



Featuring  
anti-moisture  
corrosion  
prevention

## NX20P0477 USB Type-C Faults Protection (OVP)

### OVERVIEW

The NX20P0477 single-chip USB Type-C port overvoltage protection solution features an integrated anti-moisture corrosion prevention algorithm. CC1/CC2 pins in the system side are protected from the 28 V short pins located right next to the  $V_{BUS}$  pins.

This overvoltage protection solution is 28 V DC tolerant on CON\_CC pins in the connector side and quickly disconnects switches if the voltage is above the overvoltage threshold. CC pins in the system side are protected from high voltage.

The NX20P0477 solution converts these USB-standard  $R_p$  currents—80  $\mu\text{A}$ , 180  $\mu\text{A}$  or 330  $\mu\text{A}$ —from the CC/PD controller to an ultra-low current source to prevent corrosion. The CC/PD controller may recognize water on CC pins as detected Sink, the corrosion will be accelerated by CC/PD controller provides 5 V through  $V_{BUS}$  pins.

### FEATURES AND BENEFITS

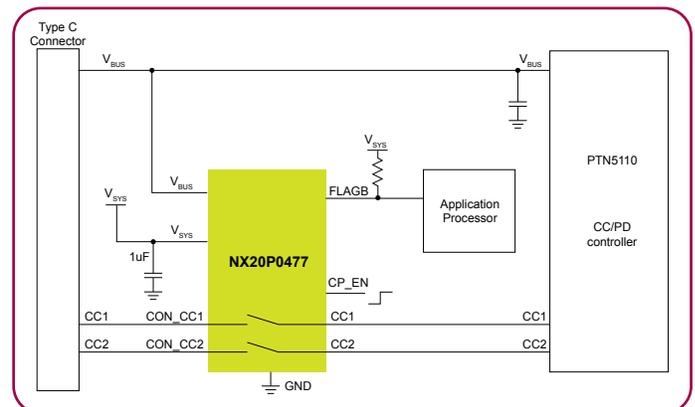
- ▶ USB Type-C CC1 and CC2 short protection to VBUS
  - CON\_CC1/CON\_CC2: 28 VDC AMR
- ▶ Rd clamp circuit in CON\_CC1/CON\_CC2 in dead battery condition
- ▶ Smart corrosion prevention scheme with low current source
- ▶ 250 m $\Omega$  low R<sub>DS(on)</sub> switch
- ▶ Robust ESD immunity for CON\_CC1/CON\_CC2
  - IEC 61000-4-2 contact discharge: 8 KV
  - IEC 61000-4-2 air discharge: 15 KV
- ▶ +/-40 V surge protection on CON\_CC1/CON\_CC2
- ▶ Low leakage current: 14  $\mu\text{A}$

- ▶ CC1/CC2 leakage current: < 1  $\mu\text{A}$
- ▶ Fast OVP turn-off time: 60 ns
- ▶ Specified from -40°C to +85°C
- ▶ WLCSP 9 bumps, 1.49 x 1.49 x 0.555 mm

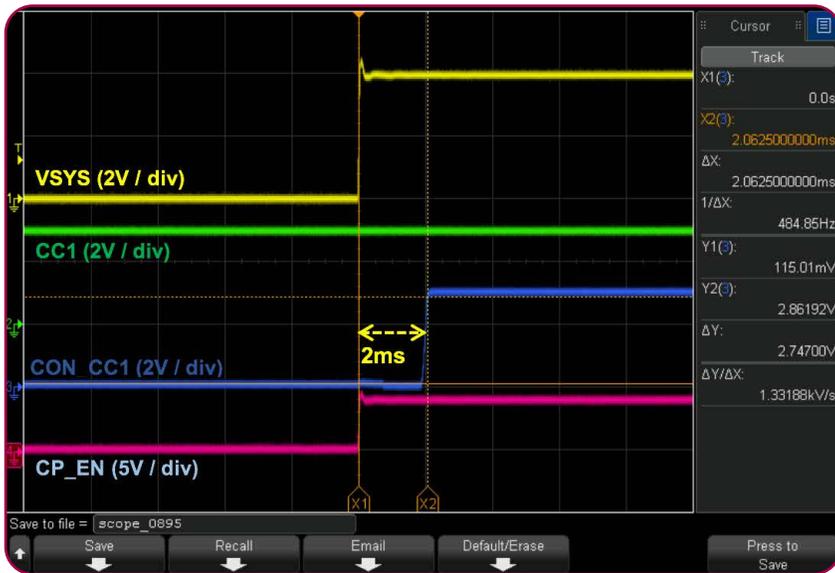
### APPLICATIONS

- ▶ Smartphones
- ▶ Tablets
- ▶ Portable devices

### USB TYPE-C CC LINE PROTECTION WITH CORROSION PREVENTION

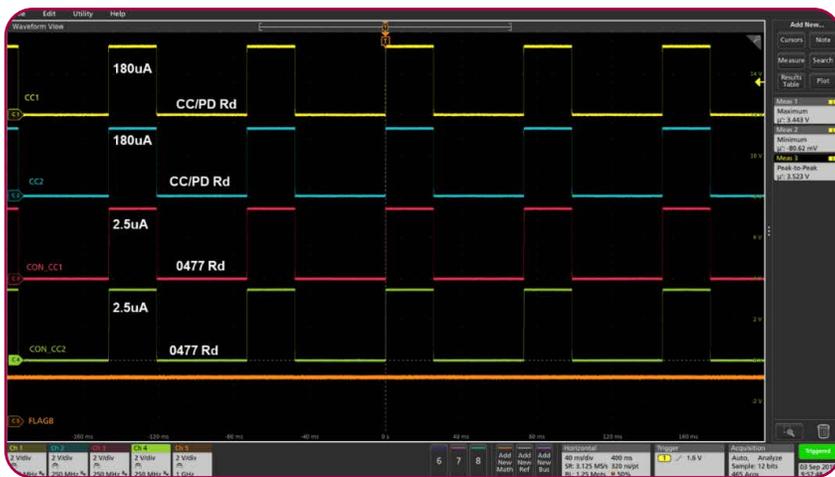


## STARTUP



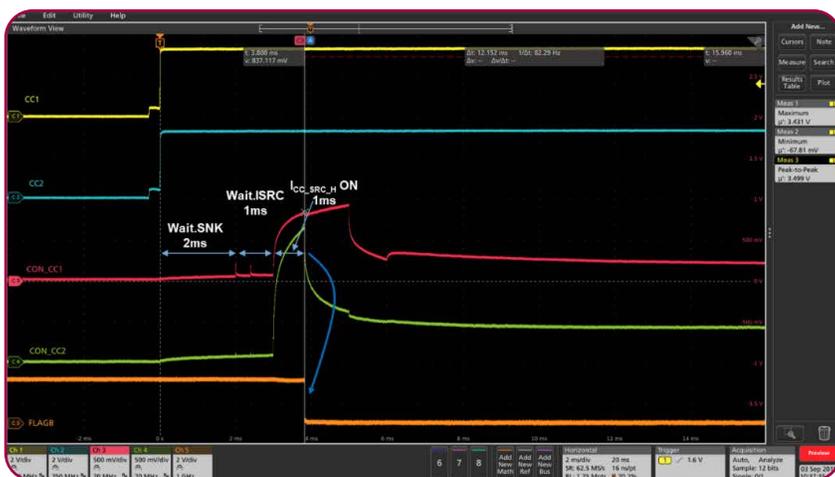
**Start up:** 2 ms power-up time from valid power source of  $V_{SYS}$ . When  $V_{SYS}$  is below  $VSYSUVLO$ , NX20P0477 stays in shutdown mode, where both CC switches are turned off. Once  $V_{SYS}$  is above  $VSYSUVLO$ , then NX20P0477 transitions to active state by turning the CC switch on within power-up time.

## STANDBY



**Standby:** USB-PD standard requires 80  $\mu$ A or 330  $\mu$ A as RP to detect the sink device. NX20P0477 converts the USB standard current source from CC/PD controller to build-in a low current source (Typical  $ICC\_SRC = 2.5 \mu$ A) to prevent corrosion from happening.

## TAP WATER DETECTION



**Tap water detection:** When tap water is injected into the Type-C connector, the switch stays off. When water contacts the Type-C connector pin, NX20P0477 detects something has changed and enables the internal current source for  $TSRC\_WAIT$ , which then enables the current source for  $TCC\_DEB$ . During this time,  $CON\_CC$  voltage increases and NX20P0477 detects water, so the switch stays off and  $FLAGB$  is pulled down.