BOOST-DRV8711 Stepper Motor Booster Pack – Test Data
Types of Tests:

1. Torque vs. Regulated Current

2. Maximal RPM

3. Thermal Characteristics

4. Current Waveforms
   a. Full Step / Fast Decay
   b. Full Step / All Mixed Decay
   c. Full Step / Auto Mixed Decay
   d. Half µStep / Fast Decay
   e. Half µStep / All Mixed Decay
   f. Half µStep / Auto Mixed Decay
   g. ¼ µStep / Fast Decay
   h. ¼ µStep / All Mixed Decay
   i. ¼ µStep / Auto Mixed Decay
   j. 1/8 µStep / Fast Decay
   k. 1/8 µStep / All Mixed Decay
   l. 1/8 µStep / Auto Mixed Decay
   m. 1/16 µStep / Fast Decay
   n. 1/16 µStep / All Mixed Decay
   o. 1/16 µStep / Auto Mixed Decay
   p. 1/32 µStep / Fast Decay
   q. 1/32 µStep / All Mixed Decay
   r. 1/32 µStep / Auto Mixed Decay
   s. 1/64 µStep / Fast Decay
   t. 1/64 µStep / All Mixed Decay
   u. 1/64 µStep / All Mixed Decay
   v. 1/128 µStep / Fast Decay
   w. 1/128 µStep / All Mixed Decay
   x. 1/128 µStep / All Mixed Decay
   y. 1/256 µStep / Fast Decay
   z. 1/256 µStep / All Mixed Decay
   aa. 1/256 µStep / All Mixed Decay

5. Current Ramp rate vs. VM
   a. VM = 12V
   b. VM = 20V
   c. VM = 24V

6. Holding Current
   a. Fast Decay
   b. All mixed Decay
   c. Auto Mixed Decay
Measurement Tools:

<table>
<thead>
<tr>
<th>Device</th>
<th>Brand</th>
<th>QTY</th>
<th>CAL. due</th>
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<tbody>
<tr>
<td>Power Supply</td>
<td>Agilent E3631A</td>
<td>1</td>
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<td>Oscilloscope</td>
<td>Tektronix DPO 7054</td>
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<td>Current Probe</td>
<td>Tektronix TCP0030</td>
<td>2</td>
<td>04/10/2015</td>
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<td>Fluke Ti32</td>
<td>1</td>
<td>Not Required</td>
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<td>Magnetic Brake</td>
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Load:

- Stepper Motor (ACT Motor 23HS8430)

<table>
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<tr>
<th>Series Mode</th>
<th>Step Angle</th>
<th>Motor Length / mm</th>
<th>Rated Voltage / V</th>
<th>Rated Current / A</th>
<th>Phase Resistance / mH</th>
<th>Phase Inductance / mH</th>
<th>Holding Torque (Min) Ncm</th>
<th>Detent Torque (Max) Ncm</th>
<th>Rotor Torque / gcm²</th>
<th>Lead Wire</th>
<th>Motor Weight / kg</th>
<th>Diameter of shaft / mm</th>
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<tr>
<td>23HS8430</td>
<td>1.8</td>
<td>76</td>
<td>3.0</td>
<td>3.0</td>
<td>1</td>
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<td>190</td>
<td>6</td>
<td>480</td>
<td>4</td>
<td>1.05</td>
<td>6.35</td>
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- 2 x Inductor 330µH (Only for thermal measurement)

Test Date:

- 05/01/2014 – 05/09/2014
1. Torque vs. Regulated Current

<table>
<thead>
<tr>
<th>I_FS / A</th>
<th>Torque</th>
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<tr>
<td>0.5 A</td>
<td>3.00 lb-in</td>
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<tr>
<td>1.0 A</td>
<td>7.25 lb-in</td>
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<tr>
<td>1.5 A</td>
<td>9.50 lb-in</td>
</tr>
<tr>
<td>2.0 A</td>
<td>10.5 lb-in</td>
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<tr>
<td>2.5 A</td>
<td>11.5 lb-in</td>
</tr>
<tr>
<td>3.0 A</td>
<td>12.5 lb-in</td>
</tr>
</tbody>
</table>

Measurement collected @ 60 RPM, Full Step using magnetic particle brake. Loading was increased continuously until motor stall. Measurements in other Step Modes delivered same results.
2. Maximum RPM

Measurement Condition:

Motor stall at around 11000 PPS => Maximum RPM = 3300
3. Thermal Characteristics

VM=24V
Full Scale Current = 6.23A
Phase Current = 4.4A RMS / CH2 = B2 & CH3 = A2
Load = 2 x Inductor à 330µH / 11.4A

Fig. 1 Thermal Image @ 138.7 °C HotSpot
4. **Current Ramp Rate vs. VM**

Measurement collected at Half Step, 60 RPM, All Mixed Decay

**Fig. 3 VM=12V**

**Fig. 4 VM=24V**
Fig. 5 VM=36V

Fig. 6 VM=48V
5. Current Waveforms

**Baseline Settings:** 60 RPM constant, $t_{\text{off}}=36\mu s$, $t_{\text{Blank}}=1\mu s$, $t_{\text{Decay}}=11\mu s$, Adaptive Blanking Time disabled, CH2 = B2, CH3 = A2

**Fig. 7 Full Step / Fast Decay**

**Fig. 8 Full Step / All Mixed Decay**
Fig. 9 Full Step / Auto Mixed Decay

Fig. 10 Half Step / Fast Decay
Fig. 11 Half Step / All Mixed Decay

Fig. 12 Half Step / Auto Mixed Decay
Fig. 13 Quad μStep / Fast Decay

Fig. 14 Quad μStep / All Mixed Decay
Fig. 15 Quad µStep / Auto Mixed Decay

Fig. 16 8µStep / Fast Decay
Fig. 17 8µStep / All Mixed Decay

Fig. 18 8µStep / Auto Mixed Decay
Fig. 19 16µStep / Fast Decay

Fig. 20 16µStep / All Mixed Decay
Fig. 21 16μStep / Auto Mixed Decay

Fig. 22 32μStep / Fast Decay
Fig. 23 32µStep / All Mixed Decay

Fig. 24 32µStep / Auto Mixed Decay
Fig. 25 64µStep / Fast Decay

Fig. 26 32µStep / All Mixed Decay
Fig. 27 64µStep / Auto Mixed Decay

Fig. 28 128µStep / Fast Decay
Fig. 29 128Step / All Mixed Decay

Fig. 30 128Step / Auto Mixed Decay
Fig. 31 256µStep / Fast Decay

Fig. 32 256µStep / All Mixed Decay
Fig. 33 256µStep / Auto Mixed Decay, t_off=36µs

Fig. 34 256µStep / Auto Mixed Decay, t_off=16µs
6. Holding Current vs. Decay Mode

Fig. 35 Fast Decay

Fig. 36 All Mixed Decay
Fig. 37 Auto Mixed Decay
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