Current transducer GHS-SME series

I_{PN} = 10 … 20 A

GHS 10-SME, GHS 12-SME, GHS 16-SME, GHS 20-SME

For the electronic measurement of current: DC, AC, pulsed..., with galvanic separation between the primary and the secondary circuit.

Features

- Hall effect measuring principle
- Multirange current transducer through PCB pattern lay-out
- Galvanic separation between primary and secondary circuit
- Insulated test voltage 2100 V rms
- Low power consumption
- Extremely low profile
- Single power supply +5 V
- Fixed offset & sensitivity.

Advantages

- Small size and space saving
- High immunity to external interference
- High insulation capability
- Low electrical resistance (0.8 mΩ)
- No magnetic hysteresis
- Robust against external fields and cross-talk.

Applications

- Motors control
- Over current detection
- The solar inverter on DC side of the inverter (MPTT)
- Combiner box
- Smart metering.

Standards

- IEC 60950-1: 2005
- EN 60749-15: 2010
- EN 60749-20: 2008
- EN 60749-21: 2011
- IPC/JEDEC J-STD020: 2014
- EIA/JEDEC J-STD022-B102: 2004
- EIA/JEDEC J-STD022-B106: 2008
- EIA/JEDEC J-STD022-A113: 2015.

Application Domains

- Industrial.

Absolute ratings (not operating)

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Maximum supply voltage	U_C	V			10	
Overload capability	$\hat{I}_P$	A			±200	T_A = 25 °C, 1 ms pulse
Electrostatic discharge voltage (HMB-Human Body Model)	$U_{ESD\ HBM}$	V			2000	AEC-Q100-002 REV D
Electrostatic discharge voltage (CDM-Charged Device Model)	$U_{ESD\ CDM}$	V			500	AEC-Q100-0011 REV B
Maximum output current	I_{out}	mA			70	
Maximum output voltage	V_{out}	V			10	
Secondary Reverse voltage	U_{SR}	V	−0.3			
Maximum junction temperature	T_J	°C			165	

Insulation coordination

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Example application	U_d	V			300	CAT II PD2 according to IEC 60664-1
Rms voltage for AC insulation test, 50/60 Hz, 1 min)	U_d	V			2100	according to IEC 60664-1
Impulse withstand voltage 1.2/50 µs	$\hat{U}_W$	V			3600	according to IEC 60664-1
Clearance (pri. - sec.)	d_{Cl}	mm		4		
Creepage distance (pri. - sec.)	d_{Cp}	mm		4		

Environmental and mechanical characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Ambient operating temperature	T_A	°C	-40		125	
Ambient storage temperature	T_S	°C	-55		165	
Resistance of the primary @T_A = 25 °C	R_P	mΩ		0.8		

Self diagnostic

Parameter	Symbol	Unit	Min	Typ	Max	Action	Output	Conditions
Start-up time	t_{start}	ms			1			V_{out} = 100 % of FS Pull-down resistor ≤ 100 kΩ. During the power-on delay the output will remain at 10 % fault band all the time
Undervoltage lockout	U_{UVLO}	V	3.15	3.3	3.45	IC reset	max 5 % U_C, Pull-down mode min 95 % U_C, Pull-up mode	R_L ≤ 25 kΩ, T ≤ 125 °C
Undervoltage lockout hysteresis	$U_{UVLO\ HYST}$	V	0.25	0.3	0.4			
Overvoltage lockout	U_{OVLO}	V	6.7		7.6	IC reset	max 5 % U_C, Pull-down mode min 95 % U_C, Pull-up mode	R_L ≤ 25 kΩ, T ≤ 125 °C
Overvoltage lockout hysteresis	$U_{OVLO\ HYST}$	V	0.05	0.1	0.7			

Electrical data GHS 10-SME

At T_A = −40 °C … 125 °C, U_C = +5 V, R_L = 6 kΩ.

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal rms current	I_{PN}	A		10		
Primary current, measuring range	I_{PM}	A	−25		25	
Supply voltage [1)]	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA	7	12	14	
Output voltage range	V_{out}	% U_C	10		90	Pull down ≥ 10 kΩ, pull up ≥ 10 kΩ
Maximum output current (driving capability)	I_{out}	mA	−2		2	V_{out} in range (3 % U_C, 97 % U_C), R_L in range (6 kΩ, 10 kΩ)
Output current limitation	I_{SL}	mA	35		180	Output shorted to ±U_C permanent
Output internal resistance	R_{out}	Ω		1	5	V_{out} = 50 % U_C, R_L = 10 kΩ
Step response time to 90 % of I_{PN}	t_r	µs		5	6	
Frequency bandwidth (−3 dB), T_A = 25 °C	BW	kHz		100		
Output voltage noise (spectral density) rms	e_{no}	µV/√Hz		25		
Capacity loading	C_L	nF		10		Stability of the output
Load resistance	R_L	kΩ	6		100	
Sensitivity	G	mV/A		80		
Offset voltage	V_O	V		2.5		T_A = 25 °C
Electrical offset voltage	V_{OE}	V	−0.005		0.005	T_A = 25 °C
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	−0.1		0.1	
Temperature coefficient of G	TCG	ppm/K	−150		150	
Linearity error	ε_L	%	−0.25		0.25	@ I_{PN}
Sensitivity error	ε_G	%	−1		1	Factory adjustment
Accuracy @ I_{PN} [2)]	X	%	−1.25		1.25	T_A = 25 °C
Accuracy @ I_{PN} @ T_A = 105 °C	X	%	−3.5		3.5	
Accuracy @ I_{PN} @ T_A = 125 °C	X	%	−4		4	

Electrical data GHS 12-SME

At T_A = −40 °C … 125 °C, U_C = +5 V, R_L = 6 kΩ.

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal rms current	I_{PN}	A		12		
Primary current, measuring range	I_{PM}	A	−30		30	
Supply voltage [1)]	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA	7	12	14	
Output voltage range	V_{out}	% U_C	10		90	Pull down ≥ 10 kΩ, pull up ≥ 10 kΩ
Maximum output current (driving capability)	I_{out}	mA	−2		2	V_{out} in range (3 % U_C, 97 % U_C), R_L in range (6 kΩ, 10 kΩ)
Output current limitation	I_{SL}	mA	35		180	Output shorted to ±U_C permanent
Output internal resistance	R_{out}	Ω		1	5	V_{out} = 50 % U_C, R_L = 10 kΩ
Step response time to 90 % of I_{PN}	t_r	µs		5	6	
Frequency bandwidth (−3 dB), T_A = 25 °C	BW	kHz		100		
Output voltage noise (spectral density) rms	e_{no}	µV/√Hz		20		
Capacity loading	C_L	nF		10		Stability of the output
Load resistance	R_L	kΩ	6		100	
Sensitivity	G	mV/A		66.7		
Offset voltage	V_O	V		2.5		T_A = 25 °C
Electrical offset voltage	V_{OE}	V	−0.005		0.005	T_A = 25 °C
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	−0.1		0.1	
Temperature coefficient of G	TCG	ppm/K	−150		150	
Linearity error	ε_L	%	−0.25		0.25	@ I_{PN}
Sensitivity error	ε_G	%	−1		1	Factory adjustment
Accuracy @ I_{PN} [2)]	X	%	−1.25		1.25	T_A = 25 °C
Accuracy @ I_{PN} @ T_A = 105 °C	X	%	−3.5		3.5	
Accuracy @ I_{PN} @ T_A = 125 °C	X	%	−4		4	

Electrical data GHS 16-SME

At T_A = −40 °C … 125 °C, U_C = +5 V, R_L = 6 kΩ.

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal rms current	I_{PN}	A		16		
Primary current, measuring range	I_{PM}	A	−40		40	
Supply voltage [1)]	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA	7	12	14	
Output voltage range	V_{out}	% U_C	10		90	Pull down ≥ 10 kΩ, pull up ≥ 10 kΩ
Maximum output current (driving capability)	I_{out}	mA	−2		2	V_{out} in range (3 % U_C, 97 % U_C), R_L in range (6 kΩ, 10 kΩ)
Output current limitation	I_{SL}	mA	35		180	Output shorted to ±U_C permanent
Output internal resistance	R_{out}	Ω		1	5	V_{out} = 50 % U_C, R_L = 10 kΩ
Step response time to 90 % of I_{PN}	t_r	µs		5	6	
Frequency bandwidth (−3 dB), T_A = 25 °C	BW	kHz		100		
Output voltage noise (spectral density) rms	e_{no}	µV/√Hz		16		
Capacity loading	C_L	nF		10		Stability of the output
Load resistance	R_L	kΩ	6		100	
Sensitivity	G	mV/A		50		
Offset voltage	V_O	V		2.5		T_A = 25 °C
Electrical offset voltage	V_{OE}	V	−0.005		0.005	T_A = 25 °C
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	−0.1		0.1	
Temperature coefficient of G	TCG	ppm/K	−150		150	
Linearity error	ε_L	%	−0.25		0.25	@ I_{PN}
Sensitivity error	ε_G	%	−1		1	Factory adjustment
Accuracy @ I_{PN} [2)]	X	%	−1.25		1.25	T_A = 25 °C
Accuracy @ I_{PN} @ T_A = 105 °C	X	%	−3.5		3.5	
Accuracy @ I_{PN} @ T_A = 125 °C	X	%	−4		4	

Electrical data GHS 20-SME

At T_A = −40 °C … 125 °C, U_C = +5 V, R_L = 6 kΩ.

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal rms current	I_{PN}	A		20		
Primary current, measuring range	I_{PM}	A	−50		50	
Supply voltage [1)]	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA	7	12	14	
Output voltage range	V_{out}	% U_C	10		90	Pull down ≥ 10 kΩ, pull up ≥ 10 kΩ
Maximum output current (driving capability)	I_{out}	mA	−2		2	V_{out} in range (3 % U_C, 97 % U_C), R_L in range (6 kΩ, 10 kΩ)
Output current limitation	I_{SL}	mA	35		180	Output shorted to ±U_C permanent
Output internal resistance	R_{out}	Ω		1	5	V_{out} = 50 % U_C, R_L = 10 kΩ
Step response time to 90 % of I_{PN}	t_r	µs		5	6	
Frequency bandwidth (−3 dB), T_A = 25 °C	BW	kHz		100		
Output voltage noise (spectral density) rms	e_{no}	µV/√Hz		12		
Capacity loading	C_L	nF		10		Stability of the output
Load resistance	R_L	kΩ	6		100	
Sensitivity	G	mV/A		40		
Offset voltage	V_O	V		2.5		T_A = 25 °C
Electrical offset voltage	V_{OE}	V	−0.005		0.005	T_A = 25 °C
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	−0.1		0.1	
Temperature coefficient of G	TCG	ppm/K	−150		150	
Linearity error	ε_L	%	−0.25		0.25	@ I_{PN}
Sensitivity error	ε_G	%	−1		1	Factory adjustment
Accuracy @ I_{PN} [2)]	X	%	−1.25		1.25	T_A = 25 °C
Accuracy @ I_{PN} @ T_A = 105 °C	X	%	−3.5		3.5	
Accuracy @ I_{PN} @ T_A = 125 °C	X	%	−4		4	

Ratiometric mode

At U_C ±10 %

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Ratiometry error Offset	ε_r V_o	%	−0.4		0.4	V_o = 50 % U_C
Ratiometry error Sensitivity	ε_r G	%	−0.4		0.4	

Notes: [1] The output voltage V_{OUT} is fully ratiometric. The offset and sensitivity are dependent on the supply voltage U_C relative to the following formula:

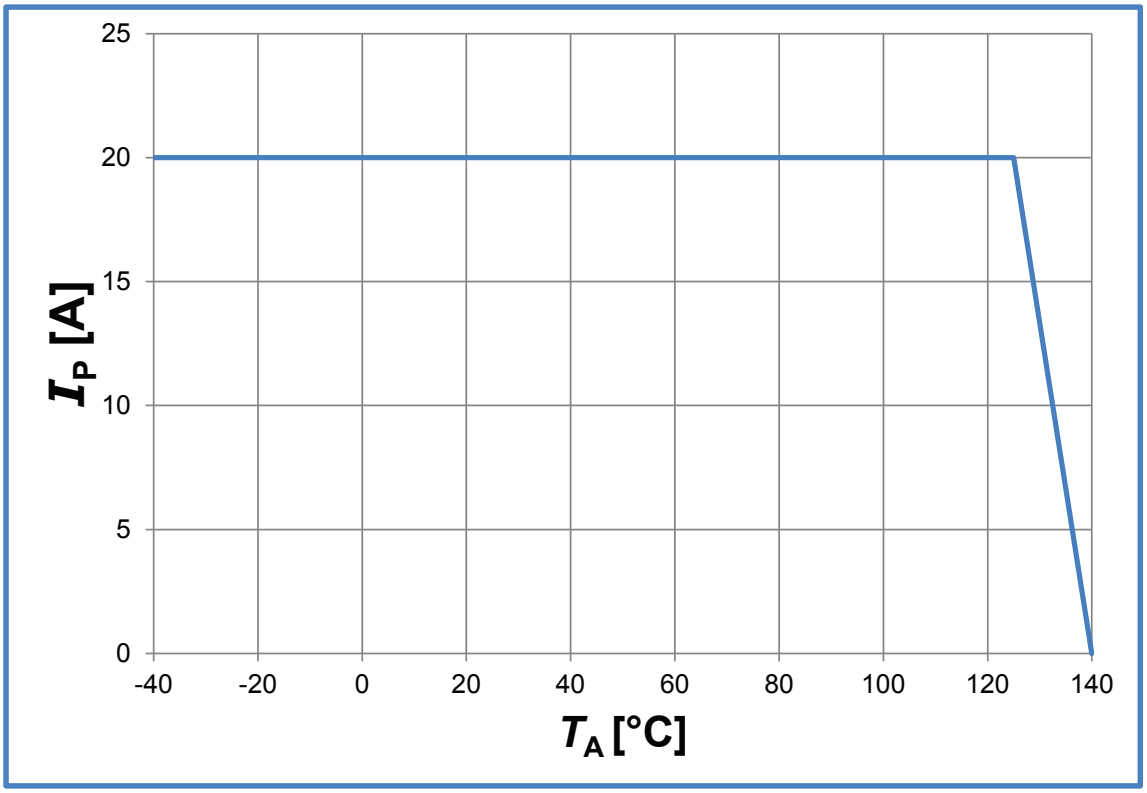
$$I_P = \left(\frac{5}{U_C} \times V_{out} - V_o\right) \times \frac{1}{G} \text{ with } G \text{ in (V/A)}$$

[2] Accuracy X at a given temperature (T_A > 25 °C) :

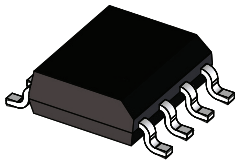
$$X_{TA} = (\varepsilon_L + \varepsilon_G) + \frac{TCV_{OE}}{I_{PN} \times G} + TCG \times 10^6) \times (T_A - 25) \times 100$$

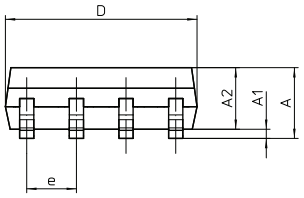
GHS-SMS series, maximum continuous DC current

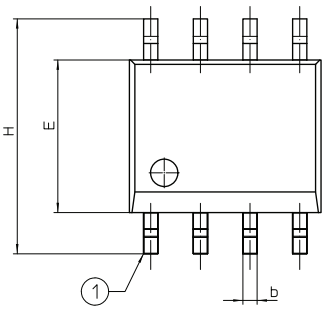
For all ranges

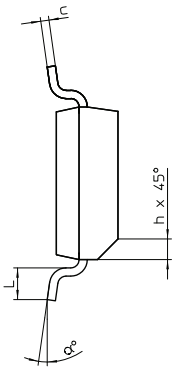


Dimensions GHS-SME series (in mm)









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°

Connection