ICP EC API
Specification

Rev R0.9
2016/11/09

Department: IEI/SW
Author: Burton Lee

History

VERSION	DATE	DESCRIPTION
R0.1	2011/01/03	First draft release by Elf ,
R0.3	2011/08/15	1:Define Watch Dog function command 2:Define delay timer function command 3:Define DMIC command 4:Define EUP define command
R0.4	2011/10/06	1:Add auto dimming counter variable . 2:Add INA220 H/W monitor shut-voltage/bus voltage/power command at FUN:0x02 offset 0x50~0x55 3:Add CPU power limit 1/2 command at FUN: 0x02 offset 56~57. 4:Add RAPL_CMOS command
R0.5	2012/05/08	1: Fix Some Error. 2: ICP EC API write byte command Update.(Page 5) 3: Add Environment Temperature 1 & 2 at Function : 0x02, Offset : 0x0C, 0x0D. 4: Change System Temperature 1 & 2 to Function : 0x02, Offset : 0x0E, 0x0F. 5: Add Light FANless Mode Function. FUN:0x02 offset:0x02, 0x38, 0x39
R0.6	2013/11/20	1: Add EC DIO Function. Function : 0x01, Offset : 0x50, 0x51 2: Add Fucttion and Device Support. Bit13: USB_SW1 Bit14: USB_SW2 Bit15: MEOVERRIDE Bit16&17: PCIECX16 3: Add Function:0x06 BMC Slave Monitor. 4: Add COM Port Type Function. Function : 0x01, Offset : 0x52 5: Add i-Menu Function Function : 0x01, Offset : 0x41
R0.7	2013/12/16	1: Add IPMI Card Status. Function : 0x01, Offset : 0x42 2: Add BIOS Version. Function : 0x03, Offset : 0x00~0x07

		3. Add iWDD Version. Function : 0x03, Offset : 0x08~0x0F 4: Add BMC Firmware Version. Function : 0x03, Offset : 0x10~0x17 5: Add ME Firmware Version. Function : 0x03, Offset : 0x18~0x1C 6: Add DDR Voltage Levels Function : 0x06, Offset : 0x50~0x51 7: Add ICP EC API Version Function : 0x00, Offset : 0x17 8: Delete VBAT Voltage Function : 0x06, Offset : 0x3E~0x3F 9: Add the definition of PCIEX16 in Page 28.
R0.8	2014/08/26	1: Power Supply Status. Function : 0x00, Offset : 0x45 2: Running Time Meter. Function : 0x00, Offset : 0x70~0x73 3: Boot Counter. Function : 0x00, Offset : 0x74~0x77 4: IPMI Card Control. Function : 0x01, Offset : 0x53 5: I2C Read/Write Function. Function : 0x01, Offset : 0x60~0x65 6: User Storage Read/Write. Function : 0x01, Offset : 0x78 7: CPU temperature record Function. Function : 0x01, Offset : 0x80~0x89 8: FDSR / FDSC Function. bit 13 : CAMMERA1 bit 14 : CAMMERA2 bit 18 : USB_SW1 bit 19 : USB_SW2 bit 20 : J_LVDS1_GP0 bit 21 : J_LVDS1_GP1 bit 22 : J_LVDS1_GP2 bit 23: J_LVDS1_GP3 bit 24: LVDS Mode Function : 0x01, Offset : 0x00~0x01 & 0x20~0x21 9: Fan3 Function. Function : 0x02, Offset : 0x22 & 0x3B~0x3F

		10: Fan4 Function. Function : 0x02, Offset : 0x23 & 0x4B~0x4F 11: Add Function:0x04 API Data Buffer 12:Add Function:0x05 User Storage Area
R0.9	2016/11/09	1: EC chip ID. Function : 0x00, Offset : 0x18 & 0x19 2. F81439 COM Port Type Select Function : 0x01, Offset : 0x54 3. System Status LED Function : 0x01, Offset : 0x55 4. SAS expansion port LED Function : 0x01, Offset : 0x56 5: FDSR / FDSC Function. bit 32 DISP_SEL_0 bit 33 DISP_SEL_1 bit 34 Addon_0 bit 35 Addon_1 bit 40 QTS_IPC bit 41 PWRBTN_Dis

Index

1. ICP EC API Input/Output Controller

Status Register

The status register is an 8-bit read-only register at I/O address hex 6C. It has information about the state of the ICP EC API I/O controller and interface. It may be read at any time.

Status-Register Bit Definition

Bit 0 Output Buffer Full –

0: Indicates that the keyboard controller's output buffer has no data.

1: Indicates that the controller has placed data into its output buffer but the system has not yet read the data.

When the system reads the output buffer (I/O address hex 68), this bit will return to a 0.

Bit 1 Input Buffer Full –

0: Indicates that the ICP EC API I/O controller's input buffer (I/O address hex 68 or 6C) is empty.

1: Indicates that data has been written into the buffer but the controller has not read the data.

When the system reads the output buffer (I/O address hex 68), this bit will return to a 0.

Bit 2 Reserved

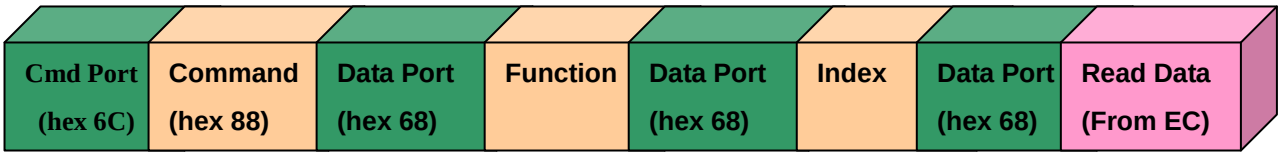
Bit 3 Command / Data –

The ICP EC API I/O controller's input buffer may be address as either I/O address hex 68 or 6C. Address hex 68 is defined as the data port, and address hex 6C is defined as the command port. Writing to address hex 6C sets this bit to 1; writing to adder hex 68 sets this bit to 0. The controller uses this bit to determine if the byte in its input buffer should be interpreted as a command byte or a data byte.

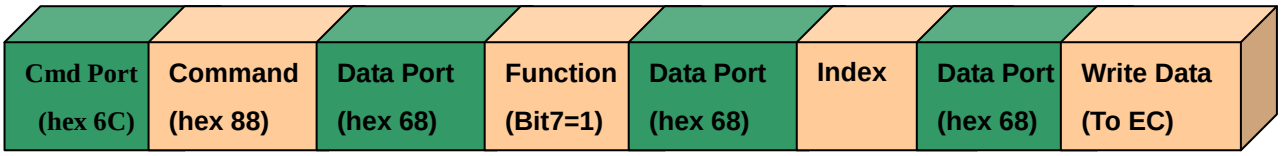
2. ICP EC API COMMAND

We can read EC data by Read Byte Command and modify EC data by Write Byte Command, the command format as follow:

- **Read Byte Command**



- **Write Byte Command**



Note:

Cmd Port:	ICP EC API Input/Output Controller Command Port.
Function:	Refer “ICP EC API Function” Chapter.
Index:	Refer “ICP EC API Function” Chapter.

Sample code:

```
//---------------------------------------------------------------------------
// Sample code with ICP EC API read byte command
//---------------------------------------------------------------------------
UINT8 Read_Byte (UINT8 Function,UINT8 Index)
{
    UINT8    Temp8;
    UINT8    Value;

    Temp8 = IoRead8 (0x68);            // clear status
    ChkIBF ();                         // check IBF
    IoWrite8(0x6C,0x88);               // write command to cmd port
    ChkIBF ();                         // check IBF
    IoWrite8(0x68, Function);          // write function to data port
    ChkIBF ();                         // check IBF
    IoWrite8(0x68, Index);             // write index to data port
    ChkIBF ();                         // check IBF
    ChkOBF ();                         // waiting OBF
    Value = IoRead8(0x68);             // read Data from EC
    return Value;
}

//---------------------------------------------------------------------------
// Sample code with ICP EC API write byte command
//---------------------------------------------------------------------------
Write_Byte (UINT8 Function,UINT8 Index,UINT8 Data)
{
    UINT8    Temp8;
    Temp8 = IoRead8 (0x68);            // clear status
    ChkIBF ();                         // check IBF
    IoWrite8(0x6C,0x88);               // write command to cmd port
    ChkIBF ();                         // check IBF
    IoWrite8(0x68, Function | 0x80);   // write function(Bit7=1) to data port
    ChkIBF ();                         // check IBF
    IoWrite8(0x68, Index);             // write index to data port
    ChkIBF ();                         // check IBF
    IoWrite8(0x68, Data);              // write index to data port
    ChkIBF ();                         // check IBF
}
```

```
//---------------------------------------------------------------------------
// check IBF waiting for EC receive the command(data).
//---------------------------------------------------------------------------
ChkIBF ()
{
     UINT8     Status;
     do {Status = IoRead8 (0x6C);
          } while (Status&2);
}

//---------------------------------------------------------------------------
// check OBF waiting for EC transfer data.
//---------------------------------------------------------------------------
ChkOBF ()
{
     UINT8     Status;
     do { Status = IoRead8 (0x6C);
          } while (!(Status&1));
}
```

3. ICP EC API Function

3.1 Function:0x00 System and Battery Information

Index	R/W	Default	Register or Action
0x00	R	0x00	iWDD Version [Byte 7] (MSB)
0x01	R	0x00	iWDD Version [Byte 6]
0x02	R	0x00	iWDD Version [Byte 5]
0x03	R	0x00	iWDD Version [Byte 4]
0x04	R	0x00	iWDD Version [Byte 3]
0x05	R	0x00	iWDD Version [Byte 2]
0x06	R	0x00	iWDD Version [Byte 1]
0x07	R	0x00	iWDD Version [Byte 0] (LSB)
0x08	R	0x00	iWDD Version Reserved
0x09	R	0x00	iWDD Version Reserved
0x0A	R	0x00	iWDD Version Reserved
0x0B	R	0x00	iWDD Version Reserved
0x0C	R	0x00	iWDD Version Reserved
0x0D	R	0x00	iWDD Version Reserved
0x0E	R	0x00	iWDD Version Reserved
0x0F	R	0x00	iWDD Version Reserved
0x10	R	-	Power Status
0x11	R	-	Battery1 Information
0x12	R	-	Battery2 Information
0x13	R	-	EC APCI States
0x14		-	Reserved
0x15	R	-	RAPL CMOS Support : BIT0 = 0 Disable , BIT1 = 1 Enable
0x16	R/W	-	RAPL CMOS Status : 0-Always OFF 1:Always ON 2:Last State
0x17	R	0x09	ICP EC API Version
0x18	R	0x85	ECHIPID1
0x19	R	0x00	ECHIPID2
0x1A		-	Reserved
0x1B		-	Reserved
0x1C		-	Reserved
0x1D		-	Reserved

Function:0x00

Index	R/W	Default	Register or Action
0x1E		-	Reserved
0x1F		-	Reserved
0x20	R	0x00	Battery1 Full Charge Capacity (Low Byte)
0x21	R	0x00	Battery1 Full Charge Capacity (High Byte)
0x22	R	0x00	Battery1 Remaining Capacity (Low Byte)
0x23	R	0x00	Battery1 Remaining Capacity (High Byte)
0x24	R	0x00	Battery1 Voltage (Low Byte)
0x25	R	0x00	Battery1 Voltage (High Byte)
0x26	R	0x00	Battery1 Temperature (Low Byte)
0x27	R	0x00	Battery1 Temperature (High Byte)
0x28	R	0x00	Battery1 Current (Low Byte)
0x29	R	0x00	Battery1 Current (High Byte)
0x2A	R	0x00	Battery1 Charging Voltage (Low Byte)
0x2B	R	0x00	Battery1 Charging Voltage (High Byte)
0x2C		-	Reserved
0x2D		-	Reserved
0x2E		-	Reserved
0x2F		-	Reserved
0x30	R	0x00	Battery2 Full Charge Capacity (Low Byte)
0x31	R	0x00	Battery2 Full Charge Capacity (High Byte)
0x32	R	0x00	Battery2 Remaining Capacity (Low Byte)
0x33	R	0x00	Battery2 Remaining Capacity (High Byte)
0x34	R	0x00	Battery2 Voltage (Low Byte)
0x35	R	0x00	Battery2 Voltage (High Byte)
0x36	R	0x00	Battery2 Temperature (Low Byte)
0x37	R	0x00	Battery2 Temperature (High Byte)
0x38	R	0x00	Battery2 Current (Low Byte)
0x39	R	0x00	Battery2 Current (High Byte)
0x3A	R	0x00	Battery2 Charging Voltage (Low Byte)
0x3B	R	0x00	Battery2 Charging Voltage (High Byte)
0x3C		-	Reserved
0x3D		-	Reserved
0x3E		-	Reserved
0x3F		-	Reserved

Function:0x00

Index	R/W	Default	Register or Action
0x40	R/W	0x00	Watchdog Timer Configuration Register
0x41	R/W	0x00	Watchdog Timer Counter Register
0x42	R/W	0x0	Auto Dimming Delay Counter (1~50) unit :125ms
0x43	R/W	0x0	Auto Dimming Rising Counter (range 1~10)
0x44	R/W	0x0	Auto Dimming Falling Counter (range 1~10)
0x45	R	0x00	Power Supply Status
0x46	R	0x00	LVDS Default Value
0x47		-	Reserved
0x48		-	Reserved
0x49		-	Reserved
0x4A		-	Reserved
0x4B		-	Reserved
0x4C		-	Reserved
0x4D		-	Reserved
0x4E		-	Reserved
0x4F		-	Reserved
0x50	R/W	-	Delay Timer Control0 (word0: low byte) (example : unit(5ms) : 1s => counts =200)
0x51	R/W	-	Delay Timer Control1 (word0: high byte)
0x52	R/W	-	Delay Timer Control2 (word1: low byte)
0x53	R/W	-	Delay Timer Control3 (word1: high byte)
0x54	R/W	-	Delay Timer Control4 (word2: low byte)
0x55	R/W	-	Delay Timer Control5 (word2: high byte)
0x56		-	Reserved
0x57		-	Reserved
0x58		-	Reserved
0x59		-	Reserved
0x5A		-	Reserved
0x5B		-	Reserved
0x5C		-	Reserved
0x5D		-	Reserved
0x5E		-	Reserved
0x5F		-	Reserved
0x60		-	Reserved
0x61		-	Reserved

Function:0x00

Index	R/W	Default	Register or Action
0x62		-	Reserved
0x63		-	Reserved
0x64		-	Reserved
0x65		-	Reserved
0x66		-	Reserved
0x67		-	Reserved
0x68		-	Reserved
0x69		-	Reserved
0x6A		-	Reserved
0x6B		-	Reserved
0x6C		-	Reserved
0x6D		-	Reserved
0x6E		-	Reserved
0x6F		-	Reserved
0x70	R	0x00	Day of Running Time Meter (High Byte)
0x71	R	0x00	Day of Running Time Meter (Low Byte)
0x72	R	0x00	Hour of Running Time Meter
0x73	R	0x00	Minute of Running Time Meter
0x74	R	0x00	Boot Counter [Byte 3] (MSB)
0x75	R	0x00	Boot Counter [Byte 2]
0x76	R	0x00	Boot Counter [Byte 1]
0x77	R	0x00	Boot Counter [Byte 0] (LSB)
0x78	R	-	Current Year
0x79		-	Current Month
0x7A		-	Current Date
0x7B		-	Current Hour
0x7C		-	Current Minute
0x7D		-	Reserved
0x7E		-	Reserved
0x7F		-	Reserved
…	…	…	…
0xFF	R/W	0x00	API Table Number For SMBus Slave(ATNSS)

Function:0x00

iWDD Version (0x00 ~ 0x07)

Indicates the EC firmware version string. A total of 8 characters. Example : if EC firmware version is "B321ER10", iWDD Version [Byte 7] = 0x42, [Byte 6] = 0x33, [Byte 5] = 0x32, [Byte 4] = 0x31, [Byte 3] = 0x45, [Byte 2] = 0x52, [Byte 1] = 0x31, [Byte 0] = 0x30.

Name	R/W	Format	Size in Bytes	Default Value
iWDD Version	R/W	Char	8	0x00

Power Status (0x10)

Bit	R/W	Name	Description	Default
7-4	Rev	Reserved	Reserved	
3	R	Docking Status	0 – Not present 1 – Present	-
2	R	Battery2 Status	0 – Not present 1 – Present	-
1	R	Battery1 Status	0 – Not present 1 – Present	-
0	R	DC Status	0 – Off-line 1 – On-line	-

Battery Information (Battery 1 : 0x11, Battery 2 : 0x12)

Bit	R/W	Name	Description	Default
7	Rev	Reserved	Reserved	-
6-4		Battery State	Bit values. Notice that the Charging bit and the Discharging bit are mutually exclusive and must not both is set at the same time. Even in critical state, hardware should report the corresponding charging/discharging state. Bit0 – 1 indicates the battery is discharging. Bit1 – 1 indicates the battery is charging. Bit2 – 1 indicates the battery is in the critical energy state	-
Bit 3-1	Rev	Reserved	Reserved	-
Bit 0	R	Battery Power Unit	Indicates the units used by the battery to report its capacity and charge/discharge rate information to the OS. 0 – Capacity information is reported in [mWh] and charge/discharge rate information in [mW]. 1 – Capacity information is reported in [mAh] and charge/discharge rate information in [mA].	-

Function:0x00

ECHIPID1 (0x18)

The content of this EC side register is the same as that of the CHIPID1 register in the host side. This register contains the Chip ID byte 1.

Name	R/W	Format	Size in Bytes	Default Value
ECHIPID1	R	Hex	1	0x85

ECHIPID2 (0x19)

The content of this EC side register is the same as that of the CHIPID2 register in the host side. This register contains the Chip ID byte 2.

Name	R/W	Format	Size in Bytes	Default Value
ECHIPID1	R	Hex	8	0x85

Watchdog Timer Configuration Register (0x40)

Bit	R/W	Name	Description	Default
7- 2		Reserved	Reserved	-
Bit 1	R	WD_UNIT	Select time unit (0: 1sec, 1: 60 sec) of watchdog timer by setting this bit.	0
Bit 0	R	WD_EN	If this bit is set to 1, the counting of watchdog time is enabled.	0

Watchdog Timer Counter Register (0x41)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
WD_TIME	R/W	Unsigned integer	1	0	255	0	1sec/1min

Function:0x00

Power Supply Status (0x45)

Bit	R/W	Name	Description	Default
Bit 7 – 1		Reserved	Reserved	-
Bit 2	R	PMBus 2 Power Good	0 –Power Fail. 1 –Power Good.	0
Bit 1	R	PMBus 1 Power Good	0 –Power Fail. 1 –Power Good.	0
Bit 0	R	Power Supply Type	0 – AT Power. 1 – ATX Power.	0

LVDS Default Value (0x46)

Bit	R/W	Name	Description	Default
Bit 4 – 7		Reserved	Reserved	-
Bit 3	R	LVDS Backlight Voltage Level	0 – Default 3.3V 1 – Default 5V	0
Bit 0 – 2		Reserved	Reserved	-

Running Time Meter (Day : 0x70 ~ 0x71, Hour : 0x72, Minute : 0x73)

A lifetime system count of the number of whole minutes that the system reset has been inactive.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
Day of Running Time Meter	R	Unsigned integer	2	0	65535	0
Hour of Running Time Meter	R	Unsigned integer	1	0	23	0
Minute of Running Time Meter	R	Unsigned integer	1	0	59	0

Boot Counter (0x74 ~ 0x77)

A lifetime system count of the number of times the EFI/BIOS's Post is completed. Post completion is defined as being just prior to processor control being passed to the first boot vector. Should no valid boot vectors be present it is also considered a valid boot.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
Boot Counter	R	Unsigned integer	4	0	4294967295	0

Function:0x00

API Table Number For SMBus Slave (0xFF)

Bit	R/W	Default	Description
7-0	R/W	00h	This read-word function define the form that BMC reading. 0x00 – FUNCTION:0X00 SYSTEM AND BATTERY INFORMATION. 0x01 – FUNCTION:0X01 ICP FUNCTION 0x02 – FUNCTION:0X02 HARDWARE MONITOR 0x03 – FUNCTION:0X03 0x04 – FUNCTION:0X04 0x05 – FUNCTION:0X05 0x06 – FUNCTION:0x06 BMC Slave Monitor

3.2 Function:0x01 ICP Function

3.2.1 Function and Device Control

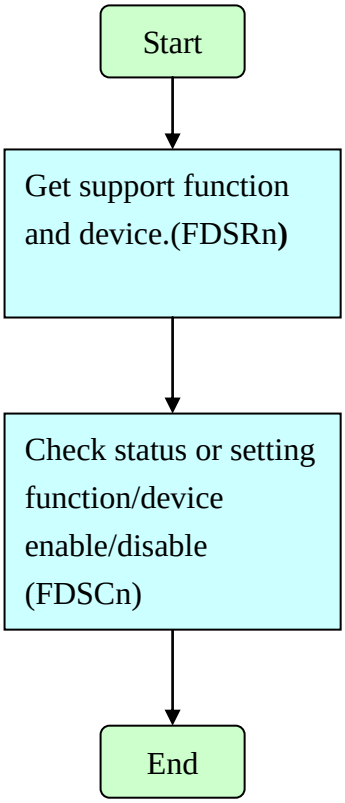
◆ Function and device on/off control.

(1) Found out which functions and devices supported of current version EC by FDSRn.

(Total 0x20 bytes 256bit mapping to each function/device.)

(2) Check/Setting status to control function/device enable/disable by FDSCn register.

Figure <Function (Device) control>



Programable key support by AP

- Programable key support

  (1) Enable API Mode in APICR.

  (2) Found out which function key supported of current version EC by FKSRn.

  (3) Check I/O port for EC send function key assert (low active).

  When API Mode enable and EC recived the function key event, EC will set and keep GPIO to low level until FKERn clear. (Reference Figure “Hardware Request”)

  (4) Found out which function key event by FKERn.

  (5) Clear status with function key event by FKERn.

Figure <Hardware Request.>

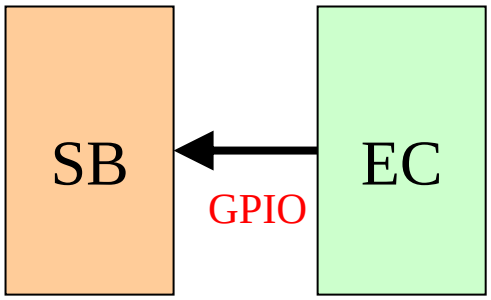
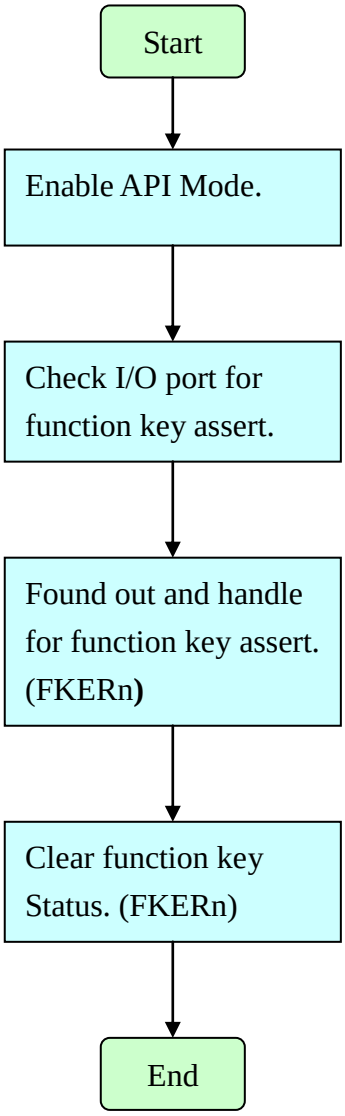


Figure <Function key control>



Function:0x01

Index	R/W	Default	Register or Action
0x00	R	0x00	Function/Device Support Register 0 (FDSR0)
0x01	R	0x00	Function/Device Support Register 1 (FDSR1)
0x02	R	0x00	Function/Device Support Register 2 (FDSR2)
0x03	R	0x00	Function/Device Support Register 3 (FDSR3)
0x04	R	0x00	Function/Device Support Register 4 (FDSR4)
0x05	R	0x00	Function/Device Support Register 5 (FDSR5)
0x06	R	-	Function/Device Support Register 6 (FDSR6)
0x07	R	-	Function/Device Support Register 7 (FDSR7)
0x08	R	-	Function/Device Support Register 8 (FDSR8)
0x09	R	-	Function/Device Support Register 9 (FDSR9)
0x0A	R	-	Function/Device Support Register 10 (FDSR10)
0x0B	R	-	Function/Device Support Register 11 (FDSR11)
0x0C	R	-	Function/Device Support Register 12 (FDSR12)
0x0D	R	-	Function/Device Support Register 13 (FDSR13)
0x0E	R	-	Function/Device Support Register 14 (FDSR14)
0x0F	R	-	Function/Device Support Register 15 (FDSR15)
0x10	R	-	Function/Device Support Register 16 (FDSR16)
0x11	R	-	Function/Device Support Register 17 (FDSR17)
0x12	R	-	Function/Device Support Register 18 (FDSR18)
0x13	R	-	Function/Device Support Register 19 (FDSR19)
0x14	R	-	Function/Device Support Register 20 (FDSR20)
0x15	R	-	Function/Device Support Register 21 (FDSR21)
0x16	R	-	Function/Device Support Register 22 (FDSR22)
0x17	R	-	Function/Device Support Register 23 (FDSR23)
0x18	R	-	Function/Device Support Register 24 (FDSR24)
0x19	R	-	Function/Device Support Register 25 (FDSR25)
0x1A	R	-	Function/Device Support Register 26 (FDSR26)
0x1B	R	-	Function/Device Support Register 27 (FDSR27)
0x1C	R	-	Function/Device Support Register 28 (FDSR28)
0x1D	R	-	Function/Device Support Register 29 (FDSR29)
0x1E	R	-	Function/Device Support Register 30 (FDSR30)
0x1F	R	-	Function/Device Support Register 31 (FDSR31)

Function:0x01

Index	R/W	Default	Register or Action
0x20	R/W	0x00	Function/Device Status / Control 0 (FDSC0)
0x21	R/W	0x00	Function/Device Status / Control 1 (FDSC1)
0x22	R/W	0x00	Function/Device Status / Control 2 (FDSC2)
0x23	R/W	0x00	Function/Device Status / Control 3 (FDSC3)
0x24	R/W	0x00	Function/Device Status / Control 4 (FDSC4)
0x25	R/W	0x00	Function/Device Status / Control 5 (FDSC5)
0x26	R/W	-	Function/Device Status / Control 6 (FDSC6)
0x27	R/W	-	Function/Device Status / Control 7 (FDSC7)
0x28	R/W	-	Function/Device Status / Control 8 (FDSC8)
0x29	R/W	-	Function/Device Status / Control 9 (FDSC9)
0x2A	R/W	-	Function/Device Status / Control 10 (FDSC10)
0x2B	R/W	-	Function/Device Status / Control 11 (FDSC11)
0x2C	R/W	-	Function/Device Status / Control 12 (FDSC12)
0x2D	R/W	-	Function/Device Status / Control 13 (FDSC13)
0x2E	R/W	-	Function/Device Status / Control 14 (FDSC14)
0x2F	R/W	-	Function/Device Status / Control 15 (FDSC15)
0x30	R/W	-	Function/Device Status / Control 16 (FDSC16)
0x31	R/W	-	Function/Device Status / Control 17 (FDSC17)
0x32	R/W	-	Function/Device Status / Control 18 (FDSC18)
0x33	R/W	-	Function/Device Status / Control 19 (FDSC19)
0x34	R/W	-	Function/Device Status / Control 20 (FDSC20)
0x35	R/W	-	Function/Device Status / Control 21 (FDSC21)
0x36	R/W	-	Function/Device Status / Control 22 (FDSC22)
0x37	R/W	-	Function/Device Status / Control 23 (FDSC23)
0x38	R/W	-	Function/Device Status / Control 24 (FDSC24)
0x39	R/W	-	Function/Device Status / Control 25 (FDSC25)
0x3A	R/W	-	Function/Device Status / Control 26 (FDSC26)
0x3B	R/W	-	Function/Device Status / Control 27 (FDSC27)
0x3C	R/W	-	Function/Device Status / Control 28 (FDSC28)
0x3D	R/W	-	Function/Device Status / Control 29 (FDSC29)
0x3E	R/W	-	Function/Device Status / Control 30 (FDSC30)
0x3F	R/W	-	Function/Device Status / Control 31 (FDSC31)

Function:0x01

Index	R/W	Default	Register or Action
0x40	R/W	-	API Configuration Register (APICR)
0x41	R/W	-	i-Menu Configuration Register (iMCR)
0x42	R/W	0x00	IPMI Card Status
0x43	R/W	0x00	EC Warning
0x44		-	Reserved
0x45		-	Reserved
0x46		-	Reserved
0x47		-	Reserved
0x48	R	-	Function Key Support Register 0 (FKSR0)
0x49	R	-	Function Key Support Register 1 (FKSR1)
0x4A	R	-	Function Key Support Register 2 (FKSR2)
0x4B	R	-	Function Key Support Register 3 (FKSR3)
0x4C	R/W	-	Function Key Event Register 0 (FKER0)
0x4D	R/W	-	Function Key Event Register 1 (FKER1)
0x4E	R/W	-	Function Key Event Register 2 (FKER2)
0x4F	R/W	-	Function Key Event Register 3 (FKER3)
0x50	R/W	0x0F	EC DIO Function(Pin Define)
0x51	R/W	-	EC DIO Function(Pin Data)
0x52	R/W	0xAA	F81438 COM Port Type Select(Com Type)
0x53	R/W	0x01	Dual BIOS ROM Selecel
0x54	R/W	0xAA	F81439 COM Port Type Select(Com Type)
0x55	R/W	0x00	System Status LED
0x56	R/W	0x00	SAS expansion port LED
0x57		-	Reserved
0x58		-	Reserved
0x59		-	Reserved
0x5A		-	Reserved
0x5B		-	Reserved
0x5C		-	Reserved
0x5D		-	Reserved
0x5E		-	Reserved
0x5F		-	Reserved

Function:0x01

Index	R/W	Default	Register or Action
0x60	R/W	0x00	Start I2C Function
0x61	R/W	0x00	I2C Slave Address
0x62	R/W	0x00	I2C Result
0x63	R	0xFF	I2C Read/Write Max Length. (255)
0x64	R/W	0x00	I2C How many Write data. (0~255)
0x65	R/W	0x00	I2C How many Read data. (0~255)
0x66		-	Reserved
0x67		-	Reserved
0x68		-	Reserved
0x69		-	Reserved
0x6A		-	Reserved
0x6B		-	Reserved
0x6C		-	Reserved
0x6D		-	Reserved
0x6E		-	Reserved
0x6F		-	Reserved
0x70		-	Reserved
0x71		-	Reserved
0x72		-	Reserved
0x73		-	Reserved
0x74		-	Reserved
0x75		-	Reserved
0x76		-	Reserved
0x77		-	Reserved
0x78	R/W	0x00	User Storage Read/Write
0x79		-	Reserved
0x7A		-	Reserved
0x7B		-	Reserved
0x7C		-	Reserved
0x7D		-	Reserved
0x7E		-	Reserved
0x7F		-	Reserved

Function:0x01

Index	R/W	Default	Register or Action
0x80	R/W	0x00	CPU temperature record status
0x81	R/W	0x00	Number of record (high byte)
0x82	R/W	0x00	Number of record (low byte)
0x83	R/W	0x00	Record Date: Month
0x84	R/W	0x00	Record Date: Day
0x85	R/W	0x00	Record Date: Hour
0x86	R/W	0x00	Record Date: Minute
0x87	R/W	0x00	Record Date: Second
0x88	R/W	0x00	SPI ROM page index(High byte)
0x89	R/W	0x00	SPI ROM page index(Low byte)
0x8A		-	Reserved
0x8B		-	Reserved
0x8C		-	Reserved
0x8D		-	Reserved
0x8E		-	Reserved
0x8F		-	Reserved
0x90		-	Reserved
0x91		-	Reserved
0x92		-	Reserved
0x93		-	Reserved
0x94		-	Reserved
0x95		-	Reserved
0x96		-	Reserved
0x97		-	Reserved
0x98		-	Reserved
0x99		-	Reserved
0x9A		-	Reserved
0x9B		-	Reserved
0x9C		-	Reserved
0x9D		-	Reserved
0x9E		-	Reserved
0x9F		-	Reserved
…	…	…	…
0xFF	R/W	0x00	API Table Number For SMBus Slave(ATNSS)

Function:0x01

API Configuration Register (0x40)

Bit	R/W	Name	Description	Default
7-1	Rev	Reserved	Reserved	-
0	R/W	API Enable	0 – Default Mode. 1 – API Mode.	0

7 Menu Configuration Register (0x41)

Bit	R/W	Name	Description	Default
7-3	Rev	Reserved	Reserved	-
2-1	R/W	System State	Only BIOS Can Write. 0 – System in OS Mode. 1 – System in Power On Mode. 2 – System in BIOS Setup Mode.	0
0	R/W	i-Menu button	If i-menu button is activated. That bit will be 1. It will be 1 continue 1 sec.	0

IPMI Card Status (0x42)

Bit	R/W	Name	Description	Default
7-2	Rev	Reserved	Reserved	-
1	R/W	BMC Ready	0 – BMC Not Ready. 1 – BMC Ready(BMC written version)	0
0	R	IPMI Card Insert	0 – No IPMI Card 1 – IPMI Card Insert	0

EC Warning (0x43)

Bit	R/W	Name	Description	Default
7-1	Rev	Reserved	Reserved	-
1	R/W	Reset Button	0 – Reset button is not press. 1 – Reset button is press.	0
0	R/W	Chassis Open Warning	0 – Chassis Remain Closed. 1 – Chassis Has Been Opened.	0

Function:0x01

Function/Device Support Register 0x00~0x1F (FDS 7-0),(FDS 15-8) …… (FDS 255-248)

Bit	R/W	Default	Description
7	R	-	Function/Device Support (FDS 7) Reference to *Note.1 0: Function/Device Not Support. 1: Function/Device Support.
6	R		Function/Device Support (FDS 6) 0: Function/Device Not Support. 1: Function/Device Support.
5	R		Function/Device Support (FDS 5) 0: Function/Device Not Support. 1: Function/Device Support.
4	R		Function/Device Support (FDS 4) 0: Function/Device Not Support. 1: Function/Device Support.
3	R		Function/Device Support (FDS 3) 0: Function/Device Not Support. 1: Function/Device Support.
2	R		Function/Device Support (FDS 2) 0: Function/Device Not Support. 1: Function/Device Support.
1	R		Function/Device Support (FDS 1) 0: Function/Device Not Support. 1: Function/Device Support.
0	R		Function/Device Support (FDS 0) 0: Function/Device Not Support. 1: Function/Device Support.

Function:0x01

Function and Device Status / Control Register 0x20~0x3F (FDC 7-0),(FDC 15-8) …… (FDC 255-248)

Bit	R/W	Default	Description
7	R/W	-	Function/Device Control (FDC 7) It indicates the function and device status with FDS. 0: Disabled 1: Enabled
6	R/W	-	Function/Device Control (FDC 6) 0: Disabled 1: Enabled
5	R/W	-	Function/Device Control (FDC 5) 0: Disabled 1: Enabled
4	R/W	-	Function/Device Control (FDC 4) 0: Disabled 1: Enabled
3	R/W	-	Function/Device Control (FDC 3) 0: Disabled 1: Enabled
2	R/W	-	Function/Device Control (FDC 2) 0: Disabled 1: Enabled
1	R/W	-	Function/Device Control (FDC 1) 0: Disabled 1: Enabled
0	R/W	-	Function/Device Control (FDC 0) 0: Disabled 1: Enabled

Function:0x01

Function Key Support Register (FKS 7-0),(FKS 15-8),(FKS 16-23),(FKS 31-24)

Bit	R/W	Default	Description
7	R	-	Function Key Support (FKS 7) 0: Function Key Not Support. 1: Function Key Support.
6	R	-	Function Key Support (FKS 6) 0: Function Key Not Support. 1: Function Key Support.
5	R	-	Function Key Support (FKS 5) 0: Function Key Not Support. 1: Function Key Support.
4	R	-	Function Key Support (FKS 4) 0: Function Key Not Support. 1: Function Key Support.
3	R	-	Function Key Support (FKS 3) 0: Function Key Not Support. 1: Function Key Support.
2	R	-	Function Key Support (FKS 2) 0: Function Key Not Support. 1: Function Key Support.
1	R	-	Function Key Support (FKS 1) 0: Function Key Not Support. 1: Function Key Support.
0	R	-	Function Key Support (FKS 0) 0: Function Key Not Support. 1: Function Key Support.

Function:0x01

Function Key Event Register (FKER 7-0),(FKER 15-8),(FKER 16-23),(FKER 31-24)

Bit	R/W	Default	Description
7	R/W	0	It indicates the event input of function key (FKE 7) 0: None. (write zero to clear status) 1: Function Key event assert.
6	R/W	0	It indicates the event input of function key (FKE 6) 0: None. (write zero to clear status) 1: Function Key event assert.
5	R/W	0	It indicates the event input of function key (FKE 5) 0: None. (write zero to clear status) 1: Function Key event assert.
4	R/W	0	It indicates the event input of function key (FKE 4) 0: None. (write zero to clear status) 1: Function Key event assert.
3	R/W	0	It indicates the event input of function key (FKE 3) 0: None. (write zero to clear status) 1: Function Key event assert.
2	R/W	0	It indicates the event input of function key (FKE 2) 0: None. (write zero to clear status) 1: Function Key event assert.
1	R/W	0	It indicates the event input of function key (FKE 1) 0: None. (write zero to clear status) 1: Function Key event assert.
0	R/W	0	It indicates the event input of function key (FKE 0) 0: None. (write zero to clear status) 1: Function Key event assert.

Function:0x01

EC DIO Function (Pin Define) (0x50)

Bit	R/W	Default	Description
7	R/W	0	GPO3 (0:Output, 1:Input)
6	R/W	0	GPO2 (0:Output, 1:Input)
5	R/W	0	GPO1 (0:Output, 1:Input)
4	R/W	0	GPO0 (0:Output, 1:Input)
3	R/W	1	GPI3 (0:Output, 1:Input)
2	R/W	1	GPI2 (0:Output, 1:Input)
1	R/W	1	GPI1 (0:Output, 1:Input)
0	R/W	1	GPI0 (0:Output, 1:Input)

EC DIO Function (Pin Data) (0x51)

Bit	R/W	Default	Description
7	R/W	1	0 : Low 1 : High
6			
5			
4			
3			
2			
1			
0			

Dual BIOS ROM Select (0x53)

Bit	R/W	Name	Description	Default
7- 1	Rev	Reserved	Reserved	-
Bit 0	R/W	BIOS Source	0 – Boot from Carrier Board 1 – Boot from CPU Module	1

F81438 COM Port Type Select(Com Type) (0x52)

Bit	R/W	Name	Description	Default
6-7	R/W	COM D Type	0x00 : Pure RS-422 Full Duplex 0x01 : RS-485 Receiver Half Duplex 0x02 : Pure RS-232 0x03 : RS-485 Driver Half Duplex	0x02
4-5	R/W	COM C Type		
2-3	R/W	COM B Type		
0-1	R/W	COM A Type		

Function:0x01

F81439 COM Port Type Select(Com Type) (0x54)

Bit	R/W	Name	Description	Default
7	Rev	Reserved	Reserved	-
6-4	R/W	COM B Type	The same as COM A Type.	0x01
3	Rev	Reserved	Reserved	0
2-0	R/W	COM A Type	0x00 : RS-422 Full Duplex 0x01 : Pure RS-232 0x02 : RS-485 Half Duplex, TX ENABLE Low Active 0x03 : RS-485 Half Duplex, TX ENABLE High Active 0x04 : RS-422 Full Duplex, with termination resistor 0x05 : Pure RS-232, co-exists with RS485 application 0x06 : RS-485 Half Duplex, with termination resistor TX ENABLE Low Active 0x07 : Low Power Shutdown	0x01

System Status LED (0x55)

Byte	Green LED	Red LED
0x00	Off	Off
0x01	On	Off
0x02	Off	On
0x03	Flashes every 0.5 sec	Off
0x04	Off	Flashes every 0.5 sec
0x05	Flashes LED_1A and LED_1B alternately every 0.5 sec	
...	...	...

SAS expansion port LED (0x56)

Byte	Amber	Reserved
0x00	Off	Off
0x01	On	Off
0x02	Flashes every 0.5 sec	Off
...	...	...

Function:0x01

User Storage Read/Write (0x78)

Bit	R/W	Name	Description	Default
7-2	Rev	Reserved	Reserved	-
1	R/W	User Storage Write	User Storage Write Command	0
0	R/W	User Storage Read	User Storage Read Command	0

Function:0x01

Start I2C Function (0x60)

Bit	R/W	Name	Description	Default
7-1	Rev	Reserved	Reserved	-
0	R/W	Start I2C Function	I2C Read/write control	0

I2C Slave Address (0x61)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
I2C Slave Address	R/W	Char	1	0x00	0xFF	0

I2C Result (0x62)

Bit	R/W	Default	Description
7-0	R	00h	0x02 – Time out 0x04 – Non-ack 0x08 - Quick command success find device 0x80 - Success

I2C Read/Write Max Length (0x63)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
I2C Read/Write Max Length	R	Unsigned integer	1	0	255	255

I2C How many Write data (0x64)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
I2C How many Write data	R/W	Unsigned integer	1	0	255	0

I2C How many Read data (0x65)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
I2C How many Read data	R/W	Unsigned integer	1	0	255	0

Function:0x01

CPU Temperature Record status (0x80)

Bit	R/W	Name	Description	Default
7	Rev	Reserved	Reserved	-
6	R/W	RECORD_DONE	Temperature record done	0
5	R/W	RCD_BUF_FULL	SPI ROM buffer full	0
4	R/W	CMD_DONE	Host command done	0
3-0	R/W	HOST_CMD	0x01 - Start to record CPU temperature 0x02 - Stop to record CPU temperature 0x03 - Get the data of CPU temperature 0x04 - Force erase temperature data(32KB)	0

Number of record (0x81 ~ 0x82)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
Number of CPU temperature record	R/W	Unsigned integer	2	0	65535	0

Record Date (Month : 0x83, Day : 0x84, Hour : 0x85, Minute : 0x86, Second : 0x87)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
CPU temperature Record Date: Month	R/W	Unsigned integer	1	1	12	0
CPU temperature Record Date: Day	R/W	Unsigned integer	1	1	31	0
CPU temperature Record Date: Hour	R/W	Unsigned integer	1	0	23	0
CPU temperature Record Date: Minute	R/W	Unsigned integer	1	0	59	0
CPU temperature Record Date: Second	R/W	Unsigned integer	1	0	59	0

SPI ROM page index (0x88 ~ 0x89)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value
SPI ROM page index of CPU temperature record	R/W	Unsigned integer	2	0	65535	0

Function:0x01

*Note 1: Function and Device support

FDS Bit		Function/Device	FDS Bit		Function/Device
FDSR0 / FDSC0	0	WIFI	FDSR4 / FDSC4	32	DISP_SEL_0
	1	Bluetooth		33	DISP_SEL_1
	2	3.5G		34	Addon_0
	3	RFID		35	Addon_1
	4	GPS		36	Reserved
	5	Bar code reader		37	Reserved
	6	G-Sensor		38	Reserved
	7	LCD Panel Backlight On/Off		39	Reserved
FDSR1 / FDSC1	8	Panel Backlight Auto Dimming	FDSR5 / FDSC5	40	QTS_IPC
	9	Flashlight		41	PWRBTN_Dis
	10	DMIC		42	Reserved
	11	EUP		43	Reserved
	12	RAPL CMOS		44	Reserved
	13	CAMMERA1		45	Reserved
	14	CAMMERA2		46	Reserved
	15	MEOVERIDE		47	Reserved
FDSR2 / FDSC2	16	PCIECX16 (P25)	FDSR6 / FDSC6	48	Reserved
	17	PCIECX16 (P24)		49	Reserved
	18	USB_SW1		50	Reserved
	19	USB_SW2		51	Reserved
	20	LAN1_Dis		52	Reserved
	21	LAN2_Dis		53	Reserved
	22	LAN3_Dis		54	Reserved
	23	LAN4_Dis		55	Reserved
FDSR3 / FDSC3	24	LVDS Backlight Control Type	56		Reserved
	25	On Board LVDS Enable/Disable	57		Reserved
	26	LVDS Backlight Control Mode	58		Reserved
	27	LVDS Backlight Voltage Level	59		Reserved
	28	J_LVDS1_GP0	60		Reserved
	29	J_LVDS1_GP1	61		Reserved
	30	J_LVDS1_GP2	…		… …
	31	J_LVDS1_GP3	255		Reserved

Function:0x01

PCIEX16

PCIEX16_Bit17 (P24)	PCIEX16_Bit16 (P25)	PCIEX16
0	0	1 x16 PCI Express
1	0	Reserved
0	1	2 x8 PCI Express
1	1	1 x8, 2 x4 PCI Express

USB_SW1/USB_SW2 Power

0	+5VS
1	+5VDUAL

J_LVDS1/LVDS Panel Type

J_LVDS1_GP3	J_LVDS1_GP2	J_LVDS1_GP1	J_LVDS1_GP0	EDID Resolution	Color Depth
0	0	0	0	800 X 600	18bit
0	0	0	1	1024 X 768	18bit
0	0	1	0	1024 X 768	24bit
0	0	1	1	1280 X 768	18bit
0	1	0	0	1280 X 800	18bit
0	1	0	1	1280 X 960	18bit
0	1	1	0	1280 X 1024	24bit
0	1	1	1	1366 X 768	18bit
1	0	0	0	1366 X 768	24bit
1	0	0	1	1440 X 900	24bit
1	0	1	0	1440 X 1050	24bit
1	0	1	1	1600 X 900	24bit
1	1	0	0	1680 X 1050	24bit
1	1	0	1	1600 X 1200	24bit
1	1	1	0	1920 X 1080	24bit
1	1	1	1	1920 X 1200	24bit

LVDS Backlight Control Type

0	PWM MODE
1	DC MODE

On Board LVDS Enable/Disable

0	LVDS Disable
1	LVDS Enable

Function:0x01

LVDS Backlight Control Mode

0	Low Active (CCFL)
1	High Active (LCD)

LVDS Backlight Voltage Level

0	3.3V Level
1	5.0V Level

DISP_SEL_1/ DISP_SEL_0

DISP_SEL_1	DISP_SEL_0	Display Port
0	0	DP
1	0	HDMI
0	1	LVDS
1	1	Reserved

QTS_IPC

0	IPC Mode
1	QTS Mode

3.3 Function:0x02 Hardware Monitor

Index	R/W	Default	Register or Action
0x00	R	-	CPU Temperature Reading Register (PECI)
0x01	R/W	-	Temperature Of FANless
0x02	-	-	Reserved
0x03	-	-	Reserved
0x04	-	-	Reserved
0x05	-	-	Reserved
0x06	-	-	Reserved
0x07	-	-	Reserved
0x08	R	-	CPU Temperature 1 Reading Register (CTRG1)
0x09	R	-	CPU Temperature 2 Reading Register (CTRG2)
0x0A	R	-	CPU Temperature 3 Reading Register (CTRG3)
0x0B	R	-	CPU Temperature 4 Reading Register (CTRG4)
0x0C	R	-	Environment Temperature 1 Reading Register (ETRG1)
0x0D	R	-	Environment Temperature 2 Reading Register (ETRG2)
0x0E	R	-	System Temperature 1 Reading Register (STRG1)
0x0F	R	-	System Temperature 2 Reading Register (STRG2)
0x10	R	-	ADC0 Reading Register (High Byte) (ADCH0)
0x11	R	-	ADC0 Reading Register (Low Byte) (ADCL0)
0x12	R	-	ADC1 Reading Register (High Byte) (ADCH1)
0x13	R	-	ADC1 Reading Register (Low Byte) (ADCL1)
0x14	R	-	ADC2 Reading Register (High Byte) (ADCH2)
0x15	R	-	ADC2 Reading Register (Low Byte) (ADCL2)
0x16	R	-	ADC3 Reading Register (High Byte) (ADCH3)
0x17	R	-	ADC3 Reading Register (Low Byte) (ADCL3)
0x18	R	-	ADC4 Reading Register (High Byte) (ADCH4)
0x19	R	-	ADC4 Reading Register (Low Byte) (ADCL4)
0x1A	R	-	ADC5 Reading Register (High Byte) (ADCH5)
0x1B	R	-	ADC5 Reading Register (Low Byte) (ADCL5)
0x1C	R	-	ADC6 Reading Register (High Byte) (ADCH6)
0x1D	R	-	ADC6 Reading Register (Low Byte) (ADCL6)
0x1E	R	-	ADC7 Reading Register (High Byte) (ADCH7)
0x1F	R	-	ADC7 Reading Register (Low Byte) (ADCL7)

Function:0x02

Index	R/W	Default	Register or Action
0x20	R/W	-	Fan1 Configuration Register
0x21	R/W	-	Fan2 Configuration Register
0x22	R/W	-	Fan3 Configuration Register
0x23	R/W	-	Fan4 Configuration Register
0x24	-	-	Reserved
0x25	-	-	Reserved
0x26	R	-	Fan1 Tachometer 1 Reading Register (High Byte)
0x27	R	-	Fan1 Tachometer 1 Reading Register (Low Byte)
0x28	R	-	Fan2 Tachometer 2 Reading Register (High Byte)
0x29	R	-	Fan2 Tachometer 2 Reading Register (Low Byte)
0x2A	R	-	Fan3 Tachometer 3 Reading Register (High Byte)
0x2B	R	-	Fan3 Tachometer 3 Reading Register (Low Byte)
0x2C	R	-	Fan4 Tachometer 4 Reading Register (High Byte)
0x2D	R	-	Fan4 Tachometer 4 Reading Register (Low Byte)
0x2E	R/W	-	Fan1 PWM Control Register (0% ~ 100%)
0x2F	R/W	-	Fan2 PWM Control Register (0% ~ 100%)
0x30	R/W	-	Fan1 Temperature Limit of Off
0x31	R/W	-	Fan1 Temperature Limit of Start
0x32	R/W	-	Fan1 Temperature Start PWM (0% ~ 100%)
0x33	R/W	-	Fan1 Temperature of Slope (1 ~ 8)
0x34	R/W	-	Fan2 Temperature Limit of Off
0x35	R/W	-	Fan2 Temperature Limit of Start
0x36	R/W	-	Fan2 Temperature Start PWM (0% ~ 100%)
0x37	R/W	-	Fan2 Temperature of Slope (1 ~ 8)
0x38	R	-	CPU Tjmax
0x39	R/W	-	Light FANless Setting
0x3A	R/W	-	CPU Throttle Level
0x3B	R/W	-	Fan3 PWM Control Register (0% ~ 100%)
0x3C	R/W	-	Fan3 Temperature Limit of Off
0x3D	R/W	-	Fan3 Temperature Limit of Start
0x3E	R/W	-	Fan3 Temperature Start PWM (0% ~ 100%)
0x3F	R/W	-	Fan3 Temperature of Slope (1 ~ 8)

Function:0x02

Index	R/W	Default	Register or Action
0x40	R/W	-	Panel Brightness Control Register
0x41	R/W	-	Volume Control Register
0x42	-	-	Reserved
0x43	-	-	Reserved
0x44	-	-	Reserved
0x45	-	-	Reserved
0x46	-	-	Reserved
0x47	-	-	Reserved
0x48	-	-	Reserved
0x49	-	-	Reserved
0x4A	-	-	Reserved
0x4B	R/W	-	Fan4 PWM Control Register (0% ~ 100%)
0x4C	R/W	-	Fan4 Temperature Limit of Off
0x4D	R/W	-	Fan4 Temperature Limit of Start
0x4E	R/W	-	Fan4 Temperature Start PWM (0% ~ 100%)
0x4F	R/W	-	Fan4 Temperature of Slope (1 ~ 8)
0x50	R	00h	Shunt Voltage(High Byte)
0x51	R	00h	Shunt Voltage(Low Byte)
0x52	R	00h	Bus Voltage(High Byte)
0x53	R	00h	Bus Voltage(Low Byte)
0x54	R	00h	System Power Measurement (High Byte)
0x55	R	00h	System Power Measurement (Low Byte)
0x56	R	00h	CPU Power Limit 1
0x57	R	00h	CPU Power Limit 2
0x58	-	-	Reserved
0x59	-	-	Reserved
0x5A	-	-	Reserved
0x5B	-	-	Reserved
0x5C	-	-	Reserved
0x5D	-	-	Reserved
0x5E	-	-	Reserved
0x5F	-	-	Reserved

Function:0x02

Index	R/W	Default	Register or Action
0x60	-	-	Reserved
0x61	-	-	Reserved
0x62	-	-	Reserved
0x63	-	-	Reserved
0x64	-	-	Reserved
0x65	-	-	Reserved
0x66	-	-	Reserved
0x67	-	-	Reserved
0x68	-	-	Reserved
0x69	-	-	Reserved
0x6A	-	-	Reserved
0x6B	-	-	Reserved
0x6C	-	-	Reserved
0x6D	-	-	Reserved
0x6E	-	-	Reserved
0x6F	-	-	Reserved
0x70	-	-	Reserved
0x71	-	-	Reserved
0x72	-	-	Reserved
0x73	-	-	Reserved
0x74	-	-	Reserved
0x75	-	-	Reserved
0x76	-	-	Reserved
0x77	-	-	Reserved
0x78	-	-	Reserved
0x79	-	-	Reserved
0x7A	-	-	Reserved
0x7B	-	-	Reserved
0x7C	-	-	Reserved
0x7D	-	-	Reserved
0x7E	-	-	Reserved
0x7F	-	-	Reserved
…	…	…	…
0xFF	R/W	0x00	API Table Number For SMBus Slave(ATNSS)

Function:0x02

CPU Temperature Reading Register (PECI) (0x00)

Bit	R/W	Default	Description
7-0	R	-	Returns CPU temperature. (if PECI support)

ADC Reading Register (High/Low) (ADC0 : 0x10~0x11, ADC1 : 0x12~0x13, ADC2 : 0x14~0x15, ADC3 : 0x16~0x15, ADC4 : 0x18~0x19, ADC5 : 0x1A~0x1B, ADC6 : 0x1C~0x1D, ADC7 : 0x1E~0x1F)

Bit	R/W	Default	Description
15-0	R	-	Returns the 10-bit resolution after software calibration and 0 to 3V input voltage range.

Fan Configuration Register (Fan1 : 0x20, Fan2 : 0x21, Fan3 : 0x22, Fan4 : 0x23)

Bit	R/W	Default	Description
7	R/W	-	0: Manual Mode. 1: Auto Mode
6-0	-	-	Reserved

Fan Tachometer Reading Register (High/Low)
(Fan1 : 0x26~0x27, Fan2 : 0x28~0x29, Fan3 : 0x2A~0x2B, Fan4 : 0x2C~0x2D)

Bit	R/W	Default	Description
7-0	R	-	Returns number of counts of the internal clock per revolution.

Fan PWM Control Register (Fan1 : 0x2E, Fan2 : 0x2F, Fan3 : 0x3B, Fan4 : 0x4B)

Bit	R/W	Default	Description
7-0	R/W	00h	Returns number of counts of the internal clock per revolution. (0% ~ 100%)

Fan Temperature Limit of Off (Fan1 : 0x30, Fan2 : 0x34, Fan3 : 0x3C, Fan4 : 0x4C)

Bit	R/W	Default	Description
7-0	R/W	7Fh	Automatic Mode Temperature Limit of OFF Register. Temperature Limit Value of Fan OFF.

Fan Temperature Limit of Start (Fan1 : 0x31, Fan2 : 0x35, Fan3 : 0x3D, Fan4 : 0x4D)

Bit	R/W	Default	Description
7-0	R/W	00h	Automatic Mode Temperature Limit of START Register. Temperature Limit Value of Fan START.

Function:0x02

Fan Temperature Start PWM (Fan1 : 0x32, Fan2 : 0x36, Fan3 : 0x3E, Fan4 : 0x4E)

Bit	R/W	Default	Description
7-0	R/W	-	Automatic Mode Fan start PWM Register. Start PWM value. (0% ~ 100%)

Fan Temperature of Slope (Fan1 : 0x33, Fan2 : 0x37, Fan3 : 0x3F, Fan4 : 0x4F)

Bit	R/W	Default	Description
7-0	R/W	-	Automatic Mode Slope PWM. (1 ~ 8)

CPU Tjmax (0x38)

Bit	R/W	Default	Description
7-0	R	-	The maximum processor junction temperature. (if PECI support)

CPU Power Limit 1 (0x56)

Bit	R/W	Default	Description
7-0	R	-	A threshold that average power will not exceed. (if PECI support)

CPU Power Limit 2 (0x57)

Bit	R/W	Default	Description
7-0	R	-	A threshold or cap that instantaneous power will not exceed. (if PECI support)

Light FANless Setting (0x39)

Bit	R/W	Default	Description
7-2	R	-	Reserved
1	R/W	-	BIOS Overwrite. 0 : BIOS Overwrite Enable 1 : BIOS Overwrite Disable
0	R/W	-	Cooling Mode 0 : Light FANless Mode 1 : Smart FAN Mode

Panel Brightness Control Register (0x40)

Bit	R/W	Default	Description
7-0	R/W	0Eh	Indicate Panel Brightness level of range 0-100.

Function:0x02

Volume Control Register (0x41)

Bit	R/W	Default	Description
7-0	R/W	0Eh	Indicate Volume level of range 0-21.

Shunt Voltage (0x50 ~ 0x51)

Bit	R/W	Default	Description
15-0	R	00h	Shunt voltage measurement data.

Bus Voltage (0x52 ~ 0x53)

Bit	R/W	Default	Description
15-0	R	00h	Bus voltage measurement data.

System Power Measurement (0x54 ~ 0x55)

Bit	R/W	Default	Description
15-0	R	00h	Power measurement data.

3.4 Function:0x03 ICP Data Storage

Index	R/W	Default	Register or Action
0x00	R/W	00h	BIOS Version [Byte 7] (MSB)
0x01	R/W	00h	BIOS Version [Byte 6]
0x02	R/W	00h	BIOS Version [Byte 5]
0x03	R/W	00h	BIOS Version [Byte 4]
0x04	R/W	00h	BIOS Version [Byte 3]
0x05	R/W	00h	BIOS Version [Byte 2]
0x06	R/W	00h	BIOS Version [Byte 1]
0x07	R/W	00h	BIOS Version [Byte 0] (LSB)
0x08	R	00h	iWDD Version [Byte 7] (MSB)
0x09	R	00h	iWDD Version [Byte 6]
0x0A	R	00h	iWDD Version [Byte 5]
0x0B	R	00h	iWDD Version [Byte 4]
0x0C	R	00h	iWDD Version [Byte 3]
0x0D	R	00h	iWDD Version [Byte 2]
0x0E	R	00h	iWDD Version [Byte 1]
0x0F	R	00h	iWDD Version [Byte 0] (LSB)
0x10	R/W	00h	BMC Version [Byte 7] (MSB)
0x11	R/W	00h	BMC Version [Byte 6]
0x12	R/W	00h	BMC Version [Byte 5]
0x13	R/W	00h	BMC Version [Byte 4]
0x14	R/W	00h	BMC Version [Byte 3]
0x15	R/W	00h	BMC Version [Byte 2]
0x16	R/W	00h	BMC Version [Byte 1]
0x17	R/W	00h	BMC Version [Byte 0] (LSB)
0x18	R/W	00h	ME Version [Byte 4] (MSB)
0x19	R/W	00h	ME Version [Byte 3]
0x1A	R/W	00h	ME Version [Byte 2]
0x1B	R/W	00h	ME Version [Byte 1]
0x1C	R/W	00h	ME Version [Byte 0] (LSB)
0x1D	-	-	Reserved
…	…	…	…
0xFF	R/W	0x00	API Table Number For SMBus Slave(ATNSS)

3.5 Function:0x04 API Data Buffer

Index	R/W	Default	Register or Action
0x00	R/W	00h	Data Buffer Area Byte 0
0x01	R/W	00h	Data Buffer Area Byte 1
0x02	R/W	00h	Data Buffer Area Byte 2
0x03	R/W	00h	Data Buffer Area Byte 3
0x04	R/W	00h	Data Buffer Area Byte 4
0x05	R/W	00h	Data Buffer Area Byte 5
…	…	…	…
0xF8	R/W	0x00	Data Buffer Area Byte 248
0xF9	R/W	0x00	Data Buffer Area Byte 249
0xFA	R/W	0x00	Data Buffer Area Byte 250
0xFB	R/W	0x00	Data Buffer Area Byte 251
0xFC	R/W	0x00	Data Buffer Area Byte 252
0xFD	R/W	0x00	Data Buffer Area Byte 253
0xFE	R/W	0x00	Data Buffer Area Byte 254
0xFF	R/W	0x00	API Table Number For SMBus Slave(ATNSS)

Data Buffer

Name	R/W	Format	Size in Bytes	Default Value
Data Buffer	R/W	BYTE	255	0x00

3.6 Function:0x05 User Storage Area

Index	R/W	Default	Register or Action
0x00	R/W	00h	User Storage Area Byte 0
0x01	R/W	00h	User Storage Area Byte 1
0x02	R/W	00h	User Storage Area Byte 2
0x03	R/W	00h	User Storage Area Byte 3
…	…	…	…
0x7C	R/W	00h	User Storage Area Byte 124
0x7D	R/W	00h	User Storage Area Byte 125
0x7E	R/W	00h	User Storage Area Byte 126
0x7F	R/W	00h	User Storage Area Byte 127
0x80	-	-	Reserved
0x81	-	-	Reserved
0x82	-	-	Reserved
0x83	-	-	Reserved
…	…	…	…
0xFF	R/W	0x00	API Table Number For SMBus Slave(ATNSS)

User Storage Area

The EAPI defines one user storage area. Standard Storage Area 128 Bytes for Read/Write access. Content of storage area will be stored in the SPI ROM or EEPROM.

Name	R/W	Format	Size in Bytes	Default Value
User Storage Area	R/W	BYTE	128	0x00

3.7 Function:0x06 BMC Slave Monitor

(*Note.2)

Index	R/W	Default	Register or Action	Unit
0x00	R	0x80	CPU Temperature 1 Reading Register (CPUT1)	℃
0x01	R	0x80	CPU Temperature 2 Reading Register (CPUT2)	℃
0x02	R	0x80	System Temperature 1 Reading Register (STRG1)	℃
0x03	R	0x80	System Temperature 2 Reading Register (STRG2)	℃
0x04	R	0x80	System Temperature 3 Reading Register (STRG3)	℃
0x05	R	0x80	System Temperature 4 Reading Register (STRG4)	℃
0x06	R	0x80	Environment Temperature 1 Reading Register (ETRG1)	℃
0x07	R	0x80	Environment Temperature 2 Reading Register (ETRG2)	℃
0x08	R	0x80	Environment Temperature 2 Reading Register (ETRG3)	℃
0x09	R	0x80	Environment Temperature 2 Reading Register (ETRG4)	℃
0x0A	R	0x80	Environment Temperature 2 Reading Register (ETRG5)	℃
0x0B	R	0x80	Environment Temperature 2 Reading Register (ETRG6)	℃
0x0C	R	0x80	Environment Temperature 2 Reading Register (ETRG7)	℃
0x0D	R	0x80	Environment Temperature 2 Reading Register (ETRG8)	℃
0x0E	R	0x80	Environment Temperature 2 Reading Register (ETRG9)	℃
0x0F	R	0x80	Environment Temperature 2 Reading Register (ETRG10)	℃
0x10	R	0x80	Environment Temperature 2 Reading Register (ETRG11)	℃
0x11	R	0x80	Environment Temperature 2 Reading Register (ETRG12)	℃
0x12	R	0x80	Environment Temperature 2 Reading Register (ETRG13)	℃
0x13	R	0x80	Environment Temperature 2 Reading Register (ETRG14)	℃
0x14	R	0x80	Environment Temperature 2 Reading Register (ETRG15)	℃
0x15	R	0x80	Environment Temperature 2 Reading Register (ETRG16)	℃
0x16	R	0x80	Environment Temperature 2 Reading Register (ETRG17)	℃
0x17	R	0x80	Environment Temperature 2 Reading Register (ETRG18)	℃
0x18	R	0x80	Environment Temperature 2 Reading Register (ETRG19)	℃
0x19	R	0x80	Environment Temperature 2 Reading Register (ETRG20)	℃
0x1A	R	0x80	Environment Temperature 2 Reading Register (ETRG21)	℃
0x1B	R	0x80	Environment Temperature 2 Reading Register (ETRG22)	℃
0x1C	R	0x80	Environment Temperature 2 Reading Register (ETRG23)	℃
0x1D	R	0x80	Environment Temperature 2 Reading Register (ETRG24)	℃
0x1E	-	-	Reserved	-
0x1F	-	-	Reserved	-

Function:0x06

Index	R/W	Default	Register or Action	Unit
0x20	R	0xFF	CPU Fan 1 Tachometer Reading Register (High Byte) (CPUF1)	RPM
0x21	R	0xFF	CPU Fan 1 Tachometer Reading Register (Low Byte) (CPUF1)	RPM
0x22	R	0xFF	CPU Fan 2 Tachometer Reading Register (High Byte) (CPUF2)	RPM
0x23	R	0xFF	CPU Fan 2 Tachometer Reading Register (Low Byte) (CPUF2)	RPM
0x24	R	0xFF	System Fan 1 Tachometer Reading Register (High Byte) (SFR1)	RPM
0x25	R	0xFF	System Fan 1 Tachometer Reading Register (Low Byte) (SFR1)	RPM
0x26	R	0xFF	System Fan 2 Tachometer Reading Register (High Byte) (SFR2)	RPM
0x27	R	0xFF	System Fan 2 Tachometer Reading Register (Low Byte) (SFR2)	RPM
0x28	R	0xFF	System Fan 3 Tachometer Reading Register (High Byte) (SFR3)	RPM
0x29	R	0xFF	System Fan 3 Tachometer Reading Register (Low Byte) (SFR3)	RPM
0x2A	R	0xFF	System Fan 4 Tachometer Reading Register (High Byte) (SFR4)	RPM
0x2B	R	0xFF	System Fan 4 Tachometer Reading Register (Low Byte) (SFR4)	RPM
0x2C	-	-	Reserved	-
0x2D	-	-	Reserved	-
0x2E	-	-	Reserved	-
0x2F	-	-	Reserved	-
0x30	R	0xFF	CPU_CORE 1 (High Byte) (COREV)	mV
0x31	R	0xFF	CPU_CORE 1 (Low Byte) (COREV)	mV
0x32	R	0xFF	+5V (High Byte) (A5V)	mV
0x33	R	0xFF	+5V (Low Byte) (A5V)	mV
0x34	R	0xFF	+12V (High Byte) (A12V)	mV
0x35	R	0xFF	+12V (Low Byte) (A12V)	mV
0x36	R	0xFF	DDR 1 (High Byte) (DDRV)	mV
0x37	R	0xFF	DDR 1 (Low Byte) (DDRV)	mV
0x38	R	0xFF	+5VSB (High Byte) (S5V)	mV
0x39	R	0xFF	+5VSB (Low Byte) (S5V)	mV
0x3A	R	0xFF	+3.3V (High Byte) (A3V3)	mV
0x3B	R	0xFF	+3.3V (Low Byte) (A3V3)	mV
0x3C	R	0xFF	+3.3VSB (High Byte) (S3V3)	mV
0x3D	R	0xFF	+3.3VSB (Low Byte) (S3V3)	mV
0x3E	-	-	Reserved	-
0x3F	-	-	Reserved	-

Function:0x06

Index	R/W	Default	Register or Action	Unit
0x40	-	-	Reserved	-
0x41	-	-	Reserved	-
0x42	-	-	Reserved	-
0x43	-	-	Reserved	-
0x44	-	-	Reserved	-
0x45	-	-	Reserved	-
0x46	-	-	Reserved	-
0x47	-	-	Reserved	-
0x48	-	-	Reserved	-
0x49	-	-	Reserved	-
0x4A	-	-	Reserved	-
0x4B	-	-	Reserved	-
0x4C	-	-	Reserved	-
0x4D	-	-	Reserved	-
0x4E	-	-	Reserved	-
0x4F	-	-	Reserved	-
0x50	R/W	0xFF	DDR Voltage Levels (High Byte) (DDRLEV)	mV
0x51	R/W	0xFF	DDR Voltage Levels (Low Byte) (DDRLEV)	mV
0x52	-	-	Reserved	-
0x53	-	-	Reserved	-
0x54	-	-	Reserved	-
0x55	-	-	Reserved	-
0x56	-	-	Reserved	-
0x57	-	-	Reserved	-
0x58	-	-	Reserved	-
0x59	-	-	Reserved	-
0x5A	-	-	Reserved	-
0x5B	-	-	Reserved	-
0x5C	-	-	Reserved	-
0x5D	-	-	Reserved	-
0x5E	-	-	Reserved	-
0x5F	-	-	Reserved	-
…	…	…	…	
0xFF	R/W	0x00	API Table Number For SMBus Slave(ATNSS)	-

Function:0x06

*Note 2: Default meaning of BMC Slave Monitor

EC SMBus Slave address is 0x66.

If the address is the storage temperature (0x00~0x0F), "0x80" represents "Not Available" and "0x00" represents "No Device".

If the address is the storage FAN Speed (0x20~0x2F) or Voltage (0x30~0x3F), "0xFFFF" represents "Not Available" and "0x0000" represents "No Device".

CPU Temperature 1 Reading Register (0x00)

Bit	R/W	Default	Description
7-0	R	80h	First CPU Temperature.

CPU Temperature 2 Reading Register (0x01)

Bit	R/W	Default	Description
7-0	R	80h	Secend CPU Temperature.

System Temperature 1 Reading Register (0x02)

Bit	R/W	Default	Description
7-0	R	80h	First System Temperature.

System Temperature 2 Reading Register (0x03)

Bit	R/W	Default	Description
7-0	R	80h	Second System Temperature.

System Temperature 3 Reading Register (0x04)

Bit	R/W	Default	Description
7-0	R	80h	Third System Temperature.

System Temperature 4 Reading Register (0x05)

Bit	R/W	Default	Description
7-0	R	80h	Fourth System Temperature.

Environment Temperature 1 Reading Register (0x06)

Bit	R/W	Default	Description
7-0	R	80h	First Environment Temperature.

Function:0x06

Environment Temperature 2 Reading Register (0x07)

Bit	R/W	Default	Description
7-0	R	80h	Second Environment Temperature.

CPU Fan 1 Tachometer Reading Register (0x20 ~ 0x21)

Bit	R/W	Default	Description
15-0	R	FFFFh	First CPU Fan Speed.

CPU Fan 2 Tachometer Reading Register (0x22 ~ 0x23)

Bit	R/W	Default	Description
15-0	R	FFFFh	Second CPU Fan Speed.

System Fan 1 Tachometer Reading Register (0x24 ~ 0x25)

Bit	R/W	Default	Description
15-0	R	FFFFh	First System Fan Speed.

System Fan 2 Tachometer Reading Register (0x26 ~ 0x27)

Bit	R/W	Default	Description
15-0	R	FFFFh	Second System Fan Speed.

System Fan 3 Tachometer Reading Register (0x28 ~ 0x29)

Bit	R/W	Default	Description
15-0	R	FFFFh	Third System Fan Speed.

CPU_CORE 1 (0x30 ~ 0x31)

Bit	R/W	Default	Description
15-0	R	FFFFh	CPU Core Voltage 1.

+5V (0x32 ~ 0x33)

Bit	R/W	Default	Description
15-0	R	FFFFh	5V Voltage.

Function:0x06

+12V (0x34 ~ 0x35)

Bit	R/W	Default	Description
15-0	R	FFFFh	12V Voltage

DDR 1(0x36 ~ 0x37)

Bit	R/W	Default	Description
15-0	R	FFFFh	DDR Voltage 1.

+5VSB (0x38 ~ 0x39)

Bit	R/W	Default	Description
15-0	R	FFFFh	5V Standby Voltage.

+3.3V (0x3A ~ 0x3B)

Bit	R/W	Default	Description
15-0	R	FFFFh	3.3V Voltage.

+3.3VSB (0x3C ~ 0x3D)

Bit	R/W	Default	Description
15-0	R	FFFFh	3.3V Standby Voltage.

3.7 Function:0x07 Battery Information

Index	R/W	Default	Register or Action
0x00	R/W	0x00	Battery1 Manufacturer Access (Low Byte)
0x01	R/W	0x00	Battery1 Manufacturer Access (High Byte)
0x02	R/W	0x00	Battery1 Remaining Capacity Alarm (Low Byte)
0x03	R/W	0x00	Battery1 Remaining Capacity Alarm (High Byte)
0x04	R/W	0x00	Battery1 Remaining Time Alarm (Low Byte)
0x05	R/W	0x00	Battery1 Remaining Time Alarm (High Byte)
0x06	R/W	0x00	Battery1 Battery Mode (Low Byte)
0x07	R/W	0x00	Battery1 Battery Mode (High Byte)
0x08	R/W	0x00	Battery1 At Rate (Low Byte)
0x09	R/W	0x00	Battery1 At Rate (High Byte)
0x0A	R	0x00	Battery1 At Rate Time To Full (Low Byte)
0x0B	R	0x00	Battery1 At Rate Time To Full (High Byte)
0x0C	R	0x00	Battery1 At Rate Time To Empty (Low Byte)
0x0D	R	0x00	Battery1 At Rate Time To Empty (High Byte)
0x0E	R	0x00	Battery1 At Rate OK (Low Byte)
0x0F	R	0x00	Battery1 At Rate OK (High Byte)
0x10	R	0x00	Battery1 Temperature (Low Byte)
0x11	R	0x00	Battery1 Temperature (High Byte)
0x12	R	0x00	Battery1 Voltage (Low Byte)
0x13	R	0x00	Battery1 Voltage (High Byte)
0x14	R	0x00	Battery1 Current (Low Byte)
0x15	R	0x00	Battery1 Current (High Byte)
0x16	R	0x00	Battery1 Average Current (Low Byte)
0x17	R	0x00	Battery1 Average Current (High Byte)
0x18	R	0x00	Battery1 Max Error (Low Byte)
0x19	R	0x00	Battery1 Max Error (High Byte)
0x1A	R	0x00	Battery1 Relative State Of Charge (Low Byte)
0x1B	R	0x00	Battery1 Relative State Of Charge (High Byte)
0x1C	R	0x00	Battery1 Absolute State Of Charge (Low Byte)
0x1D	R	0x00	Battery1 Absolute State Of Charge (High Byte)
0x1E	R	0x00	Battery1 Remaining Capacity (Low Byte)
0x1F	R	0x00	Battery1 Remaining Capacity (High Byte)

Function:0x07

Index	R/W	Default	Register or Action
0x20	R	0x00	Battery1 Full Charge Capacity (Low Byte)
0x21	R	0x00	Battery1 Full Charge Capacity (High Byte)
0x22	R	0x00	Battery1 Run Time To Empty (Low Byte)
0x23	R	0x00	Battery1 Run Time To Empty (High Byte)
0x24	R	0x00	Battery1 Average Time To Empty (Low Byte)
0x25	R	0x00	Battery1 Average Time To Empty (High Byte)
0x26	R	0x00	Battery1 Average Time To Full (Low Byte)
0x27	R	0x00	Battery1 Average Time To Full (High Byte)
0x28	R	0x00	Battery1 Charging Current (Low Byte)
0x29	R	0x00	Battery1 Charging Current (High Byte)
0x2A	R	0x00	Battery1 Charging Voltage (Low Byte)
0x2B	R	0x00	Battery1 Charging Voltage (High Byte)
0x2C	R	0x00	Battery1 Battery Status (Low Byte)
0x2D	R	0x00	Battery1 Battery Status (High Byte)
0x2E	R	0x00	Battery1 Cycle Count (Low Byte)
0x2F	R	0x00	Battery1 Cycle Count (High Byte)
0x30	R	0x00	Battery1 Design Capacity (Low Byte)
0x31	R	0x00	Battery1 Design Capacity (High Byte)
0x32	R	0x00	Battery1 Design Voltage (Low Byte)
0x33	R	0x00	Battery1 Design Voltage (High Byte)
0x34	R	0x00	Battery1 Specification Info (Low Byte)
0x35	R	0x00	Battery1 Specification Info (High Byte)
0x36	R	0x00	Battery1 Manufacture Date (Low Byte)
0x37	R	0x00	Battery1 Manufacture Date (High Byte)
0x38	R	0x00	Battery1 Serial Number (Low Byte)
0x39	R	0x00	Battery1 Serial Number (High Byte)
0x3A	R	0x00	Reserved
0x3B	R	0x00	Reserved
0x3C	R	0x00	Reserved
0x3D	R	0x00	Reserved
0x3E	R	0x00	Reserved
0x3F	R	0x00	Reserved

Function:0x07

Index	R/W	Default	Register or Action
0x40	R	0x00	Reserved
0x41	R	0x00	Reserved
0x42	R	0x00	Reserved
0x43	R	0x00	Reserved
0x44	R	0x00	Reserved
0x45	R	0x00	Reserved
0x46	R	0x00	Reserved
0x47	R	0x00	Reserved
0x48	R	0x00	Reserved
0x49	R	0x00	Reserved
0x4A	R	0x00	Reserved
0x4B	R	0x00	Reserved
0x4C	R	0x00	Reserved
0x4D	R	0x00	Reserved
0x4E	R	0x00	Reserved
0x4F	R	0x00	Reserved
0x50	R	0x00	Reserved
0x51	R	0x00	Reserved
0x52	R	0x00	Reserved
0x53	R	0x00	Reserved
0x54	R	0x00	Reserved
0x55	R	0x00	Reserved
0x56	R	0x00	Reserved
0x57	R	0x00	Reserved
0x58	R	0x00	Reserved
0x59	R	0x00	Reserved
0x5A	R	0x00	Reserved
0x5B	R	0x00	Reserved
0x5C	R	0x00	Reserved
0x5D	R	0x00	Reserved
0x5E	R	0x00	Reserved
0x5F	R	0x00	Reserved

Function:0x07

Index	R/W	Default	Register or Action
0x60	R	-	Reserved
0x61	R	-	Reserved
0x62	R	-	Reserved
0x63	R	-	Reserved
0x64	R	-	Reserved
0x65	R	-	Reserved
0x66	R	-	Reserved
0x67	R	-	Reserved
0x68	R	-	Reserved
0x69	R	-	Reserved
0x6A	R	-	Reserved
0x6B	R	-	Reserved
0x6C	R	-	Reserved
0x6D	R	-	Reserved
0x6E	R	-	Reserved
0x6F	R	-	Reserved
0x70	R	-	Reserved
0x71	R	-	Reserved
0x72	R	-	Reserved
0x73	R	-	Reserved
0x74	R	-	Reserved
0x75	R	-	Reserved
0x76	R	-	Reserved
0x77	R	-	Reserved
0x78	R	-	Reserved
0x79	R	-	Reserved
0x7A	R	-	Reserved
0x7B	R	-	Reserved
0x7C	R	-	Reserved
0x7D	R	-	Reserved
0x7E	R	-	Reserved
0x7F	R	-	Reserved

Function:0x07

Index	R/W	Default	Register or Action
0x80	R/W	0x00	Battery2 Manufacturer Access (Low Byte)
0x81	R/W	0x00	Battery2 Manufacturer Access (High Byte)
0x82	R/W	0x00	Battery2 Remaining Capacity Alarm (Low Byte)
0x83	R/W	0x00	Battery2 Remaining Capacity Alarm (High Byte)
0x84	R/W	0x00	Battery2 Remaining Time Alarm (Low Byte)
0x85	R/W	0x00	Battery2 Remaining Time Alarm (High Byte)
0x86	R/W	0x00	Battery2 Battery Mode (Low Byte)
0x87	R/W	0x00	Battery2 Battery Mode (High Byte)
0x88	R/W	0x00	Battery2 At Rate (Low Byte)
0x89	R/W	0x00	Battery2 At Rate (High Byte)
0x8A	R	0x00	Battery2 At Rate Time To Full (Low Byte)
0x8B	R	0x00	Battery2 At Rate Time To Full (High Byte)
0x8C	R	0x00	Battery2 At Rate Time To Empty (Low Byte)
0x8D	R	0x00	Battery2 At Rate Time To Empty (High Byte)
0x8E	R	0x00	Battery2 At Rate OK (Low Byte)
0x8F	R	0x00	Battery2 At Rate OK (High Byte)
0x90	R	0x00	Battery2 Temperature (Low Byte)
0x91	R	0x00	Battery2 Temperature (High Byte)
0x92	R	0x00	Battery2 Voltage (Low Byte)
0x93	R	0x00	Battery2 Voltage (High Byte)
0x94	R	0x00	Battery2 Current (Low Byte)
0x95	R	0x00	Battery2 Current (High Byte)
0x96	R	0x00	Battery2 Average Current (Low Byte)
0x97	R	0x00	Battery2 Average Current (High Byte)
0x98	R	0x00	Battery2 Max Error (Low Byte)
0x99	R	0x00	Battery2 Max Error (High Byte)
0x9A	R	0x00	Battery2 Relative State Of Charge (Low Byte)
0x9B	R	0x00	Battery2 Relative State Of Charge (High Byte)
0x9C	R	0x00	Battery2 Absolute State Of Charge (Low Byte)
0x9D	R	0x00	Battery2 Absolute State Of Charge (High Byte)
0x9E	R	0x00	Battery2 Remaining Capacity (Low Byte)
0x9F	R	0x00	Battery2 Remaining Capacity (High Byte)

Function:0x07

Index	R/W	Default	Register or Action
0xA0	R	0x00	Battery2 Full Charge Capacity (Low Byte)
0xA1	R	0x00	Battery2 Full Charge Capacity (High Byte)
0xA2	R	0x00	Battery2 Run Time To Empty (Low Byte)
0xA3	R	0x00	Battery2 Run Time To Empty (High Byte)
0xA4	R	0x00	Battery2 Average Time To Empty (Low Byte)
0xA5	R	0x00	Battery2 Average Time To Empty (High Byte)
0xA6	R	0x00	Battery2 Average Time To Full (Low Byte)
0xA7	R	0x00	Battery2 Average Time To Full (High Byte)
0xA8	R	0x00	Battery2 Charging Current (Low Byte)
0xA9	R	0x00	Battery2 Charging Current (High Byte)
0xAA	R	0x00	Battery2 Charging Voltage (Low Byte)
0xAB	R	0x00	Battery2 Charging Voltage (High Byte)
0xAC	R	0x00	Battery2 Battery Status (Low Byte)
0xAD	R	0x00	Battery2 Battery Status (High Byte)
0xAE	R	0x00	Battery2 Cycle Count (Low Byte)
0xAF	R	0x00	Battery2 Cycle Count (High Byte)
0xB0	R	0x00	Battery2 Design Capacity (Low Byte)
0xB1	R	0x00	Battery2 Design Capacity (High Byte)
0xB2	R	0x00	Battery2 Design Voltage (Low Byte)
0xB3	R	0x00	Battery2 Design Voltage (High Byte)
0xB4	R	0x00	Battery2 Specification Info (Low Byte)
0xB5	R	0x00	Battery2 Specification Info (High Byte)
0xB6	R	0x00	Battery2 Manufacture Date (Low Byte)
0xB7	R	0x00	Battery2 Manufacture Date (High Byte)
0xB8	R	0x00	Battery2 Serial Number (Low Byte)
0xB9	R	0x00	Battery2 Serial Number (High Byte)
0xBA	R	-	Reserved
0xBB	R	-	Reserved
0xBC	R	-	Reserved
0xBD	R	-	Reserved
0xBE	R	-	Reserved
0xBF	R	-	Reserved

Function:0x07

Index	R/W	Default	Register or Action
0xC0	R	-	Reserved
0xC1	R	-	Reserved
0xC2	R	-	Reserved
0xC3	R	-	Reserved
0xC4	R	-	Reserved
0xC5	R	-	Reserved
0xC6	R	-	Reserved
0xC7	R	-	Reserved
0xC8	R	-	Reserved
0xC9	R	-	Reserved
0xCA	R	-	Reserved
0xCB	R	-	Reserved
0xCC	R	-	Reserved
0xCD	R	-	Reserved
0xCE	R	-	Reserved
0xCF	R	-	Reserved
0xD0	R	-	Reserved
0xD1	R	-	Reserved
0xD2	R	-	Reserved
0xD3	R	-	Reserved
0xD4	R	-	Reserved
0xD5	R	-	Reserved
0xD6	R	-	Reserved
0xD7	R	-	Reserved
0xD8	R	-	Reserved
0xD9	R	-	Reserved
0xDA	R	-	Reserved
0xDB	R	-	Reserved
0xDC	R	-	Reserved
0xDD	R	-	Reserved
0xDE	R	-	Reserved
0xDF	R	-	Reserved

Function:0x07

Index	R/W	Default	Register or Action
0xE0	R	-	Reserved
0xE1	R	-	Reserved
0xE2	R	-	Reserved
0xE3	R	-	Reserved
0xE4	R	-	Reserved
0xE5	R	-	Reserved
0xE6	R	-	Reserved
0xE7	R	-	Reserved
0xE8	R	-	Reserved
0xE9	R	-	Reserved
0xEA	R	-	Reserved
0xEB	R	-	Reserved
0xEC	R	-	Reserved
0xED	R	-	Reserved
0xEE	R	-	Reserved
0xEF	R	-	Reserved
0xF0	R	-	Reserved
0xF1	R	-	Reserved
0xF2	R	-	Reserved
0xF3	R	-	Reserved
0xF4	R	-	Reserved
0xF5	R	-	Reserved
0xF6	R	-	Reserved
0xF7	R	-	Reserved
0xF8	R	-	Reserved
0xF9	R	-	Reserved
0xFA	R	-	Reserved
0xFB	R	-	Reserved
0xFC	R	-	Reserved
0xFD	R	-	Reserved
0xFE	R	-	Reserved
0xFF	R	-	

Function:0x07

Manufacturer Access (Battery 1 : 0x00 ~ 0x01, Battery 2 : 0x80 ~0x81)

Smart Battery Data Specification : ManufacturerAccess() (0x00)

Description : This function is optional and its meaning is implementation specific. It may be used by a battery manufacturer or silicon supplier to return specific version information, internal calibration information, or some other manufacturer specific function. There is no implied or required use for this function and therefore it may be used for multiple purposes. The only requirement is the data protocol listed below: read word or write word.

Purpose : The ManufacturerAccess() function's purpose is manufacturer specific. No functional requirement is implied although example uses are mentioned in this text.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Manufacturer Access	R/W	Hex	2	0x0000	0xffff	0	-

Remaining Capacity Alarm (Battery 1 : 0x02 ~ 0x03, Battery 2 : 0x82 ~0x83)

Smart Battery Data Specification : RemainingCapacityAlarm() (0x01)

Description : Sets or gets the Low Capacity alarm threshold value. Whenever the RemainingCapacity() falls below the Low Capacity value, the Smart Battery sends AlarmWarning() messages to the SMBus Host with the REMAINING_CAPACITY_ALARM bit set. A Low Capacity value of 0 disables this alarm. (If the ALARM_MODE bit is set in BatteryMode() then the AlarmWarning() message is disabled for a set period of time. See the BatteryMode() function for further information.) The Low Capacity value is set to 10% of design capacity at time of manufacture. The Low Capacity value will remain unchanged until altered by the RemainingCapacityAlarm() function. The Low Capacity value may be expressed in either capacity (mAh) or power (10mWh) depending on the setting of the BatteryMode()'s CAPACITY_MODE bit (see BatteryMode()).

Purpose : The RemainingCapacityAlarm() function can be used by systems to indicate a first level near end of discharge state. Since the alarm and the RemainingCapacity() value itself are expressed at C/5 or P/5 discharge rates, the value may not directly correspond to the actual present discharge rate. Although this provides a finely controlled alarm set-point, the RemainingTimeAlarm() and related time functions are better suited to for indicating at which point a system should transition into a suspend or hibernate state. The Low Capacity value can be read to verify the value in use by the Smart Battery's Low Capacity alarm.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Remaining Capacity Alarm	R/W	Unsigned int	2	0	65535	0	mAh or 10mWh

Function:0x07

Remaining Time Alarm (Battery 1 : 0x04 ~ 0x05, Battery 2 : 0x84 ~0x85)

Smart Battery Data Specification : RemainingTimeAlarm() (0x02)

Description : Sets or gets the Remaining Time alarm value. Whenever the AverageTimeToEmpty() falls below the Remaining Time value, the Smart Battery sends AlarmWarning() messages to the SMBus Host with the REMAINING_TIME_ALARM bit set. A Remaining Time value of 0 effectively disables this alarm. (If the ALARM_MODE bit is set in BatteryMode() then the AlarmWarning() message is disabled for a set period of time. See the BatteryMode() function for further information.) The Remaining Time value is set to 10 minutes at time of manufacture. The Remaining Time value will remain unchanged until altered by the RemainingTimeAlarm() function.

Purpose : The RemainingTimeAlarm() function can be used by systems that want to adjust when the remaining time alarm warning is sent. Since the time functions incorporate all aspects of the discharge (rate, temperature, state-of-charge) they are better suited for predicting transition points to suspend or hibernate states. The Remaining Time value can be read to verify the value in use by the Smart Battery's RemainingTimeAlarm().

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Remaining Time Alarm	R	Unsigned int	2	0	65535	-	minutes

Battery Mode (Battery 1 : 0x06 ~ 0x07, Battery 2 : 0x86 ~0x87)

Smart Battery Data Specification : BatteryMode() (0x03)

Description : This function selects the various battery operational modes and reports the battery's capabilities, modes, and flags minor conditions requiring attention.

Defined capabilities include:

· Internal charge controller supported (INTERNAL_CHARGE_CONTROLLER bit)

· Internal primary battery control supported (PRIMARY_BATTERY_SUPPORT bit)

Note: These capabilities listed are optional but their indicating flag bits must be supported.

Defined modes include:

· Battery's capacity information is specified to be reported in either mAh or 10 mWh (CAPACITY_MODE bit)

· Whether the ChargingCurrent() and ChargingVoltage() values are to be broadcast to the Smart Battery Charger when the Smart Battery requires charging (CHARGER_MODE bit)

· Internal charge controller enable (CHARGE_CONTROLLER_ENABLED bit) [Optional]

· Internal primary battery control enable (PRIMARY_BATTERY bit) [Optional]

Defined conditions requiring attention include:

· Battery requesting a conditioning cycle (CONDITION_FLAG bit)

Function:0x07

Purpose : To allow configuration of the Smart Battery for particular application requirements. (See individual bit definitions which follow.)

Bit	R/W	Name	Description	Default
15	R/W	CAPACITY_MODE	0 - Report in mA or mAh (default) 1 - Report in 10mW or 10mWh	0
14	R/W	CHARGER_MODE	0 - Enable ChargingVoltage and ChargingCurrent broadcasts to Smart Battery Charger (default) 1 - Disable broadcasts of ChargingVoltage and ChargingCurrent to Smart Battery Charger	0
13	R/W	ALARM_MODE	0 - Enable AlarmWarning broadcasts to Host and Smart Battery Charger (default) 1 - Disable AlarmWarning broadcast to Host and Smart Battery Charger	0
12-10	Rev	Reserved	Reserved	-
9	R/W	PRIMARY_BATTERY	0 - Battery operating in its secondary role(default) 1 - Battery operating in its primary role	0
8	R/W	CHARGE_CONTROLLER_ENABLED	0 - Internal Charge Control Disabled(default) 1 - Internal Charge Control Enabled	0
7	R	CONDITION_FLAG	0 - Battery OK 1 - Conditioning Cycle Requested	0
6-2	Rev	Reserved	Reserved	-
1	R	PRIMARY_BATTERY_SUPPORT	0 - Function Not Supported 1 - Primary or Secondary Battery Support	0
0	R	INTERNAL_CHARGE_CONTROLLER	0 - Function Not Supported 1 - Internal Charge Controller Supported	0

At Rate (Battery 1 : 0x08 ~ 0x09, Battery 2 : 0x88 ~0x89)

Smart Battery Data Specification : AtRate() (0x04)

Description : The AtRate() function is the first half of a two-function call-set used to set the AtRate value used in calculations made by the AtRateTimeToFull(), AtRateTimeToEmpty(), and AtRateOK() functions. The AtRate value may be expressed in either current (mA) or power (10mW) depending on the setting of the BatteryMode()'s CAPACITY_MODE bit. (Configuration of the CAPACITY_MODE bit will alter the calculation of AtRate functions. Changing the state of CAPACITY_MODE may require a re-write to the AtRate() function using the appropriate units.)

Purpose : Since the AtRate() function is the first half of a two-function call-set, it is followed by the second function of the call-set that calculates and returns a value based on the AtRate value and the battery's present state:

· When the AtRate value is positive, the AtRateTimeToFull() function returns the predicted time to fullcharge at the AtRate value of charge. (This does NOT include the present charge or discharge rate and so is calculated independently from the present charge or discharge rate of the battery.)

· When the AtRate value is negative, the AtRateTimeToEmpty() function returns the predicted operating time at the AtRate value of discharge. (This does NOT include the present charge or discharge rate and so is calculated independently from the present charge or discharge rate of the battery.)

Function:0x07

· When the AtRate value is negative, the AtRateOK() function returns a Boolean value that predicts the battery's ability to supply the AtRate value of additional discharge energy (current or power) for a minimum of 10 seconds. (This DOES include the present discharge rate of the battery and so is calculated differently from the previous 'Time' values listed.)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
At Rate	R/W	signed int	2	-32768	32767	-	mA or 10mW

At Rate Time To Full (Battery 1 : 0x0A ~ 0x0B, Battery 2 : 0x8A ~0x8B)

Smart Battery Data Specification : AtRateTimeToFull() (0x05)

Description : Returns the predicted remaining time to fully charge the battery at the previously written AtRate value in mA.

Note: This function is only required to return a value when the CAPACITY_MODE bit is cleared and the AtRate() value is written in mA units. If the CAPACITY_MODE bit is set, then AtRateTimeToFull() may return 65535 to indicate over-range and return an error code indicating overflow. Alternately, this function may return a remaining time to full based on a 10 mW value in AtRate(). All other AtRate functions are required to return both values corresponding to the CAPACITY_MODE setting except AtRateTimeToFull(). Support for power capacity (10 mW) reporting in AtRateTimeToFull() is optional.

Purpose : The AtRateTimeToFull() function is part of a two-function call-set used to determine the predicted remaining charge time at the AtRate value (mA.) It will be used immediately after the SMBus Host sets the AtRate() value. The calculated AtRateTimeToFull() value is independent of the present charge or discharge rate of the battery. Refer to AtRate() for additional usage information.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
At Rate Time To Full	R	Unsigned int	2	0	65534	0	minutes

At Rate Time To Empty (Battery 1 : 0x0C ~ 0x0D, Battery 2 : 0x8C ~0x8D)

Smart Battery Data Specification : AtRateTimeToEmpty() (0x06)

Description : Returns the predicted remaining operating time if the battery is discharged at the previously written AtRate value. (Result will depend on the setting of CAPACITY_MODE bit.)

Purpose : The AtRateTimeToEmpty() function is part of a two-function call-set used to determine the remaining operating time at the AtRate value. It will be used immediately after the SMBus Host sets the AtRate value. The calculated AtRateTimeToEmpty() value is independent of the present charge or discharge rate of the battery. Refer to AtRate() for additional usage information.

Function:0x07

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
At Rate Time To Empty	R	Unsigned int	2	0	65534	0	minutes

At Rate OK (Battery 1 : 0x0E ~ 0x0F, Battery 2 : 0x8E ~0x8F)

Smart Battery Data Specification : AtRateOK() (0x07)

Description : Returns a Boolean value that indicates whether or not the battery can deliver the previously written AtRate value of additional energy for 10 seconds (Boolean). If the AtRate value is zero or positive, the AtRateOK() function will ALWAYS return true. Result may depend on the setting of CAPACITY_MODE bit.

Purpose : The AtRateOK() function is part of a two-function call-set used by power management systems to determine if the battery can safely supply enough energy for an additional load. It will be used immediately after the SMBus Host sets the AtRate value. Refer to AtRate() for additional usage information.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
At Rate OK	R	Unsigned int	2	0	65535	-	-

Temperature (Battery 1 : 0x10 ~ 0x11, Battery 2 : 0x90 ~0x91)

Smart Battery Data Specification : Temperature() (0x08)

Description : Returns the cell-pack's internal temperature (°K). The actual operational temperature range will be defined at a pack level by a particular manufacturer. Typically it will be in the range of -20°C to +75°C.

Purpose : The Temperature() function provides accurate cell temperatures for use by battery chargers and thermal management systems. A battery charger will be able to use the temperature as a safety check. Thermal management systems may use the temperature because the battery is one of the largest thermal sources in a system. (Kelvin units are used to facilitate simple unsigned handling of temperature information and to permit easy conversion to other units.)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Temperature	R	Unsigned int	2	0	65535	-	0.1°K

Voltage (Battery 1 : 0x12 ~ 0x13, Battery 2 : 0x92 ~0x93)

Smart Battery Data Specification : Voltage() (0x09)

Description : Returns the cell-pack voltage (mV).

Function:0x07

Purpose : The Voltage() function provides power management systems with an accurate battery terminal voltage. Power management systems can use this voltage, along with battery current information, to characterize devices they control. This ability will help enable intelligent, adaptive power management systems.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Voltage	R	Unsigned int	2	0	20000	-	mV

Current (Battery 1 : 0x14 ~ 0x15, Battery 2 : 0x94 ~0x95)

Smart Battery Data Specification : Current() (0x0a)

Description : Returns the current being supplied (or accepted) through the battery's terminals (mA).

Purpose : The Current() function provides a snapshot for the power management system of the current flowing into or out of the battery. This information will be of particular use in power management systems because they can characterize individual devices and "tune" their operation to actual system power behavior.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Current	R	signed int	2	-32768	32767	-	mA

Average Current (Battery 1 : 0x16 ~ 0x17, Battery 2 : 0x96 ~0x97)

Smart Battery Data Specification : AverageCurrent() (0x0b)

Description : Returns a one-minute rolling average based on the current being supplied (or accepted) through the battery's terminals (mA). The AverageCurrent() function is expected to return meaningful values during the battery's first minute of operation.

Purpose : The AverageCurrent() function provides the average current flowing into or out of the battery for the power management system.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Average Current	R	Integer	2	-32768	32767	0	mA

Function:0x07

Max Error (Battery 1 : 0x18 ~ 0x19, Battery 2 : 0x98 ~0x99)

Smart Battery Data Specification : MaxError() (0x0c)

Description : eturns the expected margin of error (%) in the state of charge calculation. For example, when MaxError() returns 10% and RelativeStateOfCharge() returns 50%, the Relative StateOfCharge() is actually between 50 and 60%. The MaxError() of a battery is expected to increase until the Smart Battery identifies a condition that will give it higher confidence in its own accuracy. For example, when a Smart Battery senses that it has been fully charged from a fully discharged state, it may use that information to reset or partially reset MaxError(). The Smart Battery can signal when MaxError() has become too high by setting the CONDITION_FLAG bit in BatteryMode().

Purpose : The MaxError() function does not exist on most systems today. It has real value to the user in two ways: first, to give the user a confidence level about the state of charge and second, to give the Power Management system information about how aggressive it should be, particularly as the battery nears the end of its life.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Max Error	R	unsigned int	2	0	100	0	%

Relative State Of Charge (Battery 1 : 0x1A ~ 0x1B, Battery 2 : 0x9A ~0x9B)

Smart Battery Data Specification : RelativeStateOfCharge() (0x0d)

Description : Returns the predicted remaining battery capacity expressed as a percentage of FullChargeCapacity().

Purpose : The RelativeStateOfCharge() function exists on most systems today (a.k.a. Fuel Gauge). It is used to estimate the amount of charge remaining in the battery. The problem with this paradigm is that the tank size is variable. As standardized battery packs come into service, physical size will have less to do with the actual capacity. Although the RelativeStateOfCharge() will continue to be used, new paradigms will be developed to communicate battery capacity, thus diminishing it's importance.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Relative State Of Charge	R	unsigned int	2	0	100	0	%

Absolute State Of Charge (Battery 1 : 0x1C ~ 0x1D, Battery 2 : 0x9C ~0x9D)

Smart Battery Data Specification : AbsoluteStateOfCharge() (0x0e)

Description : Returns the predicted remaining battery capacity expressed as a percentage of DesignCapacity() (%).

Note that AbsoluteStateOfCharge() can return values greater than 100%.

Purpose : See RelativeStateOfCharge() function description.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Absolute State Of Charge	R	unsigned int	2	0	100	0	%

Function:0x07

Remaining Capacity (Battery 1 : 0x1E ~ 0x1F, Battery 2 : 0x9E ~0x9F)

Smart Battery Data Specification : RemainingCapacity() (0x0f)

Description : Returns the predicted remaining battery capacity. The RemainingCapacity() capacity value is expressed in either current (mAh at a C/5 discharge rate) or power (10mWh at a P/5 discharge rate) depending on the setting of the BatteryMode()'s CAPACITY_MODE bit.

Purpose : The RemainingCapacity() function returns the battery's remaining capacity in absolute terms but relative to a specific discharge rate. This information is a numeric indication of remaining charge which can also be represented by the Absolute or Relative StateOfCharge() functions and may be in a better form for use by power management systems. (StateOfCharge() functions return values in percentage format which is a relative representation while RemainingCapacity() function returns a more absolute value defined at a specific discharge value.)

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Remaining Capacity	R	unsigned int	2	0	65535	-	mAh or 10 mWh

Full Charge Capacity (Battery 1 : 0x20 ~ 0x21, Battery 2 : 0xA0 ~0xA1)

Smart Battery Data Specification : FullChargeCapacity() (0x10)

Description : Returns the predicted pack capacity when it is fully charged. The FullChargeCapacity() value is expressed in either current (mAh at a C/5 discharge rate) or power (10mWh at a P/5 discharge rate) depending on the setting of the BatteryMode()'s CAPACITY_MODE bit.

Purpose : The FullChargeCapacity() function provides the user with a means of understanding the "tank size" of their battery. This information, along with information about the original capacity of the battery, can be presented to the user as an indication of battery wear.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Full Charge Capacity	R	Unsigned int	2	0	65535	-	mAh or 10 mWh

Run Time To Empty (Battery 1 : 0x22 ~ 0x23, Battery 2 : 0xA2 ~0xA3)

Smart Battery Data Specification : RunTimeToEmpty() (0x11)

Description : Returns the predicted remaining battery life at the present rate of discharge (minutes). The RunTimeToEmpty() value is calculated based on either current or power depending on the setting of the BatteryMode()'s CAPACITY_MODE bit. This is an important distinction because use of the wrong calculation mode may result in inaccurate return values.

Function:0x07

Purpose : The RunTimeToEmpty() can be used by the power management system to get information about the relative gain or loss in remaining battery life in response to a change in power policy. This information is NOT the same as the AverageTimeToEmpty(), which is not suitable to determine the effects that result from a change in power policy.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Run Time To Empty	R	unsigned int	2	0	65534	0	Minutes

Average Time To Empty (Battery 1 : 0x24 ~ 0x25, Battery 2 : 0xA4 ~0xA5)

Smart Battery Data Specification : AverageTimeToEmpty() (0x12)

Description : Returns a one-minute rolling average of the predicted remaining battery life (minutes). The AverageTimeToEmpty() value is calculated based on either current or power depending on the setting of the BatteryMode()'s CAPACITY_MODE bit. This is an important distinction because use of the wrong calculation mode may result in inaccurate return values.

Purpose : The AverageTimeToEmpty() displays state-of-charge information in a more useful way. By averaging the instantaneous estimations, the remaining time will not appear to "jump" around as it does on many of today's systems.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Average Time To Empty	R	unsigned int	2	0	65534	0	Minutes

Average Time To Full (Battery 1 : 0x26 ~ 0x27, Battery 2 : 0xA6 ~0xA7)

Smart Battery Data Specification : AverageTimeToFull() (0x13)

Description : Returns a one minute rolling average of the predicted remaining time until the Smart Battery reaches full charge (minutes).

Purpose : The AverageTimeToFull() function can be used by the SMBus Host's power management system to aid in its policy. It may also be used to find out how long the system must be left on to achieve full charge.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Average Time To Full	R	unsigned int	2	0	65534	0	Minutes

Function:0x07

Charging Current (Battery 1 : 0x28 ~ 0x29, Battery 2 : 0xA8 ~0xA9)

Smart Battery Data Specification : ChargingCurrent() (0x14)

Description : Sends the desired charging voltage to the Smart Battery Charger (mV). This represents the maximum voltage which may be provided by the Smart Battery Charger to permit the Smart Battery to reach a Fully Charged state.

Purpose : The ChargingVoltage() function sets the maximum voltage that a Smart Battery Charger may deliver to the Smart Battery. In combination with the ChargingCurrent() function and the battery's internal impedance, this function determines the Smart Battery Charger's desired operating point. Together, these functions permit a Smart Battery Charger to dynamically adjust its charging profile (current/voltage) for optimal charge. The Smart Battery can effectively turn off the Smart Battery Charger by returning a value of 0 for this function. Smart Battery Chargers may be operated as a constant current source above their maximum regulated voltage range by returning a ChargingVoltage() value of 65535.

Note1: This is the same value as that listed in 5.3.2 but this is written (broadcast) by the Smart Battery to the Smart Battery Charger.

Note2: The Smart Battery Charger to responds to the voltage requests in one of three ways:

· supply the voltage requested

· supply its programmatic maximum voltage if the request is greater than its programmatic maximum and less than 65535

· supply its maximum voltage if the request is 65535.

Note3: ChargingVoltage() is NOT altered by the voltage scaling factor in SpecificationInfo().

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Charge Current	R	Unsigned int	2	0	65534	-	mA

Charging Voltage (Battery 1 : 0x2A ~ 0x2B, Battery 2 : 0xAA ~0xAB)

Smart Battery Data Specification : ChargingVoltage() (0x15)

Description : Sends the desired charging voltage to the Smart Battery Charger (mV). This represents the maximum voltage which may be provided by the Smart Battery Charger to permit the Smart Battery to reach a Fully Charged state.

Purpose : The ChargingVoltage() function sets the maximum voltage that a Smart Battery Charger may deliver to the Smart Battery. In combination with the ChargingCurrent() function and the battery's internal impedance, this function determines the Smart Battery Charger's desired operating point. Together, these functions permit a Smart Battery Charger to dynamically adjust its charging profile (current/voltage) for optimal charge. The Smart Battery can effectively turn off the Smart Battery Charger by returning a value of 0 for this function. Smart Battery Chargers may be operated as a constant current source above their maximum regulated voltage range by returning a ChargingVoltage() value of 65535.

Function:0x07

Note1: This is the same value as that listed in 5.3.2 but this is written (broadcast) by the Smart Battery to the Smart Battery Charger.

Note2: The Smart Battery Charger to responds to the voltage requests in one of three ways:

- **supply the voltage requested**
- **supply its programmatic maximum voltage if the request is greater than its programmatic maximum and less than 65535**
- **supply its maximum voltage if the request is 65535.**

Note3: ChargingVoltage() is NOT altered by the voltage scaling factor in SpecificationInfo().

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Charge Voltage	R	Unsigned int	2	0	65534	-	mV

Cycle Count (Battery 1 : 0x2E ~ 0x2F, Battery 2 : 0xAE ~0xAF)

Smart Battery Data Specification : CycleCount() (0x17)

Description : Returns the number of cycles the battery has experienced. A cycle is defined as: An amount of discharge approximately equal to the value of DesignCapacity.

Purpose : The CycleCount() function provides a means to determine their battery's wear. It may be used to give advanced warning that the battery is nearing its end of life. The CycleCount returned value multiplied by the DesignCapacity value can give an approximate “odometer” reading for the total capacity delivered by the Smart Battery.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Cycle Count	R	Unsigned int	2	0	65535	0	-

Function:0x07

Battery Status (Battery 1 : 0x2C ~ 0x2D, Battery 2 : 0xAC ~0xAD)

Smart Battery Data Specification : BatteryStatus() (0x16)

Description : Returns the Smart Battery's status word which contains Alarm and Status bit flags. Some of the BatteryStatus() flags (REMAINING_CAPACITY_ALARM and REMAINING_TIME_ALARM) are calculated based on either current or power depending on the setting of the BatteryMode()'s CAPACITY_MODE bit. This is important because use of the wrong calculation mode may result in an inaccurate alarm.

Purpose : The BatteryStatus() function is used by the power management system to get alarm and status bits, as well as error codes from the Smart Battery. This is the same information broadcast to both the SMBus Host and the Smart Battery Charger by the AlarmWarning() function except that the AlarmWarning() function sets the Error Code bits all high before sending the data.

Bit	R/W	Name	Description	Default
15	R	OVER_CHARGED_ALARM	0 - Charging is no longer detected and condition causing alarm is removed 1- Stop Charging	0
14	R	TERMINATE_CHARGE_ALARM	0 - Charging is no longer detected and condition causing alarm is removed 1 - Stop Charging	0
13	Rev	Reserved	Reserved	-
12	R	OVER_TEMP_ALARM	0 - Temperature drops into acceptable range. 1 - Stop Charging	0
11	R	TERMINATE_DISCHARGE_ALARM	0 - Discharge is no longer detected 1 - Stop Discharge As Soon As Possible	0
10	Rev	Reserved	Reserved	-
9	R	REMAINING_CAPACITY_ALARM	0 - Value of RemainingCapacity Alarm() is zero or is less than the value of RemainingCapacity() 1 - (Undefined)	0
8	R	REMAINING_TIME_ALARM	0 - Value of RemainingTime Alarm() is zero or is less than the value of AverageTimeToEmpty() 1 - (Undefined)	0
7	R	INITIALIZED	0 - Battery electronics have determined that calibration or configuration information has been lost and accuracy is significantly impaired. 1 - None required.	0
6	R	DISCHARGING	0 - Battery is accepting a charge current. 1 - None required.	0
5	R	FULLY_CHARGED	0 - Battery is no longer considered in a full state. 1 - Stop Charging.	0
4	R	FULLY_DISCHARGED	0 - RelativeStateOfCharge() value is greater than 20% 1 - Stop Discharging.	0
3-0	Rev	Reserved	Reserved	-

Function:0x07

Design Capacity (Battery 1 : 0x30 ~ 0x31, Battery 2 : 0xB0 ~0xB1)

Smart Battery Data Specification : DesignCapacity() (0x18)

Description : Returns the theoretical capacity of a new pack. The DesignCapacity() value is expressed in either current (mAh at a C/5 discharge rate) or power (10mWh at a P/5 discharge rate) depending on the setting of the BatteryMode()'s CAPACITY_MODE bit.

Purpose : The DesignCapacity() function is used by the SMBus Host's power management in conjunction with FullChargeCapacity() to determine battery wear. The power management system may present this information to the user and also adjust its power policy as a result.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Design Capacity	R	Unsigned int	2	0	65535	0	mAh or 10mWh

Design Voltage (Battery 1 : 0x32 ~ 0x33, Battery 2 : 0xB2 ~0xB3)

Smart Battery Data Specification : DesignVoltage() (0x19)

Description : Returns the theoretical voltage of a new pack (mV).

Purpose : The DesignVoltage() function can be used to give additional information about a particular Smart Battery's expected terminal voltage.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Design Voltage	R	Unsigned int	2	0	65535	0	mV

Specification Info (Battery 1 : 0x34 ~ 0x35, Battery 2 : 0xB4 ~0xB5)

Smart Battery Data Specification : SpecificationInfo() (0x1a)

Description : Returns the version number of the Smart Battery specification the battery pack supports, as well as voltage and current and capacity scaling information in a packed unsigned integer. Power scaling is the product of the voltage scaling times the current scaling.

Purpose : The SpecificationInfo() function is used by the SMBus Host's power management system to determine what information the Smart Battery can provide. It can be used by Smart Battery Systems where the defined 16-bit data values do not provide enough range for higher power applications.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Specification Info	R	Unsigned int	2	0	65535	0	-

Function:0x07

Manufacture Date (Battery 1 : 0x36 ~ 0x37, Battery 2 : 0xB6 ~0xB7)

Smart Battery Data Specification : ManufactureDate() (0x1b)

Description : This function returns the date the cell pack was manufactured in a packed integer. The date is packed in the following fashion: (year-1980) * 512 + month * 32 + day.

Purpose : The ManufactureDate() provides the system with information that can be used to uniquely identify a particular battery.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Manufacture Date	R	Unsigned int	2	0	65535	0	0

Serial Number (Battery 1 : 0x38 ~ 0x39, Battery 2 : 0xB8 ~0xB9)

Smart Battery Data Specification : SerialNumber() (0x1c)

Description : This function is used to return a serial number. This number when combined with the ManufacturerName(), the DeviceName(), and the ManufactureDate() will uniquely identify the battery (unsigned int).

Purpose : The SerialNumber() function is used to identify a particular battery. This may be important in systems that are powered by multiple batteries where the system can log information about each battery that it encounters.

Name	R/W	Format	Size in Bytes	Min Value	Max Value	Default Value	Unit
Serial Number	R	Hex	2	0x0000	0xffff	0	0