DATA SHEET

GPY0033A

PWM Amplifier with Audio Mixer

Jan 31, 2013

Version 1.0

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PWM AMPLIFIER WITH AUDIO MIXER

1. GENERAL DESCRIPTION

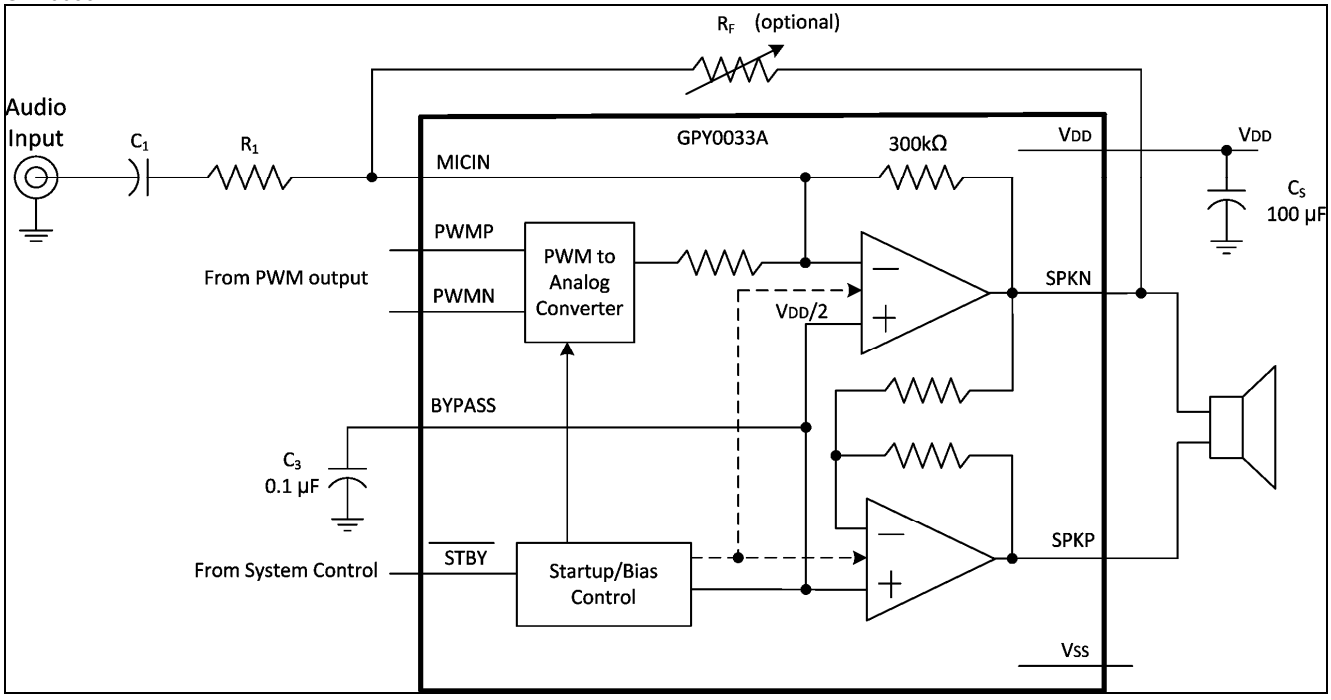
The GPY0033A is an audio amplifier, designed especially for PWM signal. It can accept PWM signal directly without any external device. In addition, it also provides a channel for analog signal to mix with the PWM signal; that is, the sound of microphone is easy to work with the PWM sound. GPY0033A is also built in the anti-pop circuit to minimize the turn-on and turn-off pop noise. Normally, it is applied for GPC series, GPF series, GPL series and other GENERALPLUS products. The GPY0033A is easily to be used in various applications and products

2. FEATURES

- Wide Operation Range: 2.4V – 5.5V
- Bridge-Tied Load (BTL)
- Low Distortion: THD+N < 1% (Typ.)
  (For VDD = 5.0V, R_L = 8.0Ω & P_{out} = 800mW)
- High Output Power: P_{OUT} > 0.8W
  (For VDD = 5.0V, THD+N =1.0%, f =1.0KHz & R_L = 8Ω)
- Low Shutdown Current: < 1.0μA
- Low Supply Current
- Minimize the turn-on and turn-off pop noise
- Fast Startup Time

3. BLOCK DIAGRAM

GPY0033A:

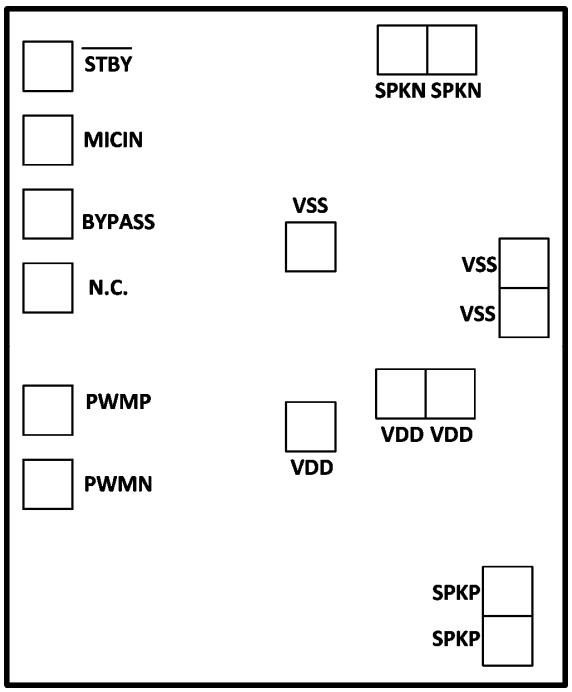


4. SIGNAL DESCRIPTIONS

GPY0033A:

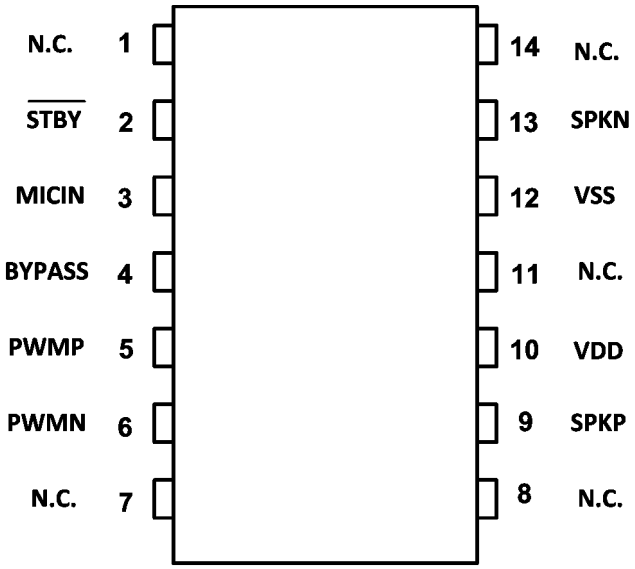
Mnemonic	PIN No.	Type	Description	Electrical Characteristics
$\overline{\text{STBY}}$	2	I	Standby control, low active. An internal resistor is pulled to ground weakly	-
MICIN	3	I	Channel for analog signal input	-
BYPASS	4	O	Reference voltage for OP positive terminal, a 0.1uF capacitor is necessary	VDD/2
PWMP	5	I	PWM positive terminal. An internal resistor is pulled to ground weakly when $\overline{\text{STBY}}$ is high.	-
PWMN	6	I	PWM negative terminal. An internal resistor is pulled to ground weakly when $\overline{\text{STBY}}$ is high.	-
SPKP	9	O	The positive terminal for speaker	-
VDD	10	I	Power VDD	2.4V – 5.5V
VSS	12	I	Power Ground	-
SPKN	13	O	The negative terminal for speaker	-

4.1. PAD Assignment



The IC substrate should be connected to VSS

4.2. Package Pin Assignment



SOP-14

5. ELECTRICAL SPECIFICATIONS

5.1. Absolute Maximum Ratings

Characteristics	Symbol	Ratings
DC Supply Voltage	V_+	< 5.5V
Input Voltage Range	V_{IN}	-0.5V to V+ + 0.5V
Operating free-air Temperature Range	T_A	-40℃ to + 85℃
Operating junction Temperature Range	T_J	-40℃ to + 150℃
Storage Temperature	T_{STO}	-50℃ to + 150℃

Note: Stresses beyond those given in the Absolute Maximum Rating table may cause permanent damage to the device. For normal operational conditions see AC/DC Electrical Characteristics.

5.2. Thermal Characteristics

Characteristics	Symbol	Value	Unit
SOP-14 Package Thermal Resistance	R_{THJA}	90	℃/W

5.3. DC Characteristics (V_{DD}=5.0V, T_A = 25°C unless otherwise specified)

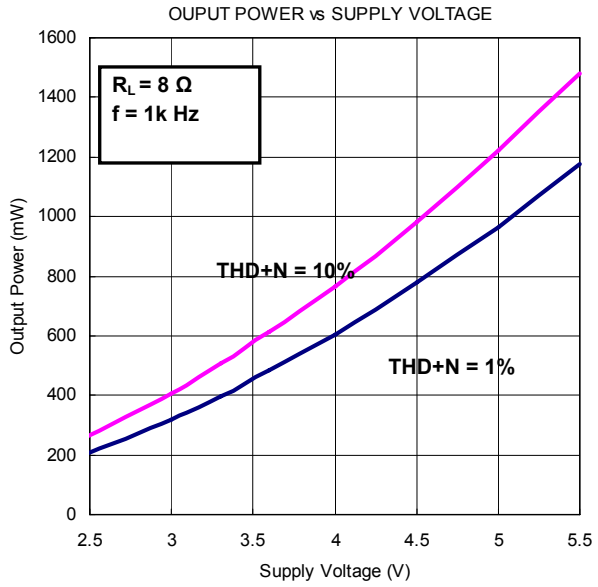
GPY0033A:

Item	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Operation Voltage	Temperature = 25℃	V_{DD}	2.4	-	5.5	V
Shutdown Current	$\overline{STBY}$=GND	I_{STBY}	-	0.2	1.0	uA
Operating Current	V_{DD} = 5.5V, $\overline{STBY}$ =V_{DD}, No Load	I_{DD}	-	3.5	5.5	mA
Input High Voltage	V_{DD} = 2.4V~3.3V	V_{IH}	0.5*V_{DD}	-	-	V
	V_{DD} = 3.3V~5.5V		0.45*V_{DD}	-	-	
Input High Voltage	V_{DD} = 2.4V~3.3V	V_{IL}	-	-	0.3*V_{DD}	V
	V_{DD} = 3.3V~5.5V		-	-	0.25*V_{DD}	
Total Harmonic Distortion + Noise	V_{DD} = 5.0V, R_L = 8.0Ω, P_{OUT} = 500mW f = 1.0KHz, R_F=33kΩ, R_I=30kΩ	THD+N	-	0.2	-	%
Output Power (From MICIN)	V_{DD} = 5.0V, THD+N = 1%, f = 1.0KHz , R_L = 8.0Ω, R_F=33kΩ, R_I=30kΩ	P_{OUT}	-	900	-	mW
	V_{DD} = 5.0V, THD+N = 10% f = 1.0KHz , R_L = 8.0Ω, R_F=33kΩ, R_I=30kΩ	P_{OUT}	-	1200	-	mW
Output Offset Voltage	V_{IN}=0V	V_{OS}	-	-	30	mV
Enable Time	V_{DD} = 5.0V, C3=0.1μF,	T_{ON}	-	-	20	ms
Shutdown Time	V_{DD} = 5.0V, C3=0.1μF,	T_{OFF}	-	-	70	ms

5.4. Typical Performance Characteristics

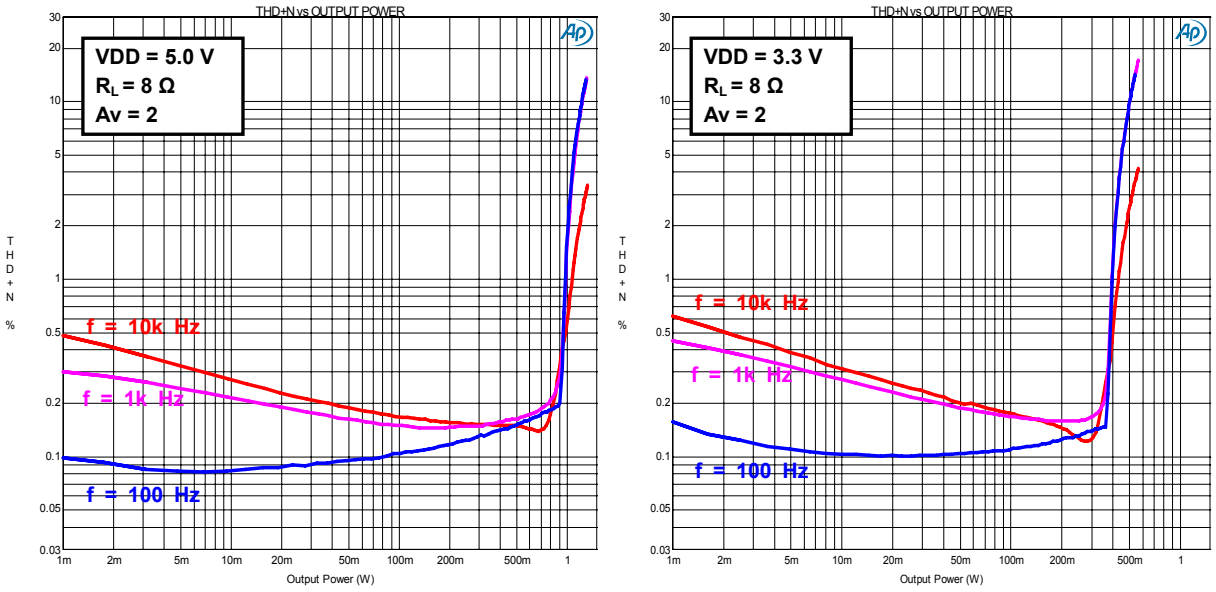
5.4.1. Output Power vs. Supply Voltage

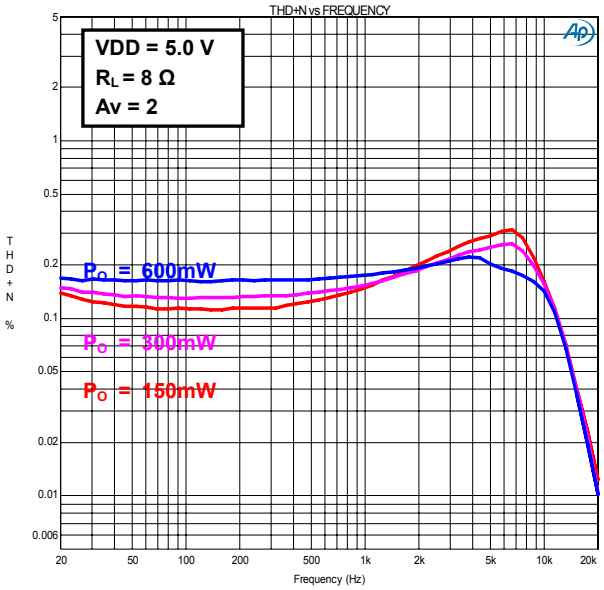
Condition: R_F = 33kΩ, R_1=30kΩ, C_1=2.2μF, signal input from MICIN

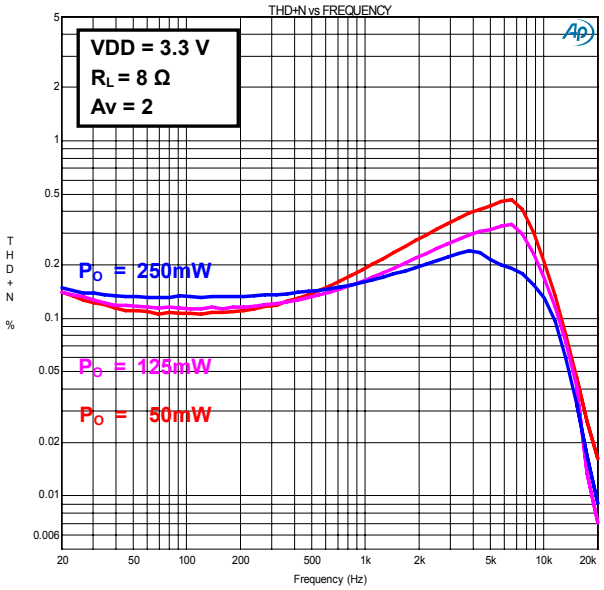


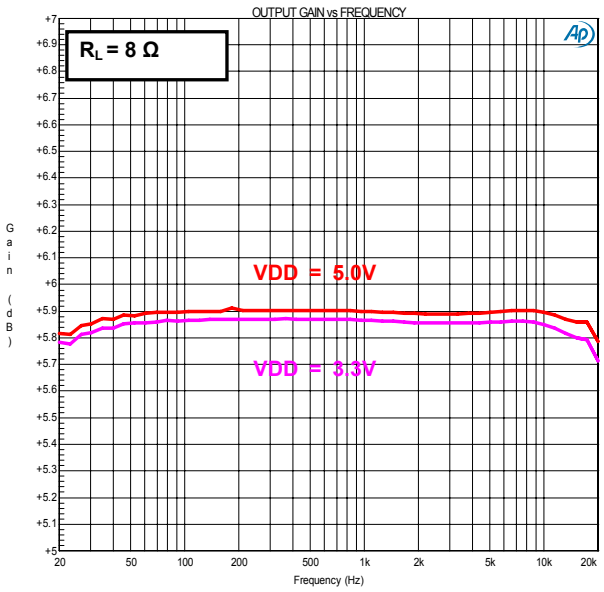
5.4.2. THD+N (from MICIN)

Condition: R_F = 33kΩ, R_1=30kΩ, C_1=2.2μF




THD+N vs FREQUENCY
VDD = 5.0 V
RL = 8 Ω
Av = 2
PO = 600mW
PO = 300mW
PO = 150mW
THD+N %
Frequency (Hz)

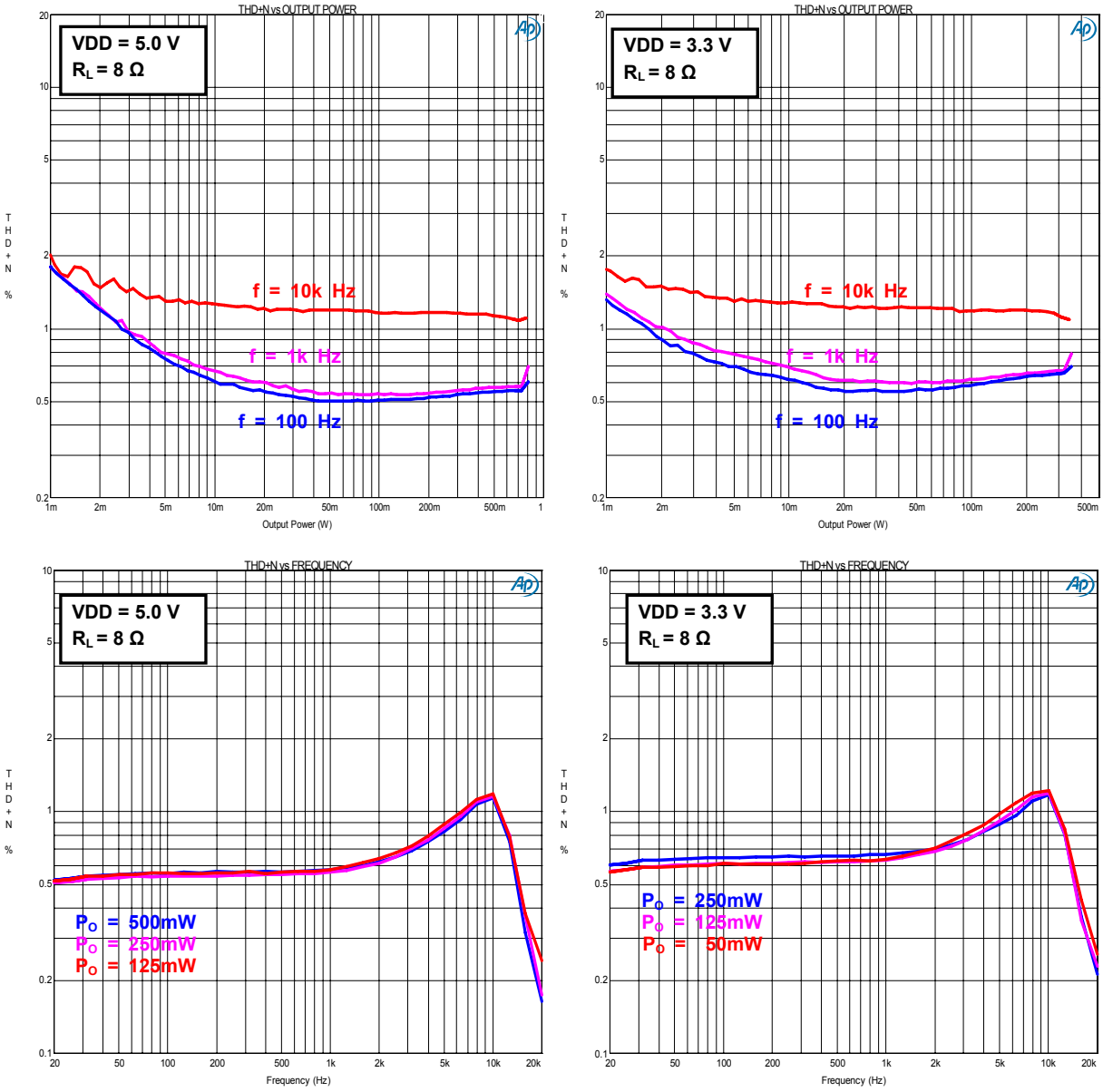

THD+N vs FREQUENCY
VDD = 3.3 V
RL = 8 Ω
Av = 2
PO = 250mW
PO = 125mW
PO = 50mW
THD+N %
Frequency (Hz)


OUTPUT GAIN vs FREQUENCY
RL = 8 Ω
VDD = 5.0V
VDD = 3.3V
Gain (dB)
Frequency (Hz)

5.4.3. THD+N (from PWM)

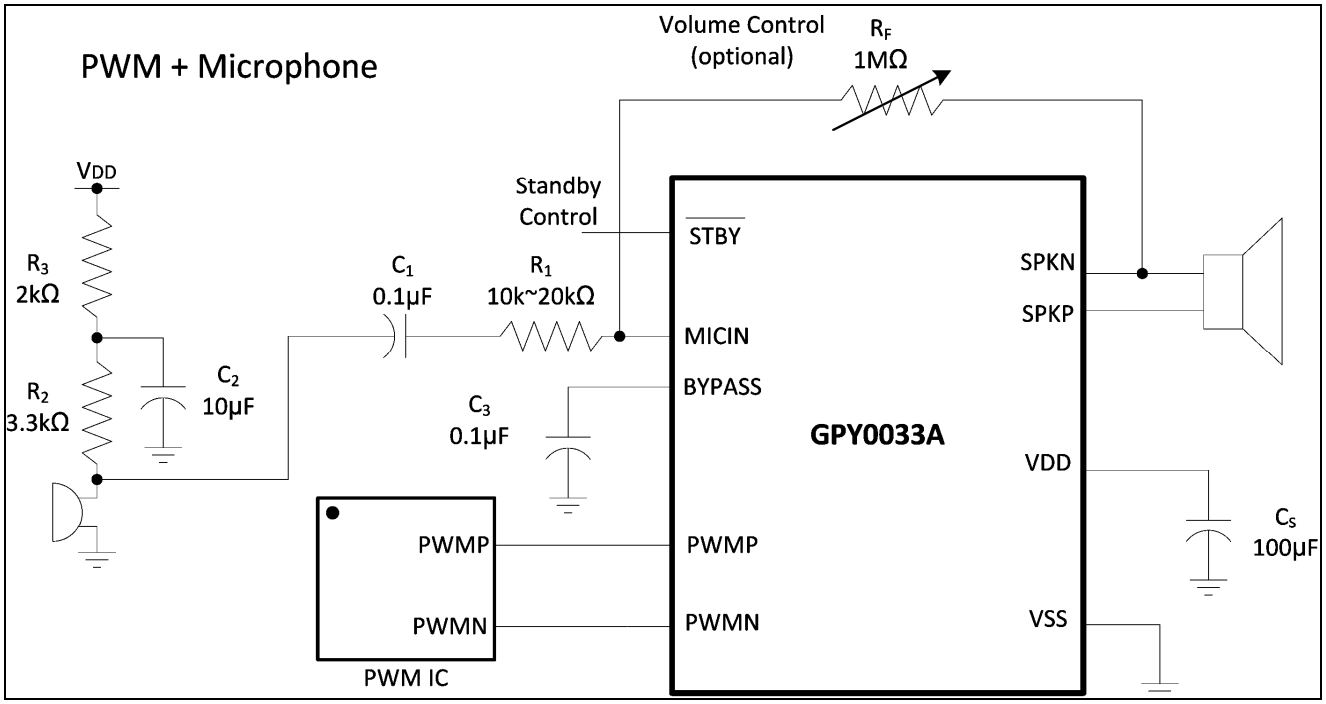
Condition: PWM signal → 2nd delta-sigma modulation, 6.144 MHz clock rate and 96 KHz sample rate

✧ ***THD+N deeply depends on the PWM signal quality***



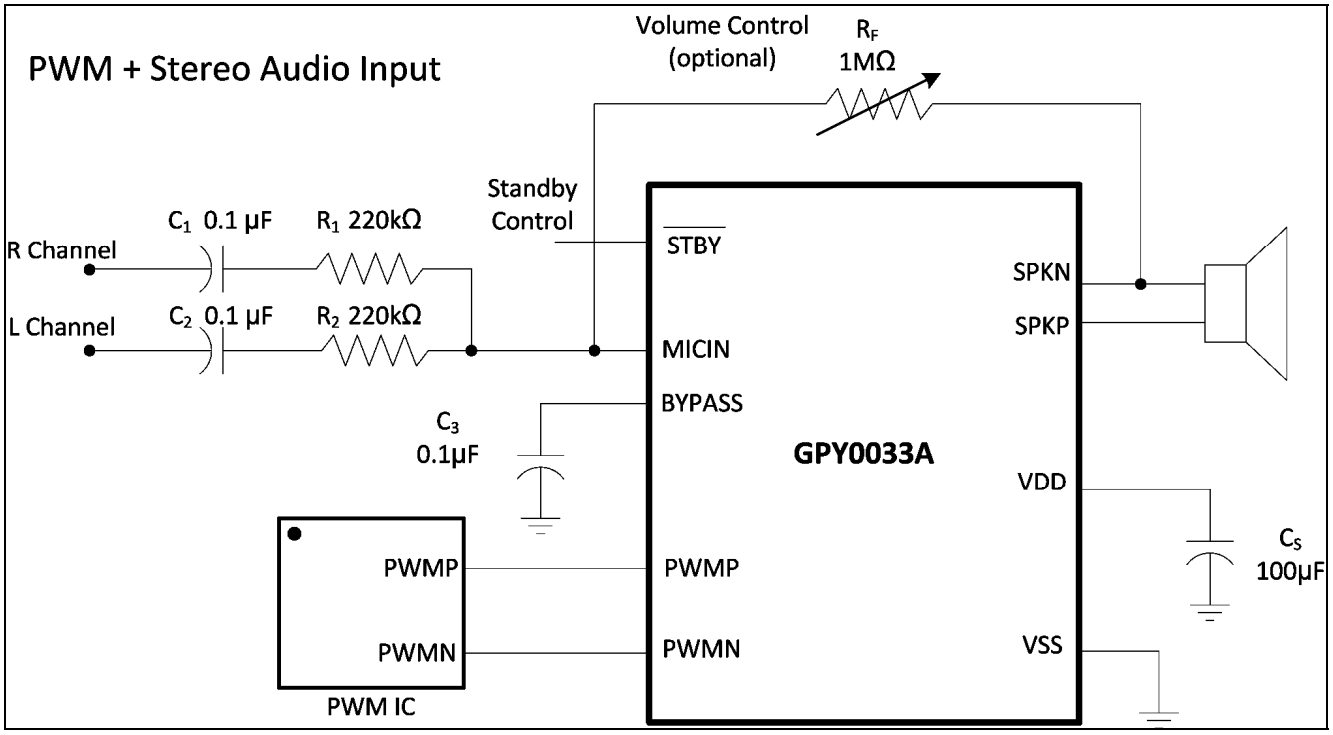
6. APPLICATION INFORMATION

6.1. GPY0033A Typical Application Circuit 1



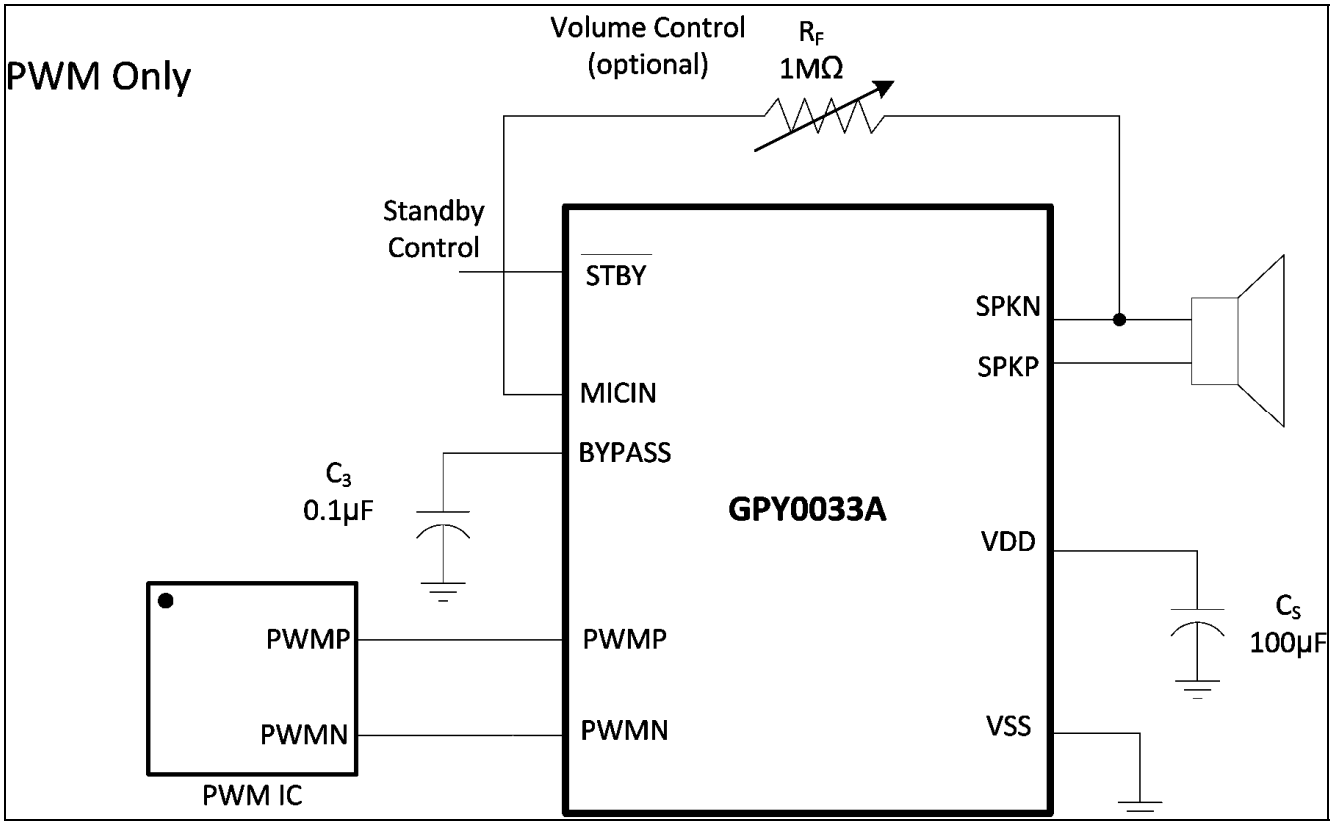
- R_F is for volume control, the microphone gain = (R_F//300kΩ)/R_1; the internal resistance between MICIN and SPKN is approx. 300kΩ.

6.2. GPY0033A Typical Application Circuit 2

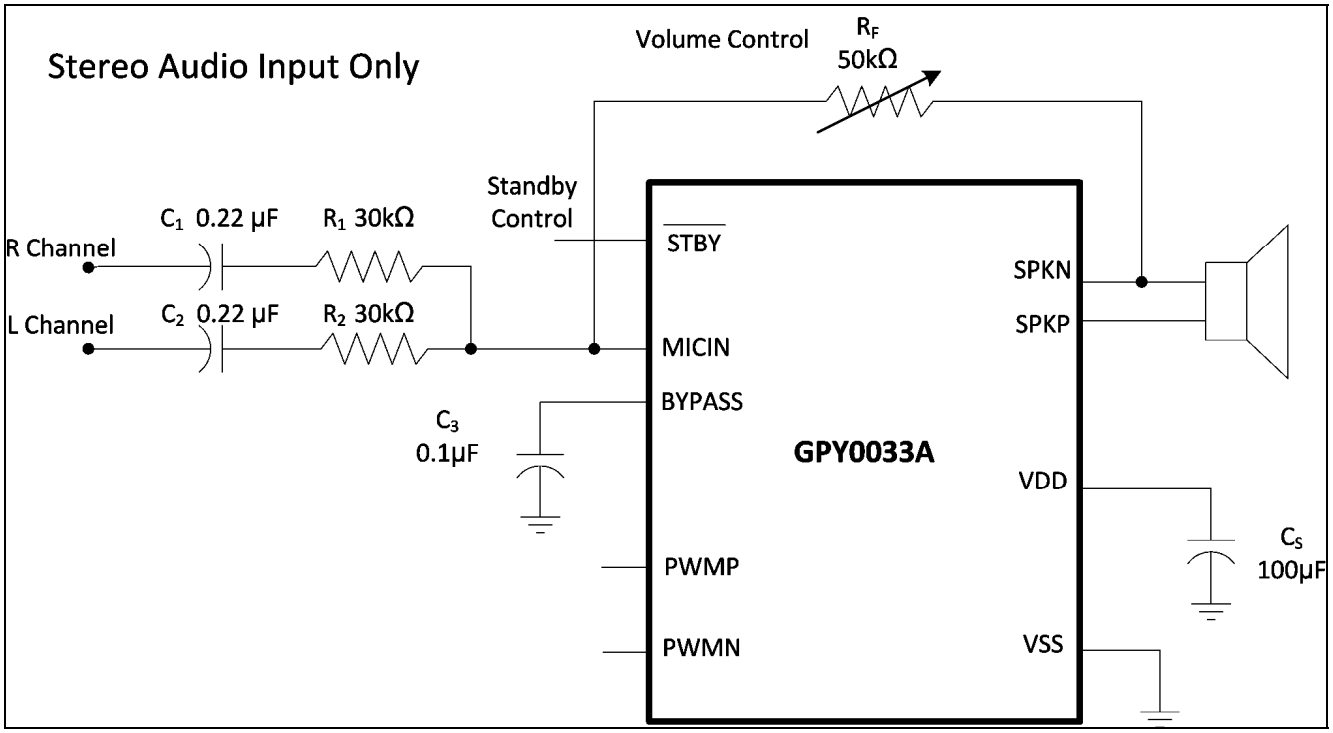


- R_F is for volume control, the audio input gain = (R_F//300kΩ)/R_1; the internal resistance between MICIN and SPKN is approx. 300kΩ.

6.3. GPY0033A Typical Application Circuit 3



6.4. GPY0033A Typical Application Circuit 4



- R_F is for volume control, the audio input gain = (R_F//300kΩ)/R_1; the internal resistance between MICIN and SPKN is approx. 300kΩ.

7. PACKAGE/PAD LOCATIONS

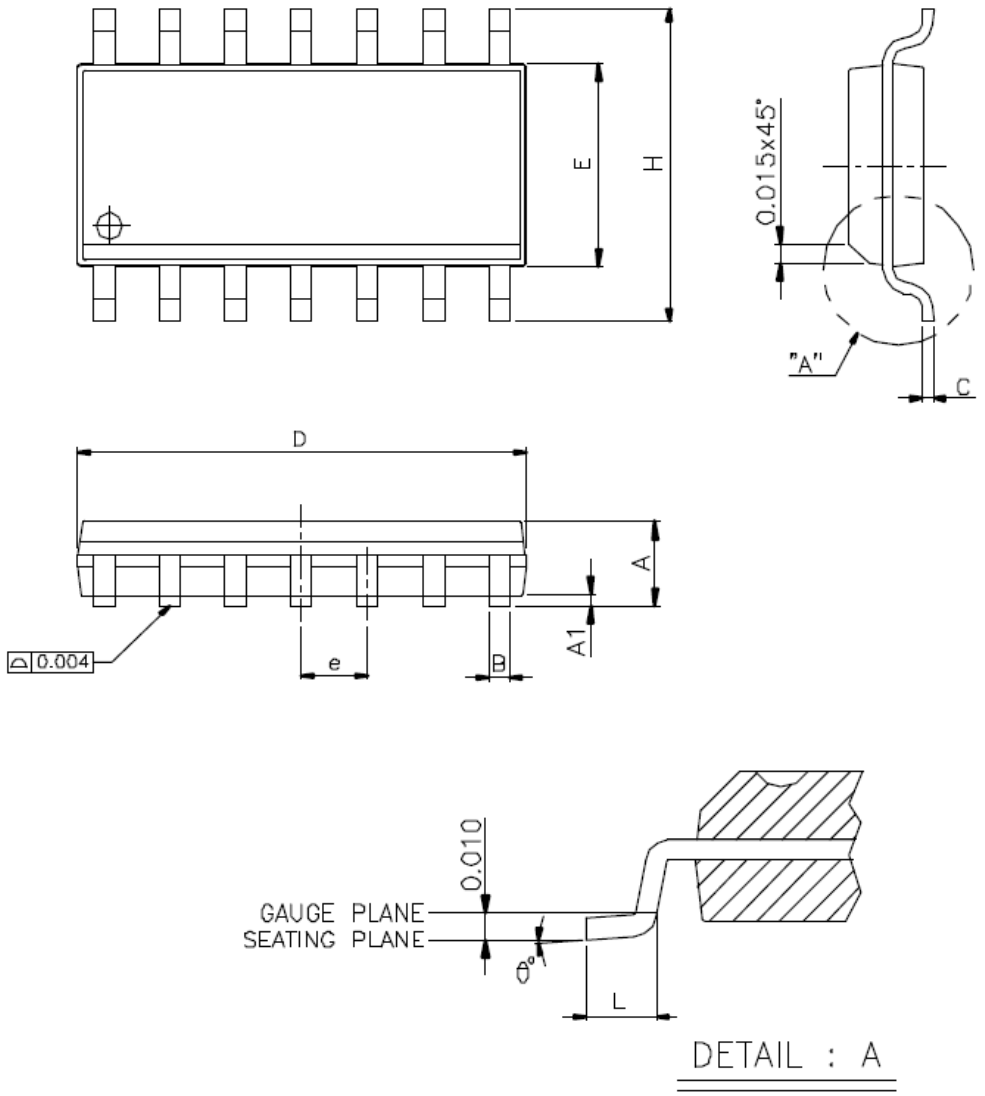
7.1. Ordering Information

Product Number	Package Type
GPY0033A - C	Chip form
GPY0033A - HS02x	Green Package – SOP-14 (150mil)

Note: Package form number (x = 1 - 9, serial number).

7.2. Package Information

7.2.1. SOP-14



Symbol	Dimension in inch		
	Min.	Typ.	Max.
A	0.058	0.064	0.068
A1	0.004	-	0.010
B	0.13	0.016	0.020
C	0.0075	0.008	0.0098

Symbol	Dimension in inch		
	Min.	Typ.	Max.
D	0.336	0.341	0.344
E	0.150	0.154	0.157
e	-	0.050	0.050
H	0.228	0.236	0.244
L	0.015	0.025	0.050
θº	0	-	8

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9. REVISION HISTORY

Date	Revision #	Description	Page
Jan 31, 2012	1.0	Modify the maximum operating current.	15
Sep 06, 2012	0.3	Preliminary version	15