

ICs for use with 3rd Overtone Crystal Oscillators

■ 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

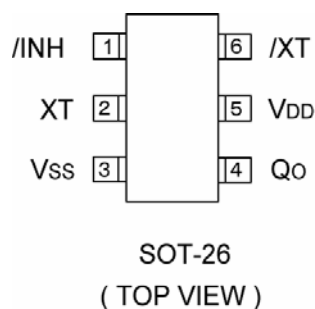
- Crystal Oscillation Modules
- Computer, DSP Clocks
- Communication Equipment
- Various System Clocks

■ FEATURES

- Oscillation Frequency** : 40MHz ~ 125MHz
(R_f, C_g, C_d internal; 5.0V)
- (3rd Overtone)** : 57MHz ~ 125MHz
(R_f, C_g, C_d internal; 3.3V)
- : 20MHz ~ 125MHz
(R_f, C_g, C_d 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 *
- CMOS**
- Built-in Oscillation Capacitor**
- Built-in Oscillation Feedback Resistor**
- Ultra Small Package** : SOT-26

* 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	Q0	Clock Output
5	VDD	Power Supply
6	/XT	Crystal Oscillator Connection (Output)

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

■ /INH, Q0 PIN FUNCTION

/INH	"H" or OPEN	"L"(Stand-by)
Q0	Divider Output	High Impedance

"H" = High Level

"L" = Low Level

PRODUCT CLASSIFICATION

● Ordering Information

XC2163 ①②③④⑤⑥

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Divider Ratio	C	: f0/1
		D	: f0/2
		E	: f0/4
		F	: f0/8
②	Output Capacity	5	: 10TTL
③	Duty Level	1	: CMOS (V _{DD} /2) *TTL : 20MHz to 37MHz
④	Frequency Range & Rf, Cg, Cd Values	Z	: External type (refer to table 1)
		A~L	: Built-in type (refer to table 2)
⑤	Package	M	: SOT-26
⑥	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed

Table 1: Frequency for External Type

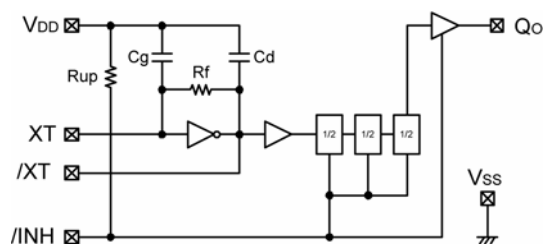
SYMBOL	5.0V TYPE			3.3V TYPE		
	FREQUENCY RANGE	Rf	Cg/Cd	FREQUENCY RANGE	Rf	Cg/Cd
Z	108MHz~125MHz	1.6kΩ	10pF	108MHz~125MHz	3.9kΩ	4pF
	93MHz~110MHz	2.4kΩ	10pF	95MHz~110MHz	2.4kΩ	7pF
	80MHz~95MHz	2.4kΩ	12pF	80MHz~97MHz	2.7kΩ	8pF
	68MHz~83MHz	2.4kΩ	15pF	68MHz~83MHz	2.7kΩ	10pF
	55MHz~70MHz	3.3kΩ	15pF	58MHz~70MHz	3.9kΩ	10pF
	45MHz~57MHz	3.3kΩ	20pF	50MHz~60MHz	3.9kΩ	12pF
	35MHz~47MHz	3.6kΩ	24pF	40MHz~52MHz	2.4kΩ	20pF
	28MHz~37MHz	4.7kΩ	27pF	33MHz~42MHz	3.6kΩ	20pF
	24MHz~30MHz	5.6kΩ	30pF	28MHz~35MHz	3.6kΩ	24pF
	20MHz~26MHz	6.8kΩ	33pF	24MHz~30MHz	3.9kΩ	27pF
	-	-	-	20MHz~26MHz	3.9kΩ	33pF

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.

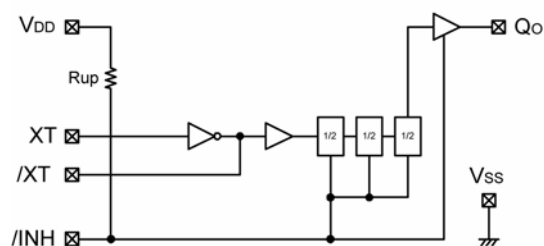
Table 2: Frequency for Built-In Type

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	11.0pF	-	-	-
L	40MHz~48MHz	6.5kΩ	11.0pF	-	-	-

BLOCK DIAGRAMS



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
Power Dissipation	P _d	250 *	mW
Operating Temperature Range	T _{opr}	-30~+80	°C
Storage Temperature Range	T _{stg}	-55~+125	°C

* When implemented on a glass epoxy PCB.

ELECTRICAL CHARACTERISTICS

XC2163C51AMR

Fosc=108MHz~125MHz

(Unless otherwise stated, VDD=3.3V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	STANDARD VALUE			UNITS
			MIN.	TYP.	MAX.	
Operating Voltage	VDD		2.97	-	3.63	V
'H' Level Input Voltage	VIH	/INH pin	2.4	-	-	V
'L' Level Input Voltage	VIL	/INH pin		-	0.4	V
'H' Level Output Voltage	VOH	Qo pin, VDD = 2.97V, IOH = 8mA	2.2	2.4	-	V
'L' Level Output Voltage	VOL	Qo pin, VDD = 2.97V, IOL = 8mA	-	0.3	0.4	V
Supply Current 1	IDD1	/INH = OPEN, CL = 15pF, f = 125MHz	-	18	-	mA
Supply Current 2	IDD2	/INH = 'L', f = 125MHz	-	5	-	mA
Input Pull-Up Resistance 1	Rup1	/INH = 'L'	1.0	2.0	4.0	MΩ
Input Pull-Up Resistance 2	Rup2	/INH = 0.7VDD	35	70	140	kΩ
Internal Oscillation Capacity	Cg	R&D Value	-	5.5	-	pF
	Cd	R&D Value	-	5.5	-	pF
Internal Oscillation Feedback Resistance	Rf		-	1.5	-	kΩ
Output Off Leak Current	Ioz	Qo pin, /INH = 'L'	-	-	10	μA

Note) R&G value

XC2163C51BMR

Fosc=93MHz~110MHz

(Unless otherwise stated, VDD=3.3V, No load, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	STANDARD VALUE			UNITS
			MIN.	TYP.	MAX.	
Operating Voltage	VDD		2.97	-	3.63	V
'H' Level Input Voltage	VIH	/INH pin	2.4	-	-	V
'L' Level Input Voltage	VIL	/INH pin	-	-	0.4	V
'H' Level Output Voltage	VOH	Qo pin, VDD = 2.97V, IOH = 8mA	2.2	2.4	-	V
'L' Level Output Voltage	VOL	Qo pin, VDD = 2.97V, IOL = 8mA	-	0.3	0.4	V
Supply Current 1	IDD1	/INH = OPEN, CL = 15pF, f = 110MHz	-	15	-	mA
Supply Current 2	IDD2	/INH = 'L', f = 110MHz	-	5	-	mA
Input Pull-Up Resistance 1	Rup1	/INH = 'L'	1.0	2.0	4.0	MΩ
Input Pull-Up Resistance 2	Rup2	/INH = 0.7VDD	35	70	140	kΩ
Internal Oscillation Capacity	Cg	R&D Value	-	6.5	-	pF
	Cd	R&D Value	-	6.5	-	pF
Internal Oscillation Feedback Resistance	Rf		-	1.7	-	kΩ
Output Off Leak Current	Ioz	Qo pin, /INH = 'L'	-	-	10	μA

SWITCHING CHARACTERISTICS

XC2163C51AMR/XC2163C51BMR

CMOS DUTY: VDD=3.3V, Ta=25°C

PARAMETER	SYMBOL	CONDITIONS		STANDARD VALUE			UNITS
				MIN.	TYP.	MAX.	
Output Rise Time	tr	CL=15pF, 0.1VDD→0.9VDD		-	1.5	-	ns
Output Fall Time	tf	CL=15pF, 0.9VDD→0.1VDD		-	1.5	-	ns
Output Duty Cycle	DUTY	C51A	0.5VDD, CL=15pF, f=125MHz	45	-	55	%
		C51B	0.5VDD, CL=15pF, f=110MHz				
Output Disable Delay Time	tplz	CL=15pF		-	-	100	ns

■ ELECTRICAL CHARACTERISTICS (Continued)

XC2163C51ZMR

Fosc = 108MHz to 125MHz; Rf = 1.6k Ω , Cg = Cd = 10pF external

(Unless otherwise stated, VDD=5.0V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	STANDARD VALUE			UNITS
			MIN.	TYP.	MAX.	
Operating Voltage	VDD		4.5	-	5.5	V
'H' Level Input Voltage	VIH	/INH pin	2.4	-	-	V
'L' Level Input Voltage	VIL	/INH pin	-	-	0.4	V
'H' Level Output Voltage	VOH	Qo pin, VDD = 4.5V, IOH = -16mA	3.9	4.2	-	V
'L' Level Output Voltage	VOL	Qo pin, VDD = 4.5V, IOL = 16mA	-	0.3	0.4	V
Supply Current 1	IDD1	/INH = OPEN, CL = 15pF, f = 120MHz	-	31	-	mA
Supply Current 2	IDD2	/INH = 'L', f = 120MHz	-	14	-	mA
Input Pull-Up Resistance 1	Rup1	/INH = 'L'	0.5	1.0	2.0	M Ω
Input Pull-Up Resistance 2	Rup2	/INH = 0.7VDD	25	50	100	k Ω
Output Off Leak Current	Ioz	Qo pin, /INH = 'L'	-	-	10	μ A

■ SWITCHING CHARACTERISTICS

XC2163C51ZMR

CMOS DUTY : VDD=5.0V, Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	STANDARD VALUE			UNITS
			MIN.	TYP.	MAX.	
Output Rise Time	tr	CL=15pF, 0.1VDD→0.9VDD	-	1.5	-	ns
Output Fall Time	tf	CL=15pF, 0.9VDD→0.1VDD	-	1.5	-	ns
Output Duty Cycle	DUTY	0.5VDD, CL=15pF, f=120MHz	45	-	55	%
Output Disable Delay Time	tplz	CL=15pF	-	-	100	ns
Output Enable Delay Time	tpzl	CL=15pF	-	-	100	ns

The contents can be changed without advance notice.

ELECTRICAL CHARACTERISTICS (Continued)

XC2163C51ZMR

Fosc= 108MHz to 125MHz : Rf = 3.9k Ω , Cg = Cd = 4pF external

(Unless otherwise stated, VDD=3.3V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	STANDARD VALUE			UNITS
			MIN.	TYP.	MAX.	
Operating Voltage	VDD		2.97	-	3.63	V
'H' Level Input Voltage	VIH	/INH pin	2.4	-	-	V
'L' Level Input Voltage	VIL	/INH pin	-	-	0.4	V
'H' Level Output Voltage	VOH	Qo pin, VDD = 2.97V, IOH = -8mA	2.2	2.4	-	V
'L' Level Output Voltage	VOL	Qo pin, VDD = 2.97V, IOL = 8mA	-	0.3	0.4	V
Supply Current 1	IDD1	/INH = OPEN, CL = 15pF, f = 120MHz	-	15	-	mA
Supply Current 2	IDD2	/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 = 0.7VDD	70	140	250	k Ω
Output Off Leak Current	Ioz	Qo pin, /INH = 'L'	-	-	10	μ A

SWITCHING CHARACTERISTICS

XC2163C51ZMR

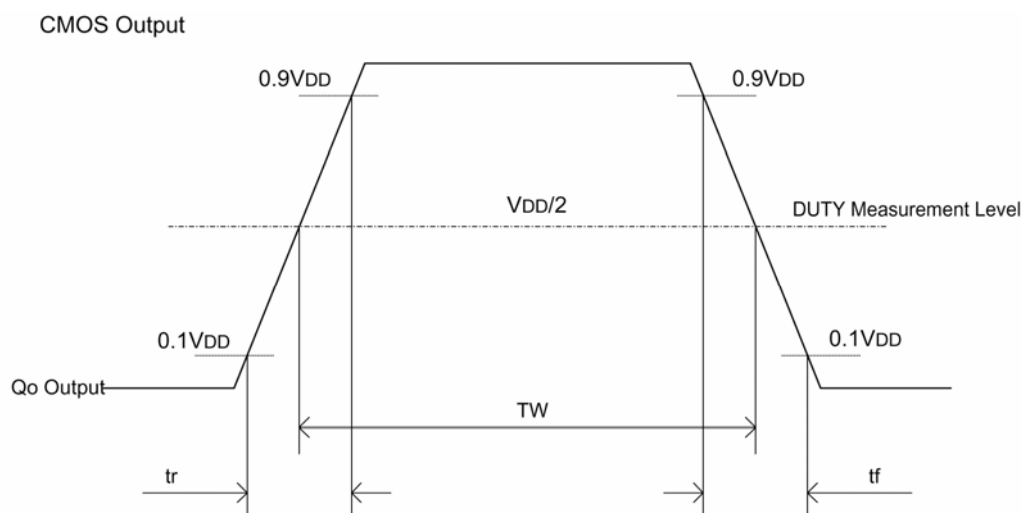
CMOS DUTY : VDD=3.3V, Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	STANDARD VALUE			UNITS
			MIN.	TYP.	MAX.	
Output Rise Time	tr	CL=15pF, 0.1VDD ~ 0.9VDD	-	1.5	-	ns
Output Fall Time	tf	CL=15pF, 0.9VDD ~ 0.1VDD	-	1.5	-	ns
Output Duty Cycle	DUTY	0.5VDD, CL=15pF, f=120MHz	45	-	55	%
Output Disable Delay Time	tplz	CL=15pF	-	-	100	ns
Output Enable Delay Time	tpzl	CL=15pF	-	-	100	ns

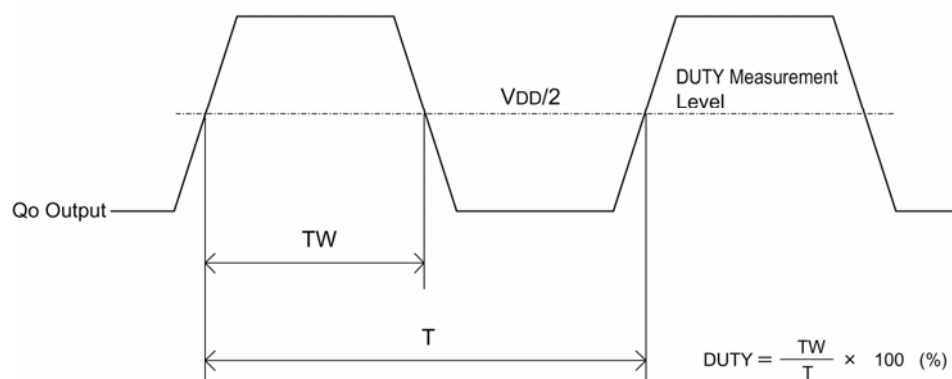
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■ SWITCHING CHARACTERISTICS MEASUREMENT WAVEFORMS

(1) Switching Time

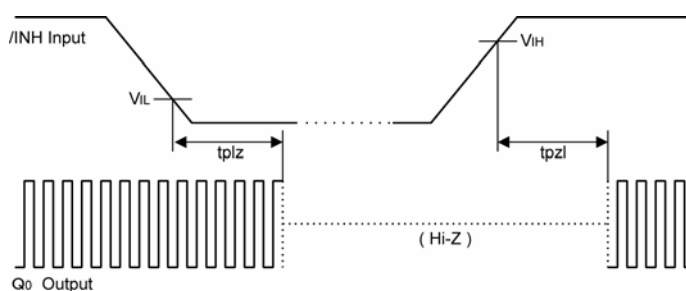


(2) Output Waveform Symmetry



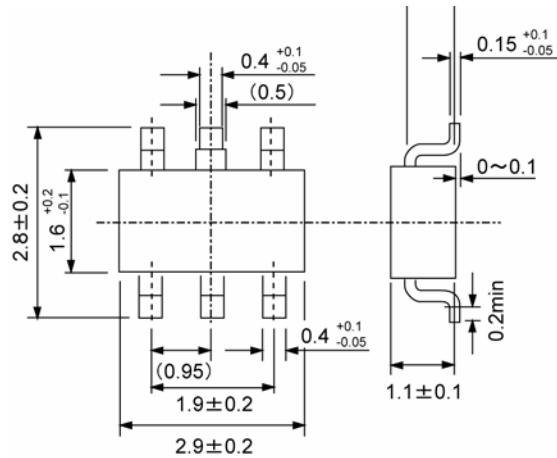
(3) Output Disable Delay Time, Output Enable Delay Time

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

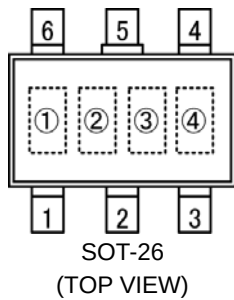


PACKAGING INFORMATION

● SOT-26



MARKING RULE



① Represents product series

MARK
6

② Represents divider ratio

MARK	RATIO	MARK	RATIO
C	fo/1	E	fo/4
D	fo/2	F	fo/8

③ Represents frequency & Rf, Cg & Cd 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 assembly lot number
(Based on internal standards)

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