

# Unipolar Driver ICs

# SI-7300A and SI-7330A

## ■ Ratings

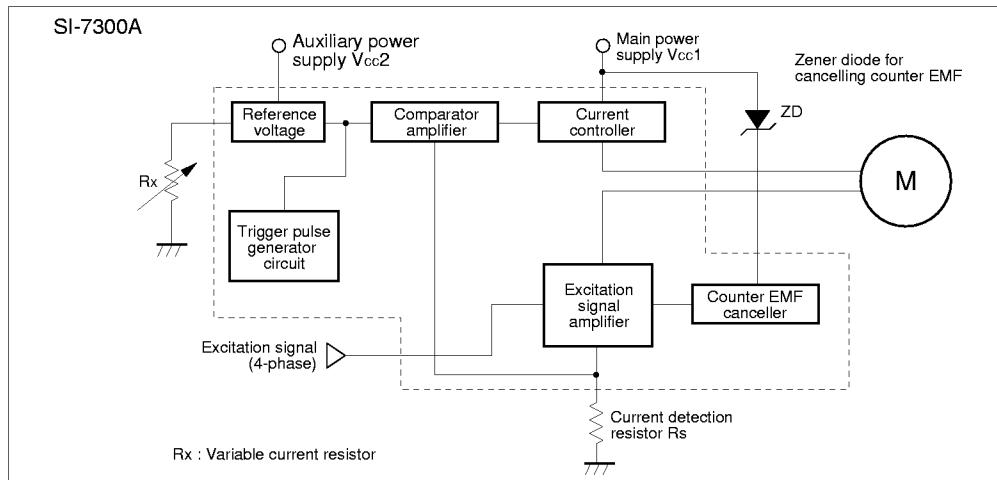
Absolute maximum rating		Supply voltage (V)		Output current (A)	Junction temperature (°C)	Operating ambient temperature (°C)	Storage temperature (°C)
Type No.		Vcc1	Vcc2	Io	Tj	Top	Tstg
SI-7300A		48	8	1.7	+125	-20 to +80	-30 to +100
SI-7330A		42	8	3.2	+125	-20 to +80	-30 to +100

## ■ Characteristics

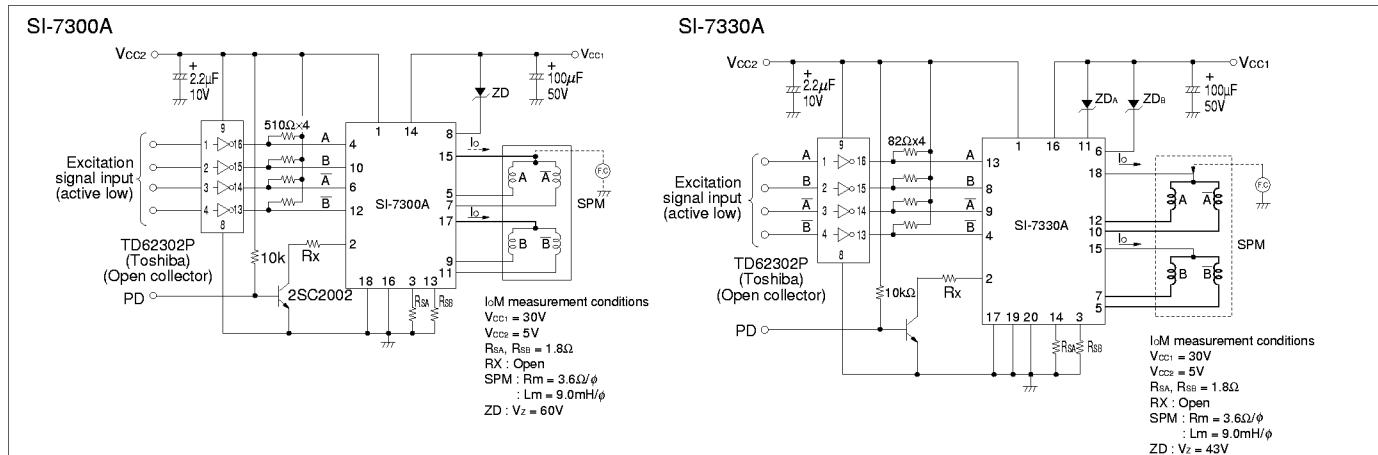
Electrical characteristics	Supply voltage (V)				Output current (mA/ø)				Vcc2 input current (mA)	Oscillation frequency (kHz)	External zener diode breakdown voltage (V)	Input excitation signal (active high)															
												Low level (OFF)		High level (ON)		Io = 0.5A/ø		Io = 1.0A/ø		Io = 1.5A/ø		Io = 3.0A/ø					
	Vcc1	Vcc2	Io	Iom*	Vcc1	Vcc2	Io	Iom*				min	typ	max	min	max	typ	min	max	min	max	min	max				
Type No.	min	typ	max	min	typ	max	min	max	max	min	max	min	typ	max	min	max	typ	min	max	min	max	min	max				
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

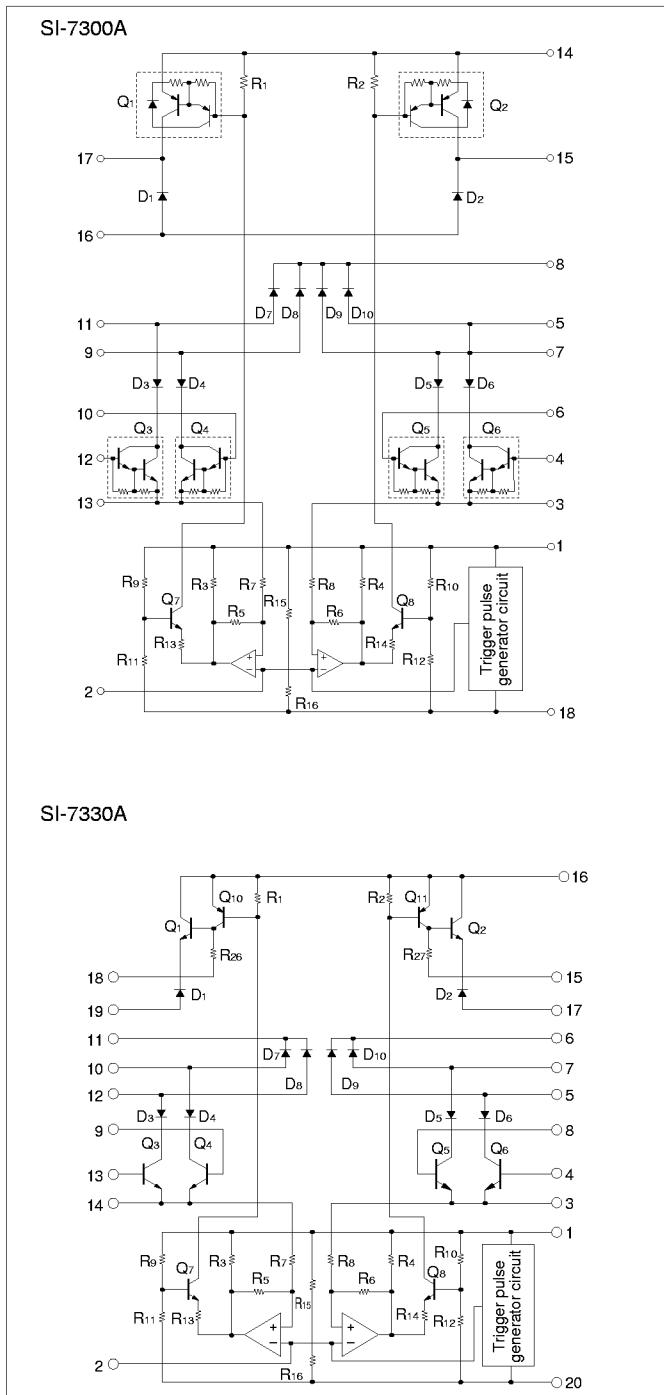


## ■ External connection diagram



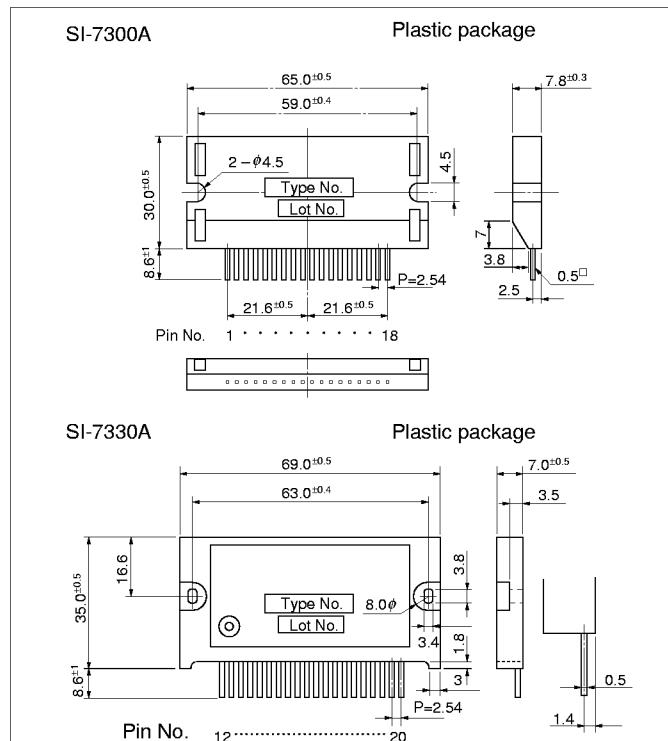
# SI-7300 and SI-7330A

## ■ Equivalent circuit diagram

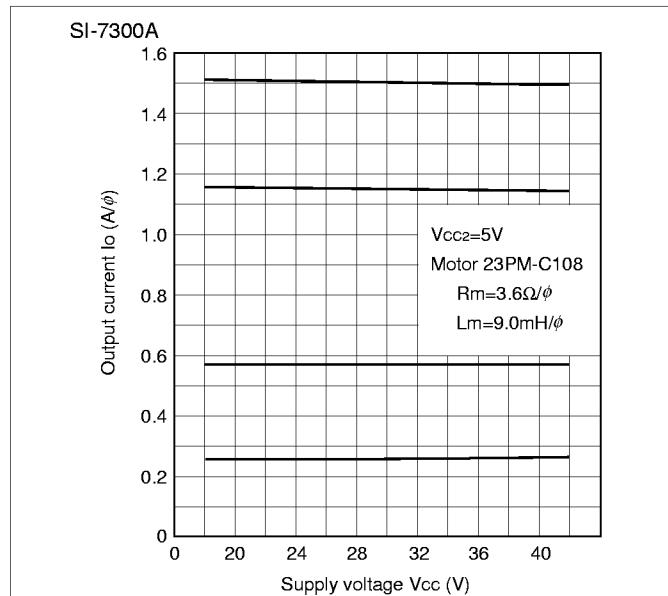


## ■ External dimensions

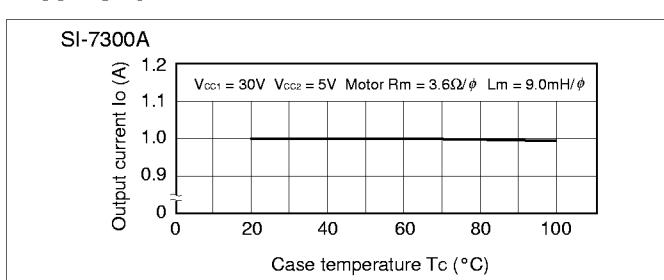
(Unit: mm)



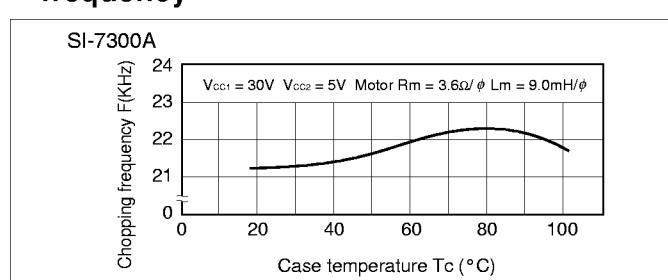
## ■ Supply voltage vs. Output current



## ■ Case temperature 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  $R_x = \infty$  (open). Based on the specifications of SI-7300A, its output current  $I_o$  can be seen as:

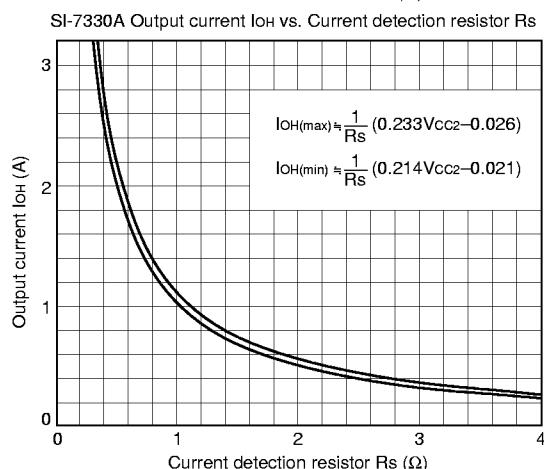
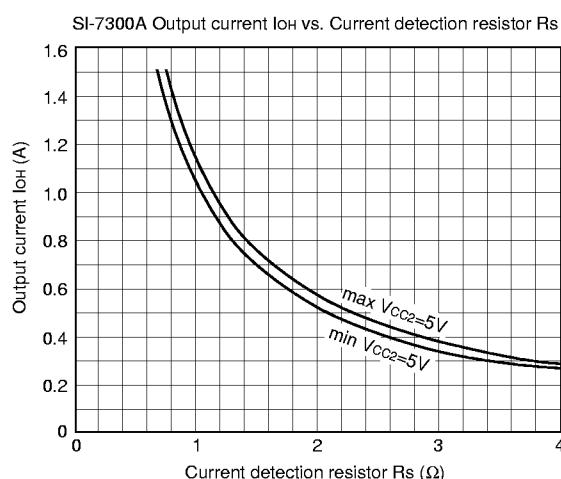
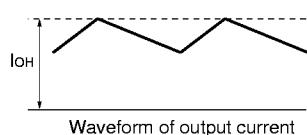
$I_o$  (rms value): 535 to 625 mA

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:

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

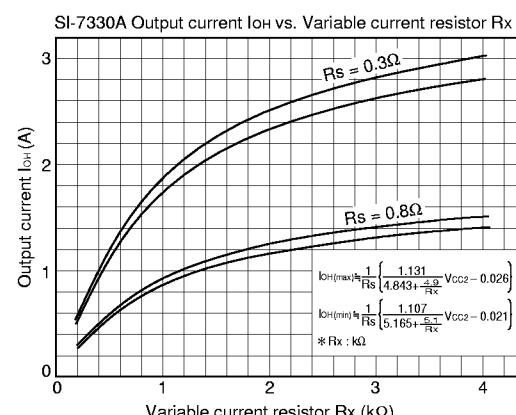
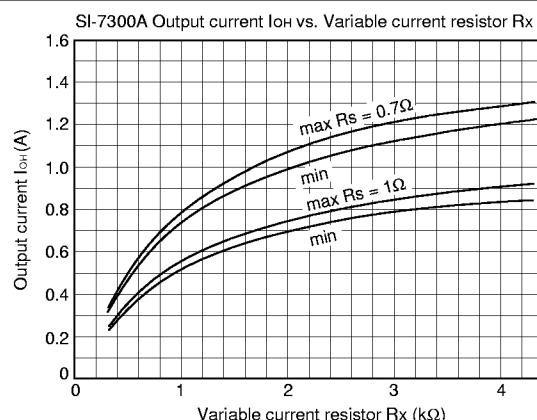
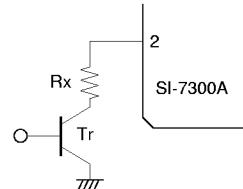
$$I_{OH(min)} = \frac{1}{R_s} (0.214 \cdot V_{CC2} - 0.021) [A]$$

The graph of this equation is shown below.



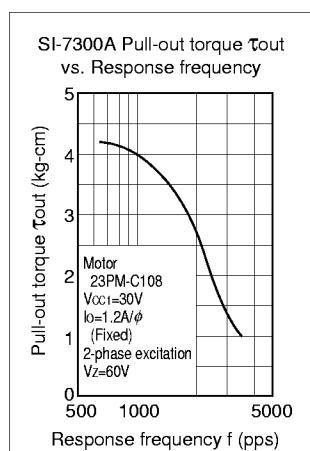
### Power down mode

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.



### Example of a Frequency vs. Torque characteristic

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



# 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.

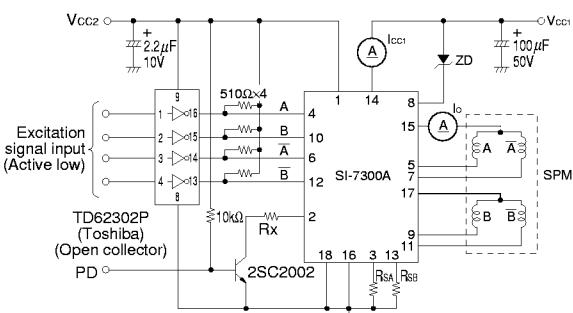
$$P_{Diss} = V_{CC1} \cdot I_{CC1} - 2I_o^2(R_L + R_S)$$

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

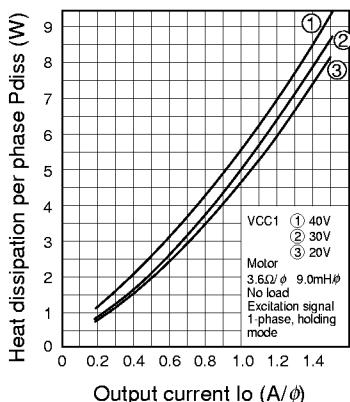
Shown in the lower graphs are sample calculations of  $P_{Diss}$  vs.  $I_o$ .

- (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°C (equivalent to max. ambient temperature) when operating under actual conditions.
- \* For details on thermal design, refer to the technical data.

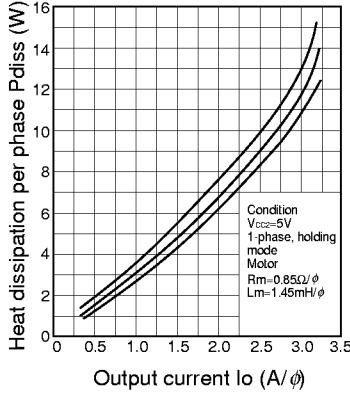
Method for measuring current SI-7300A



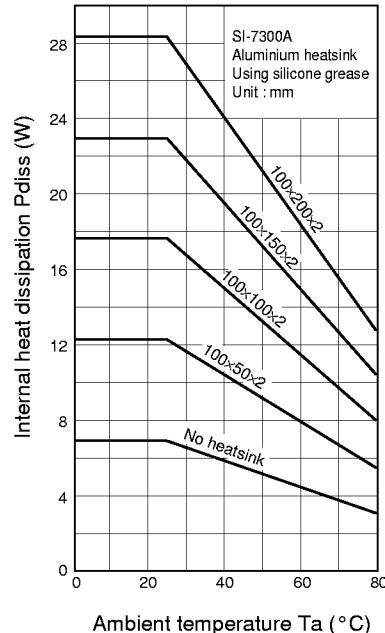
SI-7300A Heat dissipation per phase vs. output current



SI-7300A Heat dissipation per phase vs. output current



SI-7300A Derating curve



SI-7330A Derating curve

