



## Product Specification for:

**NR2-DVR900-N**

**1+1 Redundant Power Supply**

**Prepared by:**

**Checked by:**

**Approved by:**

**Date : 2014/03/12**

Date	Revision	Reason
2014/03/12	01	First draft

<b>1.0 INPUT:</b> .....	<b>4</b>
1.1 Input Voltage.....	4
1.2 Input Current .....	4
1.3 Inrush Current.....	4
<b>2.0 OUTPUT:</b> .....	<b>4</b>
2.1 Output Rating Table.....	4
2.2 Power Supply Timing .....	4
2.3 Rise Time(Tvout _rise) .....	5
2.4 Tsb-on & Tac-on Delay Time.....	5
2.5 Main Output Delay Time(Tsb_vout).....	5
2.6 Tpson_on_delay.....	5
2.7 Power Work OK Delay(Tpwok_on).....	6
2.8 Hold Up Time(Tvout_holdup) .....	6
2.9 Power Fail Delay Time(Tpwok_off) .....	6
2.10 Duration Time for PWOK(Tpwok_low).....	6
2.11 PWOK Delay PSON Deactivate(Tpson_pwok).....	6
2.12 Power Efficiency .....	6
2.13 Capacitive Loading.....	6
2.14 Dynamic Loading .....	6
2.15 Current Sharing .....	6
<b>3.0 PROTECTION:</b> .....	<b>7</b>
3.1 Input Under and Over Voltage Protection .....	7
3.1 Output Over Current Protection (Per Unit) .....	7
3.3 Output Over Voltage Protection.....	7
3.4 Output Short Protection.....	7
3.5 Over Temperature Protection .....	7
<b>4.0 ENVIRONMENT:</b> .....	<b>7</b>
<b>5.0 HI-POT:</b> .....	<b>8</b>
5.1 Primary to Secondary.....	8
5.2 Primary to Earth.....	8

5.3 Grounding Resistance.....	8
<b>6.0 SAFETY AND EMI REQUIREMENT .....</b>	<b>8</b>
6.1 Conduction and Radiation .....	8
6.2 Safety Standards.....	8
<b>7.0 MTBF AT 25°C(DEMONSTRATED) .....</b>	<b>8</b>
<b>8.0 DIMENSIONS .....</b>	<b>8</b>
Mechanical Outline.....	8
<b>9.0 OUTPUT TERMINAL AND LED DESCRIPTION.....</b>	<b>9</b>
<b>10.0 FIRMWARE.....</b>	<b>10</b>
10.1 PMBUS and EEPROM .....	10
10.2 PMBUS Communication.....	10
10.3 PMBUS Specification .....	12
10.4 PMBUS Command Supported.....	12

## 1.0 INPUT:

## 1.1 Input Voltage

Minimum	Nominal	Maximum	Units
40Vdc	48Vdc	60Vdc	Vrms

## 1.2 Input Current

30A max at 40Vdc~60Vdc.

### 1.3 Inrush Current

25A max at 60Vdc input when 25°C cold start, ignore the instantaneous charge current for X,Y caps, but the peak current during time should < 100uS.

## 2.0 OUTPUT:

## 2.1 Output Rating Table

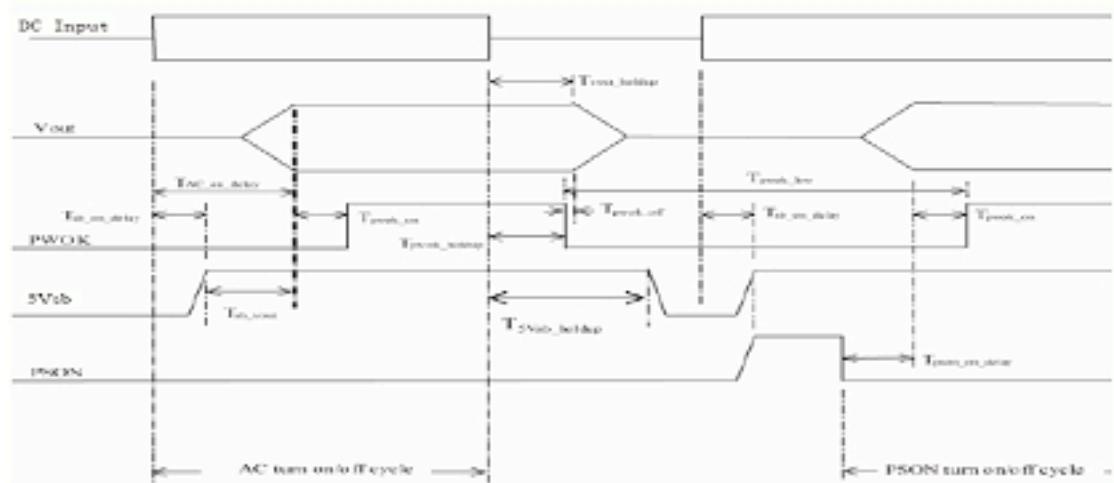
Input Range	40Vdc~60Vdc				
Output	12V	3.3V	5V	5Vsb	-12V
Max load(A)	75	25.0	25.0	4.0	1.0
Min load(A)	0.0	0.0	0.0	0.0	0.0
Regulation	±5%	±5%	±5%	±5%	±10%
Ripple & Noise (mV)	120	50	50	50	120

\* The continuous total max output power is 900W.

\* The ripple & noise is measured over a bandwidth of 10Hz to 20MHz at the power supply output connectors. A  $10\mu\text{F}$  electrical capacitor in parallel with a  $0.1\mu\text{F}$  ceramic capacitor is placed at the point of measurement.

## 2.2 Power Supply Timing

Below figure & table shows the power supply timing & requirements



Turn	Description	Min	Max	Units
Tvout_rise	Output voltage rise from 10% to 90% time for 5Vsb	1	70	ms
Tvout_rise	Output voltage rise from 10% to 90% time for 12V,3.3V,5V,-12V	1	25	ms
Tsb_on_delay	Delay from AC being applied to 5Vsb being within regulation		1500	ms
Tac_on_delay	Delay from AC being applied to 12V,3.3V,5V,-12V being within regulation		3000	ms
Tsb_vout	Delay from 5Vsb being in regulation to 12V,3.3V,5V,-12V being in regulation at AC turn on	50	1000	ms
Tpson_on_delay	Delay from PSON active to output voltages being within regulation limits	5	400	ms
Tpwok_on	Delay from output voltages within regulation limits to PWOK asserted at turn on	100	500	ms
Tvout_holdup	Time 12V,3.3V,5V,-12V output stay within regulation after AC loss	13		ms
Tpwok_holdup	Delay from loss of AC to de-assertion of PWOK	12		ms
T5Vsb_holdup	Time the 5Vsb output voltage stays within regulation after loss of AC	70		ms
Tpwok_off	Delay from PWOK de-asserted to output voltages dropping out of regulation limits	1		ms
Tpwok_low	Duration of PWOK being in the de-asserted state during an OFF/ON cycle using AC or the PSON signal	100		ms
Tpson_pwok	PWOK being de-asserted delay from PSON deactivate		5	ms

### 2.3 Rise Time(Tvout\_rise)

The 12V,3.3V,5V,-12V must rise from 10% to 90% within regulation limits within 1 to 25ms.

For 5Vsb, it is allowed to rise up within 1.0 to 70ms. All outputs must rise monotonically.

### 2.4 Tsb-on & Tac-on Delay Time

The Tsb-on delay time for 5Vsb should be  $\leq 1.5s$  at 48Vdc when full load.

The Tac-on delay time for 12V,3.3V,5V,-12V should be  $\leq 3s$  at 48Vdc when full load.

### 2.5 Main Output Delay Time(Tsb\_vout)

The 12V,3.3V,5V,-12V main output being in regulation delay from 5Vsb being in regulation should be 50 to 1000ms when at DC turn on.

### 2.6 Tpson\_on\_delay

The 12V,3.3V,5V,-12V output must be within regulation after PSON active for 5 to 400ms.

## 2.7 Power Work OK Delay(Tpwok\_on)

PWOK should delay from 12V,3.3V,5V,-12V output within regulation for 100 to 500ms.

## 2.8 Hold Up Time(Tvout\_holdup)

The hold up time for 12V & PWOK should  $\geq 12$  ms at 48Vdc input and full load.

The hold up time for 5Vsb should  $\geq 70$  ms at 48Vdc input and full load.

## 2.9 Power Fail Delay Time(Tpwok\_off)

12V dropping out of regulation delay from PWOK should  $\geq 1$ ms when power off at full load.

## 2.10 Duration Time for PWOK(Tpwok\_low)

The duraing time of PWOK when OFF/ON cycle using DC or the PSON signal shoud  $\geq 100$ ms

## 2.11 PWOK Delay PSON Deactivate(Tpson\_pwok)

PWOK being de-asserted shoud delay from PSON deactivate  $\leq 5$ ms

## 2.12 Power Efficiency

Below table provides efficiency requirement at various load for only one module.

Load	Efficiency for 48Vdc Input		
	12V	3.3V & 5V & 5Vsb & -12V	Limit
10%	7.5A	0.0A	80%
Light	15A	0.0A	88%
Typical	37.5A	0.0A	90%
Full	75A	0.0A	87%

## 2.13 Capacitive Loading

The power supply shall be stable and can start up at no load with below capacitive loading.

Output	12V	3.3V	5V	5Vsb	-12V
Capacitor	30000uF	10000uF	10000 $\mu$ F	3000 $\mu$ F	1000uF

## 2.14 Dynamic Loading

The output voltages should remain within regulation for the step loading and capacitive load

specified in the below stable, The load transient repetition is tested between 50Hz and 5kHz at

50% duty cycles.

Output	$\Delta$ Step Load Size	Slew Rate	Frequency	Test Capacitive Load
5Vsb	1.0A	1.0A/uS	50Hz & 5kHz	3000uF
-12V	0.5A	1.0A/uS	50Hz & 5kHz	1000uF
3.3V&5V	30% Max Load	1.0A/uS	50Hz & 5kHz	10000uF
12V	60% Max Load	1.0A/uS	50Hz & 5kHz	30000uF

## 2.15 Current Sharing

As this power supply has redundant function, the output current sharing should within  $\pm 5\%$  when half and full load. The supplies must be able to load share in parallel and operate in a hot-swap/redundant configuration.

### 3.0 PROTECTION:

When the 12V,3.3V,5V,-12V output's OCP/OVP is triggered, the power supply will shut down and latched off. The latch can be cleared by toggling the PSON signal or by an DC power interruption. When the input UVP/OVP , OTP or 5Vsb output's OCP & OVP is triggered, The power supply will shut down and auto recovery when the fault condition removed.

#### 3.1 Input Under and Over Voltage Protection

The input UVP should be 38Vdc  $\pm 2$ Vdc and recover point should be 42Vdc  $\pm 2$ Vdc.

The input OVP should be 62Vdc  $\pm 2$ Vdc and recover point should be 58Vdc  $\pm 2$ Vdc.

#### 3.1 Output Over Current Protection (Per Unit)

The power supply should have over current protection to prevent the outputs from exceeding limits, If the OCP occurred, the power supply should shut down and auto-recovered after removing

OCP limit. 3.3V & 5V: 28~38A, 5Vsb : 4.5~8A, -12V: 1.3~1.6A

12V: 80~100A for 48Vdc input

#### 3.3 Output Over Voltage Protection

The power supply should have over voltage protection to prevent the outputs from exceeding limits, If the OVP occurred, the power supply should shut down and latch-off, The latch will be cleared by toggling the PSON signal or an DC on/off cycle operation, 5Vsb will be auto-recovered after removing OVP limit. 12V output : 13.3~14.5Vdc, 3.3V output : 3.7~4.1Vdc, 5V & 5Vsb output: 5.5~6.3Vdc, -12V output: -13.6~16.5Vdc

#### 3.4 Output Short Protection

5Vsb or 12V,3.3V,5V,-12V output to GND.

#### 3.5 Over Temperature Protection

The power supply will be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU will shut down. When the power supply temperature drops to within specified limits, the power supply shall restore power automatically, while the 12Vsb remains always on.

### 4.0 ENVIRONMENT:

**Operating Temperature:** -20°C to +50 °C

**Storage Temperature:** -40 °C to +70 °C

**Operating Humidity:** 10% to 90%, non-condensing at 40 °C

**Storage Humidity:** 5% to 95%, non-condensing at 55°C

**Operating Altitude:** 0 to 5000m

**Storage Altitude:** 0 to 6000m

## 5.0 HI-POT:

### 5.1 Primary to Secondary

1500Vdc for 60 seconds for power supply.

### 5.2 Primary to Earth

1500Vdc for 60 seconds

### 5.3 Grounding Resistance

Earth ground to ground 25A, 100m ohms Max.

## 6.0 SAFETY and EMI REQUIREMENT

### 6.1 Conduction and Radiation

1. Meet FCC: Class A
2. Meet CISPR 22: Class A
3. Meet CCC: Class A

### 6.2 Safety Standards

1. Meet FCC
2. Meet CE
3. Meet CCC

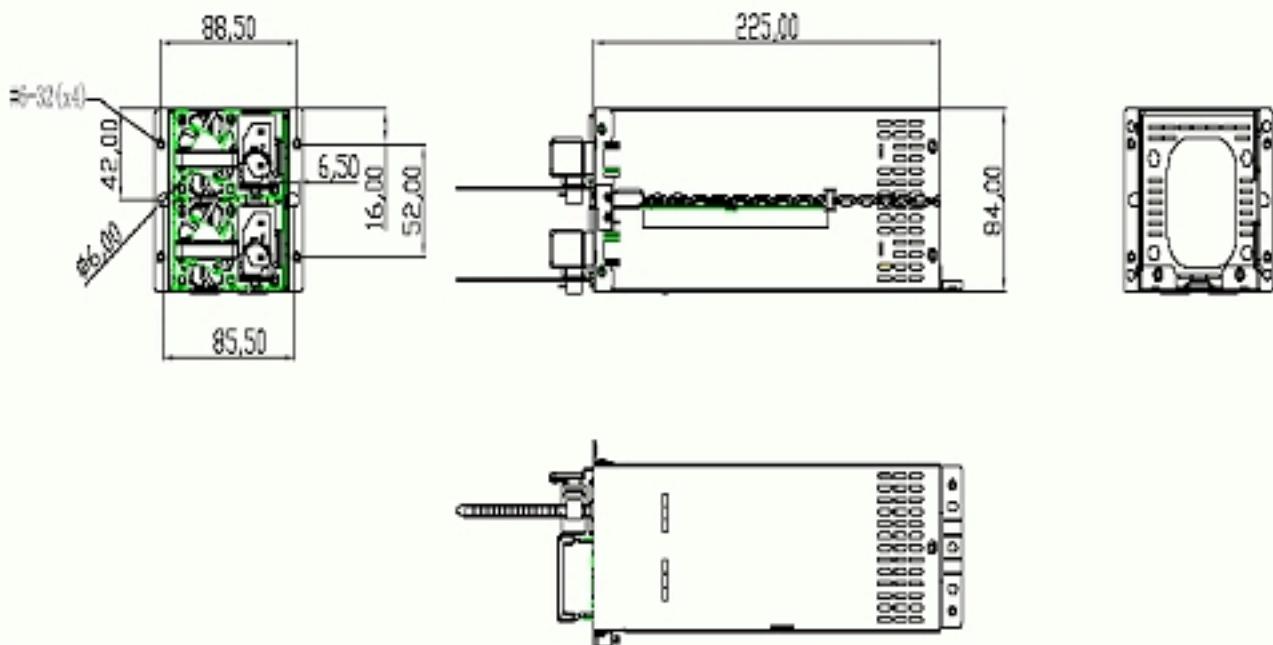
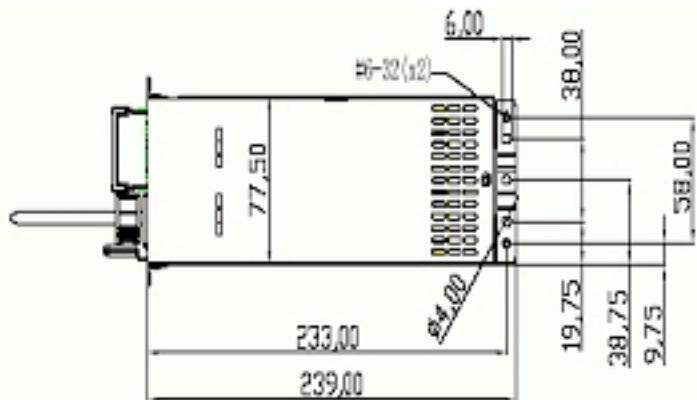
## 7.0 MTBF at 25°C(Demonstrated)

100K hrs Minimum

## 8.0 Dimensions

8.1 Outline: NR2-DVR900-N: 225mm\*84mm\*77.5mm

## Mechanical Outline



## 9.0 Output Terminal and LED Description

### Output Terminals

Signal	Description	Note
GND	Outputs' return and it's also connected with the case	Black wire
12V	The main output voltage	Yellow wire
5V	5V output voltage	Red wire
3.3V	3.3V output voltage	Orange wire
-12V	-12V output voltage	Blue wire
5Vsb	The auxiliary output voltage	Purple wire
PSON	Remote ON/OFF control signal: When PSON signal is low, the power supply will turn on, and turn off when it's high	Green wire

PWOK	Power supply work OK signal.	Gray wire
12V Sense	12V output voltage return sense for feedback	
5V Sense	5V output voltage return sense for feedback	
3.3V Sense	3.3V output voltage return sense for feedback	
SMB*Alert	Power supply warning signal: When this pin output is low signal will notice system the power supply has some fault occurred	
Reset button	Reset the buzzer warning signal	
Status LED	Lighting warning for the power supply's status	

LED Description

Power Supply Status	LED Status
Output ON and OK	Green
No DC power to all power supplies.	OFF
DC present/Only 5Vsb on (PS off) or PS in cold redundant state.	1Hz Blink Green
DC cord unplugged or AC power lost; with a second power supply in parallel still with DC input power .	Amber
Power supply warning events where the power supply continues to operate: high temperature, Fan Fail.	1Hz Blink Amber
Power supply critical event causing a shutdown: UVP, OVP, OCP, OTP	Amber
Power supply Firmware updating.	2Hz Blink Green

Note: The power supply's LED is on the case's front panel.

## 10.0 Firmware

### 10.1 PMBUS and EEPROM

There is a 8Kbyte EEPROM in power supply, communication with system via IIC bus.

### 10.2 PMBUS Communication

There is 3.3V voltage to supply the EEPROM and MCU's Vcc in power supply. The MCU and EEPROM in power supply can communicate with system via PMBus1.2 protocol or IIC protocol bus. The power supply output terminal has two signals, one is SCL (clock bus), the other is SDA (data bus), they are bidirectional communication and can get a continuous signal bus. The supply voltage of bus is 3.3 ~ 5V, So SDA (data bus) and SCL (clock bus) needs to be pulled up a 4.7K resistor from system board's 3.3V or 5V voltage.

IIC Address

Equipment	Address	Address Bit (From high to low order)								
MCU	0xBx	1	0	1	1	x	x	x	R/W	
EEPROM	0xAx	1	0	1	0	x	x	x	R/W	

The slave address is EEPROM 24LC64 Address A0H,

Back Address B0H,

Model Address B2H ' B4H ' B6H, etc.

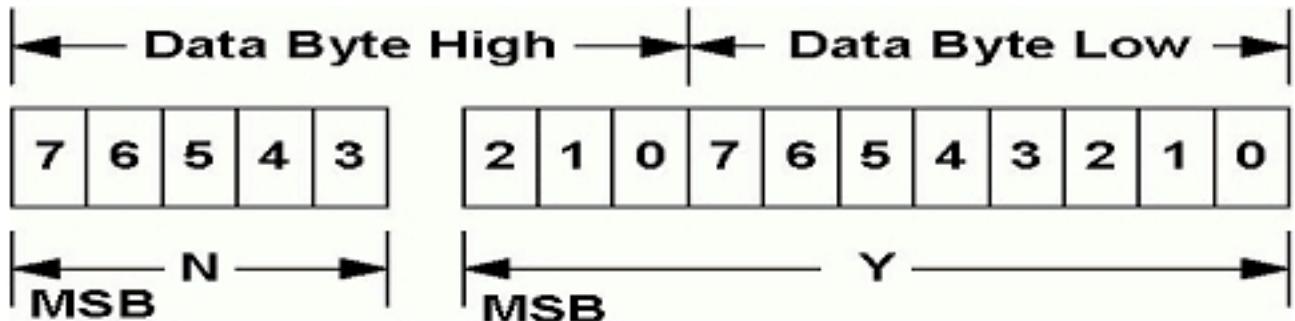
#### EEPROM DATA

Byte address (decimal)	Byte address (hex)	Item	Format	Value	Description
00-06	00H-06H	Manufacturer Name	Char*7	"NEGORACK"	Use the ASCII Code
07-24	07H-18H	Product Name	Char*18	"NR2-DVR900-N "	Use the ASCII Code
25-34	19H-22H	Mfg. Date	Char*10	Mfg. Date	Use the ASCII Code Pad Pad ( Always 20H)
35-36	23H-24H	Checksum1	Uint16	C628H	Checksum( 00H~22H )
37-66	25H-42H	Product Serial No.	Char*30	Series No.	Use the ASCII Code Pad Pad ( Always 20H)
67-86	43H-56H	Model No.	Char*20	Model No.	Use the ASCII Code Pad Pad ( Always 20H)
87-88	57H-58H	Checksum2	Uint16	0093H	Checksum( 25H~56H )
89-93	59H-5DH	Product Version	Char*5	"1.0 "	Use the ASCII Code
94-98	5EH-62H	Firmware Version	Char*5	"3.1.0"	Use the ASCII Code
99-100	63H-64H	Checksum3	Uint16	907DH	Checksum( 59H~62H )
101	65H	Block length	Uint8	00H	HEX Pad ( Always 00H)
102	66H	Block_count	Uint8	2	HEX
103-104	67H-68H	Power_consumption	Uint16	0000H	HEX Pad ( Always 0000H)
105	69H	Eeprom_size	Uint8	64 (64Kbit)	HEX
106-107	6AH-6BH	Checksum4	Uint16	2448H	Checksum( 65H~69H )
108-255	6CH-FFH	Unused Area	Uint8	FFH	Pad ( Always FFH)

### 10.3 PMBUS Specification

#### Linear Data Format

The Linear Data Format is a two byte value with: An 11 bit, two's complement mantissa and A 5 bit, two's complement exponent (scaling factor). The format of the two data bytes is illustrated in below Figure



The relation between Y, N and the "real world" value is:  $X = Y \cdot 2^N$

Where, as described above:

X is the "real world" value being communicated

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

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

Devices that use the Linear format must accept and be able to process any value of N.

### 10.4 PMBUS Command Supported

**Note: When not specified, the default is only module supports the following commands.**

#### STATUS\_WORD Command

Byte	Bit No.	Status Bit Name	Meaning	Support
Low	7	BUSY	A fault was declared because the device was busy and unable to respond.	No
	6	OFF	This bit is asserted if the unit is not providing power to the output, regardless of the reason, including simply not being enabled.	Yes
	5	VOUT_OV	An output over voltage fault has occurred	Yes
	4	IOUT_OC	An output over current fault has occurred	Yes
	3	VIN_UV	An input under voltage fault has occurred	Yes
	2	TEMPERATURE	A temperature fault or warning has occurred	Yes
	1	CML	A communications, memory or logic fault has occurred	No

	0	NONE OF THE ABOVE	A fault or warning not listed in bits [7:1] of this byte has occurred No	
High	7	VOUT	An output voltage fault or warning has occurred	Yes
	6	IOUT/POUT	An output current or output power fault or warning has occurred Yes	
	5	INPUT	An input voltage, input current, or input power fault or warning has occurred	Yes
	4	MFR	A manufacturer specific fault or warning has occurred	Yes
	3	POWER_GOOD#	The POWER_GOOD signal, if present, is negated	Yes
	2	FANS	A fan or airflow fault or warning has occurred	Yes
	1	OTHER	A bit in STATUS_OTHER is set	Yes
	0	UNKNOWN	A fault type not given in bits [15:1] of the STATUS_WORD has been detected	No

## STATUS\_VOUT Command

Bit	Meaning	Support
7	VOUT Over voltage Fault	Yes
6	VOUT Over voltage Warning	No
5	VOUT Under voltage Warning	No
4	VOUT Under voltage Fault	Yes
3	VOUT_MAX Warning (An attempt has been made to set the output voltage to value higher than allowed by the VOUT_MAX command)	No
2	TON_MAX_FAULT	No
1	TOFF_MAX Warning	No
0	VOUT Tracking Error	No

## STATUS\_IOUT Command

Bit	Meaning	Support
7	IOUT Over current Fault	Yes
6	IOUT Over current And Low Voltage Shutdown Fault	No
5	IOUT Over current Warning	No
4	IOUT Underrcurrent Fault	No
3	Current Share Fault	No

2	Power Limiting	No
1	POUT Overpower Fault	No
0	POUT Overpower Warning	Yes

## STATUS\_INPUT Command

Bit	Meaning	Support
7	VIN Over voltage Fault	Yes
6	VIN Over voltage Warning	No
5	VIN Under voltage Warning	No
4	VIN Under voltage Fault	Yes
3	Unit Off For Insufficient Input Voltage	Yes
2	IIN Over current Fault	No
1	IIN Over current Warning	No
0	PIN Overpower Warning	No

## STATUS\_TEMPERATURE Command

Bit	Meaning	Support
7	Over temperature Fault	Yes
6	Over temperature Warning	Yes
5	Under temperature Warning	No
4	Under temperature Fault	No
3	Power unit high temperature protection(Mfr. Defined)	Yes
2	Reserved	
1	Reserved	
0	Reserved	

## STATUS\_FAN\_1\_2 Command

Bit	Meaning	Support
7	Fan 1 Fault	Yes
6	Fan 2 Fault	No
5	Fan 1 Warning	No
4	Fan 2 Warning	No

3	Fan 1 Speed Overridden	Yes
2	Fan 2 Speed Overridden	No
1	Airflow Fault	No
0	Airflow Warning	No

## STATUS\_OTHER Command

Bit	Meaning	Support
7	Vsb Output Over current Fault (Mfr. Defined, Only backplane support)	Yes
6	Module_PFC_Voltage_FAULT When read module; Back_Vsb_Voltage_FAULT When read back (Mfr. Defined)	Yes
5	Input A Fuse Or Circuit Breaker Fault	No
4	Input B Fuse Or Circuit Breaker Fault	No
3	Input A OR-ing Device Fault	No
2	Input B OR-ing Device Fault	No
1	Output OR-ing Device Fault	No
0	- 12V Output Over current Fault (Mfr. Defined, Only backplane support)	Yes

## STATUS\_MFR\_SPECIFIC Command (Only backplane support)

Bit	Meaning	Support
7	+ 5V Output Over voltage Fault (Mfr. Defined)	Yes
6	+ 5V Output Under voltage Fault (Mfr. Defined)	Yes
5	+ 5V Output Over current Fault (Mfr. Defined)	Yes
4	+3.3V Output Over voltage Fault (Mfr. Defined)	Yes
3	+3.3V Output Under voltage Fault (Mfr. Defined)	Yes
2	+3.3V Output Over current Fault (Mfr. Defined)	Yes
1	- 12V Output Under voltage Fault (Mfr. Defined)	Yes
0	- 12V Output Over voltage Fault (Mfr. Defined)	Yes

## Supported Command Summary

Note: When not specified, the default is only module supports the following commands.

CMD Code	Name	Type	Bytes	Conditions
03h	CLEAR_FAULTS	Send Byte	0	
19h	CAPABILITY	Read Byte	1	Value 0x10
1Ah	QUERY	Block Read	1	Value 0xA0
78h	STATUS_BYTE	Read Byte	1	
79h	STATUS_WORD	Read Word	2	
7Ah	STATUS_VOUT	Read Byte	1	
7Bh	STATUS_IOUT	Read Byte	1	
7Ch	STATUS_INPUT	Read Byte	1	
7Dh	STATUS_TEMPERATURE	Read Byte	1	
7Fh	STATUS_OTHER	Read Byte	1	
80h	STATUS_MFR_SPECIFIC	Read Byte	1	
81h	STATUS_FANS_1_2	Read Byte	1	
88h	READ_VIN	Read Word	2	
8Bh	READ_VOUT (When read back, READ_5V_Vout)	Read Word	2	
8Ch	READ_IOUT (When read back, READ_5V_Iout)	Read Word	2	
8Dh	READ_TEMPERATURE_1	Read Word	2	
90h	READ_FAN_SPEED_1	Read Word	2	Rpm value
96h	READ_POUT	Read Word	2	
98h	PMBUS_REVISION	Read Byte	1	V1.2
99h	MFR_ID	Read Block	Variable	See MFR Data table
9Ah	MFR_MODEL	Read Block	Variable	See MFR Data table
9Bh	MFR_REVISION	Read Block	Variable	See MFR Data table
A0h	MFR_VIN_MIN	Read Word	2	See MFR Data table

A1h	MFR_VIN_MAX	Read Word	2	See MFR Data table
A4h	MFR_VOUT_MIN	Read Word	2	See MFR Data table
A5h	MFR_VOUT_MAX	Read Word	2	See MFR Data table
A8h	MFR_TAMBIENT_MAX	Read Word	2	See MFR Data table
A9h	MFR_TAMBIENT_MIN	Read Word	2	See MFR Data table
---	---	---	---	
84h	READ_Model_Vsb_OUT (Mfr. Defined)	Read Word	2	
D1h	READ_3p3V_Vout (Mfr. Defined)	Read Word	2	Only backplane support
D2h	READ_3p3V_Iout (Mfr. Defined)	Read Word	2	Only backplane support
D3h	READ_N12V_Vout (Mfr. Defined)	Read Word	2	Only backplane support
D4h	READ_N12V_Iout (Mfr. Defined)	Read Word	2	Only backplane support
D5h	READ_Back_Vsb_OUT (Mfr. Defined)	Read Word	2	Only backplane support
D6h	READ_Back_Isb_OUT (Mfr. Defined)	Read Word	2	Only backplane support

## MFR Data table

CMD Code	Name	Conditions
99h	MFR_ID	NEGORACK
9Ah	MFR_MODEL	NR2-DVR900-N
9Bh	MFR_REVISION	1.0
A0h	MFR_VIN_MIN	40V
A1h	MFR_VIN_MAX	60V
A4h	MFR_VOUT_MIN	11.4V
A5h	MFR_VOUT_MAX	12.6V
A8h	MFR_TAMBIENT_MAX	50°C
A9h	MFR_TAMBIENT_MIN	-20°C