

# BUK9207-30B

## N-channel TrenchMOS logic level FET

Rev. 03 — 16 June 2010

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

- Low conduction losses due to low on-state resistance
- Q101 compliant
- Suitable for logic level gate drive sources
- Suitable for thermally demanding environments due to 185 °C rating

### 1.3 Applications

- 12 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	$T_j \geq 25\text{ °C}; T_j \leq 185\text{ °C}$	-	-	30	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>	[1]	-	75	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	-	167	W
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 25\text{ A};$ $T_j = 25\text{ °C}$	-	4.4	5	mΩ
		$V_{GS} = 5\text{ V}; I_D = 25\text{ A};$ $T_j = 25\text{ °C};$ see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	-	5.9	7	mΩ



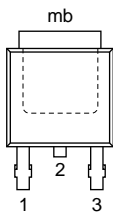
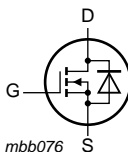
**Table 1. Quick reference data ...continued**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75\text{ A}$ ; $V_{sup} \leq 30\text{ V}$ ; $R_{GS} = 50\ \Omega$ ; $V_{GS} = 5\text{ V}$ ; $T_{j(init)} = 25\text{ }^\circ\text{C}$ ; unclamped	-	-	329	mJ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 5\text{ V}$ ; $I_D = 25\text{ A}$ ; $V_{DS} = 24\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 11</a>	-	12	-	nC

[1] Continuous current is limited by package.

## 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		

**SOT428 (DPAK)**

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

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
BUK9207-30B	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

## 4. Limiting values

**Table 4. Limiting values**

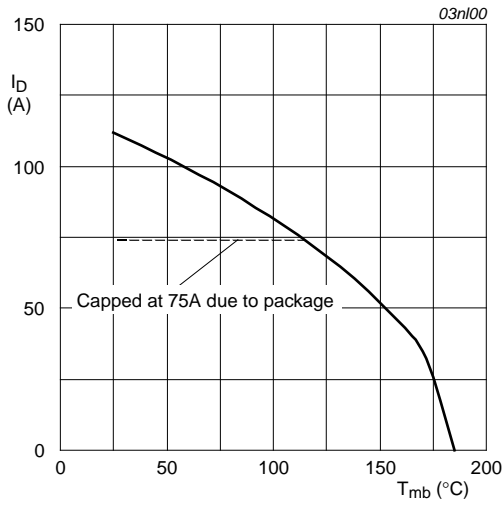
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 185\text{ °C}$	-	-	30	V	
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	-	30	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>	[1]	-	-	75	A
			[2]	-	-	112	A
		$T_{mb} = 100\text{ °C}$ ; $V_{GS} = 5\text{ V}$ ; see <a href="#">Figure 1</a>	[1]	-	-	75	A
$I_{DM}$	peak drain current	$T_{mb} = 25\text{ °C}$ ; $t_p \leq 10\text{ }\mu\text{s}$ ; pulsed; see <a href="#">Figure 3</a>	-	-	449	A	
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	-	167	W	
$T_{stg}$	storage temperature		-55	-	185	°C	
$T_j$	junction temperature		-55	-	185	°C	
<b>Source-drain diode</b>							
$I_S$	source current	$T_{mb} = 25\text{ °C}$	[3]	-	-	75	A
			[2]	-	-	112	A
$I_{SM}$	peak source current	$t_p \leq 10\text{ }\mu\text{s}$ ; pulsed; $T_{mb} = 25\text{ °C}$	-	-	449	A	
<b>Avalanche ruggedness</b>							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75\text{ A}$ ; $V_{sup} \leq 30\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 5\text{ V}$ ; $T_{j(Init)} = 25\text{ °C}$ ; unclamped	-	-	329	mJ	

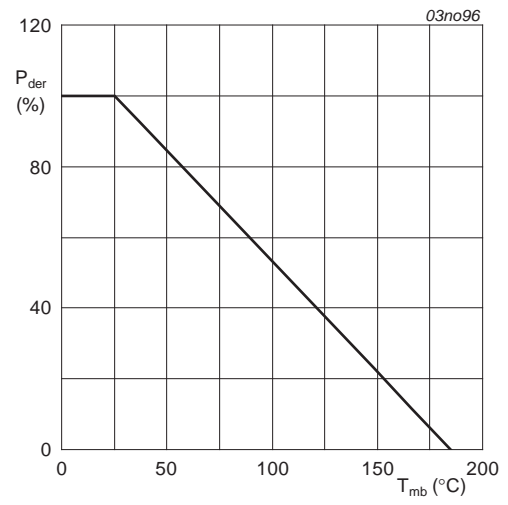
[1] Continuous current is limited by package.

[2] Current is limited by power dissipation chip rating.

[3] Continuous current is limited by package.

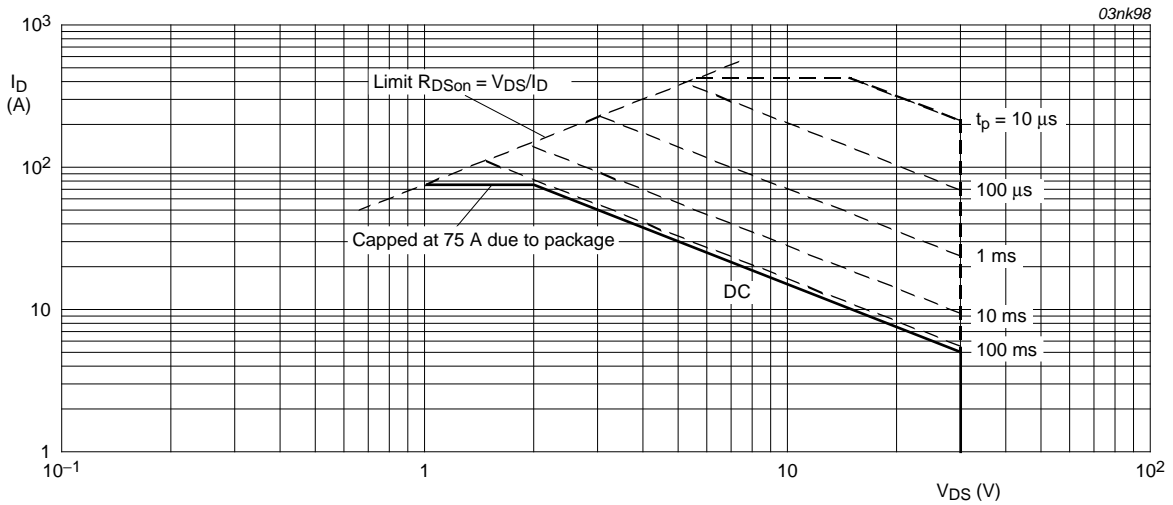


**Fig 1. Normalized continuous drain current as a function of mounting base temperature**



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

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



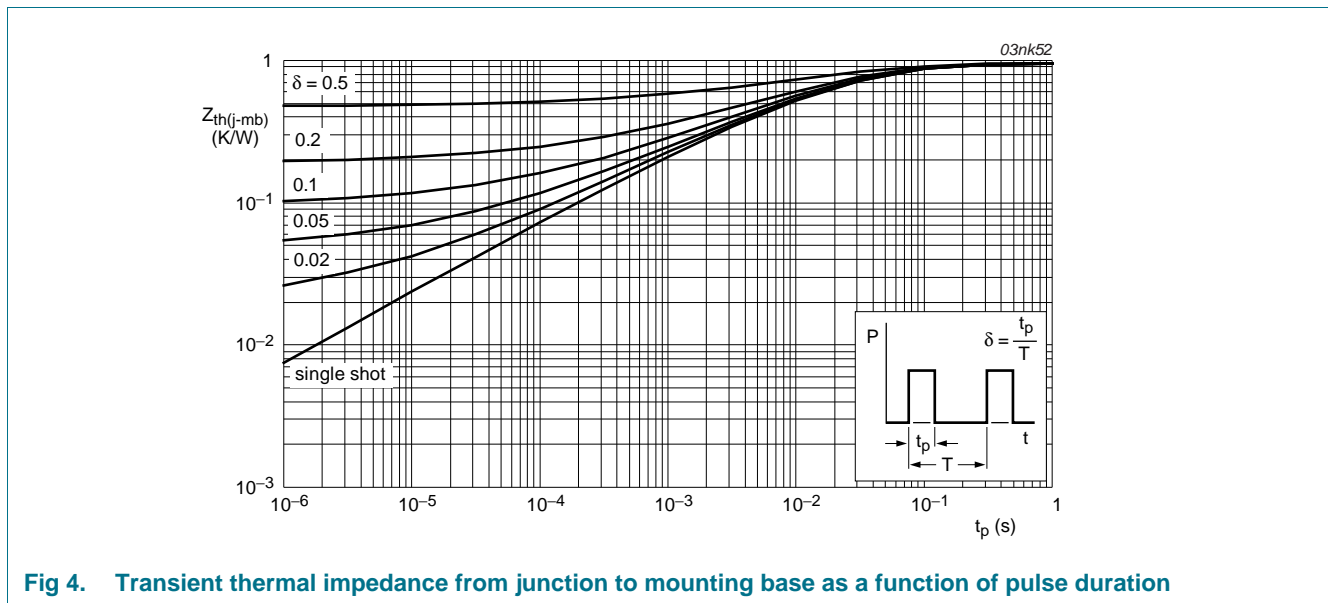
$T_{mb} = 25^\circ C; I_{DM}$  is single pulse

**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		-	71.4	-	K/W

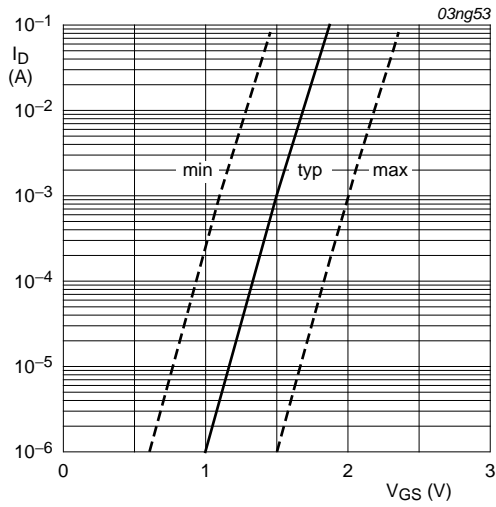


**Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration**

## 6. Characteristics

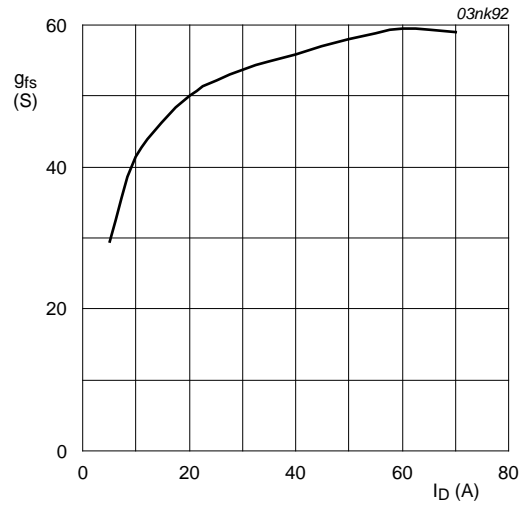
**Table 6. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	30	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see <a href="#">Figure 8</a>	-	-	2.3	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 8</a>	1.1	1.5	2	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 185 \text{ }^\circ\text{C};$ see <a href="#">Figure 8</a>	0.4	-	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	1	$\mu\text{A}$
		$V_{DS} = 30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 185 \text{ }^\circ\text{C}$	-	-	500	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{DS} = 0 \text{ V}; V_{GS} = 15 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
		$V_{DS} = 0 \text{ V}; V_{GS} = -15 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	4.4	5	m $\Omega$
		$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	-	7.7	m $\Omega$
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 185 \text{ }^\circ\text{C};$ see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	-	-	13.3	m $\Omega$
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	-	5.9	7	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 24 \text{ V}; V_{GS} = 5 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a>	-	31	-	nC
$Q_{GS}$	gate-source charge		-	8	-	nC
$Q_{GD}$	gate-drain charge		-	12	-	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 12</a>	-	2573	3430	pF
$C_{oss}$	output capacitance		-	635	762	pF
$C_{rss}$	reverse transfer capacitance		-	268	367	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 25 \text{ V}; R_L = 1.2 \text{ } \Omega; V_{GS} = 5 \text{ V};$ $R_{G(ext)} = 10 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	19	-	ns
$t_r$	rise time		-	82	-	ns
$t_{d(off)}$	turn-off delay time		-	100	-	ns
$t_f$	fall time		-	107	-	ns
$L_D$	internal drain inductance	measured from drain to center of die ; $T_j = 25 \text{ }^\circ\text{C}$	-	2.5	-	nH
$L_S$	internal source inductance	measured from source lead to source bond pad ; $T_j = 25 \text{ }^\circ\text{C}$	-	7.5	-	nH
<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 13</a>	-	0.85	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 \text{ A}; di_S/dt = -100 \text{ A}/\mu\text{s};$ $V_{GS} = -10 \text{ V}; V_{DS} = 25 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	55	-	ns
$Q_r$	recovered charge		-	42	-	nC



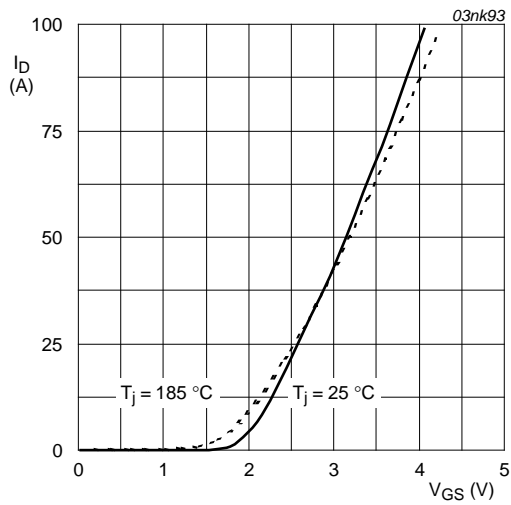
$T_j = 25^\circ\text{C}; V_{DS} = V_{GS}$

**Fig 5. Sub-threshold drain current as a function of gate-source voltage**



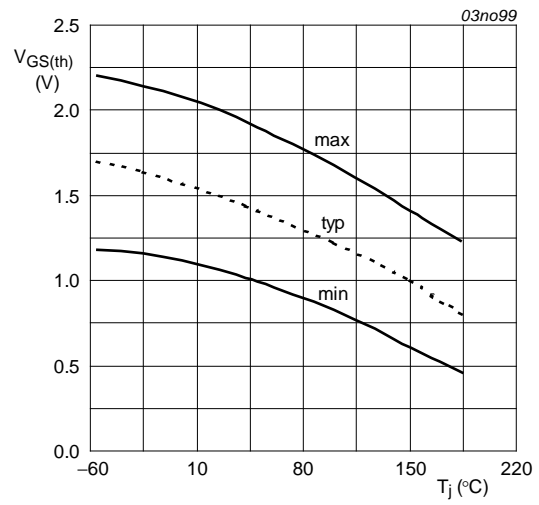
$T_j = 25^\circ\text{C}; V_{DS} = 25\text{V}$

**Fig 6. Forward transconductance as a function of drain current; typical values**



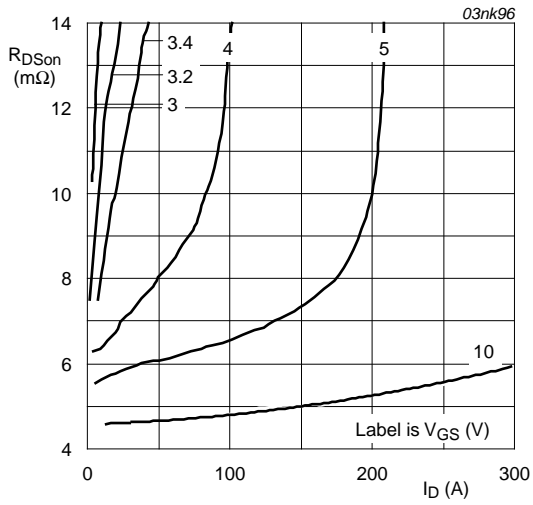
$V_{DS} = 25\text{V}$

**Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



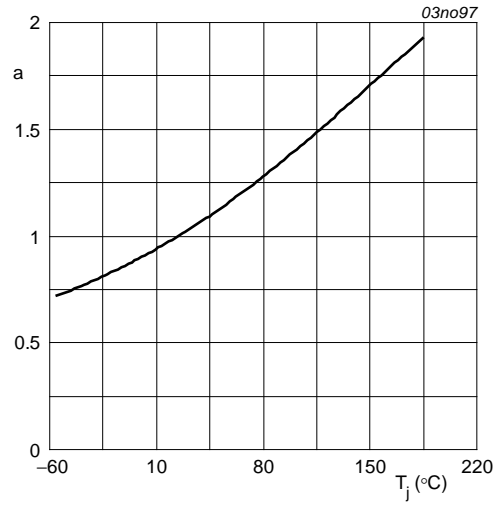
$I_D = 1\text{mA}; V_{DS} = V_{GS}$

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



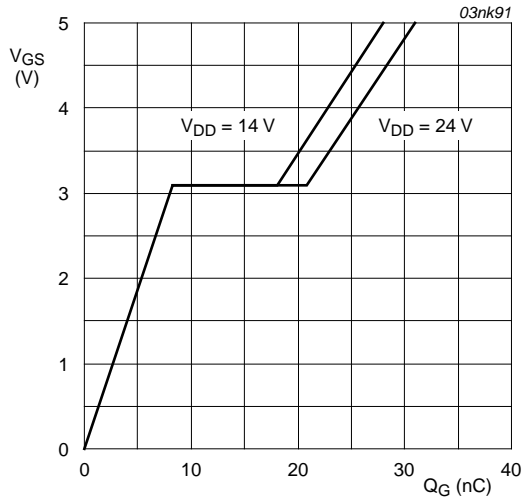
$T_j = 25^\circ\text{C}; t_p = 300\mu\text{s}$

**Fig 9.** Drain-source on-state resistance as a function of drain current; typical values



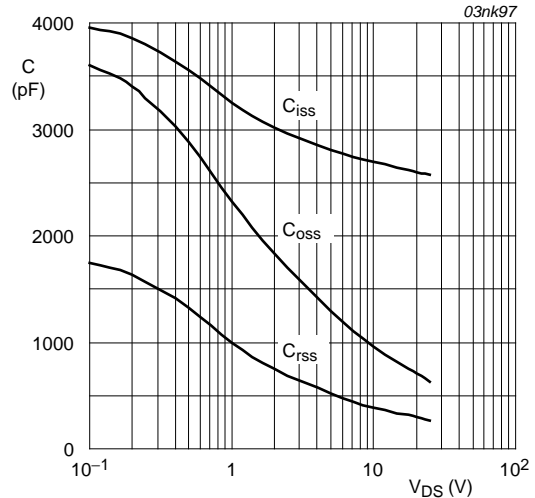
$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

**Fig 10.** Normalized drain-source on-state resistance factor as a function of junction temperature



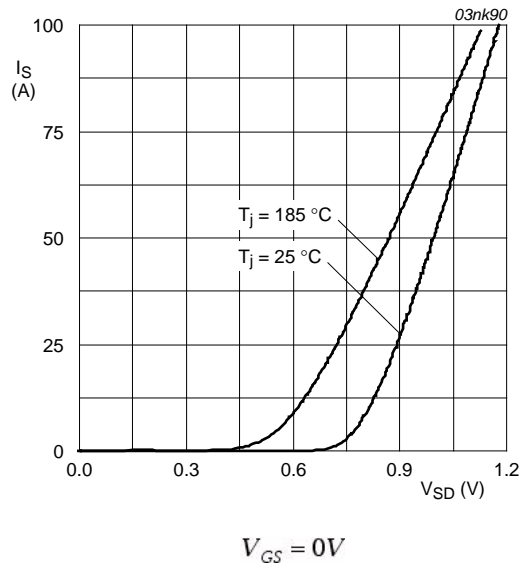
$T_j = 25^\circ\text{C}; I_D = 25\text{ A}$

**Fig 11.** Gate-source voltage as a function of turn-on gate charge; typical values



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

**Fig 12.** Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



**Fig 13. Source current as a function of source-drain voltage; typical values**

**7. Package outline**

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

SOT428

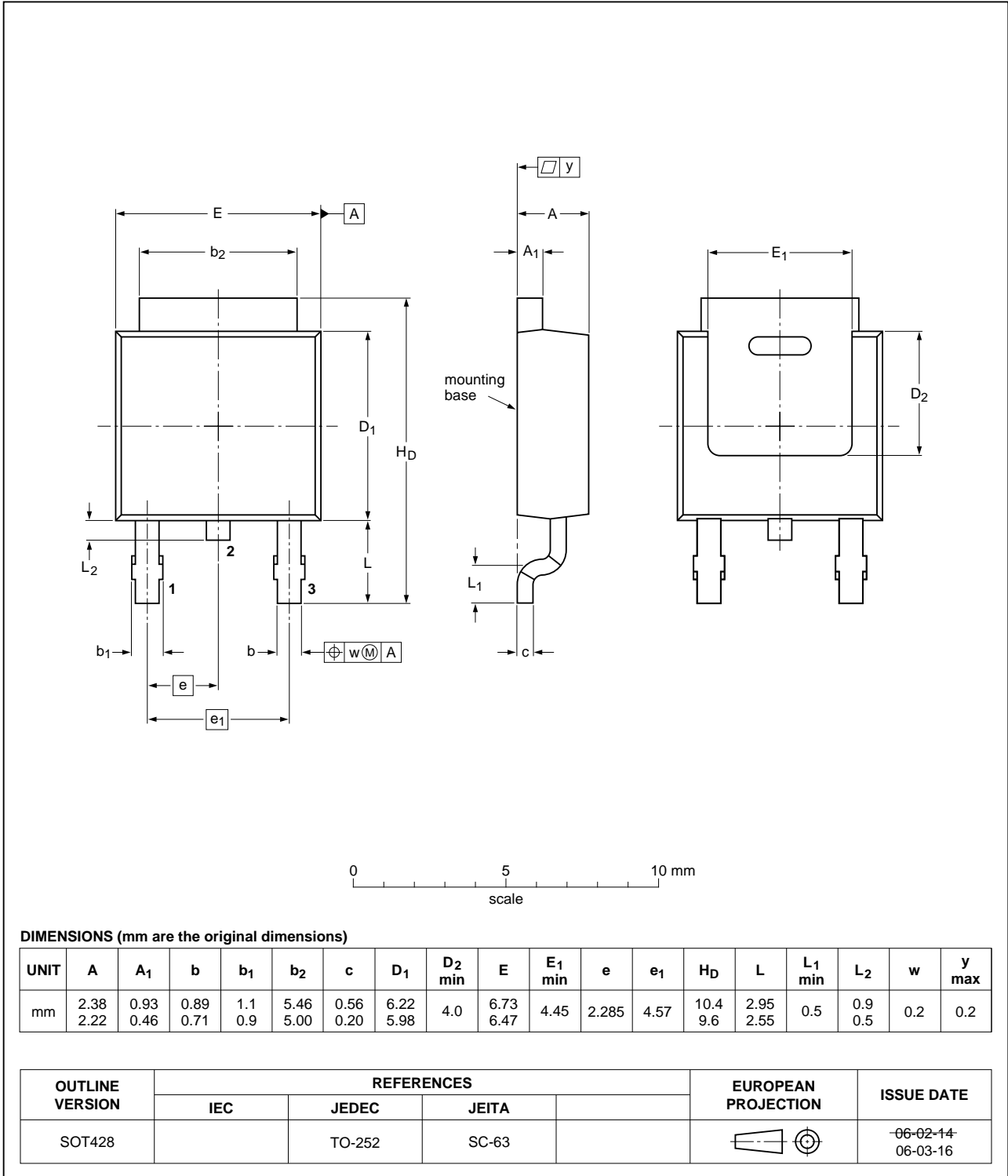


Fig 14. Package outline SOT428 (DPAK)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9207-30B v.3	20100616	Product data sheet	-	BUK9207-30B v.2
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></ul>	
BUK9207-30B v.2 (9397 750 12233)	20031212	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".

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