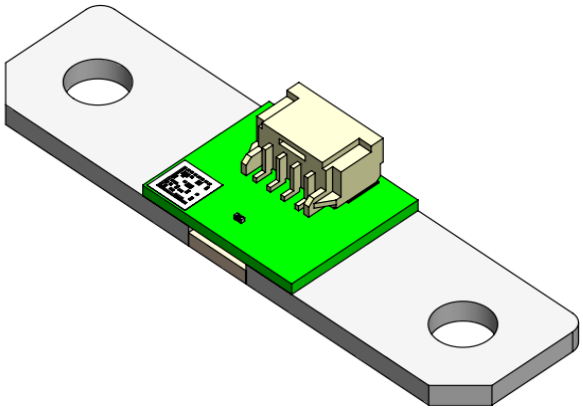
REVERSION HISTORY:

Date	Revision	Changes
2020.1.7	A0	Initial released for preliminary datasheet
2020.7.7	A1	Modification: TCR: ±100ppm/℃ , torque: 8-12Nm *Delete the thickness of shunt to PCB board
2021.10.26	A3	change Label format from QR code to data matrix Document number from CYNP-201-006 (A3) VGE00-500VN-010 to CYNPW-20X-022 (A0) VGE00-500VN-010
2021.11.25	A1	Update the description of the R definition in Data-matrix
2022.01.12	A2	1. Revise the description on page1 2. Label QR code to data-matrix (PCB Laser marking) 3. Add Type Designation chapter 4. Add Packing chapter
2022.01.14	A3	1. Update the drawing and schematic
2022.09.12	A4	1. Replace the symbol R_{comp} by R_{comp_f} in the figure on page5 2. Change all of the symbol R_{comp} to R_{comp_f} 3. Change the symbol R25 in the compensated flow on page6 4. Add Packing chapter.
2022.11.29	A5	1. Increase Operating temp. range from -40℃~105℃ to -40℃~125℃ 2. “” NTC temperature need to be between -40℃ to 105℃.” ” Change as ” NTC temperature need to be between -40℃ to 125℃.” 3. Update schematic of the TCR calibration
202308.15	A6	1. Define re-measure the R should within ±0.3%內 2. EMF < 1μV/℃ to < 0.6μV/℃
2023.10.31	A7	Change the feature description 1. Low inductance < 3nH
2023.11.24	A8	Correct resistance unit (note2 and note3) within data-matrix information

FEATURES:

- Nominal Current Up to 500A
- High pulse current rating
- Low inductance (< 3nH)
- Low thermal EMF (< 0.6μV/℃)
- Welding construction; Excellent long-term stability
- Pb-free for RoHS compliant
- Ni & Sn plating assists with PCB mounting and corrosion protection



APPLICATIONS:

- EV/HEV BMS
- Battery and storage based application

GENERAL DESCRIPTION:

The shunt module is a PCBA which include a thermistor and a connector mount on the shunt resistor. User can easy mount the module on current sense location and connect to signal processing side via board to wire connection.

ELECTRICAL SPECIFICATIONS:

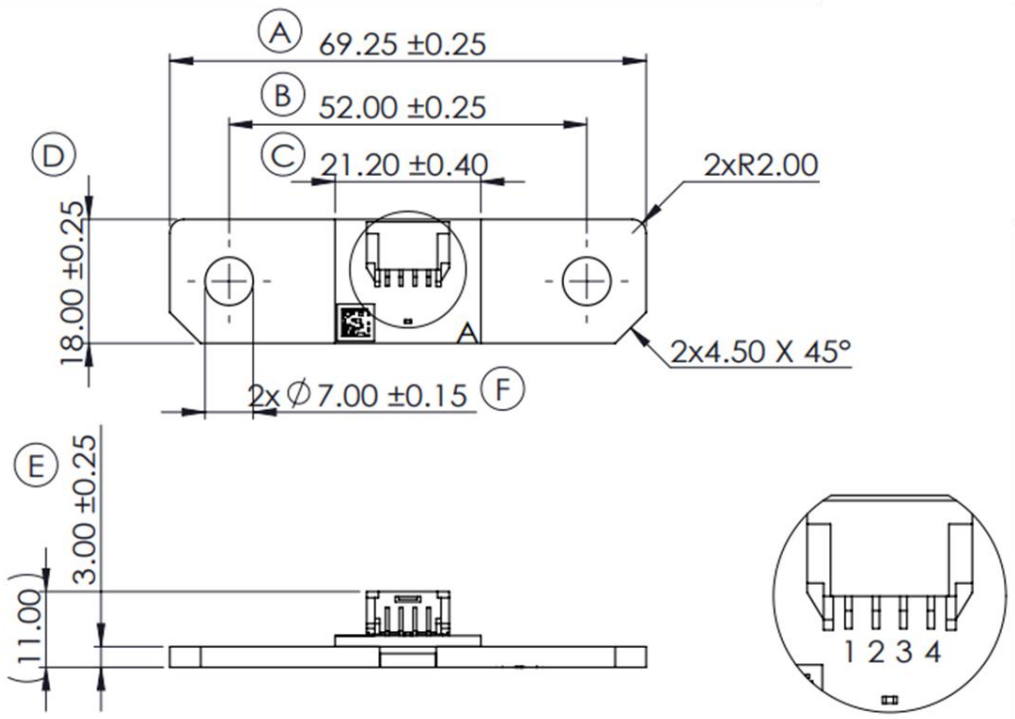
Characteristics	Feature
Nominal current	500A
Resistance value	0.1mΩ
Temperature coefficient of resistance(25℃/125℃)	± 100 ppm/℃
Operating Temperature *NOTE1	-40~125℃
Storage Temperature	-40~125℃
Resistance tolerance	± 5%
Resistance re-testing tolerance at room temperature	± 0.3%

Note1: Operating temperature means that NTC temperature need to be between -40℃ to 125℃

OUTLINE DRAWING:

Unit: mm

Dimension



Component	Manufacturer	Part No.	Pin Definition
Connector	MOLEX	502352-0400	1: TEMP_P 2: SHUNT SENSE_P 3: SHUNT SENSE_N 4: TEMP_N
Thermistor	Thinking	TSM0C103F34D1R	

*Connector Mates Part(s): 560123-0400, 505151-0401

Type Designation :

VGE	00	-	500	VN	-	010
(1)	(2)		(3)	(4)		(5)

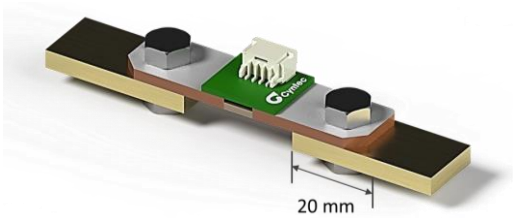
Note :

(1) Series No.
(2) Connector type
(3) Nominal Current
(4) Series No.
(5) Hardware Format

Bus bar Connection:

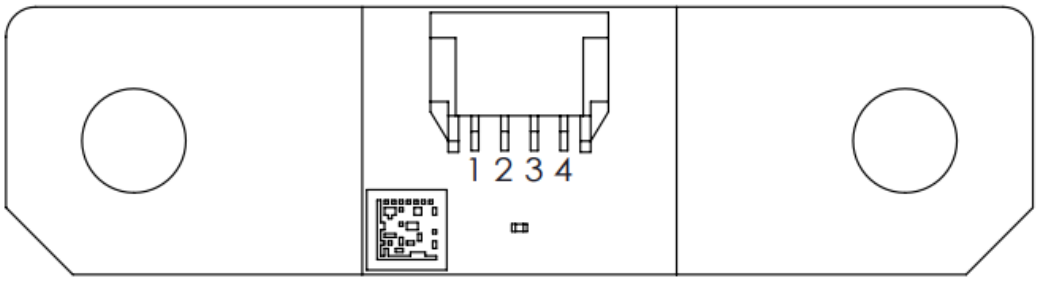
There are a few recommendations for a good connection.

- Always use screws with an outer diameter of 6 mm (M6)
- The recommended torque is 8~10Nm Shunt and bus bar must be clean.
- Correct mounting 20mm overlap ad shown in below figure.



Data matrix Information for reference:

1. PCB Top overlay (for laser marking) dimension : 5mm x 5mm (ref.)
2. Data-matrix dimension : 4mm x 4mm (ref.)



1. Data matrix information for reference :

	Year	Month	Day	Module ID	Resistance R_{25}*	Quadratic coefficient	First-order coefficient	Constant term
Form	YYYY	MM	DD	XXXXX	Rxxxxxn or Rxxxxxxn*NOTE2	±x.xxxxxxxxx	±x.xxxxxxxxx	±x.xxxxxxxxx
Example	2020	11	25	00001	R100123n R99123n	-0.000000576	+0.000086780	+0.998188760
	If R≧100μOhm 20201125000001R100123n-0.000000576+0.000086780+0.998188760*NOTE3 If R<100μOhm 20201125000001R99123n-0.000000576+0.000086780+0.998188760*NOTE3							

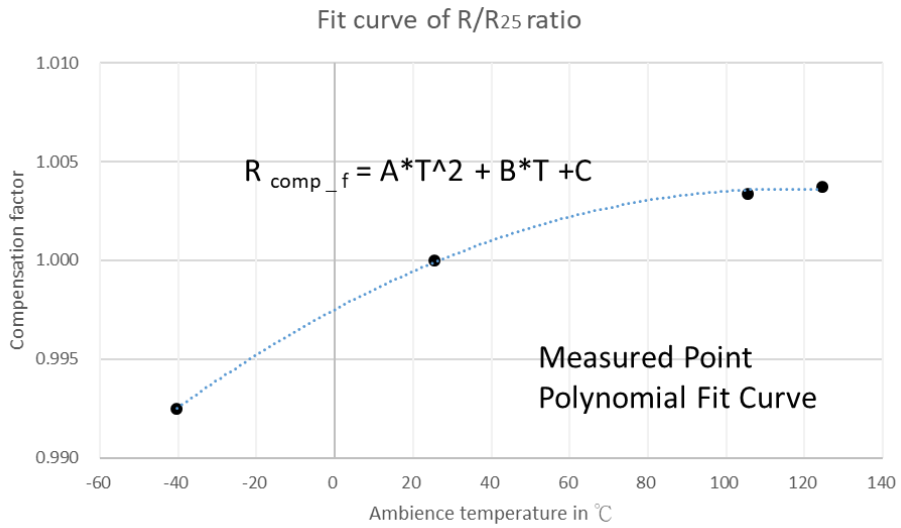
* R_{25} is shunt resistance at 25℃, unit: nOhm

* Note2 : If R≧100μOhm, content of resistance is Rxxxxxxn.

If R<100μOhm, content of resistance is Rxxxxxn

*Note3 : If R≧100μOhm,total Characters are 57. And if R<100μOhm, total Characters are 56.

Shunt Temperature Compensation Function:



Generic compensation factor the resistance of shunt need to be multiplied with:

R_{comp_f} = A*T^2 + B*T +C

Where:

R_{comp_f} is the compensation factor for Shunt resistance drift over ambience temperature normalized to 1 at 25℃.

T is temperature reading from PCB temperature sensor NTC.

A is quadratic coefficient, the default value is -0.000000576*.

B is first-order coefficient, the default value is +0.000086780*.

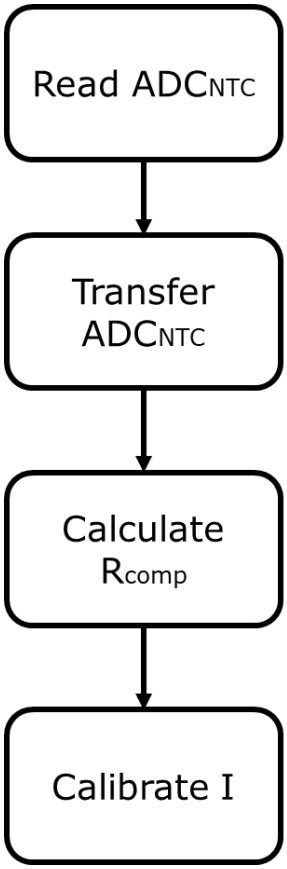
C: constant term coefficient, the default value is +0.998188760*.

The compensated shunt resistance value $R_{comp} = R_{25} * R_{comp\_f}$.

R_{25} is resistance value of shunt at 25℃.

*Value is for reference only.

Compensated Flow:



ADC_{NTC}: ADC value of NTC

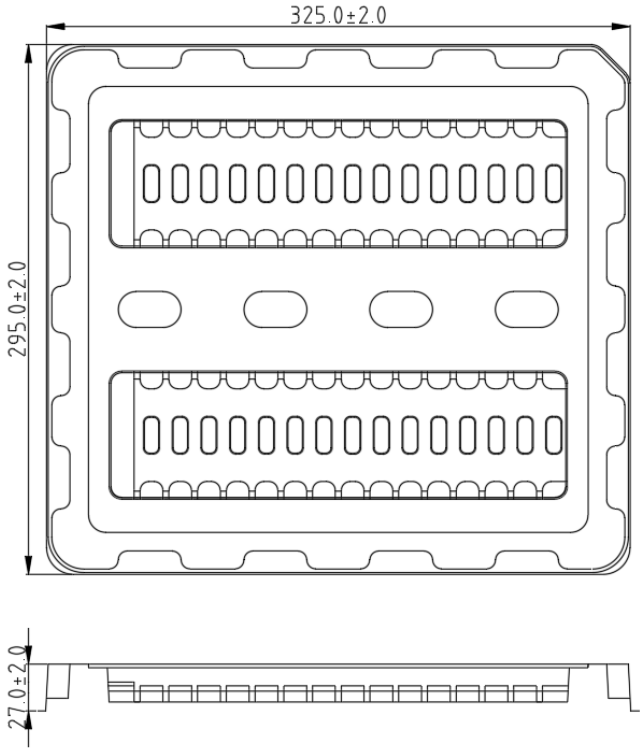
Transfer ADC_{NTC} to T
T: Temperature of NTC (℃)

$R_{comp} = R_{25}*(A*T^2+B*T+C)$
R_{25}: Resistance of the shunt at 25 ℃
A,B,C: Compensation factor

$I = V_{shunt} / R_{comp}$
V_{shunt}: Voltage drop of shunt

Packing:

Tray packaging dimensions :



Label Marking :

The following items shall be marked on tray

(1) Description

(2) Quantity

(3) Part No.

(4) Tapping No.

(5) Quantity:

30 Pcs / Tray

90 Pcs / Box

Reliability Test:

Test Item	Test Condition	Spec
Low temperature storage	ISO 16750-4 IEC 60068-2-1 Ad Temperature: -40℃, Time: 240hrs, 500hrs	△R: ± 1%
High temperature storage	ISO 16750-4 IEC 60068-2-2 Temperature: 125℃,Time: 1000hrs, 2000hrs	△R: ± 1%
Temperature cycling storage	IEC 60068-2-14,Nb -40℃to 125℃, Dwell time ≥ 15 min, 1000 cycles	△R: ± 1%
Thermal shock storage	IEC 60068-2-14,Na -40℃ to 125℃, Dwell times ≥ 15 min Transfer time: ≤30s, 500, 1000 cycles	△R: ± 1%
Cycling moisture resistance storage	MIL-STD-883. METHOD 1004.7 -10℃ to 70℃ ; 90% ~ 100%RH @ 70℃, 20 cycles	△R: ± 1%
Damp heat storage	JESD22-A 101 Temperature: 85℃ ;Humidity:85%;Time :1000hrs	△R: ± 1%
Vibration	ISO 16750-3 IEC 60068-2, 64 Random 10~1000Hz, profile: 8hrs/axis The r.m.s. acceleration value shall be 27,1 m/s2.	△R: ± 0.5%
Mechanical Shock	ISO 16750-3 6 axis, 50G, 6ms, half-sine, 10 times/axis	△R: ± 0.5%
Free Fall	ISO 16750-3 3 axis, 2 falls per DUT by axis, 1m, concrete ground or steel plate	△R: ± 0.5%