

ICs for use with low voltage Crystal Oscillators

■ GENERAL DESCRIPTION

The XC2165 series is a CMOS IC operates in 1.5V to 3.6V with the built-in circuits for crystal oscillator and divider.

Output is selectable from any one of f0, f0/1, f0/2, f0/4 and f0/8.

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 high impedance.

The XC2165 series is available in SOT-26 package.

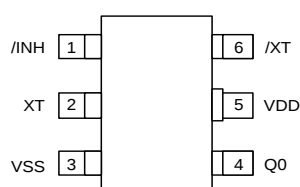
■ APPLICATIONS

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

■ FEATURES

Oscillation Frequency	: 8MHz~120MHz (Fundamental)
Divider Ratio	: f0/1, f0/2, f0/4, f0/8
Output	: 3-State
Operating Voltage Range	: 1.5V ~ 3.6V
Low Current Consumption	: Stand-by function included : 30 μ A (MAX.) when stand-by
Built-in Capacitors Cg, Cd	
Built-in Feedback Resistor	
Operating Ambient Temperature	: - 40°C ~ + 85°C
Package	: SOT-26
Environmentally Friendly	: EU RoHS Compliant, Pb Free

■ PIN CONFIGURATION



SOT-26 (TOP VIEW)

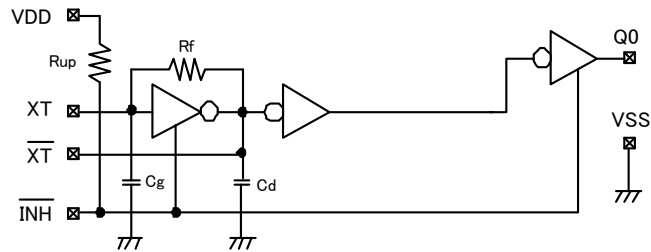
■ PIN ASSIGNMENT

PIN NUMBER	PIN NAME	FUNCTIONS
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)

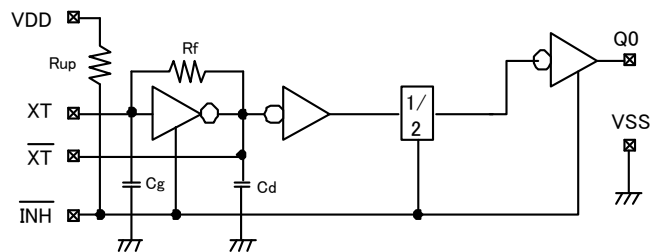
* Pull-up resistor is built-in to the stand-by control pin.

■ BLOCK DIAGRAM

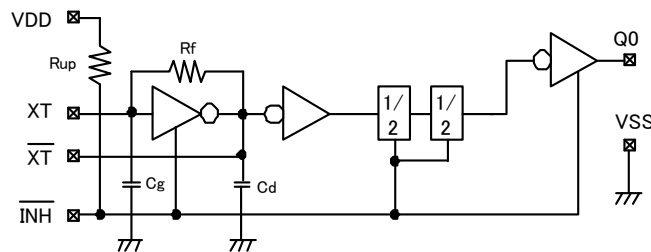
1). XC2165C21Axx/XC2165C21Bxx ($f_{OSC} = f_0/1$)



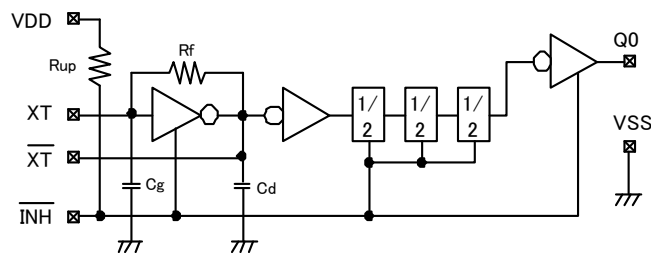
2). XC2165C22Axx/XC2165C22Bxx ($f_{OSC} = f_0/2$)



3). XC2165C24Axx/XC2165C24Bxx ($f_{OSC} = f_0/4$)



4). XC2165C28Axx/XC2165C28Bxx ($f_{OSC} = f_0/8$)



■ PRODUCT CLASSIFICATION

● Ordering Information

XC2165 ①②③④⑤⑥-⑦

DESIGNATOR	ITEM	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
⑤⑥-⑦ ^(*)	Package(Order Unit)	MR	SOT-26(3,000/Reel)
		MR-G	SOT-26(3,000/Reel)

^(*) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

■ PIN FUNCTION

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

■ 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	250	mW
Operating Ambient Temperature	T _{opr}	- 40 to + 85	°C
Storage Temperature	T _{stg}	- 55 to + 125	°C

DC ELECTRICAL CHARACTERISTICS

XC2165C2xAxx

1.8V Operation (Unless otherwise stated, $V_{DD} = 1.8V$, $f_0 = 70MHz$, No Load, $T_a = -40^{\circ}C \sim +85^{\circ}C$)

PARAMETER	SYMBOL	FUNCTION		MIN.	TYP.	MAX.	UNIT	CIRCUIT
Operating Voltage	V _{DD}			1.5	1.8	3.6	V	-
Crystal Oscillation Frequency	f _o			8	-	70	MHz	-
Output Frequency	f _{OSC}	MIN : f ₀ =8MHz, MAX : f ₀ =70MHz, C _L =15pF	XC2165C21Axx	8	-	70	MHz	-
			XC2165C22Axx	4	-	35		
			XC2165C24Axx	2	-	17.5		
			XC2165C28Axx	1	-	8.75		
'H' Level Input Voltage	V _{IH}	/INH pin		0.7V _{DD}	-	-	V	1
'L' Level Input Voltage	V _{IL}	/INH pin		-	-	0.3V _{DD}	V	1
'H' Level Output Voltage	V _{OH}	Q0 pin, V _{DD} =1.5V, I _{OH} = - 2.0mA		1.0	1.1	-	V	2
'L' Level Output Voltage	V _{OL}	Q0 pin, V _{DD} =1.5V, I _{OL} = 2.0mA		-	0.3	0.4	V	2
Supply Current 1	I _{DD1}	/INH =Open, C _L =15pF	XC2165C21Axx	-	5.0	10.0	mA	3
			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	μ A	3
Input Pull-Up Resistance 1	R _{up1}	/INH = 'L'		0.8	2.0	6.0	M Ω	4
Input Pull-Up Resistance 2	R _{up2}	/INH = 0.7V _{DD}		20.0	50.0	150.0	k Ω	4
Internal Oscillation Capacity	C _g			-	10 ^(*)	-	pF	-
	C _d			-	10 ^(*)	-	pF	-
Internal Oscillation Feedback Resistance	R _f			1.2	3.0	5.5	M Ω	5
Output Off Leak Current	I _{oz}	V _{DD} =3.6V, /INH = 'L'		-	-	1.0	μ A	6

(*) Designed value

AC ELECTRICAL CHARACTERISTICS

XC2165C2xAxx

1.8V Operation (Unless otherwise stated, $V_{DD} = 1.8V$, $f_0 = 70MHz$, $C_L = 15pF$, $T_a = -40^{\circ}C \sim +85^{\circ}C$)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT	CIRCUIT
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	-
Duty Cycle	DUTY	$C_L = 15pF$ @ $0.5V_{DD}$	40	-	60	%	7
Output Start Time	t_{on}	$f_0 = 8MHz$	-	-	$4.0^{(*)}$	ms	-

(*) Designed value

■ DC 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	CIRCUIT
Operating Voltage	V _{DD}			1.8	2.5	3.6	V	-
Crystal Oscillation Frequency	f _o			16	-	120	MHz	-
Output Frequency	f _{OSC}	MIN : f ₀ =16MHz, MAX : f ₀ =120MHz, C _L =5pF	XC2165C21Bxx	16	-	120	MHz	-
			XC2165C22Bxx	8	-	60		
			XC2165C24Bxx	4	-	30		
			XC2165C28Bxx	2	-	15		
'H' Level Input Voltage	V _{IH}	/INH pin		0.7V _{DD}	-	-	V	1
'L' Level Input Voltage	V _{IL}	/INH pin		-	-	0.3V _{DD}	V	1
'H' Level Output Voltage	V _{OH}	Q0 pin, V _{DD} =1.8V, I _{OH} = - 2.0mA		1.3	1.4	-	V	2
'L' Level Output Voltage	V _{OL}	Q0 pin, V _{DD} =1.8V, I _{OL} = 2.0mA		-	0.3	0.4	V	2
Supply Current 1	I _{DD1}	/INH =Open, f ₀ =120MHz, C _L =5pF	XC2165C21Bxx	-	10.0	20.0	mA	3
			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	μ A	3
Input Pull-Up Resistance 1	Rup1	/INH = 'L'		0.8	2.0	6.0	M Ω	4
Input Pull-Up Resistance 2	Rup2	/INH = 0.7V _{DD}		20.0	50.0	150.0	k Ω	4
Internal Oscillation Capacity	Cg			-	10 ^(*)	-	pF	-
	Cd			-	10 ^(*)	-	pF	-
Internal Oscillation Feedback Resistance	Rf			1.2	3.0	5.5	M Ω	5
Output Off Leak Current	Ioz	V _{DD} =3.6V, /INH = 'L'		-	-	1.0	μ A	6

(*) Designed value

■ AC ELECTRICAL CHARACTERISTICS (Continued)

XC2165C2xBxx

2.7V Operation (Unless otherwise stated, V_{DD} = 2.7V, f₀=120MHz, C_L=5pF, Ta = - 40°C ~ + 85°C)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT	CIRCUIT
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	-
Duty Cycle	DUTY	C _L =5pF @ 0.5V _{DD}	40	-	60	%	7
Oscillation Start Time	tosc_on	f ₀ =16MHz	-	-	3.0 ^(*)	ms	-

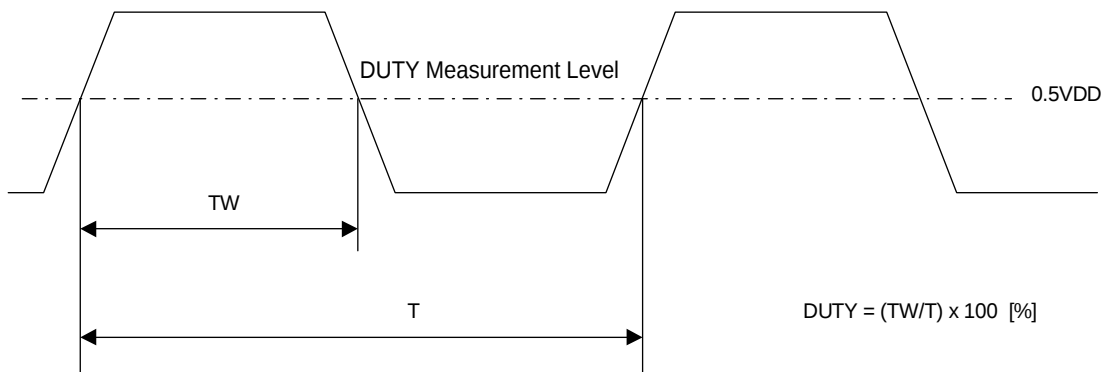
(*) Designed value

SWITCHING CHARACTERISTICS MEASUREMENT WAVEFORMS

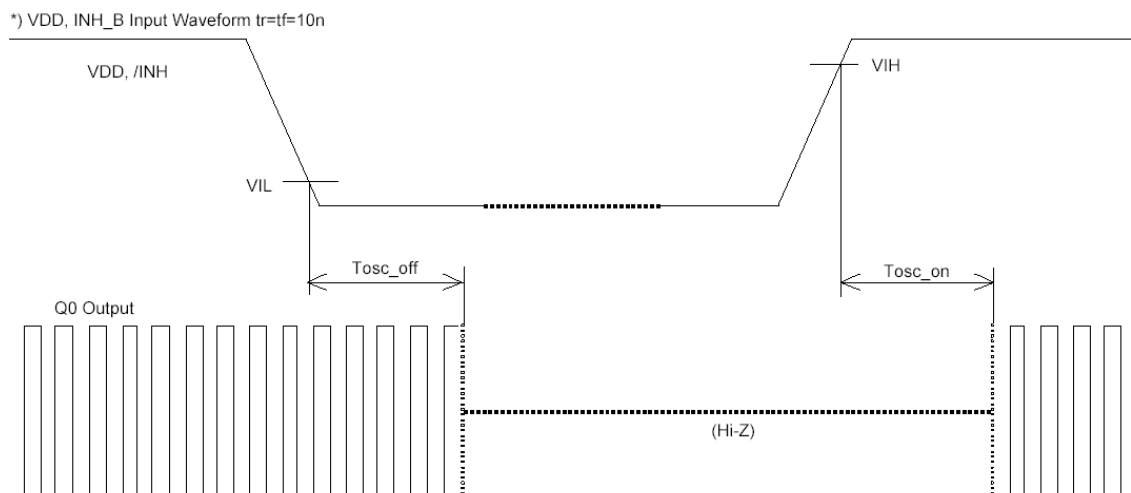
(1) Output Rise Time: t_r / Output Fall Time: t_f



(2) Duty Cycle

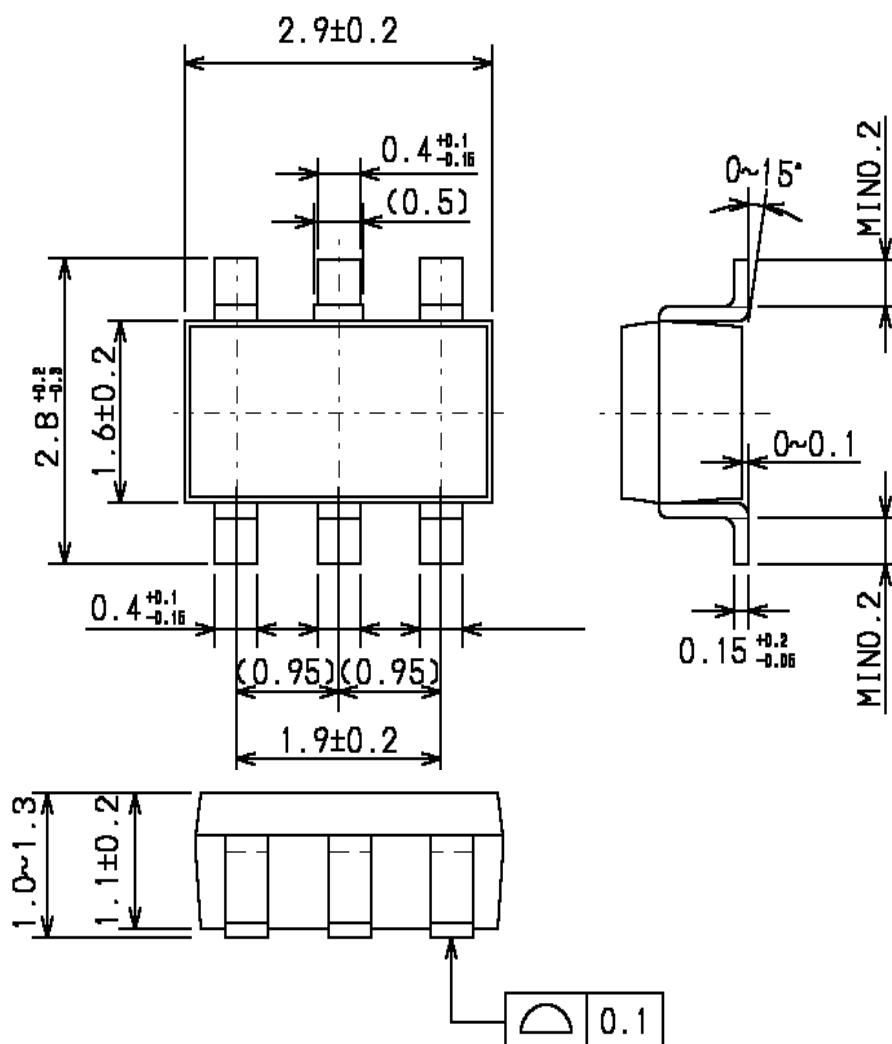


(3) Oscillation Start Time: t_{osc_on} / Oscillation Stop Time: t_{osc_off}

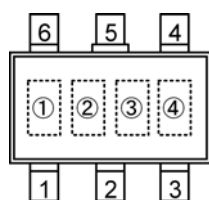


PACKAGING INFORMATION

●SOT-26



MARKING RULE



SOT-26 (TOP VIEW)

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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