

ICs for use with Crystal Oscillators (PLL built - in)

■ GENERAL DESCRIPTION

The XC2173 series are high frequency, low power consumption CMOS ICs with built-in crystal oscillator, divider and clock multiplier PLL circuits. Output is selectable from any one of the following values for f_0 : $f_0 \times 5$, $f_0 \times 6$, $f_0 \times 7$, $f_0 \times 8$, $f_0/2$, $f_0/4$, $f_0/8$. With an oscillation capacitor & oscillation feedback resistor built-in, a stable oscillator circuit can be put together using only an external crystal oscillator.

By connecting an external standard clock, the above mentioned output frequencies can be achieved.

■ APPLICATIONS

- Crystal oscillation modules
- Computer, DSP clocks
- Communication equipment
- Various system clocks

■ FEATURES

- Oscillation Frequency** : 10MHz ~ 25MHz
- Divider Ratio** : $f_0/2$, $f_0/4$, $f_0/8$
- Multiplier** : $f_0 \times 5$, $f_0 \times 6$, $f_0 \times 7$, $f_0 \times 8$
- Output** : 3-State
- Operating Voltage Range** : 3.3V $\pm 10\%$ and 5.0V $\pm 10\%$
- Small Consumption Current**: Stand-by function included*
* Oscillation continues in stand-by

CMOS

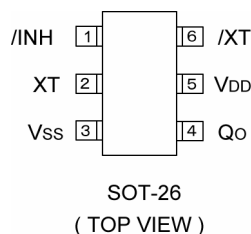
- Output Frequency** : 80MHz ~ 160MHz (5.0V)
: 50MHz ~ 125MHz (3.3V)

Divider Circuit & PLL Circuit Built-In

Oscillation Capacitor & Oscillation Feedback Resistor Built-In

- Ultra Small Package** : SOT-26

■ 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) /Standard Clock Input

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

■ INH, Q0 PIN FUNCTION

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

"H" = High level

"L" = Low level

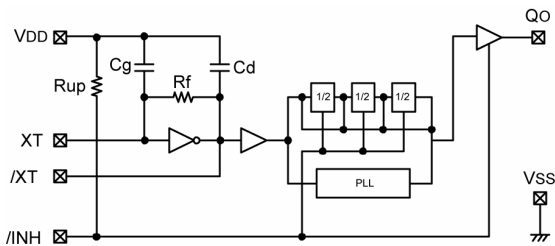
PRODUCT CLASSIFICATION

Ordering Information

XC2173①②③④⑤⑥

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Duty Level	C	: CMOS (VDD/2)
②	Output Capacity	M	: Multiplier output
		D	: Divider output
③	Multiplier or Divider Ratio	2	: $f_0 / 2$
		4	: $f_0 / 4$
		5	: $f_0 \times 5$
		6	: $f_0 \times 6$
		7	: $f_0 \times 7$
		8	: $f_0 / 8$ & $f_0 \times 8$
④	Input Oscillation Frequency	1	: 10MHz ~ 25MHz
⑤	Package	M	: SOT-26
⑥	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	CONDITIONS	UNITS
Supply Voltage	VDD	Vss-0.3~Vss+7.0	V
Input Voltage	VIN	Vss-0.3~VDD+0.3	V
Power Dissipation	Pd	250 (*)	mW
Operating Temperature Range	Topr	-40~+85	°C
Storage Temperature Range	Tstg	-55~+125	°C

* When measured on a glass epoxy PCB

ELECTRICAL CHARACTERISTICS

 3.3V, f₀ x 8 multiplier (*1)

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		2.97	3.30	3.63	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =2.97V, I _{OH} =-8mA	2.47	-	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =2.97V, I _{OL} =8mA	-	-	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", C _L =15pF, f=80MHz	-	10	-	mA
Supply Current 2	I _{DD2}	/INH="L", C _L =15pF, f=80MHz	-	1	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	1.0	2.0	4.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	35	70	140	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		0.3	1.0	2.0	MΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

 5.0V, f₀ x 8 multiplier (*2)

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		4.5	5.0	5.5	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =4.5V, I _{OH} =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =4.5V, I _{OL} =16mA	-	0.3	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", C _L =15pF, f=160MHz	-	35	-	mA
Supply Current 2	I _{DD2}	/INH="L", C _L =15pF, f=160MHz	-	5	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	0.5	1.0	2.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	25	50	100	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		100	240	400	kΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

 *1: Output frequency range is 80 MHz to 125MHz with a multiplier of f₀ x 8 at 3.3V

 *2: Output frequency range is 80 MHz to 160MHz with a multiplier of f₀ x 8 at 5.0V

*3: R&D value

ELECTRICAL CHARACTERISTICS (Continued)

3.3V, f₀ x 7 multiplier (*1)

T_a=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		2.97	3.30	3.63	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =2.97V, I _{OH} =-8mA	2.47	-	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =2.97V, I _{OL} =8mA	-	-	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", C _L =15pF, f=70MHz	-	9	-	mA
Supply Current 2	I _{DD2}	/INH="L", C _L =15pF, f=70MHz	-	1	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	1.0	2.0	4.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	35	70	140	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		0.3	1.0	2.0	MΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

5.0V, f₀ x 7 multiplier (*2)

T_a=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		4.5	5.0	5.5	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =4.5V, I _{OH} =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =4.5V, I _{OL} =16mA	-	0.3	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", C _L =15pF, f=140MHz	-	28	-	mA
Supply Current 2	I _{DD2}	/INH="L", C _L =15pF, f=140MHz	-	5	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	0.5	1.0	2.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	25	50	100	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		100	240	400	kΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

*1 : Output frequency range is 70 MHz to 125MHz with a multiplier of f₀ x 7 at 3.3V

*2 : Output frequency range is 80 MHz to 160MHz with a multiplier of f₀ x 7 at 5.0V

*3 : R&D value

■ ELECTRICAL CHARACTERISTICS (Continued)

3.3V, f0 x 6 multiplier (*1)

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		2.97	3.30	3.63	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =2.97V, I _{OH} =-8mA	2.47	-	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =2.97V, I _{OL} =8mA	-	-	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", CL=15pF, f=60MHz	-	8	-	mA
Supply Current 2	I _{DD2}	/INH="L", CL=15pF, f=60MHz	-	1	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	1.0	2.0	4.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	35	70	140	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		0.3	1.0	2.0	MΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

5.0V, f0 x 6 multiplier (*2)

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		4.5	5.0	5.5	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =4.5V, I _{OH} =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =4.5V, I _{OL} =16mA	-	0.3	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", CL=15pF, f=120MHz	-	23	-	mA
Supply Current 2	I _{DD2}	/INH="L", CL=15pF, f=120MHz	-	5	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	0.5	1.0	2.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	25	50	100	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		100	240	400	kΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

*1: Output frequency range is 60 MHz to 125MHz with a multiplier of f0 x 6 at 3.3V

*2: Output frequency range is 80 MHz to 150MHz with a multiplier of f0 x 6 at 5.0V

*3:R&D value

ELECTRICAL CHARACTERISTICS (Continued)

3.3V, f0 x 5 multiplier (*1)

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		2.97	3.30	3.63	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =2.97V, I _{OH} =-8mA	2.47	-	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =2.97V, I _{OL} =8mA	-	-	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", C _L =15pF, f=50MHz	-	7	-	mA
Supply Current 2	I _{DD2}	/INH="L", C _L =15pF, f=50MHz	-	1	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	1.0	2.0	4.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	35	70	140	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		0.3	1.0	2.0	MΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

5.0V, f0 x 5 multiplier (*2)

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V _{DD}		4.5	5.0	5.5	V
'H' Level Input Voltage	V _{IH}		2.4	-	-	V
'L' Level Input Voltage	V _{IL}		-	-	0.4	V
'H' Level Output Voltage	V _{OH}	CMOS: V _{DD} =4.5V, I _{OH} =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V _{OL}	CMOS: V _{DD} =4.5V, I _{OL} =16mA	-	0.3	0.4	V
Supply Current 1	I _{DD1}	/INH="OPEN", C _L =15pF, f=100MHz	-	23	-	mA
Supply Current 2	I _{DD2}	/INH="L", C _L =15pF, f=100MHz	-	5	-	mA
Input Pull-Up Resistance 1	R _{up1}	/INH="L"	0.5	1.0	2.0	MΩ
Input Pull-Up Resistance 2	R _{up2}	/INH=0.7V _{DD}	25	50	100	kΩ
Internal Oscillation Capacitance	C _g	(*3)	-	13	-	pF
	C _d	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R _f		100	240	400	kΩ
Output Off Leak Current	I _{oz}	/INH="L"	-	-	10	μA

*1: Output frequency range is 50 MHz to 125MHz with a multiplier of f0 x 5 at 3.3V

*2: Output frequency range is 80 MHz to 125MHz with a multiplier of f0 x 5 at 5.0V

*3: R&D value

■ SWITCHING CHARACTERISTICS

3.3V

Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Rise Time	tr	CL=15pF, 0.1VDD ~ 0.9VDD (*1)	-	2.0	-	ns
Output Fall Time	tf	CL=15pF, 0.9VDD ~ 0.1VDD (*1)	-	2.0	-	ns
Output DUTY Cycle	DUTY	CMOS: 0.5VDD, CL=15pF	45	-	55	%
Output Disable Delay Time	tplz	CL=15pF (*1)	-	-	100	ns
Output Enable Delay Time	tpzl	CL=15pF (*1)	-	-	100	ns
Jitter	tj	1σ (*1)	-	50	-	ps

5.0V

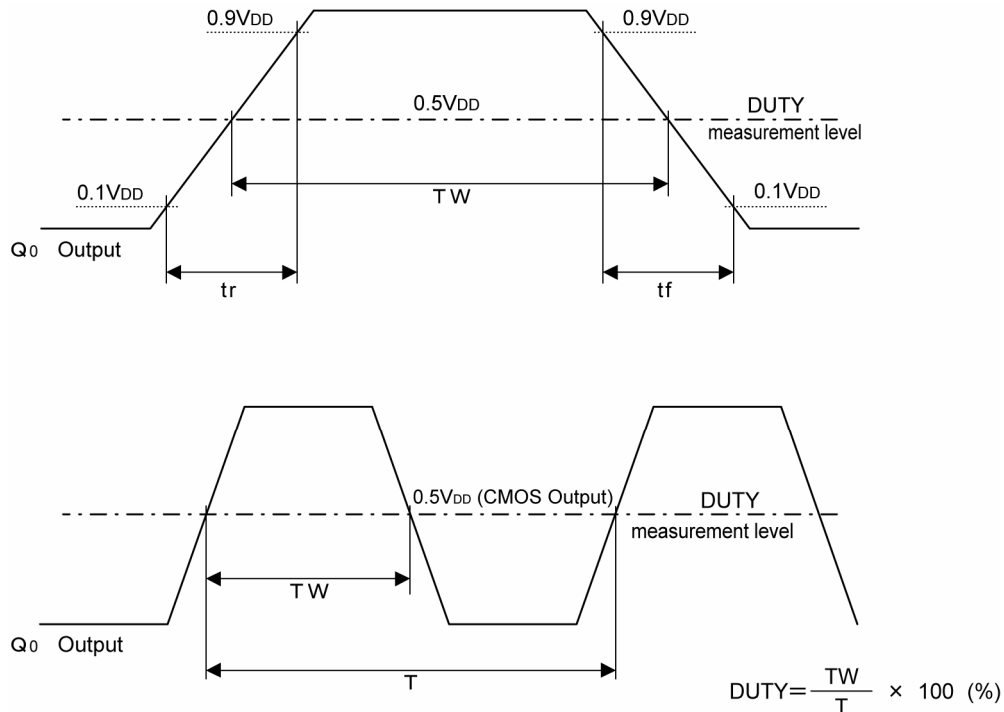
Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Rise Time	tr	CL=15pF, 0.1VDD ~ 0.9VDD (*1)	-	1.5	-	ns
Output Fall Time	tf	CL=15pF, 0.9VDD ~ 0.1VDD (*1)	-	1.5	-	ns
Output DUTY Cycle	DUTY	CMOS: 0.5VDD, CL=15pF	45	-	55	%
Output Disable Delay Time	tplz	CL=15pF (*1)	-	-	100	ns
Output Enable Delay Time	tpzl	CL=15pF (*1)	-	-	100	ns
Jitter	tj	1σ (*1)	-	50	-	ps

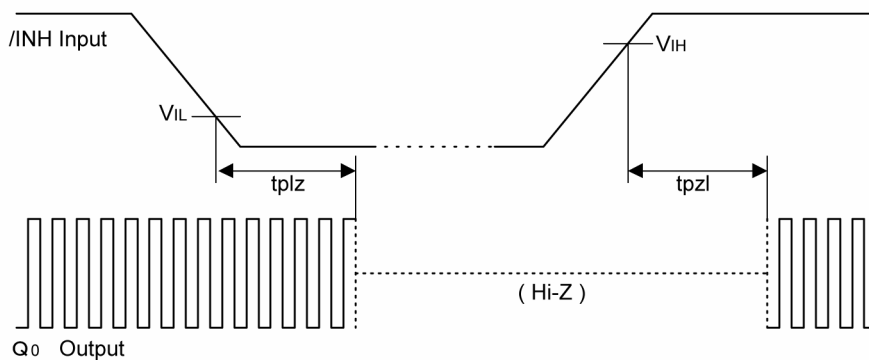
*1 : R&D value

SWITCHING CHARACTERISTICS

1) CMOS Level: tr , tf , Duty



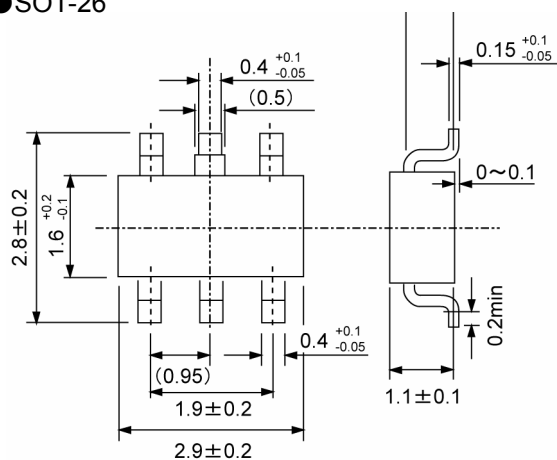
2) Output Disable/Enable Delay Time



*) $/INH$ pin input waveform: $t_r = t_f =$ less than 10 ns

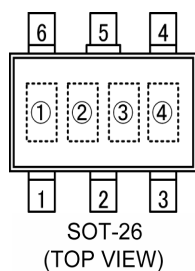
PACKAGING INFORMATION

● SOT-26



MARKING RULE

● SOT-26



① Represents product series

MARK
7

② Represents output

MARK	OUTPUT
M	Multiplier
D	Divider

③ Represents multiplier and/or divider ratio

MARK	RATIO	MARK	RATIO
2	f0/2	6	f0 x 6
4	f0/4	7	f0 x 7
5	f0/5	8	f0/8 & f0 x 8

④ Represents assembly lot number.
(Based on internal standards)

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