

# AN6650, AN6650S

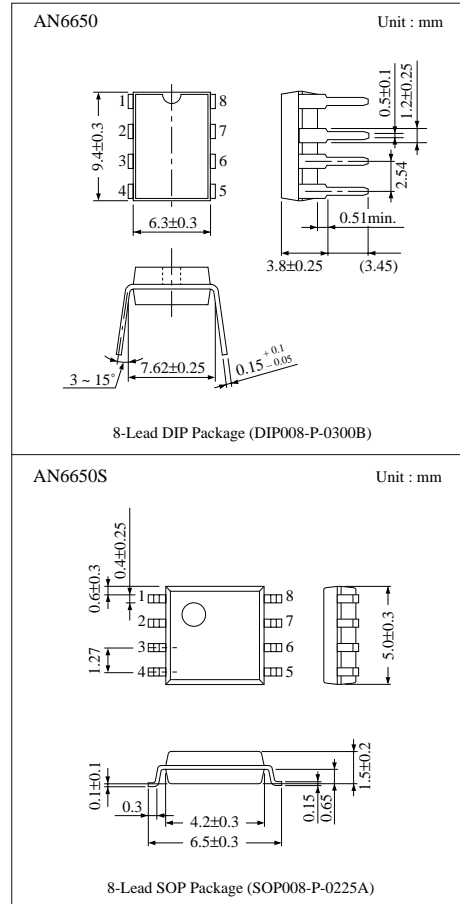
## Motor Control Circuits

### ■ Overview

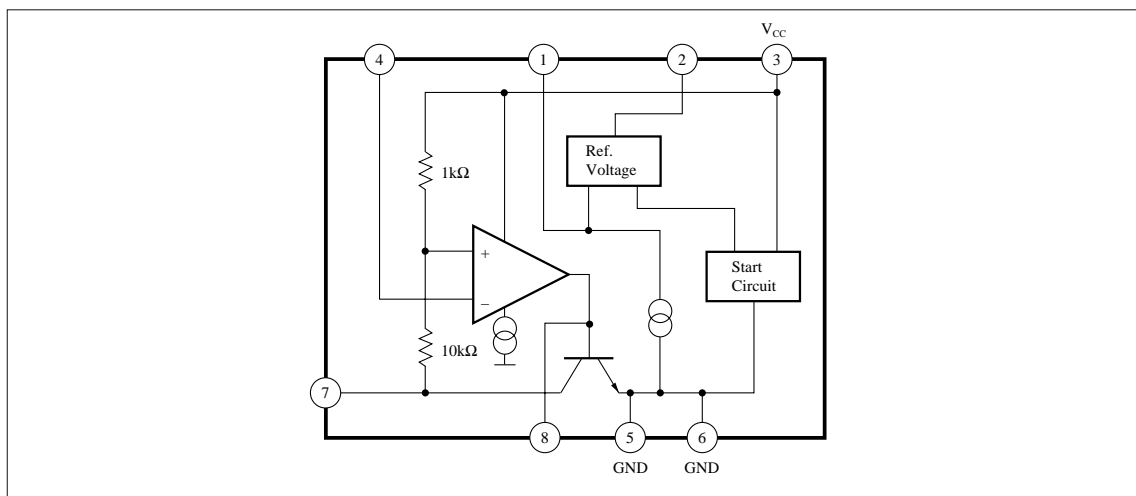
The AN6650 and the AN6650S are the electronic governors suitable for a low-voltage and compact DC motor which is used for a tape recorder, etc.

### ■ Features

- Wide range of operating voltage :  $V_{CC(opr)} = 1.8V \sim 7V$   
 AN6650 :  $V_{CC(opr)} = 1.8V \sim 7V$   
 AN6650S :  $V_{CC(opr)} = 1.8V \sim 3.6V$
- 2 package types
- Fewer external parts
- Speed control in steps with linear fine control



### ■ Block Diagram



### Pin Descriptions

| Pin No. | Pin Name           | Pin No. | Pin Name           |
|---------|--------------------|---------|--------------------|
| 1       | V <sub>REF</sub> ⊖ | 5       | GND                |
| 2       | V <sub>REF</sub> ⊕ | 6       | GND                |
| 3       | V <sub>CC</sub>    | 7       | Motor Pin          |
| 4       | Comparator Input   | 8       | Phase Compensation |

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

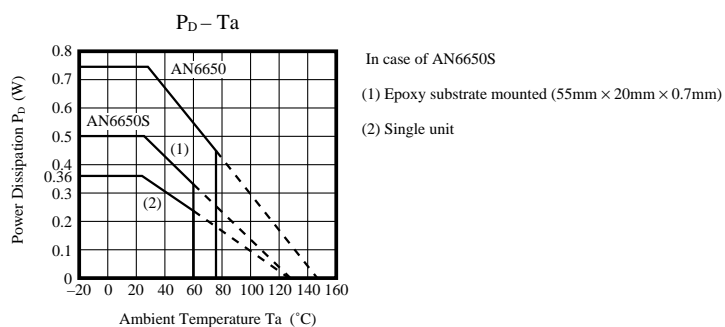
| Parameter                     | Symbol                                 | Rating     | Unit |
|-------------------------------|--|------------|------|
| Supply Voltage                | AN6650                                 | 7.5        | V    |
|                               | AN6650S                                | 4          |      |
| Circuit Voltage               | AN6650                                 | -0.5       | V    |
|                               | AN6650S                                | 4          |      |
| Circuit Voltage               | V <sub>n-5,6</sub><br>(n = 1, 2, 3, 4) | -0.5       | 1    |
| Supply Current                | I <sub>CC</sub> *                      | 1000       | mA   |
| Circuit Current               | I <sub>7</sub>                         | —          | 1000 |
| Power Dissipation             | AN6650                                 | 750        | mW   |
|                               | AN6650S                                | 360        |      |
| Operating Ambient Temperature | AN6650                                 | -20 ~ +75  | °C   |
|                               | AN6650S                                | -20 ~ +60  |      |
| Storage Temperature           | AN6650                                 | -40 ~ +150 | °C   |
|                               | AN6650S                                | -40 ~ +125 |      |

\* AN6650 : t ≤ 5μs, AN6650S : t ≤ 1μs

### Electrical Characteristics (Ta = 25°C)

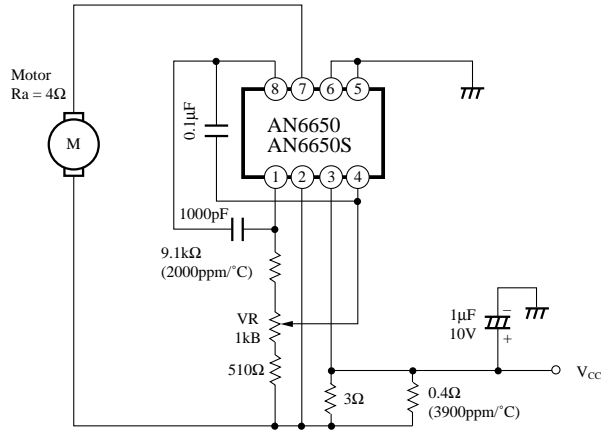
| Parameter                           | Symbol  | Condition  | min.  | typ. | max. | Unit |
|-------------------------------------|---|--|-------|------|------|------|
| Supply Current                      | I <sub>CC</sub>                               | V <sub>CC</sub> = 3V,                            | —     | 2    | 3    | mA   |
| Reference Voltage                   | V <sub>ref</sub>                              | V <sub>CC</sub> = 3V, V <sub>2-1</sub> > 10kΩ    | 1.20  | 1.28 | 1.35 | V    |
| Starting Voltage                    | V <sub>CC(S)</sub>                            | Supply voltage in which 30mA current flows to Ra | —     | 1.0  | 1.2  | V    |
| Saturation Voltage                  | V <sub>sat</sub>                              | V <sub>CC</sub> = 1.8V, Ra = 4.7Ω                | —     | 0.2  | 0.5  | V    |
| Voltage Characteristics 1           | AN6650  | V <sub>CC</sub> = 1.8V ~ 7.0V                    | -1.25 | 0.1  | 1.25 | %/V  |
|                                     | AN6650S                                       |  |       |      |      |      |
| Voltage Characteristics 2           | AN6650  | V <sub>CC</sub> = 1.8V ~ 7.0V                    | -1.2  | 0.1  | 1.2  | %/V  |
|                                     | AN6650S                                       |  |       |      |      |      |
| Current Characteristics             | $\frac{\Delta V_{ref}}{V_{ref}} / \Delta I_7$ | I <sub>7</sub> = 1mA ~ 20mA                      | -0.2  | 0.01 | 0.2  | %/mA |
| Temperature Current Characteristics | $\frac{\Delta V_{ref}}{V_{ref}} / \Delta T_a$ | Ta = -20°C ~ +60°C, V <sub>CC</sub> = 3.0V       | —     | 0.01 | —    | %/°C |

Note) Operating Supply Voltage Range : V<sub>CC(oper)</sub> = 1.8V ~ 3.6V



■ Application Circuit

Speed Control Circuit with 3V Core Motor



Motor Constants

- {  $R_a$  : Internal resistor =  $4\Omega$
- {  $K_a$  : Electromotive force constant =  $0.4\text{mV/rpm}$
- {  $K_T$  : Torque constant =  $30\text{g} \cdot \text{cm/A}$

