

Specification condition

- IC : TPS40302
- V_{in} : 12V
- V_{out} : -5V
- I_{out} : 3.6A
- F_{sw} : 600kHz
- L : 3.3 μ H
- Resistor value sets the OCP : ①2.49k Ω 、②4.99k Ω
- SS/ENA pin is OPEN.
- Ambient temperature : -40 $^{\circ}$ C (4.99k Ω) -10 $^{\circ}$ C (2.49k Ω)
- Topology is Inverting Buck Boost.

■ Problem

■ **Waveform and calculated value do not match.**

About overcurrent setting resistance value

It is a calculation formula of overcurrent protection from **Mathew Jacob1 replied** .

10uA x the resistor value sets the OCP trip point.=A

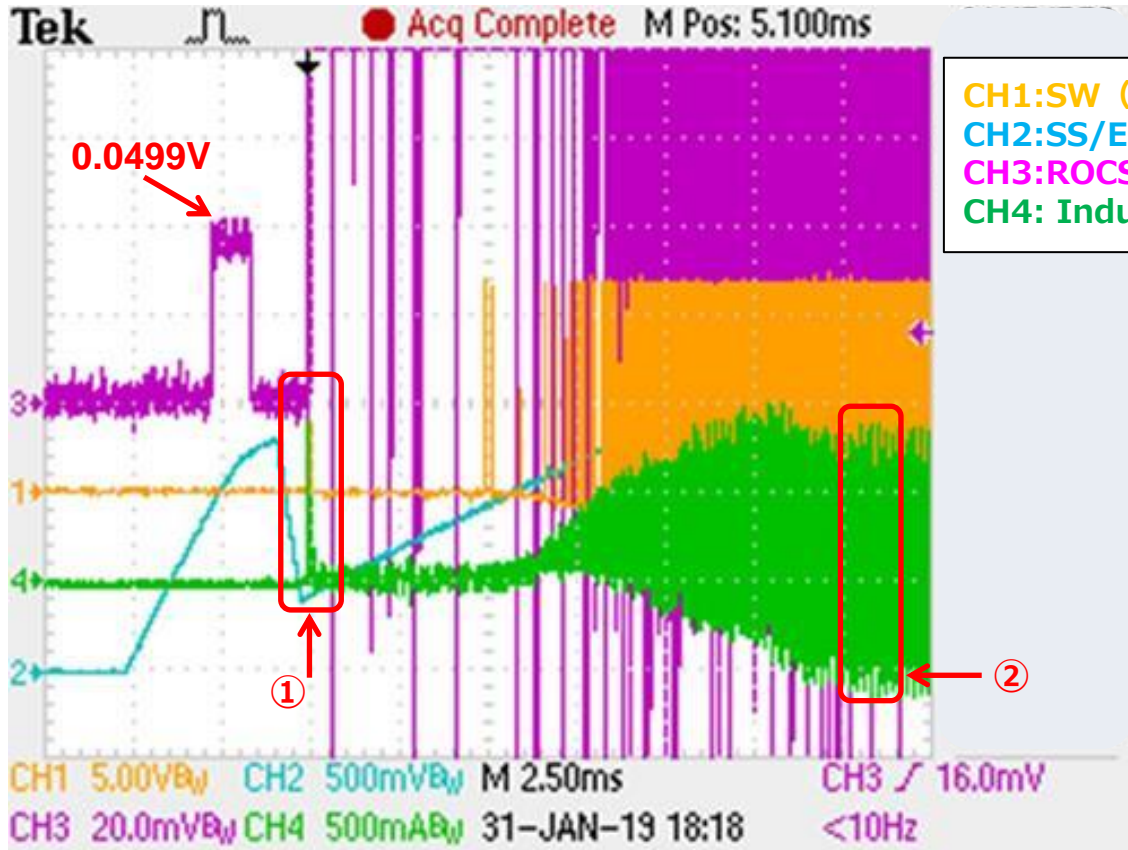
Peak current x the low side mosfet Rdson should be less than A

OCP Trip Point (A) > Peak Current × the low side mosfet Rdson

Is this formula correct?

Next page is my customer measurement waveform.

3- 1. TPS40304 Measurement Overall waveform resistor value sets the OCP :4.99kΩ



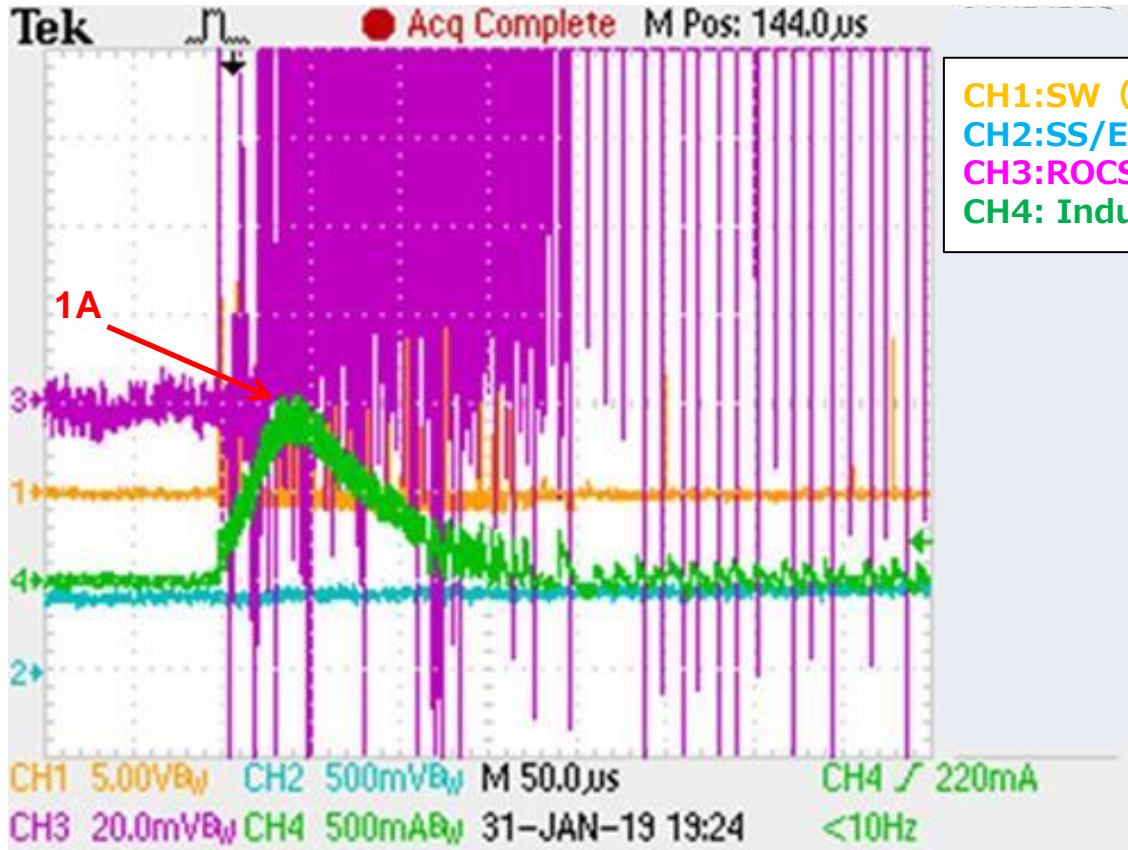
SS/ENA pin is OPEN
Measurement
Temperature -40°C

About Current limit calculation formula

Your answer
10uA x the resistor value sets the OCP
trip point.=A

$$A = 10\mu\text{A} \times 4.99\text{k}\Omega \\ = \mathbf{0.0499\text{V}}$$

3-1-①. TPS40304 Measurement ①Part Expanded waveform resistor value sets the OCP :4.99kΩ



SS/ENA pin is OPEN
Measurement
Temperature -40°C

About Current limit calculation formula

Your answer
10uA x the resistor value sets the OCP
trip point.=A

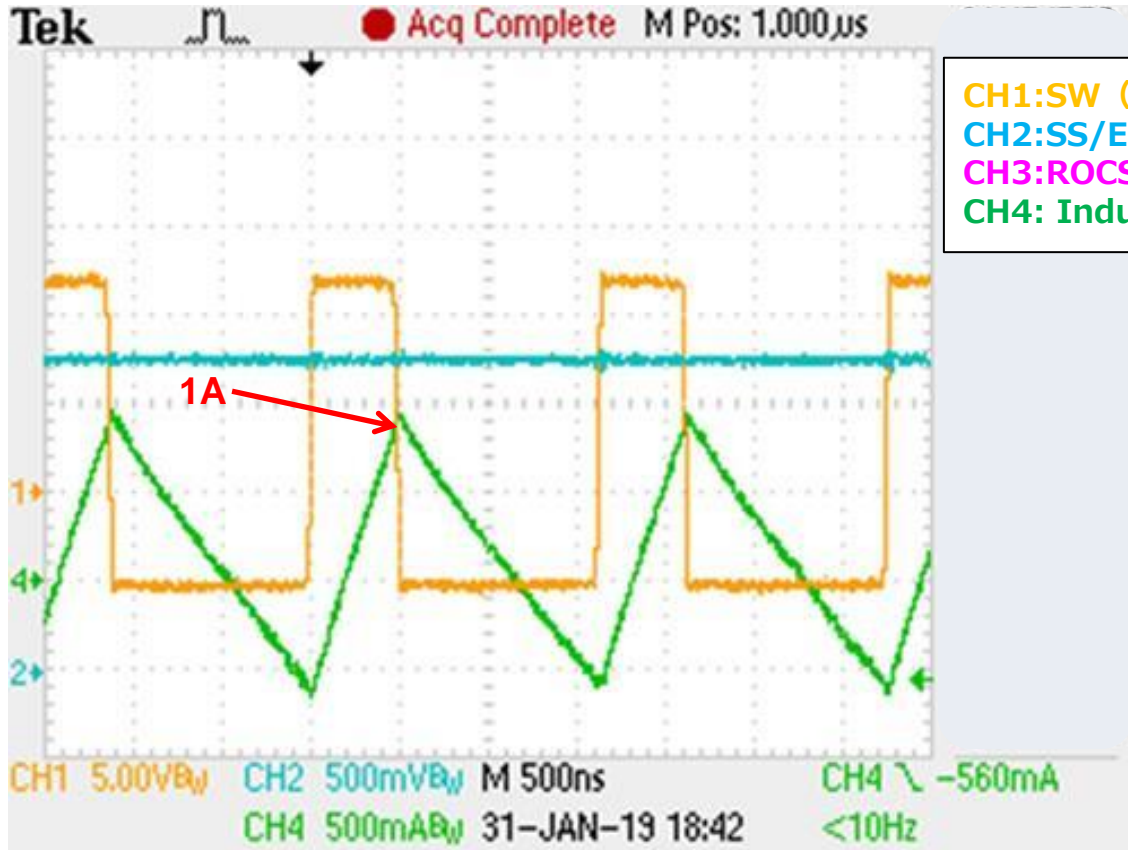
$$A = 10\mu\text{A} \times 4.99\text{k}\Omega \\ = \mathbf{0.0499\text{V}}$$

Peak current x the low side mosfet R_{dson} should be less than A
Peak Current x 8mΩ
= 1A x 8mΩ
= **0.008V**

OCP Trip Point (0.0499V) > Peak Current x 8mΩ (0.008V)

Overcurrent limitation does not work, normal operation.

3-1-②. TPS40304 Measurement ②Part Expanded waveform resistor value sets the OCP :4.99kΩ



SS/ENA pin is OPEN
Measurement
Temperature -40°C

About Current limit calculation formula

Your answer
10uA x the resistor value sets the OCP
trip point.=A

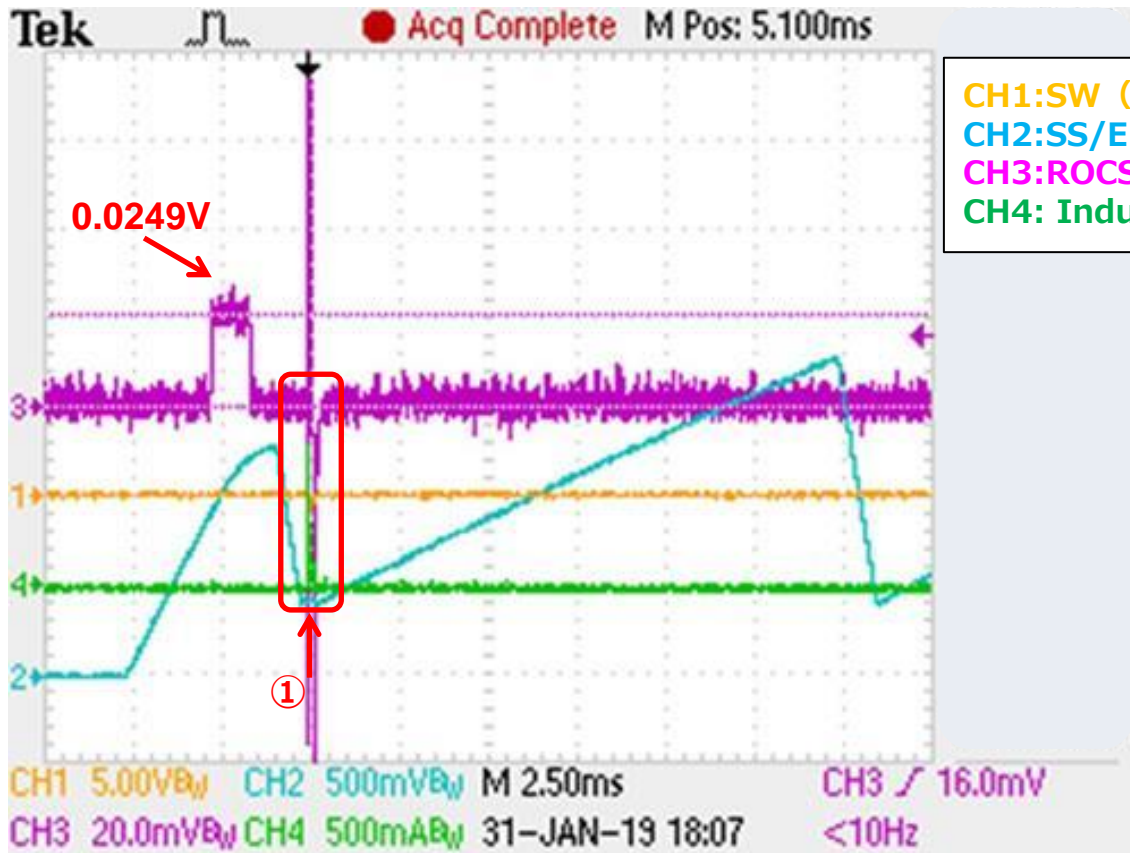
$$A = 10\mu A \times 4.99k\Omega \\ = \mathbf{0.0499V}$$

Peak current x the low side mosfet Rdson should be less than A
Peak Current x 8mΩ
= 1A x 8mΩ
= **0.008V**

OCP Trip Point (0.0499V) > Peak Current x 8mΩ (0.008V)

Overcurrent limitation does not work, normal operation.

3-2. TPS40304 Measurement Overall waveform resistor value sets the OCP :2.49kΩ



SS/ENA pin is OPEN
Measurement
Temperature -10°C

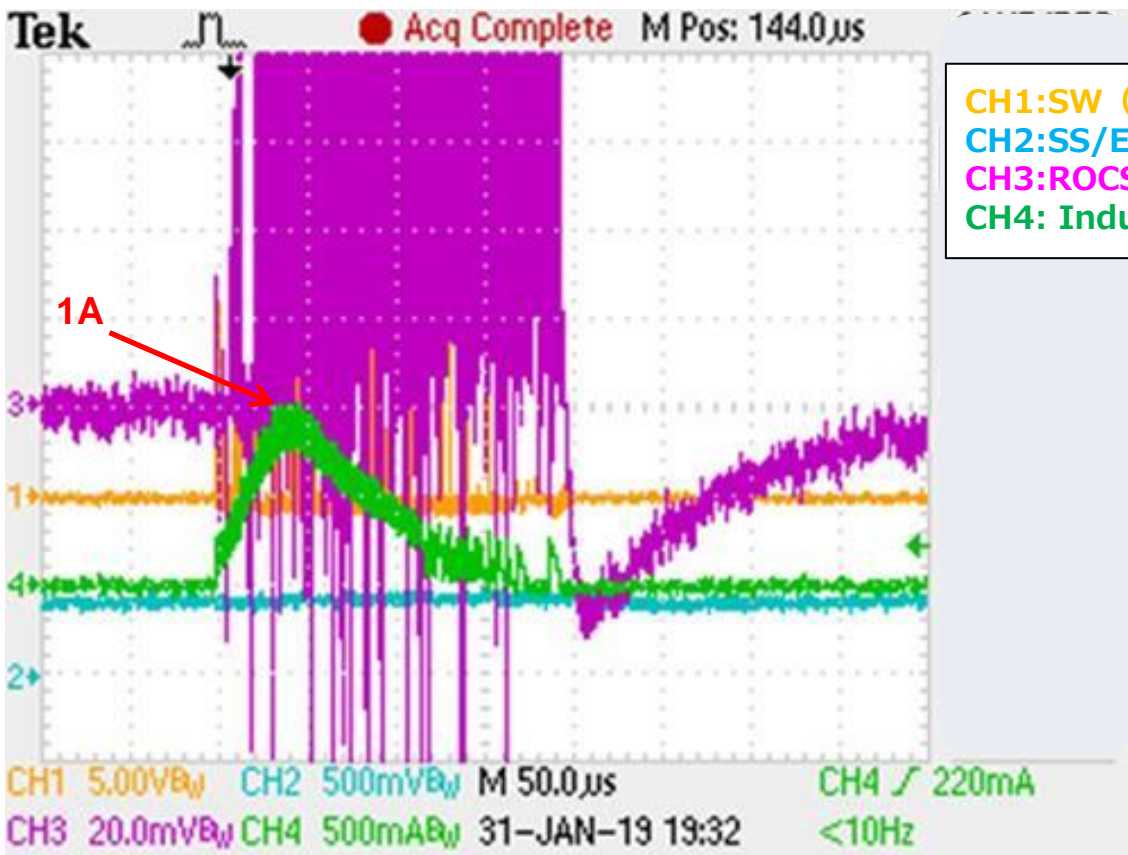
About Current limit calculation formula

Your answer

$10\mu\text{A} \times \text{the resistor value sets the OCP}$
trip point.=A

$$A = 10\mu\text{A} \times 2.49\text{k}\Omega$$
$$= \mathbf{0.0249V}$$

3-2-①. TPS40304 Measurement ①Part Expanded waveform resistor value sets the OCP :2.49kΩ



SS/ENA pin is OPEN
Measurement
Temperature -10°C

About Current limit calculation formula

Your answer
10uA x the resistor value sets the OCP
trip point.=A

$$A = 10\mu\text{A} \times 2.49\text{k}\Omega \\ = \mathbf{0.0249\text{V}}$$

Peak current x the low side mosfet R_{ds(on)} should be less than A
Peak Current x 8mΩ
= 1A x 8mΩ
= **0.008V**

OCP Trip Point (0.0249V) > Peak Current x 8mΩ (0.008V)

**Overcurrent limitation work and not normal operation.
Overcurrent limitation Phenomenon occurs.**

Question

- I think that there is no problem with $2.49 \text{ k}\Omega$ calculation formula taught from Mathew Jacob1, why does overcurrent protection work?
- ① When starting up, ② in steady operation, ③ Is the formula for overcurrent protection the same in the inverting circuit?
- If not, please put out each formula.