

YAMAHA LSI

YSD221

DIT3

Digital audio Interface Transmitter 3

■ OUTLINE

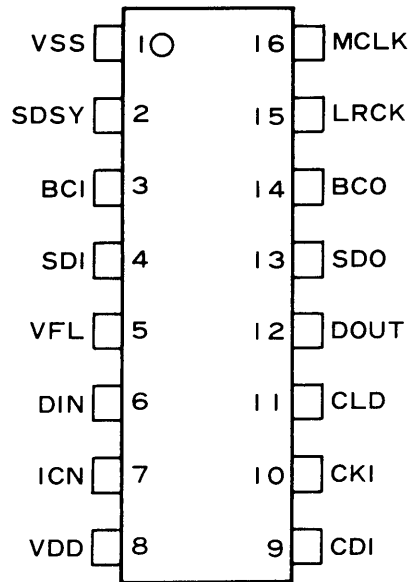
YSD221(DIT3) is an LSI which outputs the digital sound signals as digital audio interface (DIF) signals that conform to EIAJ CP-340 and AES/EBU. It also has a function of multiplexing with DIF signals from the CD signal processing LSI.

Use of YSD221 in combination with YM7110(LVFM) enables sound signals from the multi-disc player to be fully digitized, peripheral circuits to be reduced, sound signals to be switched and bilingual processed as well.

■ FEATURES

- Synchronous operation with the external clock (384fs) inputted into the MCLK terminal.
- Capable of accepting synchronized DIF signals in addition to the digital sound signals.
- Useable for bilingual discs as any input channel signals can be switched to the output channel.
- Outputs input signals as bi-phase signal.
- Also outputs signals to the digital filter, etc.
- First 32 bit of the channel status can be set through microprocessor.
- 5V single power supply, Si-gate CMOS process.
- 16 pin SOP or 16 pin DIP.

■ PIN CONFIGURATION



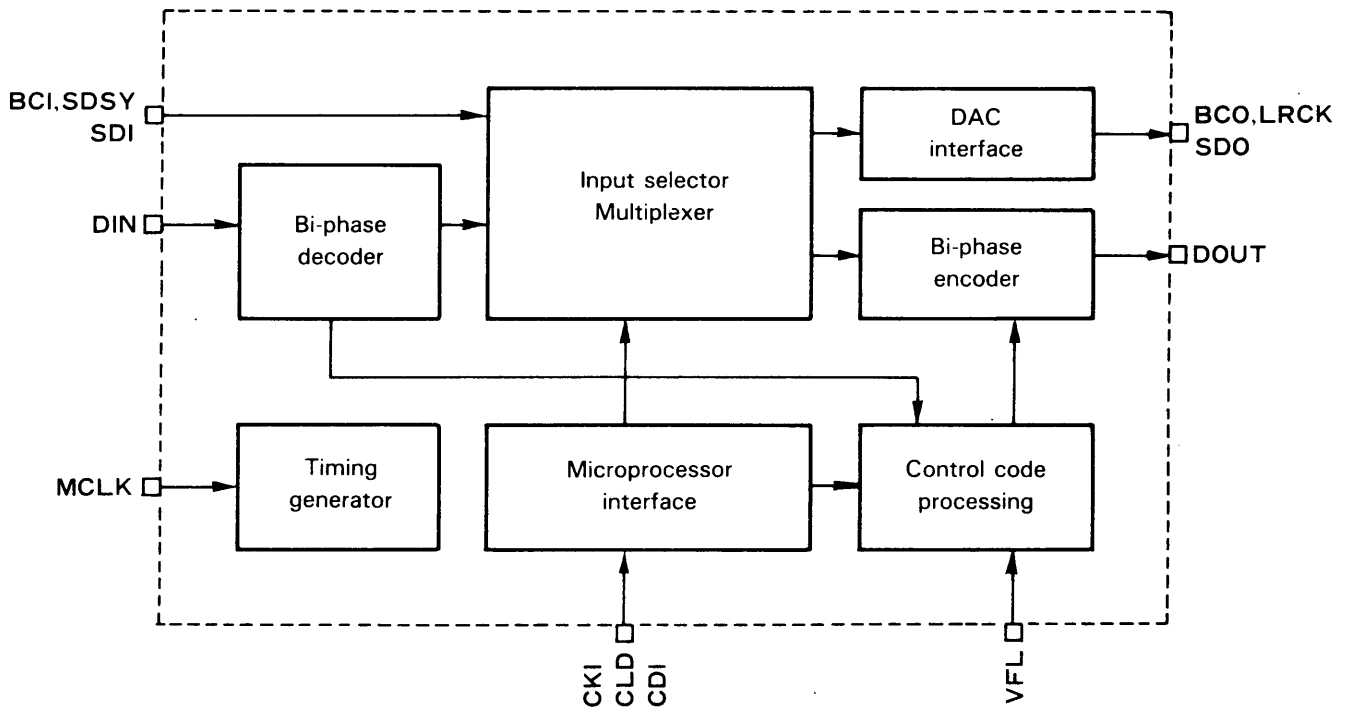
< 16 SOP, 16 DIP Top View >

■ PIN DESCRIPTION

No.	Name	I/O	Function
1	VSS		GND
2	SDSY	I+	Digital sound signal input
3	BCI	I+	Bit clock
4	SDI	I+	Serial data
5	VFL	I-	Validity flag data
6	DIN	I+	Synchronized digital audio interface signal input
7	ICN	I+	Initial clear input
8	VDD		+5V power supply
9	CDI	I	Microprocessor interface
10	CKI	I	Clock input
11	CLD	I	Load input
12	DOUT	O	Digital audio interface signal output
13	SDO	O	Digital sound signal output
14	BCO	O	Bit clock
15	LRCK	O	L/R clock
16	MCLK	I	Master clock input (384fs)

(Note) I+: Input terminal with pull-up resistor
 I-: Input terminal with pull-down resistor

■ BLOCK DIAGRAM



■ FUNCTION DESCRIPTION

1. Master clock MCLK

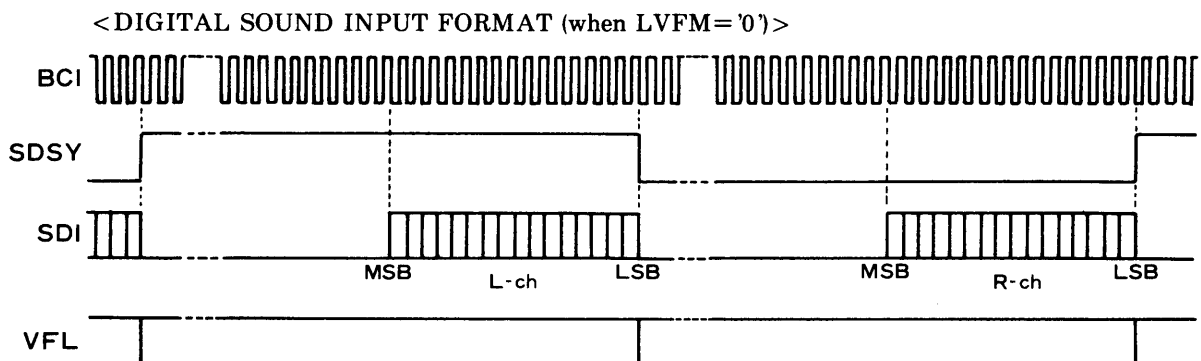
Inputs 384fs master clock to MCLK pin.

2. Data input DIN, BCI, SDSY, SDI, VFL

Digital sound signals are inputted through each pin of BCI, SDSY, SDI and VFL.

The input format is set through the microprocessor.

Interface with YM7110(LVFM) is also available.



- The acceptable sound data length is 16 bit.
- BCI, SDSY, SDI and VFL must be synchronized with MCLK.
- BCI must be one of 32fs, 48fs, 64fs, 96fs, 128fs and 192fs.

DIF signal is inputted through DIN pin by making use of the output of CD signal processing LSI, etc. 24 bit data including AUX bit and the control code can be accepted.

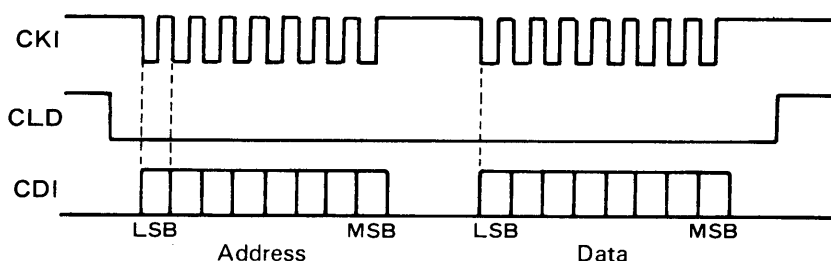
When inputting the DIF signal, it must be synchronized with the MCLK clock.

3. Microprocessor interface CLD, CKI, CDI

Setting multiplex of the input signal and channel status 32 bit should be done by sending the serial data in the format shown below through the microprocessor interface

3-1. Data format

Send the register address and setting data as a set.



3-2. Register map

ADDR		LSB	b1	b2	b3	b4	b5	b6	MSB
0	Output setting	LVFM	—	—	—	—	—	—	TEST
1		DIF	DAON	DION	—	CMOD	UMOD	VMOD	—
2		DA L		DA R		DI L		DI R	
3	Channel status	0	Control					0	0
4		Category code							
5	First 32 bit setting data	Source No.				Channel No.			
6		Sampling frequency				Clock accuracy	0	0	

LVFM: Setting digital sound input format

0: Digital sound format <default>

1: YM7110(LVFM) format

TEST: LSI test

Always set to '0'.

DIF: Setting DIF signal output

0: Output OFF (DOUT='L')

1: Output ON <default>

DAON: Setting digital sound output

0: Output OFF (SDO MUTE) <default>

1: Output ON

DION: Setting DIF signal output

- 0: Output OFF (Audio data mute)
- 1: Output ON <default >

CMOD: Setting channel status output mode

- 0: Microprocessor setting data output (same for L and R, first 32 bit each and all '0' after this) <default >
- 1: Data inputted from DIN is copied and output (L and R, 192 bit each)

UMOD: Setting user data output mode

- 0: All '0' output <default >
- 1: Data inputted from DIN is copied and output (192 bit *2)

VMOD: Setting validity flag output mode

- 0: '0' output all the time
- 1: Data inputted from VFL (when SDI is selected) or DIN (when DIF is selected) is copied and output <default >

DA L, DA R: Setting digital sound output multiplex

DA L selects digital sound output to L channel and DA R selects output data to R channel

DA L		Signal output to digital sound output L channel
LSB	b1	
0	0	Digital sound input L channel
1	0	Digital sound input R channel
0	1	DIF signal input L channel
1	1	DIF signal input R channel

default value is (LSB, b1)=(0, 0)

DA R		Signal output to digital sound output R channel
b2	b3	
0	0	Digital sound input L channel
1	0	Digital sound input R channel
0	1	DIF signal input L channel
1	1	DIF signal input R channel

Initial value is (b2, b3)=(0, 0)

DI L, DI R: Setting DIF signal output multiplex

DI L selects DIF signal output to L channel and DI R selects output data to R channel

DI L		Signal output to DIF signal output L channel
b4	b5	
0	0	Digital sound input L channel
1	0	Digital sound input R channel
0	1	DIF signal input L channel
1	1	DIF signal input R channel

default value is (b4, b5)=(0, 0)

DI R		Signal output to DIF signal output R channel
b6	MSB	
0	0	Digital sound input L channel
1	0	Digital sound input R channel
0	1	DIF signal input L channel
1	1	DIF signal input R channel

Initial value is (b6, MSB)=(1, 0)

Channel status 32 bit:

Set data as the first 32 bit of channel status.

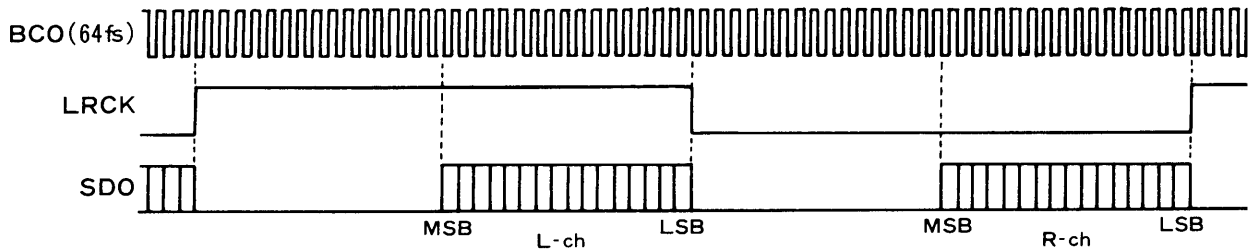
The data, as set, is output to both L and R channels from the immediately following preamble 'B' frame.

The initial value is all '0'.

4. Data output DOUT, BCO, LRCK, SDO

The audio data and control code are output through DOUT pin after bi-phase modulation. If DIF signal is selected, 24 bit including the AUX bit is output. Also, the digital sound data is output in the following format through BCO, LRCK and SDO terminals.

<DIGITAL SOUND OUTPUT FORMAT>



- The sound data length is 16 bit regardless of the input signal

5. System reset ICN

This LSI requires initial clear operation when the power is turned ON.

After the clock is fed, set the ICN pin to 'L' for 32 or more cycles of the sampling frequency.

While the ICN pin is 'L', DOUT output becomes 'L'.

■ ELECTRICAL CHARACTERISTICS

1. Absolute maximum ratings

Parameter	Symbol	Rating	Unit
Power supply voltage	VDD	-0.3 ~ 7.0	V
Input voltage	VI	-0.3 ~ VDD+0.3	V
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	VDD	4.75	5.00	5.25	V
Operating temperature	T _{op}	0	25	70	°C

3. DC characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply current	IDD				10	mA
Input voltage H level (1)	VIH1	*1	2.2			V
Input voltage L level (1)	VIL1	*1			0.8	V
Input voltage H level (2)	VIH2	*2	3.5			V
Input voltage L level (2)	VIL2	*2			1.5	V
Input leakage current	ILK	*3	-10		10	μA
Pull-up, pull-down resistance	RP	*4	60		600	kΩ
Output voltage H level	VOH	I _{OH} = -0.4mA, *5	4.0			V
Output voltage L level	VOL	I _{OL} = 1.0mA, *5			0.4	V
Input capacitance	CI	f = 1MHz			8	pF

*1) Applicable to input pins except for ICN.

*2) Applicable to ICN pin.

*3) Applicable to CDI, CKI, CLD and MCLK pins.

*4) Applicable to SDSY, BCI, SDI, VFL, DIN and ICN pins.

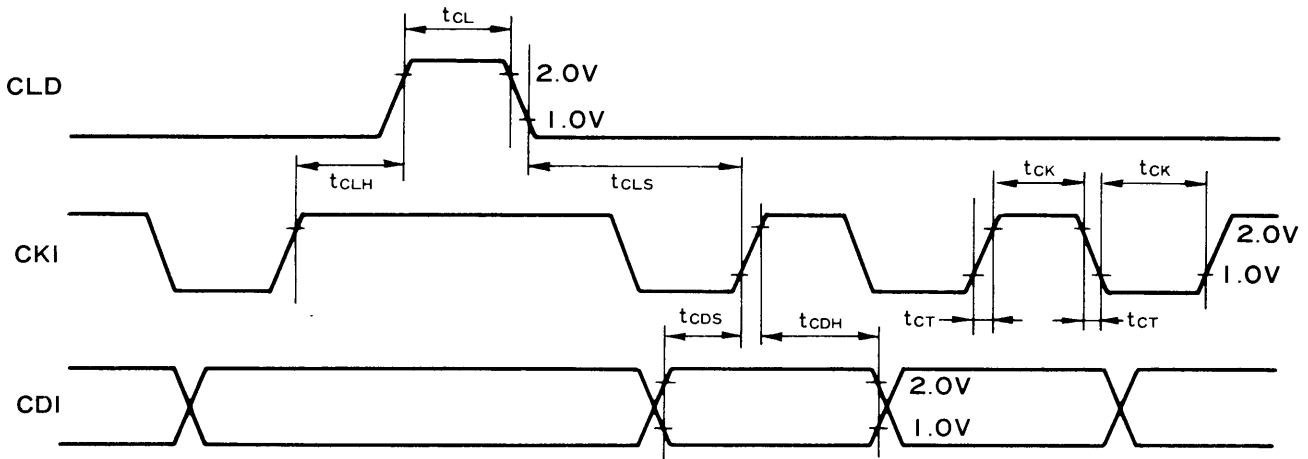
*5) Applicable to all output pins.

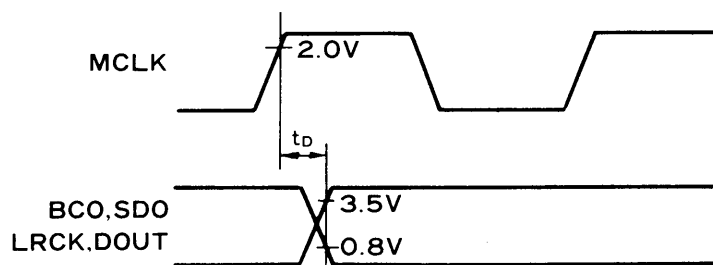
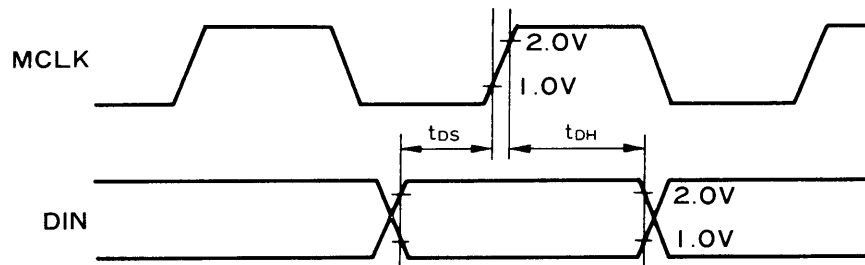
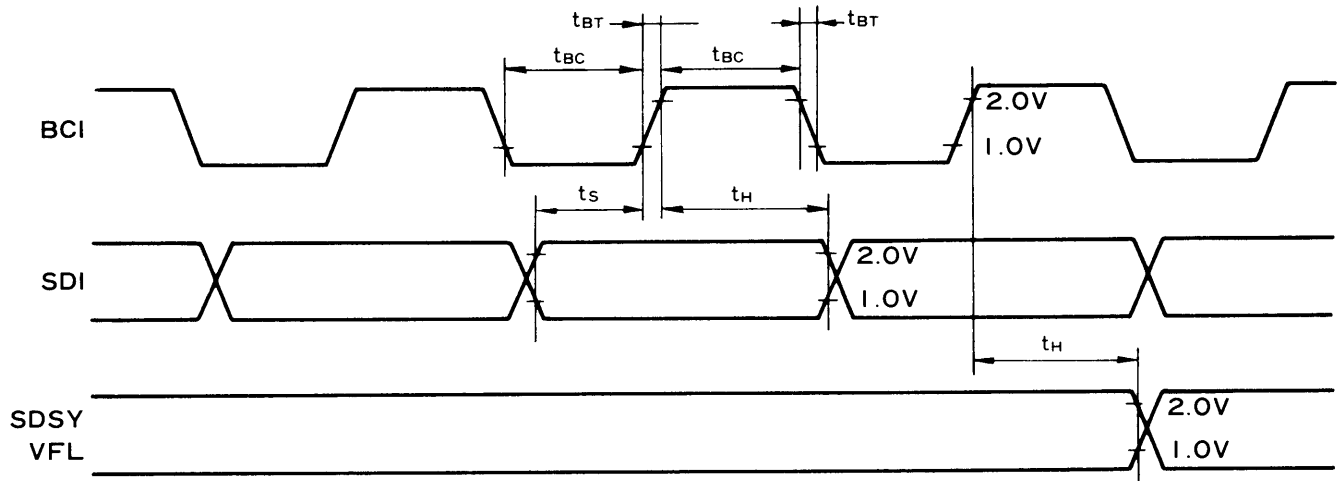
4. AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
MCLK frequency	fM	12.2		18.5	MHz
MCLK Duty	DM	40	50	60	%
CDI Setup time	tCDS	20			ns
CDI Hold time	tCDH	20			ns
CKI ON/OFF time	tCK	40			ns
CKI Transition time	tCT			50	ns
CLD Setup time	tCLS	40			ns
CLD Hold time	tCLH	0			ns
CLD ON time	tCL	14/fM			ns
SDI Setup time	tS	20			ns
SDI Hold time	tH	20			ns
BCI ON/OFF time	tBC	40			ns
BCI Transition time	tBT			50	ns
DIF Setup time	tDS	20			ns
DIF Hold time	tDH	20			ns
BCO, LRCK, SDO, DOUT	tD			80	ns
Delay time					

*1) Either tDS or tDH may be less than its Min. value but not both of them at the same time.

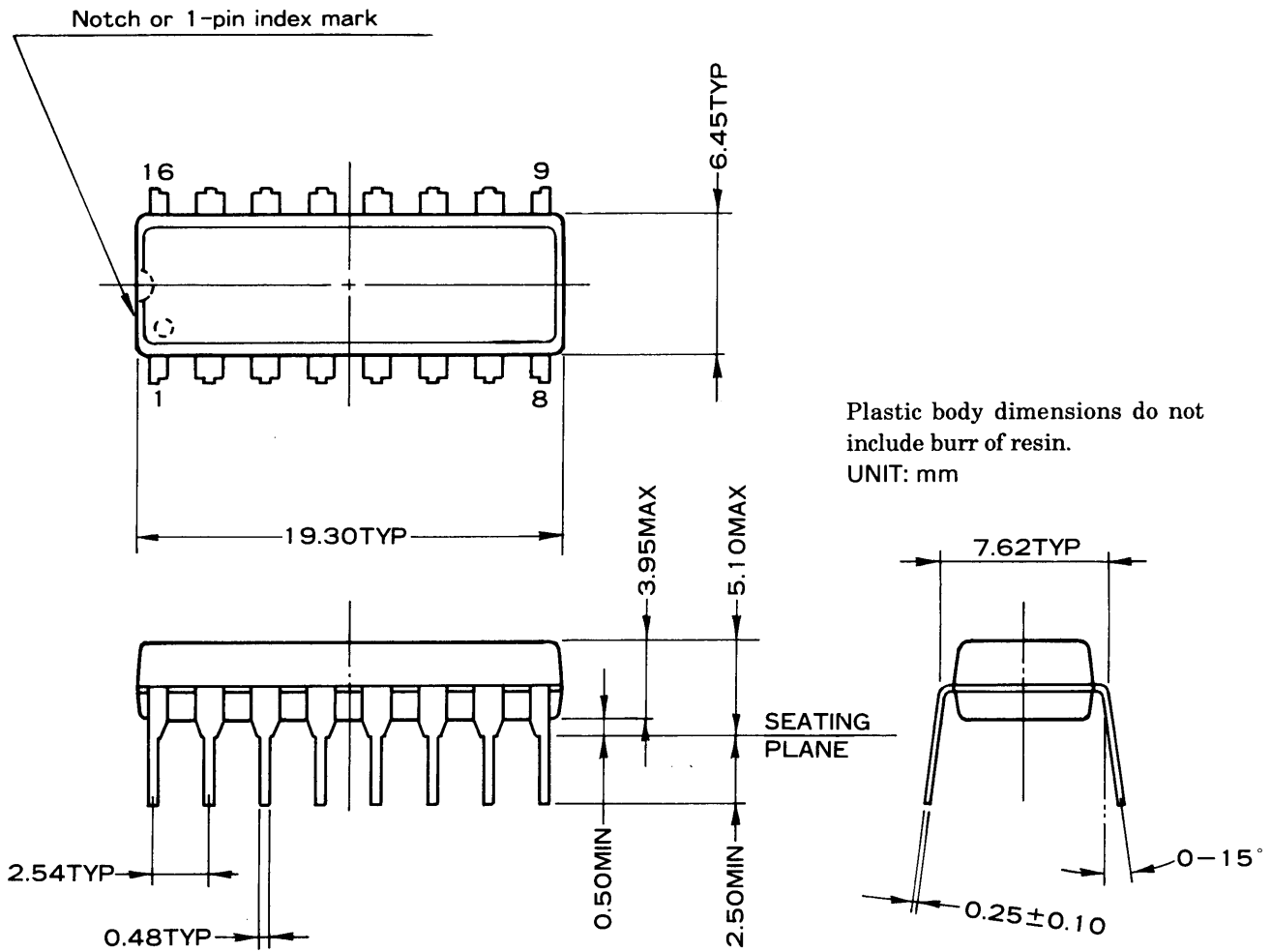
*2) Load capacitance : 100pF or less

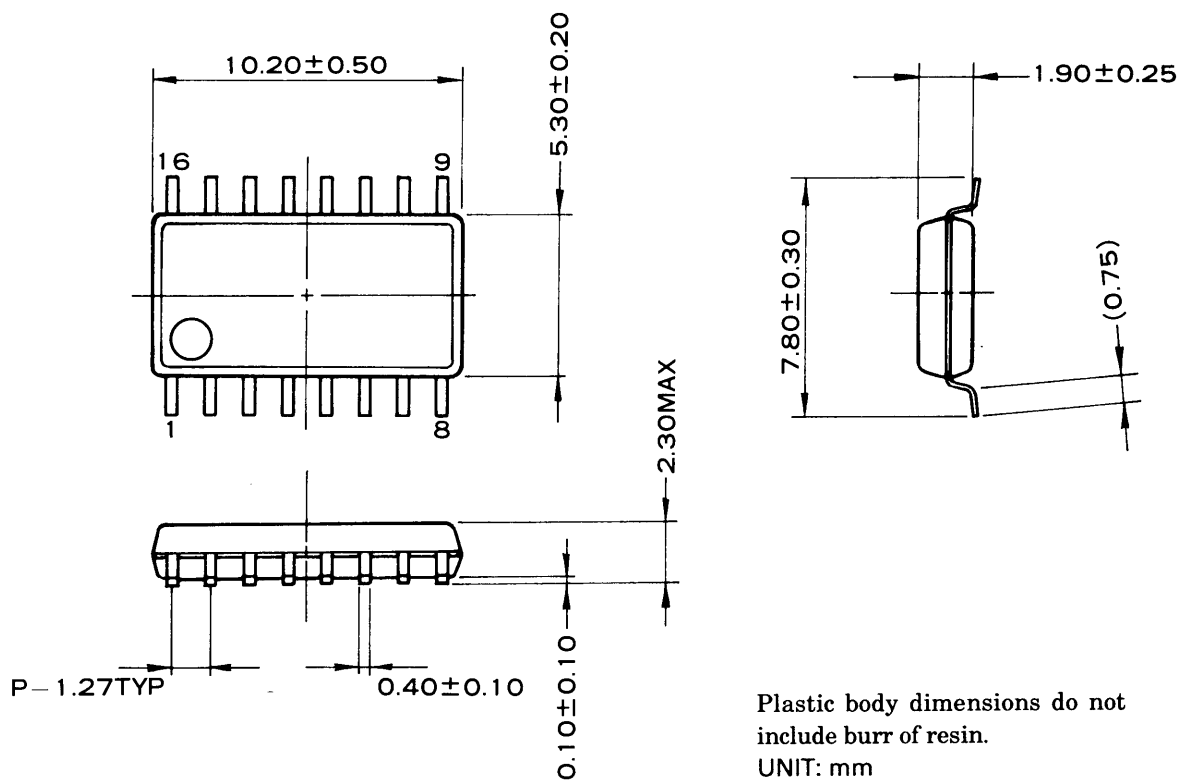




EXTERNAL DIMENSIONS

- YSD221-D





Note : The LSIs for surface mount need especial consideration on strage and soldering conditions. For detailed information, please contact your nearest agent of yamaha.

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