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Power supply module for MPPC

C11204-01

Command Reference

Be sure to read the operation manual carefully before this board is used.
If operated differently from the standard procedure in the manual,
a serious accident may occur.
Keep this manual for future reference.

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FormKXX-3512 A

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Introduction

This document describes the commands specification for C11204-01.

C11204-01 is communicated in UART communication protocol.

By using the communication command, you can make voltage control and parameter setting of C11204-01.

1. Communication specification

1.1 UART communication specifications

UART communication specifications for C11204-01 are as follows:

Baud rate	: 38400[bps]
Data bit	: 8
Parity bit	: Even
Stop bit	: 1
Flow control	: None
Data order	: LSB

1.2 The basic steps of communication

When C11204-01 receives the command from the host, perform a process according to the command type. There is always a response to the command. Also by analyzing the contents of the command response the exchange of data between the host and C11204-01 is performed.
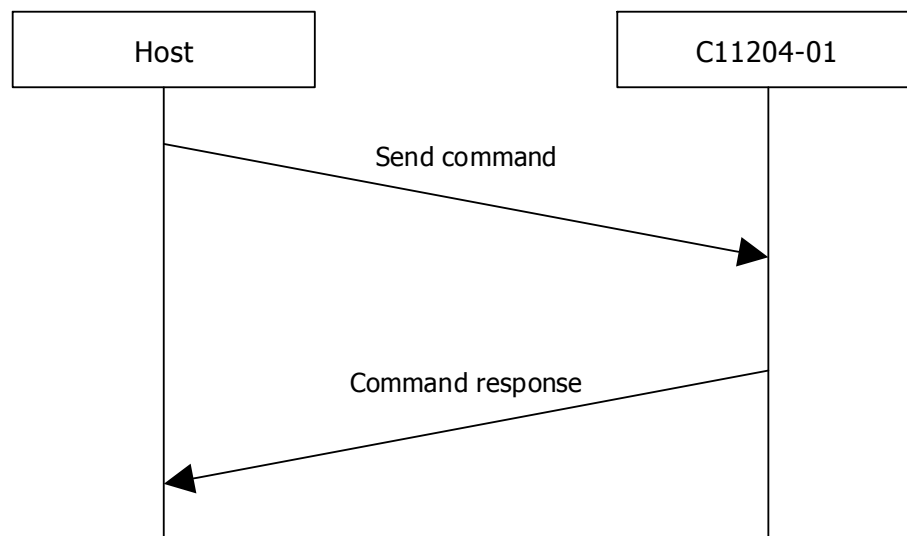

Figure1.The basic steps for communication between the C11204-01 and the host

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2. Overview of communication commands

The command character code is ASCII. For the ASCII code characters, refer to the standards published on web or document. Follow the specified format to create communication commands.

2.1 Send command format
Header and delimiter of the command is STX and CR
The checksum is the sum of the STX from ETX.

Symbol	Size(Byte)	Description
STX	1	Start of text (0x02)Fixed
Command	3	Type of command
Data	0～52	The data length is fixed for each command
ETX	1	End of text (0x03)Fixed
Check Sum	2	Checksum
Delimiter	1	Delimiter (0x0D)Fixed

Example Send command)

Command name

STX	H	P	O	ETX	E	C	CR
0x02	0x48	0x50	0x4f	0x03	0x45	0x43	0x0D

2.2 Command response format

Symbol	Size(Byte)	Description
STX	1	Start of text (0x02)Fixed
Command	3	Command the type of response
Data	0～52	The data length is fixed for each command
ETX	1	End of text (0x03)Fixed
Check Sum	2	Checksum
Delimiter	1	Delimiter (0x0D)Fixed

Example Command response)

	Command			Status				Output voltage setting			
STX	h	p	o	0	0	0	9	B	D	8	7
0x02	0x68	0x70	0x6f	0x30	0x30	0x30	0x39	0x42	0x44	0x38	0x37

Output voltage monitor				Output current monitor				MPPC temperature monitor							
9	B	3	7	0	0	1	0	B	8	4	4	ETX	9	2	CR
0x39	0x42	0x33	0x37	0x30	0x30	0x31	0x30	0x42	0x38	0x34	0x34	0x03	0x39	0x32	0x0D

2.3 Checksum

Checksum is an error detection code.

When creating a command on the transmit side, take a sum of data from [STX] to [ETX] of the command and place the2 byte in [CHECK SUM].

The command will fail unless the checksum on the transmit side matches the checksum of the C11204-01 side during UART communication.

Example) Checksum calculation

STX	H	P	O	ETX	E	C	CR
0x02	0x48	0x50	0x4f	0x03	0x45	0x43	0x0D

 0x02 + 0x48 + 0x50 + 0x4f + 0x03 = 0xEC

The sum of the STX from ETX is 0xEC. If checksum have more than three orders of magnitude, put the value of the lower 2Byte.

2.4 Error reply

If the command does not work for some reason, C11204-01 performs the error response to the host.

■Command response

Command name	Error reply	
Command response	Host ← C11204-01	
	Command	Error code
Size(Byte)	3	4
Character code	"hxx"'	"0000～FFFF"

Error code	Error description	Description
0001	UART communication error	Parity error, overrun error, framing error. This indicates that an error has occurred either.
0002	Timeout error	This indicates that the CR has not been received within 1000ms of receiving the STX. The received packet is discarded.
0003	Syntax error	The beginning of the received command is other than STX, which indicates the length of the command or 256byte.
0004	Checksum error	This indicates that the checksum does not match
0005	Command error	This indicates that it is an undefined command
0006	Parameter error	This indicates that the codes other than ASCII code(0～F) is in the parameter.
0007	Parameter size error	This indicates that the data length of the parameter is outside the specified length.

If the command has been successfully processed, command will return a response to lower case. For command response for each command, please refer to the "4.Command detail".

3. List of command

Content	Command name	Function
Poling	HPO	Get the monitor information and status
Set the temperature correction factor	HST	Set the temperature correction factor
Read the temperature correction factor	HRT	Read the temperature correction factor
High voltage output OFF	HOF	High voltage output OFF
High voltage output ON	HON	High voltage output ON
Switching the temperature compensation mode	HCM	Switching the temperature compensation mode
Power supply reset	HRE	Power supply reset
Temporary setting for the reference voltage	HBV	Temporary setting for the reference voltage
Temperature acquisition MPPC	HGT	Temperature acquisition MPPC
Get the output voltage	HGV	Get the output voltage
Get the output current	HGC	Get the output current
Get the status	HGS	Get the status

	Send command Host → C11204-01	Command response Host ← C11204-01
Poling	HPO	hpo
Set the temperature correction factor	HST	hst
Read the temperature correction factor	HRT	hrt
High voltage output OFF	HOF	hof
High voltage output ON	HON	hon
Switching the temperature compensation mode	HCM	hcm
Power supply reset	HRE	hre
Temporary setting for the reference voltage	HBV	hbv
Temperature acquisition MPPC	HGT	hgt
Get the output voltage	HGV	hgv
Get the output current	HGC	hgc
Get the status	HGS	hgs

Send command and response command have a one to one correspondence.

4. Command detail

4.1 Poling

■Send command

Command name	Poling	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HPO"	

■Commentary
This command is the command for status monitoring.
It is possible to obtain the C11204-01 status and monitor information.

■Command response

Command name	Poling response	
Command response	Host ← C11204-01	
	Command	Status
Size(Byte)	3	4
Character code	"hpo"	"0000～FFFF"
	Output voltage setting	Output voltage monitor
	4	4
	"0000～FFFF"	"0000～FFFF"
	Output current monitor	MPPC temperature monitor
	4	4
	"0000～03FF"	"0000～FFFF"

■Commentary
Data of command response is status information and monitor information for C11204-01.
Please refer to "C11204-01 Manual" for details.
For unit conversion value for each monitor, please refer to document the "5.unit conversion table ".

4.2 Set the temperature correction factor

■Send command

Command name	Set the temperature correction factor	
Send command	Host → C11204-01	
	Command	Secondly high temperature side coefficient
Size(Byte)	3	4
Character code	"HST"	"FC18～03E8"
	Secondly low temperature side coefficient	primary high temperature side coefficient
	4	4
	"FC18～03E8"	"0000～FFFF"
	primary low temperature side coefficient	Reference voltage
	4	4
	"0000～FFFF"	"0000～FFFF"
	Reference temperature	
	4	
	"0000～FFFF"	

■Commentary
Set the temperature correction factor.
Please refer to "C11204-01 Manual" for more information on each parameter.
For unit conversion value for each setting, please refer to the "5. Unit conversion table".

■Command request

Command name	Set the temperature correction factor response
Command response	Host ← C11204-01
	Command
Size(Byte)	3
Character code	"hst"

■Commentary
Return the reply command.

4.3 Read the temperature correction factor

■Send command

Command name	Read the temperature correction factor	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HRT"	

■Commentary
Read the temperature correction factor.

■Command request

Command name	Read the temperature correction factor response	
Command response	Host ← C11204-01	
	Command	Secondly high temperature side coefficient
Size(Byte)	3	4
Character code	"hrt"	"FC18～03E8"
	Secondly low temperature side coefficient	primary high temperature side coefficient
	4	4
	"FC18～03E8"	"0000～FFFF"
	primary low temperature side coefficient	Reference voltage
	4	4
	"0000～FFFF"	"0000～FFFF"
	Reference temperature	
	4	
	"0000～FFFF"	

■Commentary
Please refer to "C11204-01 Manual" for more information on each parameter.
For unit conversion value for each setting, please refer to the "5. Unit conversion table".

4.4 High voltage output OFF

■Send command

Command name	High voltage output OFF	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HOF"	

■Commentary
Turn off high voltage output.
When you want to operate it again, you send a command of "4.5 voltage output ON", or reboot a power supply.
If it is rebooted, it becomes ON in any situation.

■Command request

Command name	Response of high voltage output OFF	
Command response	Host ← C11204-01	
	Command	
Size(Byte)	3	
Character code	"hof"	

■Commentary
Return the reply command.

4.5 High voltage output ON

■Send command

Command name	High voltage output ON	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HON"	

■Commentary
Output the high voltage.

■Command request

Command name	Response of high voltage output ON	
Command response	Host ← C11204-01	
	Command	
Size(Byte)	3	
Character code	"hon"	

■Commentary
Return the reply command.

4.6 Switch the temperature compensation mode

■Send command

Command name	Switch the temperature compensation mode	
Send command	Host → C11204-01	
	Command	Mode
Size(Byte)	3	1
Character code	"HCM"	"0" or "1"

■Commentary
Switch the temperature compensation mode.
 0: Disable
 1: Enable
In the case of 1, output voltage is determined by each setting parameter and value of the temperature sensor. Please refer to "C11204-01 manual.pdf" for the calculation method.
In the case of 0, it is decided only by a standard voltage coefficient. Each temperature coefficient is calculated as 0.

■Command request

Command name	Switching response of the temperature compensation mode
Command response	Host ← C11204-01
	Command
Size(Byte)	3
Character code	"hcm"

■Commentary
Return the reply command.

4.7 Reset of power supply

■Send command

Command name	Reset of power supply	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HRE"	

■Commentary
Initialize the high voltage power supply.

■Command request

Command name	Reset response of power supply	
Command response	Host ← C11204-01	
	Command	
Size(Byte)	3	
Character code	"hre"	

■Commentary
Return the reply command.

4.8 Set the reference voltage

■Send command

Command name	Temporary setting for the reference voltage	
Send command	Host → C11204-01	
	Command	Reference voltage
Size(Byte)	3	4
Character code	"HBV"	"0000～FFFF"

■Commentary
This command sets the reference voltage temporarily.
Setting will disappear when you turn off the power.
When you set the reference voltage by this command, the temperature correction is OFF.

■Command request

Command name	Temporary setting response for the reference voltage
Command response	Host ← C11204-01
	Command
Size(Byte)	3
Character code	"hbv"

■Commentary
Return the reply command.

4.9 Temperature acquisition MPPC

■Send command

Command name	Temperature acquisition MPPC	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HGT"	

■Commentary
This command gets the MPPC temperature.

■Command request

Command name	Temperature acquisition MPPC response	
Command response	Host ← C11204-01	
	Command	MPPC temperature
Size(Byte)	3	4
Character code	"hgt"	"0000～FFFF"

■Commentary
Return the MPPC temperature.
For unit conversion value for each setting, please refer to the "5. Unit conversion table".

4.10 Get the output voltage

■Send command

Command name	Get the output voltage	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HGV"	

■Commentary
This command gets the output voltage.

■Command request

Command name	Get the output voltage response	
Command response	Host ← C11204-01	
	Command	Output voltage
Size(Byte)	3	4
Character code	"hgv"	"0000～FFFF"

■Commentary
Return the output voltage.
For unit conversion value for each setting, please refer to the "5. Unit conversion table".

4.11 Get the output current

■Send command

Command name	Get the output current	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HGC"	

■Commentary
This command gets the output current.

■Command request

Command name	Get the output current response	
Command response	Host ← C11204-01	
	Command	Output current
Size(Byte)	3	4
Character code	"hgc"	"0000～FFFF"

■Commentary
Return the output current.
For unit conversion value for each setting, please refer to the "5. Unit conversion table".

4.12 Get the status

■Send command

Command name	Get the status	
Send command	Host → C11204-01	
	Command	
Size(Byte)	3	
Character code	"HGS"	

■Commentary
This command gets the status.

■Command request

Command name	Get the status response	
Command response	Host ← C11204-01	
	Command	Status
Size(Byte)	3	4
Character code	"hgs"	"0000～FFFF"

■Commentary
Return the status information.
For unit conversion value for each setting, please refer to the "6. Status list".

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5. Unit conversion table

The monitor value and the set value for this product are communicated by hexadecimal integer.
When converting unit V and °C, it is necessary to multiply the transform coefficients.

■Unit conversion table

Function	Data range(Hexadecimal)	Data range(Decimal)	Conversion factor(digit→)	Unit
Output voltage monitor	0000～FFFF	0～65535	1.812×10^{-3}	V
Output current monitor	0000～0400	0～1024	4.980×10^{-3}	mA
MPPC temperature monitor	0000～FFFF	0～65535	$(\mathrm{digit}\times1.907\times10^{-5}-1.035)/(-5.5\times10^{-3})$	°C[note1]
Secondly high temp side coefficient $\Delta T'1$	FC18～03E8	-1000～1000	1.507×10^{-3}	mV/°C^2
Secondly low temp side coefficient $\Delta T'2$	FC18～03E8	-1000～1000	1.507×10^{-3}	mV/°C^2
Primary high temp side coefficient $\Delta T1$	0000～FFFF	0～65535	5.225×10^{-2}	mV/°C
Primary low temp side coefficient $\Delta T2$	0000～FFFF	0～65535	5.225×10^{-2}	mV/°C
Reference voltage Vb	0000～FFFF	0～65535	1.812×10^{-3}	V
Reference tenperature Tb	0000～FFFF	0～65535	$(\mathrm{digit}\times1.907\times10^{-5}-1.035)/(-5.5\times10^{-3})$	°C[note1]

note1: For more information, please refer to the LM94021 (Texas Instruments) datasheet.

Example 1) if you want to convert to unit of V
　　　　1-1) Convert a hexadecimal number to decimal 　　$9B38_{(16)}$ → $39736_{(10)}$
　　　　1-2) Multiply by the conversion factor 　　$39736 \times 1.812\times10^{-3} \fallingdotseq 72.001[V]$

Example 2) If you enter a reference voltage to 70.123[V]
　　　　2-1) Divide by the conversion factor 　　$70.123 \div 1.812\times10^{-3} \fallingdotseq 38699$
　　　　　　　　　　　　　　　　　　　　　　(Truncate the decimal point）
　　　　2-2) Convert a decimal number to hexadecimal 　　$38699_{(10)}$ → $972B_{(10)}$

6. Status list

■Status list

Bit	Status	0	1
bit0	High voltage output	OFF	ON
bit1	Over-current protection	No	Yes
bit2	Current value	Within specification	Outside specifications
bit3	MPPC temperature sensor	Disconnect	Connect
bit4	MPPC temperature sensor	Within specification	Outside specification
bit5	Reserve 1		
bit6	Temperature correction	Invalid	Effectiveness
bit7	Reserve 2		
bit8	Reserve 3		
bit9	Reserve 4		
bit10	Reserve 5		
bit11	Reserve 6		
bit12	Reserve 7		
bit13	Reserve 8		
bit14	Reserve 9		
bit15	Reserve 10		

6.1 High voltage output
This is condition of the high voltage output.
0: OFF
1: ON
Note2: High voltage is output immediately after the power is turned on.

6.2 Over-current protection
This is the condition of over-current protection.
0: Protection is disabled.
1: Protection is enabled.
The threshold of the default is 3mA.When current load of 3mA exceeded more than 4 seconds, the output voltage becomes 0V. When you want to output the high voltage again, please send a reset command or reboot the C11204-01.

6.3 Current monitor
This is the condition of current monitor.
0: Value is less than 2mA.
1: Value is more than 2mA.

6.4 MPPC temperature sensor
This is the condition of temperature sensor connection.
0: Temperature sensor is connected and operating temperature is -30 to 100 degree.
1: Temperature sensor is unconnected or operating temperature departs from -30 to 100 degree.
If temperature departs from the operating temperature limit greatly, the temperature compensation becomes OFF forcibly.

6.5 Operating temperature
This is the condition of operating temperature.
0: Operating temperature is 0 to 50 degree.
1: Operating temperature departs from 0 to 50 degree.
If temperature departs from the operating temperature limit greatly, the temperature compensation becomes OFF forcibly.

6.6 Temperature correction
This is the condition of temperature correction mode.
0: Enable temperature correction
1: Disable temperature correction
In the case of 0, output voltage is determined by each setting parameter and value of the temperature sensor. Please refer to "C11204-01 manual.pdf" for the calculation method.
In the case of 1, it is decided only by a standard voltage coefficient.