

BUK7Y20-30B

N-channel TrenchMOS standard level FET Rev. 04 — 7 April 2010

Product data sheet

Product profile

1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using Nexperia High-Performance Automotive (HPA) 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

- Q101 compliant
- Suitable for standard level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

1.3 Applications

- 12 V Loads
- Automotive systems

- General purpose power switch
- Motors, lamps and solenoids

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	-	30	V
I _D	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 25 \text{ °C};$ see <u>Figure 1</u> ; see <u>Figure 4</u>	-	-	39.5	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	-	59	W
Static chara	acteristics					
R _{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 12}}{\text{See } \frac{\text{Figure 13}}{\text{Figure 13}}};$	-	16	20	mΩ
Avalanche	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	$I_D = 39.5 \text{ A}; V_{sup} \le 30 \text{ V};$ $R_{GS} = 50 \Omega; V_{GS} = 10 \text{ V};$ $T_{j(init)} = 25 ^{\circ}C; \text{ unclamped}$	-	-	45	mJ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$I_D = 20 \text{ A}; V_{DS} = 24 \text{ V};$ $V_{GS} = 10 \text{ V}; \text{ see } \frac{\text{Figure } 14}{\text{Figure } 14}$	-	3.84	-	nC



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source		_
2	S	source	mb	D
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain	1 2 3 4	mbb076 S
			SOT669 (LFPAK)	

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK7Y20-30B	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

Table 4. Limiting values

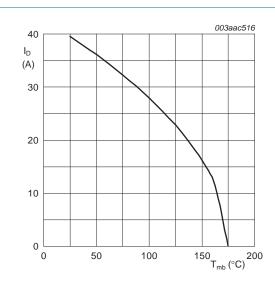
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Тур	Max	Unit
V_{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C		-	-	30	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20 \text{ k}\Omega$		-	-	30	V
V_{GS}	gate-source voltage			-20	-	20	V
I _D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; see <u>Figure 1</u> ; see <u>Figure 4</u>		-	-	39.5	Α
		$T_{mb} = 100 ^{\circ}\text{C}; V_{GS} = 10 \text{V}; \text{see} \underline{\text{Figure 1}}$		-	-	28	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; t_p ≤ 10 μs; pulsed; see Figure 4		-	-	158	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>		-	-	59	W
T _{stg}	storage temperature			-55	-	175	°C
Tj	junction temperature			-55	-	175	°C
Source-drain of	diode						
Is	source current	T _{mb} = 25 °C		-	-	39.5	Α
I _{SM}	peak source current	$t_p \le 10 \ \mu s$; pulsed; $T_{mb} = 25 \ ^{\circ}C$		-	-	158	Α
Avalanche rug	gedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	$\begin{split} I_D &= 39.5 \text{ A; V}_{\text{sup}} \leq 30 \text{ V; R}_{\text{GS}} = 50 \Omega; \\ V_{\text{GS}} &= 10 \text{ V; T}_{j(\text{init})} = 25 \text{ °C; unclamped} \end{split}$		-	-	45	mJ
E _{DS(AL)R}	repetitive drain-source avalanche energy	see Figure 3	[1][2][3]	-	-	-	J

^[1] Single-pulse avalanche rating limited by maximum junction temperature of 175 $^{\circ}$ C.

^[2] Repetitive avalanche rating limited by an average junction temperature of 170 °C.

^[3] Refer to application note AN10273 for further information.



120
Poder (%)
80

40

40 T_{mb} (°C) T_{mb} (°C) T_{mb} (°C)

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

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

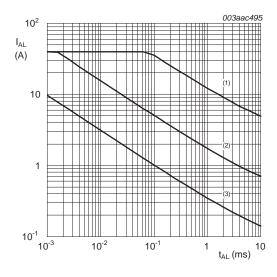
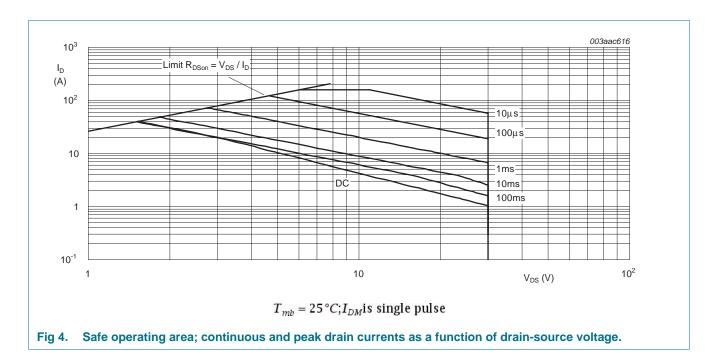


Fig 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

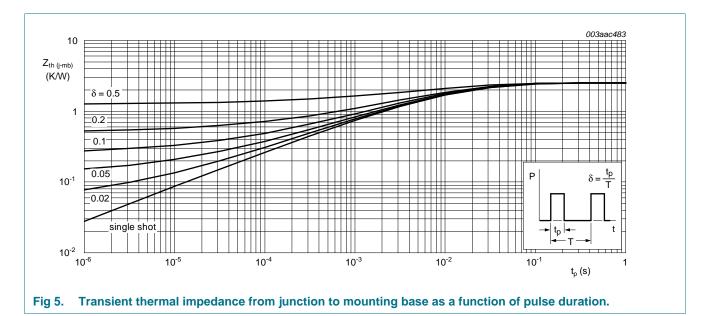
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5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see <u>Figure 5</u>	-	-	2.53	K/W



6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	racteristics					
V _{(BR)DSS}	drain-source	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 °C$	30	-	-	V
bre	breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 °C$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ °C}$; see <u>Figure 10</u> ; see <u>Figure 11</u>	2	3	4	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = -55$ °C; see <u>Figure 10</u>	-	-	4.4	V
		$I_D = 1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 175 \text{ °C}$; see Figure 10	1	-	-	V
I _{DSS}	drain leakage current	$V_{DS} = 30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C}$	-	0.02	1	μΑ
		$V_{DS} = 30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ °C}$	-	-	500	μΑ
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
Doon	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A}; T_j = 175 ^{\circ}\text{C};$ see Figure 12	-	-	38	mΩ
		$V_{GS} = 10 \text{ V}$; $I_D = 20 \text{ A}$; $T_j = 25 \text{ °C}$; see Figure 12; see Figure 13	-	16	20	mΩ
Dynamic o	haracteristics					
Q _{G(tot)}	total gate charge	$I_D = 20 \text{ A}; V_{DS} = 24 \text{ V}; V_{GS} = 10 \text{ V};$	-	11.2	-	nC
Q _{GS}	gate-source charge	see Figure 14	-	3.75	-	nC
Q_{GD}	gate-drain charge		-	3.84	-	nC
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	516	688	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 15</u>	-	188	226	pF
C _{rss}	reverse transfer capacitance		-	94	129	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 25 \text{ V}; R_L = 1.25 \Omega; V_{GS} = 10 \text{ V};$	-	9.5	-	ns
t _r	rise time	$R_{G(ext)} = 10 \Omega$	-	18	-	ns
t _{d(off)}	turn-off delay time		-	20.5	-	ns
t _f	fall time		-	10	-	ns
Source-dr	ain diode					
V_{SD}	source-drain voltage	$I_S = 20 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ °C}$; see Figure 16	-	0.85	1.2	V
t _{rr}	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A/}\mu\text{s}; V_{GS} = 0 \text{ V};$	-	28	-	ns
Q _r	recovered charge	$V_{DS} = 25 \text{ V}$	-	27.4	-	nC

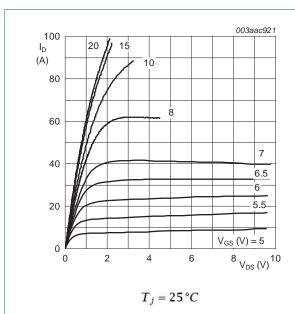


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values.

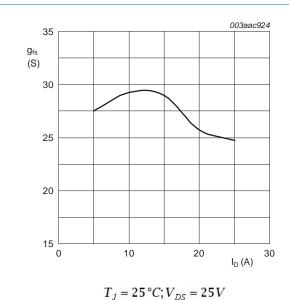


Fig 8. Forward transconductance as a function of drain current; typical values.

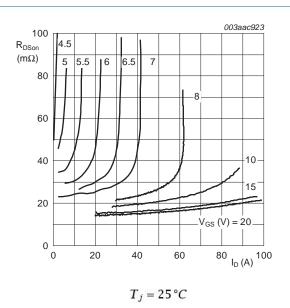


Fig 7. Drain-source on-state resistance as a function of drain current; typical values.

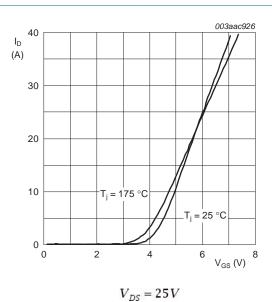


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values.

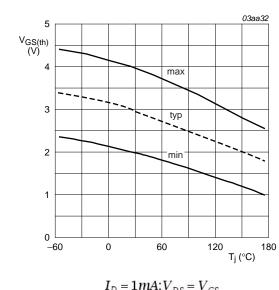
. typ

max

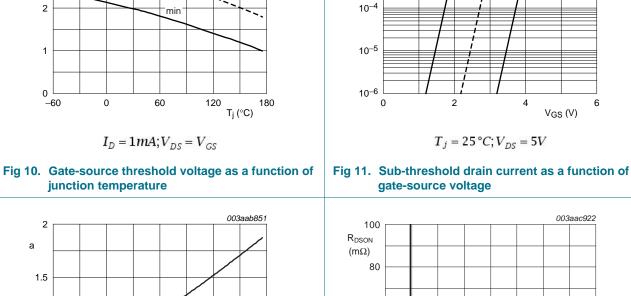
6

003aac922

min



junction temperature

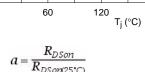


10-1

10-2

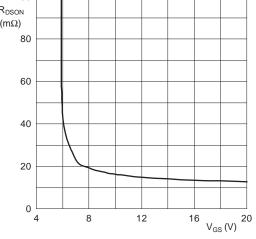
10-3

I_D (A)



60

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



 $T_j = 25 \,^{\circ}C; I_D = 20A$

Fig 13. Drain-source on-state resistance as a function of gate-source voltage; typical values.

0.5

-60

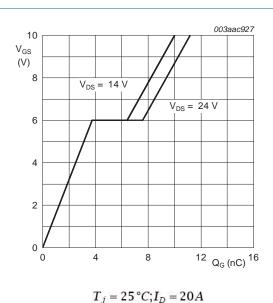


Fig 14. Gate-source voltage as a function of gate charge; typical values.

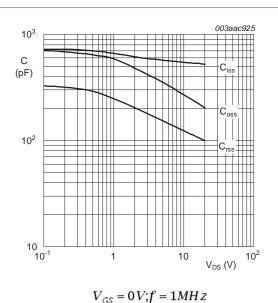


Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical

values.

 $V_{GS} \ge 0 \, V$

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 (LFPAK); 4 leads

SOT669

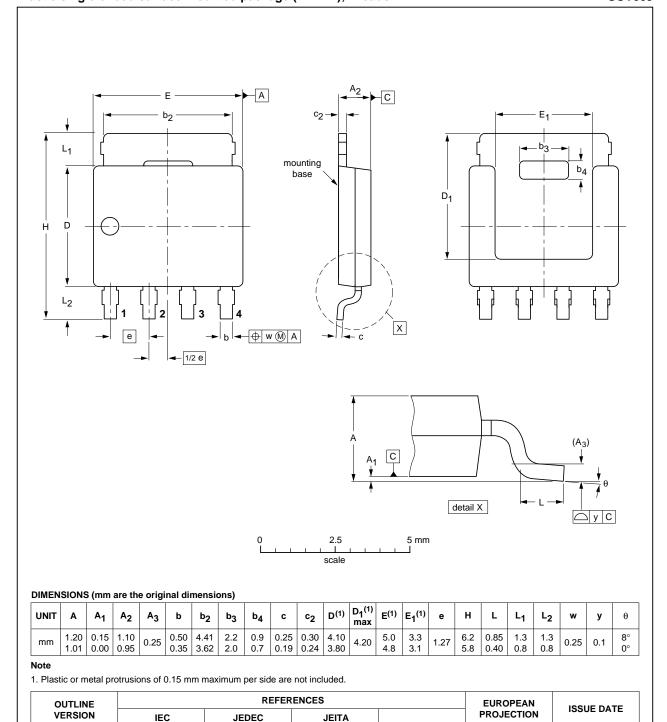


Fig 17. Package outline SOT669 (LFPAK)

BUK7Y20-30B

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MO-235

04-10-13

06-03-16

SOT669

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
BUK7Y20-30B_4	20100407	Product data sheet	-	BUK7Y20-30B_3	
Modifications: • Status changed from objective to product					
BUK7Y20-30B_3	20100217	Objective data sheet	-	BUK7Y20-30B_2	

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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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