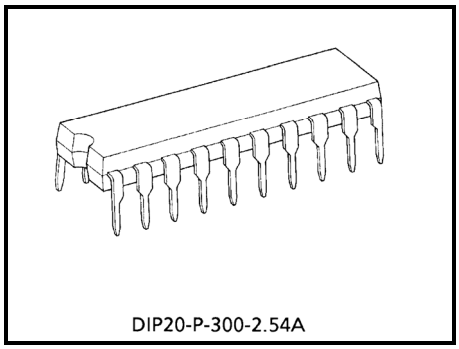
TOSHIBA Bi−CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

TD62C851PG,TD62C852PG

8BIT SERIAL−IN PARALLEL−OUT SHIFT REGISTER / LATCH DRIVERS

The TD62C851PG and TD62C852PG are monolithic circuits designed to be used together with Bi−CMOS integrated circuits. The devices consist of a 8bit shift register, 8bit latches, and 8 output circuits (integral clamp diodes for switching inductive loads).
The suffix (G) appended to the part number represents a Lead (Pb)-Free product.

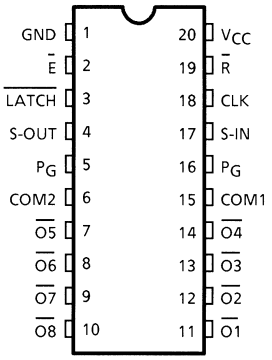


Weight: 2.25 g (typ.)

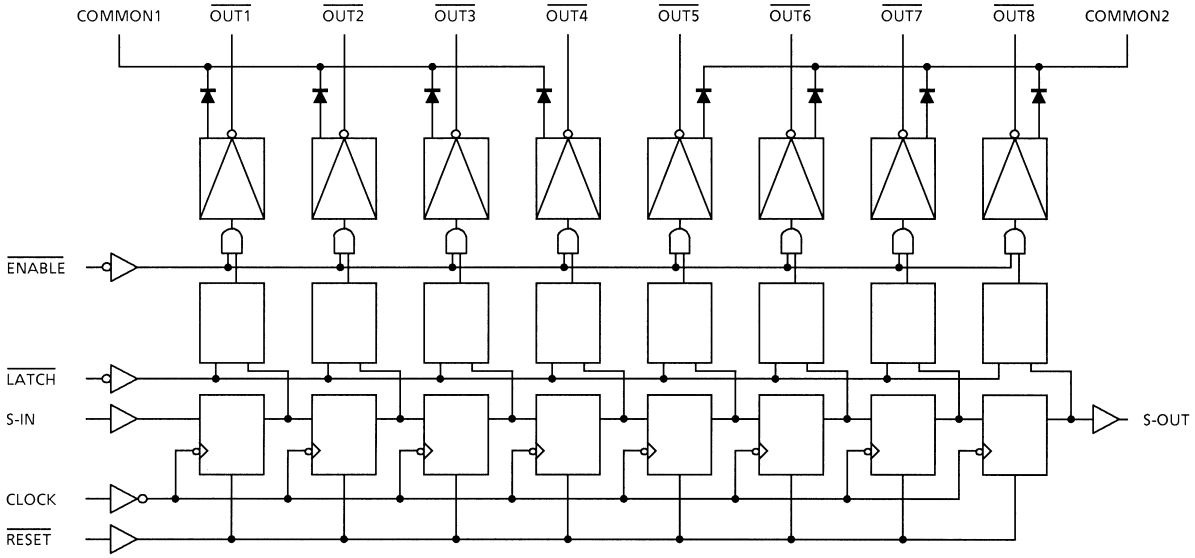
FEATURES

- 8bit serial−in parallel−out shift register / latch driver (Bi−CMOS process)
- Output sustaining voltage ; 50 V
- Output current ;
  TD62C851PG 200 mA / ch (Low saturation type)
  TD62C852PG 500 mA / ch (darlington type)
- Built−in output clamp diodes
- CMOS compatible inputs
- Package ; DIP20−P−300A

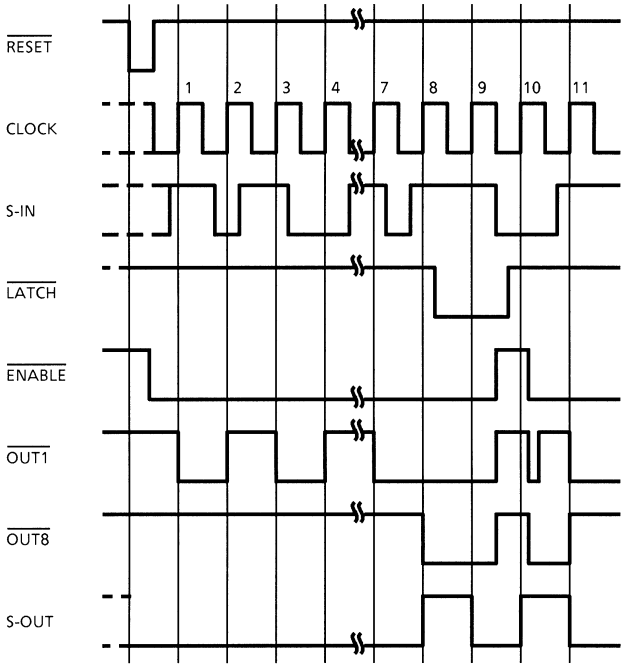
PIN CONNECTION (TOP VIEW)



BLOCK DIAGRAM

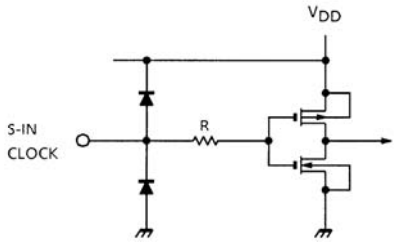


TIMING DIAGRAM

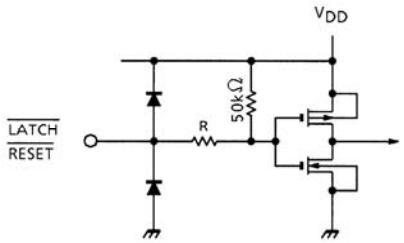


EQUIVALENT OF INPUTS AND OUTPUTS

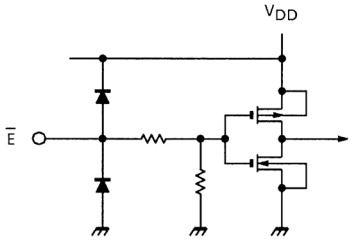
S−IN, clock terminal equivalent circuits



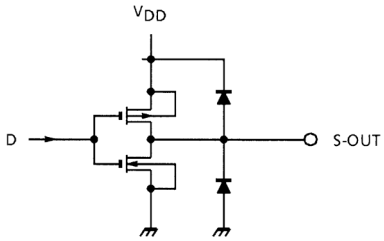
$\overline{\text{LATCH}}$, $\overline{\text{RESET}}$ terminal equivalent circuits



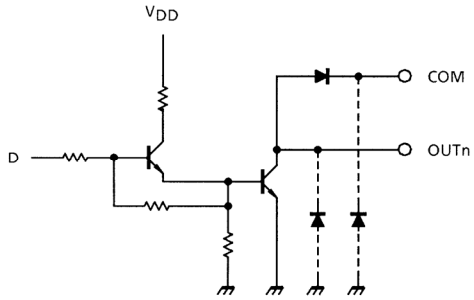
$\overline{\text{ENABLE}}$ terminal equivalent circuits



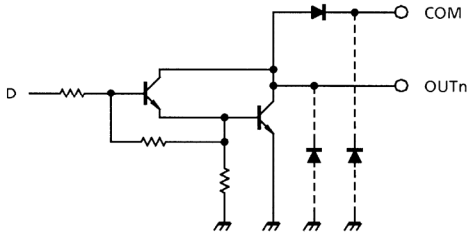
S−OUT terminal equivalent circuits



Output terminal equivalent circuits (TD62C851PG)



Output terminal equivalent circuits (TD62C852PG)



Note: The output parasitic diode cannot be used as clamp diode.

TRUTH TABLE

CK	$\overline{E}$	$\overline{R}$	$\overline{LATCH}$	S−IN	OUT		S−OUT
					$\overline{O1}$	$\overline{On}$	
↓	L	H	H	L	OFF	$\overline{On-1}$	Q_7
↓	L	H	H	H	ON	$\overline{On-1}$	Q_7
↓	L	H	L	(*)	NC	NC	Q_7
↓	H	H	(*)	(*)	OFF	NC	Q_7
↑	(*)	(*)	(*)	(*)	NC	NC	Q_7
(*)	(*)	L	H	(*)	OFF	OFF	L
(*)	H	⊓	L	(*)	NC	NC	L

CK = CLOCK
$\overline{E}$ = ENABLE
$\overline{R}$ = RESET
$\overline{LATCH}$ = LATCH
S−IN = SERIAL IN
OUT = PARALLEL OUT
S−OUT = SERIAL OUT

(*) = DON'T CARE
NC = NO CHANGE
L = LOW LEVEL
H = HIGH LEVEL

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{DD}	−0.3~7.0	V
Output Sustaining Voltage		$V_{CE\ (SUS)}$	−0.5~50	V
Output Current	TD62C851PG	I_{OUT}	200	mA / ch
	TD62C852PG		500	
Input Voltage		V_{IN}	~0.4~V_{DD} + 0.3	V
Power Dissipation		P_D	1.47	W
Operating Temperature		T_{opr}	−40~85	°C
Storage Temperature		T_{stg}	−55~150	°C

RECOMMENDED OPERATING CONDITIONS (Ta = −40~85°C)

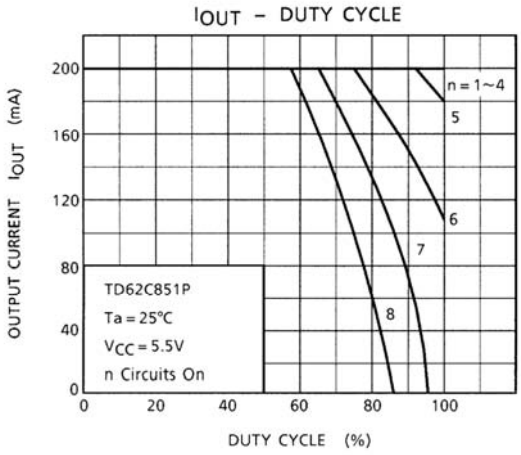
CHARACTERISTIC			SYMBOL	CONDITION		MIN	TYP.	MAX	UNIT
Supply Voltage			V_{DD}	—		4.5	5.0	5.5	V
Input Voltage			V_{IN}	—		0	—	V_{DD}	V
Output Current (“H” Level)		S−OUT	I_{OH}	Ta = 25°C		—	—	−0.4	mA
Output Voltage (“L” Level)		$\overline{On}$	V_{OH}	—		0	—	50	V
Output Current (“L” Level)		S−OUT	I_{OL}	—		—	—	0.4	mA / ch
	TD62C 851PG	$\overline{On}$		DC 1 circuit, Ta = 25°C		0	—	160	
				8 circuit on T_{pw} = 25 ms Ta = 85°C V_{DD} = 5.5 V	Duty = 10%	0	—	160	
					Duty = 40%	0	—	95	
	TD62C 852PG			D C 1 circuit, Ta = 25°C		0	—	400	
				8 circuit on T_{pw} = 25 ms Ta = 85°C V_{DD} = 5.5 V	Duty = 10%	0	—	400	
					Duty = 50%	0	—	170	
Clock Frequency			f_{CLOCK}	—		1.5	—	—	MHz
Clock Pulse Width			$f_{w\ CLOCK}$	—		0.33	—	—	μs
Data Set Up Time			t_{setup}	—		100	—	—	ns
Data Hold Time			t_{hold}	—		100	—	—	ns
Clamp Diode Reverse Voltage			V_R	—		0	—	50	V
Clamp Diode Forward Current		TD62C851PG	I_F	—		0	—	160	mA
		TD62C852PG		—		0	—	400	

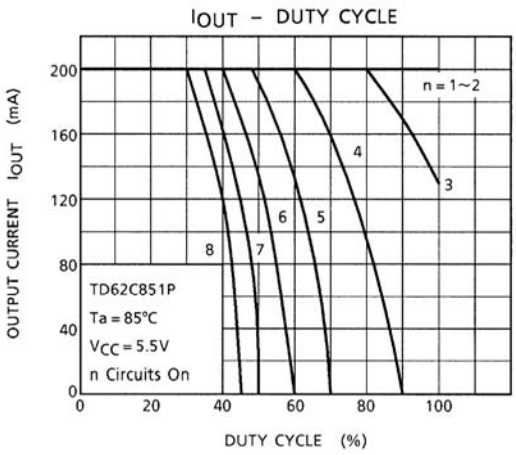
ELECTRICAL CHARACTERISTICS (Ta = −40~85°C)

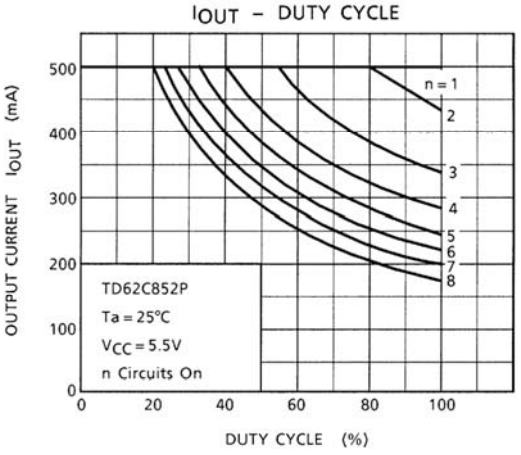
CHARACTERISTIC				SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN	TYP.	MAX	UNIT
Input Voltage			"H" Level	V_{IH}	—	—		0.7 V_{DD}	—	—	V
			"L" Level	V_{IL}	—	—		—	—	0.3 V_{DD}	
Input Current			"H" Level	I_{IH}	—	ENABLE, V_{DD} = 5.5 V V_{IH} = V_{DD}		28	55	110	μA
			"L" Level	I_{IL}	—	LATCH, RESET V_{DD} = 5.5 V, V_{IL} = GND		−55	−110	−275	
				I_{IN}	—	CLOCK, S−IN V_{IN} = V_{CC} or GND		—	—	±1.0	
Output Voltage	"H" Level		S−OUT	V_{OH}	—	V_{DD} = 4.5 V I_{OH} = −10 μA		3.9	4.1	—	V
	"L" Level		S−OUT	V_{OL}	—	V_{DD} = 4.5 V	I_{OL} = 0.8 mA	—	0.2	0.4	V
		$\overline{On}$	TD62C851P				I_{OL} = 100 mA	—	0.29	0.50	
							I_{OL} = 160 mA	—	0.39	0.65	
			TD62C852P				I_{OL} = 250 mA	—	1.24	1.90	
							I_{OL} = 400 mA	—	1.54	2.30	
Output Current	"H" Level	$\overline{On}$		I_{OH}	—	V_{DD} = 5.5 V, V_{OH} = 50.0 V		—	—	100	μA
Operating Supply Current				I_{DD1}	—	V_{DD} = 5.5 V Ta = 25°C	ENABLE = "H"	—	130	200	mA
				I_{DD2}			f_{CLK} = 1 MHz Output open DATA = 1 / 2 ENABLE = "H"	—	2.0	5.0	
		TD62C851PG		I_{DD3}			1 circuit on f_{CLK} = 1 MHz ENABLE = "L"	—	35	40	
		TD62C852PG						—	1.0	1.5	
Clamp Diode Reverse Current				I_R	—	V_R = 50 V		—	—	50	μA
Clamp Diode Froward Voltage		TD62C851PG		V_F	—	I_F = 160 mA		—	1.0	2.0	V
		TD62C852PG				I_F = 400 mA		—	1.5	2.0	

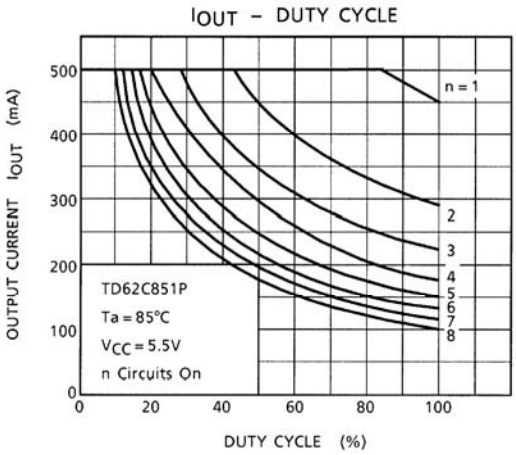
SWITCHING CHARACTERISTICS (Ta = 25°C)

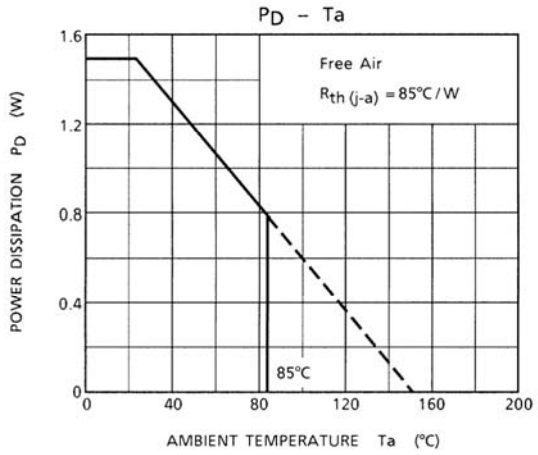
CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Propagation Delay Time	Low-to-High	CK-S-OUT	t_{pLH}	—	V_{DD} = 5.0 V, V_{IH} = 5.0 V V_{IL} = 0 V, Duty = 50% R_L = 300 Ω (TD62C851) / 120 Ω (TD62C852)	—	0.40	0.65	μs
		CK- $\overline{On}$				—	1.80	3.00	
		L- $\overline{On}$				—	2.10	3.50	
		R- $\overline{On}$				—	1.50	2.50	
		E- $\overline{On}$				—	1.50	2.50	
	High-to-Low	CK-S-OUT	t_{pHL}	—		—	0.33	0.55	
		CK- $\overline{On}$				—	0.41	0.70	
		L- $\overline{On}$				—	0.30	0.50	
		R-S-OUT				—	0.25	0.42	
		E- $\overline{On}$				—	0.21	0.35	
Maximum Clock Frequency			f_{MAX}	—		1.5	2.0	—	MHz
Minimum Pulse Width		CLOCK	t_{wCK}	—		—	250	330	ns
		$\overline{LATCH}$	t_{wL}			—	116	160	
		$\overline{RESET}$	t_{wR}			—	107	140	
Data Set Up Time			t_{setup}	—		—	30	60	ns
Data Hold Time			t_{hold}			—	14	40	
Maximum Clock Rise Time			t_r	—		—	70	—	ns
Maximum Clock Fall Time			t_f			—	70	—	

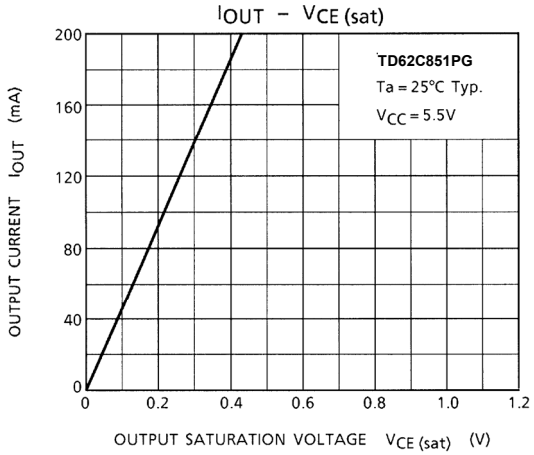

IOUT – DUTY CYCLE
OUTPUT CURRENT IOUT (mA)
DUTY CYCLE (%)
n = 1~4
5
6
7
8
TD62C851P
Ta = 25°C
VCC = 5.5V
n Circuits On

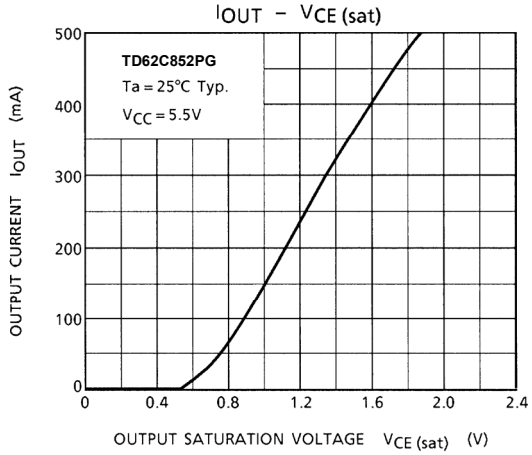

IOUT – DUTY CYCLE
OUTPUT CURRENT IOUT (mA)
DUTY CYCLE (%)
n = 1~2
3
4
5
6
7
8
TD62C851P
Ta = 85°C
VCC = 5.5V
n Circuits On

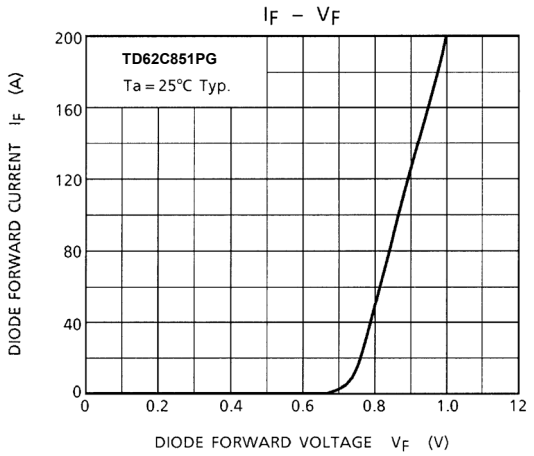

IOUT – DUTY CYCLE
OUTPUT CURRENT IOUT (mA)
DUTY CYCLE (%)
n = 1
2
3
4
5
6
7
8
TD62C852P
Ta = 25°C
VCC = 5.5V
n Circuits On

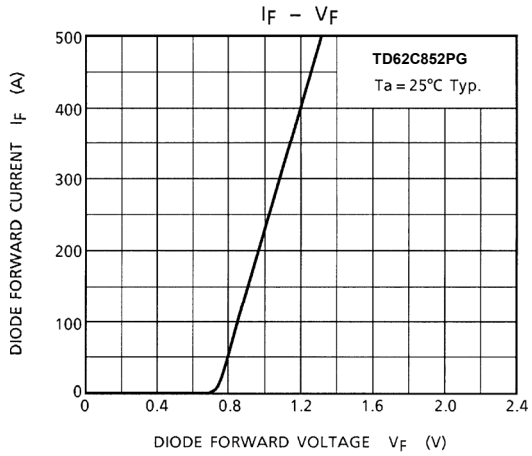

IOUT – DUTY CYCLE
OUTPUT CURRENT IOUT (mA)
DUTY CYCLE (%)
n = 1
2
3
4
5
6
7
8
TD62C851P
Ta = 85°C
VCC = 5.5V
n Circuits On


PD – Ta
POWER DISSIPATION PD (W)
AMBIENT TEMPERATURE Ta (°C)
Free Air
Rth (j-a) = 85°C/W
85°C







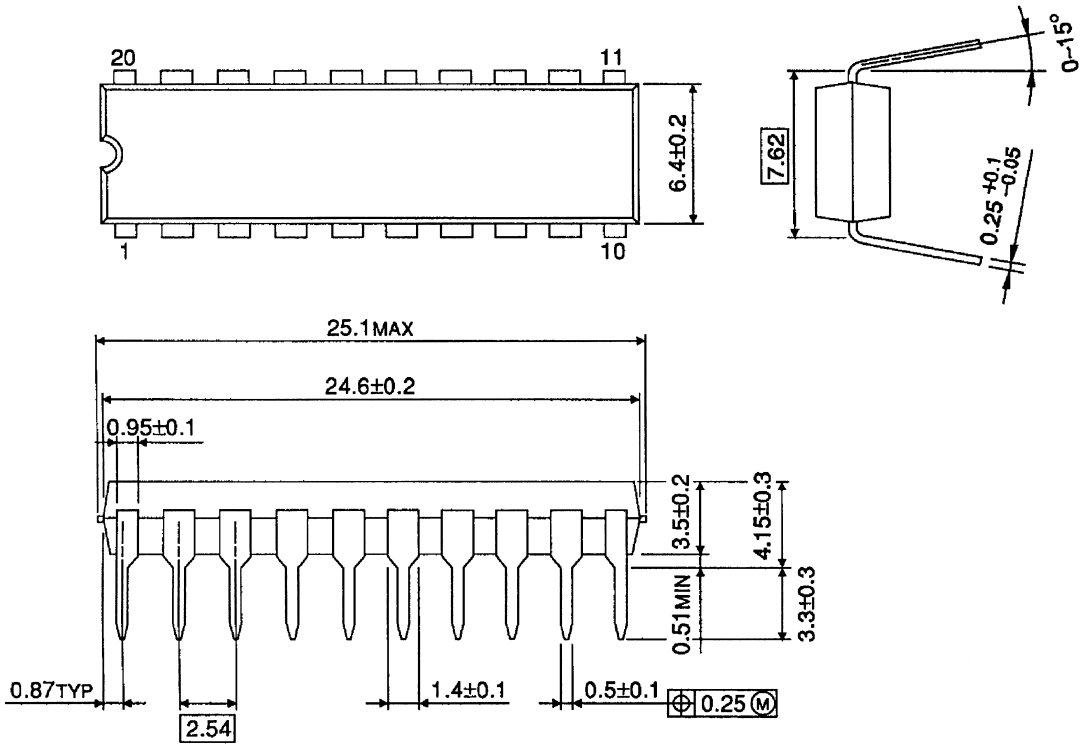


PRECAUTIONS FOR USING

This IC does not integrate protection circuits such as overcurrent and overvoltage protectors.
Thus, if excess current or voltage is applied to the IC, the IC may be damaged. Please design the IC so that excess current or voltage will not be applied to the IC.
Utmost care is necessary in the design of the output line, V_{CC} and GND line since IC may be destroyed due to short−circuit between outputs, air contamination fault, or fault by improper grounding.

PACKAGE DIMENSIONS

DIP20−P−300−2.54A Unit: mm



Weight: 2.25 g (Typ.)

Notes on Contents

1. Block Diagrams

Some of the functional blocks, circuits, or constants in the block diagram may be omitted or simplified for explanatory purposes.

2. Equivalent Circuits

The equivalent circuit diagrams may be simplified or some parts of them may be omitted for explanatory purposes.

3. Timing Charts

Timing charts may be simplified for explanatory purposes.

IC Usage Considerations

Notes on Handling of ICs

(1) The absolute maximum ratings of a semiconductor device are a set of ratings that must not be exceeded, even for a moment. Do not exceed any of these ratings.
Exceeding the rating(s) may cause the device breakdown, damage or deterioration, and may result injury by explosion or combustion.

(2) Use an appropriate power supply fuse to ensure that a large current does not continuously flow in case of over current and/or IC failure. The IC will fully break down when used under conditions that exceed its absolute maximum ratings, when the wiring is routed improperly or when an abnormal pulse noise occurs from the wiring or load, causing a large current to continuously flow and the breakdown can lead smoke or ignition. To minimize the effects of the flow of a large current in case of breakdown, appropriate settings, such as fuse capacity, fusing time and insertion circuit location, are required.

(3) If your design includes an inductive load such as a motor coil, incorporate a protection circuit into the design to prevent device malfunction or breakdown caused by the current resulting from the inrush current at power ON or the negative current resulting from the back electromotive force at power OFF. IC breakdown may cause injury, smoke or ignition.
Use a stable power supply with ICs with built-in protection functions. If the power supply is unstable, the protection function may not operate, causing IC breakdown. IC breakdown may cause injury, smoke or ignition.

(4) Do not insert devices in the wrong orientation or incorrectly.
Make sure that the positive and negative terminals of power supplies are connected properly. Otherwise, the current or power consumption may exceed the absolute maximum rating, and exceeding the rating(s) may cause the device breakdown, damage or deterioration, and may result injury by explosion or combustion.
In addition, do not use any device that is applied the current with inserting in the wrong orientation or incorrectly even just one time.

(5) Carefully select external components (such as inputs and negative feedback capacitors) and load components (such as speakers), for example, power amp and regulator.
If there is a large amount of leakage current such as input or negative feedback condenser, the IC output DC voltage will increase. If this output voltage is connected to a speaker with low input withstand voltage, overcurrent or IC failure can cause smoke or ignition. (The over current can cause smoke or ignition from the IC itself.) In particular, please pay attention when using a Bridge Tied Load (BTL) connection type IC that inputs output DC voltage to a speaker directly.

Points to Remember on Handling of ICs

(1) Heat Radiation Design
In using an IC with large current flow such as power amp, regulator or driver, please design the device so that heat is appropriately radiated, not to exceed the specified junction temperature (Tj) at any time and condition. These ICs generate heat even during normal use. An inadequate IC heat radiation design can lead to decrease in IC life, deterioration of IC characteristics or IC breakdown. In addition, please design the device taking into considerate the effect of IC heat radiation with peripheral components.

(2) Back-EMF
When a motor rotates in the reverse direction, stops or slows down abruptly, a current flow back to the motor's power supply due to the effect of back-EMF. If the current sink capability of the power supply is small, the device's motor power supply and output pins might be exposed to conditions beyond absolute maximum ratings. To avoid this problem, take the effect of back-EMF into consideration in system design.

About solderability, following conditions were confirmed

- Solderability

  (1) Use of Sn-37Pb solder Bath
  - solder bath temperature = 230°C
  - dipping time = 5 seconds
  - the number of times = once
  - use of R-type flux

  (2) Use of Sn-3.0Ag-0.5Cu solder Bath
  - solder bath temperature = 245°C
  - dipping time = 5 seconds
  - the number of times = once
  - use of R-type flux

RESTRICTIONS ON PRODUCT USE

060116EBA

- The information contained herein is subject to change without notice. 021023_D
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  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc. 021023_A
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