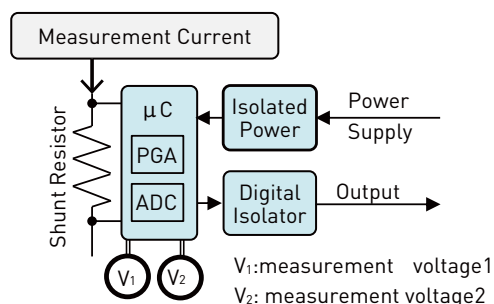
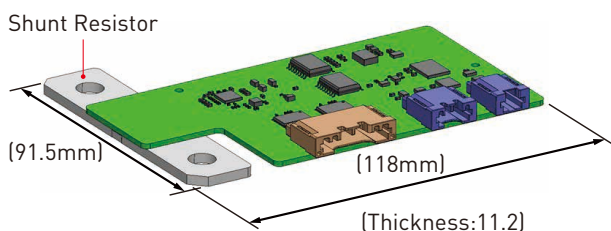


Inform measurements of current, voltage and temperature of high voltage battery to upper stream electronic unit by communication

- Measurement of current, voltage and temperature is required for high voltage line (battery pack) protection and battery management in EV
- Measure current for BMU battery management
- Measure voltage to detect troubles in high voltage power contactor, such as welding
- Measure temperature for protecting the unit body and external μ C peripheral parts

Specification

Power Voltage	$5V \pm 0.25$ (6V to 16V)	Countinous Flowing Current	400A
Usage Temperature	-40 to 85 degC	Current Measuring Accuracy	$\pm 0.05A$ (offset error) $\pm 0.5\%$ (gain error)
Output System	Digital communication UART (Support CAN)	Voltage Detective Range	1000V
Shunt Resistance Temperature	Output	Voltage Measuring Accuracy	$\pm 1\%$
BMU External Temperature	Output (1ch)	Voltage Measuring ch	2ch
Current Detective Range	$\pm 5000A$		

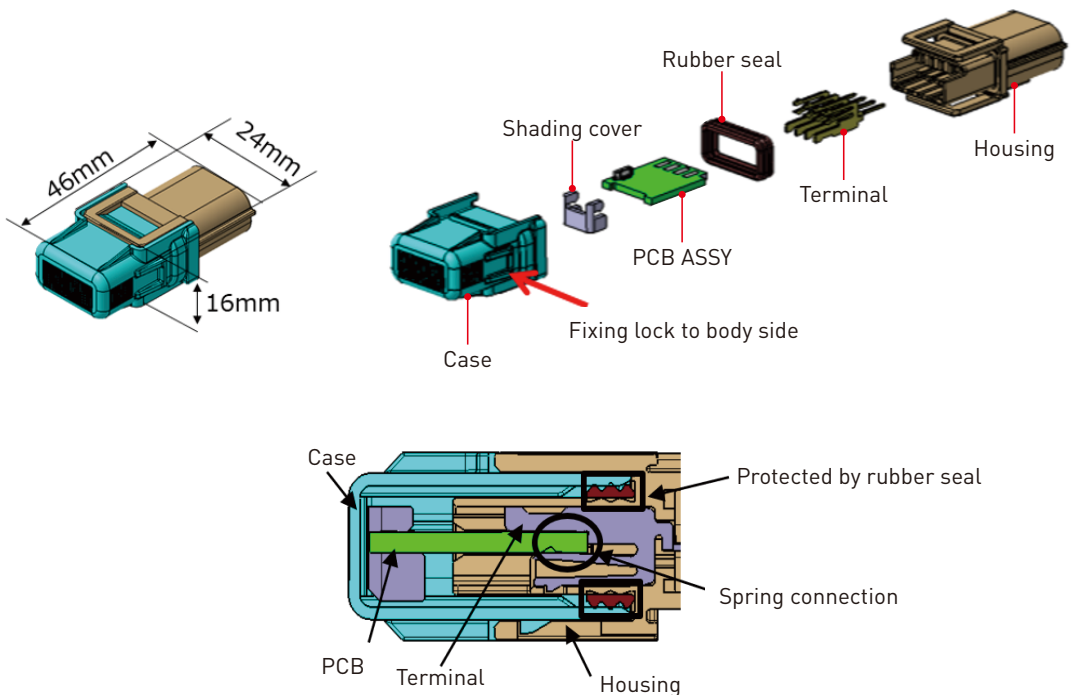


- Lighting a charging port for night charging/feeding
- Notify charging status by LED lighting

- BEV/PHEV will grow from 2030

Offer products to meet increasing needs for lights and indicators for night charging/feeding at home

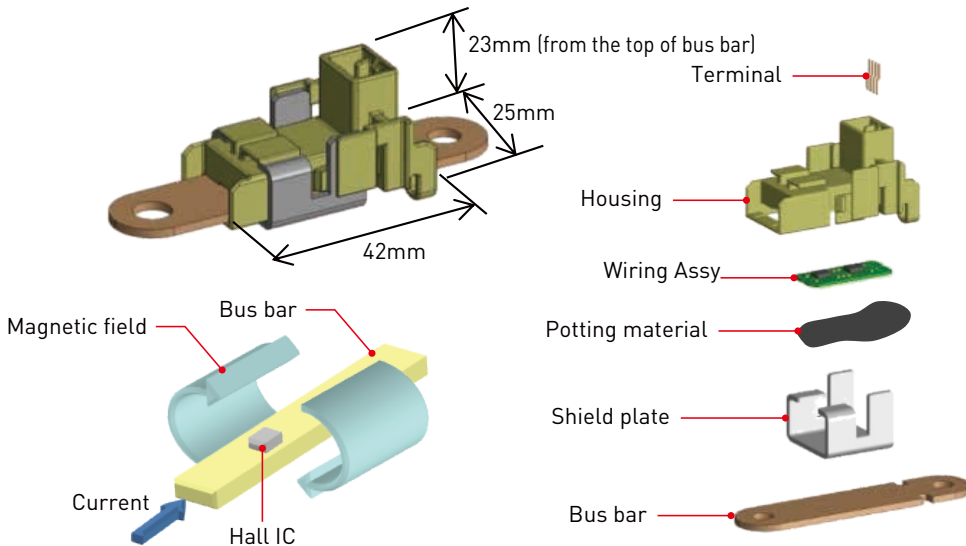
- Only circuit change enables current ON/OFF and turning light ON/OFF by communication control
- Sealed function equivalent to sealed connector (98kPa or more)
- The compact unit enables to be installed even in places without spaces for inlet



Calculate BEV/HEV battery current

- Improve vehicle mountability by producing compact sensors necessary for determining the remaining BEV/HEV battery life and controlling the amount of charge/discharge

- Improve vehicle mountability
 - Reduce the size and weight by eliminating core
 - Improve ASSY by built-in busbar
- Additional features
 - Set current ranges for 2 outputs type
 - Failure diagnosis



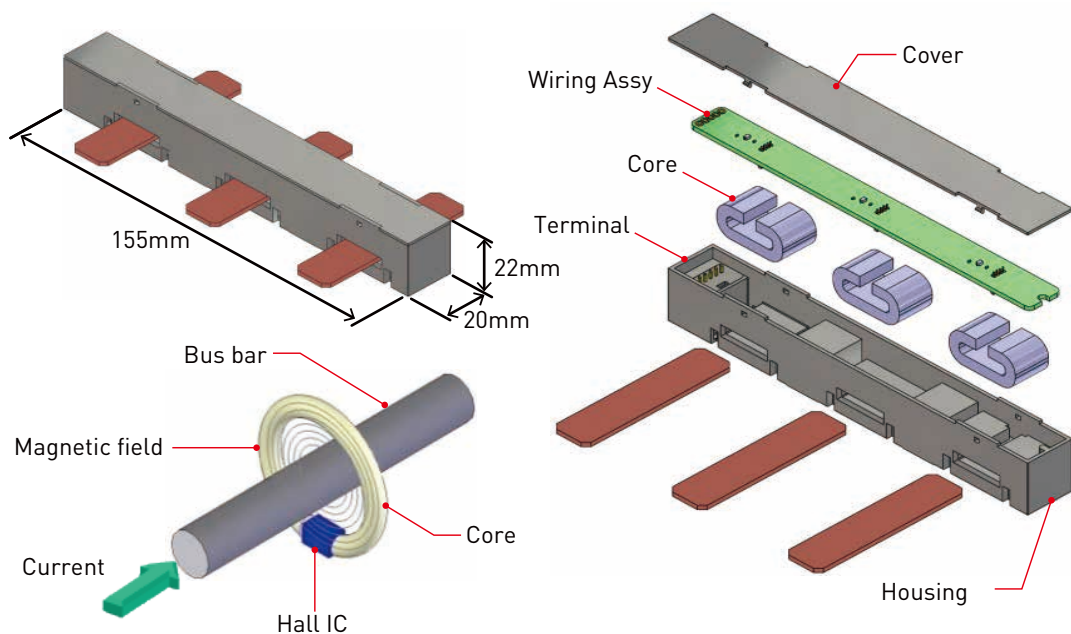
Specification

Supply voltage	5.0V \pm 0.5V
Usage temperature	-40 to 85degC
Current detectable range	2 outputs (1) \pm 80A to \pm 200A (2) \pm 250A to \pm 600A
Output system	Analog (ratiometric output)

Output accuracy	\pm 2A (offset) \pm 2% (gain)
Reaction speed	Max. 100 μ s
Detective system	Detect magnetic flux density by Hall IC
Current consumption	Up to 26mA

Detect three-phase alternating current from a motor and control it to be proper value by controlled circuit

- Develop a current sensor to detect three-phase alternating current for BEV/HEV motor
- Voltage output proportional measuring current
- Current detective range can be customized by using Hall IC with EEPROM
- Compact design for current measurement range



Specification

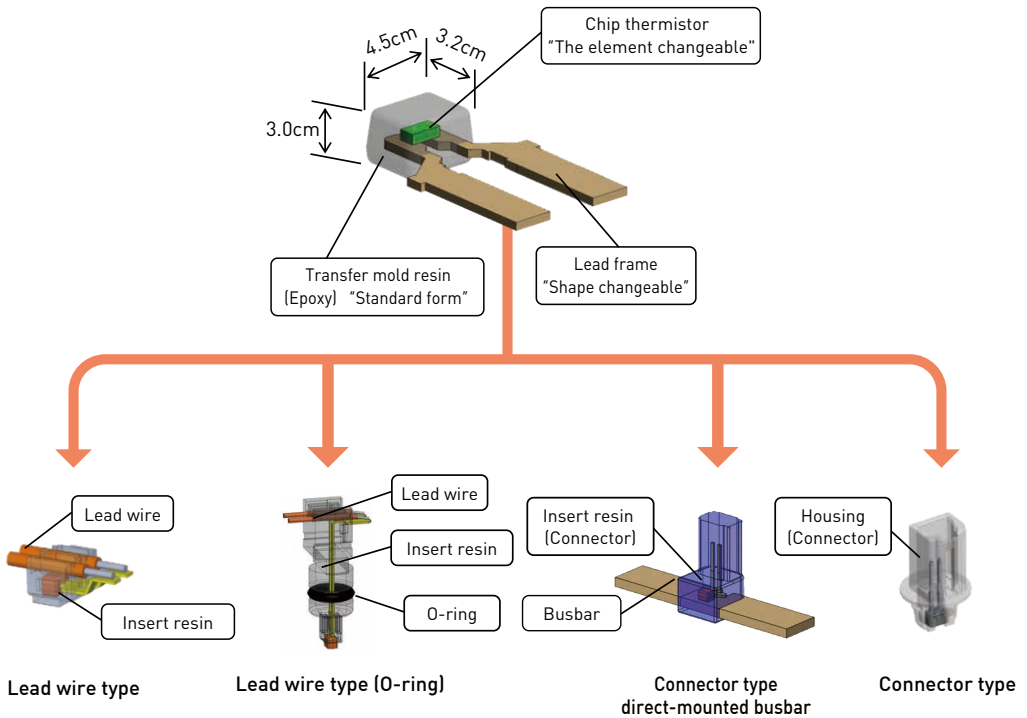
Supply voltage	5.0V±0.5V
Usage temperature	-40 to 125degC
Current detective range	±1000A (3 output)
Output accuracy	Up to ±4.5A (offset) Up to ±2% (gain)

Output system	Analog (ratiometric output)
Reaction speed	Max. 6μs
Detective system	Detect magnetic flux density by Hall IC
Current consumption	Up to 42mA

- Sensing temperature of cooling water and oil in automotive various systems
- Sensing temperature of busbar and battery pack etc

- Temperature sensor to be various forms with using chip thermistor instead of leaded glass thermistor (Transfer mold)

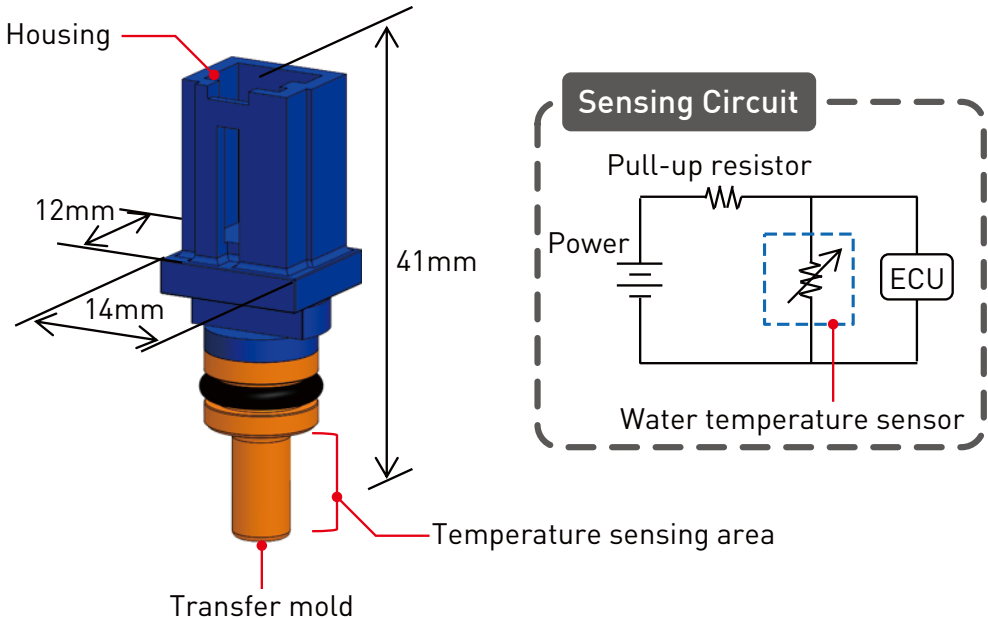
- High reliable transfer mold form
- Fast reaction
- High dimensional accuracy and flexible mounting (Pull out lead wires and changeable connector type)



Low cost and fast reaction by using transfer mold for the temperature sensing area

- EV thermal management is necessary to control the temperature of various systems, including e-Axle, and is essential for sensors of cooling water temperature

- Fast reaction
- High reliability and durability
- Cost reduction by commoditized the temperature sensing area



Specification

Sensing system	NTC Chip Thermistor	Temperature property	Customize
Sensing target	LLC (Long Life Coolant)	Reaction performance	≤ 5 sec. (Stirred water)
Supply voltage	DC 5V	Standard Temperature Property	R25 = 10kΩ ±1%
Usage temperature	-40 to 90degC		B constant: B(25/85) = 3,960K ±1%

Flexible wires that can be routing for narrow space

- Wire size is getting bigger due to being higher voltage and larger current in electric vehicles
The mounting space for wire harness is being narrow

- Improve 60% flexibility by using flexible insulations
- It has a great environmental resistance and can be mounted anywhere
- Same production methods as before

Size	Conductor			Insulation thickness [mm]	Finished outer diameter [mm]
	Cross-sectional area [mm ²]	Outer diameter [mm]	Conductor resistance [mΩ/m] Max(20°C)		
30	29.03	7.8	0.647	1.3	10.4
40	39.73	9.1	0.473	1.4	11.9
50	50.43	10.1	0.368	1.5	13.1
70	70.29	12.0	0.259	1.5	15.0
95	96.27	14.0	0.196	1.6	17.2

- High flexibility allows routing of vehicle layout in saving space

- Busbar can be installed on various layouts

- Routable conductors are required in compact installing space of battery pack with expanding battery capacities

- Shorter routing materials: Use busbar instead of wires
- End-To-End manufacturing from hoop materials to products
- Connect flexible wires to edge of busbar

Busbar routing materials (1) Forming bus bar

- Use covering busbar utilized wire technology and end-to-end manufacturing from hoop materials to products
→ Reduce tooling, safe and secure (Same as wire management)



Busbar routing materials (2) High flexible and low wire (Busbar with absorbing dimensional tolerance)

- Connect flexible wires to the edge part and absorb dimensional tolerance and stress
→ Apply to long wiring routes



- Connect battery cells and modularize the battery
- Detect the state of each individual battery cell to enable battery control

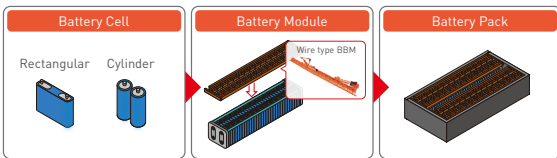
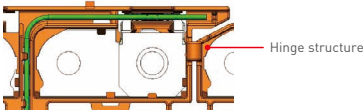
- Provide low height, integrated, compact, and lightweight BBM for batteries in electrification vehicles, whose capacities and densities are increasing

Suggestion

Mass-production

Wire Type Battery Busbar Module

- Develop and produce BBM for various types of battery cells such as rectangular and cylinder
- Hinge structure absorbs variation due to expansion/ shrink of battery cells

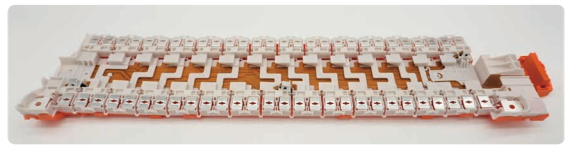


Feature
Performance/Specification

Mass-production

FPC Type Battery Busbar Module

- Reduce part numbers and weight Reduce 50% weight than conventional Yazaki products
- Ensure stable product quality by automatic production No wrong assembly and low failure risk due to printed technology
- Directly implement electronic parts to FPC

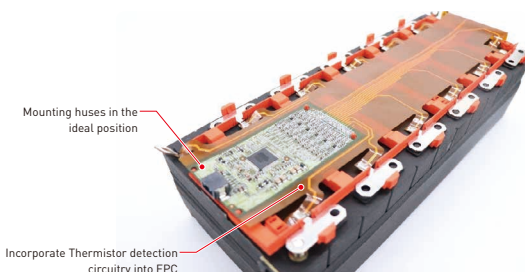


Feature
Performance/Specification

Developing

FPC Type Battery Busbar Module with Cell Voltage Sensor

- Saving space and height reduction by integrated functions
- The best layout of fuses, thermistors and circuit areas
- Directly implement electronic parts

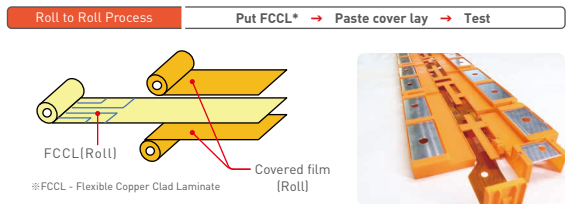


Feature
Performance/Specification

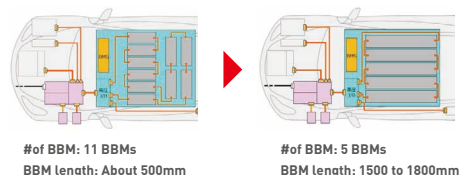
Developing

Long FPC Battery Busbar Module

- Various size of FPC can be produced with a same equipment in Roll to Roll process



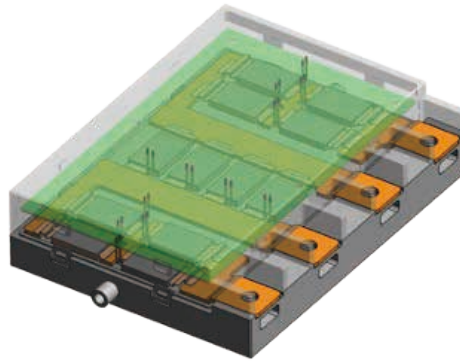
- Available large capacity of battery



- Switching between series and parallel batteries
- Fast judgement of semiconductor fuse problems

- Need actions for charging of 800V BEV from existing 400V rapid charger which are mostly dominated

- Switching between series and parallel batteries allows charging of 800V BEV from existing 400V rapid chargers
- Reduce size by relay semiconductor
- Reduce size by high efficiency water cooling for large current



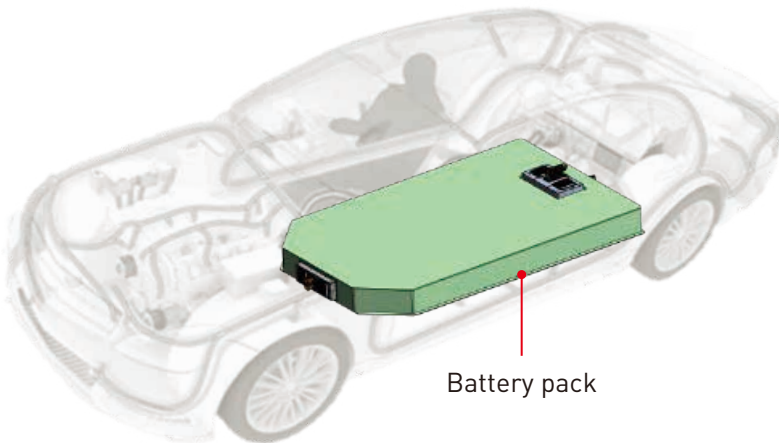
Semiconductor Relay Type of Battery Series-Parallel Switching Junction BOX

Target Specification

Max. voltage	Series 1000V Parallel 500V
Max. current	(1) Rapid charging at 350kW: Series 500A continuous (2) Rapid charging at 150kW: Parallel 300A continuous
Usage temperature	-30 to 60degC
Size	Semiconductor type 220×170×60mm

Supply/distribute high voltage power

- It is necessary to develop products with high output charging specification to reduce charging time as one of the challenges for electric vehicles
- Downsize with a semiconductor relay(Decrease in 50% volume of Yazaki's product)



Battery pack

High Voltage Junction Box (Power supply / distribution)

Heatsink



Semiconductor
Relay Module

Specification

Voltage	Up to 800V
Current	Continuous 200A
Implement semiconductor FUSE function	
Internal voltage/ current sensor	