**General Specifications**

**Motor Type:**
DC Brushless Motor

**Motor Protection:**
Auto Restart / Polarity Protection (Motor withstands reverse connection for positive and negative leads.)

**Insulation Resistance:**
10Ω or over with a DC 500V Megger

**Dielectric Withstand Voltage:**
AC 500V 1min or AC 700V 1sec

**Allowable Ambient Temperature Range:**
-10°C ~ +70°C (Operating)
-40°C ~ +70°C (Storage)
(non-condensing environment)

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**Characteristic Curves**

<table>
<thead>
<tr>
<th>Static Pressure [Pa]</th>
<th>P-Q CURVE</th>
<th>SPEED CURVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>[in H₂O]</td>
<td>Speed [min⁻¹]</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>0.2</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>3500</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>4500</td>
<td></td>
</tr>
</tbody>
</table>

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**Features**

- DC axial fan with outstanding P-Q performance, IP68 protection, PWM speed control, and tach output
- Vertically integrated manufacturing, with key components made in-house
- IP68 with highest level of protection from water/dust ingress and GR-487 salt fog compliant
- Outfitted with NMB precision machined stainless steel ball bearings for long life
- Ideal for applications such as EV chargers, PV inverters, telecom cabinets, small cell 5G network and many other outdoor applications

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**Life Expectancy L10**

80,000 Hours at 25 Celsius

*Fan life expectation is based on free air operation at 25°C, rated voltage, and indoor benign lab environment

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**Specifications**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Rating Voltage (V)</th>
<th>Operating Voltage (V)</th>
<th>Current (A)</th>
<th>Input Power (W)</th>
<th>Speed (min⁻¹)</th>
<th>Max. Air Flow (CFM)</th>
<th>Max. Static Pressure (in H₂O) (Pa)</th>
<th>Noise (dB)</th>
<th>Mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>04028DE-12P-ZUK-2</td>
<td>12</td>
<td>10.8 to 12.6</td>
<td>0.57</td>
<td>6.84</td>
<td>18,000</td>
<td>24.0</td>
<td>1.84</td>
<td>55</td>
<td>55</td>
</tr>
</tbody>
</table>
IP68 Protected DC Fan with PWM and Tach Output
04028DE-12P (K-Type)

PWM Specifications

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
   PWM Duty means that a ratio of high level time (t)/PWM Input Pulse(T).
   \[(t/T) \times 100 : \text{On Duty 0\%~100\%}\]
   PWM Frequency \(f = 25\text{kHz}\)

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˚C]

PWM Characteristic Curve

Reference PWM Duty VS Speed
Conditions: at Rating Voltage, Vst=5.0V, f=25kHz, Ta=25˚C

TACHO Specifications

1. Output Circuit: Open Drain
2. Specification
   \[V_{\text{DSmax}}: +15V\]
   \[I_{\text{Dmax}}: 5mA[V_{\text{DS(on)}}=0.5V]\]

3. Output Waveform: At Rated Voltage
   Output Signal Voltage

   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
   \[m: \text{Fan Speed (min}\^{-1})\]
   Tacho Duty Cycle=50\%±10\%
IP68 Protected DC Fan with PWM and Tach Output

04028DE-12P (K-Type)

Outlines

(Name Plate)

Materials

Casing: Plastic (Black UL 94V-0)
Impeller: Plastic (Black UL 94V-0)
Bearing: Stainless Steel Ball Bearing
Lead Wire: UL3443 AWG26 for
Red (+)
Black (-)
White (Tach)
Brown (PWM)

(Outline)

(Package)
Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

MinebeaMitsumi:
04028DE-12P-ZUK-2