



# BUK765R2-40B

N-channel TrenchMOS standard level FET

Rev. 3 — 22 November 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

- 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

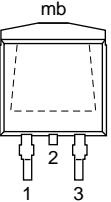
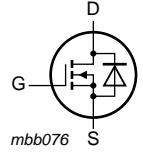
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25 \text{ }^\circ\text{C}; T_j \leq 175 \text{ }^\circ\text{C}$	-	-	40	V
$I_D$	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 25 \text{ }^\circ\text{C}$ ; see <a href="#">Figure 1</a> ; <a href="#">[1]</a> see <a href="#">Figure 3</a>	-	-	75	A
$P_{tot}$	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$ ; see <a href="#">Figure 2</a>	-	-	203	W
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ ; see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	-	4.4	5.2	$\text{m}\Omega$
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; V_{DS} = 32 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ ; see <a href="#">Figure 13</a>	-	16	-	nC
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75 \text{ A}; V_{sup} \leq 40 \text{ V}; R_{GS} = 50 \Omega; V_{GS} = 10 \text{ V}; T_{j(init)} = 25 \text{ }^\circ\text{C}$ ; unclamped	-	-	494	$\text{mJ}$

[1] Continuous current is limited by package.

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## 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
BUK765R2-40B	D2PAK		plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

## 4. Limiting values

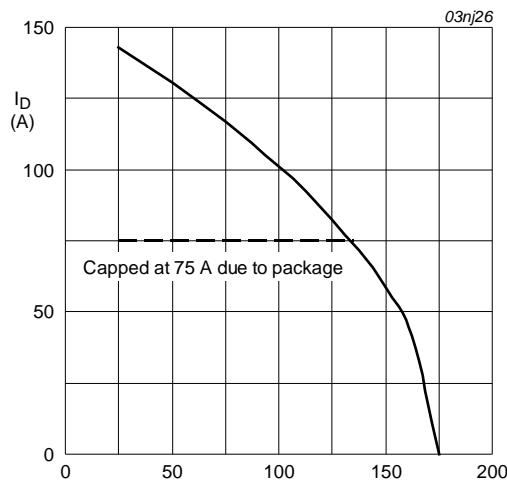
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}$	-	40	V
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20 \text{ k}\Omega$	-	40	V
$V_{GS}$	gate-source voltage		-20	20	V
$I_D$	drain current	$T_{mb} = 25^\circ\text{C}; V_{GS} = 10 \text{ V}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a>	[1] -	143	A
		$T_{mb} = 100^\circ\text{C}; V_{GS} = 10 \text{ V}$ ; see <a href="#">Figure 1</a>	[2] -	75	A
$I_{DM}$	peak drain current	$T_{mb} = 25^\circ\text{C}$ ; pulsed; $t_p \leq 10 \mu\text{s}$ ; see <a href="#">Figure 3</a>	-	573	A
$P_{tot}$	total power dissipation	$T_{mb} = 25^\circ\text{C}$ ; see <a href="#">Figure 2</a>	-	203	W
$T_{stg}$	storage temperature		-55	175	°C
$T_j$	junction temperature		-55	175	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{mb} = 25^\circ\text{C}$	[1] -	143	A
			[2] -	75	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10 \mu\text{s}; T_{mb} = 25^\circ\text{C}$	-	573	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75 \text{ A}; V_{sup} \leq 40 \text{ V}; R_{GS} = 50 \Omega; V_{GS} = 10 \text{ V}; T_{j(init)} = 25^\circ\text{C}$ ; unclamped	-	494	mJ

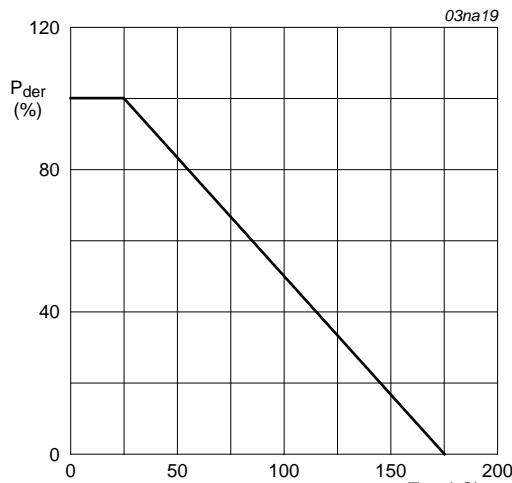
[1] Current is limited by power dissipation chip rating.

[2] Continuous current is limited by package.

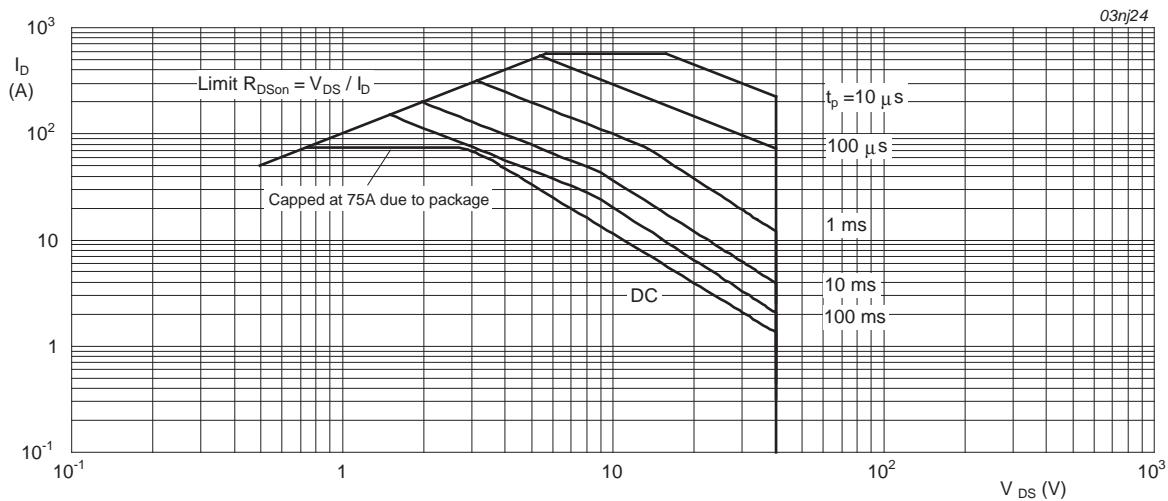


$V_{GS} \geq 4.5V$

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



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



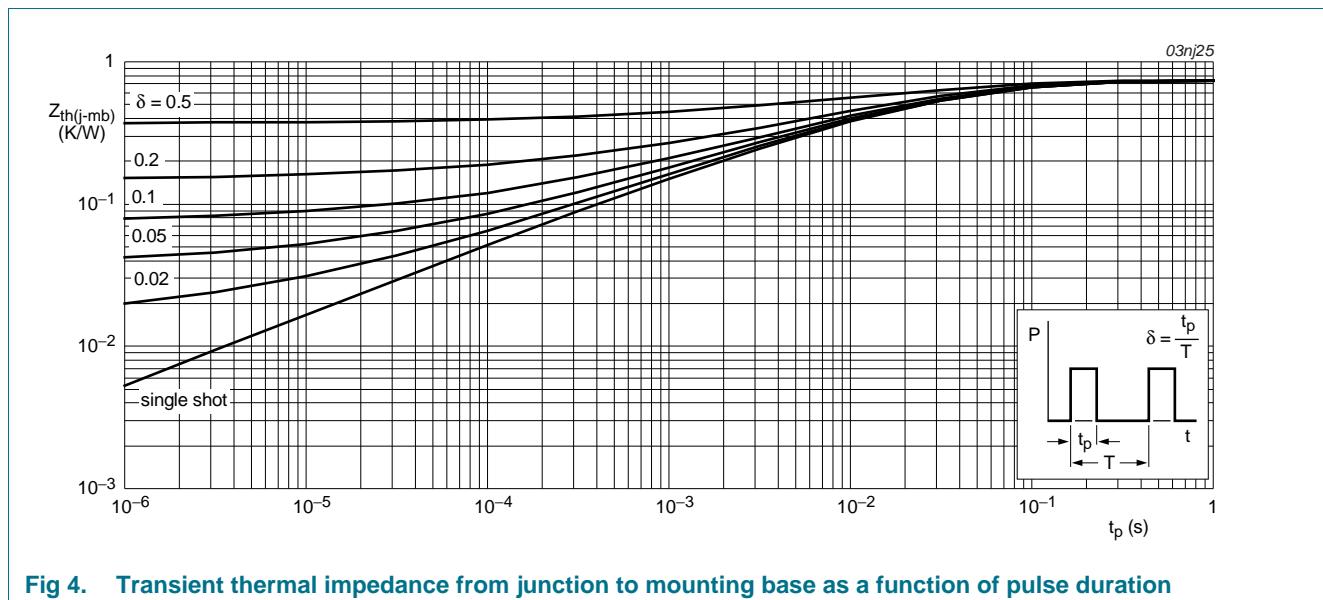
$T_{mb} = 25^\circ C$ ;  $I_{DM}$  is single pulse

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
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	see <a href="#">Figure 4</a>	-	-	0.74	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient	minimum footprint ; mounted on a printed-circuit board	-	50	-	K/W

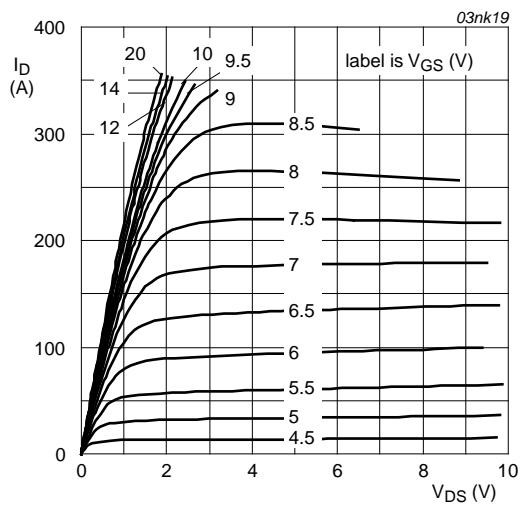


**Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration**

## 6. Characteristics

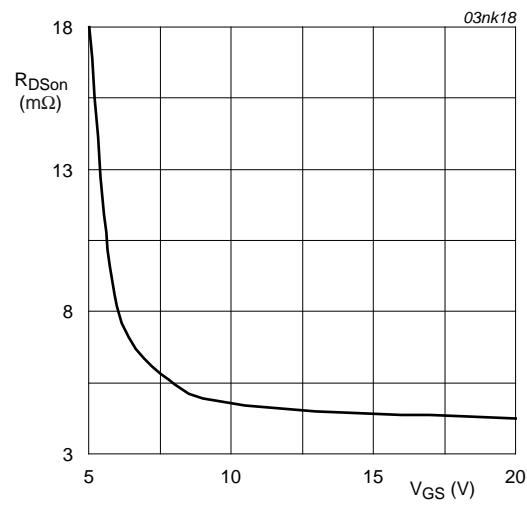
**Table 6. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	40	-	-	V
$V_{GS(\text{th})}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 10</a> $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see <a href="#">Figure 10</a> $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 10</a>	2	3	4	V
$I_{DSS}$	drain leakage current	$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ $V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	0.02	1	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ $V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a> $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	-	-	9.9	$\text{m}\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(\text{tot})}$	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 32 \text{ V}; V_{GS} = 10 \text{ V};$	-	52	-	nC
$Q_{GS}$	gate-source charge	$T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 13</a>	-	12	-	nC
$Q_{GD}$	gate-drain charge		-	16	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	2842	3789	pF
$C_{oss}$	output capacitance	$T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 14</a>	-	711	853	pF
$C_{rss}$	reverse transfer capacitance		-	296	406	pF
$t_{d(\text{on})}$	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \text{ }\Omega; V_{GS} = 10 \text{ V};$	-	15	-	ns
$t_r$	rise time	$R_{G(\text{ext})} = 10 \text{ }\Omega; T_j = 25 \text{ }^\circ\text{C}$	-	51	-	ns
$t_{d(\text{off})}$	turn-off delay time		-	81	-	ns
$t_f$	fall time		-	56	-	ns
$L_D$	internal drain inductance	from drain lead 6 mm from package to centre of die ; $T_j = 25 \text{ }^\circ\text{C}$ from upper edge of drain mounting base 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
<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 15</a>	-	0.85	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A}/\mu\text{s};$ $V_{GS} = -10 \text{ V}; V_{DS} = 20 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	54	-	ns
$Q_r$	recovered charge		-	38	-	nC



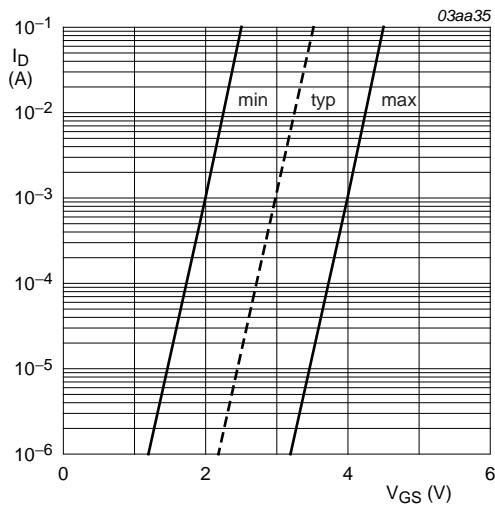
$T_j = 25^\circ C; t_p = 300\mu s$

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



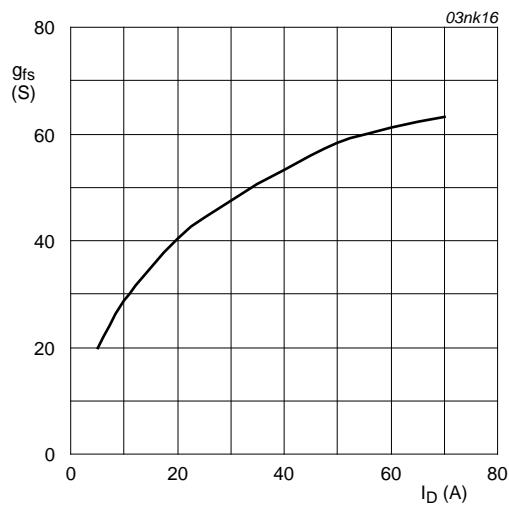
$T_j = 25^\circ C; I_D = 25A$

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



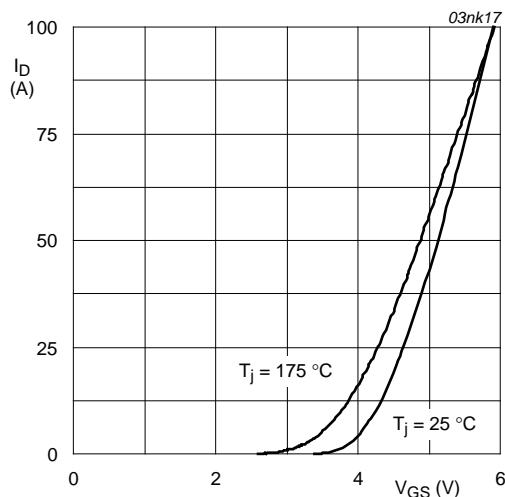
$T_j = 25^\circ C; V_{DS} = 5V$

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

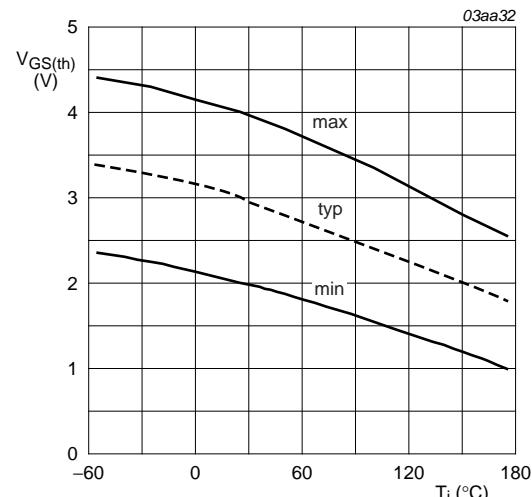


$T_j = 25^\circ C; V_{DS} = 25V$

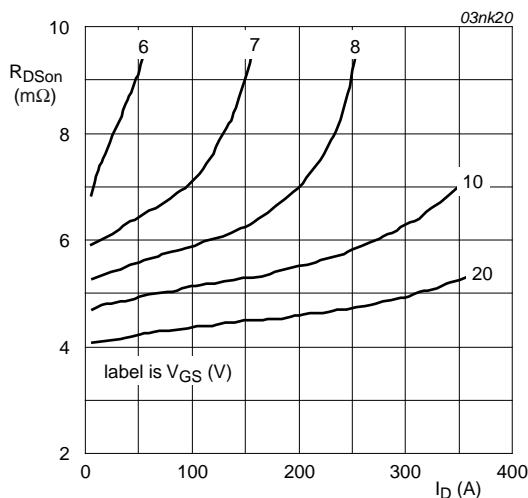
**Fig 8. Forward transconductance as a function of drain current; typical values**



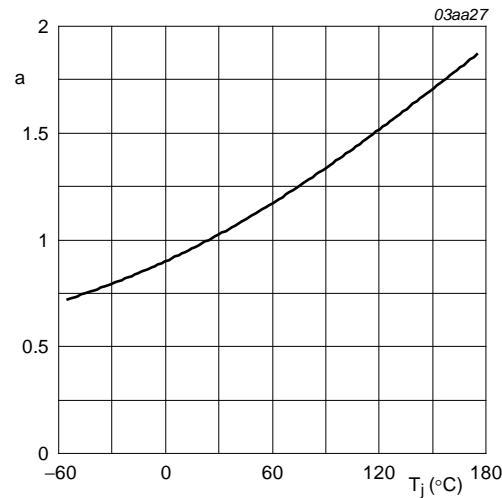
**Fig 9.** Transfer characteristics: drain current as a function of gate-source voltage; typical values



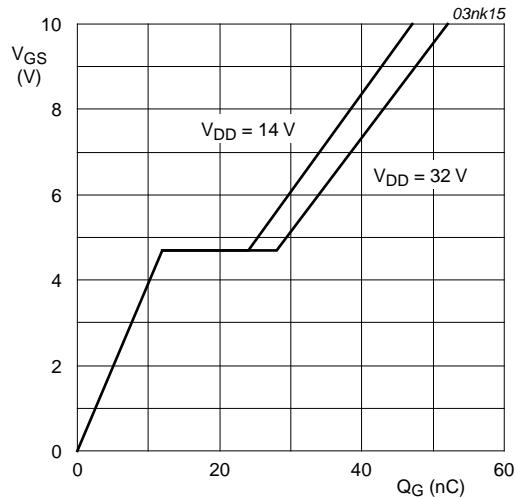
**Fig 10.** Gate-source threshold voltage as a function of junction temperature



**Fig 11.** Drain-source on-state resistance as a function of drain current; typical values

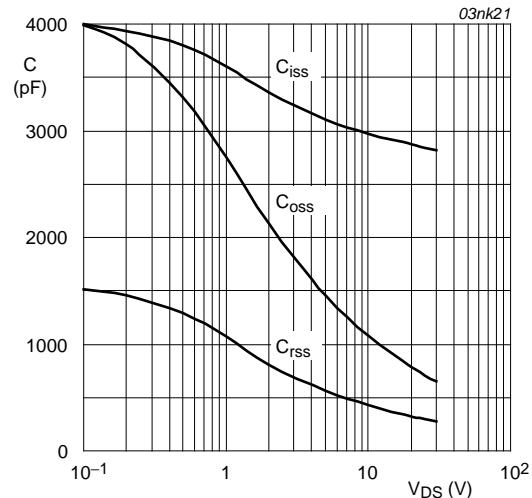


**Fig 12.** Normalized drain-source on-state resistance factor as a function of junction temperature



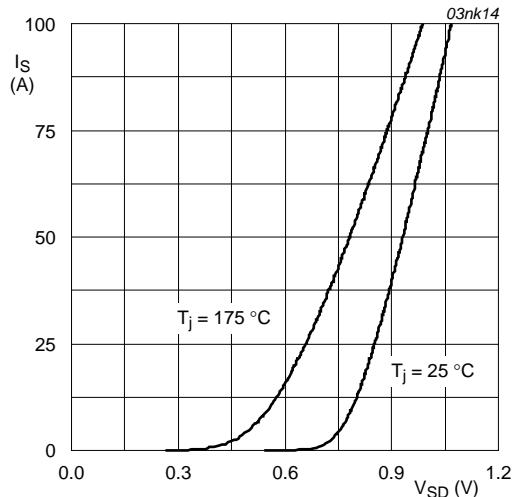
$T_j = 25^\circ C; I_D = 25A$

**Fig 13. Gate-source voltage as a function of gate charge; typical values**



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

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



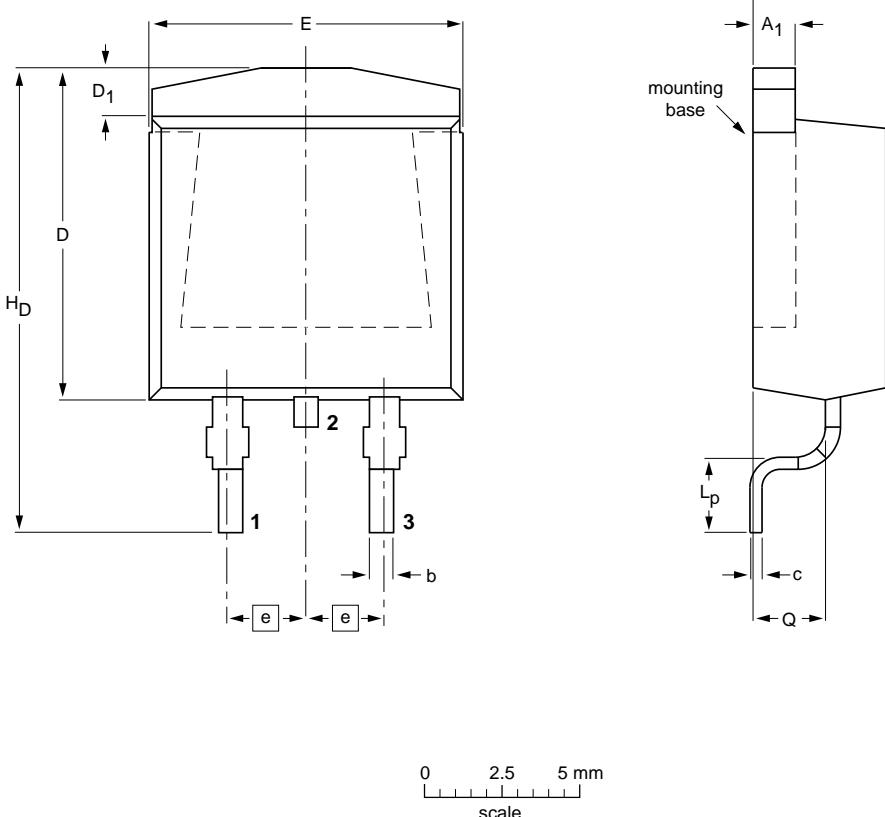
$V_{GS} = 0V$

**Fig 15. 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



### 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 16. Package outline SOT404 (D2PAK)

## 8. Revision history

**Table 7. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK765R2-40B v.3	20111122	Product data sheet	-	BUK765R2-40B v.2
Modifications:		• Various changes to content.		
BUK765R2-40B v.2	20090116	Product data sheet	-	BUK75_765R2_40B v.1

## 9. Legal information

### 9.1 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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# OCEAN CHIPS

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- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибутором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибутором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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