



CTS-CS-PAX-12

Current Sensor Module

Features

- Low hysteresis
- High Permeability
- Unipolar 5 V DC power supply
- Open Loop Hall-Effect Measurement
- Primary current range up to $\pm 1000 A_{PK}$
- Temperature Range: -40 to 125 °C
- Fully ratio-metric

Advantages

- Excellent accuracy
- High Linearity
- Excellent output linearity
- Low Thermal Offset Drift <5 mV (T-0)
- Low Thermal Sensitivity Drift <1 % (T-0)
- High Bandwidth (>30 kHz)
- Non-intrusive sensing (no losses)
- Small Size, Lightweight

Applications

- Inverters
- DC Link
- DC/DC converters

Description

The CTS-CS-PAX-12 is an analog open loop current sensor module designed for non-intrusive and galvanically isolated measurement of AC and DC currents. Thanks to it's design CTS-CS-PAX-12 can be used in high power applications such as automotive inverters or DC/DC converters.





Ordering Information

Product	Option Code	Typical Sensitivity	Current Range
CTS-CS-PAX-12-0250	0250	8.00 mV/A	±250 A _{PK}
CTS-CS-PAX-12-0500	0500	4.00 mV/A	±500 A _{PK}
CTS-CS-PAX-12-0750	0750	2.67 mV/A	±750 A _{PK}
CTS-CS-PAX-12-1000	1000	2.00 mV/A	±1000 A _{PK}

Option Codes ⇒ Current Range. Current Range defines the peak current value.

CTS-CS-PAX-12-XXXX (Option Code).

Contact CTS for custom current ranges/sensitivity.

Absolute Maximum Ratings (unpowered)

Parameter	Symbol	Value	Unit	Condition
Positive Supply Voltage	V _{DD}	+10	V	
Reverse Supply Voltage	V _{DD_REV}	-0.3	V	
Positive Output Voltage	V _{OUT}	+10	V	
Reverse Output Voltage	V _{OUT_REV}	-0.3	V	
Output Current	I _{OUT}	±70	mA	
Reverse Output Current	I _{OUT_REV}	-50	mA	
Operating Ambient Temperature	T _A	-40 to 125	°C	
Storage Temperature	T _S	-40 to 125	°C	
ESD Human Body Model	U _{ESD-HBM}	2	kV	JESD 22-A 114-B Class 2
RMS Voltage, AC insulation test	U _{INS}	2.5	kV	IEC 60664-1
Clearance distance	D _{CL}	≥ 5.5	mm	
Creepage distance	D _{CP}	≥ 8.0	mm	
Comparative Tracking Index	CTI	≥ 600	/	

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.



Nominal Operating Ratings (powered)

Operating Parameters $T_A = -40$ to 150°C , $V_{DD} = 5\text{V} \pm 10\%$, unless otherwise specified.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}	-	4.5	5	5.5	V
Supply Current	I_{DD}	No output load		12.5	15.0	mA
Output Resistive Load	R_L	For high linearity	10	25	200	k Ω
Output Capacitor Load	C_L	-	1	4.7	10	nF
Linear Output Range	V_{OUTLIN}	$R_L \geq 10\text{k}\Omega$	10	-	90	% V_{DD}
Output Quiescent Voltage	V_{OQ}	$R_L \geq 10\text{k}\Omega$, $V_{DD} = 5\text{V}$	-	50	-	% V_{DD}
Diagnostic Band	DIAG	$10\text{k}\Omega \leq R_L \leq 200$ $V_{DD} = 5\text{V}$	0	-	4	% V_{DD}
Under-Voltage Detection	V_{DD_UVL}	Detected Voltage	4.0	-	4.5	V
	V_{DD_UVH}	Hysteresis	0.01	-	0.2	V
Under-Voltage Detection	V_{DD_OVL}	Detected Voltage	6.7	-	7.4	V
	V_{DD_OVH}	Hysteresis	0.37	-	0.66	V
Broken GND Output Level	-	$R_L \geq 10\text{k}\Omega$, $V_{DD} = 5\text{V}$	96	-	100	% V_{DD}
Broken VDD Output Level	-	$R_L \geq 10\text{k}\Omega$, $V_{DD} = 5\text{V}$	0	-	4	% V_{DD}



Current Ranges

Operating Parameters $T_A = 25^\circ\text{C}$, $V_{DD} = 5\text{V} \pm 10\%$, unless otherwise specified.

CTS-CS-PAX-12-0250

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Primary Current Range	I_P	-	-250		250	A
Sensitivity	S	$V_{DD} = 5\text{V}$		8.00		mV/A
Output Quiescent Voltage	V_{OQ}	$V_{DD} = 5\text{V}$, $R_L \geq 10\text{k}\Omega$		2.5		V

CTS-CS-PAX-12-0500

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Primary Current Range	I_P	-	-500		500	A
Sensitivity	S	$V_{DD} = 5\text{V}$		4.00		mV/A
Output Quiescent Voltage	V_{OQ}	$V_{DD} = 5\text{V}$, $R_L \geq 10\text{k}\Omega$		2.5		V

CTS-CS-PAX-12-0750

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Primary Current Range	I_P	-	-750		750	A
Sensitivity	S	$V_{DD} = 5\text{V}$		2.67		mV/A
Output Quiescent Voltage	V_{OQ}	$V_{DD} = 5\text{V}$, $R_L \geq 10\text{k}\Omega$		2.5		V

CTS-CS-PAX-12-1000

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Primary Current Range	I_P	-	-1000		1000	A
Sensitivity	S	$V_{DD} = 5\text{V}$		2.00		mV/A
Output Quiescent Voltage	V_{OQ}	$V_{DD} = 5\text{V}$, $R_L \geq 10\text{k}\Omega$		2.5		V



Accuracy Specifications

Operating Parameters $T_A = -40$ to 125°C , $V_{DD} = 5V \pm 10\%$, unless otherwise specified.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Sensitivity Resolution	S_Δ	$T_A = 25^\circ\text{C}$, $V_{DD} = 5V$	-0.5	-	0.5	%S
Thermal Sensitivity Drift	$\Delta^T S$	$V_{DD} = 5V$	-1	-	1	%S
Sensitivity Ratiometry Drift	$\Delta^R S$	$V_{DD} = 5V$	-0.5	-	0.5	%S
Offset Resolution	$V_{OQ\Delta}$	$T_A = 25^\circ\text{C}$, $V_{DD} = 5V$	-2.5	-	2.5	mV
Thermal Offset Drift (total)	$\Delta^T V_{OQ}$	$V_{DD} = 5V$	-5	-	5	mV
Offset Ratiometry Drift	$\Delta^R V_{OQ}$	$V_{DD} = 5V$	-0.4	-	0.4	% V_{OQ}
RMS Output Noise	N_{RMS}	$V_{DD} = 5V$	-	10	-	mV_{RMS}
Magnetic Offset Drift (hyst.)	$\Delta^T M$	$T_A = 25^\circ\text{C}$, $V_{DD} = 5V$, $\pm I_P$	-2	-	2	mV
Linearity Error	N_L	Full Range of I_P	-1	-	1	% I_P
Step Response Time	T_R	@ $100 \text{ A}/\mu\text{s}$	-	2	4	μs
Frequency Bandwidth	BW	@ -3 dB (output)	30	-	-	kHz
Phase shift	Δ_ϕ	@ DC to 1 kHz	3	-	-	$^\circ$



Durability Specifications

Specifications are according to defined standard.

Test Name	Standard	Specification
Life Tests		
Vibration	ISO 16750-3	Vibration profile: Passenger car, Gearbox in T °C: 22 h/axis, 96.6 m/s ² RMS
Mechanical Shocks	ISO 16750-3	500m/s ² , 10 shocks ± each direction
Thermal Shock	IEC 60068-2-14	-40C to +125C, 30 minutes dwells, 1000 cycles
Thermal cycle test	IEC 60068-2-14	-40C to +125C, 1000 cycles
Ageing	JESD22-A101	85C/85% RH, 1000 hours
High T °C Storage	IEC 60068-2-2 Bd	125 °C for 1000 h, Uc not connected IP = 0 A
Low T °C Storage	IEC 60068-2-1 Ad	-40 °C for 1000 h, Uc not connected IP = 0 A
Electrical Tests		
Phase shift, frequency bandwidth,	CTS Procedure	100 Hz to 100 kHz, 100 A peak
Noise	CTS Procedure	DC to 1 MHz
Delay time	CTS Procedure	100 A/μs I pulse = IP peak
EMC Tests		
Radiated immunity: Bulk current injection	ISO 11452-4	1MHz to 400MHz
Radiated immunity: Anechoic chamber	ISO 11452-4	200MHz to 3100MHz
Resistance to Electrostatic Discharge Voltage	ISO 10605	150 pF, 2KΩ Powered: Air: ±15 kV (II); Contact: ±4kV(I), ±6kV(I), ±8 kV (II) Unpowered: Air: ±8 kV (IV); Contact: ±4Kv (IV), ±6Kv (IV)



Dimensions

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

NOTE: Dimensions are preliminary

