



BUK9675-100A

N-channel TrenchMOS logic level FET

Rev. 04 — 19 April 2011

Product data sheet

1. Product profile

1.1 General description

Logic 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
- Low conduction losses due to low on-state resistance

1.3 Applications

- Automotive and general purpose power switching

1.4 Quick reference data

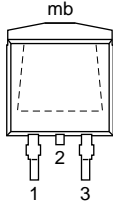
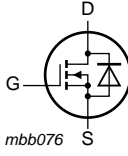
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	100	V
I_D	drain current	$T_{mb} = 25\text{ °C}$	-	-	23	A
P_{tot}	total power dissipation		-	-	98	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 10\text{ A}; T_j = 25\text{ °C}$	-	55	72	m Ω
		$V_{GS} = 5\text{ V}; I_D = 10\text{ A}; T_j = 25\text{ °C}$	-	60	75	m Ω
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 14.2\text{ A}; V_{sup} \leq 25\text{ V}; R_{GS} = 50\text{ }\Omega;$ $V_{GS} = 5\text{ V}; T_{j(init)} = 25\text{ °C};$ unclamped	-	-	100	mJ



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

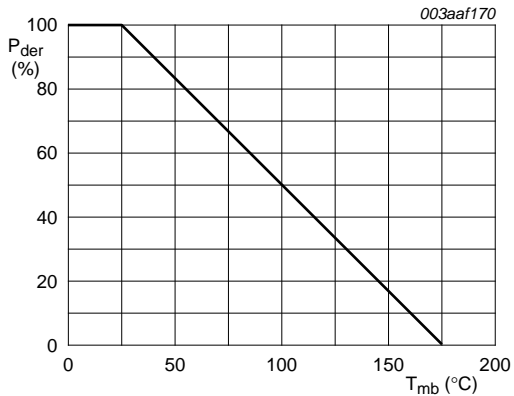
Type number	Package		
	Name	Description	Version
BUK9675-100A	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Limiting values

Table 4. Limiting values

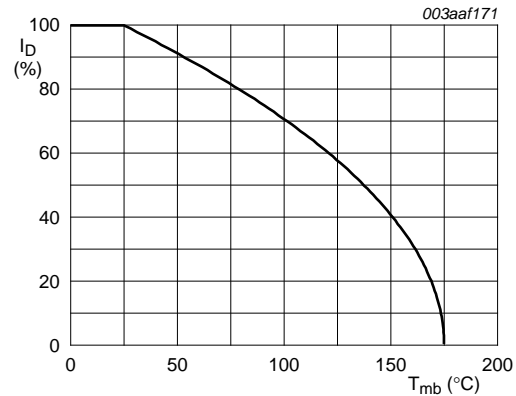
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	100	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	100	V
V_{GS}	gate-source voltage		-15	15	V
I_D	drain current	$T_{mb} = 100\text{ °C}$	-	16	A
		$T_{mb} = 25\text{ °C}$	-	23	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C}$; pulsed	-	91	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$	-	98	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25\text{ °C}$	-	23	A
I_{SM}	peak source current	pulsed; $T_{mb} = 25\text{ °C}$	-	92	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 14.2\text{ A}$; $V_{sup} \leq 25\text{ V}$; $R_{GS} = 50\ \Omega$; $V_{GS} = 5\text{ V}$; $T_{j(init)} = 25\text{ °C}$; unclamped	-	100	mJ



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

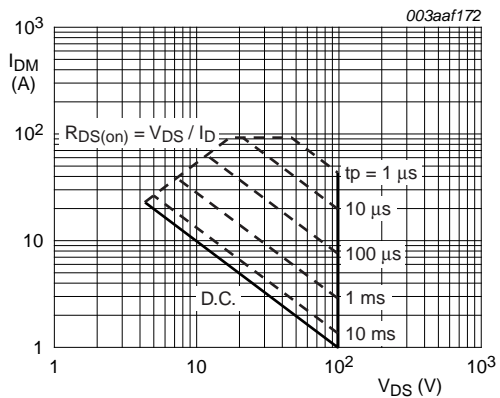
Fig 1. Normalized total power dissipation as a function of mounting base temperature



$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100\%$$

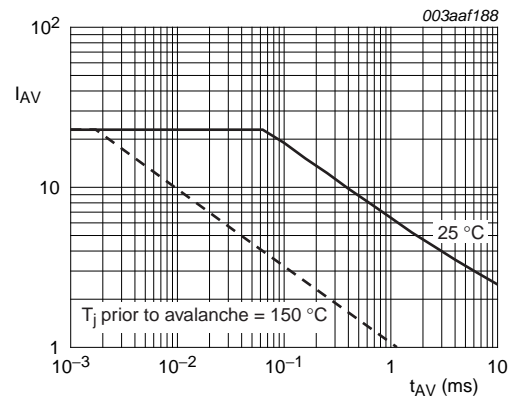
$V_{GS} \geq 5\text{ V}$

Fig 2. Normalized continuous drain current as a function of mounting base temperature



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

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



unclamped inductive load

Fig 4. Single-shot avalanche rating; avalanche current as a function of avalanche period

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		-	-	1.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Minimum footprint; FR4 board	-	50	-	K/W

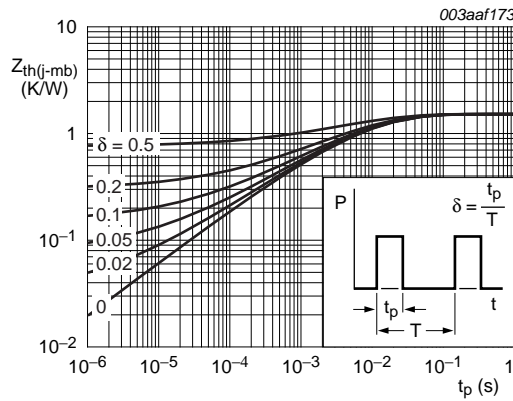


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	100	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	89	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C}$	0.5	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C}$	1	1.5	2	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C}$	-	-	2.3	V
I_{DSS}	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	μA
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.05	10	μA
I_{GSS}	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	55	72	m Ω
		$V_{GS} = 5 \text{ V}; I_D = 10 \text{ A}; T_j = 175 \text{ }^\circ\text{C}$	-	-	188	m Ω
		$V_{GS} = 4.5 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	61	84	m Ω
		$V_{GS} = 5 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	60	75	m Ω
Dynamic characteristics						
C_{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	1278	1704	pF
C_{oss}	output capacitance		-	129	155	pF
C_{rss}	reverse transfer capacitance		-	88	120	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \text{ } \Omega; V_{GS} = 5 \text{ V}; R_{G(ext)} = 10 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	13	20	ns
t_r	rise time		-	120	168	ns
$t_{d(off)}$	turn-off delay time		-	58	87	ns
t_f	fall time		-	57	86	ns
L_D	internal drain inductance	from drain lead 6 mm from package to centre of die ; $T_j = 25 \text{ }^\circ\text{C}$	-	4.5	-	nH
		from upper edge of drain tab to centre of die ; $T_j = 25 \text{ }^\circ\text{C}$	-	2.5	-	nH
L_S	internal source inductance	from source lead to source bond pad; $T_j = 25 \text{ }^\circ\text{C}$	-	7.5	-	nH
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 10 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.85	1.2	V
		$I_S = 23 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	1.1	-	V
t_{rr}	reverse recovery time	$I_S = 23 \text{ A}; di_S/dt = -100 \text{ A}/\mu\text{s}; V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	63	-	ns
Q_r	recovered charge		-	0.22	-	μC

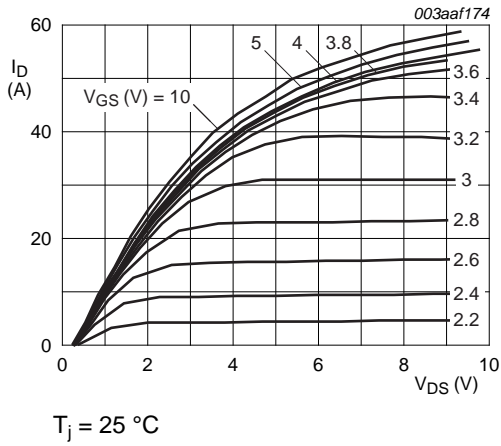


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

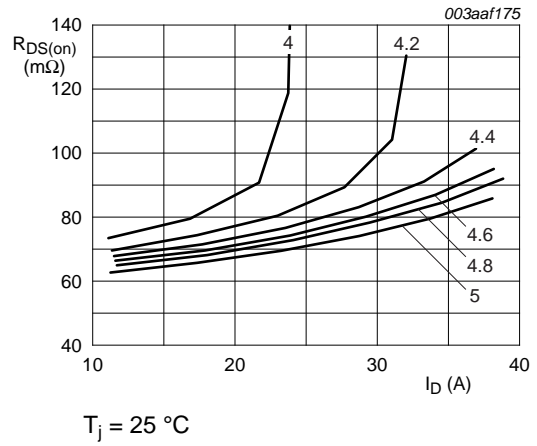


Fig 7. Drain-source on-state resistance as a function of drain current; typical values

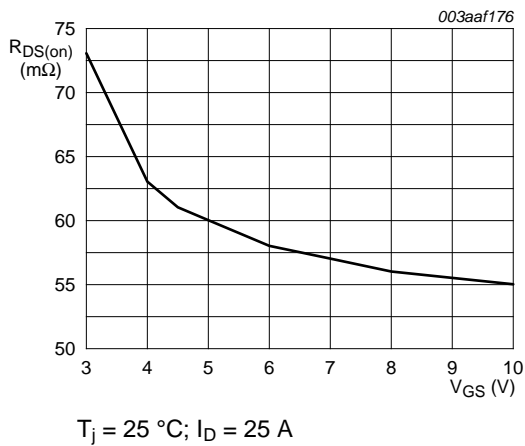


Fig 8. Drain-source on-state resistance as a function of gate-source voltage; typical values

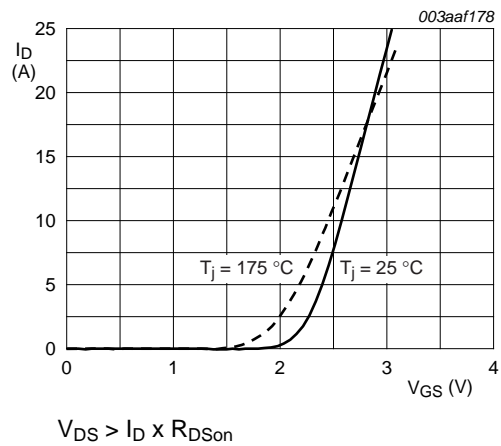


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

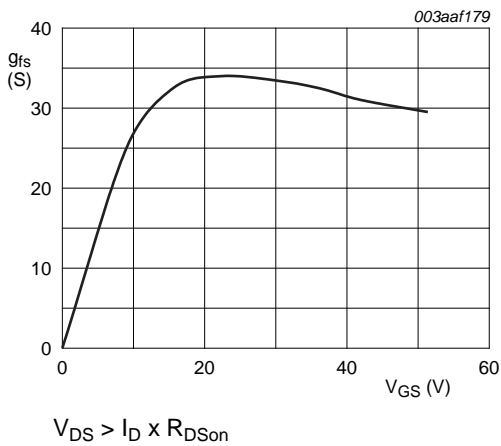
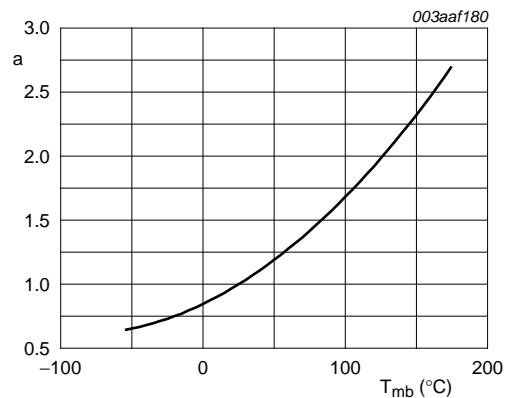
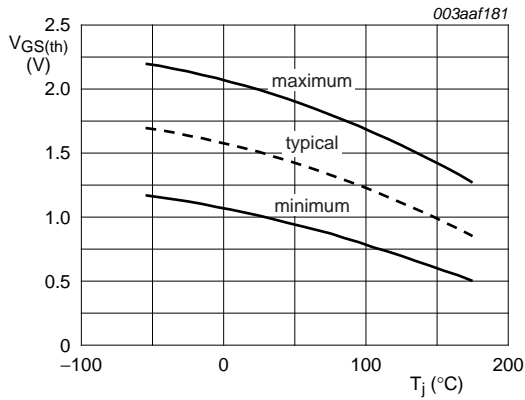


Fig 10. Forward transconductance as a function of drain current; typical values



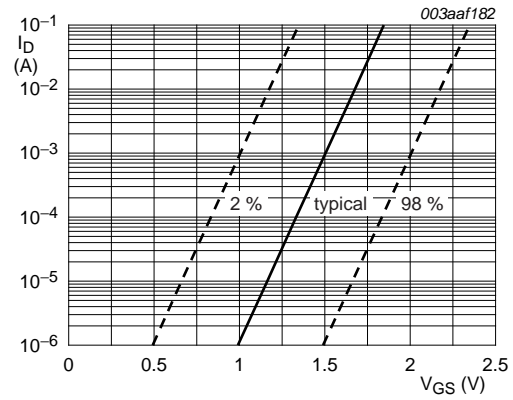
$$a = \frac{R_{DS(on)}}{R_{DS(on)@25^{\circ}C}}$$

Fig 11. Normalized drain-source on-state resistance factor as a function of junction temperature



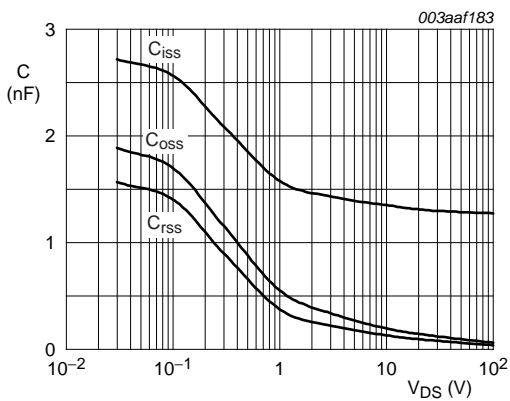
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

Fig 12. Gate-source threshold voltage as a function of junction temperature



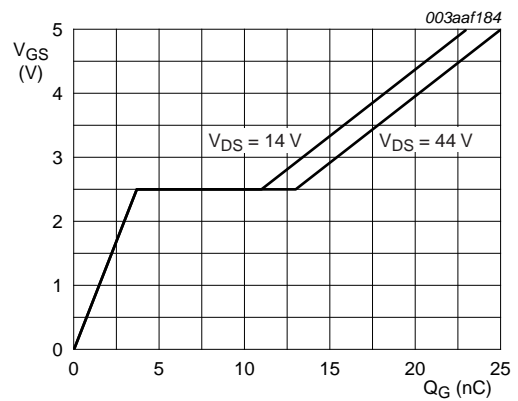
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = V_{GS}$

Fig 13. Sub-threshold drain current as a function of gate-source voltage



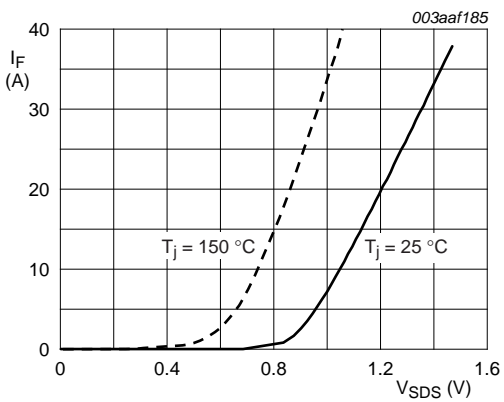
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

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



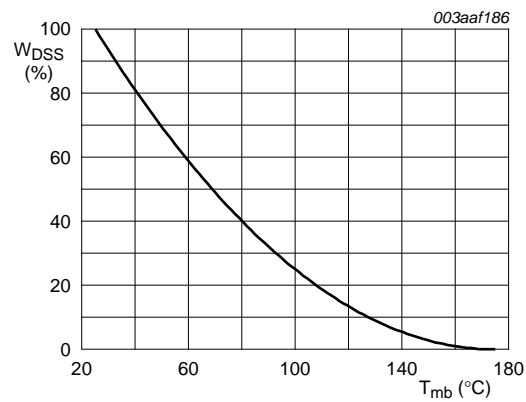
$T_j = 25 \text{ }^\circ\text{C}; I_D = 25 \text{ A}$

Fig 15. Gate-source voltage as a function of gate charge; typical values



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

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



$I_D = 75 \text{ A}$

Fig 17. Normalised drain-source avalanche energy as a function of mounting-base temperature.

7. Package outline

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

SOT404

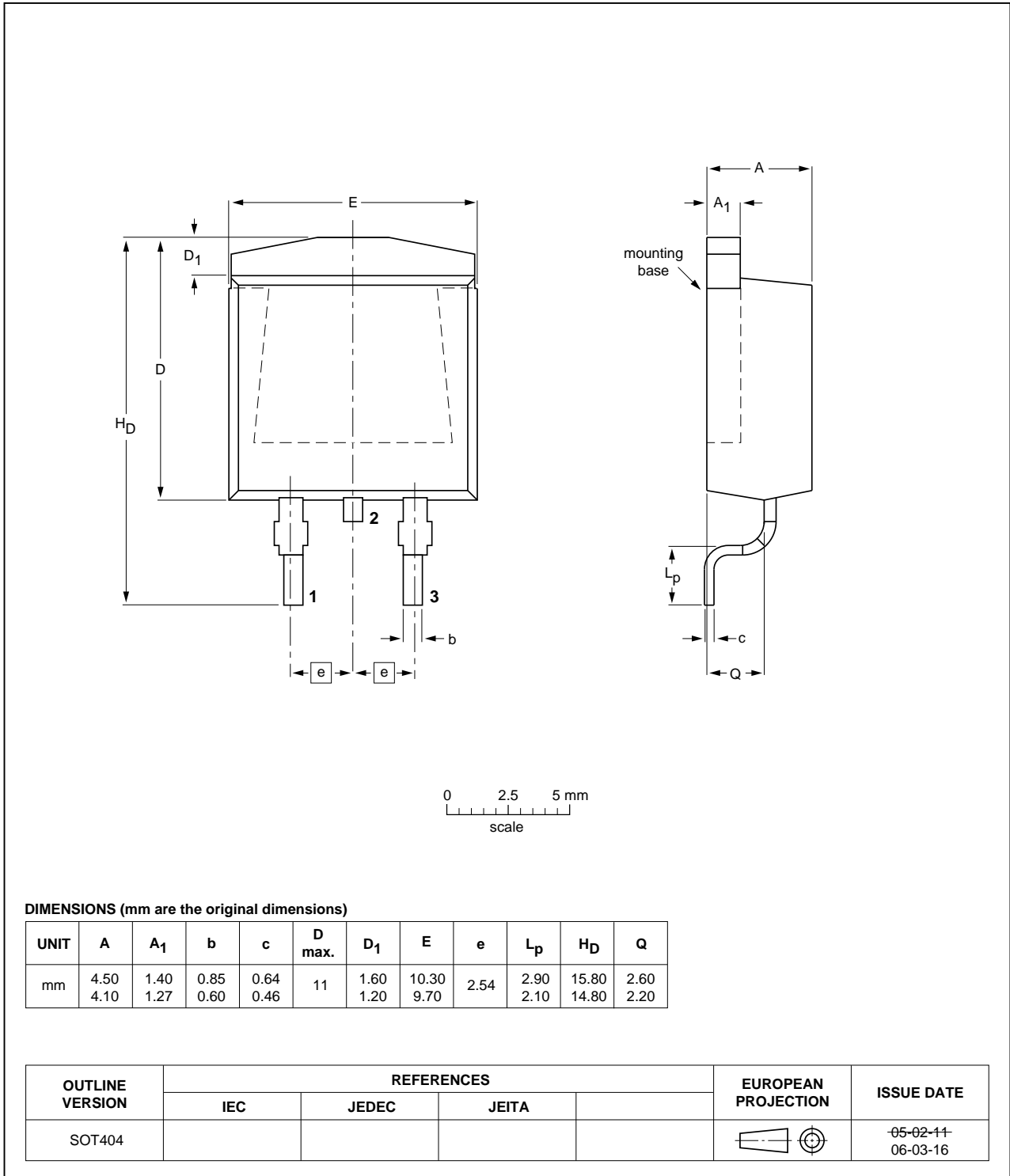


Fig 18. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9675-100A v.4	20110419	Product data sheet	-	BUK9675-100A v.3
Modifications:	• Various changes to content.			
BUK9675-100A v.3	20110328	Product data sheet	-	BUK9575_9675-100A v.2

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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