TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT   SILICON MONOLITHIC
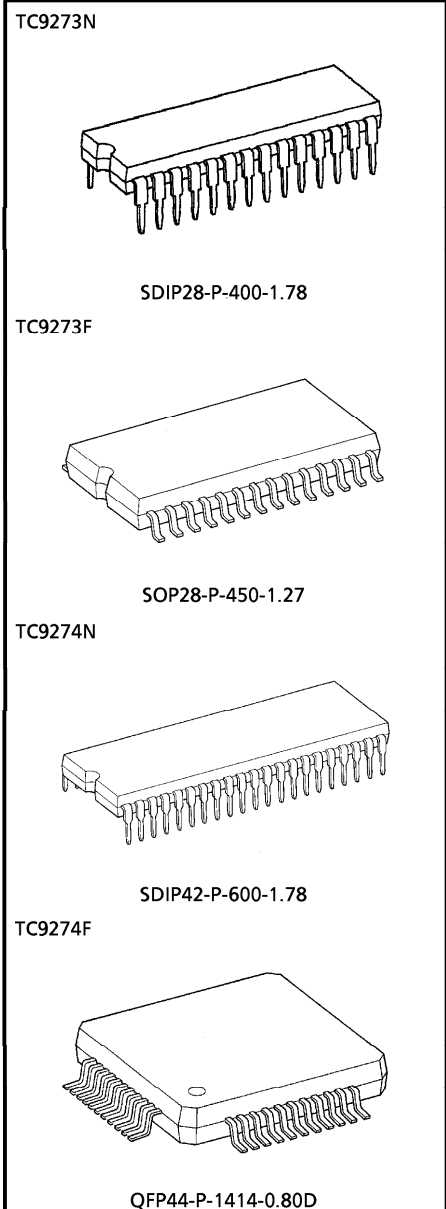
TC9273N, TC9273F, TC9274N, TC9274F

ANALOG SWITCH ARRAY ICs

TC9273N, TC9273F, TC9274N and TC9274F are analog switch array ICs developed for use in audio equipment such as home stereo sets. Switch connection layouts can be customized for different sets, thus simplifying the external wiring.

FEATURES

- 10 analog switches × 2 channels built in :   TC9273N
                                               TC9273F

- 18 analog switches × 2 channels built in :   TC9274N
                                               TC9274F

- An aluminum mask process allows switch connections to be customized.

- Switches are controlled by serial data.

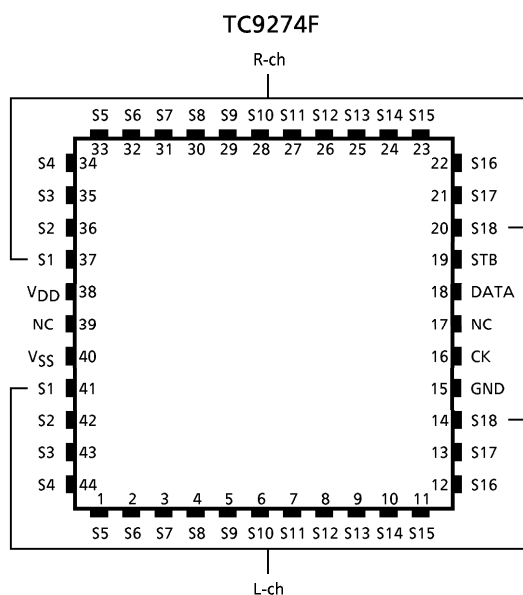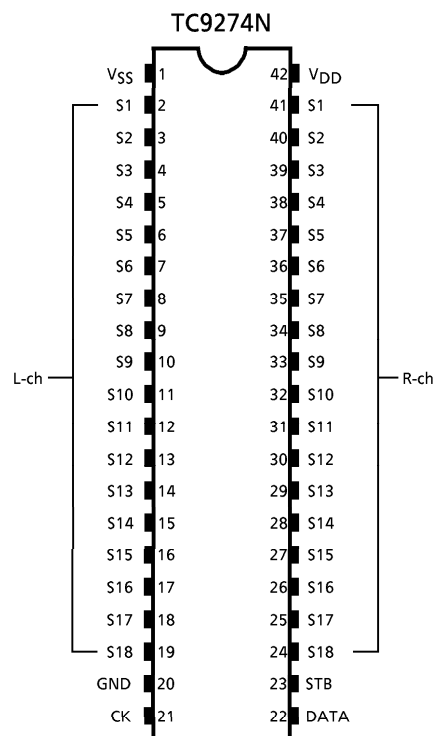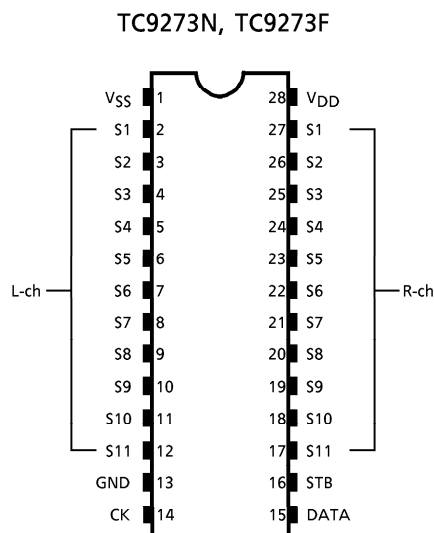- Built-in 5V microcomputer interface.

- Shrink DIP or flat package.

TC9273N

SDIP28-P-400-1.78

TC9273F

SOP28-P-450-1.27

TC9274N

SDIP42-P-600-1.78

TC9274F

QFP44-P-1414-0.80D

Weight
SDIP28-P-400-1.78   : 2.2g (Typ.)
SOP28-P-450-1.27   : 0.8g (Typ.)
SDIP42-P-600-1.78   : 4.2g (Typ.)
QFP44-P-1414-0.80D : 1.1g (Typ.)

980508EBA2'

PIN CONNECTION (TOP VIEW)

TC9273N, TC9273F

V$_{SS}$	1	28 V$_{DD}$
S1	2	27 S1
S2	3	26 S2
S3	4	25 S3
S4	5	24 S4
S5	6	23 S5
S6	7	22 S6
S7	8	21 S7
S8	9	20 S8
S9	10	19 S9
S10	11	18 S10
S11	12	17 S11
GND	13	16 STB
CK	14	15 DATA

L-ch (S1–S11)   R-ch (S1–S11)

TC9274N

V$_{SS}$	1	42 V$_{DD}$
S1	2	41 S1
S2	3	40 S2
S3	4	39 S3
S4	5	38 S4
S5	6	37 S5
S6	7	36 S6
S7	8	35 S7
S8	9	34 S8
S9	10	33 S9
S10	11	32 S10
S11	12	31 S11
S12	13	30 S12
S13	14	29 S13
S14	15	28 S14
S15	16	27 S15
S16	17	26 S16
S17	18	25 S17
S18	19	24 S18
GND	20	23 STB
CK	21	22 DATA

L-ch   R-ch

TC9274F

R-ch

Top: S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15
Pins: 33 32 31 30 29 28 27 26 25 24 23

S4	34	22 S16
S3	35	21 S17
S2	36	20 S18
S1	37	19 STB
V$_{DD}$	38	18 DATA
NC	39	17 NC
V$_{SS}$	40	16 CK
S1	41	15 GND
S2	42	14 S18
S3	43	13 S17
S4	44	12 S16

Pins: 1 2 3 4 5 6 7 8 9 10 11
Bottom: S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15

L-ch

980508EBA2'

BLOCK DIAGRAM

TC9273N, TC9273F

TC9274N

TC9274F

PIN FUNCTION (Left channel / right channel)

PIN No.			SYMBOL	PIN NAME	FUNCTION AND OPERATION		NOTE
TC9273N/F	TC9274N	TC9274F					
1	1	40	V_{SS}	Negative power supply pin	Dual power supply	$V_{DD} = 8.0 \sim 17V$ $GND = 0V$ $V_{SS} = -8.0 \sim -17V$	—
13	20	16	GND	Digital ground pin			
28	42	38	V_{DD}	Positive power supply pin	Single power supply	$V_{DD} = 8.0 \sim 18V$ $V_{SS} = GND = 0V$	
2 / 27	2 / 41	41 / 37	S1	Input / output pins	Analog switch input pins. × : Aluminum mask switch. ● : Open or closed can be specified. Connection for right and left channels can be different.		—
3 / 26	3 / 40	42 / 36	S2				
4 / 25	4 / 39	43 / 35	S3				
5 / 24	5 / 38	44 / 34	S4				
6 / 23	6 / 37	1 / 33	S5				
7 / 22	7 / 36	2 / 32	S6				
8 / 21	8 / 35	3 / 31	S7				
9 / 20	9 / 34	4 / 30	S8				
10 / 19	10 / 33	5 / 29	S9				
11 / 18	11 / 32	6 / 28	S10				
12 / 17	12 / 31	7 / 27	S11				
—	13 / 30	8 / 26	S12				
—	14 / 29	9 / 25	S13				
—	15 / 28	10 / 24	S14				
—	16 / 27	11 / 23	S15				
—	17 / 26	12 / 22	S16				
—	18 / 25	13 / 21	S17				
—	19 / 24	14 / 20	S18				
—	—	17 / 39	NC	Not connected	—		—
14	21	16	CK	Clock input pin	Clock input for data transfer		Low threshold value input pins
15	22	18	DATA	Data input pin	Serial data input for setting switches		
16	23	19	STB	Strobe input pin	Strobe input for data writing		

OPERATION

1. Switch ON / OFF setting

   The switches are set to ON or OFF using 18bit or 26bit serial data.

   ● Data format
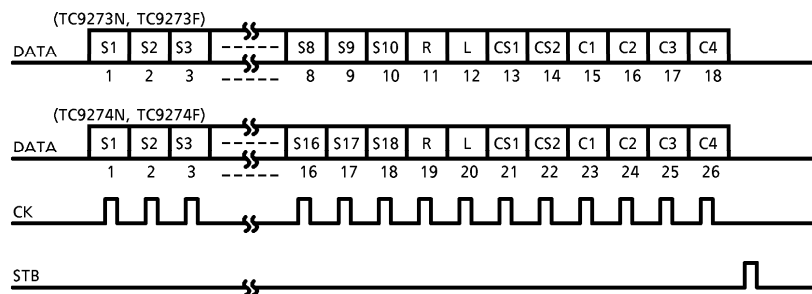
   1) $S_1 \sim S_{10} \sim S_{18}$: Switch control data
   When $S_n = 1$, S_n is set to ON ; when $S_n = 0$, to OFF.

   2) R and L   : Channel select data
      When R = 1, right-channel switches are set ; when L = 1, left-channel switches are set.
      (When R = L = 1, both channel switches are set simultaneously.)

   3) CS1 and CS2 : Sub-code data
      The sub-code data are customized.

   4) $C_1 \sim C_4$: Chip select data (fixed)

IC NAME	C_1	C_2	C_3	C_4
TC9273N, TC9273F	0	0	1	0
TC9274N, TC9274F	1	0	1	0

2. Serial data timing

Input the CK, DATA and STB signals at the following timing.

$a \geqq 0.5 \mu s, \; b \geqq 1.0 \mu s$
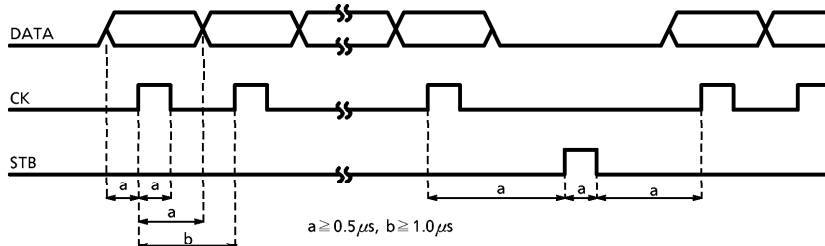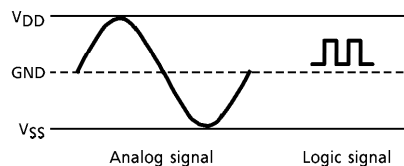
3. One and dual power supply operation

TC9273N, TC9273F, TC9274N and TC9274F can operate with one or dual power supply. With single or dual power supply, serial data logic level can be $0 - 5V$.

● Single power supply operation
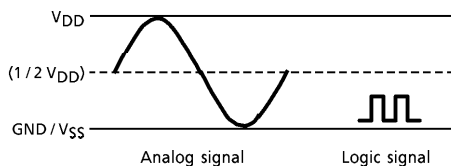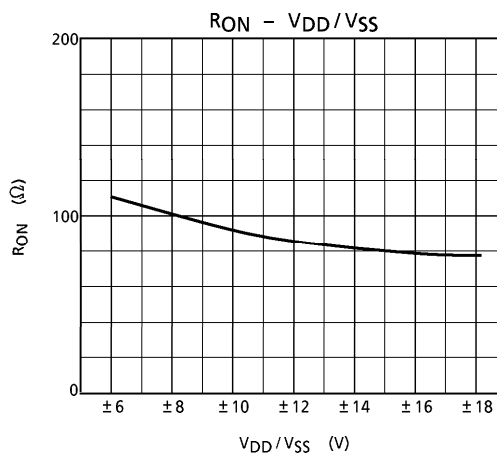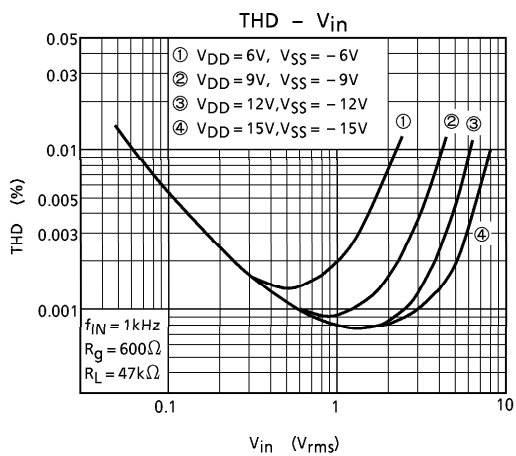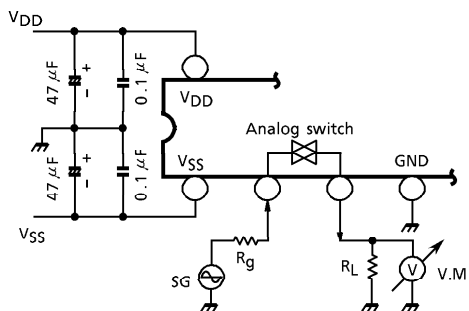

● Dual power supply operation

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage (1)	$V_{DD} - V_{SS}$	$-0.3 \sim 36$	V
Power Supply Voltage (2)	$V_{DD} - GND$	$-0.3 \sim 20$	V
GND Input Voltage	V_{IN} (1)	$-0.3 \sim V_{DD} + 0.3$	V
V_{SS} Input Voltage	V_{IN} (2)	$V_{SS} - 0.3 \sim V_{DD} + 0.3$	V
Power Dissipation	P_D	300	mW
Operating Temperature	T_{opr}	$-40 \sim 85$	°C
Storage Temperature	T_{stg}	$-65 \sim 150$	°C

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $V_{DD} = 15V$, $V_{SS} = -15V$, GND = 0V, Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Operating Supply Voltage (1)		$V_{DD} - V_{SS}$	—	Dual power supplying		16	~	34	V
Operating Supply Voltage (2)		$V_{DD} - GND$	—	Single power supplying		8	~	18	V
Operating Supply Current		I_{DD}	—	No-load, No-input		—	0.01	0.1	mA
Input Voltage	"H" Level	V_{IH}	—	CK, DATA, STB Terminal $V_{DD} = 8 \sim 18V$		4.0	~	V_{DD}	V
	"L" Level	V_{IL}				GND	~	1.0	
Input Current	"H" Level	I_{IH}	—	CK, DATA, STB Terminal	$V_{IH} = 15V$	-1.0	~	1.0	μA
	"L" Level	I_{IL}			$V_{IL} = 0V$	-1.0	~	1.0	
Operating Frequency		fop		CK, DATA, STB Terminal		0	~	1.0	MHz
Operating Minimum Clock Wide		Tck	—			0.5	—	—	μs
Switch-on Resistance		R_{ON}	—	Internal analog switch		—	80	100	Ω
Analog Switch OFF Leak		I_{OFF}				-0.1	~	0.1	μA
Total Harmonic Distortion		THD		$f_{IN} = 1kHz$, $V_{IN} = 1V_{rms}$ $Rg = 600\Omega$, $R_L = 47k\Omega$ BW = 20Hz~50kHz		—	0.001	—	%
Noise Output Voltage		V_N	1			—	1.0	—	μV_{rms}
Crosstalk		C·T				—	100	—	dB

TEST CIRCUIT 1 (THD / V$_N$ / C·T)

THD − V$_{in}$

① V$_{DD}$ = 6V, V$_{SS}$ = − 6V
② V$_{DD}$ = 9V, V$_{SS}$ = − 9V
③ V$_{DD}$ = 12V, V$_{SS}$ = − 12V
④ V$_{DD}$ = 15V, V$_{SS}$ = − 15V

f_{IN} = 1kHz
R_g = 600Ω
R_L = 47kΩ

R$_{ON}$ − V$_{DD}$ / V$_{SS}$

APPLICATION CIRCUIT

1) Typical switch connection for an application set. (N : Switch number)

$\left(\begin{array}{l}\text{No. of switches}\quad : 17 \\ \text{Input/output pins}: 18\end{array}\right)$
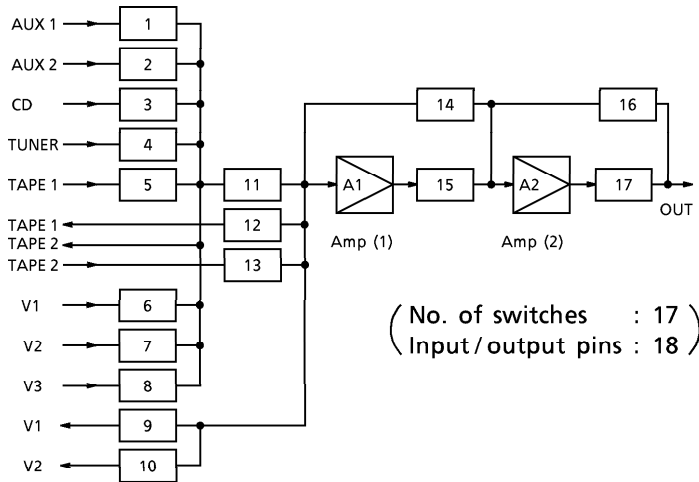
2) Typical switch array for the circuit above.
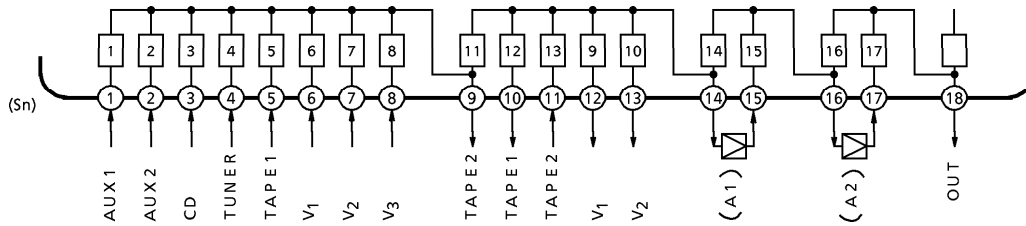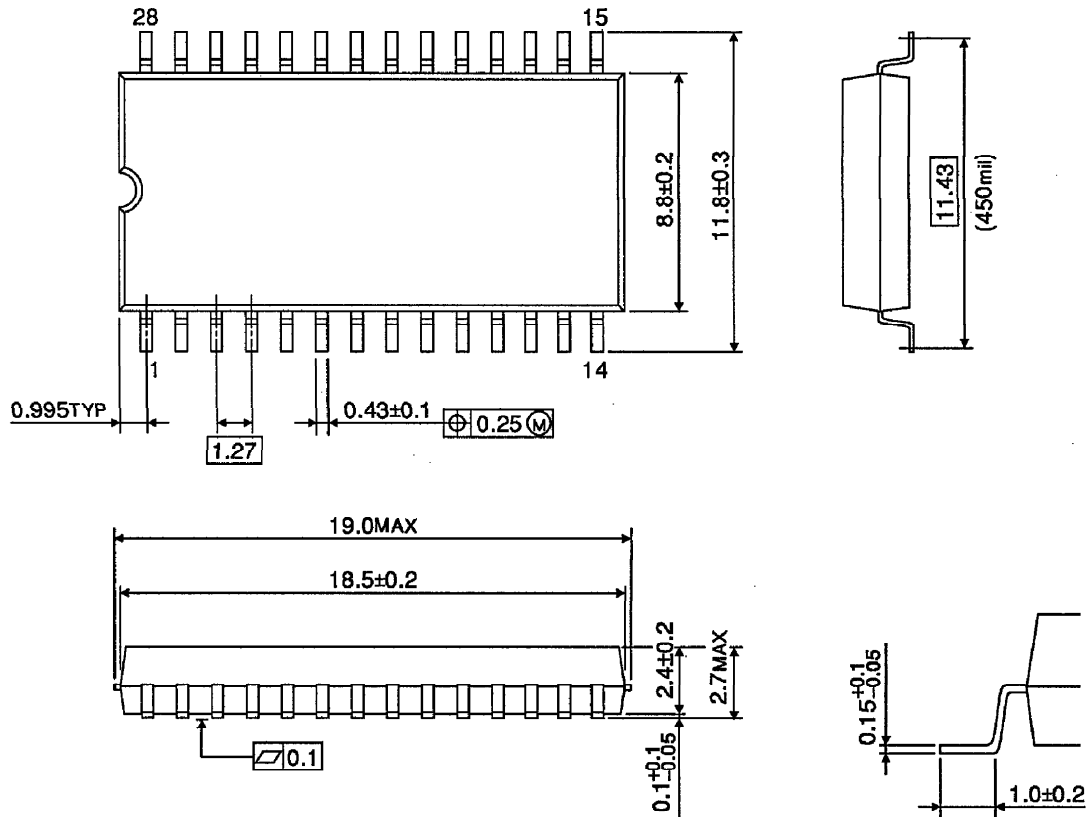
OUTLINE DRAWING

SDIP28-P-400-1.78

Unit : mm
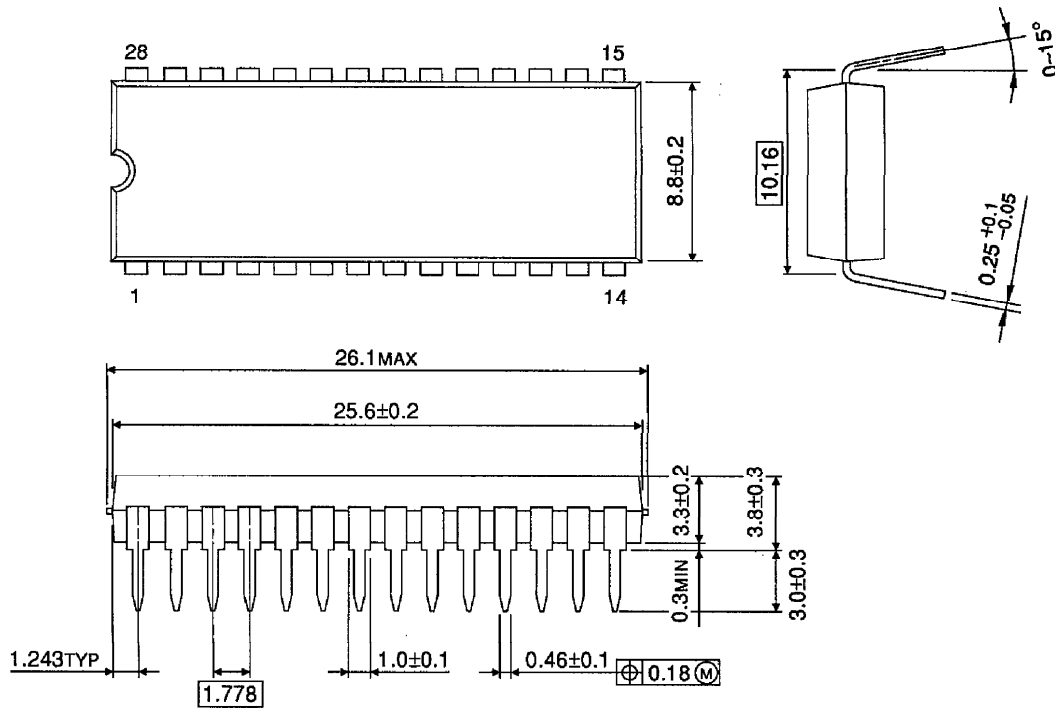
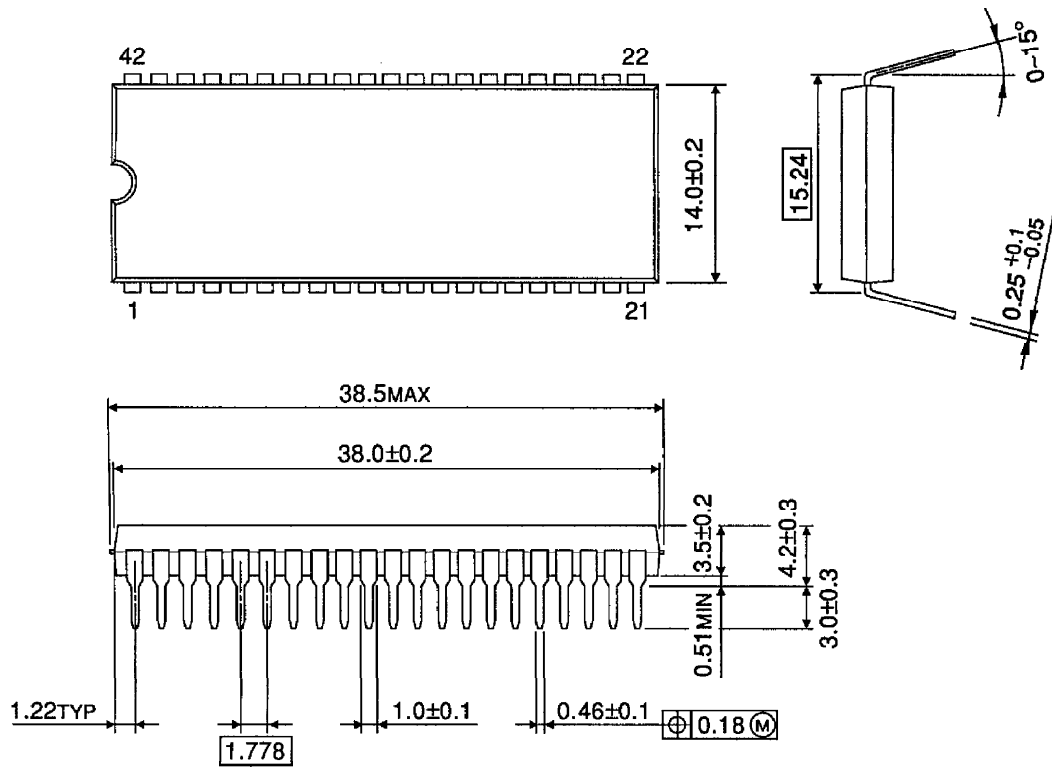Weight : 2.2g (Typ.)

OUTLINE DRAWING

SOP28-P-450-1.27

Unit : mm

Weight : 0.8g (Typ.)

OUTLINE DRAWING
SDIP42-P-600-1.78

Unit : mm

Weight : 4.2g (Typ.)

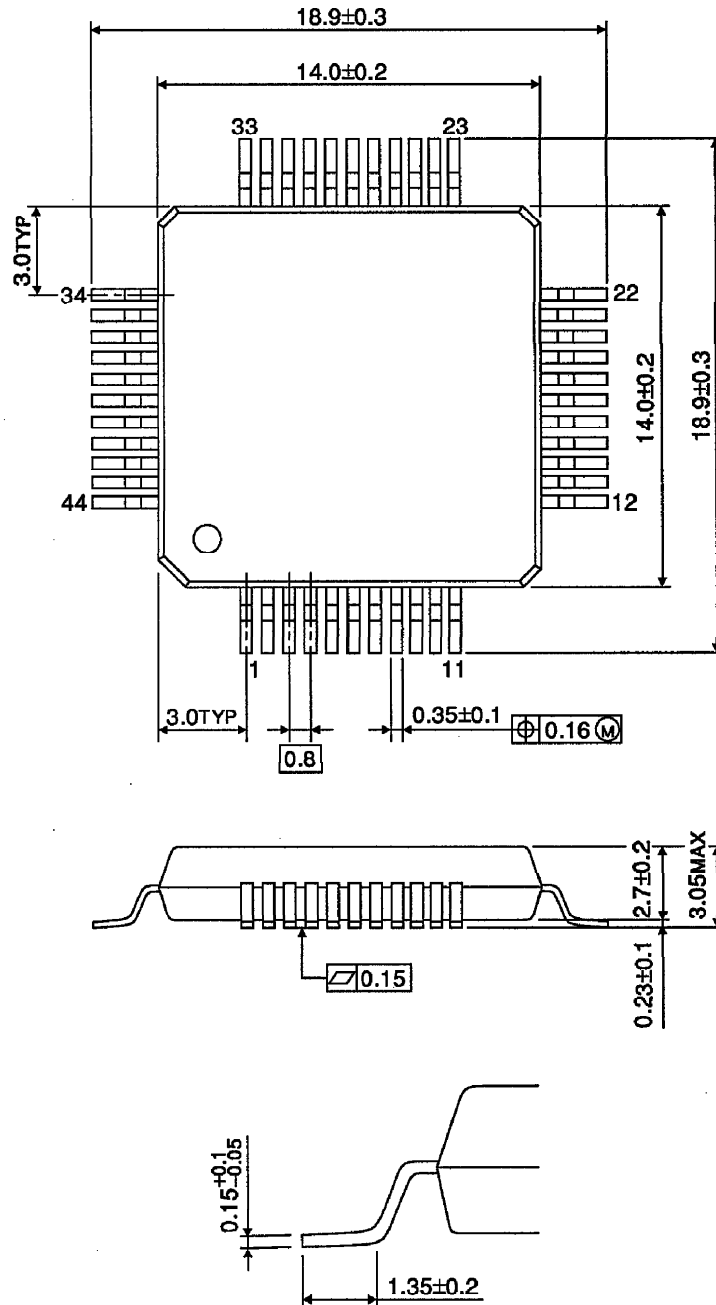**OUTLINE DRAWING**
QFP44-P-1414-0.80D

Unit : mm

Weight : 1.1g (Typ.)