



BUK9Y53-100B

N-channel TrenchMOS logic level FET

Rev. 01 — 30 August 2007

Product data sheet

1. Product profile

1.1 General description

N-channel enhancement mode power Field-Effect Transistor (FET) in a plastic package using Nexperia High-Performance Automotive (HPA) TrenchMOS technology.

1.2 Features

- Very low on-state resistance
- 175 °C rated
- Q101 compliant
- Logic level compatible

1.3 Applications

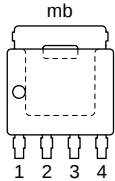
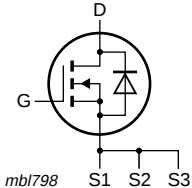
- Automotive systems
- Motors, lamps and solenoids
- General purpose power switching
- 12 V, 24 V and 42 V loads

1.4 Quick reference data

- $E_{DS(AL)S} \leq 85 \text{ mJ}$
- $I_D \leq 23 \text{ A}$
- $R_{DS(on)} = 45 \text{ m}\Omega$ (typ)
- $P_{tot} \leq 75 \text{ W}$

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1, 2, 3	source (S)	 SOT669 (LPAK)	 mb1798
4	gate (G)		
mb	mounting base; connected to drain (D)		

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BUK9Y53-100B	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

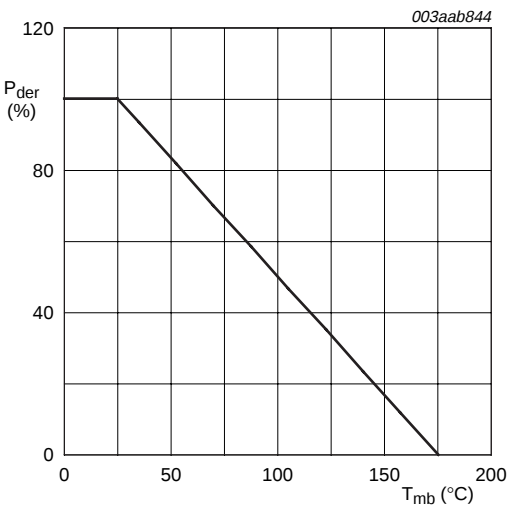
Table 3. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	100	V
V_{DGR}	drain-gate voltage (DC)	$R_{GS} = 20\text{ k}\Omega$	-	100	V
V_{GS}	gate-source voltage		-	± 15	V
I_D	drain current	$T_{mb} = 25\text{ }^\circ\text{C}$; $V_{GS} = 5\text{ V}$; see Figure 2 and 3	-	23	A
		$T_{mb} = 100\text{ }^\circ\text{C}$; $V_{GS} = 5\text{ V}$; see Figure 2	-	16	A
I_{DM}	peak drain current	$T_{mb} = 25\text{ }^\circ\text{C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; see Figure 3	-	94	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^\circ\text{C}$; see Figure 1	-	75	W
T_{stg}	storage temperature		-55	+175	$^\circ\text{C}$
T_j	junction temperature		-55	+175	$^\circ\text{C}$
Source-drain diode					
I_{DR}	reverse drain current	$T_{mb} = 25\text{ }^\circ\text{C}$	-	23	A
I_{DRM}	peak reverse drain current	$T_{mb} = 25\text{ }^\circ\text{C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$	-	94	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	unclamped inductive load; $I_D = 23\text{ A}$; $V_{DS} \leq 100\text{ V}$; $V_{GS} = 5\text{ V}$; $R_{GS} = 50\text{ }\Omega$; starting at $T_j = 25\text{ }^\circ\text{C}$	-	85	mJ
$E_{DS(AL)R}$	repetitive drain-source avalanche energy		-	[1]	-

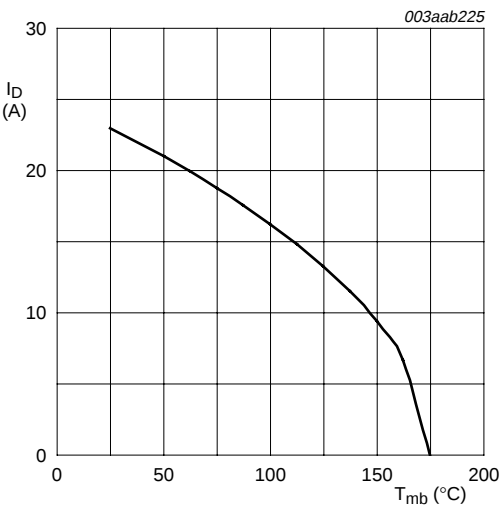
[1] Conditions:

- Maximum value not quoted. Repetitive rating defined in [Figure 16](#).
- Single-pulse avalanche rating limited by $T_{j(max)}$ of $175\text{ }^\circ\text{C}$.
- Repetitive avalanche rating limited by $T_{j(avg)}$ of $170\text{ }^\circ\text{C}$.
- Refer to application note [AN10273](#) for further information.



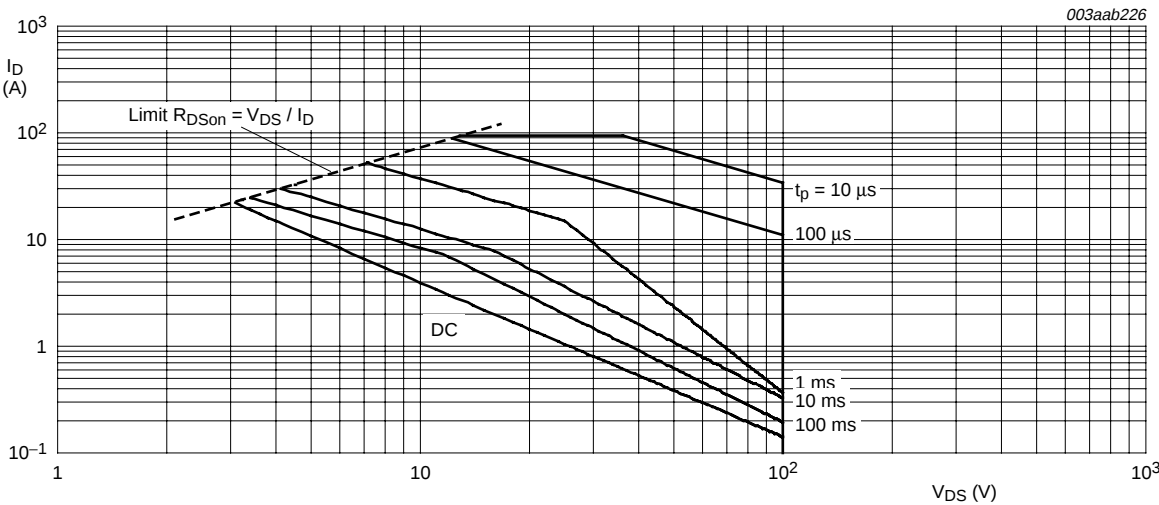
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100 \%$$

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



$$V_{GS} \geq 5 \text{ V}$$

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



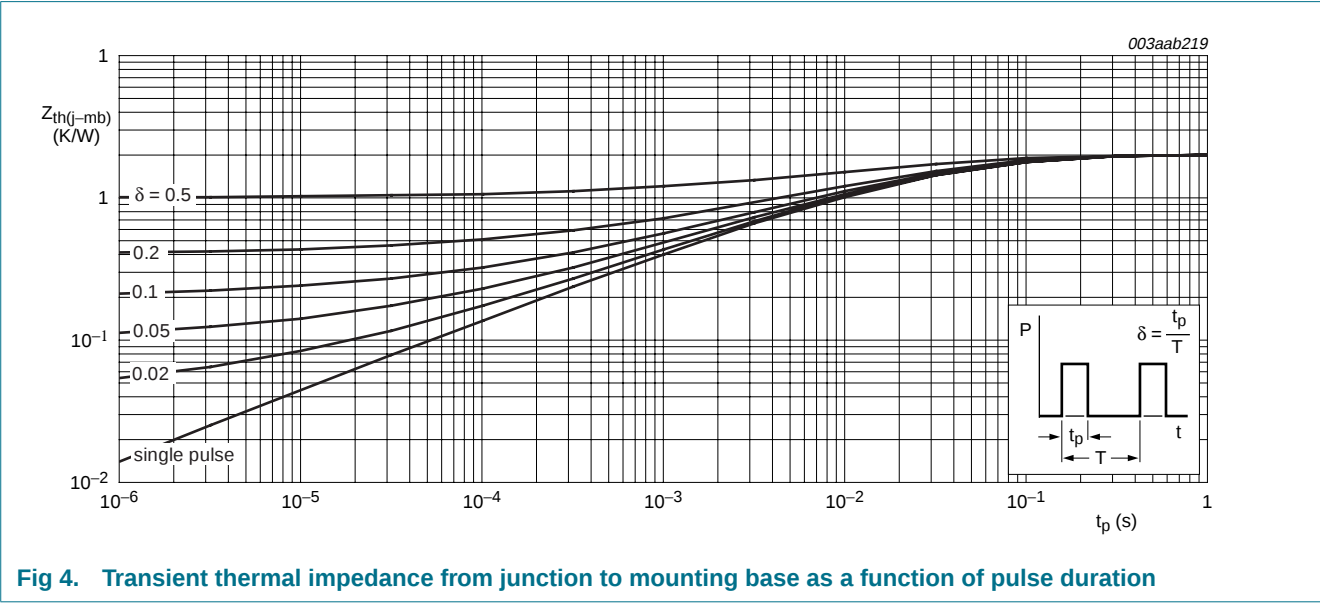
$$T_{mb} = 25^{\circ}C; I_{DM} \text{ is single pulse.}$$

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

5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	2	K/W

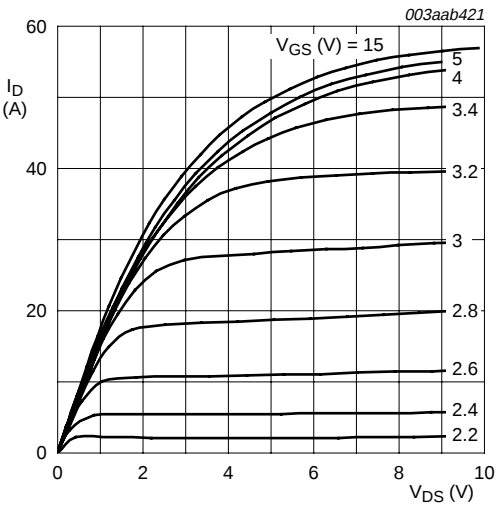


6. Characteristics

Table 5: Characteristics

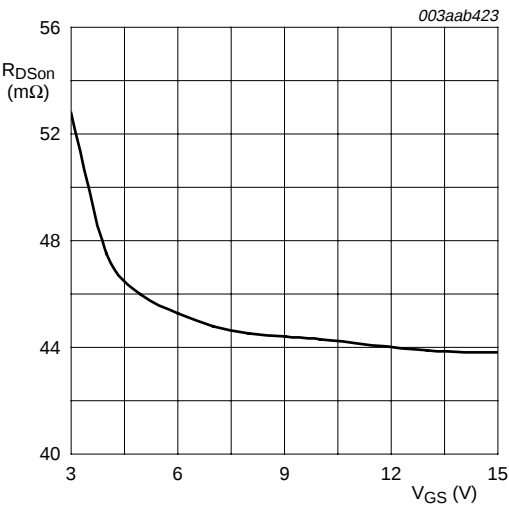
$T_j = 25\text{ °C}$ unless otherwise specified.

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
		T _j = −55 °C	89	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; see Figure 9 and 10				
		T _j = 25 °C	1.1	1.5	2	V
		T _j = 175 °C	0.5	-	-	V
		T _j = −55 °C	-	-	2.3	V
I _{DSS}	drain leakage current	V _{DS} = 100 V; V _{GS} = 0 V				
		T _j = 25 °C	-	0.02	1	μA
		T _j = 175 °C	-	-	500	μA
I _{GSS}	gate leakage current	V _{GS} = ±15 V; V _{DS} = 0 V	-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 5 V; I _D = 10 A; see Figure 6 and 8				
		T _j = 25 °C	-	45	53	mΩ
		T _j = 175 °C	-	-	132	mΩ
		V _{GS} = 4.5 V; I _D = 10 A	-	-	59	mΩ
		V _{GS} = 10 V; I _D = 10 A	-	41	49	mΩ
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 15 A; V _{DS} = 80 V; V _{GS} = 5 V; see Figure 14	-	18	-	nC
Q _{GS}	gate-source charge		-	4.1	-	nC
Q _{GD}	gate-drain charge		-	8	-	nC
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz; see Figure 12	-	1600	2130	pF
C _{oss}	output capacitance		-	141	170	pF
C _{rss}	reverse transfer capacitance		-	60	82	pF
t _{d(on)}	turn-on delay time	V _{DS} = 30 V; R _L = 2.5 Ω; V _{GS} = 5 V; R _G = 10 Ω	-	18	-	ns
t _r	rise time		-	26	-	ns
t _{d(off)}	turn-off delay time		-	52	-	ns
t _f	fall time		-	16	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; see Figure 15	-	0.85	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = −100 A/μs; V _{GS} = 0 V; V _R = 30 V	-	71	-	ns
Q _r	recovered charge		-	83	-	nC



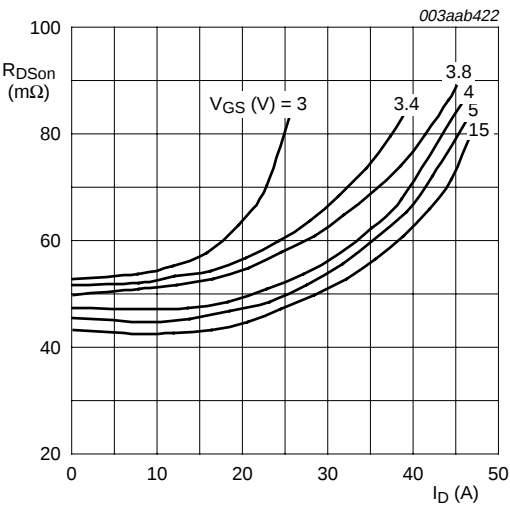
$T_j = 25\text{ }^{\circ}\text{C}$

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



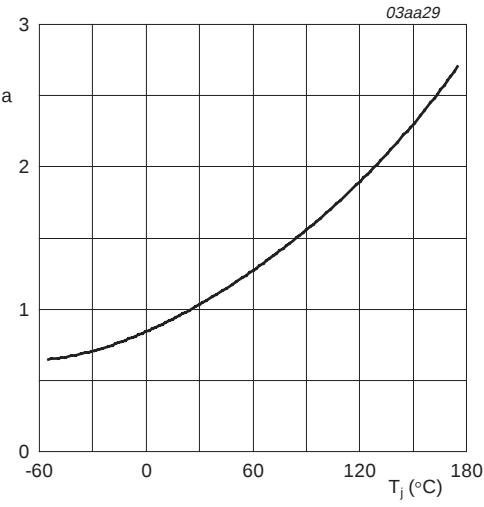
$T_j = 25\text{ }^{\circ}\text{C}; I_D = 20\text{ A}$

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



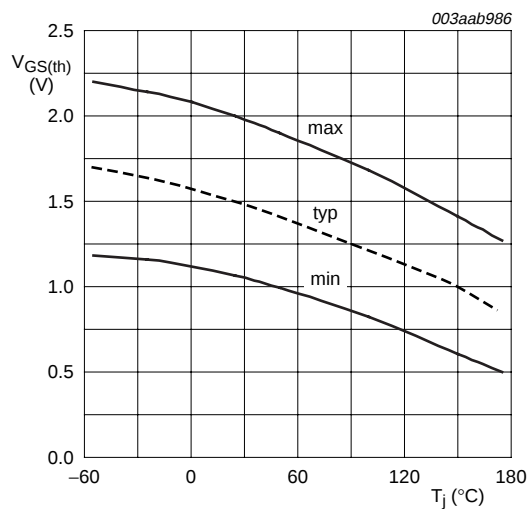
$T_j = 25\text{ }^{\circ}\text{C}$

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



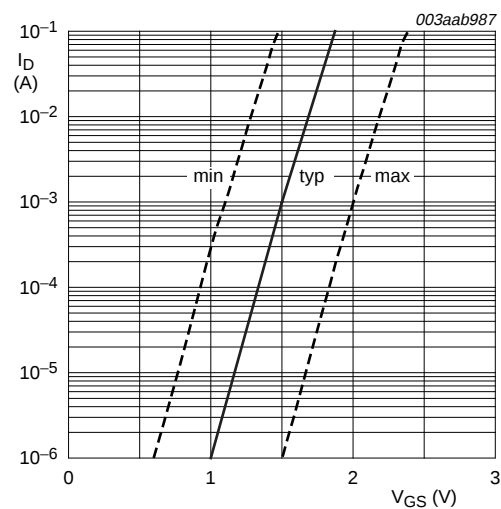
$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}\text{C})}}$$

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



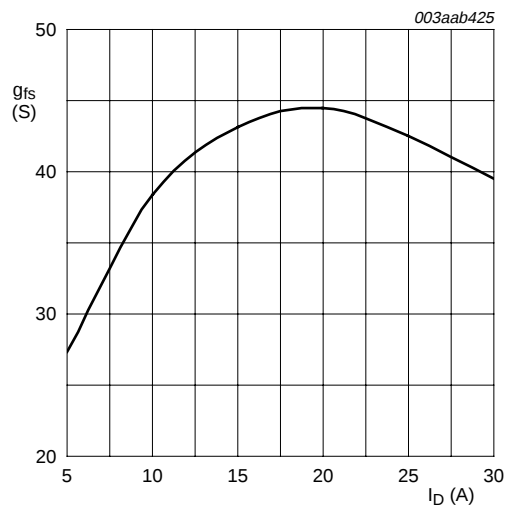
$I_D = 1\text{ mA}$; $V_{DS} = V_{GS}$

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



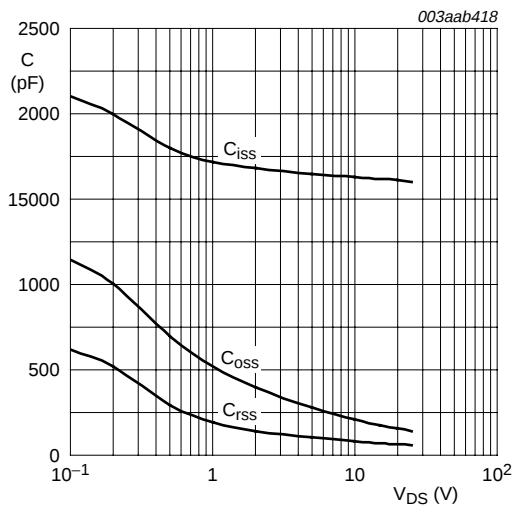
$T_j = 25\text{ °C}$; $V_{DS} = V_{GS}$

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



$T_j = 25\text{ °C}$; $V_{DS} = 25\text{ V}$

Fig 11. Forward transconductance as a function of drain current; typical values



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

Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

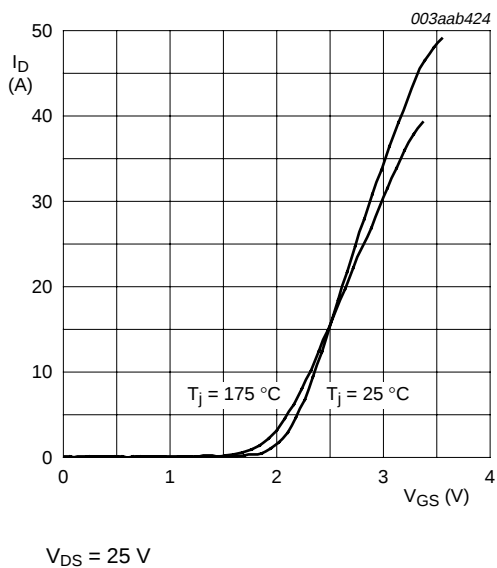


Fig 13. Transfer characteristics: drain current as a function of gate-source voltage; typical values

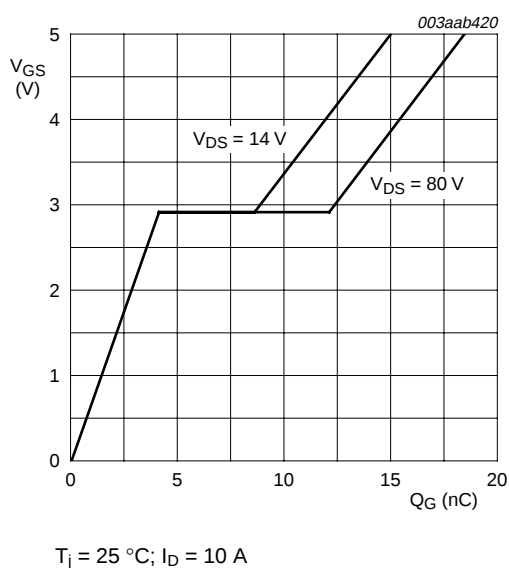


Fig 14. Gate-source voltage as a function of gate charge; typical values

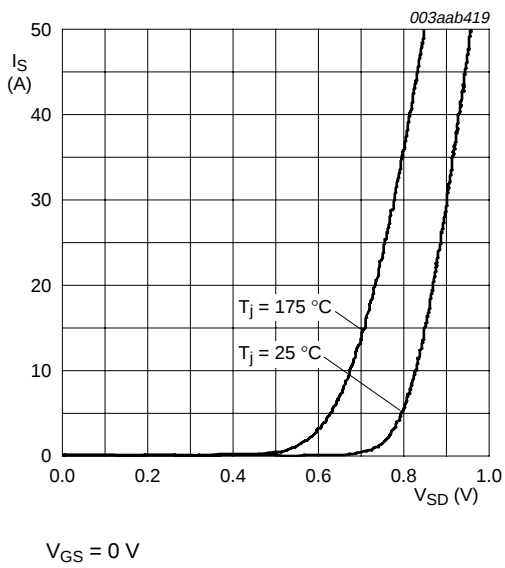
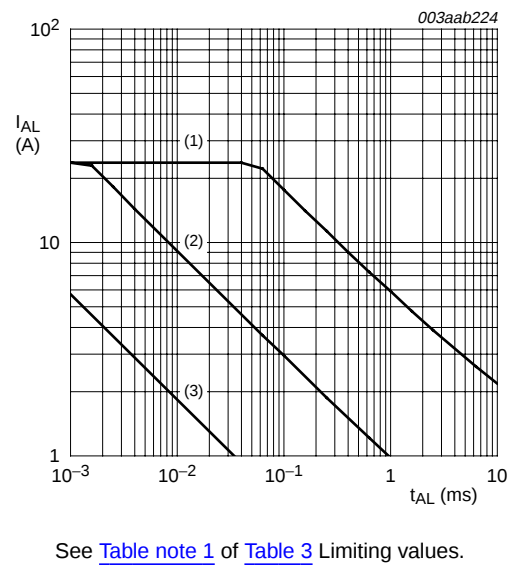


Fig 15. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values



See [Table note 1](#) of [Table 3](#) Limiting values.

(1) Single-pulse; $T_j = 25\text{ }^{\circ}\text{C}$.

(2) Single-pulse; $T_j = 150\text{ }^{\circ}\text{C}$.

(3) Repetitive.

Fig 16. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

7. Package outline

Plastic single-ended surface-mounted package (LPAK); 4 leads

SOT669

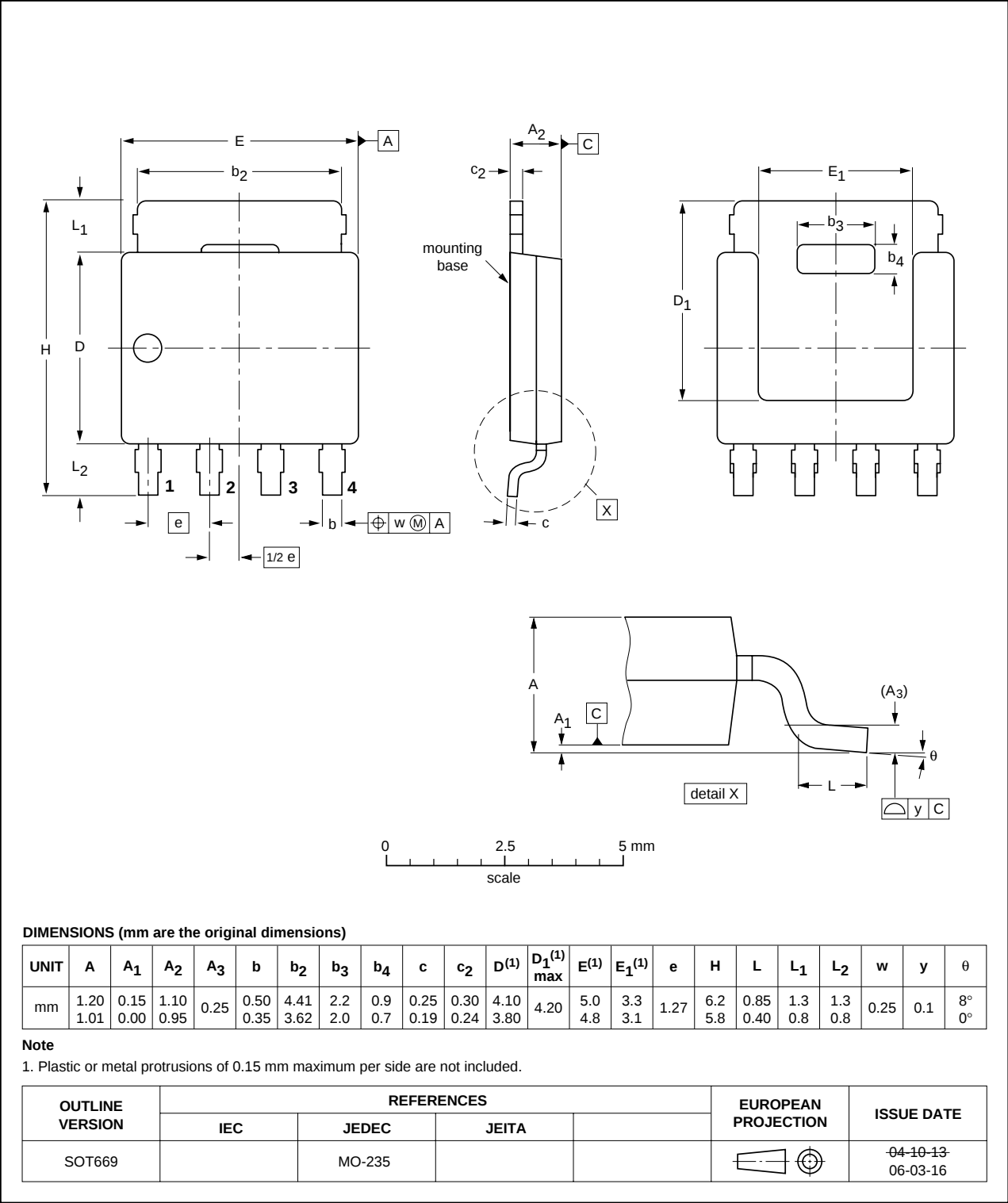


Fig 17. Package outline SOT669 (LPAK)

8. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9Y53-100B_01	20070830	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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