

Voice Switched Speakerphone Circuit with Speaker Amplifier

■ GENERAL DESCRIPTION

The **NJW1128** is a Voice Switched Speakerphone Circuit. It includes all of functions processing a high quality hands-free speakerphone system, such as the necessary amplifiers (Mic , Receive ,Line, Speaker), attenuators, level detectors functions.

The **NJW1128** is controllable independently power-down of the speaker amplifier and the entire IC excluding the speaker amplifier.

All external capacitors are sufficient small so that ceramic capacitors are applied.

■ PACKAGE OUTLINE



NJW1128FR3

■ APPLICATION

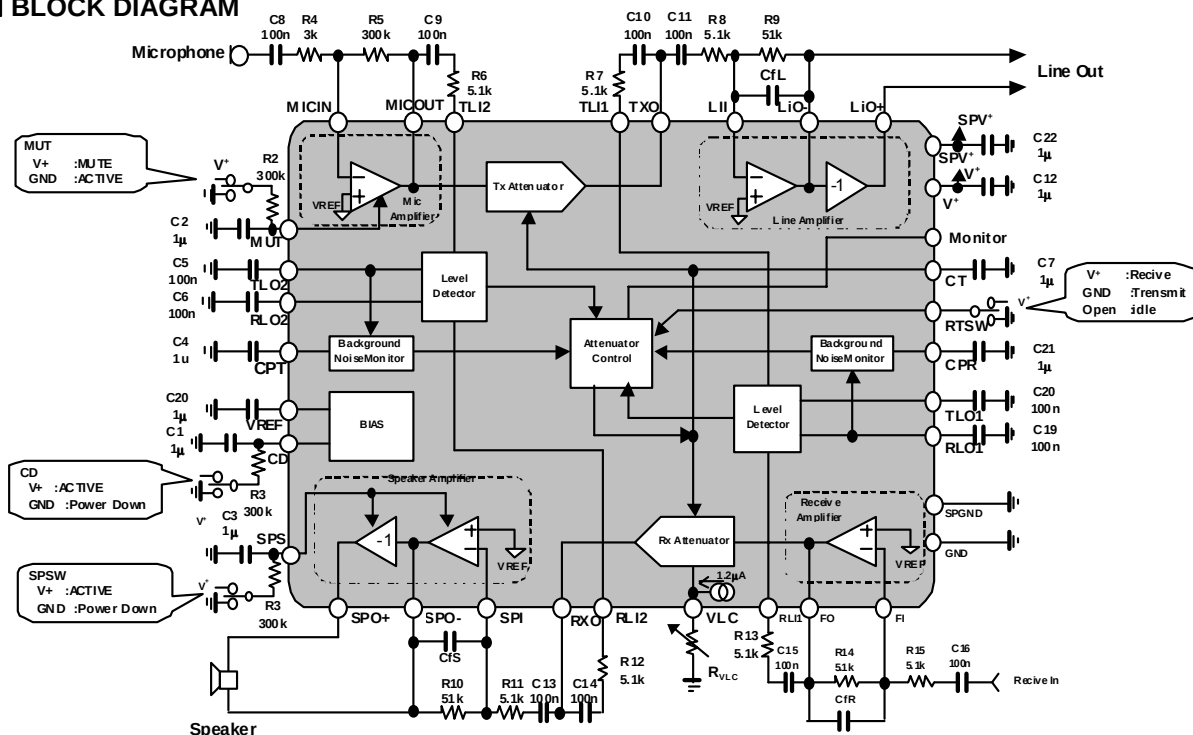
- Video Door Phone
- Conference System
- Wireless Application
- Security System

■ FEATURES

- Operating voltage range 3.9 to 5.5V
- Attenuator gain range between Transmit and Receive 52dB
- Speaker amplifier
- Microphone amplifier with mute function
- Force to Receive, Transmit, or Idle modes
- Mode –watching monitor
- Background noise monitor for each path
- 4-point signal sensing
- Chip disable Pin powers down the entire IC excluding the speaker amplifier
- Speaker switch Pin power down the speaker amplifier
- Microphone and Receive Amplifiers pinned out for flexibility
- Package Outline

LQFP48-R3

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Power Supply Voltage	V ₊	7	V
Power Dissipation	P _D	1,330(Note1)	mW
Operating Temperature Range	Topr	-40 ~ +85	°C
Storage Temperature Range	Tstg	-40 ~ +125	°C
Maximum Input Voltage	V _{IMAX}	0 ~ V ⁺ (Note2)	V

(Note1) EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layer, FR-4) mounting

■ OPERATING VOLTAGE

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V ⁺	-	3.9	5.0	5.5	V

■ ELECTRICAL CHARACTERISTICS (Ta=25°C, V⁺=5V, Vin=150mVrms/1kHz, MUT=CD=SPSW= V⁺, MON=OPEN, R_{VLC}=0Ω)

●Power Supply

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current 1	I _{CC1}	RX-mode (Receive)	2.0	3.5	6.0	mA
Operating Current 2	I _{CC2}	TX-mode (Transmit)	2.0	3.5	6.0	mA
Operating Current 3	I _{CC3}	Idle-mode (Standby)	2.0	3.5	6.0	mA
Operating Current 4	I _{CC4}	Idle-mode, SPSW=PD	1.0	2.5	4.0	mA
Operating Current 5	I _{CC5}	Idle-mode, CD=PD, SPSW=PD	0.5	1	1.5	mA
Reference Voltage	V _{REF}	No signal, Idle-mode	2.2	2.5	2.8	V

●Receive Attenuator(RxIN=200Vrms, Receive Amplifier Gv=0dB)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Receive Attenuator Gain 1	G _{R1}	RX-mode (Receive)	3.0	6.0	9.0	dB
Receive Attenuator Gain 2	G _{R2}	TX-mode (Transmit)	-42	-46	-50	dB
Receive Attenuator Gain 3	G _{R3}	Idle-mode (Standby)	-17	-20	-23	dB
Range R to T mode	dG _R	RX-mode – TX-mode	47	52	57	dB
Dynamic DC offset	G _{RDC}	RX-mode – TX-mode (DC)	-50	-	50	mV
Volume control range	G _{RVR}	RX-mode, R _{VLC} =0Ω-100kΩ	35	45	55	dB

●Transmit Attenuator (TxIN=200Vrms, Mic.amplifier Gv=0dB)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Transmit Attenuator Gain 1	G _{T1}	TX-mode (Transmit)	3.0	6.0	9.0	dB
Transmit Attenuator Gain 2	G _{T2}	RX-mode (Receive)	-42	-46	-50	dB
Transmit Attenuator Gain 3	G _{T3}	Idle-mode (Standby)	-17	-20	-23	dB
Range R to T mode	dG _T	TX-mode – RX-mode	47	52	57	dB
Dynamic DC offset	G _{TDC}	TX-mode – RX-mode (DC)	-50	-	50	mV

●MIC Amplifier(TxIN=1mVrms, Gv=40dB, RL=5.1kΩ)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Offset Voltage	V _{MOS}	RF=300kΩ	-50	0.0	50	mV
Input Bias Current	I _{MBIAS}		-	30	-	nA
Voltage Gain 1	G _{VM1}	f=1kHz	-	40	-	dB
Voltage Gain 2	G _{VM2}	f=20kHz	-	36	-	dB
Maximum Output Voltage	V _{MMAX}	THD=1%	1.0	-	-	Vrms
Maximum Attenuation	G _{MMUTE}	MUT=MUTE	-70	-73	-	dB

●Receive Amplifier (RxIN=1mVrms, Gv=40dB, RL=5.1kΩ)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Offset Voltage	V _{ROS}	RF=300kΩ	-50	0.0	50	mV
Input Bias Current	I _{RBIAS}		-	30	-	nA
Voltage Gain 1	G _{VR1}	f=1kHz	-	40	-	dB
Voltage Gain 2	G _{VR2}	f=20kHz	-	36	-	dB
Maximum Output Voltage	V _{RMAX}	THD=1%	1.0	-	-	Vrms

●Line Amplifier (LINEIN=50mVrms, Gv=26dB, RL=1.2kΩ)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Offset Voltage	V _{LOS}	RF=51kΩ	-50	0.0	50	mV
Input Bias Current	I _{RBIAS}		-	30	-	nA
Voltage Gain 1	G _{VL1}	f=1kHz	-	26	-	nA
Voltage Gain 2	G _{VL2}	f=20kHz	-	25	-	nA
Gain Bandwidth	G _{LBW}	RL=600Ω, LIO	-	1.5	-	MHz
Closed Loop Gain	G _{LC}	RL=1.2kΩ, LIO- to LIO+	-0.5	0	0.5	dB
Maximum Output Voltage	V _{LMAX}	RL=1.2kΩ, THD=1%	2.0	-	-	Vrms
Total Harmonic Distortion	THD _{LN}	VIN=100mVrms, Gv=20dB RL=1.2Ω	-	-	0.5	%

●Speaker Amplifier (SPIN=50mVrms, Gv=26dB, RL=32Ω)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Offset Voltage	V _{SPOS}	RF=51kΩ	-50	0.0	50	mV
Voltage Gain 1	G _{VSP1}	f=1kHz	-	26	-	dB
Voltage Gain 2	G _{VSP2}	f=20kHz	-	24	-	dB
Voltage Gain 3	G _{VSP3}	f=1kHz, G _{VSP} =6dB, RL=8Ω	-	6	-	dB
Voltage Gain 4	G _{VSO4}	f=20kHz, G _{VSP} =6dB, RL=8Ω	-	4	-	dB
Closed Loop Gain	G _{LC}	SPO- to SPO+	-0.6	0	0.6	dB
Maximum Output Power	P _{OMAX1}	RL=32Ω, THD=3%	200	300	-	mW
	P _{OMAX2}	RL=8Ω, THD=3%	300	500	-	mW
Total Harmonic Distortion	THD _{SP1}	VIN=500mVrms, f=1KHz, RL=32Ω, G _{VD} =26dB		-	1.0	%
	THD _{SP2}	VIN=500mVrms, f=1KHz, RL=8Ω, G _{VD} =6dB	-	-	1.0	%

●MONITOR TERMINAL (32Pin)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rx-mode	Rx	-	$V^+ - 0.6$	-	V^+	V
Tx-mode	Tx	-	GND	-	0.6	V
Idle-mode	Idle	No Signal	2.4	2.5	2.6	V
Maximum Output Current	I_{MON}	Rx-mode / Tx-mode	-	0.9	-	mA

■ CONTROL CHARACTERISTICS (MUT)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Low Level Input Voltage	V_{IL1}	-	-	-	0.3	V
High Level Input Voltage	V_{IH1}	-	1.5	-	-	V

■ CONTROL CHARACTERISTICS (RTSW)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Low Level Input Voltage	V_{IL2}	-	-	-	0.3	V
High Level Input Voltage	V_{IH2}	-	$V^+ - 0.3$	-	-	V

■ FUNCTION

●CD

INPUT VOLTAGE	STATUS	OPERATION
V_{IH}	ACTIVE	NJW1128 is active.
V_{IL}	MUTE	NJW1128 is stand-by except Speaker Amplifier.

●MUT

INPUT VOLTAGE	STATUS	OPERATION
V_{IH}	MUTE	The microphone input is mute.
V_{IL}	ACTIVE	The microphone input is active.

●SPSW

INPUT VOLTAGE	STATUS	OPERATION
V_{IH}	ACTIVE	The Speaker Amplifier is Active.
V_{IL}	PD	The Speaker Amplifier is Stand-by.

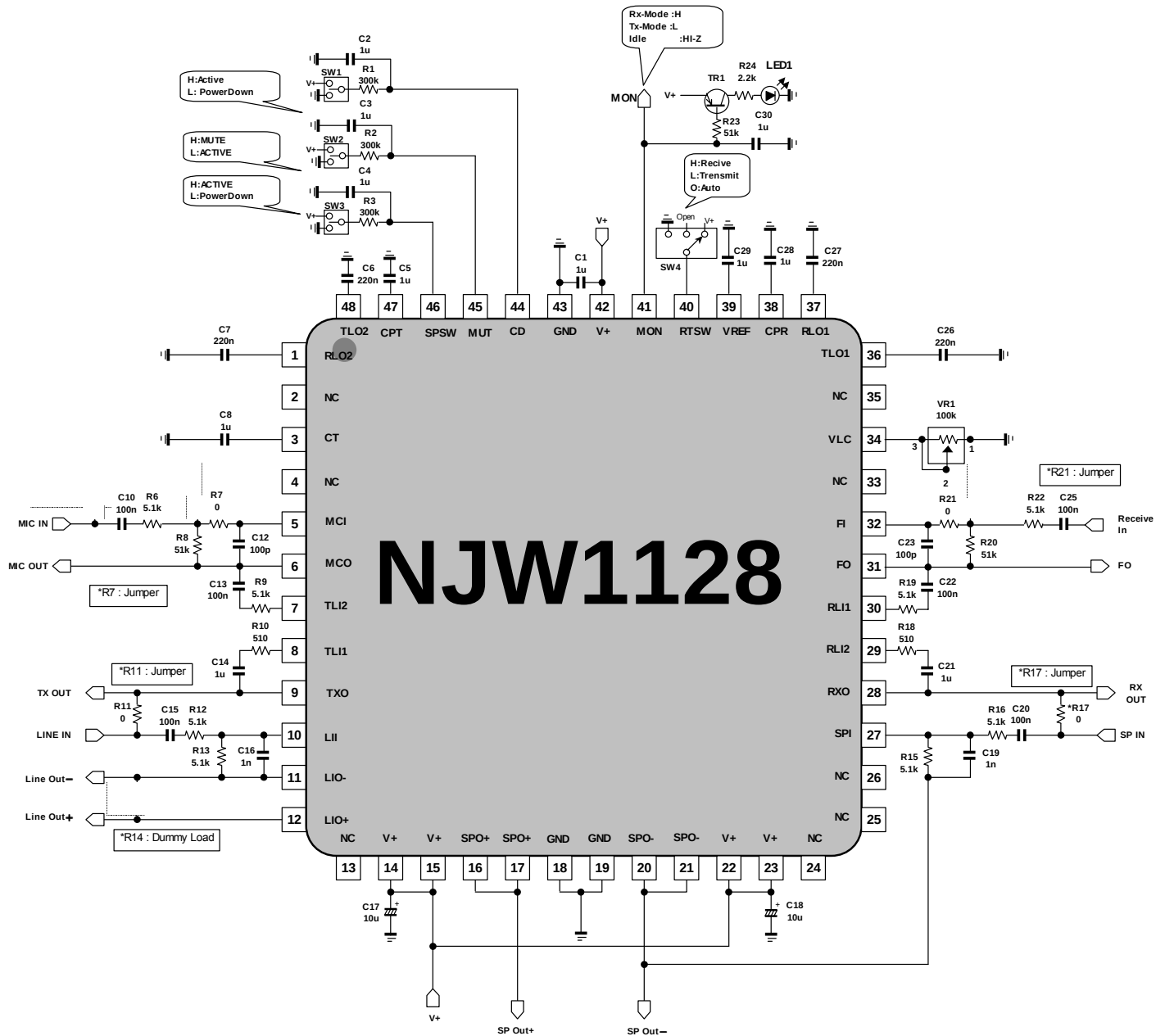
●RTSW

INPUT VOLTAGE	STATUS	OPERATION
V_{IH}	Receive	Force to Receive mode.
OPEN	AUTO	Receive mode and Transmit mode are automatically switched.
V_{IL}	Transmit	Force to Transmit mode.

● R_{VLC} (26pin)

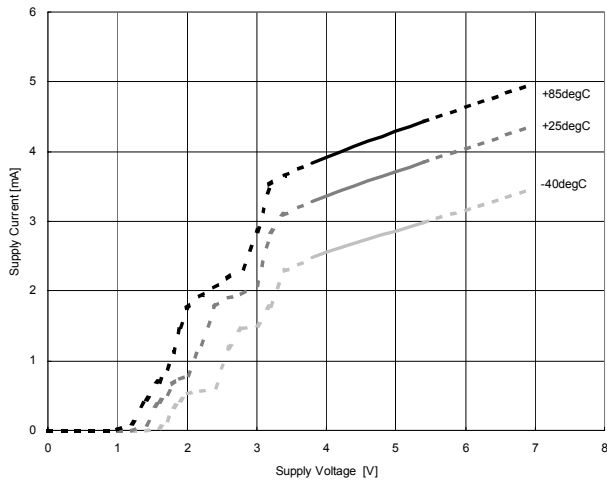
IMPEDANCE	STATUS	OPERATION
0	Vol_{MAM}	The Receive attenuator Volume is maximum.
100k Ω	Vol_{MIN}	The Receive attenuator Volume is minimum.

APPLICATION CIRCUIT

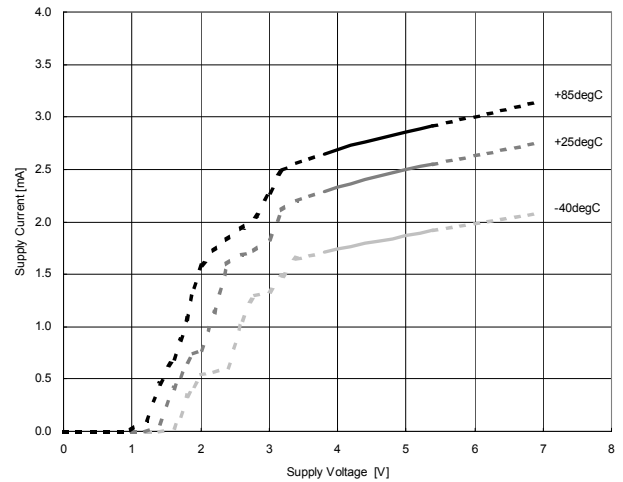


TYPICAL CHARACTERISTICS

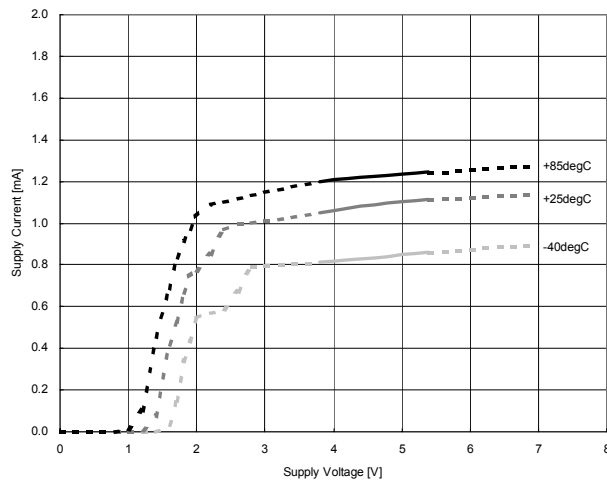
Supply Current vs Supply Voltage
No Signal, Supply Current 1



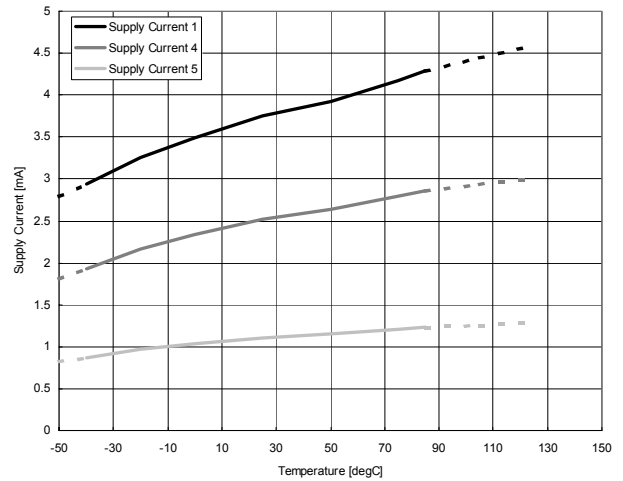
Supply Current vs Supply Voltage
No Signal, Supply Current 4



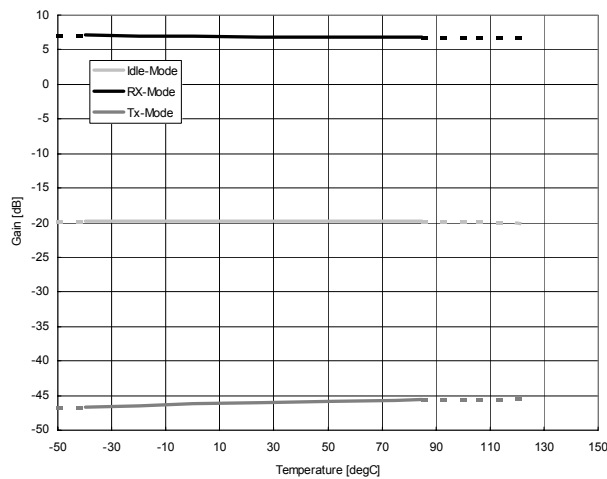
Supply Current vs Supply Voltage
No Signal, Supply Current 5



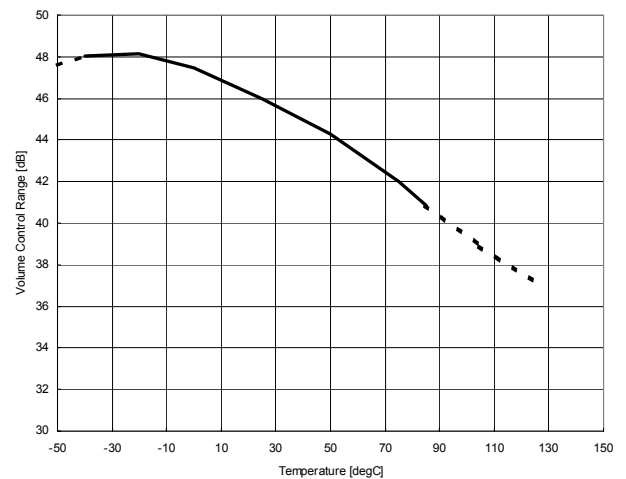
Supply Current vs Temperature
V+ = 5.0V, No Signal



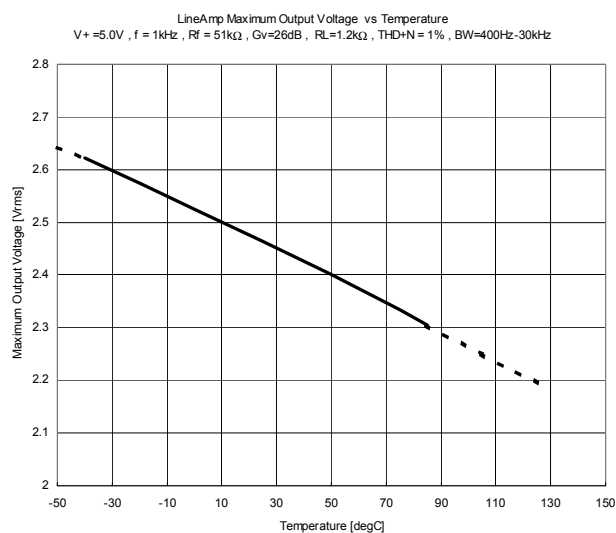
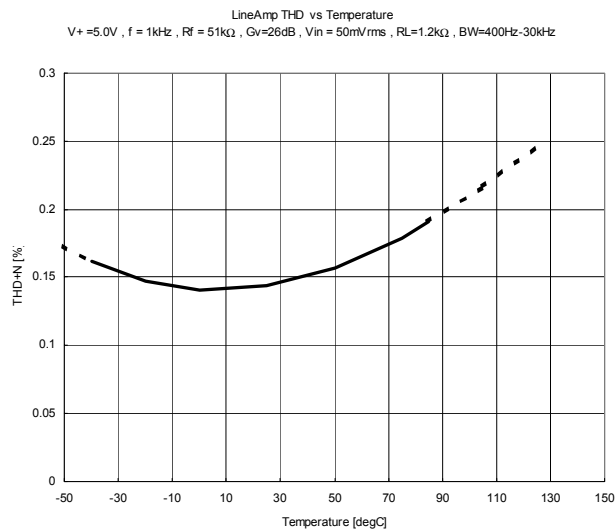
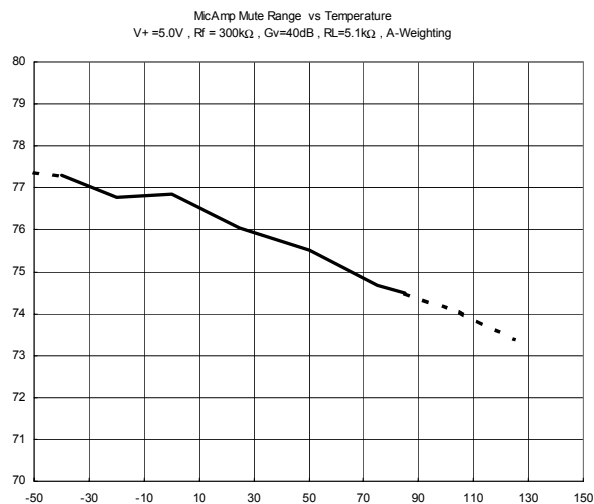
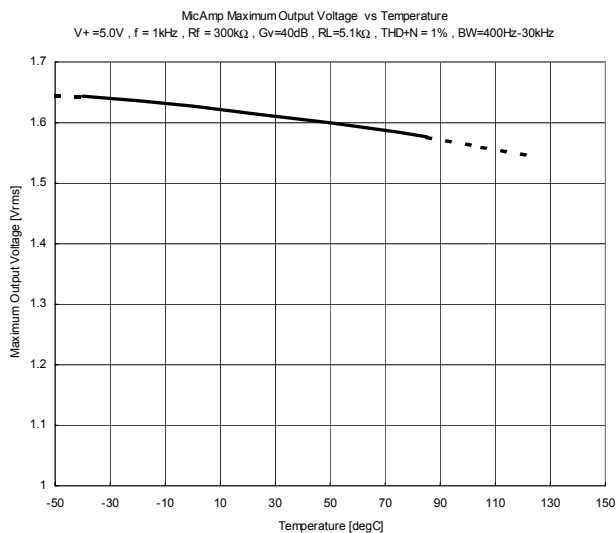
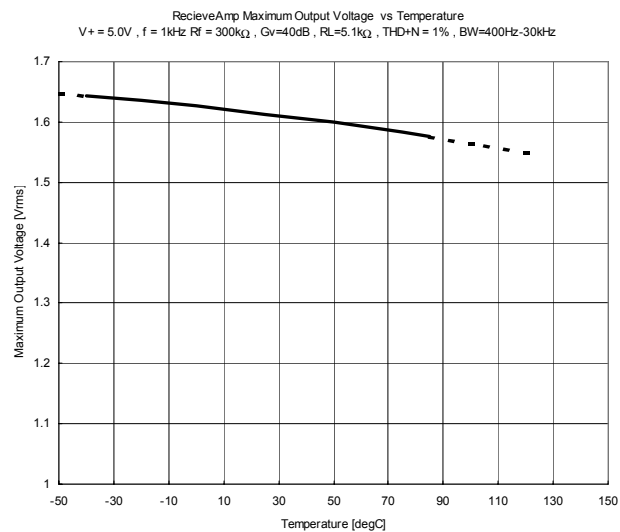
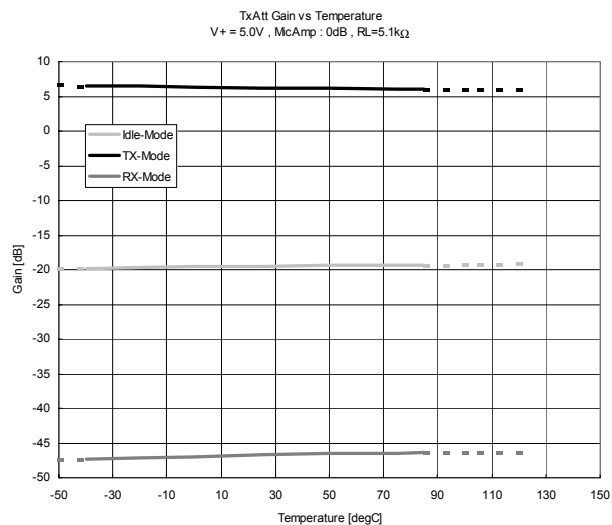
RxAtt Gain vs Temperature
V+ = 5.0V, RecieveAmp : 0dB, RL=5.1k Ω



RxAtt Gain vs Temperature
V+ = 5.0V, Rx-Mode, RecieveAmp : 0dB, RL=5.1k Ω

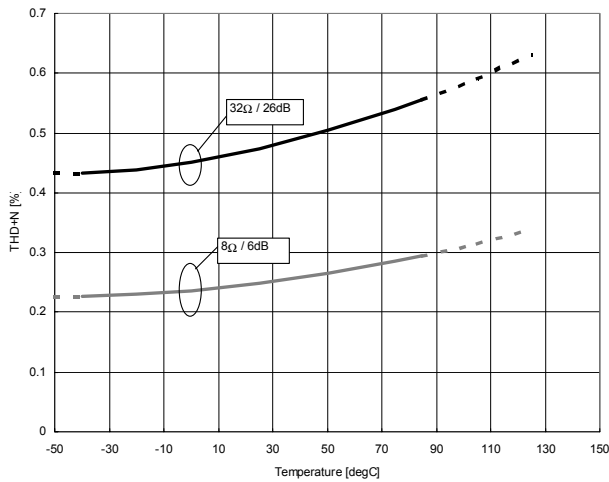


TYPICAL CHARACTERISTICS

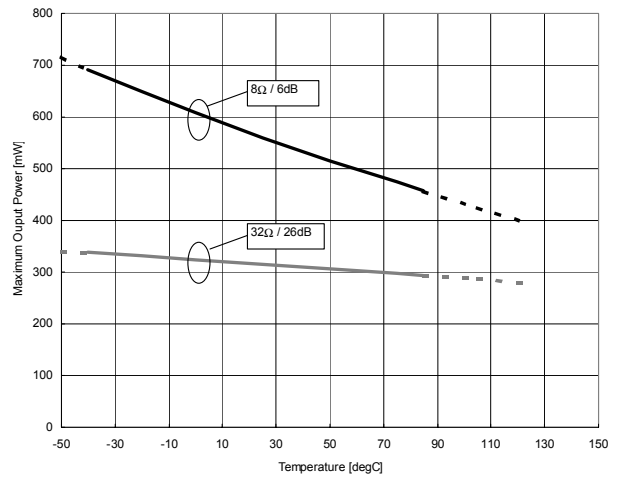


TYPICAL CHARACTERISTICS

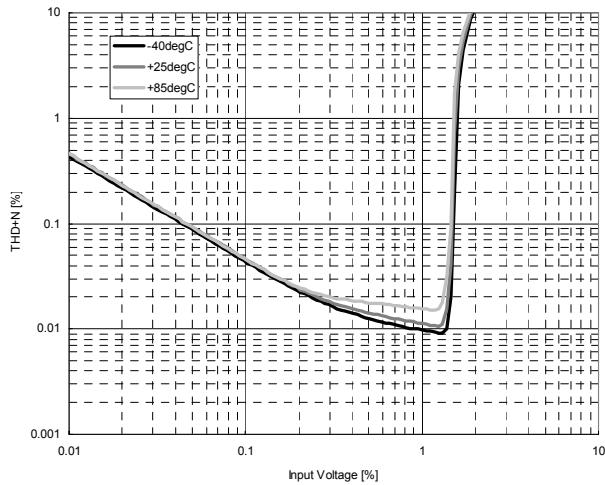
Speaker Amp THD+N vs Temperature
V+ = 5.0V, f = 1kHz, BW=400Hz-30kHz



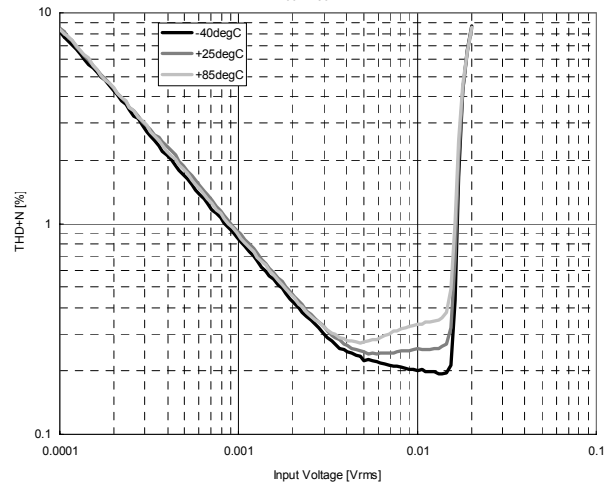
Speaker Amp Maximum Output Power vs Temperature
V+ = 5.0V, f = 1kHz, THD+N = 3%, BW=400Hz-30kHz



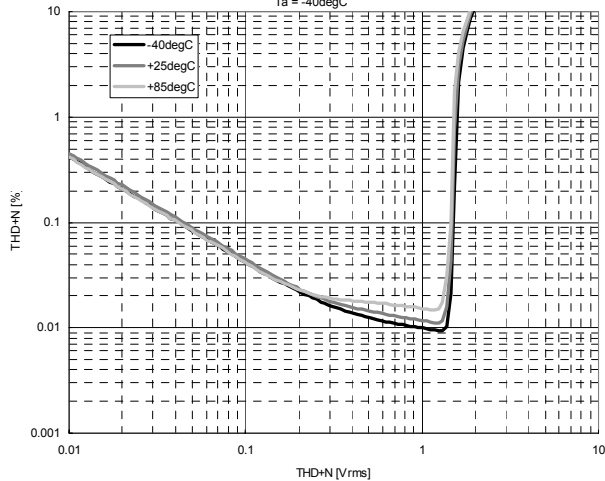
Receive Amp THD+N vs Input Voltage
V+ = 5.0V, f = 1kHz Rf = 3kΩ, Ri = 3kΩ, Ci = 1μF, Gv = 0dB, RL = 5.1kΩ, BW=400Hz-30kHz



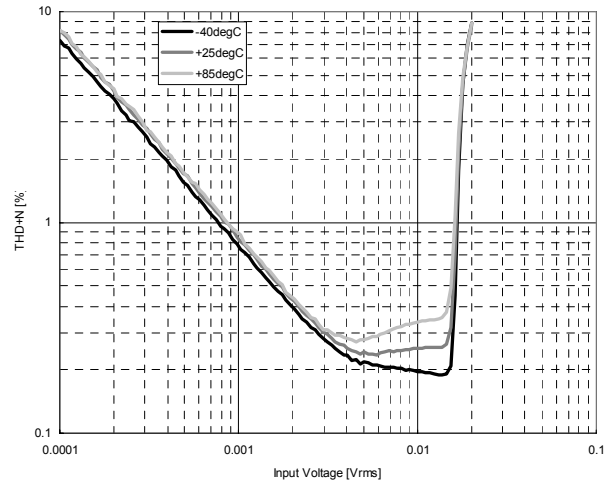
Receive Amp THD+N vs Input Voltage
V+ = 5.0V, f = 1kHz Rf = 300kΩ, Ri = 3kΩ, Ci = 1μF, Gv = 40dB, RL = 5.1kΩ, BW=400Hz-30kHz



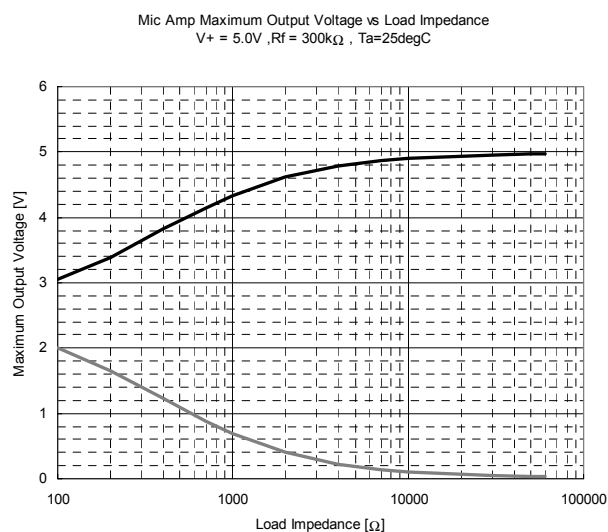
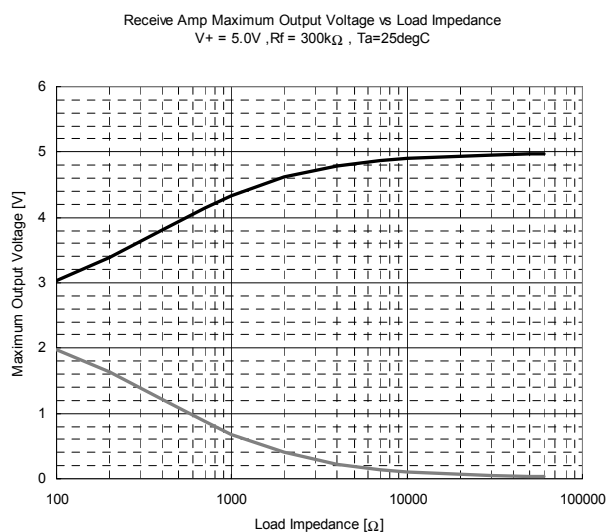
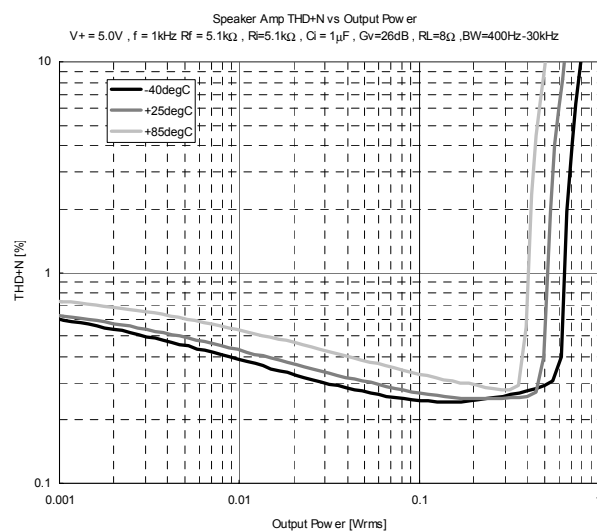
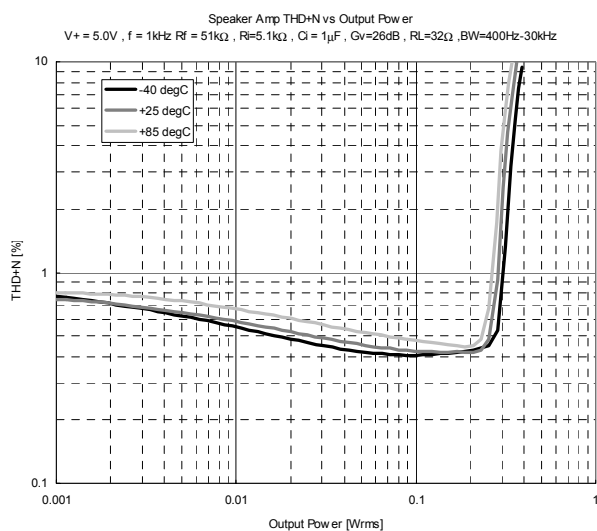
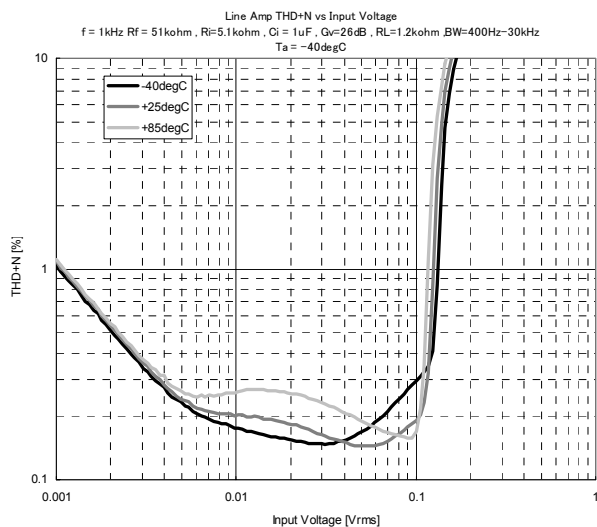
Mic Amp THD+N vs Input Voltage
f = 1kHz Rf = 3kΩ, Ri = 3kΩ, Ci = 1μF, Gv = 0dB, RL = 5.1kΩ, BW=400Hz-30kHz
Ta = -40degC



Mic Amp THD+N vs Input Voltage
V+ = 5.0V, f = 1kHz Rf = 300kΩ, Ri = 3kΩ, Ci = 1μF, Gv = 40dB, RL = 5.1kΩ, BW=400Hz-30kHz

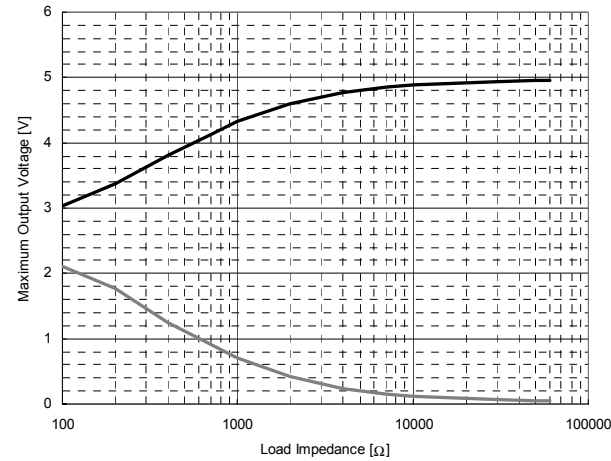


TYPICAL CHARACTERISTICS

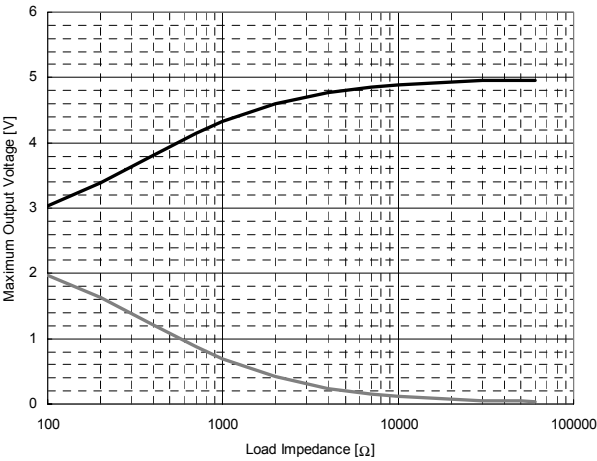


TYPICAL CHARACTERISTICS

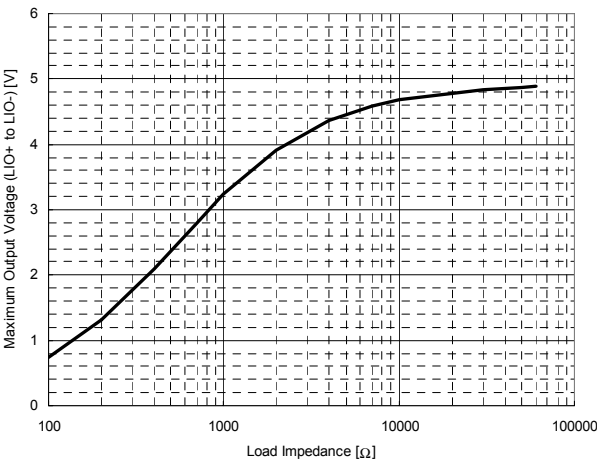
Rx Att Maximum Output Voltage vs Load Impedance
V+=5.0V , Ta=25degC



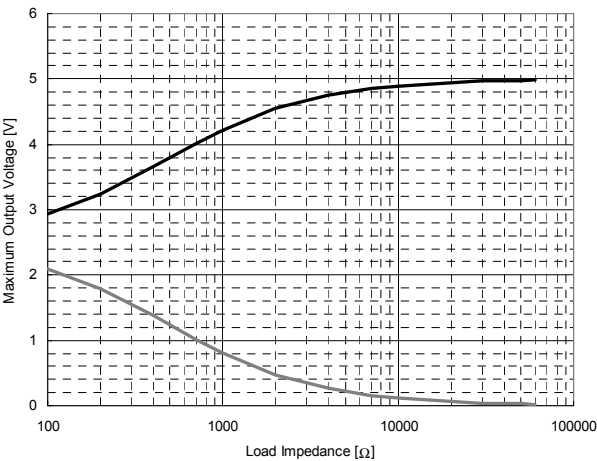
Tx Att Maximum Output Voltage vs Load Impedance
V+=5.0V , Ta=25degC



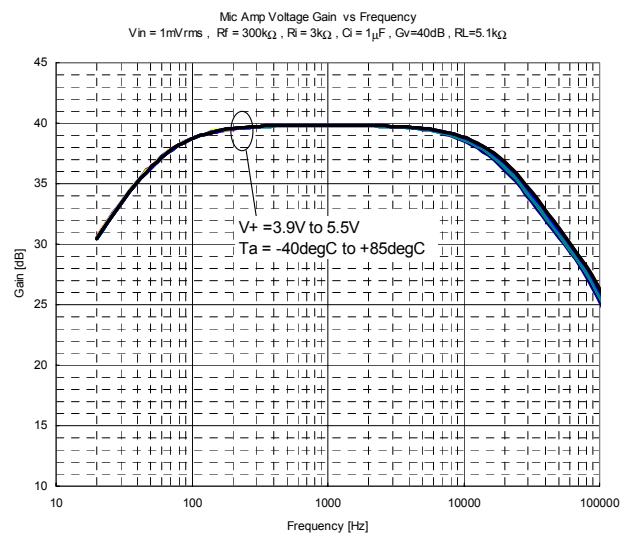
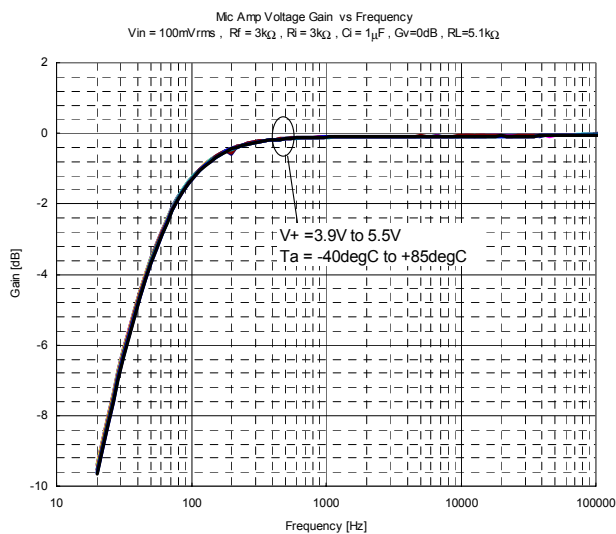
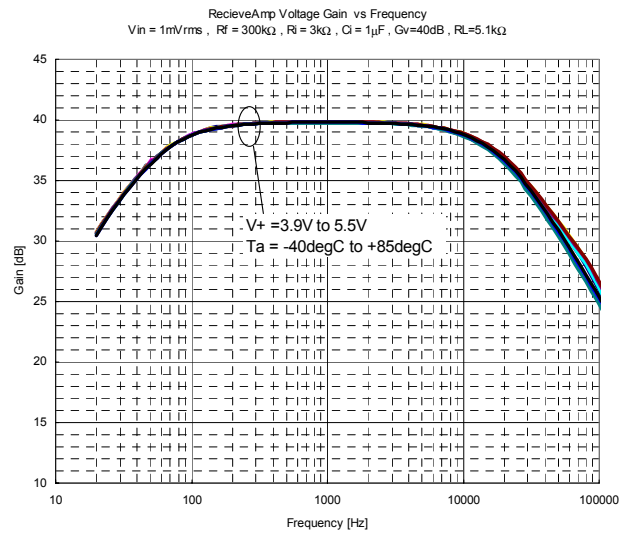
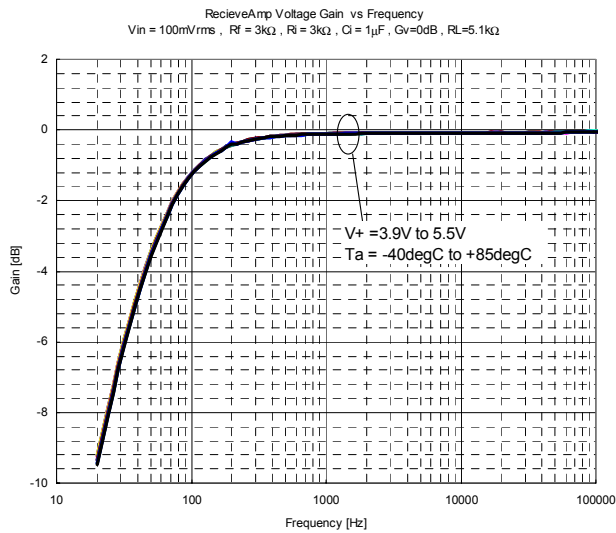
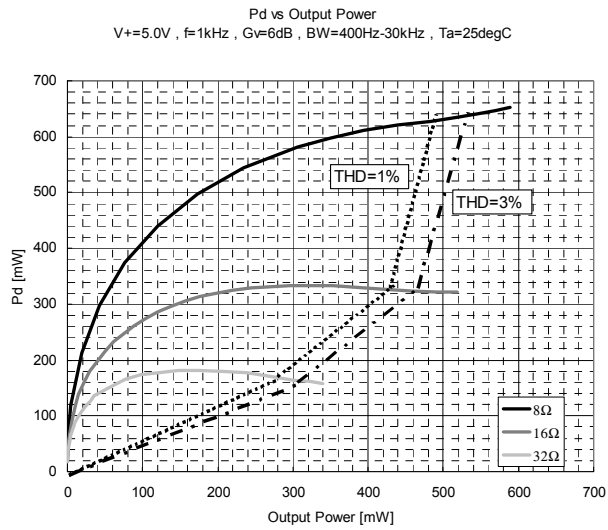
Line Amp Maximum Output Voltage vs Load Impedance
V+ = 5.0V , Rf = 51kΩ , Ta=25degC



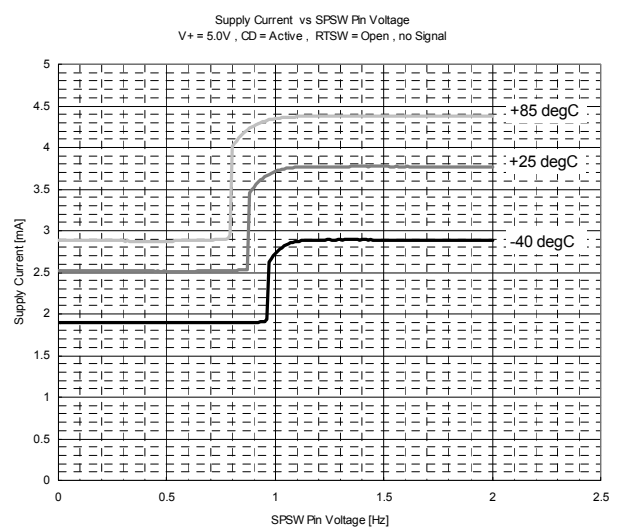
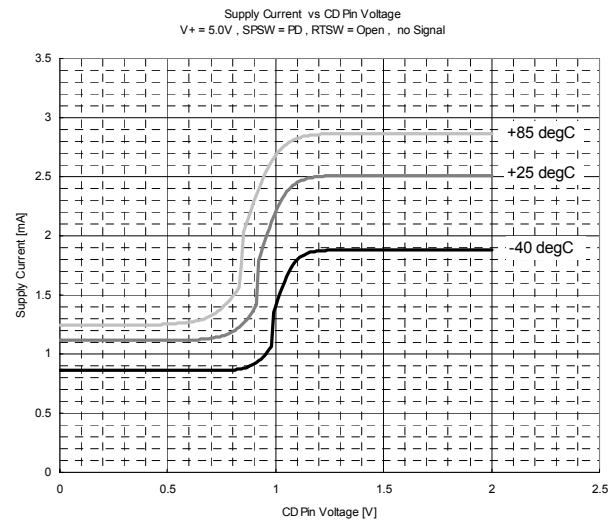
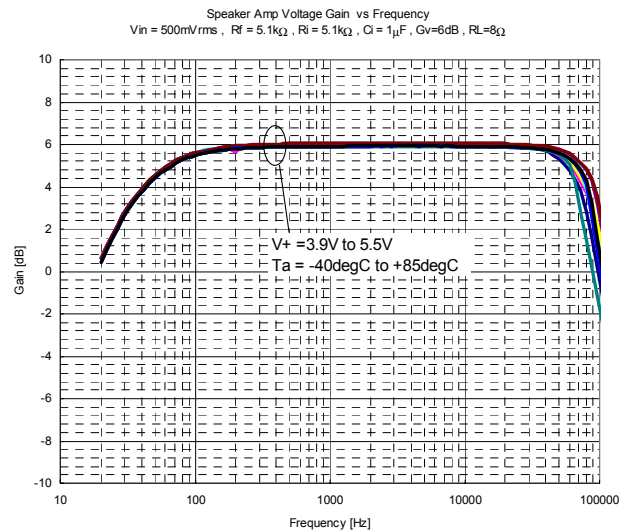
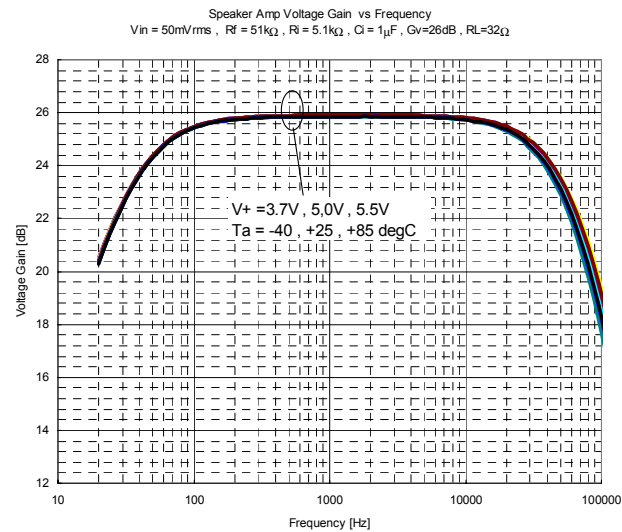
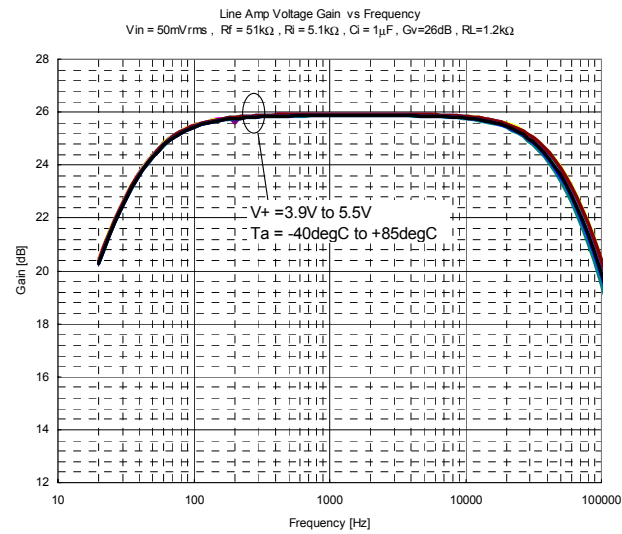
Monitor out Maximum Output Voltage vs Load Impedance
V+=5.0V , Ta=25degC



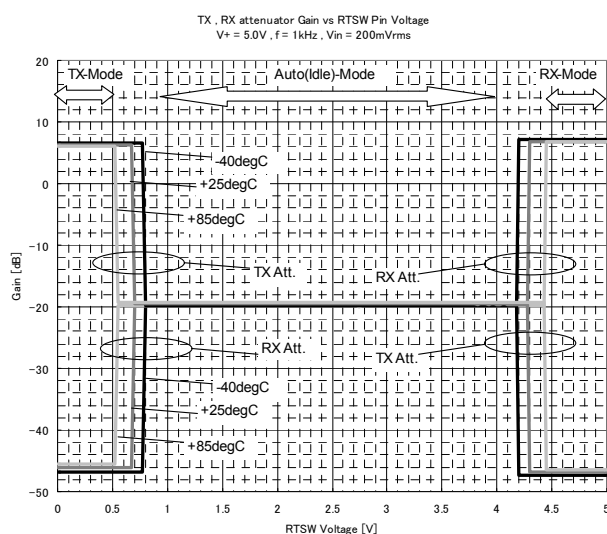
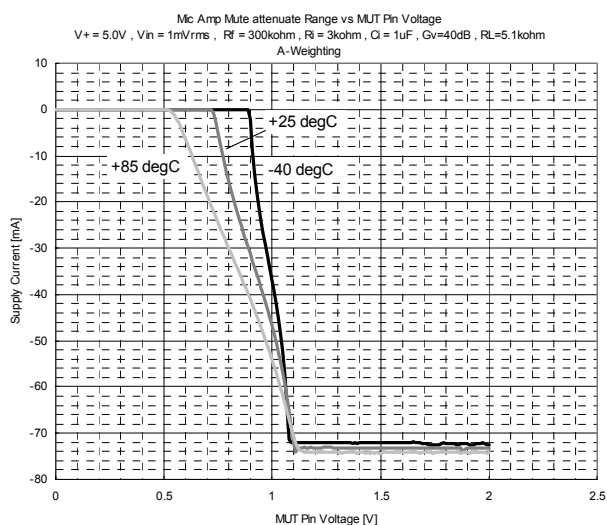
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.