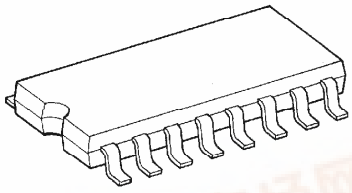
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC9250F, TC9250P

16 BITS RESISTER STRINGS DA CONVERTER

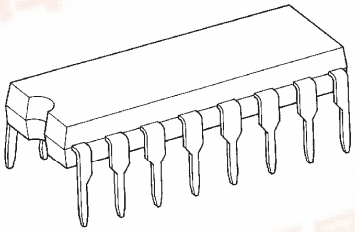
TC9250F, TC9250P is 16 bits resister strings DA converter for digital audio. Data input accepts 1fs~8fs.
It is possible to construct the DA converter unit at a low price.

TC9250F



SOP16-P-300-1.27

TC9250P



DIP16-P-300-2.54A

Weight
SOP16-P-300-1.27 : 0.16g (Typ.)
DIP16-P-300-2.54A : 1.00g (Typ.)

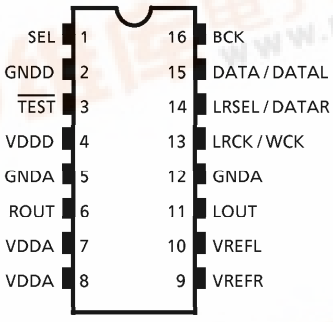
FEATURES

- Data input accepts 1fs~8fs.
- Built-in twin DA converter.
- Simultaneous outputs to L-ch and R-ch.
- Built-in output buffer.
- DA converter characteristics is as follows.

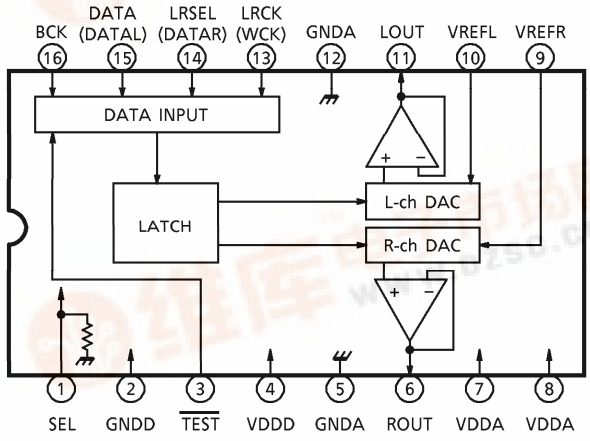
THD + N	S / N	D-RANGE
– 65dB (Typ.)	100dB (Typ.)	93dB (Typ.)

- 2 kinds of package, 16 pin flat package and 16 pin DIP.

PIN CONNECTION



BLOCK DIAGRAM

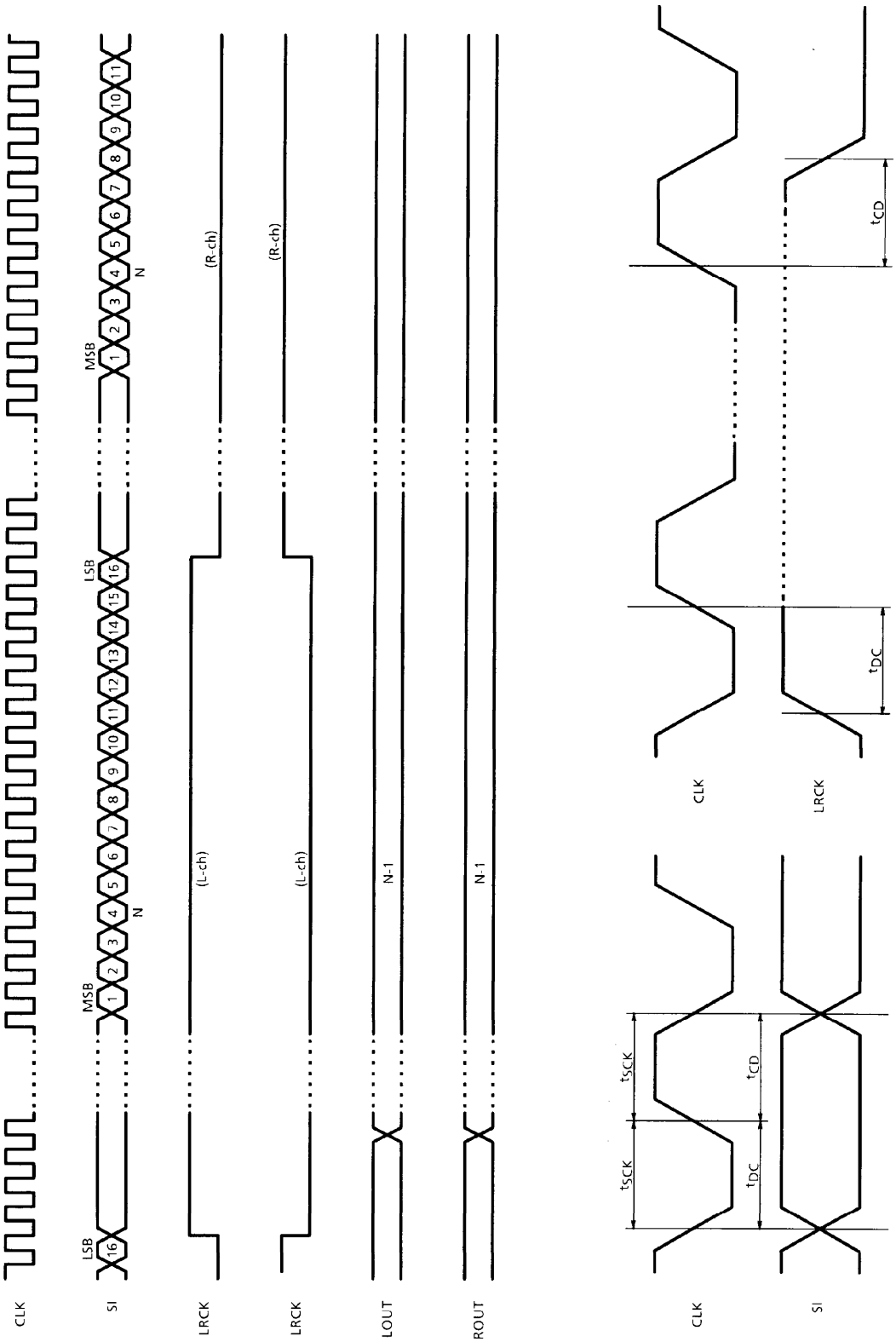


980910EBA2

PIN FUNCTION

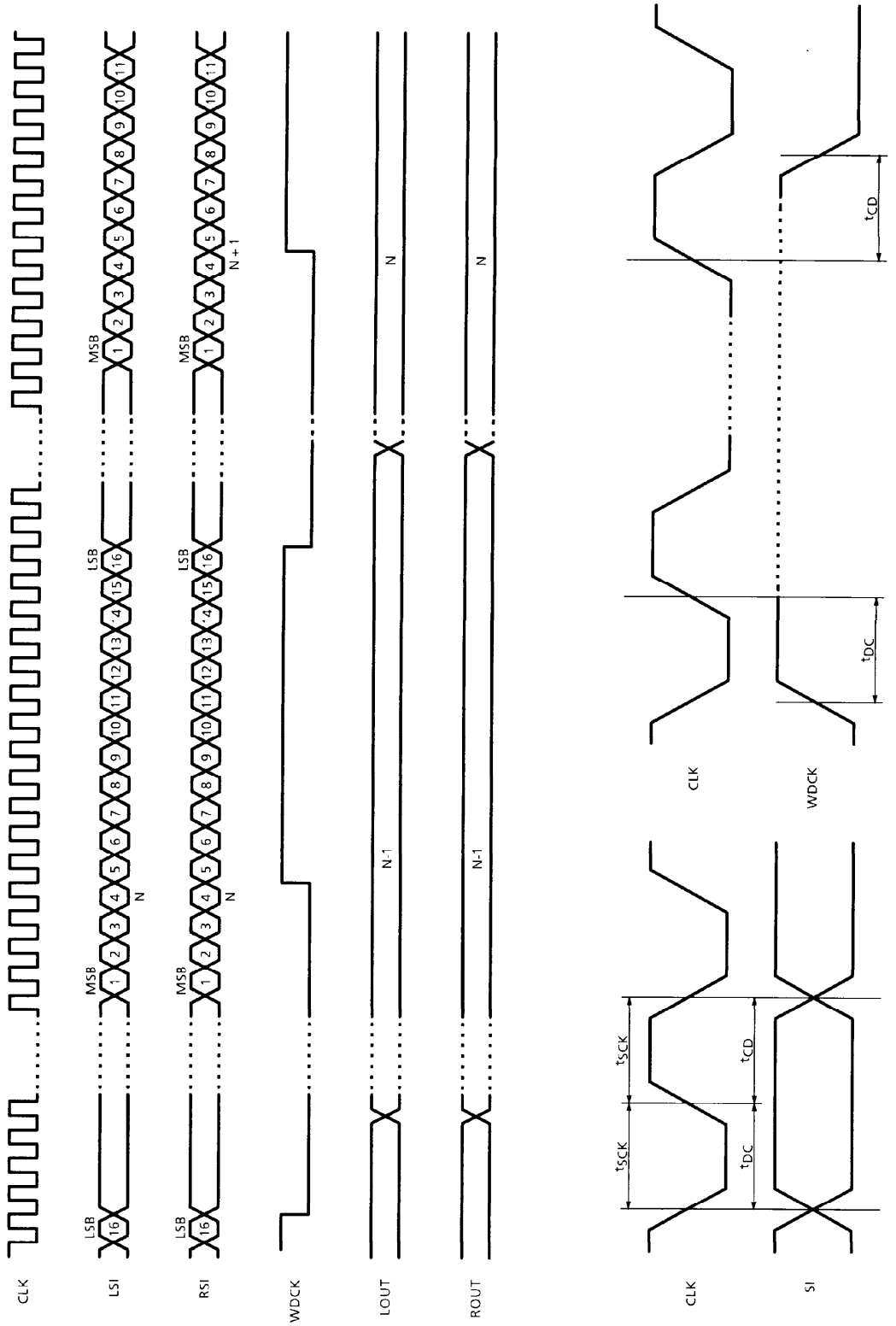
<table>
<tr><th>PIN No.</th><th>SYMBOL</th><th>I / O</th><th>FUNCTION / OPERATION</th><th>REMARKS</th></tr>
<tr><td>1</td><td>SEL</td><td>I</td><td>Input data selection terminal.
At "L" or open, L-ch and R-ch serial data input pin15.
At "H", L-ch data input pin15 and R-ch data input pin14.</td><td>Pull-down Resistance</td></tr>
<tr><td>2</td><td>GNDD</td><td>—</td><td>Logic grand terminal.</td><td></td></tr>
<tr><td>3</td><td>$\overline{\text{TEST}}$</td><td>I</td><td>Test terminal. Normally, use at "L".</td><td></td></tr>
<tr><td>4</td><td>VDDD</td><td>—</td><td>Logic power supply terminal.</td><td></td></tr>
<tr><td>5</td><td>GNDA</td><td>—</td><td>Analog grand terminal.</td><td></td></tr>
<tr><td>6</td><td>ROUT</td><td>O</td><td>R-ch analog output terminal.</td><td></td></tr>
<tr><td>7</td><td>VDDA</td><td rowspan="2">—</td><td rowspan="2">Analog power supply terminal.</td><td rowspan="2"></td></tr>
<tr><td>8</td><td>VDDA</td></tr>
<tr><td>9</td><td>VREFR</td><td>—</td><td>R-ch reference voltage terminal.</td><td></td></tr>
<tr><td>10</td><td>VREFL</td><td>—</td><td>L-ch reference voltage terminal.</td><td></td></tr>
<tr><td>11</td><td>LOUT</td><td>O</td><td>L-ch analog output terminal.</td><td></td></tr>
<tr><td>12</td><td>GNDA</td><td>—</td><td>Analog grand terminal.</td><td></td></tr>
<tr><td>13</td><td>LRCK / WCK</td><td>I</td><td>At pin1 "H" or "OPEN", LR clock input terminal.
At pin1 "L", word clock input terminal.</td><td></td></tr>
<tr><td>14</td><td>LRSEL / DATAR</td><td>I</td><td>At pin 1 "L", LR channel data selection terminal.
<table><tr><th rowspan="2">LRSEL INPUT</th><th colspan="2">LRCK</th></tr><tr><th>"L"</th><th>"H"</th></tr><tr><td>"L"</td><td>R-ch data input</td><td>L-ch data input</td></tr><tr><td>"H"</td><td>L-ch data input</td><td>R-ch data input</td></tr></table>At pin1 "H", R-ch data input terminal.</td><td></td></tr>
<tr><td>15</td><td>DATA / DATAL</td><td>I</td><td>At pin1 "L", L-ch and R-ch data input terminal.
At pin1 "H", L-ch data input terminal.</td><td></td></tr>
<tr><td>16</td><td>BCK</td><td>I</td><td>Bit clock input terminal.</td><td></td></tr>
</table>

1-1 DATA INPUT TIMING (SEL = "L")



TC9250F/P—3

1-2 DATA INPUT TIMING (SEL = "H")



TC9250F/P—4

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{DD}	−0.3~6.0	V
Input Voltage		V_{IN}	−0.3~V_{DD} + 0.3	V
Power Dissipation	TC9250F	P_D	200	mW
	TC9250P		300	
Operating Temperature		T_{opr}	−20~85	°C
Storage Temperature		T_{stg}	−40~125	°C

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta = 25°C, V_{DD} = 5V)

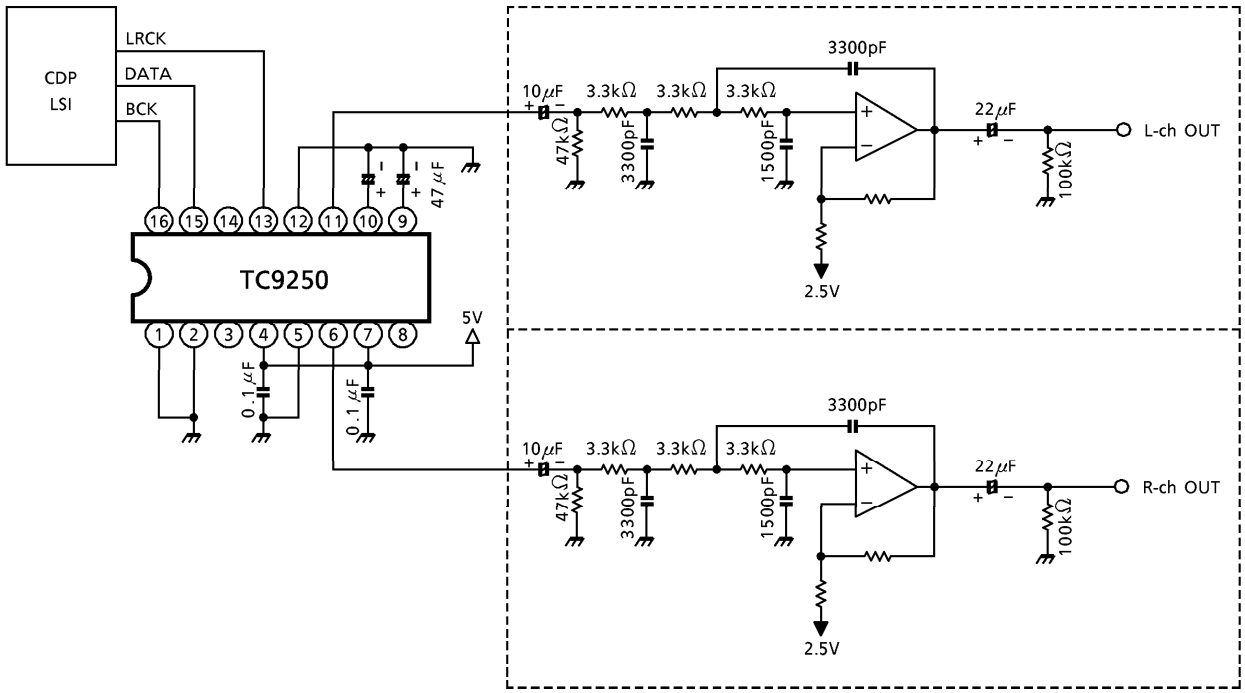
DC characteristic

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V_{DD}	1	Ta = −35~85°C	4.5	5.0	5.5	V
Power Dissipation	I_{DD}	1	fs = 44.1kHz, 8 times data input	—	2.0	6.0	mA
Input Voltage	VIH	1		V_{DD} × 0.7	—	V_{DD}	V
	VIL			0	—	V_{DD} × 0.3	
Output Resister	RL	—	ROUT, LOUT terminal	5	—	—	kΩ
Convert Frequency	fs	1		—	—	400	kHz
Clock Frequency	f_{CLK}	1		—	—	10	MHz
Clock Pulse Width	f_{SCK}	1		40	—	—	ns
SI, LRCK Setuptime	t_{DC}	1		12	—	—	ns
SI, LRCK Holdtime	t_{CD}	1		12	—	—	ns

AC characteristic

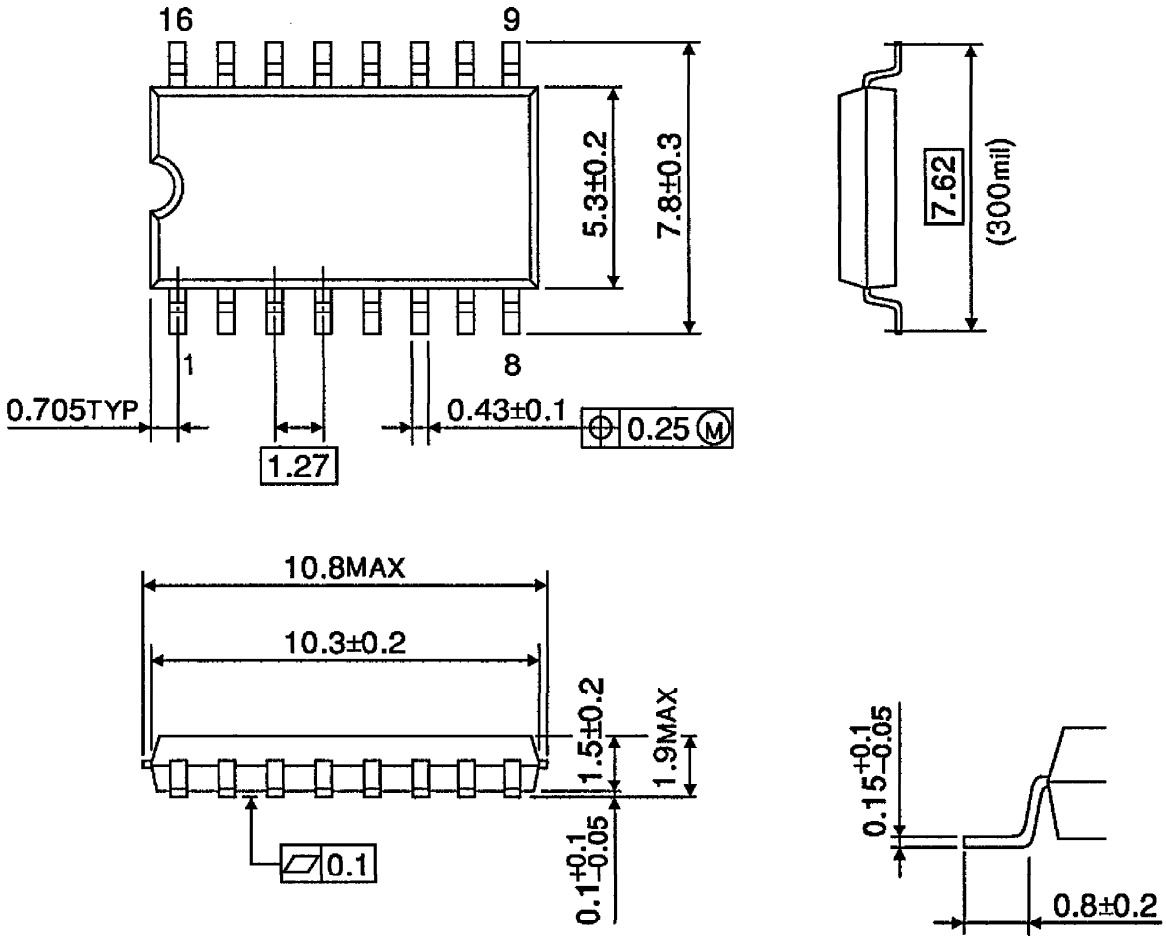
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Resolution	RES	—		—	16	—	bit
Noise Distortion	THD + N	1	f_{IN} = 1kHz, 0dB 20kHz LPF ON	—	−65	−60	dB
S / N	S / N	—	JIS-A	96	100	—	dB
Dynamic Range	DR	—	f_{IN} = 1kHz, −60dB, JIS-A ON	90	93	—	dB
Cross-Talk	CT	—	One channel 1kHz 0dB input	85	95	—	dB
Full Scale Output Voltage	VFS	—	1kHz 0dB output	—	2.0	2.3	V_{p-p}

APPLICATION CIRCUUIT (Test circuit 1)



PACKAGE DIMENSIONS

SOP16-P-300-1.27 Unit : mm

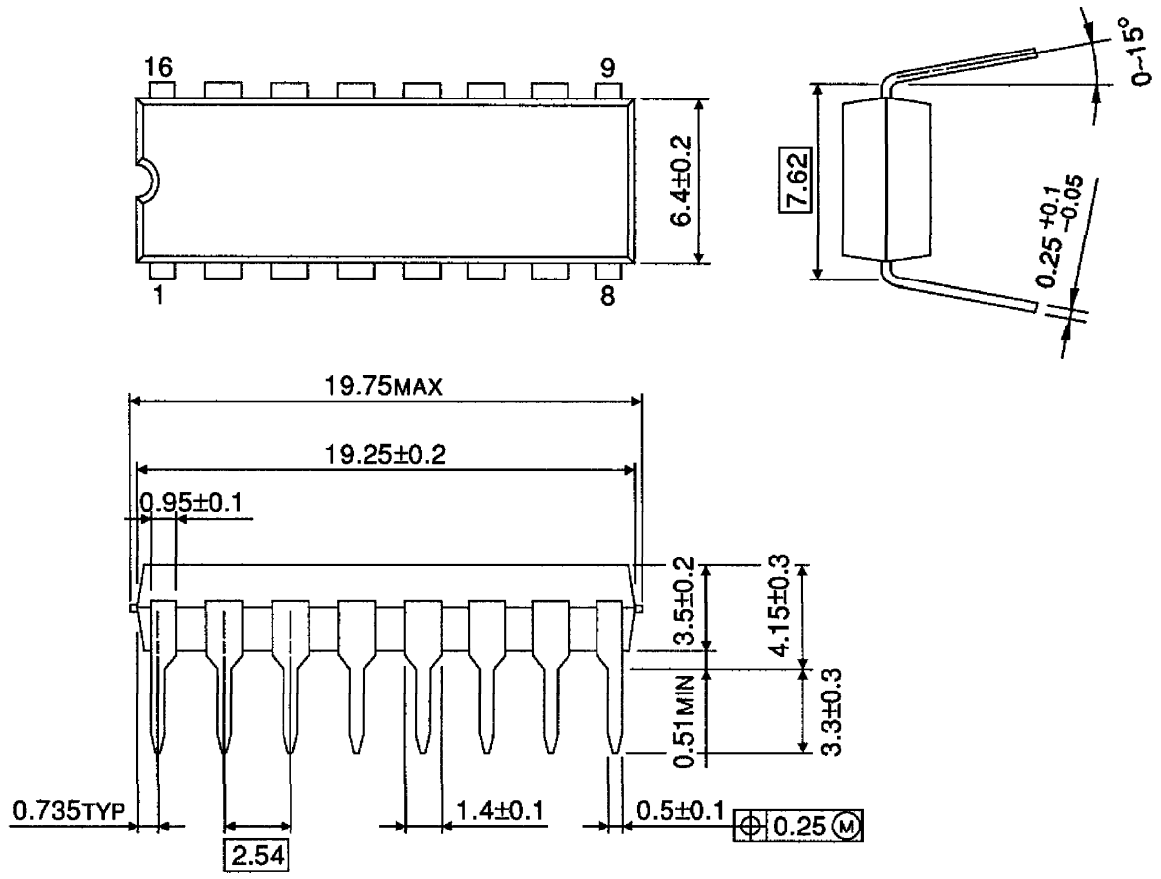


Weight : 0.16g (Typ.)

PACKAGE DIMENSIONS

DIP16-P-300-2.54A

Unit : mm



Weight : 1.00g (Typ.)