



## 3.3V LVPECL 1:4 Clock Fanout Buffer AK8181B

### Features

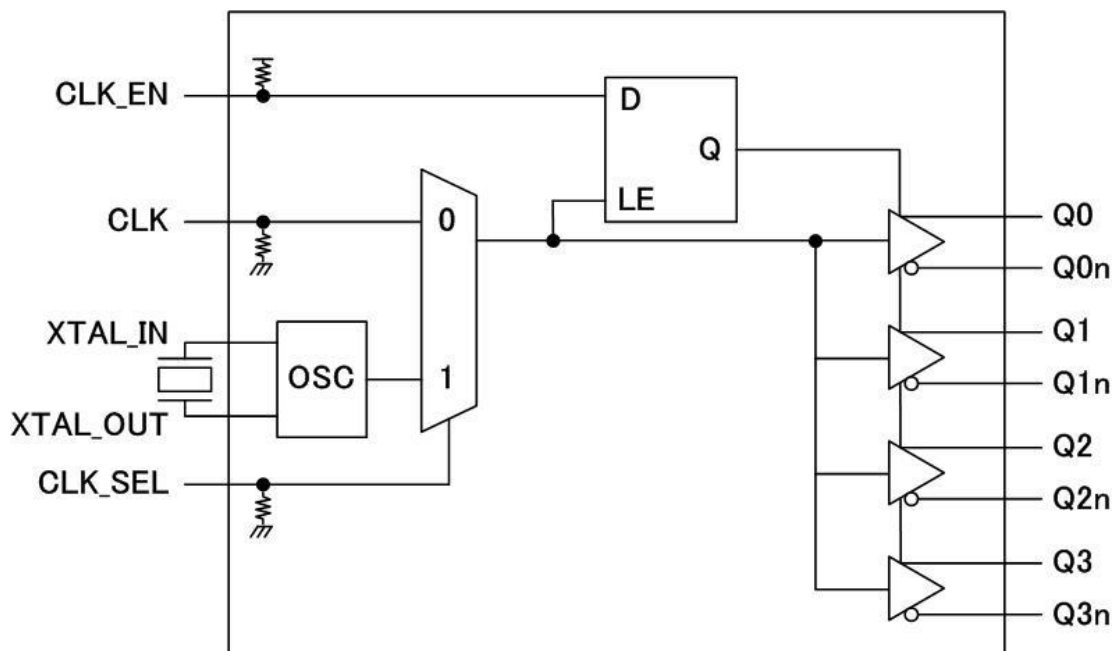
- Four differential 3.3V LVPECL outputs
- Selectable LVTTTL/LVCMOS CLK or crystal input
- Clock output frequency up to 266MHz
- Output skew : 10ps typical
- Part-to-part skew : 200ps maximum
- Propagation delay : 1.4ns maximum
- Additive phase jitter(RMS) : 0.057ps(typical)
- Operating Temperature Range: -40 to +85°C
- Package: 20-pin TSSOP (Pb free)
- Pin compatible with ICS8535I-31

### Description

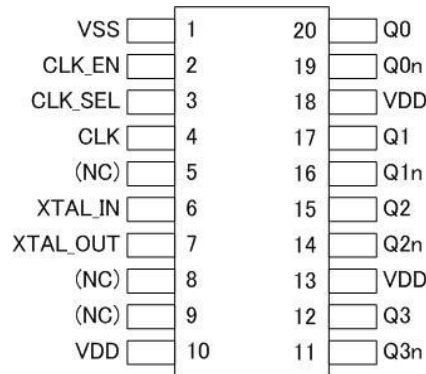
The AK8181B is a member of AKM's LVPECL clock fanout buffer family designed for telecom, networking and computer applications, requiring a range of clocks with high performance and low skew. The AK8181B distributes 4 buffered clocks.

AK8181B are derived from AKM's long-term-experienced clock device technology, and enable clock output to perform low skew. The AK8181B is available in a 20-pin TSSOP package.

### Block Diagram



**Pin Descriptions**



**Package: 20-Pin TSSOP (Top View)**

Pin No.	Pin Name	Pin Type	Pullup down	Description
1	VSS	PWR	--	Negative power supply
2	CLK_EN	IN	Pull up	Synchronizing clock output enable (LVCMOS/LVTTL) Pin is connected to VDD by internal resistor. (typ. 51kΩ) High (Open): clock outputs follow clock input. Low: Q outputs are forced low, Qn outputs are forced high.
3	CLK_SEL	IN	Pull down	CLK Select Input (LVCMOS/LVTTL) Pin is connected to VSS by internal resistor. (typ. 51kΩ) High: selects XTAL input    Low (Open): selects CLK input
4	CLK	IN	Pull down	LVCMOS/LVTTL Clock Input Pin is connected to VSS by internal resistor. (typ. 51kΩ) *When using crystal input (CLK_SEL=High), it should be connected to VSS or opened.
5	NC	--	--	No connect
6	XTAL_IN	IN	--	Crystal oscillator interface *When using CLK input (CLK_SEL=Low), it should be connected to VSS or opened.
7	XTAL_OUT	OUT	--	Crystal oscillator interface *When using CLK input (CLK_SEL=Low), it should be connected to VSS or opened.
8	NC	--	--	No connect
9	NC	--	--	No connect
10	VDD	PWR	--	Positive power supply
11, 12	Q3n, Q3	OUT	--	Differential clock output (LVPECL)
13	VDD	PWR	--	Positive power supply
14, 15	Q2n, Q2	OUT	--	Differential clock output (LVPECL)
16, 17	Q1n, Q1	OUT	--	Differential clock output (LVPECL)
18	VDD	PWR	--	Positive power supply
19, 20	Q0n, Q0	OUT	--	Differential clock output (LVPECL)

**Ordering Information**

Part Number	Marking	Shipping Packaging	Package	Temperature Range
AK8181B	AK8181B	Tape and Reel	20-pin TSSOP	-40 to 85 °C

## Absolute Maximum Rating

Over operating free-air temperature range unless otherwise noted <sup>(1)</sup>

Items	Symbol	Ratings	Unit
Supply voltage <sup>(2)</sup>	VDD	-0.3 to 4.6	V
Input voltage <sup>(2)</sup>	V <sub>in</sub>	-0.5 to VDD+0.5	V
Input current (any pins except supplies)	I <sub>IN</sub>	±10	mA
Storage temperature	T <sub>stg</sub>	-55 to 150	°C

Note

(1) Stress beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. 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-rating conditions for extended periods may affect device reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

(2) VSS=0V



### ESD Sensitive Device

This device is manufactured on a CMOS process, therefore, generically susceptible to damage by excessive static voltage. Failure to observe proper handling and installation procedures can cause damage. AKM recommends that this device is handled with appropriate precautions.

## Recommended Operation Conditions

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating temperature	T <sub>a</sub>		-40		85	°C
Supply voltage <sup>(1)</sup>	VDD	VDD±5%, VSS=0V	3.135	3.3	3.465	V

(1) Power of 3.3V requires to be supplied from a single source. A decoupling capacitor of 0.1μF for power supply line should be located close to each VDD pin.

## Pin Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Capacitance	C <sub>IN</sub>			4		pF
Input Pullup Resistor	R <sub>PU</sub>			51		kΩ
Input Pulldown Resistor	R <sub>PD</sub>			51		kΩ

## DC Characteristics

All specifications at VDD= 3.3V±5%, VSS=0V, Ta: -40 to +85°C, unless otherwise noted

Parameter		Symbol	Conditions	MIN	TYP	MAX	Unit
Input High Voltage		V <sub>IH</sub>		2.0		VDD+0.3	V
Input Low Voltage		V <sub>IL</sub>		-0.3		0.8	V
Input High Current	CLK, CLK_SEL	I <sub>H</sub>	Vin=VDD=3.465V			150	μA
	CLK_EN		Vin=VDD=3.465V			5	μA
Input Low Current	CLK, CLK_SEL	I <sub>L</sub>	Vin=VSS, VDD=3.465V	-5			μA
	CLK_EN		Vin=VSS, VDD=3.465V	-150			μA
Output High Voltage <sup>(1)</sup>		V <sub>OH</sub>		VDD-1.4		VDD-0.9	V
Output Low Voltage <sup>(1)</sup>		V <sub>OL</sub>		VDD-2.0		VDD-1.7	V
Peak-to-Peak Output Voltage Swing		V <sub>SWING</sub>		0.6		1.0	V
Supply Current		I <sub>DD</sub>				60	mA

(1) Outputs terminated with 50Ω to VDD-2V.

## Crystal Characteristics

All specifications at VDD= 3.3V±5%, VSS=0V, Ta: -40 to +85°C, unless otherwise noted

Parameter	Conditions	MIN	TYP	MAX	Unit
Mode of Oscillation		Fundamental			
Frequency		12		50	MHz
Equivalent Series Resistance (ESR)				50	Ω
Shunt Capacitance				7	pF
Drive Level				1	mW

## AC Characteristics

All specifications at VDD= 3.3V±5%, VSS=0V, Ta: -40 to +85°C, unless otherwise noted

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Output Frequency	f <sub>OUT</sub>				266	MHz
Propagation Delay <sup>(1)</sup>	t <sub>PD</sub>		0.6		1.4	ns
Output Skew <sup>(2)(3)</sup>	t <sub>sk(O)</sub>			10		ps
Part-to-Part Skew <sup>(3)(5)</sup>	t <sub>skPP</sub>				200	ps
Buffer Additive Jitter, RMS	t <sub>jit</sub>	155.52MHz (12kHz – 20MHz)		0.057		ps
Output Rise/Fall Time <sup>(4)</sup>	t <sub>r</sub> , t <sub>f</sub>	20% to 80%	200		600	ps
Output Duty Cycle	DC <sub>OUT</sub>		46	50	54	%

(1) Measured from the VDD/2 of the input to the differential output crossing point.

(2) Defined as skew between outputs at the same supply voltage and with equal load conditions.

(3) This parameter is defined in accordance with JEDEC Standard 65.

(4) Design value.

(5) Defined as skew between outputs on different devices operating at the same supply voltages and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at the differential cross points.

Parameter Measurement Information

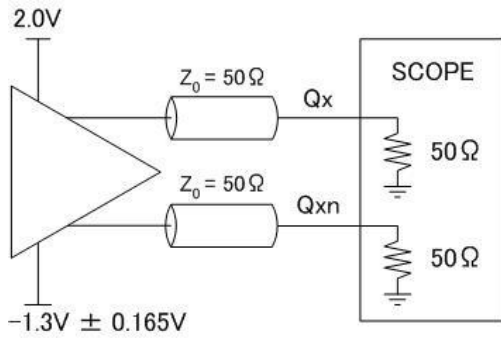


Figure 1 3.3V Output Load Test Circuit

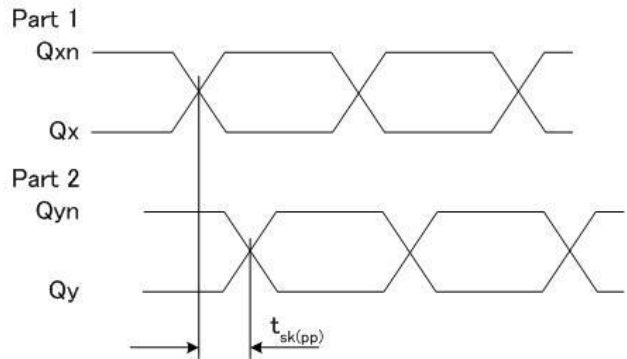


Figure 2 Part-to-Part Skew

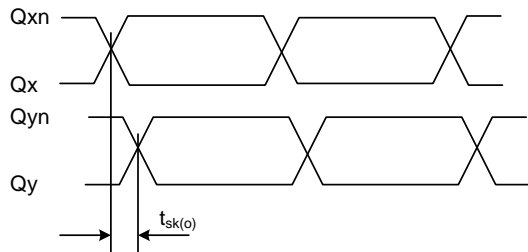


Figure 3 Output Skew

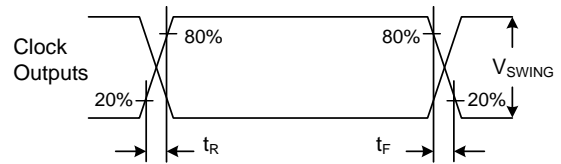


Figure 4 Output Rise/Fall Time

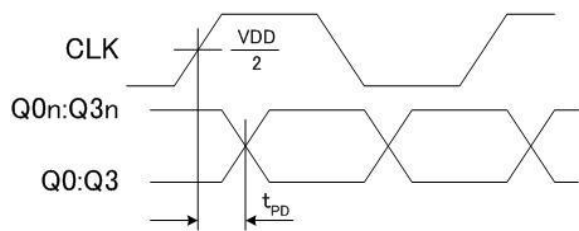


Figure 5 Propagation Delay

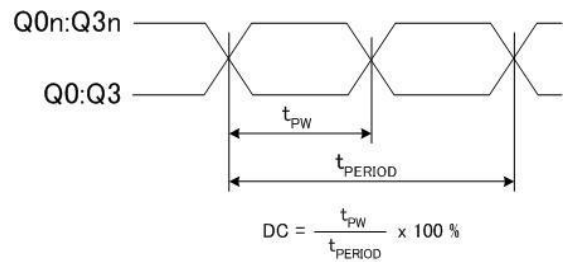


Figure 6 Output Duty/ Pulse Width/ Period

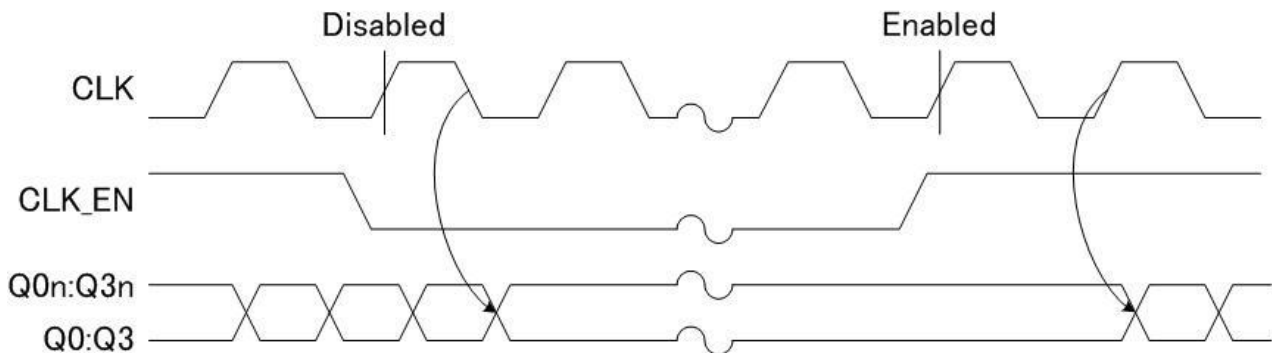
## Function Table

The following table shows the inputs/outputs clock state configured through the control pins.

**Table 1: Control Input Function Table**

Inputs			Outputs	
CLK_EN	CLK_SEL	Selected Source	Q0:Q3	Q0n:Q3n
0	0 (Open)	CLK	Disabled: Low	Disabled: High
0	1	XTAL_IN, XTAL_OUT	Disabled: Low	Disabled: High
1 (Open)	0 (Open)	CLK	Enabled	Enabled
1 (Open)	1	XTAL_IN, XTAL_OUT	Enabled	Enabled

After CLK\_EN switches, the clock outputs are disabled or enabled following a rising and falling input clock or crystal oscillator edge as shown in Figure 7. In the active mode, the state of the outputs are a function of the CLK input as described in Table 2.



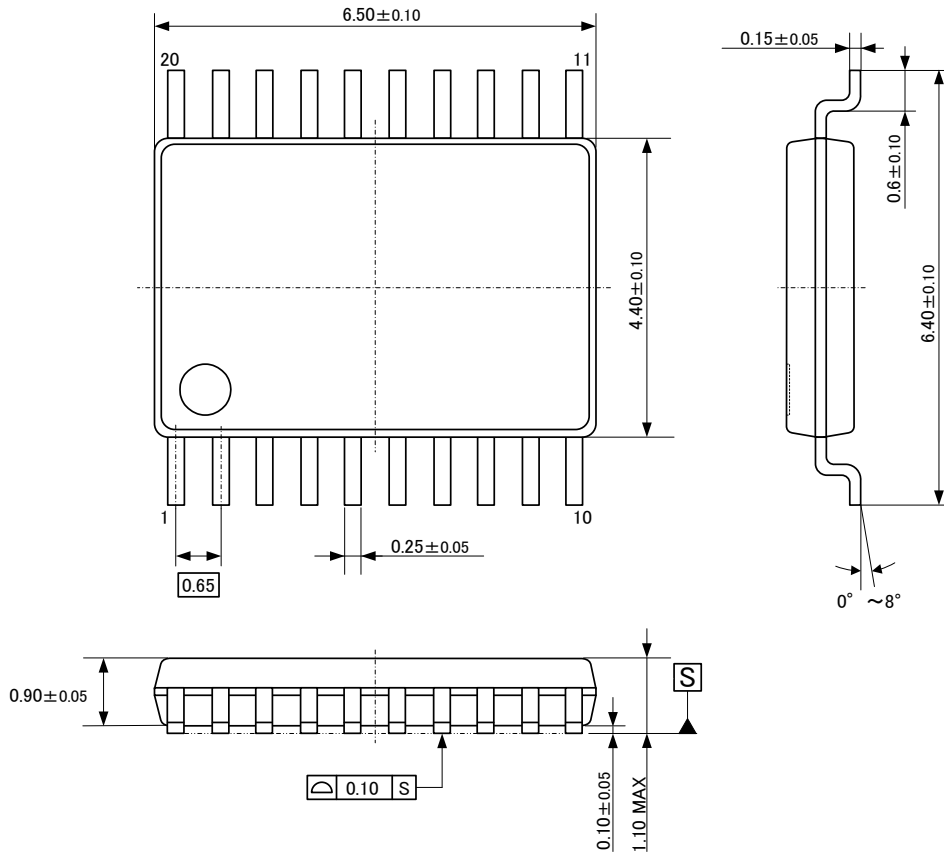
**Figure 7 CLK\_EN Timing Diagram**

**Table 2 Clock Input Function Table**

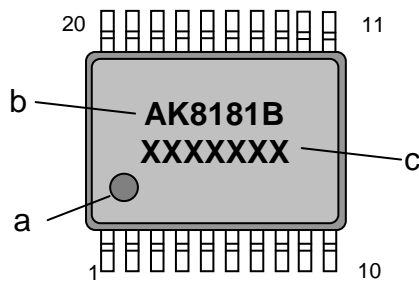
Inputs	Outputs	
CLK	Q0 : Q3	Q0n : Q3n
0	Low	High
1	High	Low

Package Information

- Mechanical data : 20pin TSSOP

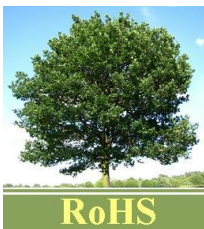


• Marking



- a: #1 Pin Index
- b: Part number
- c: Date code ( 7 digits)

• RoHS Compliance



All integrated circuits from Asahi Kasei Microdevices Corporation (AKM) assembled in “lead-free” packages\* are fully compliant with RoHS.

(\* ) RoHS compliant products from AKM are identified with “Pb free” letter indication on product label posted on the anti-shield bag and boxes.



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