

74HC2G17-Q100; 74HCT2G17-Q100

Dual non-inverting Schmitt trigger

Rev. 2 — 2 February 2022

Product data sheet

1. General description

The 74HC2G17-Q100; 74HCT2G17-Q100 are dual buffers with Schmitt-trigger inputs. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} . Schmitt trigger inputs transform slowly changing input signals into sharply defined jitter-free output signals.

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 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Unlimited input rise and fall times
- Balanced propagation delays
- Input levels:
 - For 74HC2G17-Q100: CMOS level
 - For 74HCT2G17-Q100: TTL level
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 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. Applications

- Wave and pulse shaper for highly noisy environments
- Astable multivibrators
- Monostable multivibrators

4. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74HC2G17GW-Q100	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	SOT363-2
74HCT2G17GW-Q100				
74HC2G17GV-Q100	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457
74HCT2G17GV-Q100				

5. Marking

Table 2. Marking

Type number	Marking code[1]
74HC2G17GW-Q100	HV
74HCT2G17GW-Q100	TV
74HC2G17GV-Q100	HV
74HCT2G17GV-Q100	TV

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

6. Functional diagram

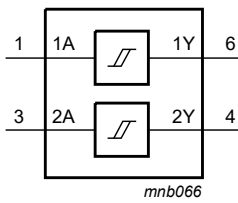


Fig. 1. Logic symbol

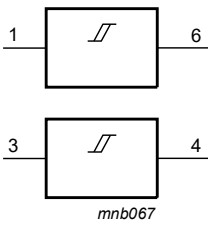


Fig. 2. IEC logic symbol

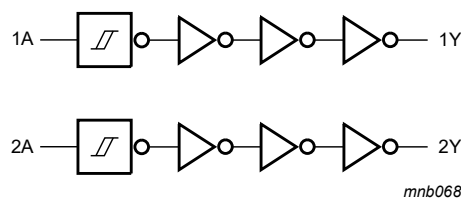


Fig. 3. Logic diagram

7. Pinning information

7.1. Pinning

74HC2G17
74HCT2G17

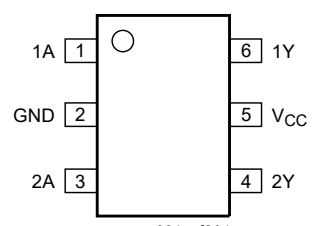


Fig. 4. Pin configuration SOT363-2 (TSSOP6) and SOT457 (SC-74; TSOP6)

7.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1A	1	data input
GND	2	ground (0 V)
2A	3	data input
2Y	4	data output
V _{CC}	5	supply voltage
1Y	6	data output

8. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

Input	Output
nA	nY
L	L
H	H

9. 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 _{CC}	supply voltage		-0.5	+7.0	V
I _{IK}	input clamping current	V _I < -0.5 V or V _I > V _{CC} + 0.5 V [1]	-	±20	mA
I _{OK}	output clamping current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V [1]	-	±20	mA
I _O	output current	V _O = -0.5 V to V _{CC} + 0.5 V [1]	-	±25	mA
I _{CC}	supply current	[1]	-	50	mA
I _{GND}	ground current	[1]	-	-50	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	[2]	-	250	mW

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

[2] For SOT363-2 (TSSOP6) package: P_{tot} derates linearly with 3.7 mW/K above 83 °C.
For SOT457 (SC-74; TSOP6) package: P_{tot} derates linearly with 4.1 mW/K above 89 °C.

10. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
74HC2G17-Q100						
V_{CC}	supply voltage		2.0	5.0	6.0	V
V_I	input voltage		0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	°C
74HCT2G17-Q100						
V_{CC}	supply voltage		4.5	5.0	5.5	V
V_I	input voltage		0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	°C

11. Static characteristics

Table 7. Static characteristics for 74HC2G17-Q100

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25\text{ °C}$						
V_{OH}	HIGH-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		$I_O = -20\text{ }\mu\text{A}$; $V_{CC} = 2.0\text{ V}$	1.9	2.0	-	V
		$I_O = -20\text{ }\mu\text{A}$; $V_{CC} = 4.5\text{ V}$	4.4	4.5	-	V
		$I_O = -20\text{ }\mu\text{A}$; $V_{CC} = 6.0\text{ V}$	5.9	6.0	-	V
		$I_O = -4.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	4.18	4.32	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		$I_O = 20\text{ }\mu\text{A}$; $V_{CC} = 2.0\text{ V}$	-	0	0.1	V
		$I_O = 20\text{ }\mu\text{A}$; $V_{CC} = 4.5\text{ V}$	-	0	0.1	V
		$I_O = 20\text{ }\mu\text{A}$; $V_{CC} = 6.0\text{ V}$	-	0	0.1	V
		$I_O = 4.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	-	0.15	0.26	V
I_I	input leakage current	$V_I = GND$ or V_{CC} ; $V_{CC} = 6.0\text{ V}$	-	-	± 0.1	μA
		$V_I = GND$ or V_{CC} ; $I_O = 0\text{ A}$; $V_{CC} = 6.0\text{ V}$	-	-	1.0	μA
C_I	input capacitance		-	2.0	-	pF

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = -40 °C to +85 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-}				
		I _O = -20 μA; V _{CC} = 2.0 V	1.9	-	-	V
		I _O = -20 μA; V _{CC} = 4.5 V	4.4	-	-	V
		I _O = -20 μA; V _{CC} = 6.0 V	5.9	-	-	V
		I _O = -4.0 mA; V _{CC} = 4.5 V	4.13	-	-	V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.63	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-}				
		I _O = 20 μA; V _{CC} = 2.0 V	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 4.5 V	-	-	0.33	V
		I _O = 5.2 mA; V _{CC} = 6.0 V	-	-	0.33	V
I _I	input leakage current	V _I = GND or V _{CC} ; V _{CC} = 6.0 V	-	-	±1.0	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 6.0 V	-	-	10.0	μA
T_{amb} = -40 °C to +125 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-}				
		I _O = -20 μA; V _{CC} = 2.0 V	1.9	-	-	V
		I _O = -20 μA; V _{CC} = 4.5 V	4.4	-	-	V
		I _O = -20 μA; V _{CC} = 6.0 V	5.9	-	-	V
		I _O = -4.0 mA; V _{CC} = 4.5 V	3.7	-	-	V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.2	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-}				
		I _O = 20 μA; V _{CC} = 2.0 V	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 4.5 V	-	-	0.4	V
		I _O = 5.2 mA; V _{CC} = 6.0 V	-	-	0.4	V
I _I	input leakage current	V _I = GND or V _{CC} ; V _{CC} = 6.0 V	-	-	±1.0	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 6.0 V	-	-	20.0	μA

Table 8. Static characteristics for 74HCT2G17-Q100

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 μA	4.4	4.5	-	V
		I _O = -4.0 mA	4.18	4.32	-	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 μA	-	0	0.1	V
		I _O = -4.0 mA	-	0.15	0.26	V
I _I	input leakage current	V _I = GND or V _{CC} ; V _{CC} = 5.5 V	-	-	±0.1	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 5.5 V	-	-	1.0	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 2.1 V; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A	-	-	300	μA
C _I	input capacitance		-	2.0	-	pF
T_{amb} = -40 °C to +85 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 μA	4.4	-	-	V
		I _O = -4.0 mA	4.13	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 μA	-	-	0.1	V
		I _O = -4.0 mA	-	-	0.33	V
I _I	input leakage current	V _I = GND or V _{CC} ; V _{CC} = 5.5 V	-	-	±1.0	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 5.5 V	-	-	10.0	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 2.1 V; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A	-	-	375	μA
T_{amb} = -40 °C to +125 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 μA	4.4	-	-	V
		I _O = -4.0 mA	3.7	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 μA	-	-	0.1	V
		I _O = -4.0 mA	-	-	0.4	V
I _I	input leakage current	V _I = GND or V _{CC} ; V _{CC} = 5.5 V	-	-	±1.0	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 5.5 V	-	-	20.0	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 2.1 V; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A	-	-	410	μA

12. Dynamic characteristics

Table 9. Dynamic characteristics

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

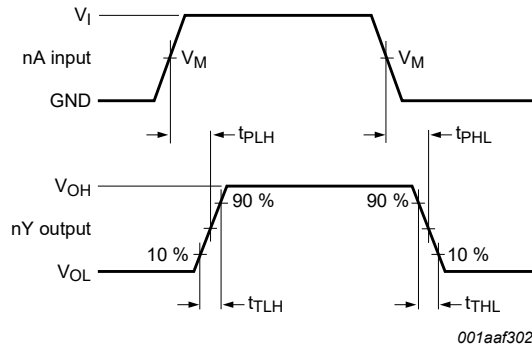
Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC2G17-Q100										
t_{pd}	propagation delay	nA to nY; see Fig. 5 [1]								
		$V_{CC} = 2.0\text{ V}; C_L = 50\text{ pF}$	-	36	115	-	140	-	175	ns
		$V_{CC} = 4.5\text{ V}; C_L = 50\text{ pF}$	-	12	22	-	27	-	34	ns
		$V_{CC} = 6.0\text{ V}; C_L = 50\text{ pF}$	-	10	18	-	22	-	28	ns
t_t	transition time	nY; see Fig. 5 [2]								
		$V_{CC} = 2.0\text{ V}; C_L = 50\text{ pF}$	-	20	75	-	95	-	110	ns
		$V_{CC} = 4.5\text{ V}; C_L = 50\text{ pF}$	-	7	15	-	19	-	22	ns
		$V_{CC} = 6.0\text{ V}; C_L = 50\text{ pF}$	-	5	13	-	16	-	19	ns
C_{PD}	power dissipation capacitance	$V_I = \text{GND to } V_{CC}$ [3]	-	10	-	-	-	-	-	pF
74HCT2G17-Q100										
t_{pd}	propagation delay	nA to nY; see Fig. 5 [1]								
		$V_{CC} = 4.5\text{ V}; C_L = 50\text{ pF}$	-	21	29	-	36	-	45	ns
t_t	transition time	nY; see Fig. 5 [2]								
		$V_{CC} = 4.5\text{ V}; C_L = 50\text{ pF}$	-	6	15	-	19	-	22	ns
C_{PD}	power dissipation capacitance	$V_I = \text{GND to } V_{CC} - 1.5\text{ V}$ [3]	-	10	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PLH} and t_{PHL}

[2] t_t is the same as t_{TLH} and t_{THL}

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 the outputs.

12.1. Waveforms and test circuit



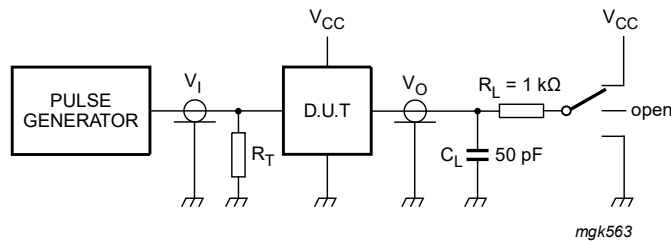
Measurement points are given in [Table 10](#).

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

Fig. 5. The data input (nA) to output (nY) propagation delays and output transition times

Table 10. Measurement points

Type	Input			Output
	V_M	V_I	$t_r = t_f$	V_M
74HC2G17-Q100	$0.5V_{CC}$	GND to V_{CC}	6.0 ns	$0.5V_{CC}$
74HCT2G17-Q100	1.3 V	GND to 3.0 V	6.0 ns	1.3 V



Test data is given in [Table 11](#).

Definitions test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

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

Fig. 6. Test circuit for measuring switching times

Table 11. Test data

Type	Input		Test
	V_I	t_r, t_f	t_{PHL}, t_{PLH}
74HC2G17-Q100	GND to V_{CC}	6 ns	open
74HCT2G17-Q100	GND to 3.0 V	6 ns	open

13. Transfer characteristics

Table 12. Transfer characteristics

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC2G17-Q100										
V_{T+}	positive-going threshold voltage	see Fig. 7, Fig. 8								
		$V_{CC} = 2.0\text{ V}$	1.00	1.18	1.50	1.00	1.50	1.00	1.50	V
		$V_{CC} = 4.5\text{ V}$	2.30	2.60	3.15	2.30	3.15	2.30	3.15	V
		$V_{CC} = 6.0\text{ V}$	3.00	3.46	4.20	3.00	4.20	3.00	4.20	V
V_{T-}	negative-going threshold voltage	see Fig. 7, Fig. 8								
		$V_{CC} = 2.0\text{ V}$	0.30	0.60	0.90	0.30	0.90	0.30	0.90	V
		$V_{CC} = 4.5\text{ V}$	1.13	1.47	2.00	1.13	2.00	1.13	2.00	V
		$V_{CC} = 6.0\text{ V}$	1.50	2.06	2.60	1.50	2.60	1.50	2.60	V
V_H	hysteresis voltage	$V_{T+} - V_{T-}$; see Fig. 7, Fig. 8 and Fig. 9								
		$V_{CC} = 2.0\text{ V}$	0.30	0.60	1.00	0.30	1.00	0.30	1.00	V
		$V_{CC} = 4.5\text{ V}$	0.60	1.13	1.40	0.60	1.40	0.60	1.40	V
		$V_{CC} = 6.0\text{ V}$	0.80	1.40	1.70	0.80	1.70	0.80	1.70	V
74HCT2G17-Q100										
V_{T+}	positive-going threshold voltage	see Fig. 7 and Fig. 8								
		$V_{CC} = 4.5\text{ V}$	1.20	1.58	1.90	1.20	1.90	1.20	1.90	V
		$V_{CC} = 5.5\text{ V}$	1.40	1.78	2.10	1.40	2.10	1.40	2.10	V
V_{T-}	negative-going threshold voltage	see Fig. 7 and Fig. 8								
		$V_{CC} = 4.5\text{ V}$	0.50	0.87	1.20	0.50	1.20	0.50	1.20	V
		$V_{CC} = 5.5\text{ V}$	0.60	1.11	1.40	0.60	1.40	0.60	1.40	V
V_H	hysteresis voltage	$V_{T+} - V_{T-}$; see Fig. 7, Fig. 8 and Fig. 10								
		$V_{CC} = 4.5\text{ V}$	0.40	0.71	-	0.40	-	0.40	-	V
		$V_{CC} = 5.5\text{ V}$	0.40	0.67	-	0.40	-	0.40	-	V

13.1. Waveforms transfer characteristics

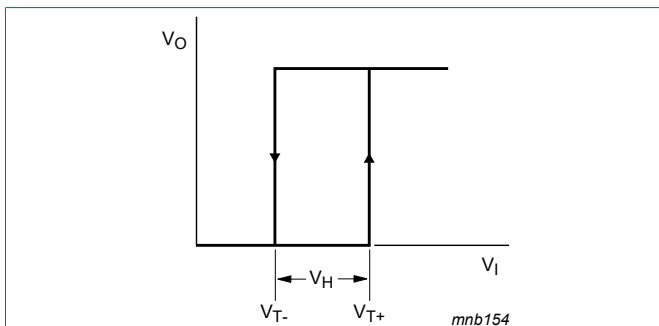


Fig. 7. Transfer characteristic

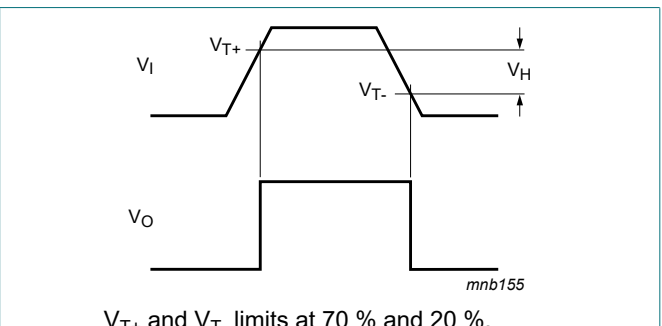


Fig. 8. Definition of V_{T+} , V_{T-} and V_H

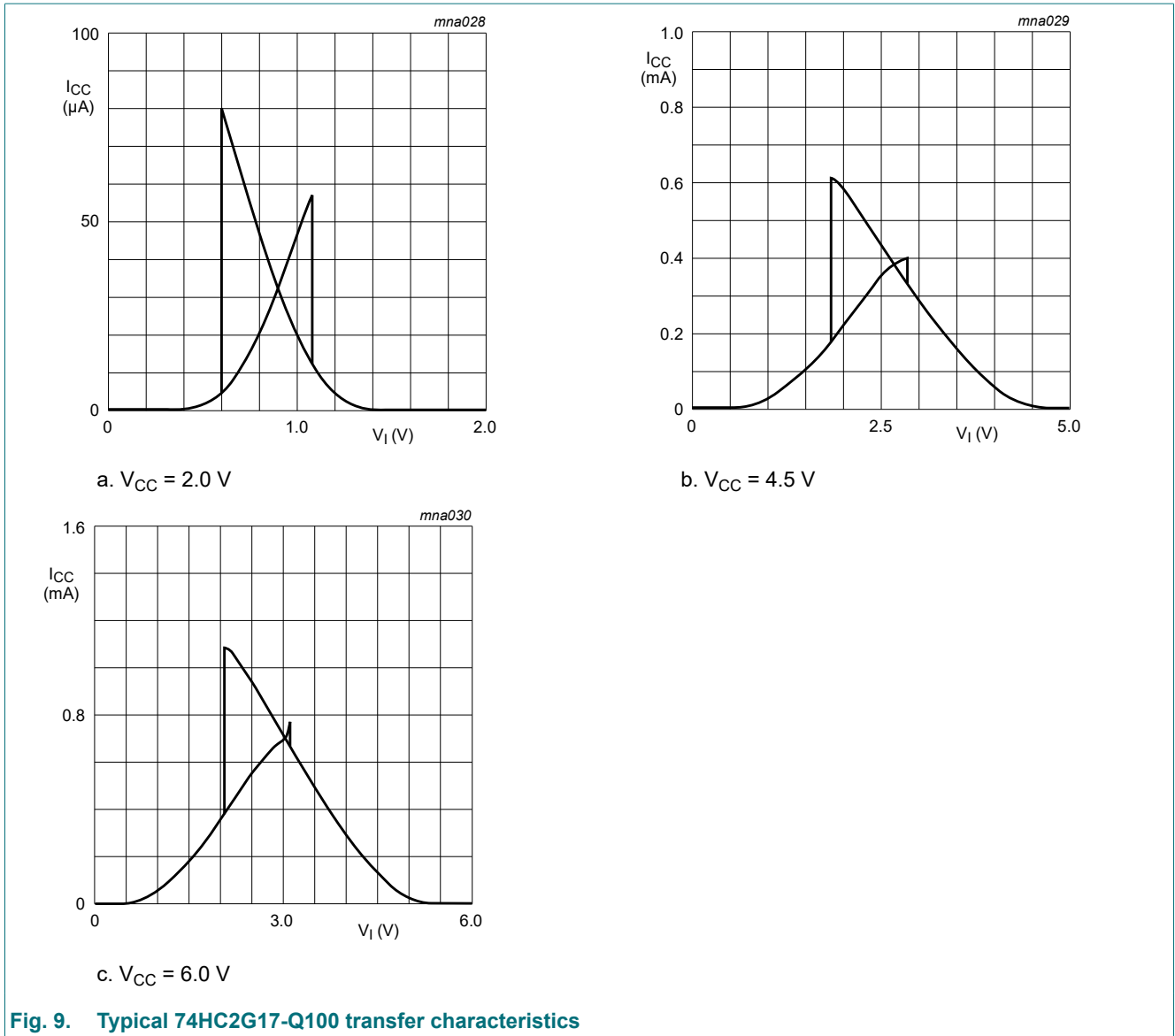


Fig. 9. Typical 74HC2G17-Q100 transfer characteristics

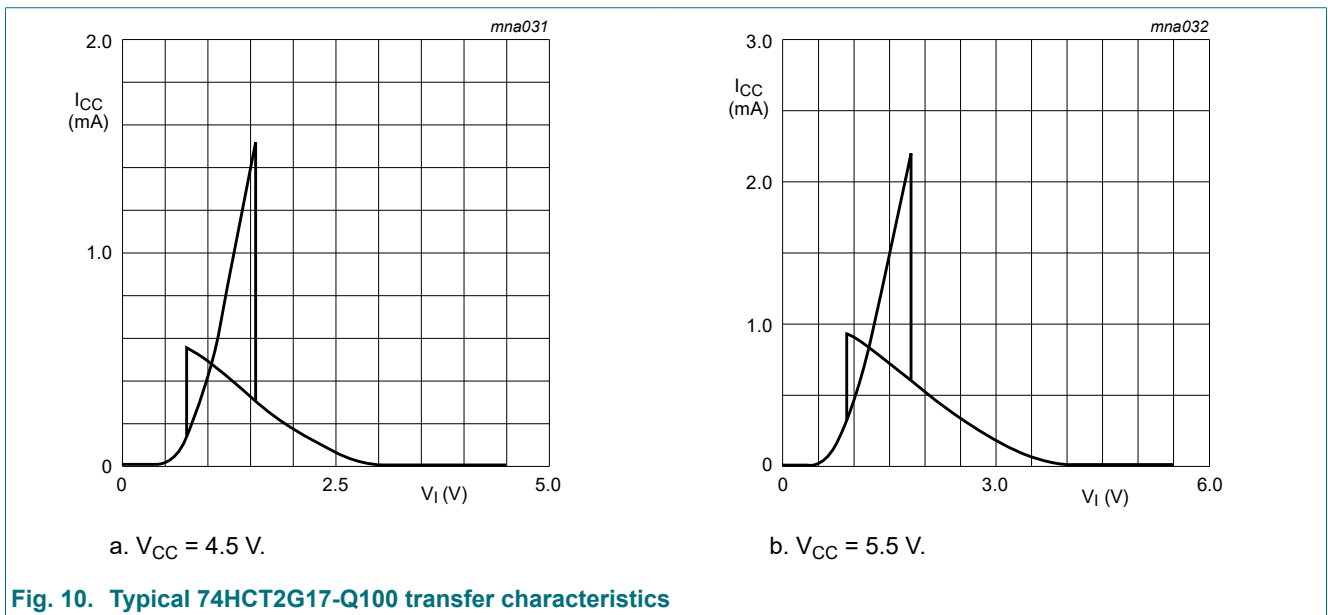


Fig. 10. Typical 74HCT2G17-Q100 transfer characteristics

14. Application information

The slow input rise and fall times cause additional power dissipation, this can be calculated using the following formula:

$$P_{\text{add}} = f_i \times (t_r \times \Delta I_{\text{CC(AV)}} + t_f \times \Delta I_{\text{CC(AV)}}) \times V_{\text{CC}}$$

where:

P_{add} = additional power dissipation (μW);

f_i = input frequency (MHz);

t_r = input rise time (ns); 10 % to 90 %;

t_f = input fall time (ns); 90 % to 10 %;

$\Delta I_{\text{CC(AV)}}$ = average additional supply current (μA).

$\Delta I_{\text{CC(AV)}}$ differs with positive or negative input transitions, as shown in Fig. 11 and Fig. 12.

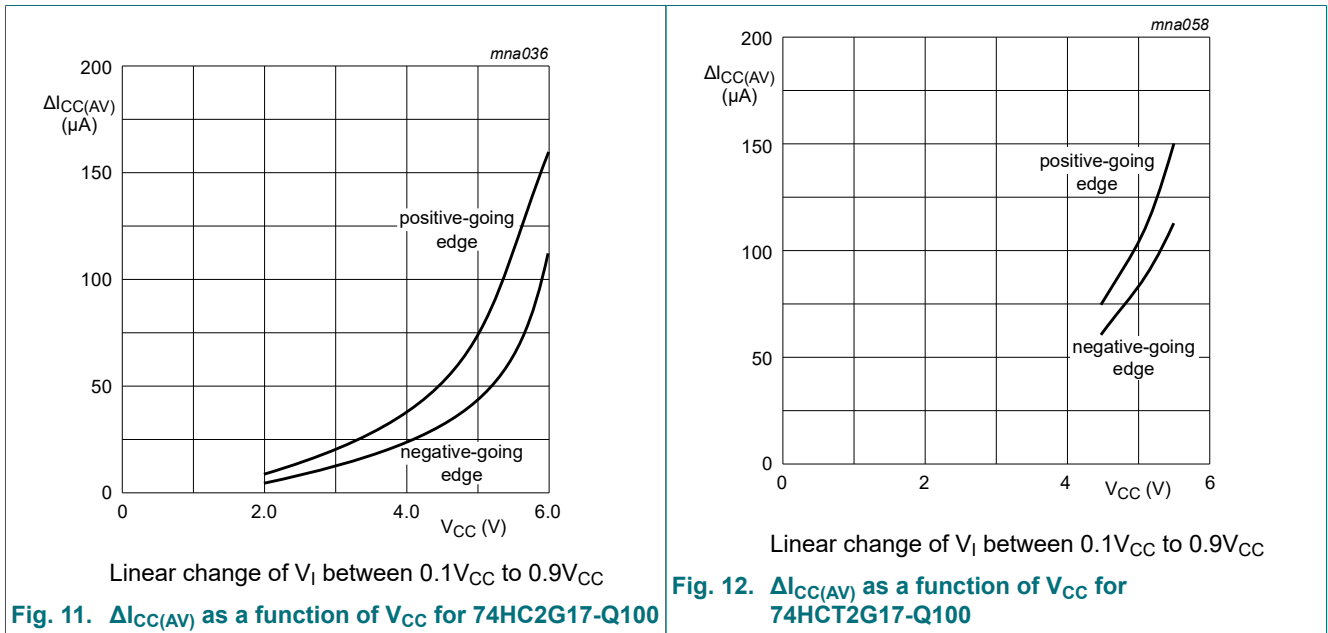


Fig. 11. $\Delta I_{\text{CC(AV)}}$ as a function of V_{CC} for 74HC2G17-Q100

Fig. 12. $\Delta I_{\text{CC(AV)}}$ as a function of V_{CC} for 74HCT2G17-Q100

15. Package outline

TSSOP6: plastic thin shrink small outline package; 6 leads; body width 1.25 mm

SOT363-2

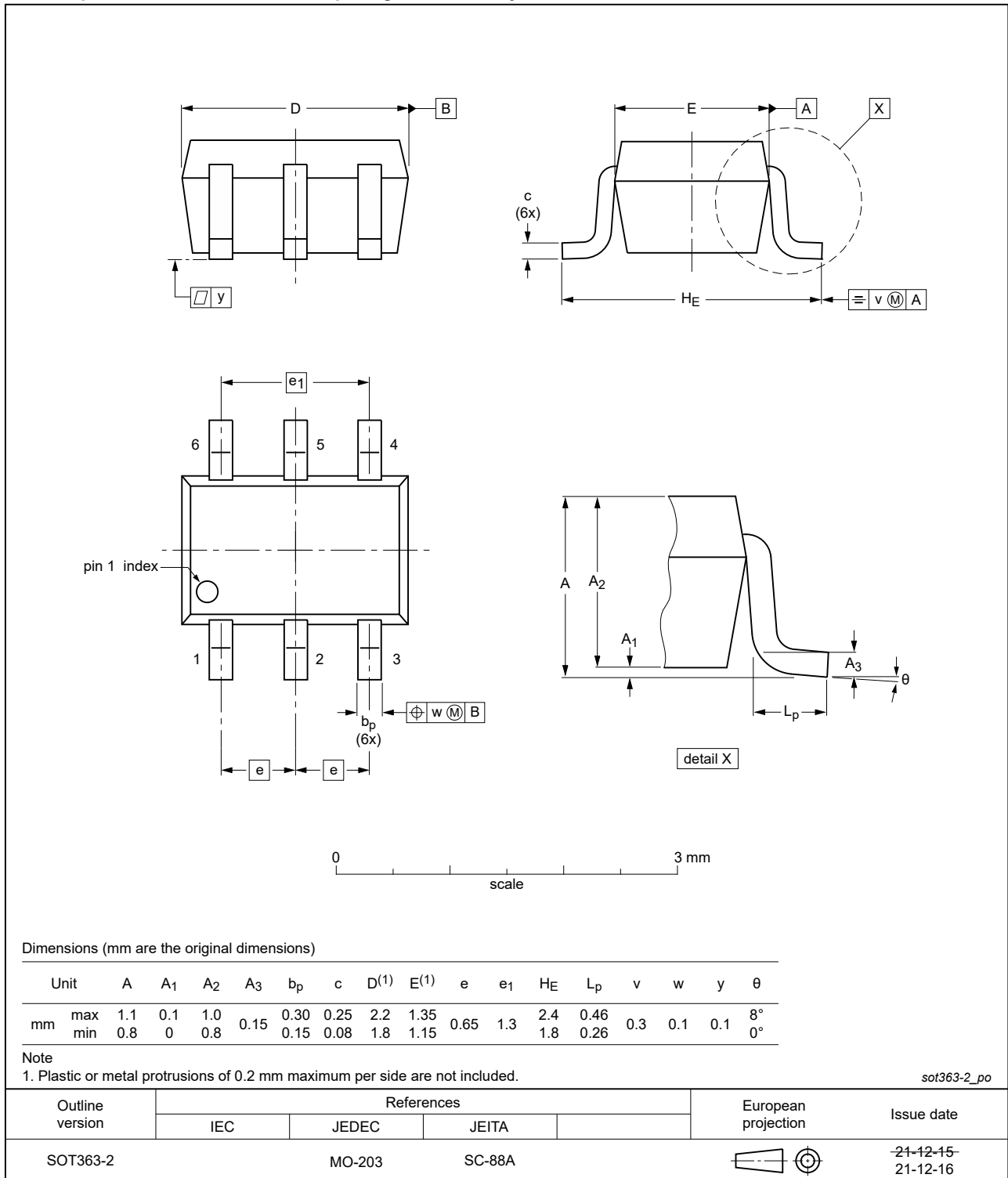


Fig. 13. Package outline SOT363-2 (TSSOP6)

Plastic, surface-mounted package (SC-74; TSOP6); 6 leads

SOT457

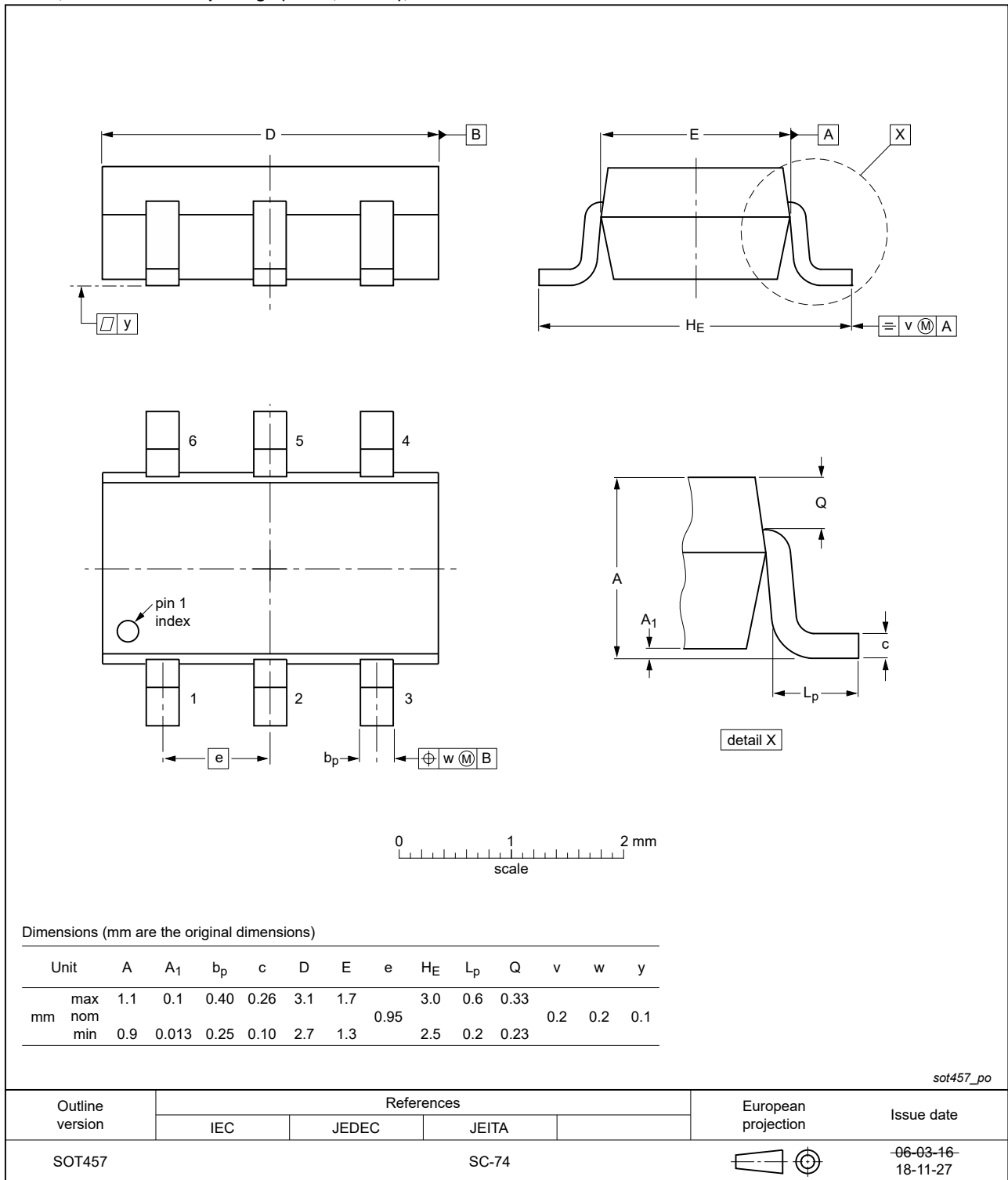


Fig. 14. Package outline SOT457 (SC-74; TSOP6)

16. Abbreviations

Table 13. 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

17. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT2G17_Q100 v.2	20220202	Product data sheet	-	74HC_HCT2G17_Q100 v.1
Modifications:	<ul style="list-style-type: none"> 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. Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6). Section 2 updated. Section 9: Derating values for P_{tot} total power dissipation updated. Fig. 14: Package outline drawing SOT457 (SC-74; TSOP6) updated. 			
74HC_HCT2G17_Q100 v.1	20130522	Product data sheet	-	-

18. 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.

- [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 <https://www.nexperia.com>.

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

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