

BUK7M17-80E

N-channel 80 V, 17 mΩ standard level MOSFET in LFPAK33
19 September 2016 Product data sheet

1. General description

Standard level N-channel MOSFET in an LFPAK33 (Power33) package using TrenchMOS technology. This product has been designed and qualified to AEC Q101 standard for use in high performance automotive applications.

2. Features and benefits

- Q101 Compliant
- Repetitive avalanche rated
- Suitable for thermally demanding environments due to 175 °C rating
- True standard level gate with V_{GS(th)} rating of greater than 1 V at 175 °C

3. Applications

- 12 V, 24 V and 48 V automotive systems
- Motors, lamps and solenoid control
- Transmission control
- · Ultra high performance power switching

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Тур	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	-	80	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; <u>Fig. 2</u>		-	-	43	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; <u>Fig. 1</u>		-	-	79	W
Static characte	Static characteristics						
R _{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ °C};$ Fig. 11		-	14	17	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	$I_D = 10 \text{ A}; V_{DS} = 64 \text{ V}; V_{GS} = 10 \text{ V};$ $T_j = 25 \text{ °C}; \underline{\text{Fig. 13}}; \underline{\text{Fig. 14}}$		-	9.7	-	nC



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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	Source		D I
2	S	Source		
3	S	Source		G L A
4	G	Gate		mbb076 S
mb	D	Mounting base; connected to drain	LFPAK33 (SOT1210)	

6. Ordering information

Table 3. Ordering information

Type number	Package				
	Name	Description	Version		
BUK7M17-80E	LFPAK33	Plastic single ended surface mounted package (LFPAK33); 8 leads	SOT1210		

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK7M17-80E	71780E

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	-	80	V
V_{DGR}	drain-gate voltage	R_{GS} = 20 k Ω	-	80	V
V_{GS}	gate-source voltage	DC; T _j ≤ 175 °C	-20	20	V
P _{tot}	total power dissipation	T _{mb} = 25 °C; <u>Fig. 1</u>	-	79	W
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; <u>Fig. 2</u>	-	43	Α
		V _{GS} = 10 V; T _{mb} = 100 °C; <u>Fig. 2</u>	-	30	Α
I _{DM}	peak drain current	pulsed; $t_p \le 10 \mu s$; $T_{mb} = 25 ^{\circ}C$; Fig. 3	-	173	Α
T _{stg}	storage temperature		-55	175	°C

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Symbol	Parameter	Conditions		Min	Max	Unit
Tj	junction temperature			-55	175	°C
Source-drai	n diode					
I _S	source current	T _{mb} = 25 °C		-	43	Α
I _{SM}	peak source current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$		-	173	Α
Avalanche r	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 43 A; V_{sup} ≤ 80 V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped; Fig. 4	[1][2]	-	47.4	mJ

- [1] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
- [2] Refer to application note AN10273 for further information.

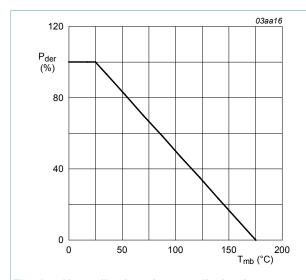


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

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

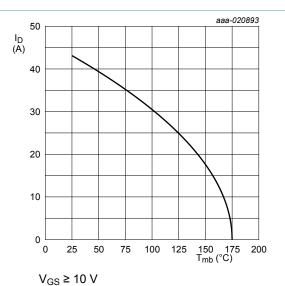
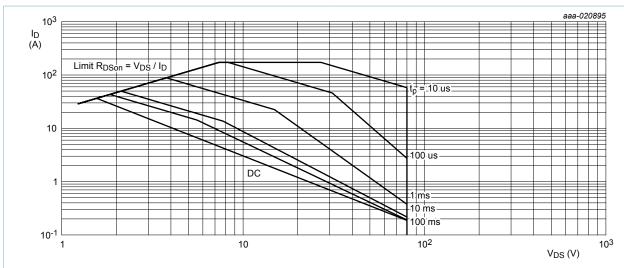


Fig. 2. Continuous drain current as a function of mounting base temperature

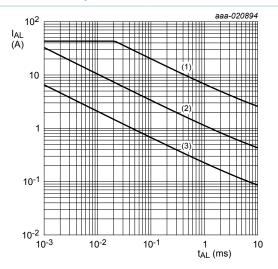
$$I_D = 43A \times \sqrt{\frac{175^{\circ}C - T_{mb}}{150^{\circ}C}} \text{ for } T_{mb} \ge 25^{\circ}C$$

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 T_{mb} = 25 °C; I_{DM} is a single pulse

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



(1) $T_{j \text{ (init)}}$ = 25 °C; (2) $T_{j \text{ (init)}}$ = 150 °C; (3) Repetitive Avalanche

Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

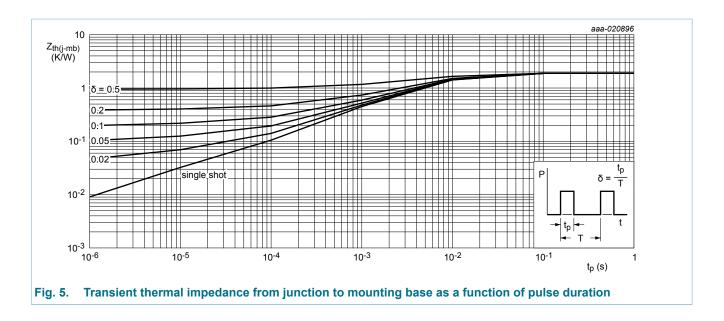
9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
R _{th(j-mb)}	thermal resistance from junction to mounting base	Fig. 5	-	1.58	1.89	K/W

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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static chara	acteristics					
()	drain-source	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 °C$	80	-	-	V
	breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 °C$	72	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; Fig. 9; Fig. 10	2.4	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ °C};$ Fig. 9	-	-	4.5	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ °C};$ Fig. 9	1	-	-	V
I _{DSS}	drain leakage current	V_{DS} = 80 V; V_{GS} = 0 V; T_j = 25 °C	-	0.01	1	μA
		V _{DS} = 80 V; V _{GS} = 0 V; T _j = 175 °C	-	-	500	μA
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
		V _{GS} = -20 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 = 10 A; T _j = 25 °C; Fig. 11	-	14	17	mΩ
		V _{GS} = 10 V; I _D = 10 A; T _j = 175 °C; Fig. 12	-	-	43	mΩ
Dynamic ch	naracteristics		·			
Q _{G(tot)}	total gate charge	I _D = 10 A; V _{DS} = 64 V; V _{GS} = 10 V;	-	29.6	-	nC
Q_{GS}	gate-source charge	T _j = 25 °C; <u>Fig. 13; Fig. 14</u>	-	6.5	-	nC
Q _{GD}	gate-drain charge		-	9.7	-	nC

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Symbol	Parameter	Conditions		Min	Тур	Max	Unit
C _{iss}	input capacitance	$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ °C}; Fig. 15$		-	1527	2031	pF
C _{oss}	output capacitance			-	161	193	pF
C _{rss}	reverse transfer capacitance			-	97	133	pF
t _{d(on)}	turn-on delay time	V_{DS} = 60 V; R_{L} = 5 Ω ; V_{GS} = 10 V; $R_{G(ext)}$ = 5 Ω ; T_{j} = 25 °C		-	6.7	-	ns
t _r	rise time			-	9.4	-	ns
t _{d(off)}	turn-off delay time			-	22.3	-	ns
t _f	fall time			-	12	-	ns
Source-dra	in diode	1	I				
V _{SD}	source-drain voltage	$I_S = 10 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C}; Fig. 16$		-	0.81	1.2	V
t _{rr}	reverse recovery time	$I_S = 10 \text{ A}; dI_S/dt = -100 \text{ A/}\mu\text{s}; V_{GS} = 0 \text{ V};$		-	26	-	ns
Q _r	recovered charge	V _{DS} = 25 V; T _j = 25 °C		-	33.9	-	nC

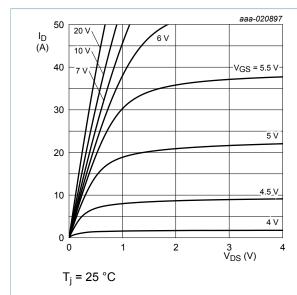


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values

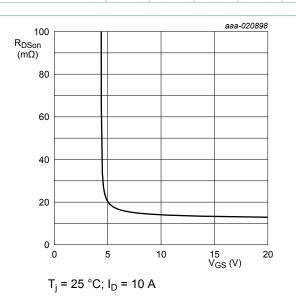


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

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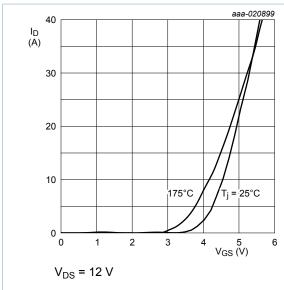


Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

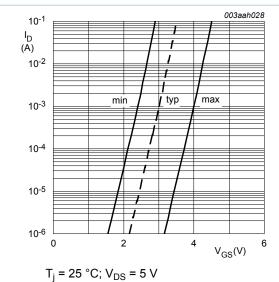


Fig. 10. Sub-threshold drain current as a function of gate-source voltage

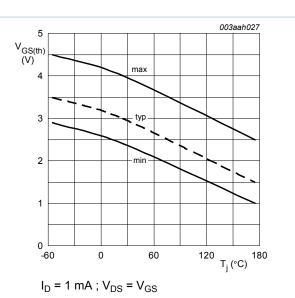


Fig. 9. Gate-source threshold voltage as a function of junction temperature

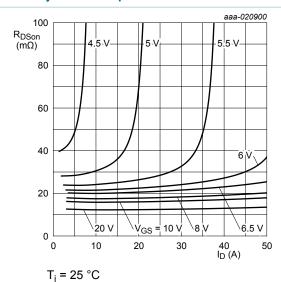


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

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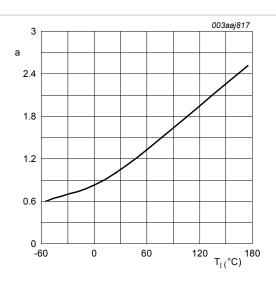


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

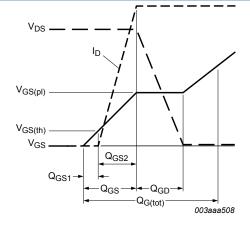


Fig. 14. Gate charge waveform definitions

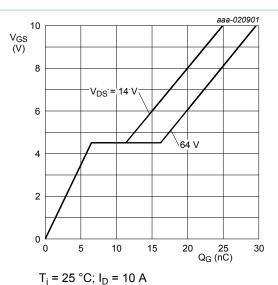
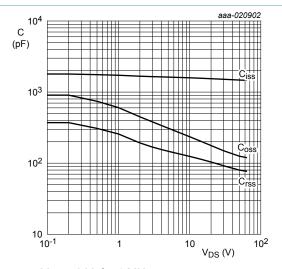


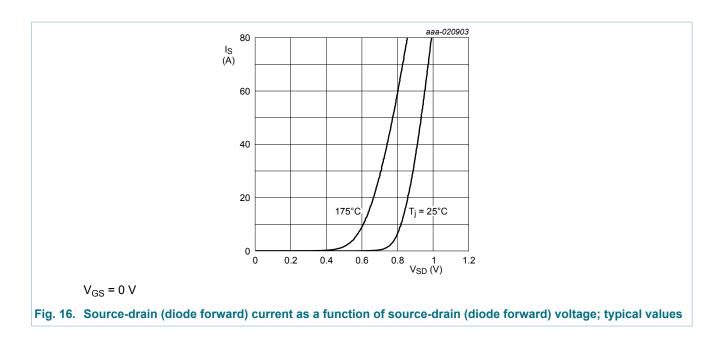
Fig. 13. Gate-source voltage as a function of gate charge; typical values



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

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

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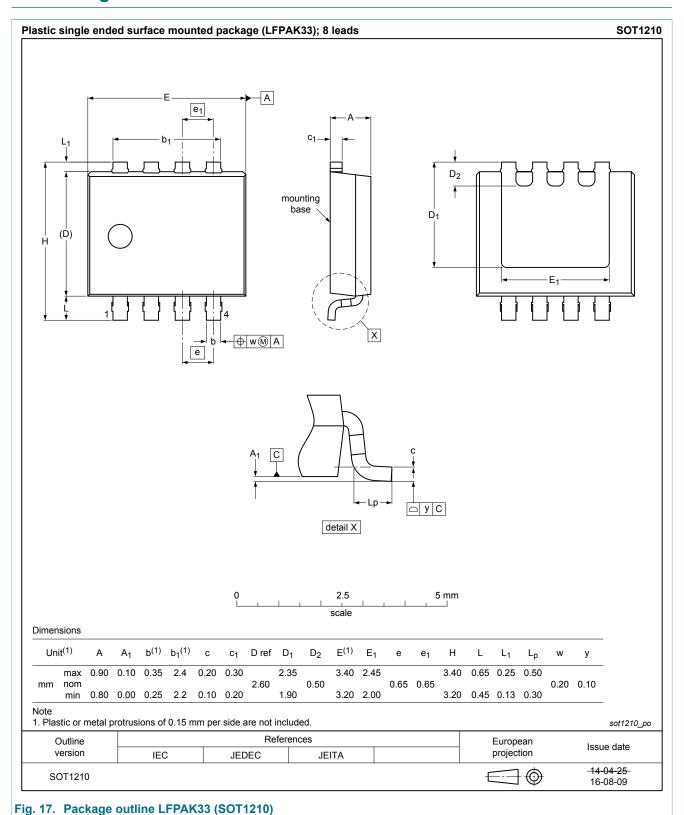
11. Application information

For guidance on how to use and understand this datasheet, please refer to application note <u>AN11158</u> "Understanding power MOSFET datasheet parameters".

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12. Package outline



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13. Legal information

13.1 Data sheet status

Document status [1][2]	Product status [3]	Definition
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