



BUK754R3-75C

N-channel TrenchMOS standard level FET

Rev. 02 — 21 April 2011

Product data sheet

1. Product profile

1.1 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.

1.2 Features and benefits

- AEC Q101 compliant
- Suitable for standard level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

1.3 Applications

- 12 V, 24 V and 42 V loads
- Automotive systems
- General purpose power switching
- Motors, lamps and solenoids

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	75	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 1 ; see Figure 4	-	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	333	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; see Figure 7 ; see Figure 8	-	3.7	4.3	mΩ
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 100\text{ A}$; $V_{sup} \leq 75\text{ V}$; $R_{GS} = 50\text{ Ω}$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; unclamped	-	-	630	mJ

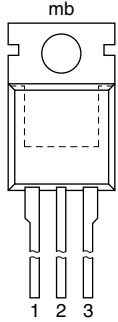
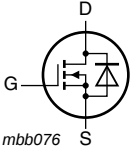
[1] Continuous current is limited by package.

[2] Refer to document 9397 750 12572 for further information.



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

SOT78A (TO-220AB)

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK754R3-75C	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78A

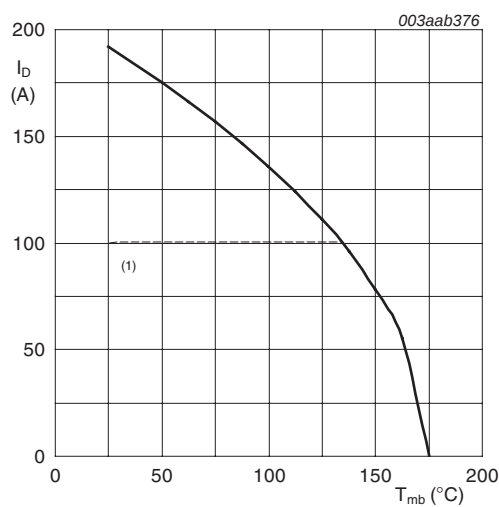
4. Limiting values

Table 4. Limiting values

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

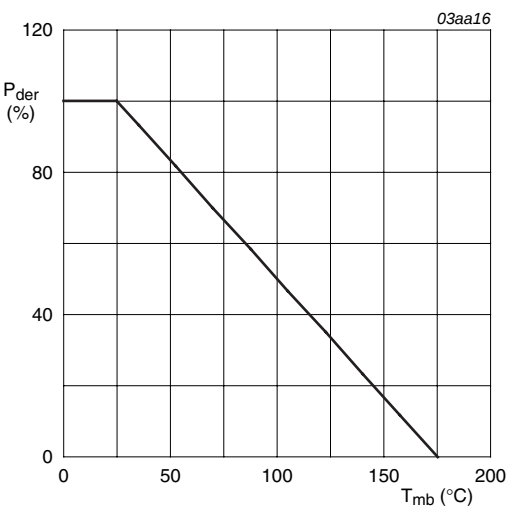
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	75	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	75	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 ; see Figure 4	[1][2]	192	A
			[3][2]	100	A
		$T_{mb} = 100\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 ; see Figure 4	[3][2]	100	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; see Figure 4	-	769	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	333	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25\text{ °C}$	[2][3]	100	A
			[2][4]	192	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$	-	769	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 100\text{ A}$; $V_{sup} \leq 75\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; unclamped	-	630	mJ
$E_{DS(AL)R}$	repetitive drain-source avalanche energy	see Figure 3	[4][5][6][7]	-	J

- [1] Current is limited by power dissipation chip rating.
 [2] Refer to document 9397 750 12572 for further information.
 [3] Continuous current is limited by package.
 [4] Maximum value not quoted. Repetitive rating defined in avalanche rating figure.
 [5] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
 [6] Repetitive avalanche rating limited by an average junction temperature of 170 °C.
 [7] Refer to application note AN10273 for further information.



$V_{GS} \geq 10\text{ V}$
(1) Capped at 100 A due to package.

Fig 1. Continuous drain current as a function of mounting base temperature



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

Fig 2. Normalized total power dissipation as a function of mounting base temperature

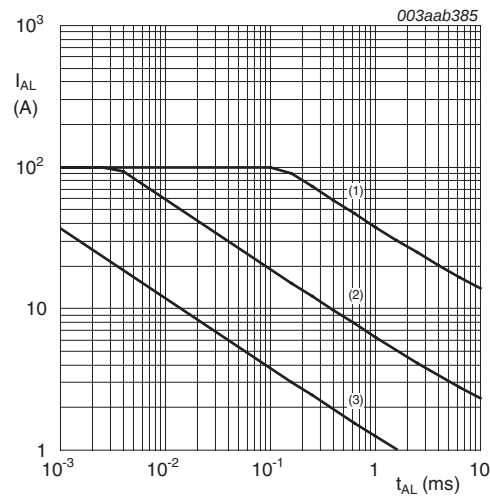
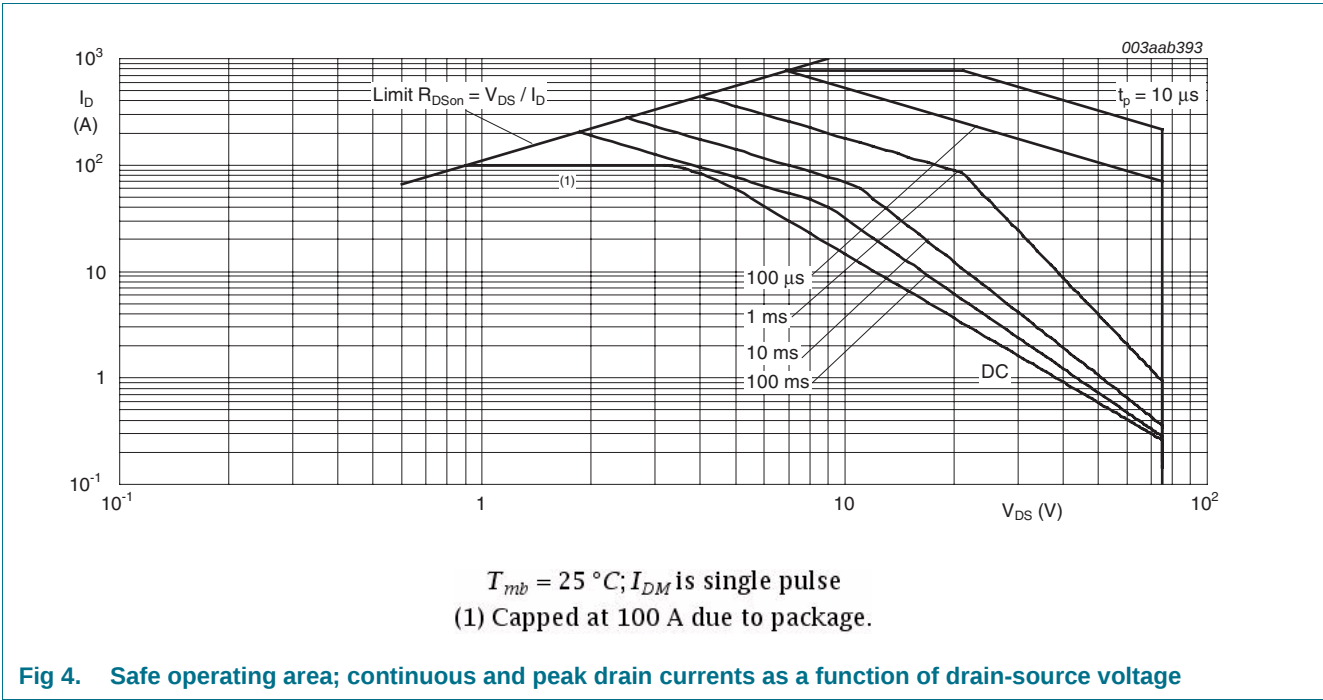


Fig 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time.



5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base		-	-	0.45	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W

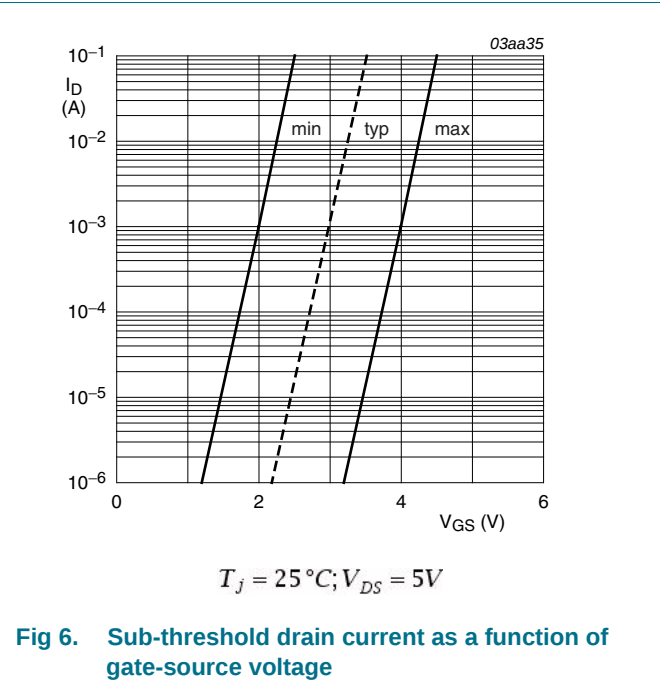
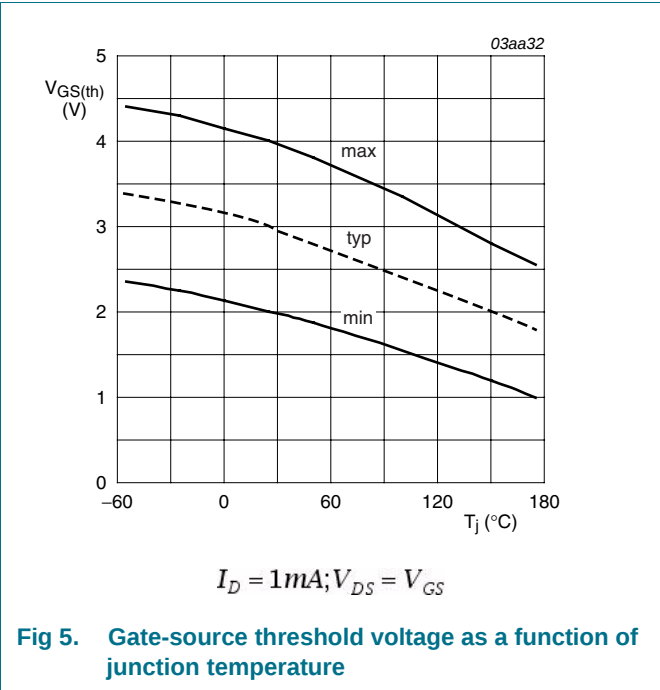
6. Characteristics

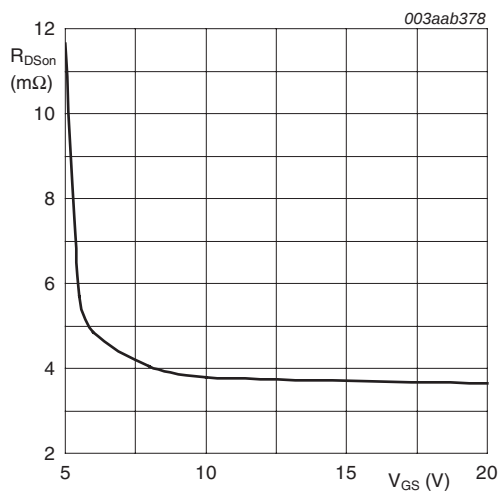
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	75	-	-	V
		$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_j = -55 ^\circ C$	70	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = -55 ^\circ C$; see Figure 5 ; see Figure 6	-	-	4.4	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = 175 ^\circ C$; see Figure 5 ; see Figure 6	1	-	-	V
		$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_j = 25 ^\circ C$; see Figure 5 ; see Figure 6	2	3	4	V
I_{DSS}	drain leakage current	$V_{DS} = 75 V$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$	-	0.02	1	μA
I_{GSS}	gate leakage current	$V_{GS} = 20 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$	-	2	100	nA
		$V_{GS} = -20 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$	-	2	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 V$; $I_D = 25 A$; $T_j = 175 ^\circ C$; see Figure 7 ; see Figure 8	-	-	9	m Ω
		$V_{GS} = 10 V$; $I_D = 25 A$; $T_j = 25 ^\circ C$; see Figure 7 ; see Figure 8	-	3.7	4.3	m Ω
I_{DSS}	drain leakage current	$V_{DS} = 75 V$; $V_{GS} = 0 V$; $T_j = 175 ^\circ C$	-	-	500	μA
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 25 A$; $V_{DS} = 60 V$; $V_{GS} = 10 V$; see Figure 9	-	142	-	nC
Q_{GS}	gate-source charge		-	36	-	nC
Q_{GD}	gate-drain charge		-	67	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 A$; $V_{DS} = 60 V$; see Figure 9	-	5	-	V
C_{iss}	input capacitance	$V_{GS} = 0 V$; $V_{DS} = 25 V$; $f = 1 MHz$; $T_j = 25 ^\circ C$; see Figure 10	-	8744	11659	pF
C_{oss}	output capacitance		-	923	1108	pF
C_{rss}	reverse transfer capacitance		-	579	793	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 V$; $R_L = 1.2 \Omega$; $V_{GS} = 10 V$; $R_{G(ext)} = 10 \Omega$	-	61	-	ns
t_r	rise time		-	100	-	ns
$t_{d(off)}$	turn-off delay time		-	194	-	ns
t_f	fall time		-	90	-	ns

Table 6. Characteristics ...continued

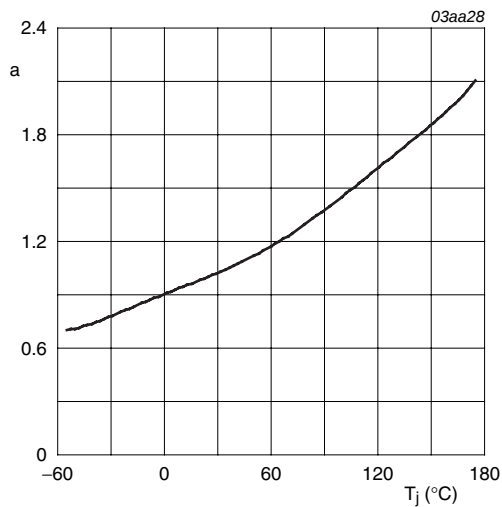
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
L_D	internal drain inductance	from drain lead 6mm from package to centre of die	-	4.5	-	nH
		from contact screw on mounting base to centre of die	-	3.5	-	nH
L_S	internal source inductance	from source lead to source bonding pad	-	7.5	-	nH
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 11	-	0.85	1.2	V
t_{rr}	reverse recovery time	$I_S = 20\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$;	-	83	-	ns
Q_r	recovered charge	$V_{GS} = 0\text{ V}$; $V_{DS} = 25\text{ V}$	-	155	-	nC





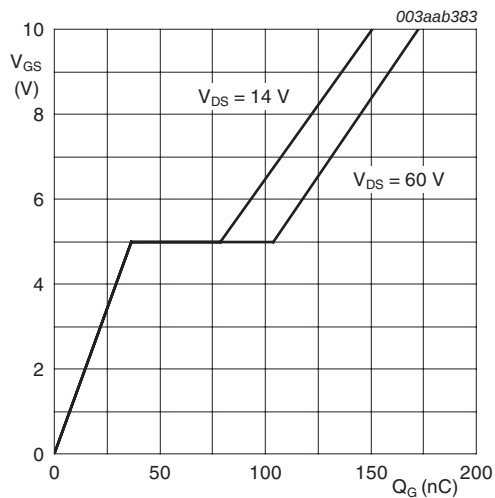
$T_j = 25\text{ }^{\circ}\text{C}; I_D = 25\text{ A}$

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



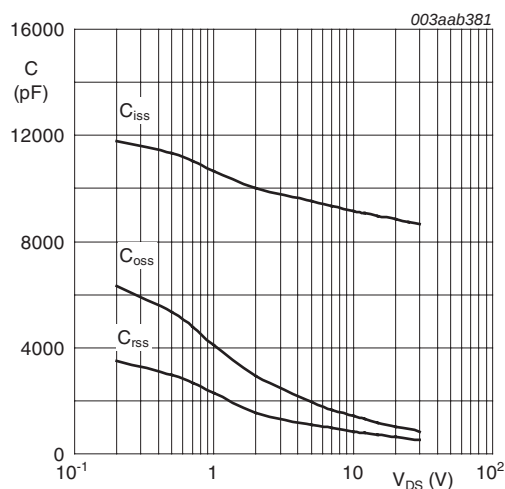
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^{\circ}\text{C})}}$$

Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature



$T_j = 25\text{ }^{\circ}\text{C}; I_D = 25\text{ A}$

Fig 9. Gate-source voltage as a function of gate charge; typical values



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

Fig 10. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

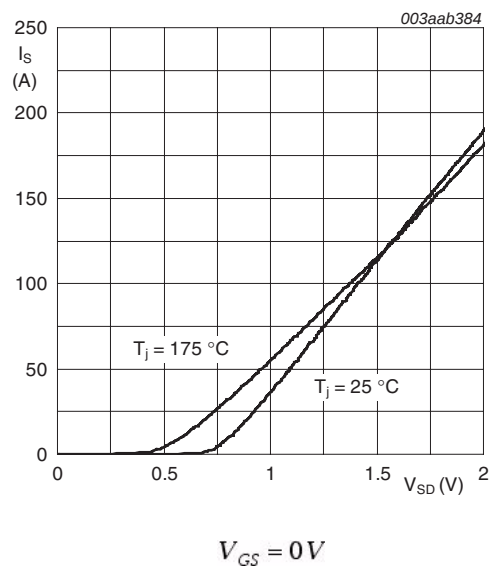


Fig 11. Source current as a function of source-drain diode; typical values

7. Package outline

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

SOT78A

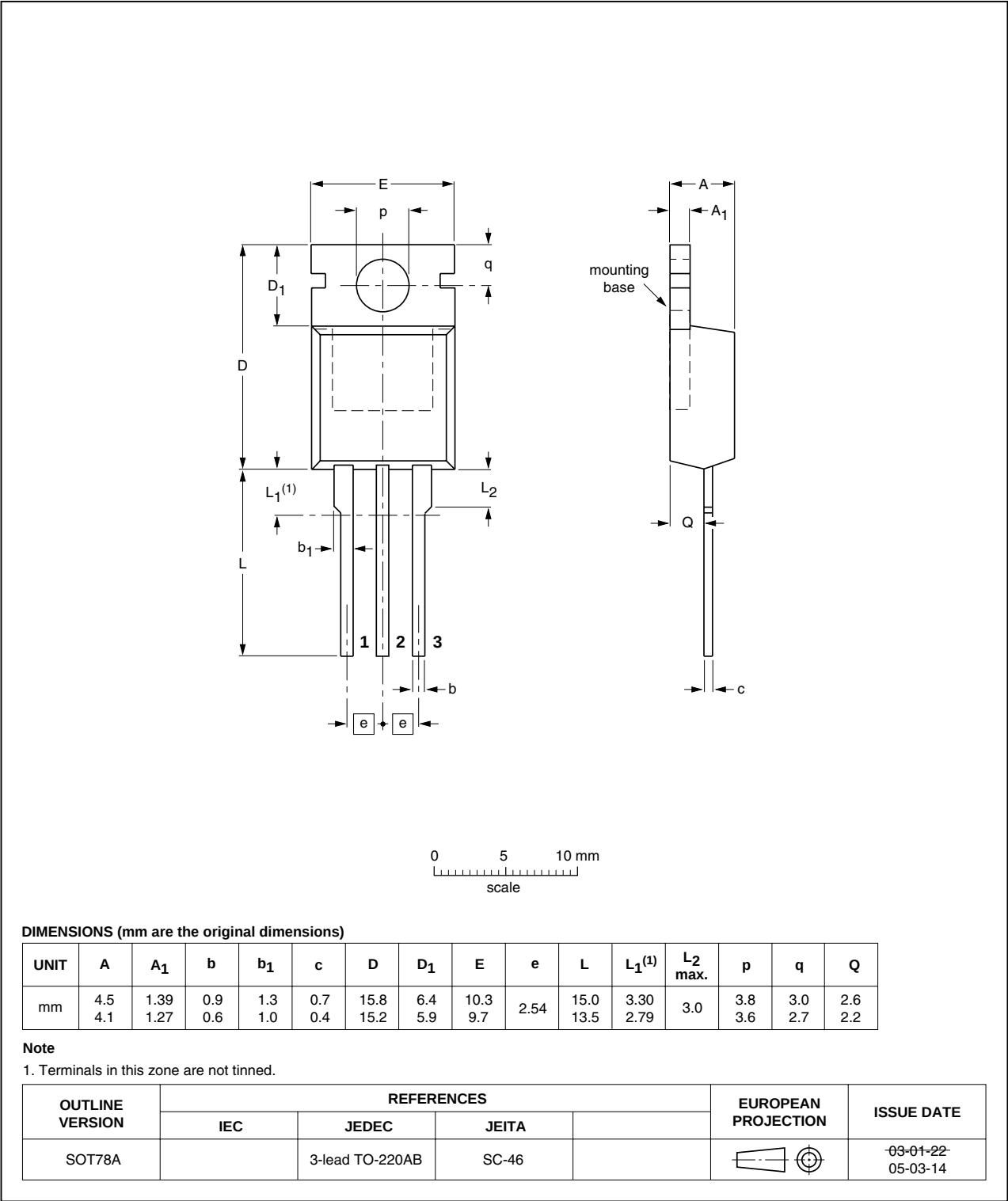


Fig 12. Package outline SOT78A (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK754R3-75C v.2	20110421	Product data sheet	-	BUK75_7E4R3-75C v.1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type number BUK754R3-75C separated from data sheet BUK75_7E4R3-75C v.1.			
BUK75_7E4R3-75C v.1	20060810	Product data sheet	-	-

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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