FAN8486D (KA3086D)

2-Phase BLDC Motor Driver

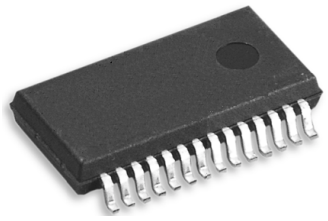
Features

- 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.

Descripiton

The FAN8486D is a monolithic integrated circuit, and it is suitable for drum motor driver of VCR system.

28-SSOP-300SG



Typical Applications

- Video cassette recorder (VCR) cylinder (drum) motor
- Other 2-phase BLDC motor

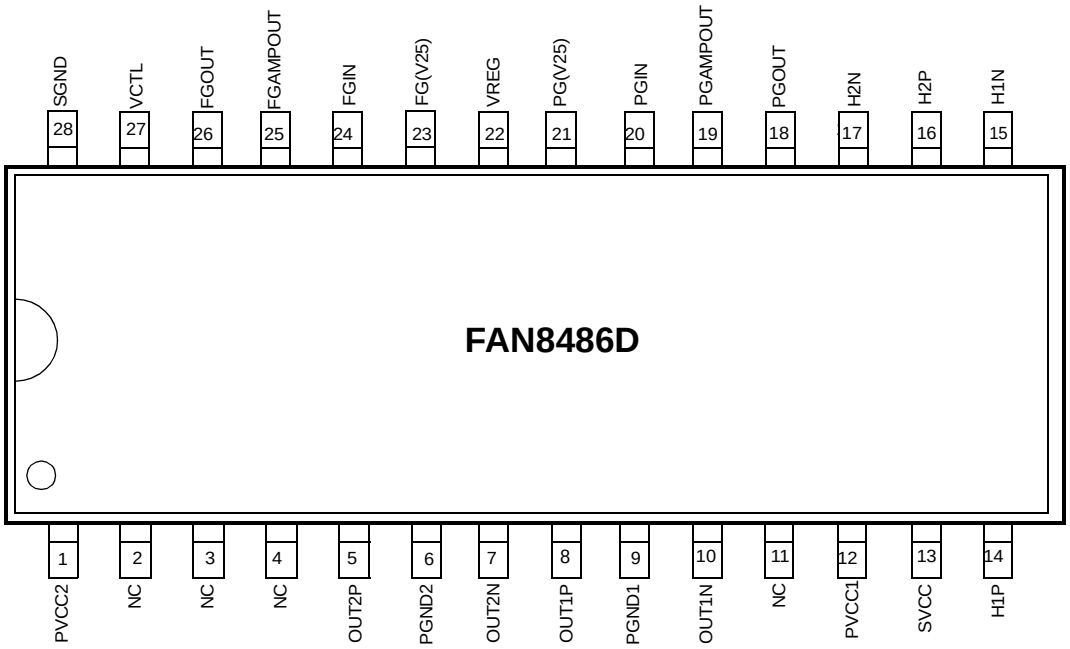
Ordering Information

Device	Package	Operating Temp.
FAN8486D	28-SSOP-300SG	–25°C ~ +75°C
FAN8486DTF	28-SSOP-300SG	–25°C ~ +75°C

Rev. 1.0.1
February. 2000.

©2000 Fairchild Semiconductor International

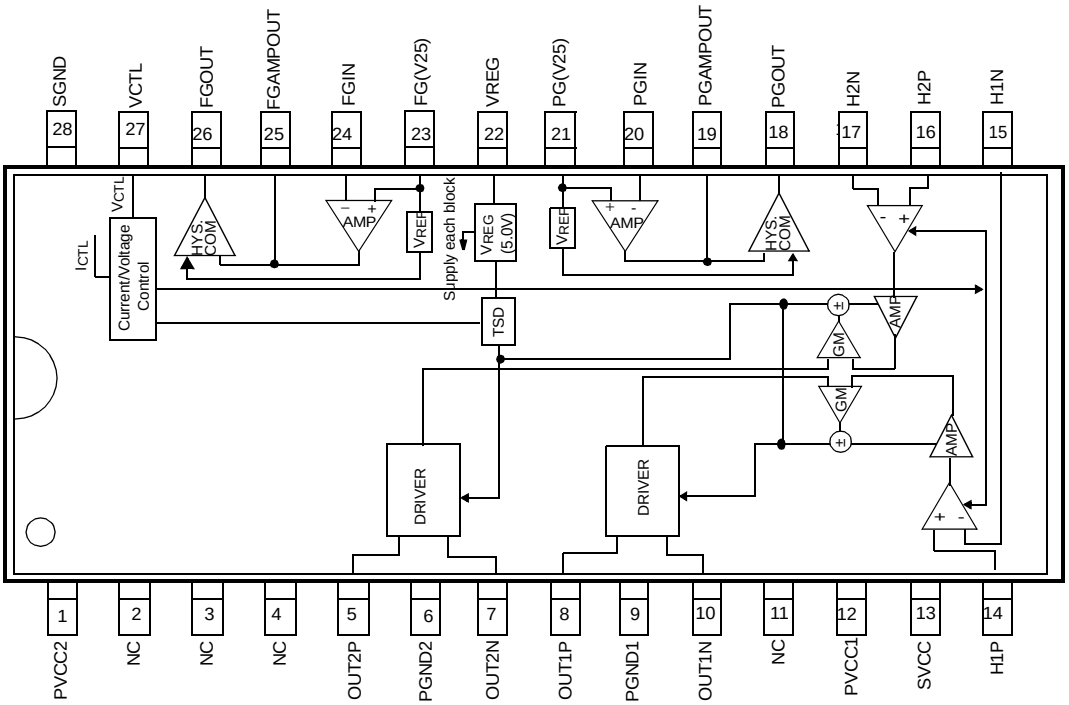
Pin Assignments



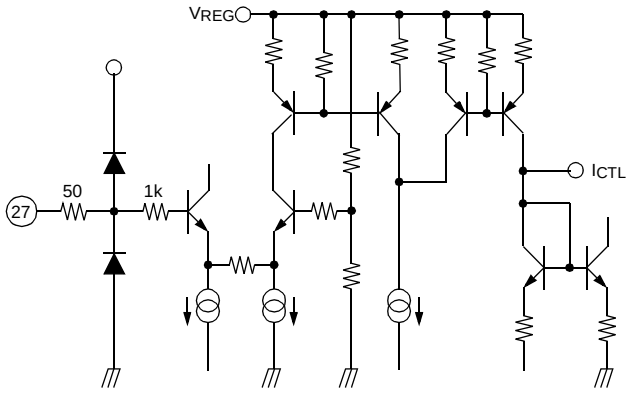
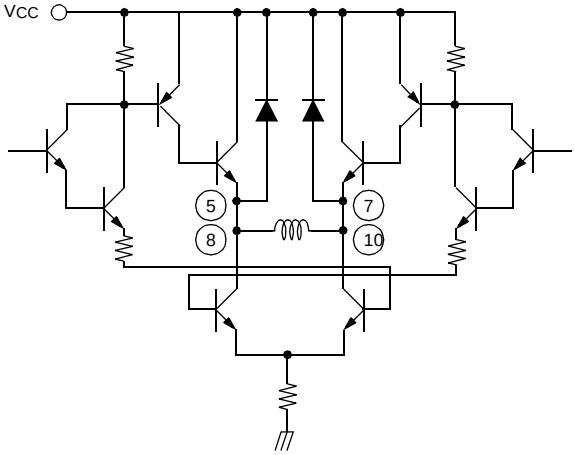
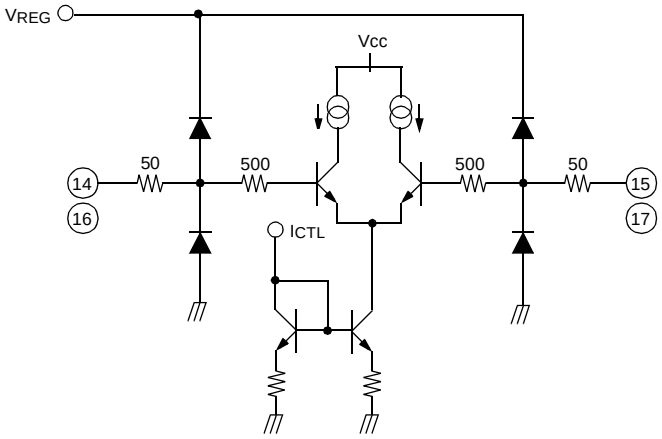
Pin Definitions

Pine Number	Pin Name	I/O	Pin Function Description
1	PVCC2	-	Power supply voltage2
2	NC	-	-
3	NC	-	-
4	NC	-	-
5	OUT2P	O	Output drive 2(P)
6	PGND2	O	Power ground 2
7	OUT2N	O	Output drive 2(N)
8	OUT1P	O	Output drive 1(P)
9	PGND1	O	Power ground 1
10	OUT1N	-	Output drive 1(N)
11	NC	-	-
12	PVCC1	-	Power supply voltage1
13	SVCC	-	Signal supply voltage
14	H1P	I	Hall signal input 1P
15	H1N	I	Hall signal input 1N
16	H2P	I	Hall signal input 2P
17	H2N	I	Hall signal input 2N
18	PGOUT	O	Phase generate output
19	PGAMPOUT	O	Phase generate amp. output
20	PGIN	I	Phase generate input
21	PG(V25)	-	Reference voltage for PG
22	VREG	-	Regulated voltage
23	FG(V25)	-	Reference voltage for FG
24	FGIN	I	Frequency generate input
25	FGAMPOUT	O	Frequency generate amp. output
26	FGOUT	O	Frequency generate output
27	VCTL	I	Voltage control(motor speed control)
28	SGND	-	Signal ground

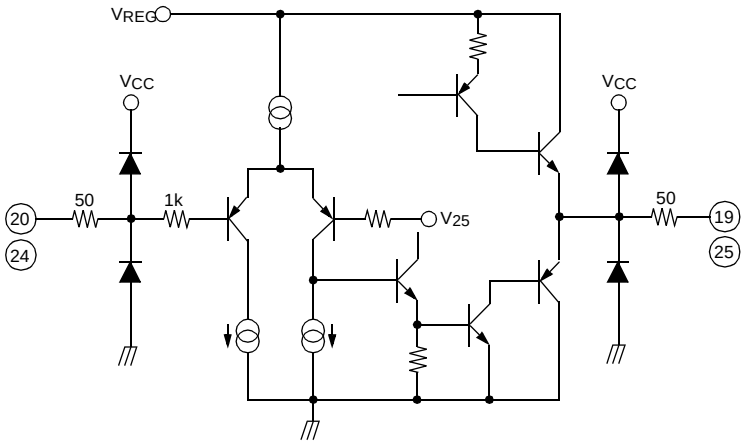
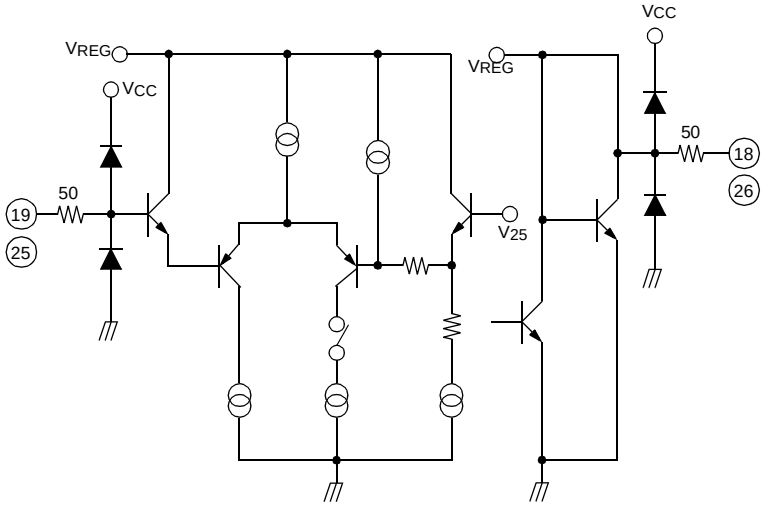
Internal Block Diagram



Equivalent Circuits

Description	Pin No.	Internal circuit
V_{CTL}	27	
Motor output	5,7,8,10	
Hall input	14,15,16,17	

Equivalent Circuits (Continued)

Description	Pin No.	Internal circuit
PG, FG amplifier	19,20 24,25	
PG, FG hysteresis amplifier	18,19,25,26	

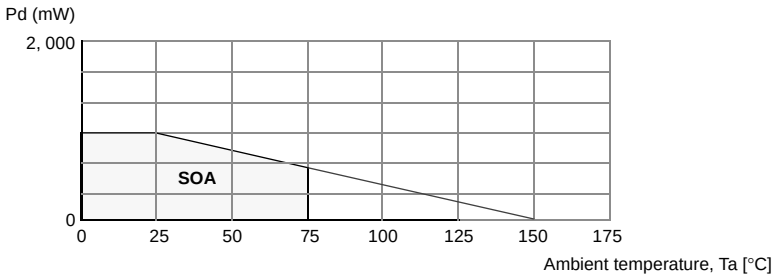
Absolute Maximum Ratings (Ta=25°C)

Parameter	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	-

Notes:

1. Duty 1 / 100, pulse width 500μs
2. 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(Safe Operating Area).

Power Dissipation Curve

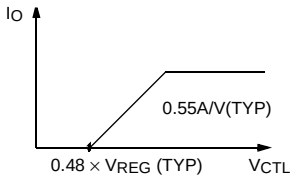


Recommened Operating Conditions (Ta=25°C)

Parameter	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)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
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	4.6	5.0	5.4	V
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_{SU}	V_{CTL}=4.5V	-	1.3	2.0	V
Output saturation voltage (Lower)	V_{SL}	V_{CTL}=4.5V	-	2.0	2.0	V
Output current A	I_{OUTA}	V_{H1P}=2.6V V_{HALL_1N}=2.4V, V_{CTL}=3.5V	500	700	900	mA
Output current B	I_{OUTB}	V_{H2P}=2.6V V_{H2N}=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_{H1P}=2.6V, V_{H1N}=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)

Parameter	Symbol	Condition	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

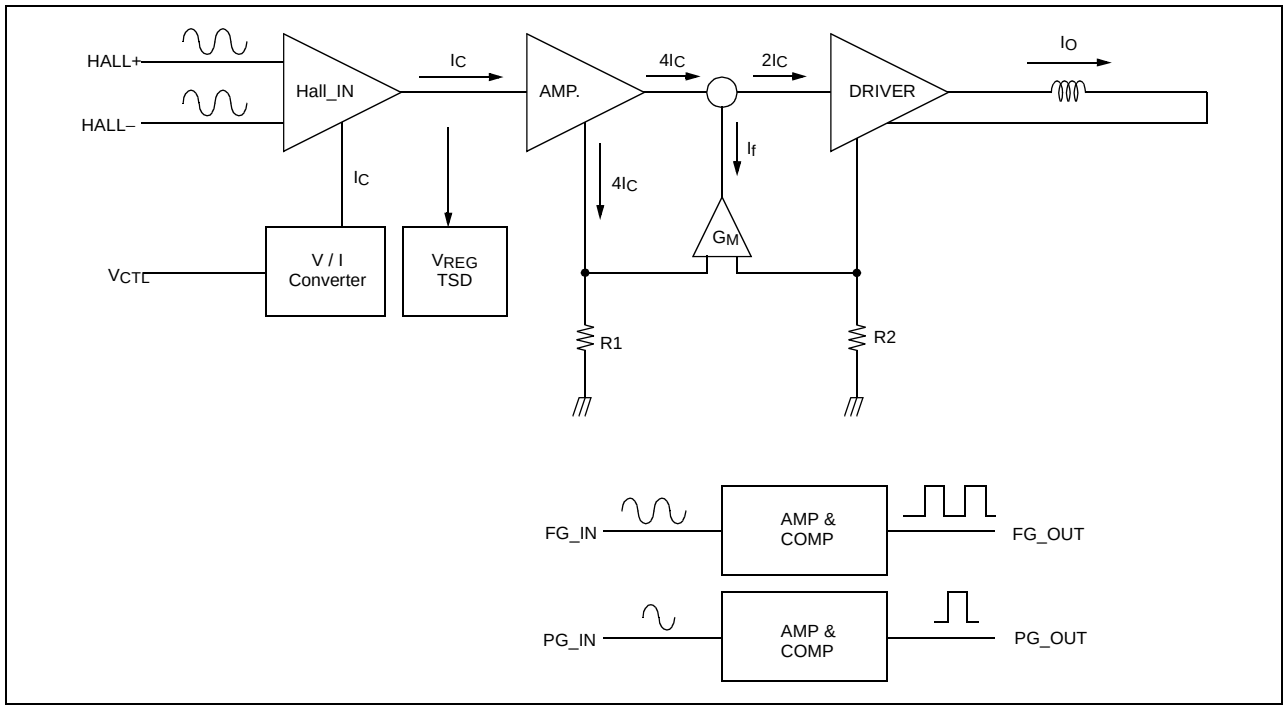


Figure 1.

Figure 1 is a conceptual diagram of the FAN8486D. 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 FAN8486D.

Furthermore, HallIN 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.

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

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

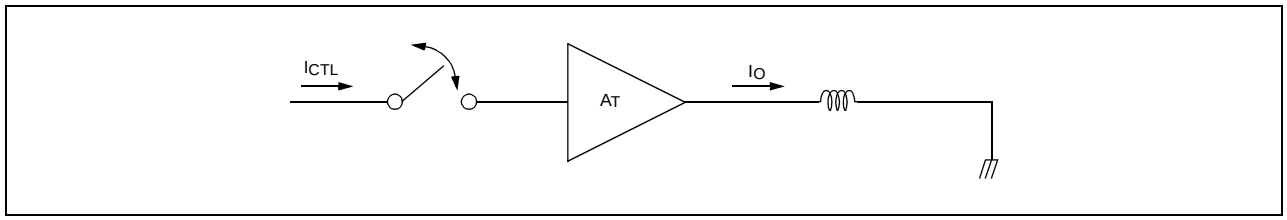


Figure 2.

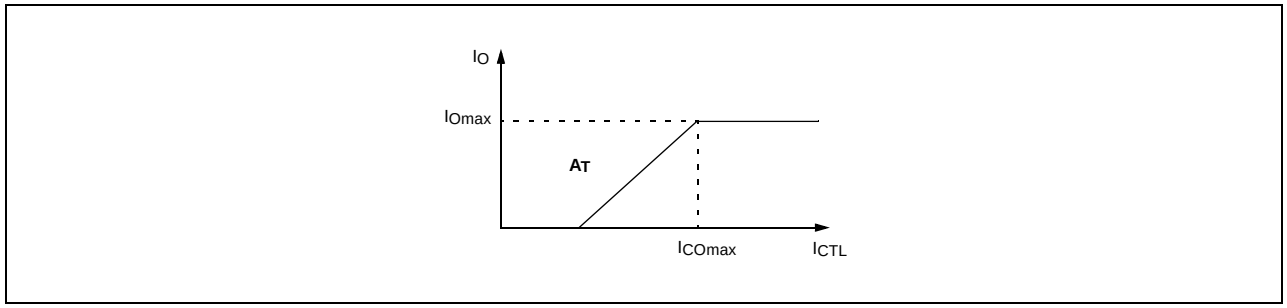


Figure 3.

3. Voltage Control

Even though FAN8486D command uses Ic to control the magnitude of I_O, it can also use voltage. FAN8486D mainly uses voltage control and has option to use current control.

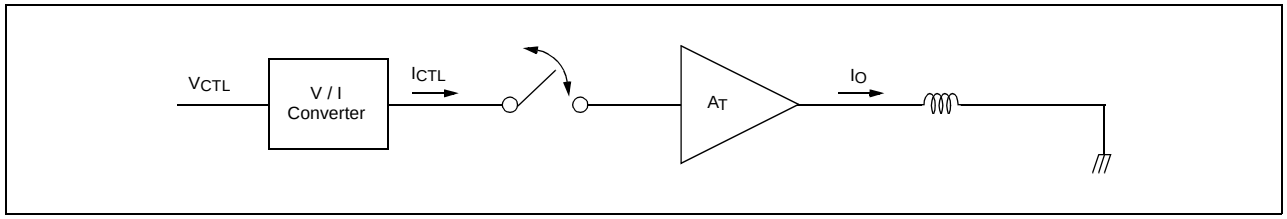


Figure 4.

Figure 4 shows the principle of the voltage control.

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

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

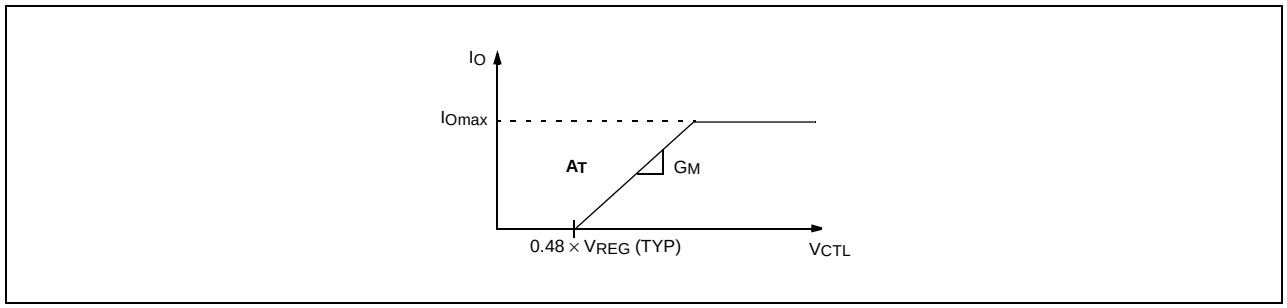
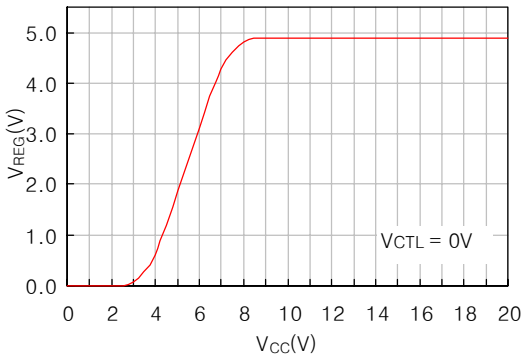
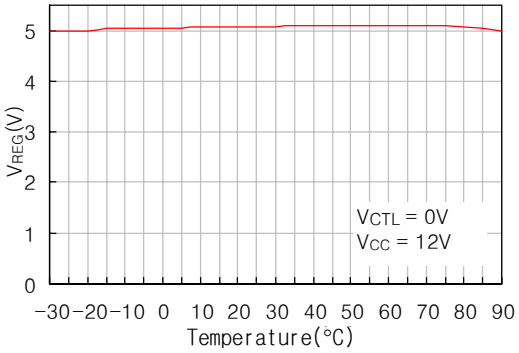


Figure 5.

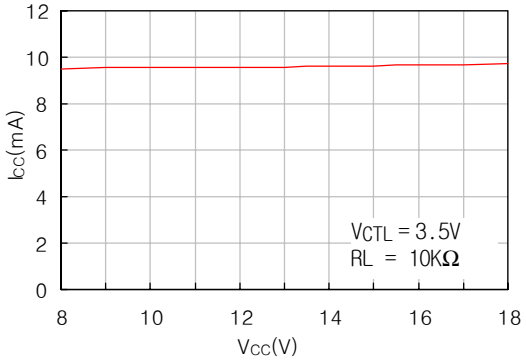
Typical Performance Characteristics



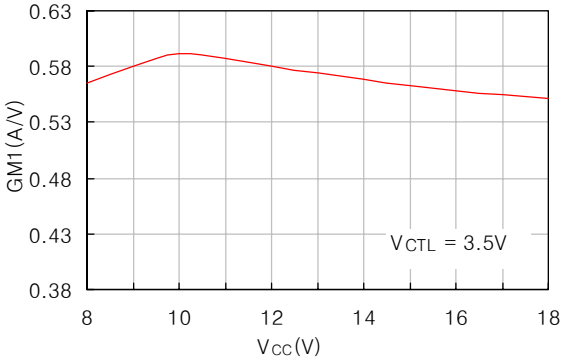
1.VCC vs VREG



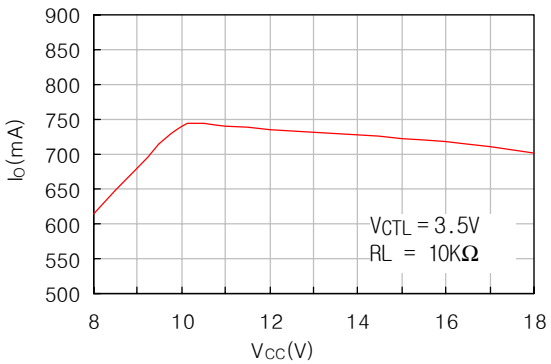
2.Temp. vs VREG



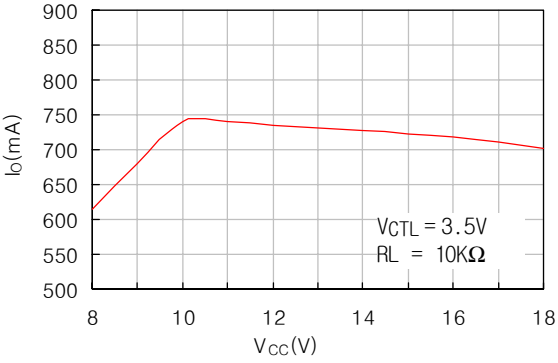
3.VCC vs ICC



4.VCC vs GM1

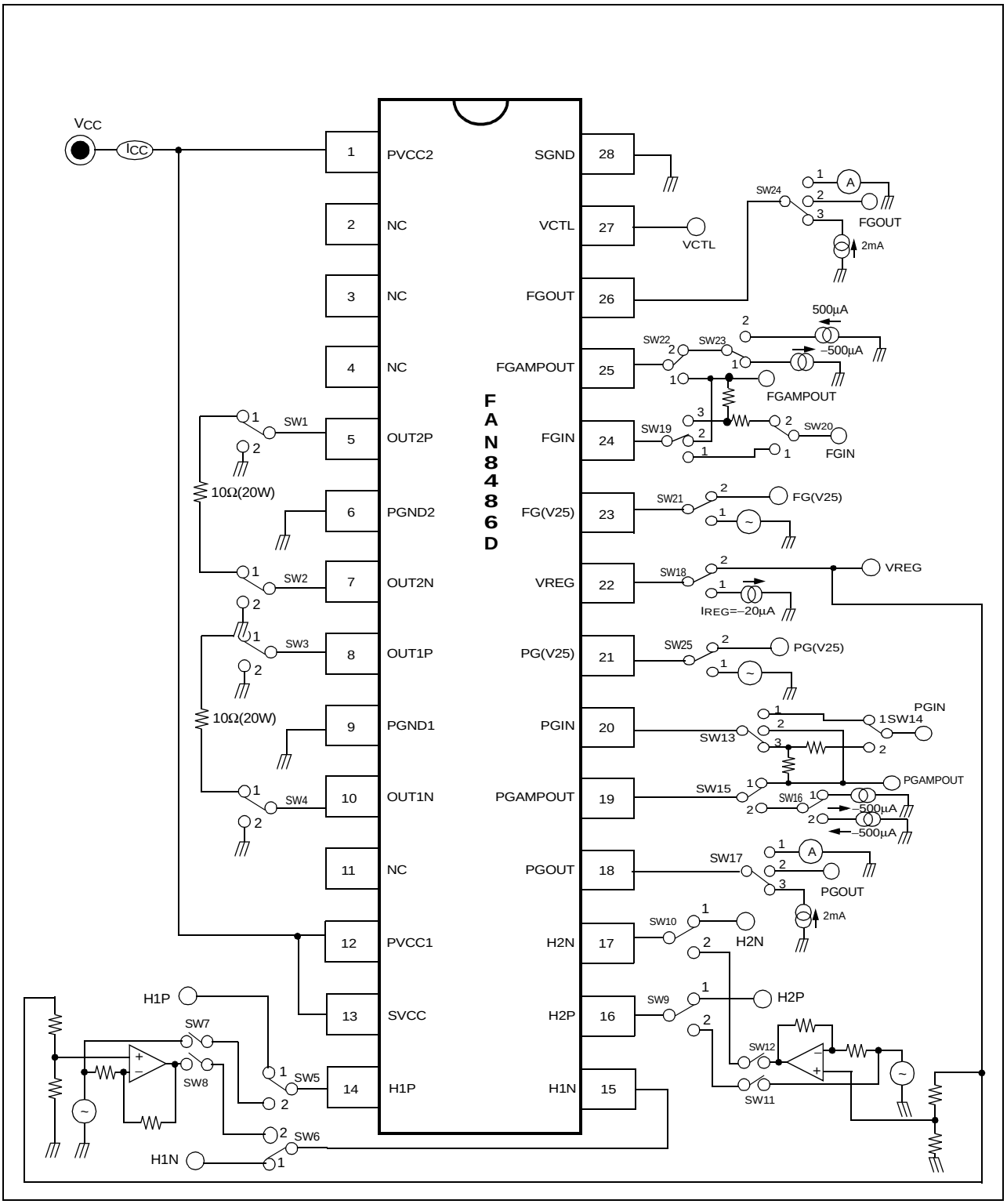


5.VCC vs IOA

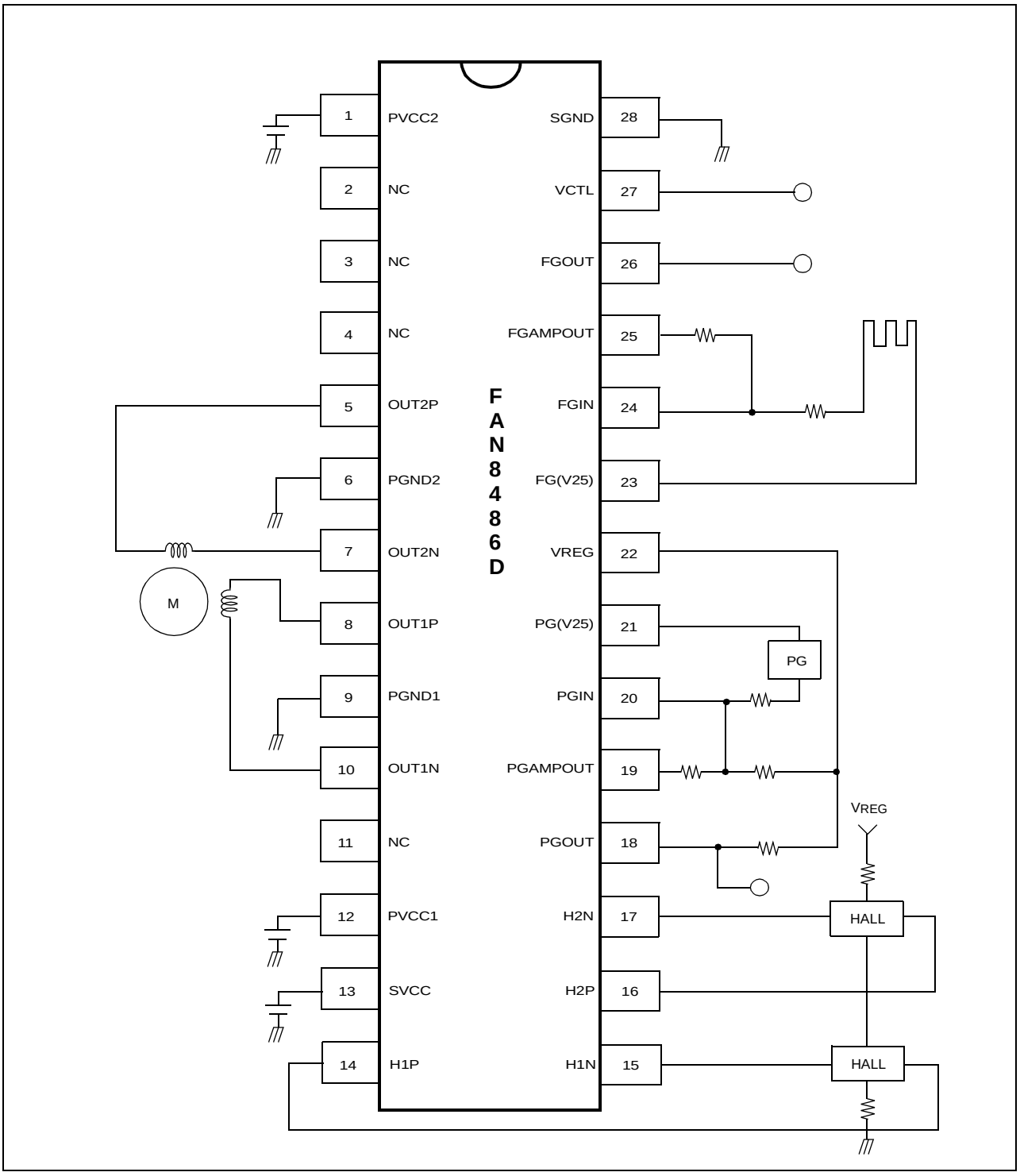


6.VCC vs IOB

Test Circuits



Typical Application Circuits



DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR INTERNATIONAL. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

12/1/00 0.0m 001
Stock#DSxxxxxxxx
© 2000 Fairchild Semiconductor International