

# XC2165 Series

ICs for use with low voltage Crystal Oscillators



## Preliminary

- ◆ Low Voltage Operation, CMOS Low Power Consumption
  - C2xA series : 1.5V (MIN.) ~ 3.6V (MAX.)
  - C2xB series : 1.8V (MIN.) ~ 3.6V (MAX.)
- ◆ Oscillation Frequency Range
  - 8MHz ~ 70MHz C2xA: Fundamental Oscillation
  - 16MHz ~ 120MHz C2xB: Fundamental Oscillation
- ◆ 3-State Output
- ◆ Built-in Capacitors Cg, Cd
- ◆ Built-in Feedback Resistor
- ◆ Chip form
- ◆ Mini Mold SOT-26 Package

## APPLICATIONS

- Crystal oscillation modules
- Micro computers, DSP clocks
- Communication equipment
- Various system clocks

## GENERAL DESCRIPTION

The XC2165 series are CMOS ICs operates from supply voltage range from 1.5V to 3.6V with built-in crystal oscillator and divider circuits.

Output is selectable from any one of the following values for  $f_0$  :  $f_0/1$ ,  $f_0/2$ ,  $f_0/4$ ,  $f_0/8$ .

With oscillation capacitors and a feedback resistor built-in, it is possible to configure a stable fundamental oscillator using only an external crystal.

In stand-by mode, oscillation stops completely and output pin Q0 becomes in the state of high impedance.

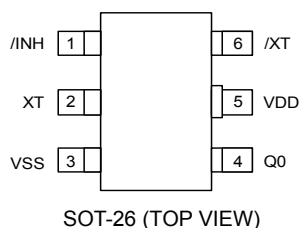
The XC2165 series are integrated into SOT-26 packages.

The series is also available in chip form.

## FEATURES

- Oscillation Frequency** : C2xA series  
8MHz ~ 70MHz (Fundamental)  
C2xB series  
16MHz ~ 120MHz (Fundamental)
- Divider Ratio** : Selectable from  $f_0/1$ ,  $f_0/2$ ,  $f_0/4$ ,  $f_0/8$
- Output** : 3-State
- Operating Voltage Range** : 1.5V ~ 3.6V  
(C21B series: 1.8V ~ 3.6V)
- Low Current Consumption** : Stand-by function included  
30  $\mu$  A (MAX.) when stand-by
- Chip Form (size)** : 800  $\times$  1200  $\mu$  m
- Ultra Small Package** : SOT-26 mini mold

## PIN CONFIGURATION

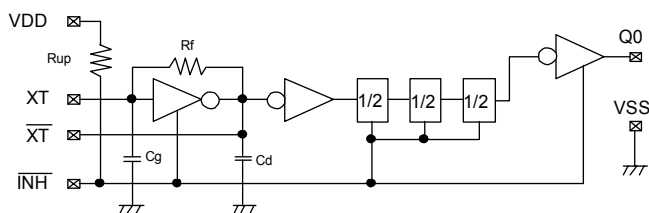


## PIN ASSIGNMENT

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

\* Pull-up resistor is built-in to the stand-by control pin.

## BLOCK DIAGRAM



## / INH, Q0 PIN FUNCTION

/ INH	Q0
'H' or Open	Clock Output
'L'	High Impedance

## PRODUCT CLASSIFICATION

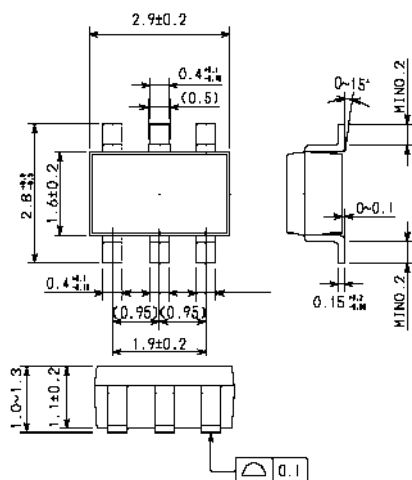
### Ordering Information

XC2165 ①②③④⑤⑥

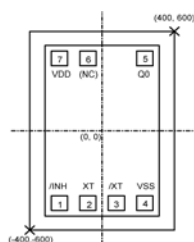
DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Duty Level	C	: CMOS
②	Fixed Number	2	: -
③	Divider Ratio	1	: f0/1
		2	: f0/2
		4	: f0/4
		8	: f0/8
④	Oscillation Frequency	A	: 8MHz ~ 70MHz
		B	: 16MHz ~ 120MHz
⑤	Chip Form & Package Type	C	: Chip form
		M	: SOT-26 package
⑥	Device Orientation	T	: Chip tray
		R	: Embossed tape, Standard feed
		L	: Embossed tape, Reverse feed
		W	: Wafer

## PACKAGING INFORMATION

### SOT-26



## PAD LAYOUT



Size (Chip) : 800 × 1200 μm  
 Thickness (Chip) : 200 ± 20 μm  
 Backside (Chip) : GND level  
 Aperture (Pad) : 90 × 90 μm

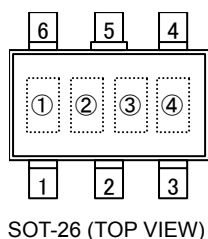
## PAD DIMENSION

Unit: μm

PIN NUMBER	PIN NAME	FUNCTION	PAD DIMENSIONS	
			X	Y
1	/ INH	Stand-by Control	- 236	- 436
2	XT	Crystal Oscillation Connection (Input)	- 79	- 436
3	/ XT	Crystal Oscillation Connection (Output)	79	- 436
4	VSS	Ground	236	- 436
5	Q0	Clock Output	236	436
6	(NC)	No Connection	- 78	436
7	VDD	Power Supply	- 236	436

\*① Pull-up resistor is built-in to the stand-by control pin.

## MARKING RULE



① Represents product series (Fixed marking)

MARK	PRODUCT SERIES
5	XC2165 series

② Represents oscillation frequency

MARK	OSCILLATION FREQUENCY
A	C2xA: 8MHz ~ 70MHz (Fundamental)
B	C2xB: 16MHz ~ 120MHz (Fundamental)

③ Represents divider ratio

MARK	DEVIDER RATIO	MARK	DEVIDER RATIO
A	f <sub>0</sub> /1	B	f <sub>0</sub> /2
C	f <sub>0</sub> /4	D	f <sub>0</sub> /8

④ Represents assembly lot number  
(based on internal standards)

## ABSOLUTE MAXIMUM RATINGS

T<sub>a</sub>=25°C

PARAMETER	SYMBOL	RATINGS	UNITS
Supply Voltage	V <sub>DD</sub>	V <sub>SS</sub> – 0.3 to V <sub>SS</sub> + 7.0	V
/ INH Pin Voltage	V <sub>INH</sub>	V <sub>SS</sub> – 0.3 to V <sub>DD</sub> + 0.3	V
Q0 Pin Voltage	V <sub>Q0</sub>	V <sub>SS</sub> – 0.3 to V <sub>DD</sub> + 0.3	V
Q0 Output Current	I <sub>Q0</sub>	± 50	mA
Power Dissipation	P <sub>d</sub>	150 *	mW
Operating Temperature Range	T <sub>opr</sub>	- 40 to + 85	°C
Storage Temperature Range	T <sub>stg</sub>	- 65 to + 150 (chip form)	°C
		- 55 to + 125 (SOT-26)	

\* SOT-26 Package: When implemented on a glass epoxy PCB.

## ELECTRICAL CHARACTERISTICS

XC2165C2xAxx

1.8V Operation (Unless otherwise stated, VDD = 1.8V, f0=70MHz, No Load, Ta = - 40°C ~ + 85°C)

PARAMETER	SYMBOL	FUNCTION		MIN.	TYP.	MAX.	UNIT
Operating Voltage	VDD			1.5	1.8	3.6	V
Crystal Oscillation Frequency	Fosc			8	-	70	MHz
‘H’ Level Input Voltage	VIH	/INH pin		0.7VDD	-	-	V
‘L’ Level Input Voltage	VIL	/INH pin		-	-	0.3VDD	V
‘H’ Level Output Voltage	VOH	Q0 pin, VDD=1.5V, IOH= - 2.0mA		1.0	1.1	-	V
‘L’ Level Output Voltage	VOL	Q0 pin, VDD=1.5V, IOL= 2.0mA		-	0.3	0.4	V
Supply Current 1	IDD1	/INH =Open, f0=70MHz, CL=15pF	XC2165C21Axx	-	5.0	10.0	mA
			XC2165C22Axx	-	3.5	7.0	
			XC2165C24Axx	-	3.0	6.0	
			XC2165C28Axx	-	2.5	6.0	
Supply Current 2	IDD2	/INH = 'L', f0 = 70MHz, CL=15pF		-	15	30	μ A
Input Pull-Up Resistance 1	Rup1	/INH = ‘L’		0.8	2.0	6.0	M Ω
Input Pull-Up Resistance 2	Rup2	/INH = 0.7VDD		20	50	150	k Ω
Internal Oscillation Capacity (*)	Cg	(*)		-	10	-	pF
	Cd	(*)		-	10	-	pF
Internal Oscillation Feedback Resistance	Rf			1.2	3.0	5.5	M Ω
Output Off Leak Current	Ioz	VDD=3.6V, /INH = ‘L’		-	-	1.0	μ A

(\*) Designed value

## SWITCHING CHARACTERISTICS

XC2165C2xAxx

1.8V Operation (Unless otherwise stated, VDD = 1.8V, f0=70MHz, CL=15pF, Ta = - 40°C ~ + 85°C)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT
Output Rise Time (*)	Tr	VDD=1.8V, CL=15pF (10% to 90%)	-	-	6.5	ns
Output Fall Time (*)	Tf	VDD=1.8V, CL=15pF (10% to 90%)	-	-	6.5	ns
Output Duty Cycle	DUTY	CL=15pF @ 0.5VDD	40	-	60	%
Oscillation Start Time (*)	Tosc_on	f0=8MHz	-	-	4.0	ms

(\*) Designed value

## ■ ELECTRICAL CHARACTERISTICS (Continued)

XC2165C2xBxx

2.5V Operation (Unless otherwise stated,  $V_{DD} = 2.5V$ ,  $f_0 = 120MHz$ , No Load,  $T_a = -40^{\circ}C \sim +85^{\circ}C$ )

PARAMETER	SYMBOL	FUNCTION		MIN.	TYP.	MAX.	UNIT
Operating Voltage	VDD			1.8	2.5	3.6	V
Crystal Oscillation Frequency	Fosc			16	-	120	MHz
‘H’ Level Input Voltage	VIH	/INH pin		0.7VDD	-	-	V
‘L’ Level Input Voltage	VIL	/INH pin		-	-	0.3VDD	V
‘H’ Level Output Voltage	VOH	Q0 pin, VDD=1.8V, IOH= - 2.0mA		1.3	1.4	-	V
‘L’ Level Output Voltage	VOL	Q0 pin, VDD=1.8V, IOL= 2.0mA		-	0.3	0.4	V
Supply Current 1	IDD1	/INH =Open, f0=120MHz, CL=5pF	XC2165C21Bxx	-	10.0	20.0	mA
			XC2165C22Bxx	-	T.B.D.	T.B.D.	
			XC2165C24Bxx	-	T.B.D.	T.B.D.	
			XC2165C28Bxx	-	T.B.D.	T.B.D.	
Supply Current 2	IDD2	/INH = 'L', f0 = 120MHz, CL=5pF		-	15.0	30.0	μ A
Input Pull-Up Resistance 1	Rup1	/INH = ‘L’		0.8	2.0	6.0	MΩ
Input Pull-Up Resistance 2	Rup2	/INH = 0.7VDD		20	50	150	kΩ
Internal Oscillation Capacity (*)	Cg	(*)		-	10	-	pF
	Cd	(*)		v	10	-	pF
Internal Oscillation Feedback Resistance	Rf			1.2	3.0	5.5	MΩ
Output Off Leak Current	Ioz	VDD=3.6V, /INH = ‘L’		-	-	1.0	μ A

(\*) Designed value

T.B.D.: To be determined

## ■ SWITCHING CHARACTERISTICS (Continued)

XC2165C2xBxx

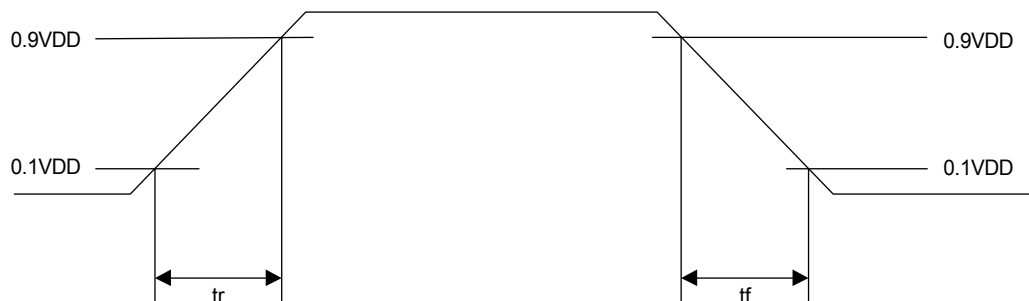
2.5V Operation (Unless otherwise stated,  $V_{DD} = 2.5V$ ,  $f_0 = 120MHz$ ,  $C_L = 5pF$ ,  $T_a = -40^{\circ}C \sim +85^{\circ}C$ )

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT
Output Rise Time (*)	$T_r$	$V_{DD}=2.5V$ , $C_L=5pF$ (10% to 90%)	-	-	4.0	ns
Output Fall Time (*)	$T_f$	$V_{DD}=2.5V$ , $C_L=5pF$ (10% to 90%)	-	-	4.0	ns
Output Duty Cycle	DUTY	$C_L=5pF$ @ $0.5V_{DD}$	40	-	60	%
Oscillation Start Time (*)	$T_{osc\_on}$	$f_0=16MHz$	-	-	3.0	ms

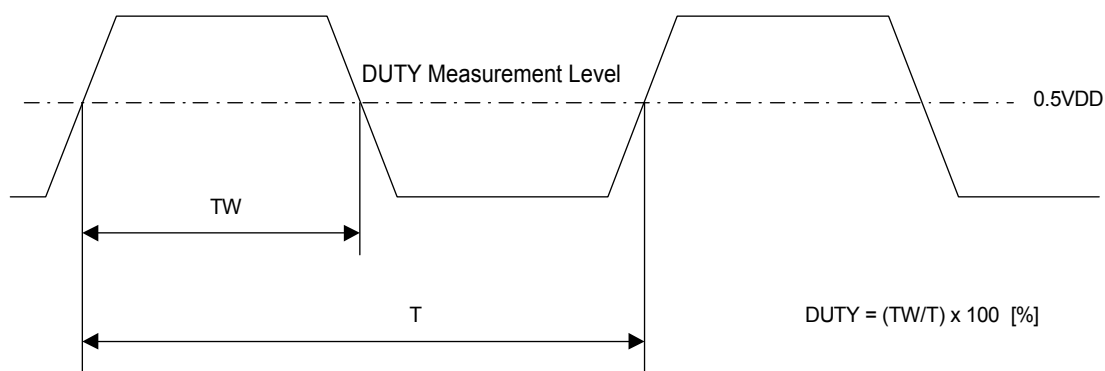
(\*) Designed value

## SWITCHING CHARACTERISTICS MEASUREMENT WAVEFORMS

(1) Output Rise Time:  $t_r$  / Output Fall Time:  $t_f$



(2) Duty Cycle



(3) Oscillation Start Time:  $T_{osc\_on}$  / Oscillation Stop Time:  $T_{osc\_off}$

