

MB3120 COMPANDOR IC

COMPANDOR IC

The Fujitsu MB3120 is a compandor IC to expand dynamic range at transmission/reception systems and to improve the tone quality by means of restricting noise.

Two function are loaded on one IC, the one is the compressor which has the 2/1 ratio of input/output ratio by logarithm, and the expander which has the 1/2 ratio of input/output ratio by logarithm.

The MB3120 is encapsulated in a small package, this enables high density mounting.

The MB3120 is well suitable for a mobile radio system like as cellular radio, MCA and handy telephone set.

- Wide power supply voltage range (3.2V to 10.0V)
- Low power supply current
- On-chip both compressor and expander
- Wide dynamic range
- Less external elements
- Inhibit function with compression/expansion ratio of one
- Equipped with mute function which cut off the output signal
- 16-pin Flat Package
17-pin Zig-zag In-line Package

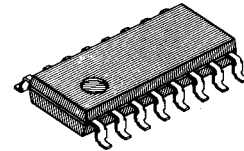
ABSOLUTE MAXIMUM RATINGS (See NOTE)

($T_A = 25^\circ\text{C}$)

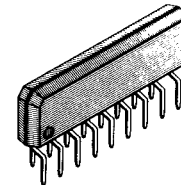
| Rating | Symbol | Value | Unit |
|-------------------------|------------|-------------|------------------|
| Power Supply Voltage | V_{CC} | 12 | V |
| Mute Control Voltage | V_{MUTE} | 5* | V |
| Inhibit Control Voltage | V_{INH} | 5* | V |
| Power Dissipation | P_D | 560 | mW |
| Operating Temperature | T_A | -20 to +75 | $^\circ\text{C}$ |
| Storage Temperature | T_{STG} | -55 to +125 | $^\circ\text{C}$ |

*: This value takes V_{CC} when V_{CC} is less than 5V.

NOTE: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

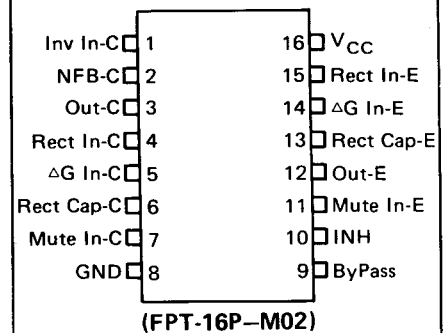


PLASTIC PACKAGE
FPT-16P-M04



PLASTIC PACKAGE
ZIP-17P-M01

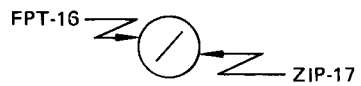
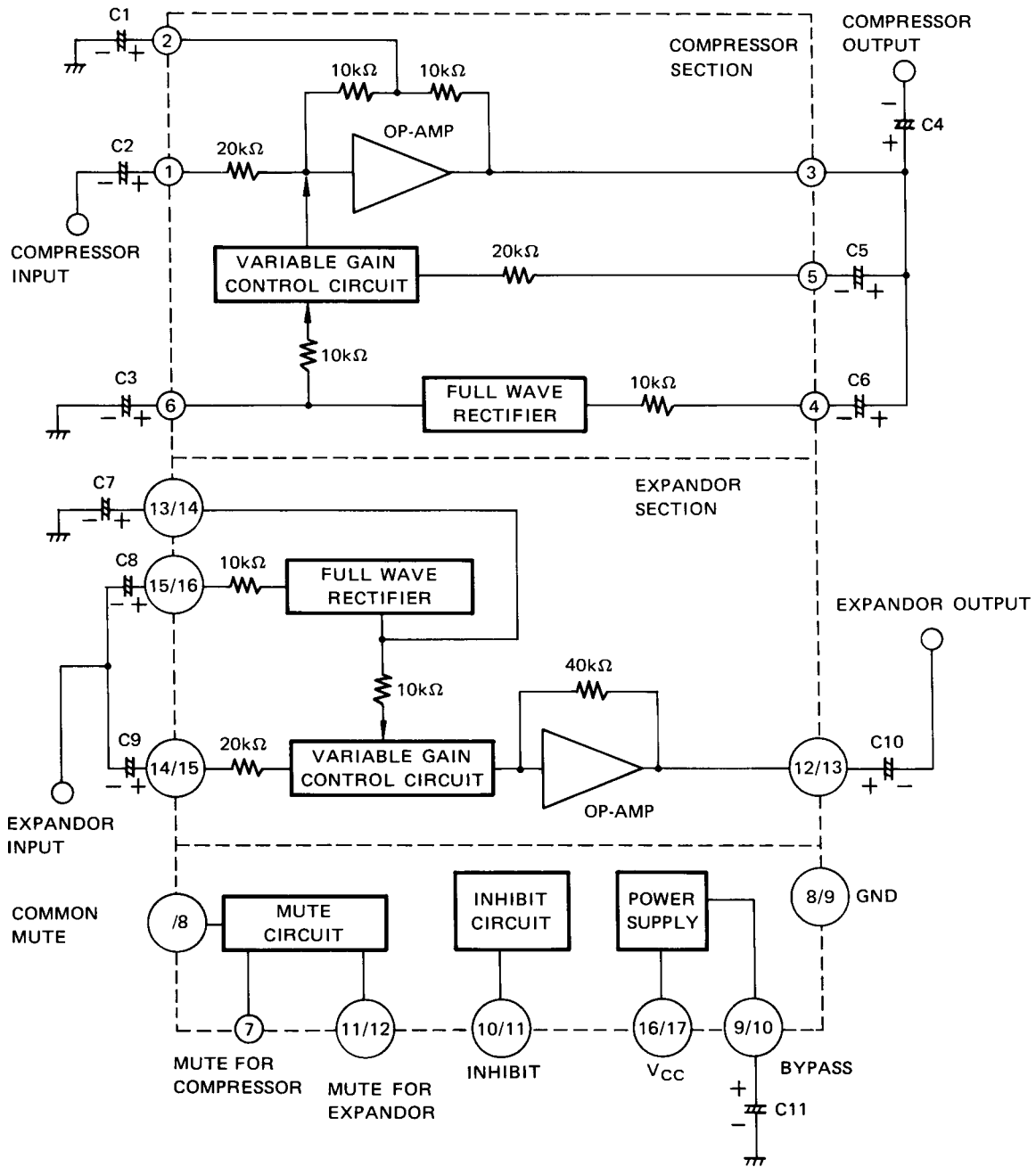
PIN ASSIGNMENT (TOP VIEW)



ZIP-17P-M01 Pin Assignment
Please See Page 12

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

MB3120 BLOCK DIAGRAM



BLOCK DESCRIPTIONS

C₁ : C₁ determines the low cut off frequency of compressor section.

$$f_c = \frac{1}{2\pi R \cdot C_1}$$

R is on chip feed back resistor (10kΩ typ.)

C₂, C₈, C₉ : Input coupling condenser

C₃, C₇ : Smooth capacitor of full wave rectifier. Attack time and recovery time are determined by C₃ and C₇.

Time constant T_C can be calculated.

$$T_C \text{ (ms)} \doteq 10 \times C_3 \text{ (}\mu\text{F)}$$

C₄, C₁₀ : Output coupling condenser

C₅, C₆ : Coupling condenser for internal feed back of compressor section.

C₁₁ : Ripple filter condenser

RECOMMENDED OPERATING CONDITIONS

| Parameter | Symbol | Value | | | Unit |
|-----------------------|-----------------|-------|-----|-----|------|
| | | Min | Typ | Max | |
| Power Supply Voltage | V _{CC} | 3.2 | | 10 | V |
| Operating Temperature | T _A | -20 | | 75 | °C |

ELECTRICAL CHARACTERISTICS

(V_{CC} = 8V, T_A = 25°C, f = 1kHz, R_L = 10kΩ)

| Parameter | Symbol | Condition | Value | | | Unit |
|----------------------|-----------------|-----------|-------|-----|-----|------|
| | | | Min | Typ | Max | |
| Power Supply Current | I _{CC} | | | 3.0 | 4.5 | mA |

Compressor

| | | | | | | |
|-----------------------|------------------|--|-------|-------|-------|-----|
| Input Resistance | R _{INC} | | 14 | 20 | | kΩ |
| Input Reference Level | V _{OC0} | V _{IN} = -6dBm | -10.5 | -9.0 | -7.5 | dBm |
| | | V _{IN} = -6dBm, T _A = -20 to 75°C*2 | -2.5 | 0 | 2.5 | dB |
| Output Level*1 | V _{OC1} | V _{IN} = -20dB | -10.5 | -10.0 | -9.5 | dB |
| | V _{OC2} | V _{IN} = -40dB | -20.7 | -20.0 | -19.3 | dB |
| | V _{OC3} | V _{IN} = -60dB | -31.5 | -30.0 | -29.0 | dB |
| | | V _{IN} = -60dB, T _A = -20 to 75°C*2 | -4.0 | 0 | 3.0 | dB |
| | V _{OC4} | V _{IN} = -80dB | | -40.0 | | dB |

ELECTRICAL CHARACTERISTICS (continued)

| Parameter | Symbol | Condition | Value | | | Unit |
|-----------|--------|-----------|-------|-----|-----|------|
| | | | Min | Typ | Max | |

Expander

| | | | | | | |
|-----------------------|-----------|--|-------|-------|-------|-----------|
| Input Resistance | R_{INE} | | 4.7 | 6.7 | | $k\Omega$ |
| Input Reference Level | V_{OE0} | $V_{IN} = -9dBm$ | -1.5 | 0 | 1.5 | dBm |
| | | $V_{IN} = -9dBm$, $T_A = -20$ to $75^\circ C^{*2}$ | -2.5 | 0 | 2.5 | dB |
| Output Level*1 | V_{OE1} | $V_{IN} = -10dB$ | -20.5 | -20.0 | -19.5 | dB |
| | V_{OE2} | $V_{IN} = -20dB$ | -40.7 | -40.0 | -39.3 | dB |
| | V_{OE3} | $V_{IN} = -30dB$ | -61.0 | -60.0 | -58.5 | dB |
| | | $V_{IN} = -30dB$, $T_A = -20$ to $75^\circ C^{*2}$ | -3.0 | 0 | 4.5 | dB |
| | V_{OE4} | $V_{IN} = -40dB$ | | -80.0 | | dB |

Compressor

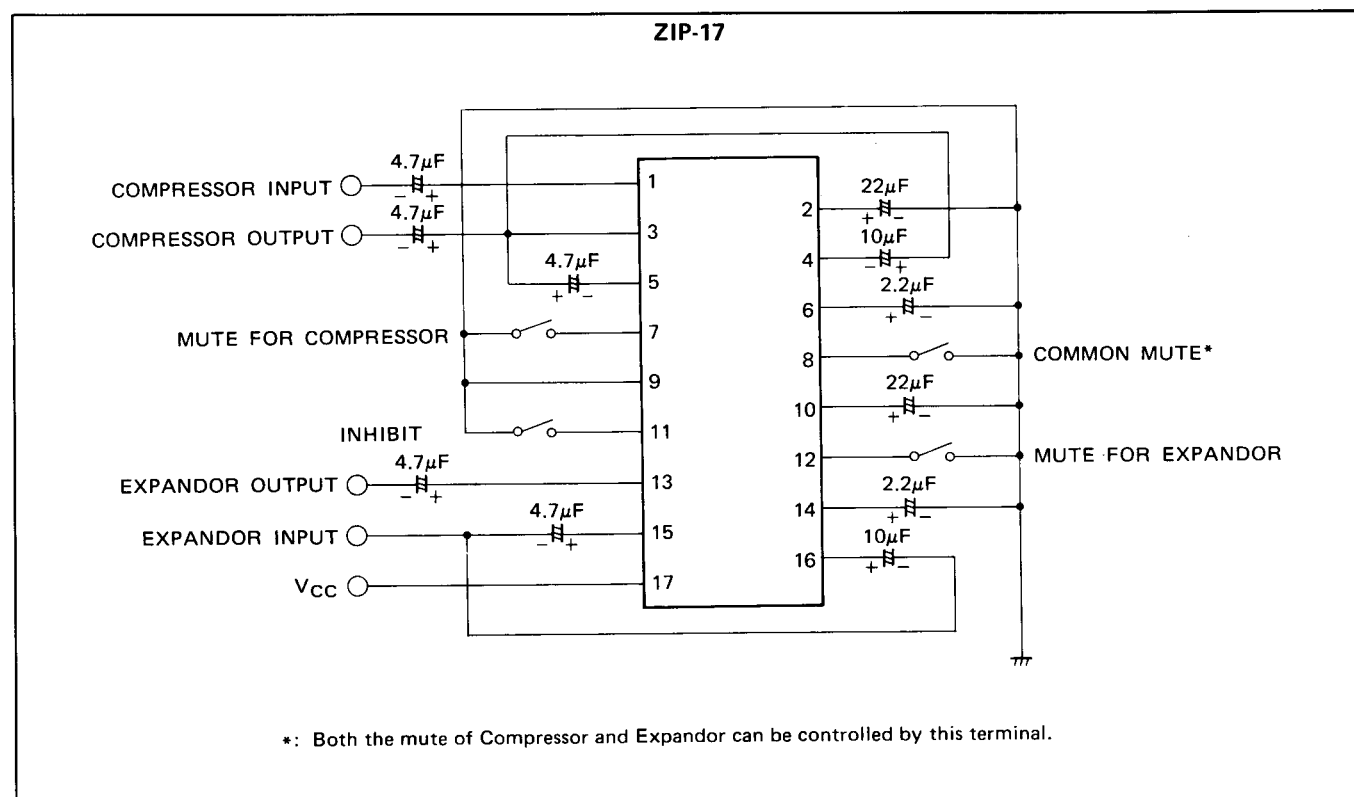
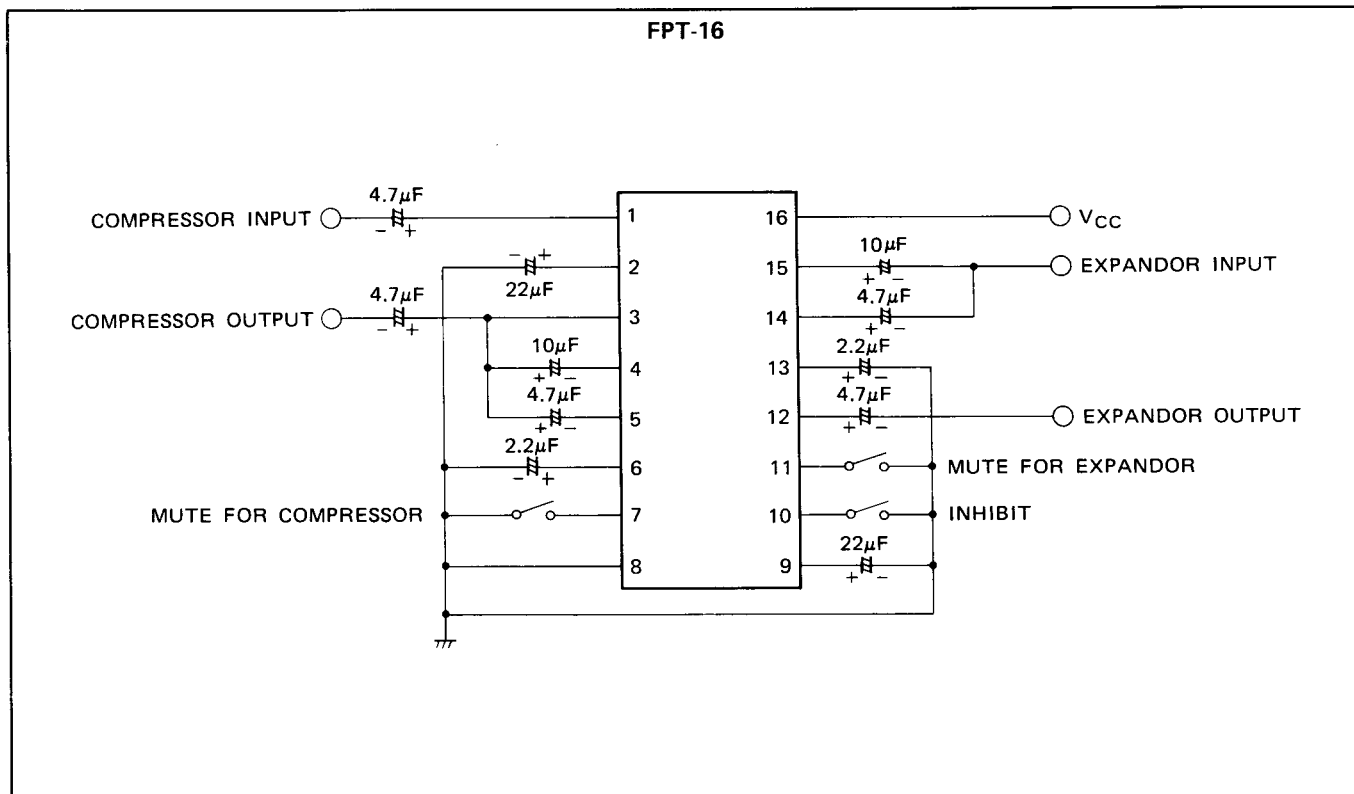
| | | | | | | |
|---------------------------|-----------------|--|------|-----|-------|-----|
| Total Harmonic Distortion | THD | $V_O = 0dBm$ | | 0.5 | 2.0 | % |
| Output Noise Voltage | V_{ON} | BW = 100Hz to 5kHz | | | -80.0 | dBm |
| Voltage Gain | A_V | $V_{IN} = -6dBm$ | 4.5 | 6.0 | 7.5 | dB |
| Gain Deviation 1 | ΔA_{V1} | $V_{IN} = -6dBm$, $T_A = -20$ to $75^\circ C^{*2}$ | -3.0 | 0 | 3.0 | dB |
| Gain Deviation 2 | ΔA_{V2} | $f = 200Hz$ to $5kHz$, $V_{O1} = 0dBm$ | -0.5 | 0 | 0.5 | dB |
| Voltage Gain at Inhibit | A_{VINH} | $V_{IN} = -6dBm$, $V_{ININH} = 0.4V$ | 4.5 | 6.0 | 7.5 | dB |

| | | | | | | |
|--|--------------|--|-----|-----|-----|-----|
| Compressor Mute Attenuation*3 | V_{OCMUTE} | $V_{IN} = -6dBm$, $V_{INCMUTE} = 2.7V$ | | -50 | | dBm |
| Expander Mute Attenuation*3 | V_{OEMUTE} | $V_{IN} = -9dBm$, $V_{INEMUTE} = 2.7V$ | | -70 | | dBm |
| High-level Control Voltage for Mute and Inhibit Pins*3 | V_{IH} | | 2.7 | | | V |
| Low-level Control Voltage for Mute and Inhibit Pins*3 | V_{IL} | | | | 0.4 | V |

Notes:

- *1 Measured at input reference level of 0dB.
- *2 Gain deviation with temperature when output level of $25^\circ C$ is specified as 0dB.
- *3 As for Zip-17 pin, both compressor and expander circuit enter mute function depending on 8 pin input.

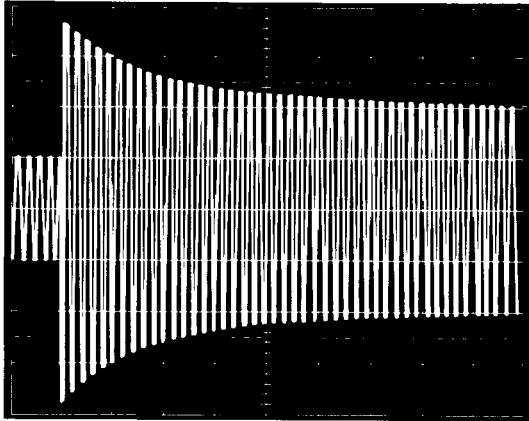
TYPICAL CONNECTION EXAMPLE



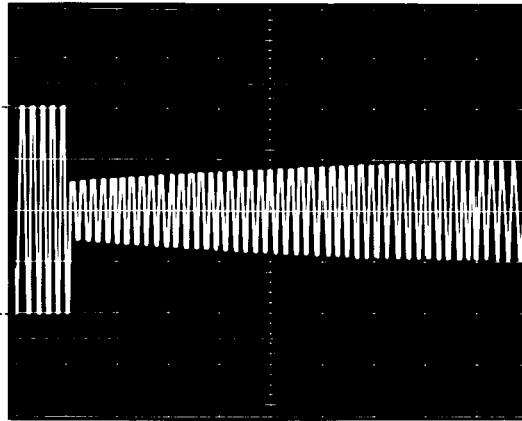
OUTPUT TRANSITION RESPONSE CHARACTERISTICS

Condition: $V_{CC} = 8V$, $f = 1kHz$, $R_L = 10k\Omega$, Mute OFF, INH OFF, Typ. connection

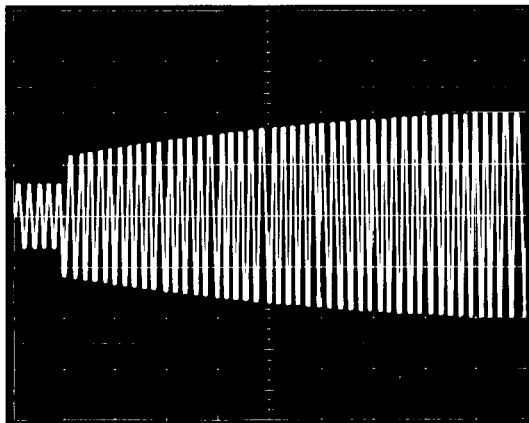
COMPRESSOR (Y: 0.2V/div, X: 5msec/div)
 $V_{IN} = -18dBm \rightarrow -6dBm$ ($V_O = -15dBm \rightarrow -9dBm$)



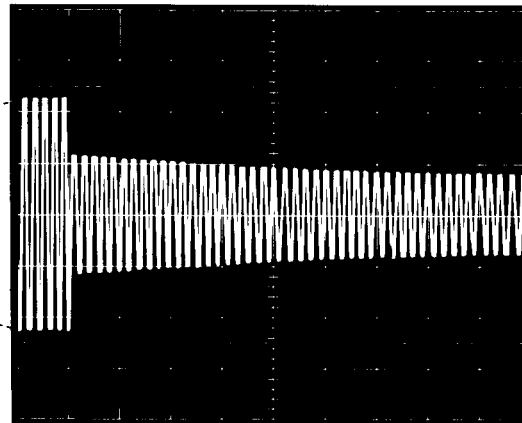
$V_{IN} = -6dBm \rightarrow -18dBm$ ($V_O = -9dBm \rightarrow -15dBm$)



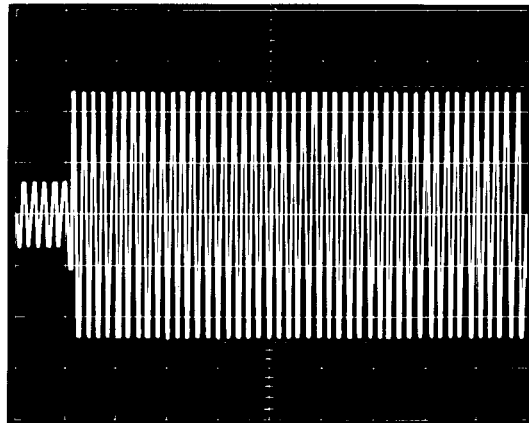
EXPANDOR (Y: 0.5V/div, X: 5msec/div)
 $V_{IN} = -15dBm \rightarrow -9dBm$ ($V_O = -12dBm \rightarrow 0dBm$)



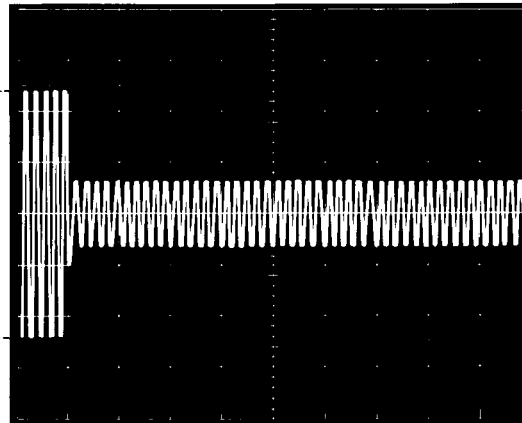
$V_{IN} = -9dBm \rightarrow -15dBm$ ($V_O = 0dBm \rightarrow -12dBm$)



COMPANDOR (Y: 0.5V/div, X: 5msec/div)
 $V_{IN} = -18dBm \rightarrow -6dBm$ ($V_O = -12dBm \rightarrow 0dBm$)



$V_{IN} = -6dBm \rightarrow -18dBm$ ($V_O = 0dBm \rightarrow -12dBm$)



TYPICAL CHARACTERISTICS CURVES

Fig. 1 – INPUT VOLTAGE vs. OUTPUT LEVEL

f = 1kHz
 Mute OFF
 INH OFF
 $R_g = 600\Omega$
 $R_L = 10k\Omega$
 TYP. CONNECTION

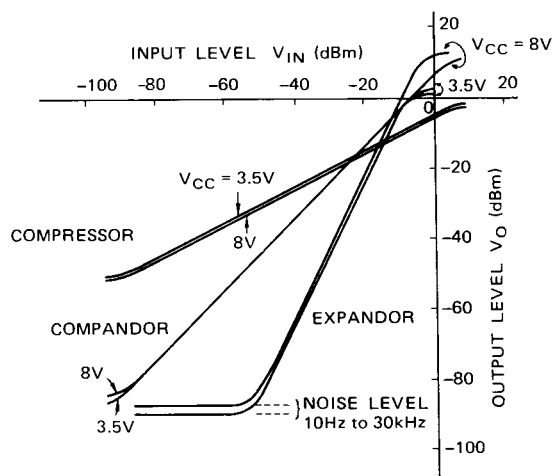


Fig. 2 – INPUT VOLTAGE vs. OUTPUT LEVEL (INHIBIT COND.)

f = 1kHz
 Mute OFF
 INH ON
 $R_g = 600\Omega$
 $R_L = 10k\Omega$
 TYP. CONNECTION

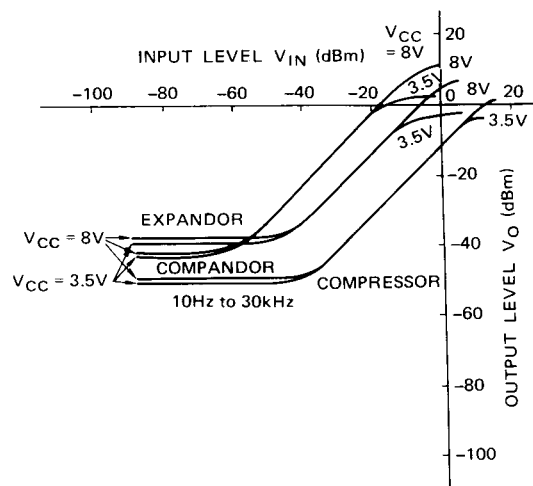


Fig. 3 – INPUT REFERENCE LEVEL vs. VOLTAGE SUPPLY

f = 1kHz
 Mute OFF
 INH OFF
 $R_g = 600\Omega$ $R_L = 600\Omega$ (dashed line)
 $R_L = 10k\Omega$ (solid line)

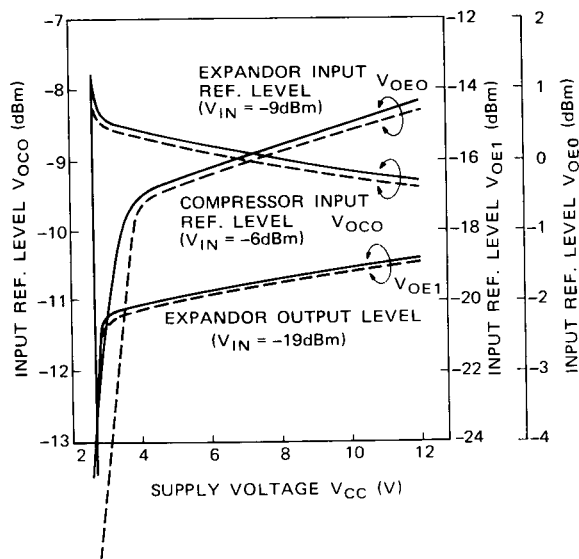
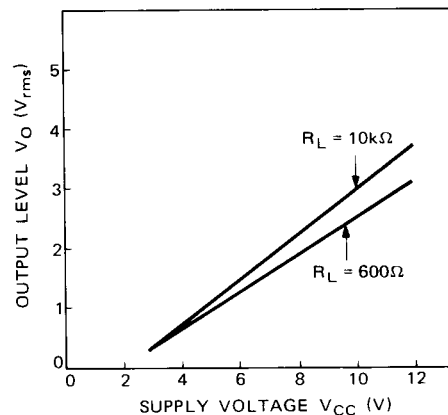


Fig. 4 – MAX. OUTPUT LEVEL vs. SUPPLY VOLTAGE (COMPANDOR)

LPF: 100kHz
 THD = 1% INH OFF
 Mute OFF $R_g = 600\Omega$



TYPICAL CHARACTERISTICS CURVES (continued)

Fig. 5 – FREQUENCY vs. VOLTAGE GAIN (COMPANDOR)

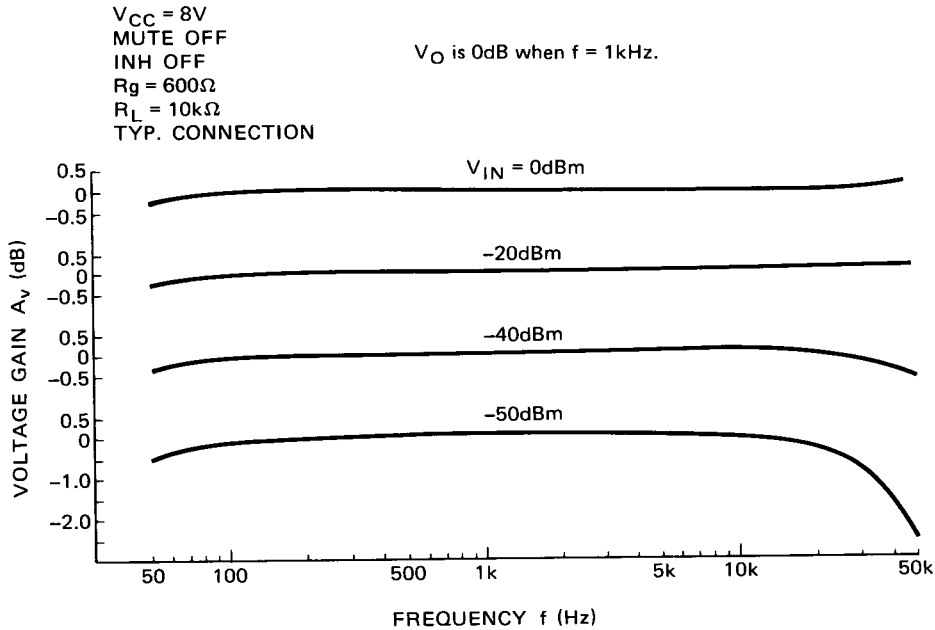


Fig. 6 – INPUT REFERENCE LEVEL vs. TEMPERATURE

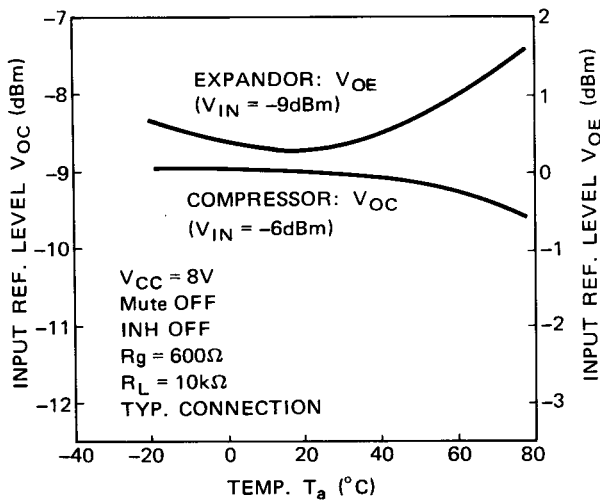
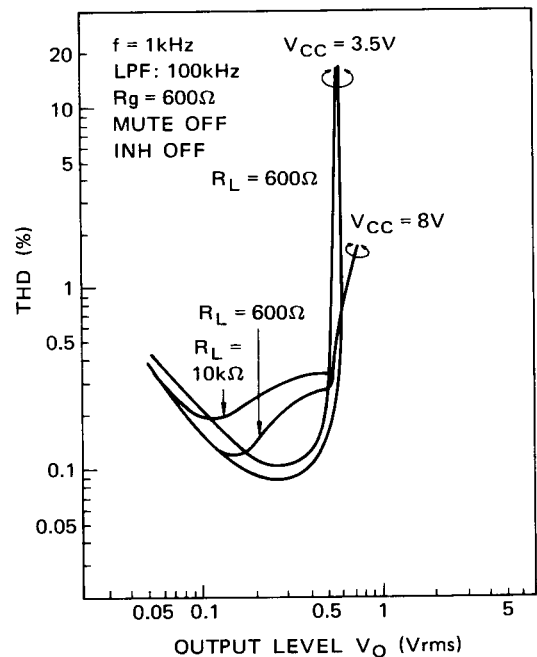


Fig. 7 – OUTPUT LEVEL vs. TOTAL HARMONIC DISTORTION (COMPRESSOR)



TYPICAL CHARACTERISTICS CURVES (continued)

Fig. 8 – OUTPUT LEVEL vs. TOTAL HARMONIC DISTORTION (EXPANDOR)

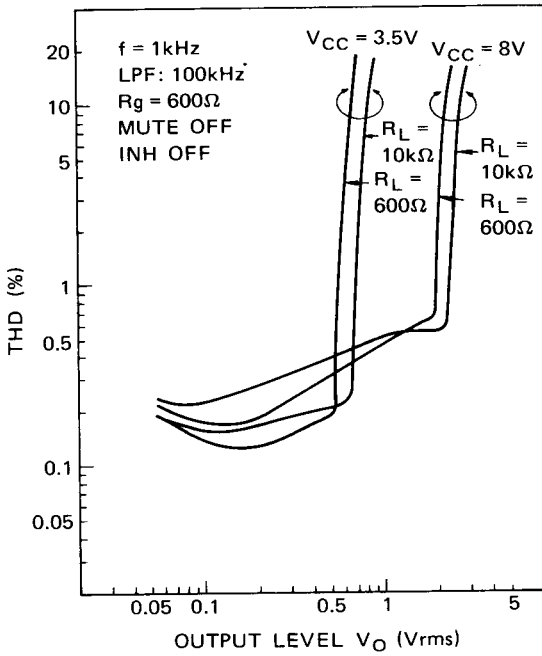


Fig. 9 – OUTPUT LEVEL vs. TOTAL HARMONIC DISTORTION (COMPANDOR)

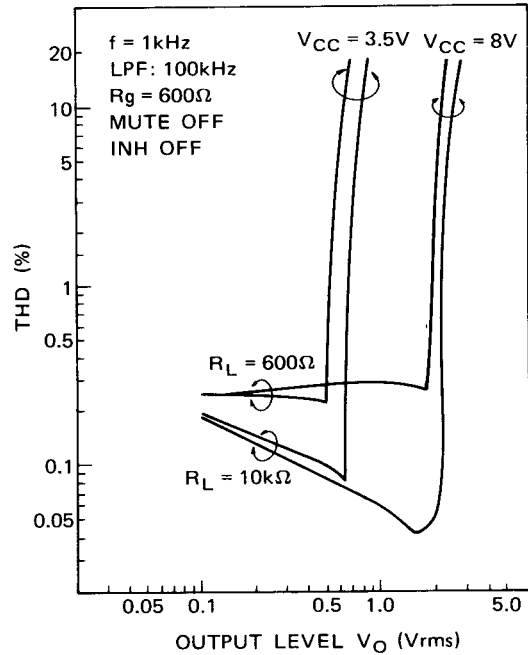


Fig. 10 – OUTPUT LEVEL vs. TOTAL HARMONIC DISTORTION (EXPANDOR INHIBIT COND.)

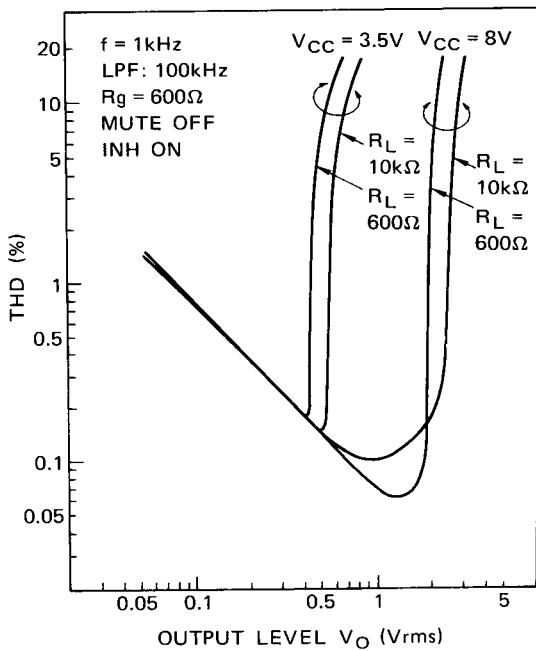
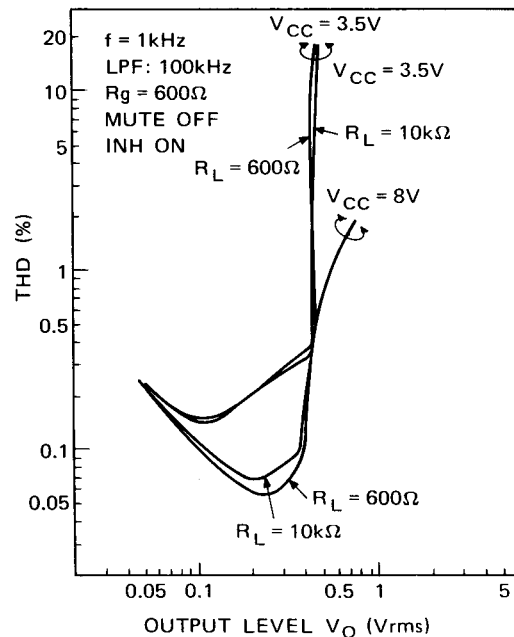


Fig. 11 – OUTPUT LEVEL vs. TOTAL HARMONIC DISTORTION (COMPRESSOR INHIBIT COND.)



TYPICAL CHARACTERISTICS CURVES (continued)

Fig. 12 – FREQUENCY vs. TOTAL HARMONIC DISTORTION (COMPANDOR)

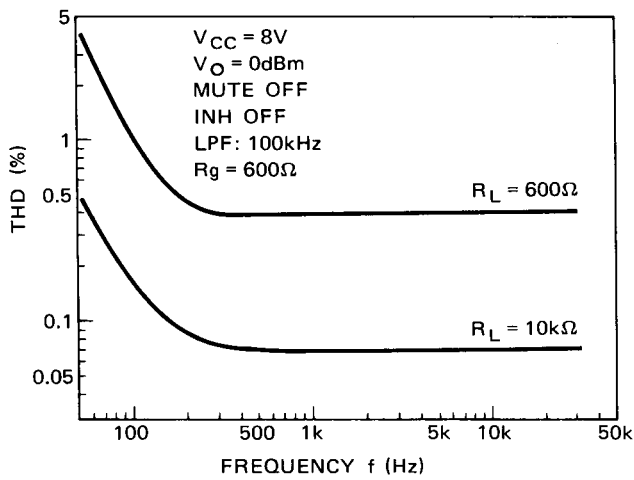


Fig. 13 – EXAPNDOR MUTE ATTENUATION

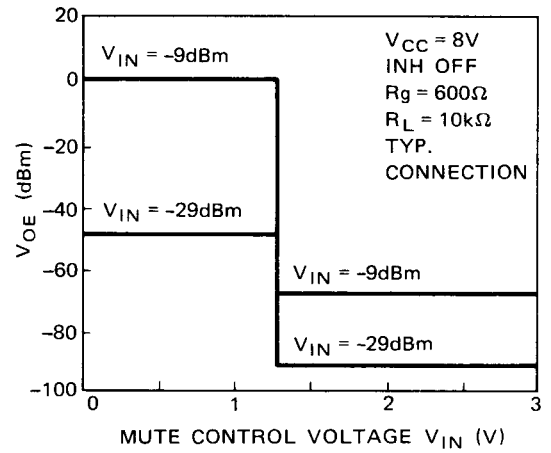
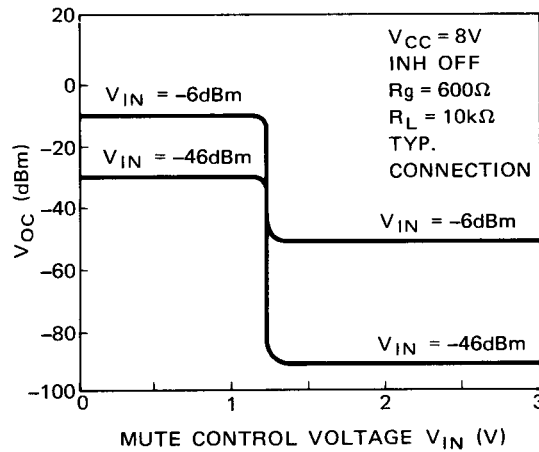
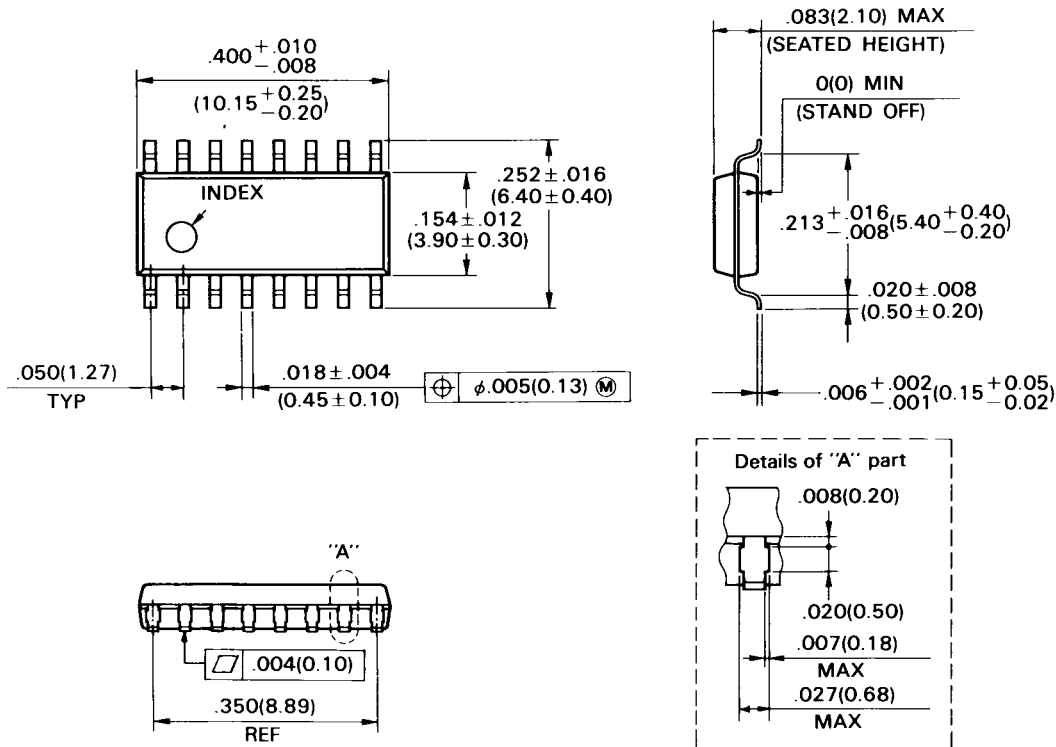


Fig. 14 – COMPRESSOR MUTE ATTENUATION

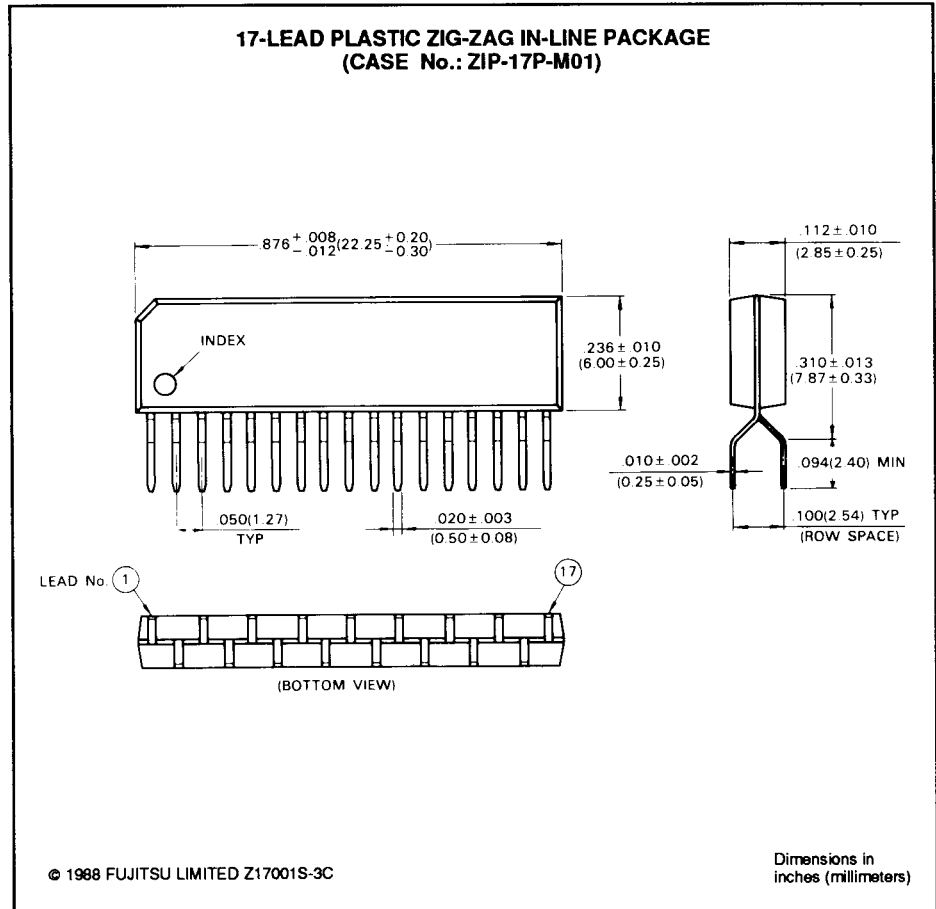
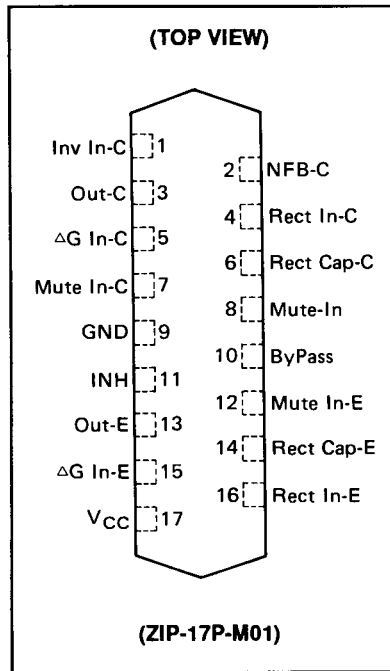


PACKAGE DIMENSIONS

**16-LEAD PLASTIC FLAT PACKAGE
(CASE No.: FPT-16P-M04)**



PACKAGE DIMENSIONS (Continued)



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