

N-channel 40 V, 6.7 mΩ logic level MOSFET in LFPAK33

29 January 2019

Product data sheet

1. General description

Automotive qualified logic level N-channel MOSFET in an LFPAK33 package using Trench 9 TrenchMOS technology. This product has been designed and qualified to AEC-Q101 for use in high performance automotive applications.

2. Features and benefits

- Fully automotive qualified to AEC-Q101 at 175 °C
- Trench 9 superjunction technology:
- · Low power losses, high power density
- LFPAK copper clip package technology:
 - High robustness and reliability
 - Gull wing leads for high manufacturability and AOI
- Repetitive avalanche rated

3. Applications

- 12 V automotive systems
- · Powertrain, chassis, body and infotainment applications
- Medium/Low power motor drive
- DC-DC systems
- LED lighting

4. Quick reference data

Symbol	Parameter	Conditions		Min	Тур	Мах	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	-	40	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; <u>Fig. 2</u>	[1]	-	-	50	А
P _{tot}	total power dissipation	T _{mb} = 25 °C; <u>Fig. 1</u>		-	-	65	W
Static char	acteristics	·					
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 20 A; T _j = 25 °C; Fig. 11		3.8	5.5	6.7	mΩ
Dynamic c	haracteristics						
Q _{GD}	gate-drain charge	I_D = 20 A; V_{DS} = 20 V; V_{GS} = 4.5 V; Fig. 13; Fig. 14		-	2.5	5	nC
Source-dra	iin diode	·		·			
Q _r	recovered charge	I_{S} = 20 A; dI _S /dt = -100 A/µs; V _{GS} = 0 V; V _{DS} = 20 V; T _i = 25 °C		-	16	-	nC

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Symbol	Parameter	Conditions	Min	Тур	Max	Unit
S		$ I_S = 20 \text{ A}; \text{dI}_S/\text{dt} = -100 \text{ A}/\mu\text{s}; \text{V}_{\text{GS}} = 0 \text{ V}; \\ \text{V}_{\text{DS}} = 20 \text{ V}; \text{T}_j = 25 ^\circ\text{C}; \overline{\text{Fig. 17}} $	-	0.6	-	

[1] 50A continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.

5. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source		D
2	S	source		
3	S	source		G (H
4	G	gate		mbb076 S
mb	D	Mounting base; connected to drain	LFPAK33 (SOT1210)	

6. Ordering information

Table 3. Ordering information								
Type number	e number Package							
	Name	Description	Version					
BUK9M6R7-40H	LFPAK33	Plastic, single ended surface mounted package (LFPAK33); 8 leads; 0.65 mm pitch	SOT1210					

7. Marking

Table 4. Marking codes				
Type number	Marking code			
BUK9M6R7-40H	96H740			

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	40	V
V _{GS}	gate-source voltage	DC; T _j ≤ 175 °C		-10	16	V
P _{tot}	total power dissipation	T _{mb} = 25 °C; <u>Fig. 1</u>		-	65	W
ID	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; <u>Fig. 2</u>	[1]	-	50	А
		V _{GS} = 10 V; T _{mb} = 100 °C; <u>Fig. 2</u>		-	50	А
I _{DM}	peak drain current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$; Fig. 3		-	282	А
T _{stg}	storage temperature			-55	175	°C
Tj	junction temperature			-55	175	°C
Source-drai	n diode					

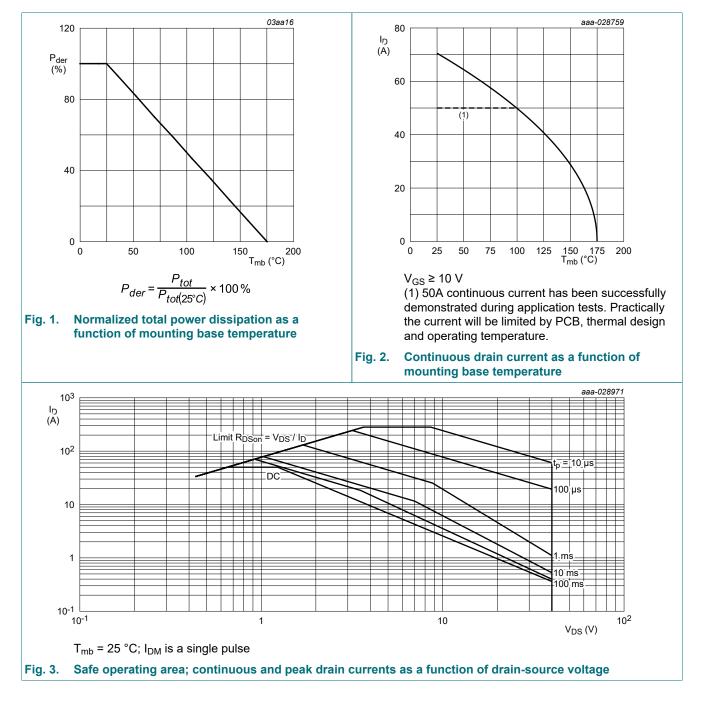
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Symbol	Parameter	Conditions		Min	Max	Unit
I _S	source current	T _{mb} = 25 °C		-	50	А
I _{SM}	peak source current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$		-	282	А
Avalanche rug	ggedness					
E _{DS(AL)S}	non-repetitive drain- source avalanche energy	$\label{eq:ld} \begin{array}{l} I_{D} = 50 \; A; \; V_{sup} \leq \; 40 \; V; \; R_{GS} = 50 \; \Omega; \\ V_{GS} = \; 10 \; V; \; T_{j(init)} = 25 \; ^{\circ}C; \; unclamped; \\ \hline Fig. \; \frac{4}{} \end{array}$	[2] [3]	-	28	mJ

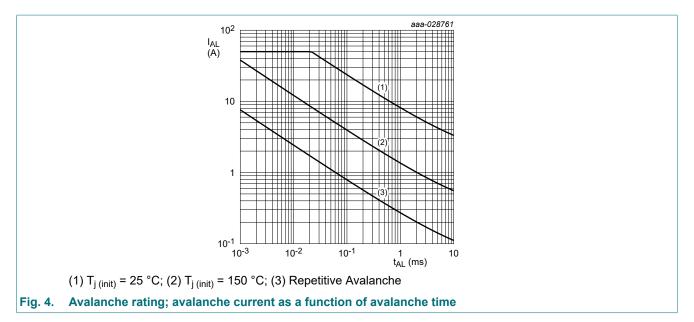
[1] 50A continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.

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

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

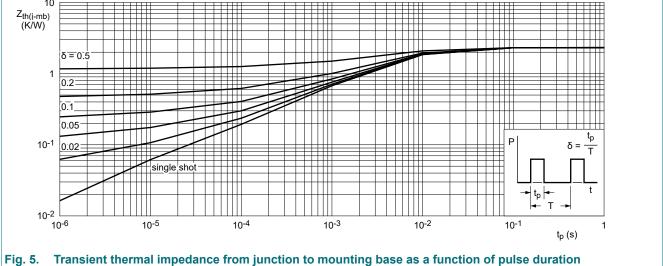


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9. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
R _{th(j-mb)}	thermal resistance from junction to mounting base	Fig. <u>5</u>	-	2.09	2.32	K/W
					a-028762	



10. Characteristics

Table 7. Cha	racteristics					
Symbol	Parameter	Conditions	Min	Тур	Мах	Unit
Static chara	octeristics					
V _{(BR)DSS}	drain-source	I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	40	43	-	V
	, breakdown voltage	I_D = 250 µA; V_{GS} = 0 V; T_j = -40 °C	-	40.5	-	V

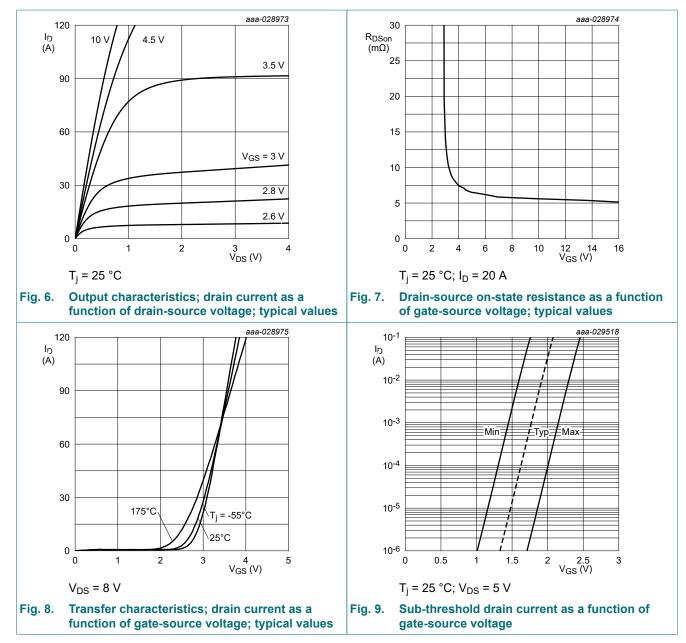
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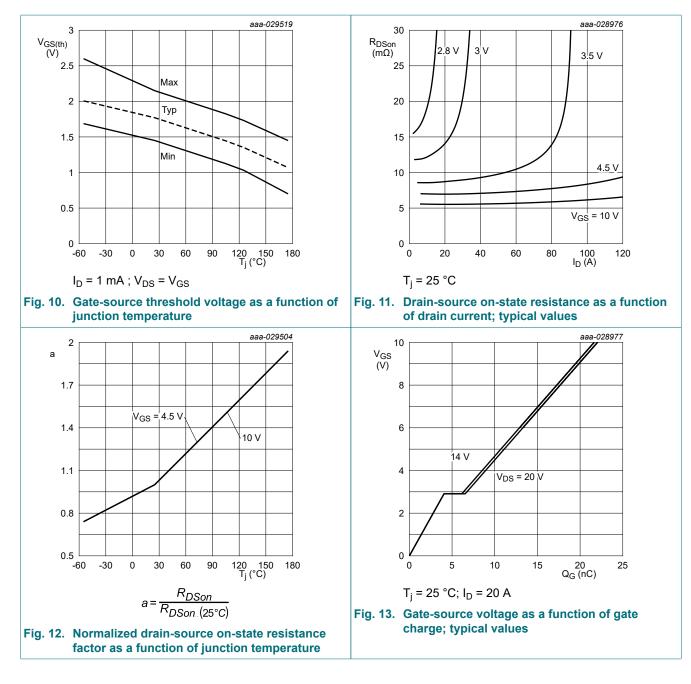
Symbol	Parameter	Conditions	Min	Тур	Мах	Unit
		I _D = 250 μA; V _{GS} = 0 V; T _j = -55 °C	36	40	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 25 °C; <u>Fig. 9</u> ; Fig. 10	1.45	1.77	2.15	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = -55 °C; <u>Fig. 10</u>	-	-	2.6	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 175 °C; Fig. 10	0.7	-	-	V
I _{DSS}	drain leakage current	V _{DS} = 40 V; V _{GS} = 0 V; T _j = 25 °C	-	0.02	5	μA
		V _{DS} = 16 V; V _{GS} = 0 V; T _j = 125 °C	-	0.51	10	μA
		V _{DS} = 40 V; V _{GS} = 0 V; T _j = 175 °C	-	44	500	μA
I _{GSS}	gate leakage current	V _{GS} = 16 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
		V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 20 A; T _j = 25 °C; <u>Fig. 11</u>	3.8	5.5	6.7	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _j = 105 °C; <u>Fig. 12</u>	5.2	8	10	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _j = 125 °C; <u>Fig. 12</u>	5.7	8.7	10.8	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _j = 175 °C; <u>Fig. 12</u>	6.9	10.5	13	mΩ
	V _{GS} = 4.5 V; I _D = 15 A; T _j = 25 °C; Fig. 11	4.9	7	8.6	mΩ	
		V _{GS} = 4.5 V; I _D = 15 A; T _j = 105 °C; Fig. 12	6.7	9.9	12.9	mΩ
	V _{GS} = 4.5 V; I _D = 15 A; T _j = 125 °C; Fig. 12	7.4	10.8	13.9	mΩ	
		V _{GS} = 4.5 V; I _D = 15 A; T _j = 175 °C; Fig. 12	9	13	16.7	mΩ
R _G	gate resistance	f = 1 MHz; T _j = 25 °C	0.3	0.8	1.9	Ω
Dynamic ch	naracteristics	· · · ·			_	
Q _{G(tot)}	total gate charge	$I_{D} = 20 \text{ A}; V_{DS} = 20 \text{ V}; V_{GS} = 10 \text{ V};$ Fig. 13; Fig. 14	-	22	31	nC
		$I_D = 20 \text{ A}; V_{DS} = 20 \text{ V}; V_{GS} = 4.5 \text{ V};$	-	10	14	nC
Q _{GS}	gate-source charge	Fig. 13; Fig. 14	-	4.1	6.2	nC
Q _{GD}	gate-drain charge		-	2.5	5	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz;	-	1467	2054	pF
C _{oss}	output capacitance	T _j = 25 °C; <u>Fig. 15</u>	-	390	546	pF
C _{rss}	reverse transfer capacitance		-	59	130	pF
t _{d(on)}	turn-on delay time	V_{DS} = 20 V; R _L = 1 Ω; V _{GS} = 4.5 V;	-	15	-	ns
t _r	rise time	$R_{G(ext)} = 5 \Omega$	-	21	-	ns
t _{d(off)}	turn-off delay time] [-	14	-	ns
t _f	fall time		-	10	-	ns
Source-drai	in diode					
V _{SD}	source-drain voltage	I _S = 20 A; V _{GS} = 0 V; T _j = 25 °C; <u>Fig. 16</u>	-	0.85	1.2	V
t _{rr}	reverse recovery time	$I_{S} = 20 \text{ A}; \text{ dI}_{S}/\text{dt} = -100 \text{ A}/\mu\text{s}; \text{ V}_{GS} = 0 \text{ V}; \\ \text{V}_{DS} = 20 \text{ V}; \text{ T}_{j} = 25 \text{ °C}; \frac{\text{Fig. 17}}{2}$	-	23	-	ns
Q _r	recovered charge	I_{S} = 20 A; dI _S /dt = -100 A/µs; V _{GS} = 0 V; V _{DS} = 20 V; T _i = 25 °C	-	16	-	nC

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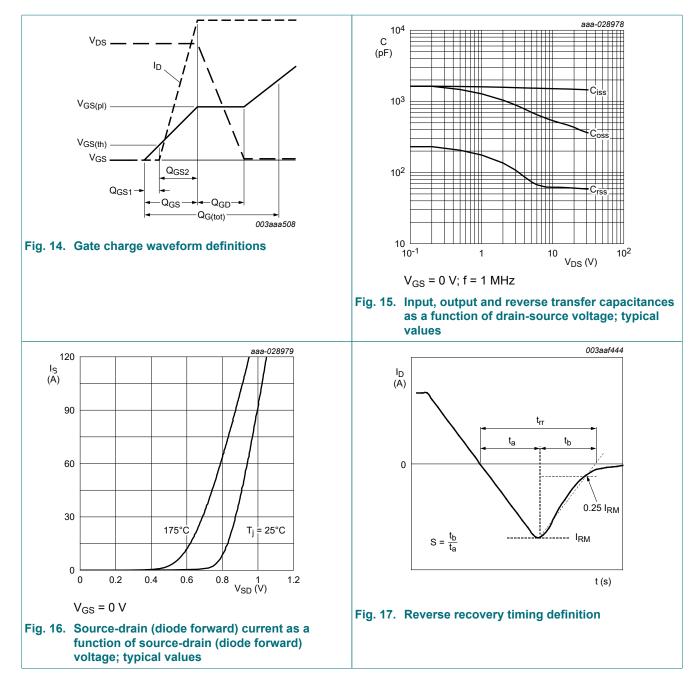
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Symbol	Parameter	Conditions	Min	Тур	Мах	Unit
S	softness factor	$I_{S} = 20 \text{ A}; \text{ d}I_{S}/\text{d}t = -100 \text{ A}/\mu\text{s}; \text{ V}_{GS} = 0 \text{ V}; \\ \text{V}_{DS} = 20 \text{ V}; \text{ T}_{j} = 25 ^{\circ}\text{C}; \text{ Fig. 17}$	-	0.6	-	
		$I_{S} = 20 \text{ A}; \text{ d}I_{S}/\text{d}t = -500 \text{ A}/\mu\text{s}; V_{GS} = 0 \text{ V}; \\ V_{DS} = 20 \text{ V}; T_{j} = 25 ^{\circ}\text{C}; \overline{\text{Fig. }17}$	-	0.43	-	



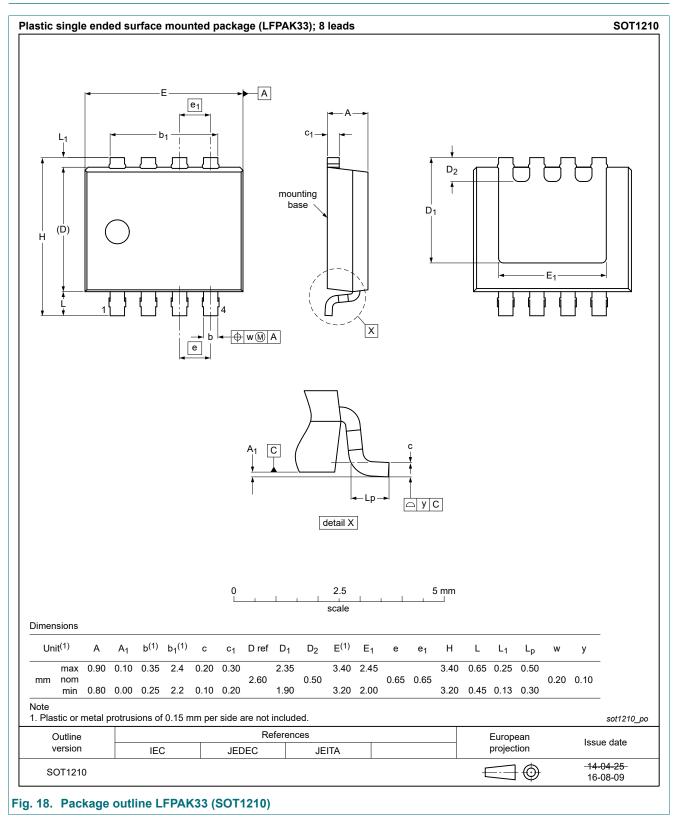


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Product data sheet

11. Package outline



12. Legal information

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.

 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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BUK9M6R7-40H



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