OVERVIEW

The SM5010 series are crystal oscillator module ICs. They incorporate oscillator and output buffer circuits, employing built-in oscillator capacitors and feedback resistors with excellent frequency response, eliminating the need for external components to form a stable crystal oscillator. There are 7 oscillator configurations available for design and application optimization.

FEATURES

- 7 types of oscillation circuit structure
  For fundamental oscillator
  - 5010A×× : Simple structure with low frequency variation
  - 5010B×× : Low crystal current type with R_D built-in oscillation circuit
  - 5010CL× : Oscillation stop function built-in
  - 5010DN× : External capacitors, C_G and C_D required
  - 5010EA× : Low current consumption type

  For 3rd overtone oscillator
  - 5010F×× : Suitable for round blank
  - 5010H×× : External resistor, R_f required
- 2.7 to 5.5V operating supply voltage
- Capacitors C_G, C_D built-in
- Inverter amplifier feedback resistor built-in
- Output duty level
  - TTL level: AK×, BK×, HK×
  - CMOS level: AN×, AH×, BN×, BH×, CL×, DN×, EA×, FN×, FH×, HN×
- Oscillator frequency output (f_O, $f_O/2$, $f_O/4$, $f_O/8$, $f_O/16$ determined by internal connection)
- Standby function
- Pull-up resistor built-in
- 8-pin SOP (SM5010×××S)
- Chip form (CF5010×××)

SERIES CONFIGURATION

For Fundamental Oscillator

Version[1]	Operating supply voltage range [V]	Built-in capacitance		R_D [Ω]	Output current (V_{DD} = 5V) [mA]	Output duty level	Output frequency	INHN input level (V_{DD} = 5V)	Standby mode	
		C_G [pF]	C_D [pF]						Oscillator stop function	Output state
CF5010AN1	2.7 to 5.5	29	29	–	16	CMOS	f_O	TTL	No	High impedance
CF5010AN2						CMOS/TTL	$f_O/2$			
CF5010AN3							$f_O/4$			
CF5010AN4							$f_O/8$			
CF5010AK1	4.5 to 5.5	29	29	–	16	TTL	f_O	TTL	No	High impedance
CF5010AH1	2.7 to 5.5	29	29	–	4	CMOS	f_O	TTL	No	High impedance
CF5010AH2							$f_O/2$			
CF5010AH3							$f_O/4$			
CF5010AH4							$f_O/8$			
CF5010BN1	2.7 to 5.5	22	22	820	16	CMOS	f_O	TTL	No	High impedance
CF5010BN2						CMOS/TTL	$f_O/2$			
CF5010BN3							$f_O/4$			
CF5010BN4							$f_O/8$			
CF5010BN5							$f_O/16$			
CF5010BK1	4.5 to 5.5	22	22	820	16	TTL	f_O	TTL	No	High impedance
CF5010BH1	2.7 to 5.5	22	22	820	4	CMOS	f_O	TTL	No	High impedance
CF5010BH2							$f_O/2$			
CF5010BH3							$f_O/4$			
CF5010BH4							$f_O/8$			
CF5010CL1	2.7 to 5.5	18	18	–	16	CMOS	f_O	CMOS	Yes	High impedance
CF5010CL2							$f_O/2$			
CF5010CL3							$f_O/4$			
CF5010CL4							$f_O/8$			
CF5010CL5							$f_O/16$			
CF5010DN1	2.7 to 5.5	–	–	820	16	CMOS	f_O	TTL	No	High impedance
CF5010EA1	2.7 to 5.5	10	15	820	4	CMOS	f_O	TTL	Yes	LOW
CF5010EA2							$f_O/2$			

1. Package devices have designation SM5010×××S.

SERIES CONFIGURATION

For 3rd Overtone Oscillator

Version	Operating supply voltage range [V]	gm ratio	Built-in capacitance		R_f [kΩ]	Output current (V_{DD} = 5V) [mA]	Output duty level
			C_G [pF]	C_D [pF]			
CF5010FNA	2.7 to 5.5	1.00	13	15	4.2	16	CMOS
CF5010FNC			11	17	3.1		
CF5010FND			13	17	2.2		
CF5010FNE	4.5 to 5.5		8	15	2.2		
CF5010FHA	4.5 to 5.5	1.00	13	15	4.2	4	CMOS
CF5010FHC			11	17	3.1		
CF5010FHD			13	17	2.2		
CF5010FHE			8	15	2.2		
CF5010HN1	4.5 to 5.5	1.17	13	17	200	16	CMOS
CF5010HK1	4.5 to 5.5	1.17	13	17	200	16	TTL

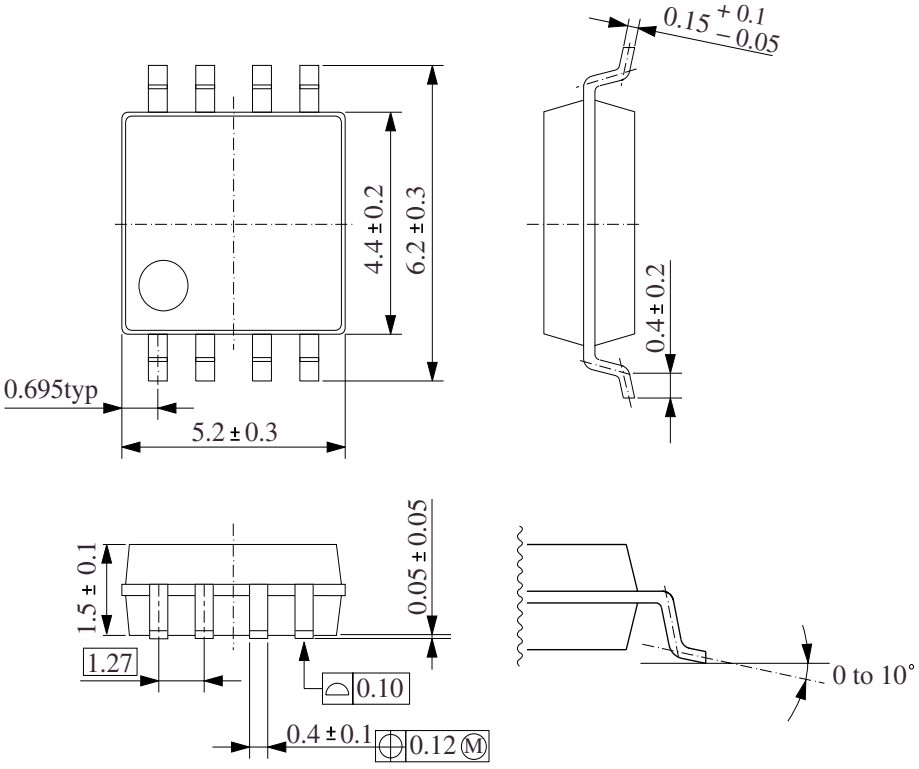
ORDERING INFORMATION

Device	Package
SM5010×××S	8-pin SOP
CF5010×××–1	Chip form

PACKAGE DIMENSIONS

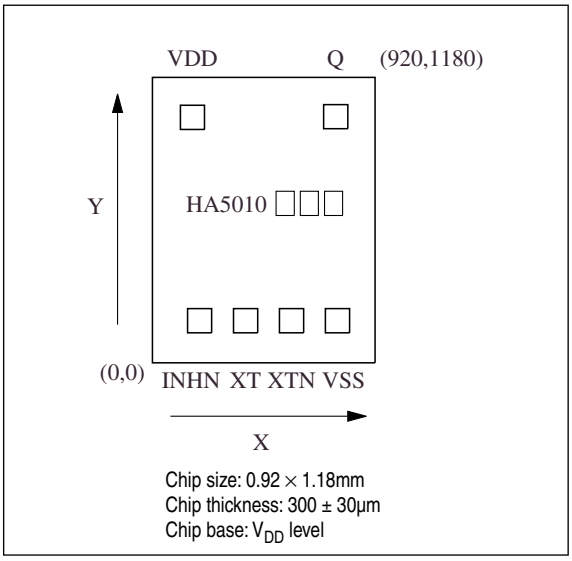
(Unit: mm)

• 8-pin SOP



PAD LAYOUT

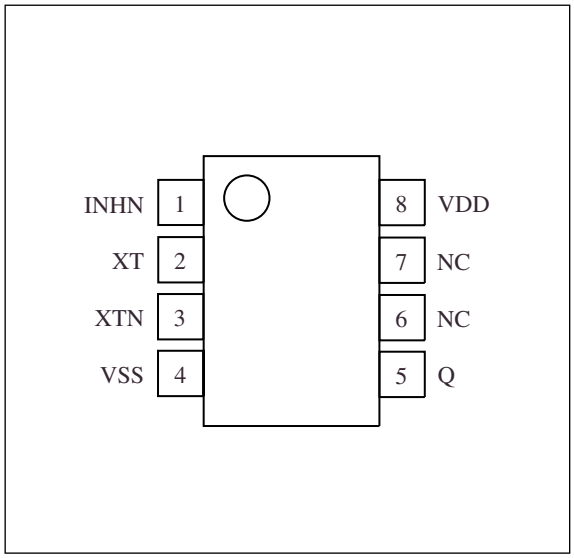
(Unit: µm)



Chip size: 0.92 × 1.18mm
Chip thickness: 300 ± 30µm
Chip base: V_{DD} level

PINOUT

(Top view)



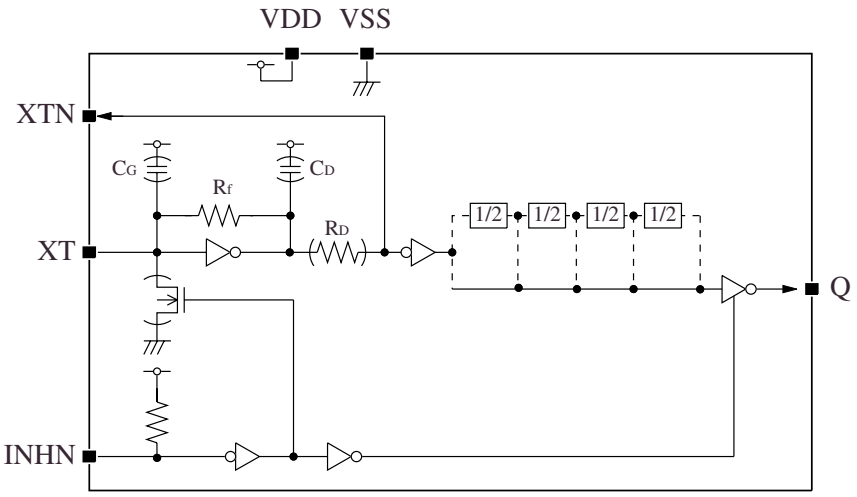
PIN DESCRIPTION and PAD DIMENSIONS

Number	Name	I/O	Description		Pad dimensions [µm]	
					X	Y
1	INHN	I	Output state control input. Standby mode when LOW, pull-up resistor built in. In the case of the 5010CL×, the oscillator stops and Power-saving pull-up resistor is built-in to reduce current consumption at standby mode.		195	174.4
2	XT	I	Amplifier input.	Crystal oscillator connection pins. Crystal oscillator connected between XT and XTN	385	174.4
3	XTN	O	Amplifier output.		575	174.4
4	VSS	–	Ground		765	174.4
5	Q	O	Output. Output frequency (f_O, $f_O/2$, $f_O/4$, $f_O/8$, $f_O/16$) determined by internal connection		757.6	1017.6
6	NC	–	No connection		–	–
7	NC	–	No connection		–	–
8	VDD	–	Supply voltage		165.4	1014.6

BLOCK DIAGRAM

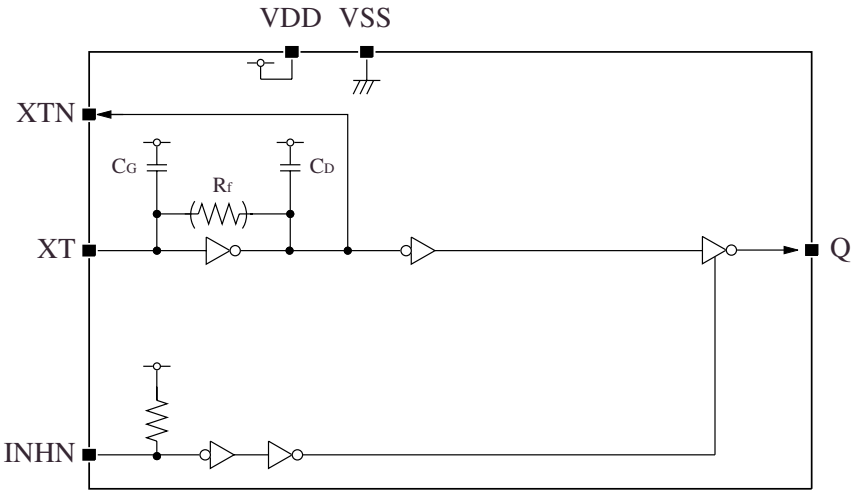
For Fundamental Oscillator

■ 5010A××, B××, CL×, DN×, EA× series



For 3rd Overtone Oscillator

■ 5010F××, H×× series



FUNCTIONAL DESCRIPTION

Standby Function

5010AH×, AK×, AN×, BH×, BK×, BN×, DN×, FN×, FH×, HN×, HK× series

When INHN goes LOW, the output on Q becomes high impedance, but internally the oscillator does not stop.

5010CL× series

When INHN goes LOW, the oscillator stops and the oscillator output on Q becomes high impedance.

5010EA× series

When INHN goes LOW, the oscillator stops and the oscillator output on Q becomes LOW.

Version	INHN	Q	Oscillator
AH×, AK×, AN×, BH×, BK×, BN×, DN×, FH×, FH×, HN×, HK× series	HIGH (or open)	Any f_O, $f_O/2$, $f_O/4$, $f_O/8$ or $f_O/16$ output frequency	Normal operation
	LOW	High impedance	Normal operation
CL× series	HIGH (or open)	Any f_O, $f_O/2$, $f_O/4$, $f_O/8$ or $f_O/16$ output frequency	Normal operation
	LOW	High impedance	Stopped
EA× series	HIGH (or open)	Either f_O or $f_O/2$ output frequency	Normal operation
	LOW	LOW	Stopped

Power-saving Pull-up Resistor (CL series only)

The INHN pull-up resistance changes in response to the input level (HIGH or LOW). When INHN goes LOW (standby state), the pull-up resistance becomes large to reduce the current consumption during standby.

SPECIFICATIONS

Absolute Maximum Ratings

V_{SS} = 0V

Parameter	Symbol	Condition	Rating	Unit
Supply voltage range	V_{DD}		–0.5 to +7.0	V
Input voltage range	V_{IN}		–0.5 to V_{DD} + 0.5	V
Output voltage range	V_{OUT}		–0.5 to V_{DD} + 0.5	V
Operating temperature range	T_{opr}		–40 to +85	°C
Storage temperature range	T_{stg}	Chip form	–65 to +150	°C
		8-pin SOP	–55 to +125	
Output current	I_{OUT}	AH×, BH×, FH×, EA×	10	mA
		AN×, AK×, BN×, BK×, CL×, DN×, FN×, HN×, HK×	25	
Power dissipation	P_D	8-pin SOP	500	mW

Recommended Operating Conditions

3V operation

V_{SS} = 0V

Parameter	Symbol	Version	Condition	Rating	Unit
Operating supply voltage	V_{DD}	All version		2.7 to 3.6	V
Input voltage	V_{IN}	All version		V_{SS} to V_{DD}	V
Operating temperature	T_{OPR}	5010AN×		–10 to +70	°C
		5010AH×			
		5010BN×			
		5010BH×			
		5010CL×		–20 to +80	
		5010DN1		–10 to +70	
		5010EA×			
		5010FN×			
Operating frequency	f	5010AN×	$C_L \leq$ 15pF	2 to 30	MHz
		5010AH×		2 to 16	
		5010BN×		2 to 30	
		5010BH×		2 to 16	
		5010CL×		2 to 30	
		5010DN1			
		5010EA×			
		5010FN×		22 to 40	

5V operation

$V_{SS} = 0V$

Parameter	Symbol	Version	Condition	Rating	Unit
Operating supply voltage	V_{DD}	All version		4.5 to 5.5	V
Input voltage	V_{IN}	All version		V_{SS} to V_{DD}	V
Operating temperature	T_{OPR}	5010AN×		–40 to +85	°C
		5010AK×			
		5010AH×			
		5010BN×			
		5010BK×			
		5010BH×			
		5010CL×			
		5010DN1			
		5010EA×	$C_L \leq 15pF$, f = 2 to 30MHz		
			$C_L \leq 15pF$, f = 2 to 40MHz	–10 to +70	
		5010FN×	$C_L \leq 50pF$, 30MHz ≤ f ≤ 50MHz	–20 to +80	
			$C_L \leq 15pF$, 50MHz ≤ f ≤ 70MHz	–15 to +75	
		5010FH×	$C_L \leq 15pF$, 30MHz ≤ f ≤ 50MHz	–20 to +80	
			$C_L \leq 15pF$, 50MHz ≤ f ≤ 60MHz	–15 to +75	
		5010HN1		–40 to +85	
		5010HK1			
Operating frequency	f	5010AN×	$C_L \leq 50pF$	2 to 30	MHz
		5010AK×	$C_L \leq 15pF$		
		5010AH×			
		5010BN×	$C_L \leq 50pF$		
		5010BK×	$C_L \leq 15pF$		
		5010BH×			
		5010CL×	$C_L \leq 50pF$		
		5010DN1			
		5010EA×	$C_L \leq 15pF$, Ta = – 40 to + 85°C	2 to 40	
		5010FN×	$C_L \leq 50pF$, Ta = – 20 to + 80°C	30 to 50	
			$C_L \leq 15pF$, Ta = – 15 to + 75°C	50 to 70	
		5010FH×	$C_L \leq 15pF$, Ta = – 20 to + 80°C	30 to 50	
			$C_L \leq 15pF$, Ta = – 15 to + 75°C	50 to 60	
		5010HN1	$C_L \leq 50pF$	22 to 50	
		5010HK1	$C_L \leq 15pF$		

Electrical Characteristics

5010AN×, BN×, DN× series

3V operation: V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 2.7V, I_{OH} = 8mA		2.1	2.4	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.7V, I_{OL} = 8mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.5	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 3.6V	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF, f = 30MHz	5010×N1	–	5	10	mA
			5010×N2	–	3.5	7	
			5010×N3	–	2.5	5	
			5010×N4	–	2	4	
			5010×N5	–	2	4	
INHN pull-up resistance	R_{UP2}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Oscillator amplifier output resistance	R_D	Design value	5010B××	690	820	940	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	5010A××	26	29	32	pF
			5010B××	20	22	24	
	C_D		5010A××	26	29	32	
			5010B××	20	22	24	

5010AN×, AK×, BN×, BK×, DN× series

5V operation: V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 4.5V, I_{OH} = 16mA		3.9	4.2	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 4.5V, I_{OL} = 16mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.8	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 5.5V	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 50pF, f = 30MHz	5010×N1	–	15	30	mA
			5010×N2	–	9	18	
			5010×N3	–	6	12	
			5010×N4	–	5	10	
			5010×N5	–	5	10	
		Measurement cct 3, load cct 2, INHN = open, C_L = 15pF, f = 30MHz	5010×K1	–	10	20	
INHN pull-up resistance	R_{UP2}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Oscillator amplifier output resistance	R_D	Design value	5010B××	690	820	940	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	5010A××	26	29	32	pF
			5010B××	20	22	24	
	C_D		5010A××	26	29	32	
			5010B××	20	22	24	

5010AH×, BH× series

3V operation: V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 2.7V, I_{OH} = 2mA		2.1	2.4	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.7V, I_{OL} = 2mA		–	0.3	0.5	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.5	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 3.6V	$V_{OH} = V_{DD}$	–	–	10	µA
			$V_{OL} = V_{SS}$	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF, f = 16MHz	5010×H1	–	3	6	mA
			5010×H2	–	2	4	
			5010×H3	–	1.5	3	
			5010×H4	–	1.5	2.5	
INHN pull-up resistance	R_{UP2}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Oscillator amplifier output resistance	R_D	Design value	5010B××	690	820	940	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	5010A××	26	29	32	pF
			5010B××	20	22	24	
	C_D		5010A××	26	29	32	
			5010B××	20	22	24	

5V operation: V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 4.5V, I_{OH} = 4mA		3.9	4.2	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 4.5V, I_{OL} = 4mA		–	0.3	0.5	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.8	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 5.5V	$V_{OH} = V_{DD}$	–	–	10	µA
			$V_{OL} = V_{SS}$	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF, f = 30MHz	5010×H1	–	9	18	mA
			5010×H2	–	6	12	
			5010×H3	–	5	10	
			5010×H4	–	4	8	
INHN pull-up resistance	R_{UP2}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Oscillator amplifier output resistance	R_D	Design value	5010B××	690	820	940	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	5010A××	26	29	32	pF
			5010B××	20	22	24	
	C_D		5010A××	26	29	32	
			5010B××	20	22	24	

5010CL× series

3V operation: V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −20 to +80°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 2.7V, I_{OH} = 8mA		2.2	2.4	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.7V, I_{OL} = 8mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		0.7V_{DD}	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.3V_{DD}	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 3.6V	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF, f = 30MHz	5010CL1	–	5	10	mA
			5010CL2	–	3.5	7	
			5010CL3	–	2.5	5	
			5010CL4	–	2	4	
			5010CL5	–	2	4	
Standby current	I_{ST}	Measurement cct 6, INHN = LOW		–	–	5	µA
INHN pull-up resistance	R_{UP1}	Measurement cct 4		2	4	15	MΩ
	R_{UP2}			40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		16	18	20	pF
	C_D			16	18	20	

5V operation: V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 4.5V, I_{OH} = 16mA		4.0	4.2	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 4.5V, I_{OL} = 16mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		0.7V_{DD}	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.3V_{DD}	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 5.5V	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 50pF, f = 30MHz	5010CL1	–	15	30	mA
			5010CL2	–	9	18	
			5010CL3	–	6	12	
			5010CL4	–	5	10	
			5010CL5	–	5	10	
Standby current	I_{ST}	Measurement cct 6, INHN = LOW		–	–	10	µA
INHN pull-up resistance	R_{UP1}	Measurement cct 4		1	2	8	MΩ
	R_{UP2}			40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		16	18	20	pF
	C_D			16	18	20	

5010EA× series

3V operation: V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 2.7V, I_{OH} = 2mA		2.1	2.4	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.7V, I_{OL} = 2mA		–	0.3	0.5	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.5	V
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF, f = 30MHz	5010EA1	–	4	8	mA
			5010EA2	–	2.5	5	
INHN pull-up resistance	R_{UP2}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Oscillator amplifier output resistance	R_D	Design value		690	820	940	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		9	10	11	pF
	C_D			13	15	17	

5V operation: V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 4.5V, I_{OH} = 3.2mA		3.9	4.2	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 4.5V, I_{OL} = 3.2mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.8	V
Current consumption	I_{DD1}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF, f = 30MHz	5010EA1	–	6	12	mA
			5010EA2	–	5	10	
	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF, f = 40MHz	5010EA1	–	9	18	
			5010EA2	–	6	12	
INHN pull-up resistance	R_{UP2}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Oscillator amplifier output resistance	R_D	Design value		690	820	940	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		9	10	11	pF
	C_D			13	15	17	

5010FN× series

3V operation: V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 2.7V, I_{OH} = 8mA		2.2	2.4	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.7V, I_{OL} = 8mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.5	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 3.6V	$V_{OH} = V_{DD}$	–	–	10	µA
			$V_{OL} = V_{SS}$	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF	5010FNA, FNC f = 30MHz	–	8	16	mA
			5010FND f = 40MHz	–	10	20	
INHN pull-up resistance	R_{UP}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5	5010FNA	3.57	4.2	4.83	kΩ
			5010FNC	2.63	3.1	3.57	
			5010FND	1.87	2.2	2.53	
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	5010FNA	11.7	13	14.3	pF
			5010FNC	9.9	11	12.1	
			5010FND	11.7	13	14.3	
	C_D		5010FNA	13.5	15	16.5	
			5010FNC	15.3	17	18.7	
			5010FND	15.3	17	18.7	

5V operation: V_{DD} = 4.5 to 5.5V, V_{SS} = 0V

30 ≤ f ≤ 50MHz: Ta = −20 to +80°C, 50 < f ≤ 70MHz: Ta = −15 to +75°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 4.5V, I_{OH} = 16mA		3.9	4.2	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 4.5V, I_{OL} = 16mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.8	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 5.5V	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	10	
Current consumption	I_{DD1}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF	5010FNE f = 70MHz	–	25	50	mA
	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 50pF	5010FNA, FNC f = 40MHz	–	23	45	
			5010FND f = 50MHz	–	25	50	
INHN pull-up resistance	R_{UP}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5	5010FNA	3.57	4.2	4.83	kΩ
			5010FNC	2.63	3.1	3.57	
			5010FND	1.87	2.2	2.53	
			5010FNE	1.87	2.2	2.53	
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	5010FNA	11.7	13	14.3	pF
			5010FNC	9.9	11	12.1	
			5010FND	11.7	13	14.3	
			5010FNE	7.2	8	8.8	
	C_D		5010FNA	13.5	15	16.5	
			5010FNC	15.3	17	18.7	
			5010FND	15.3	17	18.7	
			5010FNE	13.5	15	16.5	

5010FH× series

5V operation: V_{DD} = 4.5 to 5.5V, V_{SS} = 0V

30 ≤ f ≤ 50MHz: Ta = −20 to +80°C, 50 < f ≤ 60MHz: Ta = −15 to +75°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 4.5V, I_{OH} = 4mA		3.9	4.2	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 4.5V, I_{OL} = 4mA		–	0.3	0.5	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.8	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 5.5V	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	10	
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF	5010FHA, FHC f = 40MHz	–	13	26	mA
			5010FHD f = 50MHz	–	15	30	
			5010FHE f = 60MHz	–	17	34	
INHN pull-up resistance	R_{UP}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5	5010FHA	3.57	4.2	4.83	kΩ
			5010FHC	2.63	3.1	3.57	
			5010FHD	1.87	2.2	2.53	
			5010FHE	1.87	2.2	2.53	
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	5010FHA	11.7	13	14.3	pF
			5010FHC	9.9	11	12.1	
			5010FHD	11.7	13	14.3	
			5010FHE	7.2	8	8.8	
	C_D		5010FHA	13.5	15	16.5	
			5010FHC	15.3	17	18.7	
			5010FHD	15.3	17	18.7	
			5010FHE	13.5	15	16.5	

5010HN×, HK× series

5V operation: V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, V_{DD} = 4.5V, I_{OH} = 16mA		3.9	4.2	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 4.5V, I_{OL} = 16mA		–	0.3	0.4	V
HIGH-level input voltage	V_{IH}	INHN		2.0	–	–	V
LOW-level input voltage	V_{IL}	INHN		–	–	0.8	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, V_{DD} = 5.5V	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	10	
Current consumption	I_{DD1}	Measurement cct 3, load cct 2, INHN = open, C_L = 15pF, f = 50MHz	5010HK1	–	20	40	mA
	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 50pF, f = 50MHz	5010HN1	–	25	50	
INHN pull-up resistance	R_{UP}	Measurement cct 4		40	100	250	kΩ
Feedback resistance	R_f	Measurement cct 5		80	200	500	kΩ
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		11.7	13	14.3	pF
	C_D			15.3	17	18.7	

Switching Characteristics

5010AN×, BN×, DN× series

3V operation/Duty level: CMOS

V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.1V_{DD} to 0.9V_{DD}	–	3.0	6.0	ns
Output fall time	t_{f1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.9V_{DD} to 0.1V_{DD}	–	3.0	6.0	ns
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF, f = 30MHz	40	–	60	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF	–	–	100	ns
Output enable delay time	t_{PZL}		–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5010AN×, AK×, BN×, BK×, DN× series

5V operation/Duty level: CMOS (5010AN×, BN×, DN1)

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	2.0	4.0	ns
	t_{r2}		C_L = 50pF	–	4.0	8.0	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	2.0	4.0	ns
	t_{f2}		C_L = 50pF	–	4.0	8.0	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 50pF, f = 30MHz		45	–	55	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5V operation/Duty level: TTL (5010×K1, AN2, AN3, AN4, BN2, BN3, BN4, BN5)

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output rise time	t_{r3}	Measurement cct 6, load cct 2, C_L = 15pF, 0.4V to 2.4V	–	1.5	3.0	ns
Output fall time	t_{f3}	Measurement cct 6, load cct 2, C_L = 15pF, 2.4V to 0.4V	–	1.5	3.0	ns
Output duty cycle[1]	Duty	Measurement cct 6, load cct 2, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF, f = 30MHz	45	–	55	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 2, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF	–	–	100	ns
Output enable delay time	t_{PZL}		–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5010AH×, BH× series

3V operation/Duty level: CMOS

V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.1V_{DD} to 0.9V_{DD}	–	8	16	ns
Output fall time	t_{f1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.9V_{DD} to 0.1V_{DD}	–	8	16	ns
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF, f = 16MHz	40	–	60	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF	–	–	100	ns
Output enable delay time	t_{PZL}		–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5V operation/Duty level: CMOS

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	5	10	ns
	t_{r2}		C_L = 50pF	–	13	26	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	5	10	ns
	t_{f2}		C_L = 50pF	–	13	26	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF, f = 30MHz		45	–	55	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5010CL× series

3V operation/Duty level: CMOS

V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = –20 to +80°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	2.0	4.0	ns
	t_{r4}		C_L = 30pF	–	3.0	6.0	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	2.0	4.0	ns
	t_{f4}		C_L = 30pF	–	3.0	6.0	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF, f = 30MHz		45	–	55	%
Output disable delay time[2]	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time[2]	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.
2. Oscillator stop function is built-in. When INHN goes LOW, normal output stops. When INHN goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

5V operation/Duty level: CMOS

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = –40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	1.5	3.0	ns
	t_{r2}		C_L = 50pF	–	4.0	8.0	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	1.5	3.0	ns
	t_{f2}		C_L = 50pF	–	4.0	8.0	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 50pF, f = 30MHz		40	–	60	%
Output disable delay time[2]	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time[2]	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.
2. Oscillator stop function is built-in. When INHN goes LOW, normal output stops. When INHN goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

5010EA× series

3V operation/Duty level: CMOS

V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.1V_{DD} to 0.9V_{DD}	–	8	16	ns
Output fall time	t_{f1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.9V_{DD} to 0.1V_{DD}	–	8	16	ns
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF, f = 30MHz	40	–	60	%
Output disable delay time[2]	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF	–	–	100	ns
Output enable delay time[2]	t_{PZL}		–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.
2. Oscillator stop function is built-in. When INHN goes LOW, normal output stops. When INHN goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

5V operation/Duty level: CMOS

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	5	10	ns
	t_{r2}		C_L = 50pF	–	13	26	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	5	10	ns
	t_{f2}		C_L = 50pF	–	13	26	
Output duty cycle[1]	Duty1	Measurement cct 6, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF	f = 30MHz	45	–	55	%
	Duty2		f = 40MHz	40	–	60	
Output disable delay time[2]	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time[2]	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.
2. Oscillator stop function is built-in. When INHN goes LOW, normal output stops. When INHN goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

5010FN× series

3V operation/Duty level: CMOS

V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −10 to +70°C unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.1V_{DD} to 0.9V_{DD}	–	3.0	6.0	ns
Output fall time	t_{f1}	Measurement cct 6, load cct 1, C_L = 15pF, 0.9V_{DD} to 0.1V_{DD}	–	3.0	6.0	ns
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF, f = 40MHz	40	–	60	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF	–	–	100	ns
Output enable delay time	t_{PZL}		–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5V operation/Duty level: CMOS

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V

30 ≤ f ≤ 50MHz: Ta = −20 to +80°C, 50 < f ≤ 70MHz: Ta = −15 to +75°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	1.5	3.0	ns
	t_{r2}		C_L = 50pF	–	3.0	6.0	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	1.5	3.0	ns
	t_{f2}		C_L = 50pF	–	3.0	6.0	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 5.0V, Ta = 25°C	C_L = 50pF f = 50MHz	45	–	55	%
			C_L = 15pF f = 70MHz	40	–	60	
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5010FH× series

5V operation/Duty level: CMOS

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V
30 ≤ f ≤ 50MHz: Ta = −20 to +80°C, 50 < f ≤ 60MHz: Ta = −15 to +75°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	4	8	ns
	t_{r2}		C_L = 50pF	–	11	21	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	4	8	ns
	t_{f2}		C_L = 50pF	–	11	21	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF	f = 50MHz	45	–	55	%
			f = 60MHz	40	–	60	
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5010HN× series

5V operation/Duty level: CMOS

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Output rise time	t_{r1}	Measurement cct 6, load cct 1, 0.1V_{DD} to 0.9V_{DD}	C_L = 15pF	–	1.5	3.0	ns
	t_{r2}		C_L = 50pF	–	3.0	6.0	
Output fall time	t_{f1}	Measurement cct 6, load cct 1, 0.9V_{DD} to 0.1V_{DD}	C_L = 15pF	–	1.5	3.0	ns
	t_{f2}		C_L = 50pF	–	3.0	6.0	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 50pF, f = 50MHz		45	–	55	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 1, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

5010HK× series

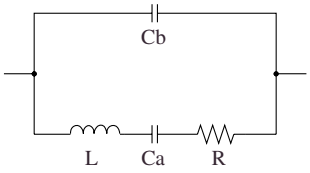
5V operation/Duty level: TTL

V_{DD} = 4.5 to 5.5V, V_{SS} = 0V, Ta = –40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating min	Rating typ	Rating max	Unit
Output rise time	t_{r3}	Measurement cct 6, load cct 2, 0.4V to 2.4V	C_L = 15pF	–	1.2	2.4	ns
	t_{r5}		C_L = 50pF	–	2.0	5.0	
Output fall time	t_{f3}	Measurement cct 6, load cct 2, 2.4V to 0.4V	C_L = 15pF	–	1.2	2.4	ns
	t_{f5}		C_L = 50pF	–	2.0	5.0	
Output duty cycle[1]	Duty	Measurement cct 6, load cct 2, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF, f = 50MHz		45	–	55	%
Output disable delay time	t_{PLZ}	Measurement cct 7, load cct 2, V_{DD} = 5.0V, Ta = 25°C, C_L = 15pF		–	–	100	ns
Output enable delay time	t_{PZL}			–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

Current consumption and Output waveform with NPC's standard crystal



for Fundamental oscillator

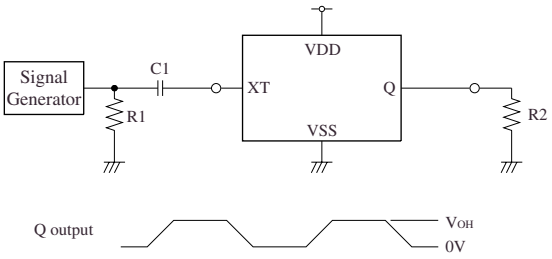
f [MHz]	R [Ω]	L [mH]	Ca [fF]	Cb [pF]
30	17.2	4.36	6.46	2.26
40	16.8	2.90	5.47	2.08

for 3rd overtone oscillator

f [MHz]	R [Ω]	L [mH]	Ca [fF]	Cb [pF]
30	18.62	16.24	1.733	5.337
40	20.53	11.34	1.396	3.989
50	22.17	7.40	1.370	4.105
60	15.37	3.83	1.836	5.191
70	25.42	4.18	1.254	5.170

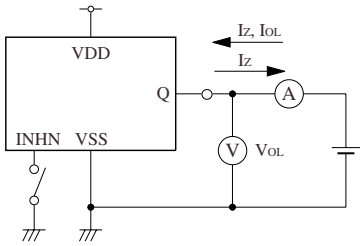
MEASUREMENT CIRCUITS

Measurement cct 1

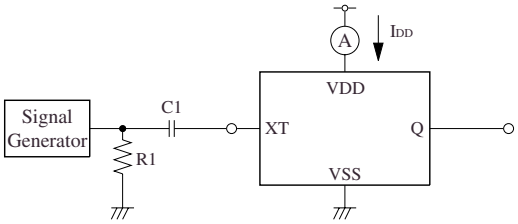


2.0V_{P-P} , 10MHz sine wave input signal (3V operation)
3.5V_{P-P} , 10MHz sine wave input signal (5V operation)
C1 : 0.001µF
R1 : 50Ω
R2 : 5010AN×, BN×, DN×, AK×, BK×
3V operation: 263Ω
5V operation: 245Ω
5010FN×, HN×, HK×
3V operation: 275Ω
5V operation: 245Ω
5010CL×
3V operation: 275Ω
5V operation: 250Ω
5010EA×, AH×, BH×
3V operation: 1050Ω
5010EA×, AH×, BH×, FH×
5V operation: 975Ω

Measurement cct 2

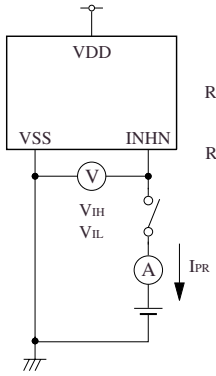


Measurement cct 3



2.0V_{P-P} , 30MHz sine wave input signal (3V operation)
3.5V_{P-P} , 30MHz sine wave input signal (5V operation)
C1 : 0.001µF
R1 : 50Ω

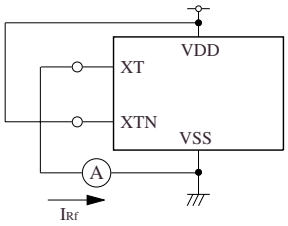
Measurement cct 4



$R_{UP1} = \frac{V_{DD}}{I_{PR}}$ (V_{IL} = 0V)

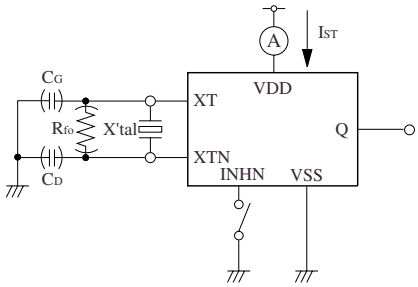
$R_{UP2} = \frac{V_{DD} - V_{IH}}{I_{PR}}$ (V_{IH} = 0.7V_{DD})

Measurement cct 5



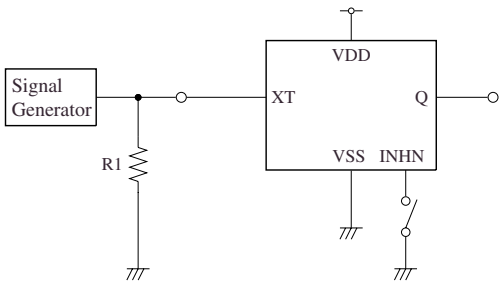
$R_f = \frac{V_{DD}}{I_{Rf}}$

Measurement cct 6



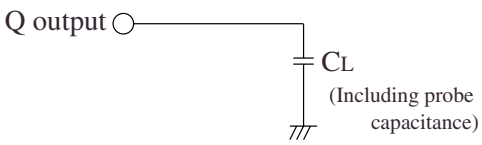
Crystal oscillation
C_G, C_D: 22pF (5010DN×)
R_{fo}: 3.0kΩ (5010H××)

Measurement cct 7



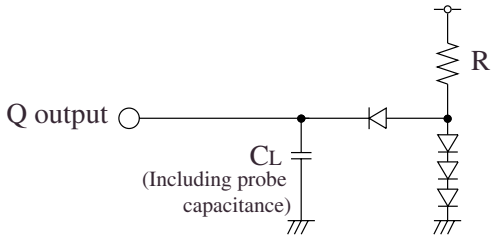
R1 : 50Ω

Load cct 1



C_L = 15pF : DUTY , I_{DD} , t_{r1} , t_{f1}
C_L = 30pF : t_{r4} , t_{f4}
C_L = 50pF : t_{r2} , t_{f2}

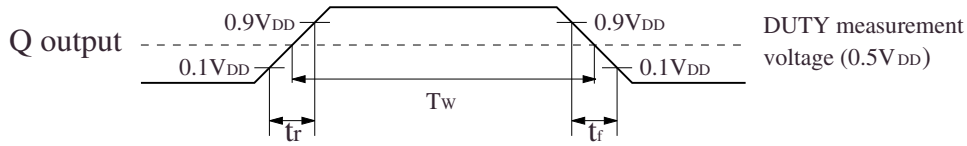
Load cct 2



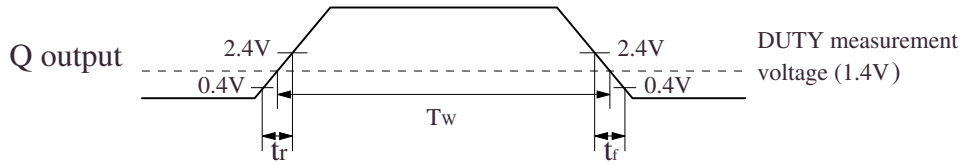
C_L = 15pF : DUTY, I_{DD} , t_{r3} , t_{f3}
C_L = 50pF : t_{r5} , t_{f5}
R = 400Ω

Switching Time Measurement Waveform

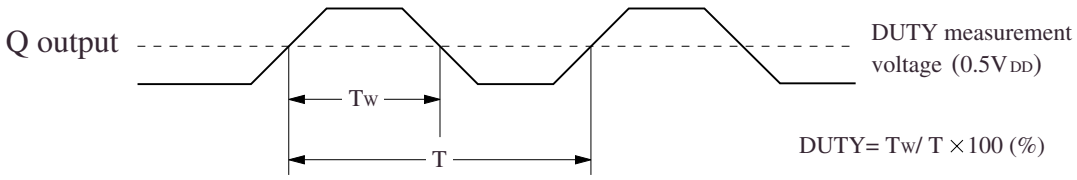
Output duty level (CMOS)



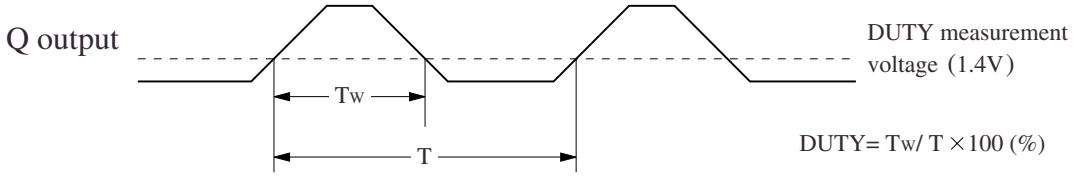
Output duty level (TTL)



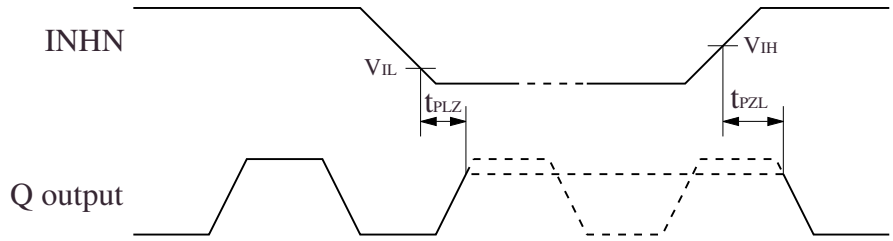
Output duty cycle (CMOS)



Output duty cycle (TTL)



Output Enable/Disable Delay



INHN input waveform $t_r = t_f \leq 10ns$

Note (CL×/EA× series only): when the device is in standby, the oscillator stops. When standby is released, the oscillator starts and stable oscillator output occurs after a short delay.

Please pay your attention to the following points at time of using the products shown in this document.

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