



NX3008NBK

30 V, 400 mA N-channel Trench MOSFET

5 November 2022

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Very fast switching
- Low threshold voltage
- Trench MOSFET technology
- ESD protection up to 2 kV
- AEC-Q101 qualified

3. Applications

- Relay driver
- High-speed line driver
- Low-side load switch
- Switching circuits

4. Quick reference data

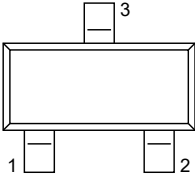
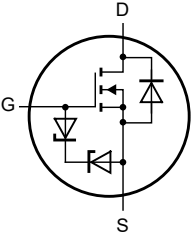
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	30	V
V_{GS}	gate-source voltage		-8	-	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	400	mA
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 350\text{ mA}; T_j = 25\text{ °C}$	-	1	1.4	Ω

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT23	 017aaa255
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
NX3008NBK	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
NX3008NBK	KS %

[1] % = placeholder for manufacturing site code

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_J = 25\text{ }^{\circ}\text{C}$		-	30	V
V_{GS}	gate-source voltage			-8	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	400	mA
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ }^{\circ}\text{C}$	[1]	-	250	mA
I_{DM}	peak drain current	$T_{amb} = 25\text{ }^{\circ}\text{C}$; single pulse; $t_p \leq 10\text{ }\mu\text{s}$		-	1.6	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^{\circ}\text{C}$	[2]	-	350	mW
			[1]	-	420	mW
		$T_{sp} = 25\text{ }^{\circ}\text{C}$		-	1140	mW
T_J	junction temperature			-55	150	$^{\circ}\text{C}$
T_{amb}	ambient temperature			-55	150	$^{\circ}\text{C}$
T_{stg}	storage temperature			-65	150	$^{\circ}\text{C}$
Source-drain diode						
I_S	source current	$T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	400	mA
ESD maximum rating						
V_{ESD}	electrostatic discharge voltage	HBM	[3]	-	2000	V

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[3] Measured between all pins.

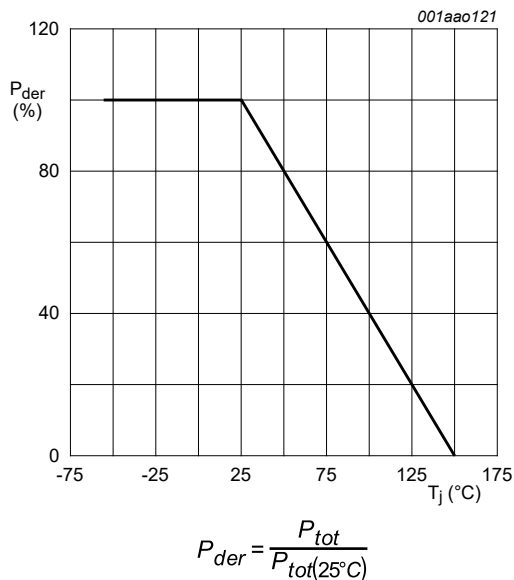


Fig. 1. Normalized total power dissipation as a function of junction temperature

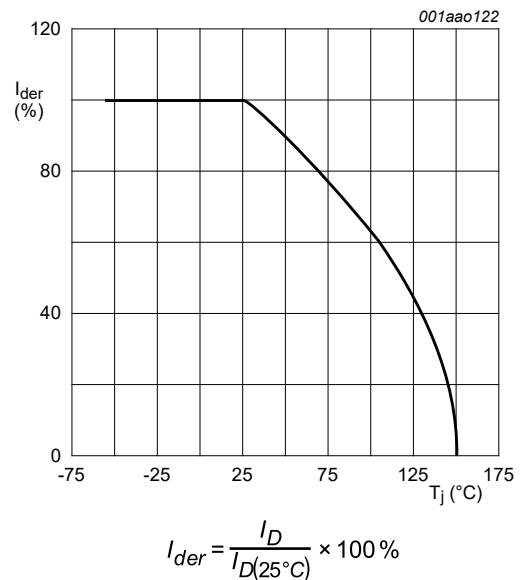
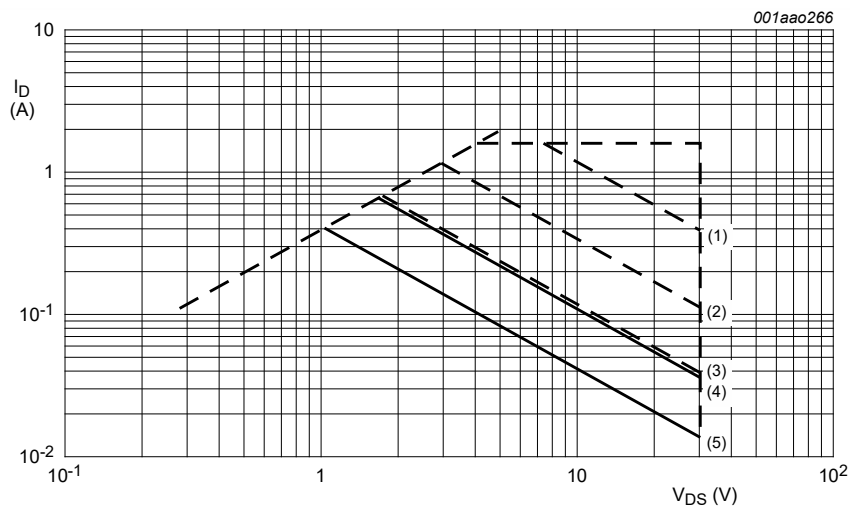


Fig. 2. Normalized continuous drain current as a function of junction temperature



I_{DM} is a single pulse

(1) $t_p = 1$ ms

(2) $t_p = 10$ ms

(3) $t_p = 100$ ms

(4) DC; $T_{sp} = 25$ °C

(5) DC; $T_{amb} = 25$ °C; 1 cm² drain mounting pad

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

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	310	370	K/W
			[2]	-	260	300	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	115	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm².

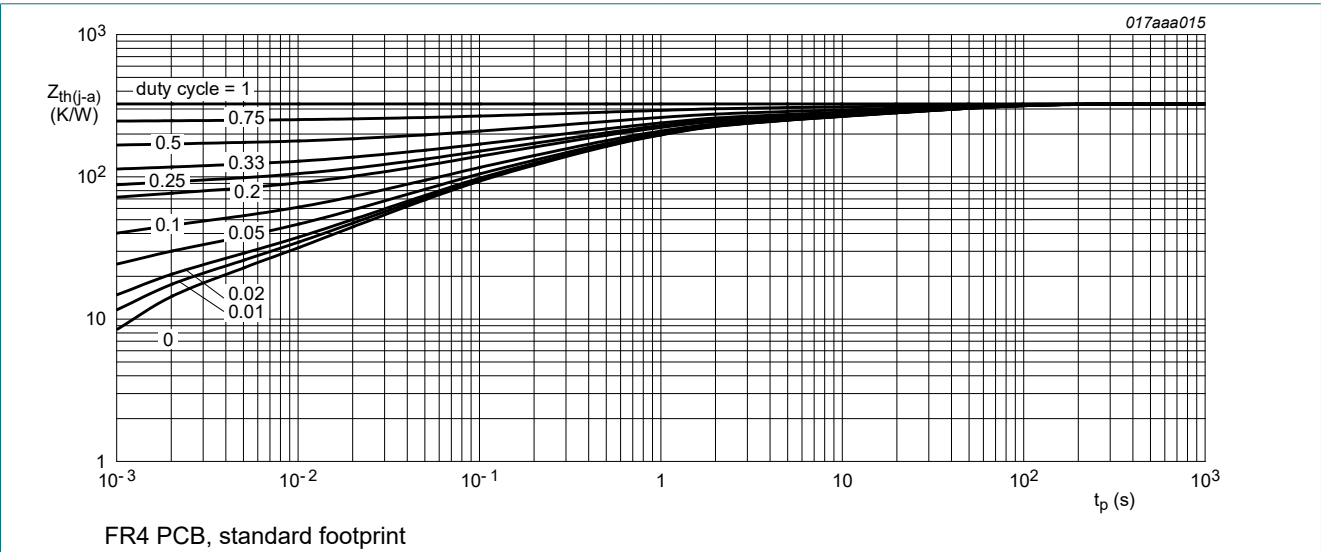


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

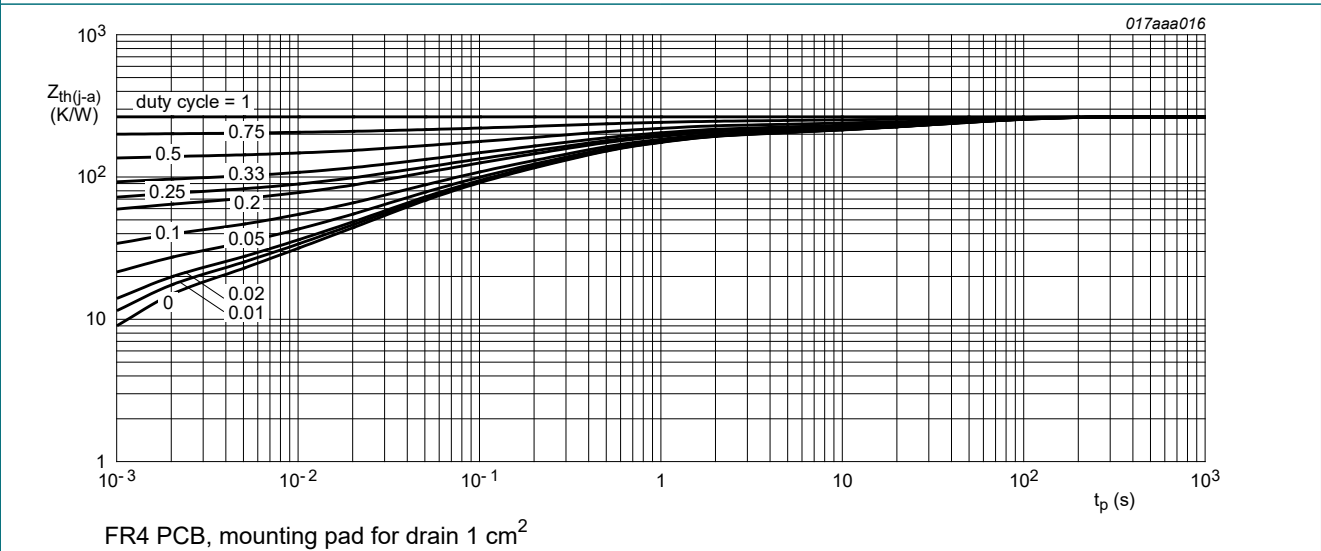


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _J = 25 °C		30	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = 250 μA; V _{DS} =V _{GS} ; T _J = 25 °C		0.6	0.9	1.1	V
I _{DSS}	drain leakage current	V _{DS} = 30 V; V _{GS} = 0 V; T _J = 25 °C		-	-	1	μA
		V _{DS} = 30 V; V _{GS} = 0 V; T _J = 150 °C		-	-	10	μA
I _{GSS}	gate leakage current	V _{GS} = 8 V; V _{DS} = 0 V; T _J = 25 °C		-	0.2	1	μA
		V _{GS} = -8 V; V _{DS} = 0 V; T _J = 25 °C		-	0.2	1	μA
		V _{GS} = 4.5 V; V _{DS} = 0 V; T _J = 25 °C		-	10	-	nA
		V _{GS} = -4.5 V; V _{DS} = 0 V; T _J = 25 °C		-	10	-	nA
		V _{GS} = 2.5 V; V _{DS} = 0 V; T _J = 25 °C		-	1	-	nA
		V _{GS} = -2.5 V; V _{DS} = 0 V; T _J = 25 °C		-	1	-	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 350 mA; T _J = 25 °C		-	1	1.4	Ω
		V _{GS} = 4.5 V; I _D = 350 mA; T _J = 150 °C		-	1.8	2.5	Ω
		V _{GS} = 2.5 V; I _D = 200 mA; T _J = 25 °C		-	1.4	2.1	Ω
		V _{GS} = 1.8 V; I _D = 10 mA; T _J = 25 °C		-	2	2.8	Ω
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 350 mA; T _J = 25 °C		-	310	-	mS
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = 15 V; I _D = 400 mA; V _{GS} = 4.5 V; T _J = 25 °C		-	0.52	0.68	nC
Q _{GS}	gate-source charge			-	0.17	-	nC
Q _{GD}	gate-drain charge			-	0.08	-	nC
C _{iss}	input capacitance	V _{DS} = 15 V; f = 1 MHz; V _{GS} = 0 V; T _J = 25 °C		-	34	50	pF
C _{oss}	output capacitance			-	6.5	-	pF
C _{rss}	reverse transfer capacitance			-	2.2	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 20 V; R _L = 250 Ω; V _{GS} = 4.5 V; R _{G(ext)} = 6 Ω; T _J = 25 °C		-	15	30	ns
t _r	rise time			-	11	-	ns
t _{d(off)}	turn-off delay time			-	69	138	ns
t _f	fall time			-	19	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 350 mA; V _{GS} = 0 V; T _J = 25 °C		0.47	0.85	1.2	V

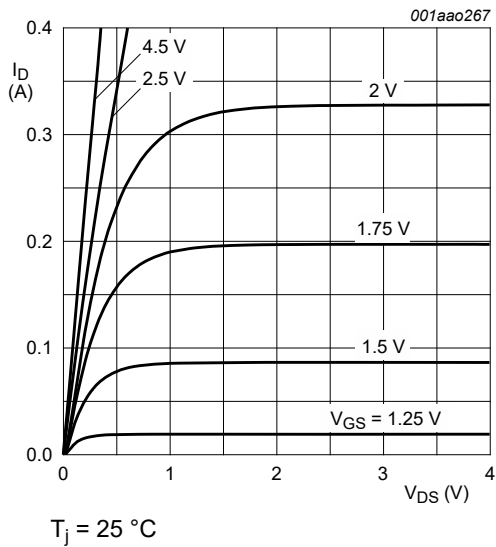


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

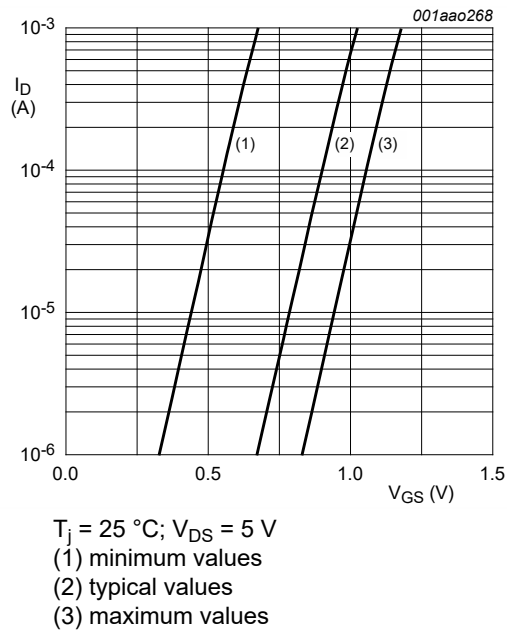


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

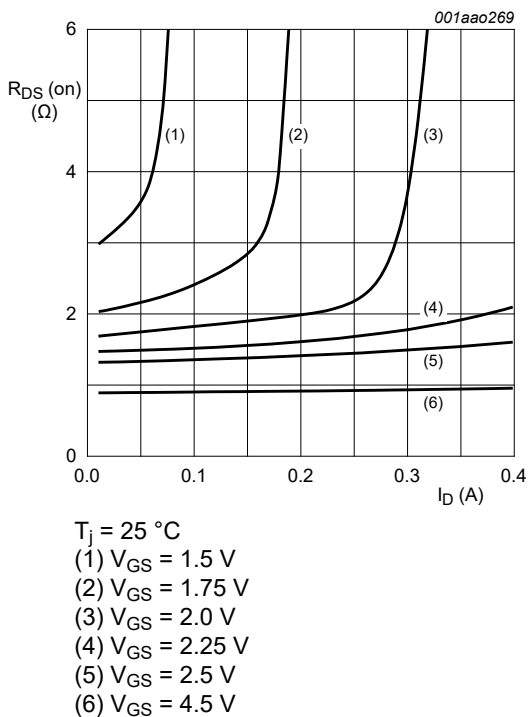


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

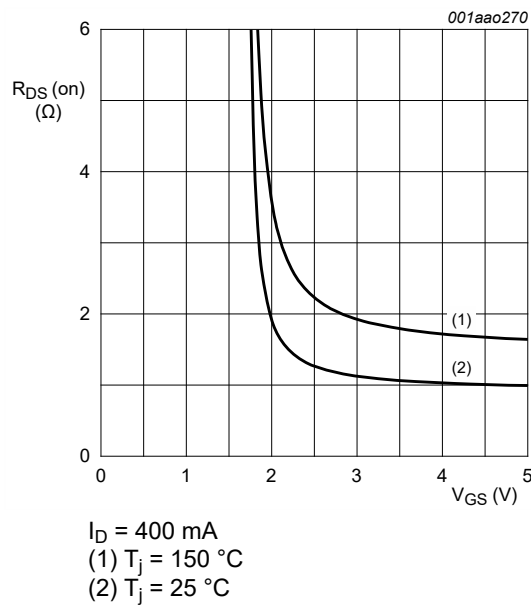


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

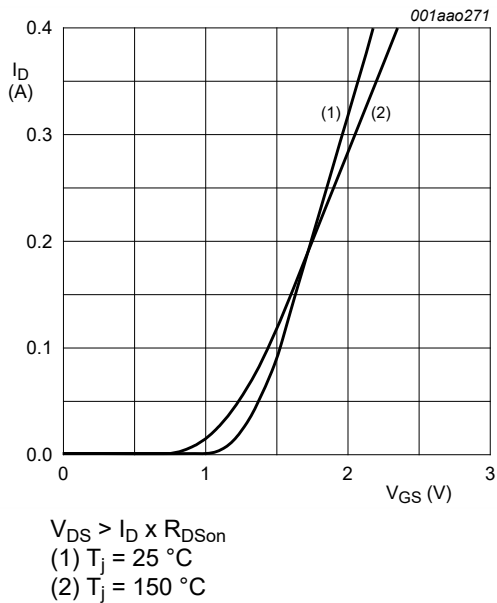


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

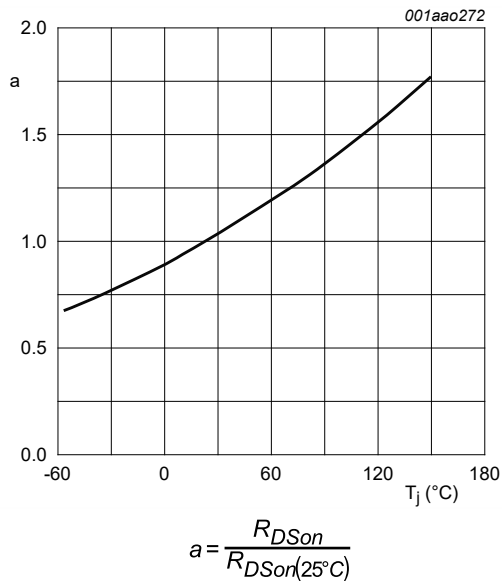


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

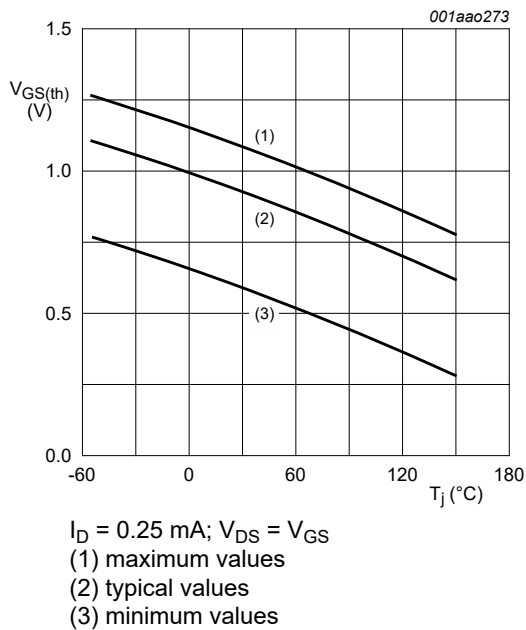


Fig. 12. Gate-source threshold voltage as a function of junction temperature

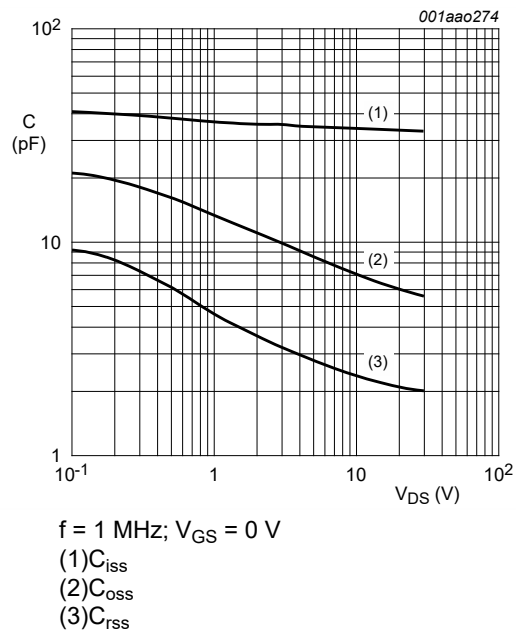


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

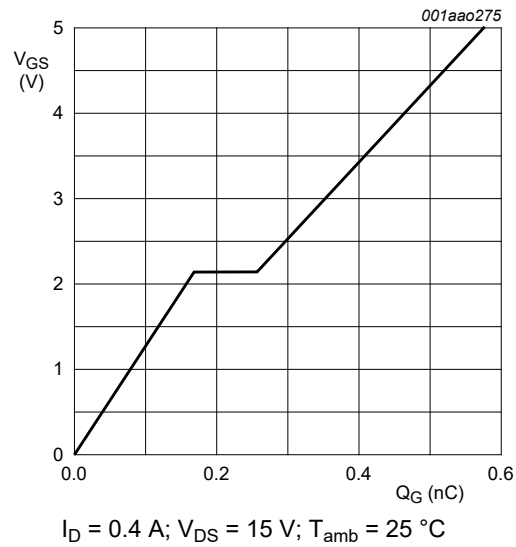


Fig. 14. Gate-source voltage as a function of gate charge; typical values

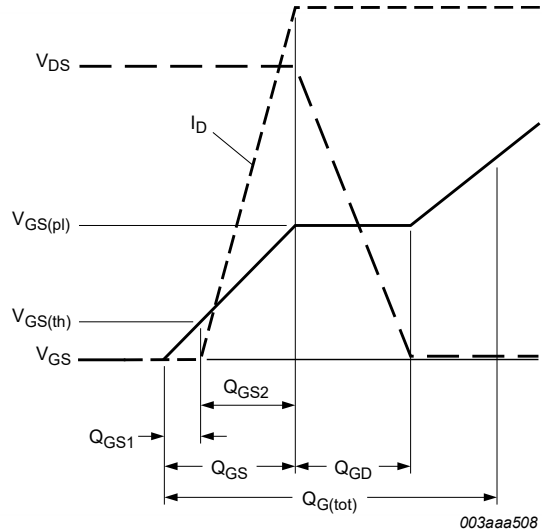
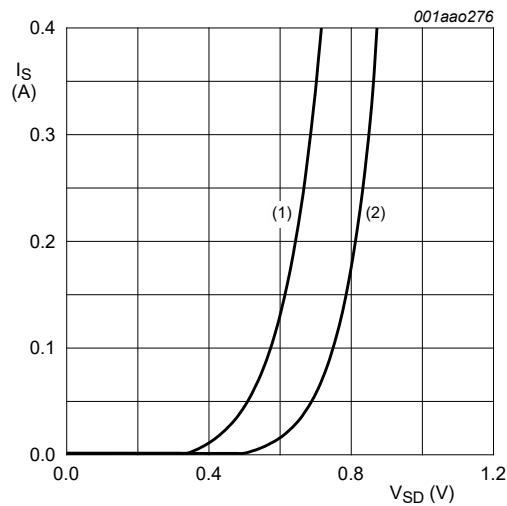


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0$ V
(1) $T_j = 150$ °C
(2) $T_j = 25$ °C

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

11. Test information



Fig. 17. Duty cycle definition

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

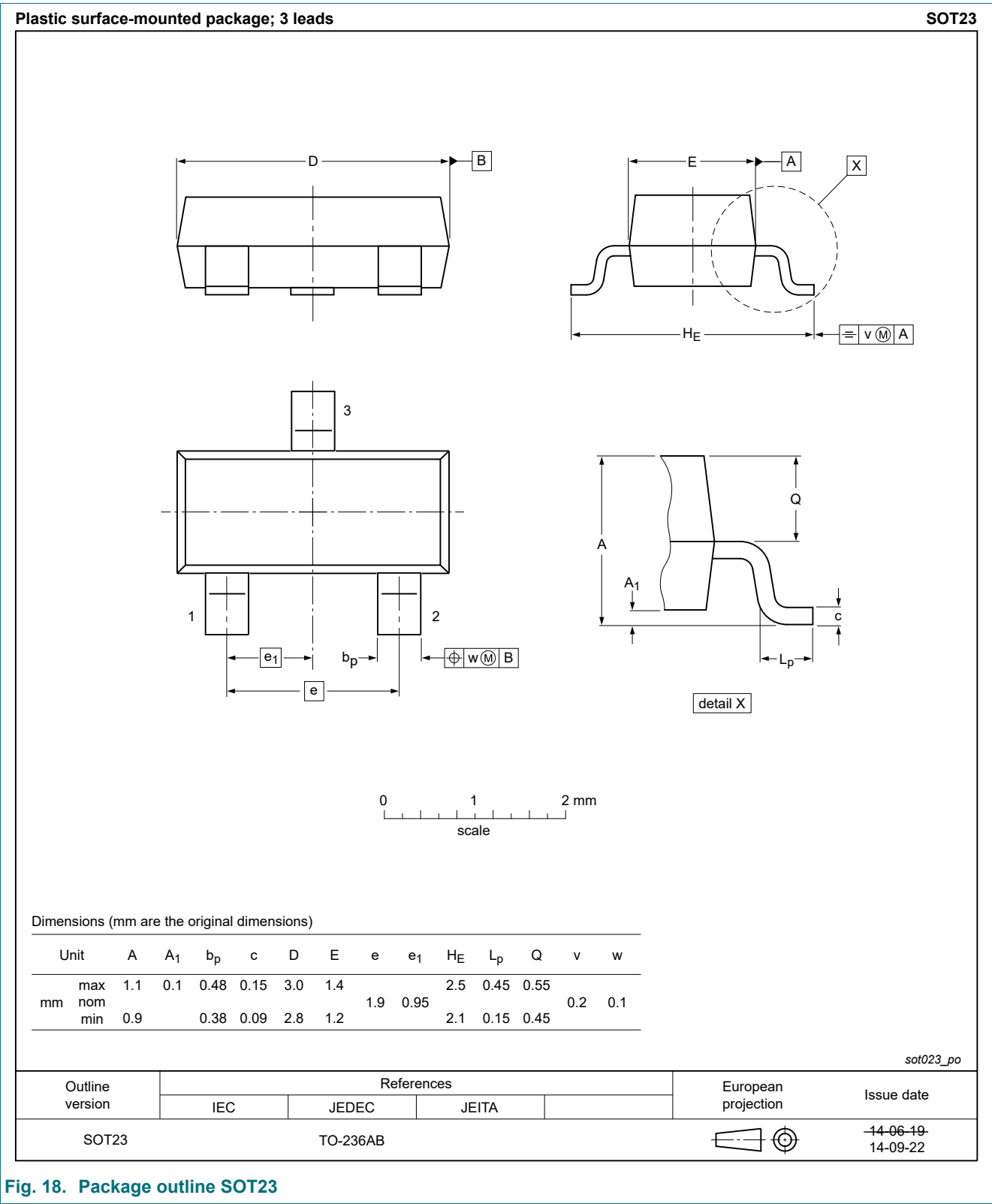
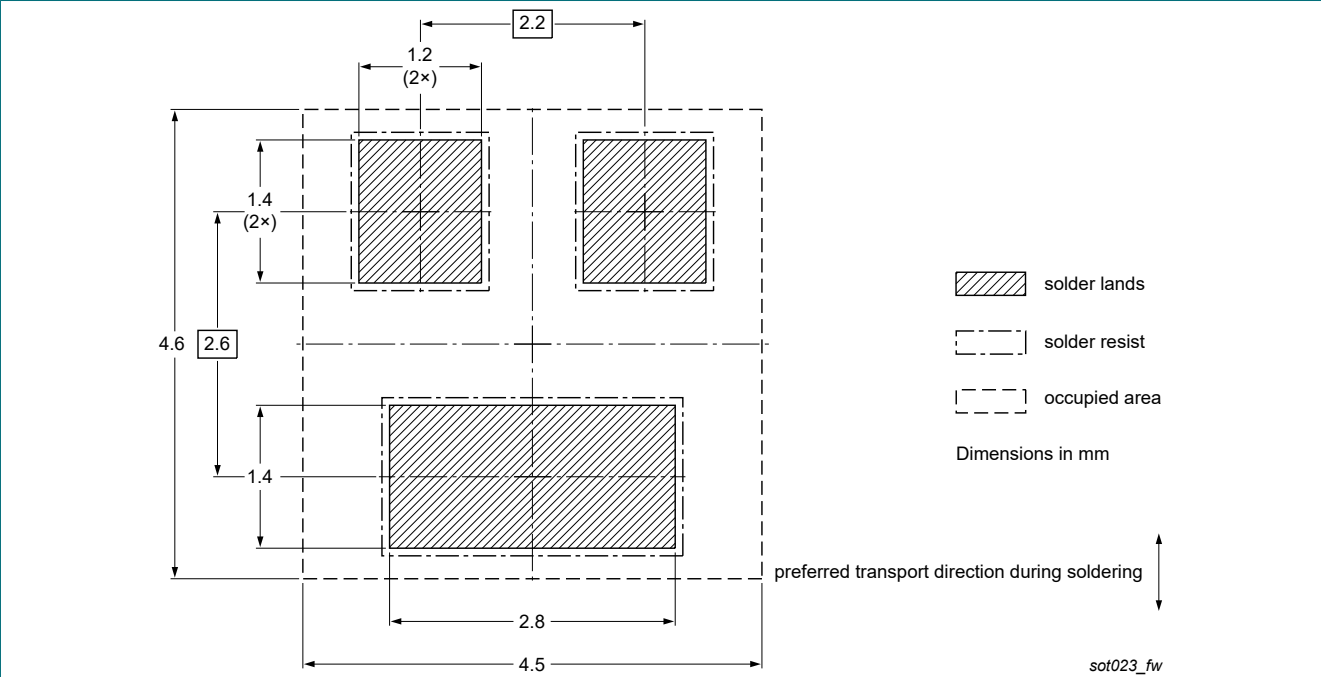


Fig. 18. Package outline SOT23

13. Soldering



14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
NX3008NBK v.2	20221105	Product data sheet	-	NX3008NBK v.1
Modifications:	• Chapter "Characteristics": typo correction, V_{SD} axis scaling for Fig. 16 revised			
NX3008NBK v.1	20110802	Product data sheet	-	-

15. Legal information

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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