

# 74AHCT07A

Hex buffer with open-drain outputs

Rev. 1 — 19 December 2016

Product data sheet

## 1. General description

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The 74AHCT07A is a hex buffer with open-drain outputs. The outputs are open-drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions.

Designed to operate over a  $V_{CC}$  range from 4.5 V to 5.5 V, the inputs are TTL compatible, which allows the device to be used to translate from 3.3 V to 5 V.

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 damaging backflow current through the device when it is powered down.

## 2. Features and benefits

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- Direct interface with TTL levels
- Supply voltage range from 4.5 V to 5.5 V
- Typical  $t_{PZL}$  of 3.4 ns at 5 V
- Typical  $V_{OL(p)} < 0.8$  V at  $V_{CC} = 5$  V,  $T_{amb} = 25$  °C
- Supports mixed-mode voltage operation on all ports
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- ESD protection:
  - ◆ HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3 kV
  - ◆ MM JESD22-A115-A exceeds 150 V
  - ◆ CDM JESD22-C101E exceeds 2 kV
- Specified from  $-40$  °C to  $+85$  °C and from  $-40$  °C to  $+125$  °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHCT07APW	−40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1

4. Functional diagram

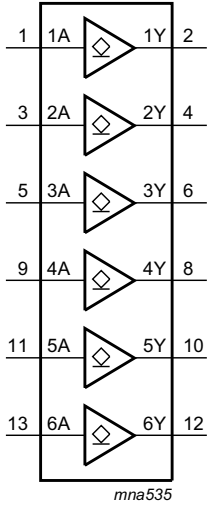


Fig 1. Logic symbol

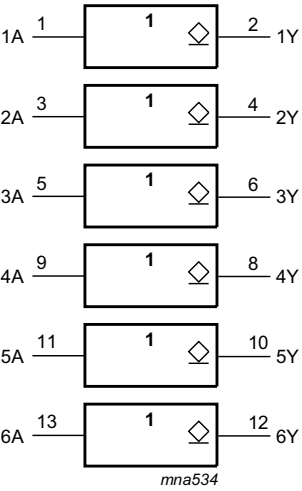


Fig 2. IEC logic symbol

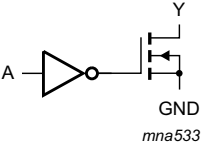


Fig 3. Logic diagram for one gate

5. Pinning information

5.1 Pinning

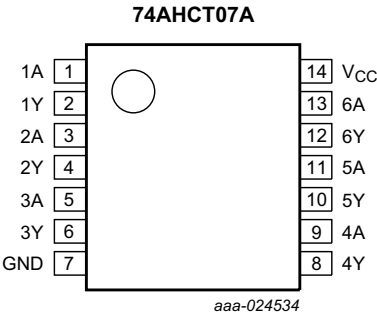


Fig 4. Pin configuration TSSOP14

## 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1A, 2A, 3A, 4A, 5A, 6A	1, 3, 5, 9, 11, 13	data input
1Y, 2Y, 3Y, 4Y, 5Y, 6Y	2, 4, 6, 8, 10, 12	data output
GND	7	ground (0 V)
V <sub>CC</sub>	14	supply voltage

## 6. Functional description

Table 3. Function selection [1]

Input	Output
nA	nY
L	L
H	Z

[1] H = HIGH voltage level; L = LOW voltage level; 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 <sub>CC</sub>	supply voltage		−0.5	+7.0	V
V <sub>I</sub>	input voltage	[1]	−0.5	+7.0	V
V <sub>O</sub>	output voltage	output LOW state, power-down or 3-state mode [2]	−0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	−20	-	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < 0 V	−20	-	mA
I <sub>O</sub>	output current	V <sub>O</sub> = 0 V to V <sub>CC</sub>	-	±25	mA
I <sub>CC</sub>	supply current		-	75	mA
I <sub>GND</sub>	ground current		−75	-	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 [3]	-	500	mW

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

[2] The output voltage ratings may be exceeded if the output current ratings are observed.

[3] For TSSOP14 packages: above 75 °C the value of P<sub>tot</sub> derates linearly at 7 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		4.5	5.0	5.5	V
$V_I$	input voltage		0	-	5.5	V
$V_O$	output voltage	output LOW state, power-down or 3-state mode	0	-	5.5	V
$T_{amb}$	ambient temperature		-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$	-	-	20	ns/V

## 9. Static characteristics

**Table 6. Static characteristics**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	2	-	-	2	-	2	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-	-	0.8	-	0.8	-	0.8	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}\text{ or }V_{IL}; V_{CC} = 4.5\text{ V}$								
		$I_O = 50\text{ }\mu\text{A}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 8\text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
$I_{OZ}$	OFF-state output current	$V_{CC} = 5.5\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; V_O = \text{GND to }5.5\text{ V}$	-	-	$\pm 0.25$	-	$\pm 2.5$	-	$\pm 2.5$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_I\text{ or }V_O = \text{GND to }5.5\text{ V}; V_{CC} = 0\text{ V}$	-	-	0.5	-	5	-	5	$\mu\text{A}$
$I_I$	input leakage current	$V_I = V_{CC}\text{ or GND}; V_{CC} = 0\text{ V to }5.5\text{ V}$	-	-	$\pm 0.1$	-	$\pm 1$	-	$\pm 1$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = V_{CC}\text{ or GND}; I_O = 0\text{ A}; V_{CC} = 5.5\text{ V}$	-	-	2	-	20	-	20	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = 3.4\text{ V}; I_O = 0\text{ A};$ other pins at $V_{CC}\text{ or GND}; V_{CC} = 5.5\text{ V}$	-	-	1.35	-	1.5	-	1.5	mA

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**  
*GND = 0 V. For test circuit see Figure 6.*

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	Min	Max	
t <sub>PZL</sub>	OFF-state to LOW propagation delay	nA to nY; see Figure 5								
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3.4	5.3	1	6.5	1	7.6	ns
		C <sub>L</sub> = 50 pF	-	5	7.8	1	9.7	1	11.4	ns
t <sub>PLZ</sub>	LOW to OFF-state propagation delay	nA to nY; see Figure 5								
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	2.9	4	1	4.6	1	5.2	ns
		C <sub>L</sub> = 50 pF	-	5.2	6.7	1	7.6	1	8.5	ns
C <sub>I</sub>	input capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5 V	-	2	6	-	6	-	6	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5 V	-	5	-	-	-	-	-	pF
C <sub>PD</sub>	power dissipation capacitance	per buffer; <sup>[2]</sup> C <sub>L</sub> = 0 pF; f = 10 MHz; V <sub>I</sub> = GND to V <sub>CC</sub>	-	2	-	-	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 5 V.

[2] C<sub>PD</sub> is used to determine the dynamic power dissipation P<sub>D</sub> (μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$  where:

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in Volts.

Table 8. Noise characteristics  
GND = 0 V. For test circuit see Figure 6.

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			Unit
			Min	Typ	Max	
V <sub>CC</sub> = 5 V; C <sub>L</sub> = 50 pF						
V <sub>OL(p)</sub>	LOW-level output voltage (peak)		-	0.4	0.8	V
V <sub>OL(v)</sub>	LOW-level output voltage (valley)		−0.8	−0.2	-	V
V <sub>IH(AC)</sub>	AC HIGH-level input voltage (dynamic)		2	-	-	V
V <sub>IL(AC)</sub>	AC LOW-level input voltage (dynamic)		-	-	0.8	V

11. Waveforms

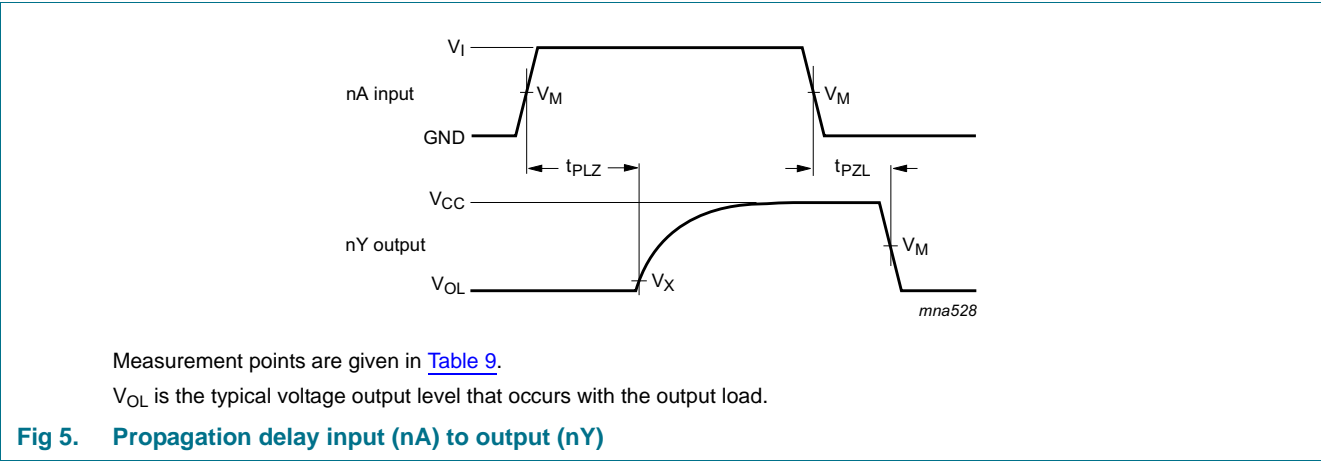


Table 9. Measurement points

Input	Output	
V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>
1.5 V	0.5 × V <sub>CC</sub>	V <sub>OL</sub> + 0.3 V

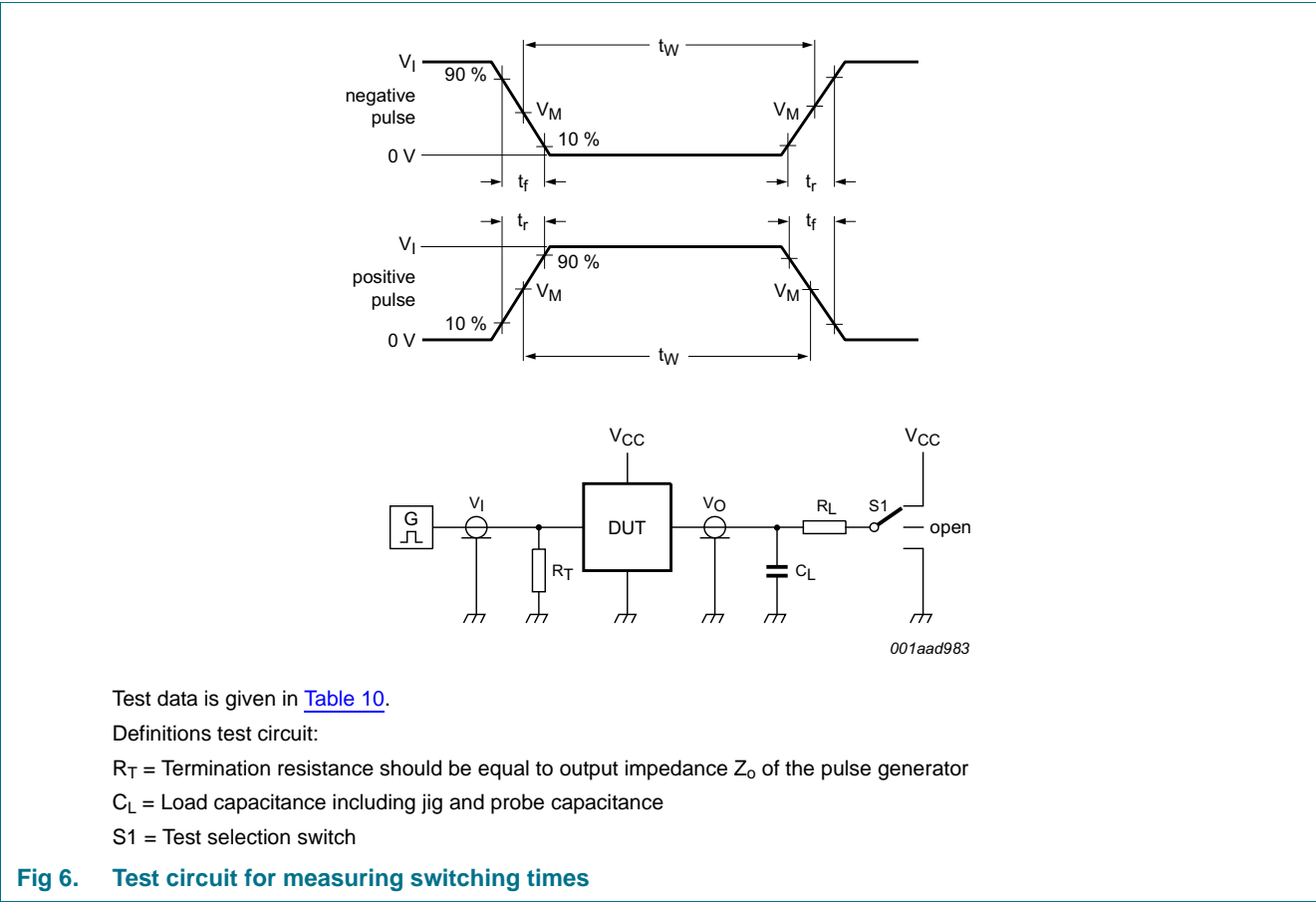


Table 10. Test data

Input		Load	S1 position
$V_I$	$t_r, t_f$	$C_L$	$t_{PLZ}, t_{PZL}$
GND to 3.0 V	3.0 ns	15 pF, 50 pF	$V_{CC}$

12. Package outline

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1

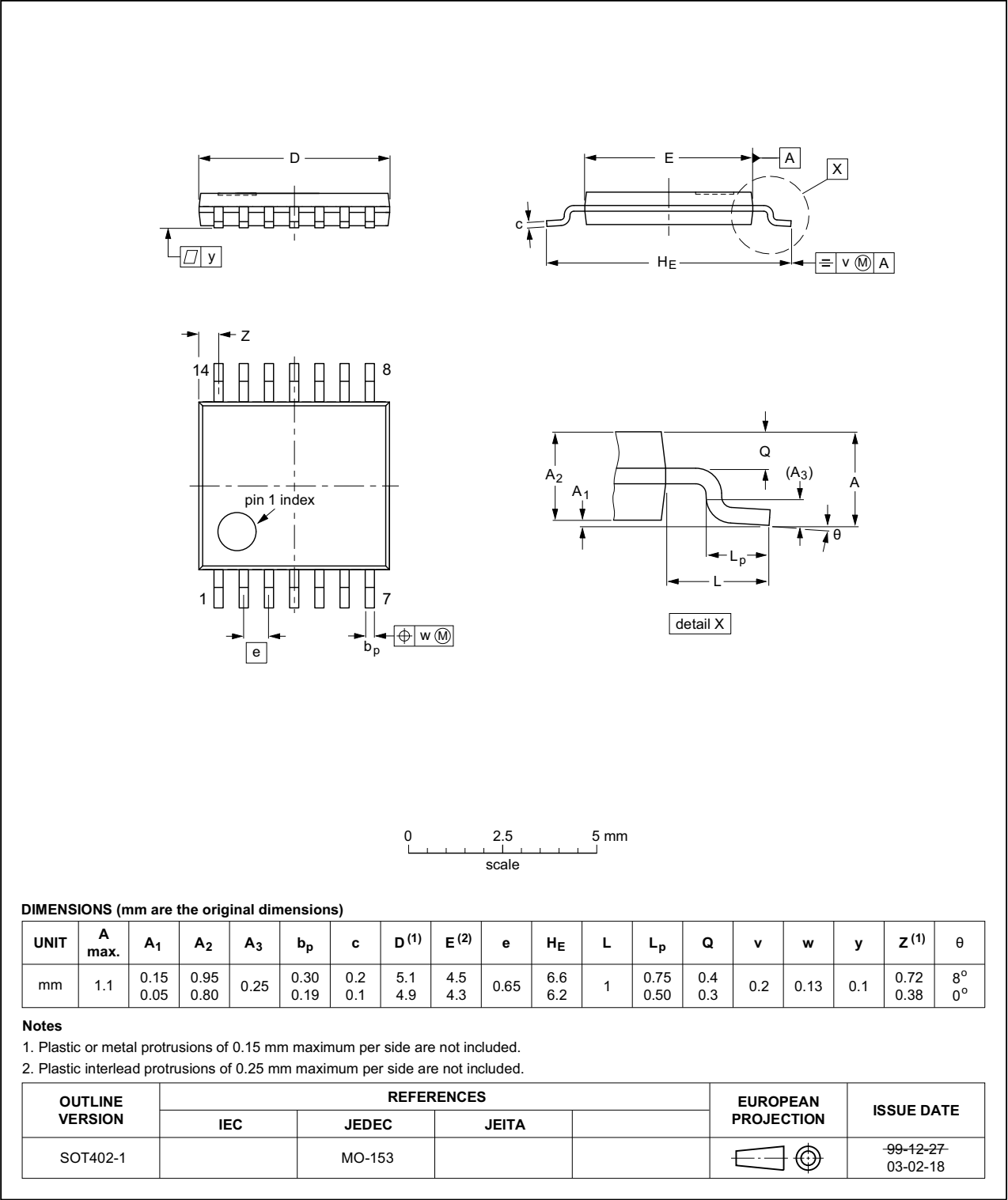


Fig 7. Package outline SOT402-1 (TSSOP14)



## 13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charge Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHCT07A v.1	20161219	Product data sheet	-	-

## 15. Legal information

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Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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