

2.45-W/Ch STEREO FILTER-FREE CLASS-D AUDIO POWER AMPLIFIER

GENERAL DESCRIPTION

The TMPA205DS is a stereo class-D filter-free audio power amplifier IC. It delivers up to 2.45W/Ch power into a 4 ohm load or 1.5W/Ch power into an 8 ohm load. Two patents are pending.

With common mode input structure, TMPA205DS requires no input or output coupling capacitors. It also features high Common Mode Rejection Ratio and Power Supply Rejection Ratio.

For multiple-input applications, independent gain control and corner frequency can be implemented by summing the input sources through resistor ratio and input capacitor values.

Analog input signal is converted into digital output which drives directly to the speaker. High power efficiency is achieved due to digital output at the load. The audio information is embedded in PWM (Pulse Width Modulation) .

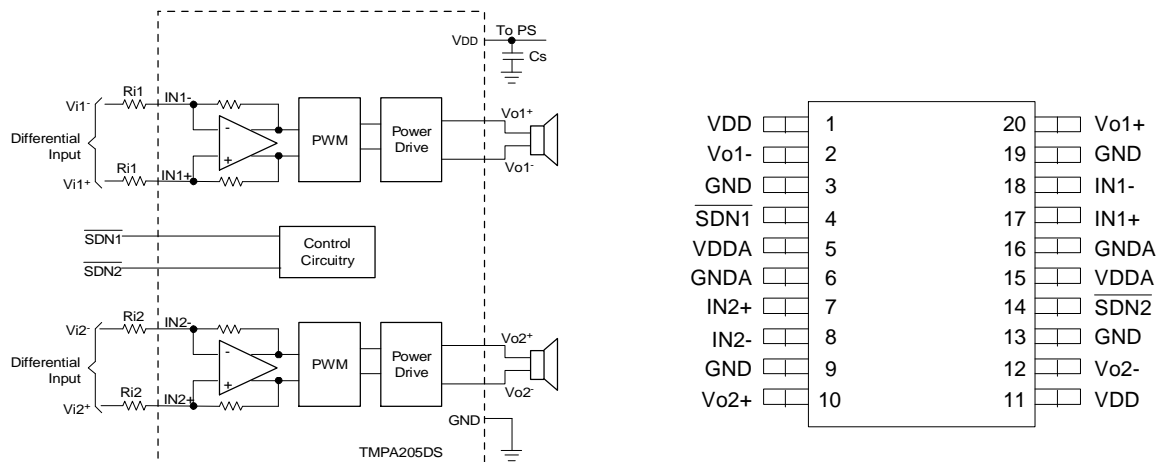
APPLICATIONS

Multimedia application includes Cellular Phones, PDAs, DVD/CD players, TFT LCD TVs/Monitors, 2.1 channel/5.1 channel audio systems, USB audio. It is also ideal for other portable devices like Wireless Radios.

FEATURES

- ◆ 2.5V to 5.5V Single Supply
- ◆ Up to 5.3W/Ch Max. Power or 2.45W/Ch rms.
- ◆ Up to 92% Power Efficiency
- ◆ 3.5mA Quiescent Current
- ◆ Less Than 0.3uA Shutdown Current
- ◆ Popless Power-Up, Shutdown and Recovery
- ◆ Differential 250 KHz PWM Allows Bridge-Tied Load to Double Output Power and Eliminates LC Output Filter
- ◆ Common Mode Structure Requires No Input Capacitors
- ◆ BTL Output Requires No Output Capacitors
- ◆ Thermal Shutoff and Automatic Recovery
- ◆ Short-Circuit Protection
- ◆ Differential Signal Processing Improves CMRR & Eliminates Power Regulation & Bypass Capacitor
- ◆ Package : TSSOP, PDIP, SOP Available

REFERENCE CIRCUIT (Please refer to TMPA002.APP for application)



(Please email david@taimec.com.tw for complete datasheet.)

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ABSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range unless otherwise noted(1)

		TMPA205DS	UNIT
Supply voltage, V _{DD}	In normal mode	-0.3V to 6V	V
	In shutdown mode	-0.3V to 7V	V
Input voltage, V _I		-0.3V to V _{DD} +0.3V	V
Continuous total power dissipation		See package dissipation ratings	
Operating free-air temperature, T _A		-40 to 85	°C
Operating junction temperature, T _J		-40 to 150	°C
Storage temperature, T _{stg}		-65 to 150	°C
Lead temperature 1,6mm(1/16 inch)from case for 10 seconds		260	°C

(1) 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.

RECOMMENDED OPERATING CONDITONS

		MIN	NOM	MAX	UNIT
Supply voltage, V _{DD}		2.5		5.5	V
High-level input voltage, V _{IH}	SDN1, SDN2	2		V _{DD}	V
Low-level input voltage, V _{IL}	SDN1, SDN2	0		0.8	V
Input resistor, R _i	Gain ≤ 20 V/V (26dB)	15			kΩ
Common Mode Input Voltage Range	V _{DD} =2.5V~5.5V, CMRR ≤ -55dB	0		V _{DD}	V
Operating free-air temperature, T _A		-40		85	°C

PACKAGE DISSIPATION RATINGS

PACKGE	DERATING FACTOR	T _A ≤ 25 °C POWER RATING	T _A = 70 °C POWER RATING	T _A = 85 °C POWER RATING
TSSOP20	9.07mW/ °C	1.1338W	0.7256W	0.5896W

ELECTRICAL CHARACTERISTICS

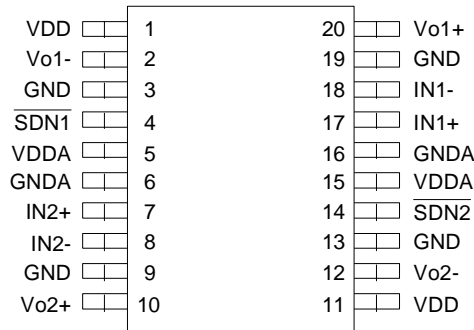
T_A=25 °C (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V _{os}	Output offset voltage (measured differentially) V _I =0V, A _v =2, V _{DD} =2.5V to 5.5V		25		mV
PSRR	Power supply rejection ratio V _{DD} =2.5V to 5.5V		-75	-55	dB
CMRR	Common mode rejection ratio V _{DD} =2.5V to 5.5V, V _{IC} =V _{DD} /2 to 0.5V V _{IC} =V _{DD} /2 to V _{DD} -0.8V		-60	-55	dB
I _{IH}	High-level input current V _{DD} =5.5V, V _I =5.8V (SDN1, SDN2)			1	μA
I _{IL}	Low-level input current V _{DD} =5.5V, V _I =-0.3V (SDN1, SDN2)			1	μA
I _Q	Quiescent current V _{DD} =5.5V, no load		4	4.6	mA
	V _{DD} =3.6V, no load		3.5	4.2	
	V _{DD} =2.5V, no load		3	3.6	
I _Q (SD)	Shutdown current V(SDN)=0.8V, V _{DD} =2.5V to 5.5V		0.3	0.5	μA
r _{DS(on)}	Static drain-source on-state resistance V _{DD} =2.5V		790		mΩ
	V _{DD} =3.6V		600		
	V _{DD} =5.5V		510		
f(sw)	Switching frequency V _{DD} =2.5V to 5.5V	210	250	290	kHz
A _v	BTL Gain V _{DD} =2.5V to 5.5V	$\frac{135k\Omega}{R_i}$	$\frac{150k\Omega}{R_i}$	$\frac{165k\Omega}{R_i}$	$\frac{V}{V}$

OPERATING CHARACTERISTICS

T_A=25 °C, A_v=2, R_L=8Ω (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
P _o	Output power/Ch THD+N=10%, f=1kHz, R _L =8Ω		1.5		W
	V _{DD} =5V		0.8		
	V _{DD} =3.6V		0.36		
P _o	Output power/Ch THD+N=10%, f=1kHz, R _L =4Ω		2.45		W
	V _{DD} =5V		1.31		
	V _{DD} =3.6V		0.58		
THD+N	Total harmonic distortion plus noise V _{DD} =5V, P _o =1W, R _L =8Ω, f=20~20kHz			0.65%	
	V _{DD} =3.6V, P _o =0.6W, R _L =8Ω, f=20~20kHz			0.77%	
	V _{DD} =2.5V, P _o =0.22W, R _L =8Ω, f=20~20kHz			0.66%	
	V _{DD} =5V, P _o =1.7W, R _L =4Ω, f=20~20kHz			0.65%	
	V _{DD} =3.6V, P _o =1W, R _L =4Ω, f=20~20kHz			0.75%	
	V _{DD} =2.5V, P _o =0.4W, R _L =4Ω, f=20~20kHz			0.88%	
SNR	Signal-to-noise ratio V _{DD} =5V, P _o =1W, R _L =8Ω		83		dB
V _n	Output voltage noise V _{DD} =3.6V, f=20Hz to 20kHz Inputs dc-grounded, No weighting		55		μVRMS
Z _I	Input impedance	27	30	33	kΩ
T _{UP}	Start-up time from shutdown V _{DD} =3.6V		20		ms



TERMINAL FUNCTIONS

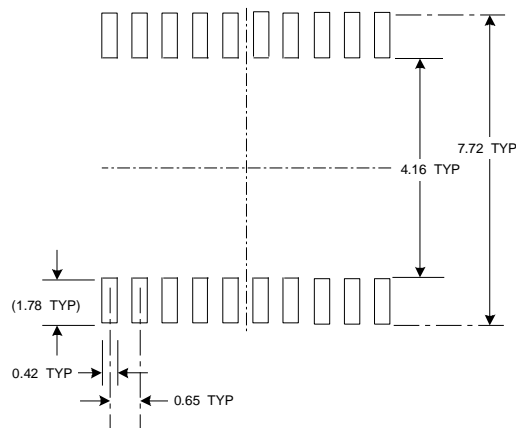
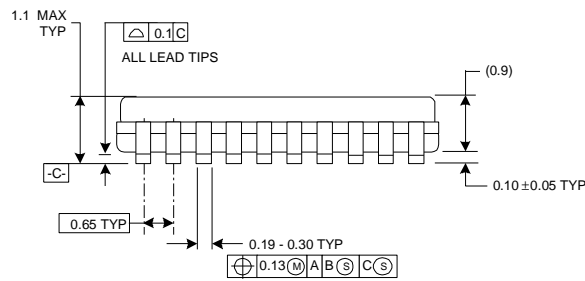
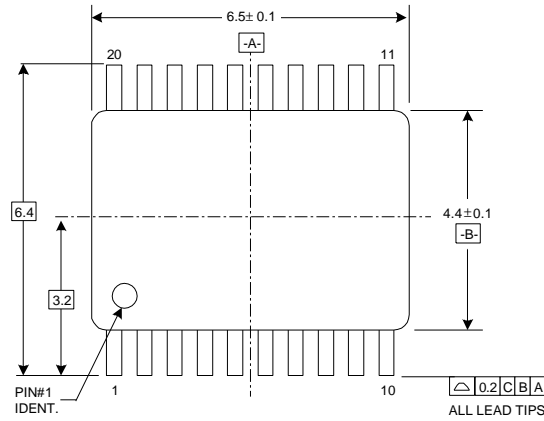
TERMINAL		I/O	DESCRIPTION
NAME	PIN NO		
IN1-,IN2-	18,8	I	Negative differential input
IN1+,IN2+	17,7	I	Positive differential input
V _{DD}	1,11	I	Digital Power supply
V _{DDA}	5,15	I	Analog Power supply
Vo1+,Vo2+	20,10	O	Positive BTL output
GND	3,9,13,19	I	Digital ground
GNDA	6,16	I	Analog ground
Vo1-,Vo2-	2,12	O	Negative BTL output
SDN1, SDN2	4,14	I	Shutdown terminal (active low logic)

TYPICAL CHARACTERISTICS

Note 1. No input coupling capacitors are used for all measurements.

- 2. Differential inputs are applied and BTL outputs are measured.
- 3. Balanced RC filter is used for THD+N measurement.
- 4. f_c (-3dB frequency) of the RC filter is set 20KHz unless otherwise specified.
- 5. Balanced LC filter is used for power efficiency measurement where L is 33 μ H and C is 1 μ F.

Physical Dimensions (IN MILLIMETERS)



TSSOP20

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