XCL225B0K1HR-G Evaluation Board User Manual

0.5A Inductor Built-in Step-down “micro DC/DC” Converter

CAUTION
ENGINEERING EVALUATION PURPOSES ONLY

This evaluation board is made for the purpose of the product evaluation.
It is strictly prohibited to use this evaluation board for any other purpose.

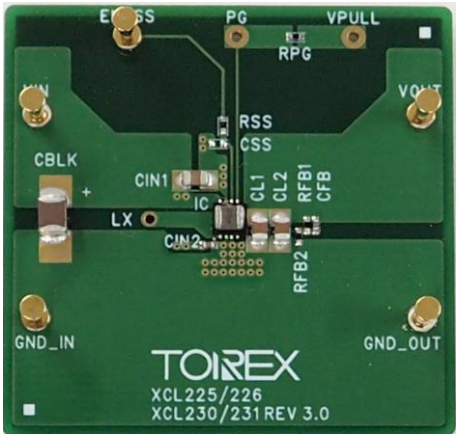
Torex Semiconductor does not guarantee that all samples will perform in exactly the same way and we recommend that you always consult our product data sheets for the minimum and maximum specifications.

It is also important that you evaluate all our products carefully before mass

XCL225B0K1HR-G Evaluation Board

18V operation synchronous step-down DC/DC converter

Evaluation Board Picture



Evaluation Board SPEC

Ta=25℃

		CONDITON.	MIN.	TYP.	MAX.	UNIT
Vin	Input Voltage Range	-	3.0	-	18.0	V
Vout	Setting Output Voltage	-	-	5.0	-	V
Iout	Output Current	-	0.0	-	500.0	mA
fosc	Switching frequency	-	-	1.2	-	MHz

XCL225/XCL226 Series Features

- Input Voltage Range ····· 3.6V ~ 18.0V
- Output Voltage Range ····· 1.0V ~ 15.0V
- Max Output Current ····· 500mA max.
- Switching frequency ····· 1.2MHz
- Max Duty Cycle ····· 100%
- Small Solution Size

- Low EMI Noise
- Built-in Inductor
- Sequence Control is possible. (Power Good and Soft Start functions)

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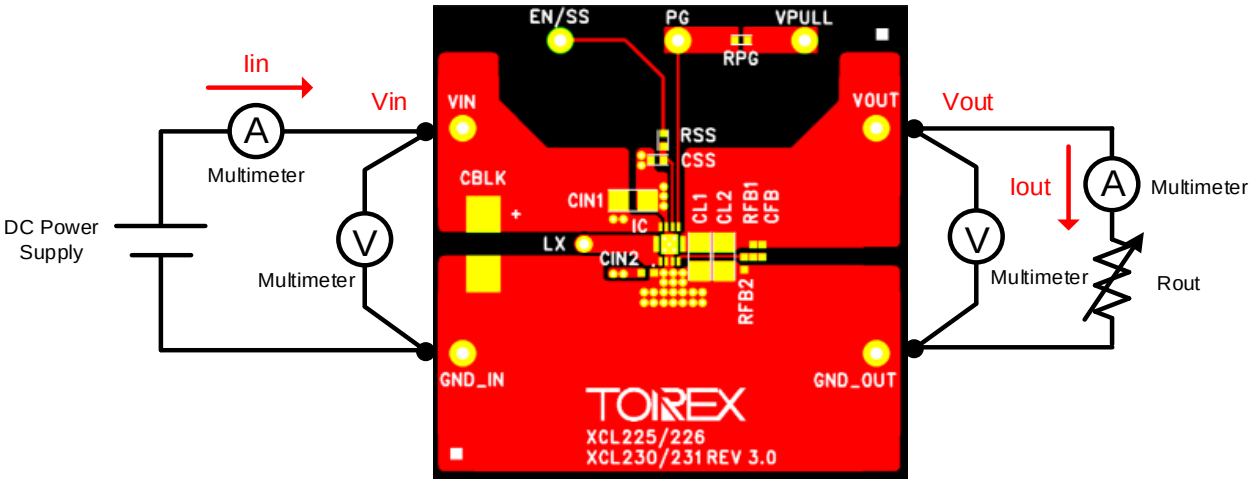
18V operation synchronous step-down DC/DC converter

Quick Start Procedure



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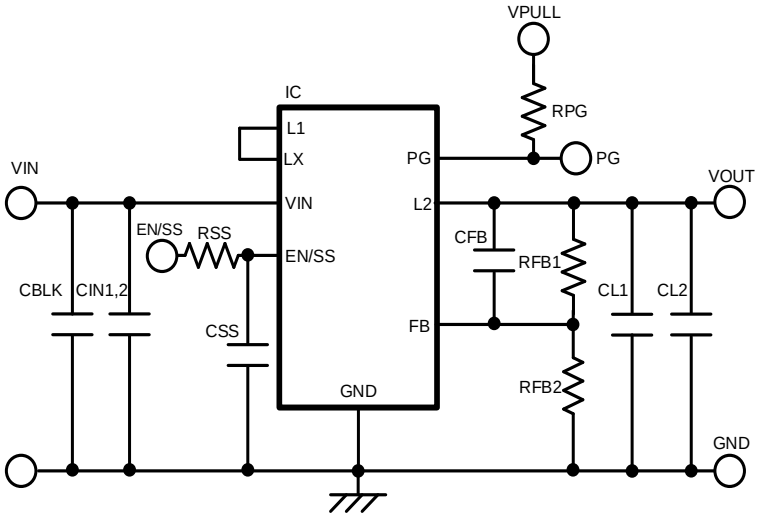
Schematic



BOM

Required Circuit Component

Item	Value	Description	Size [mm]	Part Number	Manufacture
IC	-	Step-Down micro DC/DC Converters	DFN3030-10B	XCL225B0K1HR	TOREX
CIN1	4.7uF	Ceramic cap., 50V	2012	UMK212BBJ475KG	Taiyo Yuden
CIN2	0.1uF	Ceramic cap., 50V	1608	CGA2B3X7R1H104K	TDK
CL1	10uF	Ceramic cap., 10V	2012	C2012X7R1A106K125AC	TDK
CL2	10uF	Ceramic cap., 10V	2012	C2012X7R1A106K125AC	TDK
RFB1	68kΩ	Resistor	1005	-	-
RFB2	12kΩ	Resistor	1005	-	-
CFB	180pF	Ceramic cap. , 50V, CH	1005	-	-
RSS	Jumper	Resistor	-	-	-
CSS	-	-	-	-	-
RPG	100kΩ	Resistor	-	-	-

Additional Demo Board Circuit Components

Item	Value	Description	Size [mm]	Part Number	Manufacture
CBLK	10uF	Ceramic cap., 50V/10uF	3225	CGA6P3X7S1H106K	TDK

Vout Setting Table

Vout Setting	RFB1	RFB2	CFB
3.0V	39kΩ	13kΩ	270pF
3.3V	51kΩ	15kΩ	220pF
5.0V	68kΩ	12kΩ	180pF
7.5V	27kΩ	3kΩ	390pF
10.0V	16kΩ	1.3kΩ	680pF
12.0V	36kΩ	2.4kΩ	330pF

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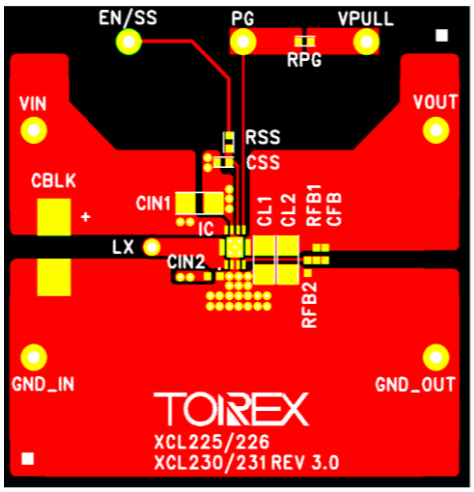
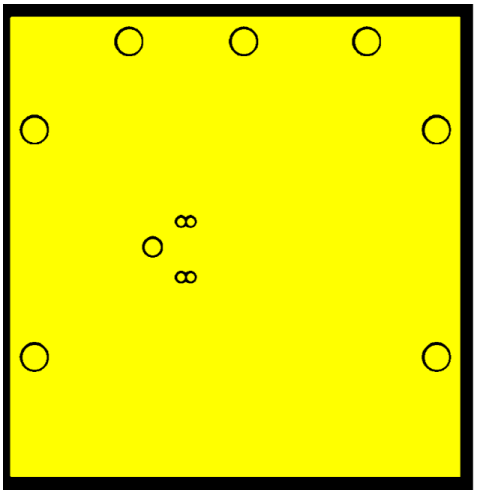
PCB Layout

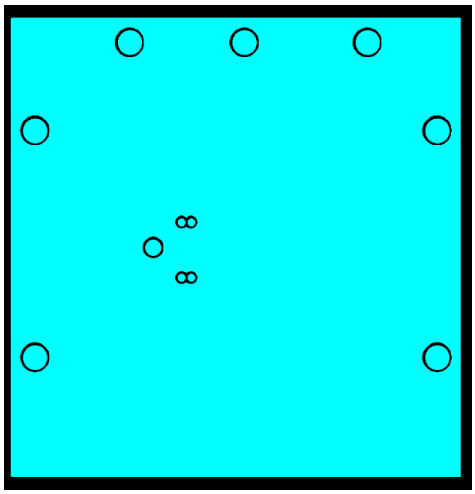
Layer 1



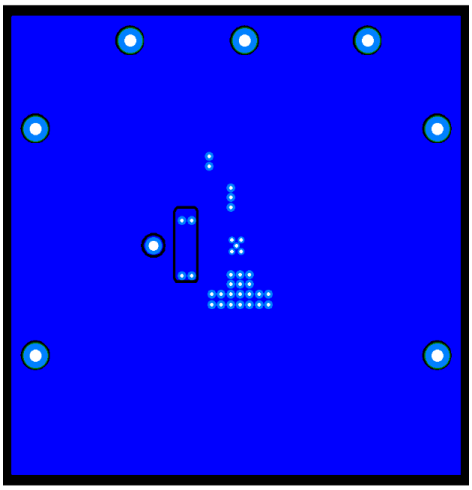
Layer 2



Layer 3



Layer 4



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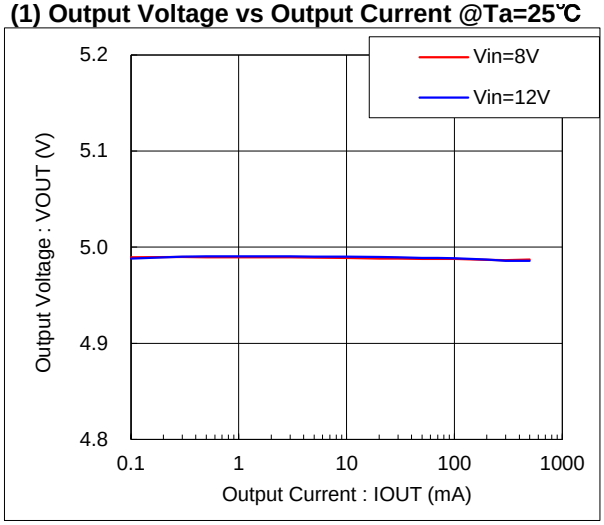
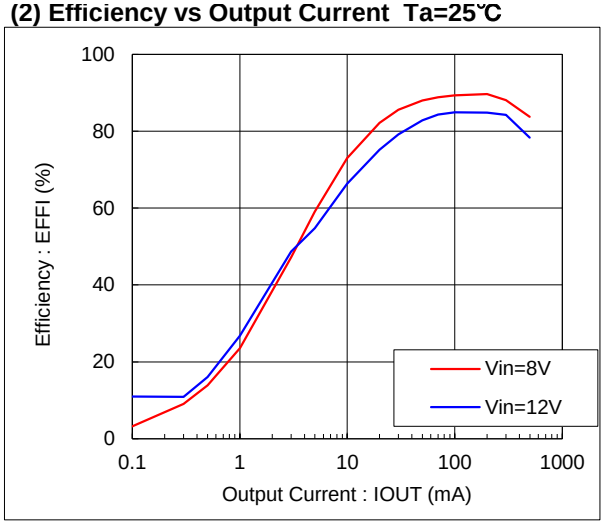
Test Result

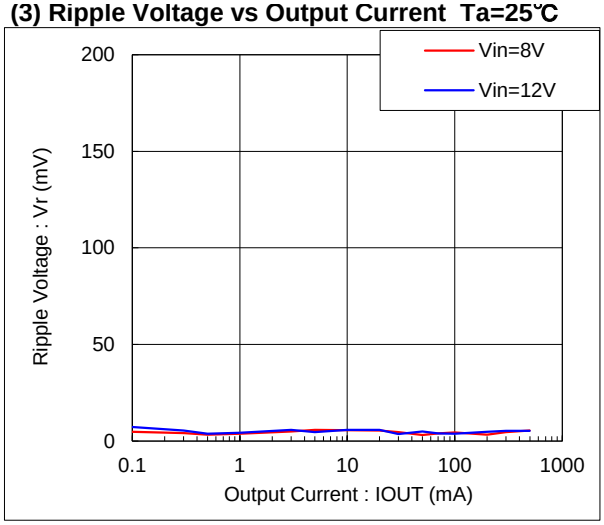
(1) Output Voltage vs Output Current @Ta=25℃



(2) Efficiency vs Output Current Ta=25℃



(3) Ripple Voltage vs Output Current Ta=25℃



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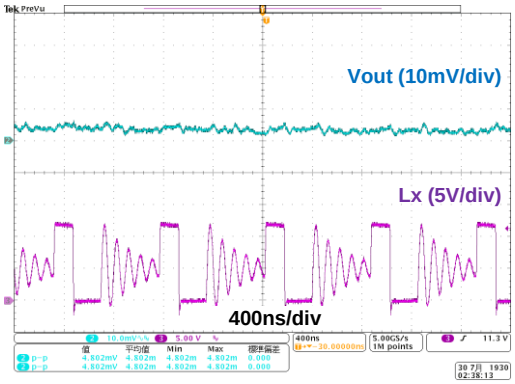
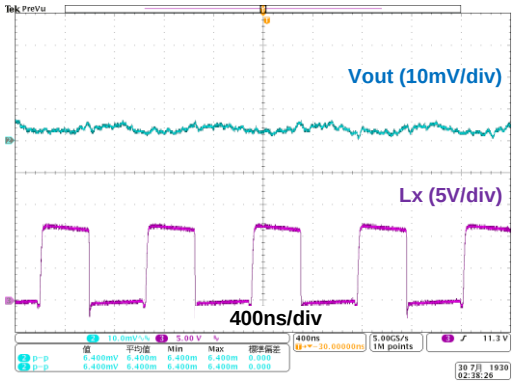
Test Result

(4) Output Voltage Waveform @ Ta=25℃

(4-1) Vin = 12V, Iout = 50mA



(4-2) Vin = 12V, Iout = 300mA



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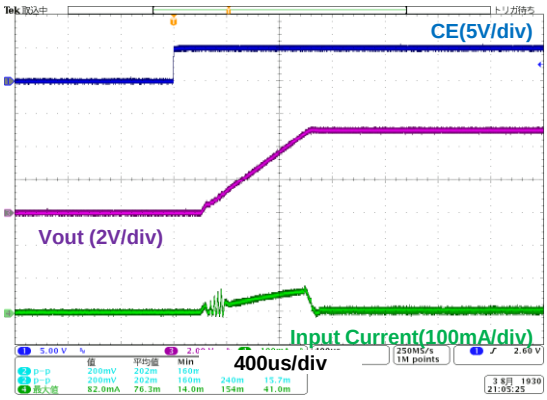
18V operation synchronous step-down DC/DC converter

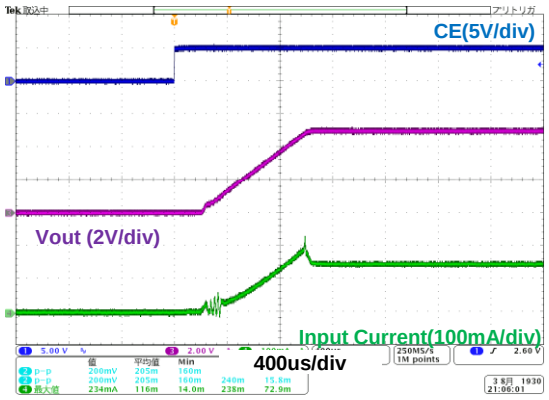
Test Result

(5) Start-up Waveform @ Ta=25℃

(5-1) Vin = 12V, Iout = 10mA



(5-2) Vin = 12V, Iout = 300mA



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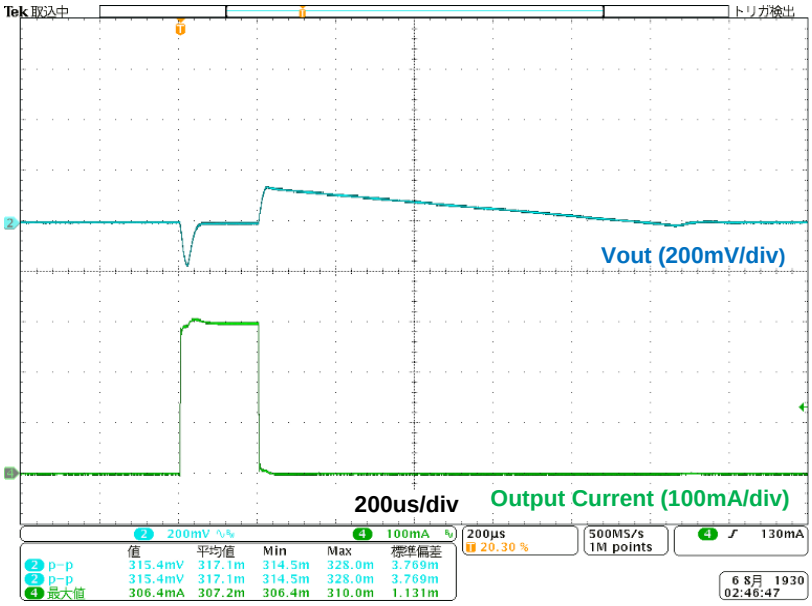
Test Result

(6) Load Transient Waveform @ Ta=25℃

(6-1) Vin = 12V, Iout = 1mA ⇔ 300mA



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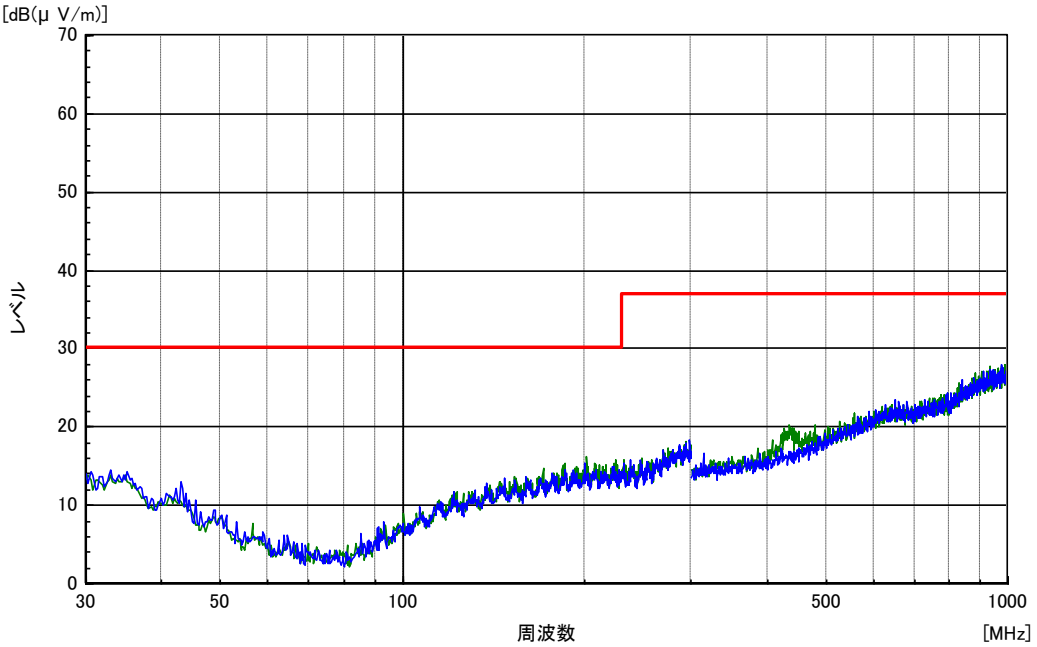
18V operation synchronous step-down DC/DC converter

Test Result

(7) Radiation EMI : VCCI 10m

Condition

IC : XCL225B0K1H2-G
Vin : 12V
Vout : 5V
Iout : 300mA



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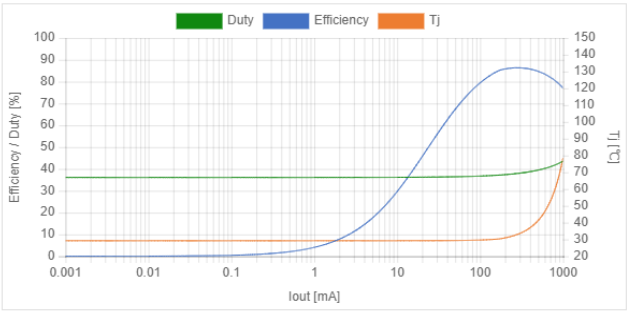
【Appendix】How to calculate DC/DC Converter or DC/DC Controller.

It can be calculated by the following "WEB DC/DC Simulation".

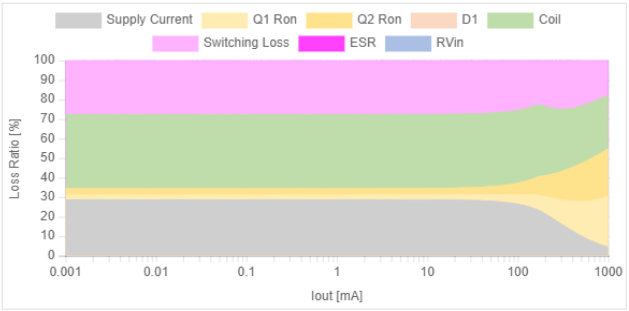
Product	XCL219 Product Info
Switching frequency	3000 [kHz]
Control Method	F-PWM
Sim Condition	
Vin	5 [V] Range: 2.5V~5.5V
Vout	1.8 [V] Range: 0.8V~3.6V
Iout	100 [mA] Range: 0~1000mA
Rvin (Battery Inpedance etc)	0 [Ω]
Ta	25 [℃] Range: -40~105℃
Thermal resistance: θja	100 [℃/W] Range: 0~1000℃/W
External Components	
CL (Effective Value)	5 [μF]
ESR	5 [mΩ]

Schematic Summary | Waveform | Efficiency Tj, Duty | Ripple Voltage Vin Voltage | Coil Current Input Current | Switching frequency

Efficiency



Loss Ratio



日本語 : https://www.torex.co.jp/technical-support/dcdc-simulation/
English : https://www.torexsemi.com/technical-support/dcdc-simulation/
简体中文 : https://www.torex.com.cn/technical-support/dcdc-simulation/

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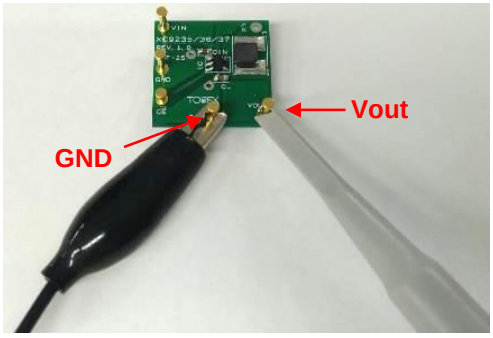
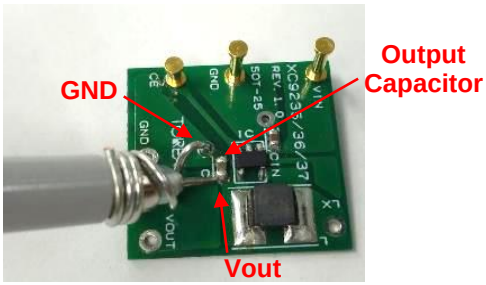
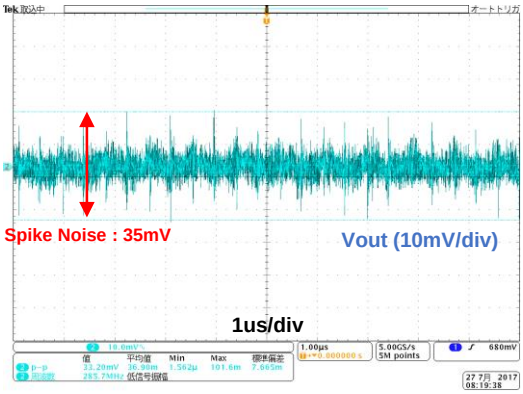
【Appendix】How to reduce the spike noise caused by measurement (Probing method with oscilloscope)

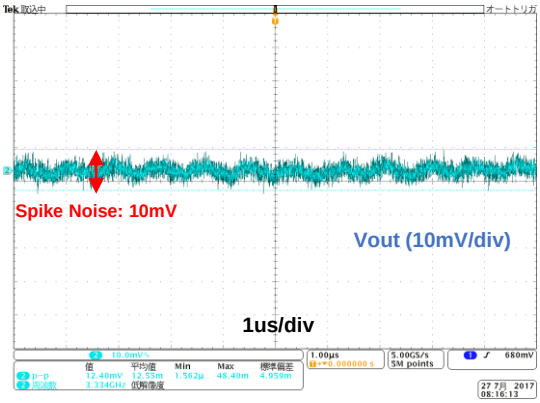
Probing method : Before improvement



Probing method : After







*** Condition : XC9236, Vin=3.6V/Vout=1.8V/100mA**

English : https://www.torexsemi.com/technical-support/tips/reduction-spike-noise/
日本語 : https://www.torex.co.jp/technical-support/tips/reduction-spike-noise/