NPC

5026 series

Crystal Oscillator Module ICs

OVERVIEW

The 5026 series are miniature crystal oscillator module ICs. They feature a damping resistor R_D matched to the crystal's characteristics to reduce crystal current. They support fundamental oscillation and 3rd overtone oscillation modes. The 5026 series can be used to correspond to wide range of applications.

FEATURES

- Miniature-crystal matched oscillator characteristics
- Operating supply voltage range
  - 2.5V operation: 2.25 to 2.75V
  - 3.0V operation: 2.7 to 3.6V
- Recommended operating frequency range
  - For fundamental oscillator
    - 5026AL×: 20MHz to 50MHz
    - 5026BL1: 20MHz to 100MHz
  - For 3rd overtone oscillator
    - 5026ML×: 70MHz to 133MHz
- –40 to 85°C operating temperature range
- Oscillator capacitor with excellent frequency characteristics built-in
- Oscillator circuit with damping resistor R_D built-in for reduced crystal current
- Standby function
  - High impedance in standby mode, oscillator stops
- Low standby current
  - Power-saving pull-up resistor built-in
- Oscillation detector function
- Frequency divider built-in (5026AL×)
  - Varies with version: f_O, $f_O/2$, $f_O/4$, $f_O/8$, $f_O/16$, $f_O/32$
- CMOS output duty level (1/2VDD)
- 50 ± 5% output duty @ 1/2VDD
- 30pF output load
- Molybdenum-gate CMOS process
- Chip form (CF5026×L×)

SERIES CONFIGURATION

Version	Operating supply voltage range [V]	Oscillation mode	Recommended operating frequency range (fundamental oscillation)*1 [MHz]	Output current (V_{DD} = 2.5V) [mA]	Output frequency	Output duty level	Standby mode	
							Oscillator stop function	Output state
CF5026AL1	2.25 to 3.6	Fundamental	20 to 50	4	f_O	CMOS	Yes	Hi-Z
CF5026AL2					$f_O/2$			
CF5026AL3					$f_O/4$			
CF5026AL4					$f_O/8$			
CF5026AL5					$f_O/16$			
CF5026AL6					$f_O/32$			
CF5026BL1*2	2.25 to 3.6	Fundamental	20 to 100	8	f_O	CMOS	Yes	Hi-Z
CF5026MLA	2.25 to 3.6	3rd overtone	70 to 80	8	f_O	CMOS	Yes	Hi-Z
CF5026MLB			80 to 100					
CF5026MLC			90 to 133					

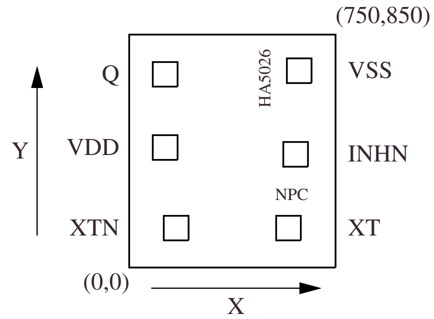
*1. The recommended operating frequency is a yardstick value derived from the crystal used for NPC characteristics authentication. However, the oscillator frequency band is not guaranteed. Specifically, the characteristics can vary greatly due to crystal characteristics and mounting conditions, so the oscillation characteristics of components must be carefully evaluated.
*2. The CF5026BL1 has a higher maximum operating frequency, hence the negative resistance is also larger than in the CF5026AL× devices.

ORDERING INFORMATION

Device	Package
CF5026×L×–3	Chip form

PAD LAYOUT

(Unit: μm)



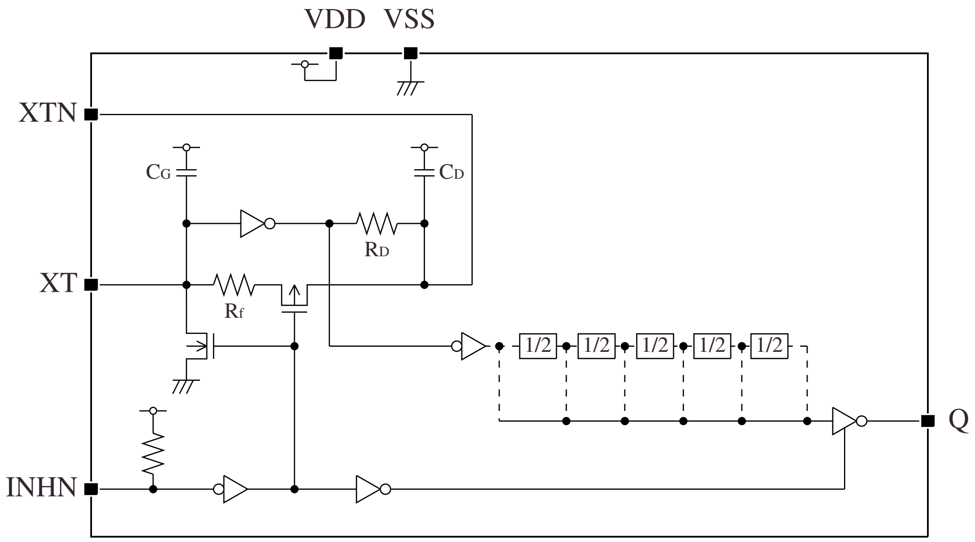
Chip size: 0.75 × 0.85mm
Chip thickness: 180 ± 20μm
PAD size: 90μm
Chip base: V_{DD} level

PIN DESCRIPTION and PAD DIMENSIONS

Name	I/O	Description		Pad dimensions [μm]	
				X	Y
INHN	I	Output state control input. High impedance when LOW (oscillator stops). Power-saving pull-up resistor built-in.		605	413
XT	I	Amplifier input	Crystal connection pins. Crystal is connected between XT and XTN.	579	144
XTN	O	Amplifier output		171	144
VDD	–	Supply voltage		131	438
Q	O	Output. Output frequency determined by internal circuit to one of f_O, $f_O/2$, $f_O/4$, $f_O/8$, $f_O/16$, $f_O/32$. High impedance in standby mode		131	705
VSS	–	Ground		618	718

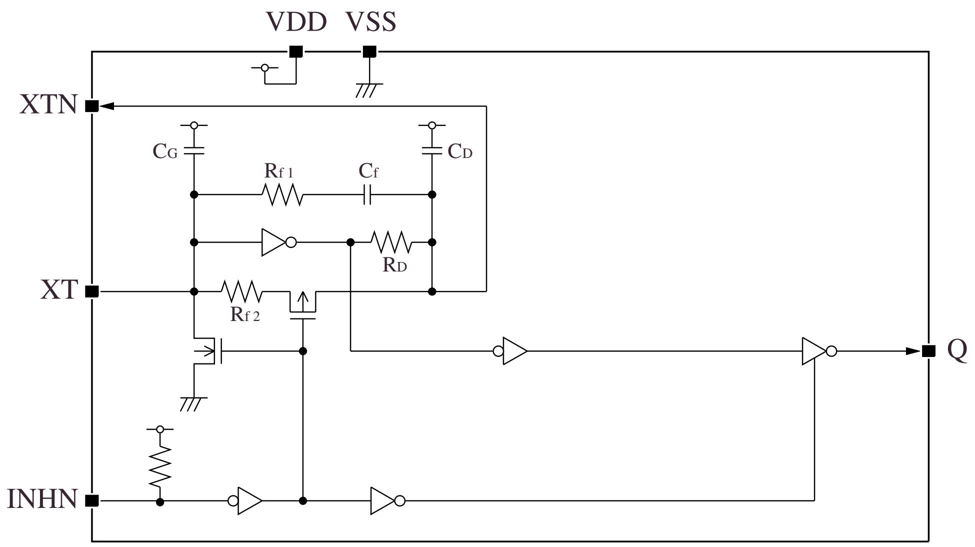
BLOCK DIAGRAM

For Fundamental Oscillator (5026AL×, 5026BL1)



INHN = LOW active

For 3rd Overtone Oscillator (5026ML×)



INHN = LOW active

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}		–65 to +150	°C
Output current	I_{OUT}		20	mA

Recommended Operating Conditions

$V_{SS} = 0V$

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Operating supply voltage	V_{DD}	5026AL×	CL ≤ 30pF	2.25	–	3.6	V
		5026BL1	CL ≤ 30pF	2.25	–	3.6	V
		5026MLA	f ≤ 80MHz, CL ≤ 30pF	2.25	–	3.6	V
		5026MLB	f ≤ 100MHz, CL ≤ 30pF	2.25	–	3.6	V
		5026MLC	f ≤ 100MHz, CL ≤ 30pF	2.25	–	3.6	V
			f ≤ 133MHz, CL ≤ 15pF	2.25	–	3.6	V
Input voltage	V_{IN}			V_{SS}	–	V_{DD}	V
Operating temperature	T_{OPR}			–40	–	+85	°C
Operating frequency*1	f_O	5026AL×		20	–	50	MHz
		5026BL1*2		20	–	100	MHz
		5026MLA		70	–	80	MHz
		5026MLB*2		80	–	100	MHz
		5026MLC*2		90	–	133	MHz

*1. The operating frequency is a yardstick value derived from the crystal used for NPC characteristics authentication. However, the oscillator frequency band is not guaranteed. Specifically, the characteristics can vary greatly due to crystal characteristics and mounting conditions, so the oscillation characteristics of components must be carefully evaluated.

*2. When 2.5V operation, the ratings of switching characteristics are difference by the frequency or output load. Refer to “Switching Characteristics”.

Electrical Characteristics

5026AL× (2.5V operation)

V_{DD} = 2.25 to 2.75V, 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} = 2.25V, I_{OH} = 4mA		1.65	1.95	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.25V, I_{OL} = 4mA		–	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	$V_{OH} = V_{DD}$	–	–	10	μA
			$V_{OL} = V_{SS}$	–	–	10	μA
Current consumption	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 30pF, f = 50MHz	5026AL1	–	7	14	mA
			5026AL2	–	4.5	9	mA
			5026AL3	–	3.5	7	mA
			5026AL4	–	2.9	5.8	mA
			5026AL5	–	2.5	5.0	mA
			5026AL6	–	2.4	4.8	mA
Standby current	I_{ST}	Measurement cct 3, INHN = LOW		–	–	3	μA
INHN pull-up resistance	R_{UP1}	Measurement cct 4		2	6	12	MΩ
	R_{UP2}			20	100	200	kΩ
Feedback resistance	R_f	Measurement cct 5		50	–	150	kΩ
Oscillator amplifier output resistance	R_D	Design value. A monitor pattern on a wafer is tested.		340	400	460	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		6.8	8	9.2	pF
	C_D			8.5	10	11.5	pF

5026AL× (3.0V operation)

V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Symbol</th><th rowspan="2" colspan="2">Condition</th><th colspan="3">Rating</th><th rowspan="2">Unit</th></tr>
<tr><th>min</th><th>typ</th><th>max</th></tr>
<tr><td>HIGH-level output voltage</td><td>V_{OH}</td><td colspan="2">Q: Measurement cct 1, V_{DD} = 2.7V, I_{OH} = 4mA</td><td>2.3</td><td>2.4</td><td>–</td><td>V</td></tr>
<tr><td>LOW-level output voltage</td><td>V_{OL}</td><td colspan="2">Q: Measurement cct 2, V_{DD} = 2.7V, I_{OL} = 4mA</td><td>–</td><td>0.3</td><td>0.4</td><td>V</td></tr>
<tr><td>HIGH-level input voltage</td><td>V_{IH}</td><td colspan="2">INHN</td><td>$0.7V_{DD}$</td><td>–</td><td>–</td><td>V</td></tr>
<tr><td>LOW-level input voltage</td><td>V_{IL}</td><td colspan="2">INHN</td><td>–</td><td>–</td><td>$0.3V_{DD}$</td><td>V</td></tr>
<tr><td rowspan="2">Output leakage current</td><td rowspan="2">I_Z</td><td rowspan="2">Q: Measurement cct 2, INHN = LOW</td><td>$V_{OH} = V_{DD}$</td><td>–</td><td>–</td><td>10</td><td>μA</td></tr>
<tr><td>$V_{OL} = V_{SS}$</td><td>–</td><td>–</td><td>10</td><td>μA</td></tr>
<tr><td rowspan="6">Current consumption</td><td rowspan="6">I_{DD2}</td><td rowspan="6">Measurement cct 3, load cct 1,
INHN = open, C_L = 30pF, f = 50MHz</td><td>5026AL1</td><td>–</td><td>8.5</td><td>17</td><td>mA</td></tr>
<tr><td>5026AL2</td><td>–</td><td>5.5</td><td>11</td><td>mA</td></tr>
<tr><td>5026AL3</td><td>–</td><td>4</td><td>8</td><td>mA</td></tr>
<tr><td>5026AL4</td><td>–</td><td>3.3</td><td>6.6</td><td>mA</td></tr>
<tr><td>5026AL5</td><td>–</td><td>2.9</td><td>5.8</td><td>mA</td></tr>
<tr><td>5026AL6</td><td>–</td><td>2.7</td><td>5.4</td><td>mA</td></tr>
<tr><td>Standby current</td><td>I_{ST}</td><td colspan="2">Measurement cct 3, INHN = LOW</td><td>–</td><td>–</td><td>5</td><td>μA</td></tr>
<tr><td rowspan="2">INHN pull-up resistance</td><td>R_{UP1}</td><td rowspan="2" colspan="2">Measurement cct 4</td><td>2</td><td>4</td><td>8</td><td>MΩ</td></tr>
<tr><td>R_{UP2}</td><td>15</td><td>75</td><td>150</td><td>kΩ</td></tr>
<tr><td>Feedback resistance</td><td>R_f</td><td colspan="2">Measurement cct 5</td><td>50</td><td>–</td><td>150</td><td>kΩ</td></tr>
<tr><td>Oscillator amplifier output resistance</td><td>R_D</td><td colspan="2">Design value. A monitor pattern on a wafer is tested.</td><td>340</td><td>400</td><td>460</td><td>Ω</td></tr>
<tr><td rowspan="2">Built-in capacitance</td><td>C_G</td><td rowspan="2" colspan="2">Design value. A monitor pattern on a wafer is tested.</td><td>6.8</td><td>8</td><td>9.2</td><td>pF</td></tr>
<tr><td>C_D</td><td>8.5</td><td>10</td><td>11.5</td><td>pF</td></tr>
</table>

5026BL1 (2.5V operation)

V_{DD} = 2.25 to 2.75V, 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} = 2.25V, I_{OH} = 8mA		1.65	1.95	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.25V, 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	$V_{OH} = V_{DD}$	–	–	10	µA
			$V_{OL} = V_{SS}$	–	–	10	µA
Current consumption	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 30pF, f = 100MHz		–	14	28	mA
Standby current	I_{ST}	Measurement cct 3, INHN = LOW		–	–	3	µA
INHN pull-up resistance	R_{UP1}	Measurement cct 4		2	6	12	MΩ
	R_{UP2}			20	100	200	kΩ
Feedback resistance	R_f	Measurement cct 5		50	–	150	kΩ
Oscillator amplifier output resistance	R_D	Design value. A monitor pattern on a wafer is tested.		170	200	230	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		6.8	8	9.2	pF
	C_D			8.5	10	11.5	pF

5026BL1 (3.0V operation)

V_{DD} = 2.7 to 3.6V, 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} = 2.7V, I_{OH} = 8mA		2.3	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	$V_{OH} = V_{DD}$	–	–	10	µA
			$V_{OL} = V_{SS}$	–	–	10	µA
Current consumption	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 30pF, f = 100MHz		–	19	38	mA
Standby current	I_{ST}	Measurement cct 3, INHN = LOW		–	–	5	µA
INHN pull-up resistance	R_{UP1}	Measurement cct 4		2	4	8	MΩ
	R_{UP2}			15	75	150	kΩ
Feedback resistance	R_f	Measurement cct 5		50	–	150	kΩ
Oscillator amplifier output resistance	R_D	Design value. A monitor pattern on a wafer is tested.		170	200	230	Ω
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		6.8	8	9.2	pF
	C_D			8.5	10	11.5	pF

5026ML× (2.5V operation)

V_{DD} = 2.25 to 2.75V, 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} = 2.25V, I_{OH} = 8mA			1.65	1.95	–	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, V_{DD} = 2.25V, 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_{OH} = V_{DD}	–	–	10	μA
				V_{OL} = V_{SS}	–	–	10	μA
Current consumption	I_{DD1}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF	f = 133MHz	5026MLC	–	15	30	mA
	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 30pF	f = 72MHz	5026MLA	–	11	22	mA
			f = 100MHz	5026MLB	–	15	30	mA
			f = 100MHz	5026MLC	–	15	30	mA
Standby current	I_{ST}	Measurement cct 3, INHN = LOW			–	–	3	μA
INHN pull-up resistance	R_{UP1}	Measurement cct 4			2	6	12	MΩ
	R_{UP2}				20	100	200	kΩ
AC feedback resistance	R_{f1}	Design value. A monitor pattern on a wafer is tested.		5026MLA	3.99	4.7	5.41	kΩ
				5026MLB	2.29	2.70	3.11	kΩ
				5026MLC	2.97	3.5	4.03	kΩ
DC feedback resistance	R_{f2}	Measurement cct 5			50	–	150	kΩ
Oscillator amplifier output resistance	R_D	Design value. A monitor pattern on a wafer is tested.			85	100	115	Ω
AC feedback capacitance	C_f	Design value. A monitor pattern on a wafer is tested.			8.5	10	11.5	pF
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		5026MLA	1.70	2	2.30	pF
				5026MLB	1.70	2	2.30	pF
				5026MLC	0.85	1	1.15	pF
	C_D	Design value. A monitor pattern on a wafer is tested.		5026MLA	3.40	4	4.60	pF
				5026MLB	3.40	4	4.60	pF
				5026MLC	3.40	4	4.60	pF

5026ML× (3.0V operation)

V_{DD} = 2.7 to 3.6V, 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} = 2.7V, I_{OH} = 8mA			2.3	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		$V_{OH} = V_{DD}$	–	–	10	μA
				$V_{OL} = V_{SS}$	–	–	10	μA
Current consumption	I_{DD1}	Measurement cct 3, load cct 1, INHN = open, C_L = 15pF	f = 133MHz	5026MLC	–	20	40	mA
	I_{DD2}	Measurement cct 3, load cct 1, INHN = open, C_L = 30pF	f = 72MHz	5026MLA	–	15	30	mA
			f = 100MHz	5026MLB	–	20	40	mA
			f = 100MHz	5026MLC	–	20	40	mA
Standby current	I_{ST}	Measurement cct 3, INHN = LOW			–	–	5	μA
INHN pull-up resistance	R_{UP1}	Measurement cct 4			2	4	8	MΩ
	R_{UP2}				15	75	150	kΩ
AC feedback resistance	R_{f1}	Design value. A monitor pattern on a wafer is tested.		5026MLA	3.99	4.7	5.41	kΩ
				5026MLB	2.29	2.70	3.11	kΩ
				5026MLC	2.97	3.5	4.03	kΩ
DC feedback resistance	R_{f2}	Measurement cct 5			50	–	150	kΩ
Oscillator amplifier output resistance	R_D	Design value. A monitor pattern on a wafer is tested.			85	100	115	Ω
AC feedback capacitance	C_f	Design value. A monitor pattern on a wafer is tested.			8.5	10	11.5	pF
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.		5026MLA	1.70	2	2.30	pF
				5026MLB	1.70	2	2.30	pF
				5026MLC	0.85	1	1.15	pF
	C_D	Design value. A monitor pattern on a wafer is tested.		5026MLA	3.40	4	4.60	pF
				5026MLB	3.40	4	4.60	pF
				5026MLC	3.40	4	4.60	pF

Switching Characteristics

5026AL× (2.5V operation)

V_{DD} = 2.25 to 2.75V, 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 3, load cct 1, $0.1V_{DD}$ to $0.9V_{DD}$	C_L = 15pF	–	3	6	ns
	t_{r2}		C_L = 30pF	–	5	10	ns
Output fall time	t_{f1}	Measurement cct 3, load cct 1, $0.9V_{DD}$ to $0.1V_{DD}$	C_L = 15pF	–	3	6	ns
	t_{f2}		C_L = 30pF	–	5	10	ns
Output duty cycle*1	Duty1	Measurement cct 3, load cct 1, V_{DD} = 2.5V, Ta = 25°C, f = 50MHz	C_L = 15pF	45	–	55	%
	Duty2		C_L = 30pF	45	–	55	%
Output disable delay time*2	t_{PLZ}	Measurement cct 6, load cct 1, V_{DD} = 2.5V, 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.

5026AL× (3.0V operation)

V_{DD} = 2.7 to 3.6V, 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 3, load cct 1, $0.1V_{DD}$ to $0.9V_{DD}$	C_L = 15pF	–	2.5	5	ns
	t_{r2}		C_L = 30pF	–	4.5	9	ns
Output fall time	t_{f1}	Measurement cct 3, load cct 1, $0.9V_{DD}$ to $0.1V_{DD}$	C_L = 15pF	–	2.5	5	ns
	t_{f2}		C_L = 30pF	–	4.5	9	ns
Output duty cycle*1	Duty1	Measurement cct 3, load cct 1, V_{DD} = 3.0V, Ta = 25°C, f = 50MHz	C_L = 15pF	45	–	55	%
	Duty2		C_L = 30pF	45	–	55	%
Output disable delay time*2	t_{PLZ}	Measurement cct 6, 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.

5026BL1 (2.5V operation)

V_{DD} = 2.25 to 2.75V, 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 3, load cct 1, $0.1V_{DD}$ to $0.9V_{DD}$	C_L = 15pF	–	2	4	ns
	t_{r2}		C_L = 30pF	–	3	6	ns
	t_{r3}	Measurement cct 3, load cct 1, $0.2V_{DD}$ to $0.8V_{DD}$	C_L = 30pF	–	2.5	5	ns
Output fall time	t_{f1}	Measurement cct 3, load cct 1, $0.9V_{DD}$ to $0.1V_{DD}$	C_L = 15pF	–	2	4	ns
	t_{f2}		C_L = 30pF	–	3	6	ns
	t_{f3}	Measurement cct 3, load cct 1, $0.8V_{DD}$ to $0.2V_{DD}$	C_L = 30pF	–	2.5	5	ns
Output duty cycle*1	Duty1	Measurement cct 3, load cct 1, V_{DD} = 2.5V, Ta = 25°C	C_L = 15pF f = 100MHz	45	–	55	%
	Duty2		C_L = 30pF f = 80MHz	45	–	55	%
	Duty3		C_L = 30pF f = 100MHz	40	–	60	%
Output disable delay time*2	t_{PLZ}	Measurement cct 6, load cct 1, V_{DD} = 2.5V, 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.

5026BL1 (3.0V operation)

V_{DD} = 2.7 to 3.6V, 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 3, load cct 1, $0.1V_{DD}$ to $0.9V_{DD}$	C_L = 15pF	–	1.5	3	ns
	t_{r2}		C_L = 30pF	–	2.5	5	ns
Output fall time	t_{f1}	Measurement cct 3, load cct 1, $0.9V_{DD}$ to $0.1V_{DD}$	C_L = 15pF	–	1.5	3	ns
	t_{f2}		C_L = 30pF	–	2.5	5	ns
Output duty cycle*1	Duty1	Measurement cct 3, load cct 1, V_{DD} = 3.0V, Ta = 25°C, f = 100MHz	C_L = 15pF	45	–	55	%
	Duty2		C_L = 30pF	45	–	55	%
Output disable delay time*2	t_{PLZ}	Measurement cct 6, 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.

5026ML× (2.5V operation)

V_{DD} = 2.25 to 2.75V, V_{SS} = 0V, Ta = –40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition			min	typ	max	Unit
Output rise time	t_{r1}	Measurement cct 3, load cct 1, 0.1V_{DD} to 0.9V_{DD}		C_L = 15pF	–	2	4	ns
	t_{r2}			C_L = 30pF	–	3	6	ns
Output fall time	t_{f1}	Measurement cct 3, load cct 1, 0.9V_{DD} to 0.1V_{DD}		C_L = 15pF	–	2	4	ns
	t_{f2}			C_L = 30pF	–	3	6	ns
Output duty cycle*1	Duty1	Measurement cct 3, load cct 1, V_{DD} = 2.5V, Ta = 25°C, C_L = 15pF	f = 72MHz	5026MLA	45	–	55	%
			f = 100MHz	5026MLB	45	–	55	%
			f = 133MHz	5026MLC	45	–	55	%
	Duty2	Measurement cct 3, load cct 1, V_{DD} = 2.5V, Ta = 25°C, C_L = 30pF	f = 72MHz	5026MLA	45	–	55	%
			f = 100MHz	5026MLB	40	–	60	%
			f = 100MHz	5026MLC	40	–	60	%
Output disable delay time*2	t_{PLZ}	Measurement cct 6, load cct 1, V_{DD} = 2.5V, 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.

5026ML× (3.0V operation)

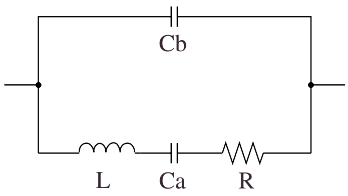
V_{DD} = 2.7 to 3.6V, V_{SS} = 0V, Ta = –40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition			min	typ	max	Unit
Output rise time	t_{r1}	Measurement cct 3, load cct 1, 0.1V_{DD} to 0.9V_{DD}		C_L = 15pF	–	1.5	3	ns
	t_{r2}			C_L = 30pF	–	2.5	5	ns
Output fall time	t_{f1}	Measurement cct 3, load cct 1, 0.9V_{DD} to 0.1V_{DD}		C_L = 15pF	–	1.5	3	ns
	t_{f2}			C_L = 30pF	–	2.5	5	ns
Output duty cycle*1	Duty1	Measurement cct 3, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 15pF	f = 72MHz	5026MLA	45	–	55	%
			f = 100MHz	5026MLB	45	–	55	%
			f = 133MHz	5026MLC	45	–	55	%
	Duty2	Measurement cct 3, load cct 1, V_{DD} = 3.0V, Ta = 25°C, C_L = 30pF	f = 72MHz	5026MLA	45	–	55	%
			f = 100MHz	5026MLB	45	–	55	%
		Measurement cct 3, load cct 1, V_{DD} = 3.3V, Ta = 25°C, C_L = 30pF, f = 100MHz		5026MLC	45	–	55	%
Output disable delay time*2	t_{PLZ}	Measurement cct 6, 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.

Current consumption and Output waveform with NPC's standard crystal



f [MHz]	R [Ω]	L [mH]	Ca [fF]	Cb [pF]
50	16.12	6.88	1.48	1.18
72	–	–	–	–
100	–	–	–	–

Note. The 72MHz and 100MHz crystal parameters are confidential.

FUNCTIONAL DESCRIPTION

Standby Function

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

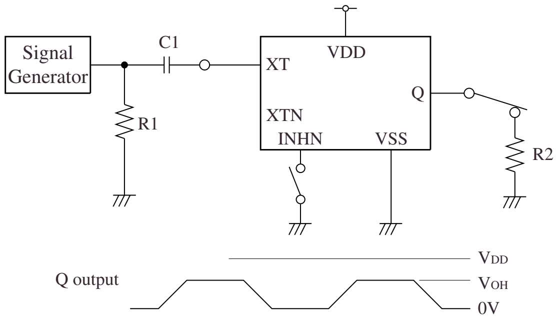
Version	INHN	Q	Oscillator
5026AL×	HIGH (or open)	Any f_O, $f_O/2$, $f_O/4$, $f_O/8$, $f_O/16$ or $f_O/32$ output frequency	Normal operation
5026BL1, ML×		f_O	
5026AL×, BL1, ML×	LOW	High impedance	Stopped

Power-saving Pull-up Resistor

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.

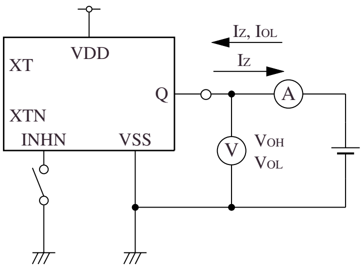
MEASUREMENT CIRCUITS

Measurement cct 1

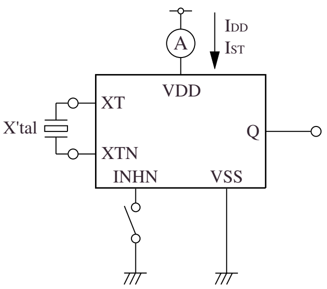


2Vp-p, 10MHz sine wave input signal
C1: 0.001µF
R1: 50Ω
R2: 5026AL× : 412Ω (2.5V operation)
575Ω (3.0V operation)
5026BL1, ML× : 206Ω (2.5V operation)
287Ω (3.0V operation)

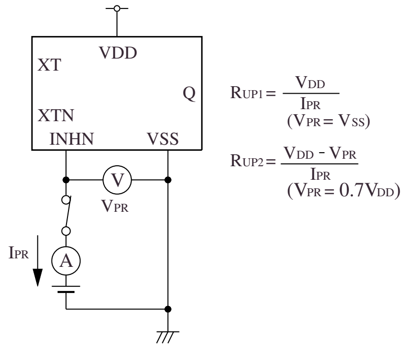
Measurement cct 2



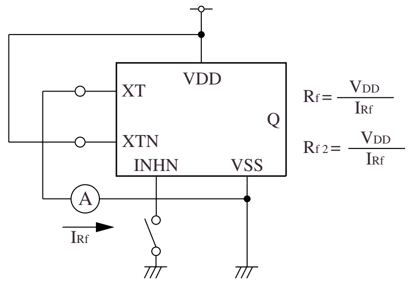
Measurement cct 3



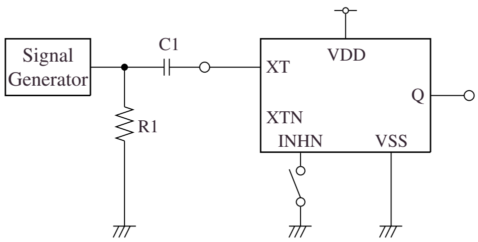
Measurement cct 4



Measurement cct 5

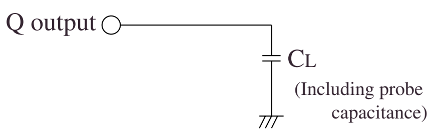


Measurement cct 6



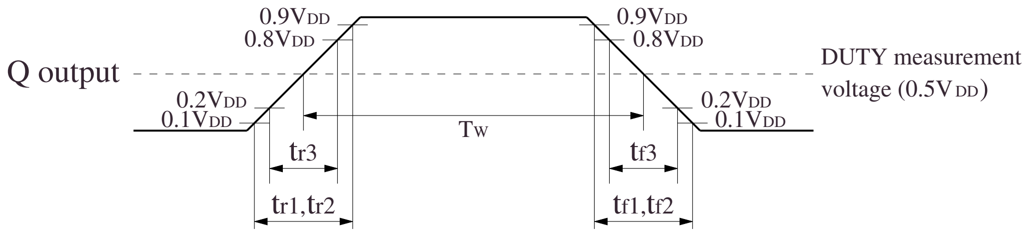
2Vp-p, 10MHz sine wave input signal
C1: 0.001µF
R1: 50Ω

Load cct 1

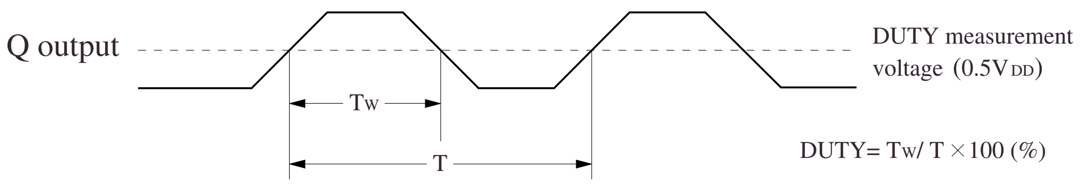


Switching Time Measurement Waveform

Output duty level, t_r, t_f

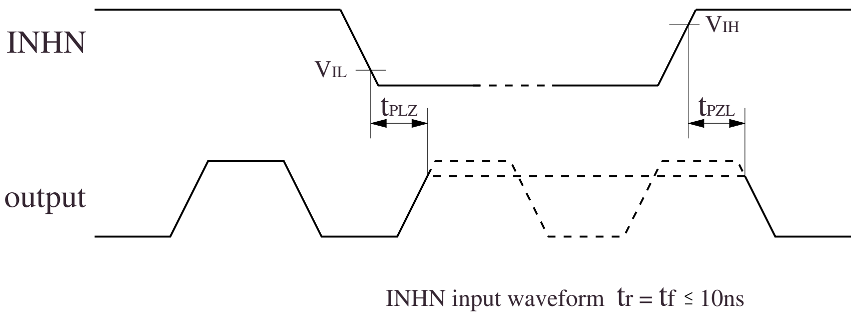


Output duty cycle



Output Enable/Disable Delay

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.



SEIKO NPC CORPORATION

15-6, Nihombashi-kabutocho, Chuo-ku,
Tokyo 103-0026, Japan
Telephone: +81-3-6667-6601
Facsimile: +81-3-6667-6611
http://www.npc.co.jp/
Email: sales@npc.co.jp

NC0413CE 2008.12