TOREX

Torex...Powerfully Small!

IEC 62368-1 Certification
Load Switch with Ideal Diode function
XC8110 / XC8111 Series Product Overview

超モノづくり部品大賞 「電気・電子部品賞」受賞

一般財団法人省エネルギーセンター 主催
2023年度 省エネ大賞
(製品・ビジネスモデル部門)
審査委員会特別賞受賞

Dec 2023

TOREX Semiconductor

Rev. 2.1

Ideal Diode Function / No Input Current under Reverse bias / Small Solution / IEC 62368-1 Certified

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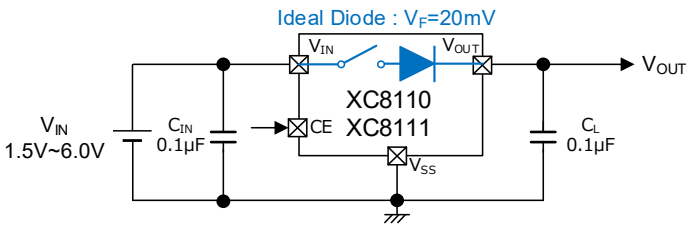
Features

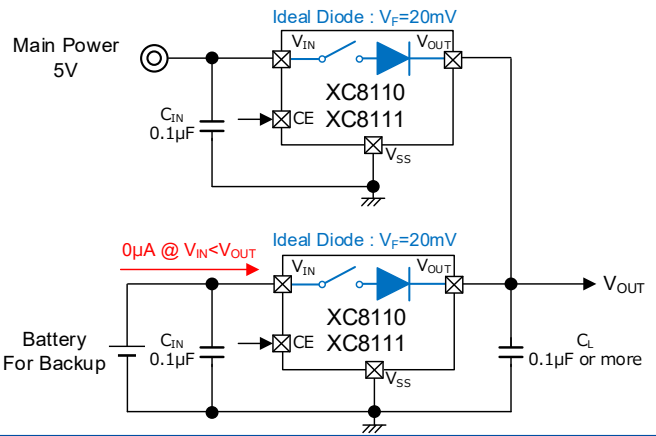
Input Voltage	: 1.5V ~ 6.0V
Output Current	: XC8110 / 500mA (V_{IN} > 1.7V)
	: XC8111 / 1A (V_{IN} >2.0V)
Stand-by Current	: 0.65µA
Supply Current	: 3.6µA (at Forward bias)
	0.0µA (at Reverse bias)
Reverse Bias Current	: 0.8µA
Forward Voltage	: 20mV
Current Limit	: XC8110 / 850mA
	: XC8111 / 1700mA
Short Current	: 50mA
Function	: Ideal diode function
Protection	: Inrush Current Protection
	: Current limit
	: Thermal Shutdown
Standard	: IEC 62368-1:2018 Certified
Packages	: WLP-4-02, SOT-25, USP-6B06
Operating Ambient Temp.	: -40℃ ~ 105℃

Typical Application Circuit

Diode / substitute for load switch

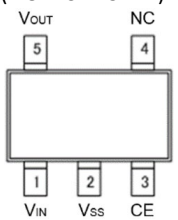


OR circuit: backup circuit, etc.

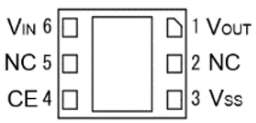


Packages

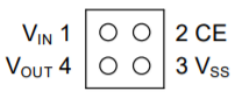
SOT-25
(2.8x2.9x1.3mm)

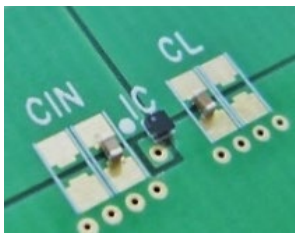


USP-6B06
(1.5x1.8x0.33mm)



WLP-4-02
(0.82*0.82*0.5mm)





XC8110/XC8111: Function as Ideal Diode

Ideal Diode function

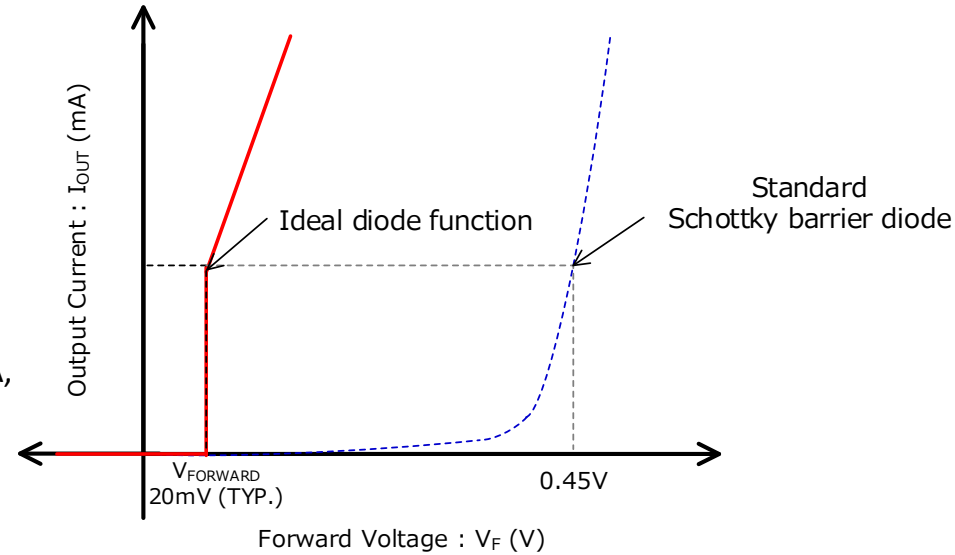
VF and leakage current are much smaller than SBD.

- VF of SBD is around 0.3~0.4V. When an SBD is inserted in series with a battery, the battery life is shortened due to VF losses. With ideal diodes, VF losses can be reduced and battery life can be prolonged.
- Good to avoid heat issue as well.

Lower leakage current from VOUT to VIN

- SBDs have a leakage current of several µA to several hundred µA, which have a negative impact on battery life.
  Whereas the ideal diode have almost no leakage current.

IV curve of Ideal diode



Reverse current function

There are types of reverse current prevention. XC8110/XC8111 has a True Reverse Current Prevention function.

✓ **True Reverse Current Prevention:**

Normally V_{OUT} is maintained at "V_{IN}-20mV". If V_{OUT} becomes higher than this, the reverse current prevention is activated.
This function provides complete reverse current prevention like a diode.

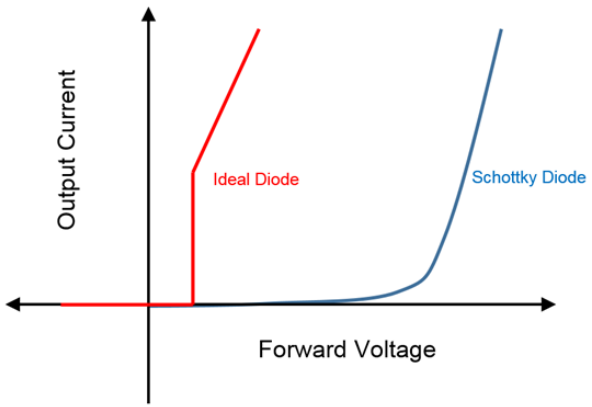
✓ **Reverse current prevention: usual load SWs**

This function prevents reverse current when the voltage on the input side becomes lower, but since reverse current is prevented after it has flowed, complete reverse current prevention is not possible.
* When CE = "L", reverse current prevention is possible without reverse current flow.

XC8110/XC8111: Protection function

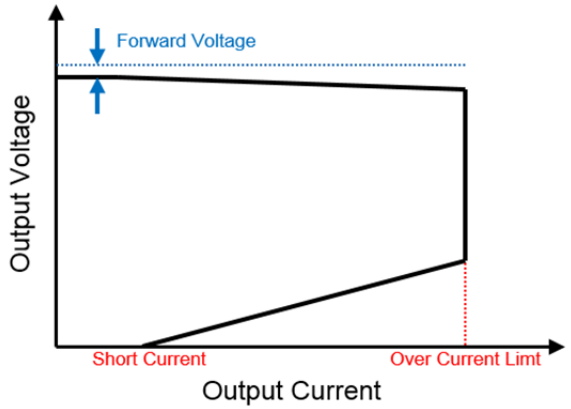
- Equipped with protective functions which are not found in diodes.

IV Characteristic



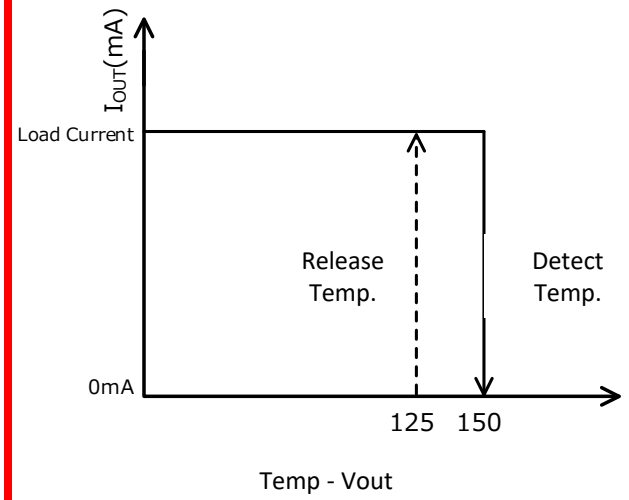
1/20 Almost no VF Compared to SBD

Current Limit



Current limit with foldback
⇒ Pseudo Fuse that can be used repeatedly

Thermal Protection



Thermal shutdown (Automatic recovery)

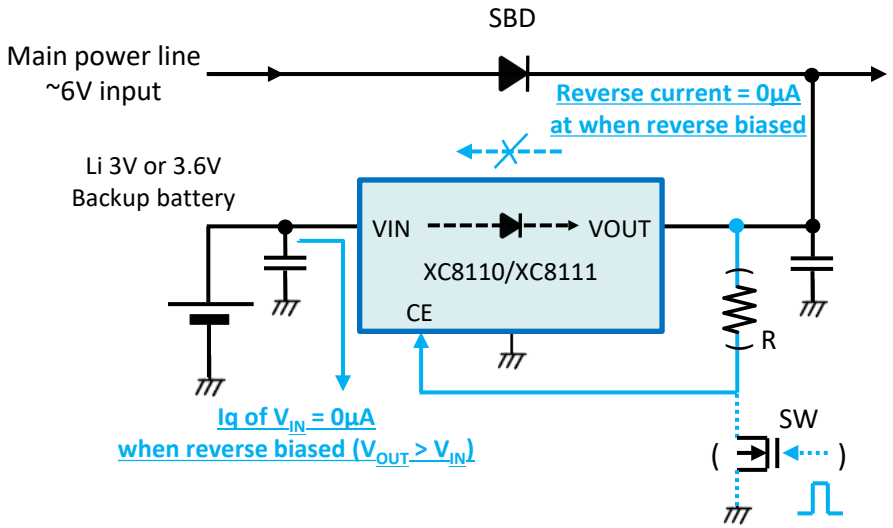
- Equipped with protection functions such as current limit function. Significantly improved safety.

IEC 62368-1:2018 certified, enabling simplification of stand-alone failure testing of the post-stage components.

XC8110/XC8111: Application circuit 1

OR Connection / Backup circuit

- There is no voltage drop such as VF of SBD.
- Iq of VIN is 0.0µA when reverse biased, so suitable for a backup circuit.
- Easy automatic switching of power supply path without control



Additional shutdown function for shipping.

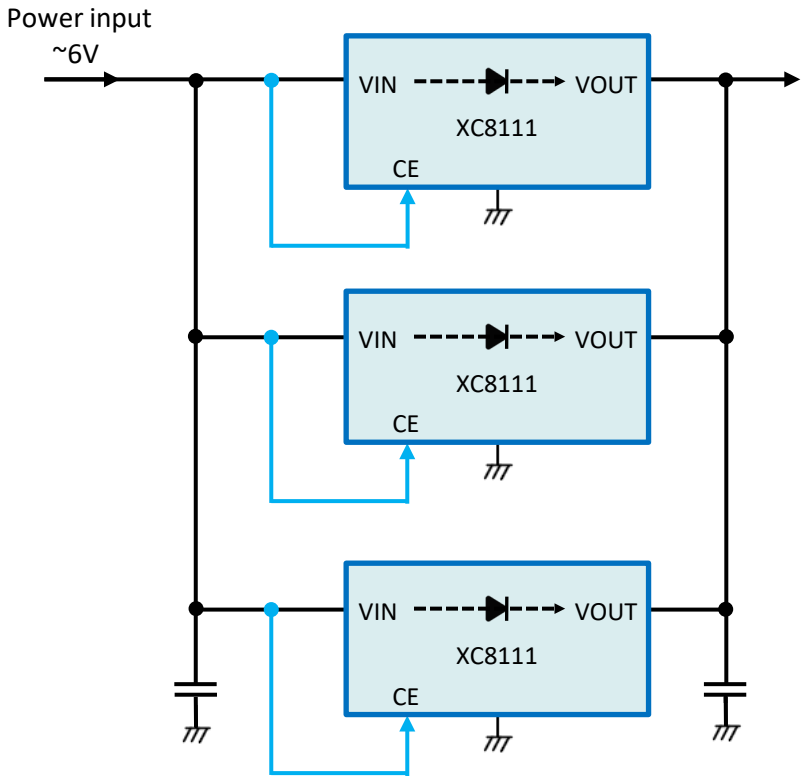
Basic use as ideal diode.
It is ideal for OR connection applications as it is equipped with true reverse current prevention.

A shutdown function at the time of shipment can also be installed by making the CE connection point on the output side.

Condition	CE	Usual case	IV_{IN} (Iq)	IV_{OUT}	ICE
Forward bias	"H"	Forward bias as a diode	3.6µA	0µA	0.48µA
Reverse bias		Reverse bias as a diode	0µA	0.8µA	
Forward bias	"L"	SW off as Load SW, Ship mode	0.65µA	0µA	0µA
Reverse bias		SW off as Load SW with Reverse bias	0µA	0.8µA	

XC8110/XC8111: Application circuit 2

Large current output by parallel connection



Parallel connection is available to use for large current and/or low Ron.

Parallel connection of the XC8111 is available for use with currents of 1 A or more.

If a current higher than 1 A or a lower Ron is required, the XC8111 can be connected in parallel.