Dual bus buffer/line driver; 3-state Rev. 4 — 26 July 2021

### 1. General description

The 74LVC2G125-Q100 is a dual buffer/line driver with 3-state outputs controlled by the output enable inputs ( $n\overline{OE}$ ). Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial power down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

### 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)

   Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 1.65 V to 5.5 V
- High noise immunity
- IOFF circuitry provides partial Power-down mode operation
- $\pm 24$  mA output drive (V<sub>CC</sub> = 3.0 V)
- CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Overvoltage tolerant inputs to 5.5 V
- Complies with JEDEC standard:
- JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
  - JESD36 (4.5 V to 5.5 V)
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

### 3. Ordering information

#### Table 1. Ordering information

Type number	Package	Package						
	Temperature range	Name	Description	Version				
74LVC2G125DP-Q100	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2				
74LVC2G125DC-Q100	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1				

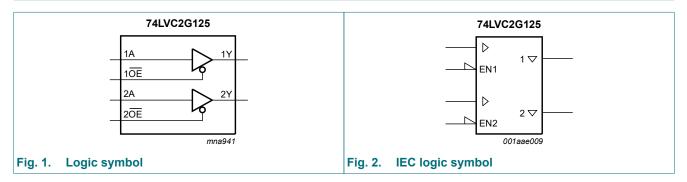
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### 4. Marking

Table 2. Marking codes					
Type number	Marking code [1]				
74LVC2G125DP-Q100	V25				
74LVC2G125DC-Q100	V25				

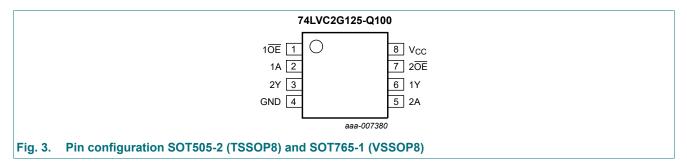
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram



# 6. Pinning information

### 6.1. Pinning



### 6.2. Pin description

Table 3. Pin description						
Symbol	Pin	Description				
1 <u>0E</u> , 2 <u>0E</u>	1, 7	output enable input (active LOW)				
1A, 2A	2, 5	data input				
GND	4	ground (0 V)				
1Y, 2Y	6, 3	data output				
V <sub>CC</sub>	8	supply voltage				

74LVC2G125\_Q100

## 7. Functional description

#### Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

	Input	Output
nŌE	nA	nY
L	L	L
L	Н	Н
Н	X	Z

### 8. Limiting values

#### Table 5. 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 <sub>CC</sub>	supply voltage			-0.5	+6.5	V
I <sub>IK</sub>	input clamping current	V <sub>1</sub> < 0 V		-50	-	mA
VI	input voltage		[1]	-0.5	+6.5	V
I <sub>OK</sub>	output clamping current	$V_{\rm O}$ > $V_{\rm CC}$ or $V_{\rm O}$ < 0 V		-	±50	mA
Vo	output voltage	Enable mode	[1]	-0.5	V <sub>CC</sub> + 0.5	V
		Disable mode	[1]	-0.5	+6.5	V
		Power-down mode; V <sub>CC</sub> = 0 V	[1]	-0.5	+6.5	V
I <sub>O</sub>	output current	$V_{O} = 0 V \text{ to } V_{CC}$		-	±50	mA
I <sub>CC</sub>	supply current			-	100	mA
I <sub>GND</sub>	ground current			-100	-	mA
T <sub>stg</sub>	storage temperature			-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C	[2]	-	250	mW

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

[2] For SOT505-2 (TSSOP8) package: P<sub>tot</sub> derates linearly with 4.6 mW/K above 96 °C.

For SOT765-1 (VSSOP8) package: Ptot derates linearly with 4.9 mW/K above 99 °C.

### 9. Recommended operating conditions

#### Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		1.65	5.5	V
VI	input voltage		0	5.5	V
Vo	output voltage	V <sub>CC</sub> = 1.65 V to 5.5 V; Enable mode	0	V <sub>CC</sub>	V
		V <sub>CC</sub> = 1.65 V to 5.5 V; Disable mode	0	5.5	V
		V <sub>CC</sub> = 0 V; Power-down mode	0	5.5	V
T <sub>amb</sub>	ambient temperature		-40	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 1.65 V to 2.7 V	-	20	ns/V
		V <sub>CC</sub> = 2.7 V to 5.5 V	-	10	ns/V

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## **10. Static characteristics**

#### Table 7. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to	Unit	
			Min	Тур [1]	Max	Min	Мах	
VIH	HIGH-level	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65V <sub>CC</sub>	-	-	0.65V <sub>CC</sub>	-	V
	input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.7V <sub>CC</sub>	-	-	0.7V <sub>CC</sub>	-	V
V <sub>IL</sub>	LOW-level	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35V <sub>CC</sub>	-	0.35V <sub>CC</sub>	V
	input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.3V <sub>CC</sub>	-	0.3V <sub>CC</sub>	V
V <sub>OL</sub>	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}$						
	output voltage	I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	-	-	0.1	-	0.1	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	-	0.70	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.3	-	0.45	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	-	0.60	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	-	0.80	V
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V	-	-	0.55	-	0.80	V
V <sub>OH</sub>	HIGH-level	$V_{I} = V_{IH} \text{ or } V_{IL}$						
	output voltage	I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	V <sub>CC</sub> - 0.1	-	-	V <sub>CC</sub> - 0.1	-	V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	1.2	-	-	0.95	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	1.7	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2	-	-	1.9	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.3	-	-	2.0	-	V
		I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V	3.8	-	-	3.4	-	V
I	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	±0.1	±1	-	±1	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GND; V <sub>CC</sub> = 3.6 V	-	±0.1	±2	-	±2	μA
I <sub>OFF</sub>	power-off leakage current	$V_{I} \text{ or } V_{O} = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±0.1	±2	-	±2	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 1.65 V to 5.5 V; I <sub>O</sub> = 0 A	-	0.1	4	-	4	μA
ΔI <sub>CC</sub>	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$ ; $I_O = 0 \text{ A}$ ; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	-	5	500	-	500	μA
CI	input capacitance		-	2	-	-	-	pF

[1] Typical values are measured at V<sub>CC</sub> = 3.3 V and at T<sub>amb</sub> = 25 °C.

### **11. Dynamic characteristics**

#### Table 8. Dynamic characteristics

Voltages are referenced to GND (ground 0 V); for test circuit see Fig. 6.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Тур [1]	Мах	Min	Max	1
t <sub>pd</sub>	propagation	nA to nY; see Fig. 4 [2]						
	delay	V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.7	9.1	1.0	11.4	ns
		$V_{CC}$ = 2.3 V to 2.7 V	0.5	2.5	4.8	0.5	6.0	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.7	4.8	1.0	6.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	2.3	4.3	0.5	5.5	ns
		$V_{CC}$ = 4.5 V to 5.5 V	0.5	1.9	3.7	0.5	4.6	ns
t <sub>en</sub>	enable time	nOE to nY; see Fig. 5 [3]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.5	4.3	9.9	1.5	12.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.8	5.6	1.0	7.0	ns
		V <sub>CC</sub> = 2.7 V	1.5	3.3	5.7	1.5	7.1	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	2.4	4.7	0.5	5.9	ns
		$V_{CC}$ = 4.5 V to 5.5 V	0.5	2.0	3.8	0.5	4.8	ns
t <sub>dis</sub>	disable time	nOE to nY; see Fig. 5 [4]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.5	11.6	1.0	14.1	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	1.8	5.8	0.5	7.6	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.7	4.8	1.0	6.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.7	4.6	1.0	5.9	ns
		$V_{CC}$ = 4.5 V to 5.5 V	0.5	1.8	3.4	0.5	4.6	ns
C <sub>PD</sub>		per buffer; $V_I = GND$ to $V_{CC}$ [5]						
	capacitance	output enabled	-	18	-	-	-	pF
		output disabled	-	5	-	-	-	pF

[1] Typical values are measured at nominal V<sub>CC</sub> and at  $T_{amb}$  = 25 °C.

[2]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[3]  $t_{en}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .

[4]  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .

[5]  $C_{PD}$  is used to determine the dynamic power dissipation (P<sub>D</sub> in  $\mu$ W).

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

 $f_i$  = input frequency in MHz;

 $f_o$  = output frequency in MHz;

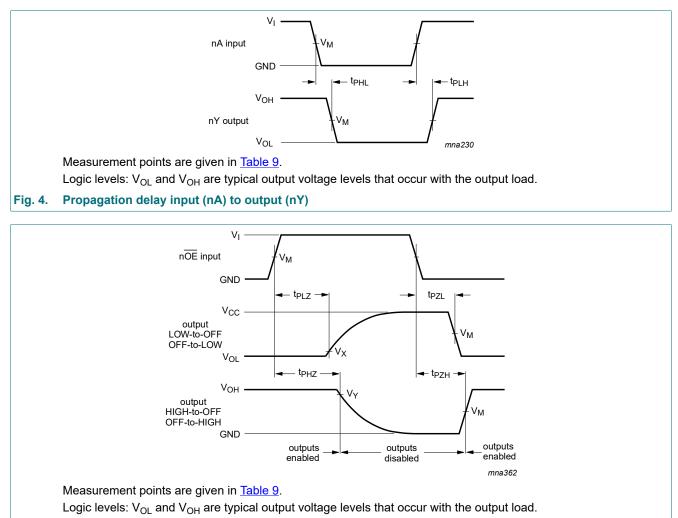
 $C_L$  = output load capacitance in pF;

 $V_{CC}$  = supply voltage in V;

N = number of inputs switching;  $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

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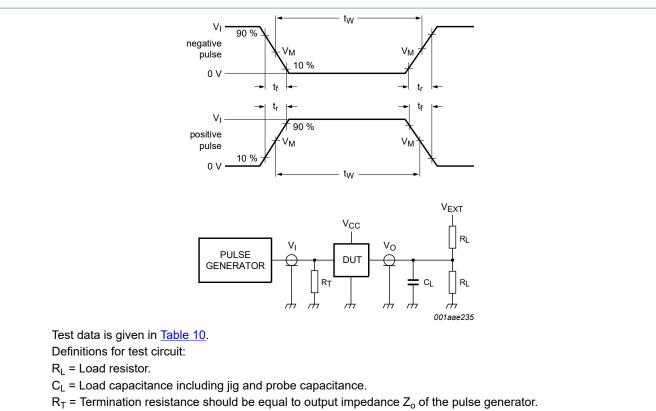


#### Fig. 5. 3-state output enable and disable times

Table 9. Measurement points							
Supply voltage	Input	Output	Output				
V <sub>cc</sub>	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>			
1.65 V to 1.95 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V			
2.3 V to 2.7 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V			
2.7 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V			
3.0 V to 3.6 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V			
4.5 V to 5.5 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V			

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### Dual bus buffer/line driver; 3-state



V<sub>EXT</sub> = Test voltage for switching times.

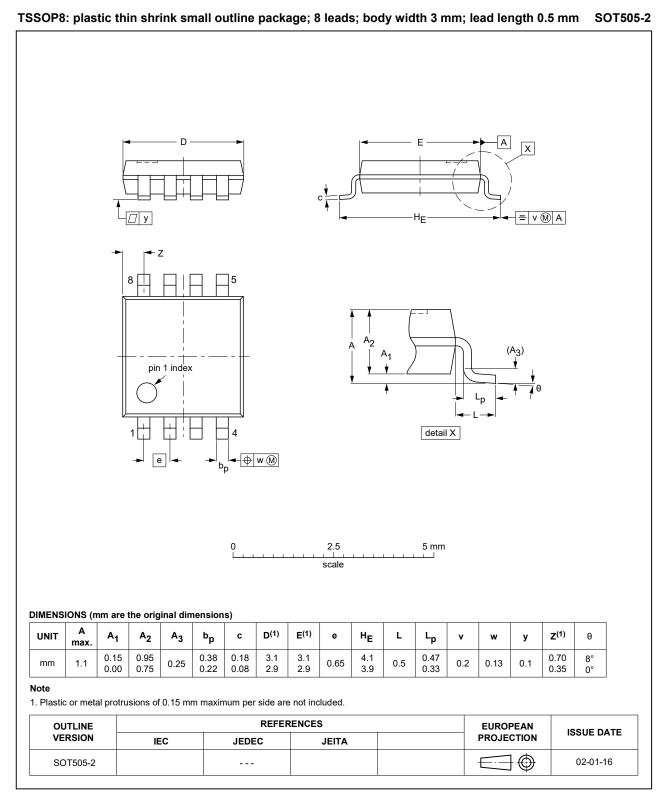
### Fig. 6. Test circuit for measuring switching times

#### Table 10. Test data

Supply voltage	Input		Load	Load		V <sub>EXT</sub>		
V <sub>cc</sub>	VI	t <sub>r</sub> , t <sub>f</sub>	CL	RL	t <sub>PLH</sub> , t <sub>PHL</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>	
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	1 kΩ	open	GND	2V <sub>CC</sub>	
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	500 Ω	open	GND	2V <sub>CC</sub>	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V	
4.5 V to 5.5 V	V <sub>CC</sub>	≤ 2.5 ns	50 pF	500 Ω	open	GND	2V <sub>CC</sub>	

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### 12. Package outline

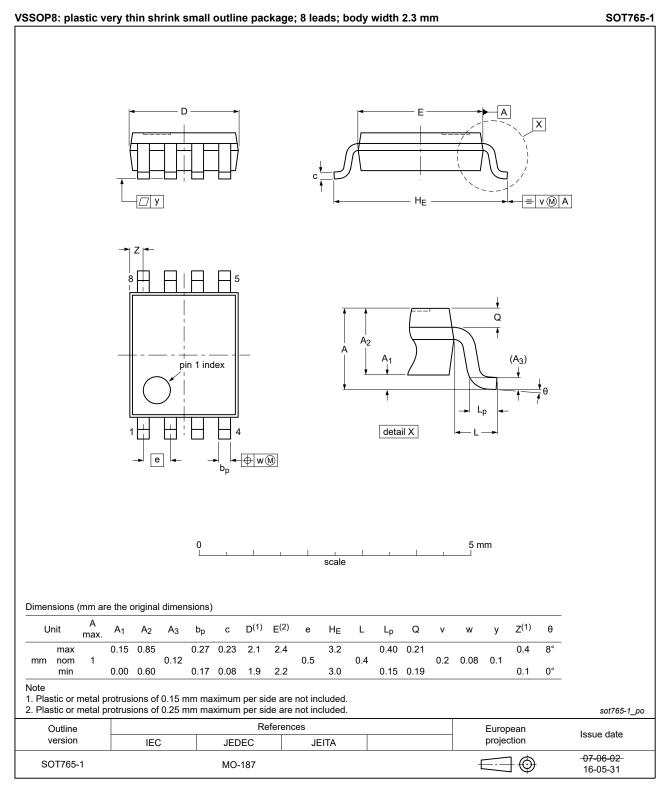


#### Fig. 7. Package outline SOT505-2 (TSSOP8)

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# 13. Abbreviations

Table 11. Abbreviations					
Acronym	Description				
CMOS	Complementary Metal-Oxide Semiconductor				
DUT	Device Under Test				
ESD	ElectroStatic Discharge				
HBM	Human Body Model				
MIL	Military				
MM	Machine Model				
TTL	Transistor-Transistor Logic				

### 14. Revision history

### Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes				
74LVC2G125_Q100 v.4	20210726	Product data sheet	-	74LVC2G125_Q100 v.3				
Modifications:	<ul> <li><u>Section 1</u> and <u>Section 2</u> updated.</li> <li><u>Section 8</u>: Derating values for P<sub>tot</sub> total power dissipation updated.</li> </ul>							
74LVC2G125_Q100 v.3	20180910	Product data sheet	-	74LVC2G125_Q100 v.2				
Modifications:	of Nexperia.	f this data sheet has been i ave been adapted to the ne	U	nply with the identity guidelines e where appropriate.				
74LVC2G125_Q100 v.2	20161214	Product data sheet	-	74LVC2G125_Q100 v.1				
Modifications:	• <u>Table 7</u> : The maximum limits for leakage current and supply current have changed.							
74LVC2G125_Q100 v.1	20130508	Product data sheet	-	-				

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# 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.

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

- [2] The term 'short data sheet' is explained in section "Definitions".
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