

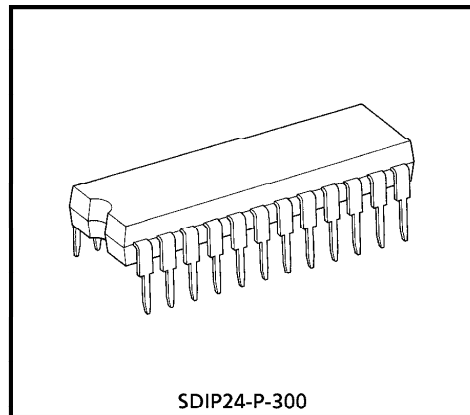
## 16BIT SHIFT REGISTER, LATCH & CONSTANT CURRENT DRIVERS

The TB62701N is specifically designed for LED and LED-DISPLAY constant current drivers.

This constant current output circuit is able to set up external resistor ( $I_{OUT} = 0$  to 50mA).

This IC is monolithic integrated circuit designed to be used together with Bi-CMOS process.

The devices consist of 16bit Shift Register, Latch, AND-GATE and Constant Current Driver.



Weight : 1.2g (Typ.)

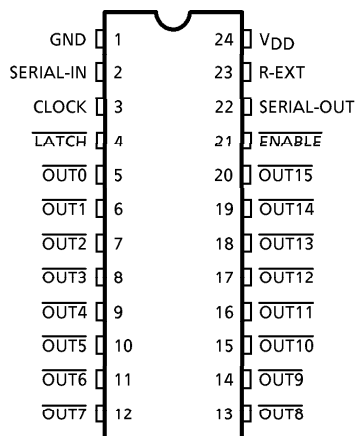
### FEATURES

- OUTPUT CURRENT : Set-up at 0 to 50mA with an external resistor.
- A LITTLE CHANGE OF OUTPUT CURRENT ( $T_a = 25^\circ\text{C}$ ,  $V_{DD} = 5.0\text{V}$ )

OUT-GND VOLTAGE	A LITTLE CHANGE OF CHANNEL	$I_{OUT}$ [mA]
$\geq 0.4\text{V}$	$\pm 7\%$	0~50mA
$\geq 0.7\text{V}$		

- 5V CMOS Compatible Input
- PACKAGE : SDIP-24 (SDIP24-P-300)
- MAXIMUM CLOCK FREQUENCY :  $f_{MAX} = 2.5\text{MHz}$  (cascade operation,  $T_a = 25^\circ\text{C}$ )

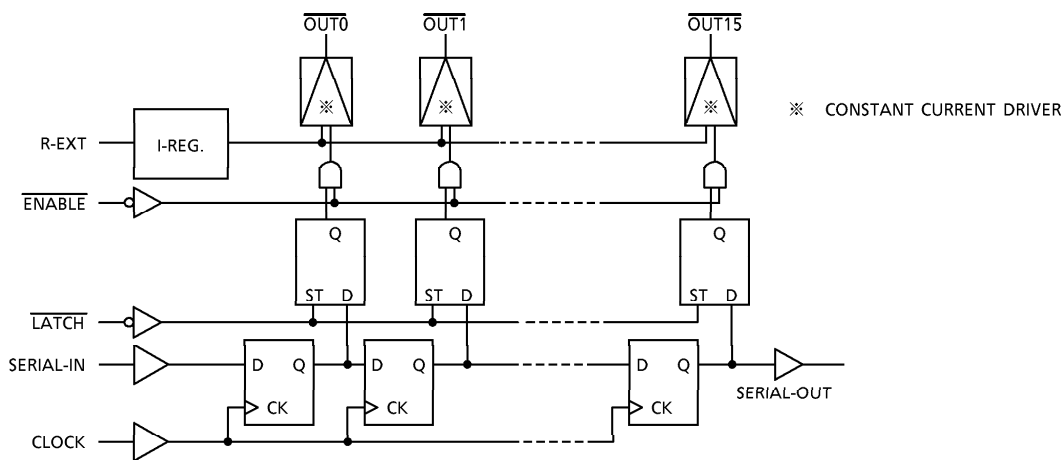
### PIN CONNECTION (TOP VIEW)



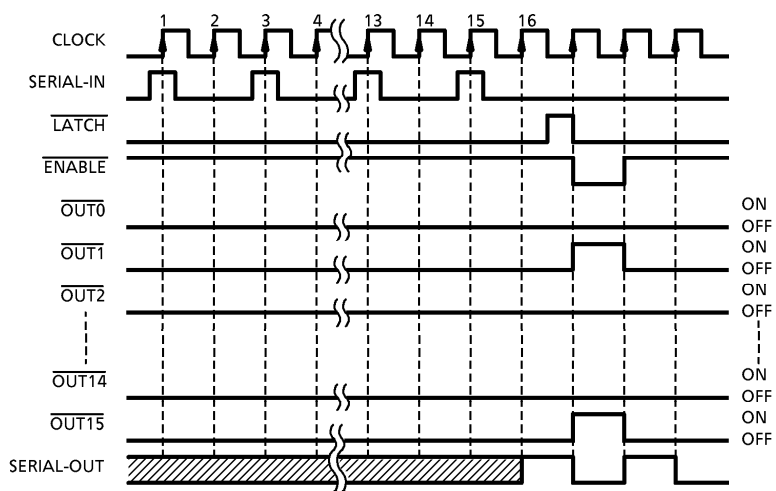
© The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.

© These TOSHIBA products are intended for use in general commercial applications (office equipment, communication equipment, measuring equipment, domestic appliances, etc.). please make sure that you consult with us before you use these TOSHIBA products in equipment which requires extraordinarily high quality and/or reliability, and in equipment which may involve life threatening or critical application, including but not limited to such uses as atomic energy control, airplane or spaceship instrumentation, traffic signals, medical instrumentation, combustion control, all types of safety devices, etc. TOSHIBA cannot accept and hereby disclaims liability for any damage which may occur in case the TOSHIBA products are used in such equipment or applications without prior consultation with TOSHIBA.

**BLOCK DIAGRAM**



**TIMING DIAGRAM**



**TERMINAL DESCRIPTION**

PIN No.	PIN NAME	FUNCTION
1	GND	GND terminal for control logic driver
2	SERIAL-IN	Serial data input terminal for shift register
3	CLOCK	Clock input terminal for data shift to up-edge
4	LATCH	"H" level : data through, "L" level : data hold
24	V <sub>DD</sub>	Supply voltage terminal
5~12 13~20	OUT <sub>n</sub>	Output terminals
21	ENABLE	"H" level output off, "L" level : latch data = "H" level then output on, latch data = "L" level then output off
22	SERIAL-OUT	Serial data output terminal for shift register
23	R-EXT	The register which connects between R-EXT and GND sets the constant output current.

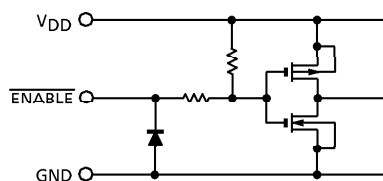
**TRUTH TABLE**

INPUT				OUTPUT OUT <sub>n</sub> (t = n)			
CLOCK	LATCH	ENABLE	SERIAL-IN	OUT <sub>0</sub> ... OUT <sub>7</sub> ... OUT <sub>15</sub>			SERIAL-OUT
	H	L	D <sub>n</sub>	D <sub>n</sub>	D <sub>n-7</sub>	D <sub>n-15</sub>	D <sub>n-15</sub>
	L	L	D <sub>n</sub>	No change			D <sub>n-15</sub>
	※	H	D <sub>n</sub>	OFF	OFF	OFF	D <sub>n-15</sub>
	※	※	D <sub>n</sub>	No change			No change

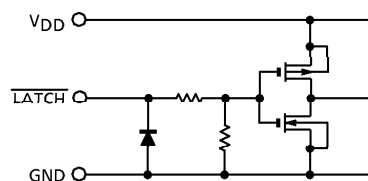
(Note) D<sub>n</sub>~D<sub>n-15</sub> = "H" then OUT<sub>n</sub> is ON, "L" then OUT<sub>n</sub> is OFF.

**EQUIVALENT CIRCUIT OF INPUTS AND OUTPUTS**

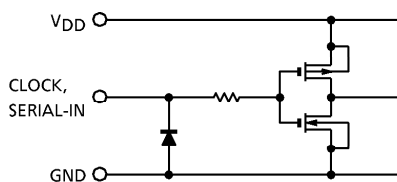
1. ENABLE terminal



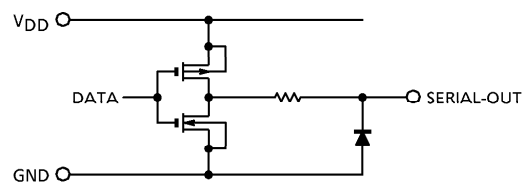
2. LATCH terminal



3. CLOCK, SERIAL-IN terminal



4. SERIAL-OUT terminal



**MAXIMUM RATINGS** (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>DD</sub>	0~7.0	V
Output Voltage	V <sub>CE</sub>	-0.5~30	V
Output Current	I <sub>OUT</sub>	50	mA
Input Voltage	V <sub>IN</sub>	-0.4~V <sub>DD</sub> +0.4	V
GND Terminal Current	I <sub>GND</sub>	800	mA
Clock Frequency	f <sub>CK</sub>	2.5	MHz
Power Dissipation	P <sub>D</sub>	1.78	W
Operating Temperature	T <sub>opr</sub>	-40~85	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

(Note) Ambient temperature delated above 25°C in the proportion of 14.2mW/°C.

**RECOMMENDED OPERATING CONDITION** (Ta = -40~85°C unless otherwise noted)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage		V <sub>DD</sub>	—	4.5	5.0	5.5	V
Output Voltage		V <sub>OUT</sub>	—	—	—	30.0	—
Output Current	OUTn	I <sub>OUT</sub>	DC 1 circuit	—	—	45	mA
	S-OUT	I <sub>OH</sub>	—	—	—	-1.0	
		I <sub>OL</sub>	—	—	—	1.0	
Input Voltage		V <sub>IN</sub>	—	0	—	V <sub>DD</sub>	V
Data Set Up Time		t <sub>setup</sub> (D)	—	100	—	—	ns
Data Hold Time		t <sub>hold</sub> (D)	—	20	—	—	ns
Latch Set Up Time		t <sub>setup</sub> (L)	—	300	—	—	ns
Latch Hold Time		t <sub>hold</sub> (L)	—	100	—	—	ns
Clock Pulse Width	t <sub>w</sub> CLK	—	—	100	—	—	ns
	t <sub>w</sub> CLK	—	—	100	—	—	
Latch Pulse Width	t <sub>w</sub> LAT	—	—	300	—	—	ns
	t <sub>w</sub> LAT	—	—	300	—	—	
Clock Frequency		f <sub>CK</sub>	Cascade operation	—	—	2.0	MHz
Power Dissipation		P <sub>D</sub>	Ta = 85°C	—	—	0.72	W

**ELECTRICAL CHARACTERISTICS** ( $V_{DD} = 5.0V$ ,  $T_a = 25^\circ C$  unless otherwise noted)

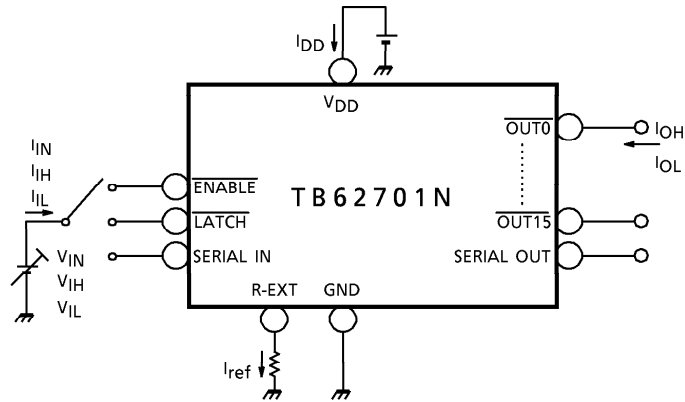
CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Voltage	"H" level	$V_{IH}$	—	—	$70\%V_{DD}$	—	$V_{DD}$	V
	"L" level	$V_{IL}$	—	—	GND	—	$30\%V_{DD}$	
Output Leakage Current		$I_{OH}$	—	$V_{OH} = 30V$	—	—	10	$\mu A$
Output Voltage	S-OUT	$V_{OL}$	—	$I_{OL} = +1.0mA$	—	—	0.4	V
		$V_{OH}$	—	$I_{OH} = -1.0mA$	4.6	—	—	
Output Current 1		$I_{OL1}$	—	$V_{CE} = 0.7V$   $R_{EXT} = 560\Omega$	35.2	41.5	47.7	mA
		$I_{OL2}$	—	$V_{CE} = 0.4V$ (include $\Delta I_{OL1}$ )	33.1	39.0	44.9	
Delta $I_{OUT}$		$\Delta I_{OL1}$	—	$R_{EXT} = 560\Omega$ $I_{OUT} = 40mA$ , $V_{CE} = 0.4V$	—	$\pm 3.0$	$\pm 7.0$	%
Supply Voltage Regulation		% / $V_{DD}$	—	$R_{EXT} = 560\Omega$	—	18	—	% / V
Reference Voltage		$V_{ref}$	—	$R_{EXT} = 560\Omega$ , $T_a = -40 \sim 85^\circ C$	—	1.26	—	V
Pull Up/Down Resister		$R_{IN}$	—	—	100	200	400	$k\Omega$
Supply Current	"OFF"	$I_{DD} (off) 1$	—	$R_{EXT} = OPEN$ , $OUT_n = Off$	—	0.4	0.6	mA
		$I_{DD} (off) 2$	—	$R_{EXT} = 560\Omega$ , $OUT_n = Off$	—	6.5	10.0	
	"ON"	$I_{DD} (on)$	—	$R_{EXT} = 560\Omega$ , $OUT_n = Off$	—	13.5	20.0	

**SWITCHING CHARACTERISTICS** (Ta = 25°C unless otherwise noted)

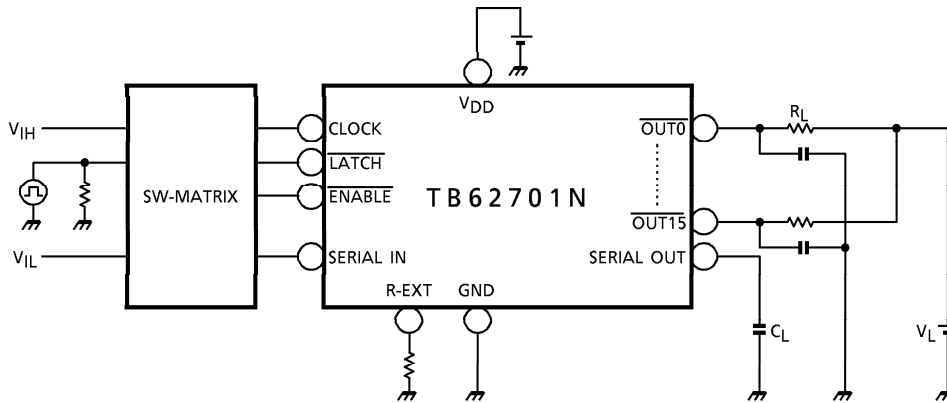
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time ("L" to "H")	CK-S-OUT	t <sub>pLH</sub>	V <sub>DD</sub> = 5.0V V <sub>CE</sub> = 1.0V V <sub>IH</sub> = V <sub>DD</sub> V <sub>IL</sub> = GND f <sub>CK</sub> = 2MHz R <sub>EXT</sub> = 560Ω I <sub>OUT</sub> = 30mA	—	95	500	ns
	CK- $\overline{\text{OUTn}}$			—	130	500	
	LATCH- $\overline{\text{OUTn}}$			—	130	500	
	EN- $\overline{\text{OUTn}}$			—	130	500	
Propagation Delay Time ("H" to "L")	CK-S-OUT	t <sub>pHL</sub>		—	95	720	ns
	CK- $\overline{\text{OUTn}}$			—	130	500	
	LATCH- $\overline{\text{OUTn}}$			—	130	500	
	EN- $\overline{\text{OUTn}}$			—	130	500	
Maximum Clock Frequency		f <sub>MAX</sub> (*1)		2.0	—	2.5	MHz
Minimum Pulse Width	CK	t <sub>w</sub> CK		—	45	80	ns
	LATCH	t <sub>w</sub> LAT		—	10	50	
Data Set Up Time		t <sub>setup</sub> (D)		—	17	50	ns
Data Hold Time		t <sub>hold</sub> (D)		—	-7	10	
Latch Set Up Time	LH	t <sub>LAT</sub> setup		—	70	200	ns
	HL		—	70	200		
Latch Hold Time	LH	t <sub>LAT</sub> hold	—	-70	50	ns	
	HL		—	-70	50		
Maximum Clock Rise Time		t <sub>r</sub>	—	—	10	μs	
Maximum Clock Fall Time		t <sub>f</sub>	—	—	10		
Maximum Output Rise Time		t <sub>or</sub>	—	35	80	ns	
Maximum Output Fall Time		t <sub>of</sub>	—	40	80		

\*1 : Cascade operation

**DC CHARACTERISTIC TEST CIRCUIT**

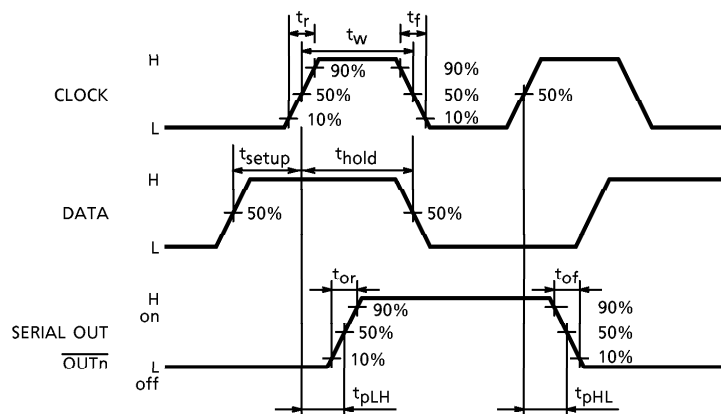


**AC CHARACTERISTIC TEST CIRCUIT**

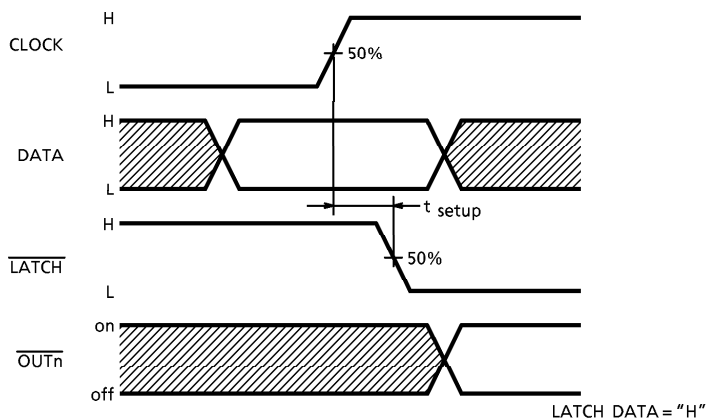


**TIMING WAVE FORM**

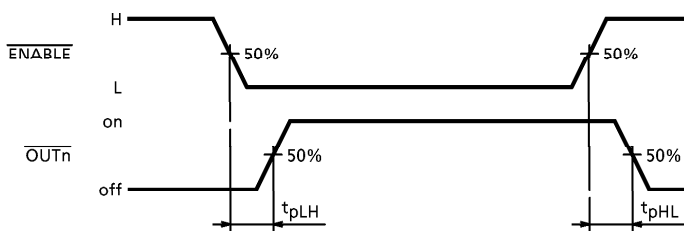
**1. CLOCK-SERIAL OUT,  $\overline{\text{OUTn}}$**



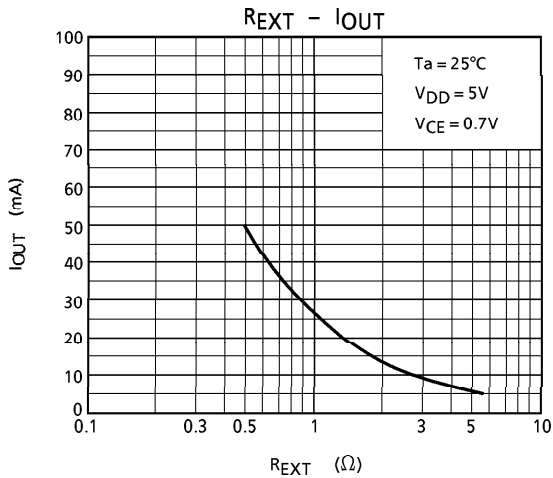
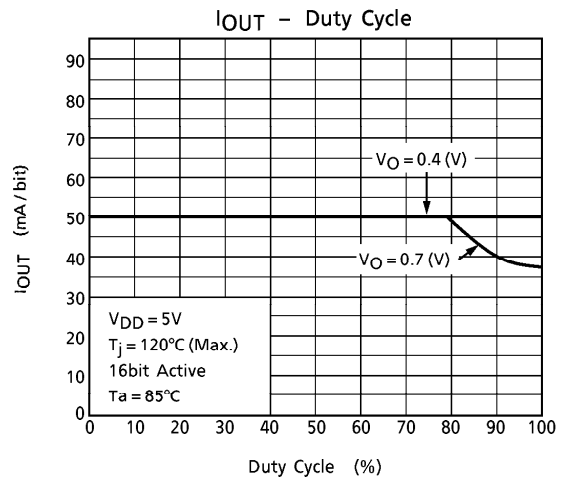
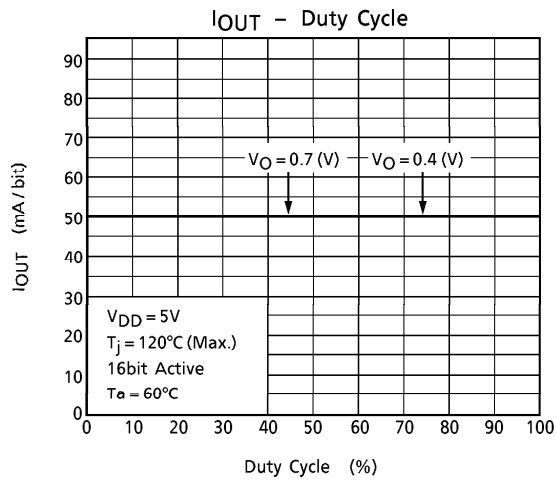
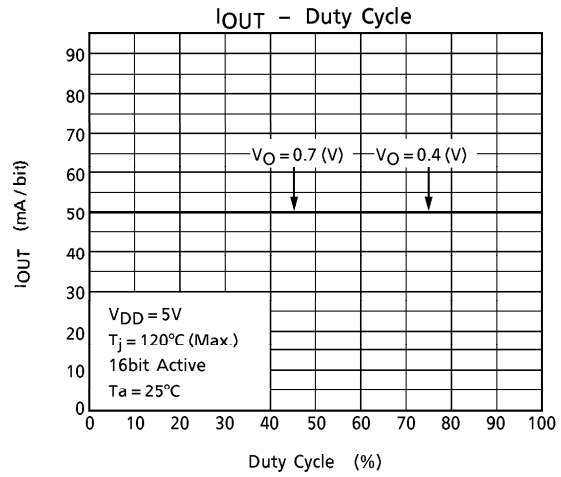
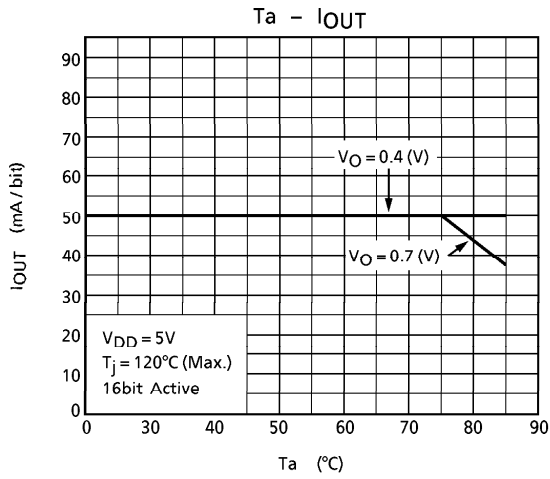
**2. CLOCK-LATCH**



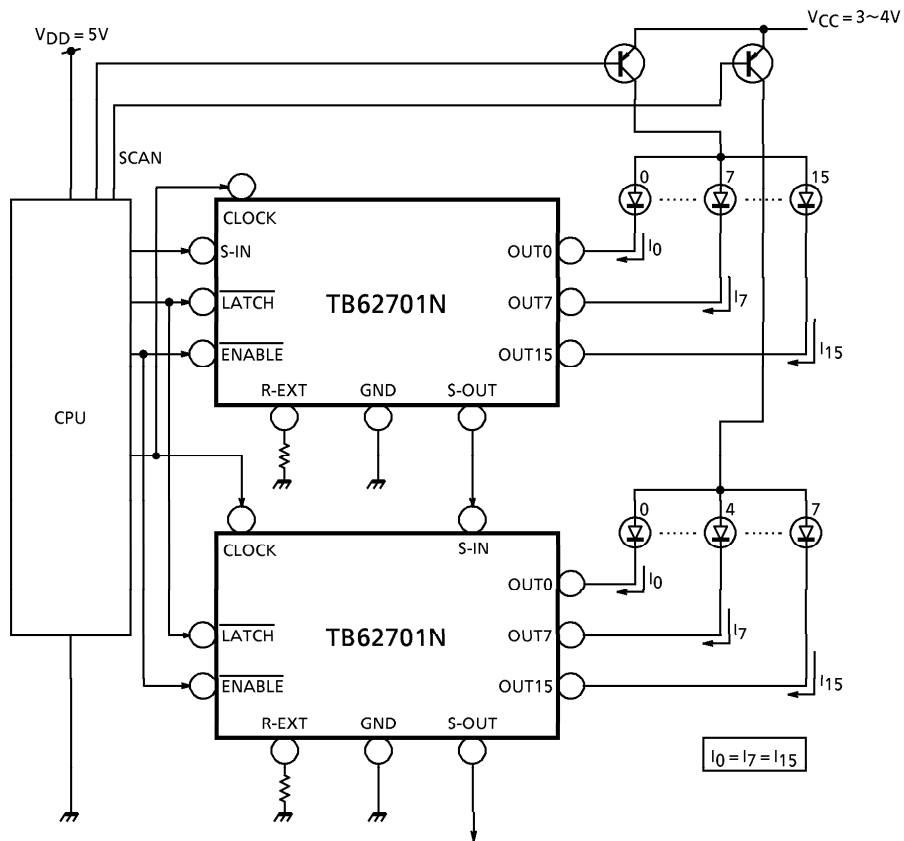
**3. ENABLE**





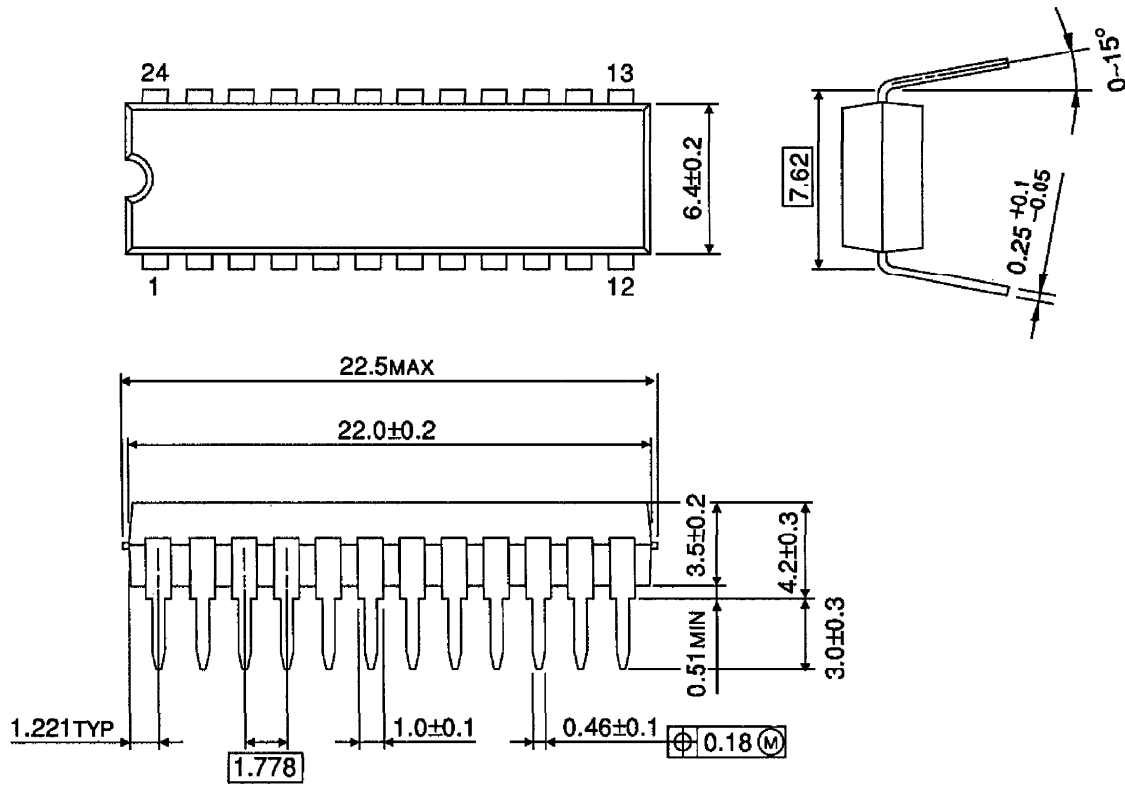


**APPLICATION CIRCUIT**



**OUTLINE DRAWING**  
SDIP24-P-300

Unit : mm



Weight : 1.2g (Typ.)