

CT-5224 4-channel digital input/4-channel digital output/4-channel PWM output

1 Module features

- ◆The module supports 4-channel of digital input, supports high-level input, and could be connected to PNP sensor; and supports low-level input, and could be connected to NPN sensor.
- ◆The module supports 4-channel digital source output, the output high level is valid;
- ◆The module supports 4-channel PWM output, it could output 40 frequencies, and the duty cycle is adjustable.
- ◆The module supports inter-channel duty cycle synchronization, PWM0 is synchronized with PWM1, PWM2 is synchronized with PWM3.

2 Technical parameters

General Parameters	
Power	System: Max.115mA@5.0VDC
Isolation	The isolation voltage between field power and system power supply: AC 500V The isolation voltage between I/O channel and system power supply: AC 500V The isolation voltage between I/O channel and PE: AC 500V The isolation voltage between digital input and output channels: AC 500V
Filed Power	Supply: 19.2~28.8V (nominal: 24VDC) Protection: reverse protection
Wiring	Max.: AWG 18 Min.: AWG 24
Mounting Type	35mm DIN-Rail
Size	115*14*75mm
Weight	75g
Environment Specification	
Operating Temperature of Vertical Installation	-35°C~60°C
Operating Temperature of Horizontal Installation	-35°C~70°C
Relative Humidity	5~ 95%RH (No Condensation)
Storage Temperature	-40°C~85°C
Storage Humidity	5~ 95%RH (No Condensation)
Manufacturing Test Temperature	-40°C~75°C
Ingress Protection Rating	IP20
Vibration Resistance	Comply with IEC 61131-2 and EC 60068-2-6
Impact resistance	Comply with IEC 61131-2 and IEC 60068-2-27
EMC Performance	Comply with IEC 61131-2 and IEC 61000-4
DI Parameters	
Channel Number	4-channel input
Indicator	4-channel input indicator
Input Type	IEC61131-2 Type3
Turn-on Voltage	Source: 11~30VDC (compared with COM terminal) Sink: -30~-11VDC (compared with COM terminal)
Turn-off Voltage	Source: -30~5VDC (compared with COM terminal) Sink: -5~30VDC (compared with COM terminal)
Turn-on Current	2.1mA@DC 11V (IEC61131, type3)
Input Impedance	>5KΩ@DC 24V
Input Delay	OFF to ON: <1ms ON to OFF: <1ms
Filter Time	Default: 10ms
Sample Frequency	500Hz
DO Parameters	
Channel Number	4-channel output

Indicator	4-channel output indicator
Rated Current	Max. 0.5A@DC 24V
Leakage Current	<5μA
Output Impedance	Typical value: <230mΩ
Output Delay	OFF to ON: <5μs ON to OFF: <10μs
Output Type	Source / High-side output
Protection Function	Short circuit protection support Overcurrent protection: 3A Over-temperature protection: thermal protection temperature of the channel: 167°C Chip thermal protection temperature: 150°C
PWM Parameters	
Channel Number	4-channel output
Rated Current	Max. 1A@DC 24V
Leakage Current	<5μA
On-resistance	Typical value: 230mΩ
Output Delay	OFF to ON: <1μs ON to OFF: <1μs
Pulse Duration Accuracy	±0.5μs
Pulse Duration Resolution	50ns
Minimum Pulse Duration	1us
Maximum Switching Frequency	60KHz
Pulse Rise Time	<200ns
Pulse Decay Time	<100ns
Protection Function	Short circuit protection support Overcurrent protection: 3A Over-temperature protection: thermal protection temperature of the channel: 167°C Chip thermal protection temperature: 150°C

WARNING

UNEXPECTED EQUIPMENT OPERATION

Do not exceed any of the ratings specified in the environmental and electrical characteristics table.

Failure to follow instructions specified by the manufacturer may result in serious consequences such as death, personal injury, or damage to equipment since the protection provided by the equipment may be impaired.

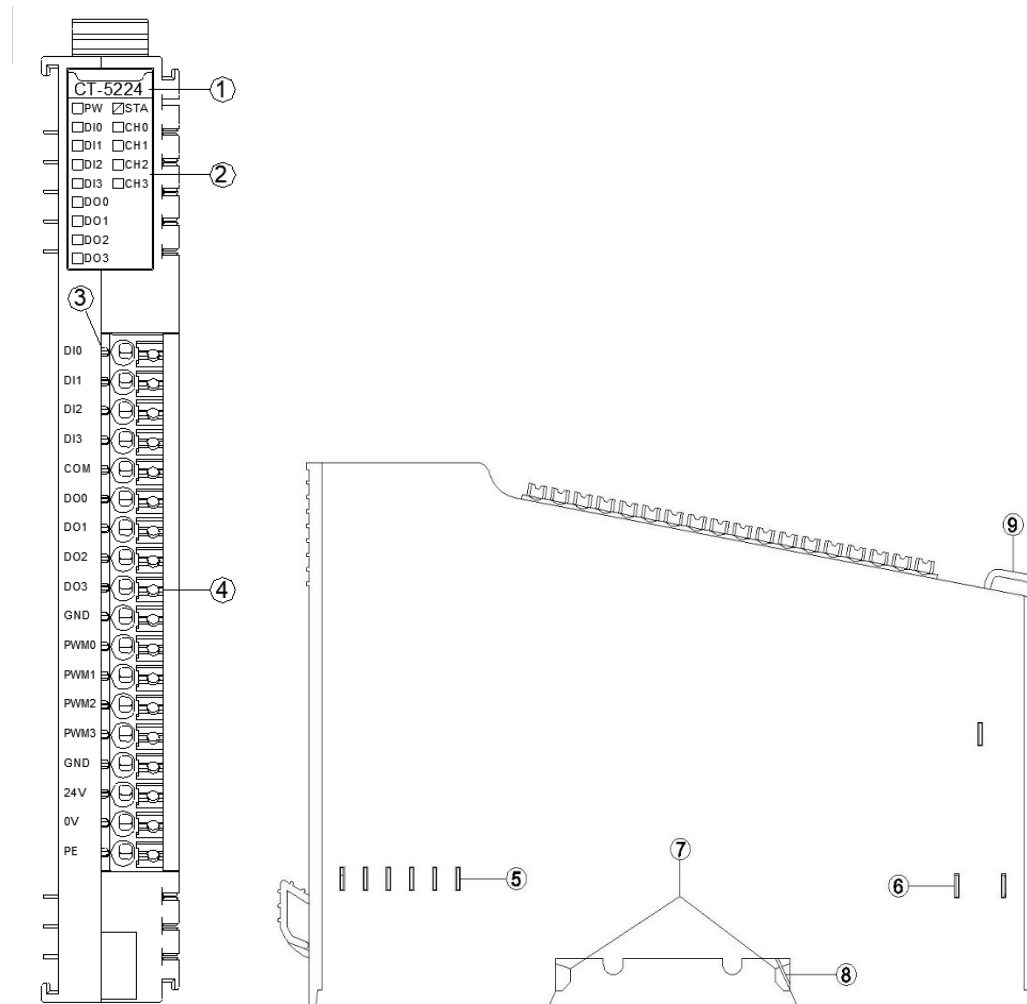
AVERTISSEMENT

FONCTIONNEMENT INATTENDU DE L'EQUIPEMENT

Ne dépassez aucune évaluation spécifiée dans le tableau de caractéristiques environnementales et électriques..

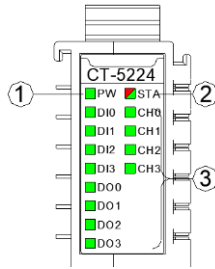
Le fait de ne pas suivre les instructions peut entraîner une défaillance de la protection fournie par l'équipement, ce qui peut entraîner des conséquences graves, comme des blessures ou des dommages à l'équipement.

3 Hardware interfaces



- ① Module Type
- ② State indicator
- ③ Channel indicator
- ④ Wiring Terminal and identification
- ⑤ Internal Bus
- ⑥ Field Power
- ⑦ Buckle
- ⑧ Grounding Spring Sheet
- ⑨ Fixed Wiring Harness

3.1 LED Indicator definition



- ① Power indicator (green)
- ② Module state indicator (red/green)
- ③ Input/output channel indicators (green)

PW Power State (green)	Definition
ON	System power supply normal
OFF	System power supply failure
STA Module State (red/green)	Definition
STA module state indicator (RED/GREEN)	Definition
Slow flash (GREEN) (2.5Hz)	Module internal bus is not started
Slow flash (RED) (2.5Hz)	Module internal bus offline
ON (GREEN)	Operation normal
Flash (RED/GREEN) (2.5Hz)	Updating mode
Flash (RED/GREEN) (10Hz)	Firmware update
DI0~DI3 Input channel indicators (green)	Definition
ON	Digital input signal valid
OFF	Digital input signal invalid
D00~D03 Output channel indicators (green)	Definition
ON	Digital output signal valid
OFF	Digital output signal invalid
CH0~CH3 Output channel indicators (green)	Definition
ON	PWM Output signal valid
OFF	PWM Output signal invalid

! WARNING

UNEXPECTED EQUIPMENT OPERATION

By viewing the PW indicator, could determine the power supply status of a module. If the PW is steady green, the power supply is normal. Otherwise, the module cannot work properly.

When the module is initially powered on, there will be 3S for the backplane bus connection. After the backplane bus is initialized, STA is in the green steady state. If STA is in the green blinking

state, it indicates that the backplane bus has not been initialized, and it needs to be powered off and restarted for re-initialization.

STA abnormal working state occurs during the normal operation of the module, please check the firmware version information of all modules, and consult ODOT technical support for details.

If a module is upgraded, check that all modules are in the normal state after the upgrade. Otherwise, an exception may occur.

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! AVERTISSEMENT

FONCTIONNEMENT INATTENDU DE L'EQUIPEMENT

En regardant l'état de l'indicateur de PW, jugez l'état d'alimentation du module. Le feu vert PW reste allumé et l'alimentation est normale. Autrement, le module ne fonctionnera pas correctement.

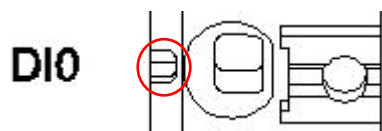
Lorsque le module est alimenté initialement, il y aura 3S pour la connexion de bus de backboard. STA est un état vert permanent après l'initialisation du bus de backboard. Si STA est en état de clignotement vert, cela signifie que l'initialisation du bus de backboard n'est pas passée et doit être redémarrée hors tension et réinitialisée.

L'état de fonctionnement anormal de STA se produit pendant le fonctionnement normal du module, veuillez vérifier les informations de version du firmware de tous les modules, et consulter le support technique ODOT pour plus de détails.

Si le module a une opération de mise à niveau, après l'achèvement de la mise à niveau, le besoin de vérifier que tous les modules sont dans l'état normal avant de courir, sinon il conduira à une exception.

Le fait de ne pas suivre les instructions peut entraîner une défaillance de la protection fournie par l'équipement, ce qui peut entraîner des conséquences graves, comme des blessures ou des dommages à l'équipement.

3.2 Field channel LED indicator (Green)



When the input signal of the input channel is valid, the corresponding field channel indicator is on.



When the output signal of the output channel is valid, the corresponding field channel indicator is on.

3.3 Terminal definition

Terminal Number	Symbol	Instruction
1	DI1	Digital signal input
2	DI2	
3	DI3	
4	DI4	
5	COM	Input common terminal
6	DO1	Digital signal output
7	DO2	
8	DO3	
9	DO4	
10	GND	Signal ground
11	PWM1	PWM output
12	PWM2	
13	PWM3	
14	PWM4	
15	GND	Signal ground
16	24V	Field power
17	0V	
18	PE	Ground terminal

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Calculate the maximum field power current consumption of a single module based on the actual field load. If the total field power current consumption of all I/O modules exceeds the power supply capacity of the field power supply, you must add an extra power expansion module. Otherwise, an output channel exception may occur.

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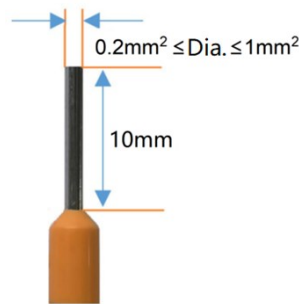
⚠ AVERTISSEMENT

FONCTIONNEMENT INATTENDU DE L'EQUIPEMENT

Calculez la consommation maximale de courant de champ d'un seul module en fonction de la charge de champ réelle. Si la consommation totale de courant de champ de tous les modules d'E/S dépasse la capacité d'alimentation de l'alimentation de champ, vous devez ajouter un module d'extension de puissance supplémentaire. Dans le cas contraire, une exception de canal de sortie peut se produire.

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When connecting a cold-pressed terminal, the terminal must be terminated and checked in strict accordance with the corresponding termination specifications or requirements, and connect the cold-pressed terminal according to the corresponding node serial number. The conductor should use copper conductor and the conductor core should be larger than 0.2mm^2 and smaller than 1mm^2 (AWG18~AWG24). Cold-pressed terminal parameters are as follows:



! WARNING

UNEXPECTED EQUIPMENT OPERATION

Strip the length of the conductor insulation layer is greater than 10mm to ensure reliable signal connection.

The wire needs to use copper wire and the wire core is greater than or equal to 0.2mm^2 and less than or equal to 1mm^2 to ensure reliable signal connection.

When connecting a cold-press terminal, connect the cold-press terminal strictly in accordance with the corresponding termination specifications or requirements, and connect the cold-press terminal according to the corresponding node serial number.

Do not power on cold-press terminals until they are properly connected or fully locked.

Failure to follow instructions specified by the manufacturer may result in serious consequences such as death, personal injury, or damage to equipment since the protection provided by the equipment may be impaired.

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FONCTIONNEMENT INATTENDU DE L'EQUIPEMENT

Dépouillez la longueur de la couche isolante du fil plus de 10mm pour assurer la connexion fiable du signal.

Le conducteur doit utiliser le fil de cuivre et le noyau de fil est supérieur ou égal à 0,2 mm², inférieur ou égal à 1mm², afin d'assurer la connexion fiable du signal.

Lorsque les terminaux de presse à froid sont terminés, ils doivent être terminés et visualisés en stricte conformité avec les spécifications ou les exigences correspondantes et terminés selon le numéro de série de noeud correspondant.

Il est interdit d'activer les bornes à froid avant qu'elles ne soient correctement articulées ou complètement verrouillées.

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DANGER

FIRE DANGER

Use the correct wiring rules only for the maximum current capacity of the I/O channel and power supply.

Failure to follow instructions specified by the manufacturer may result in serious consequences such as death, personal injury, or damage to equipment since the protection provided by the equipment may be impaired.

WARNING

UNEXPECTED EQUIPMENT OPERATION

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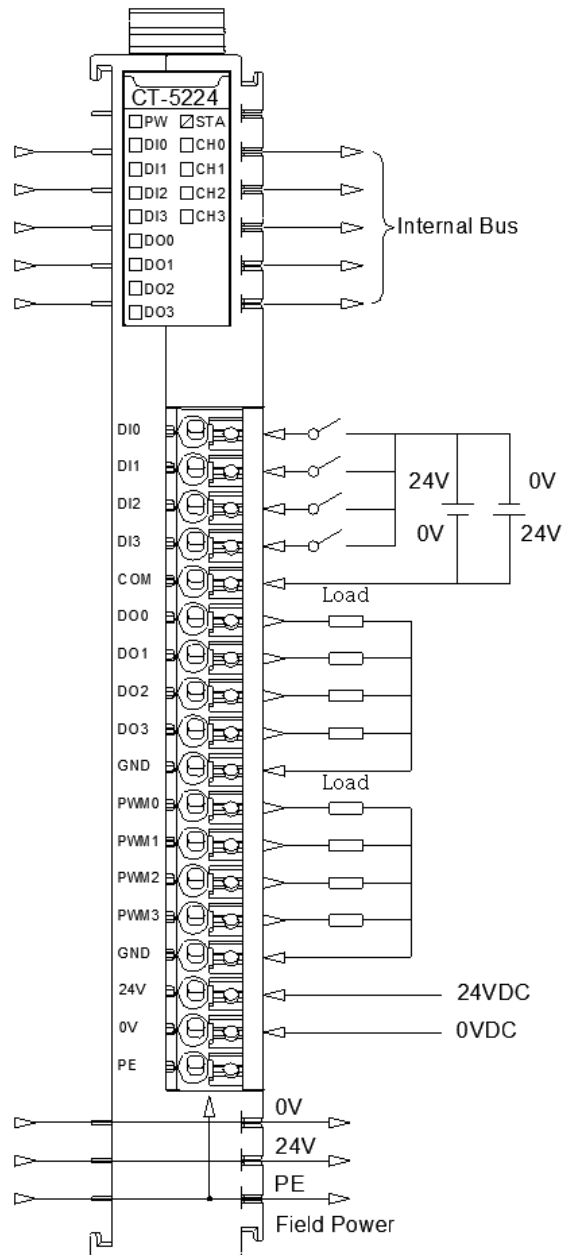
AVERTISSEMENT

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4 Wiring



NOTICE

EQUIPMENT INOPERABLE

Do not crimp the spring terminal with more than the maximum pressure specified for the terminal. Otherwise, the resilience of the spring terminal may be damaged and the terminal rebound may be affected.

Do not press the spring terminal with a sharp tool when removing cable from the channel. Otherwise, the spring terminal will be damaged.

Failure to follow these instructions may result in equipment damage.

5 Process data definition

5.1 Input data

Input data								
Bit No	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved				DI Ch#3	DI Ch#2	DI Ch#1	DI Ch#0
Byte 1	DO Short Circuit (Ch#3)	DO Short Circuit (Ch#2)	DO Short Circuit (Ch#1)	DO Short Circuit (Ch#0)	PWM Short Circuit (Ch#3)	PWM Short Circuit (Ch#2)	PWM Short Circuit (Ch#1)	PWM Short Circuit (Ch#0)
Byte 2	Ch#1 QLMN HLM	Ch#0 QLMN HLM	PWM Output State (Ch#1)	PWM Output State (Ch#0)	STS SW Enable (Ch#1)	STS SW Enable (Ch#0)	ERR OUT VAL	ERR 24V
Byte 3	Reserved							Jitter Cycle Error
Byte 4	Ch#3 QLMN HLM	Ch#2 QLMN HLM	PWM Output State (Ch#3)	PWM Output State (Ch#2)	STS SW Enable (Ch#3)	STS SW Enable (Ch#2)	ERR OUT VAL	ERR 24V
Byte 5	Reserved							Jitter Cycle Error

Data description:

DI Input Data (Ch#0~ Ch#3): DI input status detection. When the input signal of the corresponding channel is valid, this bit is forced to 1, and when the input is invalid, this bit is forced to 0.

PWM Short Circuit (Ch#0~ Ch#3): Detect if there is a short circuit in the PWM channel. If there is a short circuit, this bit is forced to 1, and otherwise this bit is forced to 0;

DO Short Circuit (Ch#0~ Ch#3): Detect whether there is a short circuit in the DO channel. If there is a short circuit, this bit is forced to 1, and otherwise this bit is forced to 0;

ERR 24V: Detect whether the power supply in the field is undervoltage. If there is undervoltage, this bit is forced to 1, and otherwise this bit is forced to 0;

ERR OUT VAL: Detect if the frequency is misconfigured. If it is wrong, this bit is

forced to 1, and otherwise this bit is forced to 0;

STS SW ENABLE (Ch#0~ Ch#3): In the software-triggered mode, check whether the software enabled PWM output is valid. If it is valid, this bit is forced to 1, and otherwise this bit is forced to 0;

PWM Output State (Ch#0~ Ch#3): Detect the PWM output is valid, if it is valid, this bit is forced to 1, and otherwise this bit is forced to 0;

QLMN HLM (Ch#0~ Ch#3): Detect whether the PWM duty cycle is within the output range, if not, this bit is forced to 1, and otherwise this bit is forced to 0;

Jitter Cycle Error: Jitter cycle error. Detect whether the cycle time of jitter is greater than or equal to four times of the PWM output cycle time, if it is less than that, this bit is forced to 1, and otherwise this bit is forced to 0;

5.2 Output data

Output data								
Bit No	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved				DO Ch#3	DO Ch#2	DO Ch#1	DO Ch#0
Byte 1	Duty Cycle Value (Ch#0)							
Byte 2								
Byte 3								
Byte 4	Duty Cycle Value (Ch#1)							
Byte 5	Reserved	Sync Switch	Jitter Switch (Ch#1)	Jitter Switch (Ch#0)	SW Active (Ch#1)	SW Active (Ch#0)	SW Trigger (Ch#1)	SW Trigger (Ch#0)
Byte 6	Reserved							
Byte 7	Duty Cycle Value (Ch#2)							
Byte 8								
Byte 9								
Byte 10	Duty Cycle Value (Ch#3)							
Byte 11	Reserved	Sync Switch	Jitter Switch (Ch#3)	Jitter Switch (Ch#2)	SW Active (Ch#3)	SW Active (Ch#2)	SW Trigger (Ch#3)	SW Trigger (Ch#2)
Byte 12	Reserved							

Data description:

Digital Output Data (Ch#0~ Ch#3): When this bit is 1, the corresponding channel output signal is valid, the output is high level, and the output is invalid when it is 0.

0: Output signal is invalid

1: Output signal is valid

Duty Cycle Value (Ch#0~ Ch#3): Output PWM duty cycle value. The output voltage is adjustable.

Output Range:0-10000, corresponds to the full scale 24V terminal access voltage.

SW Trigger (Ch#0~ Ch#3): Software-triggered switch. Operates only in software trigger mode (configured in configuration parameters).

0: Disable

1: Enable

SW Active (Ch#0~ Ch#3) : PWM active switch, it is used to control whether the PWM output is turned on or off. To enable output, set 1 in either hardware or software trigger mode.

0: OFF

1: ON

Jitter Switch (Ch#0~ Ch#3): Jitter switch, it is used to control whether the PWM jitter output is turned on or off.

0: OFF

1: ON

Sync Switch: Synchro switch, it is used to control the synchronous output of the PWM channel to be turned on or off.

Annotation: For channels at the same set of frequencies, that is (CH0 and CH1) (CH2 and CH3) synchronization and jitter functions could not be used at the same time.

6 Configuration parameter definitions

Configuration parameters								
Bit No	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved							16Bit Data Format
Byte 1	Input Filtering Time							
Byte 2								
Byte 3	Reserved				Input Holding Time			
Byte 4	Reserved				Fault Action (Ch#3)	Fault Action (Ch#2)	Fault Action (Ch#1)	Fault Action (Ch#0)
Byte 5	Reserved				Fault Value (Ch#3)	Fault Value (Ch#2)	Fault Value (Ch#1)	Fault Value (Ch#0)
Byte 6	Reserved				Module Offline Fault Action Output (Ch#3)	Module Offline Fault Action Output (Ch#2)	Module Offline Fault Action Output (Ch#1)	Module Offline Fault Action Output (Ch#0)
PWM Configuration parameters （Ch#0-Ch#1）								
Byte 0	Freq. Choice						Pulse Trigger Mode (Ch#1)	Pulse Trigger Mode (Ch#0)
Byte 1	Open DelayTime							
Byte 2								
Byte 3	Sync. AddMinus Time							
Byte 4								
Byte 5	Reserved						Channel Sync.	
Byte 6	Jitter Period							
Byte 7	Jitter Magnitude							
Byte 8	Jitter Slope							
Byte 9								
Byte 10	Reserved							
PWM Configuration parameters （Ch#2-Ch#3）								
Byte 0	Freq. Choice						Pulse Trigger Mode (Ch#3)	Pulse Trigger Mode (Ch#2)
Byte 1	Open DelayTime							
Byte 2								
Byte 3	Sync. AddMinus Time							
Byte 4								
Byte 5	Reserved						Channel Sync.	
Byte 6	Jitter Period							
Byte 7	Jitter Magnitude							
Byte 8	Jitter Slope							
Byte 9								
Byte 10	Reserved							

Module configuration parameter data description:

16Bit Data Format: Sequence of 16-bit data byte transmission (Default:0)

0: A_B

1: B_A

Input Filtering Time: Digital input filtering time. (Default:10)

Input range: 0-65535ms

Input Holding Time: Digital input hold time (ms). (Default:0)

0: Disable

1: 200ms

2: 500ms

3: 1000ms

4: 1500ms

5: 2000ms

6: 3000ms

7: 5000ms

Fault Action (Ch#0~ Ch#3): DO Fault output mode. When the I/O module detects that the internal bus enters offline mode abnormally, it processes the output data in this way. (Default :1)

0: Keep the last output value

1: Outputs the fault value

Fault Value (Ch#0~ Ch#3): Fault output value. When the fault output mode is 1, this bit sets the fault output value. When the internal bus of the I/O module is offline, this bit is output. (Default :0)

0: Output low level

1: Output high level

Module Offline Fault Action Output (Ch#0~ Ch#3): PWM module offline fault action output. (Default:1)

0: Keep the last output value

1: Reset

PWM Configuration parameter (Ch#0~Ch#3) data description:

Pulse Trigger Mode (Ch#0~Ch#3): Trigger mode. When the software is selected to trigger, the module could be output directly through the host computer. When the hardware trigger is selected, the external voltage must be input to the DI port to ensure that the DI port detects the voltage. Each channel could be configured independently. (Default :0)

0: Software trigger

1: Hardware trigger

Freq. Choice: Frequency choice. Ch#0 and Ch#1 use the same frequency, Ch#2 and Ch#3 use the same frequency. (Default:26)

0: 1HZ

1: 2HZ

2: 3HZ

3: 4HZ

4: 5HZ

5: 6HZ

6: 8HZ

7: 10HZ

8: 15HZ

9: 20HZ

10: 25HZ

11: 30HZ

12: 40HZ

13: 50HZ

14: 60HZ

15: 80HZ

16: 100HZ

17: 150HZ

18: 200HZ

19: 250HZ

20: 300HZ

21: 400HZ

22: 500HZ

23: 600HZ

24: 750HZ

25: 800HZ

26: 1KHZ

27: 1.2KHZ

28: 1.5KHZ

29: 2.0KHZ

30: 3.0KHZ

31: 4.0KHZ

32: 6.0KHZ

33: 12KHZ

34: 15KHZ

35: 20KHZ

36: 24KHZ

37: 30KHZ

38: 40KHZ

39: 60KHZ

Open DelayTime: Open delaytime. After the data is sent to the host computer, the output is delayed for a period of time. (Default :0)

Input range: 0-65535

Unit: ms

Sync. AddMinus Time: Synchronize acceleration and deceleration time. Synchronous acceleration and deceleration time and channel synchronization source are used to implement channel synchronization. (Default :20)

Input range: 20-5000

Unit: ms

Channel Sync. (Ch#0~Ch#1) : Channel synchronization source. That is, if channel A is selected, channel A is used for reference, and the duty cycle between channel B and channel A is synchronized. Synchronous acceleration and deceleration time and channel synchronization source are used to implement channel synchronization. (Default :0)

0: Disabled

1: CH#0

2: CH#1

Channel Sync. (Ch#2~Ch#3) : Channel synchronization source. That is, if channel A is selected, channel A is used for reference, and the duty cycle between channel B and channel A is synchronized. Synchronous acceleration and deceleration time and channel synchronization source are used to implement channel synchronization. (Default :0)

0: Disabled

1: CH#2

2: CH#3

Jitter Period: Jitter Period. The jitter period, jitter amplitude, and jitter slope are used to implement the jitter function of the channel duty cycle. (Default :2)

Input range: 2-100

Unit: ms

Jitter Magnitude: Jitter amplitude, which is used to adjust the jitter amplitude of the duty cycle. The jitter period, jitter amplitude, and jitter slope are used to implement the jitter function of the channel duty cycle. (Default :0)

Input range: 0-50

Unit: %

Jitter Slope: Jitter slope, used to control the duration of the jitter ramp up and ramp down of the duty cycle. The jitter period, jitter amplitude, and jitter slope are used to implement the jitter function of the channel duty cycle. (Default :0)

Input range: 0-30000

Unit: ms

A Dimension drawing

