AUTOMOTIVE CURRENT TRANSDUCER SMART SHUNT TECHNOLOGY
SSVT-105

Introduction

The SSVT-105 is designed for a lead acid battery management system. It allows to manage a set of two 12 V batteries in serial (24 V application). Information are transmitted over a CAN high speed (ISO 11898-2) network.

Features

- Designed for 24 V application.Powered from the 24 V voltage
- Power supply range: 6 to 36 V
- Voltage, Current and Temperature measurement
- Operating temperature range: −40 °C to +105 °C
- Primary current measuring range ±1500 A
- 12 V voltage measuring range up to 18 V
- 24 V voltage measuring range up to 36 V
- Temperature measuring range: −40 °C to +105 °C
- Very low quiescent current allows monitoring the battery during engine key off.

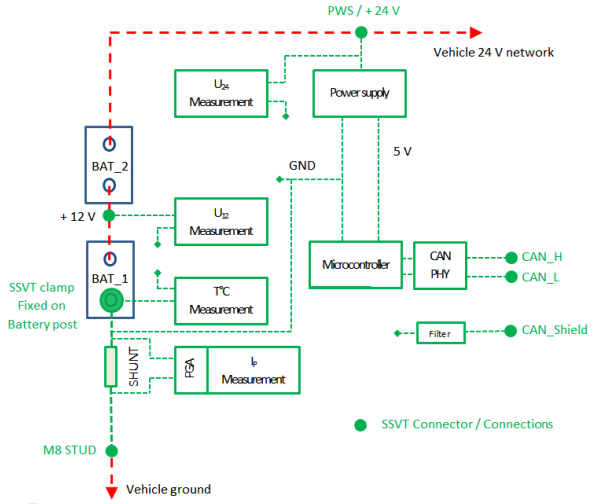
Advantages

- Synchronized measurement of I, U_{12} and U_{24}
- Excellent accuracy over the temperature range
- Very good linearity
- Low offset error for leakage current measurement.

Automotive applications

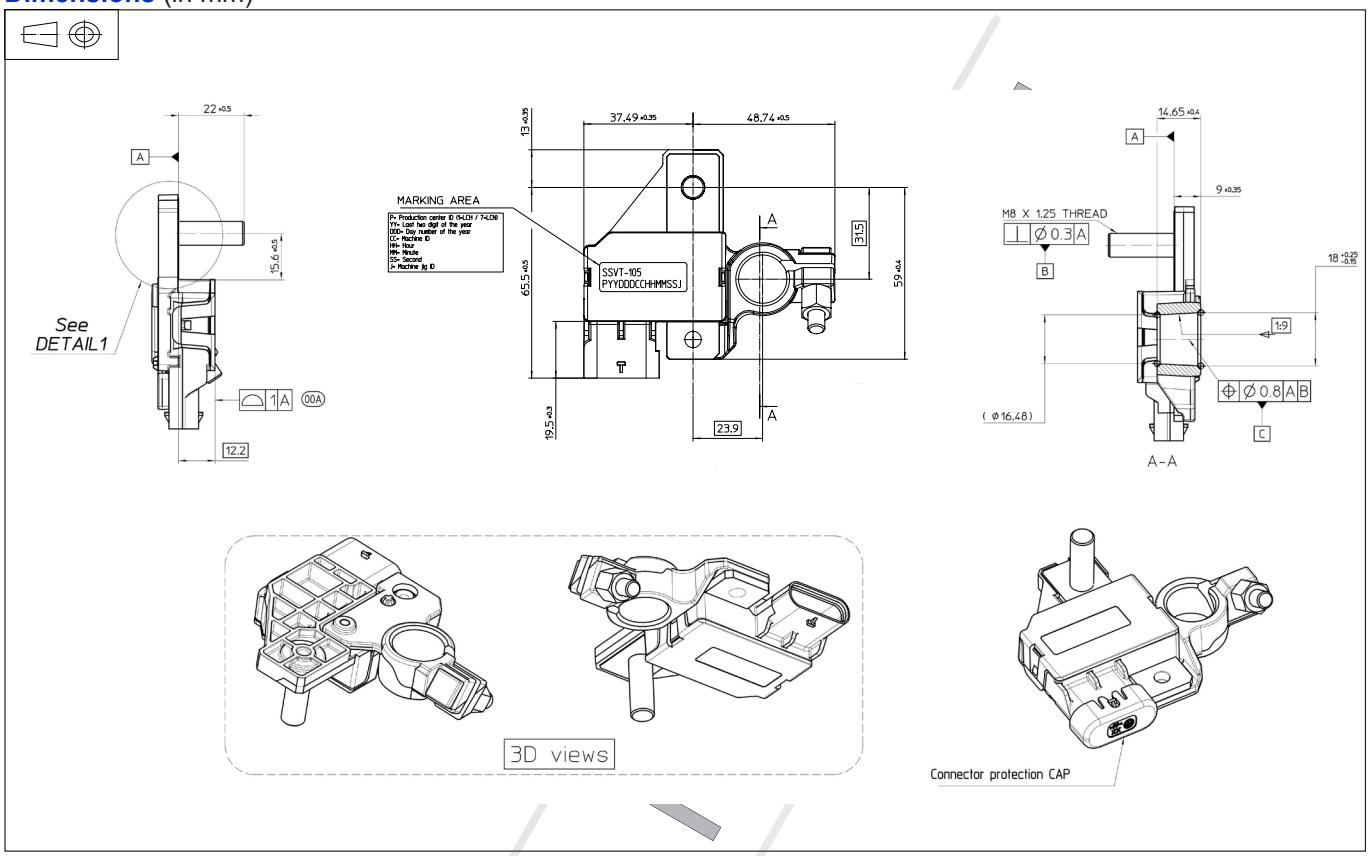
- ‘Start stop’ technology implementation in a truck
- Energy management for a long-haul truck.

Principle of SSVT family



LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Dimensions (in mm)



Mechanical characteristics

- Mass 144 ± 8 g
- Terminals Electroplated tin

CAN configuration

Parameter	Unit	Specification		
		Min	Typical	Max
CAN controller version			CAN 2.0B	
CAN transceiver			NXP TJA 1042	
CAN bit rate	kbps		250	
CAN bit rate accuracy	%	0.05		
CAN termination resistor			No	
CAN wake-up capability			Yes	

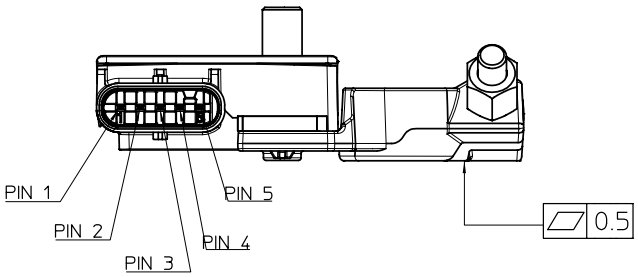
Connector housing

TE reference 1-1718806-1 keying/coding A

Connector pinouts

Pin Number	Name	Function
1	U_{bat_24}	Power supply + U_{24} sense
2	CAN_Shield	CAN bus shield
3	U_{bat_12}	U_{12} sense
4	CAN_L	ISO 11898-2 CAN_L bus line
5	CAN_H	ISO 11898-2 CAN_H bus line

The ground connection is done by the battery clamp on negative battery pole connection



LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

CAN message table overview

Message name	ID	ID-Format	DLC [Byte]	Cycle time (ms)
IBS_2	0x18FF4EF4	CAN Extended	8	100
VEP7	0x18FC0AF4			100
VEP9	0x18FC08F4			100

CAN signal overview

IBS_2 message

Name	Startbit	Length [Bit]	Byte Order	Value Type	Factor	Offset	Minimum	Maximum	Unit
BatteryCurrent	0	32	Intel	Unsigned	0.001	-2105540.607	-2105540.607	2105540.608	A
Reserved_32	32	32	Intel	Unsigned	1	0	0	16777215	

VEP7 message

Name	Startbit	Length [Bit]	Byte Order	Value Type	Factor	Offset	Minimum	Maximum	Unit
Reserved_16_1	0	16	Intel	Unsigned	1	0	0	65535	
Batt1Temp	16	8	Intel	Unsigned	1	-40	-40	210	deg C
Batt1Voltage	24	16	Intel	Unsigned	0.05	0	0	3212.75	V
Reserved_24_1	40	24	Intel	Unsigned	1	0	0	16777215	

VEP9 message

Name	Startbit	Length [Bit]	Byte Order	Value Type	Factor	Offset	Minimum	Maximum	Unit
Reserved_16_2	0	16	Intel	Unsigned	1	0	0	65535	
Batt2Temp	16	8	Intel	Unsigned	1	-40	-40	210	deg C
Batt2Voltage	24	16	Intel	Unsigned	0.05	0	0	3212.75	V
Reserved_24_2	40	24	Intel	Unsigned	1	0	0	16777215	

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Absolute ratings (not operating)

Pin/Parameter	Value	Unit	
All connector pins	±36	V	
Primary Current	±3640	A	Duration ≤ 200 ms
	±1620		Duration ≤ 1 s
	±510		Duration ≤ 10 s
	±300		Duration ≤ 30 s
	±210		Duration ≤ 60 s
Storage temperature	−40 to 115	°C	

Operating conditions

Mode	Pin/Parameter	Value	Unit
Functional operating supply voltage - Sensor is fully functional. All features are operating	U_{bat_24}	6 to 32	V
Functional operating U_{bat_24} sense	U_{bat_24}	6 to 36	V
Functional operating U_{bat_12} sense	U_{bat_12}	0 to 18	V
Functional temperature sense	T_{PM}	−40 to 105	°C
Functional operating primary current sense	I_{PM}	−1500 to 1500	A
Operating ambient temperature	T_A	−40 to 105	°C

Supply currents

Mode	Pin/Parameter	Min	Typical	Max	Unit
Normal mode current. CAN communication active. CAN frame acknowledged. U_{bat_24} = 32 V	I_C/U_{bat_24}		18		mA
Sleep mode current. No CAN communication. U_{bat_24} < 26 V	I_C/U_{bat_24}			250	µA
Sleep mode current. No CAN communication. U_{bat_12} < 13 V	I_C/U_{bat_12}			30	µA

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Static electrical characteristics

Parameters	Name	Min	Typical	Max	Unit
Current measurement [1]					
Sensitivity error from −10 °C to 55 °C	ε_S	−1.2	±0.5	+1.2	%
Sensitivity error from −40 °C to 105 °C		−1.6	±0.6	+1.6	
Offset error from −40 °C to 105 °C	I_{OE}	−20	±10	+20	mA
U_{bat_12} Voltage measurement					
Total error from −10 °C to 55 °C, I_P = 0 A	ε_{tot}	−0.35	±0.15	+0.35	%
Total error from −40 °C to 105 °C, −1200 A ≤ I_P ≤ +200 A		−0.8	±0.2	+0.8	%
U_{bat_24} Voltage measurement					
Tota error from −10 °C to 55 °C, I_P = 0 A	ε_{tot}	−0.35	±0.15	+0.35	%
Total error from −40 °C to 105 °C, −1200 A ≤ I_P ≤ +200 A		−0.8	±0.2	+0.8	%
Temperature measurement					
Internal temperature accuracy [2]			±3		°C

1) The current consumed by the sensor (IC) is not included in the measurement. A negative current means a current sourced by the battery (discharging current). A positive current means a charging current
2) After temperature convergence (≤ 10 hours), Accuracy specification of the thermal model for a known environment.

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

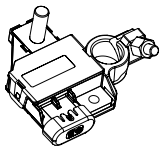
Recommendations For Use:

IMPORTANT :
According to the EC regulation NO. 1907/2006 (REACH), we would like to make you aware that our sensors SSVT-105 contain the substance lead (CAS 7439-92-1, EC 231-100-4) at a concentration of more than 0.1 percent by mass. Lead has been classified as a SVHC (Substances of Very High Concern), since 27th June 2018 in accordance with REACH regulation (see https://echa.europa.eu/en/candidate-list-table).
Nevertheless, the lead contained in our sensor isn't directly contactable by the user.

STORAGE :
The LEM transducers must be stored in a dry location, within the following ambient room conditions(< 40 °C and < 60 % RH)
The product should be stored in its closed and original packing. Ensure during storage and transport,the units are not damaged by applying excess weight to the boxes.
The transducers mustn't be stored more than 2 years.
Ensure during storage and transport, the units are not damaged by applying excess weight to the boxes
Maximal stackup storage of secondary container (pallet) must not exceed 2.

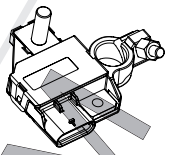
UNPACKING :
When unpacking, care must be taken with cutting tools not to damage the transducer.

Sensor with the connector cap



connector cap

Sensor without the connector cap



HANDLING :
The LEM transducers must be handled with care and not undergo any shocks or falls (fall = scrap).
It is recommended to handle the transducer as long as possible inside its original packing (thermoformed tray on customer's assembly station).
ESD gloves are mandatory to handle the transducer.
It is forbidden to handle the transducers neither by their terminals nor by the shunt (copper), nor by the connector cap → risk of ESD and/or corrosion and/or fall.
Any rework operation is forbidden and will conduct part out of LEM warranty.

INSTALLATION :
The workshop and the people in contact with the transducers must be ESD protected
Before installing the sensor on the battery, the connector area's cap must be removed and rejected
Place the cable on the sensor's stud and tighten a M8 nut respecting the torque 20 Nm ±2.
We recommend having a dedicated support for this operation
Install the sensor's clamp on the negative battery post : it is in abutment on the battery terminal
Tighten the clamp screw at the torque of 6 Nm ±1.5.
Plug the connector to the sensor : the connector type to use is the TE reference 1-1718806-1 key A.
Do not install (or re-install) a damaged part (broken or crushed element...)
LEM do not recommend customers to make any maintenance on LEM sensors other wise, it will drive sensors directly out of warranty.
The transducer installation must be done unless otherwise specified on this page and in the datasheet, according to LEM Transducer Generic Mounting Rules available on our Web site:
http://www.lem.com/images/stories/files/Products/app_note_ane120504_1_web.pdf

DISASSEMBLY :
Unplug the connector from the sensor
Suppress all electricity power before disassembling the transducer.

RECYCLING :
The sensor must be disposed of in an appropriate recovery and recycling structure (contains lead).

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Test specifications

Topic	Norm	Chapter in the norm
High temperature endurance test		700 hours / 105 °C
Humidity test		900 hours / 85 °C / 85 % *RH*
Thermal cycling test		2000 hours / −40 °C ↔105 °C
High temperature storage test	GB/T 28046.4	48 hours / 105 °C
Low temperature storage test	GB/T 28046.4	24 hours / −40 °C
Thermal shock	GB/T 28046.4	300 cycles / −40°C ↔105 °C
Dust test	GB/T 28046.4	
Waterproof test	GB/T 28046.4	IP6K9K
Vibration test	GB/T 28046.3	Random, 32 hours per axis
Salt spray	GB/T 28046.4	
Ice water impact	GB/T 28046.4	
Free fall test	GB/T 28046.3	
Mechanical impact test	GB/T 28046.3	Chapter 4.2.2
Chemical resistance test	GB/T 28046.5	External installation Code D
EMC test	JA 3700-93C-1	

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com