

PMBus™ Commands

This application note is applicable to the following products.

D1U3CS-W-1300F-12-HA4EC

D1U3CS-W-1300F-12-HC4EC

Standard PMBus™ Commands

All data passed over the PMBus™ interface does not use Packet Error Checking (PEC) per the PMBus™ specification v 1.1 definition. Linear data formatting is used for all passed parameters. Block reads (whereby the loose byte received denotes the remaining bytes to be clocked out) are not supported on these D1U3CS-W-1300F-Hx4EC power supplies. A minimum 100 µsec delay between transactions (between START and STOP bits) is recommended for robust PMBus™ communications.

Note: 100kHz I²C communication is supported on the PMBus™ interface. These products do not support 400kHz I²C communication on the PMBus™ interface.

D1U3CS-W-1300F-12-Hx4EC

Power Supply Main Controller			
Vendor	MFG Part Number	Package	Description
Cypress Semiconductor Inc.	CY8C2763-24LTXIT	48-pin QFN	8-bit PSoc, 16K flash, 256b RAM, -40C to 85°C
Power Supply External EEPROM			
Vendor	MFG Part Number	Package	Description
Microchip Technology Inc.	24AA024T-I/MS	8-pin MSOP	2Kbit, 2.5-5.5V 400kHz, 1.8-2.5V 100kHz, 85°C serial EEPROM
A1 (Serial Address BIT 1)	A0 (Serial Address BIT 0)	Power Supply Main Controller (Serial Communication Slave Address)	Power Supply External EEPROM (Serial Communication Slave Address)
LOW	LOW	0x5C+ (R/W)	0x54+ (R/W)
LOW	HIGH	0x5D+ (R/W)	0x55+ (R/W)
HIGH	LOW	0x5E+ (R/W)	0x56+ (R/W)
HIGH	HIGH	0x5F+ (R/W)	0x57+ (R/W)

Command Code	Command Name	Read / Write	Byte Name	Bit Number	Bit Name	Definition	Supported
1	OPERATION	R/W		7		Turn the unit on/off in conjunction with digital input from PSON	YES
						Set output margin high/low voltages	NO
3	CLEAR_FAULTS	W				Write only command clears all faults that have been set in all the STATUS_XXXX registers simultaneously	YES
20	VOLTAGE_MODE	R				Single data byte sets the READ_VOUT sensor to linear mode data format and supplies PMBus™ Spec - Part II - Revision 1.1 - Sections 8.1-8.3	YES
3A	FAN_CONFIG_1_2	R		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	NO
				2	FAN_2_SETTING_MODE	Asserted when fan is commanded in RPM (Clear when fan is commanded in Duty Cycle)	NO
				1	FAN_2_TACH_PULSES	Fan 2 Tachometer pulses per revolution (upper bit)	NO
				0	FAN_2_TACH_PULSES	Fan 2 Tachometer pulses per revolution (lower bit)	NO
3B	FAN_COMMAND_1	R/W				Two-byte manual fan override command fan speed value in RPM Command speed formatted in linear data format as per command 0x90 - READ_FAN_SPEED_1	YES

* Implementation Status: Supports RPM Mode only

Command Code	Command Name	Read / Write	Byte Name	Bit Number	Bit Name	Definition	Supported
79	STATUS_WORD	R	STATUS_WORD (Upper byte of STATUS_WORD)	7	VOUT_F_W	Asserted when an output voltage fault or warning has occurred	YES
				6	IOUT_POUT_F_W	Asserted when a main 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
			STATUS_BYTE (Lower byte of STATUS_WORD)	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
7A	STATUS_VOUT	R		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
				7	VOUT_OV_F	Asserted when a main output overvoltage fault has occurred	YES
				6	VOUT_OV_W	Asserted when a main output overvoltage warning has occurred	YES
				5	VOUT_UV_W	Asserted when a main output undervoltage warning has occurred	YES
				4	VOUT_UV_F	Asserted when the main output is < 12% for more than 20mS; Toggle enable after 3Sec (Customer spec 3.3.7)	NO
				3	VOUT_MAX_F	Asserted when the main output is set higher than the commanded VOUT_MAX limit	NO
				2	TON_MAX_F	Asserted when the main output turn-on timing has exceeded theTON_MAX fault timing	NO
				1	TON_MAX_W	Asserted when the main output turn-on timing has exceeded theTON_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		7	IOUT_OC_F	Asserted when a main output overcurrent fault has occurred	YES
				6	IOUT_OC_SHUTDOWN	Asserted when a main output overcurrent and low voltage shutdown fault has occurred	YES
				5	IOUT_OC_W	Asserted when a main output overcurrent warning has occurred	YES
				4	IOUT_UC_W	Asserted when a main output undercurrent fault has occurred	NO
				3	CURRENT_SHARE_F	Asserted when a 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	YES
7C	STATUS_INPUT	R		7	VIN_OV_F	Asserted when an input overvoltage fault has occurred	NO
				6	VIN_OV_W	Asserted when an input overvoltage warning has occurred	YES
				5	VIN_UV_W	Asserted when an input undervoltage warning has occurred	YES
				4	VIN_UV_F	Asserted when an input undervoltage fault has occurred	YES
				3	VIN_UV_OFF	Asserted when the Unit is OFF for insufficient input voltage	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	YES
				0	PIN_OP_W	Asserted when an input overpower warning has occurred	YES
7D	STATUS_TEMPERATURE	R		7	TEMPERATURE_OT_F	Asserted when an overtemperature fault has occurred	YES
				6	TEMPERATURE_OT_W	Asserted when an overtemperature warning has occurred	YES
				5	TEMPERATURE_UT_W	Asserted when an undertemperature warning has occurred	NO
				4	TEMPERATURE_UT_F	Asserted when an undertemperature fault has occurred	NO
				3	RESERVED	Reserved	NO
				2	RESERVED	Reserved	NO
				1	RESERVED	Reserved	NO
				0	RESERVED	Reserved	NO

Command Code	Command Name	Read / Write	Byte Name	Bit Number	Bit Name	Definition	Supported
7E	STATUS_CML	R		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	NO
				3	CML_PROCESSOR_F	Asserted when a processor fault is detected	NO
				2	RESERVED	Reserved	NO
				1	CML_NONE_F	Asserted when a communication fault not listed in [7:3] has occurred	NO
				0	CML_OTHER_F	Asserted when another memory or logic fault has occurred	NO
80	STATUS_MFG_SPECIFIC	R		7	PS_KILL	Asserted when the PS_KILL pin is shorted and the unit is properly seated in the chassis	YES
				6	AC_OK	Asserted when the input voltage is within operating specification	YES
				5	PS_ON	Asserted when the PS_ON_H is high	YES
				4	VSTBY_OV_W	Asserted when a standby output overvoltage warning has occurred	YES
				3	VSTBY_UV_W	Asserted when a standby output undervoltage warning has occurred	YES
				2	VSTBY_UV_F	Asserted when a standby output overvoltage fault has occurred	YES
				1	ISTBY_OC_W	Asserted when a standby output overcurrent warning has occurred	YES
				0	ISTBY_OC_F	Asserted when a standby output overcurrent fault has occurred	YES
81	STATUS_FANS_1_2	R		7	FAN_1_F	Fan 1 fault	YES
				6	FAN_2_F	Fan 2 fault	NO
				5	FAN_1_W	Fan 1 warning	YES
				4	FAN_2_W	Fan 2 warning	NO
				3	FAN_1_OVERRIDE	Fan 1 speed overridden	YES
				2	FAN_2_OVERRIDE	Fan 2 speed overridden	NO
				1	FAN_AIRFLOW_F	Airflow fault	NO
				0	FAN_AIRFLOW_W	Airflow warning	NO
88	READ_VIN	R			Two-byte Input Voltage Sensor Reading in Vrms PMBus™ Data Format: Linear Data Format (N = -1) PMBus™ Sensor Resolution: 0.5Vrms (linear format) Raw sensor full-scale: 300Vrms Accuracy: ±5% of raw sensor full-scale	YES	
89	READ_IIN	R			Two-byte Input Current Sensor Reading in Arms PMBus™ Data Format: Linear Data Format (N = -5) PMBus™ Sensor Resolution: 0.03125Arms (linear format) Raw sensor full-scale: 31.96875Arms Accuracy: ±5% of raw sensor full-scale	YES	
8B	READ_VOUT	R			Two-byte Output Voltage Sensor Reading in Vdc PMBus™ Data Format: Linear Data Format (N = -6) supplied by command 0x20 VOUT_MODE PMBus™ Sensor Resolution: 0.015625Vdc (linear format) Raw sensor full-scale: 15.984 Vdc Accuracy: ±2% of raw sensor full-scale	YES	
8C	READ_IOUT	R			Two-byte Output Current Sensor Reading in Adc PMBus™ Data Format: Linear Data Format (N = -3) PMBus™ Sensor Resolution: 0.125 Adc (linear format) Raw sensor full-scale: 127.8 Adc Accuracy: ±2% of raw sensor full-scale	YES	
8D	READ_TEMPERATURE_1	R			Two-byte Outlet Temperature Sensor reading in °C PMBus™ Data Format: Linear Data Format (N = 0) PMBus™ Sensor Resolution: 1 °C (linear format) Raw sensor full-scale: -7C to 150C Accuracy: ±3 C	YES	
8E	READ_TEMPERATURE_2	R			Two-byte Inlet Temperature Sensor reading in °C PMBus™ Data Format: Linear Data Format (N = 0) PMBus™ Sensor Resolution: 1 °C (linear format) Raw sensor full-scale: -10C to 150C Accuracy: ±3 C	YES	
8F	READ_TEMPERATURE_3	R			Two-byte Secondary Hotspot Temperature Sensor reading in °C PMBus™ Data Format: Linear Data Format (N = 0) PMBus™ Sensor Resolution: 1 °C (linear format) Raw sensor full-scale: 27C to 150C Accuracy: ±3 C	YES	

Command Code	Command Name	Read / Write	Byte Name	Bit Number	Bit Name	Definition	Supported		
90	READ_FAN_SPEED_1	R				Two-byte Fan Speed Sensor reading in RPM	YES		
						PMBus™ Data Format: Linear Data Format (N = 5)			
						PMBus™ Sensor Resolution: 32 RPM			
						Raw sensor full-scale: 32736 rpm			
						Accuracy: ±5% of full-speed			
96	READ_POUT	R				Two-byte Output Power Sensor reading in watts	YES		
						PMBus™ Data Format: Linear Data Format (N = 1)			
						PMBus™ Sensor Resolution: 2 Watts			
						Sensor full-scale: 2,046 Watts			
97	READ_PIN	R				Two-byte Input Power Sensor reading in watts	YES		
						PMBus™ Data Format: Linear Data Format (N = 1)			
						PMBus™ Sensor Resolution: 2 Watts			
						Sensor full-scale: 2,046 Watts			
98	PMBUS_REVISION	R				Single data byte reading of the PMBus™ revision to which the powersupply is compliant	YES		
						PMBus™ Spec - Part II - Revision 1.1 - Section 22.1			
9B	MFG_REVISION	R	PMBus Block Read			MFR_REVISION_LENGTH 9 Number of bytes to be read	YES		
						Example			
						MFR_REVISION_0		"0"	// Primary FW major rev byte1
						MFR_REVISION_1		"0"	// Primary FW major rev byte0
						MFR_REVISION_2		"0"	// Primary FW minor rev byte1
						MFR_REVISION_3		"1"	// Primary FW minor rev byte0
						MFR_REVISION_4		"_"	
						MFR_REVISION_5		"0"	// Secondary FW major rev byte0
						MFR_REVISION_6		"0"	// Secondary FW major rev byte1
						MFR_REVISION_7		"0"	// Secondary FW minor rev byte0
MFR_REVISION_8	"1"	// Secondary FW minor rev byte1							
E1	EEPROM_WP(MFG_SPECIFIC_17)	R/W				Single data byte write to enable (write 0x9A) or disable (write 0x56) writes to the external EEPROM	YES		
E3	READ_HOURS_USED	R				Three byte accumulated fault-free power-on hours of the main output inhours	YES		
						PMBus™ Data Format: Linear Data Format (N = 0)			
						PMBus™ Sensor Resolution: 1 hour			
						Sensor full-scale: ~ 120 Years			
E5	READ_VSTBY	R				Two-byte Standby Voltage Sensor Reading in Vdc	YES		
						PMBus™ Data Format: Linear Data Format (N = -7)			
						PMBus™ Sensor Resolution: 0.0078125Vdc (linear format)			
						Raw sensor full-scale: 8Vdc			
E6	READ_IJSTBY	R				Two-byte Standby Current Sensor Reading in Adc	YES		
						PMBus™ Data Format: Linear Data Format (N = -7)			
						PMBus™ Sensor Resolution: 0.0078125Adc (linear format)			
						Raw sensor full-scale: 8Adc			
						Accuracy: ±2% of raw sensor full-scale			

Data Format

The Data Format section is entirely redundant. The products use the Linear data format.

Formula: $X = Y * 2^N$

X = the calculated value

Y = the two-byte value read from PMBus

N = the sensor-specific exponent

Command Name	N	Resolution per Bit	Minimum Reading	Maximum Reading	Units
READ_VIN	-1	0.5	0	300	Vrms
READ_IIN	-5	0.03125	0	31.96875	Arms
READ_VOUT	-6	0.015625	0	15.984375	Vdc
READ_IOUT	-3	0.125	0	127.875	Adc
READ_TEMPERATURE_1	0	1	-7	150	C
READ_TEMPERATURE_2	0	1	-10	150	C
READ_TEMPERATURE_3	0	1	27	150	C
READ_FAN_SPEED_1	5	32	0	32736	RPM
READ_POUT	1	2	0	2046	W
READ_PIN	1	2	0	2046	W
READ_VSTBY	-7	0.0078125	0	7.9921875	Vdc
READ_ISTBY	-7	0.0078125	0	7.9921875	Adc

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