Product data sheet

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1 General description

The 74ALVC244 is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74ALVC244 is an octal non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $1\overline{OE}$ and $2\overline{OE}$. A HIGH on $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

2 Features and benefits

- Wide supply voltage range from 1.65 V to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standards:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - HBM JESD22-A114E exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V

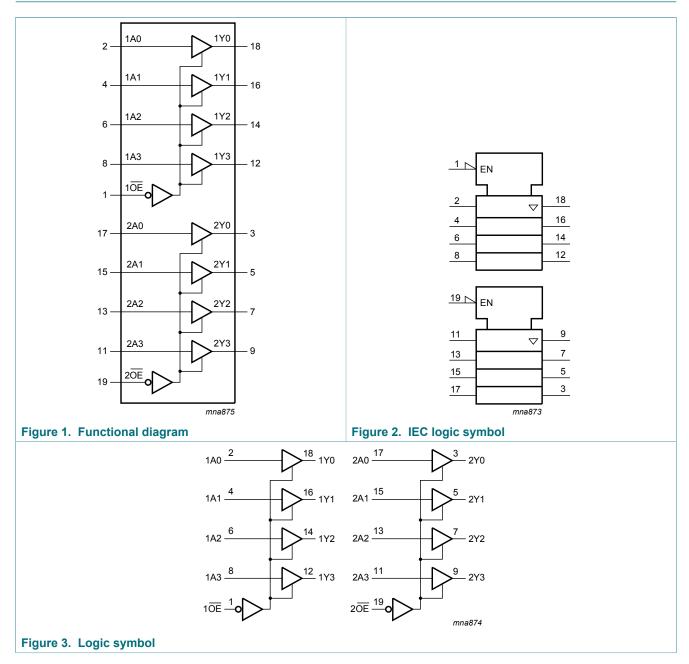
3 Ordering information

Table 1. Ordering information

Type number	Package						
	Temperature range	Name	Description	Version			
74ALVC244D	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1			
74ALVC244PW	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1			
74ALVC244BQ	-40 °C to +85 °C	DHVQFN20	plastic dual-in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm	SOT764-1			

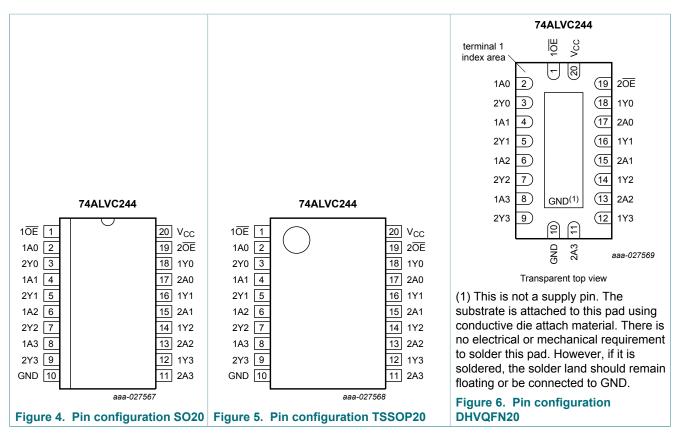
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4 Functional diagram



5 Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description						
Symbol	Pin	Description				
10E, 20E	1, 19	output enable input (active LOW)				
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	data input				
2Y0, 2Y1, 2Y2, 2Y3	3, 5, 7, 9	bus output				
GND	10	ground (0 V)				
2A0, 2A1, 2A2, 2A3	17, 15, 13, 11	data input				
1Y0, 1Y1, 1Y2, 1Y3	18, 16, 14, 12	bus output				
V _{CC}	20	supply voltage				

6 Functional description

Table 3. Function table ^[1]

Input	Output	
nOE	nAn	nYn
L	L	L
L	Н	Н
Н	X	Z

[1] H = HIGH voltage level;

L = LOW voltage level;

X = don't care;

Z = high-impedance OFF-state.

7 Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+4.6	V
VI	input voltage	[1]	-0.5	+4.6	V
Vo	output voltage	output HIGH or LOW state [1]	-0.5	V _{CC} + 0.5	V
		output OFF-state	-0.5	+4.6	V
		power-down mode, $V_{CC} = 0 V$ ^[2]	-0.5	+4.6	V
I _{IK}	input clamping current	V _I < 0 V	-	-50	mA
I _{OK}	output clamping current	$V_{\rm O} > V_{\rm CC}$ or $V_{\rm O} < 0$ V	-	±50	mA
I _O	output current	$V_{O} = 0 V \text{ to } V_{CC}$	-	±50	mA
I _{CC}	supply current		-	100	mA
I _{GND}	ground current		-100	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 \ ^{\circ}C \ to \ +85 \ ^{\circ}C$ [3]	-	500	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] When $V_{CC} = 0 V$ (power-down mode), the output voltage can be 3.6 V in normal operation. [3] For SO20 packages: above 70 °C derate linearly with 8 mW/K.

For SSO20 packages: above 70 °C derate linearly with 8 mW/K. For TSSOP20 packages: above 60 °C derate linearly with 5.5 mW/K.

For DHVQFN20 packages: above 60 °C derate linearly with 4.5 mW/K.

8 Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		1.65	3.6	V
VI	input voltage		0	3.6	V
V _O outpu	output voltage	V _{CC} = 1.65 to 3.6 V; output HIGH or LOW state	0	V _{CC}	V
		V _{CC} = 1.65 to 3.6 V; output OFF-state	0	3.6	V
		V_{CC} = 0 V; power-down mode	0	3.6	V
T _{amb}	ambient temperature	in free air	-40	+85	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 1.65 V to 2.7 V	0	20	ns/V
		V _{CC} = 2.7 V to 3.6 V	0	10	ns/V

Table 5. Recommended operating conditions

9 Static characteristics

Table 6. Static characteristics

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T _{amb} =	T _{amb} = -40 °C to +85 °C				
			Min	Тур ^[1]	Max			
V _{IH}	HIGH-level input	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	V		
	voltage	V_{CC} = 2.3 V to 2.7 V	1.7	-	-	V		
		V_{CC} = 2.7 V to 3.6 V	2.0	-	-	V		
VIL LOW-level input		V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	V		
	voltage	V_{CC} = 2.3 V to 2.7 V	-	-	0.7	V		
	V	V_{CC} = 2.7 V to 3.6 V	-	-	0.8	V		
V _{OH}	HIGH-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$						
		I_{O} = -100 µA; V_{CC} = 1.65 V to 3.6 V	V _{CC} - 0.2	-	-	V		
		I _O = -6 mA; V _{CC} = 1.65 V	1.25	-	-	V		
		I _O = -12 mA; V _{CC} = 2.3 V	1.8	-	-	V		
		I _O = -18 mA; V _{CC} = 2.3 V	1.7	-	-	V		
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	V		
		I _O = -18 mA; V _{CC} = 3.0 V	2.4	-	-	V		
		I _O = -24 mA; V _{CC} = 3.0 V	2.2	-	-	V		

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Symbol	Parameter	Conditions	T _{amb}	Unit		
			Min	Тур ^[1]	Max	
V _{OL}	LOW-level output	$V_{I} = V_{IH} \text{ or } V_{IL}$				
	voltage	I_{O} = 100 µA; V_{CC} = 1.65 V to 3.6 V	-	-	0.2	V
		I _O = 6 mA; V _{CC} = 1.65 V	-	-	0.3	V
		I _O = 12 mA; V _{CC} = 2.3 V	-	-	0.4	V
		I _O = 18 mA; V _{CC} = 2.3 V	-	-	0.6	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	V
		I _O = 18 mA; V _{CC} = 3.0 V	-	-	0.4	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	V
lı	input leakage current	V_{CC} = 3.6 V; V _I = 3.6 V or GND	-	±0.1	±5	μA
I _{OZ}	OFF-state output current	V_{CC} = 3.6 V; V _I = V _{IH} or V _{IL} ; V _O = 3.6 V or GND	-	0.1	±10	μA
I _{OFF}	power-off leakage current	V_{CC} = 0 V; V ₁ or V ₀ = 3.6 V	-	±0.1	±10	μA
I _{CC}	supply current	V_{CC} = 3.6 V; V_{I} = V_{CC} or GND; I_{O} = 0 A	-	0.2	20	μA
∆I _{CC}	additional supply current	per input pin; V _{CC} = 3.0 V to 3.6 V; V _I = V _{CC} - 0.6 V; I _O = 0 A	-	5	750	μA
CI	input capacitance		-	3.5	-	pF

[1] All typical values are measured at T_{amb} = 25 $^\circ C.$

10 Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit, see Figure 9.

Symbol	Parameter	Conditions		T _{amb} :	= -40 °C to +	-85 °C	Unit
				Min	Тур ^[1]	Мах	
t _{pd}	propagation delay	nAn to nYn; see Figure 7	[2]				
		V _{CC} = 1.65 V to 1.95 V		1.0	2.7	4.4	ns
		V_{CC} = 2.3 V to 2.7 V		1.0	2.0	3.1	ns
		V _{CC} = 2.7 V		1.0	2.3	3.1	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.2	2.8	ns
t _{en} enable time	enable time	nOE to nYn; see <u>Figure 8</u>	[3]				
		V _{CC} = 1.65 V to 1.95 V		1.0	3.4	6.9	ns
		V_{CC} = 2.3 V to 2.7 V		1.0	2.6	5.4	ns
		$V_{CC} = 2.7 V$		1.0	3.2	5.3	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.5	4.5	ns
t _{dis}	disable time	nOE to nYn; see <u>Figure 8</u>	[4]				
		V _{CC} = 1.65 V to 1.95 V		1.0	3.8	5.9	ns
		V_{CC} = 2.3 V to 2.7 V		1.0	2.2	4.1	ns
		$V_{CC} = 2.7 V$		1.0	3.0	4.4	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.9	4.2	ns
C _{PD}	power dissipation capacitance	per buffer; V _I = GND to V _{CC} ; V _{CC} = 3.3 V	[5]	-	20	-	pF

[1] Typical values are measured at T_{amb} = 25 $^\circ\text{C}$

Typical values for V_{CC} = 1.65 V to 1.95 V are measured at V_{CC} = 1.8 V Typical values for V_{CC} = 2.3 V to 2.7 V are measured at V_{CC} = 2.5 V

- [3] t_{en} is the same as t_{PZH} and t_{PZL}.
- [4] t_{dis} is the same as t_{PLZ} and t_{PLZ} . [5] C_{PD} is used to determine the dynamic power dissipation (P_D in µW).

 $P_{D} = C_{PD} \times V_{CC}^{2} \times f_{i} \times N + \Sigma (C_{L} \times V_{CC}^{2} \times f_{o}) \text{ where:}$

 f_i = input frequency in MHz

 $f_o =$ output frequency in MHz

C_L = output load capacitance in pF

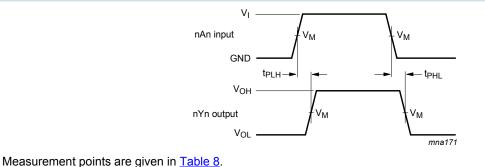
V_{CC} = supply voltage in Volt

N = number of inputs switching

 $\Sigma(C_L \times V_{CC}^2 \times f_0)$ = sum of the outputs

Typical values for V_{CC} = 3.0 V to 3.6 V are measured at V_{CC} = 3.3 V [2] t_{pd} is the same as t_{PHL} and t_{PLH} .

10.1 Waveforms and test circuit



 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Figure 7. Inputs nAn to output nYn propagation delays

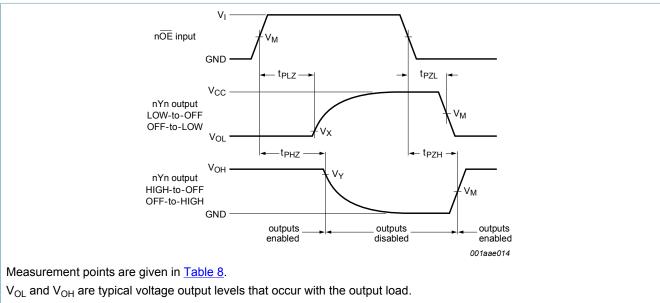


Figure 8. 3-state enable and disable times

Table 8. Measurement points

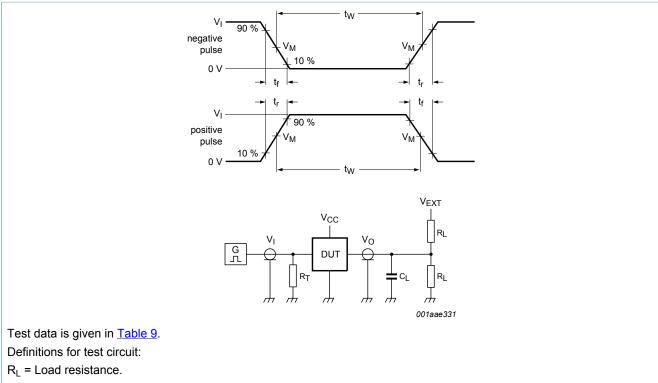
Supply voltage	Input	Input		Output			
V _{cc}	VI	V _M	V _M	V _X	V _Y		
1.65 V to 1.95 V	V _{CC}	$0.5 \times V_{CC}$	0.5V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V		
2.3 V to 2.7 V	V _{CC}	$0.5 \times V_{CC}$	0.5V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V		
2.7 V	2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V		
3.0 V to 3.6 V	2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V		

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 C_L = Load capacitance including jig and probe capacitance.

 R_T = Termination resistance should be equal to output impedance Z_0 of the pulse generator.

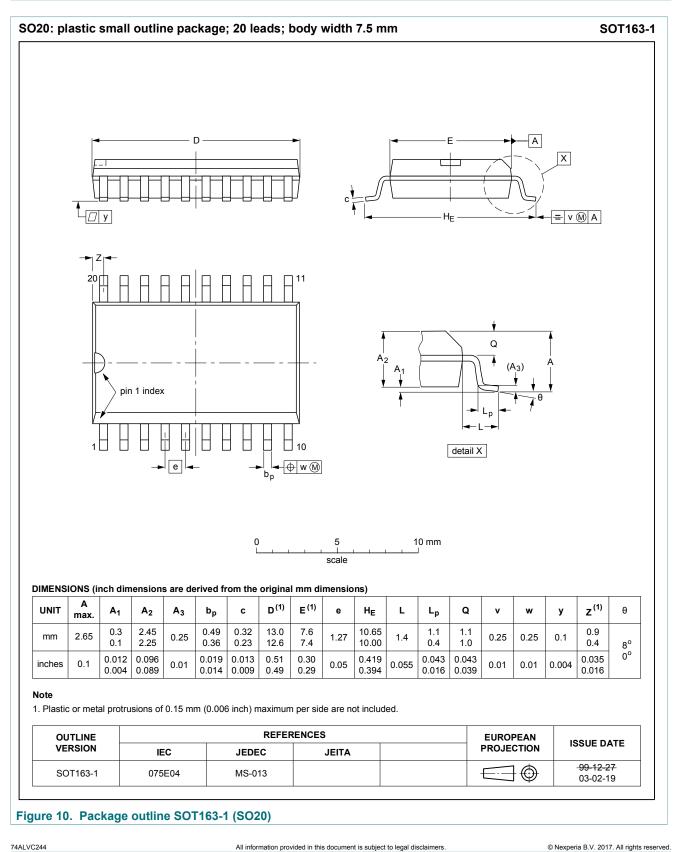
 V_{EXT} = External voltage for measuring switching times.

Figure 9. Test circuit for measuring switching times

Table 9. Test data

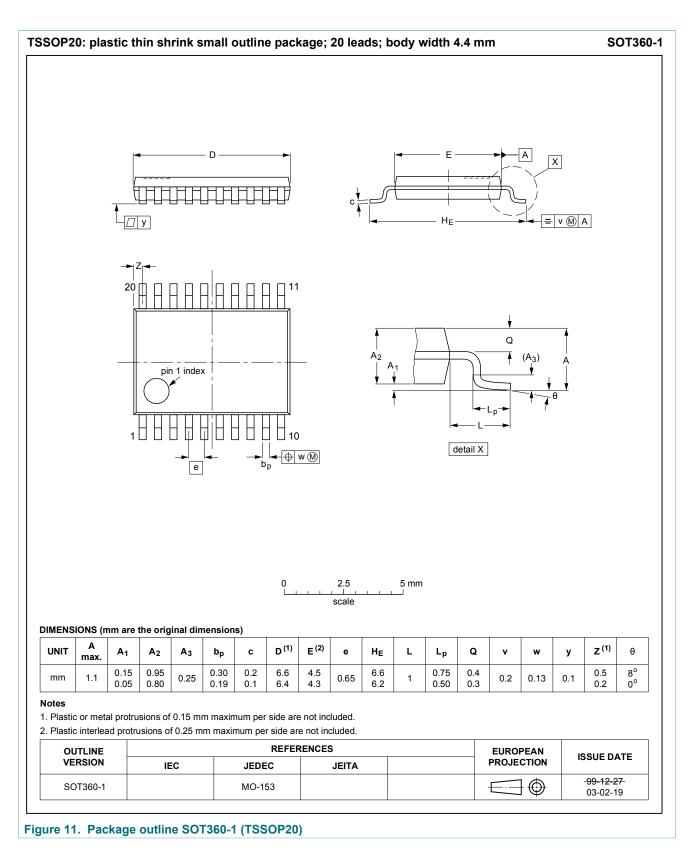
Supply voltage	Input		Load		V _{EXT}	V _{EXT}		
V _{cc}	VI	t _r , t _f	CL	RL	t _{PLH} , t _{PHL}	t _{PLZ} , t _{PZL}	t _{PHZ} , t _{PZH}	
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	open	$2 \times V_{CC}$	GND	
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	open	$2 \times V_{CC}$	GND	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND	

11 Package outline

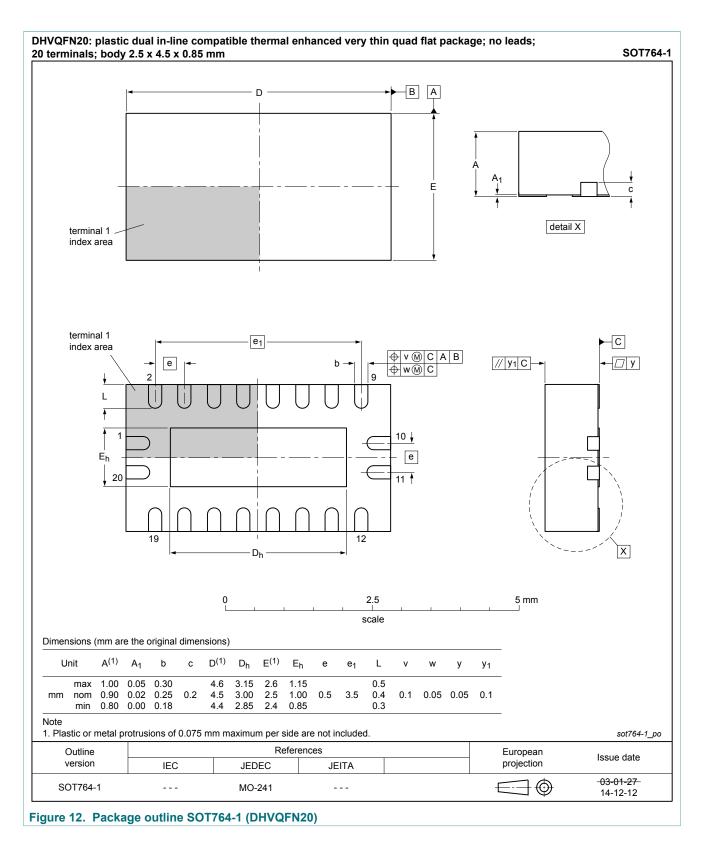


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12 Abbreviations

Table 10. Abbreviations					
Acronym	Description				
CMOS	Complementary Metal-Oxide Semiconductor				
DUT	Device Under Test				
ESD	ElectroStatic Discharge				
НВМ	Human Body Model				
MM	Machine Model				
TTL	Transistor-Transistor Logic				

13 Revision history

Table 1	1. Rev	vision	history

Document ID	Release date	Data sheet status	Change notice	Supersedes			
74ALVC244 v.4	20171010	Product data sheet	-	74ALVC244 v.3			
Modifications:	Nexperia.	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. 					
74ALVC244 v.3	20030908	Product specification	-	74ALVC244 v.2			
74ALVC244 v.2	20030811	Product specification	-	74ALVC244 v.1			
74ALVC244 v.1	20011030	Product specification	-	-			

14 Legal information

14.1 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.

Please consult the most recently issued document before initiating or completing a design. [1]

The term 'short data sheet' is explained in section "Definitions".

[2] [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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