M65830AP,AFP
DIGITAL ECHO (DIGITAL DELAY)

DESCRIPTION

The M65830 CMOS IC is used to add echoes to karaoke * singing.

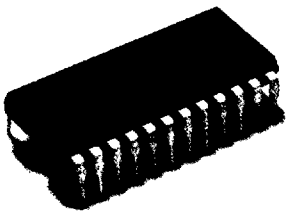
It is optimal to provide the echo effect function for karaoke players, such as radio cassette recorders, mini audio components and television sets.

This IC can be used in digital surround systems because it generates a highly precise short delay when equipped with an improved master clock function.

* Karaoke : Recorded music to accompany live singing

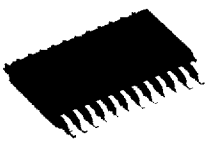
FEATURES

- Delay time can be variable in four lengths between 81.9 msec and 131.1msec
- Delay time is set with 2-bit parallel data
- Built-in A-D, D-A converters, input/output low-pass filter, and 16K bit delay memory
- High sound quality is assured by simple system construction, due to A-D, D-A converters with ADM (Adaptive Delta Modulation) system
  - Output noise voltage : − 80dBV (typ)
  - Total harmonic distortion : 1.2% (typ)
- Built-in mute circuit



Outline 24P4(AP)

2.54mm pitch 600mil DIP
(13.0mm × 31.1mm × 3.8mm)



Outline 24P2W-A(AFP)

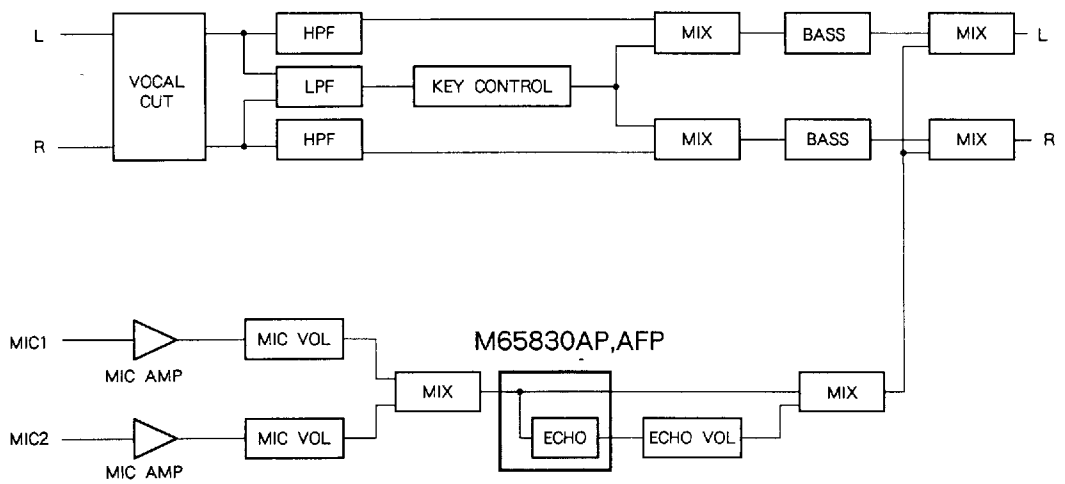
1.27mm pitch 450mil SOP
(8.4mm × 15.0mm × 2.0mm)

RECOMMENDED OPERATING CONDITIONS

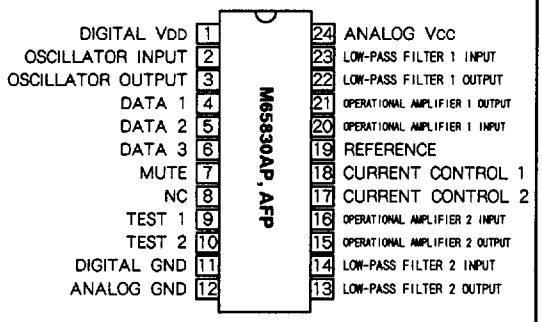
Supply voltage range ..... V_{CC}, V_{DD} = 4.5~5.5V

Rated supply voltage ..... V_{CC}, V_{DD} = 5V

SYSTEM CONFIGURATION

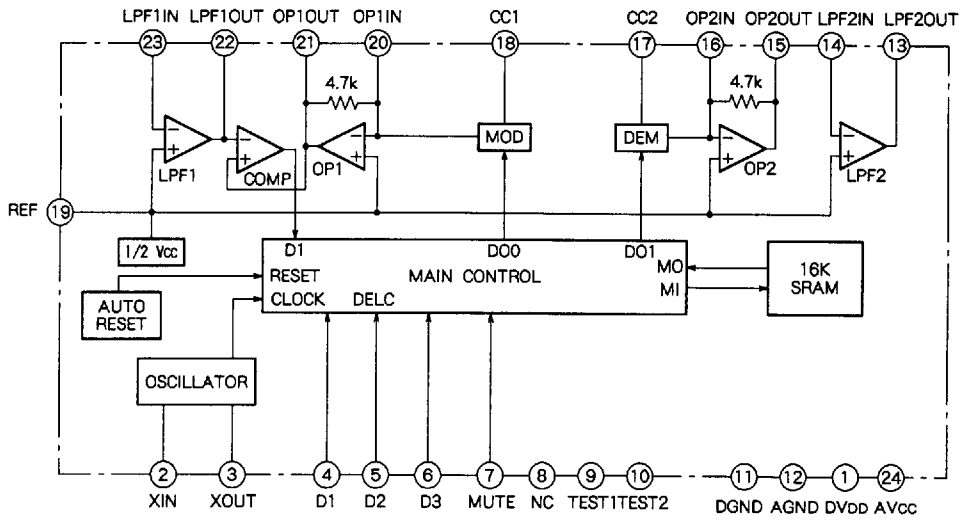


PIN CONFIGURATION



Outline 24P4(AP)
24P2W-A(AFP)
NC : NO CONNECTION

IC INTERNAL BLOCK DIAGRAM



PIN DESCRIPTION

Pin No.	Symbol	Name	I/O	Function
①	V_{DD}	Digital power supply	–	
②	X_{IN}	Oscillator input	I	Ceramic oscillator or external clock is connected
③	X_{OUT}	Oscillator output	O	Ceramic oscillator is connected Set to open when external clock is used
④	D1	Data 1	I	Delay time setting data 1 is input
⑤	D2	Data 2	I	Delay time setting data 2 is input
⑥	D3	Data 3	I	Delay time setting data 3 is input Normally set to "L"
⑦	MUTE	Mute	I	Mute control L = Mute
⑧	NC	No connection	–	No external connection
⑨	TEST1	Test 1	I	Normally set to "L"
⑩	TEST2	Test 2	I	Normally set to "L"
⑪	D GND	Digital GND	–	
⑫	A GND	Analog GND	–	
⑬	LPF2 OUT	Low-pass filter 2 output	O	Forms output low-pass filter with external capacitor and resistor
⑭	LPF2 IN	Low-pass filter 2 input	I	
⑮	OP2 OUT	Operational amplifier 2 output	O	Forms demodulating integrator with external capacitor
⑯	OP2 IN	Operational amplifier 2 input	I	
⑰	CC2	Current control 2	–	Demodulator ADM control
⑱	CC1	Current control 1	–	Modulator ADM control
⑲	REF	Reference	–	Analog reference voltage = 1/2Vcc
⑳	OP1 IN	Operational amplifier 1 input	I	Forms modulating integrator with external capacitor and resistor
㉑	OP1 OUT	Operational amplifier 1 output	O	
㉒	LPF1 OUT	Low-pass filter 1 output	O	Forms input low-pass filter with external capacitor and resistor
㉓	LPF1 IN	Low-pass filter 1 input	I	
㉔	Vcc	Analog power supply	–	

ABSOLUTE MAXIMUM RATINGS (Ta = 25℃, unless otherwise noted)

Symbol	Parameter		Ratings	Unit
V_{CC}	Supply voltage		6.5	V
I_{CC}	Circuit current		100	mA
P_d	Power dissipation	M65830AP	1	W
		M65830AFP	0.8	
T_{opr}	Operating temperature		−20~+75	℃
T_{stg}	Storage temperature		−40~+125	℃

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{CC}	Analog supply voltage		4.5	5	5.5	V
V_{DD}	Digital supply voltage		4.5	5	5.5	V
V_{CC}-V_{DD}	Potential difference V_{CC}, V_{DD}		−0.3	0	0.3	V
f_{ck}	Clock frequency		450	500	550	kHz
V_{IH}	Input voltage ("H" level)		0.7V_{DD}	–	V_{DD}	V
V_{IL}	Input voltage ("L" level)		0	–	0.3V_{DD}	V

ELECTRICAL CHARACTERISTICS (V_{CC} = 5V, f = 1kHz, V_I = 100mVrms, Ta = 25℃, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{CC}	Circuit current	No signals	5	13	35	mA
Gv	Voltage gain between input and output	R_L = 47kΩ	−3.5	−0.5	2.5	dB
V_{Omax}	Maximum output voltage	THD = 10%	0.7	1	–	Vrms
THD	Total harmonic distortion	30kHz LPF	–	1.2	3.0	%
No	Output noise voltage	DIN-AUDIO	–	−85	−70	dBV
SVRR	Power suppression ratio	△Vcc = −20dBV, f = 100Hz	–	−40	−25	dB

FUNCTION

(1) Sampling frequency fs

Sampling frequency is obtained with the following formula :

fs = 1/4 Clock frequency(Hz)

When clock frequency fck is 500kHz, sampling frequency is :

fs = 1/4 × 500kHz = 125kHz

(2) Delay time Td

Delay time can be varied in four lengths by using pin ④D1 and ⑤D2.

(Condition : fs = 125kHz)

④D1	⑤D2	Delay time(msec)
H	H	81.9
L	H	98.3
H	L	114.7
L	L	131.1

(3) Mute

Output can be muted depending on the status of MUTE pin ⑦

⑦MUTE	Mode
H	Normal mode
L	Mute mode

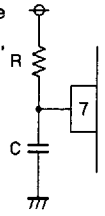
We recommend that, to prevent noise during power supply, output be muted by connection as shown in the diagram. The muting time is determined depending on the resistance and capacitance. The relationship between muting time, capacitance (C) and resistance (R) is as shown below :

Muting time(t mute) ≒ 0.92 × CR(sec)

When capacitance is 10 μF and resistance is 150kΩ :

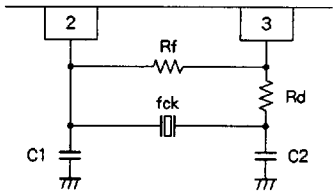
t mute ≒ 0.92 × 10 μ × 150k = 1.38(sec)

Mute time is approximately 1.4 seconds.



(4) Oscillation circuit

M65830AP,AFP has a built-in oscillation buffer. An oscillation circuit can be formed by connecting the ceramic oscillator to resistors and capacitors as shown below :



When frequency fck = 500kHz(Clock CSB500E by Murata Mfg. Co., Ltd. FCR500K3 by TDK Co., Ltd.), we recommend that resistance and capacitance be applied as follows :

Rf = 1MΩ

Rd = 3.3kΩ

$C_1 = C_2$ = 330pF

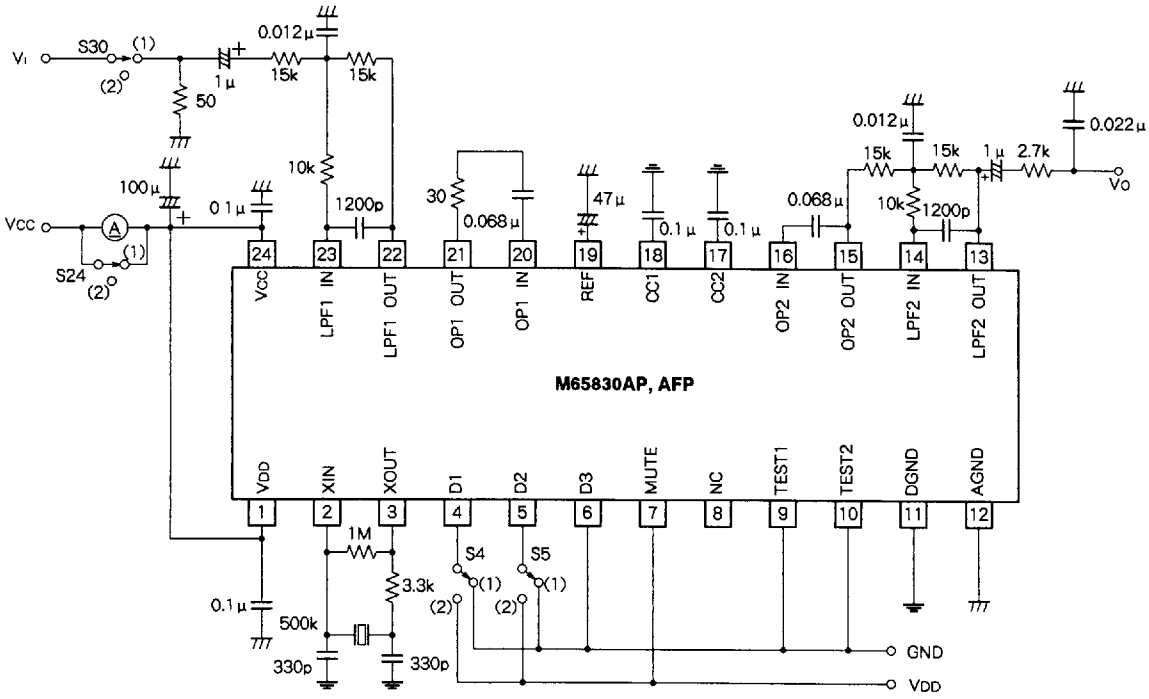
Please note that resistance and capacitance are different depending on the oscillator's manufacturer and frequency, as well as the environment where the oscillation circuit is used (e.g. the capacity of the circuit board and wiring).

TEST CONDITIONS

Symbol	Parameter	S4	S5	S24	S30	Remark
Icc	Circuit current	×	×	2	2	No signals
Gv	Voltage gain	×	×	1	1	Gv = 20log(Vo/Vi)
Td1	Delay time	2	2	1	1	Refer to (2)
Td2		1	2	1	1	
Td3		2	1	1	1	
Td4		1	1	1	1	
Vomax	Maximum output voltage	×	×	1	1	30kHz LPF, THD = 10%
THD	Total harmonic distortion	×	×	1	1	30kHz LPF
No	Output noise voltage	×	×	1	1	DIN AUDIO, Vi = 0mVrms
SVRR	Power suppression ratio	×	×	1	2	ΔVcc = − 20dBV, f = 100Hz

×··1 or 2

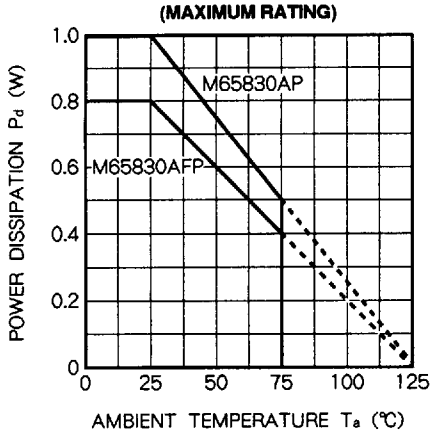
TEST CIRCUIT



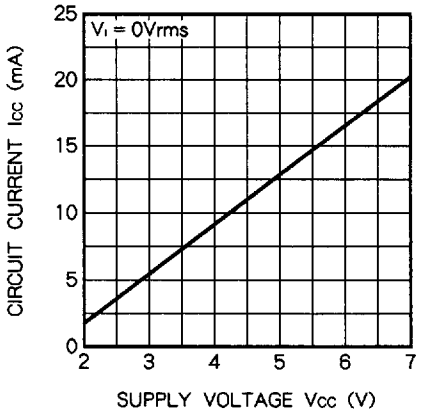
Units Resistance : Ω
Capacitance : F

TYPICAL CHARACTERISTICS

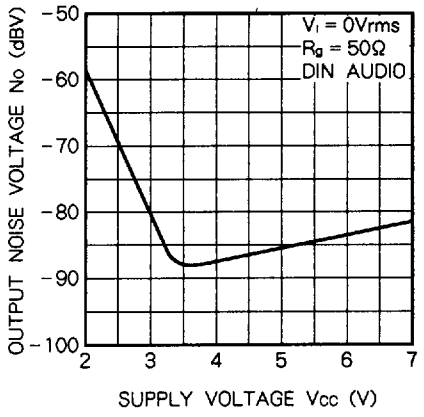
THERMAL DERATING
(MAXIMUM RATING)



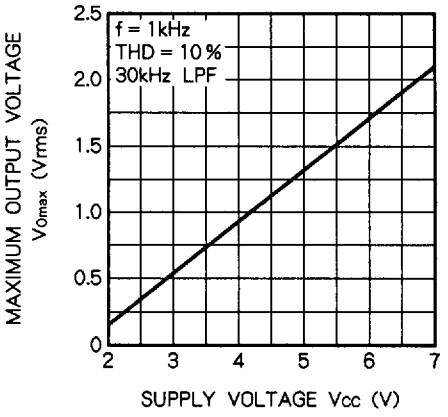
CIRCUIT CURRENT VS. SUPPLY VOLTAGE



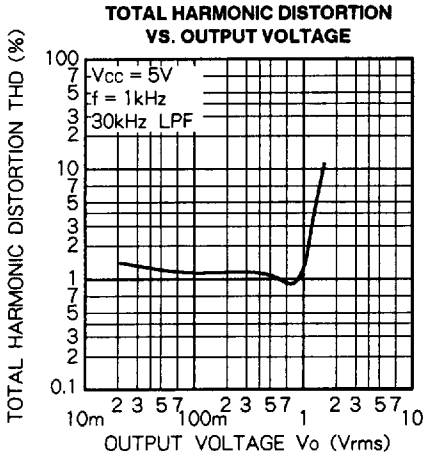
OUTPUT NOISE VOLTAGE
VS. SUPPLY VOLTAGE



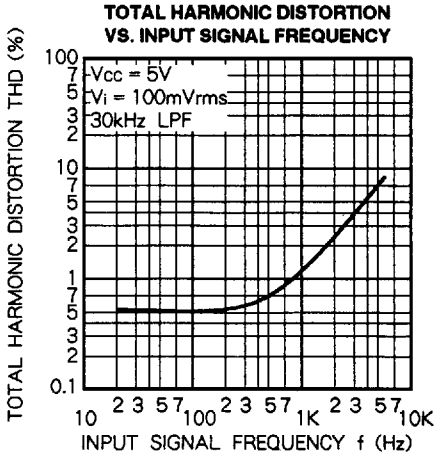
MAXIMUM OUTPUT VOLTAGE
VS. SUPPLY VOLTAGE



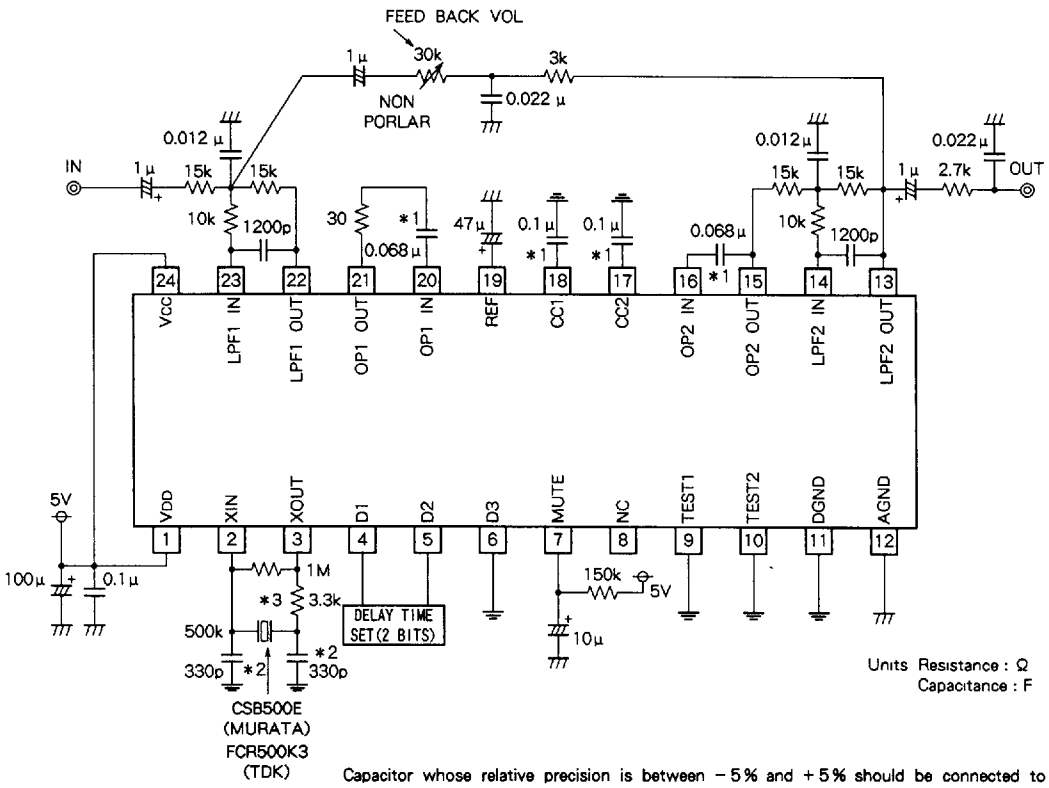
TOTAL HARMONIC DISTORTION
VS. OUTPUT VOLTAGE



TOTAL HARMONIC DISTORTION
VS. INPUT SIGNAL FREQUENCY



APPLICATION EXAMPLE



Capacitor whose relative precision is between −5% and +5% should be connected to *1

Capacitors at *2 and resistors at *3 should be selected depending on the frequency of the ceramic oscillator and the environment where the oscillation circuit is used