CSNV1500 SERIES

009558
Issue 1

Closed Loop Current Sensors

DESCRIPTION

The CSNV1500 Series are Hall-effect, closed loop 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 CSNV1500 Series are rated for a primary current measurement range of ±1500 A DC. They are calibrated and temperature compensated for improved accuracy using multi-point temperature characterization.

DIAGNOSTIC FUNCTIONALITY/ CAN OUTPUT

The CAN output of the CSNV1500 Series provides fault detection and communication capability. Also, the digital CAN communication is very immune to electrical interference. Examples of sensor and host system faults are as follows:

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

CUSTOMIZATION

The CSNV1500 Series may be customized to best 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:** Closed loop 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 2.0A is the default protocol, CAN 2.0B is available as a custom variant.

POTENTIAL INDUSTRIAL APPLICATIONS

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

RoHS COMPLIANT

FEATURES

- Active closed loop current sensing using Hall-effect technology
- 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
- CE certification; REACH and RoHS compliant

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

CHARACTERISTIC	SYMBOL	UNIT	PARAMETER	CONDITION
Load dump over voltage	V_S	V	32	400 mSec
Over voltage	V_S	V V	24 20	10 min continuous
Reverse polarity	V_S	V	-24	10 min
Supply voltage: minimum maximum	V_S	 V V	 7 18	 — —
CAN operation: supply voltage under range alarm, no measurement supply voltage over range alarm, no measurement	V_S	 V V	 6 to 7 18 to 24	 CAN continuous CAN continuous
Insulation resistance	IR	MΩ	500	500 V DC at 1 min
Creepage distance	D_{Cp}	mm	7,5	—
Clearance	D_{Cl}	mm	7	—
RMS voltage: AC isolation voltage DC isolation voltage	—	kV	 2.5 2.5	 50 Hz, 1 min 1 min

TABLE 2. OPERATING SPECIFICATIONS IN NOMINAL RANGE (I_{PN})

CHARACTERISTIC	SYMBOL	UNIT	PARAMETER			CONDITION
			MIN.	TYP.	MAX.	
Primary current, nominal measuring range (DC)	I_{PN}	A	-1500	—	1500	full temperature range
Supply voltage	V_S	V	7	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 6.8	 — — — —	 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 = 1500 A	 I_{SUPPLY} I_{SUPPLY}	 mA mA	 — —	 21 —	 30 250	 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, ±3 sigma
Error at I_p = -10 A to +10 A (offset current)	I_{OS}	A	-0.1	—	0.1	3 sigma, T = 40°C to 85°C
Total accuracy at 10 A < I_p < 1500 A	X_G	—	—	±1%	—	3 sigma, T = 40°C to 85°C

TABLE 3. MECHANICAL SPECIFICATIONS

CHARACTERISTIC	PARAMETER
Housing material	PA66+GF25 (UL 94V - 0)
Mounting screws	M5, torque max. 3.5 N m
Mating electrical connector	TE MPN 1473672-1

TABLE 4. CANBUS SPECIFICATIONS[1, 2, 3]

MESSAGE DESCRIPTION	CAN ID	DATA LENGTH	MESSAGE LAUNCH TYPE	SIGNAL DESCRIPTION	SIGNAL NAME	START BIT	LENGTH
Primary current I_p (mA)	See Figure 1	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 indication (1 bit) 0 = normal 1 = failure	ERROR_INDICATION	32	1
				Error information 0x64 when indication = 0	ERROR_INFORMATION	33	7
				Fixed to 0	CRC_8	56	8

[1]CANBUS speed: See Figure 1.
[2]CAN oscillator tolerance: 0.3125%.
[3]Byte order: Big endian (Motorola).

TABLE 5. DIAGNOSTIC TROUBLE CODES

FAILURE MODE	I_p VALUE	ERROR INDICATION	ERROR INFORMATION
Flash CRC error	FFFF FFFFh	1	0x40
AFE over range happens	FFFF FFFFh	1	0x41
AFE error happens	FFFF FFFFh	1	0x42
Internal LUT error	FFFF FFFFh	1	0x44
Power minimum limit	FFFF FFFFh	1	0x46
Power maximum limit	FFFF FFFFh	1	0x47

FIGURE 1. I_p POSITIVE PRIMARY CURRENT DIRECTION (POLARITY)

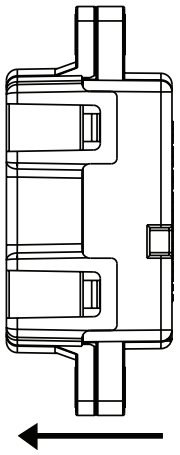

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TABLE 6. ORDER GUIDE

CATALOG LISTING	DESCRIPTION
CSNV1500N-121	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C1 CAN ID
CSNV1500N-122	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C2 CAN ID
CSNV1500N-123	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C3 CAN ID
CSNV1500N-124	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C4 CAN ID
CSNV1500N-125	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C5 CAN ID
CSNV1500N-126	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C6 CAN ID
CSNV1500N-127	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C7 CAN ID
CSNV1500N-128	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C8 CAN ID
CSNV1500N-129	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 250k baud rate, 3C9 CAN ID
CSNV1500N-151	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C1 CAN ID
CSNV1500N-152	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C2 CAN ID
CSNV1500N-153	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C3 CAN ID
CSNV1500N-154	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C4 CAN ID
CSNV1500N-155	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C5 CAN ID
CSNV1500N-156	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C6 CAN ID
CSNV1500N-157	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C7 CAN ID
CSNV1500N-158	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C8 CAN ID
CSNV1500N-159	CSNV1500 Series Hall-effect closed loop current sensor, 1500 A, through-hole mounting with stainless steel bushing, 12 V supply voltage, 500k baud rate, 3C9 CAN ID

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FIGURE 2. NOMENCLATURE

CS	N	V	1500	N	1	5	1	A
Type	Principle	Use	Rated Current	Fixture Type	Supply Voltage	Baud Rate	CAN ID	Customization
Current Sensor	N Hall-effect closed loop	V Vehicle applications	1500 1500 A	N Through-hole mounting with stainless steel bushing	1 12 V	2 250 k 5 500 k	1 3C1 2 3C2 3 3C3 4 3C4 5 3C5 9 3C0	A to Z

FIGURE 3. DIMENSIONAL DRAWINGS (FOR REFERENCE ONLY: MM)

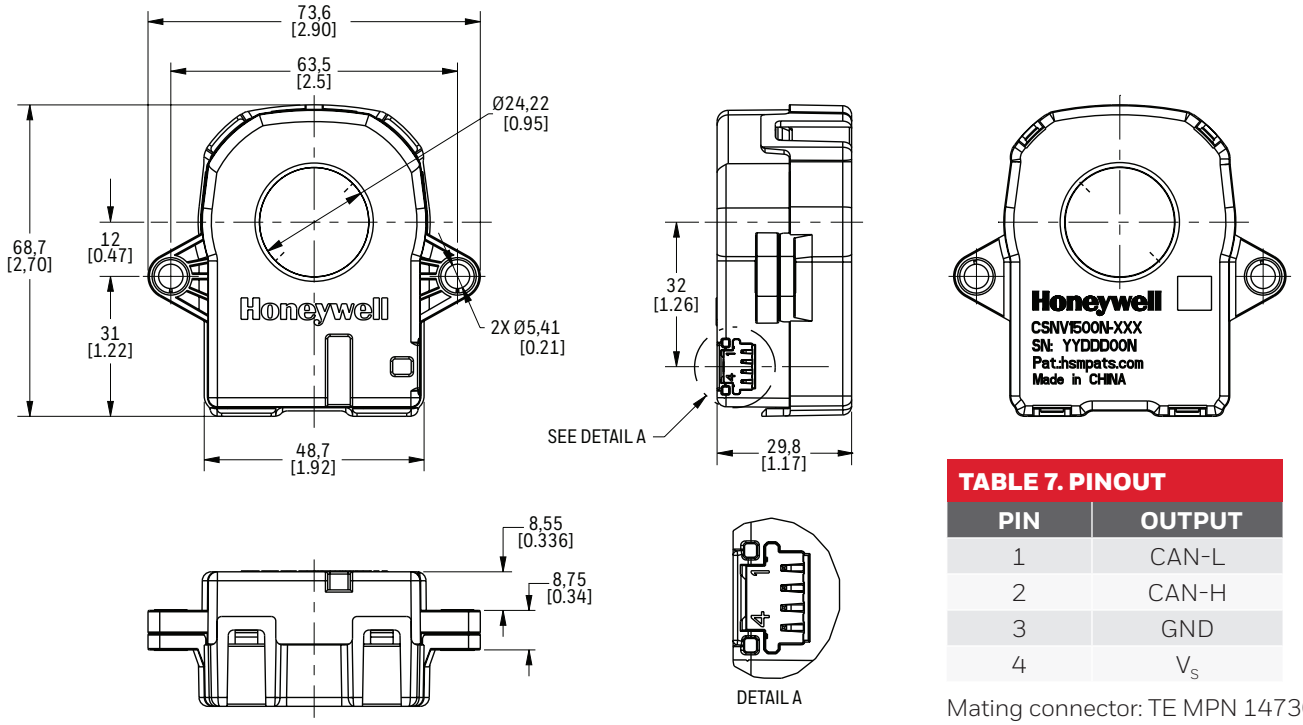

TABLE 7. PINOUT

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

Mating connector: TE MPN 1473672-1

FIGURE 4. PART MARKING DETAILS

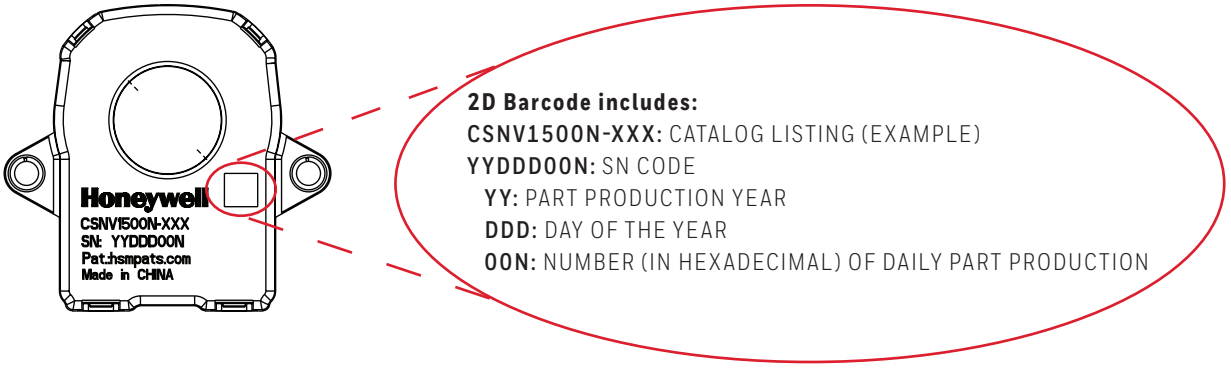

TABLE 8. EMC TEST SPECIFICATIONS

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 9. 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 10. 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 18V 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	-24 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 Us and hold for 60 s. Connect CAN-L and Us 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.

ADDITIONAL MATERIALS

The following associated literature is available at sps.honeywell.com/ast:

- Product range guide
- Installation drawings

NOTICE
PRELIMINARY DOCUMENTATION

The information contained in this document is preliminary and for reference only. Preliminary means that the product described has not been or is currently being formally tested. Specifications are subject to change without notice. Reliance on the information contained herein is at the reader's own risk.

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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

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- 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.

FOR MORE INFORMATION

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