

Customer Code:

DATASHEET

DAPU P/N: CM22B-T328-10.00MHz-D

Customer P/N: _____

DAPU			Customer Approval
Drew	Audited	Approved	Stamp, please! Thanks!
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Table of Amendment

Version	Revision contents	Prepared by	Revised date
1.0	First issued	<i>Amway</i>	2022.06.06
1.1	The “Marking” changed	<i>Amway</i>	2022.06.10
1.2	增加补充协议	<i>Amway</i>	2022.06.21



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1 General Description

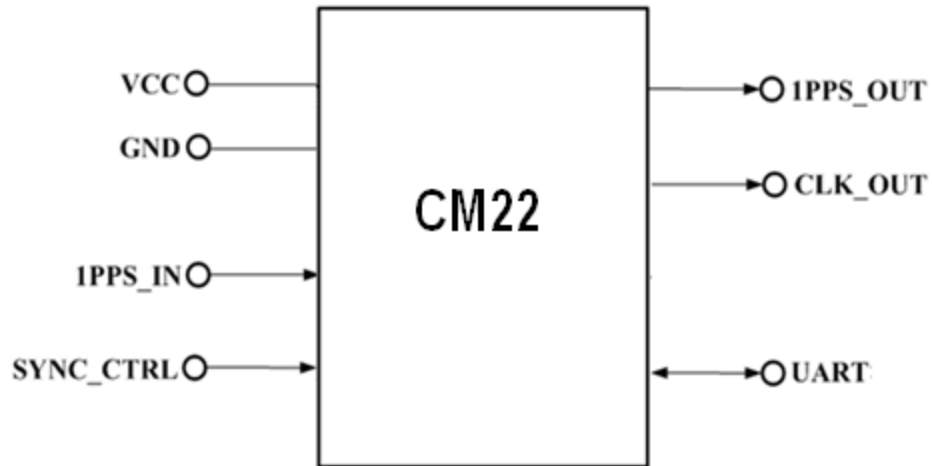


Figure 1 CM22

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:** $\pm 0.2\text{ppb}(-40^{\circ}\text{C}-85^{\circ}\text{C})$
- **Holdover:** $\pm 200\text{ns}/1\text{H}$, $\pm 300\text{ns}/2\text{H}$, $\pm 500\text{ns}/6\text{H}$, after power up and locking 24H
- **Clocks Input and Output:** 1*1PPS input, 1*1PPS output and 1*10MHz output
- **Serial Interface:** 1*UART for management and ToD In/Output
- **Mechanical Size:** 20.2mm*20.2mm*13.0mm



2 Pin Definition

Table 1 Pin Definition

Pin group	Pin#	Pin Name	Type	Description
Supply Voltage	2	VCC	PWR	Power Supply
	3	GND	GND	Ground
Control and Status Pins	1	SYNC_CTRL	I	Synchronization Procedure Control
UART	5	RXD	I	Asynchronous Serial Data Output/Input
	6	TXD	O	
Input Clock	4	1PPS_IN	I	1PPS Reference Input.
Output Clocks	7	1PPS_OUT	O	1PPS Output
	8	CLK_OUT	O	10.00MHz Output

3 Electrical Parameters

Table 2 Electrical Parameters

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



4 Performance

Table 3 Performance

Item	Parameter	Minimum	Typical	Maximum	Units	Test Condition	
Clock Output	Nominal Frequency	10.00			MHz	Synchronizing with 1PPS reference.	
	Duty Cycle	45	50	55	%	Load 15pF	
	Frequency vs. Temperature	-0.2		+0.2	$\times 10^{-9}$	$V_{CC}=3.3V$; $O_{load}=15pF$; T_A varies from -40°C to 85°C, temperature slope less than 2°C per minute.	
	Accuracy	-5		+5	$\times 10^{-12}$	24 hours average value when locked to 1PPS.	
	Short-term Stability	-0.01		+0.01	$\times 10^{-9}$	$V_{CC}=3.3V$; $T_A=25^\circ C$; 1s; no EMI/EMC or other interference.	
	Daily Aging	-0.5		+0.5	$\times 10^{-9}$	$V_{CC}=3.3V$; $T_A=25^\circ C$.	
	Yearly Aging	-0.03		+0.03	$\times 10^{-6}$		
	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		
	Pulse Width	0.001	100	500	ms		



1 PPS Output	Waveform	LVCMOS					
	Pulse Width	0.001	100	500	ms		
	Accuracy	-50		+50	ns	Synchronizing with 1PPS reference.	
	6-hour holdover	-500		+500	ns	$\Delta T = \pm 5^{\circ}\text{C}$, 6 hour holdover after power up and locking 24 hours; temperature slope less than 1°C per minute.	
	1-hour holdover	-200		+200	ns		
	2-hour holdover	-300		300	ns		
Supply Voltage	Supply Voltage	3.135	3.3	3.465	V		
	Warm Up Current			750	mA		
	Steady Current			300	mA	@25°C	
	AC Ripple			50	mVpk-pk	10Hz to 1MHz	

5 UART

UART interfaces are used for management and TOD, which has a fixed baud rate (115200) using 1 stop bit and no parity. It is a LVTTTL-compatible port and needs an external translator to work with other signal types (such as RS-232C or RS-485).

a) TOD input sentence format

\$GPZDA,<1>,<2>,<3>,<4>,<5>,<6>*HH<CR><LF>

Parameter Number	Parameter Name	Format	Description
<1>	UTC time	hhmmss.ss	Hour, minute, second,9 characters
<2>	day	dd	Range: 01~31, 2 characters
<3>	month	mm	Range: 01~12, 2 characters
<4>	year	yyyy	4 characters
<5>	NA	00	Filled with 00
<6>	NA	00	Filled with 00

Note: All sentences begin with "\$", end with<CR><LF>

* HH represents the bitwise XOR result of all characters between "\$" and "*" <CR><LF>: Carriage Return and Line Feed.

Example: \$GPZDA,010516.00,26,11,2008,00,00*6B

b) TOD output sentence format



\$DPZDA, <1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12>,<13>,<14>*HH<CR><LF>

Parameter Number	Parameter Name	Format	Description
<1>	UTCtime	hhmmss	Hour,minute,second, 6 characters
<2>	Day	dd	Range: 01~31, 2 characters
<3>	Month	mm	Range: 01~12, 2 characters
<4>	Year	yyyy	4 characters
<5>	System state	xx	00-Freerun, 01-fast track, 10-lock, 11-holdover
<6>	Lock indicator	x	0-unlock, 1-locked
<7>	temperature	xxx	Unit: 0.1℃ 。 e.g.234means23.4℃
<8>	Input identifier	x	1-1PPS Input, 0-no1PPS Input.
<9>	GPZDA input identifier	x	1 means GPZDA Input, 0 means no GPZDA Input.
<10>	reserve	0	--
<11>	T1	xxxxxx	Test parameter1: range +8192~-8192, 5 parameters
<12>	T2	xxxxxxxxxx	Test parameter2: range 65535.0000~00000.0000, 10 parameters
<13>	T3	xxxxxxxxxx	Test parameter3: 10 parameters
<14>	reserve	xxxxxxx	7 characters
Note: All sentences begin with "\$" , end with<CR><LF> * HH represents the bitwise XOR result of all characters between "\$" and "*"			
<CR><LF>: Carriage Return and Line Feed.			
Example: \$DPZDA,010517,26,11,2008,10,1,315,1,1,0,-0000,31945.0000,-0000.1146,0000000*78			

6 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 forced to work in free-run or holdover status when the SYNC_CTRL pin is driven low.



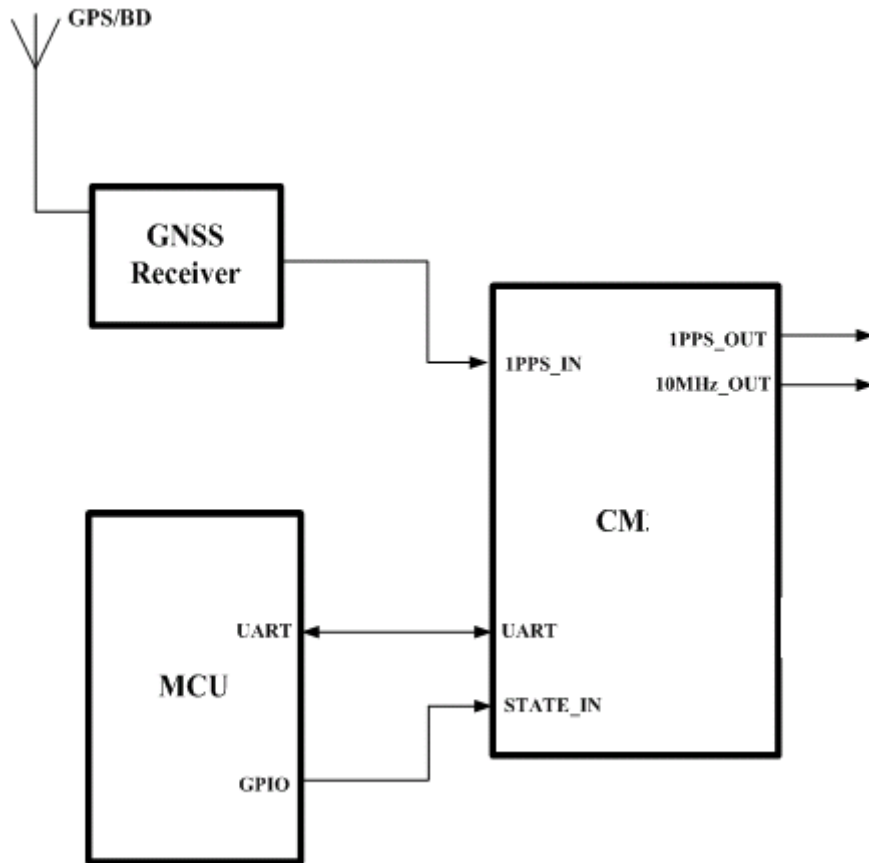
7 Environmental Conditions

Table 5 Environmental Conditions

Parameter	Conditions	
Operating Temperature	-40°C to 85°C	
Storage Temperature	-55°C to 105°C	
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°C~35°C	



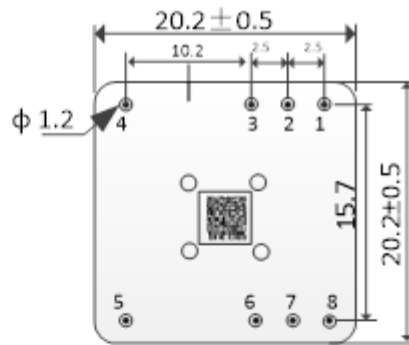
8 Typical Application



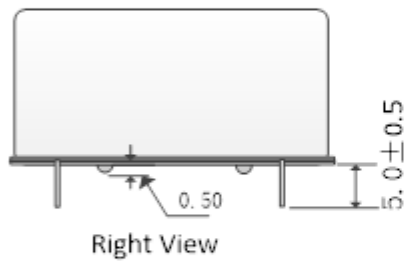
GNSS Receiver offers 1PPS signal to CM22.
The MCU monitors the work state of CM22.



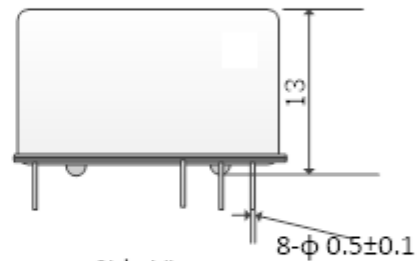
9 Mechanical Structure (mm)



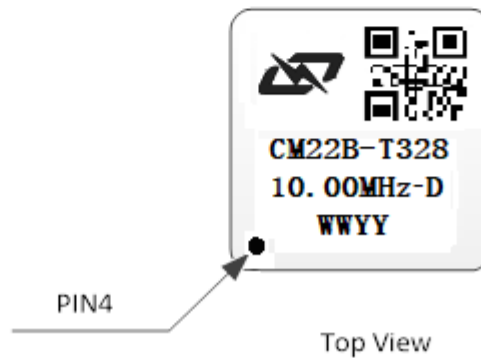
Bottom View



Right View



Side View



Top View

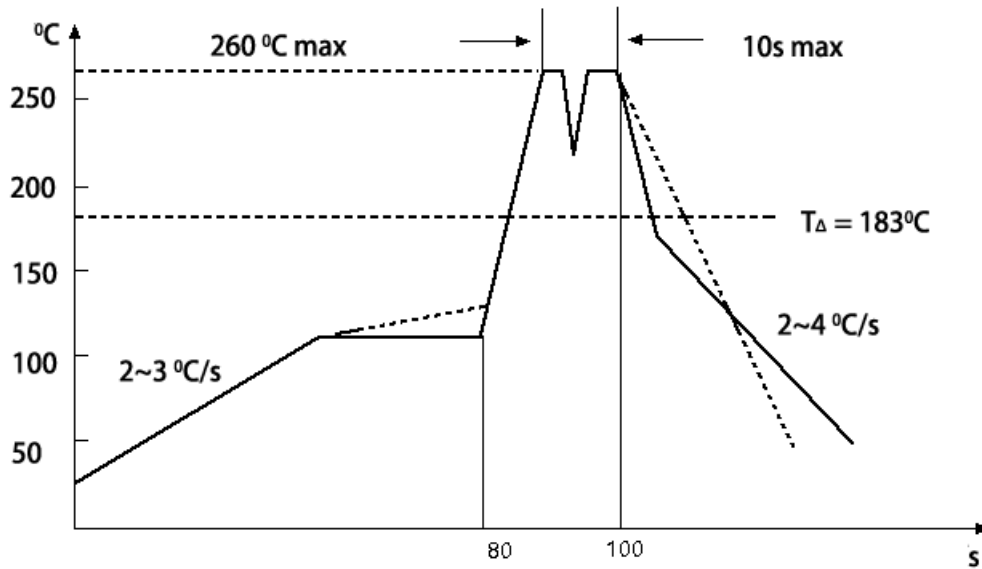
Note1: Tolerance $\pm 0.3\text{mm}$ without mark.

Note2: WW represents Week.

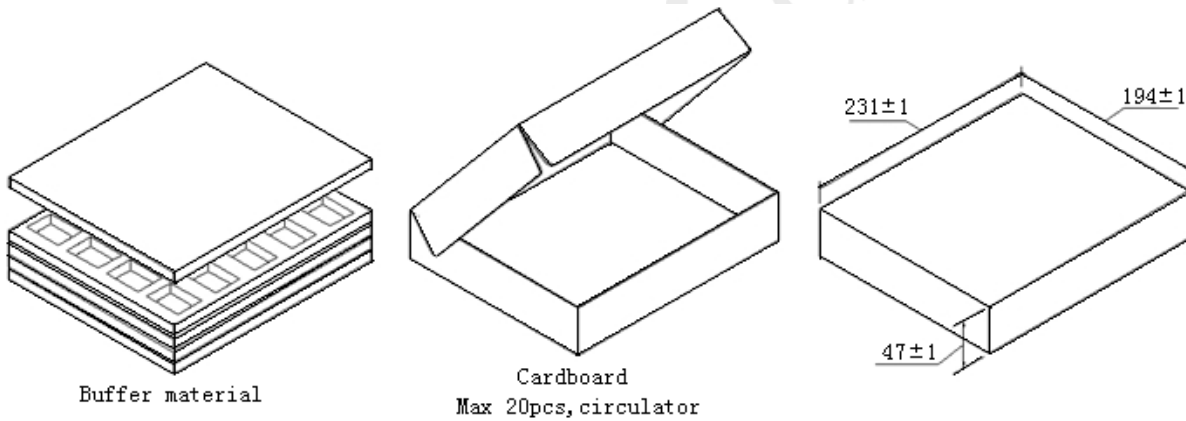
YY represents Year.



10 Wave Soldering Curve (RoHS)



11 Package (mm)





CM22B-T328-10.00MHz-D 补充技术协议

结合当前设备应用的环境特点，除 CM22B-T328-10.00MHz-D 规格书具体技术指标要求之外，需满足如下功能要求：

1. 开机给稳定驯服源的情况下 10 分钟以内稳定锁定。
2. 在已锁定稳定状态下，在外部输入 PPS 存在较大波动时，模块具有异常处理功能。
3. 由守时态进入驯服态时，模块输出调整量根据相差阈值确定，大于阈值则快调，小于阈值则慢调。
4. 可以通过串口信息获取当前晶振的基本信息，便于集成设备识别。
5. 丰富串口调试信息，便于后续问题排查。
6. 具有锁定状态指示功能。

附录作为协议一部分，定义具体实现及用法。

附录

- 1, 稳定锁定定义为输出 1pps 同步精度 50ns 以内。
- 2, 在已锁定稳定状态下，对于持续 15S 以内大于 100ns 的外部输入源异常波动，输出不跟着调整。对于持续 15S 以上的大于 100ns 小于 1us 的异常波动，输出 1pps 每秒的调整变化量小于 100ns。对于 15S 以上大于 1us 的源波动，不受调整量限制，尽快调整同步。
- 3, 由守时态进入驯服态时，1pps 输入与 1pps 输出相差小于 1us 时，1PPS 输出每秒调整量小于 100ns，1pps 输入与 1pps 输出相差大于 1us 时则调整量不受限制，尽快调整同步。
- 4, 增加晶振基本信息查询指令，基本信息包含完整型号代码（比如-82 表示 CM22B-T328-10.00MHz-D，-81 表示 CM22B-T328-10.00MHz-B 等），软件版本等。晶振唯一编码使用打标二维码。
- 5, 模块每秒输出 \$DPZDA 打印输出，外部系统将串口调试信息收集保存进文件，便于问题查询，保存时长容量根据实际应用场景定义。大普提供几个典型的异常判定机制可以整理分析方法，外部系统负责分析，并定义输出错误代码。
- 6, 同步精度稳定在 50ns 以内，进入 L,S 态，判定为稳定锁定。刚启动，稳定锁定进入 L,S 状态 10S 后判定为稳定锁定。稳定锁定态进入异常，并快速调整时，置 L, Q 态。保持期间，H, S 态判定为锁定，H, Q 不可用。