BUK761R8-30C

N-channel TrenchMOS standard level FET

Rev. 02 — 20 August 2007 Product data sheet

1. Product profile

1.1 General description

N-channel enhancement mode power Field-Effect Transistor (FET) in a plastic package, using NXP Ultra High-Performance (UHP) automotive TrenchMOS technology.

1.2 Features

- 175 °C rated
- Standard level compatible
- Q101 compliant
- TrenchMOS technology

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference

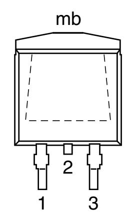
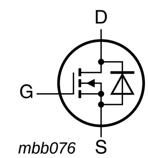
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_D	drain current	V_{GS} = 10 V; T_{mb} = 25 °C; see Figure 1 and 4	[1][2]	-	-	100	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 2		-	-	333	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; see Figure 12 and 13		-	1.5	1.8	mΩ
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 100 A; V_{sup} ≤ 30 V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C		-	-	1.7	J

[1] Refer to document 9397 750 12572 for further information.

[2] Continuous current is limited by package.

2. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Graphic Symbol
1	G	gate	 SOT404 (D2PAK)	
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK761R8-30C	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			-	30	V
V_{DGR}	drain-gate voltage	R_{GS} = 20 kΩ		-	30	V
V_{GS}	gate-source voltage			-20	20	V
I_D	drain current	T_{mb} = 100 °C; V_{GS} = 10 V; see Figure 1 and 4	[1][2]	-	100	A
		T_{mb} = 25 °C; V_{GS} = 10 V; see Figure 1 and 4	[1][2]	-	100	A
		T_{mb} = 25 °C; V_{GS} = 10 V; see Figure 1 and 4	[1][3]	-	312	A
I_{DM}	peak drain current	T_{mb} = 25 °C; $t_p \leq 10$ µs; pulsed; see Figure 4		-	1249	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 2		-	333	W
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-55	175	°C
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 100 A; $V_{sup} \leq 30$ V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C		-	1.7	J
$E_{DS(AL)R}$	repetitive drain-source avalanche energy	see Figure 3	[4][5] [6][7]	-	-	J
Source-drain diode						
I_S	source current	T_{mb} = 25 °C	[1][3]	-	312	A
		T_{mb} = 25 °C	[1][2]	-	100	A
I_{SM}	peak source current	$t_p \leq 10$ µs; pulsed; T_{mb} = 25 °C		-	1249	A

[1] Refer to document 9397 750 12572 for further information.

[2] Continuous current is limited by package.

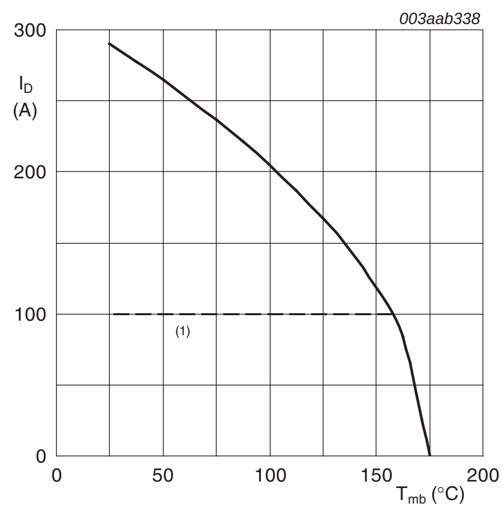
[3] Current is limited by chip power dissipation rating.

[4] Maximum value not quoted. Repetitive rating defined in avalanche rating figure.

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

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

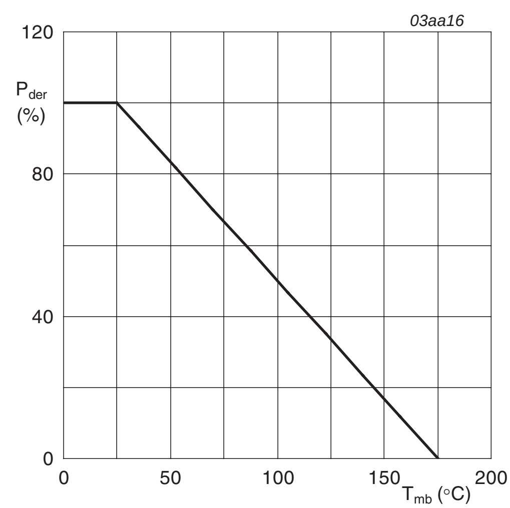
[7] Refer to application note AN10273 for further information.



$V_{GS} \geq 10\,V$

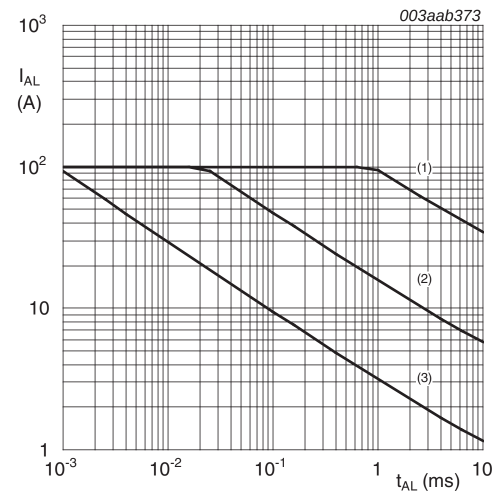
(1) Capped at 100 A due to package.

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



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

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

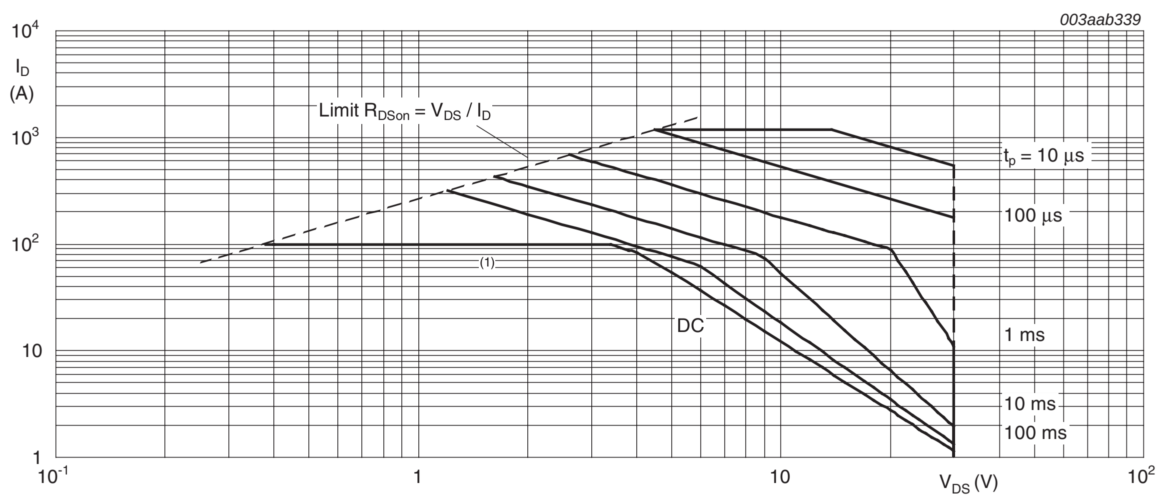


(1) Single−pulse; T_{mb} = 25 °C.

(2) Single−pulse; T_{mb} = 150 °C.

(3) Repetitive.

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



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

(1) Capped at 100 A due to package.

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

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on printed circuit board; minimum footprint	-	50	-	K/W
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 5	-	-	0.45	K/W

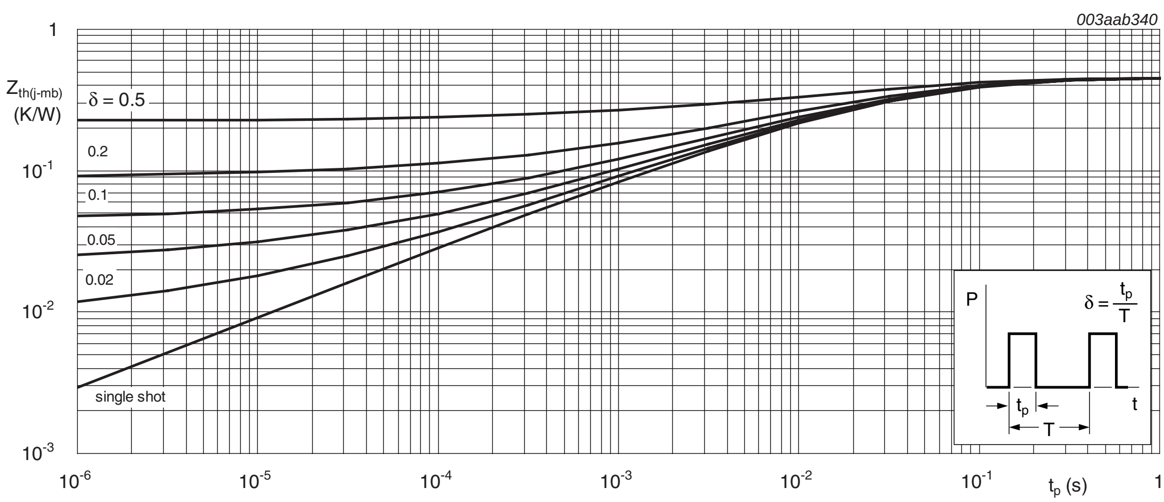


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 μA; V_{GS} = 0 V; T_j = 25 °C	30	-	-	V
		I_D = 250 μA; V_{GS} = 0 V; T_j = -55 °C	27	-	-	V
V_{GSth}	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 10	-	-	4.4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; see Figure 11 and 10	1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 11 and 10	2	3	4	V

Table 6. Characteristics *…continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{DSS}	drain leakage current	V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{DS} = 30 V; V_{GS} = 0 V; T_j = 175 °C	-	-	500	µA
I_{GSS}	gate leakage current	V_{DS} = 0 V; V_{GS} = 20 V; T_j = 25 °C	-	2	100	nA
		V_{DS} = 0 V; V_{GS} = -20 V; T_j = 25 °C	-	2	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; see Figure 12 and 13	-	-	3.4	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; see Figure 12 and 13	-	1.5	1.8	mΩ
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 16	-	0.85	1.2	V
t_{rr}	reverse recovery time	I_S = 20 A; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 25 V	-	73	-	ns
Q_r	recovered charge	I_S = 20 A; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 25 V	-	48	-	nC
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 24 V; V_{GS} = 10 V; see Figure 14	-	150	-	nC
Q_{GS}	gate-source charge	I_D = 25 A; V_{DS} = 24 V; V_{GS} = 10 V; see Figure 14	-	36	-	nC
Q_{GD}	gate-drain charge	I_D = 25 A; V_{DS} = 24 V; V_{GS} = 10 V; see Figure 14	-	52	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	I_D = 25 A; V_{DS} = 24 V; see Figure 14	-	5	-	V
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C; see Figure 15	-	7762	10349	pF
C_{oss}	output capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C; see Figure 15	-	1807	2168	pF
C_{rss}	reverse transfer capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C; see Figure 15	-	996	1365	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 25 V; R_L = 1.2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 10 Ω	-	52	-	ns
t_r	rise time	V_{DS} = 25 V; R_L = 1.2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 10 Ω	-	110	-	ns
$t_{d(off)}$	turn-off delay time	V_{DS} = 25 V; R_L = 1.2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 10 Ω	-	186	-	ns

Table 6. Characteristics *…continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_f	fall time	V_{DS} = 25 V; R_L = 1.2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 10 Ω	-	134	-	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

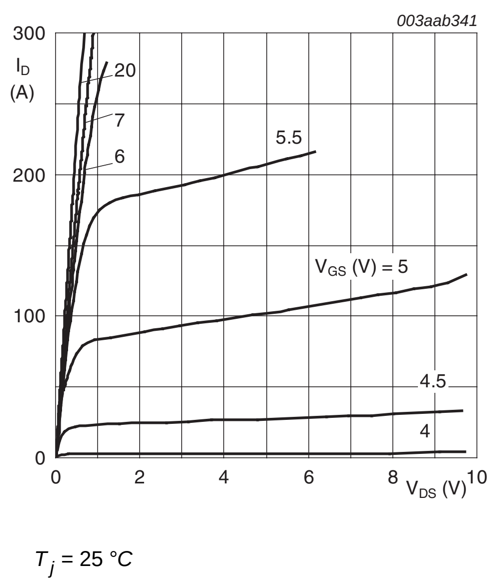


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

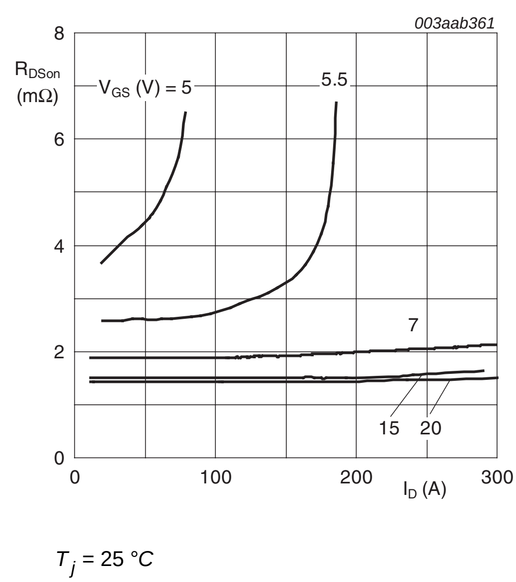
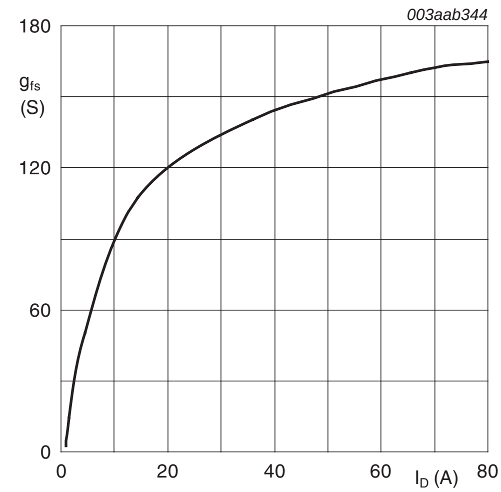
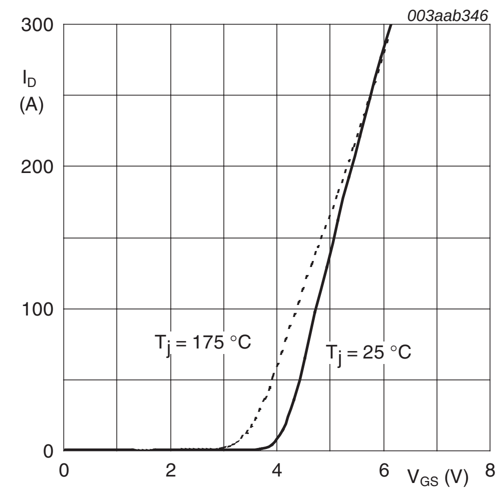


Fig 7. Drain-source on-state resistance as a function of drain current; typical values



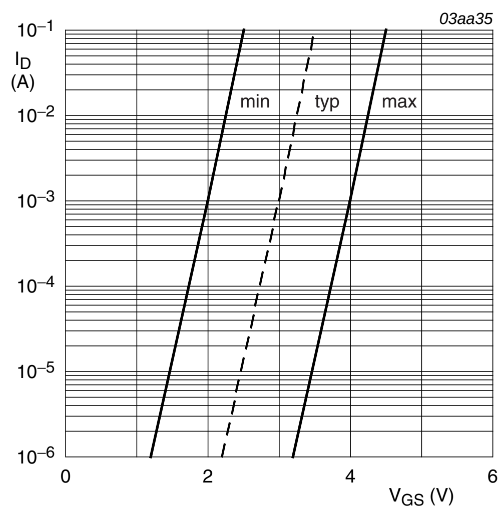
$T_j = 25\ °C; V_{DS} = 25\ V$

Fig 8. Forward transconductance as a function of drain current; typical values



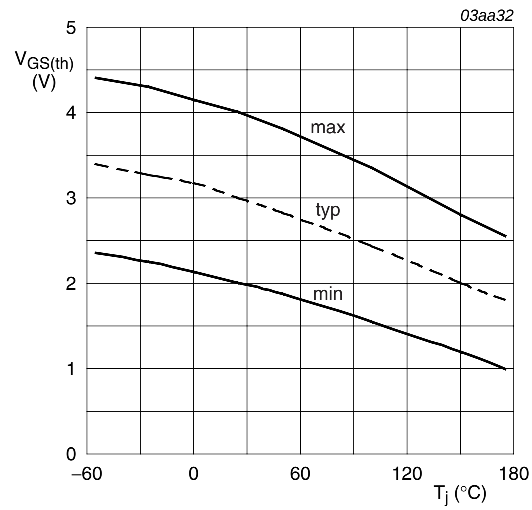
$V_{DS} = 25\ V$

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



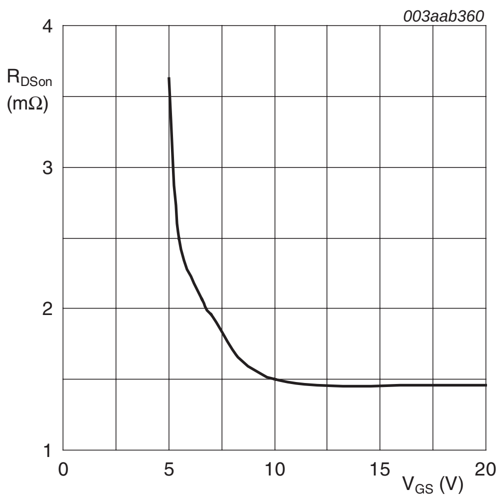
$T_j = 25\ °C; V_{DS} = V_{GS}$

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



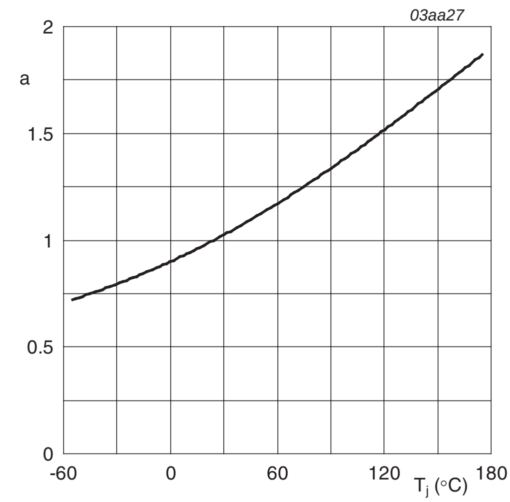
$I_D = 1\ mA; V_{DS} = V_{GS}$

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



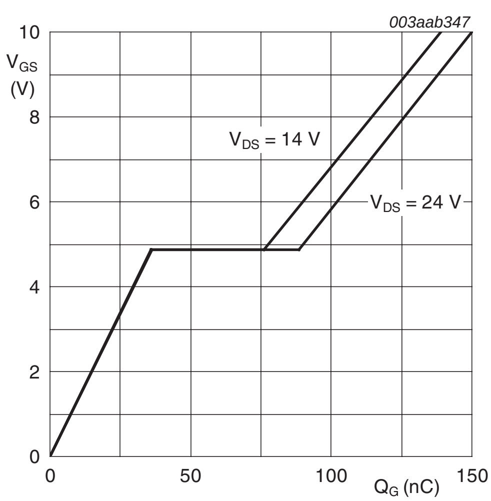
T_j = 25 °C; I_D = 25 A

Fig 12. Drain-source on-state resistance as a function of gate-source voltage; typical values



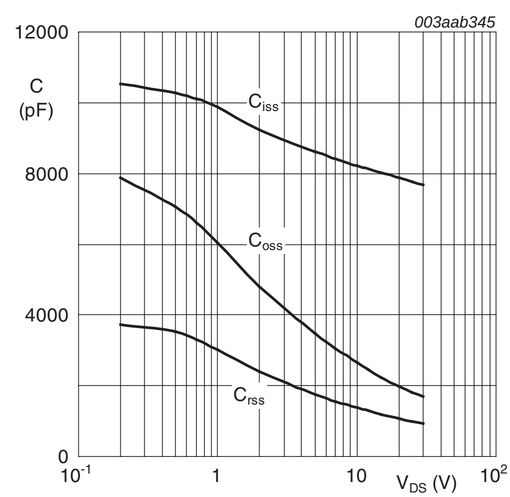
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

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



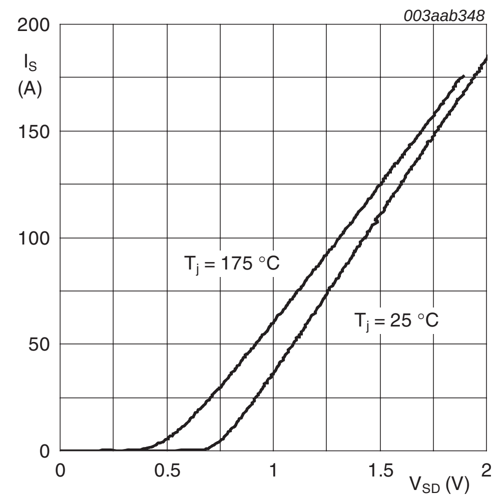
T_j = 25 °C; I_D = 25 A

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



V_{GS} = 0 V; f = 1 MHz

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

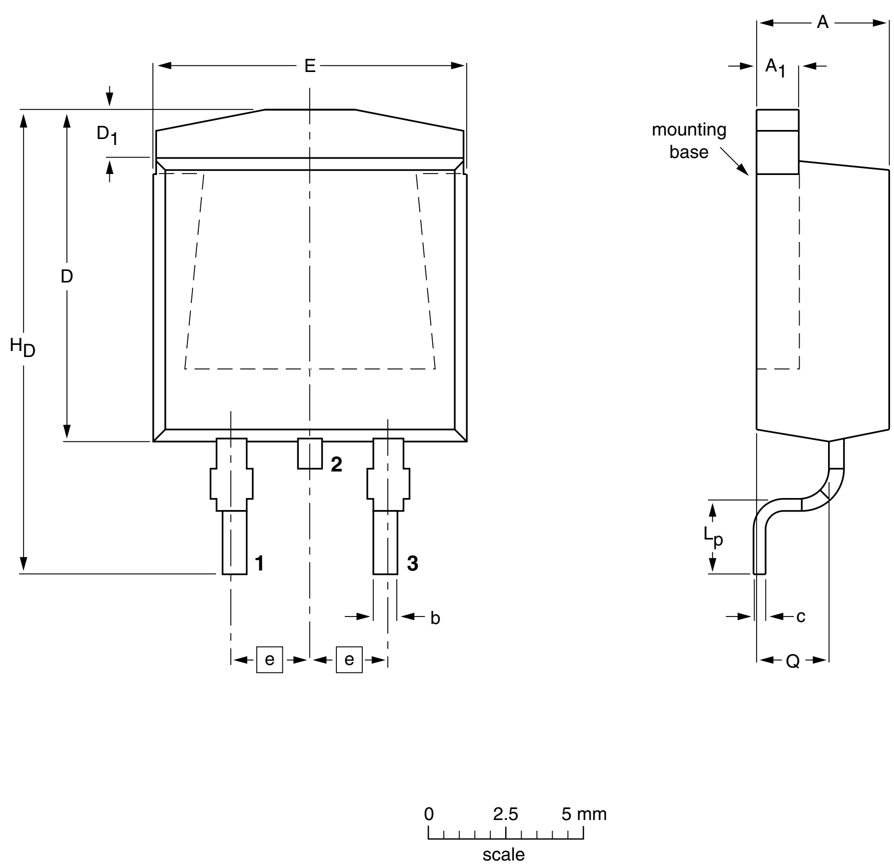


$V_{GS} = 0\,V$

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

7. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) **SOT404**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	c	D max.	D_1	E	e	L_p	H_D	Q
mm	4.50 4.10	1.40 1.27	0.85 0.60	0.64 0.46	11	1.60 1.20	10.30 9.70	2.54	2.90 2.10	15.80 14.80	2.60 2.20

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT404						~~05-02-11~~ 06-03-16

Fig 17. Package outline SOT404 (D2PAK)

8. Soldering

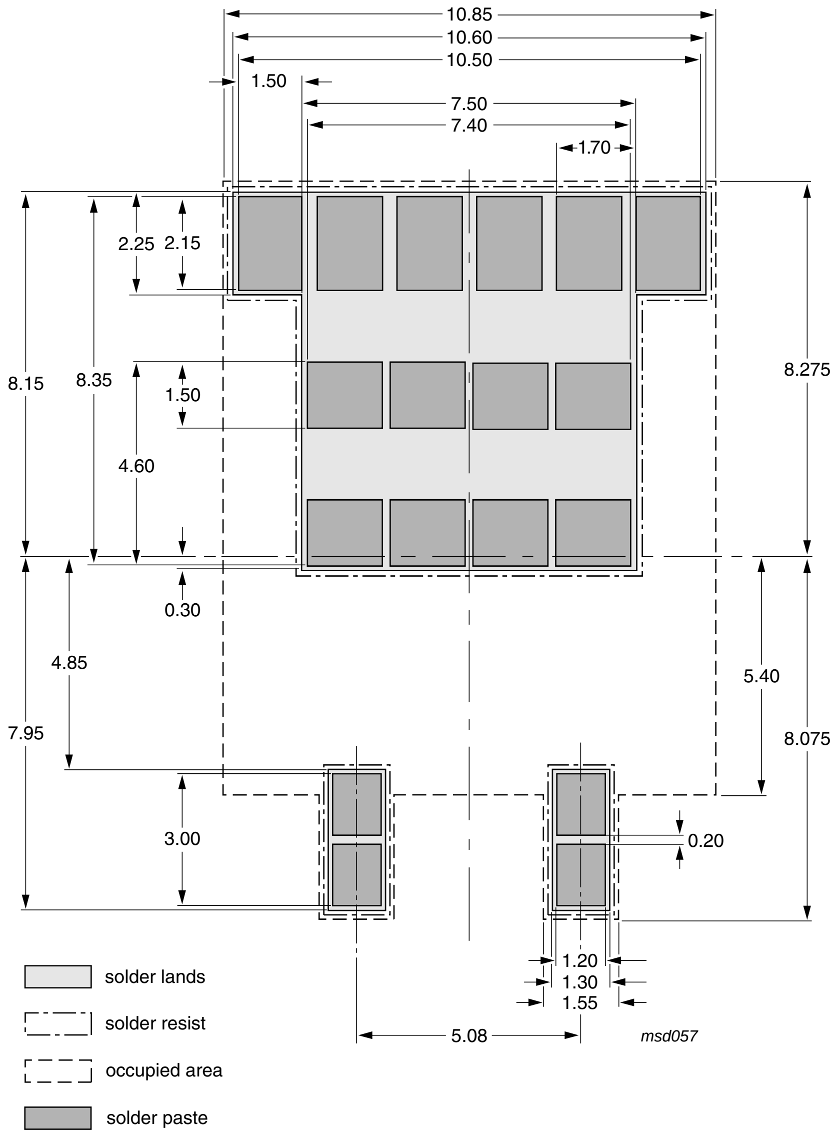


Fig 18. Reflow soldering footprint for SOT404

9. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK761R8-30C_2	20070820	Product data sheet	-	BUK761R8-30C_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate.			
BUK761R8-30C_1	20060725	Product 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.

[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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12. Contents

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