

### Features

- HCMOS Output
- Stabilities to  $\pm 20$  PPM
- Temperature Ranges as wide as  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Supply Voltages: 1.0V; 1.5V; 1.8V; 2.5V; 3.3V; Variable (1.6V ~ 3.63V; 2.25V ~ 3.63V)

1.0V ELECTRICAL CHARACTERISTICS	
PARAMETERS	MAX (Unless otherwise noted)
Frequency Range ( $F_o$ )	1.8 ~ 50.0 MHz
Temperature Range	
Storage ( $T_{STG}$ )	$-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$
Supply Voltage ( $V_{DD}$ )	$1.0\text{V} \pm 5\%$
Input Current ( $I_{DD}$ )	
1.8 ~ 32.1 MHz	2.5 mA
>32.1 ~ 50.0 MHz	3.5 mA
Standby Current	100 $\mu\text{A}$
Output Symmetry (50% $V_{DD}$ )	40 % ~ 60 %
Rise/Fall Time (20%/80% $V_{DD}$ Levels) ( $T_R/T_F$ )	5 nS
Output Voltage ( $V_{OL}$ )	20 % $V_{DD}$
( $V_{OH}$ )	80 % $V_{DD}$ Min
Output Load (HCMOS)	15 pF
Start-up Time ( $T_S$ )	10 mS
Output Disable Time <sup>1</sup>	50 $\mu\text{S}$
Output Enable Time <sup>1</sup>	10 mS

ENABLE / DISABLE FUNCTION	
Pin1	Output (pin 3)
OPEN <sup>1</sup>	Active
'1' Level $V_{IH} \geq 70\%V_{DD}$	Active
'0' Level $V_{IL} \leq 30\%V_{DD}$	High Z

Available Options by Stability & Operating Temp for 1.0V		
Frequency Stability <sup>2</sup>	Operating Temperature ( $^{\circ}\text{C}$ )	Frequency Range (MHz)
$\pm 100\text{PPM}$	$-10 \sim +70$	1.8 ~ 50.0
$\pm 100\text{PPM}$	$-40 \sim +85$	1.8 ~ 50.0
$\pm 50\text{PPM}$	$-10 \sim +70$	1.8 ~ 50.0
$\pm 50\text{PPM}$	$-40 \sim +85$	1.8 ~ 50.0
$\pm 25\text{PPM}$	$-10 \sim +70$	1.8 ~ 50.0
$\pm 25\text{PPM}$	$-40 \sim +85$	1.8 ~ 50.0
$\pm 20\text{PPM}$	$-10 \sim +70$	1.8 ~ 50.0

<sup>1</sup> An internal pull-up resistor from pin 1 to pin 4 allows active output if pin 1 is left open

<sup>2</sup> Inclusive of  $25^{\circ}\text{C}$  tolerance, operating temperature range, input voltage change, load change, shock, Vibration, reflow, and one-year aging.

<sup>3</sup> Inclusive of  $25^{\circ}\text{C}$  tolerance and operating temperature range.

1.5V ELECTRICAL CHARACTERISTICS	
PARAMETERS	MAX (Unless otherwise noted)
Frequency Range (F <sub>0</sub> )	1.25 ~ 50.0 MHz
Temperature Range	
Storage (T <sub>STG</sub> )	-55°C ~ +125°C
Supply Voltage (V <sub>DD</sub> )	1.5V±5%
Input Current (I <sub>DD</sub> )	
1.25 ~ 10.0 MHz	2.5 mA
>10.0 ~ 20.0 MHz	3.5 mA
>20.0 ~ 30.0 MHz	4.0 mA
>30.0 ~ 40.0 MHz	4.5 mA
>40.0 ~ 50.0 MHz	6.0 mA
Standby Current	100µA
Output Symmetry (50% V <sub>DD</sub> )	45 % ~ 55 %
Rise/Fall Time (10%/90% V <sub>DD</sub> Levels) (T <sub>R</sub> /T <sub>F</sub> )	10 nS
Output Voltage (V <sub>OL</sub> )	10 % V <sub>DD</sub>
(V <sub>OH</sub> )	90 % V <sub>DD</sub> Min
Output Load (HCMOS)	15 pF
Start-up Time (T <sub>S</sub> )	10 mS
Output Disable Time <sup>1</sup>	50 µS
Output Enable Time <sup>1</sup>	10 mS

ENABLE / DISABLE FUNCTION	
Pin1	Output (pin 3)
OPEN <sup>1</sup>	Active
'1' Level V <sub>IH</sub> ≥ 70%V <sub>DD</sub>	Active
'0' Level V <sub>IL</sub> ≤ 30%V <sub>DD</sub>	High Z

Available Options by Stability & Operating Temp for 1.5V		
Frequency Stability <sup>2</sup>	Operating Temperature (°C)	Frequency Range (MHz)
±100PPM	-20 ~ +70	1.25 ~ 50.0
±100PPM	-40 ~ +85	1.25 ~ 50.0
±50PPM	-20 ~ +70	1.25 ~ 50.0
±50PPM	-40 ~ +85	1.25 ~ 50.0
±25PPM	-20 ~ +70	1.25 ~ 50.0
±25PPM <sup>3</sup>	-40 ~ +85	1.25 ~ 50.0

<sup>1</sup> An internal pull-up resistor from pin 1 to pin 4 allows active output if pin 1 is left open

<sup>2</sup> Inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, shock, Vibration, reflow, and one-year aging.

<sup>3</sup> Inclusive of 25°C tolerance and operating temperature range.

1.8V ELECTRICAL CHARACTERISTICS	
PARAMETERS	MAX (Unless otherwise noted)
Frequency Range (F <sub>0</sub> )	1.25 ~ 133.0MHz
Temperature Range	
Storage (T <sub>STG</sub> )	-55°C ~ +125°C
Supply Voltage (V <sub>DD</sub> )	1.8V±5%
Input Current (I <sub>DD</sub> )	
1.25 ~ 10.0 MHz	2.5 mA
>10.0 ~ 20.0 MHz	3.5 mA
>20.0 ~ 30.0 MHz	4.0 mA
>30.0 ~ 40.0 MHz	4.5 mA
>40.0 ~ 60.0 MHz	6.0 mA
>60.0 ~ 100.0 MHz	10.0 mA
>100.0 ~ 133.0 MHz	20.0 mA
Standby Current	10µA
Output Symmetry (50% V <sub>DD</sub> )	
1.25 ~ 50.0 MHz	45 % ~ 55 %
>50.0 MHz	40 % ~ 60 %
Rise/Fall Time (10%/90% V <sub>DD</sub> Levels) (T <sub>R</sub> /T <sub>F</sub> )	10 nS
Output Voltage (V <sub>OL</sub> )	10 % V <sub>DD</sub>
(V <sub>OH</sub> )	90 % V <sub>DD</sub> Min
Output Load (HCMOS)	15 pF
Start-up Time (T <sub>S</sub> )	10 mS
Output Disable Time <sup>1</sup>	10µA
Output Enable Time <sup>1</sup>	10 mS

ENABLE / DISABLE FUNCTION	
Pin1	Output (pin 3)
OPEN <sup>1</sup>	Active
'1' Level V <sub>IH</sub> ≥ 70%V <sub>DD</sub>	Active
'0' Level V <sub>IL</sub> ≤ 30%V <sub>DD</sub>	High Z

Available Options by Stability & Operating Temp for 1.8V		
Frequency Stability <sup>2</sup>	Operating Temperature (°C)	Frequency Range (MHz)
±100PPM	-10 ~ +70	1.25 ~ 133.0
±100PPM	-40 ~ +85	1.25 ~ 133.0
±50PPM	-10 ~ +70	1.25 ~ 133.0
±50PPM	-40 ~ +85	1.25 ~ 133.0
±25PPM	-10 ~ +70	1.25 ~ 133.0
±25PPM <sup>3</sup>	-40 ~ +85	1.25 ~ 133.0

<sup>1</sup> An internal pull-up resistor from pin 1 to pin 4 allows active output if pin 1 is left open

<sup>2</sup> Inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, shock, Vibration, reflow, and one-year aging.

<sup>3</sup> Inclusive of 25°C tolerance and operating temperature range.

2.5V ELECTRICAL CHARACTERISTICS	
PARAMETERS	MAX (Unless otherwise noted)
Frequency Range (F <sub>0</sub> )	1.25 ~ 170.0 MHz
Temperature Range	
Storage (T <sub>STG</sub> )	-55°C ~ +125°C
Supply Voltage (V <sub>DD</sub> )	2.5V±5%
Input Current (I <sub>DD</sub> )	
1.25 ~ 19.999999 MHz	5 mA
20.0 ~ 39.999999 MHz	9 mA
40.0 ~ 50.0 MHz	11 mA
>50.0MHz ~ 170MHz	30 mA
Standby Current	10µA
Output Symmetry (50% V <sub>DD</sub> )	
1.25 ~ 50.0 MHz	45 % ~ 55 %
>50.0 MHz	40 % ~ 60 %
Rise/Fall Time (10%/90% V <sub>DD</sub> Levels) (T <sub>R</sub> /T <sub>F</sub> )	10 nS
Output Voltage (V <sub>OL</sub> )	10 % V <sub>DD</sub>
(V <sub>OH</sub> )	90 % V <sub>DD</sub> Min
Output Load (HCMOS)	15 pF
Start-up Time (T <sub>S</sub> )	10 mS
Output Disable Time <sup>1</sup>	200 µS
Output Enable Time <sup>1</sup>	10 mS

ENABLE / DISABLE FUNCTION	
Pin1	Output (pin 3)
OPEN <sup>1</sup>	Active
'1' Level V <sub>IH</sub> ≥ 80%V <sub>DD</sub>	Active
'0' Level V <sub>IL</sub> ≤ 20%V <sub>DD</sub>	High Z

Available Options by Stability & Operating Temp for 1.5V		
Frequency Stability <sup>2</sup>	Operating Temperature (°C)	Frequency Range (MHz)
±100PPM	-20 ~ +70	1.25 ~ 170.0
±100PPM	-40 ~ +85	1.25 ~ 170.0
±50PPM	-20 ~ +70	1.25 ~ 170.0
±50PPM	-40 ~ +85	1.25 ~ 170.0
±25PPM	-20 ~ +70	1.25 ~ 170.0
±25PPM <sup>3</sup>	-40 ~ +85	1.25 ~ 170.0

<sup>1</sup> An internal pull-up resistor from pin 1 to pin 4 allows active output if pin 1 is left open

<sup>2</sup> Inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, shock, Vibration, reflow, and one-year aging.

<sup>3</sup> Inclusive of 25°C tolerance and operating temperature range.

3.3V ELECTRICAL CHARACTERISTICS	
PARAMETERS	MAX (Unless otherwise noted)
Frequency Range (F <sub>0</sub> )	1.00 ~ 170.0 MHz
Temperature Range	
Storage (T <sub>STG</sub> )	-55°C ~ +125°C
Supply Voltage (V <sub>DD</sub> )	3.3V±5%
Input Current (I <sub>DD</sub> )	
1.00 ~ 19.999999 MHz	7 mA
20.0 ~ 39.999999 MHz	13 mA
40.0 ~ 50.0 MHz	19 mA
>50.0 ~ 170MHz	40 mA
Standby Current (-20 to 70°C; -40 to 85°C)	10µA
(-40 to +105°C)	20µA
Output Symmetry (50% V <sub>DD</sub> )	
1.00 ~ 50.0 MHz	45 % ~ 55 %
>50.0 MHz	40 % ~ 60 %
Rise/Fall Time (10%/90% V <sub>DD</sub> Levels) (T <sub>R</sub> /T <sub>F</sub> )	10 nS
Output Voltage (V <sub>OL</sub> )	10 % V <sub>DD</sub>
(V <sub>OH</sub> )	90 % V <sub>DD</sub> Min
Output Load (HCMOS)	15 pF
Start-up Time (T <sub>S</sub> )	10 mS
Output Disable Time <sup>1</sup>	200 µS
Output Enable Time <sup>1</sup>	10 mS

ENABLE / DISABLE FUNCTION	
Pin1	Output (pin 3)
OPEN <sup>1</sup>	Active
'1' Level V <sub>IH</sub> ≥ 80%V <sub>DD</sub>	Active
'0' Level V <sub>IL</sub> ≤ 20%V <sub>DD</sub>	High Z

Available Options by Stability & Operating Temp for 3.3V		
Frequency Stability <sup>2</sup>	Operating Temperature (°C)	Frequency Range (MHz)
±100PPM	-20 ~ +70	1.00 ~ 170.0
±100PPM	-40 ~ +85	1.00 ~ 170.0
±100PPM	-40 ~ +105	2 ~ 50.0
±50PPM	-20 ~ +70	1.00 ~ 170.0
±50PPM	-40 ~ +85	1.00 ~ 170.0
±50PPM	-40 ~ +105	2 ~ 50.0
±25PPM	-20 ~ +70	1.00 ~ 170.0
±25PPM <sup>3</sup>	-40 ~ +85	1.00 ~ 170.0

<sup>1</sup> An internal pull-up resistor from pin 1 to pin 4 allows active output if pin 1 is left open

<sup>2</sup> Inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, shock, Vibration, reflow, and one-year aging.

<sup>3</sup> Inclusive of 25°C tolerance and operating temperature range.

VARIABLE VOLTAGE ELECTRICAL CHARACTERISTICS	
PARAMETERS	MAX (Unless otherwise noted)
Frequency Range ( $F_0$ )	0.75 ~ 156.25 MHz
Temperature Range	
Storage ( $T_{STG}$ )	-55°C ~ +125°C
Supply Voltage ( $V_{DD}$ )	
0.75 ~ 135.0 MHz	1.6V ~ 3.63V
>135.0 ~ 156.25 MHz	2.25V ~ 3.63V
Input Current ( $I_{DD}$ )	
0.75 ~ 19.999 MHz	4 mA
20.0 ~ 39.999 MHz	6 mA
40.0 ~ 59.999 MHz	10 mA
60.0 ~ 84.999 MHz	15 mA
85.0 ~ 135.0 MHz	30 mA
>135.0 ~ 156.250 MHz	40 mA
Standby Current	
$T_{OPR} = -40 \sim +85^\circ\text{C}$	10 $\mu\text{A}$
$T_{OPR} = -40 \sim +105^\circ\text{C} / -40 \sim +125^\circ\text{C}$	20 $\mu\text{A}$
Output Symmetry (50% $V_{DD}$ )	
0.75 ~ 84.999 MHz	45 % ~ 55 %
85.0 ~ 156.25 MHz	40 % ~ 60 %
Rise/Fall Time (10%/90% $V_{DD}$ Levels) ( $T_R/T_F$ )	6 nS
Output Voltage ( $V_{OL}$ )	10 % $V_{DD}$
( $V_{OH}$ )	90 % $V_{DD}$ Min
Output Load (HCMOS)	15 pF
Start-up Time ( $T_S$ )	5 mS
Output Disable Time <sup>1</sup>	200nS
Output Enable Time <sup>1</sup>	5 mS

ENABLE / DISABLE FUNCTION	
Pin1	Output (pin 3)
OPEN <sup>1</sup>	Active
'1' Level $V_{IH} \geq 70\%V_{DD}$	Active
'0' Level $V_{IL} \leq 30\%V_{DD}$	High Z



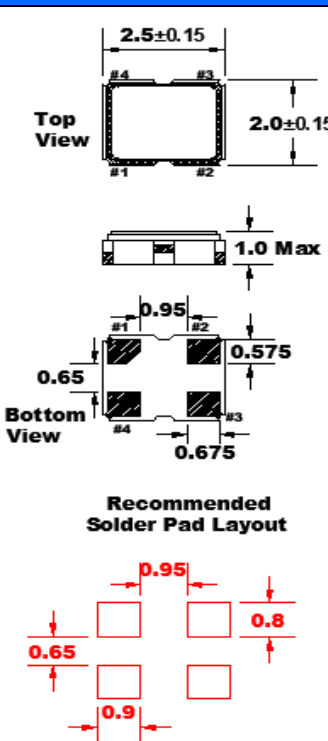
Available Options by Stability & Operating Temp For Variable Voltage		
Frequency Stability <sup>2</sup>	Operating Temperature (°C)	Frequency Range (MHz)
±100PPM	-20 ~ +70	0.75 ~ 156.25
±100PPM	-40 ~ +85	0.75 ~ 156.25
±100PPM	-40 ~ +105	1.25 ~ 135.0
±100PPM	-40 ~ +125	1.25 ~ 135.0
±50PPM	-20 ~ +70	0.75 ~ 156.25
±50PPM	-40 ~ +85	0.75 ~ 156.25
±50PPM	-40 ~ +105	1.25 ~ 135.0
±50PPM	-40 ~ +125	1.25 ~ 135.0
±25PPM	-20 ~ +70	0.75 ~ 156.25
±25PPM <sup>3</sup>	-40 ~ +85	0.75 ~ 156.25
±25PPM <sup>3</sup>	-20 ~ +70	0.75 ~ 156.25

<sup>1</sup> An internal pull-up resistor from pin 1 to pin 4 allows active output if pin 1 is left open

<sup>2</sup> Inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, shock, Vibration, reflow, and one-year aging.

<sup>3</sup> Inclusive of 25°C tolerance and operating temperature range.

DIMENSIONS / MECHANICAL SPECIFICATIONS



**Recommended Solder Pad Layout**

All dimensions are in millimeters.

**Pin Connections**  
 #1 E/D    #3 Output  
 #2 GND   #4 V<sub>DD</sub>

Note:

- 1, A 0.01μF capacitor should be placed between V<sub>DD</sub> (Pin 4) and G<sub>ND</sub> (Pin2) to minimize power supply line noise.
- 2, Dimensional drawing is for reference to critical specifications defined by size measurements. Certain non-critical visual attributes, such as side castellations, etc. may vary.

STANDARD SPECIFICATIONS	
PARAMETERS	MAX (Unless otherwise noted)
Maximum Soldering Temp / Time	260°C / 10 Seconds x 2
Moisture Sensitivity Level (MSL)	N/A
Termination Finish	Au (0.3~1μm) over Ni (1.27~8.89μm)
Seal Method	Seam
Lead (Pb) Free	Yes
RoHS Compliant	Yes, no exemptions
REACH Compliant (latest version)	Yes



# FO2HS

(Former F200, F210, F230, F240)

2.5mm x 2.0mm

HCMOS SMD Oscillator



TAPE SPECIFICATIONS (mm)						REEL SPECIFICATIONS (mm)							
A	B	C	D	E	F	REEL QTY	G	H	I	J	K	L	M
∅1.55	4.0	4.0	3.5	8.0	1.15	-T3 = 3,000 -T2 = 2,000 -T1 = 1,000	2.0	∅13	∅21	∅60	∅180	9.0	2.0

Available Options & Part Identification*						
Sample PN: <b>FO2HSBBM25.0-T3</b>						
F	O2HS	B	B	M	25.0	-T3
<b>Fox</b>	<b>Model Number</b>	<b>Voltage</b> M = 1.0V±5% I = 1.5V±5% K = 1.8V±5% H = 2.5V±5% <b>B = 3.3V±5%</b> V = 1.6V to 3.63V W = 2.25V to 3.63V	<b>Stability</b> A = ±100 PPM <b>B = ±50 PPM</b> D = ±25 PPM E = ±20 PPM	<b>Operating Temperature</b> E = -10 to +70°C F = -20 to +70°C <b>M = -40 to +85°C</b> P = -40 to +105°C I = -40 to +125°C	<b>Frequency (MHz)</b>	<b>Values Added Options</b> Blank = Bulk T1 = 1,000 pcs T2 = 2,000 pcs <b>T3 = 3,000 pcs</b>

\* Not all frequencies in the frequency range, or every combination of stability, temp range, and voltage available. See stabilities and op temps for each V<sub>DD</sub>.

Reliability Test Conditions
Please contact Abracon Quality Assurance department