YAMAHA LSI

YSS239

KPC
Karaoke Processor C

■ OUTLINE

The YSS239 (KPC) is an audio signal processing LSI with 1 channel key control function for karaoke systems. It can specify the key variation by 100 cent and performs key control from –600 cent to +600 cent (13 steps) or –400 cent to +400 cent (9 steps).

Also, as it has LED drive terminals for indication of the current key variation, it can drive 13 LEDs or numeric LEDs.

■ FEATURES

- The YSS239 can specify key variation by 100 cent.
- Key control of –600 cent to +600 cent or –400 cent to +400 cent.
- 13 LED drive terminals for indication of key variation from –600 cent to +600 cent by 100 cent.
- Sampling frequency for internal audio signal processing is 16kHz.
- 14 bit floating A/D and D/A converters are built in to input and output analog audio signal.
- Sampling frequency for A/D and D/A converters is 32kHz.
- RAM for key control processing is built in.
- Microprocessor is not required as key variation is specified through pulse input by using switches.
- Master clock frequency is 768kHz (48fs).
- 5V single power supply, Si-gate CMOS process.
- 28-pin DIP package.

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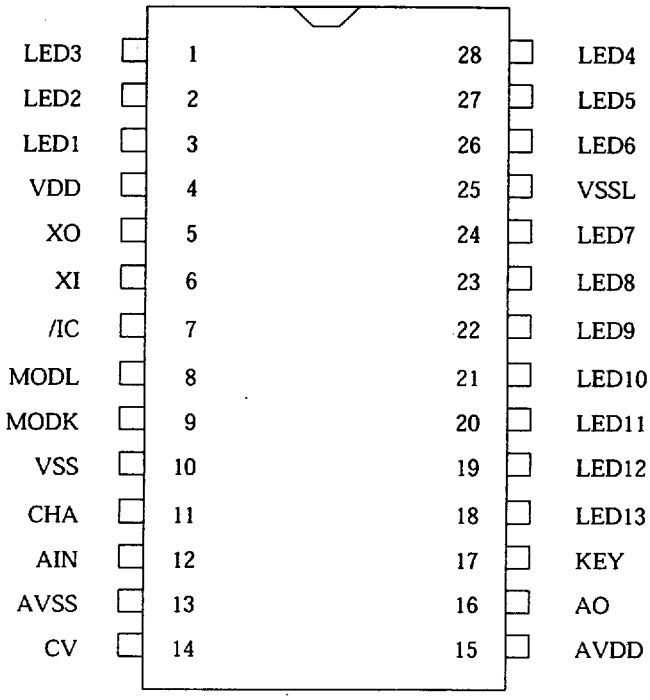
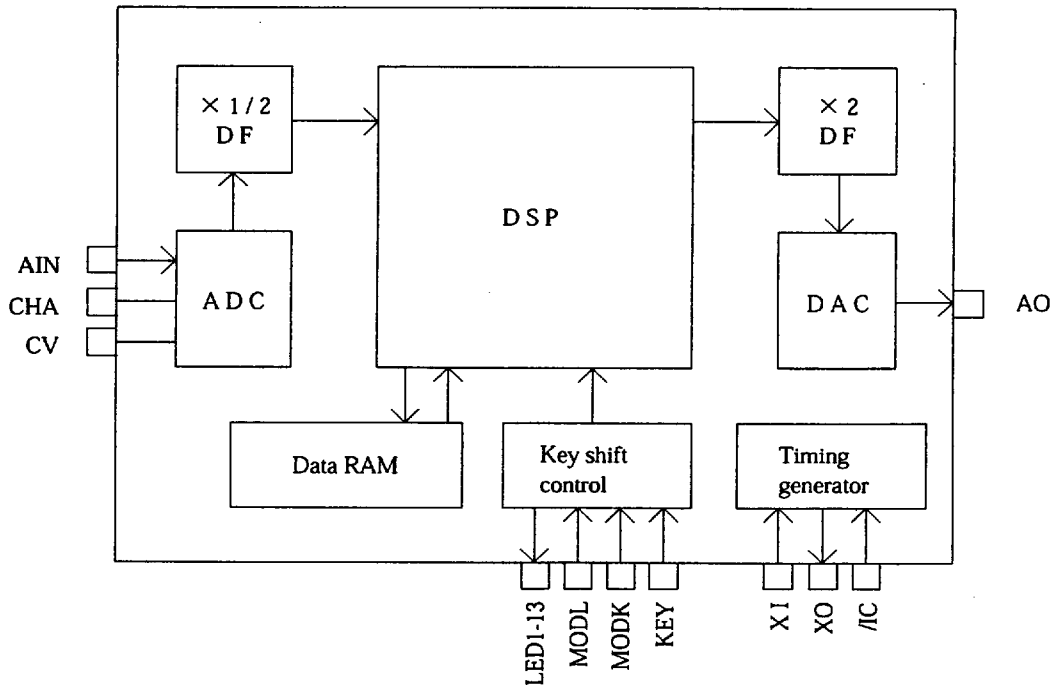
YSS239 CATALOG
CATALOG No. : LSI-4SS239A3
1995. 6

■ PIN CONFIGURATION



■ BLOCK DIAGRAM



■ PIN DESCRIPTION

No.	Name	I/O	Function
1	LED3	OD	LED drive terminal
2	LED2	OD	LED drive terminal
3	LED1	OD	LED drive terminal
4	VDD	–	5V power supply for digital block
5	XO	O	Crystal oscillator connection terminal
6	XI	I	Crystal oscillator connection terminal, or external clock input (768kHz)
7	/IC	Is	Initial reset input
8	MODL	I	LED mode selection
9	MODK	I	Key mode selection
10	VSS	–	GND for digital block
11	CHA	–A	Connecting terminal for sample/hold capacitor of AIN signal
12	AIN	IA	Analog audio signal ADC input
13	AVSS	–A	GND for analog block
14	CV	–A	Center voltage terminal for internal ADC
15	AVDD	–A	5V power supply for analog block
16	AO	OA	Analog audio signal DAC output
17	KEY	IA	Key shift control input
18	LED13	OD	LED drive terminal
19	LED12	OD	LED drive terminal
20	LED11	OD	LED drive terminal
21	LED10	OD	LED drive terminal
22	LED9	OD	LED drive terminal
23	LED8	OD	LED drive terminal
24	LED7	OD	LED drive terminal
25	VSSL	–	GND for LED drive terminal
26	LED6	OD	LED drive terminal
27	LED5	OD	LED drive terminal
28	LED4	OD	LED drive terminal

Note)

Is : Input terminal with Schmidt

OD : Open drain output terminal

A : Analog terminal

■ FUNCTION DESCRIPTION

1. Clock XI, XO

The crystal oscillation circuit is constructed by using XI and XO terminals. The oscillation frequency is 768kHz (48fs).

It is possible to input external clock into the XI terminal. Do not use the XO terminal for any other purpose than for the crystal oscillation circuit.

2. Audio signal input/output AIN, CHA, CV, AO

The analog audio signal is input through the AIN terminal. The signal undergoes A/D conversion at 32kHz, undersampling through the 1/2 undersampling filter to 16kHz and then digital processing.
Connect a sample hold capacitor for A/D conversion of the AIN terminal to the CHA terminal.
The CV terminal is a center voltage terminal of ADC. Bias the AIN terminal signal at this voltage with the stabilization capacitor connected.
After key shift processing, the audio signal is over-sampled to 32kHz through the 2 times oversampling filter and D/A conversion and it is output from the AO terminal. With a sample hold capacitor connected to the AO terminal, execute the signal by a high input impedance buffer.

3. Key control KEY, MODK

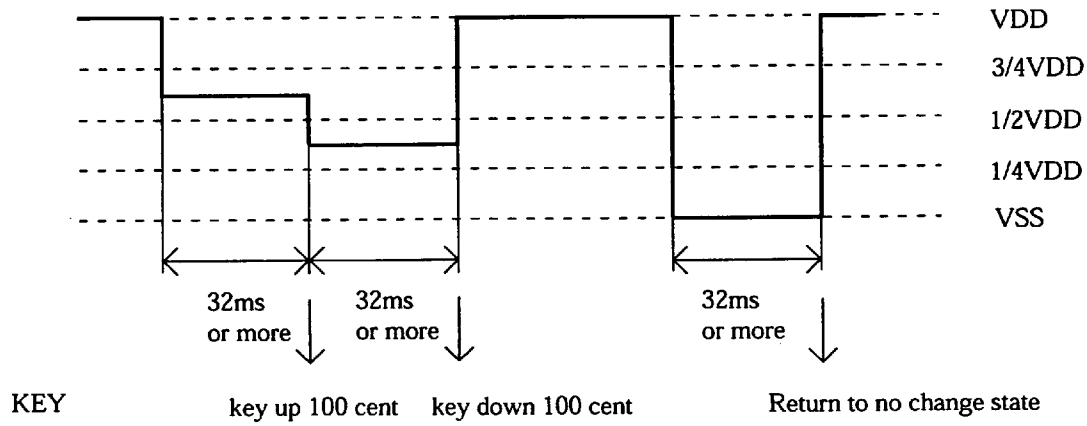
The MODK terminal is a key variation mode select terminal. Through this terminal, the variation range of the key can be specified. In both modes, key variation is specified by 100 cent.

MODK	Key variation
L	–600 cent~+600 cent
H	–400 cent~+400 cent

The KEY terminal is the input terminal used to control the key variation. For its control, the VDD power supply is used as a reference and the key varies by 100 cent for each pulse according to the pulse level.
A 32ms or more pulse width is necessary. A pulse shorter than that is ignored. The pulse which specifies beyond the variable range is also ignored.

KEY terminal voltage [V]	Operation	Variable range	
		MODK="L"	MODK="H"
VDD(VDD~3/4VDD)	No change		
5/8 VDD(3/4VDD~2/4VDD)	Key shift up (100 cent)	+600 cent	+400 cent
3/8 VDD(2/4VDD~1/4VDD)	Key shift down (100 cent)	–600 cent	–400 cent
VSS (1/4 VDD~VSS)	Return to no change state		

(Example)



4. LED INDICATION LED1 - LED13, MODL

LED1 to LED13 are output terminals to indicate the key variation condition by using LEDs.
There are two indication modes and which one to use is set through the MODL terminal.

MODL = "L" : Key indication
"H" : Number indication

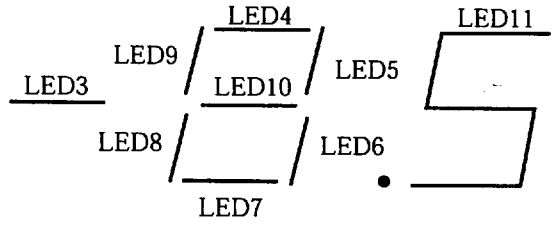
The output condition of LED output terminals is as shown below.

	Key indication (MODL="L")													Number indication (MODL="H")								
LED / Key	1	2	3	4	5	6	7	8	9	10	11	12	13	3	4	5	6	7	8	9	10	11
-3.0	L	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	L	L	L	L	Z	Z	L	Z
-2.5	Z	L	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	L	L	Z	L	L	Z	L	L
-2.0	Z	Z	L	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	L	L	Z	L	L	Z	L	Z
-1.5	Z	Z	Z	L	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	Z	L	L	Z	Z	Z	Z	L
-1.0	Z	Z	Z	Z	L	Z	Z	Z	Z	Z	Z	Z	Z	L	Z	L	L	Z	Z	Z	Z	Z
-0.5	Z	Z	Z	Z	Z	L	Z	Z	Z	Z	Z	Z	Z	L	L	L	L	L	L	L	Z	L
0	Z	Z	Z	Z	Z	Z	L	Z	Z	Z	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z
0.5	Z	Z	Z	Z	Z	Z	Z	L	Z	Z	Z	Z	Z	Z	L	L	L	L	L	L	Z	L
1.0	Z	Z	Z	Z	Z	Z	Z	Z	L	Z	Z	Z	Z	Z	Z	L	L	Z	Z	Z	Z	Z
1.5	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	Z	Z	Z	Z	Z	L	L	Z	Z	Z	Z	L
2.0	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	Z	Z	Z	L	L	Z	L	L	Z	L	Z
2.5	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	Z	Z	L	L	Z	L	L	Z	L	L
3.0	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	L	Z	L	L	L	L	Z	Z	L	Z

Note) L : Low level
Z : High impedance

In the key indication mode (MODL="L"), use LED1 to LED13 when the key variation is between –600 cent to +600 cent (MODK="L") and LED3 to LED11 for the variation between –400 cent to +400 cent (MODK="H").

In the number indication mode (MODL="H"), LED3 to LED11 are used, LED2 connects to VDD with a resistance (4.7kΩ). LED1, LED12 and LED13 are unconnected.
LED3 indicates the code for the key variation and LED11 below decimal point. LED4 to LED10 are used to express the absolute value of the key variation integer value as shown below.



5. Reset /IC

This LSI requires resetting when turning ON the power. The reset should be set to 'L' for 10 clocks of XI clock (13μs) or more.

■ ELECTRICAL CHARACTERISTICS

1. Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Power Supply Voltage	V_{DD}	−0.5~7.0	V
Input Voltage	V_I	−0.5~V_{DD}+0.5	V
Output Current	I_O	−20~20	mA
Operating Temperature	T_{op}	0~70	°C
Storage Temperature	T_{stg}	−50~125	°C

2. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{DD}	4.5	5.0	5.5	V
Operating Temperature	Top	0	25	70	°C

3. DC Characteristics

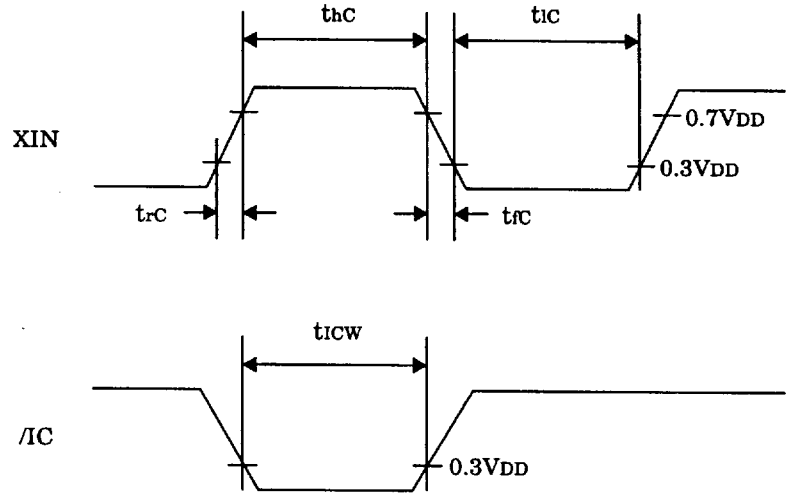
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply Current	I_{DD}	V_{DD}=5.0V		9	15	mA
Input Voltage L Level	V_{IL}	*1			0.3V_{DD}	V
Input Voltage H Level	V_{IH}	*1	0.7V_{DD}			V
Input Leakage Current	I_{LI}	*1			10	μA
Input Capacitance	C_I	*1			8	pF
Output Voltage L Level	V_{OL}	I_{OL}=10mA, *2			0.6	V
Output Capacitance	C_O	*2			10	pF

*1) Applicable to XI, MODL, MODK, /IC terminals.

*2) Applicable to LED1~LED13 terminals

4. AC Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
XIN Clock Frequency	fc	690	768	845	kHz
H Level Time	thc	390			ns
L Level Time	tlc	390			ns
Rise Time	trc		50	200	ns
Fall Time	tfc		50	200	ns
/IC Pulse Width	tIcw	13			µs

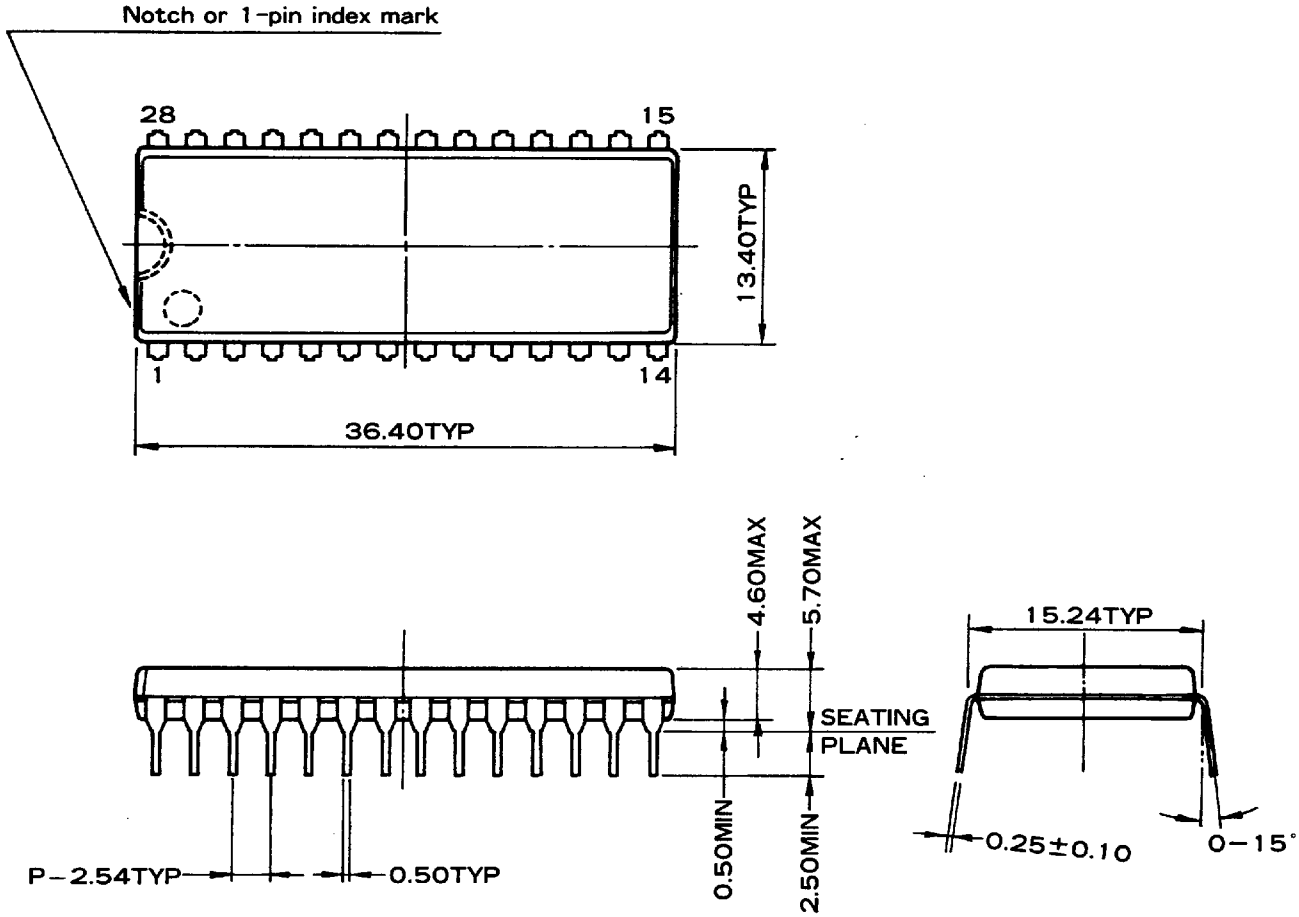


5. DC Characteristics (V_{DD} = 5.0V, Top = 25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Analog Input Voltage (1)	VIA1	AIN Terminal	0.05VDD		0.95VDD	V
Analog Input Voltage (2)	VIA2	KEY Terminal	0		VDD	V
Analog Output Voltage	VOA	AO Terminal	0.02VDD		0.98VDD	V
CV Center Voltage	Vc	CV Terminal		0.5VDD		V
Total Harmonic Distortion	THD+N	1kHz, 0dB, *1			1.0	%
		1kHz, -30dB, *1			1.5	%
Signal to Noise Ratio	S/N	S = 0dB, *1	75	80		dB

*1) 0dB=4.5Vpp, A/D → D/A through

■ EXTERNAL DIMENSIONS



The specifications of this product are subject to improvement changes without prior notice.

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