



PXM012-100QS

N-channel 100 V, 12 mOhm, standard level Trench MOSFET in MLPAK33

21 September 2023

Product data sheet

1. General description

General purpose MOSFET for standard applications, 50 A, standard level N-channel enhancement mode Power MOSFET in MLPAK33 package.

2. Features and benefits

- Standard level compatibility
- Trench MOSFET technology
- Thermally efficient package in a small form factor (3.3 mm x 3.3 mm footprint)

3. Applications

- Secondary side synchronous rectification
- DC-to-DC converters
- Home appliance
- Motor drive
- Load switching
- LED lighting

4. Quick reference data

Table 1. Quick reference data

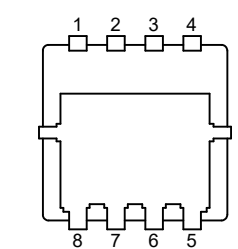
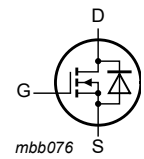
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|--|--|-----|------|------|------|
| V_{DS} | drain-source voltage | $25\text{ °C} \leq T_j \leq 150\text{ °C}$ | - | - | 100 | V |
| I_D | drain current | $V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C}; \text{Fig. 2}$ | - | - | 50 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}; \text{Fig. 1}$ | - | - | 58 | W |
| T_j | junction temperature | | -55 | - | 150 | °C |
| Static characteristics | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10\text{ V}; I_D = 10\text{ A}; T_j = 25\text{ °C}; \text{Fig. 9}$ | - | 10.6 | 12 | mΩ |
| Dynamic characteristics | | | | | | |
| Q_{GD} | gate-drain charge | $I_D = 10\text{ A}; V_{DS} = 50\text{ V}; V_{GS} = 10\text{ V}; T_j = 25\text{ °C}; \text{Fig. 11}; \text{Fig. 12}$ | - | 5.5 | - | nC |
| $Q_{G(tot)}$ | total gate charge | | - | 22 | - | nC |
| Avalanche ruggedness | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 23.2\text{ A}; V_{sup} \leq 100\text{ V}; V_{GS} = 10\text{ V}; T_{j(init)} = 25\text{ °C}; \text{unclamped}$ | [1] | - | 53.8 | mJ |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------------------|------------------|---|-----|-----|-----|------|----|
| Source-drain diode | | | | | | | |
| Q_r | recovered charge | $I_S = 10\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 15 | [2] | - | 27 | - | nC |

- [1] Protected by 100% test
- [2] includes capacitive recovery

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|--|---|
| 1 | S | source |  <p>MLPAK33 (SOT8002-1)</p> |  <p>mbb076</p> |
| 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 |
| PXN012-100QS | MLPAK33 | plastic thermal enhanced surface mounted package; mini leads; 8 terminals; pitch 0.65 mm; 3.3 x 3.3 x 0.8 mm body | SOT8002-1 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|--------------|--------------|
| PXN012-100QS | 7AN |

8. Limiting values

Table 5. Limiting values

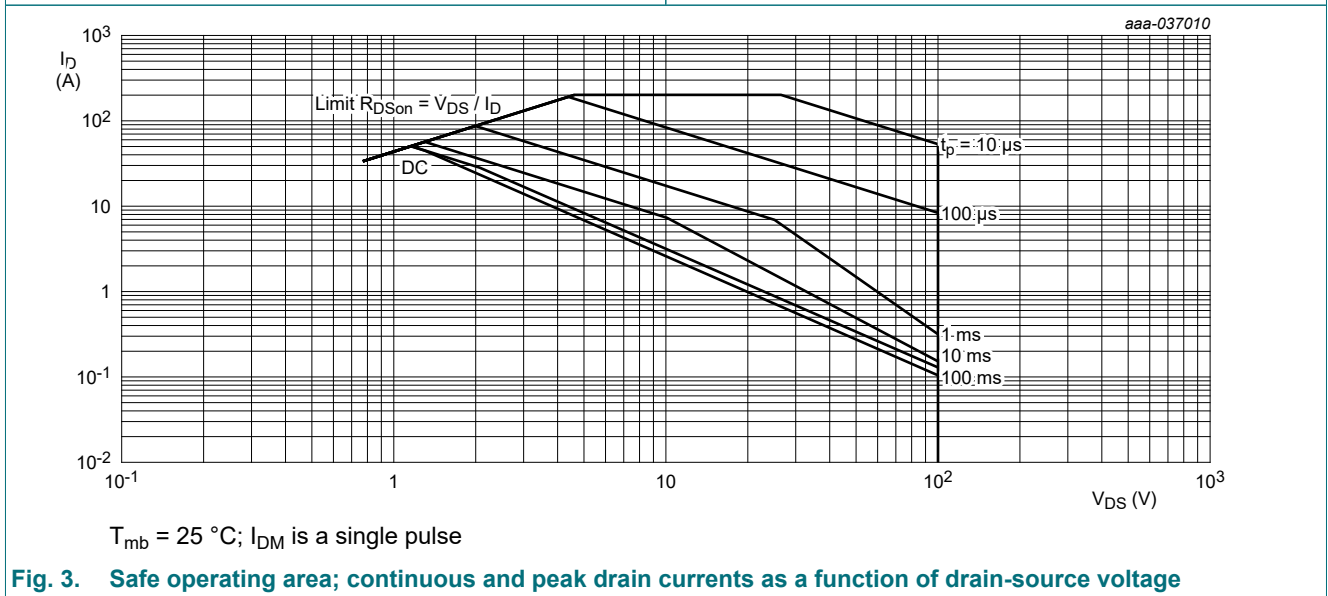
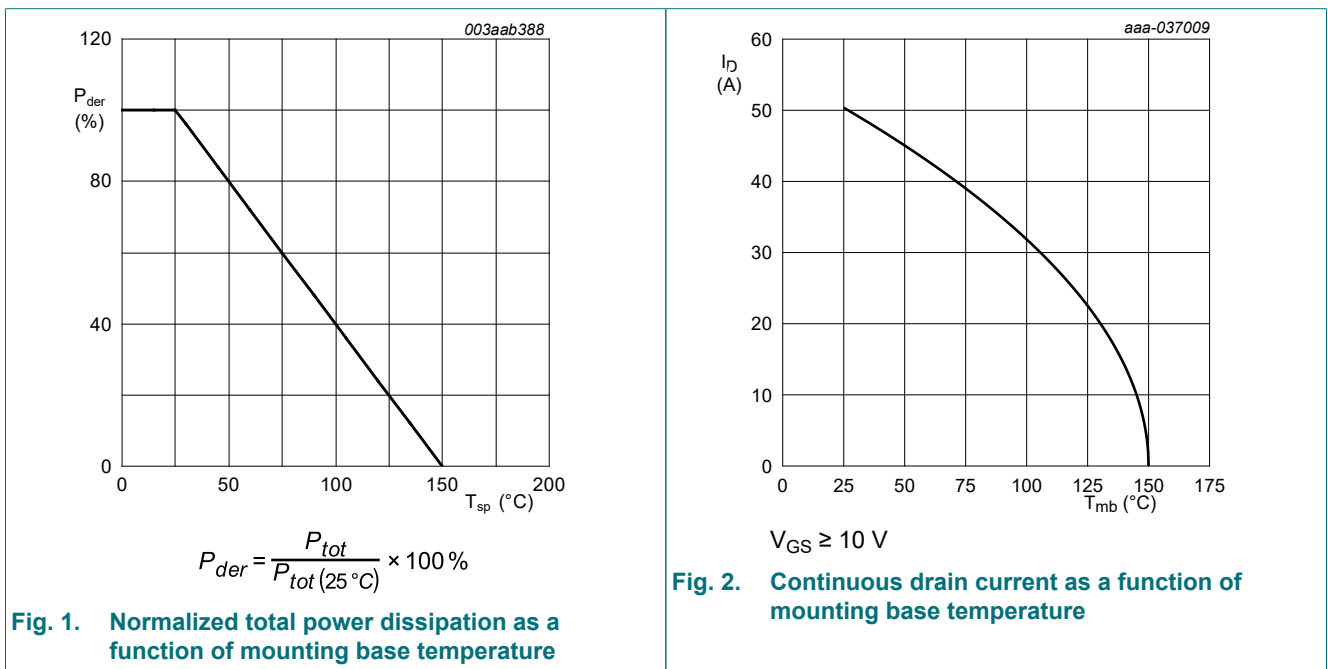
In accordance with the Absolute Maximum Rating System (IEC 60134). $T_J = 25\text{ }^\circ\text{C}$ unless otherwise stated.

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|-------------------------|---|-----|-----|------------------|
| V_{DS} | drain-source voltage | $25\text{ }^\circ\text{C} \leq T_J \leq 150\text{ }^\circ\text{C}$ | - | 100 | V |
| V_{GS} | gate-source voltage | | -20 | 20 | V |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 1 | - | 58 | W |
| I_D | drain current | $V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 2 | - | 50 | A |
| | | $V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ }^\circ\text{C}$; Fig. 2 | - | 32 | A |
| I_{DM} | peak drain current | pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 3 | - | 201 | A |
| T_{stg} | storage temperature | | -55 | 150 | $^\circ\text{C}$ |

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| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------------------------|--|---|-----|-----|---------|
| T_j | junction temperature | | -55 | 150 | °C |
| $T_{sld(M)}$ | peak soldering temperature | | - | 260 | °C |
| Source-drain diode | | | | | |
| I_S | source current | $T_{mb} = 25\text{ °C}$ | - | 48 | A |
| I_{SM} | peak source current | pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$ | - | 201 | A |
| Avalanche ruggedness | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 23.2\text{ A}$; $V_{sup} \leq 100\text{ V}$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; unclamped | [1] | - | 53.8 mJ |
| I_{AS} | non-repetitive avalanche current | $T_{j(init)} = 25\text{ °C}$ | [1] | - | 23.2 A |

[1] Protected by 100% test



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. 4 | - | 1.79 | 2.15 | K/W |

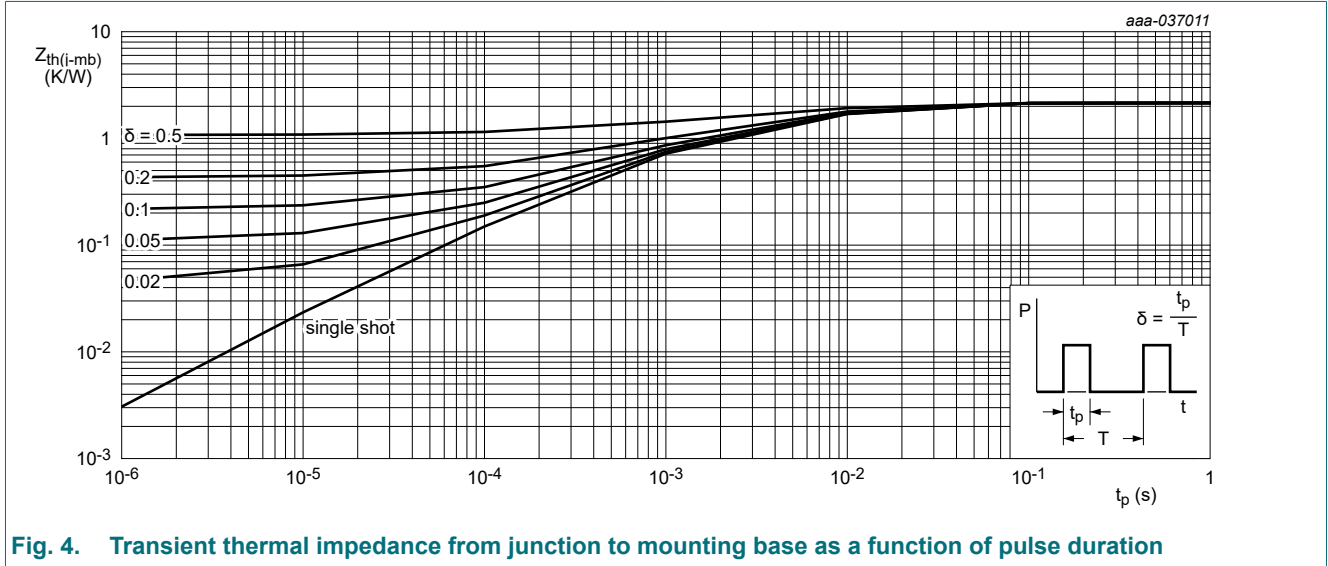


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

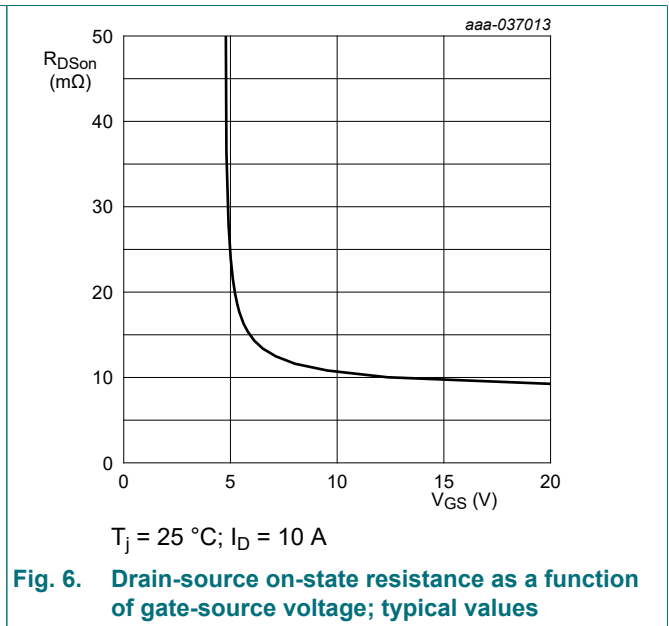
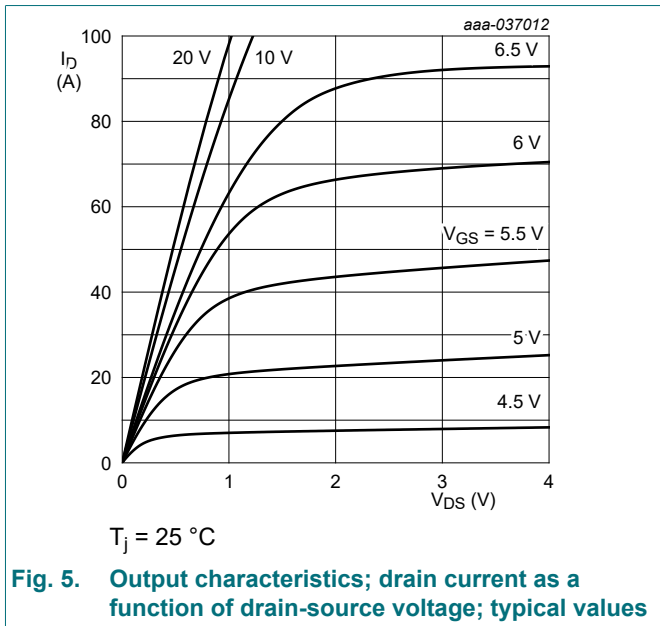
Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|--|--|-----|------|-----|------------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | 100 | - | - | V |
| | | $I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$ | - | 100 | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D = 0.25 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C;$ Fig. 8 | 2 | 3 | 4 | V |
| | | $I_D = 0.25 \text{ mA}; V_{DS}=V_{GS}; T_j = 150 \text{ }^\circ C$ | - | 1.8 | - | V |
| | | $I_D = 0.25 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$ | - | 3.6 | - | V |
| $\Delta V_{GS(th)}/\Delta T$ | gate-source threshold voltage variation with temperature | $25 \text{ }^\circ C \leq T_j \leq 150 \text{ }^\circ C$ | - | -9.2 | - | mV/K |
| I_{DSS} | drain leakage current | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 0.01 | 1 | μA |
| | | $V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 150 \text{ }^\circ C$ | - | 9 | - | μA |
| I_{GSS} | gate leakage current | $V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 2 | 100 | nA |
| | | $V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ | - | 2 | 100 | nA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ }^\circ C;$ Fig. 9 | - | 10.6 | 12 | m Ω |
| | | $V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 150 \text{ }^\circ C;$ Fig. 10 | - | - | 23 | m Ω |
| R_G | gate resistance | $f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ C$ | - | 1 | - | Ω |

N-channel 100 V, 12 mOhm, standard level Trench MOSFET in MLPAK33

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|--|--|------|-----|------|
| Dynamic characteristics | | | | | | |
| Q _{G(tot)} | total gate charge | I _D = 10 A; V _{DS} = 50 V; V _{GS} = 10 V; T _j = 25 °C; Fig. 11 ; Fig. 12 | - | 22 | - | nC |
| | | I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V; T _j = 25 °C | - | 11 | - | nC |
| Q _{GS} | gate-source charge | I _D = 10 A; V _{DS} = 50 V; V _{GS} = 10 V; T _j = 25 °C; Fig. 11 ; Fig. 12 | - | 6 | - | nC |
| Q _{GS(th)} | pre-threshold gate-source charge | | - | 3.8 | - | nC |
| Q _{GS(th-pl)} | post-threshold gate-source charge | | - | 2.1 | - | nC |
| Q _{GD} | gate-drain charge | | - | 5.5 | - | nC |
| V _{GS(pl)} | gate-source plateau voltage | | I _D = 10 A; V _{DS} = 50 V; T _j = 25 °C; Fig. 11 ; Fig. 12 | - | 4.6 | - |
| C _{iss} | input capacitance | V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 13 | - | 1313 | - | pF |
| C _{oss} | output capacitance | | - | 456 | - | pF |
| C _{rss} | reverse transfer capacitance | | - | 16 | - | pF |
| t _{d(on)} | turn-on delay time | V _{DS} = 50 V; R _L = 5 Ω; V _{GS} = 10 V; R _{G(ext)} = 5 Ω; T _j = 25 °C | - | 6.7 | - | ns |
| t _r | rise time | | - | 5.8 | - | ns |
| t _{d(off)} | turn-off delay time | | - | 14 | - | ns |
| t _f | fall time | | - | 9.7 | - | ns |
| Q _{oss} | output charge | | V _{GS} = 0 V; V _{DS} = 50 V; f = 1 MHz; T _j = 25 °C | - | 35 | - |
| Source-drain diode | | | | | | |
| V _{SD} | source-drain voltage | I _S = 10 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 14 | - | 0.83 | 1.2 | V |
| t _{rr} | reverse recovery time | I _S = 10 A; di _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 50 V; T _j = 25 °C; Fig. 15 | - | 33 | - | ns |
| Q _r | recovered charge | | [1] | 27 | - | nC |

[1] includes capacitive recovery



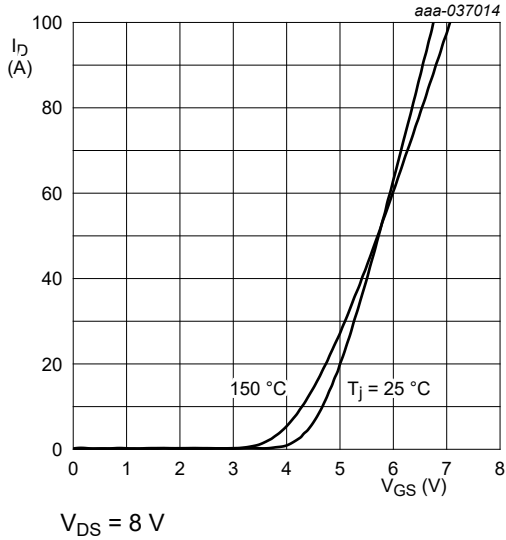


Fig. 7. Transfer characteristics; drain current as a function of gate-source voltage; typical values

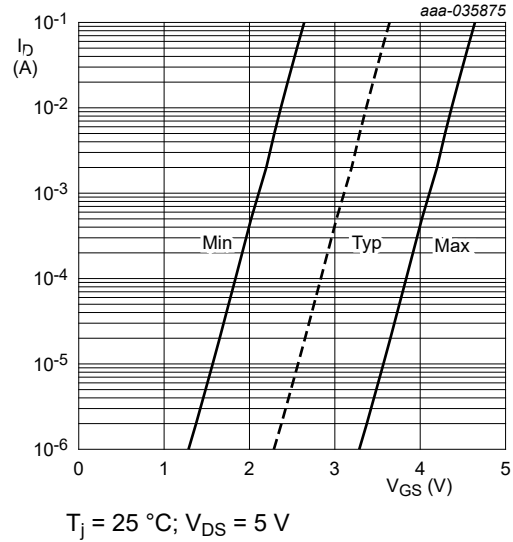


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

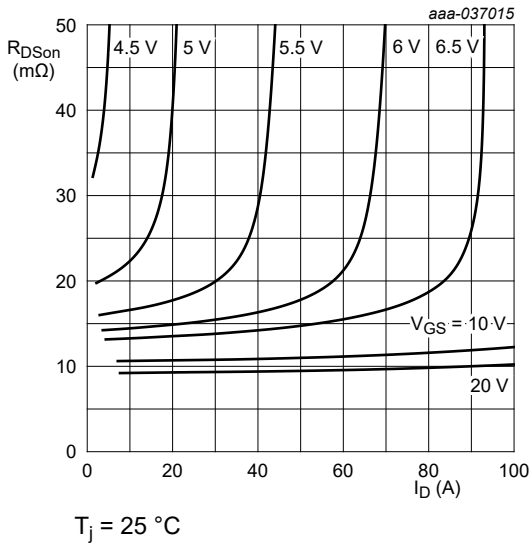


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values

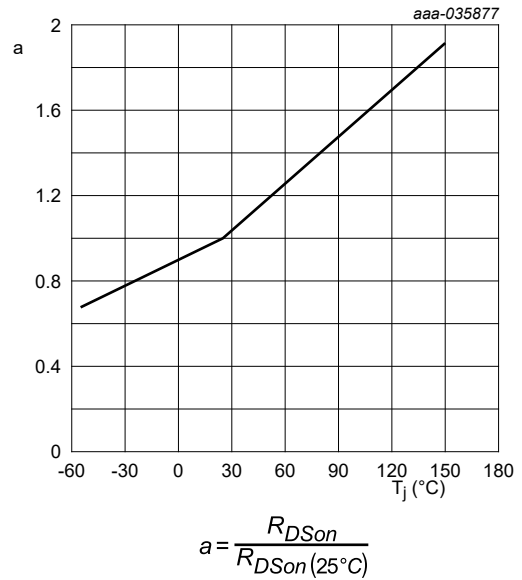


Fig. 10. Normalized drain-source on-state resistance factor as a function of junction temperature

$$a = \frac{R_{DSon}}{R_{DSon}(25^{\circ}\text{C})}$$

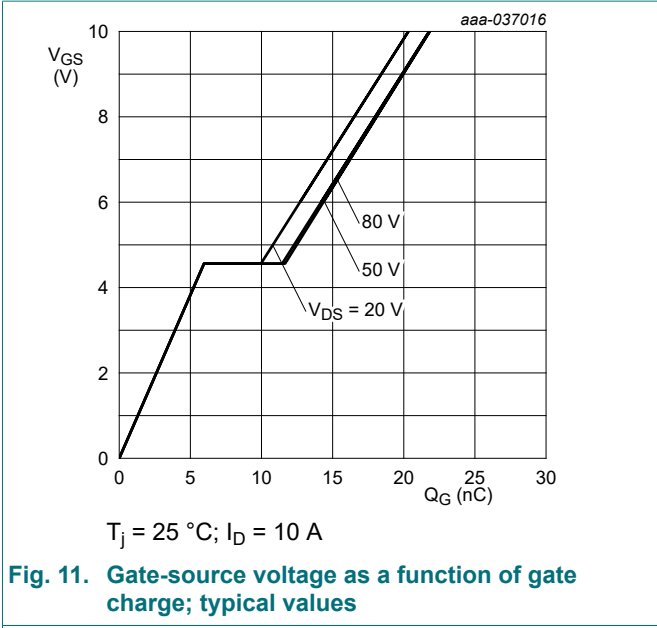


Fig. 11. Gate-source voltage as a function of gate charge; typical values

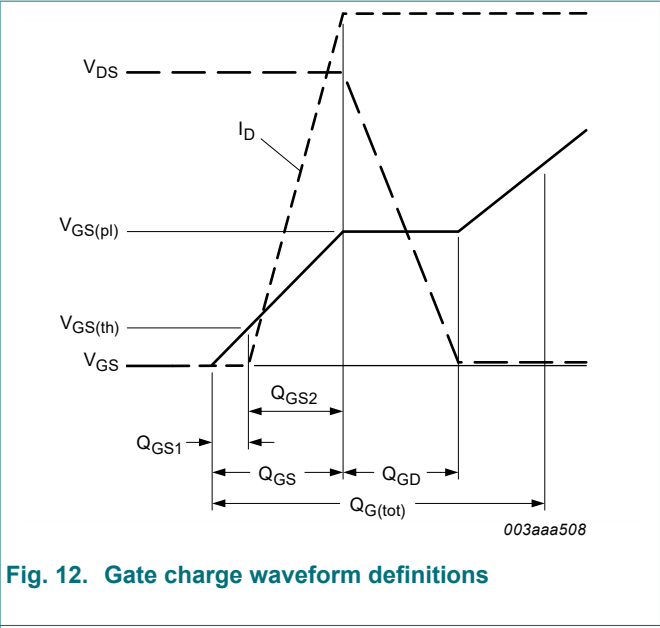


Fig. 12. Gate charge waveform definitions

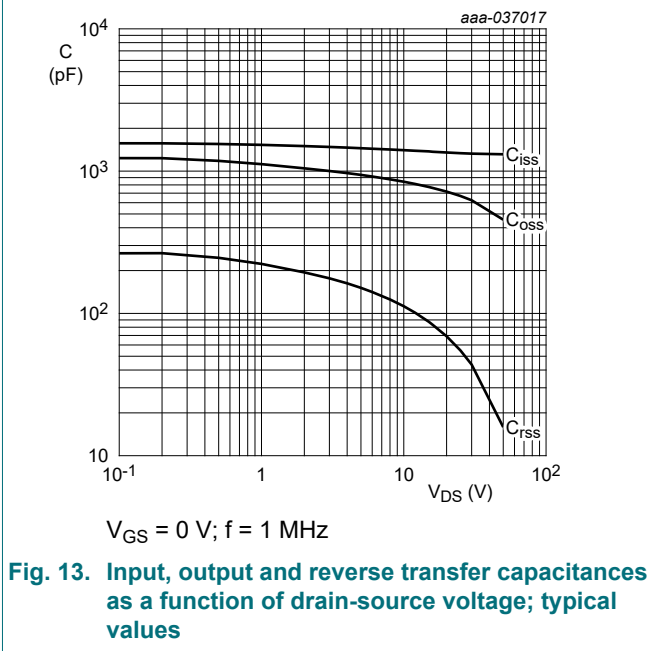


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

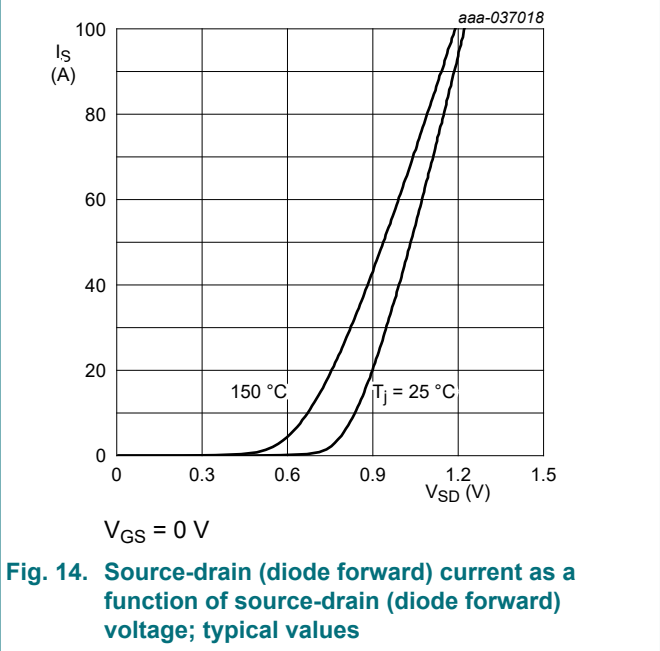


Fig. 14. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

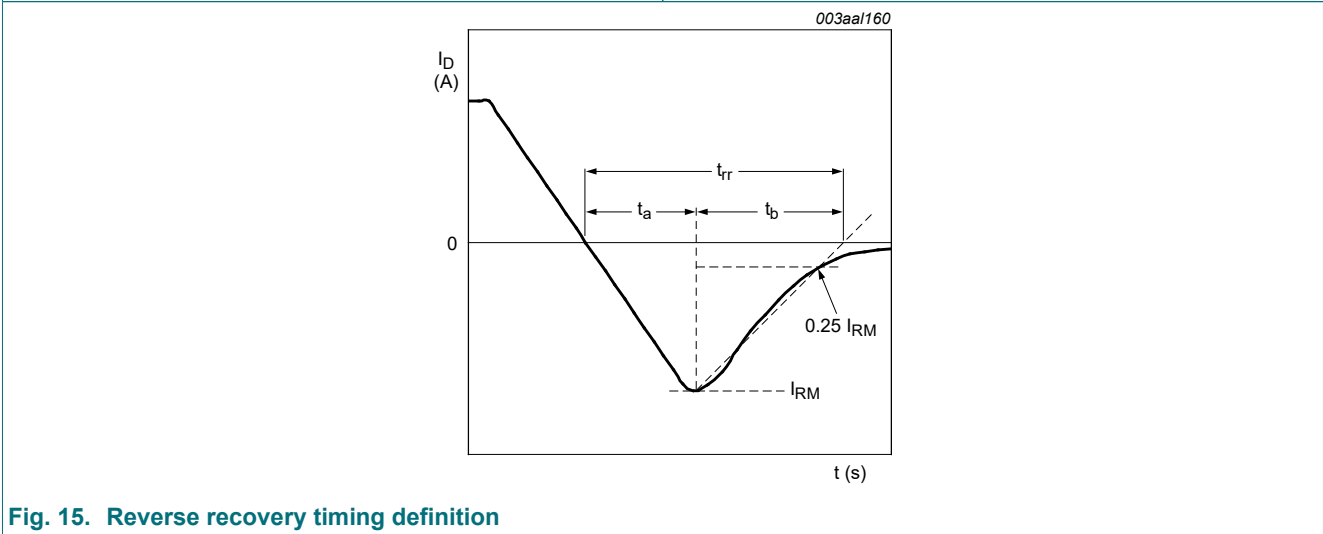
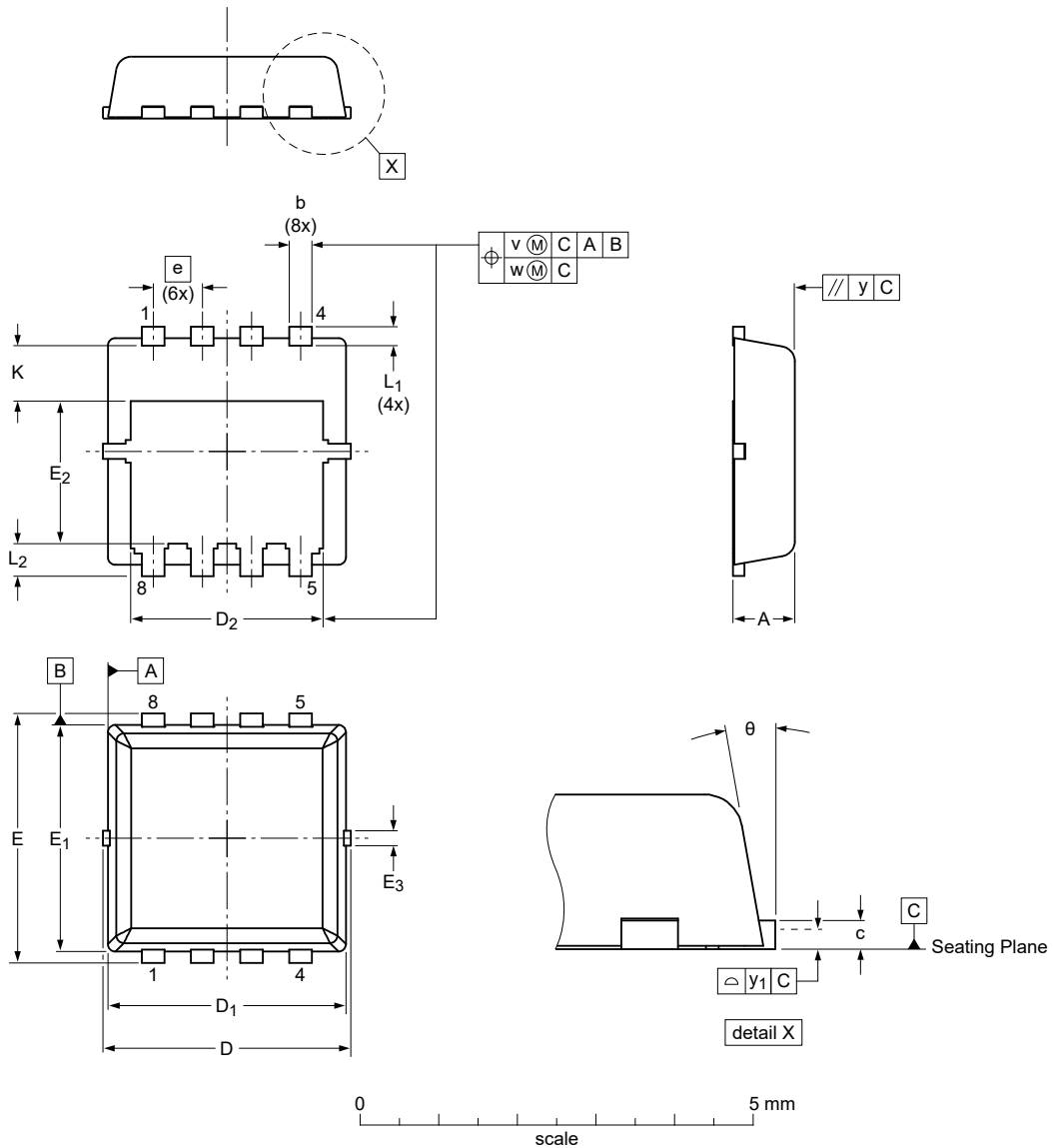


Fig. 15. Reverse recovery timing definition

11. Package outline

MLPAK33: plastic thermal enhanced surface mounted package; mini leads; 8 terminals; pitch 0.65 mm; 3.3 x 3.3 x 0.8 mm body

SOT8002-1



Dimensions (mm are the original dimensions)

| Unit | A | b | c | D | D ₁ | D ₂ | e | E | E ₁ | E ₂ | E ₃ | K | L ₁ | L ₂ | θ | y | y ₁ | v | w |
|--------|------|------|------|------|----------------|----------------|------|------|----------------|----------------|----------------|------------|----------------|----------------|-----|------|----------------|-----|------|
| max | 0.90 | 0.35 | 0.18 | 3.50 | 3.25 | 2.65 | | 3.50 | 3.10 | 1.99 | 0.25 | | 0.40 | 0.58 | 12° | | | | |
| mm nom | 0.80 | 0.30 | 0.15 | 3.30 | 3.15 | 2.55 | 0.65 | 3.30 | 3.00 | 1.89 | 0.20 | 0.65 (ref) | 0.25 | 0.43 | 10° | 0.05 | 0.05 | 0.1 | 0.05 |
| min | 0.70 | 0.25 | 0.12 | 3.10 | 3.05 | 2.45 | | 3.10 | 2.90 | 1.79 | 0.15 | | 0.10 | 0.28 | 8° | | | | |

sot8002-1_po

| Outline version | References | | | | European projection | Issue date |
|-----------------|------------|-------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT8002-1 | | | | | | 20-01-19 23-05-17 |

Fig. 16. Package outline MLPAK33 (SOT8002-1)

12. Soldering

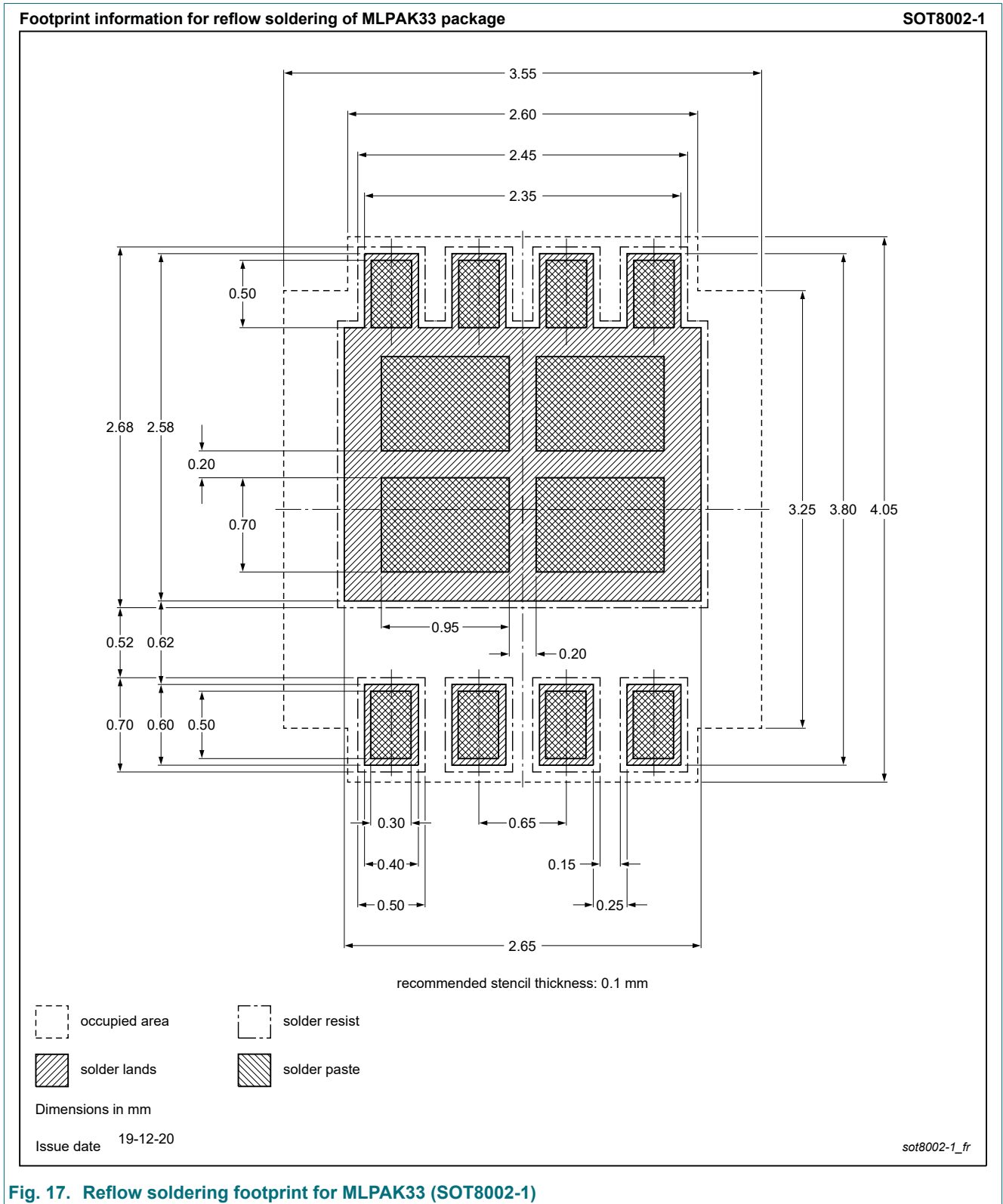


Fig. 17. Reflow soldering footprint for MLPAK33 (SOT8002-1)

13. Legal information

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| Document status [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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