74AHC1G32; 74AHCT1G32

2-input OR gate

Rev. 07 — 14 May 2009 Product data sheet

1. General description

74AHC1G32 and 74AHCT1G32 are high-speed Si-gate CMOS devices. They provide a 2-input OR function.

The AHC device has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

The AHCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V.

2. Features

- Symmetrical output impedance
- High noise immunity
- ESD protection:
  - HBM JESD22-A114E: exceeds 2000 V
  - MM JESD22-A115-A: exceeds 200 V
  - CDM JESD22-C101C: exceeds 1000 V
- Low power dissipation
- Balanced propagation delays
- SOT353-1 and SOT753 package options
- Specified from –40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHC1G32GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74AHCT1G32GW				
74AHC1G32GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74AHCT1G32GV				

4. Marking

Table 2. Marking codes

Type number	Marking code
74AHC1G32GW	AG
74AHCT1G32GW	CG
74AHC1G32GV	A32
74AHCT1G32GV	C32

5. Functional diagram

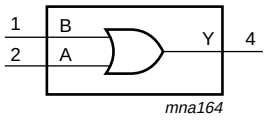


Fig 1. Logic symbol

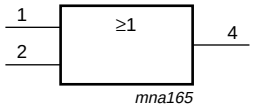


Fig 2. IEC logic symbol

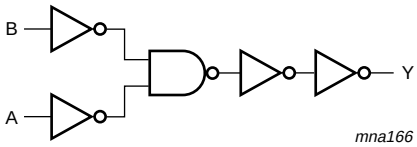


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning

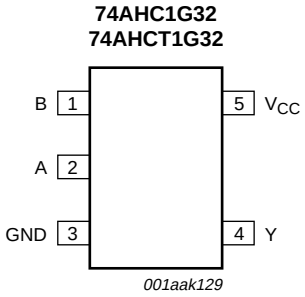


Fig 4. Pin configuration SOT353-1 (TSSOP5) and SOT753 (SC-74A)

6.2 Pin description

Table 3. Pin description

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

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

Inputs		Output
A	**B**	**Y**
L	L	L
L	H	H
H	L	H
H	H	H

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage			–0.5	+7.0	V
V_I	input voltage			–0.5	+7.0	V
I_{IK}	input clamping current	$V_I < –0.5$ V		–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	$–0.5 \text{ V} < V_O < V_{CC} + 0.5$ V		-	±25	mA
I_{CC}	supply current			-	75	mA
I_{GND}	ground current			–75	-	mA
T_{stg}	storage temperature			–65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = –40$ °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 both TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74AHC1G32			74AHCT1G32			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
V_I	input voltage		0	-	5.5	0	-	5.5	V
V_O	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
T_{amb}	ambient temperature		–40	+25	+125	–40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 3.3 V ± 0.3 V	-	-	100	-	-	-	ns/V
		V_{CC} = 5.0 V ± 0.5 V	-	-	20	-	-	20	ns/V

10. Static characteristics

Table 7. 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	
For type 74AHC1G32										
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		V_{CC} = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V_{CC} = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		V_{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V_{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = –50 µA; V_{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I_O = –50 µA; V_{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I_O = –50 µA; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = –4.0 mA; V_{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
		I_O = –8.0 mA; V_{CC} = 4.5 V	3.94	-	-	3.8	-	3.70	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = 50 µA; V_{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 50 µA; V_{CC} = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 50 µA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 4.0 mA; V_{CC} = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
		I_O = 8.0 mA; V_{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
I_I	input leakage current	V_I = 5.5 V or GND; V_{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.0	-	10	-	40	µA
C_I	input capacitance		-	1.5	10	-	10	-	10	pF

Table 7. Static characteristics *…continued*

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	
For type 74AHCT1G32										
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V								
		I_O = –50 µA	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = –8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V								
		I_O = 50 µA	-	0	0.1	-	0.1	-	0.1	V
		I_O = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
I_I	input leakage current	V_I = 5.5 V or GND; V_{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.0	-	10	-	40	µA
ΔI_{CC}	additional supply current	per input pin; V_I = 3.4 V; other inputs at V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C_I	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; t_r = t_f = ≤ 3.0 ns. For waveform see Figure 5. For test circuit see Figure 6.

Symbol	Parameter	Conditions		25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
For type 74AHC1G32											
t_{pd}	propagation delay	A and B to Y	[1]								
		V_{CC} = 3.0 V to 3.6 V	[2]								
		C_L = 15 pF		-	4.4	7.9	1.0	9.5	1.0	10.0	ns
		C_L = 50 pF		-	6.3	11.4	1.0	13.0	1.0	14.5	ns
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C_L = 15 pF		-	3.2	5.5	1.0	6.5	1.0	7.0	ns
		C_L = 50 pF		-	4.6	7.5	1.0	8.5	1.0	9.5	ns
C_{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC}	[4]	-	16	-	-	-	-	-	pF

Table 8. Dynamic characteristics *…continued*

GND = 0 V; $t_r = t_f = \leq 3.0$ ns. For waveform see Figure 5. For test circuit see Figure 6.

Symbol	Parameter	Conditions		25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
For type 74AHCT1G32											
t_{pd}	propagation delay	A and B to Y; see Figure 5; V_{CC} = 4.5 V to 5.5 V	[1] [3]								
		C_L = 15 pF		-	3.3	6.9	1.0	8.0	1.0	9.0	ns
		C_L = 50 pF		-	4.8	7.9	1.0	9.0	1.0	10	ns
C_{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC}	[4]	-	17	-	-	-	-	-	pF

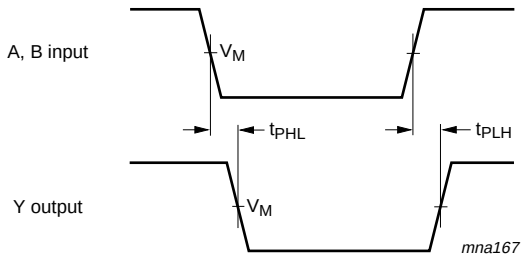
[1] t_{pd} is the same as t_{PLH} and t_{PHL}.

[2] Typical values are measured at V_{CC} = 3.3 V.

[3] Typical values are measured at V_{CC} = 5.0 V.

[4] C_{PD} is used to determine the dynamic power dissipation P_D (µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ 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 Volts.

12. Waveforms

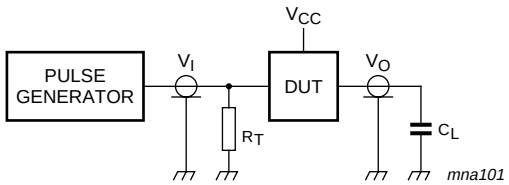


Measurement points are given in Table 9.

Fig 5. The input (A and B) to output (Y) propagation delays

Table 9. Measurement points

Type number	Input		Output
	V_I	V_M	V_M
74AHC1G32	GND to V_{CC}	0.5 × V_{CC}	0.5 × V_{CC}
74AHCT1G32	GND to 3.0 V	1.5 V	0.5 × V_{CC}



Test data is given in Table 8.

Definitions for test circuit:

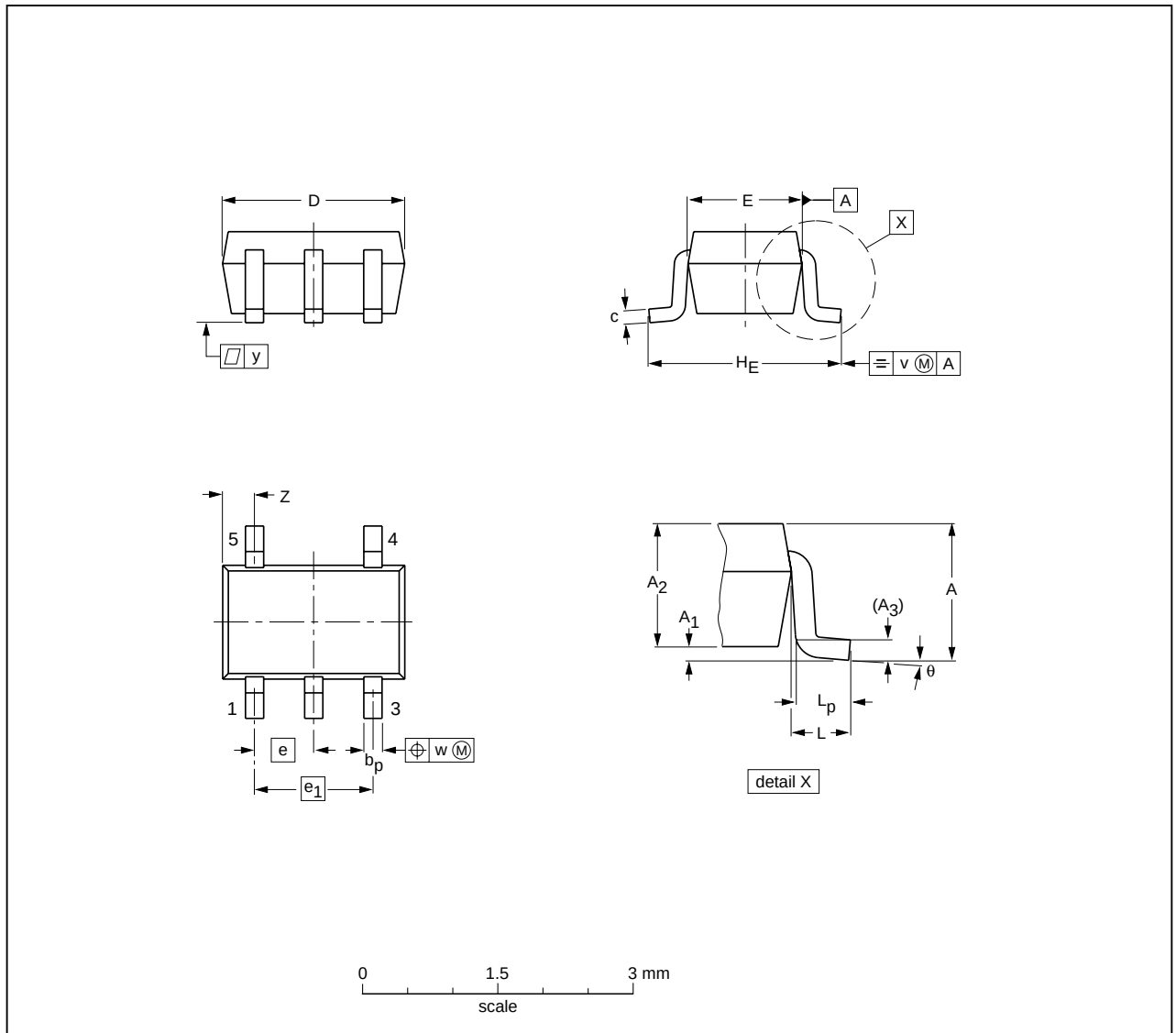
C_L = Load capacitance including jig and probe capacitance.

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

Fig 6. Load circuitry for switching times

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm **SOT353-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	e_1	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°

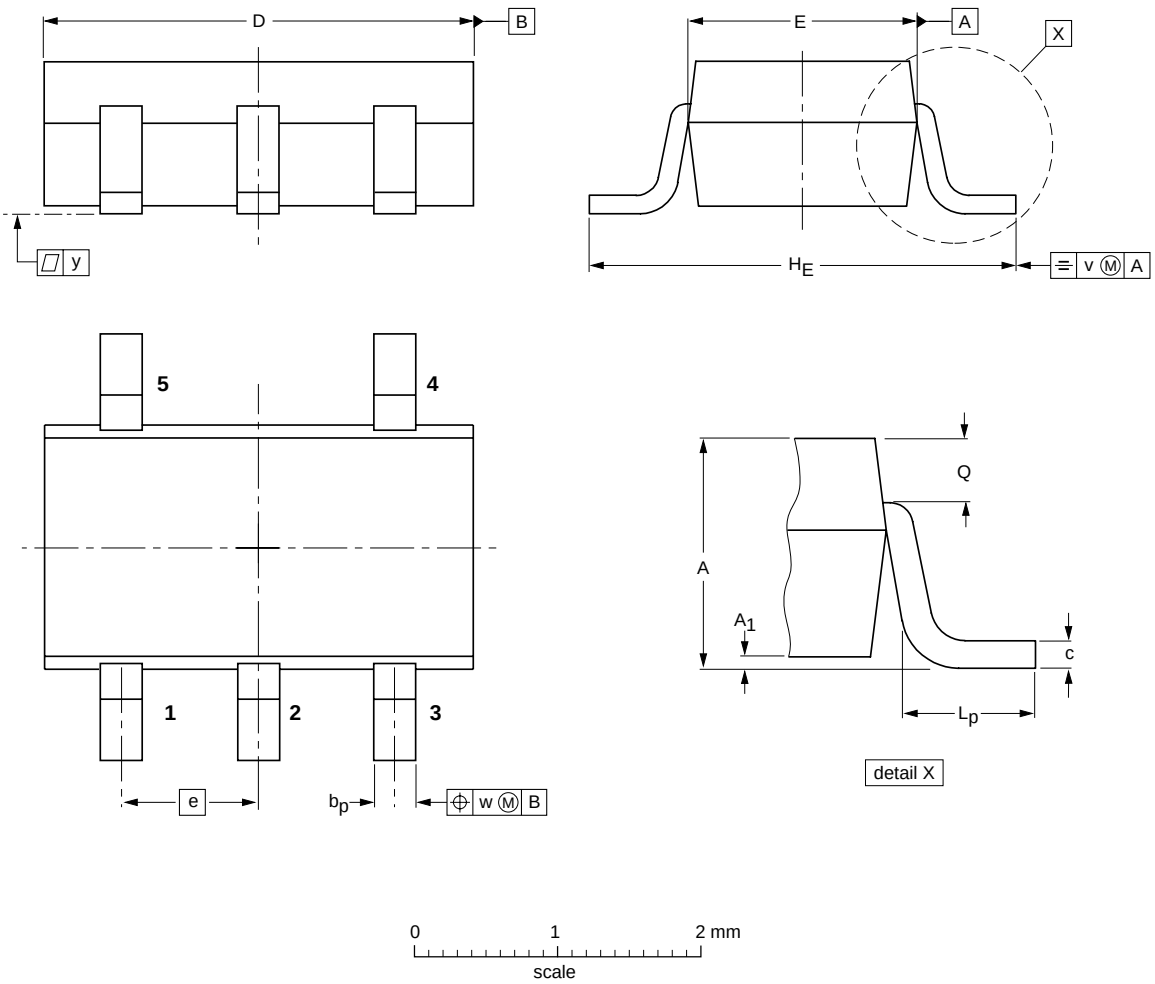
Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT353-1		MO-203	SC-88A			~~00-09-01~~ 03-02-19

Fig 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads **SOT753**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.100 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT753			SC-74A			~~02-04-16~~ 06-03-16

Fig 8. Package outline SOT753 (SC-74A)

14. Abbreviations

Table 10. Abbreviations

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

15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT1G32_7	20090514	Product data sheet	-	74AHC_AHCT1G32_6
Modifications:	• Pin configuration SOT353-1 (TSSOP5) and SOT753 (SC-74A) drawing corrected.			
74AHC_AHCT1G32_6	20070702	Product data sheet	-	74AHC_AHCT1G32_5
74AHC_AHCT1G32_5	20020605	Product specification	-	74AHC_AHCT1G32_4
74AHC_AHCT1G32_4	20020326	Product specification	-	74AHC_AHCT1G32_3
74AHC_AHCT1G32_3	20010222	Product specification	-	74AHC_AHCT1G32_2
74AHC_AHCT1G32_2	19990127	Product specification	-	74AHC_AHCT1G32_N_1
74AHC_AHCT1G32_N_1	19981125	Product specification	-	-

16. Legal information

16.1 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".

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18. Contents

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