# Technical Reference PMBus BMR473

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 BMR4731X01/001 R1 | | Min Set Value | Max Set Value | Unit |
|---|---|---|---|---|---|---|---|
| 0x01 | OPERATION | R/W Byte | 0x04 | | | | |
| 0x02 | ON_OFF_CONFIG | R/W Byte | 0x17 | | | | |
| 0x03 | CLEAR_FAULTS | Send Byte | | | | | |
| 0x04 | PHASE | R/W Byte | | | | | |
| 0x10 | WRITE_PROTECT | R/W Byte | 0x00 | | | | |
| 0x15 | STORE_USER_ALL (Phase 0xFF) | Send Byte | | | | | |
| 0x16 | RESTORE_USER_ALL (Phase 0xFF) | Send Byte | | | | | |
| 0x19 | CAPABILITY | Read Byte | | | | | |
| 0x1B | SMBALERT_MASK_VOUT (STATUS_VOUT) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_VOUT (Phase 0xFF) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_IOUT (STATUS_IOUT) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_IOUT (Phase 0xFF) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_INPUT (STATUS_INPUT) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_INPUT (Phase 0xFF) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_TEMPERATURE (STATUS_TEMPERATURE) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_TEMPERATURE (Phase 0xFF) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_CML (STATUS_CML) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_CML (Phase 0xFF) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_MFR_SPECIFIC (STATUS_MFR_SPECIFIC) | SMBAlert Mask | 0x00 | | | | |
| 0x1B | SMBALERT_MASK_MFR_SPECIFIC (Phase 0xFF) | SMBAlert Mask | 0x00 | | | | |
| 0x20 | VOUT_MODE | Read Byte | 0x97 | | | | |
| 0x21 | VOUT_COMMAND | R/W Word | 1 x Vout by pin-strap | | | | |
| 0x22 | VOUT_TRIM | R/W Word | Unit Specific | | | | |
| 0x24 | VOUT_MAX | R/W Word | Configured by pin-strap | | 0.6 | 6.0 | V |
| 0x25 | VOUT_MARGIN_HIGH | R/W Word | 0x021A | 1.05 | | | * Vout |
| 0x26 | VOUT_MARGIN_LOW | R/W Word | 0x01E6 | 0.95 | | | * Vout |
| 0x27 | VOUT_TRANSITION_RATE | R/W Word | 0xE010 | 1.00 | 0.067 | 15.933 | V/ms |
| 0x29 | VOUT_SCALE_LOOP | R/W Word | Configured by pin-strap | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0x2B | VOUT_MIN | R/W Word | Configured by pin-strap | | 0.5 | 5.0 | V |
| 0x33 | FREQUENCY_SWITCH | R/W Word | 0x01C2 | 450.00 | 450 | 900 | kHz |
| 0x35 | VIN_ON | R/W Word | 0xF016 | 5.50 | 5.5 | 15 | V |
| 0x36 | VIN_OFF | R/W Word | 0xF012 | 4.50 | 4.5 | 15 | V |
| 0x37 | INTERLEAVE | R/W Word | | | | | |
| 0x38 | IOUT_CAL_GAIN | R/W Word | Unit Specific | | | | |
| 0x39 | IOUT_CAL_OFFSET (Phase 0) | R/W Word | Unit Specific | | | | |
| 0x39 | IOUT_CAL_OFFSET (Phase 1) | R/W Word | Unit Specific | | | | |
| 0x39 | IOUT_CAL_OFFSET (Phase 2) | R/W Word | Unit Specific | | | | |
| 0x39 | IOUT_CAL_OFFSET (Phase 3) | R/W Word | Unit Specific | | | | |
| 0x40 | VOUT_OV_FAULT_LIMIT | R/W Word | 0x024C | 1.15 | | | * Vout |
| 0x41 | VOUT_OV_FAULT_RESPONSE | R/W Byte | 0xBF | | | | |
| 0x42 | VOUT_OV_WARN_LIMIT | R/W Word | 0x0233 | 1.10 | | | * Vout |
| 0x43 | VOUT_UV_WARN_LIMIT | R/W Word | 0x01CC | 0.90 | | | * Vout |
| 0x44 | VOUT_UV_FAULT_LIMIT | R/W Word | 0x01B3 | 0.85 | | | * Vout |
| 0x45 | VOUT_UV_FAULT_RESPONSE | R/W Byte | 0xBF | | | | |
| 0x46 | IOUT_OC_FAULT_LIMIT (Phase 0) | R/W Word | 0xF0D0 | 52.00 | 8 | 52 | A |
| 0x46 | IOUT_OC_FAULT_LIMIT (Phase 1) | R/W Word | 0xF0D0 | 52.00 | 8 | 52 | A |
| 0x46 | IOUT_OC_FAULT_LIMIT (Phase 2) | R/W Word | 0xF0D0 | 52.00 | 8 | 52 | A |
| 0x46 | IOUT_OC_FAULT_LIMIT (Phase 3) | R/W Word | 0xF0D0 | 52.00 | 8 | 52 | A |
| 0x47 | IOUT_OC_FAULT_RESPONSE | R/W Byte | 0xBF | | | | |
| 0x4A | IOUT_OC_WARN_LIMIT (Phase 0) | R/W Word | 0xF0A0 | 40.00 | 8 | 52 | A |
| 0x4A | IOUT_OC_WARN_LIMIT (Phase 1) | R/W Word | 0xF0A0 | 40.00 | 8 | 52 | A |
| 0x4A | IOUT_OC_WARN_LIMIT (Phase 2) | R/W Word | 0xF0A0 | 40.00 | 8 | 52 | A |
| 0x4A | IOUT_OC_WARN_LIMIT (Phase 3) | R/W Word | 0xF0A0 | 40.00 | 8 | 52 | A |
| 0x4F | OT_FAULT_LIMIT (Phase 0) | R/W Word | 0x0087 | 135.00 | 0 | 150 | °C |
| 0x4F | OT_FAULT_LIMIT (Phase 1) | R/W Word | 0x0087 | 135.00 | 0 | 150 | °C |
| 0x4F | OT_FAULT_LIMIT (Phase 2) | R/W Word | 0x0087 | 135.00 | 0 | 150 | °C |
| 0x4F | OT_FAULT_LIMIT (Phase 3) | R/W Word | 0x0087 | 135.00 | 0 | 150 | °C |
| 0x50 | OT_FAULT_RESPONSE | R/W Byte | 0xBF | | | | |
| 0x51 | OT_WARN_LIMIT (Phase 0) | R/W Word | 0x007D | 125.00 | 0 | 150 | °C |
| 0x51 | OT_WARN_LIMIT (Phase 1) | R/W Word | 0x007D | 125.00 | 0 | 150 | °C |
| 0x51 | OT_WARN_LIMIT (Phase 2) | R/W Word | 0x007D | 125.00 | 0 | 150 | °C |
| 0x51 | OT_WARN_LIMIT (Phase 3) | R/W Word | 0x007D | 125.00 | 0 | 150 | °C |
| 0x55 | VIN_OV_FAULT_LIMIT | R/W Word | 0x0010 | 16.00 | 6 | 16 | V |
| 0x56 | VIN_OV_FAULT_RESPONSE | R/W Byte | 0xBF | | | | |
| 0x58 | VIN_UV_WARN_LIMIT (Phase 0) | R/W Word | 0xF016 | 5.50 | 4 | 11.25 | V |
| 0x58 | VIN_UV_WARN_LIMIT (Phase 1) | R/W Word | 0xF016 | 5.50 | 4 | 11.25 | V |
| 0x58 | VIN_UV_WARN_LIMIT (Phase 2) | R/W Word | 0xF016 | 5.50 | 4 | 11.25 | V |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0x58 | VIN_UV_WARN_LIMIT (Phase 3) | R/W Word | 0xF016 | 5.50 | 4 | 11.25 | V |
| 0x60 | TON_DELAY | R/W Word | 0xF814 | 10.00 | 0 | 127.5 | ms |
| 0x61 | TON_RISE | R/W Word | 0xF028 | 10.00 | 0 | 31.75 | ms |
| 0x62 | TON_MAX_FAULT_LIMIT | R/W Word | 0xF800 | 0.00 | | | ms |
| 0x63 | TON_MAX_FAULT_RESPONSE | R/W Byte | 0x3B | | | | |
| 0x64 | TOFF_DELAY | R/W Word | 0xF800 | 0.00 | 0 | 127.5 | ms |
| 0x65 | TOFF_FALL | R/W Word | 0xF002 | 0.50 | 0 | 31.75 | ms |
| 0x78 | STATUS_BYTE (Phase 0) | Read Byte | | | | | |
| 0x78 | STATUS_BYTE (Phase 1) | Read Byte | | | | | |
| 0x78 | STATUS_BYTE (Phase 2) | Read Byte | | | | | |
| 0x78 | STATUS_BYTE (Phase 3) | Read Byte | | | | | |
| 0x79 | STATUS_WORD (Phase 0) | R/W Word | | | | | |
| 0x79 | STATUS_WORD (Phase 1) | R/W Word | | | | | |
| 0x79 | STATUS_WORD (Phase 2) | R/W Word | | | | | |
| 0x79 | STATUS_WORD (Phase 3) | R/W Word | | | | | |
| 0x7A | STATUS_VOUT | R/W Byte | | | | | |
| 0x7B | STATUS_IOUT (Phase 0) | R/W Byte | | | | | |
| 0x7B | STATUS_IOUT (Phase 1) | R/W Byte | | | | | |
| 0x7B | STATUS_IOUT (Phase 2) | R/W Byte | | | | | |
| 0x7B | STATUS_IOUT (Phase 3) | R/W Byte | | | | | |
| 0x7C | STATUS_INPUT (Phase 0) | R/W Byte | | | | | |
| 0x7C | STATUS_INPUT (Phase 1) | R/W Byte | | | | | |
| 0x7C | STATUS_INPUT (Phase 2) | R/W Byte | | | | | |
| 0x7C | STATUS_INPUT (Phase 3) | R/W Byte | | | | | |
| 0x7D | STATUS_TEMPERATURE (Phase 0) | R/W Byte | | | | | |
| 0x7D | STATUS_TEMPERATURE (Phase 1) | R/W Byte | | | | | |
| 0x7D | STATUS_TEMPERATURE (Phase 2) | R/W Byte | | | | | |
| 0x7D | STATUS_TEMPERATURE (Phase 3) | R/W Byte | | | | | |
| 0x7E | STATUS_CML (Phase 0) | R/W Byte | | | | | |
| 0x7E | STATUS_CML (Phase 1) | R/W Byte | | | | | |
| 0x7E | STATUS_CML (Phase 2) | R/W Byte | | | | | |
| 0x7E | STATUS_CML (Phase 3) | R/W Byte | | | | | |
| 0x7F | STATUS_OTHER | Read Byte | | | | | |
| 0x80 | STATUS_MFR_SPECIFIC (Phase 0) | R/W Byte | | | | | |
| 0x80 | STATUS_MFR_SPECIFIC (Phase 1) | R/W Byte | | | | | |
| 0x80 | STATUS_MFR_SPECIFIC (Phase 2) | R/W Byte | | | | | |
| 0x80 | STATUS_MFR_SPECIFIC (Phase 3) | R/W Byte | | | | | |
| 0x88 | READ_VIN (Phase 0) | Read Word | | | | | |
| 0x88 | READ_VIN (Phase 1) | Read Word | | | | | |
| 0x88 | READ_VIN (Phase 2) | Read Word | | | | | |
| 0x88 | READ_VIN (Phase 3) | Read Word | | | | | |
| 0x8B | READ_VOUT (Phase 0) | Read Word | | | | | |
| 0x8B | READ_VOUT (Phase 1) | Read Word | | | | | |
| 0x8B | READ_VOUT (Phase 2) | Read Word | | | | | |
| 0x8B | READ_VOUT (Phase 3) | Read Word | | | | | |
| 0x8C | READ_IOUT (Phase 0) | Read Word | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0x8C | READ_IOUT (Phase 1) | Read Word | | | | | |
| 0x8C | READ_IOUT (Phase 2) | Read Word | | | | | |
| 0x8C | READ_IOUT (Phase 3) | Read Word | | | | | |
| 0x8C | READ_IOUT (Per Rail) | Read Word | | | | | |
| 0x8D | READ_TEMPERATURE_1 (Phase 0) | Read Word | | | | | |
| 0x8D | READ_TEMPERATURE_1 (Phase 1) | Read Word | | | | | |
| 0x8D | READ_TEMPERATURE_1 (Phase 2) | Read Word | | | | | |
| 0x8D | READ_TEMPERATURE_1 (Phase 3) | Read Word | | | | | |
| 0x8D | READ_TEMPERATURE_1 (Per Rail) | Read Word | | | | | |
| 0x98 | PMBUS_REVISION | Read Byte | | | | | |
| 0x99 | MFR_ID | R/W Block3 | Unit Specific | | | | |
| 0x9A | MFR_MODEL | R/W Block3 | Unit Specific | | | | |
| 0x9B | MFR_REVISION | R/W Block3 | Unit Specific | | | | |
| 0x9E | MFR_SERIAL | R/W Block3 | Unit Specific | | | | |
| 0xAD | IC_DEVICE_ID | Read Block6 | | | | | |
| 0xAE | IC_DEVICE_REV | Read Block2 | | | | | |
| 0xB1 | USER_DATA_01 (Phase 0xFF) | R/W Block5 | 0xC43FF82311 | | | | |
| 0xD0 | TELEMETRY_CONFIG | R/W Block6 | 0x030003030303 | | | | |
| 0xDA | READ_ALL | Read Block14 | | | | | |
| 0xDB | STATUS_ALL | Read Block7 | | | | | |
| 0xDC | STATUS_PHASE (Phase 0xFF) | Read Word | | | | | |
| 0xE3 | PGOOD_CONFIG | R/W Word | 0x006A | | | | |
| 0xE4 | SYNC_CONFIG | R/W Byte | 0xF0 | | | | |
| 0xEC | STACK_CONFIG | R/W Word | 0x0000 | | | | |
| 0xED | MISC_OPTIONS | R/W Word | 0x0000 | | | | |
| 0xEE | PIN_DETECT_OVERRIDE | R/W Word | 0x192D | | | | |
| 0xEF | SLAVE_ADDRESS | R/W Byte | 0x14 | | | | |
| 0xF0 | NVM_CHECKSUM | Read Word | | | | | |
| 0xF1 | SIMULATE_FAULT | R/W Word | 0x0000 | | | | |

**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 controlled ramp-down or sequencing. |
| | | | 01 | Soft Off | Disable by controlled ramp-down timings or sequencing. |
| | | | 10 | Enable | Enable device to the set voltage or margin state, using ramp up timings / sequencing. |
| 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 overvoltage/undervoltage warnings and faults are ignored and do not trigger shutdown or STATUS updates. |
| | | | 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 CTRL pin and the PMBus.

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 4 | Powerup Operation | | 0 | Ignore CTRL pin or PMBus | Unit starts power conversion any time the input power is present regardless of the state of the CTRL pin. |
| | | | 1 | CTRL pin or PMBus | Device does not power up until commanded by the CTRL pin or OPERATION command. |
| 3 | PMBus Enable Mode | Controls how the device responds to the PMBus command OPERATION. | 0 | Ignore PMBus command | Ignores the on/off portion of the OPERATION command. |
| | | | 1 | Use PMBus command | Device requires on by OPERATION command to enable the output voltage. |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Enable Pin Mode | Controls how the device responds to the CTRL pin. | 0 | Ignore CTRL pin | Device ignores the CTRL pin. |
| | | | 1 | Use CTRL pin | Device requires the CTRL pin to be asserted to enable the output voltage. |
| 1 | Enable Pin Polarity | Polarity of the CTRL pin. | 0 | Active Low | CTRL pin will cause device to enable when driven low. |
| | | | 1 | Active High | CTRL pin will cause device to enable when driven high. |
| 0 | Disable Action | CTRL pin action when commanding the output to turn off. | 0 | Soft Off | Use the configured turn off delay and fall time. |
| | | | 1 | Immediate 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

**PHASE (0x04)**
Description: Used to configure, control, and monitor individual phases. The phase configuration needs to be established before any phase-dependent command can be successfully excuted.

| Bit | Description | Format |
|---|---|---|
| 7:0 | Selects a specific phase on a multi-phase output rail. Listed values for phase selection: 0x00 PHASE, 0X01 PHASE, 0x02 PHASE, 0X03 and 0XFF TOTAL PHASE (all phases as a single entity). | Integer Unsigned |

**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 | | 0x80 | Disable all writes | Disable all writes except to the WRITE_PROTECT command. |
| | | 0x40 | Enable operation | Disable all writes except to the WRITE_PROTECT and OPERATION commands. |
| | | 0x20 | Enable control and Vout commands | Disable all writes except to the WRITE_PROTECT, OPERATION, ON_OFF_CONFIG and VOUT_COMMAND commands. |
| | | 0x00 | Enable all commands | Enable writes to all commands. |

**STORE_USER_ALL (0x15)**
Addressing: Phase
Description: Commands the device to copy the entire contents of the operating memory to the matching locations in the non-volatile user store memory.

**RESTORE_USER_ALL (0x16)**
Addressing: Phase
Description: Commands the device to copy the entire contents of the non-volatile User Store Memory to the matching locations in the operating memory.

**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 | 0 | No Smbalert | The device does not have a SMBALERT# pin and does not support the SMBus Alert Response protocol. |
| | | | 1 | 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 OV Fault | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 6 | Vout OV Warn | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 5 | | | 0 | Pull SALERT | |

| | | | | | |
|---|---|---|---|---|---|
| | Vout UV Warn | | 1 | Ignore | |
| 4 | Vout UV Fault | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 3 | Vout Min/Max Fault | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 2 | Ton Max Fault | | 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 OC Fault | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 5 | Iout OC Warn | | 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 | |
| 5 | Vin UV Warn | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 3 | Low Vin Fault | | 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 Warn | | 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 | | | 0 | Pull SALERT | |

| | | | | | |
|---|---|---|---|---|---|
| | Invalid Or Unsupported Command Received | | 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 Error | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 1 | Other Communication Fault | | 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 | Power-On Reset Fault | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 6 | Power-On Self-Check | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 3 | Reset | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 2 | BCX fault | | 0 | Pull SALERT | |
| | | | 1 | Ignore | |
| 1 | Sync fault | | 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 | Parameter | Five bit two's complement EXPONENT for the MANTISSA delivered as the data bytes for VOUT_COMMAND in VOUT_LINEAR Mode. | Integer Signed |

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 7 | Rel | Selection of Absolute or Relative data format. | 1 | Relative | Relative Data Format. |
| 6:5 | Mode | Selection of mode for representation of output voltage parameters. | 00 | Linear | Linear Mode Format. |

**VOUT_COMMAND (0x21)**
Description: Sets the nominal value of the output voltage from 0.6V to 5V.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the nominal value of the output voltage. | Vout Mode Unsigned (Exp = -9) | V |

**VOUT_TRIM (0x22)**
Description: Configures a fixed offset to be applied to the output voltage when enabled.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets VOUT trim value. The range is limited to +/-31 mV. | Vout Mode Signed (Exp = -9) | V |

**VOUT_MAX (0x24)**
Description: Configures the maximum allowed output voltage.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | If the device is commanded to a Vout value higher than this level, the output voltage will be clamped to this level. | Vout Mode Unsigned (Exp = -9) | V |

**VOUT_MARGIN_HIGH (0x25)**
Description: Configures the target for margin-up commands.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the output voltage value during a margin high. | Vout Mode Unsigned (Exp = -9) | * Vout |

**VOUT_MARGIN_LOW (0x26)**
Description: Configures the target for margin-down commands.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the output voltage value during a margin low. | Vout Mode Unsigned (Exp = -9) | * Vout |

**VOUT_TRANSITION_RATE (0x27)**
Description: Sets the transition rate when changing output voltage.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Configures the transition time for margining and on-the-fly VOUT_COMMAND changes. | Linear | V/ms |

**VOUT_SCALE_LOOP (0x29)**
Description: Allows PMBus devices to map between the commanded voltage, and the voltage at the control circuit.

| Bit | Description | Format |
|---|---|---|
| 15:0 | Choose scaling factor. Recommended value depending on Vout: 0.5 for Vout in range 0.5 to 1.5 V 0.25 for Vout in range 1 to 3 V 0.125 for Vout in range 2 to 6 V | Linear |

**VOUT_MIN (0x2B)**
Description: Configures the minimum allowed output voltage.

| Bit | Description | Format | Unit |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 15:0 | If the device is commanded to a Vout value lower than this level, the output voltage will be clamped to this level. | Vout Mode Unsigned (Exp = -9) | V |

**FREQUENCY_SWITCH (0x33)**
Description: Controls the switching frequency.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the switching frequency in kHz. The specified range is 450 - 900 kHz. The effective switching frequency is limited to a limited set of values: 450 kHz, 550 kHz, 650 kHz, 750 kHz, 900 kHz | Linear | kHz |

**VIN_ON (0x35)**
Description: Input voltage must be above this level before the output can be enabled.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the VIN ON threshold in 0.25 V steps in the range 5.5 - 15 V. | Linear | V |

**VIN_OFF (0x36)**
Description: Sets the value of the PVIN input voltage, in Volts, at which the unit should stop power conversion.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the VIN OFF threshold in 0.25 V steps. The specified range is 2.25 - 18.25 V. | Linear | V |

**INTERLEAVE (0x37)**
Description: Configures the phase offset with respect to a common SYNC clock.

| 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 in Group | Value 1 to 4. Sets the number of phases positions and the phase shift for each value of ORDER. | Integer Unsigned |
| 3:0 | Order within the group | Value 0 to NUM_GROUP - 1. Each value of ORDER adds a phase shift equal to 360° / NUM_GROUP. | Integer Unsigned |

**IOUT_CAL_GAIN (0x38)**
Description: Sets the current sense resistance.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the effective impedance for current sensing at +25°C. | Linear | mΩ |

**IOUT_CAL_OFFSET (0x39)**
Addressing: Phase
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: Sets the overvoltage fault threshold relative to the current VOUT_COMMAND.

| Bit | Description | Format | Unit |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 15:0 | Sets the VOUT overvoltage fault threshold, which is a fixed percentage of the current output voltage target. | Vout Mode Unsigned (Exp = -9) | * Vout |

**VOUT_OV_FAULT_RESPONSE (0x41)**
Description: Sets the VOUT OV fault response.

| 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 | Shutdown After Delay | The PMBus device continues operation for the delay time specified by bits [2:0]. |
| | | | 10 | Shutdown Immediately | The device shuts down immediately. |
| 5:3 | Retry Setting | The device attempts to restart the number of times set by these bits. | 000 | Latch Off | 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. |
| | | | 001 | Retry Once | The PMBus device attempts to restart 1 time. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 010 | Retry Twice | The PMBus device attempts to restart 2 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 011 | Retry 3 times | The PMBus device attempts to restart 3 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 100 | Retry 4 times | The PMBus device attempts to restart 4 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 101 | Retry 5 times | The PMBus device attempts to restart 5 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 110 | Retry 6 times | The PMBus device attempts to restart 6 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 111 | Retry Continuously | The PMBus device attempts to restart continuously, without limitation, until output is DISABLED, bias power is removed, or another fault condition causes the output to shut down. |
| 2:0 | Retry Time and Delay Time | Sets the output overvoltage delay time for respond after delay and HICCUP. | 0 | 0 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |
| | | | 1 | 1 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |
| | | | 2 | 2 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 2 times TON_RISE. |
| | | | 3 | 3 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 3 times TON_RISE. |
| | | | 4 | 4 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 4 times TON_RISE. |
| | | | 5 | 5 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 5 times TON_RISE. |
| | | | 6 | 6 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 6 times TON_RISE. |
| | | | 7 | 7 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 7 times TON_RISE. |

**VOUT_OV_WARN_LIMIT (0x42)**
Description: Sets the overvoltage warning threshold relative to the current VOUT_COMMAND.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the VOUT overvoltage warning threshold, which is a fixed percentage of the current output voltage target. | Vout Mode Unsigned (Exp = -9) | * Vout |

**VOUT_UV_WARN_LIMIT (0x43)**
Description: Sets the undervoltage warning threshold relative to the current VOUT_COMMAND.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the VOUT undervoltage warning threshold, which is a fixed percentage of the current output voltage target. | Vout Mode Unsigned (Exp = -9) | * Vout |

**VOUT_UV_FAULT_LIMIT (0x44)**
Description: Sets the undervoltage fault threshold relative to the current VOUT_COMMAND.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the VOUT undervoltage fault threshold, which is a fixed percentage of the current output voltage target. | Vout Mode Unsigned (Exp = -9) | * Vout |

**VOUT_UV_FAULT_RESPONSE (0x45)**
Description: Sets the VOUT UV fault response.

| 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 | Shutdown After Delay | The PMBus device continues operation for the delay time specified by bits [2:0]. |
| | | | 10 | Shutdown Immediately | The device shuts down immediately. |
| 5:3 | Retry Setting | The device attempts to restart the number of times set by these bits. | 000 | Latch Off | 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. |
| | | | 001 | Retry Once | The PMBus device attempts to restart 1 time. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 010 | Retry Twice | The PMBus device attempts to restart 2 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 011 | Retry 3 times | The PMBus device attempts to restart 3 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 100 | Retry 4 times | The PMBus device attempts to restart 4 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 101 | Retry 5 times | The PMBus device attempts to restart 5 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 110 | Retry 6 times | The PMBus device attempts to restart 6 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 111 | Retry Continuously | The PMBus device attempts to restart continuously, without limitation, until output is DISABLED, bias power is removed, or another fault condition causes the output to shut down. |
| 2:0 | Retry Time and Delay Time | Sets the output undervoltage delay time for respond after delay and HICCUP. | 0 | 0 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |
| | | | 1 | 1 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |
| | | | 2 | 2 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 2 times TON_RISE. |
| | | | 3 | 3 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 3 times TON_RISE. |
| | | | 4 | 4 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 4 times TON_RISE. |
| | | | 5 | 5 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 5 times TON_RISE. |
| | | | 6 | 6 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 6 times TON_RISE. |
| | | | 7 | 7 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 7 times TON_RISE. |

**IOUT_OC_FAULT_LIMIT (0x46)**
Addressing: Phase
Description: Sets the output over-current peak limit for per phase.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the IOUT overcurrent peak fault threshold for each phase with PHASE command set to 0x00 - 0x03. Sets the IOUT overcurrent peak fault threshold for all phases with PHASE command set to 0xFF. The analog hardware supports values from 8 A to 62 A in 2 A steps. Adjustable range from 0-62A. Linear format with LSB=0.25A. Note that the effective current limit of the multi-phase stack is equal to the lowest IOUT_OC_FAULT_LIMIT setting times the number of phases in the stack. | Linear | A |

**IOUT_OC_FAULT_RESPONSE (0x47)**
Description: Sets the output total over-current fault response.

| 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. |
| | | | 10 | Shutdown After Delay | The PMBus device continues operation for the delay time specified by bits [2:0]. |
| | | | 11 | Shutdown Immediately | The device shuts down immediately. |
| 5:3 | Retry Setting | The device attempts to restart the number of times set by these bits. | 000 | Latch Off | 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. |
| | | | 001 | Retry Once | The PMBus device attempts to restart 1 time. If the device fails to restart, it disables the output and remains off until the fault is cleared as described in Section 10.7. The time between the start of each attempt to restart is set by the value in bits [2:] along with the delay time unit specified for that particular fault. |
| | | | 010 | Retry Twice | The PMBus device attempts to restart 2 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 011 | Retry 3 times | The PMBus device attempts to restart 3 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 100 | Retry 4 times | The PMBus device attempts to restart 4 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 101 | Retry 5 times | The PMBus device attempts to restart 5 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 110 | Retry 6 times | The PMBus device attempts to restart 6 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 111 | Retry Continuously | The PMBus device attempts to restart continuously, without limitation, until output is DISABLED, bias power is removed, or another fault condition causes the output to shut down. |
| 2:0 | Retry Time and Delay Time | Sets the output overcurrent delay time for respond after delay and HICCUP. | 0 | 0 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |
| | | | 1 | 1 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |
| | | | 2 | 2 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 2 times TON_RISE. |
| | | | 3 | 3 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 3 times TON_RISE. |
| | | | 4 | 4 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 4 times TON_RISE. |
| | | | 5 | 5 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 5 times TON_RISE. |
| | | | 6 | 6 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 6 times TON_RISE. |
| | | | 7 | 7 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 7 times TON_RISE. |

**IOUT_OC_WARN_LIMIT (0x4A)**
Addressing: Phase
Description: Sets the value of the output current that causes the overcurrent detector to indicate an overcurrent warning condition. IOUT_OC_WARN_LIMIT is a phased command. Each phase will report an output current overcurrent warning independently.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the value of the overcurrent warning threshold for each phase with PHASE command set to 0x00 - 0x03. The analog hardware supports values from 8 A to 62 A in 2 A steps. Adjustable range from 0-62A. Linear format with LSB=0.25A. | Linear | A |

**OT_FAULT_LIMIT (0x4F)**
Addressing: Phase
Description: Sets the over-temperature fault limit.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the over-temperature fault threshold. Adjustable range from 0-160°C in 1°C steps. Setting 255°C value will disable the over-temperature fault limit without disabling the on-die Bandgap thermal shutdown. | Linear | °C |

**OT_FAULT_RESPONSE (0x50)**
Description: Sets the over-temperature fault response.

| 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 shuts down (disables the output) until the temperature is below the over-temperature warn limit, then restarts according to the retry setting in bits [5:3]. |
| 5:3 | Retry Setting | The device attempts to restart the number of times set by these bits. | 000 | Latch Off | 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. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 001 | Retry Once | The PMBus device attempts to restart 1 time. If the device fails to restart, it disables the output and remains off until the fault is cleared as described in Section 10.7. The time between the start of each attempt to restart is set by the value in bits [2:] along with the delay time unit specified for that particular fault. |
| | | | 010 | Retry Twice | The PMBus device attempts to restart 2 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 011 | Retry 3 times | The PMBus device attempts to restart 3 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 100 | Retry 4 times | The PMBus device attempts to restart 4 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 101 | Retry 5 times | The PMBus device attempts to restart 5 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 110 | Retry 6 times | The PMBus device attempts to restart 6 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 111 | Retry Continuously | The PMBus device attempts to restart continuously, without limitation, until output is DISABLED, bias power is removed, or another fault condition causes the output to shut down. |

| | | | | | |
|---|---|---|---|---|---|
| 2:0 | Retry Time and Delay Time | Sets the over-temperature delay time for respond after delay and HICCUP. | 0 | 10 ms | Shutdown delay of 10 ms, HICCUP equal to TON_RISE, HICCUP delay equal to TON_RISE. |
| | | | 1 | 1 ms | |
| | | | 2 | 2 ms | |
| | | | 3 | 3 ms | |
| | | | 4 | 4 ms | |
| | | | 5 | 5 ms | |
| | | | 6 | 6 ms | |
| | | | 7 | 7 ms | |

**OT_WARN_LIMIT (0x51)**
Addressing: Phase
Description: Sets the over-temperature warn limit.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the over-temperature warning threshold. Adjustable range from 0-160°C in 1°C steps. Setting 255°C value will disable disable the OT_WARN_LIMIT function. | Linear | °C |

**VIN_OV_FAULT_LIMIT (0x55)**
Description: Sets the input over-voltage fault limit.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the VIN overvoltage fault threshold. Values 4 - 20 V in 1 V steps. | Linear | V |

**VIN_OV_FAULT_RESPONSE (0x56)**
Description: Sets the input over-voltage fault response.

| 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]. |
| 5:3 | Retry Setting | The device attempts to restart the number of times set by these bits. | 000 | Latch Off | 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. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 001 | Retry Once | The PMBus device attempts to restart 1 time. If the device fails to restart, it disables the output and remains off until the fault is cleared as described in Section 10.7. The time between the start of each attempt to restart is set by the value in bits [2:] along with the delay time unit specified for that particular fault. |
| | | | 010 | Retry Twice | The PMBus device attempts to restart 2 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 011 | Retry 3 times | The PMBus device attempts to restart 3 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 100 | Retry 4 times | The PMBus device attempts to restart 4 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 101 | Retry 5 times | The PMBus device attempts to restart 5 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 110 | Retry 6 times | The PMBus device attempts to restart 6 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 111 | Retry Continuously | The PMBus device attempts to restart continuously, without limitation, until output is DISABLED, bias power is removed, or another fault condition causes the output to shut down. |
| 2:0 | Retry Time and Delay Time | Sets the output over-voltage delay time for respond after delay and HICCUP. | 0 | 0 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 1 | 1 | Shutdown delay of 1 PWM_CLK, HICCUP equal to TON_RISE. |
| | | | 2 | 2 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 2 times TON_RISE. |
| | | | 3 | 3 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 3 times TON_RISE. |
| | | | 4 | 4 | Shutdown delay of 3 PWM_CLK, HICCUP equal to 4 times TON_RISE. |
| | | | 5 | 5 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 5 times TON_RISE. |
| | | | 6 | 6 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 6 times TON_RISE. |
| | | | 7 | 7 | Shutdown delay of 7 PWM_CLK, HICCUP equal to 7 times TON_RISE. |

**VIN_UV_WARN_LIMIT (0x58)**
Addressing: Phase
Description: Sets the input under-voltage warning limit.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the VIN undervoltage warning threshold. | Linear | V |

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

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the time, from when a start condition is received (as programmed by the ON_OFF_CONFIG command) until the output voltage starts to rise. | Linear | ms |

**TON_RISE (0x61)**
Description: Sets the turn-on ramp-up time.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the rise time of VOUT after ENABLE and On Delay. The time can range from 0 ms to 31.75 ms in 0.25 ms steps. Values less than 0.5 ms are supported as 0.5 ms. | Linear | ms |

**TON_MAX_FAULT_LIMIT (0x62)**
Description: Sets an upper limit on how long the unit can attempt to power up the output without reaching the target voltage.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the upper limit time. The time can range from 0 ms to 127 ms in 0.5 ms steps. Value 0 ms disables the TON_MAX functionality. | Linear | ms |

**TON_MAX_FAULT_RESPONSE (0x63)**
Description: Instructs the device on what action to take in response to TON_MAX fault.

| 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]. |
| 5:3 | Retry Setting | The device attempts to restart the number of times set by these bits. | 000 | Latch Off | 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. |
| | | | 001 | Retry Once | The PMBus device attempts to restart 1 time. If the device fails to restart, it disables the output and remains off until the fault is cleared as described in Section 10.7. The time between the start of each attempt to restart is set by the value in bits [2:] along with the delay time unit specified for that particular fault. |
| | | | 010 | Retry Twice | The PMBus device attempts to restart 2 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 011 | Retry 3 times | The PMBus device attempts to restart 3 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 100 | Retry 4 times | The PMBus device attempts to restart 4 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 101 | Retry 5 times | The PMBus device attempts to restart 5 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 110 | Retry 6 times | The PMBus device attempts to restart 6 times. If the device fails to restart, it disables the output and remains off until either: a reset signal is asserted, or a bias power is removed from the device. |
| | | | 111 | Retry Continuously | The PMBus device attempts to restart continuously, without limitation, until output is DISABLED, bias power is removed, or another fault condition causes the output to shut down. |
| 2:0 | Retry Time and Delay Time | Sets the output over-voltage delay time for respond after delay and HICCUP. | 0 | 1 ms | Shutdown delay of 1 ms, HICCUP equal to TON_RISE. |
| | | | 1 | 1 ms | Shutdown delay of 1 ms, HICCUP equal to 1 times TON_RISE. |
| | | | 2 | 2 ms | Shutdown delay of 2 ms, HICCUP equal to 2 times TON_RISE. |
| | | | 3 | 3 ms | Shutdown delay of 3 ms, HICCUP equal to 3 times TON_RISE. |
| | | | 4 | 4 ms | Shutdown delay of 4 ms, HICCUP equal to 4 times TON_RISE. |
| | | | 5 | 5 ms | Shutdown delay of 5 ms, HICCUP equal to 5 times TON_RISE. |
| | | | 6 | 6 ms | Shutdown delay of 6 ms, HICCUP equal to 6 times TON_RISE. |
| | | | 7 | 7 ms | Shutdown delay of 7 ms, HICCUP equal to 7 times TON_RISE. |

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

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the delay time from DISABLE to start of the fall of the output voltage. Normally the time can range from 0 ms up to 127.5 ms in 0.5 ms steps. An internal delay of up to 50 µs will be added to TOFF_DELAY, even if TOFF_DELAY is equal to 0 ms. | Linear | ms |

**TOFF_FALL (0x65)**
Description: Sets the turn-off ramp-down time.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Sets the fall time for VOUT after DISABLE and Off Delay. The time can range from 0 ms to 31.75 ms in 0.25 ms steps. Values less than 0.5 ms will be implemented as 0.5 ms. | Linear | ms |

**STATUS_BYTE (0x78)**
Addressing: Phase
Description: Returns a brief fault/warning status byte. Setting and clearing of supported bits must be done in the individual status registers. For example, Clearing VOUT_OVF in STATUS_VOUT also clears VOUT_OV in STATUS_BYTE.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 7 | Busy | A fault was declared because the device was busy and unable to respond. | 0 | No fault |
| | | | 1 | Fault |
| 6 | Off | This bit is asserted if the unit is not providing power to the output due to not being enabled, i.e. not set when output shut down due to fault. | 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 |

**STATUS_WORD (0x79)**
Addressing: Phase
Description: Returns an extended fault/warning status byte. Writing 0080h to STATUS_WORD will clear the BUSY bit, if set. Writing 0180h to STATUS_WORD will clear both the BUSY bit and UNKNOWN bit, if set.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 15 | Vout | An output voltage fault or warning has occurred. | 0 | No fault |
| | | | 1 | Fault |
| 14 | Iout | An output current 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 | 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 | An other fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 7 | Busy | A fault was declared because the device was busy and unable to respond. | 0 | No Fault. |
| | | | 1 | Fault. |
| 6 | Off | This bit is asserted if the unit is not providing power to the output due to not being enabled, i.e. not set when output shut down due to fault. | 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. |

**STATUS_VOUT (0x7A)**
Description: Returns Vout-related fault/warning status bits. All supported bits can be cleared either by CLEAR_FAULTS, or individually by writing 1b to the STATUS_VOUT (0x7A) register in their position.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 7 | Vout OV Fault | Latched flag of Vout over-voltage fault has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 6 | Vout OV Warn | Latched flag of Vout over-voltage warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 5 | Vout UV Warn | Latched flag of Vout under-voltage warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 4 | Vout UV Fault | Latched flag of Vout under-voltage fault has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 3 | Vout Min/Max Fault | Latched flag of Vout min/max fault or warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 2 | Ton Max Fault | Latched flag of Ton max fault or warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |

**STATUS_IOUT (0x7B)**
Addressing: Phase
Description: Returns Iout-related fault/warning status bits. All supported bits can be cleared either by CLEAR_FAULTS, or individually by writing 1b to the STATUS_IOUT (0x7B) register in their position.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 7 | Iout OC Fault | Latched flag of Iout over-current fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 5 | Iout OC Warn | Latched flag of Iout over-current warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 4 | Iout UC Fault | Latched flag of Iout under-current fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 3 | Current Share Fault | Latched flag of current share fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |

**STATUS_INPUT (0x7C)**
Addressing: Phase
Description: Returns VIN/IIN-related fault/warning status bits. All supported bits can cleared either by CLEAR_FAULTS, or individually by writing 1b to the STATUS_INPUT register (0x7C) in their position.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 7 | Vin Overvoltage Fault | Latched flag of input over-voltage fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 6 | Vin OV Warn | Latched flag of input over-voltage warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 5 | Vin UV Warn | Latched flag of input under-voltage warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 4 | Vin UV Fault | Latched flag of input under-voltage fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 3 | Low Vin Fault | Latched flag of shutdown unit due to insufficient VIN . | 0 | No Fault. |
| | | | 1 | Fault. |
| 2 | Iin Oc Fault | | 0 | No Fault. |

| | | | | |
|---|---|---|---|---|
| | | Latched flag of input over-current fault has occurred. | 1 | Fault. |
| 1 | Iin Oc Warn | Latched flag of input over-current warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 0 | Pin Op Warn | Latched flag of input over-power warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |

**STATUS_TEMPERATURE (0x7D)**
Addressing: Phase
Description: Returns the temperature-related fault/warning status bits. All supported bits can be cleared either by CLEAR_FAULTS, or individually by writing 1b to the STATUS_TEMPERATURE (0x7D) register in their position.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 7 | Overtemperature Fault | Latched flag of over-temperature fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 6 | Overtemperature Warn | Latched flag of over-temperature warn has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |

**STATUS_CML (0x7E)**
Addressing: Phase
Description: Returns Communication/Logic/Memory-related fault/warning status bits. All supported bits can be cleared either by CLEAR_FAULTS, or individually by writing 1b to the STATUS_CML (0x7E) register in their position.

| 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 (PEC) Failed. | 0 | No Failure. |
| | | | 1 | Failure. |
| 4 | Memory Error | A memory error was detected. | 0 | No Fault. |
| | | | 1 | Fault. |
| 1 | Other Communication Fault | A PMBus command tried to write to a read-only or protected command, or a communication fault other than the ones listed in this table has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |

**STATUS_OTHER (0x7F)**
Description: Returns one data byte with information not specified in the other STATUS_BYTE.

| Bit | Description | Value | Description |
|---|---|---|---|
| 0 | The device was the first to assert SMBALERT. | 1 | First to assert SMBALERT. |
| | | 0 | The device was not the first to assert SMBALERT. This could mean either that the SMBALERT signal is not asserted (or has since been cleared), or that it is asserted, but this device was not the first on the bus to assert it. |

**STATUS_MFR_SPECIFIC (0x80)**
Addressing: Phase
Description: Returns manufacturer specific status information. All supported bits may be cleared either by CLEAR_FAULTS, or individually by writing 1b to the STATUS_MFR_SPECIFIC (0x80) register in their position.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 7 | Power-On Reset Fault | Power-on reset fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 6 | Power-On Self-Check | Showing the status of the Power-On Self-Check. | 0 | Power On Self-Check is complete. All expected BCX slaves have responded. |
| | | | 1 | Power-On Self-Check is in progress. One or more BCX slaves have not responded. |
| 3 | Reset | VOUT_COMMAND has been reset without PMBus commands. | 0 | RESET_VOUT event has not occurred. |
| | | | 1 | RESET_VOUT event has occurred. |
| 2 | BCX fault | Back-channel communications fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 1 | Sync fault | Sync fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |

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

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Returns the input voltage reading. When PHASE = FFh, READ_VIN returns the input voltage of the master device. | Linear | V |

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

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Returns the output voltage reading. | Vout Mode Unsigned (Exp = -9) | V |

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

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | Returns the output current reading. When PHASE = FFh, READ_IOUT returns the total current for the stack of devices. | Linear | A |

**READ_TEMPERATURE_1 (0x8D)**
Addressing: Phase
Description: Returns the maximum power stage temperature.

| Bit | Description | Format | Unit |
|---|---|---|---|
| 15:0 | When PHASE = FFh, READ_TEMPERATURE_1 returns the temperature of the hottest of device in the stack of devices. | Linear | °C |

**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. | 0011 | 1.3 | Part I Revision 1.3. |
| 3:0 | Part II Revision | Part II Revision. | 0011 | 1.3 | Part II Revision 1.3. |

**MFR_ID (0x99)**
Description: Sets the manufacturer ID String.

| Bit | Description | Format |
|---|---|---|
| 23:0 | Maximum of 3 bytes. | Byte Array |

**MFR_MODEL (0x9A)**
Description: Sets the manufacturer model string.

| Bit | Description | Format |
|---|---|---|
| 23:0 | Maximum of 3 bytes. | Byte Array |

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

| Bit | Description | Format |
|---|---|---|
| 23:0 | Maximum of 3 bytes. | Byte Array |

**MFR_SERIAL (0x9E)**
Description: Sets the manufacturer serial number.

| Bit | Description | Format |
|---|---|---|
| 23:0 | 3-byte serial number assigned by manufacturer. | Byte Array |

**IC_DEVICE_ID (0xAD)**
Description: Reports identification information.

| Bit | Description | Format |
|---|---|---|
| 47:0 | Reports identification information. | Byte Array |

**IC_DEVICE_REV (0xAE)**
Description: Reports revision information.

| Bit | Description | Format |
|---|---|---|
| 15:0 | Reports revision information. | Byte Array |

**USER_DATA_01 (0xB1)**
Addressing: Phase
Description: Configures the control loop compensation settings.

| Bit | Function | Description | Format |
|---|---|---|---|
| 39:38 | SEL_CZI High | High bits component of CZI scalar. | Byte Array |
| 25:24 | SEL_CZI Low | Low bits component of CZI scalar. | Byte Array |

| | | | |
|---|---|---|---|
| 23:22 | SEL_CZV High | High bits component of CZV scalar. | Byte Array |
| 9:8 | SEL_CZV Low | Low bits component of CZV scalar. | Byte Array |

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 37:33 | CPI | Selects the value of current loop filter capacitor. | 00000 | 0 pF | |
| | | | 00001 | 3.2 pF | |
| | | | 00010 | 6.4 pF | |
| | | | 00011 | 9.6 pF | |
| | | | 00100 | 12.8 pF | |
| | | | 00101 | 16 pF | |
| | | | 00110 | 19.2 pF | |
| | | | 00111 | 22.4 pF | |
| | | | 01000 | 25.6 pF | |
| | | | 01001 | 28.8 pF | |
| | | | 01010 | 32 pF | |
| | | | 01011 | 35.2 pF | |
| | | | 01100 | 38.4 pF | |
| | | | 01101 | 41.6 pF | |
| | | | 01110 | 44.8 pF | |
| | | | 01111 | 48 pF | |
| | | | 10000 | 51.2 pF | |
| | | | 10001 | 54.4 pF | |
| | | | 10010 | 57.6 pF | |
| | | | 10011 | 60.8 pF | |
| | | | 10100 | 64 pF | |
| | | | 10101 | 67.2 pF | |
| | | | 10110 | 70.4 pF | |
| | | | 10111 | 73.6 pF | |
| | | | 11000 | 76.8 pF | |
| | | | 11001 | 80 pF | |
| | | | 11010 | 83.2 pF | |
| | | | 11011 | 86.4 pF | |
| | | | 11100 | 89.6 pF | |
| | | | 11101 | 92.8 pF | |
| | | | 11110 | 96 pF | |
| | | | 11111 | 99.2 pF | |
| 32 | CZI multiplier | Selects the value of current loop integrating capacitor multiplier. | 0 | 1 | |
| | | | 1 | 2 | |
| 31:26 | RVI | Selects the value of current loop mid-band gain resistor. | 000000 | 0 kΩ | |
| | | | 000001 | 5 kΩ | |
| | | | 000010 | 10 kΩ | |
| | | | 000011 | 15 kΩ | |
| | | | 000100 | 20 kΩ | |
| | | | 000101 | 25 kΩ | |
| | | | 000110 | 30 kΩ | |
| | | | 000111 | 35 kΩ | |
| | | | 001000 | 40 kΩ | |
| | | | 001001 | 45 kΩ | |
| | | | 001010 | 50 kΩ | |
| | | | 001011 | 55 kΩ | |
| | | | 001100 | 60 kΩ | |
| | | | 001101 | 65 kΩ | |
| | | | 001110 | 70 kΩ | |
| | | | 001111 | 75 kΩ | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 010000 | 80 kΩ | |
| | | | 010001 | 85 kΩ | |
| | | | 010010 | 90 kΩ | |
| | | | 010011 | 95 kΩ | |
| | | | 010100 | 100 kΩ | |
| | | | 010101 | 105 kΩ | |
| | | | 010110 | 110 kΩ | |
| | | | 010111 | 115 kΩ | |
| | | | 011000 | 120 kΩ | |
| | | | 011001 | 125 kΩ | |
| | | | 011010 | 130 kΩ | |
| | | | 011011 | 135 kΩ | |
| | | | 011100 | 140 kΩ | |
| | | | 011101 | 145 kΩ | |
| | | | 011110 | 150 kΩ | |
| | | | 011111 | 155 kΩ | |
| | | | 100000 | 160 kΩ | |
| | | | 100001 | 165 kΩ | |
| | | | 100010 | 170 kΩ | |
| | | | 100011 | 175 kΩ | |
| | | | 100100 | 180 kΩ | |
| | | | 100101 | 185 kΩ | |
| | | | 100110 | 190 kΩ | |
| | | | 100111 | 195 kΩ | |
| | | | 101000 | 200 kΩ | |
| | | | 101001 | 205 kΩ | |
| | | | 101010 | 210 kΩ | |
| | | | 101011 | 215 kΩ | |
| | | | 101100 | 220 kΩ | |
| | | | 101101 | 225 kΩ | |
| | | | 101110 | 230 kΩ | |
| | | | 101111 | 235 kΩ | |
| | | | 110000 | 240 kΩ | |
| | | | 110001 | 245 kΩ | |
| | | | 110010 | 250 kΩ | |
| | | | 110011 | 255 kΩ | |
| | | | 110100 | 260 kΩ | |
| | | | 110101 | 265 kΩ | |
| | | | 110110 | 270 kΩ | |
| | | | 110111 | 275 kΩ | |
| | | | 111000 | 280 kΩ | |
| | | | 111001 | 285 kΩ | |
| | | | 111010 | 290 kΩ | |
| | | | 111011 | 295 kΩ | |
| | | | 111100 | 300 kΩ | |
| | | | 111101 | 305 kΩ | |
| | | | 111110 | 310 kΩ | |
| | | | 111111 | 315 kΩ | |
| 21:17 | CPV | Selects the value of voltage loop filter capacitor. | 00000 | 0 pF | |
| | | | 00001 | 6.25 pF | |
| | | | 00010 | 12.5 pF | |
| | | | 00011 | 18.75 pF | |
| | | | 00100 | 25 pF | |
| | | | 00101 | 31.25 pF | |
| | | | 00110 | 37.5 pF | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 00111 | 43.75 pF | |
| | | | 01000 | 50 pF | |
| | | | 01001 | 56.25 pF | |
| | | | 01010 | 62.5 pF | |
| | | | 01011 | 68.75 pF | |
| | | | 01100 | 75 pF | |
| | | | 01101 | 81.25 pF | |
| | | | 01110 | 87.5 pF | |
| | | | 01111 | 93.75 pF | |
| | | | 10000 | 100 pF | |
| | | | 10001 | 106.25 pF | |
| | | | 10010 | 112.5 pF | |
| | | | 10011 | 118.75 pF | |
| | | | 10100 | 125 pF | |
| | | | 10101 | 131.25 pF | |
| | | | 10110 | 137.5 pF | |
| | | | 10111 | 143.75 pF | |
| | | | 11000 | 150 pF | |
| | | | 11001 | 156.25 pF | |
| | | | 11010 | 162.5 pF | |
| | | | 11011 | 168.75 pF | |
| | | | 11100 | 175 pF | |
| | | | 11101 | 181.25 pF | |
| | | | 11110 | 187.5 pF | |
| | | | 11111 | 193.75 pF | |
| 15:10 | RVV | Selects the value of voltage loop mid-band gain resistor. | 000000 | 0 kΩ | |
| | | | 000001 | 5 kΩ | |
| | | | 000010 | 10 kΩ | |
| | | | 000011 | 15 kΩ | |
| | | | 000100 | 20 kΩ | |
| | | | 000101 | 25 kΩ | |
| | | | 000110 | 30 kΩ | |
| | | | 000111 | 35 kΩ | |
| | | | 001000 | 40 kΩ | |
| | | | 001001 | 45 kΩ | |
| | | | 001010 | 50 kΩ | |
| | | | 001011 | 55 kΩ | |
| | | | 001100 | 60 kΩ | |
| | | | 001101 | 65 kΩ | |
| | | | 001110 | 70 kΩ | |
| | | | 001111 | 75 kΩ | |
| | | | 010000 | 80 kΩ | |
| | | | 010001 | 85 kΩ | |
| | | | 010010 | 90 kΩ | |
| | | | 010011 | 95 kΩ | |
| | | | 010100 | 100 kΩ | |
| | | | 010101 | 105 kΩ | |
| | | | 010110 | 110 kΩ | |
| | | | 010111 | 115 kΩ | |
| | | | 011000 | 120 kΩ | |
| | | | 011001 | 125 kΩ | |
| | | | 011010 | 130 kΩ | |
| | | | 011011 | 135 kΩ | |
| | | | 011100 | 140 kΩ | |
| | | | 011101 | 145 kΩ | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 011110 | 150 kΩ | |
| | | | 011111 | 155 kΩ | |
| | | | 100000 | 160 kΩ | |
| | | | 100001 | 165 kΩ | |
| | | | 100010 | 170 kΩ | |
| | | | 100011 | 175 kΩ | |
| | | | 100100 | 180 kΩ | |
| | | | 100101 | 185 kΩ | |
| | | | 100110 | 190 kΩ | |
| | | | 100111 | 195 kΩ | |
| | | | 101000 | 200 kΩ | |
| | | | 101001 | 205 kΩ | |
| | | | 101010 | 210 kΩ | |
| | | | 101011 | 215 kΩ | |
| | | | 101100 | 220 kΩ | |
| | | | 101101 | 225 kΩ | |
| | | | 101110 | 230 kΩ | |
| | | | 101111 | 235 kΩ | |
| | | | 110000 | 240 kΩ | |
| | | | 110001 | 245 kΩ | |
| | | | 110010 | 250 kΩ | |
| | | | 110011 | 255 kΩ | |
| | | | 110100 | 260 kΩ | |
| | | | 110101 | 265 kΩ | |
| | | | 110110 | 270 kΩ | |
| | | | 110111 | 275 kΩ | |
| | | | 111000 | 280 kΩ | |
| | | | 111001 | 285 kΩ | |
| | | | 111010 | 290 kΩ | |
| | | | 111011 | 295 kΩ | |
| | | | 111100 | 300 kΩ | |
| | | | 111101 | 305 kΩ | |
| | | | 111110 | 310 kΩ | |
| | | | 111111 | 315 kΩ | |
| 5:4 | GMV | Selects the value of voltage error transconductance. | 00 | 25 µS | |
| | | | 01 | 50 µS | |
| | | | 10 | 100 µS | |
| | | | 11 | 200 µS | |
| 1:0 | GMI | Selects the value of current error transconductance. | 00 | 25 µS | |
| | | | 01 | 50 µS | |
| | | | 10 | 100 µS | |
| | | | 11 | 200 µS | |

**TELEMETRY_CONFIG (0xD0)**
Description: Configures the priority and averaging for each channel of the internal telemetry system. The internal telemetry system shares a single ADC across each measurement. The priority setting allows the user to adjust the relative rate of measurement of each telemetry value. The ADC will first measure each value with a priority A value.With each pass through all priority A measurements, one priority B measurement will be taken. With each pass through all priority B measurements, one priority C measurement will be taken.

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 31:30 | READ_VIN Priority | Assigns priority A-C to input voltage telemetry. | 00 | A priority | |
| | | | 01 | B priority | |
| | | | 10 | C priority | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 11 | Disable input voltage telemetry. | |
| 26:24 | READ_VIN Rolling Avg | READ_VIN Rolling average of 2^N samples. | 000 | 1 sample (N=0) | |
| | | | 001 | 2 samples (N=1) | |
| | | | 010 | 4 samples (N=2) | |
| | | | 011 | 8 samples (N=3) | |
| | | | 100 | 16 samples (N=4) | |
| | | | 101 | 32 samples (N=5) | |
| 23:22 | READ_TEMPERATURE_1 Priority | Assigns priority A-C to output temperature telemetry. The temperature telemetry cannot be disabled because it is used for Over-temperature Protection. | 00 | A priority | |
| | | | 01 | B priority | |
| | | | 10 | C priority | |
| 18:16 | READ_TEMPERATURE_1 Rolling Avg | READ_TEMPERATURE_1 Rolling average of 2^N samples. | 000 | 1 sample (N=0) | |
| | | | 001 | 2 samples (N=1) | |
| | | | 010 | 4 samples (N=2) | |
| | | | 011 | 8 samples (N=3) | |
| | | | 100 | 16 samples (N=4) | |
| | | | 101 | 32 samples (N=5) | |
| 15:14 | READ_IOUT Priority | Assigns priority A-C to output current telemetry. | 00 | A priority | |
| | | | 01 | B priority | |
| | | | 10 | C priority | |
| | | | 11 | Disable output current telemetry. | |
| 10:8 | READ_IOUT Rolling Avg | READ_IOUT Rolling average of 2^N samples. | 000 | 1 sample (N=0) | |
| | | | 001 | 2 samples (N=1) | |
| | | | 010 | 4 samples (N=2) | |
| | | | 011 | 8 samples (N=3) | |
| | | | 100 | 16 samples (N=4) | |
| | | | 101 | 32 samples (N=5) | |
| 7:6 | READ_VOUT Priority | Assigns priority A-C to output voltage telemetry. | 00 | A priority | |
| | | | 01 | B priority | |
| | | | 10 | C priority | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 11 | Disable output voltage telemetry. | |
| 2:0 | READ_VOUT Rolling Avg | READ_VOUT Rolling average of 2^N samples. | 000 | 1 sample (N=0) | |
| | | | 001 | 2 samples (N=1) | |
| | | | 010 | 4 samples (N=2) | |
| | | | 011 | 8 samples (N=3) | |
| | | | 100 | 16 samples (N=4) | |
| | | | 101 | 32 samples (N=5) | |

**READ_ALL (0xDA)**
Description: Returns a 14-byte block of STATUS_WORD and telemetry values. This can reduce bus utilization by combining multiple read functions into a single command.

| Bit | Function | Description | Format | Unit |
|---|---|---|---|---|
| 79:64 | Read Vin | Returns the input voltage reading. When PHASE = FFh, READ_VIN returns the input voltage of the master device. | Linear | V |
| 63:48 | Read Temperature 1 | When PHASE = FFh, READ_TEMPERATURE_1 returns the temperature of the hottest of device in the stack of devices. | Linear | °C |
| 47:32 | Read Iout | Returns the output current reading. When PHASE = FFh, READ_IOUT returns the total current for the stack of devices. | Linear | A |
| 31:16 | Read Vout | Returns the output voltage reading. | Vout Mode Unsigned (Exp = -9) | V |

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 15 | Vout | An output voltage fault or warning has occurred. | 0 | No fault |
| | | | 1 | Fault |
| 14 | Iout | An output current 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 | 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 | An other fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 7 | Busy | A fault was declared because the device was busy and unable to respond. | 0 | No Fault. |
| | | | 1 | Fault. |
| 6 | Off | This bit is asserted if the unit is not providing power to the output due to not being enabled, i.e. not set when output shut down due to fault. | 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. |

**STATUS_ALL (0xDB)**
Description: Returns 7-byte block of STATUS command codes. This can reduce bus utilization to read multiple faults.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 55 | Power-On Reset Fault | Power-on reset fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 54 | Power-On Self-Check | Showing the status of the Power-On Self-Check. | 0 | Power On Self-Check is complete. All expected BCX slaves have responded. |
| | | | 1 | Power-On Self-Check is in progress. One or more BCX slaves have not responded. |
| 51 | Reset | VOUT_COMMAND has been reset without PMBus commands. | 0 | RESET_VOUT event has not occurred. |
| | | | 1 | RESET_VOUT event has occurred. |
| 50 | BCX fault | Back-channel communications fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 49 | Sync fault | Sync fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 40 | First to Alert | The device was the first to assert SMBALERT. | 1 | First to assert SMBALERT. |
| | | | 0 | The device was not the first to assert SMBALERT. This could mean either that the SMBALERT signal is not asserted (or has since been cleared), or that it is asserted, but this device was not the first on the bus to assert it. |
| 39 | Invalid Or Unsupported Command Received | Invalid Or Unsupported Command Received. | 0 | No Invalid Command Received. |
| | | | 1 | Invalid Command Received. |
| 38 | Invalid Or Unsupported Data Received | Invalid Or Unsupported Data Received. | 0 | No Invalid Data Received. |
| | | | 1 | Invalid Data Received. |
| 37 | Packet Error Check Failed | Packet Error Check (PEC) Failed. | 0 | No Failure. |
| | | | 1 | Failure. |
| 36 | Memory Error | A memory error was detected. | 0 | No Fault. |
| | | | 1 | Fault. |
| 33 | | | 0 | No Fault. |

| | | | | |
|---|---|---|---|---|
| | Other Communication Fault | A PMBus command tried to write to a read-only or protected command, or a communication fault other than the ones listed in this table has occurred. | 1 | Fault. |
| 31 | Overtemperature Fault | Latched flag of over-temperature fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 30 | Overtemperature Warn | Latched flag of over-temperature warn has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 23 | Vin Overvoltage Fault | Latched flag of input over-voltage fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 22 | Vin OV Warn | Latched flag of input over-voltage warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 21 | Vin UV Warn | Latched flag of input under-voltage warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 20 | Vin UV Fault | Latched flag of input under-voltage fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 19 | Low Vin Fault | Latched flag of shutdown unit due to insufficient VIN . | 0 | No Fault. |
| | | | 1 | Fault. |
| 18 | Iin Oc Fault | Latched flag of input over-current fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 17 | Iin Oc Warn | Latched flag of input over-current warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 16 | Pin Op Warn | Latched flag of input over-power warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 15 | Iout OC Fault | Latched flag of Iout over-current fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 13 | Iout OC Warn | Latched flag of Iout over-current warning has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 12 | Iout UC Fault | Latched flag of Iout under-current fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 11 | Current Share Fault | Latched flag of current share fault has occurred. | 0 | No Fault. |
| | | | 1 | Fault. |
| 7 | Vout OV Fault | Latched flag of Vout over-voltage fault has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 6 | Vout OV Warn | Latched flag of Vout over-voltage warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 5 | Vout UV Warn | Latched flag of Vout under-voltage warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 4 | Vout UV Fault | Latched flag of Vout under-voltage fault has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 3 | Vout Min/Max Fault | Latched flag of Vout min/max fault or warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |
| 2 | Ton Max Fault | Latched flag of Ton max fault or warning has occurred . | 0 | No Fault. |
| | | | 1 | Fault. |

**STATUS_PHASE (0xDC)**
Addressing: Phase
Description: When PHASE = FFh or 80h, reads to this command return a data word detailing which phases have experienced fault conditions. When PHASE != FFh, reads to this command return a data word detailing which fault(s) the current PHASE has experienced. PHASE number assignment is per PHASE_CONFIG.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 3 | Phase 4 Fault | | 0 | |

| | | | | |
|---|---|---|---|---|
| | | The module assigned to PHASE=3 has experienced a fault. Set PHASE = 3, and read STATUS_WORD or STATUS_ALL for more information. | 1 | |
| 2 | Phase 3 Fault | The module assigned to PHASE=2 has experienced a fault. Set PHASE = 2, and read STATUS_WORD or STATUS_ALL for more information. | 0 | |
| | | | 1 | |
| 1 | Phase 2 Fault | The module assigned to PHASE=1 has experienced a fault. Set PHASE = 1, and read STATUS_WORD or STATUS_ALL for more information. | 0 | |
| | | | 1 | |
| 0 | Phase 1 Fault | The module assigned to PHASE=0 has experienced a fault. Set PHASE = 0, and read STATUS_WORD or STATUS_ALL for more information. | 0 | |
| | | | 1 | |

**PGOOD_CONFIG (0xE3)**
Description: Provides control of the delays asserting and releasing PGOOD.

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 15:12 | PGOOD Off Delay | Sets Delay from the detection of an unmasked Fault or Warning event to the assertion of PGOOD low. 0d: Delay PGOOD high-low: 1 PWM CLK 1d-15d: Delay PGOOD high-low: 2^N+1 PWM CLKs | 0x0 | 1 PWM CLK | |
| | | | 0x1 | 3 PWM CLKs | |
| | | | 0x2 | 5 PWM CLKs | |
| | | | 0x3 | 9 PWM CLKs | |
| | | | 0x4 | 17 PWM CLKs | |
| | | | 0x5 | 33 PWM CLKs | |
| | | | 0x6 | 65 PWM CLKs | |
| | | | 0x7 | 129 PWM CLKs | |
| | | | 0x8 | 257 PWM CLKs | |
| | | | 0x9 | 513 PWM CLKs | |
| | | | 0xA | 1025 PWM CLKs | |
| | | | 0xB | 2049 PWM CLKs | |
| | | | 0xC | 4097 PWM CLKs | |
| | | | 0xD | 8193 PWM CLKs | |
| | | | 0xE | 16385 PWM CLKs | |
| | | | 0xF | 32769 PWM CLKs | |
| 11:8 | PGOOD On Delay | Sets Delay from the detection of no unmasked Fault or Warning events to the release of PGOOD low. 0d: Delay PGOOD low-high: 1 PWM CLK 1d-15d: Delay PGOOD low-high: 2^N+1 PWM CLKs | 0x0 | 1 PWM CLK | |
| | | | 0x1 | 3 PWM CLKs | |
| | | | 0x2 | 5 PWM CLKs | |
| | | | 0x3 | 9 PWM CLKs | |
| | | | 0x4 | 17 PWM CLKs | |
| | | | 0x5 | 33 PWM CLKs | |
| | | | 0x6 | 65 PWM CLKs | |
| | | | 0x7 | 129 PWM CLKs | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 0x8 | 257 PWM CLKs | |
| | | | 0x9 | 513 PWM CLKs | |
| | | | 0xA | 1025 PWM CLKs | |
| | | | 0xB | 2049 PWM CLKs | |
| | | | 0xC | 4097 PWM CLKs | |
| | | | 0xD | 8193 PWM CLKs | |
| | | | 0xE | 16385 PWM CLKs | |
| | | | 0xF | 32769 PWM CLKs | |
| 7 | PGOOD Output Overvoltage Fault | Controls if Output Overvoltage Fault should assert PGOOD low. | 0 | True | PGOOD asserted low by Output Overvoltage Fault |
| | | | 1 | False | PGOOD not asserted low by Output Overvoltage Fault |
| 6 | PGOOD Output Overvoltage Warning | Controls if Output Overvoltage Warning should assert PGOOD low. | 0 | True | PGOOD asserted low by Output Overvoltage Warning |
| | | | 1 | False | PGOOD not asserted low by Output Overvoltage Warning |
| 5 | PGOOD Output Undervoltage Fault | Controls if Output Undervoltage Fault should assert PGOOD low. | 0 | True | PGOOD asserted low by Output Undervoltage Fault |
| | | | 1 | False | PGOOD not asserted low by Output Undervoltage Fault |
| 4 | PGOOD Output Undervoltage Warning | Controls if Output Undervoltage Warning should assert PGOOD low. | 0 | True | PGOOD asserted low by Output Undervoltage Warning |
| | | | 1 | False | PGOOD not asserted low by Output Undervoltage Warning |
| 3 | PGOOD Output Overcurrent Warning | Controls if Output Overcurrent Warning should assert PGOOD low. | 0 | True | PGOOD asserted low by Output Overcurrent Warning |
| | | | 1 | False | PGOOD not asserted low by Output Overcurrent Warning |
| 2 | PGOOD Output Overcurrent Fault | Controls if Output Overcurrent Fault should assert PGOOD low. | 0 | True | PGOOD asserted low by Output Overcurrent Fault |
| | | | 1 | False | PGOOD not asserted low by Output Overcurrent Fault |
| 1 | PGOOD Input Overvoltage Warning | Controls if Input Overvoltage Warning should assert PGOOD low. | 0 | True | PGOOD asserted low by Input Overvoltage Warning |
| | | | 1 | False | PGOOD not asserted low by Input Overvoltage Warning |
| 0 | PGOOD Input Overvoltage Fault | Controls if Input Overvoltage Fault should assert PGOOD low. | 0 | True | PGOOD asserted low by Input Overvoltage Fault |
| | | | 1 | False | PGOOD not asserted low by Input Overvoltage Fault |

**SYNC_CONFIG (0xE4)**
Description: Configures synchronization options.

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 7:6 | Sync Dir | When SYNC_DIR = 11b - Enable Auto Detect, the SYNC_IN or SYNC_OUT will be selected based on the state of the SYNC pin when the enable Condition, as defined by ON_OFF_CONFIG is met. | 00 | SYNC Disabled | |
| | | | 01 | Sync out | |
| | | | 10 | Sync in | |
| | | | 11 | Auto Detect Sync | |
| 5 | Sync Edge | Synchronizes to falling or rising edge of SYNC. | 0 | Falling Edge | |
| | | | 1 | Rising Edge | |

**STACK_CONFIG (0xEC)**
Description: Configures multi-phase stack settings.

| Bit | Function | Description | Format |
|---|---|---|---|
| 7:4 | BCX Start | BCX address for stack master. | Integer Unsigned |

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 3:0 | BCX Stop | Configures multi-phase stack settings. | 0000 | Stand Alone, 1 Phase | |
| | | | 0001 | 1 Slave, 2 Phases | |
| | | | 0010 | 2 Slaves, 3 Phases | |
| | | | 0011 | 3 Slaves, 4 Phases | |

**MISC_OPTIONS (0xED)**
Description: Configures miscellaneous settings.

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 15 | Require Packet Error Check | Enables/Disables Packet Error Check. | 0 | | Disabled |
| | | | 1 | | Enabled |
| 14 | Reset on Shutdown | Resets VOUT_COMMAND to VBOOT on shutdown. | 0 | | VOUT_COMMAND will be unchanged following a shutdown. |
| | | | 1 | | VOUT_COMMAND will be changed to VBOOT on a Control or OPERATION shutdown. |
| 13 | Reset on Fault | Resets VOUT_COMMAND to VBOOT on fault restart. | 0 | | VOUT_COMMAND will be unchanged following a Fault Restart. |
| | | | 1 | | VOUT_COMMAND will be changed to VBOOT on Restart from a Fault when Fault Retry is set to Retry after Fault. |
| 12 | Reset | Sets the function of the PGOOD/RESET pin. | 0 | PGOOD | |
| 3 | Pull-up | Sets the pull-up of the PGD/RESET_B pin when RESET# = 1b. | 0 | Disabled | Disabled |
| 2 | Fault Count | Fault count. | 0 | Counts down 1 cycle | Fault Counter counts down one cycle on PWM cycle without fault. |

| | | | | | |
|---|---|---|---|---|---|
| | | | 1 | Resets to 0 | Fault Counter resets counter to 0 on PWM cycle without fault. |
| 1:0 | ADC Resolution | Sets the ADC resolution. | 00 | 12-bit | |
| | | | 01 | 10-bit | |
| | | | 10 | 8-bit | |
| | | | 11 | 6-bit | |

**PIN_DETECT_OVERRIDE (0xEE)**
Description: Prevents the Default or User Store values from over-writing the pin-programmed value.

| Bit | Function | Description | Value | Function | Description |
|---|---|---|---|---|---|
| 12 | STACK_CONFIG | Decides if STACK_CONFIG will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| | | | 1 | Pin Detection | |
| 11 | SYNC_CONFIG | Decides if SYNC_CONFIG will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| | | | 1 | Pin Detection | |
| 9 | COMPENSATION_CONFIG | Decides if COMPENSATION_CONFIG will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| 8 | SLAVE_ADDRESS | Decides if SLAVE_ADDRESS will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| | | | 1 | Pin Detection | |
| 5 | INTERLEAVE | Decides if INTERLEAVE will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| | | | 1 | Pin Detection | |
| 3 | TON_RISE | Decides if TON_RISE will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| | | | 1 | Pin Detection | |
| 2 | IOUT_OC_FAULT/WARN_LIMIT | Decides if IOUT_OC_FAULT_LIMIT and IOUT_OC_WARN_LIMIT will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| | | | 1 | Pin Detection | |
| 1 | FREQUENCY_SWITCH | Decides if FREQUENCY_SWITCH will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| 0 | Vout Related Commands | Decides if VOUT_COMMAND, VOUT_SCALE_LOOP, VOUT_MAX, and VOUT_MIN will be restored from NVM or pin detection at power-up or RESTORE. | 0 | NVM | |
| | | | 1 | Pin Detection | |

**SLAVE_ADDRESS (0xEF)**
Description: Used to program or read-back the slave address of digital communication. When a slave address is updated, the device starts responding to the new address immediately.

| Bit | Description | Format |
|---|---|---|
| 6:0 | Sets or retrieves the PMBus slave address. There are a number of slave address values which are reserved in the SMBus specification. The following reserved addresses are invalid and can not be programmed: 0x0C, 0x28, 0x37 and 0x61. | Integer Unsigned |

**NVM_CHECKSUM (0xF0)**
Description: Reports the CRC-16 (polynomial 0x8005) checksum for the current NVM settings.

| Bit | Description | Format |
|---|---|---|
| 15:0 | CRC16 for EEPROM settings. | Integer Unsigned |

**SIMULATE_FAULT (0xF1)**
Description: Simulates fault and warning conditions by triggering the output of the detection circuit for that controls it. Multiple faults and/or warnings can be simulated at once.

| Bit | Function | Description | Value | Description |
|---|---|---|---|---|
| 15 | Fault Persist | Persist simulated faults. | 0 | Simulated faults are automatically removed after one Fault response. |
| | | | 1 | Simulated faults persist until SIMULATE_FAULT is written again. |
| 14 | Sim Temp OTF | Simulate over-temperature fault | 0 | |
| | | | 1 | |
| 12 | Sim IOUT OCF | Simulate output current over-current fault. | 0 | |
| | | | 1 | |
| 11 | Sim VIN UVLO | Simulate VIN undervoltage lockout. | 0 | |
| | | | 1 | |
| 10 | Sim VIN OVF | Simulate VIN over-voltage fault. | 0 | |
| | | | 1 | |
| 9 | Sim VOUT UVF | Simulate VOUT under-voltage fault. | 0 | |
| | | | 1 | |
| 8 | Sim VOUT OVF | Simulate VOUT over-voltage fault. | 0 | |
| | | | 1 | |
| 7 | Warn Persist | Persist simulated warnings. | 0 | Simulated warnings are automatically removed after one Fault response. |
| | | | 1 | Simulated warnings persist until SIMULATE_FAULT is written again. |
| 4 | Sim IOUT OCW | Simulate output current over-current warning. | 0 | |
| | | | 1 | |
| 3 | Sim VIN UVW | Simulate VIN under-voltage warning. | 0 | |
| | | | 1 | |
| 1 | Sim VOUT UVW | Simulate VOUT under-voltage warning. | 0 | |
| | | | 1 | |
| 0 | Sim VOUT OVW | Simulate VOUT over-voltage warning. | 0 | |
| | | | 1 | |