



# MP45DT01

## MEMS audio sensor omni-directional digital microphone

Preliminary data

### Features

- Single supply voltage operation
- Low power consumption
- 120 dB SPL acoustic overload point
- Omni-directional sensitivity
- PDM single-bit output with stereo operation support
- HLGA package
- ECOPACK<sup>®</sup> RoHS and “Green” compliant

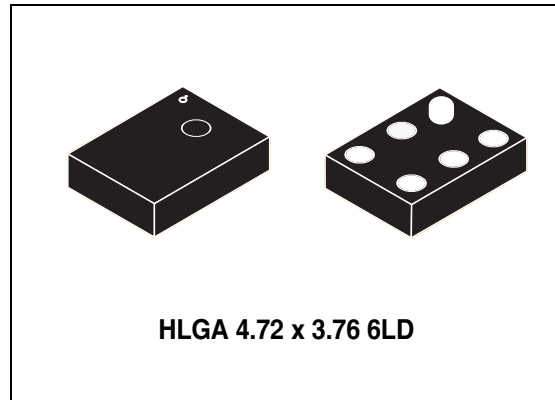
### Applications

- Mobile terminals
- Laptop and notebook computers
- Portable media players
- VoIP
- Speech recognition
- A/V eLearning devices
- Gaming and virtual reality input devices
- Digital still and video cameras
- Antitheft systems

### Description

The MP45DT01 is a compact low-power microphone built up with a sensing element and an IC interface with stereo operation capability.

The sensing element, capable of detecting acoustic waves, is manufactured using a



specialized silicon micromachining process to produce audio sensors.

The IC interface is manufactured using a CMOS process that allows to design a dedicated circuit able to provide a digital signal to the external world in PDM format.

The MP45DT01 has an acoustic overload point of 120 dB SPL with 58 dB signal to noise ratio.

The MP45DT01 is available in SMD compliant package and it is guaranteed to operate over an extended temperature range from -30 °C to +85 °C.

**Table 1. Device summary**

Order code	Temperature range [°C]	Package	Packing
MP45DT01	-30 to +85	HLGA 4.72x3.76 6LD	Tray
MP45DT01TR	-30 to +85	HLGA 4.72x3.76 6LD	Tape and reel

---

# Contents

<b>1</b>	<b>Pin description</b> .....	<b>3</b>
<b>2</b>	<b>Acoustic and electrical specifications</b> .....	<b>4</b>
	2.1 Acoustic and electrical characteristics .....	4
	2.2 Absolute maximum ratings .....	5
	2.3 Frequency response .....	5
<b>3</b>	<b>Functionality</b> .....	<b>6</b>
	3.1 L/R channel selection .....	6
<b>4</b>	<b>Application hints</b> .....	<b>7</b>
	4.1 Soldering information .....	8
<b>5</b>	<b>Package information</b> .....	<b>9</b>
<b>6</b>	<b>Revision history</b> .....	<b>10</b>

# 1 Pin description

Figure 1. Pin connection

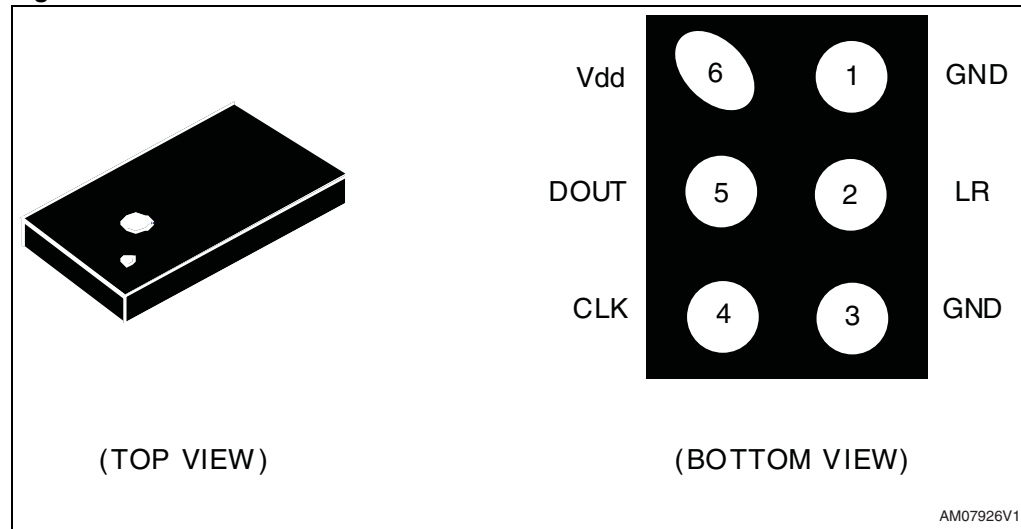


Table 2. Pin description

Pin #	Pin name	Function
1	GND	0 V supply
2	LR	Left/right channel selection; MIC1 LR connected to GND/Vdd and MIC2 LR connected to Vdd/GND (see <a href="#">Figure 3</a> )
3	GND	0 V supply
4	CLK	Synchronization input clock
5	DOUT	Left/Right PDM data output
6	Vdd	Power supply

## 2 Acoustic and electrical specifications

### 2.1 Acoustic and electrical characteristics

Characteristics @ Vdd = 1.8 V, Clock = 2.4 MHz, T = 25 °C unless otherwise noted.

**Table 3. Electrical characteristics**

Symbol	Parameter	Test condition	Min.	Typ. <sup>(1)</sup>	Max.	Unit
Vdd	Supply voltage		1.64	1.8	3.6	V
Idd	Current consumption in normal mode	No load on data line		0.65		mA
IddPdn	Current consumption in power-down mode <sup>(2)</sup>			20		μA
Sc	Short circuit current		1		10	mA
AOP	Acoustic overload point			120		dBSP L
So	Sensitivity			-26		dBFS
SNR	Signal to noise ratio	A-weighted @ 1 kHz, 1Pa		58		dB
PSR	Power supply rejection	guaranteed by design <sup>(3)</sup>		-70		dBFS
Clock	Input clock frequency <sup>(4)</sup>		1	2.4	3.25	MHz
TWK	Wake up time <sup>(5)</sup>	guaranteed by design			10	ms
Top	Operating temperature range		-30		+85	°C

1. Typical specifications are not guaranteed.
2. Input clock in static mode.
3. Test signal: 217Hz square wave, 100 mVpp on Vdd pin.
4. Duty cycle: min=40% max=60%.
5. Time from the first clock edge to valid output data.

**Table 4. Distorsion specifications**

Parameter	Test condition	Value
Distorsion	100 dB SPL (50Hz - 4kHz)	<1 % THD + N
Distorsion	115 dB SPL (1kHz)	<5 % THD + N

## 2.2 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
V <sub>dd</sub>	Supply voltage	-0.3 to 6	V
V <sub>in</sub>	Input voltage on any control pin	-0.3 to V <sub>dd</sub> +0.3	V
T <sub>STG</sub>	Storage temperature range	-40 to +125	°C
ESD	Electrostatic discharge protection	2(HBM)	kV



This is a mechanical shock sensitive device, improper handling can cause permanent damages to the part



This is an ESD sensitive device, improper handling can cause permanent damages to the part

## 2.3 Frequency response

**Table 6. Frequency Response Mask for digital microphones <sup>(1)</sup>**

Frequency / Hz	Lower limit	Upper limit	Unit
20...100	-5	+5	dBr 1kHz
100...8000	-2	+2	dBr 1kHz
8000...10000	-5	+5	dBr 1kHz

1. @ T=20°C and acoustic stimulus =1Pa (94dB SPL)

## 3 Functionality

### 3.1 L/R channel selection

The L/R digital pad lets the user select the DATA signal pattern as explained in [Table](#) . L/R pin must be connected to Vdd or GND.

**Table 7. L/R channel selection**

L/R	CLK Low	CLK High
GND	Data Valid	High Impedence
Vdd	High Impedence	Data Valid

## 4 Application hints

Figure 2. MP45DT01 electrical connection

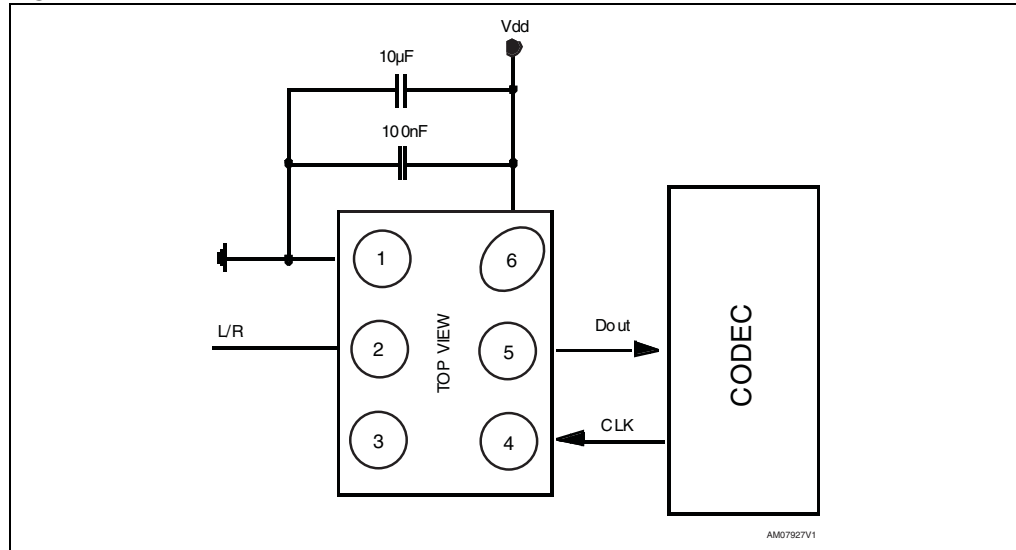
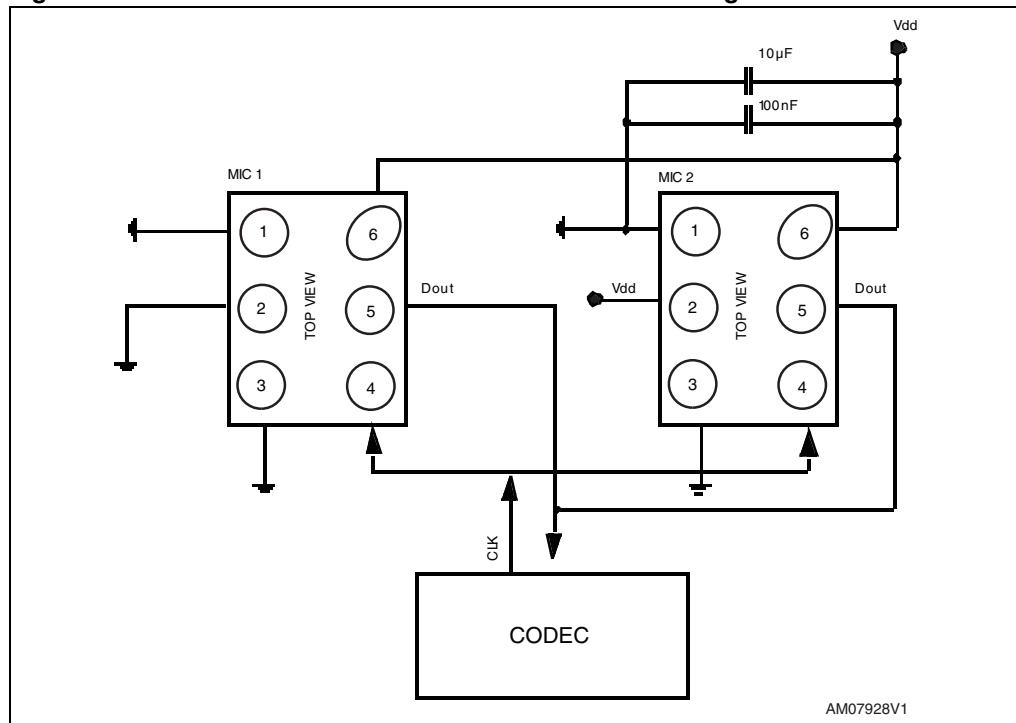


Figure 3. MP45DT01 electrical connection for stereo configuration



Power supply decoupling capacitors (100 nF ceramic, 10 µF ceramic) should be placed as near as possible to the pin 6 of the device (common design practice).

L/R pin must be connected to Vdd or GND (refer to [Table 2](#)).

## 4.1 Soldering information

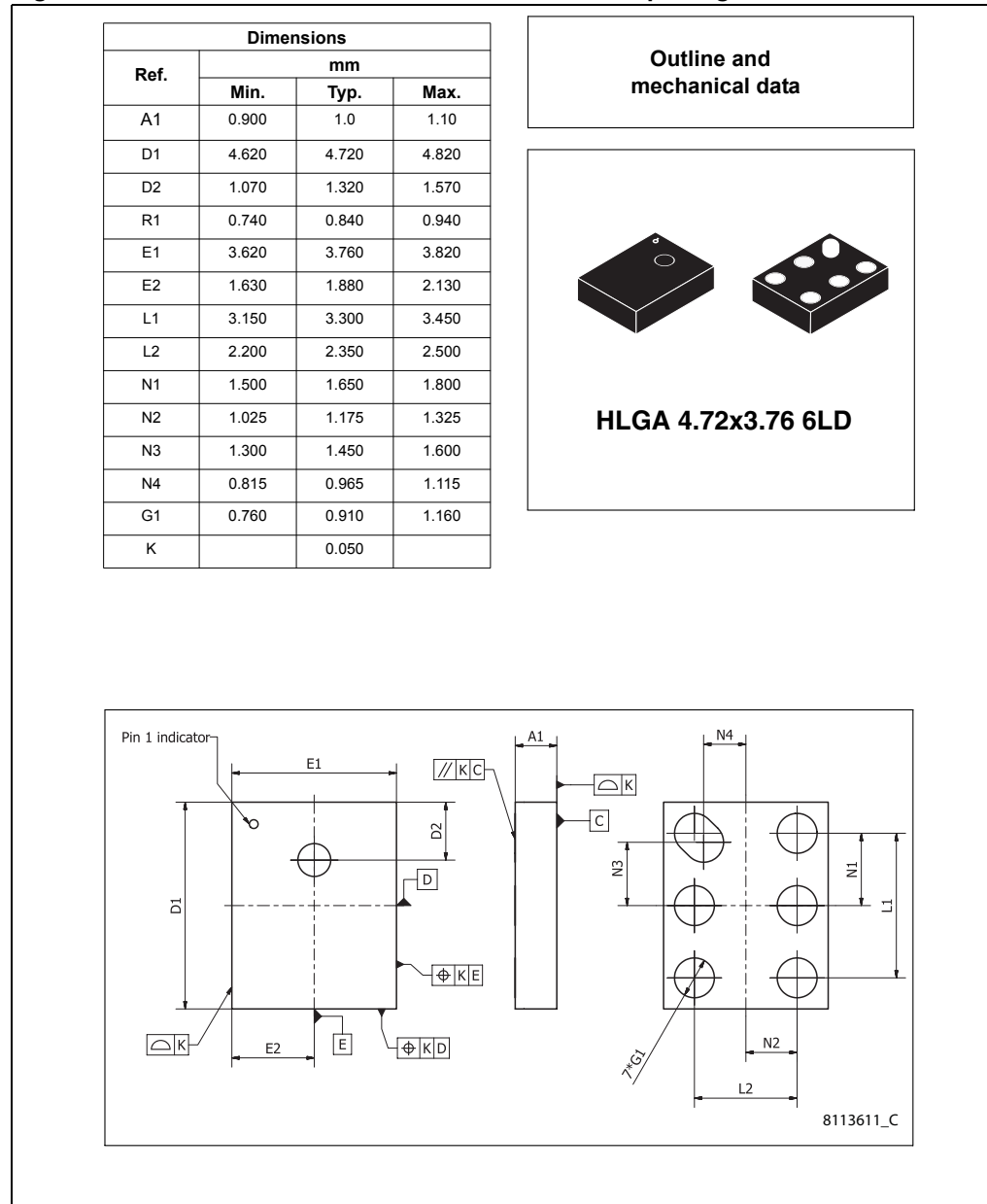
The HLGA 4.72x3.76 6LD package is compliant with the ECOPACK<sup>®</sup>, RoHS and “Green” standard. It is qualified for soldering heat resistance according to JEDEC J-STD-020. Land pattern and soldering recommendations are available at [www.st.com](http://www.st.com).



## 5 Package information

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

**Figure 4. HLGA 4.72x3.76 6LD: mechanical data and package dimensions**



## 6 Revision history

Table 8. Document revision history

Date	Revision	Changes
06-Aug-2010	1	First release.

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2010 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)

