

# MTD2003F

### FEATURES

- Constant-current chopping function  
(Frequency fixed, separate-oscillation)
- 4-phase input  
(with inhibit for simultaneously turn ON)
- Current levels can be selected in  
2 bit digital signal
- A noise cancel function is provided  
(No externally attached filter needed)
- Protection for penetration current
- Built-in overheating protection
- Built-in flywheel diodes

### RATINGS

- Absolute Maximum Ratings (Ta=25°C)

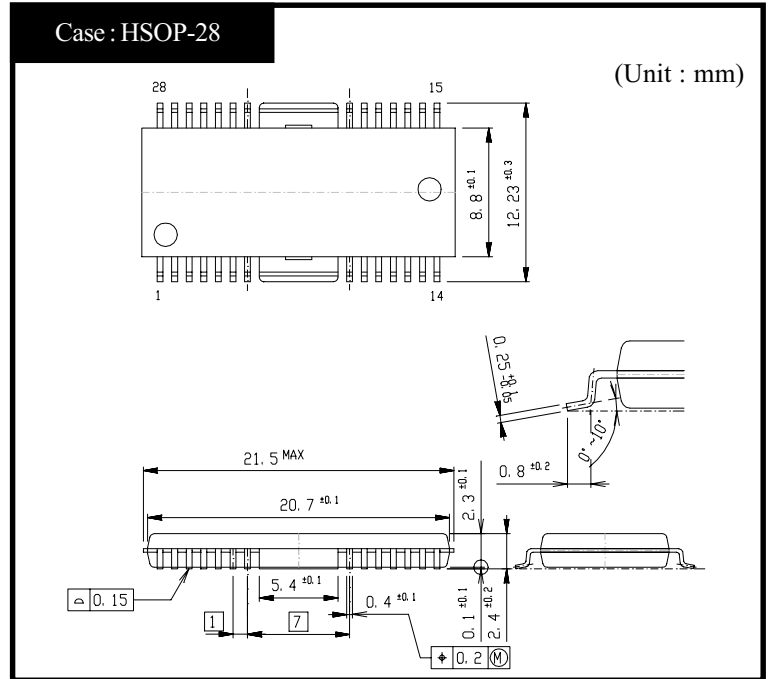
| Item                    | Symbol         | Ratings       | Unit |
|-------------------------|----------------|---------------|------|
| Output Voltage          | $V_{CEO(SUS)}$ | 30            | V    |
| Output Current          | $I_O$          | 1.2           | A    |
| Logic Supply Voltage    | $V_{CC}$       | 0 to 6        | V    |
| Logic Input Voltage     | $V_{IN}$       | 0 to $V_{CC}$ | V    |
| Total Power Dissipation | $P_T$          | 3             | W    |
| Junction Temperature    | $T_j$          | 150           | °C   |
| Storage Temperature     | $T_{stg}$      | -40 to 150    | °C   |

- Electrical Characteristics (Ta=25°C)

| Item                                  | Symbol         | Test Conditions                       | min.  | typ. | max.     | Unit    |
|---------------------------------------|----------------|---------------------------------------|-------|------|----------|---------|
| Output Saturation Voltage(Upper side) | $V_{CE(sat)H}$ | $I_o=1.0A$                            |       | 1.2  | 1.4      | V       |
| Output Saturation Voltage(Lower side) | $V_{CE(sat)L}$ | $I_o=1.0A$                            |       | 0.7  | 1.0      | V       |
| Output Leakage Current(Upper side)    | $I_{rH}$       | $V_{mm}=30V, V_{out}=0V$              |       |      | 10       | $\mu A$ |
| Output Leakage Current(Lower side)    | $I_{rL}$       | $V_{out}=30V, V_{RS}=0V$              |       |      | 10       | $\mu A$ |
| Logic Supply Current(Standby)         | $I_{CC(OFF)}$  | $V_{CC}=5V, IN="H,H"$ or "L,L"        |       | 15   | 25       | mA      |
| Logic Supply Current(All Circuit ON)  | $I_{CC(ON)}$   | $V_{CC}=5V$                           |       | 50   | 65       | mA      |
| Input High Voltage                    | $V_{INH}$      | $V_{CC}=5V$                           | 2.3   |      | $V_{CC}$ | V       |
| Input Low Voltage                     | $V_{INL}$      | $V_{CC}=5V$                           | GND   |      | 0.6      | V       |
| Logic High Input Current              | $I_{INH}$      | $V_{CC}=5V, V_{IN}=5V$                |       |      | 10       | $\mu A$ |
| Logic Low Input Current               | $I_{INL}$      | $V_{CC}=5V, V_{IN}=0V$                |       | -3   | -20      | $\mu A$ |
| $I_o, I_L$ "H" Input Voltage          | $V(I_o, I_L)H$ | $V_{CC}=5V$                           | 2.3   |      | $V_{CC}$ | V       |
| $I_o, I_L$ "L" Input Voltage          | $V(I_o, I_L)L$ | $V_{CC}=5V$                           | GND   |      | 0.6      | V       |
| $I_o, I_L$ "H" Input Current          | $I(I_o, I_L)H$ | $V_{CC}=5V, V(I_o, I_L)=5V$           |       |      | 10       | $\mu A$ |
| $I_o, I_L$ "L" Input Current          | $I(I_o, I_L)L$ | $V_{CC}=5V, V(I_o, I_L)=0V$           |       | -75  | -100     | $\mu A$ |
| Current Sensor Threshold(100%)        | $V_{S1}$       | $V_{CC}=V_r=5V, V(I_o)=0V, V(I_L)=0V$ | 0.475 | 0.5  | 0.525    | V       |
| Current Sensor Threshold(70%)         | $V_{S2}$       | $V_{CC}=V_r=5V, V(I_o)=5V, V(I_L)=0V$ | 0.322 | 0.35 | 0.378    | V       |
| Current Sensor Threshold(33%)         | $V_{S3}$       | $V_{CC}=V_r=5V, V(I_o)=0V, V(I_L)=5V$ | 0.153 | 0.17 | 0.187    | V       |
| Reference Input Current               | $I_{ref}$      | $V_{CC}=5V, V_r=5V$                   |       | 500  | 650      | $\mu A$ |
| Input Current(Current Sensor)         | $I_{sense}$    | $V_{CC}=5V, V_s=0V$                   |       | -1   | -10      | $\mu A$ |
| Pulse Blanking Time                   | $t_b$          | $V_{CC}=5V, C_t=3300pF$               |       | 1.55 |          | $\mu s$ |
| Thermal Shutdown Temperature          | $T_{TSD}$      |                                       |       | 150  |          | °C      |

### OUTLINE DIMENSIONS

Case : HSOP-28



(Unit : mm)

### ●Setting of Output Current and Chopping Frequency

Fig.1 shows constant current chopping wave form.

Output Current setting

$$I_o(100\%) = \frac{V_r}{10 \cdot R_s} - 0.015$$

Chopping Frequency Setting

$$f = \frac{1}{0.72 \cdot C_t \cdot R_t}$$

### ●True Table

| IN 1 or 4 | IN 2 or 3 | Out 1 or 4 | Out 2 or 3 |
|-----------|-----------|------------|------------|
| L         | L         | OFF        | OFF        |
| L         | H         | L          | H          |
| H         | L         | H          | L          |
| H         | H         | OFF        | OFF        |

### ●True Table for Current Chopping Level

| $I_o$ | I1 | Current Level (%) | Vref(V)<br>(Vr=5V) |
|-------|----|-------------------|--------------------|
| L     | L  | 100               | 0.5±5%             |
| H     | L  | 70                | 0.35±8%            |
| L     | H  | 33                | 0.17±10%           |
| H     | H  | 0                 |                    |

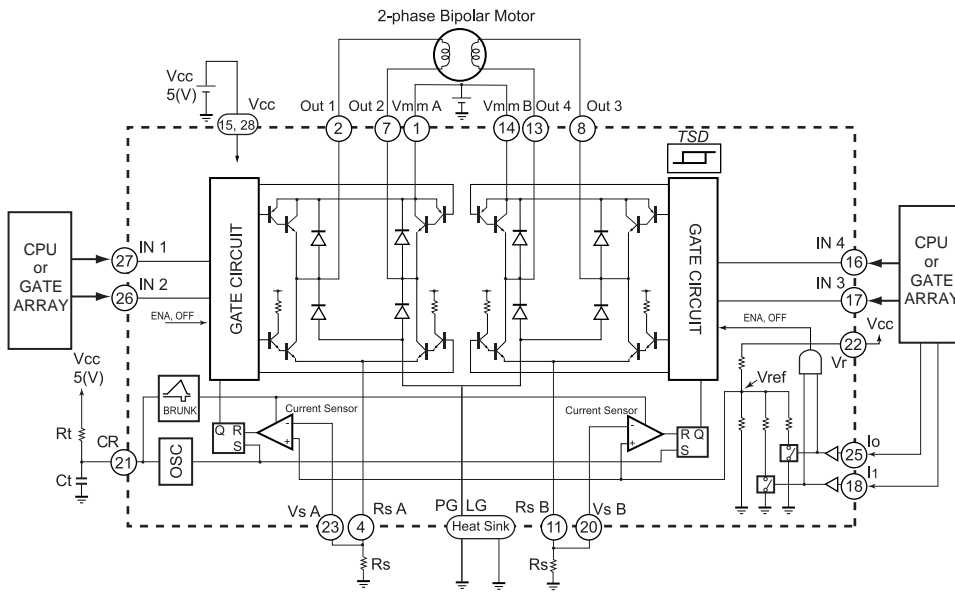
### ●Recommended Parts Value

| Symbol | Recommended Value | Unit       |
|--------|-------------------|------------|
| $R_s$  | 0.68              | $\Omega$   |
| $R_t$  | 18                | k $\Omega$ |
| $C_t$  | 3300              | pF         |
| $V_r$  | $V_{cc}$          | V          |

### ●Recommended Operating Conditions (Ta=25°C)

| Item                  | Symbol   | min. | typ. | max. | Unit |
|-----------------------|----------|------|------|------|------|
| Motor Supply Voltage  | $V_{mm}$ |      |      | 27   | V    |
| Output Current        | $I_o$    |      |      | 0.8  | A    |
| Logic Supply Voltage  | $V_{cc}$ | 4.75 |      | 5.25 | V    |
| Chopping Frequency    | fchop    |      | 20   |      | kHz  |
| Operating Temperature | Top      | -25  |      | 120  | °C   |

Equivalent Circuit / Basic Application Circuit



Pin Assignment

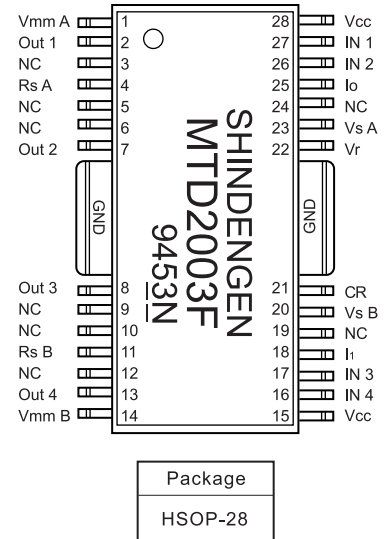


Fig.1 Constant current wave form (Motor current)

