

Toshiba Bi-CD Integrated Circuit Silicon Monolithic

TB6552FN, TB6552FL

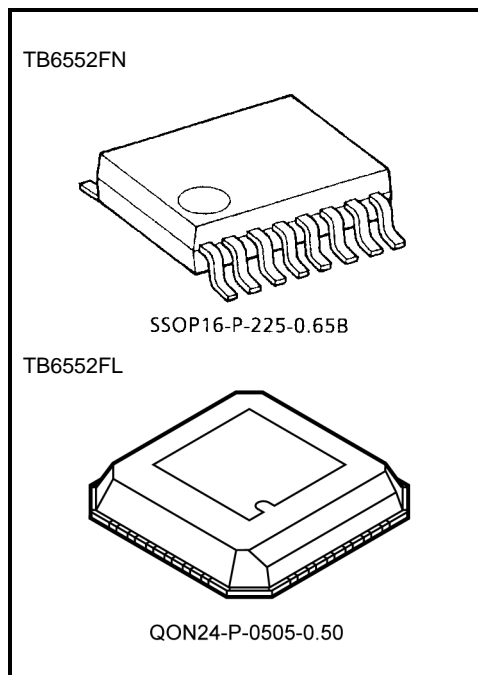
Dual-Bridge Driver IC for DC motor

TB6552FN/FL is a dual-bridge driver IC for DC motor with output transistor in LD MOS structure with low ON-resistor. Two input signals, IN1 and IN2, can chose one of four modes such as CW, CCW, short brake, and stop mode. Efficient driven at high temperature is possible by PWM drive system.

Features

- Power supply voltage for motor: $V_M \leq 15\text{ V}$ (max)
- Power supply voltage for control: $V_{CC} = 2.7\text{ V}$ to 6.0 V
- Output current: 1 A (max)
- Low ON resistor: $1.5\ \Omega$ (typ.)
(Upper side + Lower side combined @ $V_M = 5\text{ V}$)
- Direct PWM control
- Standby system (Power save)
- CW/CCW/short brake/stop function modes.
- Built-in thermal shutdown circuit
- Package: SSOP16 for TB6552FN /QON24 for TB6552FL

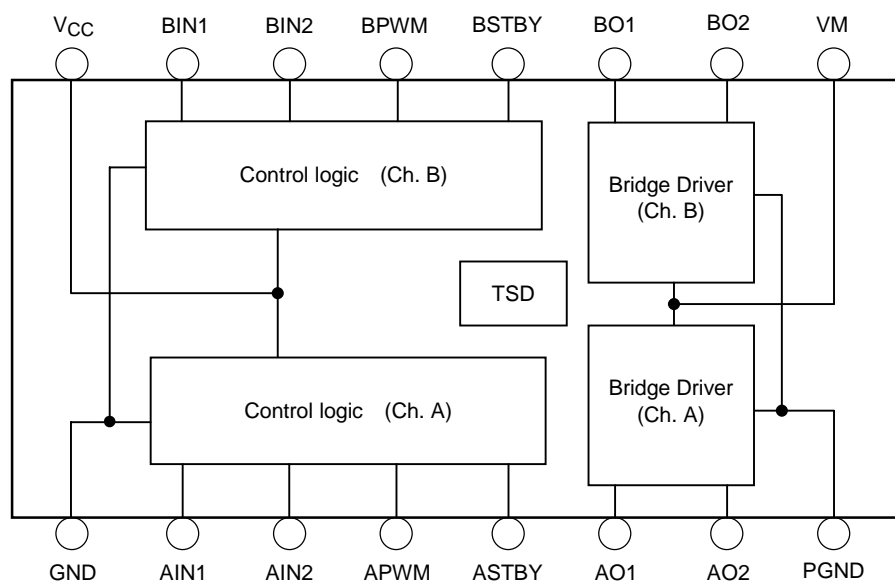
DataSheet4U.com



Weight

SSOP16-P-225-0.65B : 0.07 g (typ.)
QON24-P-0505-0.50 : 0.05 g (typ.)

* This product has a MOS structure and is sensitive to electrostatic discharge. When handling this product, ensure that the environment is protected against electrostatic discharge by using an earth strap, a conductive mat and an ionizer. Ensure also that the ambient temperature and relative humidity are maintained at reasonable levels.

Block Diagram**Pin Functions**

Pin.Name	Pin No		Functional Description	Remarks
	FN	FL		
GND	1	21	Small-signal GND pin	GND for small-signal power supply (V _{CC})
AIN1	2	18	Control signal input 1 (Ch. A)	
AIN2	3	17	Control signal input 2 (Ch. A)	
APWM	4	16	PWM control signal input pin (Ch. A)	Input PWM signal
ASTBY	5	15	Standby control input pin (Ch. A)	Ch. A circuit is in standby (power save) state while this signal is Low.
AO1	7	13	Output pin 1 (Ch. A)	Ch. A connect to motor coil pin
AO2	8	11	Output pin 2 (Ch. A)	Ch. A connect to motor coil pin
PGND	9	10	GND pin for motor	GND for motor power supply (VM)
VM	6	14	Motor power supply pin	VM (ope) = 2.5 V to 13.5 V
BO2	10	8	Output pin 2 (Ch. B)	Ch. B connect to motor coil pin
BO1	11	5	Output pin 1 (Ch. B)	Ch. B connect to motor coil pin
BSTBY	12	4	Standby control input pin (Ch. B)	Ch. B circuit is in standby (power save) state while this signal is Low.
BPWM	13	3	PWM control signal input pin (Ch. B)	Input PWM signal
BIN2	14	2	Control signal input 2 (Ch. B)	
BIN1	15	1	Control signal input 1 (Ch. B)	
V _{CC}	16	22	Small-signal power supply pin	V _{CC} (ope) = 2.7 V to 5.5 V

Note: Pins 6, 7, 9, 12, 19, 20, 23 and 24 on the FL are NC (not connected) pins.

Input/Output Function (common for channel A and B)

Input				Output		
IN1	IN2	STBY	PWM	O1	O2	Mode
H	H	H	H	L	L	Short brake
			L			
L	H	H	H	L	H	CW/CCW
			L	L	L	Short brake
H	L	H	H	H	L	CCW/CW
			L	L	L	Short brake
L	L	H	H	OFF (high impedance)		Stop
			L			
H/L	H/L	L	H	OFF (high impedance)		Standby
			L			

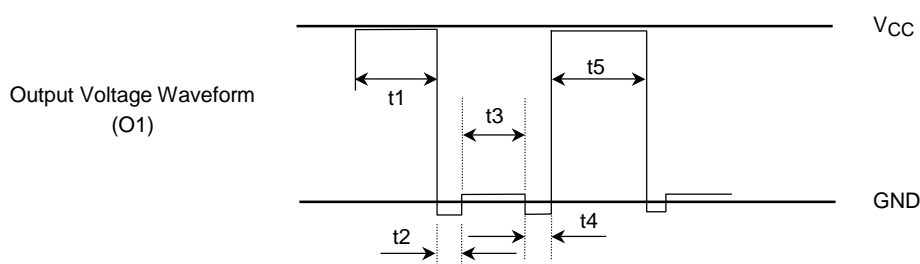
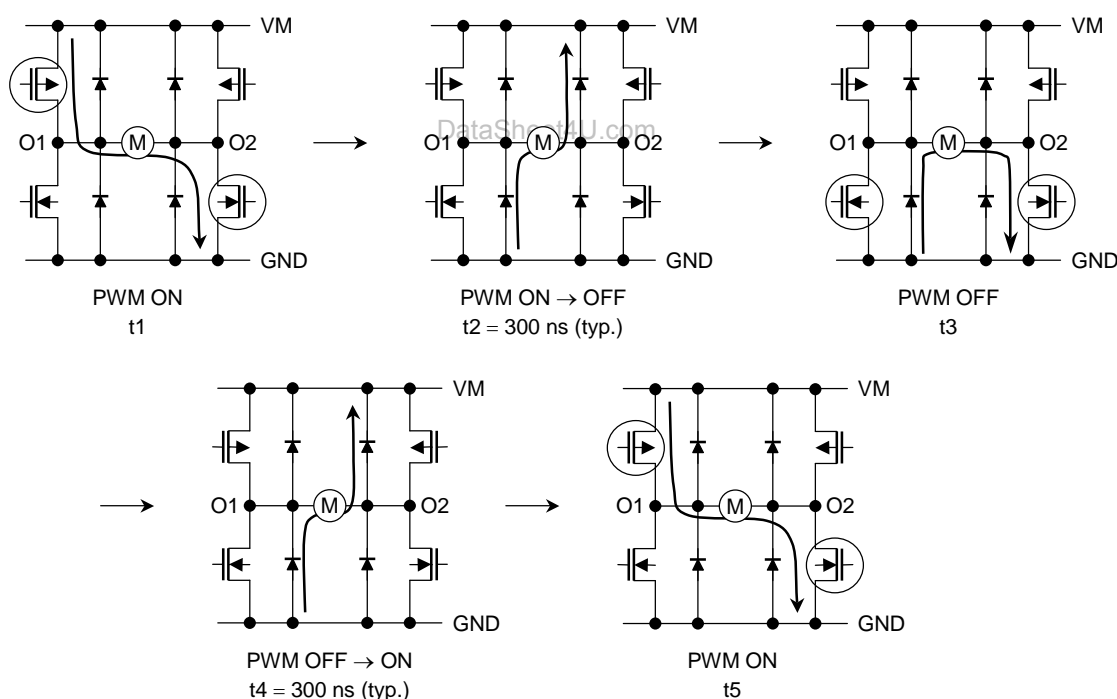
Operating Description

- PWM control function

Speed can be controlled by inputting the high-level or low-level PWM signal to the pin PWM.

When PWM control is provided, normal operation and short brake operation are repeated.

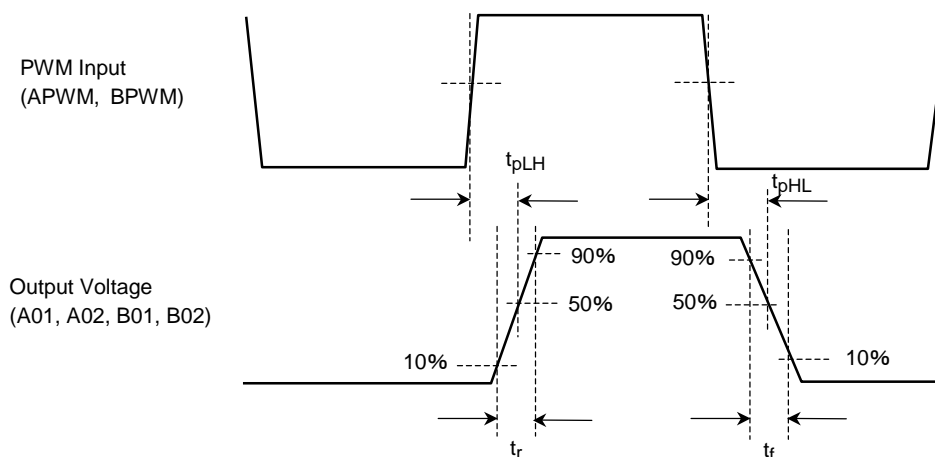
To prevent penetrating current, dead time t_2 and t_4 is provided in the IC.



Note: Please set the pin PWM to High when PWM control function is not used.

- Switching characteristics of output transistors

The switching characteristics between PWM input and the output transistors are shown below.



<Typical Value>

Item	Typical Value	Unit
t_{pLH}	1000	ns
t_{pHL}	1000	
t_r	100	
t_f	100	

- Input pin

Input pins (AIN1, AIN2, APWM, ASTBY, BIN1, BIN2, BPWM and BSTBY) have internal pull-down resistors that are connected to ground.

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit	Remarks
Supply voltage	VM	15	V	
	V _{CC}	6		
Input voltage	V _{IN}	−0.2 to 6	V	IN1, 2, STBY and PWM pins
Output current	I _{OUT}	1	A	
Power dissipation	P _D	0.78 (Note 1)	W	
Operating temperature	T _{opr}	−20 to 85	°C	
Storage temperature	T _{stg}	−55 to 150	°C	

Note 1: This value is obtained by 50 × 30 × 1.6 mm glass-epoxy PCB mounting occupied 40% of copper area.

Operating Range (Ta = −20 to 85°C)

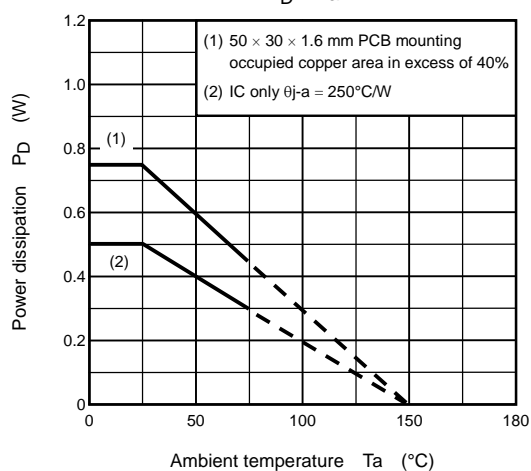
Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage (V _{CC})	V _{CC}	2.7	3.0	5.5	V
Supply voltage (VM)	VM	2.5	5.0	13.5	V
Output current	I _{out}	—	—	0.8	A
PWM frequency	f _{PWM}	—	—	100	kHz

Electrical Characteristics (unless otherwise specified, $V_{CC} = 3\text{ V}$, $V_M = 12\text{ V}$, $T_a = 25^\circ\text{C}$)

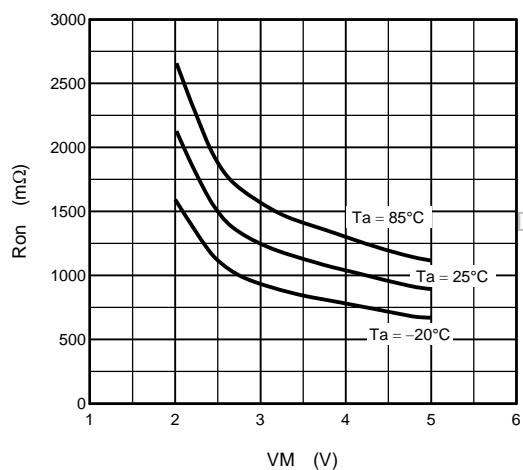
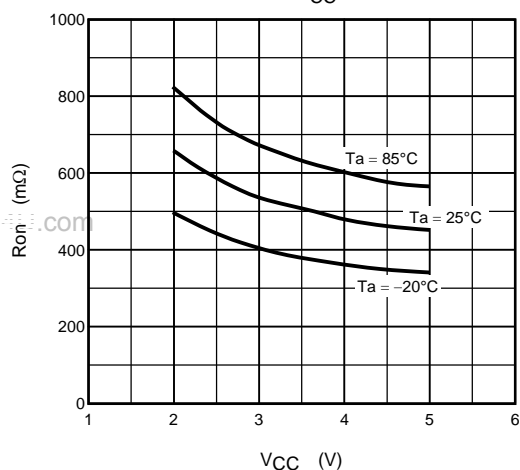
Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Supply current		I _{CC} (STP)	—	Stop mode	—	0.9	1.2	mA
		I _{CC} (W)	—	CW/CCW mode	—	0.9	1.2	
		I _{CC} (SB)	—	Short break mode	—	0.9	1.2	
		I _{CC} (STB)	—	(Standby mode)	—	—	10	μA
		I _M (STB)	—		—	—	1	
Control circuit	Input voltage	V _{INH}	—		2	—	V _{CC} + 0.2	V
		V _{INL}	—		−0.2	—	0.8	
	Hysteresis voltage	V _{IN} (HIS)	—	(Not tested)	—	0.2	—	
	Input current	I _{INH}	—		5	15	25	μA
		I _{INL}	—		—	—	1	
Standby circuit	Input voltage	V _{INSH}	—		2	—	V _{CC} + 0.2	V
		V _{INSL}	—		−0.2	—	0.8	
	Input current	I _{INSH}	—		5	10	20	μA
		I _{INSL}	—		—	—	1	
Output saturating voltage		V _{sat} (U + L)		I _o = 0.2 A	—	0.3	0.4	V
				I _o = 0.8 A	—	1.2	1.5	
Output leakage current		I _L (U)		V _M = 15 V	—	—	1	μA
		I _L (L)			—	—	1	
Diode forward voltage		V _F (U)		I _o = 0.8 A	—	1	1.2	V
		V _F (L)		I _o = 0.8 A	—	1	1.2	
PWM control circuit	PWM frequency	f _{PWM}			—	—	100	kHz
	Minimum clock pulse width	t _w (PWM)			—	—	10	μs
Output transistor switching		T _r		Not tested	—	100	—	ns
		T _f			—	100	—	
		t _{pLH} (PWM)			—	1000	—	
		t _{pHL} (PWM)			—	1000	—	
Thermal shutdown circuit operating temperature		T _{SD}		(Not tested)	—	170	—	°C
Thermal shutdown hysteresis		ΔT _{SD}		(Not tested)	—	20	—	°C

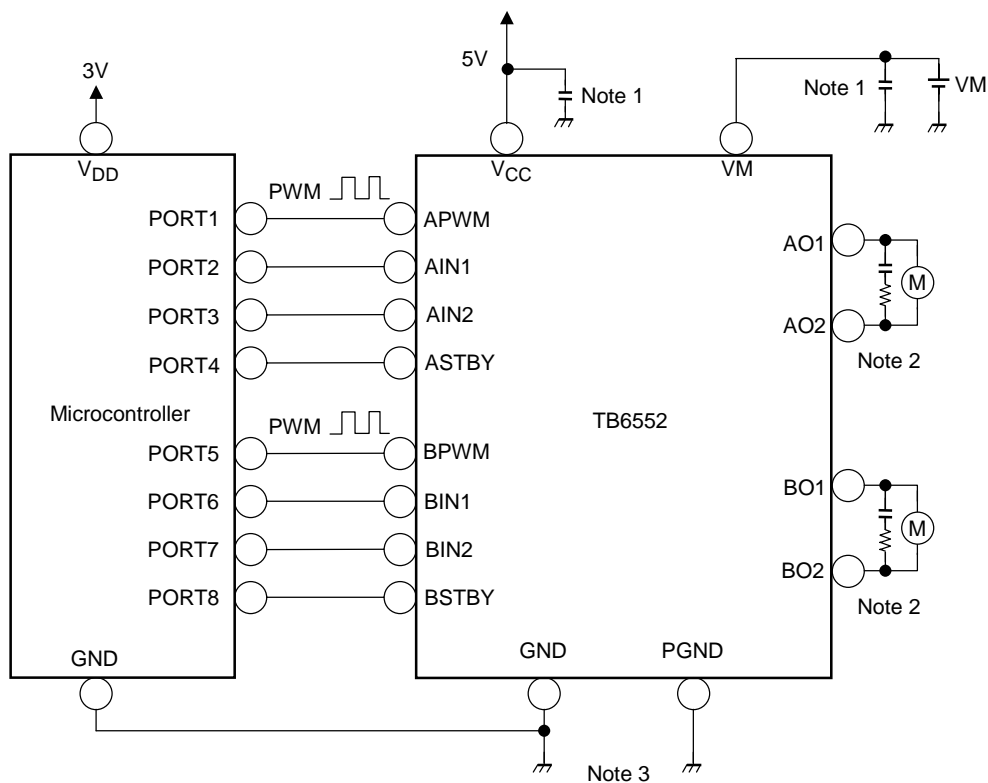
Characteristic Wave Form

TB6552FN

 $P_D - T_a$ 

Hi-side VM – Ron

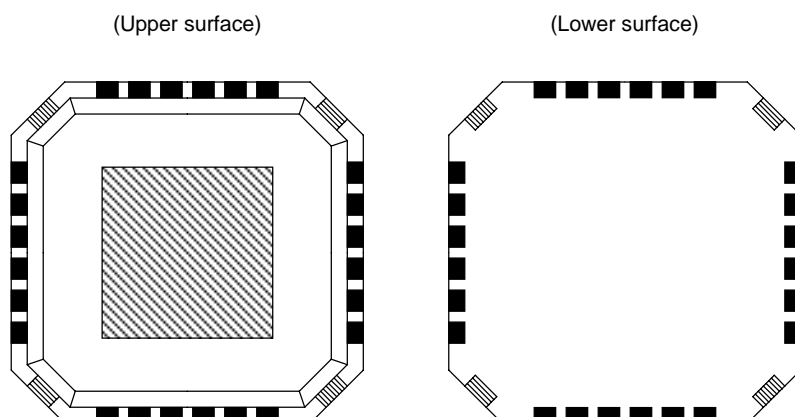
Lo-side $V_{CC} - R_{on}$ 

Typical Application Diagram

Note 1: The power supply capacitor should be connected as close as possible to the IC.

Note 2: When connecting the motor pins through the capacitor for reducing noise, connect a resistor to the capacitor for limiting the charge current.

Note 3: Avoid using common impedance for GND and PGND.

Requests Concerning Use of QON**Outline Drawing of Package**

When using QON, please take into account the following items.

Caution

- (1) Do not carry out soldering on the island section in the four corners of the package (the section shown on the lower surface drawing with diagonal lines) with the aim of increasing mechanical strength.
- (2) The island section exposed on the package surface (the section shown on the upper surface drawing with diagonal lines) must be used as (Note 6) below while electrically insulated from outside.

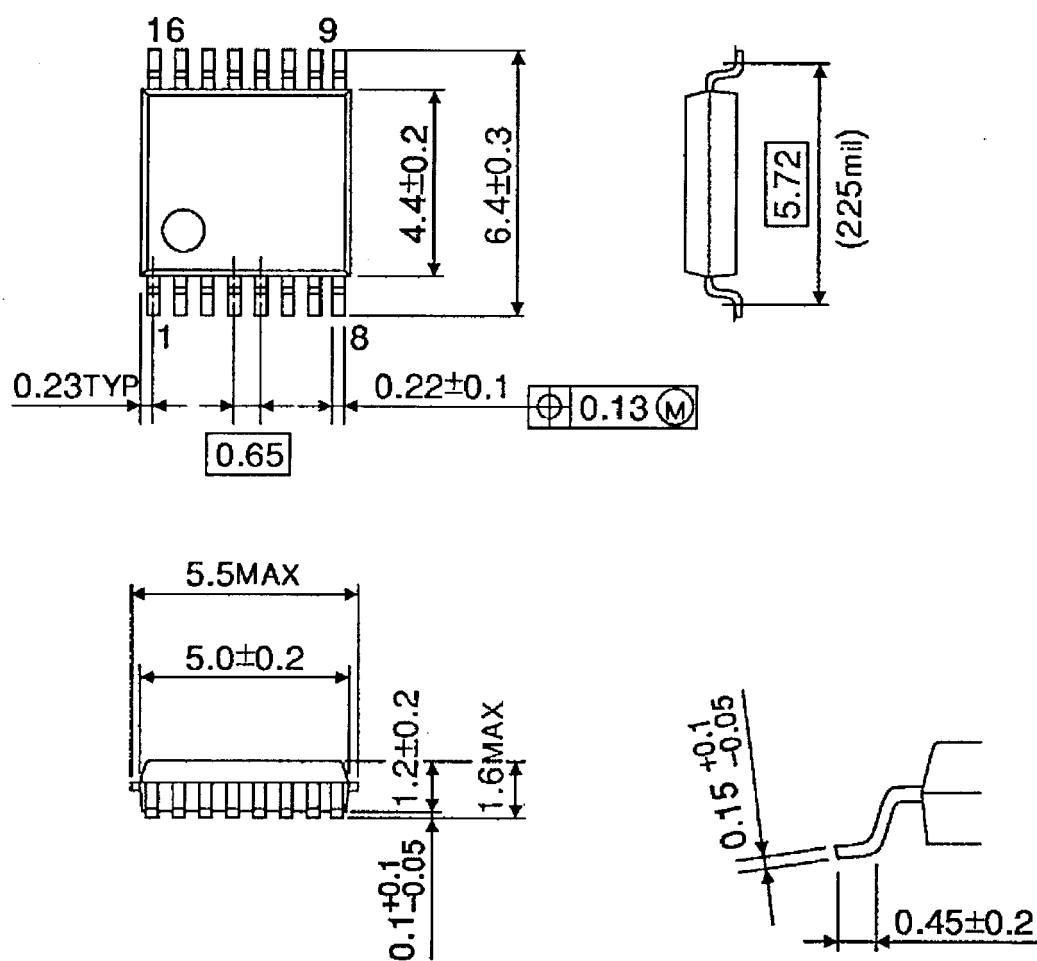
Note 6: Ensure that the island section (the section shown on the lower surface drawing with diagonal lines) does not come into contact with solder from through-holes on the board layout.

- When mounting or soldering, take care to ensure that neither static electricity nor electrical overstress is applied to the IC (measures to prevent anti-static, leaks, etc.).
- When incorporating into a set, adopt a set design that does not apply voltage directly to the island section.

Package Dimensions

SSOP16-P-225-0.65B

Unit : mm

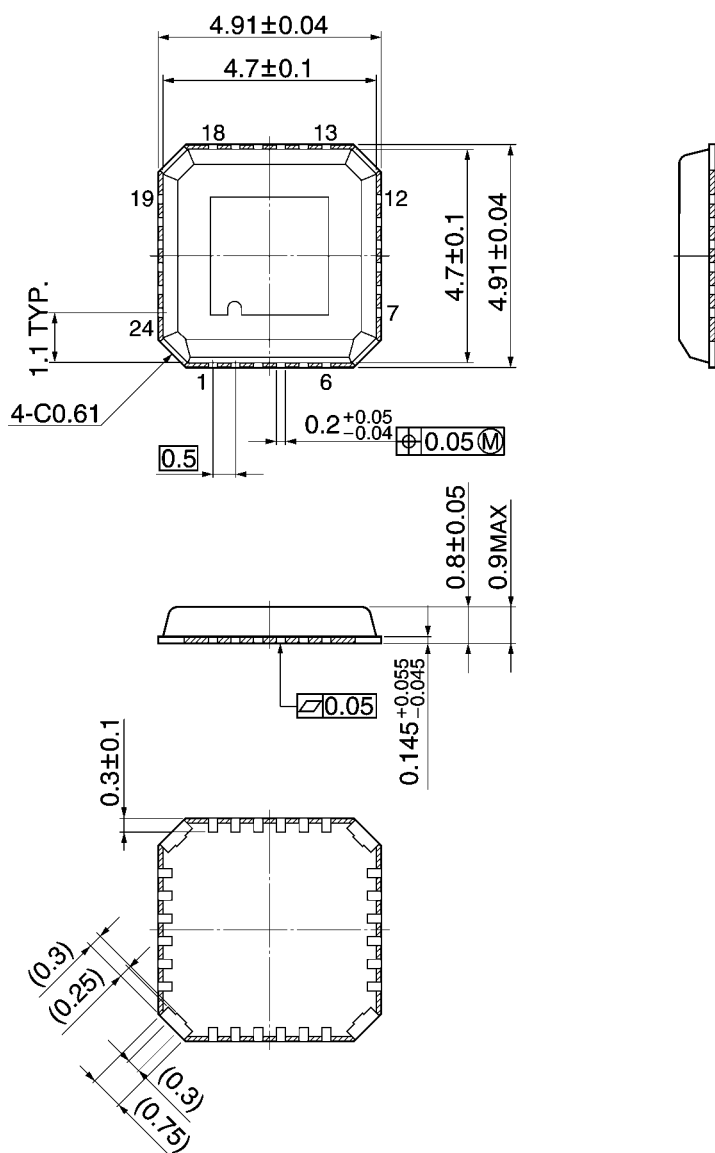


Weight: 0.07 g (typ.)

Package Dimensions


QON24-P-0505-0.50

Unit: mm



Note 1) The solder plating portion in four corners of the package shall not be treated as an external terminal.

Note 2) Don't carry out soldering to four corners of the package.

Note 3)  area : Resin surface

Weight: 0.05 g (typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
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..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- 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.
- The information contained herein is subject to change without notice.