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CZ-37xx Application Note

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0. Overview

This document is an application note to help use AKM's current sensor CZ-37xx series effectively.

This document consists of three sections;

1. Electric characteristics of the current sensor
2. Board design guideline
3. Useful tips

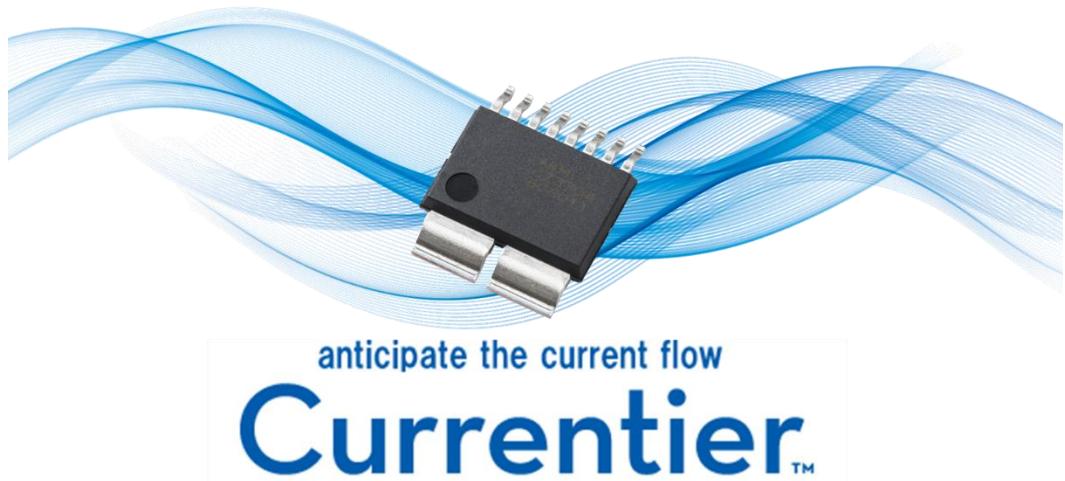


Figure 1. A trademark of AKM's coreless current sensor = **Currentier**

0.1. CZ-37xx

Part number	CZ-370x (x : 0~6) , CZ-372x (x : 0~6)
Features	Creepage, Clearance >8mm Capable of 60A _{rms} High Accuracy Coreless Current Sensor
Applications	AC Motors, DC Motors, UPS, Low Voltage Drives & Power Conditioners Best fit for the applications that need isolation, low heat and small size.

Market trend

To meet safety standard UL61800-5-1 for industrial markets, AKM has developed the coreless current sensor CZ-370x series. A wide line up of measurement ranges from $\pm 5.3A_{pp}$ to $\pm 180A_{pp}$ (bipolar) and from $-0.4 \sim 10.3A_{pp}$ to $-14.9 \sim 345.2A_{pp}$ (Unipolar) enables customers to use the same series for different products.

Details of Features

1. Creepage, Clearance >8mm

Our unique package design enables us to achieve more than 8mm creepage and clearance in a small configuration. A Working Voltage=557V_{rms} (reinforced insulation) helps customers easily design products using these devices.

2. Low heat generation, 60A_{rms}, Bipolar: from $\pm 5A_{pp}$ to $\pm 180A_{pp}$,

Unipolar: from -0.4 ~ 10.3 A_{pp} to -14.9 ~ 345.2 A_{pp}

The CZ-37xx series has primary conductor resistance as low as 0.27mΩ due to AKM's unique packaging. This will reduce the heat generated by primary current significantly compared to a shunt resistor or similar product from another company, while allowing a continuous current flow of 60A_{rms}.

3. High Accuracy

The CZ-370x series is a coreless current sensor with accuracy of $\pm 0.4\%$ F.S.(Typ). The built-in stray magnetic field reduction function solves the problem of existing coreless current sensors. The CZ-370x series contributes to the improvement of system efficiency and precise control in a wider range of applications.

Table 1. CZ-37xx series

Part #	Linear Sensing Range (A)	Sensitivity (mV/A)	Temperature Drift of Sensitivity (%) ^{*1}	Temperature Drift of Zero-current Output (mV) ^{*1}	Total Accuracy (%F.S.) ^{*2}	Response Time (μs)	
CZ-3700	± 5.3	400	± 0.7	± 4.9	± 0.4 (Typ.)	1	
CZ-3701	± 10.7	200		± 4.0			
CZ-3702	± 21.5	100		± 3.5			
CZ-3703	± 36	60		± 3.3			
CZ-3704	± 54	40		± 3.2			
CZ-3705	± 86.4	25		± 3.1			
CZ-3706	± 180	12		± 3.1			
CZ-3720	-0.4~+10.3	400		± 4.9	± 0.7 (Typ.)		
CZ-3721	-0.8~+20.6	200		± 4.0			
CZ-3722	-1.7~+41.3	100		± 3.5			
CZ-3723	-2.9~+68.8	60		± 3.3			
CZ-3724	-4.4~+103.4	40		± 3.2			
CZ-3725	-7.1~+165.8	25		± 3.1			
CZ-3726	-14.9~+345.2	12		± 3.1			

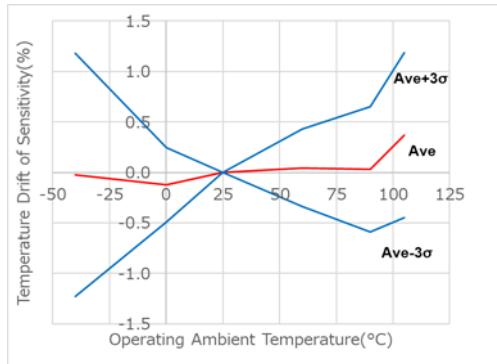
*1 Defined as the average value $\pm 3\sigma$ of the actual measurement results within a certain lot at $T_a=0\sim 90^\circ C$.

*2 The typical value is defined as the average value $\pm 1\sigma$ of the actual measurement results within a certain lot at $T_a=0\sim 90^\circ C$. The minimum and maximum value are defined as the average value $\pm 3\sigma$ of the same.

1. Electrical Characteristics of the current sensor

1.1. Temperature Drift of Sensitivity

Temperature Drift of Sensitivity (V_{h-d} [%]) is defined as the change rate of Sensitivity (V_h [mV/A]) when Operating Ambient Temperature (T_a [°C]) changes from 25°C to T_{a1} ($-40^{\circ}\text{C} \leq T_{a1} \leq 105^{\circ}\text{C}$);



$$V_{h-d} = 100 \times \left(\frac{V_h(T_a = T_{a1})}{V_h(T_a = 25^{\circ}\text{C})} - 1 \right)$$

Figure 2. Temperature Drift of Sensitivity

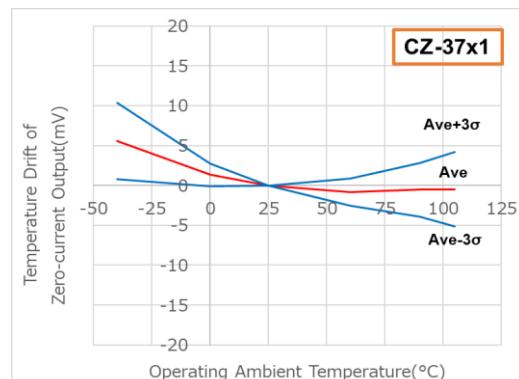
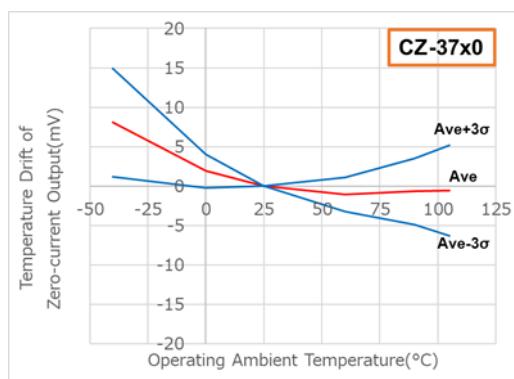
Figure 2. shows "Average" and "Average $\pm 3\sigma$ " of the actual result in a certain lot. This temperature characteristic is the same in CZ-37xx series.

Please be noted that there is a difference between the definition of "Average" and that of "Typical" in the datasheet. "Typical" equals "Average" $\pm 1\sigma$.

1.2. Temperature Drift of Zero-current Output

Temperature Drift of Zero-current Output (V_{of-d} [mV]) is defined as the change of Zero-current Output (V_{of} [V]) when Operating Ambient Temperature (T_a [°C]) changes from 25°C to T_{a1} ($-40^{\circ}\text{C} \leq T_{a1} \leq 105^{\circ}\text{C}$);

$$V_{of-d} = V_{of}(T_a = T_{a1}) - V_{of}(T_a = 25^{\circ}\text{C})$$



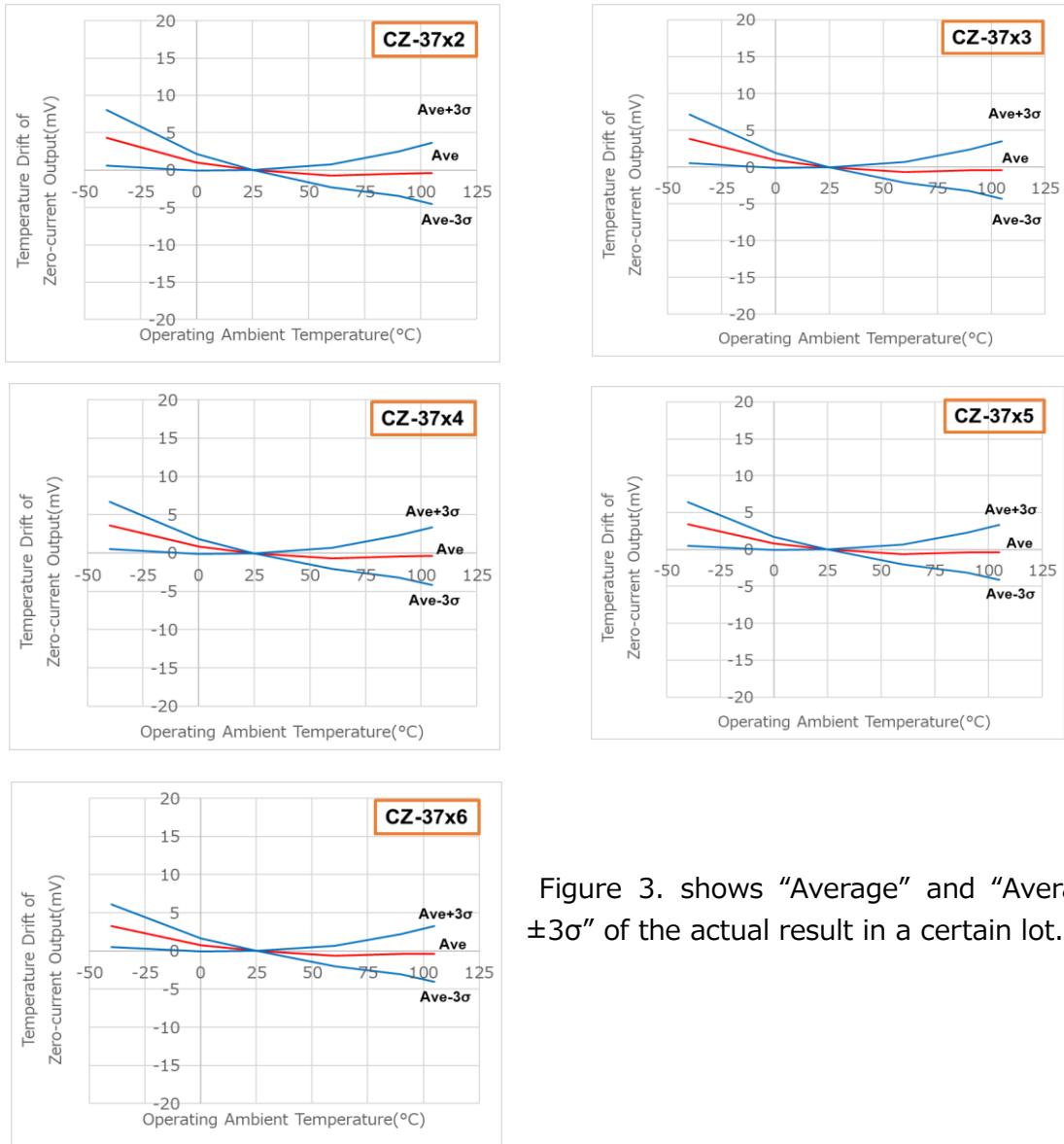


Figure 3. shows “Average” and “Average $\pm 3\sigma$ ” of the actual result in a certain lot.

Figure 3. Temperature Drift of Zero-current Output

Please note that there is a difference between the definition of “Average” and that of “Typical” in the datasheet. “Typical” equals “Average” $\pm 1\sigma$.

1.3. Temperature dependency of Total Accuracy

Total Accuracy (E_{total}) is defined as follows;

$$E_{total} = 100 \times \frac{V_{err}}{F.S.}$$

$$V_{err} = (V_{h-meas} - V_h) \times I_{NS} + V_{off-d} + \rho_{meas} \times F.S.$$

V_{h-meas} : Measured Sensitivity [mV/A]

V_h : Typical Sensitivity [mV/A]

V_{off-d} : Measured Drift of Zero-current Output [mV]

ρ_{meas} : Measured Linearity Error [%F.S.]

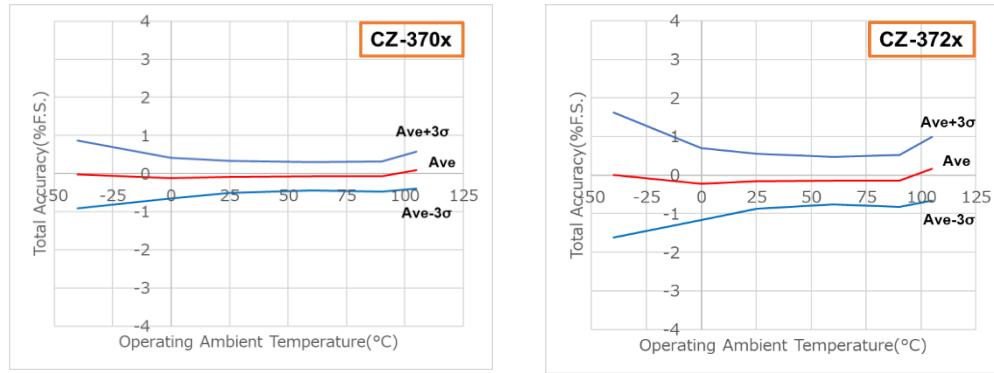


Figure 4. Temperature dependency of Total Accuracy

Figure 4. shows “Average” and “Average $\pm 3\sigma$ ” of the actual results within a certain lot. Please note that there is a difference between the definition of “Average” and that of “Typical” in the datasheet. “Typical” equals “Average” $\pm 1\sigma$.

1.4. Resolution of measured current (Output Noise)

Output noise affects the resolution of the measured current. It is possible to reduce the output noise by filter and to increase the resolution depending on the filter characteristic.

Table 2. Current resolution of CZ-37xx (without filter, typical datasheet values)

Part #	Sensitivity [mV/A]	Linear sensing range [A]	Output Noise [mV _{pp}]	Output Noise [mV _{rms}]	Input Current Equivalent Noise [mA _{rms}]	ENOB [Bits]
CZ-3700	400	± 5.3	79	12	30	6.7
CZ-3701	200	± 10.7	40	6	30	7.7
CZ-3702	100	± 21.5	20	3	30	8.7
CZ-3703	60	± 36	12	1.8	30	9.4
CZ-3704	40	± 54	8	1.2	30	10.0
CZ-3705	25	± 86.4	8	1.2	50	10.0
CZ-3706	12	± 180	8	1.2	100	10.0
CZ-3720	400	-0.4~+10.3	79	12	30	6.7
CZ-3721	200	-0.8~+20.6	40	6	30	7.7
CZ-3722	100	-1.7~+41.3	20	3	30	8.7
CZ-3723	60	-2.9~+68.8	12	1.8	30	9.4
CZ-3724	40	-4.4~+103.4	8	1.2	30	10.0
CZ-3725	25	-7.1~+165.8	8	1.2	50	10.0
CZ-3726	12	-14.9~+345.2	8	1.2	100	10.0

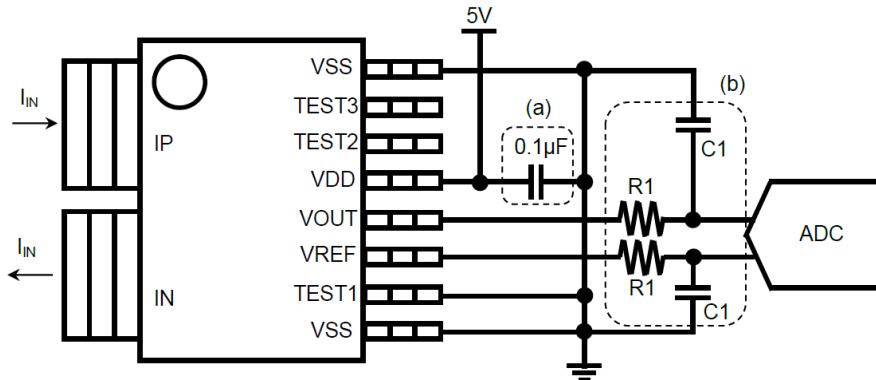


Figure 5. External Circuits Example

- (a) A $0.1\mu\text{F}$ bypass capacitor should be placed close to VDD and VSS pins of the device.
 (b) Add a low-pass filter to VOUT and VREF pins if it is necessary. The R1 and C1 values should be fixed in consideration of the time constant of the filter and load conditions.

Table 3. Example of Current Resolution and Filter Characteristics
 (CZ-3706, actual result of N=1)

C1[nF]	R1[kΩ]	Bandwidth [kHz]	Output Noise [mV _{pp}]	Output Noise [mV _{rms}]	Input Current Equivalent Noise [mA _{rms}]	ENOB [Bits]
Without filter			6.0	0.9	75.4	10.4
0.47	3	113	3.7	0.6	46.3	11.1
4.7	3	11	1.3	0.2	17.0	12.6
4.7	10	3.4	0.8	0.1	9.8	13.4

1.5. Voltage Noise Rejection Ratio

The Voltage Noise Rejection Ratio of the Primary Conductor was calculated by measuring the output while a high frequency sine wave voltage was applied as the input noise to the primary conductor. Table 4 shows the CZ-37xx series having a strong voltage noise rejection ratio. Figure 6. shows the frequency dependency of the voltage noise rejection ratio.

Table 4. Voltage Noise Rejection Ratio when high frequency sine wave voltage (20V_{pp}) is applied

Frequency (MHz)	Vout (mV _{pp})	Noise Rejection (dB)
5	7	-69.5
10	13	-64.0
15	31	-56.1
20	67	-49.4

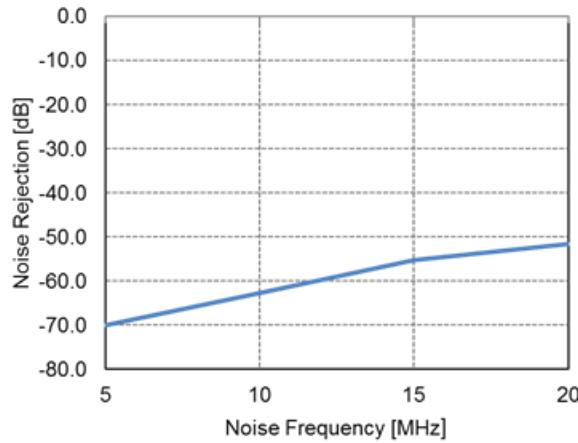


Figure 6. CZ-37xx Noise Frequency vs Voltage Noise Rejection Ratio

1.6. Temperature Drift of the Primary Conductor Resistance

Figure 7. shows the temperature drift of the primary conductor resistance of CZ-37xx. (reference)

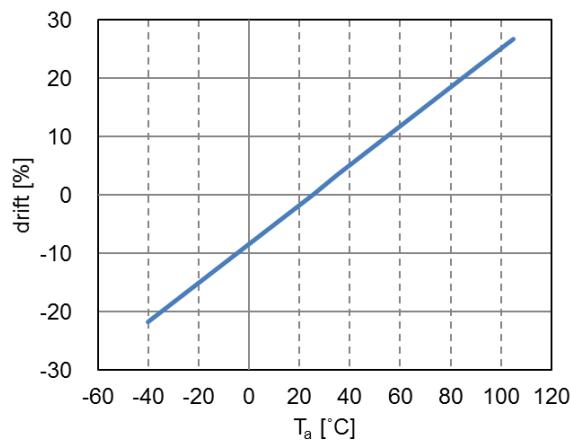


Figure 7. CZ-37xx Temperature Drift of the Primary Conductor Resistance (normalized at 25°C)

1.7. Variation of the Primary Conductor Resistance

The primary conductor resistance of CZ-37xx varies from $0.21\text{m}\Omega$ to $0.30\text{m}\Omega$ (reference) at 25°C .

1.8. Inductance of the Primary Conductor

The Primary Conductor Inductance of CZ-37xx is about 3nH (reference) at 25°C .

1.9. Thermal Resistance

The thermal resistance (θ_{ja}) of CZ-37xx is $32^{\circ}\text{C}/\text{W}$ when using the board shown in Figure 8.

Table 5. Thermal Resistance measurement board

Board size	68.58mm×63.5mm
Number of layer	4 layers
Copper layer thickness	70 μm /layer
Board thickness	1.6mm

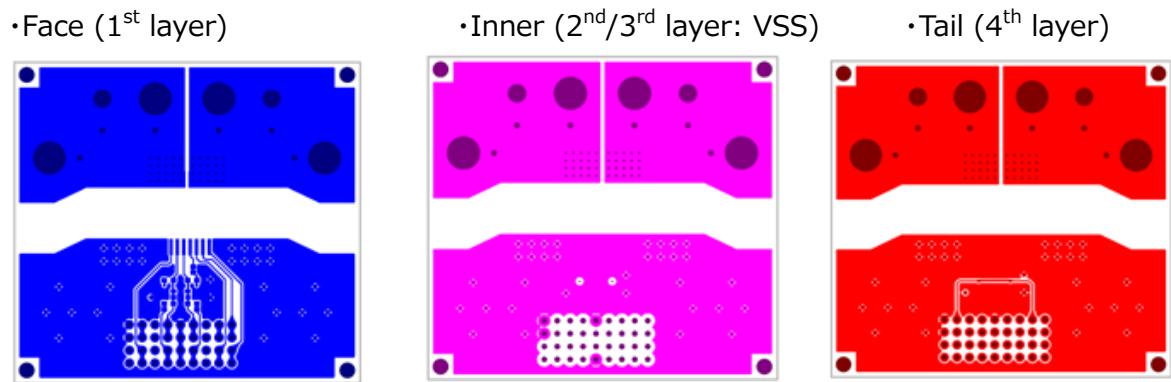


Figure 8. Thermal Resistance measurement board

1.10. Response Time

Figure 9. shows the actual performance of the typical pulse response waveform. The part used was CZ-3704 ($V_h=40\text{mV/A}$), Input current $I_{in}=25\text{A}$. Rise and fall response time is about $0.5\mu\text{s}$.

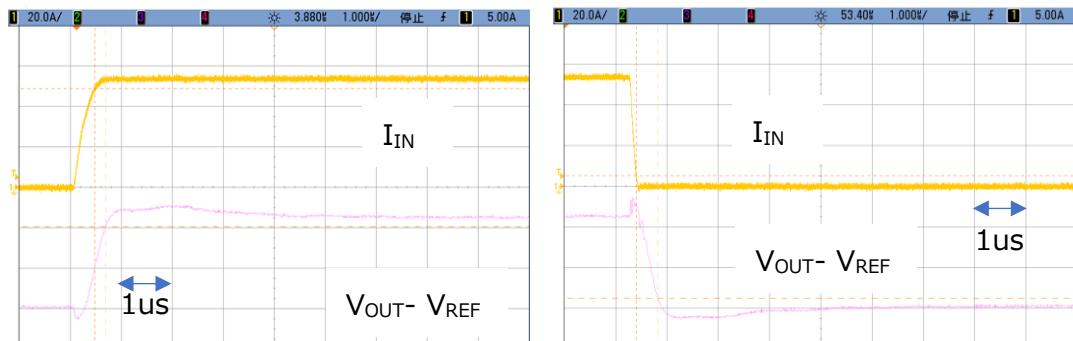


Figure 9. Rise response waveform (left), fall response waveform (right).

1.11. dV/dt Noise, dI/dt Noise

Figure 10. shows the dV/dt noise of CZ-37xx output voltage ($V_{OUT} - V_{REF}$), when 1kV is applied to the primary conductor at the rise time of 1 μ s. The yellow line shows the input voltage waveform and the pink line shows the output voltage waveform. The convergence time is as short as 2 μ s. Please avoid this noise by adjusting the capture timing.

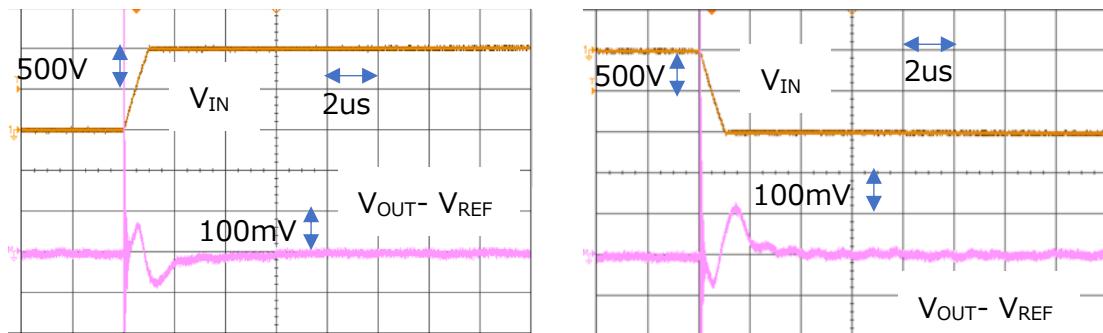


Figure 10. dV/dt noise waveform (left: rise waveform, right: fall waveform)

Figure 11. shows the output voltage ($V_{OUT} - V_{REF}$) of CZ-37xx, when a 25A pulse is applied to the primary conductor with a pulse width of 1 μ s. The yellow line shows the input current waveform and the green line shows the output voltage waveform. The convergence time is as short as 2 μ s.

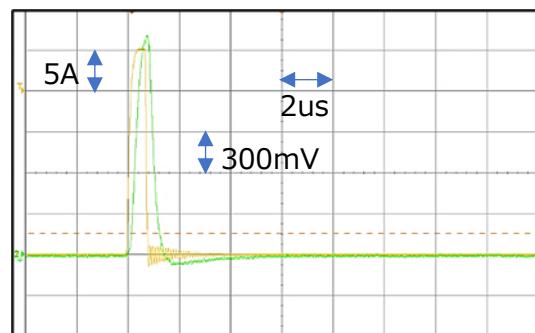


Figure 11. dI/dt noise waveform

2. Board Design Guidelines

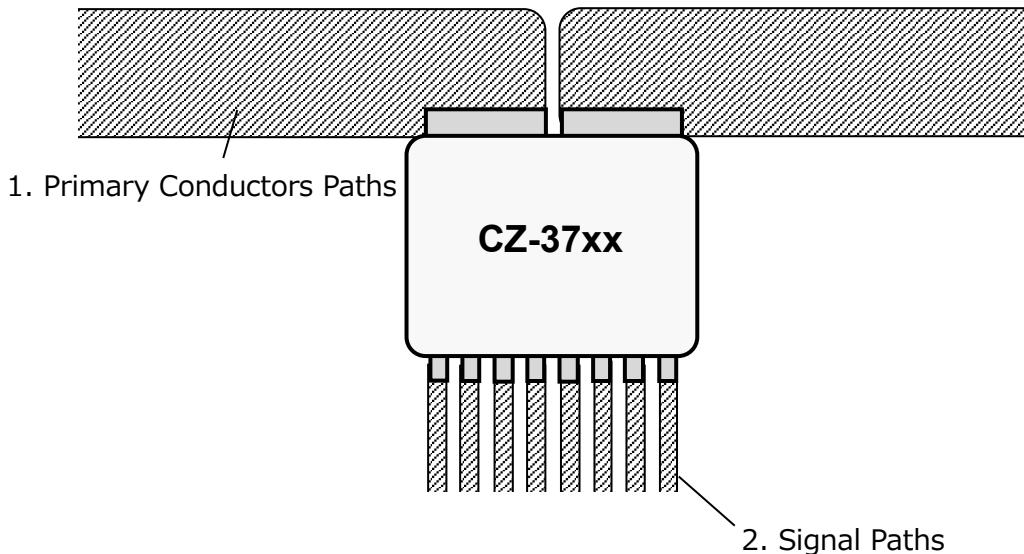


Figure 12. Board layout names in this section

2.1. External Circuits Example

In this subsection, we show three examples of the external circuit when using CZ37xx. These are just examples and there are other possible circuits. Please evaluate your external circuit by yourself.

Case1) Connecting a 5V A/D converter in the subsequent stage

Case2) Connecting a 3.3V A/D converter in the subsequent stage

Case3) Connecting an amplifier to change the reference voltage of the output or to change the sensitivity

Case1) CZ-37xx + ADC(5V)

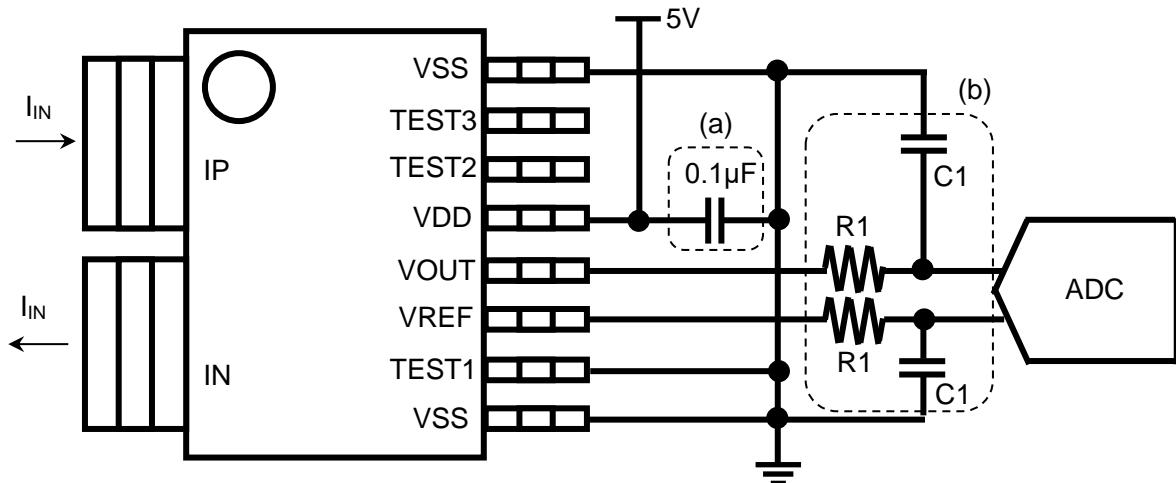


Figure 13. External Circuit Example 1

(a) A $0.1\mu\text{F}$ bypass capacitor should be placed close to VDD and VSS pins of CZ-37xx.

(b) Add a low-pass filter to VOUT and VREF pins if it is necessary. The R1 and C1 values should be fixed in consideration of the time constant of the filter and load conditions.

Case2) CZ-37xx + ADC(3.3V)

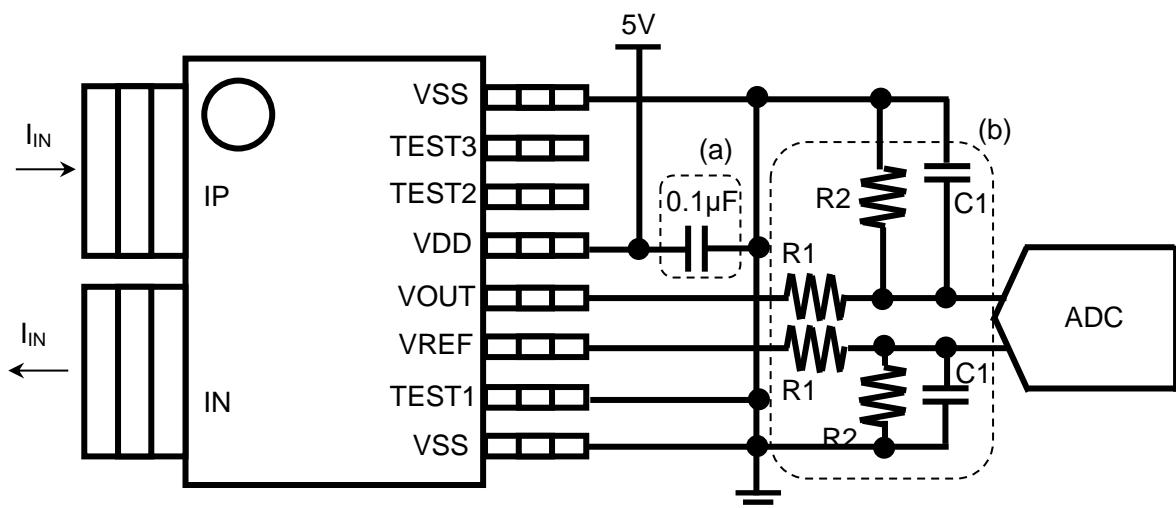


Figure 14. External Circuit Example 2

(a) $0.1\mu\text{F}$ bypass capacitor should be placed close to VDD and VSS pins of CZ-37xx.

(b) Add a low-pass filter to VOUT and VREF pins if it is necessary. The R1, R2 and C1 values should be fixed in consideration of the time constant and the resistive divider ratio.

Case3) CZ-37xx + Amplifier

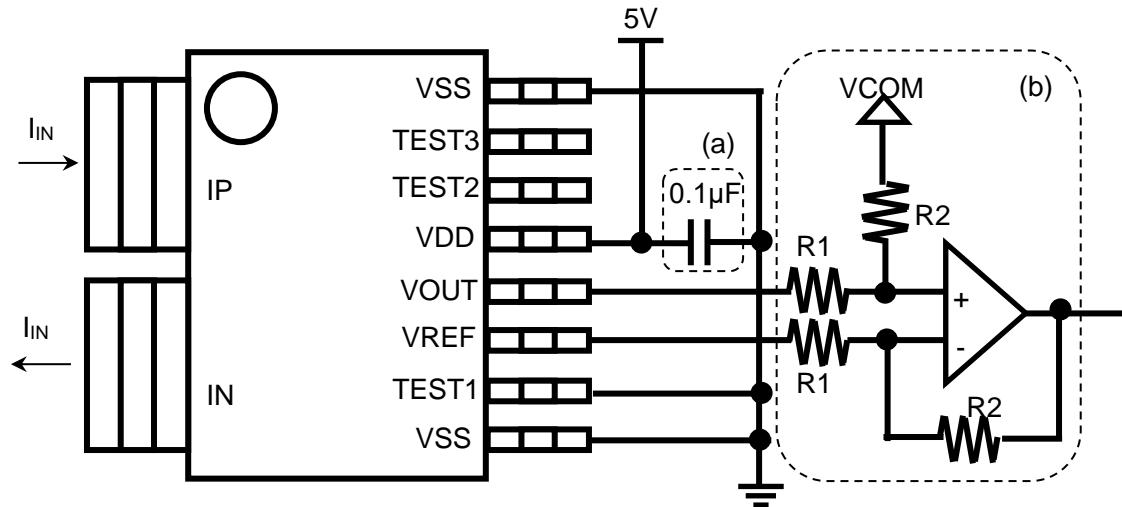


Figure 15. External Circuit Example 3

- (a) 0.1 μ F bypass capacitor should be placed close to VDD and VSS pins of CZ-37xx.
 (b) R1 and R2 are resistors that decides the gain. The R1 and R2 values should be fixed in consideration of the gain.

2.2. Trace of the Primary Current

2.2.1. Width and Length of the Primary Current Trace

Please design the trace of the primary current for CZ-37xx wider in the width and shorter in the length to make the trace resistance small and to prevent overheating.

Please refer to Figure 16. for the recommended footprint.

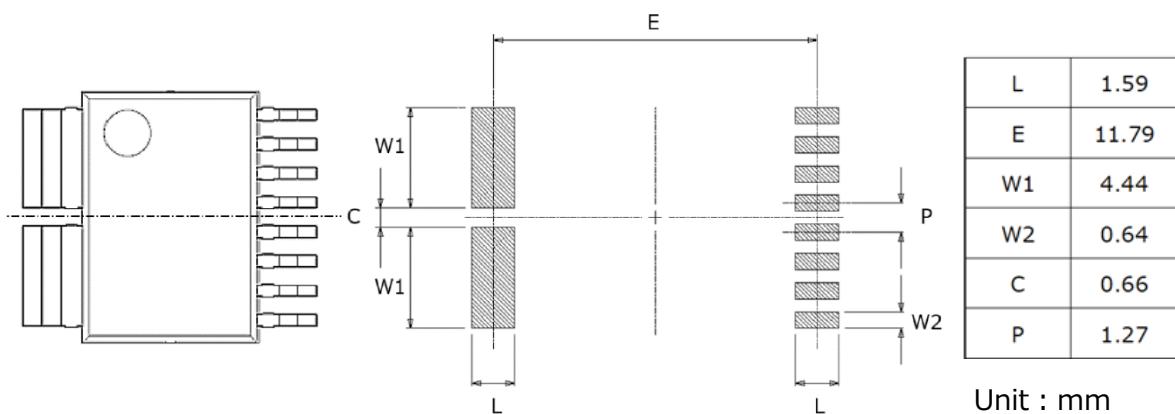


Figure 16. CZ-37xx recommended footprint

2.2.2. The Configuration of the Trace

We recommend extending straight to right and left as shown in the Figure17(a). If this is not possible due to board layout limitations, we recommend extending away from the signal paths as shown in the Figure17(b). The sensitivity may differ 1% at maximum between these two traces. Please evaluate the trace design in the actual environment in order to achieve the highest possible accuracy.

We do not recommend extending toward the signal paths as shown in the Figure17(c). It may degrade the withstand voltage as stated in section 2.3.4.

We also do not recommend routing primary current traces beneath the current sensor. The output may fluctuate due to stray magnetic fields. Refer to section 2.5. Please evaluate carefully if this is not avoidable.

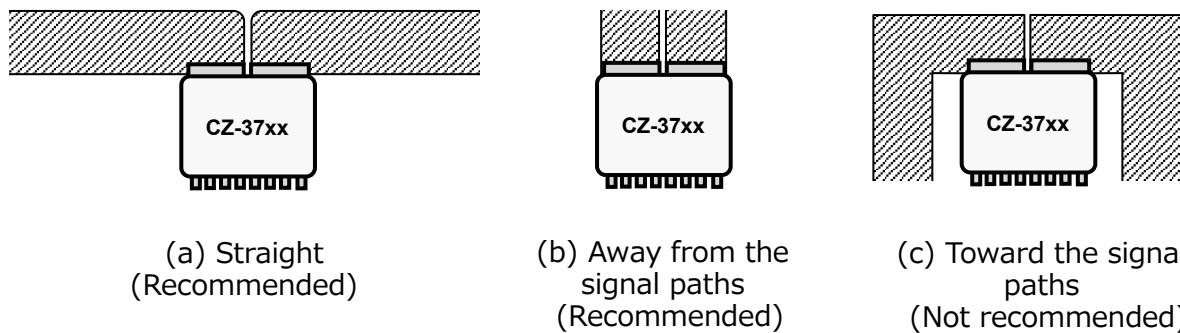


Figure 17. How to trace the primary conductor of CZ-37xx

2.2.3. Direction of the primary current

The user needs to know the direction of the current flow in the primary conductor to detect the correct output. In case of the trace shown in the Figure18, the output of the CZ-37xx increases as current flows from right to left, and decreases from left to right.

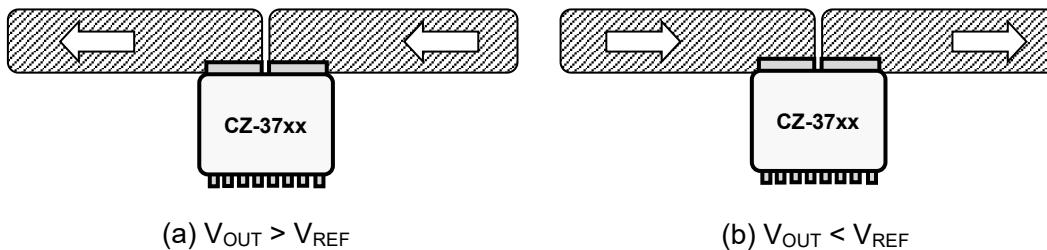


Figure 18. The relationship between the output of CZ-37xx and the direction of the primary current

2.3 Trace of the signal paths

Please refer to the followings for pin names of CZ-37xx.

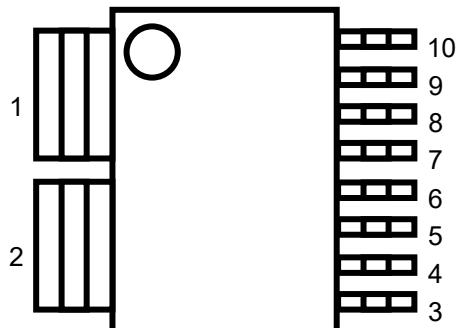


Figure 19. CZ-37xx Pin configuration

Table 6. Pin functions of CZ-37xx

Pin No.	Pin Name	I/O	Type	Function
1	IP	I	—	Primary conductor pin (+)
2	IN	I	—	Primary conductor pin (-)
3	VSS	GND	Power	Ground pin (GND)
4	TEST1	—	—	Test pin (Recommended external connection: GND)
5	VREF*	O	Analog	Reference output pin
6	VOUT	O	Analog	Sensor output pin
7	VDD	PWR	Power	Power supply pin (5V)
8	TEST2	—	—	Test pin (Recommended external connection: OPEN)
9	TEST3	—	—	Test pin (Recommended external connection: OPEN)
10	VSS	GND	Power	Ground pin (GND)

*VREF pin is output pin, cannot input voltage

2.3.1. Length and width of the signal paths

We recommend making the traces of VDD, VOUT and VREF signals as wide and short as possible to avoid electrical noise from external capacitive coupling.

2.3.2. Noise filtering

In order to reduce the noise superimposed on the power line, we recommend placing a $0.1\mu\text{F}$ by-pass capacitor between VDD and VSS pins as close to those pins as possible. By adding an electrolytic capacitor with larger capacitance in parallel, it will reduce the effect of the instant voltage drop of the power supply.

In case that large noise is superimposed on the output, adding a low pass filter to the VOUT and VREF pins may provide improvement. When adding a low pass filter, please consider the time constant to meet the required response time.

2.3.3. Connection to GND

Generally, in an inverter circuit board, GND of power line and that of signal line are isolated from each other in order to avoid malfunction of the MCU due to noise. Please connect the VSS pin of CZ-37xx to the GND of signal line.

2.3.4. Insulation design

The package of CZ-37xx is compliant with safety standard UL61800-5-1. The clearance and creepage between the primary conductor and the signal paths are more than 8mm. The Comparative Tracking Index (CTI) of the CZ-37xx package resin is 400V to 600V, and the Material Group is II. Table 7 shows the Working Voltage of CZ-37xx.

In order to maximize the insulation withstanding voltage of CZ-37xx, please keep enough distance between traces of the primary conductor and the signal paths. In case that there is a specific standard required for the system, please design the clearance and creepage to meet that requirement.

If the creepage is shorter than the requirement, it is possible to increase to more than 8mm by adding a slit in the board as shown in Figure 20.

Table 7. Working Voltage

Working Voltage	Pollution Degree			(Vrms)
	1	2	3	
Basic Isolation	2100	1118	561	
Reinforced Isolation	1200	557	281	

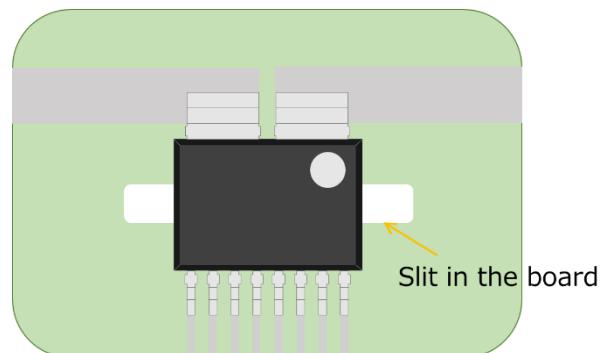


Figure 20. Example to increase the creepage

2.4 Thermal design

2.4.1. Thermal design(Compliant with UL61800-5-1)

The CZ-37xx is capable of $60A_{rms}$ continuous current, even larger current in case of transitional. When CZ-37xx is used under conditions compliant with UL61800-5-1, please ensure the case temperature (T_c) is kept lower than 130°C from heating by the primary current. Please refer to the Figure21. for the position to measure T_c .

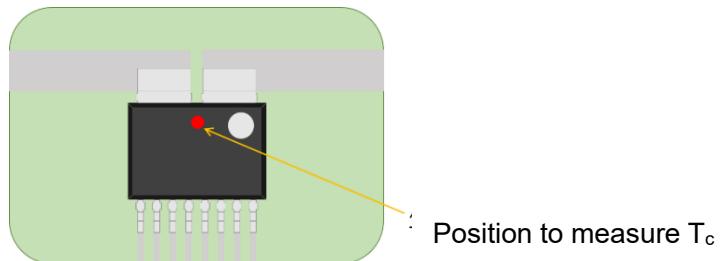


Figure 21. Position to measure package case temperature

If the heat dissipation is not enough, using "pad on vias" at the primary conductor pads may help. These can increase heat dissipation without increasing the trace area by thermally connecting the primary conductors to an inner and outer layers directly.

2.4.2. Junction temperature (T_j) estimation

T_j can be estimated the temperature from CZ-37xx's lead frame. Because it nearly equals to the temperature of the sensor inside the package.

2.4.3. Heating Measurement(reference)

Figure 21.,22. show the results of T_c measurement using figure 8. "Evaluation board". This result is a reference data. T_c changes a lot by the board layout and the heat dissipation. Please confirm it in your evaluation environment.

Measurement Condition

Measurement Temperature : at RT. (about 25°C)

Position to measure T_c : Refer to Figure 19.

Maximum operation temperature : $T_c < 130^{\circ}\text{C}$

The size of wire which is connected to the board is selected according to the standard of the amount of current.

30~90A : 14sq ,AWG5.8 , Diameter:4.2mm

120~150A : 30sq ,AWG2.5 , Diameter:6.2mm

180A : 50sq , AWG0.3 , Diameter:8.0mm

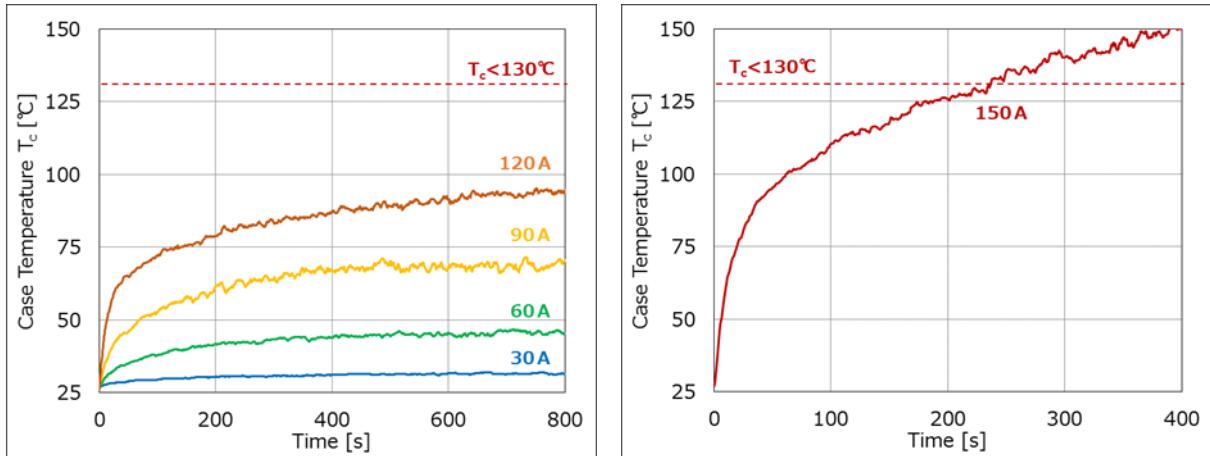


Figure 21. Relationship between CZ-37xx Case temperature and amount of input current (left: 30~120A, right: 150A)

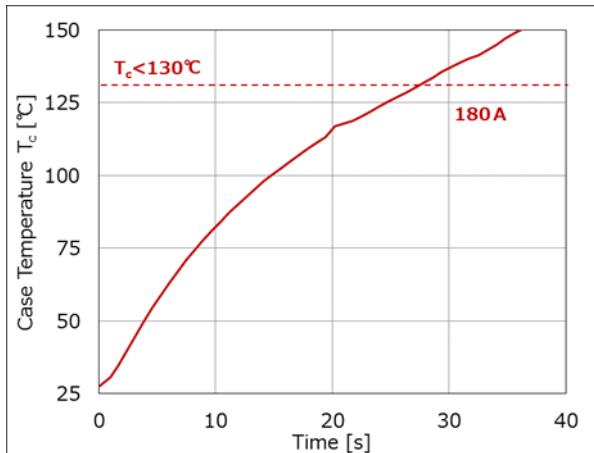


Figure 22. Relationship between CZ-37xx Case temperature and amount of input current (180A)

2.5. Stray Magnetic Field Reduction Function

There are two Hall elements inside CZ-37xx connected in a differential manner. By detecting the difference of these two Hall elements' outputs, CZ-37xx reduces the effects of stray magnetic fields as a built-in common-mode rejection function. When the same magnetic field is applied to both Hall elements, this magnetic field is deemed to be the stray and is reduced from the output of CZ-37xx by the ratio of Stray Magnetic Field Reduction (E_{bc} : 0.01A/mT Typ.).

Example: When a stray magnetic field of 1mT is applied to the CZ-37xx, the output will have additional error of 0.01A=10mA equivalent.

- CZ-3700: Sensitivity=400mV/A, Error=10mA \rightarrow Output error=4mV
- CZ-3706: Sensitivity=12mV/A, Error=10mA \rightarrow Output error=0.12mV

On the other hand, when different magnetic fields are applied to each Hall element, this will appear as output error. For example, a current carrying trace that runs close the CZ-37xx may cause this. The extent of the error will depend on the layout of the current trace, actual current, distance from the CZ-37xx, and the part number (sensitivity). Figure 22 shows some simulated examples of output error by the nearby current.

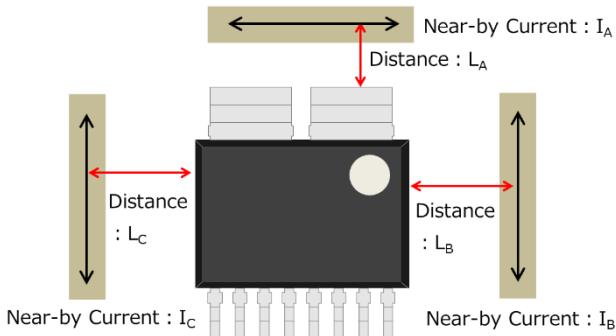


Figure 23. Examples of nearby current lines

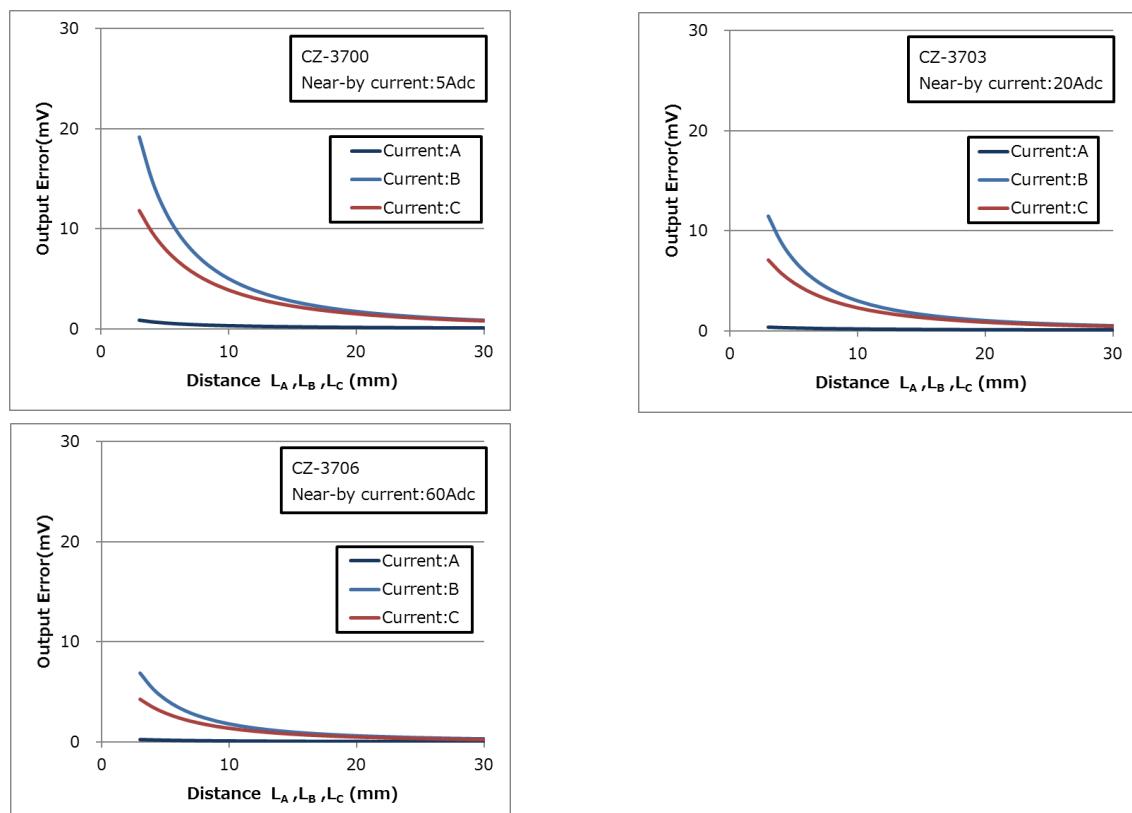


Figure 24. Output Error by nearby current

3. Useful Tips

3.1 Supply Voltage

The CZ-37xx has a ratiometric output. This means that the output of the current sensor changes proportionally to the supply power voltage. A ratiometric output is suitable for applications where the output is converted to digital using an A/D converter and where fluctuation of the power supply voltage causes reference error of the A/D converter.

Figure 13. shows an example of the external circuit where a 5V A/D converter is connected. Figure 14 shows the case where a 3.3V A/D is used. The supply voltage of the CZ-37xx and the reference voltage of the A/D converter fluctuate at the same ratio. This will avoid the effects of the fluctuation of the power supply to the A/D converter output.

Table 8. shows the VDD dependence of VREF voltage. Figure 25 shows the output voltage of the CZ-3702 (Sensitivity $V_h=100\text{mV/A}$) as an example ratiometric output.

Table 8. VDD dependence of VREF voltage

VDD(V)	VREF(V)
4.5	2.25
5.0	2.50
5.5	2.75

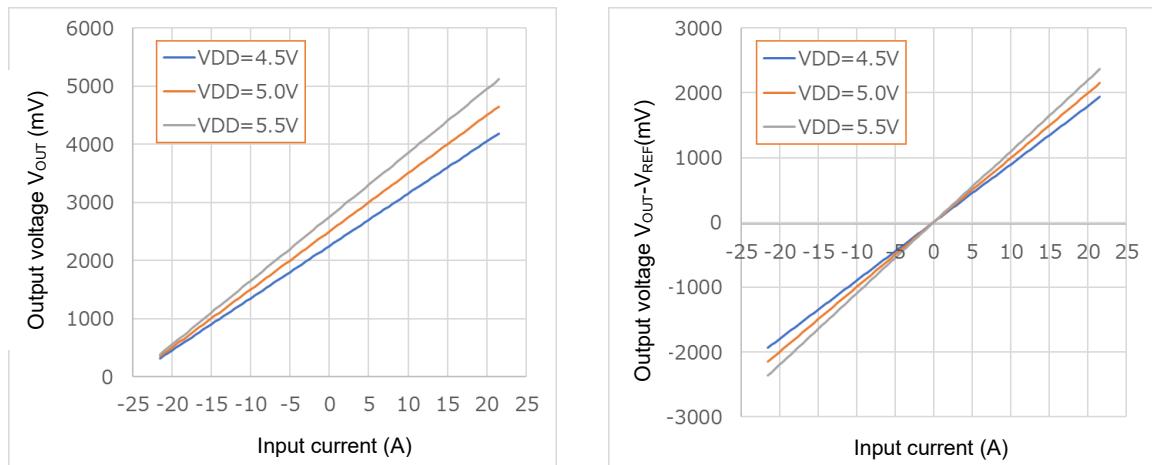


Figure 25. Output voltage of the CZ-3702 vs Input current with different VDD.
(Left: V_{out} , Right: $V_{out} - V_{REF}$)

3.2 Calibration of Zero-Current Output in initialization

The Zero-Current Output of the CZ-37xx may drift over time within the values defined in datasheet Section 14. Therefore, in order to minimize this drift, we strongly recommend calibrating the Zero-Current Output by software after the power-up time of the system when the measured current is zero.

3.3 Power up

Figure 22 shows a recommended example of the power up sequence. In the power up sequence, if the time from $V_{DD}=3.7V$ to $V_{DD}=5V$ is less than 0.4msec, the output will be stabilized after 1.2msec(typ.) from the time $V_{DD}=3.7V$. If it takes 0.4msec or more, it may take longer to stabilize the output. Please check the time needed to stabilize the output in that case.

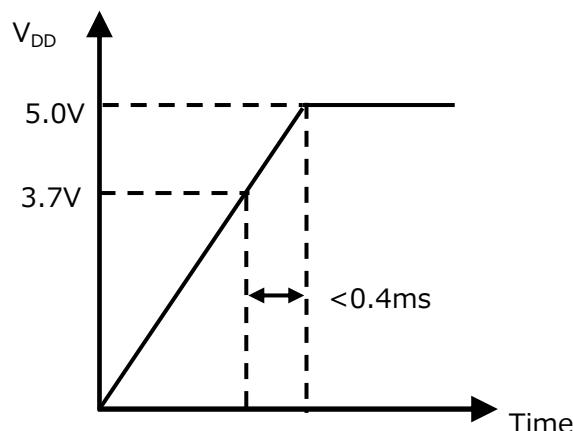


Figure 22. Recommended example of the power up sequence

3.4 Magnetic parts around

The CZ-37xx output can be affected by magnetic devices (mechanical relays, transformers, etc.) that are nearby. In the case where magnetic devices must be placed close to the CZ-37xx, please check the effect on sensitivity or other characteristics and make sure any effects are understood and mitigated as much as possible.

3.5 Storage Environment

CZ-37xx is the condition of MSL2a (JEDEC J-STD-020).

Please store under the following conditions.

[Storage term]

Within 1 year after delivery (Before and after unpacking the moisture-proof packing.)

[Before unpacking the moisture-proof packing]

5~40°C, less than 90%RH

[After unpacking the moisture-proof packing]

5~30°C, 60%RH or less, less than 4week.

3.6 Sensitivity and Zero-Current Output Drift by Reflow

Solder reflow can cause the Sensitivity and Zero-Current Output of CZ-37xx to drift. Section 9 of the datasheet shows the variation of the shipment test results by AKM. The reflow process can induce drift within the values defined in Section 14 of the datasheet. Regarding Zero-Current Output drift, we recommend calibrating according to Section 3.2 of this document.

Figure 27. and Table.10 show the recommended reflow temperature profile. AKM recommends subjecting the CZ-37xx to a reflow process a maximum of three (3) times.

Table 9. Reflow Conditions

Preheat/Soak	T_{smin}	150°C
	T_{smax}	200°C
	T_{smin} to T_{smax}	60~120s
Liquidous Temperature	T_L	217°C
	t_L	60~150s
Ramp-up Rate	T_L to T_p	3°C/s max.
Peak Package Body Temperature	T_p	260°C max.
	t_p	30s max.
Ramp-down Rate	T_p to T_L	6°C/s max.
Time 25°C to Peak Temperature	25°C to T_p	8min max.

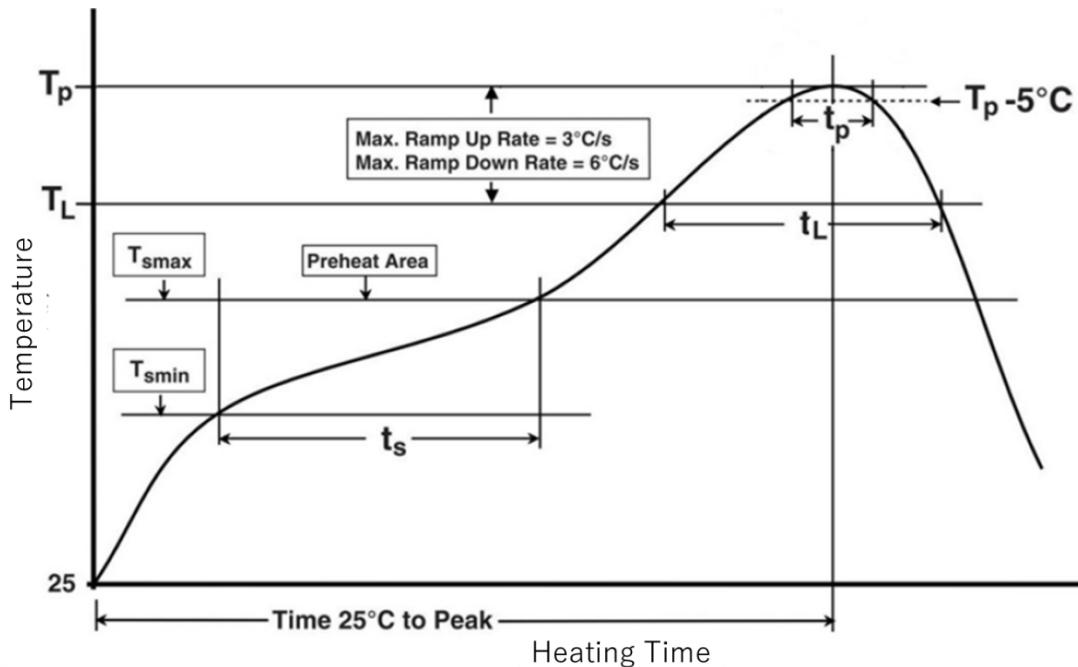


Figure 23. Reflow profile

3.6 Maximum Primary Current and Linear Sensing Range

Maximum Primary Current (I_{RMSmax}) is the maximum current that can be flowed through the primary conductor continuously. It depends on the cross-sectional area of the primary conductor. CZ-37xx can be damaged if it is used in conditions where the DC current or the root-mean-square value of AC current exceeds I_{RMSmax} for an extended period of time. In the case of pulsed current, it is possible to apply currents larger than I_{RMSmax} .

Linear Sensing Range (I_{NS}) is the current range where we guarantee the linearity of CZ-37xx output. If the primary current is beyond I_{NS} , the output will saturate. However, it will return to normal once the primary current is back within I_{NS} .

3.7 Safety Standard

CZ-37xx is certified as IEC/UL-62368-1,UL-1577 by the international certification organization.

- IEC/UL 62368-1 Audio/video, information and communication technology equipment Part 1: Safety requirements Edition 2. (File No. E359197)
- CSA C22.2 No.62368-1-14 Audio/video, information and communication technology equipment Part 1: Safety requirements Edition 2. (File No. E359197)
- UL1577 Non-Optical Isolators-Edition 5.(File No. E499004)
- CSA Component Acceptance Service No. 5A - Component Acceptance Service for Optocouplers and Related Devices (File No. E499004)

3.8 Other information

Please check our website akm.com for datasheets, selection guide, and more.

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