Problem Report for the Stepping Motor Driver

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[Outline]
When the motor drives with the stepping motor driver (product of Texas Instruments), it sometimes vibrates.

[Details of the motor driver]
Manufacturer : Texas Instruments
Type : DRV8825

## [Driving conditions of the stepping motor driver]
Driving Voltage : 24V
Frequency (CLK) : About 1400Hz
Set Current Value : 1.8A
Excitation (MODE) : 2 phase excitation (Full-step)
Attenuation Mode (DECAY) : High speed mode

[Details of the stepping motor driver]
Manufacturer : MinebeaMitsumi
Type : 23KM-H251CNVA2439
Rated Voltage : 2.0V
Rated Current : 2.5A
Maximum Input : 10.0W
Maximum Static Torque : 66mNm
Detent Torque : 26mNm
Pull-out Torqye : 270mNm
Pull-in Torque : 26mNm
Present Activation Frequency (Max.) : 12000Hz
Driving Condition : DC24V
Winding Resistor : 0.8Ω±0.12Ω
Inductance : 2.0mH

[Current Waveform for when passing a current through a winding wire (In case of vibrating the stepping motor.)]
When the winding resistor (AOUT2) of the stepping motor is measured with an ammeter, the vibration is generated and the wavefrom becomes deformed.

Measurement position (AOUT2)
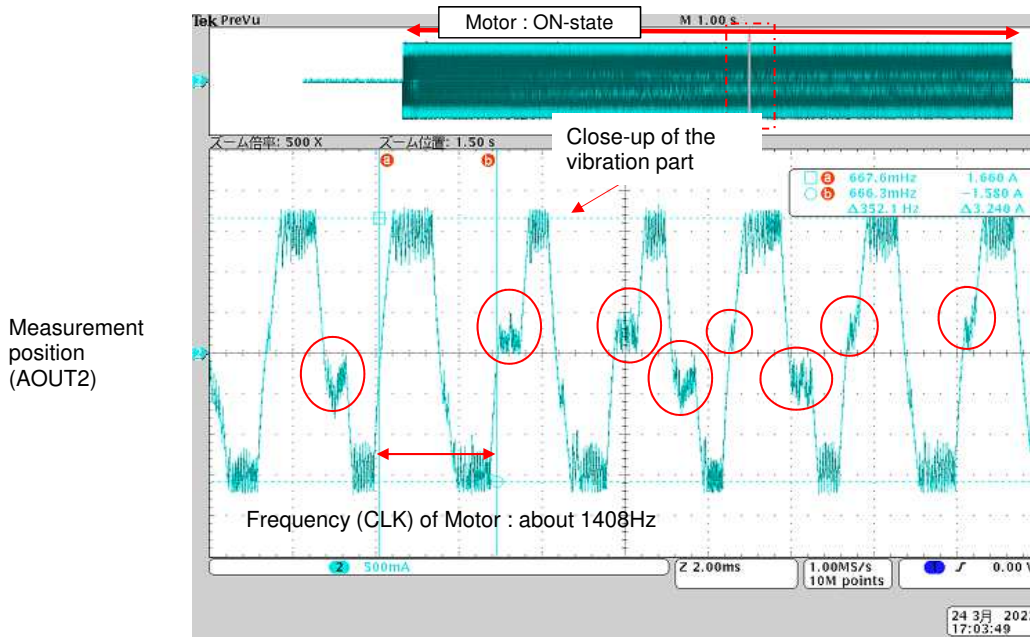
The motor vibrates at the positions circled in red.
The vibration is generated in a certain period of time after the motor is turned on.

Measurement position (AOUT2)

Motor : ON-state

Close-up

Frequency (CLK) of Motor : about 1408Hz
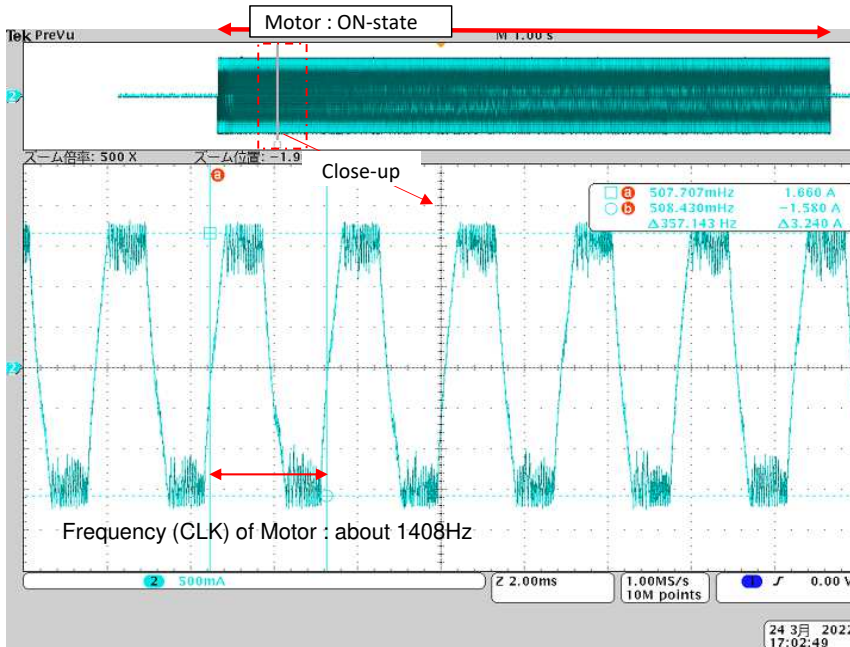
There is no vibration for a while after the motor is turned on.

The above 2 waveforms show that the vibration is generated gradually after the motor starts to drive.
As another case, the motor vibrates for a while after it starts to drive and the vibration is gradually disappeared.

Not all motor drivers in the same production lot have the vibration issue.
(Some of them have the vibration issue, and some of them have no vibration issue.)

[Our circuit diagram (around the motor driver)]

・MODE setting of the motor
・CLK Frequency
・Rotation Direction
・Error Detection
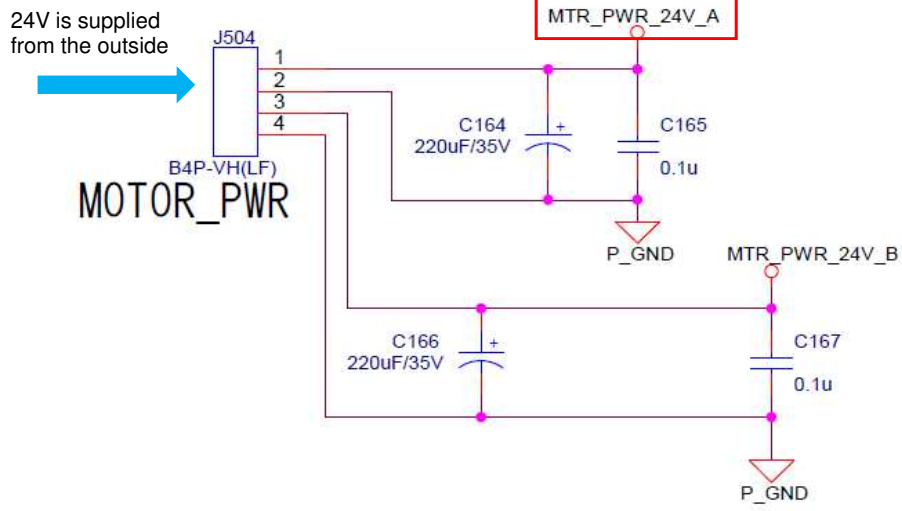・Reset Operation

Connecting to the stepping motor
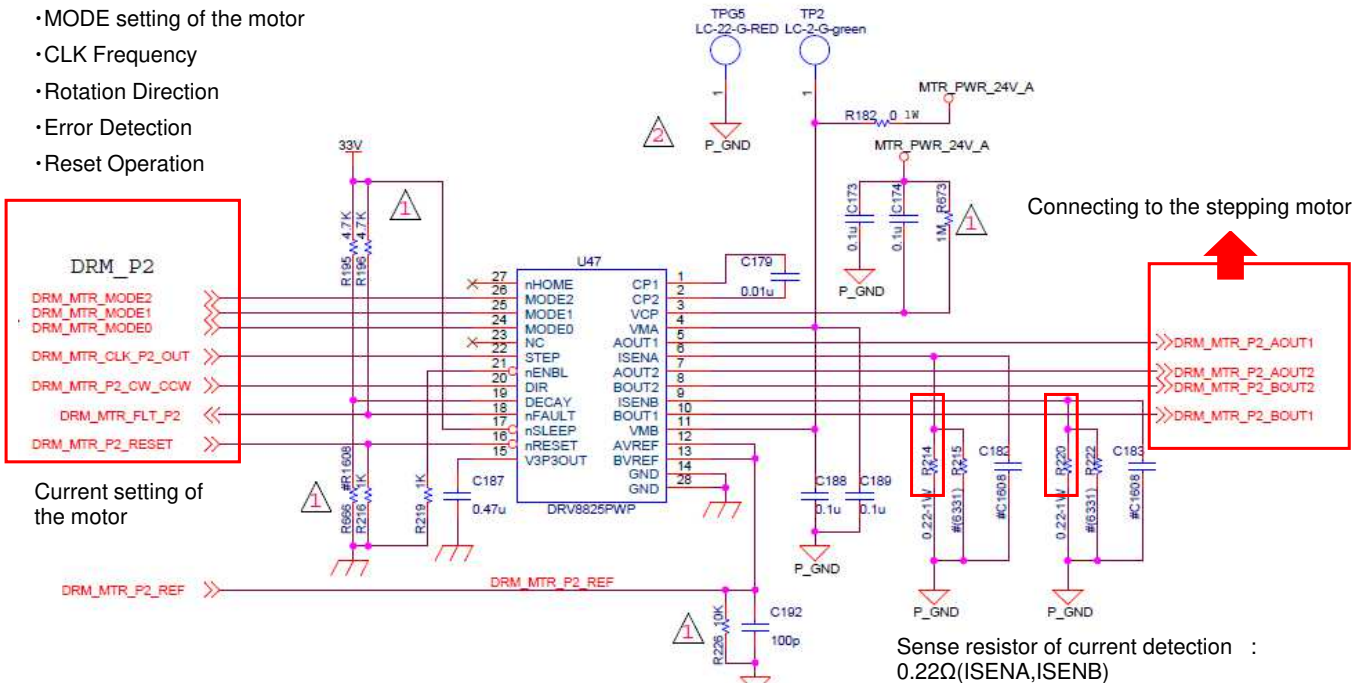
Current setting of the motor

Sense resistor of current detection ：
0.22Ω(ISENA,ISENB)

[Our circuit diagram (around the motor driver)] Connecting to the power supply pin
of the motor driver

24V is supplied
from the outside

J504

MOTOR_PWR

B4P-VH(LF)

MTR_PWR_24V_A

C164
220uF/35V

C165
0.1u

P_GND

MTR_PWR_24V_B

C166
220uF/35V

C167
0.1u

P_GND

We tested it and confirmed the followings.

[Test Method]
We prepared 2 Printed Boards and 2 Motor Drivers (one of them had vibration issue and the other had no issue), and then checked whether or not the issue was shifted by exchanging these motor drivers.
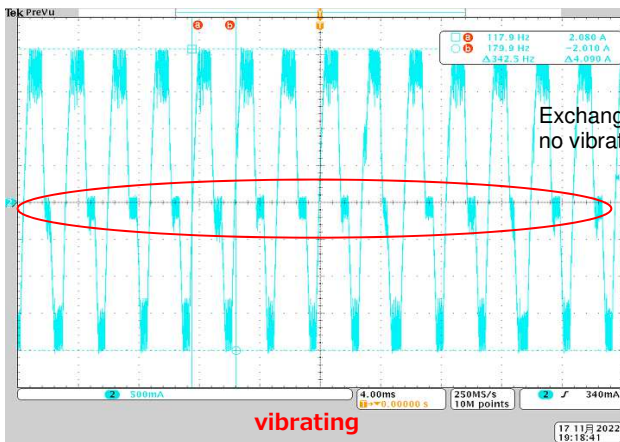
Printed Board 1 with the Motor Driver having the vibration issue.

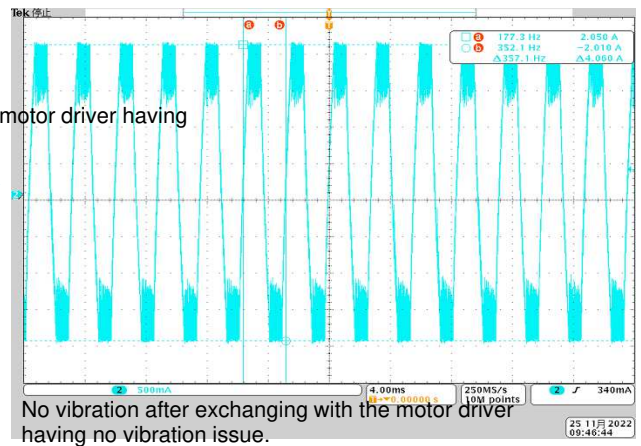Printed Board 2 with the Motor Driver having no vibration issue. .

Printed Board	Exchanged	Printed Board 2
Motor Driver	⟷	Motor Driver

Printed Board 1 with the Motor Driver having the vibration issue.

Printed Board 1 with the Motor Driver having no vibraiton issue.

Exchanged with the motor driver having no vibration issue.
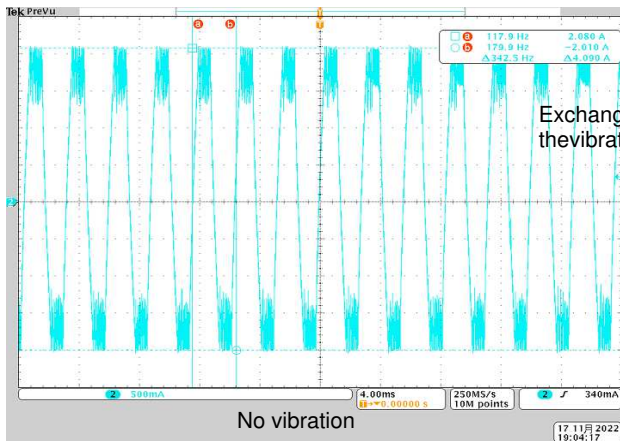
vibrating

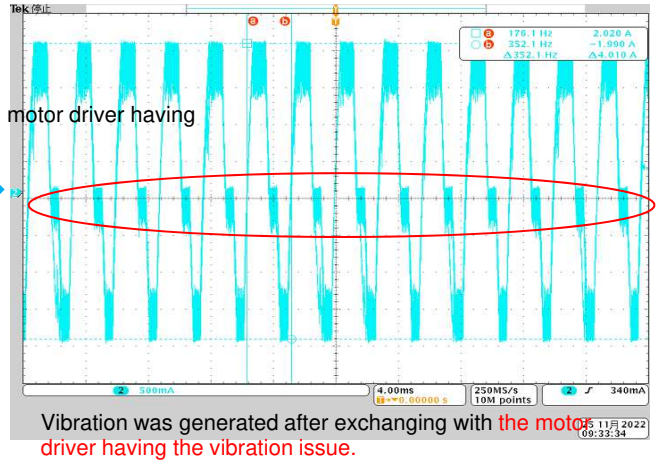No vibration after exchanging with the motor driver having no vibration issue.
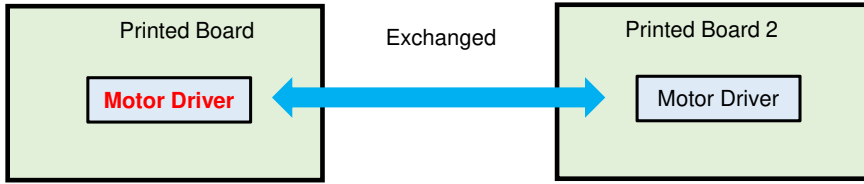
Printed Board 2 with the Motor Driver having no vibration issue.

Printed Board 2 with the Motor Driver having the vibration issue.

Exchanged with the motor driver having thevibration issue.

No vibration

Vibration was generated after exchanging with the motor driver having the vibration issue.

[Result]
Printed Board 1 : As there was no vibration issue after exchanging with the motor driver having no vibration issue, the issue seems to be shifted.
Printed Board 2 : As the vibration was generated after exchanging with the motor driver having the vibration issue, the issue seems to be shifted.

[Our Request]
・We would like you to tell us why the stepping motor vibrates and its solution.
・We can provide the IC having the issue for investigation. Is it possible for you to check it?

=END=