

# Unipolar Driver ICs

# SI-7300A and SI-7330A

## ■ Ratings

(Ta = 25°C)

Type No.	Supply voltage (V)		Output current (A)	Junction temperature (°C)	Operating ambient temperature (°C)	Storage temperature (°C)
	Vcc1	Vcc2	Io	Tj	Top	Tstg
SI-7300A	48	8	1.7	+125	-20 to +80	-30 to +100
SI-7330A	42	8	3.2	+125	-20 to +80	-30 to +100

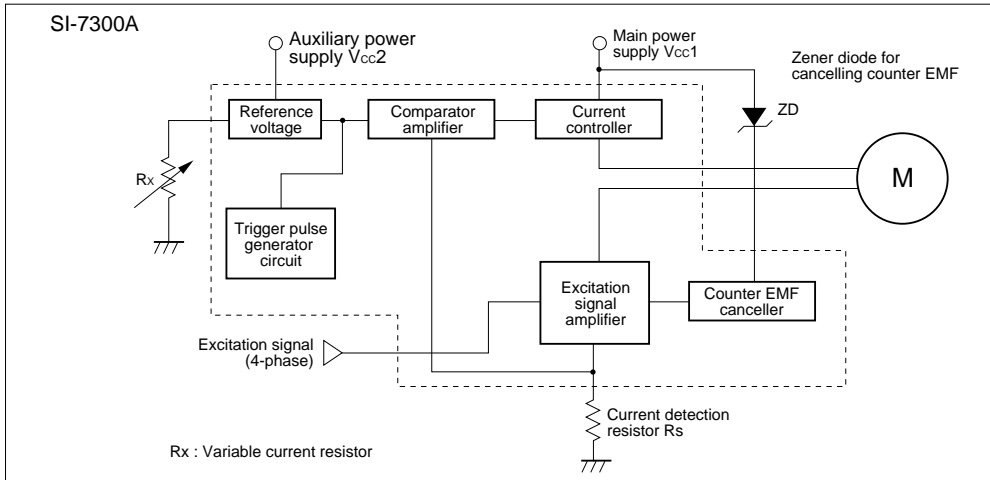
## ■ Characteristics

(Ta = 25°C)

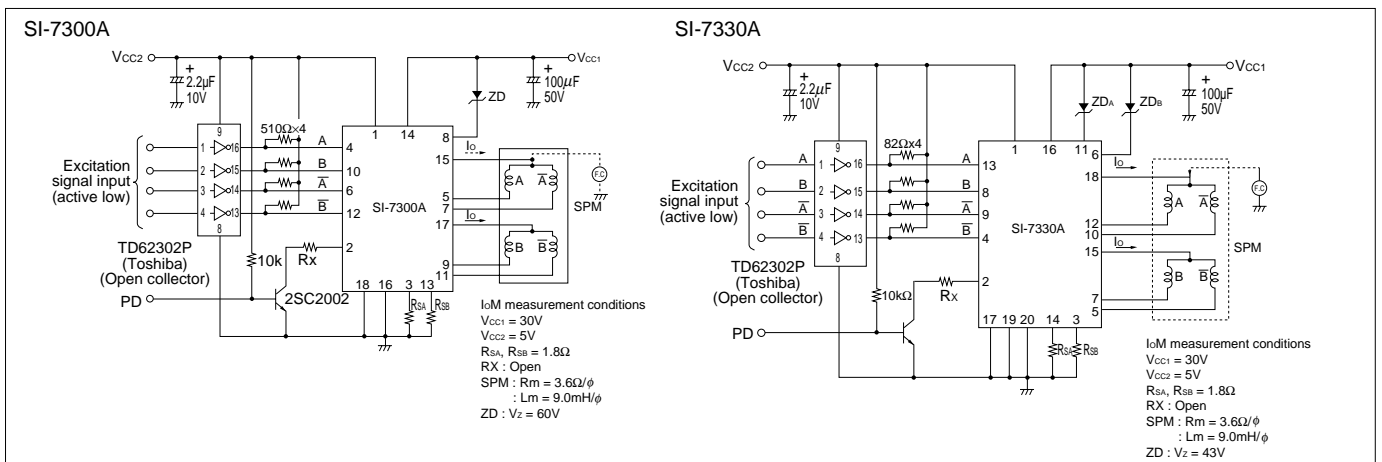
Type No.	Supply voltage (V)		Output current (mA/ø)				Vcc2 input current (mA)	Oscillation frequency (kHz)			External zener diode breakdown voltage (V)		Input excitation signal (active high)														
	Vcc1		Vcc2		Io		Icc2	F			Vz		Input voltage (V)		High level input current (mA)												
	min	typ	max	min	typ	max	max	min	typ	max	min	max	VIL	VIH	Io=0.5A/ø	Io=1.0A/ø	Io=1.5A/ø	Io=3.0A/ø									
SI-7300A	15	30	42	4.5	5	5.5	200	1500	535	580	625	45	19	21	25	Vcc1+5	70	0.8	2.8	2.2	10.0	3.0	10.0	4.9	10.0		
SI-7330A	15	30	35	4.5	5	5.5	200	3000	535	580	625	45	19	21	25	Vcc1	43	0.3	1.8	5	100			15	100	40	100

\* Measurement conditions are as shown in the external connection diagram.

## ■ Block diagram

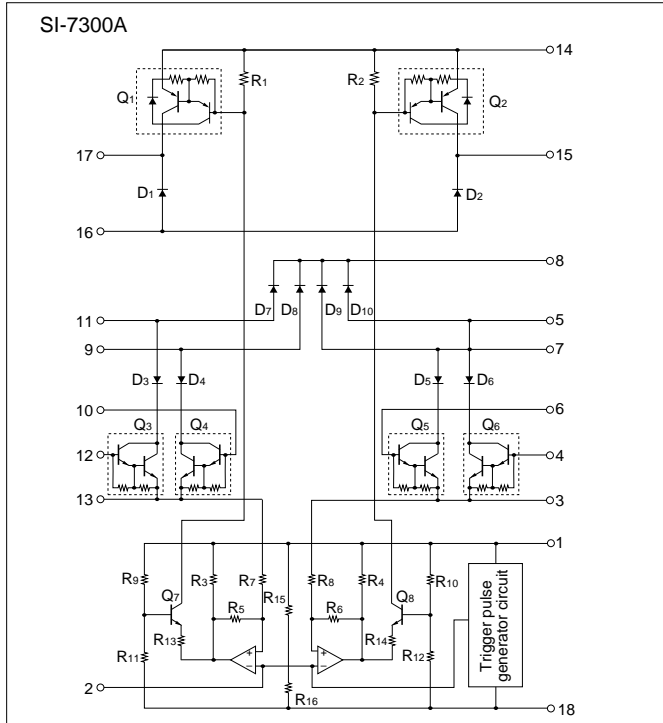


## ■ External connection diagram

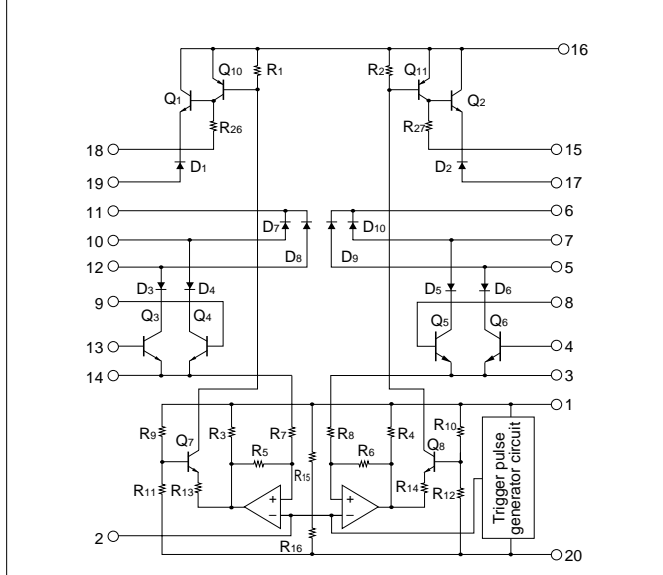


# SI-7300 and SI-7330A

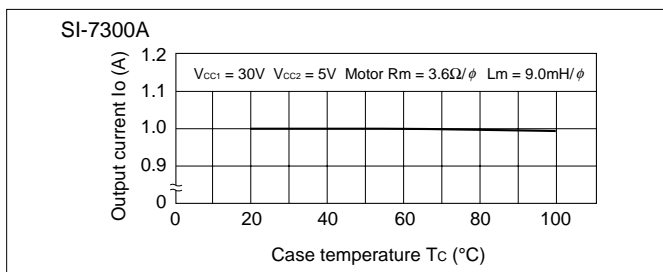
## ■ Equivalent circuit diagram



SI-7330A

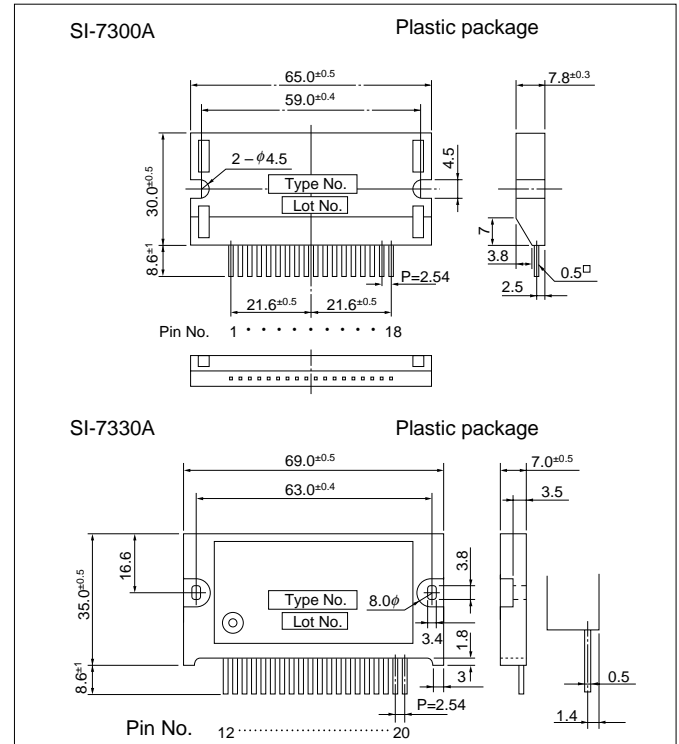


## ■ Case temperature vs. Output current

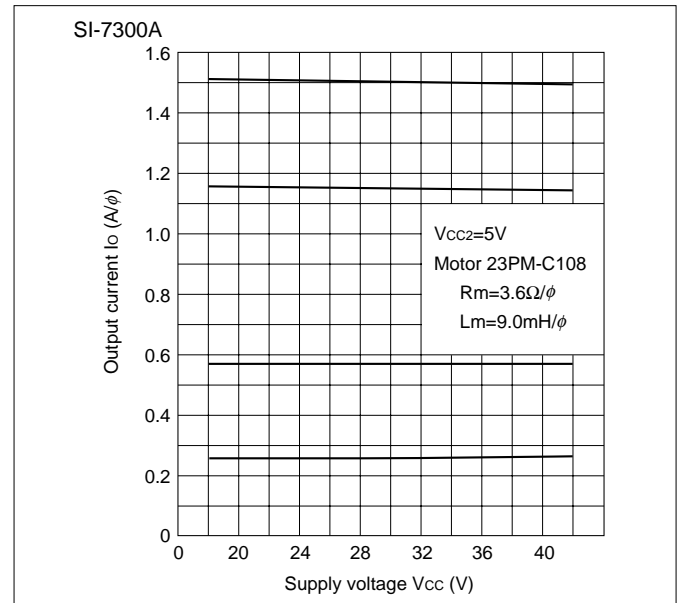


## ■ External dimensions

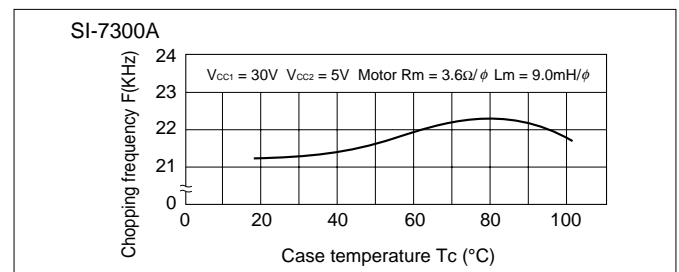
(Unit: mm)



## ■ Supply voltage vs. Output current



## ■ Case temperature vs. Chopping frequency



# SI-7300 and SI-7330A

## Application Note

### ■ Determining the output current $I_O$ (motor coil current)

The output current,  $I_O$  is fixed by the following circuit elements:

- $R_s$  : Current detection resistor
- $V_{CC2}$  : Supply voltage
- $R_x$  : Variable current resistor

To operate a motor at maximum current level, set  $R_x$  = infinity (open). Based on the specifications of SI-7300A, its output current  $I_O$  can be seen as:

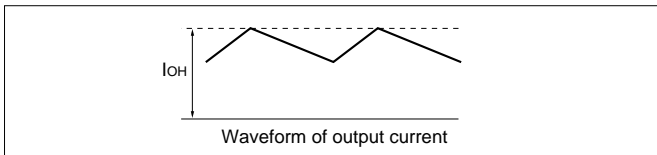
$I_O$  (rms value): 535 to 625 mA

To compute  $I_O$  when different values are used for  $R_s$  and  $V_{CC2}$ , use the approximation formula below. The maximum ripple value  $I_{OH}$  of the output current waveform can be computed as follows:

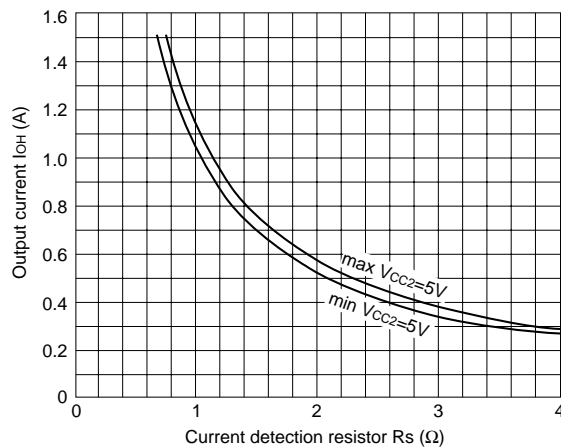
$$I_{OH(max)} \approx \frac{1}{R_s} (0.233 \cdot V_{CC2} - 0.026) \text{ [A]}$$

$$I_{OH(min)} \approx \frac{1}{R_s} (0.214 \cdot V_{CC2} - 0.021) \text{ [A]}$$

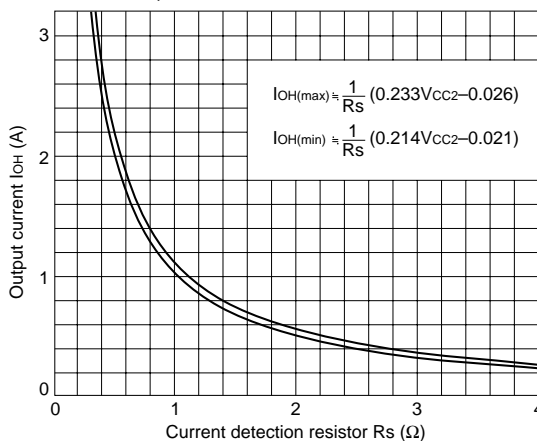
The graph of this equation is shown below.



SI-7300A Output current  $I_{OH}$  vs. Current detection resistor  $R_s$

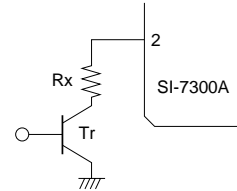


SI-7330A Output current  $I_{OH}$  vs. Current detection resistor  $R_s$

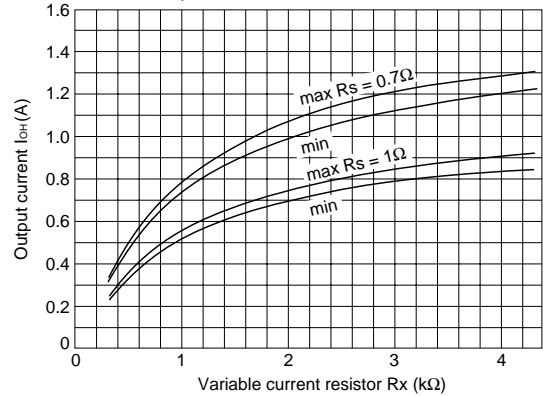


### ■ Power down mode

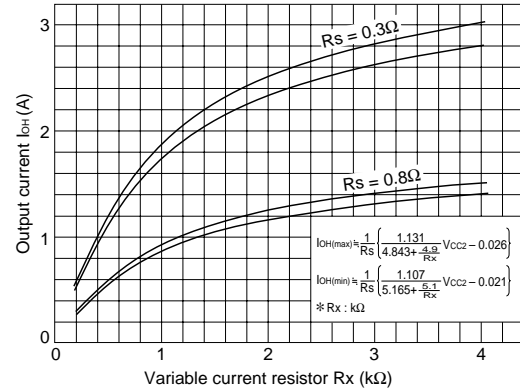
The SI-7300A can be operated in power down mode. The circuit is shown below. When transistor  $Tr$  is switched on, the reference voltage drops and the output current can be decreased.



SI-7300A Output current  $I_{OH}$  vs. Variable current resistor  $R_x$



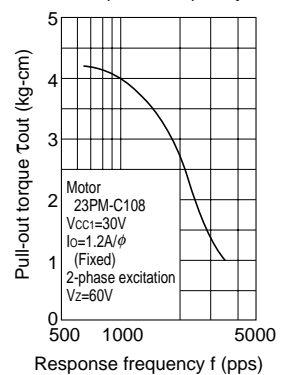
SI-7330A Output current  $I_{OH}$  vs. Variable current resistor  $R_x$



### ■ Example of a Frequency vs. Torque characteristic

The graph shows the relationship between frequency and pull-out torque of SI-7300A.

SI-7300A Pull-out torque  $T_{out}$  vs. Response frequency



# SI-7300A and SI-7330A

## Application Note

### Thermal design

The procedures for the thermal design of the SI-7300A are as follows:

- (1) As shown in the right figure, the supply current  $I_{CC1}$  and the output current  $I_o$  are measured at the maximum level of the supply voltage  $V_{CC1}$ . However, the motor is in holding mode at the 2-phase excitation.
- (2) From the above measurements, the internal power dissipation (2 phases) of the hybrid IC can be obtained through the following formula.

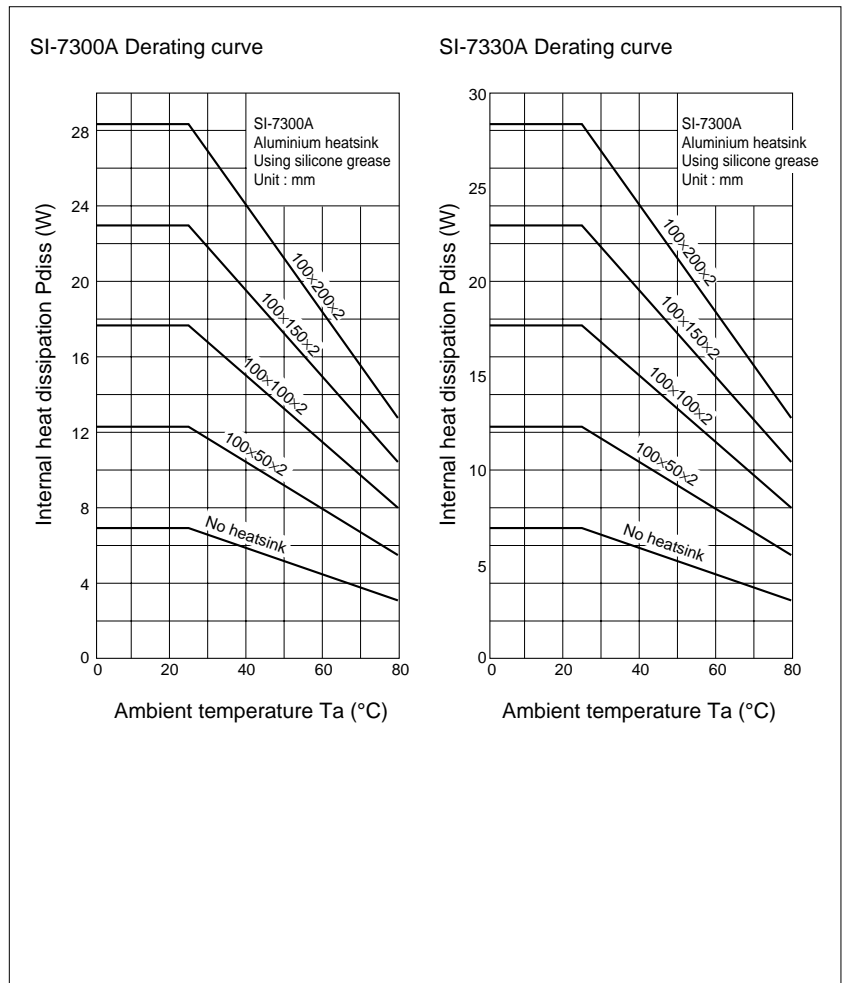
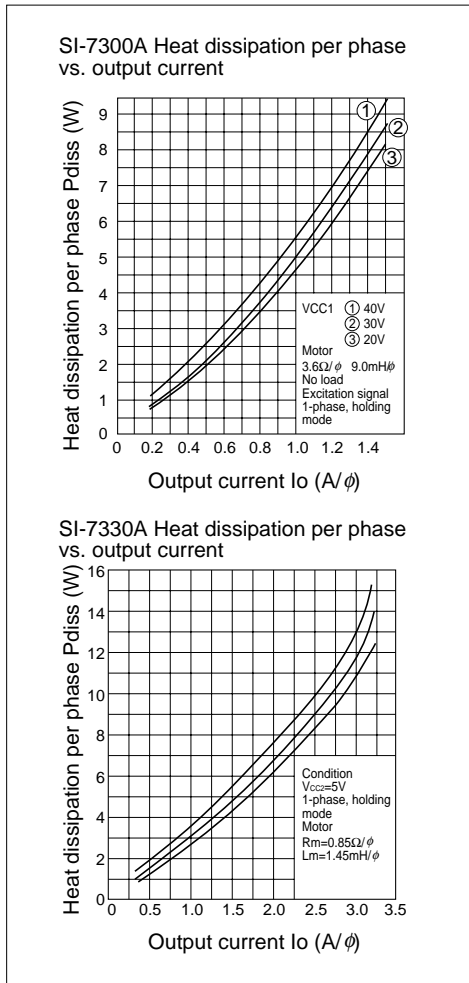
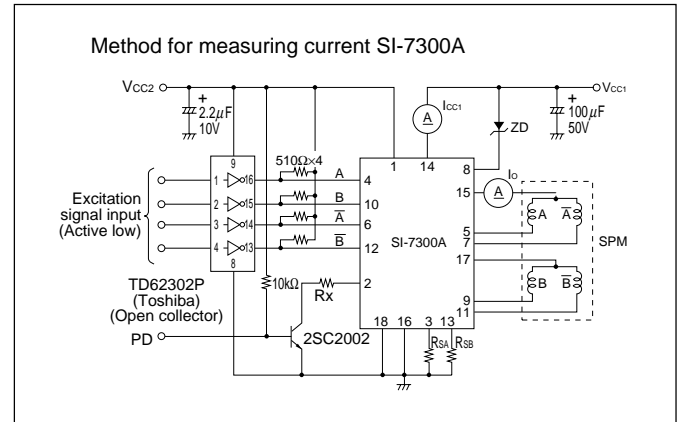
$$P_{diss} = V_{CC1} \cdot I_{CC1} - 2I_o^2(R_L + R_s)$$

Where  $R_L$ : coil resistance of the motor per phase

Shown in the lower graphs are sample calculations of  $P_{diss}$  vs.  $I_o$ .

- (3) The heatsink area corresponding to the ambient temperature can be obtained from the SI-7300A derating curve shown in the lower right.
- (4) Verify that the temperature of the aluminum base plate of the hybrid IC or adjacent heatsinks is below  $85^\circ\text{C}$  (equivalent to max. ambient temperature) when operating under actual conditions.

\* For details on thermal design, refer to the technical data.



# SI-7200M, SI-7230M, SI-7115B, SI-7300A, SI-7330A, SI-7500A and SI-7502

## Handling Precautions

(Note: The SI-7502 is applicable for item (2) only.)

For details, refer to the relevant product specifications.

### (1) Tightening torque:

The torque to be applied in tightening screws when mounting the IC on a heatsink should be below 49N•m.

### (2) Solvent:

Do not use the following solvents:

Substances that dissolve the package	Chlorine-based solvents : Trichloroethylene, Trichloroethane, etc. Aromatic hydrogen compounds: Benzene, Toluene, Xylene, etc. Ketone and Acetone group solvents
Substances that weaken the package	Gasoline, Benzine and Kerosene

### (3) Silicone grease:

The silicone grease to be used between the aluminum base plate of the hybrid IC and the heatsink should be any of the following:

- G-746 SHINETSU CHEMICAL INDUSTRIES CO., LTD.
- YG6260 TOSHIBA SILICONE CO., LTD.
- SC102 DOW CORNING TORAY SILICONE CO., LTD.

Please pay sufficient attention in selecting silicone grease since oil in some grease may penetrate the product, which will result in an extremely short product life.

## Others

### • Resistance against radiation

Resistance against radiation was not considered in the development of these ICs because it is assumed that they will be used in ordinary environment.