CB600F8536A Series, Automotive, 0.1% Tolerance Operating Temperature -40°C~+105°C Shunt Based Current Sensor

1、Characteristics

- Current Sensing: Measurement Range：-20000A~+20000A
  - Continuous Operating Range：-600A~+600A
  - Measurement Accuracy：±0.1% (MAX)
  - Resolution: 1mA
- Temperature Sensing: Measurement Range: -50°C~+150°C
  - Measurement Error: ±3°C (MAX)
  - Resolution: 0.1°C
- Communication Protocol：CAN2.0 A/B
  - Selectable Data Format
  - Configurable CAN ID
  - Configurable CAN Speed：250Kbps/500Kbps/1Mbps
- Supply Voltage：6V~18V
- Operating Temperature Range：-40°C~+105°C
- Power Consumption：≤384mW @12VDC
- Galvanic Isolation：3000VAC

2、Applications

- Automotive Current Monitor
- Grid Energy Storage
- UPS
- Charging Station

3、Introduction

CB600F8536A current sensor is an automotive current sensing module, which can be used to measure bidirectional DC current. Featuring high accuracy, low power consumption, wide operating temperature range, excellent response speed, temperature stability and anti-interference ability.

The sensor is designed based on low-TCR shunt, adopts high-precision ADC, communicates through CAN2.0 A/B protocol, and has large ranges of current and temperature measurement capabilities, and current compensation at whole temperature range.

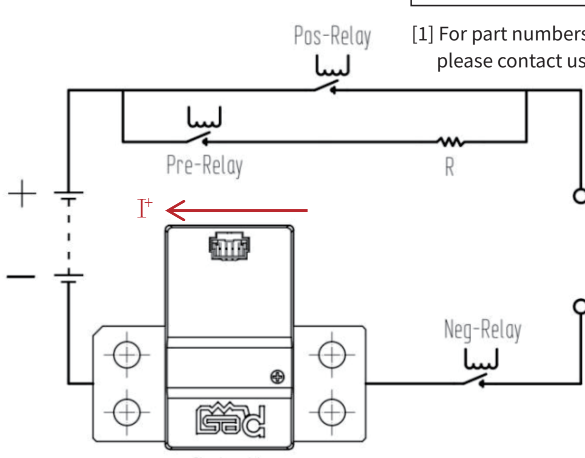
The sensor meets the operating temperature range of -40°C~+105°C, can apply to the continuous operating current of -600A~+600A at the whole temperature range, and the current measurement accuracy is no more than ± 0.1% in the range of +50A~+600A or -600A~-50A.

Power supply of CB600F8536A current sensor is from 6VDC to 18VDC. Its power consumption is controlled below 384mW (12VDC), and it can realize complete high-low voltage isolation, which can be applied to the main positive electrode or the main negative electrode of the battery system.

Sensor Information

Part Number	Shunt Thickness	Resistance	Terminal Resistor
CB600F8536A1SS00	3mm	50μΩ	Yes
CB600F8536A1SN00	3mm	50μΩ	No

[1] For part numbers not included in the table, please contact us for technical support.



Typical Application

Content

4、Revision

Date	Revised Content	Note
2023.01	/	A0
2023.02	Revised maximum supply voltage from 26V to 18V.	A1
2023.04.06	Flat washer is removed in Copper Bar Connection Diagram	A2
2023.08.21	Change the product packaging	A3
2023.09.14	Modify limit parameters of CAN, format B of data frame, order of connector pin and start-up time test curve	A4

5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max.	Unit
Supply Voltage				30	VDC
Current Measurement Range	±1500A			30	s
	±1800A			25	s
	±2500A			15	s
	±3000A			10	s
	±20000A			50	ms
CAN Interface	Configured 120Ω Terminal Resistor (Continuous Power Supply)			6	V
	ESD			8	KV
Operating Temperature		-40		105	℃
Storage Temperature		-40		125	℃
Humidity				95	%RH

5.2 General Parameters

Test Conditions: Ambient Temperature 25℃ (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Power Supply					
Supply Voltage		6	12	18	VDC
Operating Current	6V	20	26	32	mA
	12V	20	26	32	mA
	18V	20	26	32	mA
Power Consumption	6V	120	150	192	mW
	12V	240	300	384	mW
	18V	360	450	576	mW
Start-Up Time	Required time from power-on to sending the first frame valid message	100	130	150	ms
Current Measurement (-40℃~+105℃)					
Accuracy	-50A~+50A		±30	±50	mA
	+50A~+600A or -600A~-50A			±0.1	%
	+600A~+3000A or -3000A~-600A		±0.5	±1	%
	+3000A~+20000A or -20000A~-3000A		±1	±5	%
Duration	-600A~+600A		Continuous		
	±1500A			25	s
	±3000A			5	s
	±20000A			40	ms
Resolution	-600A~+600A		1		mA
	>600A or <-600A		10		mA
Linearity	-600A~+600A		±0.01		%
	>600A or <-600A		±0.1		%

Test Conditions: Ambient Temperature 25 ℃ (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Temperature Measurement					
Measurement Range		-50		+150	℃
Measurement Error	-50℃~+150℃	-3		+3	℃
Resolution			0.1		℃
Power & Temperature Rise					
DC Impedance		45	50	55	μΩ
Inductance				3	nH
Temperature Rise	±600A@25℃ Copper Bus Bar 40mm*3mm, 15Nm			60	℃
	±600A@85℃ Copper Bus Bar 40mm*3mm, 15Nm			60	℃
Communication					
Protocol	CAN2.0A/B				
Communication Speed		250	500	1000	Kbps
Terminal Resistor	With Terminal Resistor	108	120	132	Ω
	Without Terminal Resistor				
Output Rate of Current Message		10	10	1000	ms
Output Rate of Temperature Message		10	100	1000	ms
Isolation					
Galvanic Isolation			3000		VAC
Creepage Distance			6		mm
Clearance			4.5		mm

5.3 Typical Characteristic Curve

5.3.1 Start-Up Time Test Curve

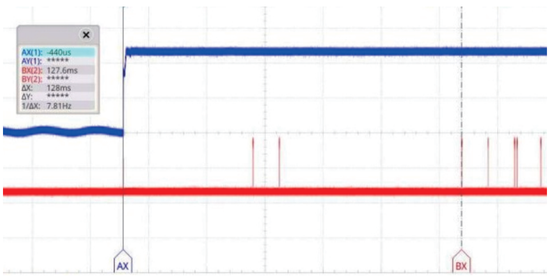


Figure 5-1 Sample1 Start-Up Time Test Curve

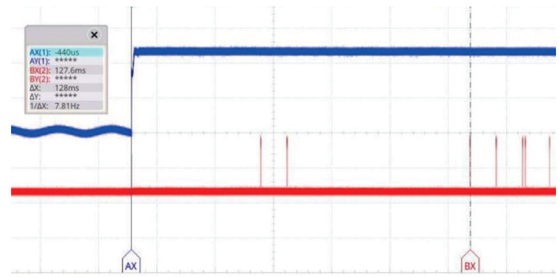


Figure 5-2 Sample2 Start-Up Time Test Curve

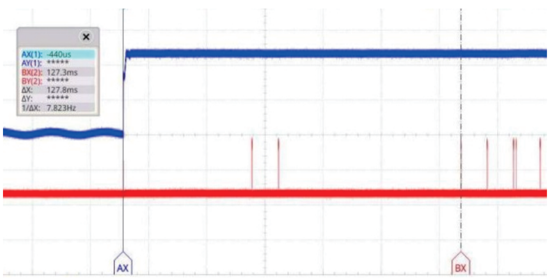


Figure 5-3 Sample3 Start-Up Time Test Curve

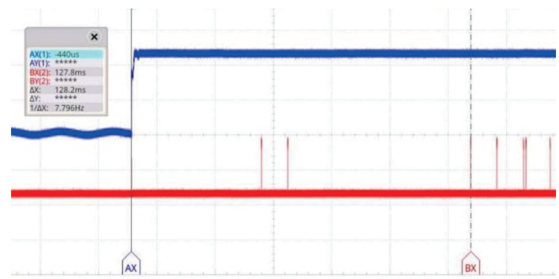


Figure 5-4 Sample4 Start-Up Time Test Curve

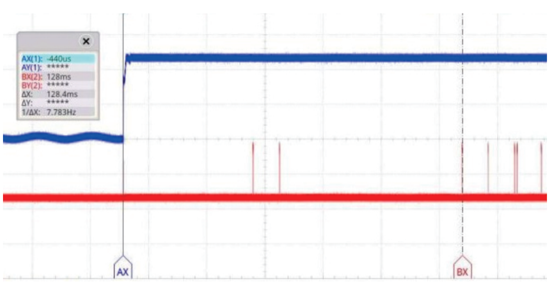


Figure 5-5 Sample5 Start-Up Time Test Curve

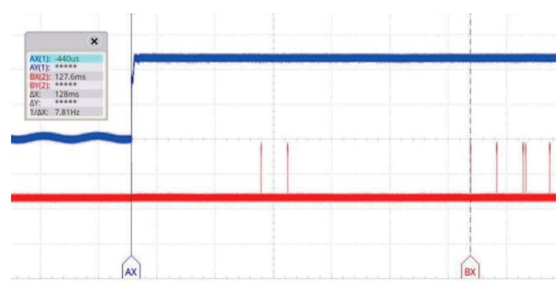


Figure 5-6 Sample6 Start-Up Time Test Curve

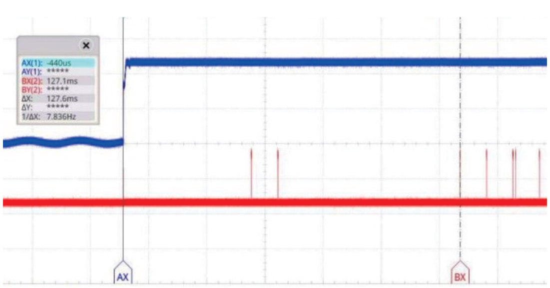


Figure 5-7 Sample7 Start-Up Time Test Curve

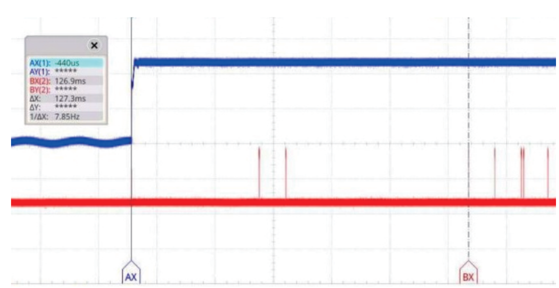


Figure 5-8 Sample8 Start-Up Time Test Curve

[1] A channel acquires data of power supply, VCC and GND.
[2] B channel acquires data of CAN differential signal, CAN_H and CAN_L.
[3] ΔX is the time interval from power-on to sending the first frame valid message

5.3.2 Operating Current Test Curve

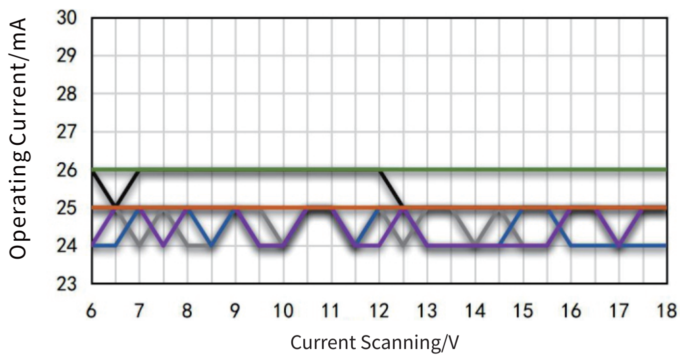


Figure 5-9 + 25℃ Operating Current Curve

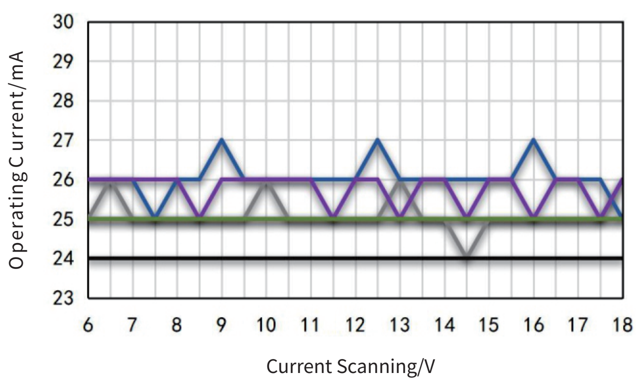


Figure 5-10 - 40℃ Operating Current Curve

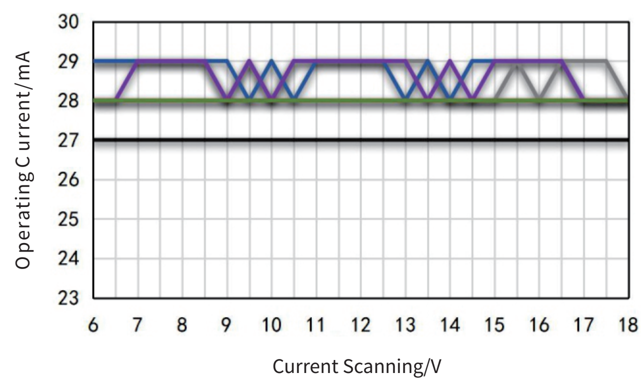


Figure 5-11 + 105℃ Operating Current Curve

5.3.3 O vercurrent Test Curve

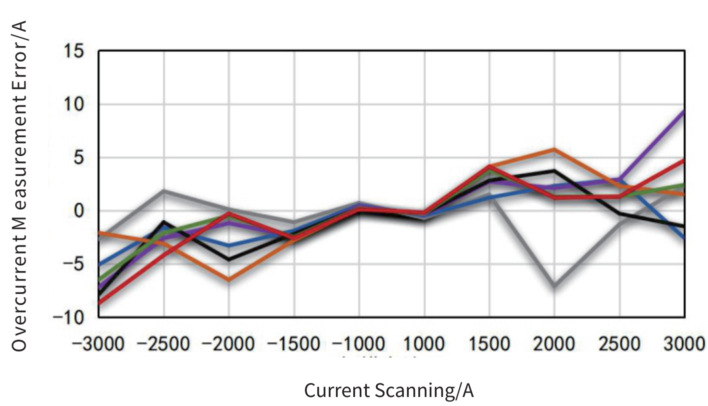


Figure 5-12 + 25℃ Overcurrent Test Curve

5.3.4 Low-Current Accuracy Test Curve

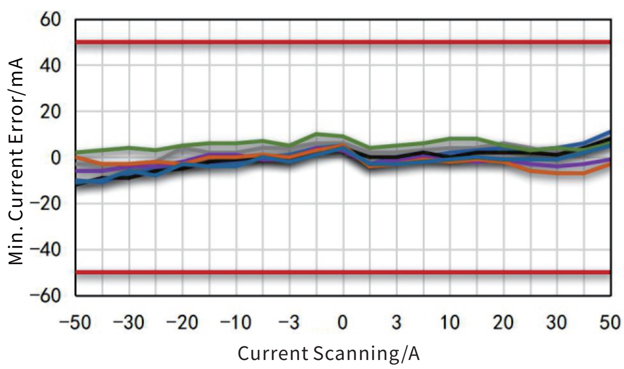


Figure 5-13 - 40℃ Low-Current Test Accuracy @Min. Current Error

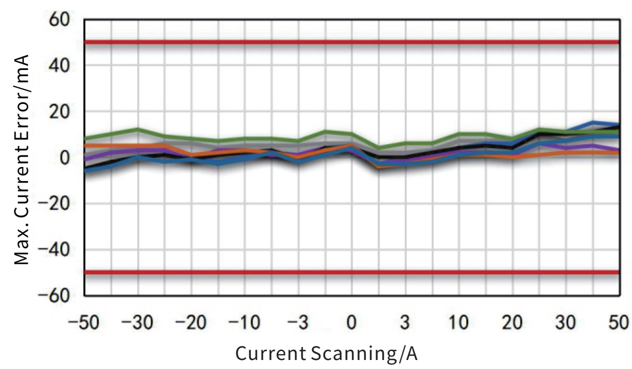


Figure 5-14 - 40℃ Low-Current Test Accuracy @ Max. Current Error

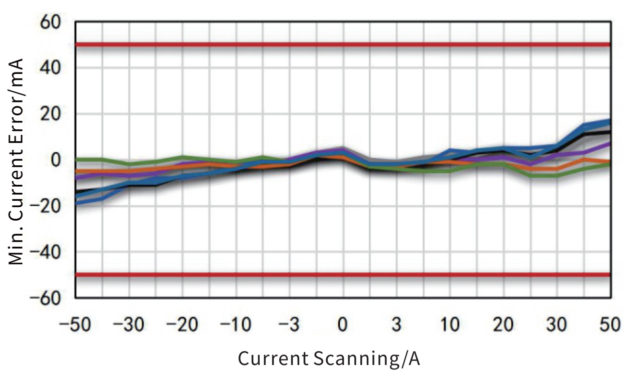


Figure 5-15 + 25℃ Low-Current Test Accuracy @ Min. Current Error

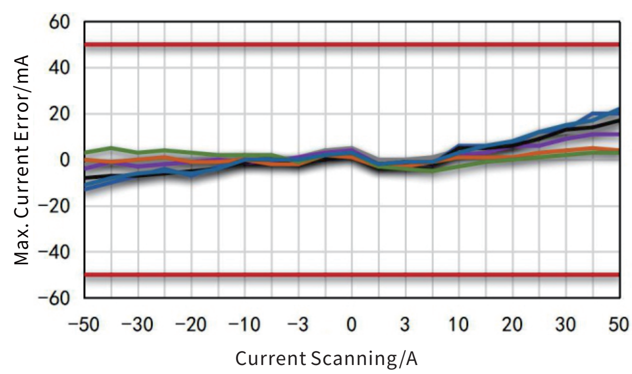


Figure 5-16 + 25℃ Low-Current Test Accuracy @ Max. Current Error

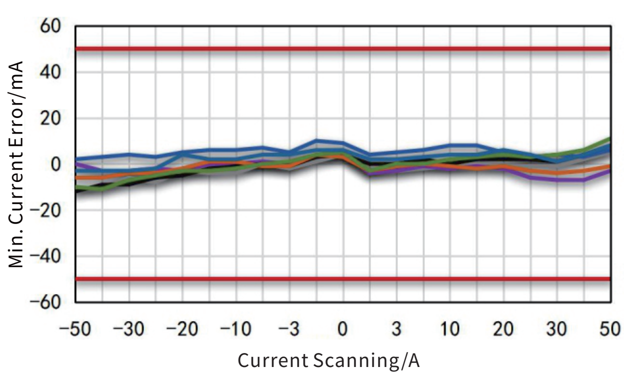


Figure 5-17 + 105℃ Low-Current Test Accuracy@Min. Current Error

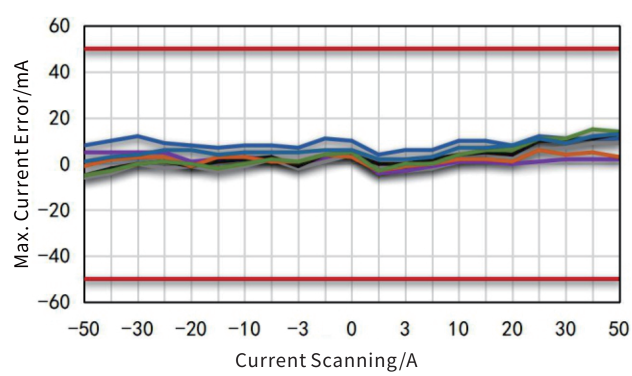


Figure 5-18 + 105℃ Low-Current Test Accuracy@Max. Current Error

5.3.5 High-Current Accuracy Test Curve

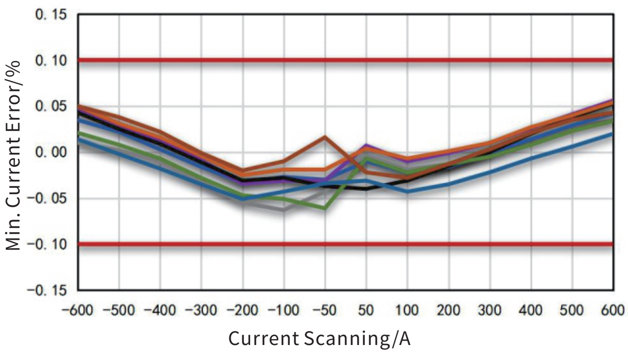


Figure 5-19 -40℃
High-Current Test Accuracy@Min. Current Error

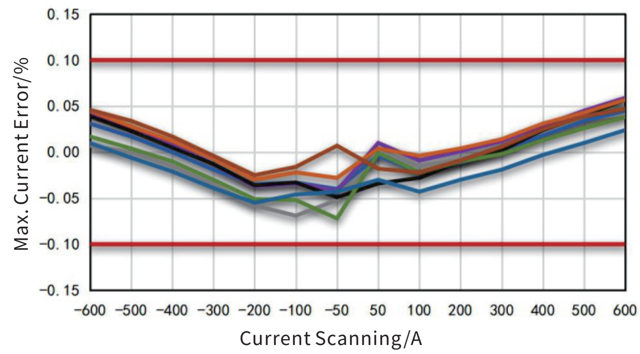


Figure 5-20 -40℃
High-Current Test Accuracy@Max. Current Error

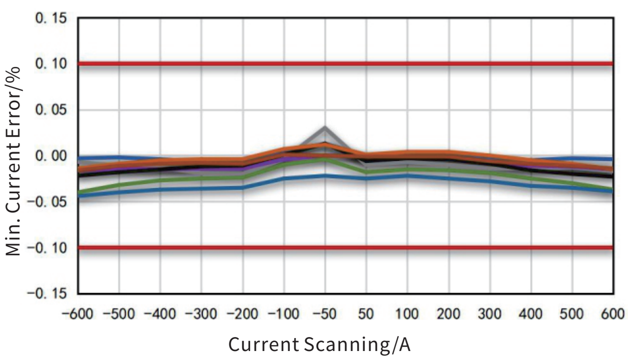


Figure 5-21 +25℃
High-Current Test Accuracy@Min. Current Error

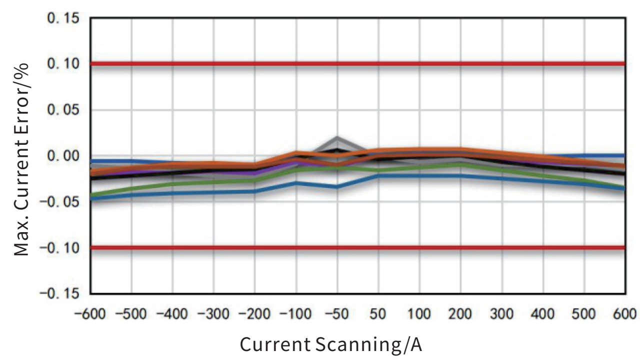


Figure 5-22 +25℃
High-Current Test Accuracy@Max. Current Error

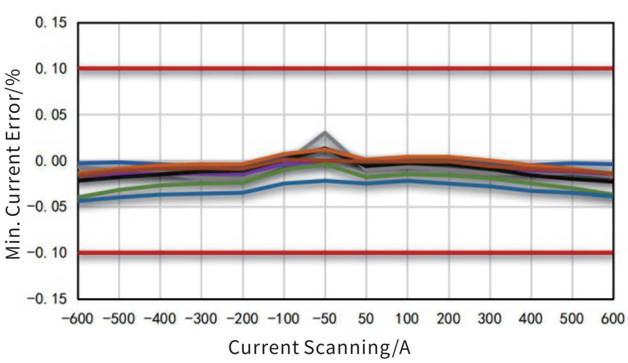


Figure 5-23 +85℃
High-Current Test Accuracy@Min. Current Error

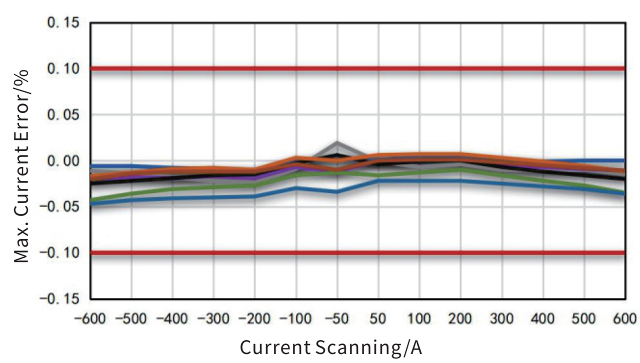


Figure 5-24 +85℃
High-Current Test Accuracy@Max. Current Error

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Function Check
Electrical loads		
5	VW 80000	E-01 Long-term overvoltage
6	VW 80000	E-02 Transient overvoltage
7	VW 80000	E-03 Transient undervoltage
8	VW 80000	E-04 Jump start
9	VW 80000	E-05 Load dump
10	VW 80000	E-06 Ripple voltage
11	VW 80000	E-07 Slow decrease and increase of the supply voltage
12	VW 80000	E-08 Slow decrease, quick increase of the supply voltage
13	VW 80000	E-09 Reset behavior
14	VW 80000	E-10 Brief interruptions
15	VW 80000	E-11 Start pulses
16	VW 80000	E-12 Voltage curve with vehicle electrical system control
17	VW 80000	E-13 Pin interruption
18	VW 80000	E-14 Connector interruption
19	VW 80000	E-15 Reverse polarity
20	VW 80000	E-16 Ground potential difference
21	VW 80000	E-17 Short circuit in signal cable and load circuits ..
22	VW 80000	E-18 Insulation resistance
23	VW 80000	E-19 Quiescent current
24	VW 80000	E-20 Dielectric strength
25	/	Continuous power test
26	ISO 7637-2:2011	CI pulse 1
27	ISO 7637-2:2011	CI pulse 2a / 2b
28	ISO 7637-2:2011	CI pulse 3a / 3b
29	ISO 7637-2:2011	CI pulse 4
30	ISO 7637-2:2011	CI pulse 5b
31	ISO 10605:2008	ESD
32	CISRP 25	Radiated emissions
33	CISRP 25	Conducted emissions
34	ISO 11452-2	Radiated immunity
35	ISO 11452-4	Bulk current injection

Test No.	Test Standards	Test Items
Climatic loads		
36	VW 80000	K-01 High-/low-temperature aging
37	VW 80000	K-02 Incremental temperature test
38	VW 80000	K-03 Low-temperature operation
39	VW 80000	K-05 Thermal shock (component).
40	VW 80000	K-14 Damp heat, constant
41	VW 80000	L-02 Service life test - high-temperature durability testing
42	VW 80000	L-03 Service life test – Temperature cycle durability testing
43	IEC 60068-2-30	Dew test
44	GB/T 2423.34	Composite temeperature & humidity cyclic test
Mechanical loads		
45	VW 80000	M-01 Free fall
46	VW 80000	M-04 Vibration test
47	VW 80000	M-05 Mechanical shock
48	VW 80000	M-08 Protection against foreign bodies - IP0x to IP4x, A, B, C, D
Regulation Validation		
49	GB/T 30512-2014	Requirements for prohibited substances on automobiles
50	UL-94:2016	Vertical Burning Test

7、Communication

7.1 CAN Protocol

CB600F8536A applies CAN2.0 A/B communication protocol and communicates through data frame. The data length of message frame is between 1-8 bytes. The default CAN speed is 500Kbps. 1Mbps/250Kbps are also available. There are two kinds of data frame, standard frame and extended frame, as shown in Figure 7-1 and Figure 7-2. Standard frame has an ID of 11 bytes, and the extended frame has an ID of 29 bytes. The defaulted data frame is standard frame, which can be adjusted to the extended frame. The defaulted data format is Motorola, which can be adjusted to Intel.

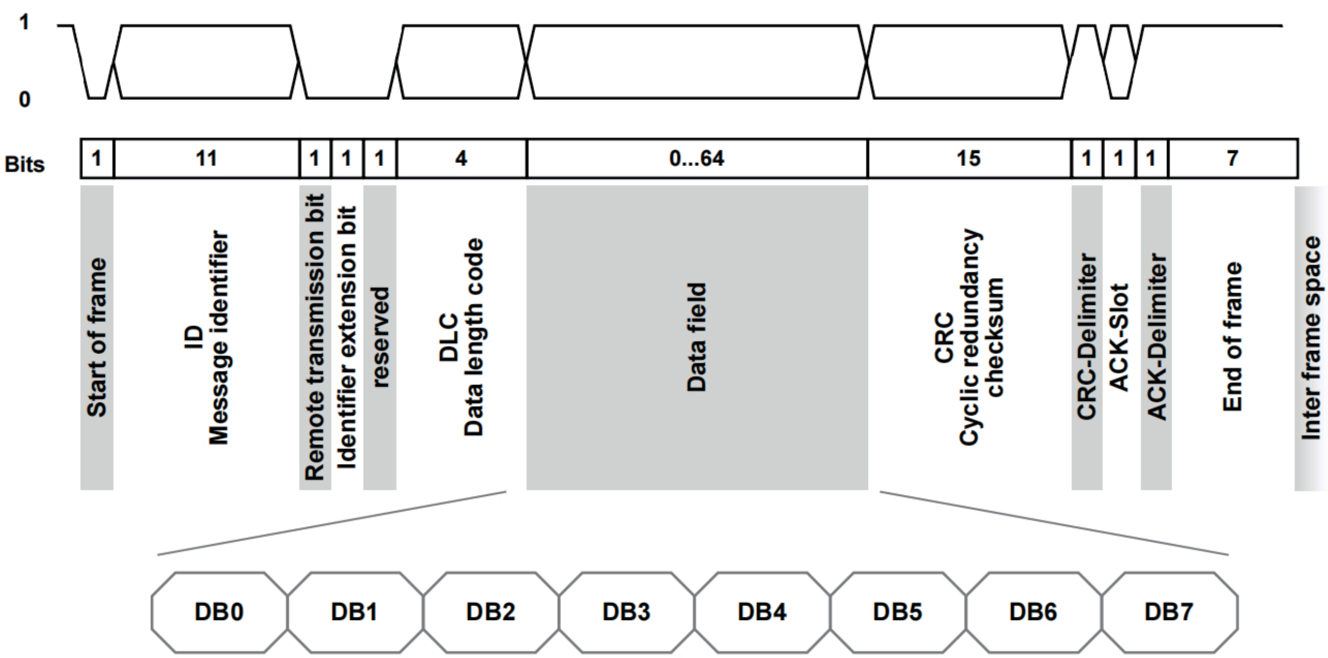


Figure 7-1 S tandard Frame

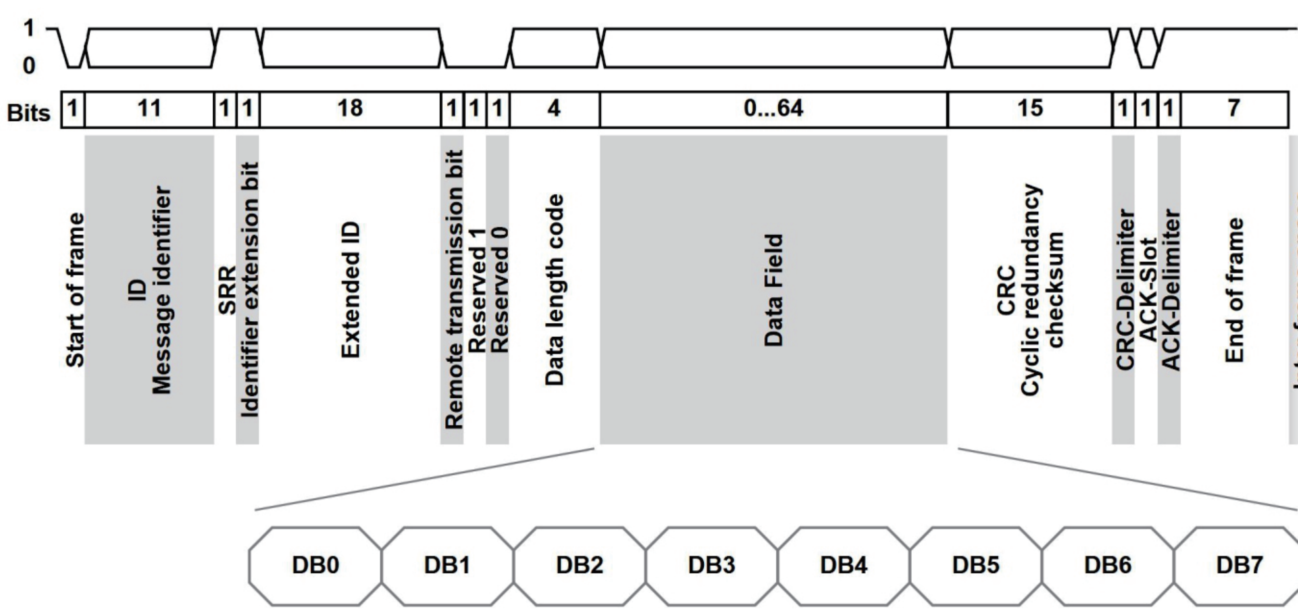


Figure 7-2 Extended Frame

7.2 Data Frame

The data frame of CB600F8536A can apply multiple data formats, as shown in Table 7-1. Among them, both formats A and B are composed of two frames of messages, which transmit real-time current and real-time temperature. Both formats C and D are composed of one frame of message. Format C transmits real-time current and real-time temperature in one frame of message. Format D only transmits real-time current. The data frame format defaults to format A.

Table 7-1. Message Frame Data Format

Data Format Type	Data Frame Content	CAN ID[1]	Data Length	Characteristics
Format A	Real-Time Current	0x0301	6	32-bit current value is a signed integer. Available Unit: mA/µA
	Real-Time Temperature	0x0325	6	32-bit temperature value is a signed integer, in 0.1°C
Format B	Real-Time Current	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA
	Real-Time Temperature	0x06C2	8	8-bit NTC temperature value is a signed short integer, in °C 8-bit MCU temperature value is a signed short integer, in °C
Format C	Real-Time Current & Temperature	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA 16-bit temperature value is a signed short integer. Unit: 0.1 °C
Format D	Real-Time Current	0x03C0	8	32-bit current value is an unsigned integer with offset 0x80000000, in mA

[1] The CAN ID in the above table are default and can be modified by commands (refer to the relevant application documents for details)

7.2.1 Format A

Format A consists of current data frame and temperature data frame, each with a 4-bit cyclic counter and a 2-bit module exception flag. In addition, the current data frame has an 8-bit current channel flag, a 32-bit current value, a 1-bit unit selection and a 1-bit reserved bit. The temperature data frame has an 8-bit temperature channel flag, a 32-bit temperature value and a 2-bit reserved bit. The details of the message are shown in Table 7-2, Examples of message and decoding information are shown in Table 7-3 and Table 7-4.

Table 7-2. Format A Message

Frame Type	CAN ID	Length	byte0	byte1	byte2	byte3	byte4	byte5
Current (mA/µA)	0x0301	6	0x00[1]	B[7]: Reserved Bit[2] B[6]: Current Unit[3] B[5]: Measurement Error Flag[4] B[4]: Overcurrent Flag[5] B[3:0]: Cyclic Counter[6]	32-bit Signed Current Value[7]			
Temperature (0.1°C)	0x0325	6	0x04[8]	B[7:6]: Reserved Bit[2] B[5]: Overtemperature Flag of Shunt[9] B[4]: Overtemperature Flag of PCBA[10] B[3:0]: Cyclic Counter[6]	32-bit Signed Temperature Value[11]			

[1] Current Channel Flag.
[2] Reserved bit, default is 0.
[3] Current Unit, 0: mA; 1: µA
[4] Measurement error flag, active when the ADC fault is detected, indicates that the current value is invalid. When alarming, the current sensor still sends and receives data messages, but the current value in the message is invalid. The measurement deviation may exceed the range specified in the technical specification.
[5] Overcurrent error flag. Default is inactive. It can be defined by the user.
[6] Cyclic Counter, 0x0-0xF cycle count value.
[7] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer.
[8] Temperature Channel Flag.
[9] Overtemperature Flag of Shunt, active when the shunt temperature is detected to be more than 150 °C, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature for a long time, the performance of current sensor can be damaged. At this time, it is recommended to limit the output power of BMS.
[10] Overtemperature Flag of PCBA, active when the board temperature is detected to be more than 125 °C, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature lasts for a long time, the performance of current sensor can be damaged. Then, it is recommended to limit the output power of BMS.
[11] 32-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: 0.1 °C

Table 7-3. Examples of Format A Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5
1	0x00	0x00	0x00	0x00	0x03	0xE8
2	0x00	0x00	0xFF	0xFF	0xFC	0x18
3	0x04	0x00	0x00	0x00	0x01	0x0A
4	0x04	0x00	0xFF	0xFF	0xFE	0xF6

Table 7-4. Decoding Information of Table 7-3 Examples

Example	Byte	Value	Message
1	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0x000003E8	Current: 1000mA, i.e. 1A
2	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0xFFFFFC18	Current: -1000mA, i.e. -1A
3	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0x0000010A	The Temperature is + 26.6 °C
4	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0xFFFFFEF6	The Temperature is - 26.6 °C

7.2.2 Format B

Format B consists of current data frame and temperature data frame, each with a 4-bit cyclic counter. In addition, the current data frame has a 24-bit current value, a 2-bit flag bit, an 8-bit software version, an 8-bit check bit and an 18-bit reserved bit. The temperature data frame has an 8-bit temperature value, a 4-bit status bit, an 8-bit check bit and a 32-bit reserved bit. The details of the message are shown in Table 7-5, Examples of message and decoding information are shown in Table 7-6 and Table 7-7.

Table 7-5. Format B Message

Frame Type	CAN ID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA)	0x03C2	8	B[7:4]: Cyclic Counter[1] B[3:2]: Reserved Bit [2] B[1]: Hardware Fault Flag[3] B[0]: ADC Conversion Error[4]	24-bit Unsigned Current Value Offset 0x800000[5]			Reserved Bit[2]		Software Version	CRC-8 Check SAE J1850[6]
Temperature (°C)	0x06C2	8	B[7:4]: Cyclic Counter[1] B[3]: SHUNT Over Temperature Flag[7] B[2]: PCBA Over Temperature Flag[8] B[1]: SHUNT Temperature measurement Error Flag. [9] B[0]: PCBA Temperature measurement Error Flag[10]	SHUNT (°C) [11]	PCBA (°C) [12]	Reserved Bit[2]				CRC-8 Check SAE J1850[6]

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Reserved bit, default is 0.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4]ADC conversion error flag. When ADC sampling timeout exceeded, indicating the present current value is invalid. When flag occurs, the sensor can still receive and send message, but the current value of the message is invalid. The measured value may be out of the specifications range.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unflaged integer. Unit: mA
The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] CRC-8 Check generates a check code for the first 7 bytes of data.
[7] SHUNT over temperature flag. When measured temperature of SHUNT is over 150℃, it will be no message or measurement accuracy decreased.
When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal.
If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[8] PCBA over temperature flag. When measured temperature of PCBA is over 125℃, it will be no message or measurement accuracy decreased.
When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal.
If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[9] SHUNT temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[10] PCBA temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[11] SHUNT temperature, 8-bit temperature data by default unflaged integers. Unit: ℃. The actual value expression is V=D-55. D is the value in the message.
[12] PCBA temperature, 8-bit temperature data by default unflaged integers. Unit: ℃. The actual value expression is V=D-55. D is the value in the message.

Table 7-6. Examples of Format B Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x00	0x00	0x64	0x83
2	0x00	0x7F	0xFC	0x18	0x00	0x00	0x64	0xAB
3	0x00	0x1A	0x1A	0x00	0x00	0x00	0x00	0xD5
4	0x00	0xE6	0xE6	0x00	0x00	0x00	0x00	0x47

Table 7-7. Decoding Information of Table 7-6 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x8003E8	Current: 1000mA, i.e. +1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V1.00
	DB7	0x83	CRC-8 Check Value
2	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V1.00
	DB7	0xAB	CRC-8 Check Value
3	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0x1A	SHUNT ：+26℃
	DB2	0x1A	PCBA：+26℃
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0xD5	CRC-8 Check Value
4	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0xE6	SHUNT ：-26℃
	DB2	0xE6	PCBA：-26℃
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0x47	CRC-8 Check Value

7.2.3 Format C

Format C consists of one frame of message, including a 24-bit current value, an 16-bit temperature value, a 4-bit cyclic counter, a 2-bit status bit, a 1-bit flag bit, an 8-bit check bit and a 9-bit reserved bit. The details of the message are shown in Table 7-8, Examples of message and decoding information are shown in Table 7-9 and Table 7-10.

Table 7-8. Format C Message

Frame Type	CAN ID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA) Temperature (0.1°C)	0x03C2	8	B[7:4]: Cyclic Counter[1] B[3:2]: Malfunction Status[2] B[1]: Hardware Fault Flag[3] B[0]:Reserved Bit [4]	24-bit Unsigned Current Value Offset 0x800000[5]			16-bit Signed Temperature Value[6]		Reserved Bit[4]	CRC-8 Check SAE J1850[7]

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Malfunction Status, '0': Normal; '1': ADC Conversion Error; '2': Current exceeds 1550A; '3': Shunt temperature exceeds 150 °C or PCBA temperature exceeds 125 °C.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4] Reserved bit, default is 0.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] 16-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: °C.
[7] CRC-8 Check generates a check code for the first 7 bytes of data.

Table 7-9. Examples of Format C Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x01	0x0A	0x00	0x2E
2	0x00	0x7F	0xFC	0x18	0xFE	0xF6	0x00	0x9D

Table 7-10. Decoding Information of Table 7-9 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x8003E8	Current: 1000mA, i.e. + 1A
	DB4-DB5	0x010A	The Temperature is + 26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x2E	CRC-8 Check Value
2	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0xFEF6	The Temperature is - 26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x9D	CRC-8 Check Value

7.2.4 Format D

Format D consists of one frame of message, including a 32-bit current value, a 1-bit flag bit, a 7-bit status bit, an 8-bit software version, a 16-bit reserved byte and no temperature value. The details of the message are shown in Table 7-11, Examples of message and decoding information are shown in Table 7-12 and Table 7-13.

Table 7-11. Format D Message

Frame Type	CAN ID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA)	0x03C0	8	32-bit Unsigned Current Value Offset 0x80000000[1]				B[0]:Error Flag [2] B[7:1]: Error Status[3]	Reserved Bit[4]		Software Version

[1] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA. The actual value is expressed as V=D-0x80000000. D is the value in the message.
[2] Error Flag, '0': Normal; '1': Error;
[3] Error Status, 0x64: no error; 0x50: ADC hardware error; 0x51: ADC conversion error; 0x60: Temperature exceeds the limit (current value remains measured).
[4] Reserved bit, default is 0.

Table 7-12. Examples of Format D Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x080	0x00	0x03	0xE8	0xC8	0x00	0x00	0x64
2	0x7F	0xFF	0xFC	0x18	0xC8	0x00	0x00	0x64

Table 7-13. Decoding Information of Table 7-12 Examples

Example	Byte	Value	Message
1	DB0-DB3	0x800003E8	Current: 1000mA, i.e. 1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved bit 0
	DB7	0x64	Software version is V1.00
2	DB0-DB3	0x7FFFFC18	Current: -1000mA, i.e. -1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved byte 0
	DB7	0x64	Software version is V1.00

7.3 Bus Topology

CB600F8536A can be applied to a bus-type topology and transmits network information to each node through the bus, as shown in Figure 7-3.

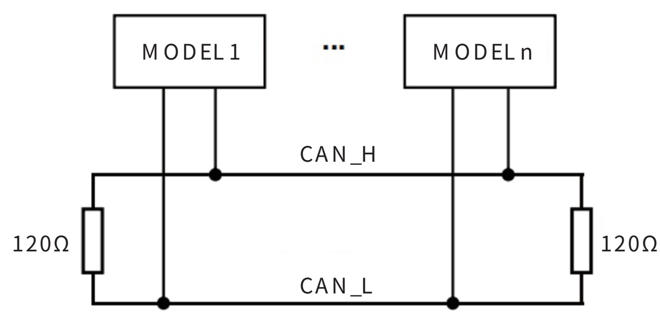


Figure 7-3 CAN Bus Topology

7.4 Measuring Mode

7.4.1 Time Interval + Command Trigger Mode

The sensor samples data at a fixed time interval set by the system and sends message to the CAN bus. At the same time, It can also respond to the trigger command. In the sampling period, the measurement will be active immediately when the trigger command is received and sends message to CAN bus. No need to wait for next sampling interval. As shown in Figure 7-4.

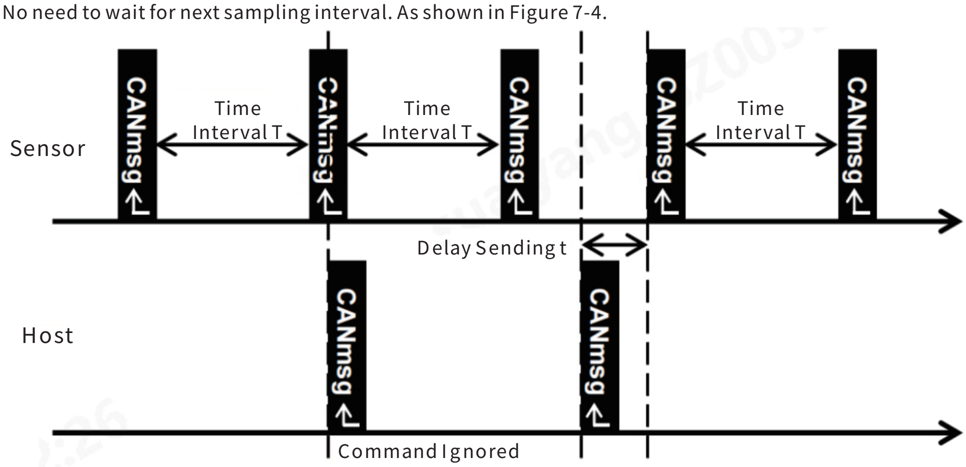


Figure 7-4. Time Interval + Command Trigger Mode

After the sensor receives the trigger command, if it is sampling or sending CAN message, the p resent trigger command will be ignored. When the command is valid, a sampling and sending process will be started, and the time interval T for the next sending will be automatically calculated from the moment of this trigger. As Figure 7 - 4 shown, there is a delay between the sensor receiving a valid trigger command and sending the CAN message, which is less than 1 ms.

7.4.2 Command Triggered Mode

Under this mode, the sensor will not automatically send message, but keep sampling, calculating and filtering data at a fixed time interval. The sensor will send the recent sampling data to CAN bus and reset the start of time interval when a valid command i s received from the host, as Figure 7 - 5 shown.

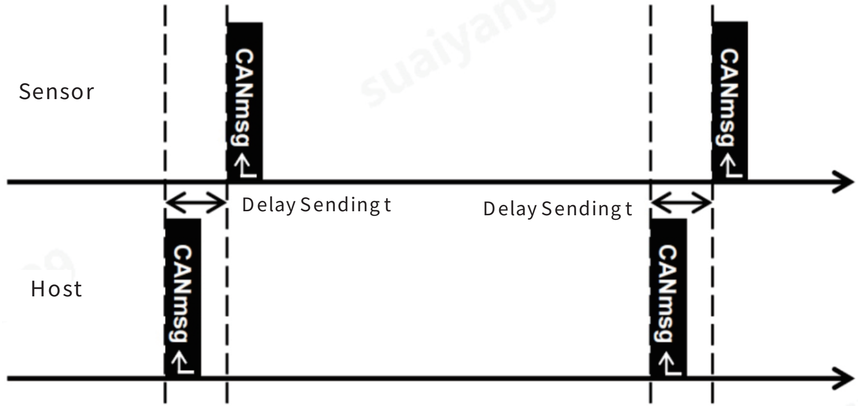


Figure 7-5. Command Trigger Mode

As Figure 7 - 5 shown, the sensor sends data to the CAN bus after receiving at rigger command from the host, with a delay of less that 1 ms between receiving the command and sending the data.

8、Mechanical Structure

8.1 Dimensions

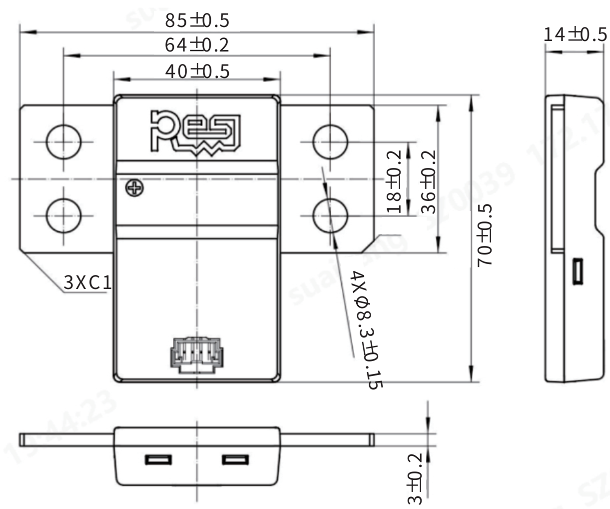


Figure 8. 1 Structure Diagram

8.2 Copper Bar Connection

- Recommended Bolts: M8
- Recommended Torque:15- 20Nm
- Recommended Width * Thickness of Copper Bar:40mm*3mm
- Recommended Length of Overlap between Shunt and Copper Bar:20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

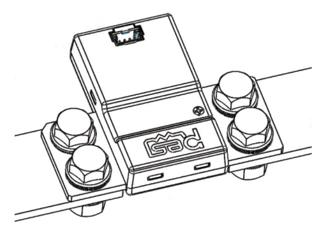


Figure 8-2. CB600F8536A Copper Bar Connection Diagram

8.3 Connector

Connector	Manufacturer	Pin Count	Part #
Male Connector[1]	Molex	4	5600200420
Recommended Female Connector[2]	Molex	4	5601230400

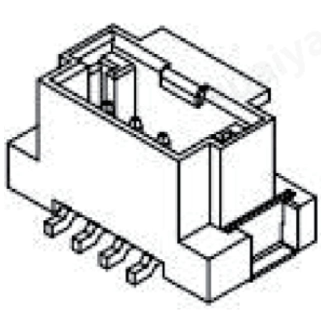


Figure 8-3. Male Connector

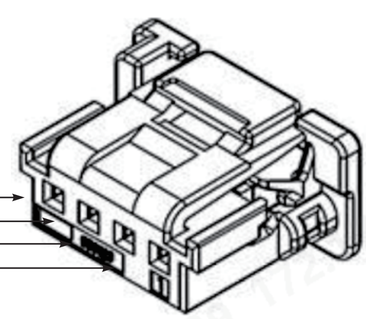


Figure 8-4. Female Connector（Wire end reference)

[1] For more information about male connector, please refer to Molex datasheet:https://www.molex.com/pdm_docs/sd/5600200420_sd.pdf
[2]For more information about female connector, please refer to Molex datasheet :https://www.molex.com/pdm_docs/sd/5601230400_sd.pdf

8.4 Connector Definition

Pin No.	Description
Pin4	VCC
Pin3	CAN_L
Pin2	CAN_H
Pin1	GND

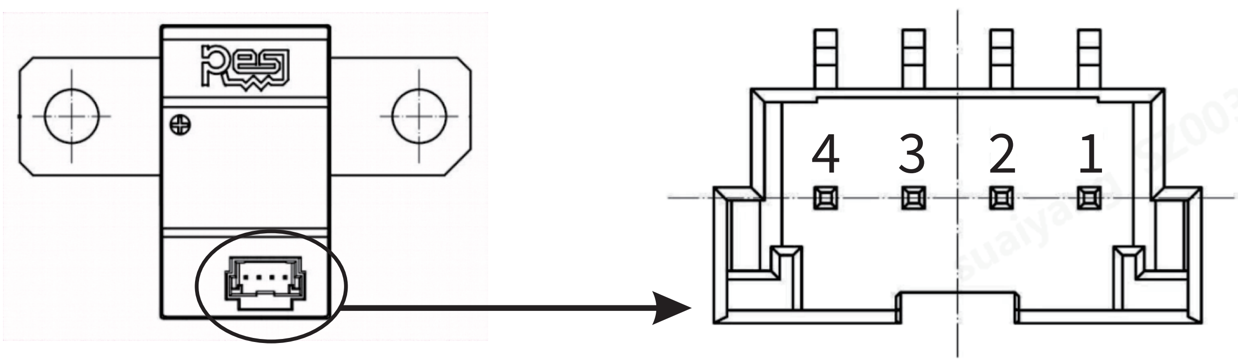


Figure 8-5. Male Connector Molex5600200420

9、Typical Applications

CB600F8536A[1] is used for accurate current measurement in key system. It is recommended that the current sensor connects to the circuit of positive or negative electrode of high-voltage end[2], as shown in Figure 9-1 and Figure 9-2, to sample the current in the main circuit. The high and low voltage ends are galvanic isolated inside the sensor. It is recommended that the low voltage end connects to the battery management system, as shown in Figure 9-3, for real-time and accurate reporting of current data in key system.

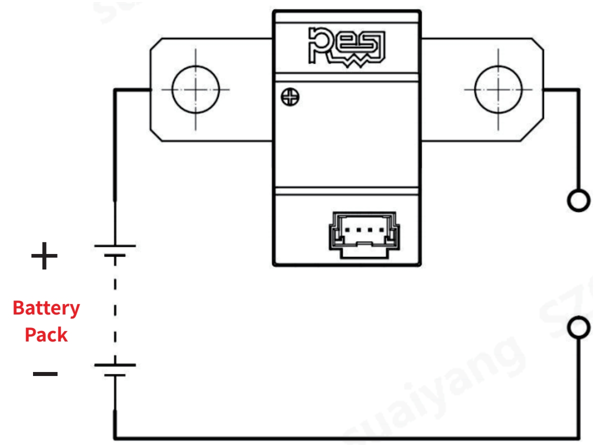


Figure 9-1. Recommended Use of Positive Electrode of High-Voltage End

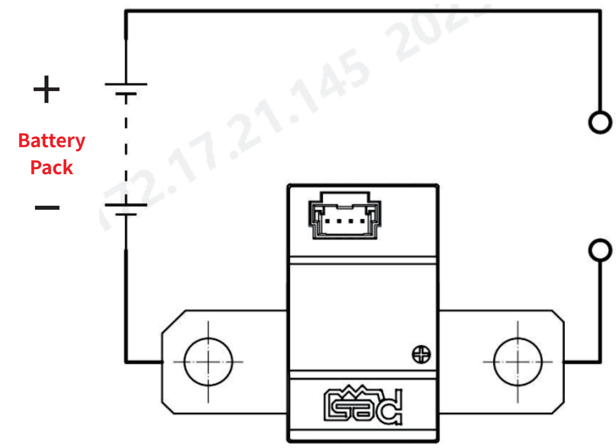


Figure 9-2. Recommended Use of Negative Electrode of High-Voltage End

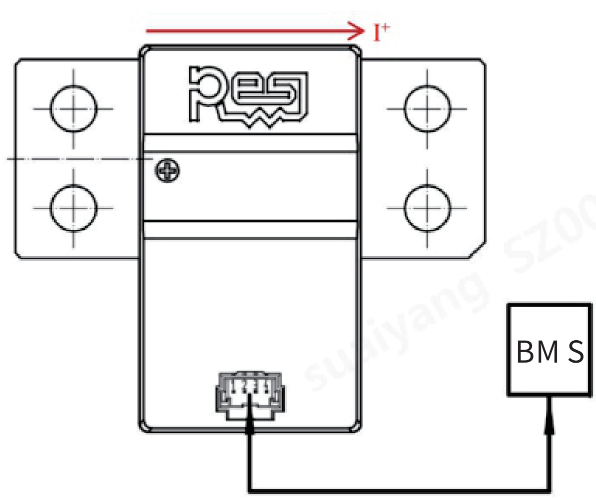


Figure 9-3. Recommended Use of Low-Voltage End

[1] The "+" on the CB600F8536A current sensor housing is the direction of current entry, that is, the positive current direction.
[2]The high voltage electrode is installed as shown in the figure. The operating condition indicated by the sensor output value is:
When the sensor outputs positive value, the battery pack is discharging;
When the sensor outputs negative value, the battery pack is charging.

10、Storage & Packaging

10.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases, and the packaging case shall be protected from direct sunlight.
- Anti-static bracelet or anti-static gloves shall be worn during installation, storage and handling.

10.2 Packaging

10.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container Name	Carton	
Container Size	480*410*282	mm
Unit Weight of Finished Product	100±5	g

[1] SNP, Standard Number of Package

10.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H(mm)	Quantity
1	50-Grid EPE Tray	468*398*86	3
2	EPE Tray Cover	460*390*10	1
3	Anti-Static PE Bag	200*150	150
4	Anti-Static PE Accordion Bag	900*510	1

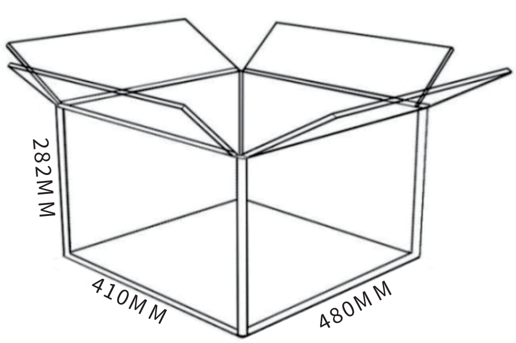


Figure 10-1. Carton Diagram

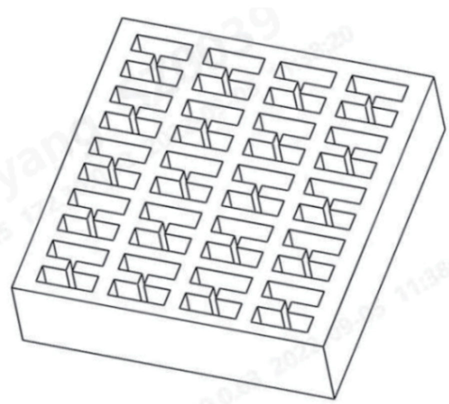


Figure 10-2. Structure Diagram of EPE

11、Part Number Information

CB 600 F 8536 A 1 S S NN

Series

CB: C & B Current Sensor

Rated Current

350: 350A
600: 600A
1000: 1000A

Tolerance

B: 0.05%
F: 0.1%
L: 0.2%
M : 0.5%
K: 1%

Shunt Size

6918: 69mm ×18mm
8518: 85mm ×18mm
8436: 84mm ×36mm
8536: 85mm ×36mm

Application Grade

A: CAN Automotive
I: CAN Industrial
T: 485 Industrial

Type

0: Standard, Thickness 4mm
1: Standard, Thickness 3mm
2: Customized

Special Byte

Standard

- K:25μΩ
- S:50μΩ
- P:100μΩ
- J:150μΩ

Customized

- Custom Byte, 0~9, A~Z

Special Byte

Standard

- S:CAN Terminal Resistor
- N:No CAN Terminal Resistor

Customized

- Custom Byte , 0 ~ 9, A ~ Z

Code

NN ：00～99 or Blank
For more performance options and other relevant information, please refer to the official website: https://en.resistor.today/

Disclaimer

This disclaimer is applicable to the purchaser or user (hereinafter referred to as "user") of electronic products produced by Shenzhen C&B Electronic Co., Ltd. and its affiliated companies (hereinafter referred to as "C&B") or produced by a third party.

Unless individually stated in writing, the technical and reliability data (including datasheets), design resources (including reference designs), application or other design suggestions, network tools, security information and other resources related to this document provided by C&B are subject to change without notice. Users should check and obtain the latest relevant information before ordering C&B products, and verify whether the information is latest and complete.

C&B provides the information of this document "according to original product". C&B does not guarantee that there is no defect and does not make any express or implied warranty, including but not limited to merchantability, examples, implied meaning and typical value.

The information contained in this document is based on laboratory conditions, and the statement that the product is suitable for specific
applications is based on the understanding of the typical requirements of C&B for general use. The characteristics and parameters of C&B Products in the user application may be different from those in the datasheet due to (i) the combination of C&B Products with other
components in the user application, or (ii) the user application environment. The characteristics and parameters of C&B products may and do vary in different applications, and the actual performance may change over time. Users should always verify the actual performance of C&B products in their specific equipment and applications, and independently determine how many additional test margins should be added to their equipment or applications to fill the gap between the laboratory and the actual conditions.

The maximum value written in this document is that this product can withstand without damaging the product. However, due to approaching the maximum value or exceeding the maximum value, C&B cannot guarantee the electrical and mechanical characteristics of the product, and cannot ensure that the product can work normally under the absolute maximum rated value. Users of C&B shall run all necessary tests on the product and its application to avoid potential defects or failures of the product and application, or the product or application of the customer's third party customers. C&B shall not be liable for this.

This document does not convey or imply any license of trademarks, patents and any other intellectual properties. C&B shall not be liable for any infringement of intellectual property or other rights of third parties that may result from the application of this document and the use of the company's products.

To the maximum extent permitted by law, C&B will not assume (i) any and all liabilities for any special, punitive, consequential, incidental or indirect damages or loss of income or profit (including but not limited to savings losses, business interruption and other costs or rework costs related to the disassembly or replacement of any product), or (ii) any and all implied warranties, including implied warranties of fitness for a particular purpose, non-infringement and merchantability. Whether such loss is based on tort (including negligence) warranty, it can be used as the theoretical basis for breach of contract or any other law.

For any loss of customers caused by any reason, the total and cumulative liability of C&B to customers for the products described in this
document is limited by the terms of the contract or agreement signed between C&B and users.

For any update of this document, please pay attention to the official website(www.resistor.today).