

# BUK7226-75A

## N-channel TrenchMOS standard level FET

Rev. 02 — 22 February 2008

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 NXP General Purpose Automotive (GPA) TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

### 1.2 Features

- 175 °C rated
- Q101 compliant
- Low on-state resistance
- Standard level compatible

### 1.3 Applications

- 12 V, 24 V and 42 V loads
- General purpose power switching
- Automotive systems
- Motors, lamps and solenoids

### 1.4 Quick reference data

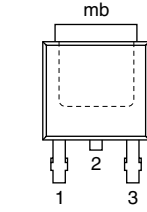
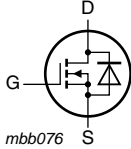
Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	75	V
$I_D$	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C};$ see <a href="#">Figure 1</a> and <a href="#">4</a>	[1]	-	45	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	-	158	W
$T_j$	junction temperature		-55	-	175	°C
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 25\text{ A};$ $T_j = 25\text{ °C};$ see <a href="#">Figure 12</a> and <a href="#">13</a>	-	22	26	mΩ
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 45\text{ A}; V_{sup} \leq 75\text{ V};$ $R_{GS} = 50\text{ }\Omega; V_{GS} = 10\text{ V};$ $T_{j(init)} = 25\text{ °C};$ unclamped inductive load	-	-	215	mJ

[1] Capped at 45 A due to bondwire.

## 2. Pinning information

**Table 2. Pinning**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>SOT428 (DPAK)</p>	 <p>mbb076</p>
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
BUK7226-75A	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

## 4. Limiting values

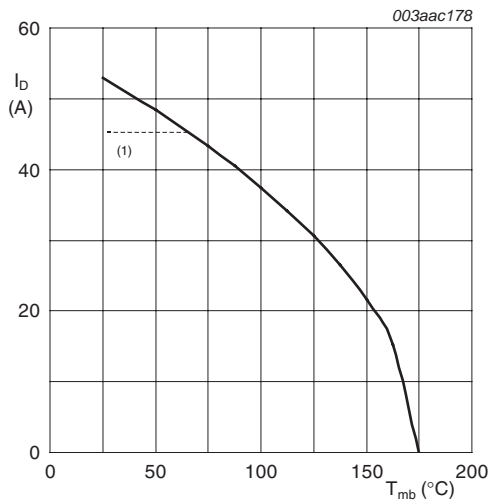
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$	-	75	V	
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	75	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> and <a href="#">4</a>	[1]	-	45	A
		$T_{mb} = 100\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a>	-	-	38	A
$I_{DM}$	peak drain current	$T_{mb} = 25\text{ °C}$ ; $t_p \leq 10\text{ }\mu\text{s}$ ; pulsed; see <a href="#">Figure 4</a>	-	215	A	
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	158	W	
$T_{stg}$	storage temperature		-55	175	°C	
$T_j$	junction temperature		-55	175	°C	
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 45\text{ A}$ ; $V_{sup} \leq 75\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; unclamped inductive load	-	215	mJ	
$E_{DS(AL)R}$	repetitive drain-source avalanche energy	see <a href="#">Figure 3</a>	[2][3] [4]	-	J	
<b>Source-drain diode</b>						
$I_S$	source current	$T_{mb} = 25\text{ °C}$	[1]	-	45	A
$I_{SM}$	peak source current	$t_p \leq 10\text{ }\mu\text{s}$ ; pulsed; $T_{mb} = 25\text{ °C}$	-	215	A	

[1] Capped at 45 A due to bondwire.

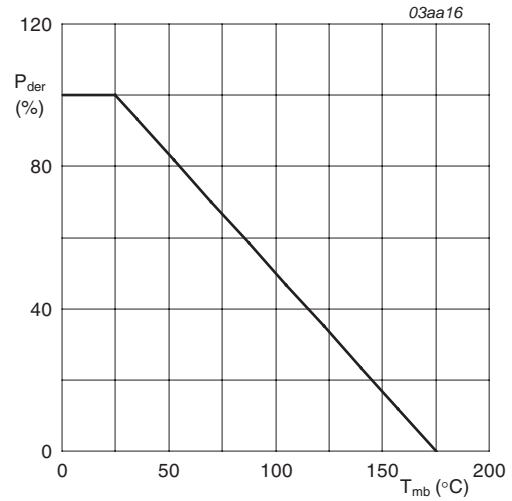
- [2] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
- [3] Repetitive avalanche rating limited by an average junction temperature of 170 °C.
- [4] Refer to application note AN10273 for further information.



$V_{GS} \geq 10 V$

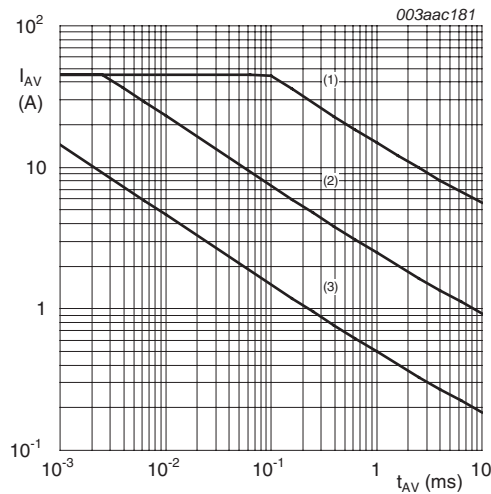
(1) Capped at 45 A due to bondwire.

**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**

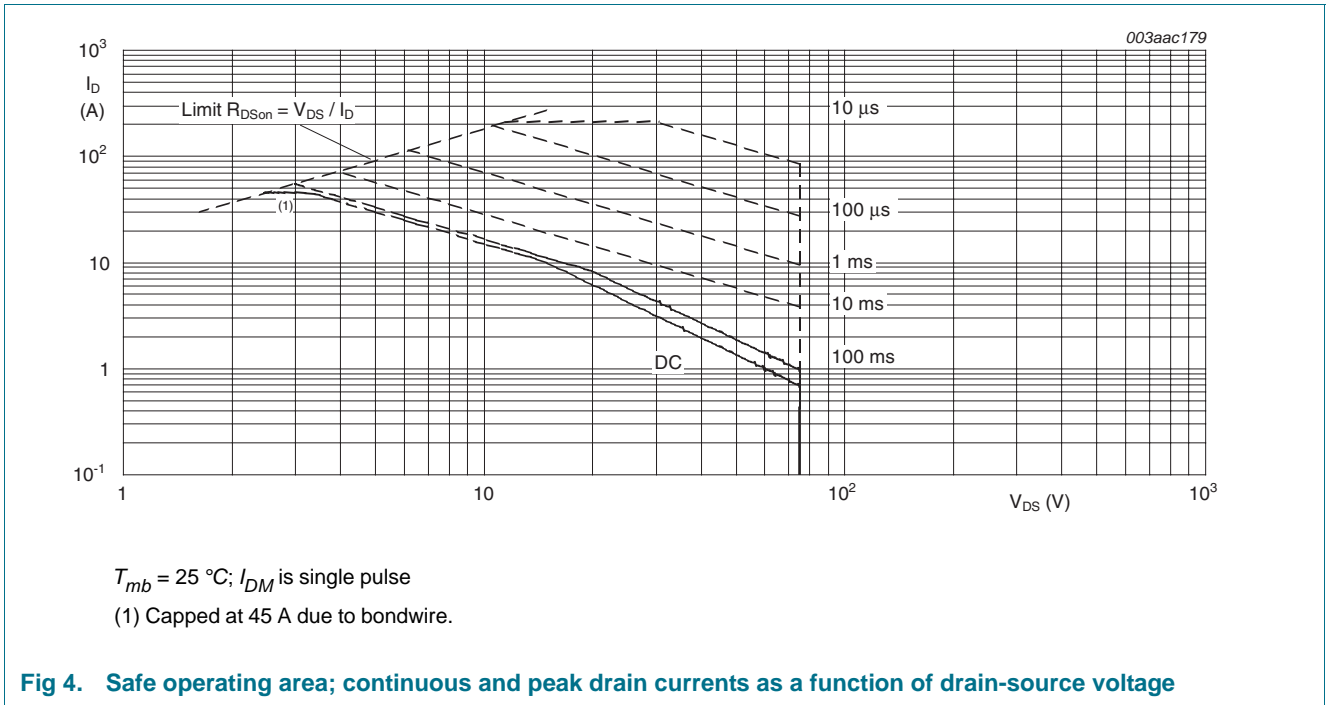


(1) Single-pulse;  $T_j = 25 \text{ }^\circ\text{C}$ .

(2) Single-pulse;  $T_j = 150 \text{ }^\circ\text{C}$ .

(3) Repetitive.

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



## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint; FR4 board	-	70	-	K/W
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see <a href="#">Figure 5</a>	-	-	1	K/W

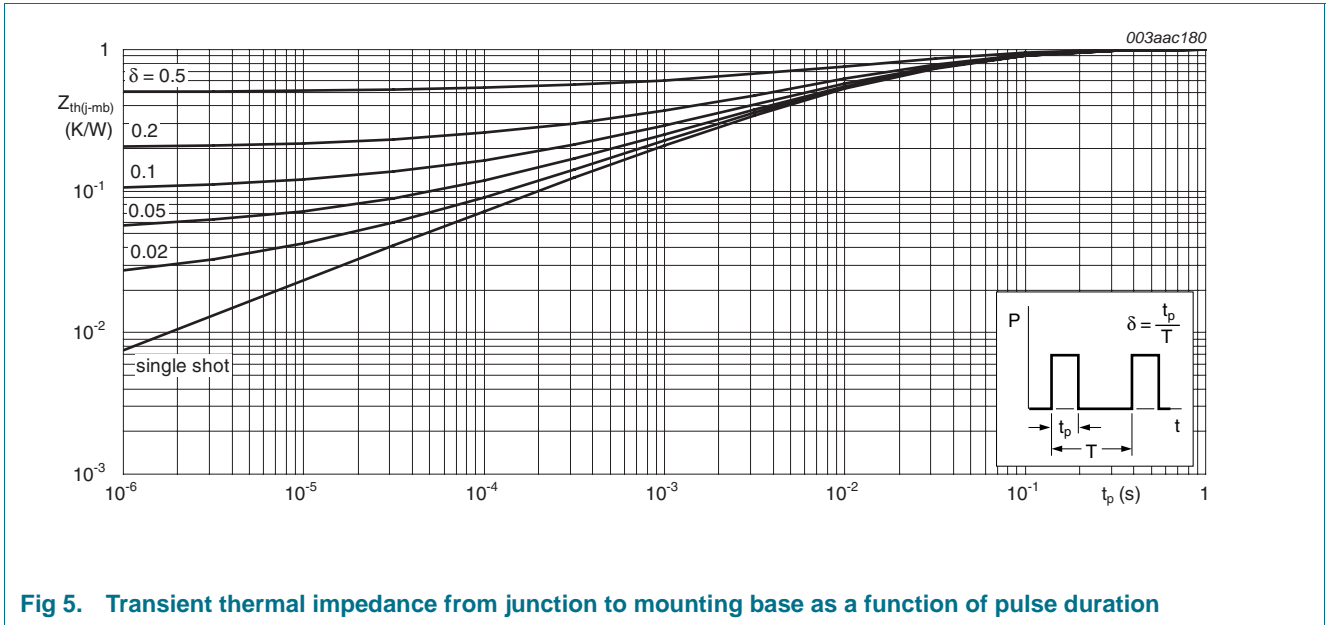


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

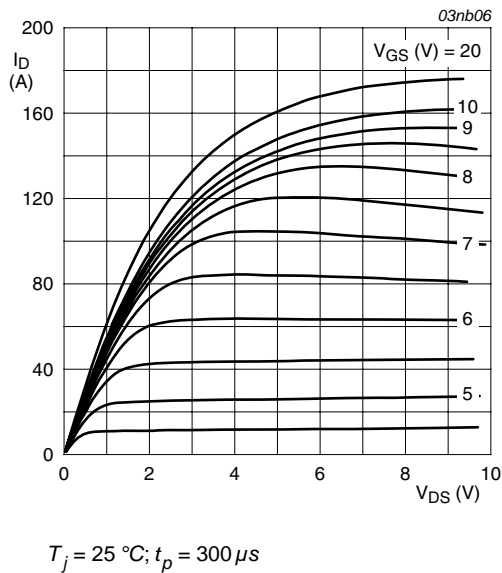
## 6. Characteristics

Table 6. Characteristics

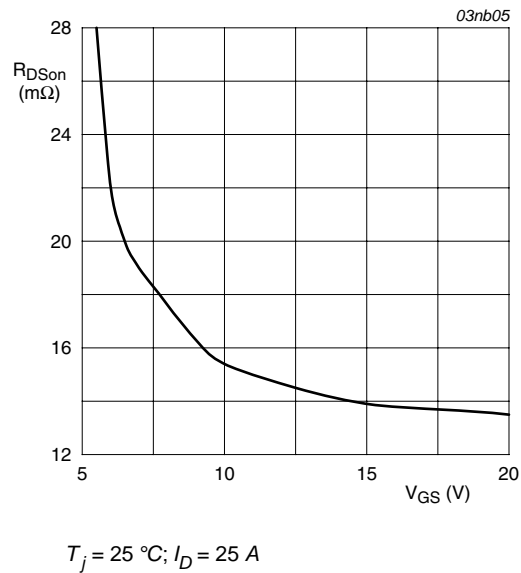
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	70	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	75	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a>	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a>	2	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a>	-	-	4.4	V
$I_{DSS}$	drain leakage current	$V_{DS} = 75 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.05	10	$\mu\text{A}$
		$V_{DS} = 75 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{DS} = 0 \text{ V}; V_{GS} = 20 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
		$V_{DS} = 0 \text{ V}; V_{GS} = -20 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 12</a> and <a href="#">13</a>	-	-	54	m $\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 12</a> and <a href="#">13</a>	-	22	26	m $\Omega$
<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 16</a>	-	0.85	1.2	V

**Table 6. Characteristics ...continued**

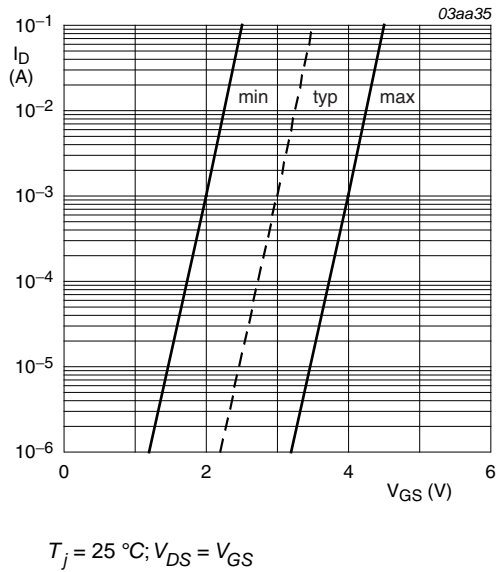
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{rr}$	reverse recovery time	$I_S = 20\text{ A}$ ; $di_S/dt = -100\text{ A}/\mu\text{s}$ ;	-	53	-	ns
$Q_r$	recovered charge	$V_{GS} = -10\text{ V}$ ; $V_{DS} = 30\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$	-	144	-	nC
<b>Dynamic characteristics</b>						
$Q_{G(\text{tot})}$	total gate charge	$I_D = 25\text{ A}$ ; $V_{DS} = 60\text{ V}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 14</a>	-	48	-	nC
$Q_{GS}$	gate-source charge		-	7.5	-	nC
$Q_{GD}$	gate-drain charge		-	17	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 25\text{ V}$ ;	-	1789	2385	pF
$C_{oss}$	output capacitance	$f = 1\text{ MHz}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 15</a>	-	382	458	pF
$C_{rss}$	reverse transfer capacitance		-	219	300	pF
$t_{d(\text{on})}$	turn-on delay time	$V_{DS} = 30\text{ V}$ ; $R_L = 1.2\ \Omega$ ;	-	14	-	ns
$t_r$	rise time	$V_{GS} = 10\text{ V}$ ; $R_{G(\text{ext})} = 10\ \Omega$ ; $T_j = 25\text{ }^\circ\text{C}$	-	66	-	ns
$t_{d(\text{off})}$	turn-off delay time		-	61	-	ns
$t_f$	fall time		-	41	-	ns
$L_D$	internal drain inductance	measured from drain lead from package to center of die; $T_j = 25\text{ }^\circ\text{C}$	-	2.5	-	nH
$L_S$	internal source inductance	measured from source lead from package to source bond pad; $T_j = 25\text{ }^\circ\text{C}$	-	7.5	-	nH



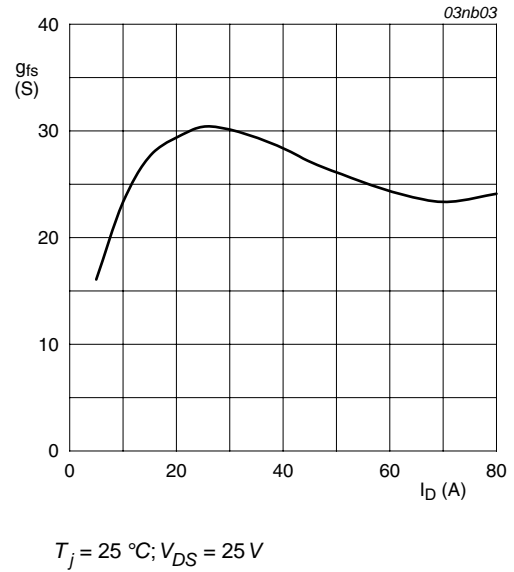
**Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



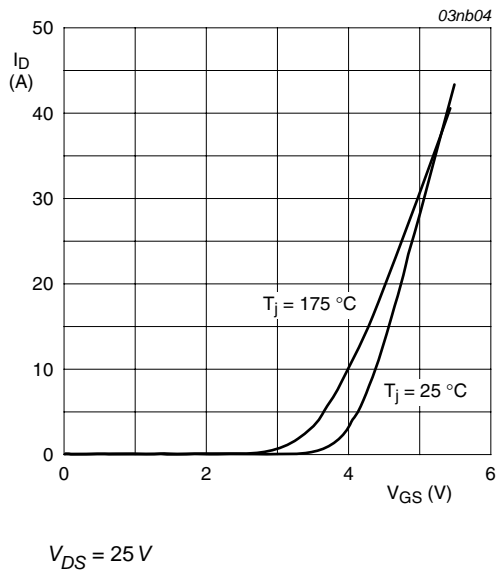
**Fig 7. Drain-source on-state resistance as a function of gate-source voltage; typical values**



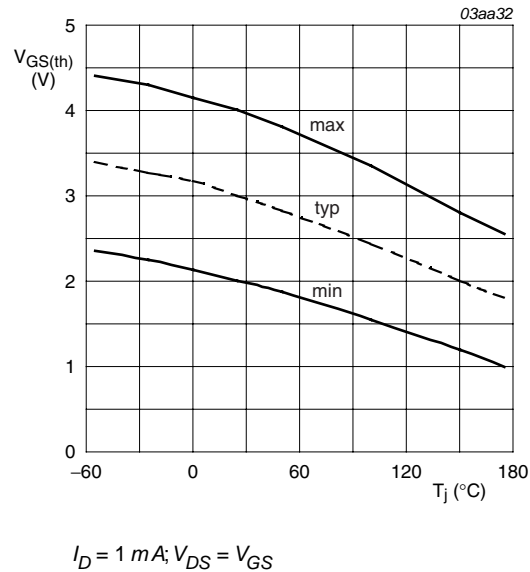
**Fig 8. Sub-threshold drain current as a function of gate-source voltage**



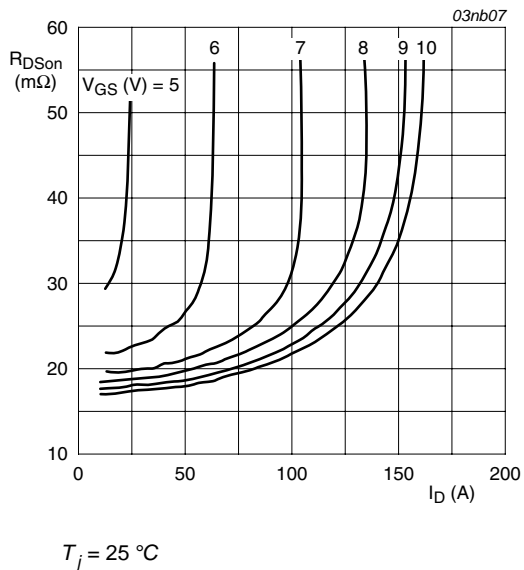
**Fig 9. Forward transconductance as a function of drain current; typical values**



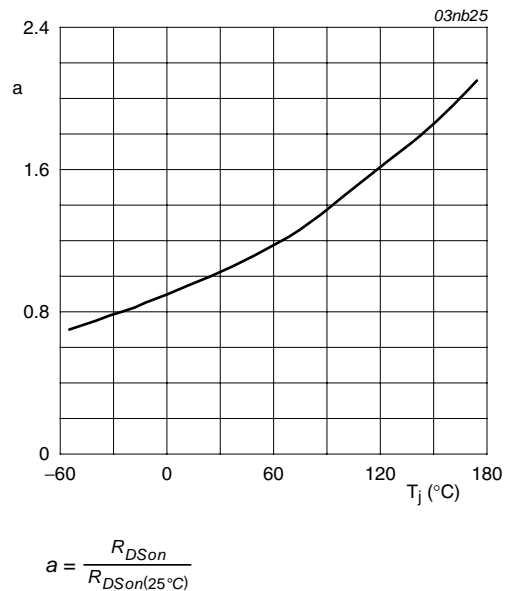
**Fig 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



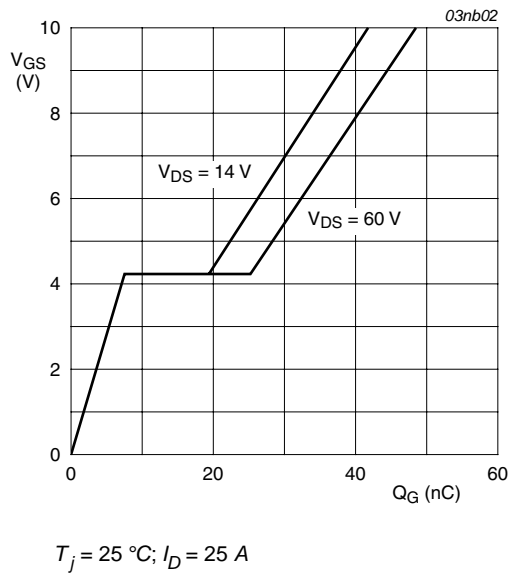
**Fig 11. Gate-source threshold voltage as a function of junction temperature**



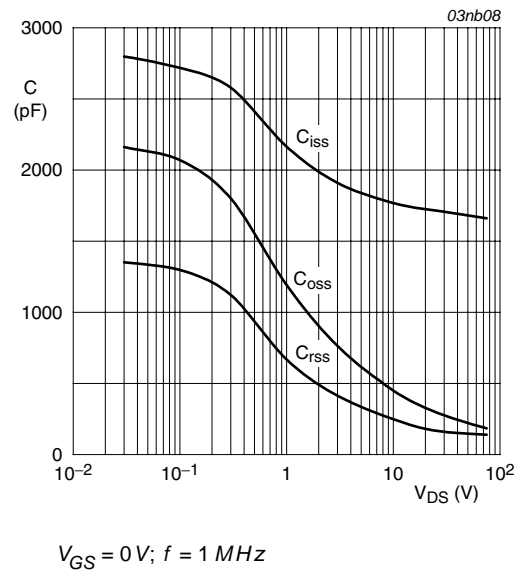
**Fig 12. Drain-source on-state resistance as a function of drain current; typical values**



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



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



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

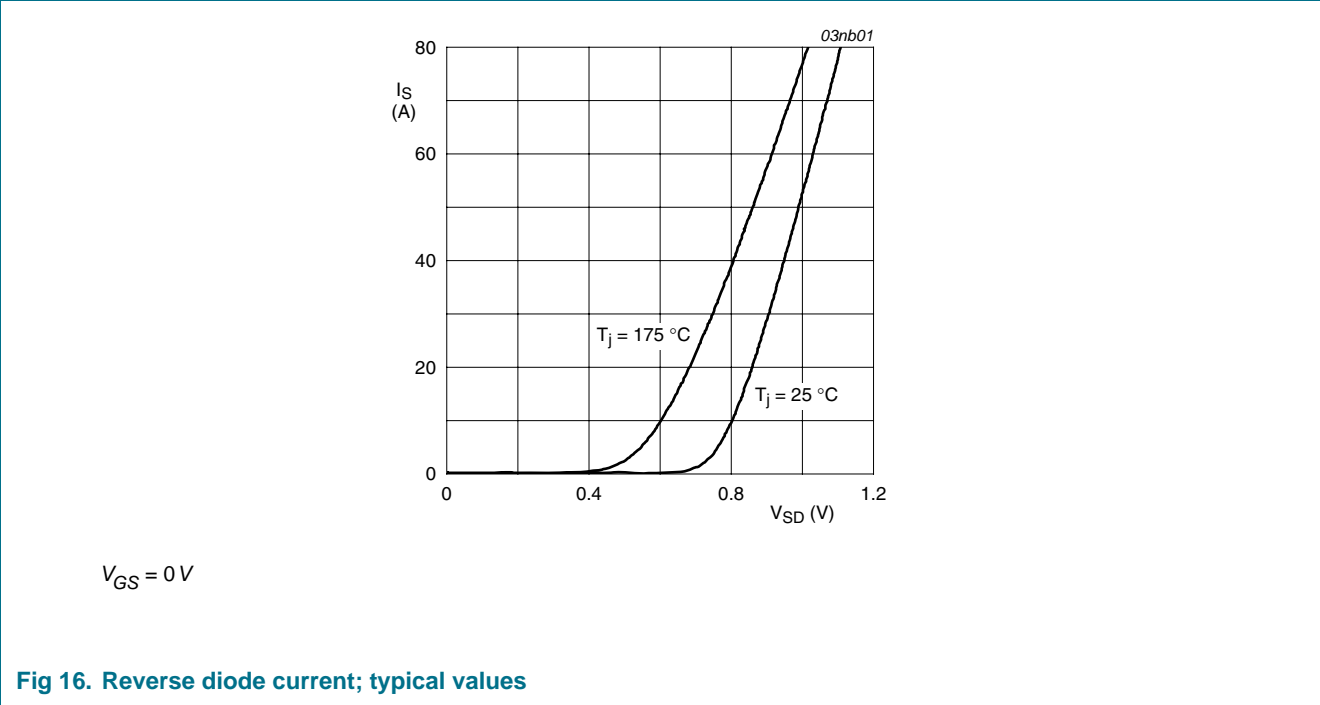


Fig 16. Reverse diode current; typical values

**7. Package outline**

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

SOT428

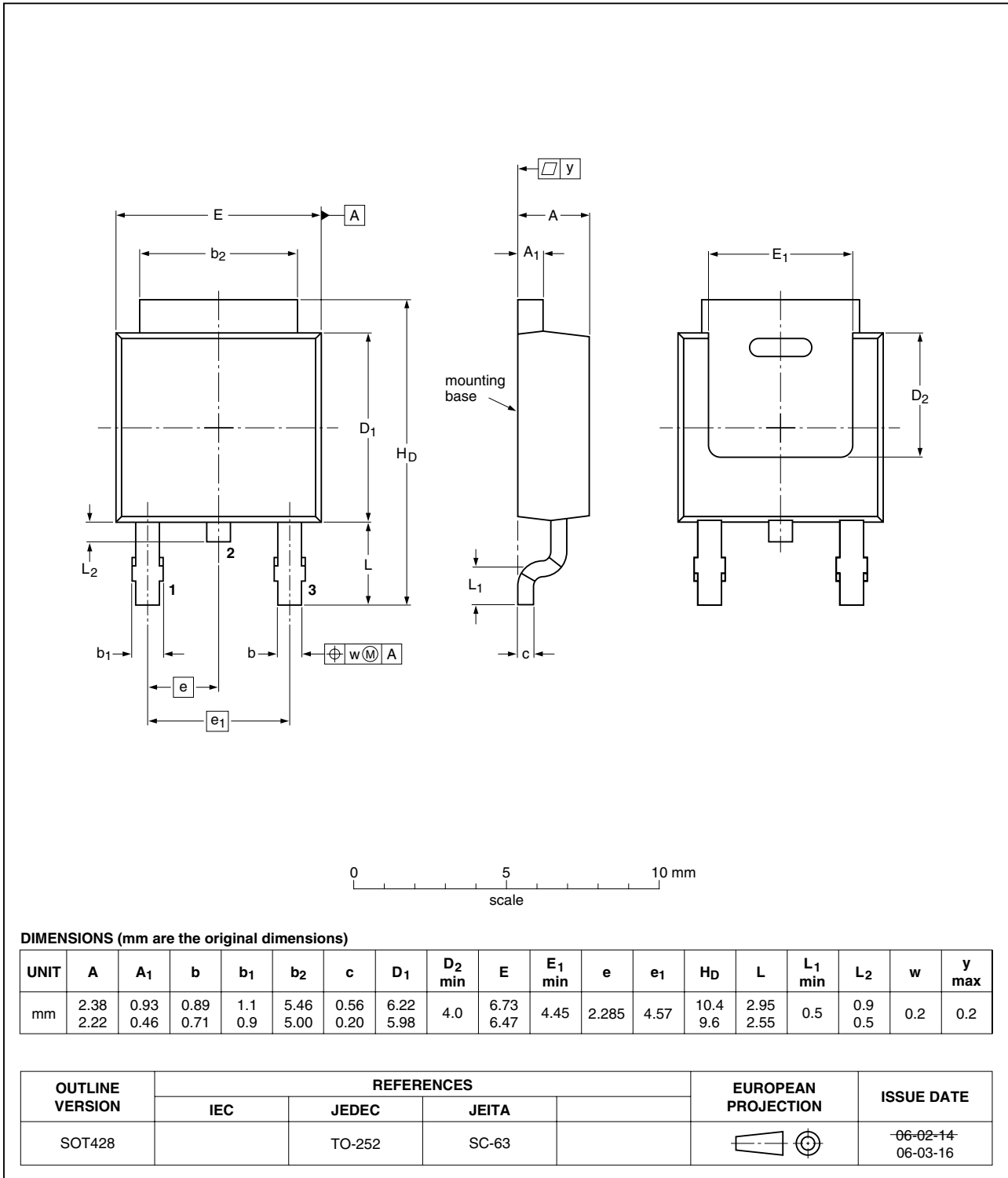


Fig 17. Package outline SOT428 (DPAK)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK7226-75A_2	20080222	Product data sheet	-	BUK7226_75A-01
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>
BUK7226_75A-01	20001009	Product specification; initial version		-

## 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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