BUK652R1-30C

N-channel TrenchMOS intermediate level FET

Rev. 01 — 5 July 2010 Objective data sheet

1. Product profile

1.1 General description

Intermediate 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 Q101 standard for use in high performance automotive applications.

1.2 Features and benefits

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

1.3 Applications

- 12 V Automotive systems
- HVAC
- Motors, lamps and solenoid control
- Start-Stop micro-hybrid applications
- Ultra high performance power switching

1.4 Quick reference data

Table 1. Quick reference data

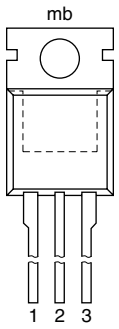
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	-	30	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 25 °C	[1]	-	-	100	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 1		-	-	262	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C; see Figure 3		-	1.8	2.1	mΩ
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; unclamped		-	-	1.7	J

[1] Continuous current is limited by package.

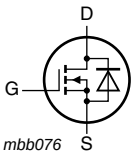
2. Pinning information

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		



SOT78 (TO-220AB)



3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK652R1-30C	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

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

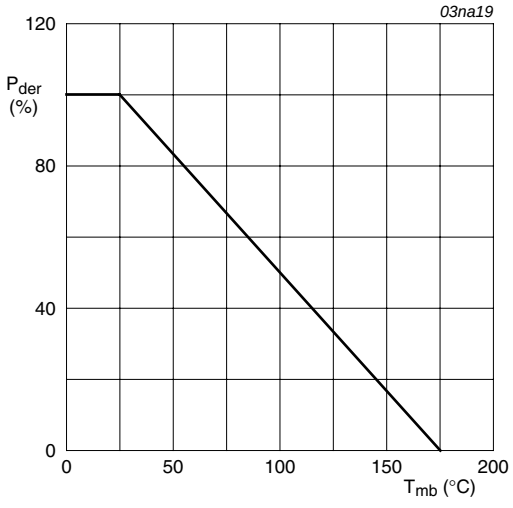
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	-	30	V
V_{GS}	gate-source voltage			-20	-	20	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V	[1]	-	-	100	A
		$T_{mb} = 100$ °C; $V_{GS} = 10$ V	[1]	-	-	100	A
I_{DM}	peak drain current	$T_{mb} = 25$ °C; $t_p \leq 10$ µs; pulsed		-	-	977	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 1		-	-	262	W
T_{stg}	storage temperature			-55	-	175	°C
T_j	junction temperature			-55	-	175	°C
Source-drain diode							
I_S	source current	$T_{mb} = 25$ °C	[1]	-	-	100	A
I_{SM}	peak source current	$t_p \leq 10$ µs; pulsed; $T_{mb} = 25$ °C		-	-	977	A
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; unclamped		-	-	1.7	J
$E_{DS(AL)R}$	repetitive drain-source avalanche energy		[2][3][4]	-	-	-	J

[1] Continuous current is limited by package.

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

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

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



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

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

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		-	-	0.57	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W

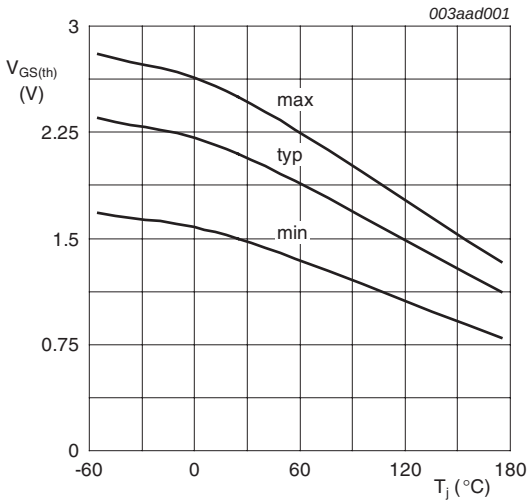
6. Characteristics

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
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 2	1.5	2.1	2.5	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 2	-	-	2.8	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; see Figure 2	0.8	-	-	V
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 = 15 A; T_j = 25 °C; see Figure 3	-	1.8	2.1	mΩ
		V_{GS} = 4.5 V; I_D = 15 A; T_j = 25 °C; see Figure 3	-	[tbd]	[tbd]	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 175 °C; see Figure 3	-	-	4.4	mΩ
		V_{GS} = 5 V; I_D = 15 A; T_j = 25 °C; see Figure 3	-	[tbd]	[tbd]	mΩ
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 24 V; V_{GS} = 5 V	-	[tbd]	[tbd]	nC
		I_D = 25 A; V_{DS} = 24 V; V_{GS} = 10 V	-	[tbd]	[tbd]	nC
Q_{GS}	gate-source charge		-	[tbd]	[tbd]	nC
Q_{GD}	gate-drain charge		-	[tbd]	[tbd]	nC
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C	-	[tbd]	[tbd]	pF
C_{oss}	output capacitance		-	[tbd]	[tbd]	pF
C_{rss}	reverse transfer capacitance		-	[tbd]	[tbd]	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 25 V; R_L = 1 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 10 Ω	-	[tbd]	[tbd]	ns
t_r	rise time		-	[tbd]	[tbd]	ns
$t_{d(off)}$	turn-off delay time		-	[tbd]	[tbd]	ns
t_f	fall time		-	[tbd]	[tbd]	ns
L_D	internal drain inductance	from drain lead 6 mm from package to centre of die ; T_j = 25 °C	-	4.5	-	nH
		from contact screw on mounting base to centre of die ; T_j = 25 °C	-	3.5	-	nH
L_S	internal source inductance	from source lead to source bond pad ; T_j = 25 °C	-	7.5	-	nH

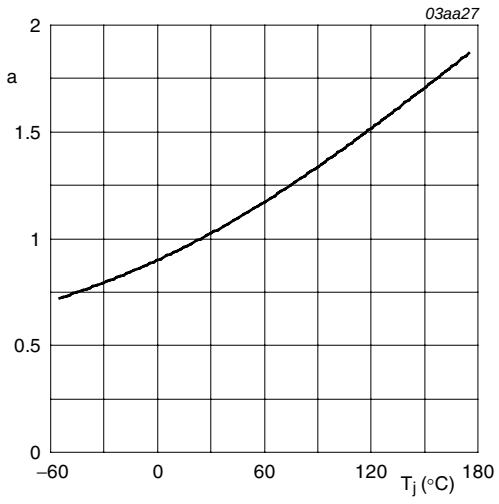
Table 6. Characteristics *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C	-	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	-	[tbd]	[tbd]	ns
Q_r	recovered charge		-	[tbd]	[tbd]	nC



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

Fig 2. Gate-source threshold voltage as a function of junction temperature

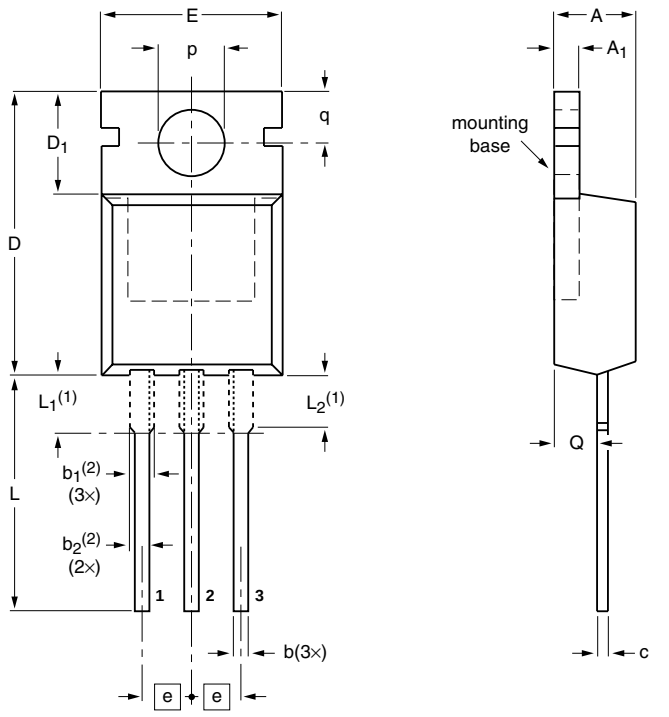


$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

Fig 3. Normalized drain-source on-state resistance factor as a function of junction temperature

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1(2)	b_2(2)	c	D	D_1	E	e	L	L_1(1)	L_2(1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

Notes

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~08-04-23~~ 08-06-13

Fig 4. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK652R1-30C v.1	20100705	Objective 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".

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Date of release: 5 July 2010
Document identifier: BUK652R1-30C