



BUK7514-55A

N-channel TrenchMOS standard level FET

Rev. 2 — 26 April 2011

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

1.2 Features and benefits

- AEC Q101 compliant
- Low conduction losses due to low on-state resistance

1.3 Applications

- Automotive and general purpose power switching

1.4 Quick reference data

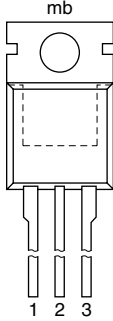
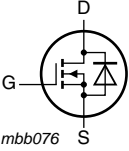
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|--|--|-----|-----|-----|------------|
| V_{DS} | drain-source voltage | $T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$ | - | - | 55 | V |
| I_D | drain current | $T_{mb} = 25\text{ }^{\circ}\text{C}$ | - | - | 73 | A |
| P_{tot} | total power dissipation | | - | - | 166 | W |
| Static characteristics | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$ | - | 12 | 14 | m Ω |
| Avalanche Ruggedness | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 50\text{ A}$; $V_{sup} \leq 25\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 5\text{ V}$; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; unclamped | - | - | 125 | mJ |



2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|--------------------------------------|---|---|
| 1 | G | gate |  |  |
| 2 | D | drain | | |
| 3 | S | source | | |
| mb | D | mounting base; connected to drain | | |

SOT78A (TO-220AB)

3. Ordering information

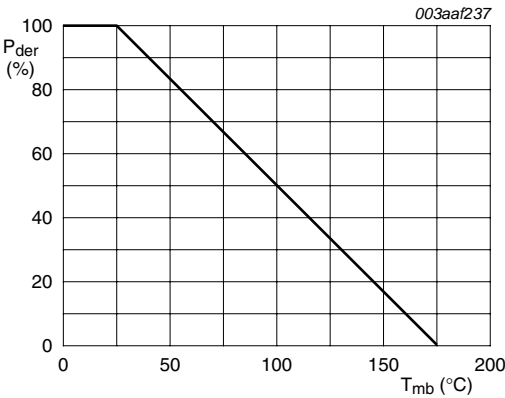
Table 3. Ordering information

| Type number | Package | | |
|-------------|----------|---|---------|
| | Name | Description | Version |
| BUK7514-55A | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78A |

4. Limiting values

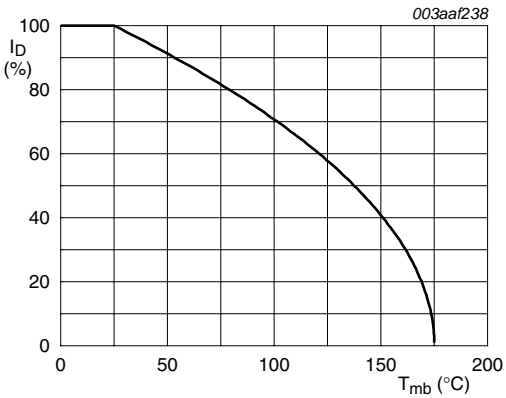
Table 4. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|----------------------|--|---|-----|-----|------|
| V _{DS} | drain-source voltage | T _j ≥ 25 °C; T _j ≤ 175 °C | - | 55 | V |
| V _{DGR} | drain-gate voltage | R _{GS} = 20 kΩ | - | 55 | V |
| V _{GS} | gate-source voltage | | -20 | 20 | V |
| I _D | drain current | T _{mb} = 25 °C | - | 73 | A |
| | | T _{mb} = 100 °C | - | 52 | A |
| I _{DM} | peak drain current | T _{mb} = 25 °C; pulsed | - | 266 | A |
| P _{tot} | total power dissipation | T _{mb} = 25 °C | - | 166 | W |
| T _{stg} | storage temperature | | -55 | 175 | °C |
| T _j | junction temperature | | -55 | 175 | °C |
| Source-drain diode | | | | | |
| I _S | source current | T _{mb} = 25 °C | - | 73 | A |
| I _{SM} | peak source current | pulsed; T _{mb} = 25 °C | - | 266 | A |
| Avalanche Ruggedness | | | | | |
| E _{DS(AL)S} | non-repetitive drain-source avalanche energy | I _D = 50 A; V _{sup} ≤ 25 V; R _{GS} = 50 Ω; V _{GS} = 5 V; T _{j(init)} = 25 °C; unclamped | - | 125 | mJ |



$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

Fig 1. Normalized total power dissipation as a function of mounting base temperature



$$I_{der} = \frac{I_D}{I_{D(25^{\circ}C)}} \times 100\%$$

V_{GS} ≥ 5 V

Fig 2. Normalized continuous drain current as a function of mounting base temperature

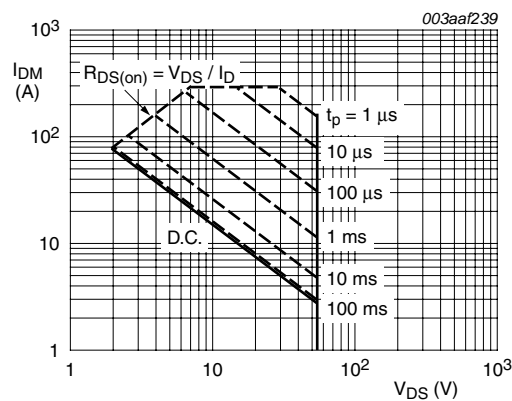


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

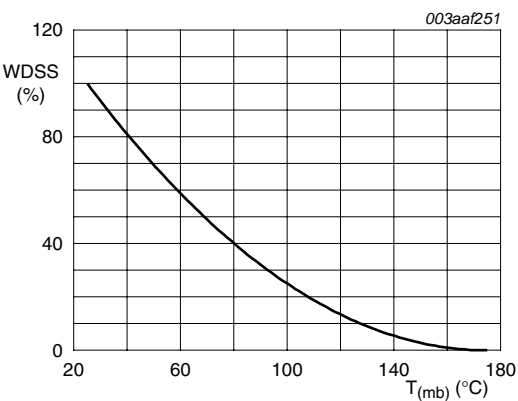


Fig 4. Normalised drain-source non-repetitive avalanche energy as a function of mounting-base temperature

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|-------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | | - | - | 0.9 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |

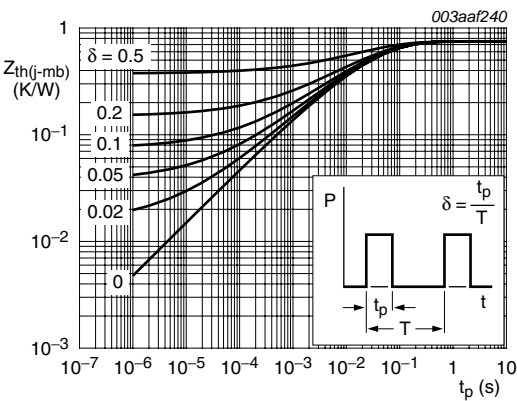
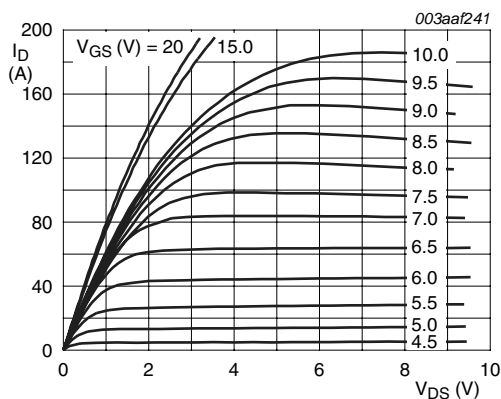


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

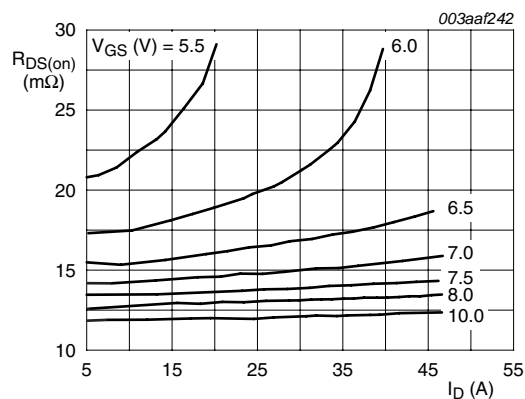
Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------|----------------------------------|---|-----|------|------|------|
| Static characteristics | | | | | | |
| V _{(BR)DSS} | drain-source breakdown voltage | I _D = 0.25 mA; V _{GS} = 0 V; T _j = 25 °C | 55 | - | - | V |
| | | I _D = 0.25 mA; V _{GS} = 0 V; T _j = -55 °C | 50 | - | - | V |
| V _{GS(th)} | gate-source threshold voltage | I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C | 2 | 3 | 4 | V |
| | | I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C | 1 | - | - | V |
| | | I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C | - | - | 4.4 | V |
| I _{DSS} | drain leakage current | V _{DS} = 55 V; V _{GS} = 0 V; T _j = 25 °C | - | 0.05 | 10 | µA |
| | | V _{DS} = 55 V; V _{GS} = 0 V; T _j = 175 °C | - | - | 500 | µA |
| I _{GSS} | gate leakage current | V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C | - | 2 | 100 | nA |
| | | V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C | - | 2 | 100 | nA |
| R _{DSon} | drain-source on-state resistance | V _{GS} = 10 V; I _D = 25 A; T _j = 175 °C | - | - | 28 | mΩ |
| | | V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C | - | 12 | 14 | mΩ |
| Dynamic characteristics | | | | | | |
| C _{iss} | input capacitance | V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz; T _j = 25 °C | - | 1848 | 2464 | pF |
| C _{oss} | output capacitance | | - | 421 | 506 | pF |
| C _{rss} | reverse transfer capacitance | | - | 231 | 317 | pF |
| t _{d(on)} | turn-on delay time | V _{DS} = 30 V; R _L = 1.2 Ω; V _{GS} = 5 V; R _{G(ext)} = 10 Ω; T _j = 25 °C | - | 17 | 26 | ns |
| t _r | rise time | | - | 79 | 119 | ns |
| t _{d(off)} | turn-off delay time | | - | 57 | 80 | ns |
| t _f | fall time | | - | 51 | 71 | ns |
| L _D | internal drain inductance | measured from drain lead 6 mm from package to centre of die; T _j = 25 °C | - | 4.5 | - | nH |
| | | measured from contact screw on tab to centre of die; T _j = 25 °C | - | 3.5 | - | nH |
| L _S | internal source inductance | measured from source lead to source bond pad; T _j = 25 °C | - | 7.5 | - | nH |
| Source-drain diode | | | | | | |
| V _{SD} | source-drain voltage | I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C | - | 0.85 | 1.2 | V |
| | | I _S = 73 A; V _{GS} = 0 V; T _j = 25 °C | - | 1.1 | - | V |
| t _{rr} | reverse recovery time | I _S = 73 A; dI _S /dt = -100 A/µs; V _{GS} = -10 V; V _{DS} = 30 V; T _j = 25 °C | - | 54 | - | ns |
| Q _r | recovered charge | | - | 0.12 | - | µC |



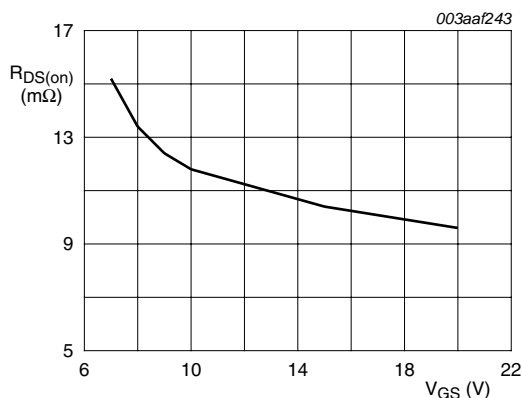
$T_j = 25\text{ }^{\circ}\text{C}$

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



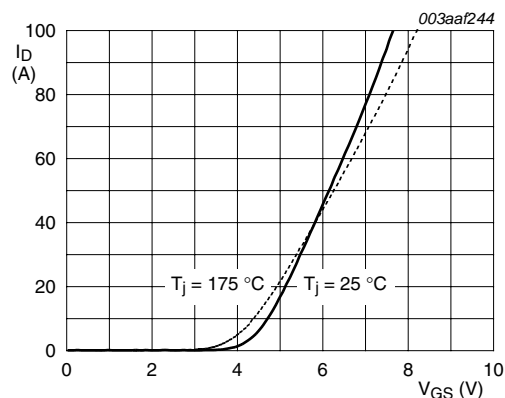
$T_j = 25\text{ }^{\circ}\text{C}$

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



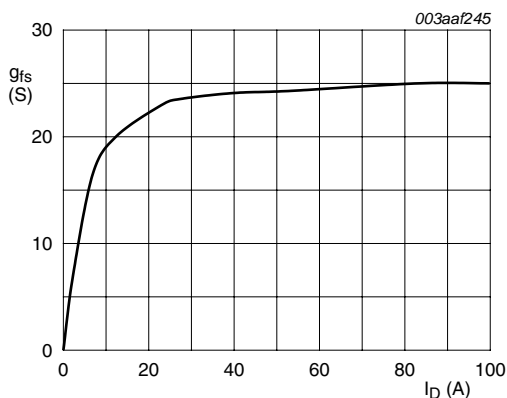
$T_j = 25\text{ }^{\circ}\text{C}$

Fig 8. Drain-source on-state resistance as a function of gate-source voltage; typical values



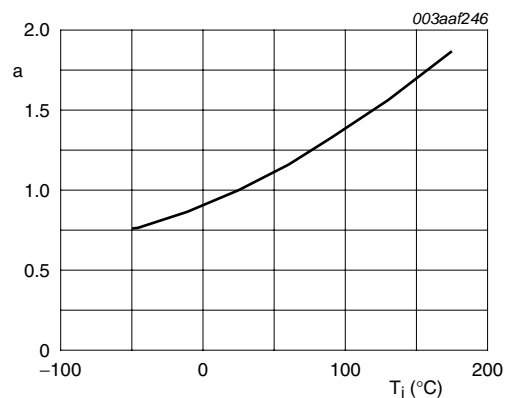
$V_{DS} > I_D \times R_{DS(on)}$

Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values



$V_{DS} > I_D \times R_{DS(on)}$

Fig 10. Forward transconductance as a function of drain current; typical values



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

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

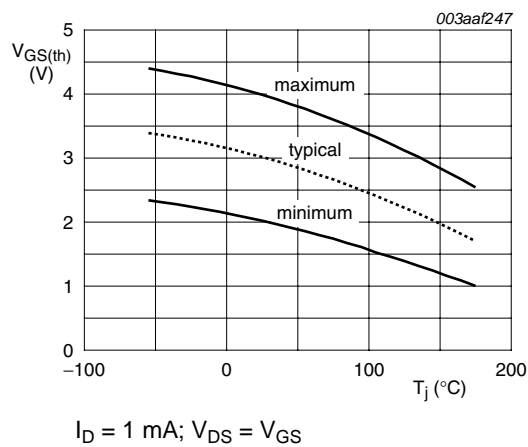


Fig 12. Gate-source threshold voltage as a function of junction temperature

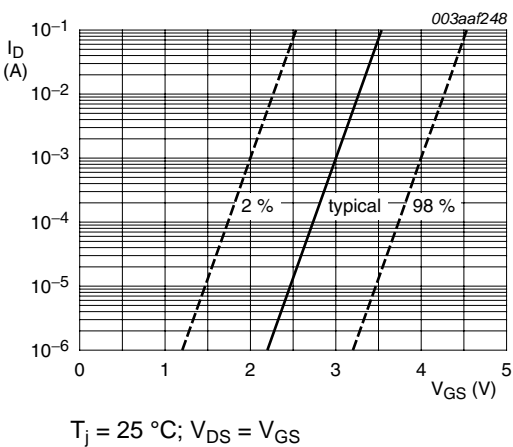


Fig 13. Sub-threshold drain current as a function of gate-source voltage

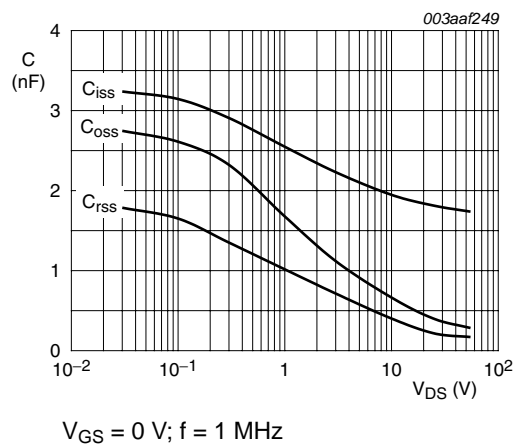


Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

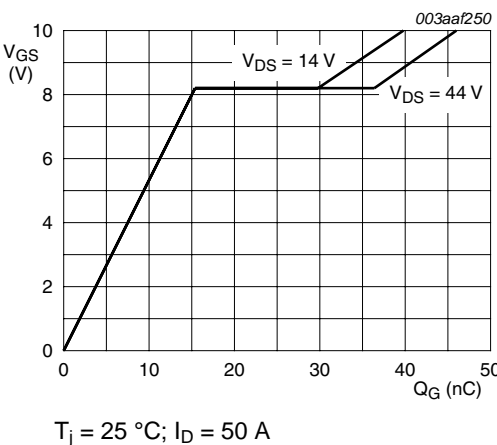


Fig 15. Gate-source voltage as a function of gate charge; typical values

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78A

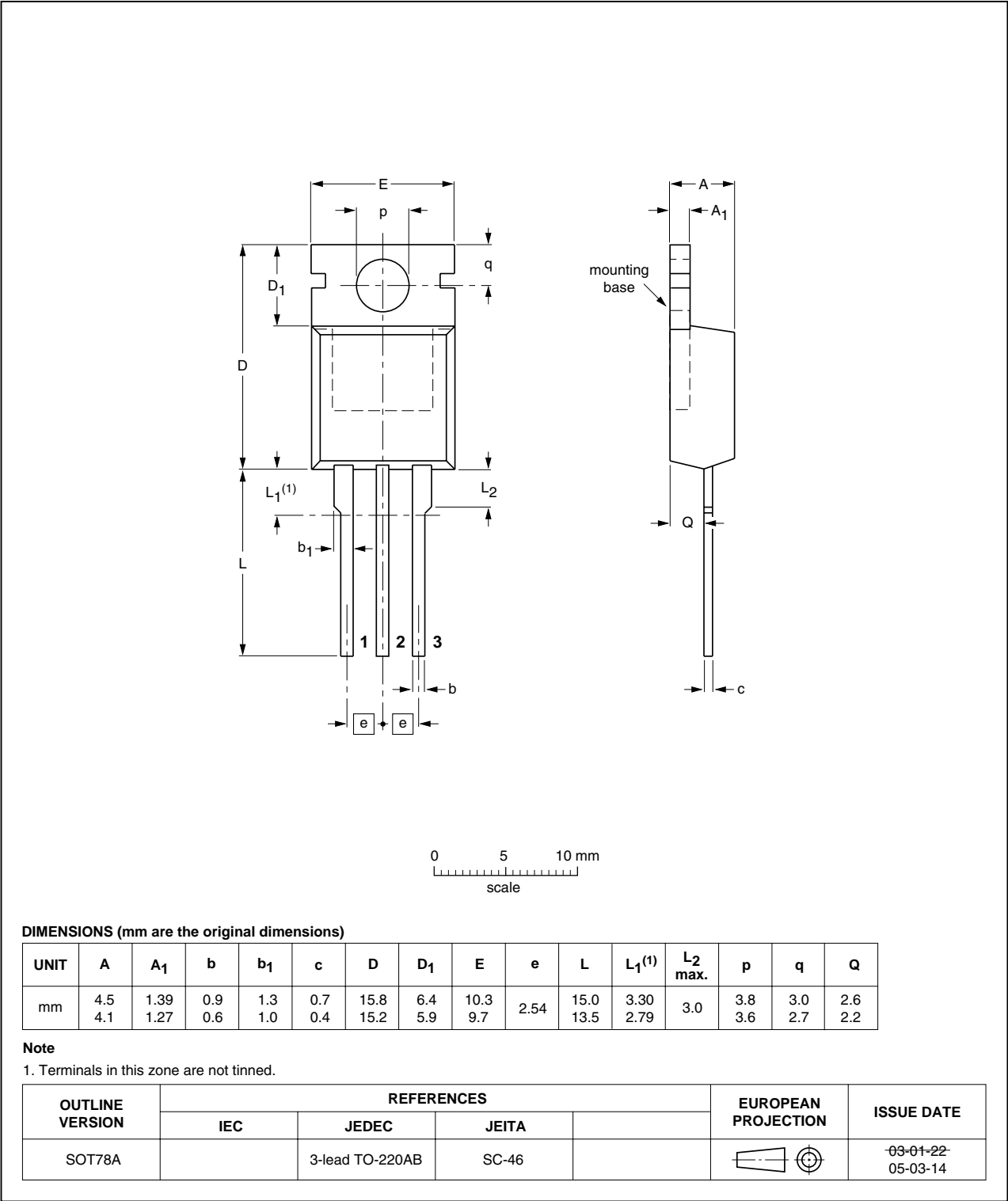


Fig 16. Package outline SOT78A (TO-220AB)

8. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------|--|-----------------------|---------------|--------------------|
| BUK7514-55A v.2 | 20110426 | Product data sheet | - | BUK7514_7614-55A_1 |
| Modifications: | <ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.• Legal texts have been adapted to the new company name where appropriate.• Type number BUK7514-55A separated from data sheet BUK7514_7614-55A_1. | | | |
| BUK7514_7614-55A_1 | 20000701 | Product specification | - | - |

9. Legal information

9.1 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. |
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[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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11. Contents

| | | |
|-----------|--|-----------|
| 1 | Product profile | 1 |
| 1.1 | General description | 1 |
| 1.2 | Features and benefits | 1 |
| 1.3 | Applications | 1 |
| 1.4 | Quick reference data | 1 |
| 2 | Pinning information | 2 |
| 3 | Ordering information | 2 |
| 4 | Limiting values | 3 |
| 5 | Thermal characteristics | 4 |
| 6 | Characteristics | 5 |
| 7 | Package outline | 8 |
| 8 | Revision history | 9 |
| 9 | Legal information | 10 |
| 9.1 | Data sheet status | 10 |
| 9.2 | Definitions | 10 |
| 9.3 | Disclaimers | 10 |
| 9.4 | Trademarks | 11 |
| 10 | Contact information | 11 |

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