Technical Reference PMBus BMR 316 XXX1/022

This appendix contains a detailed reference of the PMBus commands supported by the product.

Data Formats

The products make use of a few standardized numerical formats, along with custom data formats. A detailed walkthrough of the above formats is provided in AN304, as well as in sections 7 and 8 of the PMBus Specification Part II. The custom data formats vary depending on the command, and are detailed in the command description.

Standard Commands

The functionality of commands with code 0x00 to 0xCF is usually based on the corresponding command specification provided in the PMBus Standard Specification Part II (see Power System Management Bus Protocol Documents below). However there might be different interpretations of the PMBus Standard Specification or only parts of the Standard Specification applied, thus the detailed command description below should always be consulted.

Forum Websites

The System Management Interface Forum (SMIF)
http://www.powersig.org/
The System Management Interface Forum (SMIF) supports the rapid advancement of an efficient and compatible technology base that promotes power management and systems technology implementations. The SMIF provides a membership path for any company or individual to be active participants in any or all of the various working groups established by the implementer forums.

Power Management Bus Implementers Forum
(PMBUS-IF)
http://pmbus.org/
The PMBus-IF supports the advancement and early adoption of the PMBus protocol for power management. This website offers recent PMBus specification documents, PMBus articles, as well as upcoming PMBus presentations and seminars, PMBus Document Review Board (DRB) meeting notes, and other PMBus related news.

PMBus – Power System Management Bus Protocol Documents

These specification documents may be obtained from the PMBus-IF website described above. These are required reading for complete understanding of the PMBus implementation. This appendix will not re-address all of the details contained within the two PMBus Specification documents.

Specification Part I – General Requirements Transport And Electrical Interface
Includes the general requirements, defines the transport and electrical interface and timing requirements of hard wired signals.

Specification Part II – Command Language
Describes the operation of commands, data formats, fault management and defines the command language used with the PMBus.

SMBus – System Management Bus Documents

System Management Bus Specification, Version 2.0, August 3, 2000
This specification specifies the version of the SMBus on which Revision 1.2 of the PMBus Specification is based. This specification is freely available from the System Management Interface Forum Web site at:
http://www.smbus.org/specs/

PMBus Command Summary and Factory Default Values of Standard Configuration

The factory default values provided in the table below are valid for the Standard configuration. Factory default values for other configurations can be found using the Flex Power Designer tool.

Code	Name	Data Format	Factory Default Value Standard Configuration BMR316XXX1/022 R1		Min Set Value	Max Set Value	Unit
0x01	OPERATION	R/W Byte	0x80				
0x02	ON_OFF_CONFIG	R/W Byte	0x16				
0x03	CLEAR_FAULTS	Send Byte					
0x10	WRITE_PROTECT	R/W Byte					
0x12	RESTORE_DEFAULT_ALL	Send Byte					
0x15	STORE_USER_ALL	Send Byte					
0x16	RESTORE_USER_ALL	Send Byte					
0x19	CAPABILITY	Read Byte	0xB0				
0x1B	SMBALERT_MASK_VOUT (STATUS_VOUT)	SMBAlert Mask	0x6E				
0x1B	SMBALERT_MASK_IOUT (STATUS_IOUT)	SMBAlert Mask	0x60				
0x1B	SMBALERT_MASK_INPUT (STATUS_INPUT)	SMBAlert Mask	0x60				
0x1B	SMBALERT_MASK_TEMPERATURE (STATUS_TEMPERATURE)	SMBAlert Mask	0x60				
0x1B	SMBALERT_MASK_CML (STATUS_CML)	SMBAlert Mask	0xFB				
0x1B	SMBALERT_MASK_OTHER (STATUS_OTHER)	SMBAlert Mask	0x01				
0x1B	SMBALERT_MASK_MFR_SPECIFIC (STATUS_MFR_SPECIFIC)	SMBAlert Mask	0x09				
0x20	VOUT_MODE	Read Byte	0x15				
0x35	VIN_ON	R/W Word	0xF094	37.00			V
0x36	VIN_OFF	R/W Word	0xF080	32.00			V
0x37	INTERLEAVE	R/W Word	0x0120				
0x39	IOUT_CAL_OFFSET	Read Word	Unit Specific				
0x40	VOUT_OV_FAULT_LIMIT	R/W Word	0x8200	16.25	0	17	V
0x41	VOUT_OV_FAULT_RESPONSE	R/W Byte	0x80				
0x42	VOUT_OV_WARN_LIMIT	R/W Word	0x7C00	15.50	0	17	V
0x43	VOUT_UV_WARN_LIMIT	R/W Word	0x4400	8.50	0	16	V
0x44	VOUT_UV_FAULT_LIMIT	R/W Word	0x3C00	7.50	0	16	V
0x45	VOUT_UV_FAULT_RESPONSE	R/W Byte	0x80				
0x46	IOUT_OC_FAULT_LIMIT	R/W Word	0x00D2	210.00	0	255	A
0x47	IOUT_OC_FAULT_RESPONSE	R/W Byte	0xC0				
0x48	IOUT_OC_LV_FAULT_LIMIT	R/W Word	0x0000	0.00			V
0x4A	IOUT_OC_WARN_LIMIT	R/W Word	0x005F	95.00	0	255	A
0x4B	IOUT_UC_FAULT_LIMIT	R/W Word	0xE440	-60.00			A
0x4C	IOUT_UC_FAULT_RESPONSE	R/W Byte	0x00				
0x4F	OT_FAULT_LIMIT	R/W Word	0x007D	125.00	-50	150	°C
0x50	OT_FAULT_RESPONSE	R/W Byte	0x80				
0x51	OT_WARN_LIMIT	R/W Word	0x006E	110.00	-50	150	°C
0x52	UT_WARN_LIMIT	R/W Word	0x0000	0.00	-50	150	°C
0x53	UT_FAULT_LIMIT	R/W Word	0xE4E0	-50.00	-50	150	°C
0x54	UT_FAULT_RESPONSE	R/W Byte	0x00				
0x55	VIN_OV_FAULT_LIMIT	R/W Word	0xF104	65.00	0	128	V

0x56	VIN_OV_FAULT_RESPONSE	R/W Byte	0x80				
0x57	VIN_OV_WARN_LIMIT	R/W Word	0xF0F8	62.00	0	128	V
0x58	VIN_UV_WARN_LIMIT	R/W Word	0xF002	0.50	0	128	V
0x59	VIN_UV_FAULT_LIMIT	R/W Word	0xF001	0.25	0	128	V
0x5A	VIN_UV_FAULT_RESPONSE	R/W Byte	0x00				
0x5E	POWER_GOOD_ON	R/W Word	0x4A66	9.30	0	16	V
0x5F	POWER_GOOD_OFF	R/W Word	0x48CD	9.10	0	16	V
0x60	TON_DELAY	R/W Word	0x0000	0.00	0	1023	ms
0x63	TON_MAX_FAULT_RESPONSE	R/W Byte	0x00				
0x64	TOFF_DELAY	R/W Word	0xF804	2.00	0	1023	ms
0x78	STATUS_BYTE	Read Byte					
0x79	STATUS_WORD	Read Word					
0x7A	STATUS_VOUT	Read Byte					
0x7B	STATUS_IOUT	Read Byte					
0x7C	STATUS_INPUT	Read Byte					
0x7D	STATUS_TEMPERATURE	Read Byte					
0x7E	STATUS_CML	Read Byte					
0x7F	STATUS_OTHER	Read Byte					
0x80	STATUS_MFR_SPECIFIC	Read Byte					
0x88	READ_VIN	Read Word					
0x8B	READ_VOUT	Read Word					
0x8C	READ_IOUT	Read Word					
0x8D	READ_TEMPERATURE_1	Read Word					
0x8E	READ_TEMPERATURE_2	Read Word					
0x94	READ_DUTY_CYCLE	Read Word					
0x95	READ_FREQUENCY	Read Word					
0x98	PMBUS_REVISION	Read Byte					
0x99	MFR_ID	Read Block12	Unit Specific				
0x9A	MFR_MODEL	Read Block20	Unit Specific				
0x9B	MFR_REVISION	Read Block12	Unit Specific				
0x9C	MFR_LOCATION	Read Block12	Unit Specific				
0x9D	MFR_DATE	Read Block12	Unit Specific				
0x9E	MFR_SERIAL	Read Block20	Unit Specific				
0xB0	USER_DATA_00	R/W Block16	Unit Specific				
0xC5	FW_CONFIG_REGULATION	Read Block14	0xF800F800D000F800F8000000A000				
0xC8	FW_CONFIG_FAULTS	Read Block25	0x000000000000000000000000000000000000000000000000				
0xC9	FW_CONFIG_PMBUS	R/W Block11	0x000000008800021001 2001				
0xCA	MFR_IOUT_OC_FAST_FAULT_RESPONSE	R/W Byte	0xC0				
0xD0	MFR_IOUT_AVG_OC_FAULT_LIMIT	Read Word	0x0064	100.00			A
0xD1	MFR_IOUT_OC_FAST_FAULT_LIMIT	Read Word	0x00DC	220			A
0xD2	MFR_IOUT_AVG_COEFF	Read Byte	0x1A				
0xDA	MFR_READ_VAUX	Read Word					
0xDC	MFR_SELECT_TEMPERATURE_SENSOR	Read Byte	0x00				
0xE0	MFR_FLEX_FIRMWARE_CMD	R/W Block8					
0xE7	MFR_TEMP_COEFF	Read Word	0x0189				
0xEA	MFR_IOUT_APC	Read Word	Unit Specific				
0xF9	MFR_MULTI_PIN_CONFIG	R/W Word	0x0002				

PMBus Command Details

OPERATION (0x01)
Description: Sets the desired PMBus enable and margin operations.

Bit	Function	Description	Value	Function	Description
7:6	Enable	Make the device enable or disable.	00	Immediate Off	Disable Immediately without sequencing.
			01	Soft Off	Disable "Softly" with sequencing.
			10	Enable	Enable device to the desired margin state.
5:4	Margin	Select between margin high/low states or nominal output.	00	Nominal	Operate at nominal output voltage.
			01	Margin Low	Operate at margin low voltage set in VOUT_MARGIN_LOW.
			10	Margin High	Operate at margin high voltage set in VOUT_MARGIN_HIGH.
3:2	Act on Fault	Set 10b to act on fault or set to 01b to ignore fault.	01	Ignore Faults	Ignore Faults when in a margined state. The device will ignore appropriate overvoltage/undervoltage warnings and faults and respond as programmed by the warning limit or fault response command.
			10	Act on Faults	Act on Faults when in a margined state. The device will handle appropriate overvoltage/undervoltage warnings and faults and respond as programmed by the warning limit or fault response command.

ON_OFF_CONFIG (0x02)
Description: Configures how the device is controlled by the CONTROL pin and the PMBus.

Bit	Function	Description	Value	Function	Description
4	Powerup Operation	Sets the default to either operate any time power is present or for the on/off to be controlled by CONTROL pin and serial bus commands.	0	Enable Always	Unit powers up any time power is present regardless of state of the CONTROL pin, taking the RC configuration into account, see command 0xE3.
			1	Enable pin or PMBus	Unit does not power up until commanded by the CONTROL pin and OPERATION command.
3	PMBus Enable Mode	Controls how the unit responds to commands received via the serial bus.	0	Ignore PMBus	Unit ignores the on/off portion of the OPERATION command from serial bus.

			1	Use PMBus	To start, the unit requires that the on/off portion of the OPERATION command is instructing the unit to run.
2	Enable Pin Mode	Controls how the unit responds to the CONTROL pin.	0	Ignore pin	Unit ignores the CONTROL/Enable pin.
			1	Use pin	Unit requires the CONTROL pin to be asserted to start the unit.
1	Enable Pin Polarity	Polarity of the CONTROL pin.	0	Active Low	Enable pin will cause device to enable when driven low.
			1	Active High	Enable pin will cause device to enable when driven high.
0	Disable Action	CONTROL pin action when commanding the unit to turn off.	0	Soft Off	Use the programmed turn off delay and fall time.
			1	Imm. Off	Turn off the output and stop transferring energy to the output as fast as possible. The device's product literature shall specify whether or not the device sinks current to decrease the output voltage fall time.

CLEAR_FAULTS (0x03)
Description: Clears all fault status bits

WRITE_PROTECT (0x10)
Description: The WRITE_PROTECT command is used to control writing to the PMBus device. The intent of this command is to provide protection against accidental changes. This command is not intended to provide protection against deliberate or malicious changes to a device's configuration or operation.

Bit	Description	Value	Function	Description
7:0	All supported commands may have their parameters read, regardless of the WRITE_PROTECT settings.	0x80	Disable all writes	Disable all writes except to the WRITE_PROTECT command.
		0x40	Enable operation	Disable all writes except to the WRITE_PROTECT, OPERATION and PAGE commands.
		0x20	Enable control and Vout commands	Disable all writes except to the WRITE_PROTECT, OPERATION, PAGE, ON_OFF_CONFIG and VOUT_COMMAND commands.
		0x00	Enable all commands	Enable writes to all commands.

RESTORE_DEFAULT_ALL (0x12)
Description: Commands the device to restore its configuration from the Default Store.

STORE_USER_ALL (0x15)
Description: Stores, at the USER level, all PMBus values that were changed since the last restore command.

RESTORE_USER_ALL (0x16)
Description: Restores PMBus settings that were stored using STORE_USER_ALL. This command is automatically performed at power up.

CAPABILITY (0x19)
Description: This command provides a way for a host system to determine some key capabilities of a PMBus device.

Bit	Function	Description	Value	Function	Description
7	Packet Error Checking	Packet error checking.	0	Not Supported	Packet Error Checking not supported.
			1	Supported	Packet Error Checking is supported.
6:5	Maximum Bus Speed	Maximum bus speed.	00	100kHz	Maximum supported bus speed is 100 kHz.
			01	400kHz	Maximum supported bus speed is 400 kHz.
			10	1MHz	Maximum supported bus speed is 1 MHz.
4	Smbalert	SMBALERT	00	No Smbalert	The device does not have a SMBALERT# pin and does not support the SMBus Alert Response protocol.
			01	Have Smbalert	The device does have a SMBALERT# pin and does support the SMBus Alert Response protocol.
3	Numeric Format	Numeric format.	0	LINEAR or DIRECT Format	Numeric data is in LINEAR or DIRECT format.
			1	IEEE Half Precision Floating Point Format	Numeric data is in IEEE half precision floating point format.
2	AVSBus Support	AVSBus support.	0	AVSBus Not Supported	AVSBus not supported.
			1	AVSBus Supported	AVSBus supported.

SMBALERT_MASK_VOUT (0x1B)
Status Registers: STATUS_VOUT (0x7A)
Description: SMBALERT_MASK bits for the STATUS_VOUT command. The SMBALERT_MASK command may be used to prevent a warning or fault condition from asserting the SALERT output signal.

Bit	Function	Description	Value	Function	Description
7	Vout Overvoltage Fault		0	Pull SALERT	
			1	Ignore	
6	Vout Overvoltage Warning		0	Pull SALERT	
			1	Ignore	
5	Vout Undervoltage Warning		0	Pull SALERT	
			1	Ignore	
4	Vout Undervoltage Fault		0	Pull SALERT	
			1	Ignore	

3	Vout Max Warning		0	Pull SALERT	
			1	Ignore	
2	Ton Max Fault		0	Pull SALERT	
			1	Ignore	
1	Toff Max Warning		0	Pull SALERT	
			1	Ignore	

SMBALERT_MASK_IOUT (0x1B)
Status Registers: STATUS_IOUT (0x7B)
Description: SMBALERT_MASK bits for the STATUS_IOUT command. The SMBALERT_MASK command may be used to prevent a warning or fault condition from asserting the SALERT output signal.

Bit	Function	Description	Value	Function	Description
7	Iout Overcurrent Fault		0	Pull SALERT	
			1	Ignore	
6	Iout Overcurrent And Low Voltage Fault		0	Pull SALERT	
			1	Ignore	
5	Iout Over Current Warning		0	Pull SALERT	
			1	Ignore	
4	Iout Undercurrent Fault		0	Pull SALERT	
			1	Ignore	

SMBALERT_MASK_INPUT (0x1B)
Status Registers: STATUS_INPUT (0x7C)
Description: SMBALERT_MASK bits for the STATUS_INPUT command. The SMBALERT_MASK command may be used to prevent a warning or fault condition from asserting the SALERT output signal.

Bit	Function	Description	Value	Function	Description
7	Vin Overvoltage Fault		0	Pull SALERT	
			1	Ignore	
6	Vin Overvoltage Warning		0	Pull SALERT	
			1	Ignore	
5	Vin Undervoltage Warning		0	Pull SALERT	
			1	Ignore	
4	Vin Undervoltage Fault		0	Pull SALERT	
			1	Ignore	
3	Insufficient Vin		0	Pull SALERT	
			1	Ignore	

SMBALERT_MASK_TEMPERATURE (0x1B)
Status Registers: STATUS_TEMPERATURE (0x7D)
Description: SMBALERT_MASK bits for the STATUS_TEMPERATURE command. The SMBALERT_MASK command may be used to prevent a warning or fault condition from asserting the SALERT output signal.

Bit	Function	Description	Value	Function	Description
7	Overtemperature Fault		0	Pull SALERT	
			1	Ignore	

6	Overtemperature Warning		0	Pull SALERT	
			1	Ignore	
5	Undertemperature Warning		0	Pull SALERT	
			1	Ignore	
4	Undertemperature Fault		0	Pull SALERT	
			1	Ignore	

SMBALERT_MASK_CML (0x1B)
Status Registers: STATUS_CML (0x7E)
Description: SMBALERT_MASK bits for the STATUS_CML command. The SMBALERT_MASK command may be used to prevent a warning or fault condition from asserting the SALERT output signal.

Bit	Function	Description	Value	Function	Description
7	Invalid Or Unsupported Command Received		0	Pull SALERT	
			1	Ignore	
6	Invalid Or Unsupported Data Received		0	Pull SALERT	
			1	Ignore	
5	Packet Error Check Failed		0	Pull SALERT	
			1	Ignore	
4	Memory Fault Detected		0	Pull SALERT	
			1	Ignore	
3	Processor Fault Detected		0	Pull SALERT	
			1	Ignore	
1	Other Communication Fault		0	Pull SALERT	
			1	Ignore	
0	Memory Or Logic Fault		0	Pull SALERT	
			1	Ignore	

SMBALERT_MASK_OTHER (0x1B)
Status Registers: STATUS_OTHER (0x7F)
Description: SMBALERT_MASK bits for the STATUS_OTHER command. The SMBALERT_MASK command may be used to prevent a warning or fault condition from asserting the SALERT output signal.

Bit	Description	Value	Function	Description
0		0	Pull SALERT	
		1	Ignore	

SMBALERT_MASK_MFR_SPECIFIC (0x1B)
Status Registers: STATUS_MFR_SPECIFIC (0x80)
Description: SMBALERT_MASK bits for the STATUS_MFR_SPECIFIC command. The SMBALERT_MASK command may be used to prevent a warning or fault condition from asserting the SALERT output signal.

Bit	Function	Description	Value	Function	Description
7	Sync Fault		0	Pull SALERT	
			1	Ignore	
6	Iout Average Overcurrent Fault		0	Pull SALERT	
			1	Ignore	

5	Iout Fast Overcurrent Fault		0	Pull SALERT	
			1	Ignore	
4	Short Circuit Protection Fault		0	Pull SALERT	
			1	Ignore	
3	Overtempera ture2 Fault		0	Pull SALERT	
			1	Ignore	
2	Auxiliary Voltage Fault		0	Pull SALERT	
			1	Ignore	
1	Startup Over Current Fault		0	Pull SALERT	
			1	Ignore	
0	Overtempera ture2 Warn		0	Pull SALERT	
			1	Ignore	

VOUT_MODE (0x20)
Description: Controls how future VOUT-related commands parameters will be interpreted.

Bit	Function	Description	Format
4:0		Five bit two's complement EXPONENT for the MANTISSA delivered as the data bytes for VOUT_COMMAND in VOUT_LINEAR Mode, five bit VID code identifier per in VID Mode or always set to 00000b in Direct Mode.	Integer Signed

Bit	Function	Description	Value	Function	Description
7:5		Set to 000b to select VOUT_LINEAR Mode (Five bit two's complement exponent for the MANTISSA delivered as the data bytes for an output voltage related command), set to 001b to select VID Mode (Five bit VID code identifier per) or set to 010b to select Direct Mode (Always set to 00000b).	000	Linear	Linear Mode Format.
			001	VID	VID Mode.
			010	Direct	Direct Mode.

VIN_ON (0x35)
Description: The VIN_ON command sets the value of the input voltage, in volts, at which the unit should start power conversion.

Bit	Description	Format	Unit
15:0	Sets the VIN ON threshold.	Linear	V

VIN_OFF (0x36)
Description: The VIN_OFF command sets the value of the input voltage, in volts, at which the unit, once operation has started, should stop power conversion.

Bit	Description	Format	Unit
15:0	Sets the VIN OFF threshold.	Linear	V

INTERLEAVE (0x37)
Description: Configures the phase offset with respect to a common SYNC clock. When multiple products share a common DC input supply, spreading of the switching phases between the products can be utilized. This reduces the input capacitance requirements and efficiency losses, since the peak current drawn from the input supply is effectively spread out over the whole switch period. If two or more units have their outputs connected in parallel, interleaving will reduce ripple currents. This requires that the products are synchronized using the SYNC pin.

Bit	Function	Description	Format
11:8	Group ID Number	Value 0-15. Sets an ID number to a group of interleaved rails.	Integer Unsigned
7:4	Number of Rails	Value 0-15. Sets the number of units in the group, including the SYNC OUT product.	Integer Unsigned
3:0	Rail Position	Value 0-15. Sets the interleave order for this unit. The product configured to SYNC OUT shall be assigned to number 0	Integer Unsigned

IOUT_CAL_OFFSET (0x39)
Description: Sets the current-sense offset.

Bit	Description	Format	Unit
15:0	Sets an offset to IOUT readings. Use to compensate for delayed measurements of current ramp.	Linear	A

VOUT_OV_FAULT_LIMIT (0x40)
Description: Output over voltage fault limit.

Bit	Description	Format	Unit
15:0	Output over voltage fault limit.	Vout Mode Unsigned (Exp = -11)	V

VOUT_OV_FAULT_RESPONSE (0x41)
Description: Output over voltage fault response.

Bit	Function	Description	Value	Function	Description
7:6	Response	Describes the device interruption operation. 00b - The PMBus device continues operation without interruption. 01b - The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]). 10b - The device shuts down (disables the output) and responds according to the Retry Setting in bits [5:3]. 11b - The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.	00	Ignore Fault	The PMBus device continues operation without interruption.
			01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].
			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.

5:3	Retries	The device attempts to restart the number of times set by these bits. 000b means the device does not attempt a restart. 111b means the device attempts restarting continuously.	000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

VOUT_OV_WARN_LIMIT (0x42)
Description: Output over voltage warning limit.

Bit	Description	Format	Unit
15:0	Output over voltage warning limit.	Vout Mode Unsigned (Exp = -11)	V

VOUT_UV_WARN_LIMIT (0x43)
Description: Output under voltage warning limit.

Bit	Description	Format	Unit
15:0	Output under voltage warning limit.	Vout Mode Unsigned (Exp = -11)	V

VOUT_UV_FAULT_LIMIT (0x44)
Description: Output under voltage fault limit.

Bit	Description	Format	Unit
15:0	Output under voltage fault limit.	Vout Mode Unsigned (Exp = -11)	V

VOUT_UV_FAULT_RESPONSE (0x45)
Description: Output under voltage fault response.

Bit	Function	Description	Value	Function	Description
7:6	Response		00	Ignore Fault	The PMBus device continues operation without interruption.

		Describes the device interruption operation. 00b - The PMBus device continues operation without interruption. 01b - The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]). 10b - The device shuts down (disables the output) and responds according to the Retry Setting in bits [5:3]. 11b - The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.	01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].
			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.
5:3	Retries	The device attempts to restart the number of times set by these bits. 000b means the device does not attempt a restart. 111b means the device attempts restarting continuously.	000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

IOUT_OC_FAULT_LIMIT (0x46)
Description: Output over current limit.

Bit	Description	Format	Unit
15:0	Output over current fault limit.	Linear	A

IOUT_OC_FAULT_RESPONSE (0x47)
Description: Output over current fault response.

Bit	Function	Description	Value	Function	Description

7:6	Response	For all values of bits [7:6],the device: Sets the corresponding fault bit in the status registers and If the device supports notifying the host, it does so.	00	Ignore Fault	The PMBus device continues to operate indefinitely while maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT without regard to the output voltage (known as constant-current or brickwall limiting).
			01	Conditioned constant current	The PMBus device continues to operate indefinitely while maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT as long as the output voltage remains above the minimum value specified by IOUT_OC_LV_FAULT_LIMIT. If the output voltage is pulled down to less than that value, then the PMBus device shuts down and responds according to the Retry setting in bits [5:3].
			10	Delay w/ Const. Current & Retry	The PMBus device continues to operate, maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT without regard to the output voltage, for the delay time set by bits [2:0] and the delay time units for specified in the IOUT_OC_FAULT_RESPONSE. If the device is still operating in current limiting at the end of the delay time, the device responds as programmed by the Retry Setting in bits [5:3].
			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.
5:3	Retries	The device attempts to restart the number of times set by these bits. 000b means the device does not attempt a restart. 111b means the device attempts restarting continuously.	000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time		0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	

		Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2.	6	64	
			7	128	

IOUT_OC_LV_FAULT_LIMIT (0x48)
Description: Set the output over-current low-voltage fault threshold.

Bit	Description	Format	Unit
15:0	Set the output over-current low-voltage fault threshold.	Vout Mode Unsigned (Exp = -11)	V

IOUT_OC_WARN_LIMIT (0x4A)
Description: Output over current warning limit.

Bit	Description	Format	Unit
15:0	Output over current warning limit.	Linear	A

IOUT_UC_FAULT_LIMIT (0x4B)
Description: Sets the output under-current peak limit.

Bit	Description	Format	Unit
15:0	Sets the IOUT under-current peak fault threshold.	Linear	A

IOUT_UC_FAULT_RESPONSE (0x4C)
Description: Configures the output undercurrent fault response. The command format is the same as the PMBus standard responses for voltage and temperature faults except that it sets the undercurrent status bit.

Bit	Function	Description	Value	Function	Description
7:6	Response	Describes the device interruption operation. For all modes set by bits [7:6], the device pulls SALERT low and sets the related fault bit in the status registers.	00	Ignore Fault	The PMBus device continues operation without interruption.
			01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and Retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].

			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.
5:3	Retry Setting	The device attempts to restart the number of times set by these bits.	000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared.
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device (10 ms/unit) is to continue operating after a fault is detected or for the amount of time (8.2 ms/unit) between attempts to restart.	0	0	
			1	1	
			2	2	
			3	3	
			4	4	
			5	5	
			6	6	
			7	7	

OT_FAULT_LIMIT (0x4F)
Description: Over temperature fault limit.

Bit	Description	Format	Unit
15:0	Over temperature fault limit.	Linear	°C

OT_FAULT_RESPONSE (0x50)
Description: Over temperature fault response.

Bit	Function	Description	Value	Function	Description
7:6	Response		00	Ignore Fault	The PMBus device continues operation without interruption.
			01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].
			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.

5:3	Retries		000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

OT_WARN_LIMIT (0x51)
Description: Over temperature warning limit.

Bit	Description	Format	Unit
15:0	Over temperature warning limit.	Linear	°C

UT_WARN_LIMIT (0x52)
Description: Under temperature warning limit.

Bit	Description	Format	Unit
15:0	Under temperature warning limit.	Linear	°C

UT_FAULT_LIMIT (0x53)
Description: Under temperature fault limit.

Bit	Description	Format	Unit
15:0	Under temperature fault limit.	Linear	°C

UT_FAULT_RESPONSE (0x54)
Description: Under temperature fault response.

Bit	Function	Description	Value	Function	Description
7:6	Response		00	Ignore Fault	The PMBus device continues operation without interruption.
			01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].

			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.
5:3	Retries		000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

VIN_OV_FAULT_LIMIT (0x55)
Description: Input over voltage fault limit.

Bit	Description	Format	Unit
15:0	Input over voltage fault limit.	Linear	V

VIN_OV_FAULT_RESPONSE (0x56)
Description: Input over voltage fault response.

Bit	Function	Description	Value	Function	Description
7:6	Response		00	Ignore Fault	The PMBus device continues operation without interruption.
			01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].
			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.

5:3	Retries		000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

VIN_OV_WARN_LIMIT (0x57)
Description: Input over voltage warning limit.

Bit	Description	Format	Unit
15:0	Input over voltage warning limit.	Linear	V

VIN_UV_WARN_LIMIT (0x58)
Description: Input under voltage warning limit. This command set also the input voltage threshold for the HRR function (Hybrid Ratio Regulation). The HRR function is enabled with command MFR_SPECIAL_OPTIONS (0xE0).

Bit	Description	Format	Unit
15:0	Input under voltage warning limit and/or HRR threshold.	Linear	V

VIN_UV_FAULT_LIMIT (0x59)
Description: Input under voltage fault limit.

Bit	Description	Format	Unit
15:0	Input under voltage fault limit.	Linear	V

VIN_UV_FAULT_RESPONSE (0x5A)
Description: Input under voltage fault response.

Bit	Function	Description	Value	Function	Description
7:6	Response		00	Ignore Fault	The PMBus device continues operation without interruption.
			01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].

			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.
5:3	Retries		000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

POWER_GOOD_ON (0x5E)
Description: Sets the output voltage threshold for asserting PG (Power Good).

Bit	Description	Format	Unit
15:0	The POWER_GOOD_ON command sets the output voltage at which an optional POWER_GOOD signal should be asserted.	Vout Mode Unsigned (Exp = -11)	V

POWER_GOOD_OFF (0x5F)
Description: Sets the output voltage threshold for deasserting PG (Power Good).

Bit	Description	Format	Unit
15:0	The POWER_GOOD_OFF command sets the output voltage at which an optional POWER_GOOD signal should be deasserted.	Vout Mode Unsigned (Exp = -11)	V

TON_DELAY (0x60)
Description: Sets the turn-on delay time

Bit	Description	Format	Unit
15:0	Sets the delay time from ENABLE to start of VOUT rise.	Linear	ms

TON_MAX_FAULT_RESPONSE (0x63)
Description: Only some of the response types are supported.

Bit	Function	Description	Value	Function	Description
7:6	Response		00	Ignore Fault	The PMBus device continues operation without interruption.

			01	Perform Retries while Operating	The PMBus device continues operation for the delay time specified by bits [2:0] and the delay time unit specified for that particular fault. If the fault condition is still present at the end of the delay time, the unit responds as programmed in the Retry Setting (bits [5:3]).
			10	Disable and retry	The device shuts down (disables the output) and responds according to the retry setting in bits [5:3].
			11	Disable, Resume When OK	The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.
5:3	Retries		000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xD2. TON_MAX_FAULT_RESPONSE time unit is referenced to VOUT FAULT time unit.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

TOFF_DELAY (0x64)
Description: Sets the turn-off delay.

Bit	Description	Format	Unit
15:0	Sets the delay time from DISABLE to start of VOUT fall.	Linear	ms

STATUS_BYTE (0x78)
Description: Returns a brief fault/warning status byte.

Bit	Function	Description	Value	Description
7	Busy	This bit is asserted if the unit is busy	0	No fault
			1	Fault
6	Off	This bit is asserted if the unit is not providing power to the output, regardless of the reason, including simply not being enabled.	0	No fault
			1	Fault
5	Vout Overvoltage Fault	An output overvoltage fault has occurred.	0	No fault
			1	Fault
4		An output overcurrent fault has occurred.	0	No fault

	Iout Overcurrent Fault		1	Fault
3	Vin Undervoltage Fault	An input undervoltage fault has occurred.	0	No fault
			1	Fault
2	Temperature	A temperature fault or warning has occurred.	0	No fault
			1	Fault
1	Communication/Logic	A communications, memory or logic fault has occurred.	0	No fault
			1	Fault
0	None of the Above	A fault or warning not listed in bits [7:1] has occurred.	0	No fault
			1	Fault

STATUS_WORD (0x79)
Description: Returns an extended fault/warning status byte.

Bit	Function	Description	Value	Description
15	Vout	An output voltage fault or warning has occurred.	0	No fault
			1	Fault
14	Iout/Pout	An output current or output power fault or warning has occurred.	0	No Fault.
			1	Fault.
13	Input	An input voltage, input current, or input power fault or warning has occurred.	0	No Fault.
			1	Fault.
12	Mfr Specific	A manufacturer specific fault or warning has occurred.	0	No fault.
			1	Fault.
11	Power-Good	The Power-Good signal, if present, is negated.	0	No Fault.
			1	Fault.
9	Other	A bit in Status-Other is set.	0	No fault
			1	Fault
6	Off	This bit is asserted if the unit is not providing power to the output, regardless of the reason, including simply not being enabled.	0	No fault
			1	Fault
5	Vout Overvoltage Fault	An output overvoltage fault has occurred.	0	No Fault.
			1	Fault.
4	Iout Overcurrent Fault	An output overcurrent fault has occurred.	0	No Fault.
			1	Fault.
3	Vin Undervoltage Fault	An input undervoltage fault has occurred.	0	No Fault.
			1	Fault.
2	Temperature	A temperature fault or warning has occurred.	0	No Fault.
			1	Fault.
1	Communication/Logic	A communications, memory or logic fault has occurred.	0	No fault.
			1	Fault.
0	None of the Above	A fault or warning not listed in bits [7:1] has occurred.	0	No fault.
			1	Fault.

STATUS_VOUT (0x7A)
Description: Returns Vout-related fault/warning status bits.

Bit	Function	Description	Value	Description
7	Vout Overvoltage Fault	Vout Overvoltage Fault.	0	No Fault.
			1	Fault.
6	Vout Overvoltage Warning	Vout Overvoltage Warning.	0	No Warning.
			1	Warning.
5	Vout Undervoltage Warning	Vout Undervoltage Warning.	0	No Warning.
			1	Warning.
4	Vout Undervoltage Fault	Vout Undervoltage Fault.	0	No Fault.
			1	Fault.

3	Vout Max Warning	Vout Max Warning (An attempt has been made to set the output voltage to value higher than allowed by the Vout Max command (Section 13.5).	0	No Warning.
			1	Warning.
2	Ton Max Fault	Ton-Max Fault.	0	No Fault
			1	Fault.
1	Toff Max Warning	Toff Max Warning.	0	No Warning.
			1	Warning.

STATUS_IOUT (0x7B)
Description: Returns Iout-related fault/warning status bits.

Bit	Function	Description	Value	Description
7	Iout Overcurrent Fault	Iout Overcurrent Fault.	0	No Fault.
			1	Fault.
6	Iout Overcurrent And Low Voltage Fault	Iout Overcurrent and low voltage fault.	0	No Fault.
			1	Fault.
5	Iout Over Current Warning	Iout Overcurrent Warning.	0	No Warning.
			1	Warning.
4	Iout Undercurrent Fault	Iout Undercurrent Fault.	0	No Fault.
			1	Fault.

STATUS_INPUT (0x7C)
Description: Returns VIN/IIN-related fault/warning status bits.

Bit	Function	Description	Value	Description
7	Vin Overvoltage Fault	Vin Overvoltage Fault.	0	No Fault.
			1	Fault.
6	Vin Overvoltage Warning	VIN Overvoltage Warning.	0	No Warning.
			1	Warning.
5	Vin Undervoltage Warning	Vin Undervoltage Warning.	0	No Warning.
			1	Warning.
4	Vin Undervoltage Fault	Vin Undervoltage Fault.	0	No Fault.
			1	Fault.
3	Insufficient Vin	Asserted when either the input voltage has never exceeded the input turn-on threshold Vin-On, or if the unit did start, the input voltage decreased below the turn-off threshold.	0	No Insufficient VIN encountered yet.
			1	Insufficient Unit is off.

STATUS_TEMPERATURE (0x7D)
Description: Returns the temperature-related fault/warning status bits

Bit	Function	Description	Value	Description
7	Overtemperature Fault	Overtemperature Fault.	0	No Fault.
			1	Fault.
6	Overtemperature Warning	Overtemperature Warning.	0	No Warning.
			1	Warning.
5	Undertemperature Warning	Undertemperature Warning.	0	No Warning.
			1	Warning.
4	Undertemperature Fault	Undertemperature Fault.	0	No Fault.
			1	Fault.

STATUS_CML (0x7E)
Description: Returns Communication/Logic/Memory-related fault/warning status bits.

Bit	Function	Description	Value	Description
7	Invalid Or Unsupported Command Received	Invalid Or Unsupported Command Received.	0	No Invalid Command Received.
			1	Invalid Command Received.
6	Invalid Or Unsupported Data Received	Invalid Or Unsupported Data Received.	0	No Invalid Data Received.
			1	Invalid Data Received.
5	Packet Error Check Failed	Packet Error Check Failed.	0	No Failure.
			1	Failure.
4	Memory Fault Detected	Memory Fault Detected.	0	No Fault.
			1	Fault.
3	Processor Fault Detected	Processor fault detected.	0	No Fault.
			1	Fault.
1	Other Communication Fault	A communication fault other than the ones listed in this table has occurred.	0	No Fault.
			1	Fault.
0	Memory Or Logic Fault	Other Memory Or Logic Fault has occurred.	0	No Fault.
			1	Fault.

STATUS_OTHER (0x7F)
Description: Returns a brief other fault/warning status bits.

Bit	Description	Value	Description
0	The device was the first to assert SMBALERT.		

STATUS_MFR_SPECIFIC (0x80)
Description: Returns manufacturer specific status information.

Bit	Function	Description	Value	Description
7	Sync Fault	Sync fault.	0	No fault.
			1	Fault.
6	Iout Average Overcurrent Fault	Iout average overcurrent fault.	0	No fault.
			1	Fault.
5	Iout Fast Overcurrent Fault	Iout fast overcurrent fault.	0	No fault.
			1	Fault.
4	Short Circuit Protection Fault	Short circuit protection fault.	0	No fault.
			1	Fault.
3	Overtemperature2 Fault	Overtemperature2 fault.	0	No fault.
			1	Fault.
2	Auxiliary Voltage Fault	Auxiliary voltage fault.	0	No fault.
			1	Fault.
1	Startup Over Current Fault	Startup over current fault.	0	No fault.
			1	Fault.
0	Overtemperature2 Warn	Overtemperature2 warn.	0	No fault.
			1	Fault.

READ_VIN (0x88)
Description: Returns the measured input voltage.

Bit	Description	Format	Unit
15:0	Returns the input voltage reading.	Linear	V

READ_VOUT (0x8B)
Description: Returns the measured output voltage.

Bit	Description	Format	Unit
15:0	Returns the measured output voltage.	Vout Mode Unsigned (Exp = -11)	V

READ_IOUT (0x8C)
Description: Returns the measured output current.

Bit	Description	Format	Unit
15:0	Returns the measured output current.	Linear	A

READ_TEMPERATURE_1 (0x8D)
Description: Reads temperature from the temperature sensor chosen in MFR_SELECT_TEMPERATURE_SENSOR (0xDC) command.

Bit	Description	Format	Unit
15:0		Linear	°C

READ_TEMPERATURE_2 (0x8E)
Description: Reads temperature from the temperature sensor chosen in MFR_SELECT_TEMPERATURE_SENSOR (0xDC) command.

Bit	Description	Format	Unit
15:0		Linear	°C

READ_DUTY_CYCLE (0x94)
Description: Returns the actual duty cycle in percent.

Bit	Description	Format	Unit
15:0	Returns the actual duty cycle in percent.	Linear	%

READ_FREQUENCY (0x95)
Description: Returns the actual switching frequency.

Bit	Description	Format	Unit
15:0	Returns the actual switching frequency.	Linear	kHz

PMBUS_REVISION (0x98)
Description: Returns the PMBus revision number for this device.

Bit	Function	Description	Value	Function	Description
7:4	Part I Revision	Part I Revision.	0x0	1.0	Part I Revision 1.0.
			0x1	1.1	Part I Revision 1.1.
			0x2	1.2	Part I Revision 1.2.
			0x3	1.3	Part I Revision 1.3.
3:0	Part II Revision	Part II Revision.	0x0	1.0	Part II Revision 1.0.
			0x1	1.1	Part II Revision 1.1.
			0x2	1.2	Part II Revision 1.2.
			0x3	1.3	Part II Revision 1.3.

MFR_ID (0x99)
Description: Sets the Manufacturers ID

Bit	Description	Format
95:0	Maximum of 12 characters.	ASCII

MFR_MODEL (0x9A)
Description: Sets the MFR MODEL string.

Bit	Description	Format
159:0	Maximum of 20 characters.	ASCII

MFR_REVISION (0x9B)
Description: Sets the MFR revision string.

Bit	Description	Format
95:0	Maximum of 12 characters.	ASCII

MFR_LOCATION (0x9C)
Description: Sets the MFR location string.

Bit	Description	Format
95:0	Maximum of 12 characters.	ASCII

MFR_DATE (0x9D)
Description: This command returns the date the regulator was manufactured.

Bit	Description	Format
95:0	Maximum of 12 characters.	ASCII

MFR_SERIAL (0x9E)
Description: This command returns a string of 13 characters and numbers that provides a unique identification of the regulator.

Bit	Description	Format
159:0	Maximum of 20 characters.	ASCII

USER_DATA_00 (0xB0)
Description: This command is available as generic read/write storage for customers.

Bit	Description	Format
127:0	16 bytes of user data.	Byte Array

FW_CONFIG_REGULATION (0xC5)
Description: FW CONFIG REGULATION parameter

Bit	Description	Value	Function	Description
0	Enable diode emulation at startup	0	Disabled	
		1	Enabled	

FW_CONFIG_FAULTS (0xC8)
Description: FW CONFIG FAULTS parameter

Bit	Function	Description	Value	Function	Description

7:6	Vout Delay Unit	Vout_Delay_Unit Time unit for retry responses. 0: 1ms, 1: 4ms, 2: 16ms, 3: 256ms	00	1ms/unit	Vout Delay Unit Time unit for retry responses
			01	4ms/unit	Vout Delay Unit Time unit for retry responses
			10	16ms/unit	Vout Delay Unit Time unit for retry responses
			11	256ms/unit	Vout Delay Unit Time unit for retry responses
5:4	Vin Delay Unit	Vin_Delay_Unit Time unit for retry responses. 0: 1ms, 1: 4ms, 2: 16ms, 3: 256ms	00	1ms/unit	Vin Delay Unit Time unit for retry responses
			01	4ms/unit	Vin Delay Unit Time unit for retry responses
			10	16ms/unit	Vin Delay Unit Time unit for retry responses
			11	256ms/unit	Vin Delay Unit Time unit for retry responses
3:2	Iout Delay Unit	IOUT_Delay_Unit Time unit for retry responses. 0: 1ms, 1: 4ms, 2: 16ms, 3: 256ms	00	1ms/unit	IOUT Delay Unit Time unit for retry responses
			01	4ms/unit	IOUT Delay Unit Time unit for retry responses
			10	16ms/unit	IOUT Delay Unit Time unit for retry responses
			11	256ms/unit	IOUT Delay Unit Time unit for retry responses
1:0	Temperature Delay Unit	Temperature_Delay_Unit Time unit for retry responses. 0: 1ms, 1: 4ms, 2: 16ms, 3: 256ms	00	1ms/unit	Temperature Delay Unit Time unit for retry responses
			01	4ms/unit	Temperature Delay Unit Time unit for retry responses
			10	16ms/unit	Temperature Delay Unit Time unit for retry responses
			11	256ms/unit	Temperature Delay Unit Time unit for retry responses

FW_CONFIG_PMBUS (0xC9)
Description: This command contains various configurable settings related to PMBus address and digital pins.

Bit	Function	Description	Format
31:24	PMBus Base Addr	Base Address for PMBus offset to start from	Integer Unsigned
23:17	PMBus Addr Offset	PMBUS Address offset when resistor offset Not enabled	Integer Unsigned

Bit	Function	Description	Value	Function	Description
33	Power good polarity	Power good polarity (1:active high; 0: active low).	0	Active low	
			1	Active high	
32	Control pin polarity	Control pin polarity (1:active high; 0: active low).	0	Active low	
			1	Active high	
16	PMBus Addr Offset Resistor Enable	PMBus_addr_offset_enable Enable PMBUS Address Offset via resistor	0	Disabled	
			1	Enabled	

MFR_IOUT_OC_FAST_FAULT_RESPONSE (0xCA)
Description: Output over current fault response.

Bit	Function	Description	Value	Function	Description

7:6	Response	For all values of bits [7:6],the device: Sets the corresponding fault bit in the status registers and If the device supports notifying the host, it does so.	00	Ignore Fault	The PMBus device continues to operate indefinitely while maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT without regard to the output voltage (known as constant-current or brickwall limiting).
			11	Shutdown and Retry	The PMBus device continues to operate, maintaining the output current at the value set by IOUT_OC_FAST_FAULT_LIMIT without regard to the output voltage, for the delay time set by bits [2:0] and the delay time units for specified in the IOUT_OC_FAST_FAULT_RESPONSE. If the device is still operating in current limiting at the end of the delay time, the device responds as programmed by the Retry Setting in bits [5:3].
5:3	Retries	The device attempts to restart the number of times set by these bits. 000b means the device does not attempt a restart. 111b means the device attempts restarting continuously.	000	Do Not Retry	A zero value for the Retry Setting means that the unit does not attempt to restart. The output remains disabled until the fault is cleared (Section 10.7).
2:0	Retry Time and Delay Time	Number of delay time units. Used for either the amount of time the device is to continue operating after a fault is detected or for the amount of time between attempts to restart. The time unit is set in register 0xC8.	0	1	
			1	2	
			2	4	
			3	8	
			4	16	
			5	32	
			6	64	
			7	128	

MFR_IOUT_AVG_OC_FAULT_LIMIT (0xD0)
Description: Average output over current limit.

Bit	Description	Format	Unit
15:0	Average output over current fault limit.	Linear	A

MFR_IOUT_OC_FAST_FAULT_LIMIT (0xD1)
Description: The MFR_IOUT_OC_FAST_FAULT_LIMIT command sets or retrieves Iout fast overcurrent fault threshold, in Amperes.

Bit	Description	Format	Unit
15:0	Sets Iout fast over-current fault threshold.	Integer Unsigned	A

MFR_IOUT_AVG_COEFF (0xD2)
Description: Coefficient for controlling the averaging strength for the averaged Iout current limit.

Bit	Description	Format
5:0	Coefficient for controlling the averaging strength for the averaged Iout current limit. Value 0-63. Setting the coefficient to 0 will disable the averaging and the average current limit behaviour.	Integer Unsigned

MFR_READ_VAUX (0xDA)
Description: Returns the measured auxiliary input voltage.

Bit	Description	Format	Unit
15:0	Returns the auxiliary input voltage reading.	Linear	V

MFR_SELECT_TEMPERATURE_SENSOR (0xDC)
Description: Select which temperature sensor, internal one or external remote temperature sensor, is used.

Bit	Function	Description	Value	Function	Description
4:3	Fault Source Select	Select which temperature sensor, internal one or external remote temperature sensor, is used.	00	Temp A	Temp A temperature sensor selected.
			01	Temp B	Temp B temperature sensor selected.
			10	Temp I	Temp I temperature sensor selected.
2:0	READ_TEMPERATURE_1 READ_TEMPERATURE_2 Source Select	READ_TEMPERATURE_1 READ_TEMPERATURE_2 Source Select.	000	TempA TempB	TempA (External Temperature sensor A) TempB (External Temperature sensor B).
			001	TempA TempI	TempA (External Temperature sensor A) TempI (Internal Temperature sensor).
			010	TempB TempA	TempB (External Temperature sensor B) TempA (External Temperature sensor A).
			011	TempB TempI	TempB (External Temperature sensor B) TempI (Internal Temperature sensor).
			100	TempI TempA	TempI (Internal Temperature sensor) TempA (External Temperature sensor A).
			101	TempI TempB	TempI (Internal Temperature sensor) TempB (External Temperature sensor B).

MFR_FLEX_FIRMWARE_CMD (0xE0)
Description: Mfr. firmware command.

Bit	Description	Format
63:0	Mfr. firmware command.	Byte Array

MFR_TEMP_COEFF (0xE7)
Description: Coefficient for Iout temperature compensation.

Bit	Description	Format
15:0	Coefficient in Q16. Iout compensation factor calculated according to: 1 / (1 + t_coeff * (T - 20))	Fixed Point Unsigned

MFR_IOUT_APC (0xEA)
Description: The iout apc gain.

Bit	Description	Format	Unit
15:0	SSet the iout apc gain. the format is Linear 11, Exponent is -9 or -8 (User selection possible). The LSB varies with isen_gain_mode - ISEN_LSB/Secondary current sense resistor (Rsense).	Linear	A

MFR_MULTI_PIN_CONFIG (0xF9)
Description: The MFR_MULTI_PIN_CONFIG command can be re-configured to enable or disable different functions and set the pin configuration.

Bit	Function	Description	Value	Function	Description
7	SMBAlert pin function	Selects if the SMBAlert pin should be used for ALERT or SYNC.	00	Alert	SMBAlert pin used as SMBAlert.
			01	Sync	SMBAlert pin used as SYNC.
6:5	Sync Mode	These bits configures the direction of the sync pin as either SYNC OUT or SYNC IN. Use the INTERLEAVE command to enable/disable the sync function and to configure phase offset.	00	Disabled	Sync Pin disabled.
			01	Sync in	When the product is configured as SYNC IN it will synchronize its switching frequency to an external sync signal. The switching phases can be spread individually using the INTERLEAVE command 0x37.
			10	Sync out	When the product is configured as SYNC OUT it will send out a SYNC signal. Only 1 product in a group can be configured as SYNC OUT.
4	Sync Output	Selects the output type of the Sync pin.	0	Open Drain	Sync output configured as Open Drain.
2	Power Good Pull-down	This bit enables or disables Power Good pin pull-down.	0	Disabled	
			1	Enabled	
1	Power Good Output	Two output options are available for Power Good output, they are Push/Pull or Open Drain.	0	Push/Pull	Power Good configured Push/Pull.
			1	Open Drain	Power Good configured Open Drain.