OC1005

N-channel TrenchMOS standard level FET

Rev. 02 — 10 December 2007 **Product data sheet**

1. Product profile

1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology.

1.2 Features

- Standard level threshold
- Very low on-state resistance

1.3 Applications

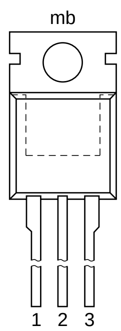
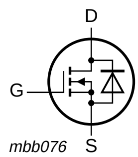
- Motors, lamps, solenoids
- DC-to-DC converters
- Uninterrupted power supplies
- General industrial applications.

1.4 Quick reference data

- $V_{DS} \leq 55$ V
- $P_{tot} \leq 200$ W
- $I_D \leq 110$ A
- $R_{DSon} \leq 7.1$ mΩ

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	gate (G)		
2	drain (D)		
3	source (S)		
mb	mounting base; connected to drain		
		SOT78 (TO-220AB)	

founded by Philips

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
OC1005	SC-46	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

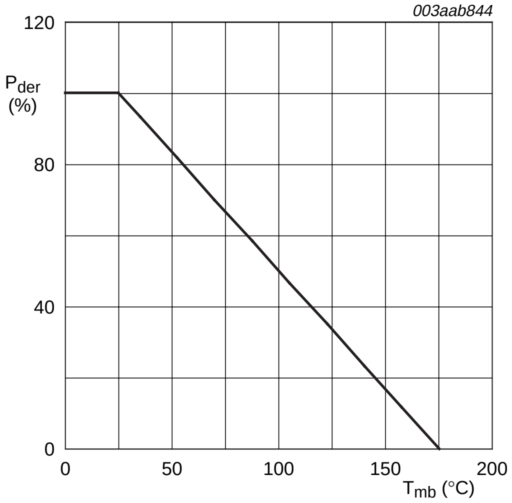
4. Limiting values

Table 3. Limiting values

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

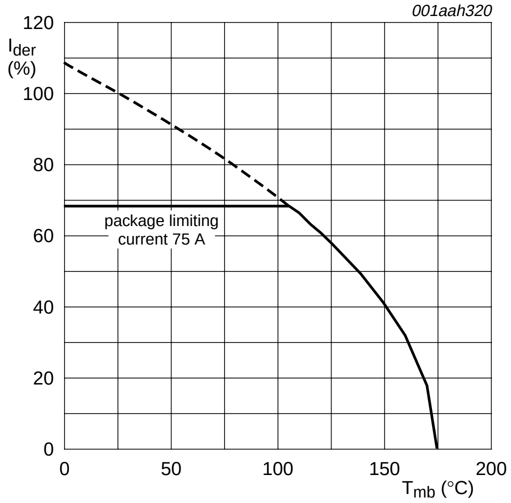
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	25 °C ≤ T_j ≤ 175 °C		-	55	V
V_{DGR}	drain-gate voltage (DC)	25 °C ≤ T_j ≤ 175 °C; R_{GS} = 20 kΩ		-	55	V
V_{GS}	gate-source voltage			-	±20	V
I_D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; see Figure 2 and 3	[1]	-	110	A
		T_{mb} = 100 °C; V_{GS} = 10 V; see Figure 2		-	80	A
I_{DM}	peak drain current	T_{mb} = 25 °C; pulsed; t_p ≤ 10 µs; see Figure 3		-	390	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 1		-	200	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	[1]	-	110	A
I_{SM}	peak source current	T_{mb} = 25 °C; pulsed; t_p ≤ 10 µs		-	390	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	unclamped inductive load; I_D = 75 A; t_p = 0.1 ms; V_{DS} ≤ 55 V; R_{GS} = 50 Ω; V_{GS} = 10 V; starting at T_j = 25 °C		-	280	mJ

[1] Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75 A.



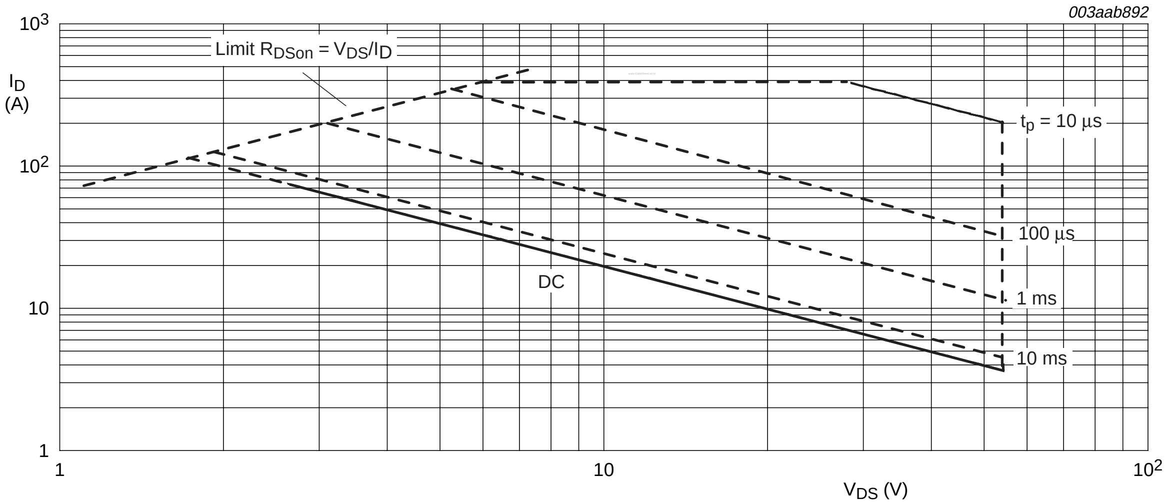
$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\ \%$$

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; V_{GS} = 10 V

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

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	0.75	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W

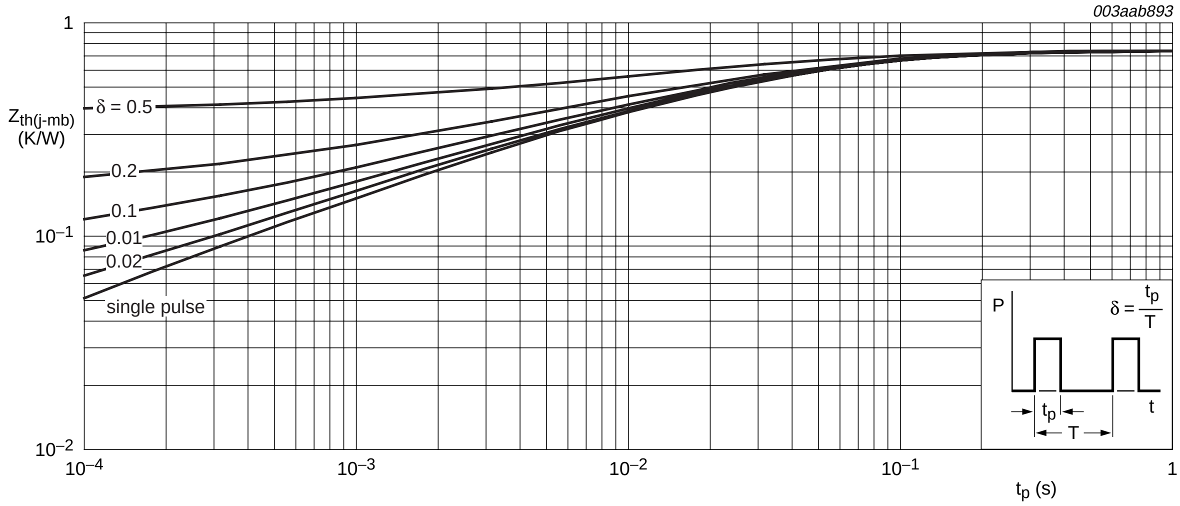


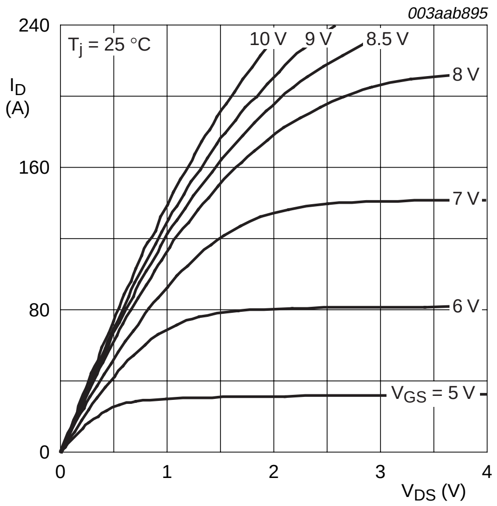
Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 5. Characteristics

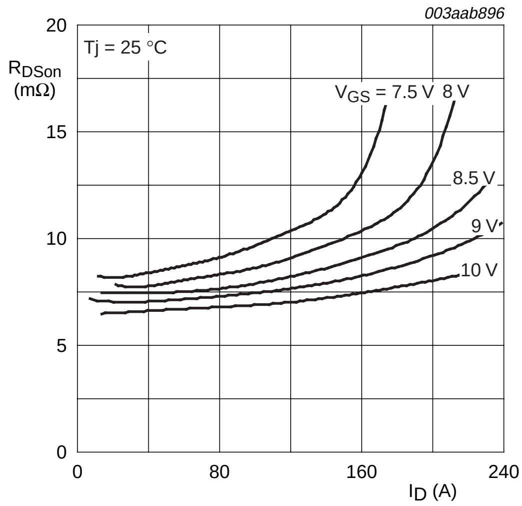
T_j = 25 °C unless otherwise specified.

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	55	-	-	V
		T_j = –55 °C	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; see Figure 9 and 10				
		T_j = 25 °C	2	3	4	V
		T_j = 175 °C	1	-	-	V
		T_j = –55 °C	-	-	4.4	V
I_{DSS}	drain leakage current	V_{DS} = 55 V; V_{GS} = 0 V				
		T_j = 25 °C	-	-	1	µA
		T_j = 175 °C	-	-	500	µA
I_{GSS}	gate leakage current	V_{GS} = ±20 V; V_{DS} = 0 V	-	2	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; see Figure 6 and 8				
		T_j = 25 °C	-	5.8	7.1	mΩ
		T_j = 175 °C	-	10.6	14.2	mΩ
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 44 V; V_{GS} = 10 V; see Figure 11 and 12	-	53	-	nC
Q_{GS}	gate-source charge		-	12.3	-	nC
Q_{GD}	gate-drain charge		-	17	-	nC
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; see Figure 14	-	2820	-	pF
C_{oss}	output capacitance		-	554	-	pF
C_{rss}	reverse transfer capacitance		-	200	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 30 V; R_L = 1.2 Ω;	-	24	-	ns
t_r	rise time	V_{GS} = 10 V; R_G = 10 Ω	-	52	-	ns
$t_{d(off)}$	turn-off delay time		-	77	-	ns
t_f	fall time		-	41	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; see Figure 13	-	0.85	1.2	V
t_{rr}	reverse recovery time	I_S = 20 A; dI_S/dt = –100 A/µs; V_{GS} = 0 V	-	62	-	ns
Q_r	recovered charge		-	60	-	nC



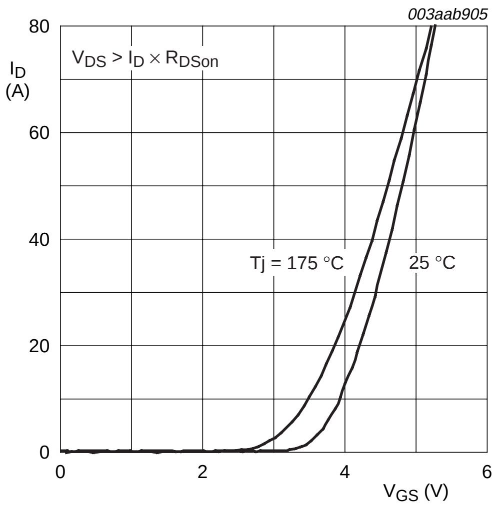
T_j = 25 °C

Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values



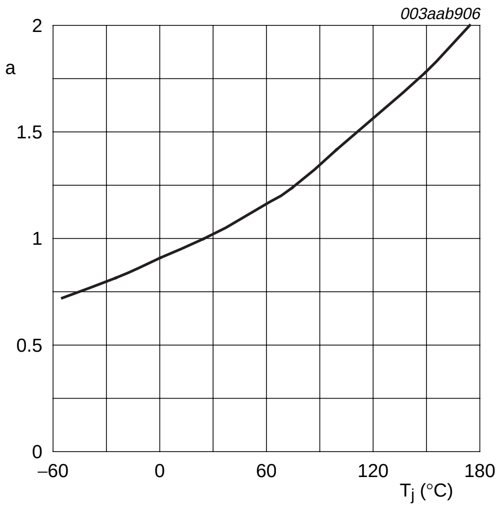
T_j = 25 °C

Fig 6. Drain-source on-state resistance as a function of drain current; typical values



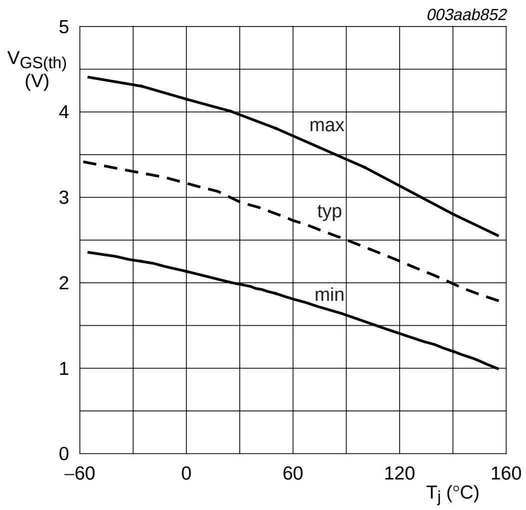
T_j = 25 °C and 175 °C; $V_{DS} > I_D \times R_{DSon}$

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



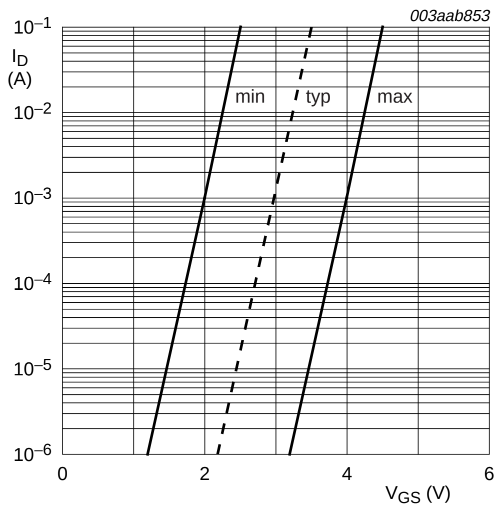
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature



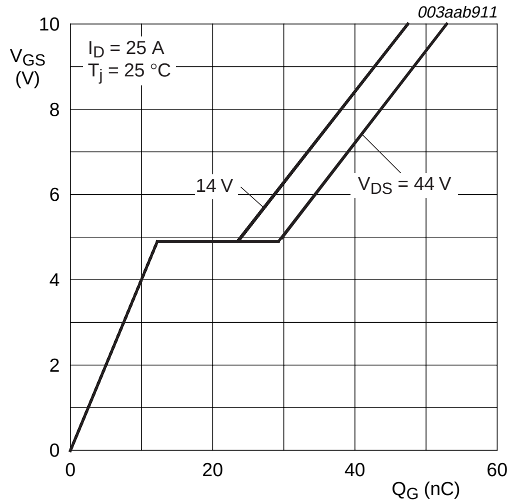
I_D = 1 mA; V_{DS} = V_{GS}

Fig 9. Gate-source threshold voltage as a function of junction temperature



T_j = 25 °C; V_{DS} = 5 V

Fig 10. Sub-threshold drain current as a function of gate-source voltage



I_D = 25 A; V_{DS} = 14 V and 44 V

Fig 11. Gate-source voltage as a function of gate charge; typical values

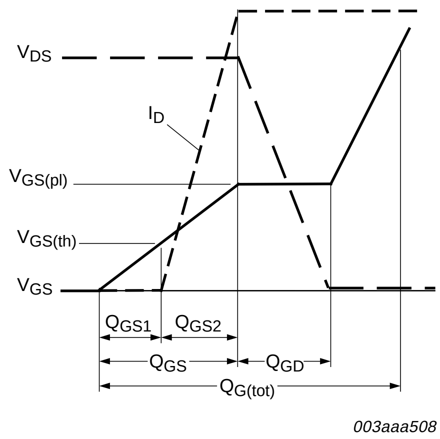
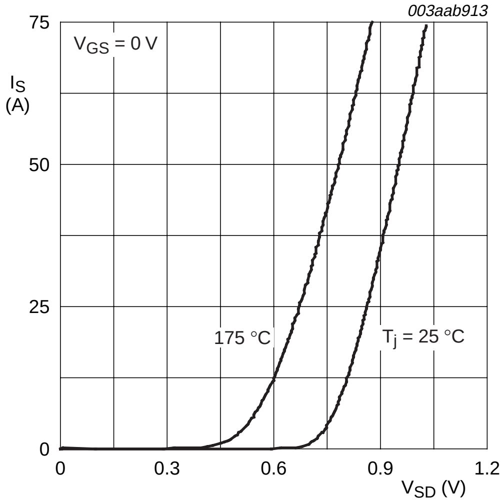
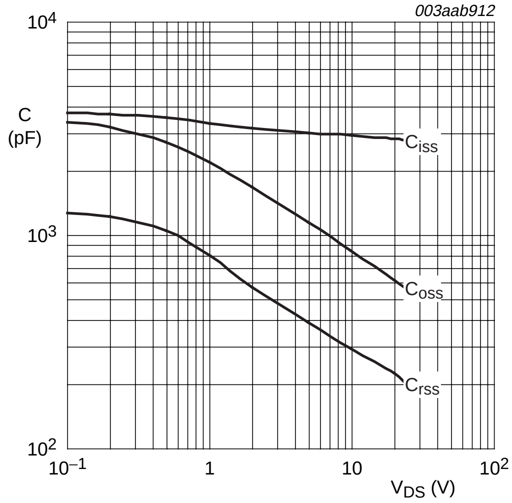


Fig 12. Gate charge waveform definitions



T_j = 25 °C and 175 °C; V_{GS} = 0 V

Fig 13. Source current as a function of source-drain voltage; typical values

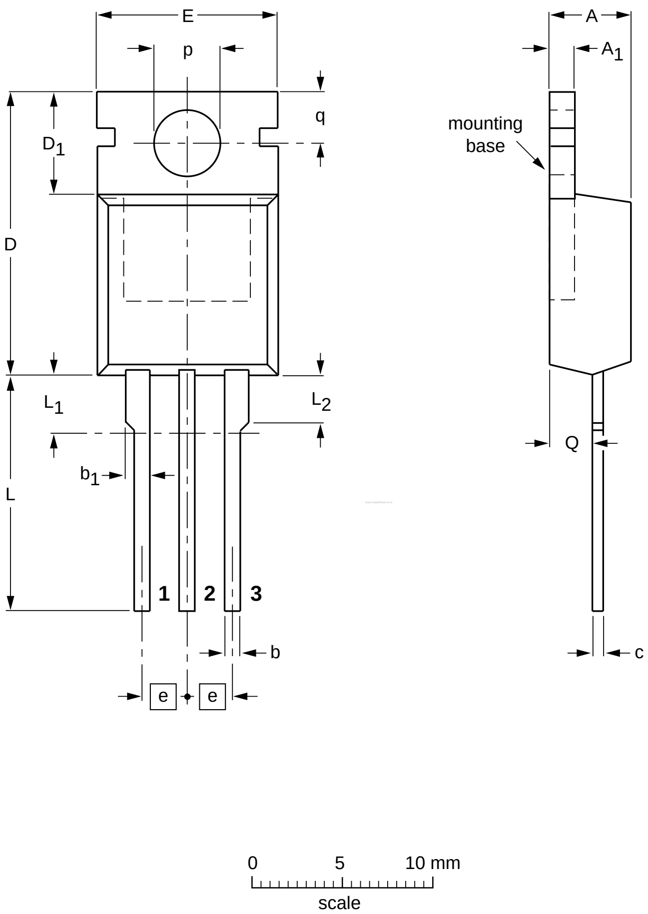


V_{GS} = 0 V; f = 1 MHz

Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	c	D	D_1	E	e	L	L_1	L_2 max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.45 1.00	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

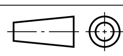
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~05-03-22~~ 05-10-25

Fig 15. Package outline SOT78 (TO-220AB)

8. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
OC1005_2	20071210	Product data sheet	-	OC1005_1
Modifications:	• Figure 2 updated.			
OC1005_1	20070907	Product data sheet	-	-

9. Legal information

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.nxp.com.

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11. Contents

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Date of release: 10 December 2007

Document identifier: OC1005_2