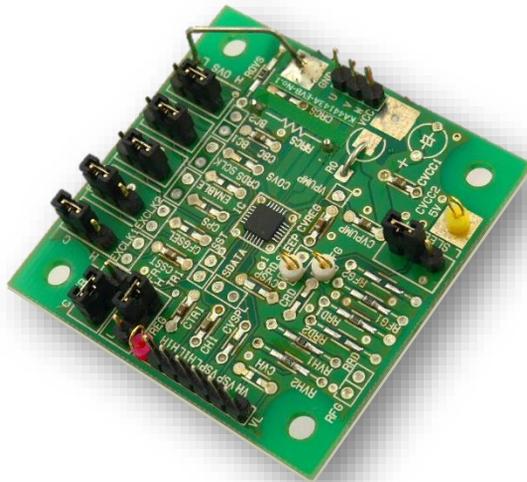


User’s Manual for KE-KA44143A Evaluation Board

This **KE-KA44143A** evaluation board provides to verify the function of our original Auto Phase Control (APC) technology installed in KA44143A, which is the three phase motor driver for Fan, Pump and etc.

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., AECQ-100, 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.

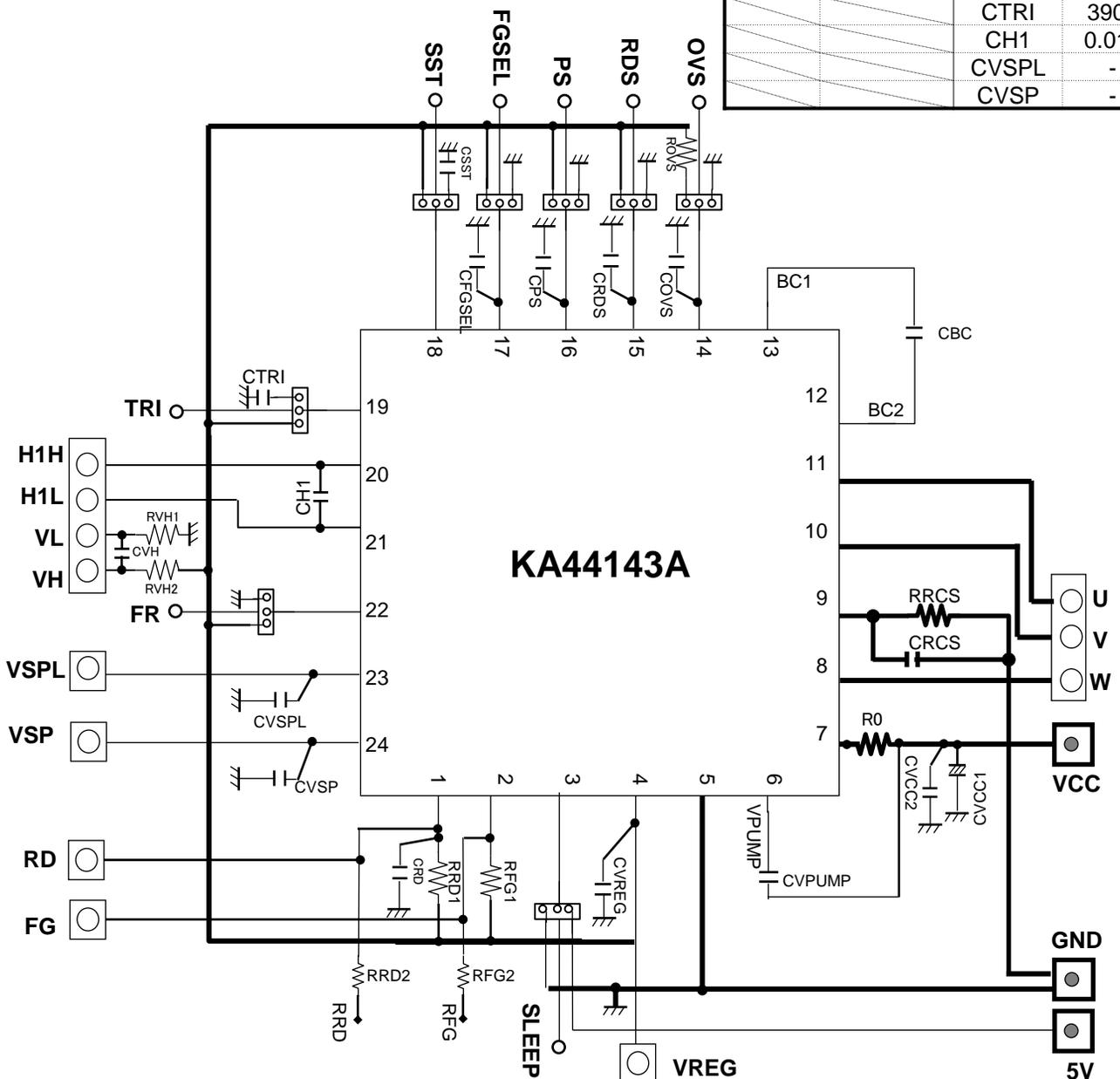
Recommended Operating Conditions

Parameter	Pin Name	Min.	Typ.	Max.	Unit	Notes
Supply voltage range	VCC	4.5	—	26.4	V	—
Input voltage range	SLEEP	0	—	VREG	V	*1
	H1H	0	—	VREG	V	*1
	H1L	0	—	VREG	V	*1
	PS	0	—	VREG	V	*1
	RDS	0	—	VREG	V	*1
	OVS	0	—	VREG	V	*1
	FGSEL	0	—	VREG	V	*1
	VSP	0	—	VREG	V	*1
	VSPL	0	—	VREG	V	*1
	FR	0	—	VREG	V	*1

Note: *1: For setting range of input control voltage, refer to IC's Datasheet.

Circuit of Evaluation Board

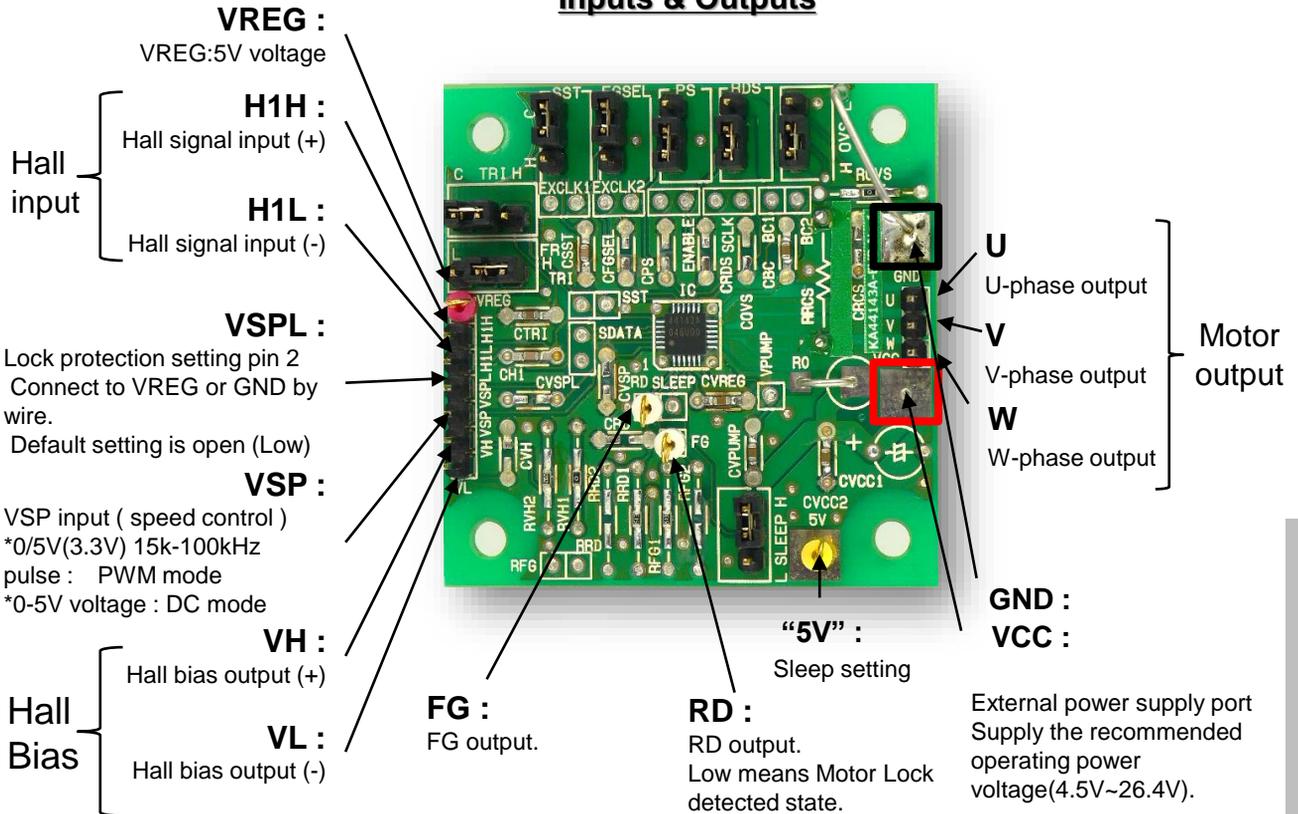
Resistor Value [ohm]	Capacitor Value [F]
RRD1	CRD
RRD2	CVREG
RFG1	CVH
RFG2	CVPUMP
RVH1	CVCC1
RVH2	CVCC2
R0	CRCS
RRCS	CBC
ROVS	COVS
	CRDS
	CPS
	CFGSEL
	CSST
	CTRI
	CH1
	CVSPL
	CVSP



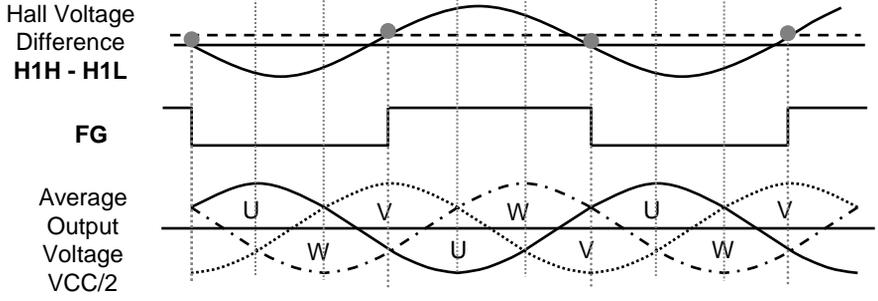
User's Manual for KE-KA44143A Evaluation Board

Description for Evaluation Board

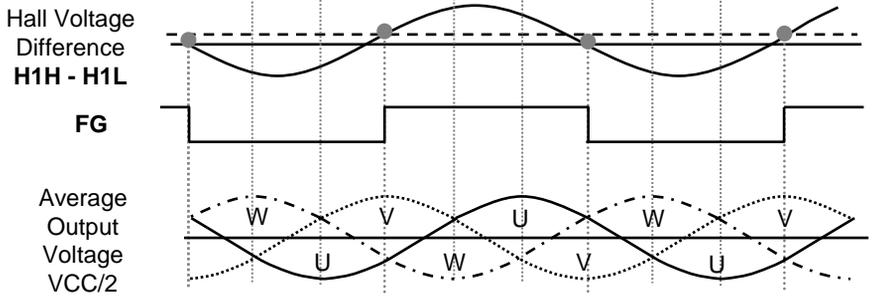
Inputs & Outputs



Forward (FR = L)

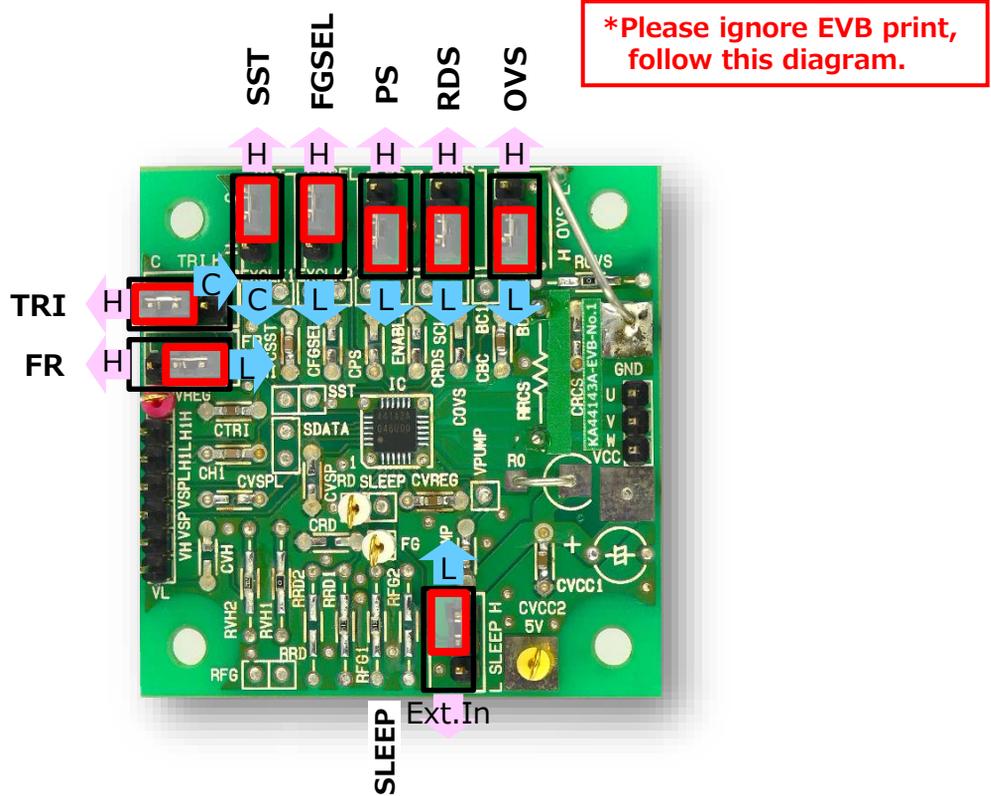


Reverse (FR = H)



Description for Evaluation Board

Jumper setting Direction



*Please ignore EVB print, follow this diagram.

Name	JP Position			Default setting	Remarks
	L (or C)	Open	H (or Ext.In)		
OVS	27.2V	(Prohibited)	16.0V	L	Vcc over voltage protection voltage
RDS	Low	(Prohibited)	High	L	Lock protection setting pin 1
PS	Auto	(Prohibited)	0deg	L	Phase control
FGSEL	1/3	1/2	1/1	H	FG Frequency divider setting
SST	Variable	(Prohibited)	OFF	H	Soft start setting. When JP5 is set to "C", Soft start time can be set by "CSST" capacitor value. In this EVB, "CSST" = 1800pF, Soft start time is set to 0.45s (Time taken for Output duty to increase from 0 to 100%, @PWM frequency = 50kHz.)
TRI	DC mode	(Prohibited)	PWM mode	H	VSP input mode. When JP6 is set to "C", DC mode is activated, and PWM output frequency can be set by "CTRI" value. In this EVB, "CTRI" = 390pF, PWM output frequency is set to 55kHz.
FR	Foward	Short-Brake	Reverse	L	Driving direction. When JP7 is set to Open, Lower FET of U,V,W are turned on, enter Short brake mode.
SLEEP	Active	(Prohibited)	(Ext.In)	L	Sleep mode setting. When JP8 is set to "Ext.In", SLEEP can be set by external input to "5V pin". ("5V"pin = High(5V) : SLEEP mode, Low(0V): Active mode)

Description for Evaluation Board

Mounting passive component 1 (Front side)

CSST:
Capacitor to set soft start time.
Default = 1800pF
Soft start time = 410ms(D=100%)

Soft start time $T_{pass} = (F_{osc} * D) / (F_{pwm} * F_{sst}) [s]$
 $F_{sst} = 4e-6 / (2 * CSST) [Hz]$
 $F_{osc} = 25e3 [Hz]$
 F_{pwm} : PWM frequency decided by CTRI
 D : Input duty for speed control

CBC
Pump up capacitor for charge pump
Default = 0.1uF

CVREG
Output capacitor for VREG
Default = 0.1uF

CVCC2
Bypass capacitor for power supply
Default = 0.1uF

CVPUMP
Output capacitor for charge pump
Default = 0.1uF

CTRI :
Capacitor for setting PWM switching frequency
Default = 390pF
PWM frequency =55kHz

PWM frequency figure $F_{pwm} = 64.5e-6 / (2 * CTRI * 1.53) [Hz]$

CH1 :
Differential capacitor for noise protection of hall input pin.
Default = "open".

RVH2 :
Hall bias resistor to limit hall bias current.
Default = "2kohm".
If you need "current limit" and "bias-adjustment" of Hall element device, please set a resistor.

RVH1 :
Hall bias resistor to limit hall bias current.
Default = "short".
If you need "current limit" and "bias-adjustment" of Hall element device, please set a resistor.

RRD1 :
Pull-up resistor for RD
The default setting is "51kohm"..

RFG1 :
Pull-up resistor for FG
The default setting is "51kohm"..

Description for Evaluation Board

Mounting passive component 2 (Front side)

CFGSEL , CPS, CRDS, COVS

Capacitor for noise protection of FGSEL, CPS and CRDS pin.
Default = all "open"

ROVS

Short resistor to connect OVS pin to VREG
Default = "short"

CRCS

Capacitor for filter of RCS pin.
Default = "open"

CH1 :

Differential capacitor for noise protection of hall input pin.
Default = "open".

CVSPL :

Capacitor for noise protection of VSPL pin.
Default = "open"

CVSP :

Capacitor for filter of VSP pin
Default = "open"

CVH1 :

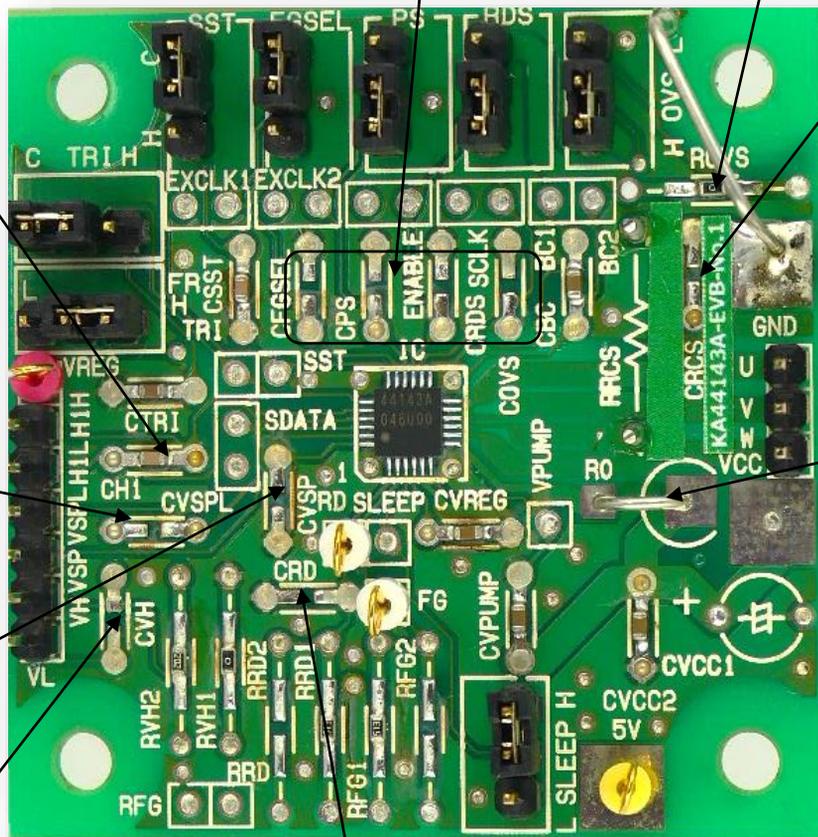
Capacitor for noise protection of hall bias pin
Default = "open".

R0

Short resistor for power supply line
Default = "Short"

CRD :

Capacitor for noise protection of RD pin
Default = "open"



Revision History

Date	Revision	Description	Page.
2023.11.1	1.00	1. initially issued.	

Important Notice

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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.

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