

Microcircuit IL9200AN, IL9200AD
(FUNCTIONAL EQUIVALENT OF HT9200A HOLTEK)

is generator DTMF of signals. The IC is purposed for formation standard DTMF the signals used for frequency coding of dialed number. It is used in telecom systems, consumer electronic devices.

Performed function – generation of standard DTMF signals and component frequencies. It is recommended to use ILA9170, ILA9270 for decoding of DTMF signals generated by IC IL9200A.

The microcircuit is available in 8-pin DIP-case MS-001BA and SO-case MS-012AA.

Features:

- Supply voltage U_{cc} from 2,0 to 5,5 V;
- Serial mode of data input;
- Clock frequency 3,58 MHz;
- Low standby current consumption;
- Internal timer for writing;
- Low total harmonic distortion ;
- Operating temperature from -20 to 75 °C

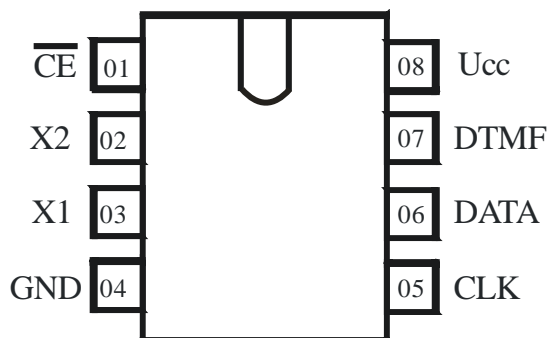
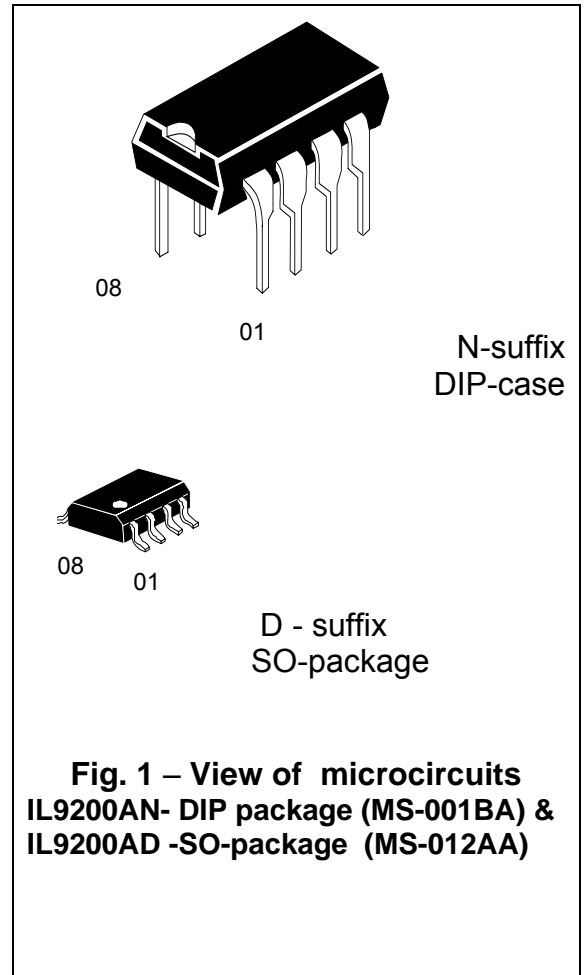


Fig. 2 – Pin assignment diagram

Table1 - Pin Description

Pin Number	Pin Name (Symbol)	Description
01	CE	Chip select (active low)
02	X2	Oscillator output
03	X1	Oscillator input
04	GND	Common pin
05	CLK	Clock input for serial mode
06	DATA	Data input for serial mode
07	DTMF	Output of the DTMF signal
08	Ucc	Voltage supply pin

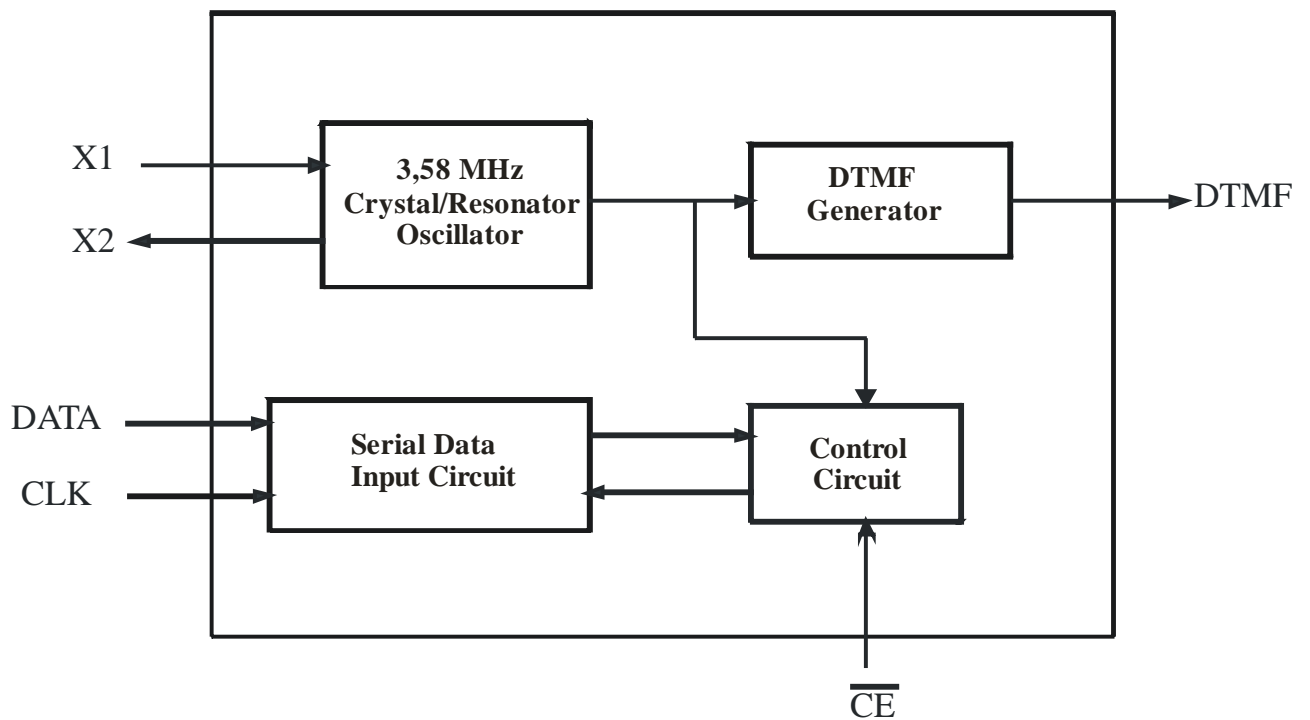


Fig. 3 –Block diagram

Table 2 –Absolute maximum ratings

Symbol	Parameter	Norm		Unit
		Min.	Max.	
U_{CC}	Supply voltage	- 0,3	6,0	V
U_{IL}	Low level input voltage	- 0,3	–	V
U_{IH}	High level input voltage	–	$U_{CC} + 0,3$	V
T_{STG}	Storage temperature	-50	125	°C

Table 3 – Recommended modes

Symbol	Parameter	Norm		Unit
		Min.	Max.	
U_{CC}	Supply voltage	2,0	5,5	V
U_{IL}	Low level input voltage	0	$0,2U_{CC}$	V
U_{IH}	High level input voltage	$0,8U_{CC}$	U_{CC}	V
f_{CLK}	Clock frequency (serial mode)	–	500	kHz
T_a	Operating temperature a	-20	-75	°C



Table 4 Electric parameters

Symbol	Parameter	Test mode	Norm		Unit	Amb. Temperature °C
			Min	Max		
I _{STB}	Stand-by consumption current	U _{CE} = U _{CC} U _{CC} = 2,5 V (no load)	–	1,0	µA	25±10; –20; 75
		U _{CC} = 5,0 V (no load)		2,0		
I _{CC}	Consumption current	U _{CE} = 0 V U _{CC} = 2,5 V (no load)	–	2500	µA	
		U _{CC} = 5,0 V (no load)		3000		
I _{TOL}	DTMF signal current	U _{CC} = 2,5 V U _{DTMF} = 0,5 V	0,1	–	mA	
U _{TAC}	DTMF output AC Level	U _{CC} = 2,5 V Row group R _L = 5 kΩ	<u>0,12</u> 0,1	<u>0,18</u> 0,17	V	<u>25±10</u> –20; 75
U _{TDC}	DTMF output DC level	U _{CC} = 2,0 – 5,5 V	0,45U _{CC}	0,75U _{CC}	V	25±10; –20; 75
A _{CR}	Column pre-emphasis,	U _{CC} = 2,5 V Row group signal level 0 dB	1,0	3,0	dB	
t _{HD}	Tone signal distortion	U _{CC} = 2,5 V R _L = 5 kΩ	–	<u>–23</u> –21	dB	<u>25±10</u> –20; 75
t _{UP} *	Oscillator start time	U _{CC} = 5,0 V f _{OSC} ** from 3,5759 to 3,5831 MHz	–	10	ms	25±10; –20; 75

* t_{UP} –time from CE signal fall (level 0,5) before oscillator provide operating frequency

$$3,5759 \text{ MHz} \leq f_{\text{OSC}} \leq 3,5831 \text{ MHz}$$

** f_{OSC} – clock frequency



Functionality of the microcircuit

Two signals are applied: 5 bits digital code to serial data input DATA and clock signal to CLK input to form DTMF signals, corresponding to applied code.

Time diagram of the microcircuit operation is displayed on fig. 4.

5-bit data codes, applied to microcircuit, and DTMF signals corresponding to these codes, and also applied codes and frequencies, composing DTMF signal, are indicated in table 5.

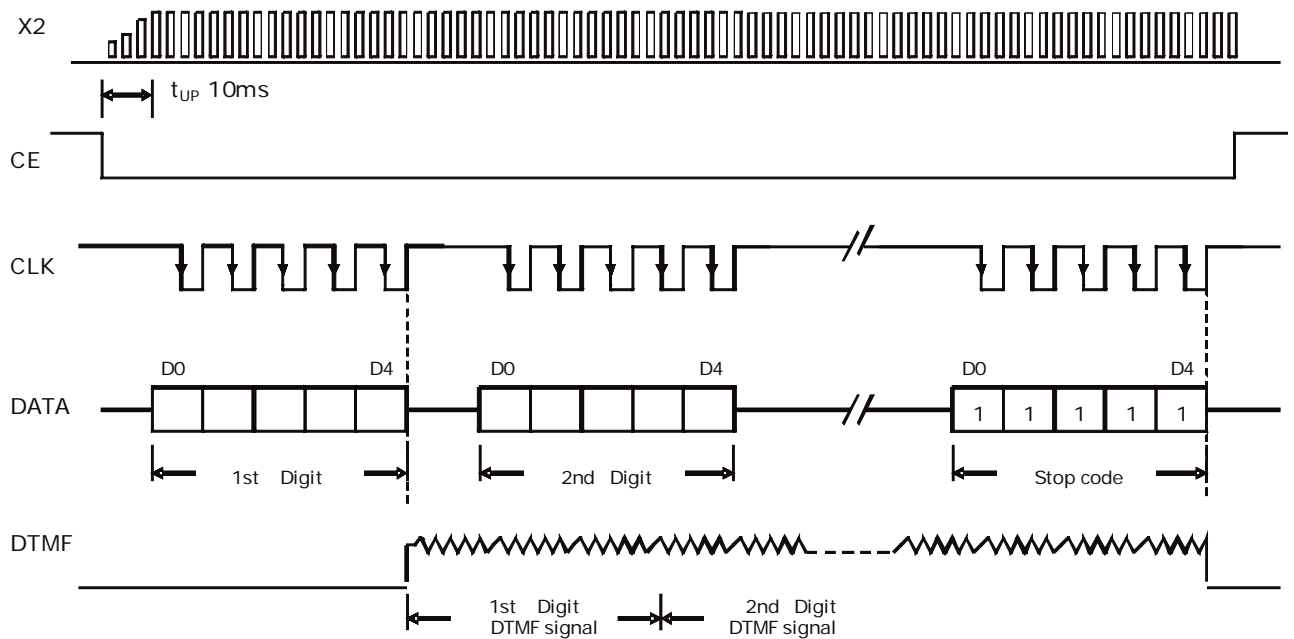


Fig. 4 – Operation time diagram

Table 5 – Digits, serial input codes and corresponding tone output frequencies

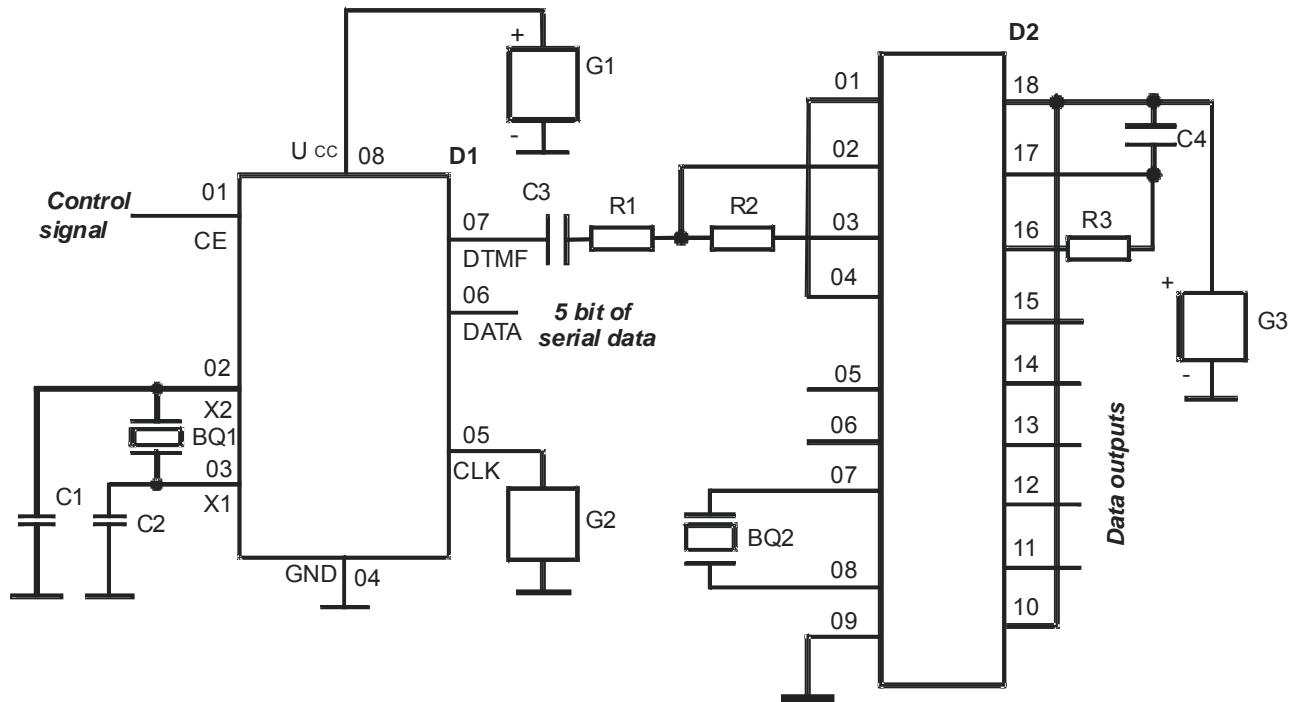
Digit	Codes of checked digits					Tone output frequency (Hz)
	D4	D3	D2	D1	D0	
1	0	0	0	0	1	697+1209
2	0	0	0	1	0	697+1336
3	0	0	0	1	1	697+1477
4	0	0	1	0	0	770+1209
5	0	0	1	0	1	770+1336
6	0	0	1	1	0	770+1477
7	0	0	1	1	1	852+1209
8	0	1	0	0	0	852+1336
9	0	1	0	0	1	852+1477
0	0	1	0	1	0	941+1336
*	0	1	0	1	1	941+1209
#	0	1	1	0	0	941+1477
A	0	1	1	0	1	697+1633
B	0	1	1	1	0	770+1633
C	0	1	1	1	1	852+1633
D	0	0	0	0	0	941+1633
–	1	0	0	0	0	697
–	1	0	0	0	1	770
–	1	0	0	1	0	852
–	1	0	0	1	1	941
–	1	0	1	0	0	1209
–	1	0	1	0	1	1336
–	1	0	1	1	0	1477
–	1	0	1	1	1	1633
DTMF OFF	1	1	1	1	1	–

Reference data

Microcircuits are steady against a static electricity with potential up to 1000 V

Latch current has to be not less than 150 mA in normal conditions at $U_{CC}=5,5V$.

Tone signal distortion - not more a minus than 23 dB is provided at output DTMF signal load not less than 5 kΩ



BQ1, BQ2 – quartz resonator $f = 3,5759 \dots 3,5831$ MHz

C1, C2 – capacitors $C = 20 \text{ pF} \pm 10 \%$

C3, C4 – capacitors $C = 0,1 \text{ } \mu\text{F} \pm 10 \%$

D1 – microcircuit IL9200AN, IL9200AD

D2 – microcircuit IL9270 (IL9170)

G1, G3 – supply voltage sources $U_{cc} = 5,0 \text{ V}$

G2 – positive polarity rectangular pulse generator with CLK parameters:

- frequency $500 \text{ k}\Gamma\mu\text{s}$;
- off-duty factor $Q \geq 2$;
- amplitude from $U_{IL} = 0,2U_{CC}$ to $U_{IH} = 0,8U_{CC}$

R1, R2 – resistors $R = 100 \text{ k}\Omega \pm 5\%$

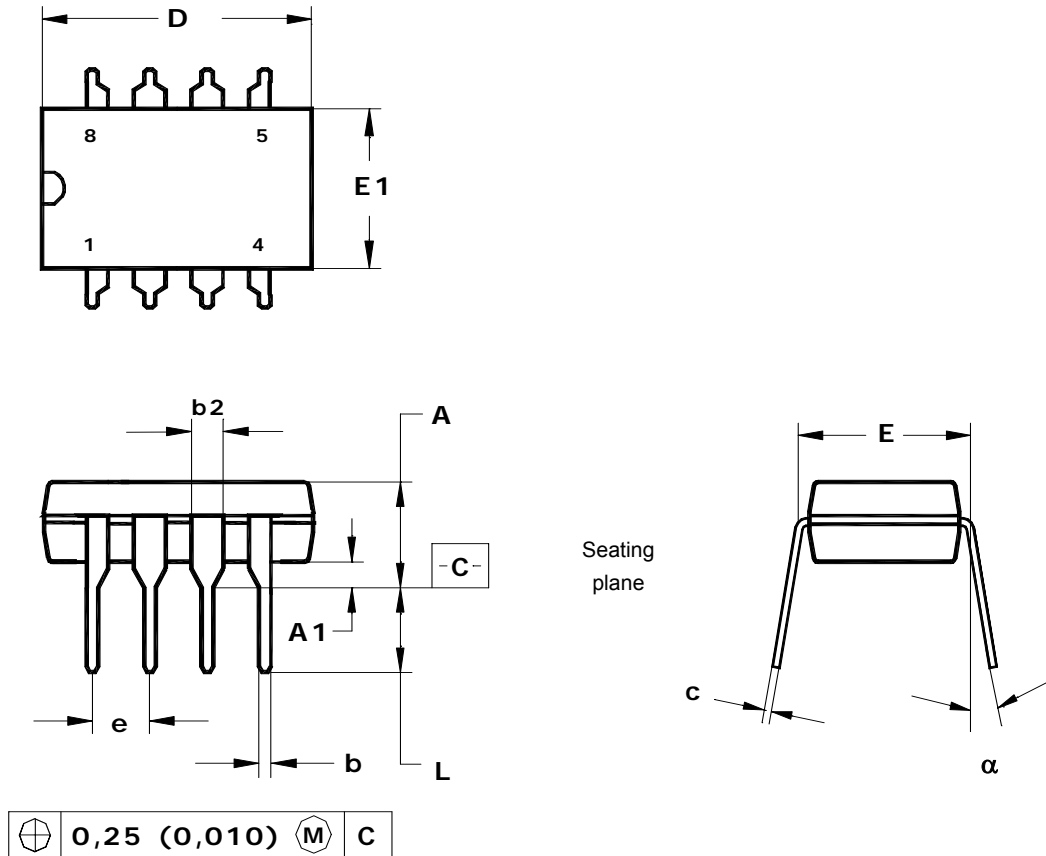
R3 – resistor $R = 390 \text{ k}\Omega \pm 5\%$

Code formed on output Q1 – Q4 (pin 11 – 14) of microcircuit IL9270 (IL9170) corresponds to input DTMF signal, formed by microcircuit IL9200A. Codes, applied to microcircuit IL9200A, and output codes of microcircuit IL9270 (IL9170) have to concur.

Fig. 5 – Application diagram

Package dimensions

N SUFFIX PLASTIC DIP
(MS-001BA)

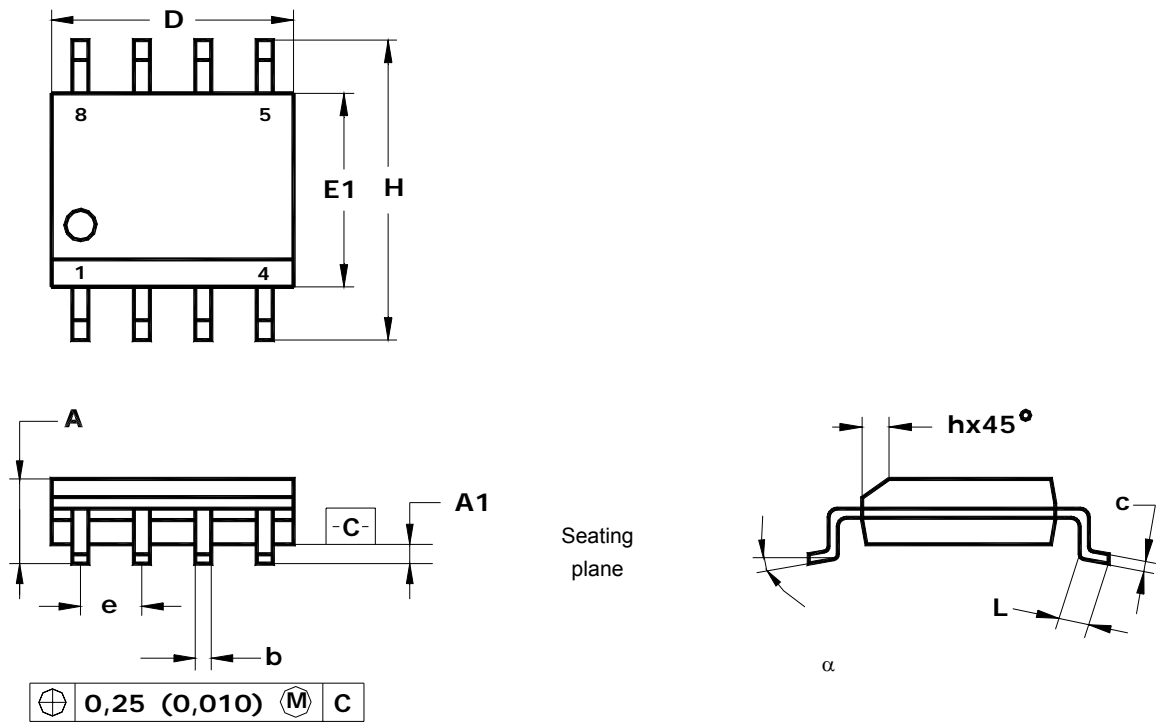


Note – The sizes D, E1 do not include size of the spew which should not be more 0,25 (0,010) on the side.

	D	E1	A	b	b2	e	α	L	E	c	A1
mm											
min	9.02	6.07	—	0.36	1.14		0°	2.93	7.62	0.20	0.38
max	10.16	7.11	5.33	0.56	1.78	2.54	15°	3.81	8.26	0.36	—
inches											
min	0.355	0.240	—	0.014	0.045		0°	0.115	0.300	0.008	0.015
max	0.400	0.280	0.210	0.022	0.070	0.1	15°	0.150	0.325	0.014	—

Fig. 6 – DIP-packade (MS-001BA) dimensions

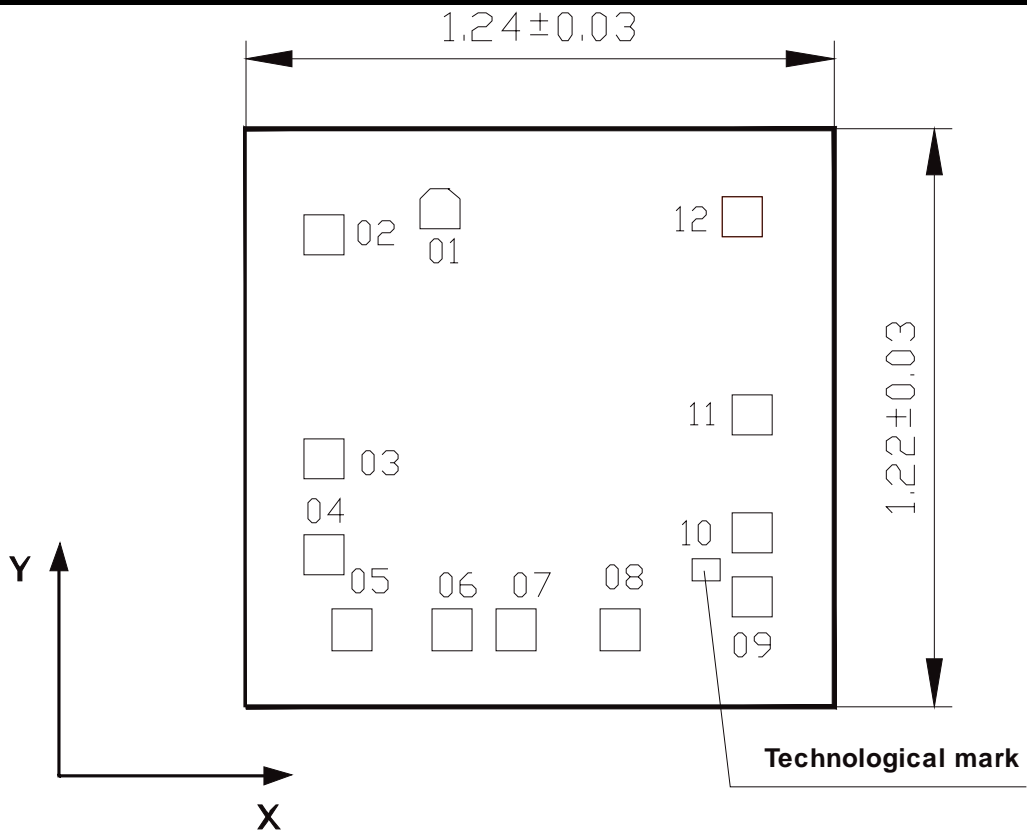
**D SUFFIX PLASTIC SOP
(MS-012AA)**



Note – The sizes D, E1 do not include size of the spew which should not be more 0,25 (0,010) on the side.

	D	E1	H	b	e	α	A	A1	c	L	h
mm											
min	4.80	3.80	5.80	0.33		0°	1.35	0.10	0.19	0.41	0.25
max	5.00	4.00	6.20	0.51	1.27	8°	1.75	0.25	0.25	1.27	0.50
inches											
min	0.189	0.1497	0.228	0.013		0°	0.053	0.004	0.007	0.016	0.009
	0		4				2	0	5		9
max	0.196	0.1574	0.244	0.020	0.100	8°	0.068	0.009	0.009	0.050	0.019
	8		0				8	0	8		6

Fig. 7 – SO- package (MS-012AA) dimensions



Technological mark IL9200 coordinates (mm): left bottom corner $x = 0,94215$, $y = 0,2667$.
 Chip thickness $0,46 \pm 0,02$ mm.

Contact pad number	Coordinates (left bottom corner) mm	
	X	Y
01	0.36740	1.00815
02	0.12560	0.95300
03	0.12560	0.48165
04	0.12560	0.27925
05	0.18440	0.12060
06	0.39490	0.12060
07	0.52935	0.12060
08	0.74630	0.12060
09	1.02560	0.18940
10	1.02560	0.32385
11	1.02560	0.57410
12	1.00660	0.99140

Note – Contact pad dimensions 0.085 x 0.085 mm and coordinates are indicated under “passivation” layer

Fig 8 – Contact pad layout and coordinates