



NX3008NBK

30 V, 400 mA N-channel Trench MOSFET

Rev. 1 — 2 August 2011

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Product data sheet

1. Product profile

1.1 General description

N-channel enhancement mode Field-Effect Transistor (FET) in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

- Very fast switching
- Low threshold voltage
- Trench MOSFET technology
- ESD protection up to 2 kV
- AEC-Q101 qualified

1.3 Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

1.4 Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|----------------------|--|-------|-----|-----|------|
| V_{DS} | drain-source voltage | $T_j = 25\text{ }^\circ\text{C}$ | - | - | 30 | V |
| V_{GS} | gate-source voltage | | -8 | - | 8 | V |
| I_D | drain current | $V_{GS} = 4.5\text{ V};$ $T_{amb} = 25\text{ }^\circ\text{C}$ | [1] - | - | 400 | mA |

Static characteristics

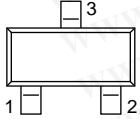
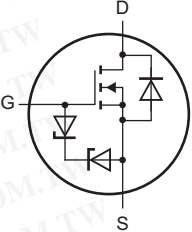
| | | | | | | |
|--------------|----------------------------------|---|---|---|-----|----------|
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 4.5\text{ V};$ $I_D = 350\text{ mA}; T_j = 25\text{ }^\circ\text{C}$ | - | 1 | 1.4 | Ω |
|--------------|----------------------------------|---|---|---|-----|----------|

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².



2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---|--|
| 1 | G | gate |  <p>SOT23 (TO-236AB)</p> |  <p>017aaa255</p> |
| 2 | S | source | | |
| 3 | D | drain | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|----------|--|---------|
| | Name | Description | |
| NX3008NBK | TO-236AB | plastic surface-mounted package; 3 leads | SOT23 |

4. Marking

Table 4. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| NX3008NBK | KS% |

[1] % = placeholder for manufacturing site code.

5. Limiting values

Table 5. Limiting values

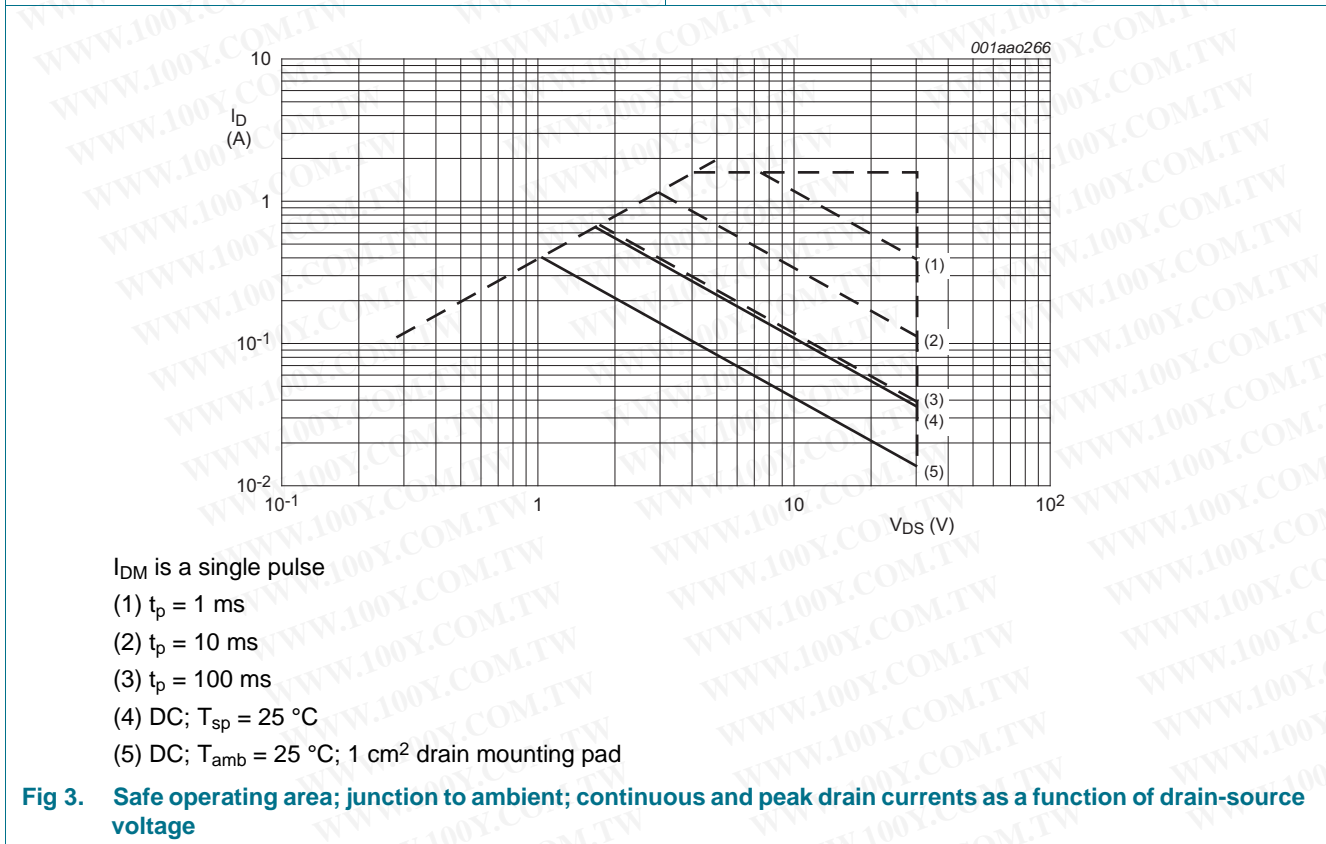
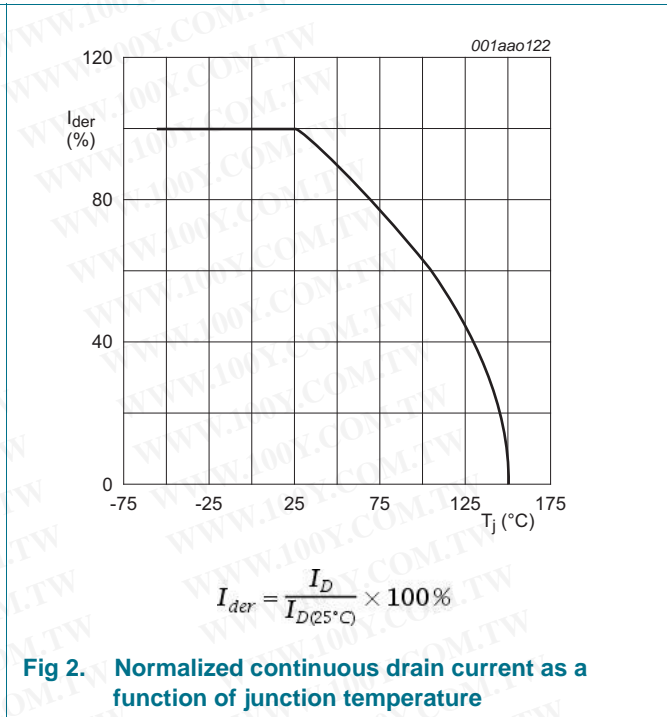
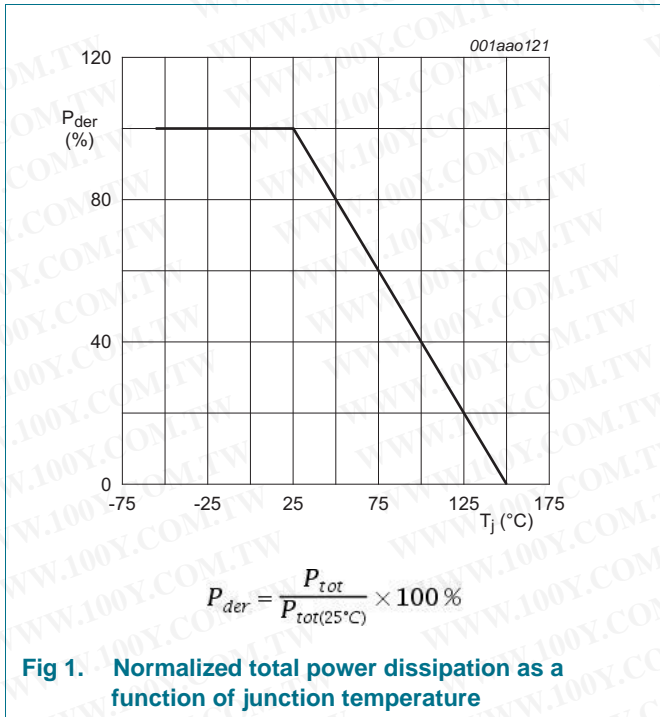
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|---------------------------|---------------------------------|--|-----|-----|------|----|
| V_{DS} | drain-source voltage | $T_j = 25\text{ °C}$ | - | 30 | V | |
| V_{GS} | gate-source voltage | | -8 | 8 | V | |
| I_D | drain current | $V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$ | [1] | - | 400 | mA |
| | | $V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$ | [1] | - | 250 | mA |
| I_{DM} | peak drain current | $T_{amb} = 25\text{ °C};$ single pulse; $t_p \leq 10\text{ }\mu\text{s}$ | - | 1.6 | A | |
| P_{tot} | total power dissipation | $T_{amb} = 25\text{ °C}$ | [2] | - | 350 | mW |
| | | | [1] | - | 420 | mW |
| | | $T_{sp} = 25\text{ °C}$ | - | - | 1140 | mW |
| T_j | junction temperature | | -55 | 150 | °C | |
| T_{amb} | ambient temperature | | -55 | 150 | °C | |
| T_{stg} | storage temperature | | -65 | 150 | °C | |
| Source-drain diode | | | | | | |
| I_S | source current | $T_{amb} = 25\text{ °C}$ | [1] | - | 400 | mA |
| ESD maximum rating | | | | | | |
| V_{ESD} | electrostatic discharge voltage | HBM | [3] | - | 2000 | V |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[3] Measured between all pins.



6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|----------------|--|-------------|-----|-----|-----|------|-----|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | 310 | 370 | K/W |
| | | | [2] | - | 260 | 300 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | - | - | 115 | K/W | |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².

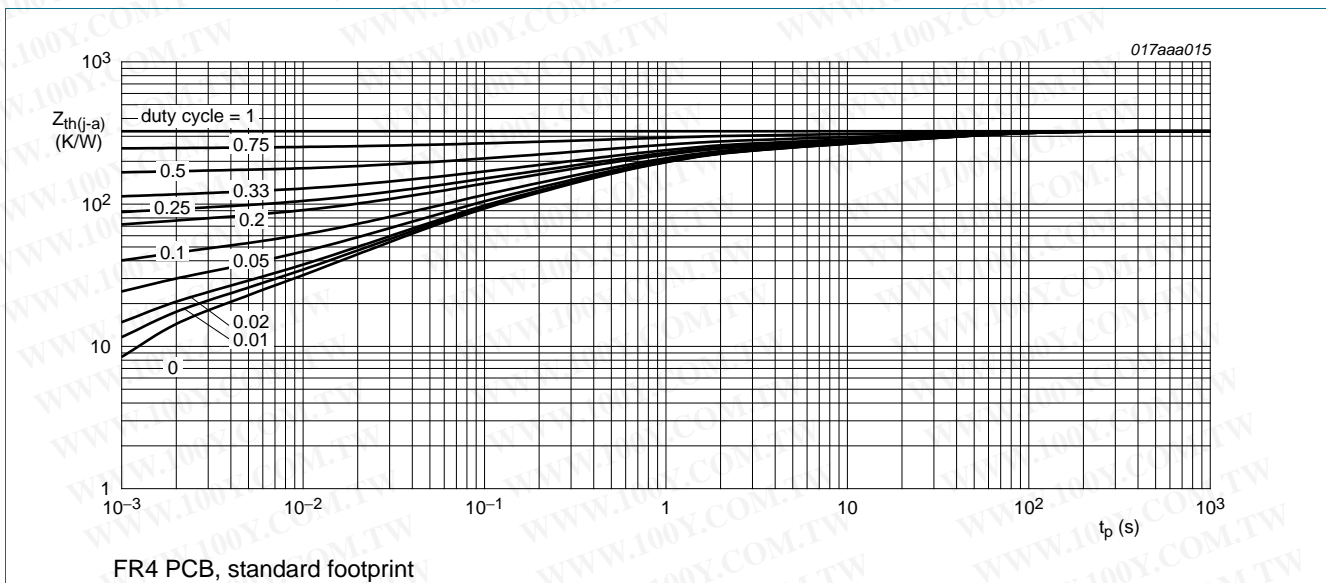


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

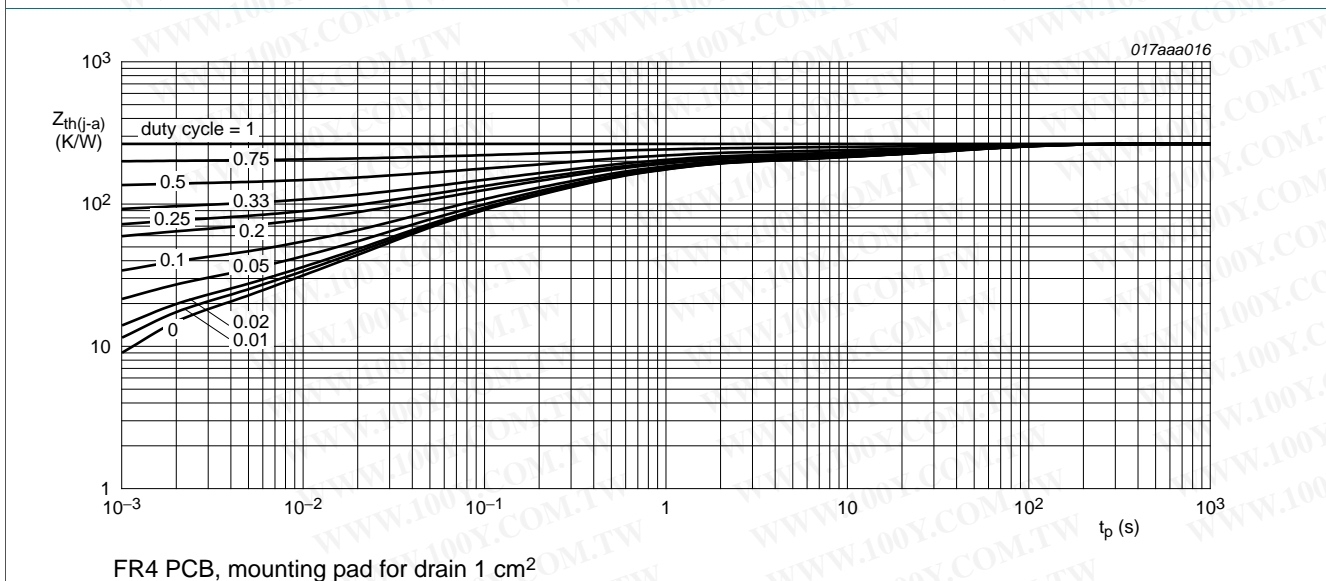
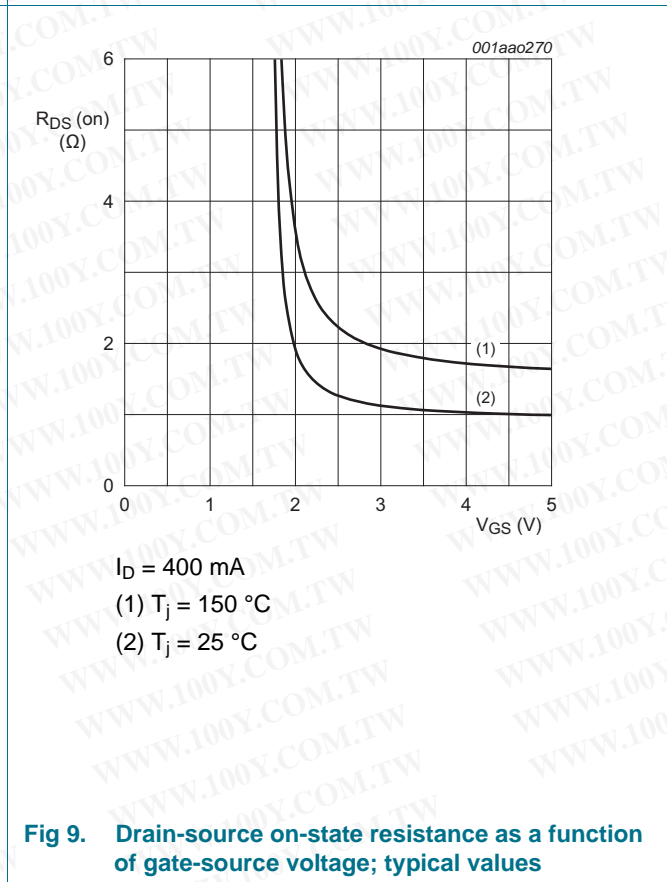
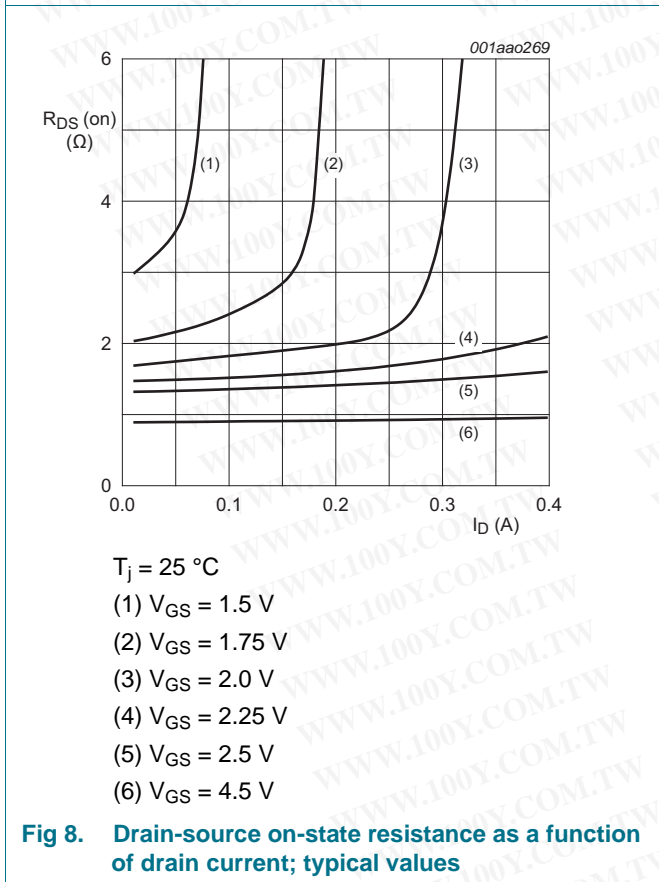
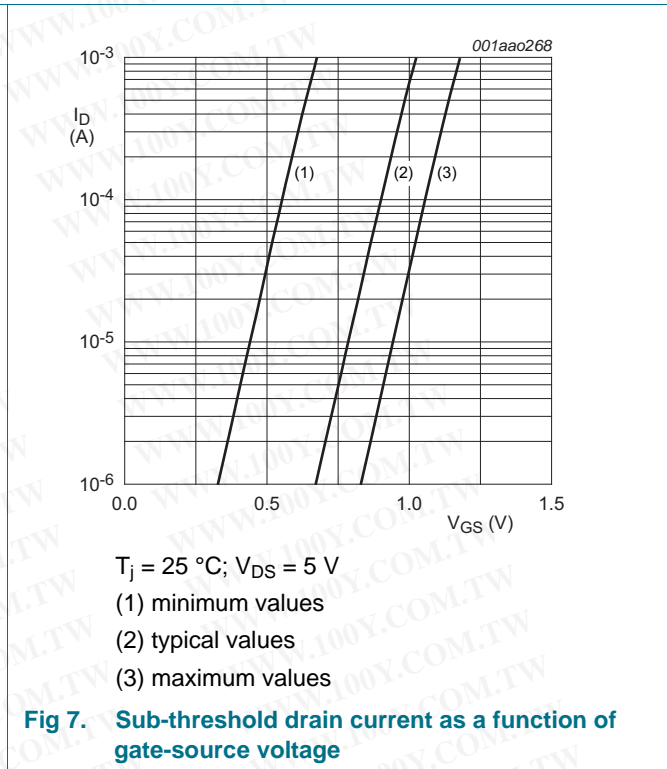
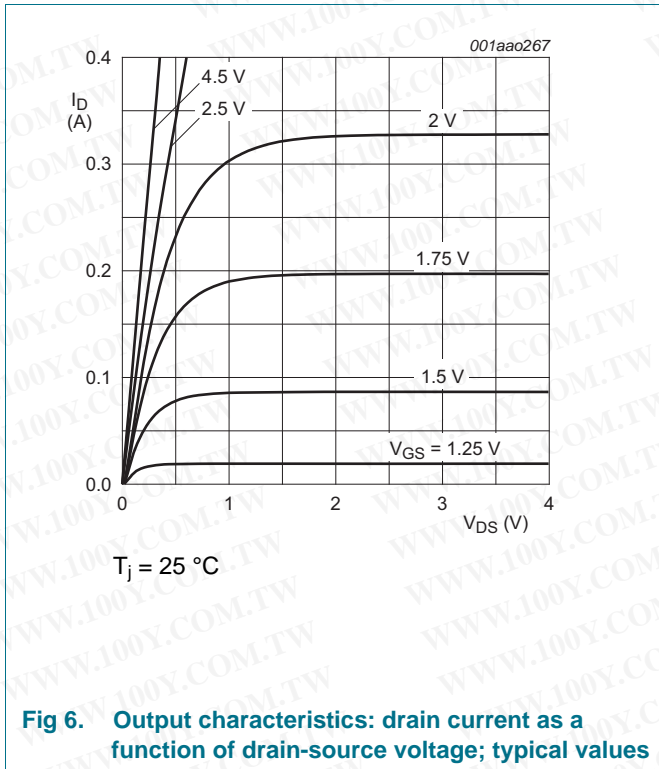


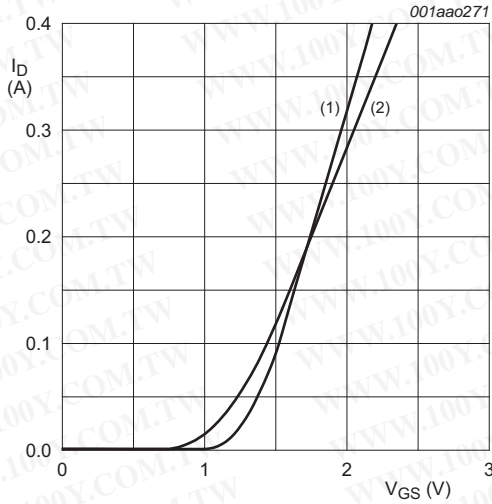
Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

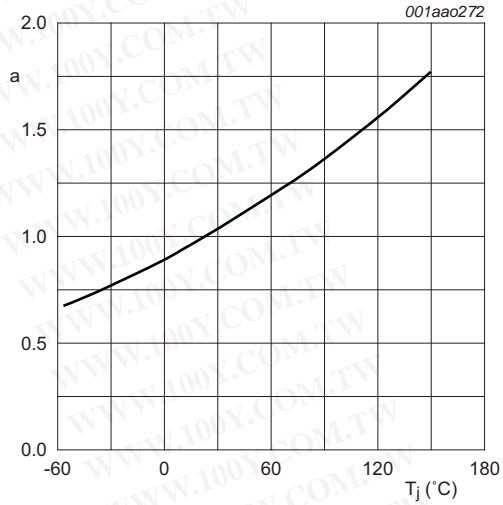
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|------|------|------|----------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | 30 | - | - | V |
| V_{GSth} | gate-source threshold voltage | $I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ | 0.6 | 0.9 | 1.1 | V |
| I_{DSS} | drain leakage current | $V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | - | 1 | μA |
| | | $V_{DS} = 30 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$ | - | - | 10 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | 0.2 | 1 | μA |
| | | $V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | 0.2 | 1 | μA |
| | | $V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | 10 | - | nA |
| | | $V_{GS} = -4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | 10 | - | nA |
| | | $V_{GS} = 2.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | 1 | - | nA |
| | | $V_{GS} = -2.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | 1 | - | nA |
| R_{DSon} | drain-source on-state resistance | $V_{GS} = 4.5 V; I_D = 350 \text{ mA}; T_j = 25 \text{ }^\circ C$ | - | 1 | 1.4 | Ω |
| | | $V_{GS} = 4.5 V; I_D = 350 \text{ mA}; T_j = 150 \text{ }^\circ C$ | - | 1.8 | 2.5 | Ω |
| | | $V_{GS} = 2.5 V; I_D = 200 \text{ mA}; T_j = 25 \text{ }^\circ C$ | - | 1.4 | 2.1 | Ω |
| | | $V_{GS} = 1.8 V; I_D = 10 \text{ mA}; T_j = 25 \text{ }^\circ C$ | - | 2 | 2.8 | Ω |
| g_{fs} | forward transconductance | $V_{DS} = 10 V; I_D = 350 \text{ mA}; T_j = 25 \text{ }^\circ C$ | - | 310 | - | mS |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $V_{DS} = 15 V; I_D = 400 \text{ mA}; V_{GS} = 4.5 V; T_j = 25 \text{ }^\circ C$ | - | 0.52 | 0.68 | nC |
| Q_{GS} | gate-source charge | | - | 0.17 | - | nC |
| Q_{GD} | gate-drain charge | | - | 0.08 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = 15 V; f = 1 \text{ MHz}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | - | 34 | 50 | pF |
| C_{oss} | output capacitance | | - | 6.5 | - | pF |
| C_{rss} | reverse transfer capacitance | | - | 2.2 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS} = 20 V; R_L = 250 \Omega; V_{GS} = 4.5 V; R_{G(ext)} = 6 \Omega; T_j = 25 \text{ }^\circ C$ | - | 15 | 30 | ns |
| t_r | rise time | | - | 11 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 69 | 138 | ns |
| t_f | fall time | | - | 19 | - | ns |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = 350 \text{ mA}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ | 0.47 | 0.85 | 1.2 | V |





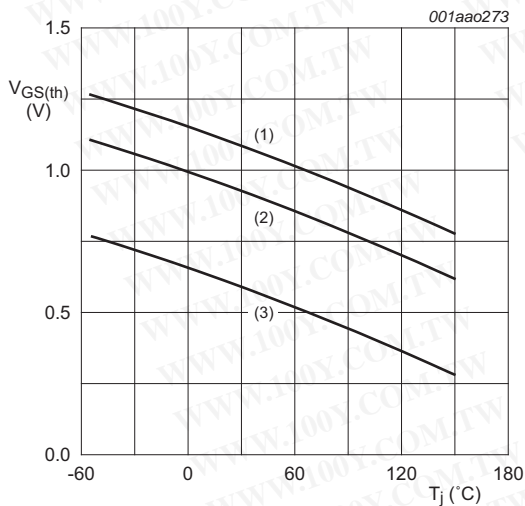
$V_{DS} > I_D \times R_{DS(on)}$
 (1) $T_j = 25\text{ °C}$
 (2) $T_j = 150\text{ °C}$

Fig 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values



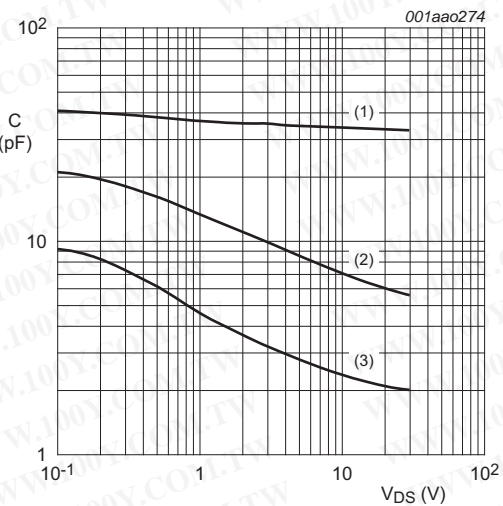
$$a = \frac{R_{DS(on)}}{R_{DS(on)25^{\circ}\text{C}}}$$

Fig 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values



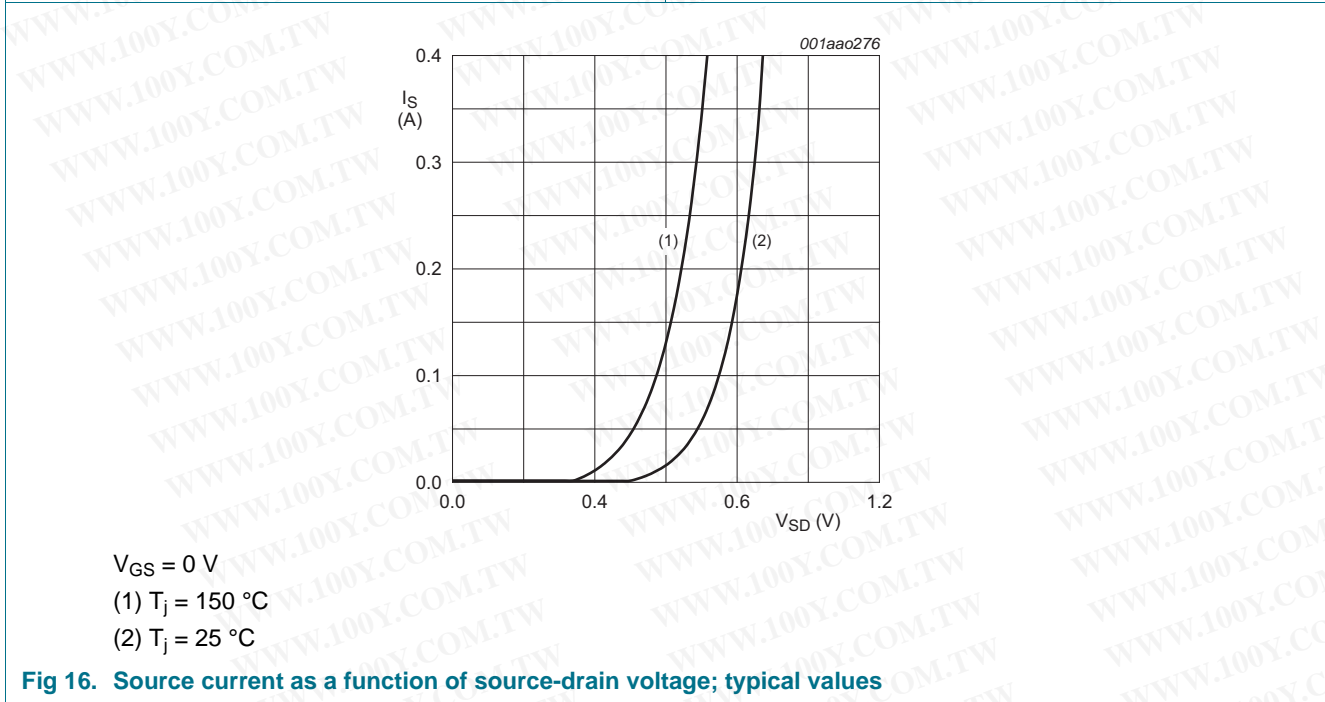
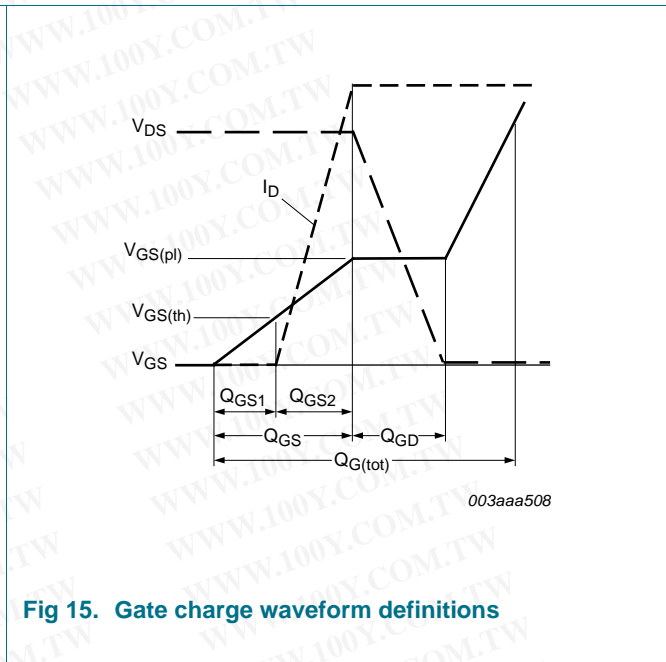
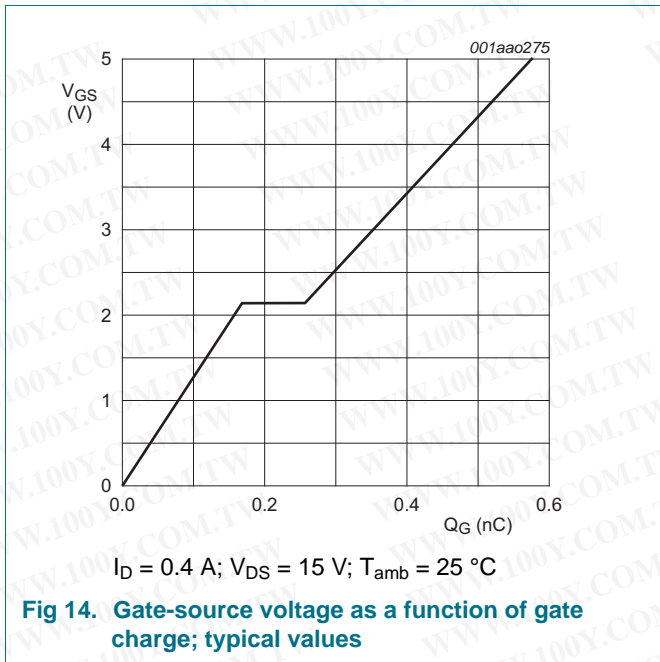
$I_D = 0.25\text{ mA}; V_{DS} = V_{GS}$
 (1) maximum values
 (2) typical values
 (3) minimum values

Fig 12. Gate-source threshold voltage as a function of junction temperature

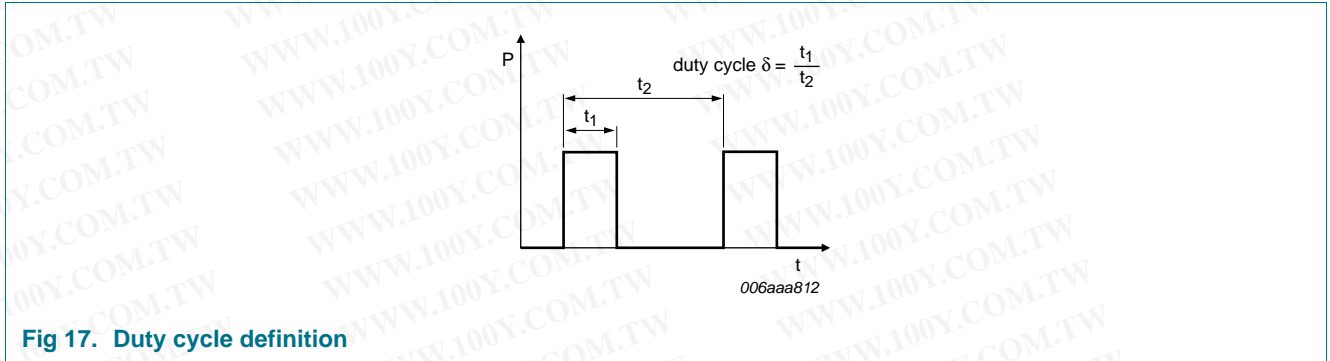


$f = 1\text{ MHz}; V_{GS} = 0\text{ V}$
 (1) C_{iss}
 (2) C_{oss}
 (3) C_{rss}

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



8. Test information



8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline

Plastic surface-mounted package; 3 leads

SOT23

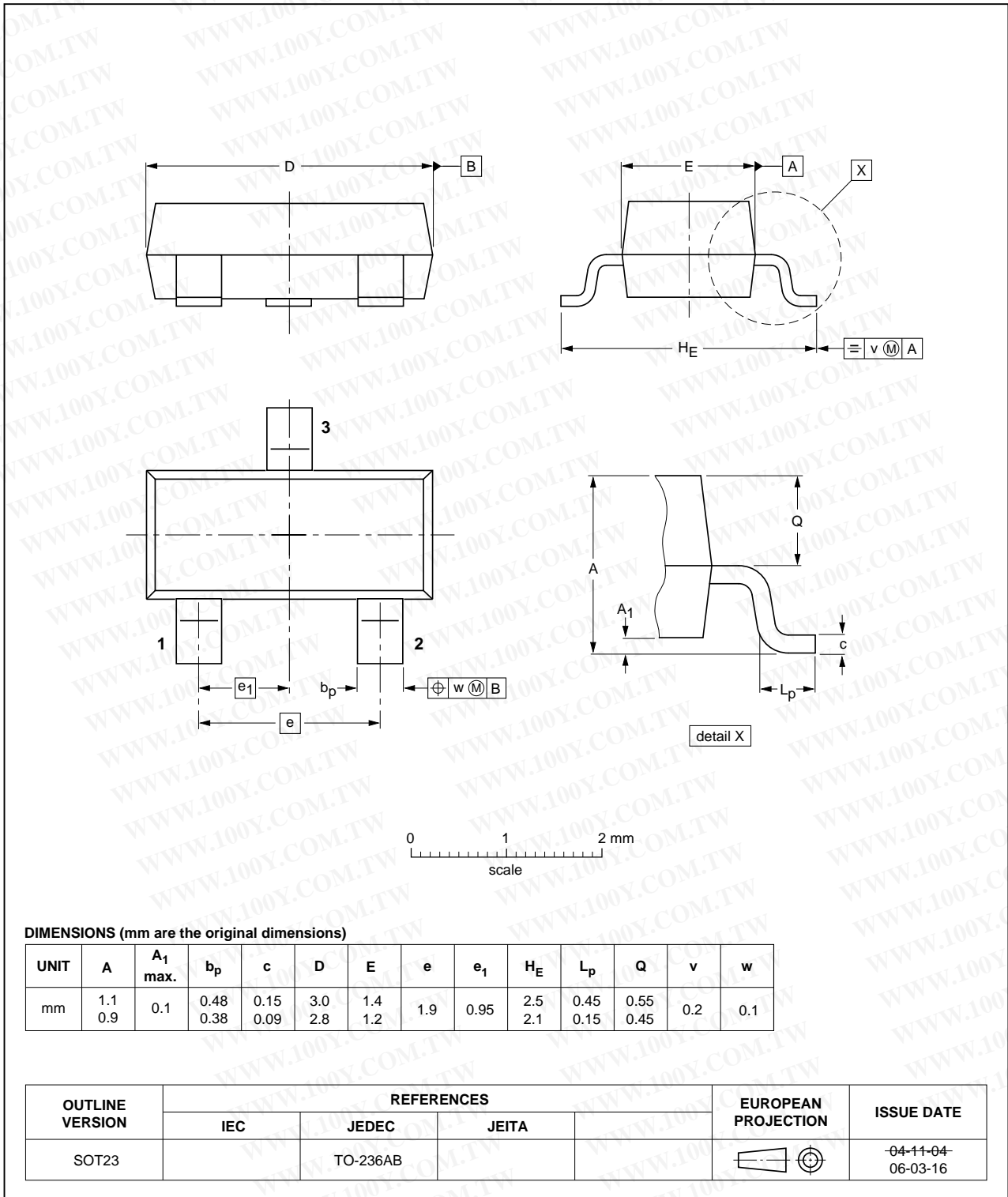


Fig 18. Package outline SOT23 (TO-236AB)

10. Soldering

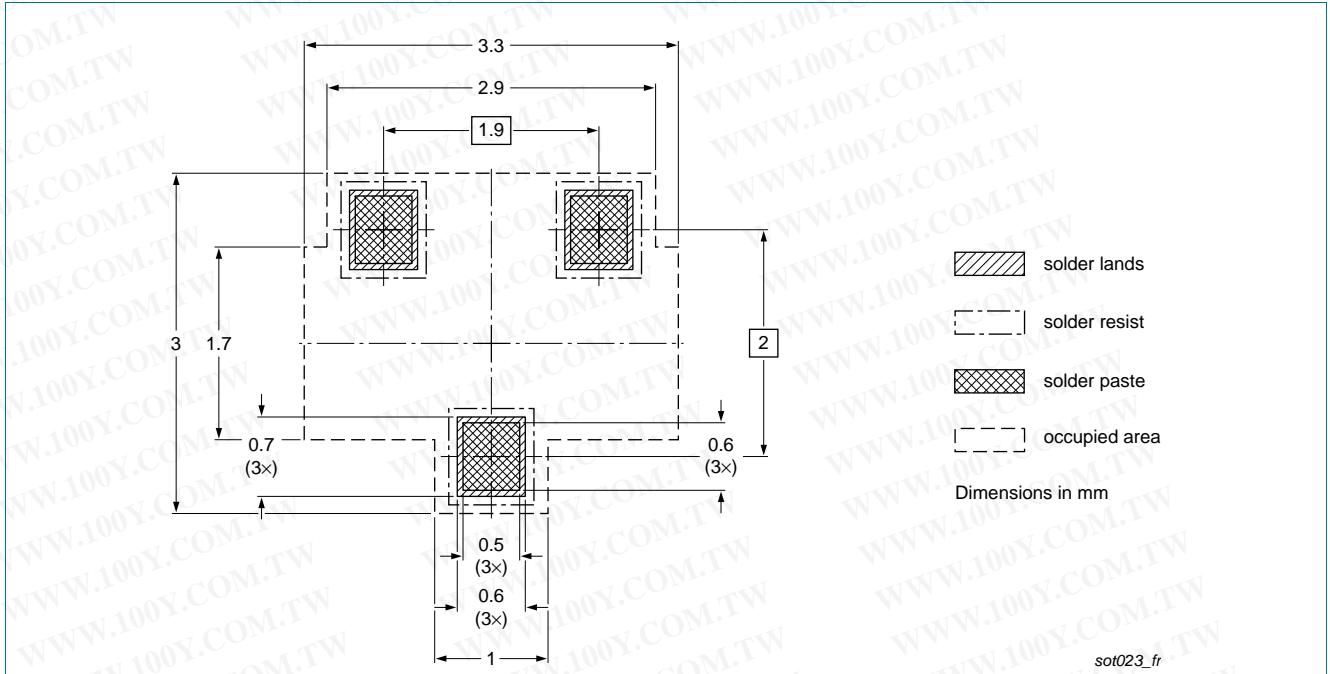


Fig 19. Reflow soldering footprint for SOT23 (TO-236AB)

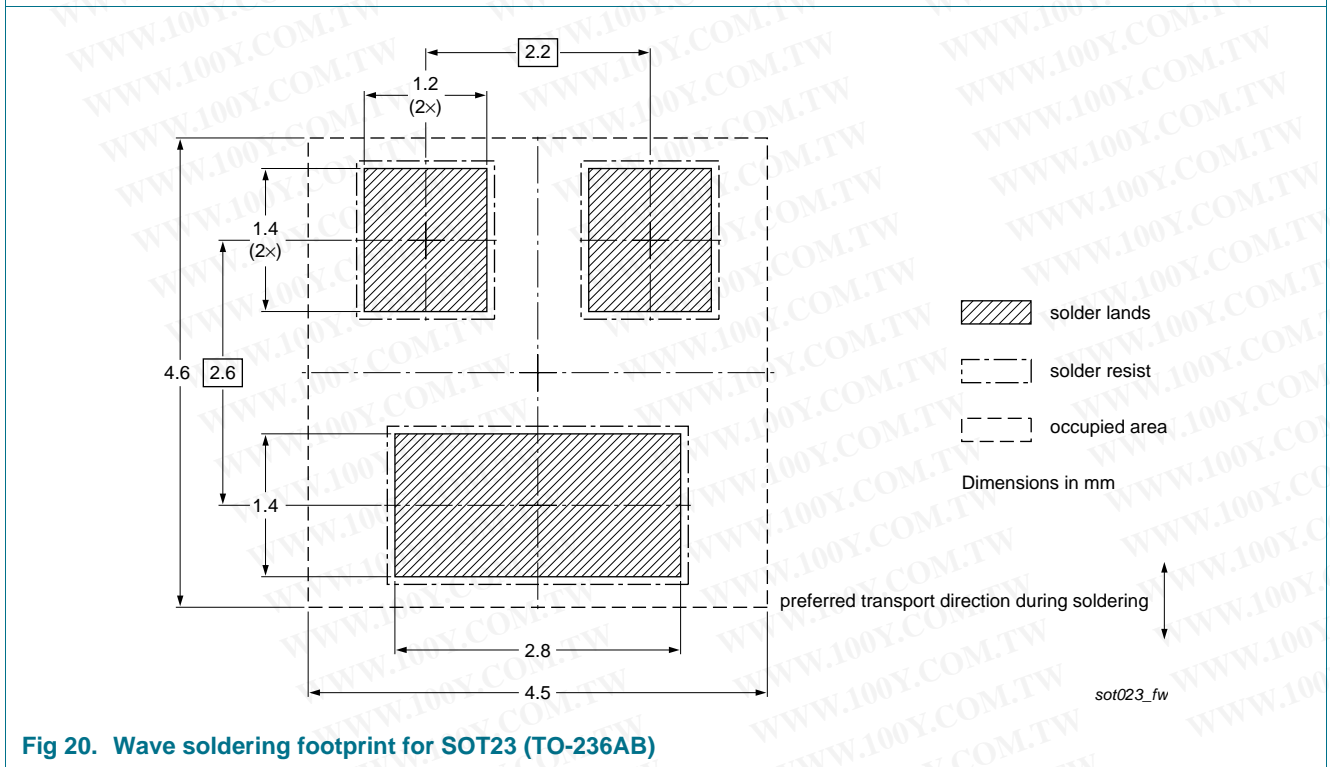


Fig 20. Wave soldering footprint for SOT23 (TO-236AB)

11. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| NX3008NBK v.1 | 20110802 | Product data sheet | - | - |

12. Legal information

12.1 Data sheet status

| Document status ^[1] ^[2] | Product status ^[3] | Definition |
|---|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

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