

# BUK7511-55A

## N-channel TrenchMOS standard level FET

Rev. 02 — 17 June 2010

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

- Low conduction losses due to low on-state resistance
- Q101 compliant
- Suitable for standard level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

### 1.3 Applications

- 12 V and 24 V loads
- Automotive and general purpose power switching
- Motors, lamps and solenoids

### 1.4 Quick reference data

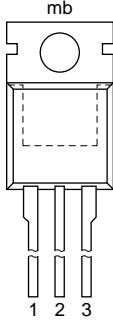
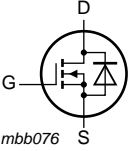
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>J</sub> ≥ 25 °C; T <sub>J</sub> ≤ 175 °C	-	-	55	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a>	-	-	75	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	-	166	W
Static characteristics						
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>J</sub> = 175 °C; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	-	22	mΩ
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>J</sub> = 25 °C; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	9	11	mΩ
Avalanche ruggedness						
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	I <sub>D</sub> = 65 A; V <sub>sup</sub> ≤ 55 V; R <sub>GS</sub> = 50 Ω; V <sub>GS</sub> = 10 V; T <sub>J(init)</sub> = 25 °C; unclamped	-	-	211	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		

SOT78 (TO-220AB)

3. Ordering information

Table 3. Ordering information

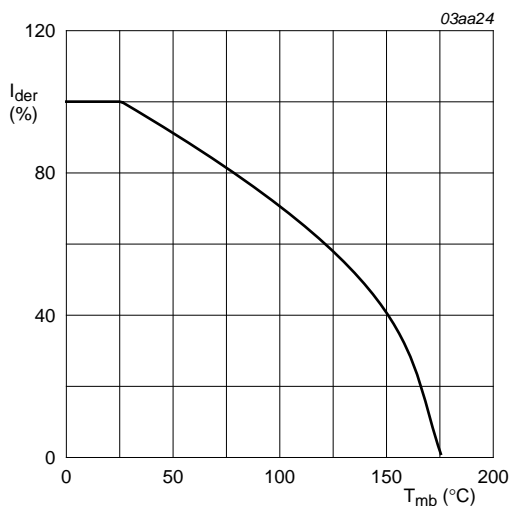
Type number	Package		
	Name	Description	Version
BUK7511-55A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 4. Limiting values

**Table 4. Limiting values**

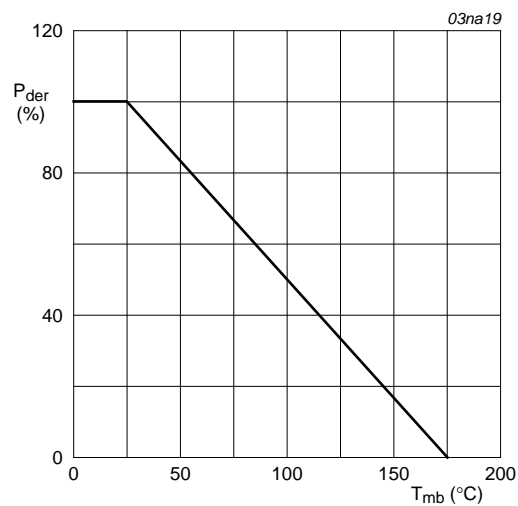
In accordance with the Absolute Maximum Rating System (IEC 60134).

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
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	-	55	V
$V_{GS}$	gate-source voltage		-20	-	20	V
$I_D$	drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a>	-	-	75	A
		$T_{mb} = 100\text{ }^{\circ}\text{C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a>	-	-	61	A
$I_{DM}$	peak drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$ ; $t_p \leq 10\text{ }\mu\text{s}$ ; pulsed; see <a href="#">Figure 3</a>	-	-	347	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 2</a>	-	-	166	W
$T_{stg}$	storage temperature		-55	-	175	$^{\circ}\text{C}$
$T_j$	junction temperature		-55	-	175	$^{\circ}\text{C}$
<b>Source-drain diode</b>						
$I_S$	source current	$T_{mb} = 25\text{ }^{\circ}\text{C}$	-	-	75	A
$I_{SM}$	peak source current	$t_p \leq 10\text{ }\mu\text{s}$ ; pulsed; $T_{mb} = 25\text{ }^{\circ}\text{C}$	-	-	347	A
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 65\text{ A}$ ; $V_{sup} \leq 55\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; unclamped	-	-	211	mJ



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

**Fig 1. Normalized continuous drain current as a function of mounting base temperature**



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

**Fig 2. Normalized total power dissipation as a function of mounting base temperature**

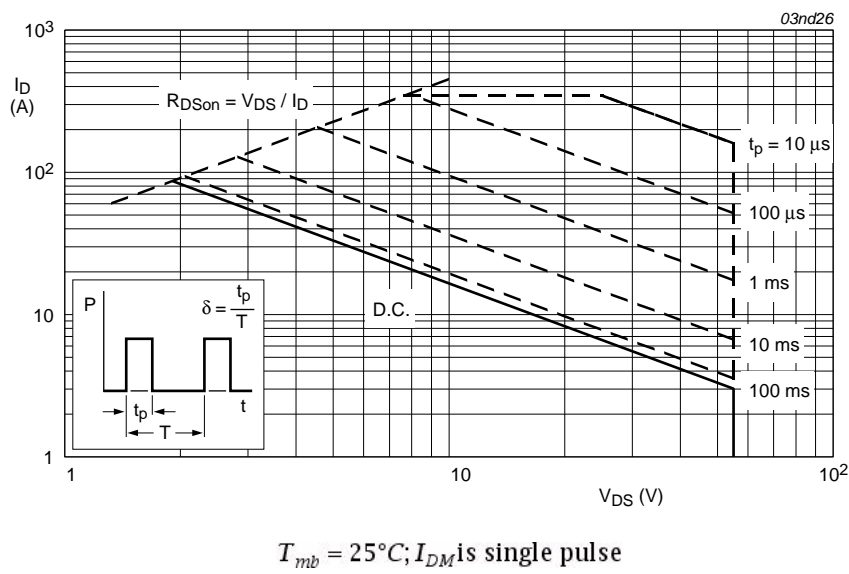


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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	see <a href="#">Figure 4</a>	-	-	0.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical still air	-	60	-	K/W

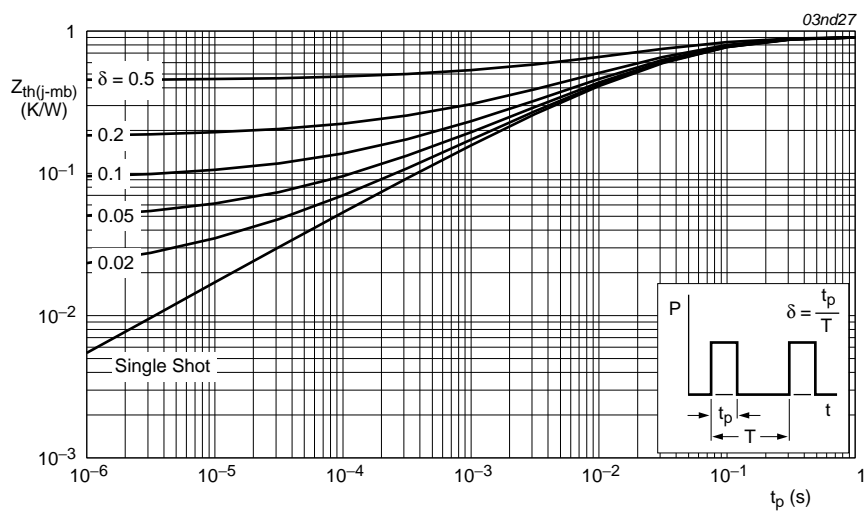


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V <sub>(BR)DSS</sub>	drain-source breakdown voltage	I <sub>D</sub> = 0.25 mA; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	55	-	-	V
		I <sub>D</sub> = 0.25 mA; V <sub>GS</sub> = 0 V; T <sub>j</sub> = -55 °C	50	-	-	V
V <sub>GS(th)</sub>	gate-source threshold voltage	I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>j</sub> = -55 °C; see <a href="#">Figure 11</a>	-	-	4.4	V
		I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>j</sub> = 25 °C; see <a href="#">Figure 11</a>	2	3	4	V
		I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>j</sub> = 175 °C; see <a href="#">Figure 11</a>	1	-	-	V
I <sub>DSS</sub>	drain leakage current	V <sub>DS</sub> = 55 V; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 175 °C	-	-	500	μA
		V <sub>DS</sub> = 55 V; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C	-	0.05	10	μA
I <sub>GSS</sub>	gate leakage current	V <sub>DS</sub> = 0 V; V <sub>GS</sub> = 20 V; T <sub>j</sub> = 25 °C	-	2	100	nA
		V <sub>DS</sub> = 0 V; V <sub>GS</sub> = -20 V; T <sub>j</sub> = 25 °C	-	2	100	nA
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 175 °C; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	-	22	mΩ
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	9	11	mΩ
Dynamic characteristics						
C <sub>iss</sub>	input capacitance	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 25 V; f = 1 MHz; T <sub>j</sub> = 25 °C; see <a href="#">Figure 14</a>	-	2230	3093	pF
C <sub>oss</sub>	output capacitance		-	510	645	pF
C <sub>rss</sub>	reverse transfer capacitance		-	290	467	pF
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 30 V; R <sub>L</sub> = 1.2 Ω; V <sub>GS</sub> = 10 V; R <sub>G(ext)</sub> = 10 Ω; T <sub>j</sub> = 25 °C	-	18	-	ns
t <sub>r</sub>	rise time		-	90	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	84	-	ns
t <sub>f</sub>	fall time		-	68	-	ns
L <sub>D</sub>	internal drain inductance	from contact screw on mounting base to centre of die ; T <sub>j</sub> = 25 °C	-	3.5	-	nH
		from drain lead 6 mm from package to centre of die ; T <sub>j</sub> = 25 °C	-	4.5	-	nH
L <sub>S</sub>	internal source inductance	from source lead to source bond pad ; T <sub>j</sub> = 25 °C	-	7.5	-	nH
Source-drain diode						
V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 25 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C; see <a href="#">Figure 15</a>	-	0.85	1.2	V
t <sub>rr</sub>	reverse recovery time	I <sub>S</sub> = 20 A; dI <sub>S</sub> /dt = -100 A/μs; V <sub>GS</sub> = -10 V; V <sub>DS</sub> = 30 V; T <sub>j</sub> = 25 °C	-	62	-	ns
Q <sub>r</sub>	recovered charge		-	140	-	nC

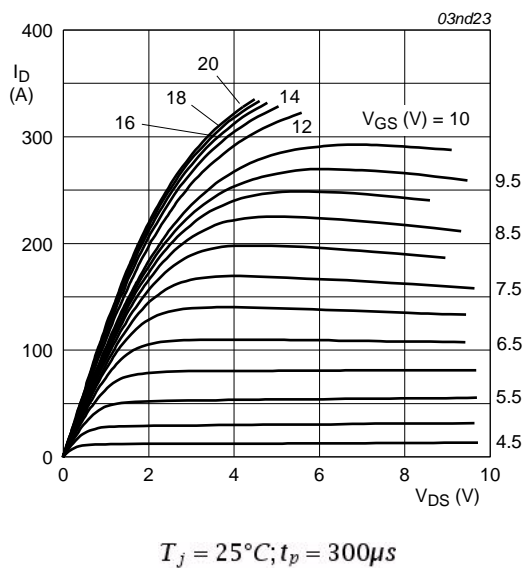


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

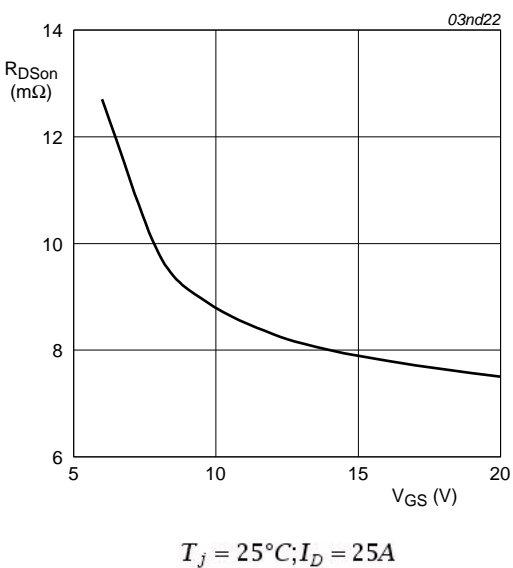


Fig 6. Drain-source on-state voltage as a function of gate-source voltage; typical values

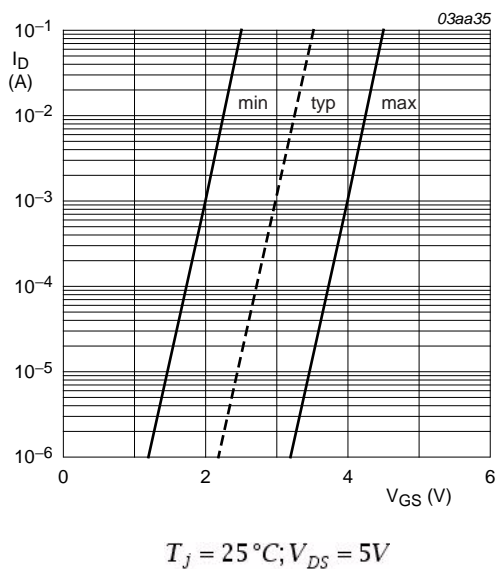


Fig 7. Sub-threshold drain current as a function of gate-source voltage

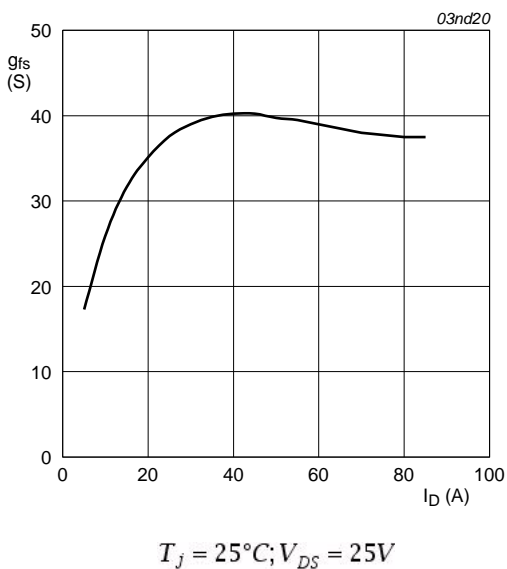


Fig 8. Forward transconductance as a function of drain current; typical values

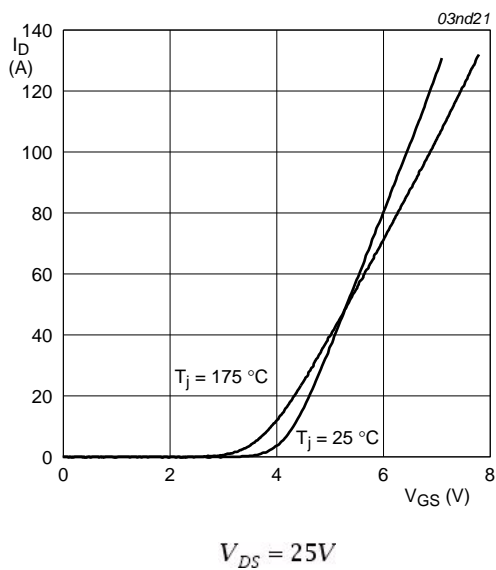


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

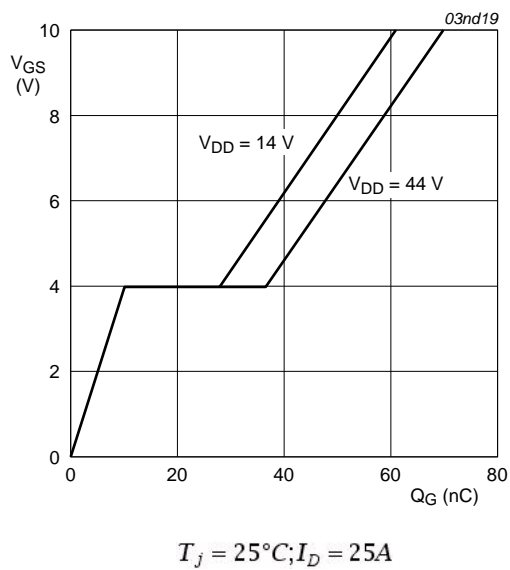


Fig 10. Gate-source voltage as a function of turn-on gate charge; typical values

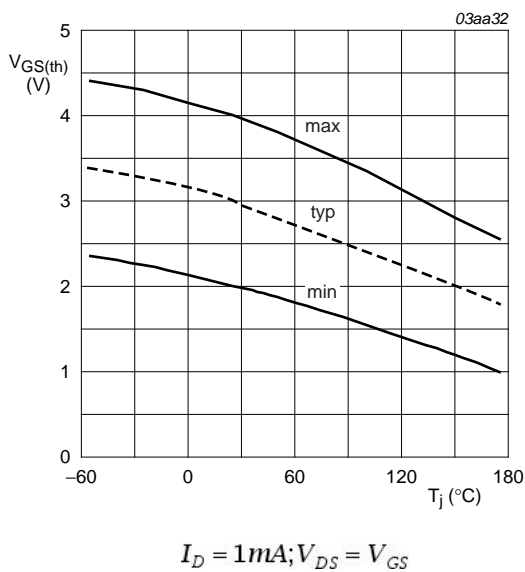


Fig 11. Gate-source threshold voltage as a function of junction temperature

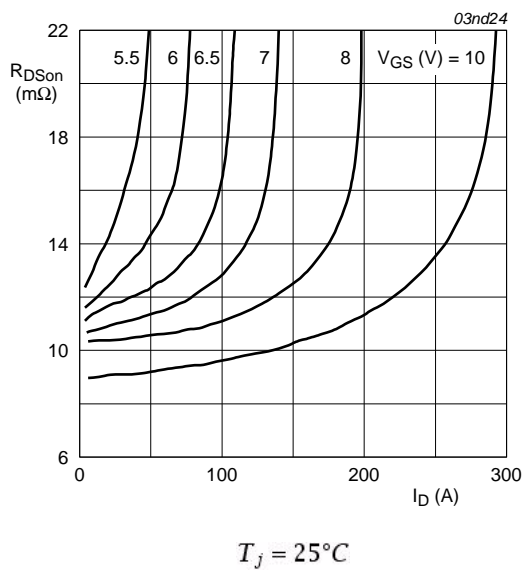
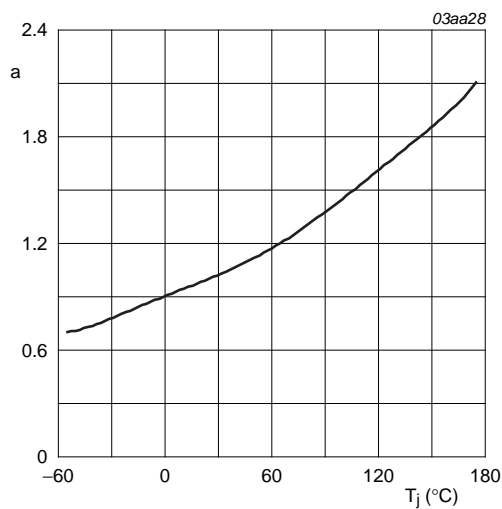
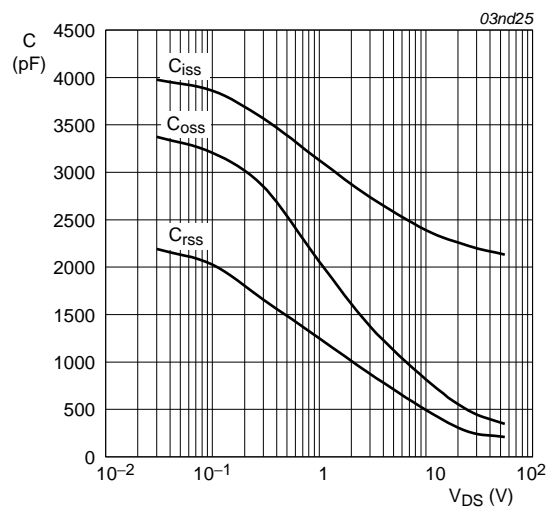


Fig 12. Drain-source on-state resistance as a function of drain current; typical values



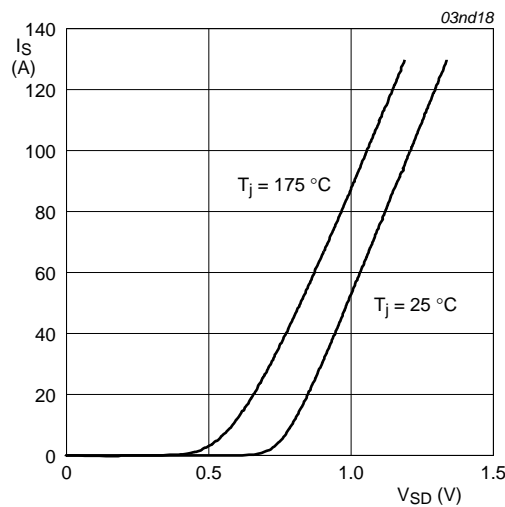
$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}\text{C})}}$$

Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature



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

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



$$V_{GS} = 0V$$

Fig 15. Reverse diode current as a function of reverse diode voltage; typical values



7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB SOT78

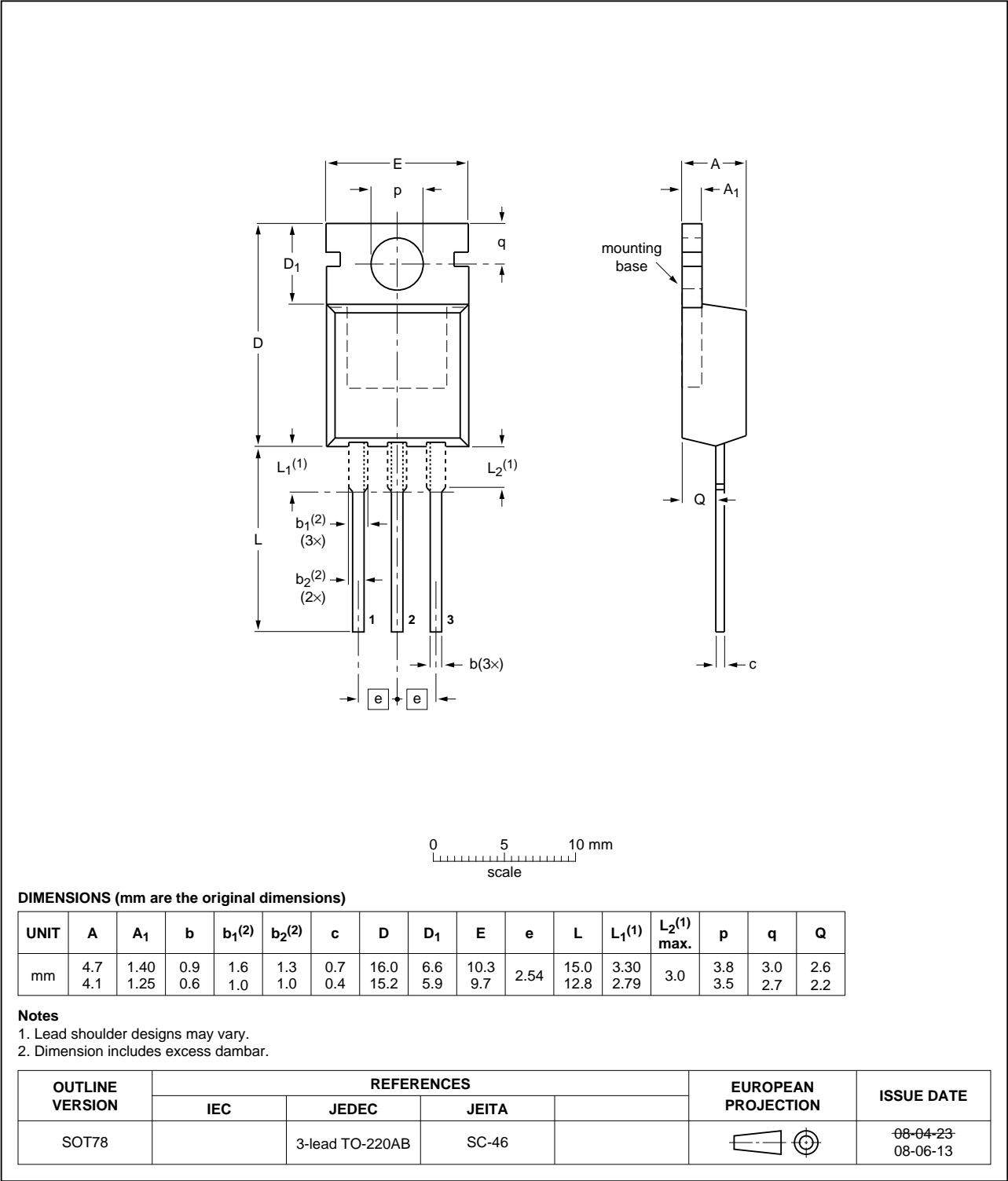


Fig 16. Package outline SOT78 (TO-220AB)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK7511-55A v.2	20100617	Product data sheet	-	BUK7511_7611_55A v.1
Modifications:	<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Type number BUK7511-55A separated from data sheet BUK7511_7611_55A v.1.</li></ul>			
BUK7511_7611_55A v.1 (9397 750 07817)	20010201	Product Specification	-	-

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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