

Crystal Oscillator Module ICs

OVERVIEW

The WF5025 series are miniature crystal oscillator module ICs. They feature a damping resistor R_D matched to the crystal's characteristics to reduce crystal current. The pad layout is arranged for flip chip mounting, which gives the pattern design more flexibility, even for mounting ultra-miniature crystal oscillators that provide almost no space for wiring patterns. They support fundamental oscillation and 3rd overtone oscillation modes. The WF5025 series can be used to correspond to wide range of applications.

FEATURES

- Pad layout optimized for flip chip mounting
- 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
 - WF5025AL×: 20MHz to 50MHz
 - WF5025BL1: 20MHz to 100MHz
 - For 3rd overtone oscillator
 - WF5025ML×: 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 builtin 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 (WF5025AL×)
 - 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)
- $50 \pm 5\%$ output duty @ 1/2VDD
- 30pF output load
- Molybdenum-gate CMOS process

SERIES CONFIGURATION

	Onevetina		Recommended	Output			Standb	y mode
Version	Operating supply voltage [V]	Oscillation mode	operating frequency range (fundamental oscillation)*1 [MHz]	current (V _{DD} = 2.5V) [mA]	Output frequency	Output duty level	Oscillator stop function	Output state
WF5025AL1					f _O			
WF5025AL2					f _O /2		Yes	
WF5025AL3	2.25 to 3.6	Eundomontol	20 to 50	4	f _O /4	CMOS		Hi-Z
WF5025AL4	2.20 10 3.0	Fundamental	20 10 30	4	f _O /8	- CIWIOS		111-2
WF5025AL5					f _O /16			
WF5025AL6					f _O /32			
WF5025BL1*2	2.25 to 3.6	Fundamental	20 to 100	8	f _O	CMOS	Yes	Hi-Z
WF5025MLA			70 to 80					
(WF5025MLB)	2.25 to 3.6	3rd overtone	80 to 100	8	f _O	CMOS	Yes	Hi-Z
WF5025MLC	1		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.

Note. These versions in parentheses () are under development. Please ask our Sales & Marketing section for further detail.

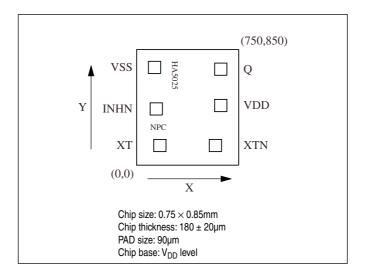
ORDERING INFORMATION

Device	Package
WF5025×××-3	Wafer form

^{*2.} The WF5025BL1 has a higher maximum operating frequency, hence the negative resistance is also larger than in the WF5025AL× devices.

PAD LAYOUT

(Unit: µm)

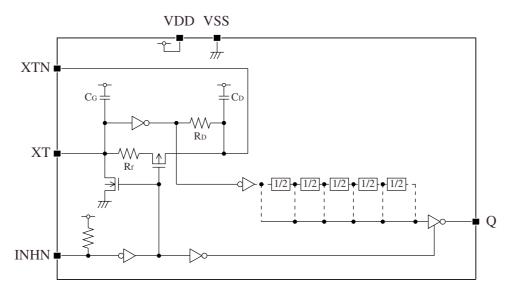


PIN DESCRIPTION and PAD DIMENSIONS

Name	1/0		Description				
Ivaille	1/0		Безсприон	Х	Υ		
INHN	I	Output state control input. I Power-saving pull-up resist	High impedance when LOW (oscillator stops). or built-in.	144.6	413.4		
XT	I	Amplifier input	Crystal connection pins.	171.0	144.6		
XTN	0	Amplifier output	Crystal is connected between XT and XTN.	579.0	144.6		
VDD	-	Supply voltage		618.2	438.6		
Q	0		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		705.4		
VSS	-	Ground		131.8	718.2		

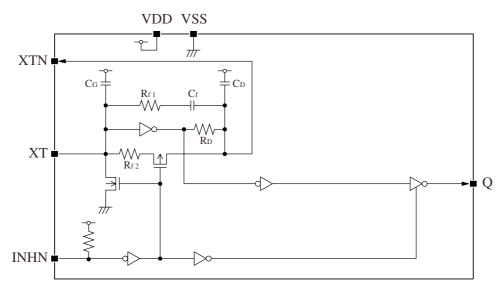
BLOCK DIAGRAM

For Fundamental Oscillator (WF5025AL×, WF5025BL1)



INHN = LOW active

For 3rd Overtone Oscillator (WF5025ML×)



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	l _{out}		20	mA

Recommended Operating Conditions

$$V_{SS} = 0V$$

Parameter	Cumbal	Condition			Unit		
Parameter	Symbol		Condition		typ	max	Unit
		WF5025AL×	CL ≤ 30pF	2.25	-	3.6	V
		WF5025BL1	CL ≤ 30pF	2.25	-	3.6	V
Operating supply voltage	l v	WF5025MLA	f ≤ 80MHz, CL ≤ 30pF	2.25	-	3.6	V
	V _{DD}	WF5025MLB	f ≤ 100MHz, CL ≤ 30pF	(2.25)	-	(3.6)	V
		WF5025MLC	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
		WF5025AL×	WF5025AL×		-	50	MHz
		WF5025BL1*3		20	-	100	MHz
Operating frequency*2	f _O	WF5025MLA	WF5025MLA		-	80	MHz
		WF5025MLB*3	1	(80)	-	(100)	MHz
		WF5025MLC*3	3	90	-	133	MHz

^{*1.} Values in parentheses () are provisional only.

^{*2.} 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.

^{*3.} When 2.5V operation, the ratings of switching characteristics are difference by the frequency or output load. Refer to "Switching Characteristics".

Electrical Characteristics

WF5025AL× (2.5V operation)

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

Parameter	Symbol	Condition		Rating			
Parameter	Syllibol	Condition		min	typ	max	Unit
HIGH-level output voltage	V _{OH}	Q: Measurement cct 1, V _{DD} = 2.25V, I _C	_{OH} = 4mA	1.65	1.95	-	V
LOW-level output voltage	V _{OL}	Q: Measurement cct 2, V _{DD} = 2.25V, I _C	_{OL} = 4mA	-	0.3	0.4	٧
HIGH-level input voltage	V _{IH}	INHN		0.7V _{DD}	-	-	٧
LOW-level input voltage	V _{IL}	INHN		_	-	0.3V _{DD}	٧
Output looks as aureant		Q: Measurement cct 2, INHN = LOW	$V_{OH} = V_{DD}$	-	-	10	μA
Output leakage current	l I _Z	Q. Measurement cot 2, INTIN = LOW	V _{OL} = V _{SS}	-	-	10	μA
			WF5025AL1	-	7	14	mA
		Measurement cct 3, load cct 1, INHN = open, C _L = 30pF, f = 50MHz	WF5025AL2	_	4.5	9	mA
0			WF5025AL3	_	3.5	7	mA
Current consumption	I _{DD2}		WF5025AL4	_	2.9	5.8	mA
			WF5025AL5	_	2.5	5	mA
			WF5025AL6	_	2.4	4.8	mA
Standby current	I _{ST}	Measurement cct 3, INHN = LOW		_	-	3	μA
INITIAL COLUMN CONTRACTOR CONTRAC	R _{UP1}	Management		2	6	12	MΩ
INHN pull-up resistance	R _{UP2}	Measurement cct 4		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 v	Design value. A monitor pattern on a wafer is tested.		400	460	Ω
Duilt in conscitones	C _G	Design value A monitor notters are as	vafor in tootad	6.8	8	9.2	pF
Built-in capacitance	C _D	Design value. A monitor pattern on a v	valei is iesied.	8.5	10	11.5	pF

WF5025AL× (3.0V operation)

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

Parameter	Cumbal	Condition			Rating		Unit
Parameter	Symbol	Condition		min	typ	max	Unit
HIGH-level output voltage	V _{OH}	Q: Measurement cct 1, V _{DD} = 2.7V, I _{OI}	_H = 4mA	2.3	2.4	-	٧
LOW-level output voltage	V _{OL}	Q: Measurement cct 2, V _{DD} = 2.7V, I _{OI}	= 4mA	-	0.3	0.4	٧
HIGH-level input voltage	V _{IH}	INHN		0.7V _{DD}	-	-	٧
LOW-level input voltage	V _{IL}	INHN		-	-	0.3V _{DD}	٧
Output lookogo ourrent	1	Q: Measurement cct 2, INHN = LOW	$V_{OH} = V_{DD}$	-	-	10	μА
Output leakage current	l _Z	Q: ivieasurement cct 2, findin = LOW	V _{OL} = V _{SS}	-	-	10	μА
			WF5025AL1	-	8.5	17	mA
		Measurement cct 3, load cct 1, INHN = open, C _L = 30pF, f = 50MHz	WF5025AL2	-	5.5	11	mA
	I _{DD2}		WF5025AL3	_	4	8	mA
Current consumption			WF5025AL4	-	3.3	6.6	mA
			WF5025AL5	-	2.9	5.8	mA
			WF5025AL6	_	2.7	5.4	mA
Standby current	I _{ST}	Measurement cct 3, INHN = LOW	•	-	-	5	μΑ
INII INI mulli un vaniataman	R _{UP1}	Management and 4		2	4	8	MΩ
INHN pull-up resistance	R _{UP2}	Measurement cct 4		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 v	vafer is tested.	340	400	460	Ω
Duilt in conscitones	C _G	Design value A monitor nottern are an	vofor in to stand	6.8	8	9.2	pF
Built-in capacitance	C _D	Design value. A monitor pattern on a v	valer is tested.	8.5	10	11.5	pF

WF5025BL1 (2.5V operation)

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

Parameter	Cymhal	Condition			Rating			
Parameter	Symbol	Condition		min	typ	max	Unit	
HIGH-level output voltage	V _{OH}	Q: Measurement cct 1, V _{DD} = 2.25V, I ₀	_{DH} = 8mA	1.65	1.95	-	V	
LOW-level output voltage	V _{OL}	Q: Measurement cct 2, V _{DD} = 2.25V, I ₀	_{DL} = 8mA	-	0.3	0.4	V	
HIGH-level input voltage	V _{IH}	INHN		0.7V _{DD}	-	-	V	
LOW-level input voltage	V _{IL}	NHN		-	-	0.3V _{DD}	٧	
Output leakage current I _Z		Q: Measurement cct 2, INHN = LOW	$V_{OH} = V_{DD}$	-	-	10	μΑ	
	l IZ		V _{OL} = V _{SS}	-	-	10	μΑ	
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	
INITIAL and the second state of the second sta	R _{UP1}	Management		2	6	12	$M\Omega$	
INHN pull-up resistance	R _{UP2}	Measurement cct 4		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 v	Design value. A monitor pattern on a wafer is tested.		200	230	Ω	
D. W. in	C _G	Decimal Association and	or front a track of	6.8	8	9.2	pF	
Built-in capacitance	C _D	Design value. A monitor pattern on a v	vaier is tested.	8.5	10	11.5	pF	

WF5025BL1 (3.0V operation)

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

Parameter	Cumbal	Condition		Unit			
Parameter	Symbol	Condition		min	typ	max	Unit
HIGH-level output voltage	V _{OH}	Q: Measurement cct 1, V _{DD} = 2.7V, I _O	H = 8mA	2.3	2.4	-	٧
LOW-level output voltage	V _{OL}	Q: Measurement cct 2, V _{DD} = 2.7V, I _{OL} = 8mA		-	0.3	0.4	٧
HIGH-level input voltage	V _{IH}	INHN		0.7V _{DD}	-	-	٧
LOW-level input voltage	V _{IL}	INHN	-	-	0.3V _{DD}	٧	
Outside the second		O Marriage and a INIIIN LOW	$V_{OH} = V_{DD}$	_	_	10	μA
Output leakage current	l I _Z	Q: Measurement cct 2, INHN = LOW	V _{OL} = V _{SS}	-	-	10	μΑ
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
INITIAL and an are determined	R _{UP1}	Management		2	4	8	MΩ
INHN pull-up resistance	R _{UP2}	Measurement cct 4		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
Duits in conseitance	C _G			6.8	8	9.2	pF
Built-in capacitance	C _D	Design value. A monitor pattern on a v	8.5	10	11.5	pF	

WF5025ML× (2.5V operation)

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

Dovometer	Cumbal	Condi	tion			Rating*1		Unit
Parameter	Symbol	Condi	uon		min	typ	max	Unit
HIGH-level output voltage	V _{OH}	Q: Measurement cct 1, V _{DD} = 2.2	25V, I _{OH} = 8mA	١	1.65	1.95	-	٧
LOW-level output voltage	V _{OL}	Q: Measurement cct 2, V _{DD} = 2.2	25V, I _{OL} = 8mA	ı	-	0.3	0.4	٧
HIGH-level input voltage	V _{IH}	INHN			0.7V _{DD}	-	-	٧
LOW-level input voltage	V _{IL}	INHN			-	-	0.3V _{DD}	٧
Output looks as surrent		O. Massurement act O. INILIN.	OW	$V_{OH} = V_{DD}$	-	-	10	μA
Output leakage current	I _Z	Q: Measurement cct 2, INHN = L	LOVV	V _{OL} = V _{SS}	-	-	10	μA
		Measurement cct 3, load cct 1,	f = 100MHz	WF5025MLB	-	TBD	TBD	mA
	I _{DD1}	INHN = open, C _L = 15pF	f = 133MHz	WF5025MLC	-	15	30	mA
Current consumption			f = 72MHz	WF5025MLA	-	11	22	mA
	I _{DD2}	Measurement cct 3, load cct 1, INHN = open, C ₁ = 30pF	f = 100MHz	WF5025MLB	-	TBD	TBD	mA
Observation and the second of			f = 100MHz	WF5025MLC	-	15	30	mA
Standby current	I _{ST}	Measurement cct 3, INHN = LOV	easurement cct 3, INHN = LOW			-	3	μΑ
R _{UP1}		Magazirament act 4			2	6	12	MΩ
INHN pull-up resistance	R _{UP2}	Measurement cct 4			20	100	200	kΩ
	R _{f1}	WF5025MLA		3.99	4.7	5.41	kΩ	
AC feedback resistance		Design value. A monitor pattern on a wafer is tested.			TBD	TBD	TBD	kΩ
			WF5025MLC			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 te	ested.	85	100	115	Ω
AC feedback capacitance	C _f	Design value. A monitor pattern	on a wafer is te	ested.	8.5	10	11.5	pF
				WF5025MLA	1.70	2	2.30	pF
	C _G	Design value. A monitor pattern tested.	on a wafer is	WF5025MLB	(1.70)	(2)	(2.30)	pF
Duilt in some its as				WF5025MLC	0.85	1	1.15	pF
Built-in capacitance				WF5025MLA	3.40	4	4.60	pF
	C _D	Design value. A monitor pattern tested.	on a wafer is	WF5025MLB	(3.40)	(4)	(4.60)	pF
		100.00.		WF5025MLC	3.40	4	4.60	pF

^{*1.} Values in parentheses () are provisional only.

WF5025ML× (3.0V operation)

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

Dovometer	Symbol	Condition				Rating*1		Unit
Parameter	Symbol	Cond	ition		min	typ	max	Unit
HIGH-level output voltage	V _{OH}	Q: Measurement cct 1, V _{DD} = 2.	7V, I _{OH} = 8mA		2.3	2.4	-	٧
LOW-level output voltage	V _{OL}	Q: Measurement cct 2, V _{DD} = 2.	7V, I _{OL} = 8mA		-	0.3	0.4	٧
HIGH-level input voltage	V _{IH}	INHN			0.7V _{DD}	-	-	٧
LOW-level input voltage	V _{IL}	INHN			-	-	0.3V _{DD}	٧
Output looks as surrent		O. Management ant O. INI IN.	OW	$V_{OH} = V_{DD}$	-	-	10	μA
Output leakage current	l _Z	Q: Measurement cct 2, INHN = L	LOVV	V _{OL} = V _{SS}	-	-	10	μA
		Measurement cct 3, load cct 1,	f = 100MHz	WF5025MLB	-	TBD	TBD	mA
	I _{DD1}	INHN = open, C _L = 15pF	f = 133MHz	WF5025MLC	-	20	40	mA
Current consumption			f = 72MHz	WF5025MLA	-	15	30	mA
	I _{DD2}	Measurement cct 3, load cct 1, INHN = open, C _L = 30pF	f = 100MHz	WF5025MLB	-	TBD	TBD	mA
		and the specific corp.	f = 100MHz	WF5025MLC	-	20	40	mA
Standby current	I _{ST}	Measurement cct 3, INHN = LO\	easurement cct 3, INHN = LOW			-	5	μA
R _{UP1}		Management and d			2	4	8	MΩ
INHN pull-up resistance	R _{UP2}	Measurement cct 4			15	75	150	kΩ
	R _{f1}	WF5025MLA			3.99	4.7	5.41	kΩ
AC feedback resistance		Design value. A monitor pattern on a wafer is tested. WF5025M		WF5025MLB	TBD	TBD	TBD	kΩ
		1001041	WF5025MLC			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 te	ested.	85	100	115	Ω
AC feedback capacitance	C _f	Design value. A monitor pattern	on a wafer is te	ested.	8.5	10	11.5	pF
				WF5025MLA	1.70	2	2.30	pF
	C_{G}	Design value. A monitor pattern tested.	on a wafer is	WF5025MLB	(1.70)	(2)	(2.30)	pF
Duilt in consider				WF5025MLC	0.85	1	1.15	pF
Built-in capacitance				WF5025MLA	3.40	4	4.60	pF
	C _D	tested.		WF5025MLB	(3.40)	(4)	(4.60)	pF
				WF5025MLC	3.40	4	4.60	pF

 $^{^{\}star}$ 1. Values in parentheses () are provisional only.

Switching Characteristics

WF5025AL× (2.5V operation)

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

Parameter	Symbol	Condition		Unit			
Farameter	Syllibol	Condition	min	typ	max	Oilit	
Output via a time	t _{r1}	Measurement cct 3, load cct 1,	C _L = 15pF	_	3	6	ns
Output rise time	t _{r2}	0.1V _{DD} to 0.9V _{DD}	C _L = 30pF	_	5	10	ns
Output fall time	t _{f1}	Measurement cct 3, load cct 1,	C _L = 15pF	_	3	6	ns
	t _{f2}	0.9V _{DD} to 0.1V _{DD}	C _L = 30pF	_	5	10	ns
Output duty cycle*1	Duty1	Measurement cct 3, load cct 1,	C _L = 15pF	45	-	55	%
Output duty cycle	Duty2	$V_{DD} = 2.5V$, Ta = 25°C, f = 50MHz	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,	_	-	100	ns
Output enable delay time*2	t _{PZL}	C _L = 15pF		-	-	100	ns

^{*1.} The duty cycle characteristic is checked the sample chips of each production lot.

WF5025AL× (3.0V operation)

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

Parameter	Symbol	Condition	Rating			Unit	
Parameter	Symbol	Condition		min	typ	max	Oilit
Output rise time	t _{r1}	Measurement cct 3, load cct 1,	C _L = 15pF	-	2.5	5	ns
Output rise time	t _{r2}	0.1V _{DD} to 0.9V _{DD}	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
Output fail time	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	%
Output duty cycle	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,	-	_	100	ns
Output enable delay time*2	t _{PZL}	C _L = 15pF		-	-	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.

^{*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.

WF5025BL1 (2.5V operation)

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

Davameter	Cumhal	Condition	Rating			1114	
Parameter	Symbol	Condition		min	typ	max	Unit
	t _{r1}	Measurement cct 3, load cct 1,	C _L = 15pF	-	2	4	ns
Output rise time	t _{r2}	0.1V _{DD} to 0.9V _{DD}	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}		C _L = 15pF	-	2	4	ns
	t _{f2}		C _L = 30pF	-	3	6	ns
	t _{f3}		-	2.5	5	ns	
Output duty cycle*1	Duty1		C _L = 15pF f = 100MHz	45	-	55	%
	Duty2	Measurement cct 3, load cct 1, V _{DD} = 2.5V, Ta = 25°C	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,		-	_	100	ns
Output enable delay time*2	t _{PZL}	C _L = 15pF	-	-	100	ns	

 $^{^{\}star}1.$ The duty cycle characteristic is checked the sample chips of each production lot.

WF5025BL1 (3.0V operation)

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

Parameter	Symbol	Condition	Rating			Unit		
raiametei	Syllibol	Condition		min typ m		max	Oiiit	
Output rise time	t _{r1}	Measurement cct 3, load cct 1,	C _L = 15pF	-	1.5	3	ns	
Output rise time	t _{r2}	0.1V _{DD} to 0.9V _{DD}	C _L = 30pF -	-	2.5	5	ns	
Outrout fall times	t _{f1}	Measurement cct 3, load cct 1,	C _L = 15pF	-	1.5	3	ns	
Output fall time	t _{f2} $0.9V_{DD}$ to $0.1V_{DD}$ $C_L = 30pF$	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	%	
Output duty cycle	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,	-	-	100	ns	
Output enable delay time*2	t _{PZL}	C _L = 15pF		-	-	100	ns	

 $^{^{\}star}1.$ 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.

^{*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.

WF5025ML× (2.5V operation)

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

Parameter	Cumbal	Condition			Rating*1			Unit
Parameter	Symbol		ondition		min	min typ max		
Output rise time	t _{r1}	Measurement cct 3, load c	Measurement cct 3, load cct 1, C _L = 15pF		-	2	4	ns
Output rise time	t _{r2}	0.1V _{DD} to 0.9V _{DD}		C _L = 30pF	-	3	6	ns
Output fall time	t _{f1}	Measurement cct 3, load cct 1, C _L = 15pF		ı	2	4	ns	
Output fail time	t _{f2}	0.9V _{DD} to 0.1V _{DD}	$0.9V_{DD}$ to $0.1V_{DD}$ $C_L = 30pF$		-	3	6	ns
	Duty1	Measurement cct 3, load cct 1, V _{DD} = 2.5V, Ta = 25°C. C ₁ = 15pF	f = 72MHz	WF5025MLA	45	-	55	%
			f = 100MHz	WF5025MLB	(45)	-	(55)	%
Output duty cycle*2			WF5025MLC	45	-	55	%	
Output duty cycle		Measurement cct 3,	f = 72MHz	WF5025MLA	45	-	55	%
	Duty2	load cct 1, V _{DD} = 2.5V,	f = 100MHz	WF5025MLB	(40)	-	(60)	%
	Ta =	Ta = 25°C, $C_L = 30pF$ $f = 100MHz$		WF5025MLC	40	-	60	%
Output disable delay time*3	t _{PLZ}	Measurement cct 6, load cct 1, V_{DD} = 2.5V, Ta = 25°C, C_L = 15pF			-		100	ns
Output enable delay time*3	t _{PZL}				-	-	100	ns

 $^{^{\}star}$ 1. Values in parentheses () are provisional only.

WF5025ML× (3.0V operation)

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

Parameter	Symbol	Condition			Rating ^{*1}			Unit
raiailletei	Symbol		ilultion		min typ max		O I III	
Output rice time	t _{r1}	Measurement cct 3, load cc	Measurement cct 3, load cct 1,		-	1.5	3	ns
Output rise time	t _{r2}	$0.1V_{DD}$ to $0.9V_{DD}$ $C_L = 30pF$		-	2.5	5	ns	
Output fall time	t _{f1}	Measurement cct 3, load cc	Measurement cct 3, load cct 1, $C_L = 15pF$ $0.9V_{DD}$ to $0.1V_{DD}$ $C_L = 30pF$		-	1.5	3	ns
Output fall time	t _{f2}	0.9V _{DD} to 0.1V _{DD}			-	2.5	5	ns
	Duty1	Measurement cct 3, load cct 1, $V_{DD} = 3.0V$, $Ta = 25^{\circ}C$, $C_{L} = 15pF$	f = 72MHz	WF5025MLA	45	-	55	%
			f = 100MHz	WF5025MLB	(45)	-	(55)	%
			f = 133MHz	WF5025MLC	45	-	55	%
Output duty cycle*2		Measurement cct 3,	f = 72MHz	WF5025MLA	45	-	55	%
	Duty2	load cct 1, $V_{DD} = 3.0V$, Ta = 25°C, $C_L = 30pF$	f = 100MHz	WF5025MLB	(45)	-	(55)	%
		Measurement cct 3, load cct 1, V_{DD} = 3.3V, Ta = 25°C, C_L = 30pF, f = 100MHz		WF5025MLC	45	-	55	%
Output disable delay time*3	t _{PLZ}	Measurement cct 6, load cc	Measurement cct 6, load cct 1, V _{DD} = 3.0V, Ta = 25°C,		-	-	100	ns
Output enable delay time*3	t _{PZL}	C _L = 15pF	55			-	100	ns

^{*1.} Values in parentheses () are provisional only.

^{*2.} The duty cycle characteristic is checked the sample chips of each production lot.

^{*3.} 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.

^{*2.} The duty cycle characteristic is checked the sample chips of each production lot.

^{*3.} 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.

FUNCTIONAL DESCRIPTION

Standby Function

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

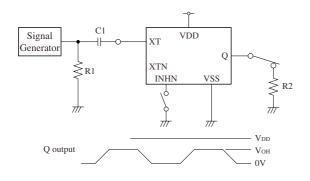
Version	INHN	Q	Oscillator	
WF5025AL×	HIGH (or open)	Any f _O , f _O /2, f _O /4, f _O /8, f _O /16 or f _O /32 output frequency	Normal operation	
WF5025BL1, ML×	nidh (oi open)	f _O		
WF5025AL×, BL1, ML×	LOW	High impedance	Stopped	

Power-save 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

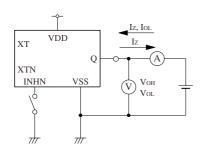
R1: 50Ω

R2: 5025AL× : 412 Ω (2.5V operation) 575 Ω (3.0V operation)

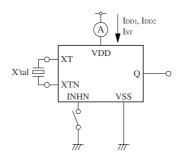
5025BL1, ML× : 206Ω (2.5V operation)

 287Ω (3.0V operation)

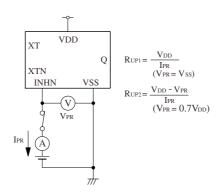
Measurement cct 2



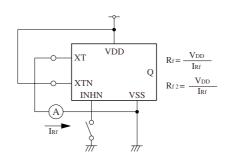
Measurement cct 3



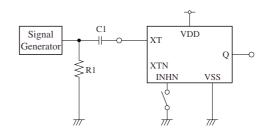
Measurement cct 4



Measurement cct 5



Measurement cct 6

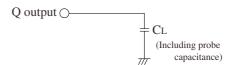


2Vp-p, 10MHz sine wave input signal

C1: 0.001µF

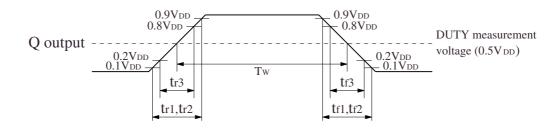
R1: 50Ω

Load cct 1

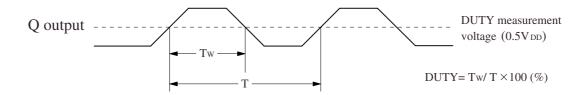


Switching Time Measurement Waveform

Output duty level, t_r, t_f

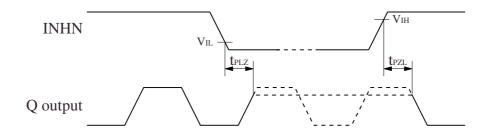


Output duty cycle



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.



INHN input waveform $tr = tf \le 10$ ns

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