APPLICATION MANUAL

1.5ch Constant Current H-bridge Driver IC
TK10203AM9

CONTENTS

TOKO

1.5ch Constant Current H-bridge Driver IC
TK10203AM9

1. DESCRIPTION

TK10203AM9 is the constant current type 1.5ch H-bridge driver IC.

This function is a shutter and iris driver.

Substrate mounting of TK10203AM9 is possible in a small space, because it uses HSON3030C-10 of a thin shape small package and needs few external parts.

Moreover, the output current is determined by setting an external resistance.

TK10203AM9 is the optimal IC for driving a shutter of slim type digital still camera and cellular phones with a digital still camera function.

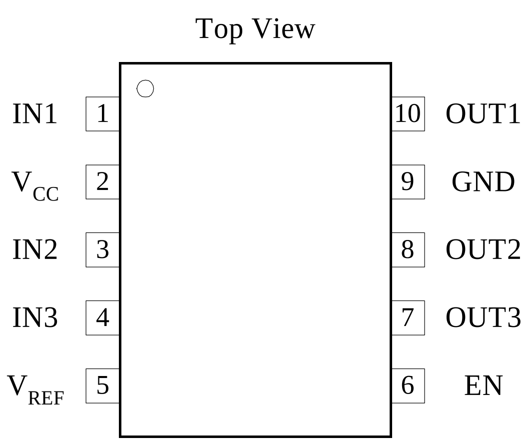
2. FEATURES

- Small package HSON3030C-10 (3.0×3.0×0.75mm)
- Low voltage operation V_{OP}=2.5~6.0V
- Low saturation output voltage
- Output current can be set up arbitrarily.
- Internal thermal shutdown

3. APPLICATIONS

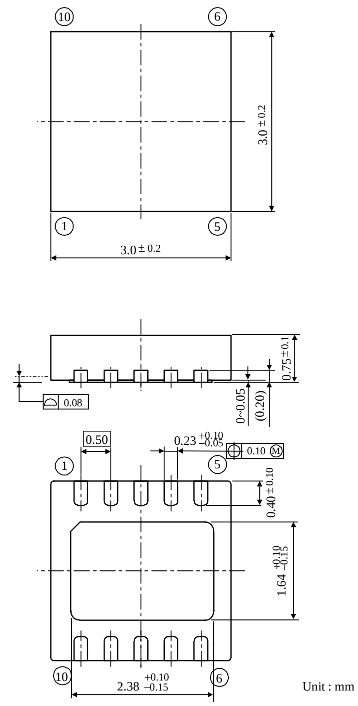
- Digital Still Camera
- Digital Video Camera
- Cellular Phone with DSC

4. PIN CONFIGURATION

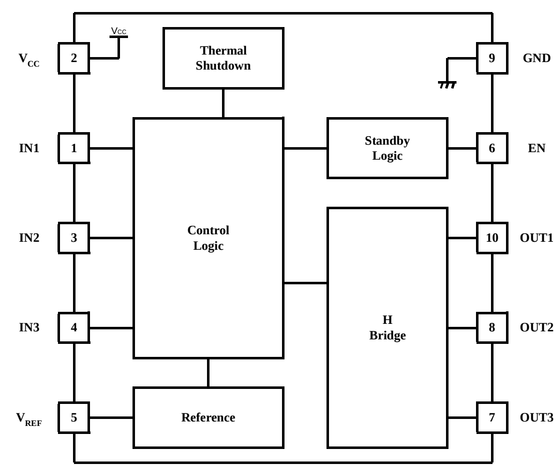


5. PACKAGE OUTLINE

- HSON3030C-10



6. BLOCK DIAGRAM



7. ABSOLUTE MAXIMUM RATINGS

T_a=25°C

Parameter	Symbol	Rating	Units	Conditions
Supply Voltage	V_{CC}	10	V	
Power Dissipation	P_D	600	mW	*
Storage Temperature Range	T_{stg}	-55 ~ +150	°C	
Operating Temperature Range	T_{OP}	-30 ~ 85	°C	
Maximum Operating Frequency	f_{MAX}	DC ~ 1.0	kHz	
Operating Voltage Range	V_{OP}	2.5 ~ 6.0	V	

* P_D must be decreased at the rate of 4.8mW/°C for operation above 25°C.

8. ELECTRICAL CHARACTERISTICS

V_{CC}=3V, V_{EN}=3V, R_{SET}=4.3kΩ, T_a=25°C

Parameter	Symbol	Value			Units	Conditions
		MIN	TYP	MAX		
Standby Supply Current	I_{CCS}	-	0.0	1.0	µA	V_{EN}=0V, R_L=∞
Supply Current 1 (OFF)	I_{CC1}	-	1.6	2.5	mA	V_{IN1}=0V, V_{IN2}=0V, R_L=∞
Supply Current 2 (BRAKE)	I_{CC2}	-	28	40	mA	V_{IN1}=3V, V_{IN2}=3V, R_L=∞
Supply Current 3 (CW)	I_{CC3}	-	24	-	mA	V_{IN1}=3V, V_{IN2}=0V, R_L=∞
Supply Current 4 (CCW)	I_{CC4}	-	24	-	mA	V_{IN1}=0V, V_{IN2}=3V, R_L=∞
Saturation Voltage (CW, CCW)	V_{SAT}	-	0.35	0.5	V	I_O=200mA, R_{SET}=1kΩ T_a= -25°C ~ +60°C
Saturation Voltage (BRAKE)	$V_{SAT\ BR}$	-	0.1	0.3	V	I_{SINK}=200mA
Maximum Output Current	I_{OMAX}	350	-	-	mA	V_{SAT}=1V, R_{SET}=1kΩ
Reference Voltage	V_{REF}	-	1.28	-	V	R_{SET}=4.3kΩ
Output Current / V_{REF} Terminal Current ratio	I_O/I_{REF}	-	670	-	-	V_{SAT}=1V, R_{SET}=4.3kΩ
Current Set Value	ISET	830	860	890	(V)	V_{SAT}=1V, R_{SET}=4.3kΩ *
EN Terminal Voltage High Level	$V_{EN}H$	1.8	-	V_{CC}	V	Operated condition
EN Terminal Voltage Low Level	$V_{EN}L$	0	-	0.6	V	Standby condition
EN Terminal Current	I_{EN}	-	20	60	µA	V_{EN}=3V
IN Terminal Voltage High Level	$V_{IN}H$	1.8	-	V_{CC}	V	
IN Terminal Voltage Low Level	$V_{IN}L$	0	-	0.6	V	
IN Terminal Current	I_{IN}	-	50	100	µA	V_{IN}=3V

* Current Set Value (ISET)

The output current is determined from the ISET and the connecting resistor of V_{REF} (R_{SET}).

I_O=ISET/R_{SET}

Example: When R_{SET} is set to 4.3kΩ, the output current is determined to 200mA.

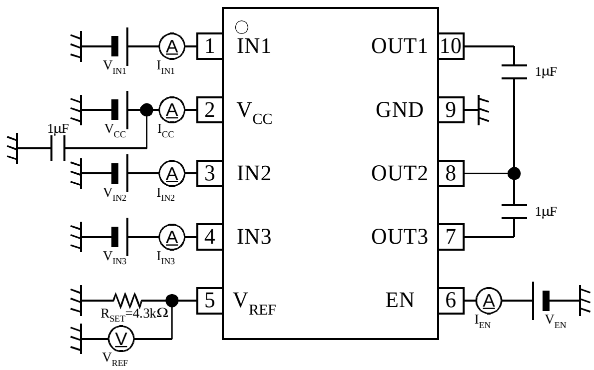
I_O=ISET/R_{SET}=860(V)/4.3kΩ=200mA

* The truth value table

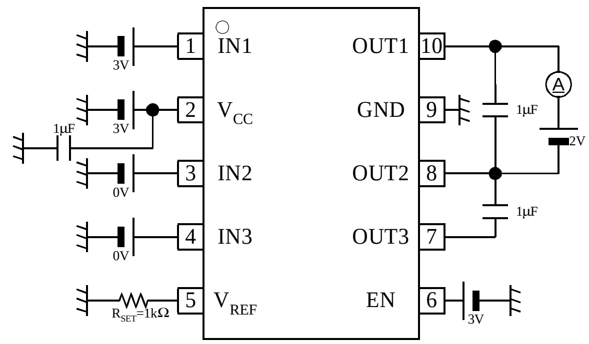
EN	IN1	IN2	IN3	OUT1	OUT2	OUT3	Mode
Low	-	-	-	Open	Open	Open	Standby
High	Low	Low	-	Open	Open	Open	OFF
High	High	Low	Low	High	Low	Open	CW_ch1
High	Low	High	Low	Low	High	Open	CCW_ch1
High	High	High	Low	Low	Low	Open	Brake_ch1
High	High	Low	High	Open	Low	High	CW_ch2
High	Low	High	High	Open	High	Low	CCW_ch2
High	High	High	High	Open	Low	Low	Brake_ch2

9. TEST CIRCUIT

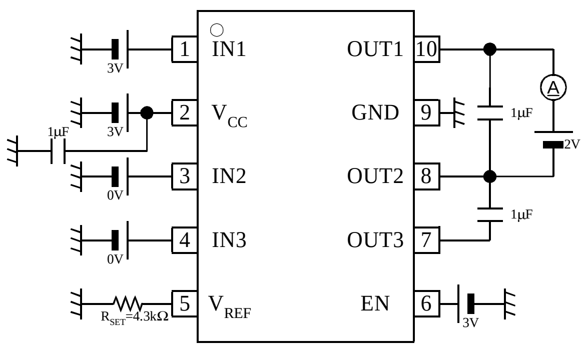
•I_{CCS}, I_{CC}, V_{REF}, I_{EN}, I_{IN1}, I_{IN2}, I_{IN3}



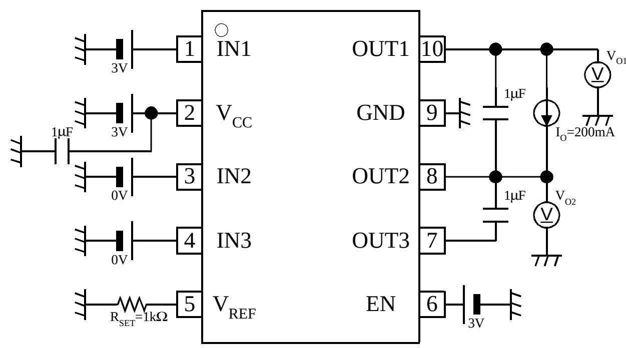
•I_{O_MAX} (CW_ch1)



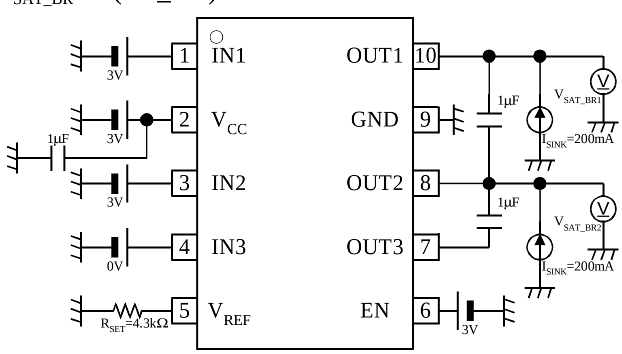
•$ISET = I_O \times R_{SET}$ (CW_ch1)



•$V_{SAT} = V_{CC} - (V_{O1} - V_{O2})$ (CW_ch1)



•V_{SAT_BR} (BR_ch1)



10. TYPICAL CHARACTERISTICS

V_{CC}=3V, V_{EN}=3V, R_{SET}=4.3kΩ, T_a=25°C

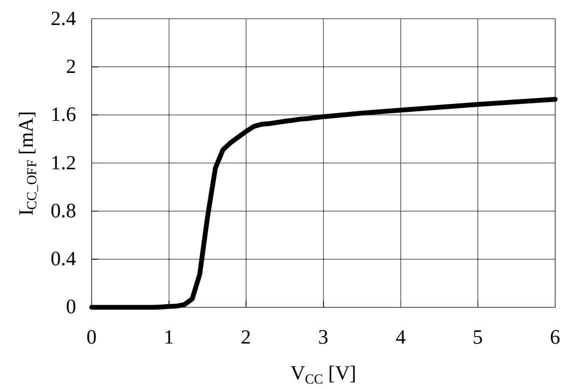


Fig1: Supply Current (OFF mode) vs Supply Voltage (R_{SET}=4.3kΩ, R_L=∞)

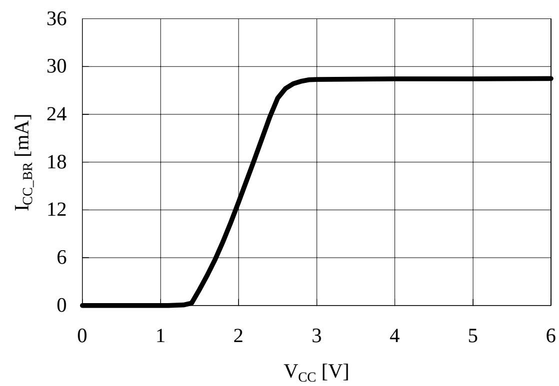


Fig2: Supply Current (BRAKE mode) vs Supply Voltage (R_{SET}=4.3kΩ, R_L=∞)

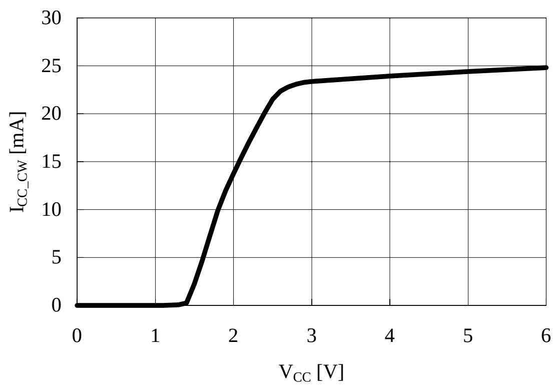


Fig3: Supply Current (CW mode) vs Supply Voltage (R_{SET}=4.3kΩ, R_L=∞)

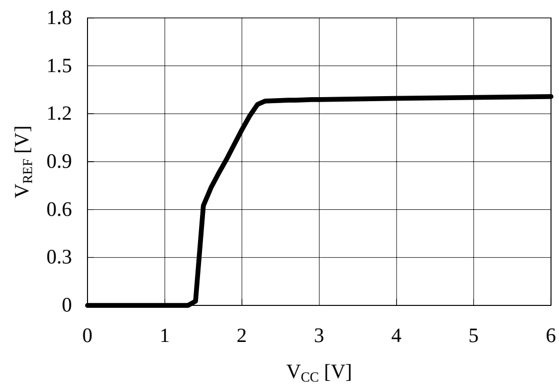


Fig4: V_{REF} Terminal Voltage vs Supply Voltage (R_{SET}=4.3kΩ, R_L=∞)

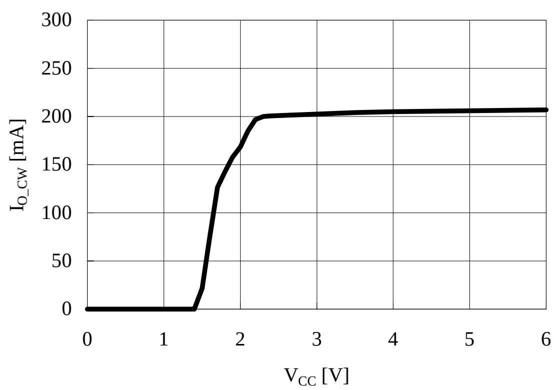


Fig5: Output Current (CW mode) vs Supply Voltage (R_{SET}=4.3kΩ, R_L=10Ω)

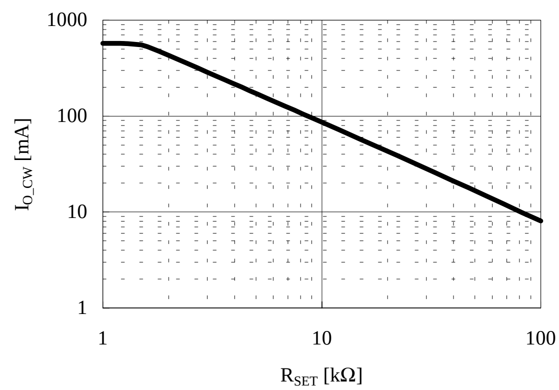


Fig6: Output Current (CW mode) vs R_{SET} Value (V_{SAT}=1V)

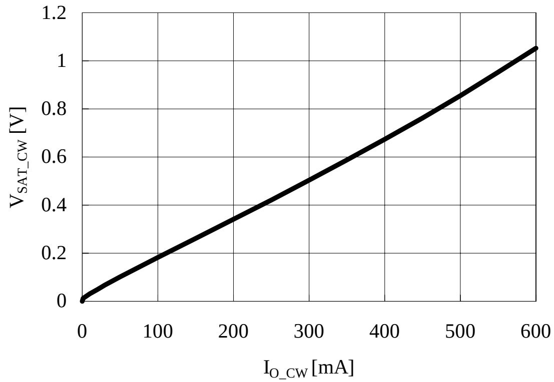


Fig7: Saturation Voltage (CW mode) vs Output Current (R_{SET}=1kΩ)

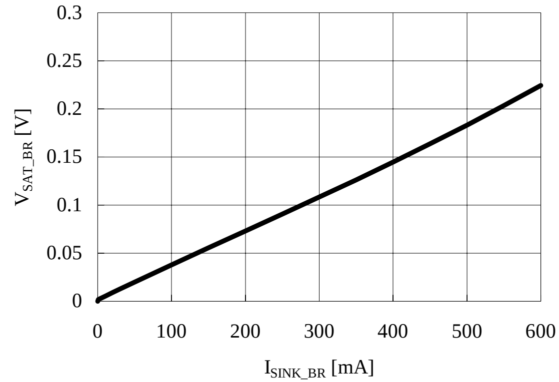


Fig8: Saturation Voltage (Brake mode) vs Sink Current (R_{SET}=1kΩ)

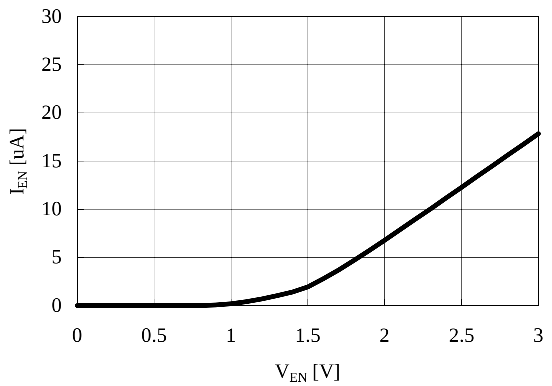


Fig9: EN Terminal Current vs EN Terminal Voltage

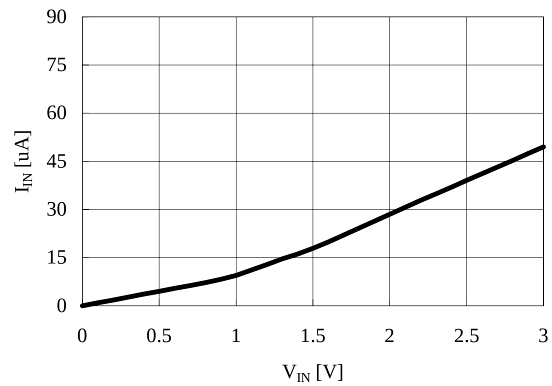


Fig10: IN Terminal Current vs IN Terminal Voltage

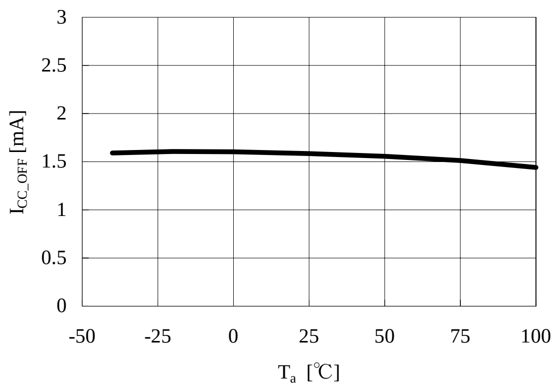


Fig11: Supply Current (OFF mode) vs Temperature
(R_{SET}=4.3kΩ, R_L=∞)

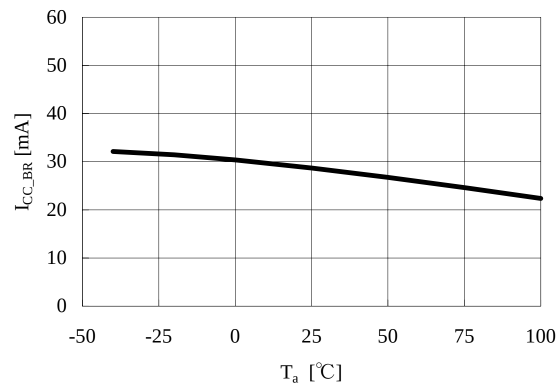


Fig12: Supply Current (Brake mode) vs Temperature
(R_{SET}=4.3kΩ, R_L=∞)

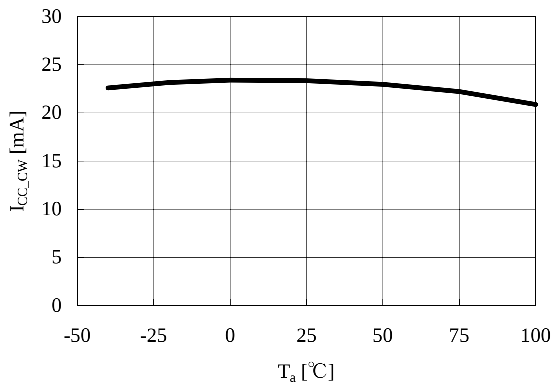


Fig13: Supply Current (CW mode) vs Temperature
(R_{SET}=4.3kΩ, R_L=∞)

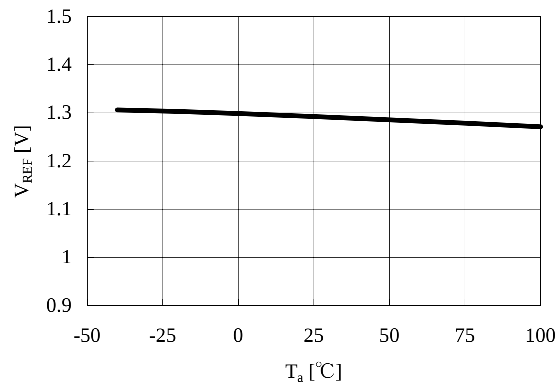


Fig14: V_{REF} Terminal Voltage vs Temperature
(R_{SET}=4.3kΩ, R_L=∞)

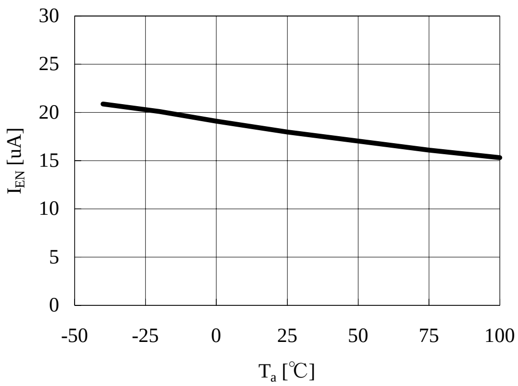


Fig15: EN Terminal Voltage vs Temperature
(V_{EN}=3V)

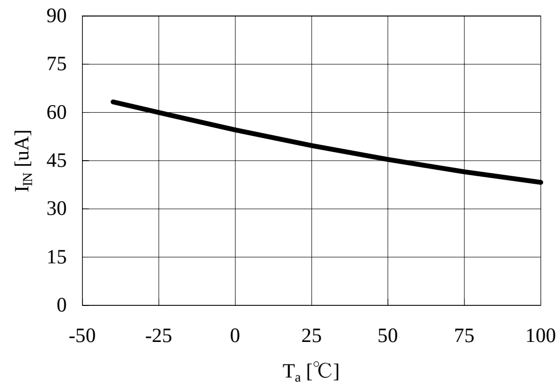


Fig16: IN Terminal Voltage vs Temperature
(V_{IN}=3V)

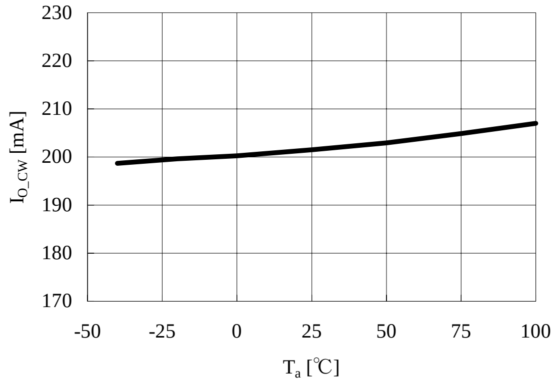


Fig17: Output Current (CW mode) vs Temperature (R_{SET}=4.3kΩ, R_L=10Ω)

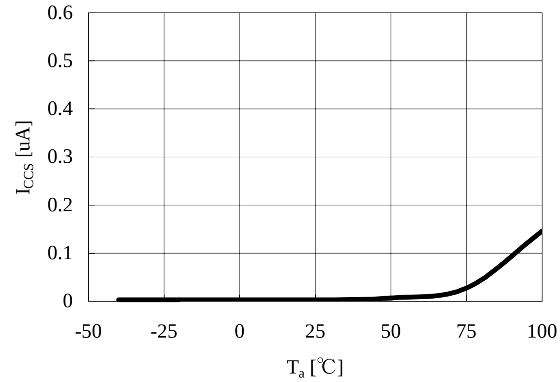


Fig18: Standby Supply Current vs Temperature (V_{EN}=0V)

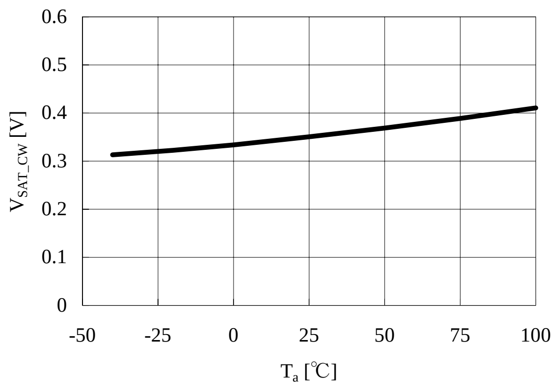


Fig19: Saturation Voltage (CW mode) vs Temperature (I_O=200mA, R_{SET}=1kΩ)

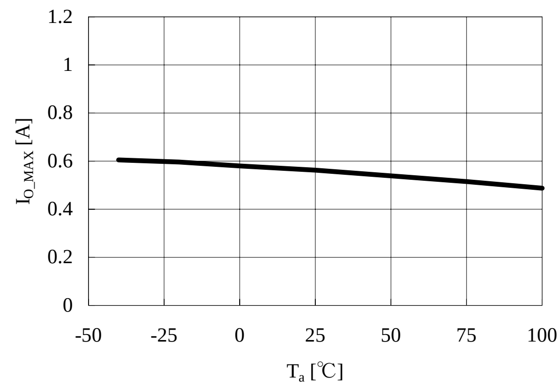


Fig20: Maximum Output Current vs Temperature (R_{SET}=1kΩ, V_{SAT}=1V)

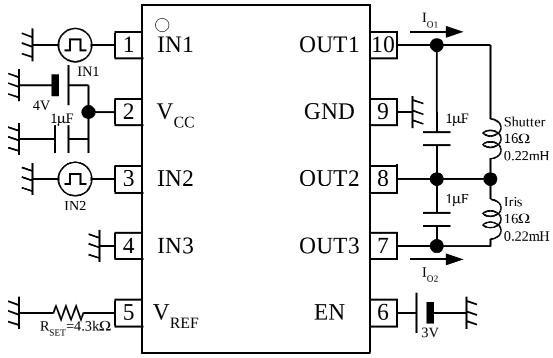


Fig21: Measurement circuit diagram
(Fig22~Fig30 Transient response characteristic)

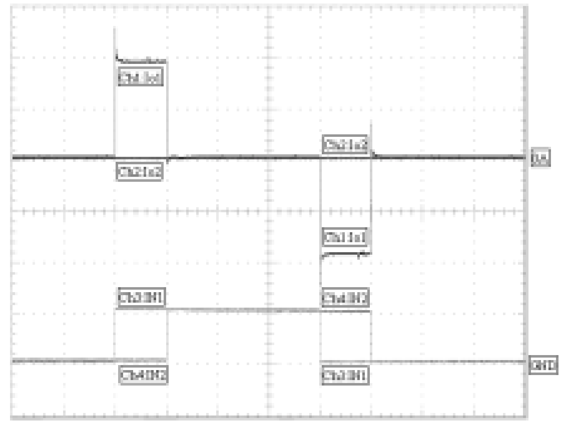


Fig22: OFF→CW→BR→CCW→OFF
Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 4ms/div.

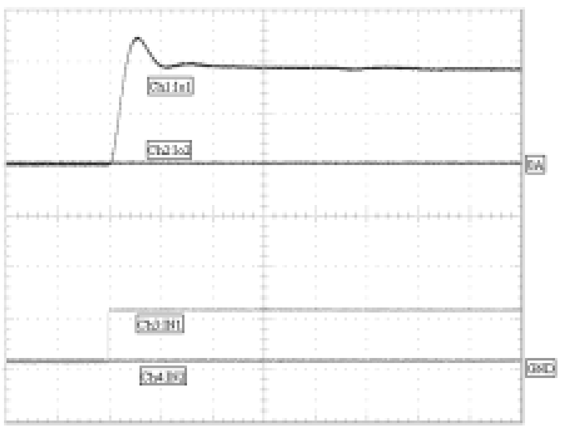


Fig23: OFF→CW Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100μs/div.

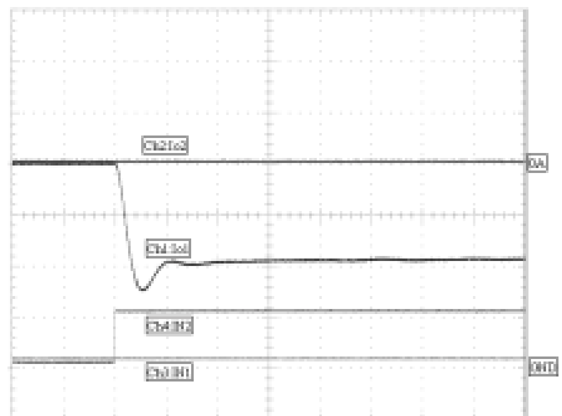


Fig24: OFF→CCW Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100μs/div.

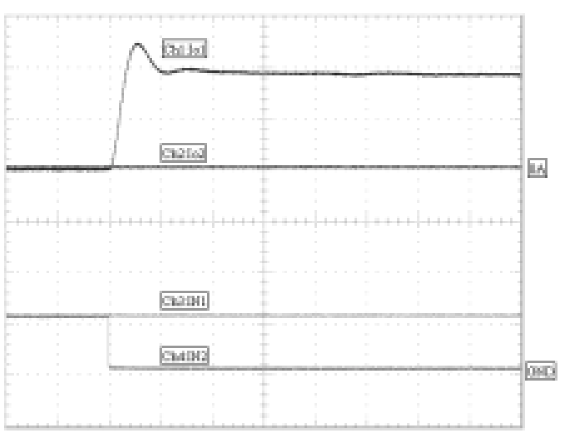


Fig25: BR→CW Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100μs/div.

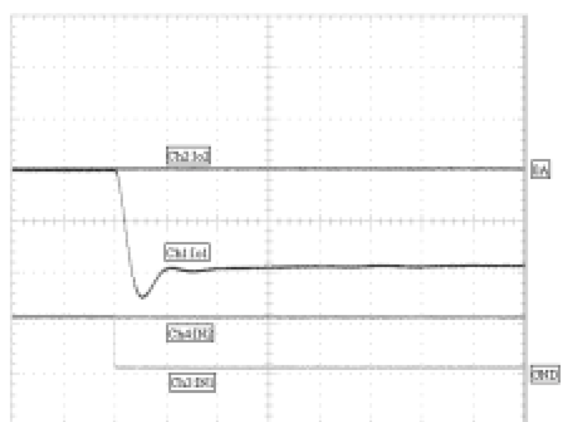


Fig26: BR→CCW Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100μs/div.

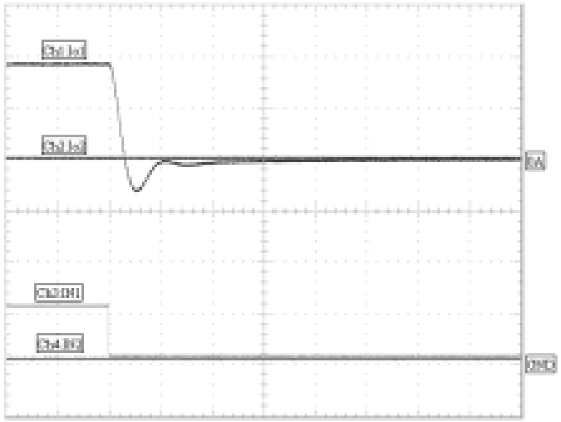


Fig27: CW→OFF Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100µs/div.

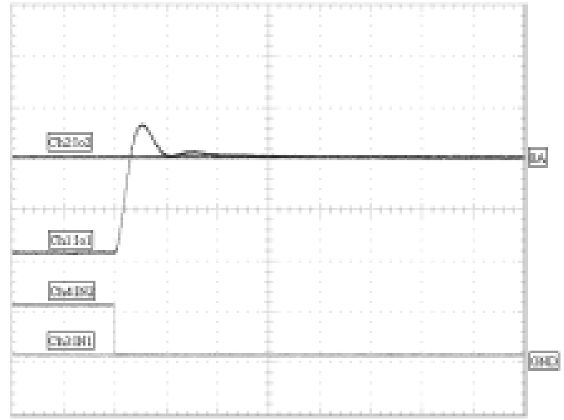


Fig28: CCW→OFF Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100µs/div.

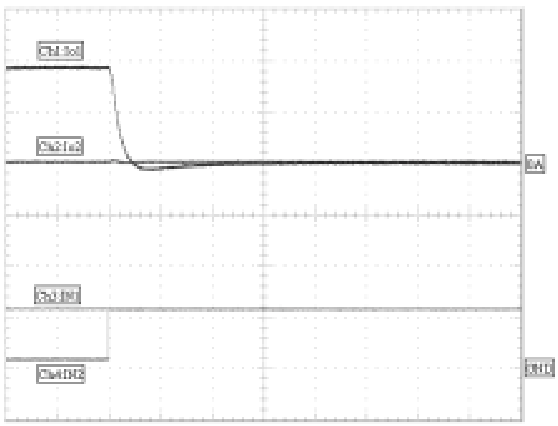


Fig29: CW→BR Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100µs/div.

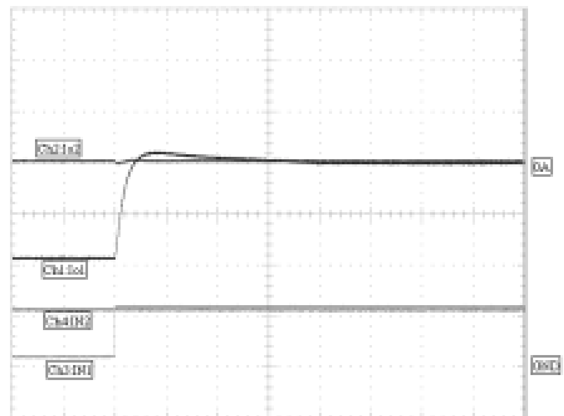
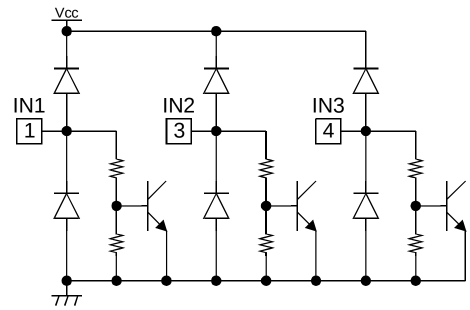
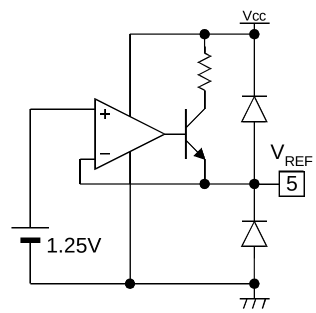
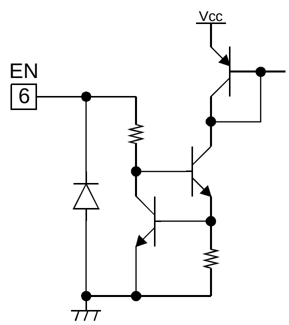
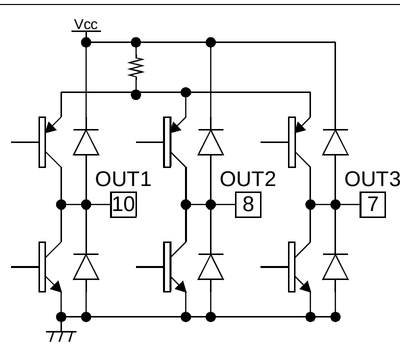
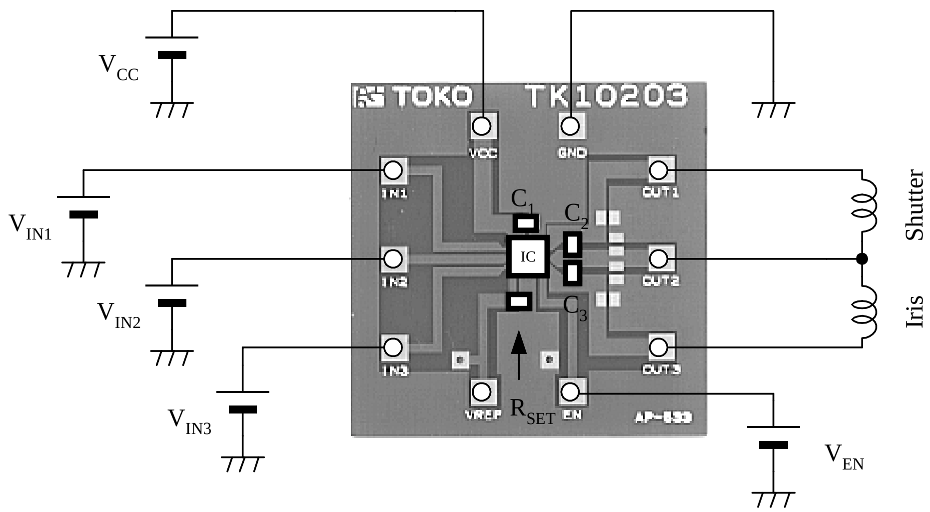


Fig30: CCW→BR Transient Response Characteristic
(Ch1, Ch2: 100mA/div. Ch3, Ch4: 2V/div.)
time: 100µs/div.

11. PIN DESCRIPTION

Pin No.	Pin Description	Internal Equivalent Circuit	Description
1 3 4	IN1 IN2 IN3		They are input terminals. IN1 terminal and IN2 terminal are used for the change of the modes. IN3 terminal is used for the change of the channel of output.
2	V_{CC}		It is a power supply terminal.
5	V_{REF}		It is V_{REF} terminal. Output current is set up by the resistance connected to this terminal. *Formula I_O = ISET / R_{SET} ISET = 860(TYP)
6	EN		It is an EN(enable) terminal. If an EN terminal is set as a High state (more than 1.8V), a circuit will operate. If it is set as a Low state (less than 0.6V), circuit operation will stop and power supply current will become below 1µA.
7 8 10	OUT3 OUT2 OUT1		They are Output terminals. A Voice Coil Motor is connected between OUT1 terminal and OUT2 terminal. Another Voice Coil Motor is connected between OUT2 terminal and OUT3 terminal.
9	GND		It is a grounding terminal

12. APPLICATIONS INFORMATION



- External parts
  Condenser: C_1, C_2, C_3=1μF *Part number: CM105B105K16K (KYOCERA CORP.)
  Resister: R_{SET}=4.3kΩ *I_O=ISET/R_{SET}=860/4.3k=200mA

11. NOTES

■ Please be sure that you carefully discuss your planned purchase with our office if you intend to use the products in this application manual under conditions where particularly extreme standards of reliability are required, or if you intend to use products for applications other than those listed in this application manual.

- Power drive products for automobile, ship or aircraft transport systems; steering and navigation systems, emergency signal communications systems, and any system other than those mentioned above which include electronic sensors, measuring, or display devices, and which could cause major damage to life, limb or property if misused or failure to function.
- Medical devices for measuring blood pressure, pulse, etc., treatment units such as coronary pacemakers and heat treatment units, and devices such as artificial organs and artificial limb systems which augment physiological functions.
- Electrical instruments, equipment or systems used in disaster or crime prevention.

■ Semiconductors, by nature, may fail or malfunction in spite of our devotion to improve product quality and reliability. We urge you to take every possible precaution against physical injuries, fire or other damages which may cause failure of our semiconductor products by taking appropriate measures, including a reasonable safety margin, malfunction preventive practices and fire-proofing when designing your products.

■ This application manual is effective from July 2005. Note that the contents are subject to change or discontinuation without notice. When placing orders, please confirm specifications and delivery condition in writing.

■ TOKO is not responsible for any problems nor for any infringement of third party patents or any other intellectual property rights that may arise from the use or method of use of the products listed in this application manual. Moreover, this application manual does not signify that TOKO agrees implicitly or explicitly to license any patent rights or other intellectual property rights which it holds.

■ None of the ozone depleting substances(ODS) under the Montreal Protocol are used in our manufacturing process.

12. OFFICES

If you need more information on this product and other TOKO products, please contact us.

■ TOKO Inc. Headquarters
1-17, Higashi-yukigaya 2-chome, Ohta-ku, Tokyo,
145-8585, Japan
TEL: +81.3.3727.1161
FAX: +81.3.3727.1176 or +81.3.3727.1169
Web site: http://www.toko.co.jp/

■ TOKO America
Web site: http://www.toko.com/

■ TOKO Europe
Web site: http://www.tokoeurope.com/

■ TOKO Hong Kong
Web site: http://www.toko.com.hk/

■ TOKO Taiwan
Web site: http://www.tokohc.com.tw/

■ TOKO Singapore
Web site: http://www.toko.com.sg/

■ TOKO Seoul
Web site: http://www.toko.co.kr/

■ TOKO Manila
Web site: http://www.toko.com.ph/

■ TOKO Brazil
Web site: http://www.toko.com.br/

TOKO

Semiconductor Div.ision

YOUR DISTRIBUTOR