RTEC1616

User Manual

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Revision history

-------------------------2020-07-22------------------------------ Initially release

Chapter 1 Function Description

1.1 Product overview

RTEC1616 is a digital isolated input and output module, including 16-channel digital isolated input and 16-channel digital isolated output.

1.1.1 Characteristic

- Support CoE (CANopen over EtherCAT)
- Support DC synchronization and FreeRun mode
- Dual port RJ45 connector for EtherCAT communication
- Input port: 16 optically isolated digital signal inputs, 24V single-ended input, common anode connection;
- Output port: 16 optical isolation + Darlington output port, each output current is 500mA
- PWM output: 4 PWM outputs, duty cycle supports 0~100%

1.1.2 Electrical characteristics

The recommended usage conditions are as follows：：

	Minimum	Normal	Maximum
Supply voltage (V)	15	24	30
Output port current (mA)	90	350	500
Input interface current consumption (mA)	5	10	30
PWM frequency	0.5K	1K	5KHz
Temperature range	-40	---	85

Chapter 2 Interface Description

1.2 Power interface X5
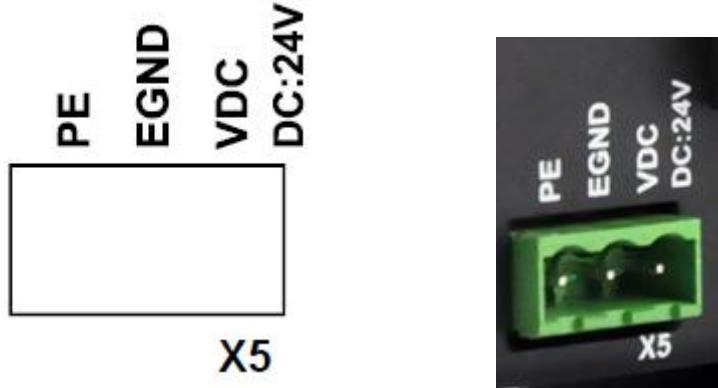
The power interface X5 includes 3PIN terminals, which are defined as follows:

| Mark	Definition
PE	PowerEarth, connect to the chassis
EGND	Negative pole of 24v power supply
VDC	Positive pole of 24v power supply

It is recommended to use a switching power supply with a power above 24V/1A.

1.3 **Digital input port**

16 optically isolated digital input ports, the internal use of common anode connection, the internal circuit diagram is as follows:
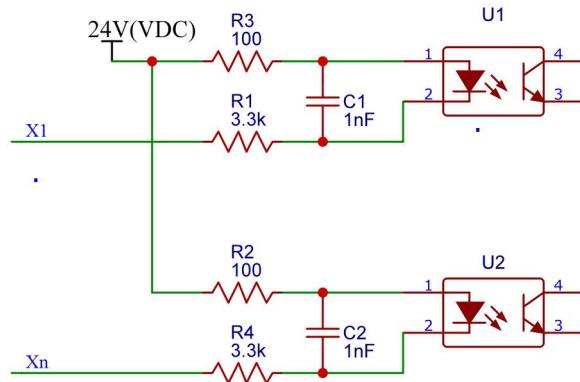
When the external input signal interface type is NPN, the wiring is as follows:
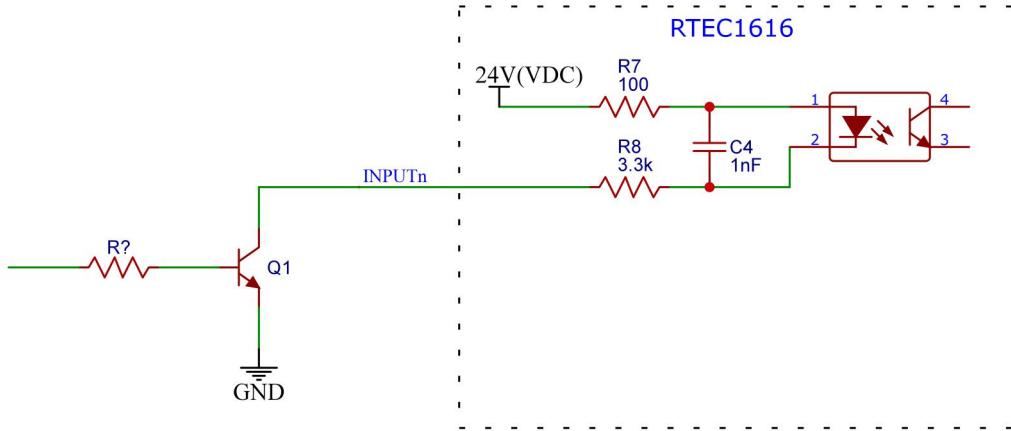
When the external signal interface type is relay, the wiring is as follows:
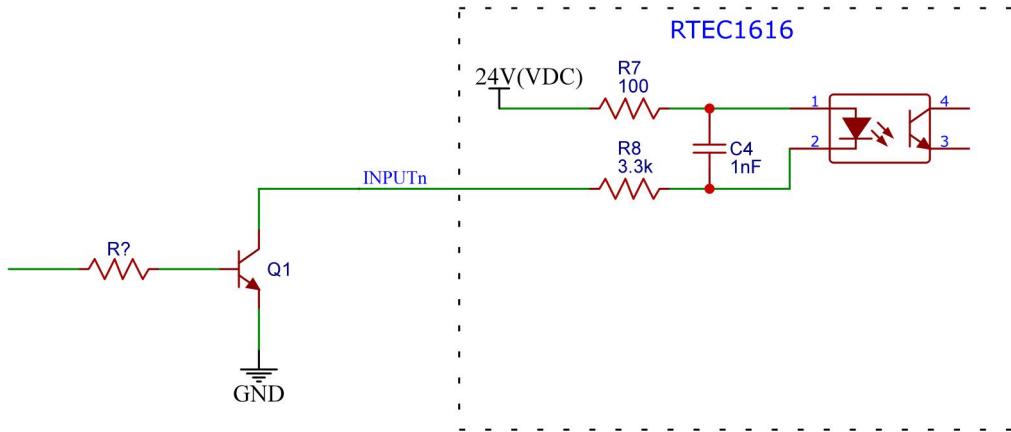
1.4 **Output port**

The 16 output ports are the Darlington output after optocoupler isolation. The internal common terminal is connected to 24V. The equivalent circuit of each output port is shown in the figure below:
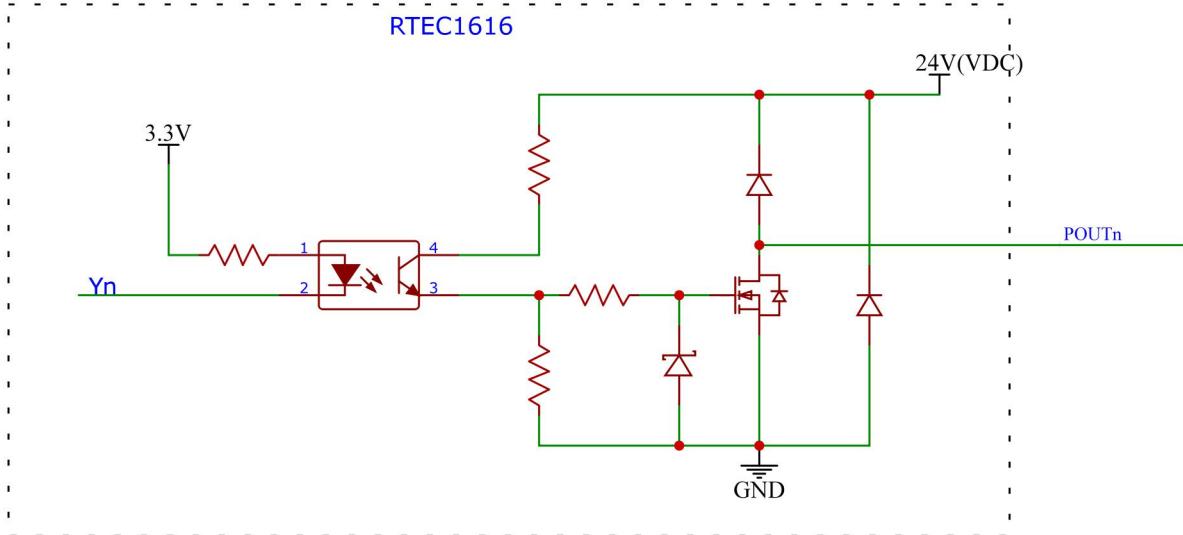
The output port of each channel can output a maximum of 500mA current, and a larger current output can be achieved by connecting multiple output ports in parallel. There is a built-in absorption diode inside the module, which can drive inductive loads.

1.5 **Connect EtherCAT**

Please use CAT5E (or higher) network cable.

The Ethernet input interface IN is connected to the Ethernet output interface OUT of the previous drive on the controller or the bus. The Ethernet output interface OUT is connected to the Ethernet input interface IN of the next drive on the bus. If the drive is the last node on the bus, you only need to connect the Ethernet input interface IN.

1.5.1 **EtherCAT status indicator**

The yellow light of RJ45 is used for Link status, indicating whether there is a network cable connection.
The green light of RJ45 is used for Activity state, indicating whether there is data communication.
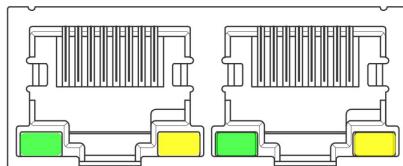
RUN/ERRLED Indicator light：

LED	COLOUR	Status	Describe
RUN	GREEN	Not bright	Initialization status
		Slow flash	Pre operational status
		Single flash	Safe operational state
		Light	Operational status
ERR	RED	Not bright	No errors
		Slow flash	General error
		Single flash	Synchronization error
		Double flash	Watchdog error

- Fast flash: On for 50ms, off for 50ms (10Hz). So cycle.
- Slow flash: On for 200ms, off for 200ms (2.5Hz). So cycle.
- Single flash: on for 200ms, off for 1s. So cycle.
- Double flash: on for 200ms, off for 200ms, on for 200ms, off for 1s. So cycle.

1.5.2 **EtherCAT site address**

The EC series supports two methods to set the slave address: object dictionary 0x2150 to set the site alias and ESC to set the site alias, and select it through the object dictionary 0x2151.

The default 0x2151 is 0, and the node address is allocated by the master station and saved in the EEPROM.

When users need to set a fixed address by themselves, they need to set 0x2151 to 1, and then write the required address value in 0x2150.

0x2151	0x2150	Site address
0	1001	The master station configures the station alias to the EEPROM 0x0004 word address of ESC
1	Settings	Object dictionary 2150 Set value to node address value

1.6 **Size**
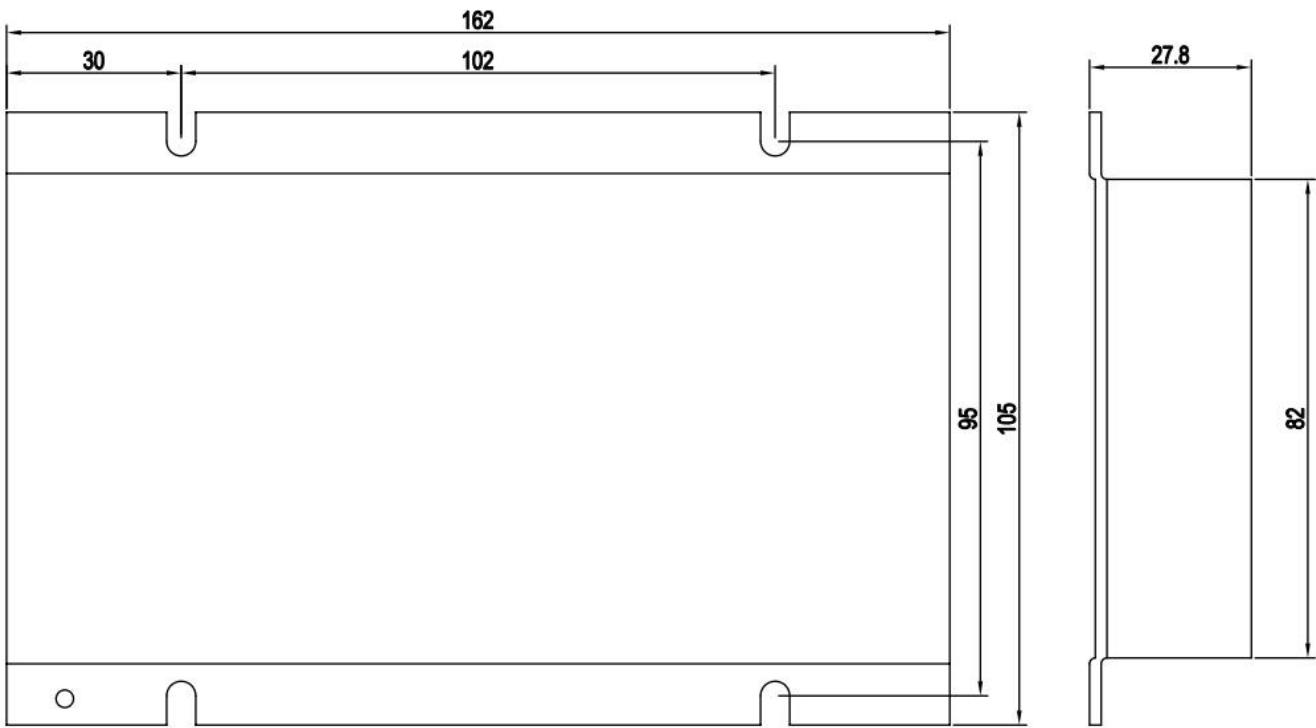
Chapter 3 Parameter Description and Setting

1.7 General parameters

1.7.1 0x1000 Device type

Object Type	Data Type	Access Type	PDO Mapping	Default Value
VAR	UNSIGNED32	RO	NO	0x00001398

Bit 0~15: Device profile number 0x1398: IO Model

Bit 16~31: Additional information 0x0000: Stepper Drive

1.7.2 0x1001 Device name

Display the current product name.

Object Type	Data Type	Access Type	PDO Mapping	Default Value
VAR	Visible string	RO	NO	RTEC1616

1.7.3 0x1009 Hardware version

Object Type	Data Type	Access Type	PDO Mapping	Default Value
VAR	Visible string	RO	NO	1.0

1.7.4 0x100A Software version

Object Type	Data Type	Access Type	PDO Mapping	Default Value
VAR	Visible string	RO	NO	1.0

1.7.5 Save parameters

Sub-index of object dictionary 0x1010: 01 Write 0x65766173 to save current parameters.

The data structure is as follows:

Index	Subindex	Name	PDO mapping	Defaults
1010	00	Maximum of subindexes	No	1
	01	Save parameters	No	0

1.7.6 Restore factory settings

Subindex of object dictionary 0x1011: 01 Write 0x64616F6C to restore the drive to the factory state.

Index	Subindex	Name	PDO mapping	Defaults
1011	00	Maximum of subindexes	No	1
	01	Save parameters	No	0

1.8 **POD and COE object dictionary**

1.8.1 **0x6000 TxPDO_INPUT**

Index	Subindex	Name	Attributes	Type	Range	Defaults
0x6000	00	Maximum of subindexes	---	---	---	1
	01	INPUT_VALUE1	RO	UINT	0~65535	0

0x6000:01 displays the physical level of the current 16-channel IO input

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
IN8	IN7	IN6	IN5	IN4	IN3	IN2	IN1
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN9

0 --- No input signal

1 --- With input signal

This module uses a fixed TxPDO mapping mode,

PDO Content (0x1A00):

Index	Size	Offs	Name	Type
0x6000:01	2.0	0.0	INPUT_VALUE1	UINT

0x1A00:

1.8.2 **0x7000 RxPDO_OUTPUT**

Index	Subindex	Name	Attributes	Type	Range	Defaults
0x7000	00	Maximum of subindexes	---	---	---	5
	01	OUT_VALSET	RW	UINT	0~65535	0
	02	OUT11_PWM_Duty	RW	UINT	0~10000	0
	03	OUT12_PWM_Duty	RW	UINT	0~10000	0
	04	OUT13_PWM_Duty	RW	UINT	0~10000	0
	05	OUT14_PWM_Duty	RW	UINT	0~10000	0

0x7000:01, when the output port is a normal output port function, it is used to set the value of the output port.

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
IN8	IN7	IN6	IN5	IN4	IN3	IN2	IN1
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN9

0 --- Disable output

1 --- Enable output

0x7000:02 to 0x7000:04, when the output ports 11 to 14 are set as the PWM output function, this object is used to control the duty cycle of the PWM output. 0 means 0%, 10000 means 100%.

This module uses a fixed RxPDO mapping mode,

0x1600:

PDO Content (0x1600):

Index	Size	Offs	Name	Type
0x7000:01	2.0	0.0	OUT_VALSET	UINT
0x7000:02	2.0	2.0	OUT11_PWM_Duty	UINT
0x7000:03	2.0	4.0	OUT12_PWM_Duty	UINT
0x7000:04	2.0	6.0	OUT13_PWM_Duty	UINT
0x7000:05	2.0	8.0	OUT14_PWM_Duty	UINT

1.8.3 **0x8000 OUTPORT_CFG**

Index	Subindex	Name	Attributes	Type	Range	Defaults
0x8000	00	Maximum of subindexes	---	---	---	5
	01	OUTPORT_State_Reset	RW	UINT	0~65535	0
	02	OUT11_Function	RW	UINT	0~1	0
	03	OUT12_ Function	RW	UINT	0~1	0
	04	OUT13_ Function	RW	UINT	0~1	0
	05	OUT14_ Function	RW	UINT	0~1	0

0x8000:01, OUTPORT_State_Reset, this object is used to set the default state of the IO expansion module when reset.

This object needs to be saved and re-powered to take effect

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
IN8	IN7	IN6	IN5	IN4	IN3	IN2	IN1
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN9

0 --- Disable output
1 --- Enable output

0x8000:02~0x8000:04，Output port function setting, output ports 11 to 14 of the expansion

module can be used as PWM output.
This object needs to be saved and re-powered to take effect

0 --- Normal output port, the value is controlled by 0x7000:01
1 --- PWM function, the duty cycle is controlled by 0x7000:02~04, and the period is set by 0x8001.

1.8.4 **0x8001 PWMOUT_CFG**

Index	Subindex	Name	Attributes	Type	Range	Defaults
0x8001	00	Maximum of subindexes	---	---	---	5
	01	OUT11_PWM_Frequency	RW	UINT	1000~5000	1000
	02	OUT12_PWM_Frequency	RW	UINT	1000~5000	1000
	03	OUT13_PWM_Frequency	RW	UINT	1000~5000	1000
	04	OUT14_PWM_Frequency	RW	UINT	1000~5000	1000

This object is used to set the frequency of PWM output.

After the set PWM frequency is set, you need to save the parameters and re-power on to take effect.