



BUK964R2-80E

N-channel TrenchMOS logic level FET

Rev. 2 — 16 May 2012

Product data sheet

1. Product profile

1.1 General description

Logic 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 logic level gate with $V_{gst(th)}$ rating of greater than 0.5V at 175 °C

1.3 Applications

- 12V, 24V and 48V Automotive systems
- 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

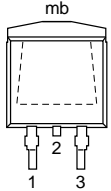
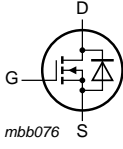
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	80	V
I_D	drain current	$V_{GS} = 5\text{ V}$; $T_{mb} = 25\text{ °C}$; $T_{mb} = 25\text{ °C}$; see Figure 1	[1]	-	120	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	357	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 5\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; see Figure 11	-	3.4	4.2	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 5\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 64\text{ V}$; see Figure 13 ; see Figure 14	-	37.5	-	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
BUK964R2-80E	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Marking

Table 4. Marking codes

Type number	Marking code
BUK964R2-80E	BUK964R2-80E

5. Limiting values

Table 5. Limiting values

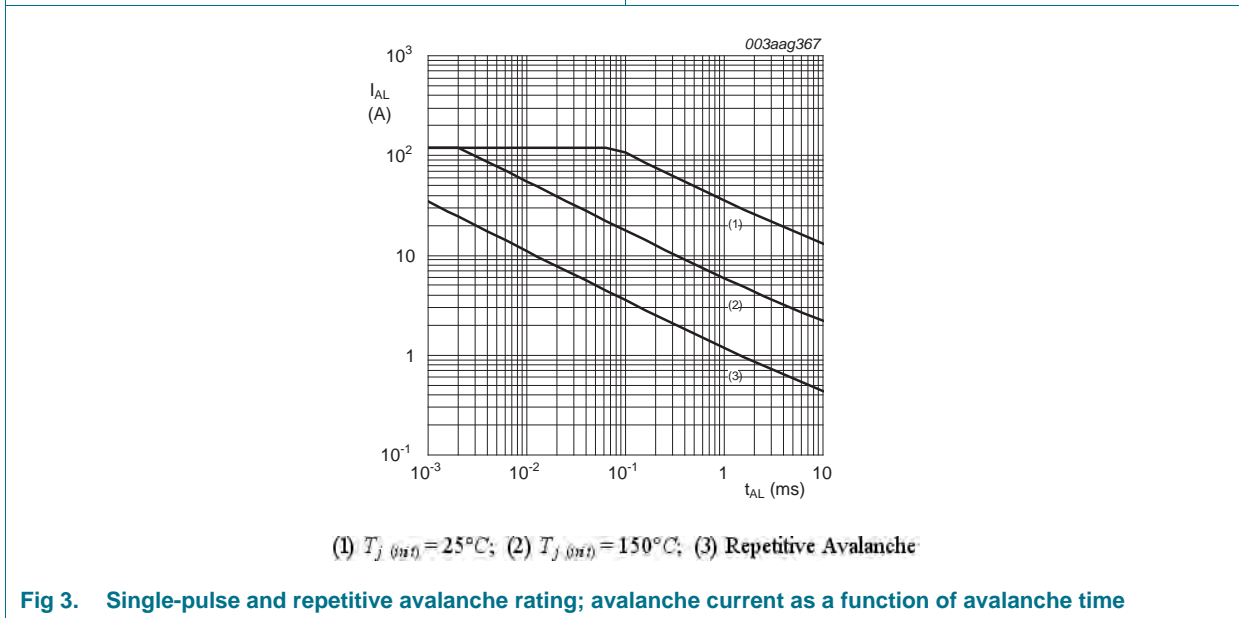
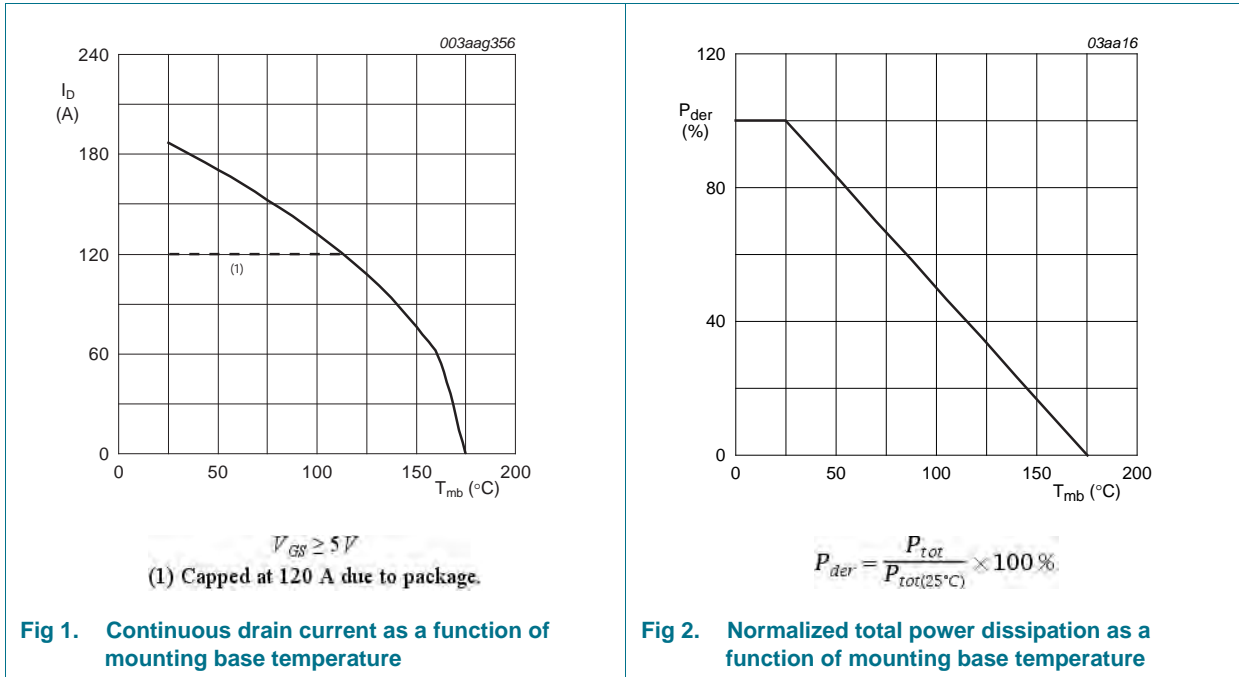
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	80	V	
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	80	V	
V_{GS}	gate-source voltage	DC	-10	10	V	
		Pulsed	-15	15	V	
I_D	drain current	$T_{mb} = 25\text{ °C}; T_{mb} = 25\text{ °C}; V_{GS} = 5\text{ V};$ see Figure 1	[1]	-	120	A
		$T_{mb} = 100\text{ °C}; V_{GS} = 5\text{ V};$ see Figure 1	[1]	-	120	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ see Figure 4	-	740	A	
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C};$ see Figure 2	-	357	W	
T_{stg}	storage temperature		-55	175	°C	
T_j	junction temperature		-55	175	°C	
Source-drain diode						
I_S	source current	$T_{mb} = 25\text{ °C}$	[1]	-	120	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25\text{ °C}$	-	740	A	
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 120\text{ A}; V_{sup} \leq 80\text{ V}; R_{GS} = 50\text{ }\Omega;$ $V_{GS} = 5\text{ V}; T_{j(init)} = 25\text{ °C};$ unclamped; see Figure 3	[2][3]	-	485	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.



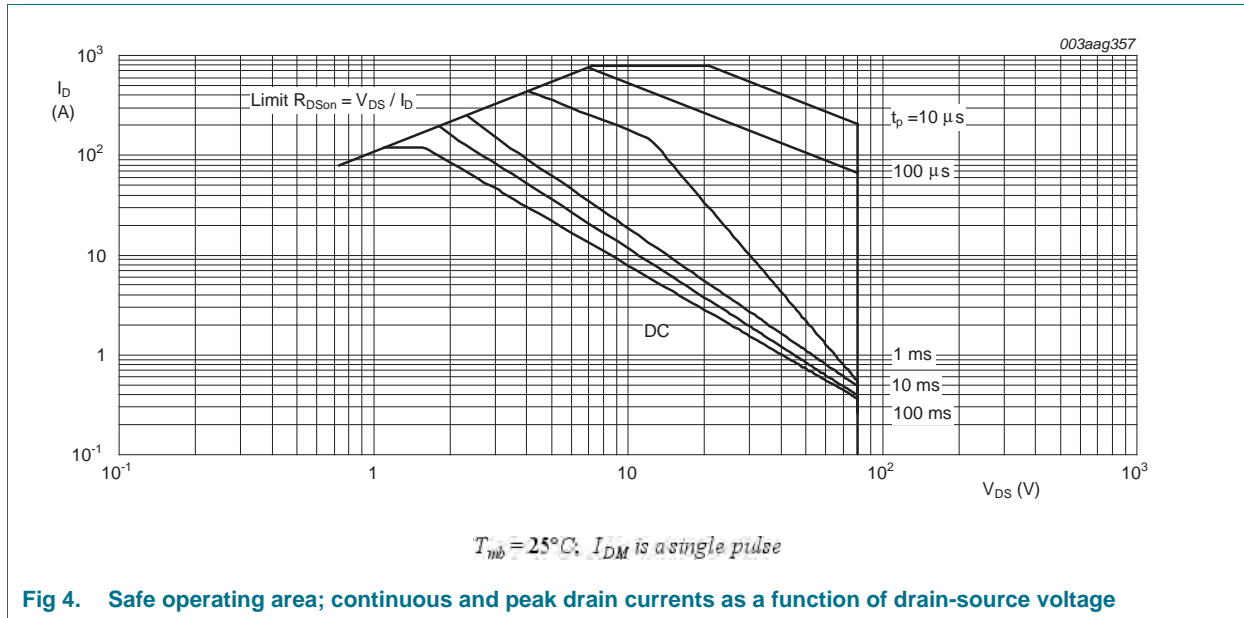


Fig 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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 Figure 5	-	-	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

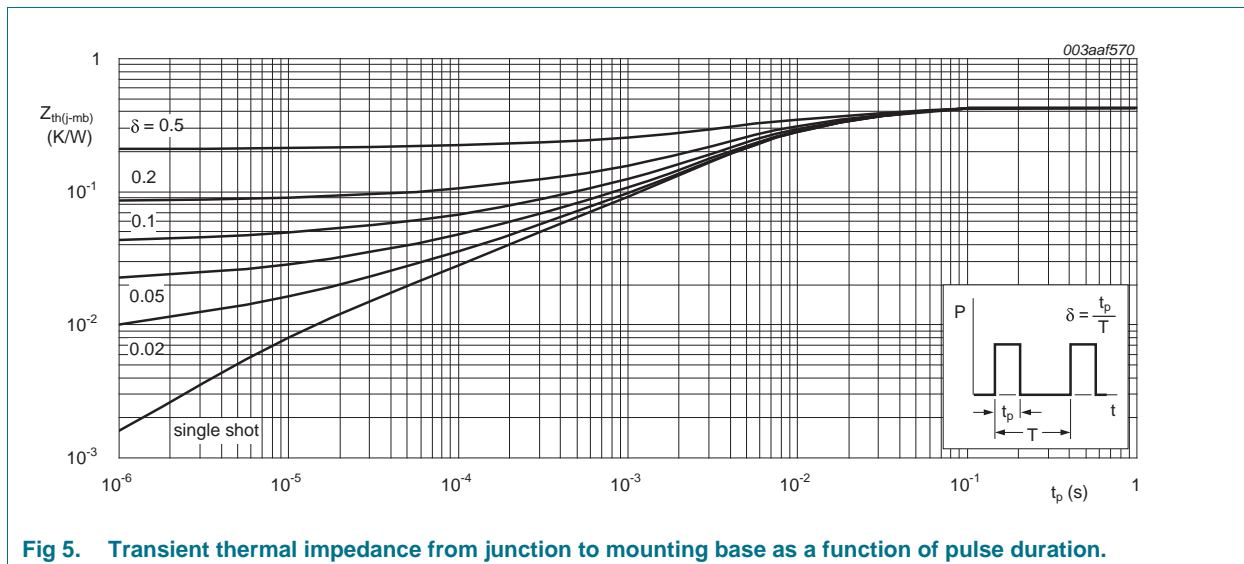
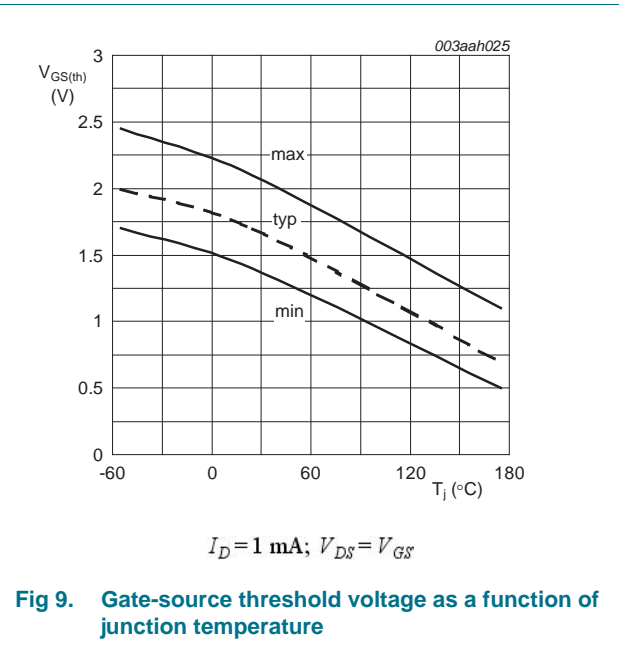
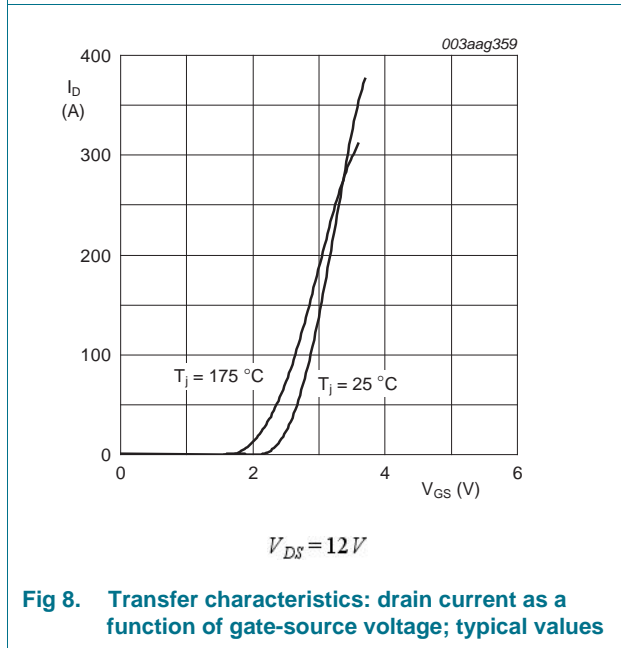
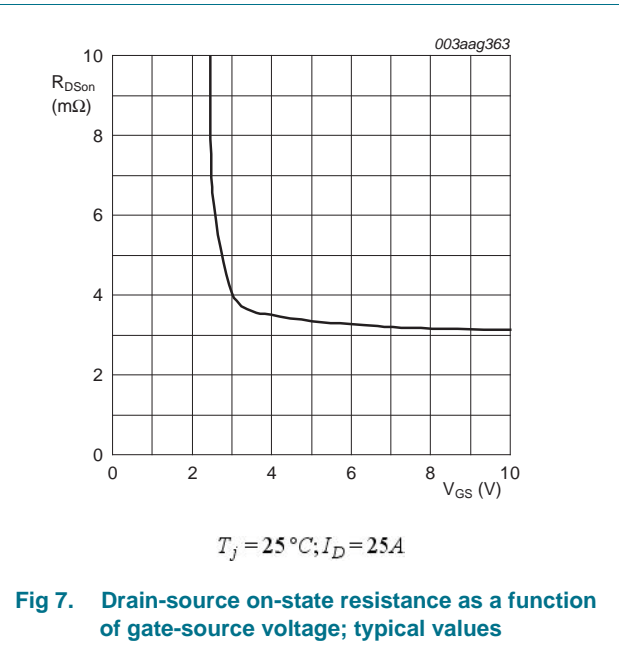
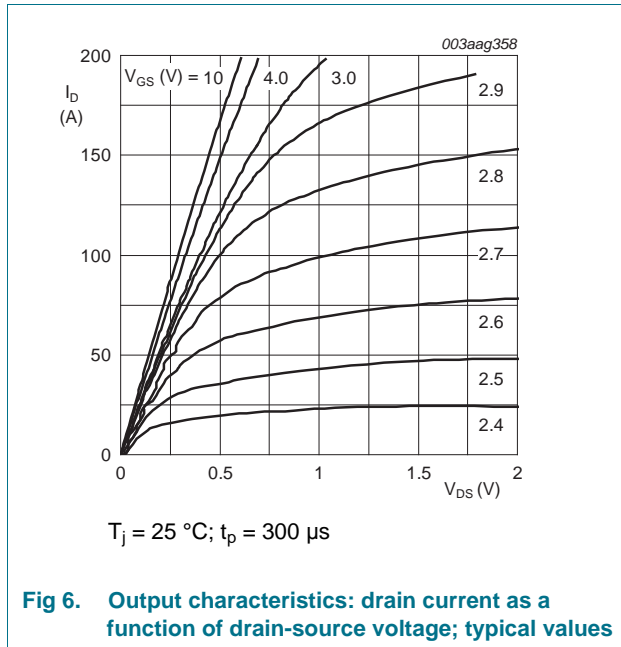


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration.

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ\text{C}$	80	-	-	V
		$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = -55 \text{ }^\circ\text{C}$	72	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 9 ; see Figure 10	1.4	1.7	2.1	V
		$I_D = 1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = -55 \text{ }^\circ\text{C}$; see Figure 9	-	-	2.45	V
		$I_D = 1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 175 \text{ }^\circ\text{C}$; see Figure 9	0.5	-	-	V
I_{DSS}	drain leakage current	$V_{DS} = 80 V$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ\text{C}$	-	0.08	1	μA
		$V_{DS} = 80 V$; $V_{GS} = 0 V$; $T_j = 175 \text{ }^\circ\text{C}$	-	-	500	μA
I_{GSS}	gate leakage current	$V_{GS} = 10 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
		$V_{GS} = -10 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 5 V$; $I_D = 25 A$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 11	-	3.4	4.2	m Ω
		$V_{GS} = 10 V$; $I_D = 25 A$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 11	-	3.2	4	m Ω
		$V_{GS} = 5 V$; $I_D = 25 A$; $T_j = 175 \text{ }^\circ\text{C}$; see Figure 12 ; see Figure 11	-	-	10.4	m Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 25 A$; $V_{DS} = 64 V$; $V_{GS} = 5 V$; see Figure 13 ; see Figure 14	-	123	-	nC
Q_{GS}	gate-source charge		-	26.6	-	nC
Q_{GD}	gate-drain charge		-	37.5	-	nC
C_{iss}	input capacitance	$V_{GS} = 0 V$; $V_{DS} = 25 V$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 15	-	12850	17130	pF
C_{oss}	output capacitance		-	850	1020	pF
C_{rss}	reverse transfer capacitance		-	420	580	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 60 V$; $R_L = 2.4 \Omega$; $V_{GS} = 5 V$; $R_{G(ext)} = 5 \Omega$	-	70	-	ns
t_r	rise time		-	109	-	ns
$t_{d(off)}$	turn-off delay time		-	203	-	ns
t_f	fall time		-	115	-	ns
L_D	internal drain inductance	from upper edge of drain mounting base to center of die	-	2.5	-	nH
L_S	internal source inductance	from source lead to source bonding pad	-	7.5	-	nH
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25 A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 16	-	0.77	1.2	V
t_{rr}	reverse recovery time	$I_S = 20 A$; $di_S/dt = -100 \text{ A}/\mu\text{s}$; $V_{GS} = 0 V$; $V_{DS} = 25 V$	-	61	-	ns
Q_r	recovered charge		-	139	-	nC



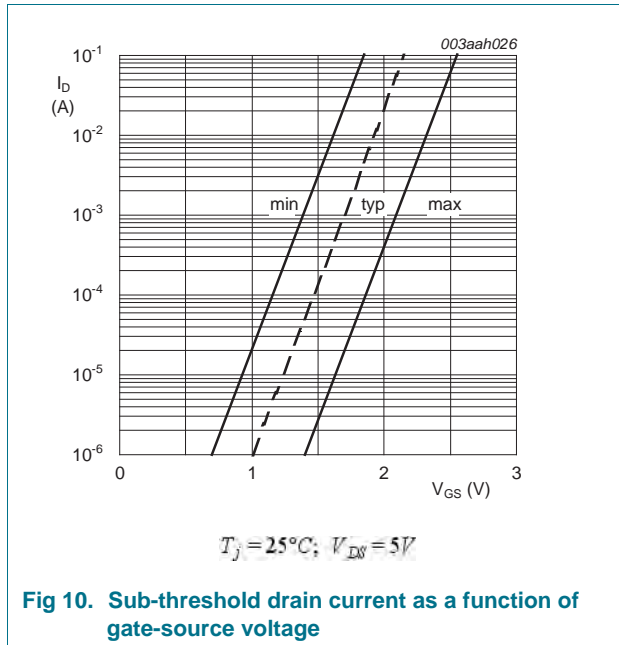


Fig 10. Sub-threshold drain current as a function of gate-source voltage

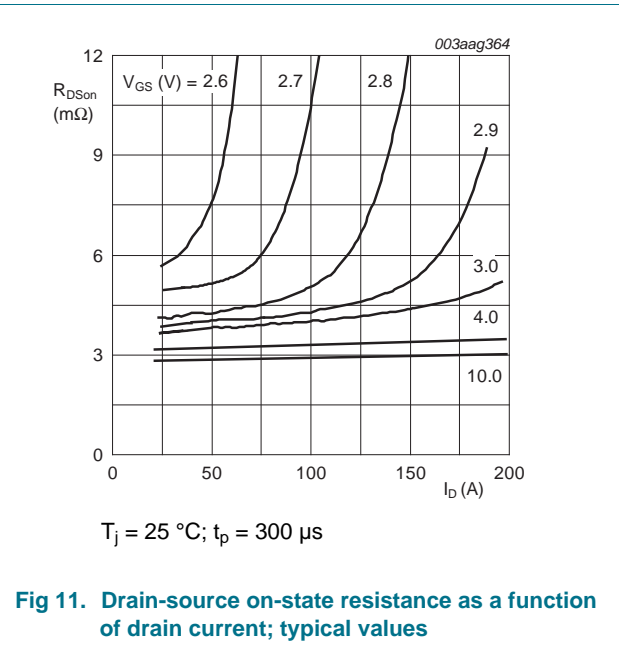


Fig 11. Drain-source on-state resistance as a function of drain current; typical values

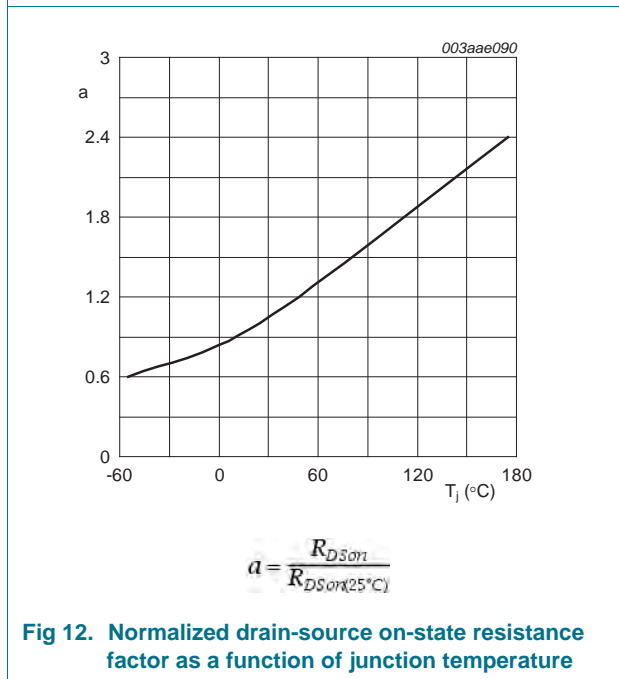


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature

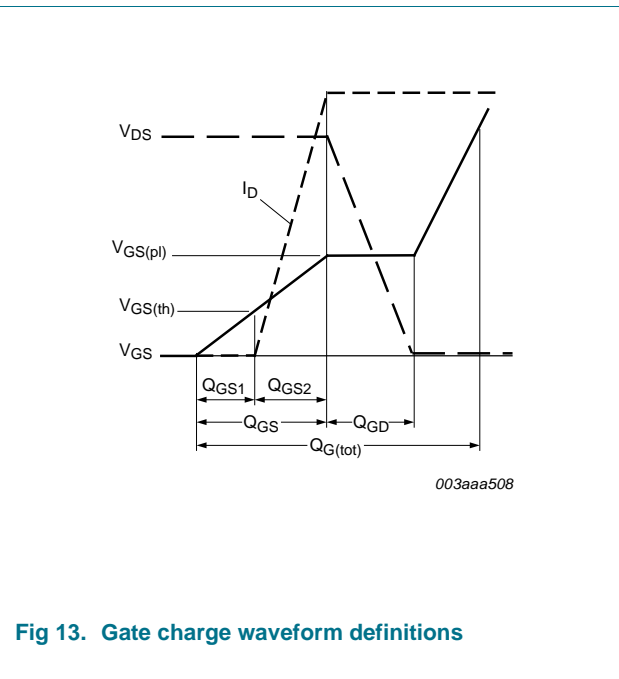


Fig 13. Gate charge waveform definitions

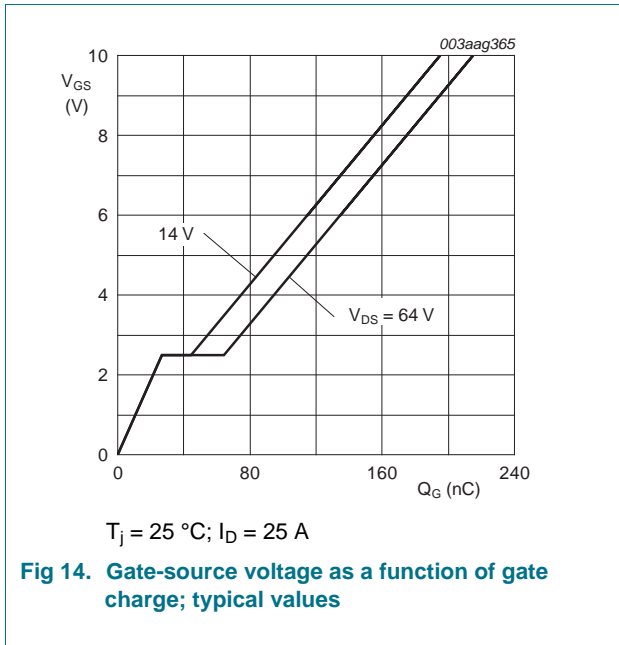


Fig 14. Gate-source voltage as a function of gate charge; typical values

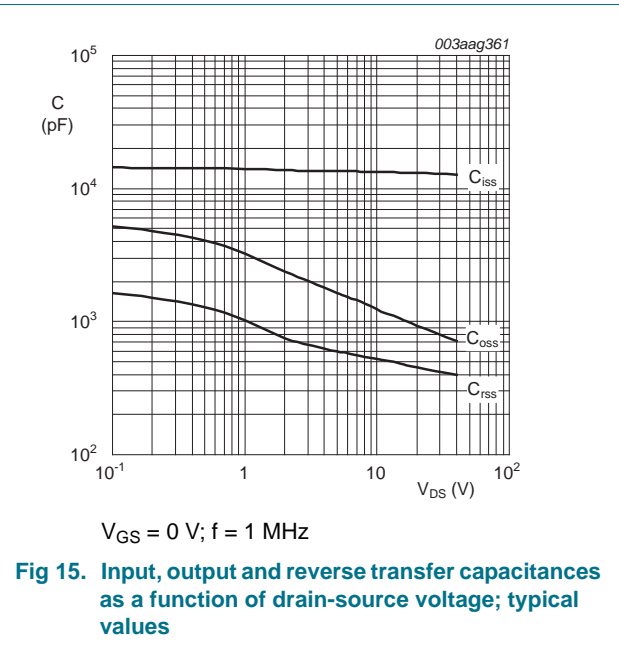


Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

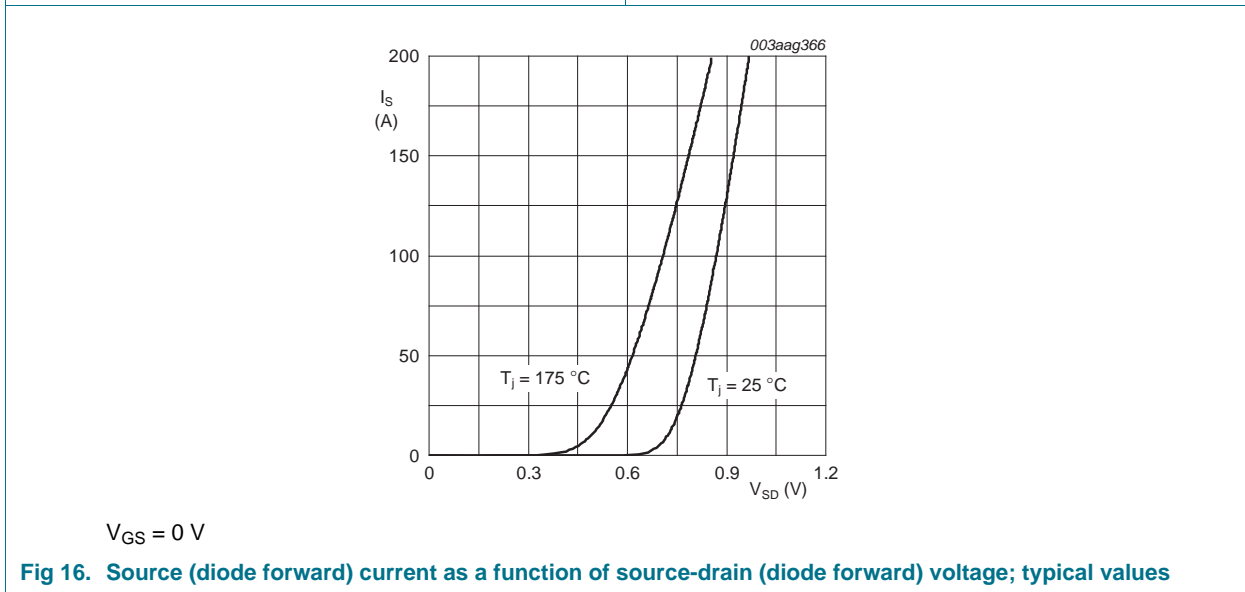


Fig 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

8. Package outline

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

SOT404

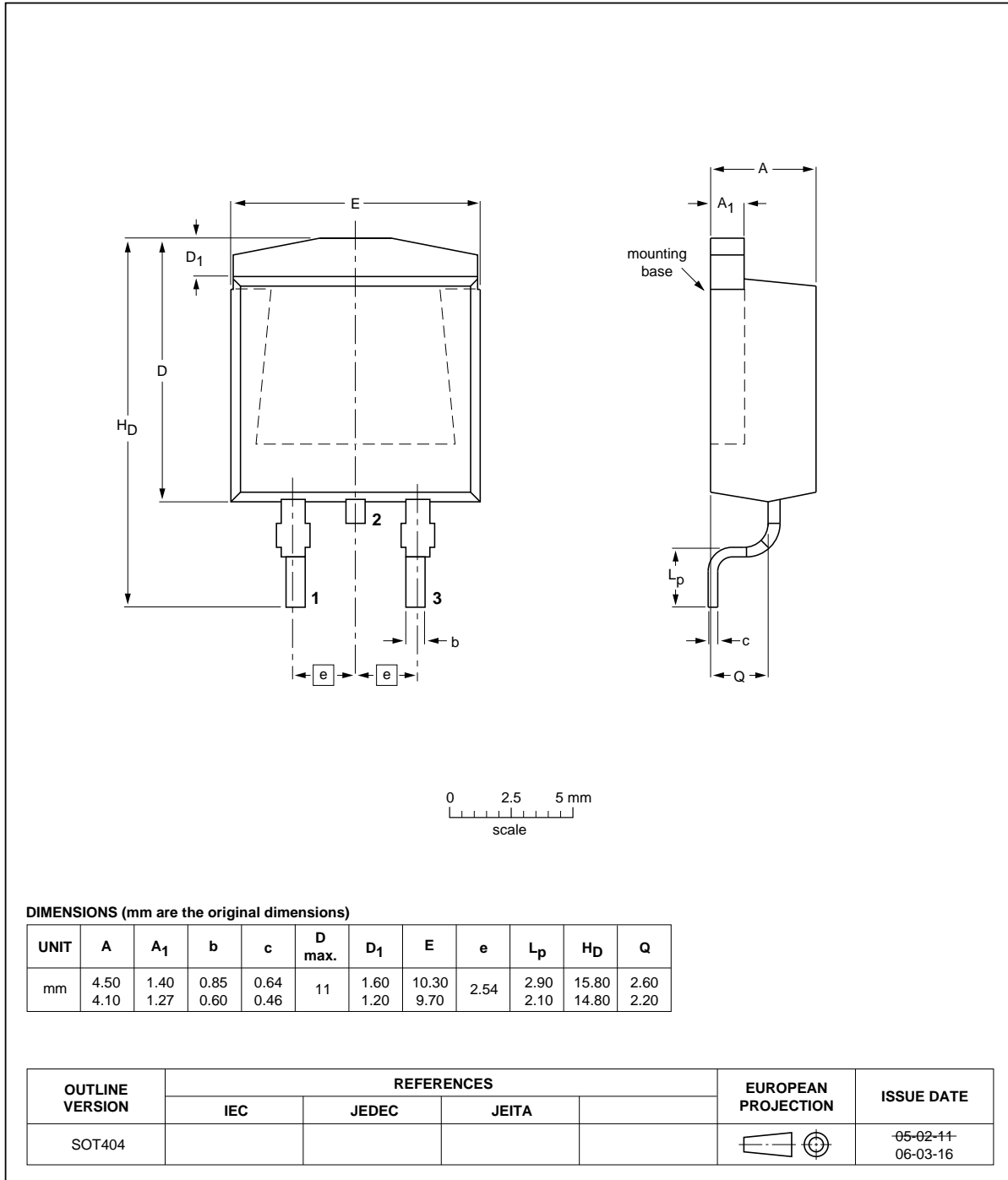


Fig 17. Package outline SOT404 (D2PAK)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK964R2-80E v.2	20120516	Product data sheet	-	BUK964R2-80E v.1
Modifications:	<ul style="list-style-type: none">• Status changed from objective to product.• Various changes to content.			
BUK964R2-80E v.1	20120404	Objective data sheet	-	-

10. Legal information

10.1 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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12. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	2
3	Ordering information	2
4	Marking	2
5	Limiting values	3
6	Thermal characteristics	5
7	Characteristics	6
8	Package outline	10
9	Revision history	11
10	Legal information	12
10.1	Data sheet status	12
10.2	Definitions	12
10.3	Disclaimers	12
10.4	Trademarks	13
11	Contact information	13

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