



# NX3008NBKW

30 V, 350 mA N-channel Trench MOSFET

5 November 2022

Product data sheet

## 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a very small SOT323 (SC70) 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

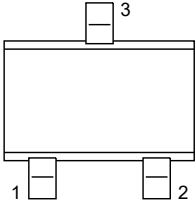
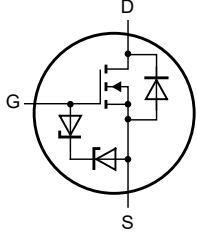
Table 1. Quick reference data

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]	-	350	mA
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 350\text{ mA}; T_j = 25\text{ °C}$	-	1	1.4	$\Omega$

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm<sup>2</sup>.

## 5. Pinning information

Table 2. Pinning information

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

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
NX3008NBKW	SC-70	plastic, surface-mounted package; 3 leads; 1.3 mm pitch; 2 mm x 1.25 mm x 0.95 mm body	SOT323

## 7. Marking

Table 4. Marking codes

Type number	Marking code[1]
NX3008NBKW	AA%

[1] % = placeholder for manufacturing site code

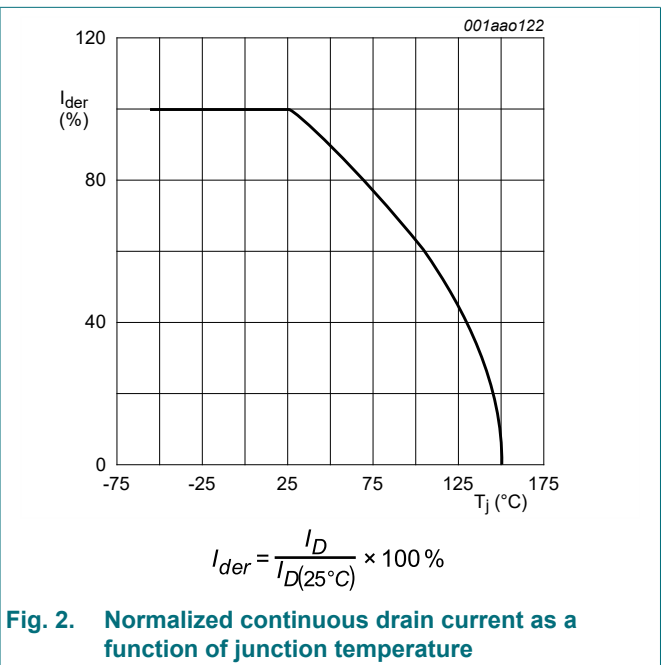
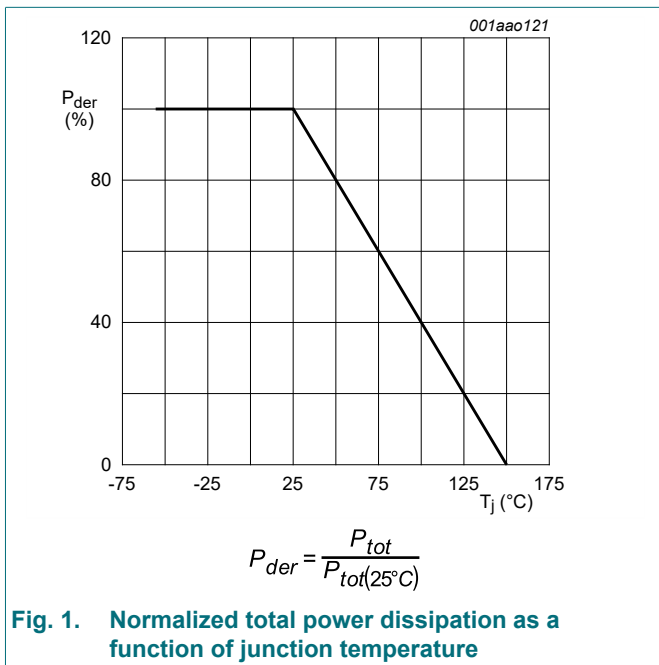
## 8. Limiting values

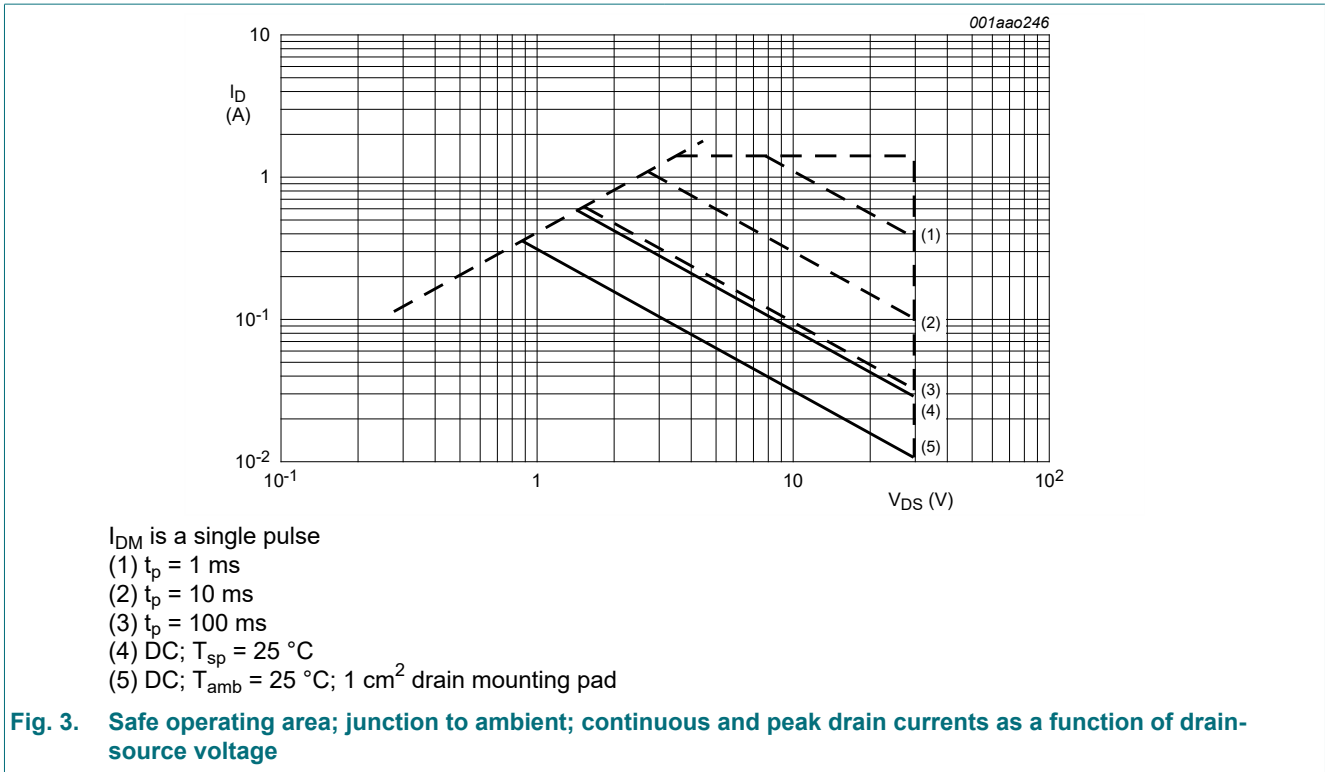
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C		-	30	V
V <sub>GS</sub>	gate-source voltage			-8	8	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	350	mA
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	230	mA
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs		-	1.4	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	260	mW
			[1]	-	310	mW
		T <sub>sp</sub> = 25 °C		-	830	mW
T <sub>j</sub>	junction temperature			-55	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C
<b>Source-drain diode</b>						
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	300	mA
<b>ESD maximum rating</b>						
V <sub>ESD</sub>	electrostatic discharge voltage	HBM	[3]	-	2000	V

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm<sup>2</sup>.
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [3] Measured between all pins.





## 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 cm<sup>2</sup>.

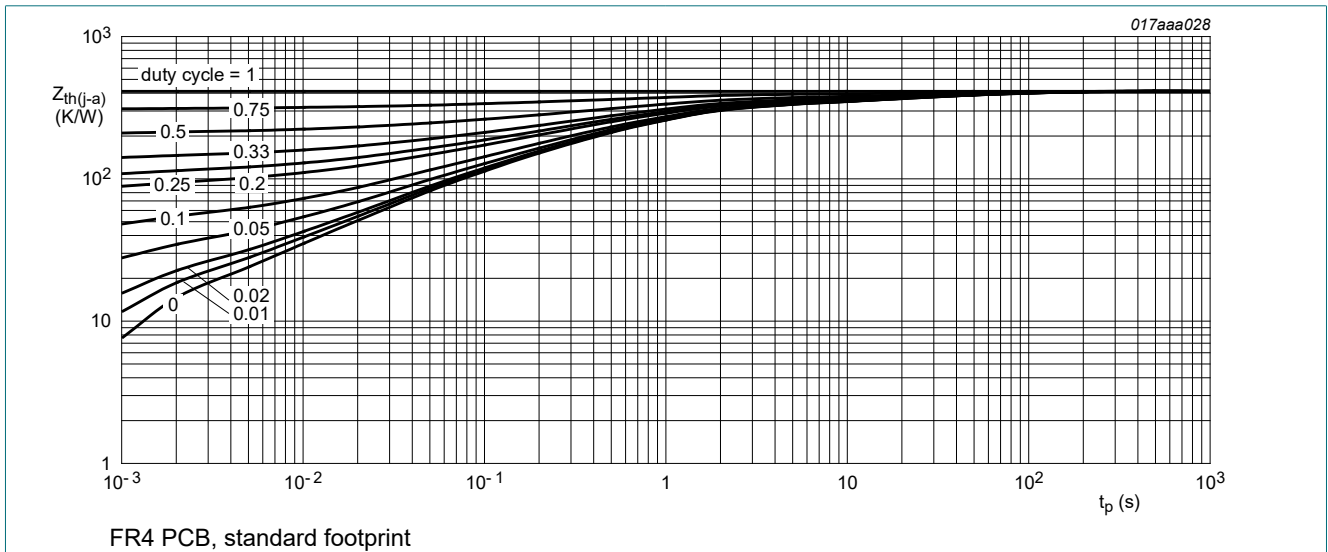


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

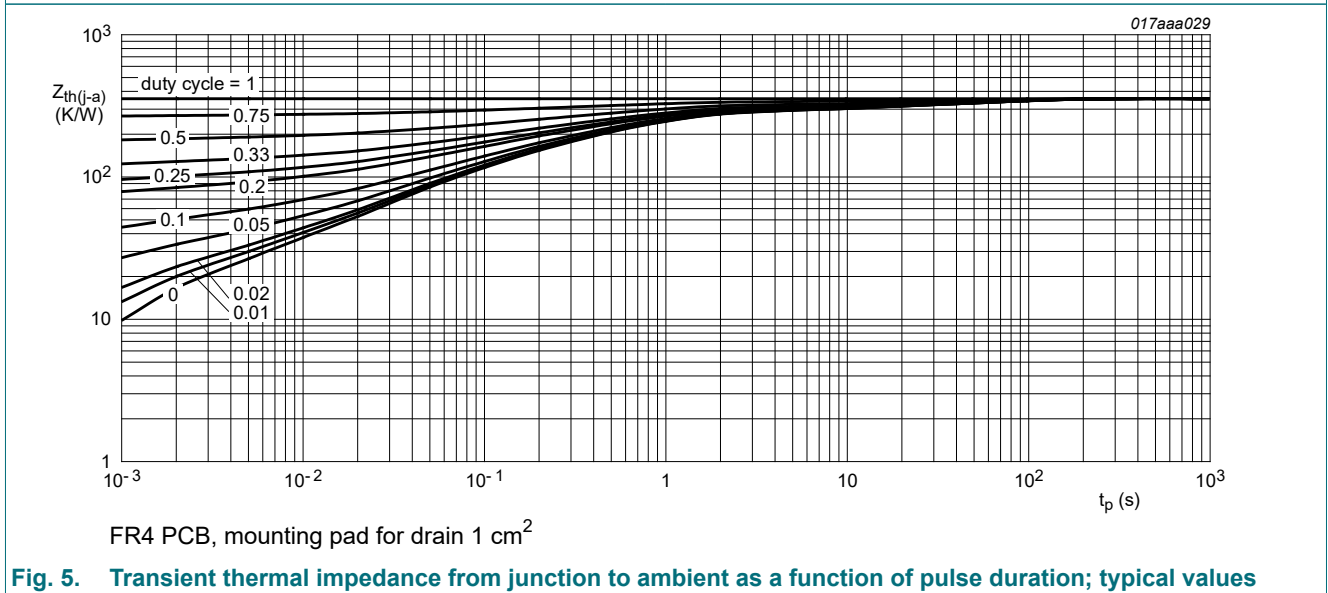
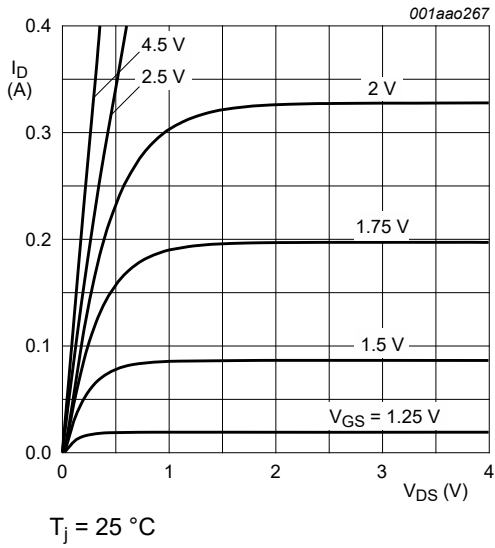


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

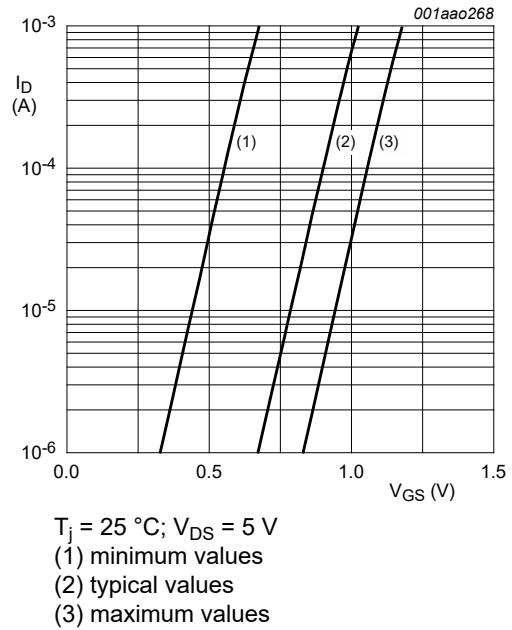
## 10. Characteristics

Table 7. Characteristics

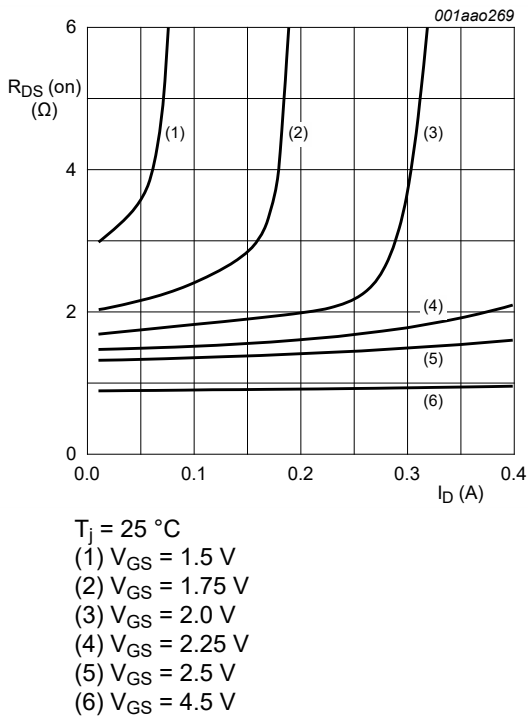
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	30	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu A$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ C$	0.6	0.9	1.1	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{DS} = 30 V$ ; $V_{GS} = 0 V$ ; $T_j = 150 \text{ }^\circ C$	-	-	10	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	0.2	1	$\mu A$
		$V_{GS} = -8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	0.2	1	$\mu A$
		$V_{GS} = 4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	10	-	nA
		$V_{GS} = -4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	10	-	nA
		$V_{GS} = 2.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	1	-	nA
		$V_{GS} = -2.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	1	-	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5 V$ ; $I_D = 350 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	1	1.4	$\Omega$
		$V_{GS} = 4.5 V$ ; $I_D = 350 \text{ mA}$ ; $T_j = 150 \text{ }^\circ C$	-	1.8	2.5	$\Omega$
		$V_{GS} = 2.5 V$ ; $I_D = 200 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	1.4	2.1	$\Omega$
		$V_{GS} = 1.8 V$ ; $I_D = 10 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	2	2.8	$\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10 V$ ; $I_D = 350 \text{ mA}$ ; $T_j = 25 \text{ }^\circ C$	-	310	-	mS
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 15 V$ ; $I_D = 350 \text{ mA}$ ; $V_{GS} = 4.5 V$ ; $T_j = 25 \text{ }^\circ C$	-	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	$V_{DS} = 15 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	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	$V_{DS} = 20 V$ ; $R_L = 250 \Omega$ ; $V_{GS} = 4.5 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ C$	-	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
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 350 \text{ mA}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	0.47	0.85	1.2	V



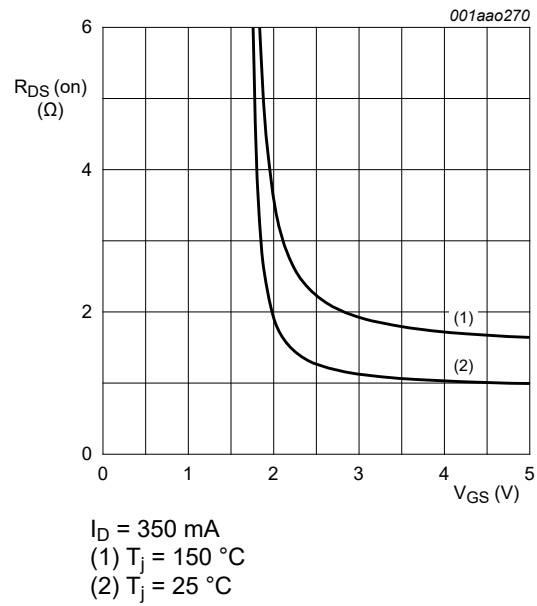
**Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values**



**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**

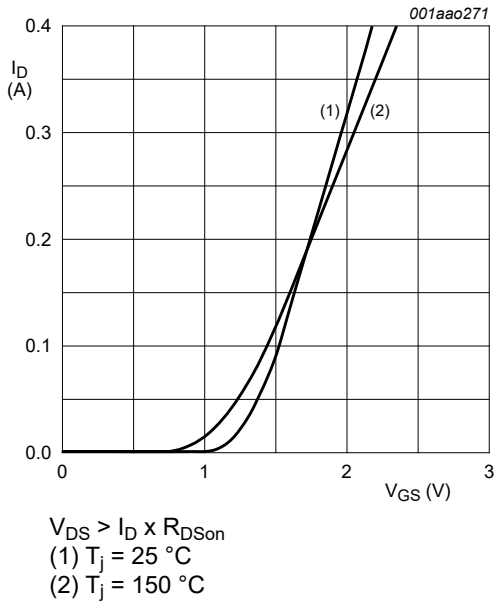


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

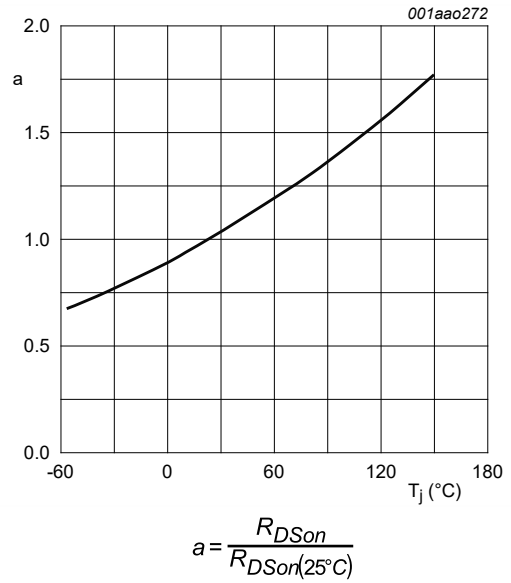


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

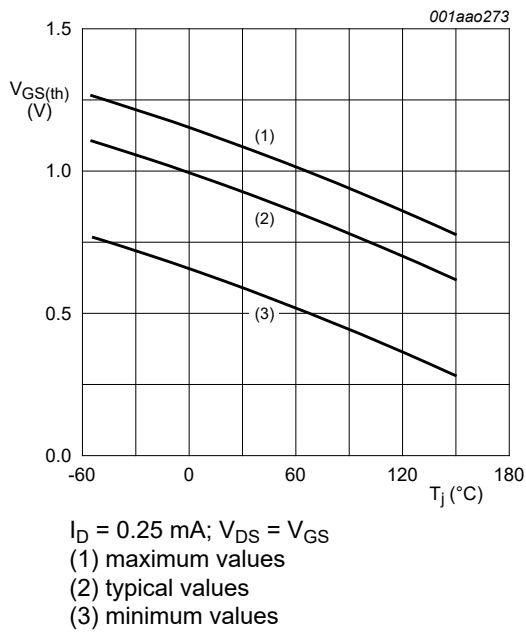


Fig. 12. Gate-source threshold voltage as a function of junction temperature

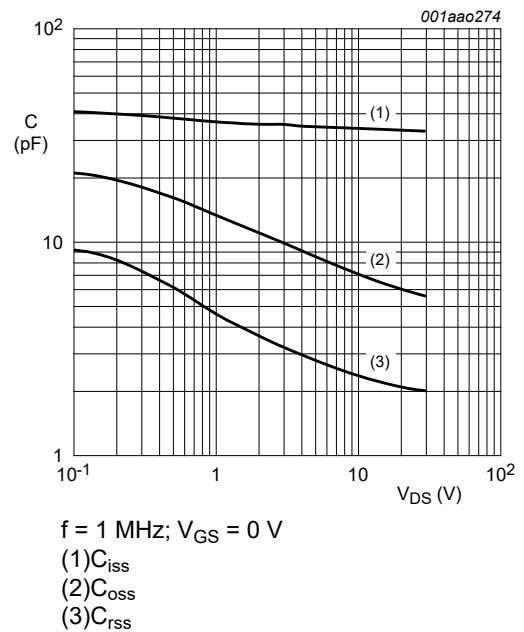


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



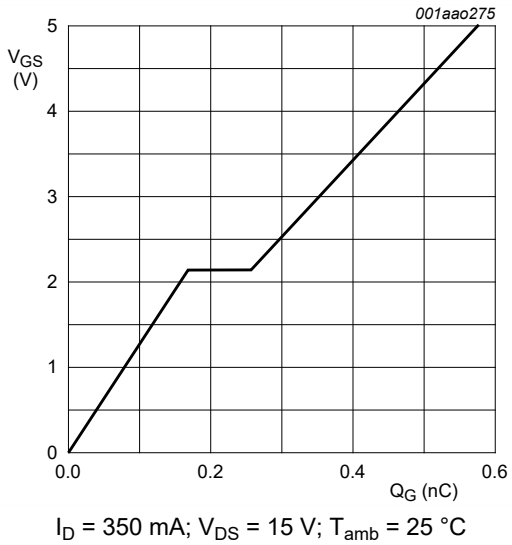


Fig. 14. Gate-source voltage as a function of gate charge; typical values

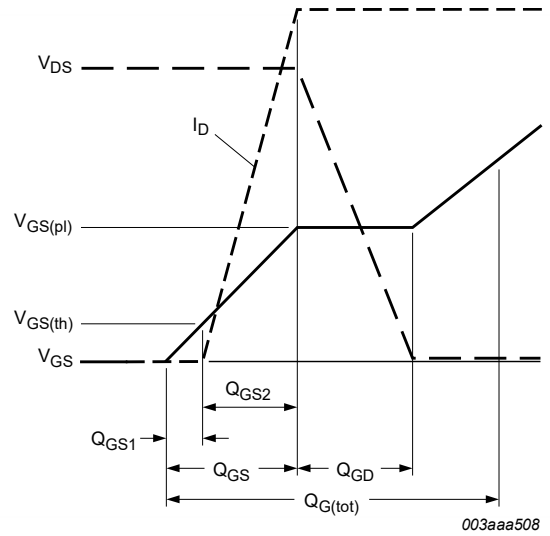
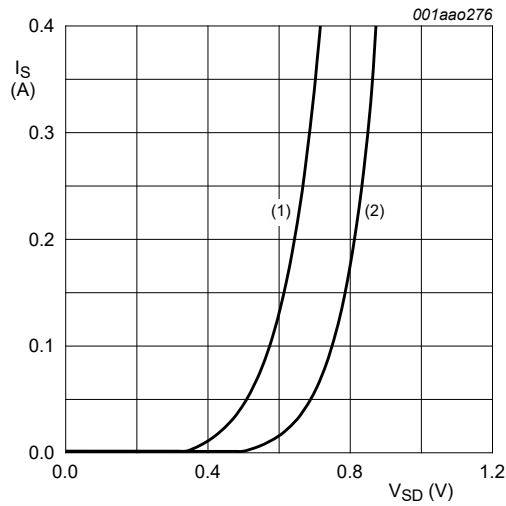


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0 \text{ V}$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$   
 (2)  $T_j = 25 \text{ }^\circ\text{C}$

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

## 11. Test information

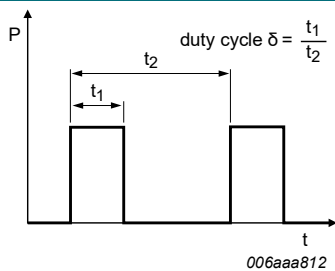


Fig. 17. Duty cycle definition

### 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

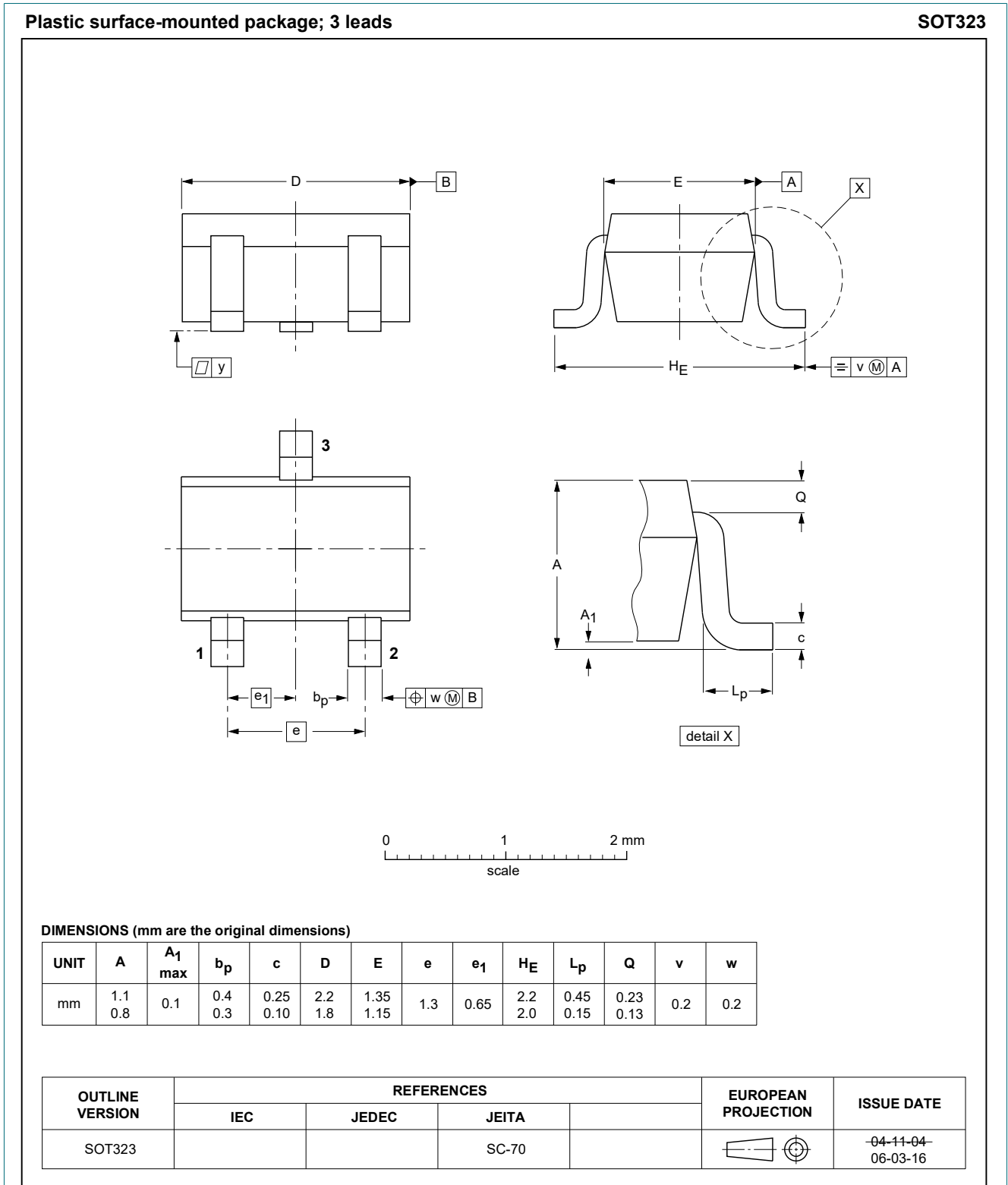


Fig. 18. Package outline SC-70 (SOT323)

### 13. Soldering

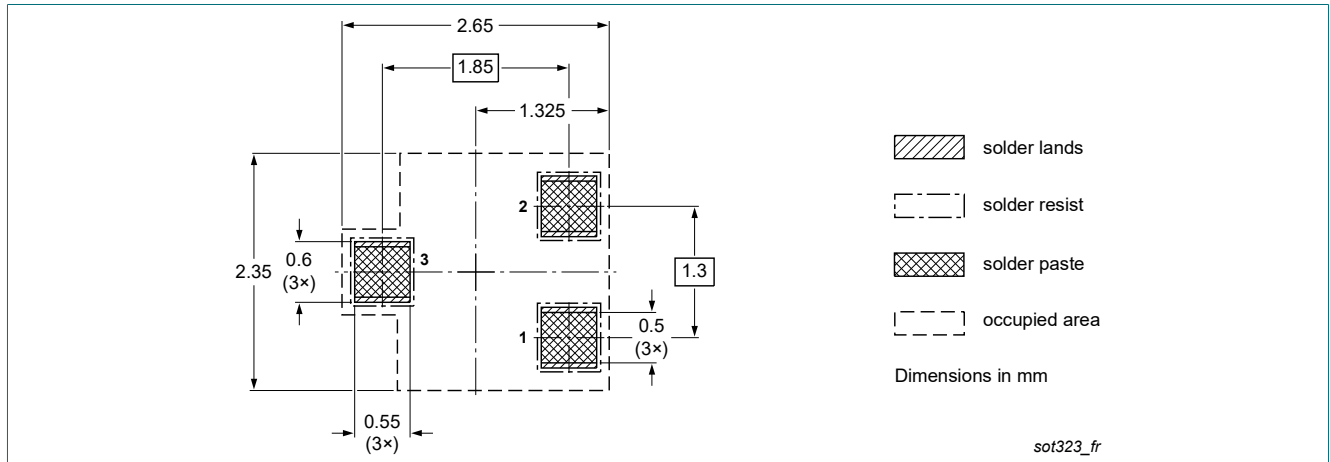


Fig. 19. Reflow soldering footprint for SC-70 (SOT323)

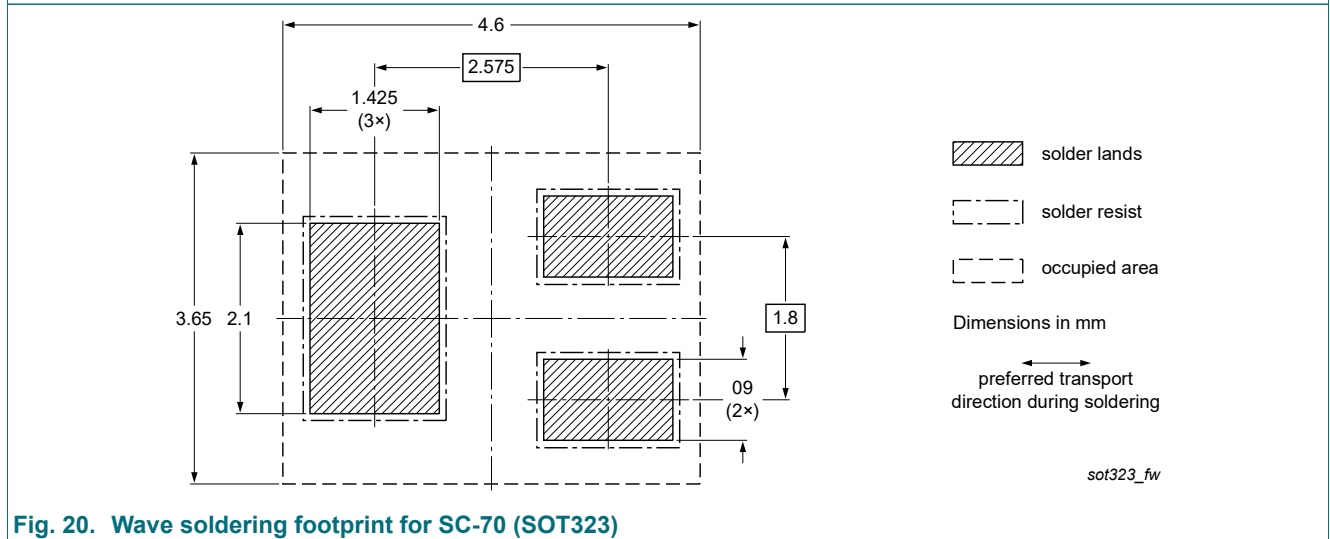


Fig. 20. Wave soldering footprint for SC-70 (SOT323)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
NX3008NBKW v.2	20221105	Product data sheet	-	NX3008NBKW v.1
Modifications:	• Chapter "Characteristics": typo correction, $V_{SD}$ axis scaling for Fig. 16 revised			
NX3008NBKW 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".
- [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 <https://www.nexperia.com>.

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