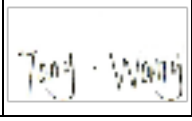
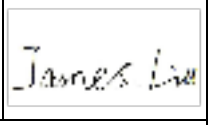
Customer Code : A021

DATASHEET

DAPU P/N : **O22S-2103-10.00MHz**

Customer P/N: _____

DAPU			Customer Approval
Drew	Audited	Approved	Stamp, please! Thanks!
			
Date: 2016.01.20			

Guangdong Dapu Telecom Technology Co.,Ltd

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Table of amendment

Version	Revision contents	Prepared by	Revised date
1.0	The first issued	Amway	2015.01.12
1.1	"Unit" ,"Initial Frequency Tolerance" changed	Amway	2015.01.14
1.2	Modified according to customer requirements: 1. " Aging Tolerance 1 Year" added 2. " Frequency Tolerance vs. Operating Temperature Range" , "Allan Deviation", "Aging Tolerance Per Day", "Current Consumption", " Warm-up completion time", " Warm up current", "3.1.2 EEPROM for inventory and data storage", "3.1.4 Temperature stability correction record in EEPROM", "3. I^2C Devices Address -Notes", "3.2. Temperature sensor" changed 3. " Warm-up stability" ,"Frequency variation During Thermal Shock", "Maximum daily ageing phase variation, based on mean ageing slope linear estimation over 48h" deleted	Amway	2015.01.28
1.3	"Initial Frequency Tolerance" and "3.2. DIGITAL THERMOMETER- Device address" changed	Amway	2015.01.29
1.4	1. Modified the 1st page 2.Modified according to customer requirements: "Warm-up completion time - Test Condition" , "3.1.3 Inventory record in EEPROM -Function Code", "3. I^2C Devices Address-Note 10-conversion formula "changed "Internal temperature" instead of "Ambient Temperature" 3. "3.2. DIGITAL THERMOMETER- Device name" , "3. I^2C Devices Address-Note 7" corrected	Amway	2015.03.16
1.5	Modified according to customer requirements: Warm-up stability	Amway	2015.04.13
1.6	1."Environmental Reliability(Air temperature)-High-Low Temp" change to "Environmental Reliability (Air temperature)- High-High Temp" 2. "Warm-up stability- Test Condition" changed	Amway	2015.04.16
1.7	"3.1.4 Temperature stability correction record in EEPROM" changed	Amway	2015.07.29
1.8	Modified according to customer requirements: "3.1.4 Temperature stability correction record in EEPROM"	Amway	2015.07.31

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1.9	Modified according to customer requirements: 1.“Thermal Hysteresis” and “Aging Predictibility” added 2.“Frequency Tolerance vs. Operating Temperature Range” , “Initial Frequency Tolerance”, “Aging Tolerance Per Day” and “Warm-up completion time- Test Condition” changed.	Amway	2015.10.30
2.0	1.Electrical Parameters-Note 1: “maximum value of thermal hysteresis” change to “the averaged thermal hysteresis”	Amway	2015.11.04
2.1	The formula corresponding to internal and ambient temperature changed	Amway	2016.01.20

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1. Electrical Parameters

MODEL： O22S-2103-10.00MHz						
Item	Description	Parameters			Unit	Test Condition
		Min.	Typ.	Max.		
Output	Frequency		10.00		MHz	
	Output Waveform		LVTTL			
	Output Low Voltage			0.4	V	V_{cc}=5.0V, O_{load}=15pF
	Output High Voltage	2.4			V	V_{cc}=5.0V, O_{load}=15pF
	Duty Cycle	45	50	55	%	@50%
	Rise / Fall Time (10%~90%)		2	3	ns	@25℃
	Load		15		pF	
	Frequency Tolerance vs. Operating Temperature Range	-5		+5	ppb	T_A varied from -5℃ to 85℃, measurement referenced to frequency observed with $f_{ref}=(f_{max}+f_{min})/2$ V_{cc}=5.0V, O_{load}=15pF, temperature variable speed less than 1℃per minute.
		-0.5		+0.5	ppb	ΔT<5℃ within range -5℃ to 85℃ V_{cc}=5.0V, O_{load}=15pF, temperature variable speed less than 1℃per minute.
		-0.3		+0.3	ppb	Frequency variation after thermal Correction within range -5℃ to 85℃ V_{cc}=5.0V, O_{load}=15pF, temperature variable speed less than 1℃per minute.
	Thermal Hysteresis			0.2	ppb	Note 1
	Initial Frequency Tolerance	-200		+200	ppb	T_A=25℃, V_{cc}=5.0V, at shipment measurement referenced to 10MHz after 10 minutes of warm-up .
	Warm-up stability	-15		+15	ppb	Y(unit: s) is the time needed from start up to steady status(refer to frequency test 1 hour after start-up). B(unit:℃) is internal temperature. Formula to calculate Y at different temperature point (ambient temperature range: -7℃~85℃) is: Y= -1.2×B+235.
	Allan Deviation			0.01	ppb	Temperature stability, no EMI\EMC or other interference，test after power for 24hours, 25℃; 1s, using PN9000 equipment.
				0.015	ppb	Temperature stability, no EMI\EMC or other interference，test after power for 24hours, 25℃; 10s, using PN9000 equipment.

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				0.05	ppb	Temperature stability, no EMI\EMC or other interference， test after power for 24hours, 25℃; 100s, using PN9000 equipment.
	Maximum total frequency jump	-0.2		+0.2	ppb	Test the frequency every 2s after the products are powered on for 72 hours. Take 10 frequency values and calculate the average value.
	Aging Tolerance Per Day	-0.75		+0.75	ppb	V_{cc}, T_A constant measurement referenced to frequency observed with T_A=25℃, V_{cc}= 5.0V and after 30 days of operation.
	Aging Tolerance 1 Year	-100		+100	ppb	
	Aging Predictibility	-0.05		+0.05	ppb/day	Note 2
	Overall Stability	-500		+500	ppb	Inclusive of the following: operating temperature -5℃ to 85℃ 5.0V±5% 15pF load ±5% 10 years aging reference to nominal frequency
Power Supply	Supply Voltage	4.9	5.0	5.1	V	
	Current Consumption			800	mA	T_A=-5℃
				300	mA	T_A=25℃
				200	mA	T_A=85℃
	Warm-up completion time			10	min	T_A=25℃, Oscillator frequency within ± 0.015×10^{-6}, with reference to 1 hour value .
	Warm up current			800	mA	
	Ripple noise on power supply			10	mV	Peak to peak
	Inrush current on the 5V supply, at power up			3500	mA	For a 50μs max
Phase Noise	Phase Noise @25℃			-80	dBc/Hz	1Hz
				-100		10Hz
				-120		100Hz
				-130		1KHz
				-130		10KHz
				-130		1MHz

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Environmental Conditions	Reference Air Velocity	1	2	3	m/s	
	Operable Temperature	-5		+85	℃	
	Storage Temperature	-40		+85	℃	
	ESD Level	Human Body Model, class2: 2000V to 4000V; ANSI/ESDA/JEDEC JS-001-2010.				
		Machine Model, class B: 200V to 400V; ANSI/ESDA/JEDEC JS-001-2010.				
	Moisture Sensitivity Level	Level 2 .				
Environmental Reliability (Operational Conditions)	Vibration(Sinusoidal)	1. Frequency range:5-9Hz（displacement：1,2mm） 2. Frequency range:9-200Hz（displacement：4m/s^2） 3. Duration:3×5 sweep cycles				
	Vibration(Random)	1. Frequency range:5-10Hz,10-50Hz,50-100Hz 2. ASD:0,04m^2/s^3 3. Duration:3 × 30 minutes				
	Shocks	1. Shock spectrum: half sine 2. Duration:11ms 3. Acceleration:50m/s^2 4. Directions of bumps:6 5. Duration:100 in each direction				
	Humidity	1. Temperature:30℃ 2. Humidity：93%RH 3. Duration：4d（96h）				
Environmental Reliability (Non Operational Conditions)	Random Vibration	1. Frequency range:5-20Hz,20-200Hz. 2. ASD:1 m^2/s^3 3. Duration:3 × 30 minutes				
	Shocks	1. Shock spectrum: half sine 2. Duration:6ms 3. Acceleration:180m/s2 4. Directions of bumps:6 5. Duration:100 in each direction				
	Free fall	1. Height:0.1m 2. Duration:1 fall on each face				
Environmental Reliability (Air temperature)	Low	1. Low Temp:-25℃； 2. Duration: 72h				
	High	1. High Temp:70℃； 2. Duration: 72h				
	air/air Change	1. Temp Change:-25℃～30℃ 2. Cycle:5				

	Humidity	1. Temperature:30℃ 2. Humidity：93%RH 3. Duration：4d（96h）
	Humidity (Condensation)	1. Temperature:30℃ 2. Humidity：90-100%RH 3. Duration：2Cycle
Full Package Storage	Relative humidity (%)	20%～70%
	Temperature (℃)	-10~35℃

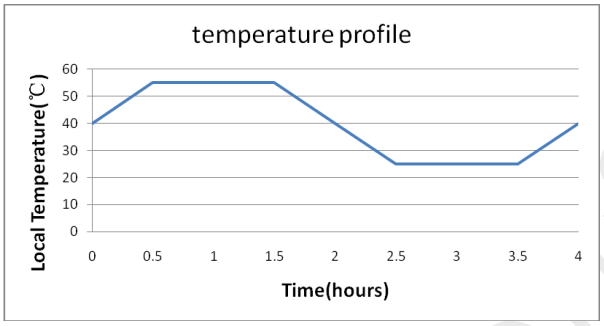
Note 1: Test standard:

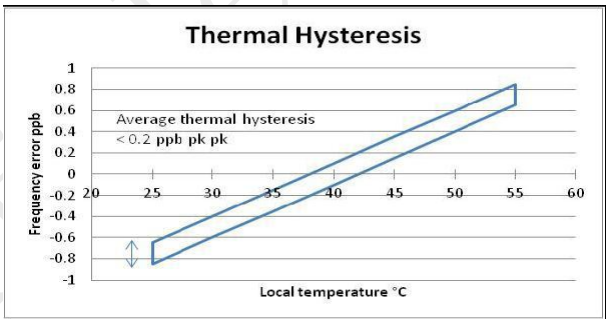
OCSD2 Conduct test after 5 days operating, set gate time as 1s.After 7 times loop test, calculate the average value.

Place the OCSD2 in high & low temperature test chamber and soak it at 40℃ for 1 hour and then begin test.

Temperature rising rate: 0.5℃/min and for each of the temperature point, soaking time is 1 hour. Order of the temperature point to be tested is 40℃,55℃,25℃,40℃.

For the test results, the averaged thermal hysteresis＜0.2ppb is qualified.





Note 2: Test standard:

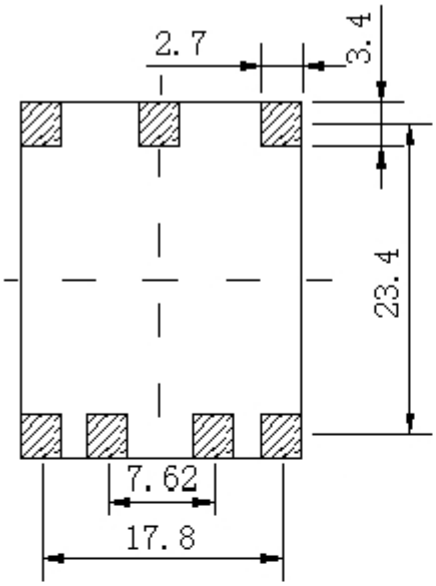
Place the OCSD2 in high temperature thermostatic chamber. Temperature variation should be within ± 0.5℃. Record temperature variation of the chamber during the test.

Conduct test after power on for 5 days at 70℃, set gate time as 1s.After 7 times loop test, calculate the average value.

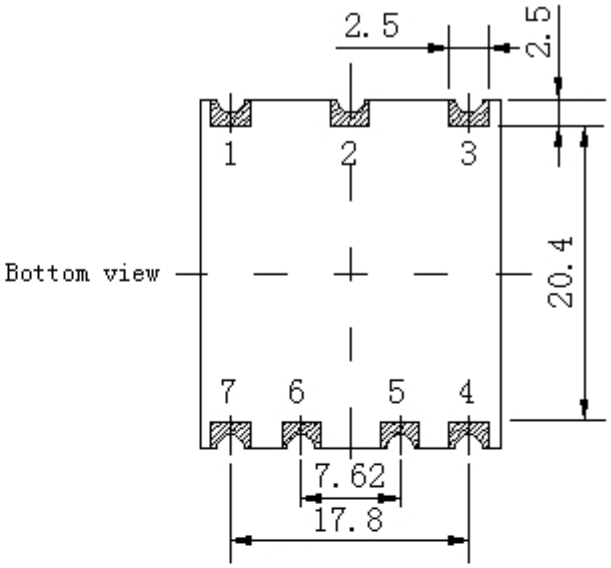
In order to meet this, the frequency is measured once a hours during 48 hours, and a 12h sliding estimation of the frequency slope is computed every hours (36 such Aging slope estimations computed in total).

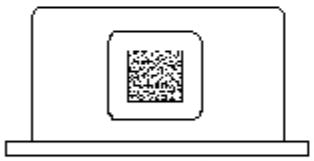
The mean daily Aging must be within ±0.750 ppb/day, and the distribution of these 36 Aging slope estimations must remain within ±0.1ppb/day of this mean value. If temperature variation of the chamber ＜0.2 ℃ during the test, Aging predictability should be controlled ±0.05ppb/day.

2. Mechanical Structure(mm)

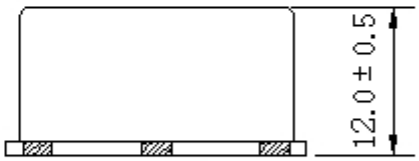


Solder Pad layout



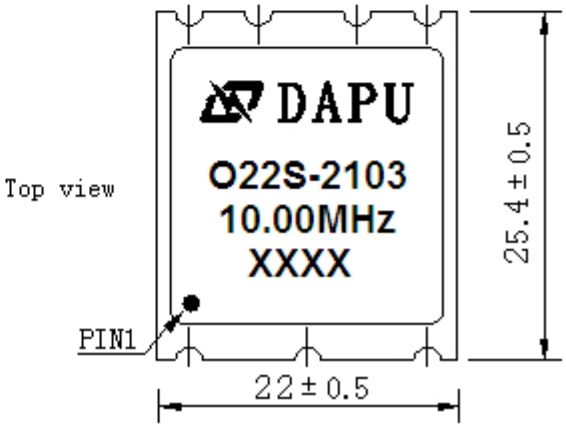


Right view



PIN FUNCTION

PIN	NOTATION	FUNCTION
1,2	NC	Not Connect
3	VCC	Supply Voltage
4	OUTPUT	RF Output
5	SCL	Serial Clock Input
6	SDA	Serial Data Input/Output
7	GND	GND



Note1: Tolerance ± 0.2mm without mark

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

Note3: Referential Weight 12 g

Note4: NC is not connect

Note5: Material composition :
Pad/terminals：Cu （Surface plating: Ni 3-6um，Au 0.1～0.5um）
Base: High-TG FR4
Cover：Stainless steel

3. I²C Devices Address

3.1.1 8K I²C SERIAL EEPROM

Device name : AT24C08C
Device supplier : Atmel
Device address : 1010100~1010111

3.1.2 EEPROM for inventory and data storage

Address	Total number of bytes	Usage
0x000 – 0x05F	96	Inventory record
0x060 – 0x07F	32	Reserved future inventory format extension
0x080 – 0x1FF	384	Temperature stability correction record
0x0200 – 0x2FF	256	Reserved for aging correction record
0x0300 – 0x3FF	256	Reserved for future use

3.1.3 Inventory record in EEPROM

The inventory record inside the EEPROM will be in the following format. This is a 96 byte format.

Identification Fields	D#	# of bytes	Values (in Hex)
Header	D0	1	80
Function Code: OCSD2	D1-D11	11	5 ASCII bytes to show "OCSD2" See note 1 for unused position filling
Serial Number: "$Y_1Y_0F_1F_0M_1M_0N_5N_4N_3N_2N_1N_0$" Y_1Y_0=year,F1F0=factory code, M_1M_0=month $N_5N_4N_3N_2N_1N_0$=unit number	D12-D24	13	Variable Note 1,2, 4
Doc Number	D25-D36	12	9 ASCII bytes to show "DD/045622" See note 1 for unused position filling
Doc Issue No. "$I_1.I_0$" (e.g. 1.8)	D37-D41	5	Note 1,6
Version "SS_2:S_1S_0 " (eg. S4:00)	D42-D47	6	Note 1,4
Supplier's Part Number : numbering scheme (12-digit)	D48-D62	15	12 ASCII bytes See note 1 for unused position filling See note 5 for value
Supplier Specific Information (If applicable)	D63-D73	11	Note 1
Specific information per function code	D74-D80	7	Note 1, 3
Supplier Code (Supplier's company name in capital letter)	D81-D94	14	"DAPU" See note 1 for unused position filling
End of File	D95	1	04

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3.1.4 Temperature stability correction record in EEPROM

In the EEPROM, record frequency-temperature slope by using below format. This is a 4 byte format.

Identification Fields	D#	# of bytes	Values (in Hex)
Frequency-Temperature Slope	0x80 – 0x83	4	Note 7,8

Notes

1. The I/D values are in ASCII representation except where explicitly noted. Unused positions in a field are filled with the ASCII space character (20h). A null character (00h) is in the last byte of each field, except header and End-of-file. The end-of-file ASCII character (04h) indicates end of inventory data.
2. The variable values will be provided by or agreed to by SCN contact for use here.
3. This field is reserved for future use.
4. F1F0 is defined by Supplier to identify different factory of the Supplier to manufacture the part.
SS2:S1S0 is defined by Supplier to differentiate different version of the part.
Every Hardware or software modification must be identified by a new value.
5. This part number is specific to each supplier, and must clearly identify the product.
Different values must be used before and after qualification.
6. The Doc Issue in inventory is the version used by supplier to design product.
7. Use IEEE754 as the storage mode:

Example

The Slope represent the frequency changes varies on the basis of the internal temperature sensor(NTC75).

Slope= -0.25ppb/℃

Decimal Representation

-0.25

Binary Representation

-0.01= -1.0*2^-2

Calculate the exponent

-2+127=125

```
Sign      Exponent              Mantissa
 |          |                      |
 1       01111101       00000000000000000000000
```

Store the data of address into EEPROM

Address	0x83	0x82	0x81	0x80
Data	0x BE	0x 80	0x 00	0x 00

8. The formula which reflects correspondence between ambient temperature and the detected internal temperature is as below(This value is only typical, each temperature spot has about ±5℃ error):

$$Y=0.26\times B+69$$

B is ambient temperature; Y is the corresponding internal temperature.

3.2. DIGITAL THERMOMETER

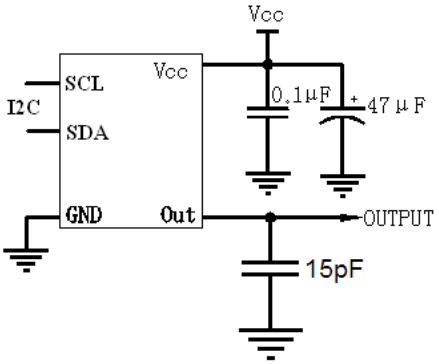
Device name: NCT75

Device supplier: ON Semiconductor

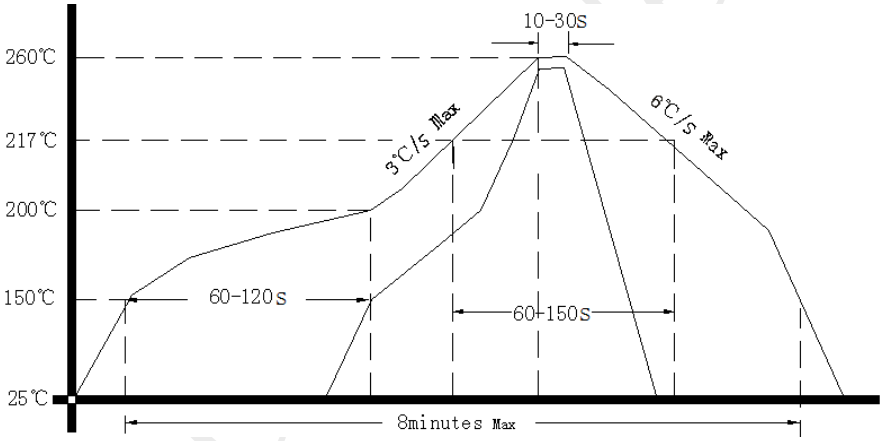
Device address: 1001001

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

4. Test Circuit



5. Reflow Soldering Curve (RoHS)



6. Package(mm)