

SANYO

No. 4931

LA8637M**Low-Voltage/Low-Power Compander IC****Overview**

The LA8637M is a compander IC that was developed to improve audio quality in transceiver systems such as cordless telephones by expanding the dynamic range of the audio signal and suppressing noise. In addition to including both a compressor circuit that compresses with a compression ratio of 1/2 (logarithmic) and an expander with an expansion factor of 2 (logarithmic), the LA8637M also integrates the following functions on the same chip: an ALC preamplifier, a BTL amplifier, a data shaper for received data, a muting function and a standby function. Thus the LA8637M is optimal as the compander/system IC in cordless telephone products.

Applications

- Cordless telephones

Functions

- Compressor
ALC preamplifier, preemphasis amplifier, limiter, transmission data input analog switch, filter buffer amplifier
- Expander
Filter buffer amplifier, de-emphasis amplifier, mute, BTL amplifier (100 Ω load)
- Level following data shaper (with hysteresis)
- Standby mode

Features

- Easy implementation of transmission system and reception system base band signal processing
- Built-in BTL amplifier that supports mobile unit handsets
- Standby function to support battery saving
- Low voltage operation: $V_{CC\text{ OP}} = 1.8$ to 6 V

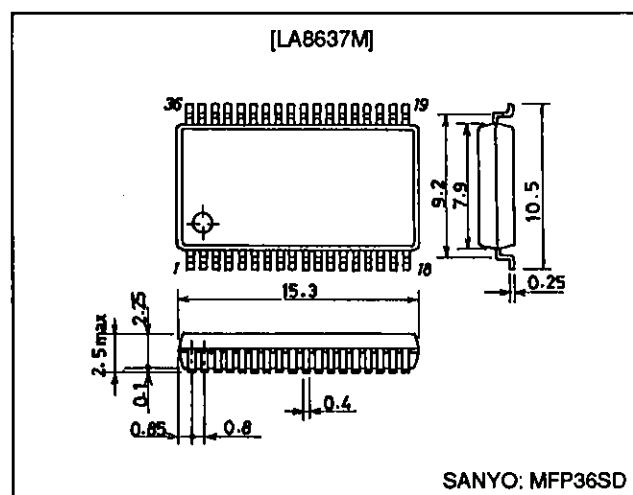
Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$		7	V
Allowable power dissipation	$P_{d\text{ max}}$	$T_a \leq 75^\circ\text{C}$	250	mW
Operating temperature	T_{op}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

Package Dimensions

unit: mm

3129-MFP36SD

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Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		3	V
Operating supply voltage	$V_{CC\text{ OP}}$		1.8 to 6	V

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 3\text{ V}$, $f = 1\text{ kHz}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	I_{CCO}	No signal	5	8	12	mA
Standby current	I_{STBY}	No signal, standby mode (pin 24: low)	0.8	1	1.2	mA
[Preamplifier]						
Voltage gain	V_{GP}	$V_i = -60\text{ dBV}$	37	39	41	dB
Maximum voltage gain	$V_{GP\text{ max}}$	$V_i = -60\text{ dBV}$		50		dB
Total harmonic distortion	THD	$V_i = -40\text{ dBV}$, ALC: ON		0.3	1.0	%
Input conversion noise voltage	V_{NI}	$R_g = 0\ \Omega$		1.5	5	μVrms
ALC level	V_{ALC}	$V_i = -40\text{ dBV}$, ALC: ON	350	420	490	mVrms
ALC range	ALC	Until the THD from the ALC circuit becomes 1%	35	40		dB
[Compressor] $V_{in\text{refc}} = -20\text{ dBV} = 0\text{ dB}$, output: pin 16						
Input impedance	r_i			30		k Ω
Output voltage	V_{oc}	$V_{in} = V_{in\text{refc}} = 0\text{ dB}$	-22	-20	-18	dBV
Gain error (1)	G_{ec1}	$V_{in} = -20\text{ dB}$	-0.5	0	+0.5	dB
Gain error (2)	G_{ec2}	$V_{in} = -40\text{ dB}$	-1.0	0	+1.0	dB
Total harmonic distortion	THD	$V_{in} = 0\text{ dB}$		0.25	1.0	%
Output noise voltage	V_{NOC}	$R_g = 620\ \Omega$, $f = 20\text{ Hz}$ to 20 kHz		0.15	1.0	mVrms
Crosstalk	CT_C	$RX-V_{in} = -20\text{ dBV}$, 1 kHz BPF		-75	-60	dB
[Analog Switch]						
Muting attenuation	ATT_C	$V_{in} = -20\text{ dB}$, 1 kHz BPF	60	75		dB
[Expander] $V_{in\text{refe}} = -20\text{ dBV} = 0\text{ dB}$						
Output voltage	V_{oe}	$V_{in} = V_{in\text{refe}} = 0\text{ dB}$	-22	-20	-18	dBV
Gain error (1)	G_{ee1}	$V_{in} = -20\text{ dB}$	-1.0	0	+1.0	dB
Gain error (2)	G_{ee2}	$V_{in} = -30\text{ dB}$	-1.5	0	+1.5	dB
Total harmonic distortion	THD	$V_{in} = 0\text{ dB}$		0.3	1.0	%
Output noise voltage	V_{NOe}	$R_g = 620\ \Omega$, $f = 20\text{ Hz}$ to 20 kHz		13	80	μVrms
Muting attenuation	ATT_e	$V_{in} = 0\text{ dB}$, 1 kHz BPF	60	75		dB
Crosstalk	CT_e	$PRE\text{ AMP-}V_{in} = -60\text{ dBV}$, 1 kHz BPF		-95	-80	dB
Maximum output voltage	$V_{O\text{ max}}$	THD = 10%, $R_L = 10\text{ k}\Omega$	0.7	1.0		Vrms
[Limiter]						
Limiting voltage	V_L	$\Delta V = 0.6\text{ V}$ (voltage between pin 9 and pin 10)	0.27	0.3	0.33	Vp-p
[BTL Amplifier] Gain = 30 dB						
Voltage Gain	V_{PWR}	$V_{in} = -40\text{ dBV}$, $R_L = 100\ \Omega$	27.5	29.5	31.5	dB
Total harmonic distortion	THD	$V_{in} = -40\text{ dBV}$, $R_L = 100\ \Omega$		0.5	1.0	%
Maximum output power	$P_{O\text{ max}}$	THD = 10%, $R_L = 100\ \Omega$	15	30		mW
Maximum output voltage	$V_{O\text{ max}}$	THD = 10%, $R_L = 620\ \Omega$	4.0	5.5		Vp-p
Output noise voltage	V_{NO}	$R_g = 0\ \Omega$, $R_L = 100\ \Omega$		120	800	μVrms
[Compressor Low-Pass Filter]						
Maximum output voltage	$V_{O\text{ max}}$	THD = 1%, $R_L = 10\text{ k}\Omega$	450	550		mVrms
[Expander Low-Pass Filter] $V_B = 1.5\text{ V}$ (V_B : low-pass filter bias voltage)						
Maximum output voltage	$V_{O\text{ max}}$	THD = 1%, $R_L = 10\text{ k}\Omega$	400	500		mVrms
[Data Shaper]						
Duty	D_{UTY}	$V_{in} = -15\text{ dBV}$	45	50	55	%
Hysteresis	W_{HYS}		45	70	100	mV
Output high level voltage	V_{OH}	$R_L = 100\text{ k}\Omega$	2.8			V
Output low level voltage	V_{OL}	$R_L = 100\text{ k}\Omega$			0.3	V
[Standby]						
Standby voltage	V_{ST}	Pin 24			0.7	V
Standby current	I_{ST}	Pin 24 outflow current			30	μA

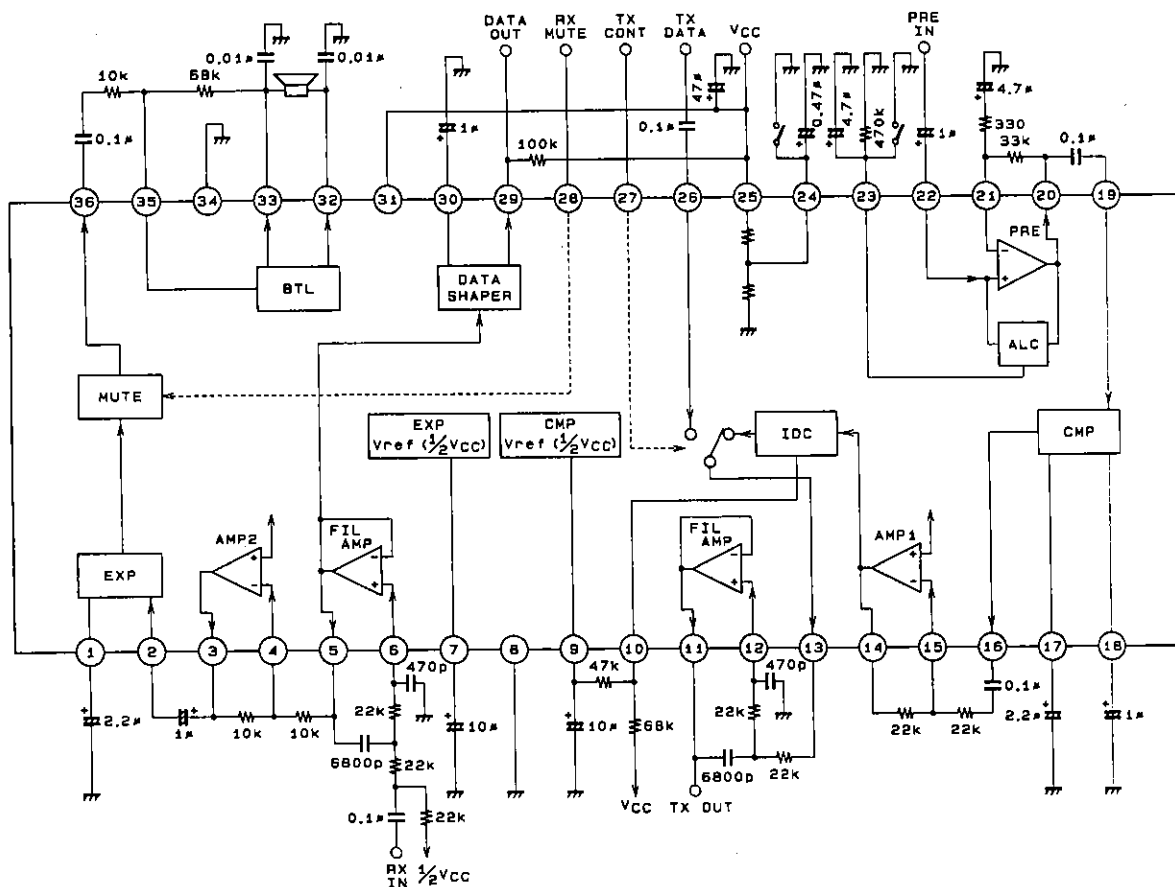
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Parameter	Symbol	Conditions	min	typ	max	Unit
[Digital Input Characteristics]						
Input low level voltage	V_{IL}	Pins 27 and 28			0.65	V
Input high level voltage	V_{IH}	Pins 27 and 28	$0.6 V_{CC}$			V
Input low level current	I_{IL}	Pins 27 and 28, $V_I = 0.2$ V			100	μA
Input high level current	I_{IH}	Pins 27 and 28, $V_I = 2$ V			5	μA

Internal Equivalent Circuit Block Diagram



A02813

Unit (resistance : Ω , capacitance : F)

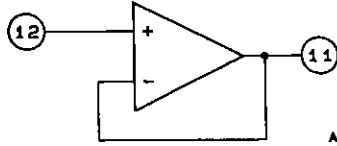
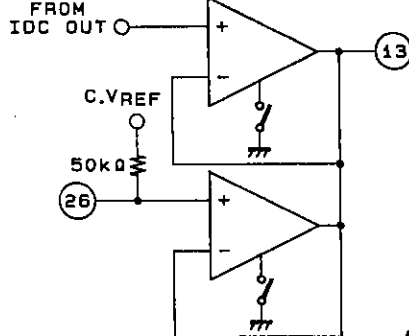
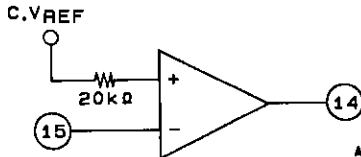
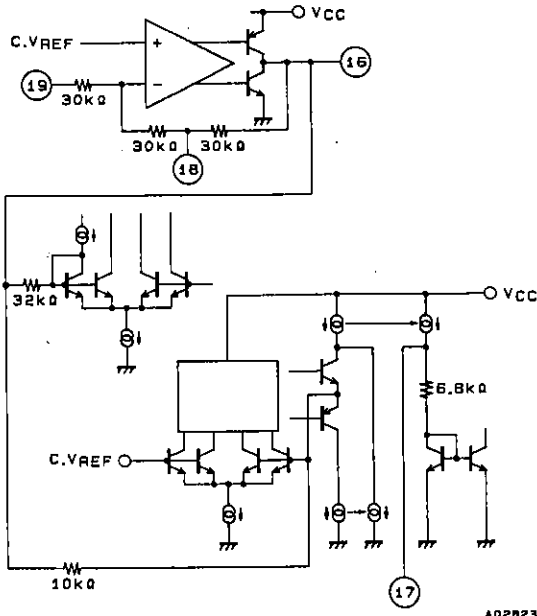
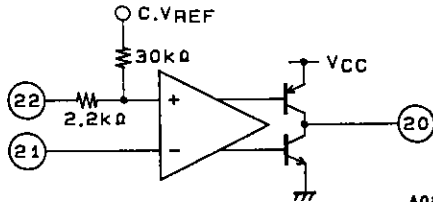
Pin Functions

Pin No.	Symbol	Internal equivalent circuit	Protective diode	
			V _{CC} side	Ground side
1 2	EXP.V _{REC} EXP.IN		○ ○	○ ○
3 4	OP OUT1 OP IN1		○ ○	○ ○
5 6	FIL.OUT1 FIL.IN1		○ ○	○ ○
7 9 24	EXP.V _{REF} CMP.V _{REF} STAND-BY		○ ○ ○	○ ○ ○
10	IDC.ADJ		○	○

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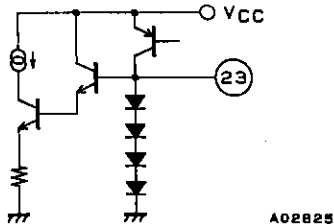
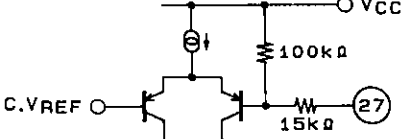
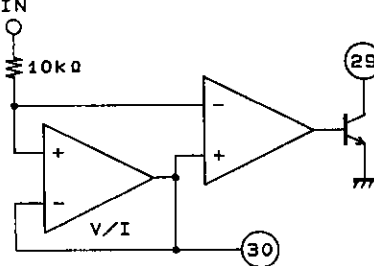
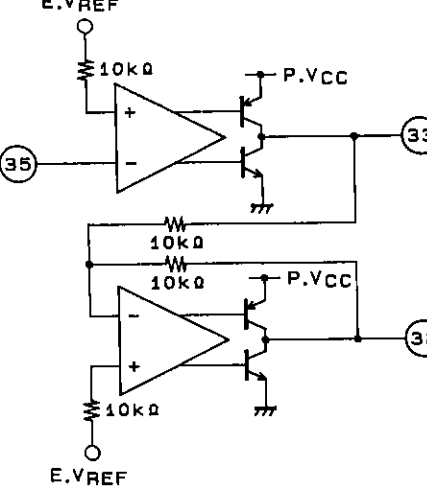
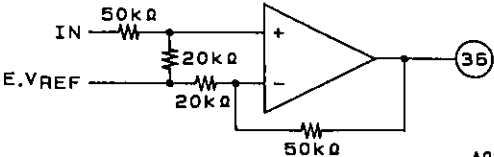
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Pin No.	Symbol	Internal equivalent circuit	Protective diode	
			V _{CC} side	Ground side
11 12	FIL.OUT2 FIL.IN2	 <p>A02820</p>	○ ○	○ ○
13 26	TX.OUT DATA IN	 <p>A02821</p>	○ ○	○ ○
14 15	OP OUT2 OP IN2	 <p>A02822</p>	○ ○	○ ○
16 17 18 19	CMP.OUT CMP.V _{REC} CMP.NF CMP.IN	 <p>A02823</p>	○ ○ ○ ○	○ ○ ○ ○
20 21 22	PRE OUT PRE NF PRE IN	 <p>A02824</p>	○ — —	○ ○ ○

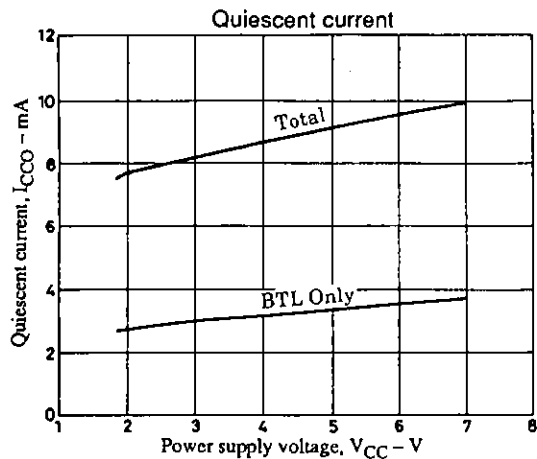
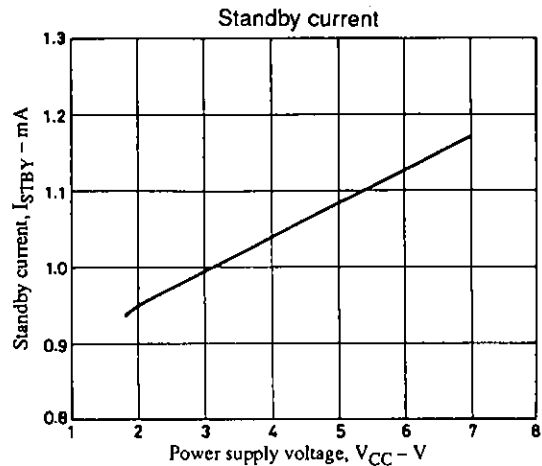
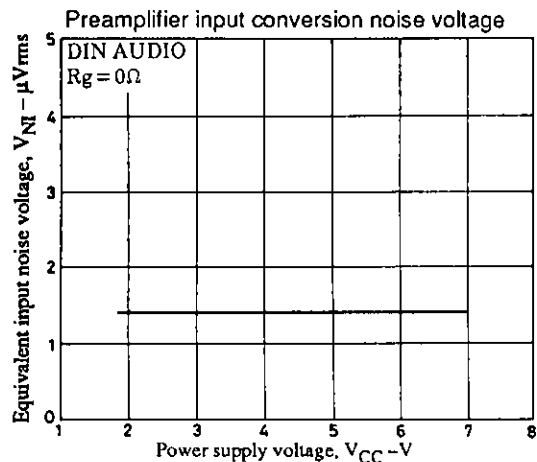
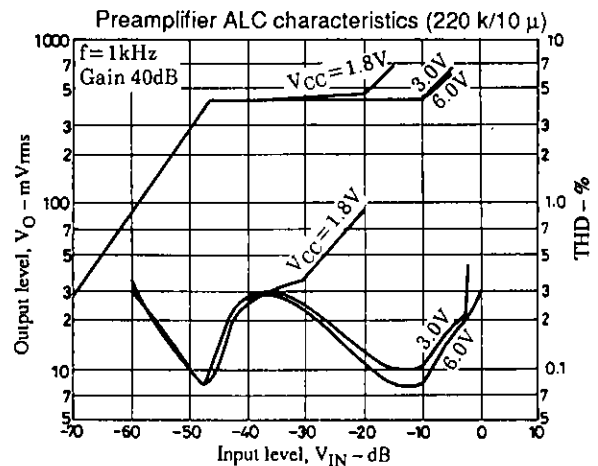
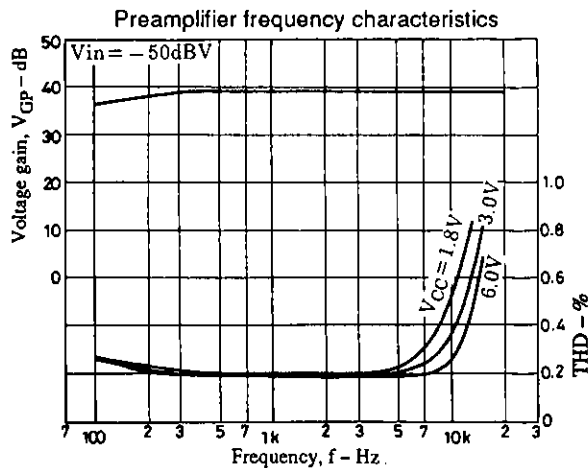
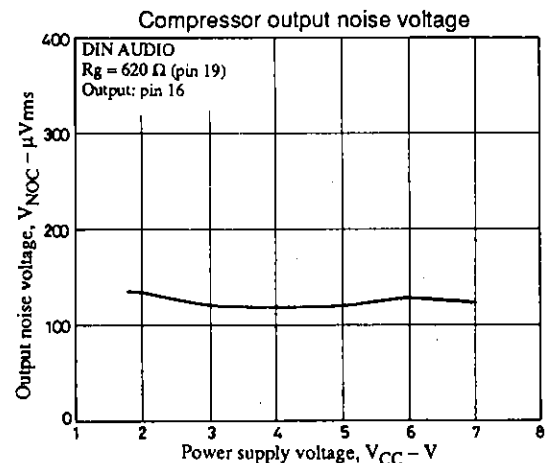
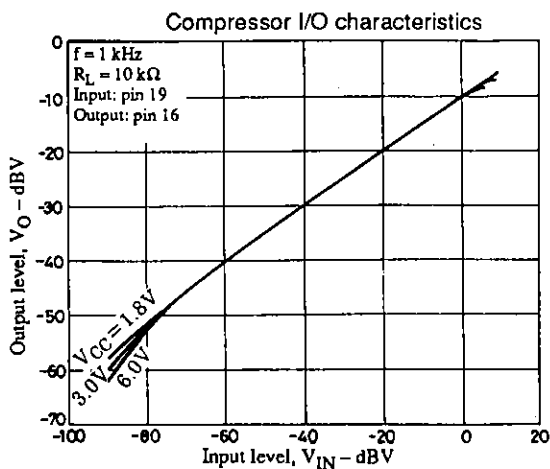
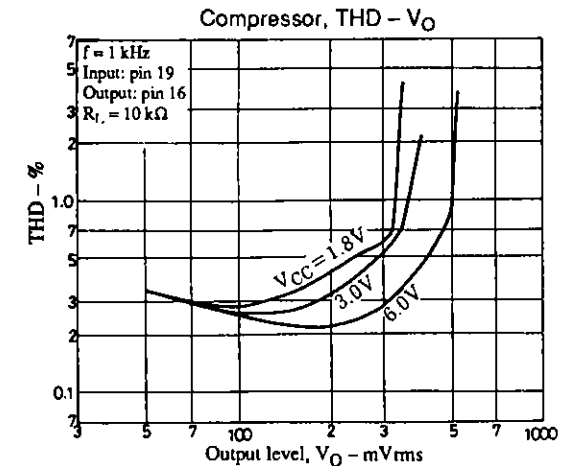
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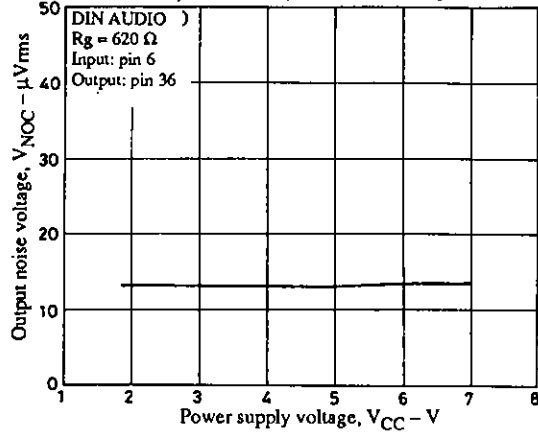
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Pin No.	Symbol	Internal equivalent circuit	Protective diode	
			V _{CC} side	Ground side
23	ALC.CT		○	○
27 28	TX.CONT RX.MUTE		○ ○	○ ○
29 30	DATA OUT V.HOLD		— ○	○ ○
32 33 35	BTL OUT2 BTL OUT1 BTL IN		— — —	○ ○ ○
36	EXP.OUT		○	○

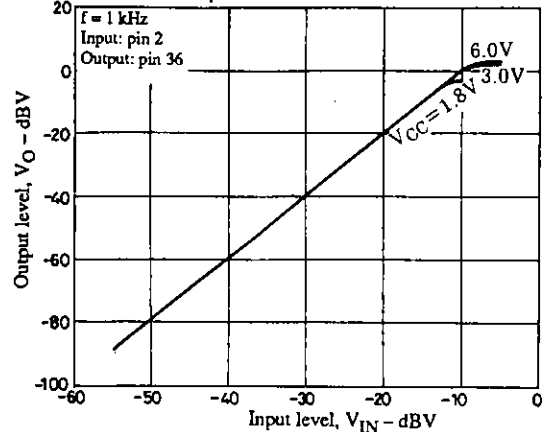
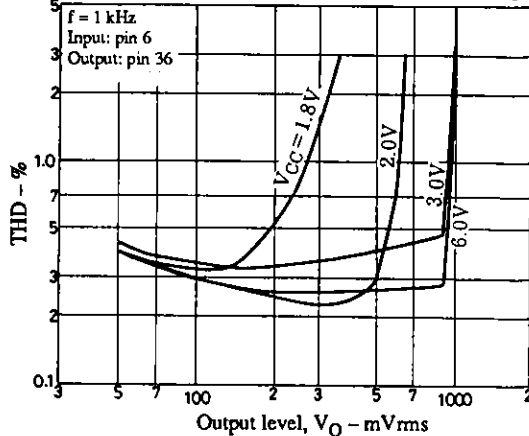
Note: All V_{CC} side diodes are connected to V_{CC} at pin 25.



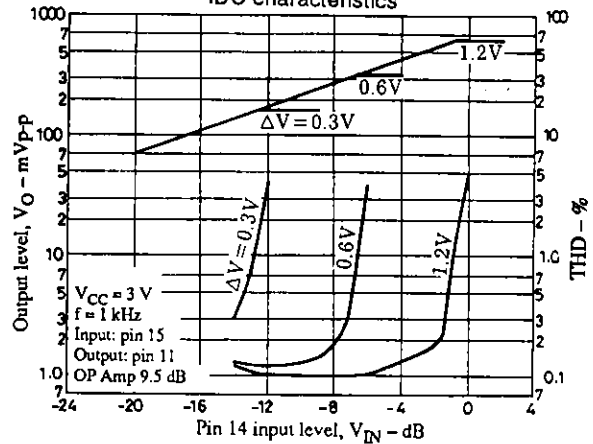
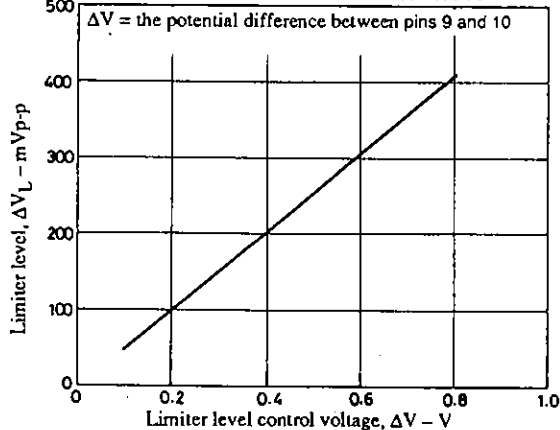
Expander output noise voltage



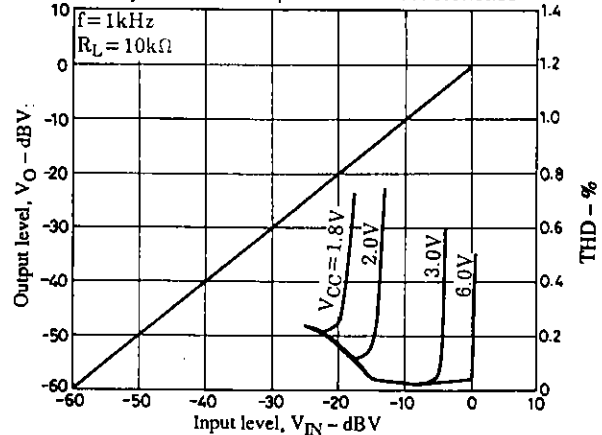
Expander characteristics

Expander total harmonic distortion, THD - V_O 

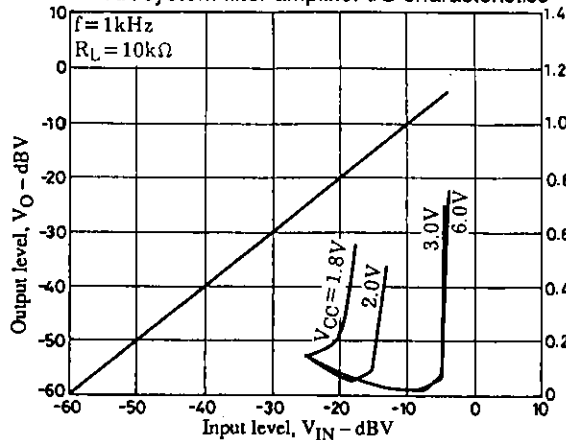
IDC characteristics

Limiter level - ΔV characteristics

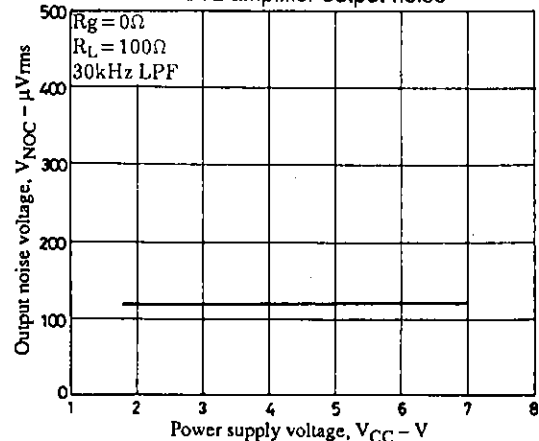
TX system filter amplifier I/O characteristics

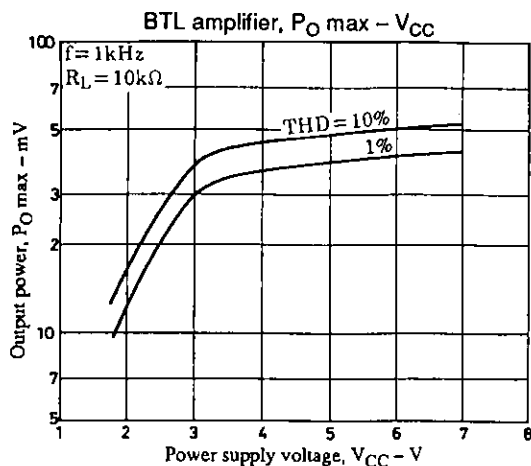
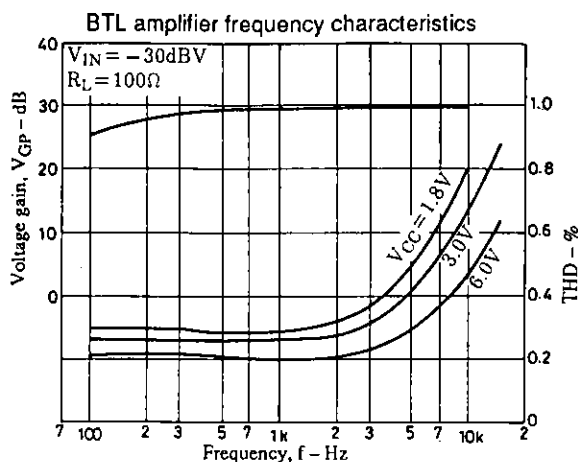
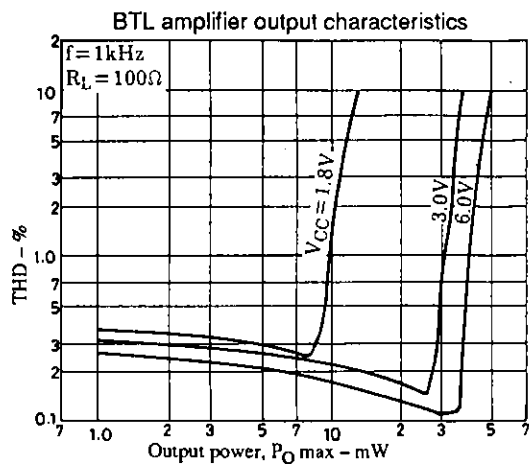
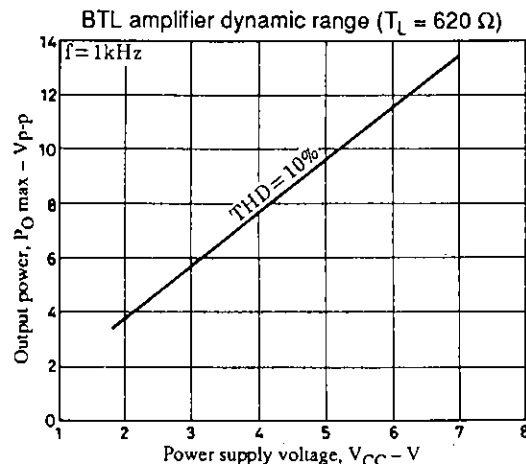
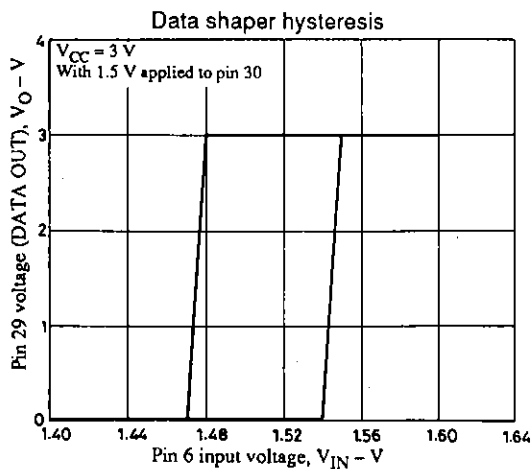
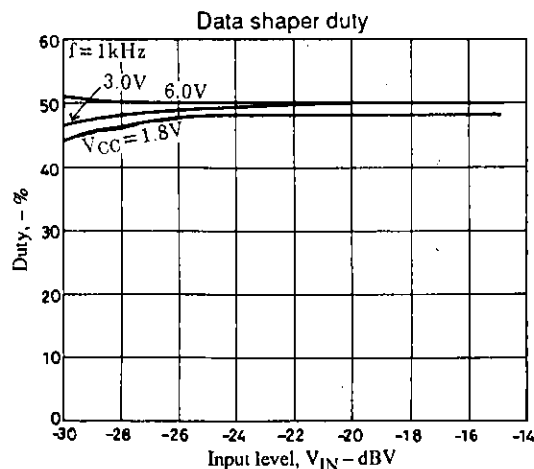


RX system filter amplifier I/O characteristics



BTL amplifier output noise





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