CH704

AEC-Q100 Qualified, 200A Hall Current Sensor IC with 4800V_{RMS} Reinforced Isolation

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Features

- Reinforced isolation: **4800V_{RMS}**
- AEC-Q100 qualified
- Single supply: **4.5-5.5V**
- Output voltage proportional to AC current: **+/-50A, +/-100A, +/-150A, +/-200A**
- Bandwidth: **180 kHz**
- Response time: **< 2μs**
- Wide temperature range: **-40ºC to 150ºC**
- High resolution offset and sensitivity trimming with EEPROM
- Primary conductor resistance: **0.1 mΩ**
- Integrated protections
  - Under-voltage protection
  - Output voltage clamp provides short circuit diagnostic
  - Output spiking suppress during fast current step inputs
- Factory programmed sensitivity and quiescent output voltage TC
- Integrated digital temperature compensation circuitry
- Nearly zero magnetic hysteresis
- Ratio-metric output from supply voltage
- Immunity to external magnetic field

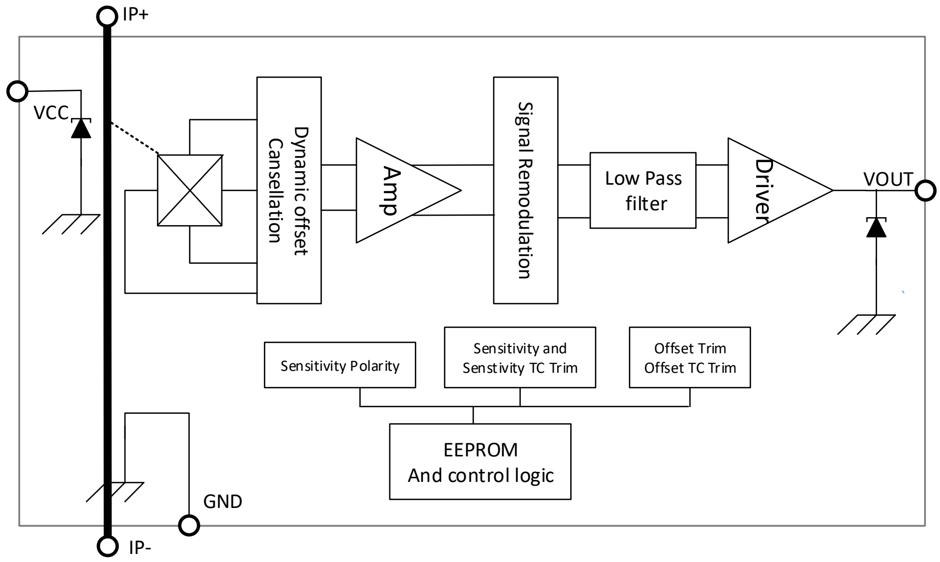
Package

5-PIN CFF

Application

- UPS current sensing
- DC-to-DC converter control
- Balance bike motor control
- Overcurrent fault detection

Functional Block Diagram



Description

The device consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage. A precise, proportional voltage is provided by the low-offset, chopper-stabilized Hall IC, which is programmed for accuracy after packaging. The output of the device has a positive slope when an increasing current flow through the primary copper conduction path, which is the path used for current sensing.

The terminals of the conductive path are electrically isolated from the sensor leads. This allows the CH704 current sensor IC to be used in high-side current sense applications without the use of high-side differential amplifiers or other costly isolation techniques.

The lead-frame is plated with 100% matte tin, which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free, except for flip-chip high-temperature Pb-based solder balls, currently exempt from RoHS. The device is fully calibrated prior to shipment from the factory.

Revision History

Date	Revision	Change
10 Oct 2021	1.0	First Released.
29 Dec 2021	1.1	Updated the isolation parameters.
3 March 2022	1.2	Updated bandwidth and packing information
27 July 2022	1.3	Updated part number rule

Table of Contents

1 Product Family Members

CH704 XXX C T

Prefix
CH7xx: Current sensor Hall

Package Carrier
T:Tube

Package Type
C:CFF-5

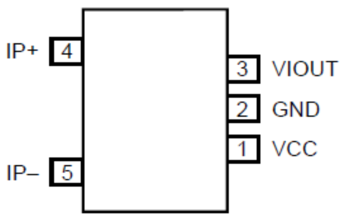
Current Sensing range

050: The maximum absolute value is 50A
100: The maximum absolute value is 100A
150: The maximum absolute value is 150A
200: The maximum absolute value is 200A

Part Number	I_{PR} (A)	Sens(Typ) at V_{CC} = 5 V (mV/A)	T_A (°C)	Packing
CH704050CT	±50	40	-40 to 125	30 pieces per tube
CH704100CT	±100	20		
CH704150CT	±150	13.3		
CH704200CT	±200	10		

2 Pin Definitions and Descriptions

Number	Name	Function
5	IP–	Terminals for current being sensed; fused internally
4	IP+	Terminals for current being sensed; fused internally
3	VIOUT	Analog output signal
2	GND	Signal ground terminal
1	VCC	Device power supply terminal



Pinout Diagram

3 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Supply Voltage	V_{CC}	-	6	V
Reverse Supply Voltage	V_{RCC}	-0.1	-	V
Output Voltage	V_{IOUT}	-	6	V
Reverse Output Voltage	V_{RIOUT}	-0.1	-	V
Output Source Current	Iout(source)		2	mA
Output Sink Current	Iout(sink)		10	mA
Operating Ambient Temperature	T_A	-40	150	°C
Storage Temperature	T_S	-65	165	°C
Junction temperature	$T_{J(max)}$		165	°C

Note 1: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum- rated conditions for extended periods may affect device reliability.

Isolation Characteristics

Characteristic	Symbol	Notes	Rating	Unit
Dielectric Strength Test Voltage	V_{ISO}	Agency type-tested for 60 seconds per UL standard 60950-1 (edition 2); production-tested at V_ISO for 1 second, in accordance with UL 60950-1 (edition 2).	4800	VRMS
Dielectric Surge Strength Test Voltage VSURGE	V_{SURGE}	Tested ±5 pulses at 2/minute in compliance to IEC 61000-4-5 1.2 µs (rise) / 50 µs (width)	8000	VAC
Working Voltage for Basic Isolation	V_{WVBI}	For basic (single) isolation per UL 60950-1 (edition 2)	1187	V_{pk} or VDC
			840	Vrms
Working Voltage for Reinforced Isolation	V_{WVRI}	For reinforced (double) isolation per UL 60950-1 (edition 2)	672	V_{pk} or VDC
			475	Vrms

Thermal Characteristics

Characteristic	Symbol	Test Conditions*	Value	Units
Package Thermal Resistance (Junction to Ambient)	$R_{\theta JA}$	Mounted on the evaluation board with 2800 mm2 (1400 mm2 on component side and 1400 mm2 on opposite side) of 4 oz. copper connected to the primary leadframe and with thermal vias connecting the copper layers. Performance is based on current flowing through the primary leadframe and includes the power consumed by the PCB.	7	ºC/W
Package Thermal Resistance (Junction to Lead)	$R_{\theta JL}$		3	ºC/W

4 ESD Protections

Parameter	Value	Unit
All pins [1)]	±6000	V
All pins [2)]	±200	V
All pins [3)]	±750	V

1) HBM (human body mode, 100pF, 1.5 kΩ) according to MIL-STD-883H Method 3015.8
2) MM (Machine Mode C=200pF, R=0Ω) according to JEDEC EIA/JESD22-A115
3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

5 Typical Overcurrent Capabilities

Characteristic	Symbol	Notes	Value	Unit
Overcurrent	I_{POC}	TA=25ºC, 1 Second duration, 1% duty cycle	1200	A
		TA=85ºC, 1 Second duration, 1% duty cycle	900	A
		TA=150ºC, 1 Second duration, 1% duty cycle	600	A

6 Electrical Characteristics[1]:

Common operating characteristics:

Valid through the full range of T_A, VCC = 5 V, C_{BYP} = 0.1uF, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}		4.5	5	5.5	V
Supply Current	I_{CC}	V_{CC} = 5 V, output open	–	7	10	mA
Supply Zener Clamp Voltage	V_z	T_A = 25°C, I_{CC} = 30mA	5.7	6.4	–	V
Power-On Time	t_{po}	Output reaches 90% of steady-state level, T_A = 25°C, I_P = I_{PR}(max) applied	–	30	–	μs
Under voltage Threshold	V_{UVLOHI}	T_A = 25°C, V_{CC} rising	2.8	2.9	3	V
	$V_{UVLOLOW}$	T_A = 25°C, V_{CC} falling	2.5	2.6	2.7	V
Rise Time	t_r	I_P = I_P(max), T_A = 25°C, C_L = 1 nF	–	3.6	–	μs
Propagation Delay	t_{pd}	I_P = I_P(max), T_A = 25°C, C_L = 1 nF	–	2.2	–	μs
Response Time	$t_{RESPONSE}$	I_P = I_P(max), T_A = 25°C, C_L = 1 nF	–	3.6	–	μs
Bandwidth	BW	Small signal –3 dB; C_L = 1 nF	–	180	–	kHz
Output Capacitance Load	C_L	VIOUT to GND	–	–	10	nF
Output Resistive Load	R_L	VIOUT to GND	4.7	–	–	kΩ
Primary Conductor Resistance	R_{IP}	T_A = 25°C	–	0.1	–	mΩ
Quiescent Ouput voltage	$V_{IOUT(QBI)}$	Ip=0, T_A=25ºC		Vcc/2		
Ratiometry	V_{RAT}	Vcc=4.5 to 5.5V		100		%
Hall Coupling Factor	G	T_A = 25ºC	–	11	–	G/A
Hall Plate Sensitivity Matching	$Sens_{match}$	T_A = 25ºC	–	±1	–	%
Noise Density	I_{ND}	Input-referenced noise density; T_A = 25°C, C_L = 1 nF	–	150	–	$μA_{(rms)}$/√Hz
Noise	I_N	Input-referenced noise: C_F = 4.7 nF, C_L = 1 nF, BW = 18 kHz, T_A = 25°C	–	20	–	$mA_{(rms)}$
Nonlinearity	E_{LIN}	Through full range of I_P	–1.5	–	+1.5	%
Sensitivity Ratiometry Coefficient	SENS_RAT_COEF	V_{CC} = 4.5 to 5.5 V, T_A = 25ºC	–	1.3	–	–
Zero-Current Output Ratiometry Coefficient	QVO_RAT_COEF	V_{CC} = 4.5 to 5.5 V, T_A = 25ºC	–	1	–	–
Saturation Voltage[3]	V_{OH}	R_L = 4.7 kΩ	–	V_{CC} – 0.3	–	V
	V_{OL}	R_L = 4.7 kΩ	–	0.3	–	V

CH704050 Performance Characteristics:

Valid at T_A = –40°C to 150°C, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.[1]	Max.	Unit
Nominal Performance						
Current-Sensing Range	I_{PR}		-50	–	50	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$	–	40	–	mV/A
Noise	V_{NOISE}	T_A = 25°C, 10nF on VIOUT pin to GND		10		mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale Ip	-1		1	%
Accuracy Performance						
Total Output Error[2]	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150ºC	–2	±1.5	2	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25ºC	–3	±2	3	%
Total Output Error Components[3] $E_{TOT} = E_{SENS} + 100 \times V_{OE}/(Sens \times I_P)$						
Magnetic Offset Error	I_{ERRM}	Ip=0, T_A = 25°C, after excursion 50A		100	250	mA
Offset Voltage	V_{OE}	I_P = 0 A, T_A = 25°C to 150ºC	–10	±3	10	mV
		I_P = 0 A, T_A = –40°C to 25ºC	–20	±5	20	mV
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{sens_drift}		–0.8	±0.2	0.8	%
Offset voltage Drift Over Lifetime	ΔV_{OE}	AEC-Q100 Grade 0	-5	1.5	5	mV
Total Output Error Lifetime Drift	E_{tot_drift}		–2	±0.5	2	%

1 Typical values with +/- are 3 sigma values
2 Percentage of I_P , with $I_P = I_{PR(max)}$.
3 A single part will not have both the maximum/minimum sensitivity error and maximum/minimum offset voltage, as that would violate the maximum/minimum total output
error specification. Also, 3 sigma distribution values are combined by taking the square root of the sum of the squares. See Application Information section.

CH704100 Performance Characteristics:

Valid at T_A = –40°C to 150°C, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.[4]	Max.	Unit
Nominal Performance						
Current-Sensing Range	I_{PR}		-100	–	100	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$	–	20	–	mV/A
Noise	V_{NOISE}	T_A = 25°C, 10nF on VIOUT pin to GND		6		mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale Ip	-1		1	%
Accuracy Performance						
Total Output Error[5]	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150ºC	–2	±1.5	2	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25ºC	–3	±2	3	%
Total Output Error Components[6] $E_{TOT} = E_{SENS} + 100 \times V_{OE}/(Sens \times I_P)$						
Magnetic Offset Error	I_{ERRM}	Ip=0, T_A = 25°C, after excursion 50A		120	300	mA
Offset Voltage	V_{OE}	I_P = 0 A, T_A = 25°C to 150ºC	–10	±3	10	mV
		I_P = 0 A, T_A = –40°C to 25ºC	–20	±5	20	mV
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{sens_drift}		–0.5	±0.15	0.5	%
Offset voltage Drift Over Lifetime	ΔV_{OE}	AEC-Q100 Grade 0	-5	1.5	5	mV
Total Output Error Lifetime Drift	E_{tot_drift}		–2	±0.5	2	%

1 Typical values with +/- are 3 sigma values
2 Percentage of I_P , with $I_P = I_{PR(max)}$.
3 A single part will not have both the maximum/minimum sensitivity error and maximum/minimum offset voltage, as that would violate the maximum/minimum total output
error specification. Also, 3 sigma distribution values are combined by taking the square root of the sum of the squares. See Application Information section.

CH704150 Performance Characteristics:

Valid at T_A = –40°C to 150°C, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.[7]	Max.	Unit
Nominal Performance						
Current-Sensing Range	I_{PR}		-150	–	150	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$	–	13.33	–	mV/A
Noise	V_{NOISE}	T_A = 25°C, 10nF on VIOUT pin to GND		4		mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale Ip	-1		1	%
Accuracy Performance						
Total Output Error[8]	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150ºC	–2	±1.5	2	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25ºC	–3	±2	3	%
Total Output Error Components[9] $E_{TOT} = E_{SENS} + 100 \times V_{OE}/(Sens \times I_P)$						
Magnetic Offset Error	I_{ERRM}	Ip=0, T_A = 25°C, after excursion 50A		120	300	mA
Offset Voltage	V_{OE}	I_P = 0 A, T_A = 25°C to 150ºC	–10	±3	10	mV
		I_P = 0 A, T_A = –40°C to 25ºC	–20	±5	20	mV
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{sens_drift}		0.25	±0.1	0.25	%
Offset voltage Drift Over Lifetime	ΔV_{OE}	AEC-Q100 Grade 0	-5	1.5	5	mV
Total Output Error Lifetime Drift	E_{tot_drift}		–2	±0.5	2	%

1 Typical values with +/- are 3 sigma values
2 Percentage of I_P , with $I_P = I_{PR(max)}$.
3 A single part will not have both the maximum/minimum sensitivity error and maximum/minimum offset voltage, as that would violate the maximum/minimum total output
error specification. Also, 3 sigma distribution values are combined by taking the square root of the sum of the squares. See Application Information section.

CH704200 Performance Characteristics:

Valid at T_A = –40°C to 150°C, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.[10]	Max.	Unit
Nominal Performance						
Current-Sensing Range	I_{PR}		-200	–	200	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$	–	10	–	mV/A
Noise	V_{NOISE}	T_A = 25°C, 10nF on VIOUT pin to GND		3		mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale Ip	-1		1	%
Accuracy Performance						
Total Output Error[11]	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150ºC	–2	±1.5	2	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25ºC	–3	±2	3	%
Total Output Error Components[12] $E_{TOT} = E_{SENS} + 100 \times V_{OE}/(Sens \times I_P)$						
Magnetic Offset Error	I_{ERRM}	Ip=0, T_A = 25°C, after excursion 50A		200	450	mA
Offset Voltage	V_{OE}	I_P = 0 A, T_A = 25°C to 150ºC	–10	±3	10	mV
		I_P = 0 A, T_A = –40°C to 25ºC	–20	±5	20	mV
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{sens_drift}		0.25	±0.1	0.25	%
Offset voltage Drift Over Lifetime	ΔV_{OE}	AEC-Q100 Grade 0	-5	1.5	5	mV
Total Output Error Lifetime Drift	E_{tot_drift}		–2	±0.5	2	%

1 Typical values with +/- are 3 sigma values
2 Percentage of I_P , with $I_P = I_{PR(max)}$.
3 A single part will not have both the maximum/minimum sensitivity error and maximum/minimum offset voltage, as that would violate the maximum/minimum total output
error specification. Also, 3 sigma distribution values are combined by taking the square root of the sum of the squares. See Application Information section.

7 Function Description

7.1 General Function

The CH704 is factory-programmed Hall-Effect Linear current sensor. The current flowing through the primary side current path induces a corresponding magnetic field measured by a build-in Hall plate. The magnetic flux through the Hall plate is proportional to the primary current. And the output signal amplified and filtered from Hall voltage induced is proportional the sensed current. The output signal also can be proportional to the supply voltage (ratio-metric behavior) as long as the analog output mode is selected.

The sensitivity and offset is factory-programmed into the EEPROM registers. And the temperature characteristics of sensitivity and offset of Hall plate will be compensated by the coefficients stored in the EEPROM memory. Then the output voltage signal will have a good linear and temperature characteristic with the sensed current.

8 Application Information

8.1 Estimating Total Error vs. Sensed Current

The Performance Characteristics tables give distribution (±3sigma) values for Total Error at $I_{PR(max)}$; however, one often wants to know what error to expect at a particular current. This can be estimated by using the distribution data for the components of Total Error, Sensitivity Error, and Offset Voltage. The ±3 sigma value for Total Error (E_{TOT}) as a function of the sensed current (I_P) is estimated as:

$$E_{TOT}(I_P) = \sqrt{{E_{SENS}}^2 + \left(\frac{100 \times V_{OE}}{Sens \times I_P}\right)^2}$$

Here, E_{SENS} and V_{OE} are the ±3 sigma values for those error terms. If there is an average sensitivity error or average offset voltage, then the average Total Error is estimated as:

$$E_{TOT_{AVG}}(I_P) = E_{SENS_{AVG}} + \frac{100 \times V_{OE_{AVG}}}{Sens \times I_P}$$

The resulting total error will be a sum of E_{TOT} and E_{TOT_AVG}.

8.2 Definitions of accuracy characteristics

Sensitivity (Sens). The change in sensor IC output in response to a 1 A change through the primary conductor. The sensitivity is the product of the magnetic circuit sensitivity (G/A) (1 G = 0.1 mT) and the linear IC amplifier gain (mV/G). The linear IC amplifier gain is programmed at the factory to optimize the sensitivity (mV/A) for the full-scale current of the device.

Nonlinearity (E_{LIN}). The nonlinearity is a measure of how linear the output of the sensor IC is over the full current measurement range. The nonlinearity is calculated as:

$$E_{LIN} = \left\{1 - \left[\frac{V_{IOUT}(I_{PR(max)}) - V_{IOUT(Q)}}{2 \times \left(V_{IOUT}\left(\frac{I_{PR(max)}}{2}\right) - V_{IOUT(Q)}\right)}\right]\right\} \times 100(\%)$$

where $V_{IOUT}(I_{PR(max)})$ is the output of the sensor IC with the maximum measurement current flowing through it and $V_{IOUT}(I_{PR(max)}/2)$ is the output of the sensor IC with half of the maximum measurement current flowing through it.

Zero-Current Output Voltage ($V_{IOUT(Q)}$). The output of the sensor when the primary current is zero. For a unipolar supply voltage, it nominally remains at 0.5 × V_{CC} for a bidirectional device and 0.1 × V_{CC} for a unidirectional device. For example, in the case of a bidirectional output device, V_{CC} = 5 V translates into $V_{IOUT(Q)}$ = 2.5 V. Variation in $V_{IOUT(Q)}$ can be attributed to the resolution of the linear IC quiescent voltage trim and thermal drift.

Offset Voltage (V_{OE}). The deviation of the device output from its ideal quiescent value of 0.5 × V_{CC} (bidirectional) or 0.1 × V_{CC} (unidirectional) due to nonmagnetic causes. To convert this voltage to amperes, divide by the device sensitivity, Sens.

Total Output Error (E_{TOT}). The difference between the current measurement from the sensor IC and the actual current (I_P), relative to the actual current. This is equivalent to the difference between the ideal output voltage and the actual output voltage, divided by the ideal sensitivity, relative to the current flowing through the primary conduction path:

$$E_{TOT}(I_P) = \frac{V_{IOUT\_ideal}(I_P) - V_{IOUT}(I_P)}{Sens_{ideal}(I_P) \times I_P} \times 100(\%)$$

The Total Output Error incorporates all sources of error and is a function of I_P . At relatively high currents, E_{TOT} will be mostly due to sensitivity error, and at relatively low currents, E_{TOT} will be mostly due to Offset Voltage (V_{OE}). In fact, at I_P = 0, E_{TOT} approaches infinity due to the offset. This is illustrated in Figures 2 and 3. Figure 2 shows a distribution of output voltages versus I_P at 25°C and across temperature. Figure 3 shows the corresponding E_{TOT} versus I_P .

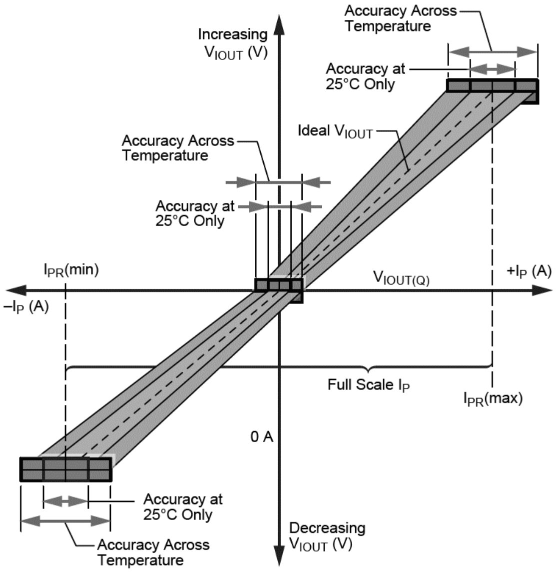


Figure 2: Output Voltage versus Sensed Current

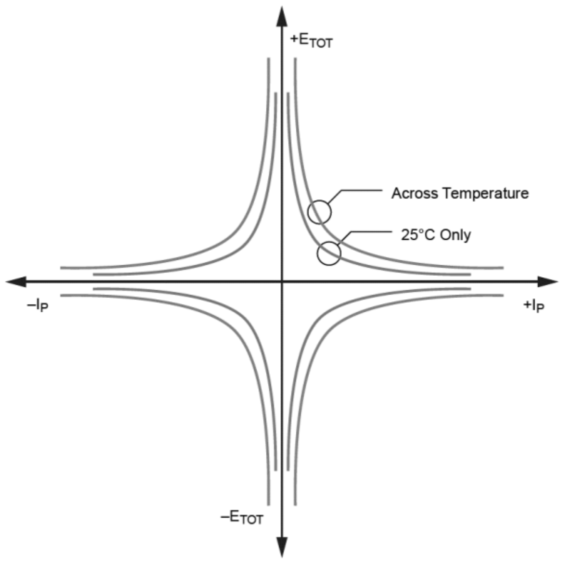


Figure3: Total Output Error versus Sensed Current

Sensitivity Ratiometry Coefficient (SENS_RAT_COEF). The coefficient defines how the sensitivity scales with V_{CC}. The ideal coefficient is 1, meaning the sensitivity scales proportionally with V_{CC}. A 10% increase in V_{CC} results in a 10% increase in sensitivity. A coefficient of 1.1 means that the sensitivity increases by 10% more than the ideal proportionality case. This means that a 10% increase in V_{CC} results in an 11% increase in sensitivity. This relationship is described by the following equation:

$$\mathrm{Sens}(V_{CC}) = Sens(5V)\left[1 + \frac{(V_{CC} - 5V) \times SENS\_RAT\_COEF}{5V}\right]$$

This can be rearranged to define the sensitivity ratiometry coefficient as:

$$SENS_{RAT_{COEF}} = \left[\frac{\mathrm{Sens}(V_{CC})}{Sens(5V)} - 1\right] \times \frac{5V}{V_{CC} - 5V}$$

Zero-Current Output Ratiometry Coefficient (QVO_RAT_ COEF). The coefficient defines how the zero-current output voltage scales with V_{CC}. The ideal coefficient is 1, meaning the output voltage scales proportionally with V_{CC}, always being equal to $V_{CC}/2$. A coefficient of 1.1 means that the zero-current output voltage increases by 10% more than the ideal proportionality case. This means that a 10% increase in V_{CC} results in an 11% increase in the zero-current output voltage. This relationship is described by the following equation:

$$\text{VIOUTQ}(V_{CC}) = \text{VIOUTQ}(5V)\left[1 + \frac{(V_{CC} - 5V) \times QVO\_RAT\_COEF}{5V}\right]$$

This can be rearranged to define the zero-current output ratiometry coefficient as:

$$QVO\_RAT\_COEF = \left[\frac{\text{VIOUTQ}(V_{CC})}{\text{VIOUTQ}(5V)} - 1\right] \times \frac{5V}{V_{CC} - 5V}$$

8.3 Definitions of dynamic response characteristics

Power-On Time (t_{PO}). When the supply is ramped to its operating voltage, the device requires a finite time to power its internal components before responding to an input magnetic field. Power-On Time, t_{PO} , is defined as the time it takes for the output voltage to settle within ±10% of its steady-state value under an applied magnetic field, after the power supply has reached its minimum specified operating voltage, $V_{CC(min)}$, as shown in the chart at right.

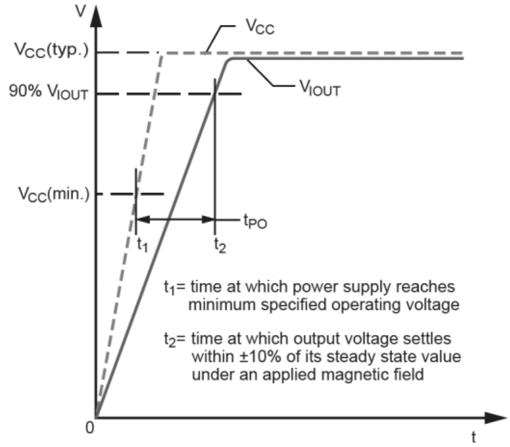


Figure 4: Power-On Time

Rise Time (t_r). The time interval between a) when the sensor IC reaches 10% of its full-scale value, and b) when it reaches 90% of its full-scale value. The rise time to a step response is used to derive the bandwidth of the current sensor IC, in which $f(-3\text{ dB}) = 0.35 / t_r$. Both t_r and $t_{RESPONSE}$ are detrimentally affected by eddy-current losses observed in the conductive IC ground plane.

Propagation Delay (t_{pd}). The propagation delay is measured as the time interval a) when the primary current signal reaches 20% of its final value, and b) when the device reaches 20% of its output corresponding to the applied current.

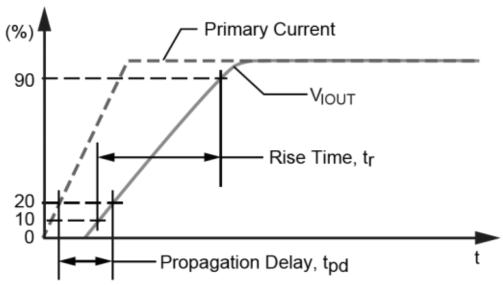


Figure 5: Rise Time and Propagation Delay

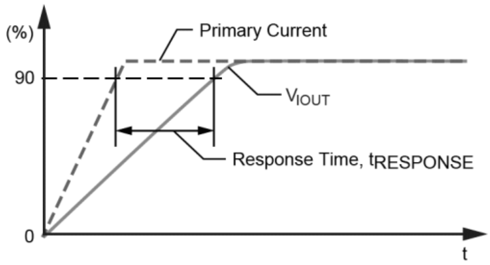


Figure 6: Response Time

Response Time ($t_{RESPONSE}$). The time interval between a) when the primary current signal reaches 90% of its final value, and b) when the device reaches 90% of its output corresponding to the applied current.

8.4 Thermal Rise vs. Primary Current

Self-heating due to the flow of current should be considered during the design of any current sensing system. The sensor, printed circuit board (PCB), and contacts to the PCB will generate heat as current moves through the system.

The thermal response is highly dependent on PCB layout, copper thickness, cooling techniques, and the profile of the injected current. The current profile includes peak current, current "on-time", and duty cycle. While the data presented in this section was collected with direct current (DC), these numbers may be used to approximate thermal response for both AC signals and current pulses.

Figure 7 shows the maximum continuous current at a given TA. Surges beyond the maximum current listed in Figure 7 are allowed given the maximum junction temperature, $T_{J(MAX)}$ (165℃), is not exceeded.

The thermal capacity of the CH704 should be verified by the end user in the application's specific conditions. The maximum junction temperature, $T_{J(MAX)}$ (165℃), should not be exceeded.

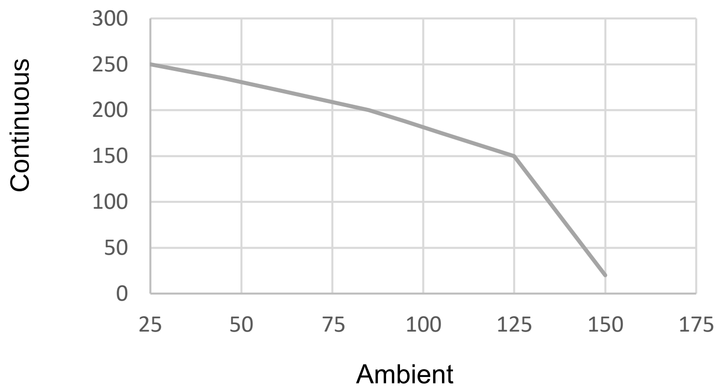
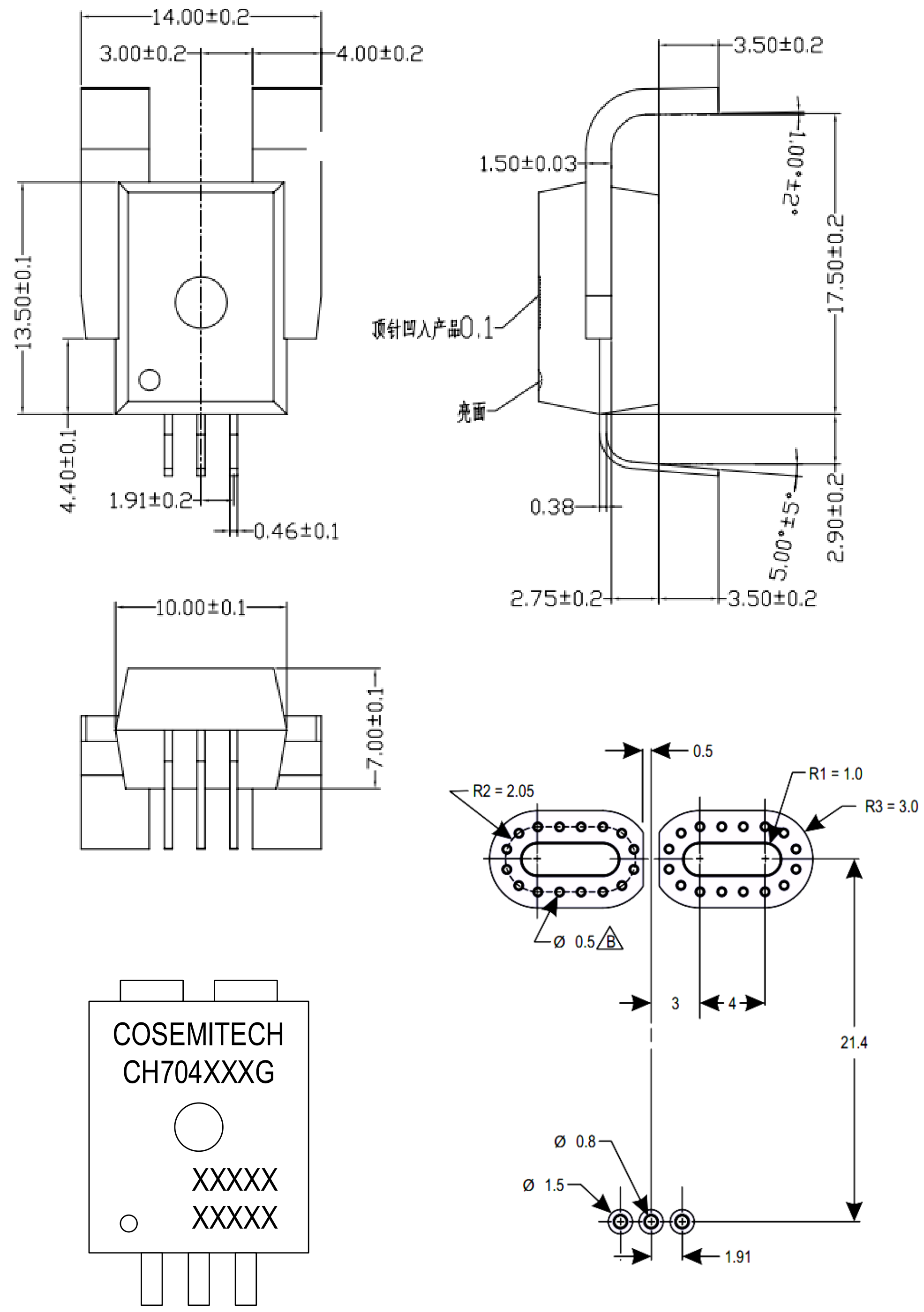


Figure 7: Maximum Continuous Current at a Given TA

9 Package Information:

For Reference Only – Not for Tooling Use



*1 CH704XXXG: XXX= Current level, G = Grade
*2 XXXXX: Factory tracking number
*3 XXXXX: Factory tracking number

Figure 8: Package CB, 5-pin Lead-form CFF