



BUK7516-55A

N-channel TrenchMOS standard level FET

Rev. 02 — 26 January 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
- Low conduction losses due to low on-state resistance
- Suitable for standard level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

1.3 Applications

- 12 V and 24 V loads
- Automotive and general purpose power switching
- Motors, lamps and solenoids

1.4 Quick reference data

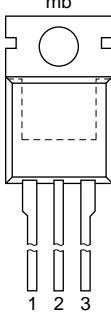
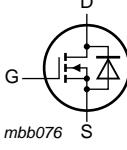
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}$	-	-	55	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 25^\circ\text{C}$; see Figure 1 ; see Figure 3	-	-	65.7	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	-	138	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 175^\circ\text{C}$; see Figure 12 ; see Figure 13	-	-	32	$\text{m}\Omega$
		$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 25^\circ\text{C}$; see Figure 12 ; see Figure 13	-	13	16	$\text{m}\Omega$
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 49\text{ A}; V_{sup} \leq 55\text{ V}; R_{GS} = 50\text{ }\Omega; V_{GS} = 10\text{ V}; T_{j(init)} = 25^\circ\text{C}$; unclamped	-	-	120	mJ



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		Version
	Name	Description	
BUK7516-55A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78A

4. Limiting values

Table 4. Limiting values

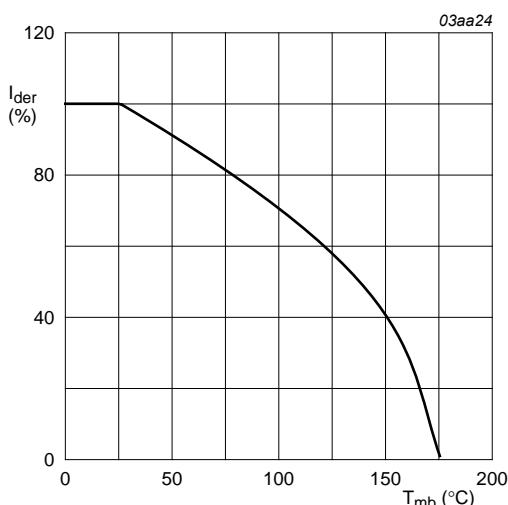
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25^\circ\text{C}$; $T_j \leq 175^\circ\text{C}$	-	55	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	55	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$T_{mb} = 25^\circ\text{C}$; $V_{GS} = 10\text{ V}$; see Figure 1 ; see Figure 3	-	65.7	A
		$T_{mb} = 100^\circ\text{C}$; $V_{GS} = 10\text{ V}$; see Figure 1	-	46.5	A
I_{DM}	peak drain current	$T_{mb} = 25^\circ\text{C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; see Figure 3	-	263	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	138	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25^\circ\text{C}$	-	65.7	A

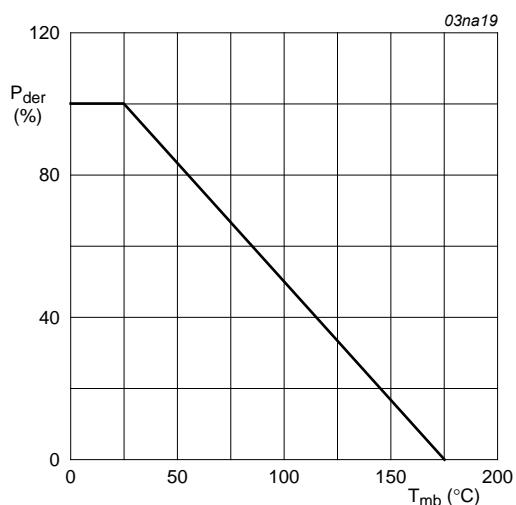
Table 4. Limiting values ...continued

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

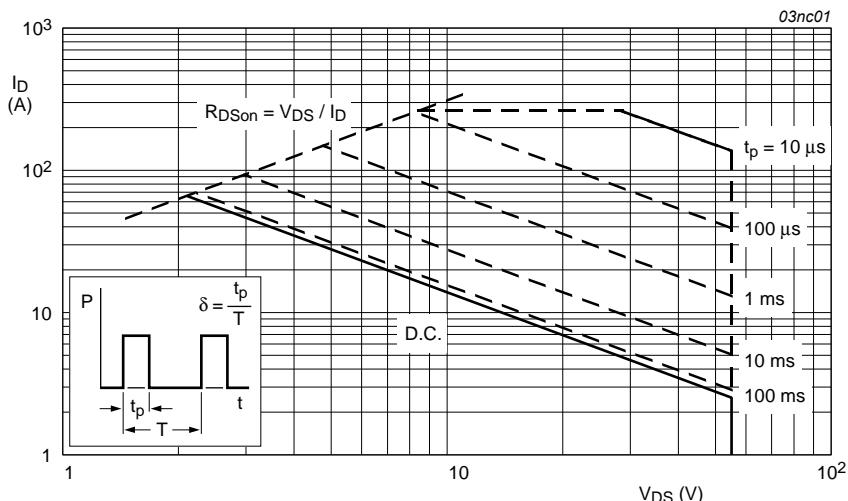
Symbol	Parameter	Conditions	Min	Max	Unit
I_{SM}	peak source current	pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$	-	263	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 49 \text{ A}$; $V_{sup} \leq 55 \text{ V}$; $R_{GS} = 50 \Omega$; $V_{GS} = 10 \text{ V}$; $T_{j(init)} = 25^\circ\text{C}$; unclamped	-	120	mJ



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

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

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

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

$T_{mb} = 25^\circ\text{C}$; I_{DM} is single pulse

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

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	1.1	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient	vertical in still air	-	60	-	K/W

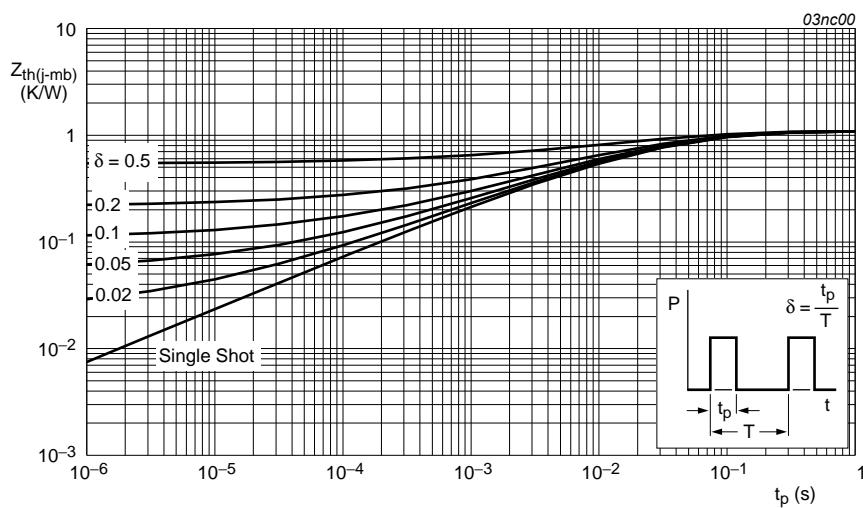


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. 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	55	-	-	V
		$I_D = 0.25$ mA; $V_{GS} = 0$ V; $T_j = -55$ °C	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see Figure 11	1	-	-	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = -55$ °C; see Figure 11	-	-	4.4	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 25$ °C; see Figure 11	2	3	4	V
I_{DSS}	drain leakage current	$V_{DS} = 55$ V; $V_{GS} = 0$ V; $T_j = 25$ °C	-	0.05	10	μA
		$V_{DS} = 55$ 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

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 175 °C; see Figure 12; see Figure 13	-	-	32	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; see Figure 12; see Figure 13	-	13	16	mΩ
Dynamic characteristics						
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz;	-	1580	2245	pF
C _{oss}	output capacitance	T _j = 25 °C; see Figure 14	-	370	423	pF
C _{rss}	reverse transfer capacitance		-	220	312	pF
t _{d(on)}	turn-on delay time	V _{DS} = 30 V; R _L = 1.2 Ω; V _{GS} = 10 V;	-	16	-	ns
t _r	rise time	R _{G(ext)} = 10 Ω; T _j = 25 °C	-	70	-	ns
t _{d(off)}	turn-off delay time		-	57	-	ns
t _f	fall time		-	41	-	ns
L _D	internal drain inductance	from contact screw on mounting base 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 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; see Figure 15	-	0.85	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs;	-	48	-	ns
Q _r	recovered charge	V _{GS} = -10 V; V _{DS} = 30 V; T _j = 25 °C	-	106	-	nC

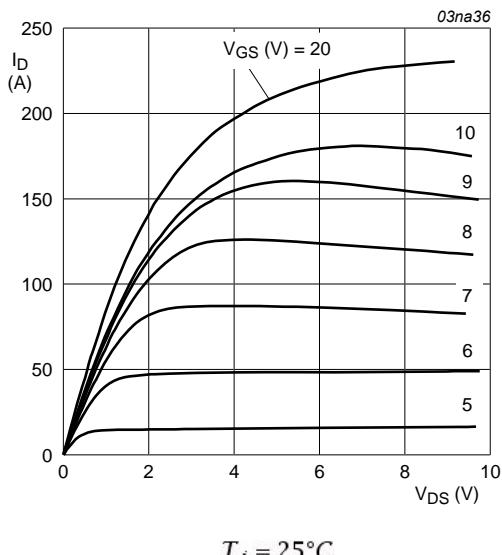


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

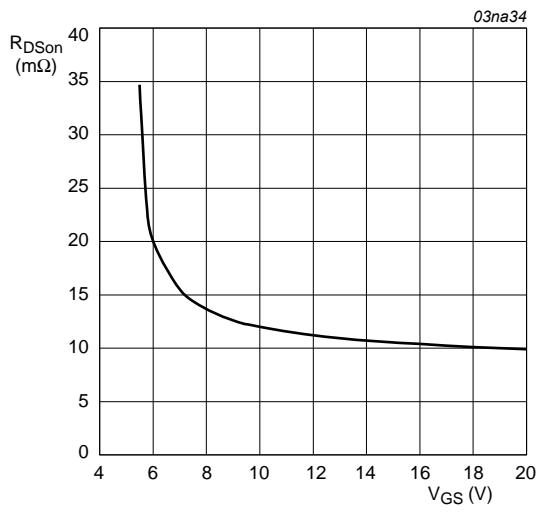
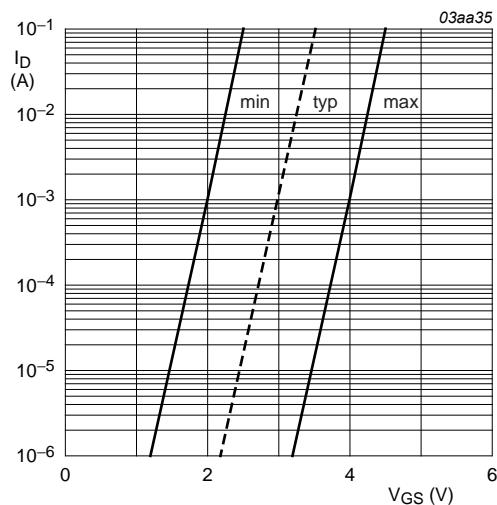
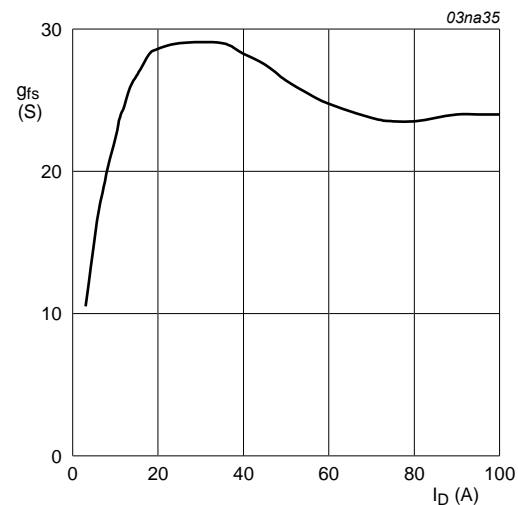


Fig 6. Drain-source on-state resistance as a function of gate-source voltage; typical values



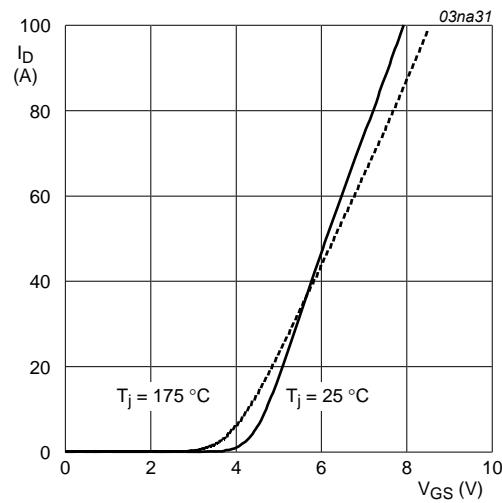
$T_j = 25^\circ C; V_{DS} = 5V$

Fig 7. Sub-threshold drain current as a function of gate-source voltage



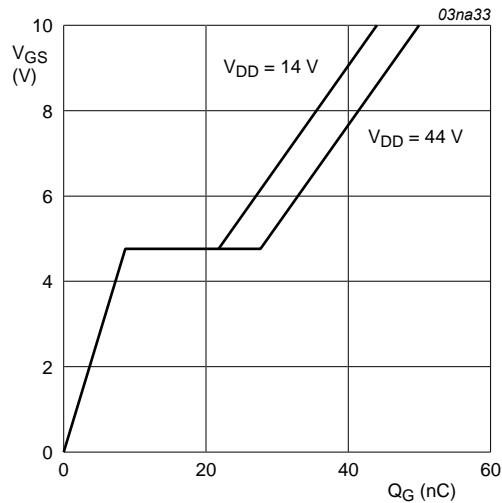
$T_j = 25^\circ C; V_{DS} = 25V$

Fig 8. Forward transconductance as a function of drain current; typical values



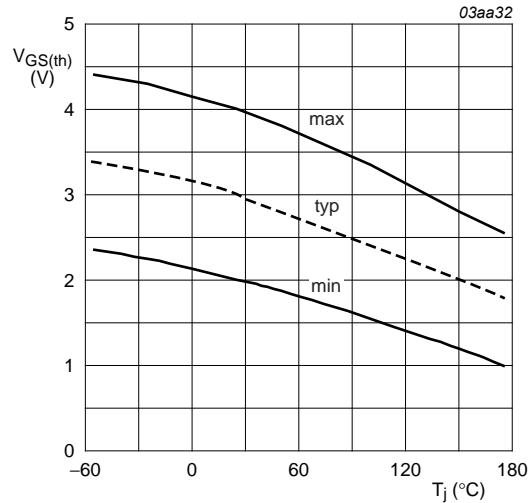
$V_{DS} = 25V$

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



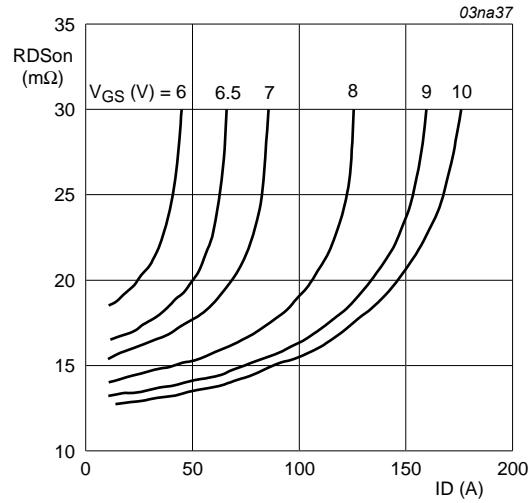
$T_j = 25^\circ C; I_D = 25A$

Fig 10. Gate-source voltage as a function of turn-on gate charge; typical values



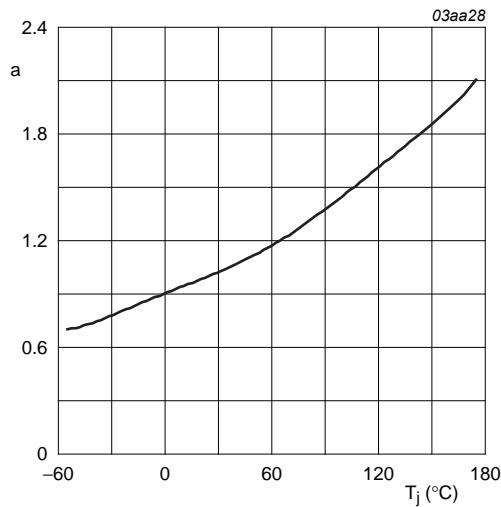
$$I_D = 1mA; V_{DS} = V_{GS}$$

Fig 11. Gate-source threshold voltage as a function of junction temperature



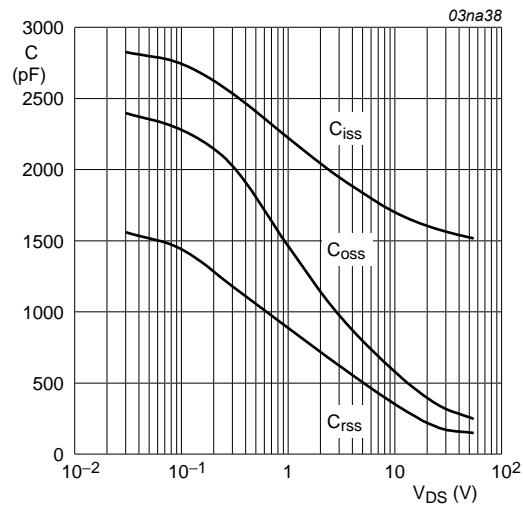
$$T_j = 25^\circ C$$

Fig 12. Drain-source on-state resistance as a function of drain current; typical values



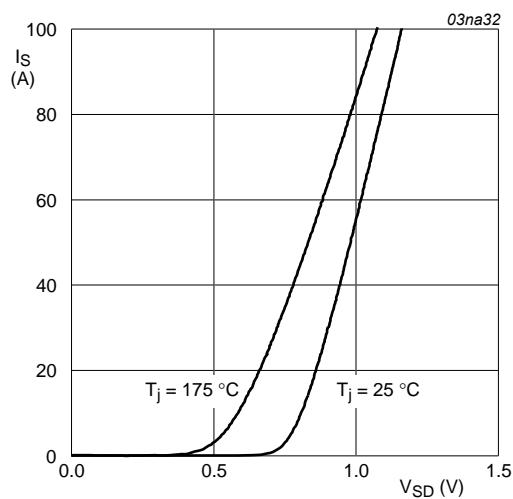
$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ C)}$$

Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature



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

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



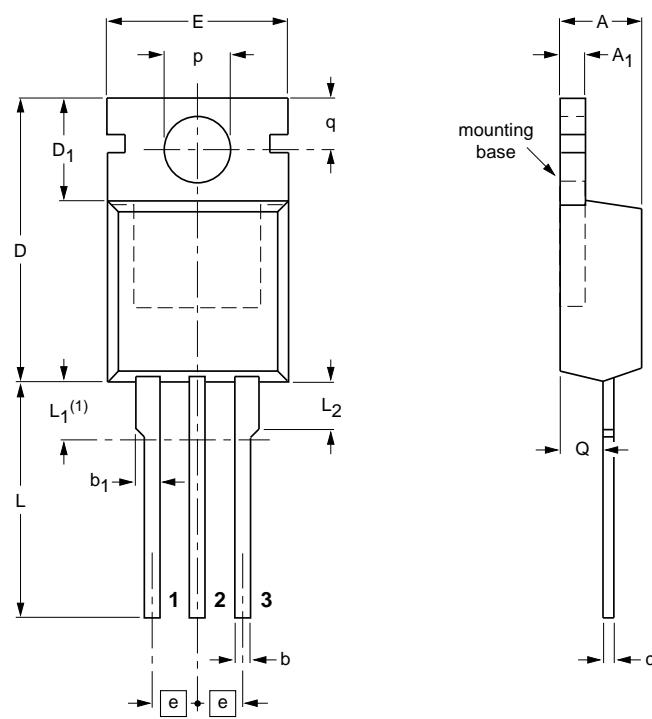
$$V_{GS} = 0V$$

Fig 15. Reverse diode current as a function of reverse diode voltage; typical values

7. Package outline

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

SOT78A



0 5 10 mm
scale

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	1.39	0.9	1.3	0.7	15.8	6.4	10.3	2.54	15.0	3.30	3.0	3.8	3.0	2.6
	4.1	1.27	0.6	1.0	0.4	15.2	5.9	9.7		13.5	2.79	3.0	3.6	2.7	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 16. Package outline SOT78A (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK7516-55A v.2	20110126	Product data sheet	-	BUK7516_7616_55A v.1
Modifications:	<ul style="list-style-type: none">• 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 BUK7516-55A separated from data sheet BUK7516_7616_55A v.1.• Various changes to content.			
BUK7516_7616_55A v.1	20010118	Product specification	-	-

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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11. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	2
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	4
6	Characteristics	4
7	Package outline	9
8	Revision history	10
9	Legal information	11
9.1	Data sheet status	11
9.2	Definitions	11
9.3	Disclaimers	11
9.4	Trademarks	12
10	Contact information	12

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