TOSUN

TTS Series Product Family

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tosunai.com

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What Is the TTS Series Product Family?

TOSUN has a wide range of product series, such as the TC series, TP series, TE series, TLog series, TTS series, and so on. Among these, the TTS series products are universal test boards designed for automotive electronic systems. They are suitable for scenarios such as hardware-in-the-loop (HIL) testing. These board cards offer an efficient and flexible way to simulate and test various Electronic Control Units (ECUs) in automobiles, helping engineers ensure system reliability and performance while accelerating the development cycle and reducing costs. They are essential tools in the development of automotive electronic systems.

What Products Are Included in the TTS Series?

TTS0001	TTS9011	TTS9015	TTS9021
TTS9036	TTS9045	TTS1018	TTS1026P
TTS1034	TTS8012 (under development)	TTS8920 (under development)	TTS8516 (under development)
TTS9036A (customized)	TTS8013PX (customized)	TTS1013 (customized)	TTS1015P (customized)
TTS1016 Pro (customized)	TTS9027 (customized)		

What Are Their Characteristics?

- **Modular Design**: The TTS series cards adopt a highly modular design, allowing users to select corresponding board card according to testing needs for quick configuration and expansion of the testing system.
- **Multi-Functional Integration**: The TTS series board cards integrate various functionalities such as relay control, resistance simulation, fault injection, digital input/output, analog input/output, and CAN/LIN/FlexRay bus communication.
- **High-Precision Output/Acquisition**: The TTS series board cards offer high-precision signal processing, including resistance simulation, voltage/current output and acquisition, PWM signal output and acquisition, and more.
- **High Software Compatibility**: The TTS series board cards are highly compatible with TOSUN's TSMaster software, allowing seamless integration into some automated test cases

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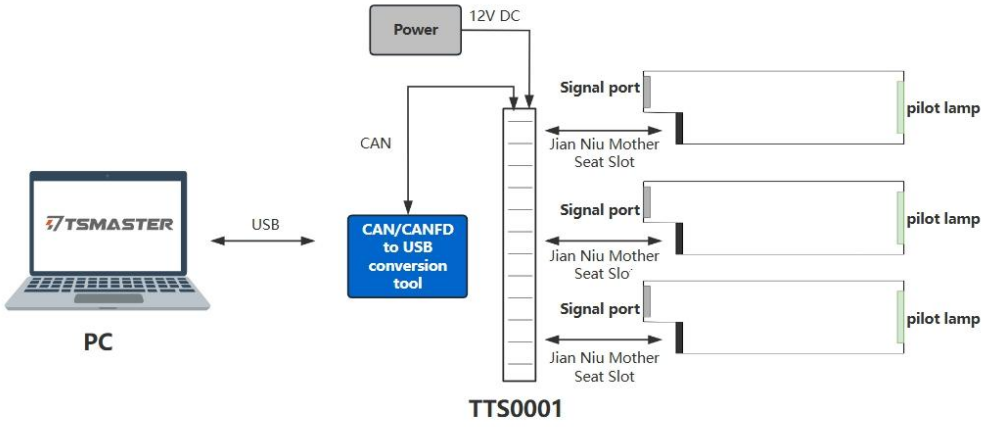
in TSMaster, simplifying the configuration process and making the usage easier.

- ...

How to Use TTS Series Product?

For HIL simulation test board cards, such as TTS9011, TTS9015, TTS9021, TTS9036, and TTS9045, insert the board cards into the slots of the TTS0001, power the TTS0001, and connect the CAN communication cable of the TTS0001 to any TOSUN CAN/CAN FD-to-USB tool. By connecting the CAN/CAN FD tool to a computer, on the computer side, you can use the board card functions via CAN communication.



For bus communication analysis board cards, such as TTS1018, TTS1026P, and TTS1034, simply insert the board cards into the slots of the TTS0001 (in some cases, the TTS0001 needs to be powered), and the board cards can be used by connecting the corresponding USB interface of the TTS0001 to a computer.

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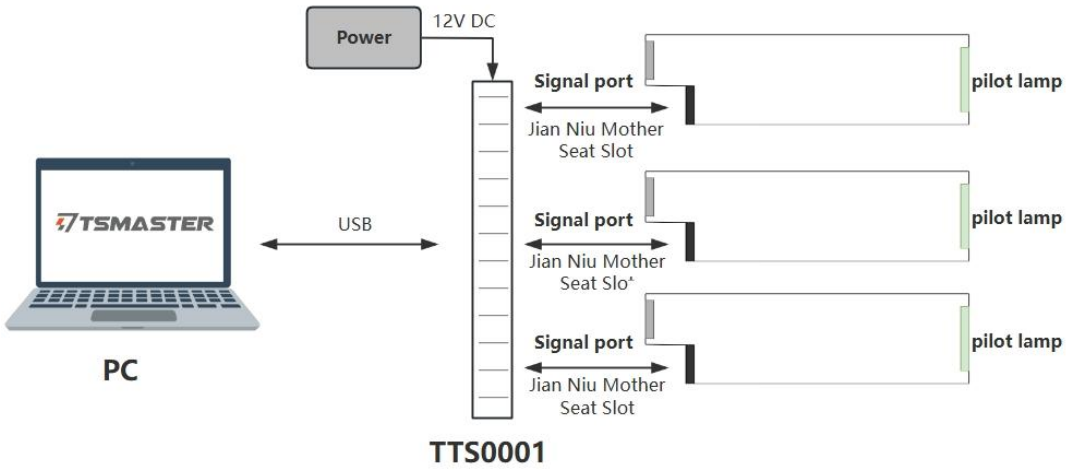

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1. About this User Manual

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2. Product Overview

2.1 Universal Test Board Cards

	TTS9011	TTS9015	TTS9021	TTS9036	TTS9045
Function	Digital input and output	Analog input and output	Fault injection	Resistance simulation	Relay on/off circuit
Number of Channels	12	8	-	5	16
Function Specification	PWM output: 0.03Hz~200kHz Duty cycle: 1%~99% PWM acquisition: 0.03Hz~200kHz Duty cycle: 1%~99%	Voltage output: 0~60V Voltage acquisition: -60~60V Current output: 0~25mA Current acquisition: 0~25mA	External reference voltage:≤24V	Resistance range: 1~4194303 Ω	Channel Overcurrent: DC 36V 2.5A DC 40V 2A
Operating	9~30V	9~30V	9~30V	9~32V	9~32V

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Voltage					
Power Consumption	3W	7W	11W	4W	5W
Height	3U	3U	3U	3U	3U
Installation Method	Chassis slide rail	Chassis slide rail	Chassis slide rail	Chassis slide rail	Chassis slide rail

2.2 Bus Communication Analysis Board Cards

	TTS1018	TTS1026P	TTS1034
Channel	12x CAN FD (1+11, CAN FD1 connected to the slide rail slot bus)	1x CAN FD (connected to the slide rail slot bus) 6x LIN	2x CAN FD (1+1, CAN FD1 connected to the slide rail slot bus) 2x FlexRay
Baud Rate	CAN: 125k-1Mbps CAN FD: max 8Mbps	CAN: 125k-1Mbps CAN FD: max 8Mbps LIN: 0-20Kbps	CAN: 125k-1Mbps CAN FD: max 8Mbps

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Transmission Rate (CAN)	20000fps	20000fps	20000fps
Isolate	2500V	2500V	2500V
Power Supply	USB power supply + DC power supply	USB power supply	USB power supply
Height	3U	3U	3U
Installation Method	Chassis slide rail	Chassis slide rail	Chassis slide rail

3. TTS0001

3.1 Overview

TTS0001 is a rack slot/chassis for mounting the TOSUN TTS9000 series 3U-height board card devices, supporting a maximum of 12 board cards to be used simultaneously.

3.2 Technical Data

- Number of slots: 12

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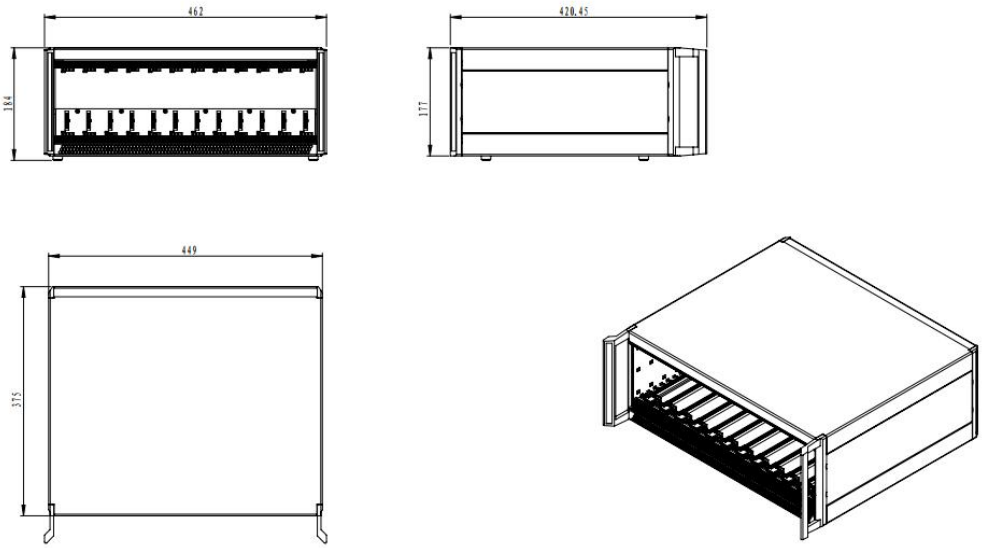
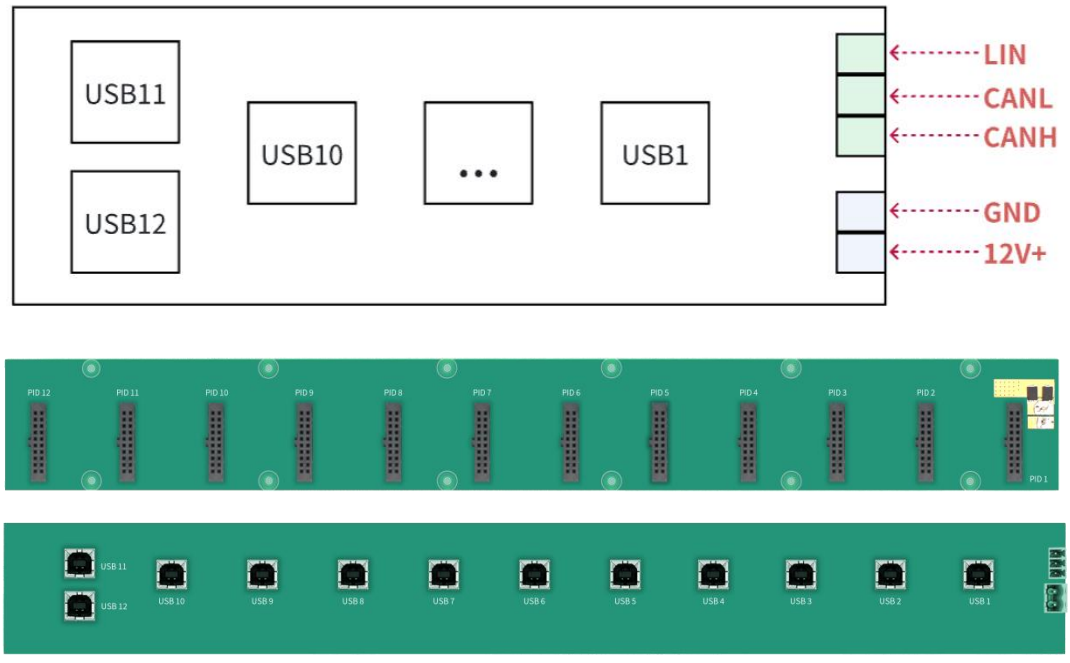
- On-board terminal resistor (bus): 60Ω
- Overcurrent capacity: 10A

3.3 Mechanical Data



3.4 Hardware Interface



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- Simplified female header 20 pin interface — board card slot;
- USB interface;
- 3 pin phoenix terminal interface——CAN communication;
- 2 pin phoenix terminal interface——DC power supply.

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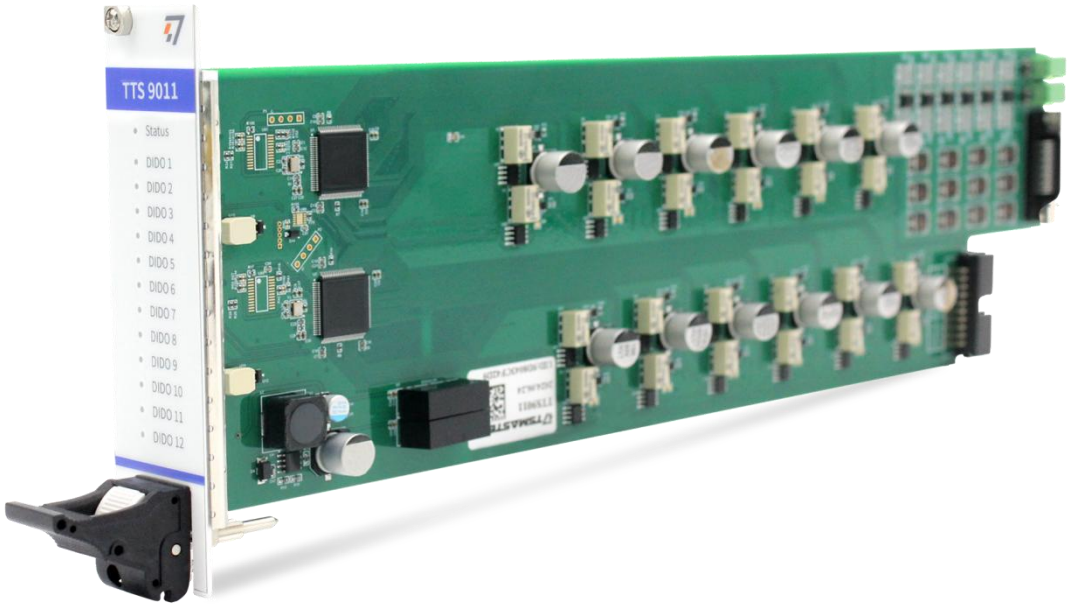
4. TTS9011

4.1 Overview

TTS9011 is a digital input/output board card with a total of 12 channels. All channels can operate independently for outputting high and low levels, collecting high and low levels, outputting PWM, and collecting PWM.



4.2 Specification

- Number of channels: 12 channels (shared for input/output)
- Operating voltage/static power consumption: 12V/2W
- Communication control: CAN 1Mbps
- Relay type: Magnetic latching relay
- Board card height: 3U
- Mounting method: chassis slide rail

4.3 Functional Data

The rise and fall time of the digital signal is approximately 680ns;

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The digital signal output supports push-pull, low-side drive (NMOS open-drain), and high-side drive (PMOS open-drain):

Modes

- Push+Pull (Push-pull mode): Capable of driving both low and high levels, with strong driving capability.
- Push (High-side drive): Capable of driving high level; external pull-down is required for low level.
- Pull (Low-side drive): Capable of driving low level; external pull-down is required for high level.

VREF and VBAT

- VREF (External Reference Voltage)
  - Default: 1.8V
  - Input range: 0 – 60V
  - Usage: PWM output
- VBAT (External Supply Voltage)
  - Default: 5V
  - Input range: 0 – 60V
  - When powered by external VBAT:
    - Maximum current: 1A for a single channel under load
    - Maximum current: 400mA when all channels are used simultaneously
  - Usage: PWM acquisition

Note:

Signal acquisition is enabled in all modes (the acquisition function remains active when in output mode).

Output Capability:

	Per-channel maximum output current	All 12 channels active simultaneously (per-channel max)	Input/output voltage range per channel
With external high-level reference voltage	250mA	100mA	0-60V

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PWM Output:

Parameter	Min	Max	Unit
PWM frequency	0.00003	200	kHz
PWM frequency accuracy			
➢ at PWM frequency ≤200kHz		0.300	%
➢ at PWM frequency ≤100kHz		0.150	%
➢ at PWM frequency ≤50kHz		0.075	%
➢ at PWM frequency ≤10kHz		0.020	%
➢ at PWM frequency ≤1kHz		0.003	%
PWM duty cycle range			
➢ at PWM frequency ≤200kHz	15	85	%
➢ at PWM frequency ≤100kHz	8	92	%
➢ at PWM frequency ≤50kHz	4	96	%
➢ at PWM frequency ≤10kHz	1	99	%
➢ at PWM frequency ≤1kHz	1	99	%
PWM duty cycle tolerance			
➢ at PWM frequency ≤200kHz		6.000	% abs
➢ at PWM frequency ≤100kHz		3.000	% abs
➢ at PWM frequency ≤50kHz		1.500	% abs
➢ at PWM frequency ≤10kHz		0.250	% abs
➢ at PWM frequency ≤1kHz		0.025	% abs

PWM Measurement:

Parameter	Min	Max	Unit
PWM frequency	0.00003	250	kHz
PWM frequency accuracy			
➢ at PWM frequency ≤250kHz		12.00	%
➢ at PWM frequency ≤100kHz		5.000	%
➢ at PWM frequency ≤50kHz		2.500	%
➢ at PWM frequency ≤10kHz		0.030	%
➢ at PWM frequency ≤1kHz		0.003	%
PWM duty cycle range			
➢ at PWM frequency ≤250kHz	10	90	%

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➢ at PWM frequency ≤100kHz	4	96	%
➢ at PWM frequency ≤50kHz	2	98	%
➢ at PWM frequency ≤10kHz	7	93	%
➢ at PWM frequency ≤1kHz	1	99	%
PWM duty cycle tolerance			
➢ at PWM frequency ≤250kHz		12.50	% abs
➢ at PWM frequency ≤100kHz		5.000	% abs
➢ at PWM frequency ≤50kHz		2.500	% abs
➢ at PWM frequency ≤10kHz		0.500	% abs
➢ at PWM frequency ≤1kHz		0.050	% abs

4.4 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	DC power supply	High-level output on all channels	9	12.0	30	V
Operating Current	DC power supply	High-level output on all channels	--	0.19	--	A
Power Consumption	DC power supply	High-level output on all channels	--	2.2	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC

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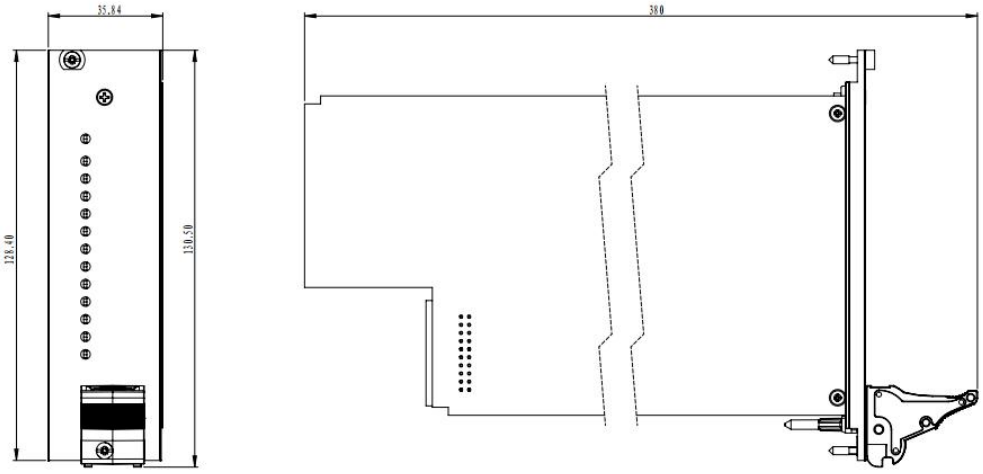
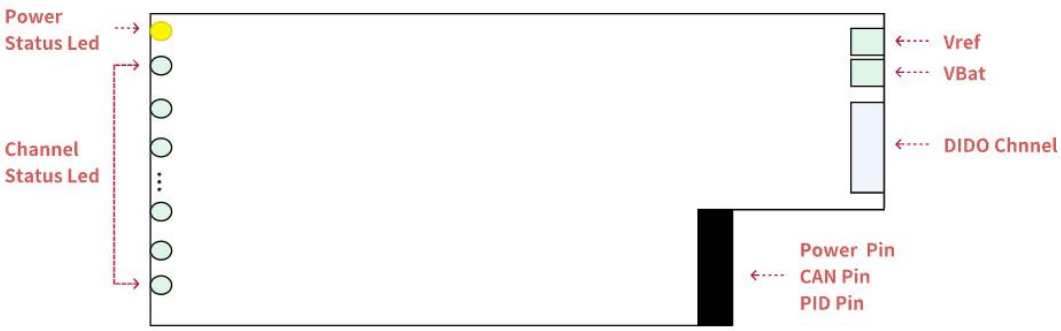
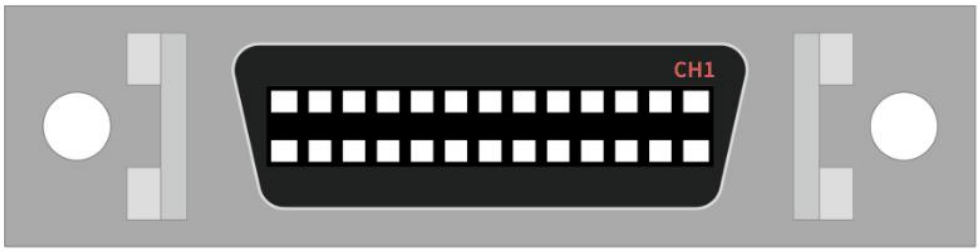
4.5 Mechanical Data



4.6 Hardware Interface





- SCSI-26 Pin Interface:

PIN	Definition	PIN	Definition	PIN	Definition	PIN	Definition
Pin 1	CH1	Pin 2	CH2	Pin 3	CH3	Pin 4	CH4
Pin 5	CH5	Pin 6	CH6	Pin 7	CH7	Pin 8	CH8
Pin 9	CH9	Pin 10	CH10	Pin 11	CH11	Pin 12	CH12

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Pin 13	CGND	Pin 14	CGND	Pin 15	CGND	Pin 16	CGND
Pin 17	CGND	Pin 18	CGND	Pin 19	CGND	Pin 20	CGND
Pin 21	CGND	Pin 22	CGND	Pin 23	CGND	Pin 24	CGND

4.7 LED

Description of indicator:

Indicator	**Definition**
Status	Indicator for status
DIDO 1~12	Indicator for DIDO channel

Description of LED color:

Color	**Description**
Status Green	The device powers on normally.
DIDO Green	The DIDO channels are in working status.

4.8 Optional Accessories

N/A

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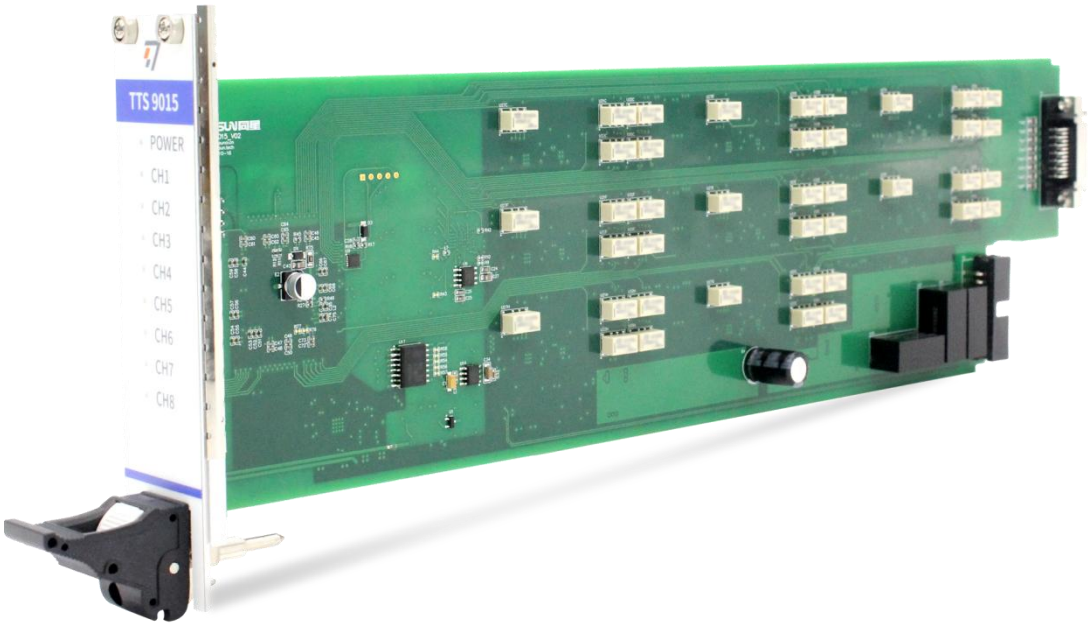
5. TTS9015

5.1 Overview

TTS9015 is an analog output/input board card with a total of 8 independent input/output channels. Each channel supports voltage output, voltage acquisition, current output, and current acquisition functions. When operating in voltage mode, it also supports the function of feedback output voltage. The voltage output supports high voltage output from 0 to 60V, and the voltage acquisition supports a wide voltage range of -60V to +60V or 0 to +60V.



5.2 Specification

- Number of channels: 8 channels (shared for input/output)
- Operating voltage/static power consumption: 12V/6W
- Communication control: CAN 1Mbps
- Relay type: magnetic latching relay
- Board card height: 3U
- Mounting method: chassis slide rail

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5.3 Functional Data

Voltage Output:

Number of Channels	8 channels
Output Range	0V~+60V
DAC Resolution	16bit
Accuracy	±(0.4% + 60mV) When outputting 0V, there may be a maximum voltage of 300mV due to channel differences.
Output Current	The maximum for a single channel is approximately 30mA, with a total maximum of about 10W for 8 channels.

Voltage Acquisition:

Number of Channels	8 channels
Measuring Range	-60V~+60V, 0V~+60V
Sampling Rate	250kHz
ADC Resolution	20bit
Accuracy	±(0.4% + 60mV)
Input Impedance	300KΩ

Current Output:

Number of Channels	8 channels
Output Range	0mA~25mA
DAC Resolution	16bit
Accuracy	±1mA

Current Acquisition:

Number of Channels	8 channels
Measuring Range	0mA~25mA
Sampling Rate	250kHz
ADC Resolution	20bit
Accuracy	±1mA

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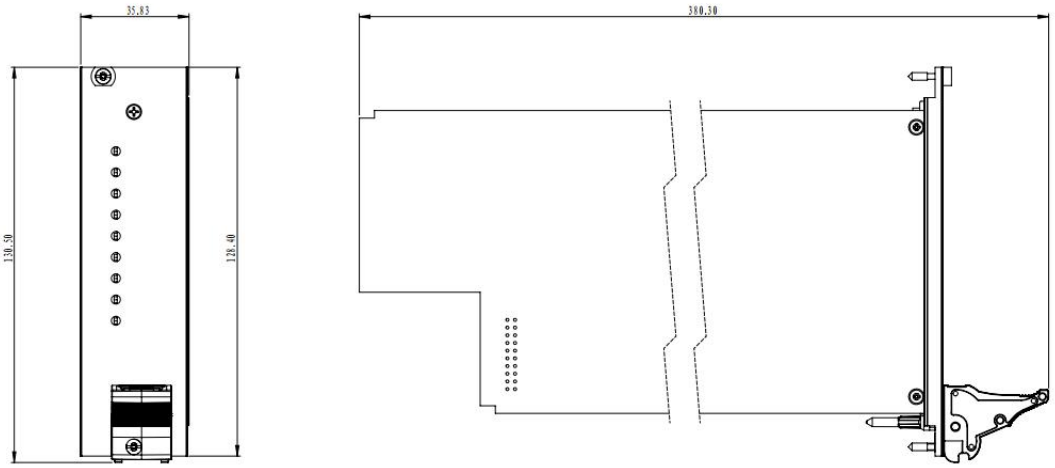
5.4 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	DC power supply	All channel feedback mode for outputting 60V voltage	9	12.0	30	V
Operating Current	DC power supply	All channel feedback mode for outputting 60V voltage	--	0.54	--	A
Power Consumption	DC power supply	All channel feedback mode for outputting 60V voltage	--	6.5	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC

5.5 Mechanical Data



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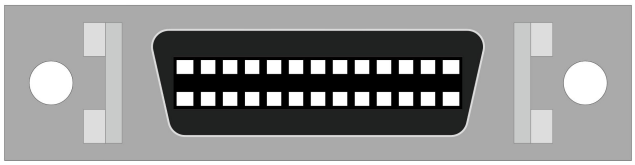
5.6 Hardware Interface



- SCSI-26 Pin interface:

PIN	Definition	PIN	Definition	PIN	Definition	PIN	Definition
Pin 1	CH1+	Pin 2	CH1-	Pin 3	CH2+	Pin 4	CH2-
Pin 5	CH3+	Pin 6	CH3-	Pin 7	CH4+	Pin 8	CH4-
Pin 9	CH5+	Pin 10	CH5-	Pin 11	CH6+	Pin 12	CH6-
Pin 13	CH7+	Pin 14	CGND	Pin 15	CGND	Pin 16	CGND
Pin 17	CGND	Pin 18	CGND	Pin 19	CGND	Pin 20	CGND
Pin 21	CGND	Pin 22	CGND	Pin 23	CH8-	Pin 24	CGND
Pin 25	CH8+	Pin 26	CH7-				

5.7 LED

Description of indicator:

Indicator	Definition

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Status	Indicator for status
AIAO 1~8	Indicator for AIAO channel

Description of LED color:

Color	**Description**
Status Green	The device powers on normally
AIAO Green	The AIAO channels are in working status

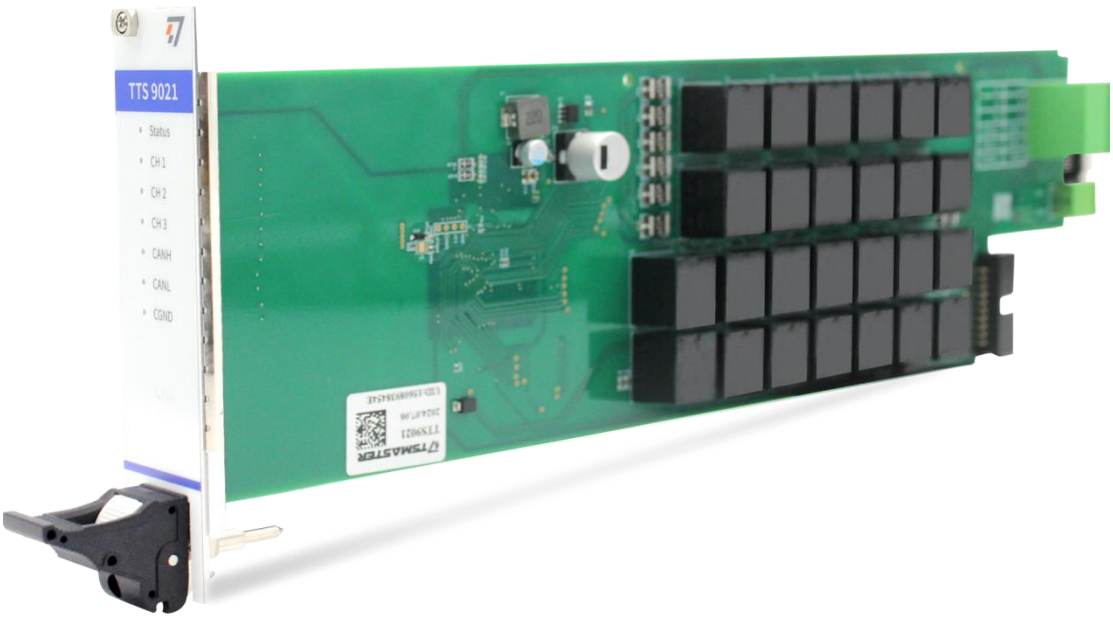
5.8 Optional Accessories

N/A

6.TTS9021

6.1 Overview

TTS9021 is a fault injection board card that can inject four different types of faults, such as power short-circuit, ground short-circuit, inter-channel short-circuit, and inter-channel open-circuit.



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6.2 Specification

- Operating voltage/static power consumption: 12V/0.8W
- Communication control: CAN 1 Mbps
- Relay type: power relay
- Board card height: 3U
- Mounting method: chassis slide rail

6.3 Functional Data

Fault Power Parameters:

Input voltage/Current range	0 ~ 24V / 0 ~ 6A

Fault Function Parameters:

Standard channel (X1-Y1, X2-Y2, X3-Y3)	Short circuit to power VBat
	Short circuit to power ground VGND
	Inter-channel short circuit
	Inter-channel open circuit
CAN channel (CANH, CANL, CAN_GND)	Short circuit to power VBat
	Short circuit to power ground VGND
	Inter-channel short circuit
	Inter-channel open circuit
	Load resistance (0Ω, 60Ω, 120Ω)

6.4 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	DC power supply	Relay in full conducting state	9	12.0	30	V
Operating Current	DC power supply	Relay in full conducting state	--	0.84	--	A
Power Consumption	DC power supply	Relay in full conducting state	--	10.1	--	W

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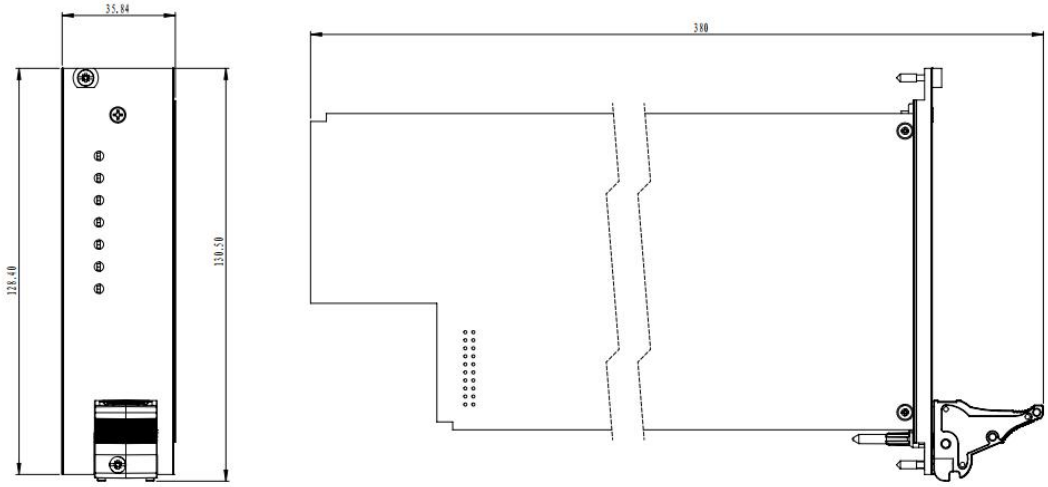
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC

6.5 Mechanical Data



6.6 Hardware Interface

- 2 pin phoenix terminal interface;
- 12 pin phoenix terminal interface:

Y1	X1
Y2	X2
Y3	X3
CANH_out	CANH_in
CANL_out	CANL_in
CGND_out	CGND_in

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6.7 LED

Description of indicator:

Indicator	Definition
Status	Indicator for status
CH1~3, CANH, CANL, CGND	Indicator for channel

Description of LED color:

Color	Description
Status Green	The device powers on normally
Channel Green	No fault injection performed
Channel Red	Fault injection activated

6.8 Optional Accessories

N/A

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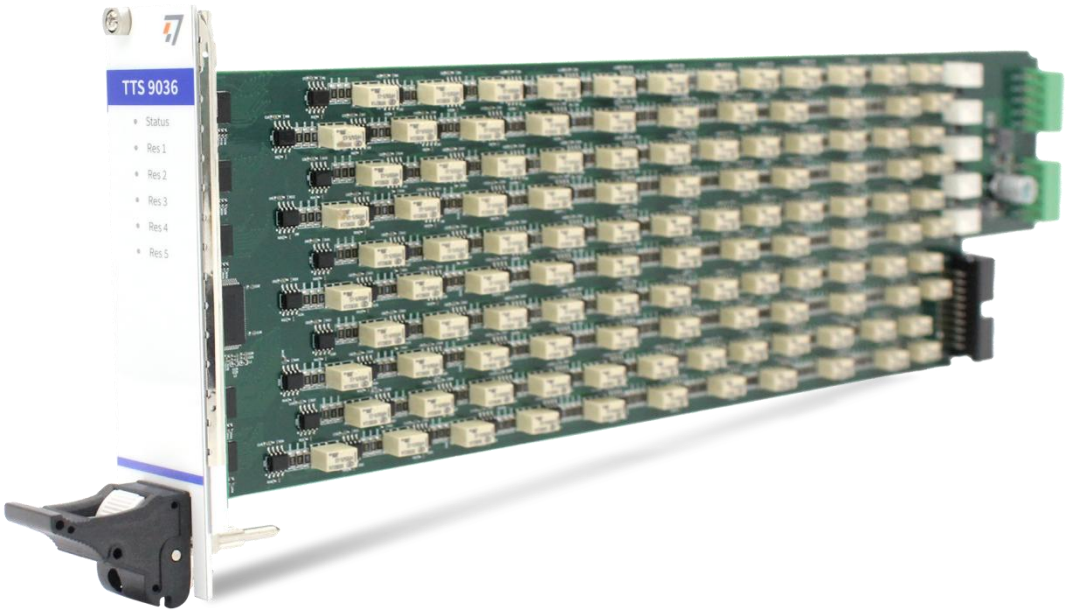
7.TTS9036

7.1 Overview

TTS9036 is a resistance board card with a total of 5 independent channels. Each channel can output resistance from 1 to 4194303Ω. In cases where the resolution or range is insufficient, the channels can also be used in parallel or series. This resistance board can be used in a wide range of signal systems and can simulate thermistors or other resistive-type sensors.



7.2 Specification

- Number of channels: 5 channels
- Operating voltage/static power consumption: 12V/0.6W
- Communication control: CAN 1 Mbps
- Relay type: magnetic latching relay
- Board card height: 3U
- Mounting method: chassis slide rail

7.3 Functional Data

Output Resistance Range	1Ω~4194303Ω

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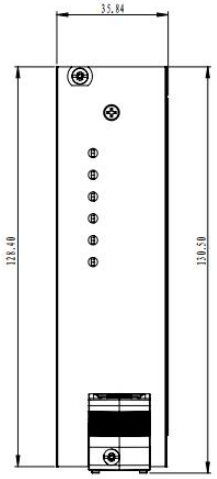
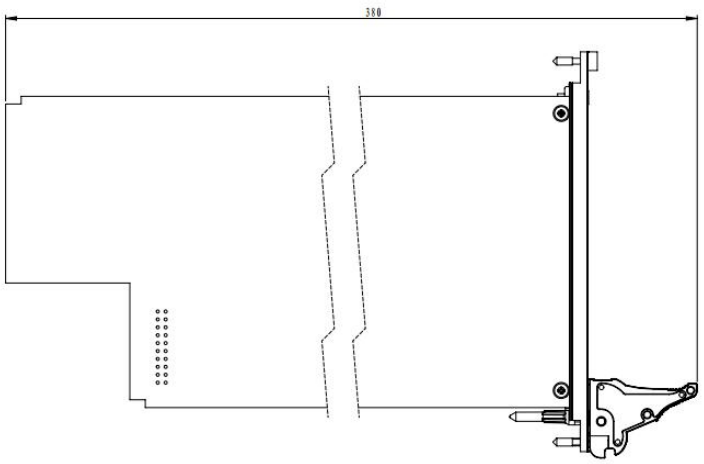
Step Value	1Ω
Resistance Accuracy	1Ω~500Ω, accuracy ±0.5Ω 500Ω~4194303Ω, accuracy±0.1%
Resistance Power	1/4W

7.4 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	DC power supply	Output resistance value	9	12.0	32	V
Operating Current	DC power supply	Output resistance value	--	0.32	--	A
Power Consumption	DC power supply	Output resistance value	--	3.9	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC

7.5 Mechanical Data





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7.6 Hardware Interface

- 5 pin phoenix terminal interface:

CH5
CH4
CH3
CH2
CH1

7.7 LED

Description of indicator:

Indicator	**Definition**
Status	Indicator for status
Res1~5	Indicator for channel

Description of LED color:

Color	**Description**
Status Green Flashing	The device powers on normally

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Res Green	The channel is in working status

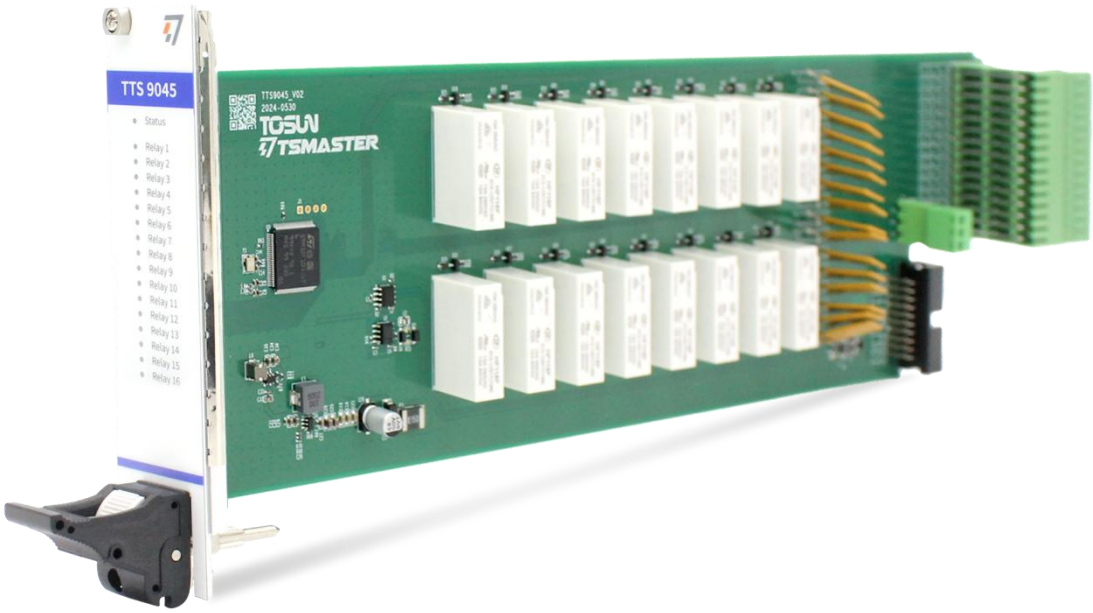
7.8 Optional Accessories

N/A

8.TTS9045

8.1 Overview

TTS9045 is a general-purpose relay board card with 16 channels. Each channel is controlled by one relay, and each relay has three terminals (CH/NO/NC).



8.2 Specification

- Number of channels: 16 channels
- Operating voltage/static power consumption: 12V/0.4W
- Communication control: CAN 1 Mbps
- Relay type: power relay
- Board card height: 3U

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- Mounting method: chassis slide rail

8.3 Functional Data

Channel Overcurrent Capacity	DC 36V 2.5A DC 40V 2A

8.4 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	DC power supply	Relay in conducting state	9	12	32	V
Operating Current	DC power supply	Relay in conducting state	--	0.36	--	A
Power Consumption	DC power supply	Relay in conducting state	--	4.4	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC

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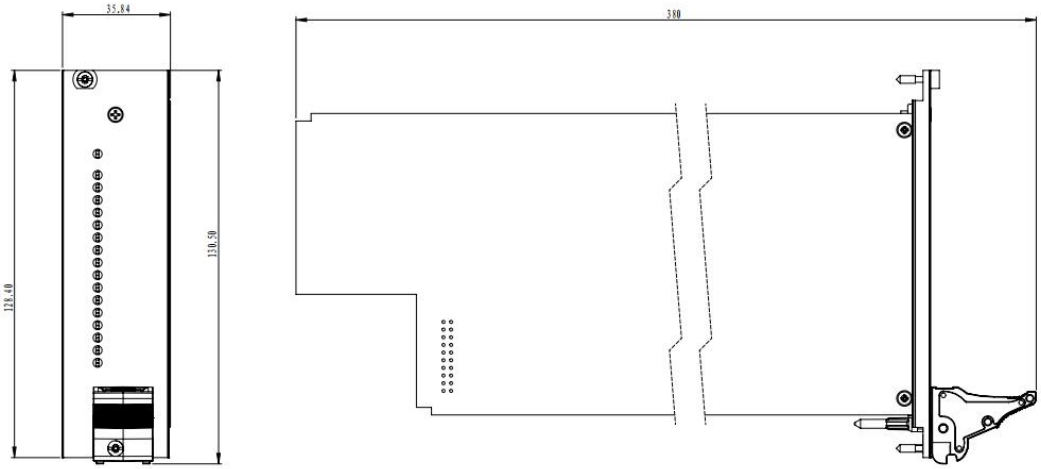
8.5 Mechanical Data



8.6 Hardware Interface

- 45 pin phoenix terminal interface + 3 pin phoenix terminal interface:

CH1	NO1	NC1
CH2	NO2	NC2
CH3	NO3	NC3
CH4	NO4	NC4
CH5	NO5	NC5
CH6	NO6	NC6
CH7	NO7	NC7
CH8	NO8	NC8
CH9	NO9	NC9
CH10	NO10	NC10
CH11	NO11	NC11
CH12	NO12	NC12
CH13	NO13	NC13
CH14	NO14	NC14
CH15	NO15	NC15

NC16

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NO16
CH16

8.7 LED

Description of indicator:

Indicator	**Definition**
Status	Indicator for status
Relay1~16	Indicator for channel

Description of LED color:

Color	**Description**
Status Green	The device powers on normally
Channel Green	Channel and NO in conducting state

8.8 Optional Accessories

N/A

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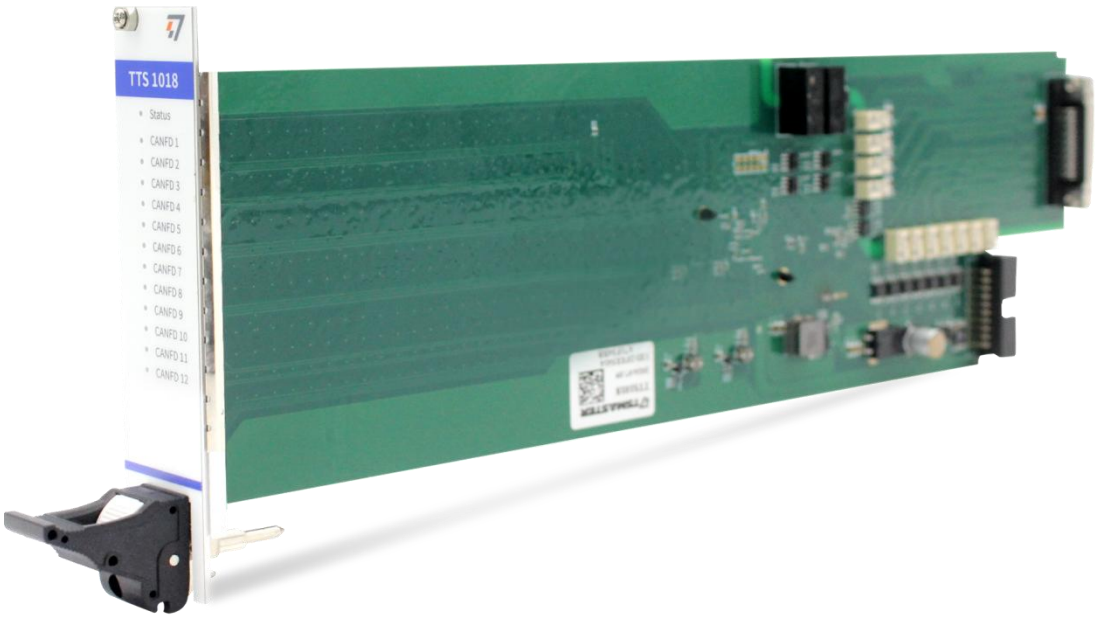
9.TTS1018

9.1 Overview

The TTS1018 is a device featuring twelve CAN FD channels, designed for easy integration into TTS systems of TOSUN with a rack-mount installation. The CAN FD1 channel is connected to the backplane control bus, allowing direct control of other boards on the same bus network. The termination resistor for CAN FD1 is provided by the TTS0001 backplane rack slot and cannot be controlled via software. Other parameters are the same as those of the TOSUN TC1018.

When paired with the powerful TSMaster software, the TTS1018 supports loading DBC and ARXML database files, enabling convenient monitoring, analysis, and simulation of CAN FD bus data. It also supports UDS diagnostics, ECU flashing, CCP/XCP calibration, and other advanced functions.



9.3 Specification

- Number of channels: 12x CAN FD
- Relay type: magnetic latching relay

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- Board card height: 3U
- Mounting method: chassis slide rail

9.3 Features

- ✓ us (microsecond) level hardware message timestamps to meet advanced requirements;
- ✓ Driverless design for Windows and Linux systems, offering excellent system compatibility;
- ✓ CAN channel DC 2500V isolation;
- ✓ Automotive-grade design, supporting dbc files, a2l files, blf files, asc files, and arxml files;
- ✓ CAN channel baud rate adjustable from 125Kbps to 1Mbps, and CAN FD supports a maximum of 8Mbps;
- ✓ Supports blf and asc format data recording and offline/online playback;
- ✓ Supports UDS diagnostics and CCP/XCP calibration;
- ✓ Supports UDS based Bootloader flashing;
- ✓ Supports information security testing;
- ✓ Supports secondary development interfaces for Windows and Linux systems;
- ✓ Except for CAN FD1, each channel has a built-in 120-ohm terminal resistor, with the resistance value configurable through software;
- ✓ Capable of loading all paid licenses for TSMaster.

9.4 Technical Data

Channel	12 *CAN FD
PC Interface	Converted to USB 2.0 via backplane slot
Communication Port Interface	SCSI-37 Pin Interface
Driver	Driverless design for Windows and Linux systems, offering excellent system compatibility
Cache	Hardware cache, with each channel's transmission buffer supporting up to 700 CAN frames
CAN	Supports CAN 2.0 A and B protocols, compliant with the ISO 11898-1 standard, with baud rates from 125Kbps to 1Mbps
CAN FD	Supports CAN FD that complies with both ISO and non-ISO standards, with baud rates from 125Kbps to 8Mbps

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Timestamp Accuracy	1 us, hardware message timestamp, can meet advanced requirements
Terminal Resistor	Built-in 120-ohm terminal resistor, with the resistance value configurable through software (except for channel 1)
Relay Type	Magnetic latching relay
Messages Sent per Second*	Up to 20,000 frames per second
Messages Received per Second*	Up to 20,000 frames per second
Isolate	CAN channel DC 2500V isolation
Power Supply	USB power supply + DC power supply
Power Consumption	4.5W
Operating Humidity	10% ～ 90% (non-condensing)
Operating Environment	Keep away from corrosive gases

*Single channel 1Mbps, with a 0-byte data field.

9.5 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	USB power supply	CAN transmission	4.8	5.0	5.2	V
	DC power supply	CAN transmission	9	12	32	V
Operating Current	USB power supply	CAN transmission	--	0	--	A
	DC power supply	CAN transmission	--	0.35	--	A
Power Consumption	USB power supply	CAN transmission	--	4.2	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Terminal resistor	Terminal resistor enabled	--	120	--	Ω
	Isolation withstand	Leakage current less than 1mA	2500	--	--	VDC

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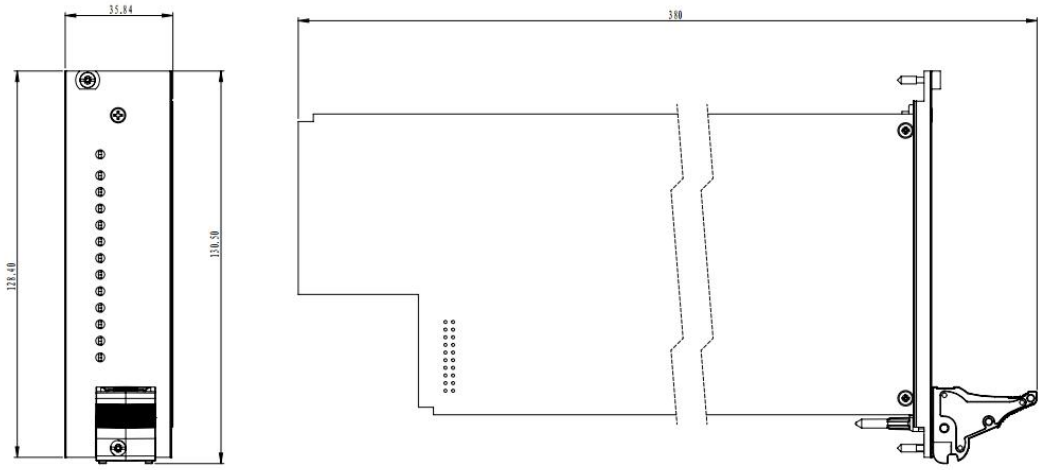
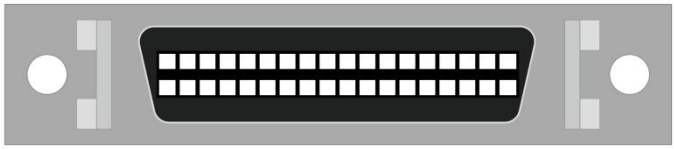
	voltage					

9.6 Mechanical Data



9.7 Hardware Interface



PIN	Definition	PIN	Definition
Pin 3	CAN_Shield	Pin 4	CGND
Pin 5	CAN2_L	Pin 6	CAN2_H
Pin 7	CAN3_L	Pin 8	CAN3_H
Pin 9	CAN_Shield	Pin 10	CGND
Pin 11	CAN4_L	Pin 12	CAN4_H
Pin 13	CAN5_L	Pin 14	CAN5_H
Pin 15	CAN_Shield	Pin 16	CGND
Pin 17	CAN6_L	Pin 18	CAN6_H
Pin 19	CAN7_L	Pin 20	CAN7_H
Pin 21	CGND	Pin 22	CAN_Shield
Pin 23	CAN8_L	Pin 24	CAN8_H

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Pin 25	CAN9_L	Pin 26	CAN9_H
Pin 27	CGND	Pin 28	CAN_Shield
Pin 29	CAN10_L	Pin 30	CAN10_H
Pin 31	CAN11_L	Pin 32	CAN11_H
Pin 33	CGND	Pin 34	CAN_Shield
Pin 35	CAN12_L	Pin 36	CAN12_H

9.8 LED

Description of indicator:

Indicator	**Definition**
Status	Indicator for hardware connection
CAN FD 1~12	Indicator for channel

Description of LED color:

Color	**Description**
Status Green	The device is connected
CAN FD Green	CAN FD channel data frame is sent or received correctly
CAN FD Red	CAN FD channel sends or receives error frames, indicating a

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	configuration, protocol, or wiring error

9.9 Optional Accessories

1.TCA00011 (CAN surge protection device)

10.TTS1026P

10.1 Overview

The TTS1026P is a device featuring one CAN FD channel and six LIN channels, designed for easy integration into TTS systems of TOSUN with a rack-mount installation. The CAN FD1 channel is connected to the backplane control bus, allowing direct control of other boards on the same bus network. The termination resistor for CAN FD1 is provided by the TTS0001 backplane rack slot and cannot be controlled via software. Other parameters are the same as those of the TOSUN TC1026P.

When paired with the powerful TSMaster software, the TTS1026P supports loading DBC, LDF, and ARXML database files, enabling convenient monitoring, analysis, and simulation of CAN FD/LIN bus data. It also supports UDS diagnostics, ECU flashing, CCP/XCP calibration, and other advanced functions.

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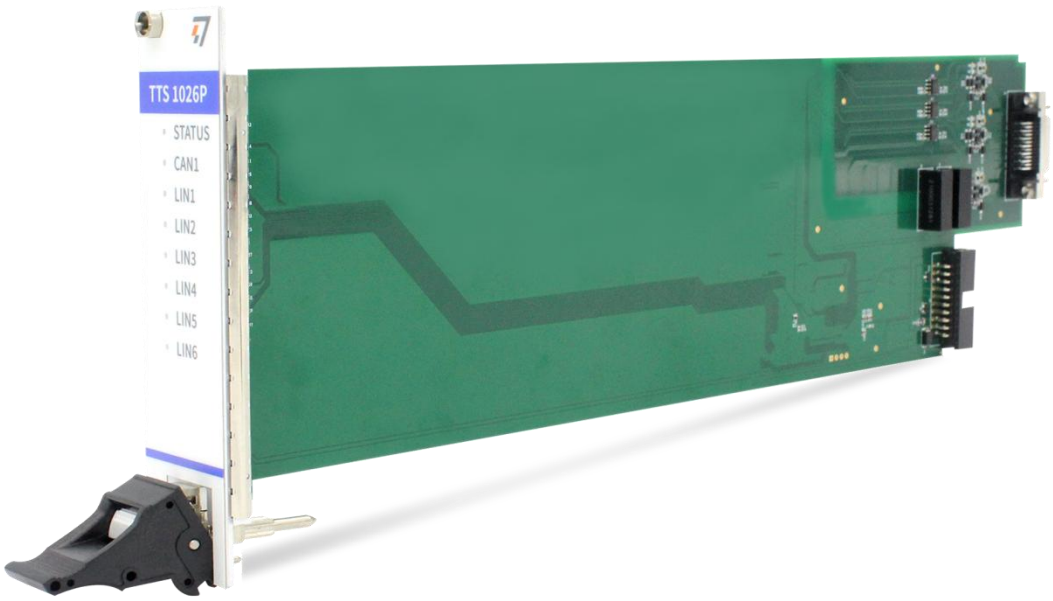

10.2 Specification

- Number of channels: 1x CAN FD;6x LIN
- Relay type: magnetic latching relay
- Board card height: 3U
- Mounting method: chassis slide rail

10.3 Features

- ✓ us (microsecond) level hardware message timestamps to meet advanced requirements;
- ✓ Driverless design for Windows and Linux systems, offering excellent system compatibility;
- ✓ CAN channel DC 2500V isolation;
- ✓ Automotive-grade design, supporting LDF, dbc files, a2l files, blf files, asc files, and arxml files;
- ✓ CAN channel baud rate adjustable from 125Kbps to 1Mbps, and CAN FD supports a maximum of 8Mbps;
- ✓ The LIN bus primary and secondary nodes can be configured via software;
- ✓ Supports blf and asc format data recording and offline/online playback;
- ✓ Supports UDS diagnostics and CCP/XCP calibration;

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- ✓ Supports UDS based Bootloader flashing;
- ✓ Supports LIN bus based UDS diagnostics;
- ✓ Supports information security testing;
- ✓ Supports secondary development interfaces for Windows and Linux systems;
- ✓ Capable of loading all paid licenses for TSMaster.

10.4 Technical Data

Channel	1 *CAN FD / 6 *LIN
PC Interface	Converted to USB 2.0 via backplane slot
Communication Port Interface	SCSI-26 Pin Interface
Driver	Driverless design for Windows and Linux systems, offering excellent system compatibility
Cache	Hardware cache, with each channel's transmission buffer supporting up to 1000 CAN frames
CAN	Supports CAN 2.0 A and B protocols, compliant with the ISO 11898-1 standard, with baud rates from 125Kbps to 1Mbps
CAN FD	Supports CAN FD that complies with both ISO and non-ISO standards, with baud rates from 125Kbps to 8Mbps
LIN	Supports LIN 1.3 and LIN 2.x, with baud rates from 0 to 20Kbps
Schedule Table	Supports LDF files and running schedule tables, and also allows for self-configuration of schedule tables
Timestamp Accuracy	1 us, hardware message timestamp, can meet advanced requirements
Relay Type	Magnetic latching relay
Messages Sent per Second*	Up to 20,000 frames per second
Messages Received per Second*	Up to 20,000 frames per second
Isolate	CAN channel DC 2500V isolation
Power Supply	USB power supply, and external power supply is needed for LIN communication
Power Consumption	2W
Operating Humidity	10% ～ 90% (non-condensing)
Operating Environment	Keep away from corrosive gases

*Single channel 1Mbps, with a 0-byte data field.

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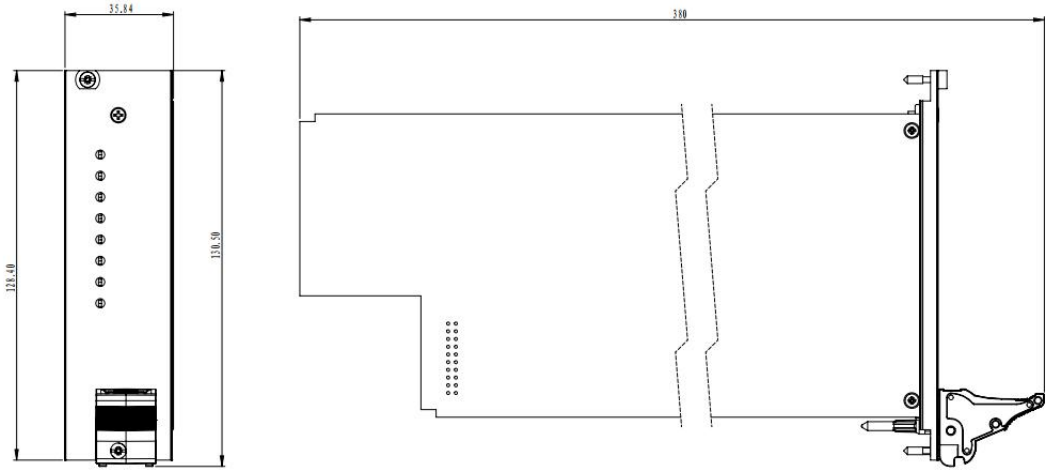
10.5 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	USB power supply	CAN/LIN transmission	4.8	5.0	5.2	V
Operating Current	USB power supply	CAN/LIN transmission	--	0.3	--	A
Power Consumption	USB power supply	CAN/LIN transmission	--	1.5	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC
LIN Interface	Bus pin voltage resistance	LIN1、LIN2	-40	--	40	V

10.6 Mechanical Data



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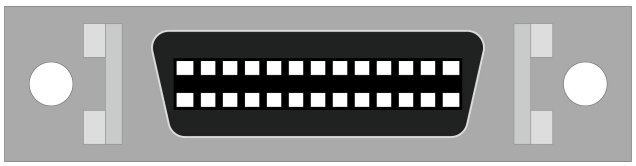
10.7 Hardware Interface



PIN	Definition	PIN	Definition
Pin 1	VCC_LIN1	Pin 2	CGND
Pin 3	LIN1	Pin 4	VCC_LIN2
Pin 5	CGND	Pin 6	LIN2
Pin 7	VCC_LIN3	Pin 8	CGND
Pin 9	LIN3	Pin 10	VCC_LIN4
Pin 11	CGND	Pin 12	LIN4
Pin 14	VCC_LIN5	Pin 15	CGND
Pin 16	LIN5	Pin 17	VCC_LIN6
Pin 18	CGND	Pin 19	LIN6

10.8 LED

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Description of indicator:

Indicator	Definition
Status	Indicator for hardware connection
CAN 1	Indicator for CAN FD channel
LIN 1~6	Indicator for LIN channel

Description of LED color:

Color	Description
Status Green	The device is connected
CAN Green	CAN FD channel data frame is sent or received correctly
CAN Red	CAN FD channel sends or receives error frames, indicating a configuration, protocol, or wiring error
LIN Green	LIN channel data frame is sent or received correctly
LIN Red	LIN channel sends or receives error frames, indicating a configuration, protocol, or wiring error

10.9 Optional Accessories

1.TCA00011 (CAN surge protection device)

11.TTS1034

11.1 Overview

The TTS1034 is a device featuring two CAN FD channels and two FlexRay channels, designed for easy integration into TTS systems of TOSUN with a rack-mount installation. The CAN FD1 channel is connected to the backplane control bus, allowing direct control of other boards on the same bus network. The termination resistor for CAN FD1 is provided by the TTS0001 backplane rack slot and cannot be controlled via software. Other parameters are the same as those of the TOSUN TC1034.

When paired with the powerful TSMaster software, the TTS1034 supports loading DBC and ARXML database files, enabling convenient monitoring, analysis, and simulation of CAN

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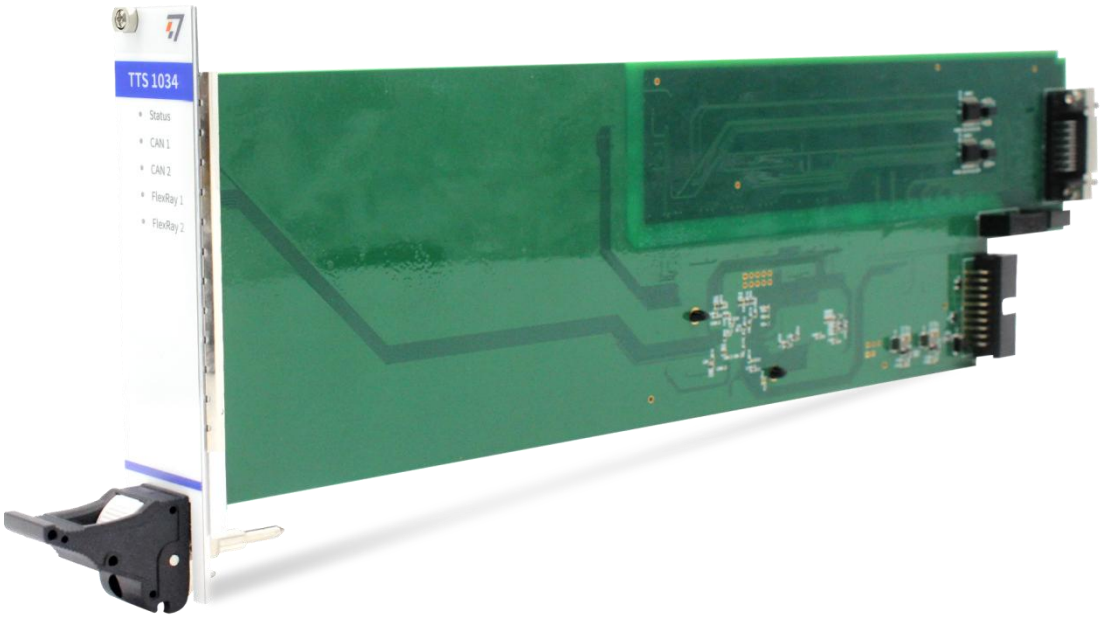
FD/FlexRay bus data. It also supports UDS diagnostics, ECU flashing, CCP/XCP calibration, and other advanced functions.



11.2 Specification

- Number of channels: 2x CAN FD;2x FlexRay
- Relay type: magnetic latching relay
- Board card height: 3U
- Mounting method: chassis slide rail

11.3 Features

- ✓ us (microsecond) level hardware message timestamps to meet advanced requirements;
- ✓ Driverless design for Windows and Linux systems, offering excellent system compatibility;
- ✓ CAN channel DC 2500V isolation;
- ✓ Automotive-grade design, supporting dbc files, a2l files, blf files, asc files, and arxml files;
- ✓ CAN channel baud rate adjustable from 125Kbps to 1Mbps, and CAN FD supports a maximum of 8Mbps;

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- ✓ Supports blf and asc format data recording and offline/online playback;
- ✓ Supports UDS diagnostics and CCP/XCP calibration;
- ✓ Supports UDS based Bootloader flashing;
- ✓ Auxiliary communication controller, eliminating the need to add extra nodes during cold starts;
- ✓ Perfectly adapts to FlexRay, CAN/CAN FD bus applications based on TSMaster;
- ✓ Supports secondary development interfaces for Windows and Linux systems;

FlexRay Functions:

- ➢ Flexible configuration for communication controller buffer;
- ➢ Capable to detect empty frame;
- ➢ Capable of forming composite communication modes through multiple cycles (cycle multiplexing);
- ➢ Supports frame payloads up to a maximum of 254 bytes;
- ➢ Supports PDUs;
- ➢ Features a start-up monitoring function;
- ➢ Supports FlexRay message recording and replay;
- ➢ Supports using two FlexRay channels as two FlexRay nodes (parallel connected).

11.4 Technical Data

Channel	2 *CAN FD / 2 *FlexRay
PC Interface	Converted to USB 2.0 via backplane slot
Communication Port Interface	SCSI-26 Pin interface
Driver	Driverless design for Windows and Linux systems, offering excellent system compatibility
FlexRay	FlexRay channel (A and B)
Cold Start	Supported
Cache	Hardware cache, with each channel's transmission buffer supporting up to 1000 CAN frames
CAN	Supports CAN 2.0 A and B protocols, compliant with the ISO 11898-1 standard, with baud rates from 125Kbps to 1Mbps
CAN FD	Supports CAN FD that complies with both ISO and non-ISO standards, with baud rates from 125Kbps to 8Mbps
Timestamp Accuracy	1 us, hardware message timestamp, can meet advanced requirements

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CAN Terminal Resistor	Built-in 120-ohm terminal resistor, with the resistance value configurable through software (except for channel 1)
FlexRay Terminal Resistor	Built-in 100-ohm terminal resistor, with the resistance value configurable through software (except for channel 1)
Replay Type	Magnetic latching relay
Messages Sent per Second*	Up to 20,000 frames per second
Messages Received per Second*	Up to 20,000 frames per second
Isolate	CAN/FlexRay channel DC 2500V isolation
Power Supply	USB power supply
Power Consumption	3W
Operating Humidity	10% ～ 90% (non-condensing)
Operating Environment	Keep away from corrosive gases

*Single channel 1Mbps, with a 0-byte data field.

11.5 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	USB power supply	CAN/FlexRay transmission	4.8	5.0	5.2	V
Operating Current	USB power supply	CAN/FlexRay transmission	--	0.51	--	A
Power Consumption	USB power supply	CAN/FlexRay transmission	--	2.6	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Terminal resistor	Terminal resistor enabled	--	120	--	Ω
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC
FlexRay Interface	Bus pin voltage resistance	FlexRay_BM、FlexRay_BP	-60	--	60	V

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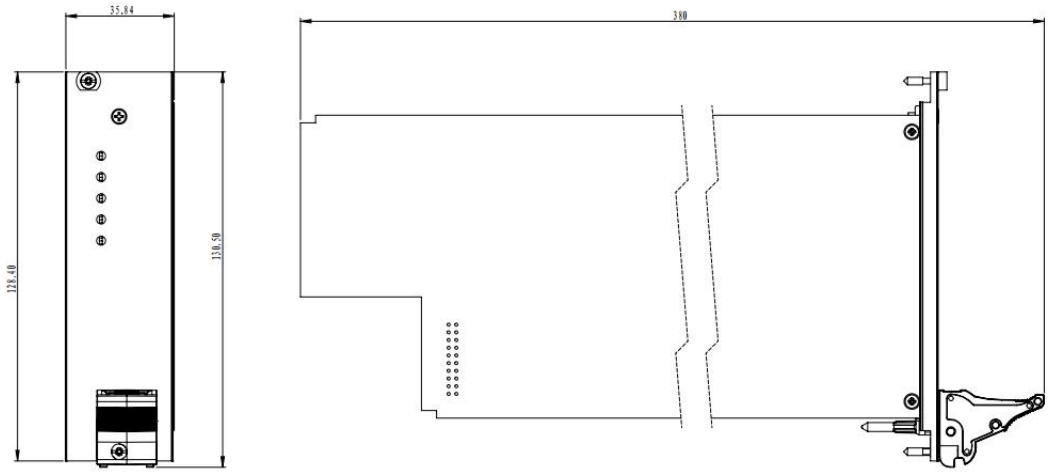
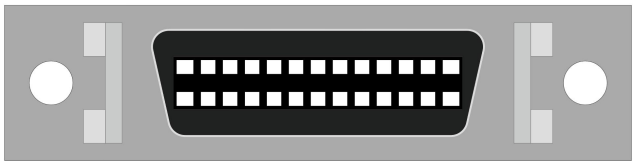
	Terminal resistor	Terminal resistor enabled	--	100	--	Ω
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC

11.6 Mechanical Data



11.7 Hardware Interface



PIN	Definition	PIN	Definition
Pin 1	CAN_Shield	Pin 2	CGND
Pin 5	CAN2_L	Pin 6	CAN2_H
Pin 7	CGND	Pin 8	CGND
Pin 9	FlexRay_BM1	Pin 10	FlexRay_BP1
Pin 11	FlexRay_BM2	Pin 12	FlexRay_BP2
Pin 13	CGND	Pin 21	CGND

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Pin 22	CGND	Pin 23	FlexRay_BP4
Pin 24	FlexRay_BM4	Pin 25	FlexRay_BP3
Pin 26	FlexRay_BM3		

11.8 LED

Description of indicator:

Indicator	**Definition**
Status	Indicator for hardware connection
CAN 1~2	Indicator for CAN FD channel
FlexRay 1~2	Indicator for FlexRay channel

Description of LED color:

Color	**Description**
Status Green	The device is connected
CAN Green	CAN FD channel data frame is sent or received correctly
CAN Red	CAN FD channel sends or receives error frames, indicating a configuration, protocol, or wiring error
FlexRay Green	Flexray channel data frame is sent or received correctly

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FlexRay Red	Flexray channel sends or receives error frames, indicating a configuration, protocol, or wiring error

11.9 Optional Accessories

1.TCA00011 (CAN surge protection device)

12.TTS1016 Pro

12.1 Overview

The TTS1016 Pro is a device featuring four CAN FD channels and two LIN channels, designed for easy integration into TTS systems of TOSUN with a rack-mount installation. The four CAN FD channels support a maximum bus rate of 8 Mbps, while the 2 LIN channels support rates ranging from 0 to 20 kbps.

When paired with the powerful TSMaster software, the TTS1016 Pro supports loading DBC, LDF, and ARXML database files, enabling convenient monitoring, analysis, and simulation of CAN FD/LIN bus data. It also supports UDS diagnostics, ECU flashing, CCP/XCP calibration, and other advanced functions.

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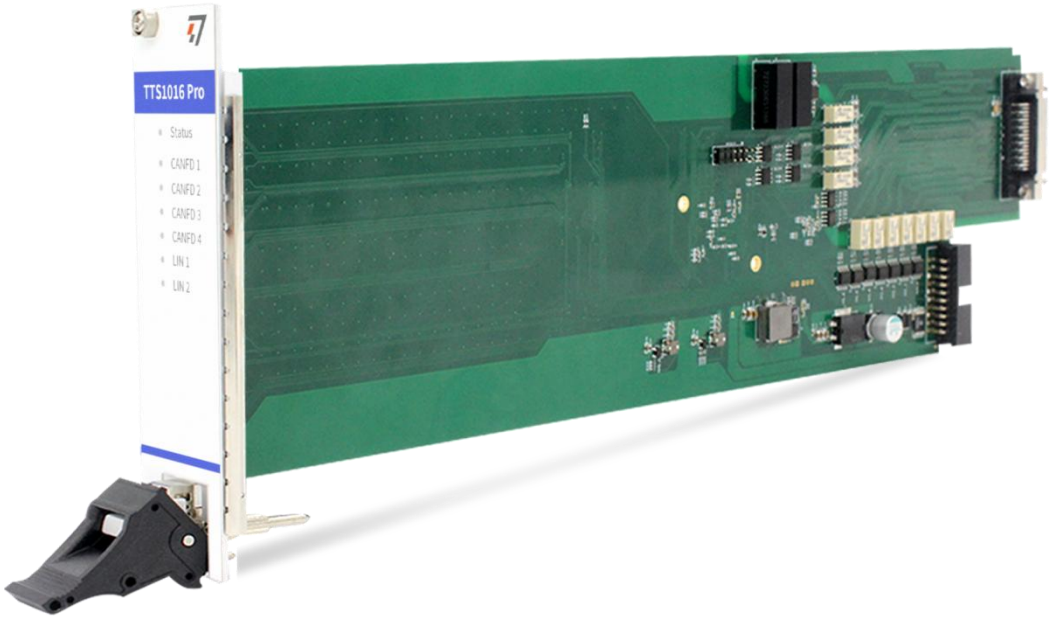

12.2 Specification

- Number of channels: 4x CANFD; 2x LIN
- Relay type: magnetic latching relay
- Board card height: 3U
- Mounting method: chassis slide rail

12.3 Features

- ✓ us (microsecond) level hardware message timestamps to meet advanced requirements;
- ✓ Driverless design for Windows and Linux systems, offering excellent system compatibility;
- ✓ CAN channel DC 2500V isolation;
- ✓ Automotive-grade design, supporting LDF, dbc files, a2l files, blf files, asc files, and arxml files;
- ✓ CAN channel baud rate adjustable from 125Kbps to 1Mbps, and CAN FD supports a maximum of 8Mbps;
- ✓ LIN bus master/slave node configurable via software;
- ✓ Supports blf and asc format data recording and offline/online playback;
- ✓ Supports UDS diagnostics and CCP/XCP calibration;
- ✓ Supports UDS based Bootloader flashing;

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- ✓ Supports UDS diagnostics based on the LIN bus;
- ✓ Supports secondary development interfaces for Windows and Linux systems;
- ✓ Capable of loading all paid licenses for TSMaster.

12.4 Technical Data

Channel	4 *CAN FD / 2 *LIN
PC Interface	Converted to USB 2.0 via backplane slot
Communication Port Interface	SCSI-26 Pin Interface
Driver	Driverless design for Windows and Linux systems, offering excellent system compatibility
Cache	Hardware cache, with each channel's transmission buffer supporting up to 1000 CAN frames
CAN	Supports CAN 2.0 A and B protocols, compliant with the ISO 11898-1 standard, with baud rates from 125Kbps to 1Mbps
CAN FD	Supports CAN FD that complies with both ISO and non-ISO standards, with baud rates from 125Kbps to 8Mbps
LIN	Supports LIN 1.3 and LIN 2.x, with baud rates from 0 to 20Kbps
Schedule Table	Supports LDF files and running schedule tables, and also allows for self-configuration of schedule tables
Timestamp Accuracy	1 us, hardware message timestamp, can meet advanced requirements
Relay Type	Magnetic latching relay
Messages Sent per Second*	Up to 20,000 frames per second
Messages Received per Second*	Up to 20,000 frames per second
Isolate	CAN channel DC 2500V isolation
Power Supply	USB power supply + DC power supply
Power Consumption	5W
Operating Humidity	10% ～ 90% (non-condensing)
Operating Environment	Keep away from corrosive gases

*Single channel 1Mbps, with a 0-byte data field.

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12.5 Electrical Data

Parameter		Test Condition	Minimum Value	Typical Value	Maximum Value	Unit
Operating Voltage	USB power supply	CAN transmission	4.8	5.0	5.2	V
	DC power supply	CAN transmission	9	12	32	V
Operating Current	USB power supply	CAN transmission	--	0	--	A
	DC power supply	CAN transmission	--	0.24	--	A
Power Consumption	USB power supply	CAN transmission	--	2.9	--	W
CAN Interface	Bus pin voltage resistance	CANH、CAHL	-58	--	58	V
	Terminal resistor	Terminal resistor enabled	--	120	--	Ω
	Isolation withstand voltage	Leakage current less than 1mA	2500	--	--	VDC
LIN Interface	Bus pin voltage resistance	LIN1、LIN2	-40	--	40	V

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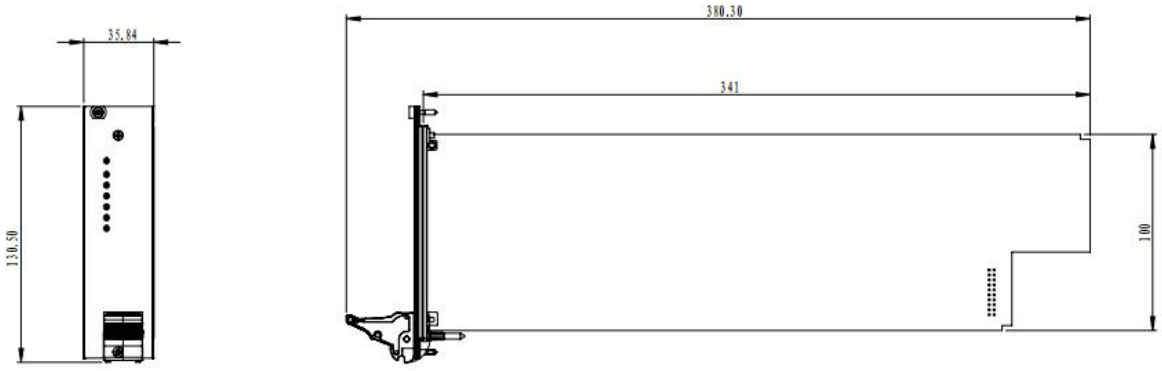
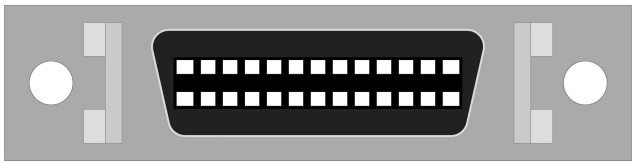
12.6 Mechanical Data



12.7 Hardware Interface



PIN	Definition	PIN	Definition
Pin 1	CAN_Shield	Pin 2	GND
Pin 3	CAN1_L	Pin 4	CAN1_H
Pin 5	CAN2_L	Pin 6	CAN2_H
Pin 7	CAN_Shield	Pin 8	GND
Pin 9	CAN3_L	Pin 10	CAN3_H
Pin 11	CAN4_L	Pin 12	CAN4_H
Pin 13	CAN_Shield	Pin 14	GND
Pin 15	LIN1	Pin 16	GND
Pin 17	LIN2	Pin 18	GND
Pin 19	VCC	Pin 20	GND

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12.8 LED

Description of indicator:

Indicator	**Definition**
Status	Indicator for hardware connection
CAN 1~4	Indicator for CAN FD channel
LIN 1~2	Indicator for LIN channel

Description of LED color:

Color	**Description**
Status Green	The device is connected
CAN Green	CAN FD channel data frame is sent or received correctly
CAN Red	CAN FD channel sends or receives error frames, indicating a configuration, protocol, or wiring error
LIN Green	LIN channel data frame is sent or received correctly
LIN Red	LIN channel sends or receives error frames, indicating a configuration, protocol, or wiring error

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12.9 Optional Accessories

1. TCA00011 (CAN surge protection device)

13. TTS8012

Under development, stay tuned.

14. TTS8920

Under development, stay tuned.

15. TTS8516

Under development, stay tuned.

16. Quick Start

16.1 Software Overview

TSMaster is a powerful and comprehensive tool that can connect, configure, and control all TOSUN hardware tools and devices, enabling functions such as automotive bus embedded code

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generation, monitoring, simulation, development, UDS diagnostics, CCP/XCP calibration, ECU flashing, I/O control, test measurement, and so on.

TSMaster supports Matlab Simulink co-simulation and CarSim dynamic model ECU algorithm simulation testing (soft real-time HIL). It provides users with a series of convenient functions and editors, allowing them to directly execute ECU code within TSMaster and supports C script and Python script editing. At the same time, TSMaster also offers a mini-program function, enabling users to customize the simulation test panel, test process, test logic, and even the entire test system, and automatically generate reports. The code written by users based on TSMaster is hardware-independent, and can be easily shared, referenced, and used on different hardware platforms.

TSMaster supports multiple commonly used bus tool brands, including Vector, Kvaser, PEAK, IXXAT, as well as mainstream instruments in the market (such as oscilloscopes, waveform generators, and digital multimeters) and boards (such as AI, DI, DO, etc.). Its design concept is to perfectly integrate with the test system to achieve joint simulation and testing of multiple hardware and multiple channels. This enables TSMaster to meet the PV/DV test verification needs for various automotive electronic components and assemblies, as well as the inspection requirements for the production line.

16.2 Software Installation

TSMaster software download link:

https://www.tosunai.com/downloads

If the link is not accessible, you can contact the corresponding sales personnel or visit the official TOSUN website to obtain the software. Meanwhile, you can scan the QR code to follow the TOSUN official account to get the download link.

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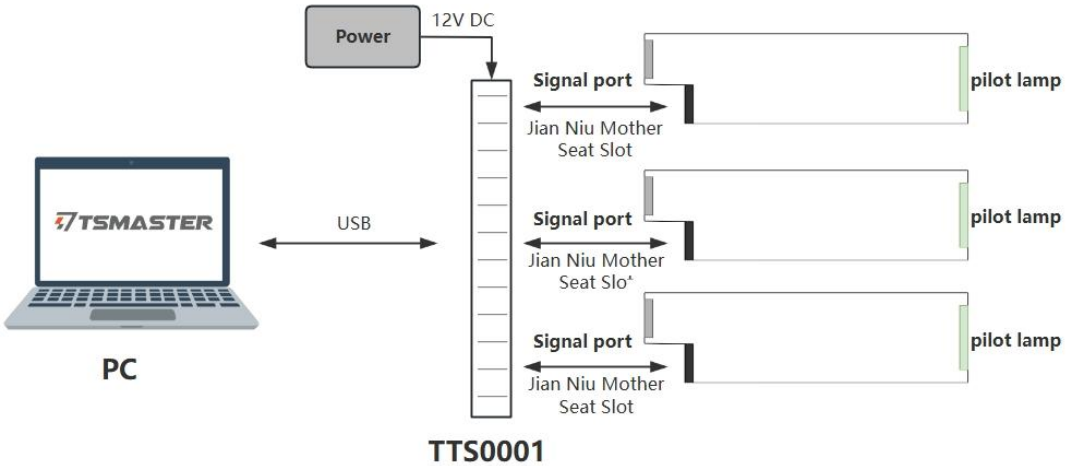
After the installation，you can see the following software on the PC.

16.3 Use TSMaster with the Hardware

16.3.1 Bus Communication Analysis Board Cards

For bus communication analysis board cards, such as TTS1018, TTS1026P, and TTS1034, simply insert the board cards into the slots of the TTS0001 (in some cases, the TTS0001 needs to be powered), and the board cards can be used by connecting the corresponding USB interface of the TTS0001 to a computer. As shown in below figure:



In TSMaster, click Hardware-Channel Selection. In the channel selection GUI, select the device you want to connect.

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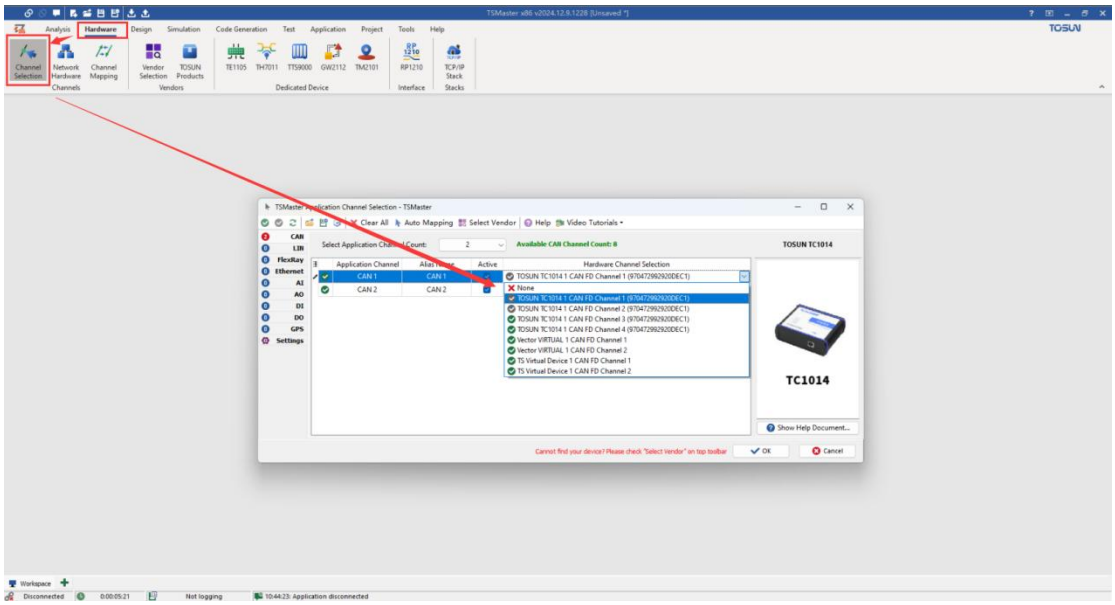
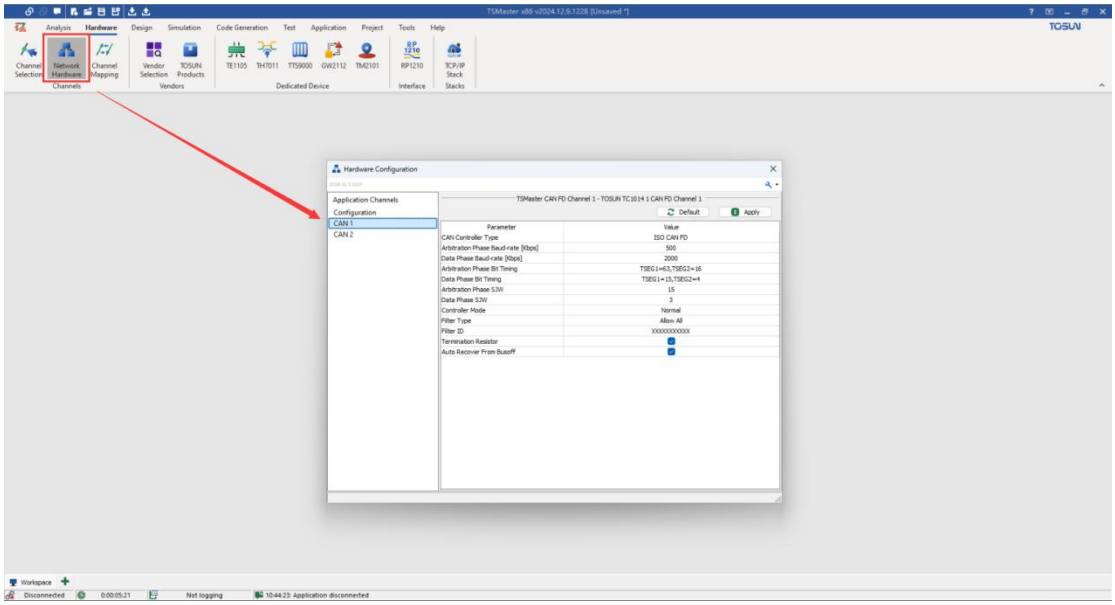


In Network Hardware, a series of controller parameters can be configured, such as protocol, baud rate, controller mode, and whether to enable the terminal resistor.



After the configuration, click Analysis->Start and connect the hardware to efficiently carry out works such as bus development, testing, ECU production line, etc. with the powerful TSMaster software. For more detailed instructions on using the TSMaster software, please refer to the TSMaster software manual and the quick start guide.

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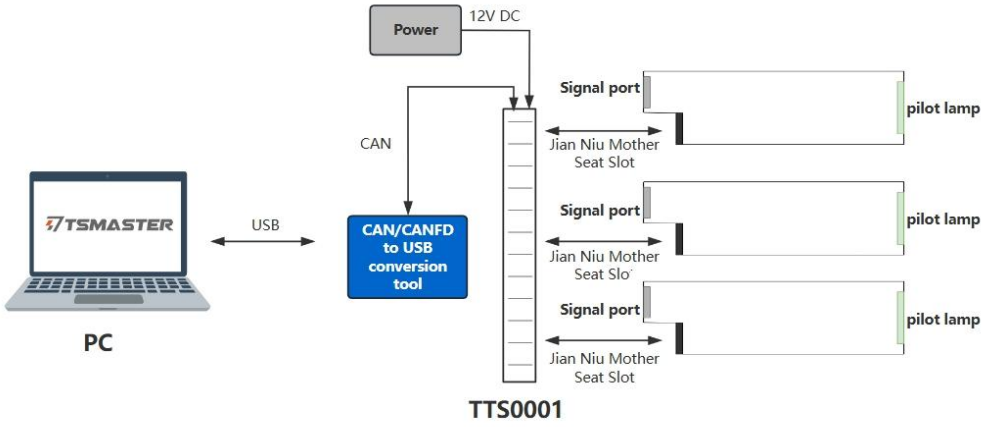
16.3.2 HIL Simulation Test Board Cards

For HIL simulation test board cards, such as TTS9011, TTS9015, TTS9021, TTS9036, and TTS9045, insert the board cards into the slots of the TTS0001, power the TTS0001, and connect the CAN communication cable of the TTS0001 to any TOSUN CAN/CAN FD-to-USB tool. By connecting the CAN/CAN FD tool to a computer, on the computer side, you can use the board card functions via CAN communication.



Basic Usage:

To help users understand the board card's functions and make the usage easier, TOSUN has designed a graphical board card control interface for user. To select the CAN channel for communication with the board card, click the button shown in the figure below.

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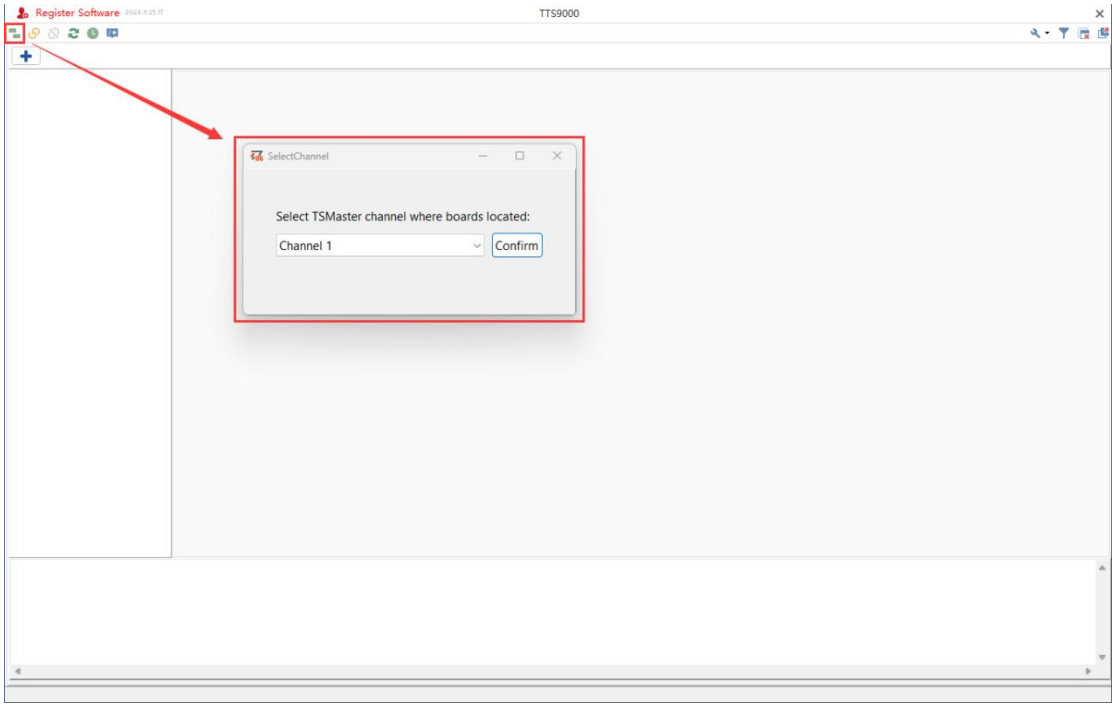
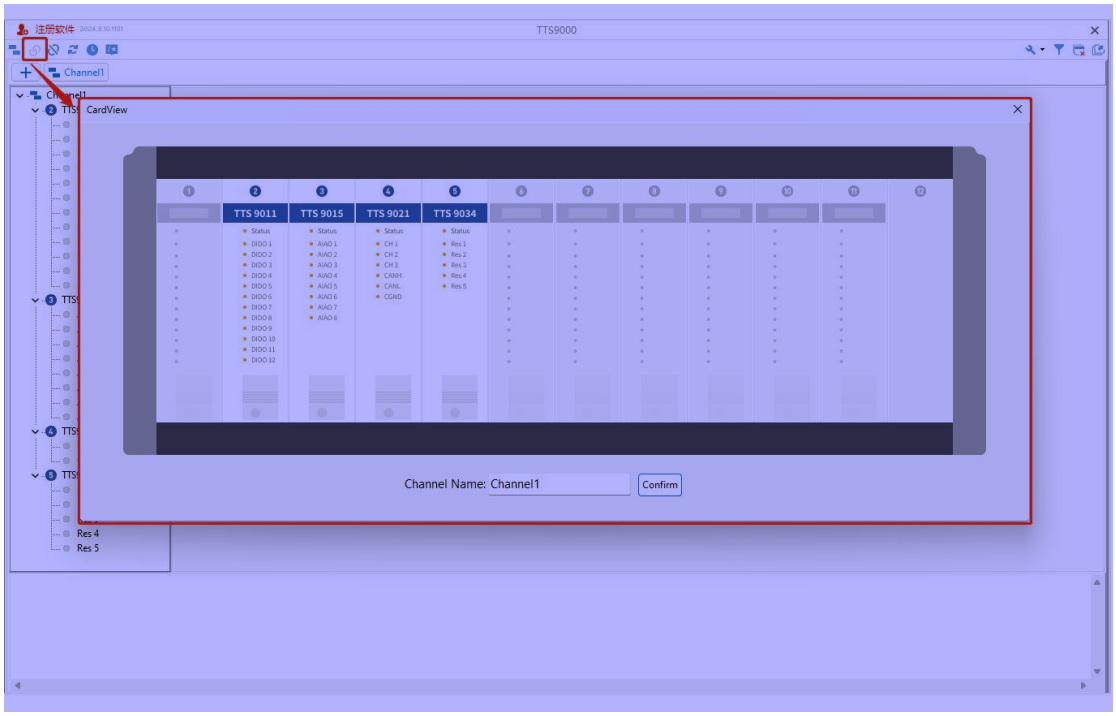


After the connection is established, all board cards inside the TTS chassis will be displayed on the interface according to their corresponding positions in the chassis.



Taking TTS9015 as an example, to achieve a 30V voltage output on channel 1, simply select channel 1 of TTS9015 on the page, set the channel mode to 0-60V voltage output, and enter 30V for the voltage.

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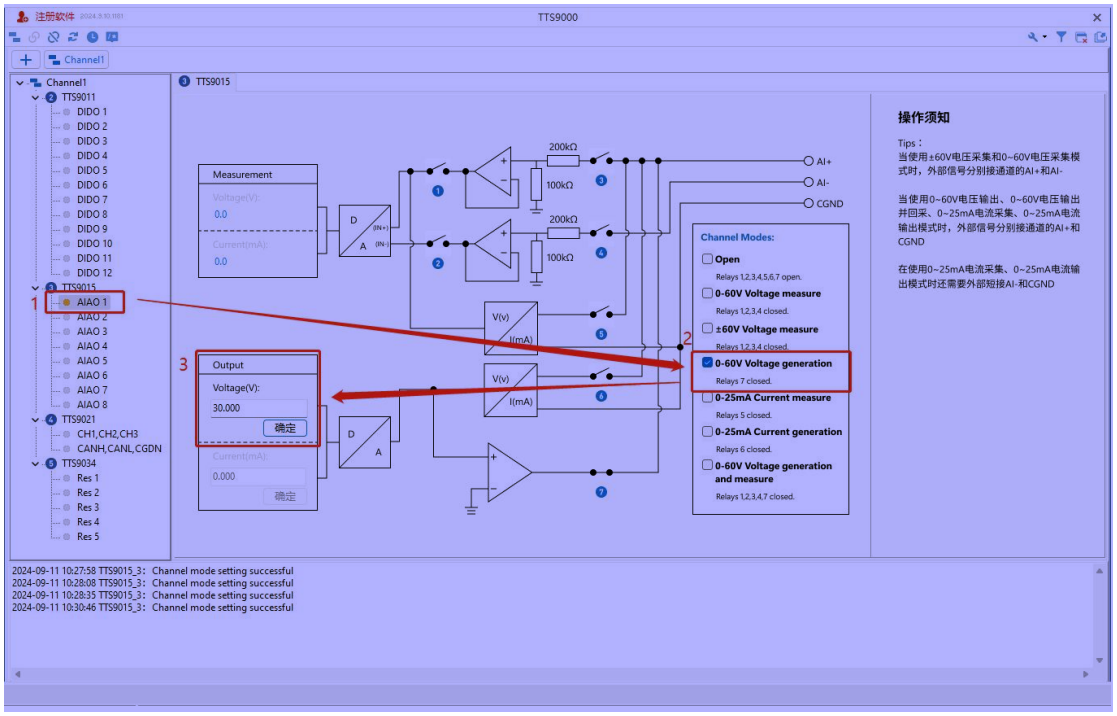

Other functions and board cards have similar operation logic. For more information, please refer to the operation guidelines within the software interface and the TSMaster software manuals.

Advanced Usage:

Users can also flexibly use the board cards by loading the TTS board card database or calling APIs to meet customization and automation needs in certain scenarios.

Before that, it's important to understand that the board cards are controlled through CAN messages. The control message IDs for TOSUN TTS board cards follow a unified set of rules.

The message type uses an extended data frame, and the ID structure is:

XX: (message type encoding)

00	Request type, the message is sent to the board card
08	Response type, the message is sent by the board card in response to the control message
18	Active report type, the message reported in real-time by the board card when the board card is in normal operating status.

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0N: (board card number, the position of the board card in the chassis slot)

00	Board card located in chassis slot 1
01	Board card located in chassis slot 2
02	Board card located in chassis slot 3
03	Board card located in chassis slot 4
...	And so on...
0F	Board card located in chassis slot 16

YY: (board card type)

18/19	TTS9011 board card
06	TTS9015 board card
14	TTS9021 board card
1B	TTS9036 board card
03	TTS9045 board card

ZZ: (command type)

TTS9015	26	Set output analog value
	04	Set message cycle
	27	Get output analog value
	25	Get input analog value
	61	Set/get channel mode, board card self-calibration
TTS9021	04	Set message cycle
	62	Set/get fault
TTS9036	61	Set channel mode
	04	Set message cycle
	29	Get output resistance value
	28	Set output resistance value
TTS9045	04	Set message cycle
	0E	Get relay status
	0D	Set relay status
TTS9011	(18)04	Set message cycle
	(18)07	Get collected level

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	(18)1C	Get collected PWM duty cycle
	(18)19	Get collected PWM frequency
	(18)12	Get collected PWM frequency and duty cycle
	(18)61	Set modes for channels 1 to 6
	(19)06	Get output level
	(19)05	Set output level
	(19)04	Set message cycle
	(19)1B	Get output PWM duty cycle
	(19)18	Get output PWM frequency
	(19)1A	Set output PWM duty cycle
	(19)17	Set output PWM frequency
	(19)11	Get output PWM frequency and duty cycle
	(19)10	Set output PWM frequency and duty cycle
	(19)61	Set modes for channels 7 to 12

Through Database:

By loading the TTS board card database in TSMaster, users can directly send all the above messages to control the board card and also perform signal analysis on the messages reported by the board card. Taking TTS9011 as an example, after loading the database in TSMaster, in the CAN message information window, the signal values of the messages reported by TTS9011 will be automatically parsed, as shown below:

At the same time, users can view all control messages for TTS9011 in the CAN database. By

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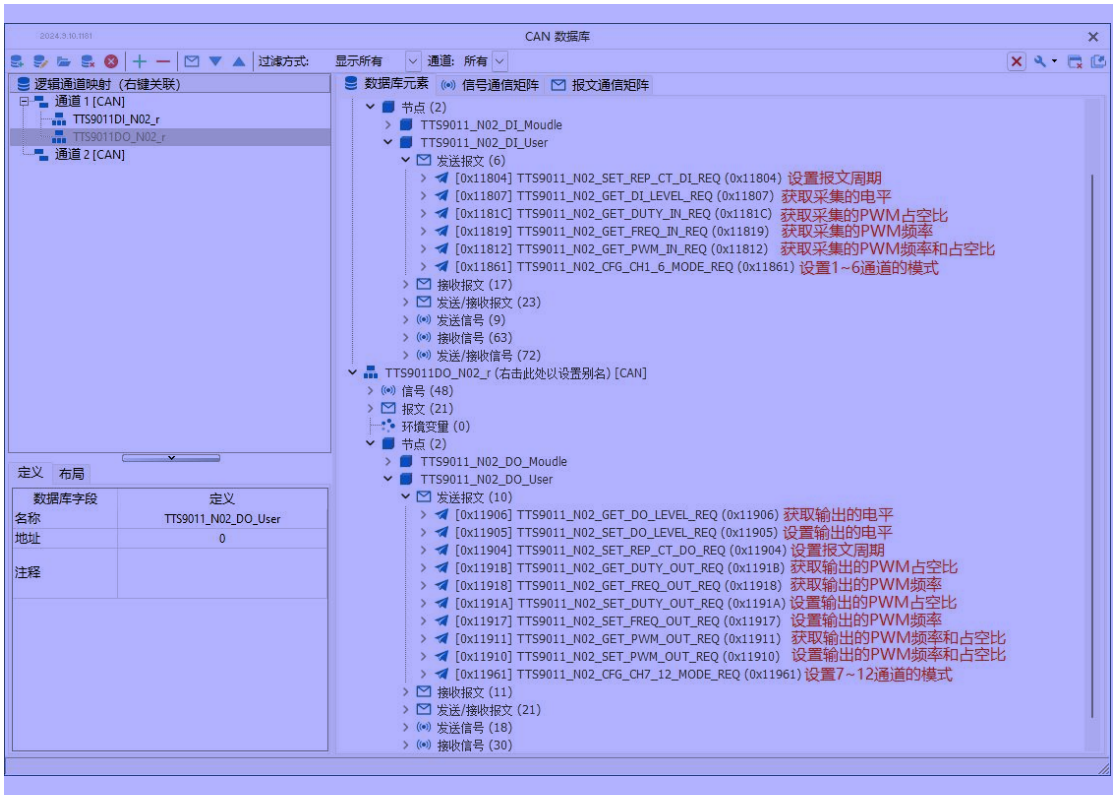
selecting and sending a message, users can control the board card to execute the corresponding function.



Though API:

Interacting with the HIL board cards through APIs further satisfies the needs of automation testing, real-time data monitoring and collection, and customer customization. It also significantly improves testing efficiency and reliability. Taking TTS9011 as an example, API calls can be used to achieve functions such as output and collect high and low levels, output and collect PWM signals, etc., as shown in the figure below.

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```
    tscard_connect,
    tscard_connect_by_serialnum,
    tscard_set_can_channel,
    tscard_name_hardware_card_sync,
    tscard_name_hardware_card_async,
    tscard_read_card_name_sync,
    tscard_add_new_card,
    tscard_check_card_is_ready,
    tscard_check_card_is_ready_by_id,
    tscard_add_new_card_by_id,
    tscard_remove_card,
    tscard_enable_cyclic_report_sync,
    tscard_enable_cyclic_report_async,
  //Digital I/O Function
    tscard_set_io_level_sync,
    tscard_set_io_level_async,
    tscard_set_io_level_signal_async,
    tscard_read_di_sync,
    tscard_read_di_chn_sync,
  //Digital I/O PWM
    tscard_read_pwm_async,
    tscard_set_pwm_frequency_and_duty_sync,
    tscard_set_pwm_frequency_and_duty_async,
    tscard_set_pwm_frequency_sync,
    tscard_set_pwm_frequency_async,
    tscard_read_di_async,
    tscard_read_do_sync,
```

Detailed API usage instructions can be obtained through the TSMaster software API manual, or by visiting the TOSUN official website's resource download page.

17. Inspection and Maintenance

The main electrical components of TTS series products are semiconductor components. Although the equipment has a long service life, they may also accelerate aging and significantly reduce their service life under an incorrect environment. Therefore, during the use of the

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equipment, periodic inspection should be carried out to ensure that the use environment maintains the required conditions.

It is recommended to conduct inspections at least once every 6 months to 1 year. Under improper environmental, more frequent inspections should be conducted. As shown in the table below, if you encounter problems during maintenance, please read the following content to find the possible causes of the problem. If the problem still cannot be solved, please contact Shanghai TOSUN Technology Ltd.

Item	Inspection	Standard	Action
Power Supply	Inspect for voltage fluctuations at the power supply end	USB port +5V DC Power supply port +12V DC	Use a USB power meter/voltage meter to check the power input end. Take necessary actions to keep the voltage fluctuations within the acceptable range.
Surrounding Environment	Check the ambient temperature of the surrounding environment. (Including the internal temperature of enclosed environments)	-40℃~+80℃	Use a thermometer to check the temperature and ensure that the ambient temperature within in the acceptable range.
	Check the ambient humidity. (Including the internal humidity of enclosed environments)	The relative humidity must be within the range of 10% to 90%	Use a hygrometer to check the humidity and ensure that the ambient humidity within the acceptable range.
	Check for the accumulation of dust, powder, salt, and metal shavings	No accumulation	Clean and protect the equipment.
	Check for any contact with water, oil, or chemical sprays on the equipment	No contact	Clean and protect the equipment if necessary.

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	Check for the presence of corrosive or flammable gases in the equipment area	No presence	Inspect by the smell, or using a sensor.
	Check for levels of vibration and shock	Vibration and shock are within the acceptable range	Install padding or other shock-absorbing devices if necessary.
	Check for noise sources near the equipment	No significant noise source	Isolate the equipment from noise sources or protect the equipment.
Wiring Installation	Check the crimped connectors in the external wiring	Ensure enough space between the connectors	Visually inspect and adjust if necessary.
	Check for damage in the external wiring	No damage	Visually inspect and replace the wiring if necessary.

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TOSUN

Engineer Everything !

Software

Support CAN(FD)/LIN/FlexRay/SOME/IP and DoIP

UDS diagnostics/ECU flashing/CCP/XCP calibration

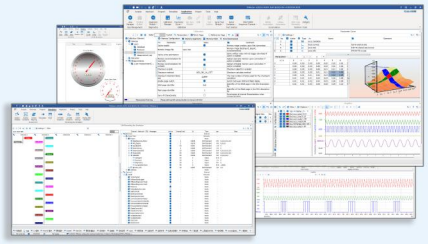
Embedded code generation/Application builder

Encrypted release/Logging and bus replay

Graphical programming/Residual bus simulation

C and Python scripting

Bus monitoring/Transmiting/Automated testing



TSMASTER

Hardware

1/2/4/8/12-channel CAN FD/CAN to USB/PCIe device

1/2/6-channel LIN to USB/PCIe device

Multi channel FlexRay/CAN FD to USB/PCIe device

Multi channel automotive Ethernet/CAN FD to USB/PCIe device

Automotive Ethernet media conversion device (T1 to Tx)

Multi-channel CAN FD/Ethernet/LIN datalogger

TTS test systems

-CAN FD/CAN/FlexRay/LIN communication boards

-Relay and fault injection boards

-Resistors for sensor simulation

-Digital I/O, Analog I/O boards available

CAN CAN FD LIN FlexRay OPEN ALLIANCE

Solutions

- Bus Conformance
- Network Automation Testing System
- Charging Testing System
- EMB Calibration Testing Equipment
- Information Security Solutions
- Steer-by-Wire Chassis Testing Solutions
- EOL Testing Equipment
- Motor Performance
- Durability Testing Solutions
- FCT

About TOSUN

The core product, TSMaster, is a comprehensive tool for automotive R&D, testing, production, and after-sales. It integrates essential functions with hardware support to streamline processes and ensure precision, making it ideal for automotive professionals.

International Organization

ASAM CiA

Quality Assurance

ISO9001:2015

CE Certification

CE

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