TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT   SILICON MONOLITHIC
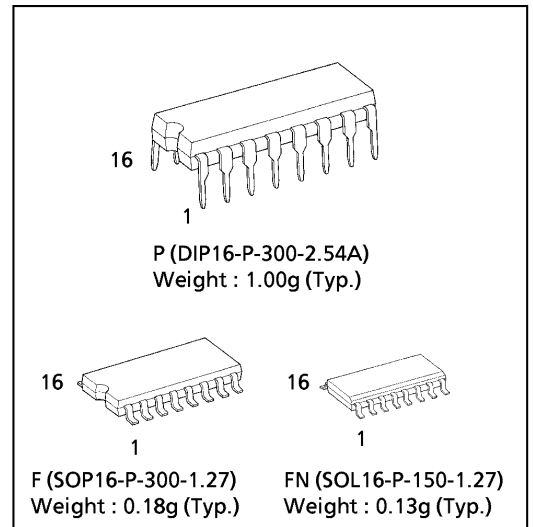
TC74HC42AP, TC74HC42AF, TC74HC42AFN

BCD – TO – DECIMAL DECODER

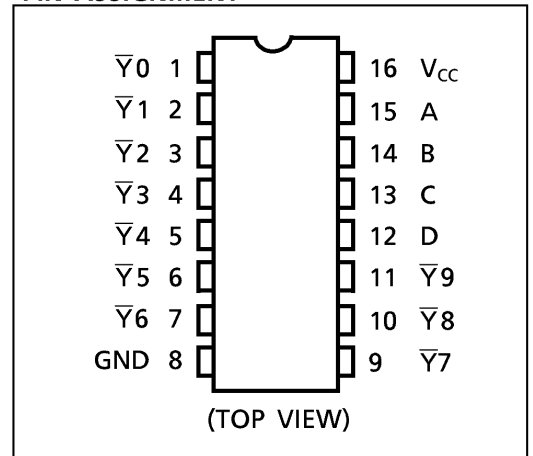(Note) The JEDEC SOP (FN) is not available in Japan.

The TC74HC42A is a high speed CMOS BCD - to - DECIMAL DECODER fabricated with silicon gate C^{2}MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

A BCD code applied to the four inputs (A - D) sets a low level at one of ten decoded outputs. A illegal BCD code such as eleven thru fifteen sets all outputs high. This device can be used as 3 - to - 8 LINE DECODER when input D is held low.

This device is useful for code conversion , address decoding , memory selection , multiplexing , or readout decoding.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

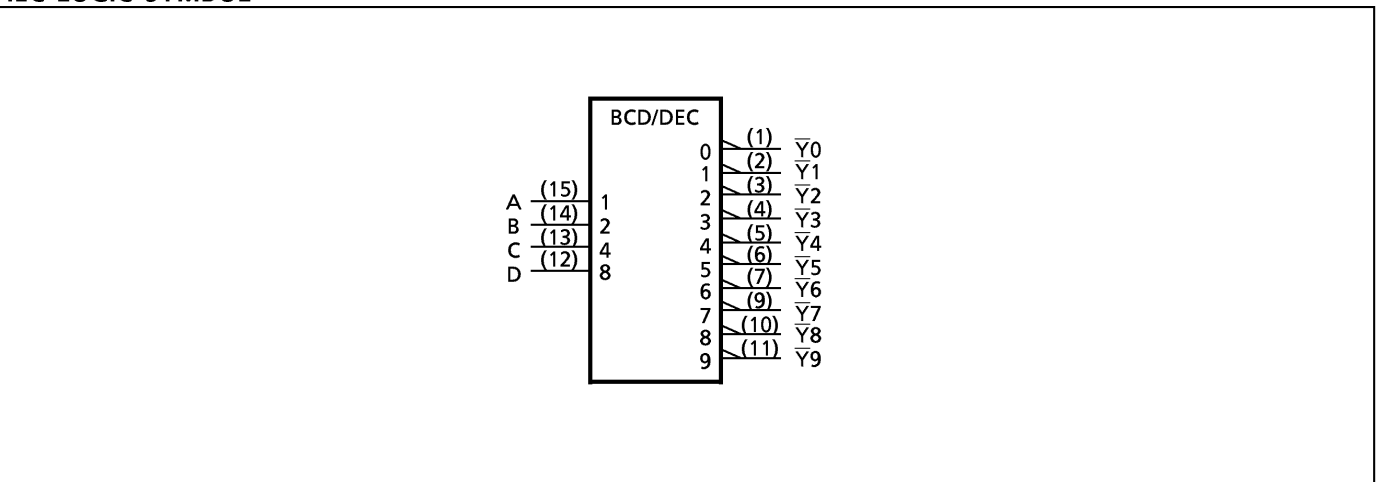P (DIP16-P-300-2.54A)
Weight : 1.00g (Typ.)

F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)

FN (SOL16-P-150-1.27)
Weight : 0.13g (Typ.)

FEATURES :

* High Speed·································t_{pd} = 13ns (typ.) at V_{CC} = 5V
* Low Power Dissipation···············I_{CC} = 4μA(max.) at Ta = 25°C
* High Noise Immunity··················V_{NIH} = V_{NIL} = 28% V_{CC} (min.)
* Output Drive Capability·············10 LSTTL Loads
* Symmetrical Output Impedance···| I_{OH} | = I_{OL} = 4mA (min.)
* Balanced Propagation Delays·····t_{pLH} ≃ t_{pHL}
* Wide Operating Voltage Range····V_{CC} (opr.) = 2V ~ 6V
* Pin and Function Compatible with 74LS42

PIN ASSIGNMENT

|				
$\overline{Y0}$	1		16	V_{CC}
$\overline{Y1}$	2		15	A
$\overline{Y2}$	3		14	B
$\overline{Y3}$	4		13	C
$\overline{Y4}$	5		12	D
$\overline{Y5}$	6		11	$\overline{Y9}$
$\overline{Y6}$	7		10	$\overline{Y8}$
GND	8		9	$\overline{Y7}$

(TOP VIEW)

IEC LOGIC SYMBOL

BCD/DEC

A (15) 1
B (14) 2
C (13) 4
D (12) 8

0	(1)	$\overline{Y0}$
1	(2)	$\overline{Y1}$
2	(3)	$\overline{Y2}$
3	(4)	$\overline{Y3}$
4	(5)	$\overline{Y4}$
5	(6)	$\overline{Y5}$
6	(7)	$\overline{Y6}$
7	(9)	$\overline{Y7}$
8	(10)	$\overline{Y8}$
9	(11)	$\overline{Y9}$

2001-05-17

TRUTH TABLE

CODE No.	BCD INPUTS				DECIMAL OUTPUTS									
	D	C	B	A	$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	$\overline{Y4}$	$\overline{Y5}$	$\overline{Y6}$	$\overline{Y7}$	$\overline{Y8}$	$\overline{Y9}$
0	L	L	L	L	L	H	H	H	H	H	H	H	H	H
1	L	L	L	H	H	L	H	H	H	H	H	H	H	H
2	L	L	H	L	H	H	L	H	H	H	H	H	H	H
3	L	L	H	H	H	H	H	L	H	H	H	H	H	H
4	L	H	L	L	H	H	H	H	L	H	H	H	H	H
5	L	H	L	H	H	H	H	H	H	L	H	H	H	H
6	L	H	H	L	H	H	H	H	H	H	L	H	H	H
7	L	H	H	H	H	H	H	H	H	H	H	L	H	H
8	H	L	L	L	H	H	H	H	H	H	H	H	L	H
9	H	L	L	H	H	H	H	H	H	H	H	H	H	L
—	H	X	H	X	H	H	H	H	H	H	H	H	H	H
—	H	H	X	X	H	H	H	H	H	H	H	H	H	H

X ; Don't Care

SYSTEM DIAGRAM
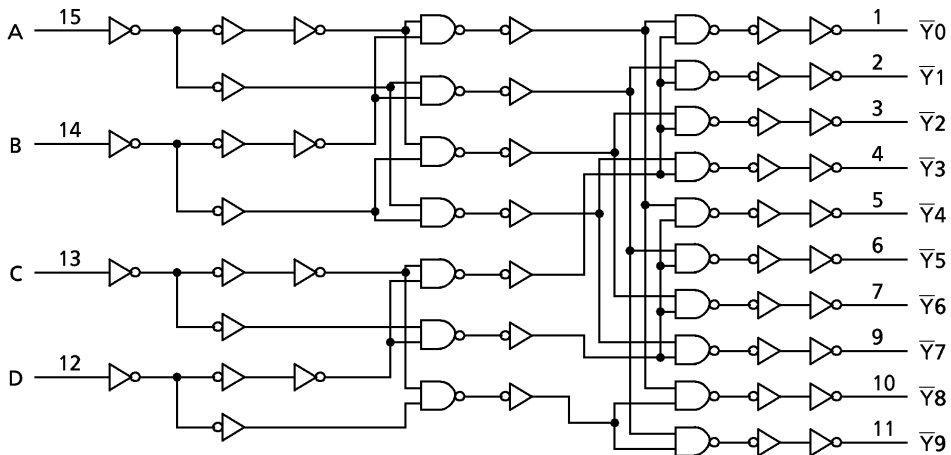
ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5\sim7$	V
DC Input Voltage	V_{IN}	$-0.5\sim V_{CC}+0.5$	V
DC Output Voltage	V_{OUT}	$-0.5\sim V_{CC}+0.5$	V
Input Diode Current	I_{IK}	±20	mA
Output Diode Current	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±25	mA
DC V_{CC} / Ground Current	I_{CC}	±50	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	T_{stg}	$-65\sim150$	°C

*500mW in the range of Ta＝－40°C～65°C. From Ta＝65°C to 85°C a derating factor of －10mW/°C shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	$2\sim6$	V
Input Voltage	V_{IN}	$0\sim V_{CC}$	V
Output Voltage	V_{OUT}	$0\sim V_{CC}$	V
Operating Temperature	T_{opr}	$-40\sim85$	°C
Input Rise and Fall Time	t_r, t_f	$0\sim1000\ (V_{CC}=2.0V)$ $0\sim\ \ 500\ (V_{CC}=4.5V)$ $0\sim\ \ 400\ (V_{CC}=6.0V)$	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V_{IH}			2.0 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	— — —	V
Low - Level Input Voltage	V_{IL}			2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	V
High - Level Output Voltage	V_{OH}	$V_{IN} =$ V_{IH} or V_{IL}	$I_{OH} = -20\mu A$	2.0 4.5 6.0	1.9 4.4 5.9	2.0 4.5 6.0	— — —	1.9 4.4 5.9	— — —	V
			$I_{OH} = -4\ \ mA$ $I_{OH} = -5.2mA$	4.5 6.0	4.18 5.68	4.31 5.80	— —	4.13 5.63	— —	
Low - Level Output Voltage	V_{OL}	$V_{IN} =$ V_{IH} or V_{IL}	$I_{OL} = 20\mu A$	2.0 4.5 6.0	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			$I_{OL} = 4\ \ mA$ $I_{OL} = 5.2mA$	4.5 6.0	— —	0.17 0.18	0.26 0.26	— —	0.33 0.33	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	4.0	—	40.0	

2001-05-17

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, V_{CC} = 5V, Ta = 25°C, Input t_r = t_f = 6ns)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		—	4	8	ns
Propagation Delay Time	t_{pLH} t_{pHL}		—	13	25	

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input t_r = t_f = 6ns)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}(V)	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		2.0 4.5 6.0	— — —	30 8 7	75 15 13	— — —	95 19 16	ns
Propagation Delay Time	t_{pLH} t_{pHL}		2.0 4.5 6.0	— — —	48 16 14	145 29 25	— — —	180 36 31	
Input Capacitance	C_{IN}			—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD} (1)			—	68	—	—	—	

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation :

$$I_{CC} (opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

DIP 16PIN PACKAGE DIMENSIONS (DIP16-P-300-2.54A)

Unit in mm

Weight : 1.00g (Typ.)

SOP 16PIN (200mil BODY) PACKAGE DIMENSIONS (SOP16-P-300-1.27)

Unit in mm

Weight : 0.18g (Typ.)

2001-05-17

SOP 16PIN (150mil BODY) PACKAGE DIMENSIONS (SOL16-P-150 -1.27) Unit in mm

(Note) This package is not available in Japan.
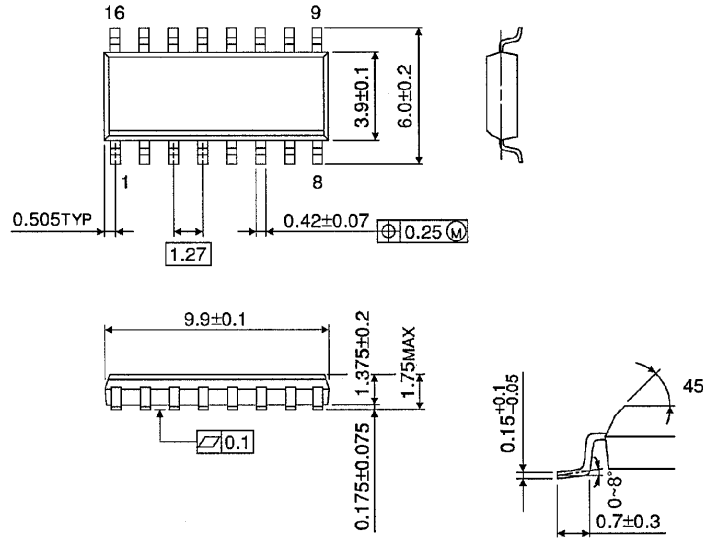
Weight : 0.13g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

2001-05-17