

免电感滤波2×15W AB/D类音频功放

2×15W Inductor Free Class AB/D Amplifier

■ FEATURES

- Output Power
2×16.8W (VDD=12V, $R_L=4\Omega$, THD+N=10%, Class D)
- Single Wide Voltage Supply: 3V-12.6V
- Low Quiescent Current: 10mA (VDD = 12V, with LC and Load, Class D)
- Anti-clipping Function (ACF)
- Class D or Class AB mode
- Differential / Single-ended Analog Input
- Over current protection/ Over temperature protection / Low voltage malfunction prevention function with auto recovery
- LF and HF Package of ETSSOP20
- 输出功率
2×16.8W (VDD=12V, $R_L=4\Omega$, THD+N=10%, Class D)
- 单电源系统, 3V-12.6V宽电压输入范围
- 低静态电流: 10mA (VDD = 12V, 带LC 和负载, Class D)
- ACF防破音功能可选
- D类或AB类可选
- 模拟差分/单端输入
- 保护功能: 过流/过热/欠压异常保护功能
- 无铅无卤封装, ETSSOP20

■ APPLICATIONS

- Sound Bars
- Wireless Speakers
- Consumer Audio Applications
- TVs/Monitors
- 条形音箱
- 便携式音箱
- 拉杆音箱
- 无线智能音箱
- 消费类音频应用
- LCD电视/监视器

■ DESCRIPTION

HTA3612 is a stereo efficient, Class AB/D audio amplifier. In class D mode, the device can drive a speaker up to 2×16.8W/4 Ω at VDD = 12V.

Advanced EMI Suppression enables the use of inexpensive ferrite bead filters while meeting EMC requirements for system cost reduction in Class D mode.

HTA3612 is protected with Under voltage, Over temperature, and Over current protection.

HTA3612 features Anti-Clipping Function (ACF) which detects output signal clip due to the over input signal and suppresses the output signal clip automatically. Also, the ACF function can adapt the output clip caused by power supply voltage down with battery. It can significantly improve the sound quality, creating a very comfortable musical enjoyment, and to protect the speakers from overload damage.

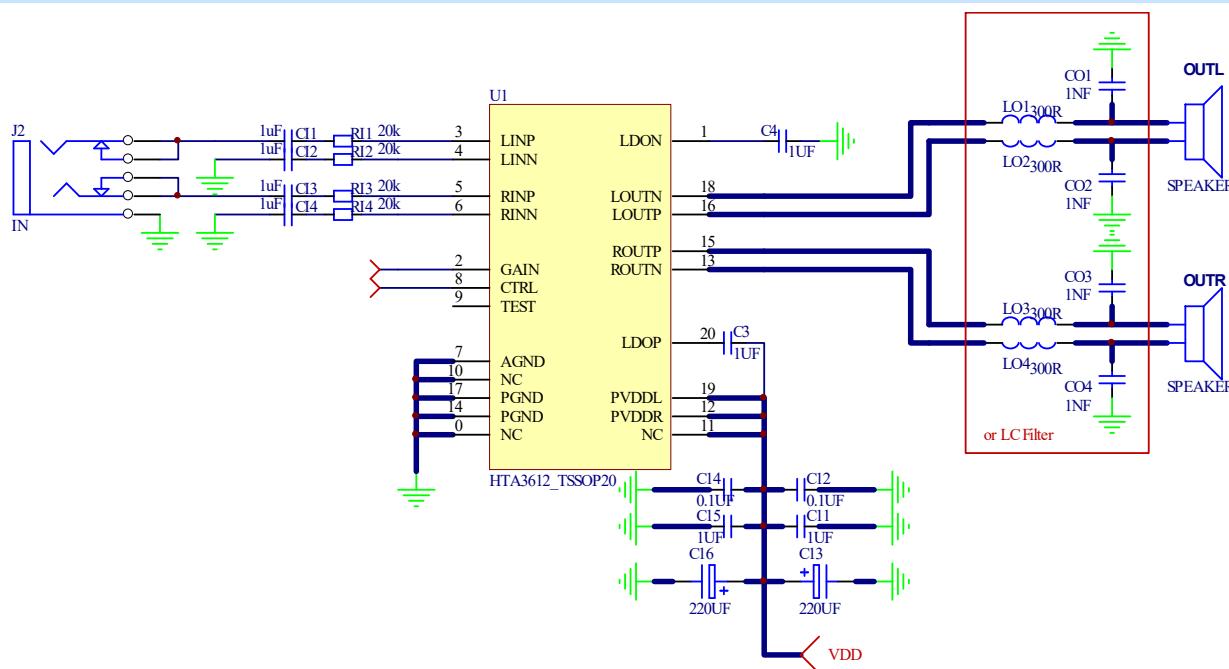
HTA3612是一款高效AB/D类音频功率放大器。D类模式, 12V供电、THD+N=10%条件下, 能够持续提供2×16.8W/4 Ω 功率输出。

HTA3612具有先进的扩频功能来抑制EMI, Class D时使用价格低廉且小体积铁氧体磁珠可满足EMC要求。

此外, HTA3612内置关断功能使待机电流最小化, 还集成了短路保护、热保护和电源欠压异常保护等功能。

HTA3612具有防削顶失真(ACF)输出控制功能, 可检测并抑制由于输入音乐、语音信号幅度过大所引起的输出信号削顶失真(破音), 也能自适应地防止在电源电压下降所造成的输出削顶, 显著提高音质, 创造非常舒适的听音享受, 并保护扬声器免受过载损坏。

■ TYPICAL APPLICATION



1. 系统增益设置

GAIN pin	D类增益	D类时芯片内部输入电阻 RIN与反馈电阻RF	AB类增益	AB类时芯片内部输入电阻 RIN与反馈电阻RF
High (接LDON)	40倍 (32dB)	RF = 800k, RIN = 20k	32倍 (30dB)	RF = 640k, RIN = 20k
Low (接地)	20倍 (26dB)	RF = 400k, RIN = 20k	16倍 (24dB)	RF = 320k, RIN = 20k

外部增加输入电阻 R_i 时, 增益 (dB) = $20 \times \log \frac{RF}{RIN + R_i}$

2. CTRL 脚设置芯片的工作模式

CTRL pin	工作模式
>2V	Class D, ACF off
1.6~1.9V	Class D, ACF on (防破音模式开)
0.8~1.5V	Class AB, ACF off
Low	Shutdown

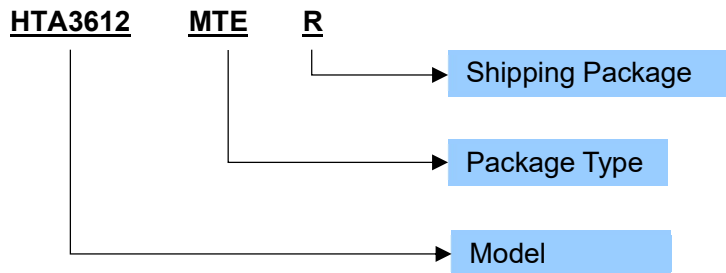
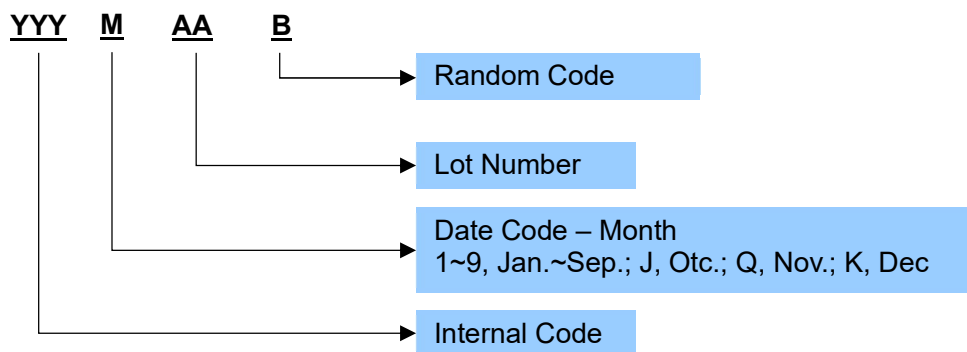
3. Pin9 TEST 脚必须悬空。

4. PVDD 电容: 一般的, 靠近 PVDDR 和 PVDDL 处各放置一组 1uF//0.1uF, 并使用粗、短走线汇集于 1 个不小于 220uF 的电解电容。

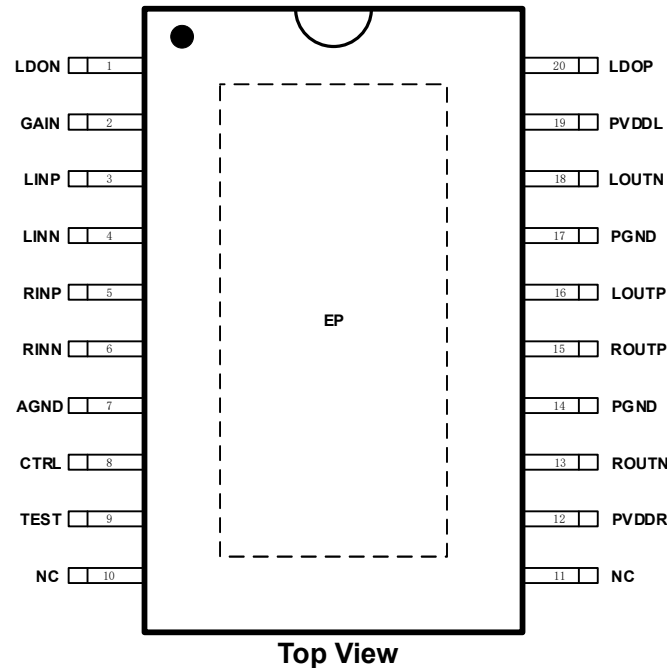
5. 辐射和传导是关注项时, 输出建议预留LC滤波器, 即LO改成电感10uH, CO改成电容0.68uF。

ORDERING INFORMATION

Part Number	Package Type	Marking	Operating Temperature Range	Shipping Package / MOQ
HTA3612MTER	ETSSOP20 (MTE)	HTA3612 YYYMAAB ¹	-40℃~85℃	Tape and Reel (R) / 3000pcs

Part Number

Production Tracking Code

¹ YYYMAAB is production tracking code

■ TERMINAL CONFIGURATION



Top View

■ TERMINAL FUNCTION

Terminal No.	Name	Description
1	LDON	Internal LDO output, connect 1uF to GND 内部LDO输出, 连接1uF到地
2	GAIN	Gain select pin. 增益选择。
3	LINP	Positive input (differential+) for audio amplifier of left channel. 音频左声道输入正端。
4	LINN	Negative input (differential-) for audio amplifier of left channel. 音频左声道输入负端。
5	RINP	Positive input (differential+) for audio amplifier of right channel. 音频右声道输入正端
6	RINN	Negative input (differential-) for audio amplifier of right channel. 音频右声道输入负端。
7	AGND	Analog ground. 模拟地。
8	CTRL	Select the working mode. 工作模式选择
9	TEST	Only for internal test, left floating , do not connect to GND. 仅做内部测试用, 保持悬空 , 不要接地。
10,11	NC	No internal connection, connect to GND for better thermal performance. 内部无连接, 连接到地。
12	PVDDR	Power Supply for internal power circuitry of Channel R. 右声道功率电源
13	ROUTN	Negative pin for differential speaker amplifier output R. 右声道输出负端
14, 17	PGND	Power Ground. 功率地
15	ROUTP	Positive pin for differential speaker amplifier output R. 右声道输出正端
16	LOUTP	Positive pin for differential speaker amplifier output L. 左声道输出正端
18	LOUTN	Negative pin for differential speaker amplifier output L. 左声道输出负端
19	PVDDL	Power Supply for internal power circuitry of Channel L. 左声道功率电源
20	LDON	Internal LDO output, connect 1uF to GND 内部LDO输出, 连接1uF到地
EP	NC	No internal connection, connect to GND for better thermal performance. 内部无连接, 连接到地。

■ SPECIFICATIONS¹

● Absolute Maximum Ratings²

PARAMETER	Symbol	MIN	MAX	UNIT
Supply voltage range (PVDDx)	V _{DD}	-0.3	14	V
Input voltage range (LINP, LINN, RINP, RINN, GAIN, CTRL)	V _I	-0.3	5.8	V
Operating temperature range	T _A	-40	85	°C
Operating junction temperature range	T _J	-40	150	°C
Storage temperature range	T _{STG}	-50	150	°C

● Recommended Operating Conditions

PARAMETER	Symbol	CONDITION	MIN	TYP	MAX	UNIT
Supply voltage range	V _{DD}		3		12.6	V
Operating temperature	T _a		-40	25	85	°C
CTRLx terminal working mode	MODE1	V _{MODE1} Class D, ACF off	2.0		5.0	V
	MODE2	V _{MODE2} Class D, ACF on	1.6		1.9	V
	MODE3	V _{MODE3} Class AB, ACF off	0.8		1.5	V
	MODE4	V _{MODE4} shutdown	0	0	0.5	V
Load impedance	R _L	With output filter		4		Ω

● Electrical Specification³

Conditions: T_A = 25°C, V_{DD} = 3V-12.6V, Load = 4ohm, Class D or Class AB mode, unless otherwise specified.

PARAMETER	Symbol	CONDITION	MIN	TYP	MAX	UNIT
Class Output Offset Voltage	V _{OS}	V _I = 0V, Gain = 26dB		1.5		mV
Quiescent supply current	I _{DD}	V _{DD} = 12V, output filter = 10uH+680nF, Load = 4ohm, Class D mode		10		mA
		V _{DD} = 12V, Load = 4ohm, Class AB mode		28		mA
Quiescent supply current in shutdown mode	I _{SD}	V _{DD} = 12V, With Load		30		uA
System Gain	Gain	GAIN = H, Class D		32		dB
		GAIN = L, Class D		26		dB
		GAIN = H, Class AB		30		dB
		GAIN = L, Class AB		24		dB
Turn-on time	t _{on}	Pull CTRL high or power on, or switch between Class AB and Class D		220		ms
Turn-off time	t _{off}	Pull CTRL low		5		us
LDO output voltage	LDON	PVDD = 9V, working on		4.9		V
		PVDD = 9V, shutdown		3.6		V
	LDOP	PVDD = 9V, working on		4.0		V
		PVDD = 9V, shutdown		8.9		V

¹ Depending on parts and PCB layout, characteristics may be changed.

² Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

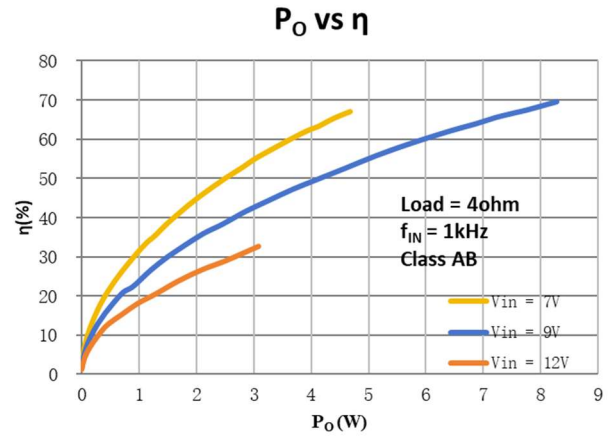
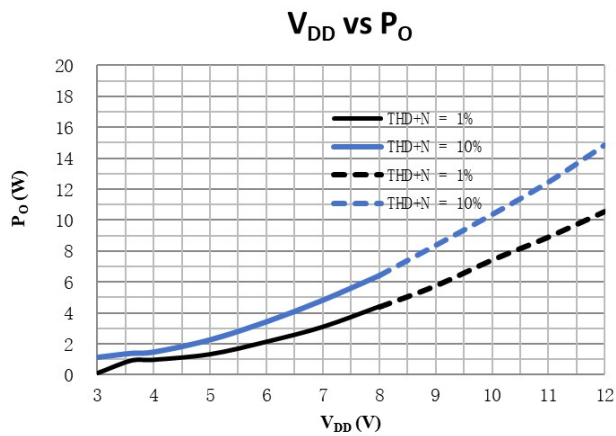
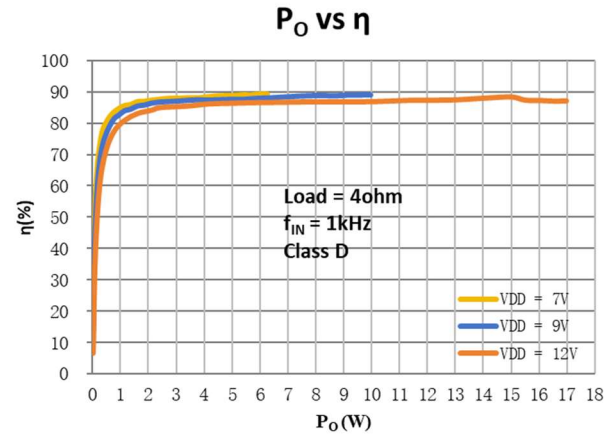
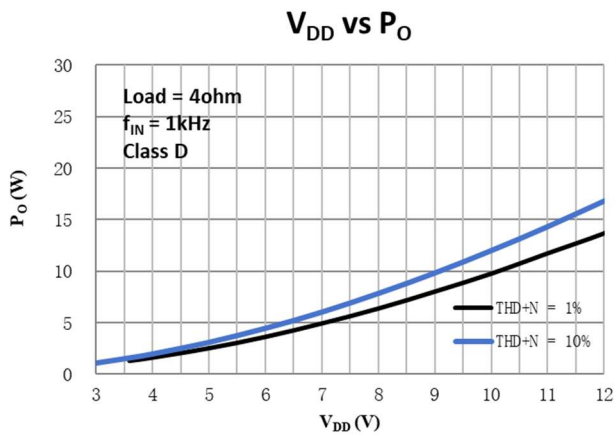
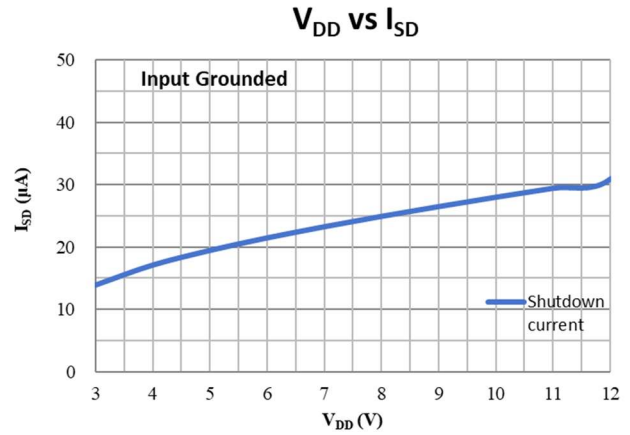
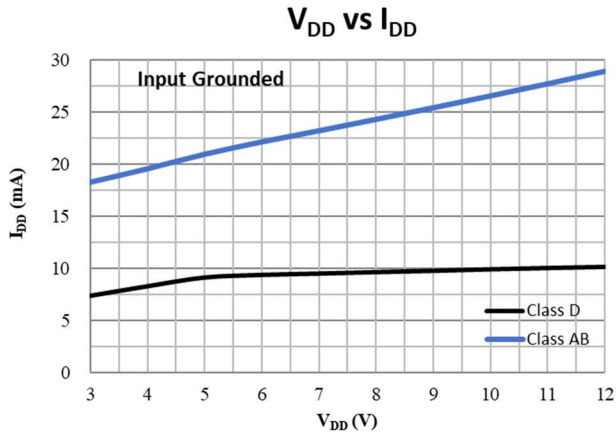
³ Depending on parts and pattern layout, characteristics may be changed.

Conditions: $T_A = 25^{\circ}\text{C}$, $V_{DD} = 3\text{-}12.6\text{V}$, Load = 4Ω , $f_{IN} = 1\text{ kHz}$, Gain = 26dB, $C_{IN} = 1\mu\text{F}$, 20-20kHz, Class D or Class AB mode, unless otherwise specified.

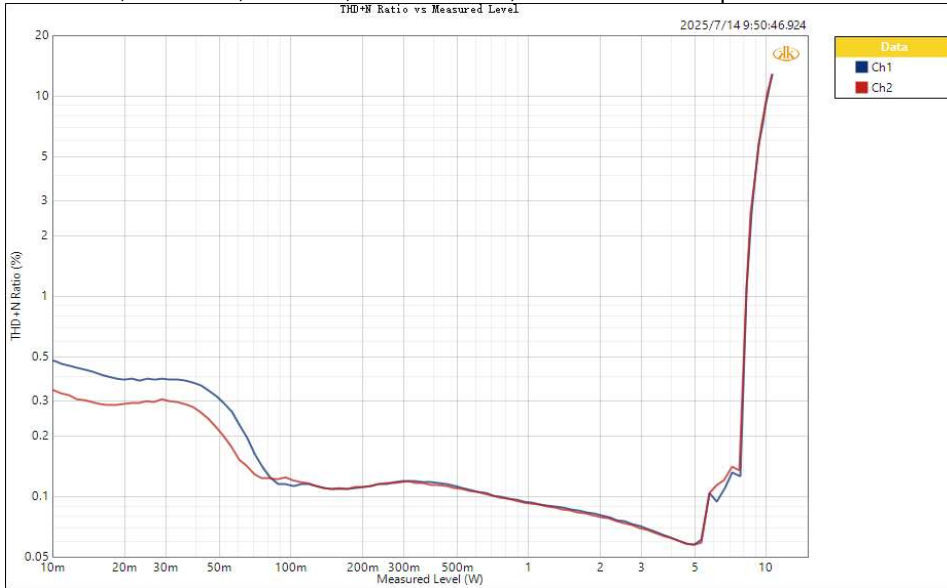
PARAMETER	Symbol	CONDITION		MIN	TYP	MAX	UNIT
Continuous output power in Class D mode	P_O	$V_{DD} = 12\text{V}$, $R_L = 4\Omega$	THD +N = 1%		2×13.6		W
			THD+N = 10%		2×16.8		W
Continuous output power in Class AB mode	P_O	$V_{DD} = 7\text{V}$	THD+N = 10%		2×4.8		W
		$V_{DD} = 9\text{V}(\text{inst.})$	THD+N = 10%		2×8.3		W
		$V_{DD} = 12\text{V}(\text{inst.})$	THD+N = 10%		2×14.8		W
Total harmonic distortion + noise	THD+N	$P_O = 1\text{W}$, $V_{DD} = 12\text{V}$, $R_L = 4\Omega$, Class D			0.1		%
		$P_O = 1\text{W}$, $V_{DD} = 12\text{V}$, $R_L = 4\Omega$, Class AB			0.15		%
Efficiency	η	$V_{DD} = 12\text{V}$, THD+N = 10%	$R_L = 4\Omega$, Class D		88		%
		$V_{DD} = 7\text{V}$, THD+N = 10%	$R_L = 4\Omega$, Class AB		68		%
Output integrated noise	V_N	f=20Hz~20kHz, A-weighted, GAIN=26dB, Class D			120		uV
		f=20Hz~20kHz, A-weighted, GAIN=24dB, Class AB			70		uV
Oscillator frequency	f_{osc}	Class D mode			300		kHz
ACF attenuation gain	Aa			-14		0	dB
Over temperature protection trigger point	OTP				150		$^{\circ}\text{C}$
Thermal shutdown hysteresis	T_{SD_HYS}				20		$^{\circ}\text{C}$
Over current trip point	OCP	Class D mode			9		A

■ TYPICAL OPERATING CHARACTERISTICS

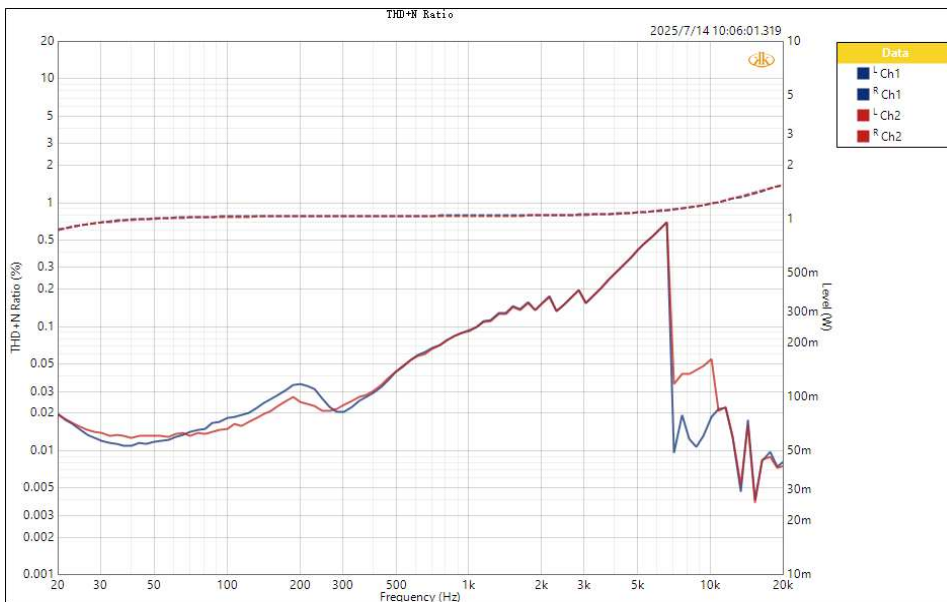
$V_{DD} = 12V$, Load = 4ohm, Class D mode, unless otherwise specified.



$R_L = 4\Omega$, $f_{IN} = 1\text{kHz}$, $V_{DD}=9\text{V}$, Class D mode, unless otherwise specified.

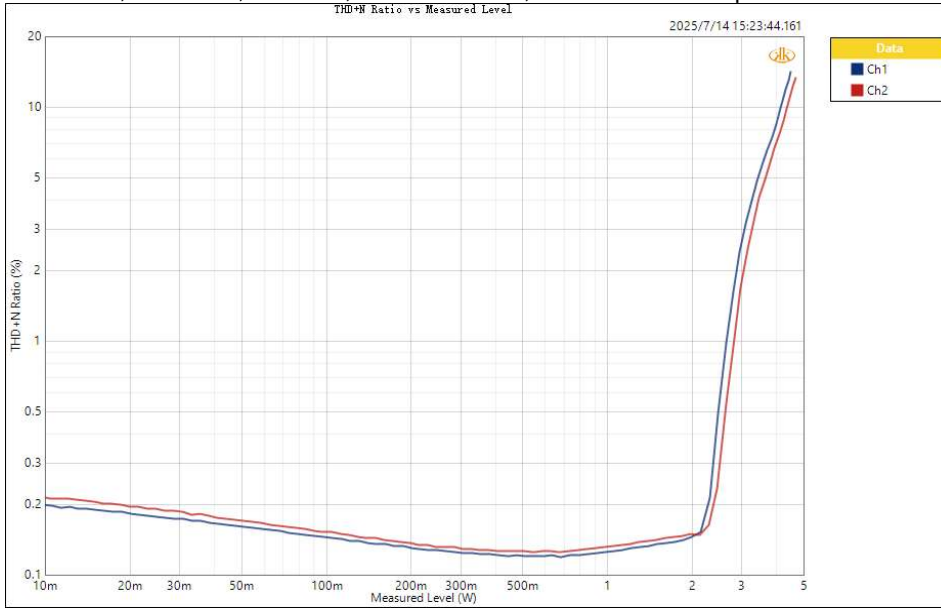


$V_{DD} = 9\text{V}$, Output power vs THD+N

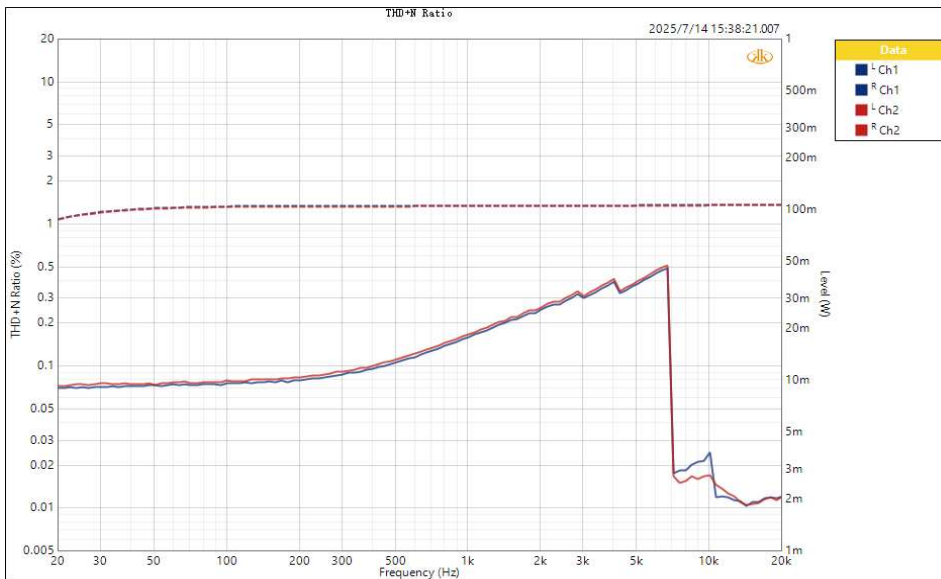


$V_{DD} = 9\text{V}$, $P_o = 1\text{W}$, frequency vs THD+N

$R_L = 4\Omega$, $f_{IN} = 1\text{kHz}$, $V_{DD}=7\text{V}$, Class AB mode, unless otherwise specified.



$V_{DD} = 7\text{V}$, $f_{IN} = 1\text{kHz}$, P_o vs THD+N



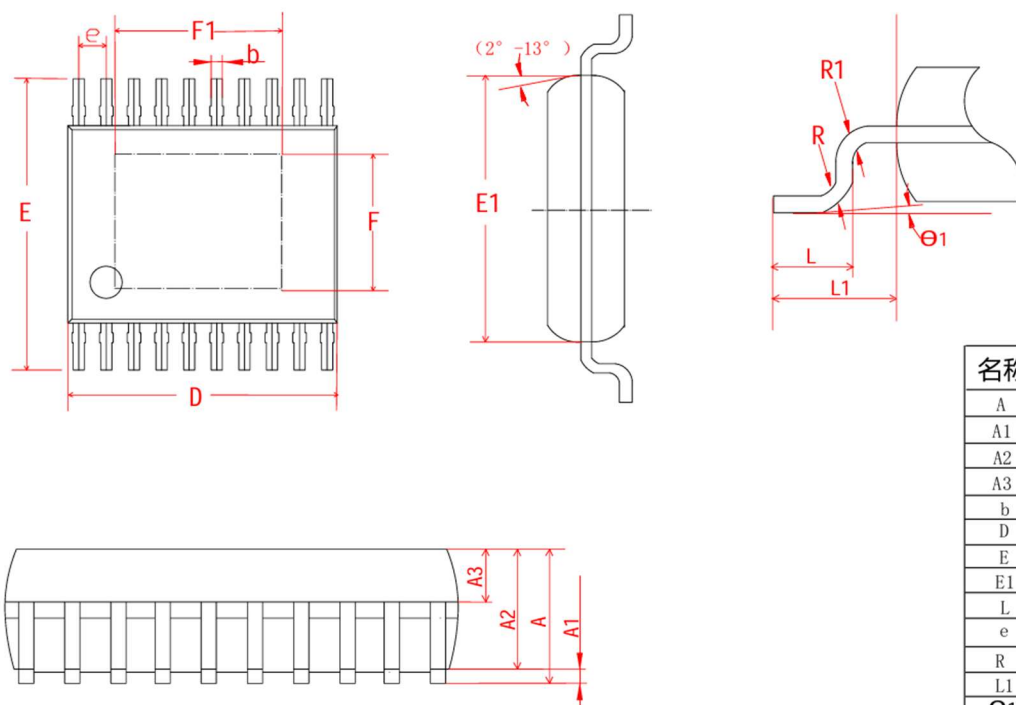
$V_{DD} = 7\text{V}$, $P_o = 0.1\text{W}$, f_{IN} vs THD+N

■ Revision History

Date	Version	Revision Content
2025-7-14	V0.5	Preliminary version.

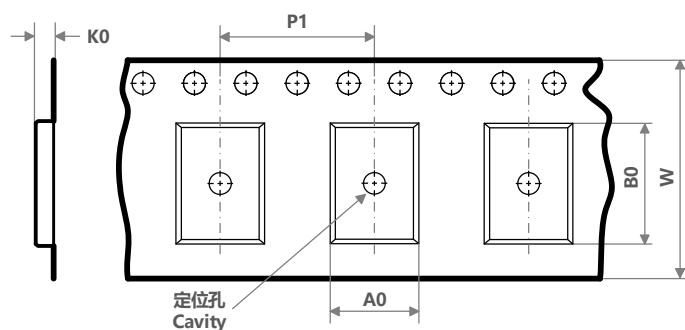
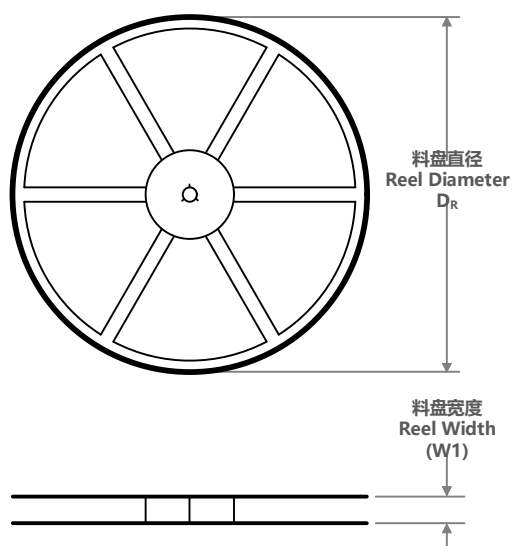
■ PACKAGE OUTLINE

MTE (ETSSOP20)



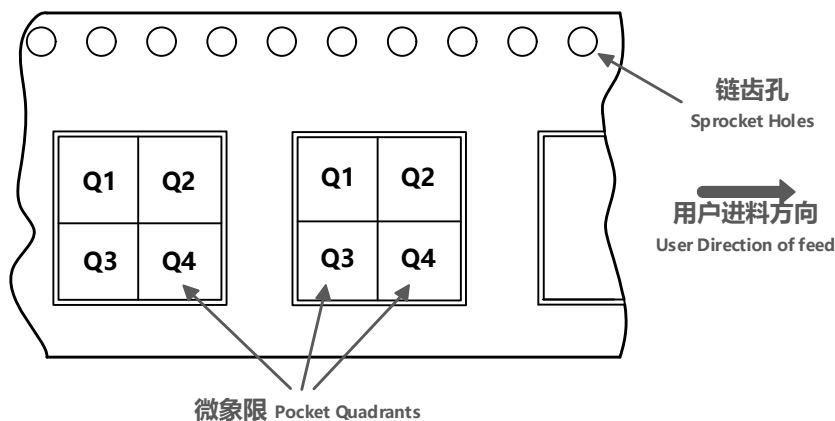
名称	尺寸		
	MIN	NOMINAL	MAX
A	1.0	—	1.10
A1	0.05	—	0.15
A2	0.90	0.95	1.0
A3	0.39	—	0.40
b	0.20	0.22	0.24
D	6.40	6.45	6.50
E	6.25	6.40	6.55
E1	—	4.35	4.40
L	0.50	0.60	0.70
e	0.65		
R	0.09		
L1	1.00REF		
$\Theta 1$	0°	—	8°
F	2.99	1.00REF	3.0
F1	4.19	—	4.20

■ TAPE AND REEL INFORMATION

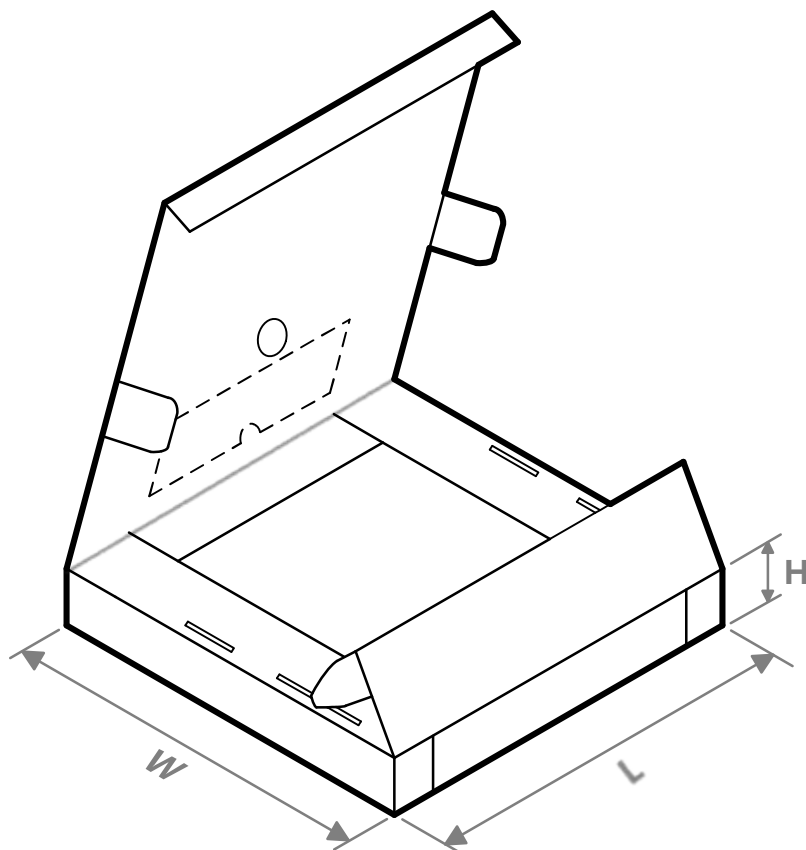


A0	Dimension designed to accommodate the component width; 料槽宽度
B0	Dimension designed to accommodate the component length; 料槽长度
K0	Dimension designed to accommodate the component thickness; 料槽厚度
W	Overall width of the carrier tape; 载带整体宽度
P1	Pitch between successive cavity centers; 相邻槽中心间距

编带 PIN1 方位象限分配 Quadrant Assignments for Pin1 Orientation in Tape



器件料号 Part No.	封装类型 Package Type	封装标识 Package Code	引脚数 Pins	SPQ	料盘直径 D_R (mm)	料盘宽度 W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 象限 Quadrant
HTA3612MTER	ETSSOP	MTE	28	3000	330	16	6.65	6.8	1.5	8	16	Q1

TAPE AND REEL BOX INFORMATION


器件料号 Part No.	封装类型 Package Type	封装标识 Package Code	引脚数 Pins	SPQ	长度 Length (mm)	宽度 Width (mm)	高度 Height (mm)
HTA3612MTER	ETSSOP	MTE	20	6000	390	345	55

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