





### Table of amendment

Version	Revision contents	Prepared by	Revised date
1.0	The first issued	<i>Anway</i>	2024.02.23



## 1. Electrical Parameters

MODEL: O22S-1801-9.61MHz						
Item	Description	Parameters			Unit	Test Condition
		Min.	Typ.	Max.		
Output	Frequency	9.61			MHz	
	Output Waveform	LVTTTL				
	Output Low Voltage			0.4	V	V <sub>cc</sub> =3.3V, Load =15pF
	Output High Voltage	2.4			V	V <sub>cc</sub> =3.3V, Load =15pF
	Duty Cycle	45		55	%	Measurement at -40~85°C
	Spurious Suppression			-90	dBc	
	Rise/Fall Time			4	ns	10%~90%V <sub>CC</sub>
	Load	13.5	15	16.5	pF	
	Start up time			1	s	90%V <sub>cc</sub> to the correct frequency output time
Frequency Stabilities	Frequency Accuracy	-0.8		+0.8	× 10 <sup>-6</sup>	Within 90 days after shipment and 15 minutes warm up time(before reflow), Measurement referenced to nominal frequency
		-0.9		+0.9	× 10 <sup>-6</sup>	After 2 hours and 5 minutes warm up time ( after reflow), Measurement referenced to the nominal frequency.
	Frequency Stability vs. Operating Temperature Range	-3		+3	× 10 <sup>-9</sup>	TA varied from -40°C to 85°C, V <sub>cc</sub> =3.3V, and Load = 15pF.Measurement referenced to frequency observed With TA = 25°C, V <sub>cc</sub> =3.3V . Air condition
	Frequency Tolerance after Temperature compensated vs Operating Temperature Range	-0.3		+0.3	× 10 <sup>-9</sup>	TA varied from -40°C to 85°C, V <sub>cc</sub> =3.3V, and Load = 15pF.Measurement referenced to frequency observed With TA = 25°C, V <sub>cc</sub> =3.3V . Air condition
	Temperature Accuracy			1	°C	TA varied from -40°C to 85°C, V <sub>cc</sub> = 3.3V, and O <sub>Load</sub> = 15 pF. Measurement TA.
	Frequency Stability vs. Supply Voltage	-1		+1	× 10 <sup>-9</sup>	TA =25°C, V <sub>cc</sub> varied from 3.135V to 3.465V and Load =15pF. Measurement referenced to frequency observed with TA = 25°C, V <sub>cc</sub> =3.3V.
	Frequency Tolerance vs Load	-1		+1	× 10 <sup>-9</sup>	10% Load Change Measurement referenced to frequency observed with TA = 25°C, V <sub>cc</sub> =3.3V.
	Slope	-1		+1	× 10 <sup>-9</sup> /°C	-40°C~ 85°C



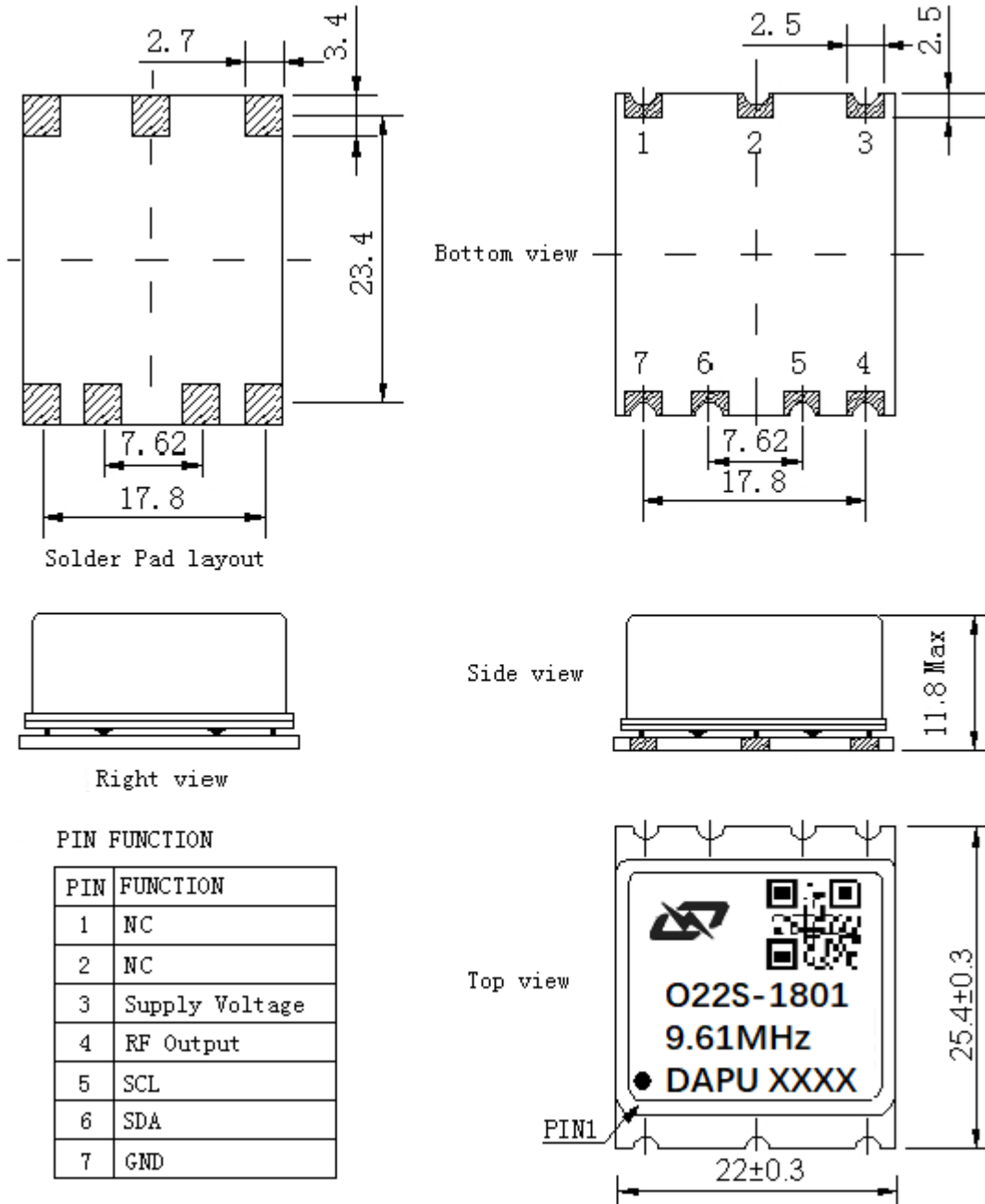
Frequency Stabilities	Short-Term Stability: Allan Variance (0°C ~75°C)			10	$\times 10^{-12}$	Temperature stability, no EMI\EMC or other interference , test after power for 1hour. 1s.
				15	$\times 10^{-12}$	Temperature stability, no EMI\EMC or other interference , test after power for 24hours. 10s.
				50	$\times 10^{-12}$	Temperature stability, no EMI\EMC or other interference , test after power for 72hours. 100s.
	Aging Tolerance per day	-0.5		+0.5	$\times 10^{-9}$	V <sub>cc</sub> , TA constant Measurement referenced to frequency observed with TA=25°C, V <sub>cc</sub> =3.3V. and after 30 days of operation
	Aging Tolerance per month	-12		+12	$\times 10^{-9}$	
	Aging Tolerance 1 Year	-0.08		+0.08	$\times 10^{-6}$	
Aging Tolerance 10 Years	-0.5		+0.5	$\times 10^{-6}$		
Power Supply	Supply Voltage	3.135	3.3	3.465	V	
	Steady Consumption			450	mA	@25°C
	Warm up current			1000	mA	When all temp range
	Warm Up Time			5	minute	
	Warm Up 1	-0.08		+0.08	$\times 10^{-6}$	After warm up 3 minutes. Measurement referenced to frequency observed with TA = 25°C, V <sub>cc</sub> =3.3V. and after 24 hours of operation.
	Warm Up 2	-0.02		+0.02	$\times 10^{-6}$	After warm up 10 minutes. Measurement referenced to frequency observed with TA = 25°C, V <sub>cc</sub> =3.3V. and after 24 hours of operation.
Phase Noise	Phase Noise			-80	dBc/Hz	1Hz
				-120		10Hz
				-140		100Hz
				-145		1KHz
				-150		10KHz
				-150		100KHz
				-150		1MHz



Environmental Conditions	Operable Temperature range	-40		+85	°C		
	Operating Temperature	-40		+85	°C		
	Storage Temperature	-55		+105	°C		
	Temperature Rate of Change			1	°C/min		
	Jitter			1.6	ps-rms	12KHz-5MHz	
	Air-tightness			1x10 <sup>-9</sup>	Pa.cm <sup>3</sup> /s	Crystal cavity	
				1x10 <sup>-5</sup>	Pa.cm <sup>3</sup> /s	Shell	
	ESD Level	Human Body Model, class2: 2000V to 4000V; ANSI/ESDA/JEDEC JS-001-2010.					
		Machine Model, class B: 200V to 400V; JEDEC JESD22-A115C.					
	Moisture Sensitivity Level	Level 2.					
Vibration	Test Condition: 0.75mm ;acceleration:10g;10Hz~500Hz, one cycle per 30 min, test 2 hour. (3 times for each 3 directions X ,Y , Z), IEC 68-2-06 Test Fc.						
Shock	50g; 11ms; half sine wave (3 times for each 3 directions X ,Y , Z ),IEC 68-2-27 Test Ea/Severity 50A.						
Full Package Storage	Relative Humidity (%)	20%~70%					
	Temperature (°C)	-10~35°C					



## 2. Mechanical Structure (mm)



**Note1:** Tolerance ± 0.20mm without mark

**Note2:** The first two xx representative: year  
After two xx representative: week

**Note3:** Referential weight 10g

**Note4:** NC is not connect



### 3. I<sup>2</sup>C Devices Address

#### 3.1. 2kbit I<sup>2</sup>C SERIAL EEPROM

Device name: FM24C02B

Device supplier: FUDAN MICRO

Device address: 1010 100

#### Memory map

Address	Size bytes	Parameter	Format	Value
0000h~0000h	1	EEPROM map version	unsigned byte	01h
0001h~0001h	1	HUAWEI Reserved		00h
0002h~0004h	3	Vendor ID(3 characters)	ASCII	DP
0005h~0024h	32	Vendor Product ID	ASCII	O22S-1801-9.61MHz
0025h~0028h	4	Nominal frequency in Hertz	32-bit unsigned integer	10000000
0029h~002Ch	4	Device serial number	32-bit unsigned integer	001
002Dh~0032h	6	Date code of manufacture	ASCII	“YYMMDD”
0033h~003Fh	13	HUAWEI Reserved		00h
0040h~0047h	8	A <sub>0</sub>	64-bit floating point	0.1334
0048h~004Fh	8	A <sub>1</sub>	64-bit floating point	-0.005225
0050h~0057h	8	A <sub>2</sub>	64-bit floating point	3.77E-05
0058h~005Fh	8	A <sub>3</sub>	64-bit floating point	-9.07E-07
0060h~0067h	8	A <sub>4</sub>	64-bit floating point	1.99E-08
0068h~006Fh	8	A <sub>5</sub>	64-bit floating point	-1.85E-10
0070h~0077h	8	B <sub>0</sub>	64-bit floating point	-101.583
0078h~007Fh	8	B <sub>1</sub>	64-bit floating point	0.740016
0080h~009Fh	32	HUAWEI Reserved		00h
00A0h~00CFh	48	Vendor Reserved		
00D0h~00D1h	2	Pmin	16-bit unsigned integer	10240
00D2h~00D3h	2	Pmax	16-bit unsigned integer	51200
00D4h~00FFh	44	Vendor Reserved		

Note: All numerical values are stored in little endian format

#### 3.2. Analog-to-Digital Converter

Device name : SD150

Device supplier : SGMICRO

Device address : 1001000

Initialize the register address: 00000001

The initialization value: 01000010 10000011

Note: More detailed information see the datasheet provide by the SGMICRO.



## 4. Temperature measurement and compensation scheme

Temperature compensation formula:

$$A_5P^5 + A_4P^4 + A_3P^3 + A_2P^2 + A_1P + A_0 = \frac{f(P) - f(P_{ref})}{f(P_{ref})}$$

**A<sub>x</sub>**: Temperature compensation parameters (see register list)

**P**: This parameter is read by ADC and is related to temperature.

**f(P)**: measured frequency.

**P<sub>ref</sub>**: Parameter variables associated with the reference Temperature (25°C)

**OCXO Ambient temperature calculation formula:**

$$B_1P + B_0 = Ta[^\circ C]$$

## 5. Vibration condition

### Random vibration and sinusoidal vibration

	Test conditions	Vibration parameter diagram
Random Vibration (outside)	5~10Hz:+12dB/oct,(0.000026g <sup>2</sup> /Hz) 10~50Hz:0.04m <sup>2</sup> /s <sup>3</sup> (0.000416 g <sup>2</sup> /Hz) 50~100Hz:-12 dB/oct,(0.000026g <sup>2</sup> /Hz) The total root mean square acceleration is 0.15Grms. 3 x 30min	Figure 3
Swept Sine (outside)	5-9Hz:1.2mm,9~200Hz:4m/s <sup>2</sup> ,3 x 5sweep cycles,1oct/min.	Figure 4
Installation vibration of trackside equipment	10~600Hz: -1.5 dB/oct 600~2000Hz:0.001g <sup>2</sup> /Hz	Figure C.4



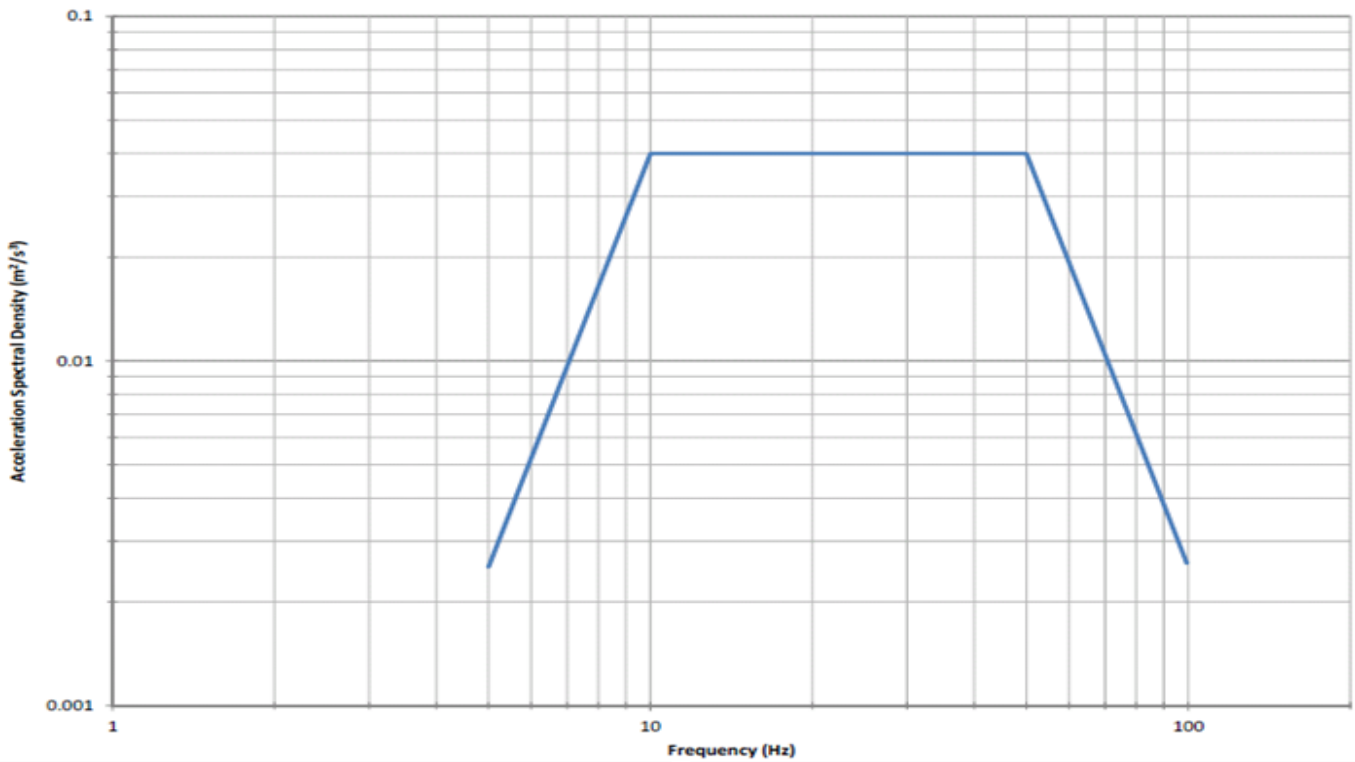


Figure 3

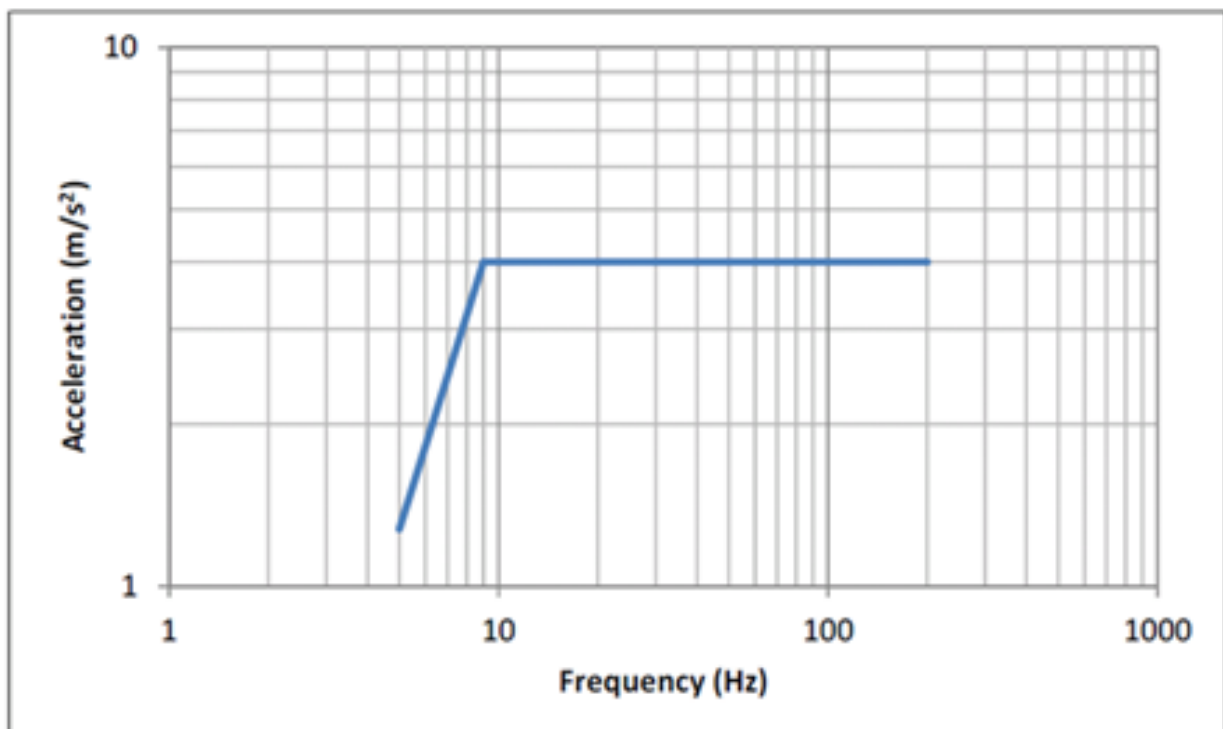


Figure 4

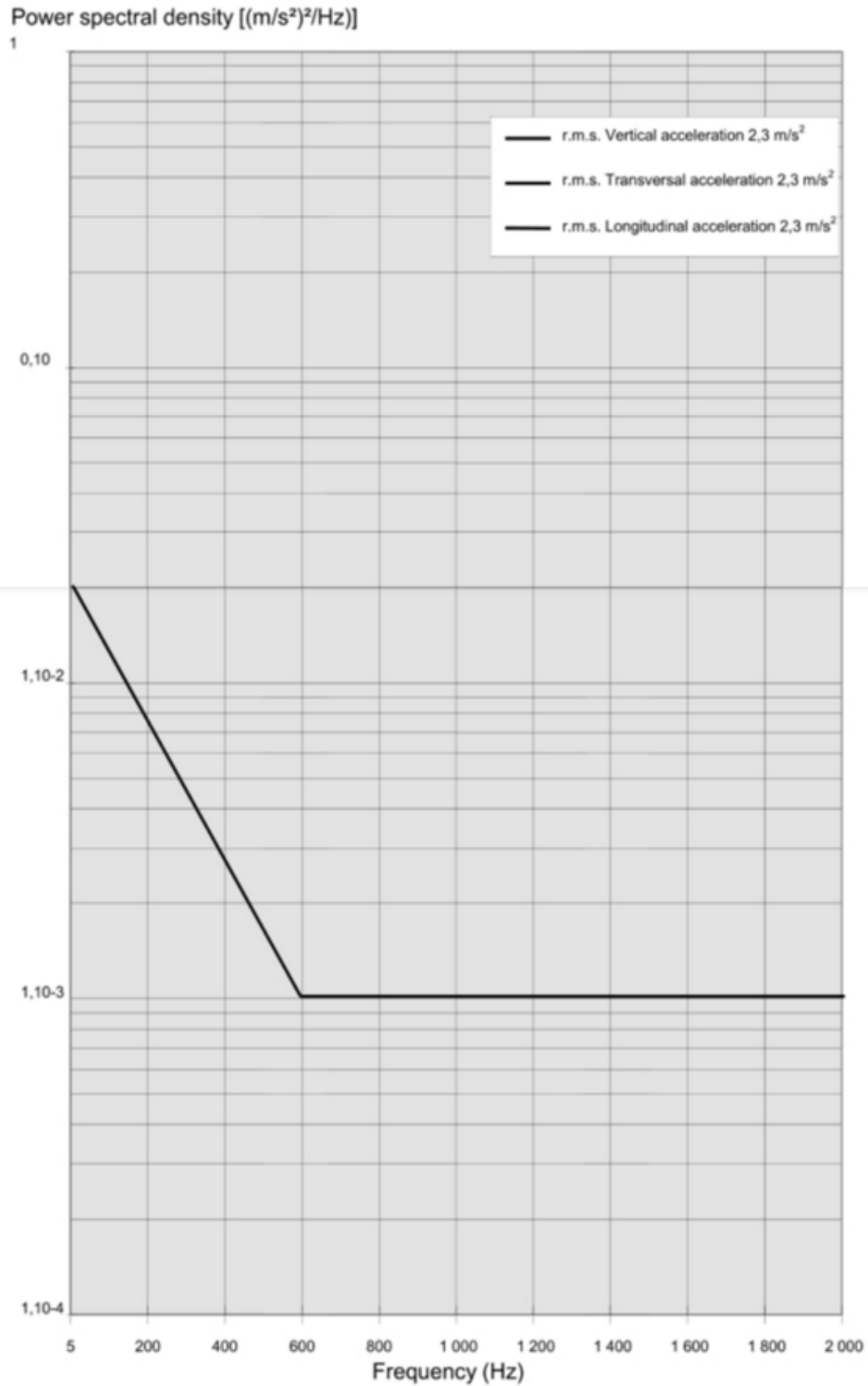
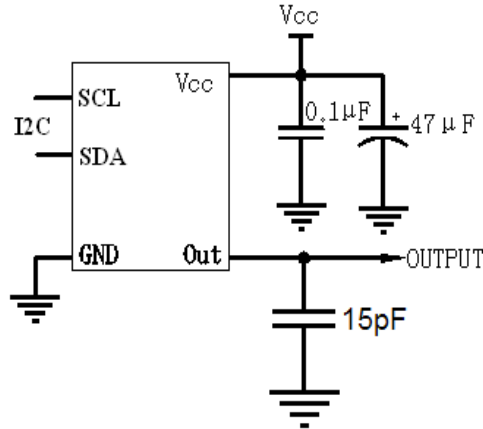


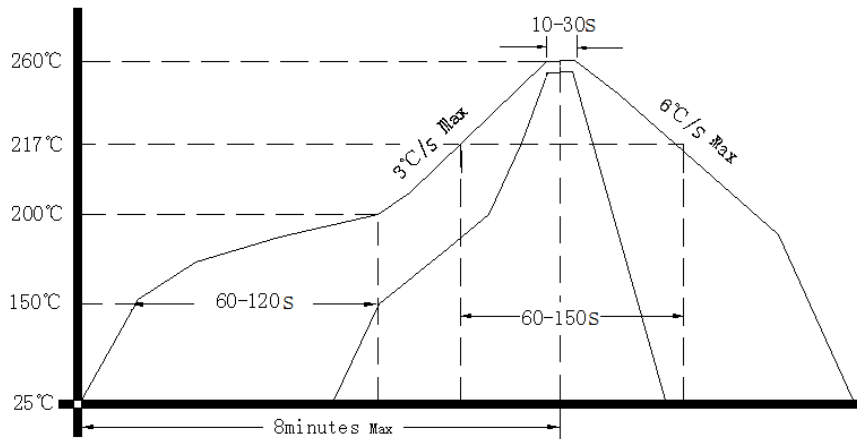
Figure C.4



## 6. Test Circuit



## 7. Reflow Soldering Curve (RoHS)



Note: Passing through reflow upside down is not supported

## 8. Package: Tape & Reel (mm)

