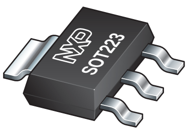


BUK9840-55

N-channel TrenchMOS logic level FET

Rev. 03 — 20 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
- Electrostatically robust due to integrated protection diodes
- Low conduction losses due to low on-state resistance

1.3 Applications

- Automotive and general purpose power switching

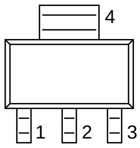
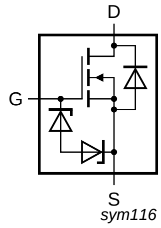
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	-	55	V
I_D	drain current	$T_{sp} = 25$ °C	-	-	10.7	A
P_{tot}	total power dissipation	$T_{amb} = 25$ °C	-	-	1.8	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 5$ V; $I_D = 5$ A; $T_j = 25$ °C	-	30	40	mΩ
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 3.6$ A; $V_{sup} \leq 25$ V; $R_{GS} = 50$ Ω; $V_{GS} = 5$ V; $T_{j(init)} = 25$ °C; unclamped	-	-	60	mJ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT223 (SOT223)	
2	D	drain		
3	S	source		
4	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK9840-55	SOT223	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
BUK9840-55	94055

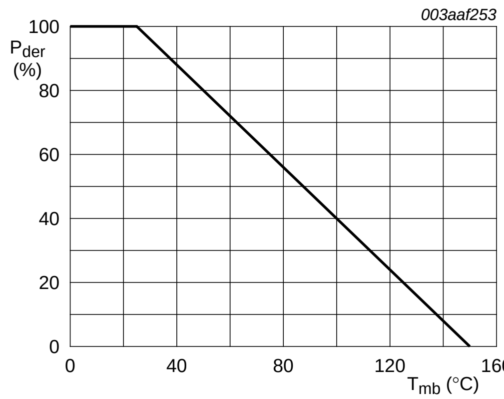
[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

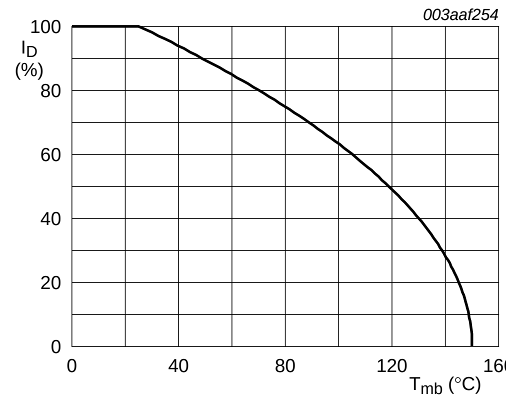
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	55	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20$ kΩ	-	55	V
V_{GS}	gate-source voltage		-10	10	V
I_D	drain current	$T_{sp} = 25$ °C	-	10.7	A
		$T_{amb} = 25$ °C	-	5	A
		$T_{amb} = 100$ °C	-	3.1	A
I_{DM}	peak drain current	$T_{sp} = 25$ °C; pulsed	-	40	A
P_{tot}	total power dissipation	$T_{amb} = 25$ °C	-	1.8	W
		$T_{sp} = 25$ °C	-	8.3	W
T_{stg}	storage temperature		-55	150	°C
T_j	junction temperature		-55	150	°C
Source-drain diode					
I_S	source current	$T_{sp} = 25$ °C	-	10.7	A
I_{SM}	peak source current	pulsed; $T_{sp} = 25$ °C	-	40	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 3.6$ A; $V_{sup} \leq 25$ V; $R_{GS} = 50$ Ω; $V_{GS} = 5$ V; $T_{j(init)} = 25$ °C; unclamped	-	60	mJ
Electrostatic discharge					
V_{esd}	electrostatic discharge voltage	HBM; C = 100 pF; R = 1.5 kΩ	-	2	kV



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

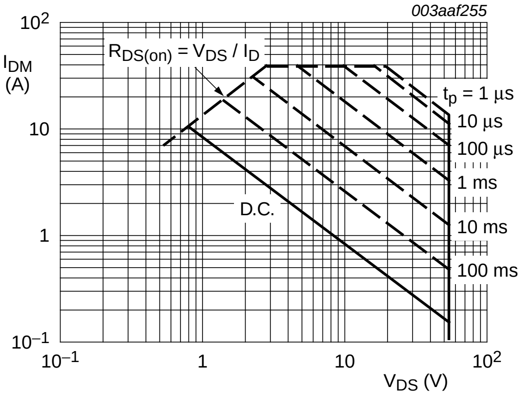
Fig 1. Normalized total power dissipation as a function of solder point temperature



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

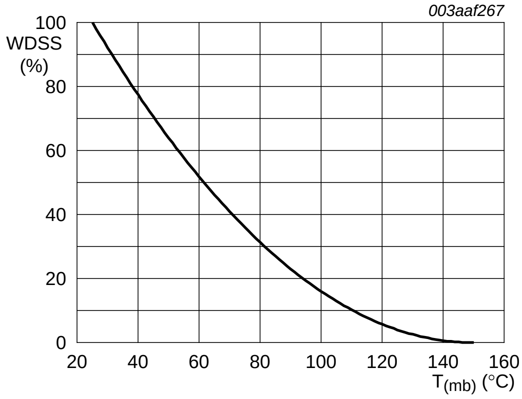
$V_{GS} \geq 10$ V

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



T_{sp} = 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 = 3.6 A

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

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	Mounted on any printed-circuit board	-	12	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Mounted on a printed-circuit	-	-	70	K/W

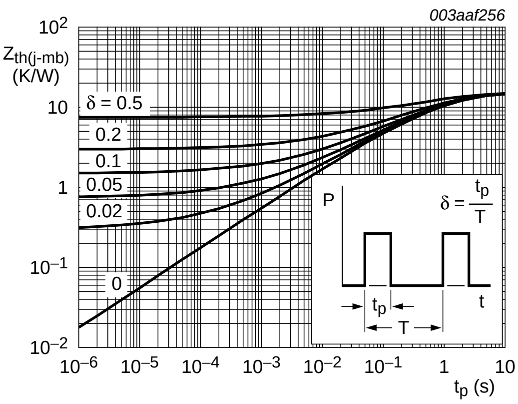
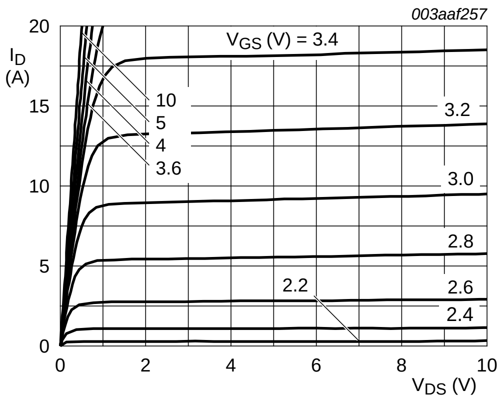


Fig 5. Transient thermal impedance from junction to solder point as a function of pulse duration

7. Characteristics

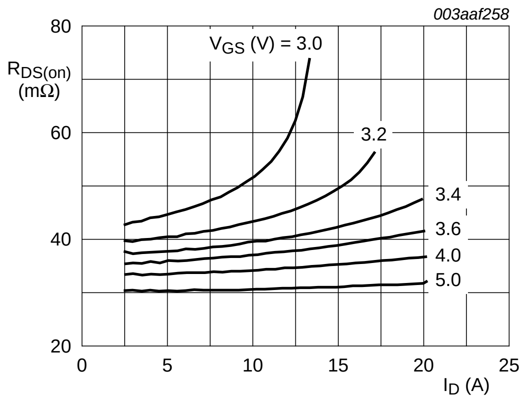
Table 7. Characteristics

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	55	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150 °C	0.6	-	-	V
		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_{DSS}	drain leakage current	V_{DS} = 55 V; V_{GS} = 0 V; T_j = 150 °C	-	-	100	µA
		V_{DS} = 55 V; V_{GS} = 0 V; T_j = 25 °C	-	0.05	10	µA
I_{GSS}	gate leakage current	V_{GS} = 5 V; V_{DS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{GS} = -5 V; V_{DS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{GS} = 5 V; V_{DS} = 0 V; T_j = 150 °C	-	-	5	µA
		V_{GS} = -5 V; V_{DS} = 0 V; T_j = 150 °C	-	-	5	µA
R_{DSon}	drain-source on-state resistance	V_{GS} = 5 V; I_D = 5 A; T_j = 150 °C	-	-	74	mΩ
		V_{GS} = 5 V; I_D = 5 A; T_j = 25 °C	-	30	40	mΩ
$V_{(BR)GSS}$	gate-source breakdown voltage	V_{DS} = 0 V; T_j = 25 °C; I_G = 1 mA	10	-	-	V
		V_{DS} = 0 V; T_j = 25 °C; I_G = -1 mA	10	-	-	V
Dynamic characteristics						
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C	-	1050	1400	pF
C_{oss}	output capacitance		-	205	245	pF
C_{rss}	reverse transfer capacitance		-	110	150	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 30 V; R_L = 3.3 Ω; V_{GS} = 5 V; $R_{G(ext)}$ = 10 Ω; T_j = 25 °C; I_D = 9 A	-	17	25	ns
t_r	rise time		-	65	100	ns
$t_{d(off)}$	turn-off delay time		-	70	105	ns
t_f	fall time		-	70	105	ns
g_{fs}	transfer conductance	V_{DS} = 25 V; I_D = 5 A; T_j = 25 °C	11	19	-	S
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 5 A; V_{GS} = 0 V; T_j = 25 °C	-	0.85	1.1	V
t_{rr}	reverse recovery time	I_S = 5 A; dI_S/dt = -100 A/µs; V_{GS} = -10 V; V_{DS} = 30 V; T_j = 25 °C	-	45	-	ns
Q_r	recovered charge		-	0.3	-	µC



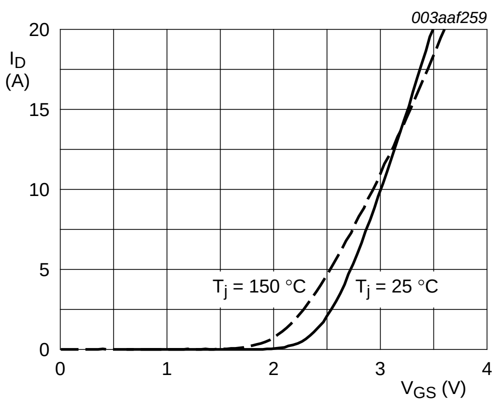
T_j = 25 °C

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



T_j = 25 °C

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



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

Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

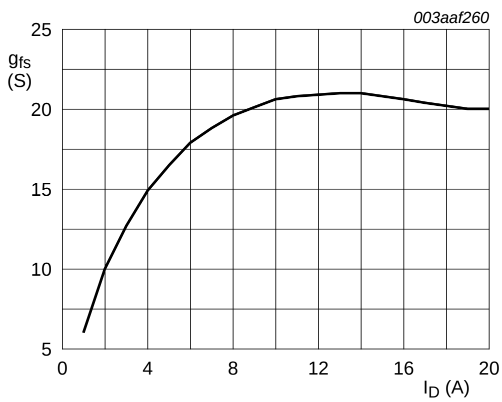
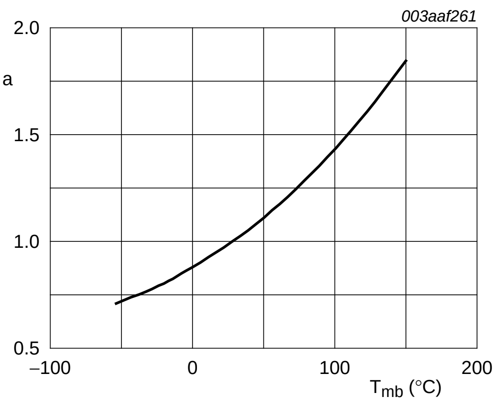
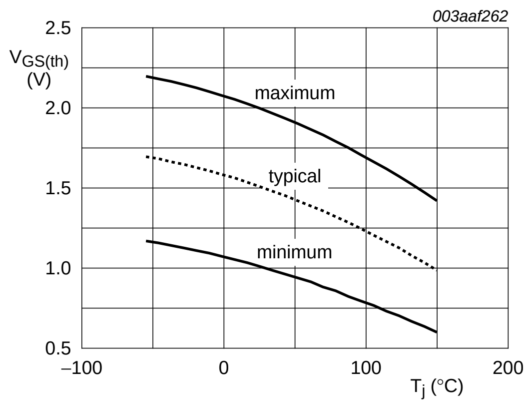


Fig 9. Forward transconductance as a function of drain current; typical values



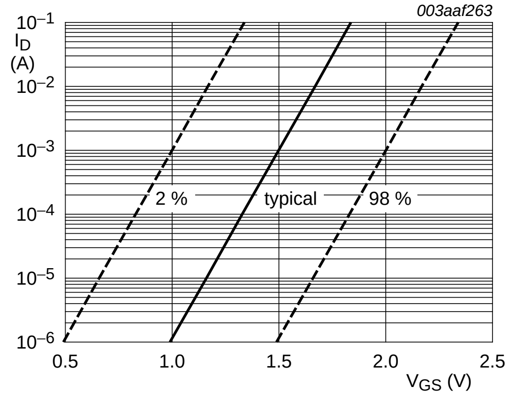
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature



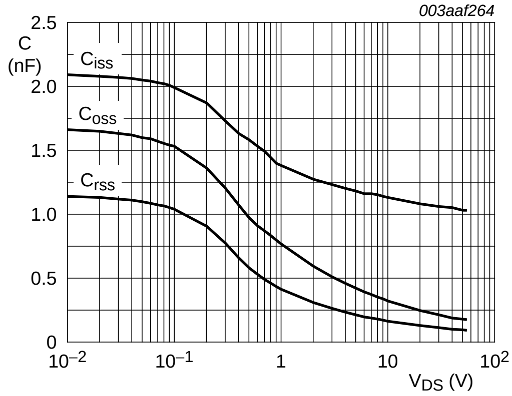
I_D = 1 mA; $V_{DS} = V_{GS}$

Fig 11. Gate-source threshold voltage as a function of junction temperature



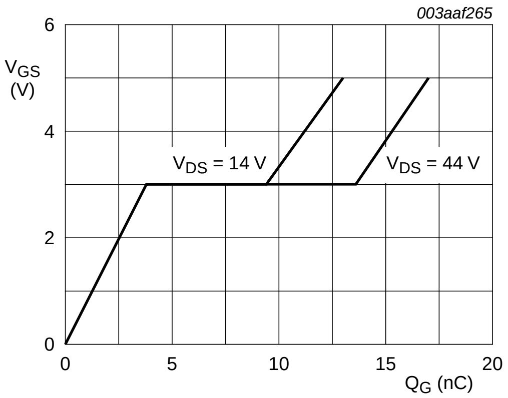
T_j = 25 °C; V_{DS} = V_{GS}

Fig 12. Sub-threshold drain current as a function of gate-source voltage



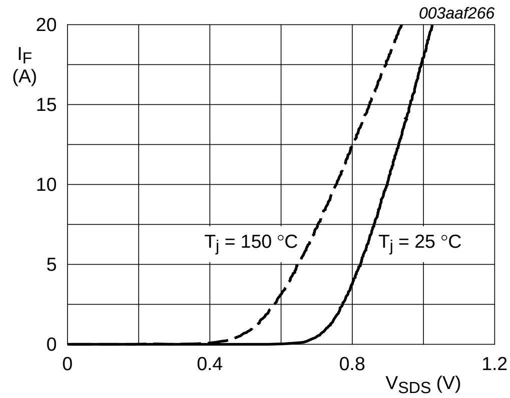
V_{GS} = 0 V; f = 1 MHz

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



T_j = 25 °C; I_D = 9 A

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

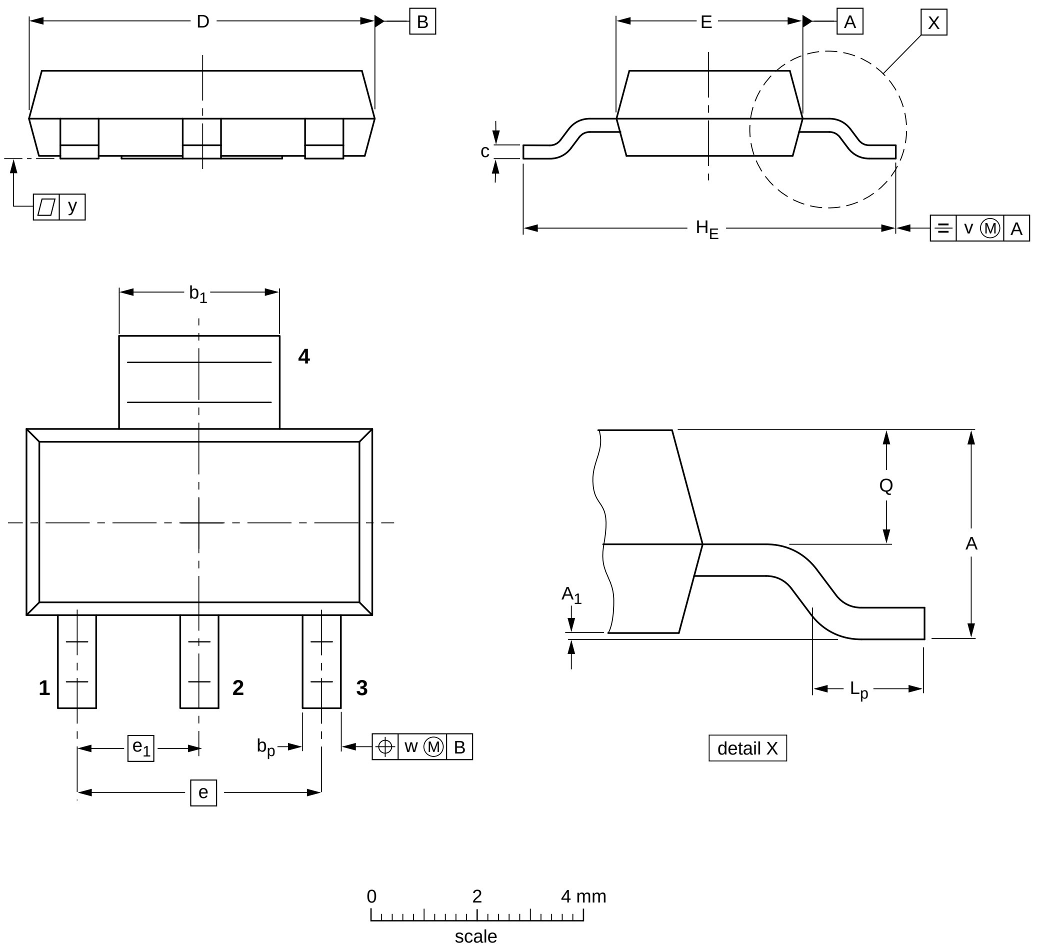


V_{GS} = 0 V

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

8. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads **SOT223**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	b_1	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.8 1.5	0.10 0.01	0.80 0.60	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	4.6	2.3	7.3 6.7	1.1 0.7	0.95 0.85	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT223			SC-73			~~04-11-10~~ 06-03-16

Fig 16. Package outline SOT223 (SOT223)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9840-55 v.3	20110420	Product data sheet	-	BUK9840-55 v.2
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. • Various changes to content.			
BUK9840-55 v.2	19980101	Product specification	-	BUK9840-55 v.1

10. Legal information

10.1 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.nxp.com.

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For sales office addresses, please send an email to: salesaddresses@nxp.com

12. Contents

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