

**US MTS DECODER****DESCRIPTION**

The  $\mu$ PC1872CU is an integrated circuit for US MTS (Multi Channel Television Sound) system. All functions for US MTS system are provided on one chip.

The  $\mu$ PC1872CU compared with the former IC ( $\mu$ PC1871) requires less supply current, and improves electrical characteristics (Separation, S/N, S/Buzz). The  $\mu$ PC1872CU has built-in SAP (Sub Audio Program) discrimination error protection circuit.

**FEATURES**

- BTSC (USA) standard demodulator (Stereo demodulation and TV-dbx noise reduction)
- Only four adjustments (2 separation, 1 stereo VCO, 1 filter)
- Supply voltage: 8 V to 10 V
- Circuit current: 27 mA TYP. (Supply voltage: 9 V)
- Input and output level (L+R, 100 % modulation)  
Input level: 0.42 V<sub>p-p</sub>  
Output level: 1.41 V<sub>p-p</sub>

**APPLICATION**

- TV

**ORDERING INFORMATION**

Part Number	Package	Quality Grade
$\mu$ PC1872CU	42-pin plastic shrink DIP (600 mil)	Standard

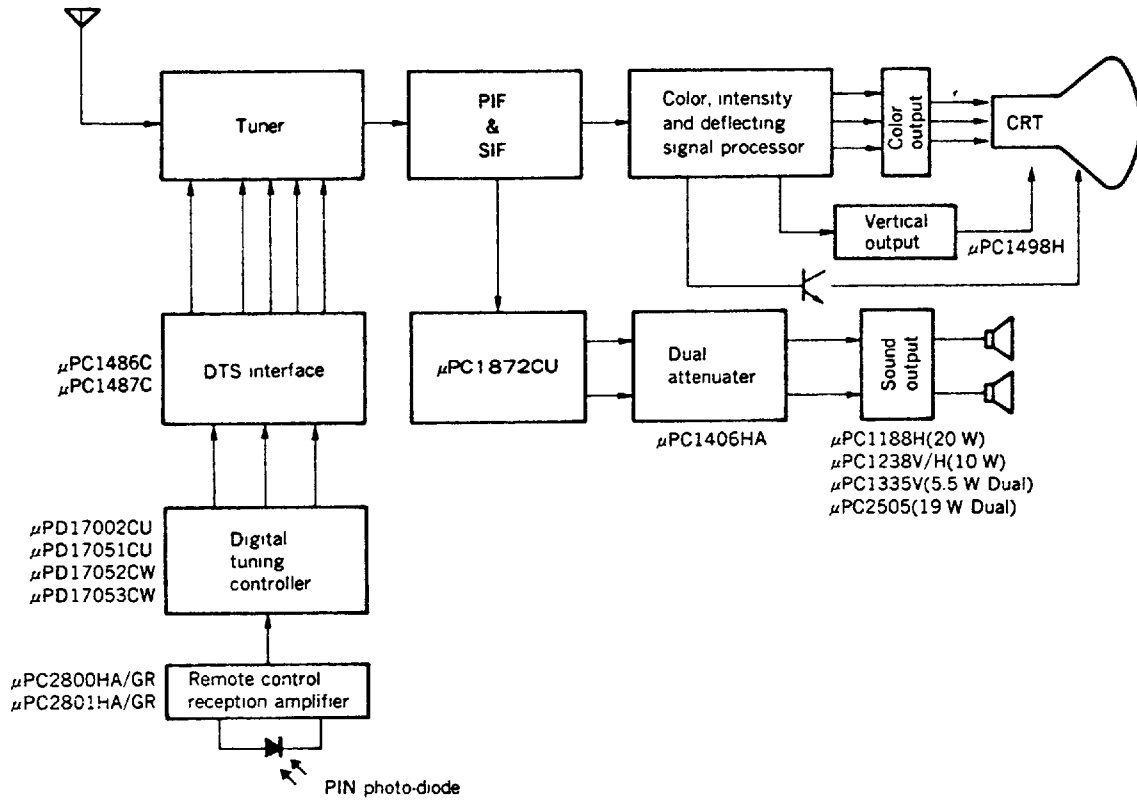
Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

The  $\mu$ PC1872CU is available only to licensees of dbx Technology Licensing.

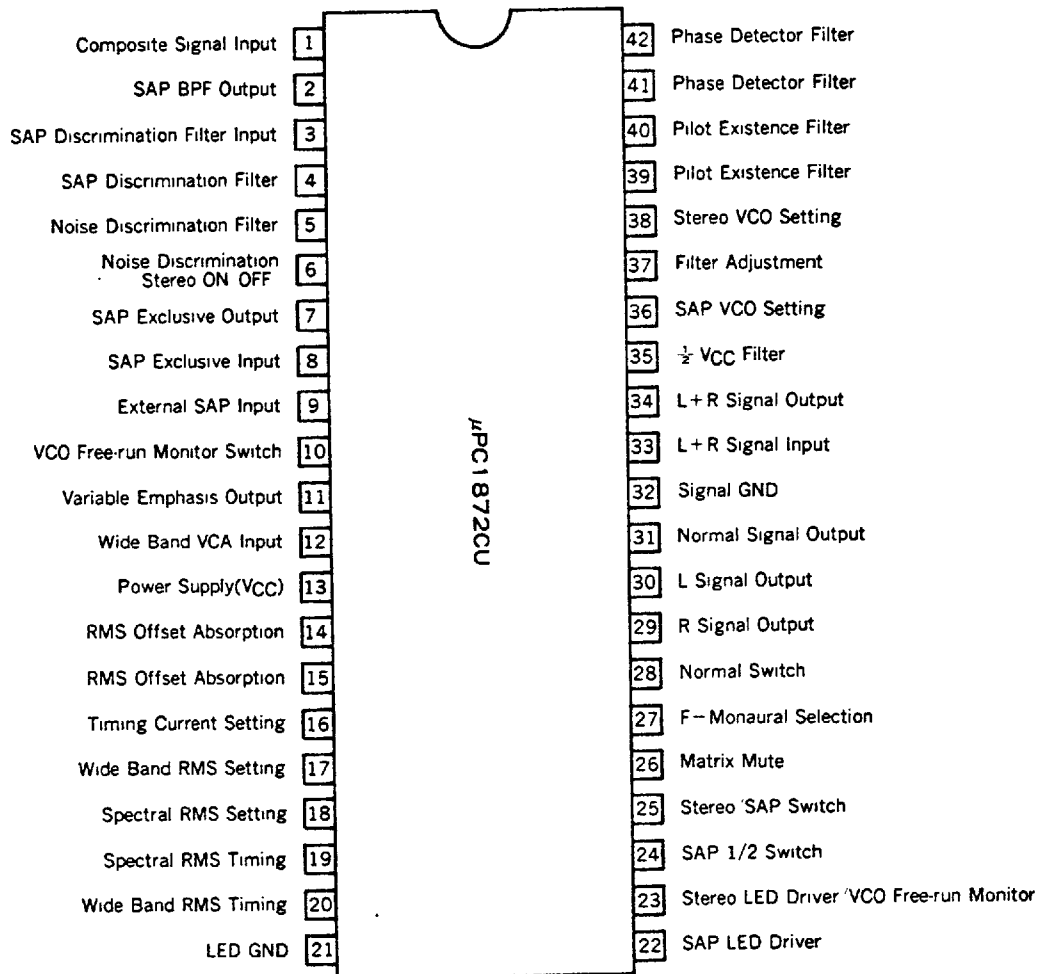
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(617) 964-4676 (USA)

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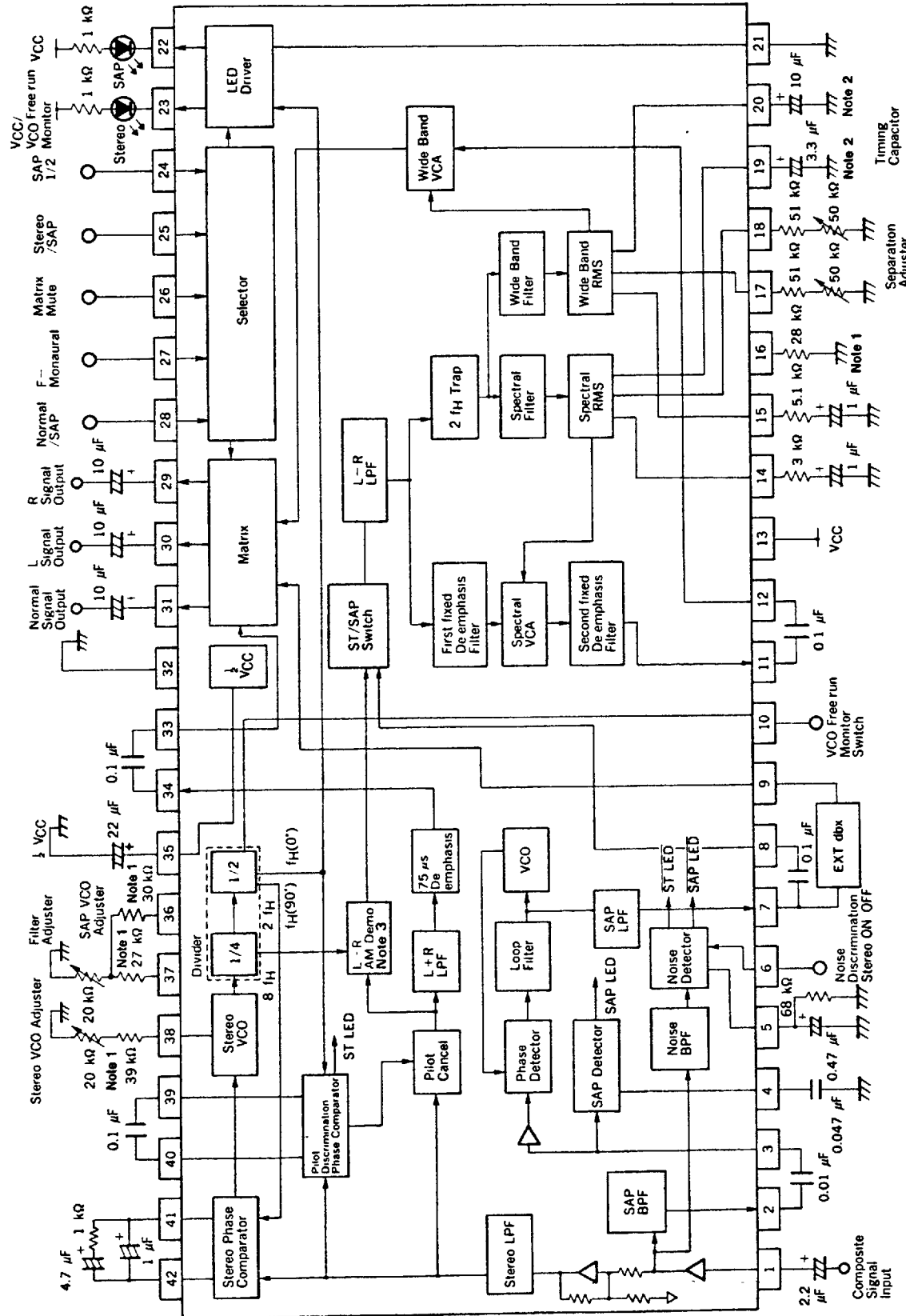
★ SYSTEM BLOCK DIAGRAM (TV)



PIN CONFIGURATION (Top View)



★ BLOCK DIAGRAM



Notes and Remarks are shown in the next page.  
 Values of parts are subject to change without notice.  
 The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

- Note**
1. Metal film resistor ( $\pm 1\%$ )
  2. Tantalum capacitor ( $\pm 5\%$ )
  3. Carrier frequency is  $2 f_H$  (31.5 kHz).

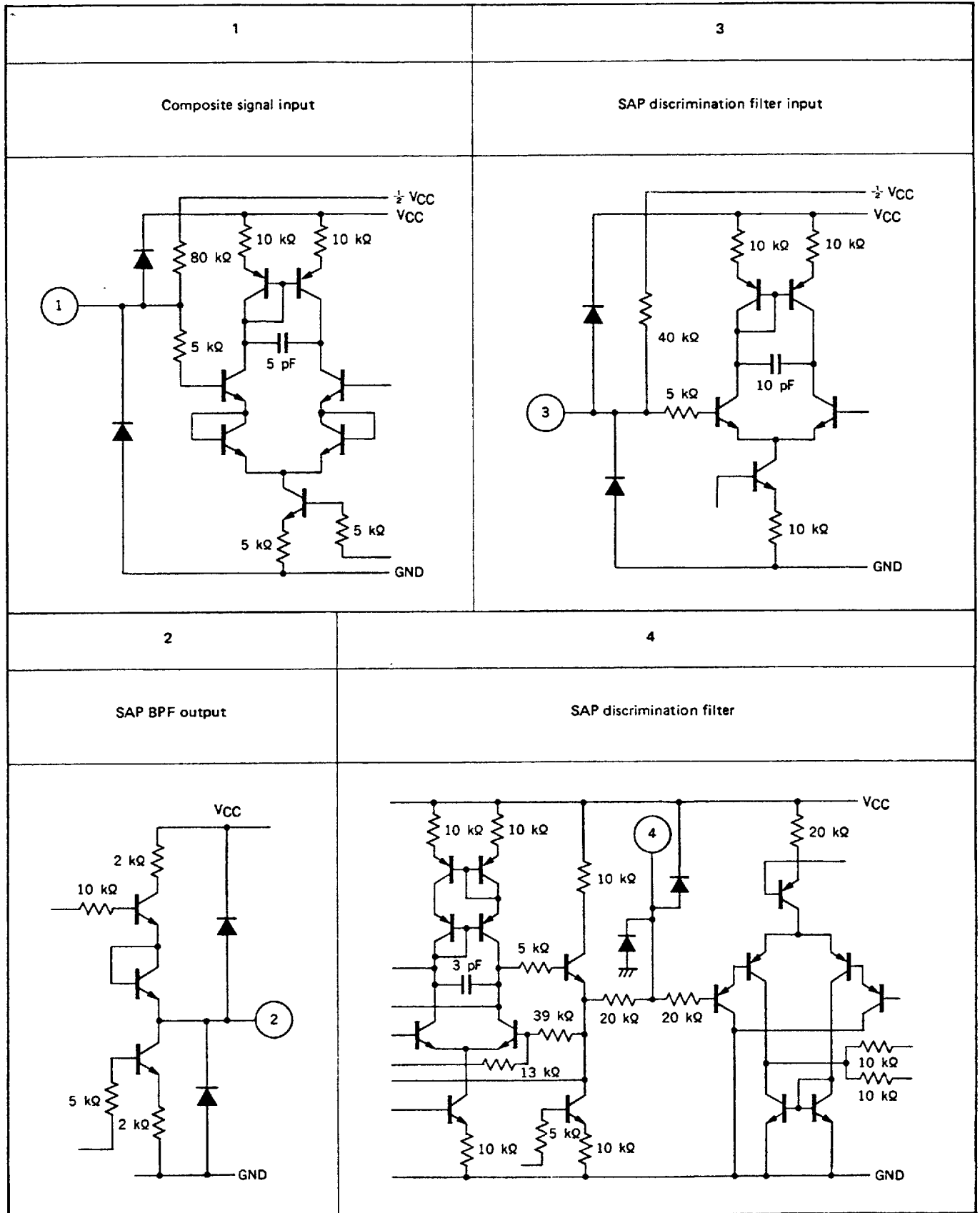
- Remark**
1. Resistors:  $\pm 5\%$  (unless otherwise specified)  
Capacitor:  $\pm 20\%$  (unless otherwise specified)  
Variable resistor:  $\pm 10\%$
  2. AM: Amplitude modulation  
LED: Light emitting diode  
LPF: Low-pass filter  
RMS: Root mean square  
VCO: Voltage controlled oscillator

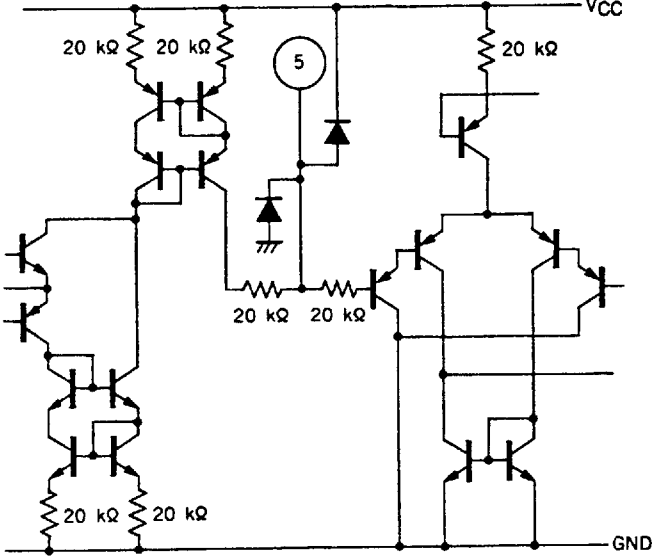
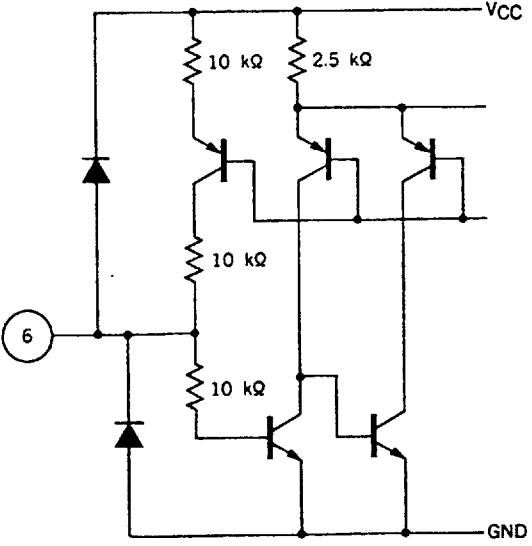
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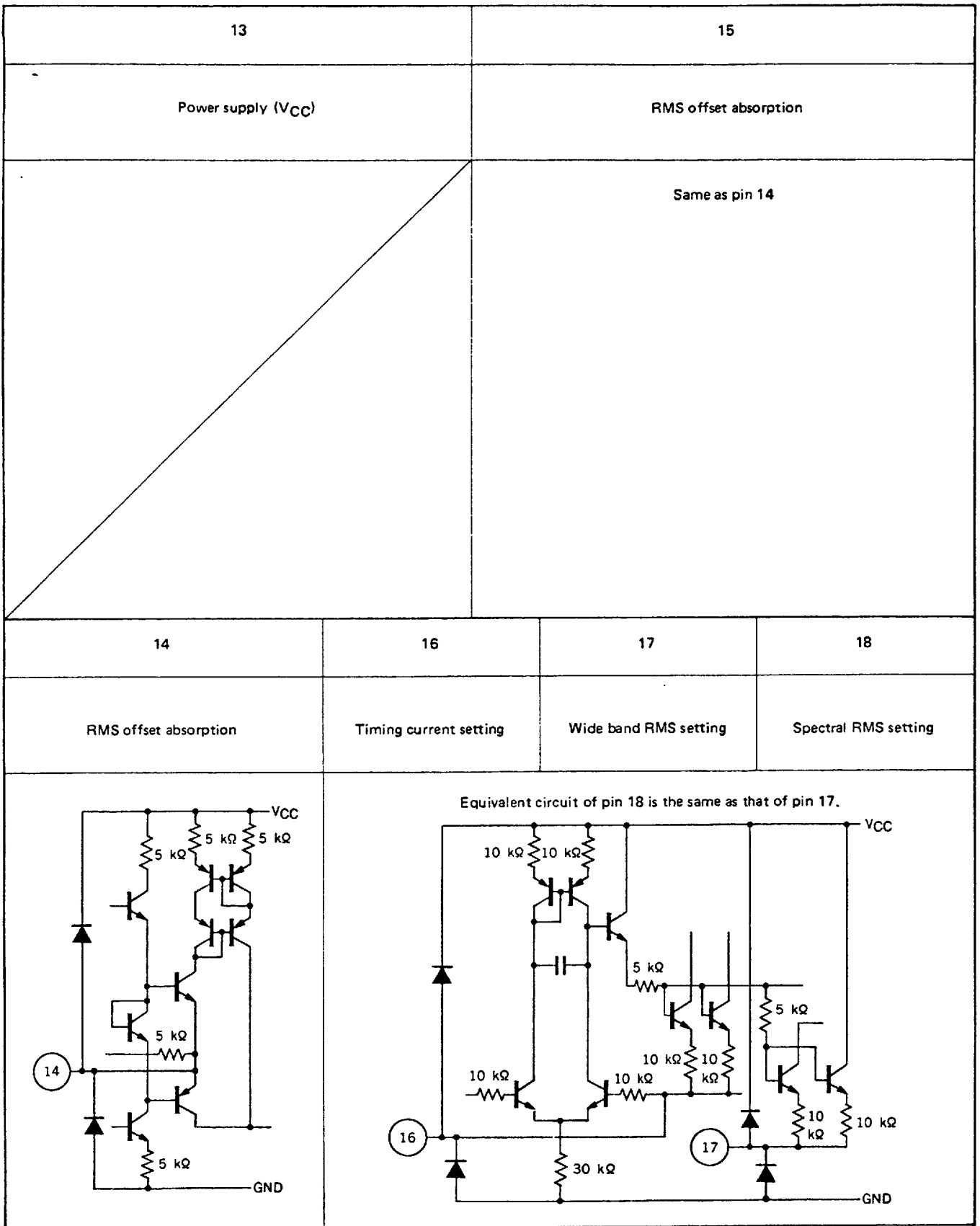
1. INTERNAL EQUIVALENT CIRCUITS

(1/9)

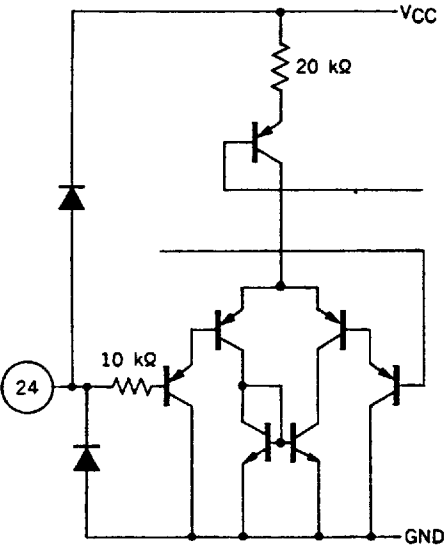
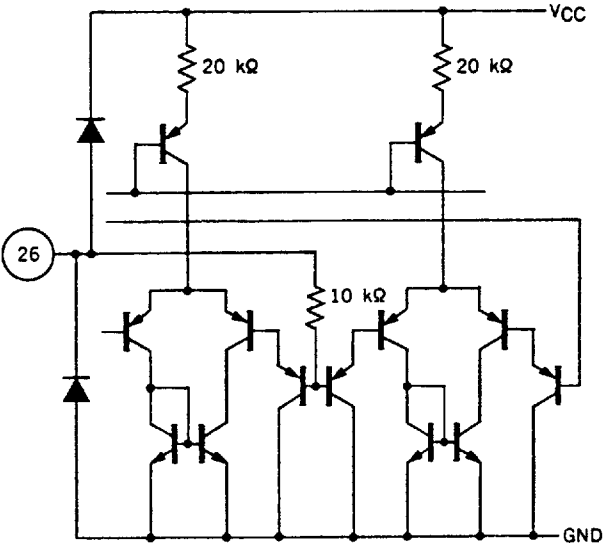


5	7
Noise discrimination filter	SAP exclusive output
	Same as pin 2
6	8
Noise discrimination stereo ON/OFF	SAP exclusive input
	Same as pin 1

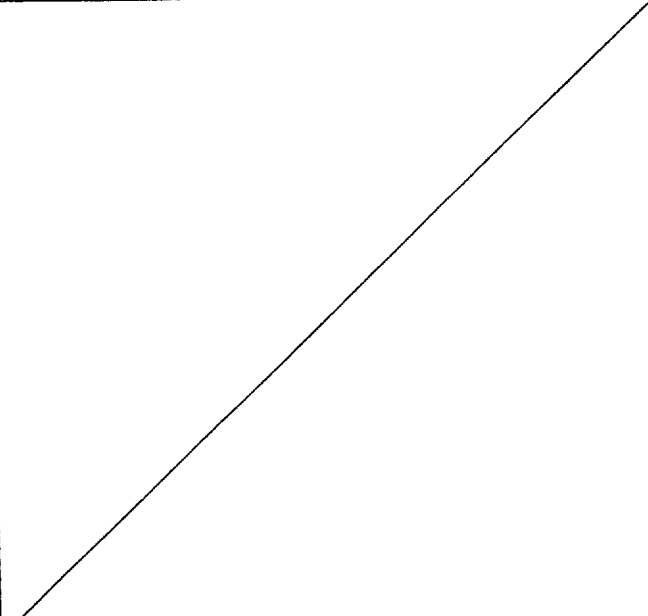
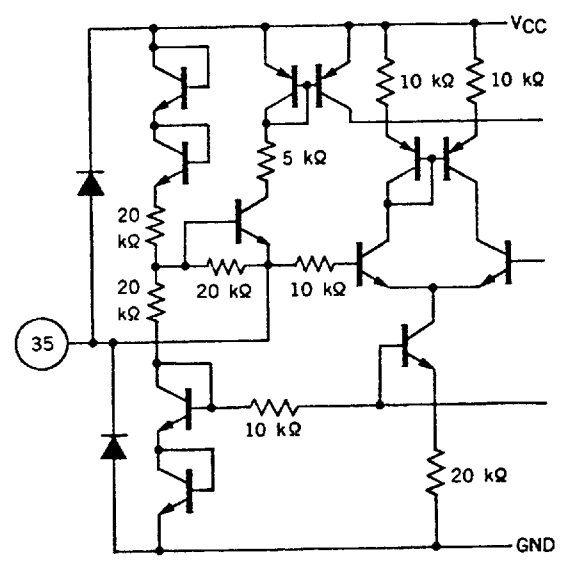
<p style="text-align: center;">9</p>	<p style="text-align: center;">11</p>
<p style="text-align: center;">External SAP input</p>	<p style="text-align: center;">Variable Emphasis output</p>
	<p style="text-align: center;">Same as pin 2</p>
<p style="text-align: center;">10</p>	<p style="text-align: center;">12</p>
<p style="text-align: center;">VCO free-run monitor switch</p>	<p style="text-align: center;">Wide band input</p>
	<p style="text-align: center;">Same as pin 9</p>

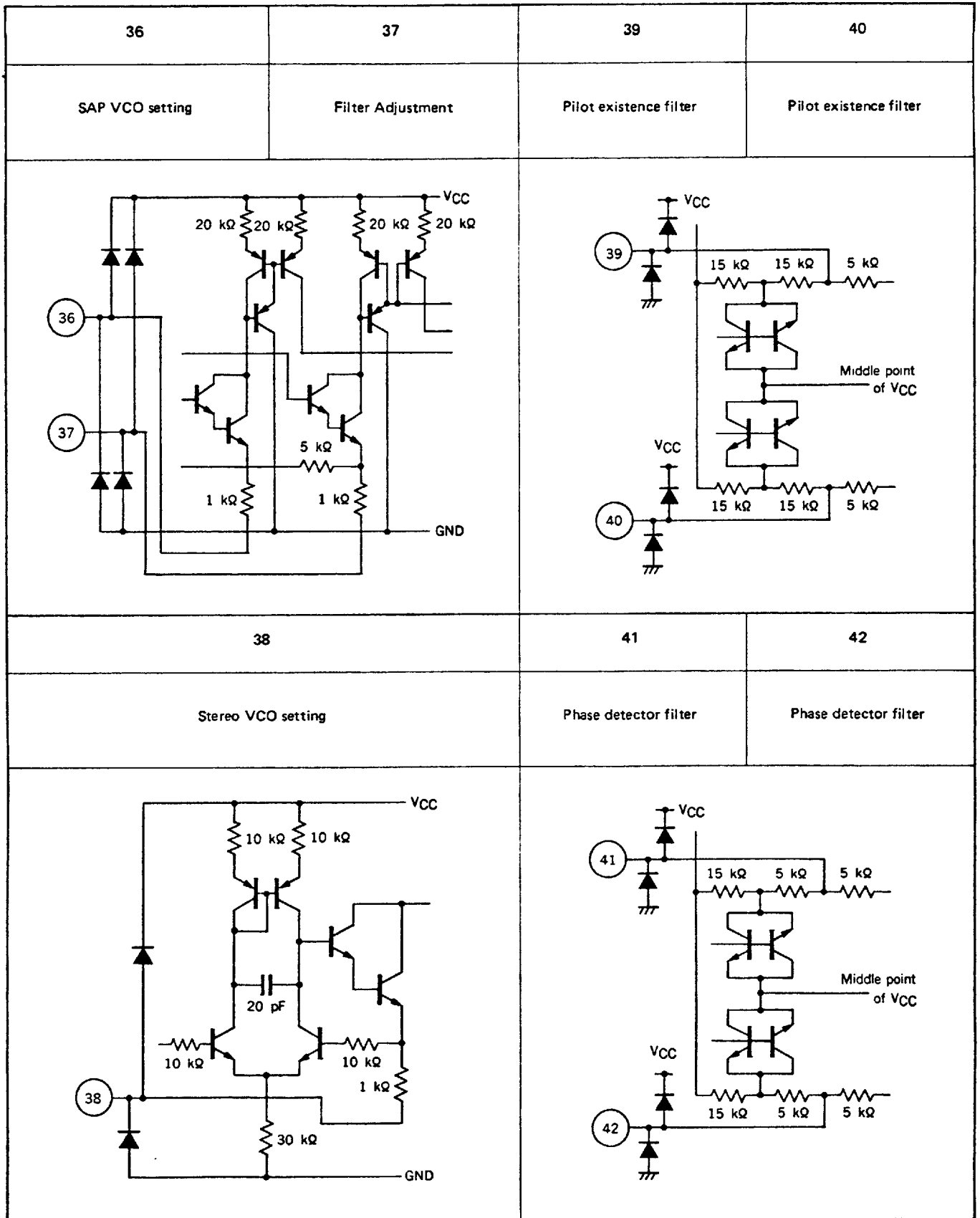


<p>19</p>	<p>21</p>	
<p>Spectral RMS timing</p>	<p>LED GND</p>	
<p>20</p>	<p>22</p>	<p>23</p>
<p>Wide band RMS timing</p>	<p>SAP LED driver</p>	<p>Stereo LED driver/ VCO free-run monitor</p>
<p>Same as pin 19</p>		

24	26
SAP 1/2 switch	Matrix mute
	
25	27
Stereo/SAP switch	F-monaural selection
Same as pin 24	Same as pin 26

<p>28</p>	<p>30</p>
<p>Normal switch</p>	<p>L signal output</p>
<p>Same as pin 26</p>	<p>Same as pin 29</p>
<p>29</p>	<p>31</p>
<p>R signal output</p>	<p>Normal signal output</p>
	<p>Same as pin 29</p>

<p>32</p>	<p>34</p>
<p>Signal GND</p>	<p>L + R signal output</p>
	<p>Same as pin 2</p>
<p>33</p>	<p>35</p>
<p>L + R signal input</p>	<p><math>\frac{1}{2} V_{CC}</math> filter</p>
<p>Same as pin 9</p>	



## ★ 2. FUNCTION OF EACH BLOCK

## 2.1 Stereo Block

## (1) Stereo low-pass filter

Filter eliminates the SAP (Sub Audio Program) signal ( $5 f_H$ ) and telemetry signal ( $6.5 f_H$ ) residing anywhere around 5 to  $6 f_H$ .

The internal L-R demodulator, which uses the double-balanced circuit, demodulates L-R signal by multiplication of L-R signal with the signal at L-R carrier frequency ( $2 f_H$ ). The L-R signal tends to be interfered by the  $6 f_H$  signal because a square waveform is used as the switching carrier in this method. To eliminate the interference, the μPC1872CU incorporates  $5 f_H$  and  $6 f_H$  traps.

Adjust the current flowing from the FILTER ADJUSTMENT (pin 37) for the filter response.

## (2) Stereo phase comparator

The  $8 f_H$  signal generated at the VCO is divided by 8 ( $4 \times 2$ ) and then multiplies it with the pilot signal passed through the stereo LPF. The two signals differ from each other by 90 degrees in terms of phase.

The resistor and capacitor connected to the PHASE DETECTOR FILTER (pins 41 and 42) form a filter which smoothes the phase error signal output from the phase comparator, converting the error signal to the DC voltage. When the voltage difference between the PHASE DETECTOR FILTER (pins 41 and 42) becomes 0 V (strictly speaking, not 0 V by the internal offset voltage), the VCO runs at  $8 f_H$ .

The lag/lead filter externally connected to the PHASE DETECTOR FILTER (pins 41 and 42) determines the capture range.

## (3) Stereo VCO

Runs at  $8 f_H$  with the internal capacitor. Adjust the current from the STEREO VCO SETTING (pin 38) for the frequency.

## (4) Divider (Flip-flop)

Produces the inphase  $f_H$  signal and the  $f_H$  signal which is different 90 degrees from the input pilot signal by dividing the  $8 f_H$  frequency by  $4 \times 2$  from the VCO.

## (5) Pilot discrimination phase comparator (Level detector)

Multiplies the pilot signal from the COMPOSITE SIGNAL INPUT (pin 1) with the inphase  $f_H$  signal from the divider. The produced signal is applied to the external filter connected to the PILOT EXISTENCE FILTER (pins 39 and 40). The signal is smoothed out to make DC voltage for judging whether to turn on or off the stereo LED.

## (6) Pilot canceler

The  $f_H$  signal from the divider is added in the stereo signal at the resistor matrix depending on the level of the input pilot signal to cancel the pilot signal.

## (7) L+R low-pass filter

This LPF, having traps at  $f_H$  and 24 kHz each, allows only the main signal to pass through. The filter response is adjusted by the FILTER ADJUSTMENT (pin 37).

## (8) 75 μs de-emphasis

Contains the 75 μs de-emphasis filter for the L+R signal. The response is adjusted by the FILTER ADJUSTMENT (pin 37).

## (9) L-R AM demodulator

Demodulates the L-R AM-DSB modulated signal by multiplying with the  $f_H$  signal which is synchronized to the pilot signal. The  $2 f_H$  square wave is used as the switching carrier.

## 2.2 SAP Block

### (1) SAP band-pass filter

Eliminates the SAP signal by the 50 kHz and 102 kHz traps, and response peak at  $5 f_H$ .  
Adjust the current from the FILTER ADJUSTMENT (pin 37) for the filter response.

### (2) Noise band-pass filter

Eliminates noises at around 180 kHz to distinguish the SAP signal from noise even in a weak electric field not to misoperate on SAP detection.  
Adjust the current from the FILTER ADJUSTMENT (pin 37) for the filter response.

### (3) Noise detector

Performs full-wave rectification of noise from noise band-pass filter to change it to the DC voltage and input it to comparator. When the noise level exceeds the reference level, the comparator outputs inverted signal to turn the LED off.  
Adjust the value of the resistor and capacitor connected to the NOISE DISCRIMINATION FILTER (pin 5) for the gain and time constant of the circuit.

### (4) SAP detector

Detects the signal coming from the SAP band-pass filter, and smoothes it with the capacitor connected the SAP DISCRIMINATION FILTER (pin 4) and input it to the comparator. When receiving the SAP signal, the comparator outputs inverted signal to turn the LED on.

### (5) Phase detector, loop filter and VCO

SAP demodulator is consist of these circuits.

The VCO oscillates at  $10 f_H$ , and performs phase-comparison between the signal which is divided by 2 of the VCO frequency and the SAP signal to make the PLL loop. Adjust the current from the SAP VCO SETTING (pin 36) for the frequency of the SAP VCO.

### (6) SAP low-pass filter

Eliminates the SAP carrier and higher frequency buzz. The filter consists of a secondary low-pass filter and  $f_H$  trap filter. Adjust the current from the FILTER ADJUSTMENT (pin 37) for the filter response.

## 2.3 dbx Block

All the filters required for the TV-dbx are incorporated. Adjust the current from the FILTER ADJUSTMENT (pin 37) for the filter response.

### (1) L-R low-pass filter

This LPF, having traps at  $f_H$  and 24 kHz each, passes only the L-R signal demodulated by the demodulator. The  $f_H$  trap filter minimizes interference to the dbx by the  $f_H$  signal which is not synchronized with the pilot signal (e.g. leakage of the synchronous idle and buzz to the video signal).

Adjust the current from the FILTER ADJUSTMENT (pin 37) for the filter response.

### (2) 1st fixed de-emphasis filter

The transfer function is as follows:

$$T(f) = \frac{1+j \frac{f}{5.23 \text{ k}}}{1+j \frac{f}{408}}$$

**(3) Spectral VCA**

Also called variable emphasis and controlled from the spectral RMS. The transfer function is as follows:

$$S^{-1}(f, b) = \frac{1+j \frac{f}{20.1 \text{ k}} \cdot \frac{1+51b}{b+1}}{1+j \frac{f}{20.1 \text{ k}} \cdot \frac{1+51}{b+1}}$$

where "b" is the variable transferred from the RMS for controlling.

**(4) Wide band VCA**

A VCA whose operating frequency range is mainly low to mid frequencies and controlled by the wide band RMS. The transfer function is as follows:

$$W^{-1}(a) = a$$

where "a" is the variable transferred from the RMS for controlling.

**(5) 2nd fixed de-emphasis filter**

The transfer function is as follows:

$$T(f) = \frac{1+j \frac{f}{62.5 \text{ k}}}{1+j \frac{f}{2.19 \text{ k}}}$$

**(6) Spectral RMS filter**

A band-pass filter that limits the band width of the signal input to the RMS which controls the spectral VCA. The transfer function is as follows:

$$T(f) = \frac{\left( j \frac{f}{7.66 \text{ k}} \right)^2}{1+j \frac{f}{7.31 \text{ k}} + \left( j \frac{f}{7.66 \text{ k}} \right)^2} \cdot \frac{j \frac{f}{3.92 \text{ k}}}{1+j \frac{f}{3.92 \text{ k}}}$$

**(7) Wide band RMS filter**

A band-pass filter that limits the band width of the signal input to the RMS which controls the wide band VCA. The transfer function is as follows:

$$T(f) = \frac{1}{\left( 1+j \frac{f}{2.09 \text{ k}} \right)^2}$$

**(8) Spectral RMS**

Detects the R.M.S. value of the signal passed through the spectral RMS filter and converts the signal to the DC voltage. Adjust the current ( $I_T$ ) from the TIMING CURRENT SETTING (pin 16) and the capacitance of the external capacitor connected to the SPECTRAL RMS TIMING (pin 19) for the release time setting.

**(9) Wide band RMS**

Detects the R.M.S. value of the signal passed through the wide band RMS filter and converts the signal to the DC voltage. Adjust the current ( $I_T$ ) from the TIMING CURRENT SETTING (pin 16) and the capacitance of the external capacitor connected to the WIDE BAND RMS TIMING (pin 20) for the release time setting.

## 2.4 Matrix Block

### (1) Matrix

~ Adds L+R signal and L-R signal to output L signal and subtracts L+R signal from L-R signal to output R signal.

### (2) Selector

Selects the user selected mode among monaural, L (R), SAP, external SAP input signal and mute, and outputs it to the R SIGNAL OUTPUT (pin 29), the L SIGNAL OUTPUT (pin 30).

2.5 Accessory Functions

2.5.1 Normal signal output (Pin 31)

L+R, SAP or external SAP signal can be output from the NORMAL SIGNAL OUTPUT (pin 31). The NORMAL SWITCH (pin 28) is used to switch these signal.

MONAURAL/SAP SWITCH MATRIX TABLE

BROADCASTING MODE	CONTROL MODE		Normal Signal Output [pin 31]
	Normal switch [pin 28]	Stereo/SAP [pin 25]	
Monaural	H	H	L + R
		L	L + R
	M	H	L + R
		L	L + R
	L	H	L + R
		L	L + R
Monaural + SAP	H	H	L + R
		L	SAP
	M	H	EXT
		L	EXT
	L	H	L + R
		L	L + R
Stereo	H	H	L + R
		L	L + R
	M	H	L + R
		L	L + R
	L	H	L + R
		L	L + R
Stereo + SAP	H	H	L + R
		L	SAP
	M	H	EXT
		L	EXT
	L	H	L + R
		L	L + R

Note EXT ... External SAP (when using 2 dbx circuits)  
 SAP ... Internal SAP (when using 1 dbx circuit)

Remark About "H" "M" "L", refer to Recommended Operating Conditions in 5. ELECTRICAL CHARACTERISTICS.

**2.5.2 Matrix Mute (pin 26)**

LED ON/OFF can be selected at muting or forced monaural operation by the MATRIX MUTE (pin 26) and the F-MONAUURAL SELECTION (pin 27).

The function of MATRIX MUTE (pin 26) is shown in following table.

MATRIX MUTE (pin 26)	NORMAL SWITCH (pin 28) R SIGNAL OUTPUT (pin 29) L SIGNAL OUTPUT (pin 29)	SAP LED DRIVER (pin 22) STEREO LED DRIVER (pin 23)
H	Mute ON	ON
M	Mute ON	OFF
L	Mute OFF	ON

**2.5.3 Noise Discrimination Stereo ON/OFF (pin 6)**

The NOISE DISCRIMINATION STEREO ON/OFF (pin 6) is used to select both stereo and SAP noise detection or only SAP noise detection.

**NOISE DISCRIMINATIONS ST ON/OFF**

NOISE DISCRIMINATION STEREO ON/OFF [pin 6]	FUNCTION
OPEN	In case of noise discrimination circuit operates, stereo demodulation circuit stops.
GND	In case of noise discrimination circuit operates, stereo demodulation circuit does not stop.

### 3. ATTENTION ON APPLICATION

#### 3.1 Impedance of Input Pins and Output Pins

Each impedance of input and output pins are the following.

Input pin	Impedance	Output pin	Impedance
1	80 kΩ	2	360 Ω
3	40 kΩ	7	360 Ω
8	80 kΩ	11	360 Ω
9	80 kΩ	29	15 Ω
12	80 kΩ	30	15 Ω
33	80 kΩ	31	15 Ω
		34	360 Ω

Scattering rate of impedance is about ±30 %.

#### 3.2 Output Load Impedance

If matrix output pins are connected to GND through 10 kΩ resistor, they can drive 700 Ω load impedance.

If the other output pin is connected to GND through 10 kΩ resistor, it can drive 10 kΩ load impedance.

If there is a load capacitance above 100 pF at the L SIGNAL OUTPUT (pin 30), the R SIGNAL OUTPUT (pin 29) and the NORMAL SIGNAL OUTPUT (pin 31), please insert a resistor between output pin (the L SIGNAL OUTPUT (pin 30), the R SIGNAL OUTPUT (pin 29) and the NORMAL SIGNAL OUTPUT (pin 31)) and a load capacitance.

#### 3.3 Attention on External Parts

Please use the (variable) resistor which has good temperature characteristics for VCO and filter adjustment.

#### 3.4 Change of Electrical Characteristics depending on External Parts

SAP sensitivity can be down by inserting a resistor between SAP DISCRIMINATION FILTER (pin 4) and GND.

Stereo sensitivity can be down by inserting a resistor between the VCO FREE-RUN MONITOR SWITCH (pin 10) and GND.

Noise sensitivity can be changed by changing a resistor between the NOISE DISCRIMINATION FILTER (pin 5) and GND.

Capture range can be changed by changing capacitor between the PHASE DETECTOR FILTER (pins 41 and 42). The smaller capacitor is, the wider capture range is, and the larger capacitor is, the narrower capture range is. Please be careful because stereo distortion rate become worse if capacitor is too small.

In case noise detection circuit doesn't operate with stereo, it is necessary that capacitor between the PILOT EXISTENCE FILTER (pins 39 and 40) is about 2.2 μF (Protection for miss operation in the weak electric field). The time for changing to stereo, become longer if capacitor is too large.

#### 4. ADJUSTMENT PROCEDURE ★

Precise alignment of the dbx decoder is absolutely critical for optimum performance. Where possible, the alignment should be performed after the μPC1872CU is mounted in the chassis and with the video system active.

##### 4.1 Stereo VCO Adjustment

Perform this adjustment with the MATRIX MUTE (pin 26) "L" and with no signal applied.

- (1) Set the VCO FREE-RUN MONITOR SWITCH (pin 10) "H" by connecting it to the POWER SUPPLY ( $V_{CC}$ ) (pin 13) through a 20 k $\Omega$  resistor.
- (2) While monitoring the output of the VCO FREE-RUN MONITOR (pin 23) with a frequency counter, adjust the variable resistor connected to the STEREO VCO SETTING (pin 38) for a measured frequency of 15.73 kHz  $\pm$ 0.1 kHz.
- (3) Set the VCO FREE-RUN MONITOR SWITCH (pin 10) unconnected.

##### 4.2 Filter Adjustment

Perform this adjustment with the MATRIX MUTE (pin 26) "L" and the VCO FREE-RUN MONITOR SWITCH (pin 10) unconnected.

- (1) Short the capacitor across the PILOT EXISTENCE FILTER (pins 39 and 40) by connecting these pins together directly.
- (2) Apply a 16.30 kHz signal to the COMPOSITE SIGNAL INPUT (pin 1) at a level greater than 30 mV<sub>r.m.s.</sub> (100 mV<sub>r.m.s.</sub> is recommended).
- (3) Adjust the variable resistor connected to the FILTER ADJUSTMENT (pin 37) so that the AC output level at the RMS OFFSET ABSORPTION (pin 14) is minimized. This signal is best monitored through a band-pass filter. A recommended circuit is shown in 7. MEASURING CIRCUIT.
- (4) Disconnect the short circuit across pins 39 and 40 after adjustment.

##### 4.3 Separation Adjustment

Perform this adjustment with the MATRIX MUTE (pin 26) "L" the VCO FREE-RUN MONITOR SWITCH (pin 10) unconnected and the F-MONAUURAL SELECTION (pin 27) "H".

Verify that a 100 % L+R signal (300 Hz, without noise reduction, pilot signal off) results in approximately 150 mV<sub>r.m.s.</sub> at the COMPOSITE SIGNAL INPUT (pin 1), and that a pilot-only signal results in 30 mV<sub>r.m.s.</sub> at the COMPOSITE SIGNAL INPUT (pin 1).

- (1) Apply a composite signal (30 % modulation, 300 Hz, L-only, with noise reduction) to the COMPOSITE SIGNAL INPUT (pin 1).
- (2) Adjust the variable resistor connected to the WIDE BAND RMS SETTING (pin 17) so that the output at the R SIGNAL OUTPUT (pin 29) is minimized.
- (3) Apply a composite signal (30 % modulation, 3 kHz, L-only, with noise reduction) to the COMPOSITE SIGNAL INPUT (pin 1).
- (4) Adjust the variable resistor connected to the SPECTRAL RMS SETTING (pin 18) so that the output at the R SIGNAL OUTPUT (pin 29) is minimized.
- (5) Repeat steps (1) and (2).

**Caution** Be sure to perform step (5).

#### 4.4 SAP VCO Adjustment

Perform this adjustment with the filter unless otherwise recommended.

Be sure to adjust SAP VCO after 4.2. Filter adjustment.

Usually, the filter and SAP VCO are adjusted simultaneously. For this reason, when this adjustment is performed, the applications of the SAP VCO SETTING (pin 36) and the FILTER ADJUSTMENT (pin 37) are modified to add variable resistor.

- (1) Input SAP signal (5 f<sub>H</sub>, no modulation) to the COMPOSITE SIGNAL INPUT (pin 1) and measure the DC voltage of the SAP EXCLUSIVE OUTPUT (pin 7).
- (2) Input no signal to the COMPOSITE SIGNAL INPUT (pin 1). Adjust the variable resistor connected to the SAP VCO SETTING (pin 36) so that the DC voltage of the SAP EXCLUSIVE OUTPUT (pin 7) may match with that of SAP signal input.

5. MODE MATRIX TABLE

BROADCASTING MODE	CONTROL MODE			OUTPUT		LED ON/OFF	
	F-Monaural Selection Pin 27	Stereo/SAP Switch Pin 25	SAP1/2 Switch Pin 24	Lch	Rch	Stereo LED	SAP LED
Monaural	H	H (Stereo)	H (SAP2)	L+R	L+R	OFF	OFF
	H	H	L (SAP1)	L+R	L+R	OFF	OFF
	H	L (SAP)	H	L+R	L+R	OFF	OFF
	H	L	L	L+R	L+R	OFF	OFF
	M	H	H	L+R	L+R	OFF	OFF
	M	H	L	L+R	L+R	OFF	OFF
	M	L	H	L+R	L+R	OFF	OFF
	M	L	L	L+R	L+R	OFF	OFF
	L	H	H	L+R	L+R	OFF	OFF
	L	H	L	L+R	L+R	OFF	OFF
	L	L	H	L+R	L+R	OFF	OFF
	L	L	L	L+R	L+R	OFF	OFF
Stereo	H	H	H	L	R	ON	OFF
	H	H	L	L	R	ON	OFF
	H	L	H	L	R	ON	OFF
	H	L	L	L	R	ON	OFF
	M	H	H	L+R	L+R	OFF	OFF
	M	H	L	L+R	L+R	OFF	OFF
	M	L	H	L+R	L+R	OFF	OFF
	M	L	L	L+R	L+R	OFF	OFF
	L	H	H	L+R	L+R	ON	OFF
	L	H	L	L+R	L+R	ON	OFF
	L	L	H	L+R	L+R	ON	OFF
	L	L	L	L+R	L+R	ON	OFF
Monaural + SAP	H	H	H	L+R	L+R	OFF	ON
	H	H	L	L+R	L+R	OFF	ON
	H	L	H	L+R	SAP	OFF	ON
	H	L	L	SAP	SAP	OFF	ON
	M	H	H	L+R	L+R	OFF	OFF
	M	H	L	L+R	L+R	OFF	OFF
	M	L	H	L+R	L+R	OFF	OFF
	M	L	L	L+R	L+R	OFF	OFF
	L	H	H	L+R	L+R	OFF	ON
	L	H	L	L+R	L+R	OFF	ON
	L	L	H	L+R	L+R	OFF	ON
	L	L	L	L+R	L+R	OFF	ON
Stereo + SAP	H	H	H	L	R	ON	ON
	H	H	L	L	R	ON	ON
	H	L	H	L+R	SAP	ON	ON
	H	L	L	SAP	SAP	ON	ON
	M	H	H	L+R	L+R	OFF	OFF
	M	H	L	L+R	L+R	OFF	OFF
	M	L	H	L+R	L+R	OFF	OFF
	M	L	L	L+R	L+R	OFF	OFF
	L	H	H	L+R	L+R	ON	ON
	L	H	L	L+R	L+R	ON	ON
	L	L	H	L+R	L+R	ON	ON
	L	L	L	L+R	L+R	ON	ON

6. ELECTRICAL CHARACTERISTICS

★ Absolute Maximum Ratings ( $T_a = +25\text{ }^\circ\text{C}$ )

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub>		11	V
LED drive current	I <sub>D</sub>	Current fed into pins 22, 23	30	mA
Control pin voltage	V <sub>CONT</sub>	Voltage applied to pins 10, 24, 25, 26, 27, 28	V <sub>CC</sub>	V
Input signal voltage	V <sub>IN</sub>	Voltage applied to pin 1	V <sub>CC</sub>	V
Power dissipation	P <sub>D</sub>	T <sub>a</sub> = +75 °C	700	mW
Operating temperature	T <sub>opt</sub>	V <sub>CC</sub> = 9 V	-20 to +75	°C
Storage temperature	T <sub>stg</sub>		-30 to +125	°C

Recommended Operating Conditions

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Supply voltage	V <sub>CC</sub>		8.0	9.0	10.0	V
LED drive current	I <sub>D</sub>	Current fed into pins 22, 23			25	mA
Output load impedance 1	R <sub>L1</sub>	A.C. load impedance which can drive output from pins 29, 30, 31 (at 100 %-modulation)	2			kΩ
Output load impedance 2	R <sub>L2</sub>	A.C. load impedance which can drive output from pins 7 (at 100 %-modulation)	10			kΩ
Signal input voltage	V <sub>in</sub>	L+R	Signal Voltage applied to pin 1 (at 100 %-modulation in case of L+R, L-R signal.)	0.424		V <sub>p-p</sub>
		L-R		0.848		V <sub>p-p</sub>
		Pilot		0.0848		V <sub>p-p</sub>
		SAP		0.254		V <sub>p-p</sub>
Control pin voltage 1 (High)	V <sub>cont1</sub> (H)	High voltage of pins 26, 27, 28	3.5		V <sub>CC</sub>	V
Control pin voltage 1 (Mid.)	V <sub>cont1</sub> (M)	Middle voltage of pins 26, 27, 28	1.5		2.5	V
Control pin voltage 1 (Low)	V <sub>cont1</sub> (L)	Low voltage of pins 26, 27, 28	0		0.8	V
Control pin voltage 2 (High)	V <sub>cont2</sub> (H)	High voltage of pins 24, 25	3.5		V <sub>CC</sub>	V
Control pin voltage 2 (Low)	V <sub>cont2</sub> (L)	Low voltage of pins 24, 25	0		2.5	V

Electrical Characteristics ( $T_a = +25^\circ\text{C}$ ,  $\text{RH} \leq 70\%$ ,  $V_{\text{CC}} = 9.0\text{V}$  unless otherwise specified)

(1/2)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Supply current	$I_{\text{CC}}$	No signal	19	27	38	mA
Stereo switch input sensitivity	$ST_{\text{SENSE}}$	$f = 15.73\text{ kHz}$	11	16	21	$\text{mV}_{\text{r.m.s.}}$
Stereo switch hysteresis	$ST_{\text{HY}}$	$f = 15.73\text{ kHz}$	4.5	7.0	9.5	dB
Stereo phase detection capture range	CC	$V_{\text{in}} = 30\text{ mV}_{\text{r.m.s.}}$	$\pm 2.5$	$\pm 4.0$	$\pm 5.5$	%
SAP switch input sensitivity	$SAP_{\text{SENSE}}$	$f = 78.67\text{ kHz}$	17	23	30	$\text{mV}_{\text{r.m.s.}}$
SAP discrimination hysteresis	$SAP_{\text{HY}}$	$f = 78.67\text{ kHz}$	3.3	4.8	6.3	dB
SAP noise discrimination sensitivity	$NO_{\text{SENSE}}$	$f = 160\text{ kHz}$ , $V_i = 10\text{ mV}_{\text{r.m.s.}}$	21	30	40	$\text{mV}_{\text{r.m.s.}}$
SAP noise discrimination hysteresis	$NO_{\text{HY}}$	$f = 160\text{ kHz}$ , $V_i = 90\text{ mV}_{\text{r.m.s.}}$	1.0	2.0	3.0	dB
Monaural total output voltage	$V_{\text{OMO}}$	$f = 300\text{ Hz}$ , 100 % modulation	450	500	550	$\text{mV}_{\text{r.m.s.}}$
Stereo total output voltage	$V_{\text{OST}}$	$f = 300\text{ Hz}$ , 100 % modulation	450	500	550	$\text{mV}_{\text{r.m.s.}}$
SAP total output voltage	$V_{\text{OSAP1}}$	$f = 300\text{ Hz}$ , 100 % modulation	450	500	600	$\text{mV}_{\text{r.m.s.}}$
Difference between monaural L and R output voltage	$V_{\text{OLR}}$	$f = 300\text{ Hz}$ , 100 % modulation	-0.5	0	+0.5	dB
SAP single output voltage	$V_{\text{OSAP2}}$	$f = 300\text{ Hz}$ , 100 % modulation	450	500	550	$\text{mV}_{\text{r.m.s.}}$
Normal output voltage	$V_{\text{ONO}}$	$f = 300\text{ Hz}$ , 100 % modulation	450	500	550	$\text{mV}_{\text{r.m.s.}}$
Monaural total frequency characteristics 1	$V_{\text{OMO1}}$	$f = 1\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.5	0	+0.5	dB
Monaural total frequency characteristics 2	$V_{\text{OMO2}}$	$f = 3\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.5	0	+0.5	dB
Monaural total frequency characteristics 3	$V_{\text{OMO3}}$	$f = 8\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.8	0	+0.8	dB
Monaural total frequency characteristics 4	$V_{\text{OMO4}}$	$f = 12\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-5.5	-3.0	-0.5	dB
Stereo total frequency characteristics 1	$V_{\text{OST1}}$	$f = 1\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.5	0	+0.5	dB
Stereo total frequency characteristics 2	$V_{\text{OST2}}$	$f = 3\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.5	0	+0.5	dB
Stereo total frequency characteristics 3	$V_{\text{OST3}}$	$f = 8\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.9	0	+0.9	dB
Stereo total frequency characteristics 4	$V_{\text{OST4}}$	$f = 12\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-8.0	-5.0	-2.0	dB
SAP total frequency characteristics 1	$V_{\text{OSAP11}}$	$f = 1\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-1.2	+0.3	+1.2	dB
SAP total frequency characteristics 2	$V_{\text{OSAP12}}$	$f = 3\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.3	+0.8	+1.9	dB
SAP total frequency characteristics 3	$V_{\text{OSAP13}}$	$f = 8\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-1.0	+1.0	+3.0	dB
SAP single frequency characteristics 1	$V_{\text{OSAP21}}$	$f = 1\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.5	0	+0.5	dB
SAP single frequency characteristics 2	$V_{\text{OSAP22}}$	$f = 3\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-0.5	0	+0.5	dB
SAP single frequency characteristics 3	$V_{\text{OSAP23}}$	$f = 8\text{ kHz}$ , 30 % modulation ( $f = 300\text{ Hz} : 0\text{ dB}$ )	-1.0	0	+1.0	dB
Stereo channel separation 1	$Sep_1$	$f = 300\text{ Hz}$ , 30 % modulation	27	32	-	dB
Stereo channel separation 2	$Sep_2$	$f = 1\text{ kHz}$ , 30 % modulation	25	30	-	dB
Stereo channel separation 3	$Sep_3$	$f = 3\text{ kHz}$ , 30 % modulation	27	35	-	dB
Stereo channel separation 4	$Sep_4$	$f = 8\text{ kHz}$ , 30 % modulation	23	30	-	dB

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Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Monaural total distortion rate	THDMO	f = 1 kHz, 100 % modulation	—	0.1	0.5	%
Stéréo total distortion rate 1	THDST1	f = 1 kHz, 100 % modulation	—	0.3	1.5	%
Stereo total distortion rate 2	THDST2	f = 8 kHz, 30 % modulation	—	0.8	1.8	%
SAP total distortion rate	THDSAP1	f = 1 kHz, 100 % modulation	—	0.5	2.0	%
SAP single distortion rate	THDSAP2	f = 1 kHz, 100 % modulation	—	0.7	2.0	%
Normal single distortion rate	THDNO	f = 1 kHz, 100 % modulation	—	0.1	0.5	%
Cross talk from SAP to stereo	CT <sub>1</sub>		—	-60	-50	dB
Cross talk from stereo to SAP	CT <sub>2</sub>		—	-60	-50	dB
Total muting level	Mute	f = 1 kHz, 100 % modulation	60	70	—	dB
LED driver saturation voltage	V <sub>OSAT</sub>	I = 10 mA	—	0.1	0.3	V
dbx timing current	I <sub>T</sub>	Current flowing into pins 19, 20	7.1	7.5	7.9	μA
Inter-mode DC offset 1	V <sub>DOF1</sub>	Mute → Monaural	-50	0	+50	mV
Inter-mode DC offset 2	V <sub>DOF2</sub>	Mute → Stereo	-50	0	+50	mV
Inter-mode DC offset 3	V <sub>DOF3</sub>	Mute → SAP	-50	0	+50	mV
Inter-mode DC offset 4	V <sub>DOF4</sub>	Mute → Monaural (Nch)	-50	0	+50	mV
Inter-mode DC offset 5	V <sub>DOF5</sub>	Mute → SAP (Nch)	-50	0	+50	mV
Monaural total S/N	S/N <sub>MO</sub>	f = 300 Hz, 100 % modulation	65	68	—	dB
Stereo total S/N	S/N <sub>ST</sub>	f = 300 Hz, 100 % modulation	65	68	—	dB
SAP total S/N	S/N <sub>SAP</sub>	f = 300 Hz, 100 % modulation	70	80	—	dB

Electrical Characteristics Measurement List ( $T_a = +25\text{ }^\circ\text{C}$ ,  $RH \leq 70\%$ ,  $V_{CC} = 9.0\text{ V}$ )

(1/6)

No.	Parameter	Symbol	Measurement
1-1	Supply current	$I_{CC}$	Current flowing to pin 13 (no signal).
2-1	Stereo switch input sensitivity	$ST_{SENSE}$	Input signal ( $f = 15.73\text{ kHz}$ ) to pin 1. Raise input voltage gradually until stereo LED turns ON. Then measure input voltage of pin 1.
2-2	Stereo switch hysteresis	$ST_{HY}$	Input signal ( $f = 15.73\text{ kHz}$ ) to pin 1 for stereo LED to be ON. Lower input voltage gradually until stereo LED turns OFF. Then assume input voltage "V". $ST_{HY} = 20 \log \frac{ST_{SENSE}}{V}$
2-3	Stereo phase detection capture range	$CC$	Input signal ( $f = 14.5\text{ kHz}$ , $V_{in} = 0.084\text{ V}_{p-p}$ [ $30\text{ mV}_{r.m.s.}$ ]) to pin 1. Raise input frequency gradually until stereo LED turns ON. Then assume input frequency " $f_{in1}$ ". $CC = \frac{15.734\text{ [kHz]} - f_{in1}}{15.734\text{ [kHz]}}$ Next, input signal ( $f = 17.0\text{ kHz}$ , $V_{in} = 0.084\text{ V}_{p-p}$ [ $30\text{ mV}_{r.m.s.}$ ]) to pin 1. Lower input frequency gradually until stereo LED turns ON. Then assume input frequency " $f_{in2}$ ". $CC = \frac{f_{in2} - 15.734\text{ [kHz]}}{15.734\text{ [kHz]}}$
2-4	SAP switch input sensitivity	$SAP_{SENSE}$	Input signal ( $f = 78.67\text{ kHz}$ , no modulation) to pin 1. Raise input voltage gradually until SAP LED turns ON. Then measure input voltage of pin 1.
2-5	SAP discrimination hysteresis	$SAP_{HY}$	Input signal ( $f = 78.67\text{ kHz}$ , no modulation) to pin 1 for SAP LED to be ON. Lower input voltage gradually until SAP LED turns OFF. Then assume input voltage "V". $SAP_{HY} = 20 \log \frac{SAP_{SENSE}}{V}$
2-6	SAP noise discrimination sensitivity	$NO_{SENSE}$	Apply 6.0 V to pin 4. Input signal ( $f = 160\text{ kHz}$ , $V_i = 10\text{ mV}_{r.m.s.}$ ) to pin 1. Raise frequency and measure the DC voltage of pin 5. At maximum voltage, raise input voltage gradually until SAP LED turns OFF. Then measure input voltage of pin 1.
2-7	SAP noise discrimination hysteresis	$NO_{HY}$	Apply 6.0 V to pin 4. Input signal ( $f = 160\text{ kHz}$ , $V_i = 90\text{ mV}_{r.m.s.}$ ) to pin 1. Raise frequency and measure the DC voltage of pin 5. At maximum voltage, lower input voltage gradually until SAP LED turns ON. Then assume input voltage of pin 1 "V". $NO_{HY} = 20 \log \frac{NO_{SENSE}}{V}$
3-1	Monaural total output voltage	$V_{OMO}$	Set pins 26 and 27 to "L". Input monaural signal (100 % modulation, $f = 300\text{ Hz}$ ) to pin 1. Measure output voltage of pin 29. Execute the same operation for pin 30.
3-2	Stereo total output voltage	$V_{OST}$	Set pins 25, 26 to "H" and pin 27 to "L". Input L-only signal (100 % modulation, $f = 300\text{ Hz}$ ) to pin 1. Measure output voltage of pin 30. Execute the same operation for pin 29 (R-only signal).
3-3	SAP total output voltage	$V_{OSAP1}$	Set pin 27 to "H" and pins 24, 25, 26 to "L". Input SAP signal (100 % modulation, $f = 300\text{ Hz}$ ) to pin 1. Measure output voltage of pin 29. Execute the same operation for pin 30 (R-only signal).
3-4	Difference between monaural L and R output voltages	$V_{OLR}$	Set pin 26 and 27 to "L". Input monaural signal (100 % modulation, $f = 300\text{ Hz}$ ) to pin 1. Measure output voltage of pin 29 and 30. Assume the output voltage of pin 29 " $V_{29}$ " and the output voltage of pin 30 " $V_{30}$ ". $V_{OLR} = 20 \log \frac{V_{30}}{V_{29}}$
3-5	SAP single output voltage	$V_{OSAP2}$	Set pin 27 to "H" and pins 24, 25, 26 to "L". Input SAP signal (100 % modulation, $f = 300\text{ Hz}$ ) to pin 1. Measure output voltage of pin 7. (Noise reduction OFF)

No.	Parameter	Symbol	Measurement
3-6	Normal output voltage	VONO	Set pin 28 to "L". Input monaural signal (100 % modulation, f = 300 Hz) to pin 1. Measure output voltage of pin 31.
4-1	Monaural total frequency characteristics 1	VOMO1	Set pins 26 and 27 to "L". Input monaural signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 29 "V <sub>300(MO)</sub> ". Input monaural signal (30 % modulation, f = 1 kHz) to pin 1. Assume output voltage of pin 29 "V <sub>1k(MO)</sub> ". $VOMO1 = 20 \log \frac{V_{1k(MO)}}{V_{300(MO)}}$ Execute the same operation for pin 30.
4-2	Monaural total frequency characteristics 2	VOMO2	Set pins 26 and 27 to "L". Input monaural signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 29 "V <sub>300(MO)</sub> ". Input monaural signal (30 % modulation, f = 3 kHz) to pin 1. Assume output voltage of pin 29 "V <sub>3k(MO)</sub> ". $VOMO2 = 20 \log \frac{V_{3k(MO)}}{V_{300(MO)}}$ Execute the same operation for pin 30.
4-3	Monaural total frequency characteristics 3	VOMO3	Set pins 26 and 27 to "L". Input monaural signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 29 "V <sub>300(MO)</sub> ". Input monaural signal (30 % modulation, f = 8 kHz) to pin 1. Assume output voltage of pin 29 "V <sub>8k(MO)</sub> ". $VOMO3 = 20 \log \frac{V_{8k(MO)}}{V_{300(MO)}}$ Execute the same operation for pin 20.
4-4	Monaural total frequency characteristics 4	VOMO4	Set pins 26 and 27 to "L". Input monaural signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 29 "V <sub>300(MO)</sub> ". Input monaural signal (30 % modulation, f = 12 kHz) to pin 1. Assume output voltage of pin 29 "V <sub>12k(MO)</sub> ". $VOMO4 = 20 \log \frac{V_{12k(MO)}}{V_{300(MO)}}$ Execute the same operation for pin 30.
4-5	Stereo total frequency characteristics 1	VOST1	Set pins 25, 27 to "H" and pin 26 to "L". Input L-only signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 30 "V <sub>300(ST)</sub> ". Input L-only signal (30 % modulation, f = 1 kHz) to pin 1. Assume output voltage of pin 30 "V <sub>1k(ST)</sub> ". $VOST1 = 20 \log \frac{V_{1k(ST)}}{V_{300(ST)}}$ Execute the same operation for pin 29 (R-only signal).
4-6	Stereo total frequency characteristics 2	VOST2	Set pins 25, 27 to "H" and pin 26 to "L". Input L-only signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 30 "V <sub>300(ST)</sub> ". Input L-only signal (30 % modulation, f = 3 kHz) to pin 1. Assume output voltage of pin 30 "V <sub>3k(ST)</sub> ". $VOST2 = 20 \log \frac{V_{3k(ST)}}{V_{300(ST)}}$ Execute the same operation for pin 29 (R-only signal).
4-7	Stereo total frequency characteristics 3	VOST3	Set pins 25, 27 to "H" and pin 26 to "L". Input L-only signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 30 "V <sub>300(ST)</sub> ". Input L-only signal (30 % modulation, f = 8 kHz) to pin 1. Assume output voltage of pin 30 "V <sub>8k(ST)</sub> ". $VOST3 = 20 \log \frac{V_{8k(ST)}}{V_{300(ST)}}$ Execute the same operation for pin 29 (R-only signal).

No.	Parameter	Symbol	Measurement
4-8	Stereo total frequency characteristics 4	VOST4	<p>Set pins 25, 27 to "H" and pin 26 to "L".                      Input L-only signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 30 "V<sub>300 (ST)</sub>".                      Input L-only signal (30 % modulation, f = 12 kHz) to pin 1. Assume output voltage of pin 30 "V<sub>12k (ST)</sub>".</p> $V_{OST4} = 20 \log \frac{V_{12k (ST)}}{V_{300 (ST)}}$ <p>Execute the same operation for pin 29 (R-only signal).</p>
4-9	SAP total frequency characteristics 1	VOSAP11	<p>Set pin 27 to "H" and pins 24, 25, 26 to "L".                      Input SAP signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 30 "V<sub>300 (SAP)</sub>".                      Input SAP signal (30 % modulation, f = 1 kHz) to pin 1. Assume output voltage of pin 30 "V<sub>1k (SAP)</sub>".</p> $V_{OSAP1} = 20 \log \frac{V_{1k (SAP)}}{V_{300 (SAP)}}$ <p>Execute the same operation for pin 29.</p>
4-10	SAP total frequency characteristics 2	VOSAP12	<p>Set pin 27 to "H" and pins 24, 25, 26 to "L".                      Input SAP signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 30 "V<sub>300 (SAP)</sub>".                      Input SAP signal (30 % modulation, f = 3 kHz) to pin 1. Assume output voltage of pin 30 "V<sub>3k (SAP)</sub>".</p> $V_{OSAP12} = 20 \log \frac{V_{3k (SAP)}}{V_{300 (SAP)}}$ <p>Execute the same operation for pin 29.</p>
4-11	SAP total frequency characteristics 3	VOSAP13	<p>Set pin 27 to "H" and pins 24, 25, 26 to "L".                      Input SAP signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 30 "V<sub>300 (SAP)</sub>".                      Input SAP signal (30 % modulation, f = 8 kHz) to pin 1. Assume output voltage of pin 30 "V<sub>8k (SAP)</sub>".</p> $V_{OSAP13} = 20 \log \frac{V_{8k (SAP)}}{V_{300 (SAP)}}$ <p>Execute the same operation for pin 29.</p>
4-12	SAP single frequency characteristics 1	VOSAP21	<p>Input SAP signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 7 "V<sub>300 (SAP)</sub>".                      Input SAP signal (30 % modulation, f = 1 kHz) to pin 1. Assume output voltage of pin 7 "V<sub>1k (SAP)</sub>".</p> $V_{OSAP21} = 20 \log \frac{V_{1k (SAP)}}{V_{300 (SAP)}}$ <p>(Noise reduction OFF)                      Execute the same operation for pin 29.</p>
4-13	SAP single frequency characteristics 2	VOSAP22	<p>Input SAP signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 7 "V<sub>300 (SAP)</sub>".                      Input SAP signal (30 % modulation, f = 3 kHz) to pin 1. Assume output voltage of pin 7 "V<sub>3k (SAP)</sub>".</p> $V_{OSAP22} = 20 \log \frac{V_{3k (SAP)}}{V_{300 (SAP)}}$ <p>(Noise reduction OFF)                      Execute the same operation for pin 29.</p>
4-14	SAP single frequency characteristics 3	VOSAP23	<p>Input SAP signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 7 "V<sub>300 (SAP)</sub>".                      Input SAP signal (30 % modulation, f = 8 kHz) to pin 1. Assume output voltage of pin 7 "V<sub>8k (SAP)</sub>".</p> $V_{OSAP23} = 20 \log \frac{V_{8k (SAP)}}{V_{300 (SAP)}}$ <p>(Noise reduction OFF)                      Execute the same operation for pin 29.</p>

No.	Parameter	Symbol	Measurement
5-1	Stereo channel separation 1	Sep <sub>1</sub>	<p>Set pins 25, 27 to "H" and pin 26 to "L".                      Input L-only signal (30 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 29 "V<sub>O29</sub>" and output voltage of pin 30 "V<sub>O30</sub>".</p> $\text{Sep}_1 = 20 \log \frac{V_{O30}}{V_{O29}}$ <p>Execute the same operation for R-only signal.                      (Sound multiplex signal generator: 465Z (Eiden))</p>
5-2	Stereo channel separation 2	Sep <sub>2</sub>	<p>Set pins 25, 27 to "H" and pin 26 to "L".                      Input L-only signal (30 % modulation, f = 1 kHz) to pin 1. Assume output voltage of pin 29 "V<sub>O29</sub>" and output voltage of pin 30 "V<sub>O30</sub>".</p> $\text{Sep}_2 = 20 \log \frac{V_{O30}}{V_{O29}}$ <p>Execute the same operation for R-only signal.                      (Sound multiplex signal generator: 465Z (Eiden))</p>
5-3	Stereo channel separation 3	Sep <sub>3</sub>	<p>Set pins 25, 27 to "H" and pin 26 to "L".                      Input L-only signal (30 % modulation, f = 3 kHz) to pin 1. Assume output voltage of pin 29 "V<sub>O29</sub>" and output voltage of pin 30 "V<sub>O30</sub>".</p> $\text{Sep}_3 = 20 \log \frac{V_{O30}}{V_{O29}}$ <p>Execute the same operation for R-only signal.                      (Sound multiplex signal generator: 465Z (Eiden))</p>
5-4	Stereo channel separation 4	Sep <sub>4</sub>	<p>Set pins 25, 27 to "H" and pin 26 to "L".                      Input L-only signal (30 % modulation, f = 8 kHz) to pin 1. Assume output voltage of pin 29 "V<sub>O29</sub>" and output voltage of pin 30 "V<sub>O30</sub>".</p> $\text{Sep}_4 = 20 \log \frac{V_{O30}}{V_{O29}}$ <p>Execute the same operation for R-only signal.                      (Sound multiplex signal generator: 465Z (Eiden))</p>
6-1	Monaural total distortion rate	THD <sub>MO</sub>	<p>Set pins 26 and 27 to "L".                      Input monaural signal (100 % modulation, f = 1 kHz) to pin 1. Measure output distortion rate of pin 29 and 30.</p>
6-2	Stereo total distortion rate 1	THD <sub>ST1</sub>	<p>Set pins 25, 27 to "H" and pin 26 to "L".                      Input L-only signal (100 % modulation, f = 1 kHz) to pin 1. Measure output distortion rate of pin 29 and 30.</p>
6-3	Stereo total distortion rate 2	THD <sub>ST2</sub>	<p>Set pins 25, 27 to "H" and pin 26 to "L".                      Input L-only signal (100 % modulation, f = 8 kHz) to pin 1. Measure output distortion rate of pin 29 and 30.</p>
6-4	SAP total distortion rate	THD <sub>SAP1</sub>	<p>Set pin 27 to "H" and pins 24, 25, 26 to "L".                      Input SAP signal (100 % modulation, f = 1 kHz) to pin 1. Measure output distortion rate of pin 29 and 30.</p>
6-5	SAP single distortion rate	THD <sub>SAP2</sub>	<p>Set pin 27 to "H" and pins 24, 25, 26 to "L".                      Input SAP signal (100 % modulation, f = 1 kHz) to pin 1. Measure output distortion rate of pin 7.                      (noise reduction OFF)</p>
6-6	Normal single distortion rate	THD <sub>NO</sub>	<p>Input monaural signal (100 % modulation, f = 1 kHz) to pin 1, and measure the normal single distortion rate of pin 29 and 30.</p>
7-1	Cross talk 1 (SAP → stereo)	CT <sub>1</sub>	<p>Set pins 25, 27 to "H" and 26 to "L".                      Input L-only signal (f = 800 kHz, 30 % modulation) and SAP signal (f = 3 kHz, 30 % modulation) to pin 1. Assume output voltage of the pin 30 "V<sub>30</sub>".                      Connect pin 30 to 3 kHz BPF (gain = 0 dB at f = 3 kHz, -80 dB or more at f = 800 Hz) to pin 30. Assume output voltage of BPF "V<sub>30CT1</sub>".</p> $\text{CT}_1 = 20 \log \frac{V_{30CT1}}{V_{30}}$
7-2	Cross talk 2 (stereo → SAP)	CT <sub>2</sub>	<p>Set pins 24, 25 to "H" and 27 to "L".                      Input L-only signal (f = 3 kHz, 30 % modulation) and SAP signal (f = 3 kHz, 30 % modulation) to pin 1. Assume output voltage of the pin 30 "V<sub>30</sub>".                      Connect pin 30 to 3 kHz BPF (gain = 0 dB at f = 3 kHz, -80 dB or more at f = 800 Hz) to pin 30. Assume output voltage of BPF "V<sub>30CT2</sub>".</p> $\text{CT}_2 = 20 \log \frac{V_{30CT2}}{V_{30}}$

No.	Parameter	Symbol	Measurement
8-1	Total muting level	Mute	<p>Set pins 26 and 27 to "L".                      Input monaural signal (100 % modulation, f = 300 Hz) to pin 1. Assume output voltage of pin 29 "V<sub>OMO</sub>".                      Set pin 27 to "H". Assume output voltage of pin 29 "V<sub>MUTE</sub>".</p> $\text{Mute} = 20 \log \frac{V_{OMO}}{V_{MUTE}}$ <p>Execute the same operation for pin 30, 31.</p>
9-1	LED driver saturation voltage	V <sub>OSAT</sub>	Input current (10 mA) to pins 22, 23 and measure input voltage of the pin.
10-1	dbx timing current	I <sub>T</sub>	Input DC voltage (6 V) to pins 19 and 20, and measure current of the pin.
11-1	Inter-mode DC offset 1 (mute → monaural)	V <sub>DOF1</sub>	<p>Set pin 27 to "L".                      Apply DC 1 V to pin 10 and DC 6 V to pin 4.                      Set pin 26 to "H". Assume output voltage of pin 29 "V<sub>29MU</sub>".                      Next, input no signal to pin 1 to change pin 26 to "L". Assume output voltage of pin 29 "V<sub>29MO</sub>".</p> $V_{DOF1} = V_{29MO} - V_{29MU}$ <p>Execute the same operation for pin 30.</p>
11-2	Inter-mode DC offset 2 (mute → stereo)	V <sub>DOF2</sub>	<p>Set pin 25, 27 to "H".                      Apply DC 1 V to pin 10 and DC 6 V to pin 4.                      Set pin 26 to "H". Assume output voltage of pin 29 "V<sub>29MU</sub>".                      Next, input pilot signal to pin 1 to change pin 26 to "L". Assume output voltage of pin 29 "V<sub>29MO</sub>".</p> $V_{DOF2} = V_{29MO} - V_{29MU}$ <p>Execute the same operation for pin 30.</p>
11-3	Inter-mode DC offset 3 (mute → SAP)	V <sub>DOF3</sub>	<p>Set pin 27 to "H" and 24, 25 "L".                      Apply DC 1 V to pin 10 and DC 6 V to pin 4.                      Set pin 26 to "H". Assume output voltage of pin 29 "V<sub>29MU</sub>".                      Next, input 5f<sub>H</sub> signal to pin 1 to change pin 26 to "L". Assume output voltage of pin 29 "V<sub>29MO</sub>".</p> $V_{DOF3} = V_{29MO} - V_{29MU}$ <p>Execute the same operation for pin 30.</p>
11-4	Inter-mode DC offset 4 (mute → monaural) (Normal output)	V <sub>DOF4</sub>	<p>Set pin 28 to "L".                      Apply DC 1 V to pin 10 and DC 6 V to pin 4.                      Set pin 26 to "H". Assume output voltage of pin 31 "V<sub>31MU</sub>".                      Next, input no signal to pin 1 to change pin 26 to "L". Assume output voltage of pin 31 "V<sub>31MO</sub>".</p> $V_{DOF4} = V_{31MO} - V_{31MU}$
11-5	Inter-mode DC offset 5 (mute → SAP) (Normal output)	V <sub>DOF5</sub>	<p>Set pin 28 to "M".                      Apply DC 1 V to pin 10 and DC 6 V to pin 4.                      Set pin 26 to "H". Assume output voltage of pin 31 "V<sub>31MU</sub>".                      Next, input 5f<sub>H</sub> signal to pin 1 to change pin 26 to "L". Assume output voltage of pin 31 "V<sub>31MO</sub>".</p> $V_{DOF5} = V_{31MO} - V_{31MU}$
12-1	Monaural total S/N	S/N <sub>MO</sub>	<p>Set pin 26 and 27 to "L".                      Input no signal to pin 1, and assume output voltage of 29 "V<sub>NMO</sub>".                      Input monaural signal (100 % modulation, f = 300 Hz) to pin 1, and assume output voltage of pin 29 "V<sub>SMO</sub>".</p> $S/N_{MO} = 20 \log \frac{V_{SMO}}{V_{NMO}}$ <p>Execute the same operation for pin 30.</p>
12-2	Stereo total S/N	S/N <sub>ST</sub>	<p>Set pin 25, 27 to "H" and pin 26 to "L".                      Input pilot signal to pin 1, and assume output voltage of 29 "V<sub>NST</sub>".                      Input stereo signal (100 % modulation, f = 300 Hz) to pin 1, and assume output voltage of pin 29 "V<sub>SST</sub>".</p> $S/N_{ST} = 20 \log \frac{V_{SST}}{V_{NST}}$ <p>Execute the same operation for pin 30.</p>

No.	Parameter	Symbol	Measurement
12-3	SAP total S/N	$S/N_{SAP}$	<p>Set pin 27 to "H" and pin 24, 25 to "L".                      Input <math>5f_H</math> signal to pin 1, and assume output voltage of 29 "<math>V_{NSAP}</math>".                      Input SAP signal (100 % modulation, <math>f = 300</math> Hz) to pin 1, and assume output voltage of pin 29 "<math>V_{SSAP}</math>".</p> $S/N_{ST} = 20 \log \frac{V_{SSAP}}{V_{NSAP}}$ <p>Execute the same operation for pin 30.</p>

Measuring Circuit Mode Table

(1/2)

Item	Switch					User Mode Note					Adjustment Point	Measuring Equipment	SG/MODE
	1	2	3	4	5	S1	ST	MUTE	F MONO	NOR-MAL			
						S2	SA						
Supply current	1	1	1	1	1	-	-	-	-	-	C	DC current meter	No signal
Stereo switch input sensitivity	1	1	1	1	1	-	ST	OFF	OFF	-	A	AC volt meter	Pilot
Stereo switch hysteresis	1	1	1	1	1	-	ST	OFF	OFF	-	A		
Stereo phase detection capture range	1	1	1	1	1	-	ST	OFF	OFF	-	A	AC volt meter f-counter	Sin wave SG
SAP switch input sensitivity	1	1	1	1	1	-	SA	OFF	OFF	-	A	AC volt meter	SAP
SAP discrimination hysteresis	1	1	1	1	1	-	SA	OFF	OFF	-	A		
SAP noise discrimination sensitivity	2	1	1	1	1	-	SA	OFF	OFF	-	A B	AC volt meter DC volt meter	Sin wave SG
SAP noise discrimination hysteresis	2	1	1	1	1	-	SA	OFF	OFF	-	A B		
Monaural total output voltage	1	1	1	1	2 3	-	-	OFF	-	-	H	AC volt meter	Monaural
Stereo total output voltage	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		Stereo
SAP total output voltage	1	1	1	1	2 3	S1	SA	OFF	OFF	-	H		SAP
Difference between L and R output voltages	1	1	1	1	2 3	-	-	OFF	-	-	H		Monaural
SAP single output voltage	1	1	1	1	1	-	SA	OFF	OFF	-	H		SAP (NROFF)
Normal output voltage	1	1	1	1	4	-	-	OFF	-	-	H		Monaural
Monaural total frequency characteristics 1	1	1	1	1	2 3	-	-	OFF	-	-	H	AC volt meter	Monaural
Monaural total frequency characteristics 2	1	1	1	1	2 3	-	-	OFF	-	-	H		
Monaural total frequency characteristics 3	1	1	1	1	2 3	-	-	OFF	-	-	H		
Monaural total frequency characteristics 4	1	1	1	1	2 3	-	-	OFF	-	-	H		
Stereo total frequency characteristics 1	1	1	1	1	2 3	-	ST	OFF	OFF	-	H	AC volt meter	L-only R-only
Stereo total frequency characteristics 2	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		
Stereo total frequency characteristics 3	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		
Stereo total frequency characteristics 4	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		
SAP total frequency characteristics 1	1	1	1	1	2 3	S1	SA	OFF	OFF	-	H	AC volt meter	SAP
SAP total frequency characteristics 2	1	1	1	1	2 3	S1	SA	OFF	OFF	-	H		
SAP total frequency characteristics 3	1	1	1	1	2 3	S1	SA	OFF	OFF	-	H		

Note ST: Stereo, SA: SAP, S1: SAP1, EX: external SAP, -: free

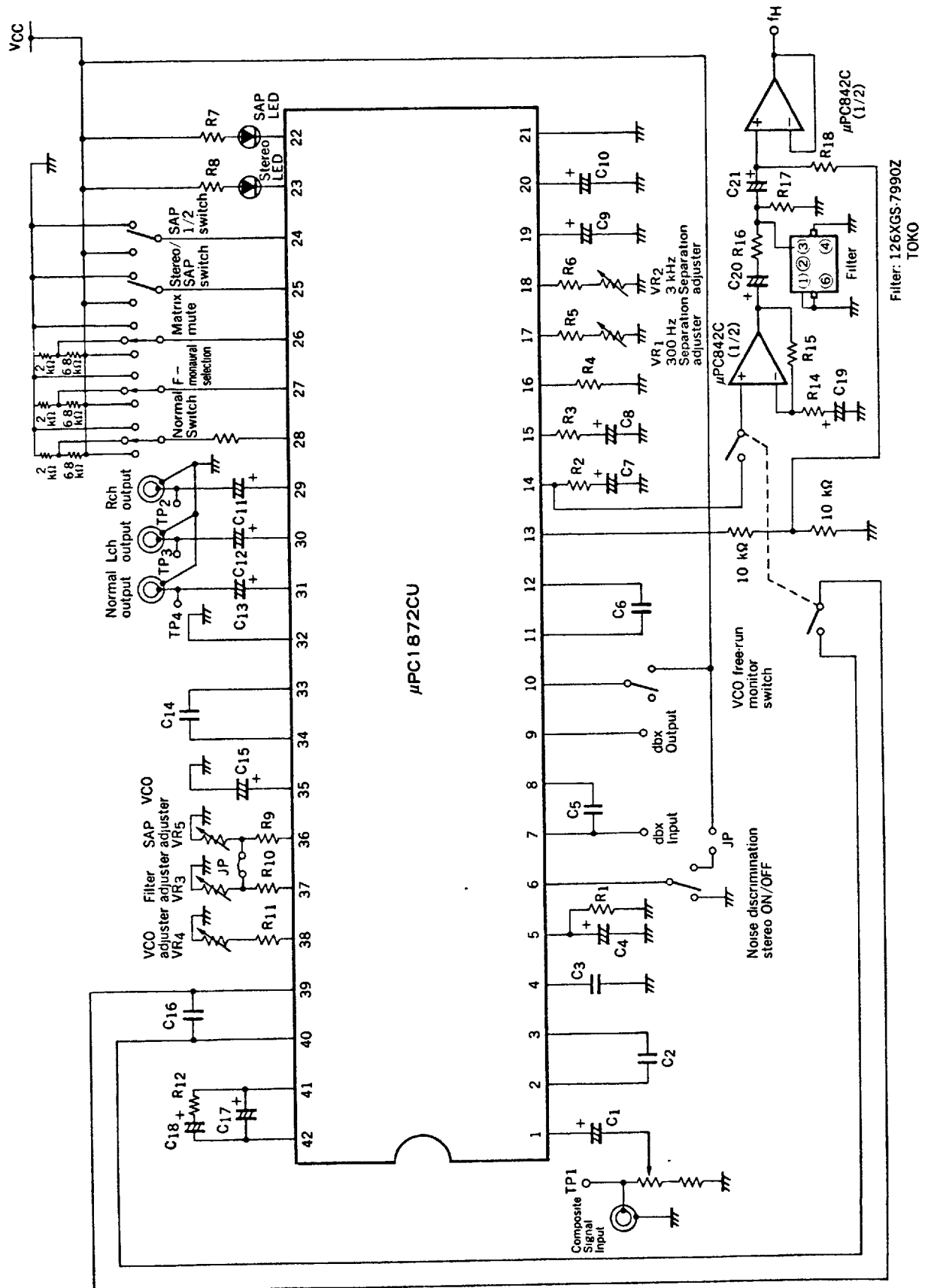
Item	Switch					User Mode <sup>Note</sup>					Adjustment Point	Measuring Equipment	SG/MODE
	1	2	3	4	5	S1	ST	MUTE	F MONO	NOR-MAL			
						S2	SA						
SAP single frequency characteristics 1	1	1	1	1	1	-	SA	OFF	OFF	-	H	AC volt meter	SAP (NR OFF)
SAP single frequency characteristics 2	1	1	1	1	1	-	SA	OFF	OFF	-	H		
SAP single frequency characteristics 3	1	1	1	1	1	-	SA	OFF	OFF	-	H		
Stereo channel separation 1	1	1	1	1	2 3	-	ST	OFF	OFF	-	H	AC volt meter	L-only R-only
Stereo channel separation 2	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		
Stereo channel separation 3	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		
Stereo channel separation 4	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		
Monaural total distortion rate	1	1	1	1	2 3	-	-	OFF	-	-	H	Distortion rate	Monaural
Stereo total distortion rate 1	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		Stereo
Stereo total distortion rate 2	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		Stereo
SAP total distortion rate	1	1	1	1	2 3	S1	SA	OFF	OFF	-	H		SAP
SAP single distortion rate	1	1	1	1	1	-	SA	OFF	OFF	-	H		SAP (NR OFF)
Normal single distortion rate	1	1	1	1	4	-	-	OFF	-	-	H		Monaural
Cross talk 1 SAP → Stereo	1	1	1	1	2 3	-	ST	OFF	OFF	-	I H	AC volt meter	Stereo SAP
Cross talk 2 Stereo → SAP	1	1	1	1	2 3	S1	SA	OFF	OFF	-	I H		
Total muting level	1	1	1	1	2 3	-	-	ON	-	-	H	AC volt meter	Monaural
LED driver saturation voltage	1	1	1	2	1	-	-	OFF	OFF	-	F G	DC volt meter	Stereo SAP
dbx timing current	1	1	2	1	1	-	-	OFF	OFF	-	D E	DC current meter	No signal
Inter-mode DC offset 1	2	2	1	1	1	-	-	ON OFF	-	-	K L	DC volt meter	No signal
Inter-mode DC offset 2	2	2	1	1	1	-	ST	ON OFF	OFF	-	K L		
Inter-mode DC offset 3	2	2	1	1	1	S1	SA	ON OFF	OFF	-	K L		
Inter-mode DC offset 4	2	2	1	1	1	-	-	ON OFF	-	MONO	M		
Inter-mode DC offset 5	2	2	1	1	1	-	-	ON OFF	OFF	EX	M		
Monaural total S/N	1	1	1	1	2 3	-	-	OFF	-	-	H	AC volt meter	No signal
Stereo total S/N	1	1	1	1	2 3	-	ST	OFF	OFF	-	H		Pilot
SAP total S/N	1	1	1	1	2 3	S1	SA	OFF	OFF	-	H		SAP

Note ST: Stereo, SA: SAP, S1: SAP1, EX: external SAP, -: free



### 8. CIRCUIT OF EVALUATION BOARD

(See this drawing when using the NEC-supplied evaluation board.)



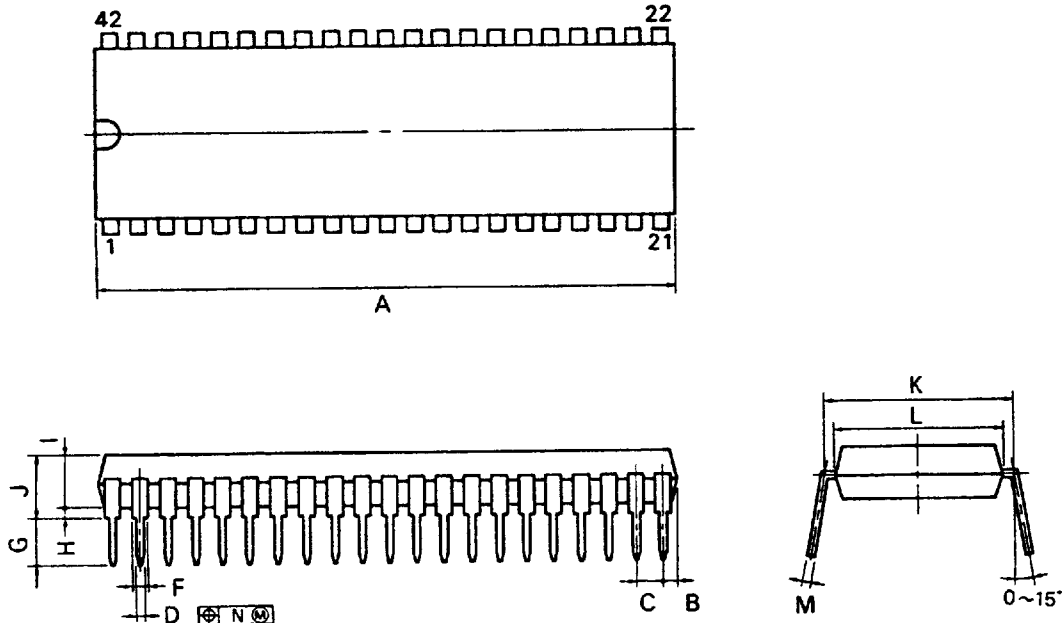
PARTS TABLE

PART	NO.	VALUE	TOLERANCE, REMARK
Resistor	R <sub>1</sub>	68 kΩ	±1 %, Metal film resistor  ±1 %, Metal film resistor ±1 %, Metal film resistor ±1 %, Metal film resistor  Circuit for filter adjustment
	R <sub>2</sub>	3 kΩ	
	R <sub>3</sub>	5.1 kΩ	
	R <sub>4</sub>	28 kΩ	
	R <sub>5</sub>	51 kΩ	
	R <sub>6</sub>	51 kΩ	
	R <sub>7</sub>	1 kΩ	
	R <sub>8</sub>	1 kΩ	
	R <sub>9</sub>	30 kΩ	
	R <sub>10</sub>	27 kΩ	
	R <sub>11</sub>	39 kΩ	
	R <sub>12</sub>	1 kΩ	
	R <sub>14</sub>	3 kΩ	
	R <sub>15</sub>	91 kΩ	
	R <sub>16</sub>	30 kΩ	
	R <sub>17</sub>	6.8 kΩ	
	R <sub>18</sub>	1 kΩ	
	Capacitor	C <sub>1</sub>	
C <sub>2</sub>		0.01 μF	
C <sub>3</sub>		0.047 μF	
C <sub>4</sub>		0.47 μF	
C <sub>5</sub>		0.1 μF	
C <sub>6</sub>		0.1 μF	
C <sub>7</sub>		1 μF	
C <sub>8</sub>		1 μF	
C <sub>9</sub>		3.3 μF	
C <sub>10</sub>		10 μF	
C <sub>11</sub>		10 μF	
C <sub>12</sub>		10 μF	
C <sub>13</sub>		10 μF	
C <sub>14</sub>		0.1 μF	
C <sub>15</sub>		22 μF	
C <sub>16</sub>		0.1 μF	
C <sub>17</sub>		1 μF	
C <sub>18</sub>		4.7 μF	
C <sub>19</sub>		10 μF	
C <sub>20</sub>		10 μF	
C <sub>21</sub>		10 μF	
Variable Resistor	VR <sub>1</sub>	50 kΩ	Only independent SAP VCO adjustment
	VR <sub>2</sub>	50 kΩ	
	VR <sub>3</sub>	20 kΩ	
	VR <sub>4</sub>	20 kΩ	
	VR <sub>5</sub>	20 kΩ	
126XGS-7990Z	Filter	f <sub>H</sub> BPF	TOKO, Circuit for filter adjustment
μPC842C	OP Amp.	Dual OP Amp.	NEC, Circuit for filter adjustment

Resistors: ±5 % (unless otherwise specified.)  
 Capacitors: ±20 % (unless otherwise specified.)  
 Variable resistors: ±20 % (unless otherwise specified.)

9. OUTLINE DIMENSION

42PIN PLASTIC SHRINK DIP (600 mil)



P42C-70-600B

NOTES

- 1) Each lead centerline is located within 0.17 mm (0.007 inch) of its true position (T.P.) at maximum material condition.
- 2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	39.13 MAX.	1.541 MAX.
B	1.78 MAX.	0.070 MAX.
C	1.778 (T.P.)	0.070 (T.P.)
D	0.50 <sup>+0.10</sup>	0.020 <sup>+0.004</sup>
F	0.85 MIN.	0.033 MIN.
G	3.2 <sup>+0.3</sup>	0.126 <sup>+0.012</sup>
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.72 MAX.	0.226 MAX.
K	15.24 (T.P.)	0.600 (T.P.)
L	13.2	0.520
M	0.25 <sup>+0.10</sup>	0.010 <sup>+0.004</sup>
N	0.17	0.007

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