SHINDENGEN

Stepping Motor Driver ICs

MTD Series

MTD2003

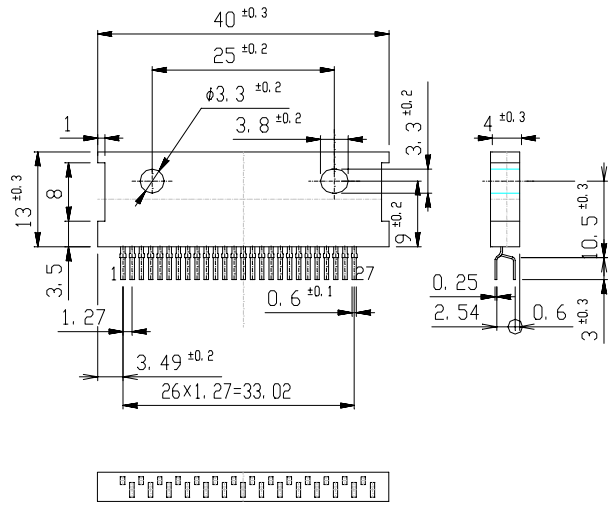
FEATURES

- ●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 flywheel diodes

OUTLINE DIMENSIONS

Case : ZIP-27

(Unit : mm)



RATINGS

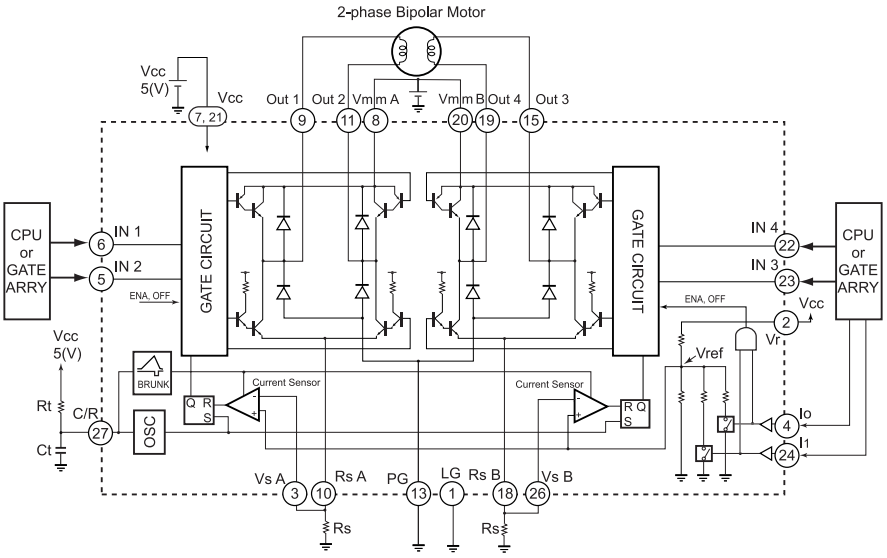
●Absolute Maximum Ratings (Ta=25℃)

Item	Symbol	Ratings	Unit
Output Voltage	$V_{CEO(SUS)}$	30	V
Output Current	I_O	1.2	A
Logic Supply Voltage	V_{CC}	0～6	V
Logic Input Voltage	V_{IN}	0～V_{CC}	V
Total Power Dissipation	P_T	5	W
Junction Temperature	Tj	150	℃
Storage Temperature	Tstg	−40～150	℃

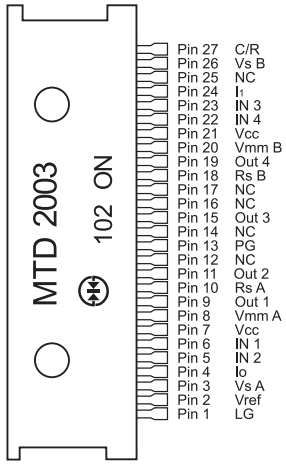
●Electrical Characteristics (Ta=25℃)

Item	Symbol	Test Conditions	min.	typ.	max.	Unit
Output Saturation Voltage(Upper side)	V_{CE}(sat)H	Io=1.0A		1.2	1.4	V
Output Saturation Voltage(Lower side)	V_{CE}(sat)L	Io=1.0A		0.7	1.0	V
Output Leakage Current(Upper side)	Ir_H	Vmm=30V,Vout=0V			10	μA
Output Leakage Current(Lower side)	I_{rL}	Vout=30V,V_{RS}=0V			10	μA
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	2.7		Vcc	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	μA
Logic Low Input Current	I_{INL}	V_{CC} = 5V,V_{IN}=0V		−3	−20	μA
Io,I_l"H"Input Voltage	V(Io,I_l)H	V_{CC}=5V	2.7		Vcc	V
Io,I_l"L"Input Voltage	V(Io,I_l)L	V_{CC}=5V	GND		0.6	V
Io,I_l"H"Input Current	I(Io,I_l)H	V_{CC}=5V,V(Io,I_l)=5V			10	μA
Io,I_l"L"Input Current	I(Io,I_l)L	V_{CC}=5V,V(Io,I_l)=0V		−75	−100	μA
Current Sensor Threshold(100%)	V_{S1}	V_{CC}=Vr=5V,V(Io)=0V,V(I_l)=0V	0.475	0.5	0.525	V
Current Sensor Threshold(70%)	V_{S2}	V_{CC}=Vr=5V,V(Io)=5V,V(I_l)=0V	0.322	0.35	0.378	V
Current Sensor Threshold(33%)	V_{S3}	V_{CC}=Vr=5V,V(Io)=0V,V(I_l)=5V	0.153	0.17	0.187	V
Reference Input Current	Iref	V_{CC}=5V,Vr=5V		500	650	μA
Input Current(Current Sensor)	Isense	V_{CC}=5V,V_S=0V		−1	−10	μA
Pulse Blanking Time	tb	V_{CC}=5V,Ct=3300pF		1.55		μs

● Equivalent Circuit・Basic Application Circuit



● Pin Assignment



Package
ZIP-27

● 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

● Recommended Parts Value

Symbol	Recommended Value	Unit
Rs	0.68	Ω
Rt	18	kΩ
Ct	3300	pF
Vr	Vcc	V

● True Table for Current Chopping Level

Io	I1	Current Level(%)	Vref(V) (Vr=5V)
L	L	100	0.5±5%
H	L	70	0.35±8%
L	H	33	0.17±10%
H	H	0	

● Setting of Output Current and Chopping Frequency

Fig.1 shows constant current chopping wave form.

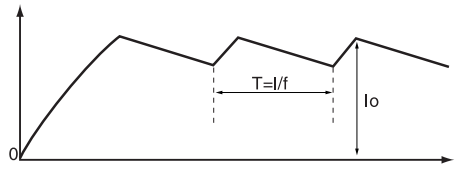
○Output Current setting

$$Io(100\%) = \frac{Vr}{10 \cdot Rs} - 0.015$$

○Chopping Frequency Setting

$$f = \frac{1}{0.72 \cdot Ct \cdot Rt}$$

Fig.1 Constant current wave form (Motor current / phase)



● Recommended Operating Conditions (Ta=25℃)

Item	Symbol	min.	typ.	max.	Unit
Motor Supply Voltage	Vmm			27	V
Output Current	Io			1	A
Logic Supply Voltage	Vcc	4.75		5.25	V
Chopping Frequency	fchop		20		kHz
Operating Temperature	Top	-25		120	℃