PWM and Tach Output Brushless DC Fan

HL HMN¸ ˘ flJ%kˇf&E<1l

NMB

; YbYfU¨GdYW]ZVWUh]cbg

A chcf¨HmdY.
DC Brushless Three Phase Motor
A chcf¨DfchYVh]cb.
Auto Restart / Polarity Protection (Motor withstands reverse connection for positive and negative leads.)
=bgi `Uh]cb¨FYg]ghUbVW.
10MΩ or over with a DC 500V Megger
8]Y`YVhf]WW]h\ghUbX¨Jc`hU[Y.
AC 700V 1sec or 500V 1min
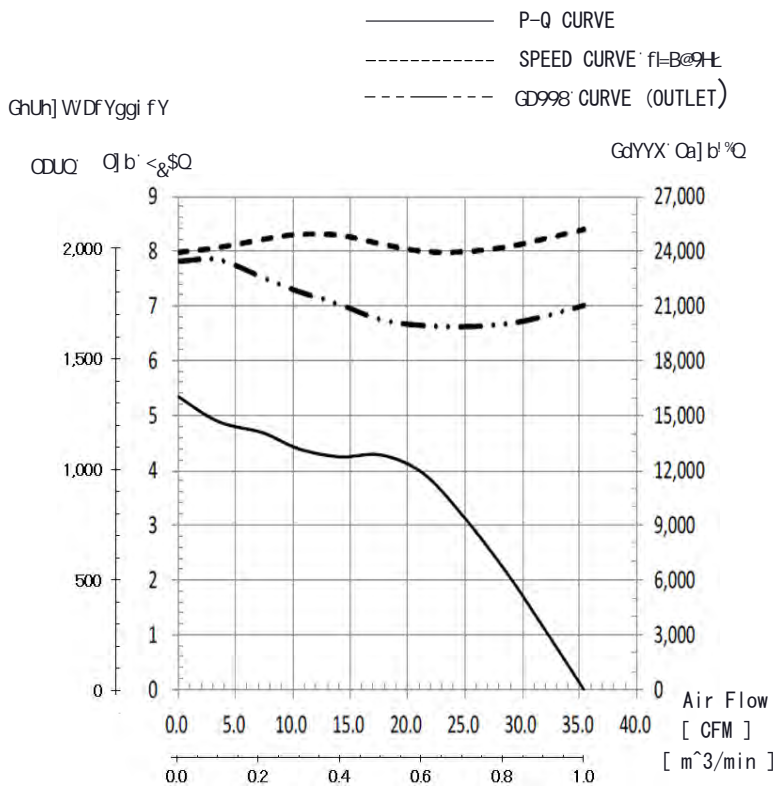**5``ckUV`Y¨5aV]Ybh¨HYa dYfUhifY¨FUb[Y.**
-10˚C ~ + 60˚C (Operating)
-30˚C ~ + 70˚C (Storage)
(non-condensing environment)

For reference only. Please see fan outline for details

7\UfUWhYf]gh]WW7i fjYg

P–Q CURVE
SPEED CURVE fl=B@9HL
GD998¨CURVE (OUTLET)

GhUh]WWDfYggifY

: YUhi fYg

- High performance counter rotating fan with eight wires and PWM with tach signal
- Efficient motor technology, high torque, and aerodynamic impeller design
- Energy saving, low vibration, and increased life expectancy
- Available in 12 volts with tach output and PWM speed control
- Outfitted with NMB precision machined ball bearings for long life

@]ZY¨9l dYWhUbWh]¨@%$

70,000 Hours at 40˚C

Fan life expectation is based on free air operation at 40°C, rated voltage, and indoor benign lab environment
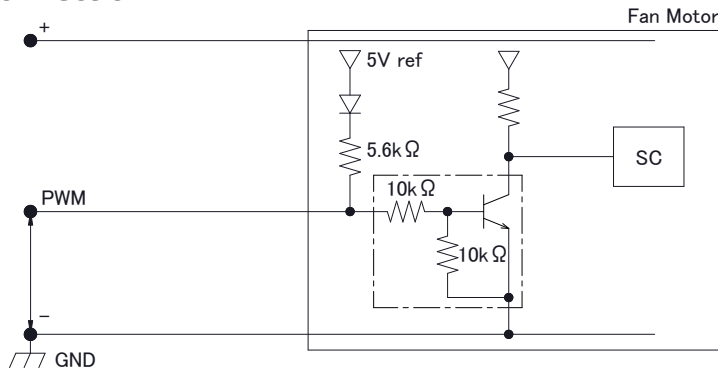
*1: Values in Free Air

GdYW]ZVWUh]cbg

MODEL	Rating Voltage	Operating Voltage	Current		Input Power		Speed Inlet/Outlet	Max. Air Flow		Max. Static Pressure		Noise	Mass
			Avg	Max	Avg	Max							
	(V)	(V)	(A)*1	(A)*1	(W)*1	(W)*1	(min^{-1})*1	(CFM)	(m^3/min)	(in H$_2$O)	(Pa)	(dB)*1	(g)
04056EA-12S-E6F-A	12	10.8 to 13.2	2.20	2.80	26.4	33.6	25,200/21,000	35.3	1.00	5.17	1285	69.5	91.0

HｕHｕＪＰ˝˘fＩＪ＆ｋ˘f＠Ｅ＜1Ｉ

NMB

PWM ˙GdYWｙ[ＺJＷＵｈ]cbg

Connection

```
                                        Fan Motor
    +
                    ▽ 5V ref        ▽
                    ▽
                    ▽
                                          SC
                    5.6kΩ
  PWM               10kΩ
                    ─WWW─
                        10kΩ
    ─
   777 GND
```
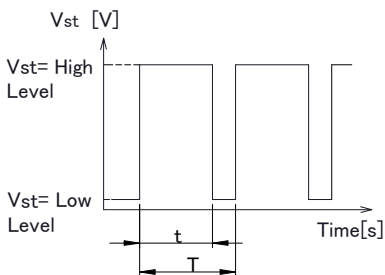
1. PWM Control
   Vst = Low Level (0V~0.4V) → Stop (On Duty 0%)
   Vst = High Level (4.0V~5.0V) → Full Speed (On Duty 100%)
   Vst = Open → Full Speed

2. PWM Duty & PWM Input Pulse

```
Vst [V]

Vst= High
Level

Vst= Low
Level
        t         Time[s]
     T
```

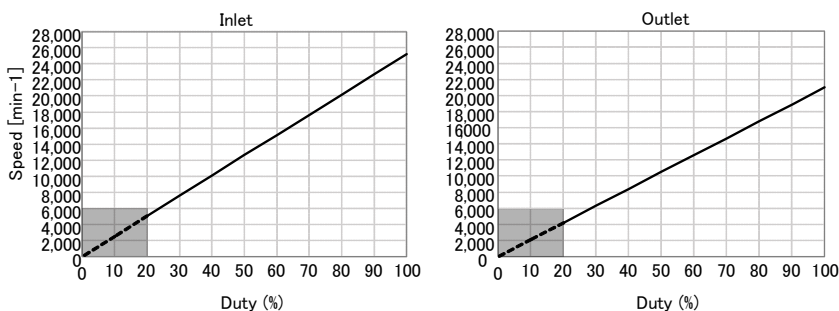PWM Duty means that a ratio of high level time (t)/PWM Input Pulse(T).

(t/T) × 100 : On Duty 0%~100%

<u>PWM Frequency f = 25[kHz]</u>

3. The condition for PWM control are as follows

・When you use this under PWM control, always be sure the motor's operation under practical mounting state. Fan motor may not start up caused by PWM control at very low speed condition.)

・To run at Rating Voltage

・Please use the start with Duty 20% or more at 25kHz.[At rated voltage input, Ambient temperature 25℃]
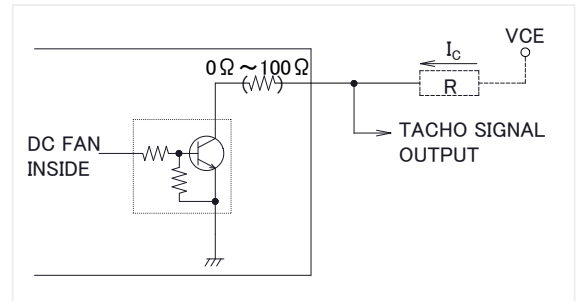
PWM Characteristic Curve

Reference PWM Duty vs Speed
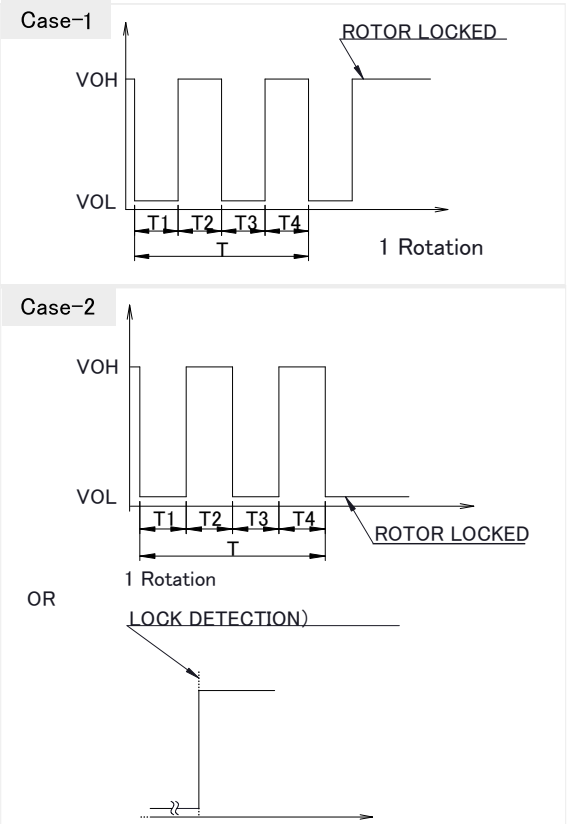Conditions : At Rating Voltage, Vst(H)=5.0V, f=25kHz, Ta=25℃

Inlet

Speed [min-1]: 28,000 / 26,000 / 24,000 / 22,000 / 20,000 / 18,000 / 16,000 / 14,000 / 12,000 / 10,000 / 8,000 / 6,000 / 4,000 / 2,000 / 0
Duty (%): 0 10 20 30 40 50 60 70 80 90 100

Outlet

28,000 / 26,000 / 24,000 / 22,000 / 20,000 / 18,000 / 16000 / 14,000 / 12,000 / 10,000 / 8,000 / 6,000 / 4,000 / 2,000 / 0
Duty (%): 0 10 20 30 40 50 60 70 80 90 100

TACHO ˙GdYWｙ[ＺJＷＵｈ]cbg

HｕＶｉｏｍ˙ｘｈ˙ＹＦ˙Ｓｉｇｈｕl

1. Output Circuit: Open Drain
2. Specification
   Absolute Maximum Ratings at Ta=25°C
   V_{D5}*max: +15V*
   I_D*max: 5mA[V_{CE}(sat)max=1.5V]*

```
                                      Ic    VCE
            0Ω～100Ω              ┌──┐ →
            ─WWW─                 │ R │  ○
  DC FAN                          └──┘
  INSIDE   ─WWW─          → TACHO SIGNAL
                            OUTPUT
          777
```

3. Output Waveform: At Rated Voltage
   Output Signal Voltage

Case-1

```
                        ROTOR LOCKED
  VOH

  VOL
       T1 T2 T3 T4
         T            1 Rotation
```

Case-2

```
  VOH

  VOL
       T1  T2  T3  T4
                      ROTOR LOCKED
          T
  1 Rotation
OR
     LOCK DETECTION)
```

1) When the rotor is locked at VOH position of signal, signal keeps VOH position.
2) When the rotor is locked at VOL position of signal, signal keeps VOL position.
3) T=T1+T2+T3+T4=60/m=1 rotation

   m: Fan Speed (min^{-1})

   Tacho Duty Cycle=50%±10%