

NACA.XXXQ4-S6/SP5VA Current Transducer

The NACA.XXXQ4-S6/SPXVA family is a tri-phase transducer for DC, AC or pulsed currents measurement in automotive applications.

It offers a galvanic separation between the primary circuit (high power) and the secondary circuit (electronic circuit).



Absolute rating (not operating)

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Maximum supply voltage	$U_{C\ max}$	V	-18		18	
Maximum reverse output Voltage	V_{ROUT}	V		-6		
Ambient storage temperature	T_S	°C	-40		125	
Electrostatic discharge voltage	V_{ESD}	kV			8	ISO 10605
Dielectric withstand voltage	V_D	kV			3	ISO 16750-2, DC
Insulation resistance	R_{INS}	MΩ	500			
Creepage distance	d_{CP}	mm	6.6			Not including the distance between busbar and sensor busbar hole
Clearance	d_{CI}	mm	5.7			Not including the distance between busbar and sensor busbar hole
Comparative tracking index	CTI	V	600			IEC60112

Operating characteristics in nominal range (I_{PN})

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Supply voltage ¹⁾	U_C	V	4.75	5	5.25	
Ambient operating temperature	T_A	°C	-40		125	Including the busbar, the magnetic core and ASIC
output voltage (Analog)	V_{out}	V	$V_{out}=(U_c/5) \cdot (V_o+G\times I_p)$			@ U_c , I_p is primary current
Offset voltage	V_o	V		2.5		
Current consumption	I_c	mA		18/phase		@ U_c =5V, No load on V_{out}

Load resistance	R _L	KΩ	10			
Capacitive loading	C _L	nF		1	4	
Performance Data ¹⁾						
Ratiometricity error	ε _R	%		±0.5		
Sensitivity error	ε _G	%		±1		@TA=25°C, @Uc=5V
Electrical offset voltage	V _{OE}	mV		±4		@TA=25°C, @Uc=5V
Magnetic offset voltage	V _{OM}	mV		±3		@TA=25°C, @Uc=5V
Linearity error	ε _L	%	-1		1	I _{pn} ≤720A
			-1.3		1.3	720A≤I _{pn}
Step response time to 90 % I _{PN}	t _r	μs		2	6	di/dt=100A/μs
Frequency bandwidth ^{3) 4)}	BW	kHz	40			@-3dB @T _A < 125°C
Operating frequency ^{3) 4)}	f _{op}	kHz		1		
Phase shift	Δφ	°	-4			@DC to 1kHz
Output voltage noise peak-peak	Vno p-p	mV		17		@DC to 1MHZ

Notes:

1) The output voltage V_{OUT} is fully ratiometric. The offset and sensitivity are dependent on the supply voltage U_c relative to the following formula.

$$I_p = (\frac{5}{U_c} \times V_{out} - V_o) \times \frac{1}{G}$$

2) Items must be met at customer application.

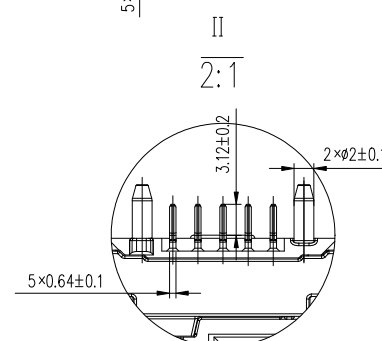
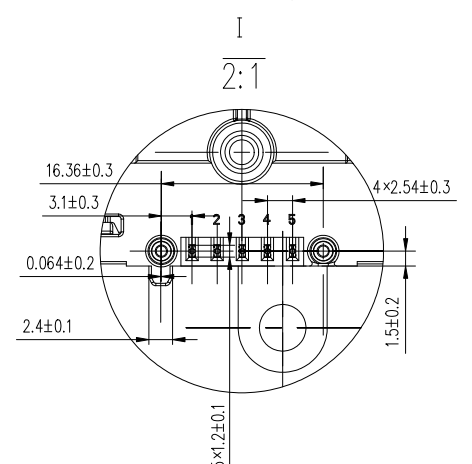
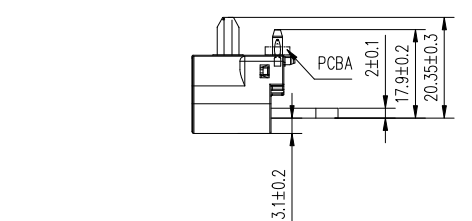
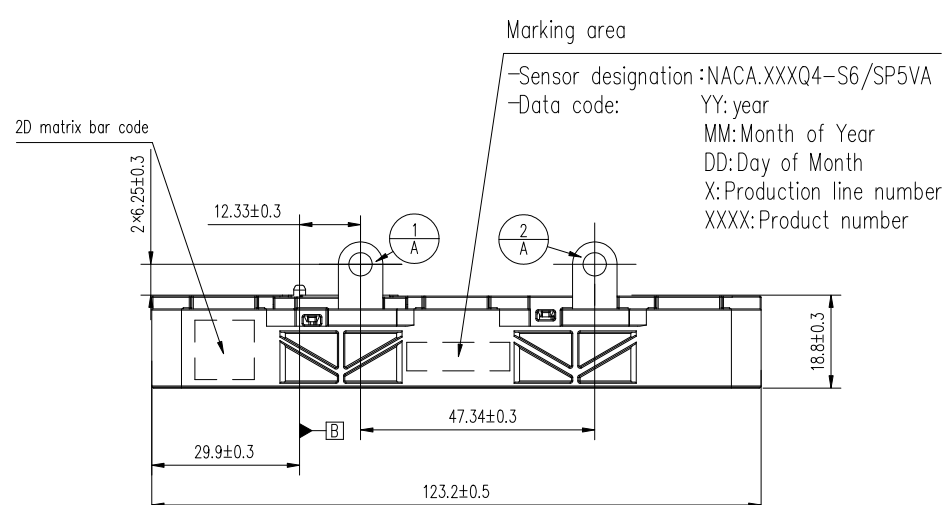
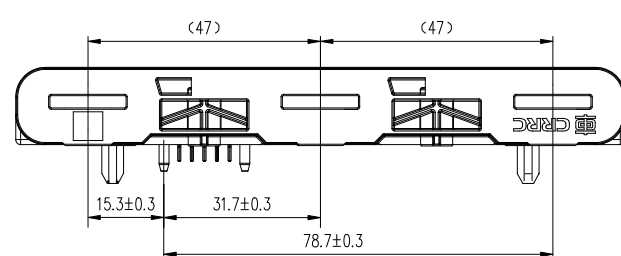
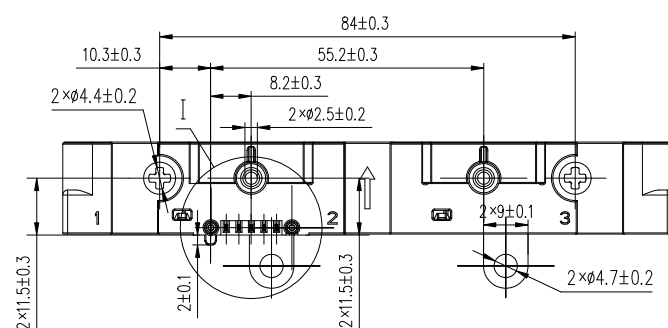
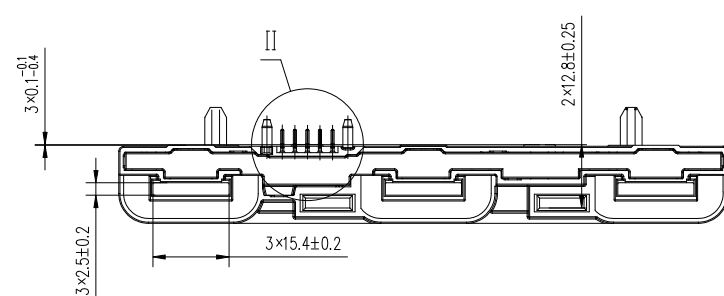
3) Primary current frequencies and maximum RMS primary admissible current must be limited in order to avoid excessive heating of the busbar, magnetic core and the ASIC, T_A<125°C

4) Please contact CRRC if sensor is applied in some extreme cases, for example: high frequency ripple, high temperature, operating frequency larger than 2kHz……

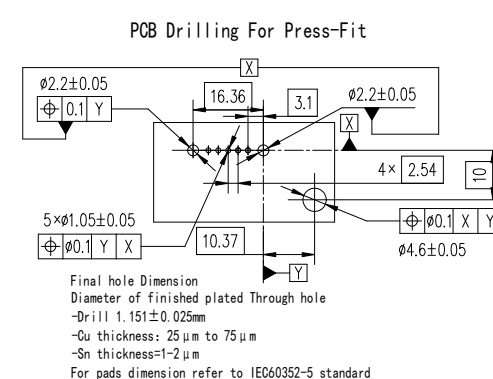
Current range and sensitivity

Part number	Parameter	Symbol	Unit	Specification			Conditions
				Min	Typical	Max	
NACA.800Q4-S6/SP5VA	Primary current, nominal range	I_{PN}	A	-800		800	
	Sensitivity	G	mV/A		2.5		@ $U_c=5V$
NACA.900Q4-S6/SP5VA	Primary current, nominal range	I_{PN}	A	-900		900	
	Sensitivity	G	mV/A		2.22		@ $U_c=5V$
NACA.1000Q4-S6/SP5VA	Primary current, nominal range	I_{PN}	A	-1000		1000	
	Sensitivity	G	mV/A		2		@ $U_c=5V$
NACA.1100Q4-S6/SP5VA	Primary current, nominal range	I_{PN}	A	-1100		1100	
	Sensitivity	G	mV/A		1.82		@ $U_c=5V$
NACA.1200Q4-S6/SP5VA	Primary current, nominal range	I_{PN}	A	-1200		1200	
	Sensitivity	G	mV/A		1.67		@ $U_c=5V$

Dimensions NACA.XXXQ4-S6/SP5VA series (in mm)



Pin out	
Pin 1	Vdd (+5V)
Pin 2	GND
Pin 3	Output 1
Pin 4	Output 3
Pin 5	Output 2



Note: +/-0.5mm for dimensions without tolerance specified.

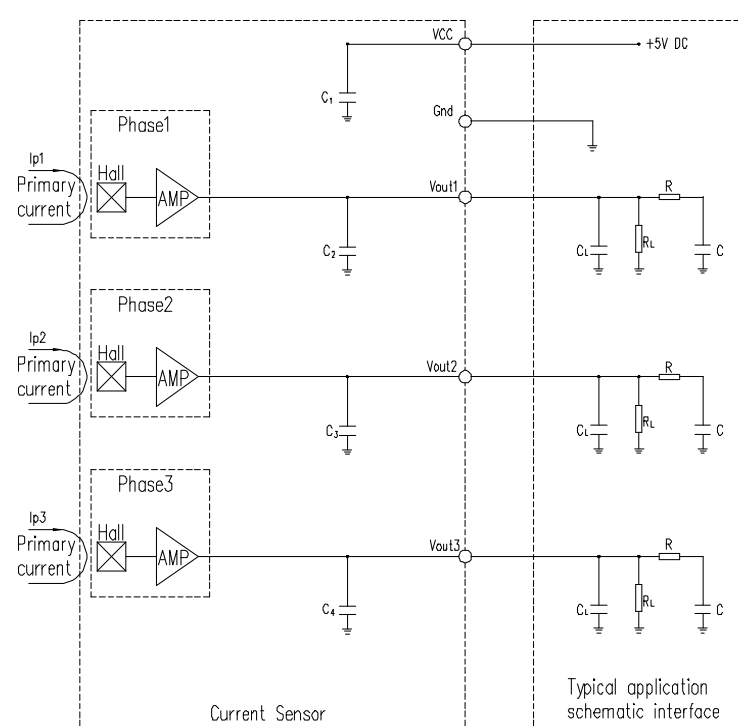
Mechanical characteristics

- Plastic case: PPA/PA66
- Magnetic core: FeSi alloy
- Mass: 85g
- Recommended screws for the fixing holes DELTA PT φ3 (for reference only) *
- Recommended M3 torque: 1.3Nm±10% (for reference only) *

Remarks

- $I_p = \left(\frac{5}{U_c} \times V_{out} - V_o \right) \times \frac{1}{G}$
- $V_{OUT} > V_o$ when I_p flows in the positive direction (see arrow on drawing)

Electronic schematic



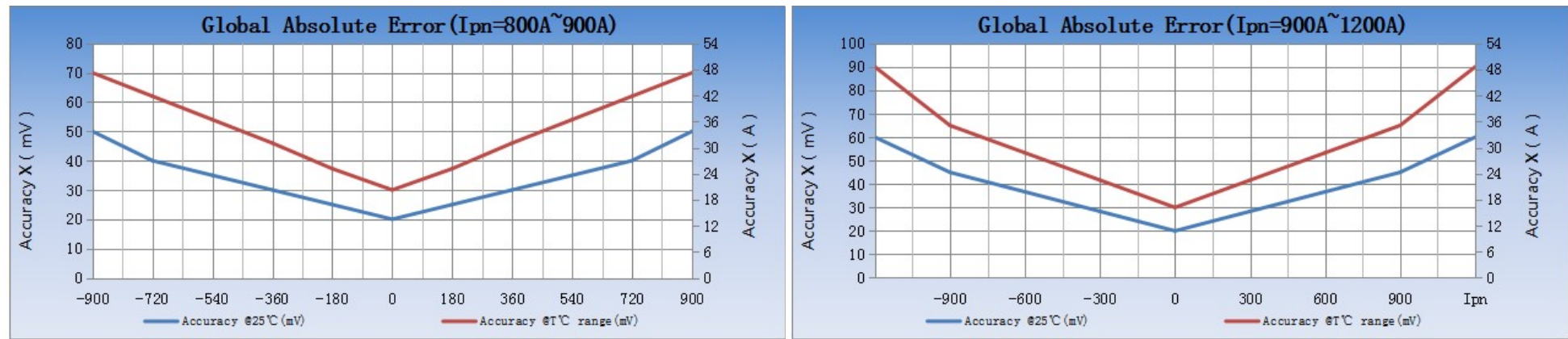
Performances Parameters Definitions

Definition of typical, minimum and maximum values

Combined with SPC principle, the initial key characteristic of CRRC product gives the typical value, minimum value and maximum value of characteristic parameter measurement. To enable customers to have a more comprehensive understanding of the product's restrictions and permitted security conditions, as follow:

1. Typical value: the typical value (Typical) generally takes the mean of the measurement sample of the product characteristic parameter in the design and verification stage as a definite target value; If there is no clear average value, the mean range of the measurement sample in the product design validation phase is taken, and the mean range is defined as 68.27% when combined with the normal distribution. The probability interval corresponding to the interval level between $-\sigma$ and $+\sigma$.
2. Minimum and maximum values: The range of feature elements measured is part of the statistical distribution (Unless otherwise specified, such as a full 100% inspection). Therefore, in combination with the principle of statistical probability distribution and the upper / lower limits of the measured value, CRRC defines the probability interval between the minimum (Min) and maximum (Max) values to be 99.73%, corresponding to the interval level between -3σ and $+3\sigma$.

Global Absolute Error (mV)



Primary current I_{PN} (A)	IP(A)	Accuracy @25°C, $U_c=5V$		Accuracy @T° Range, $U_c=5V$	
1000~1200	$-I_{PN}$	$\pm 60mV$	$\pm 3\%$	$\pm 90mV$	$\pm 4.5\%$
	-900	$\pm 45mV$	$\pm 2.25\%$	$\pm 65mV$	$\pm 3.25\%$
	0	$\pm 20mV$	$\pm 1\%$	$\pm 30mV$	$\pm 1.5\%$
	900	$\pm 45mV$	$\pm 2.25\%$	$\pm 65mV$	$\pm 3.25\%$
	I_{PN}	$\pm 60mV$	$\pm 3\%$	$\pm 90mV$	$\pm 4.5\%$
800~900	$-I_{PN}$	$\pm 50mV$	$\pm 2.5\%$	$\pm 70mV$	$\pm 3.5\%$
	-720	$\pm 40mV$	$\pm 2\%$	$\pm 62mV$	$\pm 3.1\%$
	0	$\pm 20mV$	$\pm 1\%$	$\pm 30mV$	$\pm 1.5\%$
	720	$\pm 40mV$	$\pm 2\%$	$\pm 62mV$	$\pm 3.1\%$
	I_{PN}	$\pm 50mV$	$\pm 2.5\%$	$\pm 70mV$	$\pm 3.5\%$

Note: The pre-product functional data meet the requirements in the above table.

Environmental test specifications

Name	Standard
THERMAL FATIGUE	
High Temperature & High Humidity	IEC 60068-2-78
Thermal cycle test	IEC 60068-2-14, GMW3172
Thermal shocks	IEC 60068-2-14, GMW3172
High temperature storage	IEC 60068-2-2
Low temperature storage	IEC 60068-2-1
MECHANICAL FATIGUE	
Shocks test	ISO 16750-3
Vibration test	ISO 16750-3
ELECTRICAL TESTS	
Phase delay	--
Output noise	--
di/dt	--
Dielectric withstand voltage	ISO 16750-2
Insulation resistance	ISO 16750-2
EMC TESTS	
Radiated Emissions: Absorber Lined Shielded Enclosure (ALSE)	CISPR25
Radiated Immunity: Bulk Current Injection (BCI)	ISO 11452-4
Radiated Immunity: Anechoic chamber	ISO 11452-2
Electrostatic Discharge Voltage (ESD)	ISO 10605

Remarks

- It is advised to use a primary conductor (busbar) that fills transducer through-hole.
- Be aware of the influence of the external field if nearby transducers are too close (relay, capacitor, choke...).

Comments:

- Items with “*” in this datasheet are recommended value for reference only. The final value must be determined by customer.
- CRRC reserves the right to carry out modifications on its transducers, in order to improve them.
- Product updates will not notified separately.The final version of the datasheet shall be confirmed through specific communication between both parties.