



Table of amendment

Version	Revision contents	Prepared by	Revised date
1.0	The first issued	<i>Amway</i>	2019.11.29
1.1	The “Frequency Accuracy” “Frequency Stability vs. Operating Temperature Range” “Tolerance after Temperature compensated vs Operating Temperature Range” “Frequency Tolerance after Temperature compensated vs Operating Temperature Range” “Temperature Resolution” “Moisture Sensitivity Level” changed, Add “G Sensitivity”.	<i>Amway</i>	2020.02.10
1.2	The “I2C Devices Address” “ESD Level” “Moisture Sensitivity Level” changed	<i>Amway</i>	2020.03.10
1.3	Add “Frequency Vibration” “Vibration condition”, The “Package: Tape & Reel” changed	<i>Amway</i>	2020.06.30



1. Electrical Parameters

MODEL: O22S-1806-10.00MHZ						
Item	Description	Parameters			Unit	Test Condition
		Min.	Typ.	Max.		
Output	Frequency	10.00			MHz	
	Output Waveform	LVTTTL				
	Output Low Voltage			0.4	V	$V_{cc}=5.0V$, Load =15pF
	Output High Voltage	2.4			V	$V_{cc}=5.0V$, Load =15pF
	Duty Cycle	45		55	%	Measurement at -40~95°C
	Spurious Suppression			-90	dBc	
	Rise/Fall Time			6	ns	10%~90%VCC
	Load	13.5	15	16.5	pF	
	Start up time			1	s	90% V_{cc} to the correct frequency output time
Frequency Stabilities	Frequency Accuracy	-1.0		+1.0	$\times 10^{-6}$	Within 90 days after shipment and 15 minutes warm up time(before reflow), Measurement referenced to nominal frequency
		-0.1		+0.1	$\times 10^{-6}$	Within 90 days after shipment and 5 minutes warm up time(after reflow), Measurement referenced to initial frequency (after 2 hours and 5 minutes warm up time after reflow)
		-1.0		+1.0	$\times 10^{-6}$	After 2 hours and 5 minutes warm up time (after reflow), Measurement referenced to the nominal frequency.
	Frequency Stability vs. Operating Temperature Range	-3.0		+3.0	$\times 10^{-9}$	TA varied from 0 to 95°C, $V_{cc}=5.0V$, and Load = 15pF. Measurement referenced to frequency observed With TA = 25°C, $V_{cc}=5.0V$.
	Frequency Tolerance after Temperature compensated vs Operating Temperature Range	-0.3		+0.3	$\times 10^{-9}$	TA varied from 0 to 95°C, $V_{cc}=5.0V$, and Load = 15 pF. Measurement referenced to frequency observed With TA = 25°C, $V_{cc}=5.0V$.
	Frequency Tolerance after Temperature compensated vs Operating Temperature Range	-5.0		+5.0	$\times 10^{-6}$	TA varied from -40 to 95°C, $V_{cc}=5.0V$, and Load = 15 pF. Measurement referenced to frequency observed With TA = 25°C, $V_{cc}=5.0V$.



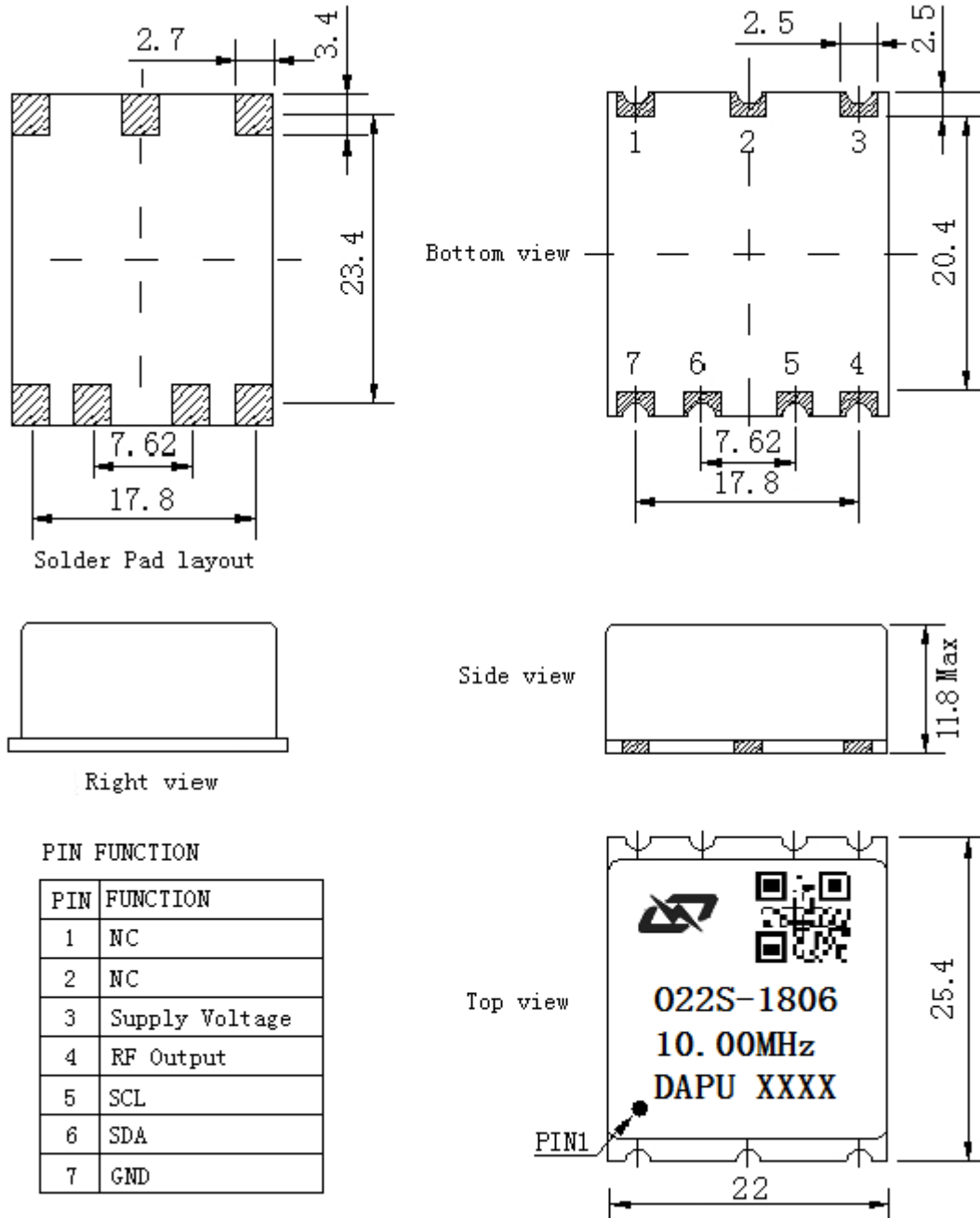
Frequency Stabilities	Short-Term Stability: Allan Variance			0.01	$\times 10^{-9}$	Temperature stability, no EMI\EMC or other interference, test after power for 1hour ref. to 25°C; 1s.
				0.015	$\times 10^{-9}$	Temperature stability, no EMI\EMC or other interference, test after power for 1hour ref. to 25°C; 10s.
				0.05	$\times 10^{-9}$	Temperature stability, no EMI\EMC or other interference, test after power for 1hour ref. to 25°C; 100s.
	Frequency Stability vs. Supply Voltage	-1		+1	$\times 10^{-9}$	TA =25°C, V _{cc} varied from 4.75 to 5.25V and Load =15pF. Measurement referenced to frequency observed with TA = 25 °C, V _{cc} =5.0V.
	Frequency Tolerance vs Load	-1		+1	$\times 10^{-9}$	10% Load Change Measurement referenced to frequency observed with TA = 25°C, V _{cc} =5.0V.
	Temperature Resolution			0.1	°C	TA varied from 0 to 95°C, V _{cc} =5.0V, and Load = 15pF. Measurement TA
	G Sensitivity			3	$\times 10^{-9}/g$	Gamma vector of all three axes from 30Hz to 1500Hz.
	Frequency Vibration	-0.5		+0.5	$\times 10^{-9}$	Frequency counter gate time =1s, continuous test. The Vibration condition See the “5.vibration condition”.
	Aging Tolerance per day	-0.5		+0.5	$\times 10^{-9}$	V _{cc} , TA constant Measurement referenced to frequency observed with TA=25°C, V _{cc} =5.0V. and after 30 days of operation
	Aging Tolerance per month	-12		+12	$\times 10^{-9}$	
	Aging Tolerance 1 Years	-0.08		+0.08	$\times 10^{-6}$	
Aging Tolerance 10 Years	-0.5		+0.5	$\times 10^{-6}$		
Power Supply	Supply Voltage	4.75	5.0	5.25	V	
	Steady Consumption			300	mA	@25°C
	Warm up current			700	mA	When all temp range
	Warm Up Time			5	minute	
	Warm Up	-0.02		+0.02	$\times 10^{-6}$	After warm up 10 minute. Measurement referenced to frequency observed with TA = 25 °C ,V _{cc} =5.0V. and after 24 hour of operation.



Phase Noise	Phase Noise			-80	dBc/Hz	1Hz
				-120		10Hz
				-140		100Hz
				-145		1KHz
				-150		10KHz
				-150		100KHz
Environmental Conditions	Operable Temperature range	-40		+95	°C	
	Operating Temperature	-40		+95	°C	
	Storage Temperature	-55		+105	°C	
	Temperature Rate of Change			5	°C/min	
	Jitter			1.6	ps-rms	12KHz-5MHz
	Air-tightness			0.1	Pa.cm3/s	Not include PCB conversion board.
	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 $\pm 0.20\text{mm}$ without mark
- Note2:** The first two xx representative: year
After two xx representative: week
- Note3:** Referential weight 10g
- Note4:** NC is not connect



3. I²C Devices Address

3.1. 2kbit I²C 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-1806-10.00MHz
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 ₀	64-bit floating point	0.1334
0048h~004Fh	8	A ₁	64-bit floating point	-0.005225
0050h~0057h	8	A ₂	64-bit floating point	3.77E-05
0058h~005Fh	8	A ₃	64-bit floating point	-9.07E-07
0060h~0067h	8	A ₄	64-bit floating point	1.99E-08
0068h~006Fh	8	A ₅	64-bit floating point	-1.85E-10
0070h~0077h	8	B ₀	64-bit floating point	-101.583
0078h~007Fh	8	B ₁	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_x: Temperature compensation parameters (see register list)

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

f(P): measured frequency.

P_{ref}: Parameter variables associated with the reference Temperature (25°C)

OCXO Ambient temperature calculation formula:

$$B_1P + B_0 = Ta[°C]$$

5. Vibration condition

Random vibration and sinusoidal vibration

	Test conditions	Vibration parameter diagram
Random Vibration (outside)	5~10Hz:+12dB/oct,(0.000026g ² /Hz) 10~50Hz:0.04m ² /s ³ (0.000416 g ² /Hz) 50~100Hz:-12 dB/oct,(0.000026g ² /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 ² ,3 x 5sweep cycles,1oct/min.	Figure 4
Installation vibration of trackside equipment	10~600Hz:-1.5 dB/oct 600~2000Hz:0.001g ² /Hz	Figure C.4

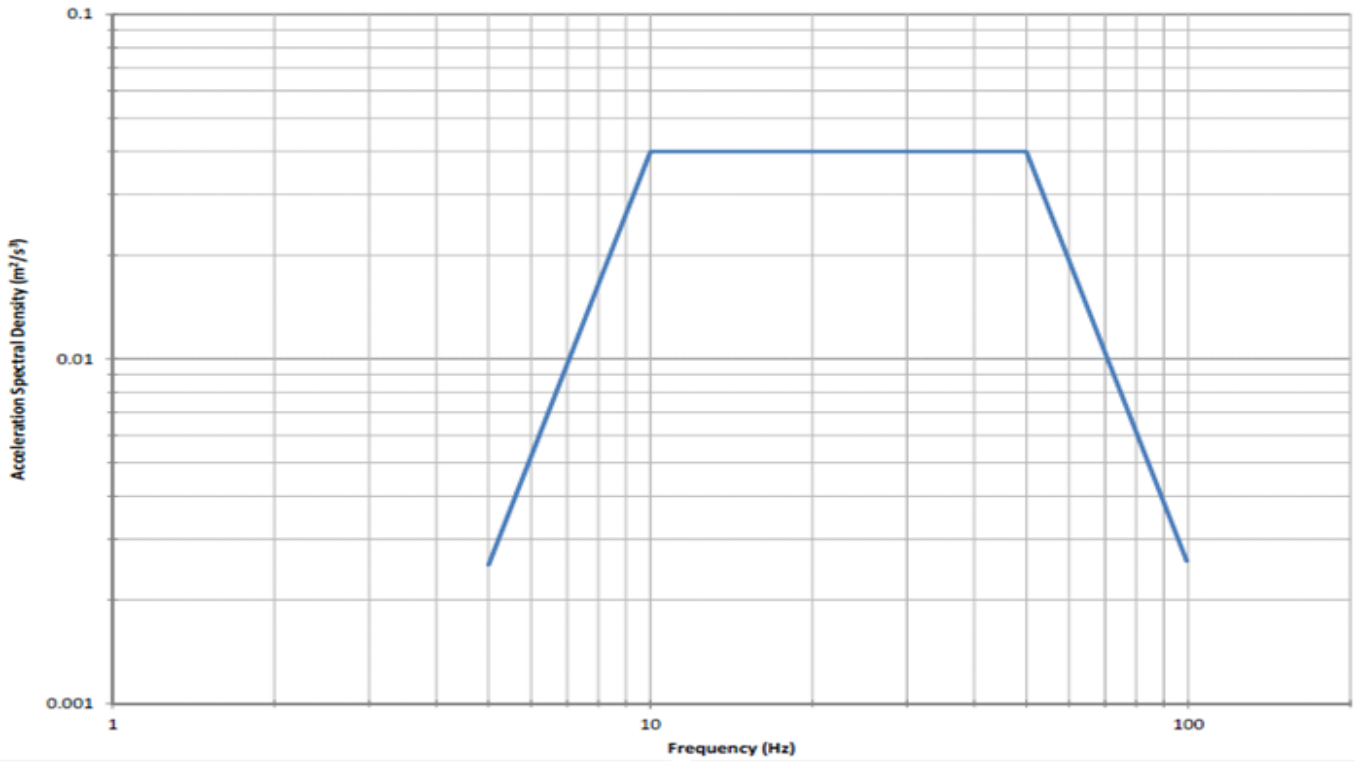


Figure 3

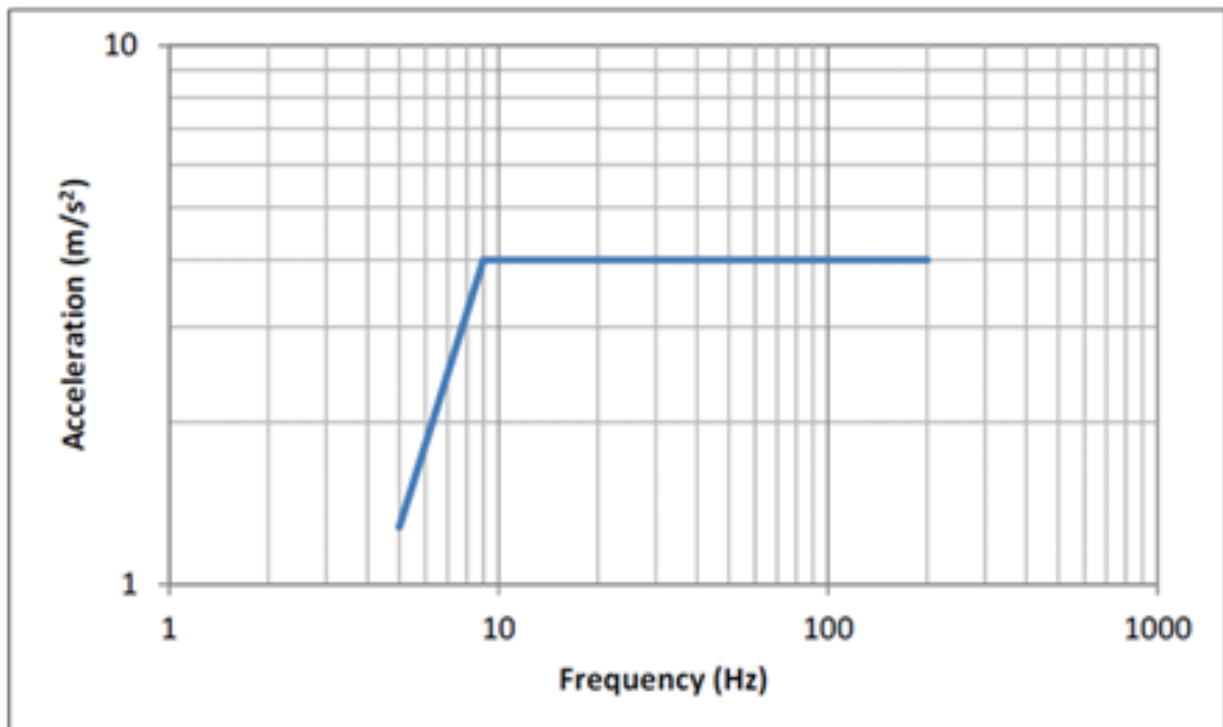


Figure 4

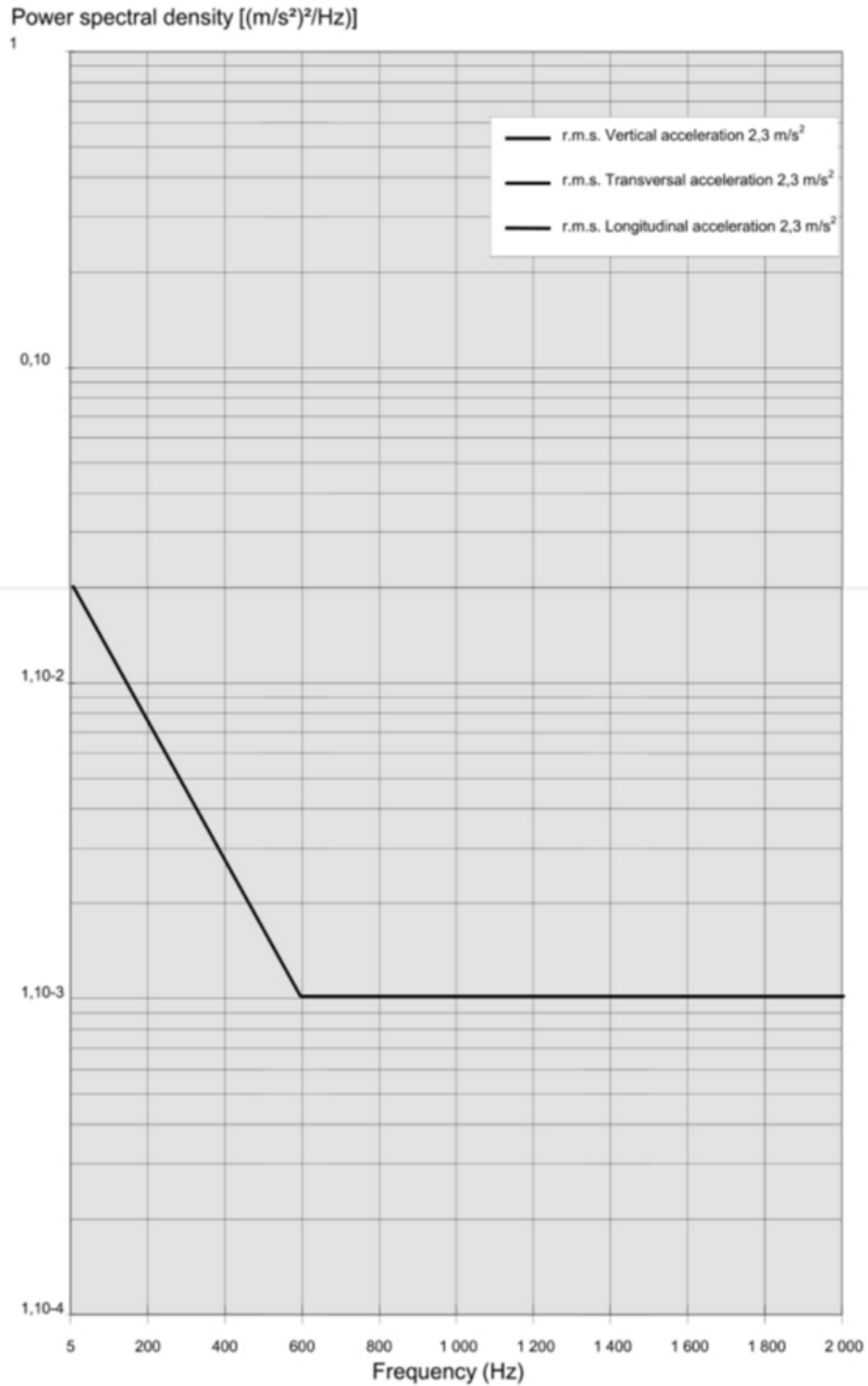
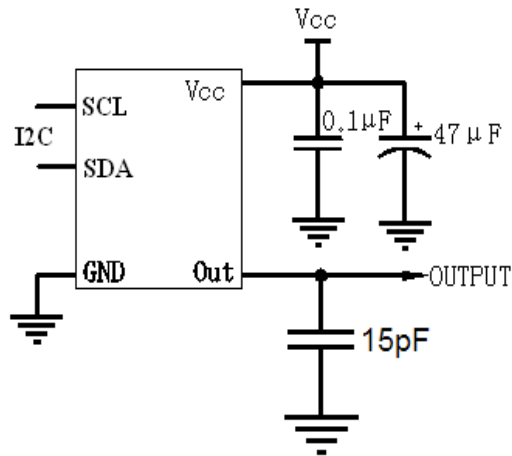


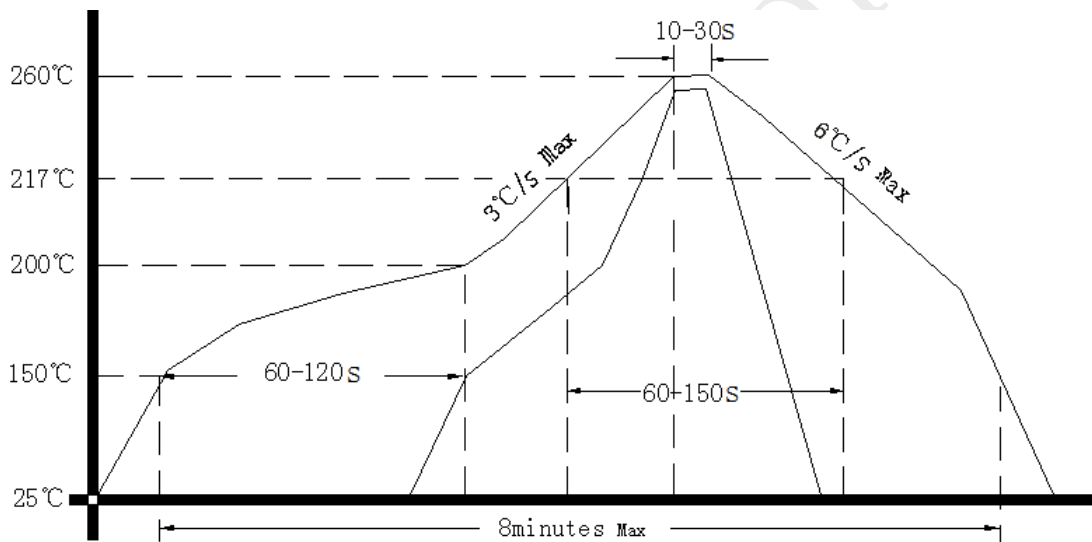
Figure C.4



6. Test Circuit



7. Reflow Soldering Curve (RoHS)



8. Package: Tape & Reel (mm)

