

## 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

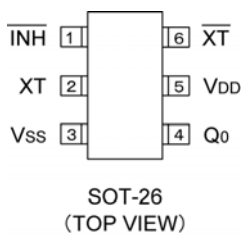
VCXO Modules

Crystal Oscillator Modules

### FEATURES

- Maximum Operating Frequency** : 160MHz
- Operating Voltage Range** : 3.3V ± 10%
- Divider Ratio** : Selectable from fin/1, fin/2, fin/4, fin/8
- Output** : 3-State
- CMOS Low Power Consumption**
- Built-In Input Amplifier**
- Package** : SOT-26
- Environmentally Friendly** : EU RoHS Compliant, Pb Free

### 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

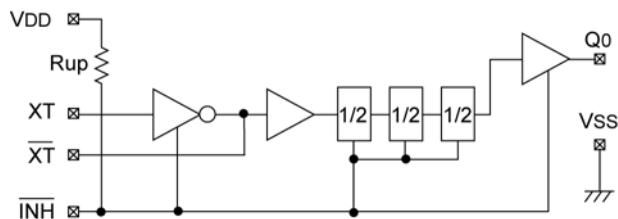
XC2301 - (\*)

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
	Duty Level	C	: CMOS (VDD/2)
	Fixed Number	5	: -
	Divider Ratio	1	: Q0=fin/1
		2	: Q0=fin/2
		4	: Q0=fin/4
		8	: Q0=fin/8
	Output	V	: Tri-state buffer
-	Packages Taping Type (*)	MR-G	: SOT-26

(\*) The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.

(\*) The device orientation is fixed in its embossed tape pocket. For reverse orientation, please contact your local Torex sales office or representative. (Standard orientation: R- , Reverse orientation: L- )

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Ta=25

PARAMETER	SYMBOL	CONDITIONS	UNITS
Supply Voltage	VDD	VSS - 0.3 ~ VSS + 7.0	V
Input Voltage	VIN	VSS - 0.3 ~ VDD + 0.3	V
Power Dissipation	Pd	250(**)	mW
Operating Temperature Range	Topr	- 40 ~ + 85	
Storage Temperature Range	Tstg	- 55 ~ + 125	

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

## ELECTRICAL CHARACTERISTICS

### DC Electrical Characteristics

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

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Operating Supply Voltage	$V_{DD}$		2.97	3.30	3.63	V	
Input Voltage "High"	$V_{IH}$	/INH pin	2.4	-	-	V	
Input Voltage "Low"	$V_{IL}$	/INH pin	-	-	0.4	V	
Output Voltage "High"	$V_{OH}$	Q0 pin, $V_{DD}=2.97V$ , $I_{OH}=-8mA$	2.2	2.4	-	V	
Output Voltage "Low"	$V_{OL}$	Q0 pin, $V_{DD}=2.97V$ , $I_{OL}=8mA$	-	0.3	0.4	V	
Supply Current 1	$I_{DD1}$	/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	$I_{DD2}$	/INH = "L", fin = 160MHz	-	4.5	-	mA	
Input Pull-Up Resistance 1	$R_{up1}$	/INH = "L"	1.0	2.0	4.0	M	
Input Pull-Up Resistance 2	$R_{up2}$	/INH = $0.7V_{DD}$	35	70	140	k	
Output Off Leak Current	IOZ	Q0 pin, /INH = "L"	-	-	10	$\mu A$	

### AC Electrical Characteristics

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

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum Operating Frequency	$f_{max}$		160	-	-	MHz

Reference Value : XC2301C51V ( $f_{Q0} = fin/1$ ), XC2301C52V ( $f_{Q0} = fin/2$ )

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

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

\*1)  $0.5V_{DD}$

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

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

Reference Value : XC2301C54V ( $f_{Q0}=fin/4$ ), XC2301C58V ( $f_{Q0}=fin/8$ )

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

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

\*1)  $0.5V_{DD}$

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

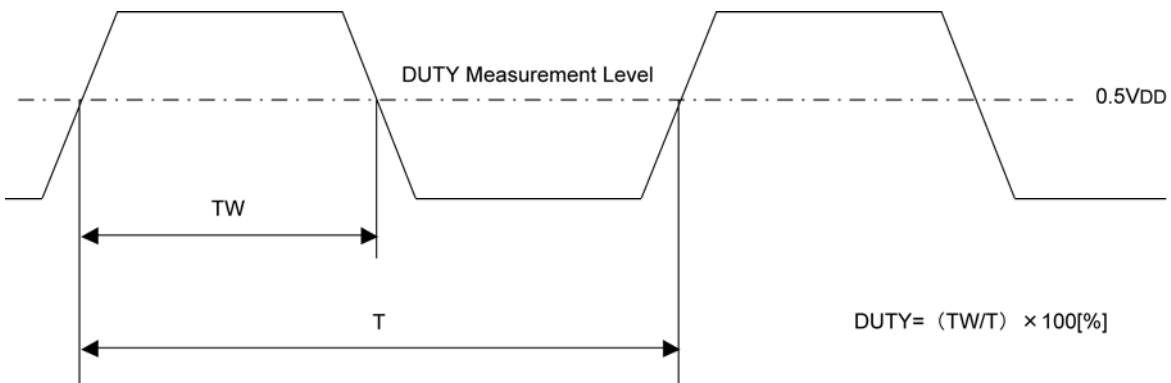
\*3)  $0.9V_{DD}$   $0.1V_{DD}$

## 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.

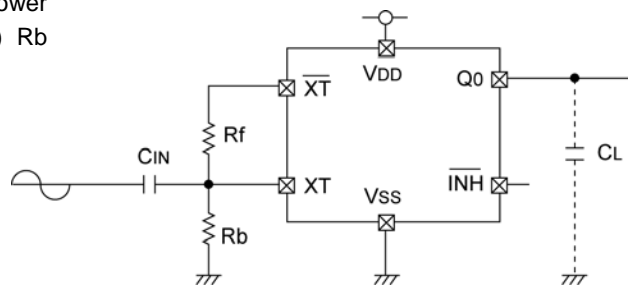
<Reference Peripheral Values:  $R_f$ ,  $R_b$ ,  $C_{IN}$ >

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

$C_{IN} = 10000 [pF]$

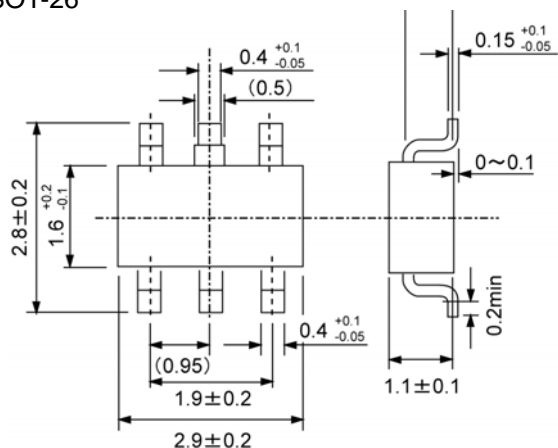
$R_f = 51 [k \ ]$

$R_b = 360 [k \ ]$



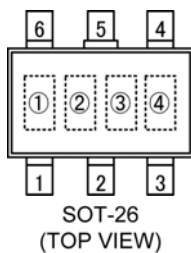
## PACKAGING INFORMATION

SOT-26



## MARKING RULE

SOT-26



Represents product series

MARK	PRODUCT SERIES
1	XC2301xxxxxx

Represents divider ratio

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

Represents tri-state buffer ICs

MARK
V

Represents assembly lot number  
(Based on internal standards)

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