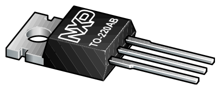


# BUK7515-100A

## N-channel TrenchMOS standard level FET

5 April 2014 — Product data sheet

## 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.

## 2. Features and benefits

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

## 3. Applications

- Automotive and general purpose power switching

## 4. Quick reference data

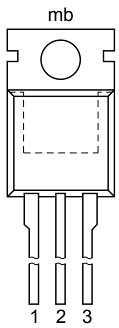
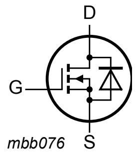
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | $T_j \geq 25$ °C; $T_j \leq 175$ °C | | - | - | 100 | V |
| $I_D$ | drain current | $T_{mb} = 25$ °C | | - | - | 75 | A |
| $P_{tot}$ | total power dissipation | | | - | - | 300 | W |
| **Static characteristics** | | | | | | | |
| $R_{DSon}$ | drain-source on-state resistance | $V_{GS} = 10$ V; $I_D = 25$ A; $T_j = 25$ °C | | - | 12 | 15 | mΩ |
| **Avalanche ruggedness** | | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 35$ A; $V_{sup} \leq 25$ V; $R_{GS} = 50$ Ω; $V_{GS} = 10$ V; $T_{j(init)} = 25$ °C; unclamped | | - | - | 120 | mJ |

Scan or click this QR code to view the latest information for this product

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | G | gate | <br>**TO-220AB (SOT78A)** |  |
| 2 | D | drain | | |
| 3 | S | source | | |
| mb | D | mounting base; connected to drain | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BUK7515-100A | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78A |

# 7. 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 | $T_j \geq 25$ °C; $T_j \leq 175$ °C | | - | 100 | V |
| $V_{DGR}$ | drain-gate voltage | $R_{GS}$ = 20 kΩ | | - | 100 | V |
| $V_{GS}$ | gate-source voltage | | | -20 | 20 | V |
| $P_{tot}$ | total power dissipation | $T_{mb}$ = 25 °C | | - | 300 | W |
| $I_D$ | drain current | | | - | 75 | A |
| | | $T_{mb}$ = 100 °C | | - | 60.8 | A |
| $I_{DM}$ | peak drain current | $T_{mb}$ = 25 °C; pulsed | | - | 240 | A |
| $T_{stg}$ | storage temperature | | | -55 | 175 | °C |
| $T_j$ | junction temperature | | | -55 | 175 | °C |
| **Source-drain diode** | | | | | | |
| $I_S$ | source current | $T_{mb}$ = 25 °C | | - | 75 | A |
| $I_{SM}$ | peak source current | pulsed; $T_{mb}$ = 25 °C | | - | 240 | A |
| **Avalanche ruggedness** | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D$ = 35 A; $V_{sup} \leq 25$ V; $R_{GS}$ = 50 Ω; $V_{GS}$ = 10 V; $T_{j(init)}$ = 25 °C; unclamped | | - | 120 | mJ |

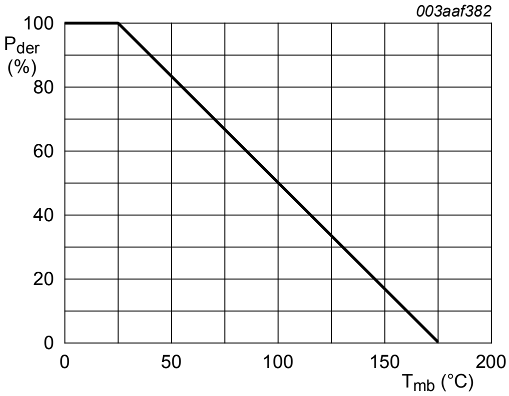
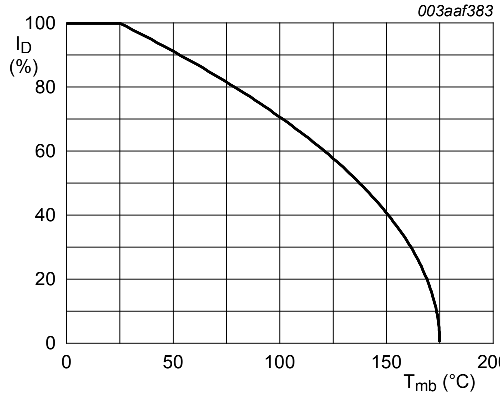



**Fig. 1. Normalized total power dissipation as a function of mounting base temperature**

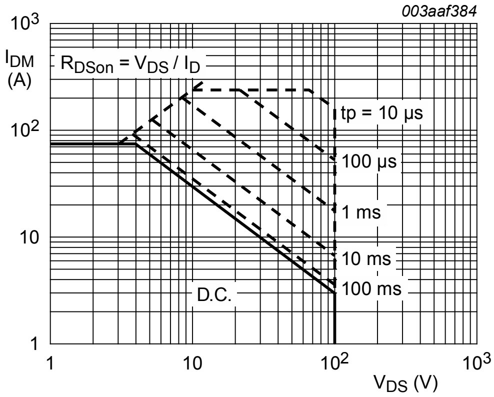
$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ C)}} \times 100\,\%$$




$V_{GS} \geq 10$ V

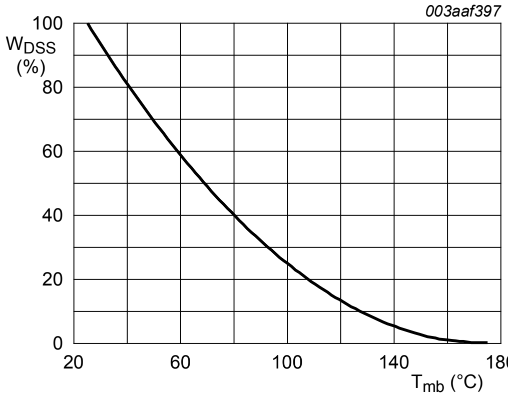
**Fig. 2. Normalized continuous drain current as a function of mounting base temperature**

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




$T_{mb}$ = 25 °C

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




$I_D$ = 75 A

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

## 8. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | | | - | - | 0.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | - | 60 | - | K/W |

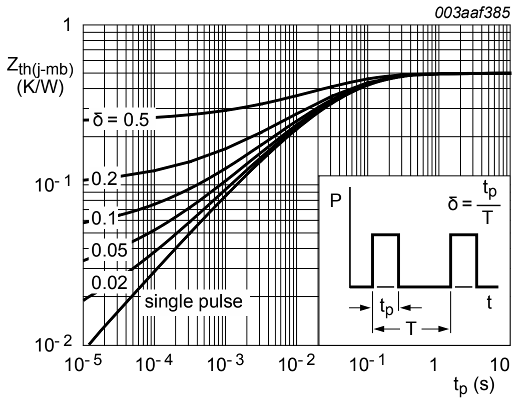
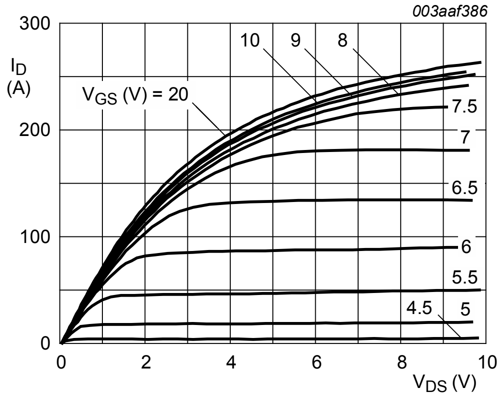



**Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration**

# 9. Characteristics

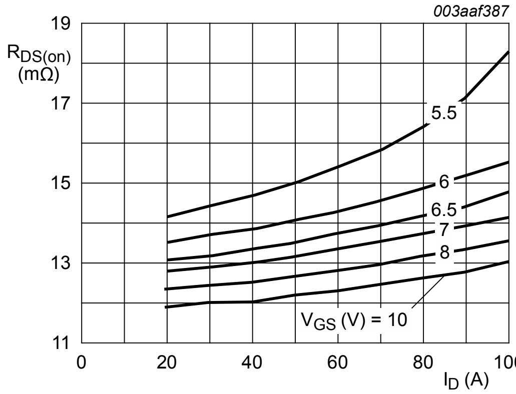
**Table 6. Characteristics**

| 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 | | 100 | - | - | V |
| | | $I_D$ = 0.25 mA; $V_{GS}$ = 0 V; $T_j$ = -55 °C | | 89 | - | - | 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 | $V_{DS}$ = 100 V; $V_{GS}$ = 0 V; $T_j$ = 175 °C | | - | - | 500 | µA |
| | | $V_{DS}$ = 100 V; $V_{GS}$ = 0 V; $T_j$ = 25 °C | | - | 0.05 | 10 | 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 | | - | - | 40.5 | mΩ |
| | | $V_{GS}$ = 10 V; $I_D$ = 25 A; $T_j$ = 25 °C | | - | 12 | 15 | mΩ |
| **Dynamic characteristics** | | | | | | | |
| $C_{iss}$ | input capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 25 V; f = 1 MHz; $T_j$ = 25 °C | | - | 4500 | 6000 | pF |
| $C_{oss}$ | output capacitance | | | - | 550 | 660 | pF |
| $C_{rss}$ | reverse transfer capacitance | | | - | 305 | 400 | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS}$ = 30 V; $R_L$ = 1.2 Ω; $V_{GS}$ = 10 V; $R_{G(ext)}$ = 10 Ω; $T_j$ = 25 °C | | - | 35 | 55 | ns |
| $t_r$ | rise time | | | - | 85 | 125 | ns |
| $t_{d(off)}$ | turn-off delay time | | | - | 150 | 225 | ns |
| $t_f$ | fall time | | | - | 70 | 100 | ns |
| $L_D$ | internal drain inductance | from contact screw on tab to centre of die; $T_j$ = 25 °C | | - | 3.5 | - | nH |
| | | from drain lead 6 mm from package to centre of die; $T_j$ = 25 °C | | - | 4.5 | - | nH |
| $L_S$ | internal source inductance | from source lead 6 mm from package 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 |
| | | $I_S$ = 75 A; $V_{GS}$ = 0 V; $T_j$ = 25 °C | | - | 1.1 | - | V |
| $t_{rr}$ | reverse recovery time | $I_S$ = 75 A; $dI_S/dt$ = -100 A/µs; $V_{GS}$ = -10 V; $V_{DS}$ = 30 V; $T_j$ = 25 °C | | - | 80 | - | ns |
| $Q_r$ | recovered charge | | | - | 0.35 | - | µC |



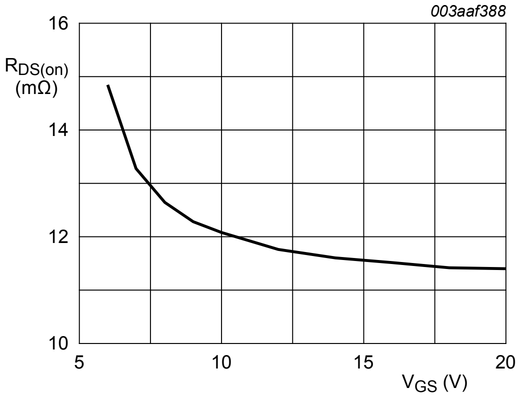

$T_j$ = 25 °C

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



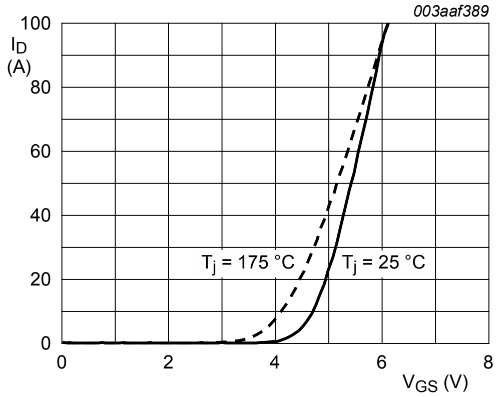

$T_j$ = 25 °C

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



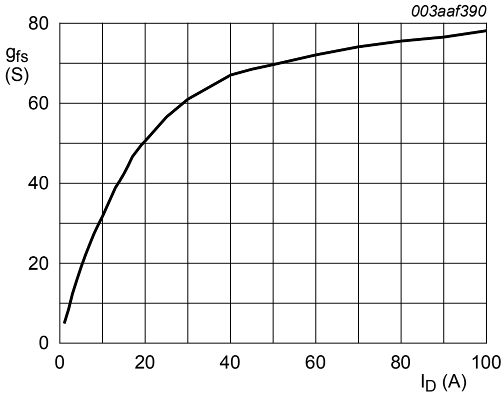

$T_j$ = 25 °C; $I_D$ = 25 A

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



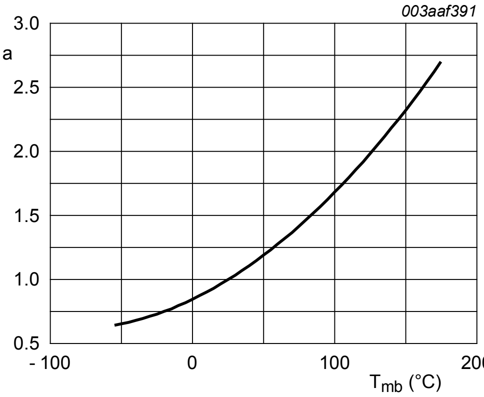

$V_{DS} > I_D \times R_{DSon}$

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




$V_{DS} > I_D \times R_{DSon}$

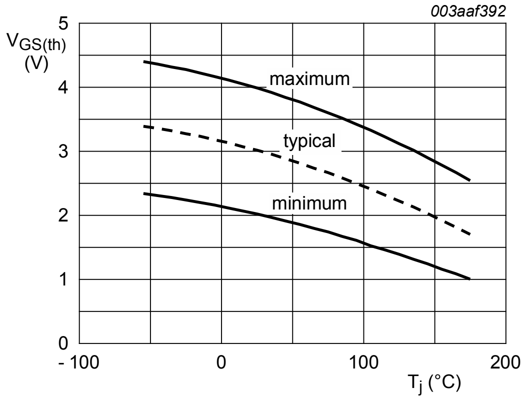
**Fig. 10. Forward transconductance as a function of drain current; typical values**




$I_D$ = 25 A; $V_{GS}$ = 10 V

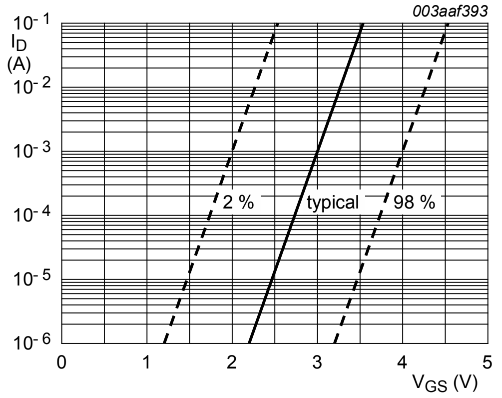
**Fig. 11. Normalized drain-source on-state resistance factor as a function of junction temperature**

$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$



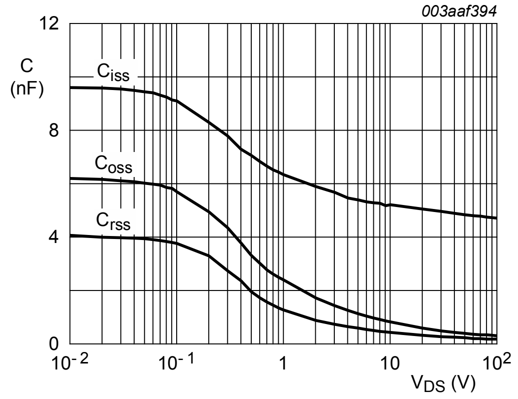

$I_D$ = 1 mA; $V_{DS}$ = $V_{GS}$

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



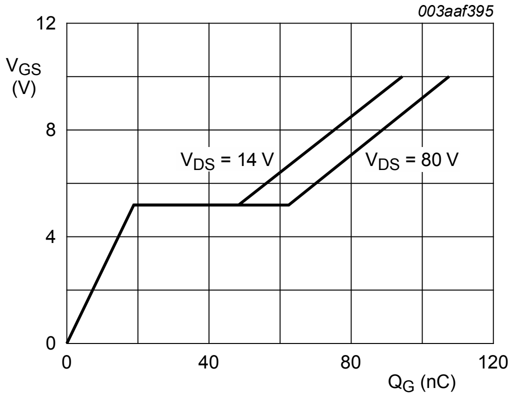

$T_j$ = 25 °C; $V_{DS}$ = $V_{GS}$

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



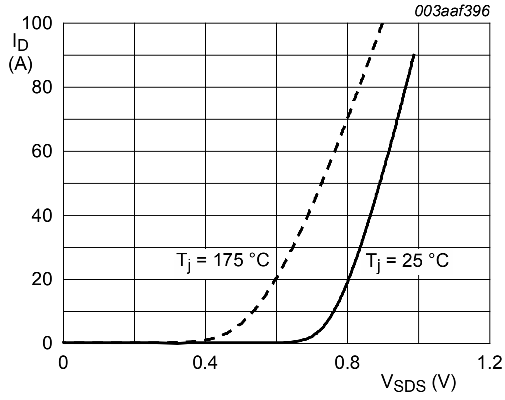

$V_{GS}$ = 0 V; f = 1 MHz

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




$T_j$ = 25 °C; $I_D$ = 25 A

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

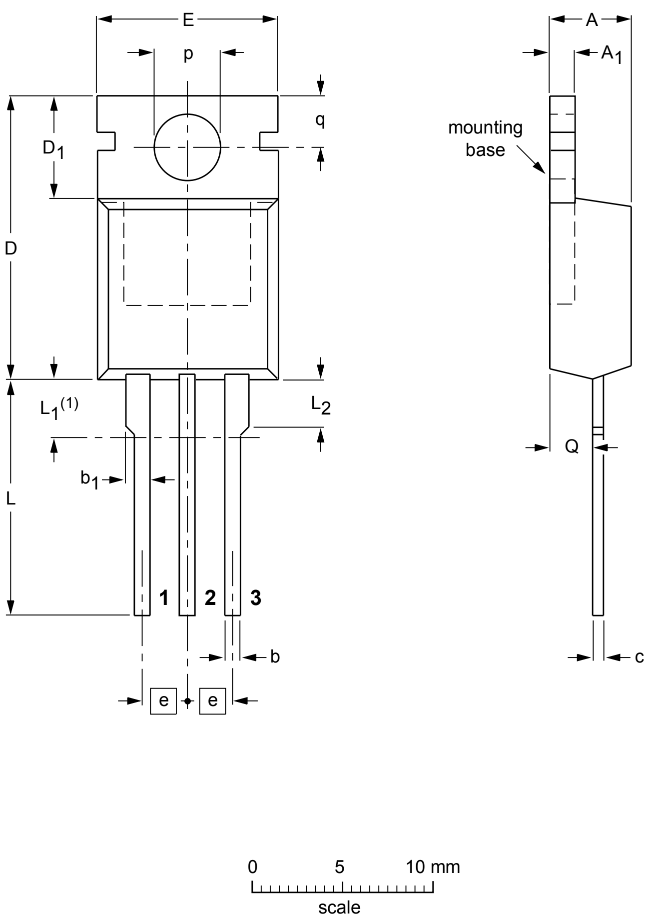



$V_{GS}$ = 0 V

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

## 10. Package outline

**Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB** **SOT78A**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ | b | $b_1$ | c | D | $D_1$ | E | e | L | $L_1^{(1)}$ | $L_2$ max. | p | q | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.5<br>4.1 | 1.39<br>1.27 | 0.9<br>0.6 | 1.3<br>1.0 | 0.7<br>0.4 | 15.8<br>15.2 | 6.4<br>5.9 | 10.3<br>9.7 | 2.54 | 15.0<br>13.5 | 3.30<br>2.79 | 3.0 | 3.8<br>3.6 | 3.0<br>2.7 | 2.6<br>2.2 |

**Note**

1. Terminals in this zone are not tinned.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT78A | | 3-lead TO-220AB | SC-46 | | | ~~03-01-22~~<br>05-03-14 |

**Fig. 17. Package outline TO-220AB (SOT78A)**

# 11. Legal information

## 11.1 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. |

[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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## 12. Contents





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**Date of release: 5 April 2014**