Non-Crack-Noise, Ultra-Low-THD+N, Ultra-Low-EMI, Second Generation Class-D Audio Amplifier

Features

- **Ultra low THD+N:0.007%**
- **AB/D operate mode**
- **Two NCN level：0.65w and0.85w**
- **Unique RNS**
- **High SNR:95dB**
- **EEE Function, Greatly reduces EMI over the full bandwidth**
- **Excellent Pop-Click Suppression**
- **No VREF capacitor**
- **Pin compatible with AW8155(A) AW8145**
- One-pulse control
- Filter-Free Class-D Architecture
- High PSRR (75dB at 217Hz)
- Low Shutdown Current (<0.1μA)
- Power Supply Range: 2.5V~5.5V
- Over-Current Protection
- Over-Temperature Protection
- Small FCQFN 1.5mmX1.5mmX0.55mm-9L Package

Applications

- Cellular Phones
- MP3/PMP
- GPS
- Digital Photo Frame
- HAC (Hearing Aid Compatibility)

General Description

The AW8155B is a non-crack-noise (NCN), ultra-low-EMI, filter-free, AB/D output mode selection, unique RNS technology, second generation Class-D audio amplifier. Ultra low THD+N, Unique NCN function, which adjusts the system gain automatically while detecting the "Crack" distortion of output signal, protects the speaker from damage at high power levels and invites the user to bask in immense musical enjoyment.

AW8155B NCN output power can be set to 0.65w or 0.85w for different speakers, this feature is embedded in order to protect speakers from damage caused by an excessive sound level.

The AW8155B features a unique RNS technology, which effectively reduces RF energy, attenuate the RF TDD-noise, an acceptable audible level to the customer.

The AW8155B features the EEE (Enhanced Emission Elimination) function which greatly reduces EMI over the full bandwidth. The AW8155B achieves better than 20dB margin under FCC limits with 24 inch of cable.

The filter-free PWM architecture and internal gain setting reduces external components count, board area consumption, system cost and simplifies the design. The over-current, over-temperature is prepared inside of the device.

The AW8155B is available in an ultra small FCQFN 1.5mmX1.5mmX0.55mm-9L package. The AW8155B is specified over the industrial temperature range of -40℃ to +85℃.

Typical Application

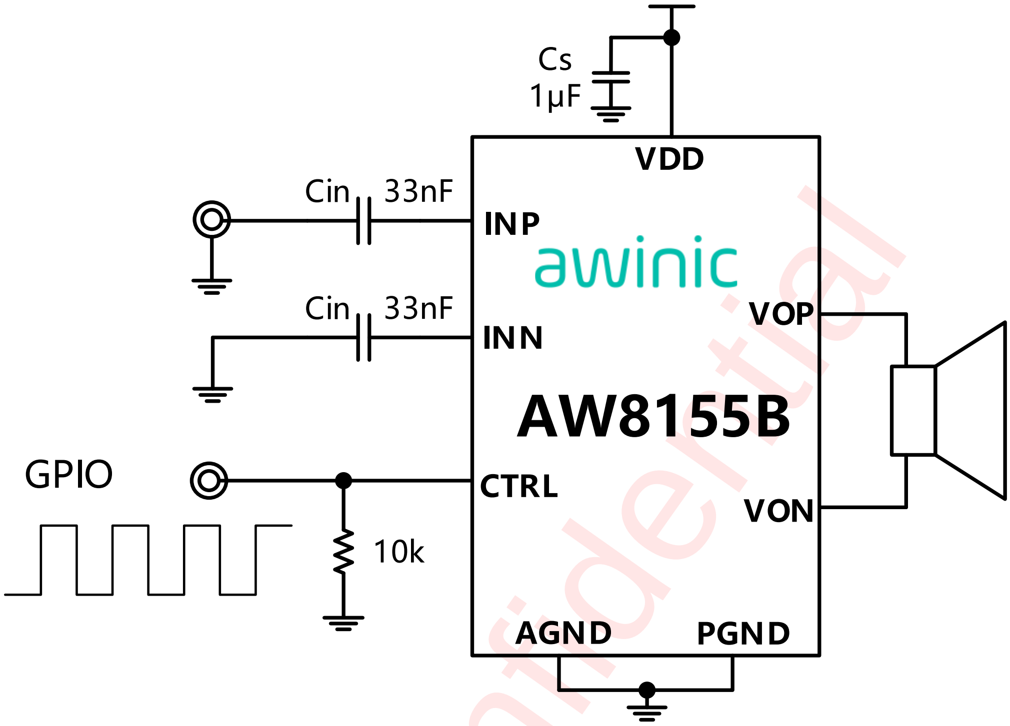


Figure 1. **AW8155B Application Schematic With Single-Ended Input**

Pin Configuration and Top Mark

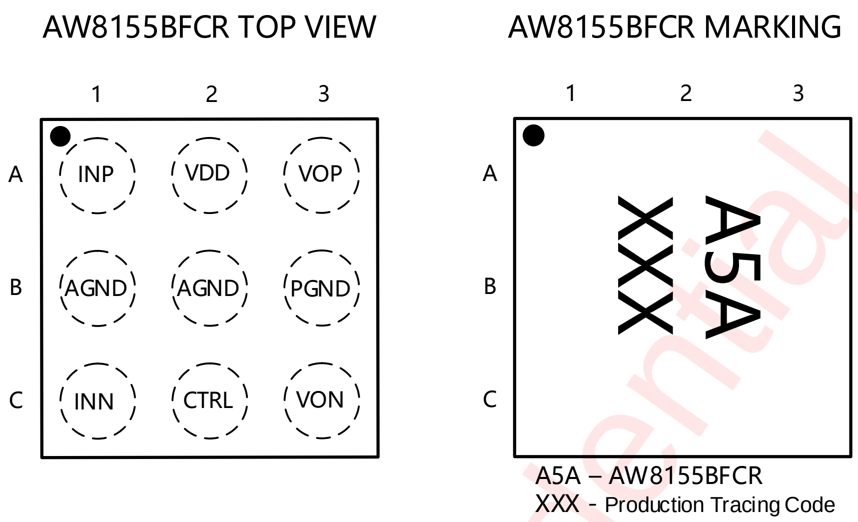


Figure 2. Pin Configuration and Top Mark of AW8155B

Pin Definition

No.	Symbol	Description
A1	INP	Positive audio input
A2	VDD	Power Supply
A3	VOP	Positive audio output
B1	AGND	Analog ground
B2	AGND	Analog ground
B3	PGND	Power ground
C1	INN	Negative audio input
C2	CTRL	Shutdown and NCN control pin
C3	VON	Negative audio output

Typical Application

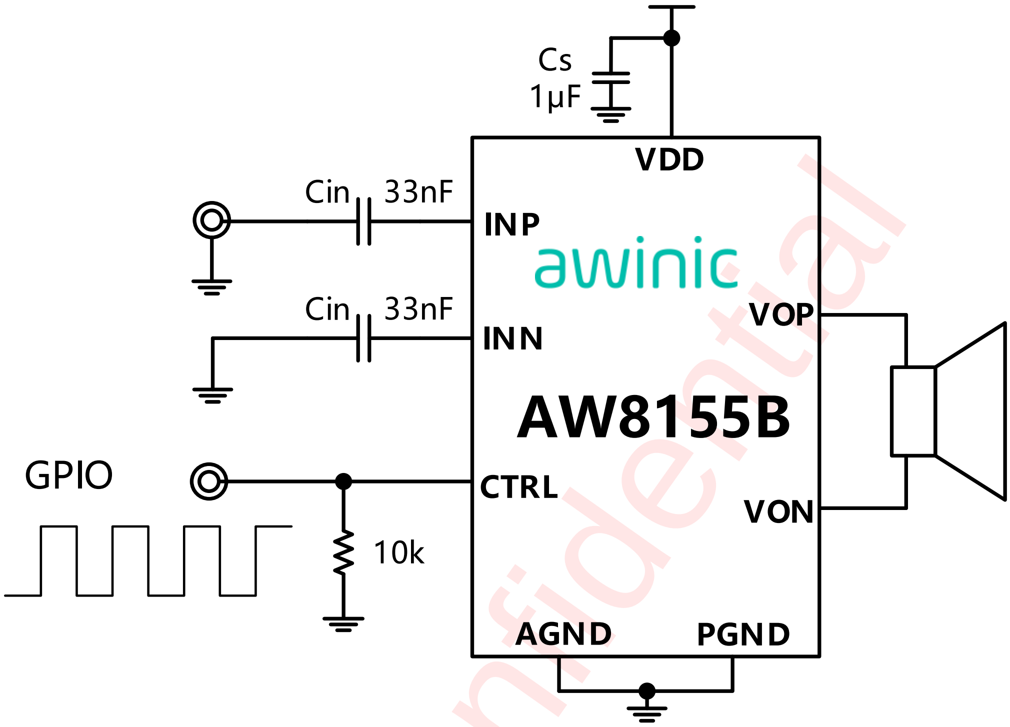


Figure 3. AW8155B Application Schematic With Single-Ended Input

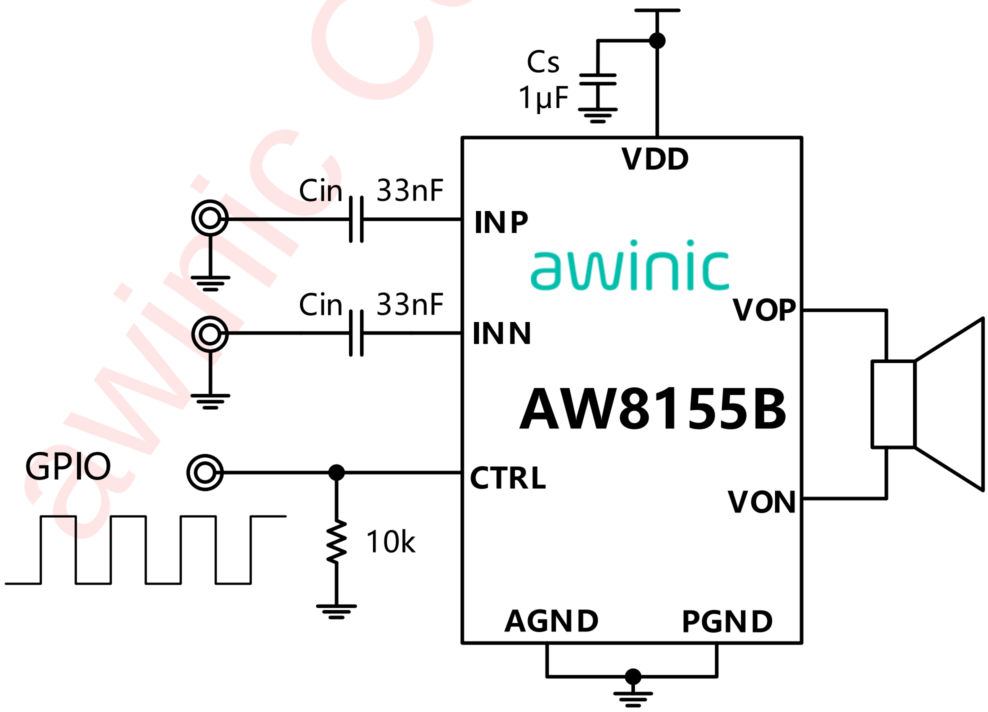


Figure 4. AW8155B Application Schematic With Differential Input

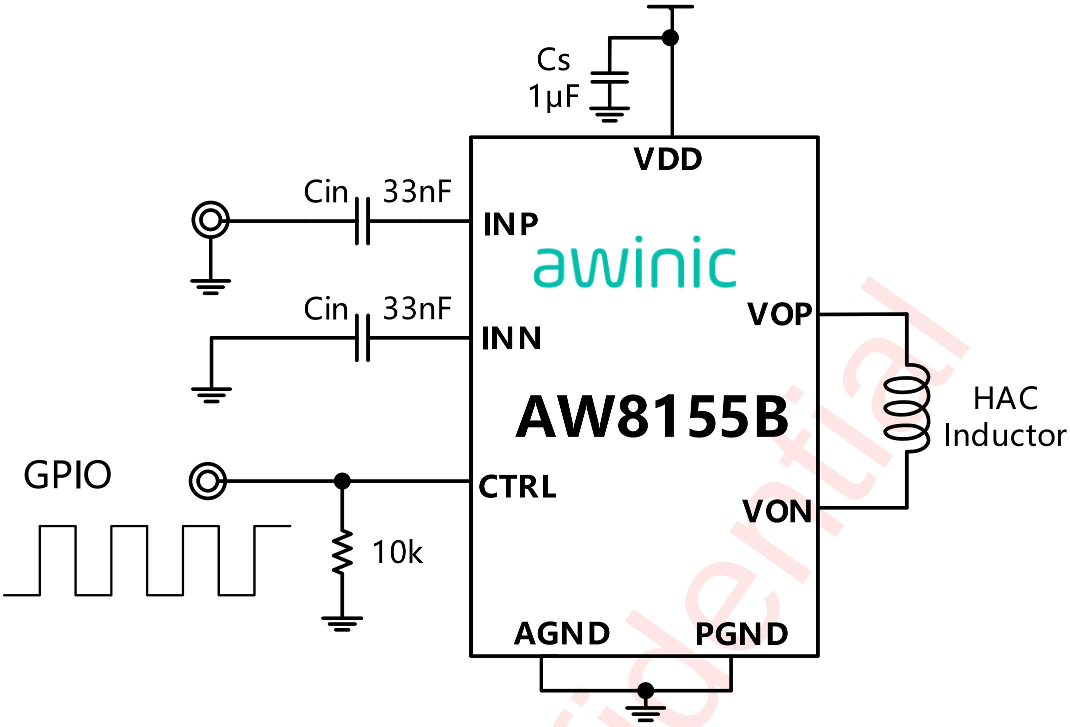


Figure 5. AW8155B HAC Application Schematic With Single-Ended Input

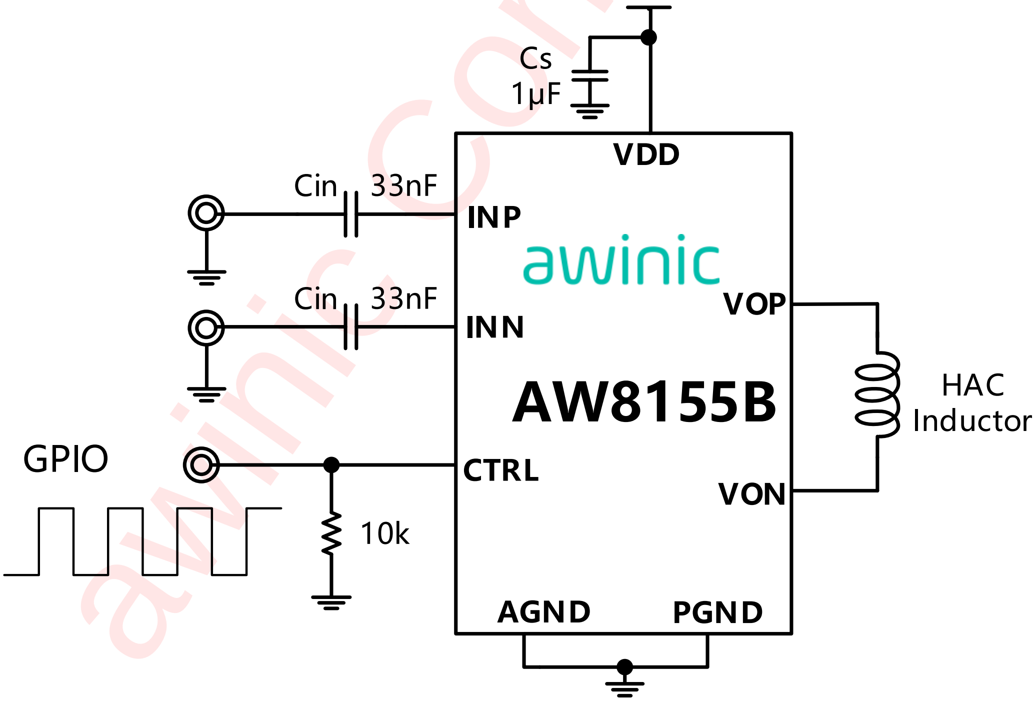


Figure 6. AW8155B HAC Application Schematic With Differential Input

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW8155BFCR	-40℃～85℃	FCQFN 1.5mmX1.5mm -9L	A5A	MSL3	RoHS+HF	3000 units/Tape and Reel

Absolute Maximum Ratings(NOTE1)

PARAMETERS	RANGE
Supply voltage range V_{DD}	-0.3V to 6V
Input voltage range	-0.3V to V_{DD}+0.3V
Junction-to-ambient thermal resistance $θ_{JA}$	90℃/W
Operating free-air temperature range	-40℃ to 85℃
Maximum operating junction temperature T_{JMAX}	125℃
Storage temperature T_{STG}	-65℃ to 150℃
Lead temperature (soldering 10 seconds)	260℃
ESD(Including CDM HBM MM)(NOTE 2)	
HBM (human body model)	±2kV
CDM (charged-device model)	±1.5kV
Latch-Up	
Test condition: JESD78E	+IT：200mA -IT：-200mA

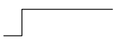
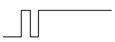
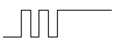
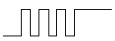
NOTE1: Conditions out of those ranges listed in "absolute maximum ratings" may cause permanent damages to the device. In spite of the limits above, functional operation conditions of the device should within the ranges listed in "recommended operating conditions". Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.

NOTE2: The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin. Test method: ESDA/JEDEC JS-001-2017

Test method of the charged-device model: ESDA/JEDEC JS-002-2018

Operate mode description

（T_A=25℃,VDD=4.2V,RL=8Ω+33uH）

mode	CTRL	operating	AV （V/V）	NCN power （W）	RNS
mode 1		Class_D	8	0.65	√
mode 2		Class_D	12	0.85	√
mode 3(Note)		Test			
mode 4		Class_AB	12	/	

Note: mode 3 is internal test mode

Electrical Characteristics

Test Condition: V_{DD}=3.6V ,T_A=25℃, R_L=8Ω+33uH，Cin=33nF，f=1kHz (Unless otherwise specified)

Parameter		Conditions	Min	Typ	Max	Units
V_{DD}	Power supply voltage		2.5		5.5	V
V_{IH}	CTRL high input voltage		1.3		V_{DD}	V
V_{IL}	CTRL low input voltage		0		0.35	V
V_{OS}	Output offset voltage	Input AC grounded，V_{DD}=2.5V to 5.5V	-30	0	30	mV
I_{SD}	Shutdown current	V_{DD}=3.6V，CTRL =0V		0.1	1	μA
f_{SW}	Modulation Frequency	V_{DD}=2.5V to 5.5V	600	800	1000	kHz
T_{SD}	Thermal Protect level			160		℃
T_{SDR}	Thermal Hysteresis			120		℃
T_{ON}	Start-up time			40		ms
Rini	Internal impedance			28.5		kΩ
P_O	Output power	THD+N=10%， R_L=4Ω+33uH，V_{DD}=5V		2.66		W
		THD+N=1%，R_L=4Ω+33uH，V_{DD}=5V		2.20		W
		THD+N=10%， R_L=8Ω+33uH，V_{DD}=5V		1.60		W
		THD+N=1%， R_L=8Ω+33uH，V_{DD}=5V		1.30		W
		THD+N=10%， R_L=4Ω+33uH，V_{DD}=4.2V		1.94		W
		THD+N=1%， R_L=4Ω+33uH，V_{DD}=4.2V		1.60		W
		THD+N=10%， R_L=8Ω+33uH，V_{DD}=4.2V		1.13		W
		THD+N=1%， R_L=8Ω+33uH，V_{DD}=4.2V		0.94		W
		THD+N=10%， R_L=4Ω+33uH，V_{DD}=3.6V		1.40		W
		THD+N=1%， R_L=4Ω+33uH，V_{DD}=3.6V		1.14		W
		THD+N=10%， R_L=8Ω+33uH，V_{DD}=3.6V		0.84		W
		THD+N=1%， R_L=8Ω+33uH，V_{DD}=3.6V		0.68		W
Mode 1						
I_q	Quiescent current	V_{DD}=3.6V，Input AC grounded, no load		3.0		mA
η	Efficiency	V_{DD}=3.6V，Po=0.8W，R_L=8Ω+33uH		91		%
Av	Voltage gain		7	8	9	V/V
PSRR	Power suppression ration	V_{DD}=4.2V，Vp-p_sin=200mV, 217Hz		75		dB
		V_{DD}=4.2V，Vp-p_sin=200mV, 1kHz		72		dB
THD+N	Total harmonic distortion plus noise	V_{DD}=4.2V，Po=0.5W，R_L=8Ω+33uH		0.007		%
		V_{DD}=3.6V，Po=0.25W，R_L=8Ω+33uH		0.008		%
P_O NCN	NCN output power	f=1kHz，R_L=8Ω+33uH，V_{DD}=4.2V		0.65		W
T_{AT}	Attack time(-11dB)	V_{DD}=4.2V		45		ms
T_{RL}	Release time(11dB)	V_{DD}=4.2V		1		s
A_{MAX}	Max attenuation	V_{DD}=4.2V		-11		dB
Vn	Output noise	f=20Hz-20kHz,input AC grounded		53		uV
SNR	Signal-to-noise ratio	V_{DD} = 5 V, P_O = 1 W, R_L = 8Ω+33uH		95		dB

Parameter		Conditions		Min	Typ	Max	Units
Mode 2							
I_q	Quiescent current	V_{DD}=3.6V，Input AC grounded, no load			3.0		mA
η	Efficiency	V_{DD}=3.6V，Po=0.8W，R_L=8Ω+33uH			91		%
Av	Voltage gain			11	12	13	V/V
PSRR	Power suppression ration	V_{DD}=4.2V，Vp-p_sin=200mV	217Hz		75		dB
			1kHz		72		dB
THD+N	Total harmonic distortion plus noise	V_{DD}=4.2V，Po=0.5W，R_L=8Ω+33uH			0.007		%
		V_{DD}=3.6V，Po=0.25W，R_L=8Ω+33uH			0.009		%
P_O NCN	NCN output power	V_{DD}=4.2V , R_L=8Ω+33uH，f=1kHz			0.85		W
T_{AT}	Attack time(-13.5dB)	V_{DD}=4.2V			50		ms
T_{RL}	Release time(13.5dB)	V_{DD}=4.2V			1.2		s
A_{MAX}	Max attenuation	V_{DD}=4.2V			-13.5		dB
Vn	Output noise	f=20Hz-20kHz,input AC grounded			76		uV
SNR	Signal-to-noise ratio	V_{DD} = 5 V, P_O = 1 W, R_L = 8Ω+33uH			93		dB
Mode 4							
I_q	Quiescent current	V_{DD}=3.6V，Input AC grounded, no load			3.5		mA
η	Efficiency	V_{DD}=3.6V，Po=0.8W，R_L=8Ω+33uH			78		%
Av	Voltage gain			11	12	13	V/V
PSRR	Power suppression ratio	V_{DD}=4.2V，Vp-p_sin=200mV，	217Hz		70		dB
			1kHz		68		dB
THD+N	Total harmonic distortion plus noise	V_{DD}=4.2V，Po=0.5W，R_L=8Ω+33uH			0.2		%
		V_{DD}=3.6V，Po=0.25W，R_L=8Ω+33uH			0.2		%
Vn	Output noise	f=20Hz-20kHz,input AC grounded			88		uV
SNR	Signal-to-noise ratio	V_{DD} = 5 V, P_O = 1 W, R_L = 8 Ω+33uH			92		dB
one-wire pulse control							
T_H	CTRL high level hold time	V_{DD}=2.5V to 5.5V		0.75	2	10	us
T_L	CTRL low level hold time	V_{DD}=2.5V to 5.5V		0.75	2	10	us
T_{LATCH}	CTRL turn on delay time	V_{DD}=2.5V to 5.5V		150		800	us
T_{OFF}	CTRL turn off delay time	V_{DD}=2.5V to 5.5V		150		800	us

MEASUREMENT SETUP

AW8155B features switching digital output, as shown in Figure 7. Need to connect a low pass filter to VOP/VON output respectively to filter out switch modulation frequency, then measure the differential output of filter to obtain analog output signal.

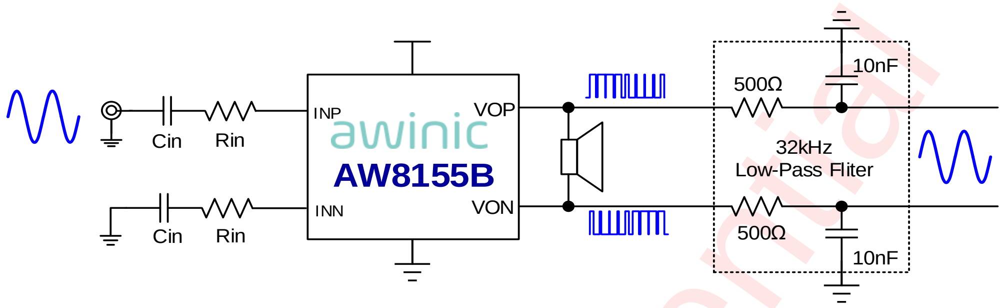


Figure 7. AW8155B test setup

Low pass filter uses resistance and capacitor values listed in Table 1.

Table 1 AW8155B recommended values for low pass filter

R_{filter}	C_{filter}	Low-pass cutoff frequency
500Ω	10nF	32kHz
1kΩ	4.7nF	34kHz

Output Power Calculation

According to the above test methods, the differential analog output signal is obtained at the output of the low pass filter. The valid values Vo_rms of the differential signal as shown below:

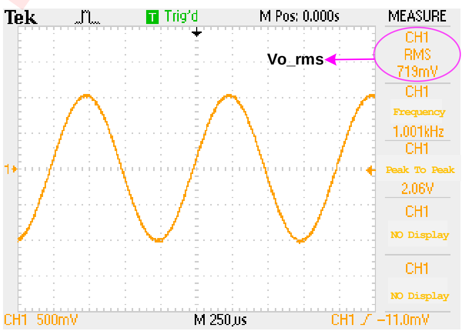
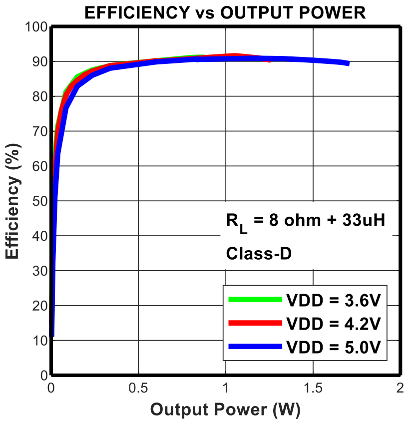


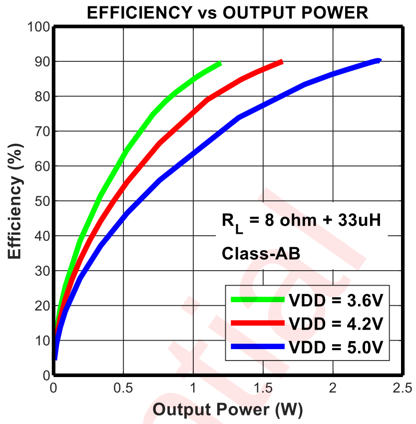
Figure 8. Valid value of AW8155B output signal

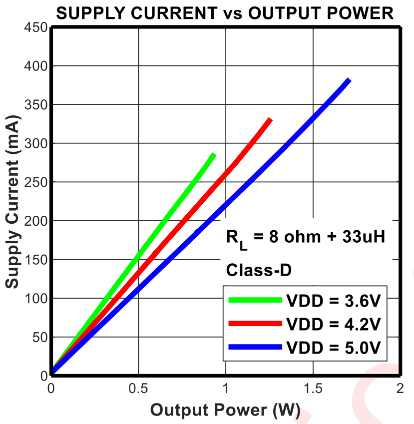
The power calculation of Speaker is as follows：

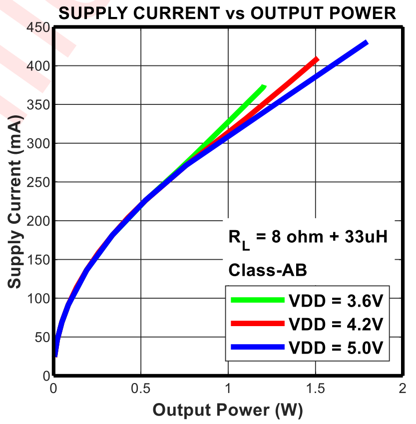
$$P_L = \frac{(Vo\_rms)^2}{R_L} \quad (R_L\text{: load impedance of the speaker})$$

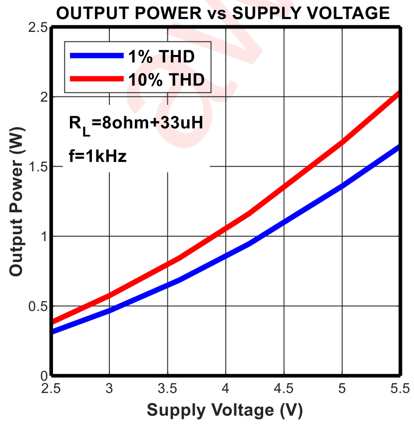
Typical Operating Characteristic

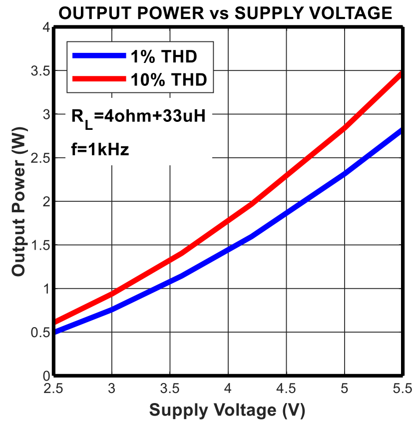


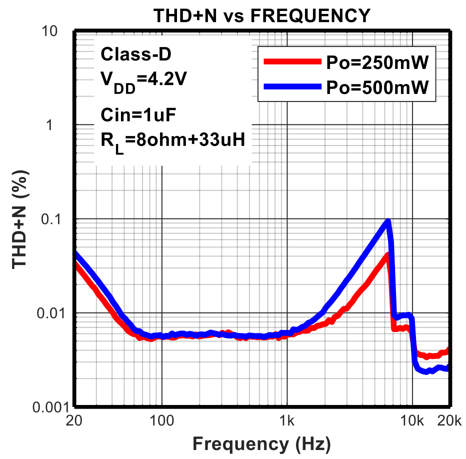


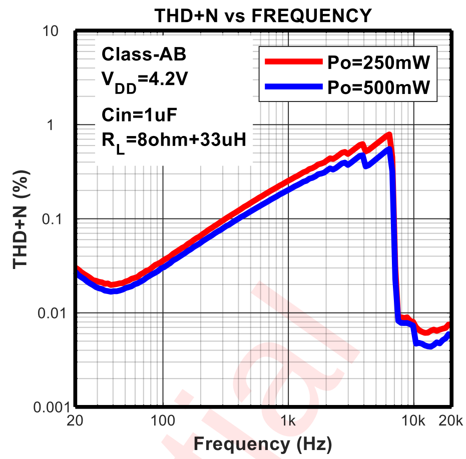


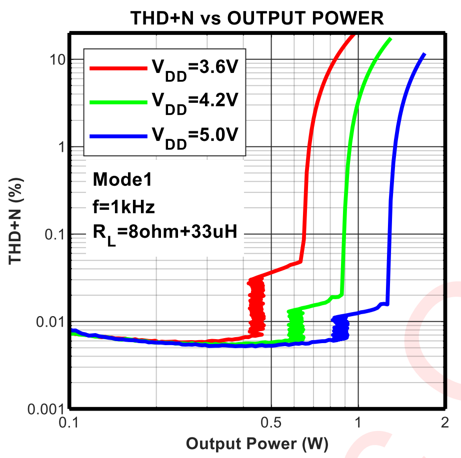


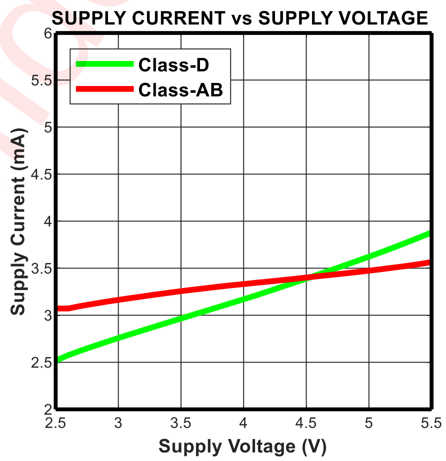


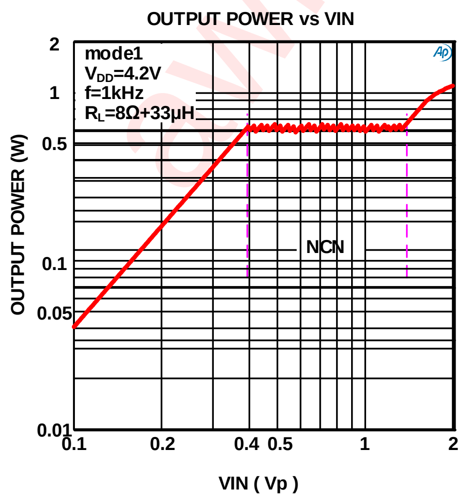


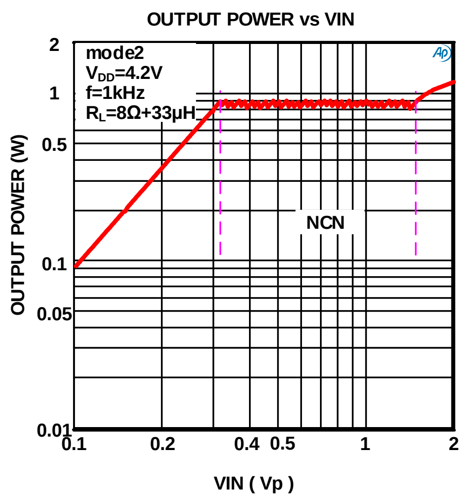

THD+N vs FREQUENCY
Class-D
V_{DD}=4.2V
Cin=1uF
R_L=8ohm+33uH
Po=250mW
Po=500mW
THD+N (%)
10
1
0.1
0.01
0.001
20
100
1k
10k
20k
Frequency (Hz)

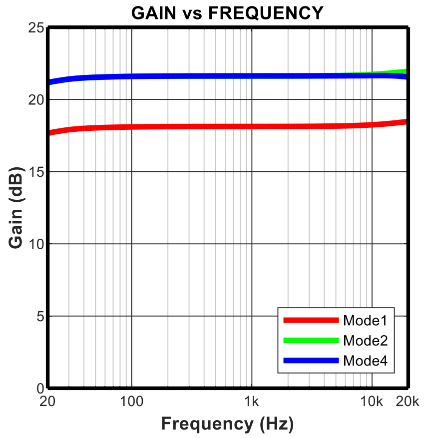

THD+N vs FREQUENCY
Class-AB
V_{DD}=4.2V
Cin=1uF
R_L=8ohm+33uH
Po=250mW
Po=500mW
THD+N (%)
10
1
0.1
0.01
0.001
20
100
1k
10k
20k
Frequency (Hz)

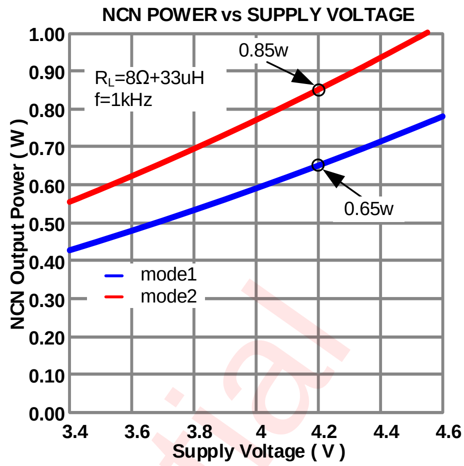

THD+N vs OUTPUT POWER
V_{DD}=3.6V
V_{DD}=4.2V
V_{DD}=5.0V
Mode1
f=1kHz
R_L=8ohm+33uH
THD+N (%)
10
1
0.1
0.01
0.001
0.1
0.5
1
2
Output Power (W)

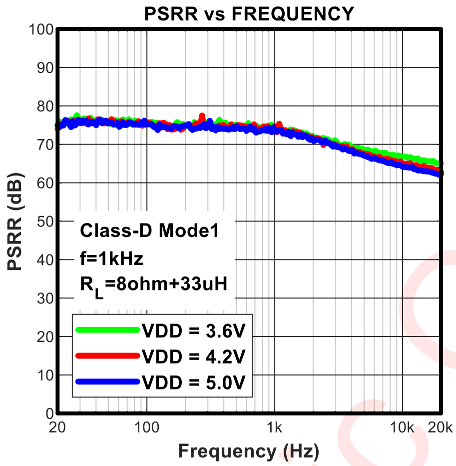

SUPPLY CURRENT vs SUPPLY VOLTAGE
Class-D
Class-AB
Supply Current (mA)
6
5.5
5
4.5
4
3.5
3
2.5
2
2.5
3
3.5
4
4.5
5
5.5
Supply Voltage (V)

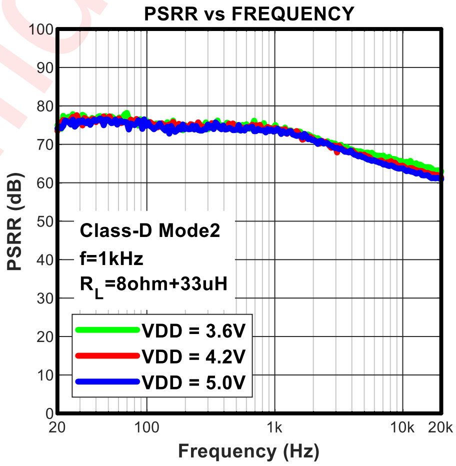

OUTPUT POWER vs VIN
mode1
V_{DD}=4.2V
f=1kHz
R_L=8Ω+33μH
NCN
OUTPUT POWER (W)
2
1
0.5
0.1
0.05
0.01
0.1
0.2
0.4
0.5
1
2
VIN (Vp)

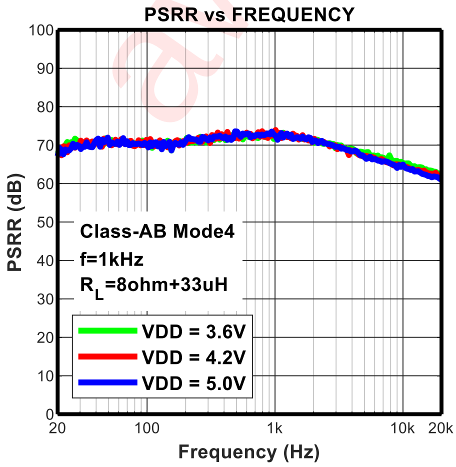

OUTPUT POWER vs VIN
mode2
V_{DD}=4.2V
f=1kHz
R_L=8Ω+33μH
NCN
OUTPUT POWER (W)
2
1
0.5
0.1
0.05
0.01
0.1
0.2
0.4
0.5
1
2
VIN (Vp)


GAIN vs FREQUENCY
Gain (dB)
Frequency (Hz)
Mode1
Mode2
Mode4

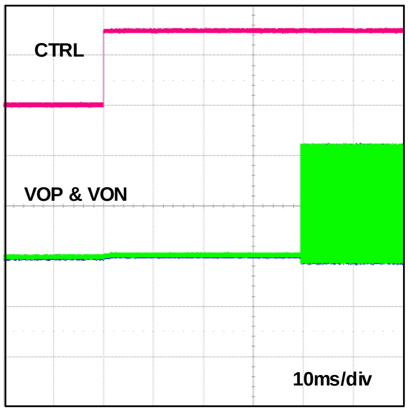

NCN POWER vs SUPPLY VOLTAGE
NCN Output Power (W)
Supply Voltage (V)
RL=8Ω+33uH
f=1kHz
0.85w
0.65w
mode1
mode2


PSRR vs FREQUENCY
PSRR (dB)
Frequency (Hz)
Class-D Mode1
f=1kHz
RL =8ohm+33uH
VDD = 3.6V
VDD = 4.2V
VDD = 5.0V

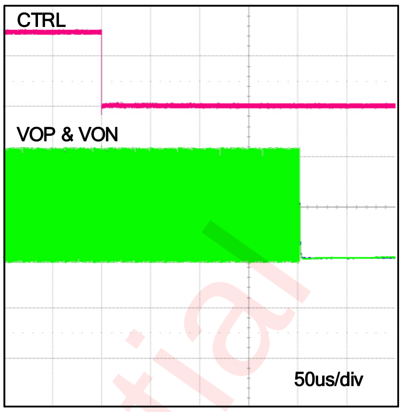

PSRR vs FREQUENCY
PSRR (dB)
Frequency (Hz)
Class-D Mode2
f=1kHz
RL =8ohm+33uH
VDD = 3.6V
VDD = 4.2V
VDD = 5.0V


PSRR vs FREQUENCY
PSRR (dB)
Frequency (Hz)
Class-AB Mode4
f=1kHz
RL =8ohm+33uH
VDD = 3.6V
VDD = 4.2V
VDD = 5.0V

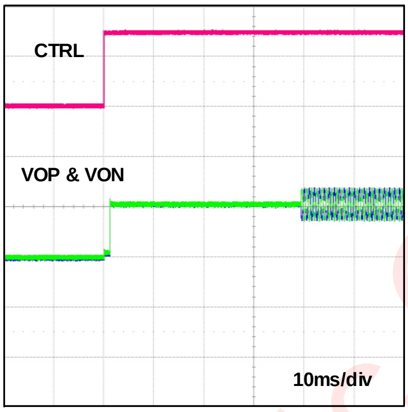
Class_D start up time



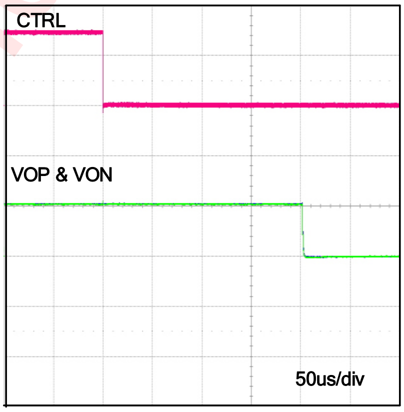
Class_D shutdown time



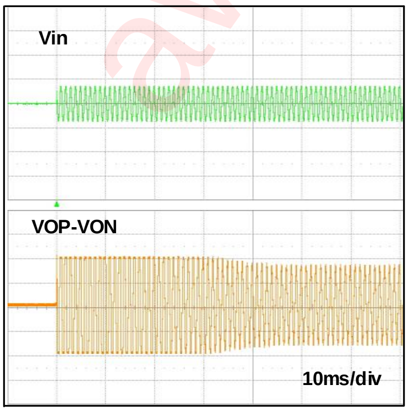
Class_AB start up time



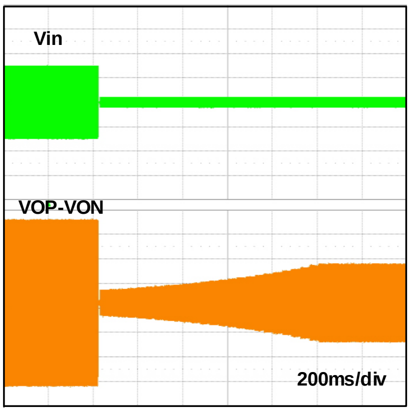
Class_AB shutdown time



NCN attack time



NCN release time



Functional Block Diagram

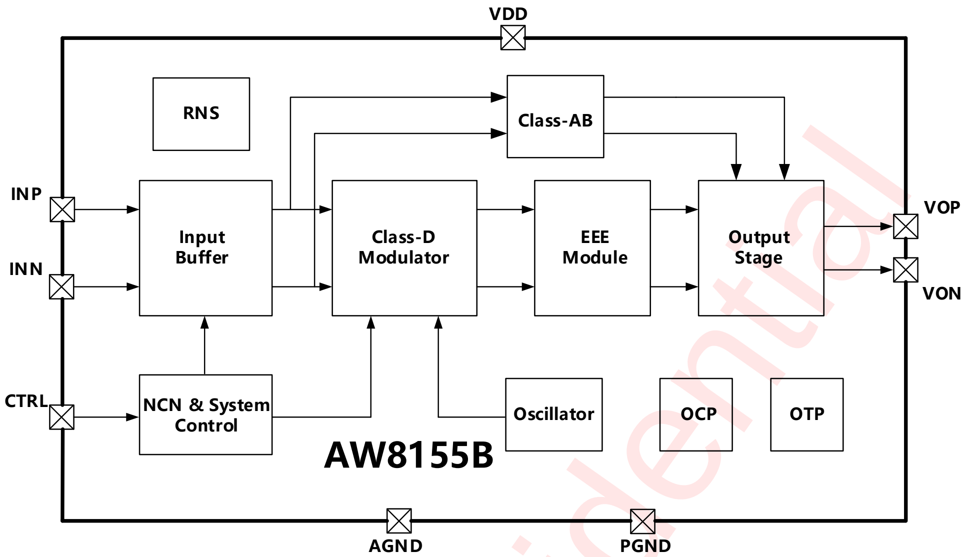


Figure 9. Functional Block Diagram of AW8155B

Operation

The AW8155B is a non-crack-noise (NCN), ultra-low-EMI, filter-free, AB/D output mode selection, second generation Class-D audio amplifier. Ultra low THD+N, Unique NCN function, which adjusts the system gain automatically while detecting the "Crack" distortion of output signal, protects the speaker from damage at high power levels and brings the most comfortable listening experience to the customers.

AW8155B NCN output power can be set to 0.65W or 0.85W for different speaker, this feature is embedded in order to protect speakers from damage caused by an excessive sound level.

The AW8155B features a unique RNS technology, which effectively reduces RF energy, attenuate the RF TDD-noise, an acceptable audible level to the customer.

The AW8155B features the EEE (Enhanced Emission Elimination) function which greatly reduces EMI over the full bandwidth. The AW8155B achieves better than 20dB margin under FCC limits with 24 inch of cable.

The filter-free PWM architecture and internal gain setting reduces external components count, board area consumption, system cost and simplifies the design. The over-current, over-temperature is prepared inside of the device.

The AW8155B is available in an ultra small FCQFN 1.5mmX1.5mm-9L package. The AW8155B is specified over the industrial temperature range of -40℃ to +85℃.

One-wire pulse control

One wire pulse control technology only needs a single GPIO port to operate the chip, complete a variety of functions, it is very popular in the area of the GPIO port shortage and portable systems.

When the control signal line is longer, because of the signal integrity or radio frequency interference problem, it will produce the narrow glitch signal. Awinic one wire pulse control technology integrated the Deglitch circuit in internal control pin, which can effectively eliminate the influence of the glitch signal, as shown in figure 10.

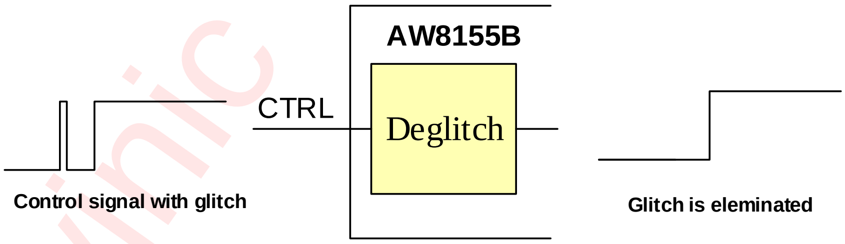


Figure 10. Awinic Deglitch function diagram

The traditional one wire pulse control technology still receives pulse signal from control port when chip is startup, so when the master control chip (such as mobile phone BB) sends wrong pulse during normal operation, the system will enter into error states. AW8155B uses one wire pulse latch technology, after the master control chip has sent pulses, the state will be latched, no longer receive the latter mis-sending pulse signals, as shown in figure 11.

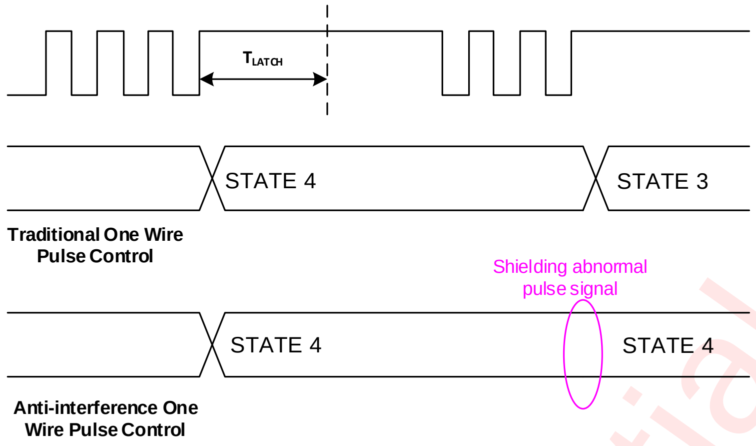


Figure 11. Anti-interference One Wire Pulse Control Function Diagram

AW8155B select each mode by one-wire pulse control, as shown in figure 12. When CTRL pin pull high form shutdown mode, there is one rising edge, AW8155B start to work and set Gain=18dB, NCN level=0.65W. When high-low-high signal set to CTRL pin, there are two rising edges, AW8155B start to work and set Gain=21.5dB, NCN level=0.85W. When there are three rising edges, internal test mode is enable. When there are four rising edges, AW8155B start to work in Class AB mode, while gain is to be set 21.5dB.

As shown in figure 12, when CTRL pull down above 1ms, AW8155B will enter shutdown mode.

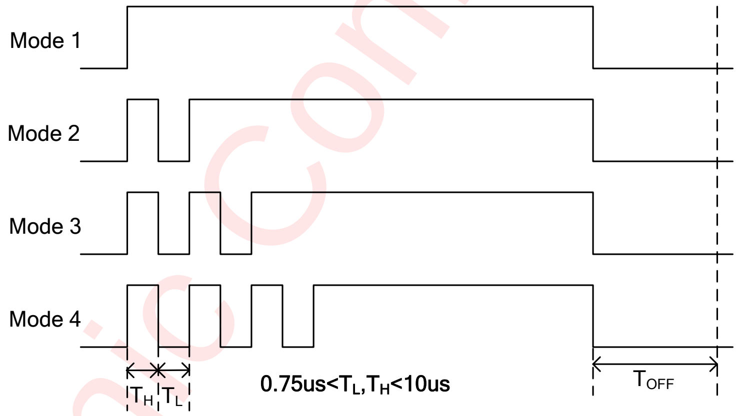


Figure 12. One-Wire pulse control

When AW8155B work in different mode, PIN CTRL should be low above 1ms which make the AW8155B shut down, Then series pulse make the AW8155B work in right mode.

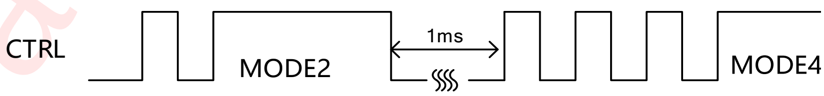


Figure 13. One-wire pulse mode switch

RNS (RF TDD Noise Suppression)

TDD Noise Causes

GSM cell phones use TDMA (Time Division Multiple Access) slot sharing technology. The time is divided into periodic frames in TDMA, and each frame is subdivided into a plurality of time slots. In order to transmit signals to the base station, the signals sent from the base stations to the plurality of mobile terminals are arranged in a predetermined time slot in the transmission. In this case, each TDMA frame contains 8 time slots, the entire frame is about 4.615ms long, and each slot time is 0.577ms.

With GSM handset, the RF power amplifier will transmit once every 4.615ms (217Hz), and the signal will produce intermittent Burst current and strong electromagnetic radiation. Intermittent Burst current will form a power fluctuation of 217 Hz; High frequency (900MHz and 1800MHz) RF signals form a 217Hz RF envelope signal. 217Hz power fluctuations will be conducted through the conduction to the audio signal path, 217Hz RF envelope signal will be coupled through the radiation into the audio signal path, if the protection is not good, it will produce an audible TDD Noise, which includes the 217Hz noise And a harmonic noise signal of 217 Hz.

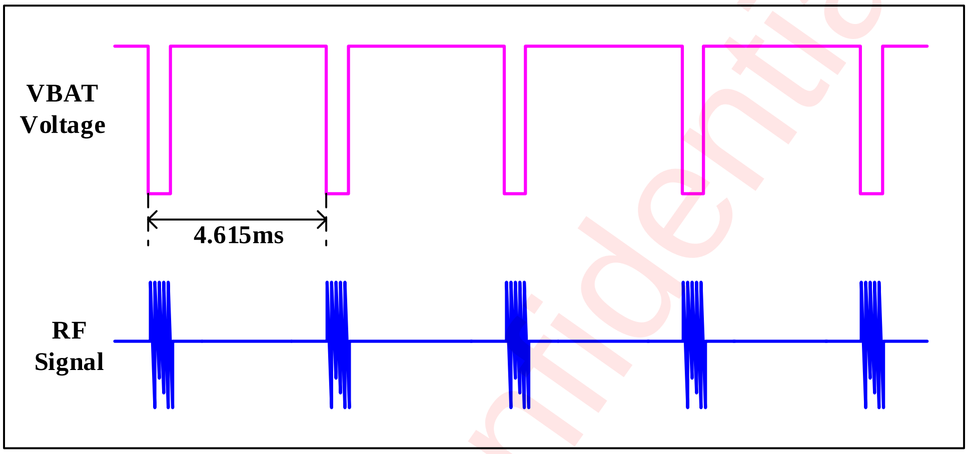


Figure 14. Schematic Diagram of Power Supply Voltage and RF Signal during GSM RF Operation

RNS fully inhibit the conduction and radiation interference by the AWINIC unique circuit architecture. Effectively improve the ability to suppress TDD Noise.

Conduction noise suppression

When the RF power amplifier is operating, it will draw the current from the battery by 217Hz frequency, Power supply will be introduced to 217Hz power ripple since the battery has a certain internal resistance, it will be coupled to the speaker through the audio power amplifier. The ability to suppress power fluctuations depends on the PSRR of the audio power amplifier.

$$PSRR = 20\log\left(\frac{vdd_{ac}}{vout_{ac}}\right)$$

Due to the input and output of the fully differential amplifier is perfectly symmetrical, theoretically, the effect of the power supply fluctuation on the two outputs is exactly the same, and the differential output is completely unaffected by the power supply fluctuation. In practice, due to process bias and other factors, the amplifier will have a certain mismatch, PSRR is generally better than 60dB, it shows the output relative to the power fluctuations can be reduced by 1000 times, such as 500mVp power fluctuations, the differential output of 0.5 mV, which basically can meet the application requirements.

But in practical applications, the power amplifier may encounter conduction of TDD Noise problem even if its PSRR is 60dB or 80dB, why is this? Because we also need to consider the impact of peripheral power mismatches of audio power amplifiers

For conventional audio power amplifiers, when the input resistor Rin and the input capacitor Cin mismatch, will greatly affect the audio power amplifier PSRR indicators, in the case of 24dB gain, PSRR will be weakened to 46dB or so if the input resistance and Capacitor with 1% mismatch. PSRR will be weakened to 28dB or so if the input resistance and input capacitance mismatch with 10% mismatch, when the power fluctuations, it is easy to produce audible TDD Noise.

In order to enhance the audio power amplifier PSRR in the input resistance and input capacitance mismatch case, AW8155B features a unique conduction noise suppression circuit, making the power amplifier to maintain a high PSRR value even in the input resistance, the input capacitance deviation of 10% or more, this greatly inhibits the generation of conducted noise.

Radiation noise suppression

Input traces, output traces, horn loops, and even power and ground loops are likely to be subject to RF radiation interference in the audio signal module, longer input traces and output traces similar to the antenna, especially vulnerable RF radiation effects.

The reasonable PCB layout can reduce the influence of RF radiation in the design, such as shorten the line length of input and output as much as possible; audio devices should be shielded and far away from the RF antenna, maintain the integrity of the device to audio signal pathway; to increase the small bypass capacitor RF signals in the sensitive nodes. However, in practical applications, PCB layout is difficult to fully consider the influence of RF radiation on the audio signal path, and some RF energy will still be coupled to the audio signal path to form audible TDD Noise. Therefore, AW8155B features a unique RF radiation suppression circuit, a shielding layer inside the chip, effectively prevent high frequency energy into RF chip, to ensure that the drive single of the amplifier provided to the speaker will not be affected by the antenna RF radiation, thus avoiding the antenna RF Radiation caused by TDD Noise.

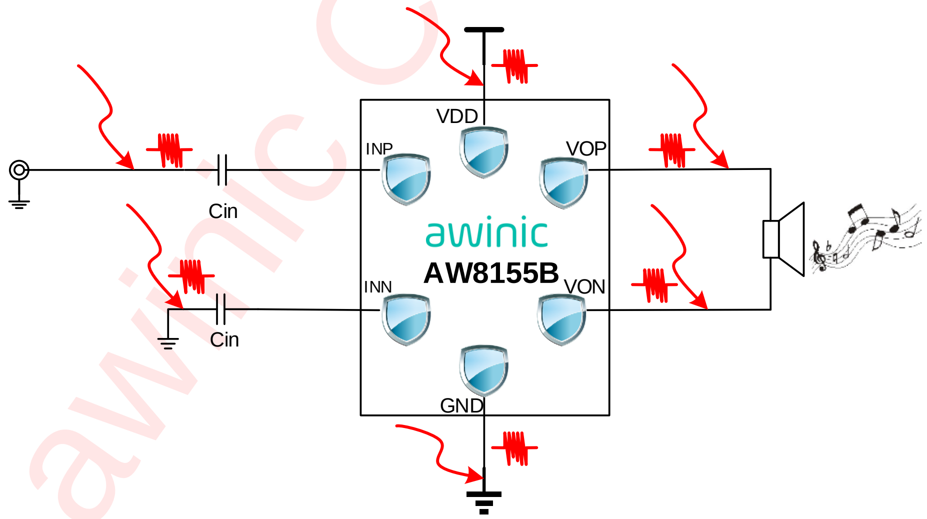


Figure 15. RF Energy Coupling Diagram

NCN

In audio application, output signal will be undesirable distortion caused by too large input and power supply voltage down with battery, and clipped output signal may cause permanent damage to the speaker. The AW8155B features unique non-crack-noise (NCN) Function, which adjusts system gain automatically to generate desired output by detecting the “Crack” distortion of output signal, protects the speaker from damage at high power levels and brings the most comfortable listening experience to the customers.

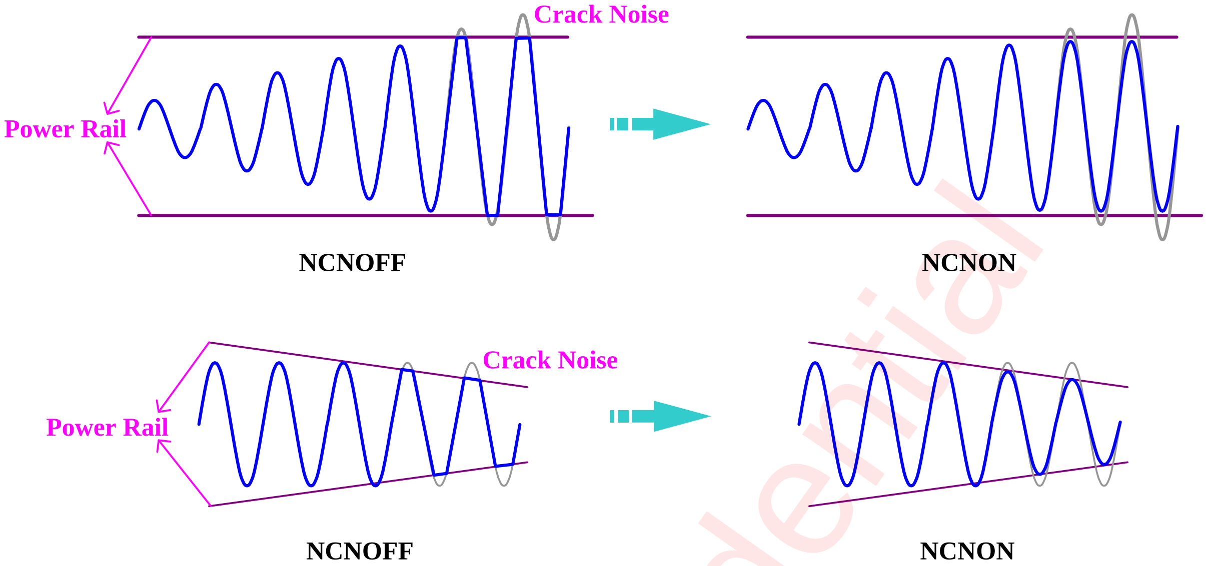


Figure 16. NCN Function Diagram

Attack time
Attack time is the time it takes for the gain to be reduced once the audio signal exceeds the NCN threshold. Fast attack times allow the NCN to react quickly and prevent transients such as symbol crashes from being distorted. However, fast attack times can lead to volume pumping, where the gain reduction and release becomes noticeable, as the NCN cycles quickly. Slower attack times cause the NCN to ignore the fast transients, and instead act upon longer, louder passages. Selecting an attack time that is too slow can lead to increased distortion in the case of the No Clip function. Attack time is set 40ms~55ms in AW8155B.

Release time
Release time is the time it takes for the gain to return to its normal level once the audio signal returns below the NCN threshold. A fast release time allows the NCN to react quickly to transients, preserving the original dynamics of the audio source. However, similar to a fast attack time, a fast release time contributes to volume pumping. A slow release time reduces the effect of volume pumping. Release time is set 0.9s~1.3s in AW8155B.

Filter-Free Modulation Scheme
The AW8155B features a filter-free PWM architecture that reduces the LC filter of the traditional Class-D amplifier, increasing efficiency, reducing board area consumption and system cost.

Pin-Compatible with AW8155(A), AW8145, no VREF capacitor
The AW8155B is pin compatible with AW8155(A) and AW8145.Without VREF 1 uF capacitor it can achieve the same performance as AW8145, which make the PCB design more convenient.

EEE
The AW8155B features a unique Enhanced Emission Elimination (EEE) technology, that controls fast transition on the output, greatly reduces EMI over the full bandwidth.

Pop-Click Suppression

The AW8155B features unique timing control circuit, that comprehensively suppresses pop-click noise, eliminates audible transients on shutdown, wakeup, and power-up/down.

Efficiency

Efficiency of a Class D amplifier is attributed to the switching operation of the output stage transistors. In a Class D amplifier, the output transistors act as current steering switches and consume negligible additional power. Any power loss associated with the Class D output stage is mostly due to the I2R loss of the MOSFET on-resistance and supply current. The AW8155B features efficiency of 91%.

Protection Function

When a short-circuit occurs between VOP/VON pin and VDD/GND or VOP and VON, the over-current circuit shutdown the device, preventing the device from being damaged. When the condition is removed, the AW8155B reactivate itself. When the junction temperature is high, the over-temperature circuit shutdown the device. The circuit switches back to normal operation when the temperature decreases to safe levels.

Applications Information

Supply Decoupling Capacitor（C_S）

The AW8155B is a high-performance audio amplifier that requires adequate power supply decoupling. For higher frequency transients, a good low equivalent-series-resistance (ESR) ceramic capacitor, typically 1μF, placed as close as possible to the device VDD pin works best. For filtering lower-frequency noise signals, a 10 μF or greater capacitor placed near the audio power amplifier would also help.

Input Capacitor

The input coupling capacitor blocks the DC voltage at the amplifier input terminal. The input capacitors and internal input resistors (28.5KΩ) form a high-pass filter with the corner frequency, fc.

$$f_C = \frac{1}{2\pi RinCin} = 169\,Hz$$

Setting the high-pass filter point high can block the 217Hz GSM noise coupled to inputs. Better matching of the input capacitors improves performance of the circuit and also help to suppress pop-click noise.

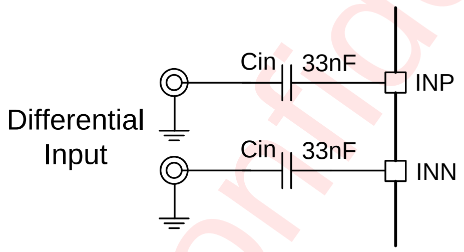


Figure 17. Differential Input

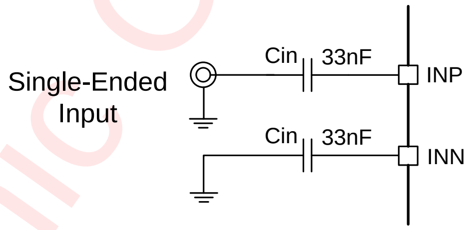


Figure 18. Single-Ended Input

Ferrite Chip Bead and Capacitor

The AW8155B passed FCC and CE radiated emissions with no ferrite chip beads and capacitors with speaker trace wires 24 inch.Use ferrite chip beads and capacitors if device near the EMI sensitive circuits and/or there are long leads from amplifier to speaker, placed as close as possible to the output pin.

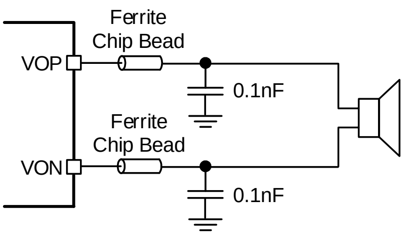


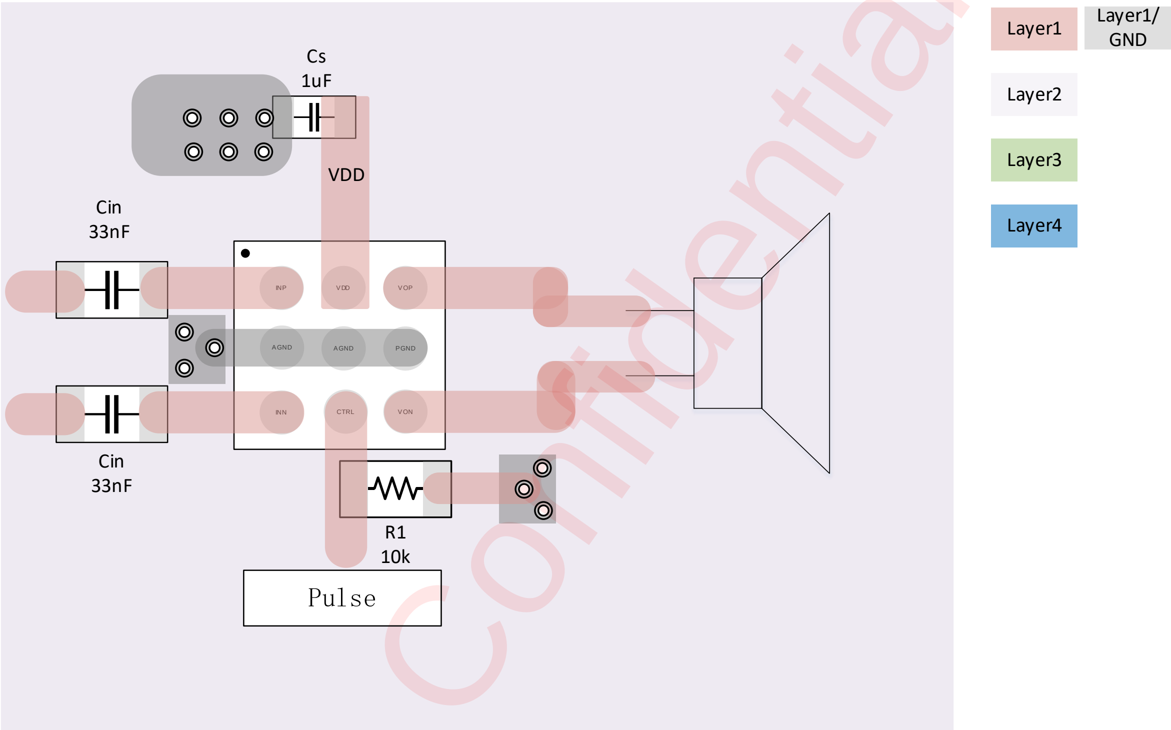
Figure 19. Ferrite Chip Bead and capacitor

PCB Layout Consideration

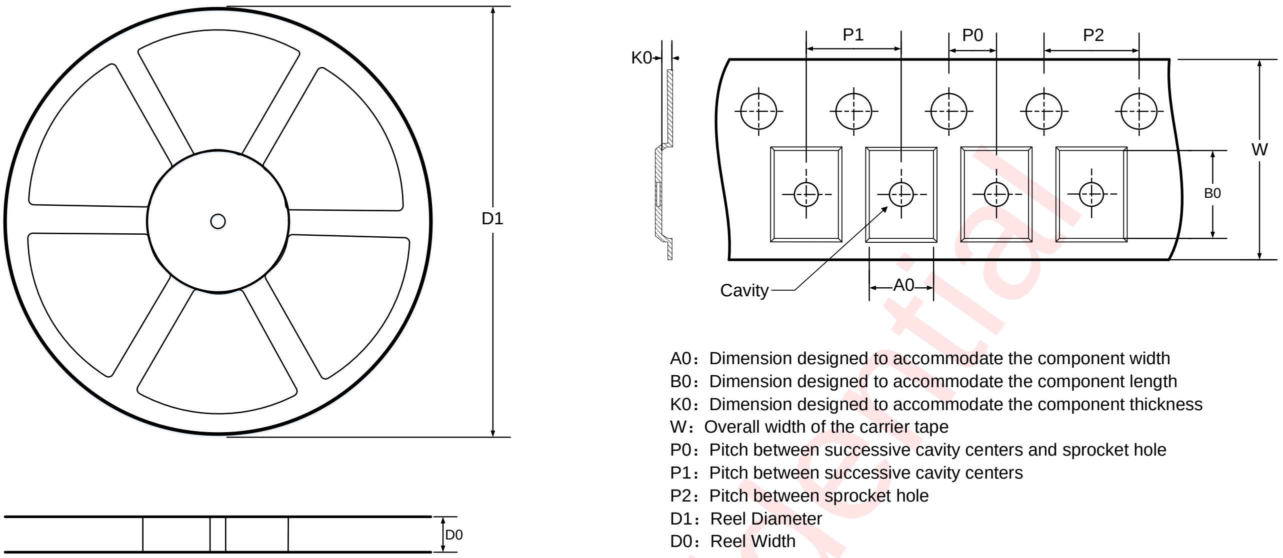
In order to obtain excellent performance of AW8155B, PCB layout must be carefully considered. The design consideration should follow the following principles:

1. Try to provide a separate short and thick power line to AW8155B, the copper width is recommended to be larger than 1.2mm. The decoupling capacitors should be placed as close as possible to power supply pin.

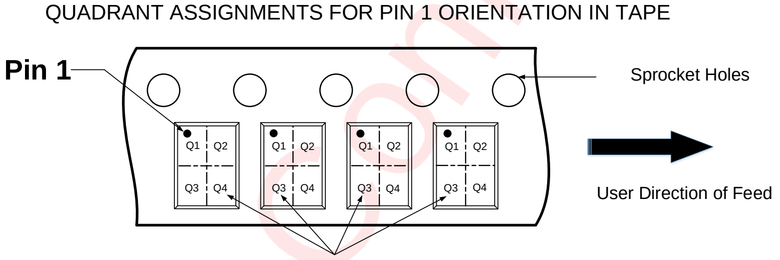
2. The input capacitors should be close to AW8155B INN and INP input pin, the input line should be parallel to suppress noise coupling.



Tape And Reel Information



A0：Dimension designed to accommodate the component width
B0：Dimension designed to accommodate the component length
K0：Dimension designed to accommodate the component thickness
W：Overall width of the carrier tape
P0：Pitch between successive cavity centers and sprocket hole
P1：Pitch between successive cavity centers
P2：Pitch between sprocket hole
D1：Reel Diameter
D0：Reel Width



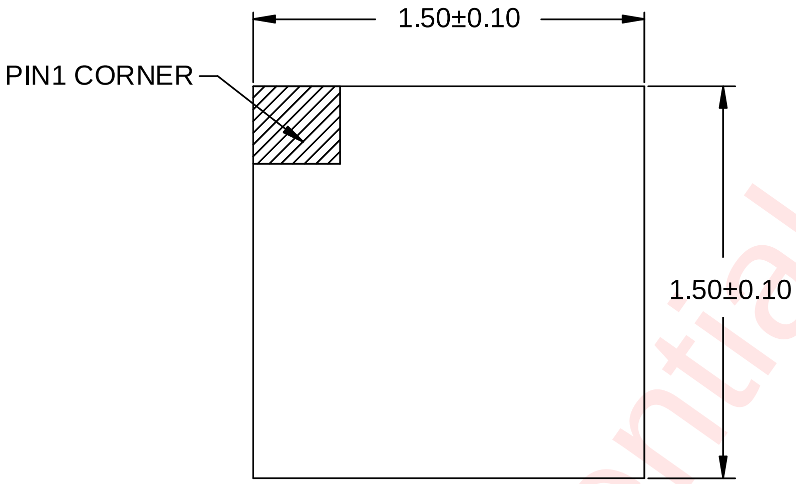
Note：The above picture is for reference only. Please refer to the value in the table below for the actual size

DIMENSIONS AND PIN1 ORIENTATION

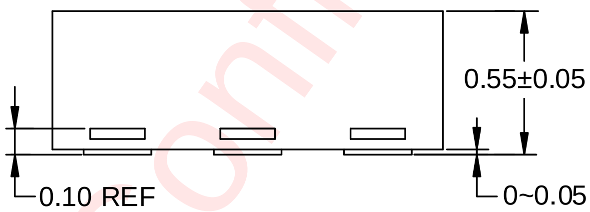
D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
178	8.4	1.7	1.7	0.76	2	4	4	8	Q1

All dimensions are nominal

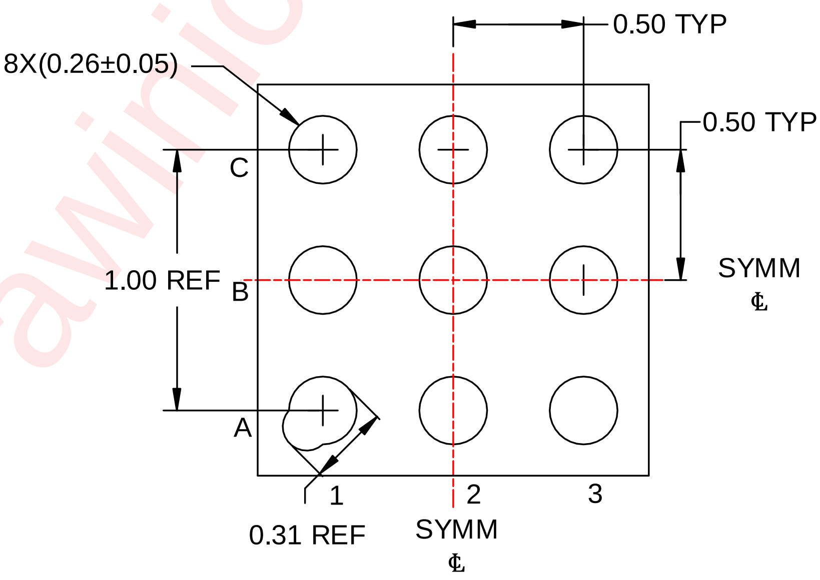
Package Description



TOP VIEW



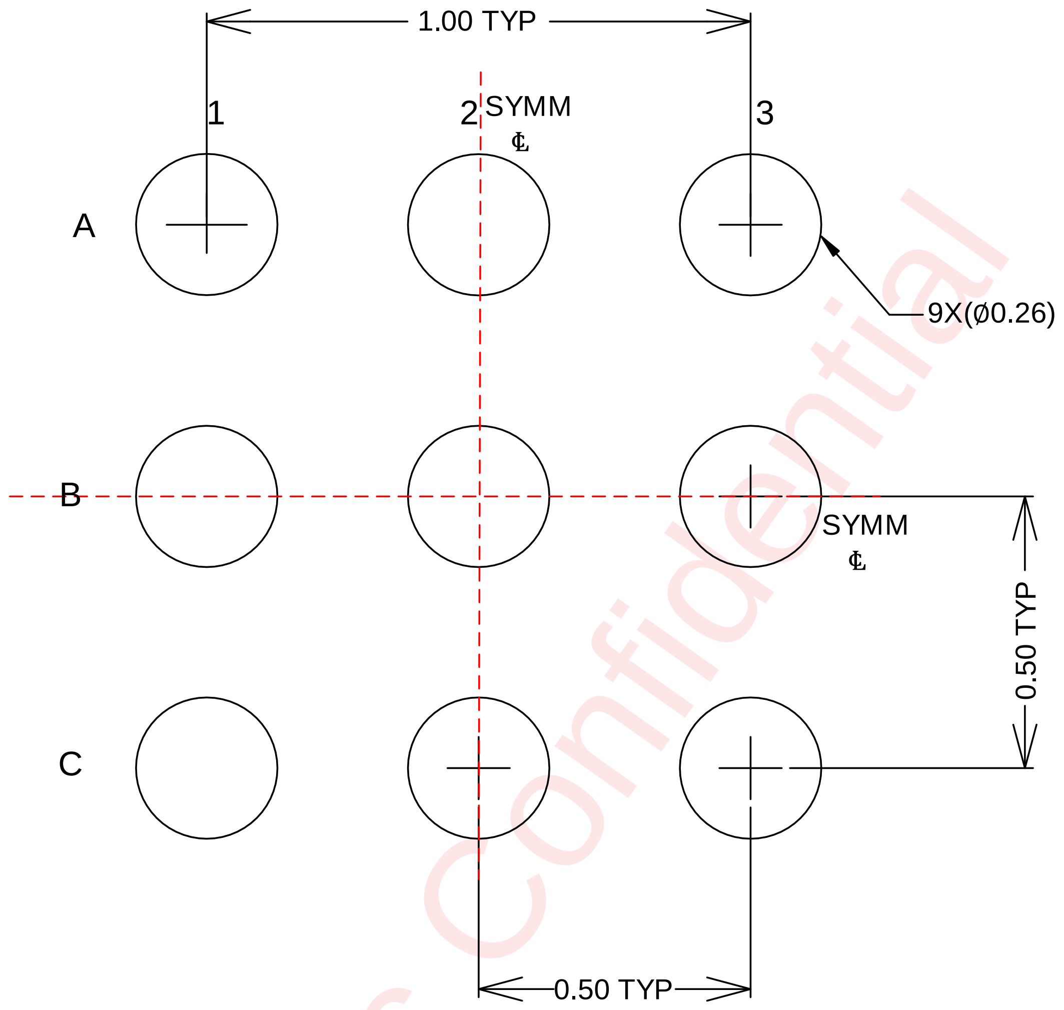
SIDE VIEW

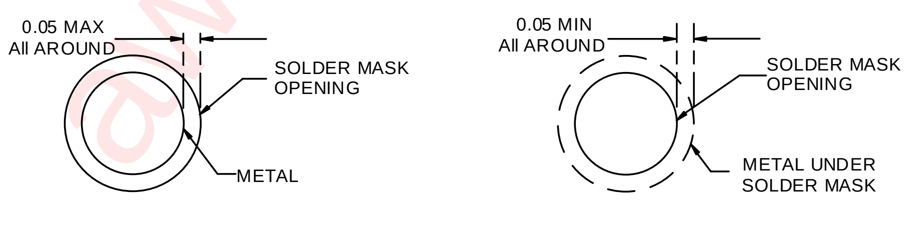


BOTTOM VIEW

Unit：mm

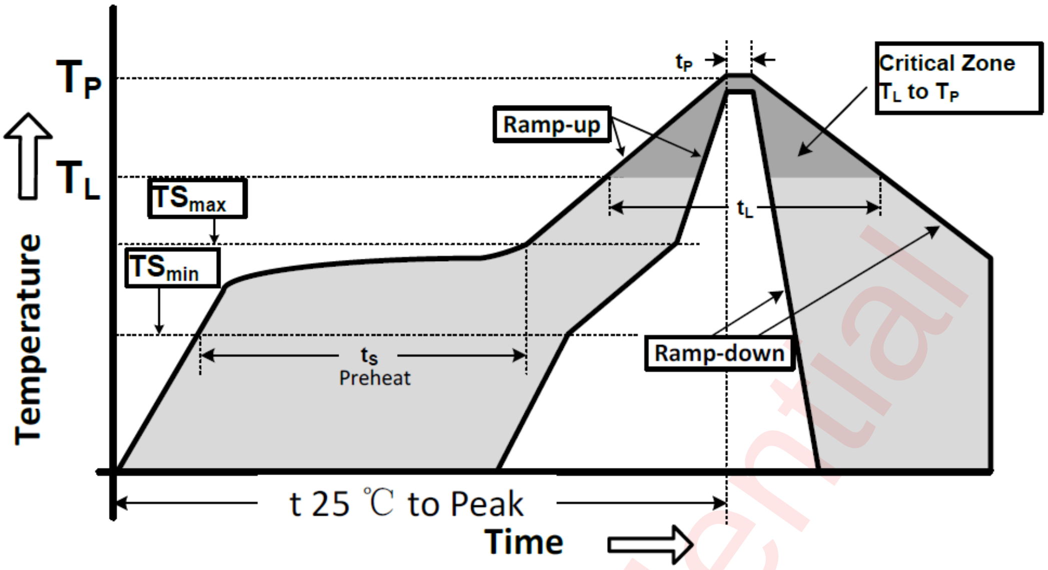
Land Pattern Data





Unit: mm

Reflow



Reflow Note	Spec
Ramp-up rate（TSmax to Tp）	3℃/second max.
Preheat temperature（TSmin to TSmax）	150℃ to 200℃
Preheat time（ts）	60 - 180 seconds
Time above TL , 217℃（tL）	60 - 150 seconds
Peak temperature（Tp）	260℃
Time within 5℃ of peak temperature(tp)	20 - 40 seconds
Ramp-down rate	6℃/second max.
Time 25℃ to peak temperature	8 minutes max.

Revision History

Version	Release date	Description
V1.0	2022-03-30	Initial release
V1.1	2022-04-13	Update Typical Operating Characteristic
V1.2	2022-06-13	Update POD and Land Pattern Data
V1.3	2022-07-29	1. Update Functional Block Diagram 2. Update Reflow

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