



### General Description

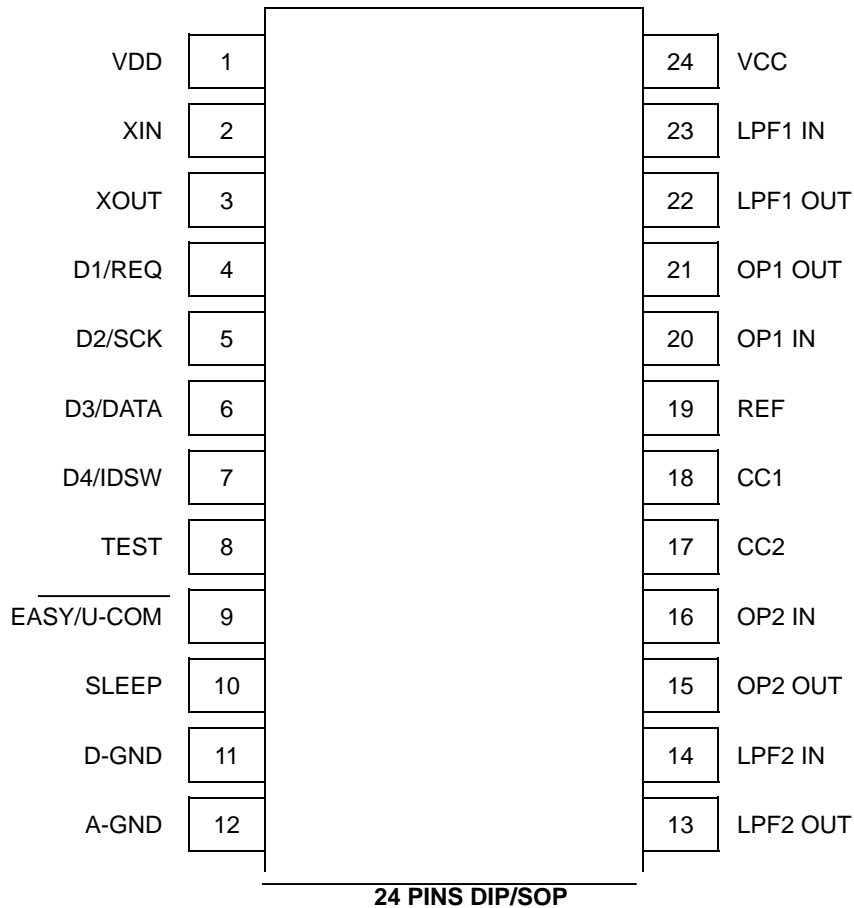
The TP5208 is a developed processor for producing echo effects added to voice signals picked up by microphone for karaoke applications. The IC has the largest memory among the digital delay series. As its design is aimed at high performance, it is best suited to provide radio cassette tape recorders and miniature unit audio system with quality echo function.

With pins compatible with the Mitsubishi M65831AP/FP, M65830CP/FP, and M65843AP/FP, the TP5208 is suitable for upgrading the series.

### Features

- Built-in input/output filters, A-D and D-A converters and memory realize a delay system with only a single chip
- Capable of composing low-noise and low-distortion delay system at low cost by ADM system (No = -88dB typ, THD = 0.17% typ)
- Control mode selections available from 2 kinds: easy mode using parallel data and microcomputer mode using serial data
- Sleep mode can be selected to stop IC functions
- Built-in automatic reset circuit

### Pin Configuration





### Pin Description

Pin No.	Symbol	Pin Name	I/O	Description
1	VDD	Digital VDD	-	Supply voltage
2	XIN	Oscillator input	I	-
3	XOUT	Oscillator input	O	Connects to 2MHz ceramic filter
4	D1/REQ	Delay1/Request	I	Easy mode: inputs D1 data U-COM mode: inputs request data
5	D2/SCK	Delay2/Shift clock	I	Easy mode: inputs D2 data U-COM mode: inputs shift clock
6	D3/DATA	Delay3/Serial data	I	Easy mode: inputs D3 data U-COM mode: inputs shift data
7	D4/IDSW	Delay4/ID switch	I	Easy mode: inputs D4 data U-COM mode: controls ID code
8	TEST	Test	I	L = normal mode
9	EASY/U-COM	EASY/U-COM	I	H = Easy mode; L = U-COM mode
10	SLEEP	Sleep	I	H = sleep mode; L = normal mode
11	DGND	Digital GND	-	Connects to analog GND at one point
12	AGND	Analog GND	-	Connects to analog GND
13	LPF2 OUT	Low pass filter2 output	O	Forms low pass filter with external C, R
14	LPF2 IN	Low pass filter2 input	I	
15	OP2 OUT	OP-AMP2 output	O	Forms integrator with external C, R
16	OP2 IN	OP-AMP2 input	I	
17	CC2	Current control 2	-	-
18	CC1	Current control 1	-	-
19	REF	Reference	-	= 1/2 VCC
20	OP1 IN	OP-AMP1 input	I	Forms integrator with external C, R
21	OP1 OUT	OP-AMP1 output	O	
22	LPF1 OUT	Low pass filter1 output	O	Forms low pass filter with external C, R
23	LPF1 IN	Low pass filter1 input	I	
24	VCC	Analog VCC	-	Supply voltage

### Functional Description

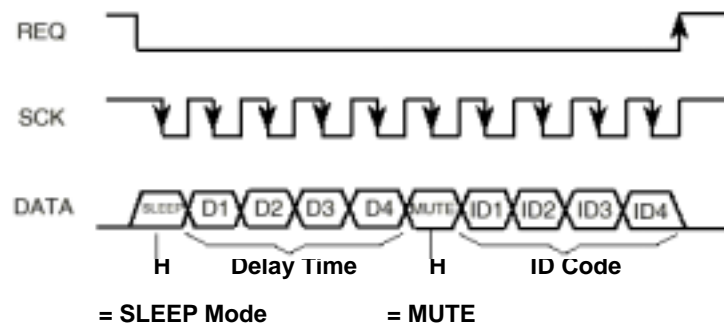
#### EASY Mode (EASY/U-COM = H)

D4	D3	D2	D1	fs	Td
L	L	L	L	666	12.3
L	L	L	H	666	24.6
L	L	H	L	666	36.9
L	L	H	H	666	49.2
L	H	L	L	666	61.4
L	H	L	H	666	73.7
L	H	H	L	666	86.0
L	H	H	H	666	98.3
H	L	L	L	333	110.6
H	L	L	H	333	122.9
H	L	H	L	333	135.2
H	L	H	H	333	147.5
H	H	L	L	333	159.7
H	H	L	H	333	172.0
H	H	H	L	333	184.3
H	H	H	H	333	196.6

NOTES: f s: Sampling Frequency (KHz)

Td: Delay Time (msec)

### U-COM Mode (EASY/U-COM = L)

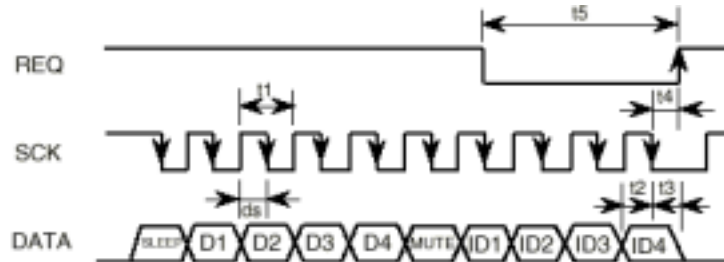


This timing chart shows that delay time is set by serial data from U-COM. DATA signal is latched at the falling edge of SCK signal; the last ten data are set at the rising edge of REQ signal when ID codes are satisfied.

ID1, ID3: L

ID2: H

ID4: equal to IDSW



### REQ, SCK, DATA Input Timing

Symbol	Parameter	Limit			Unit
		Min	Typ	Max	
t1	SCK Pulse Width	250	-	-	ns
ds	SCK Pulse Duty	-	50	-	%
t2	DATA Setup Time	100	t1/2	-	ns
t3	DATA Hold Time	100	t1/2	-	ns
t4	REQ Hold Time	100	-	-	ns
t5	REQ Pulse Width	250	-	-	ns

### MUTING

#### EASY mode

Automatic mute upon changing delay time, canceling SLEEP mode and power-on.

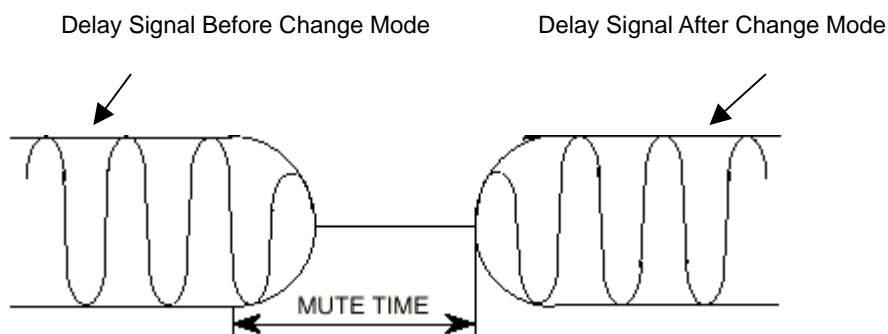
#### U-COM mode

MUTE = H: mute

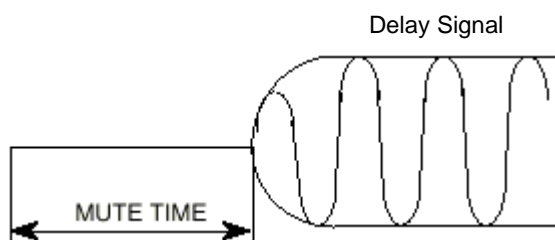
MUTE = L: automatic mute

### Automatic Mute

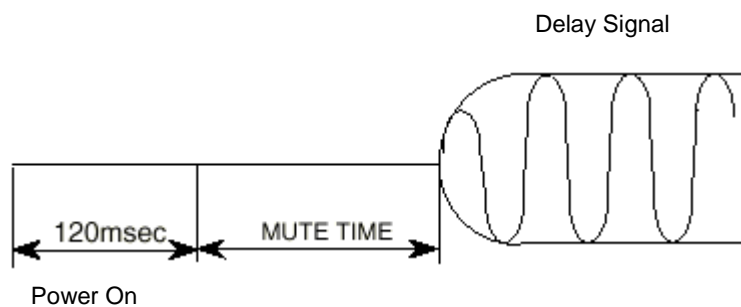
#### 1. Upon Changing Delay Time



#### 2. Upon Canceling SLEEP Mode



#### 3. Upon Power-On



### SLEEP Mode

SLEEP data is

H: clock and RAM stop to reduce circuit current (SLEEP mode)

L: normal operation

### System Reset

Automatically reset power-on. The reset time is about 120msec and the delay time is set at 147.5msec.



## Absolute Maximum Ratings (Ta = 25 °C, unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Supply Voltage	Vcc	6.5	V
Supply Current	Icc	100	mA
Power Dissipation	Pd	1.7	W
Operating Temperature	Topr	-20 ~ +75	
Storage Temperature	Tstg	-25 ~ +125	

## Recommended Operating Conditions

Parameter	Symbol	Limit			Unit
		Min	Typ	Max	
Supply Voltage	VCC	4.5	5	5.5	V
Supply Voltage	VDD	4.5	5	5.5	V
Difference Voltage	VCC - VDD	-0.3	0	0.3	V
Clock Frequency	fck	1	2	3	MHz
High Input Voltage	V <sub>IH</sub>	0.7V <sub>DD</sub>	-	-	V
Low Input Voltage	V <sub>IL</sub>	-	-	0.3V <sub>DD</sub>	V

## AC Electrical Characteristics

(VCC = 5.0V, fin = 1KHz, Vi = 100mVrms, fck = 2MHz, Ta = 25 °C, unless otherwise noted)

Parameter	Symbol	Limit			Unit	Test Condition
		Min	Typ	Max		
Circuit Current	Icc	-	36	50	mA	No Signal
Voltage gain	Gv	-	-0.5	2.5	dB	R <sub>L</sub> = 47KΩ
Maximum Output Voltage	Vomax	1.0	1.6	-	Vrms	THD = 10%
Output Distortion	THD	-	0.17	0.8	%	30KHz
		-	0.4	1.2	%	L.P.F. fs = 666KHz fs = 333KHz
Mute Time	TMUTE	508	528	548	ms	Upon Changing Delay Time
		508	528	548	ms	Upon Canceling Sleep Mode
Output Noise Voltage	No	-	-88	-80	dBV	DIN-AUDIO (fs = 333KHz)

## DC Electrical Characteristics

Parameter	Symbol	Limit			Unit
		Min	Typ	Max	
Supply Voltage	Vcc	4.5	5	5.5	V
Supply Current	Icc	-	60	80	mA
High Input Voltage	V <sub>IH</sub>	0.7V <sub>DD</sub>	-	-	V
Low Input Voltage	V <sub>IL</sub>	-	-	0.3V <sub>DD</sub>	V

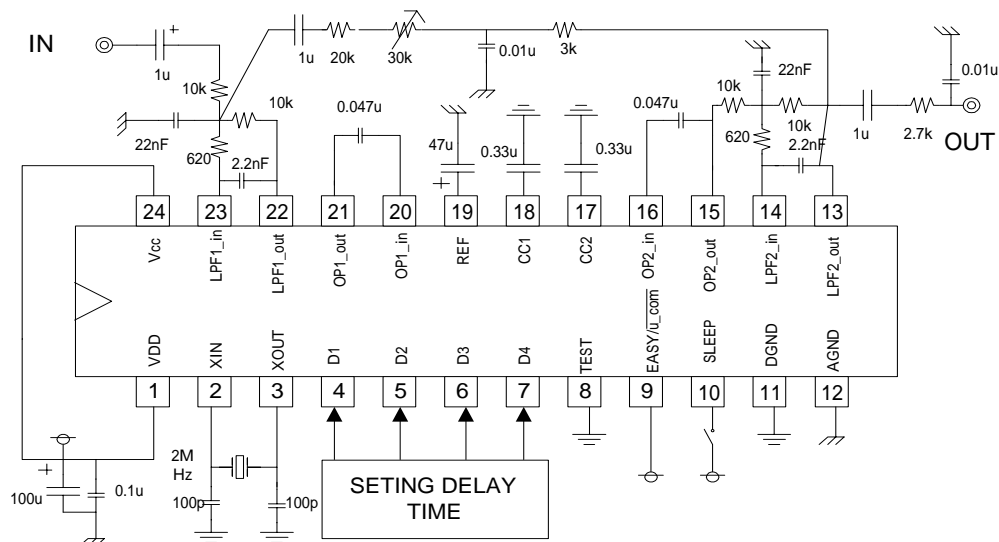


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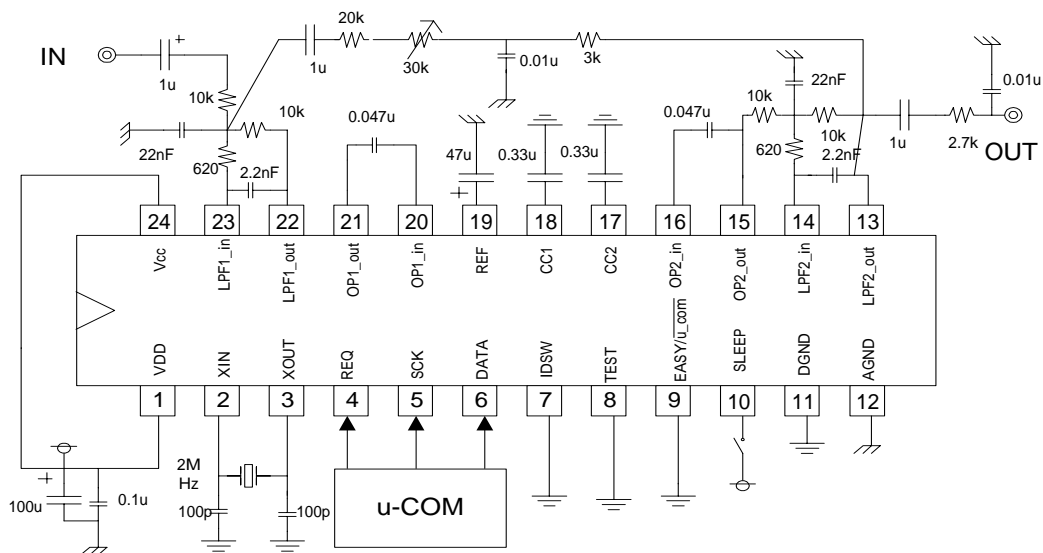
## 64K SRAM ECHO PROCESSOR

### Application

#### EASY Mode



#### U-COM Mode



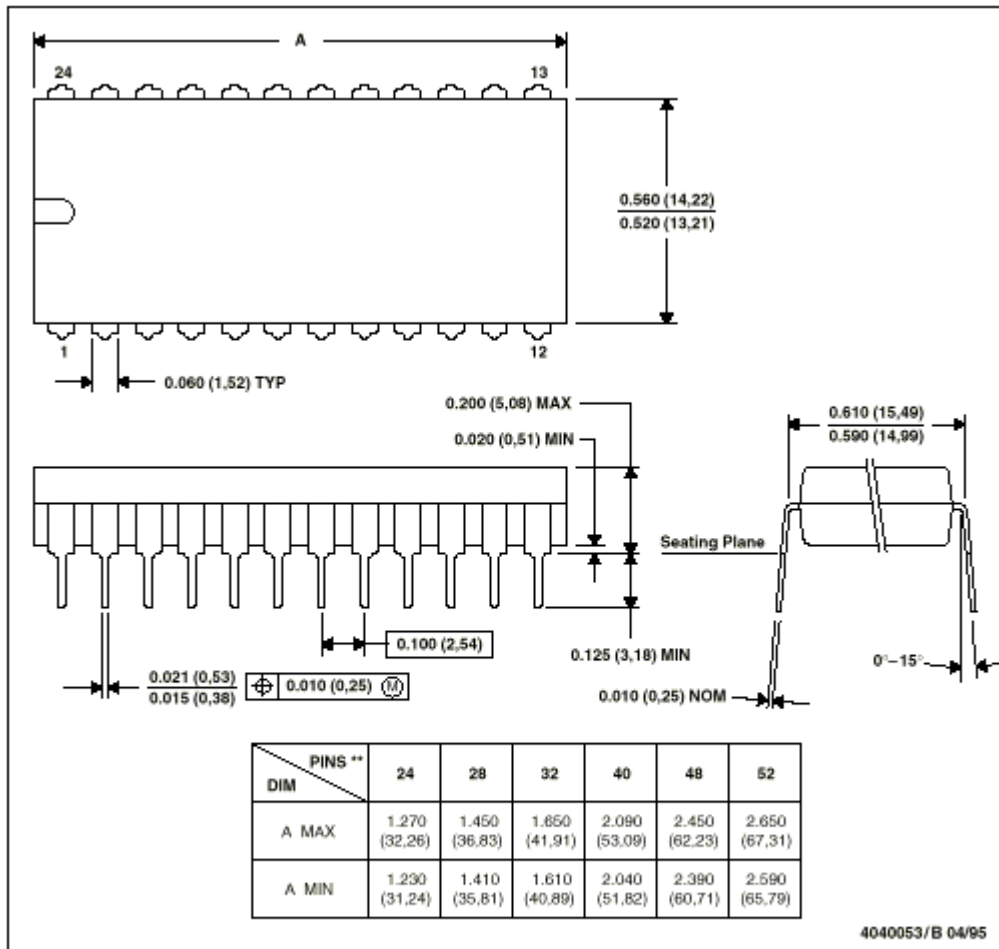


# TP5208

## 64K SRAM ECHO PROCESSOR

### Package Information

#### TP5208P (24-pin DIP)



NOTES: A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.  
C. Falls within JEDEC MS-011  
D. Falls within JEDEC MS-015 (32 pin only)

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