Travelling Merchant: A026

DATASHEET

Standard: **O25S-2602-10.00MHz**

P/N:

Plot			The Label
Drew	Audited	Approved	Stamp, please! Thanks!
Amway.wei	Carry.Wang	James.Liu	
Date: 2017.02.08			

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Table of amendment

Version	Revision contents	Prepared by	Revised date
1.0	The first issued	Amway	2017.01.16
1.1	“Functional Temperature Range”、“Reference Voltage Temperature Stability”、“Temperature Sensor Output (Vtemp) Characteristics”、“EEPROM Data Format”、“Output Impedance” and “Min/Max Temperature Sensor Voltage Parameters” changed	Amway	2017.02.08

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1、Electrical Parameters

MODEL：O25S-2602-10.00MHz						
Item	Description	Parameters			Unit	Test Condition
		Min.	Typ.	Max.		
Output	Frequency		10.00		MHz	f_n
	Output Waveform		HCMOS			
	Output Low Voltage	0		0.8	V	V_{cc}=5.05V, I_{load}=-8 mA
	Output High Voltage	3.4		4.6	V	V_{cc}=5.05V, I_{load}=8 mA
	Duty Cycle	40	50	60	%	@50%
	Rise / Fall Time (10%~90%)		5	15	ns	@25℃
	Load		15±5%		pF	
	Reference Voltage Accuracy	3.8	4.0	4.2	Vdc	100kΩ load
	Reference Voltage Temperature Stability	-1	±0.5	1	%	-50℃ to 92℃
	Functional Temperature Range	-50		+92	℃	Functional= Vref and Vtemp output valid
	Output Impedance		142	150	Ω	
Frequency Stabilities	Initial Frequency Tolerance	-2		+2	$\times 10^{-6}$	Measurement referenced to frequency Observed with TA=25℃,Vcc=5.05V, and after 15minutes of operation.
	Over all frequency stability	-3		+3	$\times 10^{-6}$	Referenced to f_n including 20 years aging
	Frequency Stability vs. EEPROM parameters	-0.3		+0.3	$\times 10^{-9}$	Residual error according to section 6.
	Frequency Stability vs. Supply voltage variation	-3.5		+3.5	$\times 10^{-9}$	Vs = 4.7V ~ 5.4V. Referenced to Vs = 5.05 V
	Frequency stability vs. data of EEPROM. Incl. moisture, aging, retrace and reflow. Δf1/f1	+0.05		-0.05	$\times 10^{-6}$	Oscillator mounted and soldered on a PCB using a reflow soldering process, stored at RH < 60% during 18 months. Reflow could happen between 0 and 6 months after delivery to Ericsson. This time is a part of the 18 months. Aging should be included for the complete 18 months period. Then put into power-on. Frequency measured after power-on for 24h. T=+40℃ (Supply voltage range, load variation, shock and direction of mounting excl.)

Δf1= Frequency deviation from the EEPROM value.
f1= Frequency according to EEPROM.

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	Holdover Stability (within temperature range)	-0.03		+0.03	$\times 10^{-6}$	Oscillator mounted and soldered on a PCB using a reflow soldering process. Then put into continuous power-on for 33 days. Reference frequency is measured at day 3. The frequency deviation is equal or less than 30ppb from the reference frequency from day 3 to day 33. Oscillator output frequency temperature compensated according to section 6.
	Tolerance Per Day Aging	-3		+3	$\times 10^{-9}$	After 3 days in operation. (See also section 7)
Power Supply	Supply Voltage	4.7	5.05	5.4	V	
	AC Ripple and Noise			50	mVp-p	10Hz to 1MHz
	Supply Voltage (Vs) to GND	-0.3		6.0	V	Pin 19
	Digital Input Voltage (SDA, SCL) to GND	-0.3		6.0	V	Pin 2 and 7
	Current Consumption			300	mA	Steady state at +25 ℃ in still air
				650	mA	During warm-up
	Warm-Up Time			5	min	To be within ±40 ppb of the frequency after 1h of operation
Phase Noise	Phase Noise			-75	dBc/Hz	1Hz
				-85		10Hz
				-110		100Hz
				-125		1KHz
				-130		10KHz
				-130		100KHz
				-145		1MHz
Spurious Level During Vibration	Spuriouses at offset from f0 during vibration at 2g Vibration conditions: (sinus wave) Vibration in three perpendicular directions. 10 to 200Hz.			-75	dBc	≤ 500 Hz (Target value)
				-40		≤ 500 Hz
				-95		> 500 Hz

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Environmental Conditions	Air flow	0		3	m/s	@-40℃~85℃
	Relative Humidity	0		95	%	Over operable temperature range
	Temperature Rate Of Change	0		1	℃/minute	
	Operable Temperature	-40		+85	℃	
	Storage Temperature	-50		+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.				
	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 (℃)	-10~35℃				

2、Temperature Sensor Output (Vtemp) Characteristics

The Product shall provide an analog XO temperature output Vtemp.

The Vtemp signal shall be linearly increasing with temperature inside Operating Temperature Range.

The Vtemp shall be increasing with same or steeper slope outside Operating Temperature Range but inside the Functional Temperature Range.

Vtemp shall be related to the output frequency according to section 6.

Parameter	Min.	Typ.	Max.	Unit	Condition
Operating Temperature Range	0.4		< Vref-0.2	Vdc	Note 1)
Functional Temperature Range	0		< Vref	Vdc	Note 2)
Minimum Frequency Resolution Over Operating Temperature.			16	ppb/V	Note 3)

Note 1) Nominal range must account for min and max airflow.

Note 2) RF output not required to meet frequency stability as during operation outside temperature range.

Note 3) This is to ensure that the voltage swing of Vtemp is large enough so that an ADC gives values over the full temperature range.

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3、Min/Max Temperature Sensor Voltage Parameters

The two parameters, (Vtmin) and (Vtmax) are stored in the EEPROM.
Definition of the Min temperature sensor voltage parameter (Vtmin) and the Max temperature sensor voltage parameter (Vtmax):

Vtmin = V(-40) – S×5
(Voltage measured at -40℃– Slope of the Vtemp vs. temp curve in V/℃ multiplied with 5)

Vtmax = V(+85) + S×5 or V(+90)
(Voltage measured at +85℃ + Slope of the Vtemp vs. temp curve in V/℃ multiplied with 5)
In the Application the EEPROM values will be compared to Vtemp, which is measured relative to Vref according to section 2. It is thus required that the values for Vtmin and Vtmax are also measured relative to Vref and then multiplied with a scaling factor of 4V.
V(t) is defined as: Vtemp voltage at temperature t / Vref *4.

3.1、Verification of Vtmax and Vtmin

Verification of Vtmin and Vtmax should be performed on component level with the OCXO fitted in a test fixture.

The trigger levels will be approved if :
+88˚C ≤ Vtmax < +92˚C (Vtmax is the voltage corresponding to the temperature)
-50 ˚C < Vtmin ≤ -40˚C (Vtmin is the voltage corresponding to the temperature)

Conditions: Nominal supply voltage.
Airflow at one level in the range 0-3m/s (single point, the requirements do not have to be fulfilled for the whole range).

4、EEPROM Interface (SDA, SCL) Characteristics

Parameter	Min.	Typ.	Max.	Units	Condition
DC Electrical Characteristics					
High Level Input Voltage (Vih)	0.7Vref		Vref+0.3	Vdc	SDA and SCL
Low Level Input Voltage (Vil)	-0.3		0.3Vref	Vdc	SDA and SCL
Input Leakage Current, SCL	-10		+10	μA	Vpin<0.4V or Vpin>0.9Vref
Input Leakage Current, SDA	-230		+30	μA	Vpin<0.4V or Vpin>0.9Vref (Note 1)
Low Level Output Voltage, SDA (Vol)	0		0.6	V	Ipin = 6mA
Electrical Characteristics (Note 2)					
SCL Clock Frequency	0		100	KHz	
Communication (Note 2)					
Product Device Address	1010 011X				X denotes read/write bit
Note: 1) SDA requires a 20kΩ pull-up resistor to Vref. 2) Product is to communicate via industry standard I^2C^{TM} bus timing. I^2C^{TM} is a Phillips Semiconductor registered trademark.					

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5、EEPROM Data Format

The oscillator shall be provided with the following information in the EEPROM. After the data is written the EEPROM should be made read-only.

EEPROM Data Format Data format is internally organized with 256 words of 1 byte each			
Header Bits 0-255	**Memory Location**	**Description**	**Format**
0-7	00h	EEPROM data version number [Version=4]	HEX
8-135	01h-10h	Serial number (Note 1)	ASCII
136-223	11-1Bh	Ericsson part number (Note 6) [RTL205614/1]	ASCII
224-255	1Ch-1Fh	Set to [ ][ ][ ][ ] [4 spaces]	ASCII
Data Bits 256-1007	**Bytes**	**Description**	
256-319	20h-27h	Initial frequency (f_1) (At 40℃ rounded to 0.001Hz)	32.32 unsigned
320-383	28h-2Fh	Temp coefficient A_3 (Note 5)	32.32 2's complement
384-447	30h-37h	Temp coefficient A_2 (Note 5)	32.32 2's complement
448-511	38h-3Fh	Temp coefficient A_1 (Note 5)	32.32 2's complement
512-575	40h-47h	Temp coefficient A_0 (Note 5)	32.32 2's complement
576-639	48h-4Fh	Vtmax [V] (Note 3, 5)	32.32 2's complement
640-703	50h-57h	Vtmin [V] (Note 3, 5)	32.32 2's complement
704-783	58h-61h	Date of calibration [YYYY-MM-DD]	ASCII/ISO-8601
784-1007	62h-7Dh	Reserved [set to all zeros]	HEX
Check Sum Bits 1008-1023	**Bytes**	**Description**	
1008-1015	7Eh	Most significant byte of the check sum (Note 4)	HEX
1016-1023	7Fh	Least significant byte of the check sum (Note 4)	HEX
Supplier Use Bits		**Description**	
1024-1983	80h-F7h	Supplier Product ID [×××××××××]	
Supplier Function Bits 1984-2039	**Bytes**	**Description**	
1984-1999	F8h-F9h	Reserved for Supplier	
2000-2007	Fah	Reserved for Supplier	
2008-2023	FBh-FCh	Reserved for Supplier	
2024-2039	FDh-FFh	Reserved for Supplier	

1) Serial number must be same serial number that is stated on Product package. Fill out with spaces (0x20) after serial number.
2) N/A
3) Temperature sensor voltage measured by Manufacturer/Supplier across temperature range, in volts, rounded to the mV. See 3.
4) Check sum is a 16-bit word that will be calculated as a byte by byte unsigned summation of only the header and data bits.
5) All Vtemp measurements shall account for the set point inaccuracy and temperature drift of VREF and measured with Vs = Vref*(1.2625 +/- 0.2%)
6) Ericsson product number should be written and stored without spaces and in CAPITAL letters.

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6、Frequency Versus Temperature

Manufacturer shall characterize each oscillator's frequency output (in ppb) over the operational temperature range as measured from the Vtemp pin using Vref as a voltage reference. While performing this characterization, Supplier shall perform a least squares curve fit to this frequency versus voltage characteristic. The curve fit shall be a cubic polynomial of the form:

$$A_3 v^3 + A_2 v^2 + A_1 v^1 + A_0 = \frac{f(v) - f_1}{f_1} \qquad \text{Equation 1}$$

The residual error shall be such that:

$$\left| \frac{f(v) - f_1}{f_1} - \sum_{i=0}^{3} A_i v^i \right| < 0.3\,ppb \qquad \text{Equation 2}$$

Where: f(v) = measured frequency, f_1 = initial frequency as per section 5 and
v = temperature sensor voltage. Equation 2 applies regardless of airflow.

In the Application the Temperature Sensor Output will be measured relative to Vref, i.e. represented by a dimensionless value Vtemp/Vref with a value between 0 and 1. For compatibility with the values in this specification a scaling factor of 4V is used.

After this calculation is performed, the coefficients, Ai shall be saved to the EEPROM as specified in section 5.
The oscillator shall be able to meet this performance over any 30℃ window within the operating temperature range and at a operating temperature range-40℃~85℃. Manufacturer understands that these coefficients represent a curve that is a measurement of the frequency versus temperature characteristic of the oscillator. The extent to which the results of Equation 2 are repeatable (+/- a vertical shift) is an indication of the thermal hysteresis or "retrace" of the characteristic.

7、Frequency Aging Characteristics

The Product shall meet a maximum aging rate of +/- 3ppb per day after 3 days of power on time. The Product shall also have an aging characteristic after 5 days of power on time that is linear as a function of time over a 24h window.

To determine this linear aging characteristic the temperature effects need to be removed from the frequency data as suggested in section 6. Let f(v,t) be the measured frequency at time, t and temperature sensor voltage, v. Define the residual data, fR(t), as:

$$f_R(t) \equiv \frac{f(v,t) - f_1}{f_1} - \sum_{i=0}^{3} A_i v^i \qquad \text{Equation 3}$$

The residual data shall fit to a linear line with slope, M and an intercept, B such that:

$$\left| f_R(t) - (Mt + B) \right| < 0.3\,ppb \qquad \text{Equation 4}$$

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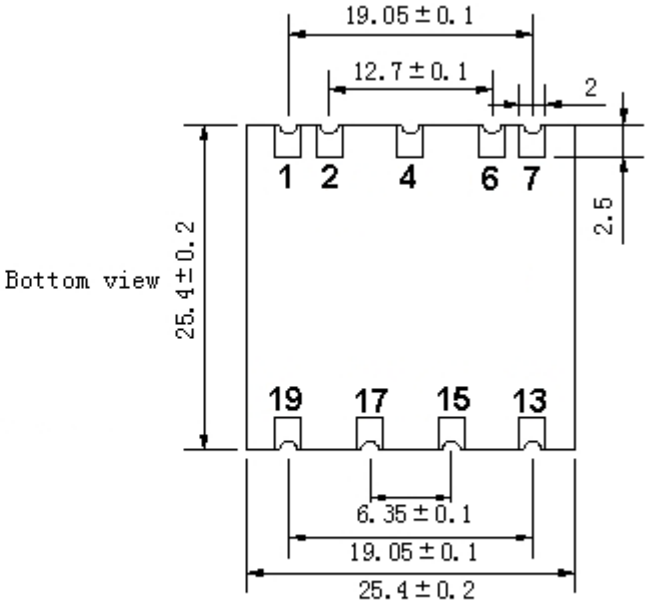
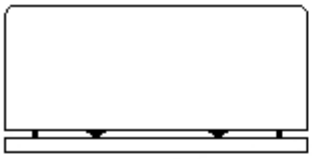
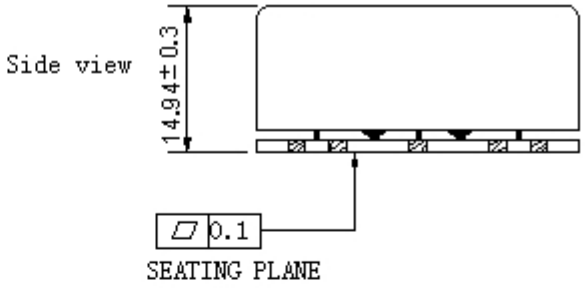
8、Mechanical Structure(mm)

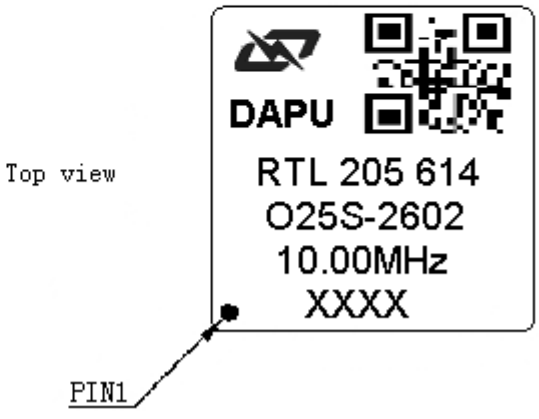






PIN FUNCTION

Terinal	Function
1	OUTPUT
2	EEPROM SDA(SDA)
4	GND(CASE)
6	NC
7	EEPROM SCL(SCL)
13	VREF
15	NC
17	VTEMP(Temperature Sensor Output)
19	Vs



Note1: Tolerance ±0.1mm without mark

Note2: Referential weight 10g

Note3: NC is not connect

Note4: The first two xx representative: date
After two xx representative: serial number

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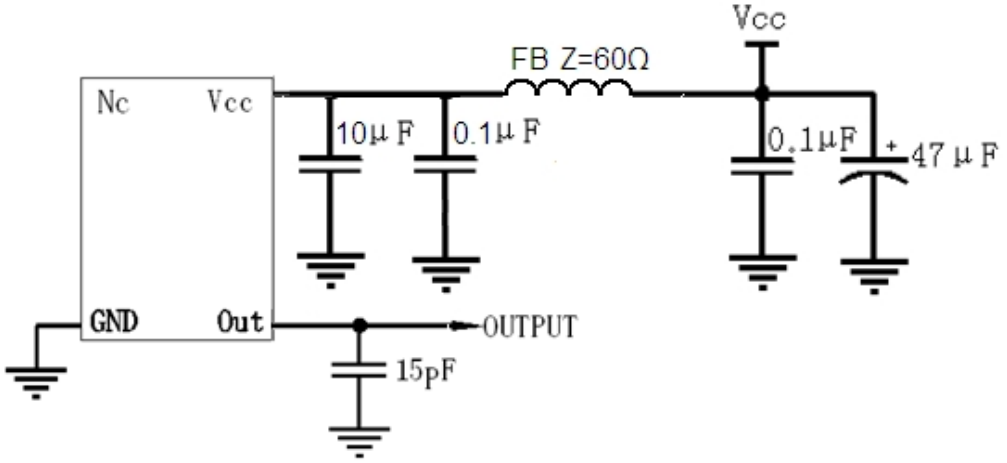
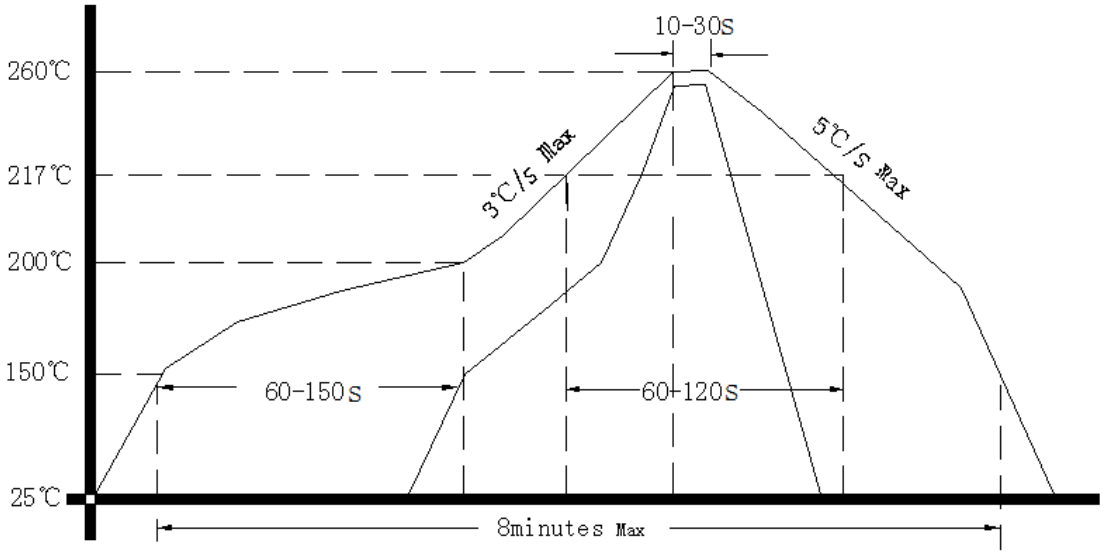
9、Test Circuit



10、Reflow Soldering Curve (RoHS)



11、Package（mm）