Integrated Current Transducer GO-SME series

Definition

The GO-SME series is a LEM integrated current transducer solution designed to measure AC and DC currents in both industrial and automotive applications. The differential sensing technique allows the sensor to reject an external field coming from a noisy environment. Proprietary stress and temperature compensation algorithms are implemented in order to achieve very good accuracy over wide temperature range. The primary conductor (pins 1 to 4) has a very low electrical resistance of 0.9 mΩ (typical), which enables excellent performance at low power losses. The GO-SME is capable of measuring continuous currents from 20 to 50 A over wide temperature range. The galvanic insulation between the primary and the secondary eliminates the need for any additional insulation, reducing the total footprint and cost of the system.

Main features & advantages

- Open loop multi-range current transducer: 50 A
- Low electrical resistance 0.9 mΩ
- Dual supply voltage 5 V or 3.3 V
- Low power consumption
- High bandwidth: 300 kHz
- No magnetic hysteresis
- Galvanic separation between primary and secondary with 4 mm of d_{Cl} and d_{Cp}
- Insulated test voltage 2400 V RMS
- Small footprint with standard surface mount PCB mounting
- AEC-Q-100 Grade 1.

Typical applications

- Small drives
- HVAC inverters
- Appliances
- Solar inverters
- E-Bikes
- Automotive & Industry qualified.

Standards

- IEC 61800-5-1: 2007
- IEC 62109-1: 2010
- IEC 62368-1:2018 (supersedes IEC 60950-1: 2005)
- UL 1577: 2014
- UL 62368: 2019.

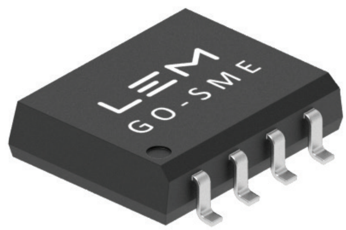

Figure 1: GO-SME package - SOIC-8
(Not to scale - For illustration: not representative)

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Application circuit and pinout

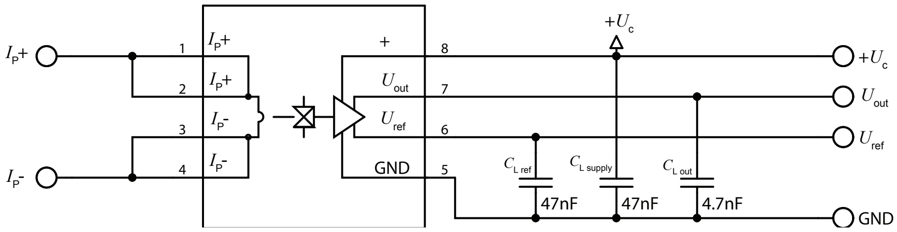

Figure 2: Application circuit

Table 1

Pin#	Name	Function
1	I_{P+}	Input of the primary current
2	I_{P+}	Input of the primary current
3	I_{P-}	Output of the primary current
4	I_{P-}	Output of the primary current
5	GND	Ground terminal
6	U_{ref}	Reference voltage
7	U_{out}	Output voltage
8	$+U_C$	Supply voltage

Table 2

External circuit example#	Min	Typ	Max	Unit
$C_{L\ out}$		4.7	6	nF
$C_{L\ supply}$		47		nF
$C_{L\ ref}$		47	100	nF

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Available products

Product name#	Current measurement range (A max)	Nominal current (A RMS) [1]	Supply voltage U_C	Ratiometricity	Temperature range (°C)
GO 10-SME	±25	±10	5 V	N	−40 ... 125 °C
GO 20-SME	±50	±20	5 V	N	
GO 12-SME/SP2	±30	±12	5 V	Y	
GO 20-SME/SP2	±50	±20	5 V	Y	
GO 10-SME/SP3	±25	±10	3.3 V	N	
GO 20-SME/SP3	±50	±20	3.3 V	N	
GO 8-SME/SP4	±20	±8	3.3 V	Y	
GO 15-SME/SP4	±37.5	±15	3.3 V	Y	

Other ratios available, contact LEM for more options.

Note: [1] Trimmings at LEM are done at this nominal current.

Block diagram

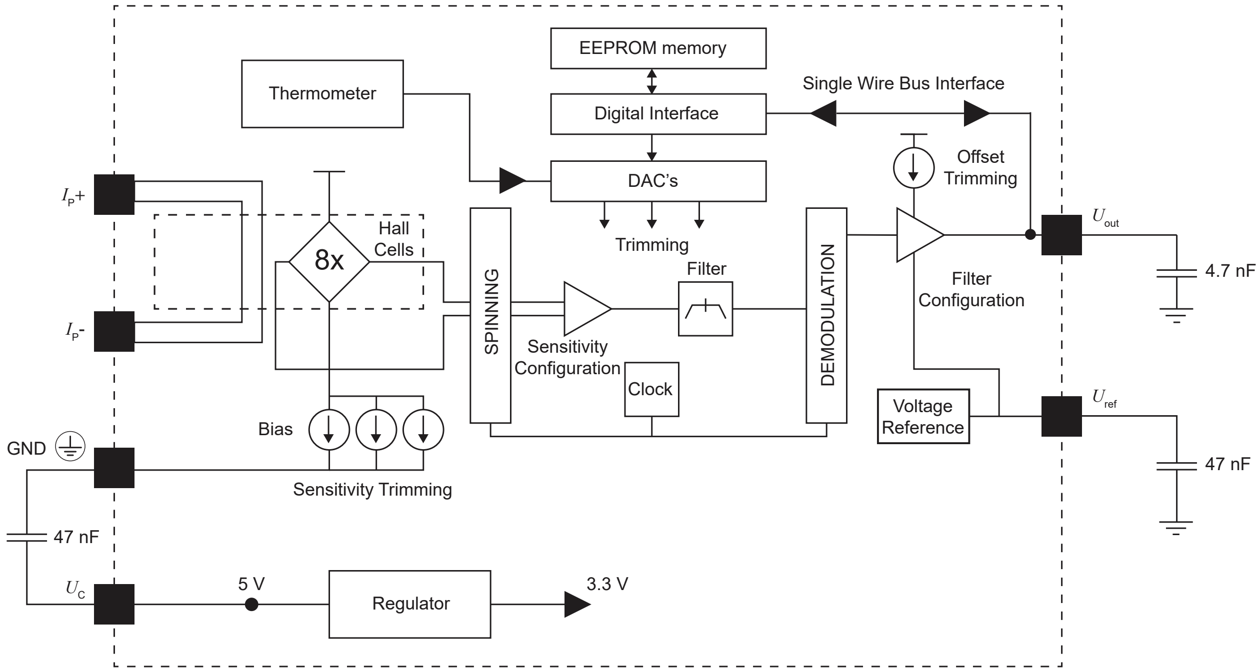

Figure 3: Block diagram GO-SME

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Absolute maximum ratings

Parameter	Symbol	Unit	Min	Max	Conditions
Ambient operating temperature	T_A	°C	−40	125	
Ambient storage temperature	$T_{A\ st}$	°C	−40	150	
Maximum junction temperature	$T_{J\ max}$	°C		165	
Output sink current		mA		50	
Output source current		mA		25	

Absolute maximum ratings apply at 25 °C unless otherwise noted.
Stresses above these ratings may cause permanent damage.
Exposure to absolute maximum ratings for extented periods may degrade reliability.

Environmental and mechanical characteristics

Parameter	Symbol	Unit	Value
Maximum supply voltage (not destructive)	$U_{C\ max}$	V	8
Maximum supply voltage on other pins (not entering non-standard modes)			6.5
Electrostatic discharge voltage (HMB-Human Body Model)	$U_{ESD\ HBM}$	kV	2
Electrostatic discharge voltage (CDM-Charged Device Model)	$U_{ESD\ CDM}$	V	500
Thermal resistance junction to board [1)]	$R_{th\ JB}$	K/W	15
Time constant (to reach steady state)	t	s	1
Mass	m	g	0.07

Note: [1)] Done with LEM evaluation board PCB 2320-00 described on later paragraph.

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Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC insulation test, 50 Hz, 1 min	U_d	kV	2.5 [1)]	According to IEC 62368
RMS voltage for AC insulation test, 60 Hz, 1 min	U_d	kV	2.5	According to UL 62368 & UL 1577
RMS voltage for AC insulation test, 50 Hz, 1 min	U_d	kV	2.5	According to IEC 60664-1
Impulse withstand voltage 1.2/50 µs	U_{Ni}	kV	4	According to IEC 62109-1, IEC 61800-5-1
Partial discharge recurring peak voltage	U_{PD}	V	330	According to IEC 62109-1, IEC 61800-5-1
Partial discharge test inception RMS voltage [2)]	U_i	V	619	According to IEC 62109-1, IEC 61800-5-1
Partial discharge extinction RMS test voltage		V	495	According to IEC 62109-1, IEC 61800-5-1
Clearance (pri. - sec.)	d_{Cl}	mm	4	Shortest distance through air
Creepage distance (pri. - sec.)	d_{Cp}			Shortest path along body
Comparative tracking index	*CTI*		600	Grade requirements mass compound

Notes: [1)] Tested at 2.5 kV in production
[2)] $U_i = U_{PD} \cdot 1.875$.

Working voltage according to IEC 62368-1

Working voltages		PD 2	Standards
Basic insulation	RMS voltage	> 600 V	According to IEC 62368-1 (replacing IEC 60950-1)
	Peak or DC voltage	847 V	
Reinforced insulation	RMS voltage	300 V	
	Peak or DC voltage	423 V	

Rated insulation voltage according to IEC 61800-5-1 / IEC 62109-1

Rated insulation voltage		OV II / PD 2	OV III / PD 2	Standards
Basic insulation	RMS voltage	600 / 600	300 / 300	According to IEC 61800-5-1 and IEC 62109-1
	Peak or DC voltage	NA/ 848	NA/ 424	
Reinforced insulation	RMS voltage	300 / 300	150 / 150	
	Peak or DC voltage	NA/ 424	NA/ 212	

UL 62368-1 Audio/Video, information and communication technology equipment - Component

File # E521147, Vol 1
Audio/Video, Information and Communication Technology Equipment - component, 4800 V AC Insulation

Standard

- UL 62368-1, Audio/video, information and communication technology equipment.

Marking

Only those products bearing the UL or UR Mark should be considered to be Listed or Recognized and covered under UL’s Follow-Up Service. Always look for the Mark on the product.

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UL 1577 Non Optical isolating devices - Component

File # E486776, Vol 1
Single protection, non-optical isolators, 2500 V AC insulation

Standards

- UL 1577, Optical Isolators;
- CSA Component Acceptance Service Notice N°. 5 A, Component Acceptance Service for Optocouplers and Related Devices.

Marking

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Common electrical data (independent of sensitivity)

At T_A = 25 °C, U_C = +5 V or +3.3 V, R_L = 100 kΩ unless otherwise noted
(see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
DC supply voltage	U_C	V	4.5	5	5.5	Standard & SP2 versions
DC supply voltage			3.14	3.3	3.47	SP3 & SP4 versions
Output voltage range @ I_{PM}	$U_{out} - U_{ref}$	V	−2		2	U_C = 5 V
			−1.25		1.25	U_C = 3.3 V
Output internal resistance of U_{out}	R_{out}	Ω		1	5	Up to 10 kHz
Primary resistance @ T_A = 25 °C	R_P	mΩ		0.9		
Internal series resistance of reference voltage source	R_{ref}	Ω	120	200	333	
Maximum output current source of U_{out}		mA	25			Up to 10 kHz
Maximum input current sink of U_{out}		mA	20			Up to 10 kHz
Output leakage current		µA		2	20	
Maximum output current source of U_{ref}		mA		0.5		
Maximum input current sink of U_{ref}		mA		0.5		
Load capacitance on U_{out}	C_L	nF	0	4.7	6	
Load capacitance on U_{ref}			0	47	100	
DC current consumption	I_C	mA		20	26	U_C = 5 V
				20	26	U_C = 3.3 V
Electrical offset voltage	U_{OE}	mV	−5		5	$U_{out} - U_{ref}$ @ U_{ref} = 2.5 V
Temperature coefficient of U_{ref}	TCU_{ref}	ppm/K	−170		170	−40 ° C... +125 °C
Temperature coefficient of U_{OE}	TCU_{OE}	mV/K	−0.075		0.075	−40 ° C... +125 °C
Delay time to 10 % of the final output value for I_{PN} step	t_{D10}	µs			1.5	
Delay time to 90 % of the final output value for I_{PN} step	t_{D90}	µs			2	
Frequency bandwidth −3 dB, T_A = 25 °C	BW	kHz		300		

Electrical data GO 10-SME

At T_A = 25 °C, U_C = +5 V, R_L = 100 kΩ unless otherwise noted
(see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		10		
Primary current, measuring range	I_{PM}	A	−25		25	
Internal reference voltage @ I_{PN} = 0	$U_{I\ ref}$	V	2.48	2.5	2.52	
Nominal sensitivity	S_N	mV/A		80		800 mV @ I_{PN}
Temperature coefficient of S	TCS	ppm/K	−150		150	−40 °C ... 125 °C
Electrical offset current referred to I_{PN}	I_{OE}	mA	−62.5		62.5	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−0.94		0.94	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		14.5		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Lifetime sensitivity error		% S		±1	±2	
Linearity error 0 … I_{PN}	ε_L	% of I_{PN}	−0.3		0.3	Referred to I_{PN}
Linearity error 0 … I_{PM}	ε_L	% of I_{PM}	−0.6		0.6	Referred to I_{PM}
Sum of sensitivity and linearity @ I_{PN}, @ T_A = 25 °C	$\varepsilon_{S L 25}$	% of I_{PM}	−0.7		0.7	
Total error over temperature	ε_{tot}	% of I_{PM}	−1		1	

Electrical data GO 20-SME

At T_A = 25 °C, U_C = +5 V, R_L = 100 kΩ unless otherwise noted
(see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		20		
Primary current, measuring range	I_{PM}	A	−50		50	
Internal reference voltage @ I_{PN} = 0	$U_{I\ ref}$	V	2.48	2.5	2.52	
Nominal sensitivity	S_N	mV/A		40		800 mV @ I_{PN}
Temperature coefficient of S	TCS	ppm/K	−150		150	−40 °C ... 125 °C
Electrical offset current referred to I_{PN}	I_{OE}	mA	−125		125	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−1.88		1.88	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		7		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Lifetime sensitivity error		% S		±2		
Linearity error 0 … I_{PN}	ε_L	% of I_{PN}	−0.3		0.3	Referred to I_{PN}
Linearity error 0 … I_{PM}	ε_L	% of I_{PM}	−0.6		0.6	Referred to I_{PM}
Sum of sensitivity and linearity @ I_{PN}, @ T_A = 25 °C	$\varepsilon_{S L 25}$	% of I_{PM}	−0.7		0.7	
Total error over temperature	ε_{tot}	% of I_{PM}	−1		1	

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Electrical data GO 12-SME/SP2

At T_A = 25 °C, U_C = +5 V, R_L = 100 kΩ unless otherwise noted
(see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		12.12		
Primary current, measuring range	I_{PM}	A	−30.3		30.3	
Internal reference voltage @ I_{PN} = 0	$U_{I\ ref}$	V	2.48	2.5	2.52	
Nominal sensitivity	S_N	mV/A		66		800 mV @ I_{PN}
Temperature coefficient of S	TCS	ppm/K	−150		150	−40 °C ... 125 °C
Electrical offset current referred to I_{PN}	I_{OE}	mA	−75.7		75.7	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−1.14		1.14	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		12.5		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Lifetime sensitivity error		% S		±1	±2	
Linearity error 0 … I_{PN}	ε_L	% of I_{PN}	−0.3		0.3	Referred to I_{PN}
Linearity error 0 … I_{PM}	ε_L	% of I_{PM}	−0.6		0.6	Referred to I_{PM}
Sum of sensitivity and linearity @ I_{PN}, @ T_A = 25 °C	$\varepsilon_{SL\,25}$	% of I_{PM}	−0.7		0.7	
Total error over temperature	ε_{tot}	% of I_{PM}	−1		1	

Electrical data GO 20-SME/SP2

At T_A = 25 °C, U_C = +5 V, R_L = 100 kΩ unless otherwise noted
(see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		20		
Primary current, measuring range	I_{PM}	A	−50		50	
Internal reference voltage @ I_{PN} = 0	$U_{I\ ref}$	V	2.48	2.5	2.52	
Nominal sensitivity	S_N	mV/A		40		800 mV @ I_{PN}
Temperature coefficient of S	TCS	ppm/K	−150		150	−40 °C ... 125 °C
Electrical offset current referred to I_{PN}	I_{OE}	mA	−125		125	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−1.88		1.88	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		7		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Lifetime sensitivity error		% S		±1	±2	
Linearity error 0 … I_{PN}	ε_L	% of I_{PN}	−0.3		0.3	Referred to I_{PN}
Linearity error 0 … I_{PM}	ε_L	% of I_{PM}	−0.6		0.6	Referred to I_{PM}
Sum of sensitivity and linearity @ I_{PN}, @ T_A = 25 °C	$\varepsilon_{SL\,25}$	% of I_{PM}	−0.7		0.7	
Total error over temperature	ε_{tot}	% of I_{PM}	−1		1	

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Electrical data GO 10-SME/SP3

At T_A = 25 °C, U_C = +3.3 V, R_L = 100 kΩ unless otherwise noted
(see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		10		
Primary current, measuring range	I_{PM}	A	−25		25	
Internal reference voltage @ I_{PN} = 0	$U_{I\ ref}$	V	1.63	1.65	1.67	
Nominal sensitivity	S_N	mV/A		50		500 mV @ I_{PN}
Temperature coefficient of S	TCS	ppm/K	−150		150	−40 °C ... 125 °C
Electrical offset current referred to I_{PN}	I_{OE}	mA	−100		100	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−1.5		1.5	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		8		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Lifetime sensitivity error		% S		±1	±2	
Linearity error 0 … I_{PN}	ε_L	% of I_{PN}	−0.3		0.3	Referred to I_{PN}
Linearity error 0 … I_{PM}	ε_L	% of I_{PM}	−0.6		0.6	Referred to I_{PM}
Sum of sensitivity and linearity @ I_{PN}, @ T_A = 25 °C	$\varepsilon_{S L 25}$	% of I_{PM}	−0.7		0.7	
Total error over temperature	ε_{tot}	% of I_{PM}	−1		1	

Electrical data GO 20-SME/SP3

At T_A = 25 °C, U_C = +3.3 V, R_L = 100 kΩ unless otherwise noted
(see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		20		
Primary current, measuring range	I_{PM}	A	−50		50	
Internal reference voltage @ I_{PN} = 0	$U_{I\ ref}$	V	1.63	1.65	1.67	
Nominal sensitivity	S_N	mV/A		25		500 mV @ I_{PN}
Temperature coefficient of S	TCS	ppm/K	−150		150	−40 °C ... 125 °C
Electrical offset current referred to I_{PN}	I_{OE}	mA	−200		200	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−3		3	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		4.5		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Lifetime sensitivity error		% S		±1	±2	
Linearity error 0 … I_{PN}	ε_L	% of I_{PN}	−0.3		0.3	Referred to I_{PN}
Linearity error 0 … I_{PM}	ε_L	% of I_{PM}	−0.6		0.6	Referred to I_{PM}
Sum of sensitivity and linearity @ I_{PN}, @ T_A = 25 °C	$\varepsilon_{S L 25}$	% of I_{PM}	−0.7		0.7	
Total error over temperature	ε_{tot}	% of I_{PM}	−1		1	

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Electrical data GO 8-SME/SP4

At T_A = 25 °C, U_C = +3.3 V, R_L = 100 kΩ unless otherwise noted (see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		8		
Primary current, measuring range	I_{PM}	A	−20		20	
Internal reference voltage @ I_{PN} = 0	$U_{I\,ref}$	V	1.63	1.65	1.67	
Nominal sensitivity	S_N	mV/A		50		500 mV @ I_{PN}
Temperature coefficient of S	TCS	ppm/K	−230		230	−40 °C ... 125 °C, including ratiometricity error
Electrical offset current referred to I_{PN}	I_{OE}	mA	−80		80	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−1.2		1.2	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		8		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Ratiometricity error	ε_r	%		±0.5		
Ratiometricity offset error	ε_{rO}	mV	−10		10	U_C = 3.3 V ±10 %
Lifetime sensitivity error		% S		±1	±2	
Linearity error 0 … I_{PN}	ε_L	% of I_{PN}	−0.3		0.3	Referred to I_{PN}
Linearity error 0 … I_{PM}	ε_L	% of I_{PM}	−0.6		0.6	Referred to I_{PM}
Sum of sensitivity and linearity @ I_{PN}, @ T_A = 25 °C	$\varepsilon_{SL\,25}$	% of I_{PM}	−0.7		0.7	
Total error over temperature	ε_{tot}	% of I_{PM}	−1.2	0.5	1.2	

LEM reserves the right to carry out modifications on its transducers, in order to improve them.

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Electrical data GO 15-SME/SP4

At T_A = 25 °C, U_C = +3.3 V, R_L = 100 kΩ unless otherwise noted (see Definition of typical, minimum and maximum values paragraph in page 12).

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	$I_{P N}$	A		15		
Primary current, measuring range	$I_{P M}$	A	−37.5		37.5	
Internal reference voltage @ $I_{P N}$ = 0	$U_{I ref}$	V	1.63	1.65	1.67	
Nominal sensitivity	S_N	mV/A		41.67		500 mV @ $I_{P N}$
Temperature coefficient of S	TCS	ppm/K	−230		230	−40 °C ... 125 °C, including ratiometricity error
Electrical offset current referred to $I_{P N}$	$I_{O E}$	mA	−125		125	
Temperature coefficient of $I_{O E}$	$TCI_{O E}$	mA/K	−1.88		1.88	−40 °C ... 125 °C
Lifetime offset drift		mV		±2		
Noise voltage spectral density	u_{no}	$\frac{\mu V}{\sqrt{Hz}}$		5		100 Hz ... 100 kHz
Sensitivity error	ε_S	%	−1		1	
Ratiometricity error	ε_r	%		±0.5		
Ratiometricity offset error	$\varepsilon_{r O}$	mV	−10		10	U_C = 3.3 V ±10 %
Lifetime sensitivity error		% S		±1	±2	
Linearity error 0 … $I_{P N}$	ε_L	% of $I_{P N}$	−0.3		0.3	Referred to $I_{P N}$
Linearity error 0 … $I_{P M}$	ε_L	% of $I_{P M}$	−0.6		0.6	Referred to $I_{P M}$
Sum of sensitivity and linearity @ $I_{P N}$, @ T_A = 25 °C	$\varepsilon_{S L 25}$	% of $I_{P M}$	−0.7		0.7	
Total error over temperature	ε_{tot}	% of $I_{P M}$	−1.2	0.5	1.2	

Definition of typical, minimum and maximum values

Minimum and maximum values for specified limiting and safety conditions have to be understood as such as well as values shown in “typical” graphs.
On the other hand, measured values are part of a statistical distribution that can be specified by an interval with upper and lower limits and a probability for measured values to lie within this interval.
Unless otherwise stated (e.g. “100 % tested”), the LEM definition for such intervals designated with “min” and “max” is that the probability for values of samples to lie in this interval is 99.73 %.
For a normal (Gaussian) distribution, this corresponds to an interval between −3 sigma and +3 sigma. If “typical” values are not obviously mean or average values, those values are defined to delimit intervals with a probability of 68.27 %, corresponding to an interval between −sigma and +sigma for a normal distribution.
Typical, maximal and minimal values are determined during the initial characterization of the product.

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Thermal characteristics

When designing a system containing a current transducer, self-heating due to the flow of the current should be considered.
When a current pass through, the transducer's temperature will increase, and this may affect its performance.
This change on temperature will depend on the current profile, PCB layout, cooling techniques and copper thickness.
The following plots show an example of different thermal responses of the GO-SME transducer when used on an evaluation LEM board described on later paragraph.

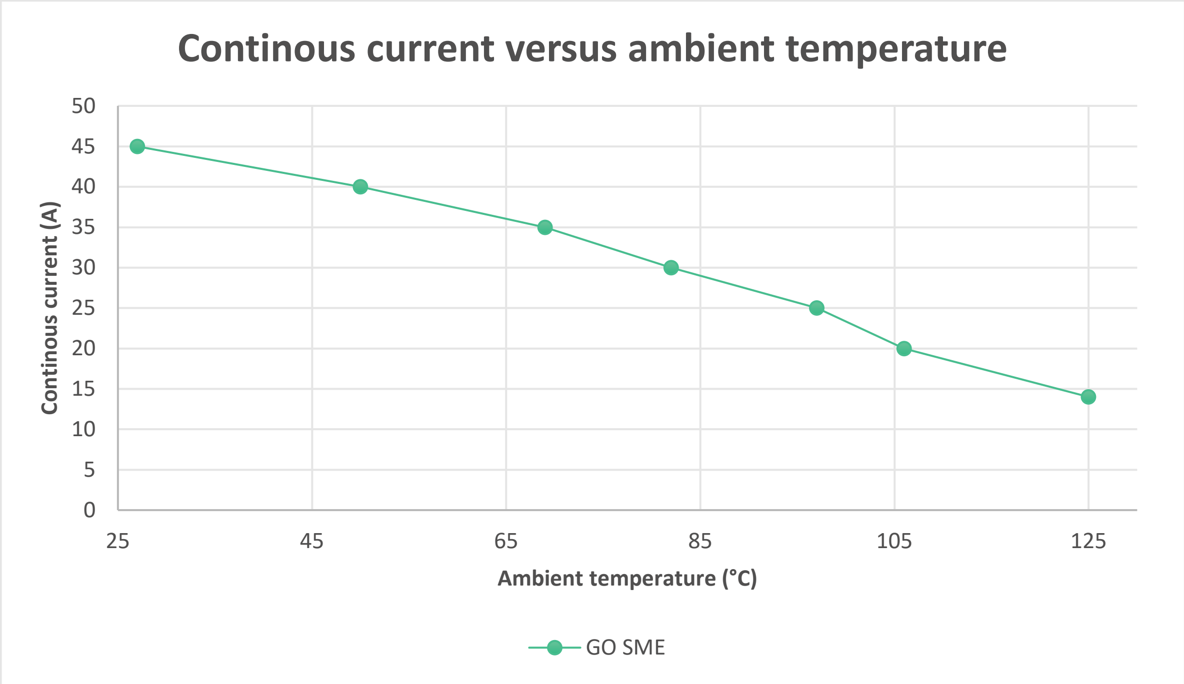

Figure 4: Continuous current vs temperature

The graph shows the mechanical capability of the GO-SME package.
The maximum current measurement range of the product is limited at 50 A.
The maximum temperature should be evaluated on the final system where the current transducer is integrated into the real application.
This temperature should never exceed the maximum junction temperature as shown on the previous paragraphs.

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Sensitivity error

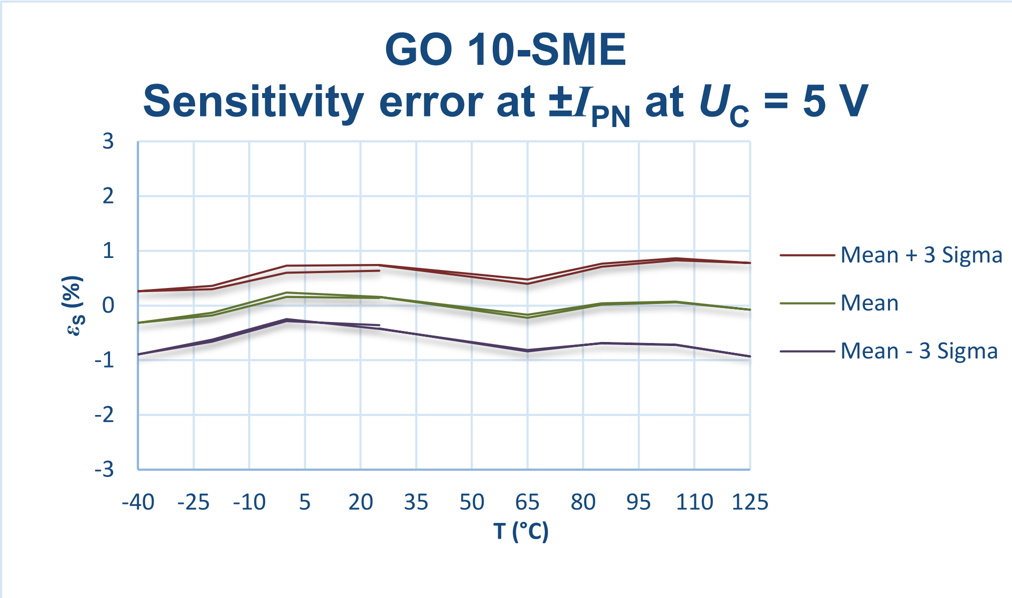

Figure 5: Sensitivity error (GO 10-SME)

Total error

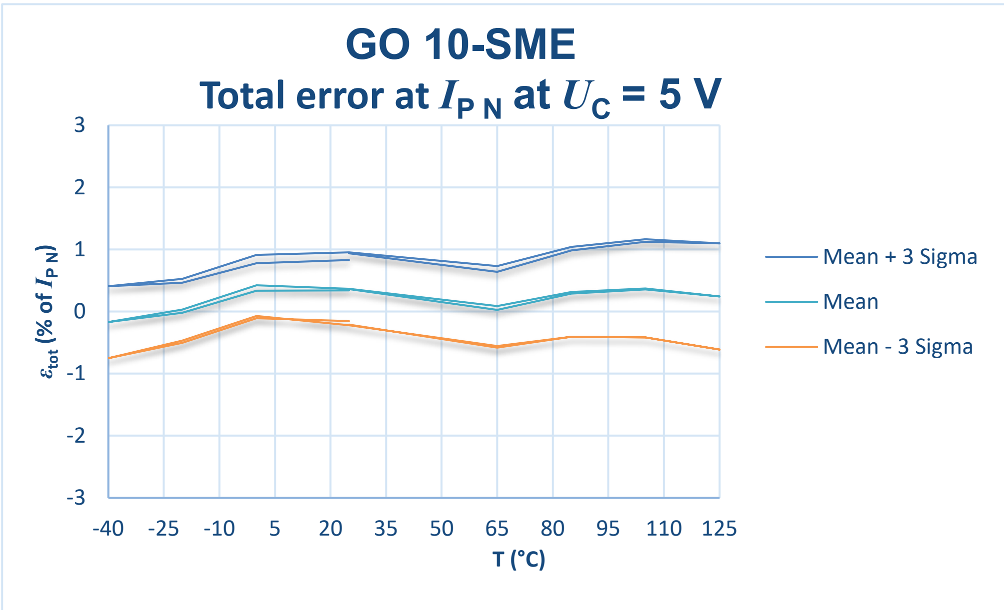

Figure 6: Total error over temperature

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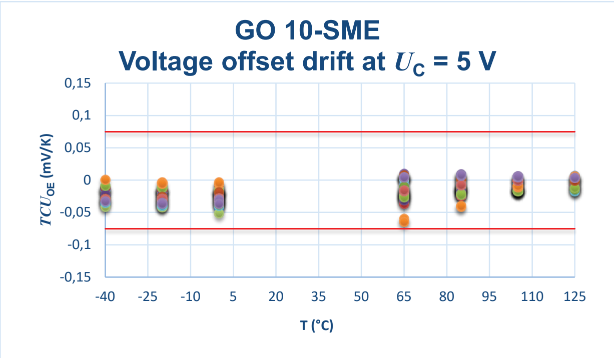
Delay time

Typical results measured on GO 10-SME @ $I_{P N}$

Ambient temperature (°C)	Delay time @ 10 %	Limit	Delay time @ 90 %	Limit
25	1.46	1.50	1.36	2.00
120	1.19	1.50	1.36	2.00
−40	1.42	1.50	1.35	2.00

Drifts over temperature (GO 10-SME)

Voltage offset drift over temperature



Sensitivity drift over temperature

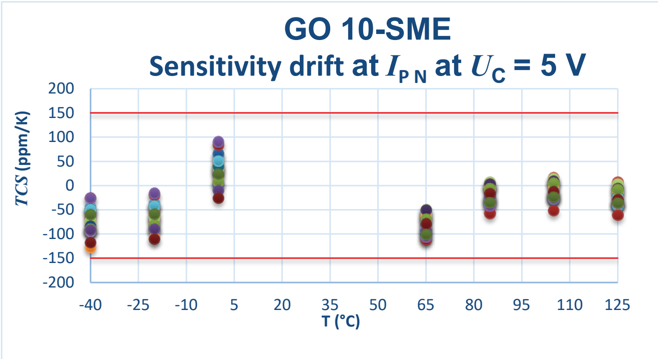


Figure 7: Drifts over temperature

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Evaluation board PCB 2320

All the above results are based on a LEM evaluation board.
This evaluation board is available at our distributors or direct sales (please contact us).

Description:

Evaluation board is based on 6 x 105 µm (3oz) copper layers.
6 x 500 sq. mm copper stitched on primary side.
This layout improves thermal performances of the transducer.

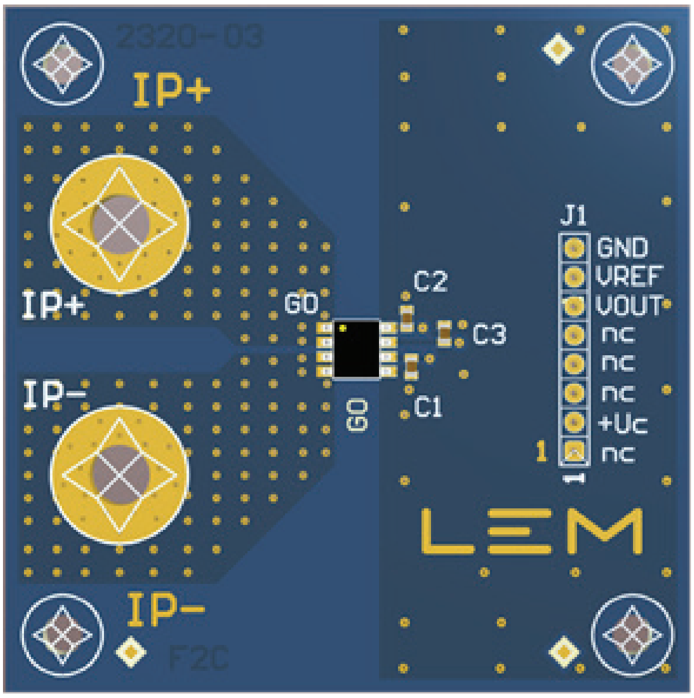

Figure 8: GO-SME Evaluation board

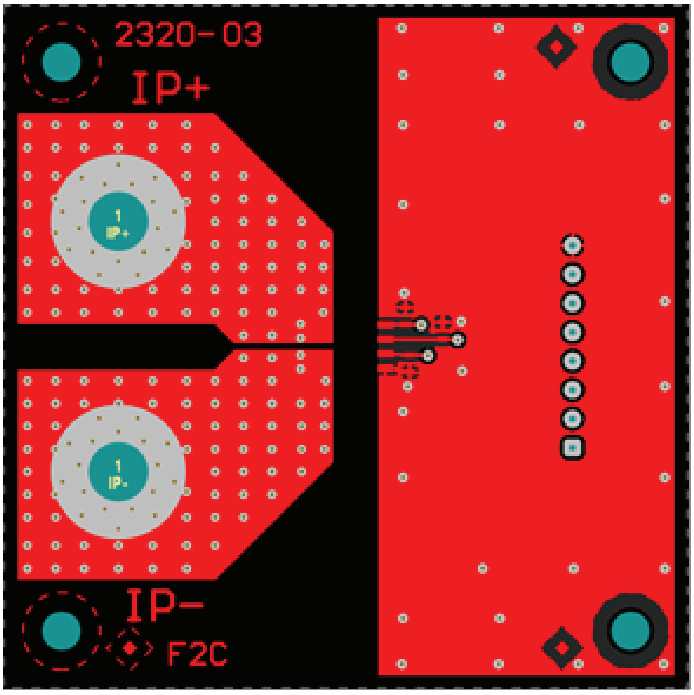

Figure 9: GO-SME Evaluation board layout

Contact LEM for more information about the evaluation board: https://www.lem.com/en/go-series

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Terms and definitions

Total error referred to primary

The total error ε_{tot} is the error at $\pm I_{PN}$, relative to the rated value I_{PN}.
It includes all errors mentioned above

- the electrical offset I_{OE}
- the magnetic offset I_{OM}
- the sensitivity error ε_S
- the linearity error ε_L (to I_{PN}).

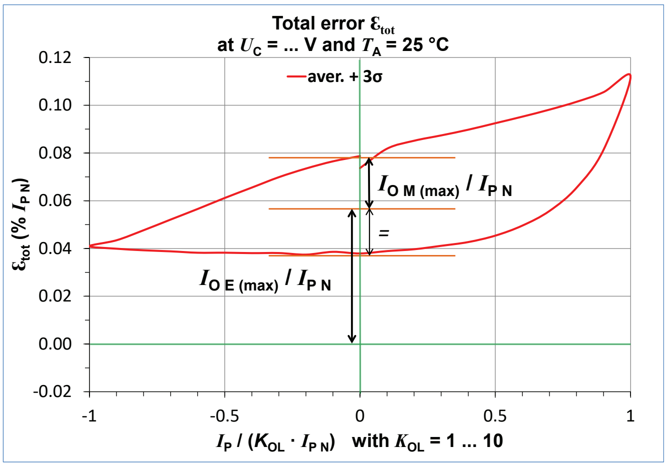

Figure 10: Total error ε_{tot}

Electrical offset referred to primary

Using the current cycle shown in figure 14, the electrical offset current I_{OE} is the residual output referred to primary when the input current is zero.

Magnetic offset referred to primary

$$I_{OE} = \frac{I_{P(3)} + I_{P(5)}}{2}$$

$$I_{OM} = \frac{I_{P(3)} - I_{P(5)}}{2}$$

The magnetic offset current I_{OM} is the consequence of a current on the primary side ("memory effect" of the transducer's ferro-magnetic parts). It is measured using the following primary current cycle. I_{OM} depends on the current value $I_P \geq I_{PN}$.

K_{OL}: Overload factor

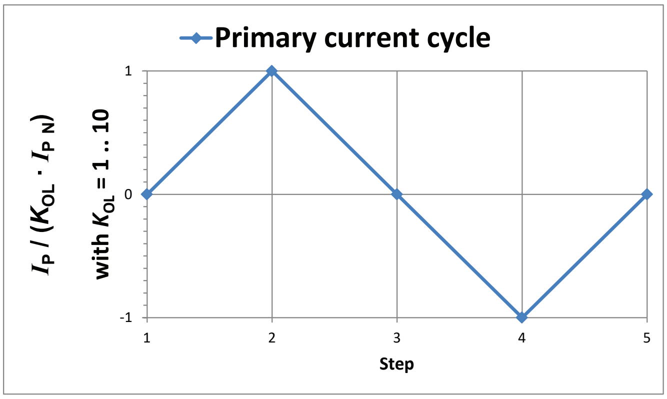

Figure 11: Current cycle used to measure magnetic and electrical offset (transducer supplied)

Sensitivity and linearity

To measure sensitivity and linearity, the primary current (DC) is cycled from 0 to I_P, then to $-I_P$ and back to 0 (equally spaced I_P/10 steps). The sensitivity S is defined as the slope of the linear regression line for a cycle between $\pm I_{PN}$.
The linearity error ε_L is the maximum positive or negative difference between the measured points and the linear regression line, expressed in % of I_{PN}.

Delay times

The delay time t_{D10} @ 10 % and the delay time t_{D90} @ 90 % with respect to the primary are shown in the next figure.
Both slightly depend on the primary current di/dt.
They are measured at nominal current.

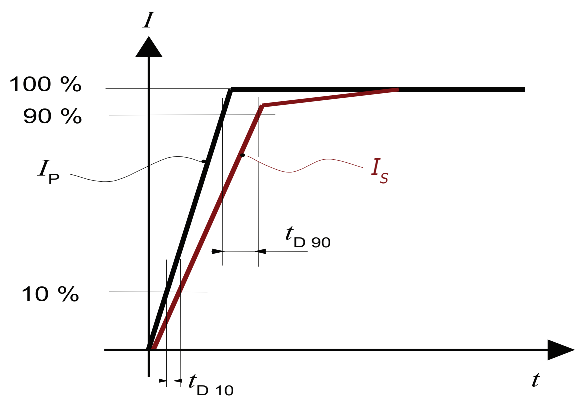

Figure 12: t_{D10} (delay time @ 10 %) and t_{D90} (delay time @ 90 %).

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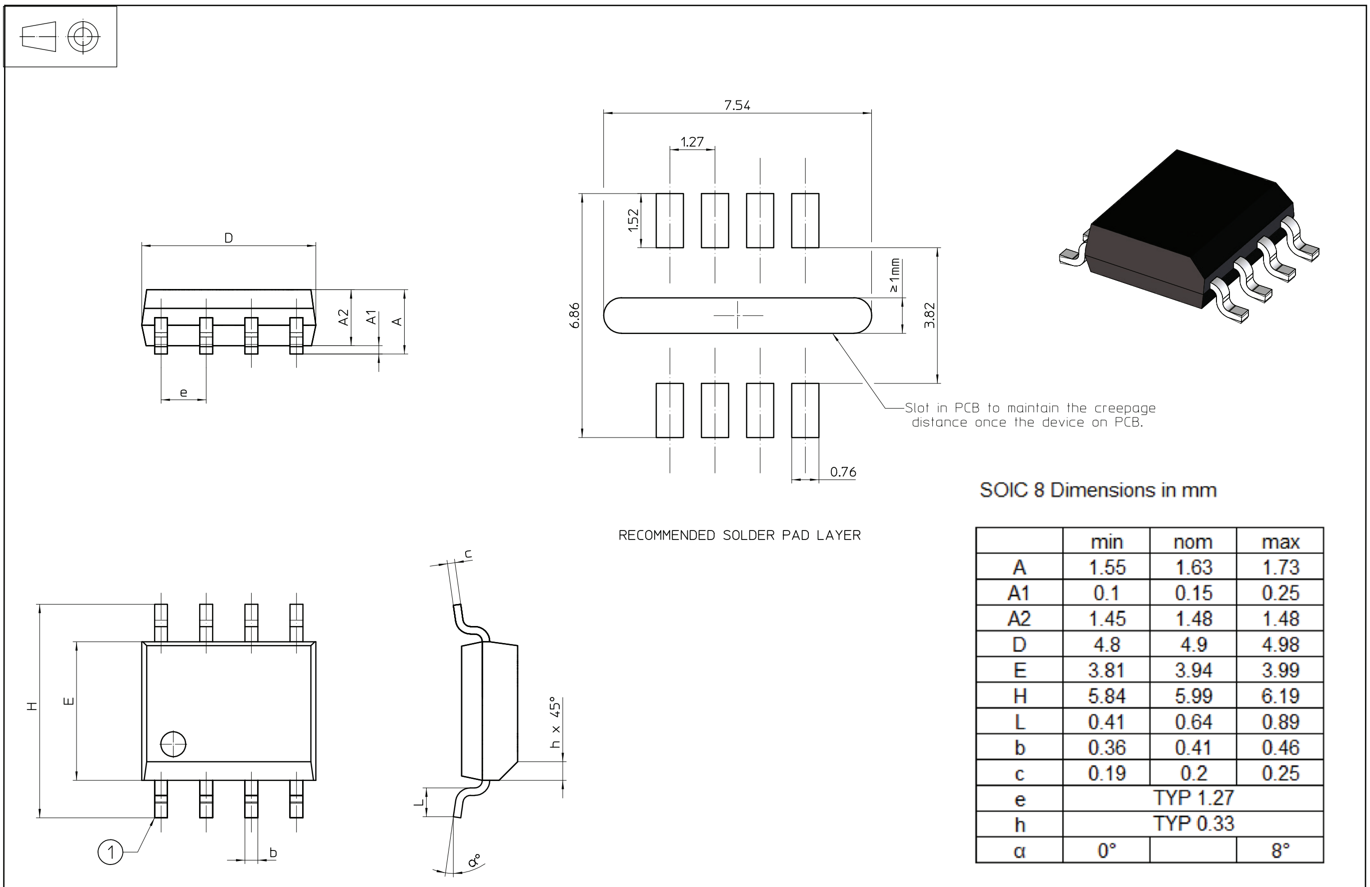
PCB footprint & dimensions (in mm)



SOIC 8 Dimensions in mm

	min	nom	max
A	1.55	1.63	1.73
A1	0.1	0.15	0.25
A2	1.45	1.48	1.48
D	4.8	4.9	4.98
E	3.81	3.94	3.99
H	5.84	5.99	6.19
L	0.41	0.64	0.89
b	0.36	0.41	0.46
c	0.19	0.2	0.25
e	TYP 1.27		
h	TYP 0.33		
α	0°		8°

Mechanical characteristics: General tolerance ±0.15 mm
Remarks: $U_{out} - U_{ref}$ is positive when I_P flows in the direction of arrow (pin 1-2 to pin 3-4).

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Soldering on PCB

Soldering remarks:

- GO-SME is qualified MSL3 for storage and mounting purposes.
- Per JEDEC J-STD-020 for packages less than 2.5 mm thick per table 4.2 (Pb-Free process) of the specification.
- Best practice is to use 7 zones or greater conventional reflow system, limiting the time at reflow temperature as indicated in profile above.
- Rework not recommended.

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Tape and reel dimensions (in mm)

Leader & Trailer:

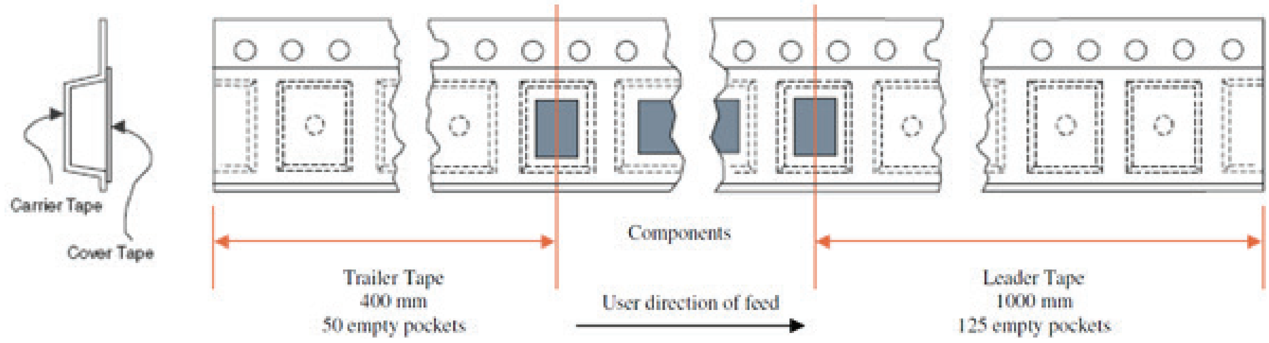

Figure 13: Leader and trailer

Carrier Tape Data:

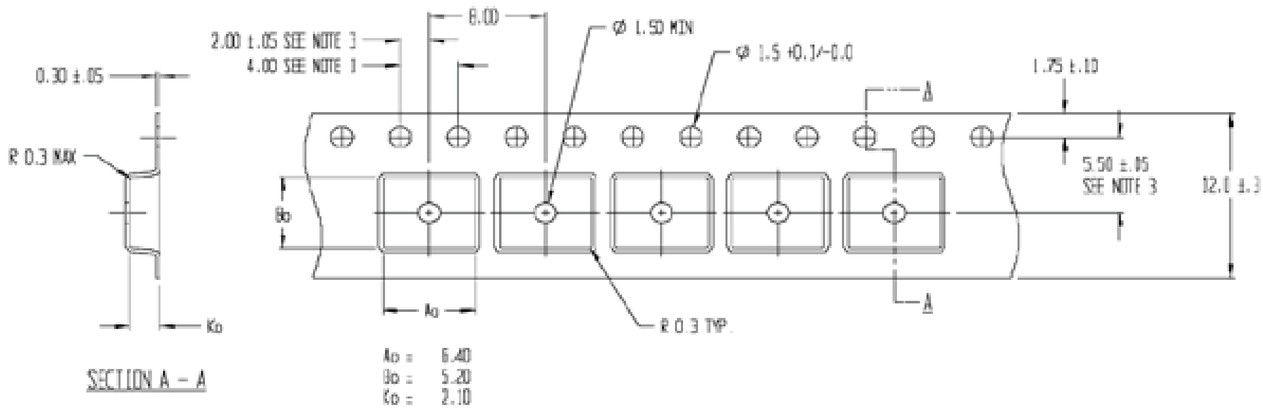

Figure 14: Carrier tape

Plastic Reel Data:

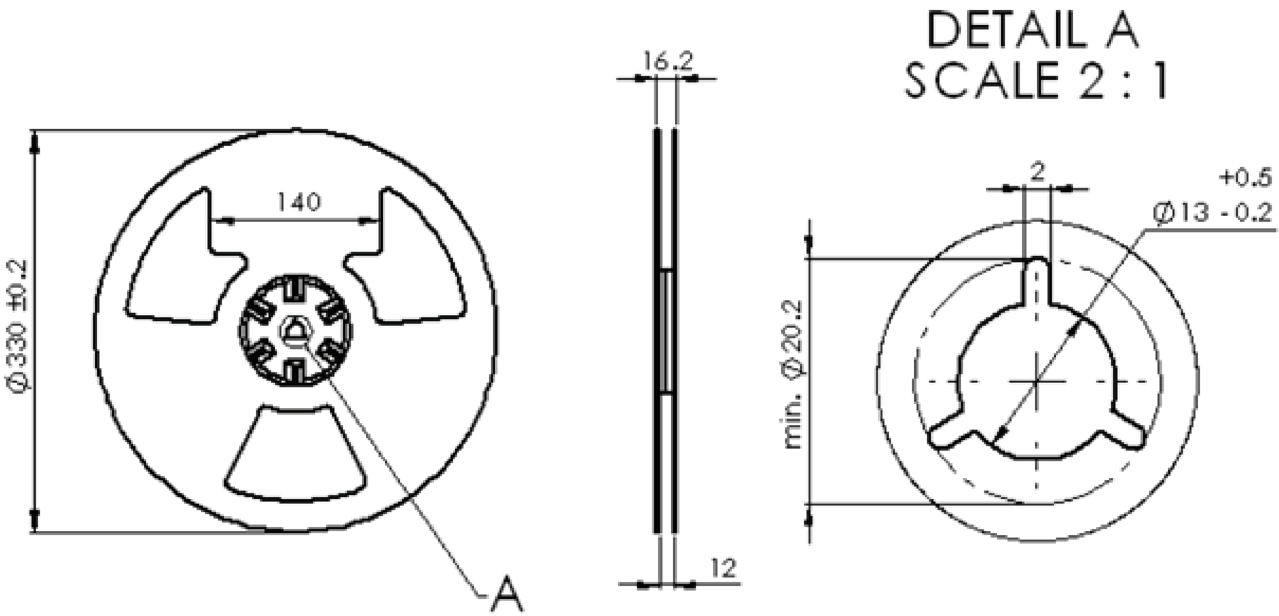

Figure 15: Plastic reel

Safety

Caution

This transducer must be used in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer's operating instructions..

Caution, risk of electrical shock

This transducer must be used in limited-energy secondary circuits according to IEC 62368-1.
When operating the transducer, certain parts of the module can carry hazardous voltages and high currents (e.g. power supply, primary conductor).
Ignoring this warning can lead to injury and or/or cause serious damage.
This transducer is a build-in device, whose hazardous live parts must be inaccessible after installation.
A protective enclosure or additional shield could be used. Main supply must be able to be disconnected.

Therefore, LEM cannot be held liable for any potential hazards, damages, injuries or loss of life resulting from the use of this product.

ESD susceptibility

This product is susceptible to be damaged from an ESD event and the personnel and workspace should be grounded when handling it.

Underwriters Laboratory Inc. recognized component

Version history

Date	Version	Comments
17 November 2021	0	New generic datasheet with SP products
22 June 2022	1	Modified definition paragraph + modified 3D picture (page 1); replaced ms by µs (page 7) + modified LEM address + last sentence (all pages)

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