NXP BUK7515-100A Electronic components datasheet

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Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

BUK7515-100A

N-channel TrenchMOS standard level FET

5 April 2014 **Product data sheet**

1. General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

2. Features and benefits

- AEC Q101 compliant
- Low conduction losses due to low on-state resistance

3. Applications

- Automotive and general purpose power switching

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		-	-	100	V
I_D	drain current	T_{mb} = 25 °C		-	-	75	A
P_{tot}	total power dissipation			-	-	300	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C		-	12	15	mΩ
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 35 A; $V_{sup} \leq 25$ V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped		-	-	120	mJ

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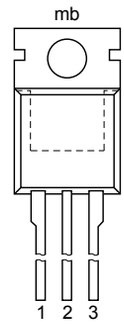
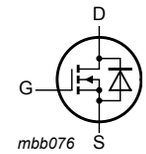
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 TO-220AB (SOT78A)	
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK7515-100A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78A

7. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	100	V
V_{DGR}	drain-gate voltage	R_{GS} = 20 kΩ		-	100	V
V_{GS}	gate-source voltage			-20	20	V
P_{tot}	total power dissipation	T_{mb} = 25 °C		-	300	W
I_D	drain current			-	75	A
		T_{mb} = 100 °C		-	60.8	A
I_{DM}	peak drain current	T_{mb} = 25 °C; pulsed		-	240	A
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		-	75	A
I_{SM}	peak source current	pulsed; T_{mb} = 25 °C		-	240	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 35 A; $V_{sup} \leq 25$ V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped		-	120	mJ

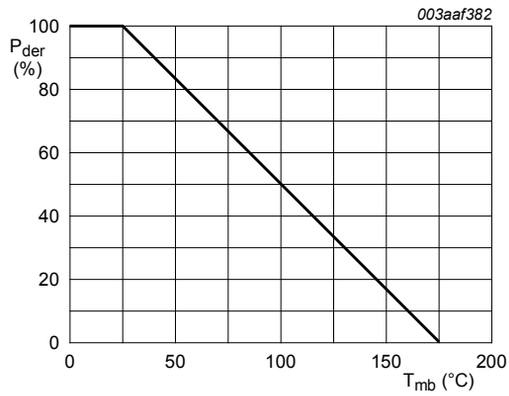
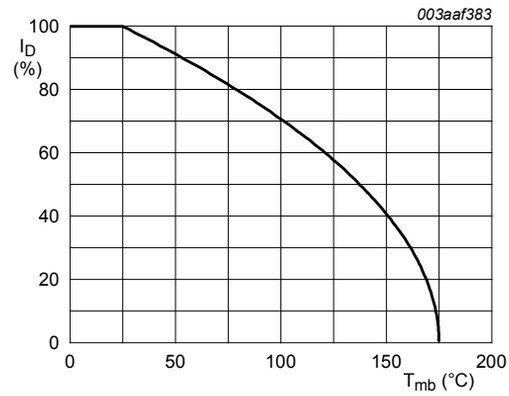


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

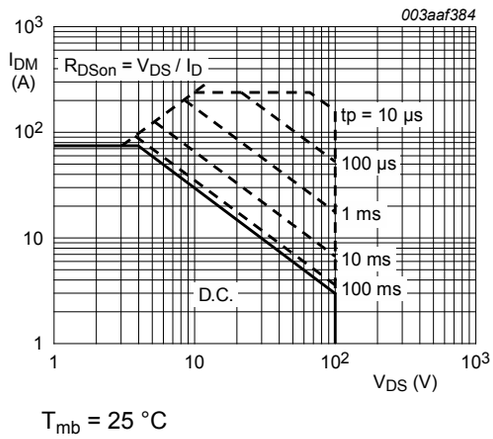
$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\,\%$$



$V_{GS} \geq 10$ V

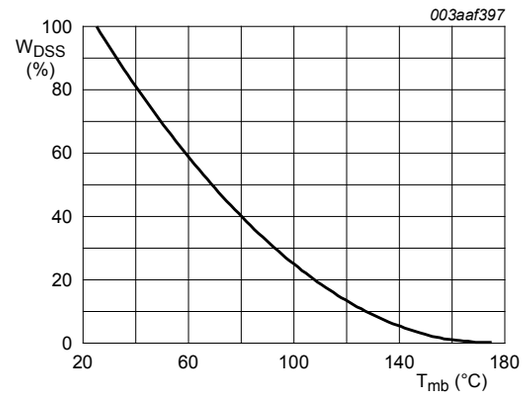
Fig. 2. Normalized continuous drain current as a function of mounting base temperature

$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\,\%$$



T_{mb} = 25 °C

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



I_D = 75 A

Fig. 4. Normalised drain-source non-repetitive avalanche energy as a function of mounting-base temperature

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base			-	-	0.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W

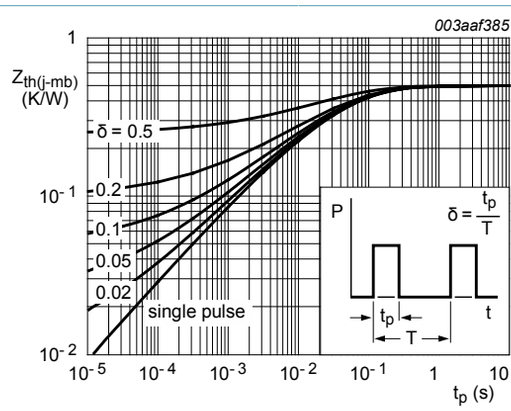
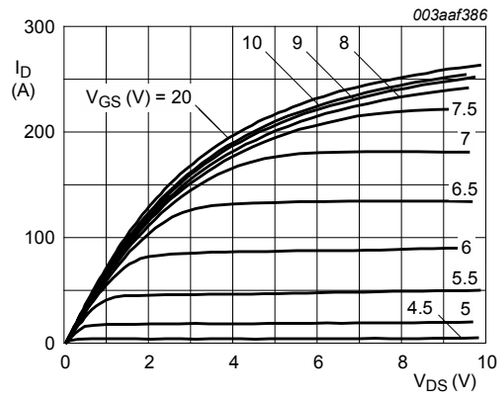


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Characteristics

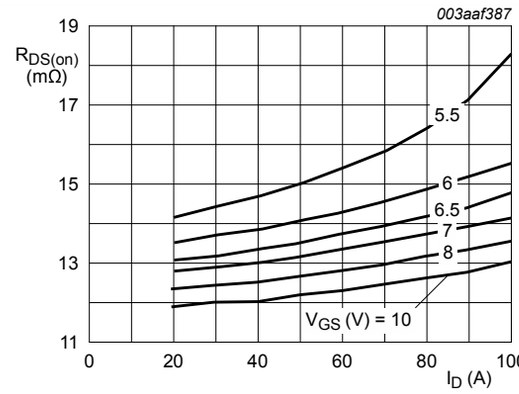
Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C		100	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C		89	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C		2	3	4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C		1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C		-	-	4.4	V
I_{DSS}	drain leakage current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 175 °C		-	-	500	µA
		V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 °C		-	0.05	10	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 = 25 A; T_j = 175 °C		-	-	40.5	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C		-	12	15	mΩ
Dynamic characteristics							
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C		-	4500	6000	pF
C_{oss}	output capacitance			-	550	660	pF
C_{rss}	reverse transfer capacitance			-	305	400	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 30 V; R_L = 1.2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 10 Ω; T_j = 25 °C		-	35	55	ns
t_r	rise time			-	85	125	ns
$t_{d(off)}$	turn-off delay time			-	150	225	ns
t_f	fall time			-	70	100	ns
L_D	internal drain inductance	from contact screw on tab to centre of die; T_j = 25 °C		-	3.5	-	nH
		from drain lead 6 mm from package to centre of die; T_j = 25 °C		-	4.5	-	nH
L_S	internal source inductance	from source lead 6 mm from package to source bond pad ; T_j = 25 °C		-	7.5	-	nH
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
		I_S = 75 A; V_{GS} = 0 V; T_j = 25 °C		-	1.1	-	V
t_{rr}	reverse recovery time	I_S = 75 A; dI_S/dt = -100 A/µs; V_{GS} = -10 V; V_{DS} = 30 V; T_j = 25 °C		-	80	-	ns
Q_r	recovered charge			-	0.35	-	µC



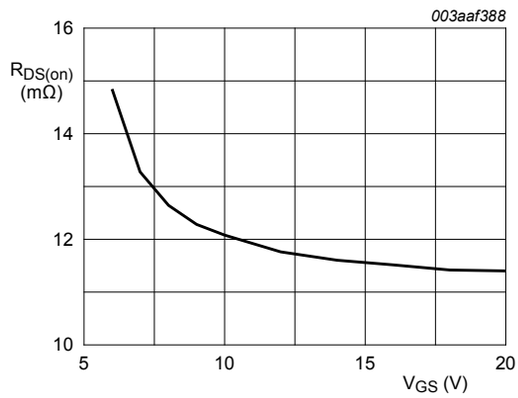
T_j = 25 °C

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



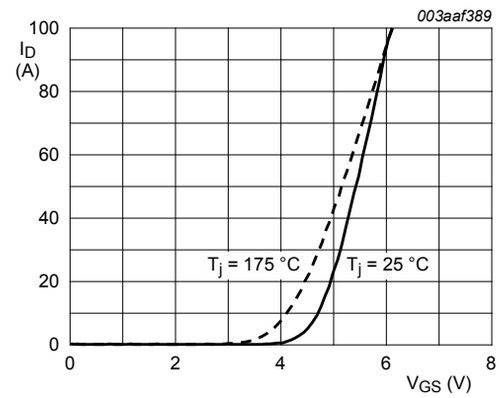
T_j = 25 °C

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



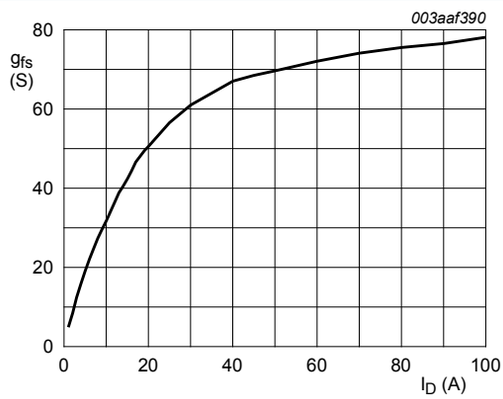
T_j = 25 °C; I_D = 25 A

Fig. 8. Drain-source on-state resistance as a function of gate-sorce voltage; typical values



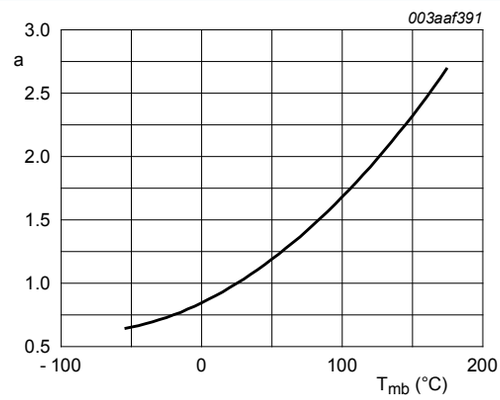
$V_{DS} > I_D \times R_{DSon}$

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



$V_{DS} > I_D \times R_{DSon}$

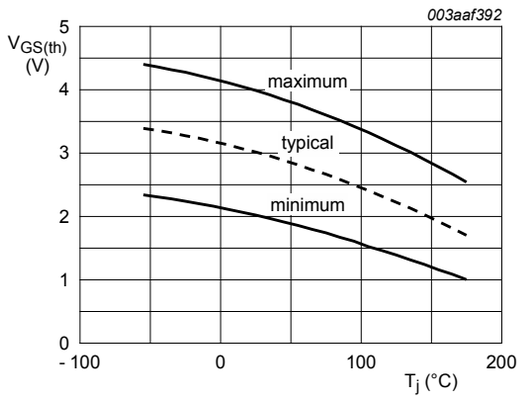
Fig. 10. Forward transconductance as a function of drain current; typical values



I_D = 25 A; V_{GS} = 10 V

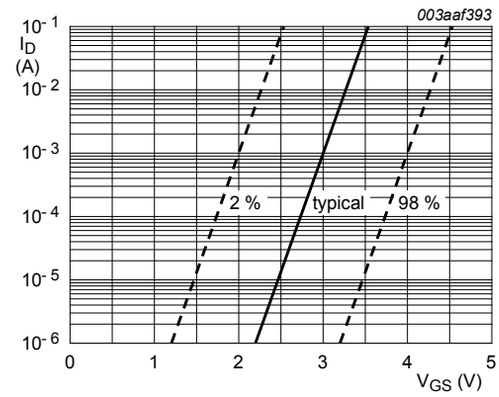
Fig. 11. Normalized drain-source on-state resistance factor as a function of junction temperature

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



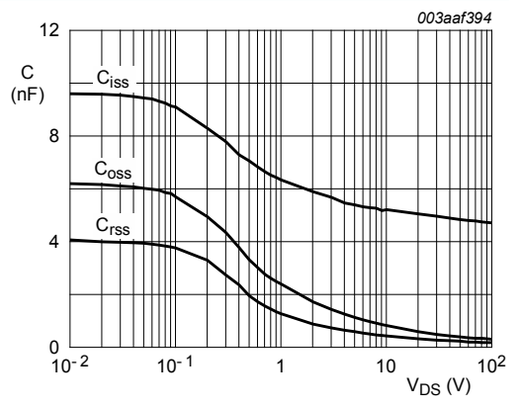
I_D = 1 mA; V_{DS} = V_{GS}

Fig. 12. Gate-source threshold voltage as a function of junction temperature



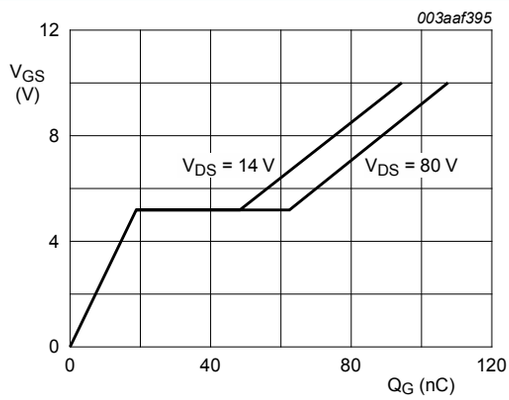
T_j = 25 °C; V_{DS} = V_{GS}

Fig. 13. Sub-threshold drain current as a function of gate-source voltage



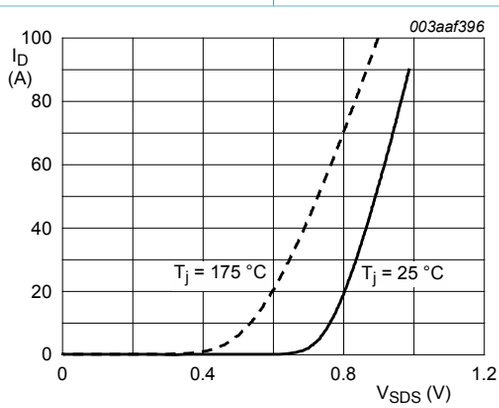
V_{GS} = 0 V; f = 1 MHz

Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



T_j = 25 °C; I_D = 25 A

Fig. 15. Gate-source voltage as a function of gate charge; typical values

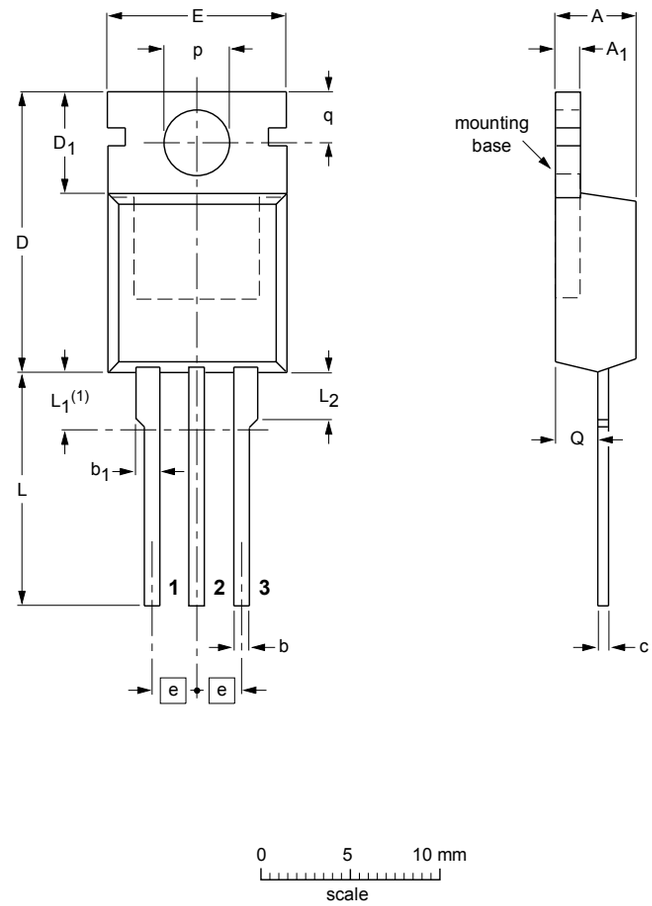


V_{GS} = 0 V

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

10. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78A**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	c	D	D_1	E	e	L	L_1(1)	L_2 max.	p	q	Q
mm	4.5 4.1	1.39 1.27	0.9 0.6	1.3 1.0	0.7 0.4	15.8 15.2	6.4 5.9	10.3 9.7	2.54	15.0 13.5	3.30 2.79	3.0	3.8 3.6	3.0 2.7	2.6 2.2

Note

1. Terminals in this zone are not tinned.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78A		3-lead TO-220AB	SC-46			~~03-01-22~~ 05-03-14

Fig. 17. Package outline TO-220AB (SOT78A)

11. Legal information

11.1 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.

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[2] The term 'short data sheet' is explained in section "Definitions".
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