



**THE DATASHEET OF
BUK763R6-40C,118**





BUK763R6-40C

N-channel TrenchMOS standard level FET

Rev. 04 — 16 June 2010

Product data sheet

1. Product profile

1.1 General description

Standard 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 standard for use in high performance automotive applications.

1.2 Features and benefits

- AEC Q101 compliant
- Avalanche robust
- Suitable for standard level gate drive
- Suitable for thermally demanding environment up to 175°C rating

1.3 Applications

- 12V Motor, lamp and solenoid loads
- High performance automotive power systems
- High performance Pulse Width Modulation (PWM) applications

1.4 Quick reference data

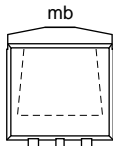
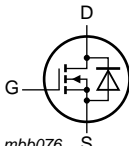
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	40	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 1 ; see Figure 3	[1]	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	203	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; see Figure 11 ; see Figure 12	-	3	3.6	mΩ
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 100\text{ A}$; $V_{sup} \leq 40\text{ V}$; $R_{GS} = 50\text{ Ω}$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; unclamped	-	-	292	mJ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 32\text{ V}$; $T_j = 25\text{ °C}$; see Figure 14 ; see Figure 13	-	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		
3	S	source		
mb	D	mounting base; connected to drain		

SOT404 (D2PAK)

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BUK763R6-40C	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Limiting values

Table 4. Limiting values

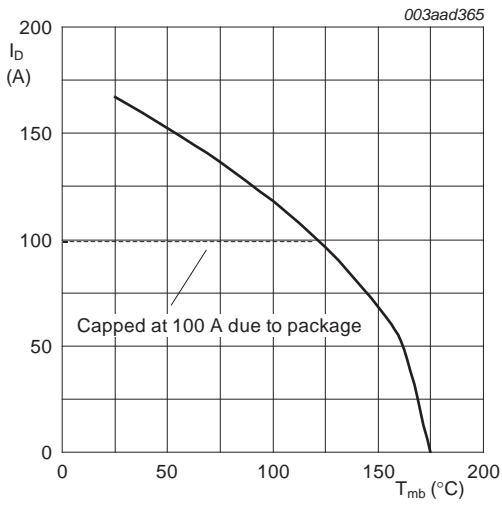
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	40	V	
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	-	40	V	
V_{GS}	gate-source voltage		[1]	-20	-	20	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 ; [2] see Figure 3	-	-	167	A	
		$T_{mb} = 100\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 [3]	-	-	100	A	
		$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 ; [3] see Figure 3	-	-	100	A	
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C}$; $t_p \leq 10\text{ }\mu\text{s}$; pulsed; see Figure 3	-	-	668	A	
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	203	W	
T_{stg}	storage temperature		-55	-	175	°C	
T_j	junction temperature		-55	-	175	°C	
Source-drain diode							
I_S	source current	$T_{mb} = 25\text{ °C}$	[3]	-	-	100	A
			[2]	-	-	167	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$	-	-	668	A	
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 100\text{ A}$; $V_{sup} \leq 40\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; unclamped	-	-	292	mJ	

[1] -20V accumulated duration not to exceed 168 hrs.

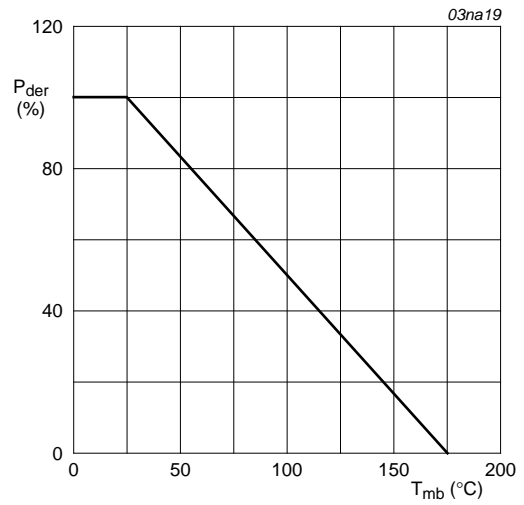
[2] Current is limited by power dissipation chip rating.

[3] Continuous current is limited by package.



$V_{GS} \geq 10V(1)$ Capped at 100A 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

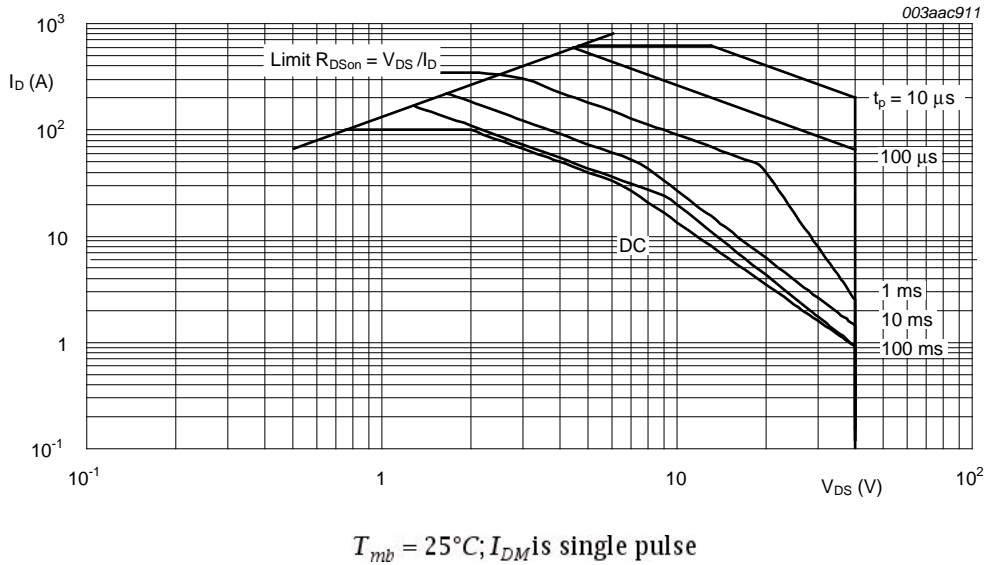


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	0.74	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on printed circuit board; minimum footprint; SOT404 package	-	-	50	K/W

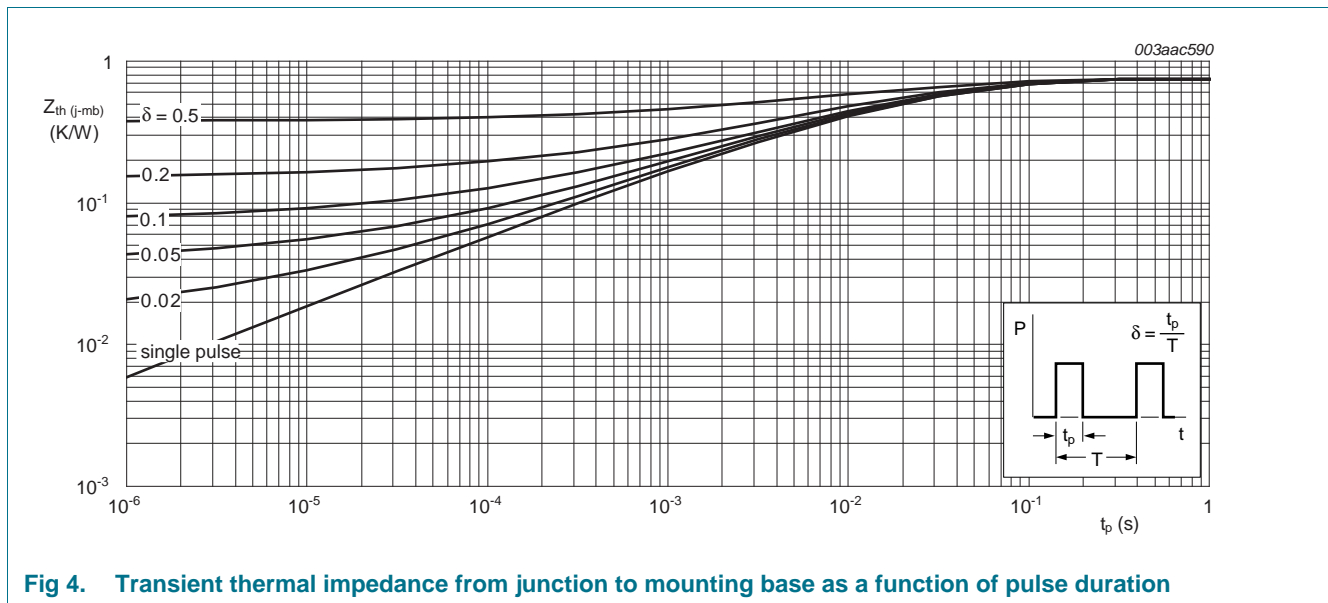
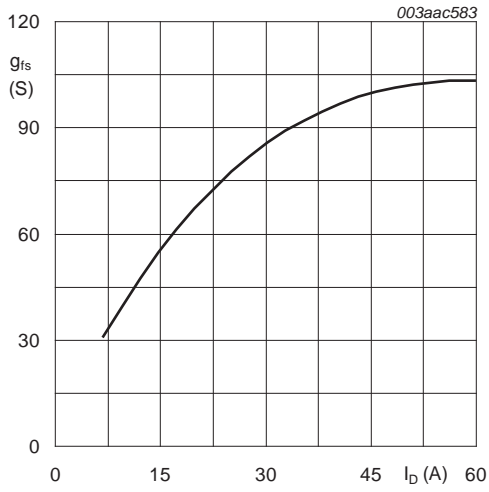


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

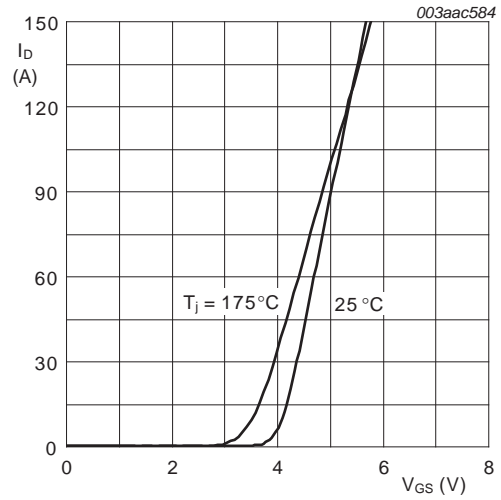
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	40	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	36	-	-	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 10	2	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ see Figure 10	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see Figure 10	-	-	4.4	V
I_{DSS}	drain leakage current	$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	μA
		$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	1	μA
I_{GSS}	gate leakage current	$V_{DS} = 0 \text{ V}; V_{GS} = 20 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	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 Figure 11	-	-	7.2	m Ω
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 11 ; see Figure 12	-	3	3.6	m Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 32 \text{ V}; V_{GS} = 10 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 13 ; see Figure 14	-	97	-	nC
Q_{GS}	gate-source charge	$T_j = 25 \text{ }^\circ\text{C};$ see Figure 13 ; see Figure 14	-	21	-	nC
Q_{GD}	gate-drain charge	$I_D = 25 \text{ A}; V_{DS} = 32 \text{ V}; V_{GS} = 10 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 14 ; see Figure 13	-	35	-	nC
C_{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 15	-	4391	5708	pF
C_{oss}	output capacitance	$T_j = 25 \text{ }^\circ\text{C};$ see Figure 15	-	800	1040	pF
C_{rSS}	reverse transfer capacitance		-	535	696	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \text{ } \Omega; V_{GS} = 10 \text{ V};$ $R_{G(ext)} = 10 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	40	-	ns
t_r	rise time		-	95	-	ns
$t_{d(off)}$	turn-off delay time		-	129	-	ns
t_f	fall time		-	92	-	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 contact screw on mounting base to centre of die ; $T_j = 25 \text{ }^\circ\text{C}$	-	3.5	-	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	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 16	-	0.83	1.2	V
t_{rr}	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A}/\mu\text{s};$ $V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	44	-	ns
Q_r	recovered charge		-	57	-	nC



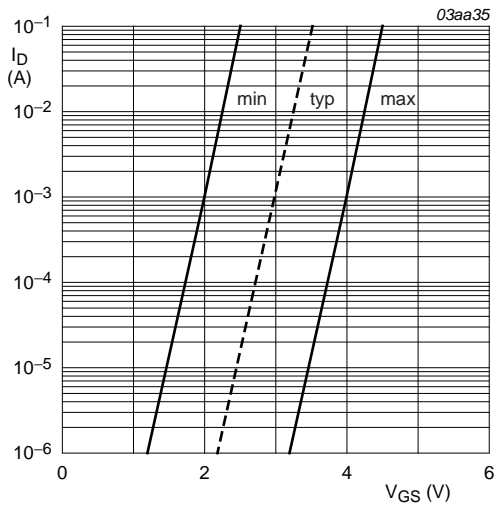
$T_j = 25^\circ\text{C}; V_{DS} = 25\text{V}$

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



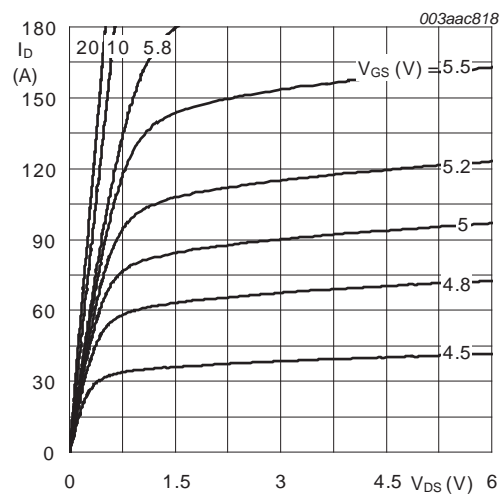
$V_{DS} = 25\text{V}$

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



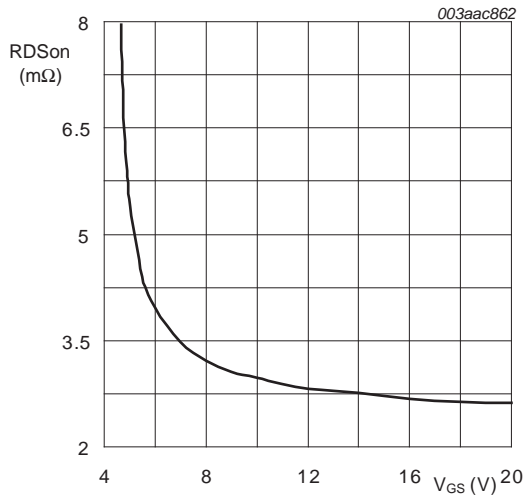
$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$

Fig 7. Sub-threshold drain current as a function of gate-source voltage



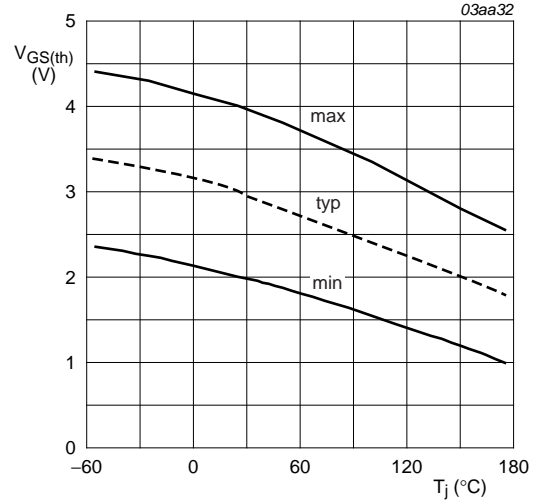
$T_j = 25^\circ\text{C}; t_p = 300\mu\text{s}$

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



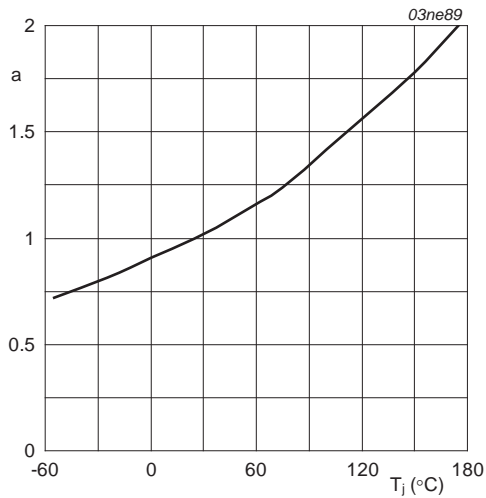
$T_j = 25^\circ\text{C}; I_D = 25\text{A}$

Fig 9. Drain-source on-state resistance as a function of gate voltage; typical values



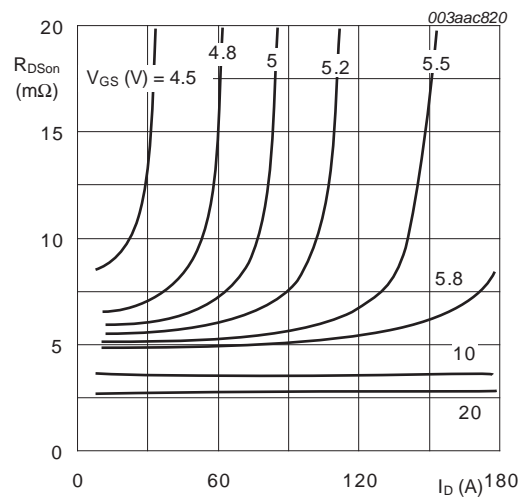
$I_D = 1\text{mA}; V_{DS} = V_{GS}$

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



$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

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



$T_j = 25^\circ\text{C}$

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

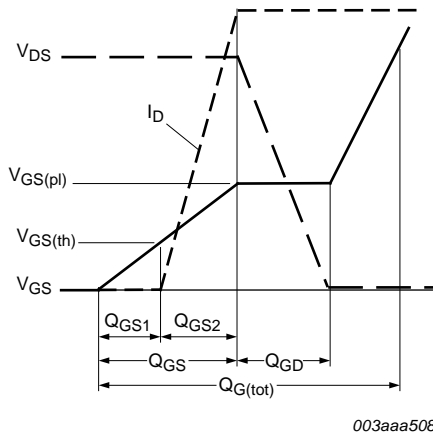


Fig 13. Gate charge waveform definitions

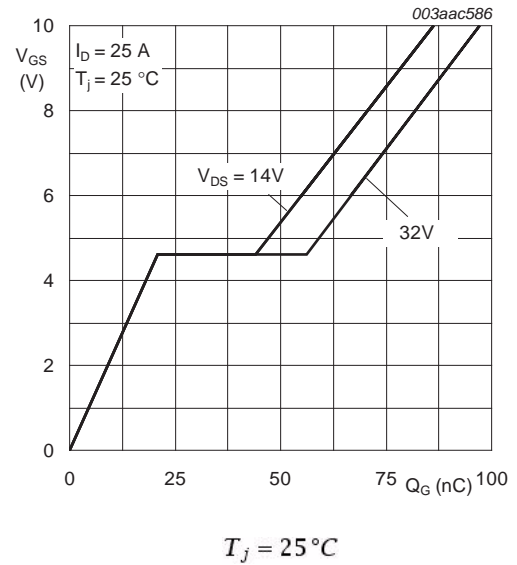


Fig 14. Gate-source voltage as a function of gate charge; typical values

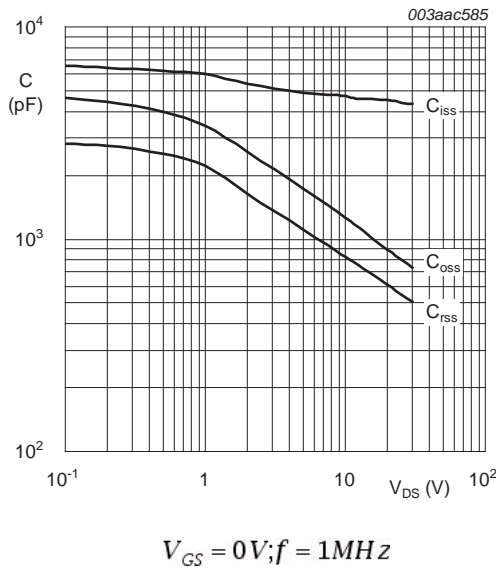


Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

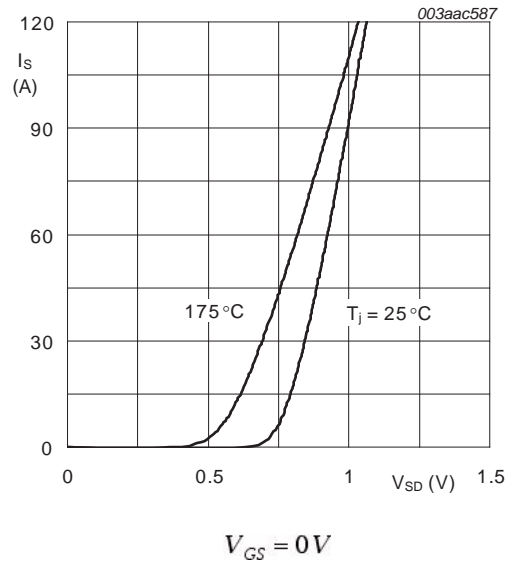


Fig 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

7. Package outline

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

SOT404

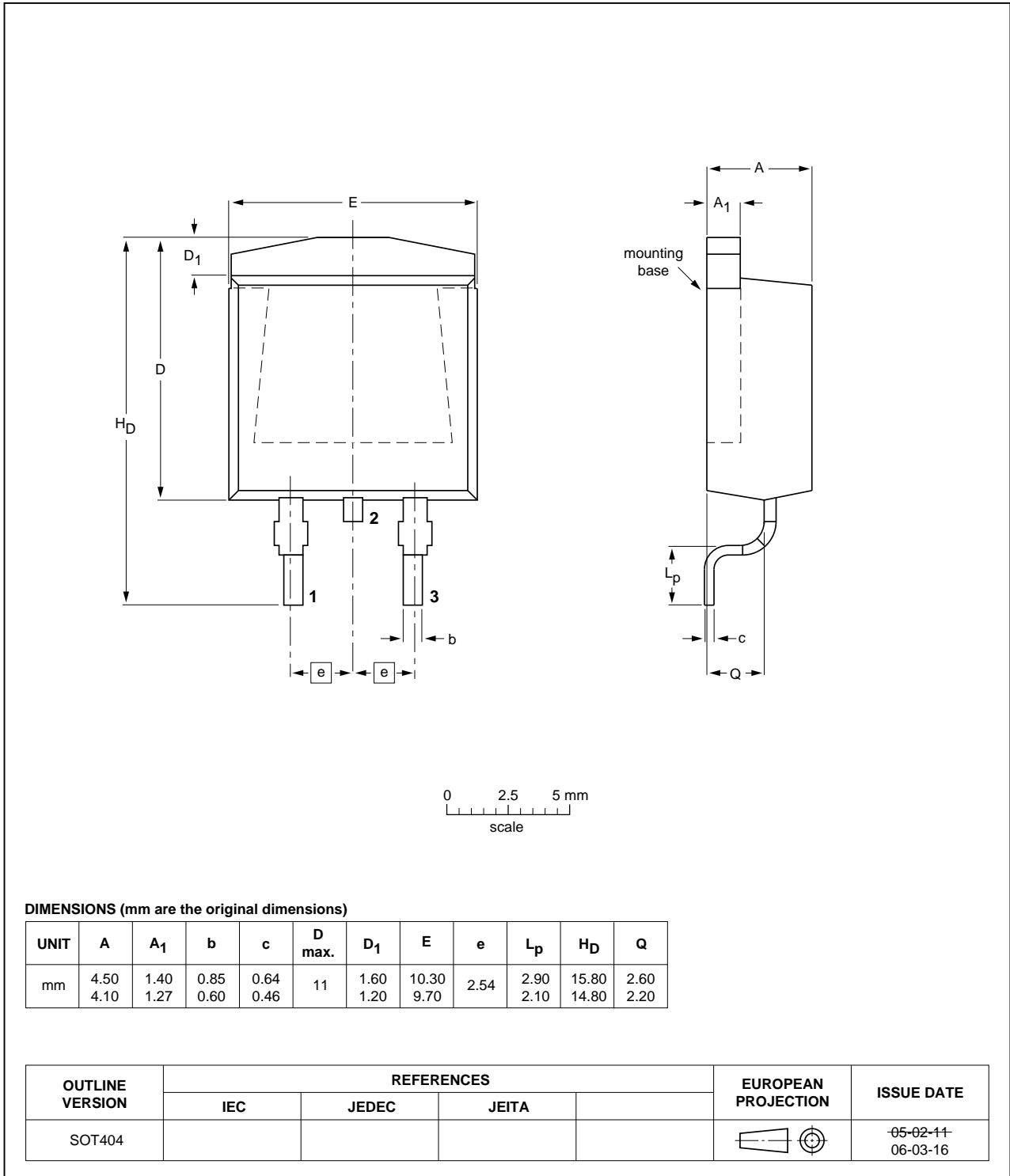


Fig 17. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK763R6-40C v.4	20100616	Product data sheet	-	BUK763R6-40C v.3
Modifications:	• Various changes to content.			
BUK763R6-40C v.3	20100602	Product 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.

[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.nexperia.com>.

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