

## Tri-State Buffer ICs

## ■ GENERAL DESCRIPTION

The 2301 series are a group of high frequency, CMOS low power tri-state buffer ICs with input amplifier, divider and output tri-state buffer circuits built-in.

Output can be selected from any one of the following values for fin (input frequency) : fin/1, fin/2, fin/4, fin/8.

The series is available in an ultra small SOT-26 package.

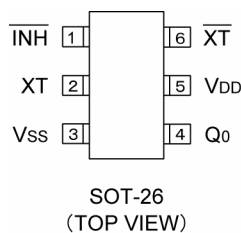
## ■ APPLICATIONS

- VCXO Modules
- Crystal Oscillator Modules

## ■ FEATURES

<b>Maximum Operating Frequency</b>	: 160MHz
<b>Operating Voltage Range</b>	: $3.3V \pm 10\%$
<b>Divider Ratio</b>	: Selectable from fin/1, fin/2, fin/4, fin/8
<b>Output</b>	: 3-State
<b>CMOS Low Power Consumption</b>	
<b>Built-In Input Amplifier</b>	
<b>Ultra Small Package</b>	: SOT-26

## ■ PIN CONFIGURATION



## ■ PIN ASSIGNMENT

PIN NUMBER	PIN NAME	FUNCTION
1	/INH	Stand-by Control (*)
2	XT	Clock Input
3	VSS	GND
4	Q0	Clock Output
5	VDD	Power Supply
6	/XT	Feedback Resistor Connection (Output)

\*Stand-by control pin has a pull-up resistor built-in.

## ■ /INH, Q0 PIN FUNCTION

/INH	Q0
"H" or OPEN	Clock Output
"L"	High Impedance

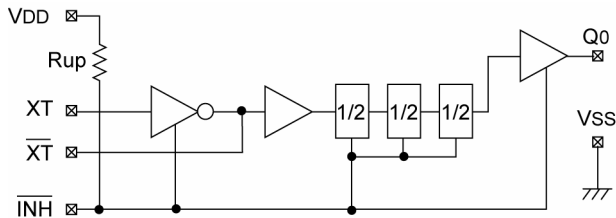
## PRODUCT CLASSIFICATION

### Ordering Information

XC2301 ①②③④⑤⑥

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Duty Level	C	: CMOS (VDD/2)
②	Fixed Number	5	: -
③	Divider Ratio	1	: Q0=fin/1
		2	: Q0=fin/2
		4	: Q0=fin/4
		8	: Q0=fin/8
④	Output	V	: Tri-state buffer
⑤	Package	M	: SOT-26
⑥	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	UNITS
Supply Voltage	V <sub>DD</sub>	V <sub>SS</sub> - 0.3 ~ V <sub>SS</sub> + 7.0	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> - 0.3 ~ V <sub>DD</sub> + 0.3	V
Power Dissipation	P <sub>d</sub>	250(**)	mW
Operating Temperature Range	T <sub>opr</sub>	- 40 ~ + 85	°C
Storage Temperature Range	T <sub>stg</sub>	- 55 ~ + 125	°C

\*\* When implemented on a glass epoxy PCB.

## ELECTRICAL CHARACTERISTICS

### DC Electrical Characteristics

(Unless otherwise stated, V<sub>DD</sub>=3.3V, No Load, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Operating Supply Voltage	V <sub>DD</sub>		2.97	3.30	3.63	V	
Input Voltage "High"	V <sub>IH</sub>	/INH pin	2.4	-	-	V	
Input Voltage "Low"	V <sub>IL</sub>	/INH pin	-	-	0.4	V	
Output Voltage "High"	V <sub>OH</sub>	Q0 pin, V <sub>DD</sub> =2.97V, I <sub>OH</sub> = -8mA	2.2	2.4	-	V	
Output Voltage "Low"	V <sub>OL</sub>	Q0 pin, V <sub>DD</sub> =2.97V, I <sub>OL</sub> =8mA	-	0.3	0.4	V	
Supply Current 1	I <sub>DD1</sub>	/INH = OPEN, Q0 = OPEN Fin=160MHz	XC2301C51V (fin/1)	-	13.0	-	mA
			XC2301C52V (fin/2)	-	9.0	-	
			XC2301C54V (fin/4)	-	7.0	-	
			XC2301C58V (fin/8)	-	6.0	-	
Supply Current 2	I <sub>DD2</sub>	/INH = "L", fin=160MHz	-	4.5	-	mA	
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH = "L"	1.0	2.0	4.0	MΩ	
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH = 0.7V <sub>DD</sub>	35	70	140	kΩ	
Output Off Leak Current	IOZ	Q0 pin, /INH = "L"	-	-	10	μA	

## ■ ELECTRICAL CHARACTERISTICS (Continued)

### ● AC Electrical Characteristics

(Unless otherwise stated,  $V_{DD}=3.3V$ , No Load,  $T_a=25^{\circ}C$ )

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum Operating Frequency	fmax		160	-	-	MHz

### ● Reference Value : XC2301C51V ( $fQ0 = f_{in}/1$ ), XC2301C52V ( $fQ0 = f_{in}/2$ )

(Unless otherwise stated,  $V_{DD}=3.3V$ , No Load,  $T_a=25^{\circ}C$ )

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Amplitude	Vipp		0.5	-	-	Vpp
Output Duty Cycle (*1)	DUTY	fin=160MHz, CL=15pF, Vipp=1.0Vpp	40	-	60	%
		fin=125MHz, CL=15pF, Vipp=0.5Vpp				
		fin=70MHz, CL=30pF, Vipp=0.5Vpp				
Output Rise Time (*2)	tr	fin=160MHz, CL=15pF, Vipp=1.0Vpp	-	(1.7)	3.0	ns
		fin=70MHz, CL=30pF, Vipp=0.5Vpp	-	(2.7)	4.5	ns
Output Fall Time (*3)	tf	fin=160MHz, CL=15pF, Vipp=1.0Vpp	-	(1.7)	3.0	ns
		fin=70MHz, CL=30pF, Vipp=0.5Vpp	-	(2.7)	4.5	ns

\*1)  $0.5V_{DD}$

\*2)  $0.1V_{DD} \rightarrow 0.9V_{DD}$

\*3)  $0.9V_{DD} \rightarrow 0.1V_{DD}$

### ● Reference Value : XC2301C54V ( $fQ0=f_{in}/4$ ), XC2301C58V ( $fQ0=f_{in}/8$ )

(Unless otherwise stated,  $V_{DD}=3.3V$ , No Load,  $T_a=25^{\circ}C$ )

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Amplitude	Vipp		0.5	-	-	Vpp
Output Duty Cycle (*1)	DUTY	fin=160MHz, CL=15pF, Vipp=1.0Vpp	45	-	55	%
		fin=125MHz, CL=15pF, Vipp=0.5Vpp				
		fin=70MHz, CL=30pF, Vipp=0.5Vpp				
Output Rise Time (*2)	tr	fin=160MHz, CL=15pF, Vipp=1.0Vpp	-	(1.7)	3.0	ns
		fin=70MHz, CL=30pF, Vipp=0.5Vpp	-	(2.7)	4.5	ns
Output Fall Time (*3)	tf	fin=160MHz, CL=15pF, Vipp=1.0Vpp	-	(1.7)	3.0	ns
		fin=70MHz, CL=30pF, Vipp=0.5Vpp	-	(2.7)	4.5	ns

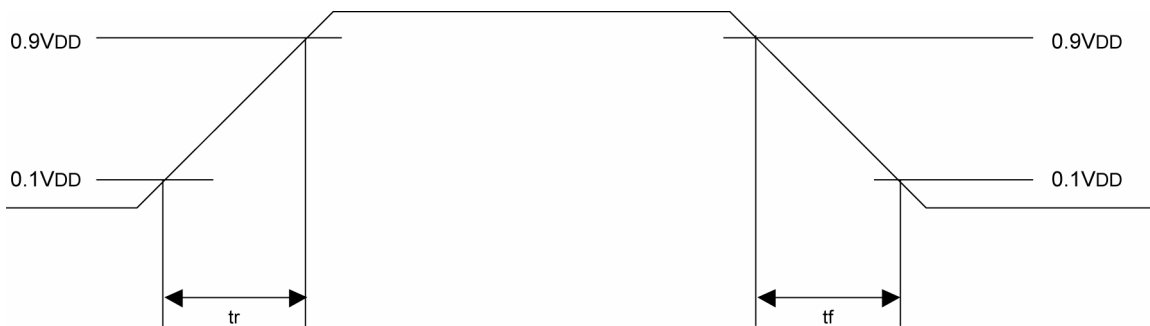
\*1)  $0.5V_{DD}$

\*2)  $0.1V_{DD} \rightarrow 0.9V_{DD}$

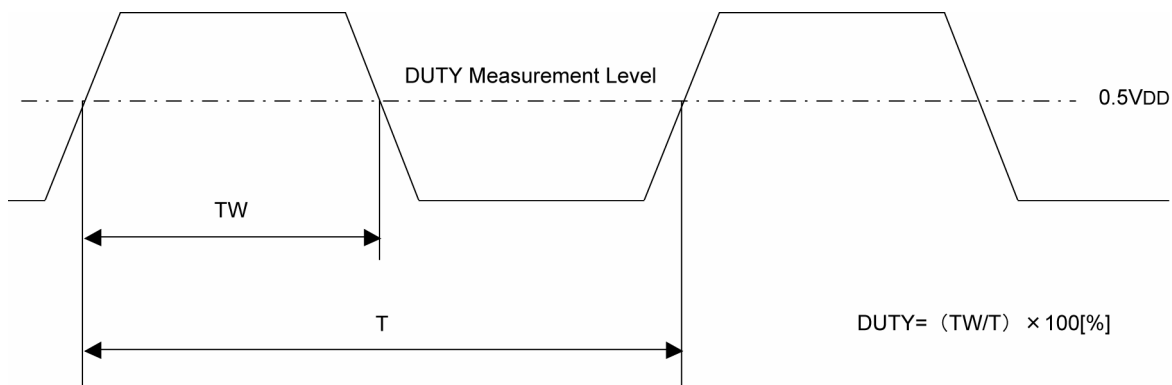
\*3)  $0.9V_{DD} \rightarrow 0.1V_{DD}$

## SWITCHING WAVEFORMS

### (1) Switching Time



### (2) Duty Cycle



## SUPPLY CURRENT, DUTY MEASUREMENT CIRCUIT

- \*) The feedback resistor (fixed)  $R_f$  must be connected.
- \*) When the duty needs to be adjusted because of power supply and/or input amplitude, duty resistor (fixed)  $R_b$  should be connected.

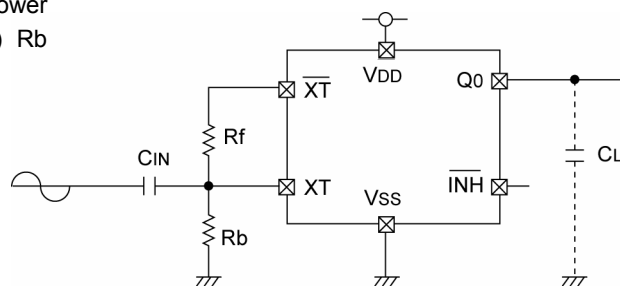
<Reference Peripheral Values:  $R_f$ ,  $R_b$ ,  $C_{IN}$ >

$V_{DD}=3.3V$ ,  $f_{in}=160MHz$ ,  $V_{ipp}=0.5V_{pp}$

$C_{IN} = 10000 [pF]$

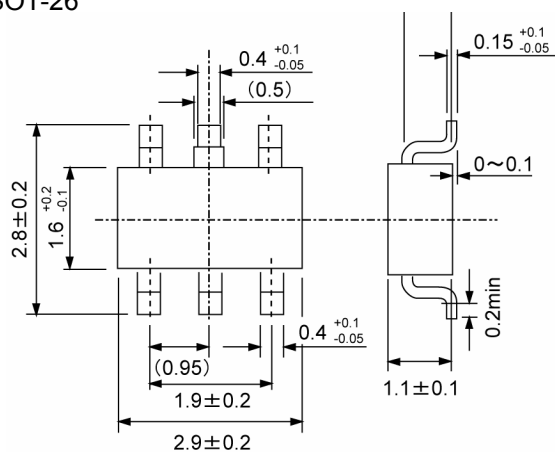
$R_f = 51 [k\Omega]$

$R_b = 360 [k\Omega]$



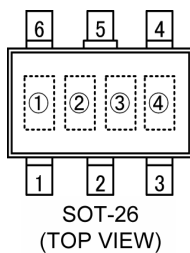
## ■ PACKAGING INFORMATION

### ● SOT-26



## ■ MARKING RULE

### ● SOT-26



① Represents product series

MARK	PRODUCT SERIES
1	XC2301xxxxxx

② Represents divider ratio

MARK	RATIO	MARK	RATIO
C	fin/1	E	fin/4
D	fin/2	F	fin/8

③ Represents tri-state buffer ICs

MARK
V

④ Represents assembly lot number  
(Based on internal standards)

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