WI of Topaz PGEM Functional Test

Document History

| Revision	Originator	Issue Date	Description of Changes
01	CHHZ	08/30/2012	Initial Release

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1. Purpose

This WI is a guide of Topaz PGEM, including HW connection, test procedure, and test result judgement, etc

2. Main equipment and HW

| Equipment/HW/SW	Description	Qty
PC	Requirement: 1.00GHz$^+$ CPU; Windows XP; Available USB port and /or Serial port	1
PSoC 3 Programmer	CY Mini Programmer 3	1
Power Supplier	ATX Power supply	1
USB ADC Acquisition and Voltage Measurement Tool	USB1208LS	1
Aardvark I2C/SPI Host Adapter	TP240141	1
Topaz PGEM Functional Test Board	TST5E1	1

3. Test Procedure

3.1 Test flow
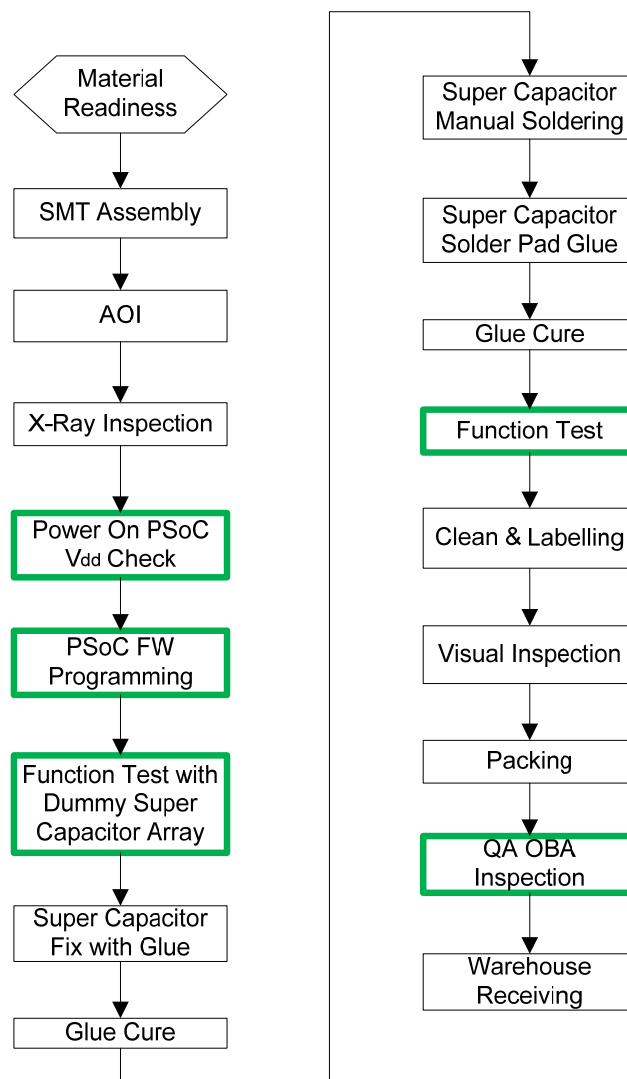
3.2 Test procedure

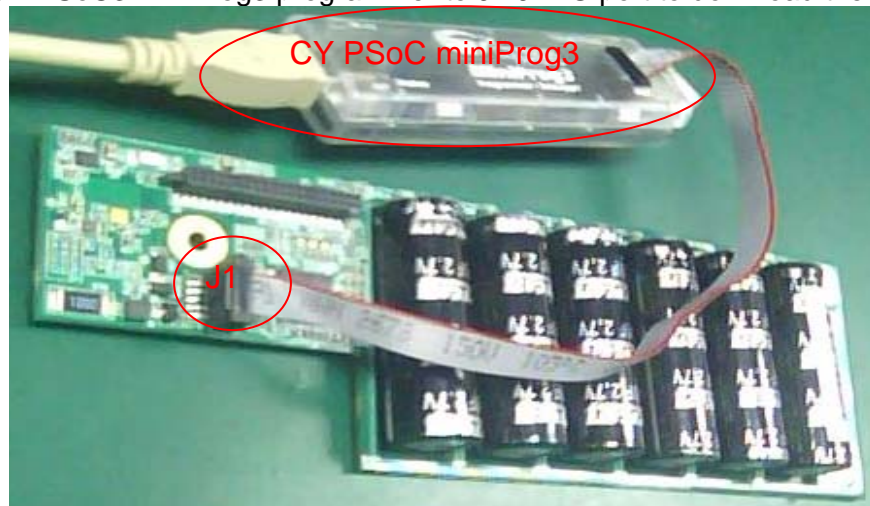3.2.1   Power On PSoC V_{dd} Check

Check PSoC Vdd voltage if ok, test point is Pin1 of J1, normal voltage should be 3.3V
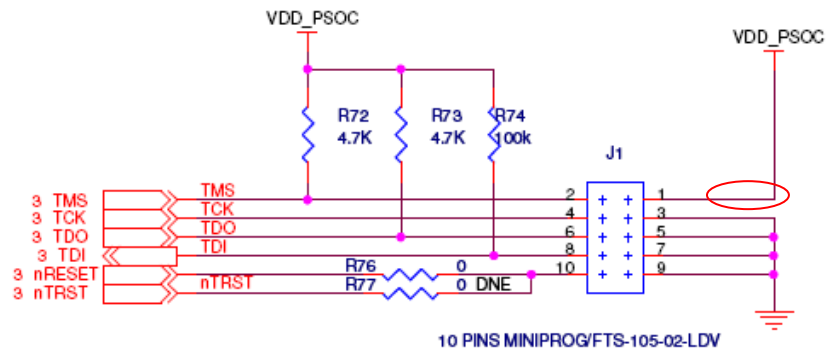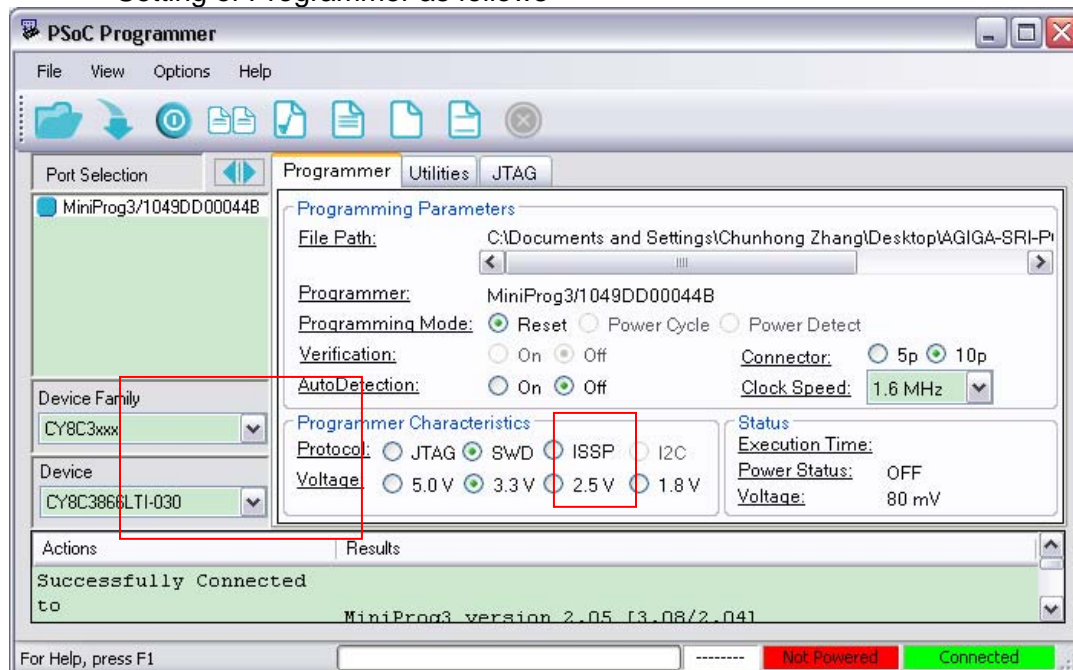

3.2.2   PSoC FW Programming

Connect CY PSoC3 MiniProg3 programmer to J1 JTAG port to download the FW of PSoC


Setting of Programmer as follows

3.2.3   Function Test with Dummy Super Capacitor Array

Test the basic function is enough, test item should be Output voltage @ input power on and Output voltage @ input power off, full charge stack voltage of Super Capacitor, test requirements as follows

Test Item	Criteria	Test Point	GND	Remark
Output	11.3V~12.1V	C19/C18(+)	C19/C18(-)	Input 11.3V~12.1V
Full Charge Stack Voltage	11.3V~13V	C45(+)	C55(-)	Input 11.3V~12.1V
Output	13V~0V	C19/C18(+)	C19/C18(-)	Input 0V
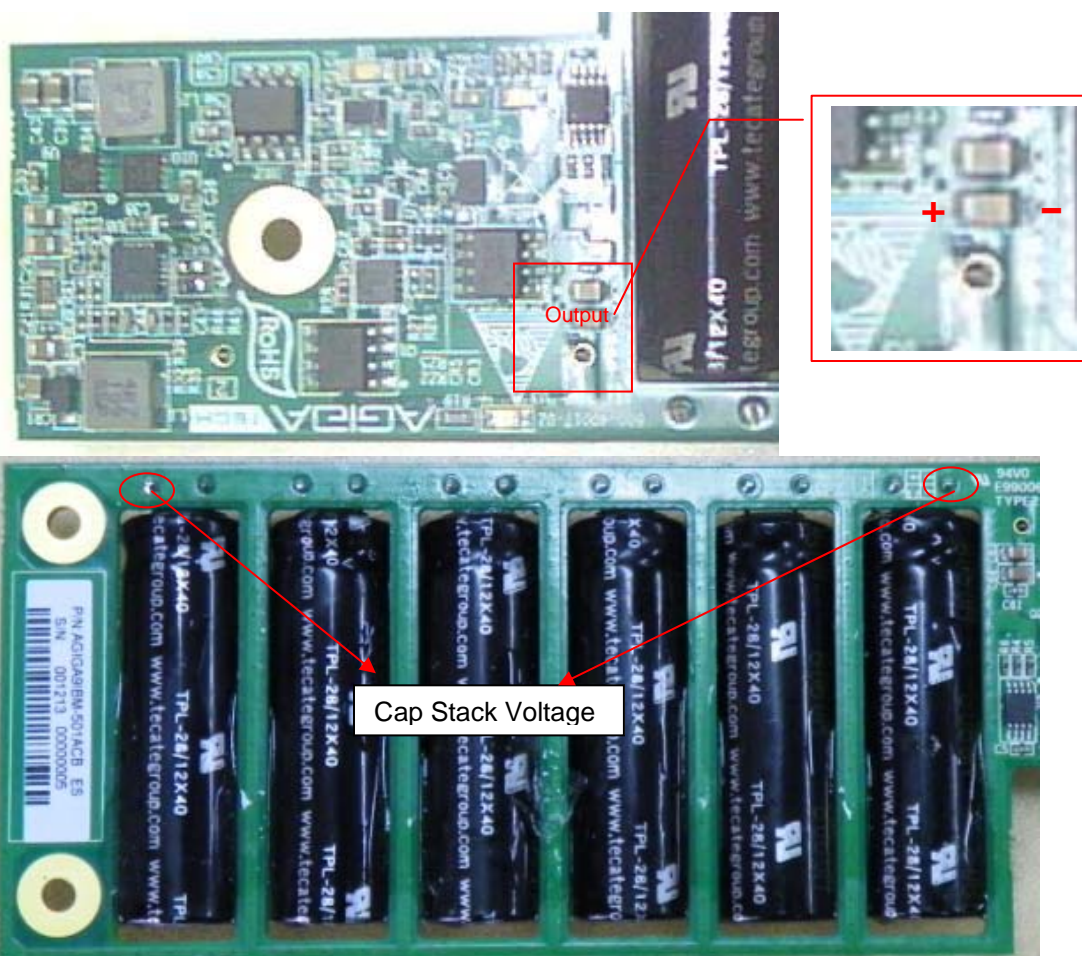
During test, refer to LED to judge the work status of Topaz, LED definition as follows

	D1(Yellow)	D2(Green)	D3(Blue)
	Caps Discharging	Caps Charging	12V Power
12 power applied	OFF	Slow Blink	ON
Caps charged	OFF	ON	ON or OFF
Caps Discharging	Slow Blink	OFF	OFF
PGEM Power OFF	OFF	OFF	OFF
Cap Failure	Alternating	Alternating	ON or OFF
Firmware upgrade is in progress or upgrade fault if indication persists after max upgrade time.	Slow Blink	Slow Blink	ON

3.2.4 Full Functional test

    1) HW connection as follows
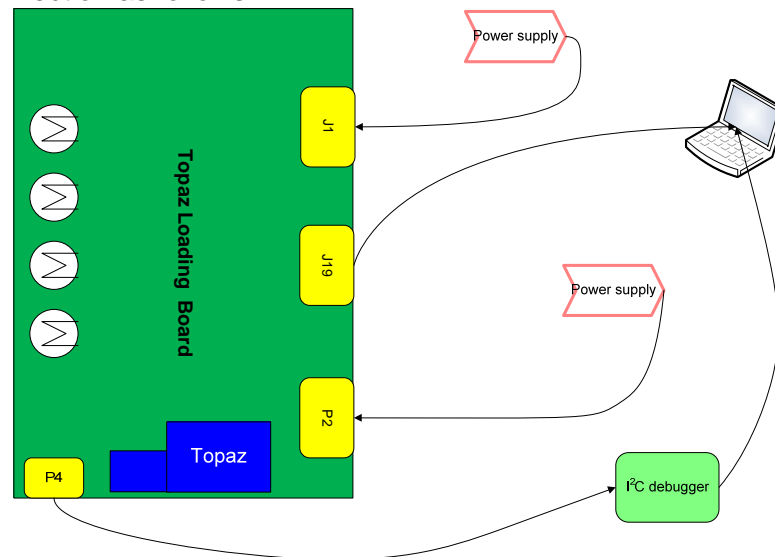
2) Install Python 2.6.6 and add the install path to path environment according to below information
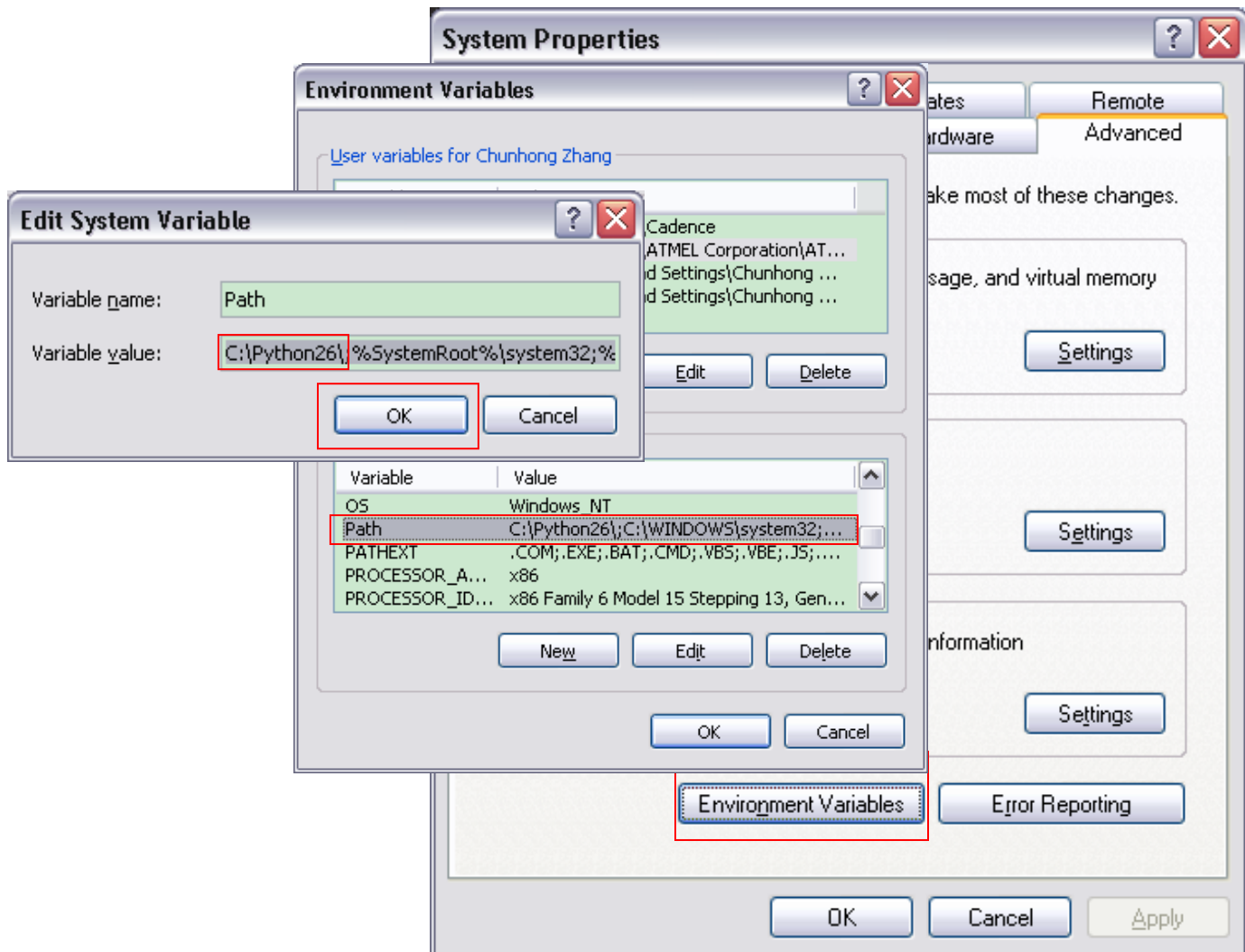
3) Copy test script folder—Topaz-Test to certain location of PC, this folder includes necessary scripts of test

4) Open the command window according to below steps

Start menu→Run→Input "CMD" and click "**OK**" to start the command window

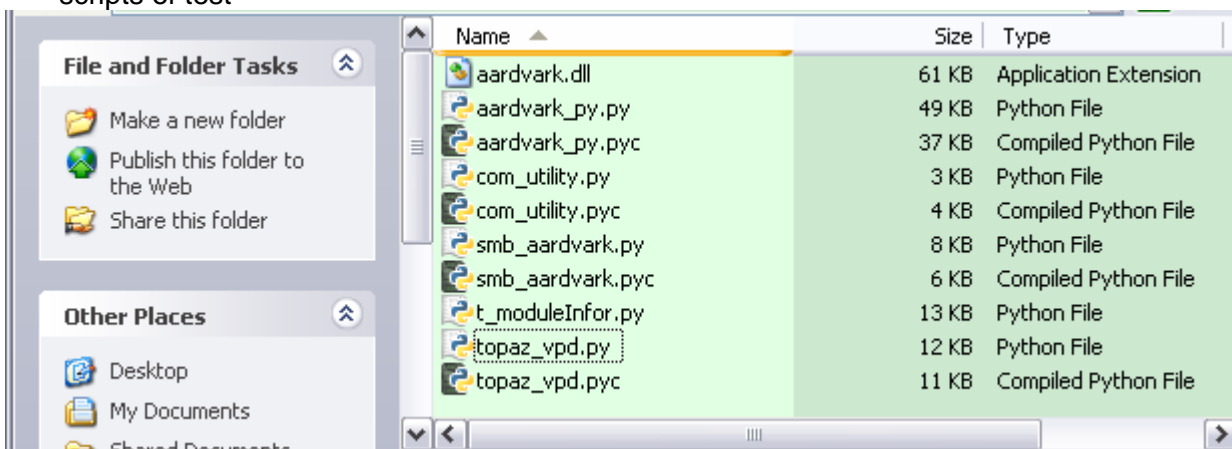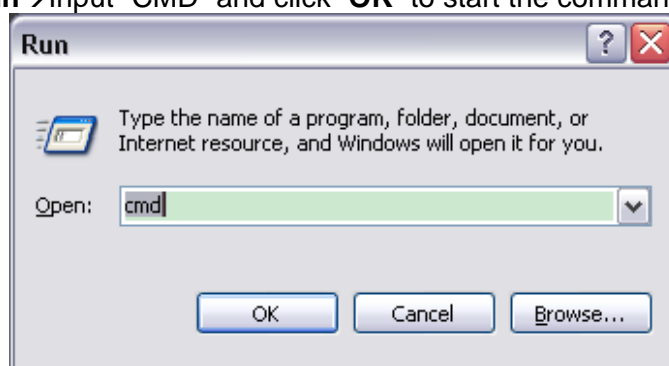5) Start the test menu according to below command under the path of test folder placed.

"python topaz_vpd.py 100 1", example as follows

```
C:\Documents and Settings\Chunhong Zhang\Desktop\Topaz-Test>python topaz_vpd.py
100 1
```

Test menu displayed as follows

```
================================================================
                    [Menu of Test SMB]
----------------------------------------------------------------
0   ---   Quit
1   ---   custom register
2   ---   Show EEPROM
3   ---   Analyze UPD on Device
4   ---   Analyze UPD in File
5   ---   Write EEPROM Byte
6   ---   Read EEPROM Byte
7   ---   Unlock RW > 512
8   ---   Lock RW > 512
9   ---   Dump EEPROM to eeprom.dump
10  ---   Program Device EEPROM
11  ---   Get Temperature History
12  ---   Get Capacity History
13  ---   Manufacture Input (henry)
```

6) Input the item number of SMB menu to start the test of each function, example as follows

```
=========================================================
                  [Menu of Test SMB]
---------------------------------------------------------
0   ---   Quit
1   ---   custom register
2   ---   Show EEPROM
3   ---   Analyze VPD on Device
4   ---   Analyze VPD in File
5   ---   Write EEPROM Byte
6   ---   Read EEPROM Byte
7   ---   Unlock RW > 512
8   ---   Lock RW > 512
9   ---   Dump EEPROM to eeprom.dump
10  ---   Program Device EEPROM
11  ---   Get Temperature History
12  ---   Get Capacity History
13  ---   Manufacture Input (henry)
please select option: 13
```

7) Run item 7 first to unlock the EEPROM, then run item 13 to write the EEPROM VPD information need to be written defined as follows

Name	Address	Description	Content to fill
MODEL	0x026B	TOPAZ Model Number	501ACBE2
FWVER	0x0273	TOPAZ FW Version	00000.20
HWVER	0x027B	TOPAZ HW Version	000Rev02
CAPPN	0x0283	Capacitor Part Number	AGTPL28F
SN	0x028B	Serial Number	*0000000X(last 8 digits of SN)*
PCBVER	0x0293	PCB Version	000Rev01
MFDATE	0x029B	Manufacture Date	*0000YYWW*
ENDUSR	0x02A3	Manufacturer Name (End user)	AGIGA-02

8) To show the whole information of product, input command "python t_moduleinfor.py 100 1" to run the function, example as follows

```
C:\Documents and Settings\Chunhong Zhang\Desktop\Topaz-Test>python t_moduleinfor
.py 100 1
+++++++++++++++++++++++++++++++
       <SMBus Validation>
-------------------------------
BITRATE =  100
SLAVE_ADDRESS =  1
+++++++++++++++++++++++++++++++
1 device found: port = 0
aa_handle = 1
Bitrate set to 100 kHz
Bus lock timeout set to 26 ms
PGM Temperature History:
-------------------------------
70 oC -- Above      0 hours
65 oC -- 70 oC:     0 hours
60 oC -- 65 oC:     0 hours
55 oC -- 60 oC:     0 hours
50 oC -- 55 oC:     0 hours
45 oC -- 50 oC:     0 hours
40 oC -- 45 oC:     0 hours
35 oC -- 40 oC:     1 hours
30 oC -- 35 oC:     0 hours
25 oC -- 30 oC:     0 hours
20 oC -- 25 oC:     0 hours
15 oC -- 20 oC:     0 hours
10 oC -- 15 oC:     0 hours
5  oC -- 10 oC:     0 hours
0  oC --  5 oC:     0 hours
Below --  0 oC:     0 hours
--------
total:  1 hours
```

```
PGM Capacity History:
--------------------
120% -- Above      0 days
115% -- 120%:      0 days
110% -- 115%:      0 days
105% -- 110%:      0 days
100% -- 105%:      0 days
 95% -- 100%:      0 days
 90% --  95%:      0 days
 85% --  90%:      0 days
 80% --  85%:      0 days
 75% --  80%:      0 days
 70% --  75%:      0 days
 65% --  70%:      0 days
 60% --  65%:      0 days
 55% --  60%:      0 days
 50% --  55%:      0 days
Below--  50%:      0 days
---------
total:  0 days
Run time --------------------- 1  hours
Run time at last power fail --- 196095  hours
Power cycles ------------------ 6  times
Last PCT cap measure  ---------- 255  %
TOPAZ module number:
TOPAZ FW version:
TOPAZ HW version:
Capacitor part number:
Serial number:
PCB   version:
Manufacture  date:
Manufacture  name:
PCassembly number:
```

REFERENCE:
Register map and EEPROM content

Register:

			Status	
0x04	READINESS	R	Ready to supply backup power	**Error! Reference source not found.**
0x05	PGEMSTAT	R	PowerGEM Status	**Error! Reference source not found.**
0x06	TEMP	R	Current Temperature	°C
0x07	VIN	R	Current Vin (tenths-of-a-volt)	0-25.5
0x08	VCAP	R	Cap Stack Voltage	Tenths of a volt
0x09	VC1	R	Voltage across C1	20 mv steps, 0-5.11V range
0x0A	VC2	R	Voltage across C2	
0x0B	VC3	R	Voltage across C3	
0x0C	VC4	R	Voltage across C4	
0x0D	VC5	R	Voltage across C5	
0x0E	VC6	R	Voltage across C6	
0x0F			Reserved, reads 0	

EEPROM:

Bytes	Acc	Name	Offset	Contents	Units	Source
512	RW	USER	0x0000	User Read/Write data		Host
1	RW	MCAPINT	0x0200	Capacitance Measurement Interval	weeks	Host
31			0x0201	Reserved		
32	R	TEMPHIST	0x0220	Temperature History	hours	TOPAZ
32	R	CAPHIST	0x0240	Capacitance History	days	TOPAZ
4	R	T_RUN	0x0260	Total Run Time	hours	TOPAZ
4	R	T_LASTPF	0x0264	Run Time at Last Power Fail (hrs)	hours	TOPAZ

2	R	PWRCYCS	0x0268	Number of Power Cycles	cycles	TOPAZ
1	R	LASTCAP	0x026A	Last PCT Capacitance Measurement	%	TOPAZ
8	R	MODEL	0x026B	TOPAZ Model Number	text	Manuf
8	R	FWVER	0x0273	TOPAZ FW Version	text	Manuf
8	R	HWVER	0x027B	TOPAZ HW Version	text	Manuf
8	R	CAPPN	0x0283	Capacitor Part Number	text	Manuf
8	R	SN	0x028B	Serial Number	text	Manuf
8	R	PCBVER	0x0293	PCB Version	text	Manuf
8	R	MFDATE	0x029B	Manufacture Date	text	Manuf
8	R	ENDUSR	0x02A3	Manufacturer Name (End user)	text	Manuf
8	R	PCA	0x02AB	PC Assembly Number	text	Manuf
1	R	CINIT	0x02B3	Measured Capacitance at time of manufacture (0.1F increments)	.1F	Manuf
331	NO	RSRVD	0x02B4	Reserved for internal use		TOPAZ