



LA8630, 8630M

Low Voltage and Current Dissipation Compandor IC

Applications

- Cordless telephone.
- FM transceiver.

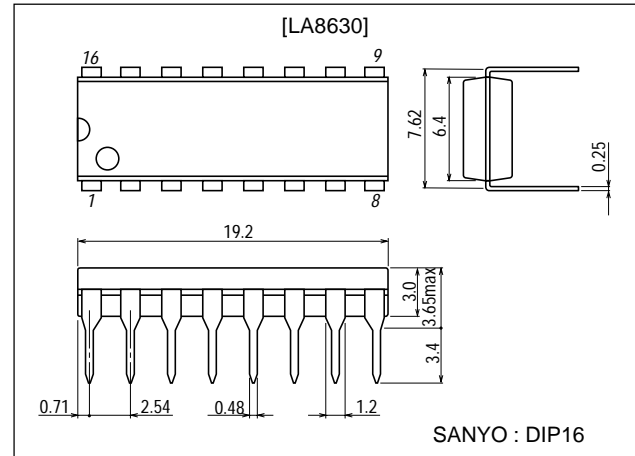
Functions

- 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

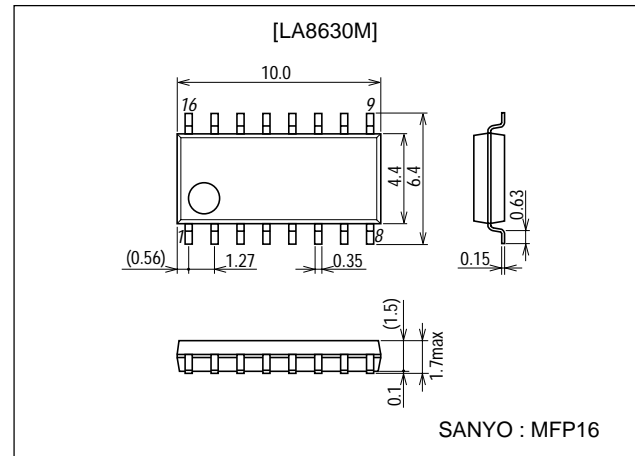
unit:mm

3006B-DIP16



unit:mm

3035B-MFP16



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12501TN (KT)/7101TS/8030TS No.3516-1/7

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Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		8	V
Allowable power dissipation	P_d max		300	mW
Operating temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		3	V
Operating voltage range	V_{CC} op		2.2 to 6	V

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC}=3.0\text{V}$, $f=1\text{kHz}$, $V_{in}=100\text{mV}_{rms}$ (0dB)

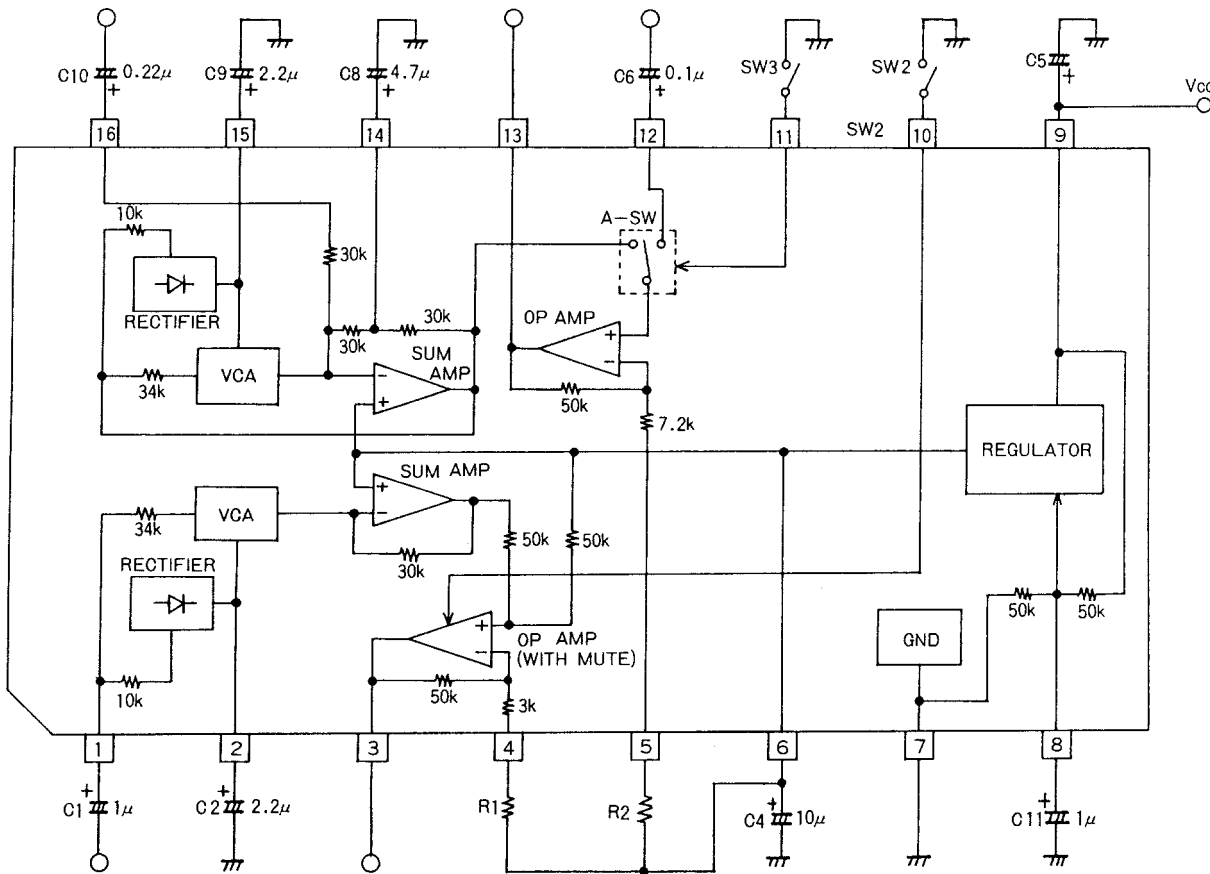
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I_{CC}	With no signal input		2.5	3.7	mA
Input reference voltage	V_{inref}			100		mVrms
[Expander] (Operational amplifier gain : 0dB)						
Output level	V_{orefe}	$V_{in}=0\text{dB}$ (Operational amplifier gain : -6dB)	-26.5	-24.5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

* Be careful that the threshold voltage is determined by V_{CC} ($V_{th}=0.45V_{CC}$).

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Equivalent Circuit Block Diagram/Sample Application Circuit

Unit (resistance: Ω , capacitance: F)

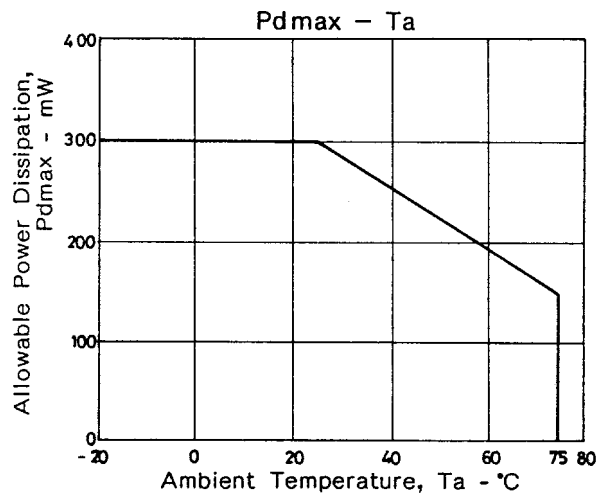


Pin Name

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

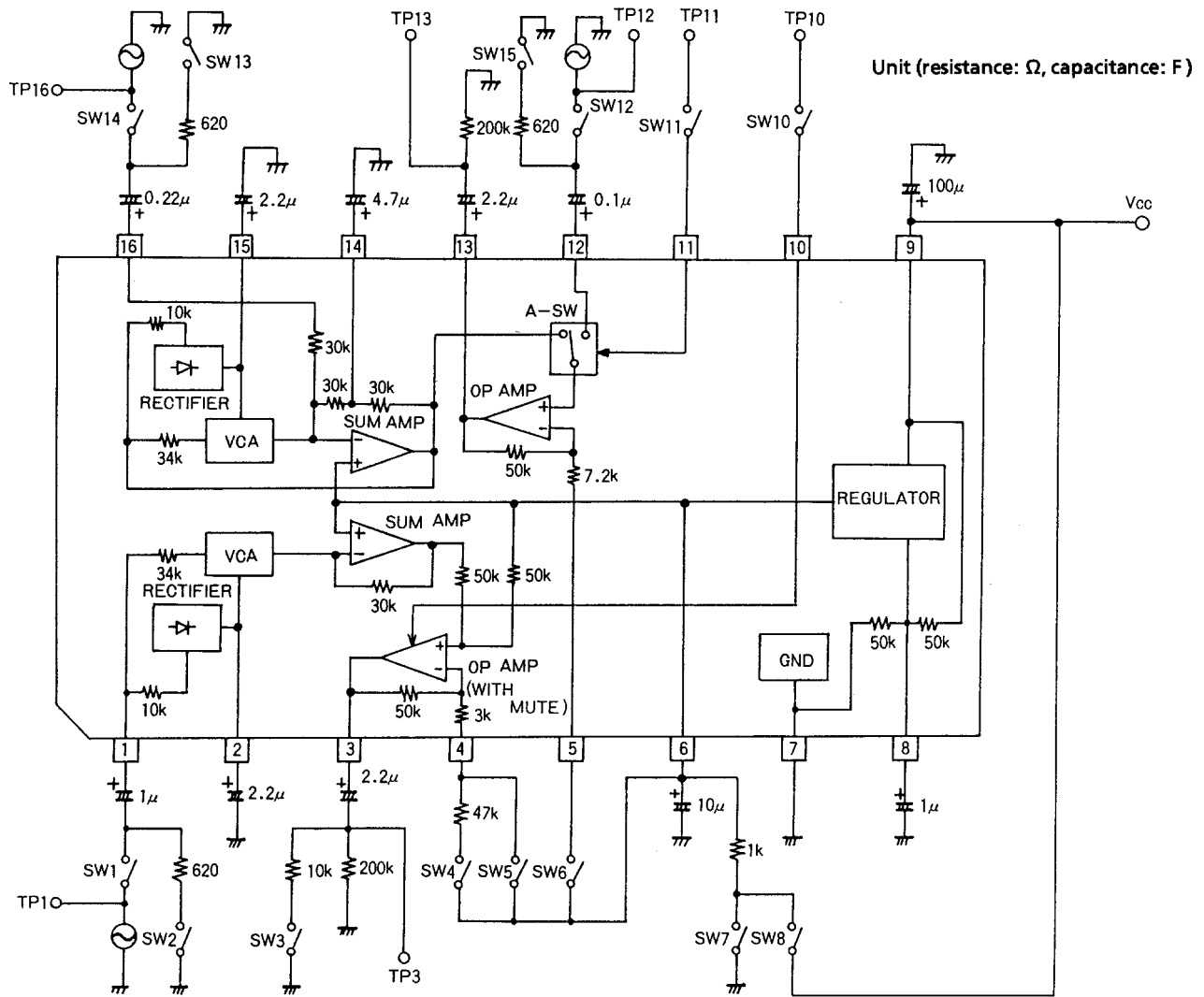
Control Mode

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



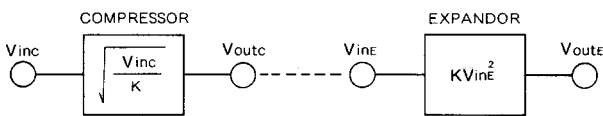
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Test Circuit



Summary of Compressor

(1) Operation



<for example>

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

$$K = 10$$

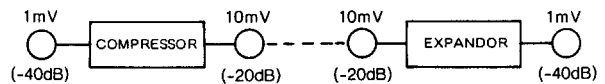
$$V_{inc} = 1\text{mV} \quad V_{outc} = \sqrt{\frac{1}{10} \times 1 \times 10^{-3}} \approx 10\text{mV} = -20\text{dB}$$

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

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

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

$$V_{outE} = K V_{InE} = K \sqrt{\frac{V_{inc}}{K}} = V_{inc}$$

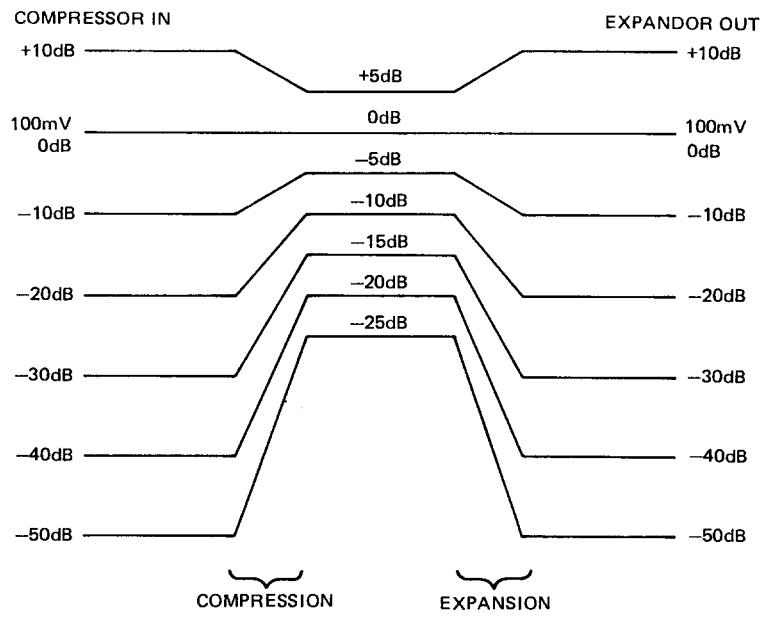


at Reference level (V_{ref}) $V_{inc} = V_{outc}$, $V_{InE} = V_{outE}$

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

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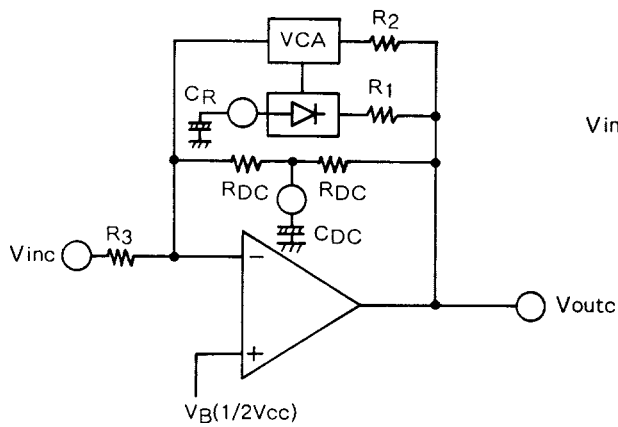
(2) Level Diagram



(3) Block Diagram <COMPRESSOR>

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

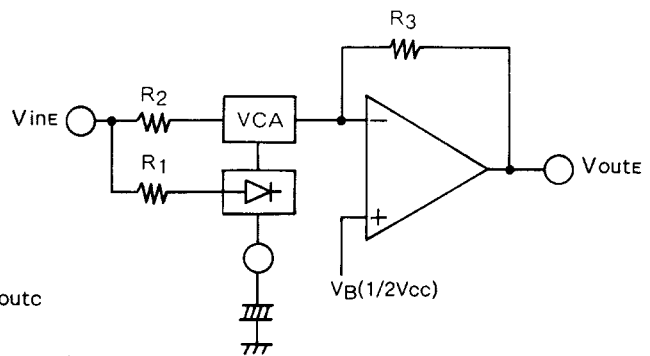
$$= \sqrt{\frac{1}{10}} V_{in}$$



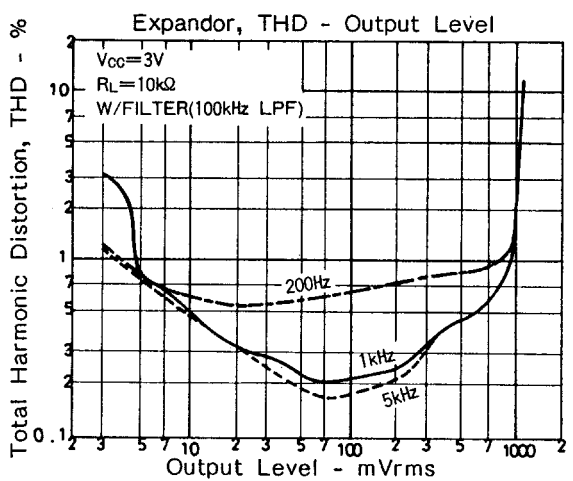
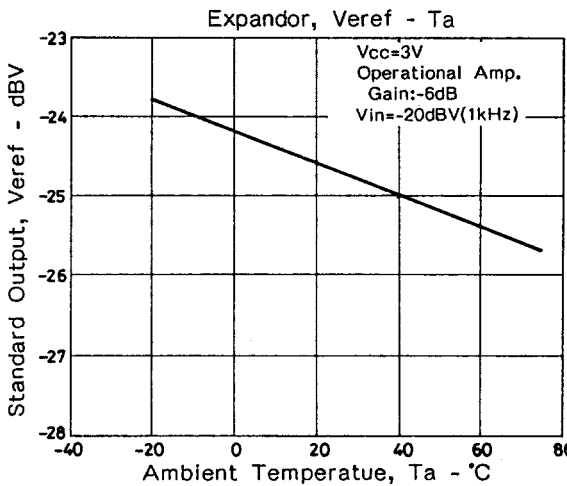
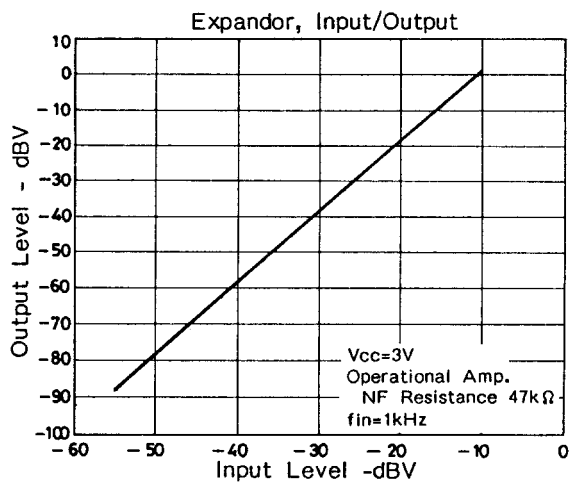
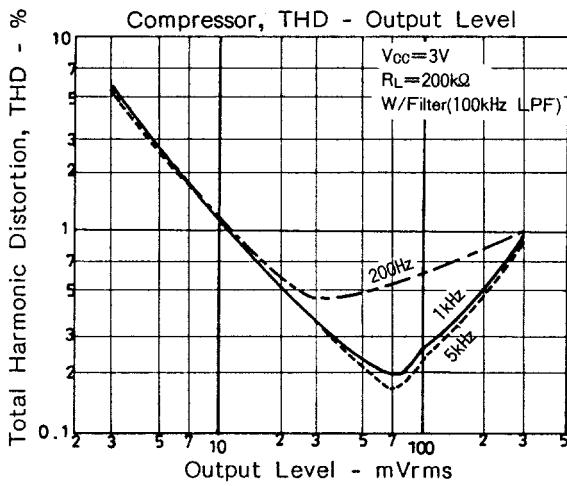
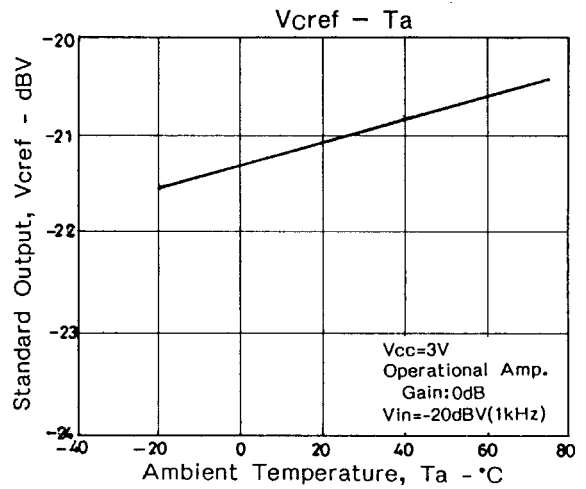
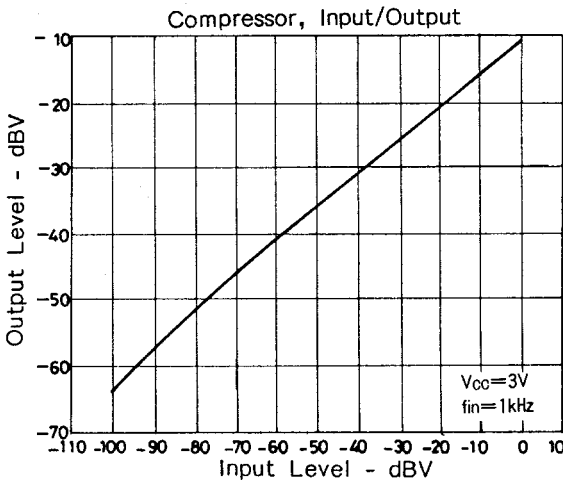
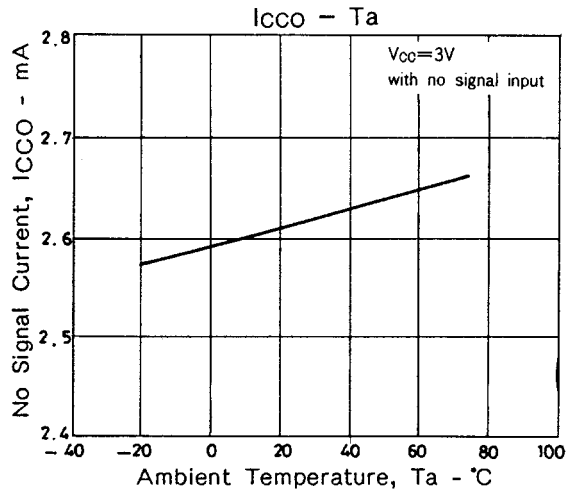
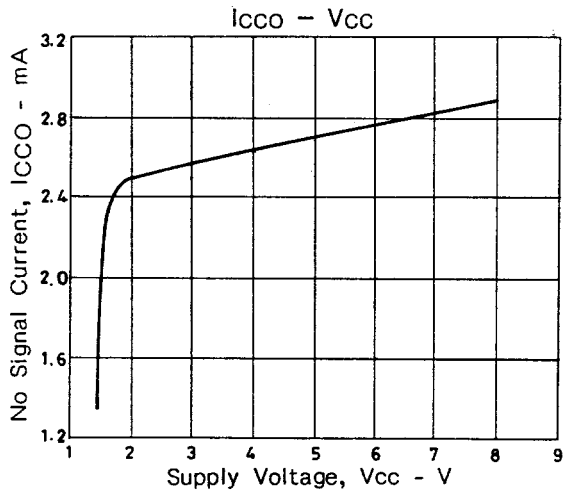
<EXPANDOR>

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

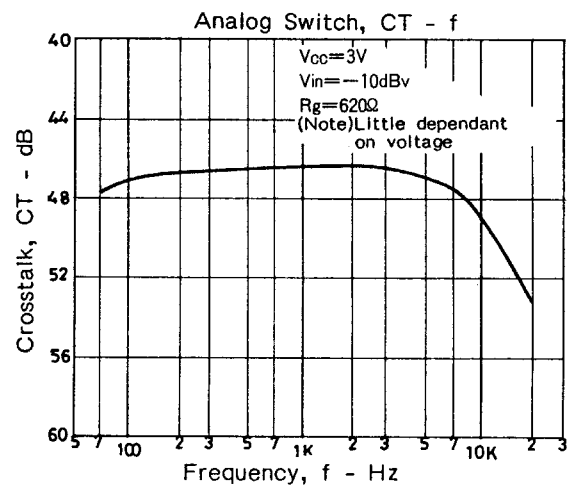
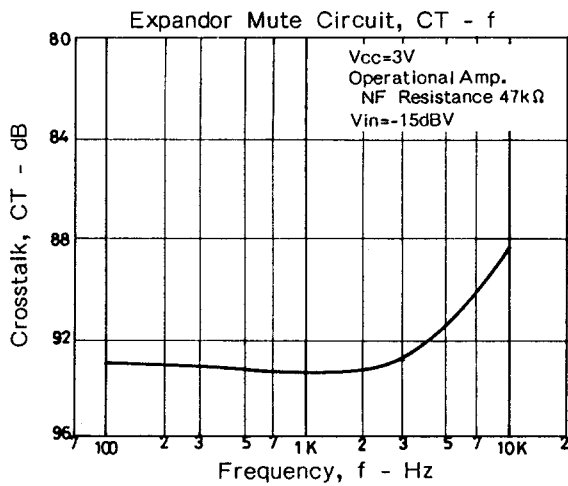
$$= 10 V_{inE}^2$$



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