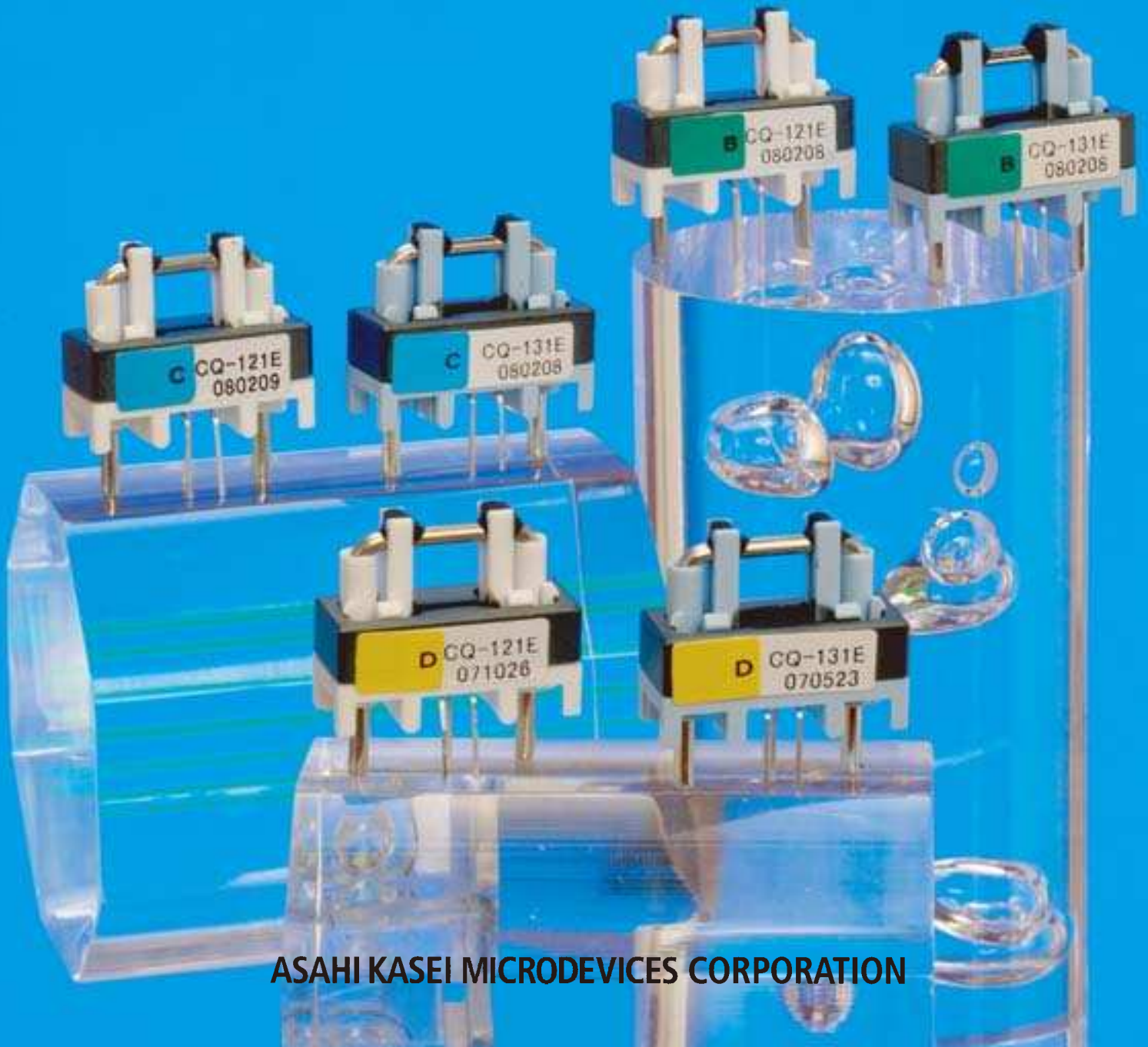


Asahi**KASEI**

# Small-Sized Current Sensor CQ-121E, CQ-131E



ASAHI KASEI MICRODEVICES CORPORATION

## Features

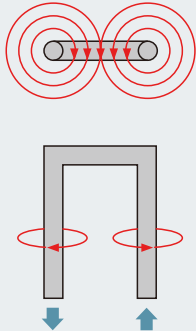
- Small-sized open loop current transducer using Linear Hall Effect IC
- Simple structure and few parts
- The primary conductor and the Hall Effect IC are isolated electrically
- The amplifier is unnecessary. It is possible to connect to micro-computer or AD converter directly.
- Small-size 8 (D) × 20 (W) × 19 (H)
- Supply voltage range 3~5.5V
- Ratiometric analog output
- Quick response Typ. 3μs
- Supply current Typ. 9mA
- Operating Temperature Range -30~80°C
- In accordance with IEC standards



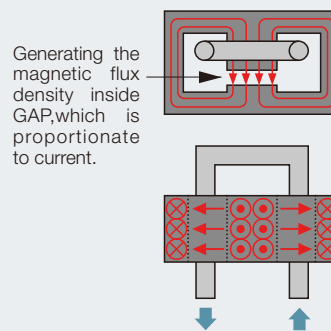
## Principles and Configuration of Current Transducer

### Principles of current sensing

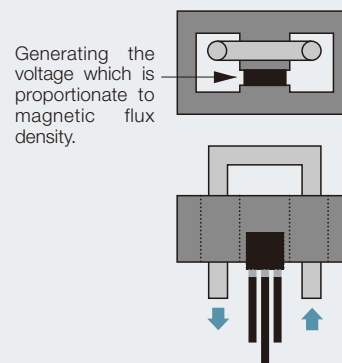
- Generating the magnetic flux density outside the primary conductor, when the current is biased in the primary conductor.



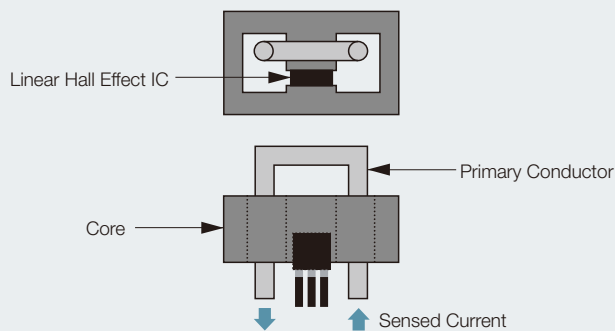
- Generating the parallel magnetic field inside the core.



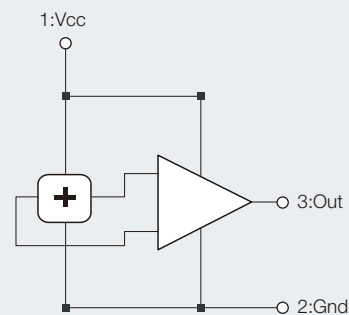
- Inserting Linear Hall Effect IC into GAP.



### Configuration of CQ-121E, 131E



### Functional Block Diagram



## Others

### ◆ Frequently Asked Questions

**Q1:** How much is sensed current resolution?

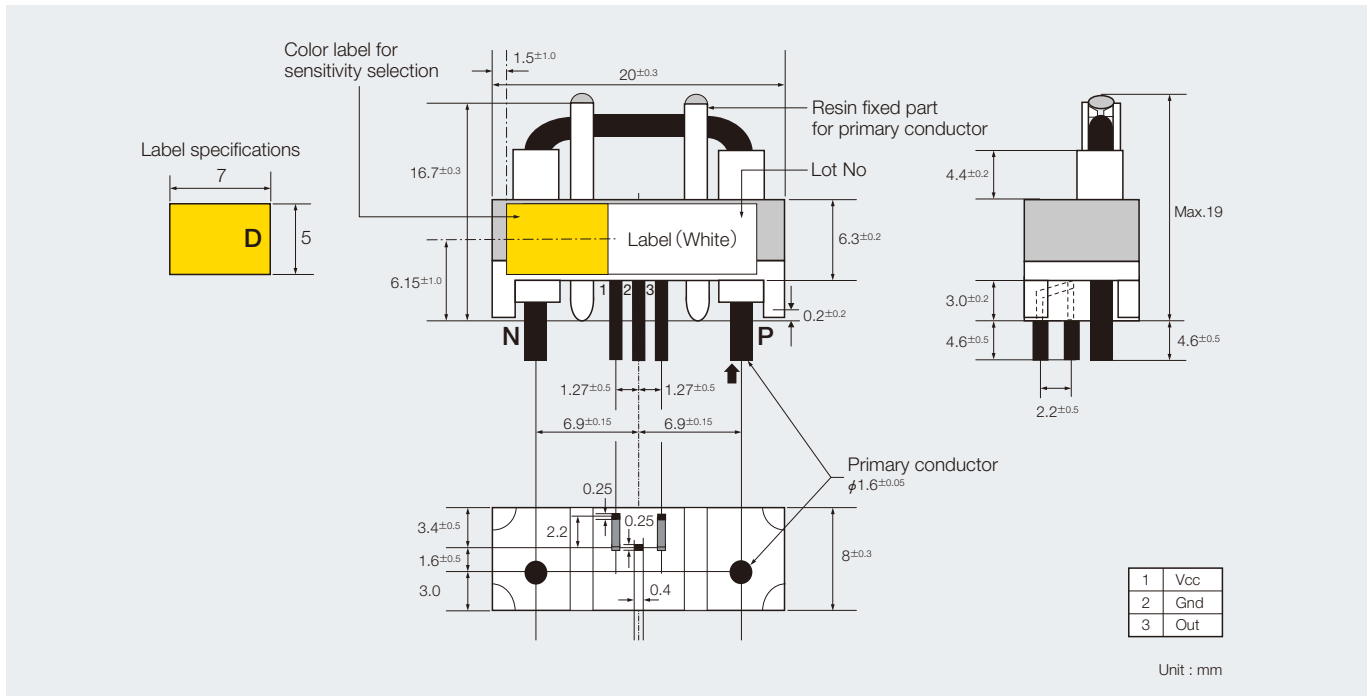
**A1:** CQ-121E is about 100mA, CQ-131E is about 250mA.

**Q2:** How much is maximum current?

**A2:** "Maximum DC continuous current is 30A.

Linearity error ±1% of CQ-121E is guaranteed between -25 and 25A.  
And that of CQ-131E is between -50 and 50A."

## Dimensions CQ-121E, CQ-131E



## Electrical specifications of CQ-121E, 131E

### ◆ Absolute Maximum Ratings (Ta=25°C) CQ-121E, 131E

Item	Symbol	Limit	Unit
Maximum Input Voltage	Vccmax	6	V
Maximum Output Current	Iomax	±1.2	mA
Operating Temp Range	Topr	-30 ~ 80	°C
Storage Temp Range	Tstg	-30 ~ 85	°C

### ◆ Electrical specifications for current sensing (Ta=25°C, Vcc=5V) CQ-121E

Item	Symbol	Min	Typ	Max	Unit	Remarks
Maximum DC sensed current	I <sub>max</sub>	-30		30	A	
Rated sensed current	I <sub>lin</sub>	-25	25		A	Linearity error guarantee range
Maximum sensed current	I <sub>ns</sub>	-30		30	A	Output unsaturation range <sup>Note1)</sup>
Sensitivity	V <sub>h</sub>	55	63.5	72	mV/A	<sup>Note2)</sup>
Linearity error	ρ	-1		1	%F.S.	Hysteresis is included <sup>Note3)</sup>

Note1) Design target

Note2) Slope in approximate straight line

Note3) Maximum difference between approximate straight line and measured output voltage divided by maximum rated current

### ◆ Electrical specifications (Ta=25°C, Vcc=5.0V) CQ-121E, 131E

Item	Symbol	Min	Typ	Max	Unit	Remarks
Supply current	I <sub>cc</sub>		9	12	mA	Without load
Offset voltage <sup>Note1)</sup>	V <sub>of</sub>	2.35	2.5	2.65	V	I <sub>in</sub> =0
Response time <sup>Note2)</sup>	T <sub>irr</sub>		3	5	μsec	
Frequency response <sup>Note2)</sup>	f	50	100		kHz	10% Decrease point
Temperature drift <sup>Note3)</sup>	V <sub>hd</sub>	-5		5	%	The maximum error from room temperature
Temperature coefficient of V <sub>of</sub> <sup>Note3)</sup>	V <sub>ofd</sub>	-0.5		0.5	mV/°C	I <sub>in</sub> =0
Isolation voltage		1.5			kV	60sec (Commercial cycle)
Isolation resistance <sup>Note2)</sup>		500			MΩ	500V (DC)

Note1) Output voltage at 0 (A) in approximate straight line

Note2) Design target

Note3) For reference only

### ◆ Recommended operating condition (Ta=25°C) CQ-121E, 131E

Item	Symbol	Min	Typ	Max	Unit
Supply voltage	Vcc	3.0	5.0	5.5	V
Output current	I <sub>o</sub>	-1		1	mA

### CQ-131E

Item	Symbol	Min	Typ	Max	Unit	Remarks
Maximum DC sensed current	I <sub>max</sub>	-30		30	A	
Rated sensed current	I <sub>lin</sub>	-50	50		A	Linearity error guarantee range
Maximum sensed current	I <sub>ns</sub>	-60		60	A	Output unsaturation range <sup>Note1)</sup>
Sensitivity	V <sub>h</sub>	24	27	30	mV/A	<sup>Note2)</sup>
Linearity error	ρ	-1		1	%F.S.	Hysteresis is included <sup>Note3)</sup>

### ◆ Sensitivity rank

#### CQ-121E

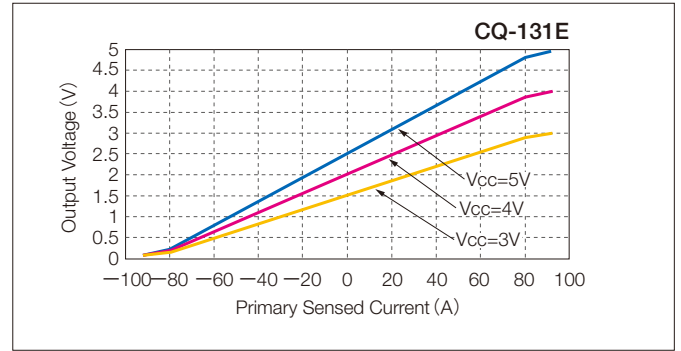
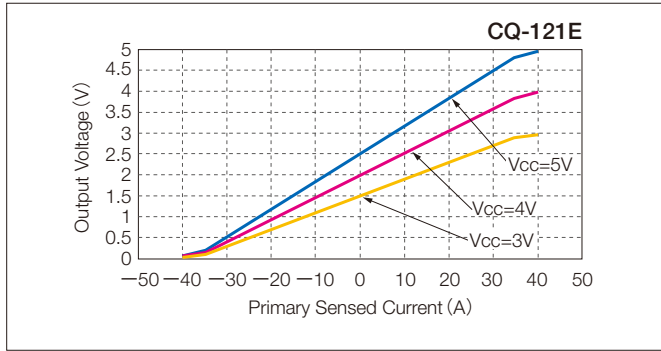
Sensitivity rank	Color of label	Sensitivity range (mV/A)		Typical sensitivity (mV/A)	Variation (%)
		Min	Max		
B	Green	55.0	60.7	57.85	±4.9
C	Blue	59.9	66.1	63.00	±4.9
D	Yellow	65.3	72.0	68.65	±4.9

#### CQ-131E

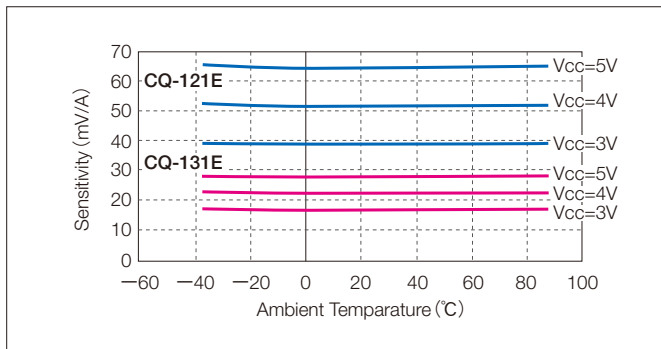
Sensitivity rank	Color of label	Sensitivity range (mV/A)		Typical sensitivity (mV/A)	Variation (%)
		Min	Max		
B	Green	24.0	26.3	25.15	±4.6
C	Blue	25.7	28.3	27.00	±4.8
D	Yellow	27.7	30.3	28.85	±4.0

## Characteristics of Current Transducer CQ-121E, CQ-131E (For reference only)

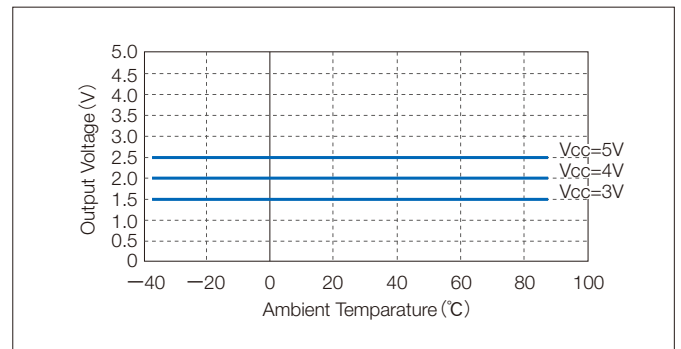
### ◆ Primary Sensed Current versus Output Voltage



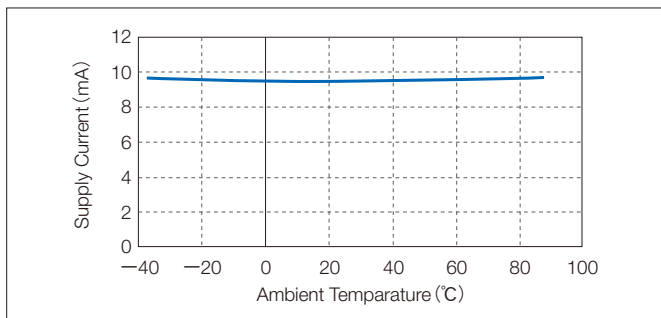
### ◆ Sensitivity versus Ambient Temperature



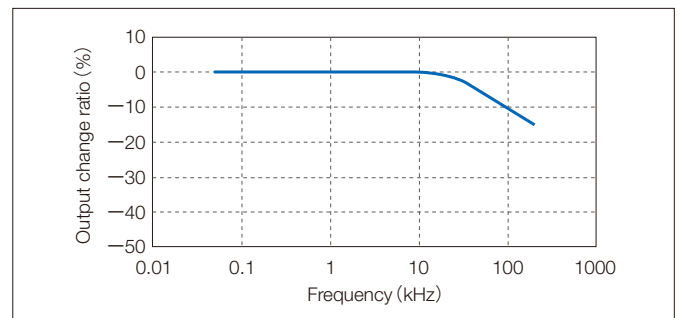
### ◆ OA Output Voltage versus Ambient Temperature



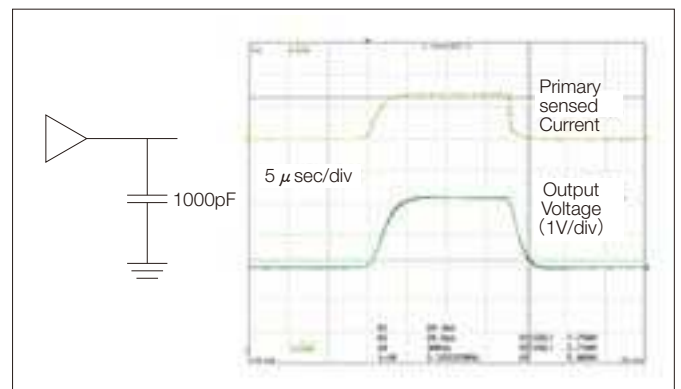
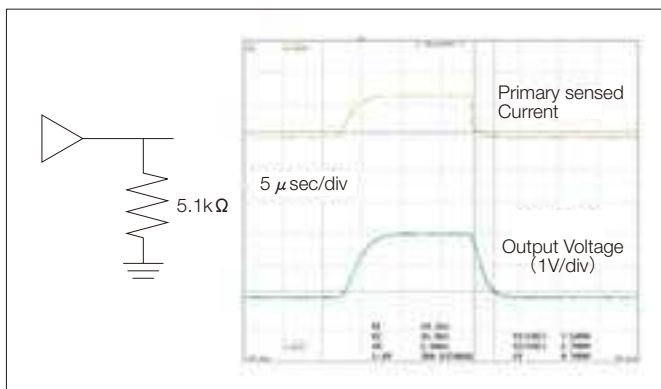
### ◆ Supply Current versus Ambient Temperature (CQ-121E, 131E)



### ◆ Frequency Response



## Step Response (CQ-121E, 131E)



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