L32P Series

Application Manual

Overview

The L32PxxxS05**series comprises "through-type and onboard" current sensors of the open-loop type.

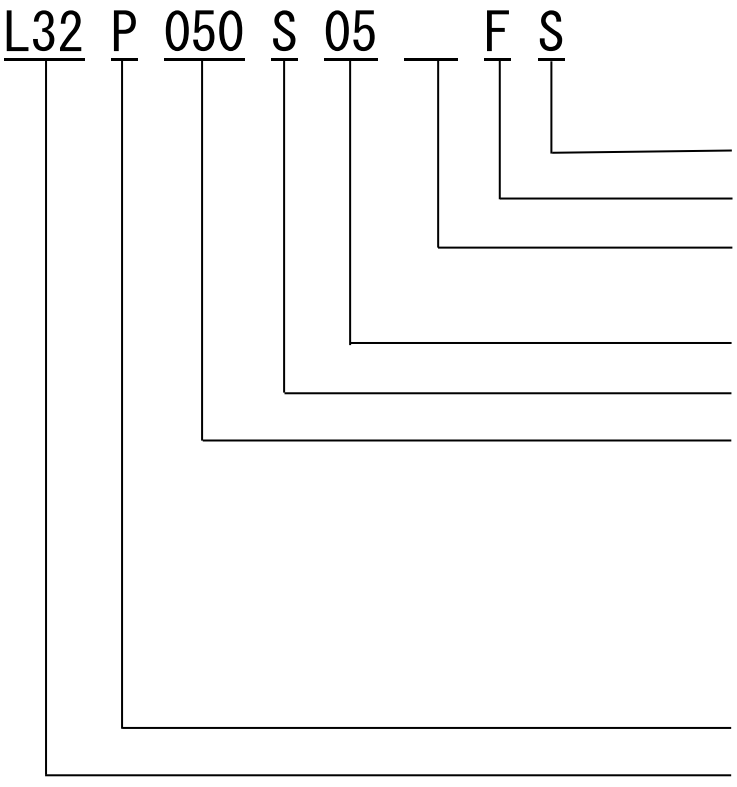
Characteristics

· Single 5V power supply.
· Through-type measured current.
· Open-loop-type circuit configuration.
· Onboard type
· Equipped with Vref terminal (reference voltage terminal) that is usable for external reference voltage.
· Reference voltage has an initial deviation of ±0.8% and a coefficient of temperature variation of 120 ppm/°C.
· Because a ferrite core is used, heat generated by high frequency current is small.
· Sulfur-resistant product

Uses

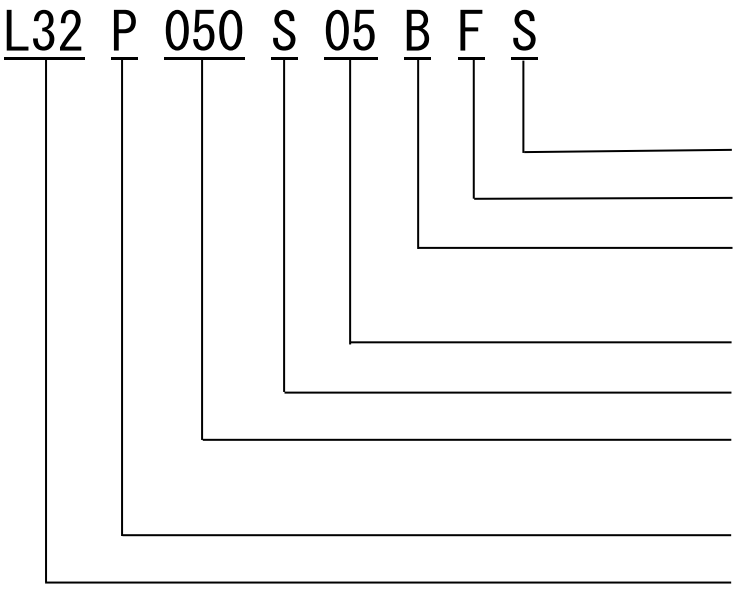
· General-purpose inverter
· Motor drive
· DCDC converter
· Generator

Format



Sulfur-resistant product (option)
Reference output product (option)
Blank: Through type

Power-supply voltage 05: 5V
Power-supply type S: Single power supply
Rated current value 050: 50A
100: 100A
150: 150A
200: 200A
300: 300A
400 400A
Mounting method P: Substrate
Series name



Sulfur-resistant product (option)
Reference output product (option)
B: Built-in bus bar

Power-supply voltage 05: 5V
Power-supply type S: Single power supply
Rated current value 050: 50A
100: 100A
Mounting method P: Substrate
Series name

Block diagram

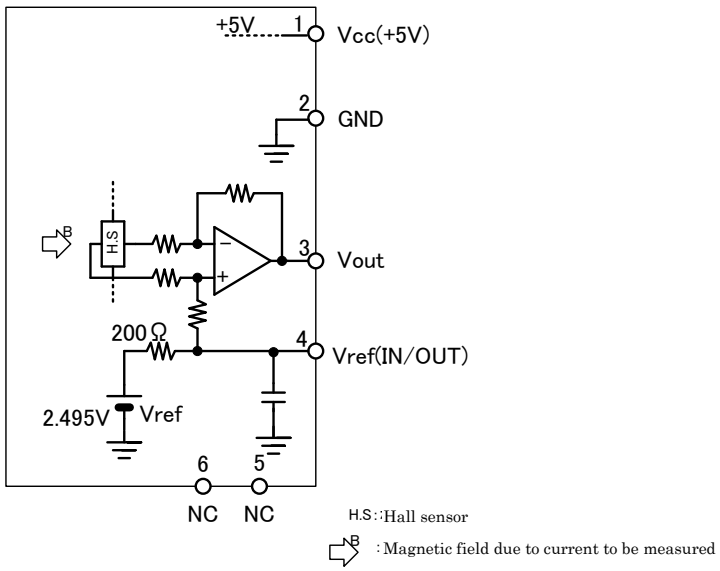


Fig. 1: Internal block diagram

Table 1: Description of terminals

Terminal number	Terminal name	Description	Remarks
1	Vcc	Power-supply voltage terminal. Apply a voltage within +5V±5%.	
2	GND	GND terminal	
3	Vout	Output terminal. When the rated current (measured current) is passed through the through-hole, an output voltage of 0.625Vtyp is output to the Vref terminal. Standard load resistance: 10 kΩ, load capacity: 60 pF max	
4	Vref	This terminal outputs the built-in high precision reference voltage. This voltage becomes the reference (internal reference voltage) for the conversion from current to voltage of the sensor output. The voltage value is 2.495Vtyp. When using this internal reference voltage, either leave this terminal open or use an input impedance of the circuit to be connected higher than 1 MΩ. The input and output resistance of this terminal is 200 Ω and the parallel capacitance is 1000 pF.	

5	NC	Terminal for fixing the main body. Solder the board to fix the main body.	
6	NC	Terminal for fixing the main body. Solder the board to fix the main body.	

■ Circuit example

Circuit for using internal reference voltage (Vref)

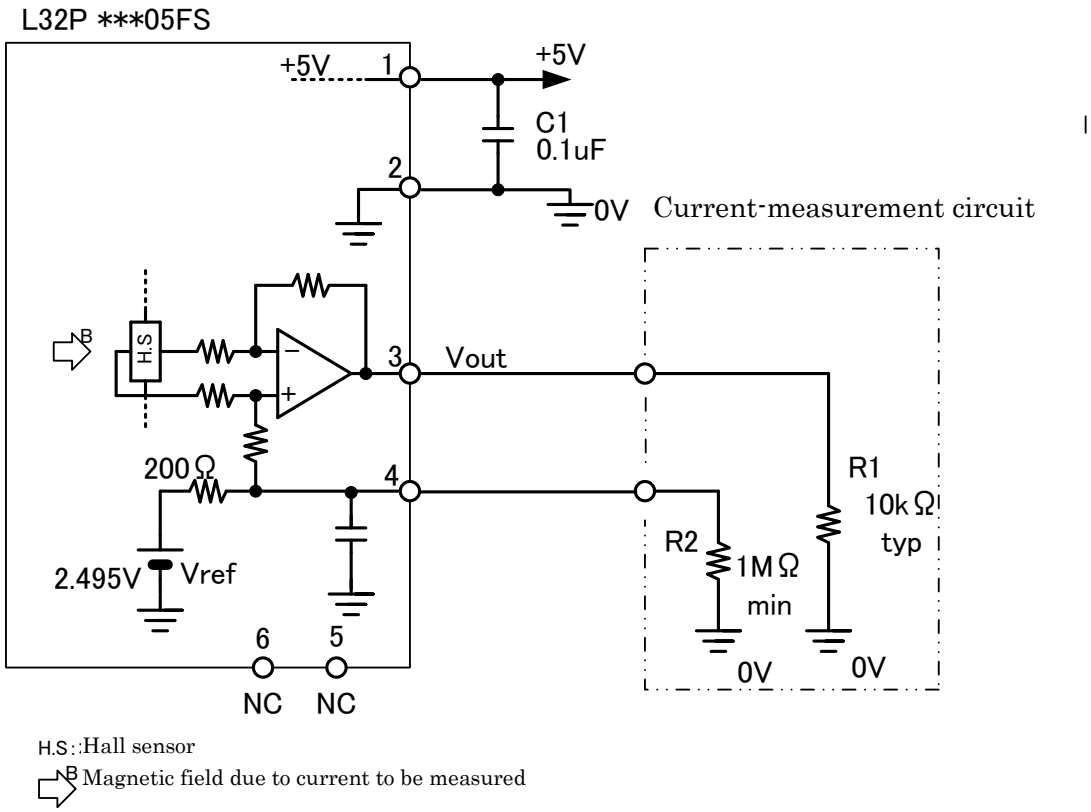


Fig. 2: Circuit for using internal reference voltage (Vref)

□Description of Fig. 2

This current sensor converts a measured current into a voltage. The output voltage Vout (3) in Fig. 2 is output in accordance with the (4) pin voltage of 2.495V. When the current to be measured is 0, Vout (3) = 2.495V. When the current to be measured is in the plus direction, Vout (3) becomes 2.495V + (voltage converted from the measured current). When the current to be measured is in the minus direction, Vout (3) becomes 2.495V – (voltage converted from the measured current). The relationship between Vout (3) and the current to be measured is shown for each model number in graphs 1 to 6 at the end of this document. Graphs 1 to 6 give standard values without consideration of the effects due to offset voltage, hysteresis error, etc. The plus direction of the current to be measured is indicated by → on the case (case or name plate).

R1 and R2 in Fig. 2 are equivalent resistances of the receiving circuit of the current sensor output Vout (3). The resistance value R2 connected to the Vref voltage (4) is recommended to be 1 MΩ or more. As the value of R2 decreases, the deviation of the Vref voltage (=2.495V) increases. The load resistance between the Vout pin (3) and the GND potential (0V) should be the standard value of 10 kΩ and the load capacitance should be 60 pF max.

C1 in Fig. 2 is a power-supply capacitor for keeping the power-supply impedance at a low value. A ceramic

capacitor with 0.1 μF is recommended.

Circuit for using external reference voltage

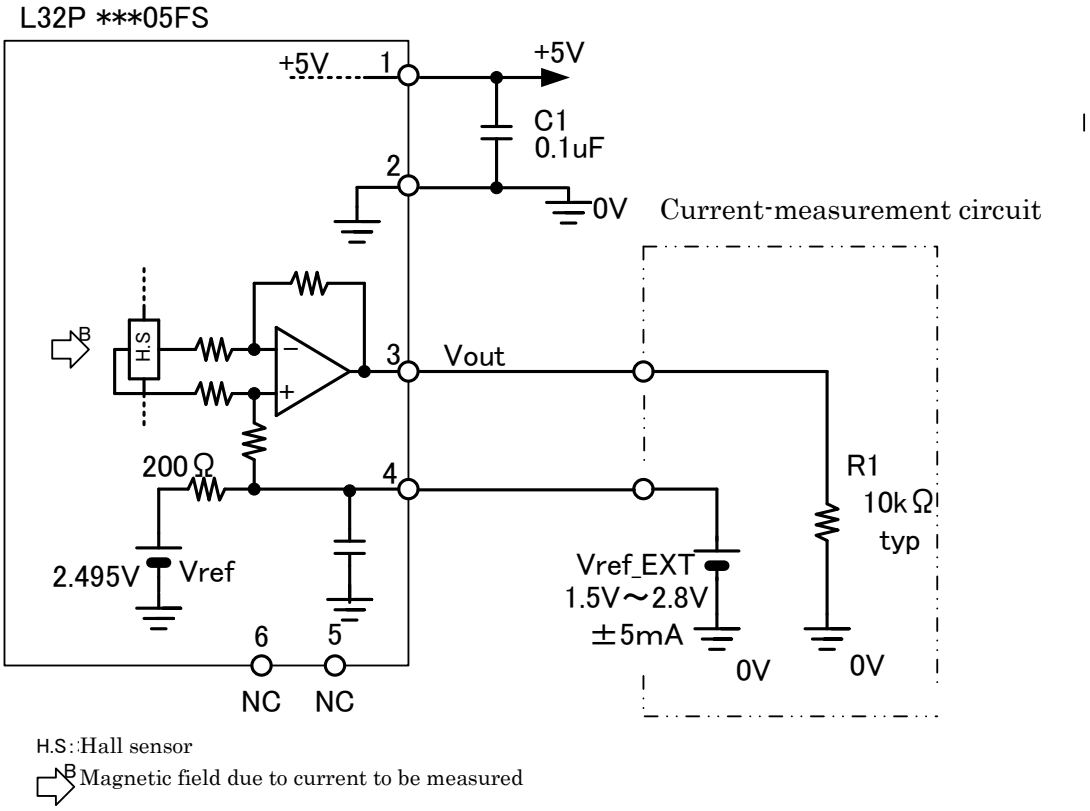


Fig. 3: Circuit for using external reference voltage (Vref_EXT)

□Description of Fig. 3

This current sensor converts a measured current into a voltage. The output voltage Vout (3) in Fig. 3 is output in accordance with the external reference voltage (Vref_EXT). When the current to be measured is 0, Vout (3) = Vref_EXT. When the current to be measured is in the plus direction, Vout (3) becomes Vref_EXT + (voltage converted from the measured current). When the current to be measured is in the minus direction, Vout (3) becomes Vref_EXT – (voltage converted from the measured current). The relationship between the output voltage and the current to be measured is shown for each model number in Graphs 7 to 12 at the end of this document. Vref_EXT is selected within the range of 1.5V to 2.8V, and the sink and source should have the current capability of 5mA. The plus direction of the current to be measured is indicated by → on the case (case or name plate).

R1 in Fig. 3 is the equivalent resistance of the receiving circuit of the current sensor output Vout (3). The load resistance between the Vout terminal (3) and the GND potential (0V) should be the standard value of 10 kΩ and the load capacity should be at most 60 pF. C1 in Fig. 3 is a power-supply capacitor for keeping the power-supply impedance at a low value. A ceramic capacitor with 0.1 μF is recommended.

Circuit for converting to 1.65V center voltage

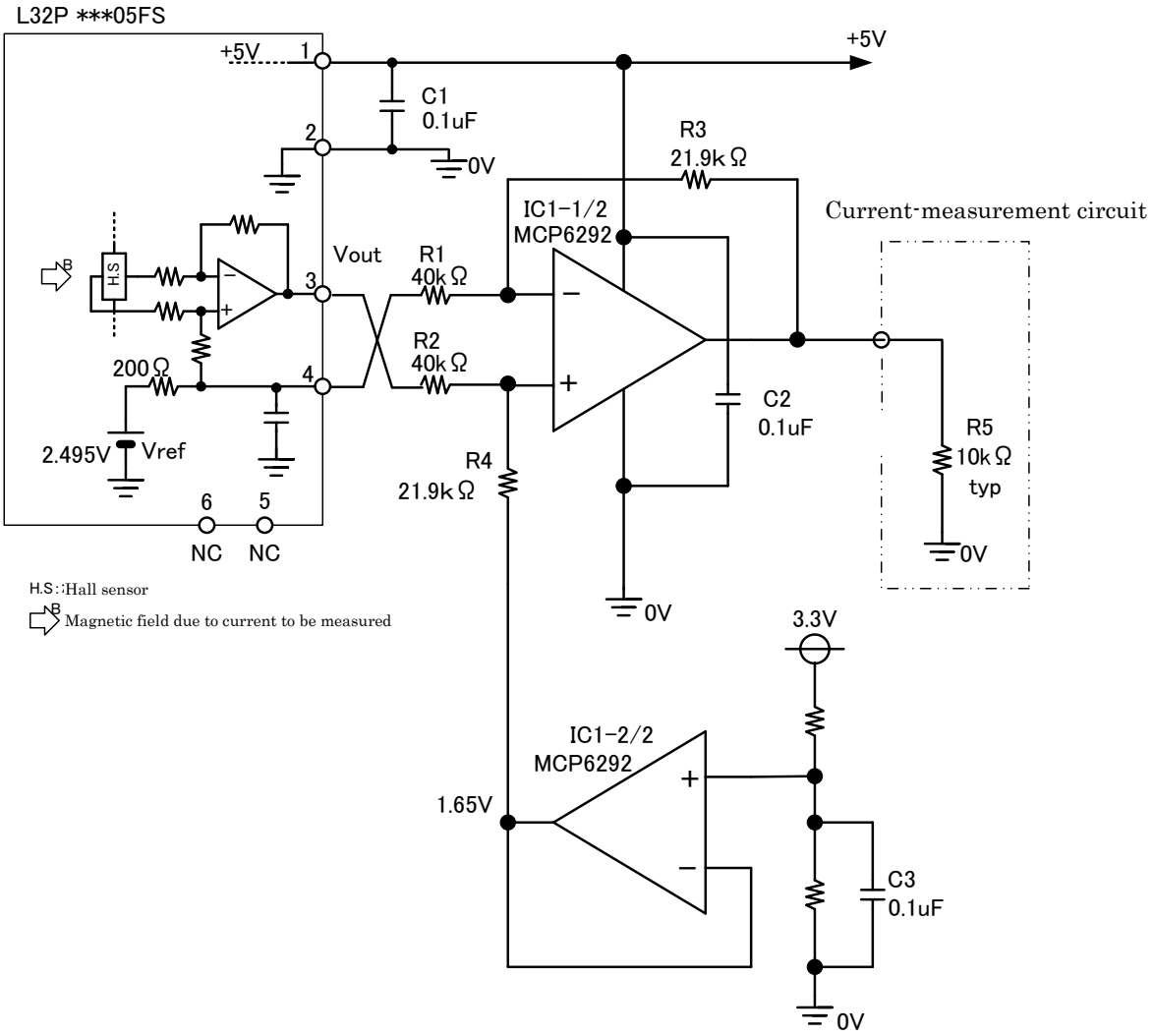


Fig. 4: Circuit with 1.65V reference

□Description of Fig. 4

Figure 4 shows a circuit that outputs the sensor output in accordance with the voltage of the center of the CPU power supply, etc. (DC 3.3V). It can be input to the AD conversion terminal of the CPU. The new reference voltage is 1.65V, which is half the power-supply voltage of the CPU. The sensor output is attenuated 0.6 times by the differential amplifier and input to the AD conversion terminal of the CPU.

■Application circuit

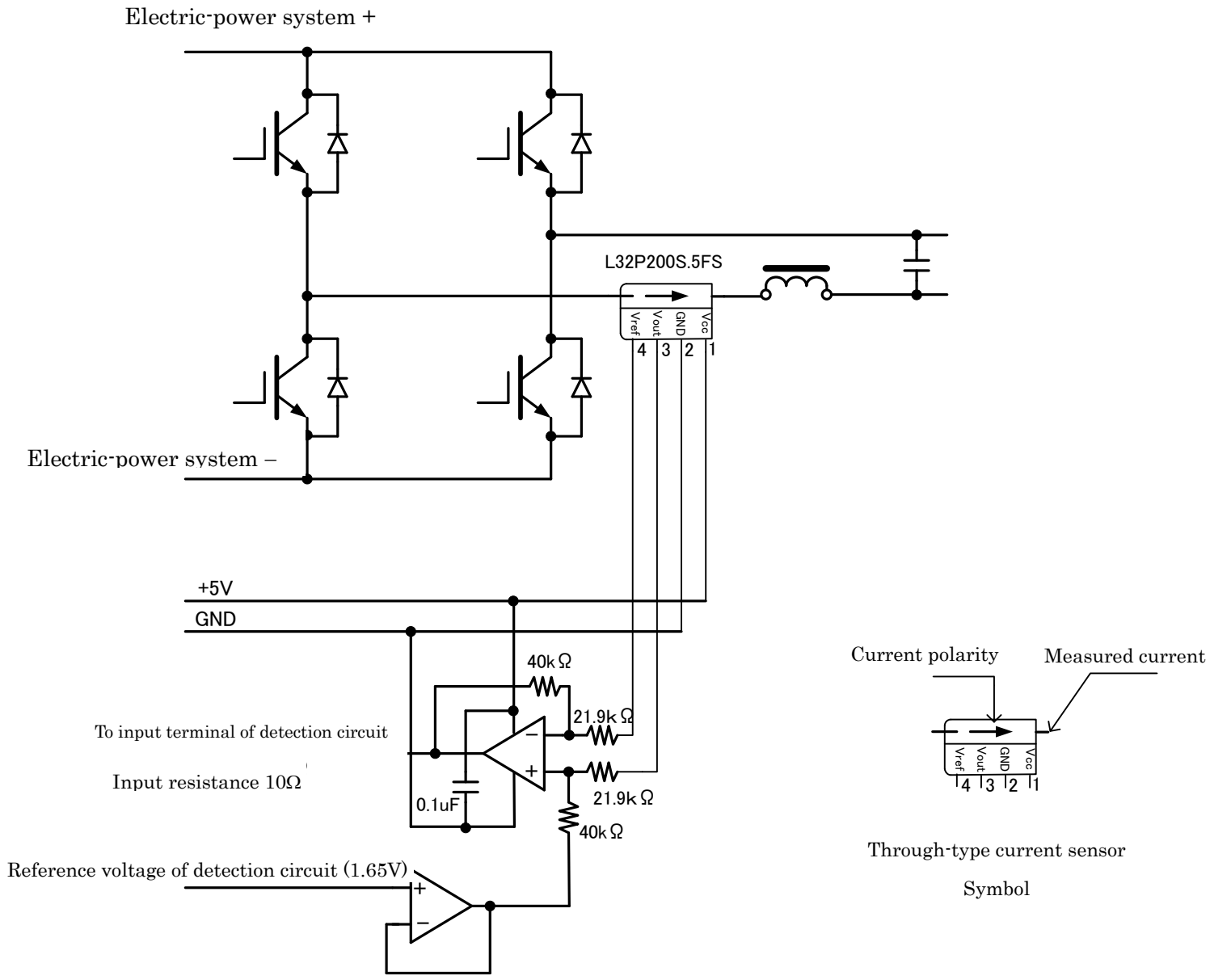


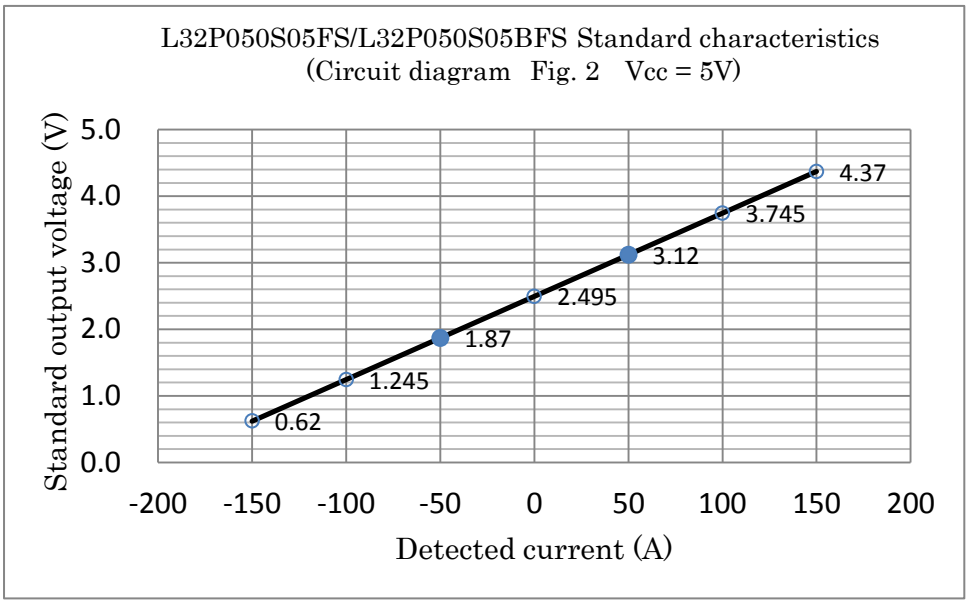
Fig. 5: Circuit applied to inverter circuit (reference voltage of control circuit = 1.65V)

Implementation

Example of pattern design

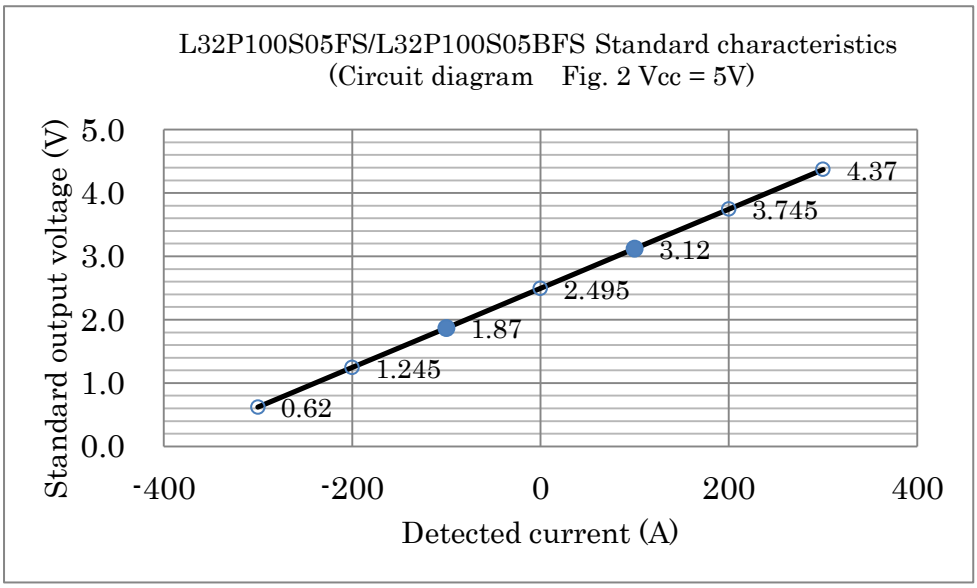
Example of bus bar design

Graph 1



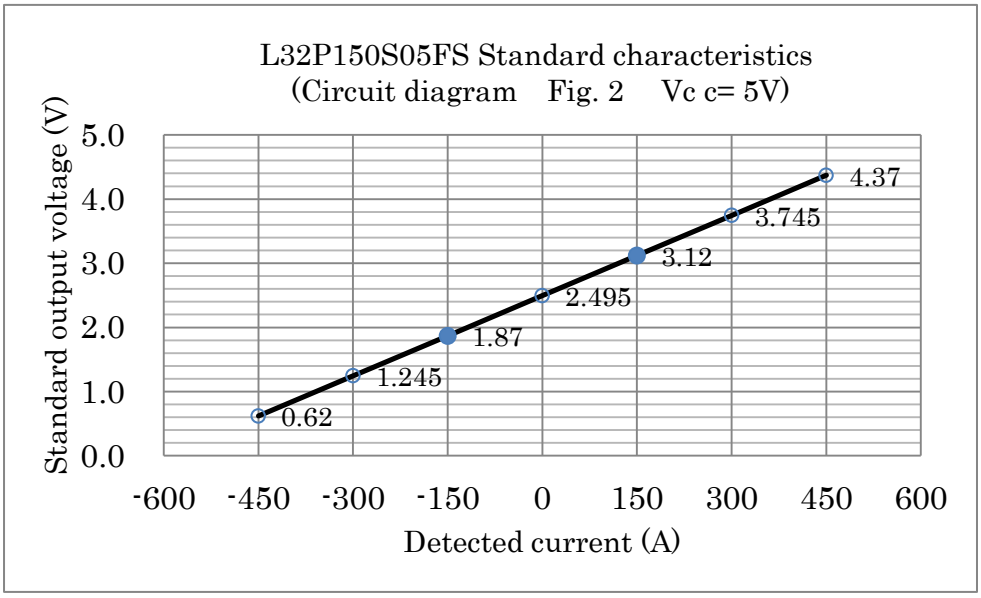
* ●: The standard output voltage of the sensor versus the rated current.

Graph 2



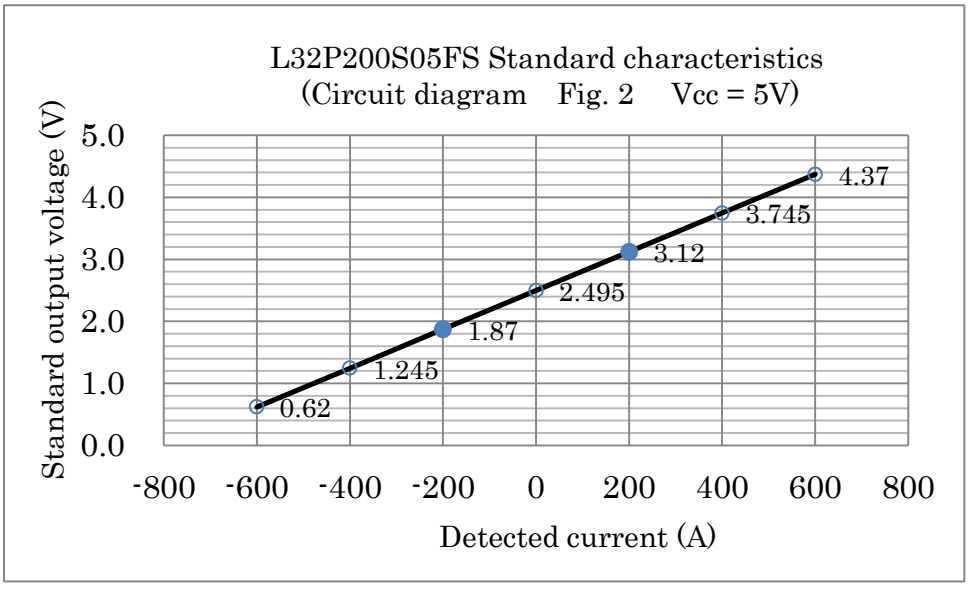
* ●: The standard output voltage of the sensor versus the rated current.

Graph 3



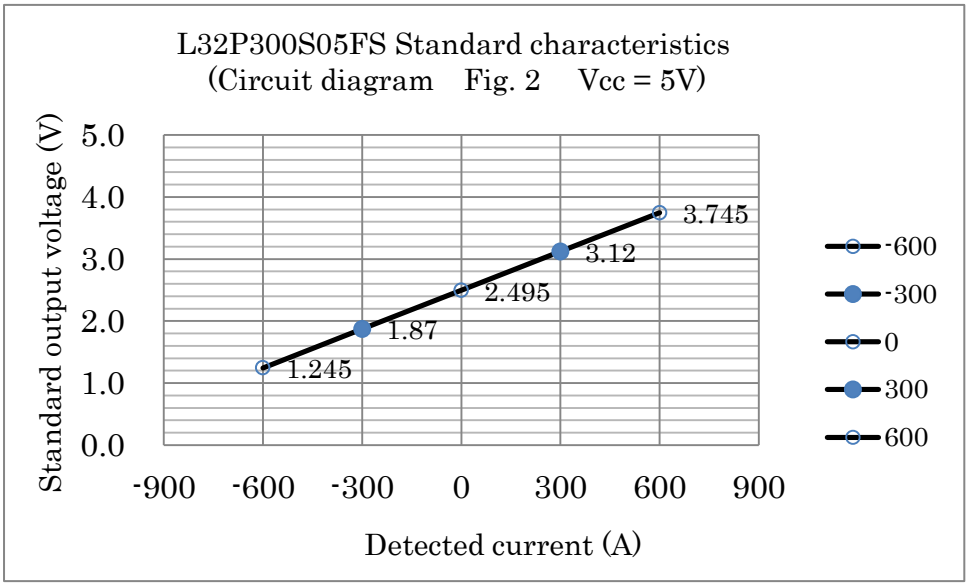
* ●: The standard output voltage of the sensor versus the rated current.

Graph 4



* ●: The standard output voltage of the sensor versus the rated current.

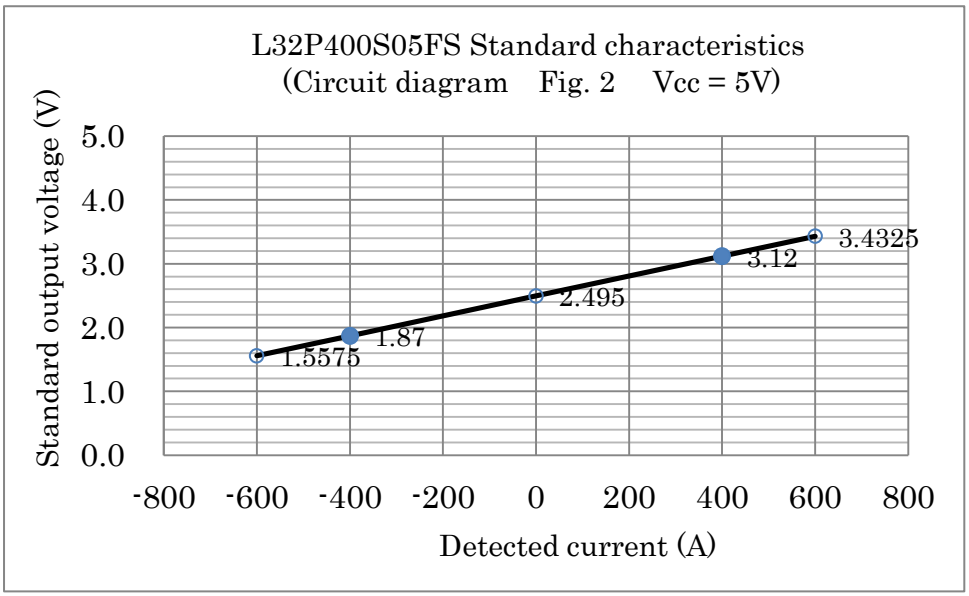
Graph 5



* ●: The standard output voltage of the sensor versus the rated current.

** Detected current is within ±600A. This value is restricted by the saturation magnetic flux density of the core.

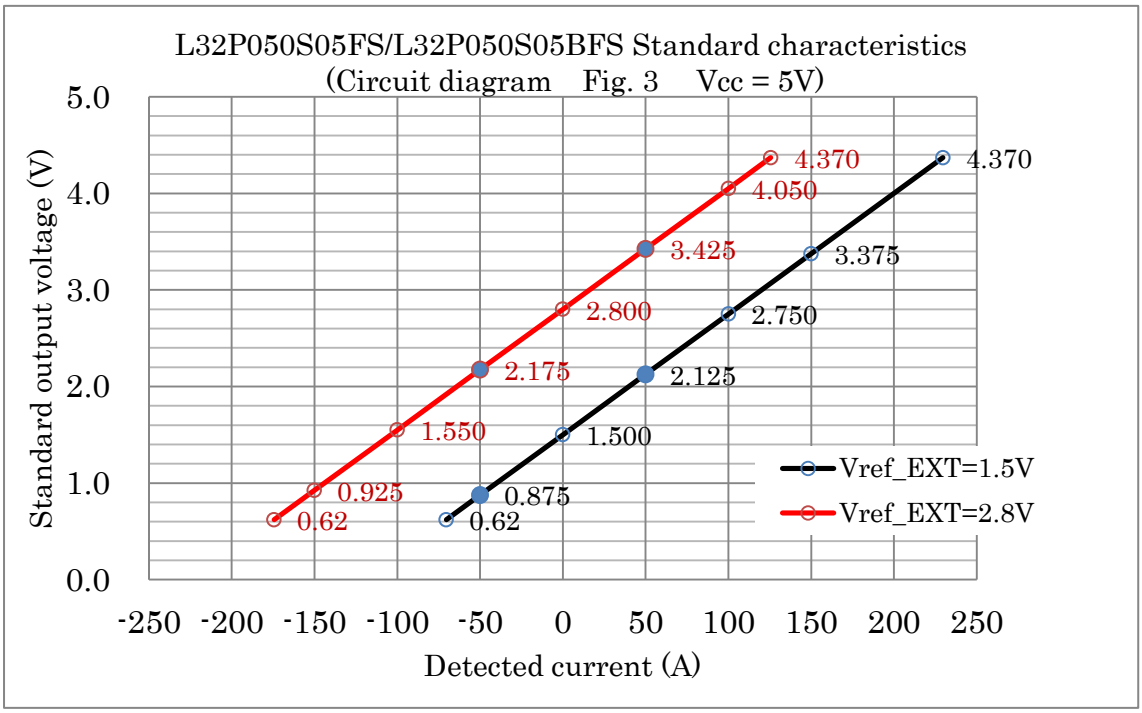
Graph 6



* ●: The standard output voltage of the sensor versus the rated current.

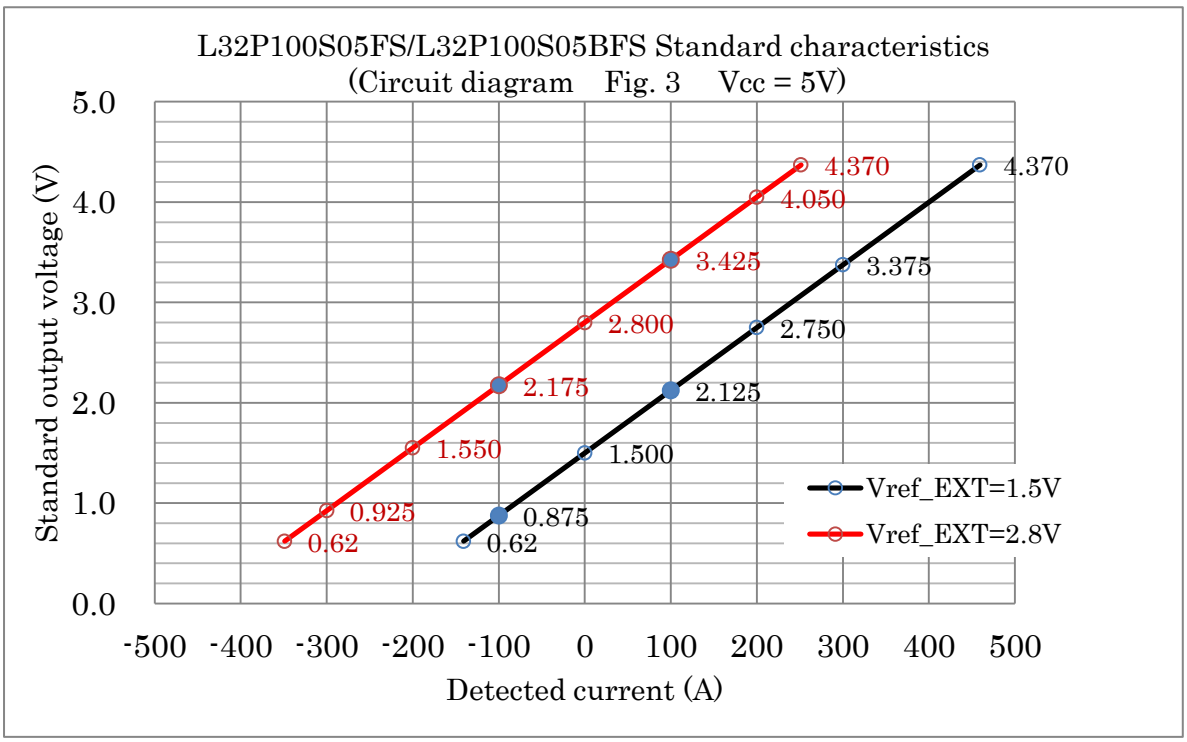
** Detected current is within ±600A. This value is restricted by the saturation magnetic flux density of the core.

Graph 7



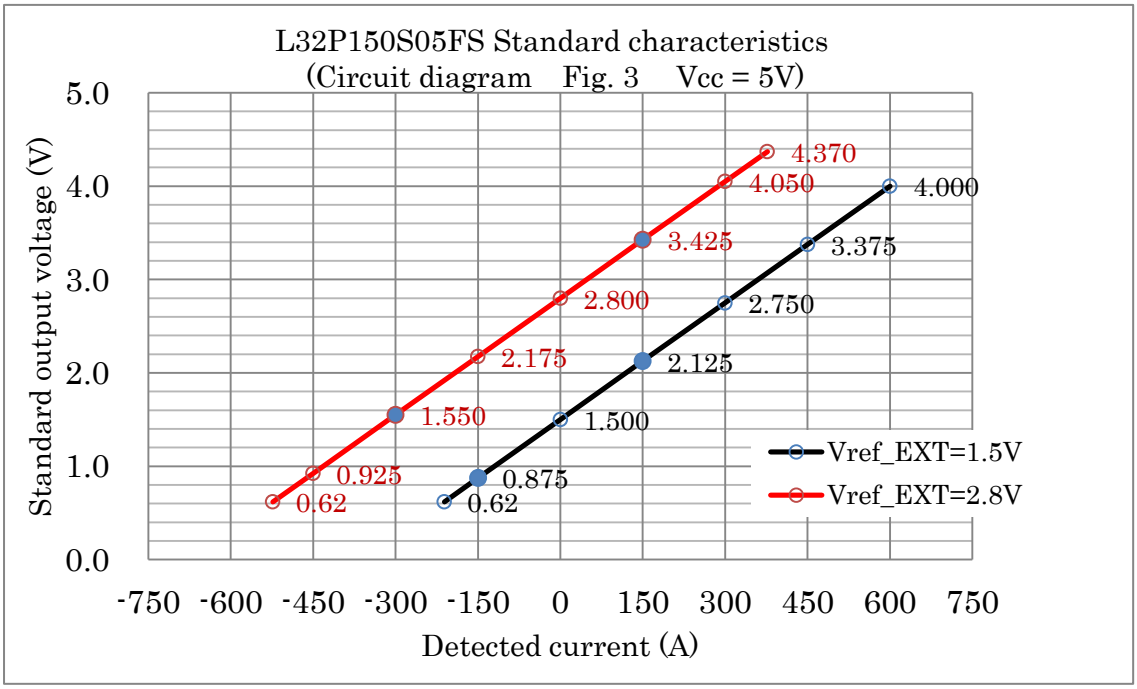
* ●: The standard output voltage of the sensor versus the rated current.

Graph 8



* ●: The standard output voltage of the sensor versus the rated current.

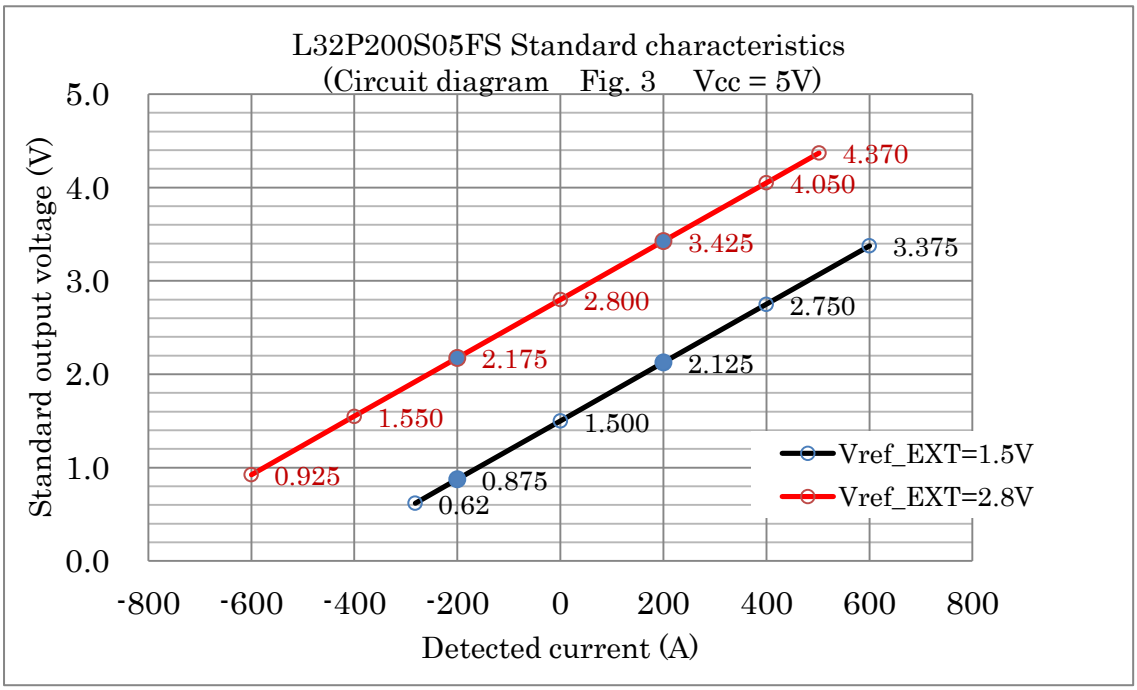
Graph 9



* ●: The standard output voltage of the sensor versus the rated current.

** Detected current is within ±600A. This value is restricted by the saturation magnetic flux density of the core.

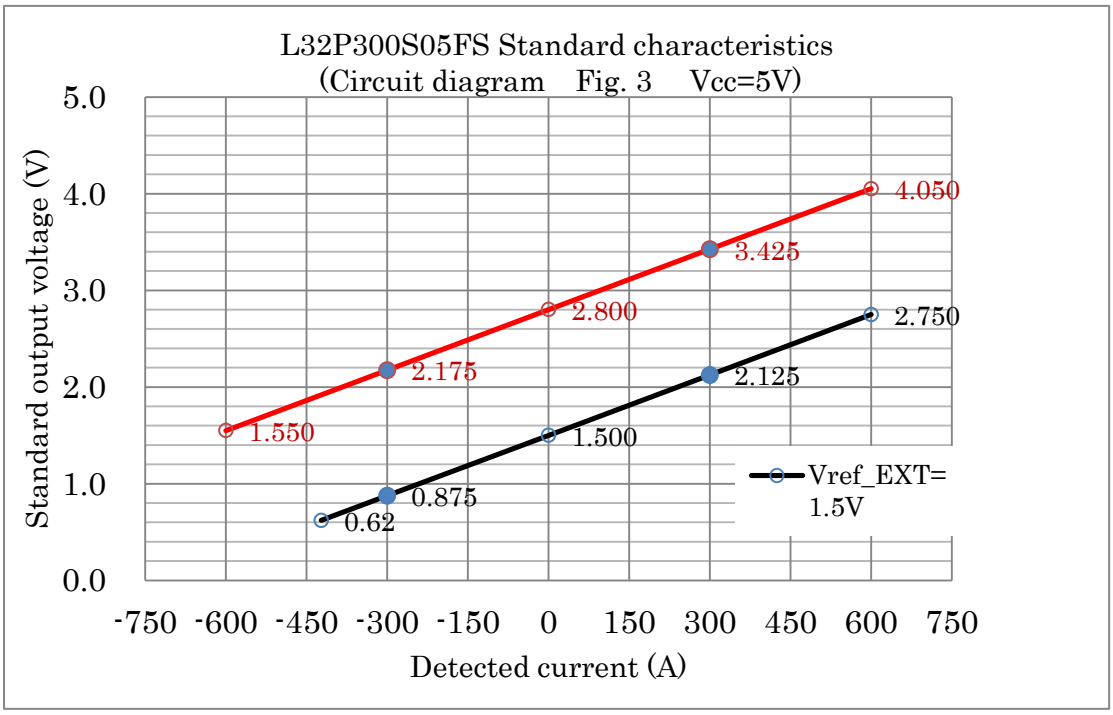
Graph 10



* ●: The standard output voltage of the sensor versus the rated current.

** Detected current is within ±600A. This value is restricted by the saturation magnetic flux density of the core.

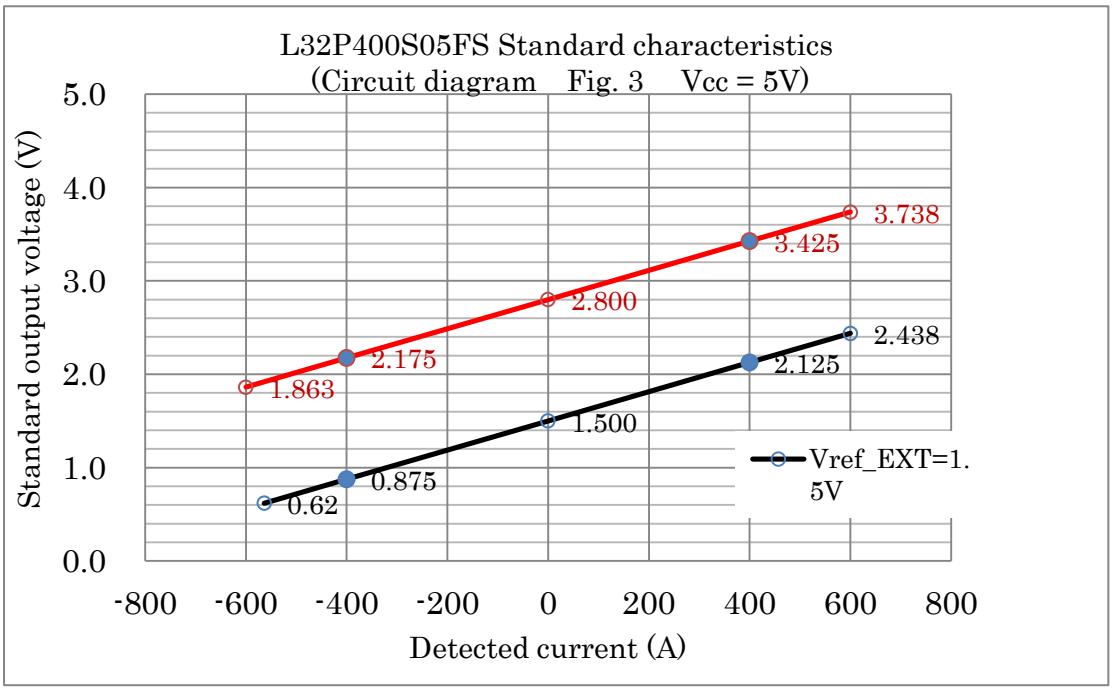
Graph 11



* ●: The standard output voltage of the sensor versus the rated current.

** Detected current is within ±600A. This value is restricted by the saturation magnetic flux density of the core.

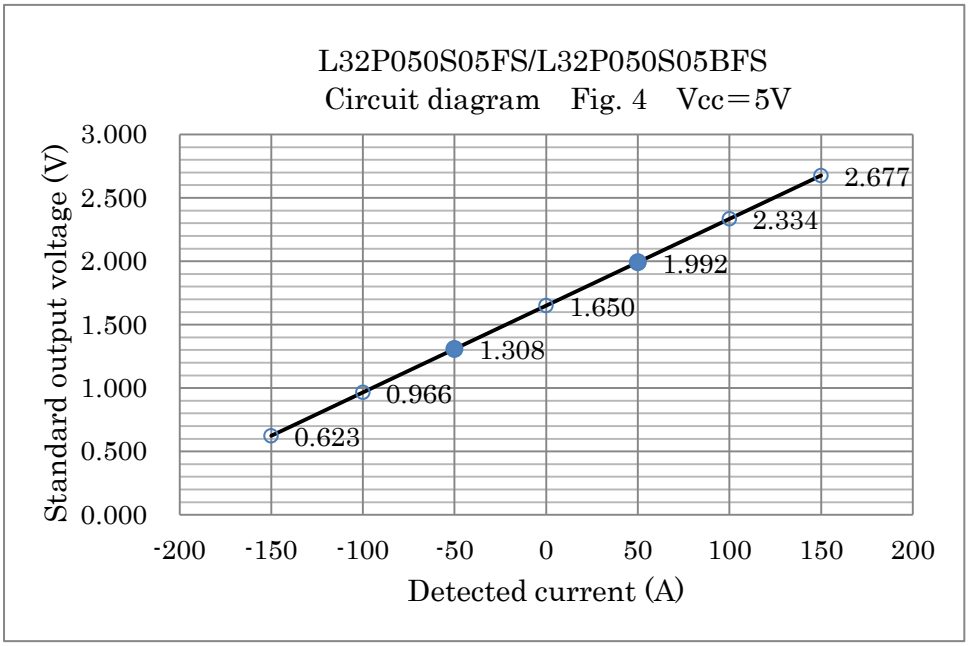
Graph 12



* ●: The standard output voltage of the sensor versus the rated current.

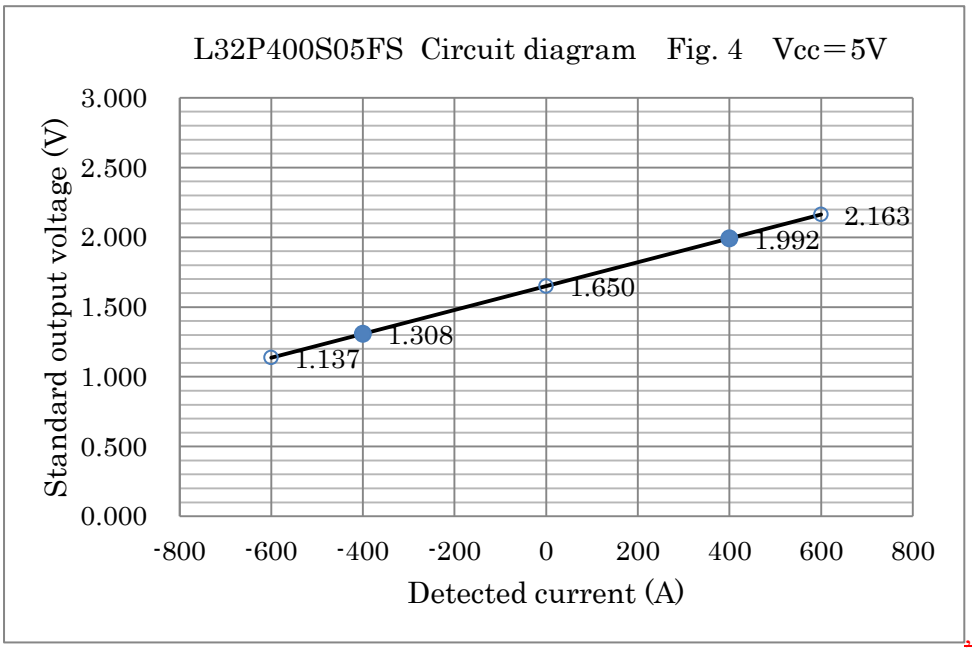
** Detected current is within ±600 A. This value is restricted by the saturation magnetic flux density of the core.

Graph 13



* ●: The standard output voltage of the sensor versus the rated current.

Graph 14



* ●: The standard output voltage of the sensor versus the rated current.

** Detected current is within ±600 A. This value is restricted by the saturation magnetic flux density of the core.