TCPP02-M18

Data brief

USB type-C protection for source application

QFN-18L 3.5 x 3.5 x 0.55 mm

Product labels

SUSTAINABLE TECHNOLOGY

LONGEVITY 10 YEARS COMMITMENT

Product status link

TCPP02-M18

Expansion board

X-NUCLEO-SRC1M1

Software example code

X-CUBE-TCPP

I2C address

0110 10x (LSB = 'x')

Features

- Externally programmable VBUS over current protection (OCP)
- Integrated charge pump and gate driver for external N-channel MOSFET
- Current sense on VBUS with analog output
- Integrated discharge on VBUS and VCONN
- Over temperature protection
- Over voltage protection (OVP) on CC lines against short-to-V_{BUS}
- V_{CONN} OCP (100 mW max), OVP (6 V max)
- ESD protection for CC1, CC2, compliant with IEC 61000-4-2 Level 4 (±8 kV contact discharge, ±15 kV air discharge)
- Compliant with PPS (programmable power supply)
- I^2C communication, with two I^2C addresses available
- Junction temperature from -40 °C to 125 °C
- Compliant with USB-C power delivery standard 3.1, standard power range (SPR), up to 100 W
- ECOPACK2 compliant

Applications

- USB-C chargers, adapters, power sharing adapters, battery charger
- Wall plugs, car charger, PoE to USB-C adapter, power bank
- Desktop, monitor, docking, USB hub, dual-port charger

Description

The TCPP02-M18 is a MCU companion chip enabling cost-effective USB-C source solution. It provides protections and functionalities to safely comply with the USB-C specification.

On provider path, TCPP02-M18 drives external N-channel MOSFET to ensure overcurrent protection on VBUS pin, as well as a discharge path. It features an analog current sense and amplifier with an output accessible for a MCU ADC, thus minimizing system cost.

The TCPP02-M18 features 24 V tolerant ESD protection as per IEC61000-4-2 level 4 on USB type-C connector communication channel pins (CC). Also, it provides overvoltage protection on CC1 and CC2 pins when these pins are subjected to short circuit with the VBUS pin that may happen when removing the USB type-C cable from its receptacle.

TCPP02-M18 embeds I2C slave registers with two possible addresses, ideal for dual-port chargers or multiple port applications.

1 Pinout and functions

Figure 1. **QFN-18L 3.5 x 3.5 x 0.55 mm (top view)**

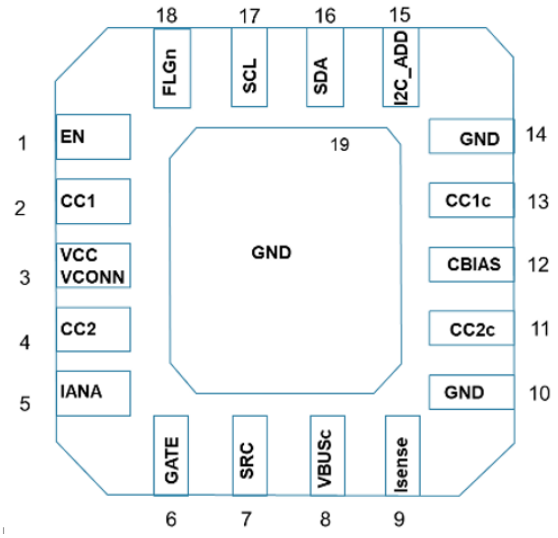


Table 1. **Pinout and functions**

Name	Pin #	Type	Description
EN	1	Input	Enable pin.
CC1	2	Input / Output	Configuration channel 1 pin on USB-C controller side.
VCC_VCONN	3	Power	Power supply for V_{CONN} power pin. Connect to 3.3 V or 5.5 V.
CC2	4	Input / Output	Configuration channel 2 pin on USB-C controller side.
I_{ANA}	5	Output	V_{BUS} current analog measurement.
GATE	6	Output	Gate driver provider: gate pin of external N-channel MOSFET.
SRC	7	Input	Gate driver provider: source pin of external N-channel MOSFET.
VBUSc	8	Input	VBUS connector side.
I_{sense}	9	Input	VBUS current measurement.
GND	10	GND	Ground.
CC2c	11	Input / Output	Configuration channel 2 pin on USB-C connector side.
C_{BIAS}	12	Output	ESD capacitor.
CC1c	13	Input / Output	Configuration channel 1 pin on USB-C connector side.
GND	14	GND	Ground.
I2C_ADD	15	Input	Least significant bit on I2C address. Connected to GND or 1.8 V / 3.3 V.
SDA	16	Input / Output	Serial data line on I2C bus.
SCL	17	Input / Output	Serial clock line on I2C bus.
FLGn	18	Output	Open-drain output flag (active low). Floating when not connected.
GND	EP	GND	Ground exposed pad.

2 Block diagram

Figure 2. **Functional block diagram**

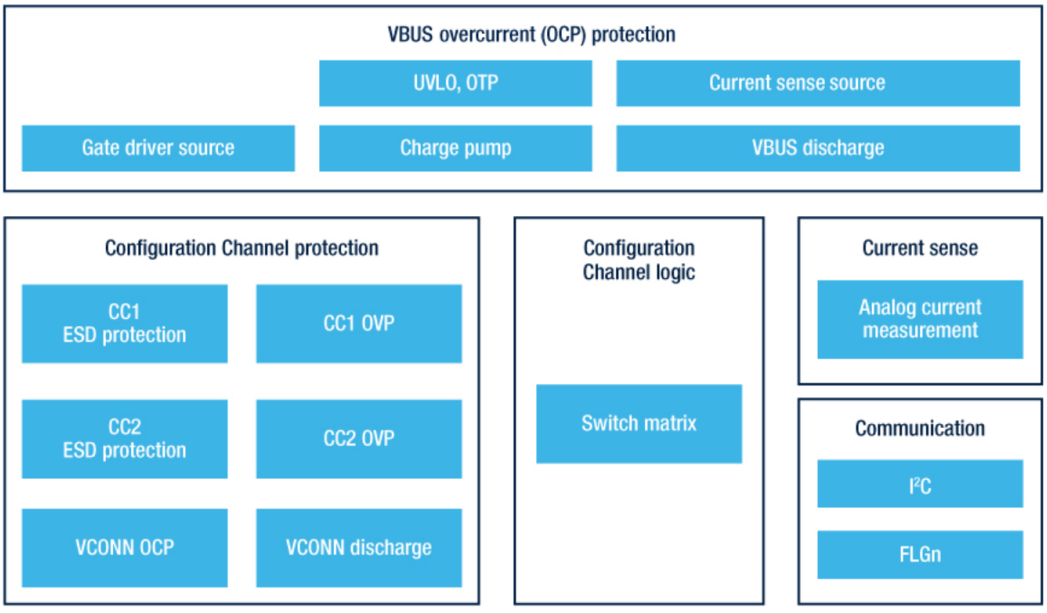
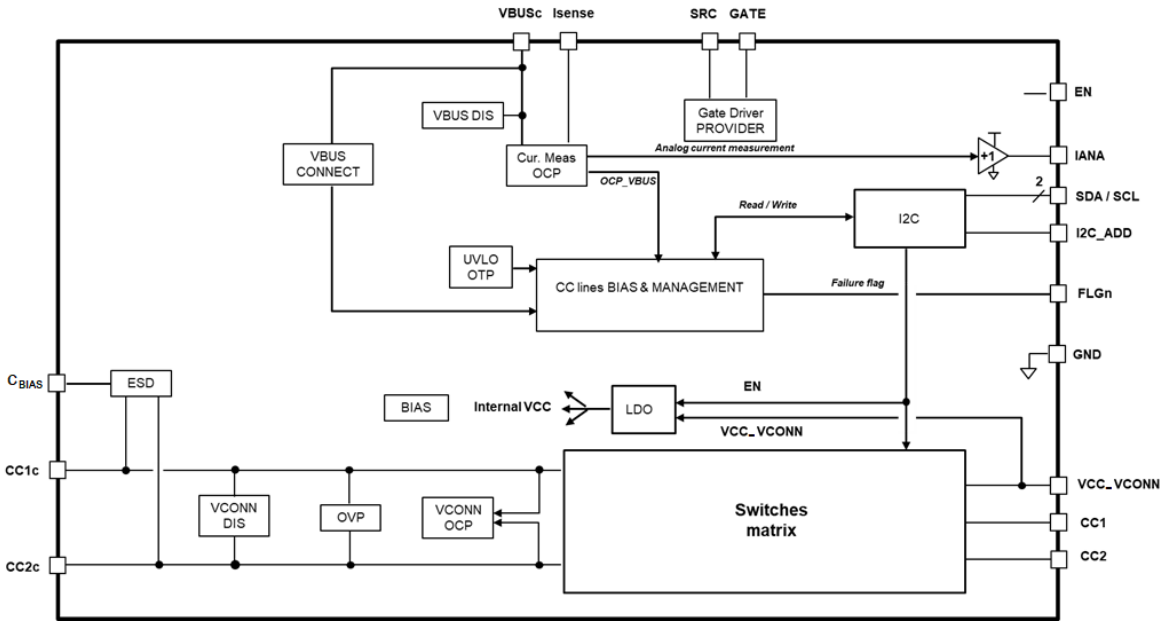
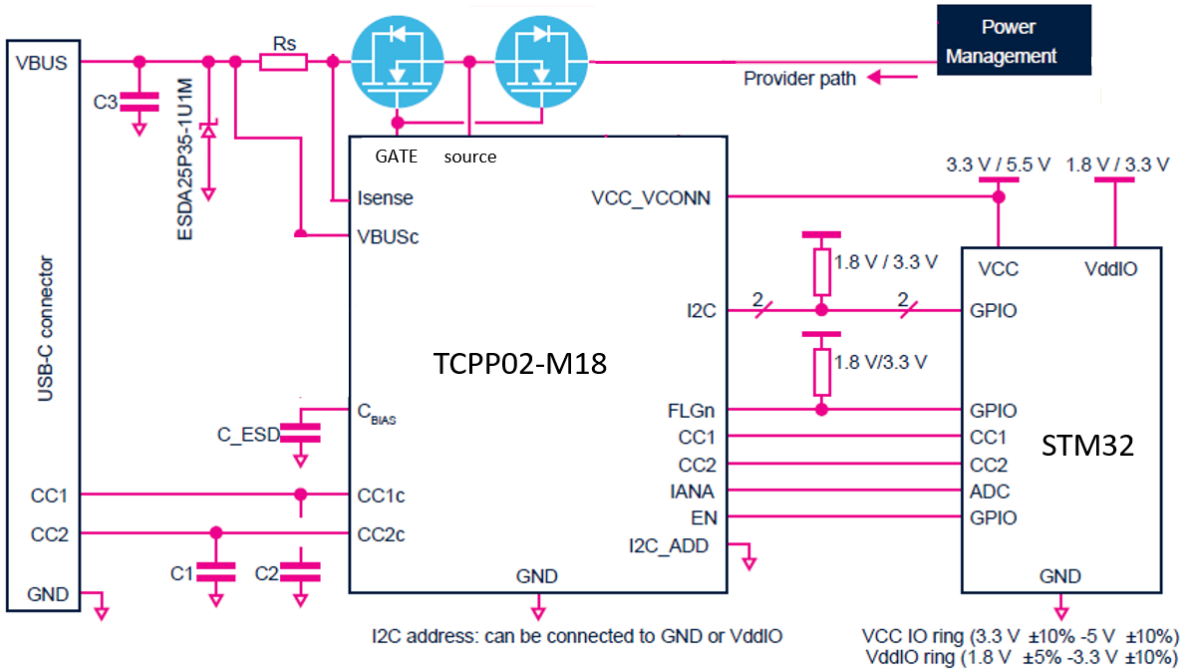


Figure 3. **Internal block diagram**



3 Typical USB-C source application block diagram

Figure 4. **Application block diagram example**



Note: UCPD stands for USB type-C and power delivery interface.

External components are described in External components description.

Please refer to TA0357 for an overview of USB type-C and power delivery technologies.

Please refer to AN5225 for more informations related to USB type-C power delivery using STM32xx Series MCUs and STM32xxx series MPUs.

For more information on EMI filtering and ESD protection of USB datalines, please refer to AN4871: USB type-C protection and filtering.

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
19-Jul-2021	1	Initial release.