



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	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$	-	-	100	V
I_D	drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$	-	-	75	A
P_{tot}	total power dissipation		-	-	300	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$	-	12	15	m Ω
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 35\text{ A}$; $V_{sup} \leq 25\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; unclamped	-	-	120	mJ

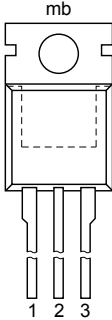
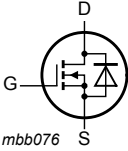


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5. Pinning information

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	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$		-	100	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$		-	100	V
V_{GS}	gate-source voltage			-20	20	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$		-	300	W
I_D	drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$		-	75	A
		$T_{mb} = 100\text{ }^{\circ}\text{C}$		-	60.8	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$; pulsed		-	240	A
T_{stg}	storage temperature			-55	175	$^{\circ}\text{C}$
T_j	junction temperature			-55	175	$^{\circ}\text{C}$
Source-drain diode						
I_S	source current	$T_{mb} = 25\text{ }^{\circ}\text{C}$		-	75	A
I_{SM}	peak source current	pulsed; $T_{mb} = 25\text{ }^{\circ}\text{C}$		-	240	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 35\text{ A}$; $V_{sup} \leq 25\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; unclamped		-	120	mJ

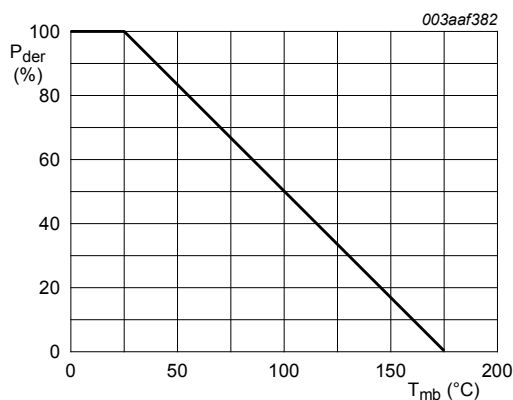
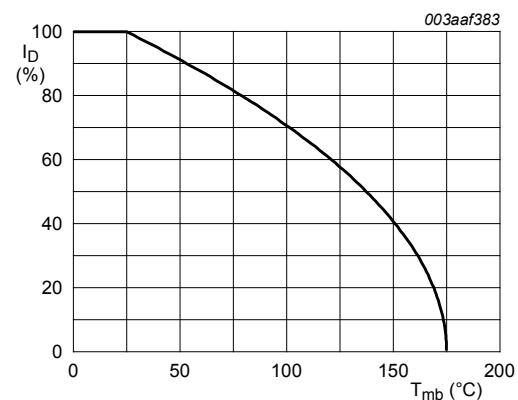


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

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



$V_{GS} \geq 10\text{ V}$

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

$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100\%$$

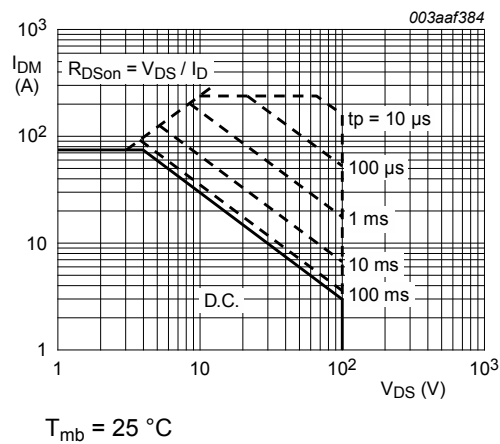


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

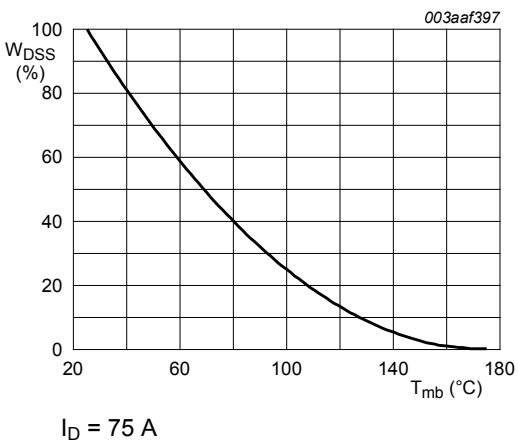


Fig. 4. Normalised drain-source non-repetitive avalanche energy as a function of mounting-base temperature

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

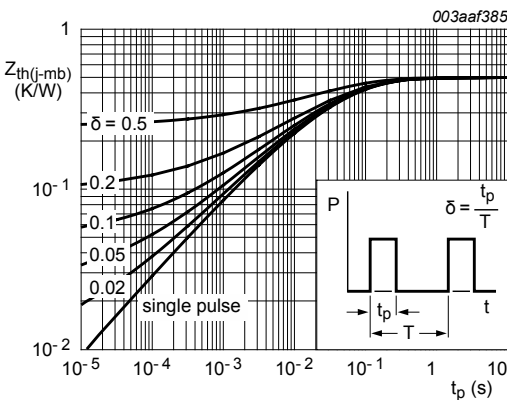


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

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

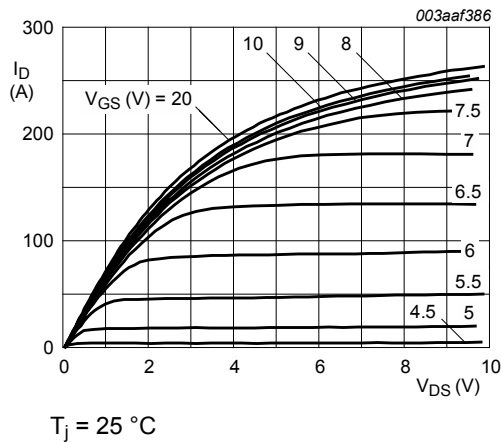


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

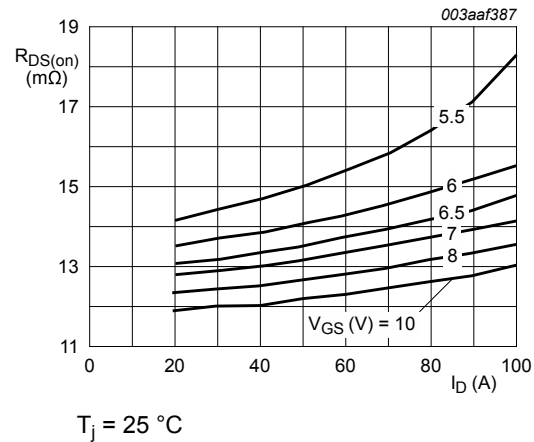


Fig. 7. Drain-source on-state resistance as a function of drain current; typical values

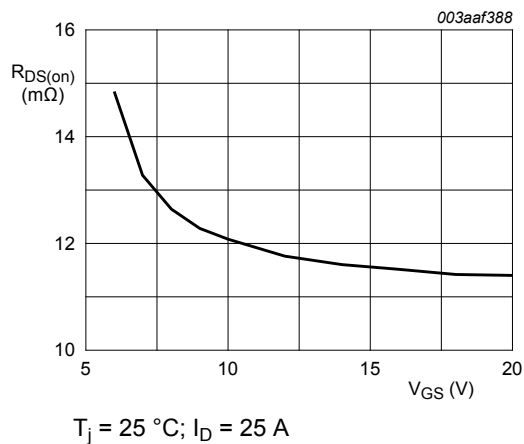


Fig. 8. Drain-source on-state resistance as a function of gate-source voltage; typical values

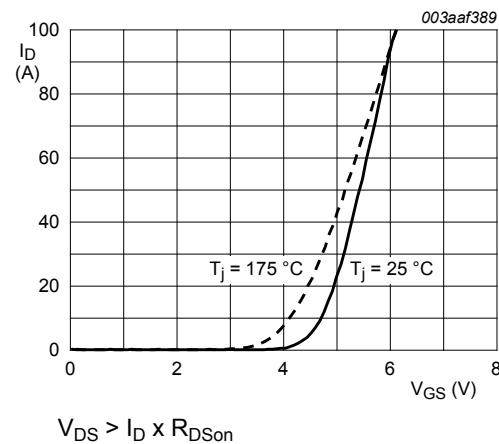


Fig. 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

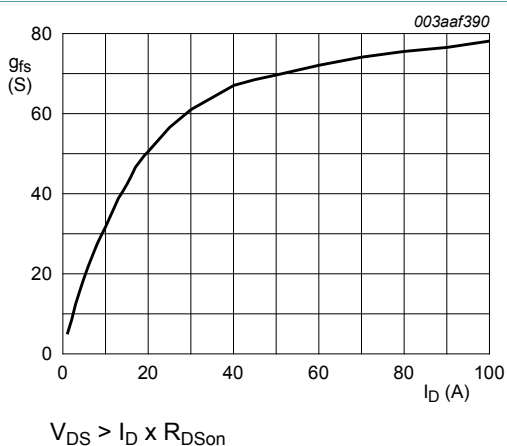


Fig. 10. Forward transconductance as a function of drain current; typical values

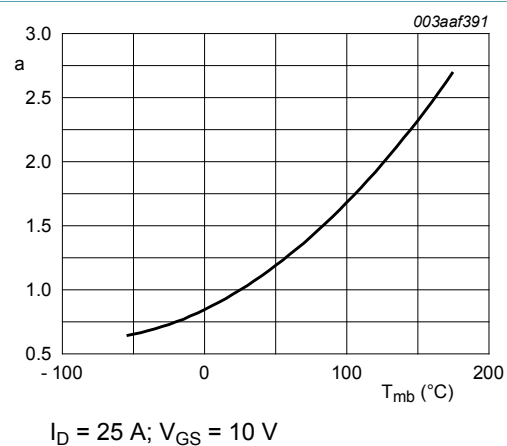


Fig. 11. Normalized drain-source on-state resistance factor as a function of junction temperature

$$a = \frac{R_{DS(on)}}{R_{DS(on)@25^{\circ}\text{C}}}$$

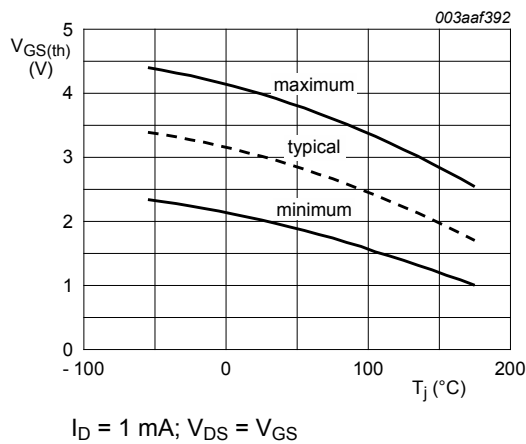


Fig. 12. Gate-source threshold voltage as a function of junction temperature

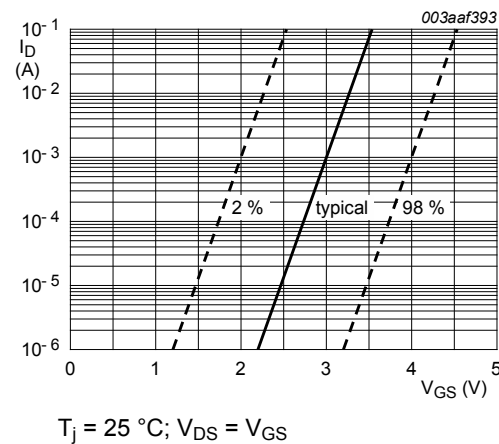


Fig. 13. Sub-threshold drain current as a function of gate-source voltage

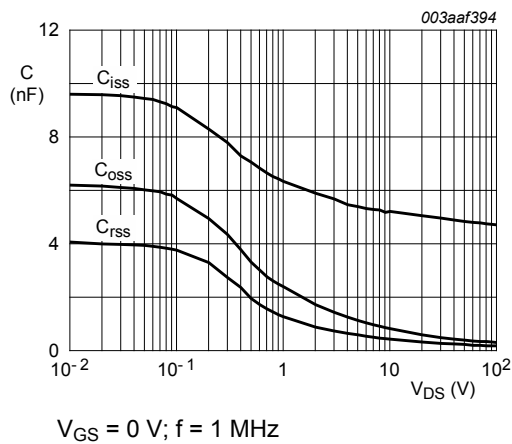


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

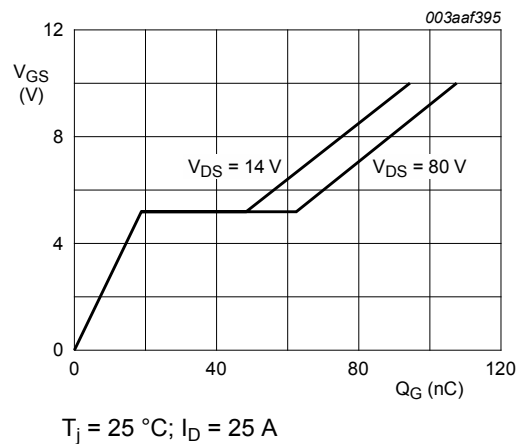


Fig. 15. Gate-source voltage as a function of gate charge; typical values

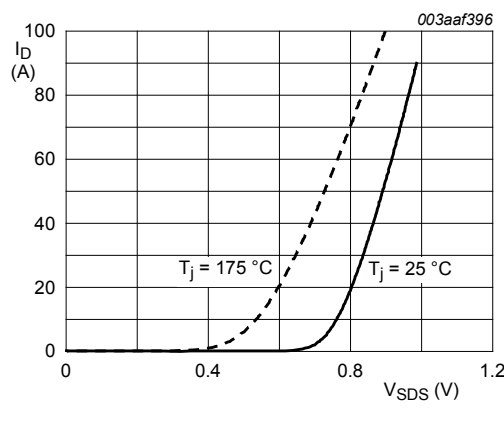


Fig. 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

10. Package outline

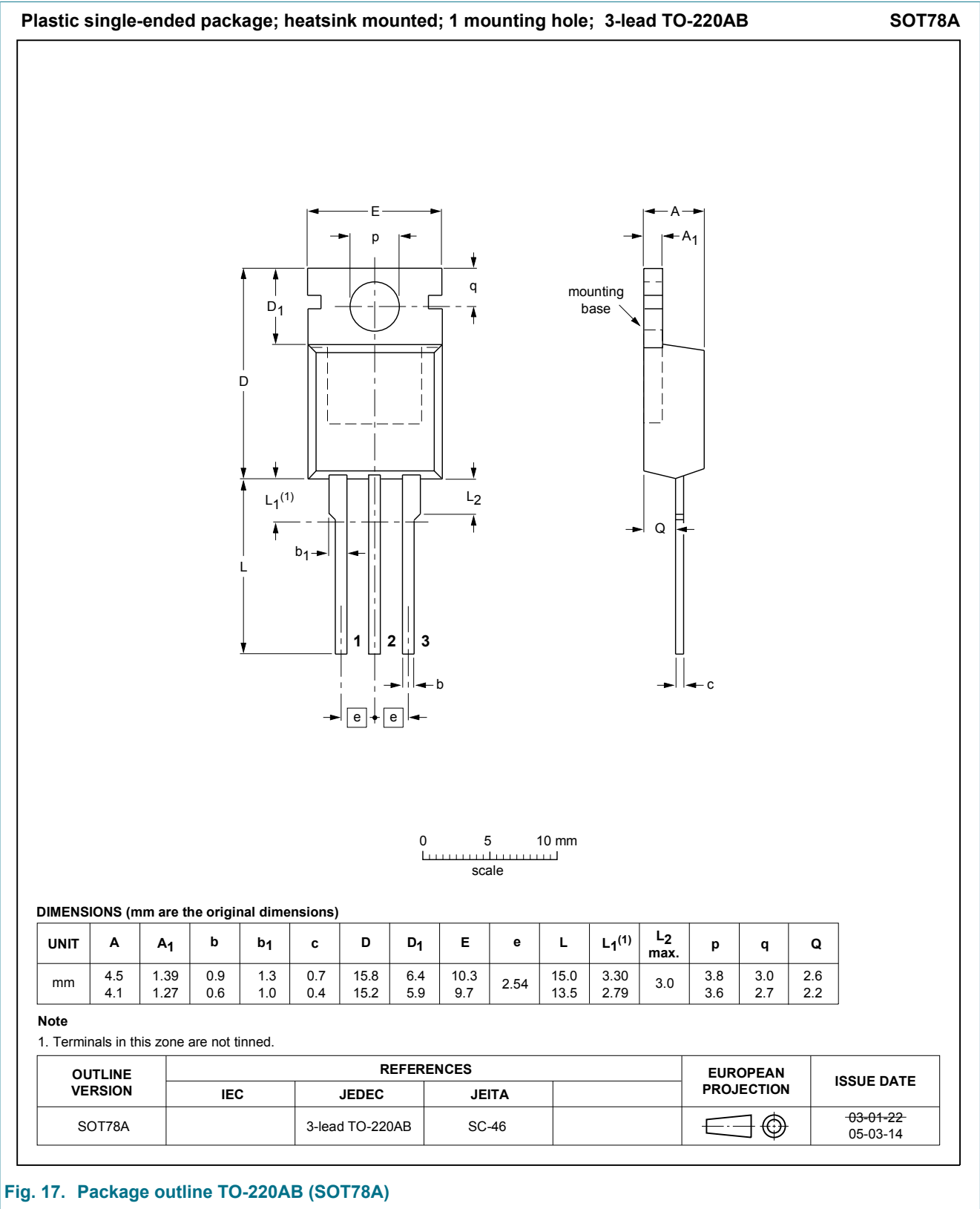


Fig. 17. Package outline TO-220AB (SOT78A)

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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