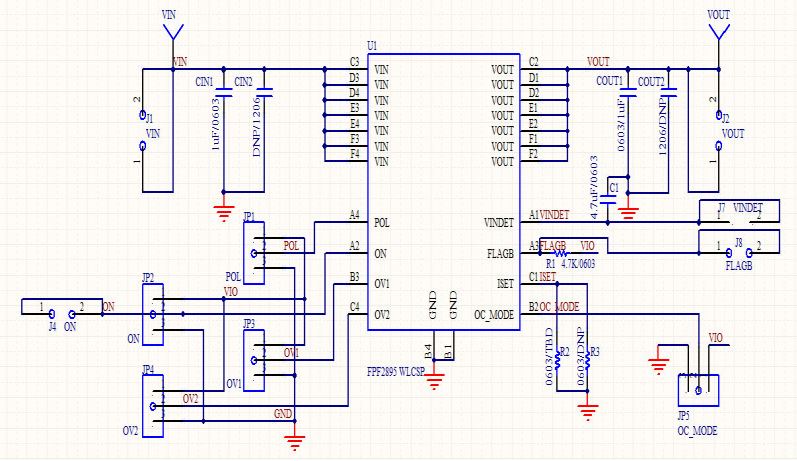
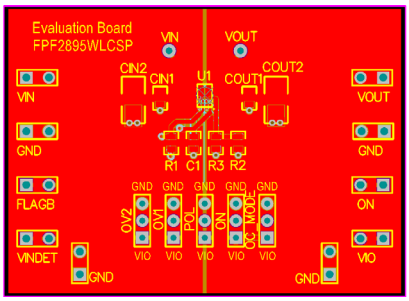
TRCB (True Reverse-Current Blocking) Test Note

AND90275/D

TRCB (True Reverse−Current Blocking)

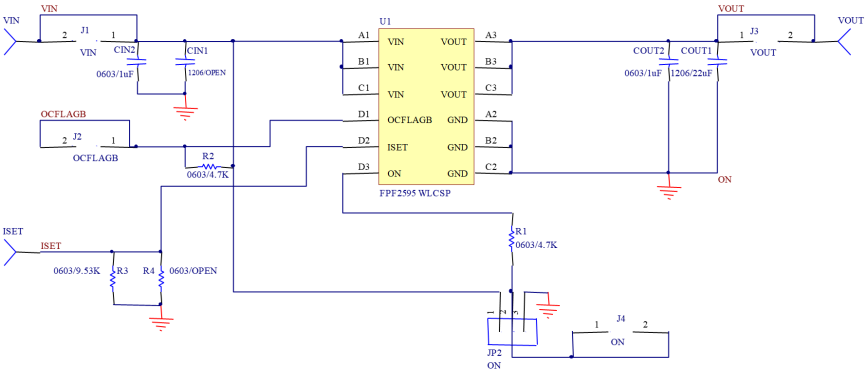
The true reverse−current blocking feature protects the input source against current flow from output to input regardless of whether the load switch is on or off.

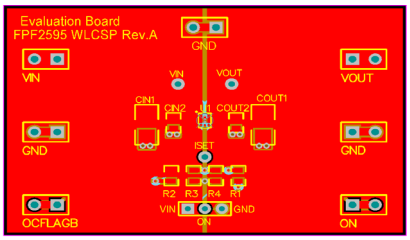




Cin2, Cout2: 0603 1 μF
Cin1, Cout1: NC
C1: 4.7 μF
R1: 4.7 kΩ
R3: 1.1 kΩ
R4,R2: NC

Figure 1. FPF2895 EVB Board Schematic and Top View





Cin2, Cout2: 0603 1 μF
Cin1, Cout1: NC
R1, R2: 4.7 kΩ
R3: 470 Ω
R4: NC

Figure 2. FPF2595 EVB Board Schematic and Top View

TRCB Test DC Power Supply Use

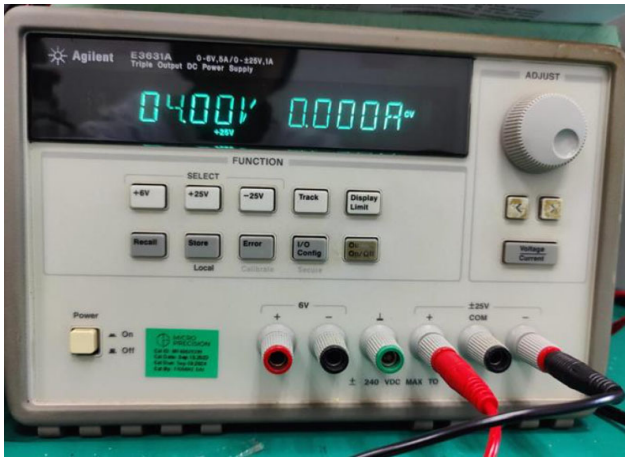


Figure 3. Agilent E3631 Power Supply

E3631 has two channels, one is 0~6 V voltage range, current max is 5 A, another one is 25 V voltage range, current is 1 A.

Figure 4. KEYSIGHT N6705C Power Supply

N6705C has four channels, CH1: 20V 3A, CH2: 20V 5A, CH3: 20V 5A, CH4: 20V 10A.

TRCB PARAMETERS

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
FPF2895 TRCB Parameters						
V_{T_RCB}	TRCB trip point	VOUT−VIN		25	40	mV
V_{R_RCB}	Release point	VIN−VOUT		25	40	mV
FPF2595 TRCB Parameters						
V_{T_RCB}	TRCB trip point	VOUT−VIN		50		mV
V_{R_RCB}	Release point	VIN−VOUT		50		mV

TRCB Operation

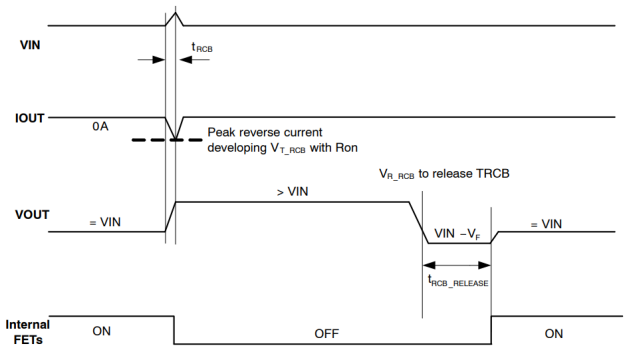


Figure 5. TRCB Behaviors

The TRCB trigger condition is VOUT should be higher than VIN threshold volt V_{T_RCB}.

FPF2895 VIN = 4 V powered by E3631

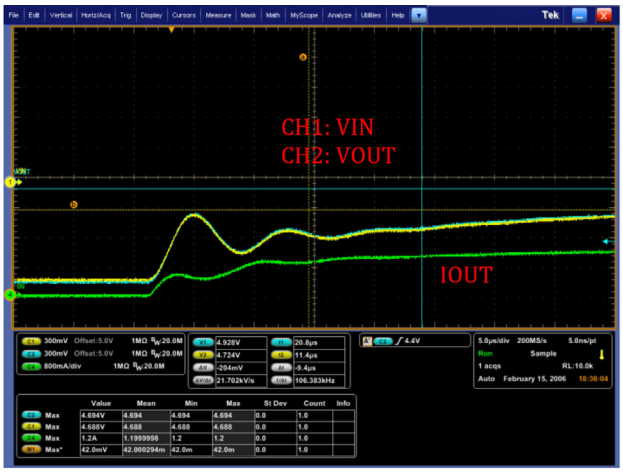


Figure 6. Experiment 1

5 V powered by the N6705C CH4, then plug into VOUT rapidly, we can see the VIN will follow up the difference between VOUT and VIN not meet the V_{T_RCB} threshold, so test Fail. See the Figure 6.

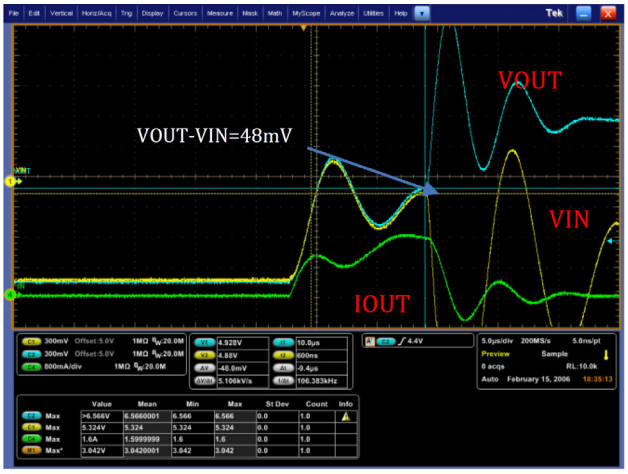


Figure 7. Experiment 2

The Figure 7. Test 5.5 V powered by the N6705C CH4 then plug into VOUT rapidly, we can see if increase the VOUT volt, the difference between VOUT and VIN can meet the VT_RCB threshold, the switch turned off the TRCB behavior test PASS.

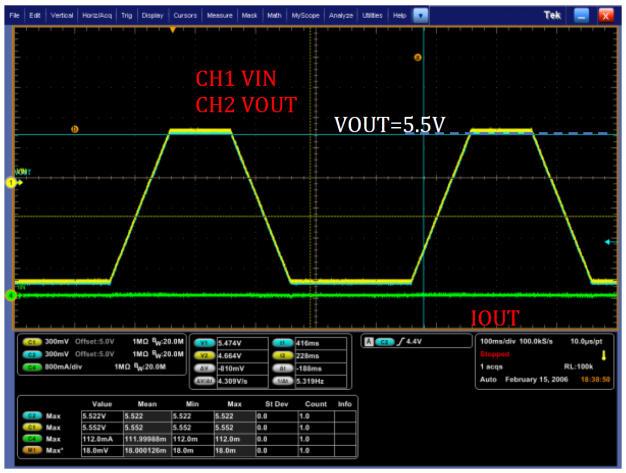


Figure 8. Experiment 3

VOUT powered by the N6705C CH4 4 V to 5.5 V 0.1 s time slew rate, VIN follow VOUT to 5.5 V, the difference between VIN and VOUT volt can not trigger the VT_RCB threshold, test TRCB behavior Fail. See the Figure 8.

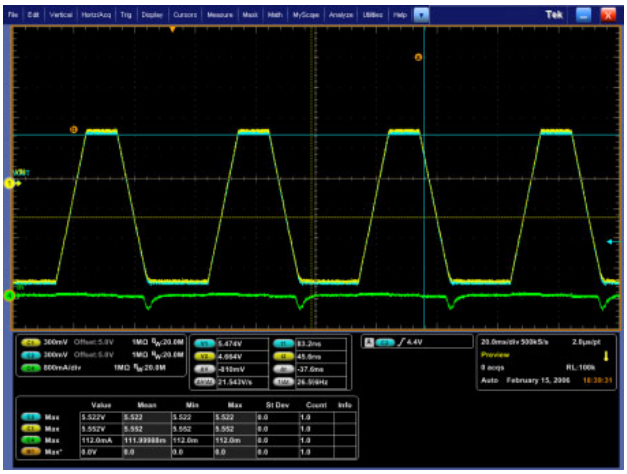


Figure 9. Experiment 4

VOUT powered by the N6705C CH4 4 V to 5.5 V 0.01 s time slew rate, VIN follow VOUT to 5.5 V, the difference between VIN and VOUT volt can not trigger the VT_RCB threshold, test TRCB behavior Fail. See the Figure 9.

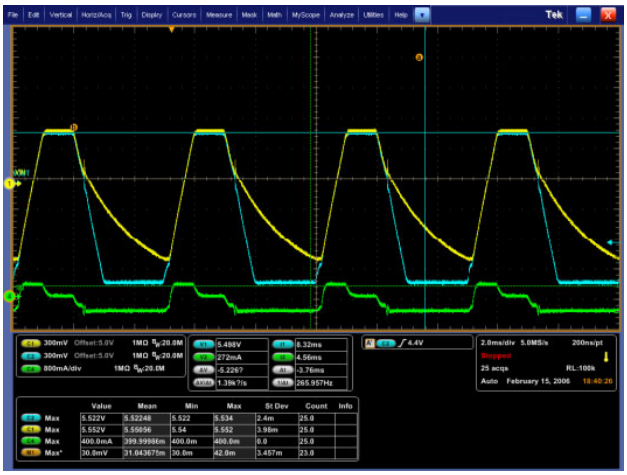


Figure 10. Experiment 5

VOUT powered by the N6705C CH4 4 V to 5.5 V 0.001 s time slew rate, VIN follow VOUT to 5.5 V, the difference between VIN and VOUT volt can not trigger the VT_RCB threshold, test TRCB behavior Fail. See the Figure 10.

FPF2895 VIN = 4 V powered by N6705C

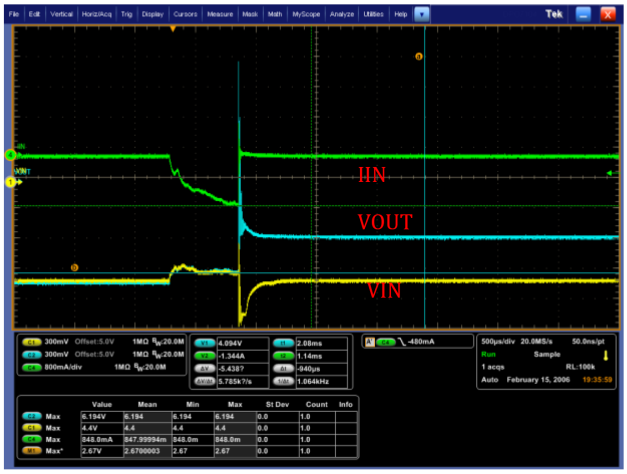


Figure 11. Experiment 6

4.4 V powered by the N6705C CH3. Then plug into VOUT rapidly, the TRCB behavior test PASS, see Figure 11.

Figure 12. Experiment 7

VOUT powered by the N6705C CH3 4 V to 4.4 V 0.1 s time slew rate, TRCB behavior test PASS, see Figure 12.

Figure 13. Experiment 8

VOUT powered by the N6705C CH3 4 V to 4.4 V 1 s time slew rate, TRCB behavior test PASS, see Figure 13.

Figure 14. Experiment 9

VOUT powered by the N6705C CH3 4 V to 4.2 V 0.1 s time slew rate, TRCB behavior test FAIL, because the difference between VIN and VOUT is 44 mV not meet the VT_RCB threshold. The TRCB test FAIL. See Figure 14.

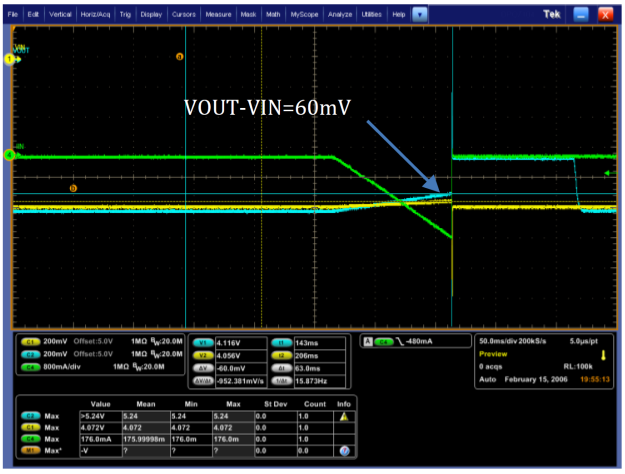


Figure 15. Experiment 10

VOUT powered by the N6705C CH3 4 V to 4.3 V 0.1 s time slew rate, TRCB behavior test PASS, see Figure 15.

Figure 16. Experiment 11

VOUT powered by the N6705C CH3 4 V to 4.3 V 0.1 s time slew rate, but CH3 current limit set is 1.5 A, the VOUT will also not increase to the VTRCB threshold the TRCB behavior test FAIL. See Figure 16.

TRCB Test Summary

- TRCB trigger must VOUT is more than VIN the VT_RCB threshold, then will see TRCB turn off the switch the normal behavior.
- TRCB behavior test the VOUT power supply capacity must enough and the current limit more than (VT_RCB/RON) can meet the VTRCB condition, Otherwise, the VOUT does not have enough force to rise up to the threshold voltage. The TRCB behavior will test FAIL.
- TRCB behavior test the VIN power supply is better use precision power supply such as N6705C which has high current limit and strong voltage regulation will not follow by the VOUT rise , otherwise, there is no chance make the VOUT is more than VIN threshold voltage. The TRCB behavior will test FAIL.

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