



# BUK763R4-30B

## N-channel TrenchMOS standard level FET

Rev. 2 — 21 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
- Suitable for standard level gate drive sources
- Suitable for thermally demanding environments due to 175 °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

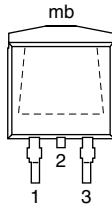
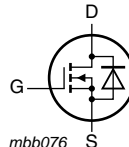
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$	-	-	30	V
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 4</a>	[1]	-	75	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	-	255	W
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	2.9	3.4	mΩ
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75\text{ A}$ ; $V_{sup} \leq 30\text{ V}$ ; $R_{GS} = 50\text{ Ω}$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; unclamped	-	-	1.3	J

[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		
3	S	source		
mb	D	mounting base; connected to drain		
SOT404 (D2PAK)				

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK763R4-30B	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 <sub>DS</sub>	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	30	V	
V <sub>DGR</sub>	drain-gate voltage	R <sub>GS</sub> = 20 kΩ	-	30	V	
V <sub>GS</sub>	gate-source voltage		-20	20	V	
I <sub>D</sub>	drain current	T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a> ; see <a href="#">Figure 4</a>	<a href="#">[1]</a>	-	75	A
		T <sub>mb</sub> = 100 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a>	<a href="#">[1]</a>	-	75	A
		T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a> ; see <a href="#">Figure 4</a>	<a href="#">[2][3]</a>	-	198	A
I <sub>DM</sub>	peak drain current	T <sub>mb</sub> = 25 °C; pulsed; t <sub>p</sub> ≤ 10 μs; see <a href="#">Figure 4</a>	-	794	A	
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	255	W	
T <sub>stg</sub>	storage temperature		-55	175	°C	
T <sub>j</sub>	junction temperature		-55	175	°C	
Source-drain diode						
I <sub>S</sub>	source current	T <sub>mb</sub> = 25 °C	<a href="#">[2][3]</a>	-	198	A
			<a href="#">[1]</a>	-	75	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C	-	794	A	
Avalanche ruggedness						
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	I <sub>D</sub> = 75 A; V <sub>sup</sub> ≤ 30 V; R <sub>GS</sub> = 50 Ω; V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; unclamped	-	1.3	J	
E <sub>DS(AL)R</sub>	repetitive drain-source avalanche energy	see <a href="#">Figure 3</a>	<a href="#">[4][5][6][7]</a>	-	-	J

[1] Continuous current is limited by package.

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

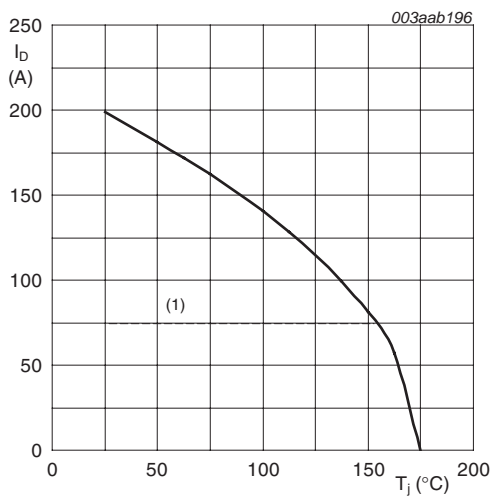
[3] Refer to document 9397 750 12572 for further information.

[4] Maximum value not quoted. Repetitive rating defined in avalanche rating figure.

[5] Single-shot avalanche rating limited by maximum junction temperature of 175 °C.

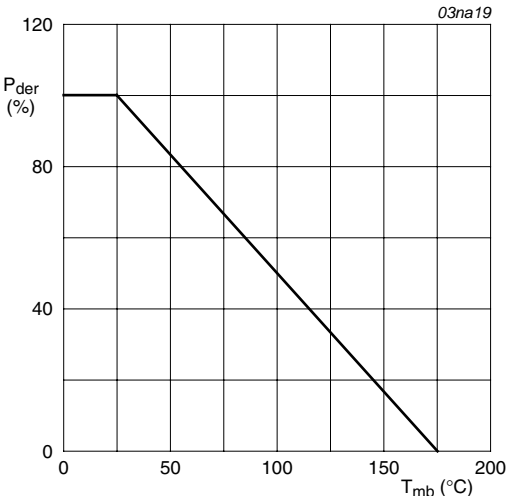
[6] Repetitive avalanche rating limited by an average junction temperature of 170 °C.

[7] Refer to application note AN10273 for further information.



$V_{GS} \geq 5\text{ V}$   
(1) Capped at 75 A due to package.

Fig 1. 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

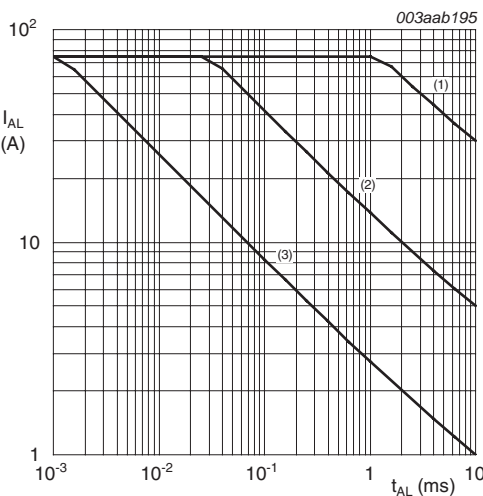


Fig 3. Single shot and repetitive avalanche rating; avalanche current as a function of avalanche time

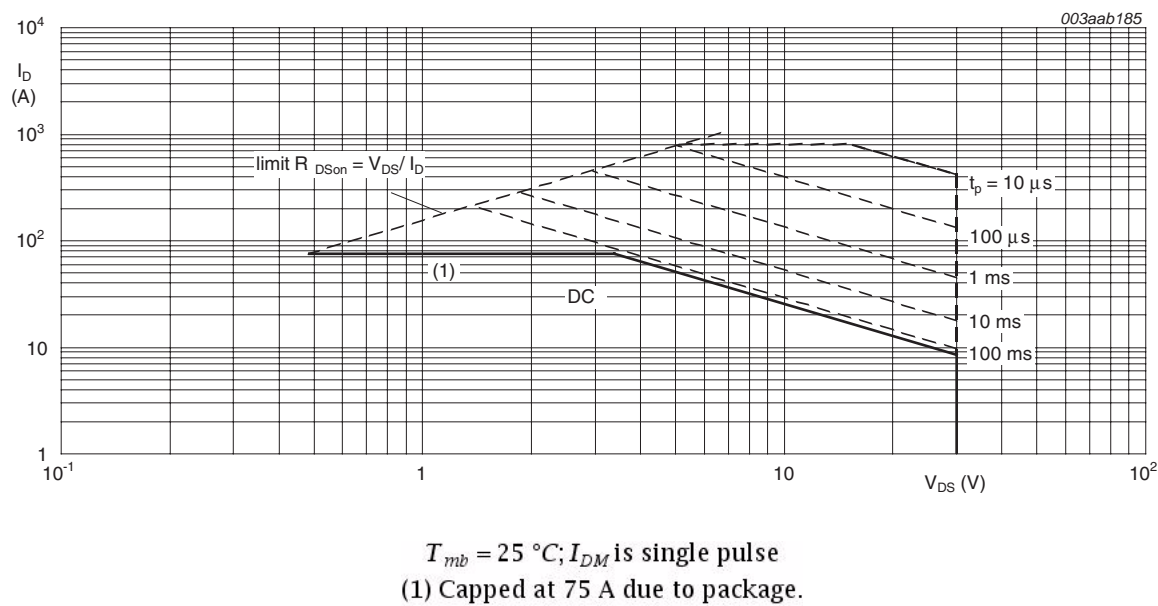


Fig 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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		-	-	0.59	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed-circuit board; minimum footprint; vertical in still air	-	50	-	K/W

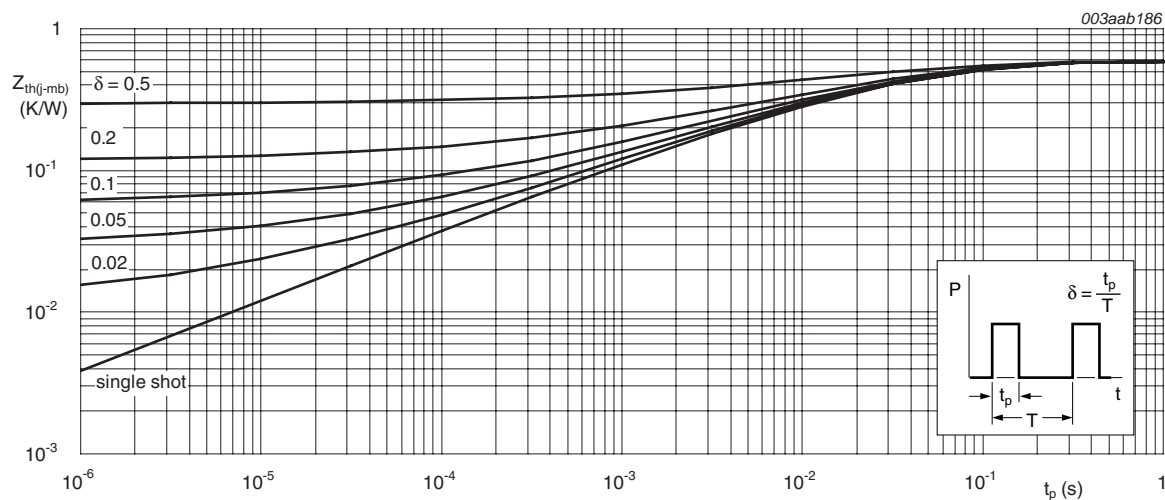
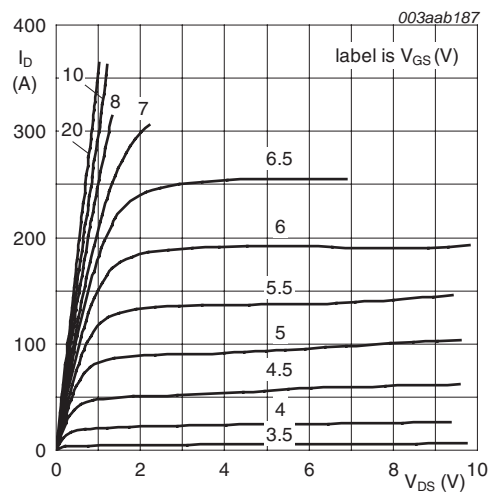


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 6. Characteristics

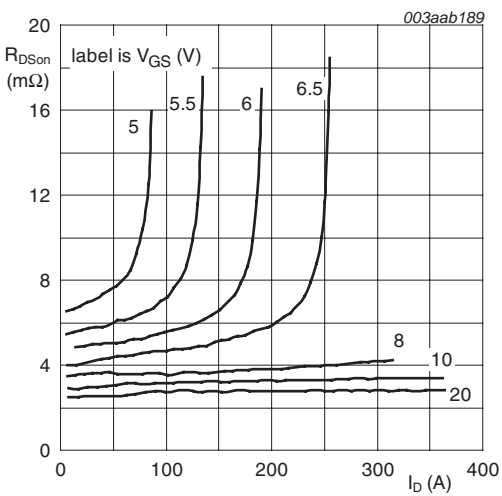
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu A$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$	30	-	-	V
		$I_D = 250\ \mu A$ ; $V_{GS} = 0\ V$ ; $T_j = -55\ ^\circ C$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\ mA$ ; $V_{DS} = V_{GS}$ ; $T_j = 25\ ^\circ C$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	2	3	4	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 1\ mA$ ; $V_{DS} = V_{GS}$ ; $T_j = -55\ ^\circ C$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	-	-	4.4	V
		$I_D = 1\ mA$ ; $V_{DS} = V_{GS}$ ; $T_j = 175\ ^\circ C$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	1	-	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30\ V$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$	-	0.05	10	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 20\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$	-	2	100	nA
		$V_{GS} = -20\ V$ ; $V_{DS} = 0\ V$ ; $T_j = 25\ ^\circ C$	-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\ V$ ; $I_D = 25\ A$ ; $T_j = 175\ ^\circ C$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	-	6.5	m $\Omega$
		$V_{GS} = 10\ V$ ; $I_D = 25\ A$ ; $T_j = 25\ ^\circ C$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>	-	2.9	3.4	m $\Omega$
$I_{DSS}$	drain leakage current	$V_{DS} = 30\ V$ ; $V_{GS} = 0\ V$ ; $T_j = 175\ ^\circ C$	-	-	500	$\mu A$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25\ A$ ; $V_{DS} = 24\ V$ ; $V_{GS} = 10\ V$ ; see <a href="#">Figure 14</a>	-	75	-	nC
$Q_{GS}$	gate-source charge		-	19	-	nC
$Q_{GD}$	gate-drain charge		-	23	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0\ V$ ; $V_{DS} = 25\ V$ ; $f = 1\ MHz$ ; $T_j = 25\ ^\circ C$ ; see <a href="#">Figure 15</a>	-	3713	4951	pF
$C_{oss}$	output capacitance		-	1249	1499	pF
$C_{rss}$	reverse transfer capacitance		-	460	630	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30\ V$ ; $R_L = 1.2\ \Omega$ ; $V_{GS} = 10\ V$ ; $R_{G(ext)} = 10\ \Omega$	-	32	-	ns
$t_r$	rise time		-	64	-	ns
$t_{d(off)}$	turn-off delay time		-	89	-	ns
$t_f$	fall time		-	71	-	ns
$L_D$	internal drain inductance	from contact screw on mounting base to centre of die	-	3.5	-	nH
		from upper edge of drain mounting base to centre of die	-	2.5	-	nH
		from drain lead 6 mm from package to centre of die	-	4.5	-	nH
$L_S$	internal source inductance	from source lead to source bonding pad	-	7.5	-	nH
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25\ A$ ; $V_{GS} = 0\ V$ ; $T_j = 25\ ^\circ C$ ; see <a href="#">Figure 16</a>	-	0.85	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20\ A$ ; $dI_S/dt = -100\ A/\mu s$ ; $V_{GS} = 0\ V$ ; $V_{DS} = 30\ V$	-	70	-	ns
$Q_r$	recovered charge		-	58	-	nC



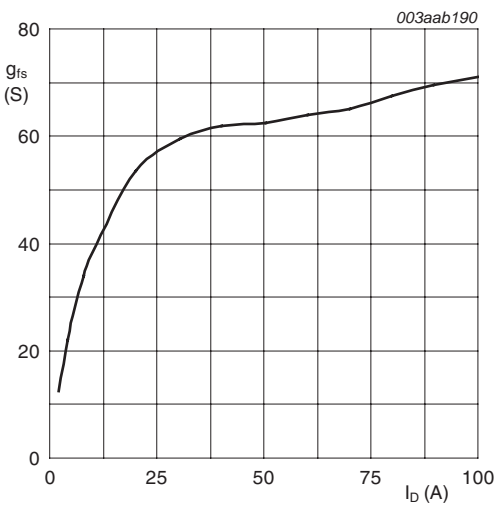
T<sub>j</sub> = 25 °C

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



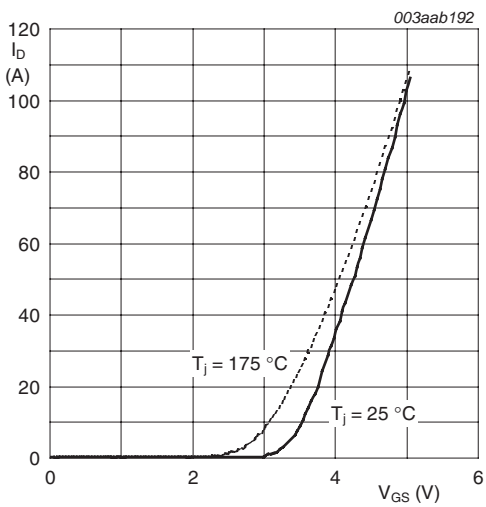
T<sub>j</sub> = 25 °C

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



T<sub>j</sub> = 25 °C; V<sub>DS</sub> = 25 V

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



V<sub>DS</sub> = 25 V

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

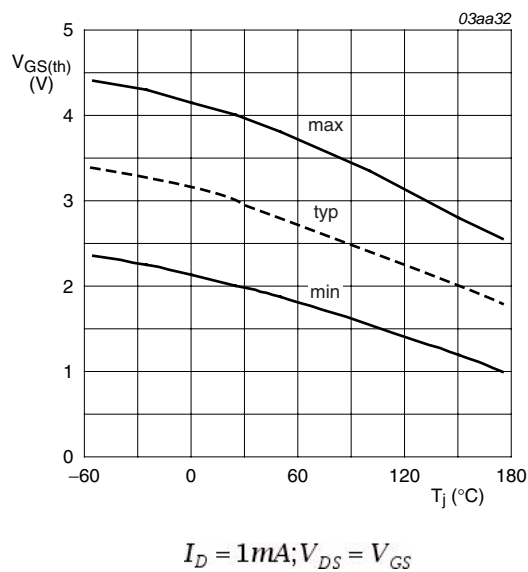


Fig 10. Gate-source threshold voltage as a function of junction temperature

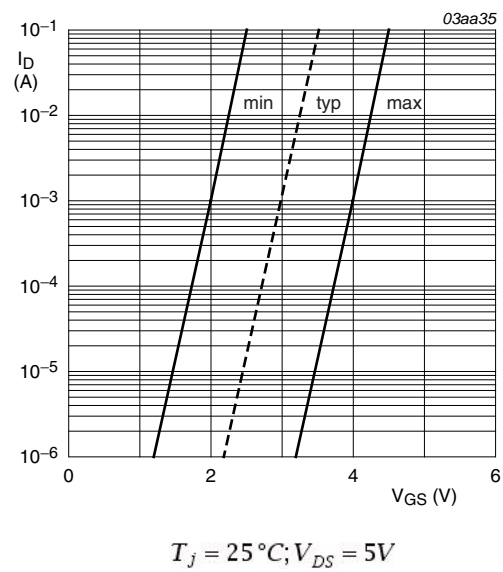


Fig 11. Sub-threshold drain current as a function of gate-source voltage

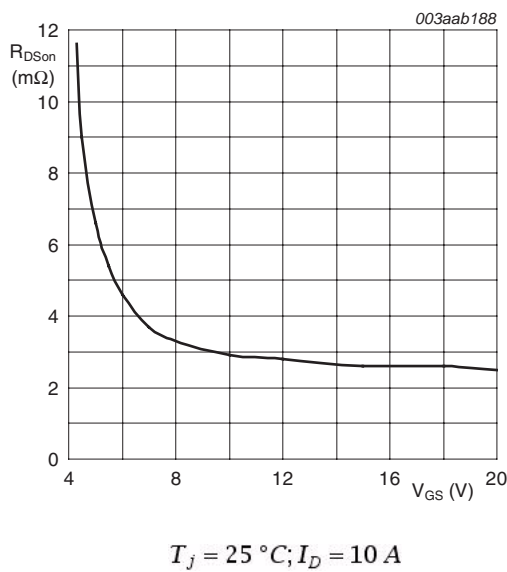


Fig 12. Drain-source on-state resistance as a function of gate-source voltage; typical values

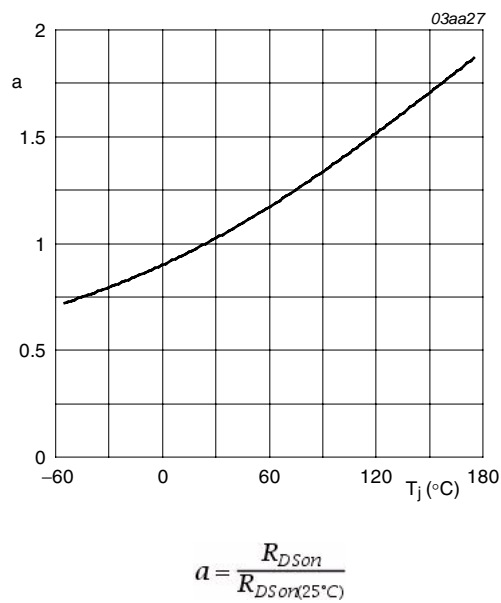
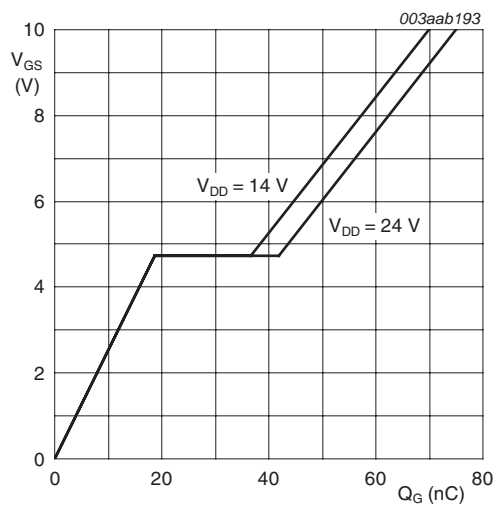


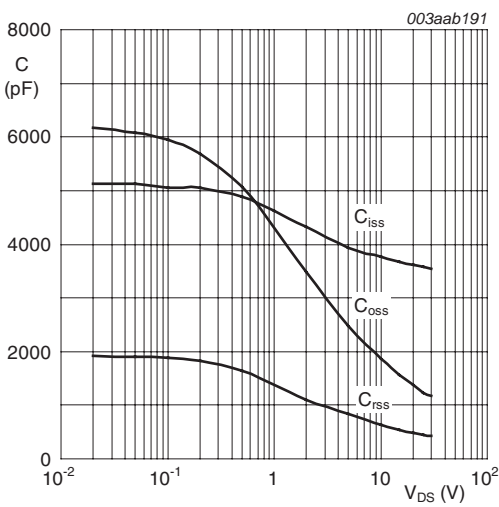
Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature





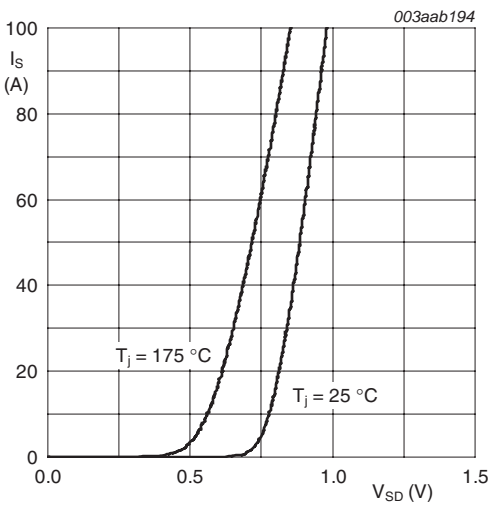
$T_j = 25\text{ }^{\circ}\text{C}; I_D = 25\text{ A}$

Fig 14. Gate-source voltage as a function of gate charge; typical values



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

Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values.



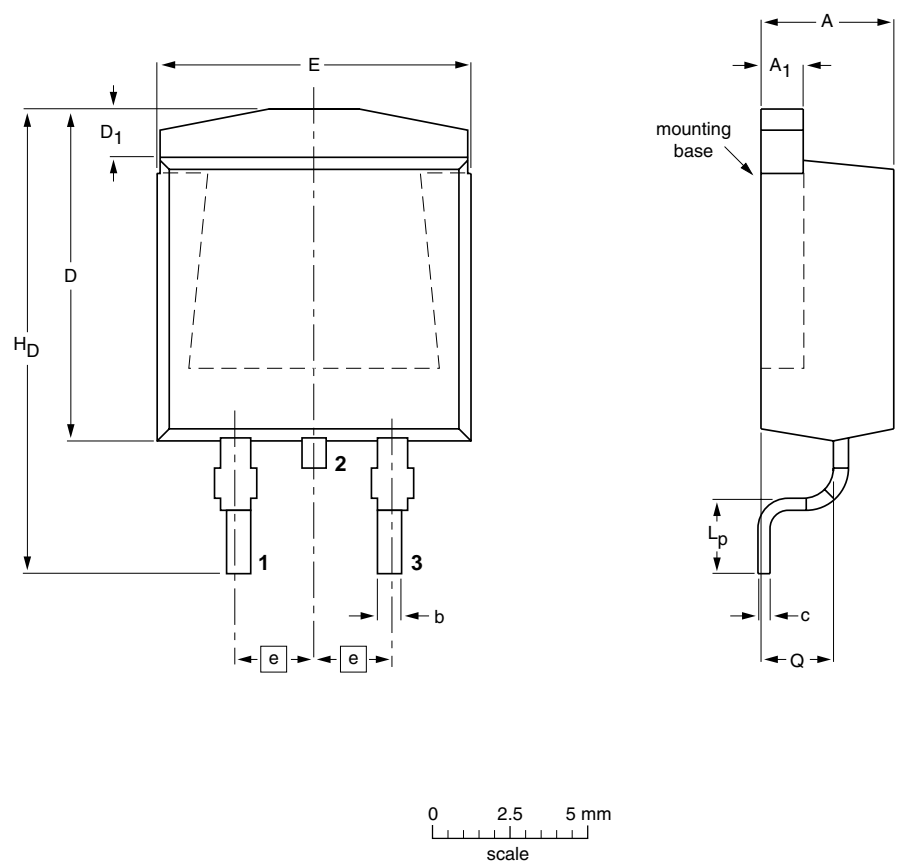
$V_{GS} = 0\text{ V}$

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

7. Package outline

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

SOT404



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	c	D <sub>max.</sub>	D <sub>1</sub>	E	e	L <sub>p</sub>	H <sub>D</sub>	Q
mm	4.50 4.10	1.40 1.27	0.85 0.60	0.64 0.46	11	1.60 1.20	10.30 9.70	2.54	2.90 2.10	15.80 14.80	2.60 2.20


OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT404						05-02-11 06-03-16

Fig 17. Package outline SOT404 (D2PAK)

## 8. Revision history

**Table 7.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK763R4-30B v.2	20110421	Product data sheet	-	BUK75_763R4-30B_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 BUK763R4-30B separated from data sheet BUK75_763R4-30B_1.</li></ul>			
BUK75_763R4-30B_1	20060105	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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