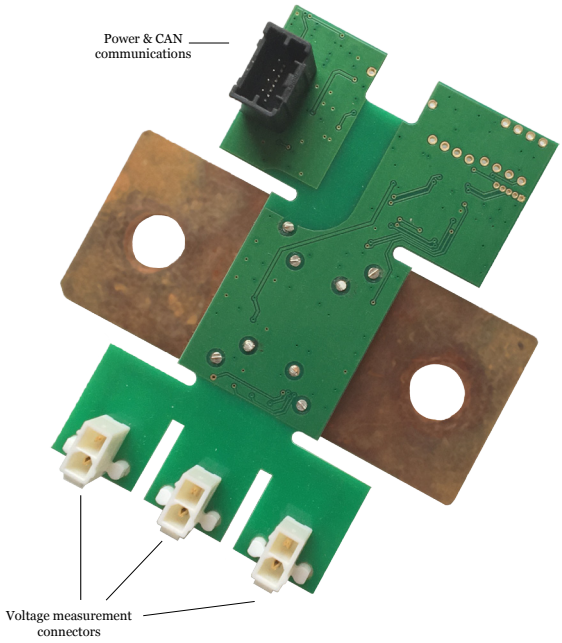
Sendyne® Sensing Products Family

Sendyne SFP200MOD Precision Current and Voltage Measurement Module



Description

The Sendyne SFP200MOD is a shunt-based, automotive grade precision module capable of measuring currents from mA to up to 500 A continuous. The module incorporates Sendyne's SFP200 IC and an 18 μΩ shunt and achieves an accuracy of better than ±1.0 % (typically ±0.5%) over the entire operating temperature range of –40 °C to +125 °C.

The module simultaneously measures bi-directional DC current through the shunt and three high voltage channels (800 V nominal, 1000 V / channel max), as well as providing separate charge, discharge and total Coulomb output.

The module can be powered from a wide voltage supply rail of nominal +5/+9/+12/+24/+36/+48 V without any modifications or adjustments. The module provides automatic compensation for resistance dependence of the shunt on temperature. Communications are achieved via an isolated CAN 2.0B interface (500 kbit/s).

Applications

– *Battery monitoring for automotive applications*
– *Grid energy storage*
– *Home energy storage*

Operating Specifications

Parameter	Value
Shunt value	18 μOhm
Power supply	+4.5~+53 V, high efficiency
Interface	CAN 2.0B isolated,120 Ω terminated
Current measurement range	±500 A continuous / ±1000 A (5 s), <±1.0% error
Voltage measurement range	3 Channels: 800 V nominal, 1000V/channel max, <±1.0% error
Rating	Automotive
Power consumption	< 350 mW

Technical Specifications

Electrical Specifications

Parameter	Min	Typ	Max	Units	Conditions/Comments
Power and General					
Shunt & electronics operating temperature range	-40		+125	°C	
Operating temperature range for connectors	-40		+105	°C	
Supply Voltage	4.5	5 to 48	53	V	
Supply Current			50	mA	At the lowest operating voltage. Supply Current is reduced when Supply Voltage is increased
Start-up time		0.5	0.75	s	After initial application of power and power supply stabilization
Current Measurement					
Total Shunt Resistance	16	18	20	μΩ	
Nominal Full-scale current		±500		A	Continuous rating in still air at room temperature of 23 °C with module connected to 18” (457 mm) 1/0 AWG cable on each side
Peak Full-scale current		±1250		A	Maximum current value that is measured without clipping; less than 5 s duration, the same conditions as above
Current offset error*	-50	<±20	+50	mA	Uncalibrated performance, applies over the full operating temperature range
Current noise error*		<25	50	mA_{RMS}	1 Hz reporting rate
Current value error*	-0.25		+0.25	%	Room temperature, test current ±20 A or higher
	-0.5		+0.5	%	0 °C to +50 °C, test current as above
	-1		+1	%	-40 °C to +125 °C, test current as above
		±1		%	End of life, test current as above
Current measurement resolution		<100		μA	Minimum discernible current change; corresponds to one count of Analog to Digital Converter (ADC), 1 Hz current report rate

* The combined Total Current Error is the ±sum of Current offset error, Current noise error, and [Current value error] x [measured value]. For currents over 100 A the Current offset error and the Current noise error could be omitted from the calculation since they will typically contribute less than 0.05 % to the error.

Electrical Specifications

Parameter	Min	Typ	Max	Units	Conditions/Comments
Charge measurement resolution		<1		μC	Minimum discernible amount of charge change,100 Hz report rate
Voltage Measurement					
Nominal Full-scale voltage range		±800		V	In reference to negative terminal of the shunt
Maximum transient voltage	±982	±1002		V	Maximum voltage value measured and reported without clipping or distortion
Voltage offset error	-200	<±50	+200	mV	V_X = 0 V, applies over the full ambient operating temperature range, T_A = -40 °C to +125 °C
Voltage gain error		<±1		%	Over full operating temperature range, TA = -40 °C to +125 °C
Voltage noise error		<12	20	mV_{RMS}	1 Hz reporting rate
Voltage measurement resolution		<1		mV	Minimum discernible voltage change; corresponds to one count of ADC, voltage report rate of 10 Hz or lower
Impedance of the voltage measurement inputs		8		MΩ	Resistive dividers utilized for the voltage inputs consist of four (4) elements connected in-series. Combined Limiting Element Voltage is 2 kV, and combined Maximum Overload Voltage is 4 kV.
Temperature Measurement (For shunt temperature measurement)					
Absolute temperature measurement error	-5	±0.5	+5	°C	Built-in temperature sensor for shunt temperature measurements
Temperature measurement resolution			10	m°C	Practical temperature measurement granularity
Isolation					
Test voltage		3		kV_{DC}	CAN interface to SHUNT. 1 min duration

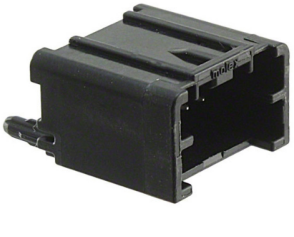
Communication

Interface	Spec	Speed	Termination	Number of units in same CAN branch
CAN	2.0B	*500 kb/s	120 Ω	1

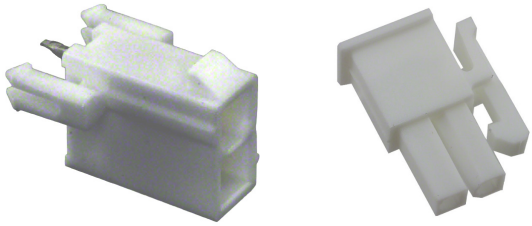
*other speeds up to 1 Mb/s, and configurations with multiple units in the same CAN branch are available.

Connectors

Interface	Manuf	Positions	Part number	Description
CAN & power on board	Molex	4	347920040	4 pos. header, Shrouded connector (2.00 mm), Through hole tin
Can & power mating con.	Molex	4	347910040	Use appropriate crimp contacts (available for AWG 22, 24 and 26)
Voltage sensing on board	Molex	2	39299029	MINIFIT JR HDR 02P 94V-0 30AU
Voltage sensing mating con.	Molex	2	39013028	MINIFIT JR RCPT DR SIDETABS 2 CKT 94V-0. Crimp contacts available for AWG 18 to 28



CAN and Power header & mating connectors



Voltage sensing header & mating connectors

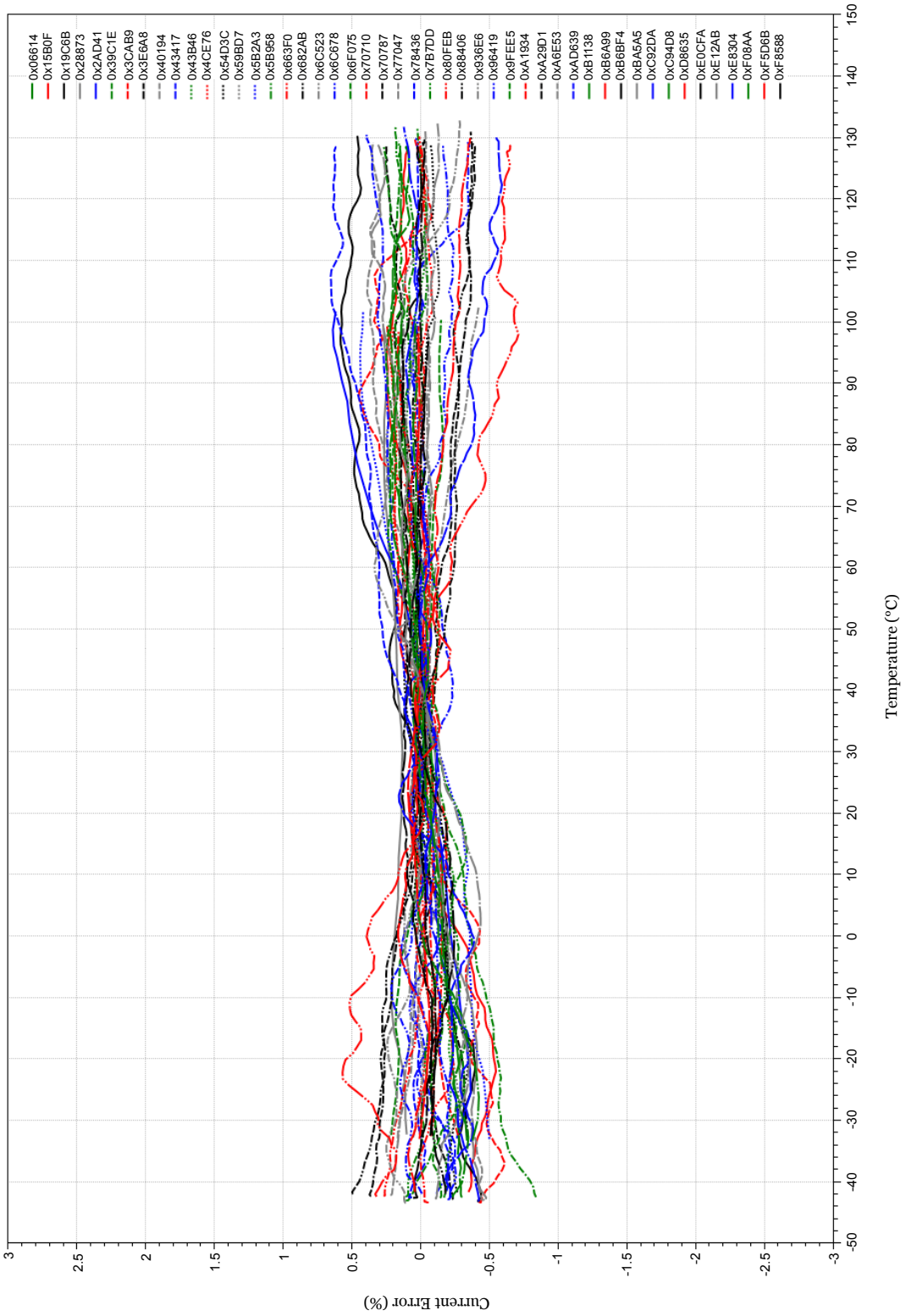
CAN Connector Pinout Description

Pin Number	Description
Pin 1	GND
Pin 2	CAN HIGH
Pin 3	CAN LOW
Pin 4	VCC

The SFP200MOD uses Molex connectors, part number 347920040 and 39299029.
For more details please see the Molex datasheets:
www.molex.com/pdm_docs/sd/347920040_sd.pdf and www.molex.com/pdm_docs/sd/039299029_sd.pdf

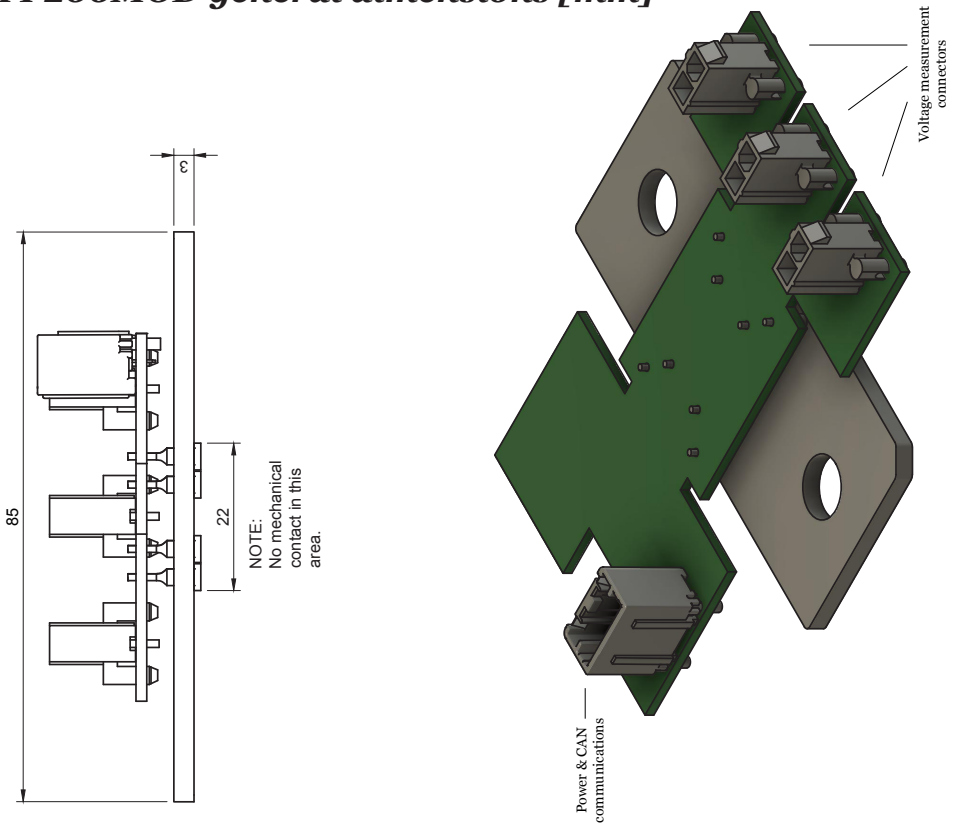
Measured performance data

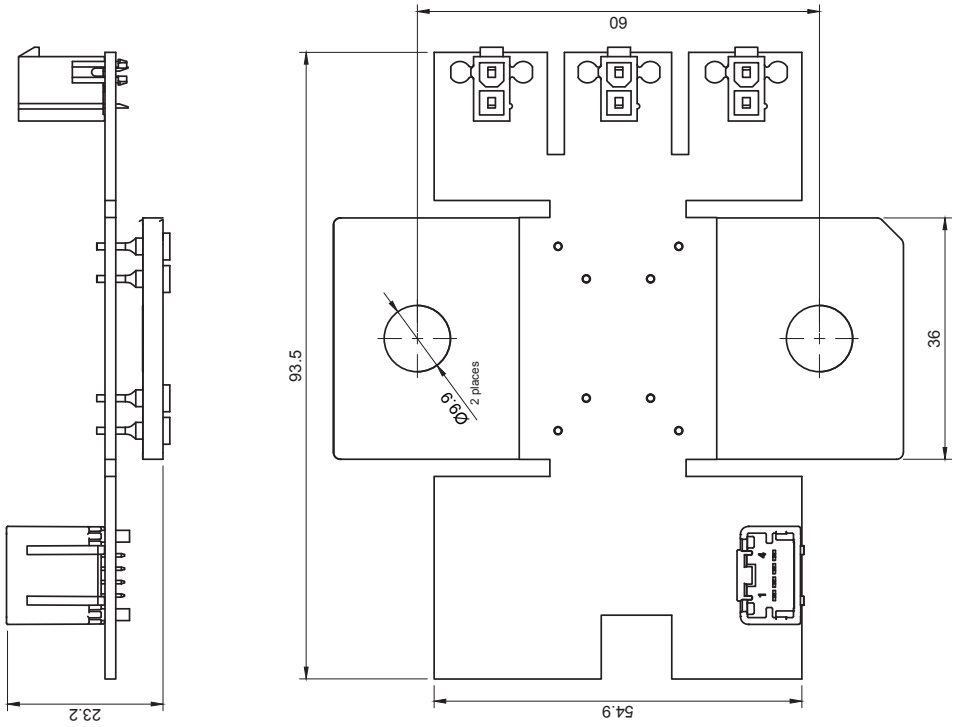
Current error over temperature range of −40 °C to +125 °C



Mechanicals

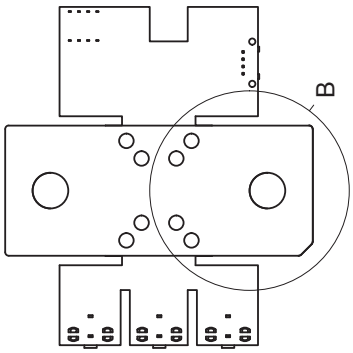
SFP200MOD general dimensions [mm]

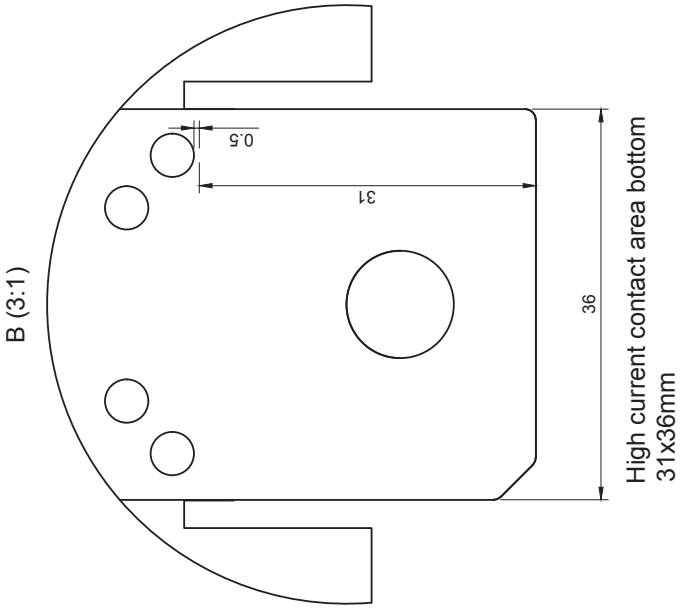


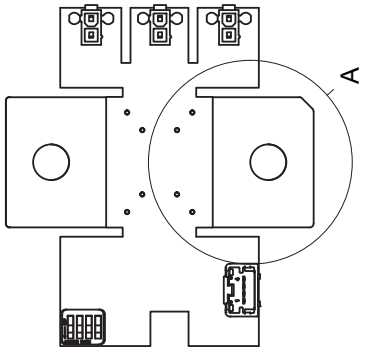


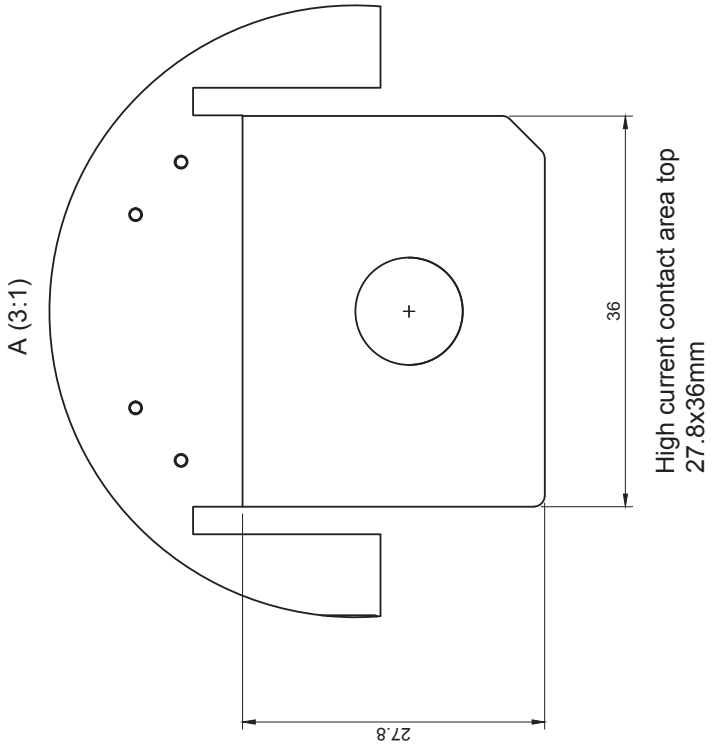
Mechanicals

SFP200MOD shunt contact points [mm]

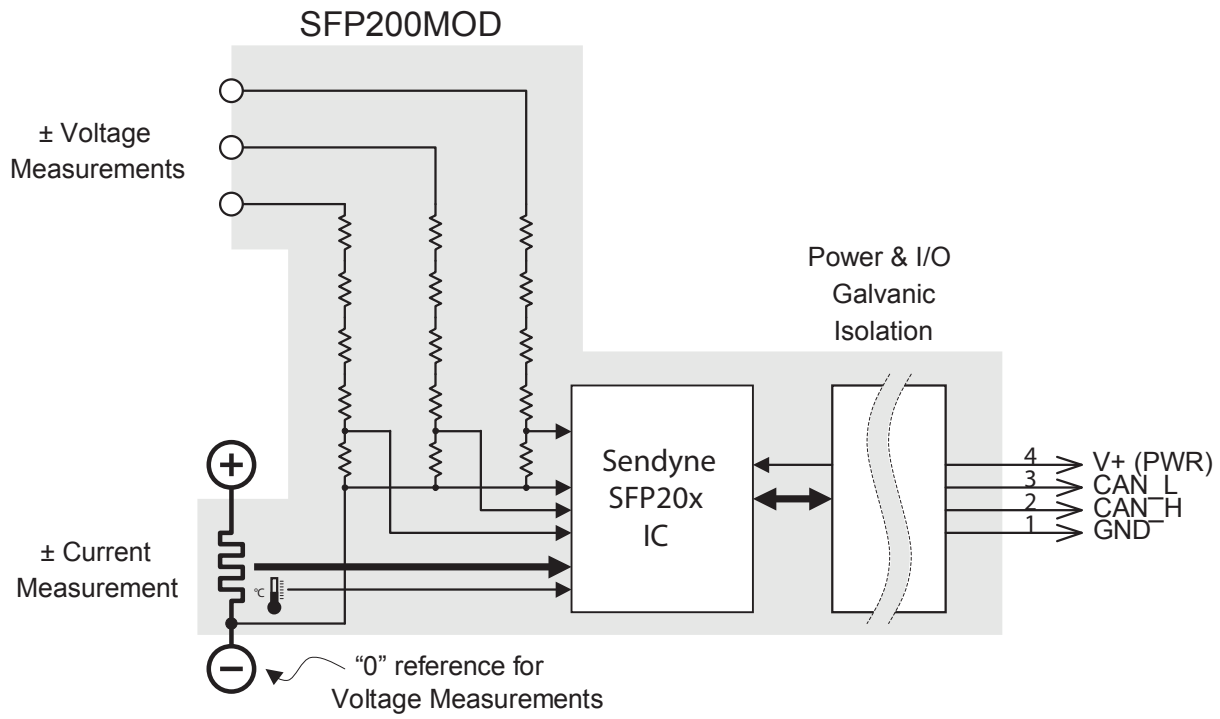








SFP200MOD block diagram



Ordering Information

Part Number	Description
SFP200CA-MOD	SFP200MOD module
SFP200KIT	SFP200MOD module, CAN to USB protocol converter for PC communication, PC software and FTDI cable

Revision History

Revision Table

Revision Number	Date	Comments
1.0	12/8/2016	Initial release

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Patents

US Pat. 8,264,216
US Pat. 8,289,030
US Pat. 9,052,343
Other patents pending

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