Customer Code:

DATASHEET

DAPU P/N: **CM22B-G328-20.00MHz**

Customer P/N: _____

DAPU			Customer Approval
Drew	Audited	Approved	
Amway.wei	Carry.Wang	Jason Zhao	
Date: 2024.09.12			Stamp, please! Thanks!

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Table of Amendment

Version	Revision contents	Prepared by	Revised date
1.0	The first issued	Amway	2024.09.12

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Table of Content

1. General Description

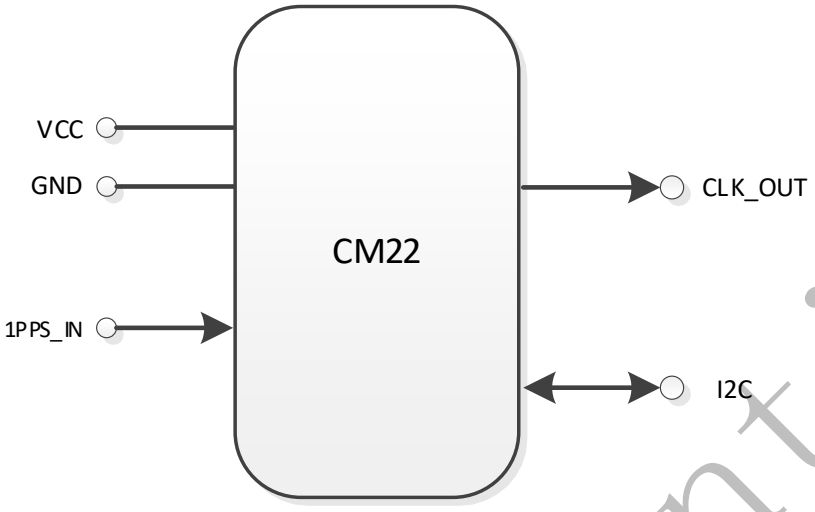


Figure 1 CM22

Figure 1 is the basic diagram of CM22. CM22 is a high-performance clock module designed to provide precise frequency and phase synchronizing with external time reference for telecom and other applications.

Key features:

- **Reference:** 1PPS and TOD from GNSS receiver, IEEE1588 etc.;
- **Temperature Stability:** ±0.2ppb;
- **Holdover:** ±1.5μs/8h @△T=±10℃ after power up 7days; ±1.5μs/6h @△T=±20℃ after power up 7days;
- **Clocks Input and Output:**1*1PPS input, 1*1PPS output and 1*20MHz output;
- **Serial Interface:**1*UART for management and ToD information;
- **Mechanical Size:** 25.4mm*22.0mm*14.0mm.

2. Electrical Parameters

Table 2 Electrical Parameters

Parameter	Symbol	Minimum	Typical	Maximum	Units
LVCMOS Input					
High Level Input Voltage	V_{IH}	2.0			V
Low Level Input Voltage	V_{IL}			0.8	V
LVCMOS Output					
High Level Output Voltage	V_{OH}	2.4			V
Low Level Output Voltage	V_{OL}			0.4	V

3. Performance

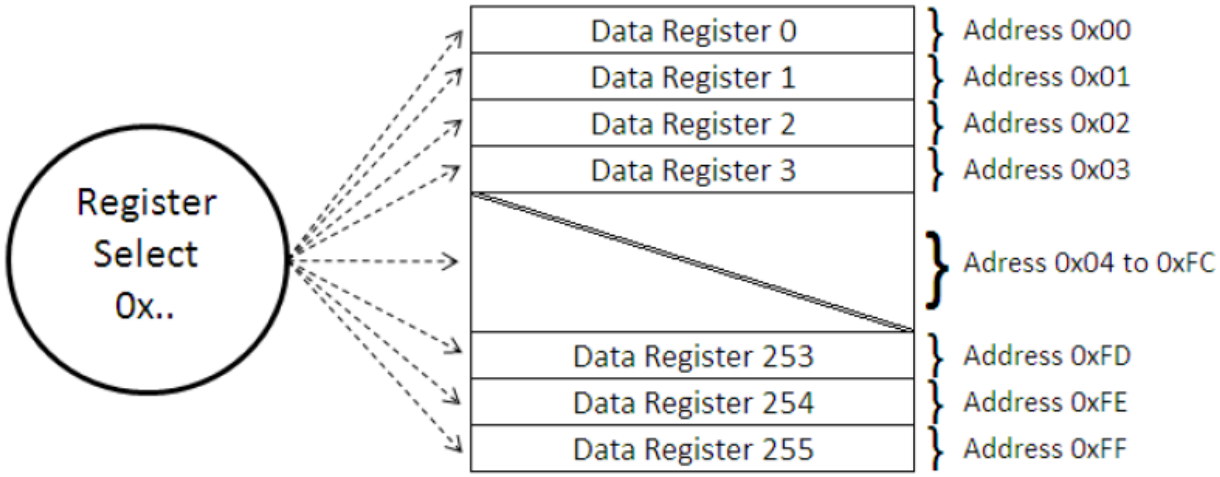
Table 3 Performance

Item	Parameter	Minimum	Typical	Maximum	Units	Test Condition
Clock Output	Waveform	LVCMOS				
	Nominal Frequency	20.00			MHz	Synchronizing with 1PPS reference.
	Duty Cycle	45	50	55	%	Load 15pF
	Frequency vs. Temperature	-0.2		+0.2	$\times10^{-9}$	Vcc=3.3V; O_{load}=15pF;$T_A$varies from -40℃ to 85℃, temperature slope less than 2℃per minute.
	Accuracy	-5		+5	$\times10^{-12}$	24 hours average value when locked to 1PPS.
	Short-term Stability	-0.01		+0.01	$\times10^{-9}$	Vcc=3.3V;T_A=25℃; 1s; no EMI\EMC or other interference.
	Daily Aging	-0.5		+0.5	$\times10^{-9}$	Vcc=3.3V;T_A=25℃.
	Yearly Aging	-0.03		+0.03	$\times10^{-6}$	
	Phase Noise		-110	-100	dBc/Hz	10Hz
			-143	-138		100Hz
			-155	-150		1KHz
			-155	-150		10KHz
			-155	-150		100KHz
			-160	-155		1MHz
1 PPS Input	Waveform	LVCMOS				
	Pulse Width	0.001	100	500	ms	
1 PPS Output	Waveform	LVCMOS				
	Pulse Width		100		ms	

	Accuracy	-50		+50	ns	Synchronizing with 1PPS reference.
	24 hours holdover	-1.5		+1.5	μs	Constant temperature
	8 hours holdover	-1.5		+1.5	μs	△T=±10℃,8 hours holdover after power up 7 days; temperature slope less than 0.5℃ per minute.
	6 hours holdover	-1.5		+1.5	μs	△T=±20℃,6 hours holdover after power up 7 days; temperature slope less than 0.5℃ per minute.
Supply Voltage	Supply Voltage	3.135	3.3	3.465	V	
	Warm Up Current			750	mA	
	Steady Current			350	mA	@25℃
	AC Ripple			50	mV pk-pk	10Hz to 1MHz

4. I²C Interface

The I²C interface allows 256 slave registers to be addressed. As shown in figure I²C Register Layout only a few of these are currently implemented, Others are reserved for future uses or internal computation and must not be addressed.



I2C Register Layout

Register detail

Next information will procure details regarding DAPU module register.

Slave Register: Refers to the address that has to be sent after the I²C slave address to select the desired register

Description: Name and function of the register.

Firmware: Details on the firmware revision the register is supported on.

Comment: Additional information regarding the register or the data it represents.

Message Info: Number of bytes to be read and data type of the data register.

Slave Register	**0x3E**	
Description	Read Temperature Sensor	
Firmware	1.4+	
Comment	Represents an image of the external temperature seen by the module. The value can vary from Ox0000 to Ox0FFF, negative slope	
Message Info	# bytes 2	Datatype U-Short

Slave Register	**0x41**	
Description	Read Frequency Control	
Firmware	1.4+	
Comment	Range can swing from Ox00000000 to Ox000C8320. 8E-13 typical frequency variation per step	
Message Info	# bytes 4	Datatype U-Long

Slave Register	**0x42**	
Description	Read Status	
Firmware	1.4+	
Comment	Gives information regarding the mode of the module and other parameters. Refer to Figure Status Details for more informations.	
Message Info	# bytes 2	Datatype Char

Slave Register	**0x50**	
Description	Read Product Identification	
Firmware	1.4+	
Comment	Product traceability information ASCII format	
Message Info	# bytes 64	Datatype Char

Slave Register	**0x51**	
Description	Read firmware revision	
Firmware	1.4+	
Comment	Includes the name, version revision, release date and special parameters. ASCII format	
Message Info	# bytes 64	Datatype Char

Slave Register	**0x52**	
Description	Read Relative Time Interval Error	
Firmware	1.4+	
Comment	Time Interval Error in nanosecond with an offset of +2000ns. Only available when system is locked and phase measurement is available. When there is no PPS measurement, system phase equivalent ageing is displayed. Ox0000 to Ox0FFF	
Message Info	# bytes 2	Datatype U-Short

Status detail

status channel is a bitfield information as shown below :

Byte MSB								Byte LSB						
0	0	0	0	0	0	0	0	0	/P.Out	Syst.F	1	HV	Lock Status	IsPPS

MSB byte is always 0x00

0	Must be 0 for normal operation.
/P.Out	0 : PPS ready and available on PPS_Out Pin D. 1: PPS not ready and not available on PPS_Out Pin D.
Syst.F	System Fail check. If PPS has been provided.
1	Must be 1 for normal operation.
HV	1 : Holdover Mode, no PPS detected. 0 : not in Holdover mode, PPS detected
Lock Status	b00 : System just started (power on mode, free run mode) b01 : 4s to 30mn maximum since system started – Stabilization (acquiring mode) b10 : System ready for use (locked mode)
IsPPS	Is there a valid PPS input ? 0: No / 1: Yes

5. Control Pins

CM22 is a clock module which synchronizes the local clock to reference such as 1 PPS retrieving from GPS. CM22 will work normally performing synchronizing algorithm when the SYNC_CTRL pin is driven high. It also could be force to work in free-run or holdover status when the SYNC_CTRL pin is driven low.

6. Environmental Conditions

Table 5 Environmental Conditions

Parameter	Conditions	
Operating Temperature	-40℃ to 85℃	
Storage Temperature	-55℃ to 105℃	
Storage Humidity	30%~80%	
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	Not humidity sensitive.	
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.	
Relative Humidity	20%～70%	Full Package Storage
Temperature	-10℃~35℃	

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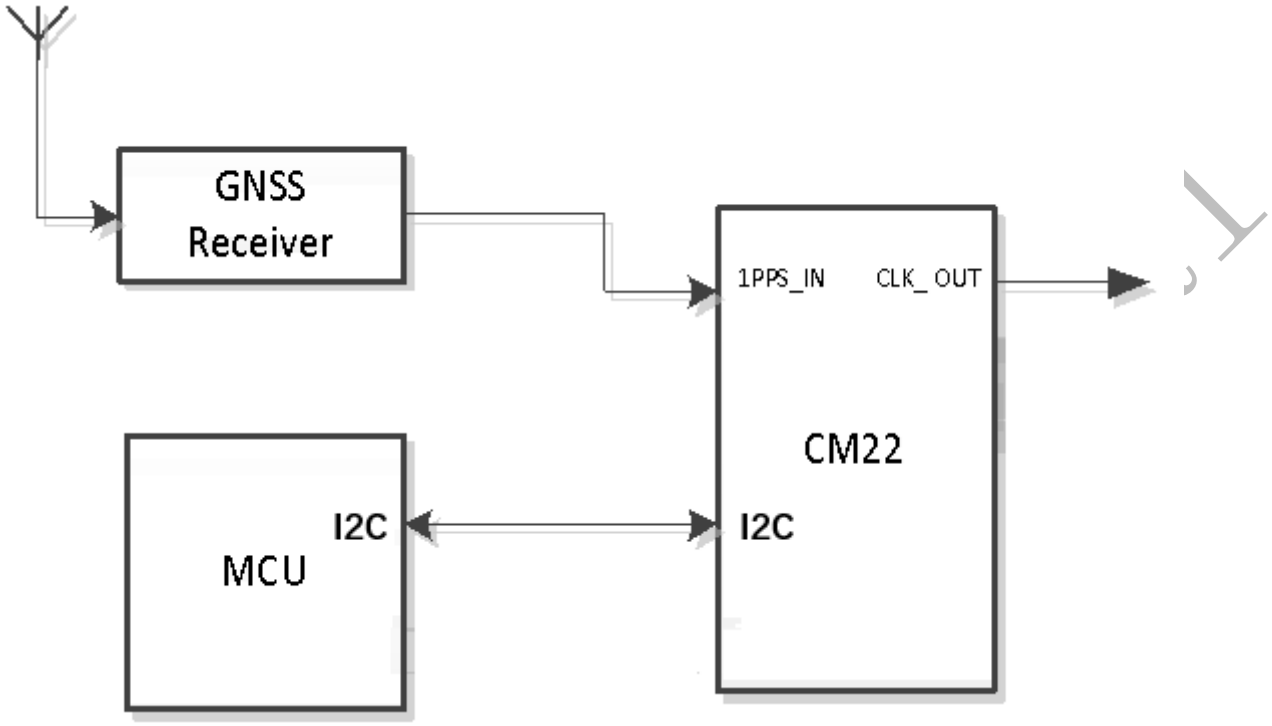
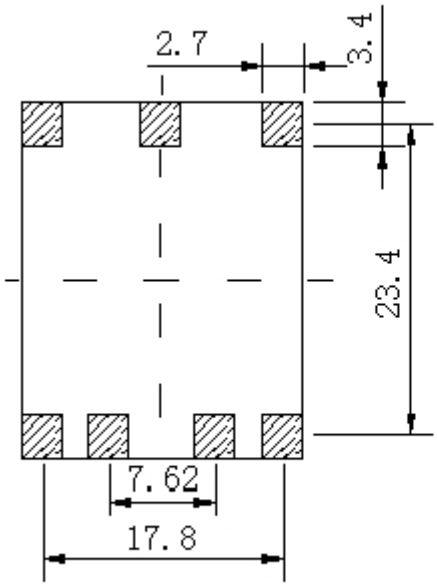
7. Typical Application

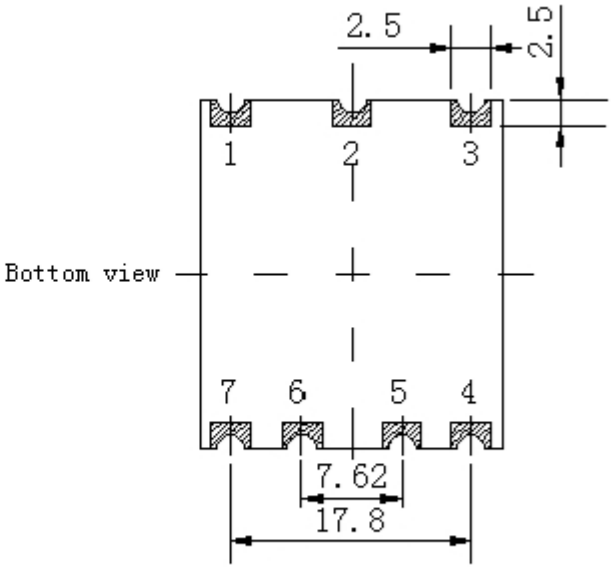


GNSS Receive offers 1PPS signal to CM22.
The MCU monitors the work state of CM22.

8. Mechanical Structure (mm)

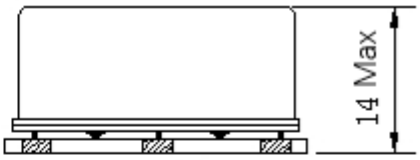


Solder Pad layout



Bottom view

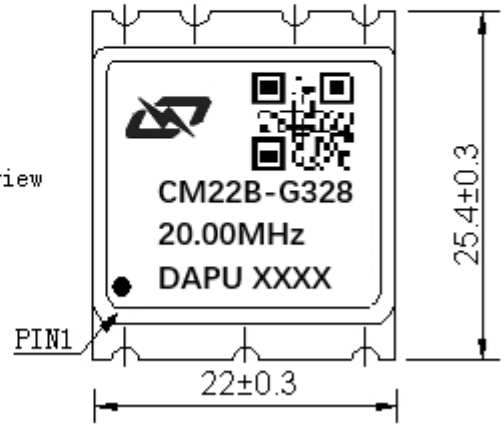
Right view



Side view

PIN FUNCTION

1	1PPS In
2	Do Not Connect
3	Supply voltage
4	RF Signal output
5	I²C Bus - SCL
6	I²C Bus - SDA
7	GND



Top view

Note1: Tolerance ± 0.20mm without mark
Note2: The first two xx representative: year
After two xx representative: week
Note3: Referential Weight 8g

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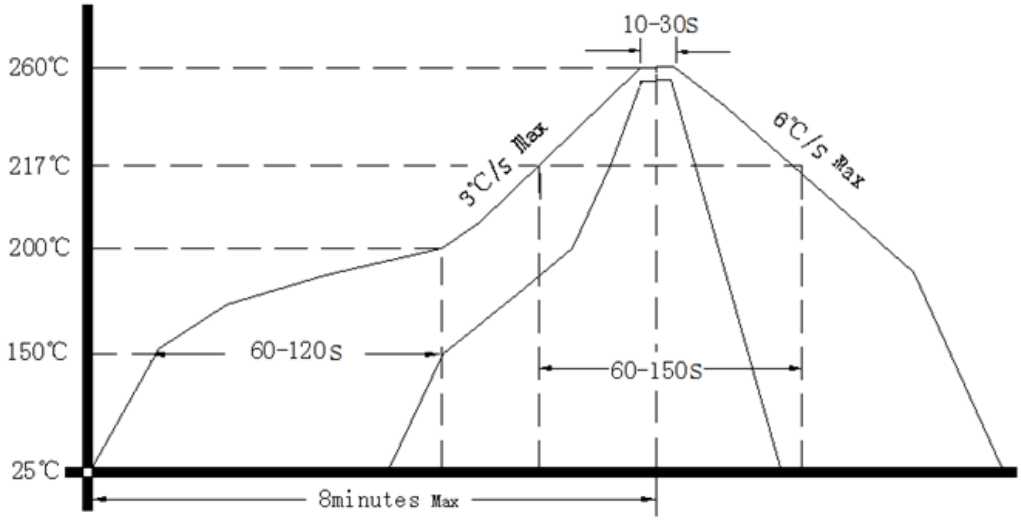
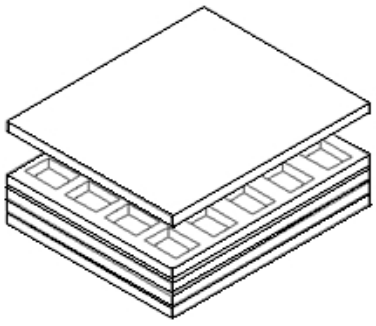
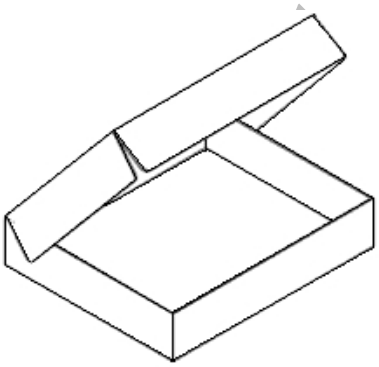
9. Reflow Soldering Curve (RoHS)



10.Package（mm）



Buffer material



Cardboard
Max 20pcs, circulator