RoHS Compliant
Directive 2011/65/EU

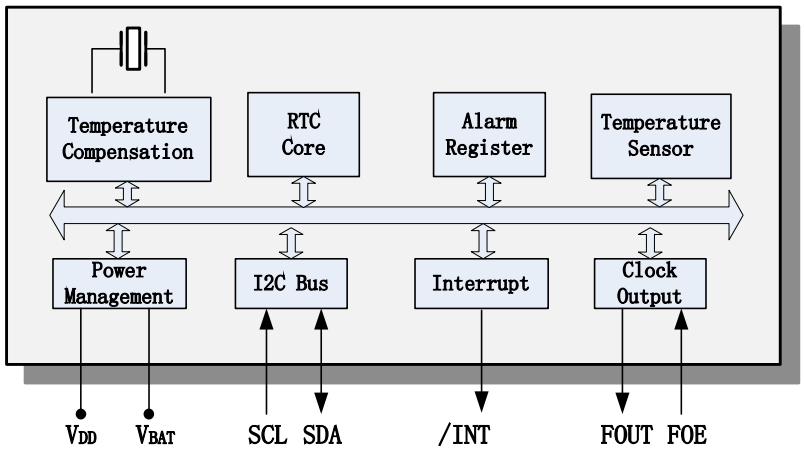
SPECIFICATION

NR3225SA-32.768KHZ-NSA5699DP

Key Features

- Low current consumption: 1.0uA (Typ.)
- High stability:
  ±5ppm @ -40°C ~ +85°C
- Build-in TCXO: 32.768KHz
- Build-in temperature sensor
- Communication Interface: I²C bus
- Power Supply Voltage: 1.6V~5.5V
- Operation Temperature Range: -40°C ~ +85°C
- Leap years autocorrection
- Backup battery switchover function
- Timer output function with adjustable period
- Package: 3.2mm × 2.5mm × 1.0mm

Block Diagram



Block Diagram

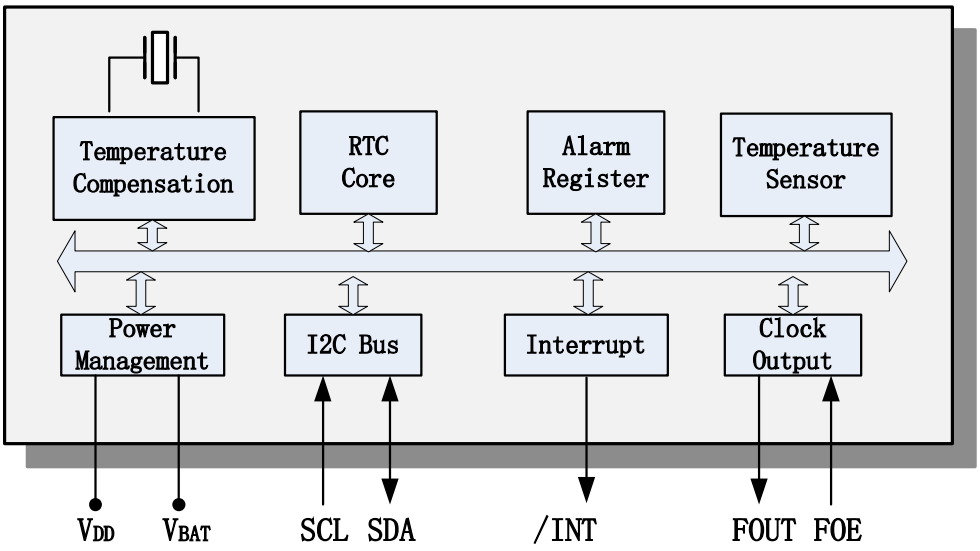


Figure 1. Block Diagram

Features

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- Communication Interface: I2C bus
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Pin definition

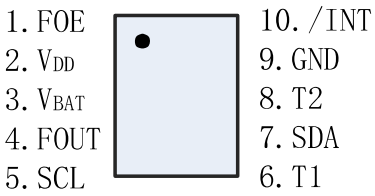


Table1. Pin Definition

Pin Number	Pin Name	I/O	Description
1	FOE	In	FOUT output control pin. “1” - enable FOUT, “0”- FOUT Hi-Z
2	V_{DD}	-	Power supply
3	V_{BAT}	-	Backup battery pin. Connect to large-capacity capacitors or a backup battery. Connect to V_{DD} when switchover function is not necessary
4	FOUT	Out	Frequency output. Controlled by FOE. Frequency can be set by FSEL bits.
5	SCL	In	I^2C clock signal
6	T1	-	Manufacturer test only. Ensure to be floating
7	SDA	In/Out	I^2C data signal
8	T2	-	Manufacturer test only. Ensure to be floating
9	GND	-	Ground
10	/INT	Out	Interrupt Output, Open-Drain

Electrical Characteristics

Absolute Maximum Ratings

Table2. Absolute Maximum Ratings

Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage	V_{DD}	-0.3		6.5	V	
Backup Battery Voltage	V_{BAT}	-0.3		6.5	V	
Input Voltage	V_{IN}	GND-0.3		6.5	V	FOE, SCL, SDA input
Clock Output Voltage	V_{OUT1}	GND-0.3		V_{DD}+0.3	V	FOUT output
Output Voltage	V_{OUT2}	GND-0.3		6.5	V	SDA, /INT output
Storage temperature	T_{STG}	-55		125	℃	

Recommended Operating Conditions

Table3. Recommended Operating Conditions

Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage (normal mode)	V_{DD}	2.5	3.0	5.5	V	
Power Supply Voltage In case of single supply (V_{DD} = V_{BAT}) (Note 1)	V_{DD}	1.6	3.0	5.5	V	
Backup Battery	V_{BAT}	1.6	3.0	5.5	V	
Current consumption	I_{DD}		1.0		uA	Using Battery supply only
Operation temperature	T_{OPR}	-40	25	85	℃	

Note 1: To apply Min. value of V_{DD} and V_{BAT}, V_{CORE} need to be supplied with more than 2.5V at least for the oscillation to stabilize (oscillation start time t_{STA}).
Note2： After powered off, ensure that V_{DD} = V_{BAT} = GND for more than 10 seconds before next power on
Note3： If there is no special indication, the test conditions are GND = 0V, VDD = Vbat = 2.5V ~ 5.5V, Ta = - 40 ℃ ~ + 85 ℃

Frequency Characteristics

Table4. Frequency Characteristics

Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Frequency stability	Δf/f	-5		+5	ppm	-40℃ ~ +85℃
Oscillation start time	t_{STA}			1	s	@25℃

Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Year Aging	f_a			±3	ppm	@25℃, First year
Temperature Sensor Accuracy	T_{emp}			±5	℃	V_{DD}=3.0V
FOUT duty cycle	$t_{w/t}$	40	50	60	%	

Note：If there is no special indication, the test conditions are GND = 0V, VDD = Vbat = 2.5V ~ 5.5V, Ta = - 40 ℃ ~ + 85 ℃

DC Characteristics

Table5. DC Characteristics

Parameter	Symbol	Value			Unit	Notes	
		Min.	Typ.	Max.			
Average Current consumption1	I_{DD1}		1.25	5.1	uA	V_{DD}=5.0V	f_{SCL}=0Hz, FOE=GND, /INT = V_{DD}; V_{DD}=V_{BAT}; FOUT off (High-Z); Compensation interval 2s; V_{DD} voltage detection time 2ms
Average Current consumption2	I_{DD2}		1.0	4.9		V_{DD}=3.0V	
Average Current consumption3	I_{DD3}		5.8	20	uA	V_{DD}=5.0V	f_{SCL}=0Hz, FOE=V_{DD}, /INT = V_{DD}; V_{DD}=V_{BAT}; FOUT:32.768kHz, CL=0pF; Compensation interval 2s; V_{DD} voltage detection time 2ms
Average Current consumption4	I_{DD4}		3.8	19		V_{DD}=3.0V	
High-level input voltage	V_{IH}	0.8*V_{DD}		5.5V	V	SCL, SDA, FOE pin	
Low-level input voltage	V_{IL}	GND-0.3		0.2*V_{DD}	V		
High-level output voltage	V_{OH1}	4.0		5.0	V	V_{DD}=5.0V, I_{OH} = -1mA	FOUT pin
	V_{OH2}	2.2		3.0		V_{DD}=3.0V, I_{OH} = -1mA	
	V_{OH3}	2.9		3.0		V_{DD}=3.0V, I_{OH} = -100uA	
Low-level output voltage	V_{OL1}	GND		GND+0.5	V	V_{DD}=5.0V, I_{OL} = 1mA	FOUT pin
	V_{OL2}	GND		GND+0.8		V_{DD}=3.0V, I_{OL} = 1mA	
	V_{OL3}	GND		GND+0.1		V_{DD}=3.0V, I_{OL} = 100uA	
	V_{OL4}	GND		GND+0.25	V	V_{DD}=5.0V, I_{OL} = 1mA	/INT pin
	V_{OL5}	GND		GND+0.4		V_{DD}=3.0V, I_{OL} = 1mA	
	V_{OL6}	GND		GND+0.4	V	V_{DD}≥3.0V, I_{OL} = 3mA	SDA pin
Input leakage current	I_{LK}	-0.5		0.5	uA	FOE, SDA, SCL pin, V_{IN} = V_{DD} or GND	
Output leakage current	I_{OZ}	-0.5		0.5	uA	FOUT, SDA, /INT pin, V_{IN} = V_{DD} or GND	

Note：If there is no special indication, the test conditions are GND = 0V, VDD = Vbat = 2.5V ~ 5.5V, Ta = - 40 ℃ ~ + 85 ℃

AC Characteristics

Table6. AC Characteristics

V_{DD}=2.5V ~ 4.5V; Ta=-40℃ ~ +85℃

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
SCL clock frequency	f_{SCL}			400	kHz
SCL low level time	t_{LOW}	1.3			us
SCL high level time	t_{HIGH}	0.6			us
Start condition setup time	$t_{HD;STA}$	0.6			us
Start condition hold time	$t_{SU;STA}$	0.6			us
Stop condition setup time	$t_{SU;STO}$	0.6			us
Bus idle time between start condition and stop condition	t_{RCV}	1.3			us
Data setup time	$t_{SU;DAT}$	100			ns
Data hold time	$t_{HD;DAT}$	0			ns
SCL, SDA rising time	t_r			0.4	us
SCL, SDA falling time	t_f			0.4	us

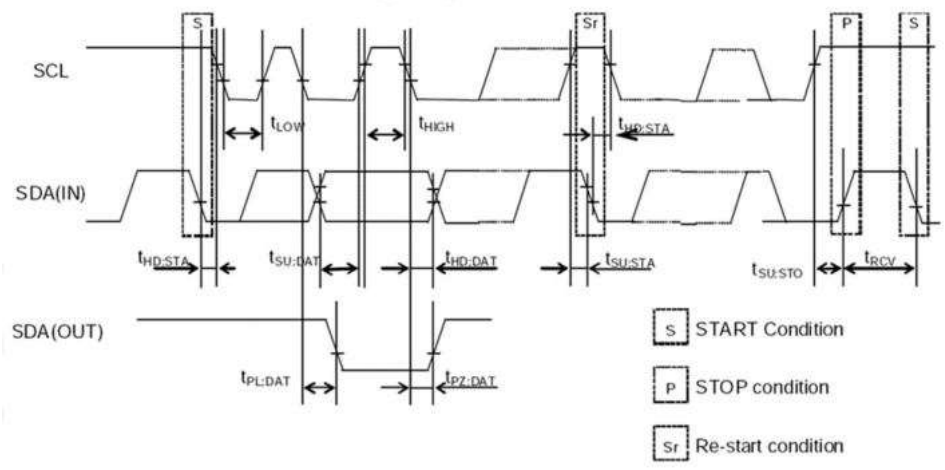


Figure 2. I^2C bus Timing Chart

Note: when the master equipment accesses the equipment through I2C bus, all communication from sending start condition to sending stop shall be completed within 1 second. If it exceeds 1 second, the I2C bus interface will be reset through the internal bus timeout function.

Reflow Soldering Curve

Standard: IPC/JEDEC J-STD-020

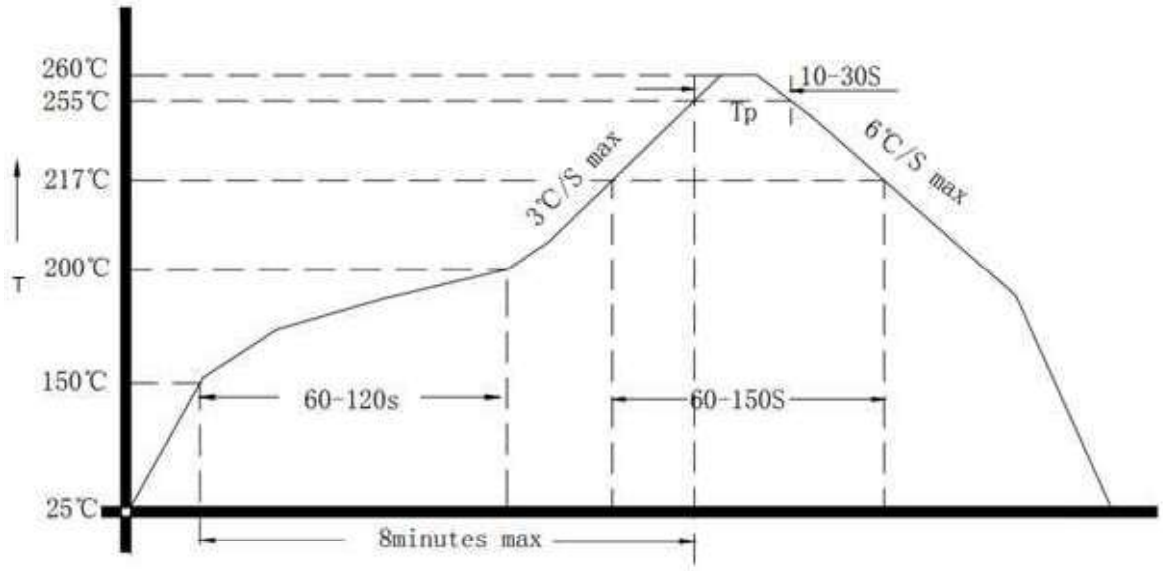
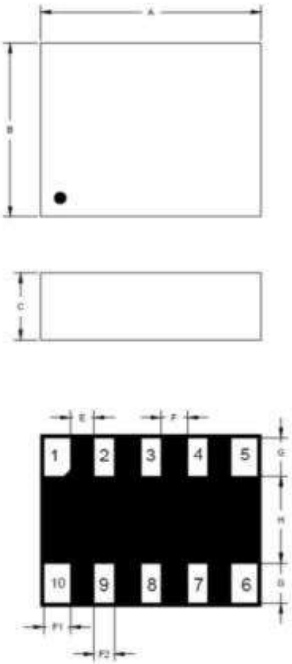


Figure 3. Reflow Soldering Curve

Note: It is suggested to solder IC under the condition shown in the curve above. Must pay attention to the temperature and time when manual soldering, if the temperature over +260°C, or you will make the xo performance bad, even damage it.

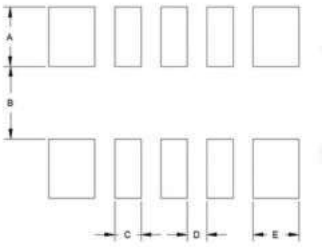
Dimensions



Dimension	Min.	Typ.	Max.
A	3.0	3.2	3.4
B	2.3	2.5	2.7
C	--	1.0	--
E	--	0.3	--
F	--	0.4	--
G	--	0.6	--
H	--	1.3	--
F1	--	0.45	--
F2	--	0.3	--

Unit：mm

Figure 4. Dimension

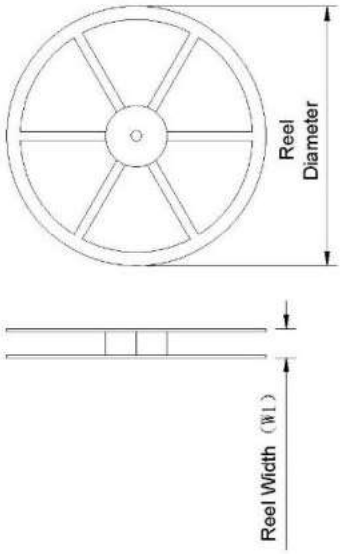


Dimension	Max.
A	0.9
B	1.1
C	0.4
D	0.3
E	0.7

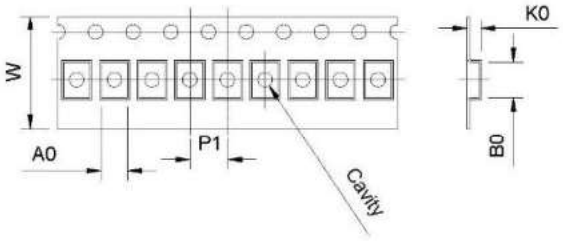
Unit：mm

Package

REEL DIMENSIONS

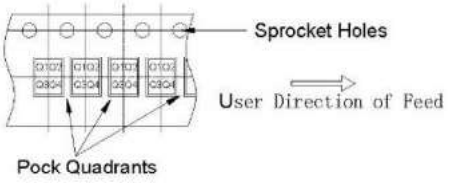


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component lengh
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	PIN1 Quadrant
NSA5699	LGA	10	3000	180	11.6±2.0	3.00	3.70	1.50	4.00	8.00	Q1