

XC2163

Series



ICs for use with 3rd Overtone Crystal Oscillators

- ◆CMOS
- ◆Oscillation Frequency : 125MHz (max)
- ◆3-State Output
- ◆Built-in Oscillation Capacitor
- ◆Built-in Oscillation Feedback Resistor
- ◆Mini Mold SOT-26 Package

General Description

The XC2163 series are high frequency, low current consumption CMOS ICs with built-in crystal oscillator and divider circuits.

Output is selectable from any one of the following values for f₀ : f₀/1, f₀/2, f₀/4, f₀/8.

With oscillation capacitors and a feedback resistors built-in, it is possible to configure a stable 3rd overtone oscillator using only an external crystal oscillator.

Also available is an external oscillation capacitor/external oscillation feedback resistor type which makes oscillation frequency control possible.

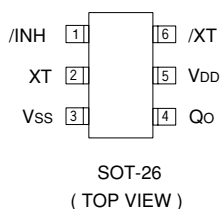
Applications

- Crystal Oscillation Modules
- Computer, DSP Clocks
- Communication Equipment
- Various System Clocks

Features

- Oscillation Frequency** : 40MHz ~ 125MHz (Rf, Cg, Cd internal ; 5.0V)
 - (3rd Overtone)** : 57MHz ~ 125MHz (Rf, Cg, Cd internal ; 3.3V)
 - : 20MHz ~ 125MHz (Rf, Cg, Cd external)
 - Divider Ratio** : Selectable from f₀/1, f₀/2, f₀/4, f₀/8.
 - Output** : 3-State
 - Operating Voltage Range** : 3.3V ±10%, 5.0V ±10%
 - Low Current Consumption**: Stand-by function included *
 - Ultra Small Package** : SOT-26 mini mold
- * oscillation continues in stand-by mode

Pin Configuration



Pin Assignment

PIN NUMBER	PIN NAME	FUNCTION
1	/INH	Stand-by control*
2	XT	Crystal Oscillator Connection (Input)
3	Vss	GND
4	Qo	Clock Output
5	VDD	Power Supply
6	/XT	Crystal Oscillator Connection (Output)

* Stand-by control pin has pull-up resistance built-in.

/INH, QO Pin Function

/INH	Qo
"H"	Divider Output
"L"	High Impedance
OPEN	Divider Output

"H" = High Level

"L" = Low Level

Product Classification

Ordering Information

XC2163 ①②③④⑤⑥

DESIGNATOR	DESCRIPTION	DESIGNATOR	DESCRIPTION
①	Ratio Divider : C = f0/1 E = f0/4 D = f0/2 F = f0/8	④	Recommended Frequency Range & Rf, Cg, Cd values External Type:Z(refer to table 1) Built-in Type:(To Be Determined)
②	Output Capacity : 5 = 10TTL	⑤	Package : M = SOT-26
③	Duty Level : 1 = CMOS (VDD/2) Note : TTL : 20MHz to 37MHz	⑥	Device Orientation : R = Embossed Tape (Standard Feed) L = Embossed Tape (Reverse Feed)

Table 1: Frequency for External Type

SYMBOL	5.0V TYPE			3.3V TYPE		
	Frequency Range	Rf	Cg/Cd	Frequency Range	Rf	Cg/Cd
Z	1 0 8MHz z~1 2 5MHz z	1.6 kΩ	1 0 pF	1 0 8MHz z~1 2 5MHz z	3.9 kΩ	4 pF
	9 3MHz z~1 1 0MHz z	2.4 kΩ	1 0 pF	9 5MHz z~1 1 0MHz z	2.4 kΩ	7 pF
	8 0MHz z~9 5MHz z	2.4 kΩ	1 2 pF	8 0MHz z~9 7MHz z	2.7 kΩ	8 pF
	6 8MHz z~8 3MHz z	2.4 kΩ	1 5 pF	6 8MHz z~8 3MHz z	2.7 kΩ	1 0 pF
	5 5MHz z~7 0MHz z	3.3 kΩ	1 5 pF	5 8MHz z~7 0MHz z	3.9 kΩ	1 0 pF
	4 5MHz z~5 7MHz z	3.3 kΩ	2 0 pF	5 0MHz z~6 0MHz z	3.9 kΩ	1 2 pF
	3 5MHz z~4 7MHz z	3.6 kΩ	2 4 pF	4 0MHz z~5 2MHz z	2.4 kΩ	2 0 pF
	2 8MHz z~3 7MHz z	4.7 kΩ	2 7 pF	3 3MHz z~4 2MHz z	3.6 kΩ	2 0 pF
	2 4MHz z~3 0MHz z	5.6 kΩ	3 0 pF	2 8MHz z~3 5MHz z	3.6 kΩ	2 4 pF
	2 0MHz z~2 6MHz z	6.8 kΩ	3 3 pF	2 4MHz z~3 0MHz z	3.9 kΩ	2 7 pF
	—	—	—	2 0MHz z~2 6MHz z	3.9 kΩ	3 3 pF

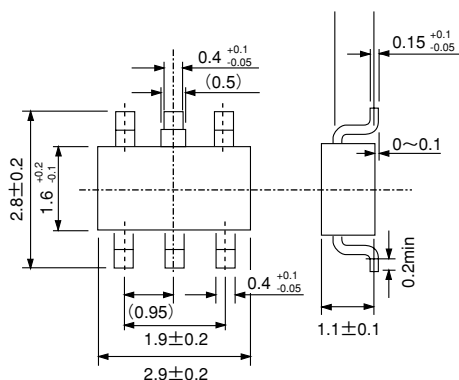
Note : We recommend that a damping resistor Rd be added between the /XT pin & the crystal oscillator pin in order to safeguard the crystal oscillator and improve oscillation stability.

Table 2: Frequency for Internal Type

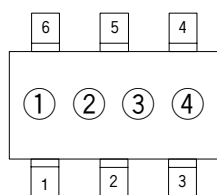
SYMBOL	5.0V TYPE			3.3V TYPE		
	Frequency Range	Rf	Cg/Cd	Frequency Range	Rf	Cg/Cd
A	-	-	-	108MHz ~ 125MHz	1.5kΩ	5.5pF
B	-	-	-	93MHz ~ 110MHz	1.7kΩ	6.5pF
C	108MHz ~ 125MHz	2.2KΩ	5.5pF	80MHz ~ 95MHz	2.2kΩ	5.5pF
D	95MHz ~ 110MHz	2.4KΩ	6.5pF	72MHz ~ 83MHz	2.4kΩ	6.5pF
E	80MHz ~ 97MHz	3.2KΩ	6.5pF	65MHz ~ 75MHz	3.2kΩ	6.5pF
F	68MHz ~ 83MHz	3.7KΩ	6.5pF	57MHz ~ 67MHz	3.7kΩ	6.5pF
H	55MHz ~ 70MHz	4.9KΩ	7.6pF	-	-	-
K	45MHz ~ 57MHz	5.5KΩ	11pF	-	-	-
L	40MHz ~ 48MHz	6.5KΩ	11pF	-	-	-

■ Packaging Information

● SOT-26



■ Marking



SOT-26
(TOP VIEW)

① Represents the Series name

MARK
6

② Represents the Divider Ratio

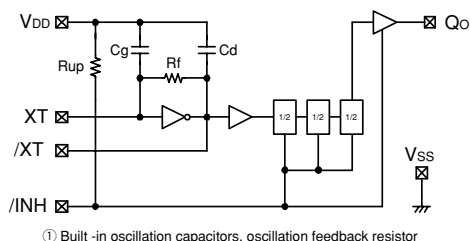
MARK	RATIO	MARK	RATIO
C	$f_o/1$	E	$f_o/4$
D	$f_o/2$	F	$f_o/8$

③ Represents Frequency & R_f, C_g & C_d Values

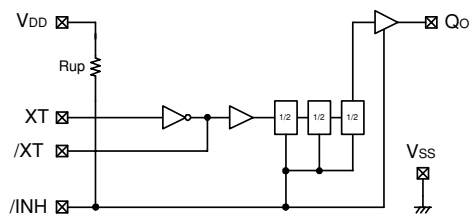
MARK	Frequency (MHz)	
	5.0V	3.3V
A	—	108~125
B	—	93~110
C	108~125	80~95
D	95~110	72~83
E	80~97	65~75
F	68~83	57~67
H	55~70	—
K	45~57	—
L	40~48	—
Z	External	

④ Represents the Assembly Lot No. (based on internal standards)

■ Block Diagram



① Built-in oscillation capacitors, oscillation feedback resistor



② External oscillation capacitors, oscillation feedback resistor

■ Absolute Maximum Ratings

PARAMETER	SYMBOL	CONDITIONS	UNITS
Supply Voltage	V _{DD}	V _{SS} -0.3~V _{SS} +7.0	V
Input Voltage	V _{IN}	V _{SS} -0.3~V _{DD} +0.3	V
Continuous Total Power Dissipation	P _d	250 *	mW
Operating Ambient Temp.	T _{opr}	-30~+80	°C
Storage Temp.	T _{stg}	-55~+125	°C

* when implemented on a glass epoxy PCB

Electrical Characteristics

XC2163C51AMR: (Unless specified, $V_{DD}=3.3V$, $T_a=25^\circ C$)

$f_{osc}=108MHz\sim 125MHz$

PARAMETER	SYMBOL	CONDITIONS	Standard value			UNITS
			MIN	TYP	MAX	
Operating Voltage	V_{DD}		2.97		3.63	V
'H' Level Input Voltage	V_{IH}	/INH pin	2.4			V
'L' Level Input Voltage	V_{IL}	/INH pin			0.4	V
'H' Level Output Voltage	V_{OH}	Qo pin, $V_{DD} = 2.97V$, $I_{OH} = -8mA$	2.2	2.4		V
'L' Level Output Voltage	V_{OL}	Qo pin, $V_{DD} = 2.97V$, $I_{OL} = 8mA$		0.3	0.4	V
Consumption Current 1	I_{DD1}	/INH = OPEN, $C_L = 15pF$, $f = 125MHz$		18		mA
Consumption Current 2	I_{DD2}	/INH = 'L', $f = 125MHz$		5		μA
Input pull up resistance 1	R_{up1}	/INH = 'L'	1.0	2.0	4.0	$M\Omega$
Input pull up resistance 2	R_{up2}	/INH = $0.7V_{DD}$	35	70	140	$k\Omega$
Internal oscillation capacity	C_g	Measured Value		5.5		pF
	C_d	Measured Value		5.5		pF
Internal oscillation feedback resistance	R_f			1.5		$M\Omega$
Output Off Leak Current	I_{oz}	Qo pin, /INH = 'L'			10	μA

note) measured value

XC2163C51BMR: (Unless specified, $V_{DD}=3.3V$, No load, $T_a=25^\circ C$)

$f_{osc}=93MHz\sim 110MHz$

PARAMETER	SYMBOL	CONDITIONS	Standard value			UNITS
			MIN	TYP	MAX	
Operating Voltage	V_{DD}		2.97		3.63	V
'H' Level Input Voltage	V_{IH}	/INH pin	2.4			V
'L' Level Input Voltage	V_{IL}	/INH pin			0.4	V
'H' Level Output Voltage	V_{OH}	Qo pin, $V_{DD} = 2.97V$, $I_{OH} = -8mA$	2.2	2.4		V
'L' Level Output Voltage	V_{OL}	Qo pin, $V_{DD} = 2.97V$, $I_{OL} = 8mA$		0.3	0.4	V
Consumption Current 1	I_{DD1}	/INH = OPEN, $C_L = 15pF$, $f = 110MHz$		15		mA
Consumption Current 2	I_{DD2}	/INH = 'L', $f = 110MHz$		5		μA
Input pull up resistance 1	R_{up1}	/INH = 'L'	1.0	2.0	4.0	$M\Omega$
Input pull up resistance 2	R_{up2}	/INH = $0.7V_{DD}$	35	70	140	$k\Omega$
Internal oscillation capacity	C_g	Measured Value		6.5		pF
	C_d	Measured Value		6.5		pF
Internal oscillation feedback resistance	R_f			1.7		$M\Omega$
Output Off Leak Current	I_{oz}	Qo pin, /INH = 'L'			10	μA

Switching Characteristics

XC2163C51AMR/XC2163C51BMR

CMOS DUTY: $V_{DD}=3.3V$, $T_a=25^\circ C$

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX
Output Rise Time	t_r	$C_L=15pF$, $0.1V_{DD}\rightarrow 0.9V_{DD}$			1.5	
Output Fall Time	t_f	$C_L=15pF$, $0.9V_{DD}\rightarrow 0.1V_{DD}$			1.5	
Output DUTY Cycle	DUTY	C51A	$0.5V_{DD}$, $C_L=15pF$, $f=125MHz$	45		55
		C51B	$0.5V_{DD}$, $C_L=15pF$, $f=110MHz$			
Output Disable (Delay Time)	t_{plz}	$C_L=15pF$				100

■ Electrical Characteristics

XC2163C51ZMR: (Unless specified, $V_{DD}=5.0V$, $T_a=25^{\circ}C$)

$f_{osc} = 108MHz$ to $125MHz$; $R_f = 1.6k\Omega$; $C_g = C_d = 10pF$ external

PARAMETER	SYMBOL	CONDITIONS	Standard value			UNITS
			MIN	TYP	MAX	
Operating Voltage	V_{DD}		4.5		5.5	V
'H' Level Input Voltage	V_{IH}	/INH pin	2.4			V
'L' Level Input Voltage	V_{IL}	/INH pin			0.4	V
'H' Level Output Voltage	V_{OH}	Qo pin, $V_{DD} = 4.5V$, $I_{OH} = -16mA$	3.9	4.2		V
'L' Level Output Voltage	V_{OL}	Qo pin, $V_{DD} = 4.5V$, $I_{OL} = 16mA$		0.3	0.4	V
Consumption Current 1	I_{DD1}	/INH = OPEN, $C_L = 15pF$, $f = 120MHz$		31		mA
Consumption Current 2	I_{DD2}	/INH = 'L', $f = 120MHz$		14		mA
Input pull up resistance 1	R_{up1}	/INH = 'L'	0.5	1.0	2.0	M Ω
Input pull up resistance 2	R_{up2}	/INH = $0.7V_{DD}$	25	50	100	k Ω
Output Off Leak Current	I_{oz}	Qo pin, /INH = 'L'			10	μA

■ Switching Characteristics

CMOS DUTY : $V_{DD}=5.0V$, $T_a=25^{\circ}C$

PARAMETER	SYMBOL	CONDITIONS	Standard value			UNITS
			MIN	TYP	MAX	
Output Rise Time	t_r	$C_L=15pF$, $0.1V_{DD} \rightarrow 0.9V_{DD}$		1.5		ns
Output Fall Time	t_f	$C_L=15pF$, $0.9V_{DD} \rightarrow 0.1V_{DD}$		1.5		ns
Output DUTY Cycle	DUTY	$0.5V_{DD}$, $C_L=15pF$, $f=120MHz$	45		55	%
Output Disable (Delay Time)	tp_{lz}	$C_L=15pF$			100	ns
Output Enable (Delay Time)	tp_{zl}	$C_L=15pF$			100	ns

This data sheet is preliminary therefore, the contents can be changed without advance notice.

Electrical Characteristics

XC2163C51ZMR: (Unless specified, $V_{DD}=3.3V$, $T_a=25^{\circ}C$)

$f_{osc} = 108MHz$ to $125MHz$: $R_f = 3.9k\Omega$, $C_g = C_d = 4pF$ external

PARAMETER	SYMBOL	CONDITIONS	Standard value			UNITS
			MIN	TYP	MAX	
Operating Voltage	V_{DD}		2.97		3.63	V
'H' Level Input Voltage	V_{IH}	/INH pin	2.4			V
'L' Level Input Voltage	V_{IL}	/INH pin			0.4	V
'H' Level Output Voltage	V_{OH}	Qo pin, $V_{DD}=2.97V$, $I_{OH}=-8mA$	2.2	2.4		V
'L' Level Output Voltage	V_{OL}	Qo pin, $V_{DD}=2.97V$, $I_{OL}=8mA$		0.3	0.4	V
Consumption Current 1	I_{DD1}	/INH=OPEN, $C_L=15pF$, $f=120MHz$		15		mA
Consumption Current 2	I_{DD2}	/INH="L", $f=100MHz$		4		mA
Input pull up resistance 1	Rup1	/INH="L"	2.0	4.0	6.0	M Ω
Input pull up resistance 2	Rup2	/INH= $0.7V_{DD}$	70	140	250	k Ω
Output Off Leak Current	IoZ	Qo pin, /INH="L"			10	μA

Switching Characteristics

CMOS DUTY : $V_{DD}=3.3V$, $T_a=25^{\circ}C$

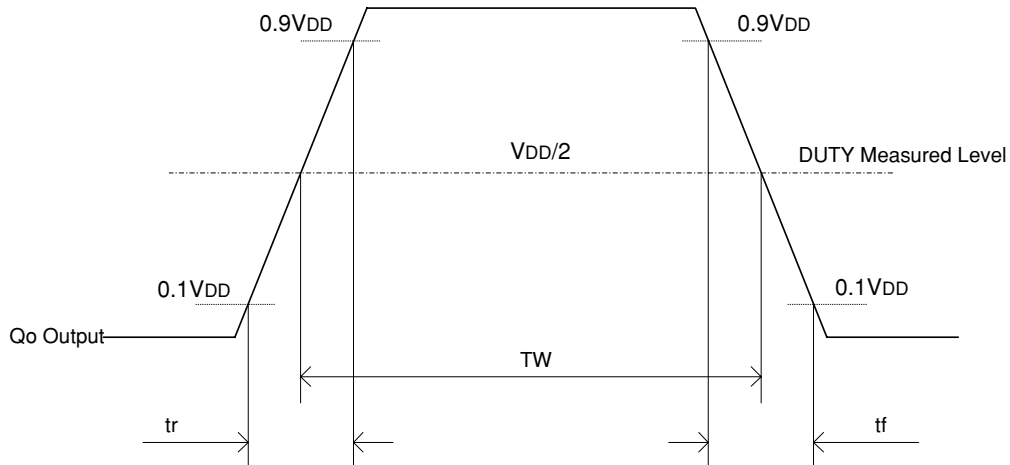
PARAMETER	SYMBOL	CONDITIONS	Standard value			UNITS
			MIN	TYP	MAX	
Output Rise Time	t_r	$C_L=15pF$, $0.1V_{DD} \sim 0.9V_{DD}$		1.5		ns
Output Fall Time	t_f	$C_L=15pF$, $0.9V_{DD} \sim 0.1V_{DD}$		1.5		ns
Output DUTY Cycle	DUTY	$0.5V_{DD}$, $C_L=15pF$, $f=120MHz$	45		55	%
Output Disable (Delay Time)	tplz	$C_L=15pF$			100	ns
Output Enable (Delay Time)	tpzl	$C_L=15pF$			100	ns

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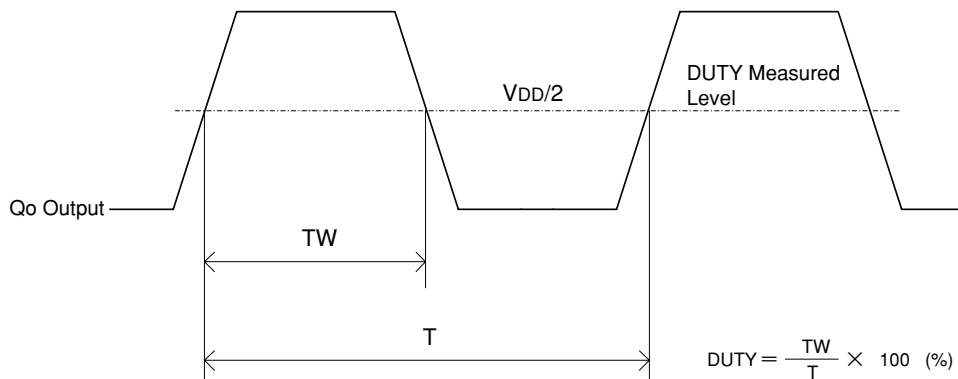
Switching Characteristic Measurement Waveforms

(1) Switching Time

CMOS Output



(2) Output Waveform Symmetry



(3) Output Disable (Delay Time), Output Enable (Delay Time)

*) /INH Pin Input Waveform $t_r = t_f = \text{less than } 10\text{ns}$

