1. General Descriptions

TRA1309CP is a speaker amplifier that can accept PWM signal and doesn't need any external device for these input signals. PWM input supports mainly for TRITAN's PWM output. The TRA1309CP contains advanced de-pop circuitry which eliminates pops during chip enable and disable. The gain is adjusted by connecting an external resistor between RGAIN and SPKN. Internal sound processing is added for better sound quality.

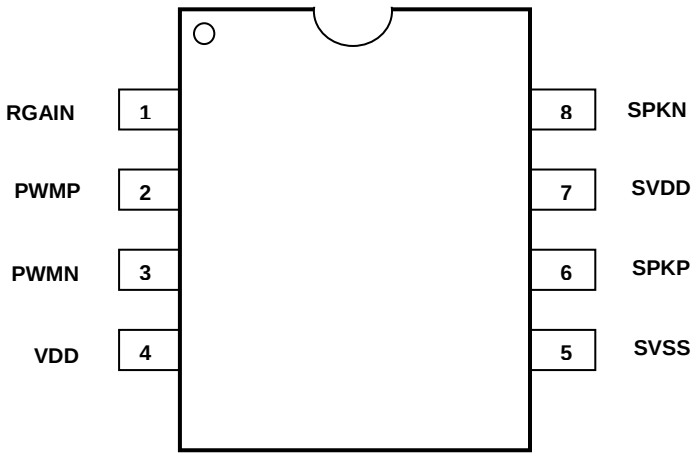
2. Features

- Accept PWM and doesn't need any external devices for these input signals.
- Mute function
- Wide operation voltage : 2.4V~5.5V
- sound processing for better sound quality
- Auto power ON/OFF
- Low standby current : 2u A, typical.
- High output power Pout = 0.8W (VDD=5.5V, THD=1%)

3. Ordering Information

Part Number	Package Type	Description
TRA1309CP-P	DIP 8	Plastic dual in-line package; 8 leads (300mil); PWM mode
TRA1309CP-S	SO 8	Plastic small outline package; 8 leads; body with 3.9 mm; PWM mode

4.1 Pin Configuration



- This chip only applicable for Tritan's SPEECH series PWM and TRD16P101/102/201 PWM

4.2 Packaging and Pads Information

Signal Name	Pin Type	Signal Description
SVDD	I	Speaker driver power input
SVSS	I	Speaker driver ground input
VDD	I	Internal circuit power input
PWMP	I	PWMP signal input
PWMN	I	PWMN signal input
RGAIN	I	Gain adjust pad
SPKP	O	Positive speaker output
SPKN	O	Negative speaker output

5. ELECTRICAL CHARACTERISTICS

5.1 Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
DC Supply Voltage	VDD	-0.5 to 5.5	V
Input Voltage	Vi	-0.5 to Vdd+0.5	V
Operating Temperature Range	Ta	-20 to 75	℃
Storage Temperature Range	Tstg	-40 to 150	℃

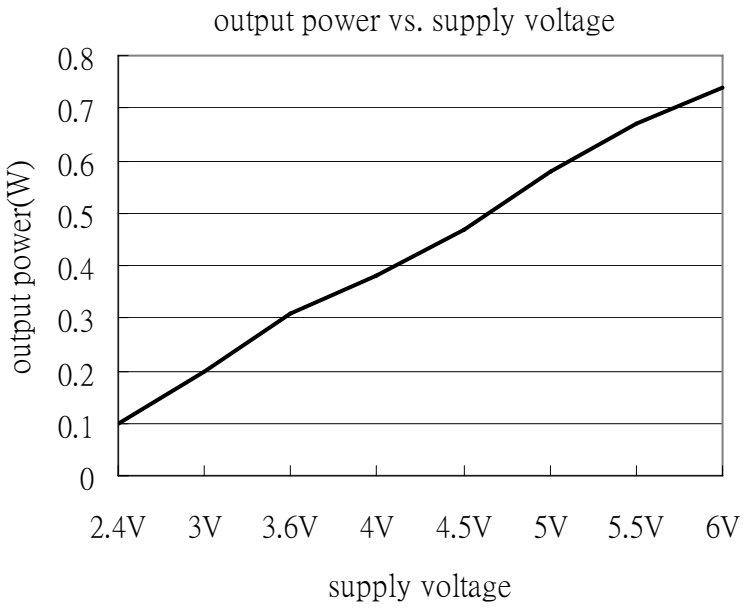
5.2 DC/AC Characteristics

Ta=25℃ unless otherwise noted

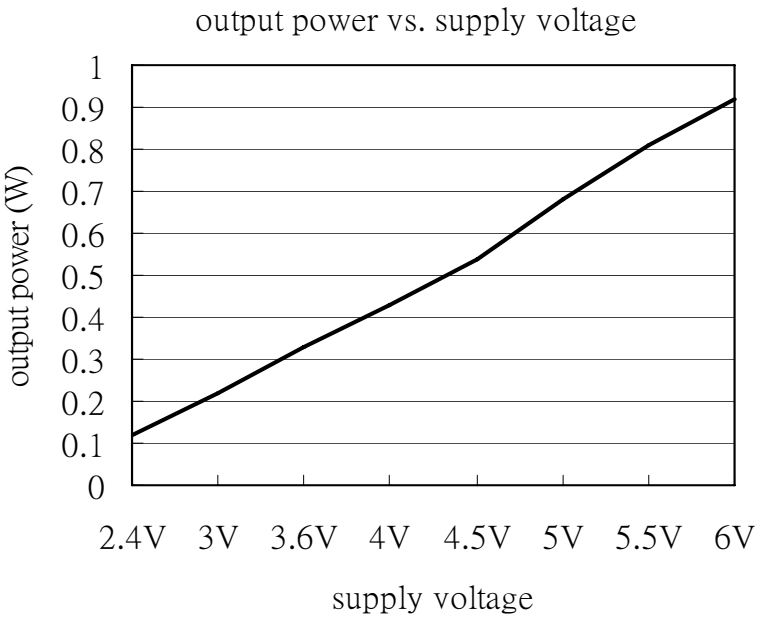
Parameters		Symbol	Minimum	Typical	Maximum	
Power supply range		VDD	2.4 V	-	5.5 V	
Operating current		Iop		6mA		VDD=5.5V
Standby current		Imute		2uA		PWMP=floating PWMN=floating
Input high voltage		Vih	1V			VDD=2.4V~5.5V
Input low voltage		Vil			0.5V	VDD=2.4V~5.5V
Input current		Ic			5 uA	When PWMP or PWMN connect to VSS will sink this current
Pull up resistor		Rpull-h		2Meg ohm		VDD=3.3V PWMP & PWMN
Output power	SOP	Pout		0.6W		VDD=5.5V,THD=1%, R_L=8Ω
	DIP			0.8W		
Mute time		Mt		30mS 200mS		T_{ON} T_{OFF}
THD+Noise		THD+N		1%		VDD=5V,Pout=0.6W,R_L=8Ω,Gain=2

5.3 Output power perfomance

1. Output power vs. supply voltage (Fin = 1Khz, R_L = 8Ω, THD=1%, normal mode)



2. Output power vs. supply voltage (Fin = 1Khz, R_L = 8Ω, THD=1%, PB mode)



6. FUNCTIONAL DESCRIPTION

6.1 PWM signal transfer to Analog signal

The PWMP direct connect to TRA1309CP's PWMP and the PWMN direct connect to TRA1309CP's PWMN (Fig 7-1). No external output components are needed.

Gain is adjusted using R1(or VR). Since PWM signal is harder to be simply defined. Power gain description is as followed :

Suppose using Tritan's 3AB/5AB, PWM is connected to 8 ohm speaker, the output power is P1.
P2 is the speaker power output using above circuit, condition is same as P1.
P2 = 1.1 x P1 , set R1 ~ 120Kohm , It is the same as TRA1309AP.
This gain setting will almost assure output signal in "non-distortion" area in any VDD/SVDD.

But if 3AB/5AB chip uses lower VDD and 1309CP uses higher VDD(and SVDD), then the output power gain(P2/P1) will be higher. Output power gain will increase propotionally to the ratio of these two VDDs.

Note : P2 = 3.5 x P1 , set R1 ~ 390Kohm , It is the same as TRA1309BP.

Note : Load capacitance on SPKP/SPKN must be take care of as followed :

Reisitor load between SPKP and SPKN	Maximum load capacitance
Open	100pF
8ohm	300pF

In case stability problem is found, connect a 22pF ~ 100pF capacitor between RGAIN and SPKN.

6.2 Mute function(AutoPowerOn/Off)

When PWM input is disabled (floating)*1, TRA1309CP will enter standby mode automatically with mute-off sequence. SPKP/N will be floated after ~200mS. When PWM is enabled, TRA1309CP will be turned on automatically and mute-on sequence is executed (Fig 6-2). SPKP/N will work after ~30mS.

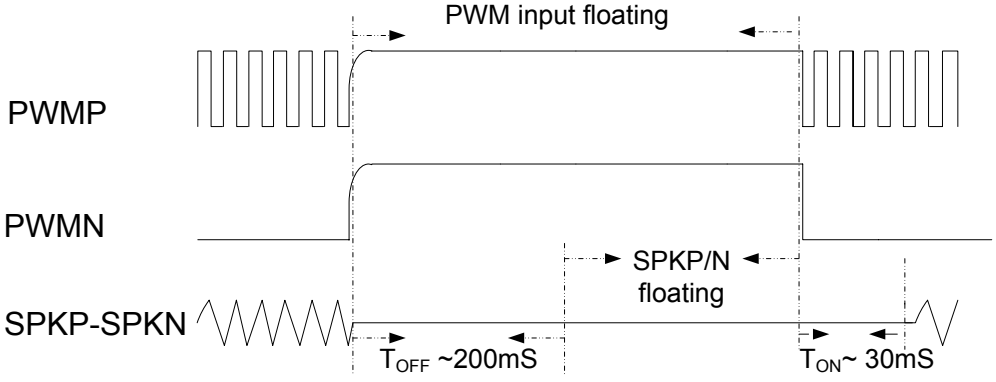


Fig 6-2 Mute sequence in TRA1309CP

***1 : PWM Input floating (Mute) must consider as below**

Parasitic capacitor (Maximum)	Rise time after PWM floating (Maximum)
50pF	100uS

7. Application circuit

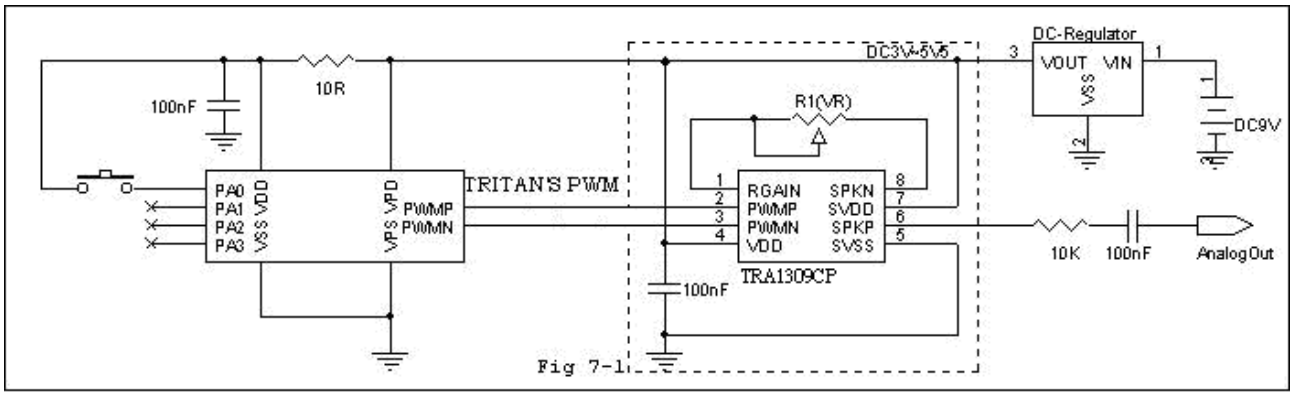


Fig 7-1

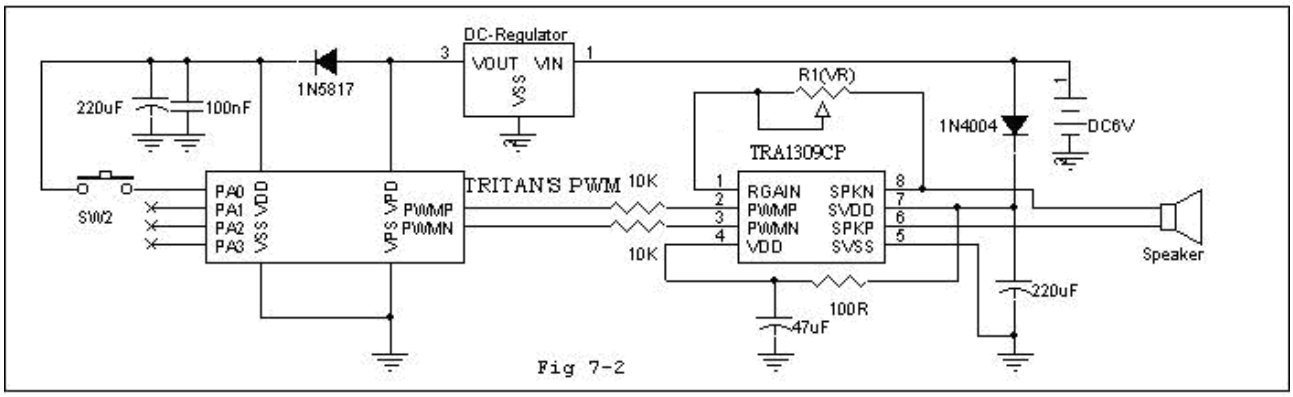


Fig 7-2

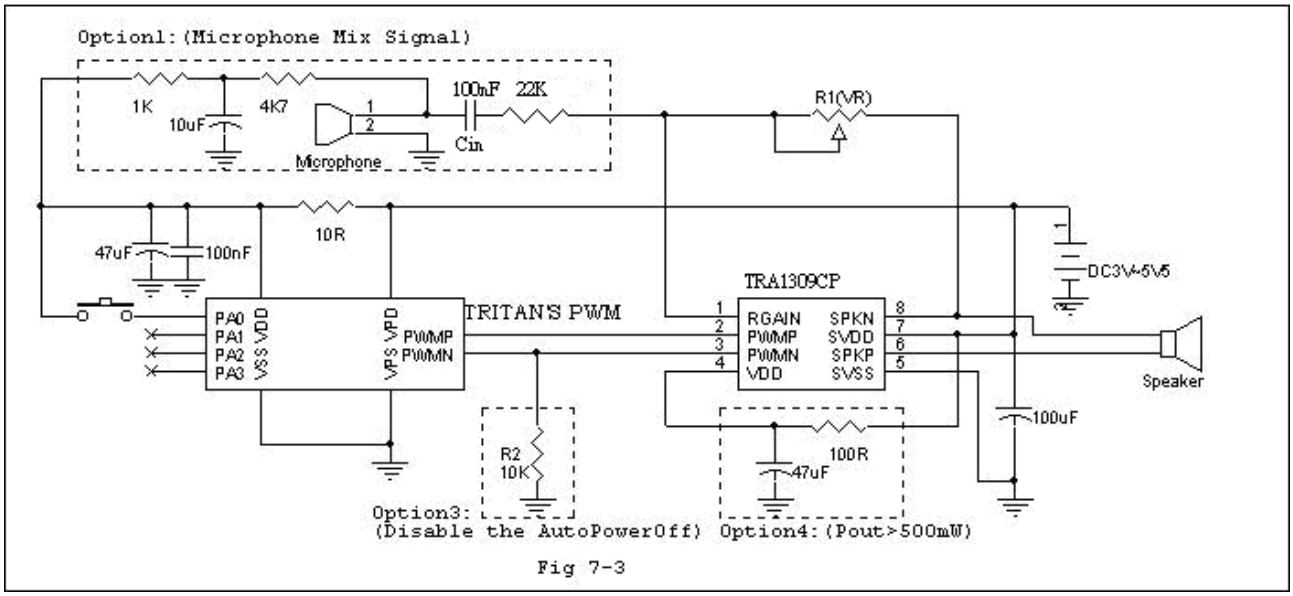
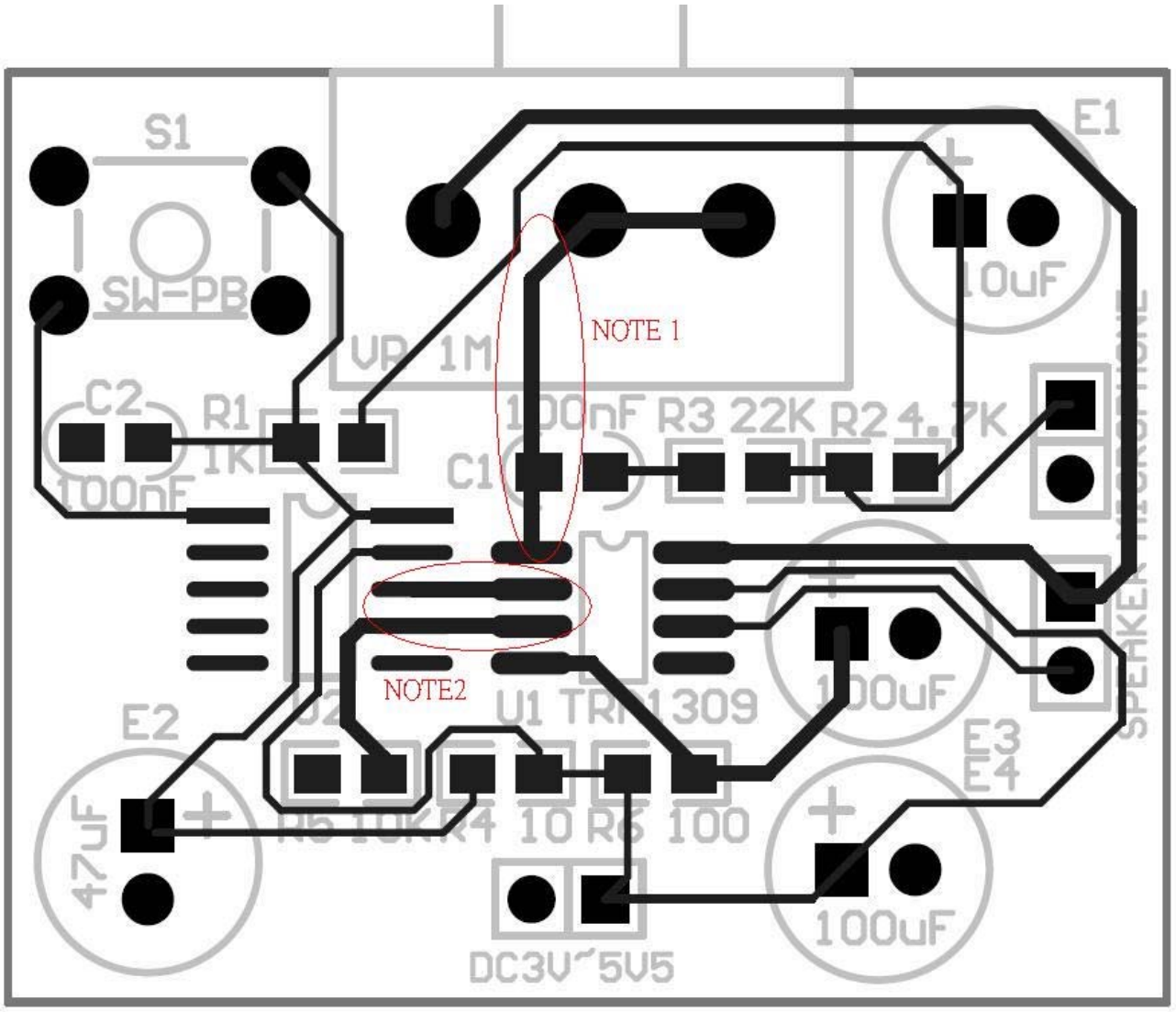


Fig 7-3

- When R1(VR) is used, wire of RGAIN must be kept as short as possible
- An analog mix signal input may be used or not. (Option 1) It's gain =R1/Rin1 .
- If output power is small. (Output power < 0.5W) SVDD can be shorted to VDD. When high output power is needed (Output power > 0.5W). Option 4 must be used.
- R2=10Kohm(Option3) can be disable the Auto Power Off function.

The PCB layout example of Fig 7-3

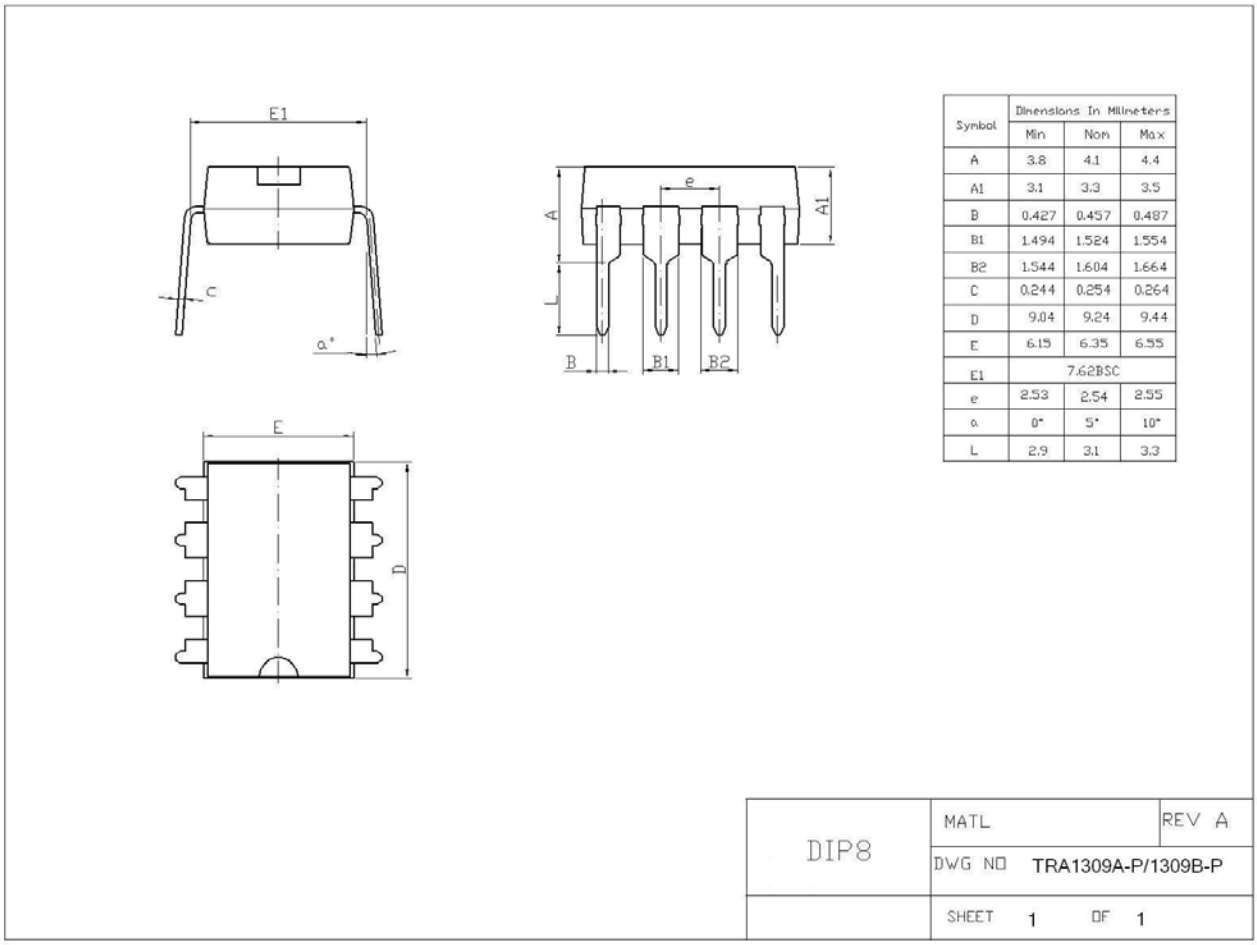


Note 1 : TRA1309CP RGAIN wire to VR and MIC input as short as possible (<2cm is needed)

Note 2: Tritan's PWM wire to TRA1309CP input as short as possible (<2cm is needed)

8.PACKAGE OUTLINES

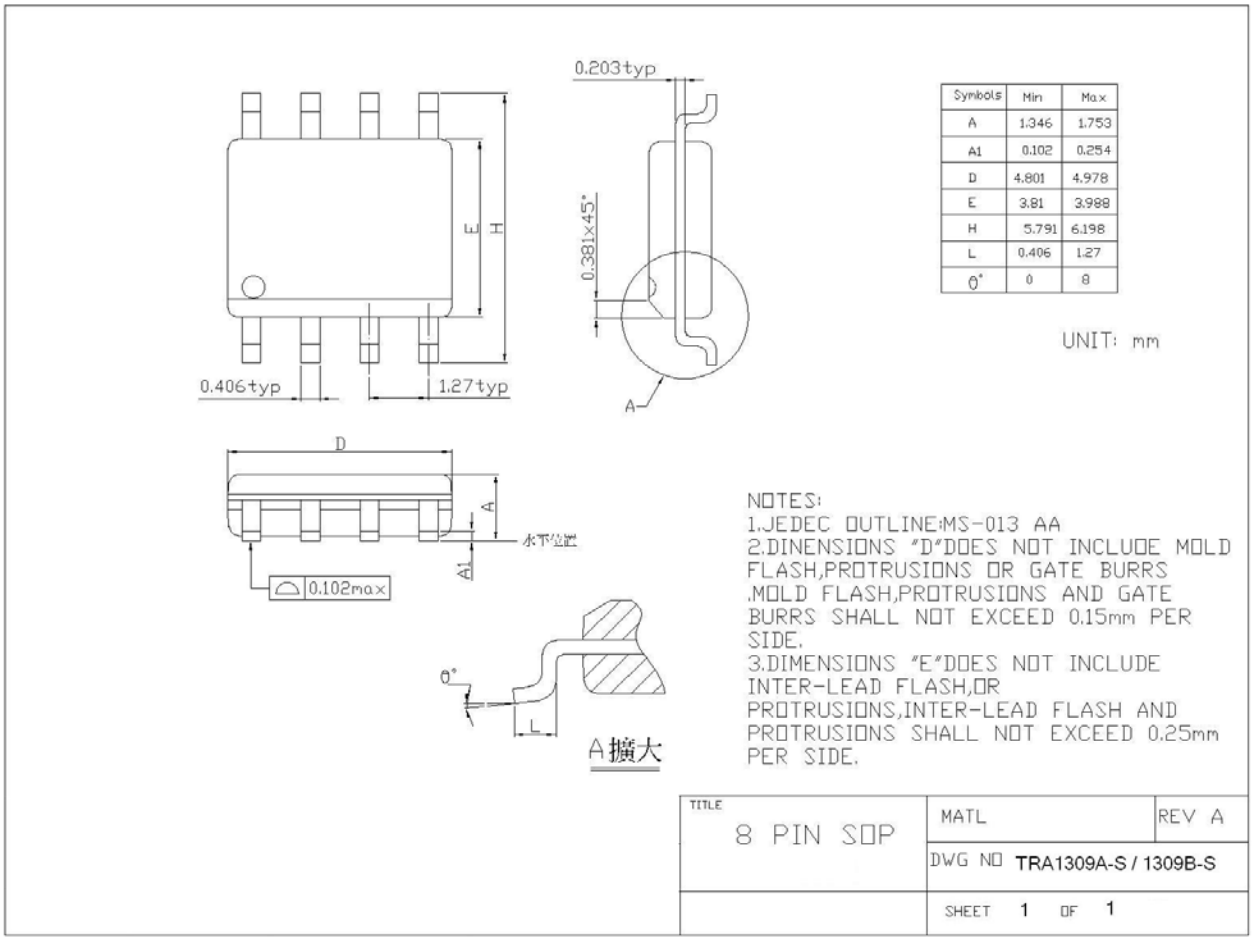
8.1 DIP8: plastic dual in-line package; 8 leads (300mil)



Symbol	Dimensions In Millimeters		
	Min	Nom	Max
A	3.8	4.1	4.4
A1	3.1	3.3	3.5
B	0.427	0.457	0.487
B1	1.494	1.524	1.554
B2	1.544	1.604	1.664
C	0.244	0.254	0.264
D	9.04	9.24	9.44
E	6.15	6.35	6.55
E1	7.62BSC		
e	2.53	2.54	2.55
α	0°	5°	10°
L	2.9	3.1	3.3

DIP8	MATL	REV A
	DWG NO TRA1309A-P/1309B-P	
	SHEET 1 OF 1	

8.2 SOP8: plastic small outline package; 8 leads; body width 3.9mm



REVISION HISTORY

REVISION	DESCRIPTION	PAGE	DATE
V1.0	New created, PWM mode with package, extracted/modified from TRA1309BA_V1.2		2010.10.20
V1.1	Mute consideration and PCB layout example	4,6	2012.03.15