BUK96180-100A

N-channel TrenchMOS logic level FET

Rev. 02 — 26 April 2011 | Product data sheet

1. Product profile

1.1 General description

Logic 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

1.3 Applications

- Automotive and general purpose power switching

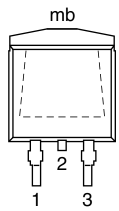
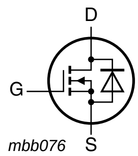
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	-	100	V
I_D	drain current	$T_{mb} = 25$ °C	-	-	11	A
P_{tot}	total power dissipation		-	-	54	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 5$ A; $T_j = 25$ °C	-	152	173	mΩ
		$V_{GS} = 5$ V; $I_D = 5$ A; $T_j = 25$ °C	-	165	180	mΩ
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 5.5$ A; $V_{sup} \leq 25$ V; $R_{GS} = 50$ Ω; $V_{GS} = 5$ V; $T_{j(init)} = 25$ °C; unclamped	-	-	1.5	mJ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT404 (D2PAK)	
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

3. Ordering information

Table 3. Ordering information

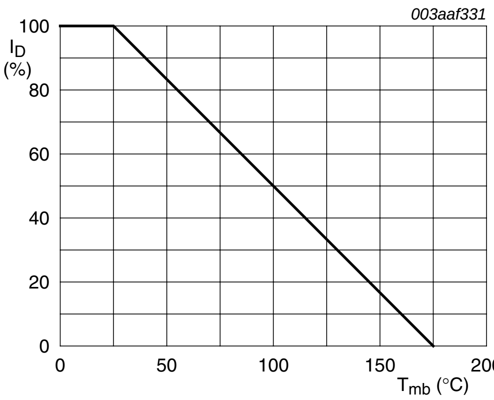
Type number	Package		
	Name	Description	Version
BUK96180-100A	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Limiting values

Table 4. Limiting values

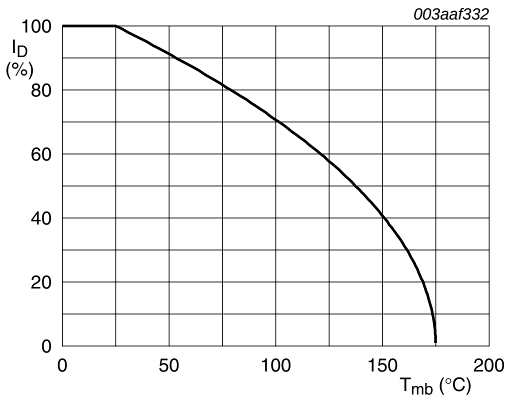
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	100	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20$ kΩ	-	100	V
V_{GS}	gate-source voltage		-15	15	V
I_D	drain current	$T_{mb} = 25$ °C	-	11	A
		$T_{mb} = 100$ °C	-	7.7	A
I_{DM}	peak drain current	$T_{mb} = 25$ °C; pulsed	-	44	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C	-	54	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25$ °C	-	11	A
I_{SM}	peak source current	pulsed; $T_{mb} = 25$ °C	-	44	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 5.5$ A; $V_{sup} \leq 25$ V; $R_{GS} = 50$ Ω; $V_{GS} = 5$ V; $T_{j(init)} = 25$ °C; unclamped	-	1.5	mJ



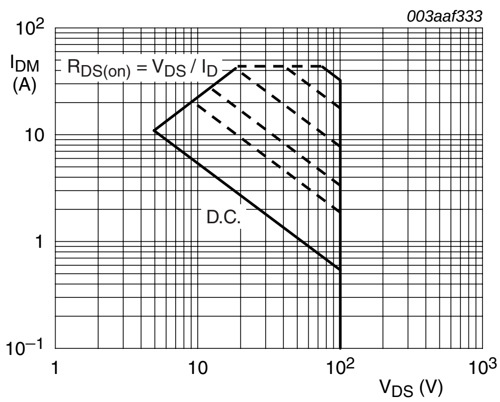
$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\,\%$$

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



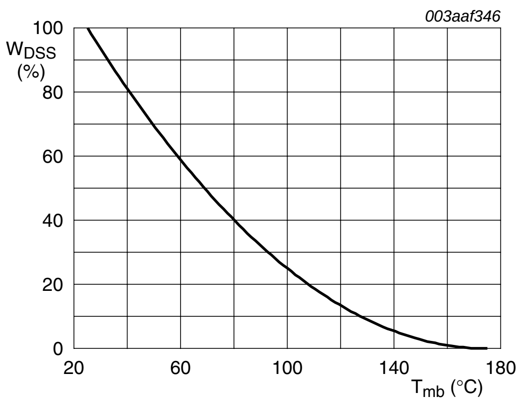
$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\,\%$$

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



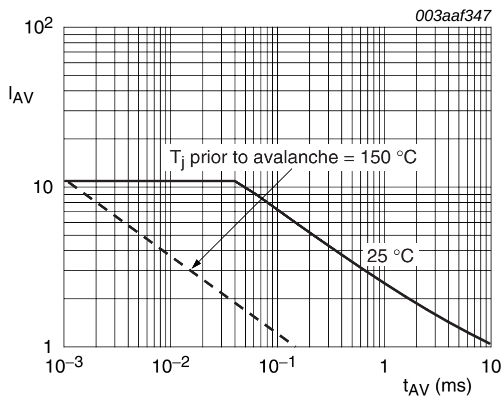
T_{mb} = 25 °C; I_{DM} is single pulse

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



I_D = 75 A

Fig 4. Normalised drain-source non-repetitive avalanche energy as a function of mounting-base temperature



unclamped inductive load

Fig 5. Single-shot avalanche rating; avalanche current as a function of avalanche period

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base		-	-	2.8	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint ; FR4 board	-	50	-	K/W

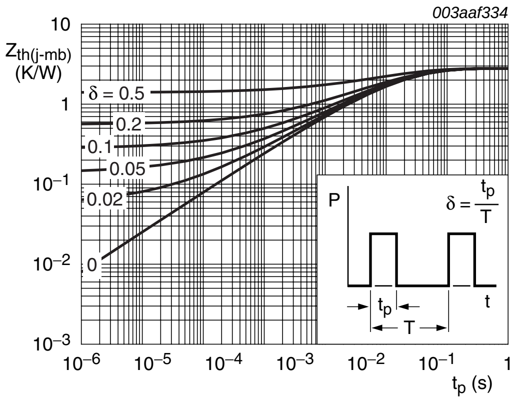
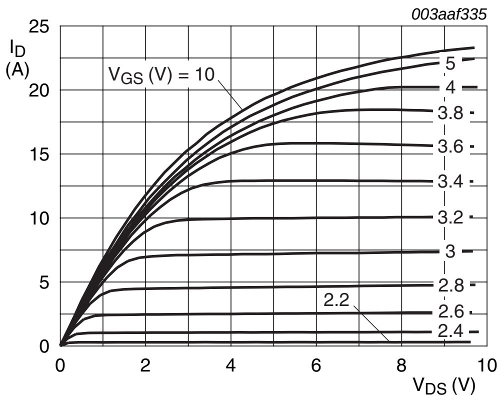


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

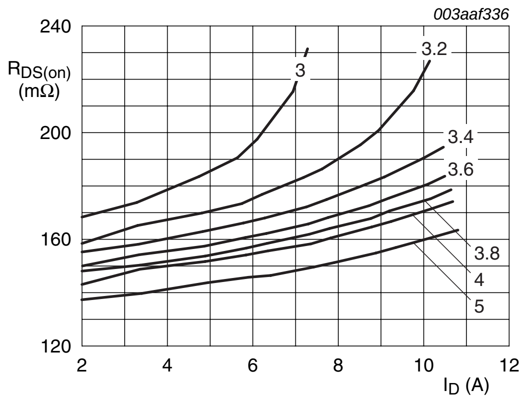
Table 6. Characteristics

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	100	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C	89	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C	-	-	2.3	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C	1	1.5	2	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C	0.5	-	-	V
I_{DSS}	drain leakage current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 175 °C	-	-	500	µA
		V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 °C	-	0.05	10	µA
I_{GSS}	gate leakage current	V_{GS} = 10 V; V_{DS} = 0 V; T_j = 25 °C	-	2	100	nA
		V_{GS} = -10 V; V_{DS} = 0 V; T_j = 25 °C	-	2	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 5 V; I_D = 5 A; T_j = 175 °C	-	-	450	mΩ
		V_{GS} = 4.5 V; I_D = 5 A; T_j = 25 °C	-	170	200	mΩ
		V_{GS} = 10 V; I_D = 5 A; T_j = 25 °C	-	152	173	mΩ
		V_{GS} = 5 V; I_D = 5 A; T_j = 25 °C	-	165	180	mΩ
Dynamic characteristics						
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C	-	464	619	pF
C_{oss}	output capacitance		-	60	72	pF
C_{rss}	reverse transfer capacitance		-	37	50	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 30 V; R_L = 1.2 Ω; V_{GS} = 5 V; $R_{G(ext)}$ = 10 Ω; T_j = 25 °C	-	9	20	ns
t_r	rise time		-	112	157	ns
$t_{d(off)}$	turn-off delay time		-	18	27	ns
t_f	fall time		-	25	38	ns
L_D	internal drain inductance	measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
		measured from upper edge of drain tab to centre of die	-	2.5	-	nH
L_S	internal source inductance	measured from source lead to source bond pad	-	7.5	-	nH
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 5 A; V_{GS} = 0 V; T_j = 25 °C	-	0.85	1.2	V
		I_S = 11 A; V_{GS} = 0 V; T_j = 25 °C	-	1.1	-	V
t_{rr}	reverse recovery time	I_S = 11 A; dI_S/dt = -100 A/µs; V_{GS} = -10 V; V_{DS} = 30 V; T_j = 25 °C	-	49	-	ns
Q_r	recovered charge		-	0.13	-	µC



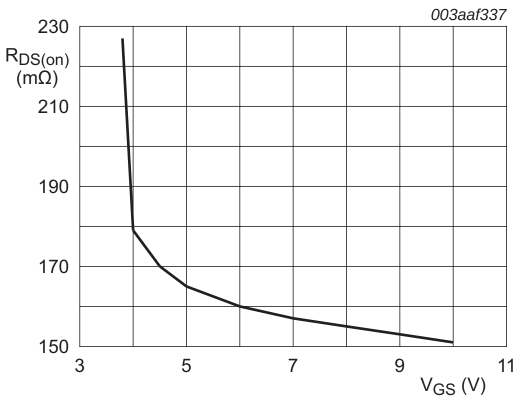
T_j = 25 °C

Fig 7. Output characteristics: drain current as a function of drain-source voltage; typical values



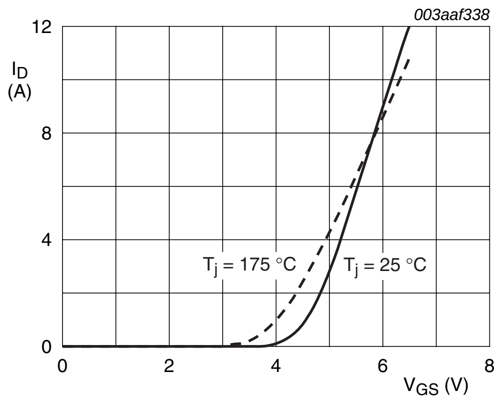
T_j = 25 °C

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



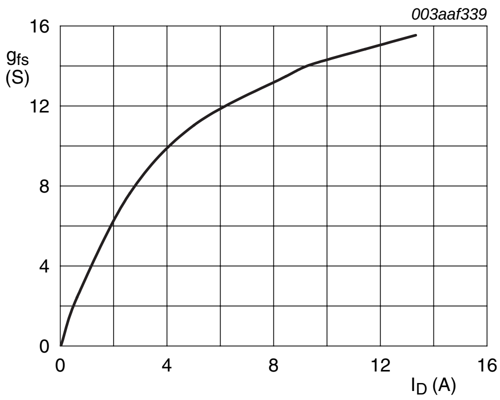
T_j = 25 °; I_D = 25 A

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



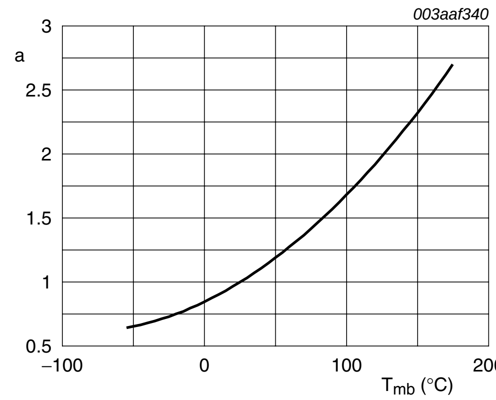
$V_{DS} > I_D \times R_{DSon}$

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



$V_{DS} > I_D \times R_{DSon}$

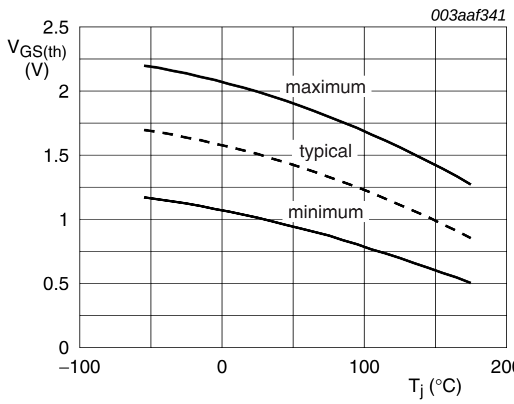
Fig 11. Forward transconductance as a function of drain current; typical values



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

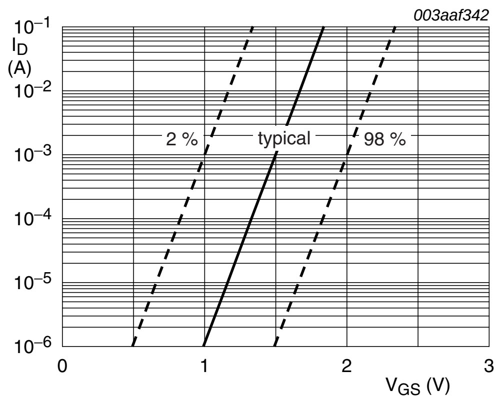
$I_D = 25$ A; $V_{GS} = 5$ V

Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature



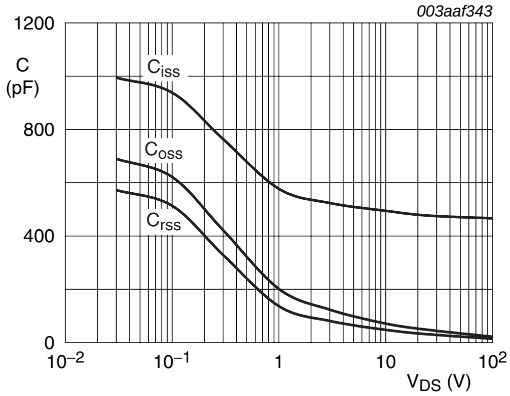
$I_D = 1$ mA; $V_{DS} = V_{GS}$

Fig 13. Gate-source threshold voltage as a function of junction temperature



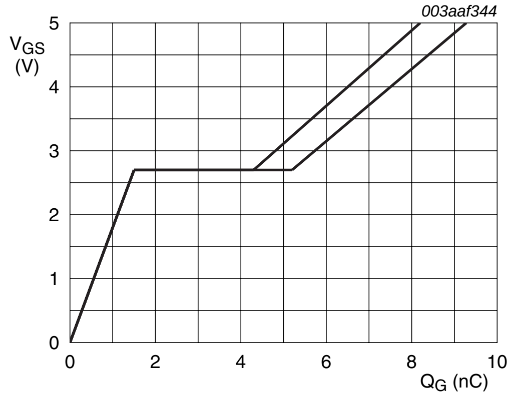
$T_j = 25$ °C; $V_{DS} = V_{GS}$

Fig 14. Sub-threshold drain current as a function of gate-source voltage



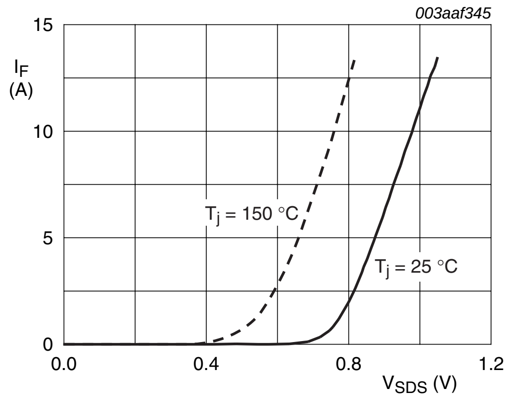
V_{GS} = 0 V; f = 1 MHz

Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



T_j = 25 °C; I_D = 25 A

Fig 16. Gate-source voltage as a function of gate charge; typical values

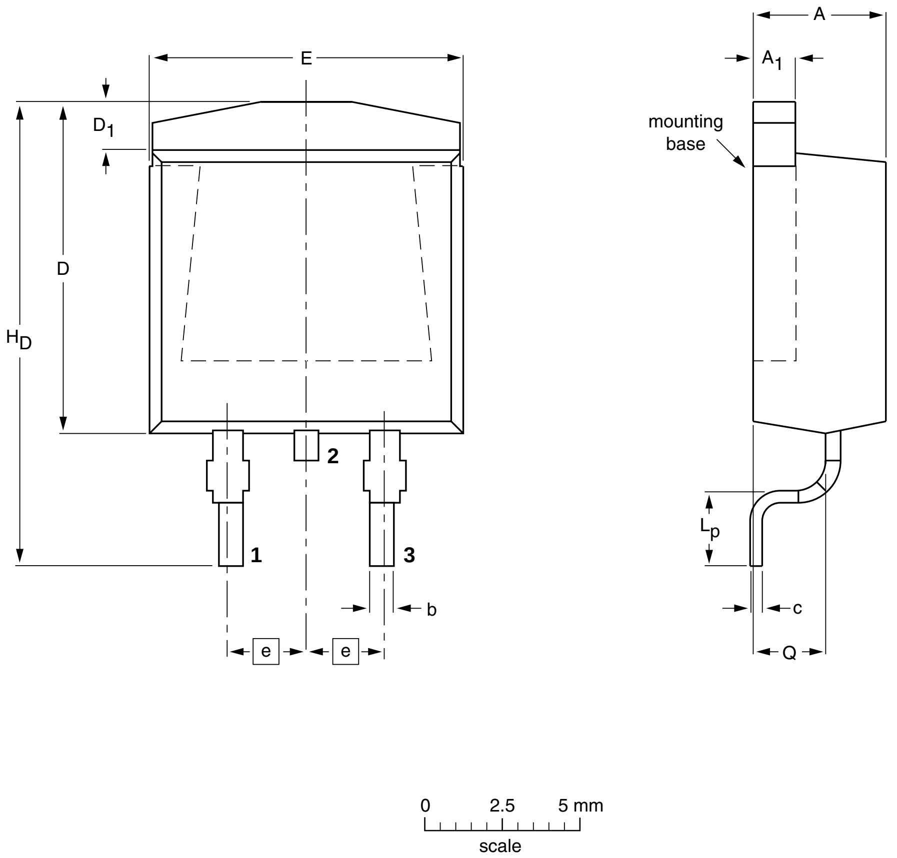


V_{GS} = 0 V

Fig 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) **SOT404**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	c	D max.	D_1	E	e	L_p	H_D	Q
mm	4.50 4.10	1.40 1.27	0.85 0.60	0.64 0.46	11	1.60 1.20	10.30 9.70	2.54	2.90 2.10	15.80 14.80	2.60 2.20

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT404						~~05-02-11~~ 06-03-16

Fig 18. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK96180-100A v.2	20110426	Product data sheet	-	BUK95180_96180-100A v.1
Modifications:	• 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 BUK96180-100A separated from data sheet BUK95180_96180-100A v.1.			
BUK95180_96180-100A v.1	20000501	Product specification	-	-

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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".

[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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11. Contents

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