

	No.3516B	LA8630,8630M
	Low Voltage and Current Dissipation Compandor IC	

Applications

- Cordless telephone
- FM transceiver

Functions

- Compressor (VCA circuit, full-wave rectifying circuit, adder amplifier)
- Expander (VCA circuit, full-wave rectifying circuit, adder amplifier)
- Operational amplifier (in the compressor)
- Operational amplifier with muting function (in the expander)
- Analog switch for data signal input (in the compressor)
- Regulator

Maximum Ratings at Ta=25°C

			unit
Maximum Supply Voltage	Vccmax	8	V
Allowable Power Dissipation	Pdmax	300	mW
Operating Temperature	Topr	-20 to +75	°C
Storage Temperature	Tstg	-40 to +125	°C

Operating Conditions at Ta=25°C

			unit
Recommended Supply Voltage	Vcc	3	V
Operating Voltage Range	Vcc op	2.2 to 6	V

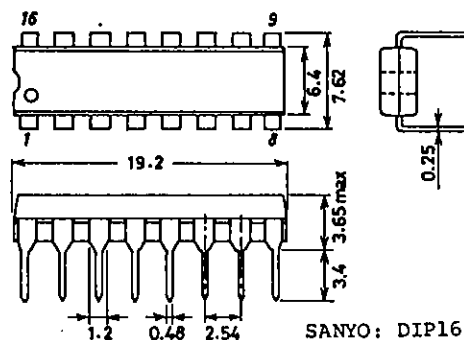
Operating Characteristics at Ta=25°C, Vcc=3.0V, f=1kHz, Vin=100mVrms (0dB) min

			typ	max	unit
Current Dissipation	Icc	With no signal input	2.5	3.7	mA
Input Reference Voltage	Vinref		100		mVrms

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Package Dimensions
 (unit: mm)
 3006B

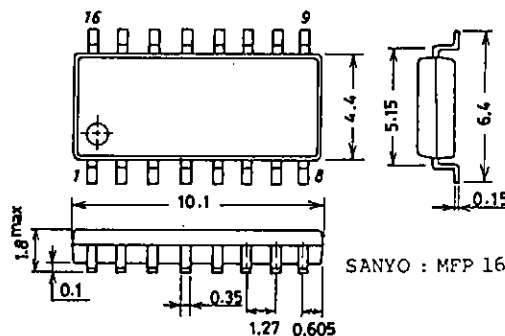
[LA8630]



SANYO: DIP16

Package Dimensions
 (unit: mm)
 3035A

[LA8630M]



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Continued from preceding page.

[Expander] (Operational amplifier gain: 0dB)

			min	typ	max	unit
Output Level	Vorefe	Vin=0dB(Operational amplifier gain: -6dB)	-26.5	-24.5	-22.5	dBV
Gain Error	Vgee(1)	Vin=+5dB	-0.5	0	+0.5	dB
	Vgee(2)	Vin=-20dB	-1.0	0	+1.0	dB
	Vgee(3)	Vin=-30dB	-1.5	0	+2.0	dB
Distortion Factor	THDe	Vin=0dB		0.35	1.0	%
Output Noise Voltage	VNOe	Vin=-∞, Rg=620Ω, f=20 to 20000Hz		12	80	μVrms
Frequency Characteristic	f	Vin=0dB, f=200 to 3500Hz		0.0		dB
Maximum Output Voltage	Vomax	RL=10kΩ, THD=10%	0.6	1.0		Vrms

[Compressor] (Operational amplifier gain: 0dB)

Output Level	Vorefc	Vin=0dB	-23	-21	-19	dBV
Gain Error	Vgec(1)	Vin=+20dB	-0.5	0	+0.5	dB
	Vgec(2)	Vin=-20dB	-0.5	0	+0.5	dB
	Vgec(3)	Vin=-40dB	-1.0	0	+1.0	dB
Distortion Factor	THDc	Vin=0dB		0.35	1.0	%
Output Noise Voltage	VNOc	Vin=-∞, Rg=620Ω, f=20 to 20000Hz		0.3	0.7	mVrms
Frequency Characteristic	f	Vin=0dB, f=200 to 3500Hz		0.0		dB

[Muting Circuit] (Operational amplifier gain: 0dB)

Muting Attenuation	CT(1)	Vin=0dB, f=1kHz	60	90		dB
Threshold Voltage	Vthm		1.25	1.35	1.45	V

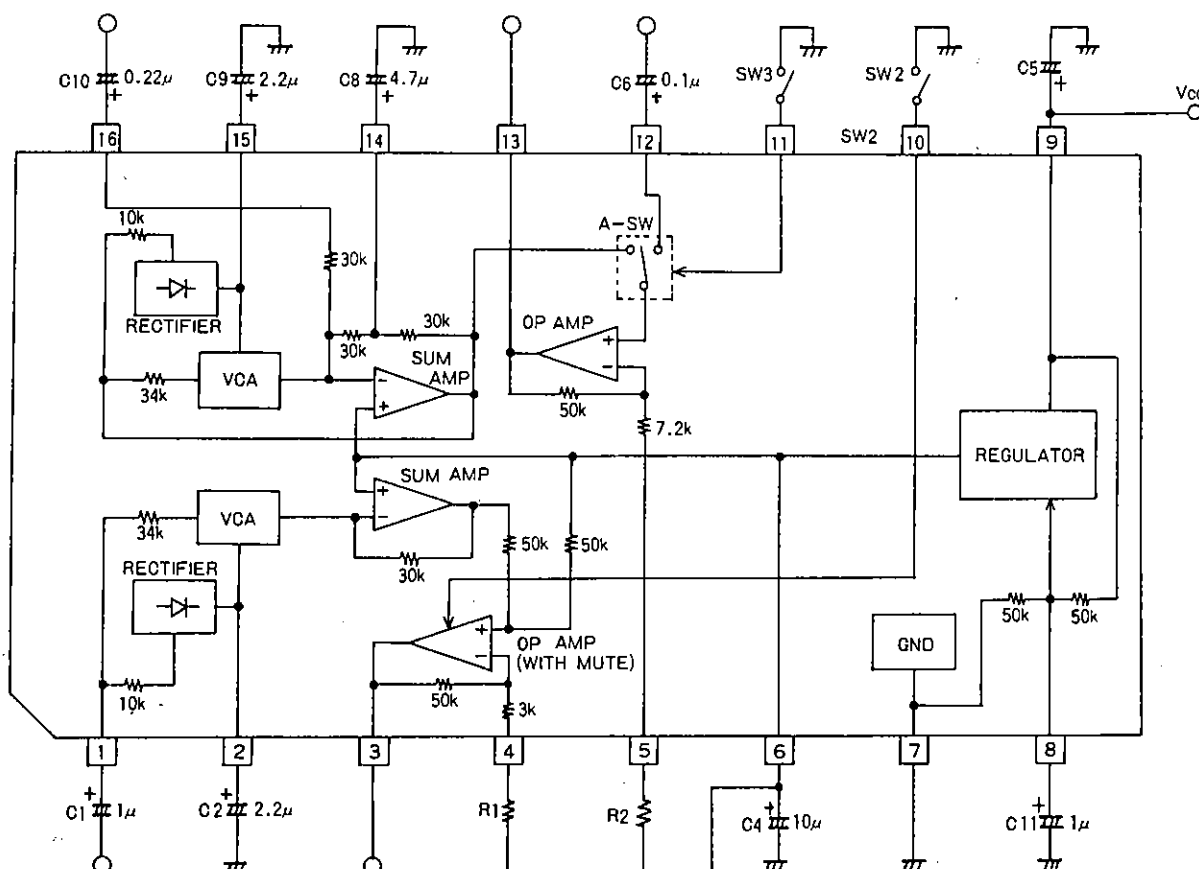
[Analog Switch Circuit] (Operational amplifier gain: 0dB)

Crosstalk	CT(2)	Vin=0dB, f=1kHz	40	47		dB
Threshold Voltage	Vtha		1.25	1.35	1.45	V

*Be careful that the threshold voltage is determined by Vcc (Vth=0.45Vcc).

Equivalent Circuit Block Diagram/Sample Application Circuit

Unit (resistance: Ω, capacitance: F)

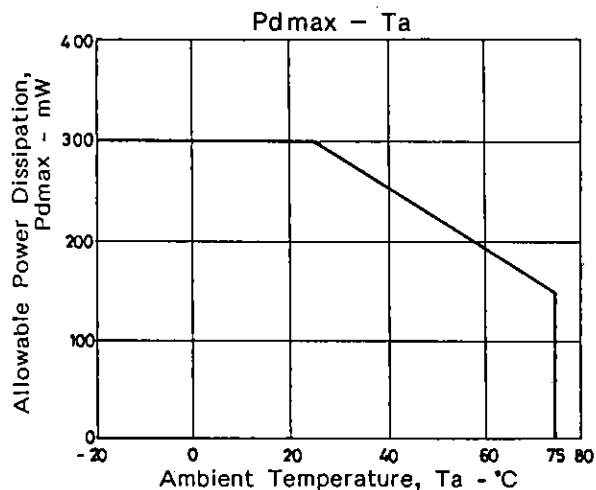


Pin Name

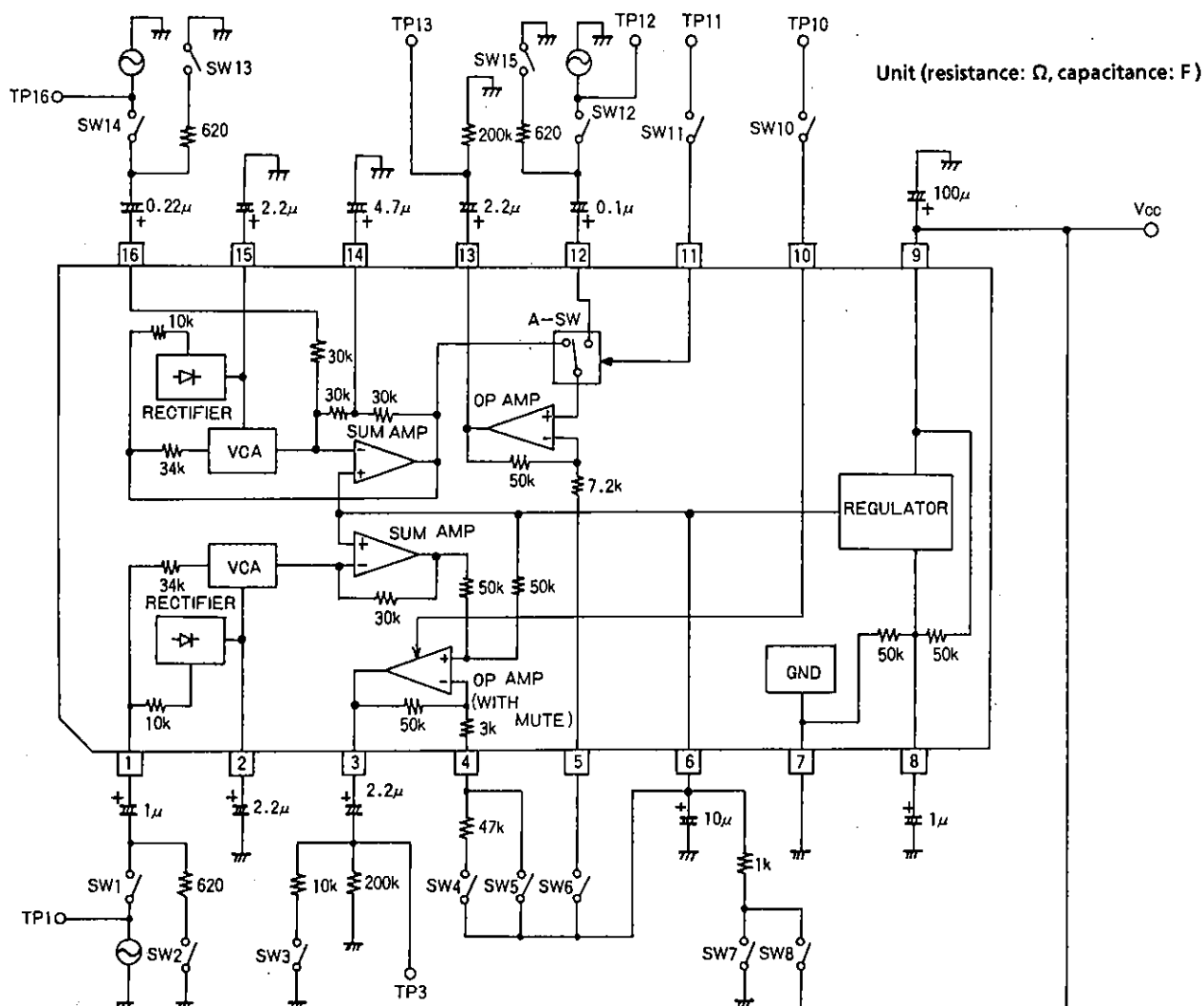
Pin No.	Name
1	EXP.VIN
2	EXP.VREC
3	EXP.VOUT
4	OP.AMP NF(EXP)
5	OP.AMP NF(COMP)
6	VREF
7	GND
8	1/2VCC
9	VCC
10	MUTE CONT.
11	DATA CONT.
12	DATA IN
13	COMP.VOUT
14	COMP.NF
15	COMP.VREC
16	COMP.VIN

Control Mode

	Mode	Audio signal	Data
Pin 10	Open	Output	—
	[LOW]	Mute	—
Pin 11	Open	Output	Mute
	[LOW]	Mute	Output

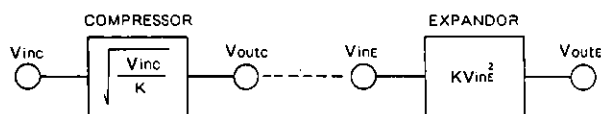


Test Circuit



Summary of Compador

(1) Operation



<for example>

$$V_{ref} = 100\text{mV}$$

$$K = 10$$

$$V_{inc} = 1\text{mV} \quad V_{outc} = \sqrt{\frac{1}{10} \times 1 \times 10^{-3}} \approx 10\text{mV} = -20\text{dB}$$

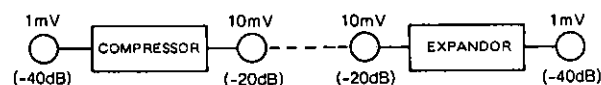
$$(-40\text{dB})$$

$$V_{incE} = 10\text{mV} \quad V_{outE} = (10 \times 10^{-3})^2 \times 10 = 1\text{mV} = -40\text{dB}$$

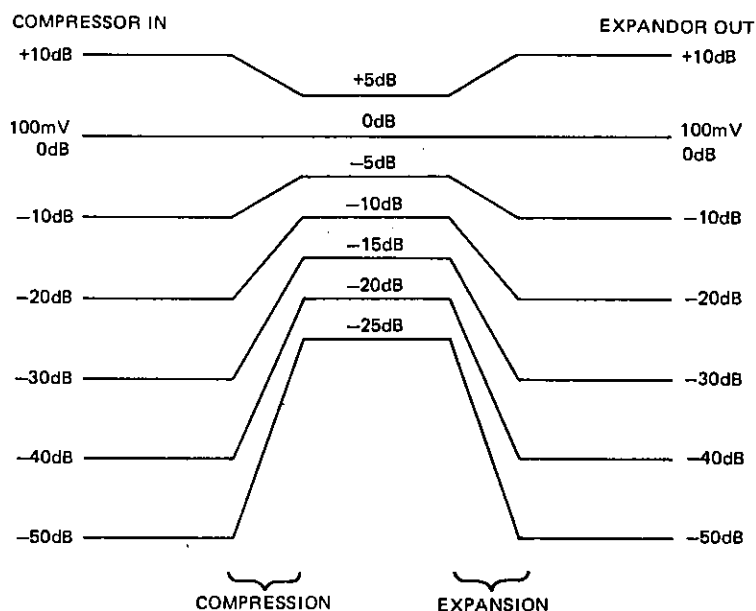
$$V_{outc} = \sqrt{V_{inc}/K}$$

$$V_{incE} = V_{outc}^2$$

$$V_{outE} = K V_{incE}^2 = K \sqrt{\frac{V_{inc}}{K}} = V_{inc}$$

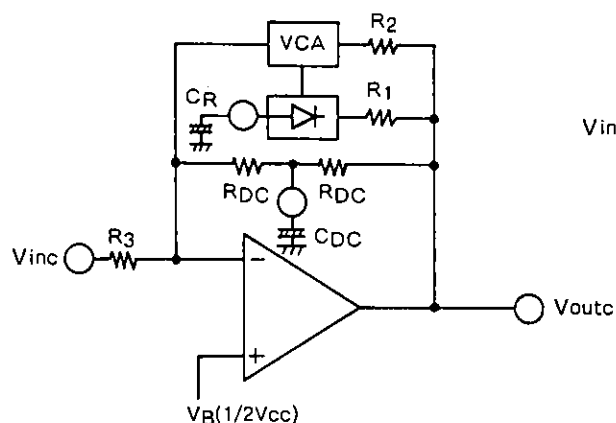
at Reference level (V_{ref}) $V_{inc} = V_{outc}$, $V_{incE} = V_{outE}$ $V_{inc} < V_{ref}$ COMPRESSOR $\rightarrow$ Amplifier $V_{incE} < V_{ref}$ EXPANDOR $\rightarrow$ Attenuator $V_{inc} > V_{ref}$ COMPRESSOR $\rightarrow$ Attenuator $V_{incE} > V_{ref}$ EXPANDOR $\rightarrow$ Amplifier

(2) Level Diagram

(3) Block Diagram
<COMPRESSOR>

$$V_{outc} = \sqrt{\frac{R_1 R_2 I_1}{2 R_3}} V_{inc}$$

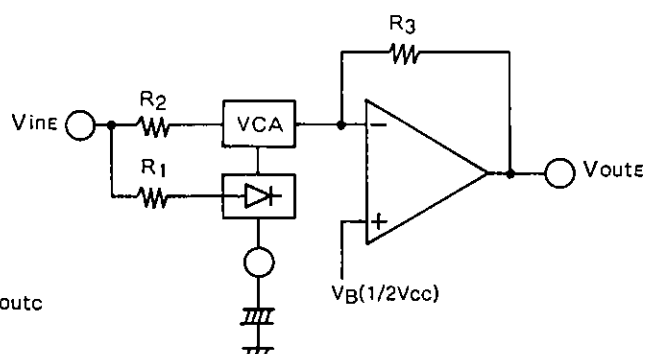
$$= \sqrt{\frac{1}{10}} V_{inc}$$

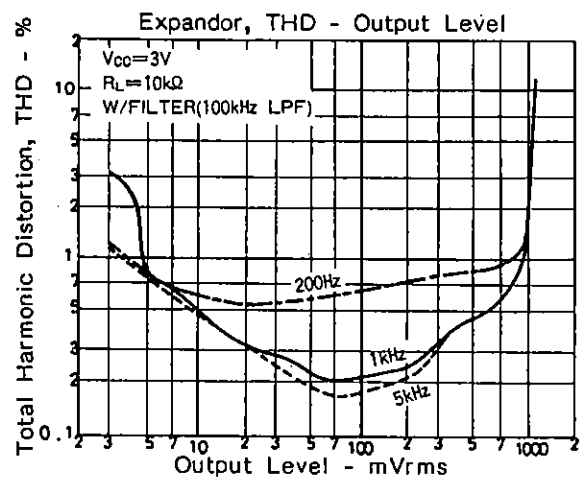
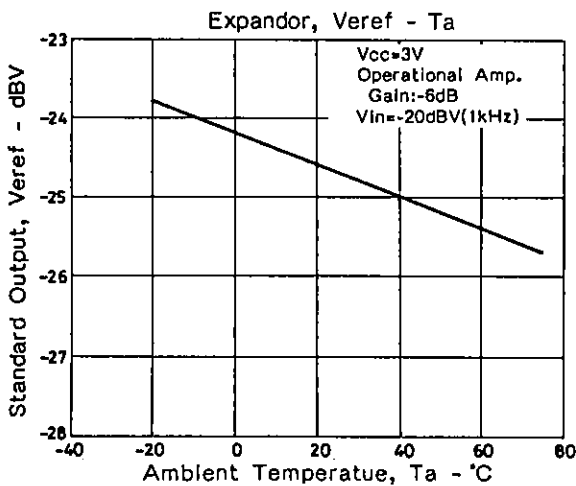
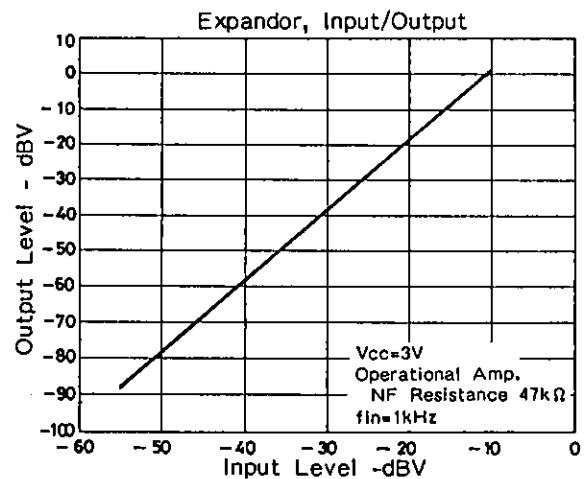
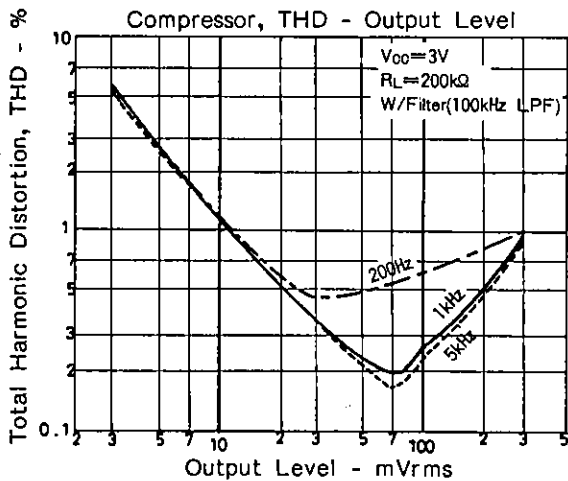
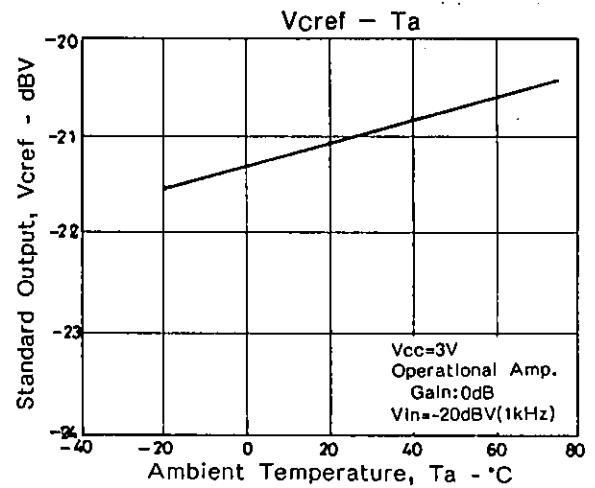
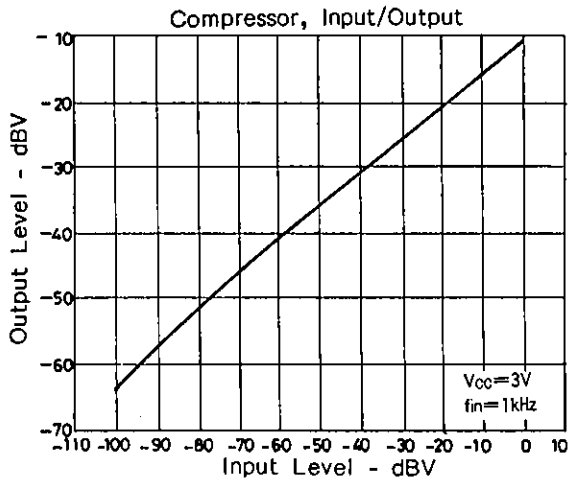
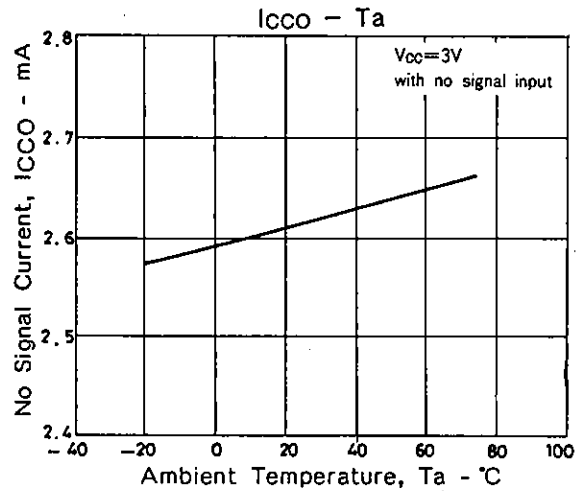
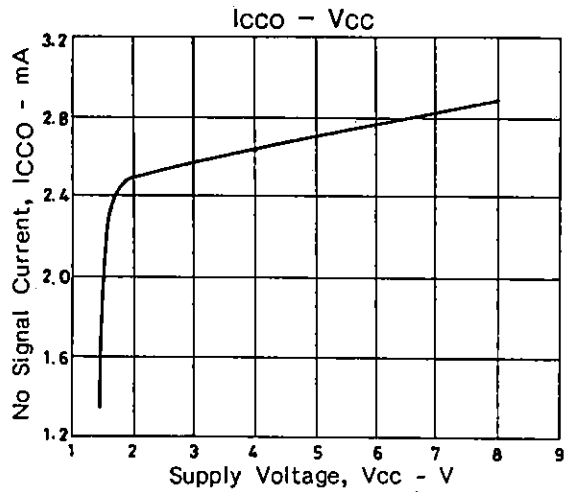


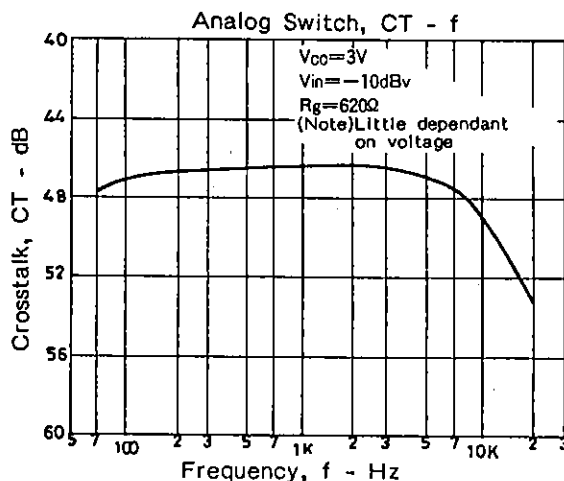
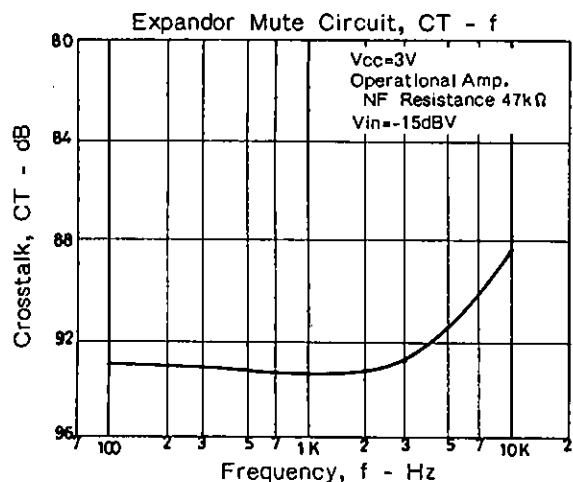
<EXPANDOR>

$$V_{outE} = \frac{2 R_3}{R_1 R_2 I_1} V_{incE}^2$$

$$= 10 V_{incE}^2$$







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			unit
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Operating Voltage Range	Vcc op	2.2 to 6	V

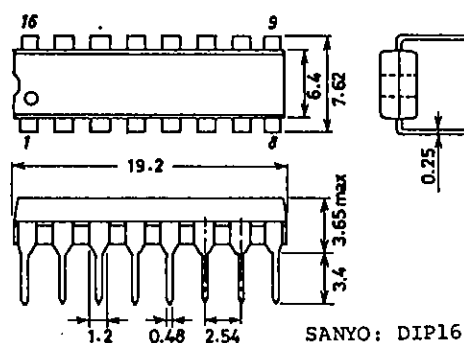
Operating Characteristics at Ta=25°C, Vcc=3.0V, f=1kHz, Vin=100mVrms (0dB) min

			typ	max	unit
Current Dissipation	Icc	With no signal input	2.5	3.7	mA
Input Reference Voltage	Vinref		100		mVrms

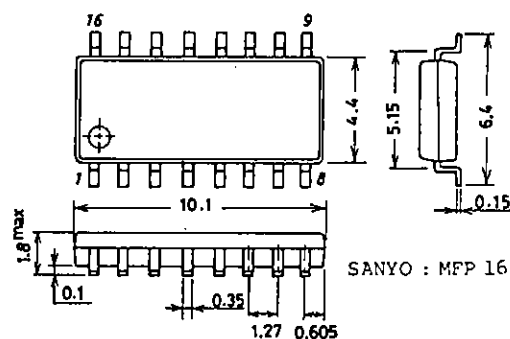
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Package Dimensions
 (unit: mm)
 3006B

[LA8630]


Package Dimensions
 (unit: mm)
 3035A

[LA8630M]



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Distortion Factor	THDe	Vin=0dB		0.35	1.0	%
Output Noise Voltage	VNOe	Vin=-∞, Rg=620Ω, f=20 to 20000Hz		12	80	μVrms
Frequency Characteristic	f	Vin=0dB, f=200 to 3500Hz		0.0		dB
Maximum Output Voltage	Vomax	RL=10kΩ, THD=10%	0.6	1.0		Vrms

[Compressor] (Operational amplifier gain: 0dB)

Output Level	Vorefc	Vin=0dB	-23	-21	-19	dBV
Gain Error	Vgec(1)	Vin=+20dB	-0.5	0	+0.5	dB
	Vgec(2)	Vin=-20dB	-0.5	0	+0.5	dB
	Vgec(3)	Vin=-40dB	-1.0	0	+1.0	dB
Distortion Factor	THDc	Vin=0dB		0.35	1.0	%
Output Noise Voltage	VNOc	Vin=-∞, Rg=620Ω, f=20 to 20000Hz		0.3	0.7	mVrms
Frequency Characteristic	f	Vin=0dB, f=200 to 3500Hz		0.0		dB

[Muting Circuit] (Operational amplifier gain: 0dB)

Muting Attenuation	CT(1)	Vin=0dB, f=1kHz	60	90		dB
Threshold Voltage	Vthm		1.25	1.35	1.45	V

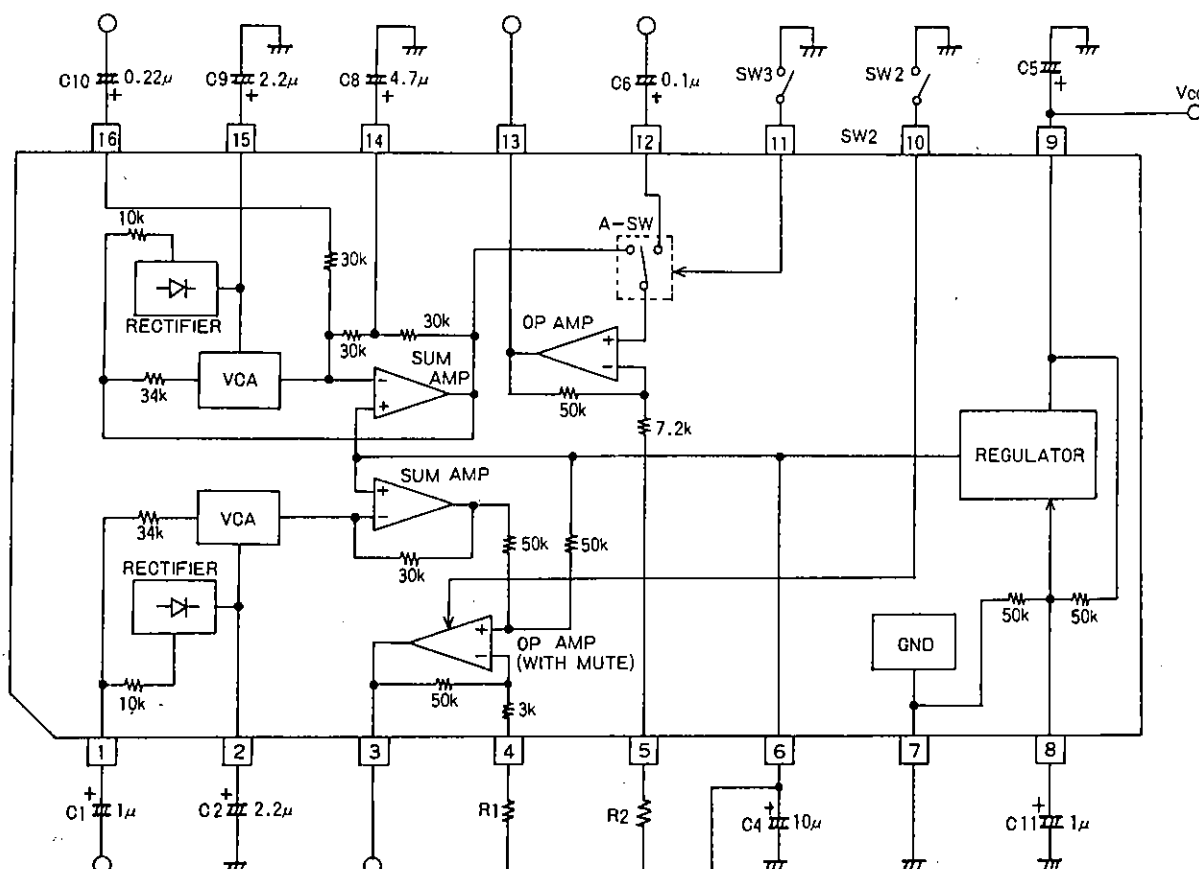
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Crosstalk	CT(2)	Vin=0dB, f=1kHz	40	47		dB
Threshold Voltage	Vtha		1.25	1.35	1.45	V

*Be careful that the threshold voltage is determined by Vcc (Vth=0.45Vcc).

Equivalent Circuit Block Diagram/Sample Application Circuit

Unit (resistance: Ω, capacitance: F)

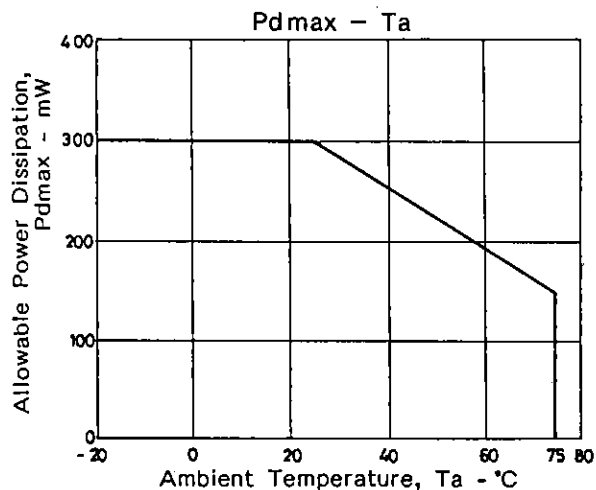


Pin Name

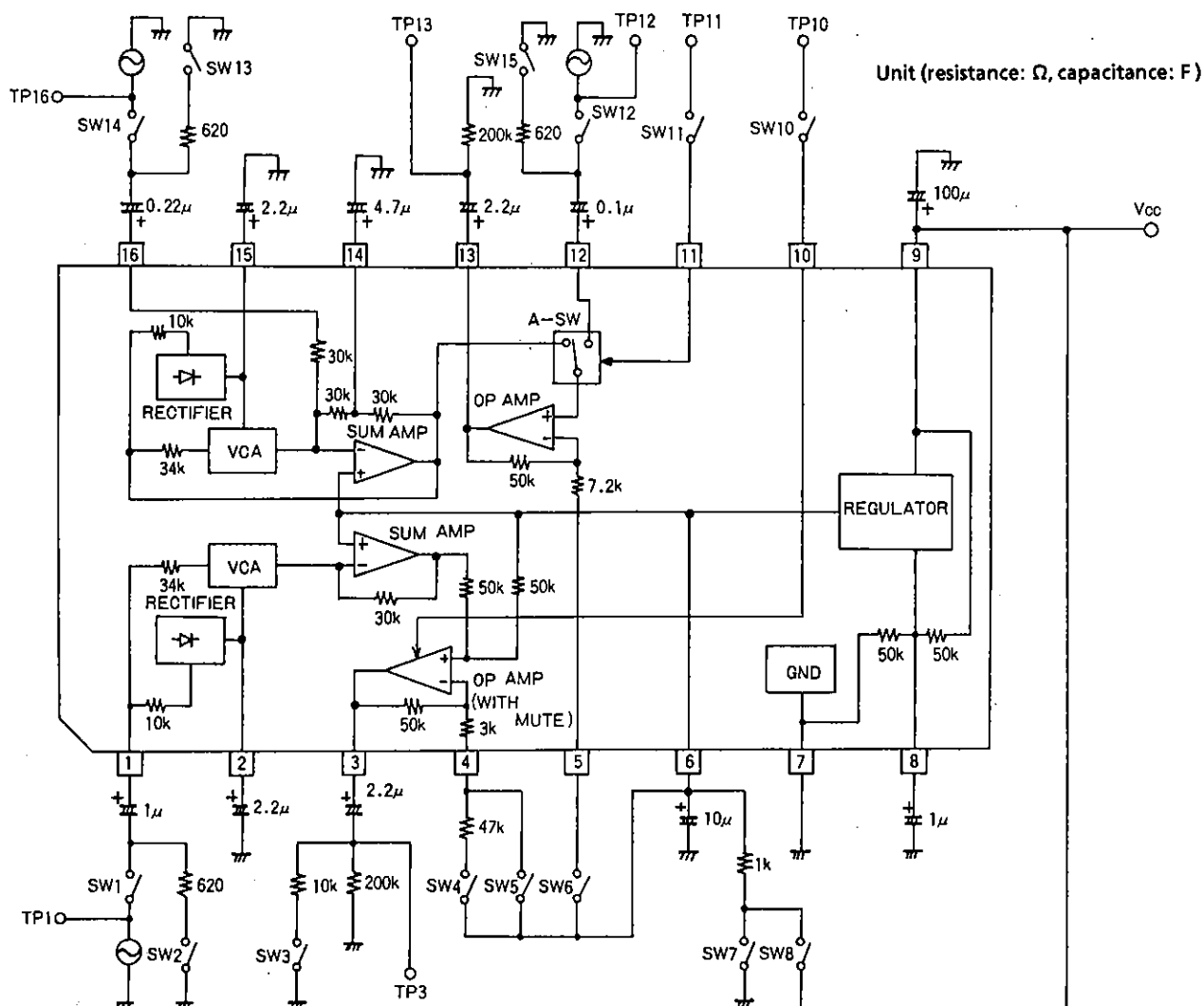
Pin No.	Name
1	EXP.VIN
2	EXP.VREC
3	EXP.VOUT
4	OP.AMP NF(EXP)
5	OP.AMP NF(COMP)
6	VREF
7	GND
8	1/2VCC
9	VCC
10	MUTE CONT.
11	DATA CONT.
12	DATA IN
13	COMP.VOUT
14	COMP.NF
15	COMP.VREC
16	COMP.VIN

Control Mode

	Mode	Audio signal	Data
Pin 10	Open	Output	—
	[LOW]	Mute	—
Pin 11	Open	Output	Mute
	[LOW]	Mute	Output

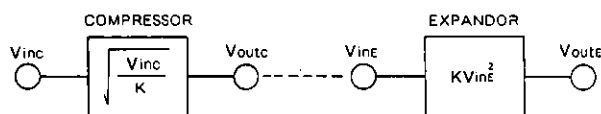


Test Circuit



Summary of Compador

(1) Operation



<for example>

$$V_{ref} = 100\text{mV}$$

$$K = 10$$

$$V_{inc} = 1\text{mV} \quad V_{outc} = \sqrt{\frac{1}{10} \times 1 \times 10^{-3}} \approx 10\text{mV} = -20\text{dB}$$

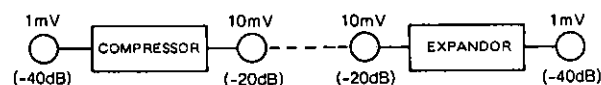
$$(-40\text{dB})$$

$$V_{incE} = 10\text{mV} \quad V_{outE} = (10 \times 10^{-3})^2 \times 10 = 1\text{mV} = -40\text{dB}$$

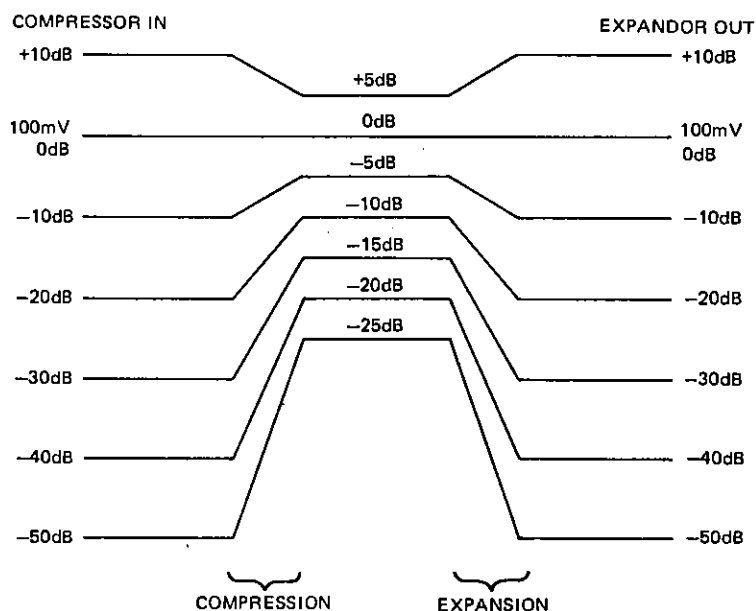
$$V_{outc} = \sqrt{V_{inc}/K}$$

$$V_{incE} = V_{outc}^2$$

$$V_{outE} = K V_{incE}^2 = K \sqrt{\frac{V_{inc}}{K}} = V_{inc}$$

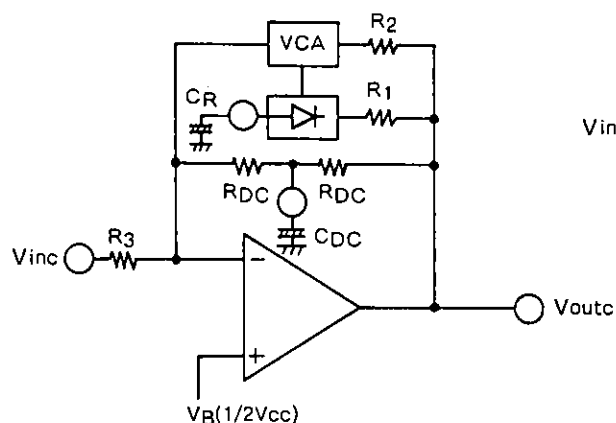
at Reference level (V_{ref}) $V_{inc} = V_{outc}$, $V_{incE} = V_{outE}$ $V_{inc} < V_{ref}$ COMPRESSOR $\rightarrow$ Amplifier $V_{incE} < V_{ref}$ EXPANDOR $\rightarrow$ Attenuator $V_{inc} > V_{ref}$ COMPRESSOR $\rightarrow$ Attenuator $V_{incE} > V_{ref}$ EXPANDOR $\rightarrow$ Amplifier

(2) Level Diagram

(3) Block Diagram
<COMPRESSOR>

$$V_{outc} = \sqrt{\frac{R_1 R_2 I_1}{2 R_3}} V_{inc}$$

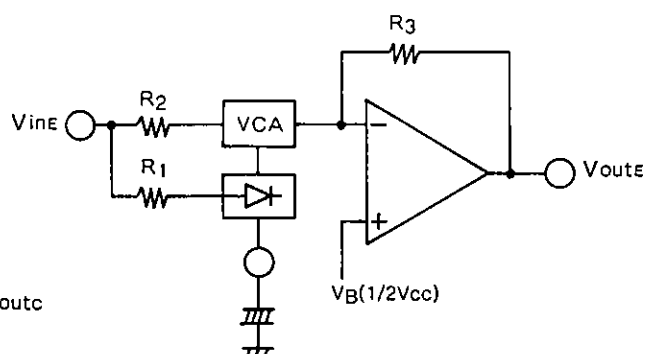
$$= \sqrt{\frac{1}{10}} V_{inc}$$

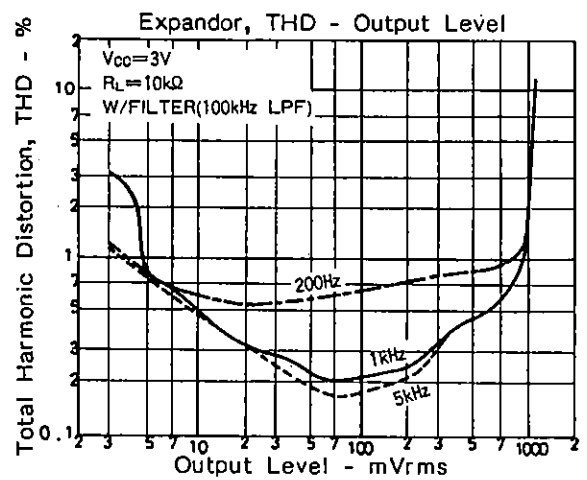
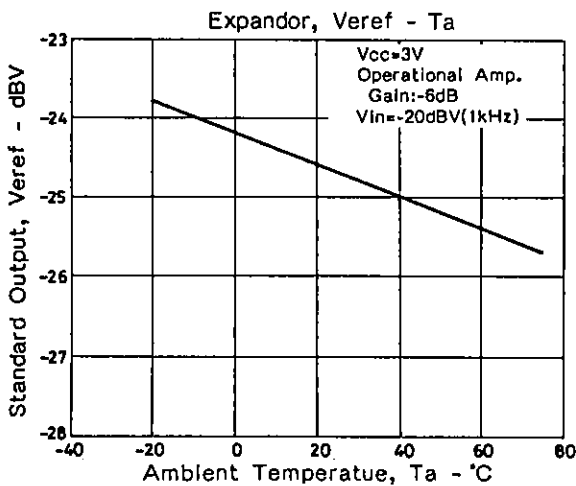
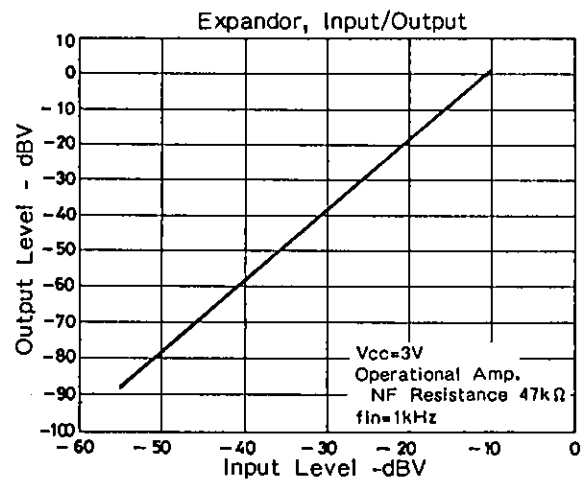
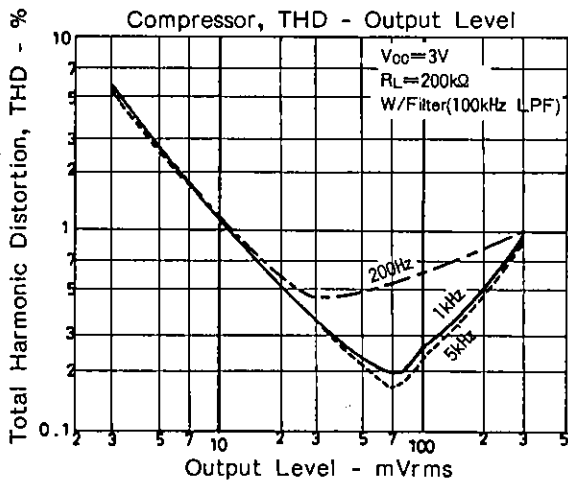
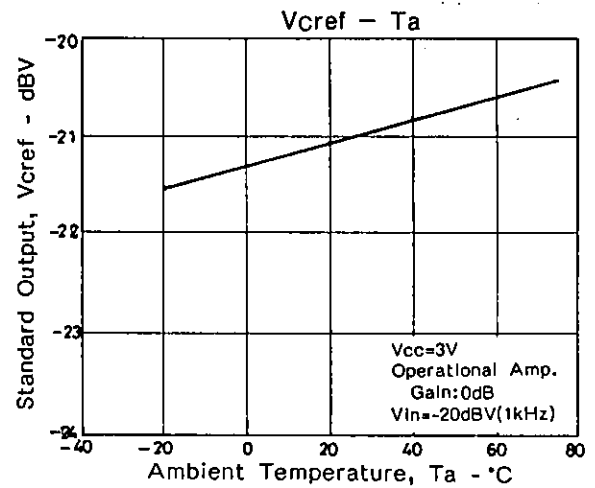
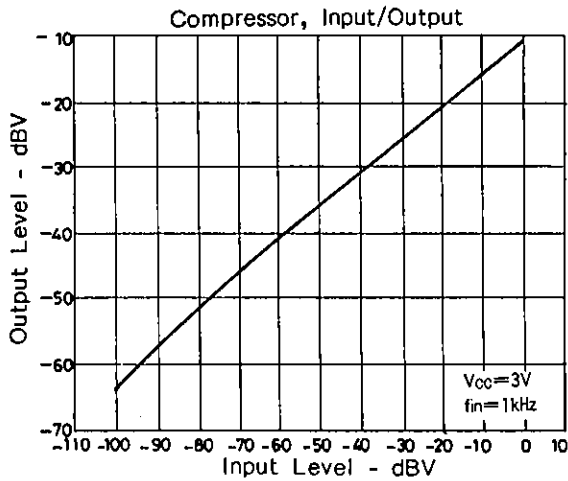
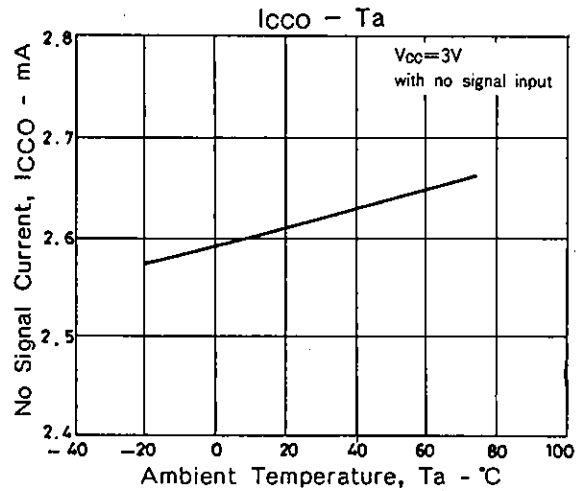
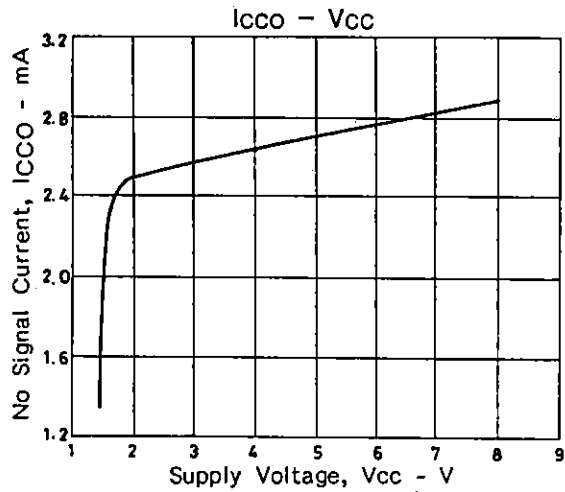


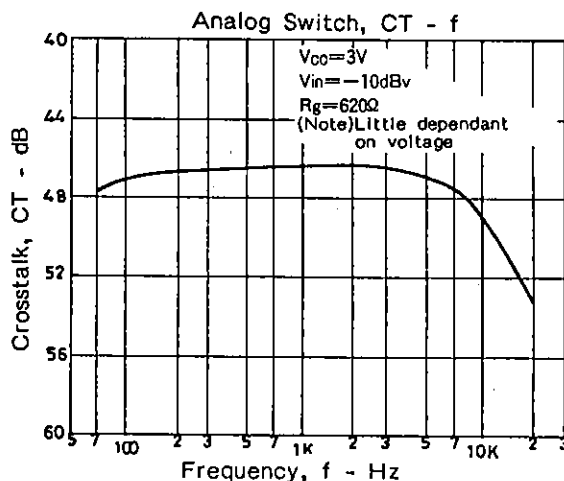
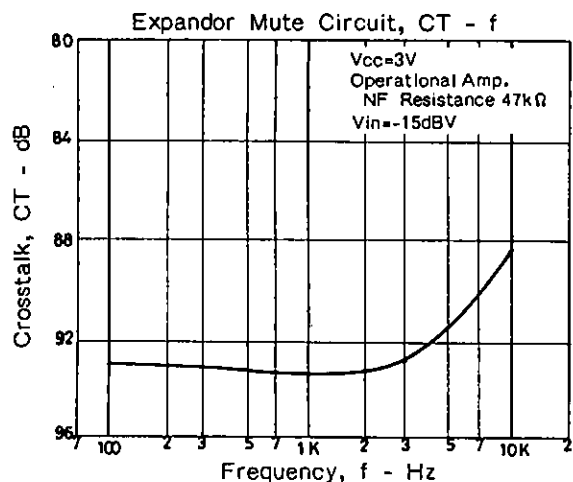
<EXPANDOR>

$$V_{outE} = \frac{2 R_3}{R_1 R_2 I_1} V_{incE}^2$$

$$= 10 V_{incE}^2$$







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