

BUK7Y12-55B

N-channel TrenchMOS standard level FET Rev. 03 — 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 and 24 V loads
- Advanced braking systems (ABS)
- Automotive systems

- General purpose power switching
- 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	-	-	55	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>	-	-	61.8	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	-	105	W
Static chara	acteristics					
R _{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure } 13}{\text{Figure } 12};$ see Figure 12	-	8.2	12	mΩ
Avalanche	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 61.8 A; $V_{sup} \le 55$ V; R_{GS} = 50 Ω ; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped	-	-	129	mJ
Dynamic ch	naracteristics					
Q_{GD}	gate-drain charge	$I_D = 20 \text{ A}; V_{DS} = 44 \text{ V};$ $V_{GS} = 10 \text{ V}; \text{ see } \frac{\text{Figure } 14}{\text{Figure } 14}$	-	14.8	-	nC



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source		
2	S	source	mb	D D
3	S	source		
4	G	gate		<u></u>
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
BUK7Y12-55B	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

Table 4. Limiting values

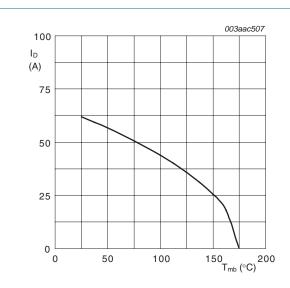
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Тур	Max	Unit
V_{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C		-	-	55	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20 \text{ k}\Omega$		-	-	55	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>		-	-	61.8	Α
		$T_{mb} = 100 ^{\circ}\text{C}; V_{GS} = 10 \text{V}; \text{see} \frac{\text{Figure 1}}{}$		-	-	43.7	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; $t_p \le 10 \mu s$; pulsed; see Figure 4		-	-	247	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>		-	-	105	W
T _{stg}	storage temperature			-55	-	175	°C
Tj	junction temperature			-55	-	175	°C
Source-drain	diode						
Is	source current	T _{mb} = 25 °C		-	-	61.8	Α
I _{SM}	peak source current	$t_p \le 10 \ \mu s$; pulsed; $T_{mb} = 25 \ ^{\circ}C$		-	-	247	Α
Avalanche rug	ggedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	$I_D = 61.8 \text{ A; } V_{sup} \le 55 \text{ V; } R_{GS} = 50 \Omega;$ $V_{GS} = 10 \text{ V; } T_{j(init)} = 25 \text{ °C; unclamped}$		-	-	129	mJ
E _{DS(AL)R}	repetitive drain-source avalanche energy	see <u>Figure 3</u>	[1][2][3]	-	-	-	J

^[1] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.

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

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



Pder (%)

80

40 $P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$

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

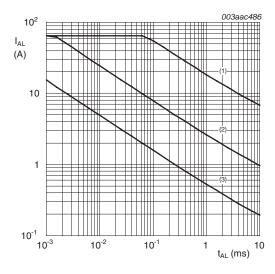
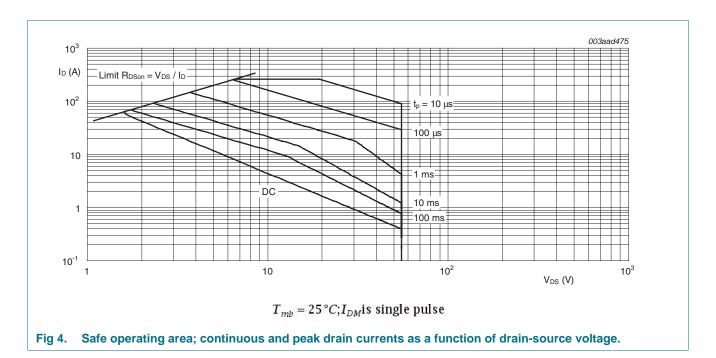


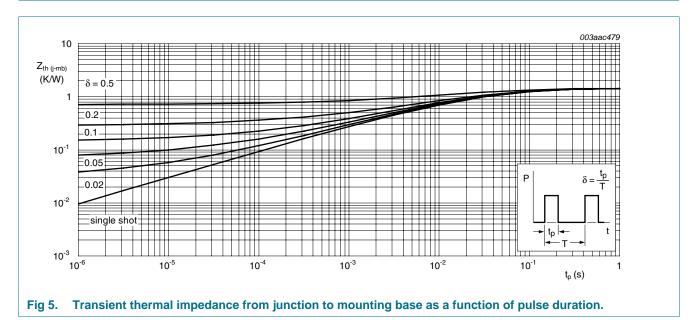
Fig 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time



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 Figure 5	-	-	1.42	K/W



6. Characteristics

Table 6. Characteristics

Table 6.	Characteristics					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	racteristics					
(DIX)DOO	drain-source	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 °C$	55	-	-	V
	breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 °C$	50	-	-	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 Figure 10	-	-	4.4	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see Figure 10	1	-	-	V
I _{DSS}	drain leakage current	$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.02	1	μΑ
		$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ °C}$	-	-	500	μΑ
I _{GSS}	gate leakage current	V _{DS} = 0 V; V _{GS} = 20 V; T _j = 25 °C	-	2	100	nA
		$V_{DS} = 0 \text{ V}; V_{GS} = -20 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nA
R _{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 20 A; T_j = 175 °C; see <u>Figure 12</u> ; see <u>Figure 13</u>	-	-	27.6	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A}; T_j = 25 ^{\circ}\text{C};$ see Figure 13; see Figure 12	-	8.2	12	mΩ
Dynamic	characteristics					
Q _{G(tot)}	total gate charge	$I_D = 20 \text{ A}; V_{DS} = 44 \text{ V}; V_{GS} = 10 \text{ V};$	-	35.2	-	nC
Q_{GS}	gate-source charge	see Figure 14	-	9.24	-	nC
Q_{GD}	gate-drain charge		-	14.8	-	nC
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	1550	2067	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 15</u>	-	328	394	pF
C _{rss}	reverse transfer capacitance		-	153	210	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.5 \Omega; V_{GS} = 10 \text{ V};$	-	19.3	-	ns
t _r	rise time	$R_{G(ext)} = 10 \Omega$	-	29.4	-	ns
t _{d(off)}	turn-off delay time		-	43.2	-	ns
t _f	fall time		-	22	-	ns
Source-d	rain diode					
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}$; $V_{GS} = 25 \text{ V}$; $T_j = 25 \text{ °C}$; see Figure 16	-	0.85	1.2	V
t _{rr}	reverse recovery time	$I_S = 20 \text{ A}$; $dI_S/dt = -100 \text{ A/}\mu\text{s}$; $V_{GS} = 0 \text{ V}$;	-	45	-	ns
Q _r	recovered charge	V _{DS} = 30 V	-	84	-	nC

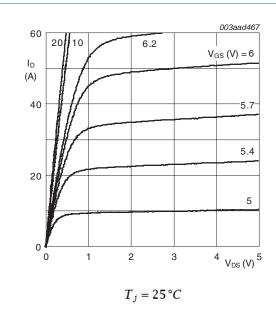


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values.

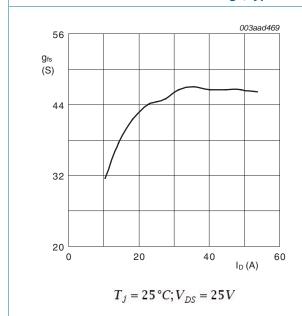


Fig 8. Forward transconductance as a function of drain current; typical values.

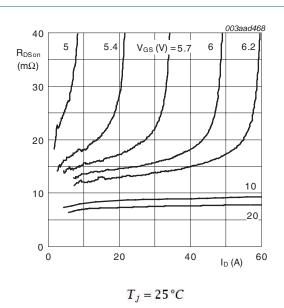


Fig 7. Drain-source on-state resistance as a function of drain current; typical values.

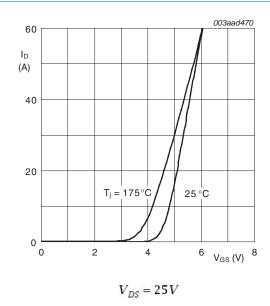


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values.

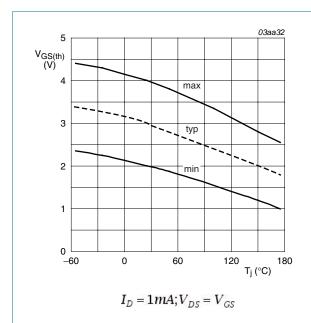
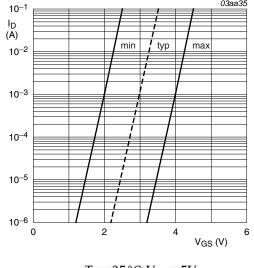


Fig 10. Gate-source threshold voltage as a function of junction temperature



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

Fig 11. Sub-threshold drain current as a function of gate-source voltage

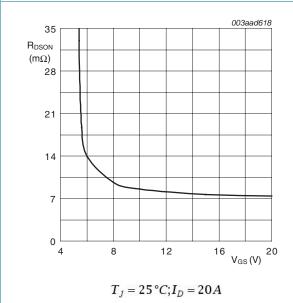


Fig 12. Drain-source on-state resistance as a function of gate-source voltage; typical values.

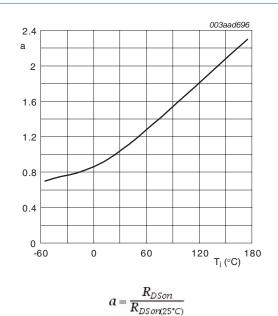


Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature.

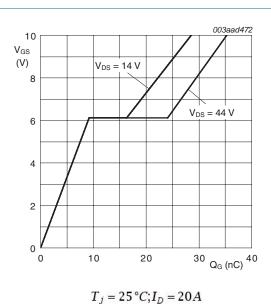
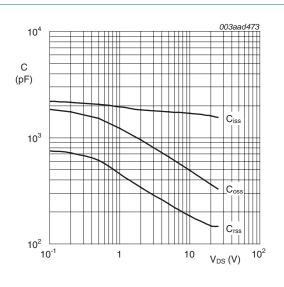
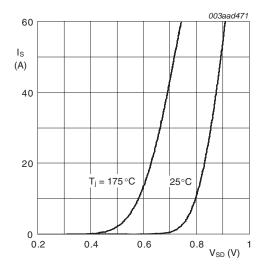


Fig 14. Gate-source voltage as a function of gate charge; typical values.



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

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



 $V_{GS} = 0V$

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

Package outline

Plastic single-ended surface-mounted package (LFPAK); 4 leads

SOT669

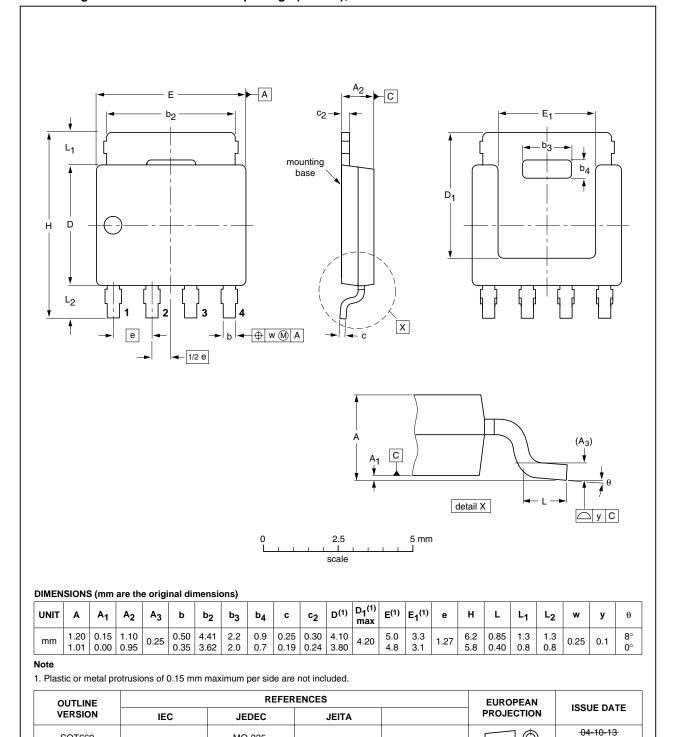


Fig 17. Package outline SOT669 (LFPAK)

BUK7Y12-55B

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SOT669

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK7Y12-55B_3	20100407	Product data sheet	-	BUK7Y12-55B_2
Modifications:	 Status cha 	nged from objective to pr	oduct.	
BUK7Y12-55B_2	20100218	Objective data sheet	-	BUK7Y12-55B_1

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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N-channel TrenchMOS standard level FET

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