



NX3008NBKW

30 V, 350 mA N-channel Trench MOSFET

Rev. 1 — 2 August 2011

Product data sheet

1. Product profile

1.1 General description

N-channel enhancement mode Field-Effect Transistor (FET) in a small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

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

1.3 Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

1.4 Quick reference data

Table 1. Quick reference data

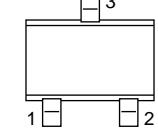
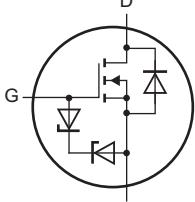
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25^\circ\text{C}$	-	-	30	V
V_{GS}	gate-source voltage		-8	-	8	V
I_D	drain current	$V_{GS} = 4.5 \text{ V}; T_{amb} = 25^\circ\text{C}$	[1]	-	-	350 mA
Static characteristics						
R_{DSon}	drain-source on-state resistance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

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

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2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	S	source		
3	D	drain	 SOT323 (SC-70)	 017aaa255

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
NX3008NBKW	SC-70	plastic surface-mounted package; 3 leads	SOT323

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
NX3008NBKW	AA%

[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

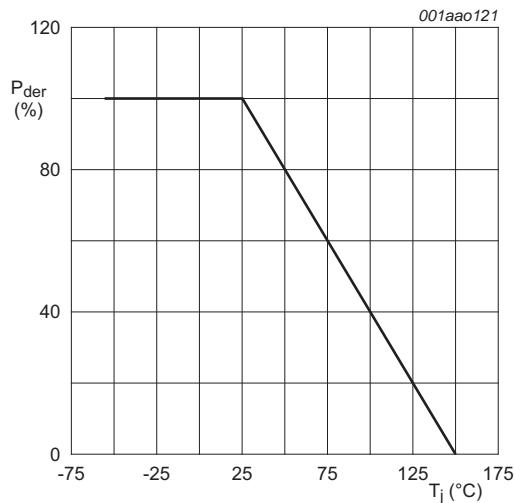
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25^\circ\text{C}$	-	30	V
V_{GS}	gate-source voltage		-8	8	V
I_D	drain current	$V_{GS} = 4.5 \text{ V}; T_{amb} = 25^\circ\text{C}$	[1] -	350	mA
		$V_{GS} = 4.5 \text{ V}; T_{amb} = 100^\circ\text{C}$	[1] -	230	mA
I_{DM}	peak drain current	$T_{amb} = 25^\circ\text{C}$; single pulse; $t_p \leq 10 \mu\text{s}$	-	1.4	A
P_{tot}	total power dissipation	$T_{amb} = 25^\circ\text{C}$	[2] -	260	mW
		$T_{sp} = 25^\circ\text{C}$	[1] -	310	mW
T_j	junction temperature		-55	150	°C
T_{amb}	ambient temperature		-55	150	°C
T_{stg}	storage temperature		-65	150	°C
Source-drain diode					
I_S	source current	$T_{amb} = 25^\circ\text{C}$	[1] -	300	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.

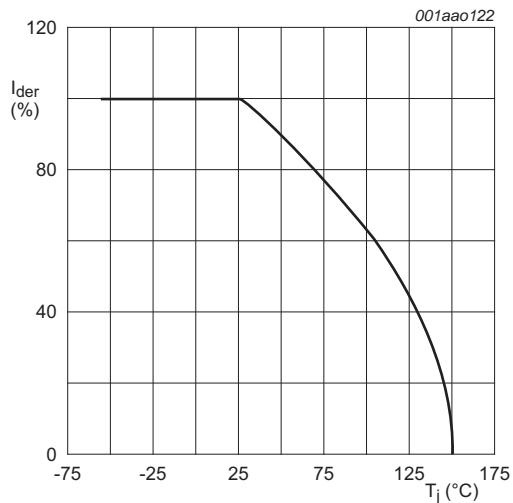
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[3] Measured between all pins.



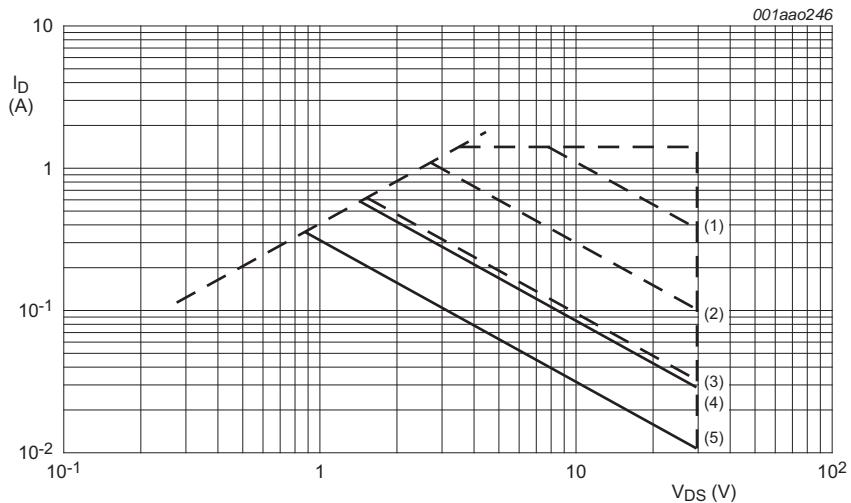
$$P_{der} = \frac{P_{tot}}{P_{tot}(25^{\circ}\text{C})} \times 100\%$$

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



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

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

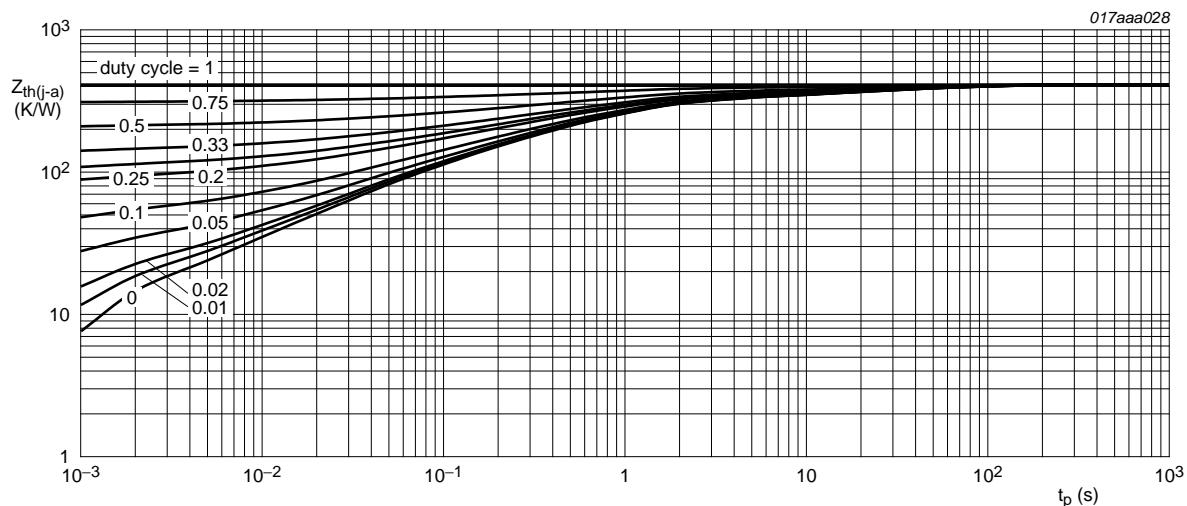
6. Thermal characteristics

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	K/W
			[2]	-	260	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	115	K/W

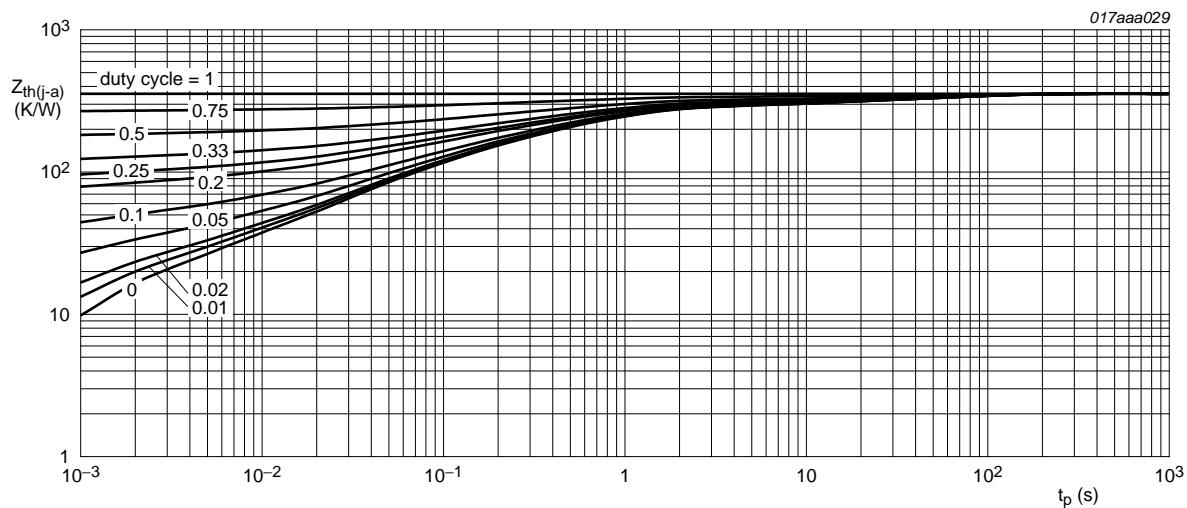
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

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



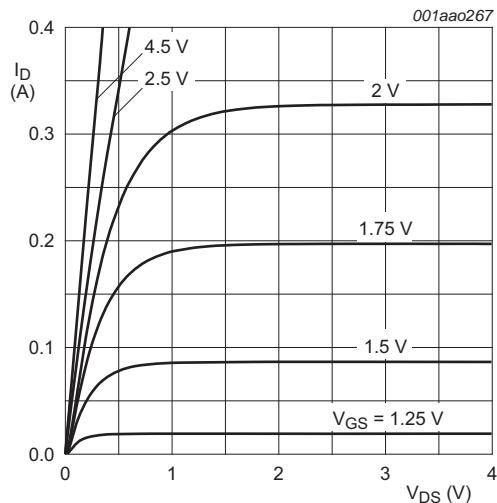
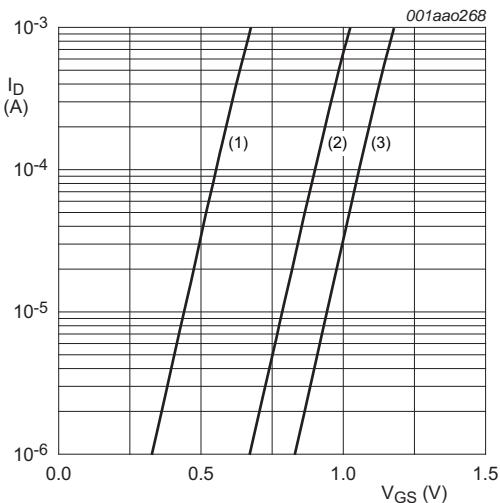
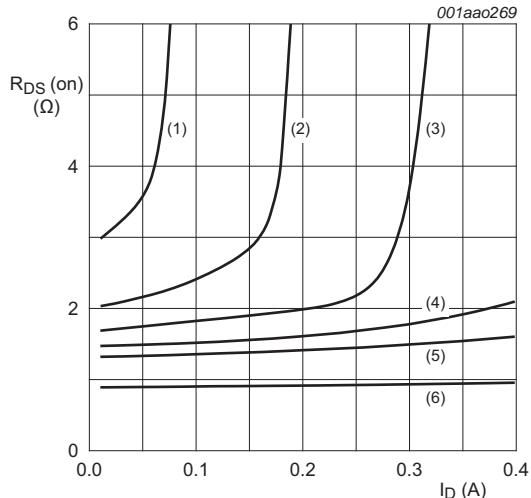
FR4 PCB, mounting pad for drain 1 cm²

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

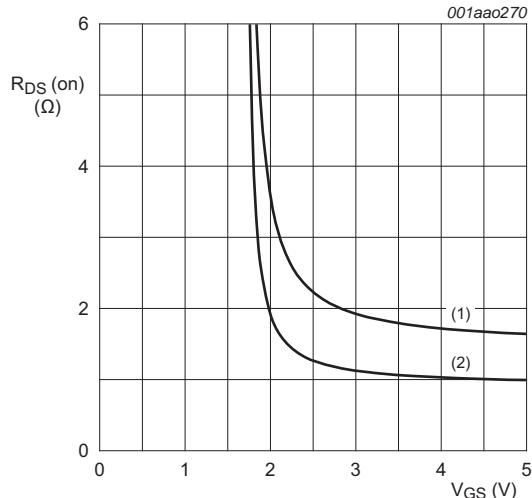
7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$	30	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25^\circ C$	0.6	0.9	1.1	V
I_{DSS}	drain leakage current	$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25^\circ C$	-	-	1	μA
		$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 150^\circ C$	-	-	10	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25^\circ C$	-	0.2	1	μA
		$V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25^\circ C$	-	0.2	1	μA
		$V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25^\circ C$	-	10	-	nA
		$V_{GS} = -4.5 V; V_{DS} = 0 V; T_j = 25^\circ C$	-	10	-	nA
		$V_{GS} = 2.5 V; V_{DS} = 0 V; T_j = 25^\circ C$	-	1	-	nA
		$V_{GS} = -2.5 V; V_{DS} = 0 V; T_j = 25^\circ C$	-	1	-	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 V; I_D = 350 mA; T_j = 25^\circ C$	-	1	1.4	Ω
		$V_{GS} = 4.5 V; I_D = 350 mA; T_j = 150^\circ C$	-	1.8	2.5	Ω
		$V_{GS} = 2.5 V; I_D = 200 mA; T_j = 25^\circ C$	-	1.4	2.1	Ω
		$V_{GS} = 1.8 V; I_D = 10 mA; T_j = 25^\circ C$	-	2	2.8	Ω
g_{fs}	forward transconductance	$V_{DS} = 10 V; I_D = 350 mA; T_j = 25^\circ C$	-	310	-	mS
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 15 V; I_D = 350 mA; V_{GS} = 4.5 V; T_j = 25^\circ C$	-	0.52	0.68	nC
Q_{GS}	gate-source charge	$T_j = 25^\circ C$	-	0.17	-	nC
Q_{GD}	gate-drain charge		-	0.08	-	nC
C_{iss}	input capacitance	$V_{DS} = 15 V; f = 1 MHz; V_{GS} = 0 V;$	-	34	50	pF
C_{oss}	output capacitance	$T_j = 25^\circ C$	-	6.5	-	pF
C_{rss}	reverse transfer capacitance		-	2.2	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 20 V; R_L = 250 \Omega; V_{GS} = 4.5 V;$	-	15	30	ns
t_r	rise time	$R_{G(ext)} = 6 \Omega; T_j = 25^\circ C$	-	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	$I_S = 350 mA; V_{GS} = 0 V; T_j = 25^\circ C$	0.47	0.85	1.2	V

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

- (1) $V_{GS} = 1.5 \text{ V}$
- (2) $V_{GS} = 1.75 \text{ V}$
- (3) $V_{GS} = 2.0 \text{ V}$
- (4) $V_{GS} = 2.25 \text{ V}$
- (5) $V_{GS} = 2.5 \text{ V}$
- (6) $V_{GS} = 4.5 \text{ V}$

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

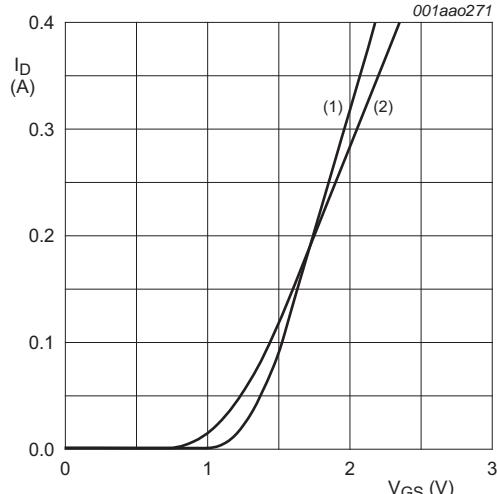
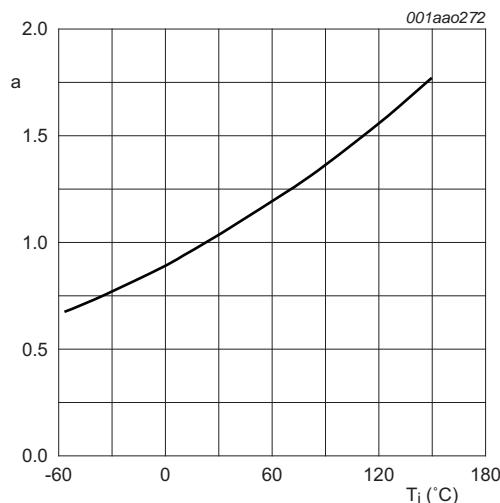

 $V_{DS} > I_D \times R_{DSon}$
 $(1) T_j = 25^\circ\text{C}$
 $(2) T_j = 150^\circ\text{C}$

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



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

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

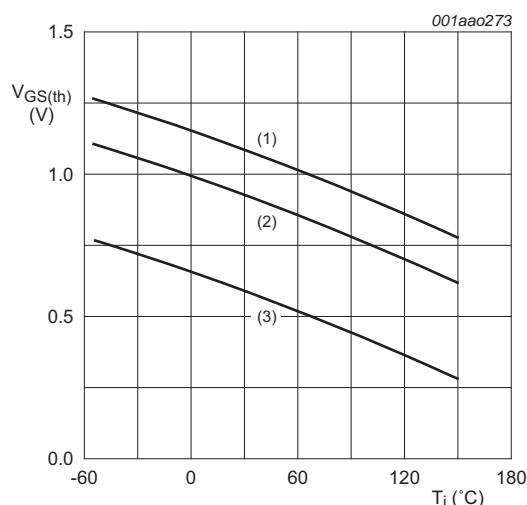

 $I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$
 $(1) \text{ maximum values}$
 $(2) \text{ typical values}$
 $(3) \text{ minimum values}$

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

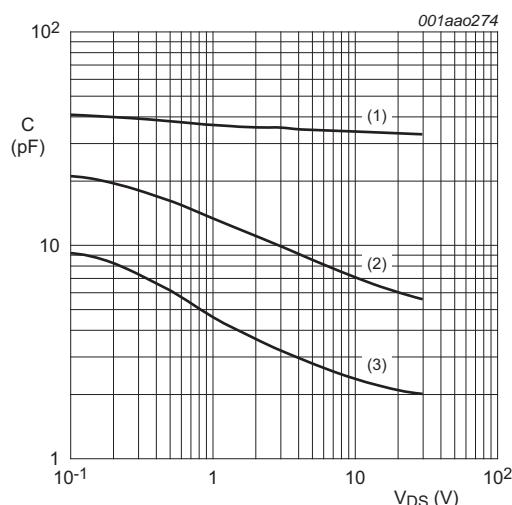
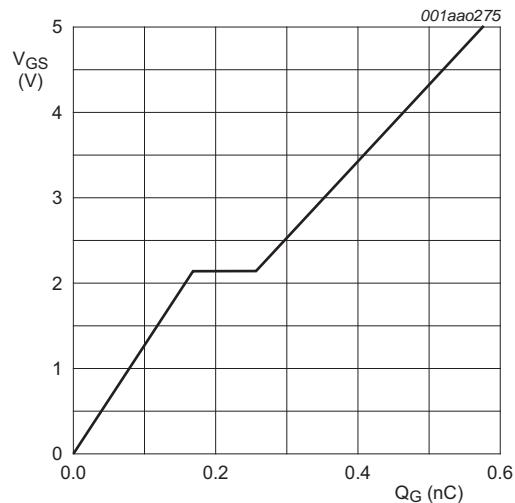

 $f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$
 $(1) C_{iss}$
 $(2) C_{oss}$
 $(3) C_{rss}$

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



I_D = 350 mA; V_{DS} = 15 V; T_{amb} = 25 °C

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

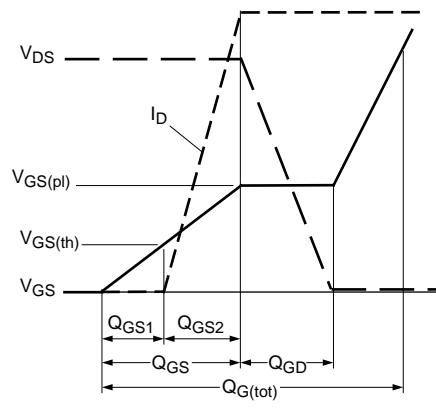
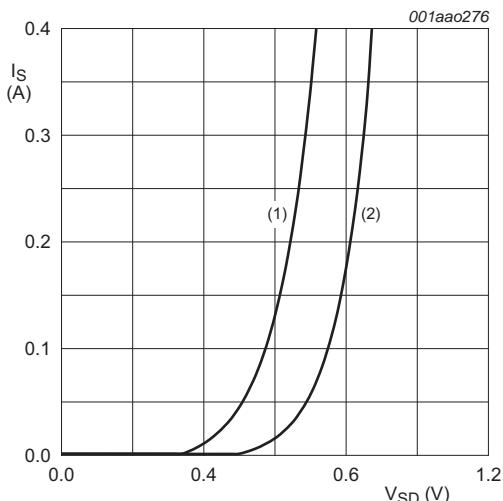


Fig 15. Gate charge waveform definitions



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

8. Test information

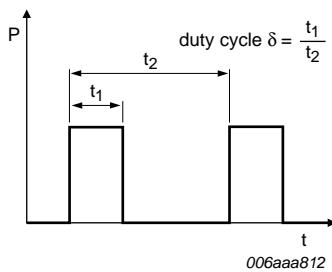


Fig 17. Duty cycle definition

8.1 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.

9. Package outline

Plastic surface-mounted package; 3 leads

SOT323

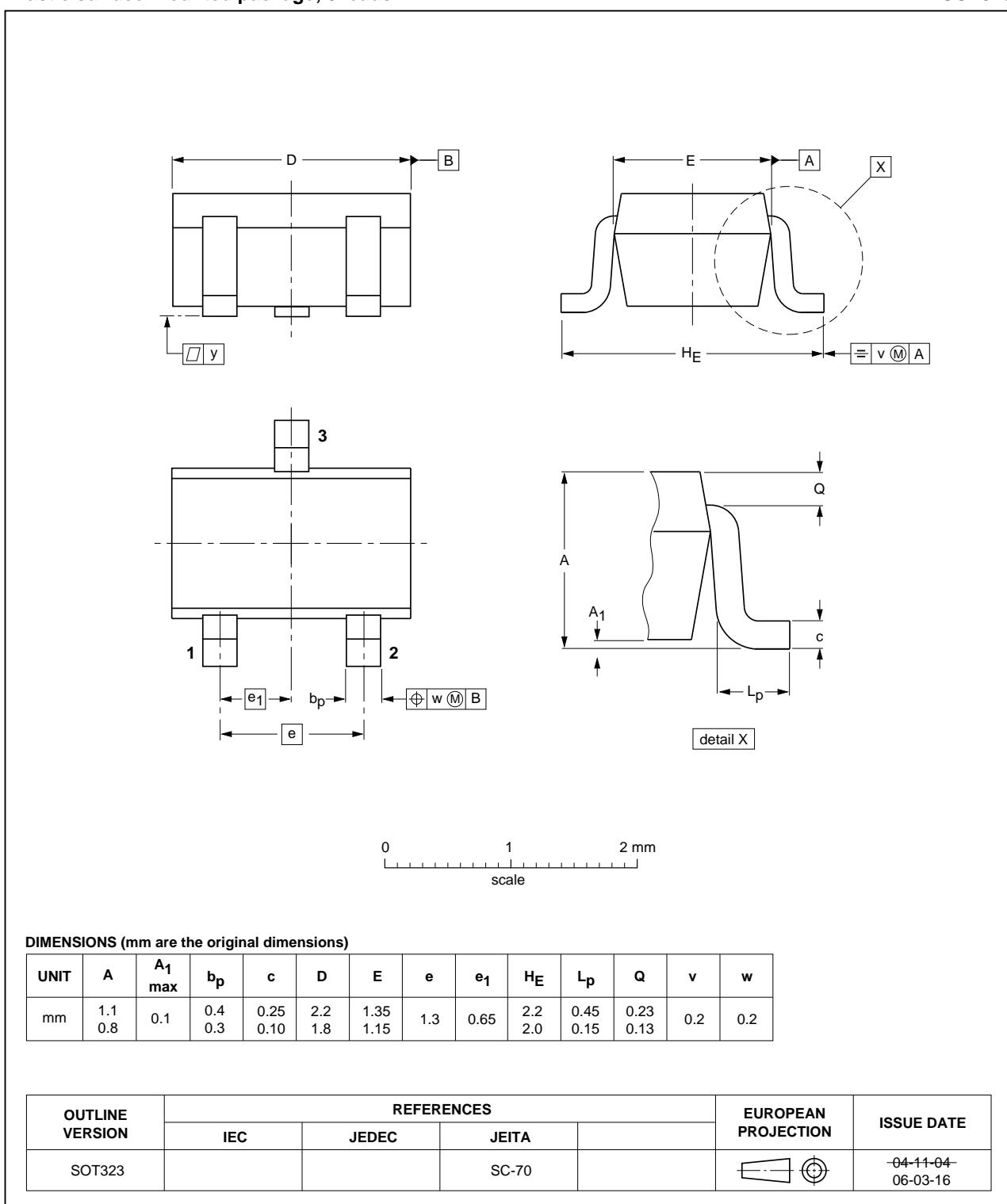
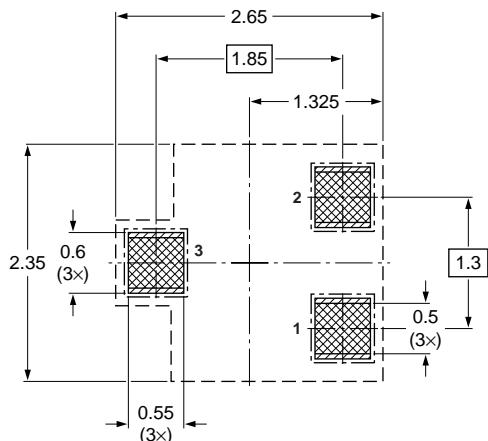


Fig 18. Package outline SOT323 (SC-70)

10. Soldering



solder lands

solder resist

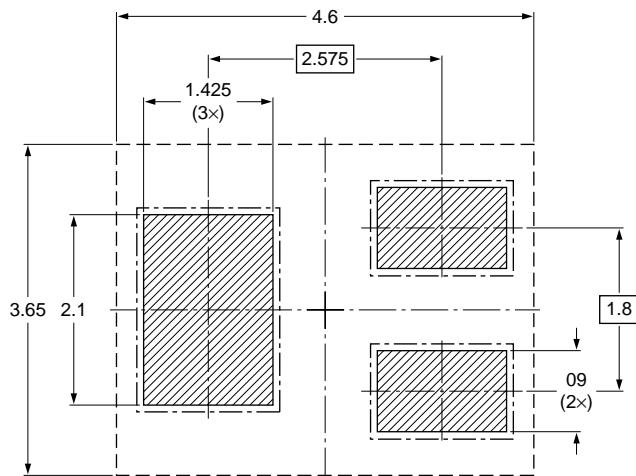
solder paste

occupied area

Dimensions in mm

sot323_fr

Fig 19. Reflow soldering footprint for SOT323 (SC-70)



solder lands

solder resist

occupied area

Dimensions in mm

preferred transport
direction during soldering

sot323_fw

Fig 20. Wave soldering footprint for SOT323 (SC-70)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
NX3008NBKW v.1	20110802	Product data sheet	-	-

12. Legal information

12.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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14. 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	Marking	2
5	Limiting values	3
6	Thermal characteristics	5
7	Characteristics	6
8	Test information	10
8.1	Quality information	10
9	Package outline	11
10	Soldering	12
11	Revision history	13
12	Legal information	14
12.1	Data sheet status	14
12.2	Definitions	14
12.3	Disclaimers	14
12.4	Trademarks	15
13	Contact information	15