CSNV700 SERIES

006009
Issue 1

Flux Gate Current Sensors

AEC-Q100

DESCRIPTION

The CSNV700 Series are advanced flux gate current sensors that use Honeywell's patented technology to bring the best combination of performance and reliability. They are non-intrusive and electrically isolated from the monitored circuit. This ensures a simple and reliable structure without loss of power to the monitored circuit. The CSNV700 Series are rated for a primary current measurement range of ±700 A dc. They are calibrated and temperature compensated for improved accuracy using multi-point temperature characterization. The CSNV700 incorporates AEC-Q100 qualified integrated circuits to meet higher quality and reliability requirements.

DIAGNOSTIC FUNCTIONALITY/ CAN OUTPUT

The CAN output of the CSNV700 Series provides fault detection and communication capability. Also, the digital CAN communication is resistant to electrical interference. Examples of sensor and host system faults are as follows:

- Sensor fault
- Supply voltage over range
- Supply voltage under range
- Current over range

CUSTOMIZATION

The CSNV700 Series may be customized to meet application needs. Solutions may be tailored to exact specifications for improved time to market, lower total system costs and enhanced reliability. For technical assistance, we provide global engineering and service support for your needs.

DIFFERENTIATION

- **Accuracy:** Multi-point temperature characterization and calibration for improved accuracy over temperature range.
- **Magnetic immunity:** Flux gate configuration and optimized magnetic circuit allow for excellent performance in diverse magnetic environments.
- **Flexible:** Customizable on-board firmware to meet specific application requirements.

VALUE TO CUSTOMERS

- **Accurate:** Designed to enable precise battery state measurement for improved user experience.
- **Ease of use:** Magnetic immunity allows for easy integration into different magnetic environments.
- **Easy system integration:** CAN communication is transmitted using international road vehicle standard ISO 11898. CAN 2.0B is the default protocol, CAN 2.0A is available as a custom variant.

APPLICATIONS

- Current measurement for battery management systems in electrified vehicles (EV, HEV, PHEV or BEV)
- Current leakage detection and fault isolation in charging systems
- Current measurement in energy storage systems
- Fault detection in heavy industrial equipment

FEATURES

- Active flux gate current sensing
- Utilizes proprietary Honeywell technology for temperature compensation
- High accuracy and low temperature drift
- Operating temperature of -40°C to 85°C [-40°F to 185°F]
- Digital output: CAN bus output with configurable ID
- Internal diagnostic function
- Different configuration options: Mounting type, baud rate, CAN ID
- UL, CE, UKCA certifications; REACH and RoHS compliant
- AEC-Q100 qualified integrated circuits for higher reliability

PORTFOLIO

Honeywell offers a variety of current sensors for potential use in many applications. To view the entire product portfolio, click here.

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TABLE 1. ABSOLUTE MAXIMUM RATINGS: SUPPLY VOLTAGE = 12 V

CHARACTERISTIC	SYMBOL	UNIT	PARAMETER	CONDITION
Load dump over voltage	V_S	V	32	400 mSec
Over voltage	V_S	V	24 20	10 min continuous
Reverse polarity	V_S	V	-24	10 min
Supply voltage: **minimum** **maximum**	 V_S V_S	 V V	 7 18	 Continuous Continuous
CAN operation: **supply voltage under range alarm, no measurement** **supply voltage over range alarm, no measurement**	 — —	 V V	 6 to 7 18 to 24	 CAN continuous CAN continuous
Insulation resistance	IR	MOhm	>500	500 V dc at 1 min
Creepage distance	D_{Cp}	mm	10	Hole for busbar
Clearance	D_{Cl}	mm	9,5	Hole for busbar
RMS voltage: **ac isolation voltage** **dc isolation voltage**	 — —	 kV kV	 5 5	 50 Hz, 1 min 1 min

TABLE 2. OPERATING CHARACTERISTICS IN NOMINAL RANGE (I_{PN}): SUPPLY VOLTAGE = 12 V

CHARACTERISTIC	SYMBOL	UNIT	SPECIFICATION			CONDITION
			MIN.	TYP.	MAX.	
Primary current, nominal measuring range (dc)	I_{PN}	A	-700	—	700	—
Supply voltage	V_S	V	8	12	18	Full accuracy
Supply voltage hysteresis: **maximum** **minimum**	 V_{UP} V_{UP} V_{LOW} V_{LOW}	 V V V V	 — — — —	 18.1 17.7 7.1 7.8	 — — — —	 When V_S increases When V_S decreases When V_S increases When V_S decreases
Current consumption: **at I_P = 0 A** **at I_P = 500 A**	 I_C I_C	 mA mA	 — —	 45 180	 — —	 V_S = 12 V, T = 25°C V_S = 12 V, T = 25°C
Ambient operating temperature	T_a	°C	-40	—	85	Temperature range with accuracy guaranteed
Total accuracy at 20 A < I_P < 700 A	X_G	%	-0.5	—	0.5	At FS, T = -40°C to 85°C, ±3 sigma
Error: **at I_P = 0 A (offset current)** **at $I_P \leq$ 20 A**	 I_{os} X_G	 A A	 -0.05 -0.1	 —	 0.05 0.1	 T = -40°C to 85°C, ±3 sigma T = -40°C to 85°C, ±3 sigma
Linearity	ε_L	%	—	0.1	—	Room temperature

TABLE 3. ABSOLUTE MAXIMUM RATINGS: SUPPLY VOLTAGE = 24 V

CHARACTERISTIC	SYMBOL	UNIT	PARAMETER	CONDITION
Load dump over voltage	V_S	V	42	400 mSec
Over voltage	V_S	V	39 36	10 min continuous
Reverse polarity	V_S	V	-36	10 min
Supply voltage: **minimum** **maximum**	 V_S V_S	 V V	 7 32	 Continuous Continuous
CAN operation: **supply voltage under range alarm, no measurement** **supply voltage over range alarm, no measurement**	 V_S V_S	 V V	 7 to 8 36 to 39	 CAN continuous CAN continuous
Insulation resistance	IR	MOhm	>500	500 Vdc at 1 min
Creepage distance	D_{Cp}	mm	10	Hole for busbar
Clearance	D_{Cl}	mm	9,5	Hole for busbar
RMS voltage: **ac isolation voltage** **dc isolation voltage**	—	 kV kV	 5 5	 50 Hz, 1 min 1 min

TABLE 4. OPERATING CHARACTERISTICS IN NOMINAL RANGE (I_{PN}): SUPPLY VOLTAGE = 24 V

CHARACTERISTIC	SYMBOL	UNIT	SPECIFICATION			CONDITION
			MIN.	TYP.	MAX.	
Primary current, nominal measuring range (dc)	I_{PN}	A	-700	—	700	—
Supply voltage	V_S	V	8	24	32	—
Supply voltage hysteresis: **maximum** **minimum**	 V_{UP} V_{UP} V_{LOW} V_{LOW}	 V V V V	 — — — —	 32.1 31.7 8.1 7.8	 — — — —	 When V_S increases When V_S decreases When V_S increases When V_S decreases
Current consumption: **at I_P = 0 A** **at I_P = 500 A**	 I_C I_C	 mA mA	 — —	 45 110	 — —	 V_S = 24 V, T = 25°C V_S = 24 V, T = 25°C
Ambient operating temperature	T_a	°C	-40	—	85	—
Total accuracy at 20 A < I_P < 700 A	X_G	%	-0.5	—	0.5	At FS, T = -40°C to 85°C, ±3 sigma
Error: **at I_P = 0 A (offset current)** **at I_P = 10 A (offset current)**	 I_{os} I_{os}	 A A	 -0.05 -0.1	 —	 0.05 0.1	 T = -40°C to 85°C, ±3 sigma T = -40°C to 85°C, ±3 sigma
Linearity	ε_L	%	—	0.1	—	Room temperature

TABLE 5. MECHANICAL CHARACTERISTICS	
CATALOG LISTING	**DESCRIPTION**
Housing material	Plastic PA66-GF25 (UL 94V-0)
Mounting screw	M6, 3 N m maximum torque
Mating electrical connector	TEM PN 1473672-1

FIGURE 1. ERROR VS CURRENT

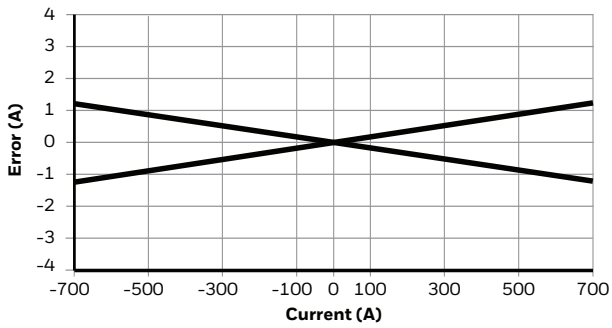

TABLE 6. CANBUS CHARACTERISTICS[1, 2, 3, 4]

MESSAGE DESCRIPTION	CAN ID	DATA LENGTH	MESSAGE LAUNCH TYPE	SIGNAL DESCRIPTION	SIGNAL NAME	START BIT	LENGTH
Primary current Ip (mA)	0x3C2	8 bytes	Cyclic transmitted message 10 mSec cycle.	I_p value: 80000000h = 0 mA 7FFFFFFFh = -1 mA 80000001h = 1 mA	IP_VALUE	24	32
				Error information	ERROR_INFORMATION	32	7
				Error indication (1 bit): 0 = normal 1 = failure	ERROR_INDICATION	39	1
				Fixed to 0	VACANT_DATA_2BYTES	48	16
				CRC-8 POLY: 8 + X2 + X + 1	CRC_8	56	8

[1]CANBUS speed: Refer to Figure 2.
[2]CAN bus protocol: Version 2.0A/B.
[3]CAN oscillator tolerance: 0.3125 %.
[4]Byte order: Big endian (Motorola).

TABLE 7. DIAGNOSTIC TROUBLE CODES			
FAILURE MODE	**I_p VALUE**	**ERROR INDICATION**	**ERROR INFORMATION**
Flash CRC error	FFFF FFFFh	1	0x48
AFE over range happens[1]	FFFF FFFFh	1	0x49
AFE error happens	FFFF FFFFh	1	0x50
Internal LUT error	FFFF FFFFh	1	0x51
Power minimum limit	FFFF FFFFh	1	0x54
Power maximum limit	FFFF FFFFh	1	0x55

[1]Overcurrent detection I_p > 740 A.

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TABLE 8. ORDER GUIDE

Catalog Listing	Description
CSNV700N-354	CSNV700 Series flux gate current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 500 k baud rate, 3C4 CAN ID
CSNV700N-355	CSNV700 Series flux gate current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 500 k baud rate, 3C5 CAN ID
CSNV700N-356	CSNV700 Series closed loop current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 500 k baud rate, 3C6 CAN ID

FIGURE 2. NOMENCLATURE

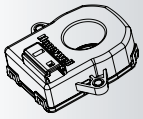
CS	N	V	700	N	3	5	4	A
Type	Principle	Use	Rated Current	Mounting Type	Supply Voltage	Baud Rate	CAN ID	Customization
Current Sensor	N Flux gate	V Designed for vehicle applications	700 700 A	N Through hole with metal bushing 	3 12 V	2 250 k 5 500 k	4 3C4 5 3C5 6 3C6	A to Z

FIGURE 3. POSITIVE PRIMARY CURRENT DIRECTION (POLARITY)

Application condition: Pollution degree PD2

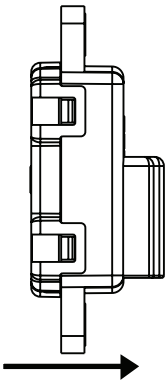


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FIGURE 4. DIMENSIONAL DRAWINGS (FOR REFERENCE ONLY: MM/[IN])

Mounting type N: Through-hole with metal bushing

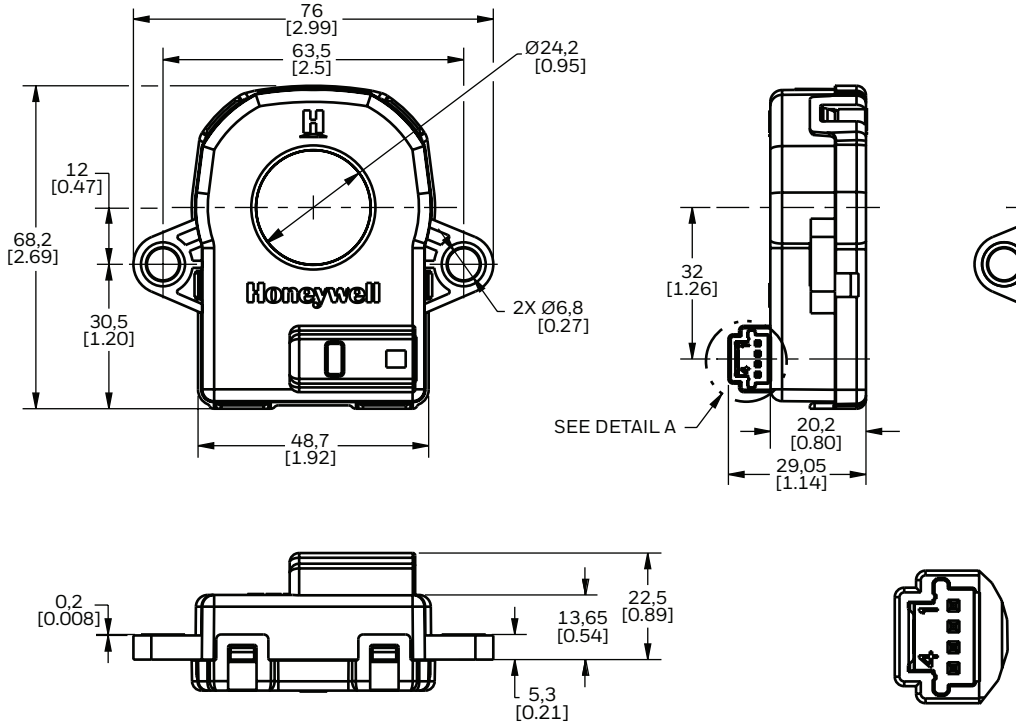

TABLE 9. PINOUT

PIN	OUTPUT
1	CAN-L
2	CAN-H
3	GND
4	V_S

TABLE 10. EMC TEST SPECIFICATIONS

TEST	STANDARD	PROCEDURE
CISPR 25 conducted RF emissions – voltage on supply lines	CISPR25	According to CISPR 25:2008 commission form of testing
CISPR 25 conducted RF emissions – voltage on supply lines	CISPR25	According to CISPR 25:2008 commission form of testing
CISPR 25 radiated emissions	CISPR25	According to CISPR 25:2008 commission form of testing
Bulk current injection (BCI) test	ISO 11452-4	According to ISO 11452-4
ALSE with a ground plane	ISO 11452-2	According to ISO 11452-2
Transient disturbances conducted along supply lines	ISO 7637-2	According to ISO 7637-2
Transient disturbances conducted along I/O or sensor lines	ISO 7637-3	According to ISO 7637-3
Immunity to magnetic field	ISO 11452-8	According to ISO 11452-8
Handling test	—	See "Electrostatic discharge"
Operating test	—	See "Electrostatic discharge"
Electrostatic discharge	ISO 10605	Unpowered direct contact discharge: ±4 kV, ±8 kV Unpowered air discharge: ±8 kV, ±15 kV Powered-up direct contact discharge: ±4 kV Powered-up air discharge: ±8 kV
Impulse noise test	—	—
Fast transient noise test	—	2 kV power port, 1 kV CAN signal and control port
Radio frequency electromagnetic field	IEC 61000-4-3	10 V/m (80 MHz to 1 GHz), 3 V/m (1.4 GHz to 2 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
Fast transients bursts susceptibility test	IEC 61000-4-4	2 kV power port, 1 kV CAN signal and control port
Radio frequency continuous conducted	IEC 61000-4-6	0.15 MHz to 80 MHz, 3 V 80 % AM (1 kHz)
Radio frequency magnetic field	IEC 61000-4-8	30 A/M
Radiated disturbance (3M semi-anechoic chamber)	CISPR-11	Group 1, Class A

TABLE 11. ENVIRONMENTAL TEST SPECIFICATIONS

TEST	STANDARD	PROCEDURE
Shipping/storage temperature exposure	—	Not tested. Covered by low and high temperature operating test.
Low temperature operating endurance	ISO16750-4	120 hr at -40°C, power on with 100 A primary current.
High temperature operating endurance	ISO16750-4	85°C, 6000 hr, power on with 100 A primary current. Performance test before and after test only at 25°C and V_S nom.
Powered thermal cycle endurance	ISO16750-4	8 hr at 120 cycles, 960 hr. Performance test before and after test only at 25°C and V_S nom.
Thermal shock	IEC60068-2-14	-40°C (30 min soak)/85°C (30 min soak), 250 cycles
Thermal humidity cycle	IEC 60068-2-38	240 hr, -10°C/65°C, 93 % humidity between rise in temperature and constant temperature zone, 80 % humidity in drop temperature zone. Performance test before and after test only at 25°C and V_S nom.
High temperature and humidity endurance	IEC60068-2-67	85°C, 85 % humidity, 1000 hr, power on with 100 A primary current. Performance test before and after test only at 25°C and V_S nom.
Vibration	IEC60068-2-64	5 Hz to 2000 Hz, 20 hr/axis, 3 axis with -40°C/85°C temperature cycle during test. Product power on with 100 A primary current. Performance test before and after test only at 25°C and V_S nom.
Mechanical shock	ISO16750-3	500 m/s, 2,20 each direction (60 total), half sine pulse. Product power on with 100 A primary current. Performance test before and after test only at 25°C and V_S nom.
Package drop	ISTA-1A or GB/T 4857.5	With final packaging, drop in direction at 1 corner, 3 edge, 4 face ≥ total 9 drops, 1 m on concrete floor.
Handling drop	ISO 16750-3	1st fall of each DUT at a different dimensional axis, 2nd fall with the given DUT at the same dimensional axis but on the opposite side of the housing, from 1 m on concrete floor. Performance test before and after test only at 25°C and V_S nom.
Dust (and other solid intrusion)	ISO20653	IP category: 4
Water intrusion	—	Not tested. IP category: 0. Not protected.
Dew formation test	—	—
Mixed flowing gas	—	Not tested.
Salt fog	ISO16750-4 or GB/T2423.17	5 % salt water solution, 96 hr at 35°C. Performance test before and after test only at 25°C and V_S nom.
Chemical exposure (outside cabin compartment)	—	Not tested.

TABLE 12. ELECTRICAL TEST SPECIFICATIONS

TEST	STANDARD	PROCEDURE
Supply voltage range	ISO 16750-2	7 V to 18 V, at 25°C, with 100 A primary current
Supply voltage ripple	—	—
Supply voltage drop out	—	—
Supply voltage dips	—	—
Slow decrease and increase of supply voltage	ISO 16750-2	Power supply changes from 18 V to 0 V with 0.5 V ±0.1 V step. At any step, power supply maintain 1 min. Power supply changes from 0 V to 18 V with 0.5 V ±0.1 V step. At any step, power supply maintain 1 min. Performance test before and after test only at 25°C and V_S nom.
Defective regulation (full-fielded alternator)	—	—
Jump start	—	Refer to "Overvoltage".
Load dump	—	32 V, 400 mSec, 5 pulses
Overvoltage	ISO 16750-2	18 V, 60 min at 85°C, 24 V for 10 min at 25°C
Reverse supply voltage	ISO 16750-2	-50 V, 10 min
Superimposed alternating voltage	ISO 16750-2	Conduct test as per ISO 16750-2 4.4. Test voltage US max 18 V for UN = 12 V systems, ac voltage (sinusoidal), severity 2, UPP = 4 V. Performance test before and after test only at 25°C and V_S nom.
Discontinuities in supply voltage	ISO 16750-2	Conduct test as per ISO 16750-2 4.6. Momentary drop in supply voltage reset behavior at voltage drop starting profile.
Immunity to short circuits in the supply voltage input and load output lines	—	See "Short circuit protection".
Immunity to short circuits in I/O signal lines	—	See "Short circuit protection".
Short circuit protection	ISO 16750-2	Sensor supply of 18 Vdc and 24 Vdc. Connect CAN-H and GND and hold for 60 s. Connect CAN-L and GND and hold for 60 s. Connect CAN-H and V_S and hold for 60 s. Connect CAN-L and V_S and hold for 60 s. Performance test before and after test only at 25°C and V_S nom.
Insulation resistance	ISO 16750-2	Test voltage: 500 Vdc ±10 Vdc between primary bar and the short-circuited secondary circuit. Test duration: 60 s, insulation resistance ≥500 MΩ
ac dielectric voltage test	IEC60664-1	Test voltage: 5000 Vac, test voltage frequency: 50 Hz to 60 Hz, test duration: 60 s, leakage current ≤1 mA
dc dielectric voltage test	IEC60664-1	Test voltage: 5000 Vdc, test duration: 60, leakage current ≤1 mA
High current transient shock test	—	Product power on with 12 V supply voltage. Monitor product CAN bus output and power supply current. Apply primary transient current shock at 2000 A, 5000 A, 7000 A, 9000 A, 10000 A Performance test before and after test only at 25°C and V_S nom.

WARRANTY/REMEDY

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⚠ WARNING
PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING
MISUSE OF DOCUMENTATION

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- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

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