

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.

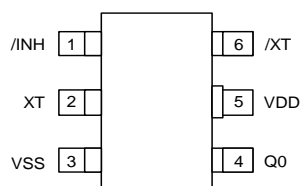
■ APPLICATIONS

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

■ FEATURES

Oscillation Frequency	:	8MHz~120MHz (Fundamental)
Divider Ratio	:	f ₀ /1, f ₀ /2, f ₀ /4, f ₀ /8
Output	:	3-State
Operating Voltage Range	:	1.5V ~ 3.6V
Low Current Consumption	:	Stand-by function included : 30 μA (MAX.) when stand-by
Built-in Capacitors C_g, C_d		
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)

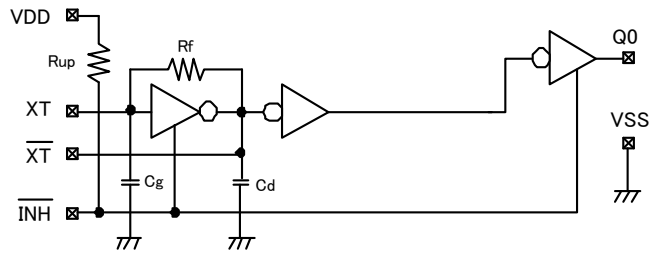
■ PIN ASSIGNMENT

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)

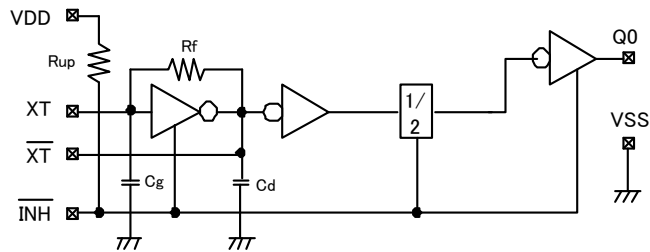
* Pull-up resistor is built-in to the stand-by control pin.

■ BLOCK DIAGRAM

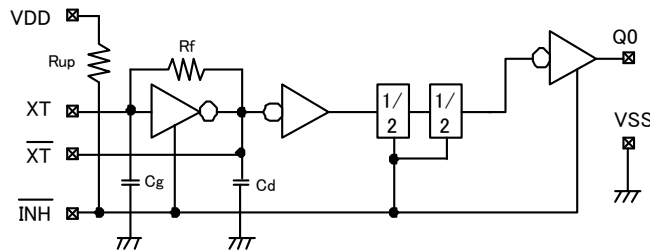
1). XC2165C21Axx/XC2165C21Bxx ($f_{OSC} = f_0/1$)



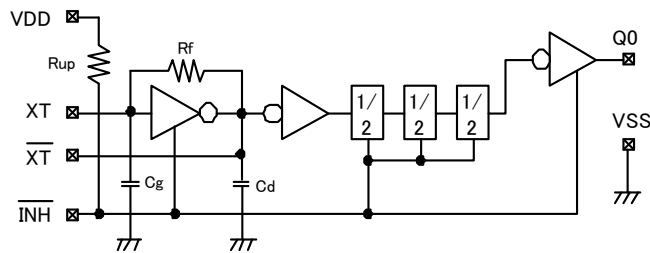
2). XC2165C22Axx/XC2165C22Bxx ($f_{OSC} = f_0/2$)



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, f₀=70MHz, No Load, Ta = - 40°C ~ + 85°C)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT	CIRCUIT	
Operating Voltage	V _{DD}		1.5	1.8	3.6	V	-	
Crystal Oscillation Frequency	f ₀		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	μA	3	
Input Pull-Up Resistance 1	R _{up1}	/INH = 'L'	0.8	2.0	6.0	MΩ	4	
Input Pull-Up Resistance 2	R _{up2}	/INH = 0.7V _{DD}	20.0	50.0	150.0	kΩ	4	
Internal Oscillation Capacity	C _g		-	10 ^(*)	-	pF	-	
	C _d		-	10 ^(*)	-	pF	-	
Internal Oscillation Feedback Resistance	R _f		1.2	3.0	5.5	MΩ	5	
Output Off Leak Current	I _{oz}	V _{DD} =3.6V, /INH = 'L'	-	-	1.0	μA	6	

(*) Designed value

AC ELECTRICAL 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	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, $V_{DD} = 2.5V$, $f_0 = 120MHz$, No Load, $T_a = -40^{\circ}C \sim +85^{\circ}C$)

PARAMETER	SYMBOL	FUNCTION	MIN.	TYP.	MAX.	UNIT	CIRCUIT	
Operating Voltage	V_{DD}		1.8	2.5	3.6	V	-	
Crystal Oscillation Frequency	f_0		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	μA	3	
Input Pull-Up Resistance 1	R_{up1}	/INH = 'L'	0.8	2.0	6.0	$M\Omega$	4	
Input Pull-Up Resistance 2	R_{up2}	/INH = $0.7V_{DD}$	20.0	50.0	150.0	$k\Omega$	4	
Internal Oscillation Capacity	C_g		-	$10^{(*)}$	-	pF	-	
	C_d		-	$10^{(*)}$	-	pF	-	
Internal Oscillation Feedback Resistance	R_f		1.2	3.0	5.5	$M\Omega$	5	
Output Off Leak Current	I_{oz}	$V_{DD} = 3.6V$, /INH = 'L'	-	-	1.0	μA	6	

(*) Designed value

AC ELECTRICAL CHARACTERISTICS (Continued)

XC2165C2xBxx

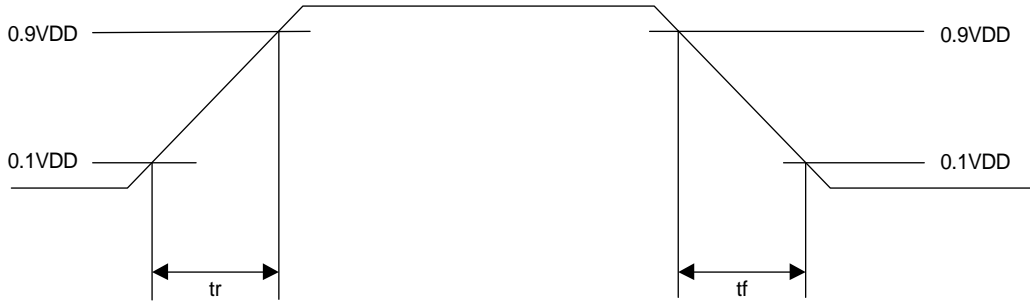
 2.7V Operation (Unless otherwise stated, $V_{DD} = 2.7V$, $f_0 = 120MHz$, $C_L = 5pF$, $T_a = -40^{\circ}C \sim +85^{\circ}C$)

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	t_{osc_on}	$f_0 = 16MHz$	-	-	$3.0^{(*)}$	ms	-

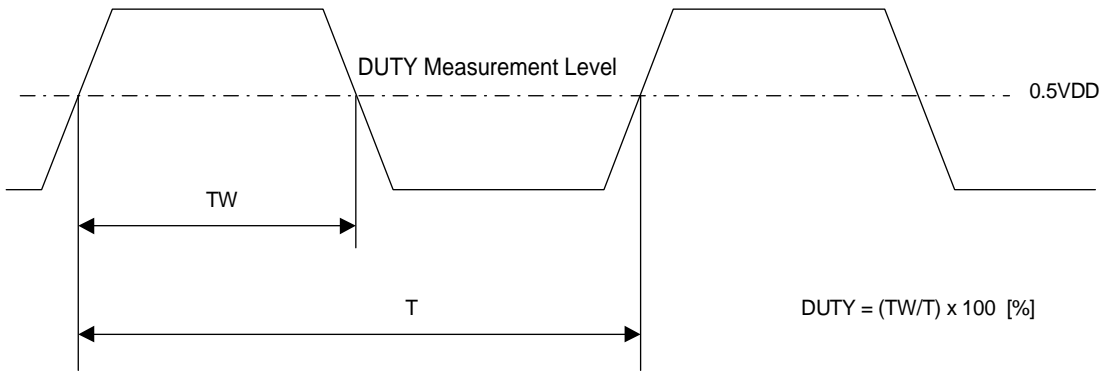
(*) Designed value

SWITCHING CHARACTERISTICS MEASUREMENT WAVEFORMS

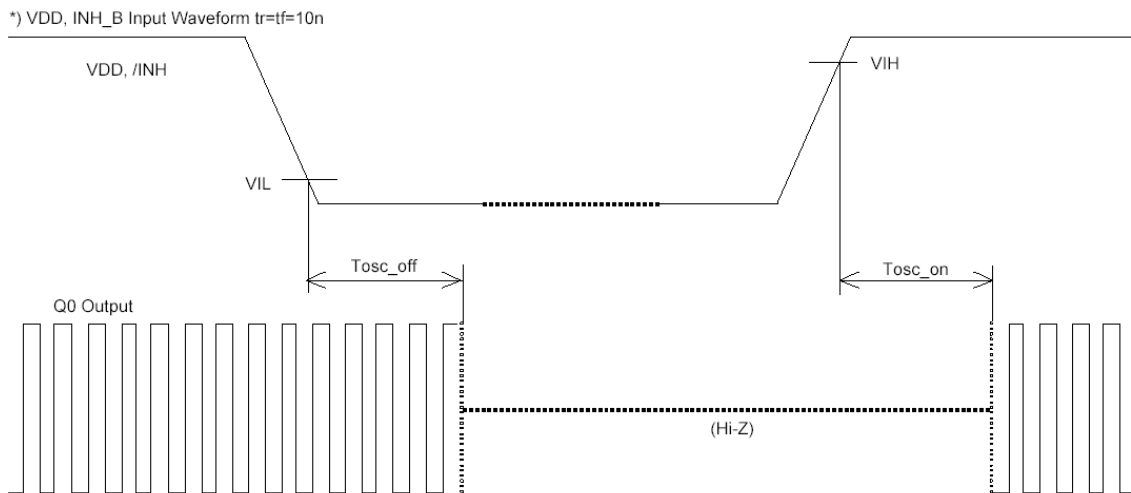
(1) Output Rise Time: t_r / Output Fall Time: t_f



(2) Duty Cycle

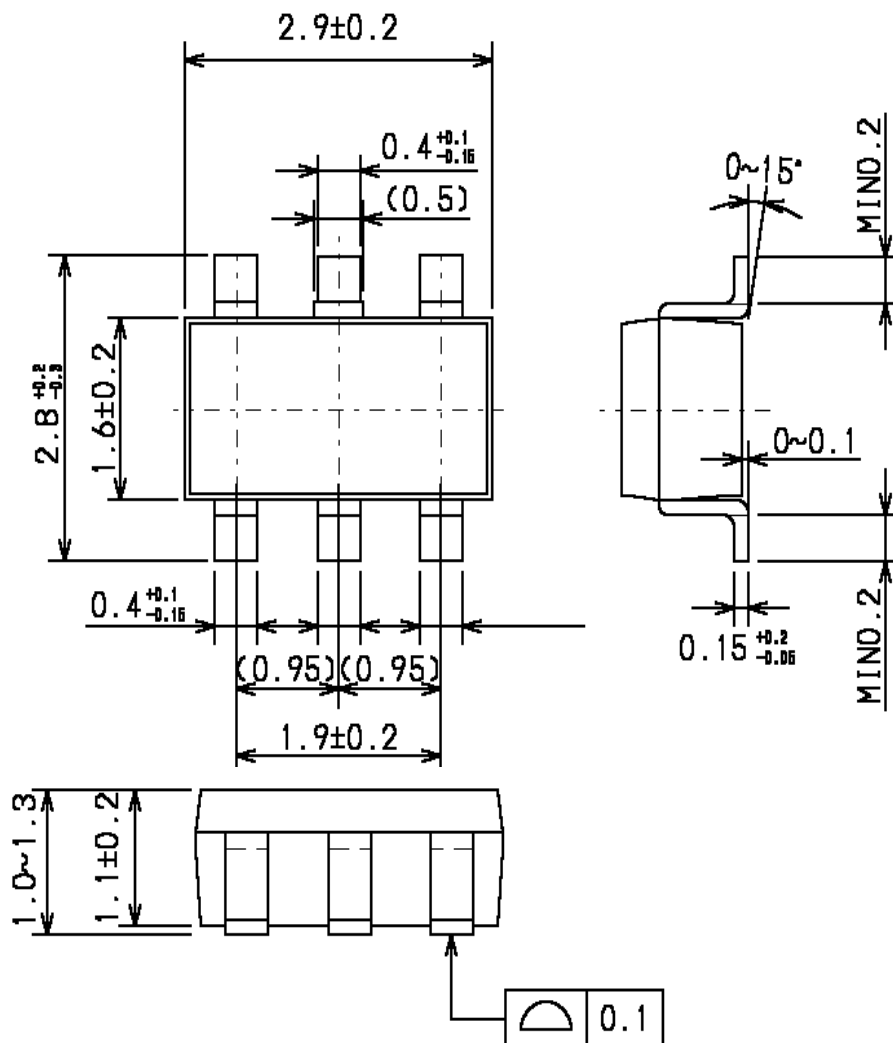


(3) Oscillation Start Time: t_{osc_on} / Oscillation Stop Time: t_{osc_off}

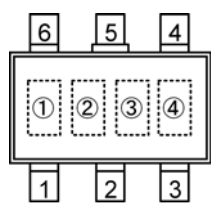


PACKAGING INFORMATION

●SOT-26



MARKING RULE



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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