User’s Manual for KE-KA44170A Evaluation Board

This KE-KA44170A evaluation board provides to verify the function of our original Auto Phase Control (APC) technology installed in KA44170A, which is the single phase motor driver for Fan and Pump. This EVB helps to accelerate products design-in to market-in.

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Disclaimer

Regarding the specifications of this product, it is considered that you have agreed to the disclaimer described below.

1. When the application system is designed using this product, please design the system at your own risk. Please read, consider, and apply appropriate usage notes and description in this standard.

2. When designing your application system, please take into the consideration of break down and failure mode occurrence and possibility in semiconductor products. Measures on the systems such as, but not limited to, redundant design, mitigating the spread of fire, or preventing glitch, are recommended in order to prevent physical injury, fire, social damages, etc. in using the Nuvoton Technology Japan Corporation (hereinafter referred to as NTCJ) products.

3. When using this product, for each actual application systems, verify the systems and the all functionality of this product as intended in application systems and the safety including the long-term reliability at your own risk.

4. Please use this product in compliance with all applicable laws, regulations and safety-related requirements that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. NTCJ shall not be held responsible for any damage incurred as a result of this product being used not in compliance with the applicable laws, regulations and safety-related requirements.

5. This product does not have any security functions using cryptographic algorithms, such as authentication, encryption, tampering detection.

6. Unless this product is indicated by NTCJ to be used in applications as meeting the requirements of a particular industry standard (e.g., ISO 9001, IATF 16949, ISO 26262, etc.), this product is neither designed nor intended for use in such environments for that applications. NTCJ shall not be held responsible for not meeting the requirements of a particular industry standard.

7. Using product that have been indicated as compliant with industry functional safety standards does not warrant that the application meets the requirements of industry functional safety standards. NTCJ shall not be held responsible for the application compliance with requirements of the particular industry functional safety standard.

8. Unless this product is indicated by NTCJ to be used in applications as meeting the requirements of a particular quality standard (e.g., AEC-Q100, etc.), this product is neither designed nor intended for use in such the environments for that applications. NTCJ shall not be held responsible for not meeting the requirements of a particular quality standard.

9. In case of damages, costs, losses, and/or liabilities incurred by NTCJ arising from customer’s non-compliance with above from 1 to 8, customer will indemnify NTCJ against every damages, costs, losses and responsibility.
Recommended Operating Conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pin Name</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage range</td>
<td>VCC</td>
<td>5.0</td>
<td>—</td>
<td>30</td>
<td>V</td>
<td>*1</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>HP</td>
<td>0</td>
<td>—</td>
<td>1.5</td>
<td>V</td>
<td>*2</td>
</tr>
<tr>
<td></td>
<td>HN</td>
<td>0</td>
<td>—</td>
<td>1.5</td>
<td>V</td>
<td>*2</td>
</tr>
<tr>
<td></td>
<td>PWMI</td>
<td>0</td>
<td>—</td>
<td>30</td>
<td>V</td>
<td>*2</td>
</tr>
</tbody>
</table>

Notes: *1: It is a value under the conditions which do not exceed the absolute maximum rating and the power dissipation.
*2: For setting range of input control voltage, refer to the IC’s Datasheet.

Circuit of Evaluation Board

<table>
<thead>
<tr>
<th>name</th>
<th>mount</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCS</td>
<td>0.135Ω (0.27Ω // 0.27Ω)</td>
</tr>
<tr>
<td>RFG</td>
<td>15kΩ</td>
</tr>
<tr>
<td>RLD</td>
<td>15kΩ</td>
</tr>
<tr>
<td>RHB</td>
<td>0Ω</td>
</tr>
<tr>
<td>RTHB</td>
<td>No mount</td>
</tr>
<tr>
<td>RVCC</td>
<td>No mount</td>
</tr>
<tr>
<td>CCLD</td>
<td>330pF</td>
</tr>
<tr>
<td>CHALL</td>
<td>No mount</td>
</tr>
<tr>
<td>CHB</td>
<td>No mount</td>
</tr>
<tr>
<td>CRCS</td>
<td>No mount</td>
</tr>
<tr>
<td>CSEL</td>
<td>No mount</td>
</tr>
<tr>
<td>CVCC1</td>
<td>1uF</td>
</tr>
<tr>
<td>CVCC2</td>
<td>No mount</td>
</tr>
<tr>
<td>ZVCC</td>
<td>No mount</td>
</tr>
<tr>
<td>DVCC</td>
<td>No mount</td>
</tr>
<tr>
<td>GND</td>
<td>Black line</td>
</tr>
<tr>
<td>VCC</td>
<td>Red line</td>
</tr>
<tr>
<td>VFGLD</td>
<td>Yellow line</td>
</tr>
<tr>
<td>IC2</td>
<td>KA44170A</td>
</tr>
<tr>
<td>JSEL</td>
<td>jumper</td>
</tr>
<tr>
<td>JVFGLD</td>
<td>jumper</td>
</tr>
<tr>
<td>JVCC1</td>
<td>short</td>
</tr>
<tr>
<td>JVCC2</td>
<td>short</td>
</tr>
</tbody>
</table>
Description for Evaluation Board

**Inputs & Outputs**

**VCC**: External power supply pin
Supply the recommended operating power voltage (5.0V~30V).

**PWMI**: External signal I/F
Input pin for torque direction.
The range of input signal frequency is 3kHz-50kHz.
Normally, please input the 3.3V-GND level signal.
(Please adjust the input voltage level within the rating voltage.)

**HP, HN**: Input pin for Hall signals
Connect to Hall effect device.
Refer to "Voltage polarity" shown below.

**HB, GND**: Output pin for Hall bias
Connect to the power-Pin of Hall effect device.
HB = 1.2V

**VCC**: External power supply pin
Supply the recommended operating power voltage (5.0V~30V).

**VCC**: External power supply pin
Supply the recommended operating power voltage (5.0V~30V).

**FG**
External signal I/F
Output pin for FG and LD.

**OUT1, OUT2**: Output pin for driving a motor
Connect to a motor's coil.

**GND**: External GND pin

Voltage polarity (exclude delay)
The voltage polarity of FG and OUT1/OUT2 to Hall input signals are as shown below.
Please note the voltage polarity when connecting to a motor.
Description for Evaluation Board

Resistance & Capacitor settings

CVCC1:
Bypass capacitor for power supply
If necessary, please mount a capacitor for protection against noise.
(Open~10μF, Default setting = 1μF)

RCS:
Resistor for limiting motor current.
Default setting = 0.135 ohm
Limited current = 1.1A (Typ)
RCS is mounted on back side of board.

CCLD:
Capacitor for setting “Lock detection time”
The default setting is 330pF.
(Lock detection time: 0.48sec (Typ), Lock release time: 0.48sec x 10 = 4.8sec)
If you want to change settings, please set CCLD by seeing the graph below.

RFG:
Pull-up resistor for FG
(Default setting = 15k ohm)

RLD:
Pull-up resistor for LD
(Default setting = 15k ohm)

RHB:
Resistor for Hall bias.
Default = “short”.
If you need “current limit” and “bias-adjustment” of Hall effect device, please set a resistor.

CVCC1:
Bypass capacitor for power supply
If necessary, please mount a capacitor for protection against noise.
(Open~10μF, Default setting = 1μF)

RCS:
Resistor for limiting motor current.
Default setting = 0.135 ohm
Limited current = 1.1A (Typ)
RCS is mounted on back side of board.

CCLD:
Capacitor for setting “Lock detection time”
The default setting is 330pF.
(Lock detection time: 0.48sec (Typ), Lock release time: 0.48sec x 10 = 4.8sec)
If you want to change settings, please set CCLD by seeing the graph below.

Graph:
- X-axis: CCLD [pF]
- Y-axis: Lock detection time (sec)
## Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023.11.1</td>
<td>1.00</td>
<td>1. initially issued.</td>
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Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, “Insecure Usage”.

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.