DESCRIPTION

The AL245 is designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input and the output-enable ($\overline{OE}$)input activate either the B-port outputs or the A-port outputs or place both output ports into the high-impedance mode.

The AL245 transmits data from the A bus to the B bus when the B-port outputs are activated, and from the B bus to the A bus when the A-port outputs are activated. The input circuitry on both A and B ports is always active and must have a logic High or Low level applied to prevent excess I_{CC} and I_{CCZ}.

This AL245 is fully specified for partial-power-down applications using I_{OFF}. The I_{OFF} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The V_{CC} isolation feature ensures that if either V_{CC} input is at GND, all outputs are in the high-impedance state. To ensure the high-impedance state during power up or power down, ($\overline{OE}$) should be tied to V_{CC} through a pullup resistor, the minimum value of the resistor is determined by the current-sinking capability of the driver.

The AL245 is available in SOP20 and TSSOP20 packages.

ORDERING INFORMATION

Package Type	Part Number	
SOP20 SPQ: 1500pcs/Reel	M20	AL245M20R
		AL245M20VR
TSSOP20 SPQ:4,000pcs/Reel	TMX20	AL245TMX20R
		AL245TMX20VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

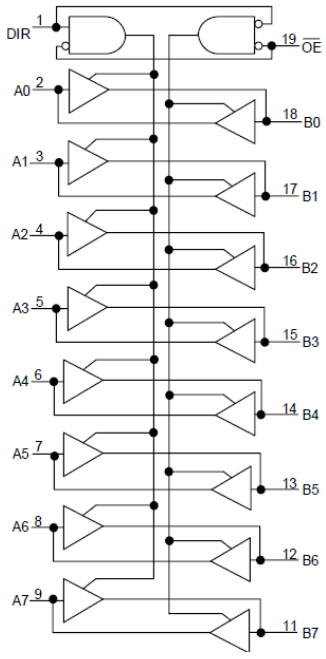
FEATURES

- 1.65V to 5.5V Operation
- V_{CC} Isolation: If VCC is at GND, Both Ports are in the High-Impedance State
- I_{OFF}: Supports Partial-Power-Down Mode Operation
- Extended Temperature: -40°C to +125°C

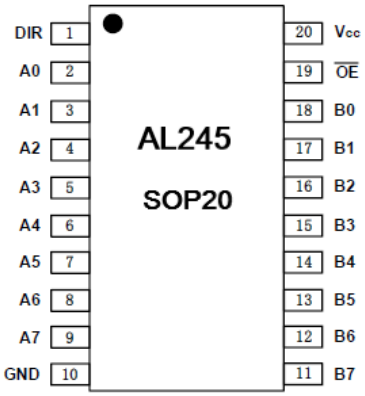
APPLICATION

- Servers
- LED Displays
- Network Switches
- Telecom Infrastructure
- Motor Drivers
- I/O Expanders
- Handset
- Smartphone
- Tablet
- Desktop PC

FUNCTIONAL BLOCK DIAGRAM

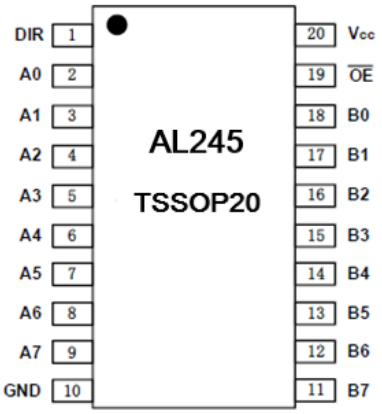


PIN DESCRIPTION



SOP20, M20

Top View



TSSOP20, TMX20

Top View

Pin #		Symbol	I/O	Function
SOT-25	SC70-5			
1	1	DIR	I	direction control
2	2	A0	I/O	Input/output
3	3	A1	I/O	Input/output
4	4	A2	I/O	Input/output
5	5	A3	I/O	Input/output
6	6	A4	I/O	Input/output
7	7	A5	I/O	Input/output
8	8	A6	I/O	Input/output
9	9	A7	I/O	Input/output
10	10	GND	G	Ground.
11	11	B7	I/O	Input/output
12	12	B6	I/O	Input/output
13	13	B5	I/O	Input/output
14	14	B4	I/O	Input/output
15	15	B3	I/O	Input/output
16	16	B2	I/O	Input/output
17	17	B1	I/O	Input/output
18	18	B0	I/O	Input/output
19	19	$\overline{OE}$	I	Output Enable (Active Low). Pull $\overline{OE}$ high to place all outputs in 3- state mode.
20	20	V_{CC}	P	supply voltage. 1.65V≤VCC≤5.5V

FUNCTION TABLE

Input		Output		OPERATION
$\overline{OE}$	DIR	A PORT	B PORT	
L	L	Enabled	Hi-Z	B data to A
L	H	Hi-Z	Enabled	A data to B
H	X	Hi-Z	Hi-Z	Isolation

H=HIGH voltage level

L=LOW voltage level

X=don't care

Z=high impedance OFF-state

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range, unless otherwise noted (1)

V_I, Input Voltage Range(2)	A port	-0.5V ~ 6.5V
	B port	-0.5V ~ 6.5V
	Control inputs	-0.5V ~ 6.5V
V_O (2), Voltage range applied to any output in the high-impedance or power-off state	A port	-0.5V ~ 6.5V
	B port	-0.5V ~ 6.5V
V_O (2)(3), Voltage range applied to any output in the high or low state	A port	-0.5V ~ V_{CC}+0.5V
	B port	-0.5V ~ V_{CC}+0.5V
I_{IK}, Input Clamp Current	V_I<0	-50mA
I_{OK}, Output Clamp Current	V_O<0	-50mA
I_O, Continuous Output Current		±50mA
Continuous Current Through V_{CC} or GND		±100mA
T_J, Junction Temperature		150℃
T_{STG}, Storage Temperature		-65℃ ~ 150℃
ESD Ratings		
$V_{(ESD)}$, Electrostatic Discharge	Human-body model (HBM)	±3000V
	Machine model (MM)	±400V

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
(3) The value of V_{CC} is provided in the Recommended Operating Conditions table.

RECOMMENDED OPERATING CONDITIONS

V_{CC} is the supply voltage associated with the input port and output port.(1)(2)

Parameter		Symbol	Conditions	Min.	Max.	Unit
Supply Voltage		V_{CC}		1.65	5.5	V
High-level input voltage		V_{IH}	V_{CC}=1.65V to 1.95V	V_{CC}x0.65	-	V
			V_{CC}=2.3V to 2.7V	1.7	-	
			V_{CC}=3V to 3.6V	2.2	-	
			V_{CC}=4.5V to 5.5V	V_{cc}x0.7	-	
Low-level input voltage		V_{IL}	V_{CC}=1.65V to 1.95V	-	V_{cc}x0.35	V
			V_{CC}=2.3V to 2.7V	-	0.7	
			V_{CC}=3V to 3.6V	-	0.8	
			V_{CC}=4.5V to 5.5V	-	V_{cc}x0.3	
Input voltage		V_I		0	5.5	V
Input/output voltage	Active state	$V_{I/O}$		0	V_{CC}	V
	3-state			0	5.5	V
High-level output current		I_{OH}	V_{CC}=1.65V to 1.95V	-	-4	mA
			V_{CC}=2.3V to 2.7V	-	-8	
			V_{CC}=3V to 3.6V	-	-24	
			V_{CC}=4.5V to 5.5V	-	-32	
Low-level output current		I_{OL}	1.65V to 1.95V	-	4	mA
			V_{CC}=2.3V to 2.7V	-	8	
			V_{CC}=3V to 3.6V	-	24	
			V_{CC}=4.5V to 5.5V	-	32	
Input transition rise or fall rate(Δt/Δv)		Data inputs	V_{CC}=1.65V to 1.95V	-	20	ns/V
			V_{CC}=2.3V to 2.7V	-	20	
			V_{CC}=3V to 3.6V	-	10	
			V_{CC}=4.5V to 5.5V	-	5	
T_A Operating free-air temperature				-40	125	°C

(1) All unused or driven (floating) data inputs (I/Os) of the device must be held at logic High or Low preferably V_{CC} or GND) to ensure proper device operation and minimize power.

(2) All unused control inputs must be held at V_{CC} or GND to ensure proper device operation and minimize power consumption.

(3) For V_{CC} values not specified in the data sheet, V_{IH} min = V_{CC} × 0.7 V, V_{IL} max = V_{CC} × 0.3 V.

ELECTRICAL CHARACTERISTICS

Parameter		Conditions	Temp	Min.	Typ.	Max.	Unit
V_{OH}		I_{OH}= -100μA, V_I =V_{IH} V_{CC}=1.65V to 5.5V	-40℃~+125℃	V_{CC}-0.1	-	-	V
		I_{OH}=-4mA, V_I =V_{IH} V_{CC}=1.65V		1.2	-	-	
		I_{OH}=-8mA, V_I =V_{IH} V_{CC}=2.3V		1.9	-	-	
		I_{OH}=-24mA, V_I =V_{IH} V_{CC}=3V		2.4	-	-	
		I_{OH}=-32mA, V_I =V_{IH} V_{CC}=4.5V		3.8	-	-	
V_{OL}		I_{OL}=100μA, V_I =V_{IL} V_{CC}=1.65V to 4.5V	-40℃~+125℃	-	-	0.1	V
		I_{OL}=4mA, V_I =V_{IL} V_{CC}=1.65V		-	-	0.45	
		I_{OL}=8mA, V_I =V_{IL} V_{CC}=2.3V		-	-	0.3	
		I_{OL}=24mA, V_I =V_{IL} V_{CC}=3V		-	-	0.55	
		I_{OL}=32mA, V_I =V_{IL} V_{CC}=4.5V		-	-	0.55	
I_I	DIR	V_I=5.5V or GND, V_{CC}= 1.65V to 5.5V	+25℃	-	-	-	μA
			-40℃~+125℃	-	-	-	
I_{off}	A or B Port	V_I or V_O= 0 to 5.5V, V_{CC}=0V	+25℃	-	-	-	μA
I_{oz}	A or B Port	VO = VCC or GND,$\overline{OE}$=V_{IH} V_{CC}= 1.65V to 5.5V	+25℃	-	-	-	
			-40℃~+125℃	-	-	-	
I_{CC}	A or B Port	V_I=5.5V or GND, I_O=0, V_{CC}=1.65V to 5.5V	+25℃	-	-	-	μA
			-40℃~+125℃	-	-	-	
ΔI_{CC}	A Port	One input at V_{CC}- 0.6V, DIR at VCC, B port = open V_{CC}=3V to 5.5V	-40℃~+125℃	-	-	-	μA
	B Port	One B port at V_{CC} - 0.6 V, DIR at GND, A port = open V_{CC}=3V to 5.5V					
	DIR	DIR at V_{CC} – 0.6 V, B port = open A port at ^{VCC} or GND					
C_I	Control inputs	VI = V_{CC} or GND V_{CC}= 3.3V	+25℃	-	-	-	μA
C_{IO}		A Port	+25℃	-	8.5	-	pF
		B Port	+25℃	-	8.5	-	pF

TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = 25℃ V_{CC}=5V, (unless otherwise noted)

Fig1 Voltage vs Current

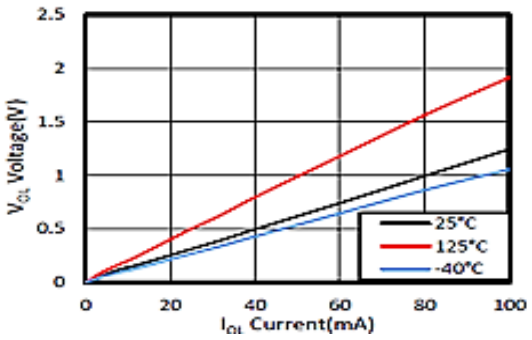
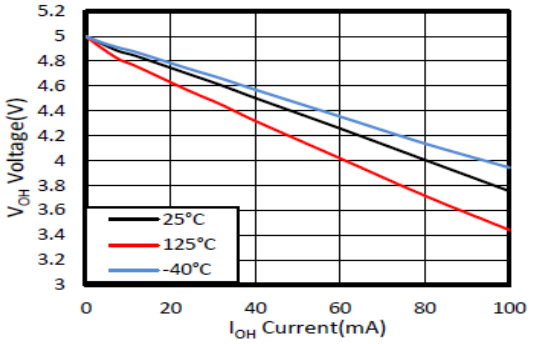


Fig2 Voltage vs Current



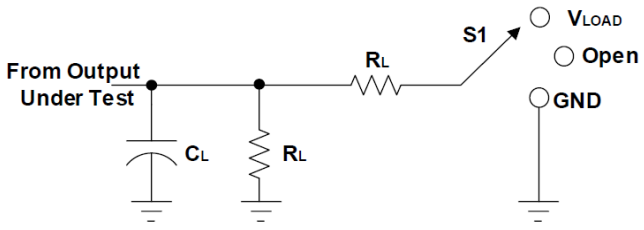
AC ELECTRICAL CHARACTERISTICS

Parameter	Form (Input)	TO (Output)	V_{CC}=1.8V ±0.15V		V_{CC}=2.5V ±0.2V		V_{CC}=3.3V ±0.3V		V_{CC}=5V ±0.5 V		Unit
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH} t_{PHL}	An	Bn	1.70	21.6	1.30	9.10	1.0	7.4	0.80	7.10	ns
t_{PLH} t_{PHL}	Bn	An	0.90	23.5	0.80	23.6	0.7	23.3	0.70	23.3	ns
t_{PHZ} t_{PLZ}	$\overline{OE}$	An	1.50	29.5	1.50	29.4	1.5	29.3	1.40	29.1	ns
t_{PHZ} t_{PLZ}	$\overline{OE}$	Bn	2.40	32.2	1.90	12.9	1.7	12.0	1.30	10.2	ns
t_{PZH} t_{PZL}	$\overline{OE}$	An	0.40	23.8	0.40	23.7	0.4	23.7	0.40	23.7	ns
t_{PZH} t_{PZL}	$\overline{OE}$	Bn	1.80	31.9	1.50	16	1.2	12.6	0.90	10.8	ns

Parameter		Test Conditions	VCC=1.8V	VCC=2.5V	VCC=3.3V	VCC=5V	Unit
			Typ	Typ	Typ	Typ	
$C_{pd(1)}$	A-port input, B-port output	C_L=0, f=10MHz, t_r=t_f=1ns	2	2	2	3	pF
	B-port input, A-port output		42	42	43	44	

(1) Power dissipation capacitance per transceiver

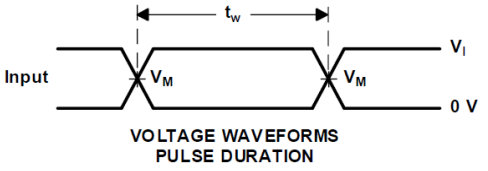
PARAMETER MEASURE MENT INFORMATION



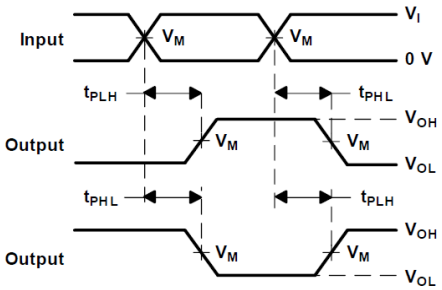
LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

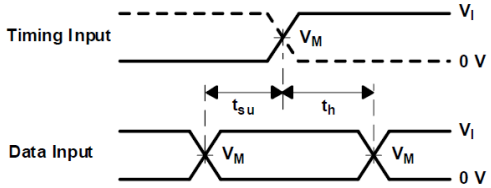
V_{CC}	V_I	V_M	C_L	R_L	V_Δ
1.8V±0.15V	V_{CC}	$V_{CC}/2$	15pF	2kΩ	0.15V
2.5V±0.2V	V_{CC}	$V_{CC}/2$	15pF	2kΩ	0.15V
3.3V±0.3V	2.7V	1.5V	15pF	2kΩ	0.3V
5.0V±0.5V	2.7V	1.5V	15pF	2kΩ	0.3V



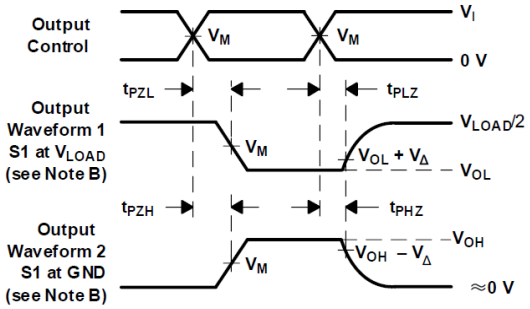
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS PROPAGATION DELAY
TIMES INVERTION AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS ENABLE AND DISABLE
TIMES LOW-AND HIGH-LEVEL ENABLING

NOTE A: C_L includes probe and jig capacitance.

B: Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C: All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50Ω. dv/dt≥1V/ns.D: The outputs are measured one at a time, with one transition per measurement.

E: t_{PLZ} and t_{PHZ} are the same as t_{dis}.

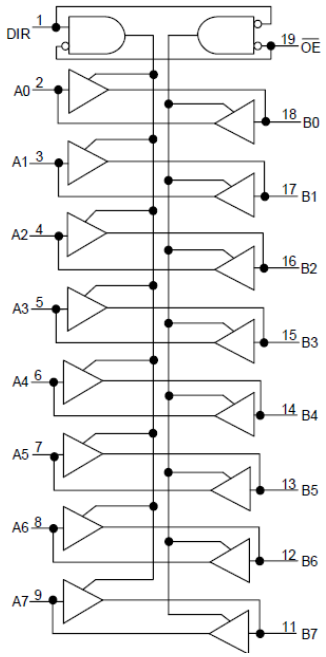
F: t_{PZL} and t_{PZH} are the same as t_{en}.

G: t_{PLH} and t_{PHL} are the same as t_{pd}.

H: All parameters and waveforms are not applicable to all devices.

Fig3. Load Circuit and Voltage Waveforms

BLOCK DIAGRAM



APPLICATION INFORMATION

AL245 is a high drive CMOS device that can be used for a multitude of bus interface type applications where output drive or PCB trace length is a concern. The inputs can accept voltages to 5.5 V at any valid V_{CC} making it ideal for down translation.

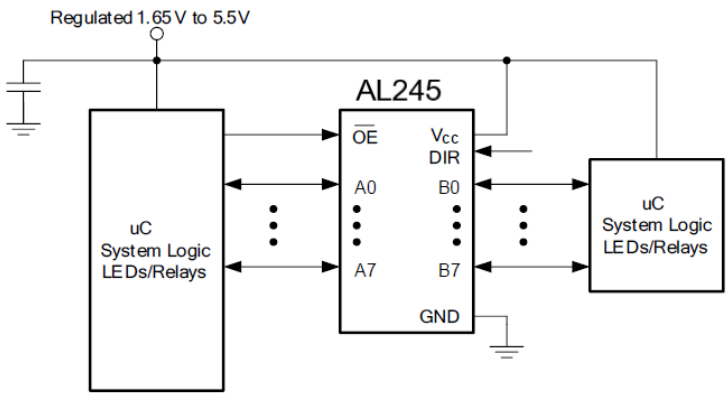
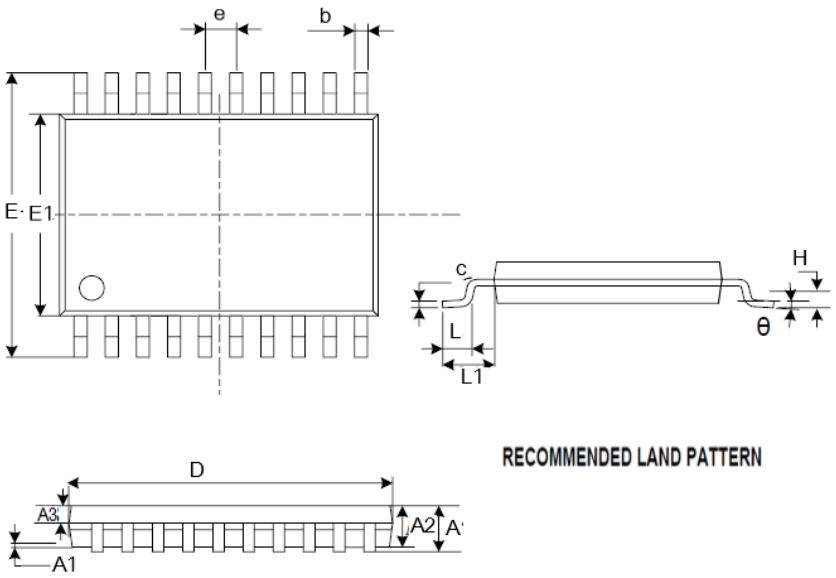


Fig4 Typical Application Schematic

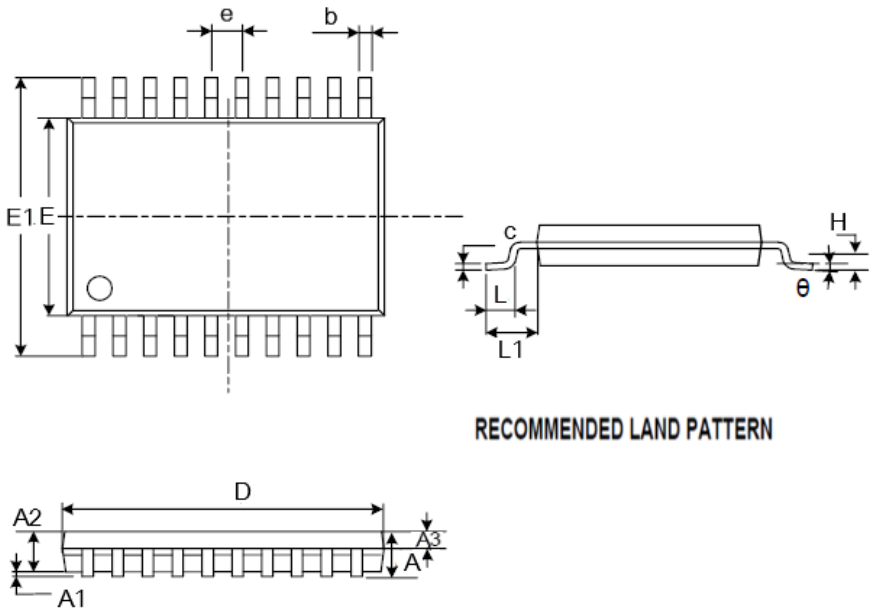
PACKAGE INFORMATION

Dimension in SOP20 (Unit: mm)



Symbol	Millimeters	
	Min	Max
A	-	2.650
A1	0.100	0.300
A2	2.250	2.350
A2	0.970	1.070
b	0.390	0.470
c	0.250	0.290
D	12.700	12.900
E	10.100	10.500
E1	7.400	7.600
e	1.270 BSC	
L	0.700	1.000
H		
θ	0°	8°
L1	1.400 REF	

Dimension in TSSOP20 (Unit: mm)



Symbol	Millimeters	
	Min	Max
A	-	1.200
A1	0.050	0.150
A2	0.800	1.050
A3	0.390	0.490
b	0.200	0.290
c	0.130	0.170
D	6.400	6.600
E	4.300	4.500
E1	6.200	6.600
e	0.650(BSC)	
L	0.450	0.750
H	0.250TYP	
θ	0°	8°
L1	0.390(REF)	

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