

# AN6656, AN6656S

## Micromotor Forward/Reverse Electronic Governors

### ■ Overview

The AN6656 and the AN6656S are the electronic governors capable of controlling the forward/reverse speed, fast forward, rewind, and start stop of the micromotors used for the radio/cassette tape recorders, automatic answering telephone sets, and so on.

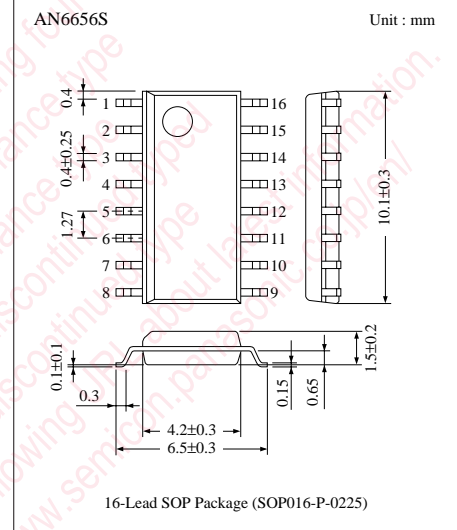
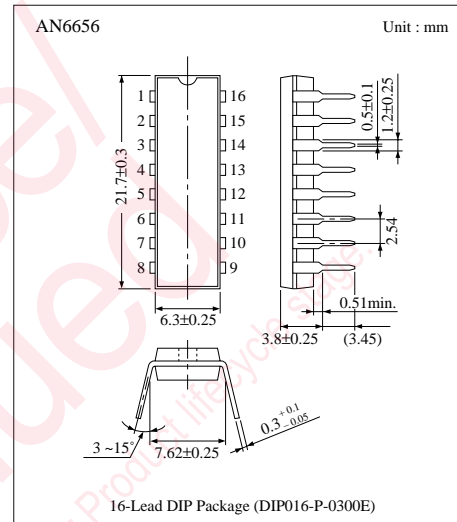
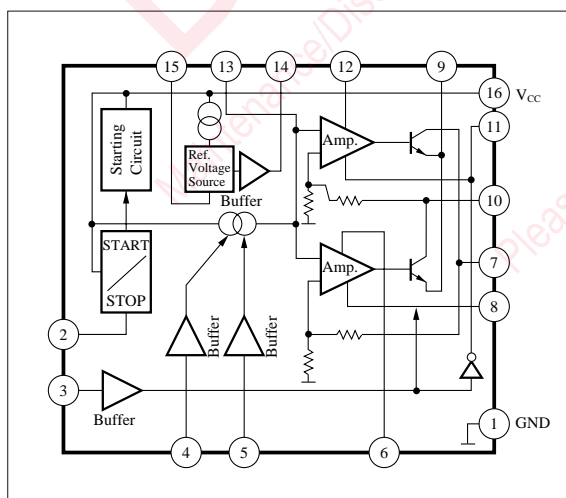
### ■ Features

- Wide operating supply voltage range :  $V_{CC}=1.8V$  to  $6V$
- Stable reference voltage (120mV) and easy speed control
- Capable of controlling forward/reverse rotation, fast forward/constant speed, and start/stop via 3 input pins
- Capable of controlling a fast forward/rewind speed
- Large starting torque and maximum control torque
- Good secular drift because of external power transistor
- Provided with the motor stop function ;  $I_{CC}=50\mu A$  or less at stop time

### ■ Applications

- Speed control of the micromotors for the radio cassettes
- Speed control of the micromotors for the microcassettes of the automatic answering telephone sets
- Control of the tape loading motors for the DATs, etc.

### ■ Block Diagram



■ Absolute Maximum Ratings (Ta= 25°C)

Parameter	Symbol	Rating	Unit
Supply Voltage	V <sub>CC</sub>	6.5	V
Supply Current	I <sub>CC</sub>	25	mA
Output Current	I <sub>o</sub>	1000	mA
Power Dissipation	AN6656	500	mW
	AN6656S	380	
Operating Ambient Temperature	T <sub>opr</sub>	-20 ~ + 70	°C
Storage Temperature	AN6656	-55 ~ +150	°C
	AN6656S	-55 ~ +125	

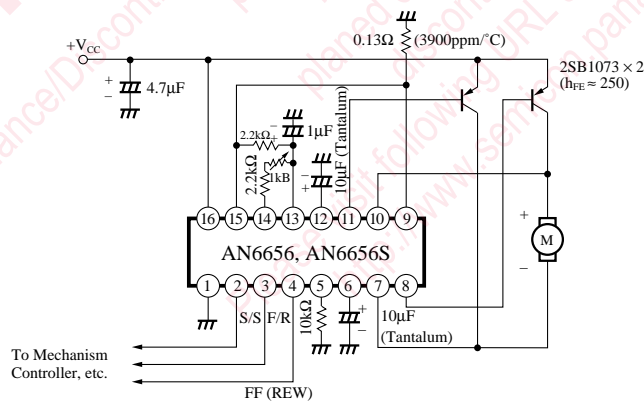
■ Recommended Operating Range (Ta = 25°C)

Parameter	Symbol	Range
Operating Supply Voltage Range	V <sub>CC</sub>	1.8V ~ 6V

■ Electrical Characteristics (Ta = 25°C)

Parameter	Symbol	Condition	min.	typ.	max.	Unit
Bias Current	I <sub>bias</sub>	V <sub>CC</sub> = 5V	—	5	15	mA
Prestart Current	I <sub>stop</sub>	V <sub>CC</sub> = 5V	—	—	50	μA
Reference Voltage	V <sub>ref</sub>	V <sub>CC</sub> = 3V	85	120	150	mV
Start Voltage	V <sub>CC(S)</sub>	Supply voltage at which a 50mA current flows to Ra	—	—	1.2	V
Start Current	I <sub>st</sub>	V <sub>CC</sub> = 1.8V, Ra = 4.9Ω	180	—	—	mA
Rated Load r.p.m.	N <sub>L</sub>	V <sub>CC</sub> = 3V, I <sub>L</sub> = 100mA, N = 2400rpm	-10	0	10	%
Forward/Reverse r.p.m. Difference	ΔN <sub>Logi</sub>	V <sub>CC</sub> = 3V, I <sub>L</sub> = 100mA, N = 2400rpm	-8	0	8	%
r.p.m. Characteristics on Voltage Change	ΔN <sub>V</sub>	V <sub>CC</sub> = 3V ~ 6V, I <sub>L</sub> = 100mA	—	—	60	rpm/V
r.p.m. Characteristics on Load Change	ΔN <sub>L</sub>	V <sub>CC</sub> = 1.8V, I <sub>L</sub> = 50mA ~ 100mA	—	—	150	rpm
Switching Mode Input H	V <sub>H</sub>		0.9	—	V <sub>CC</sub> +0.5	V
Switching Mode Input L	V <sub>L</sub>		0	—	0.3	V
Ref. Voltage Temperature Characteristics	ΔV <sub>r</sub> /Ta	V <sub>CC</sub> = 3V, Ta = 0°C ~ 60°C	—	0.01	—	%/°C

■ Application Circuit

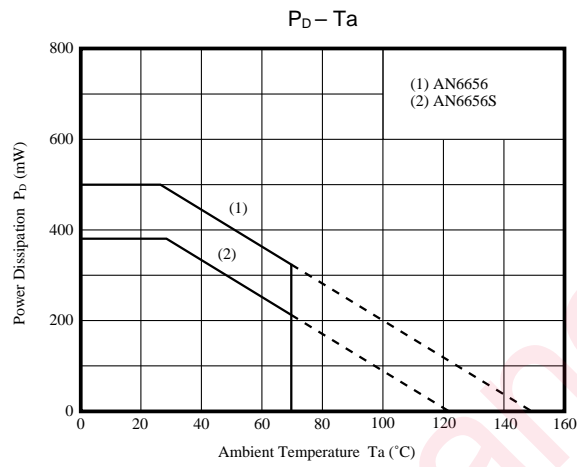


Note) The motor stops when the Pin2 is at "L" (0 to 0.3V), and starts at "H" (0.9 to V<sub>CC</sub> + 0.5V).  
 The motor runs in the reverse direction (a current flows from the motor ⊖ pin to ⊕ pin) when the Pin3 is at "L" (0 to 0.3V).  
 The motor runs in the forward direction (a current flows from the motor ⊕ pin to ⊖ pin) when the Pin3 is at "H" (0.9 to V<sub>CC</sub> + 0.5V).  
 The motor runs at a normal speed when the Pin4 is at "L" (0 to 0.3V), and runs at a high speed (fast forward, rewind) when at "H" (0.9 to V<sub>CC</sub> + 0.5V).  
 At high speed rotation, the motor speed can be controlled with resistor between the Pin5 and GND.

■ Pin Descriptions

Pin No.	Pin Name	Description	I/O	Voltage	Equivalent Circuit
1	GND	GND pin	I	—	—————
2	Start/Stop	Start/stop control pin	I	—	
3	Forward/Reverse	Forward/reverse control pin	I		
4	FF (REW) Switching	FF (REW) speed control pin	I		
5	FF (REW) Speed Control	FF (REW) speed setting pin	O	0.05V	
6	Phase Compensation	Oscillation preventive phase compensation pin	I	0.7V	
7	Drive 1	Motor drive pin 1	O	—	
8	Output Control 1	External transistor control pin 1	O		
9	Load Characteristics Setting	Load characteristics setting pin	O		
10	Drive 2	Motor drive pin 2	O		
11	Output Control 2	External transistor control pin 2	O		
12	Phase Compensation	Oscillation preventive phase compensation pin	I	0.7V	
13	Speed Setting	Speed setting input pin	I	—	
14	Reference Voltage ⊕	Reference voltage ⊕ output pin	O	0.15V	
15	Reference Voltage ⊖	Reference voltage ⊖ output pin	O	0	
16	V <sub>CC</sub>	V <sub>CC</sub> pin	I	—	—————

## ■ Characteristics Curve



## Request for your special attention and precautions in using the technical information and semiconductors described in this book

- (1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.
- (2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products, and no license is granted under any intellectual property right or other right owned by our company or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.
- (3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).  
Consult our sales staff in advance for information on the following applications:
  - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
  - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
  - Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
- (7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of Matsushita Electric Industrial Co., Ltd.