

TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

TD62C851PG,TD62C852PG

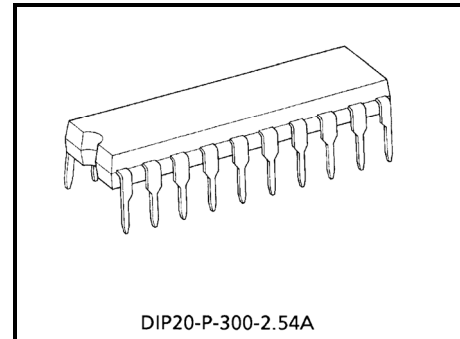
8BIT SERIAL-IN PARALLEL-OUT SHIFT REGISTER / LATCH DRIVERS

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.

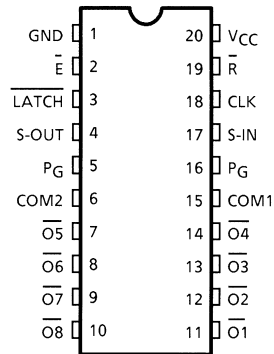
FEATURES

- 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

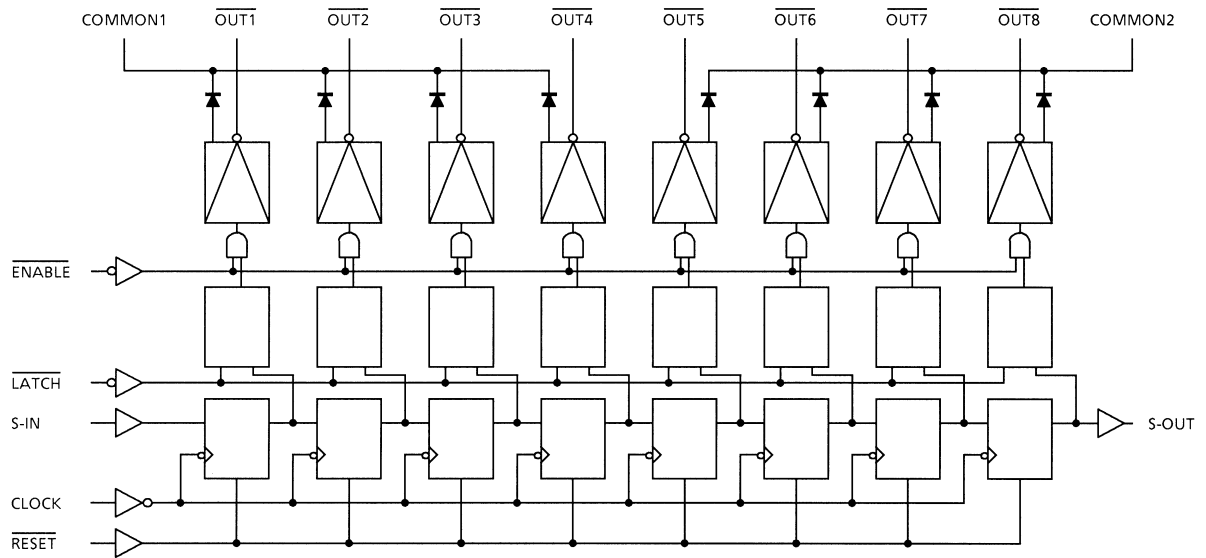


Weight: 2.25 g (typ.)

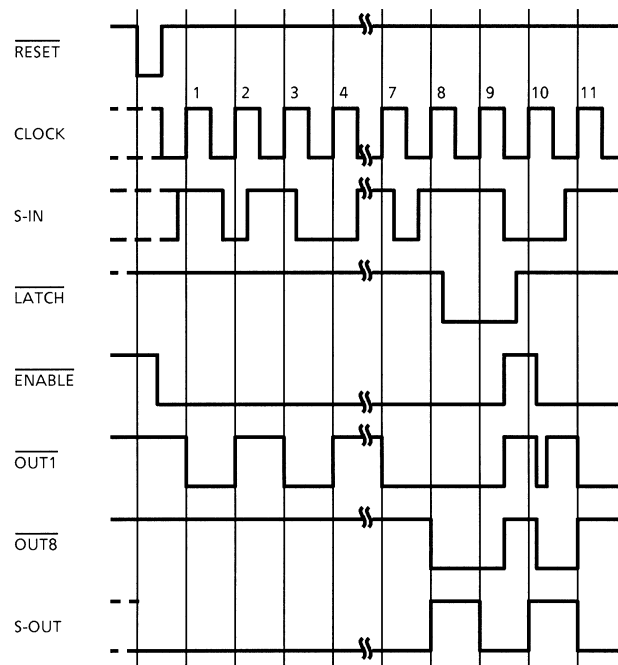
PIN CONNECTION (TOP VIEW)



BLOCK DIAGRAM

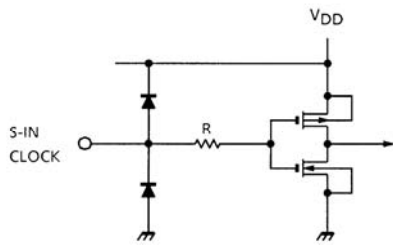


TIMING DIAGRAM

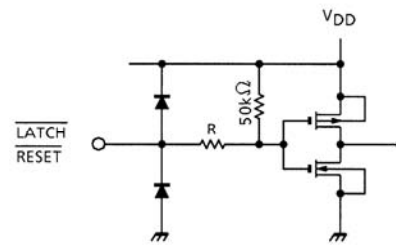


EQUIVALENT OF INPUTS AND OUTPUTS

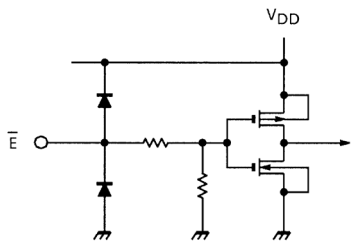
S-IN, clock terminal equivalent circuits



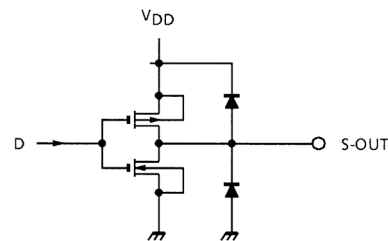
$\overline{\text{LATCH}}$, $\overline{\text{RESET}}$ terminal equivalent circuits



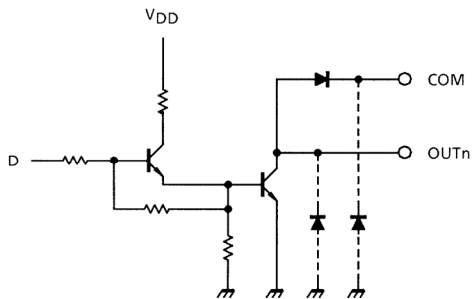
$\overline{\text{ENABLE}}$ terminal equivalent circuits



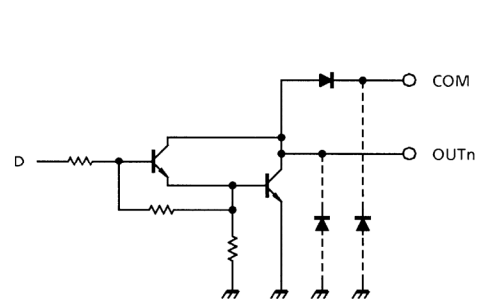
S-OUT terminal equivalent circuits



**Output terminal equivalent circuits
(TD62C851PG)**



**Output terminal equivalent circuits
(TD62C852PG)**



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

TRUTH TABLE

CK	$\bar{E}$	$\bar{R}$	$\overline{\text{LATCH}}$	S-IN	OUT		S-OUT
					$\overline{O1}$	$\overline{On-1}$	
	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 $\bar{E}$ = ENABLE $\bar{R}$ = RESET 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}	$\sim 0.4 \sim V_{DD} + 0.3$	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)

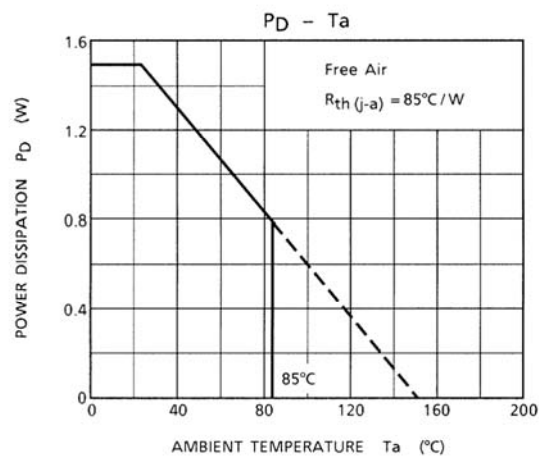
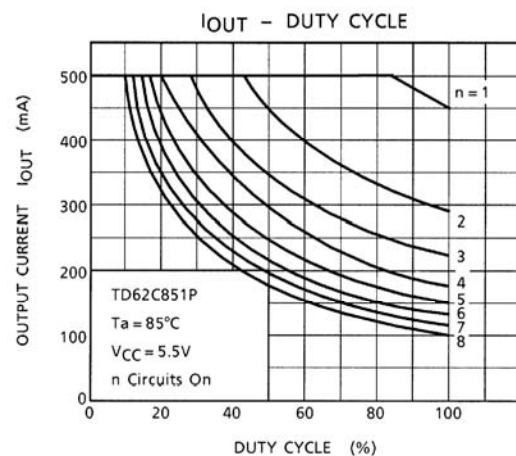
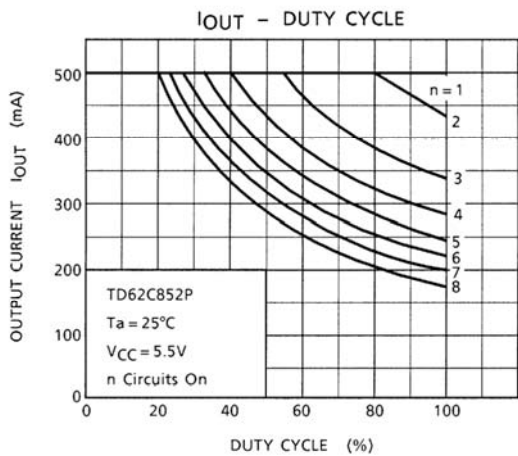
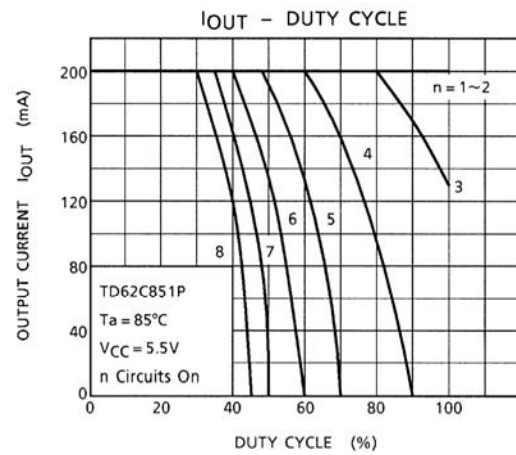
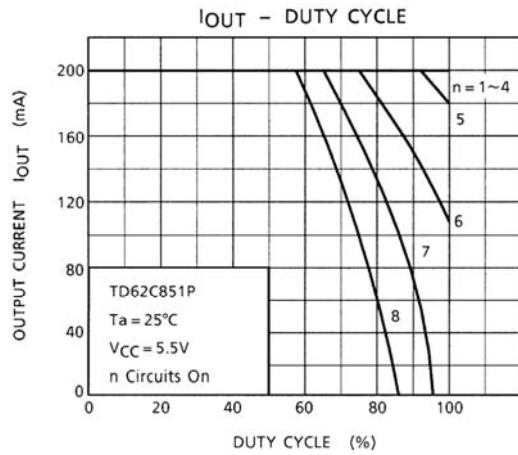
CHARACTERISTIC		SYMBOL	CONDITION		MIN	TYP.	MAX	UNIT	
Supply Voltage		V _{DD}	—		4.5	5.0	5.5	V	
Input Voltage		V _{IN}	—		0	—	V _{DD}	V	
Output Current (“H” Level)	S-OUT	I _{OH}	Ta = 25°C		—	—	−0.4	mA	
Output Voltage (“L” Level)	$\overline{\text{On}}$	V _{OH}	—		0	—	50	V	
Output Current (“L” Level)		S-OUT	I _{OL}	—	—	—	0.4	mA / ch	
	TD62C 851PG	$\overline{\text{On}}$		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		—
	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		—
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		

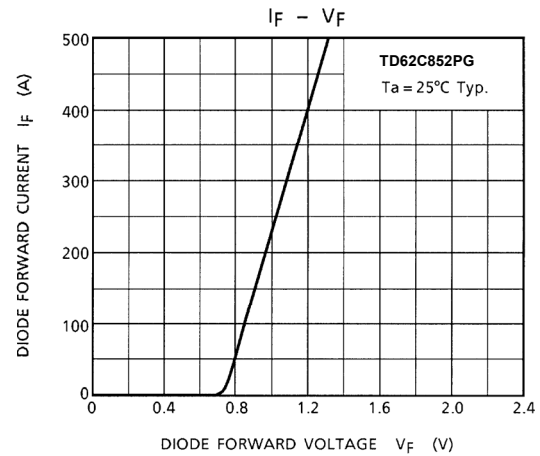
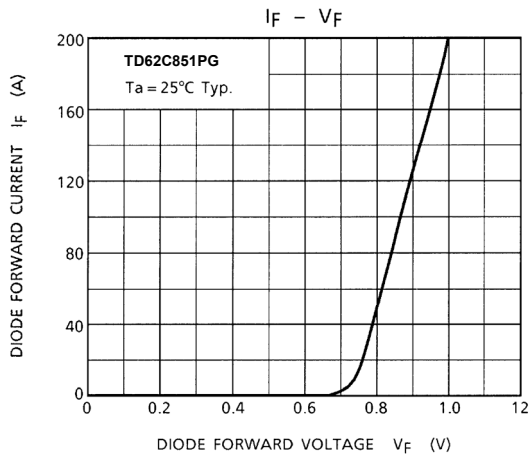
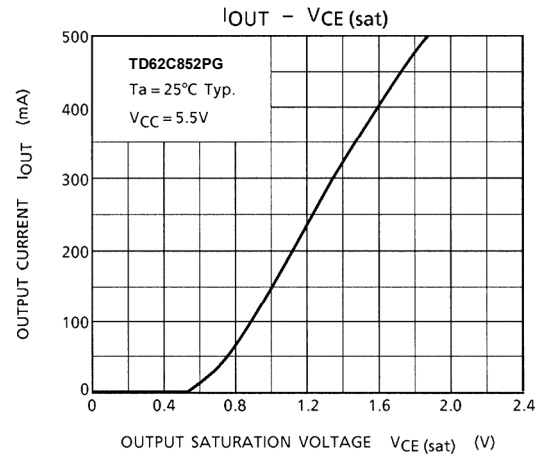
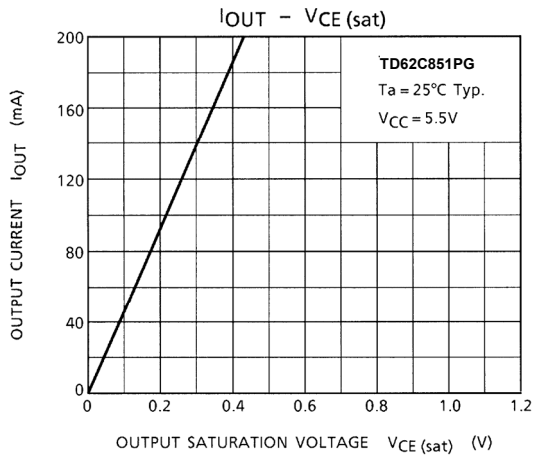
ELECTRICAL CHARACTERISTICS (Ta = -40~85°C)

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
		On	TD62C 851P				I _{OL} = 100 mA	—	0.29	0.50	
			TD62C 852P				I _{OL} = 160 mA	—	0.39	0.65	
							I _{OL} = 250 mA	—	1.24	1.90	
							I _{OL} = 400 mA	—	1.54	2.30	
Output Current	“H” Level	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}	—	$V_{DD} = 5.0 \text{ V}, V_{IH} = 5.0 \text{ V}$ $V_{IL} = 0 \text{ V}, \text{Duty} = 50\%$ $R_L = \left[\begin{array}{l} 300 \, \Omega \text{ (TD62C851)} \\ 120 \, \Omega \text{ (TD62C852)} \end{array} \right]$	—	0.40	0.65	μs
		$\overline{\text{CK}} - \overline{\text{On}}$				—	1.80	3.00	
		$\text{L} - \overline{\text{On}}$				—	2.10	3.50	
		$\text{R} - \overline{\text{On}}$				—	1.50	2.50	
		$\text{E} - \overline{\text{On}}$				—	1.50	2.50	
	High-to-Low	CK-S-OUT	t_{pHL}	—		—	0.33	0.55	
		$\overline{\text{CK}} - \overline{\text{On}}$				—	0.41	0.70	
		$\text{L} - \overline{\text{On}}$				—	0.30	0.50	
		R-S-OUT				—	0.25	0.42	
		$\text{E} - \overline{\text{On}}$				—	0.21	0.35	
Maximum Clock Frequency			f_{MAX}	—	1.5	2.0	—	MHz	
Minimum Pulse Width		CLOCK	t_{wCK}	—	—	250	330	ns	
		LATCH	t_{wL}		—	116	160		
		$\overline{\text{RESET}}$	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	—		





PRECAUTIONS FOR USING

This IC does not integrate protection circuits such as overcurrent and overvoltage protectors.

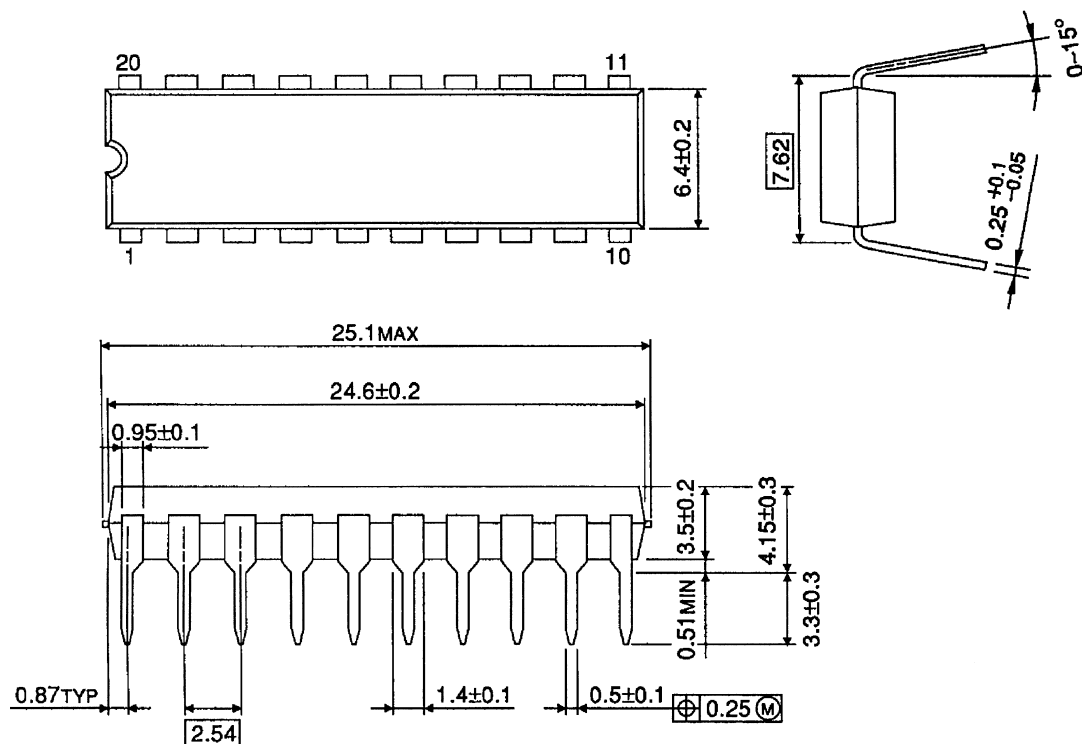
Thus, if excess current or voltage is applied to the IC, the IC may be damaged. Please design the IC so that excess current or voltage will not be applied to the IC.

Utmost care is necessary in the design of the output line, VCC 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 (T_j) 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 consideration 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 flows 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

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