M74HC253P/FP/DP

DUAL 4-INPUT DATA SELECTOR/MULTIPLEXER WITH 3-STATE OUTPUTS

DESCRIPTION

The M74HC253 is a semiconductor integrated circuit consisting of two 4-line to 1-line data selectors/multiplexrs with 3-state outputs.

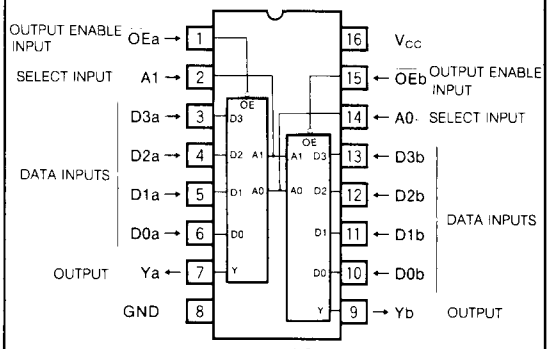
FEATURES

- High-speed: 18ns typ. (C_L=15pF, V_{CC}=5V)
- Low power dissipation: 20μW/package, max (V_{CC}=5V, T_a=25℃, quiescent state)
- High noise margin: 30% of V_{CC}, min (V_{CC}=4.5V, 6V)
- Capable of driving 10 74LSTTL loads
- Wide supply voltage range: V_{CC}=2~6V
- Wide operating temperature range: T_a=−40~+85℃

APPLICATION

General purpose, for use in industrial and consumer digital equipment.

PIN CONFIGURATION (TOP VIEW)



Outline 16P4, 16P2N, 16P2P

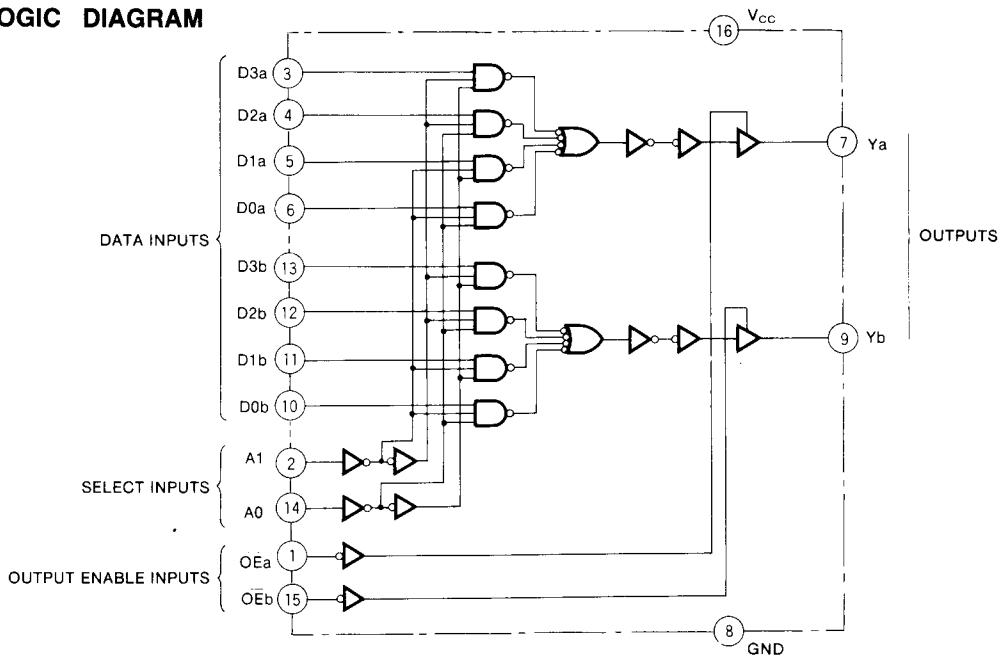
FUNCTIONAL DESCRIPTION

Use of silicon gate technology allows the M74HC253P to maintain the low power dissipation and high noise margin characteristics of the standard CMOS logic 4000B series while giving high-speed performance equivalent to the 74LS253.

The M74HC253 consists of data selector functions for selecting one of four input line signals and multiplex functions for converting 4-bit parallel data into serial data using time-division.

The 4-line signal is applied to data inputs D0 through D7, and after one of the data inputs has been selected by select inputs A0 and A1, that input signal will be output at Y. By applying 4-bit parallel data to D0 through D3, and connecting the output of a synchronous quadruple counter to A0 and A1, D0 through D3 data will be output at Y synchronous with the clock pulse in the order of D0-D3. Slelct inputs A are common to the two circuits while the output-enable inputs $\overline{OE}$ are independent. When $\overline{OE}$ is high, Y will become a high-impedance state irrespective of other inputs.

LOGIC DIAGRAM



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DUAL 4-INPUT DATA SELECTOR/MULTIPLEXER WITH 3-STATE OUTPUTS

FUNCTION TABLE (Note 1)

Inputs							Output
A1	A0	D0	D1	D2	D3	$\overline{OE}$	Y
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

Note 1 : X : Irrelevant
Z : High impedance

ABSOLUTE MAXIMUM RATINGS (T_a = −40∼+85℃)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		−0.5∼+7.0	V
V_I	Input voltage		−0.5∼V_{CC}+0.5	V
V_O	Output voltage		−0.5∼V_{CC}+0.5	V
I_{IK}	Input protection diode current	V_I < 0V	−20	mA
		V_I > V_{CC}	20	
I_{OK}	Output parasitic diode current	V_O < 0V	−20	mA
		V_O > V_{CC}	20	
I_O	Output current per output pin		±25	mA
I_{CC}	Supply/GND current	V_{CC}, GND	±50	mA
P_d	Power dissipation	(Note 2)	500	mW
Tstg	Storage temperature range		−65∼+150	℃

Note 2 : M74HC253FP, T_a = −40∼+70℃ and T_a = 70∼85℃ are derated at −6mW/℃.
M74HC253DP, T_a = −40∼+50℃ and T_a = 50∼85℃ are derated at −5mW/℃.

RECOMMENDED OPERATING CONDITIONS (T_a = −40∼+85℃)

Symbol	Parameter		Limits			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage		2		6	V
V_I	Input voltage		0		V_{CC}	V
V_O	Output voltage		0		V_{CC}	V
Topr	Operating temperature range		−40		+85	℃
t_r, t_f	Input risetime, falltime	V_{CC} = 2.0V	0		1000	ns
		V_{CC} = 4.5V	0		500	
		V_{CC} = 6.0V	0		400	

DUAL 4-INPUT DATA SELECTOR/MULTIPLEXER WITH 3-STATE OUTPUTS

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test conditions		Limits					Unit
				25℃			−40～+85℃		
			V_{CC}(V)	Min	Typ	Max	Min	Max	
V_{IH}	High-level input voltage	V_O = 0.1V, V_{CC}−0.1V $\|I_O\|$ = 20μA	2.0	1.5			1.5		V
			4.5	3.15			3.15		
			6.0	4.2			4.2		
V_{IL}	Low-level input voltage	V_O = 0.1V, V_{CC}−0.1V $\|I_O\|$ = 20μA	2.0			0.5		0.5	V
			4.5			1.35		1.35	
			6.0			1.8		1.8	
V_{OH}	High-level output voltage	V_I = V_{IH}, V_{IL}	I_{OH} = −20μA	2.0	1.9		1.9		V
			I_{OH} = −20μA	4.5	4.4		4.4		
			I_{OH} = −20μA	6.0	5.9		5.9		
			I_{OH} = −4.0mA	4.5	4.18		4.13		
			I_{OH} = −5.2mA	6.0	5.68		5.63		
V_{OL}	Low-level output voltage	V_I = V_{IH}, V_{IL}	I_{OL} = 20μA	2.0		0.1		0.1	V
			I_{OL} = 20μA	4.5		0.1		0.1	
			I_{OL} = 20μA	6.0		0.1		0.1	
			I_{OL} = 4.0mA	4.5		0.26		0.33	
			I_{OL} = 5.2mA	6.0		0.26		0.33	
I_{IH}	High-level input current	V_I = 6V		6.0		0.1		1.0	μA
I_{IL}	Low-level input current	V_I = 0V		6.0		−0.1		−1.0	μA
I_{OZH}	Off-state high-level output current	V_I = V_{IH}, V_{IL}, V_O = V_{CC}		6.0		0.5		5.0	μA
I_{OZL}	Off-state low-level output current	V_I = V_{IH}, V_{IL}, V_O = GND		6.0		−0.5		−5.0	μA
I_{CC}	Quiescent supply current	V_I = V_{CC}, GND, I_O = 0μA		6.0		4.0		40.0	μA

SWITCHING CHARACTERISTICS (V_{CC} = 5V, T_a = 25℃)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{TLH}	Low-level to high-level and high-level to low-level output transition time	C_L = 15pF (Note 4)			10	ns
t_{THL}					10	ns
t_{PLH}	Low-level to high-level and high-level to low-level output propagation time (D − Y)				23	ns
t_{PHL}					23	ns
t_{PLH}	Low-level to high-level and high-level to low-level output propagation time (A − Y)				30	ns
t_{PHL}					30	ns
t_{PLZ}	Output disable time from low-level and high-level ($\overline{OE}$ − Y)	C_L = 5 pF (Note 4)			27	ns
t_{PHZ}					27	ns
t_{PZL}	Output enable time to low-level and high-level ($\overline{OE}$ − Y)	C_L = 15pF (Note 4)			18	ns
t_{PZH}					18	ns

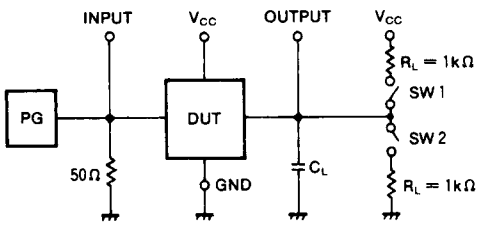
DUAL 4-INPUT DATA SELECTOR/MULTIPLEXER WITH 3-STATE OUTPUTS

SWITCHING CHARACTERISTICS (V_{CC} = 2~6V, T_a = −40~+85℃)

Symbol	Parameter	Test conditions		Limits					Unit
				25℃			−40~+85℃		
			V_{CC}(V)	Min	Typ	Max	Min	Max	
t_{TLH}	Low-level to high-level and high-level to low-level output transition time	C_L = 50pF (Note 4)	2.0			75		95	ns
			4.5			15		19	
			6.0			13		16	
t_{THL}			2.0			75		95	ns
			4.5			15		19	
			6.0			13		16	
t_{PLH}	Low-level to high-level and high-level to low-level output propagation time (D − Y)		2.0			126		158	ns
			4.5			28		35	
			6.0			23		29	
t_{PHL}			2.0			126		158	ns
			4.5			28		35	
			6.0			23		29	
t_{PLH}	Low-level to high-level and high-level to low-level output propagation time (A − Y)		2.0			158		198	ns
			4.5			35		44	
			6.0			30		38	
t_{PHL}			2.0			158		198	ns
			4.5			35		44	
			6.0			30		38	
t_{PLZ}	Output disable time from low-level and high-level ($\overline{OE}$ − Y)		2.0			135		169	ns
			4.5			30		38	
			6.0			25		31	
t_{PHZ}			2.0			135		169	ns
			4.5			30		38	
			6.0			25		31	
t_{PZL}	Output enable time to low-level and high-level ($\overline{OE}$ − Y)		2.0			90		113	ns
			4.5			20		25	
			6.0			17		21	
t_{PZH}			2.0			90		113	ns
			4.5			20		25	
			6.0			17		21	
C_I	Input capacitance					10		10	pF
C_O	Off-state output capacitance	$\overline{OE}$ = V_{CC}				15		15	pF
C_{PD}	Power dissipation capacitance (Note 3)				61				pF

Note 3 : C_{PD} is the internal capacitance of the IC calculated from operation supply current under no-load conditions.
The power dissipated during operation under no-load conditions is calculated using the following formula:
$P_D = C_{PD} \cdot V_{CC}^2 \cdot f_I + I_{CC} \cdot V_{CC}$

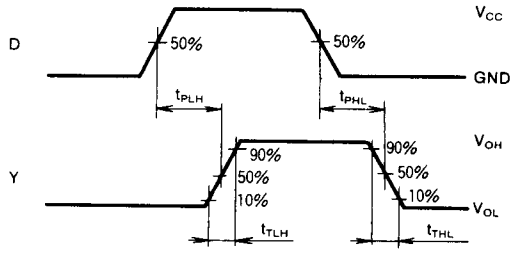
Note 4 : Test Circuit

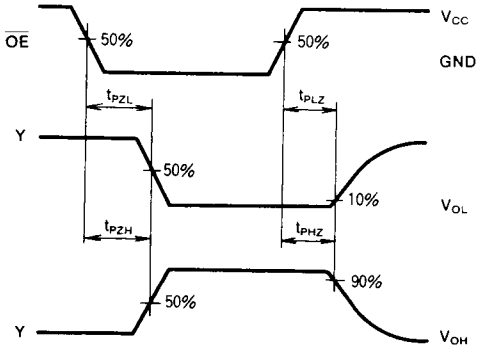


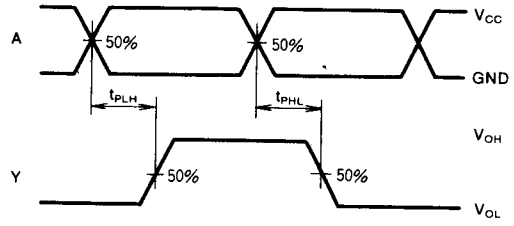
Parameter	SW 1	SW 2
t_{TLH}, t_{THL} t_{PLH}, t_{PHL}	Open	Open
t_{PLZ}	Closed	Open
t_{PHZ}	Open	Closed
t_{PZL}	Closed	Open
t_{PZH}	Open	Closed

(1) The pulse generator (PG) has the following characteristics (10%~90%): t_r = 6ns, t_f = 6ns
(2) The capacitance C_L includes stray wiring capacitance and the probe input capacitance.

TIMING DIAGRAM





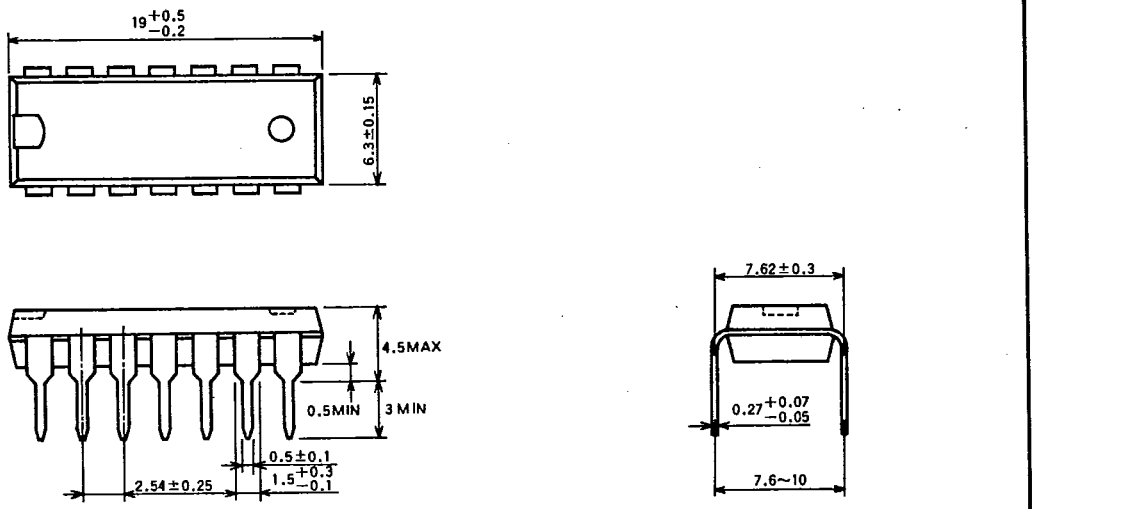


MITSUBISHI HIGH SPEED CMOS

PACKAGE OUTLINES

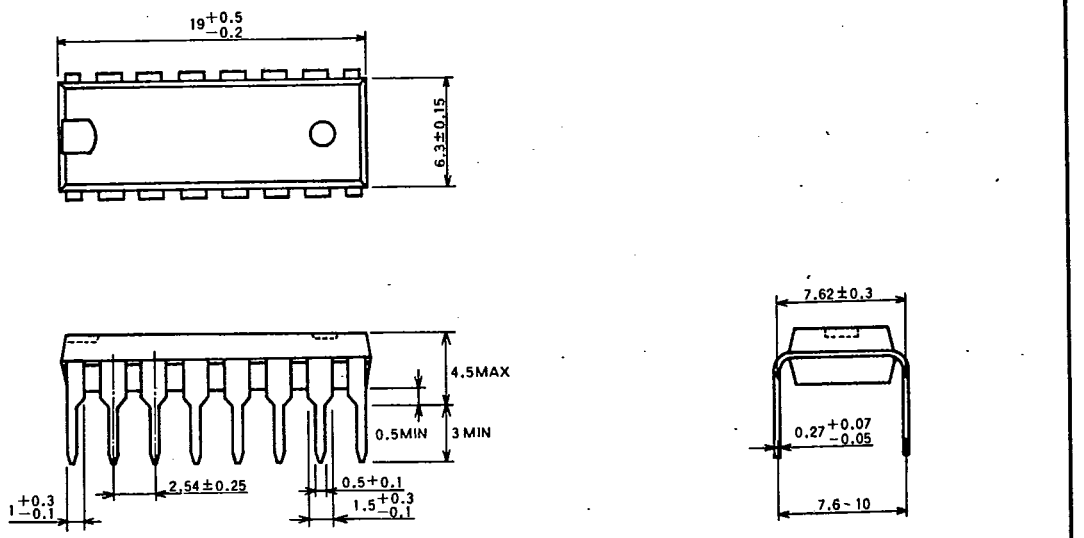
TYPE 14P4 14-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIP

Dimension in mm

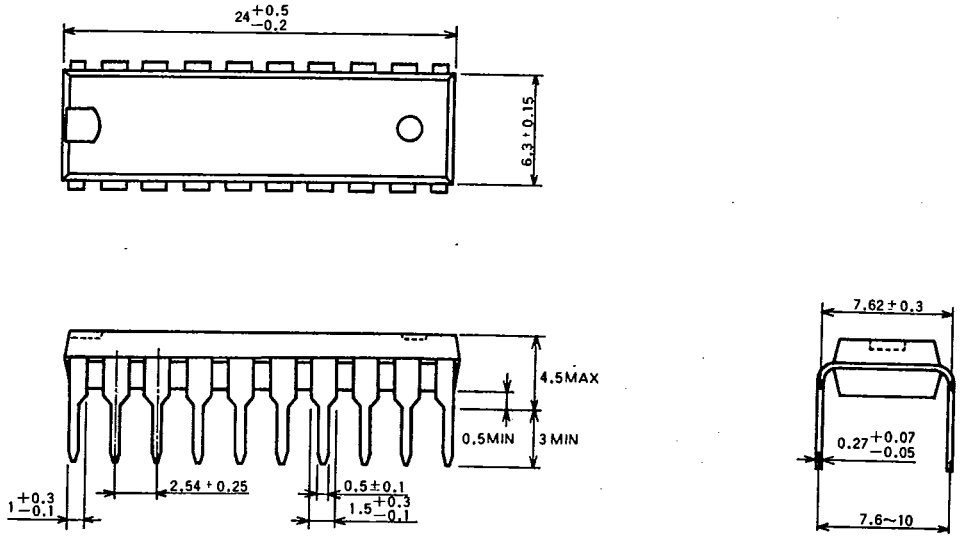


MITSUBISHI HIGH SPEED CMOS

PACKAGE OUTLINES

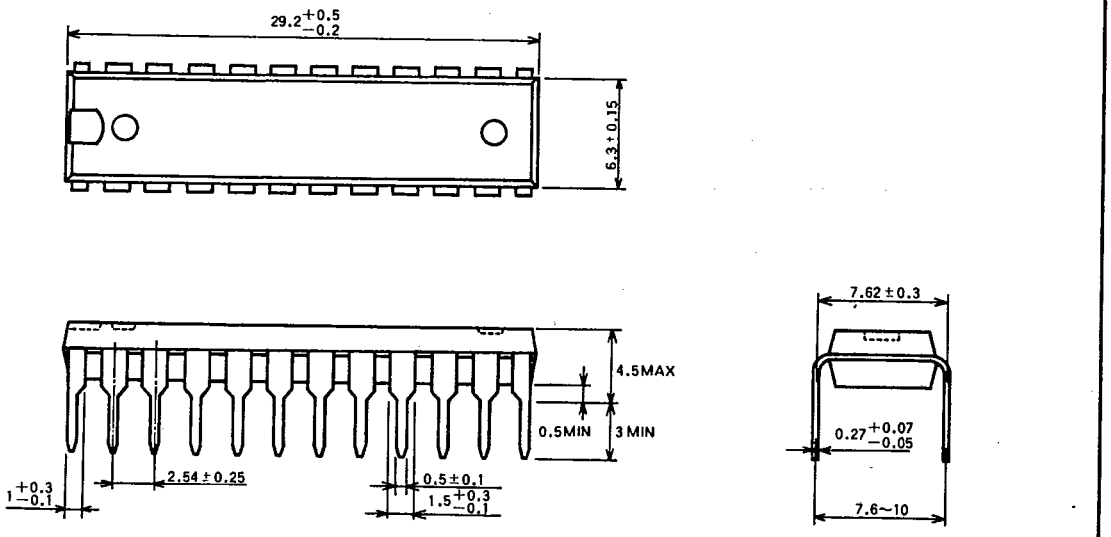
TYPE 20P4 20-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE 24P4D 24-PIN MOLDED PLASTIC DIP

Dimension in mm



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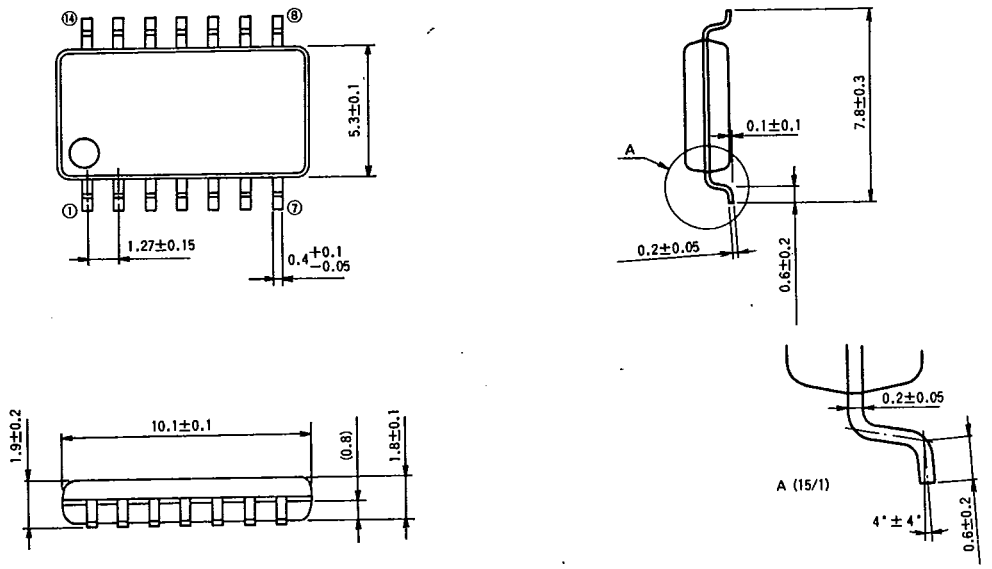
MITSUBISHI HIGH SPEED CMOS

PACKAGE OUTLINES

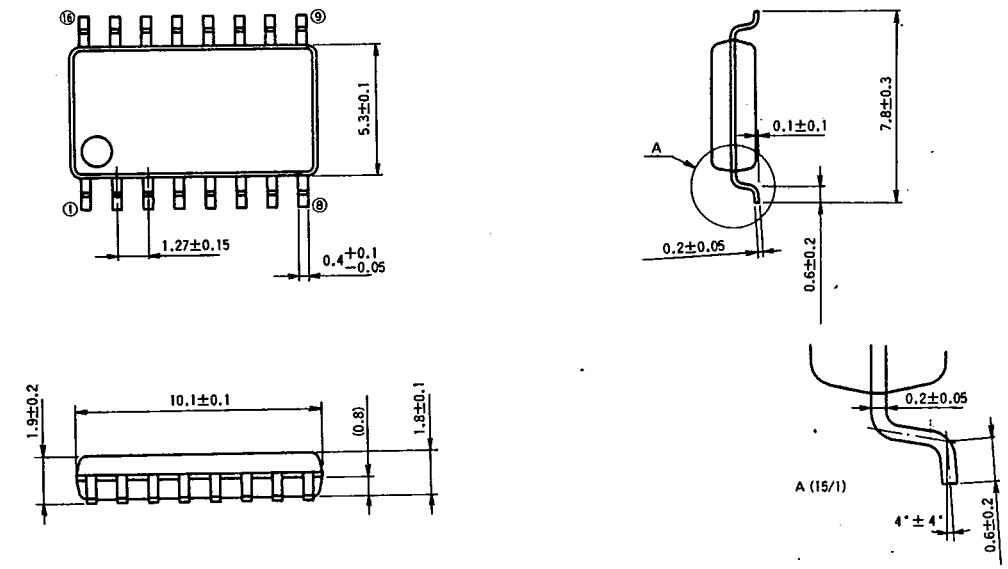
TYPE 14P2N 14PIN MOLDED PLASTIC SOP

Dimension in mm



TYPE 16P2N 16PIN MOLDED PLASTIC SOP

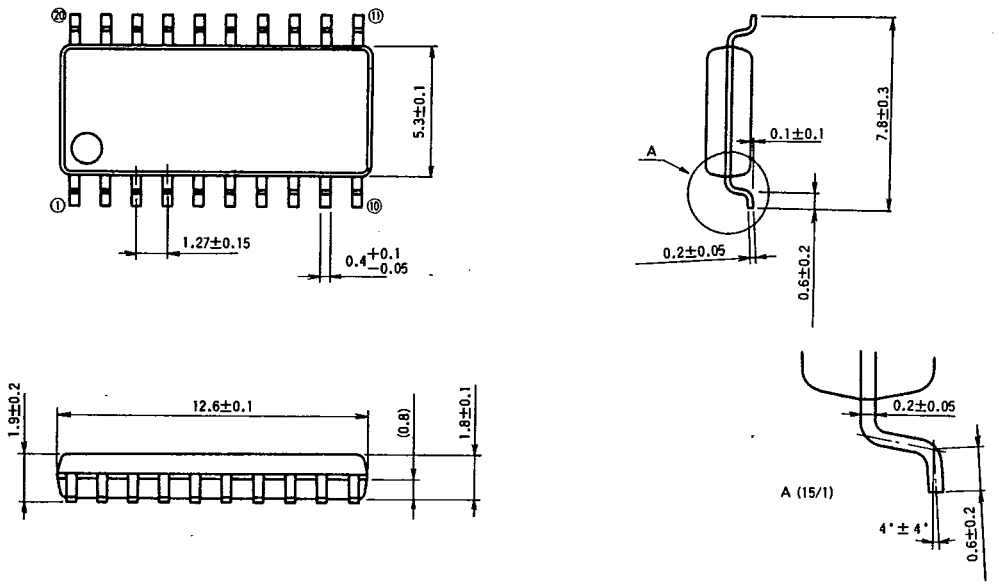
Dimension in mm



PACKAGE OUTLINES

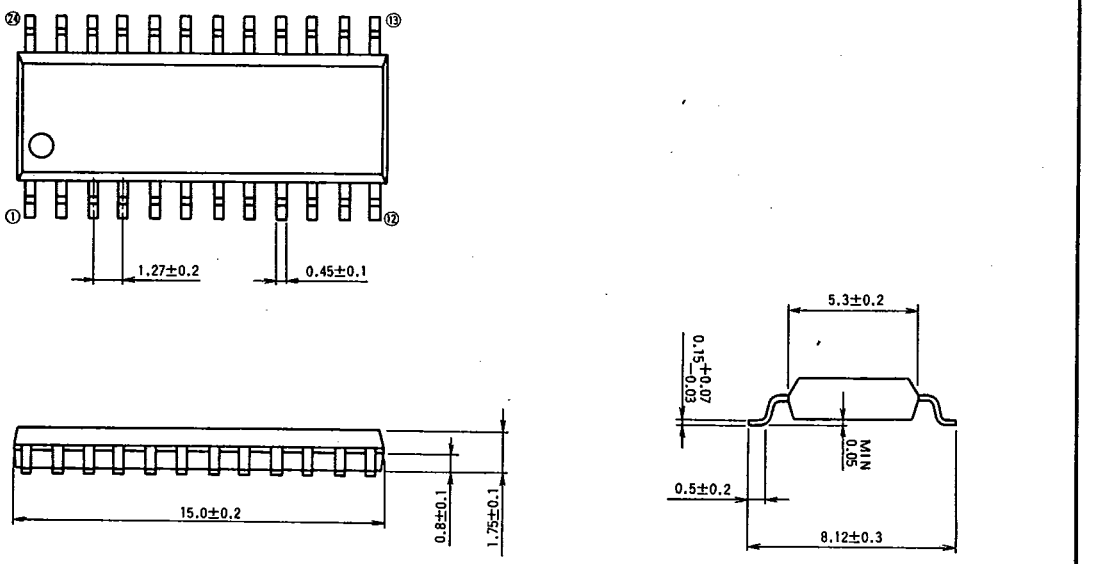
TYPE 20P2N 20PIN MOLDED PLASTIC SOP

Dimension in mm



TYPE 24P2 24PIN MOLDED PLASTIC SOP

Dimension in mm



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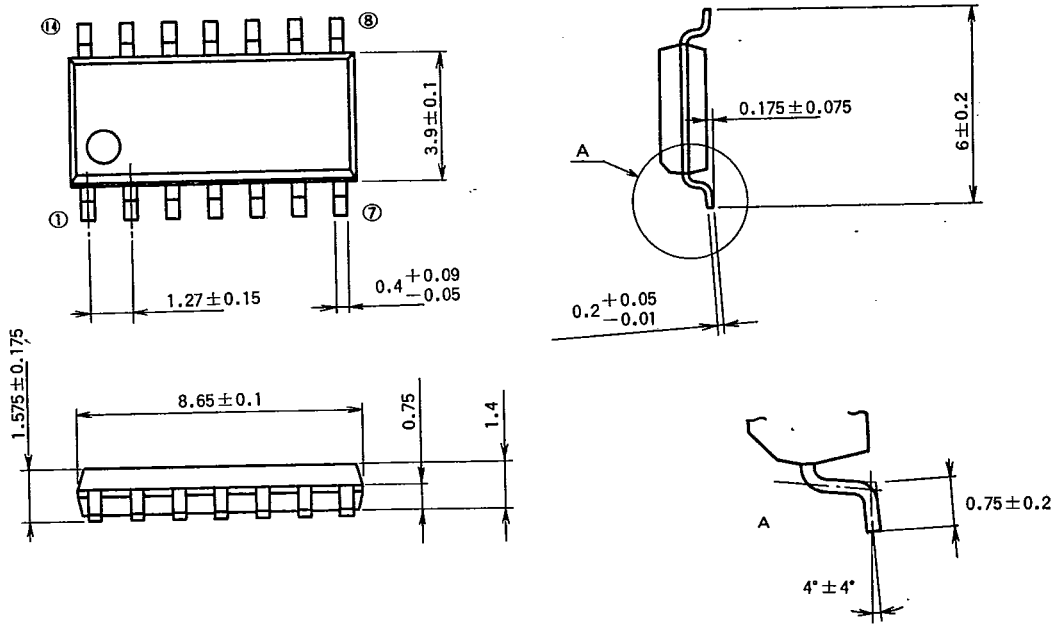
PACKAGE OUTLINES

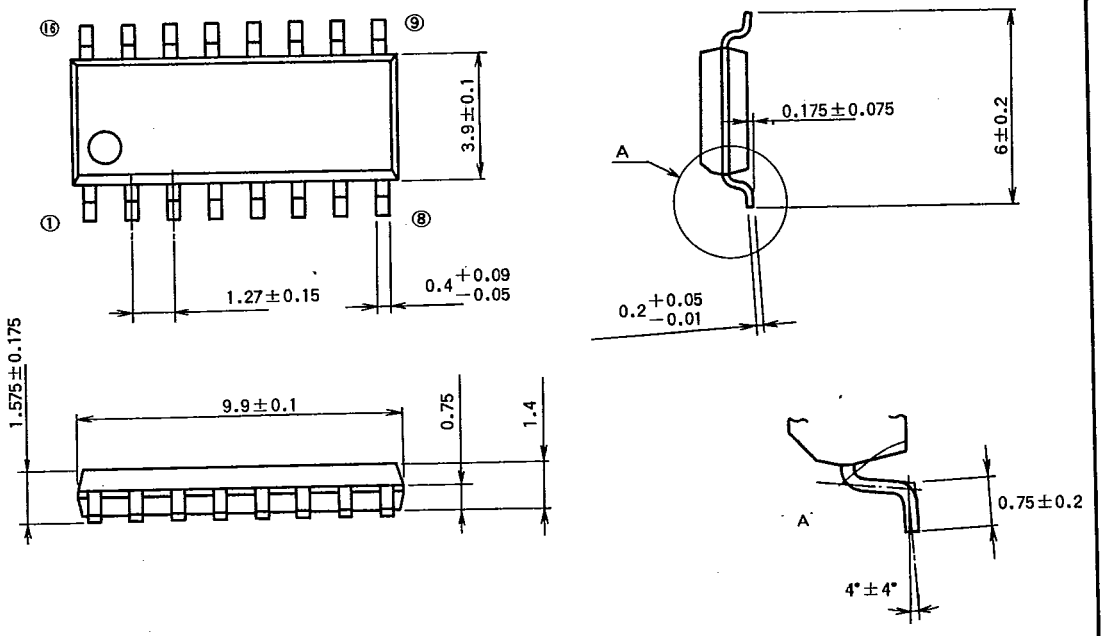
TYPE 14P2P 14-PIN MOLDED PLASTIC SOP(JEDEC 150mil body)

Dimension in mm

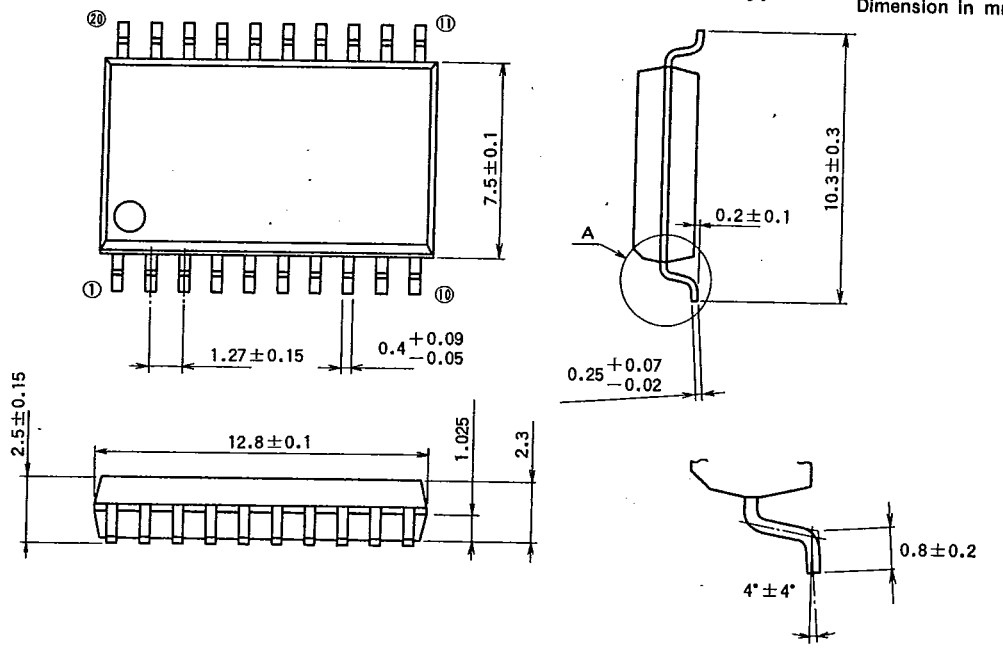


TYPE 16P2P 16-PIN MOLDED PLASTIC SOP(JEDEC 150mil body)

Dimension in mm



PACKAGE OUTLINES

TYPE 20P2V 20-PIN MOLDED PLASTIC SOP(JEDEC 300mil body)

Dimension in mm