



# BUK9629-100B

N-channel TrenchMOS logic level FET

Rev. 02 — 9 February 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Logic 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
- Suitable for logic level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

### 1.3 Applications

- 12 V, 24 V and 42 V loads
- Automotive systems
- 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
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$	-	-	100	V
$I_D$	drain current	$V_{GS} = 5\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a>	-	-	46	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	-	157	W

#### Static characteristics

$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 25\text{ °C}$	-	22	27	m $\Omega$
		$V_{GS} = 5\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 6</a> ; see <a href="#">Figure 7</a>	-	24	29	m $\Omega$

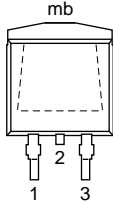
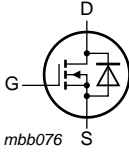
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Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 46\text{ A}$ ; $V_{sup} \leq 100\text{ V}$ ; $R_{GS} = 50\ \Omega$ ; $V_{GS} = 5\text{ V}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; unclamped	-	-	152	mJ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 5\text{ V}$ ; $I_D = 25\text{ A}$ ; $V_{DS} = 80\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 8</a>	-	13	-	nC

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain <sup>[1]</sup>		
3	S	source		
mb	D	mounting base; connected to drain		

**SOT404 (D2PAK)**

[1] It is not possible to make a connection to pin 2.

## 3. Ordering information

Table 3. Ordering information

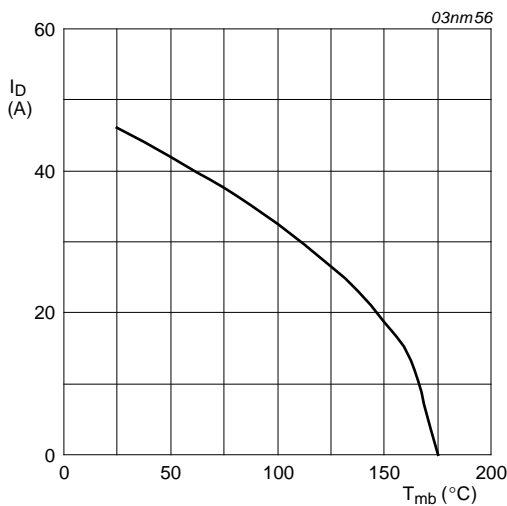
Type number	Package		Version
	Name	Description	
BUK9629-100B	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

## 4. Limiting values

**Table 4. Limiting values**

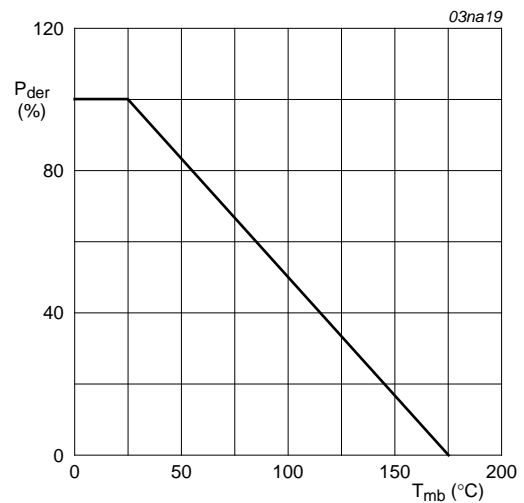
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	100	V
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage		-15	15	V
$I_D$	drain current	$T_{mb} = 25\text{ °C}; V_{GS} = 5\text{ V};$ see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a>	-	46	A
		$T_{mb} = 100\text{ °C}; V_{GS} = 5\text{ V};$ see <a href="#">Figure 1</a>	-	32	A
$I_{DM}$	peak drain current	$T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ see <a href="#">Figure 3</a>	-	186	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	157	W
$T_{stg}$	storage temperature		-55	175	°C
$T_j$	junction temperature		-55	175	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{mb} = 25\text{ °C}$	-	46	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25\text{ °C}$	-	186	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 46\text{ A}; V_{sup} \leq 100\text{ V}; R_{GS} = 50\text{ }\Omega;$ $V_{GS} = 5\text{ V}; T_{j(init)} = 25\text{ °C};$ unclamped	-	152	mJ



$$V_{GS} \geq 5V$$

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



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

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

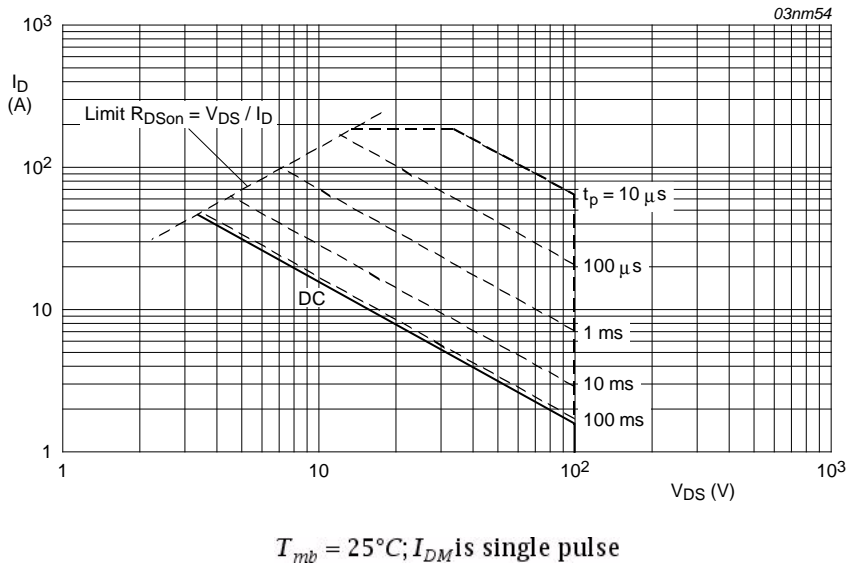


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

### 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>	-	-	0.95	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint; mounted on a printed-circuit board	-	50	-	K/W

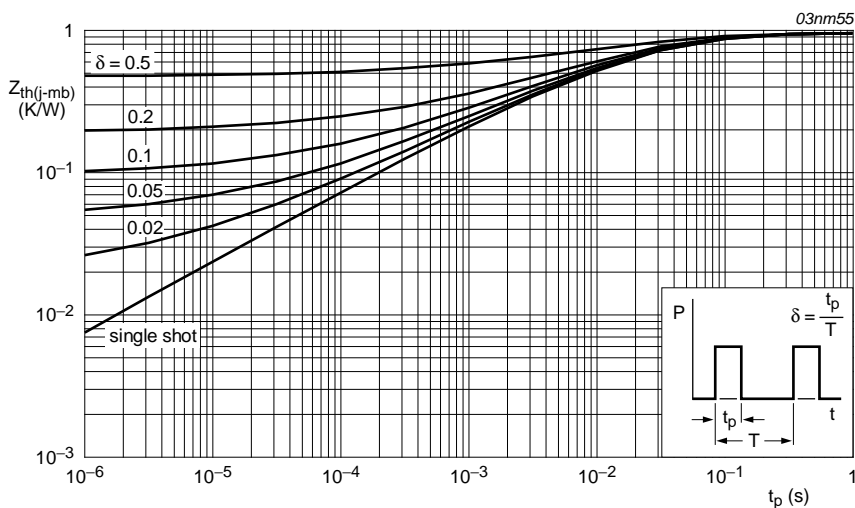


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

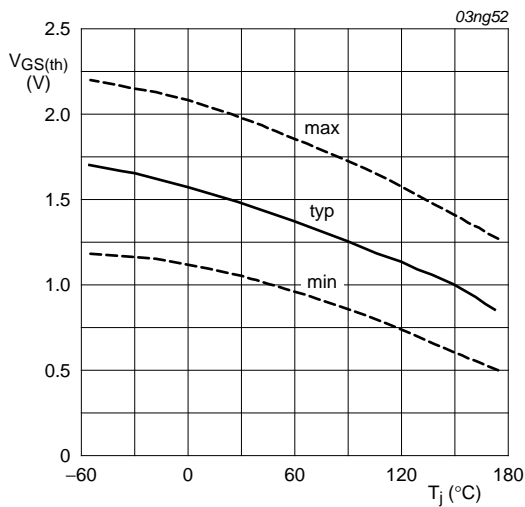
## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	100	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	89	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 5</a>	1.1	1.5	2	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see <a href="#">Figure 5</a>	-	-	2.3	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 5</a>	0.5	-	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	$\mu\text{A}$
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	1	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 15 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
		$V_{GS} = -15 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	-	32	m $\Omega$
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 6</a> ; see <a href="#">Figure 7</a>	-	-	75	m $\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	22	27	m $\Omega$
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 6</a> ; see <a href="#">Figure 7</a>	-	24	29	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 80 \text{ V}; V_{GS} = 5 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 8</a>	-	33	-	nC
$Q_{GS}$	gate-source charge		-	7	-	nC
$Q_{GD}$	gate-drain charge		-	13	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 9</a>	-	3270	4360	pF
$C_{oss}$	output capacitance		-	236	283	pF
$C_{rss}$	reverse transfer capacitance		-	103	141	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \text{ } \Omega; V_{GS} = 5 \text{ V};$ $R_{G(ext)} = 10 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	30	-	ns
$t_r$	rise time		-	86	-	ns
$t_{d(off)}$	turn-off delay time		-	96	-	ns
$t_f$	fall time		-	46	-	ns
$L_D$	internal drain inductance	from upper edge of drain mounting base to centre of die; $T_j = 25 \text{ }^\circ\text{C}$	-	2.5	-	nH
		from drain lead 6 mm from package to centre of die; $T_j = 25 \text{ }^\circ\text{C}$	-	4.5	-	nH
$L_S$	internal source inductance	from source lead to source bond pad; $T_j = 25 \text{ }^\circ\text{C}$	-	7.5	-	nH

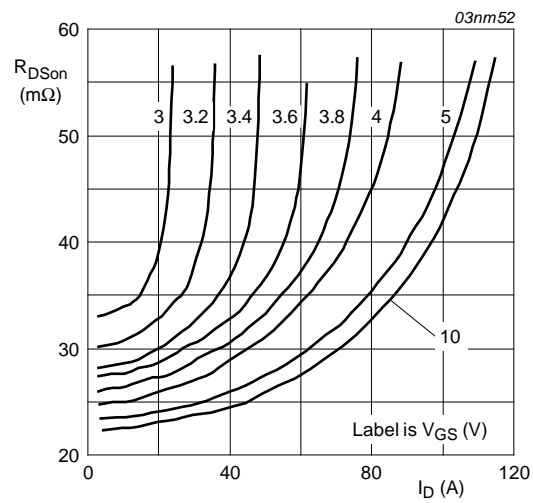
**Table 6. Characteristics ...continued**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 10</a>	-	0.85	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20\text{ A}$ ; $di_S/dt = -100\text{ A}/\mu\text{s}$ ;	-	114	-	ns
$Q_r$	recovered charge	$V_{GS} = -10\text{ V}$ ; $V_{DS} = 30\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$	-	196	-	nC



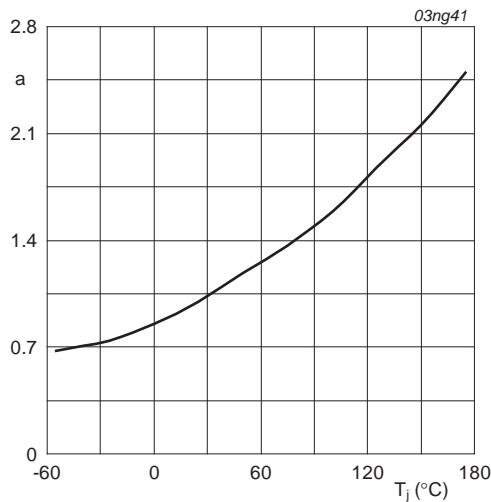
$$I_D = 1\text{ mA}; V_{DS} = V_{GS}$$

**Fig 5. Gate-source threshold voltage as a function of junction temperature**



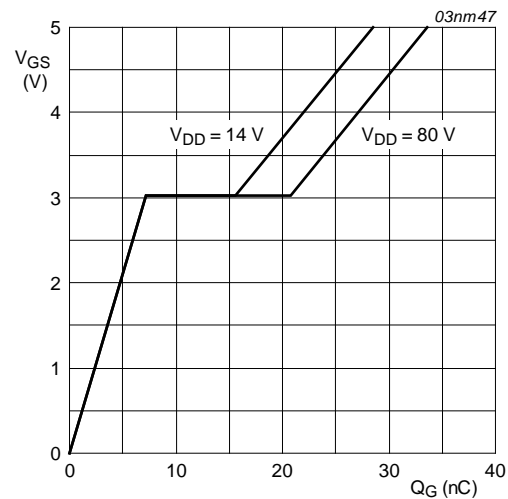
$$T_j = 25^\circ\text{C}$$

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



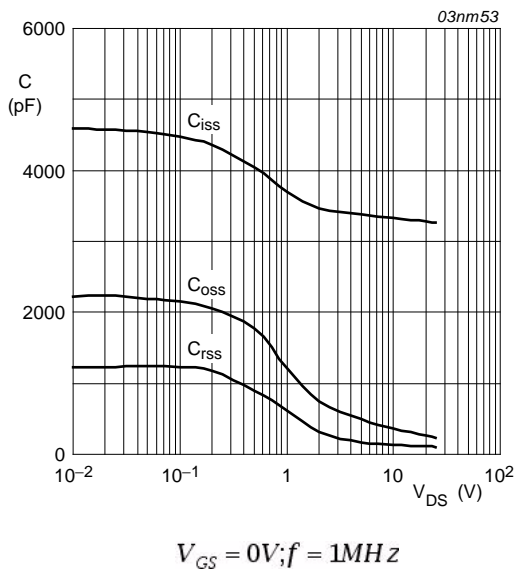
$$a = \frac{R_{DS(on)}}{R_{DS(on)25^\circ\text{C}}}$$

**Fig 7. Normalized drain-source on-state resistance factor as a function of junction temperature**

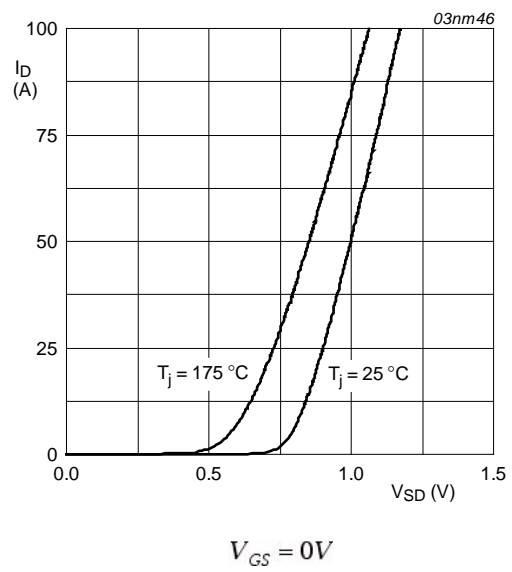


$$T_j = 25^\circ\text{C}; I_D = 25\text{ A}$$

**Fig 8. Gate-source threshold voltage as a function of junction temperature**



**Fig 9. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**

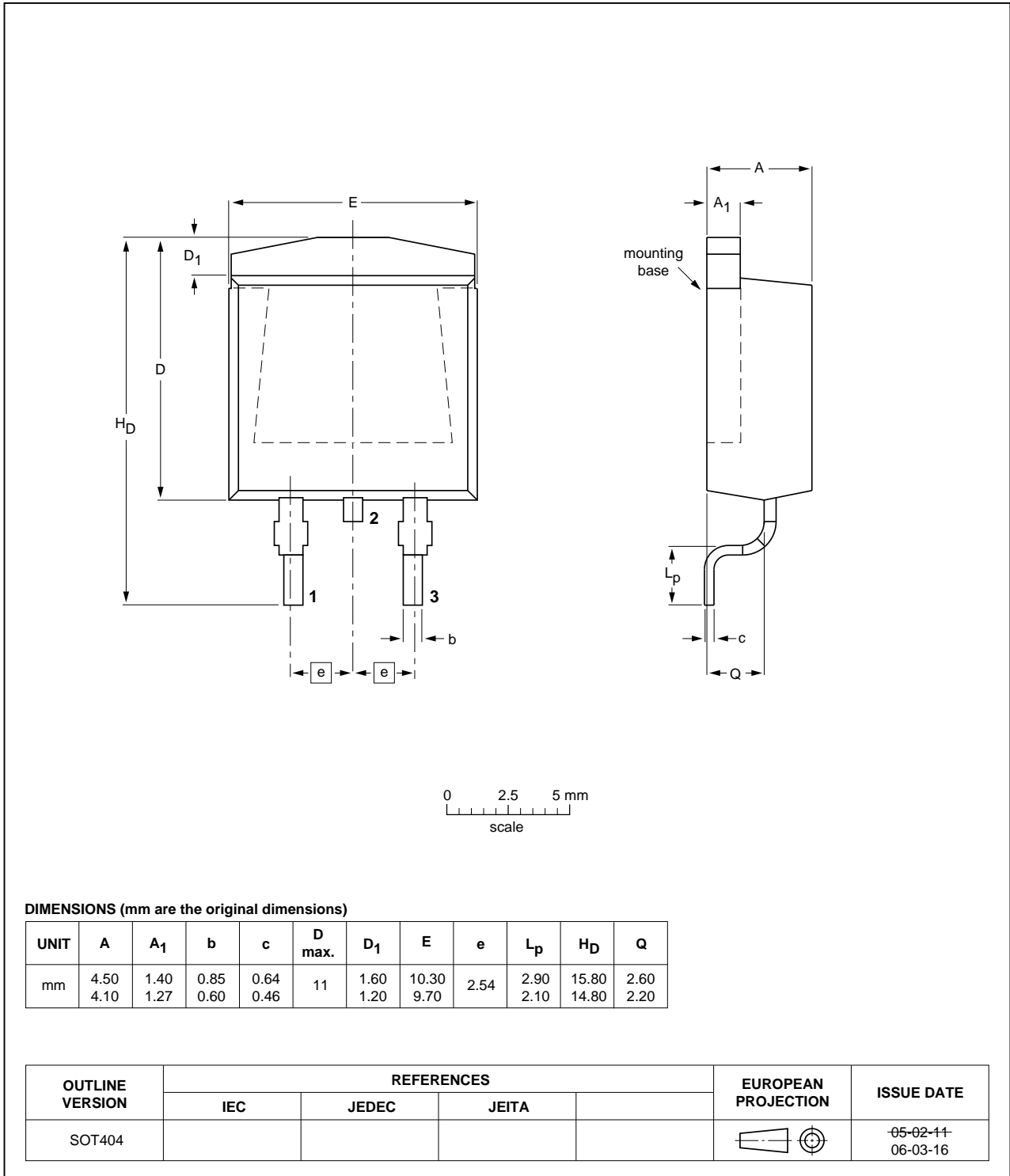


**Fig 10. Source current as a function of source-drain voltage; typical values**

**7. Package outline**

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

**SOT404**



**Fig 11. Package outline SOT404 (D2PAK)**



## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9629-100B v.2	20110209	Product data sheet	-	BUK95_9629_100B 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 BUK9629-100B separated from data sheet BUK95_9629_100B v.1.</li></ul>
BUK95_9629_100B v.1 (9397 750 11249)	20030418	Product data	-	-

## 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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