



Features

- Ultra-low operating supply voltage: 0.9V to 2.0V
- Low crystal drive current
- -40 to 125°C operating temperature range
- Input frequency :10MHz~50MHz
- Crystal frequency: 10MHz~50MHz
- Very low standby current
- $50 \pm 5\%$ output duty cycle
- 15pF output drive capability

Description

The RS2CB2701ZAE is Ultra-Low operating voltage Clock buffer ICs. The oscillator circuit stage has constant current drive, significantly reducing current consumption and crystal current, compared with existing devices, and significantly reducing the oscillator characteristics supply voltage dependency.

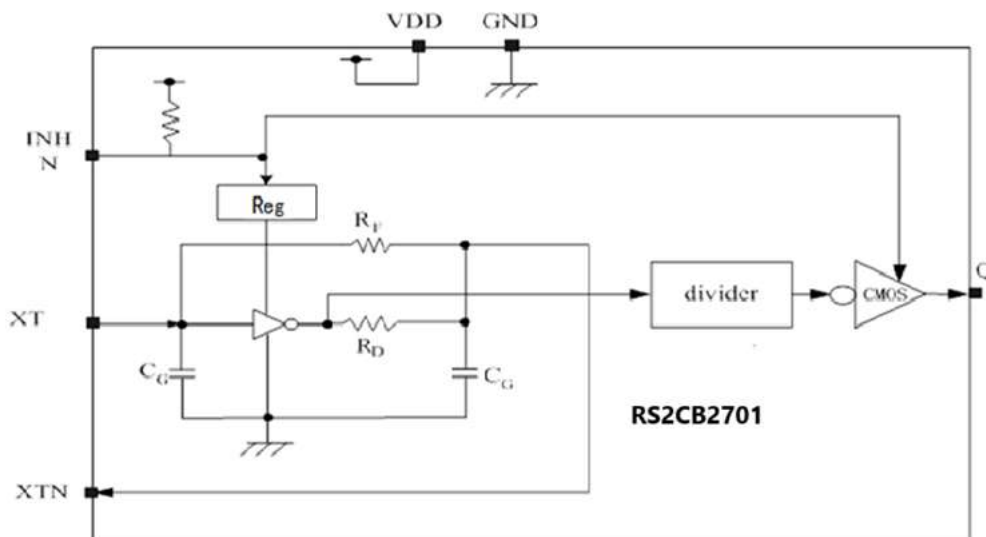
Applications

Ultra-Low operating voltage Clock buffer

Ordering Information

Ordering Code	Package	Description
RS2CB2701ZAE	TDFN-8L	2 x 2 x 0.75 mm,0.5mm Pitch

Block Diagram





Function Description

Standby Function

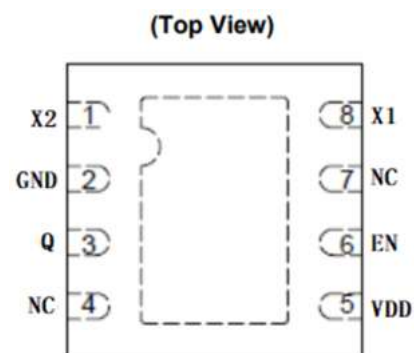
When INHN goes LOW, the oscillator stops and the output on Q becomes high impedance.

INHN	Q	Oscillator
HIGH (or open)	output frequency	Normal operation
Low	High impedance	Stopped

Power-saving Pull-up Resistor

The INHN pin pull-up resistance RUP1 or RUP2 changes in response to the input level (HIGH or LOW). When INHN is tied LOW level, the pull-up resistance is large (RUP1), reducing the current consumed by the resistance. When INHN is left open circuit, the pull-up resistance is small (RUP2), which increases the input susceptibility to external noise. However, the pull-up resistance ties the INHN pin HIGH level to prevent external noise from unexpectedly stopping the output.

Outline Drawing and Terminal Assignment



Pad Description

Sym.	Type	Description
X2	O	Crystal Output
X1	I	Crystal Input
EN	I	Output state control input. Output High Impedance when LOW. Power-saving pull-up resistor built in.
V _{DD}	P	Supply voltage
GND	P	Ground
Q	O	LVC MOS level output



Maximum Ratings

Parameter	Conditions	Min	Typ.	Max	Unit
Storage Temperature		-65	-	150	°C
Supply Voltage to Ground Potential (V_{DD} to GND)	-	-0.5		5.5	V
DC Input (All Other inputs except V_{DD} &GND)		-0.5		$V_{DD}+0.5$	V
DC Output		-0.5		$V_{DD}+0.5$	V
DC Output Current (all outputs)	-			20	mA

Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability

Recommended Operating Conditions

(GND=0V, unless otherwise noted.)

Sym.	Parameter	Conditions	Min	Typ.	Max	Unit
V_{DD}	Supply voltage		0.9	-	2.0	V
T_A	Operating temperature	-	-40		+125	°C
f_0	Oscillation frequency*1	-	10		50	MHz



DC Electrical Characteristics

$V_{DD} = 0.9$ to $2.0V$, $T_A = -40$ to $125^{\circ}C$, unless otherwise noted.)

Parameter	Sym	Conditions	Min	Typ.	Max	Unit
HIGH-level output voltage	V_{OH}	$I_{OH}=1mA$	$V_{DD}-0.4$	-	-	V
LOW-level output voltage	V_{OL}	$I_{OL}=1mA$	-	-	0.4	
HIGH-level input voltage	V_{IH}	OE Measurement	$0.8V_{DD}$	-	-	V
LOW-level input voltage	V_{IL}	OE Measurement	-	-	$0.2V_{DD}$	
Operating Current	I_{CC}	$V_{DD}=1.1V$ (25MHz/10pf)	-	0.9	1.4	mA
Operating Current	I_{CC}	$V_{DD}=1.8V$ (25MHz/10pf)	-	2.2	3.3	mA
Operating Current	I_{CC}	$V_{DD}=1.1V$ (50MHz/10pf)	-	1.6	2.4	mA
Operating Current	I_{CC}	$V_{DD}=1.8V$ (50MHz/10pf)	-	3.4	5.0	mA
Standby Current	I_{sb}	OE=off			10	uA
OE pull-up resistance			-		-	
	R_{PULL}	$V_{DD}=1.8V$	-	5	10	MΩ
Output leakage current	I_Z	OE=OFF $V_O=V_{DD}$	-	-	10	μA

AC Characteristics

$T_A=-40$ to $125^{\circ}C$ unless otherwise noted

Parameter	Symbol	Condition		Min	Typ.	Max	Unit
Output Disable Delay	t _{OD}	Output Disable Function (OE)		-	-	500	ns
Output Disable Delay(Signal)	t _{OE}	Output Disable Function (OE)		-	-	100	us
Output Enable Delay(Crystal)	t _{STR}	Output Enable Function (OE)		-	-	10	ms
Output rise time	t _{r1}	25MHz/10pf, 0.2V _{DD} to 0.8V _{DD}	V _{DD} =1.2V	-	1.5	3.0	ns
	t _{r2}		V _{DD} =1.5V	-	1.0	2.0	ns
	t _{r3}		V _{DD} =1.8V	-	0.8	1.6	ns
Output fall time	t _{f1}	25MHz/10pf, 0.8V _{DD} to 0.2V _{DD}	V _{DD} =1.2V	-	1.5	3.0	ns
	t _{f2}		V _{DD} =1.5V	-	1.0	2.0	ns
	t _{f3}		V _{DD} =1.8V	-	0.8	1.6	ns
Output duty cycle	Duty	T _A =25°C, C _L =10pF		45	50	55	%
V _{DD} Sensitivity Frequency vs. VDD+/-10%		Frequency vs. V _{DD} +/-10%		-5	-	+5	ppm
OSC frequency range	f _R	Fundamental Crystal		10		50	MHz

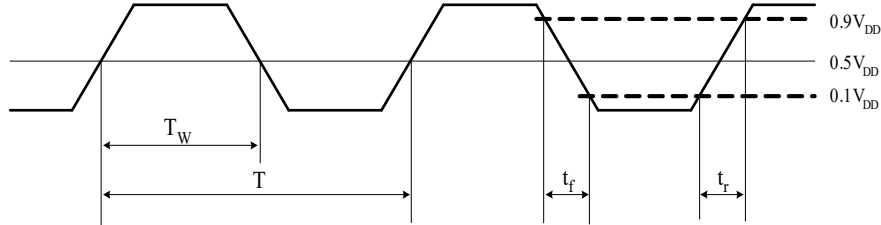
Crystal Specifications

Parameters	Sym	Conditions	Min	Typ.	Max	Units
Fundamental Crystal Resonator Frequency	F_{XIN}	-	10		50	MHz
Maximum Sustainable Drive Level		-	-	-	100	μW
Operating Drive Level		-	-	30	-	μW
Crystal Shunt capacitance	C_O	-	-	-	4	pF
Effective Series Resistance, Fundamental, 10-50MHz	ESR	-	-	-	30	Ω



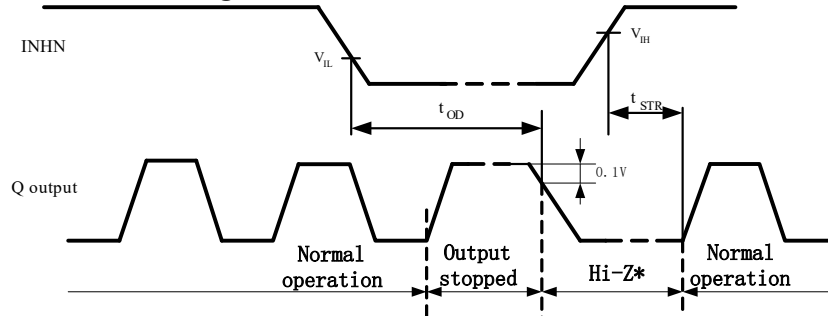
AC Electrical Characteristics

Output switching waveform



$$\text{DUTY} = T_W / T \times 100 (\%)$$

Output disable and oscillation start timing chart



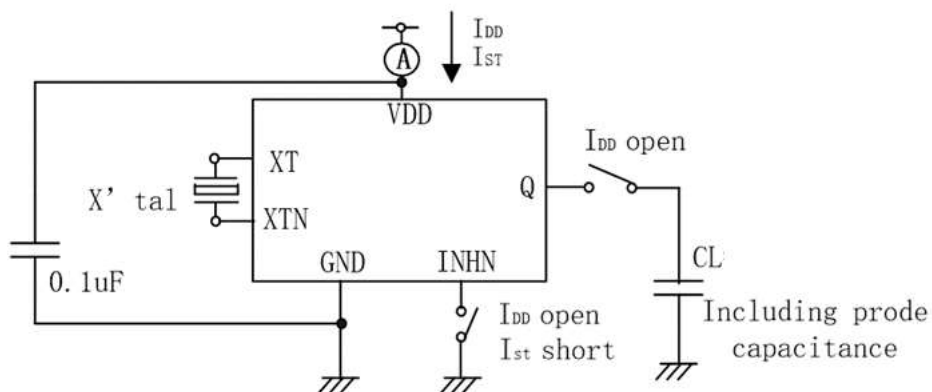
When INHN goes HIGH to LOW, the Q output goes HIGH once and then becomes high impedance.

When INHN goes LOW to HIGH, the Q output from high impedance to normal output operation when the oscillation starts (oscillation is detected)

*: the high-impedance interval in the figure is shown as a LOW level due to the 1K Ω pull-down resistor connected to the Q pin (see "Measurement circuit 2" in the "Measurement circuits" section)

Measurement Circuit

Measurement parameter: I_{DD} , I_{ST} , Duty, t_r , t_f



Note: The AC characteristics are observed using an oscilloscope on pin Q



Revision History:

Revision	Description	Date
V1.0	Initial release	2024/10/30