MP34DT02

MEMS audio sensor omnidirectional digital microphone

HCLGA (3 x 4 x 1.06) mm 4LD
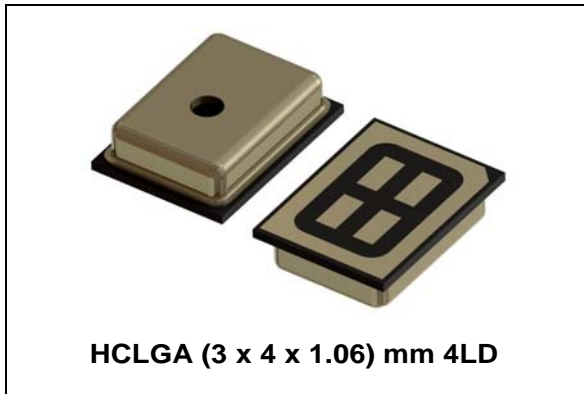
- Speech recognition
- A/V eLearning devices
- Gaming and virtual reality input devices
- Digital still and video cameras
- Antitheft systems

Description

The MP34DT02 is an ultra-compact, low-power, omnidirectional, digital MEMS microphone built with a capacitive sensing element and an IC interface.

The sensing element, capable of detecting acoustic waves, is manufactured using a specialized silicon micromachining process dedicated to produce audio sensors.

The IC interface is manufactured using a CMOS process that allows designing a dedicated circuit able to provide a digital signal externally in PDM format.

The MP34DT02 has an acoustic overload point of 120 dBSPL with a 60 dB signal-to-noise ratio and −26 dBFS sensitivity.

The MP34DT02 is available in a top-port, SMD-compliant, EMI-shielded package and is guaranteed to operate over an extended temperature range from -40 °C to +85 °C.

Features

- Single supply voltage
- Low power consumption
- 120 dBSPL acoustic overload point
- 60 dB signal-to-noise ratio
- Omnidirectional sensitivity
- −26 dBFS sensitivity
- PDM output
- HCLGA package
  - Top-port design
  - SMD-compliant
  - EMI-shielded
  - ECOPACK®, RoHS, and "Green" compliant

Applications

- Mobile terminals
- Laptop and notebook computers
- Portable media players
- VoIP

Table 1. Device summary

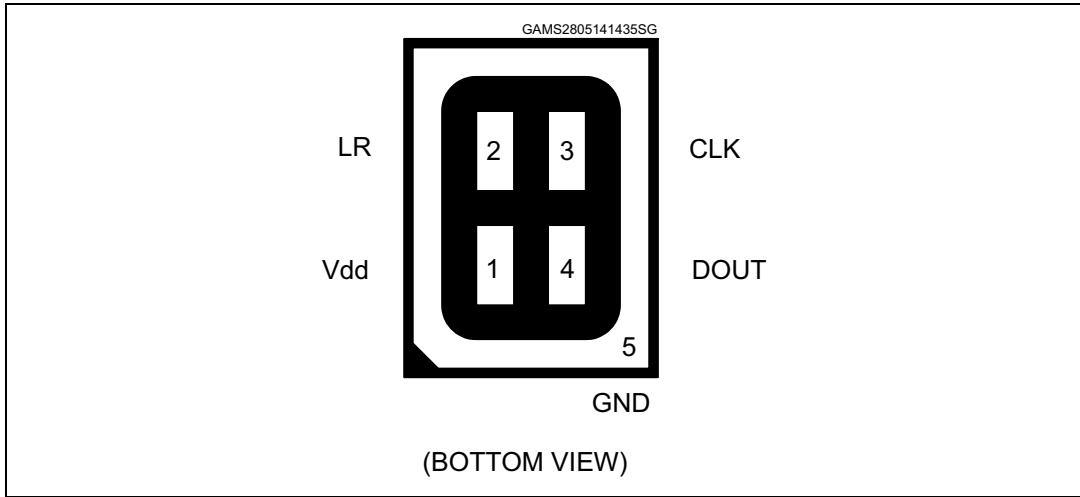| Part number	Temperature range [°C]	Package	Packing
MP34DT02	-40 to +85	HCLGA (3 x 4 x 1.06) mm 4LD	Tray
MP34DT02TR	-40 to +85	HCLGA (3 x 4 x 1.06) mm 4LD	Tape and reel

Contents

1 Pin description

Figure 1. Pin connections

(BOTTOM VIEW)

Table 2. Pin description

Pin n°	Pin name	Function
1	Vdd	Power supply
2	LR	Left/Right channel selection
3	CLK	Synchronization input clock
4	DOUT	Left/Right PDM data output
5 (ground ring)	GND	0 V supply

2 Acoustic and electrical specifications

2.1 Acoustic and electrical characteristics

The values listed in the table below are specified for Vdd = 1.8 V, Clock = 2.4 MHz,
T = 25 °C, unless otherwise noted.

Table 3. Acoustic and electrical characteristics

Symbol	Parameter	Test condition	Min.	Typ.[1]	Max.	Unit
Vdd	Supply voltage		1.64	1.8	3.6	V
Idd	Current consumption in normal mode	Mean value		0.6		mA
IddPdn	Current consumption in power-down mode[2]			20		µA
Scc	Short-circuit current		1		10	mA
AOP	Acoustic overload point			120		dBSPL
So	Sensitivity		-27	-26	-25	dBFS
SNR	Signal-to-noise ratio	A-weighted at 1 kHz, 1 Pa		60		dB
PSR	Power supply rejection	Guaranteed by design		-70		dBFS
Clock	Input clock frequency[3]		1	2.4	3.25	MHz
Ton	Turn-on time [4]	Guaranteed by design			10	ms
Top	Operating temperature range		-40		+85	°C
V_{IOL}	Low level logic input/output voltage	I_{out} = 1 mA	-0.3		0.35xVdd	V
V_{IOH}	High level logic input/output voltage	I_{out} = 1 mA	0.65xVdd		Vdd+0.3	V

1. Typical specifications are not guaranteed.

2. Input clock in static mode.

3. Duty cycle: min = 40% max = 60%.

4. Time from the first clock edge to valid output data.

2.2 Timing characteristics

Table 4. Timing characteristics

Parameter	Description	Min	Max	Unit
f_{CLK}	Clock frequency for normal mode	1	3.25	MHz
f_{PD}	Clock frequency for power-down mode		0.23	MHz
T_{CLK}	Clock period for normal mode	308	1000	ns
$T_{R,EN}$	Data enabled on DATA line, L/R pin = 1	18[1]		ns
$T_{R,DIS}$	Data disabled on DATA line, L/R pin = 1		16[1]	ns
$T_{L,EN}$	Data enabled on DATA line, L/R pin = 0	18[1]		ns
$T_{L,DIS}$	Data disabled on DATA line, L/R pin = 0		16[1]	ns

1. From design simulations

Figure 2. Timing waveforms
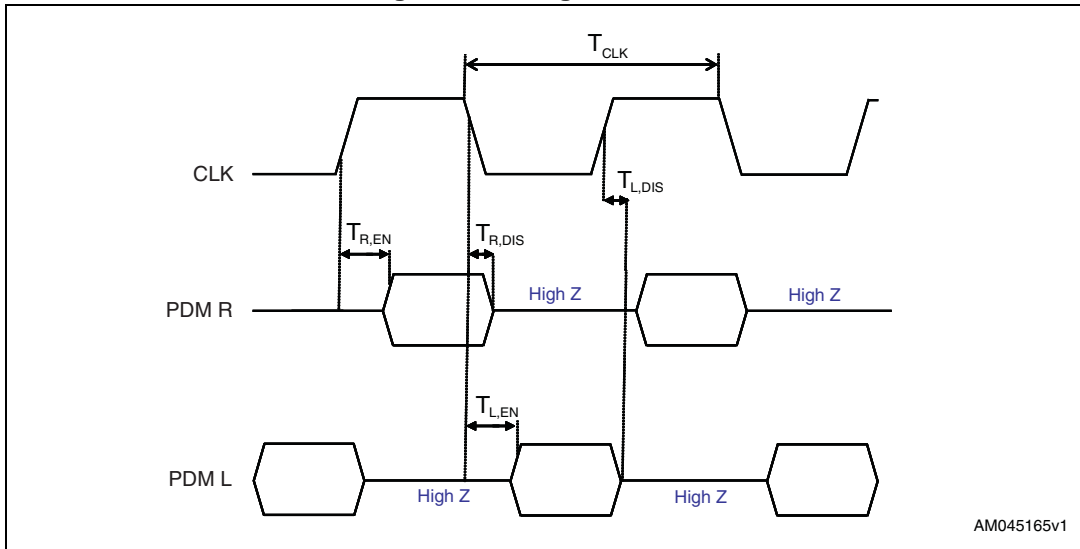
AM045165v1

3 Sensing element

The sensing element shall mean the acoustic sensor consisting of a conductive movable plate and a fixed plate placed in a tiny silicon chip. This sensor transducers the sound pressure into the changes of coupled capacity between those two plates.

Omron Corporation supplies this element for STMicroelectronics.

4   Absolute maximum ratings

Stresses above those listed as "absolute maximum ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Table 5. Absolute maximum ratings

Symbol	Ratings	Maximum value	Unit
Vdd	Supply voltage	-0.3 to 6	V
Vin	Input voltage on any control pin	-0.3 to Vdd +0.3	V
T_{STG}	Storage temperature range	-40 to +125	°C
ESD	Electrostatic discharge protection	2 (HBM)	kV

This device is sensitive to mechanical shock, improper handling can cause permanent damage to the part.

This device is ESD-sensitive, improper handling can cause permanent damage to the part.

5 Functionality

5.1 L/R channel selection

The L/R digital pad lets the user select the DOUT signal pattern as shown in *Table 6*. The L/R pin must be connected to Vdd or GND.

Table 6. L/R channel selection

L/R	CLK low	CLK high
GND	Data valid	High impedance
Vdd	High impedance	Data valid

6   Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Soldering information

The HCLGA 3x4 4LD package is also compliant with the RoHS and "Green" standards and is qualified for soldering heat resistance according to JEDEC J-STD-020.

Landing pattern and soldering recommendations are available at *www.st.com*.

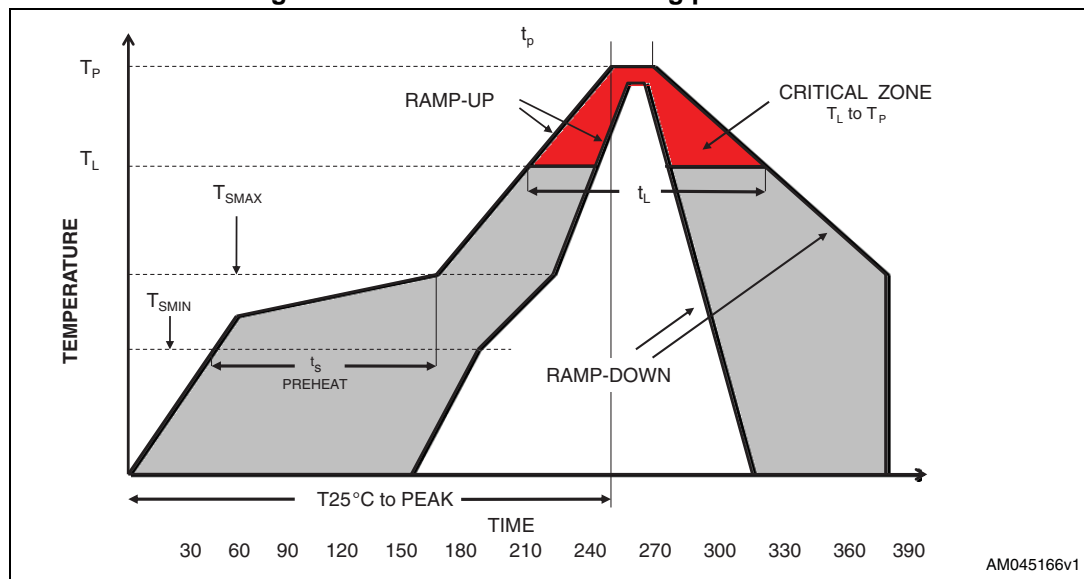**Figure 3. Recommended soldering profile limits**

Table 7. Recommended soldering profile limits

Description	Parameter	Pb free
Average ramp rate	T_L to T_P	3 °C/sec max

Preheat
         Minimum temperature
         Maximum temperature
         Time (T_{SMIN} to T_{SMAX})
	T_{SMIN}
	T_{SMAX}
	t_S
		150 °C
		200 °C
		60 sec to 120 sec

Ramp-up rate	T_{SMAX} to T_L	
Time maintained above liquidus temperature Liquidus temperature	t_L T_L	60 sec to 150 sec 217 °C
Peak temperature	T_P	260 °C max
Time within 5 °C of actual peak temperature		20 sec to 40 sec
Ramp-down rate		6 °C/sec max
Time 25 °C (t25 °C) to peak temperature		8 minutes max

Figure 4. HCLGA (3 x 4 x 1.06 mm) 4-lead package outline

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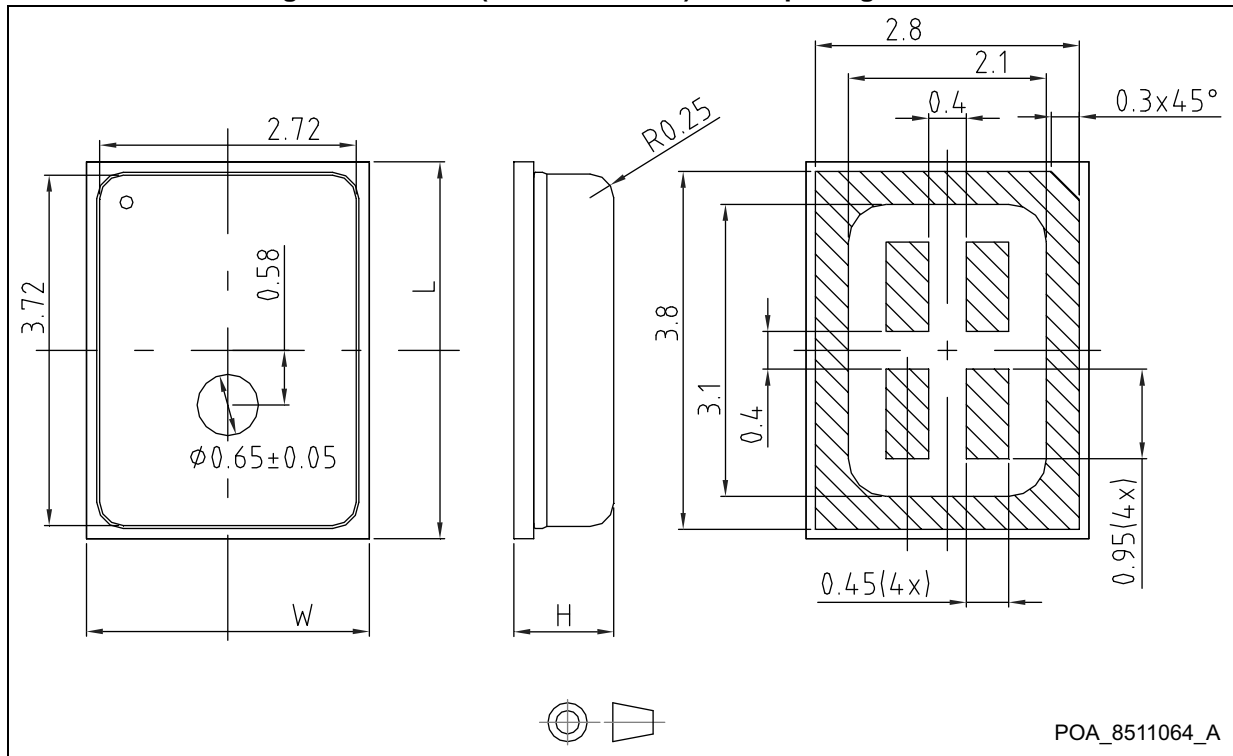
Note: *The MEMS microphone metal cap can exhibit some level of variation in color when the device is subjected to thermal process.*

Dimensions are in millimeter unless otherwise specified. General tolerance is ± 0.15 mm unless otherwise specified.

Table 8. HCLGA (3 x 4 x 1.06 mm) mechanical data

Item	Dimension (mm)	Tolerance (mm)
Length [L]	4	± 0.1
Width [W]	3	± 0.1
Height [H]	1.06	± 0.1

7 Carrier tape mechanical specifications

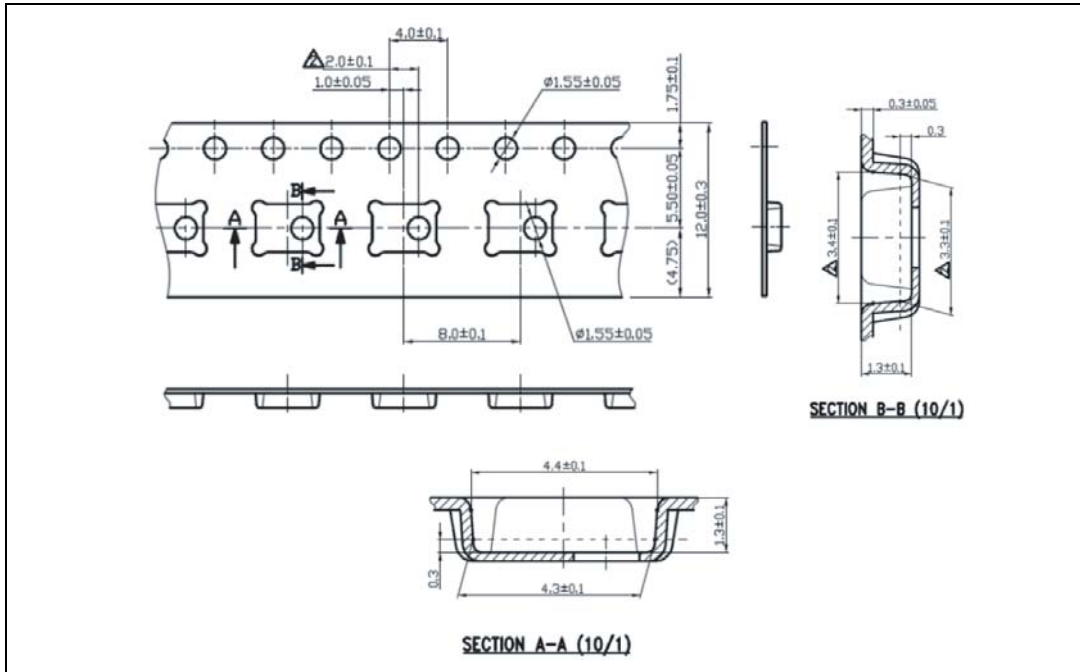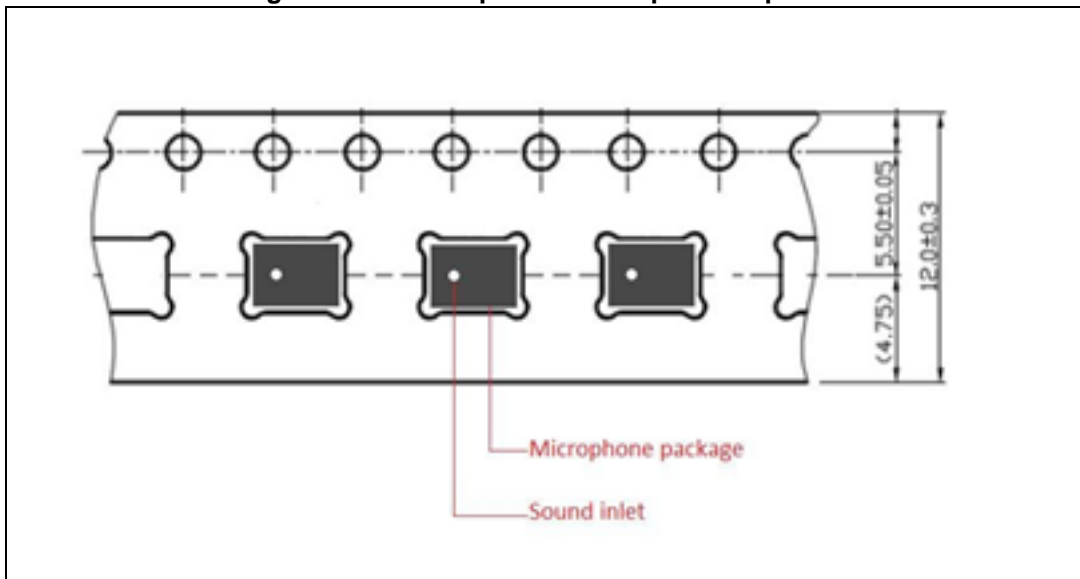**Figure 5. Carrier tape without microphone-top view**

Figure 6. Carrier tape with microphone-top view

8 Revision history

Table 9. Document revision history

Date	Revision	Changes
19-Jun-2014	1	Initial release

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