Built in Charge Pump Module, Fixed 28 Times Gain, AB/D switching, 3 Kinds of Anti Breaking Modes Are Optional, Peripheral Full Chip RC Application, 7W Mono Channel GF Class Audio Power Amplifier

General Description

CS5263E is a class GF single channel audio power amplifier with CMOS technology, which can provide up to 7W continuous power for 4Ω load; the internal fixed gain of chip effectively reduces the number of peripheral components; the application of peripheral full chip resistor and capacitor device can reduce the peripheral board area as much as possible, and reduce the cost increase caused by manual plug-in; It integrates two working modes of class D and class AB, which can not only ensure the strong power output in class D mode, but also eliminate the interference of power amplifier to the system in the case of FM; CS5263E has a unique anti breaking (NCN) function, which can automatically adjust the gain of power amplifier according to the size of the output signal, so as to achieve more comfortable auditory feeling.

In the mobile audio equipment powered by lithium battery, CS5263E is an ideal power amplifier solution for audio subsystem. The fully differential architecture and extremely high PSRR of CS5263E effectively improve the RF noise suppression ability of CS5263E.

In addition, CS5263E has built-in over-current protection and overheating protection, which can effectively protect the chip from damage under abnormal working conditions. CS5263E offers the ESOP10 package type with a rated operating temperature range of -40℃ to 85 ℃.

Features

- Integrates Charge Pump Boost Module,Integration of Class AB and Class D Operation Modes, GF Class Audio Power Amplifier
- Output Power(Cout=1μF+10μF,NCN OFF@D MODE)

VBAT = 5.0V, THD+N=10% RL=4Ω+33uH@ 6W
VBAT = 5.0V, THD+N=1% RL=4Ω+33uH@ 4.8W
VBAT = 3.6V, THD+N=10% RL=4Ω+33uH@5W
VBAT = 3.6V, THD+N=1% RL=4Ω+33uH@4.3W
VBAT = 5.0V, THD+N=10% RL=3Ω+33uH@ 7W
VBAT = 5.0V, THD+N=1% RL=3Ω+33uH@ 5.8W
VBAT = 3.6V, THD+N=10% RL=3Ω+33uH@5.7W
VBAT = 3.6V, THD+N=1% RL=3Ω+33uH@5.0W

- Input Voltage Range:2.7~5.5V
- Turn off current:<1μA
- Standby Current:20mA@5V
- Class D modulation frequency: 350KHz
- Anti Breaking Mode Switch
- AERC Patented Technology Provides Excellent Full Bandwidth EMI Suppression Capability
- Excellent "Pop Click" Noise Suppression
- High PSRR: - 80dB at 217Hz
- Over Temperature Protection
- Over Voltage Protection

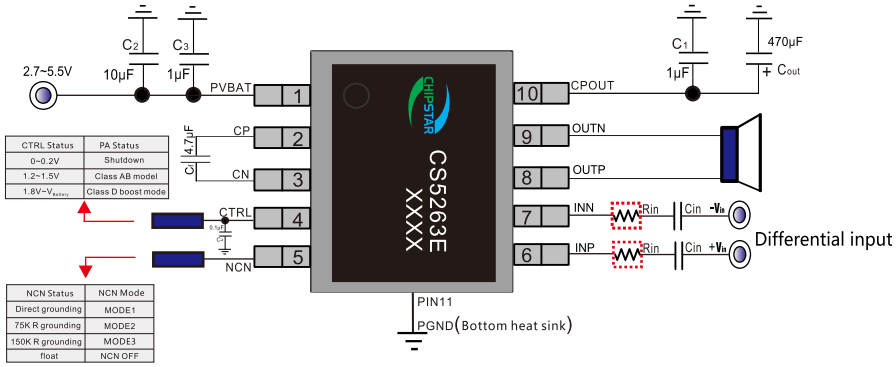
Applications

- Bluetooth Speaker
- Portable Audio Device

Package

- ESOP10L

Typical Applications

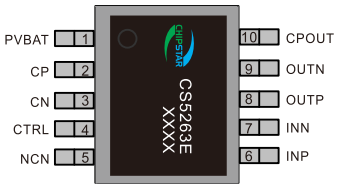


NOTES:
(1) The heat sink at the bottom is the pin 11 (PGND) of CS5263E, which is connected to the earth.
(2) In the figure, Rin in the red box is the reserved input resistance position, the CS5263E has 28 times of built-in gain, the internal integrated input resistance is 20K, and the feedback resistance is 560K,If gain is less than 28 times:Gain=560K/(20K+Rin)

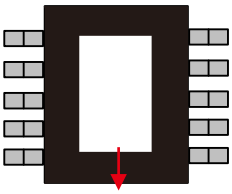
PIN Configuration and Functions

CS5263E(ESOP10 PACKAGE)

TOP VIEW



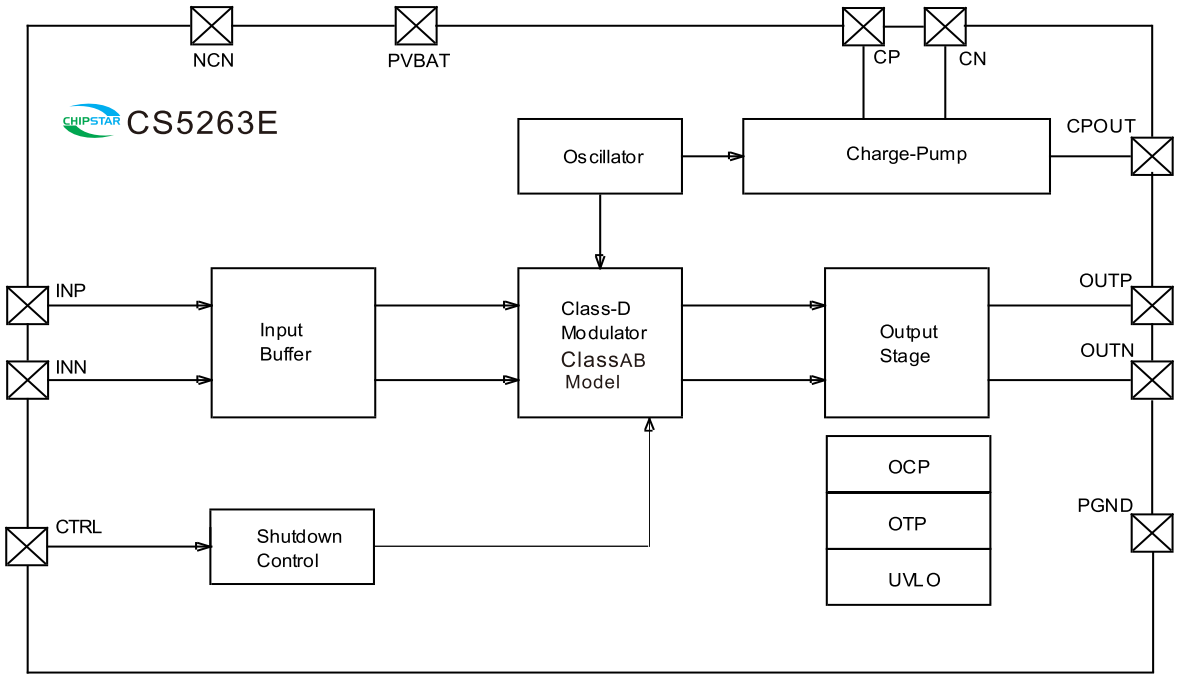
BOTTOM VIEW



PIN11:Bottom heat sink

NO.	NAME	I/O	DESCRIPTION
1	PVBAT	P	Power supply pin, connected to external power supply
2	CP	I	Positive end of Flying capacitor
3	CN	I	Negative end of Flying capacitor
4	CTRL	I	Turn off / class AB class D switch control pin
5	NCN	I	Anti breaking mode control pin
6	INP	I	Audio input signal positive end
7	INN	I	Audio input signal Negative end
8	OUTP	O	Audio output signal positive end
9	OUTN	O	Audio output signal Negative end
10	CPOUT	P	Charge pump module power output pin
11	PGND (Bottom heat sink)	P	Power ground (bottom heat sink, connected to ground)

Functional Block Diagram



Absolute Maximum Ratings [1]

SYMBOL	PARAMETER	VALUE	UNIT
V_{DD}	Power supply without signal input	7.0	V
V_I	Input voltage	-0.3 to VDD+0.3	V
T_J	Junction operating temperature range	-40 to 150	℃
T_{SDR}	Lead temperature (Soldering, 15 sec.)	220	℃
T_{STG}	Storage temperature range	-65 to 150	℃

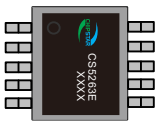
Recommended Operating Conditions

SYMBOL	PARAMETER	VALUE	UNIT
V_{DD}	Input voltage	2.7~5.5	V
T_A	Ambient temperature range	-40~85	℃
T_j	Junction operating temperature range	-40~150	℃

Thermal Information [2]

SYMBOL	PARAMETER	VALUE	UNIT
θ_{JA}(ESOP10)	Package thermal resistance - chip to environment thermal resistance	45	℃/W
θ_{JC}(ESOP10)	Package thermal resistance - chip to package surface thermal resistance	10	℃/W

Ordering Information

Product Name	Package Type	Device Marking	Reel Size	Tape width	Quantity
CS5263E	ESOP10L		13"	12mm	4000
CS5263E	ESOP10L		Tube		100

ESD Range

HBM (Human Body Model) ---------- ±4kV
MM (Machine model) ---------- ±400V

1. The above parameters are only the limit values of device operation. It is not recommended that the working conditions of the device exceed the limit values. Otherwise, the reliability and life of the device will be affected, and even permanent damage will be caused.

2. Where the PCB board is placed in CS5263E, a heat dissipation design is needed. The heat sink at the bottom of CS5263E is connected with the heat sink area of PCB board.

Electrical Characteristics (T_A=25℃，unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
PVBAT	Supply voltage		2.7		5.5	V
$\|V_{OS}\|$	Output offset voltage	VBAT=0V, Av=2V/V VBAT=3.0V to 5.0V		5	30	mV
PSRR	Power supply ripple rejection ratio	VBAT=2.7~5.5V,217Hz		-80		dB
CMRR	Common mode rejection ratio	输入管脚短接 VBAT=2.7~5.5V		-72		dB
I_{DD}	Quiescent current	VBAT=3.7V,无负载,无滤波(D类)		20		mA
		VBAT=3.7V,无负载(AB类)		10		
I_{SD}	Turn off current			0.1		μA
$r_{DS(ON)}$	Source drain on resistance (Mode D)	VBAT=3.7V		220		mΩ
		VBAT=5.0V		200		
$f_{(SW:D)}$	Class D modulation frequency	VBTA=2.7V to 5.5V		350		KHz
$f_{(SW:CH)}$	Charge Pump modulation frequency	VBTA=2.7V to 5.5V		1700		KHz
Rin	Internal input resistance			20		KΩ
T_{SD}	Over temperature protection temperature threshold			160		℃
T_{SDR}	Over temperature exit temperature threshold			120		℃
V_{CPOUT}	Charge Pump output voltage	I_{PVDD}=100mA	6.7	6.9	7.1	V
I_{CPOUT}	Charge Pump Maximum output current	PVBAT=4.2V		1.8		A
T_{SS}	Charge Pump soft start time			500		μs
T_{st}	Chip start set time			120		ms
t_{MOD_D}	Setting time of D/AB̄ mode conversion			120		ms

Working characteristics

T_A=25°C, Class D pattern,C_f=4.7μF,f=1KHz

SYMBOL	PARAMETER	TEST CONDITIONS	RL=4Ω	RL=3Ω	UNIT
P_O	output power	PVBAT=5.0V,THD=10%,NCN OFF	6.00	7.00	W
		PVBAT=5.0V,THD=1%,NCN OFF	4.80	5.80	
		PVBAT=4.2V,THD=10%,NCN OFF	6.00	7.30	
		PVBAT=4.2V,THD=1%,NCN OFF	4.90	6.00	
		PVBAT=3.6V,THD=10%,NCN OFF	5.00	5.70	
		PVBAT=3.6V,THD=1%,NCN OFF	4.30	5.00	
		PVBAT=3.4V,THD=10%,NCN OFF	4.50	5.00	
		PVBAT=3.4V,THD=1%,NCN OFF	3.90	4.50	
THD+N	Total harmonic distortion + noise	PVBAT=4.2V,Po=1.0W,NCN OFF	0.12		%
		PVBAT=4.2V,Vpp=300mV,NCN OFF	0.27		
η	efficiency	PVBAT=4.2V,Po=0.5W	72		%

T_A=25°C, RL= 4Ω Pure resistance,Class AB pattern,C_{out}=66μF,C_f=4.7μF,f=1KHz,CTRL Voltage:1.2~1.5V

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
P_O	output power	PVBAT=4.0V,THD=10%		2.20		W
		PVBAT=4.0V,THD=1%		1.50		
		PVBAT=3.6V,THD=10%		1.70		
		PVBAT=3.6V,THD=1%		1.10		

T_A=25°C,Class D pattern,RL=4Ω,C_f=4.7μF,f=1KHz,NCN grounding

SYMBOL	PARAMETER	TEST CONDITIONS	MIX	TYP	MAX	UNIT
P_O	output power	PVBAT=5.0V,Vpp=300mV,NCN MODE2		4.5		W
		PVBAT=4.2V,Vpp=300mV,NCN MODE2		4.2		
		PVBAT=3.6V,Vpp=300mV,NCN MODE2		3.4		
THD+N	Total harmonic distortion + noise	PVBAT=4.2V,Vpp=300mV,NCN MODE2		1.70		%
		PVBAT=3.6V,Vpp=300mV,NCN MODE2		0.90		
T_{at}	Anti breaking start time			50		ms
T_{rl}	Anti breaking release time			300		ms

T_A=25°C,Class D pattern,C_f=4.7μF,f=1KHz,The NCN is grounded through a 75K Ω resistor

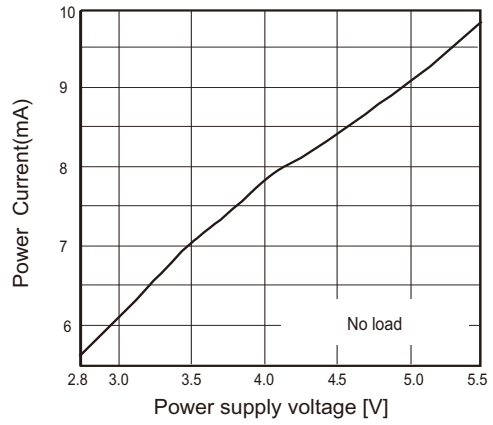
SYMBOL	PARAMETER	TEST CONDITIONS	MIX	TYP	MAX	UNIT
P_O	output power	PVBAT=5.0V,Vpp=300mV,NCN MODE2		3.3		W
		PVBAT=4.2V,Vpp=300mV,NCN MODE2		3.3		
		PVBAT=3.6V,Vpp=300mV,NCN MODE2		3.3		
THD+N	Total harmonic distortion + noise	PVBAT=4.2V,Vpp=300mV,NCN MODE2		0.50		%
		PVBAT=3.6V,Vpp=300mV,NCN MODE2		0.50		
T_{at}	Anti breaking start time			4		ms
T_{rl}	Anti breaking release time			2		s

T_A=25°C,Class D pattern,C_f=4.7μF,f=1KHz,The NCN is grounded through a 150K Ω resistor

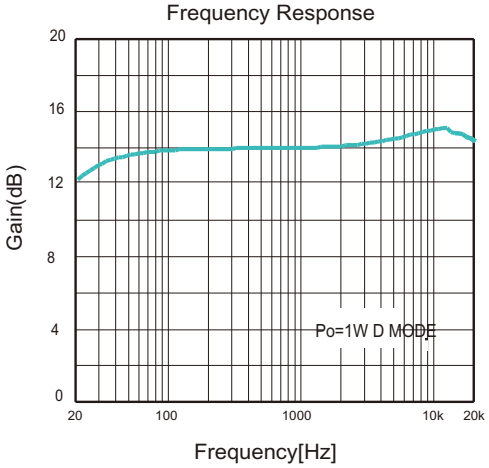
SYMBOL	PARAMETER	TEST CONDITIONS	MIX	TYP	MAX	UNIT
P_O	output power	PVBAT=5.0V,Vpp=300mV,NCN MODE2		5.00		W
		PVBAT=4.2V,Vpp=300mV,NCN MODE2		4.30		
		PVBAT=3.6V,Vpp=300mV,NCN MODE2		0.27		
THD+N	Total harmonic distortion + noise	PVBAT=4.2V,Vpp=300mV,NCN MODE2		0.45		%
		PVBAT=3.6V,Vpp=300mV,NCN MODE2		0.55		
T_{at}	Anti breaking start time			50		ms
T_{rl}	Anti breaking release time			75		ms

Typical Characteristics (TA=25°C,RL=4Ω, NCN OFF, D MODE)

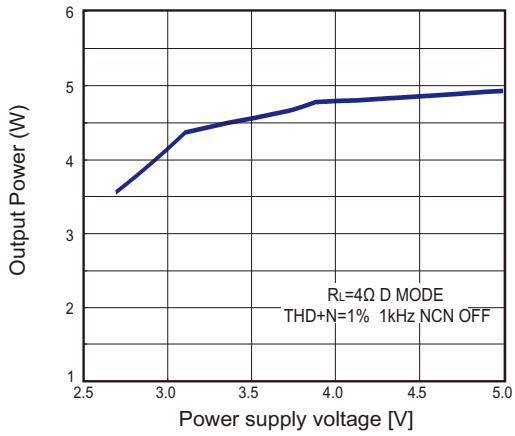
Power supply voltage vs Current



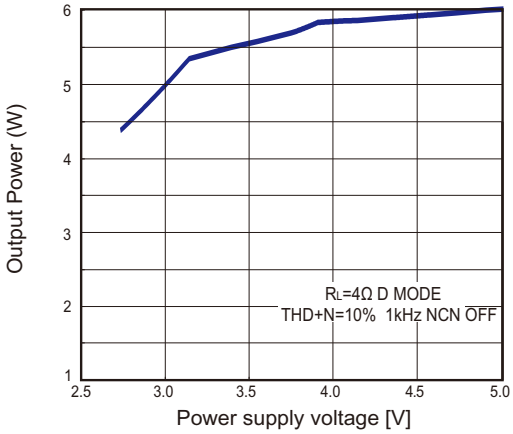
Frequency Response



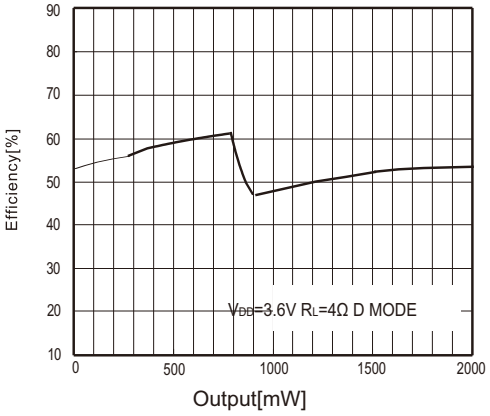
Power supply voltage vs Output



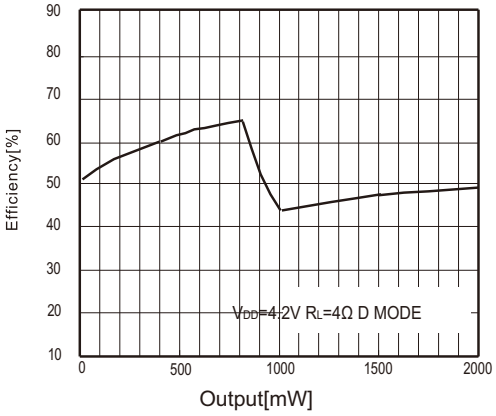
Power supply voltage vs Output



Output vs Efficiency

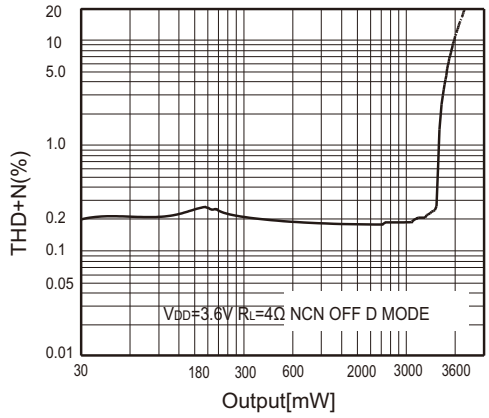


Output vs Efficiency

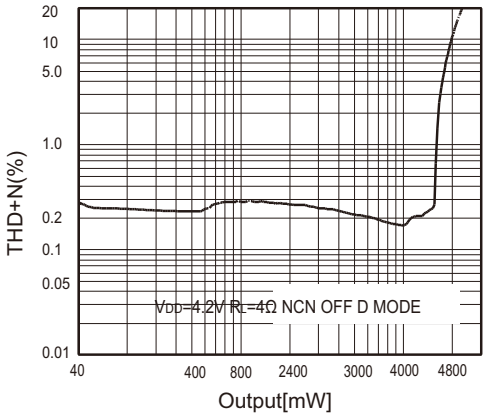


Typical Characteristics (TA=25°C,RL=4Ω, AB MODE,Charge Pump off)

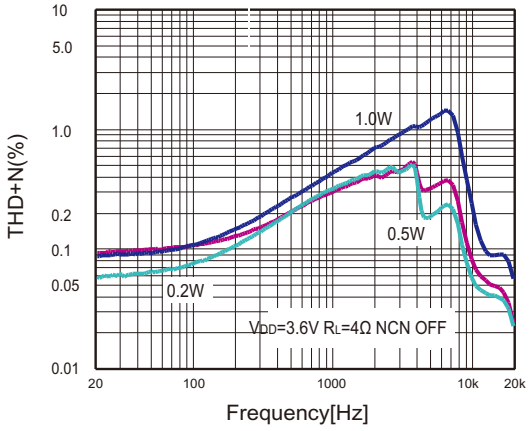
Output vs THD+N



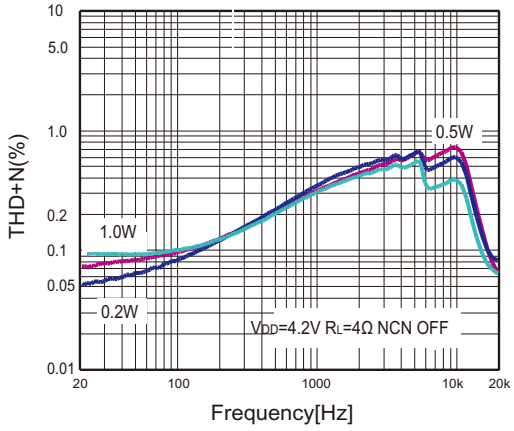
Output vs THD+N



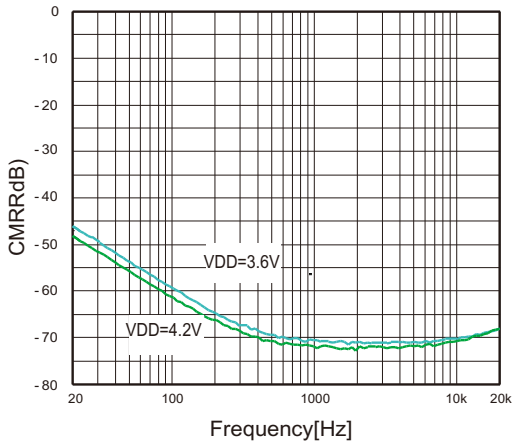
Frequency vs THD+N



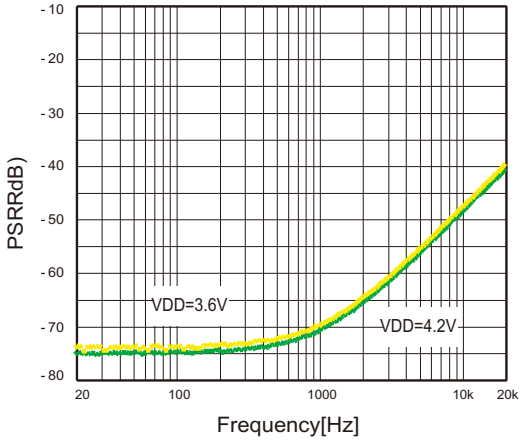
Frequency vs THD+N



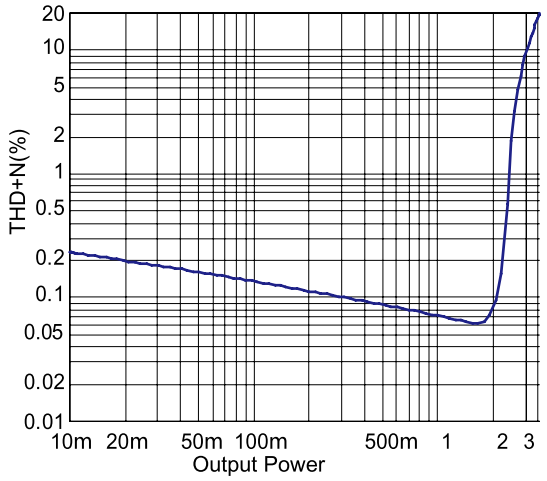
Frequency vs CMRR



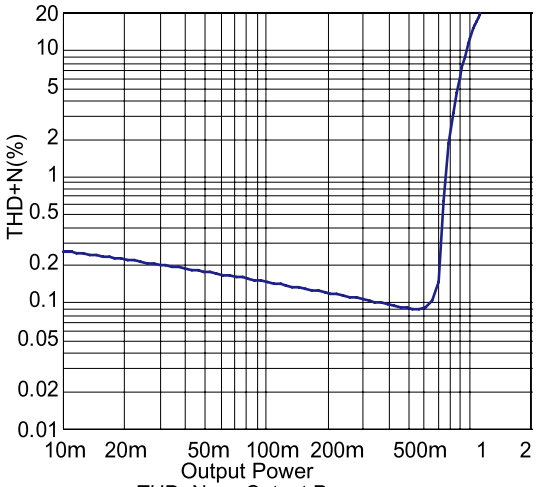
Frequency vs PSRR



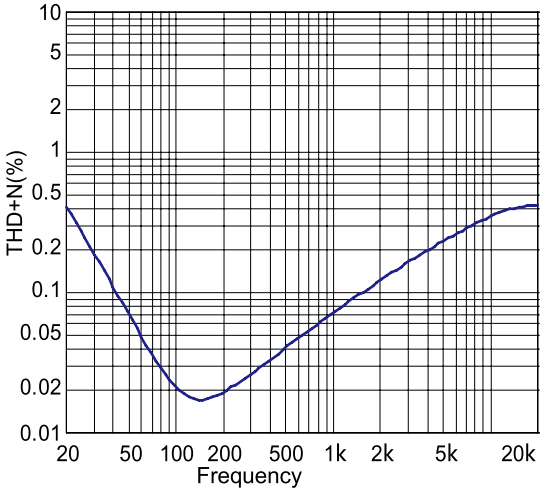
Typical Characteristics (TA=25°C,RL=4Ω, NCN OFF, D MODE)



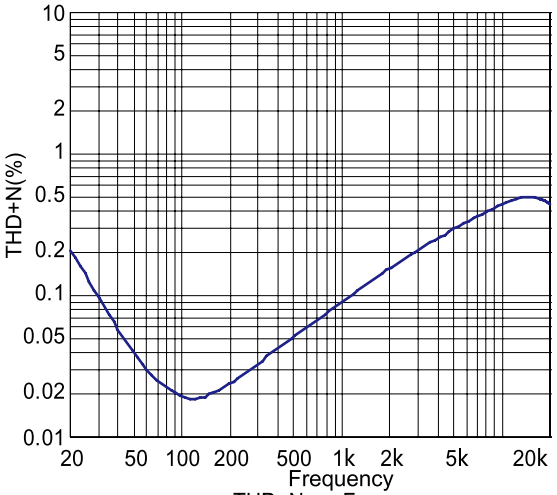
THD+N vs. Output Power
5V, 4Ohm, f=1 kHz



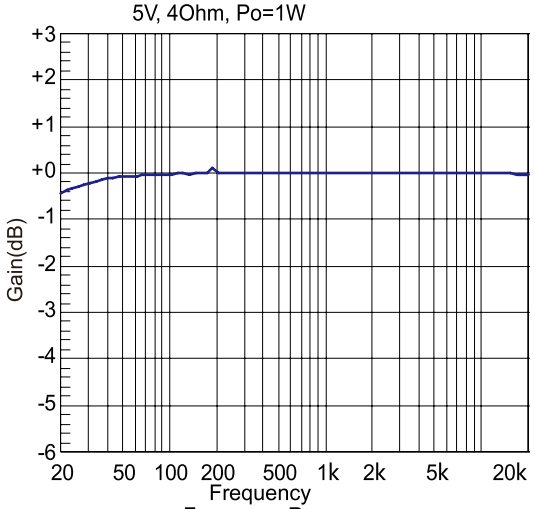
THD+N vs. Output Power
3V, 4Ohm, f=1 kHz



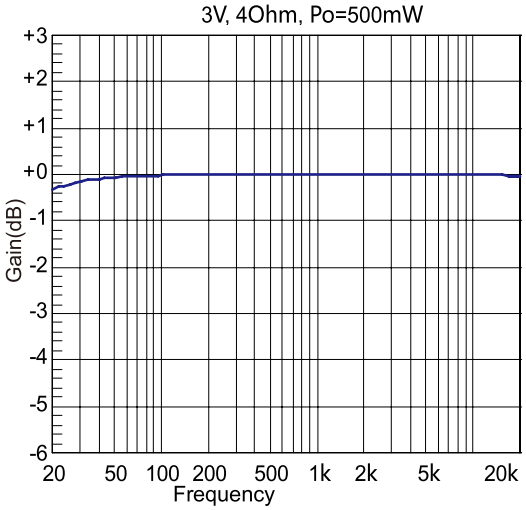
THD+N vs. Frequency
5V, 4Ohm, Po=1W



THD+N vs. Frequency
3V, 4Ohm, Po=500mW

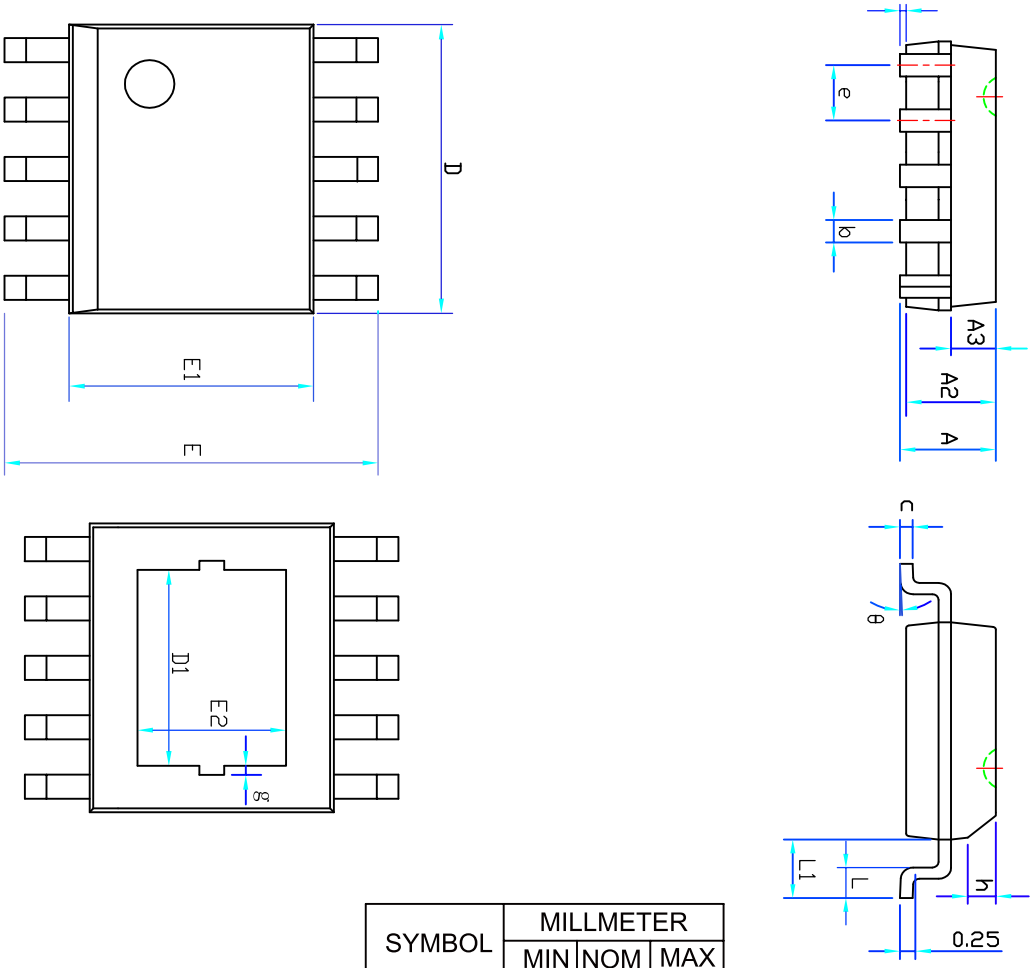


Frequency Response
5V, 4Ohm



Frequency Response
3V, 4Ohm

Package Information:CS5263E ESOP10L



SYMBOL	MILLMETER		
	MIN	NOM	MAX
A	—	—	1.50
A1	0.02	0.05	0.08
A2	1.30	1.40	1.50
A3	0.70	0.75	0.80
b	0.35	—	0.45
c	0.20	—	0.24
D	4.80	4.90	5.00
D1	3.10REF		
e	1.00BSC		
E	6.05	6.15	6.25
E1	3.82	3.92	4.02
E2	2.20REF		
L	0.50	—	0.70
L1	1.15REF		
h	0.30	0.40	0.50
θ	0	—	8°
g	0.15REF		