

This application note describes the PMBus™ digital communications protocol features of **MW0CP68-3600** series of power modules.

Standard PMBus™ characteristics

- Complies with PMBus™ Power Systems Management Protocol Part 1 – General Requirements Rev 1.2 including use of PEC (Packet Error Checking).
- [Linear data](#) format is used for all supported parameters unless noted.
- A minimum of 300µs delay between transactions (between the STOP of one command and the START of the next command) is required.
- 100KHz I²C communications is supported for the PMBus™ interface.

Internal PSU Device Details

Power Supply Controllers			
Vendor	MFG Part Number	Package	Description
Texas Instruments	UCD3138128PFC	TQFP80	(Secondary) IC Dig SMT Microcontroller UCD3138 TQFP80 31.25MHz
Texas Instruments	UCD3138064RMH	QFN40	(Primary) IC Dig SMT Controller PWM Industrial UCD3138 QFN40 31.25MHz
ST	M24C02-WMN6TP		Power Supply EEPROM

Device Addressing:

The power module employs “left shifted” 7-Bit address where bit “0” of the address is the Read/Write bit. Three address pins are provided on the power module to configure the address of the internal slave devices and correspond to address bits A0 (least significant bit), A1, and A2”. The address listed below assume the Read/Write bit is logic level “0”.

Power Supply Module's Internal Slave Device Serial Addresses					
Microcontroller	External EEPROM	Bit / Pin# Logic			
		A2 / B3	A1 / B4	A0 / B5	
0xB0	0xA0	0	0	0	
0xB2	0xA2	0	0	1	
0xB4	0xA4	0	1	0	
0xB6	0xA6	0	1	1	
0xB8	0xA8	1	0	0	
0xBA	0xAA	1	0	1	
0xBC	0xAC	1	1	0	
0xBE	0xAE	1	1	1	

PMBus™ Command List: Pg. 0 (Main Output)

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
00	PAGE	R/W Byte	1	All			Command to provide ability to configure, control & monitor multiple outputs Value= 0 or 1	YES
01	OPERATION	R/W Byte	1	All	7		Turn the unit on/off in conjunction with digital input from PSON_H	YES
03	CLEAR_FAULTS	Send Byte	0	All			Write only command clears all faults that have been set in all the STATUS_XXXX registers in all pages simultaneously	YES
05	PAGE_PLUS_WRITE	Write Block	Variable	All			Set the page within a device, send a command, and send the data for the command in one packet. Support the following command codes: 01, 3B, 3C, 46, 4A, 51, 5D, 6A, 6B, 7A, 7B, 7C, 7D, 7E, 80, 81, E0, E2, E4	YES
06	PAGE_PLUS_READ	Block Write - Block Read Process Call	Variable	All			Set the page within a device, send a command, and read the data returned by the command in one packet. Support the following command codes: 01, 19, 20, 3A, 3B, 3C, 46, 4A, 51, 5D, 6A, 6B, 78, 79, 7A, 7B, 7C, 7D, 7E, 80, 81, 88, 89, 8A, 8B, 8C, 8D, 8E, 8F, 90, 91, 96, 97, 9F, A0, A1, A2, A3, A4, A5, A6, A7, A8, A9, C0, C1, C2, D0, D1, D2, D8, E0, E2, E3, E4	YES
19	CAPABILITY	Read Byte	1	All			This command provides a way for a host system to determine some key capabilities of a PMBus device.. Always read 90h	YES
1A	QUERY	Block Write - Block Read Process Call	1	All			Used to ask a PMBus device if it supports a given command, and if so, what data formats it supports for that command.	YES
					7	CMD_SUPPORTED	Command is supported	YES
					6	CMD_SUPPORTED_WR	Command is supported for write	YES
					5	CMD_SUPPORTED_RD	Command is supported for read	YES
					4:2	CMD_FORMAT	Data format - 0 = Linear data format, 011 = Direct mode format, 111 = Non numeric data	YES
					1	RESERVED	Reserved	NO
					0	RESERVED	Reserved	NO
1B	SMBALERT_MASK	Write Word/Block Write - Block Read Process Call	2 / Variable	All			Used to prevent a warning or fault condition from asserting the SMBALERT# signal. Support the following Status_x command code: 7A and 7B (for main output), 7C, 7D, 7E, 80 and 81 (for both main and standby output)	YES
20	VOUT_MODE	Read Byte	1	0			Single data byte sets the READ_VOUT sensor to linear mode data format and supplies N = -9 exponent for translation to volts. Always read 17h	YES
30	COEFFICIENT	Block Write - Block Read Process Call	5	All			Used to retrieve the m, b and R coefficients needed by data in the DIRECT format. Support the following command codes: 86, 87 Always read m = 1, b = 0, R= 0	YES

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
3A	FAN_CONFIG_1_2	Read Byte	1	All			Show the config of fan. Always read 99h	YES
					7	FAN_1_INSTALLATION	Asserted when fan is installed in position 1	YES
					6	FAN_1_SETTING_MODE	Asserted when fan is commanded in RPM (Clear when fan is commanded in Duty Cycle)	YES
					5	FAN_1_TACH_PULSES	Fan 1 Tachometer pulses per revolution (upper bit)	YES
					4	FAN_1_TACH_PULSES	Fan 1 Tachometer pulses per revolution (lower bit)	YES
					3	FAN_2_INSTALLATION	Asserted when fan is installed in position 2	YES
					2	FAN_2_SETTING_MODE	Asserted when fan is commanded in RPM (Clear when fan is commanded in Duty Cycle)	YES
					1	FAN_2_TACH_PULSES	Fan 2 Tachometer pulses per revolution (upper bit)	YES
					0	FAN_2_TACH_PULSES	Fan 2 Tachometer pulses per revolution (lower bit)	YES
3B	FAN_COMMAND_1	R/W Word	2	All			Manual fan override command fan speed value in Duty Cycle (0-100) Command speed formatted in Linear (N = 0)	YES
3C	FAN_COMMAND_2	R/W Word	2	All			Always keep same value as FAN_COMMAND_1 Read/write both 3B and 3C command get the same result Command speed formatted in Linear (N = 0)	YES
46	IOUT_OC_FAULT_LIMIT	R/W Word	2	0			Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent fault condition. The value should be within 1A to default value (87A)	YES
4A	IOUT_OC_WARN_LIMIT	R/W Word	2	0			Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent warning. The value should be within 1A to default value (70A)	YES
51	OT_WARN_LIMIT (Hot Spot)	R/W Word	2	All			Set the temperature, in degrees Celsius, of the secondary hot spot (READ_TEMPERATURE_2) at which it should indicate an Overtemperature Warning alarm. The value should be within 0 to default value (100degC)	YES
5D	IIN_OC_WARN_LIMIT	R/W Word	2	All			Sets the value of the input current, in amperes, that causes a warning that the input current is high. The value should be within 0 to default value (25A)	YES
6A	POUT_OP_WARN_LIMIT	R/W Word	2	All			Sets the value of the output power, in watts, that causes a warning that the output power is high. The value should be within 0 to default value (4500W)	YES
6B	PIN_OP_WARN_LIMIT	R/W Word	2	All			Sets the value of the input power, in watts, that causes a warning that the input power is high. The value should be within 0 to default value (4500W)	YES
78	STATUS_BYTE	Read Byte	1	0	7	BUSY_F	Asserted when device busy and unable to respond fault	NO
					6	UNIT_OFF	Asserted when unit not providing power to the output	YES
					5	OUTPUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					4	OUTPUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					3	INPUT_UV_F	Asserted when an input undervoltage fault has occurred	YES
					2	TEMPERATURE_F_W	Asserted when an overtemperature fault or warning has occurred	YES
					1	CML_F	Asserted when a communications, memory, or logic fault has occurred	YES
					0	NONE_F_W	Asserted when a fault not listed in [7:1] occurred	NO

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
79	STATUS_WORD	Read Word	2	0	7	VOUT_F_W	Asserted when an output voltage fault or warning has occurred	YES
					6	IOUT_POUT_F_W	Asserted when an output current / output power fault or warning has occurred	YES
					5	INPUT_F_W	Asserted when an Input voltage/current/power fault or warning has occurred	YES
					4	MFG_SPECIFIC_F_W	Manufacturer specific fault or warning has occurred	YES
					3	POWER_GOOD_L	Asserted when the POWER_GOOD signal is negated	YES
					2	FANS_F_W	Asserted when a fan fault or warning has occurred	YES
					1	STATUS_OTHER_F_W	Asserted when a bit in command STATUS_OTHER set	NO
					0	UNKNOWN_F_W	Asserted when a fault not listed in [15:1] has occurred	NO
					7	BUSY_F	Asserted when device busy and unable to respond fault	NO
					6	UNIT_OFF	Asserted when unit not providing power to the output	YES
					5	OUTPUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					4	OUTPUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					3	INPUT_UV_F	Asserted when an input undervoltage fault has occurred	YES
					2	TEMPERATURE_F_W	Asserted when an overtemperature fault or warning has occurred	YES
					1	CML_F	Asserted when a communications, memory, or logic fault has occurred	YES
					0	NONE_F_W	Asserted when a fault not listed in [7:1] occurred	NO
7A	STATUS_VOUT	R/W Byte	1	0	7	VOUT_OV_F	Asserted when an output overvoltage fault has occurred (Assert threshold 58.8V)	YES
					6	VOUT_OV_W	Asserted when an output overvoltage warning has occurred (Assert threshold 56.1V, recover 55V)	YES
					5	VOUT_UV_W	Asserted when an output undervoltage warning has occurred (Assert threshold 52.8V, recover 54V)	YES
					4	VOUT_UV_F	Asserted when an output undervoltage fault has occurred (Assert threshold 45V)	YES
					3	VOUT_MAX_F	Asserted when the output is set higher than the commanded VOUT_MAX limit	NO
					2	TON_MAX_F	Asserted when the output turn-on timing has exceeded the TON_MAX fault timing	NO
					1	TON_MAX_W	Asserted when the output turn-on timing has exceeded the TON_MAX warning timing	NO
					0	VOUT_TRACKING_E	Asserted when an error in the output voltage during power-up/down has occurred	NO
7B	STATUS_IOUT	R/W Byte	1	0	7	IOUT_OC_F	Asserted when an output overcurrent fault has occurred (Assert threshold refer to the setting of command 0x46 IOUT_OC_FAULT_LIMIT)	YES
					6	IOUT_OC_SHUTDOWN	Asserted when an output overcurrent and low voltage shutdown fault has occurred	NO
					5	IOUT_OC_W	Asserted when an output overcurrent warning has occurred (Assert threshold refer to the setting of command 0x4A IOUT_OC_WARN_LIMIT, recover threshold = IOUT_OC_WARN_LIMIT - 2A)	YES
					4	IOUT_UC_W	Asserted when an output undercurrent fault has occurred	NO
					3	CURRENT_SHARE_F	Asserted when an output current share fault has occurred	NO
					2	POWER_LIMIT_MODE	Asserted when the unit has entered output power limiting mode	NO
					1	POUT_OP_F	Asserted when an output overpower fault has occurred (Assert threshold 4680W)	YES
					0	POUT_OP_W	Asserted when an output overpower warning has occurred (Assert threshold refer to the setting of command 0x6A POUT_OP_WARN_LIMIT, recover threshold = POUT_OP_WARN_LIMIT - 50W)	YES

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
7C	STATUS_INPUT	R/W Byte	1	All	7	VIN_OV_F	Asserted when an input overvoltage fault has occurred (AC assert threshold 315V, recover 310V) (DC assert threshold 410V, recover 403V)	YES
					6	VIN_OV_W	Asserted when an input overvoltage warning has occurred (AC assert threshold 308V, recover 302V) (DC assert threshold 405V, recover 402V)	YES
					5	VIN_UV_W	Asserted when an input undervoltage warning has occurred (AC assert threshold 173V, recover 178V) (DC assert threshold 178V, recover 188V)	YES
					4	VIN_UV_F	Asserted when an input undervoltage fault has occurred, only when input voltage change from normal to undervoltage. (AC assert threshold 168V, recover 178V) (DC assert threshold 176V, recover 186V)	YES
					3	VIN_UV_OFF	Asserted when the Unit is OFF for insufficient input voltage. (AC assert threshold 168V, recover 178V) (DC assert threshold 176V, recover 186V)	YES
					2	IIN_OC_F	Asserted when an input overcurrent fault has occurred	NO
					1	IIN_OC_W	Asserted when an input overcurrent warning has occurred (Assert threshold refer to the setting of command 0x5D IIN_OC_WARN_LIMIT, recover threshold = IIN_OC_WARN_LIMIT - 1A)	YES
					0	PIN_OP_W	Asserted when an input overpower warning has occurred (Assert threshold refer to the setting of command 0x6B PIN_OP_WARN_LIMIT, recover threshold = PIN_OP_WARN_LIMIT - 50W)	YES
7D	STATUS_TEMPERATURE	R/W Byte	1	All	7	TEMPERATURE_OT_F	Asserted when an overtemperature fault has occurred (Assert when one of the temperature sensors is over their corresponding set threshold for 11 second)	YES
					6	TEMPERATURE_OT_W	Asserted when an overtemperature warning has occurred (Assert when one of the temperature sensors is over their corresponding set threshold for 1 second)	YES
					5	TEMPERATURE_UT_W	Asserted when an under temperature warning has occurred	NO
					4	TEMPERATURE_UT_F	Asserted when an under temperature fault has occurred	NO
					3	RESERVED	Reserved	NO
					2	RESERVED	Reserved	NO
					1	RESERVED	Reserved	NO
					0	RESERVED	Reserved	NO
7E	STATUS_CML	R/W Byte	1	All	7	CML_COMMAND_E	Asserted when an invalid or unsupported command is received	YES
					6	CML_DATA_E	Asserted when invalid or unsupported data is received	YES
					5	CML_PEC_E	Asserted when a packet error checking (PEC) failed has occurred	YES
					4	CML_MEMORY_F	Asserted when a memory fault is detected (example: Checksum errors during bootload)	YES
					3	CML_PROCESSOR_F	Asserted when a processor fault is detected (primary-secondary UART error)	YES
					2	RESERVED	Reserved	NO
					1	CML_COMM_F	Asserted when a communication fault not listed in [7:3] has occurred, such as timeout	YES
					0	CML_OTHER_F	Asserted when another memory or logic fault has occurred (example: UART error)	NO
80	STATUS_MFR_SPECIFIC	R/W Byte	1	All	7	RESERVED		NO
					6	PRI_TEMP_OT	LLC primary temp sensor over temperature fault	YES
					5	ORING_TEMP_OT	Oring temp sensor over temperature fault	YES
					4	I_SENSE_FAIL	Current sensor reading error	YES
					3	TEMP_SENSE_FAIL	Temperature sensor reading error	YES
					2	WRONG_PID	Primary product ID incorrect	YES
					1	RESERVED		NO
					0	ORING_FAULT	Oring FET fault	YES

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
81	STATUS_FANS_1_2	R/W Byte	1	All	7	FAN_1_F	Fan 1 fault (Assert threshold - fan 1 RPM 5400, recover 6000)	YES
					6	FAN_2_F	Fan 2 fault (Assert threshold - fan 2 RPM 5400, recover 6000)	YES
					5	FAN_1_W	Fan 1 warning (Assert threshold - (fan 1 RPM error > 4000, recover 2500) or (fan RPM error < -8000, recover -4500))	YES
					4	FAN_2_W	Fan 2 warning (Assert threshold - (fan 2 RPM error > 4000, recover 2500) or (fan RPM error < -8000, recover -4500))	YES
					3	FAN_1_OVERRIDE	Fan 1 speed overridden	YES
					2	FAN_2_OVERRIDE	Fan 2 speed overridden	YES
					1	FAN_AIRFLOW_F	Airflow fault	NO
					0	FAN_AIRFLOW_W	Airflow warning	NO
86	READ_EIN	Block Read	6	All			Input Energy count, Rollover count and Sample count	YES
							Direct data format, coefficients supplied by command COEFFICIENT	
							Energy count Resolution: 1W	
87	READ_EOUT	Block Read	6	All			Output Energy count, Rollover count and Sample count	YES
							Direct data format, coefficients supplied by command COEFFICIENT	
							Energy count Resolution: 1W	
88	READ_VIN	Read Word	2	All			Input Voltage Sensor Reading in Vrms	YES
							PMBus Sensor Data Format : Linear (N= -2 or -1)	
							PMBus Sensor Resolution: 0.25Vrms	
							Full-scale : 359Vac / 506Vdc	
							Accuracy: +/-2%	
89	READ_IIN	Read Word	2	All			Input Current Sensor Reading in Arms	YES
							PMBus Sensor Data Format : Linear (N= 0 to -7)	
							PMBus Sensor Resolution: 0.0078Arms	
							Full-scale : 28.3Arms / 40 Adc	
							Accuracy: +/-5% @10-20% load, +/-2% @>20% load	
8A	READ_VCAP	Read Word	2	All			Bulk Capacitor Voltage Sensor Reading in Vdc	YES
							PMBus Data Format : Linear (N= 0 to -1)	
							PMBus Sensor Resolution: 0.5Vdc	
							Full-scale : 1023 Vdc	
							Accuracy: +/-2%	
8B	READ_VOUT	Read Word	2	0			Output Voltage Sensor Reading in Vdc	YES
							PMBus Sensor Data Format : Linear (N = -9) supplied by command VOUT_MODE	
							PMBus Sensor Resolution: 0.00195Vdc	
							Full-scale : 61.5 Vdc	
							Accuracy: +/-2%	
8C	READ_IOUT	Read Word	2	0			Output Current Sensor Reading in Adc	YES
							PMBus Sensor Data Format : Linear (N= -4 to -1)	
							PMBus Sensor Resolution: 0.125 Adc	
							Full-scale : 182 Adc	
							Accuracy: +/-5% @10-20% load, +/-2% @>20% load	

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
8D	READ_TEMPERATURE_1	Read Word	2	All			Temperature Sensor reading in °C	YES
							PMBus Sensor Data Format : Linear (N = -3)	
							PMBus Sensor Resolution: 0.125 °C	
							Range : -128°C to 128°C	
							Accuracy: +/-3°C	
8E	READ_TEMPERATURE_2	Read Word	2	All			Temperature Sensor reading in °C	YES
							PMBus Sensor Data Format : Linear (N = -3)	
							PMBus Sensor Resolution: 0.125 °C	
							Range : -128°C to 128°C	
							Accuracy: +/-3°C	
8F	READ_TEMPERATURE_3	Read Word	2	All			Temperature Sensor reading in °C	YES
							PMBus Sensor Data Format : Linear (N = -3)	
							PMBus Sensor Resolution: 0.125 °C	
							Range : -128°C to 128°C	
							Accuracy: +/-3°C	
90	READ_FAN_SPEED_1	Read Word	2	All			Fan Speed Sensor reading in RPM	YES
							PMBus Sensor Data Format : Linear (N = 5 RPM_MAX <= 32736)	
							PMBus Sensor Resolution: 32 RPM (N=5)	
							Full-scale : 32736 RPM	
							Accuracy: +/-5% of full-speed	
91	READ_FAN_SPEED_2	Read Word	2	All			Fan Speed Sensor reading in RPM	YES
							PMBus Sensor Data Format : Linear (N = 5 RPM_MAX <= 32736)	
							PMBus Sensor Resolution: 32 RPM (N=5)	
							Full-scale : 32736 RPM	
							Accuracy: +/-5% of full-speed	
96	READ_POUT	Read Word	2	0			Output Power Sensor reading in watts	YES
							PMBus Sensor Data Format : Linear (N = 3 to -3)	
							PMBus Sensor Resolution: 0.125 Watts	
							Full-scale : 8184W	
							Accuracy: +/-5% @10-20% load, +/-2% @>20% load	
97	READ_PIN	Read Word	2	All			Input Power Sensor reading in watts	YES
							PMBus Sensor Data Format : Linear (N = 3 to -3)	
							PMBus Sensor Resolution: 0.125 Watts	
							Full-scale : 8184W	
							Accuracy: +/-5% @10-20% load, +/-2% @>20% load	
98	PMBUS_REVISION	Read Byte	1	All			Reading of the PMBus revision to which the power supply is compliant Always read 22h	YES
99	MFR_ID	Block Read	1+9	All			Manufacture's ID (ASCII code): Murata-PS	YES
9A	MFR_MODEL	Block Read	1+17	All			Manufacture's Model Number (ASCII code) : MW0CP68-3600-D-RM	YES
9B	MFR_REVISION	Block Read	1+14	All			Manufacturer's model revision (ASCII code). XXXX-YYYY-0000 XXXX - Primary FW version/revision, YYYY- Secondary FW version/revision	YES
9C	MFR_LOCATION	Block Read	1+5	All			Identify the facility that manufactured the unit (ASCII code) : China	YES
9D	MFR_DATE	Block Read	1+4	All			Identify the unit's date of manufacture (ASCII code: YYWW, e.g. 1535, 15-> year, 35 -> week)	YES
9E	MFR_SERIAL	Block Read	1+12	All			Serial Number : TBD	YES
A0	MFR_VIN_MIN	Read Word	2	All			Minimum rated value of the AC input voltage = 180V. Always read F2D0h. Minimum rated value of the DC input voltage = 192V. Always read F300h.	YES
A1	MFR_VIN_MAX	Read Word	2	All			Maximum rated value of the AC input voltage =305V. Always read FA62h. Maximum rated value of the DC input voltage =400V. Always read FB20.	YES

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
A2	MFR_IIN_MAX	Read Word	2	All			Maximum rated value of the input current = 25Amps. Always read DB20h.	YES
A3	MFR_PIN_MAX	Read Word	2	All			Maximum rated value of the input power = 3900W. Always read 13CFh.	YES
A4	MFR_VOUT_MIN	Read Word	2	0			Minimum rated value of the output voltage = 52.865V. Linear (N = -9) supplied by command VOUT_MODE. Always read 69BBh.	YES
A5	MFR_VOUT_MAX	Read Word	2	0			Maximum rated value of the output voltage = 56.135V. Linear (N = -9) supplied by command VOUT_MODE. Always read 7045h.	YES
A6	MFR_IOUT_MAX	Read Word	2	0			Maximum rated value of the output current = 66A. Always read EA10h.	YES
A7	MFR_POUT_MAX	Read Word	2	All			Maximum rated value of the output power = 3600W. Always read 1384h.	YES
A8	MFR_TAMBIENT_MAX	Read Word	2	All			Maximum ambient temperature: 50degC. Always read 32h	YES
A9	MFR_TAMBIENT_MIN	Read Word	2	All			Minimum ambient temperature: 0degC. Always read 0	YES
AB	MFR_EFFICIENCY_HL	Block Read	1+14	All			Retrieves information about the efficiency of the device while operating at a high line condition: Vin =230V, LP = 720W, Leff = 94%, MP = 1800W, Meff = 96%, HP = 3600W, Heff = 91%. Always read 0x98, 0xF3, 0xD0, 0x02, 0xF0, 0xEA, 0x84, 0x0B, 0x00, 0xEB, 0x84, 0x13, 0xD8, 0xEA	YES
C0	MFR_MAX_TEMP1 (Ambient)	Read Word	2	All			Maximum rated temperature (Ambient): 55degC. Always read 37h	YES
C1	MFR_MAX_TEMP2 (Hot-spot secondary)	Read Word	2	All			Maximum rated temperature (hot-spot secondary): 100degC. Always read 64h	YES
C2	MFR_MAX_TEMP3 (Hot-spot primary)	Read Word	2	All			Maximum rated temperature (hot-spot primary): 110degC. Always read 6Eh	YES
D0 - FF	RESERVED						Reserved for manufacturer	

PMBus™ Command List: Pg. 1 (Vsb output)

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
00	Same as page 0							
01	Same as page 0							
03	Same as page 0							
05	Same as page 0							
06	Same as page 0							
19	Same as page 0							
1A	Same as page 0							
1B	SMBALERT_MASK	Write Word/Block Write - Block Read Process Call	2 / Variable	All			Used to prevent a warning or fault condition from asserting the SMBALERT# signal. Support the following Status_x command code: 7A and 7B (for standby output), 7C, 7D, 7E, 80 and 81 (for both main and standby output)	YES
20	VOUT_MODE	Read Byte	1	1			Single data byte sets the READ_VOUT sensor to linear mode data format and supplies N = -9 exponent for translation to volts. Always read 17h	YES
30	Same as page 0							
3A	Same as page 0							
3B	Same as page 0							
3C	Same as page 0							
46	IOUT_OC_FAULT_LIMIT	R/W Word	2	1			Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent fault condition. The value should be within 1A to default value (4A)	YES
4A	IOUT_OC_WARN_LIMIT	R/W Word	2	1			Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent warning. The value should be within 1A to default value (3.5A)	YES
51	Same as page 0							
5D	Same as page 0							
6A	Same as page 0							
6B	Same as page 0							
78	Same as page 0							
79	Same as page 0							
7A	STATUS_VOUT	R/W Byte	1	1	7	VOUT_OV_F	Asserted when an output overvoltage fault has occurred (Assert threshold 14V)	YES
					6	VOUT_OV_W	Asserted when an output overvoltage warning has occurred (Assert threshold 12.6V, recover 12.4V)	YES
					5	VOUT_UV_W	Asserted when an output undervoltage warning has occurred (Assert threshold 11.4V, recover 11.6V)	YES
					4	VOUT_UV_F	Asserted when an output undervoltage fault has occurred (Assert threshold 10.5V)	YES
					3	VOUT_MAX_F	Asserted when the output is set higher than the commanded VOUT_MAX limit	NO
					2	TON_MAX_F	Asserted when the output turn-on timing has exceeded the TON_MAX fault timing	NO
					1	TON_MAX_W	Asserted when the output turn-on timing has exceeded the TON_MAX warning timing	NO
					0	VOUT_TRACKING_E	Asserted when an error in the output voltage during power-up/down has occurred	NO

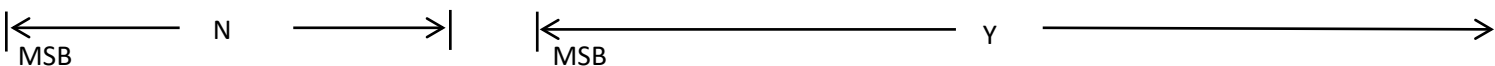
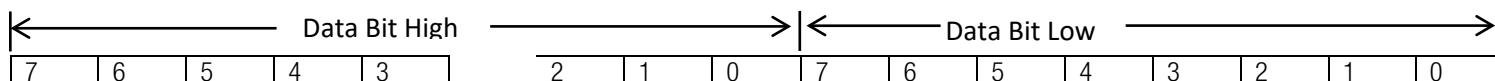
Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
7B	STATUS_IOUT	R/W Byte	1	1	7	IOUT_OC_F	Asserted when an output overcurrent fault has occurred (Assert threshold refer to the setting of command 0x46 IOUT_OC_FAULT_LIMIT)	YES
					6	IOUT_OC_SHUTDOWN	Asserted when an output overcurrent and low voltage shutdown fault has occurred	NO
					5	IOUT_OC_W	Asserted when an output overcurrent warning has occurred (Assert threshold refer to the setting of command 0x4A IOUT_OC_WARN_LIMIT, recover threshold = IOUT_OC_WARN_LIMIT - 0.1A)	YES
					4	IOUT_UC_W	Asserted when an output undercurrent fault has occurred	NO
					3	CURRENT_SHARE_F	Asserted when an output current share fault has occurred	NO
					2	POWER_LIMIT_MODE	Asserted when the unit has entered output power limiting mode	NO
					1	POUT_OP_F	Asserted when an output overpower fault has occurred	NO
					0	POUT_OP_W	Asserted when an output overpower warning has occurred	NO
7C	Same as page 0							
7D	Same as page 0							
7E	Same as page 0							
80	Same as page 0							
81	Same as page 0							
86	Same as page 0							
87	Same as page 0							
88	Same as page 0							
89	Same as page 0							
8A	Same as page 0							
8B	READ_VOUT	Read Word	2	1			Output Voltage Sensor Reading in Vdc	YES
							PMBus Sensor Data Format : Linear (N = -9) supplied by command VOUT_MODE	
							PMBus Sensor Resolution: 0.00195Vdc	
							Full-scale : 16 Vdc	
							Accuracy: +/-2%	
8C	READ_IOUT	Read Word	2	1			Output Current Sensor Reading in Adc	YES
							PMBus Sensor Data Format : Linear (N = -7)	
							PMBus Sensor Resolution: 0.0078125 Adc	
							Full-scale : 8 Adc	
							Accuracy: +/-5% @10-20% load, +/-2% @>20% load	
8D	Same as page 0							
8E	Same as page 0							
8F	Same as page 0							
90	Same as page 0							
91	Same as page 0							
96	READ_POUT	Read Word	2	1			Output Power Sensor reading in watts	YES
							PMBus Sensor Data Format : Linear (N = -5)	
							PMBus Sensor Resolution: 0.03125 Watts	
							Full-scale : 32W	
							Accuracy: +/-5% @10-20% load, +/-2% @>20% load	
97	Same as page 0							
98	Same as page 0							
99	Same as page 0							
9A	Same as page 0							
9B	Same as page 0							
9C	Same as page 0							
9D	Same as page 0							

Command Code	Command Name	Read / Write	# of Bytes	Page	Bit(s) Number	Bit Name	Definition	Supported Y/N
9E	Same as page 0							
9F	Same as page 0							
A0	Same as page 0							
A1	Same as page 0							
A2	Same as page 0							
A3	Same as page 0							
A4	MFR_VOUT_MIN	Read Word	2	1			Minimum rated value of the output voltage = 11.64V. Linear (N = -9) supplied by command VOUT_MODE. Always read 1748h.	YES
A5	MFR_VOUT_MAX	Read Word	2	1			Maximum rated value of the output voltage = 12.36V. Linear (N = -9) supplied by command VOUT_MODE. Always read 18B8h.	YES
A6	MFR_IOUT_MAX	Read Word	2	1			Maximum rated value of the output current = 2.5A. Linear (N = -3) Always read E814h.	YES
A7	MFR_POUT_MAX	Read Word	2	All			Maximum rated value of the output power = 30W. Always read DBC0h.	YES
A8	Same as page 0							
A9	Same as page 0							
AA	Same as page 0							
AB	Same as page 0							
C0	Same as page 0							
C1	Same as page 0							
C2	Same as page 0							

Linear Data Format

Link to [front page](#)

Telemetry sensor and output voltage readings follow linear format as defined by PMBus Power System Mgmt. Protocol Specification – Part II – Revision 1.2 (summarized below)



The Relationship between Y, N and the “real world” value is:

$$X = Y \cdot 2^N$$

Where, as described above:

X is the “real world” value;

Y is an 11 bit, two's compliment integer; and

N is a 5 bit, two's compliment integer.

VOUT_MODE:

Link to [command list](#)

Output Voltage returned readings and parameters are expressed in Linear VOUT_MODE format described below.

Step one:

Read VOUT_Mode (CMD_20h) to determine the exponent and format - results are as follows:

Mode definition			Returned results for CMD_20h				
Mode	Bits (7:5)	Bits (4:0) (Parameter)	Command Code (Hex)	Command Name	Value	Bit#	Value
Linear (Default)	000b	Five bit two's complement exponent for the mantissa delivered as the data bytes for an output voltage command. Bits 4:0 returned= 10111b = N=-9 (Default)	20	VOUT_MODE	17h	Bit 7	0
						Bit 6	0
						Bit 5	0
						Bit 4	1
						Bit 3	0
						Bit 2	1
						Bit 1	1
						Bit 0	1

Step Two:

Convert the high and low data bytes known as the Mantissa into real world output voltage:

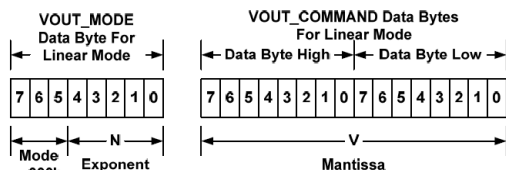


Figure 6. Linear Format Data Bytes

The Mode bits are set to 000b.

The Voltage, in volts, is calculated from the equation:

$$\text{Voltage} = V \cdot 2^N$$

Where:

Voltage is the parameter of interest in volts;

V is a 16 bit unsigned binary integer; and

N is a 5 bit two's complement binary integer.

Murata Power Solutions, Inc.
129 Flanders Road
Westborough, MA 01581
ISO 9001 REGISTERED



This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy. Refer to: <https://www.murata-ps.com/requirements/>

Murata Power Solutions, Inc. ("Murata") makes no representation that the use of its products in the circuits described herein, or the use of other technical information contained herein, will not infringe upon existing or future patent rights. The descriptions contained herein do not imply the granting of licenses to make, use, or sell equipment constructed in accordance therewith. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards that anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm, and take appropriate remedial actions. Buyer will fully indemnify Murata, its affiliated companies, and its representatives against any damages arising out of the use of any Murata products in safety-critical applications. Specifications are subject to change without notice.

© 2022 Murata Power Solutions, Inc.