

ICs for use with low voltage Crystal Oscillators

Preliminary

■ 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.

resistance and ultra high-speed switching characteristics.

Two FET devices are built into the one package.

Because high-speed switching is possible, the IC can be efficiently set thereby saving energy.

The small SOP-8 package makes high density mounting possible.

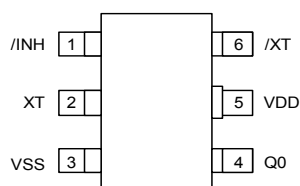
■ APPLICATIONS

- Crystal oscillation modules
- Micro computers, DSP clocks
- Communication equipment
- Various system clocks
- Cellular and portable phones

■ 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 μ A (MAX.) when stand-by
- Chip Form (size)** : 800 × 1200 μ m
- Built-in Capacitors Cg, Cd**
- Built-in Feedback Resistor**
- Ultra Small Package** : SOT-26

■ PIN CONFIGURATION



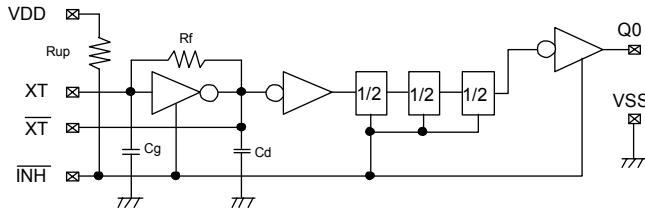
SOT-26 (TOP VIEW)

■ 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

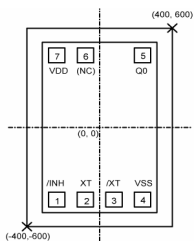
■ PRODUCT CLASSIFICATION

● 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

■ PAD LAYOUT



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

■ PAD DIMENSIONS

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

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

■ ABSOLUTE MAXIMUM RATINGS

Ta=25°C

PARAMETER	SYMBOL	RATINGS	UNITS
Supply Voltage	V _{DD}	V _{SS} – 0.3 to V _{SS} + 7.0	V
/ INH Pin Voltage	V _{INH}	V _{SS} – 0.3 to V _{DD} + 0.3	V
Q0 Pin Voltage	V _{Q0}	V _{SS} – 0.3 to V _{DD} + 0.3	V
Q0 Output Current	I _{Q0}	± 50	mA
Power Dissipation	P _d	150 *	mW
Operating Temperature Range	T _{opr}	- 40 to + 85	°C
Storage Temperature Range	T _{stg}	- 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, V_{DD} = 1.8V, f₀=70MHz, No Load, Ta = - 40°C ~ + 85°C)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT	
Operating Voltage	V _{DD}		1.5	1.8	3.6	V	
Crystal Oscillation Frequency	F _{osc}		8	-	70	MHz	
'H' Level Input Voltage	V _{IH}	/INH pin	0.7V _{DD}	-	-	V	
'L' Level Input Voltage	V _{IL}	/INH pin	-	-	0.3V _{DD}	V	
'H' Level Output Voltage	V _{OH}	Q0 pin, V _{DD} =1.5V, I _{OH} = - 2.0mA	1.0	1.1	-	V	
'L' Level Output Voltage	V _{OL}	Q0 pin, V _{DD} =1.5V, I _{OL} = 2.0mA	-	0.3	0.4	V	
Supply Current 1	I _{DD1}	/INH =Open, f ₀ =70MHz, C _L =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	I _{DD2}	/INH = 'L', f ₀ = 70MHz, C _L =15pF	-	15	30	μA	
Input Pull-Up Resistance 1	R _{up1}	/INH = 'L'	0.8	2.0	6.0	MΩ	
Input Pull-Up Resistance 2	R _{up2}	/INH = 0.7V _{DD}	20	50	150	kΩ	
Internal Oscillation Capacity (*)	C _g	(*)	-	10	-	pF	
	C _d	(*)	-	10	-	pF	
Internal Oscillation Feedback Resistance	R _f		1.2	3.0	5.5	MΩ	
Output Off Leak Current	I _{oz}	V _{DD} =3.6V, /INH = 'L'	-	-	1.0	μA	

(*) Designed value

■ SWITCHING CHARACTERISTICS

XC2165C2xAxx

 1.8V Operation (Unless otherwise stated, V_{DD} = 1.8V, f₀=70MHz, C_L=15pF, Ta = - 40°C ~ + 85°C)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT
Output Rise Time (*)	T _r	V _{DD} =1.8V, C _L =15pF (10% to 90%)	-	-	6.5	ns
Output Fall Time (*)	T _f	V _{DD} =1.8V, C _L =15pF (10% to 90%)	-	-	6.5	ns
Output Duty Cycle	DUTY	C _L =15pF @ 0.5V _{DD}	40	-	60	%
Oscillation Start Time (*)	T _{osc_on}	f ₀ =8MHz	-	-	4.0	ms

(*) Designed value

ELECTRICAL CHARACTERISTICS (Continued)

XC2165C2xBxx

2.5V Operation (Unless otherwise stated, V_{DD} = 2.5V, f₀=120MHz, No Load, Ta = - 40°C ~ + 85°C)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT	
Operating Voltage	V _{DD}		1.8	2.5	3.6	V	
Crystal Oscillation Frequency	F _{osc}		16	-	120	MHz	
'H' Level Input Voltage	V _{IH}	/INH pin	0.7V _{DD}	-	-	V	
'L' Level Input Voltage	V _{IL}	/INH pin	-	-	0.3V _{DD}	V	
'H' Level Output Voltage	V _{OH}	Q0 pin, V _{DD} =1.8V, I _{OH} = - 2.0mA	1.3	1.4	-	V	
'L' Level Output Voltage	V _{OL}	Q0 pin, V _{DD} =1.8V, I _{OL} = 2.0mA	-	0.3	0.4	V	
Supply Current 1	I _{DD1}	/INH =Open, f ₀ =120MHz, C _L =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	I _{DD2}	/INH = 'L', f ₀ = 120MHz, C _L =5pF	-	15.0	30.0	μA	
Input Pull-Up Resistance 1	R _{up1}	/INH = 'L'	0.8	2.0	6.0	MΩ	
Input Pull-Up Resistance 2	R _{up2}	/INH = 0.7V _{DD}	20	50	150	kΩ	
Internal Oscillation Capacity (*)	C _g	(*)	-	10	-	pF	
	C _d	(*)	-	10	-	pF	
Internal Oscillation Feedback Resistance	R _f		1.2	3.0	5.5	MΩ	
Output Off Leak Current	I _{oz}	V _{DD} =3.6V, /INH = 'L'	-	-	1.0	μA	

(*) Designed value

T.B.D.: To be determined

SWITCHING CHARACTERISTICS (Continued)

XC2165C2xBxx

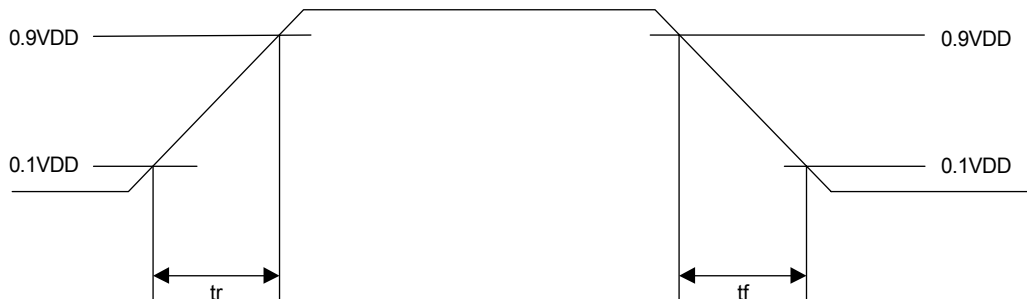
2.5V Operation (Unless otherwise stated, V_{DD} = 2.5V, f₀=120MHz, C_L=5pF, Ta = - 40°C ~ + 85°C)

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

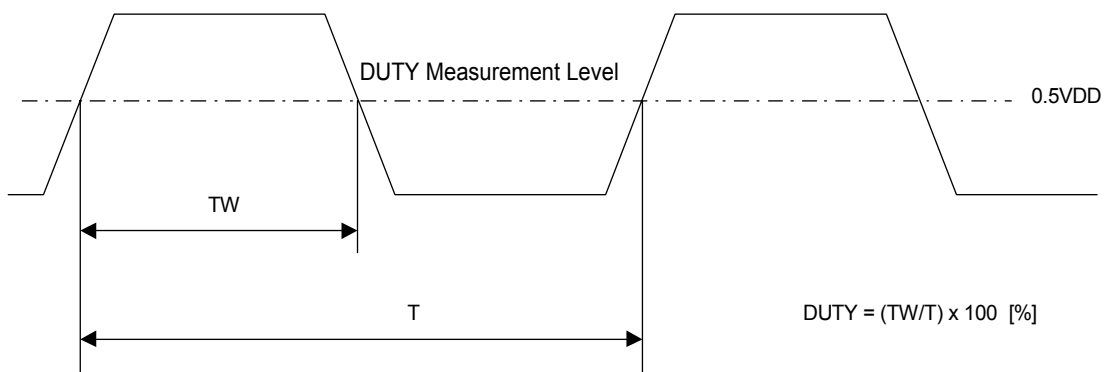
(*) Designed value

SWITCHING CHARACTERISTICS MEASUREMENT WAVEFORMS

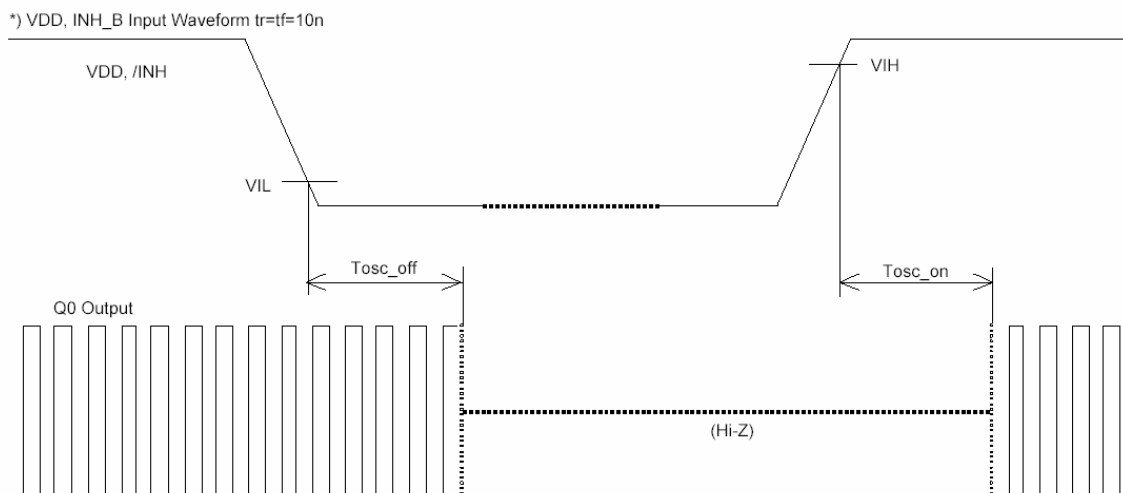
(1) Output Rise Time: T_r / Output Fall Time: T_f



(2) Duty Cycle

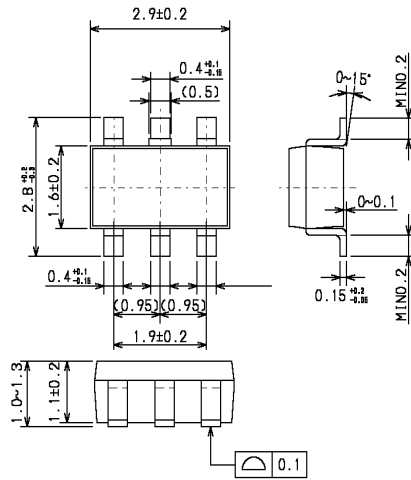


(3) Oscillation Start Time: T_{osc_on} / Oscillation Stop Time: T_{osc_off}

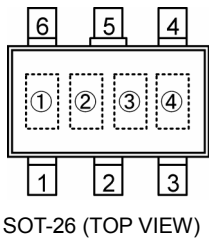


PACKAGING INFORMATION

● SOT-26



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	f0/1	B	f0/2
C	f0/4	D	f0/8

④ Represents assembly lot number
(based on internal standards)

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