

MITSUBISHI HIGH SPEED CMOS M74HC14P/FP/DP

HEX SCHMITT-TRIGGER INVERTER

DESCRIPTION

The M74HC14 is a semiconductor integrated circuit consisting of six Schmitt-trigger inverters.

FEATURES

- High-speed: 12ns typ. ($C_L=15\text{pF}$, $V_{CC}=5\text{V}$)
- Wide hysteresis voltage width: 0.8V ($V_{CC}=5\text{V}$, typ)
- Low power dissipation: $5\mu\text{W}/\text{package}$, max ($V_{CC}=5\text{V}$, $T_a=25^\circ\text{C}$, quiescent state)
- Capable of driving 10 74LSTTL loads
- Wide operating voltage range: $V_{CC}=2\sim 6\text{V}$
- Wide operating temperature range: $T_a=-40\sim +85^\circ\text{C}$

APPLICATION

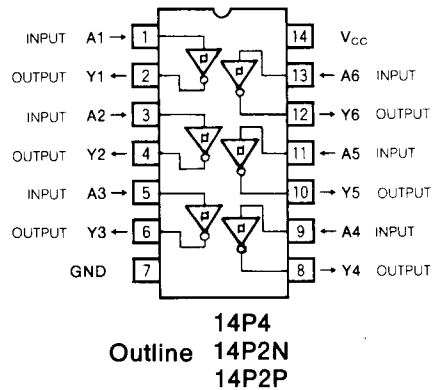
General purpose, for use in industrial and consumer digital equipment.

FUNCTIONAL DESCRIPTION

Use of silicon gate technology allows the M74HC14 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 74LS14.

Built-in Schmitt-trigger circuits prevent the occurrence of incorrect oscillations even when input signals having slow rise and fall times are applied. The Schmitt triggers ensure a signal of restored waveshape will appear at the output. When input A is high, the output Y will become low, and when input A is low, the output Y will become high.

PIN CONFIGURATION (TOP VIEW)



LOGIC DIAGRAM (EACH SCHMITT-TRIGGER)



FUNCTION TABLE

Input	Output
A	Y
L	H
H	L

ABSOLUTE MAXIMUM RATINGS ($T_a = -40\sim +85^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		$-0.5\sim +7.0$	V
V_I	Input voltage		$-0.5\sim V_{CC}+0.5$	V
V_O	Output voltage		$-0.5\sim V_{CC}+0.5$	V
I_{IK}	Input protection diode current	$V_I < 0\text{V}$	-20	mA
		$V_I > V_{CC}$	20	
I_{OK}	Output parasitic diode current	$V_O < 0\text{V}$	-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 1)	500	mW
T_{stg}	Storage temperature range		$-65\sim +150$	$^\circ\text{C}$

Note 1 : M74HC14FP, $T_a = -40\sim +60^\circ\text{C}$ and $T_a = 60\sim 85^\circ\text{C}$ are derated at $-6\text{mW}/^\circ\text{C}$.
M74HC14DP, $T_a = -40\sim +50^\circ\text{C}$ and $T_a = 50\sim 85^\circ\text{C}$ are derated at $-5\text{mW}/^\circ\text{C}$.

HEX SCHMITT-TRIGGER INVERTER

RECOMMENDED OPERATING CONDITIONS ($T_a = -40 \sim +85^\circ\text{C}$)

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
T_{opr}	Operating temperature range	-40		+85	°C
t_r, t_f	Input risetime, falltime	No restriction			ns

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits					Unit	
			$V_{CC}(V)$	25°C			-40~+85°C		
				Min	Typ	Max	Min		Max
V_{T+}	Positive-going threshold voltage	$V_O = 0.1V$ $ I_O = 20\mu A$	2.0	0.7		1.5	0.7	1.5	V
			4.5	1.55		3.15	1.55	3.15	
			6.0	2.1		4.2	2.1	4.2	
V_{T-}	Negative-going threshold voltage	$V_O = V_{CC} - 0.1V$ $ I_O = 20\mu A$	2.0	0.3		1.0	0.3	1.0	V
			4.5	0.9		2.45	0.9	2.45	
			6.0	1.2		3.2	1.2	3.2	
V_H	Hysteresis voltage	$V_O = 0.1V, V_{CC} - 0.1V$ $ I_O = 20\mu A$	2.0	0.2		1.2	0.2	1.2	V
			4.5	0.4		2.1	0.4	2.1	
			6.0	0.5		2.5	0.5	2.5	
V_{OH}	High-level output voltage	$V_I = V_{T-}$	$I_{OH} = -20\mu A$	2.0	1.9		1.9		V
			$I_{OH} = -20\mu A$	4.5	4.4		4.4		
			$I_{OH} = -20\mu A$	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	$V_I = V_{T+}$	$I_{OL} = 20\mu A$	2.0		0.1		0.1	V
			$I_{OL} = 20\mu A$	4.5		0.1		0.1	
			$I_{OL} = 20\mu A$	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_{CC}	Quiescent supply current	$V_I = V_{CC}, GND, I_O = 0\mu A$	6.0		1.0		10.0	μA	

HEX SCHMITT-TRIGGER INVERTER

SWITCHING CHARACTERISTICS ($V_{CC} = 5V, T_a = 25^\circ C$)

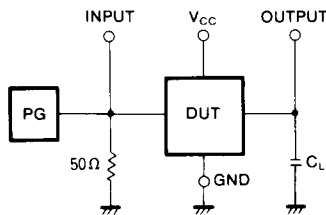
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{TLH}	Low-level to high-level and high-level to low-level	$C_L = 15pF$ (Note 3)			10	ns
t_{THL}	output transition time				10	ns
t_{PLH}	Low-level to high-level and high-level to low-level				22	ns
t_{PHL}	output propagation time				22	ns

SWITCHING CHARACTERISTICS ($V_{CC} = 2\sim 6V, T_a = -40\sim +85^\circ C$)

Symbol	Parameter	Test conditions	Limits						Unit
			25°C			-40~+85°C			
			$V_{CC}(V)$	Min	Typ	Max	Min		
t_{TLH}	Low-level to high-level and high-level to low-level	$C_L = 50pF$ (Note 3)	2.0			75		95	ns
			4.5			15		19	
			6.0			13		16	
t_{THL}	output transition time		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		2.0			125		156	ns
			4.5			25		31	
			6.0			21		26	
t_{PHL}	output propagation time	2.0			125		156	ns	
		4.5			25		31		
		6.0			21		26		
C_I	Input capacitance				10		10	pF	
C_{PD}	Power dissipation capacitance (Note 2)			29				pF	

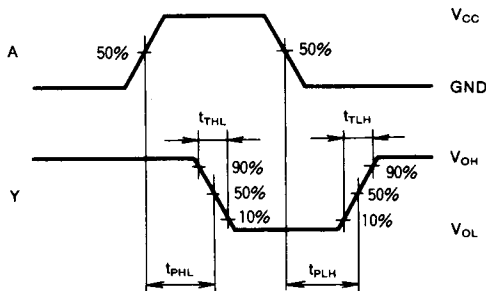
Note 2 : C_{PD} is the internal capacitance of the IC calculated from operation supply current under no-load conditions. (per inverter)
The power dissipated during operation under no-load conditions is calculated using the following formula:
 $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_i + I_{CC} \cdot V_{CC}$

Note 3 : Test Circuit



- (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

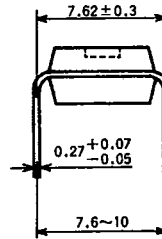
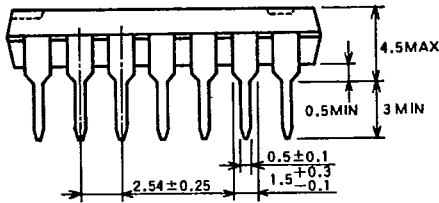
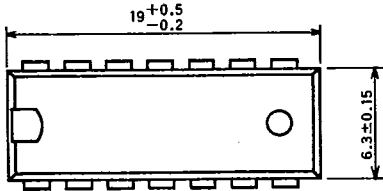
6249827 MITSUBISHI (DGTL LOGIC)

91D 12849

D T-90-20

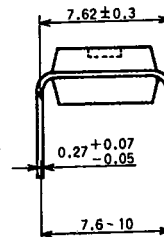
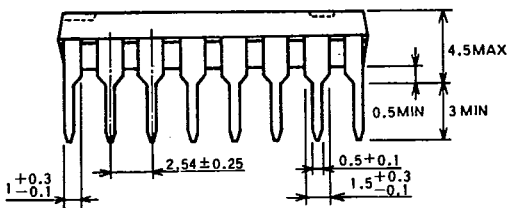
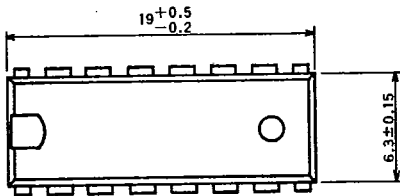
TYPE 14P4 14-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIP

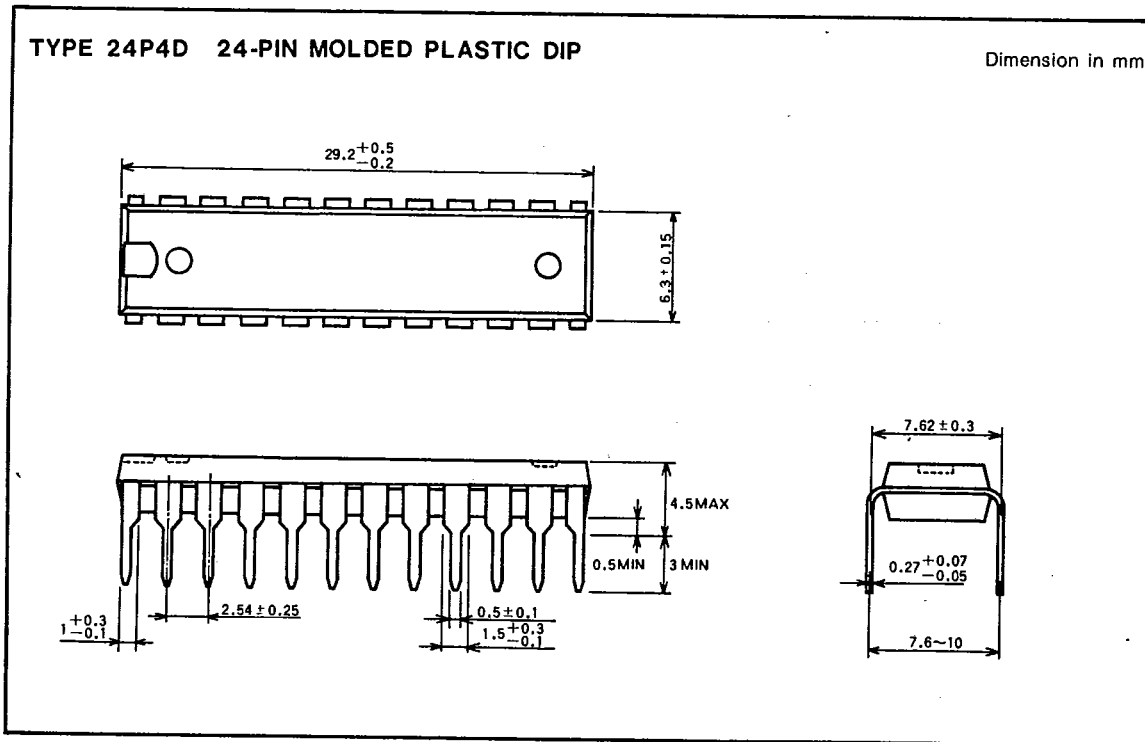
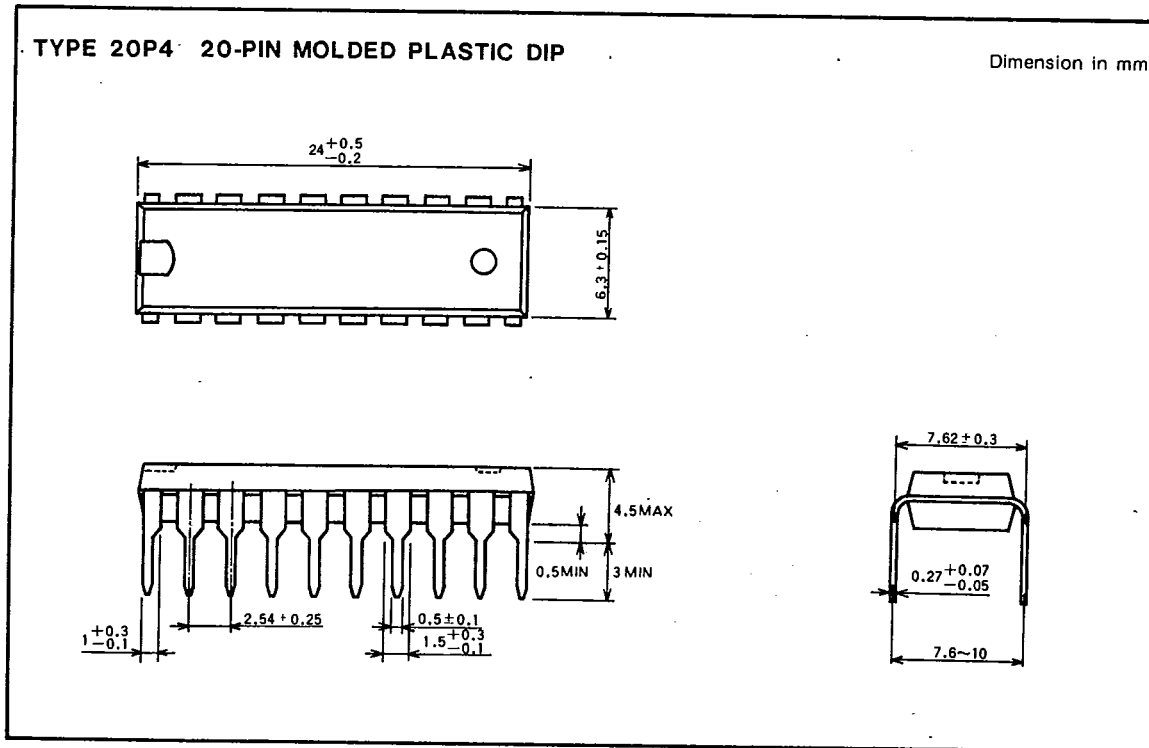
Dimension in mm



MITSUBISHI HIGH SPEED CMOS
PACKAGE OUTLINES

6249827 MITSUBISHI (DGTL LOGIC)

91D 12850 D.T-90-20



2933

G-02

1-52

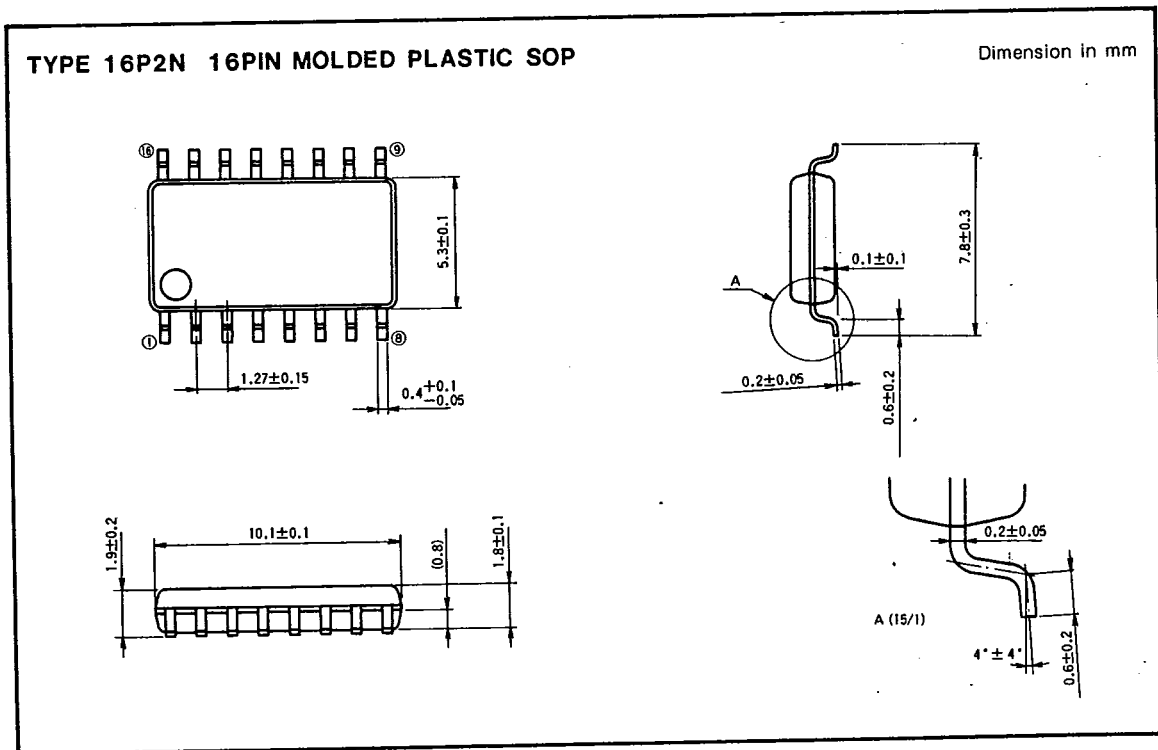
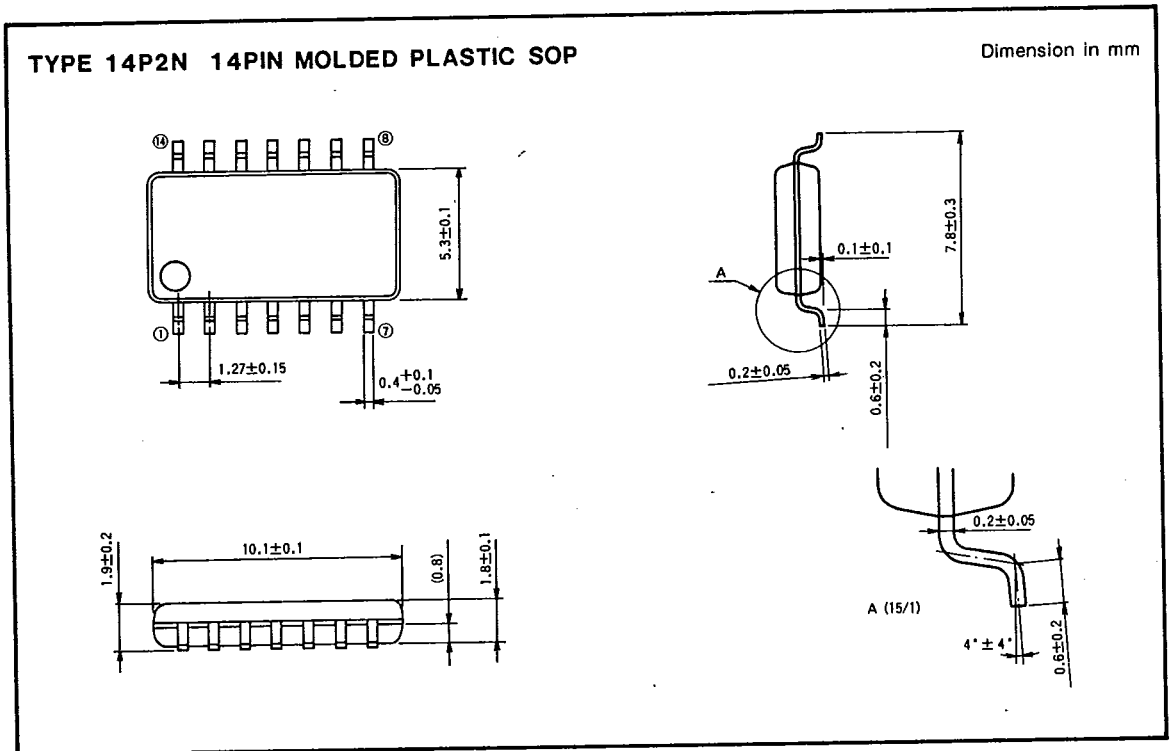


MITSUBISHI ELECTRIC CO. TOKYO, JAPAN

MITSUBISHI HIGH SPEED CMOS
PACKAGE OUTLINES

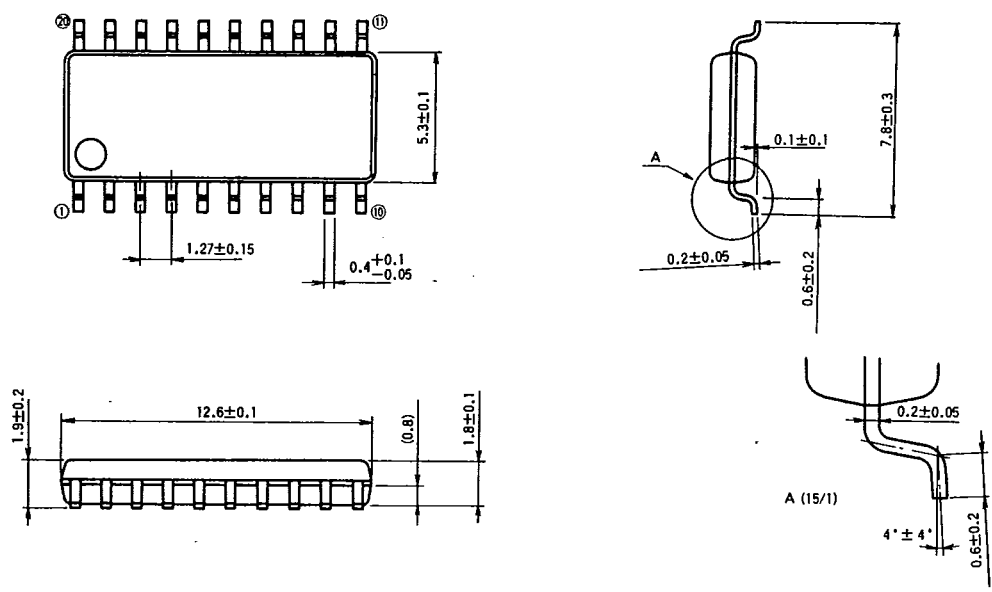
6249827 MITSUBISHI (DGTL LOGIC)

91D 12851 D T-90.20



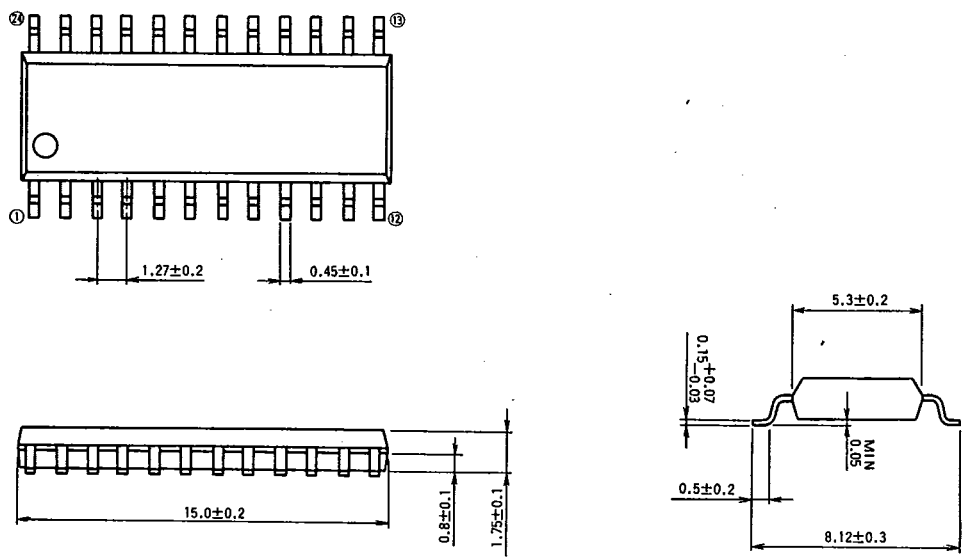
TYPE 20P2N 20PIN MOLDED PLASTIC SOP

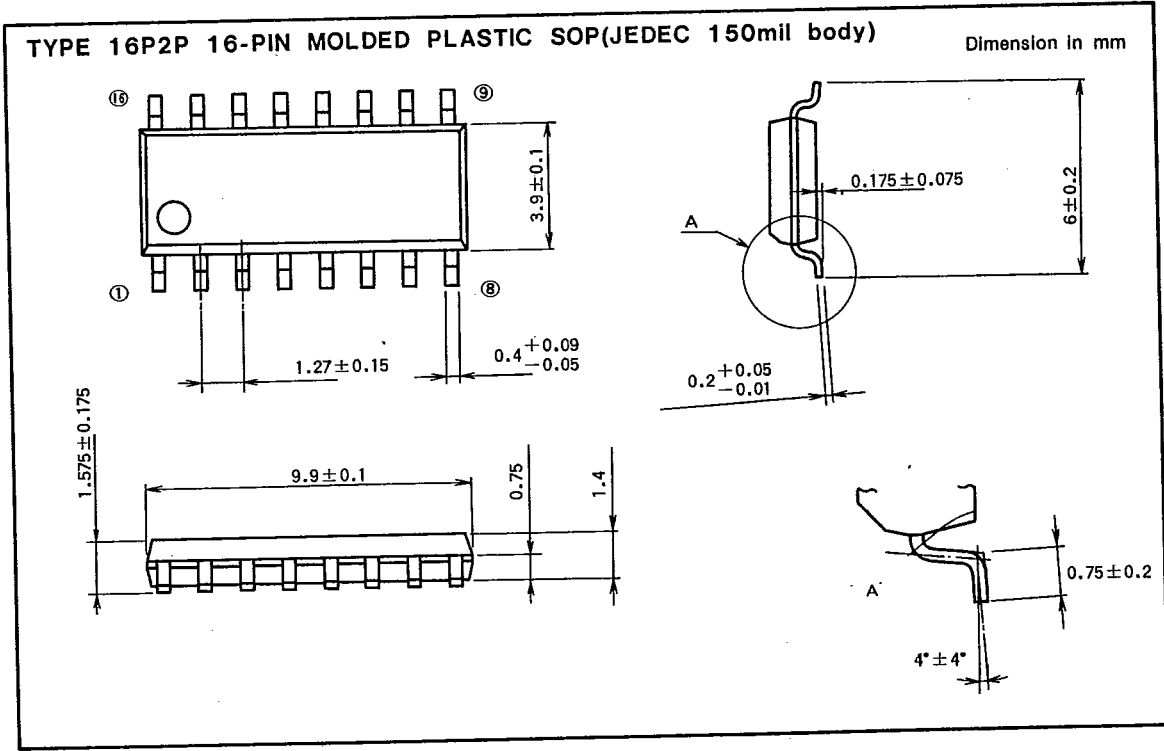
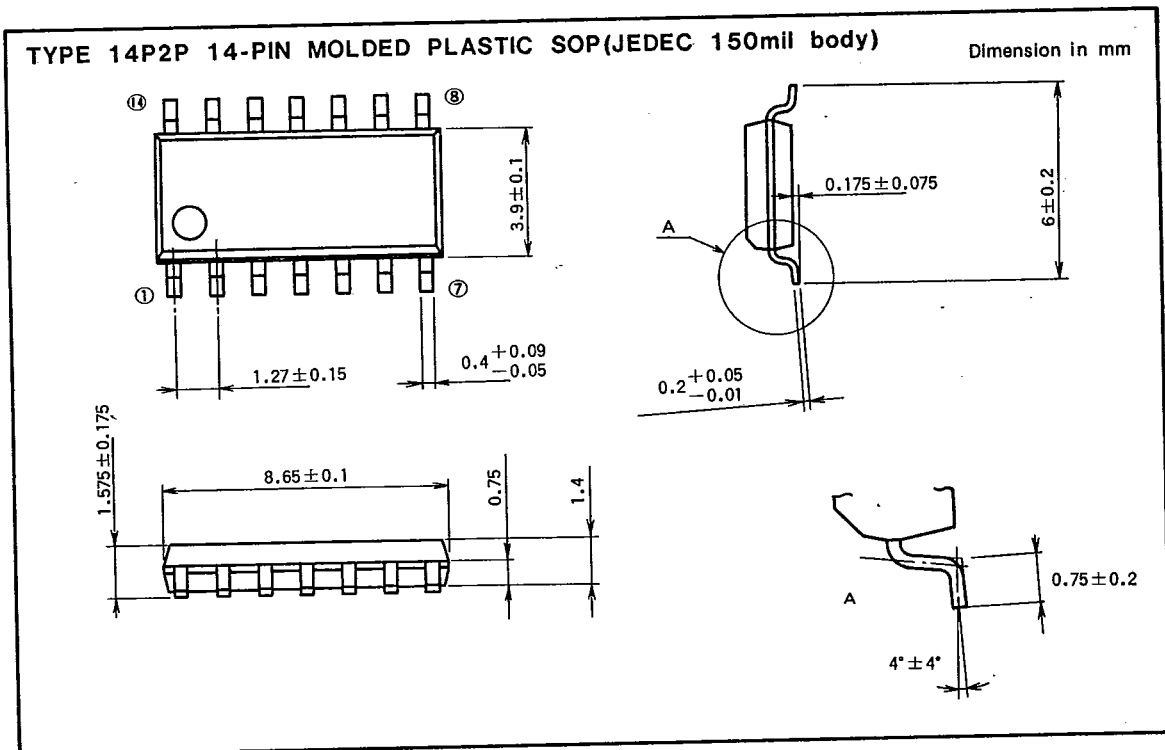
Dimension in mm



TYPE 24P2 24PIN MOLDED PLASTIC SOP

Dimension in mm

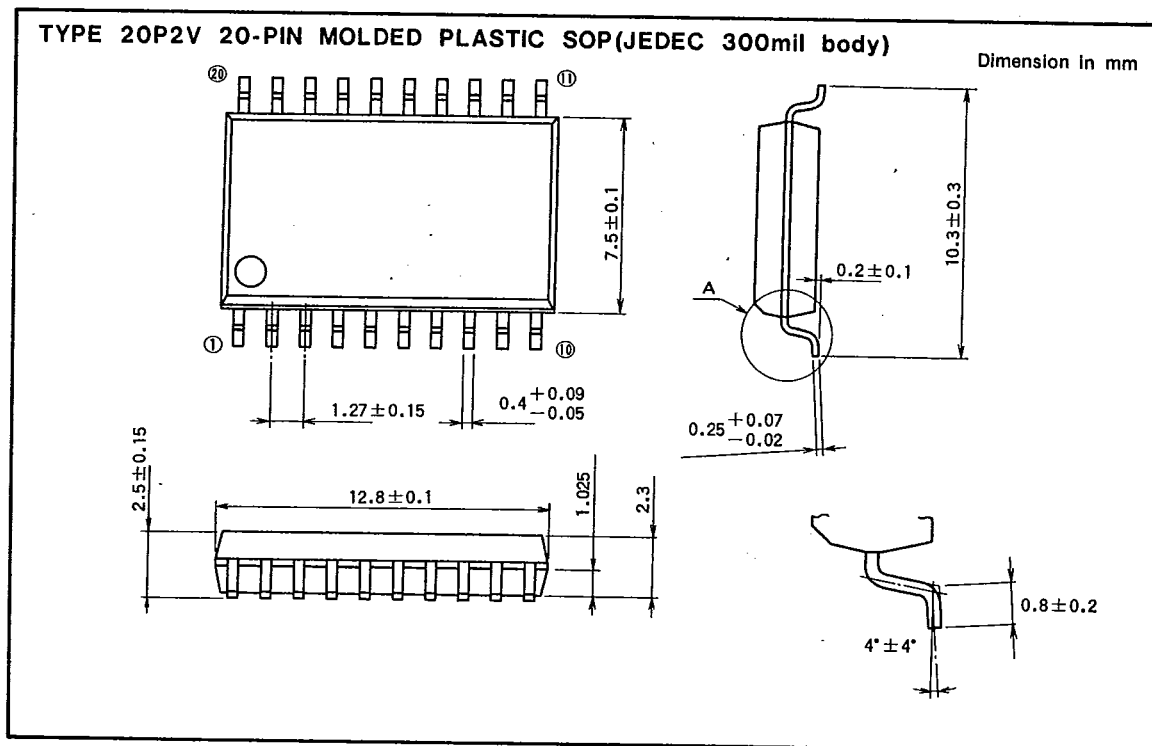




MITSUBISHI HIGH SPEED CMOS
PACKAGE OUTLINES

6249827 MITSUBISHI (DGTL LOGIC)

91D 12854 D T-90-20



Vertical text on the left margin.