



# BUK762R4-60E

## N-channel TrenchMOS standard level FET

Rev. 2 — 16 May 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel MOSFET in a SOT404 package using TrenchMOS technology. This product has been designed and qualified to AEC Q101 standard for use in high performance automotive applications.

### 1.2 Features and benefits

- AEC Q101 compliant
- Repetitive avalanche rated
- Suitable for thermally demanding environments due to 175 °C rating
- True standard level gate with VGS(th) rating of greater than 1V at 175 °C

### 1.3 Applications

- 12 V Automotive systems
- Electric and electro-hydraulic power steering
- Motors, lamps and solenoid control
- Start-Stop micro-hybrid applications
- Transmission control
- Ultra high performance power switching

### 1.4 Quick reference data

Table 1. Quick reference data

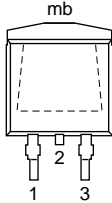
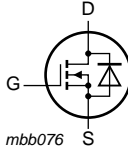
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	60	V
$I_D$	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C};$ see <a href="#">Figure 1</a>	[1]	-	120	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	-	357	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 11</a>	-	1.9	2.4	mΩ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$I_D = 25\text{ A}; V_{DS} = 48\text{ V}; V_{GS} = 10\text{ V};$ see <a href="#">Figure 13</a> ; see <a href="#">Figure 14</a>	-	45.5	-	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		
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
BUK762R4-60E	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
BUK762R4-60E	BUK762R4-60E

## 5. Limiting values

**Table 5. Limiting values**

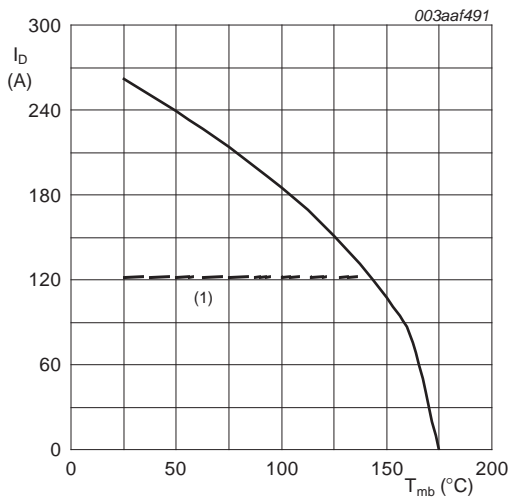
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$	-	60	V	
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	60	V	
$V_{GS}$	gate-source voltage		-20	20	V	
$I_D$	drain current	$T_{mb} = 25\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a>	[1]	-	120	A
		$T_{mb} = 100\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a>	[1]	-	120	A
$I_{DM}$	peak drain current	$T_{mb} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; see <a href="#">Figure 4</a>	-	1047	A	
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	357	W	
$T_{stg}$	storage temperature		-55	175	°C	
$T_j$	junction temperature		-55	175	°C	
<b>Source-drain diode</b>						
$I_S$	source current	$T_{mb} = 25\text{ °C}$	[1]	-	120	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$	-	1047	A	
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 120\text{ A}$ ; $V_{sup} \leq 60\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 60\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; unclamped; see <a href="#">Figure 3</a>	[2][3]	-	660	mJ

[1] Continuous current is limited by package.

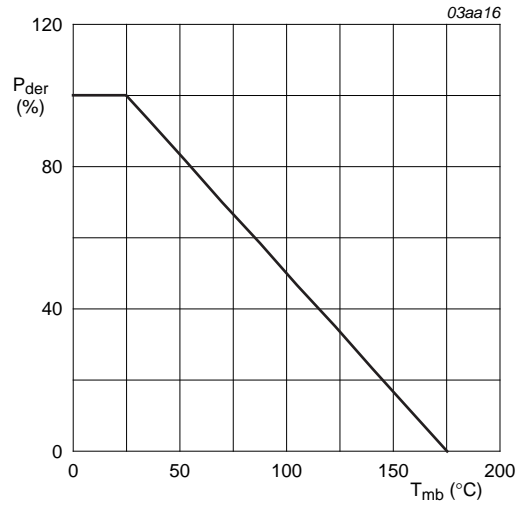
[2] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.

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



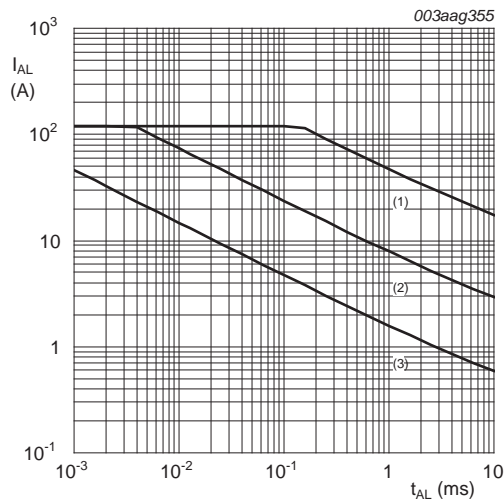
$V_{GS} \geq 10V$   
 (1) Capped at 120 A due to package.

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



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

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



(1)  $T_j (amb) = 25^{\circ}C$ ; (2)  $T_j (amb) = 150^{\circ}C$ ; (3) Repetitive Avalanche

**Fig 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time**

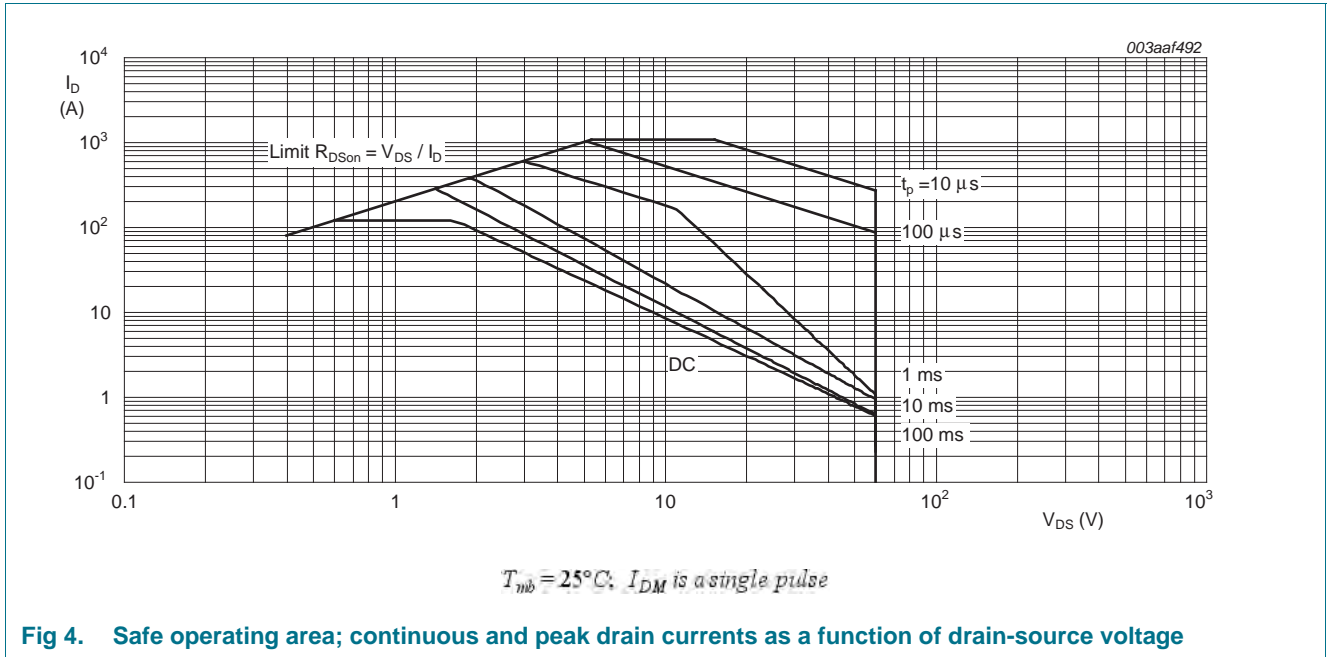


Fig 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

## 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see <a href="#">Figure 5</a>	-	-	0.42	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint; mounted on a printed-circuit board	-	50	-	K/W

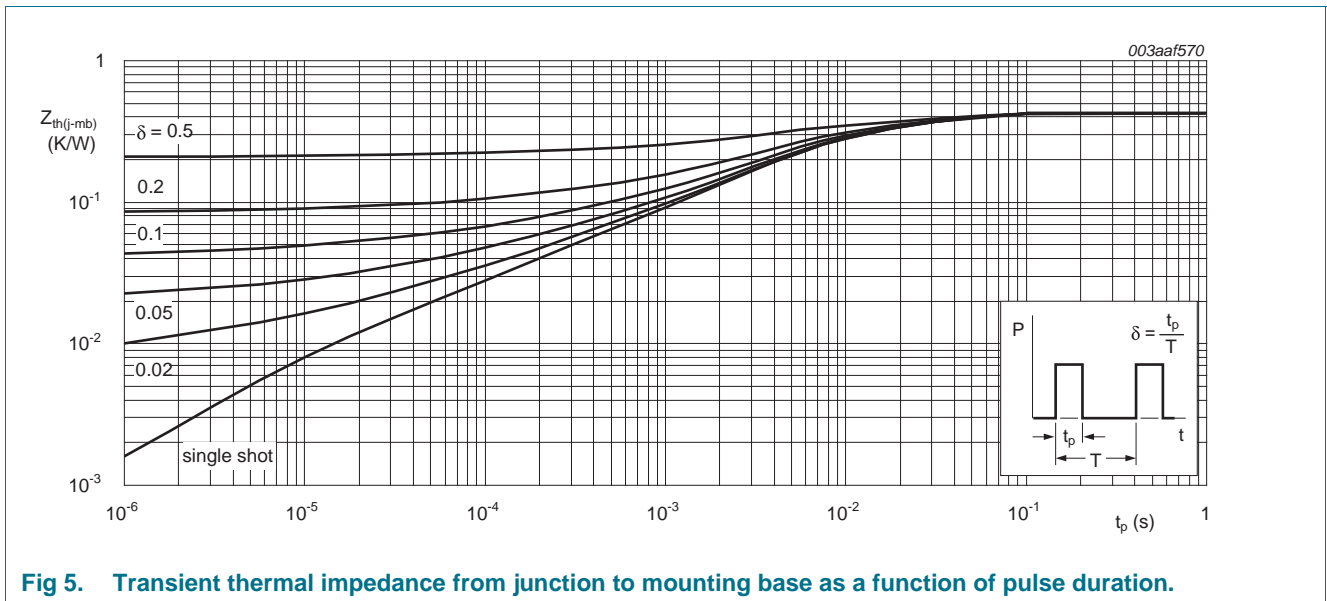
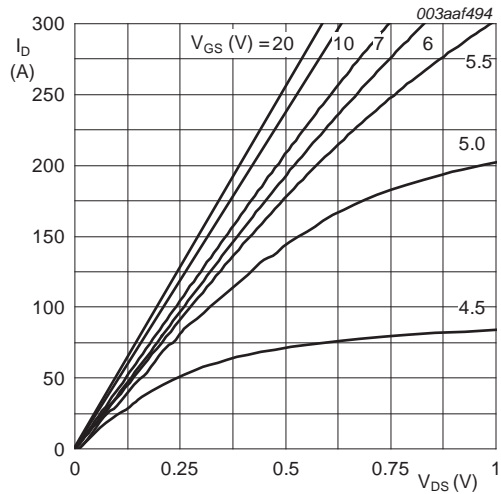


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration.

## 7. Characteristics

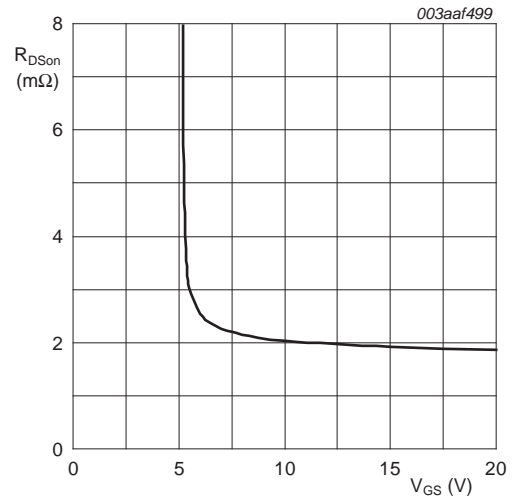
**Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	60	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	54	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	2.4	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ C$ ; see <a href="#">Figure 9</a>	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C$ ; see <a href="#">Figure 9</a>	-	-	4.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	0.15	1	$\mu A$
		$V_{DS} = 60 V; V_{GS} = 0 V; T_j = 175 \text{ }^\circ C$	-	-	500	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	2	100	nA
		$V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 25 A; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 11</a>	-	1.9	2.4	m $\Omega$
		$V_{GS} = 10 V; I_D = 25 A; T_j = 175 \text{ }^\circ C$ ; see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	-	-	5.2	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25 A; V_{DS} = 48 V; V_{GS} = 10 V$ ; see <a href="#">Figure 13</a> ; see <a href="#">Figure 14</a>	-	158	-	nC
$Q_{GS}$	gate-source charge		-	35.3	-	nC
$Q_{GD}$	gate-drain charge		-	45.5	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0 V; V_{DS} = 25 V; f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 15</a>	-	9380	11180	pF
$C_{oss}$	output capacitance		-	1066	1280	pF
$C_{rss}$	reverse transfer capacitance		-	642	880	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 45 V; R_L = 1.8 \text{ } \Omega; V_{GS} = 10 V$ ; $R_{G(ext)} = 5 \text{ } \Omega$	-	36	-	ns
$t_r$	rise time		-	50	-	ns
$t_{d(off)}$	turn-off delay time		-	130	-	ns
$t_f$	fall time		-	71	-	ns
$L_D$	internal drain inductance	from upper edge of mounting base to centre of die; $T_j = 25 \text{ }^\circ C$	-	2.5	-	nH
$L_S$	internal source inductance	measured from source lead to source bond pad; $T_j = 25 \text{ }^\circ C$	-	7.5	-	nH
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25 A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 16</a>	-	0.77	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 A; dI_S/dt = -100 \text{ A}/\mu s; V_{GS} = 0 V$ ; $V_{DS} = 25 V$	-	54	-	ns
$Q_r$	recovered charge		-	89	-	nC



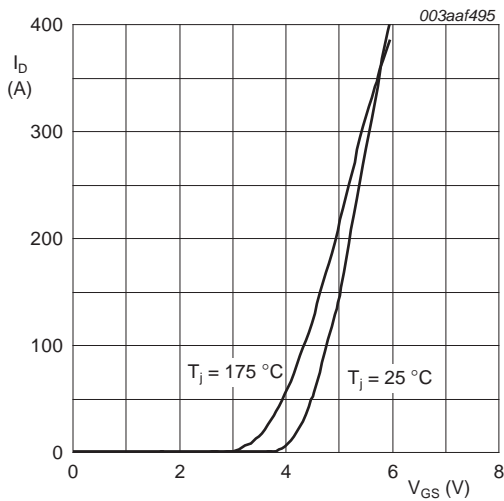
$T_j = 25\text{ }^\circ\text{C}; t_p = 300\text{ }\mu\text{s}$

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



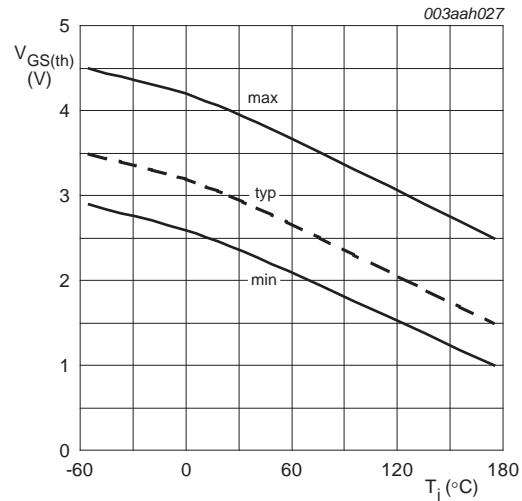
$T_j = 25\text{ }^\circ\text{C}; I_D = 25\text{ A}$

**Fig 7. Drain-source on-state resistance as a function of gate-source voltage; typical values**



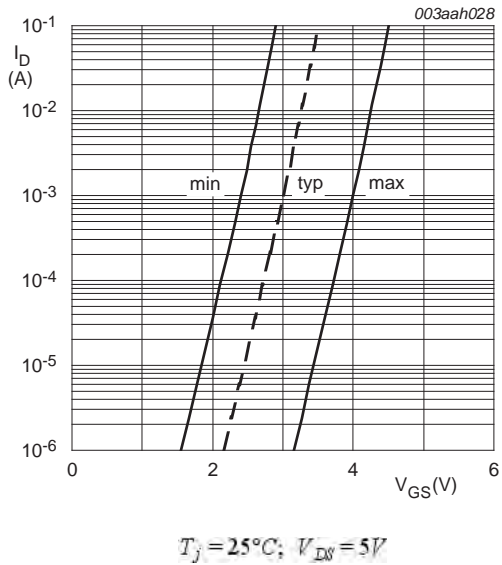
$V_{DS} = 12\text{ V}$

**Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values**

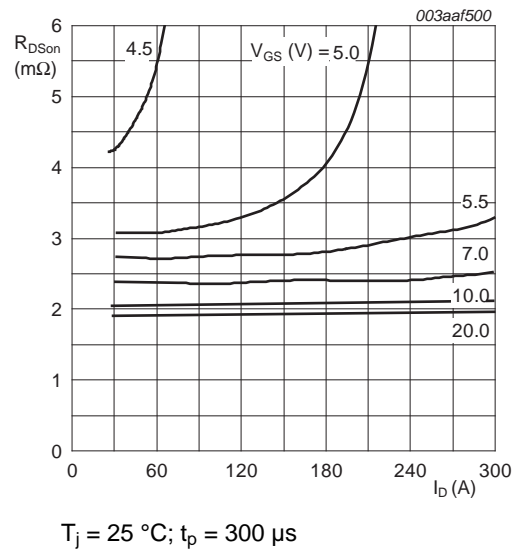


$I_D = 1\text{ mA}; V_{DS} = V_{GS}$

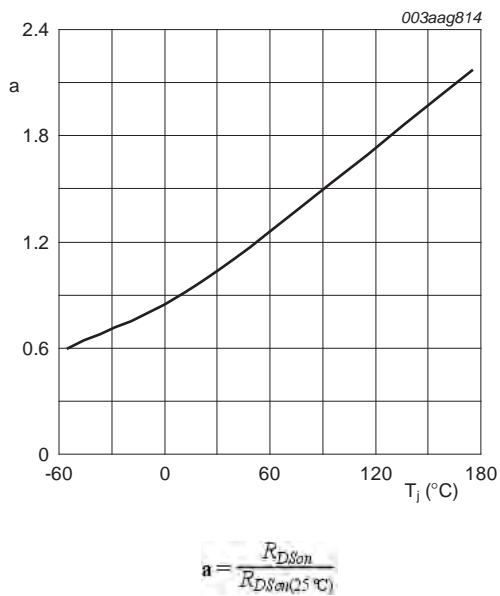
**Fig 9. Gate-source threshold voltage as a function of junction temperature**



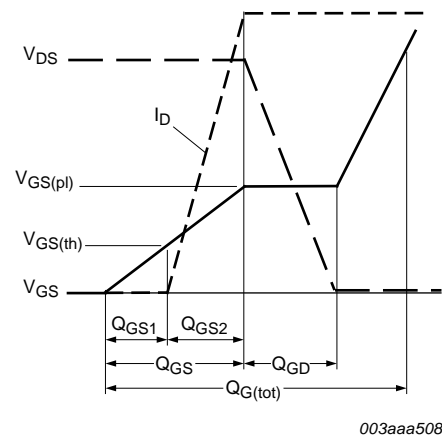
**Fig 10. Sub-threshold drain current as a function of gate-source voltage**



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

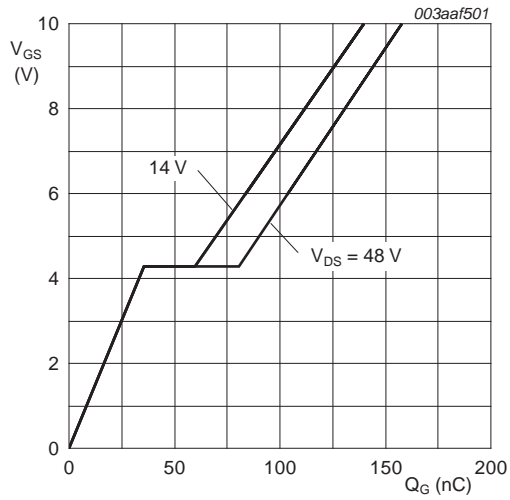


**Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature**



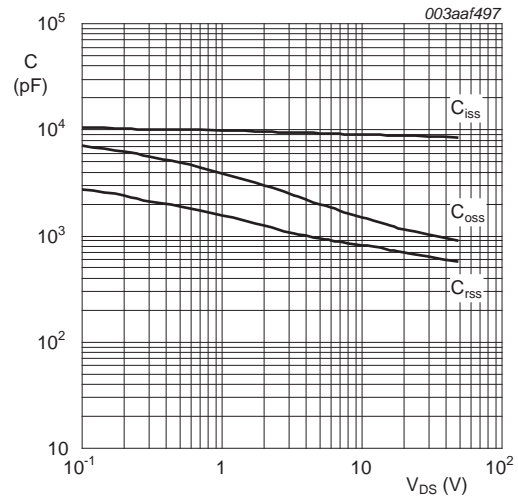
**Fig 13. Gate charge waveform definitions**





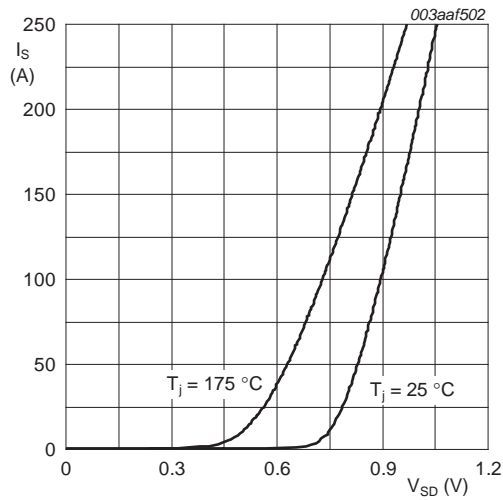
$T_j = 25\text{ }^\circ\text{C}; I_D = 25\text{ A}$

**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**

**8. Package outline**

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

**SOT404**



**Fig 17. Package outline SOT404 (D2PAK)**

## 9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK762R4-60E v.2	20120516	Product data sheet	-	BUK762R4-60E v.1
Modifications:	<ul style="list-style-type: none"><li>• Status changed from objective to product.</li><li>• Various changes to content.</li></ul>			
BUK762R4-60E v.1	20120404	Objective data sheet	-	-

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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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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