FAN8460MTC

Single Phase Full Wave BLDC Motor Driver with Variable Speed Control

Features

- Output direct PWM drive for speed control
- Selectable PWM frequency : internal or external
- Versatile speed control inputs: A thermistor or PWM input.
- A wide range of operating voltage: 3.2V to 28V
- Locked rotor protection with open collector output and auto retry
- Open collector hall output for speed feedback
- Adjustable minimum speed
- Thermistor disconnection protection
- TSD protection.

Description

The FAN8460MTC is a single phase BLDC motor driver with variable speed control using output direct PWM method and it's typical application is DC cooling fans with wide range of supply voltage(5/12/24V). This approach eliminates the need for external pass devices such as BJT, MOSFET. This solution also offers other advantages over commonly used external PWM turning fan's power on and off at fixed frequency. The external PWM increas stress on fan and needs level translation in speed and alarm output because these outputs share the fan's negative terminal.
In case of CPU cooling, digital controller can give speed control command with PWM signal adjusting the duty. If a system has no digital controller, the NTC thermistor input mechanism can control fan speed with local or ambient temperature sensing.These two kinds of input schemes can meet various system requirements and applications.

14-TSSOP

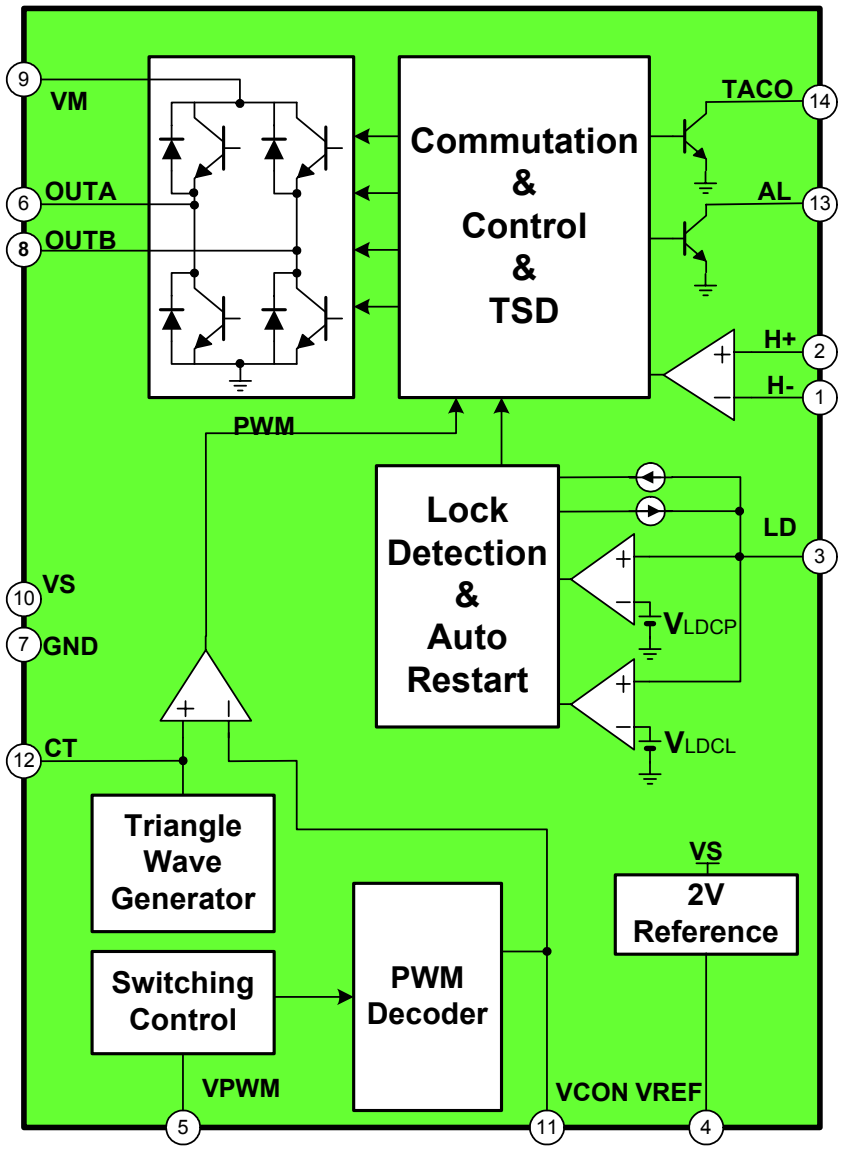
Typical Applications

- CPU Cooling Fans
- Instrumentation Fans
- Desktop PC Fans

Ordering Information

Device	Package	Operating Temp.
FAN8460MTC	14-TSSOP	–30°C ~ 90°C
FAN8460MTCX	14-TSSOP	–30°C ~ 90°C

Block Diagram



Pin Definitions

Pin Number	Pin Name	I/O	Pin Function Description	Remark
1	H–	A	Hall input -	
2	H+	A	Hall input +	-
3	LD	A	Sawtooth wave generator for lock detector and automatic restart	-
4	VREF	A	Reference voltage output	
5	VPWM	I	PWM input for speed control	-
6	OUTA	A	Motor output A	-
7	GND	P	Ground	-
8	OUTB	A	Motor output B	-
9	VM	P	Power supply for output stage	-
10	VS	P	Power supply for signal block	
11	VCON	A	Speed control signal	
12	CT	A	Triangle waveform out	-
13	AL	O	Alarm output	Open collector
14	TACO	O	Speed output	Open collector

Absolute Maximum Ratings (Ta = 25°C)

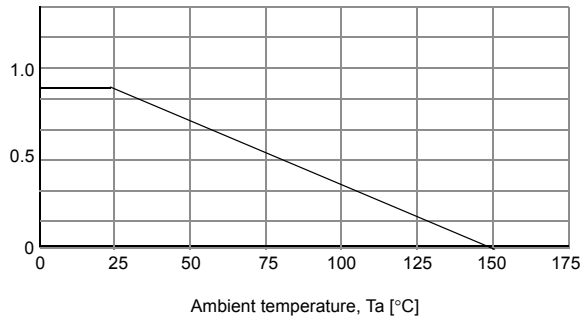
Parameter	Symbol	Value	Unit
Maximum power supply voltage	VS_{MAX}, VM_{MAX}	32	V
Thermal resistance	Rja	143	°C/W
Maximum power dissipation	P_{DMAX}	870	mW
Maximum output voltage	V_{OMAX}	36	V
Maximum output current	I_{OMAX}	0.8[note1]	A
Maximum Taco/Alarm output current	$I_{TACO/AL}$	5	mA
Taco/Alarm output sustain voltage	$V_{TACO/AL}$	36	V
Hall output withstanding voltage	V_{HO}	36	V
VPWM Input voltage	V_{VPWM}	-0.3~ VS	V
Operating temperature	T_{OPR}	–30 ~ 90	°C
Storage temperature	T_{STG}	–55 ~ 150	°C

note 1: Should not exceed P_D or ASO value.

Recommended Operating Conditions (Ta = 25°C)

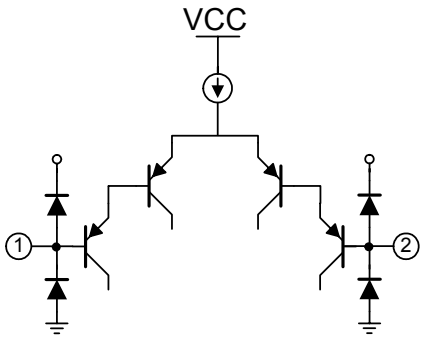
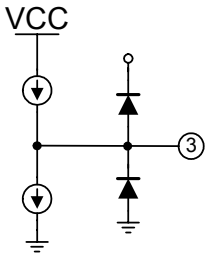
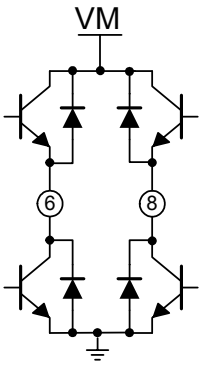
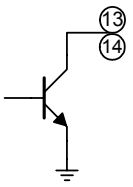
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage for signal block	VS	3.2	–	28	V
Supply voltage for output stage	VM	3.2	–	28	V

Power Dissipation Curve

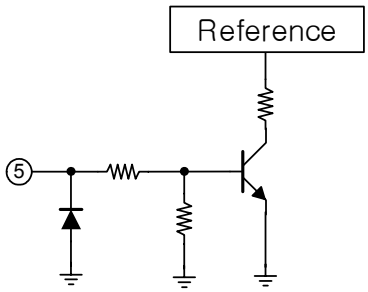
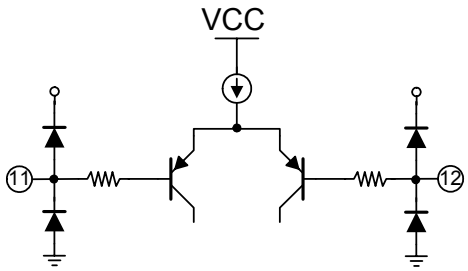


PCB condition: When mounted on 76.2mm × 114mm × 1.57mm PCB (glass epoxy material).

Equivalent Circuits

Description	Pin No.	Internal Circuit
Hall input	1 , 2	
LD	3	
Output	6 , 8	
AL/TACO	13 , 14	

Equivalent Circuits

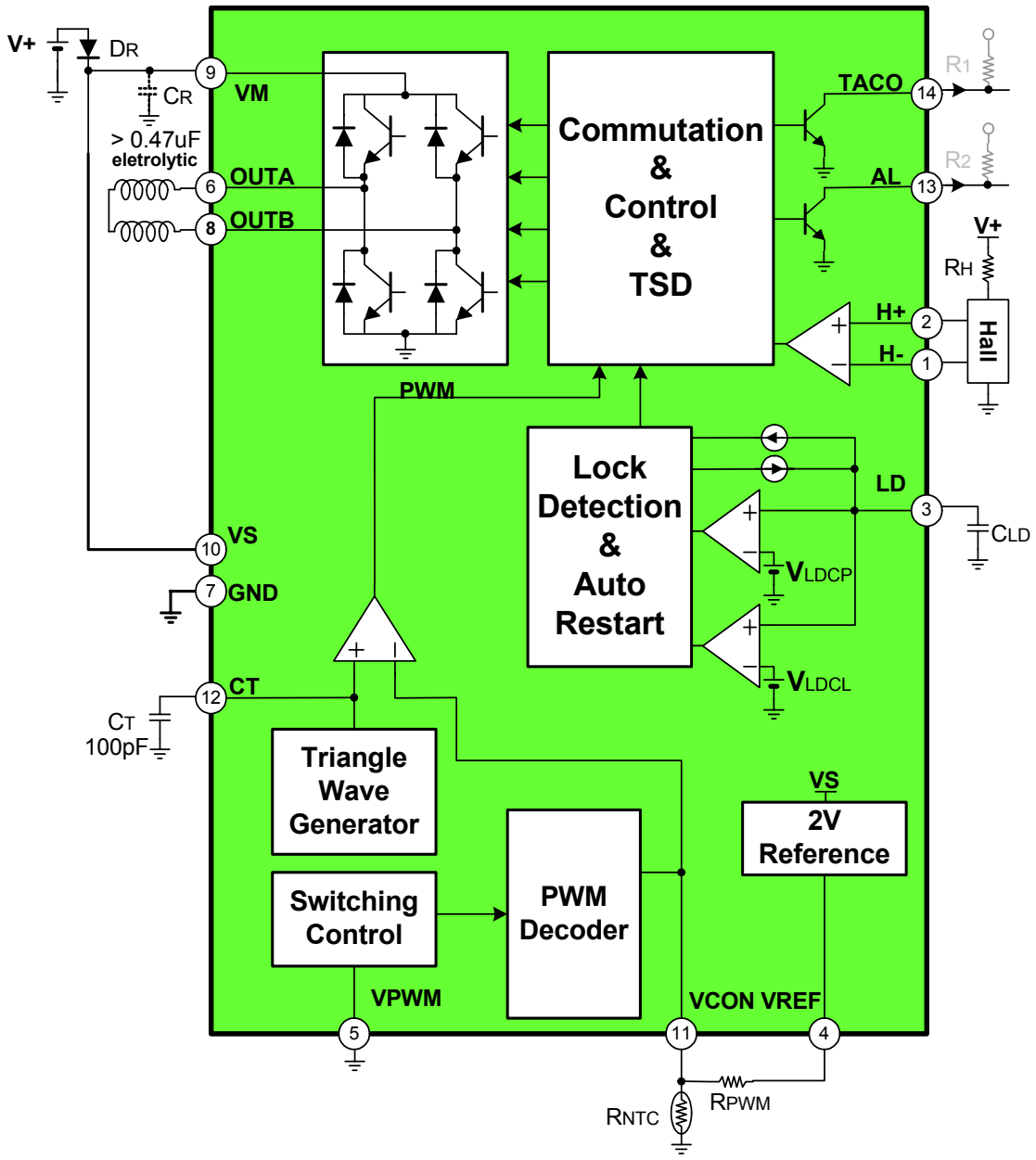
Description	Pin No.	Internal Circuit
VPWM	5	
VCON/CT	11/12	

FAN8460MTC Electrical Characteristics

(Ta = 25°C, V_S = 12V unless otherwise specified)

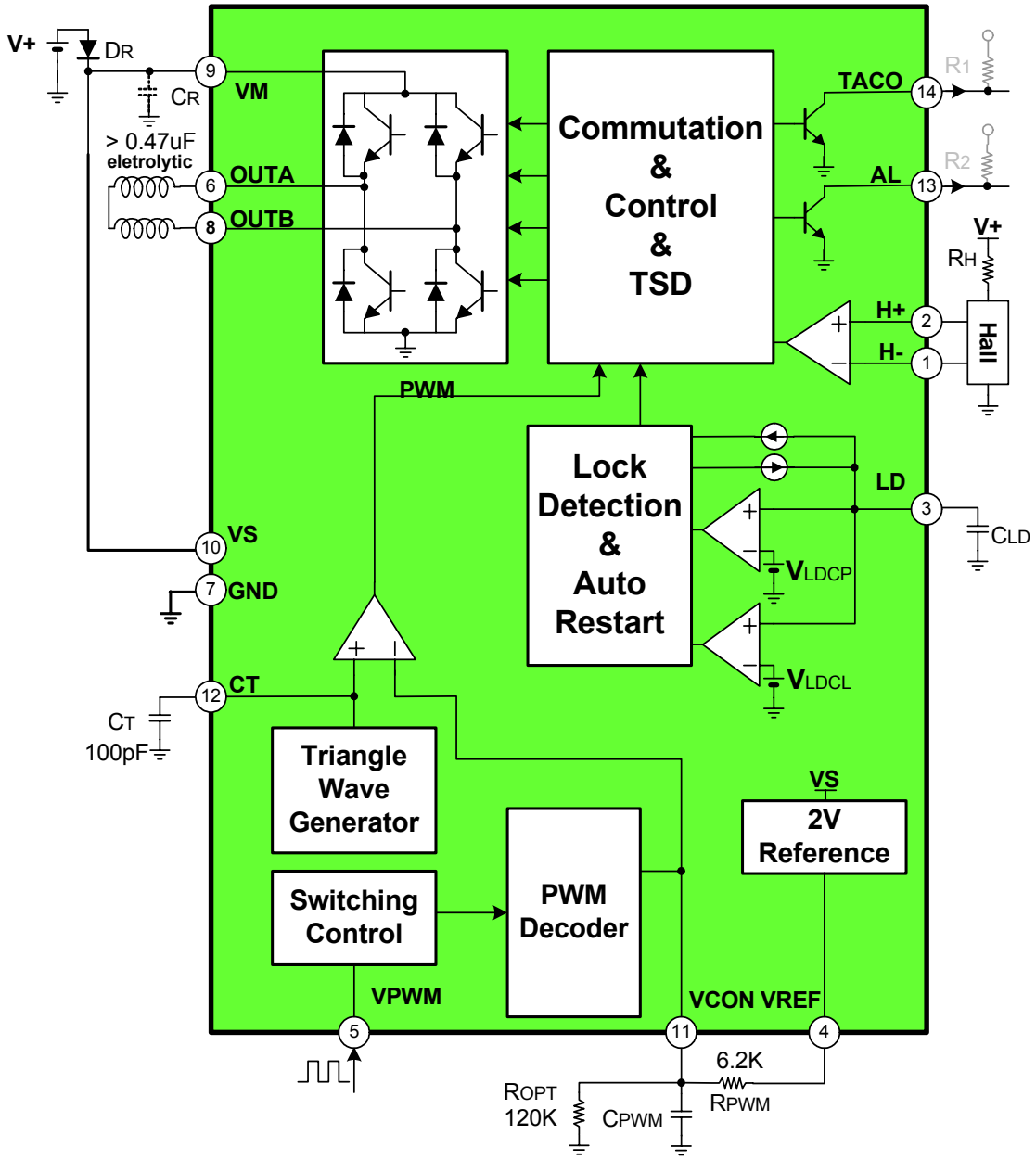
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Common Block						
Supply current	I_{CC}		-	4.5	7	mA
Reference output voltage	V_{REF1}	Iref=200uA	1.85	2.0	2.15	V
Reference output voltage	V_{REF2}	Iref=2mA	1.75	1.94	2.13	V
Lock Detector & Auto Restart						
LD charging current	I_{LDC}	V_{LD}=0V-->1.5V ,V_{LD}=1.5V	1.4	2.2	2.9	μA
LD discharging current	I_{LDD}	V_{LD}=3V-->1.5V ,V_{LD}=1.5V	0.15	0.33	0.50	μA
LD clamp voltage	V_{LDCL}	-	2.3	2.6	2.9	V
LD comparator voltage	V_{LDCP}	-	0.4	0.6	0.8	V
Triangle Wave Generator						
CT discharging current	I_{CTD}	V_{CT}=2.0V-->1.2V,V_{CT}=1.2V	-7.2	-6	-4.8	μA
CT charging current	I_{CTC}	V_{CT}=0.5V-->1.2V,V_{CT}=1.2V	4.8	6	7.2	μA
CT valley voltage	V_{CTMIN}	-	0.71	0.8	0.89	V
CT peak voltage	V_{CTMAX}	-	1.7	1.8	1.9	V
Speed Control Voltage						
VCON output current	I_{VCON}	V_{VCON}=2V, PWM=H	180	200	220	μA
Output OFF VCON low voltage	V_{CONL}		-	-	300	mV
VPWM Input						
VPWM low Voltage	V_{PWML}			-	0.5	V
VPWM high Voltage	V_{PWMH}		2.8	-	-	V
VPWM input current	I_{PWML}	V_{VPWM}=5V	-	70	100	μA
Output Stage						
High side output saturation voltage	V_{OSH}	I_O=200mA	-	0.9	1.1	V
Low side output saturation voltage	V_{OSL}	I_O=200mA		0.2	0.3	V
Speed output (TACO) & Lock Detection Output (AL)						
TACO output saturation voltage	V_{TACOS}	I_{TACO}=5mA	-	0.1	0.3	V
TACO output leakage current	I_{TACO}	V_{TACO}=12V	-	0.1	10	μA
AL output saturation voltage	V_{ALS}	I_{AL}=5mA	-	0.1	0.3	V
AL output leakage current	I_{AL}	V_{AL}=12V	-	0.1	10	μA
Hall Amplifier						
Input range	V_{HDC}	-	0	-	V_S-2.8	V
Input offset	V_{HOF}	-	-10	-	10	mV

Typical Application Circuits 1 (NTC Thermistor based Speed Control)



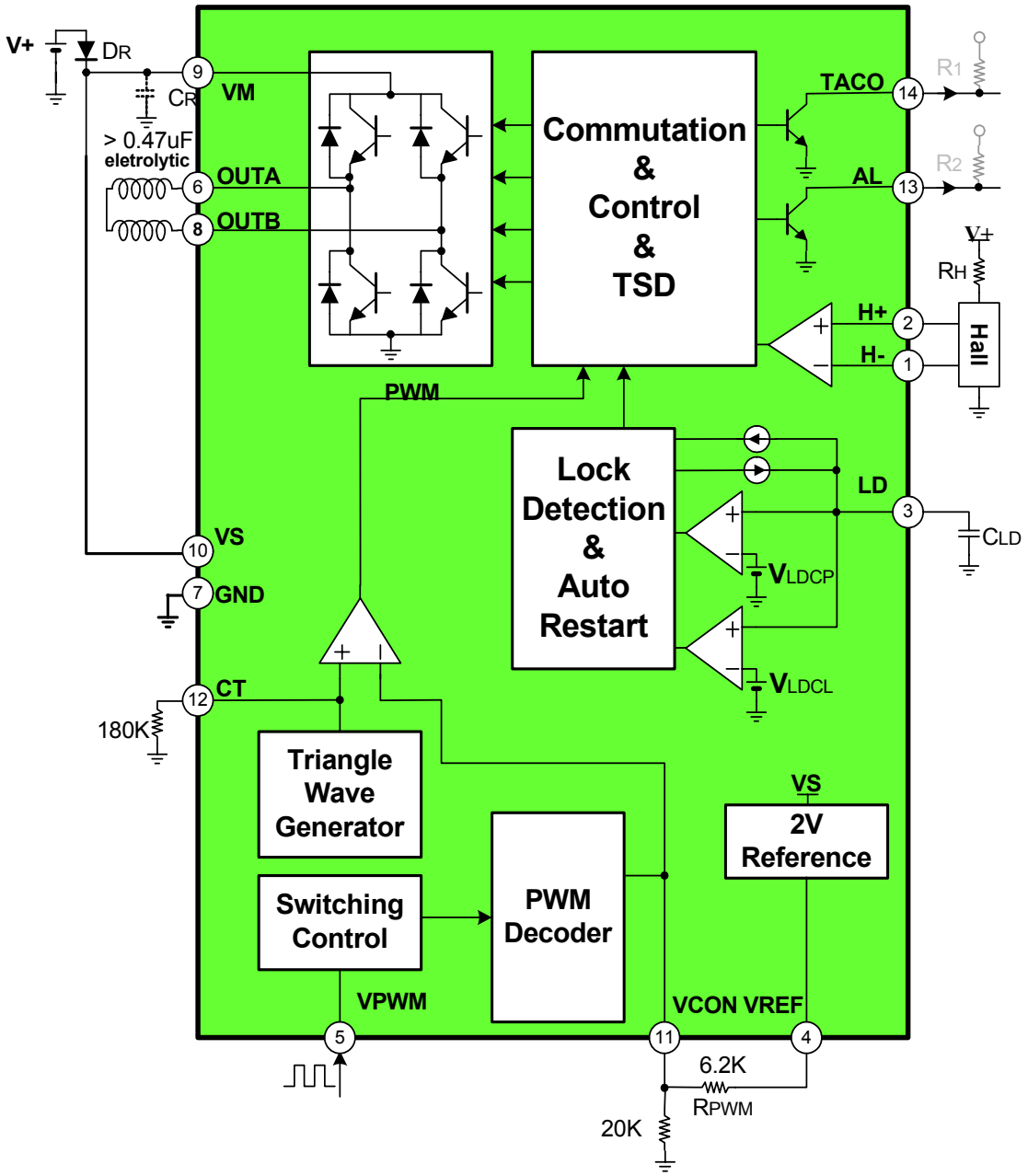
Mode	VPWM	VCON	Speed Condition
Thermistor Input	GND	Depend on thermistor resistance	The higher TEMP, the faster fan speed

Typical Application Circuits 2 (PWM Input Speed Control using Internal Oscillator)



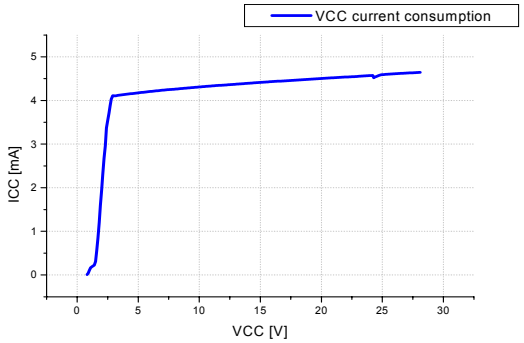
Mode	VPWM	VCON	Speed Condition
PWM Input	H	L	Full Speed
	L	H	Stop
	L/H	H/L	proportional to PWM duty (Duty range:0.15 ~ 0.85)

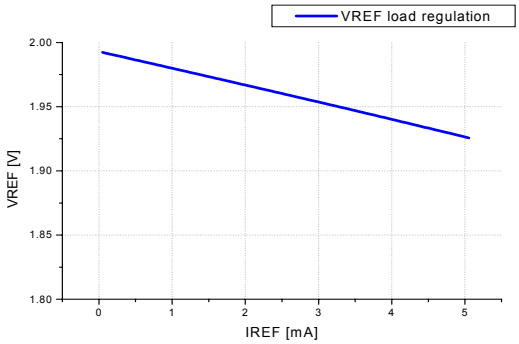
Typical Application Circuits 3 (PWM Input Speed Control using External PWM Input)

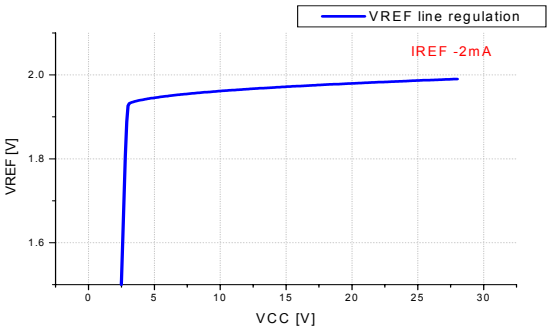


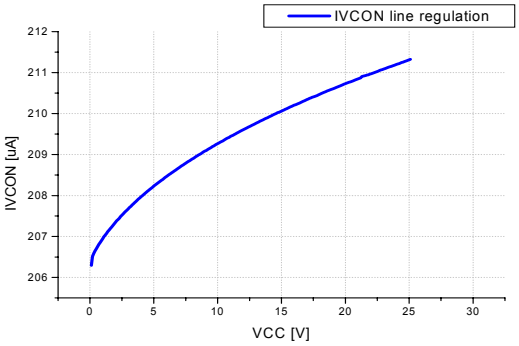
Mode	VPWM	VCON	Speed Condition
PWM Input	H	L	Full speed
	L	H	Stop
	H/L	L/H	proportional to PWM Duty

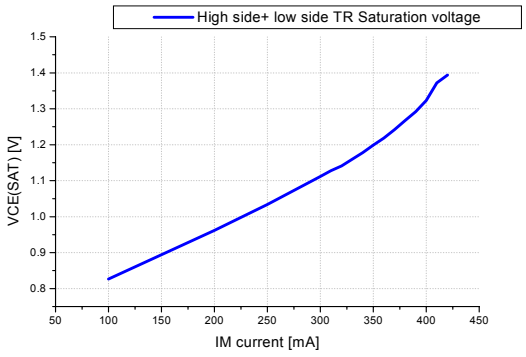
Typical Performance characreristics

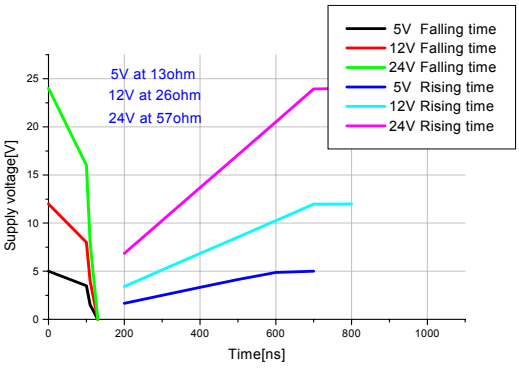






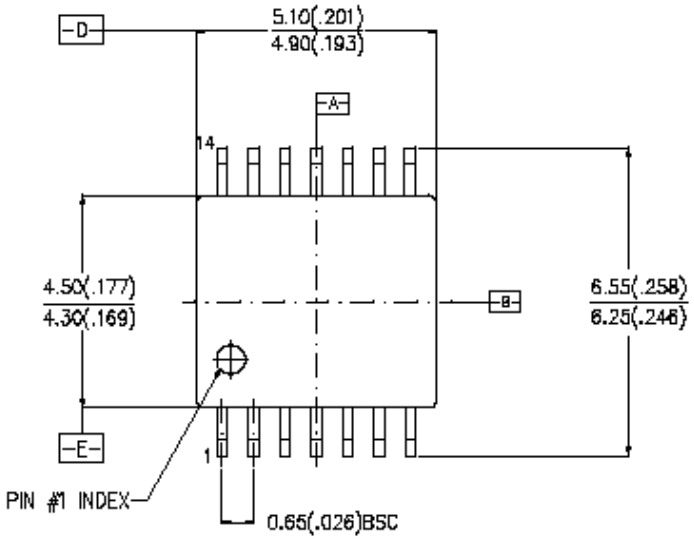


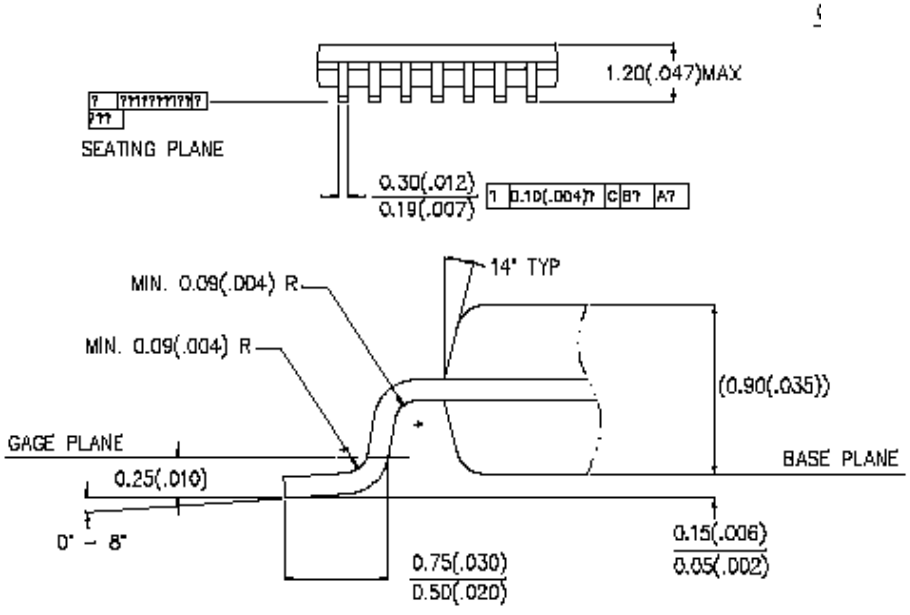




Package Dimensions (Unit: mm)

14-TSSOP





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 CORPORATION. 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.

11/3/03 0.0m 001
Stock#DSxxxxxxxx