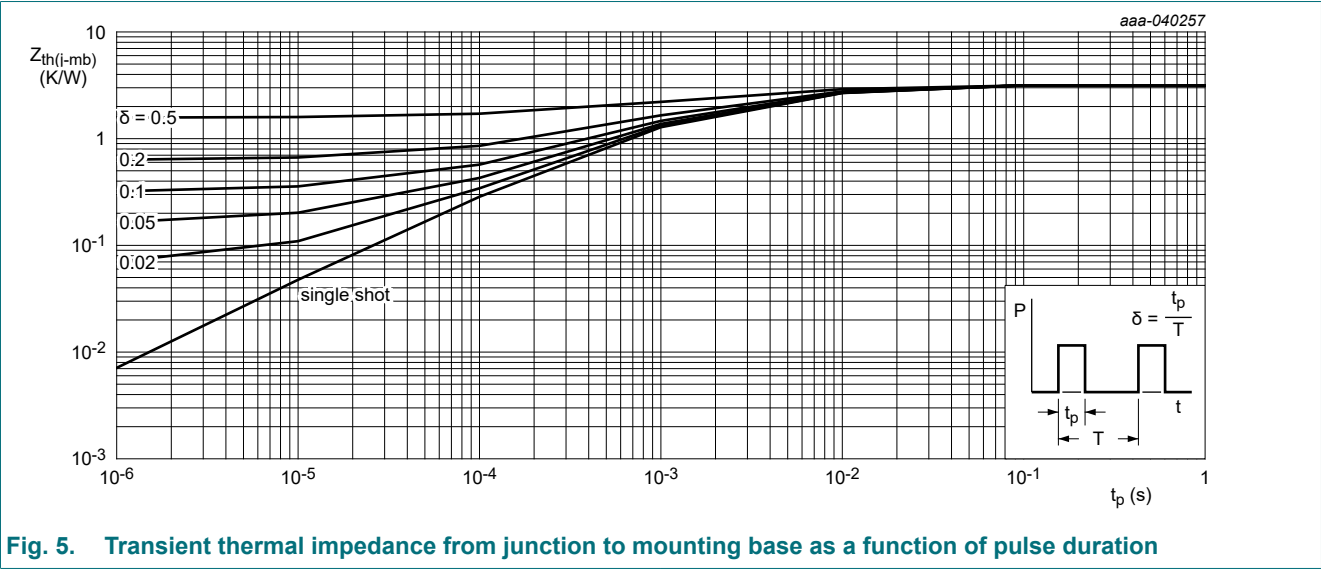


9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter                                         | Conditions |     | Min | Typ | Max | Unit |
|----------------|---------------------------------------------------|------------|-----|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 5     |     | -   | 2.5 | 3.1 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       |            | [1] | -   | 40  | -   | K/W  |

[1] Device on 4 layer PCB. Refer to TN00008 for further information.



## 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                        | Conditions                                                                                                                      |  | Min  | Typ  | Max  | Unit       |
|--------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--|------|------|------|------------|
| <b>Static characteristics</b>  |                                  |                                                                                                                                 |  |      |      |      |            |
| $V_{(BR)DSS}$                  | drain-source breakdown voltage   | $I_D = 250\ \mu A$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                                                     |  | 100  | 115  | -    | V          |
|                                |                                  | $I_D = 250\ \mu A$ ; $V_{GS} = 0\ V$ ; $T_j = -40\ ^\circ C$                                                                    |  | 97   | 112  | -    | V          |
|                                |                                  | $I_D = 250\ \mu A$ ; $V_{GS} = 0\ V$ ; $T_j = -55\ ^\circ C$                                                                    |  | 96   | 111  | -    | V          |
| $V_{GS(th)}$                   | gate-source threshold voltage    | $I_D = 1\ mA$ ; $V_{DS}=V_{GS}$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>                       |  | 1.45 | 1.7  | 2.15 | V          |
| $I_{DSS}$                      | drain leakage current            | $V_{DS} = 100\ V$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                                                      |  | -    | -    | 1    | $\mu A$    |
|                                |                                  | $V_{DS} = 100\ V$ ; $V_{GS} = 0\ V$ ; $T_j = 125\ ^\circ C$                                                                     |  | -    | -    | 20   | $\mu A$    |
|                                |                                  | $V_{DS} = 100\ V$ ; $V_{GS} = 0\ V$ ; $T_j = 175\ ^\circ C$                                                                     |  | -    | -    | 200  | $\mu A$    |
| $I_{GSS}$                      | gate leakage current             | $V_{GS} = 20\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                                                       |  | -    | -    | 100  | nA         |
|                                |                                  | $V_{GS} = -20\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$                                                                      |  | -    | -    | -100 | nA         |
| $R_{DS(on)}$                   | drain-source on-state resistance | $V_{GS} = 10\ V$ ; $I_D = 6.5\ A$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 11</a>                                              |  | -    | 15   | 19.5 | m $\Omega$ |
|                                |                                  | $V_{GS} = 10\ V$ ; $I_D = 6.5\ A$ ; $T_j = 105\ ^\circ C$ ; <a href="#">Fig. 12</a>                                             |  | -    | 23   | 30   | m $\Omega$ |
|                                |                                  | $V_{GS} = 10\ V$ ; $I_D = 6.5\ A$ ; $T_j = 125\ ^\circ C$ ; <a href="#">Fig. 12</a>                                             |  | -    | 25   | 32   | m $\Omega$ |
|                                |                                  | $V_{GS} = 10\ V$ ; $I_D = 6.5\ A$ ; $T_j = 175\ ^\circ C$ ; <a href="#">Fig. 12</a>                                             |  | -    | 30   | 41   | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5\ V$ ; $I_D = 6\ A$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 11</a>                                               |  | -    | 19   | 25.5 | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5\ V$ ; $I_D = 6\ A$ ; $T_j = 105\ ^\circ C$ ; <a href="#">Fig. 12</a>                                              |  | -    | 29   | 40   | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5\ V$ ; $I_D = 6\ A$ ; $T_j = 125\ ^\circ C$ ; <a href="#">Fig. 12</a>                                              |  | -    | 30   | 42   | m $\Omega$ |
|                                |                                  | $V_{GS} = 4.5\ V$ ; $I_D = 6\ A$ ; $T_j = 175\ ^\circ C$ ; <a href="#">Fig. 12</a>                                              |  | -    | 36   | 54   | m $\Omega$ |
| $R_G$                          | gate resistance                  | $f = 1\ MHz$ ; $T_j = 25\ ^\circ C$                                                                                             |  | -    | 1.1  | -    | $\Omega$   |
| <b>Dynamic characteristics</b> |                                  |                                                                                                                                 |  |      |      |      |            |
| $Q_{G(tot)}$                   | total gate charge                | $I_D = 6.5\ A$ ; $V_{DS} = 50\ V$ ; $V_{GS} = 10\ V$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a> |  | -    | 30   | 45   | nC         |
|                                |                                  | $I_D = 6.5\ A$ ; $V_{DS} = 50\ V$ ; $V_{GS} = 5\ V$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>  |  | -    | 15   | -    | nC         |
| $Q_{GS}$                       | gate-source charge               | $I_D = 6.5\ A$ ; $V_{DS} = 50\ V$ ; $V_{GS} = 10\ V$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a> |  | -    | 4.8  | -    | nC         |
| $Q_{GD}$                       | gate-drain charge                |                                                                                                                                 |  | -    | 3.9  | -    | nC         |
| $C_{iss}$                      | input capacitance                | $V_{DS} = 50\ V$ ; $V_{GS} = 0\ V$ ; $f = 1\ MHz$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 15</a>                              |  | -    | 1929 | -    | pF         |
| $C_{oss}$                      | output capacitance               |                                                                                                                                 |  | -    | 334  | -    | pF         |
| $C_{rss}$                      | reverse transfer capacitance     |                                                                                                                                 |  | -    | 9    | -    | pF         |
| $t_{d(on)}$                    | turn-on delay time               | $V_{DS} = 50\ V$ ; $R_L = 7.4\ \Omega$ ; $V_{GS} = 10\ V$ ; $R_{G(ext)} = 5\ \Omega$ ; $T_j = 25\ ^\circ C$                     |  | -    | 5.6  | -    | ns         |
| $t_r$                          | rise time                        |                                                                                                                                 |  | -    | 4.3  | -    | ns         |
| $t_{d(off)}$                   | turn-off delay time              |                                                                                                                                 |  | -    | 29   | -    | ns         |
| $t_f$                          | fall time                        |                                                                                                                                 |  | -    | 11   | -    | ns         |
| <b>Source-drain diode</b>      |                                  |                                                                                                                                 |  |      |      |      |            |
| $V_{SD}$                       | source-drain voltage             | $I_S = 1.7\ A$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$ ; <a href="#">Fig. 16</a>                                               |  | -    | 0.75 | 1    | V          |

| Symbol   | Parameter             | Conditions                                                                                                                                          |  | Min | Typ | Max | Unit |
|----------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|-----|-----|------|
| $t_{rr}$ | reverse recovery time | $I_S = 2.5\text{ A}$ ; $dI_S/dt = -100\text{ A}/\mu\text{s}$ ;<br>$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ |  | -   | 47  | -   | ns   |
| $Q_r$    | recovered charge      |                                                                                                                                                     |  | -   | 37  | -   | nC   |

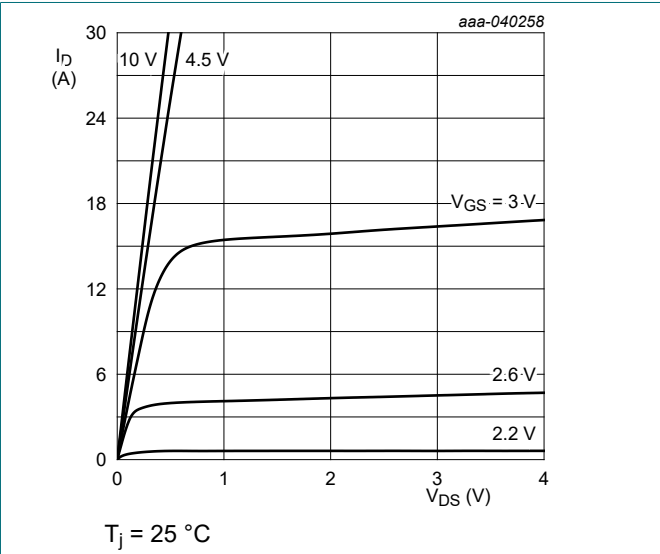


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values

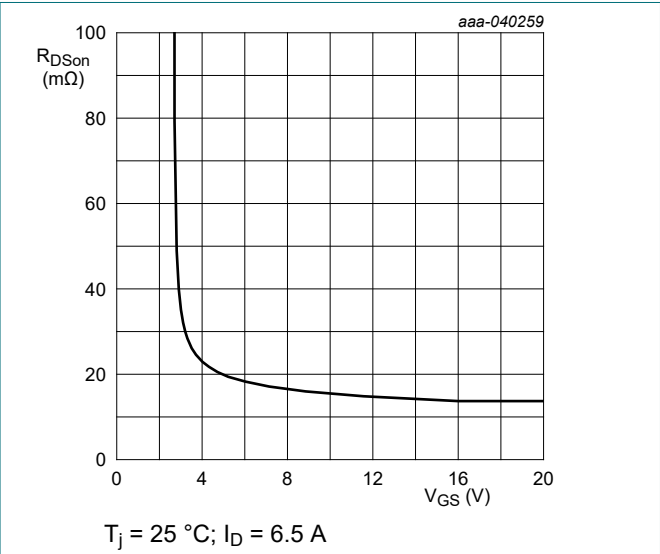


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

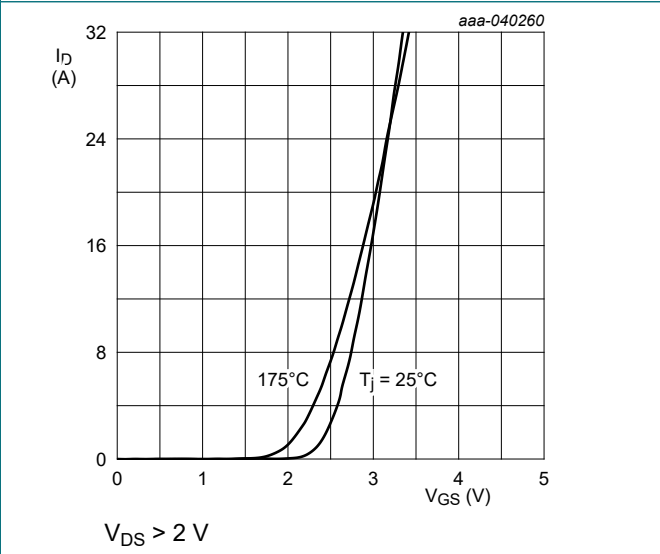


Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

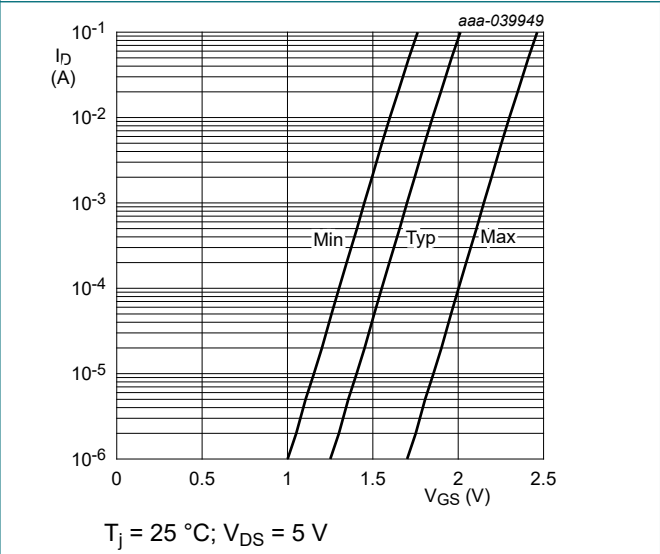


Fig. 9. Sub-threshold drain current as a function of gate-source voltage



Fig. 10. Gate-source threshold voltage as a function of junction temperature

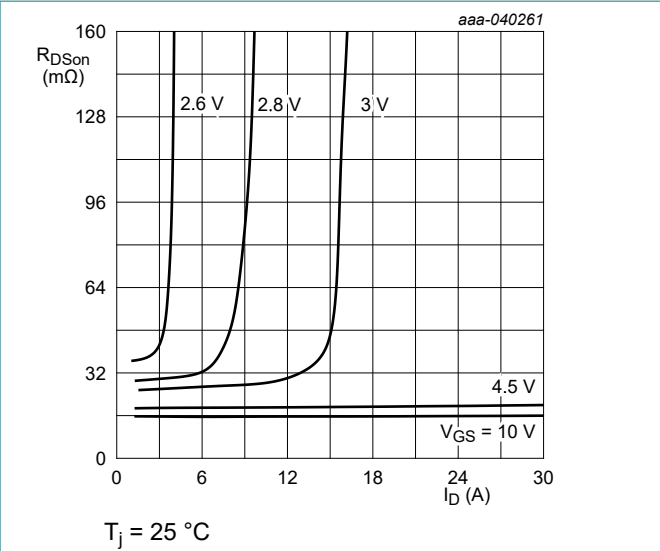


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

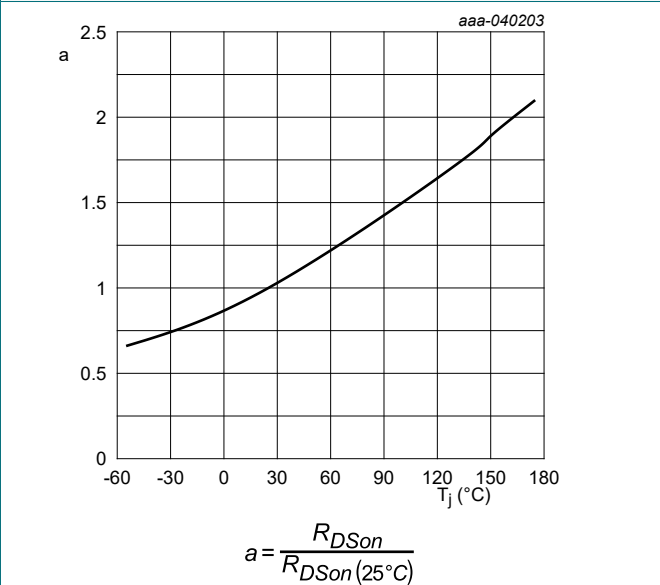


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

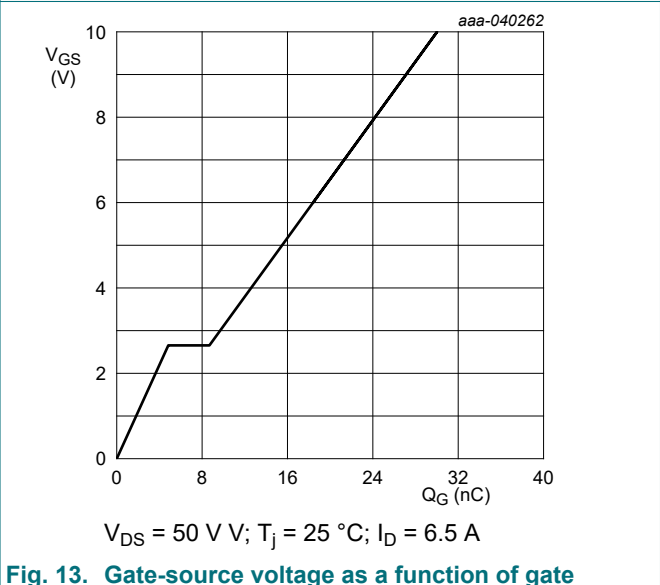


Fig. 13. Gate-source voltage as a function of gate charge; typical values

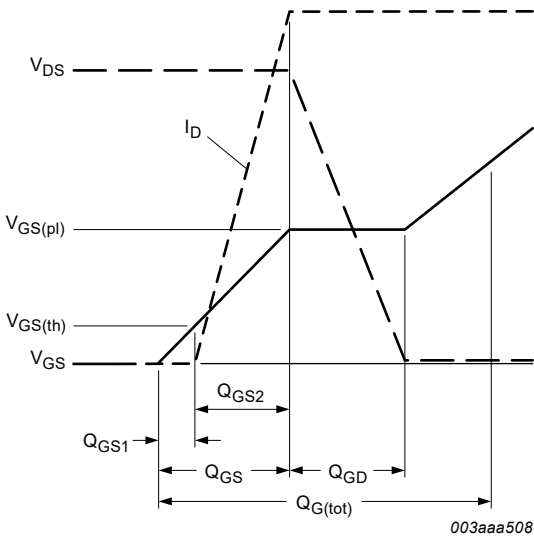


Fig. 14. Gate charge waveform definitions

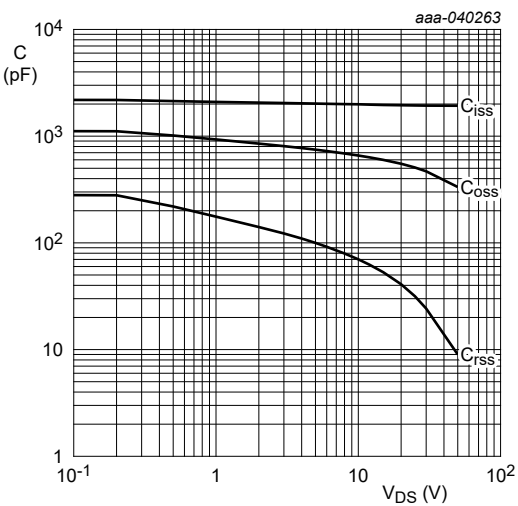
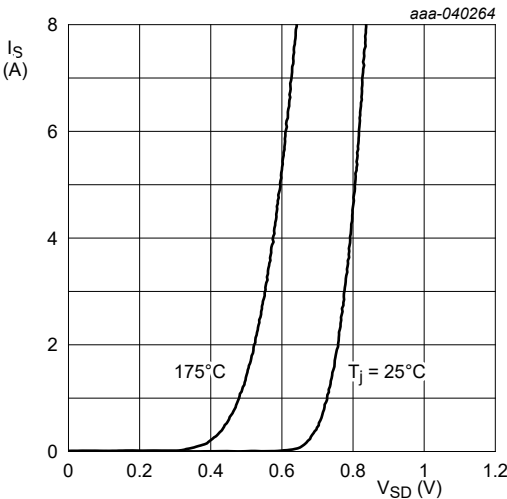


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$V_{GS} = 0\text{ V}$

Fig. 16. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

11. Package outline

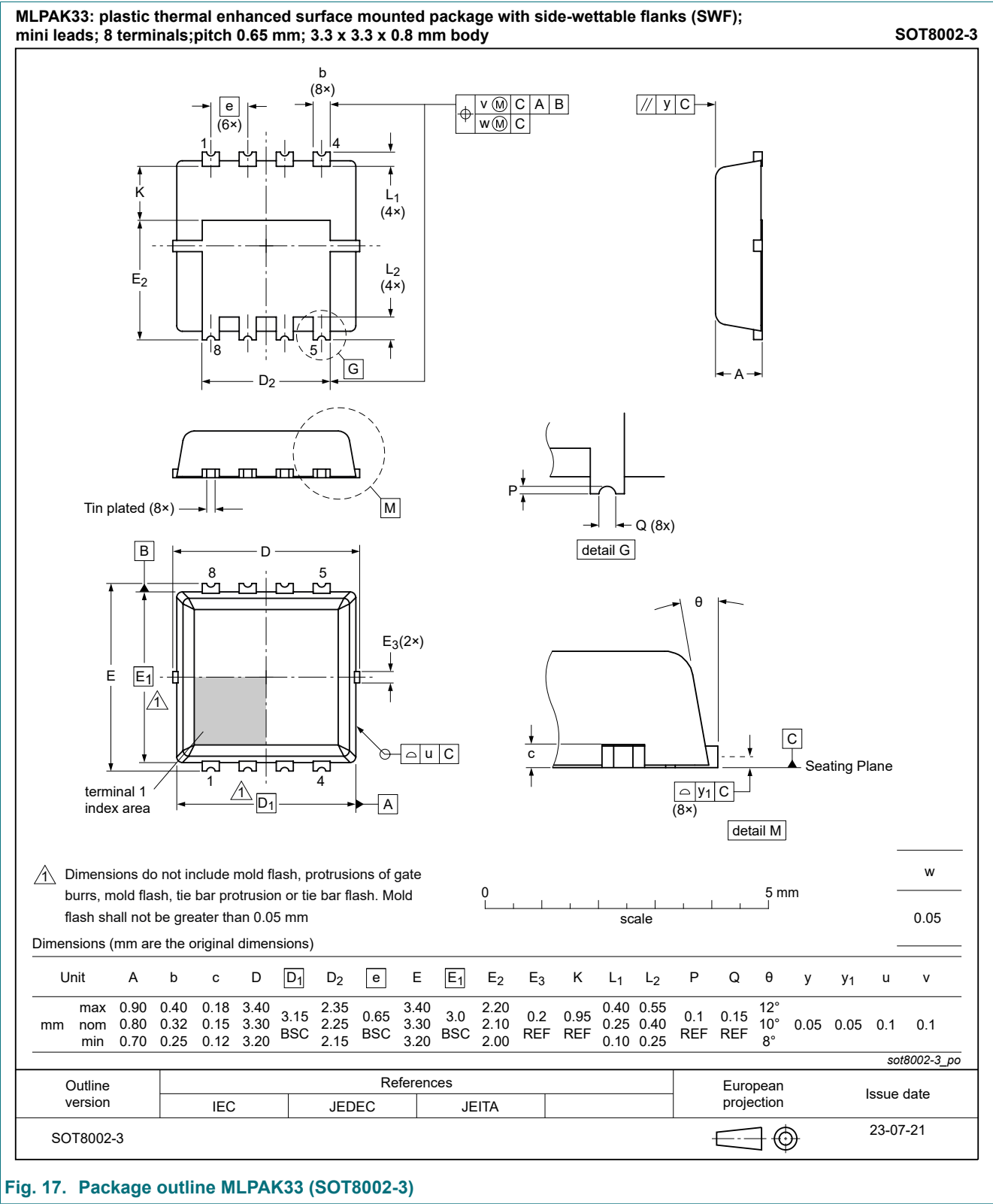


Fig. 17. Package outline MLPAK33 (SOT8002-3)

12. Soldering

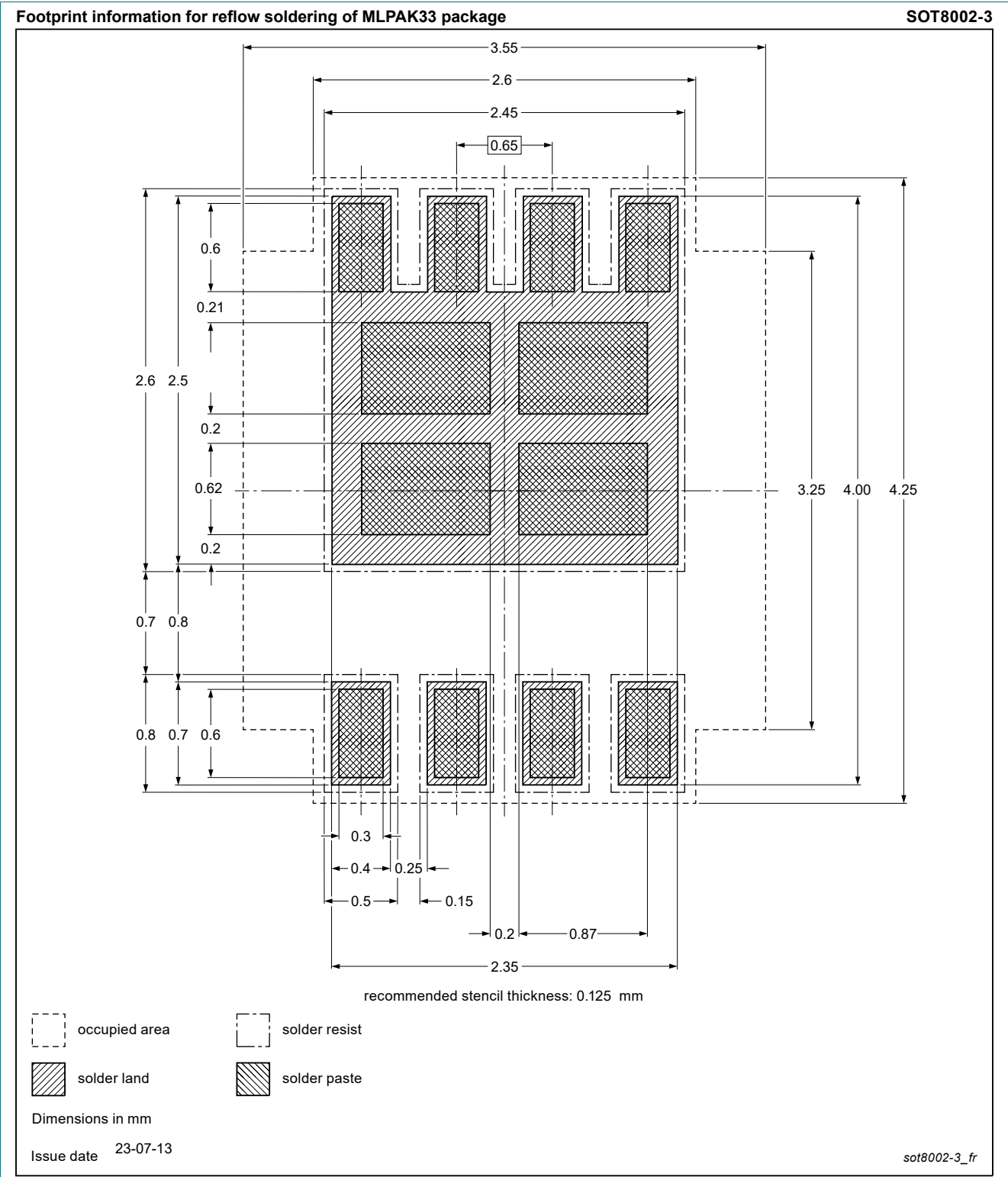


Fig. 18. Reflow soldering footprint for MLPAK33 (SOT8002-3)

### 13. Legal information

#### Data sheet status

| Document status<br>[1][2]      | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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