

#### PMBus™ Commands & Features

This application note is applicable for the following members of the D1U54-D-650-12-HBxxC-xxx Series:

| MPS#  | Model Number            | Serial Communication Slave Addressing | Airflow       | Standby (Vdc) |
|-------|-------------------------|---------------------------------------|---------------|---------------|
| M1846 | N/A                     | ADDR_Select (External Resistor)       | Back-to-Front | 12            |
| M1873 | D1U54-D-650-12-HB4BC-AB |                                       |               |               |
| M1878 | D1U54-D-650-12-HB4C     |                                       |               |               |
| M1879 | D1U54-D-650-12-HB3C     |                                       | Front-to-back |               |
| M1874 | D1U54-D-650-12-HB3BC-AB |                                       |               |               |

#### Standard PMBus™ Commands

All data communicated over the PMBus™ interface uses PEC (Packet Error Checking) as defined by the standard for PMBus™ Power Systems Management Protocol Part 1 – General Requirements Rev 1.1.

Linear data formatting is used for all passed parameters. It is **strongly** recommended to fully utilize the PEC byte to validate all transactions and to repeat if not validated. Block reads (where the loose byte received denotes the remaining byte to be clocked out) are not supported on this product series.

A minimum of 300µs delay between transactions (between the STOP of one command and the START of the next command) is recommended for robust communications.

Note: 100/400 KHz I<sup>2</sup>C communications is supported for the PMBus™ interface.

Note: The PMBus™ slave controller does “clock stretch” on ACK or NAK.

#### Device Details

##### Power Module Internal Devices

| Vendor                    | Manufacturers Part Number | Package | Description                                                                       |
|---------------------------|---------------------------|---------|-----------------------------------------------------------------------------------|
| Microchip Technology Inc. | PIC24FJ32GA002T- I /SS    | 28 Pin  | Primary Digital Signal Controller, 16-bit PIC, 32K flash, 8K SRAM, -40C to +85C   |
| Microchip Technology Inc. | PIC24FJ64GA306T-50I/PT    | 64 Pin  | Secondary Digital Signal Controller, 16-bit PIC, 64K flash, 8K SRAM, -40C to +85C |
| Microchip Technology Inc. | 24AA024T- I /MS           | 8 Pin   | 2K Bit, 2.5-5.5V, 400KHz, 1.8-2.5V 100KHz, -40C to +85C                           |

#### Device Addressing Methods

(See D1U54P-12-CONC Interface Card; Application Note ACAN-64 for Additional Details):

There are two methods whereby the three lower order address bits of the seven bit address structure of the internal addressable devices can be assigned (for the secondary microcontroller and the EEPROM device A0, A1 & A2; see the PMBus™ standard). These are as follows:

- Using the ADDR signal pin (Pin# A3) in digital mode by either:
  - Un-terminating (leaving open circuit); this will set a default setting of “111” for the last three addressable bits (A0, A1 & A2) of the seven bit address byte.
  - Terminating the pin to RTN/ground (Pin numbers A2/B2); this method will set a default address of “000” for the last three addressable bits (A0, A1 & A2) of the address byte.
- Using the ADDR signal pin (Pin# A3) in analogue mode by connection of an external resistance to RTN/ground (pin numbers A2/B2).  
 For the possible external resistance values this will result in the following address combinations:

| HEX Address Combinations by Analogue Method; ADDR External Resistance Values |                                                               |                                             |
|------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------|
| ADDR External Resistance to RTN/Ground (KΩ; ±5% Tolerance)                   | Power Module Secondary Main Controller (Serial Slave Address) | Power Module EEPROM (Serial Slave Address)* |
| 0.82                                                                         | 0xB0                                                          | 0xA0                                        |
| 2.7                                                                          | 0xB2                                                          | 0xA2                                        |
| 5.6                                                                          | 0xB4                                                          | 0xA4                                        |
| 8.2                                                                          | 0xB6                                                          | 0xA6                                        |
| 15                                                                           | 0xB8                                                          | 0xA8                                        |
| 27                                                                           | 0xBA                                                          | 0xAA                                        |
| 56                                                                           | 0xBC                                                          | 0xAC                                        |
| 180                                                                          | 0xBE                                                          | 0xAE                                        |

The D1U54-D-650-12-HBxxC-xxx uses 7-bit “left shifted” device addressing; the EEPROM addressing follows a similar convention (commences at base address 0xA0); the lowest order bit of the slave address is the Read/Write bit (PMBus™ Power Systems Management Protocol Part 1 – General Requirements Rev 1.1) and is assumed set to logic level “0” (for addresses shown in the table above).

Page Command is supported to allow the ability to control and monitor the dual outputs (the Main V1 output and VSTANDBY outputs). Each Command Code is annotated with either “All”, “0”, “1”, “2” or “3” accordingly to identify which “page” is associated with the command.

| Command Code (Hex) | Command Name                                                                | Read/Write | Page | Format             | Number of Bytes | Bit(s) Number | Bit Name        | Definition                                                                                                                | Supported |
|--------------------|-----------------------------------------------------------------------------|------------|------|--------------------|-----------------|---------------|-----------------|---------------------------------------------------------------------------------------------------------------------------|-----------|
| 00                 | PAGE                                                                        | R/W        | All  |                    | 1               |               |                 | Command to provide ability to configure, control & monitor multiple outputs                                               | YES       |
| 01                 | OPERATION<br>(See Relevant Table at the Rear of Document)<br>#ComCodex01    | R/W        | All  | Bit Flags          | 1               | 5:0           |                 | Set output margin high/low voltages                                                                                       | NO        |
|                    |                                                                             |            |      |                    |                 | 7:6           |                 | Turn the unit on/off in conjunction with digital input from PSON_L                                                        | YES       |
| 02                 | ON_OFF_CONFIG<br>See Relevant Table at the Rear of Document)<br>#ComCodex02 | R          | All  | Bit Flags          | 1               | 0             | ON_OFF_DELAY    | Set when Turn off immediately (default) / 0 = Use delay @ turn-off                                                        | YES       |
|                    |                                                                             |            |      |                    |                 | 1             | ON_OFF_POLARITY | Set when Power on processing is active high (default)                                                                     | YES       |
|                    |                                                                             |            |      |                    |                 | 2             | USE_CONTROL     | Set when Use CONTROL pin for on/off power processing (default)                                                            | YES       |
|                    |                                                                             |            |      |                    |                 | 3             | USE_OPERATION   | Set when Use OPERATION command for on/off power processing (default)                                                      | YES       |
|                    |                                                                             |            |      |                    |                 | 4             | USE_CNTL_AND_OP | Set when Use both CONTROL pin & OPERATION command (default)                                                               | YES       |
|                    |                                                                             |            |      |                    |                 | 5             | RESERVED        |                                                                                                                           | NO        |
|                    |                                                                             |            |      |                    |                 | 6             | RESERVED        |                                                                                                                           | NO        |
| 03                 | CLEAR_FAULTS                                                                | W          | All  |                    | 1               |               |                 | Write only command clears all faults that have been set in all the STATUS_XXXX registers simultaneously                   | YES       |
|                    |                                                                             |            |      |                    |                 |               |                 |                                                                                                                           |           |
| 19                 | CAPABILITY                                                                  | R          | All  | Bit Flags          | 1               | 0:3           | RESERVED        |                                                                                                                           | NO        |
|                    |                                                                             |            |      |                    |                 | 4             | SMBALERT_L      | Set when device has SMBALERT_L pin which supports the SMBus Alert Response protocol                                       | YES       |
|                    |                                                                             |            |      |                    |                 | 6:5           | MAX_BUS_SPEED   | 01 = Max supported bus speed = 400kHz; 00 Max supported bus speed = 100kHz                                                | YES       |
|                    |                                                                             |            |      |                    |                 | 7             | PEC             | Set when packet error checking is supported                                                                               | YES       |
| 20                 | VOUT_MODE                                                                   | R          | 0    | Bit Flags          | 1               |               |                 | Single data byte sets the READ_VOUT sensor to linear mode data format and supplies required N'N exponent.                 | YES       |
|                    |                                                                             |            |      |                    |                 |               |                 | PMBus Spec - Part II - Revision 1.1 - Sections 8.1-8.3                                                                    |           |
| 20                 | VSTBY_MODE                                                                  | R          | 1    | Bit Flags          | 1               |               |                 | Single data byte sets the READ_VOUT sensor to linear mode data format and supplies exponent "N" for translation to volts. | YES       |
|                    |                                                                             |            |      |                    |                 |               |                 | PMBus Spec - Part II - Revision 1.1 - Sections 8.1-8.3                                                                    |           |
| 21                 | VOUT_COMMAND                                                                | R/W        | All  | Linear Data Format | 2               |               |                 | Manual override main output set point command - Voltage range setting 11.5V - 12.75V                                      | YES       |
|                    |                                                                             |            |      |                    |                 |               |                 | Command formatted in Linear as per command 0x8B – READ_VOUT                                                               |           |
| 25                 | VOUT_MARGIN_HIGH                                                            | R/W        | 0    | Linear Data Format | 2               |               |                 | Load the unit with the voltage to which the output is to be changed when the OPERATION command set to "Margin High"       | NO        |
| 25                 | VSTBY_MARGIN_LOW                                                            | R/W        | 1    | Linear Data Format | 2               |               |                 | Load the unit with the voltage to which the output is to be changed when the OPERATION command set to "Margin High"       | NO        |
| 26                 | VOUT_MARGIN_HIGH                                                            | R/W        | 0    | Linear Data Format | 2               |               |                 | Load the unit with the voltage to which the output is to be changed when the OPERATION command set to "Margin Low"        | NO        |
| 26                 | VSTBY_MARGIN_LOW                                                            | R/W        | 1    | Linear Data Format | 2               |               |                 | Load the unit with the voltage to which the output is to be changed when the OPERATION command set to "Margin Low"        | NO        |

| Command Code (Hex) | Command Name             | Read/Write | Page | Format             | Number of Bytes | Bit(s) Number                                                                                                          | Bit Name           | Definition                                                                                                                     | Supported  |
|--------------------|--------------------------|------------|------|--------------------|-----------------|------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>3A</b>          | FAN_CONFIG_1_2           | R          | All  | Bit Flags          | 1               | 0                                                                                                                      | FAN_2_TACH_PULSES  | Fan 2 Tachometer pulses per revolution (lower bit)                                                                             | <b>NO</b>  |
|                    |                          |            |      |                    |                 | 1                                                                                                                      | FAN_2_TACH_PULSES  | Fan 2 Tachometer pulses per revolution (upper bit)                                                                             | <b>NO</b>  |
|                    |                          |            |      |                    |                 | 2                                                                                                                      | FAN_2_SETTING_MODE | Set when fan is commanded in RPM (Clear when fan is commanded in Duty Cycle)                                                   | <b>NO</b>  |
|                    |                          |            |      |                    |                 | 3                                                                                                                      | FAN_2_INSTALLATION | Set when fan is installed in position 2                                                                                        | <b>NO</b>  |
|                    |                          |            |      |                    |                 | 4                                                                                                                      | FAN_1_TACH_PULSES  | Fan 1 Tachometer pulses per revolution (lower bit)                                                                             | <b>YES</b> |
|                    |                          |            |      |                    |                 | 5                                                                                                                      | FAN_1_TACH_PULSES  | Fan 1 Tachometer pulses per revolution (upper bit)                                                                             | <b>YES</b> |
|                    |                          |            |      |                    |                 | 6                                                                                                                      | FAN_1_SETTING_MODE | Set when fan is commanded in RPM (Clear when fan is commanded in Duty Cycle)                                                   | <b>YES</b> |
|                    |                          |            |      |                    |                 | 7                                                                                                                      | FAN_1_INSTALLATION | Set when fan is installed in position 1                                                                                        | <b>YES</b> |
| <b>3B</b>          | FAN_COMMAND_1            | R/W        | All  | R/W                | 2               |                                                                                                                        |                    | Manual fan override command fan speed value in RPM<br>Command speed formatted in Linear as per command 0x90 - READ_FAN_SPEED_1 | <b>YES</b> |
| <b>3C</b>          | FAN_COMMAND_2            | R/W        | All  | R/W                | 2               |                                                                                                                        |                    | Manual fan override command fan speed value in RPM<br>Command speed formatted in Linear as per command 0x90 - READ_FAN_SPEED_2 | <b>NO</b>  |
| <b>40</b>          | VOUT_OV_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2               | See Returned Data Tables for Individual Models<br><a href="#">#HB4xCcomcodex40</a><br><a href="#">#HB3xCcomcodex40</a> |                    | Main Output Overvoltage Fault Limit                                                                                            | <b>YES</b> |
| <b>40</b>          | VSTBY_OV_FAULT_LIMIT     | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                    | Standby(Auxiliary) Output Overvoltage Fault Limit                                                                              | <b>YES</b> |
| <b>41</b>          | VOUT_OV_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1               |                                                                                                                        |                    | Main Output Overvoltage Fault Response Actions                                                                                 | <b>YES</b> |
| <b>41</b>          | VSTBY_OV_FAULT_RESPONSE  | R          | 1    | Bit Flags          | 1               |                                                                                                                        |                    | Standby(Auxiliary) Output Overvoltage Fault Response Actions                                                                   | <b>YES</b> |
| <b>42</b>          | VOUT_OV_WARN_LIMIT       | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                    | Main Output Overvoltage Warning Limit                                                                                          | <b>YES</b> |
| <b>42</b>          | VSTBY_OV_WARN_LIMIT      | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                    | Standby(Auxiliary) Output Overvoltage Warning Limit                                                                            | <b>YES</b> |
| <b>43</b>          | VOUT_UV_WARN_LIMIT       | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                    | Main Output Undervoltage Warning Limit                                                                                         | <b>YES</b> |
| <b>43</b>          | VSTBY_UV_WARN_LIMIT      | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                    | Standby(Auxiliary) Output Undervoltage Warning Limit                                                                           | <b>YES</b> |
| <b>44</b>          | VOUT_UV_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                    | Main Output Undervoltage Fault Limit                                                                                           | <b>YES</b> |
| <b>44</b>          | VSTBY_UV_FAULT_LIMIT     | R          | 1    | Bit Flags          | 1               |                                                                                                                        |                    | Standby(Auxiliary) Output Undervoltage Fault Limit                                                                             | <b>YES</b> |
| <b>45</b>          | VOUT_UV_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1               |                                                                                                                        |                    | Main Output Undervoltage Fault Response Actions                                                                                | <b>YES</b> |
| <b>45</b>          | VSTBY_UV_FAULT_RESPONSE  | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                    | Standby(Auxiliary) Output Undervoltage Fault Response Actions                                                                  | <b>YES</b> |
| <b>46</b>          | IOUT_OC_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                    | Main Output Overcurrent Fault Limit - High line                                                                                | <b>YES</b> |
| <b>46</b>          | ISTBY_OC_FAULT_LIMIT     | R          | 2    | Bit Flags          | 1               |                                                                                                                        |                    | Standby(Auxiliary) Output Overvoltage Fault Limit                                                                              | <b>YES</b> |
| <b>47</b>          | IOUT_OC_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1               |                                                                                                                        |                    | Main Output Overcurrent Fault Response Actions                                                                                 | <b>YES</b> |
| <b>47</b>          | ISTBY_OC_FAULT_RESPONSE  | R          | 2    | Linear Data Format | 2               |                                                                                                                        |                    | Standby(Auxiliary) Output Response Actions                                                                                     | <b>YES</b> |
| <b>4A</b>          | IOUT_OC_WARN_LIMIT       | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                    | Standby(Auxiliary) Output Overcurrent Fault Response Actions                                                                   | <b>YES</b> |
| <b>4A</b>          | IOUT_OC_WARN_LIMIT       | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                    | Main Output Overcurrent Warning Limit - High line                                                                              | <b>YES</b> |
| <b>4A</b>          | ISTBY_OC_WARN_LIMIT      | R          | 2    | Linear Data Format | 2               |                                                                                                                        |                    | Main Output Overcurrent Warning Limit - Low line                                                                               | <b>YES</b> |
| <b>4F</b>          | AIRFLOW_1_OT_FAULT_LIMIT | R          | 2    | Linear Data Format | 2               |                                                                                                                        |                    | Airflow 1 Overtemperature Fault Limit                                                                                          | <b>YES</b> |
| <b>4F</b>          | HOTSPOT_1_OT_FAULT_LIMIT | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                    | Hotspot 1 Overtemperature Fault Limit                                                                                          | <b>YES</b> |
| <b>4F</b>          | AIRFLOW_2_OT_FAULT_LIMIT | R          | 2    | Linear Data Format | 2               |                                                                                                                        |                    | Airflow 2 Overtemperature Fault Limit                                                                                          | <b>YES</b> |
| <b>4F</b>          | HOTSPOT_2_OT_FAULT_LIMIT | R          | 3    | Bit Flags          | 1               |                                                                                                                        |                    | Hotspot 2 Overtemperature Fault Limit                                                                                          | <b>YES</b> |

| Command Code (Hex) | Command Name                | Read/Write | Page | Format             | Number of Bytes | Bit(s) Number                                                                                                          | Bit Name        | Definition                                                     | Supported |
|--------------------|-----------------------------|------------|------|--------------------|-----------------|------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------|-----------|
| 50                 | AIRFLOW_1_OT_FAULT_RESPONSE | R          | 0    | Bit Flags          | 1               | See Returned Data Tables for Individual Models<br><a href="#">#HB4xCcomcodex50</a><br><a href="#">#HB3xCcomcodex50</a> |                 | Airflow 1 Overtemperature Fault Response Actions               | YES       |
| 50                 | HOTSPOT_1_OT_FAULT_RESPONSE | R          | 1    | Bit Flags          | 1               |                                                                                                                        |                 | Hotspot 1 Overtemperature Fault Response Actions               | YES       |
| 50                 | AIRFLOW_2_OT_FAULT_RESPONSE | R          | 2    | Bit Flags          | 1               |                                                                                                                        |                 | Airflow 2 Overtemperature Fault Response Actions               | YES       |
| 50                 | HOTSPOT_2_OT_FAULT_RESPONSE | R          | 3    | Bit Flags          | 2               |                                                                                                                        |                 | Hotspot 2 Overtemperature Fault Response Actions               | YES       |
| 51                 | AIRFLOW_1_OT_WARN_LIMIT     | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Airflow 1 Overtemperature Warning Limit                        | YES       |
| 51                 | HOTSPOT_1_OT_WARN_LIMIT     | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                 | Hotspot 1 Overtemperature Warning Limit                        | YES       |
| 51                 | AIRFLOW_2_OT_WARN_LIMIT     | R          | 2    | Linear Data Format | 2               |                                                                                                                        |                 | Airflow 2 Overtemperature Warning Limit                        | YES       |
| 51                 | HOTSPOT_2_OT_WARN_LIMIT     | R          | 3    | Linear Data Format | 2               |                                                                                                                        |                 | Hotspot 2 Overtemperature Warning Limit                        | YES       |
| 55                 | VIN_OV_FAULT_LIMIT          | R          | 0    | Bit Flags          | 1               |                                                                                                                        |                 | Input Overvoltage Fault Limit                                  | YES       |
| 56                 | VIN_OV_FAULT_RESPONSE       | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Input Overvoltage Fault Response Actions                       | YES       |
| 57                 | VIN_OV_WARN_LIMIT           | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Input Overvoltage Warning Limit                                | YES       |
| 58                 | VIN_UV_WARN_LIMIT           | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Input Undervoltage Warning Limit                               | YES       |
| 59                 | VIN_UV_FAULT_LIMIT          | R          | 0    | Linear Data Format | 1               |                                                                                                                        |                 | Input Undervoltage Fault Limit                                 | YES       |
| 5A                 | VIN_UV_FAULT_RESPONSE       | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Input Undervoltage Fault Response Actions                      | YES       |
| 5B                 | IIN_OC_FAULT_LIMIT          | R          | 0    | Bit Flags          | 1               |                                                                                                                        |                 | Input Overcurrent Fault Limit                                  | YES       |
| 5C                 | IIN_OC_FAULT_RESPONSE       | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Input Overcurrent Fault Response Actions                       | YES       |
| 5D                 | IIN_OC_WARN_LIMIT           | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Input Overcurrent Warning Limit                                | YES       |
| 5E                 | POWER_GOOD_ON               | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Power Good On Main Output Voltage Limit                        | YES       |
| 5F                 | POWER_GOOD_OFF              | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Power Good Off Main Output Voltage Limit                       | YES       |
| 68                 | POUT_OP_FAULT_LIMIT         | R          | 0    | Bit Flags          | 1               |                                                                                                                        |                 | Output Overpower Fault Limit                                   | YES       |
| 69                 | POUT_OP_FAULT_RESPONSE      | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Output Overpower Fault Response Actions                        | YES       |
| 6A                 | POUT_OP_WARN_LIMIT          | R          | 1    | Linear Data Format | 2               |                                                                                                                        |                 | Output Overpower Warning Limit - Low line                      | YES       |
| 6B                 | PIN_OP_WARN_LIMIT           | R          | 0    | Linear Data Format | 2               |                                                                                                                        |                 | Input Overpower Warning Limit - High line                      | YES       |
| 79                 | STATUS_BYTE                 | R          | All  | Bit Flags          | 1               | 0                                                                                                                      | NONE_F_W        | Set when a fault not listed in [7:1] occurred                  | NO        |
|                    |                             |            |      |                    |                 | 1                                                                                                                      | CML_F           | Set when a communications, memory, or logic fault has occurred | YES       |
|                    |                             |            |      |                    |                 | 2                                                                                                                      | TEMPERATURE_F_W | Set when an overtemperature fault or warning has occurred      | YES       |
|                    |                             |            |      |                    |                 | 3                                                                                                                      | INPUT_UV_F      | Set when an input undervoltage fault has occurred              | YES       |
|                    |                             |            |      |                    |                 | 4                                                                                                                      | OUTPUT_OC_F     | Set when an output overcurrent fault has occurred              | YES       |
|                    |                             |            |      |                    |                 | 5                                                                                                                      | OUTPUT_OV_F     | Set when an output overvoltage fault has occurred              | YES       |
|                    |                             |            |      |                    |                 | 6                                                                                                                      | UNIT_OFF        | Set when unit not providing power to the output                | YES       |
|                    |                             |            |      |                    |                 | 7                                                                                                                      | BUSY_F          | Asserted when device busy and unable to respond fault          | YES       |

| Command Code (Hex) | Command Name | Read/Write | Page | Format    | Number of Bytes | Bit(s) Number | Bit Name         | Definition                                                                 | Supported |
|--------------------|--------------|------------|------|-----------|-----------------|---------------|------------------|----------------------------------------------------------------------------|-----------|
| 79                 | STATUS_WORD  | R          | All  | Bit Flags | 2               | 0             | NONE_F_W         | Set when a fault not listed in [7:1] occurred                              | NO        |
|                    |              |            |      |           |                 | 1             | CML_F            | Set when a communications, memory, or logic fault has occurred             | YES       |
|                    |              |            |      |           |                 | 2             | TEMPERATURE_F_W  | Set when an overtemperature fault or warning has occurred                  | YES       |
|                    |              |            |      |           |                 | 3             | INPUT_UV_F       | Set when an input undervoltage fault has occurred                          | YES       |
|                    |              |            |      |           |                 | 4             | OUTPUT_OC_F      | Set when an output overcurrent fault has occurred                          | YES       |
|                    |              |            |      |           |                 | 5             | OUTPUT_OV_F      | Set when an output overvoltage fault has occurred                          | YES       |
|                    |              |            |      |           |                 | 6             | UNIT_OFF         | Set when unit not providing power to the output                            | YES       |
|                    |              |            |      |           |                 | 7             | BUSY_F           | Asserted when device busy and unable to respond fault                      | YES       |
|                    |              |            |      |           |                 | 8             | UNKNOWN_F_W      | Set when a fault not listed in [15:1] has occurred                         | NO        |
|                    |              |            |      |           |                 | 9             | STATUS_OTHER_F_W | Set when a bit in command STATUS_OTHER set                                 | NO        |
|                    |              |            |      |           |                 | 10            | FANS_F_W         | Set when a fan fault or warning has occurred                               | YES       |
|                    |              |            |      |           |                 | 11            | POWER_GOOD_L     | Set when the POWER_GOOD signal is negated                                  | YES       |
|                    |              |            |      |           |                 | 12            | MFG_SPECIFIC_F_W | Manufacturer specific fault or warning has occurred                        | YES       |
|                    |              |            |      |           |                 | 13            | INPUT_F_W        | Set when an Input voltage/current/power fault or warning has occurred      | YES       |
|                    |              |            |      |           |                 | 14            | IOUT_POUT_F_W    | Set when an output current / output power fault or warning has occurred    | YES       |
|                    |              |            |      |           |                 | 15            | VOUT_F_W         | Set when an output voltage fault or warning has occurred                   | YES       |
| 7A                 | STATUS_VOUT  | R          | 0    | Bit Flags | 1               | 0             | VOUT_TRACKING_E  | Set when an error in the output voltage during power-up/down has occurred  | NO        |
|                    |              |            |      |           |                 | 1             | TON_MAX_W        | Set when the output turn-on timing has exceeded the TON_MAX warning timing | NO        |
|                    |              |            |      |           |                 | 2             | TON_MAX_F        | Set when the output turn-on timing has exceeded the TON_MAX fault timing   | NO        |
|                    |              |            |      |           |                 | 3             | VOUT_MAX_F       | Set when the output is set higher than the commanded VOUT_MAX limit        | NO        |
|                    |              |            |      |           |                 | 4             | VOUT_UV_F        | Set when an output undervoltage fault has occurred                         | YES       |
|                    |              |            |      |           |                 | 5             | VOUT_UV_W        | Set when an output undervoltage warning has occurred                       | YES       |
|                    |              |            |      |           |                 | 6             | VOUT_OV_W        | Set when an output overvoltage warning has occurred                        | YES       |
|                    |              |            |      |           |                 | 7             | VOUT_OV_F        | Set when an output overvoltage fault has occurred                          | YES       |
| 7A                 | STATUS_VSTBY | R          | 1    | Bit Flags | 1               | 0             | VOUT_TRACKING_E  | Set when an error in the output voltage during power-up/down has occurred  | NO        |
|                    |              |            |      |           |                 | 1             | TON_MAX_W        | Set when the output turn-on timing has exceeded the TON_MAX warning timing | NO        |
|                    |              |            |      |           |                 | 2             | TON_MAX_F        | Set when the output turn-on timing has exceeded the TON_MAX fault timing   | NO        |
|                    |              |            |      |           |                 | 3             | VOUT_MAX_F       | Set when the output is set higher than the commanded VOUT_MAX limit        | NO        |
|                    |              |            |      |           |                 | 4             | VOUT_UV_F        | Set when an output undervoltage fault has occurred                         | YES       |
|                    |              |            |      |           |                 | 5             | VOUT_UV_W        | Set when an output under-voltage warning has occurred                      | YES       |
|                    |              |            |      |           |                 | 6             | VOUT_OV_W        | Set when an output overvoltage warning has occurred                        | YES       |
|                    |              |            |      |           |                 | 7             | VOUT_OV_F        | Set when an output overvoltage fault has occurred                          | YES       |

| Command Code (Hex) | Command Name       | Read/Write | Page | Format    | Number of Bytes | Bit(s) Number | Bit Name         | Definition                                                                             | Supported |
|--------------------|--------------------|------------|------|-----------|-----------------|---------------|------------------|----------------------------------------------------------------------------------------|-----------|
| <b>7B</b>          | STATUS_IOUT        | R          | 0    | Bit Flags | 1               | 0             | POUT_OP_W        | Set when an output overpower warning has occurred                                      | YES       |
|                    |                    |            |      |           |                 | 1             | POUT_OP_F        | Set when an output overpower fault has occurred                                        | YES       |
|                    |                    |            |      |           |                 | 2             | POWER_LIMIT_MODE | Set when the unit has entered output power limiting mode                               | NO        |
|                    |                    |            |      |           |                 | 3             | CURRENT_SHARE_F  | Set when an output current share fault has occurred                                    | NO        |
|                    |                    |            |      |           |                 | 4             | IOUT_UC_W        | Set when an output undercurrent fault has occurred                                     | NO        |
|                    |                    |            |      |           |                 | 5             | IOUT_OC_W        | Set when an output overcurrent warning has occurred                                    | YES       |
|                    |                    |            |      |           |                 | 6             | IOUT_OC_SHUTDOWN | Set when an output overcurrent and low voltage shutdown fault has occurred             | YES       |
|                    |                    |            |      |           |                 | 7             | IOUT_OC_F        | Set when an output overcurrent fault has occurred                                      | YES       |
| <b>7B</b>          | STATUS_ISTBY       | R          | 1    | Bit Flags | 1               | 0             | POUT_OP_W        | Set when an output overpower warning has occurred                                      | YES       |
|                    |                    |            |      |           |                 | 1             | POUT_OP_F        | Set when an output overpower fault has occurred                                        | YES       |
|                    |                    |            |      |           |                 | 2             | POWER_LIMIT_MODE | Set when the unit has entered output power limiting mode                               | NO        |
|                    |                    |            |      |           |                 | 3             | CURRENT_SHARE_F  | Set when an output current share fault has occurred                                    | NO        |
|                    |                    |            |      |           |                 | 4             | IOUT_UC_W        | Set when an output undercurrent fault has occurred                                     | NO        |
|                    |                    |            |      |           |                 | 5             | IOUT_OC_W        | Set when an output overcurrent warning has occurred                                    | YES       |
|                    |                    |            |      |           |                 | 6             | IOUT_OC_SHUTDOWN | Set when an output overcurrent and low voltage shutdown fault has occurred             | YES       |
|                    |                    |            |      |           |                 | 7             | IOUT_OC_F        | Set when an output overcurrent fault has occurred                                      | YES       |
| <b>7C</b>          | STATUS_INPUT       | R          | ALL  | Bit Flags | 1               | 0             | PIN_OP_W         | Set when an input overpower warning has occurred                                       | YES       |
|                    |                    |            |      |           |                 | 1             | IIN_OC_W         | Set when an input overcurrent warning has occurred                                     | YES       |
|                    |                    |            |      |           |                 | 2             | IIN_OC_F         | Set when an input overcurrent fault has occurred                                       | YES       |
|                    |                    |            |      |           |                 | 3             | VIN_UV_OFF       | Set when the Unit is OFF for insufficient input voltage                                | NO        |
|                    |                    |            |      |           |                 | 4             | VIN_UV_F         | Set when an input undervoltage fault has occurred                                      | NO        |
|                    |                    |            |      |           |                 | 5             | VIN_UV_W         | Set when an input undervoltage warning has occurred                                    | YES       |
|                    |                    |            |      |           |                 | 6             | VIN_OV_W         | Set when an input overvoltage warning has occurred                                     | YES       |
|                    |                    |            |      |           |                 | 7             | VIN_OV_F         | Set when an input overvoltage fault has occurred                                       | YES       |
| <b>7D</b>          | STATUS-TEMPERATURE | R          | ALL  | Bit Flags | 1               | 0             | RESERVED         | Reserved                                                                               | NO        |
|                    |                    |            |      |           |                 | 1             | RESERVED         | Reserved                                                                               | NO        |
|                    |                    |            |      |           |                 | 2             | RESERVED         | Reserved                                                                               | NO        |
|                    |                    |            |      |           |                 | 3             | RESERVED         | Reserved                                                                               | NO        |
|                    |                    |            |      |           |                 | 4             | TEMPERATURE_UT_F | Set when an undertemperature fault has occurred                                        | NO        |
|                    |                    |            |      |           |                 | 5             | TEMPERATURE_UT_W | Set when an undertemperature warning has occurred                                      | NO        |
|                    |                    |            |      |           |                 | 6             | TEMPERATURE_OT_W | Set when an overtemperature warning has occurred                                       | YES       |
|                    |                    |            |      |           |                 | 7             | TEMPERATURE_OT_F | Set when an overtemperature fault has occurred                                         | YES       |
| <b>7E</b>          | STATUS_CML         | R          | All  | Bit Flags | 1               | 0             | OTHER_MEMORY_F   | Set when another memory or logic fault has occurred                                    | NO        |
|                    |                    |            |      |           |                 | 1             | OTHER_COMM_F     | Set when a communication fault not listed in [7:3] has occurred (example: UART or SPI) | YES       |
|                    |                    |            |      |           |                 | 2             | RESERVED         | Reserved                                                                               | NO        |
|                    |                    |            |      |           |                 | 3             | PROCESSOR_F      | Set when a processor fault is detected                                                 | NO        |
|                    |                    |            |      |           |                 | 4             | MEMORY_F         | Set when a memory fault is detected (example: Checksum errors during bootload)         | NO        |
|                    |                    |            |      |           |                 | 5             | PEC_ERROR_F      | Set when a packet error checking (PEC) failed has occurred                             | YES       |
|                    |                    |            |      |           |                 | 6             | DATA_ERROR_F     | Set when invalid or unsupported data is received                                       | YES       |
|                    |                    |            |      |           |                 | 7             | COMMAND_ERROR_F  | Set when an invalid or unsupported command is received                                 | YES       |



## ACAN-60 Application Note

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| Command Code (Hex) | Command Name                                        | Read/Write | Page | Format             | Number of Bytes | Bit(s) Number | Bit Name/Comment                                            | Description                                                                               | Supported |
|--------------------|-----------------------------------------------------|------------|------|--------------------|-----------------|---------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------|
| A0                 | MFR_VIN_MIN                                         | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Input Voltage Minimum Specification                                          | YES       |
| A1                 | MFR_VIN_MAX                                         | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Input Voltage Maximum Specification                                          | YES       |
| A2                 | MFR_IIN_MAX                                         | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Input Current Maximum Specification                                          | YES       |
| A3                 | MFR_PIN_MAX                                         | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Input Power Maximum Specification                                            | YES       |
| A4                 | MFR_VOUT_MIN                                        | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Main Output Voltage Minimum Specification                                    | YES       |
| A5                 | MFR_VOUT_MAX                                        | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Main Output Voltage Maximum Specification                                    | YES       |
| A6                 | MFR_IOUT_MAX                                        | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Main Output Current Maximum Specification                                    | YES       |
| A7                 | MFR_POUT_MAX                                        | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Output Power Maximum Specification                                           | YES       |
| A8                 | MFR_TAMBIENT_MAX                                    | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Operating Ambient Temperature Maximum Specification                          | YES       |
| A9                 | MFR_TAMBIENT_MIN                                    | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply Operating Ambient Temperature Minimum Specification                          | YES       |
| AA                 | MFR_EFFICIENCY_LL                                   | R          | All  | Linear Data Format | 2               |               | See Manufacturers Data Tables<br><a href="#">ComCodexA0</a> | Power Supply High-Line Low Power Specification                                            | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Low Power Efficiency Specification                                 | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Medium Power Specification                                         | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Medium Power Efficiency Specification                              | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line High Power Specification                                           | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Low Power Specification                                            | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Low Power Efficiency Specification                                 | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Input Voltage Specification                                        | YES       |
| AB                 | MFR_EFFICIENCY_HL                                   | R          | All  | Linear Data Format | 2               |               |                                                             | Power Supply High-Line Low Power Specification                                            | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Low Power Efficiency Specification                                 | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Medium Power Specification                                         | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line Medium Power Efficiency Specification                              | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             | Power Supply High-Line High Power Specification                                           | YES       |
|                    |                                                     |            |      |                    |                 |               |                                                             |                                                                                           |           |
|                    |                                                     |            |      |                    |                 |               |                                                             |                                                                                           |           |
|                    |                                                     |            |      |                    |                 |               |                                                             |                                                                                           |           |
| E0                 | PS_STATUS<br>(Non-sticky™ Power Supply Status Bits) | R          | All  | Bit Flags          | 2               | 0             | CALIBRATION                                                 | Set when the unit is in Calibration mode                                                  | YES       |
|                    |                                                     |            |      |                    |                 | 1             | VSTBY_SELECT                                                | Set when Vstby set to 5V; de-set when Vstby set to 3.3V                                   | NO        |
|                    |                                                     |            |      |                    |                 | 2             | PS_KILL                                                     | Set when the PS_KILL pin is defeated and the unit is properly seated in the chassis       | YES       |
|                    |                                                     |            |      |                    |                 | 3             | VIN_OK                                                      | Set when the input voltage is within operating specification                              | YES       |
|                    |                                                     |            |      |                    |                 | 4             | VIN_RANGE                                                   | Set when input voltage range is high; de-set when input voltage range is low              | YES       |
|                    |                                                     |            |      |                    |                 | 5             | PFC_BUS                                                     | Set when the PFC Bus is within operating specification                                    | YES       |
|                    |                                                     |            |      |                    |                 | 6             | PS_ON                                                       | Set when the PS_ON logic set to enable the main output                                    | YES       |
|                    |                                                     |            |      |                    |                 | 7             | POWER_GOOD                                                  | Set when main output power delivered by the unit is OK; mirrors the digital output signal | YES       |
|                    |                                                     |            |      |                    |                 | 8             | POWER_DOWN                                                  | Set when boot loader is taking control and the main output and PFC need to be shutdown    | YES       |
|                    |                                                     |            |      |                    |                 | 9             | BOOTLOAD_COMPLETED                                          | Set when the boot loader has completed and system reset needs to be Set                   | YES       |
|                    |                                                     |            |      |                    |                 | 10            | UNUSED                                                      |                                                                                           | NO        |
|                    |                                                     |            |      |                    |                 | 11            | UNUSED                                                      |                                                                                           | NO        |
|                    |                                                     |            |      |                    |                 | 12            | UNUSED                                                      |                                                                                           | NO        |
|                    |                                                     |            |      |                    |                 | 13            | UNUSED                                                      |                                                                                           | NO        |
|                    |                                                     |            |      |                    |                 | 14            | WARNING                                                     | Set when power supply warning has occurred; tracks 'WARNING' status LED                   | YES       |
|                    |                                                     |            |      |                    |                 | 15            | FAULT                                                       | Set when power supply fault has occurred; tracks 'FAULT' status LED                       | YES       |

| Command Code (Hex) | Command Name                                | Read/Write | Page | Format             | Number of Bytes | Bit(s) Number | Bit Name/Comment                                                                                                                        | Description                                                                                                                    | Supported |
|--------------------|---------------------------------------------|------------|------|--------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------|
| E1                 | EEPROM_WP                                   | R/W        | All  | Integer            | 1               |               | See EEPROM FRU Data<br>EEPROMDATA1845<br>EEPROMDATAH4BCAB<br>EEPROMDATAHB4C<br>EEPROMDATAHB4CJBL<br>EEPROMDATAHB3BCAB<br>EEPROMDATAHB3C | Write 0x9A to enable write protection to the external EEPROM.<br>Write 0x56 to disable write protection to the external EEPROM | YES       |
| E2                 | READ_HOURS_USED                             | R          | All  | Linear Data Format | 3               |               | See Sensor Data Tables for Individual Models<br>ComCodexE2HB4xCxxx<br>ComCodexE2HB3xCxxx                                                | Power Supply Accumulated Main Output Power-On Hours                                                                            | YES       |
| E5                 | READ_RESETS                                 | R          | All  | Bit Flags          | 2               |               |                                                                                                                                         | RCON register status flags for troubleshooting                                                                                 | YES       |
|                    |                                             |            |      | Bit Flags          | 2               |               |                                                                                                                                         | RCON2 register status flags for troubleshooting                                                                                | YES       |
| EE                 | PMBUS_CONFIG<br><a href="#">PMBUSCONFIG</a> | R          | All  | Bit Flags          | 2               | 0             | DATA_FORMAT                                                                                                                             | 0 = Linear data format 1 = Direct data format                                                                                  | YES       |
|                    |                                             |            |      |                    |                 | 1             | SMBALERT_L                                                                                                                              | 0 = SMBALERT_L implemented & supported 1 = SMBALERT not implemented                                                            | NO        |
|                    |                                             |            |      |                    |                 | 2             | MAX_BUS_SPEED                                                                                                                           | 0 = 100kHz 1 = 400kHz                                                                                                          | NO        |
|                    |                                             |            |      |                    |                 | 3             | PEC                                                                                                                                     | 0 = PEC not supported 1 = PEC supported                                                                                        | YES       |
|                    |                                             |            |      |                    |                 | 4:7           | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 8:15          | CMD_KEY                                                                                                                                 | Command activation/verification key = 0x5A                                                                                     | YES       |
| EF                 | LED_CONTROL                                 | R          | All  | Bit Flags          | 1               | 0:2           | LED_MODE                                                                                                                                | LED mode change bits                                                                                                           | YES       |
|                    |                                             |            |      |                    |                 | 3:6           | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 7             | LED_CONTROL<br><a href="#">LEDCONTROL</a>                                                                                               | LED manual/auto control toggle bit                                                                                             | NO        |
| F0                 | READ_RESETS                                 | R          | All  | Bit Flags          | 2               |               |                                                                                                                                         | RCON register status flags for troubleshooting                                                                                 | YES       |
|                    |                                             |            |      | Bit Flags          | 2               |               |                                                                                                                                         | RCON2 register status flags for troubleshooting                                                                                |           |
| F8                 | BOOTLOAD_RESTART                            | R/W        | All  | HEX                | 1               |               |                                                                                                                                         | Boot loader completion and application restart request command                                                                 | YES       |
| FA                 | BOOTLOADER_REQUEST                          | R/W        | All  | Ascii Text Block   | 6               |               |                                                                                                                                         | Boot loader request command                                                                                                    | YES       |
| FB                 | BOOTLOADER-STATUS                           | R          | All  | Bit Flags          | 2               | 0             | BOOTLOADING_PRI                                                                                                                         | Set when primary uC bootloading in process                                                                                     | YES       |
|                    |                                             |            |      |                    |                 | 1             | BOOTLOADING_FLOAT                                                                                                                       | Set when floating uC bootloading in process                                                                                    | YES       |
|                    |                                             |            |      |                    |                 | 2             | BOOTLOADING_SEC                                                                                                                         | Set when secondary uC bootloading in process                                                                                   | YES       |
|                    |                                             |            |      |                    |                 | 3             | BOOTLOADED_PRI                                                                                                                          | Set when primary uC bootloading completed; reset required                                                                      | YES       |
|                    |                                             |            |      |                    |                 | 4             | BOOTLOADED_FLOAT                                                                                                                        | Set when floating uC bootloading completed; reset required                                                                     | YES       |
|                    |                                             |            |      |                    |                 | 5             | BOOTLOADED_SEC                                                                                                                          | Set when secondary uC bootloading completed; reset required                                                                    | YES       |
|                    |                                             |            |      |                    |                 | 6             | RESET_PRI                                                                                                                               | Set when primary uC reset                                                                                                      | YES       |
|                    |                                             |            |      |                    |                 | 7             | RESET_FLOAT                                                                                                                             | Set when floating uC reset                                                                                                     | YES       |
|                    |                                             |            |      |                    |                 | 8             | RESET_SEC                                                                                                                               | Set when secondary uC reset                                                                                                    | YES       |
|                    |                                             |            |      |                    |                 | 9             | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 10            | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 11            | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 12            | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 13            | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 14            | RESERVED                                                                                                                                |                                                                                                                                | NO        |
|                    |                                             |            |      |                    |                 | 15            | RESERVED                                                                                                                                |                                                                                                                                | NO        |

The following table represents typical results/responses returned from respective Command Code entries and is provided as an illustration of what should be expected.

**RETURNED RESULTS: M1846 & D1U54-D-650-12-HB4xC-xxx; Back to Front Airflow: 12VSB (M1873, M1878)**

| Command Code Hex) | Command Name             | Read/Write | Page | Data Format        | # of Bytes | Units | Scaling Coefficients |   |   |   | Bit # | Reading | Comments                                                                                     |
|-------------------|--------------------------|------------|------|--------------------|------------|-------|----------------------|---|---|---|-------|---------|----------------------------------------------------------------------------------------------|
|                   |                          |            |      |                    |            |       | N                    | m | R | b |       |         |                                                                                              |
| 40                | VOUT_OV_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 13      |                                                                                              |
| 40                | VSTBY_OV_FAULT_LIMIT     | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 13      |                                                                                              |
| 41                | VOUT_OV_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 41                | VSTBY_OV_FAULT_RESPONSE  | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 42                | VOUT_OV_WARN_LIMIT       | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 12.5    |                                                                                              |
| 42                | VSTBY_OV_WARN_LIMIT      | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 12.5    |                                                                                              |
| 43                | VOUT_UV_WARN_LIMIT       | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 11.5    |                                                                                              |
| 43                | VSTBY_UV_WARN_LIMIT      | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 11.5    |                                                                                              |
| 44                | VOUT_UV_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 44                | VSTBY_UV_FAULT_LIMIT     | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 45                | VOUT_UV_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 45                | VSTBY_UV_FAULT_RESPONSE  | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 46                | IOUT_OC_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2          | Adc   | -4                   |   |   |   |       | 64      |                                                                                              |
| 46                | ISTBY_OC_FAULT_LIMIT     | R          | 1    | Linear Data Format | 2          | Adc   | -8                   |   |   |   |       | 2.3     |                                                                                              |
| 47                | IOUT_OC_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 7       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Continuous restart (self-recovery)                                                |
| 47                | ISTBY_OC_FAULT_RESPONSE  | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 7       | Response - Continuous restart (self-recovery)                                                |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 4A                | IOUT_OC_WARN_LIMIT       | R          | 0    | Linear Data Format | 2          | Adc   | -4                   |   |   |   |       | 60      |                                                                                              |
| 4A                | ISTBY_OC_WARN_LIMIT      | R          | 1    | Linear Data Format | 2          | Adc   | -8                   |   |   |   |       | 2.2     |                                                                                              |
| 4F                | AIRFLOW_1_OT_FAULT_LIMIT | R          | 0    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 125     | Primary Airflow – Outlet                                                                     |
| 4F                | HOTSPOT_1_OT_FAULT_LIMIT | R          | 1    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 100     | Primary Hotspot – Bridge                                                                     |
| 4F                | HOTSPOT_2_OT_FAULT_LIMIT | R          | 2    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 125     | Primary Hotspot – Boost                                                                      |
| 4F                | AIRFLOW_2_OT_FAULT_LIMIT | R          | 3    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 80      | Secondary Airflow – Inlet                                                                    |
| 4F                | HOTSPOT_3_OT_FAULT_LIMIT | R          | 4    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 105     | Secondary Hotspot – Main Output Hotspot                                                      |

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**Murata Power Solutions**

# D1U54-D-650-12-HBxxC-xxx PMBus™ Communications Protocol

ACAN-60 Application Note

**RETURNED RESULTS: M1846 & D1U54-D-650-12-HB4xC-xxx; Back to Front Airflow: 12VSB (M1871, M1876)**

| Command Code Hex) | Command Name                | Read/Write | Page | Data Format        | # of Bytes | Units | Scaling Coefficients |   |   |   | Bit # | Reading | Comments                                                                                     |
|-------------------|-----------------------------|------------|------|--------------------|------------|-------|----------------------|---|---|---|-------|---------|----------------------------------------------------------------------------------------------|
|                   |                             |            |      |                    |            |       | N                    | m | R | b |       |         |                                                                                              |
| 50                | AIRFLOW_1_OT_FAULT_RESPONSE | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | HOTSPOT_1_OT_FAULT_RESPONSE | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | AIRFLOW_2_OT_FAULT_RESPONSE | R          | 2    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | HOTSPOT_2_OT_FAULT_RESPONSE | R          | 3    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | HOTSPOT_3_OT_FAULT_RESPONSE | R          | 4    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 51                | AIRFLOW_1_OT_WARN_LIMIT     | R          | 0    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 115     | Primary Airflow - Outlet                                                                     |
| 51                | HOTSPOT_1_OT_WARN_LIMIT     | R          | 3    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 100     | Primary Hotspot - Bridge                                                                     |
| 51                | HOTSPOT_2_OT_WARN_LIMIT     | R          | 4    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 100     | Primary Hotspot - Boost                                                                      |
| 51                | AIRFLOW_2_OT_WARN_LIMIT     | R          | 1    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 75      | Secondary Airflow - Inlet                                                                    |
| 51                | HOTSPOT_3_OT_WARN_LIMIT     |            | 2    |                    |            |       |                      |   |   |   |       | 100     | Secondary Hotspot - Main Output Hotspot                                                      |
| 55                | VIN_OV_FAULT_LIMIT          | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 76/100  | Recoverable/Latched                                                                          |
| 56                | VIN_OV_FAULT_RESPONSE       | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 57                | VIN_OV_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 74      |                                                                                              |
| 58                | VIN_UV_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 40      |                                                                                              |
| 59                | VIN_UV_FAULT_LIMIT          | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 38      |                                                                                              |
| 5A                | VIN_UV_FAULT_RESPONSE       | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 5B                | IIN_OC_FAULT_LIMIT          | R          | 0    | Linear Data Format | 2          | Adc   | -5                   |   |   |   |       | 22      |                                                                                              |
| 5C                | IIN_OC_FAULT_RESPONSE       | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 5D                | IIN_OC_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Adc   | -5                   |   |   |   |       | 20      |                                                                                              |
| 5E                | POWER_GOOD_ON               | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 5F                | POWER_GOOD_OFF              | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 68                | POUT_OP_FAULT_LIMIT         | R          | 0    | Linear Data Format | 2          | Watts | 0                    |   |   |   |       | 780     |                                                                                              |
| 69                | POUT_OP_FAULT_RESPONSE      | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 6A                | POUT_OP_WARN_LIMIT          | R          | 0    | Linear Data Format | 2          | Watts | 0                    |   |   |   |       | 750     |                                                                                              |
| 6B                | PIN_OP_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Watts | 0                    |   |   |   |       | 860     |                                                                                              |

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**RETURNED RESULTS: D1U54-D-650-12-HB3xC-xxx; Front to Back Airflow: 12VSB (M1874, M1879)**

| Command Code Hex) | Command Name             | Read/Write | Page | Data Format        | # of Bytes | Units | Scaling Coefficients |   |   |   | Bit # | Reading | Comments                                                                                     |
|-------------------|--------------------------|------------|------|--------------------|------------|-------|----------------------|---|---|---|-------|---------|----------------------------------------------------------------------------------------------|
|                   |                          |            |      |                    |            |       | N                    | m | R | b |       |         |                                                                                              |
| 40                | VOUT_OV_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 13      |                                                                                              |
| 40                | VSTBY_OV_FAULT_LIMIT     | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 13      |                                                                                              |
| 41                | VOUT_OV_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 41                | VSTBY_OV_FAULT_RESPONSE  | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 42                | VOUT_OV_WARN_LIMIT       | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 12.5    |                                                                                              |
| 42                | VSTBY_OV_WARN_LIMIT      | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 12.5    |                                                                                              |
| 43                | VOUT_UV_WARN_LIMIT       | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 11.5    |                                                                                              |
| 43                | VSTBY_UV_WARN_LIMIT      | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 11.5    |                                                                                              |
| 44                | VOUT_UV_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 44                | VSTBY_UV_FAULT_LIMIT     | R          | 1    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 45                | VOUT_UV_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 45                | VSTBY_UV_FAULT_RESPONSE  | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 46                | IOUT_OC_FAULT_LIMIT      | R          | 0    | Linear Data Format | 2          | Adc   | -4                   |   |   |   |       | 64      |                                                                                              |
| 46                | ISTBY_OC_FAULT_LIMIT     | R          | 1    | Linear Data Format | 2          | Adc   | -8                   |   |   |   |       | 2.3     |                                                                                              |
| 47                | IOUT_OC_FAULT_RESPONSE   | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 7       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Continuous restart (self-recovery)                                                |
| 47                | ISTBY_OC_FAULT_RESPONSE  | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 5:3   | 7       | Response - Continuous restart (self-recovery)                                                |
|                   |                          |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 4A                | IOUT_OC_WARN_LIMIT       | R          | 0    | Linear Data Format | 2          | Adc   | -4                   |   |   |   |       | 60      |                                                                                              |
| 4A                | ISTBY_OC_WARN_LIMIT      | R          | 1    | Linear Data Format | 2          | Adc   | -8                   |   |   |   |       | 2.2     |                                                                                              |
| 4F                | AIRFLOW_1_OT_FAULT_LIMIT | R          | 0    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 80      | Primary Airflow - Inlet                                                                      |
| 4F                | HOTSPOT_1_OT_FAULT_LIMIT | R          | 1    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 100     | Primary Hotspot - Bridge                                                                     |
| 4F                | HOTSPOT_2_OT_FAULT_LIMIT | R          | 2    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 125     | Primary Hotspot - Boost                                                                      |
| 4F                | AIRFLOW_2_OT_FAULT_LIMIT | R          | 3    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 125     | Secondary Airflow - Outlet                                                                   |
| 4F                | HOTSPOT_3_OT_FAULT_LIMIT | R          | 3    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 105     | Secondary Hotspot - Main Output Hotspot                                                      |

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**Murata Power Solutions**

# D1U54-D-650-12-HBxxC-xxx PMBus™ Communications Protocol

ACAN-60 Application Note

**RETURNED RESULTS: D1U54-D-650-12-HB3xC-xxx; Front to Back Airflow: 12VSB (M1874, M1879)**

| Command Code Hex) | Command Name                | Read/Write | Page | Data Format        | # of Bytes | Units | Scaling Coefficients |   |   |   | Bit # | Reading | Comments                                                                                     |
|-------------------|-----------------------------|------------|------|--------------------|------------|-------|----------------------|---|---|---|-------|---------|----------------------------------------------------------------------------------------------|
|                   |                             |            |      |                    |            |       | N                    | m | R | b |       |         |                                                                                              |
| 50                | AIRFLOW_1_OT_FAULT_RESPONSE | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | AIRFLOW_2_OT_FAULT_RESPONSE | R          | 1    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | HOTSPOT_1_OT_FAULT_RESPONSE | R          | 2    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | HOTSPOT_2_OT_FAULT_RESPONSE | R          | 3    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 50                | HOTSPOT_3_OT_FAULT_RESPONSE | R          | 3    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 51                | AIRFLOW_1_OT_WARN_LIMIT     | R          | 0    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 75      | Primary Airflow - Inlet                                                                      |
| 51                | HOTSPOT_1_OT_WARN_LIMIT     | R          | 3    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 100     | Primary Hotspot - Bridge                                                                     |
| 51                | HOTSPOT_2_OT_WARN_LIMIT     | R          | 4    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 100     | Primary Hotspot - Boost                                                                      |
| 51                | AIRFLOW_2_OT_WARN_LIMIT     | R          | 1    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 115     | Secondary Airflow - Outlet                                                                   |
| 51                | HOTSPOT_3_OT_WARN_LIMIT     | R          | 2    | Linear Data Format | 2          | °C    | 0                    |   |   |   |       | 100     | Secondary Hotspot - Main Output Hotspot                                                      |
| 55                | VIN_OV_FAULT_LIMIT          | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 76/100  | Recoverable / Latched                                                                        |
| 56                | VIN_OV_FAULT_RESPONSE       | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 57                | VIN_OV_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 74      |                                                                                              |
| 58                | VIN_UV_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 40      |                                                                                              |
| 59                | VIN_UV_FAULT_LIMIT          | R          | 0    | Linear Data Format | 2          | Vdc   | -3                   |   |   |   |       | 38      |                                                                                              |
| 5A                | VIN_UV_FAULT_RESPONSE       | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 5B                | IIN_OC_FAULT_LIMIT          | R          | 0    | Linear Data Format | 2          | Adc   | -6                   |   |   |   |       | 22      |                                                                                              |
| 5C                | IIN_OC_FAULT_RESPONSE       | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 8       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 5D                | IIN_OC_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Arms  | -5                   |   |   |   |       | 20      |                                                                                              |
| 5E                | POWER_GOOD_ON               | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 5F                | POWER_GOOD_OFF              | R          | 0    | Linear Data Format | 2          | Vdc   | -6                   |   |   |   |       | 10.9    |                                                                                              |
| 68                | POUT_OP_FAULT_LIMIT         | R          | 0    | Linear Data Format | 2          | Watts | 0                    |   |   |   |       | 780     |                                                                                              |
| 69                | POUT_OP_FAULT_RESPONSE      | R          | 0    | Bit Flags          | 1          |       |                      |   |   |   | 2:0   | 0       | Delay Time - None                                                                            |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 5:3   | 0       | Retry Setting - Unit does not attempt to restart & output remains disabled until fault clear |
|                   |                             |            |      |                    |            |       |                      |   |   |   | 7:6   | 3       | Response - Output disabled while fault is present & remains disabled until fault cleared     |
| 6A                | POUT_OP_WARN_LIMIT          | R          | 0    | Linear Data Format | 2          | Watts | 0                    |   |   |   |       | 750     |                                                                                              |
| 6B                | PIN_OP_WARN_LIMIT           | R          | 0    | Linear Data Format | 2          | Watts | 0                    |   |   |   |       | 860     | POUT_OP_WARN_LIMIT / 0.87                                                                    |

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**SENSOR DATA AND RESOLUTION**
**SENSOR DATA: M1846 & D1U54-D-650-12-HB4xC-xxx; Back to Front Airflow: 12VSB (M1846; M1873, M1878)**

| Command Code (Hex) | Command Name        | Description                                                       | Page | Data Format        | Units | Scaling Coefficient |   |   |   | Raw Sensor         |            | PMBus Reporting Sensor |            |                                  |
|--------------------|---------------------|-------------------------------------------------------------------|------|--------------------|-------|---------------------|---|---|---|--------------------|------------|------------------------|------------|----------------------------------|
|                    |                     |                                                                   |      |                    |       | N                   | m | R | b | Full-scale / Range | Resolution | Full-scale / Range     | Resolution | Accuracy                         |
| 88                 | READ_VIN            | Input Voltage Sensor Reading                                      | All  | Linear Data Format | Vdc   | -3                  |   |   |   | 109.98             | 0.1075     | 127.875                | 0.125      | + / - 2% of Reporting Full-Scale |
| 89                 | READ_IIN            | Input Current Sensor Reading                                      | All  | Linear Data Format | Adc   | -5                  |   |   |   | 66                 | 0.0645     | 31.97                  | 0.0313     | + / - 5% of Reporting Full-Scale |
| 8B                 | READ_VOUT           | Main Output Voltage Sensor Reading                                | 0    | Direct Data Format | Vdc   | -6                  |   |   |   | 15.28              | 0.0149     | 15.98                  | 0.0156     | + / - 2% of Reporting Full-Scale |
| 8B                 | READ_VSTBY          | Standby(Auxiliary) Output Voltage Sensor Reading                  | 1    | Direct Data Format | Vdc   | -6                  |   |   |   | 15.28              | 0.0149     | 15.984                 | 0.01563    | + / - 2% of Reporting Full-Scale |
| 8C                 | READ_IOUT           | Main Output Current Sensor Reading                                | 0    | Direct Data Format | Adc   | -4                  |   |   |   | 81.36              | 0.0795     | 63.94                  | 0.063      | + / - 2% of Reporting Full-Scale |
| 8C                 | READ_ISTBY          | Standby(Auxiliary) Output Current Sensor Reading                  | 1    | Direct Data Format | Adc   | -8                  |   |   |   | 2.16               | 0.0021     | 3.996                  | 0.00391    | + / - 2% of Reporting Full-Scale |
| 8D                 | READ_TEMPERATURE_1  | Temperature Sensor Reading - Inlet (Secondary Side)               | 0    | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 8E                 | READ_TEMPERATURE_2  | Temperature Sensor Reading - Outlet (Primary Side)                | 0    | Direct Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 8F                 | READ_TEMPERATURE_3  | Temperature Sensor Reading - Main Output Hotspot (Secondary Side) | 0    | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 8F                 | READ_TEMPERATURE_3  | Temperature Sensor Reading - Bridge Hotspot (Primary Side)        | 1    | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 90                 | READ_TEMPERATURE_3  | Temperature Sensor Reading - Boost Hotspot (Primary Side)         | All  | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 91                 | READ_FAN_SPEED_1    | Fan 1 Speed Sensor Reading                                        | All  | Linear Data Format | RPM   | 5                   |   |   |   | 24,000             |            | 32736                  | 32         | + / - 5% of Reporting Full-Scale |
| 97                 | READ_POUT           | Output Power Sensor Reading                                       | All  | Linear Data Format | Watts | 0                   |   |   |   |                    |            | 1023                   | 1          | + / - 5% of Reporting Full-Scale |
| #Backtox88         | READ_PIN            | Input Power Sensor Reading                                        | All  | Linear Data Format | Watts | 0                   |   |   |   |                    |            | 1023                   | 1          | + / - 5% of Reporting Full-Scale |
| E2<br>#BacktoxE2   | READ_POWER_ON_HOURS | Accumulated Main Output Power-On Hours                            | All  | Linear Data Format | Hours | 0                   |   |   |   | ~1,900 (Years)     |            | ~1,900 (Years)         | 0.125      | + / - 3%                         |

**SENSOR DATA: D1U54-D-650-12-HB3xC-xxx; Front to Back Airflow: 12VSB (M1874, M1879)**

| Command Code (Hex) | Command Name        | Description                                                       | Page | Data Format        | Units | Scaling Coefficient |   |   |   | Raw Sensor         |            | PMBus Reporting Sensor |            |                                  |
|--------------------|---------------------|-------------------------------------------------------------------|------|--------------------|-------|---------------------|---|---|---|--------------------|------------|------------------------|------------|----------------------------------|
|                    |                     |                                                                   |      |                    |       | N                   | m | R | b | Full-scale / Range | Resolution | Full-scale / Range     | Resolution | Accuracy                         |
| 88                 | READ_VIN            | Input Voltage Sensor Reading                                      | All  | Linear Data Format | Vdc   | -3                  |   |   |   | 109.98             | 0.1075     | 127.875                | 0.125      | + / - 2% of Reporting Full-Scale |
| 89                 | READ_IIN            | Input Current Sensor Reading                                      | All  | Linear Data Format | Adc   | -5                  |   |   |   | 66                 | 0.0645     | 31.97                  | 0.0313     | + / - 5% of Reporting Full-Scale |
| 8B                 | READ_VOUT           | Main Output Voltage Sensor Reading                                | 0    | Direct Data Format | Vdc   | -6                  |   |   |   | 15.28              | 0.0149     | 15.98                  | 0.0156     | + / - 2% of Reporting Full-Scale |
| 8B                 | READ_VSTBY          | Standby(Auxiliary) Output Voltage Sensor Reading                  | 1    | Direct Data Format | Vdc   | -6                  |   |   |   | 15.28              | 0.0149     | 15.984                 | 0.01563    | + / - 2% of Reporting Full-Scale |
| 8C                 | READ_IOUT           | Main Output Current Sensor Reading                                | 0    | Direct Data Format | Adc   | -4                  |   |   |   | 81.36              | 0.0795     | 63.94                  | 0.063      | + / - 2% of Reporting Full-Scale |
| 8C                 | READ_ISTBY          | Standby(Auxiliary) Output Current Sensor Reading                  | 1    | Direct Data Format | Adc   | -8                  |   |   |   | 2.16               | 0.0021     | 3.996                  | 0.00391    | + / - 2% of Reporting Full-Scale |
| 8D                 | READ_TEMPERATURE_1  | Temperature Sensor Reading - Inlet (Primary Side)                 | 0    | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 8E                 | READ_TEMPERATURE_2  | Temperature Sensor Reading - Outlet (Secondary Side)              | 0    | Direct Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 8F                 | READ_TEMPERATURE_3  | Temperature Sensor Reading - Main Output Hotspot (Secondary Side) | 0    | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 8F                 | READ_TEMPERATURE_3  | Temperature Sensor Reading - Bridge Hotspot (Primary Side)        | 1    | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 90                 | READ_TEMPERATURE_3  | Temperature Sensor Reading - Boost Hotspot (Primary Side)         | All  | Linear Data Format | °C    | 0                   |   |   |   | -40 to 150         |            | -40 to 150             | 1          | + / - 5°C                        |
| 91                 | READ_FAN_SPEED_1    | Fan 1 Speed Sensor Reading                                        | All  | Linear Data Format | RPM   | 5                   |   |   |   | 24,000             |            | 32736                  | 32         | + / - 5% of Reporting Full-Scale |
| 96                 | READ_POUT           | Output Power Sensor Reading                                       | All  | Linear Data Format | Watts | 0                   |   |   |   |                    |            | 1023                   | 1          | + / - 5% of Reporting Full-Scale |
| 97                 | READ_PIN            | Input Power Sensor Reading                                        | All  | Linear Data Format | Watts | 0                   |   |   |   |                    |            | 1023                   | 1          | + / - 5% of Reporting Full-Scale |
| #Backtox88         | READ_POWER_ON_HOURS | Accumulated Main Output Power-On Hours                            | All  | Linear Data Format | Hours | 0                   |   |   |   | ~1,900 (Years)     |            | ~1,900 (Years)         | 0.125      | + / - 3%                         |

| Command Code (Hex)               | Command Name | Value     | Units | ID Length/Bit#ID/ASCII Text |   |      |
|----------------------------------|--------------|-----------|-------|-----------------------------|---|------|
| 99<br><a href="#">#Backtox99</a> | MFR_ID       | Murata-PS | N/A   | MFR_ID_LENGTH               | 9 |      |
|                                  |              |           |       | MFR_ID_0                    |   | 'M'  |
|                                  |              |           |       | MFR_ID_1                    |   | 'u'  |
|                                  |              |           |       | MFR_ID_2                    |   | 'r'  |
|                                  |              |           |       | MFR_ID_3                    |   | 'a'  |
|                                  |              |           |       | MFR_ID_4                    |   | 't'  |
|                                  |              |           |       | MFR_ID_5                    |   | 'a'  |
|                                  |              |           |       | MFR_ID_6                    |   | '.'' |
|                                  |              |           |       | MFR_ID_7                    |   | 'P'  |
|                                  |              |           |       | MFR_ID_8                    |   | 'S'  |

**Command Code 9A HEX; (MFR\_MODEL) M1846; DC Input Variant; Back to Front Airflow**

| Command Code (Hex)               | Command Name | Value | Units | ID Length/Bit#ID/ASCII Text |  |     |
|----------------------------------|--------------|-------|-------|-----------------------------|--|-----|
| 9A<br><a href="#">#Backtox9A</a> | MFR_MODEL    | M1846 | N/A   | MFR_MODEL_LENGTH = 5        |  |     |
|                                  |              |       |       | MFR_MODEL_0                 |  | 'M' |
|                                  |              |       |       | MFR_MODEL_1                 |  | '1' |
|                                  |              |       |       | MFR_MODEL_2                 |  | '8' |
|                                  |              |       |       | MFR_MODEL_3                 |  | '4' |
|                                  |              |       |       | MFR_MODEL_4                 |  | '6' |

**Command Code 9A HEX; (MAN\_MODEL) D1U54-D-650-12-HB4BC-AB DC Input Variant; Back to Front Airflow (M1873)**

| Command Code (Hex)               | Command Name | Value                   | Units | ID Length/Bit#ID/ASCII Text |  |      |
|----------------------------------|--------------|-------------------------|-------|-----------------------------|--|------|
| 9A<br><a href="#">#Backtox9A</a> | MFR_MODEL    | D1U54-D-650-12-HB4BC-AB | N/A   | MFR_MODEL_LENGTH = 23       |  |      |
|                                  |              |                         |       | MFR_MODEL_0                 |  | 'D'  |
|                                  |              |                         |       | MFR_MODEL_1                 |  | '1'  |
|                                  |              |                         |       | MFR_MODEL_2                 |  | 'U'  |
|                                  |              |                         |       | MFR_MODEL_3                 |  | '5'  |
|                                  |              |                         |       | MFR_MODEL_4                 |  | '4'  |
|                                  |              |                         |       | MFR_MODEL_5                 |  | '.'' |
|                                  |              |                         |       | MFR_MODEL_6                 |  | 'D'  |
|                                  |              |                         |       | MFR_MODEL_7                 |  | '.'' |
|                                  |              |                         |       | MFR_MODEL_8                 |  | '6'  |
|                                  |              |                         |       | MFR_MODEL_10                |  | '5'  |
|                                  |              |                         |       | MFR_MODEL_11                |  | '0'  |
|                                  |              |                         |       | MFR_MODEL_12                |  | '.'' |
|                                  |              |                         |       | MFR_MODEL_13                |  | '1'  |
|                                  |              |                         |       | MFR_MODEL_14                |  | '2'  |
|                                  |              |                         |       | MFR_MODEL_15                |  | '.'' |
|                                  |              |                         |       | MFR_MODEL_16                |  | 'H'  |
|                                  |              |                         |       | MFR_MODEL_17                |  | 'B'  |
|                                  |              |                         |       | MFR_MODEL_18                |  | '4'  |
|                                  |              |                         |       | MFR_MODEL_19                |  | 'B'  |
|                                  |              |                         |       | MFR_MODEL_20                |  | 'C'  |
|                                  |              |                         |       | MFR_MODEL_21                |  | '.'' |
|                                  |              |                         |       | MFR_MODEL_22                |  | 'A'  |
|                                  |              |                         |       | MFR_MODEL_23                |  | 'B'  |
|                                  |              |                         |       | MFR_MODEL_24                |  |      |

Command Code 9A HEX; (MAN\_MODEL) D1U54-D-650-12-HB4C; DC Input Variant; Back to Front Airflow (M1878)

| Command Code (Hex) | Command Name | Value               | Units | ID Length/Bit#ID/ASCII Text |
|--------------------|--------------|---------------------|-------|-----------------------------|
| 9A<br>#Backtox9A   | MFR_MODEL    | D1U54-D-650-12-HB4C | N/A   | MFR_MODEL_LENGTH = 20       |
|                    |              |                     |       | MFR_MODEL_0 'D'             |
|                    |              |                     |       | MFR_MODEL_1 '1'             |
|                    |              |                     |       | MFR_MODEL_2 'U'             |
|                    |              |                     |       | MFR_MODEL_3 '5'             |
|                    |              |                     |       | MFR_MODEL_4 '4'             |
|                    |              |                     |       | MFR_MODEL_5 'L'             |
|                    |              |                     |       | MFR_MODEL_6 'D'             |
|                    |              |                     |       | MFR_MODEL_7 'L'             |
|                    |              |                     |       | MFR_MODEL_8 '6'             |
|                    |              |                     |       | MFR_MODEL_10 '5'            |
|                    |              |                     |       | MFR_MODEL_11 '0'            |
|                    |              |                     |       | MFR_MODEL_12 'L'            |
|                    |              |                     |       | MFR_MODEL_13 '1'            |
|                    |              |                     |       | MFR_MODEL_14 '2'            |
|                    |              |                     |       | MFR_MODEL_15 'L'            |
|                    |              |                     |       | MFR_MODEL_16 'H'            |
|                    |              |                     |       | MFR_MODEL_17 'B'            |
|                    |              |                     |       | MFR_MODEL_18 '4'            |
|                    |              |                     |       | MFR_MODEL_19 'C'            |

Command Code 9A HEX; (MAN\_MODEL) D1U54-D-650-12-HB3BC-AB; AC Input Variant; Front to Back Airflow (M1874)

| Command Code (Hex) | Command Name | Value                   | Units | ID Length/Bit#ID/ASCII Text |
|--------------------|--------------|-------------------------|-------|-----------------------------|
| 9A<br>#Backtox9A   | MFR_MODEL    | D1U54-D-650-12-HB3BC-AB | N/A   | MFR_MODEL_LENGTH = 24       |
|                    |              |                         |       | MFR_MODEL_0 'D'             |
|                    |              |                         |       | MFR_MODEL_1 '1'             |
|                    |              |                         |       | MFR_MODEL_2 'U'             |
|                    |              |                         |       | MFR_MODEL_3 '5'             |
|                    |              |                         |       | MFR_MODEL_4 '4'             |
|                    |              |                         |       | MFR_MODEL_5 'L'             |
|                    |              |                         |       | MFR_MODEL_6 'D'             |
|                    |              |                         |       | MFR_MODEL_7 'L'             |
|                    |              |                         |       | MFR_MODEL_8 '6'             |
|                    |              |                         |       | MFR_MODEL_10 '5'            |
|                    |              |                         |       | MFR_MODEL_11 '0'            |
|                    |              |                         |       | MFR_MODEL_12 'L'            |
|                    |              |                         |       | MFR_MODEL_13 '1'            |
|                    |              |                         |       | MFR_MODEL_14 '2'            |
|                    |              |                         |       | MFR_MODEL_15 'L'            |
|                    |              |                         |       | MFR_MODEL_16 'H'            |
|                    |              |                         |       | MFR_MODEL_17 'B'            |
|                    |              |                         |       | MFR_MODEL_18 '3'            |
|                    |              |                         |       | MFR_MODEL_19 'B'            |
|                    |              |                         |       | MFR_MODEL_20 'C'            |
|                    |              |                         |       | MFR_MODEL_21 'L'            |
|                    |              |                         |       | MFR_MODEL_22 'A'            |
|                    |              |                         |       | MFR_MODEL_23 'B'            |



Murata Power Solutions

Command Code 9A HEX; (MAN\_MODEL) D1U54-D-650-12-HB3C; AC Input Variant; Back to Front Airflow (M1879)

# D1U54-D-650-12-HBxxC-xxx PMBus™ Communications Protocol

ACAN-60 Application Note

| Command Code (Hex)               | Command Name | Value               | Units | ID Length/Bit#ID/ASCII Text |     |  |
|----------------------------------|--------------|---------------------|-------|-----------------------------|-----|--|
| 9A<br><a href="#">#Backtox9A</a> | MFR_MODEL    | D1U54-D-650-12-HB3C | N/A   | MFR_MODEL_LENGTH = 20       |     |  |
|                                  |              |                     |       | MFR_MODEL_0                 | 'D' |  |
|                                  |              |                     |       | MFR_MODEL_1                 | '1' |  |
|                                  |              |                     |       | MFR_MODEL_2                 | 'U' |  |
|                                  |              |                     |       | MFR_MODEL_3                 | '5' |  |
|                                  |              |                     |       | MFR_MODEL_4                 | '4' |  |
|                                  |              |                     |       | MFR_MODEL_5                 | '.' |  |
|                                  |              |                     |       | MFR_MODEL_6                 | 'D' |  |
|                                  |              |                     |       | MFR_MODEL_7                 | '.' |  |
|                                  |              |                     |       | MFR_MODEL_8                 | '6' |  |
|                                  |              |                     |       | MFR_MODEL_10                | '5' |  |
|                                  |              |                     |       | MFR_MODEL_11                | '0' |  |
|                                  |              |                     |       | MFR_MODEL_12                | '.' |  |
|                                  |              |                     |       | MFR_MODEL_13                | '1' |  |
|                                  |              |                     |       | MFR_MODEL_14                | '2' |  |
|                                  |              |                     |       | MFR_MODEL_15                | '.' |  |
|                                  |              |                     |       | MFR_MODEL_16                | 'H' |  |
|                                  |              |                     |       | MFR_MODEL_17                | 'B' |  |
|                                  |              |                     |       | MFR_MODEL_18                | '3' |  |
|                                  |              |                     |       | MFR_MODEL_19                | 'C' |  |

Command Code 9B HEX; (MFR\_REVISION)

| Command Code (Hex)               | Command Name | Value          | Units | ID Length/Bit#ID/ASCII Text |     |                 |
|----------------------------------|--------------|----------------|-------|-----------------------------|-----|-----------------|
| 9B<br><a href="#">#Backtox9B</a> | MFR_MODEL    | 0001-0001-0000 | N/A   | MFR_MODEL_LENGTH = 14       |     |                 |
|                                  |              |                |       | MFR_MODEL_0                 | '0' | Primary Micro   |
|                                  |              |                |       | MFR_MODEL_1                 | '0' |                 |
|                                  |              |                |       | MFR_MODEL_2                 | '0' |                 |
|                                  |              |                |       | MFR_MODEL_3                 | '1' |                 |
|                                  |              |                |       | MFR_MODEL_4                 | '.' |                 |
|                                  |              |                |       | MFR_MODEL_5                 | '0' | Secondary Micro |
|                                  |              |                |       | MFR_MODEL_6                 | '0' |                 |
|                                  |              |                |       | MFR_MODEL_7                 | '0' |                 |
|                                  |              |                |       | MFR_MODEL_8                 | '1' |                 |
|                                  |              |                |       | MFR_MODEL_9                 | '.' |                 |
|                                  |              |                |       | MFR_MODEL_10                | '0' | Floating Micro  |
|                                  |              |                |       | MFR_MODEL_11                | '0' |                 |
|                                  |              |                |       | MFR_MODEL_12                | '0' |                 |
|                                  |              |                |       | MFR_MODEL_13                | '0' |                 |

| Command Code (Hex)                      | Command Name | Value | ID Length/Bit#ID/ASCII Text |     |
|-----------------------------------------|--------------|-------|-----------------------------|-----|
| <b>9C</b><br><a href="#">#Backtox9C</a> | MFR_LOCATION | China | MFR_LOCATION_LENGTH = 5     |     |
|                                         |              |       | MFR_LOCATION_0              | 'C' |
|                                         |              |       | MFR_LOCATION_1              | 'h' |
|                                         |              |       | MFR_LOCATION_2              | 'i' |
|                                         |              |       | MFR_LOCATION_3              | 'n' |
|                                         |              |       | MFR_LOCATION_4              | 'a' |

**Command Code 9D HEX (MFR\_DATE)**

| Command Code (Hex)                      | Command Name | Value | ID Length/Bit#ID/ASCII Text |     |
|-----------------------------------------|--------------|-------|-----------------------------|-----|
| <b>9D</b><br><a href="#">#Backtox9D</a> | MFR_DATE     | 1400  | MFR_DATE_LENGTH = 4         |     |
|                                         |              |       | MFR_DATE_0                  | '1' |
|                                         |              |       | MFR_DATE_1                  | '4' |
|                                         |              |       | MFR_DATE_2                  | '0' |
|                                         |              |       | MFR_DATE_3                  | '0' |

**Command Code 9E HEX (MFR\_SERIAL)**

| Command Code (Hex)                      | Command Name | Value        | ID Length/Bit#ID/ASCII Text |     |
|-----------------------------------------|--------------|--------------|-----------------------------|-----|
| <b>9E</b><br><a href="#">#Backtox9E</a> | MFR_SERIAL   | QEyywwR1xxxx | MFR_SERIAL_LENGTH = 12      |     |
|                                         |              |              | MFR_SERIAL_0                | 'Q' |
|                                         |              |              | MFR_SERIAL_1                | 'E' |
|                                         |              |              | MFR_SERIAL_2                | 'y' |
|                                         |              |              | MFR_SERIAL_3                | 'y' |
|                                         |              |              | MFR_SERIAL_4                | 'w' |
|                                         |              |              | MFR_SERIAL_5                | 'w' |
|                                         |              |              | MFR_SERIAL_6                | 'R' |
|                                         |              |              | MFR_SERIAL_7                | '1' |
|                                         |              |              | MFR_SERIAL_8                | 'x' |
|                                         |              |              | MFR_SERIAL_9                | 'x' |
|                                         |              |              | MFR_SERIAL_10               | 'x' |
|                                         |              |              | MFR_SERIAL_11               | 'x' |

| Command Code (Hex) | Command Name            | Value | Units | Scaling Coefficients |   |   |   | Read Value (Decimal) |                                |
|--------------------|-------------------------|-------|-------|----------------------|---|---|---|----------------------|--------------------------------|
|                    |                         |       |       | N                    | m | R | b |                      |                                |
| A0                 | MFR_VIN_MIN             | 40    | Vdc   | -3                   |   |   |   | 320                  | <a href="#">#BacktoxA0toAB</a> |
| A1                 | MFR_VIN_MAX             | 72    | Vdc   | -3                   |   |   |   | 576                  |                                |
| A2                 | MFR_IIN_MAX             | 18    | Adc   | -4                   |   |   |   | 800                  |                                |
| A3                 | MFR_PIN_MAX             | 722   | W     | 0                    |   |   |   | 909                  |                                |
| A4                 | MFR_VOUT_MIN            | 11.6  | Vdc   | -6                   |   |   |   | 745                  |                                |
| A5                 | MFR_VOUT_MAX            | 12.4  | Vdc   | -6                   |   |   |   | 791                  |                                |
| A6                 | MFR_IOUT_MAX            | 54    | Adc   | -2                   |   |   |   | 532                  |                                |
| A7                 | MFR_POUT_MAX            | 650   | W     | 1                    |   |   |   | 800                  |                                |
| A8                 | MFR_TAMBIENT_MAX        | 60    | C     | 0                    |   |   |   | 50                   |                                |
| A9                 | MFR_TAMBIENT_MIN        | 0     | C     | 0                    |   |   |   | 0                    |                                |
| AA                 | MFR_EFFICIENCY_LL_VIN   | 40    | Vdc   | -3                   |   |   |   | 320                  |                                |
|                    | MFR_EFFICIENCY_LL_POUT1 | 130   | W     | 1                    |   |   |   | 120                  |                                |
|                    | MFR_EFFICIENCY_LL_EFF1  | 0.9   |       | -10                  |   |   |   | 922                  |                                |
|                    | MFR_EFFICIENCY_LL_POUT2 | 325   | W     | 1                    |   |   |   | 300                  |                                |
|                    | MFR_EFFICIENCY_LL_EFF2  | 0.92  |       | -10                  |   |   |   | 942                  |                                |
|                    | MFR_EFFICIENCY_LL_POUT3 | 650   | W     | 1                    |   |   |   | 600                  |                                |
| AB                 | MFR_EFFICIENCY_LL_EFF3  | 0.89  |       | -10                  |   |   |   | 922                  |                                |
|                    | MFR_EFFICIENCY_HL_VIN   | 72    | Vdc   | -3                   |   |   |   | 576                  |                                |
|                    | MFR_EFFICIENCY_HL_POUT1 | 130   | W     | 1                    |   |   |   | 120                  |                                |
|                    | MFR_EFFICIENCY_HL_EFF1  | 0.9   |       | -10                  |   |   |   | 922                  |                                |
|                    | MFR_EFFICIENCY_HL_POUT2 | 325   | W     | 1                    |   |   |   | 300                  |                                |
|                    | MFR_EFFICIENCY_HL_EFF2  | 0.94  |       | -10                  |   |   |   | 942                  |                                |
|                    | MFR_EFFICIENCY_HL_POUT3 | 650   | W     | 1                    |   |   |   | 600                  |                                |
|                    | MFR_EFFICIENCY_HL_EFF3  | 0.91  |       | -10                  |   |   |   | 922                  |                                |

| Power Module On/Off Mode: Bit # / Bit Description (Command Code 01 HEX) |            |                             |   |                           |   |          |     | Valid Values |         | Power Module Status                                                    |
|-------------------------------------------------------------------------|------------|-----------------------------|---|---------------------------|---|----------|-----|--------------|---------|------------------------------------------------------------------------|
| 7                                                                       | 6          | 5                           | 4 | 3                         | 2 | 1        | 0   | Dec          | Hex     |                                                                        |
| On/off Bit                                                              | On/off Bit | Margin on/off/high/low Bits |   | Margin Fault Control Bits |   | Bit      | Bit |              |         |                                                                        |
| 1                                                                       | 0          | 1                           | 0 | 1                         | 0 | Not Used |     |              |         |                                                                        |
| 0                                                                       | 0          | x                           | x | x                         | x | x        | x   | 0 - 63       | 0 - 3F  | Disable power supply when OPERATION command supported                  |
| 1                                                                       | 0          | x                           | x | x                         | x | x        | x   | 128 - 191    | 80 - BF | Enable power supply when OPERATION command supported – DEFAULT setting |

[#Backtox01](#)

## ON/OFF COMMAND CODE 02 HEX

| Power Module On/Off Configuration: Bit # / Bit Description (Command Code 02 HEX) |          |          |                                                    |                             |             |          |        | Valid Values |          | Power Supply On/Off Mode                                                    |
|----------------------------------------------------------------------------------|----------|----------|----------------------------------------------------|-----------------------------|-------------|----------|--------|--------------|----------|-----------------------------------------------------------------------------|
| 7                                                                                | 6        | 5        | 4                                                  | 3                           | 2           | 1        | 0      | Dec          | Hex      |                                                                             |
|                                                                                  |          |          |                                                    |                             | CONTROL Pin |          |        |              |          |                                                                             |
| reserved                                                                         | reserved | reserved | CONTROL pin /<br>OPERATION<br>command PS<br>on/off | OPERATION<br>command on/off | On/Off      | Polarity | Action |              |          |                                                                             |
| 0                                                                                | 0        | 0        | 1                                                  | 0                           | 1           | 0        | 1      | 21           | 15       | Control pin only ; active low polarity                                      |
| 0                                                                                | 0        | 0        | 1                                                  | 0                           | 1           | 1        | 1      | 23           | 17       | Control pin only ; active high polarity                                     |
| 0                                                                                | 0        | 0        | 1                                                  | 1                           | 0           | x        | 1      | 25 or 27     | 19 or 1B | Operation command only                                                      |
| 0                                                                                | 0        | 0        | 1                                                  | 1                           | 1           | 0        | 1      | 29           | 1D       | Operation command and control pin ;<br>active low polarity; DEFAULT setting |
| 0                                                                                | 0        | 0        | 1                                                  | 1                           | 1           | 1        | 1      | 31           | 1F       | Operation command and control pin ;<br>active high polarity                 |

[#Backtox02](#)

## EEPROM DATA; D1U54-D-650-12-HB4C (M1876) Back to Front Airflow

| Address (HEX) | Data Length | Register Contents (Hexadecimal Format)<br>Order = Low Address -> High Address<br>Dynamic Data Byte = "xx" | Register Name          | Static or Dynamic Register? (S/D) | R/W | Protected? (Y/N) | Data Type | Description                                                                                                                                                           |
|---------------|-------------|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------|-----|------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 00 - 0A       | 11          | 01 00 00 00 01 00 00 FE 01 08 19                                                                          | Header                 | S                                 |     | N                | HEX       |                                                                                                                                                                       |
| 0B - 14       | 10          | C9 4D 75 72 61 74 61 2D 50 53                                                                             | Manufacturer Bytes     | S                                 |     | N                | TEXT      | Reads as "Murata-PS"                                                                                                                                                  |
| 15 - 1A       | 6           | C5 4D 31 38 37 36                                                                                         | Product Name           | S                                 |     | N                | TEXT      | Reads as "M1876"                                                                                                                                                      |
| 1B - 2F       | 21          | D4 44 31 55 35 34 2D 44 2D 36 35 30 2D 31 32 2D 48 42 34 43                                               | Part Number            | S                                 |     | N                | TEXT      | Reads as "D1U54P-D-650-12-HB4C"                                                                                                                                       |
| 30            | 1           | C0                                                                                                        | Product Version Length | S                                 |     | N                | HEX       | Product version, length = 0                                                                                                                                           |
| 31 - 3D       | 13          | CC pp pp yy yy ww ww rr rr XX XX XX XX                                                                    | Product Serial Number  | D                                 |     | N                | TEXT      | CC = HEX 0xCC length identifier<br>pp = Product Code<br>yy = Serial Number Year<br>ww = Serial Number Week<br>rr = Serial Number Revision Level<br>XX = Serial Number |
| 3E - 43       | 6           | C0 C0 C0 C0 C0 C0                                                                                         | Custom data            | S                                 |     | N                | HEX       | Asset tag, Custom data, FRU ID                                                                                                                                        |
| 44            | 1           | C1                                                                                                        | END                    | S                                 |     | N                | HEX       | Signifies end of information                                                                                                                                          |
| 45 - 46       | 2           | 00 00                                                                                                     | UNUSED EEPROM          | S                                 |     | N                | HEX       | Fill all unused memory locations with 0x00                                                                                                                            |
| 47            | 1           | XX                                                                                                        | Checksum               | D                                 |     | N                | HEX       | XX = 2's complement checksum from 0x08 - 0x46                                                                                                                         |
| 48 - FF       | 184         | 00 00 00 ... 00 00 00                                                                                     | UNUSED EEPROM          | S                                 |     |                  | HEX       | Fill all unused memory locations with 0x00                                                                                                                            |

[#BacktoxE1](#)

**EEPROM DATA; D1U54-D-650-12-HB3C (M1877) Front to Back Airflow**

| Address (HEX) | Data Length | Register Contents (Hexadecimal Format)<br>Order = Low Address -> High Address<br>Dynamic Data Byte = "xx" | Register Name          | Static or Dynamic Register? (S/D) | R/W | Protected? (Y/N) | Data Type | Description                                                                                                                                                           |
|---------------|-------------|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------|-----|------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 00 - 0A       | 11          | 01 00 00 00 01 00 00 FE 01 08 19                                                                          | Header                 | S                                 |     | N                | HEX       |                                                                                                                                                                       |
| 0B - 14       | 10          | C9 4D 75 72 61 74 61 2D 50 53                                                                             | Manufacturer Bytes     | S                                 |     | N                | TEXT      | Reads as "Murata-PS"                                                                                                                                                  |
| 15 - 1A       | 6           | C5 4D 31 38 37 37                                                                                         | Product Name           | S                                 |     | N                | TEXT      | Reads as "M1877"                                                                                                                                                      |
| 1B - 2F       | 21          | D4 44 31 55 35 34 2D 44 2D 36 35 30 2D 31 32 2D 48 42 33 43                                               | Part Number            | S                                 |     | N                | TEXT      | Reads as "D1U54-D-650-12-HB3C"                                                                                                                                        |
| 30            | 1           | C0                                                                                                        | Product Version Length | S                                 |     | N                | HEX       | Product version, length = 0                                                                                                                                           |
| 31 - 3D       | 13          | CC pp pp yy yy ww ww rr rr XX XX XX XX                                                                    | Product Serial Number  | D                                 |     | N                | TEXT      | CC = HEX 0xCC length identifier<br>pp = Product Code<br>yy = Serial Number Year<br>ww = Serial Number Week<br>rr = Serial Number Revision Level<br>XX = Serial Number |
| 3E - 43       | 6           | C0 C0 C0 C0 C0 C0                                                                                         | Custom data            | S                                 |     | N                | HEX       | Asset tag, Custom data, FRU ID                                                                                                                                        |
| 44            | 1           | C1                                                                                                        | END                    | S                                 |     | N                | HEX       | Signifies end of information                                                                                                                                          |
| 45 - 46       | 2           | 00 00                                                                                                     | UNUSED EEPROM          | S                                 |     | N                | HEX       | Fill all unused memory locations with 0x00                                                                                                                            |
| 47            | 1           | XX                                                                                                        | Checksum               | D                                 |     | N                | HEX       | XX = 2's complement checksum from 0x08 - 0x46                                                                                                                         |
| 48 - FF       | 184         | 00 00 00 ... 00 00 00                                                                                     | UNUSED EEPROM          | S                                 |     |                  | HEX       | Fill all unused memory locations with 0x00                                                                                                                            |

**#BacktoxE1**

**PMBUS Configurable Bits**
**BacktoxEE**

| Parameter   | Bit#  | Bit | Function                                                               |         |
|-------------|-------|-----|------------------------------------------------------------------------|---------|
| Data Format | Bit 0 | 1   | Direct Data Format                                                     |         |
|             |       | 0   | Linear Data Format                                                     | Default |
| SMBALERT    | Bit 1 | 1   | PS does not have SMBALERT pin or does not support SMBus alert protocol |         |
|             |       | 0   | PS does have SMBALERT pin and supports SMBus alert protocol            | Default |
| Bus Speed   | Bit 2 | 1   | Maximum supported bus speed = 400kHz                                   | Default |
|             |       | 0   | Maximum supported bus speed = 100kHz                                   |         |
| PEC support | Bit 3 | 1   | Packed error checking supported                                        | Default |
|             |       | 0   | Packed error checking not supported                                    |         |

| Bit # / Bit Description |          |          |          |          |                |                |                | Valid Values |        | Read / Write | LED Status & Control                |
|-------------------------|----------|----------|----------|----------|----------------|----------------|----------------|--------------|--------|--------------|-------------------------------------|
| 7                       | 6        | 5        | 4        | 3        | 2              | 1              | 0              | Dec          | Hex    |              |                                     |
| CONTROL Bit             | Reserved | Reserved | Reserved | Reserved | LED Mode Bit 2 | LED Mode Bit 1 | LED Mode Bit 0 |              |        |              |                                     |
| Page 0 - INPUT LED      |          |          |          |          |                |                |                |              |        |              |                                     |
| 0                       | 0        | 0        | 0        | 0        | 0              | 0              | 0              | 0            | 0      | Read         | Auto - LED off                      |
| 0                       | 0        | 0        | 0        | 0        | 0              | 0              | 1              | 1            | 1      | Read         | Auto - LED solid green              |
| 0                       | 0        | 0        | 0        | 0        | 0              | 1              | 0              | 2            | 2      | Read         | Auto - LED blinking green           |
| 0                       | X        | X        | X        | X        | X              | X              | X              | 0 - 127      | 0 - 7F | Write        | Set to Auto LED control             |
| 1                       | 0        | 0        | 0        | 0        | 0              | 0              | 0              | 128          | 80     | Read / Write | Set to Manual - LED off             |
| 1                       | 0        | 0        | 0        | 0        | 0              | 0              | 1              | 129          | 81     | Read / Write | Set to Manual - LED solid green     |
| 1                       | 0        | 0        | 0        | 0        | 0              | 1              | 0              | 130          | 82     | Read / Write | Set to Manual - LED blinking green  |
| Page 1 - OUTPUT LED     |          |          |          |          |                |                |                |              |        |              |                                     |
| 0                       | 0        | 0        | 0        | 0        | 0              | 0              | 0              | 0            | 0      | Read         | Auto - LED off                      |
| 0                       | 0        | 0        | 0        | 0        | 0              | 0              | 1              | 1            | 1      | Read         | Auto - LED solid green              |
| 0                       | 0        | 0        | 0        | 0        | 0              | 1              | 0              | 2            | 2      | Read         | Auto - LED blinking green           |
| 0                       | 0        | 0        | 0        | 0        | 0              | 1              | 1              | 3            | 3      | Read         | Auto - LED solid red                |
| 0                       | 0        | 0        | 0        | 0        | 1              | 0              | 0              | 4            | 4      | Read         | Auto - LED blinking red             |
| 0                       | 0        | 0        | 0        | 0        | 1              | 0              | 1              | 5            | 5      | Read         | Auto - LED solid yellow             |
| 0                       | 0        | 0        | 0        | 0        | 1              | 1              | 0              | 6            | 6      | Read         | Auto - LED blinking yellow          |
| 0                       | X        | X        | X        | X        | X              | X              | X              | 0 - 127      | 0 - 7F | Write        | Set to Auto LED control             |
| 1                       | 0        | 0        | 0        | 0        | 0              | 0              | 0              | 128          | 80     | Read / Write | Set to Manual - LED off             |
| 1                       | 0        | 0        | 0        | 0        | 0              | 0              | 1              | 129          | 81     | Read / Write | Set to Manual - LED solid green     |
| 1                       | 0        | 0        | 0        | 0        | 0              | 1              | 0              | 130          | 82     | Read / Write | Set to Manual - LED blinking green  |
| 1                       | 0        | 0        | 0        | 0        | 0              | 1              | 1              | 131          | 83     | Read / Write | Set to Manual - LED solid red       |
| 1                       | 0        | 0        | 0        | 0        | 1              | 0              | 0              | 132          | 84     | Read / Write | Set to Manual - LED blinking red    |
| 1                       | 0        | 0        | 0        | 0        | 1              | 0              | 1              | 133          | 85     | Read / Write | Set to Manual - LED solid yellow    |
| 1                       | 0        | 0        | 0        | 0        | 1              | 1              | 0              | 134          | 86     | Read / Write | Set to Manual - LED blinking yellow |

= Default Settings