

## Current transducer GHS-SME series

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

$$I_{PN} = 10 \dots 20 \text{ A}$$

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



RoHS



#### 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	$T_A = 25\text{ °C}$ , 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 $\mu$ s	$\hat{U}_W$	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 @ $T_A = 25\text{ °C}$	$R_P$	m $\Omega$		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 $\leq 100\text{ k}\Omega$ . 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	$R_L \leq 25\text{ k}\Omega$ , $T \leq 125\text{ }^\circ\text{C}$
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	$R_L \leq 25\text{ k}\Omega$ , $T \leq 125\text{ }^\circ\text{C}$
Overvoltage lockout hysteresis	$U_{OVLO\ HYST}$	V	0.05	0.1	0.7			

**Electrical data GHS 10-SME**

 At  $T_A = -40\text{ °C} \dots 125\text{ °C}$ ,  $U_C = +5\text{ V}$ ,  $R_L = 6\text{ k}\Omega$ .

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 <sup>1)</sup>	$U_C$	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 $\geq 10\text{ k}\Omega$ , pull up $\geq 10\text{ k}\Omega$
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 k $\Omega$ , 10 k $\Omega$ )
Output current limitation	$I_{SL}$	mA	35		180	Output shorted to $\pm U_C$ permanent
Output internal resistance	$R_{out}$	$\Omega$		1	5	$V_{out} = 50\% U_C$ , $R_L = 10\text{ k}\Omega$
Step response time to 90 % of $I_{PN}$	$t_r$	$\mu\text{s}$		5	6	
Frequency bandwidth (-3 dB), $T_A = 25\text{ °C}$	$BW$	kHz		100		
Output voltage noise (spectral density) rms	$e_{no}$	$\mu\text{V}/\sqrt{\text{Hz}}$		25		
Capacity loading	$C_L$	nF		10		Stability of the output
Load resistance	$R_L$	k $\Omega$	6		100	
Sensitivity	$G$	mV/A		80		
Offset voltage	$V_O$	V		2.5		$T_A = 25\text{ °C}$
Electrical offset voltage	$V_{OE}$	V	-0.005		0.005	$T_A = 25\text{ °C}$
Temperature coefficient of $V_{OE}$	$TCV_{OE}$	mV/K	-0.1		0.1	
Temperature coefficient of $G$	$TCG$	ppm/K	-150		150	
Linearity error	$\epsilon_L$	%	-0.25		0.25	@ $I_{PN}$
Sensitivity error	$\epsilon_G$	%	-1		1	Factory adjustment
Accuracy @ $I_{PN}$ <sup>2)</sup>	$X$	%	-1.25		1.25	$T_A = 25\text{ °C}$
Accuracy @ $I_{PN}$ @ $T_A = 105\text{ °C}$	$X$	%	-3.5		3.5	
Accuracy @ $I_{PN}$ @ $T_A = 125\text{ °C}$	$X$	%	-4		4	

**Electrical data GHS 12-SME**

 At  $T_A = -40\text{ °C} \dots 125\text{ °C}$ ,  $U_C = +5\text{ V}$ ,  $R_L = 6\text{ k}\Omega$ .

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 <sup>1)</sup>	$U_C$	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 $\geq 10\text{ k}\Omega$ , pull up $\geq 10\text{ k}\Omega$
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 k $\Omega$ , 10 k $\Omega$ )
Output current limitation	$I_{SL}$	mA	35		180	Output shorted to $\pm U_C$ permanent
Output internal resistance	$R_{out}$	$\Omega$		1	5	$V_{out} = 50\% U_C$ , $R_L = 10\text{ k}\Omega$
Step response time to 90 % of $I_{PN}$	$t_r$	$\mu\text{s}$		5	6	
Frequency bandwidth (-3 dB), $T_A = 25\text{ °C}$	$BW$	kHz		100		
Output voltage noise (spectral density) rms	$e_{no}$	$\mu\text{V}/\sqrt{\text{Hz}}$		20		
Capacity loading	$C_L$	nF		10		Stability of the output
Load resistance	$R_L$	k $\Omega$	6		100	
Sensitivity	$G$	mV/A		66.7		
Offset voltage	$V_O$	V		2.5		$T_A = 25\text{ °C}$
Electrical offset voltage	$V_{OE}$	V	-0.005		0.005	$T_A = 25\text{ °C}$
Temperature coefficient of $V_{OE}$	$TCV_{OE}$	mV/K	-0.1		0.1	
Temperature coefficient of $G$	$TCG$	ppm/K	-150		150	
Linearity error	$\varepsilon_L$	%	-0.25		0.25	@ $I_{PN}$
Sensitivity error	$\varepsilon_G$	%	-1		1	Factory adjustment
Accuracy @ $I_{PN}$ <sup>2)</sup>	$X$	%	-1.25		1.25	$T_A = 25\text{ °C}$
Accuracy @ $I_{PN}$ @ $T_A = 105\text{ °C}$	$X$	%	-3.5		3.5	
Accuracy @ $I_{PN}$ @ $T_A = 125\text{ °C}$	$X$	%	-4		4	

**Electrical data GHS 16-SME**

 At  $T_A = -40\text{ °C} \dots 125\text{ °C}$ ,  $U_C = +5\text{ V}$ ,  $R_L = 6\text{ k}\Omega$ .

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 <sup>1)</sup>	$U_C$	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 $\geq 10\text{ k}\Omega$ , pull up $\geq 10\text{ k}\Omega$
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 k $\Omega$ , 10 k $\Omega$ )
Output current limitation	$I_{SL}$	mA	35		180	Output shorted to $\pm U_C$ permanent
Output internal resistance	$R_{out}$	$\Omega$		1	5	$V_{out} = 50\% U_C$ , $R_L = 10\text{ k}\Omega$
Step response time to 90 % of $I_{PN}$	$t_r$	$\mu\text{s}$		5	6	
Frequency bandwidth (-3 dB), $T_A = 25\text{ °C}$	$BW$	kHz		100		
Output voltage noise (spectral density) rms	$e_{no}$	$\mu\text{V}/\sqrt{\text{Hz}}$		16		
Capacity loading	$C_L$	nF		10		Stability of the output
Load resistance	$R_L$	k $\Omega$	6		100	
Sensitivity	$G$	mV/A		50		
Offset voltage	$V_O$	V		2.5		$T_A = 25\text{ °C}$
Electrical offset voltage	$V_{OE}$	V	-0.005		0.005	$T_A = 25\text{ °C}$
Temperature coefficient of $V_{OE}$	$TCV_{OE}$	mV/K	-0.1		0.1	
Temperature coefficient of $G$	$TCG$	ppm/K	-150		150	
Linearity error	$\epsilon_L$	%	-0.25		0.25	@ $I_{PN}$
Sensitivity error	$\epsilon_G$	%	-1		1	Factory adjustment
Accuracy @ $I_{PN}$ <sup>2)</sup>	$X$	%	-1.25		1.25	$T_A = 25\text{ °C}$
Accuracy @ $I_{PN}$ @ $T_A = 105\text{ °C}$	$X$	%	-3.5		3.5	
Accuracy @ $I_{PN}$ @ $T_A = 125\text{ °C}$	$X$	%	-4		4	

**Electrical data GHS 20-SME**

 At  $T_A = -40\text{ °C} \dots 125\text{ °C}$ ,  $U_C = +5\text{ V}$ ,  $R_L = 6\text{ k}\Omega$ .

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 <sup>1)</sup>	$U_C$	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 $\geq 10\text{ k}\Omega$ , pull up $\geq 10\text{ k}\Omega$
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 k $\Omega$ , 10 k $\Omega$ )
Output current limitation	$I_{SL}$	mA	35		180	Output shorted to $\pm U_C$ permanent
Output internal resistance	$R_{out}$	$\Omega$		1	5	$V_{out} = 50\% U_C$ , $R_L = 10\text{ k}\Omega$
Step response time to 90 % of $I_{PN}$	$t_r$	$\mu\text{s}$		5	6	
Frequency bandwidth (-3 dB), $T_A = 25\text{ °C}$	$BW$	kHz		100		
Output voltage noise (spectral density) rms	$e_{no}$	$\mu\text{V}/\sqrt{\text{Hz}}$		12		
Capacity loading	$C_L$	nF		10		Stability of the output
Load resistance	$R_L$	k $\Omega$	6		100	
Sensitivity	$G$	mV/A		40		
Offset voltage	$V_O$	V		2.5		$T_A = 25\text{ °C}$
Electrical offset voltage	$V_{OE}$	V	-0.005		0.005	$T_A = 25\text{ °C}$
Temperature coefficient of $V_{OE}$	$TCV_{OE}$	mV/K	-0.1		0.1	
Temperature coefficient of $G$	$TCG$	ppm/K	-150		150	
Linearity error	$\epsilon_L$	%	-0.25		0.25	@ $I_{PN}$
Sensitivity error	$\epsilon_G$	%	-1		1	Factory adjustment
Accuracy @ $I_{PN}$ <sup>2)</sup>	$X$	%	-1.25		1.25	$T_A = 25\text{ °C}$
Accuracy @ $I_{PN}$ @ $T_A = 105\text{ °C}$	$X$	%	-3.5		3.5	
Accuracy @ $I_{PN}$ @ $T_A = 125\text{ °C}$	$X$	%	-4		4	

**Ratiometric mode**

At  $U_C \pm 10\%$

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
Ratiometry error Offset	$\epsilon_r V_o$	%	-0.4		0.4	$V_o = 50\% U_C$
Ratiometry error Sensitivity	$\epsilon_r G$	%	-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:

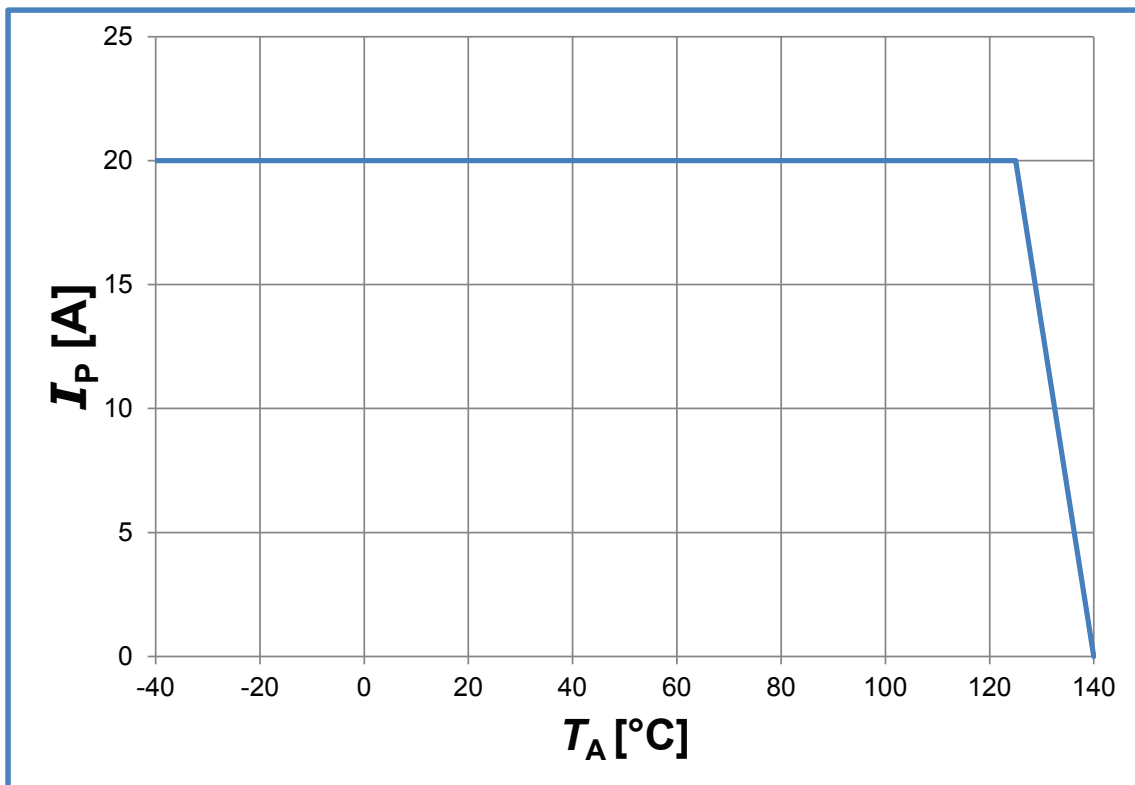
$$I_P = \left( \frac{5}{U_C} \times V_{out} - V_o \right) \times \frac{1}{G} \text{ with } G \text{ in (V/A)}$$

2) Accuracy  $X$  at a given temperature ( $T_A > 25\text{ }^\circ\text{C}$ ):

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

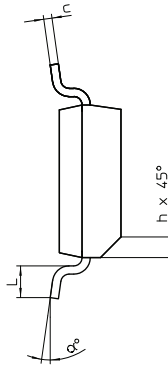
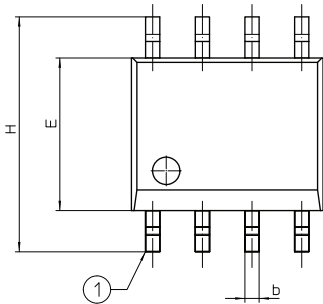
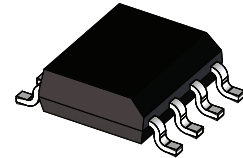
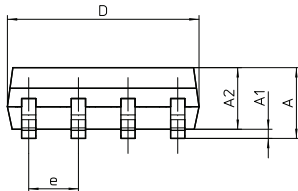
**GHS-SMS series, maximum continuous DC current**

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

