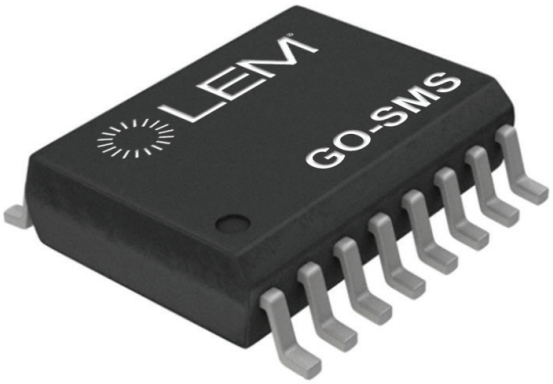
Current Transducer GO-SMS series

I_{PN} = 10 ... 30 A

Ref: GO 10-SMS, GO 20-SMS, GO 30-SMS

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

Provisional



Features

- Hall effect measuring principle
- Galvanic separation between primary and secondary circuit
- Insulated test voltage 3000 V RMS
- Low power consumption
- Extremely low profile
- Single power supply +5 V
- Double overcurrent detection
- Fixed offset & sensitivity
- Response time 2 µs.

Advantages

- Small size and space saving
- High immunity to external interference
- High insulation capability
- Low electrical resistance (0.75 mΩ)
- No magnetic hysteresis
- Robust against external fields and cross-talk.

Applications

- Small drives
- HVAC
- Appliances
- E-Bikes
- Solar.

Standards

- EN 61800-5-1
- IEC 62109-1
- IEC/UL 60950-1 (pending).

Application Domains

- Industrial.

Absolute maximum ratings

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Maximum supply voltage (not destructive)	$U_{C\ max}$	V			8	
Maximum supply voltage (not entering non-standard modes)					6.5	
Maximum overload capability	$\hat{I}_{P\ max}$	A			±200	T_A = 25 °C, 1 ms pulse
Maximum electrostatic discharge voltage (HMB-Human Body Model)	$U_{ESD\ HBM}$	V			2000	AEC-Q100-002 REV D
Maximum electrostatic discharge voltage (CDM-Charged Device Model)	$U_{ESD\ CDM}$	V			500	AEC-Q100-011 REV B
Maximum output current source	$I_{out\ max}$	mA			25	
Maximum output current sink	$I_{out\ max}$	mA			50	
Maximum junction temperature	$T_{J\ max}$	°C			165	

Insulation coordination

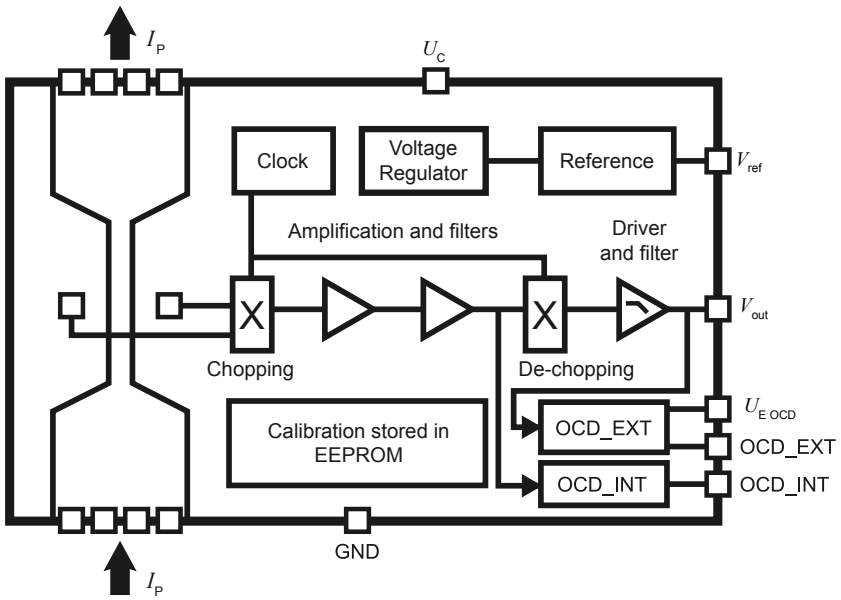
Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC insulation test, 50 Hz, 1 min	U_d	V	3000	
Impulse withstand voltage 1.2/50 µs	$\hat{U}_W$	V	4000	According to IEC 61800-5-1 , IEC 62109-1, UL 60950-1
Partial discharge RMS test voltage (q_m < 5 pC)	U_t	V	850	Primary/secondary Corresponds to a recurring peak voltage of 728 V peak-to-peak According to IEC 61800-5-1, IEC 62109-1
Clearance (pri. - sec.)	d_{Cl}	mm	7	Shortest distance through air
Creepage distance (pri. - sec.)	d_{Cp}			Shortest path along body
Comparative tracking index	CTI		< 600	Material group II
Application example		V	300 V RMS CAT III, PD2	Basic insulation according to IEC 61800-5-1, IEC 62109-1, UL 60950-1
Application example		V	515 V RMS/ 728 V peak-to peak CAT II, PD2	Basic insulation according to IEC 61800-5-1 IEC 62109-1, UL 60950-1

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		0.75		
Thermal resistance junction to board [1)]	$R_{th\ JB}$	°K/W		9		
Time constant	t	s		1		To reach steady state

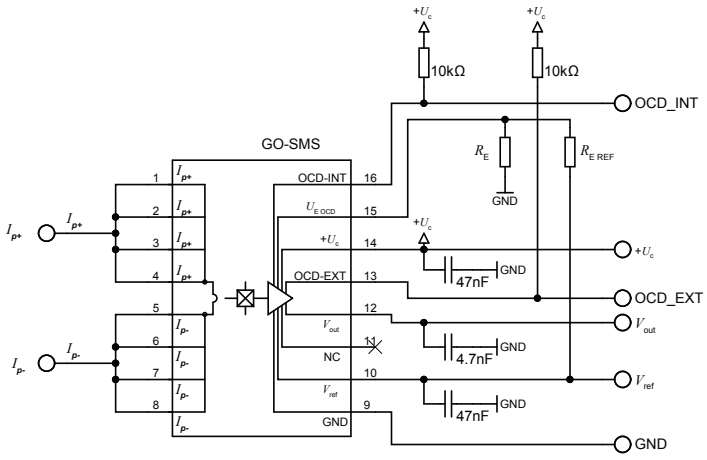
Note: [1)] Done on LEM evaluation board PCB2325.

Block diagram



Connection diagram

Pin#	Name	Function
From 1 to 4	I_{P+}	Input of the primary current
From 5 to 8	I_{P-}	Output of the primary current
9	GND	Ground
10	V_{ref}	Reference voltage (output)
11	NC	No connected pin, leave floating
12	V_{out}	Output voltage
13	OCD_EXT	Output of the external over current detection
14	U_C	Supply voltage
15	$U_{E\ OCD}$	Setting of the external over current detection
16	OCD_INT	Output of the internal over current detection, factory setting



Electrical data GO 10-SMS

At T_A = −40 °C … 125 °C, U_C = +5 V, R_L = 10 kΩ unless otherwise noted.

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	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA		20	26	
Reference voltage (output)	V_{ref}	V	2.48	2.5	2.52	@ 25 °C
Reference voltage (input)	V_{ref}	V	0.5		2.6	U_C = 5 V
Output voltage range @ I_{PM}	$V_{out} - V_{ref}$	V	−2		2	
Output internal resistance	R_{out}	Ω			5	Up to 10 kHz
Reference internal resistance	R_{ref}	Ω	120	200	333	
Load resistance	R_L	kΩ	5		100	
Capacitive loading	C_L	nF	0		6	
Theoretical sensitivity	G_{th}	mV/A		80		
Electrical offset voltage @ I_{PN} = 0	V_{OE}	mV	−5		5	T_A = 25 °C, $V_{out} - V_{ref}$ @ V_{ref} = 2.5 V
Electrical offset current referred to I_{PN}	I_{OE}	mA	−62.5		62.5	T_A = 25 °C
Temperature coefficient of V_{ref}	TCV_{ref}	ppm/K	−150		150	V_{ref} = 2.5 V
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	−0.075		0.075	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−0.94		0.94	
Temperature coefficient of G	TCG	ppm/K	−150		150	
Step response time to 90 % of I_{PN}	t_r	µs			2	
Reaction time @ 10 % of I_{PN}	t_{ra}	µs			1.5	
Frequency bandwidth −3 dB, T_A = 25 °C	BW	KHz		300		
Output noise voltage spectral density	e_{no}	µV/Hz$^{1/2}$		13.5		NBW = 1 kHz … 100 kHz
Internal overcurrent detection (OCD) threshold	$I_{I\,OCD}$	A		2.93 × I_{PN}		Factory setting EEPROM
Internal OCD threshold error	$\varepsilon_{I\,OCD}$	%	−8		8	of peak value
Internal OCD output on resistance	$R_{on\,I\,OCD}$	Ω	70	95	100	open drain output, active low
Internal OCD output hold time	$t_{hold\,I\,OCD}$	µs	7	10	14	
Internal OCD response time	$t_{r\,I\,OCD}$	µs	1.4		2.1	
Sensitivity error	ε_G	%	−1		1	Factory adjustment
Linearity error 0 … I_{PN}	ε_L	%	−0.3		0.3	
Linearity error 0 … I_{PM}	ε_L	%	−0.6		0.6	
Measurement error @ I_{PN}	ε	%	−1.3		1.3	T_A = 25 °C
Measurement error @ I_{PN} @ T_A = 85 °C [1)]	ε	%	−2.76		2.76	
Measurement error @ I_{PN} @ T_A = 105 °C	ε	%	−3.25		3.25	
Measurement error @ I_{PN} @ T_A = 125 °C	ε	%	−3.74		3.74	

Electrical data GO 20-SMS

At T_A = −40 °C … 125 °C, U_C = +5 V, R_L = 10 kΩ unless otherwise noted.

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	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA		20	26	
Reference voltage (output)	V_{ref}	V	2.48	2.5	2.52	@ 25 °C
Reference voltage (input)	V_{ref}	V	0.5		2.6	U_C = 5 V
Output voltage range @ I_{PM}	$V_{out} - V_{ref}$	V	−2		2	
Output internal resistance	R_{out}	Ω			5	Up to 10 kHz
Reference internal resistance	R_{ref}	Ω	120	200	333	
Load resistance	R_L	kΩ	5		100	
Capacitive loading	C_L	nF	0		6	
Theoretical sensitivity	G_{th}	mV/A		40		
Electrical offset voltage @ I_{PN} = 0	V_{OE}	mV	−5		5	T_A = 25 °C, $V_{out} - V_{ref}$ @ V_{ref} = 2.5 V
Electrical offset current referred to I_{PN}	I_{OE}	mA	−62.5		62.5	T_A = 25 °C
Temperature coefficient of V_{ref}	TCV_{ref}	ppm/K	−150		150	V_{ref} = 2.5 V
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	−0.075		0.075	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−1.88		1.88	
Temperature coefficient of G	TCG	ppm/K	−150		150	
Step response time to 90 % of I_{PN}	t_r	µs			2	
Reaction time @ 10 % of I_{PN}	t_{ra}	µs			1.5	
Frequency bandwidth −3 dB, T_A = 25 °C	BW	KHz		300		
Output noise voltage spectral density	e_{no}	µV/Hz$^{1/2}$		7		NBW = 1 kHz … 100 kHz
Internal overcurrent detection (OCD) threshold	$I_{I\,OCD}$	A		2.93 × I_{PN}		Factory setting EEPROM
Internal OCD threshold error	$\varepsilon_{I\,OCD}$	%	−8		8	of peak value
Internal OCD output on resistance	$R_{on\,I\,OCD}$	Ω	70	95	100	open drain output, active low
Internal OCD output hold time	$t_{hold\,I\,OCD}$	µs	7	10	14	
Internal OCD response time	$t_{r\,I\,OCD}$	µs	1.4		2.1	
Sensitivity error	ε_G	%	−1		1	Factory adjustment
Linearity error 0 … I_{PN}	ε_L	%	−0.3		0.3	
Linearity error 0 … I_{PN}	ε_L	%	−0.6		0.6	
Measurement error @ I_{PN}	ε	%	−1.3		1.3	T_A = 25 °C
Measurement error @ I_{PN} @ T_A = 85 °C [1)]	ε	%	−2.76		2.76	
Measurement error @ I_{PN} @ T_A = 105 °C	ε	%	−3.25		3.25	
Measurement error @ I_{PN} @ T_A = 125 °C	ε	%	−3.74		3.74	

Electrical data GO 30-SMS

At T_A = −40 °C … 125 °C, U_C = +5 V, R_L = 10 kΩ unless otherwise noted.

Parameter	Symbol	Unit	Min	Typ	Max	Conditions
Primary nominal RMS current	I_{PN}	A		30		
Primary current, measuring range	I_{PM}	A	−75		75	
Supply voltage	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA		20	26	
Reference voltage (output)	V_{ref}	V	2.48	2.5	2.52	@ 25 °C
Reference voltage (input)	V_{ref}	V	0.5		2.6	U_C = 5 V
Output voltage range @ I_{PM}	$V_{out} - V_{ref}$	V	−2		2	
Output internal resistance	R_{out}	Ω			5	Up to 10 kHz
Reference internal resistance	R_{ref}	Ω	120	200	333	
Load resistance	R_L	kΩ	5		100	
Capacitive loading	C_L	nF	0		6	
Theoretical sensitivity	G_{th}	mV/A		26.7		
Electrical offset voltage @ I_{PN} = 0	V_{OE}	mV	−5		5	T_A = 25 °C, $V_{out} - V_{ref}$ @ V_{ref} = 2.5 V
Electrical offset current referred to I_{PN}	I_{OE}	mA	−100		100	T_A = 25 °C
Temperature coefficient of V_{ref}	TCV_{ref}	ppm/K	−150		150	V_{ref} = 1.65 V
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	−0.075		0.075	
Temperature coefficient of I_{OE}	TCI_{OE}	mA/K	−2.8		2.8	
Temperature coefficient of G	TCG	ppm/K	−150		150	
Step response time to 90 % of I_{PN}	t_r	µs			2	
Reaction time @ 10 % of I_{PN}	t_{ra}	µs			1.5	
Frequency bandwidth −3 dB, T_A = 25 °C	BW	KHz		300		
Output noise voltage spectral density	e_{no}	µV/Hz$^{1/2}$		5		NBW = 1 kHz … 100 kHz
Overcurrent detect (INT)	$\hat{I}_{OCD\ INT}$	A		2.93 × I_{PN}		Factory setting EEPROM
OCD accuracy (INT)	$X_{OCD\ INT}$	%	−8		8	of peak value
OCD output: on resistance (INT)	$R_{on\ INT}$	Ω	70	95	100	open drain output, active low
OCD output: Hold time (INT)	$t_{hold\ INT}$	µs	7	10	14	
OCD: response time (INT)	$t_{r\ OCD\ INT}$	µs	1.4		2.1	
Sensitivity error	ε_G	%	−1		1	Factory adjustment
Linearity error 0 … I_{PN}	ε_L	%	−0.3		0.3	
Linearity error 0 … I_{PN}	ε_L	%	−0.6		0.6	
Accuracy @ I_{PN}	X	%	−1.3		1.3	T_A = 25 °C
Accuracy @ I_{PN} @ T_A = 85 °C [1]	X	%	−2.76		2.76	
Accuracy @ I_{PN} @ T_A = 105 °C	X	%	−3.25		3.25	
Accuracy @ I_{PN} @ T_A = 125 °C	X	%	−3.74		3.74	

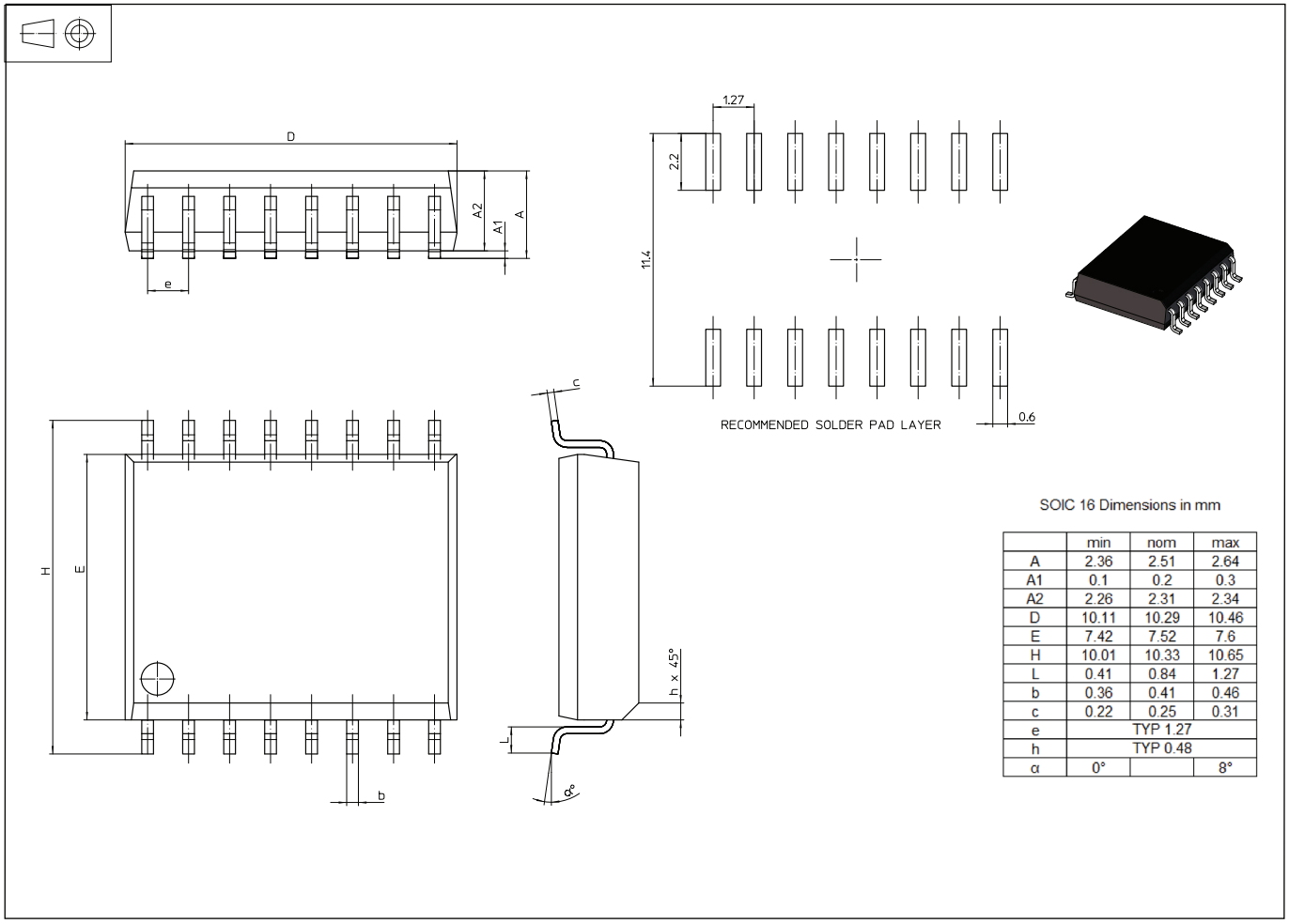
Note: [1] Accuracy X:

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

External overcurrent detection

Parameter	Symbol	Unit	Specification			Conditions
			Min	Typical	Max	
External OCD voltage	$U_{E\ OCD}$	V	0.3		2	
External OCD output on resistance to ground	$R_{on\ E\ OCD}$	Ω	35	200	300	
External OCD response time	$t_{r\ E\ OCD}$	µs		10		To be added to the sensor response time
External OCD output hold time	$t_{hold\ E\ OCD}$	µs		10		
Internal OCD threshold error	$\varepsilon_{\ I\ OCD}$	%		±5		Switch point error between V_{out} and $U_{E\ OCD}$

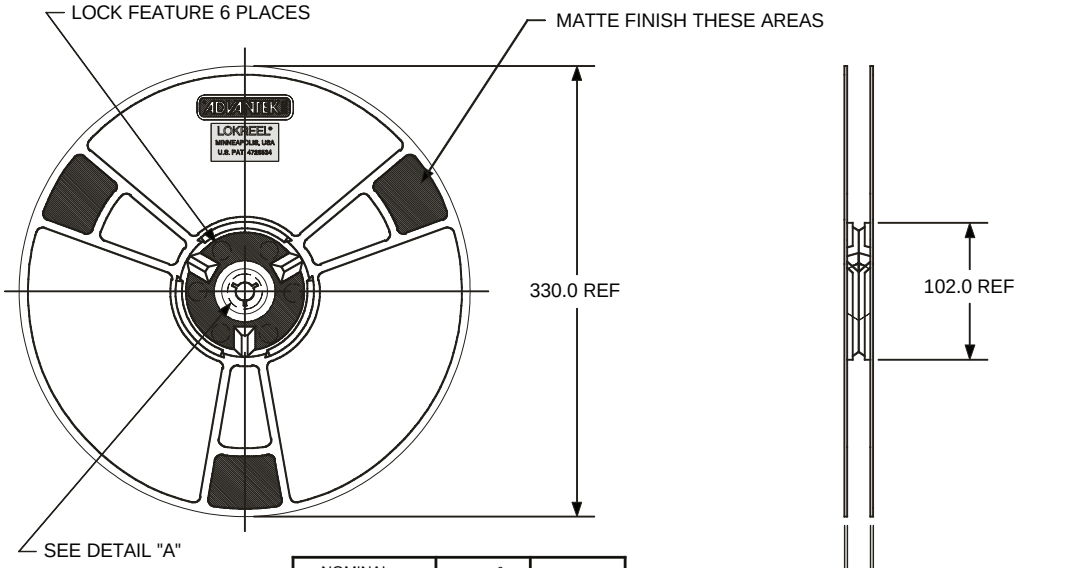
Dimensions (in mm)



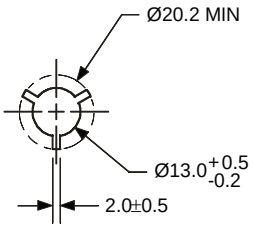
SOIC 16 Dimensions in mm

	min	nom	max
A	2.36	2.51	2.64
A1	0.1	0.2	0.3
A2	2.26	2.31	2.34
D	10.11	10.29	10.46
E	7.42	7.52	7.6
H	10.01	10.33	10.65
L	0.41	0.84	1.27
b	0.36	0.41	0.46
c	0.22	0.25	0.31
e	TYP 1.27		
h	TYP 0.48		
α	0°		8°

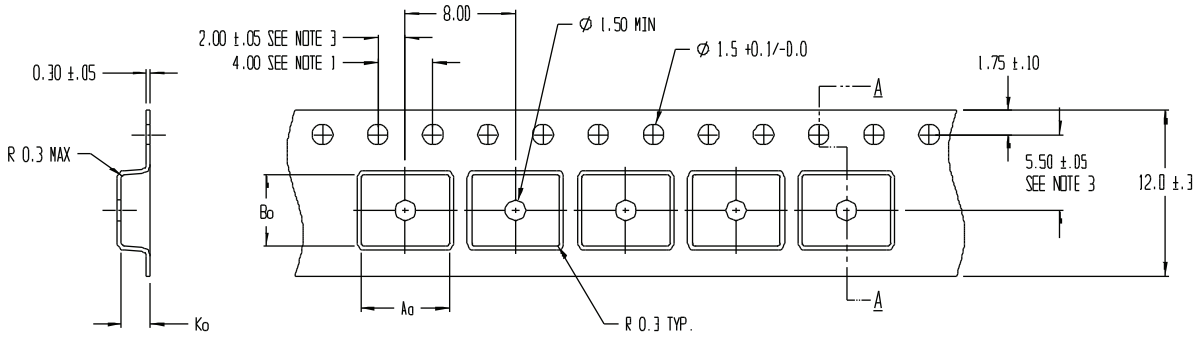
Tape and reel dimensions (in mm)



NOMINAL HUB WIDTH	W_1 $^{+.6}_{-.4}$	W_2 MAX
8mm	8.8	14.2
12mm	12.8	18.2
16mm	16.8	22.2
24mm	24.8	30.2
32mm	32.8	38.2
44mm	44.8	50.2
56mm	56.8	62.2



DETAIL "A"



SECTION A - A

Notes:
1) 10 Sprocket hole pitch cumulative tolerance ±0.2 mm
2) Camber in compliance with EIA 481
3) Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Soldering requirements

MSL3, 260 °C - IPC/JEDEC J-STD-020

Ordering information

Item number	Description	Package type	Package quantity
G2.07.13.000.0	GO 10-SMS	Reel	1500
G2.07.13.100.0	GO 10-SMS KIT 5P	Blister	5
G2.07.13.300.0	GO 10-SMS SET OF 50 PCS	SMD Bag	50
G2.07.17.000.0	GO 20-SMS	Reel	1500
G2.07.17.100.0	GO 20-SMS KIT 5P	Blister	5
G2.07.17.300.0	GO 20-SMS SET OF 50 PCS	SMD Bag	50
G2.07.20.000.0	GO 30-SMS	Reel	1500
G2.07.20.100.0	GO 30-SMS KIT 5P	Blister	5
G2.07.20.300.0	GO 30-SMS SET OF 50 PCS	SMD Bag	50