

TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

**TB62003PG, TB62003FG, TB62004PG, TB62004FG**  
**TB62006PG, TB62006FG, TB62007PG, TB62007FG**  
**TB62008PG, TB62008FG, TB62009PG, TB62009FG**

**8CH DMOS TRANSISTOR ARRAY WITH GATE**

TB62003PG, TB62003FG  
 INVERTER & DMOS DRIVER

TB62004PG, TB62004FG  
 THROUGH & DMOS DRIVER

TB62006PG, TB62006FG  
 NAND & DMOS DRIVER

TB62007PG, TB62007FG  
 AND & DMOS DRIVER

TB62008PG, TB62008FG  
 NOR & DMOS DRIVER

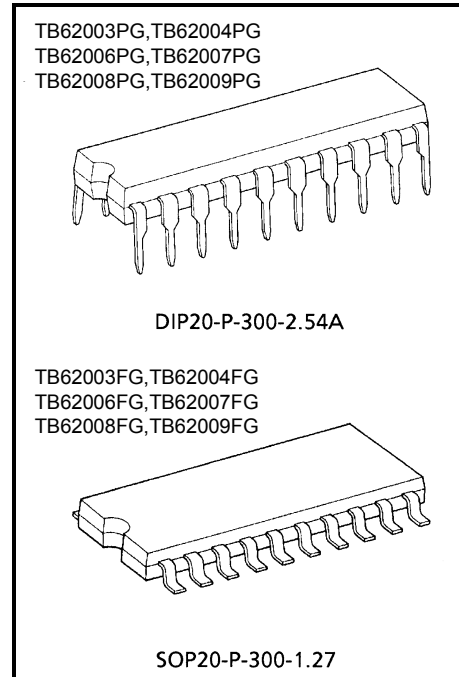
TB62009PG, TB62009FG  
 OR & DMOS DRIVER

The TB62003 Series are high-voltage, high-current arrays comprised of eight N-ch DMOS pairs.

The suffix (G) appended to the part number represents a Lead (Pb)-Free product.

**Features**

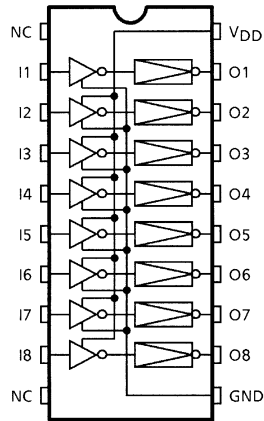
- Package : Type-PG DIP-20 pin  
Type-FG SOP-20 pin (200 mil)
- Output rating : 35 V (Min.) / 200 mA (Max.)
- Low power



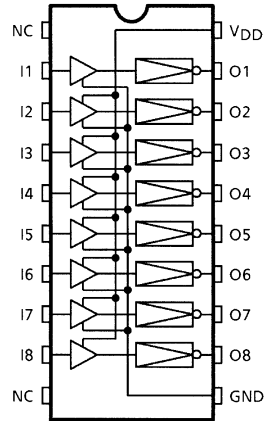
Weight  
 DIP20-P-300-2.54 A: 2.25 g (typ.)  
 SOP20-P-300-1.27: 0.25 g (typ.)

Pin connection (top view)

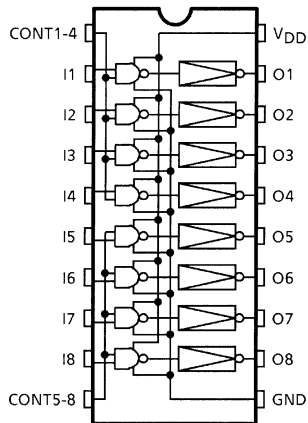
**TB62003PG / FG**



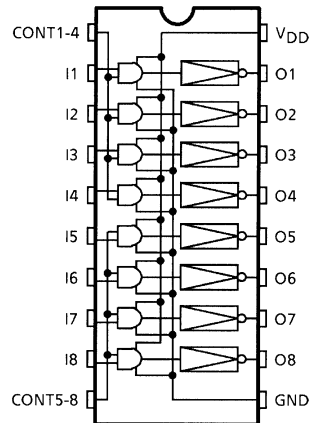
**TB62004PG / FG**



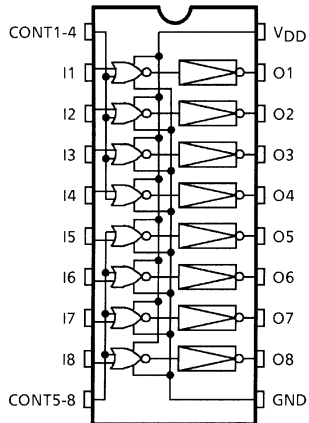
**TB62003PG / FG**



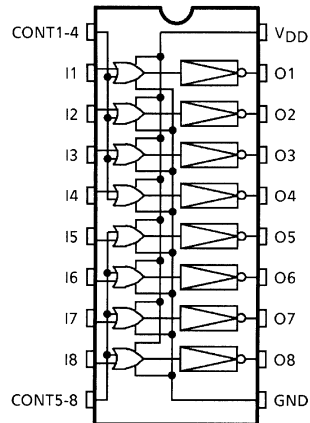
**TB62007PG / FG**



**TB62008PG / FG**



**TB62009PG / FG**



## Truth Table

### TB62006PG / FG

INPUT				OUTPUT	
I1~4	I5~8	CONT1~4	CONT5~8	O3~4	O5~8
H	X	H	X	OFF	NOT FIX
H	X	L	X	ON	NOT FIX
L	X	H	X	ON	NOT FIX
L	X	L	X	ON	NOT FIX
X	H	X	H	NOT FIX	OFF
X	H	X	L	NOT FIX	ON
X	L	X	H	NOT FIX	ON
X	L	X	L	NOT FIX	ON

X: Don't Care

### TB62007PG / FG

INPUT				OUTPUT	
I1~4	I5~8	CONT1~4	CONT5~8	O3~4	O5~8
H	X	H	X	ON	NOT FIX
H	X	L	X	OFF	NOT FIX
L	X	H	X	OFF	NOT FIX
L	X	L	X	OFF	NOT FIX
X	H	X	H	NOT FIX	ON
X	H	X	L	NOT FIX	OFF
X	L	X	H	NOT FIX	OFF
X	L	X	L	NOT FIX	OFF

X: Don't Care

## TB62008PG / FG

INPUT				OUTPUT	
I1~4	I5~8	CONT1~4	CONT5~8	O3~4	O5~8
H	X	H	X	OFF	NOT FIX
H	X	L	X	OFF	NOT FIX
L	X	H	X	OFF	NOT FIX
L	X	L	X	ON	NOT FIX
X	H	X	H	NOT FIX	OFF
X	H	X	L	NOT FIX	OFF
X	L	X	H	NOT FIX	OFF
X	L	X	L	NOT FIX	ON

X: Don't Care

## TB62009PG / FG

INPUT				OUTPUT	
I1~4	I5~8	CONT1~4	CONT5~8	O3~4	O5~8
H	X	H	X	ON	NOT FIX
H	X	L	X	ON	NOT FIX
L	X	H	X	ON	NOT FIX
L	X	L	X	OFF	NOT FIX
X	H	X	H	NOT FIX	ON
X	H	X	L	NOT FIX	ON
X	L	X	H	NOT FIX	ON
X	L	X	L	NOT FIX	OFF

X: Don't Care

## Absolute Maximum Ratings (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V <sub>DD</sub>	7	V
DC Output Voltage		V <sub>DS</sub>	-0.5~35	V
DC Output Current		I <sub>DS</sub>	200	mA / ch
DC Input Voltage		V <sub>IN</sub>	-0.4+V <sub>DD</sub> +0.4	V
DC Input Current		I <sub>IN</sub>	±5	mA
Input Diode Current		I <sub>ID</sub>	±5	mA
Output Diode Current		I <sub>OK</sub>	5	mA
Power Dissipation	PG	P <sub>D</sub> (Note 1)	1.47	W
	FG		0.96 (Note 2)	
Operating Temperature		T <sub>opr</sub>	-40~85	°C
Storage Temperature		T <sub>stg</sub>	-55~150	°C

Note 1: On Glass Epoxy PCB (50 × 50 × 1.6 mm Cu 40%)

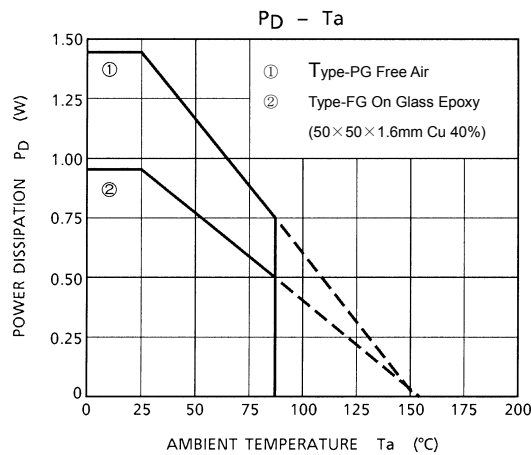
Note 2: Delated above 25°C in the proportion of 7.7 mW / °C (F Type)

## Recommended Operating Condition (Ta = -40~85°C)

CHARACTERISTIC		SYMBOL	CONDITION		MIN	TYP.	MAX	UNIT
Supply Voltage Range		V <sub>DD</sub>	—		4.5	—	5.5	V
DC Output Voltage		V <sub>DS</sub>	—		—	—	30	V
DC Output Current	PG	I <sub>DS</sub>	Duty 80%	8ch On V <sub>DD</sub> = 5.0 V	—	—	170	mA / ch
	FG				—	—	90	
	PG		Duty 100%		—	—	150	
	FG				—	—	80	
DC Input Voltage		V <sub>IN</sub>	—		GND	—	V <sub>DD</sub>	V

## Electrical Characteristics (Ta = 25°C, VDD = 5.0 V)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Output Leakage Current	I <sub>OZ</sub>	—	V <sub>DS</sub> = 35 V	—	—	50	μA
Low-Level Output Voltage	V <sub>DS</sub>	—	I <sub>DS</sub> = 150 mA	—	0.70	0.8	V
		—	I <sub>DS</sub> = 200 mA	—	0.94	1.2	
Output Resistance	R <sub>ON</sub>	—	I <sub>DS</sub> = 200 mA	—	4.7	6.0	Ω
DC Input Current	I <sub>IN</sub>	—	V <sub>IN</sub> = GND, V <sub>IN</sub> = V <sub>DD</sub>	—	—	±1.0	μA
High-Level Input Voltage	V <sub>IN</sub> (H)	—	—	3.5	—	V <sub>DD</sub> +0.4	V
	V <sub>IN</sub> (L)	—	—	-0.4	—	1.5	
Operating Supply Current	I <sub>DDopr</sub>	—	8ch On, Output open f <sub>IN</sub> = 1MHz	—	2	—	μA
Output Diode Forward Voltage	V <sub>FK</sub>	—	I <sub>OK</sub> = 5 mA	—	0.6	—	V
Turn-On Delay	t <sub>ON</sub>	—	I <sub>OUT</sub> = 170 mA	—	300	—	ns
Turn-Off Delay	t <sub>OFF</sub>	—	—	—	300	—	
Supply Current	I <sub>DD</sub>	—	—	—	—	10	μA
Input Capacitance	C <sub>IN</sub>	—	—	—	15	—	pF



### Precautions for Using

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

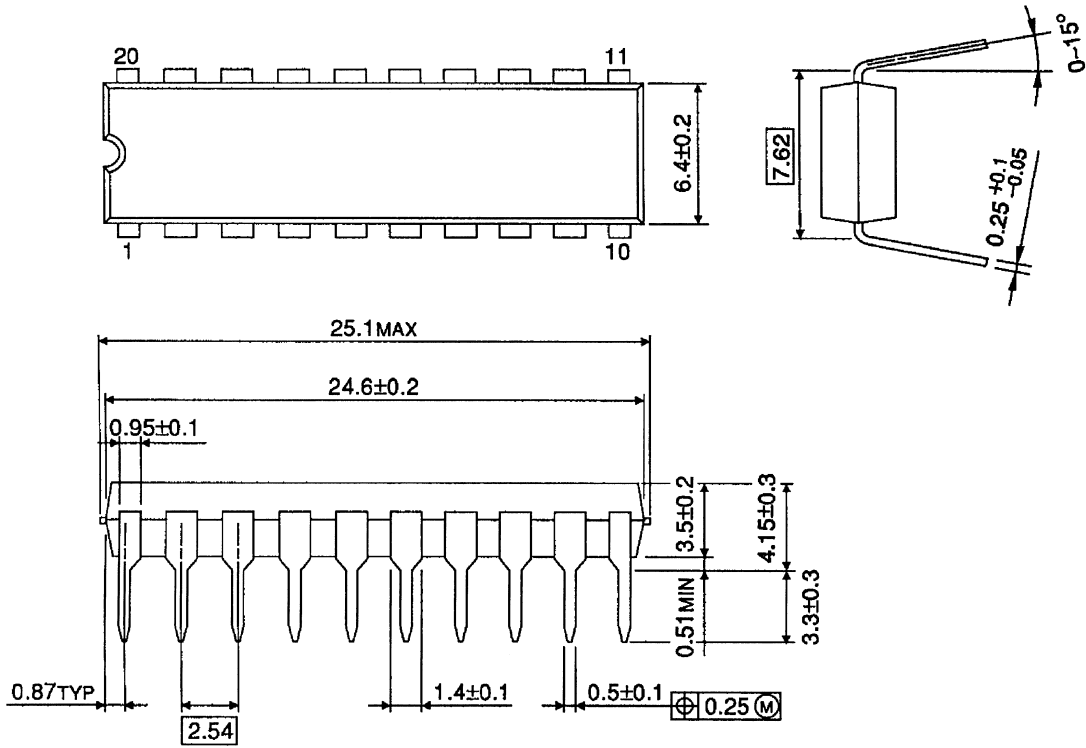
Thus, if excess current or voltage is applied to the IC, the IC may be damaged. Please design the IC so that excess current or voltage will not be applied to the IC.

Utmost care is necessary in the design of the output line, VCC (V<sub>DD</sub>) 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

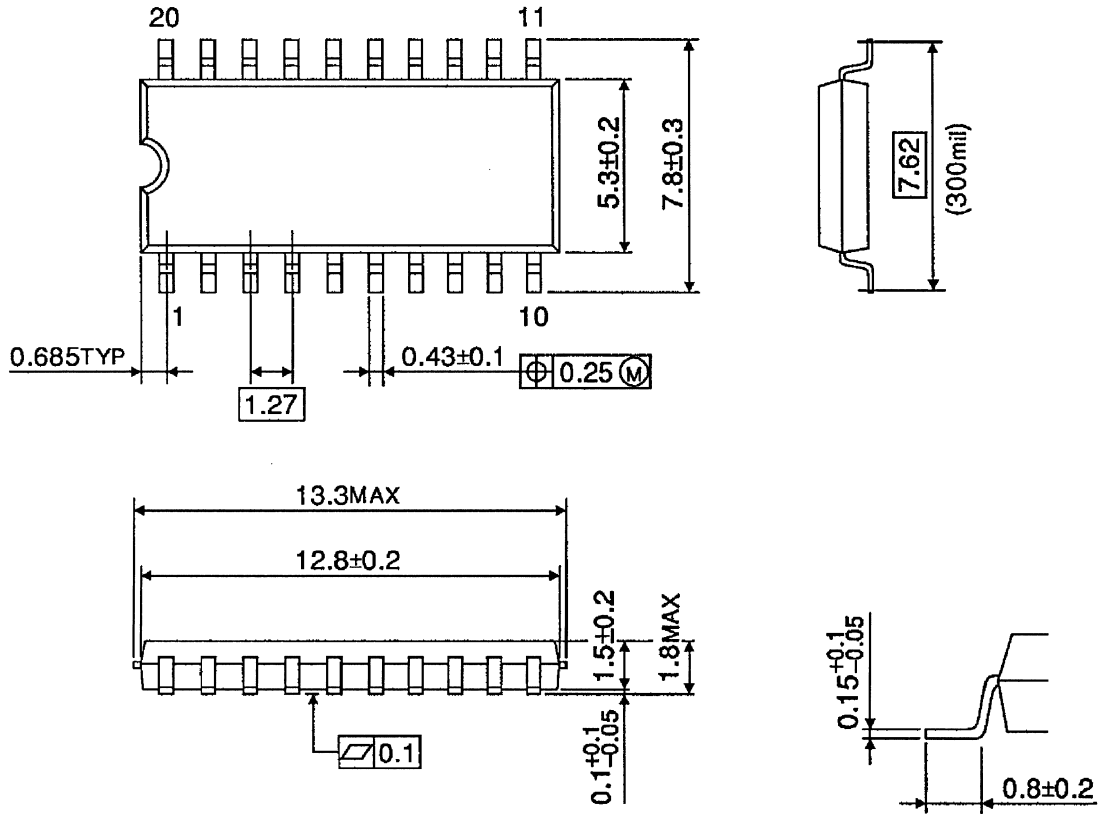


Weight: 2.25 g (Typ.)

## Package Dimensions

SOP20-P-300-1.27

Unit: mm



Weight: 0.25 g (Typ.)



## 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 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

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