



# LA8630, 8630M

## Low Voltage and Current Dissipation Compandor IC

### Applications

- Cordless telephone.
- FM transceiver.

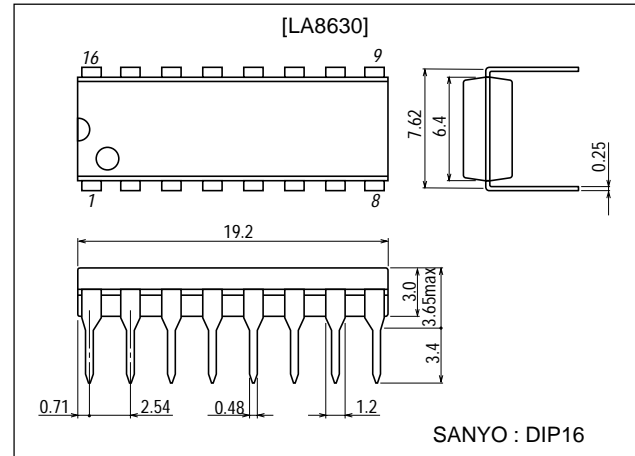
### Functions

- 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.

### Package Dimensions

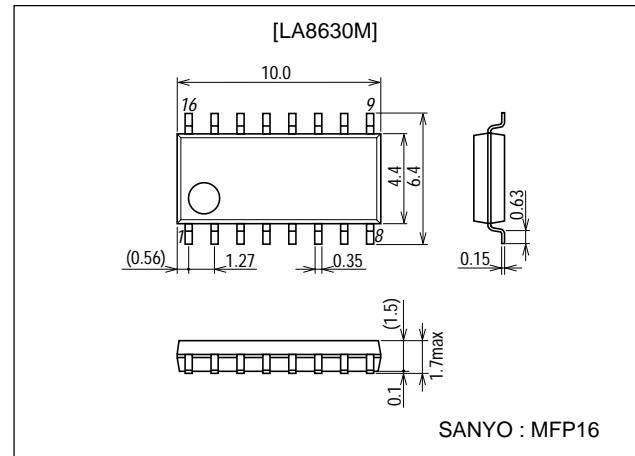
unit:mm

3006B-DIP16



unit:mm

3035B-MFP16



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**SANYO Electric Co.,Ltd. Semiconductor Company**

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## Specifications

### Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		8	V
Allowable power dissipation	Pd max		300	mW
Operating temperature	Topr		-20 to +75	°C
Storage temperature	Tstg		-40 to +125	°C

### Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>CC</sub>		3	V
Operating voltage range	V <sub>CC</sub> op		2.2 to 6	V

### Operating Characteristics at Ta = 25°C, V<sub>CC</sub>=3.0V, f=1kHz, Vin=100mVrms (0dB)

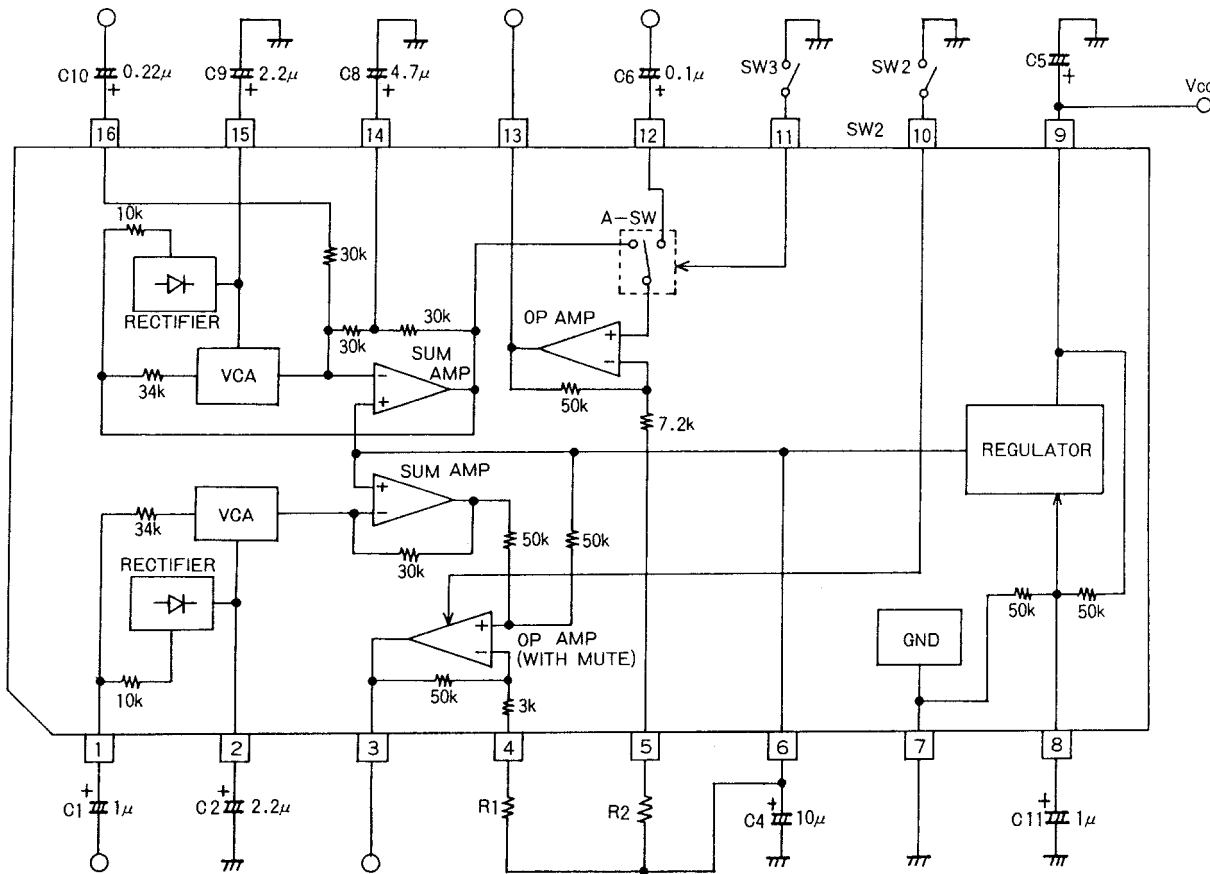
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I <sub>CC</sub>	With no signal input		2.5	3.7	mA
Input reference voltage	V <sub>inref</sub>			100		mVrms
[Expander] (Operational amplifier gain : 0dB)						
Output level	V <sub>orefe</sub>	V <sub>in</sub> =0dB (Operational amplifier gain : -6dB)	-26.5	-24.5	-22.5	dBV
Gain error	V <sub>gee1</sub>	V <sub>in</sub> =+5dB	-0.5	0	+0.5	dB
	V <sub>gee2</sub>	V <sub>in</sub> =-20dB	-1.0	0	+1.0	dB
	V <sub>gee3</sub>	V <sub>in</sub> =-30dB	-1.5	0	+2.0	dB
Distortion factor	THDe	V <sub>in</sub> =0dB		0.35	1.0	%
Output noise voltage	V <sub>NOe</sub>	V <sub>in</sub> =∞, R <sub>g</sub> =620Ω, f=20 to 20000Hz		12	80	μVrms
Frequency characteristic	f	V <sub>in</sub> =0dB, f=200 to 3500Hz		0.0		dB
Maximum output voltage	V <sub>O</sub> max	R <sub>L</sub> =10kΩ, THD=10%	0.6	1.0		Vrms
[Compressor] (Operational amplifier gain : 0dB)						
Output level	V <sub>orefc</sub>	V <sub>in</sub> =0dB	-23	-21	-19	dBV
Gain error	V <sub>gec1</sub>	V <sub>in</sub> =+20dB	-0.5	0	+0.5	dB
	V <sub>gec2</sub>	V <sub>in</sub> =-20dB	-0.5	0	+0.5	dB
	V <sub>gec3</sub>	V <sub>in</sub> =-40dB	-1.0	0	+1.0	dB
Distortion factor	THDc	V <sub>in</sub> =0dB		0.35	1.0	%
Output noise voltage	V <sub>NOc</sub>	V <sub>in</sub> =∞, R <sub>g</sub> =620Ω, f=20 to 20000Hz		0.3	0.7	mVrms
Frequency characteristic	f	V <sub>in</sub> =0dB, f=200 to 3500Hz		0.0		dB
[Muting circuit] (Operational amplifier gain : 0dB)						
Muting attenuation	CT1	V <sub>in</sub> =0dB, f=1kHz	60	90		dB
Threshold voltage	V <sub>thm</sub>		1.25	1.35	1.45	V
[Analog switch circuit] (operational amplifier gain : 0dB)						
Crosstalk	CT2	V <sub>in</sub> =0dB, f=1kHz	40	47		dB
Threshold voltage	V <sub>tha</sub>		1.25	1.35	1.45	V

\* Be careful that the threshold voltage is determined by V<sub>CC</sub> (V<sub>th</sub>=0.45V<sub>CC</sub>).

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## Equivalent Circuit Block Diagram/Sample Application Circuit

Unit (resistance:  $\Omega$ , capacitance: F)

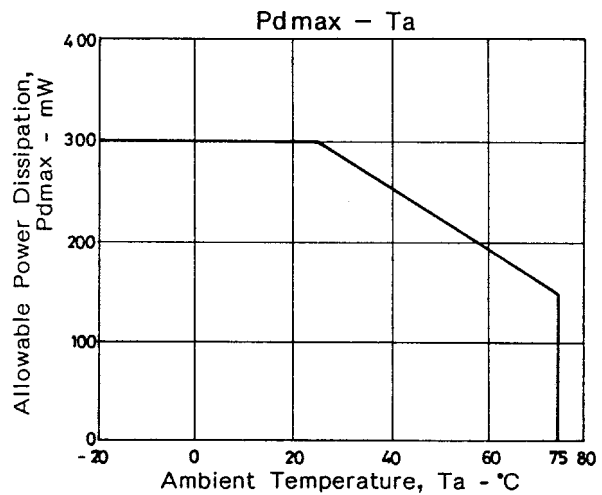


### Pin Name

Pin No.	Name
1	EXP. VIN
2	EXP. VREC
3	EXO. 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

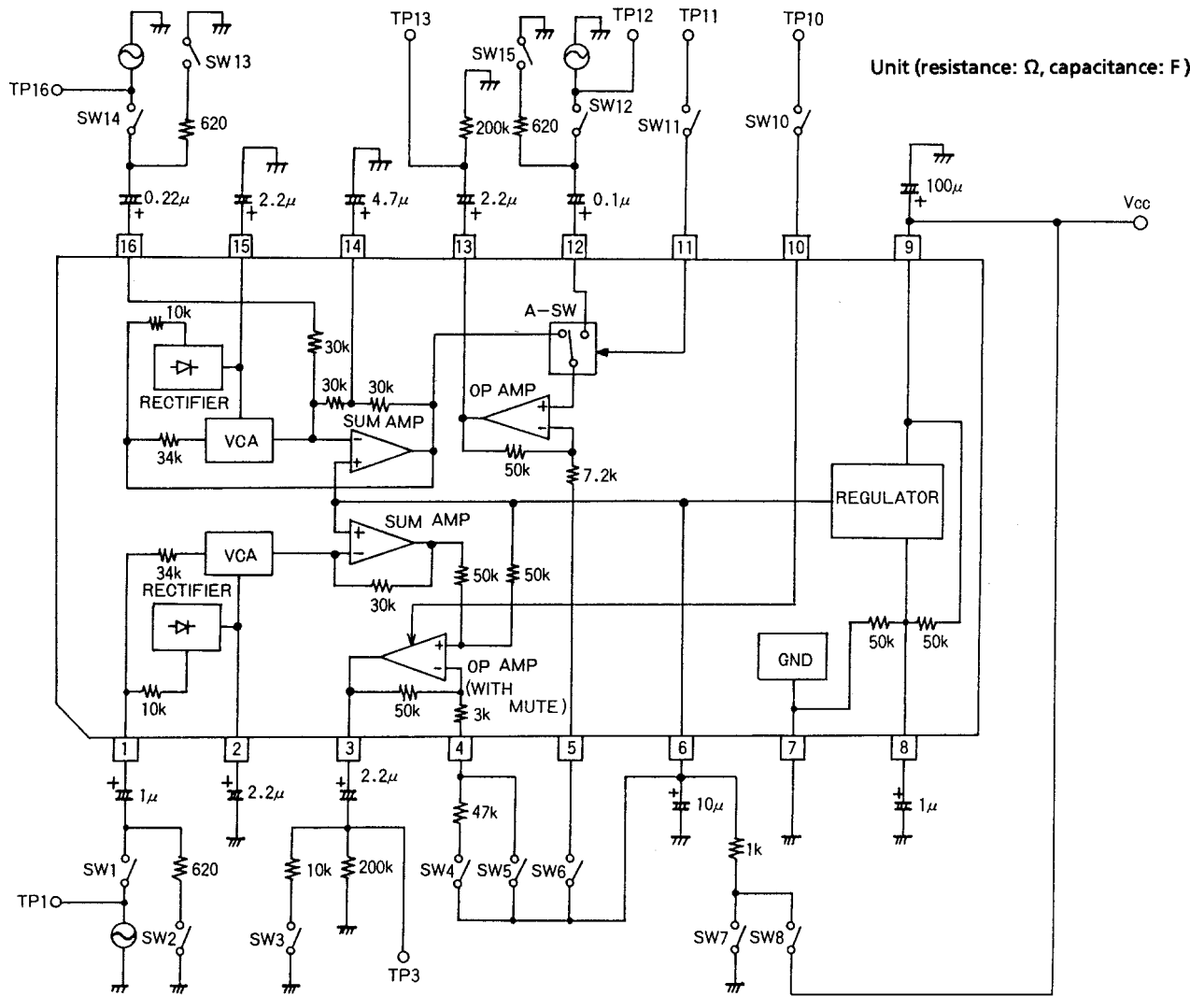
### Control Mode

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



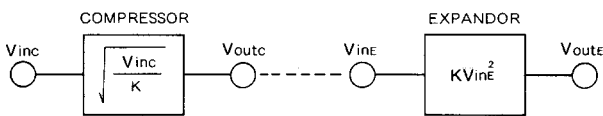
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## Test Circuit



## Summary of Compressor

(1) Operation



<for example>

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

$$K = 10$$

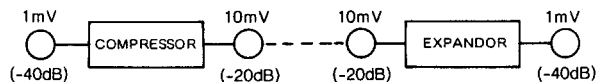
$$V_{inc} = 1\text{mV} \quad V_{outc} = \sqrt{\frac{1}{10} \times 1 \times 10^{-3}} \approx 10\text{mV} = -20\text{dB} \quad (-40\text{dB})$$

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

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

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

$$V_{oute} = K V_{ine} = K \sqrt{\frac{V_{inc}}{K}} = V_{inc}$$

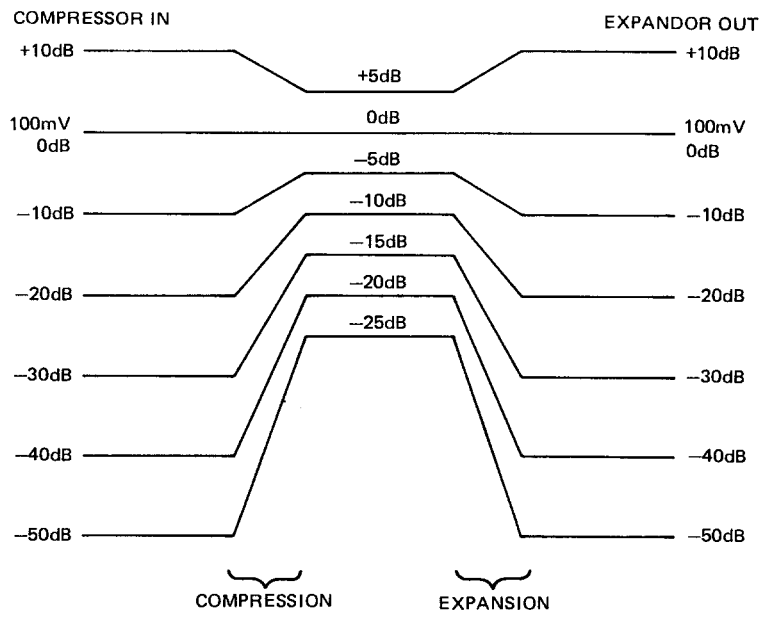


at Reference level ( $V_{ref}$ )  $V_{inc} = V_{outc}$ ,  $V_{ine} = V_{oute}$

- $V_{inc} < V_{ref}$  COMPRESSOR → Amplifier
- $V_{inc} < V_{ref}$  EXPANDOR → Attenuator
- $V_{inc} > V_{ref}$  COMPRESSOR → Attenuator
- $V_{inc} > V_{ref}$  EXPANDOR → Amplifier

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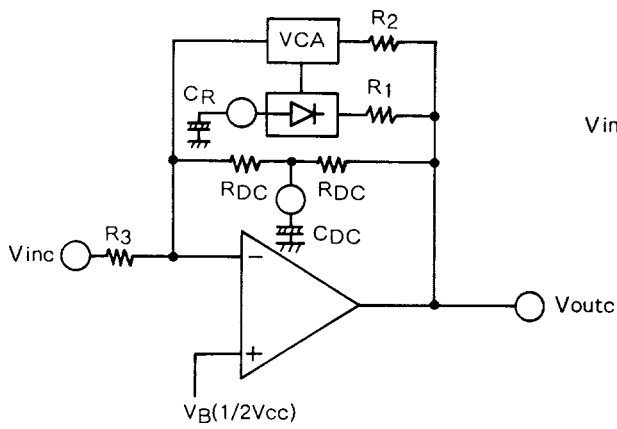
## (2) Level Diagram



## (3) Block Diagram <COMPRESSOR>

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

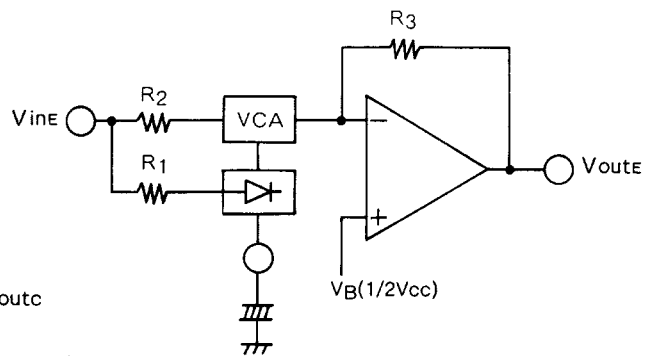
$$= \sqrt{\frac{1}{10}} V_{in}$$



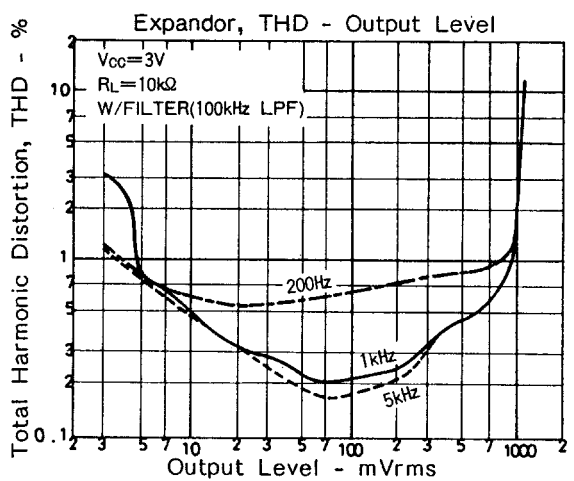
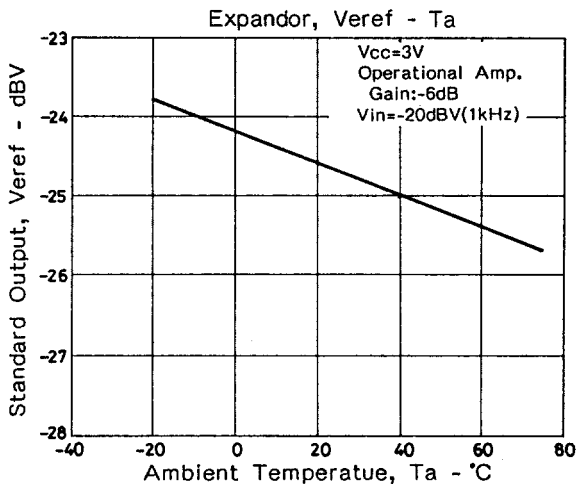
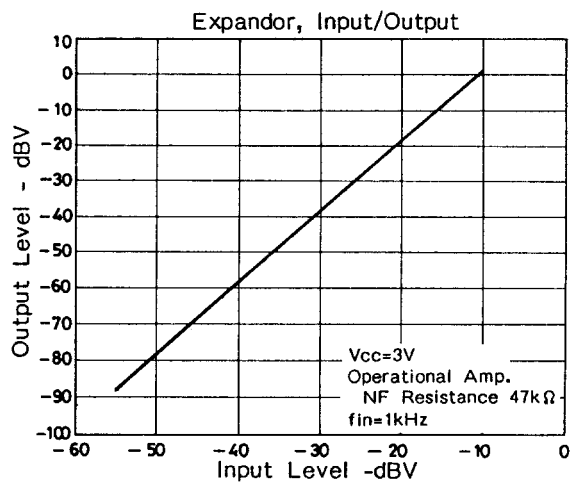
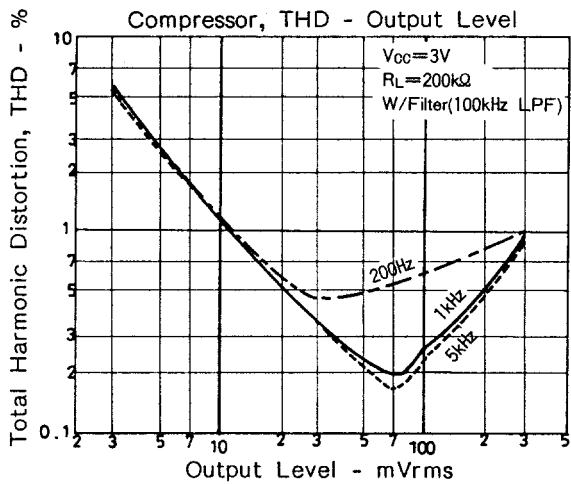
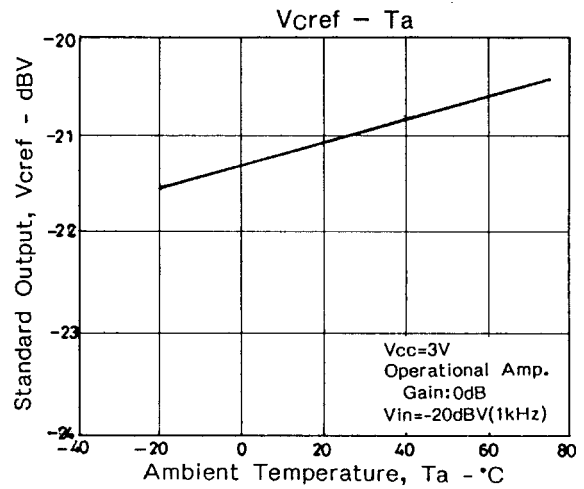
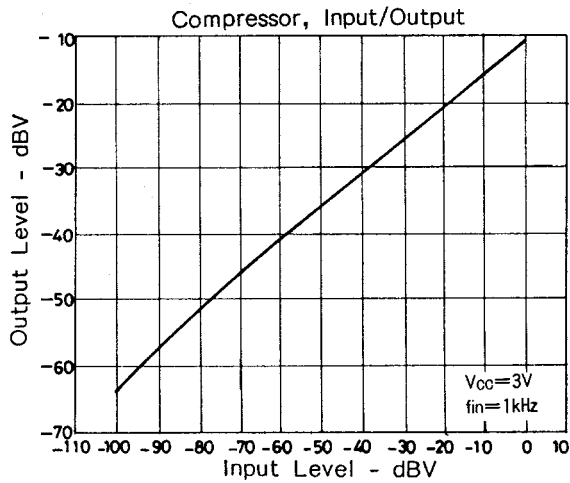
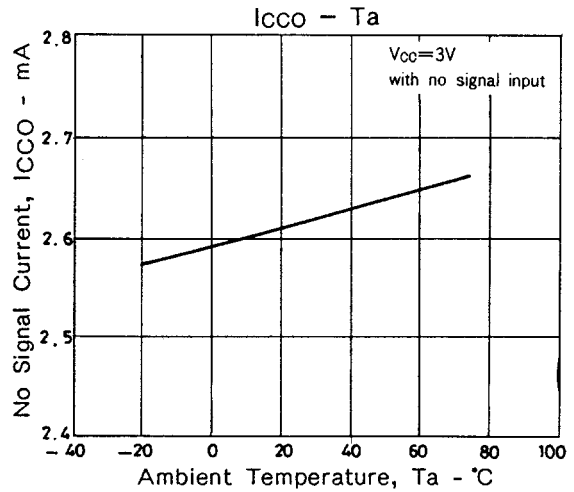
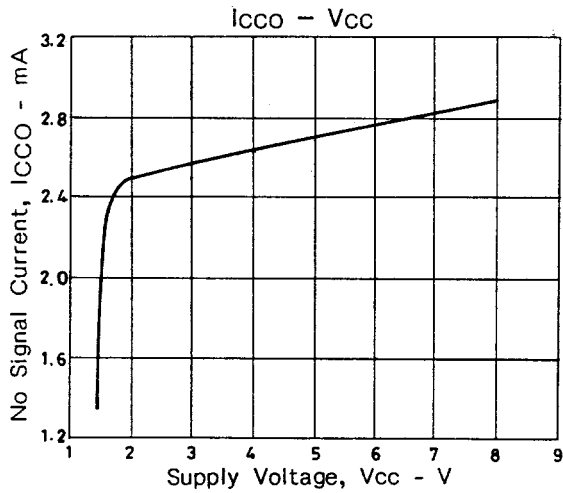
## <EXPANDOR>

$$V_{oute} = \frac{2 R_3}{R_1 R_2 I_1} V_{inE}^2$$

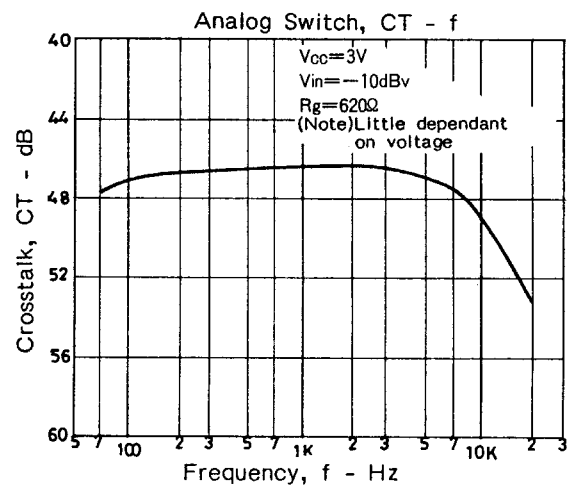
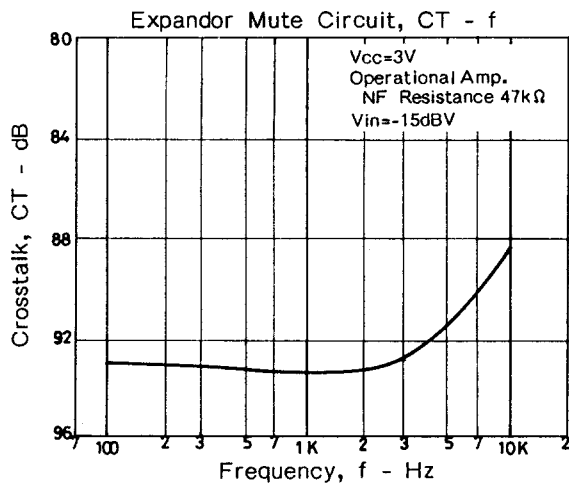
$$= 10 V_{inE}^2$$



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