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XCL206 Evaluation Board

'micro-DC/DC'

Step-down DC/DC Converter with Integrated
Multilayer Inductor

USER MANUAL:

XCL206B123-EVB	($V_{OUT} = 1.2V$)
XCL206B153-EVB	($V_{OUT} = 1.5V$)
XCL206B183-EVB	($V_{OUT} = 1.8V$)
XCL206B283-EVB	($V_{OUT} = 2.8V$)
XCL206B303-EVB	($V_{OUT} = 3.0V$)



XCL206 Evaluation Board Inductor Built-in Step-Down DC/DC Converters

WARNING

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.

XCL206 DATASHEET → www.torex.co.jp

It is also important that you evaluate all our products carefully before mass production and in case of any doubt, please contact your Torex representative.

Important Notes:

- The operating temperature range for this IC is $-20\sim+85^{\circ}\text{C}$.
- The operating DC input voltage range is from 2.0V to 6.0V.

If an input voltage higher than 6.0V is applied, the operation of this IC cannot be guaranteed. Moreover, if a voltage higher than 6.5V is applied the IC may be permanently damaged.

• At the output of the IC, if the selected load causes the IC to supply a continuous current higher than the maximum rated current (600mA), the IC may be damaged.

CAUTION

ENGINEERING EVALUATION PURPOSES ONLY

This evaluation board is made for the purpose of the XCL206 product evaluation. It is strictly prohibited to use this evaluation board for any other purpose.



XCL206 Evaluation Board

Inductor Built-in Step-Down DC/DC Converters

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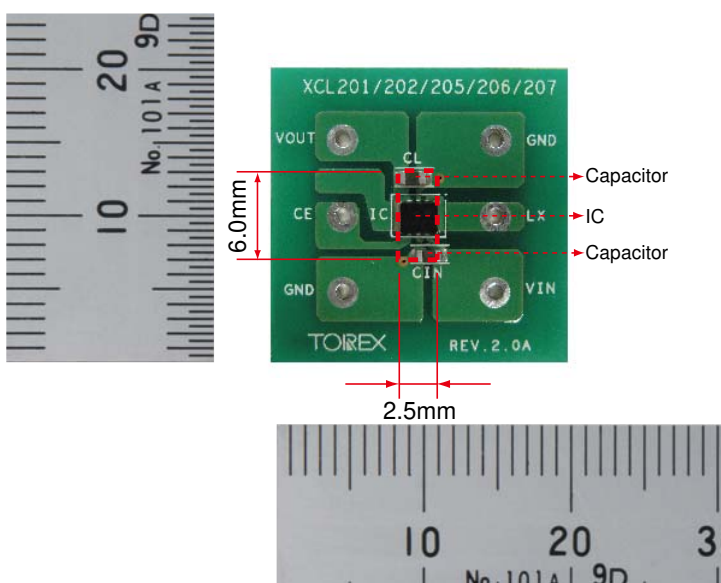
Chapter 1: INTRODUCTION

The XCL206 series is a synchronous step-down DC/DC converter which integrates an inductor and a control IC in one tiny package (2.5mm × 2.0mm, H=1.0mm). A stable power supply with an output current of 600mA is configured using only two capacitors connected externally.

Operating voltage range is from 2.0V to 6.0V. Output voltage is internally set in a range from 0.8V to 4.0V in increments of 0.05V. The device is operated by 3.0MHz, and includes 0.42Ω P-channel driver transistor and 0.52Ω N-channel switching transistor. The XCL206 series has automatic PWM/PFM switching control, allowing fast response, low ripple and high efficiency over the full range of loads (from light load to heavy load). During stand-by, the device is shutdown to reduce current consumption to as low as 1.0 μA or less.

With the built-in UVLO (Under Voltage Lock Out) function, the internal driver transistor is forced OFF when input voltage becomes 1.4V or lower. XCL206B series provide short-time turn-on by the soft start function internally set in 0.25ms (TYP). XCL206B integrate CL auto discharge function which enables the electric charge stored at the output capacitor CL to be discharged via the internal auto-discharge switch located between the LX and VSS pins. When the devices enter stand-by mode, output voltage quickly returns to the V_{SS} level as a result of this function.

Parameter	Symbol	Value	Unit
Input Voltage	V _{IN}	~ 6.0	V
Output Voltage	V _{OUT}	1.2V, 1.5V, 1.8V, 2.8V, 3.0V	V
Output Current	I _{OUT}	600	mA



Chapter 2: QUICK START GUIDE

2.1. CE pin (XCL206 series)

To enable the IC, connect the Chip Enable (CE) pin to VIN or to any other source voltage between 0.65V and 6V.

To disable the IC, connect the CE pin to GND or to any other voltage lower than 0.25V.

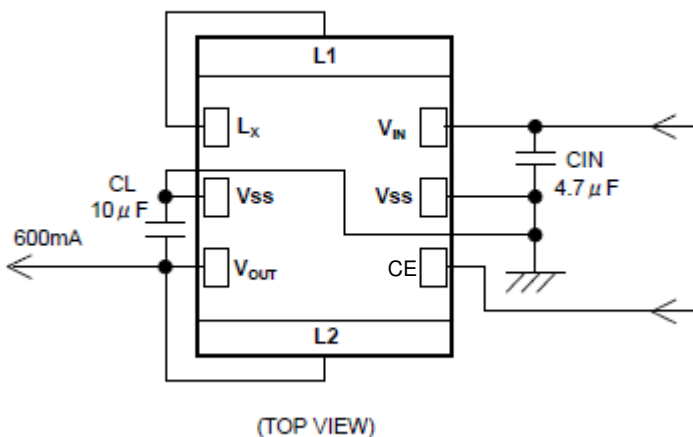
The XCL206 always operates in PWM/PFM mode. At low to medium output currents, the XCL206 will use the more efficient PFM (Pulse Frequency Modulation) mode. In PFM mode, the device switches less often, which means that the XCL206 will have a very high efficiency over the whole load range.

Because of some clever implementation, in PFM mode, the XCL206 combines a high efficiency with a very low output voltage ripple (usually below 15mVpp over the whole range of input voltage values).

Chapter 3: SCHEMATIC, BOM AND PCB LAYOUT

3.1. Schematic

Below is the schematic of the XCL evaluation board.



* "L1 and Lx", and "L2 and Vout" are connected by wiring.

3.2. Bill of Materials

As you will notice on your evaluation board, the XCL circuit only requires two small (EIA size 0603) ceramic capacitors. So it hardly takes more space than a standard LDO voltage regulator circuit, while exhibiting a much higher efficiency.

XCL206B123-EVB

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	CIN	4.7 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ475KA
1	CL	10 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ106MA
1	IC	1.2V	Synchronous Step-Down Micro DC/DC	CL2025	Torex	XCL206B123AR-G

XCL206B153-EVB

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	CIN	4.7 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ475KA
1	CL	10 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ106MA
1	IC	1.5V	Synchronous Step-Down Micro DC/DC	CL2025	Torex	XCL206B153AR-G

XCL206B183-EVB

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	CIN	4.7 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ475KA
1	CL	10 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ106MA
1	IC	1.8V	Synchronous Step-Down Micro DC/DC	CL2025	Torex	XCL206B183AR-G

XCL206B283-EVB

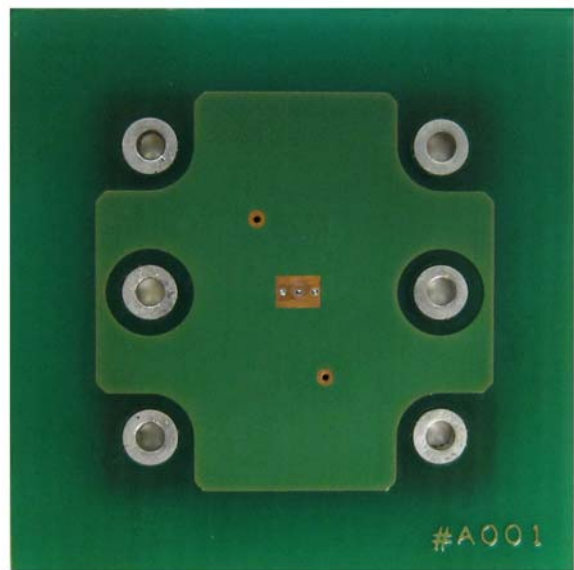
Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	CIN	4.7 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ475KA
1	CL	10 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ106MA
1	IC	2.8V	Synchronous Step-Down Micro DC/DC	CL2025	Torex	XCL206B283AR-G

XCL206B303-EVB

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	CIN	4.7 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ475KA
1	CL	10 μ F	Ceramic 10V B, X5R	1608 (0603-EIA)	Taiyo Yuden	LMK107BJ106MA
1	IC	3.0V	Synchronous Step-Down Micro DC/DC	CL2025	Torex	XCL206B303AR-G

3.3. PCB layout

The below pictures are showing the top (left) and bottom (right) views of the PCB.



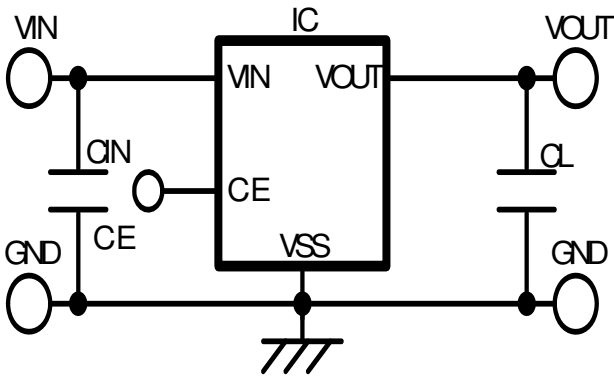
The following picture is showing a fully populated XCL evaluation board.



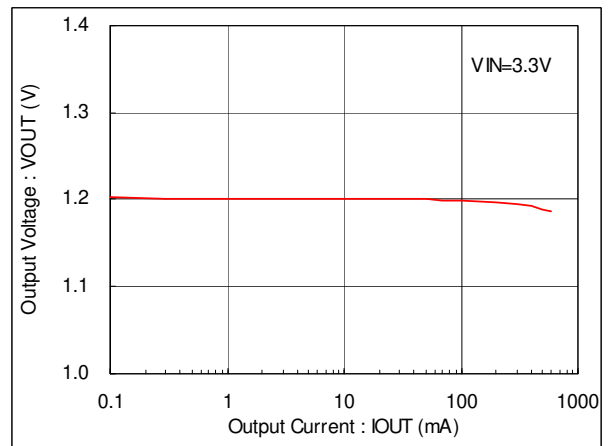
Chapter 4: TYPICAL CHARACTERISTICS

XCL206B123-EVB

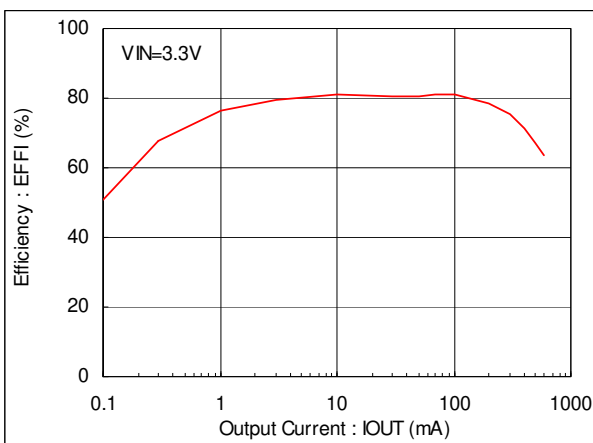
Below are the typical performances that you should observe when using your XCL evaluation board.



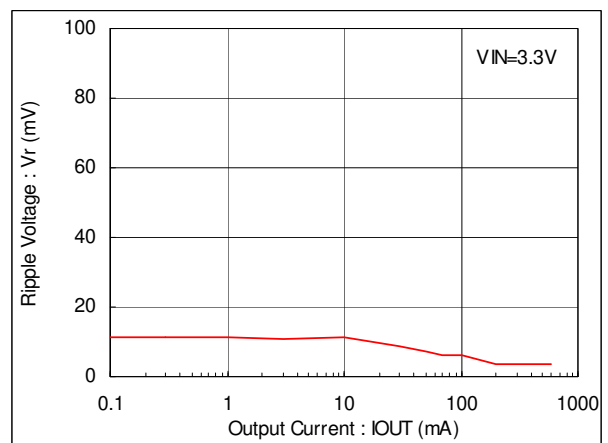
(1) Output Voltage vs. Output Current $T_a=25^\circ\text{C}$



(2) Efficiency vs. Output Current $T_a=25^\circ\text{C}$



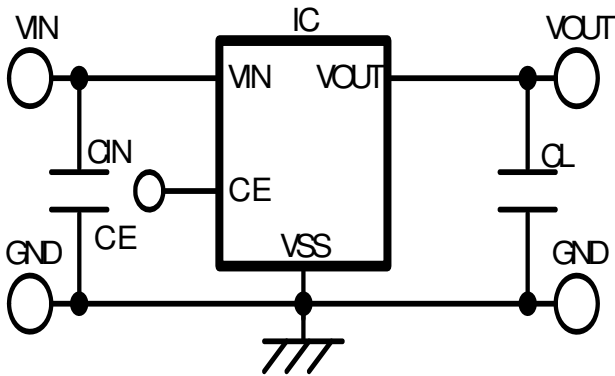
(3) Ripple Voltage vs. Output Current $T_a=25^\circ\text{C}$



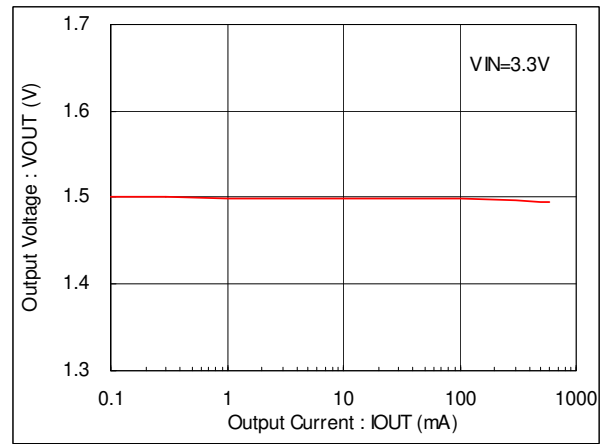
Chapter 4: TYPICAL CHARACTERISTICS

XCL206B153-EVB

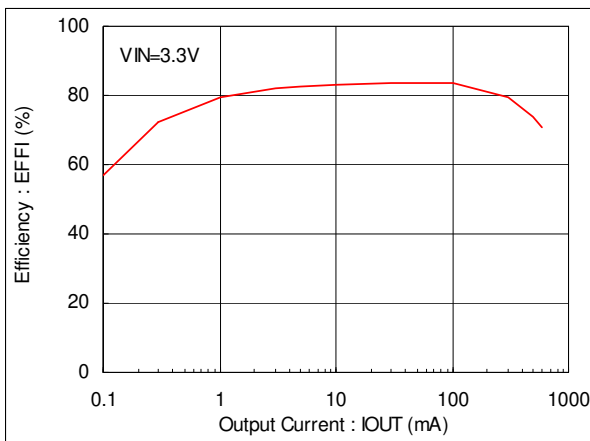
Below are the typical performances that you should observe when using your XCL evaluation board.



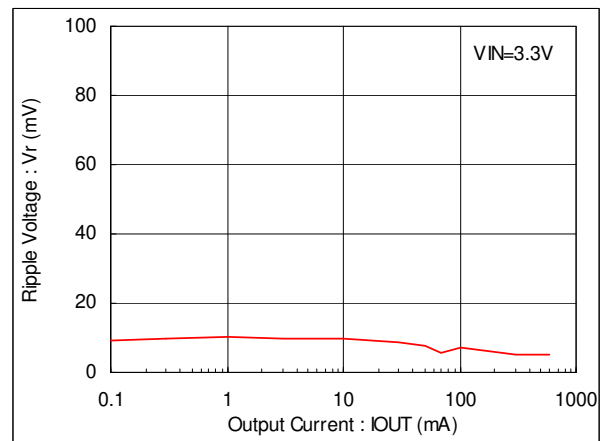
(1) Output Voltage vs. Output Current $T_a=25^\circ\text{C}$



(2) Efficiency vs. Output Current $T_a=25^\circ\text{C}$



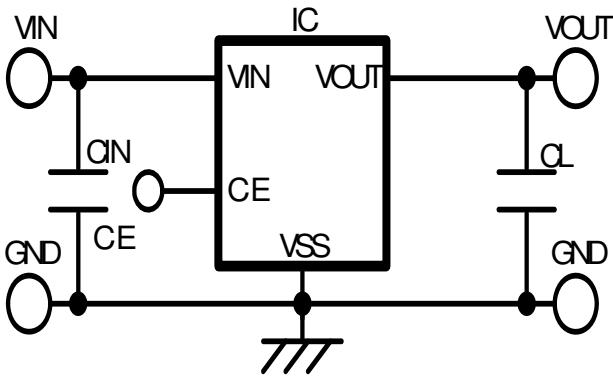
(3) Ripple Voltage vs. Output Current $T_a=25^\circ\text{C}$



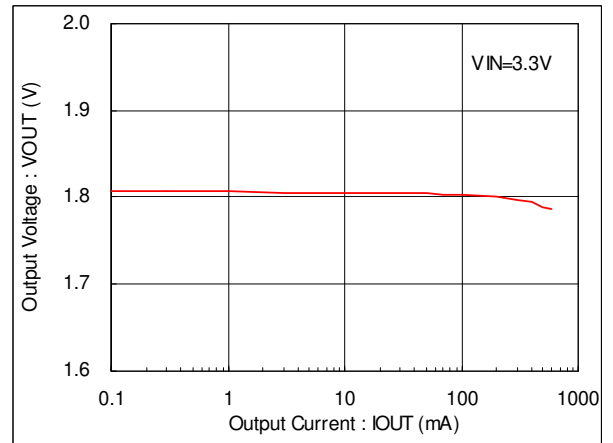
Chapter 4: TYPICAL CHARACTERISTICS

XCL206B183-EVB

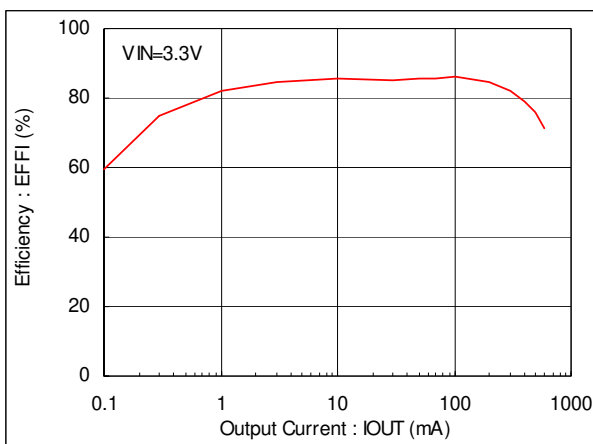
Below are the typical performances that you should observe when using your XCL evaluation board.



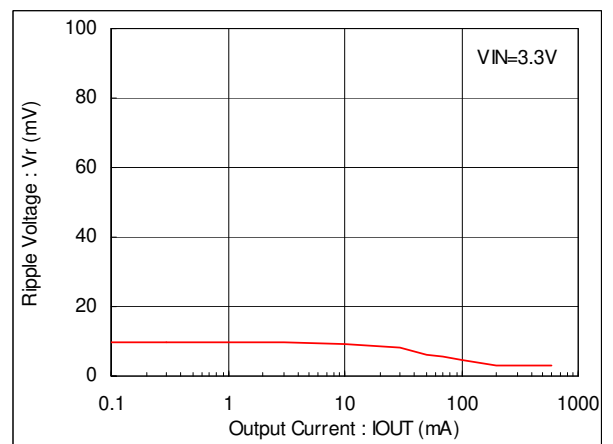
(1) Output Voltage vs. Output Current $T_a=25^\circ\text{C}$



(2) Efficiency vs. Output Current $T_a=25^\circ\text{C}$



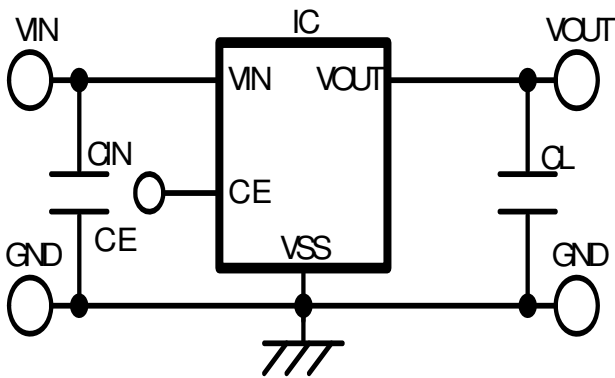
(3) Ripple Voltage vs. Output Current $T_a=25^\circ\text{C}$



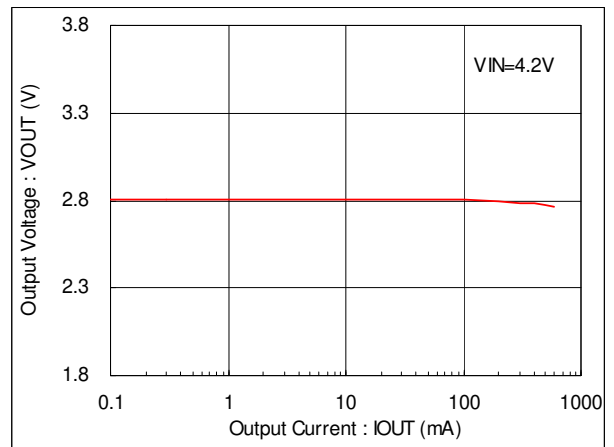
Chapter 4: TYPICAL CHARACTERISTICS

XCL206B283-EVB

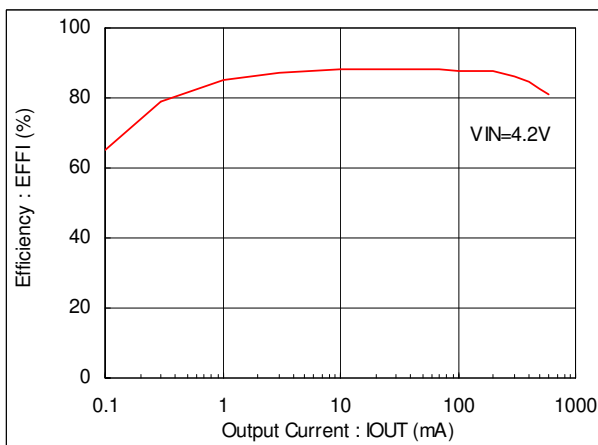
Below are the typical performances that you should observe when using your XCL evaluation board.



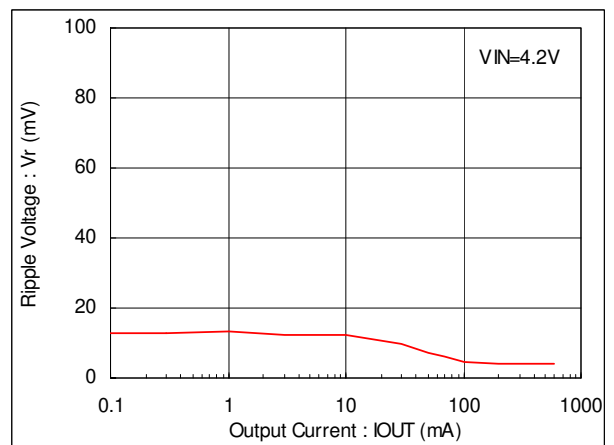
(1) Output Voltage vs. Output Current $T_a=25^\circ\text{C}$



(2) Efficiency vs. Output Current $T_a=25^\circ\text{C}$



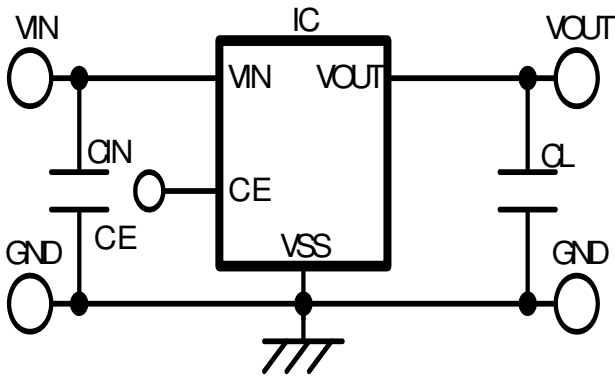
(3) Ripple Voltage vs. Output Current $T_a=25^\circ\text{C}$



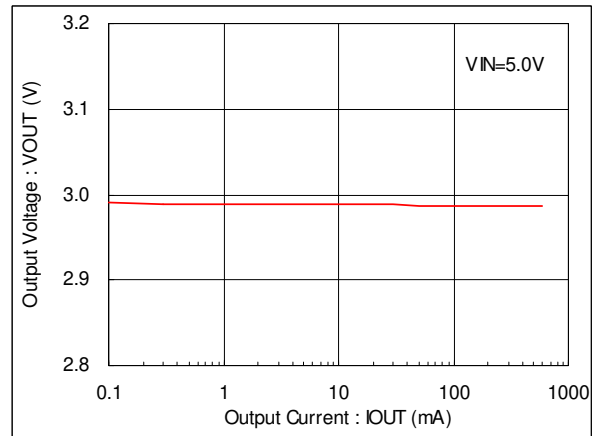
Chapter 4: TYPICAL CHARACTERISTICS

XCL206B303-EVB

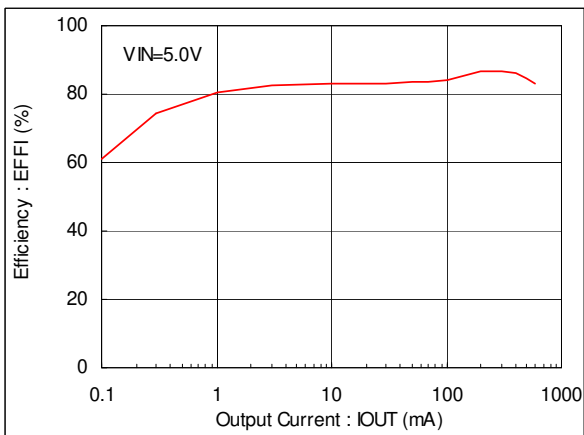
Below are the typical performances that you should observe when using your XCL evaluation board.



(1) Output Voltage vs. Output Current $T_a=25^\circ\text{C}$



(2) Efficiency vs. Output Current $T_a=25^\circ\text{C}$



(3) Ripple Voltage vs. Output Current $T_a=25^\circ\text{C}$

