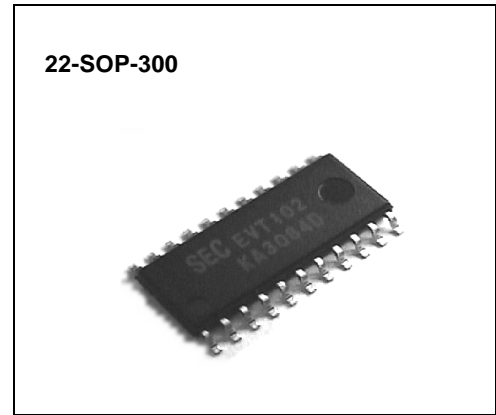


2-PHASE DRUM MOTOR DRIVER

The KA3084D is a monolithic integrated circuit, and it is suitable for drum motor driver of VCR system.

FEATURES

- Drives the BLDC motor using 2 hall sensors.
- 2-phase, full-wave drive method
- Built-in thermal shutdown (TSD) circuit
- Controls the motor speed through voltage
- Built-in bandgap circuit
- Built-in frequency Generator (FG) & Phase Generator (PG) amplifier & comparator.



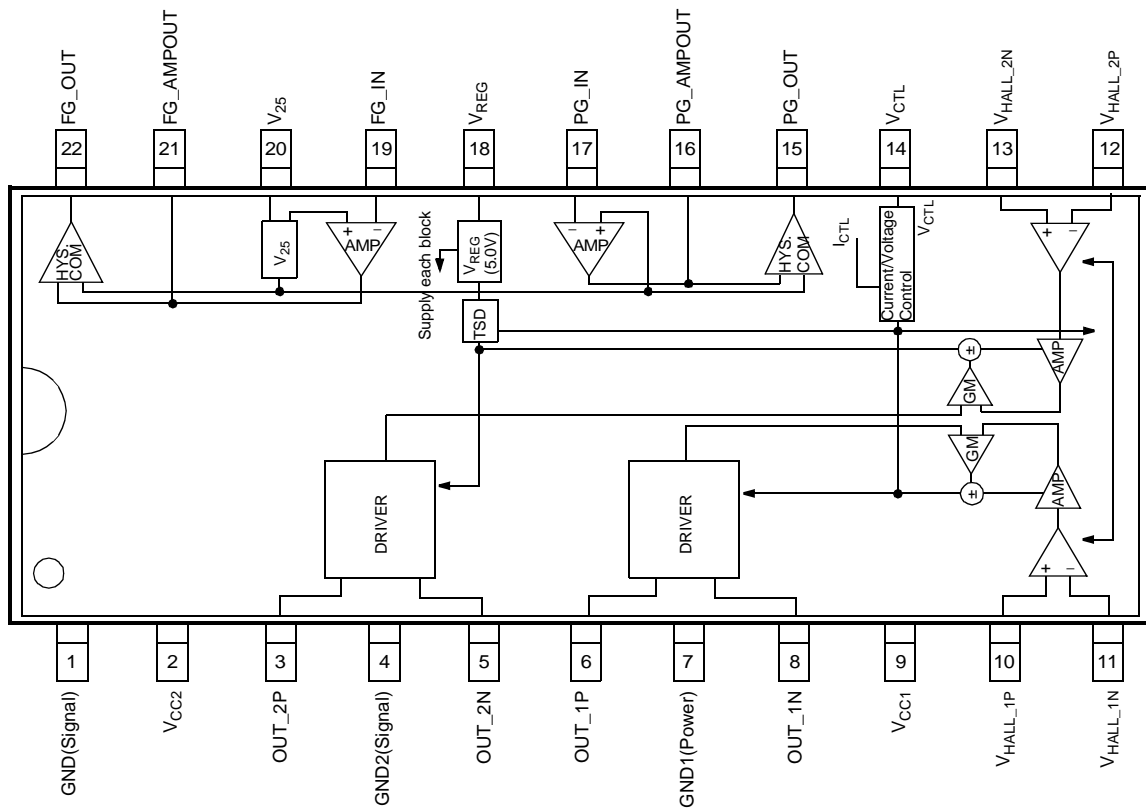
ORDERING INFORMATION

Device	Package	Operating Temperature
KA3084D	22-SOP-300	-25°C ~ +75°C

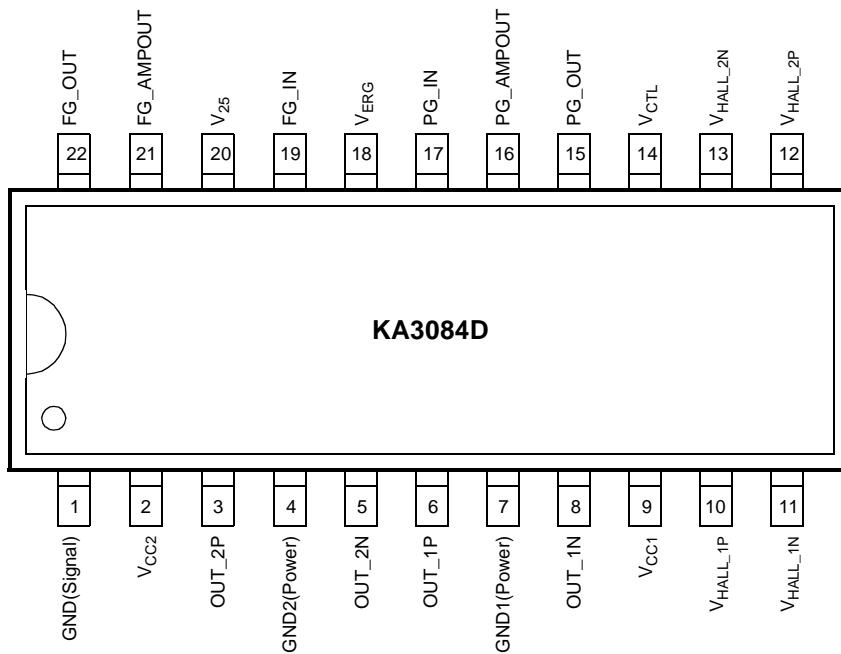
TARGET APPLICATIONS

- VCR drum motors

BLOCK DIAGRAM



PIN CONFIGURATIONS



PIN DESCRIPTION

Pin No.	Symbol	I/O	Description
1	GND (Signal)	–	Ground (Signal)
2	V _{CC2}	–	Power supply 2
3	OUT_2P	O	Output drive 2(P)
4	GND2 (Power)	–	Power ground 2
5	OUT_2N	O	Output drive 2(N)
6	OUT_1P	O	Power supply 1(P)
7	GND1 (Power)	–	Power ground 1
8	OUT_1N	O	Output drive 1(N)
9	V _{CC1}	–	Power supply 1
10	V _{HALL_1P}	I	Hall signal input 1P
11	V _{HALL_1N}	I	Hall signal input 1N
12	V _{HALL_2P}	I	Hall signal input 2P
13	V _{HALL_2N}	I	Hall signal input 2N
14	V _{CTL}	I	Voltage control (Motor speed control)
15	PG_OUT	O	Phase generator output
16	PG_AMPOUT	O	Phase generator amp. output
17	PG_IN	I	Phase generator input
18	V _{REG}	O	Regurated voltage
19	FG_IN	I	Frequency generator input
20	V ₂₅	I/O	Reference voltage
21	FG_AMPOUT	O	Frequency generator amp. output
22	FG_OUT	O	Frequency generator output

INTERNAL CIRCUIT

Description	Pin No.	Internal circuit
V_{CTL}	14	
Motor output	3, 5, 6, 8	
Hall input	10, 11, 12, 13	

INTERNAL CIRCUIT (Continued)

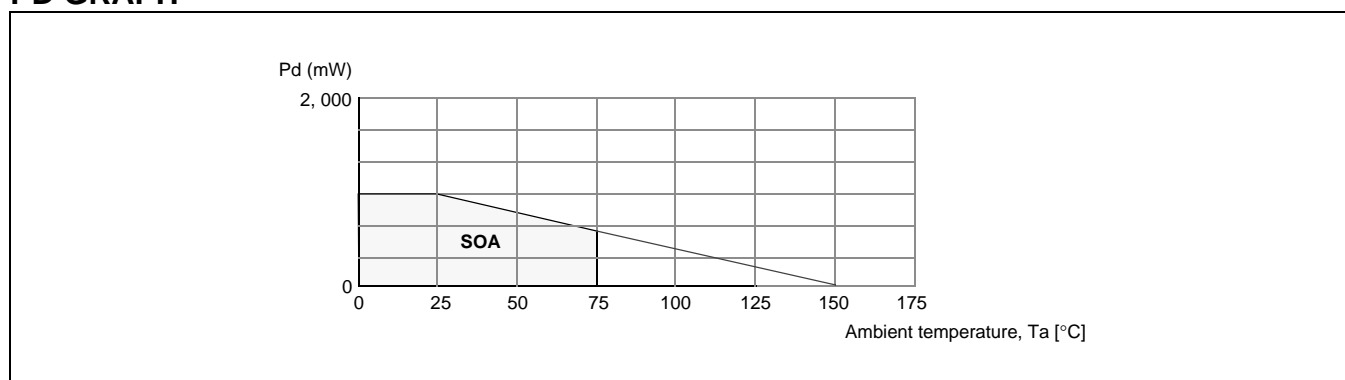
Description	Pin No.	Internal circuit
PG, FG amplifier	16, 17 19, 21	
PG, FG hysteresis amplifier	3, 5, 6, 8	

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Characteristics	Symbol	Value	Unit	Remark
Supply voltage	V_{CCmax}	18	V	–
Maxium output current	I_{Omax}	1.0 ^{note1}	A	–
V_{REG} output current	I_{REGmax}	30	mA	–
Power dissipation	P_d	1 ^{note2}	W	No heat sink
Operating temperature	T_{OPR}	–25 ~ +75	°C	–
Storage temperature	T_{STG}	–45 ~ +125	°C	–

NOTE:

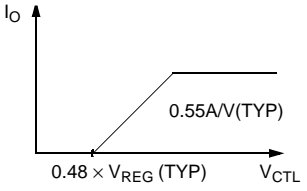
- Duty 1 / 100, pulse width 500 μ s
- 1) When mounted on glass epoxy PCB (76.2 × 114 × 1.57mm)
- 2) Power dissipation reduces 8.0mW / °C for using above Ta=25°C. (Without heat-sink)
- 3) Do not exceed Pd and SOA.

PD GRAPH**RECOMMENED OPERATING CONDITIONS**

Characteristics	Symbol	Min.	Typ.	Max	Unit
Operating supply voltage	V_{CC}	8	12	16	V

ELECTRICAL CHARACTERISTICS

(Ta=25°C, V_{CC}=12V, unless otherwise specified)

Characteristic	Symbol	Test conditions	Spec.			Unit
			Min.	Typ.	max.	
FULL CIRCUIT						
Quiescent current	I _Q	V _{CC} =12V	–	8.5	13	mA
VOLTAGE REGULATOR						
Regulated voltage	V _{REG}	V _{CC} =12V	4.6	5.0	5.4	V
Regulated voltage	V _{REG}	V _{CC} =12V, I _{REG} =–20mA	–	8.5	13	mA
HALL INPUT						
Hall minimum input level ^{note}	V _{INH}	–	50	–	–	mVp-p
Hall bias current	I _{BH}	V _{CTL} =2.0V, Hall=2.5V	–	0.25	2.0	μA
OUTPUT DIRVE						
Output saturation voltage (Upper)	V _{S_U}	V _{CTL} =4.5V	–	1.3	2.0	V
Output saturation voltage (Lower)	V _{S_L}	V _{CTL} =4.5V	–	2.0	2.0	V
Output current A	I _{OUT A}	V _{HALL_1P} =2.6V V _{HALL_1N} =2.4V, V _{CTL} =3.5V	500	700	900	mA
Output current B	I _{OUT B}	V _{HALL_2P} =2.6V V _{HALL_2N} =2.4V, V _{CTL} =2.5V	500	700	900	mA
VOLTAGE CONTROL						
V _{CTL} reference voltage ^{note}	V ₂₅	0.48 × V _{REG}	2.0	2.3	2.5	V
V _{CTL} injput range ^{note}	V _{CTL}	–	0	–	V _{REG}	V
V _{CTL} offset range	V _{OFF}	V _{CTL} =0 ~ V _{CTL}	–150	0	+150	mV
V _{CTL} input bias current	I _{VCTL}	V _{CTL} =2.5V	–	1.0	6.0	μA
Voltage control gain	G _M	V _{CTL} =2.8V, 3.3V ΔI _O / ΔV _{CTL} V _{HALL_1P} =2.6V, V _{HALL_1N} =2.4V 	0.38	0.55	0.64	A / V

NOTE: The note in the chart means items calculated and approved in design not the items proven by actual test result.

ELECTRICAL CHARACTERISTICS (Continued)(Ta=25°C, V_{CC}=12V, unless otherwise specified)

Characteristic	Symbol	Test conditions	Min.	Typ.	max.	Unit
FULL CIRCUIT						
Shutdown temperature ^{note}	TSD	–	130	160	–	°C
Temperature hysteresis ^{note}	T _{HYS}	–	–	30	–	°C
FG / PG AMP						
Input offset voltage	V _{OFS}	–	–	0	± 8	mV
Input current	I _{AMP_IN}	V _{IN} =2.5V	–	0.2	2.0	μA
Open loop gain ^{note}	G _A	V _{CC} =12V, Signal=500Hz	65	70	–	dB
Output high voltage	V _{OHA}	V _{IN} =2.0V	V _{REG} –1.48	V _{REG} –0.74	–	V
Output low voltage	V _{OLA}	V _{IN} =2.7	–	0.85	1.45	V
COMPARATOR (HYSTERESIS)						
Hysteresis level	V _{HYS}	–	±130	±165	±200	mV
Output low voltage	V _{OLHYS}	V _{IN} =2.0V	–	0.12	0.32	V
Output pull-up resistance	V _{BHYS}	–	7.0	10	13	kΩ

NOTE: The note in the chart means items calculated and approved in design not the items proven by actual test result.

APPLICATION INFORMATIONS

1. A DIAGRAM SUMMARIZING THE ENTIRE SYSTEM

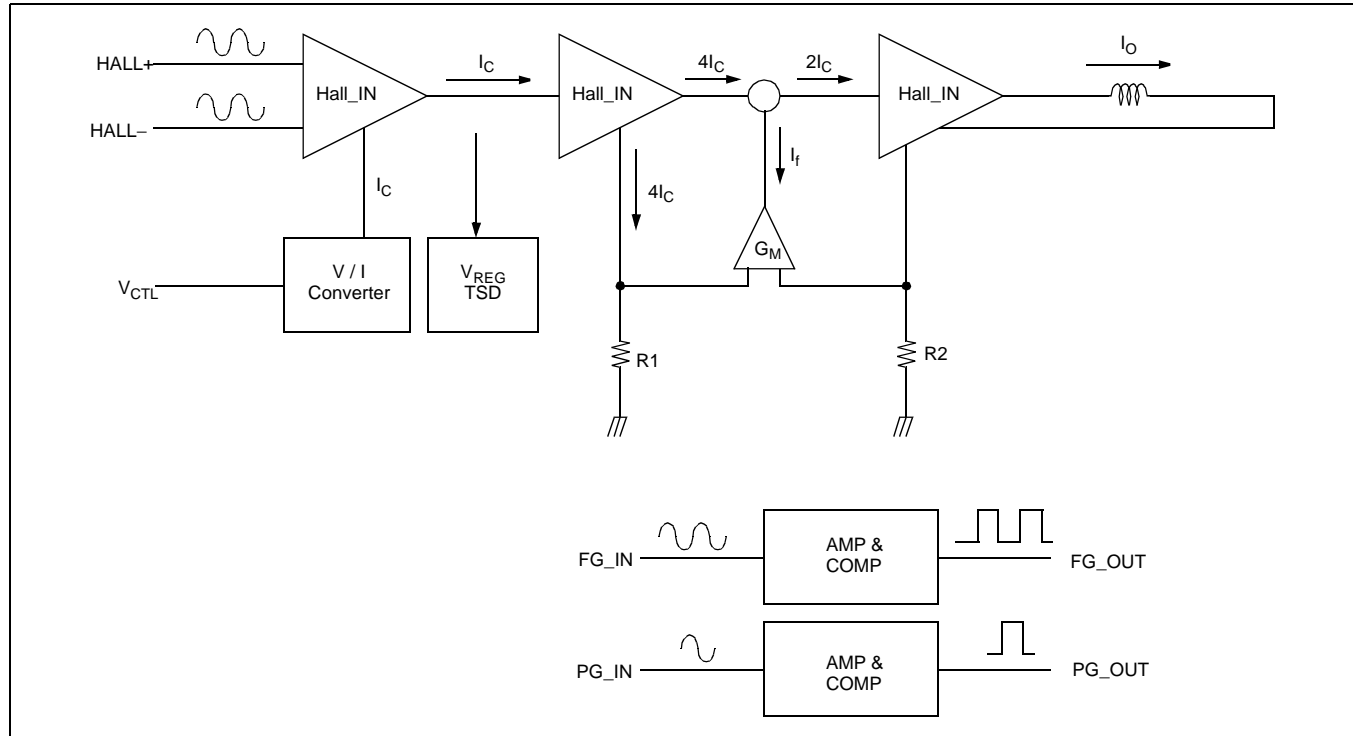


Figure 1.

Figure 1 is a diagram of the KA3084D concept. Essentially, it shows that it turns on or off depending on the signal of the hall sensor used for sensing the rotor position of motor.

The AMP, G_M (Feedback) and output blocks are circuits used to determine current gain of KA3084D.

Furthermore, Hall_IN represents the hall signal switch.

It supplies stable bias to each V_{REG} block. The TSD block is a thermal shutdown circuit that protects the IC during an high temperature inside the IC.

Moreover, FG. and PG. blocks output individual signals generated in the motor using the amplifier and comparator.

These signals transmit motor speed and position data to controller of external servo etc. for their control.

2. CURRENT CONTROL

Figure 2 simplifies figure 1 even more.

The supplied I_O current drives the motor and the I_C current controls the motor speed.

At this time, I_{CTL} controls the magnitude of I_O . Moreover, A_T is the system's entire current gain.

Figure 3 is a graph of I_{CTL} vs. I_O .

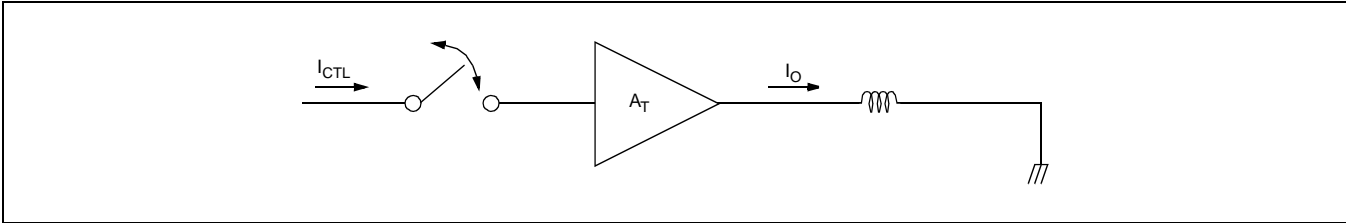


Figure 2.

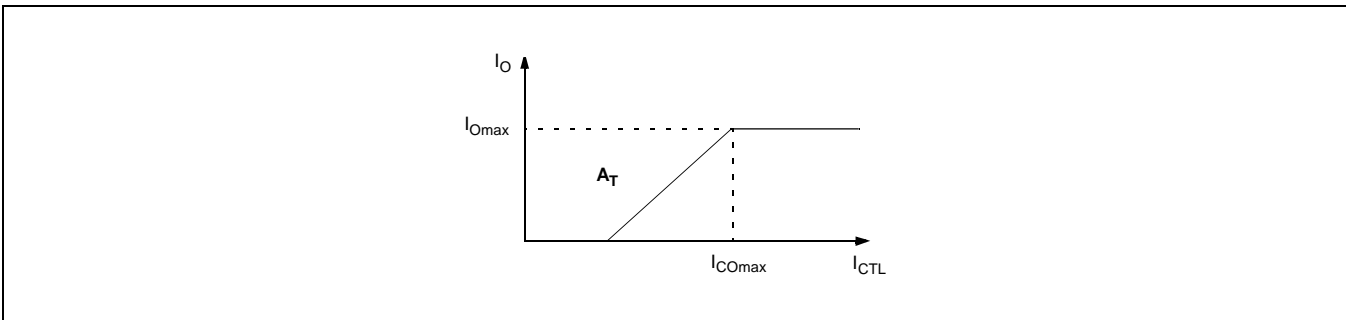


Figure 3.

3. VOLTAGE CONTROL

Even though KA3084D command uses I_c to control the magnitude of I_o , it can also use voltage. KA3084D mainly uses voltage control and optionally uses current control.

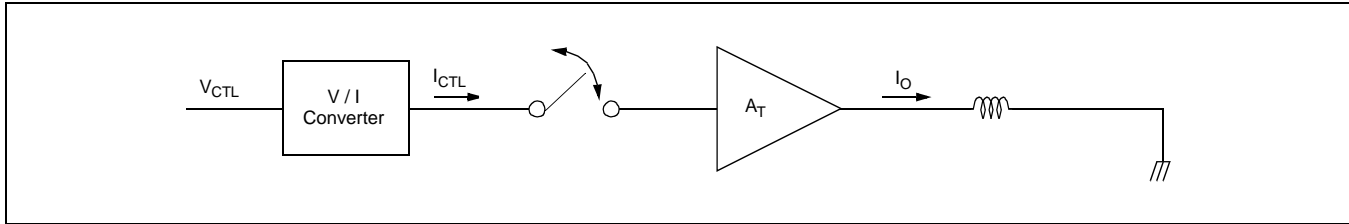


Figure 4.

Figure 4 shows the principle of the voltage control.

The V_{CTL} is the motor speed control voltage, and the I_{CTL} is V_{CTL} that was converted to current through the V / I converter.

Figure 5 shows the graph of V_{CTL} vs. I_o .

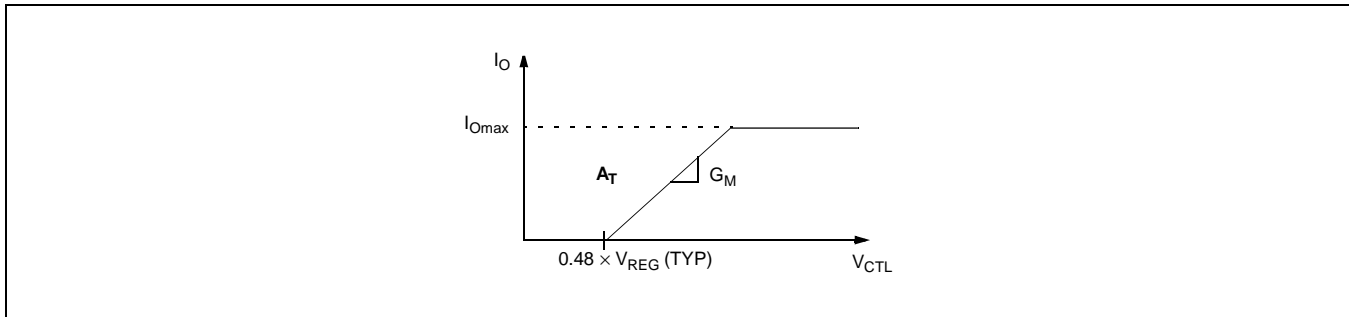
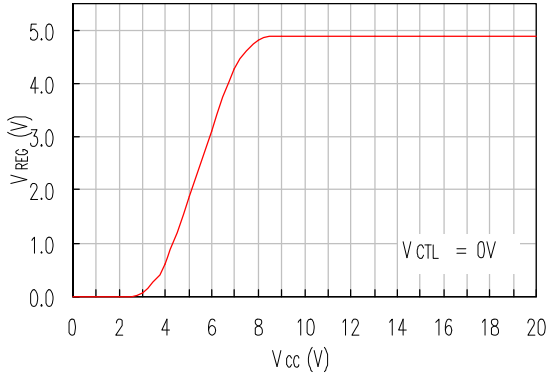
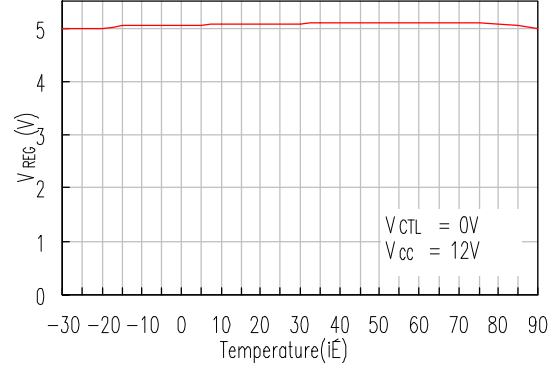


Figure 5.

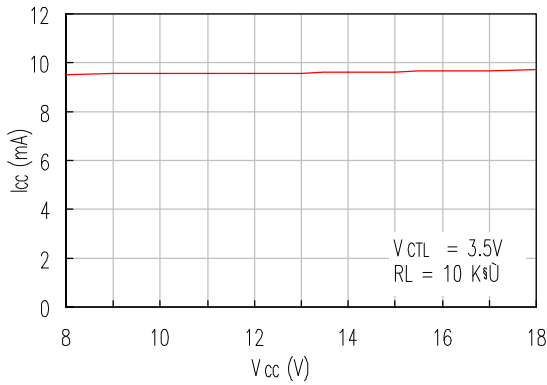
CHARACTERISTIC GRAPHS



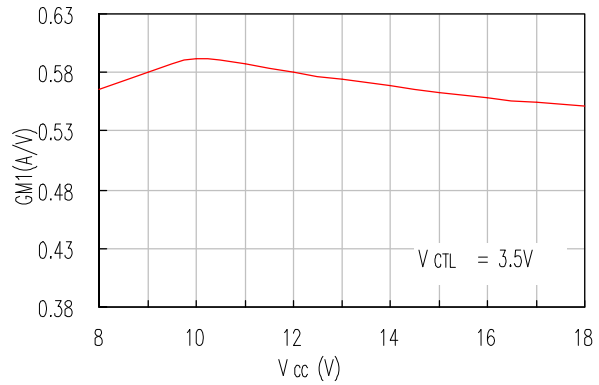
1. V_{CC} vs V_{REG}



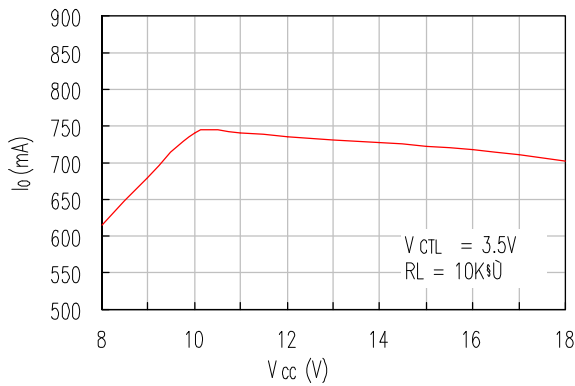
2. Temp. vs V_{REG}



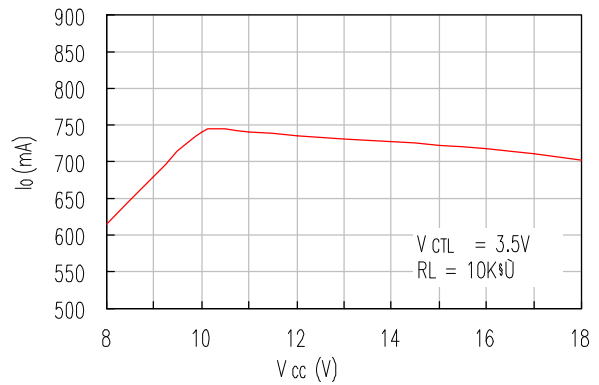
3. V_{CC} vs I_{CC}



4. V_{CC} vs $GM1$

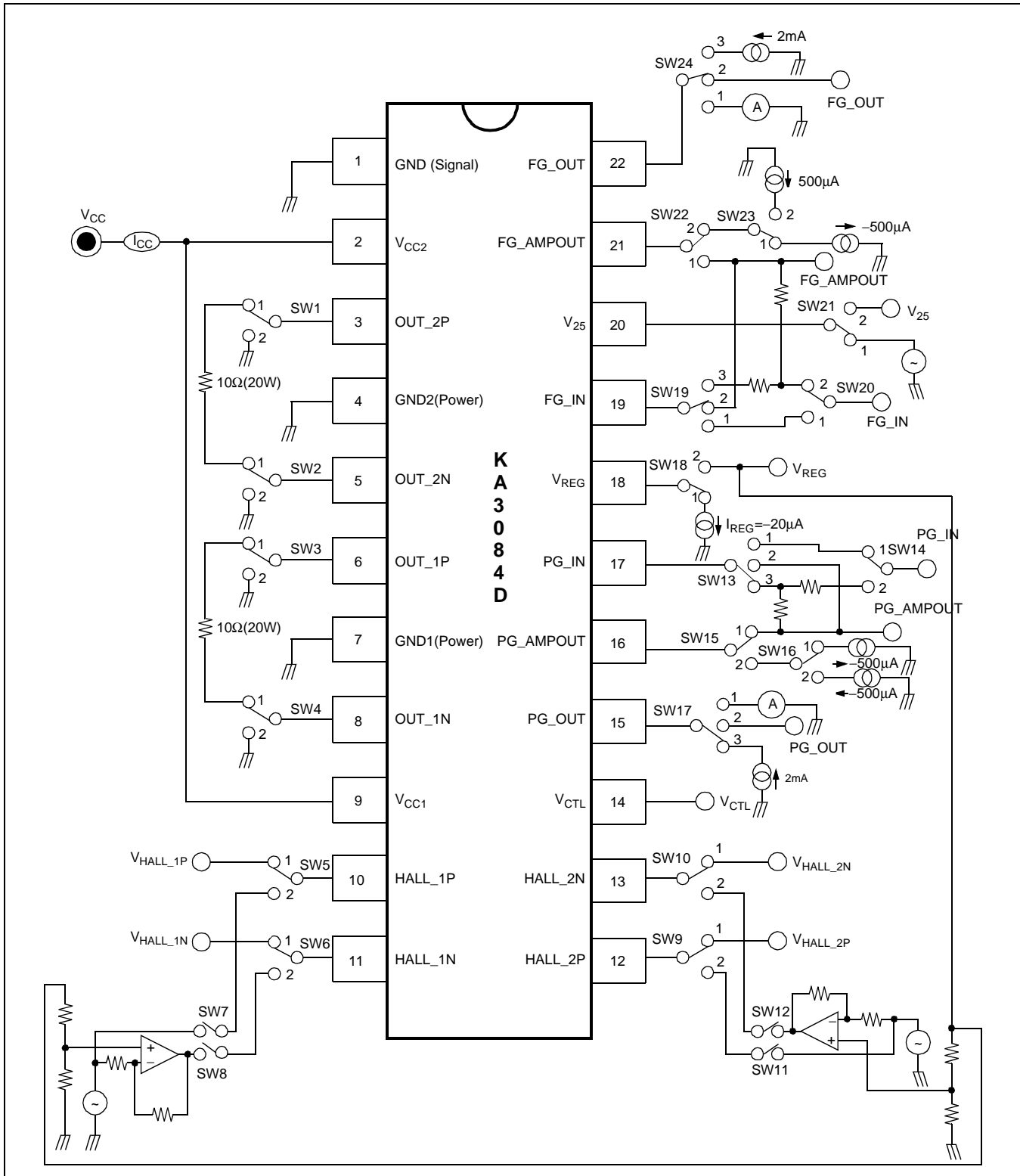


5. V_{CC} vs I_{OA}

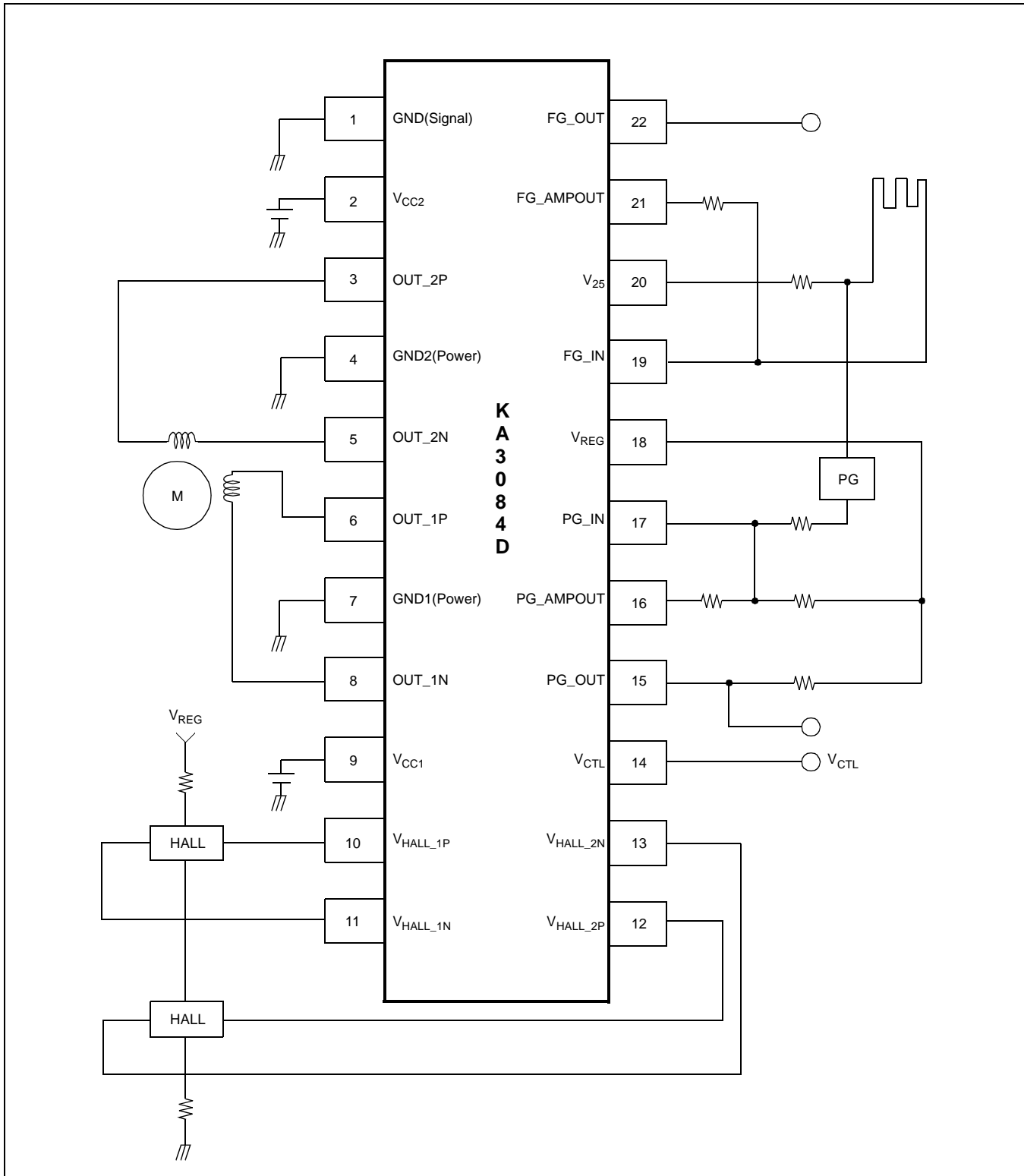


6. V_{CC} vs I_{OB}

TEST CIRCUIT



APPLICATION CIRCUIT



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