

BUK6607-75C

N-channel TrenchMOS FET Rev. 2 — 17 November 2010

Product data sheet

Product profile 1.

1.1 General description

Intermediate level gate drive N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using advanced TrenchMOS technology. This product has been designed and qualified to the appropriate AEC Q101 standard for use in high performance automotive applications.

1.2 Features and benefits

- AEC Q101 compliant
- Suitable for intermediate level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

1.3 Applications

- 12 V and 24 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	Тур	Max	Unit
V_{DS}	drain-source voltage	$T_j \ge 25 \text{ °C}; T_j \le 175 \text{ °C}$		-	-	75	V
I _D	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 25 \text{ °C};$ see Figure 1	<u>[1]</u>	-	-	100	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>		-	-	204	W
Static characteristics							
R _{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 11}}{\text{ or } 100 \text{ c}}$		-	6	7	mΩ



Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit	
Avalanche ruggedness							
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 100 A; $V_{sup} \le 75$ V; R_{GS} = 50 Ω ; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped	-	-	191	mJ	
Dynamic o	Dynamic characteristics						
Q_{GD}	gate-drain charge	I_D = 25 A; V_{DS} = 60 V; V_{GS} = 10 V; see <u>Figure 13</u> ; see <u>Figure 14</u>	-	35	-	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	mb			
3	S	source				
mb	D	mounting base; connected to drain	onnected to	mbb076 S		
			SOT404 (D2PAK)			

3. Ordering information

Table 3. Ordering information

Type number	Package	Package				
	Name	Description	Version			
BUK6607-75C	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 ≥ 25 °C; T _j ≤ 175 °C		-	75	V
V_{GS}	gate-source voltage	DC	<u>[1]</u>	-16	16	V
		Pulsed	[2]	-20	20	V
I _D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; see <u>Figure 1</u>	[3]	-	100	Α
		T_{mb} = 100 °C; V_{GS} = 10 V; see <u>Figure 1</u>	[3]	-	75	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; $t_p \le 10 \mu s$; pulsed; see <u>Figure 3</u>		-	423	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>		-	204	W
T _{stg}	storage temperature			-55	175	°C
Tj	junction temperature			-55	175	°C
Source-drain of	diode					
Is	source current	T _{mb} = 25 °C	[3]	-	100	Α
I _{SM}	peak source current	$t_p \le 10 \mu\text{s}; \text{ pulsed}; T_{mb} = 25 ^{\circ}\text{C}$		-	423	Α
Avalanche rug	gedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 100 A; $V_{sup} \le$ 75 V; R_{GS} = 50 Ω ; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped		-	191	mJ
E _{DS(AL)R}	repetitive drain-source avalanche energy		[4][5][6]	-	-	J

^{[1] -16} V accumulated duration not to exceed 168 hrs.

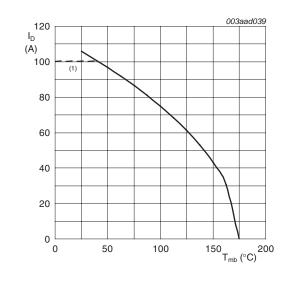
^[2] Accumulated pulse duration not to exceed 5mins.

^[3] Continuous current is limited by package.

^[4] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.

^[5] Repetitive avalanche rating limited by an average junction temperature of 170 °C.

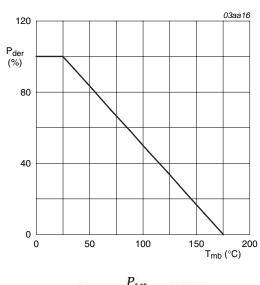
^[6] Refer to application note AN10273 for further information.



 $V_{GS} \geq$ 10 V

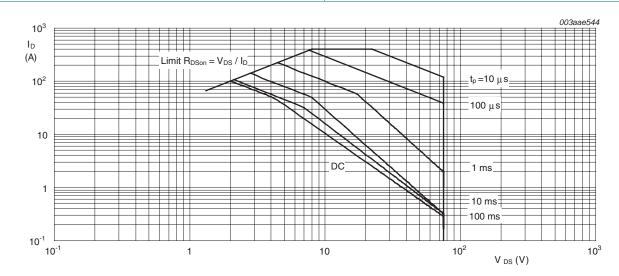
(1) Capped at 100 A due to package.

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



 $T_{mb} = 25$ °C; I_{DM} is a single pulse

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

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Thermal characteristics

Table 5. **Thermal characteristics**

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	0.74	K/W

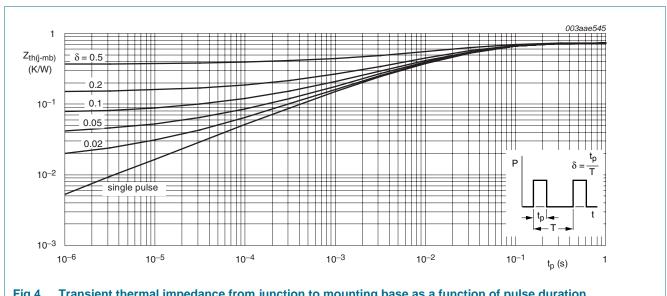


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Table 6.	Characteristics					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	aracteristics					
V _{(BR)DSS}	drain-source	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 °C$	75	-	-	V
	breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 °C$	68	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 25$ °C; see <u>Figure 9</u> ; see <u>Figure 10</u>	1.8	2.3	2.8	V
		I_D = 1 mA; V_{DS} = V_{GS} ; T_j = -55 °C; see <u>Figure 10</u>	-	-	3.3	V
		I_D = 2.5 mA; V_{DS} = V_{GS} ; T_j = 175 °C; see <u>Figure 10</u>	0.8	-	-	V
I _{DSS}	drain leakage current	$V_{DS} = 75 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ °C}$	-	-	500	μA
		$V_{DS} = 75 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.02	1	μA
I _{GSS}	gate leakage current	$V_{DS} = 0 \text{ V}; V_{GS} = 20 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nΑ
		$V_{DS} = 0 \text{ V}; V_{GS} = -20 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nΑ
R _{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_{D} = 25 A; T_{j} = 25 °C; see <u>Figure 11</u>	-	6	7	mΩ
		$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 ^{\circ}\text{C};$ see Figure 11	-	7.3	9.7	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 ^{\circ}\text{C};$ see <u>Figure 11</u>	-	6.9	8.6	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; see <u>Figure 12</u> ; see <u>Figure 11</u>	-	-	18.2	mΩ
Dynamic	characteristics					
Q _{G(tot)} total gate charge		$I_D = 25 \text{ A}$; $V_{DS} = 60 \text{ V}$; $V_{GS} = 10 \text{ V}$; see <u>Figure 13</u> ; see <u>Figure 14</u>	-	123	-	nC
		$I_D = 25 \text{ A}$; $V_{DS} = 60 \text{ V}$; $V_{GS} = 5 \text{ V}$; see <u>Figure 13</u> ; see <u>Figure 14</u>	-	69	-	nC
Q _{GS}	gate-source charge	$I_D = 25 \text{ A}; V_{DS} = 60 \text{ V}; V_{GS} = 10 \text{ V};$	-	15	-	nC
Q_{GD}	gate-drain charge	see Figure 13; see Figure 14	-	35	-	nC
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	5610	7600	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 15</u>	-	441	530	pF
C _{rss}	reverse transfer capacitance		-	297	410	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 55 \text{ V}; R_L = 2.2 \Omega; V_{GS} = 10 \text{ V};$	-	24	-	ns
t _r	rise time	$R_{G(ext)} = 10 \Omega$	-	54	-	ns
t _{d(off)}	turn-off delay time		-	247	-	ns
t _f	fall time		-	110	-	ns
L _D	internal drain inductance	from upper edge of drain mounting base to centre of die; $T_j = 25$ °C	-	3.5	-	nΗ
L _S	internal source inductance	from source lead to source bond pad; $T_j = 25 ^{\circ}\text{C}$	-	7.5	-	nΗ

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Source-drain diode						
V _{SD}	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C};$ see <u>Figure 16</u>	-	0.8	1.2	V
t _{rr}	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A/}\mu\text{s}; V_{GS} = 0 \text{ V};$ $V_{DS} = 25 \text{ V}$	-	54	-	ns
Qr	recovered charge		-	129	-	nC

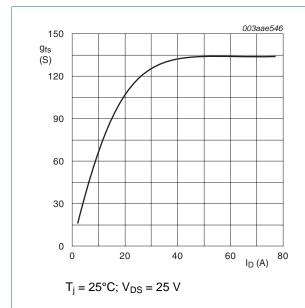


Fig 5. Forward transconductance as a function of drain current; typical values

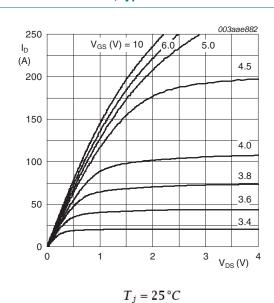
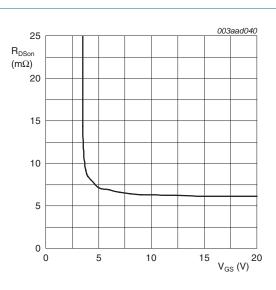
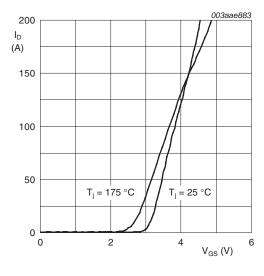


Fig 7. Output characteristics: drain current as a function of drain-source voltage; typical values



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

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



 $V_{DS} > I_D \times R_{DSon}$

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

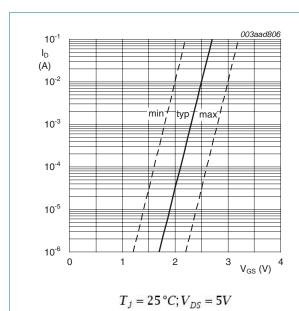


Fig 9. Sub-threshold drain current as a function of gate-source voltage

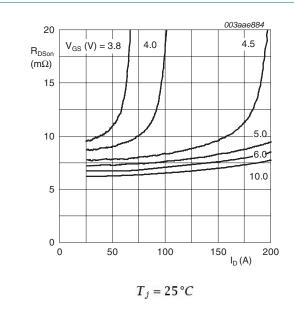


Fig 11. Drain-source on-state resistance as a function of drain current; typical values

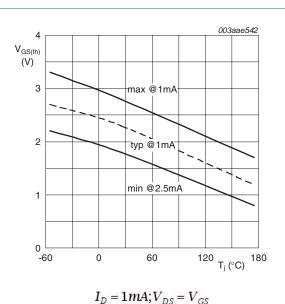


Fig 10. Gate-source threshold voltage as a function of junction temperature

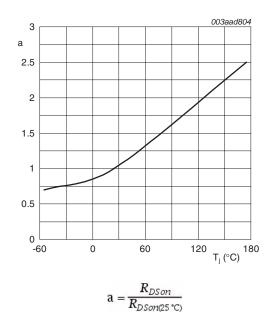


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature

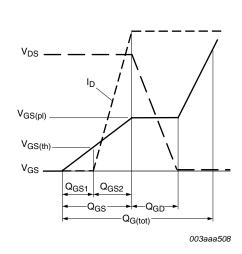


Fig 13. Gate charge waveform definitions

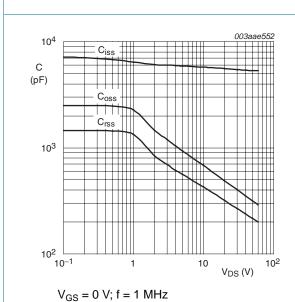
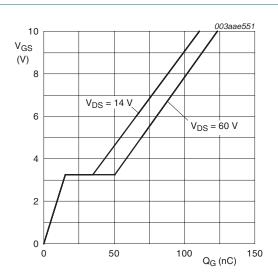
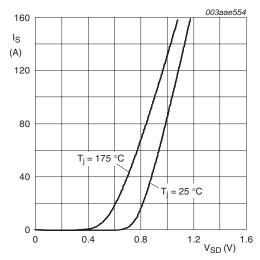


Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



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

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



 $V_{GS} = 0 V$

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

7. Package outline

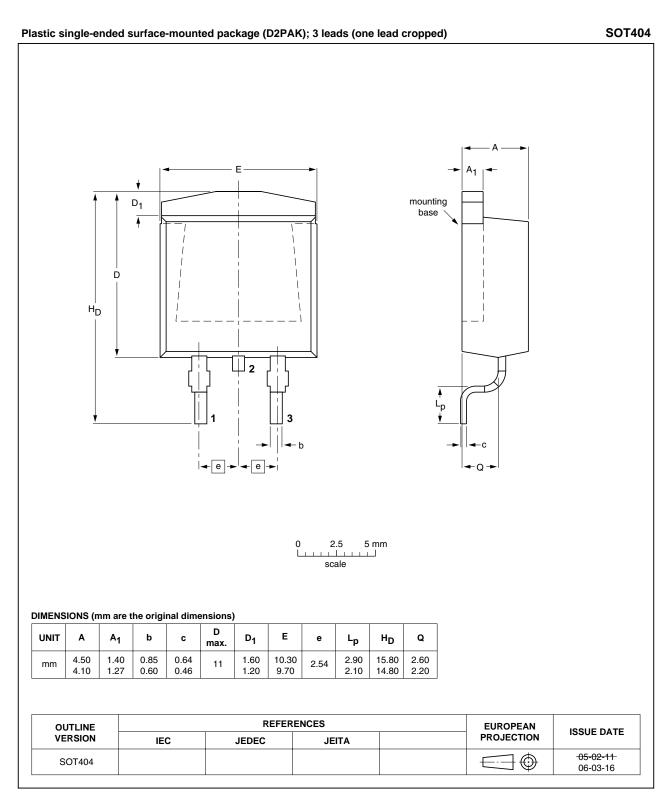


Fig 17. Package outline SOT404 (D2PAK)

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK6607-75C v.2	20101117	Product data sheet	-	BUK6607-75C v.1
Modifications:	 Status change 	ed from objective to product.		
BUK6607-75C v.1	20090323	Objective data sheet	-	-

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.

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