



CTS-CS-MCS-HASU-1000

MULTI-CORE Redundant Current and Temperature Sensor

Features

- Input Supply Voltage: 4.5 - 5.5V
- Current Measuring Range: ± 1000 [Apk]
- Measurement accuracy: 1% (Hall) and 0.5% (Shunt)
- Operational temperature Range: -40 to +125 °C

Advantages

- Functional safety through sensor heterogeneous redundancy
- Single module reduces BOM and wiring complexity
- Suitable for high-power EV and ESS applications
- Designed to support ISO 26262 system architectures (sensor level).



Applications

- Electric Vehicle Battery Management System (EV BMS)
- Energy Storage System Battery Management System (ESS BMS), including UPS

Description

- The CTS-MCS is a galvanically isolated, redundant current sensing module designed for high-power battery systems up to ± 1000 A. By combining precision shunt measurement with Hall-effect sensing, CTS-MCS enables fault-tolerant current measurement for safety-critical BMS architectures in electric vehicles and stationary energy storage systems.
- The MCS is Current Sensors with UART communication and analog signal multiple output ways for easy installation and use.



Configuration information

Product	Condition	Combination of signal types	Connector pin definition					
			pin1	pin2	pin3	pin4	pin5	pin6
CTS-CS-MCS-HASU-1000	CONF 1	1*ANALOG + 1*UART	UTX	URX	GND	V(NTC)	OUT	VDD
CTS-CS-MCS-XXSU-1000	CONF 2	1*UART	VDD	URX	UTX	SHUNT_M	SHUNT_P	GND
CTS-CS-MCS-XXSL-1000	CONF 3	1*LIN	VDD	LIN	/	SHUNT_M	SHUNT_P	GND
CTS-CS-MCS-HAXX-1000	CONF 4	1*ANALOG	VDD	VDD	V(NTC)	OUT	GND	GND
CTS-CS-MCS-HASA-1000	CONF 5	2*ANALOG	VDD	OUT	V(NTC)	SHUNT_M	SHUNT_P	GND

IMPORTANT:

H=HALL EFFECT, A=ANALOG, S=SHUNT, U=UART, L=LIN

The first two respectively represent Hall channel and the form of Hall output, while the last two respectively represent shunt channel and the form of shunt output. In addition, the first two "XX" represent the absence of Hall output, and the last two "XX" represent the absence of shunt output.

This datasheet is only applicable to CONF1. The specific parameters of the other four conditions are not displayed in this datasheet.

Ordering information

Product	Option Code	Current Range
CTS-CS-MCS-HASU-500	500	±500 Apk
CTS-CS-MCS-HASU-800	800	±800 Apk
CTS-CS-MCS-HASU-1000	1000	±1000 Apk



Absolute ratings (not operating)

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Supply voltage	V_{DD}	V	4.5		5.5	
RMS current consumption @0A	I_c	mA	15	24	45	VDD=5V
Ambient storage temperature	T_A	°C	-40		125	
Electrostatic discharge voltage (HBM)	$U_{ESD-HBM}$	KV			8	
RMS voltage for AC insulation test	U_D	KV			4.2	50Hz,1 min, IEC 60664 Part1
Insulation resistance	R_{INS}	MΩ	500			

IMPORTANT: exceeding the absolute maximum ratings may cause permanent damage to the sensor module. Exposure to absolute maximum-rated conditions for extended periods of time may affect sensor module reliability.

Operating characteristics in nominal range for Shunt channel

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Resistance value	R	μΩ	99.5		100.5	@25°C
Operating temperature	T	°C	-40		125	
Rated continuous power		W		16		
Resolution ratio	N_{Rr}	bits		16		
Total Error	ε_{Tol}	%		±0.3		@25°C
				±0.5		@Full Temp. Range
Offset error @0A	ε_{off}	A		±0.1		@25°C



Operating characteristics in nominal range for Hall channel

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Operating temperature	T	°C	-40		125	
Response Time	T _{RESP}	μs			2	
Hysteresis	ε _H	%FS		±0.25		@25°C
Sensitivity	S	mV/mT		32		
Total Error	ε _{Tol}	%		±1		@25°C
				±1.5		@Full Temp. Range
Offset error@0A	ε _{off}	A		±3		@25°C

Operating characteristics in nominal range for Temperature channel

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Measuring range	T _M	°C	-40		150	
Measurement accuracy	ε _a	%	-1		1	@25°C

Shunt and Hall

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Current measuring range	I _M	A	-1000		1000	Duration ≤ 150s @25°C
Max continuous DC current	I _r	A	-400		400	@25°C
Start-up time	I _{start}	ms		500		



UART Communication Interface

- Baud Rate: 115200 bps
- Data Bits: 8 bit
- Stop Bits: 1 bit
- Parity: None
- Flow Control: None
- Transmission Mode: Full Duplex
- Signal Level: TTL (3.3V / 5V compatible)
- Interface Type: Asynchronous serial communication

NOTE: These parameters are configurable and can be customized per customer requirements.



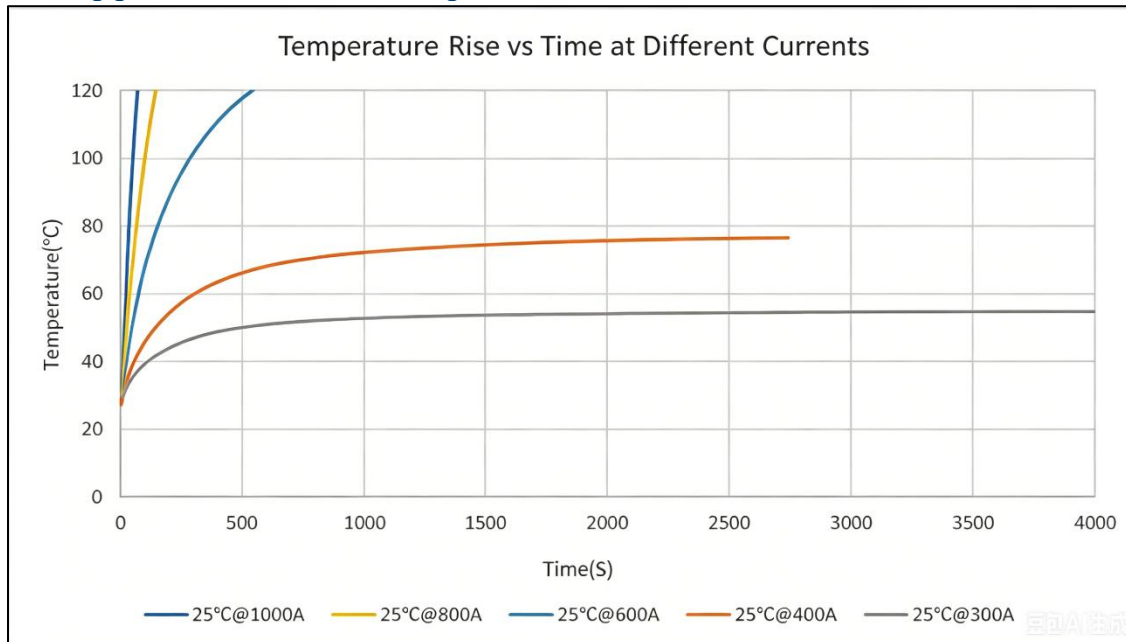
Appendix 1: Derating & Thermal Characteristics

- This section describes the self-heating and temperature rise characteristics of the sensor, which are part of the derating guidelines for reliable operation.
- This Derating & Thermal Characteristics section includes test setup details and temperature rise performance data, all of which form the official derating guidelines for reliable sensor operation.

Setup

- Test environment: Climate chamber, ambient temperature set to 25°C
- Test point: Shunt alloy
- Data collection: NTC thermistor on PCB
- No active cooling in the busbar

Heating generation chart according to above condition

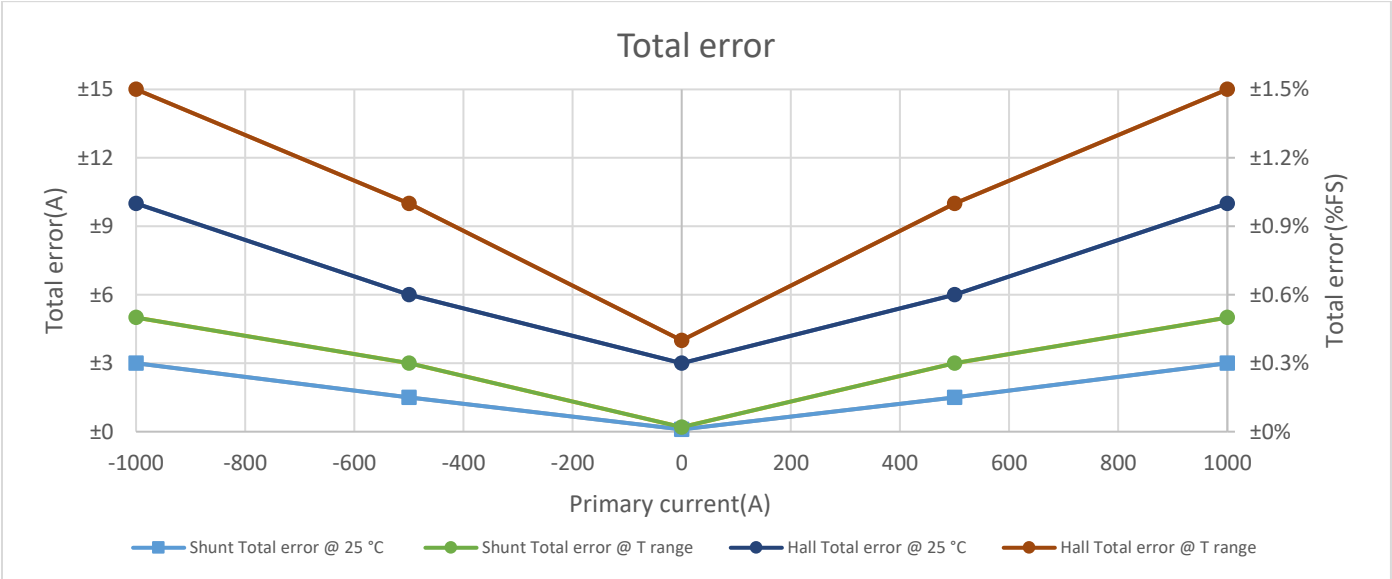


Note:

- 1.The temperature rise curves are measured under the conditions specified above. Actual temperature rise may vary based on PCB design, ambient temperature, and cooling conditions.
2. Depending on the conditions of use, the temperature of the exposed parts of the Shunt alloy may reach or exceed 125°C.
- 3.The sensor must not be operated if the junction temperature exceeds the rated maximum operating temperature. Refer to the derating guidelines for current limits at elevated temperatures.
- 4.This section is part of the derating specification, consistent with industry-standard datasheet practices for current sensors and power components.



Appendix 2: Total error ϵ_{Tot}



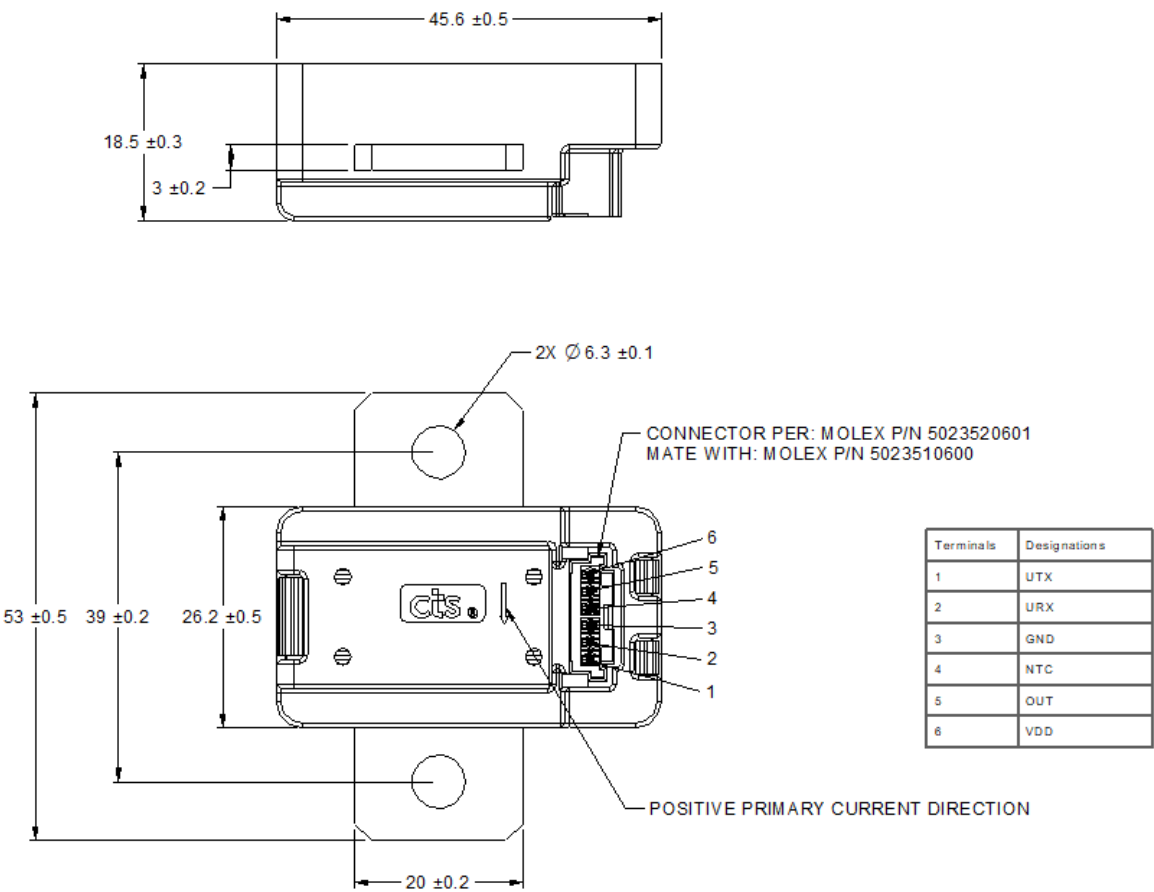
Primary current	Total error @ 25 °C				Total error @ T range			
A	Hall(A)	Hall(%FS)	Shunt(A)	Shunt(%FS)	Hall(A)	Hall(%FS)	Shunt(A)	Shunt(%FS)
1000	10	1	3	0.3	15	1.5	5	0.5
500	6	0.6	1.5	0.15	10	1	3	0.3
0	3	0.3	0.1	0.01	4	0.4	0.2	0.02
500	6	0.6	1.5	0.15	10	1	3	0.3
1000	10	1	3	0.3	15	1.5	5	0.5

Note: Hall channel accuracy calculated by Ipm



Dimensions

All the dimensions are expressed in [mm], unless otherwise specified.





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