DVK91220 – SOIC16
User Guide

Contents

1. Scope and Development Kit content

The DVK91220 provides all the needed components to evaluate the performances and the functionalities of MLX91220 integrated current sensor family. It includes:

- A ready-to-use evaluation board provided with **MLX91220KDF-ABF-050** for a quick start.
- An evaluation board with no IC to be customized with the reference you need. Please refer to the datasheet for all available product codes.

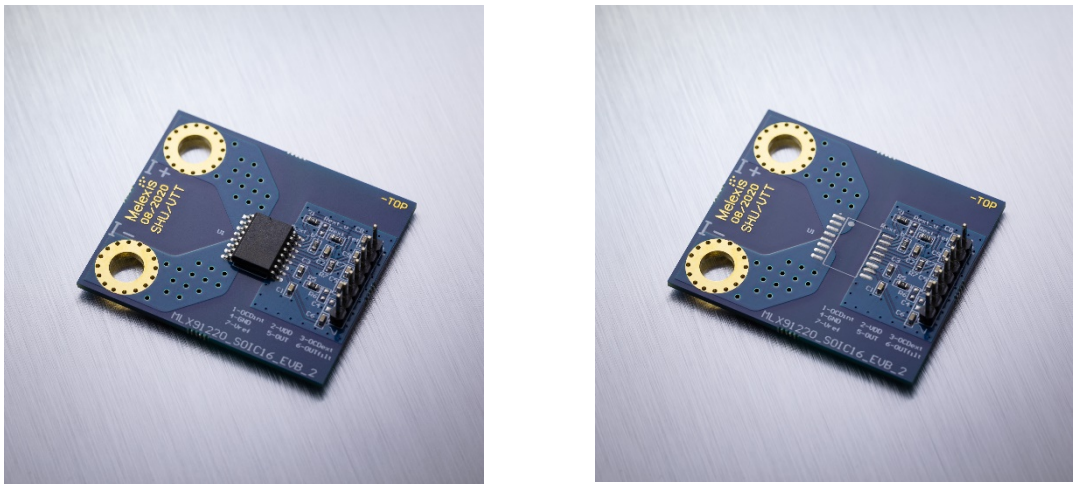

Figure 1: Content of DVK91220-SOIC16 : A ready-to use EVB with MLX91220KDF-ABF-050 (left) and a customizable EVB (right)

2. Key features

2.1. Sensor

- Isolated current measurement demonstrator factory calibrated for 50 A
- 5 V of working supply
- 4.8kV_{RMS} of voltage isolation
- Stray field immune due to differential measurement
- < 3 µs response time

2.2. PCB

- PCB adapted to high current measurements up to 35 Arms continuous
- Ground Layer and decoupling capacitors for high EMC performances
- Placeholder for output filter implementation

3. Hardware

3.1. PCB layout

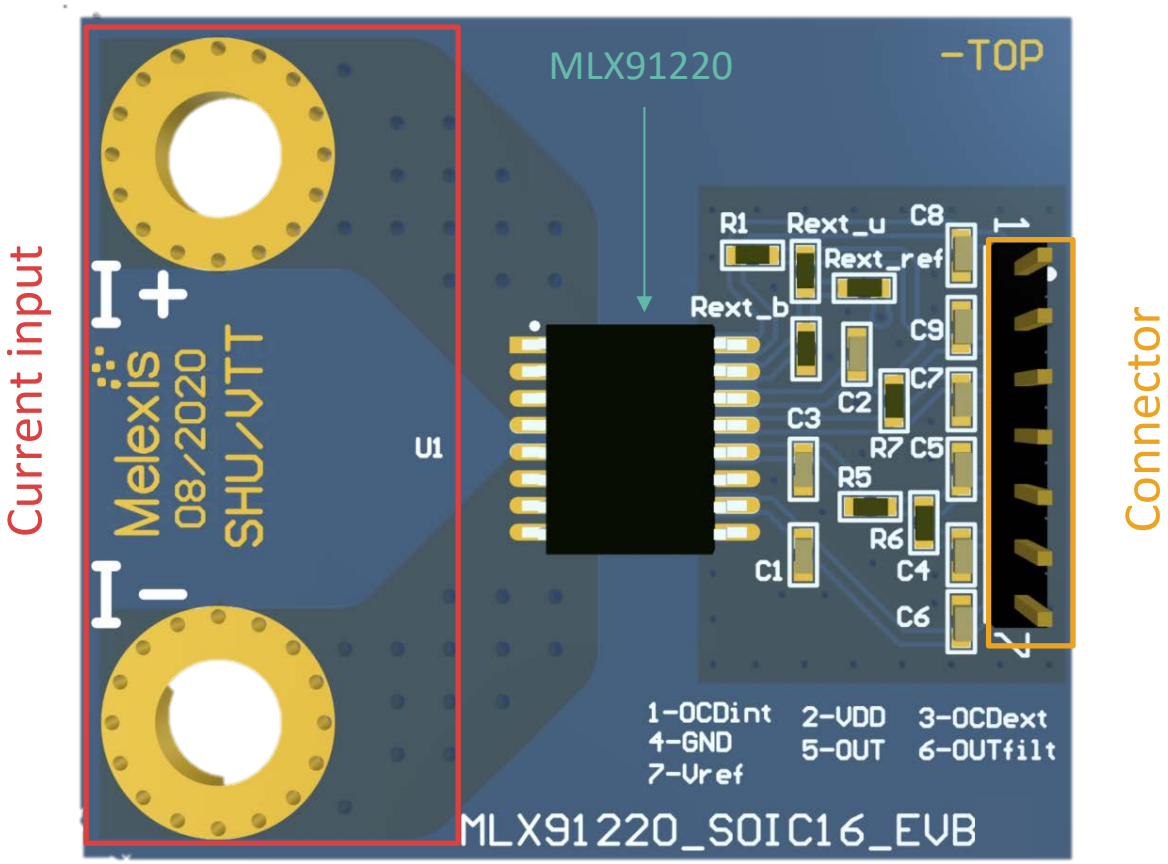

Figure 2: Layout of the EVB91220 SOIC16

Please note that for the version *MLX91220_SOIC16_EMC_APP_V1* of the PCB, the current inputs were inverted.

3.2. PCB characteristics

The MLX91220_SOIC16_EVB is manufactured with two 105 µm copper layers and an ENIG Surface finishing.

Please note that the revision 2 of the board (MLX91220_SOIC16_EVB_**2)** has two 70 µm copper layers and no ENIG surface finishing. This version can still be used for 40 Arms continuous current at 25°C but the thermal management will be less efficient.

3.3. Schematics

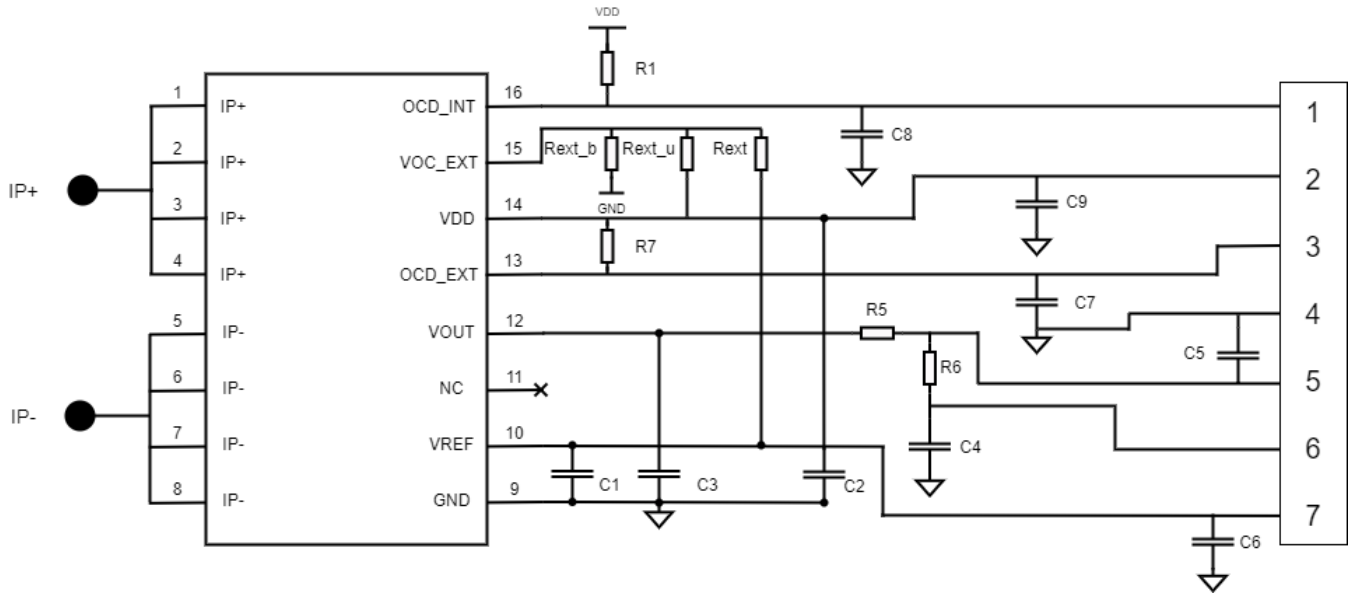

Figure 3: Layout of the EVB91220 - SOIC16

3.4. Pins Designation

Table 1: MLX91220 pin designation

PIN	Pin	Function	Type
1	IP+	Primary Current Path Input	Analog
2			
3			
4			
5	IP-	Primary Current Path Output	Analog
6			
7			
8			
9	V_{SS}	Ground Voltage	Ground
10	V_{REF}	Reference Voltage	Analog
11	NC	Not connected	N.A.
12	V_{OUT}	Output Voltage	Analog
13	OCD_{EXT}	External Overcurrent detection	Digital
14	V_{DD}	Supply Voltage	Supply
15	VOC_{EXT}	External Overcurrent threshold Voltage	Analog Input
16	OCD_{INT}	Internal Overcurrent Detection	Digital

Table 2: Connector pins designation

Pin	Function
1	Internal Overcurrent Detection
2	Supply Voltage
3	External Overcurrent Detection
4	Ground Voltage
5	Output Voltage
6	Filtered Output Voltage (not populated)
7	Reference Voltage

3.5. Bill of Material

Part	Description	Value
C1	Reference pin decoupling capacitor EMI, ESD	47 nF
C2	Supply capacitor, EMI , ESD	47 nF
C3	Output pin Decoupling capacitor EMI, ESD	4.7 nF
C5, C6, C7, C8	Decoupling capacitor EMI, ESD	1 nF
R5	Connection to header	0 Ω
R1, R7	Pull-up resistors for overcurrent detection	10 kΩ
Rext_b	Resistor to determine external bipolar overcurrent detection level	30 kΩ
Rext_u	Resistor to determine external unipolar overcurrent detection level	TBD
Rext_ref	Resistor to determine external overcurrent detection level	160 kΩ
R6, C4	Extra RC filter	TBD

4.

5. MLX91220KDF-ABF-050

5.1. Characteristics

The Development Kit contains two PCBs. One is not populated. Please refer to the datasheet of MLX91220 or MLX91221 to find the adapted product for your application.

One PCB is populated with MLX91220KDF-ABF-050. Table 3 describes its configuration. Please refer to the datasheet for the full specifications. Figure 4: Output of MLX91220KDF-ABF-050

Table 3: MLX91220KDC-ABF-050 configuration

Product code	Legend
MLX91220	5V Supply Integrated Current Sensor
K	- 40°C to 125°C ambient temperature
DF	SOIC-16 WB (Wide Body – 300mils) package
A	Die version
B	Bipolar sensing. The sensor provides a symmetrical output around the 0A point which is set at V_{ref}
F	Fixed mode output
50	50 A at Full Scale current measurement (corresponding to 2V excursion from VOQ). Corresponds to a sensitivity of **40 mV/A**

5.2. Sensor output

Figure 4 displays the expected output of the sensor and V_{ref} value. The measured current can be retrieved by the following formula:

$$I = \frac{V_{out} - V_{ref}}{S}$$

Where S = 40 mV/A.

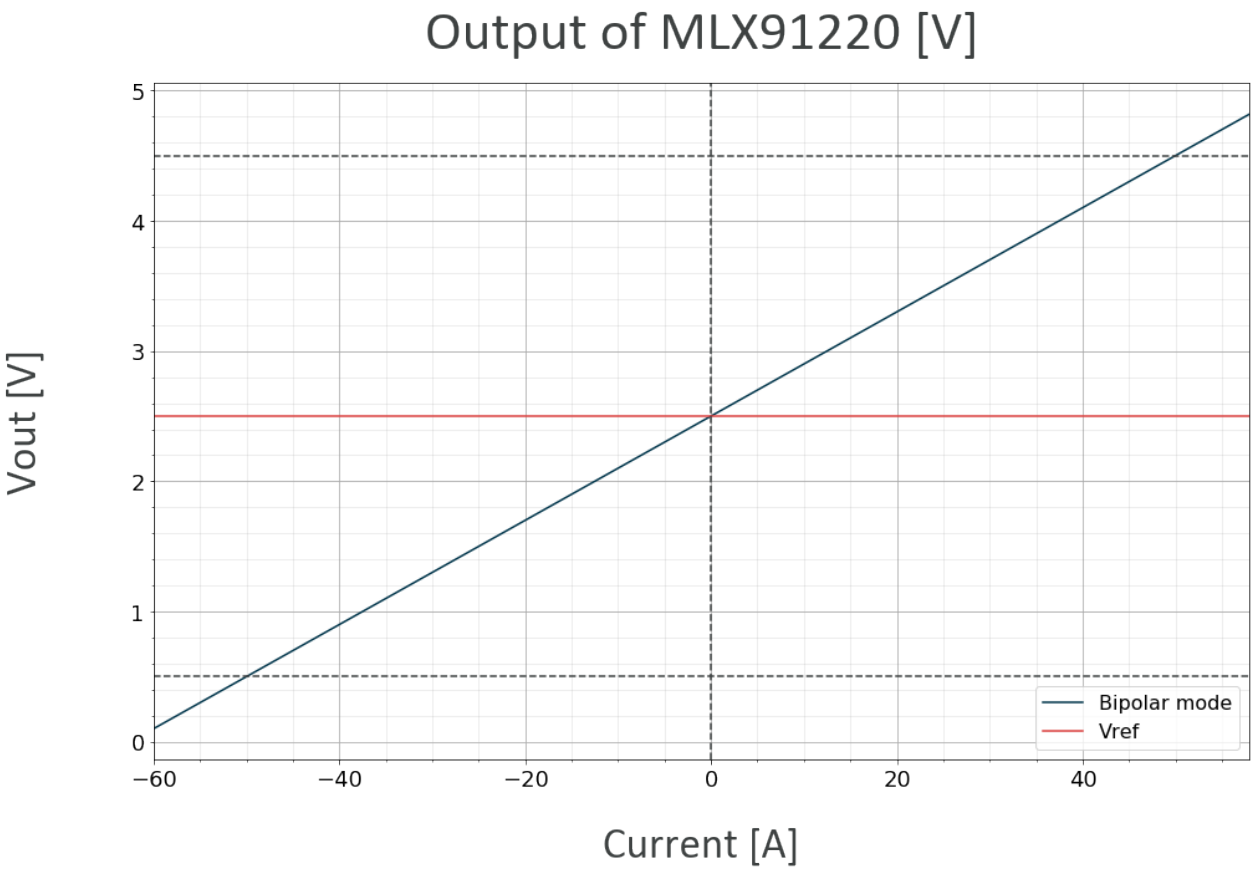

Figure 4: Output of MLX91220KDF-ABF-050

5.3. OverCurrent detection

Our integrated current sensor solutions offer two different types of OverCurrent Detection with the SOIC-16 packages.

The internal OverCurrent Detection (OCD_INT) is a factory-set level. The application can set external OverCurrent Detection (OCD_EXT) level.

In the EVB91220, a resistive divider (Rext and Rext_b) determines the OCD_EXT level.

This section presents the behavior of the EVB91220 populated with MLX91220KDF-ABF-050 behavior. For more information on the Overcurrent features for all the MLX91220 product codes, please refer to AN91220_OverCurrentDetection.

5.3.1. Internal OverCurrent Detection

For MLX91220KDF-ABF-050, the factory-trimmed internal OverCurrent level is **±58 A**. During typical application, OCD_INT (Pin 1 of the EVB) is pulled-up to VDD. If a current higher than 58 A is detected, the signal OCD_INT is pulled-down to ground..

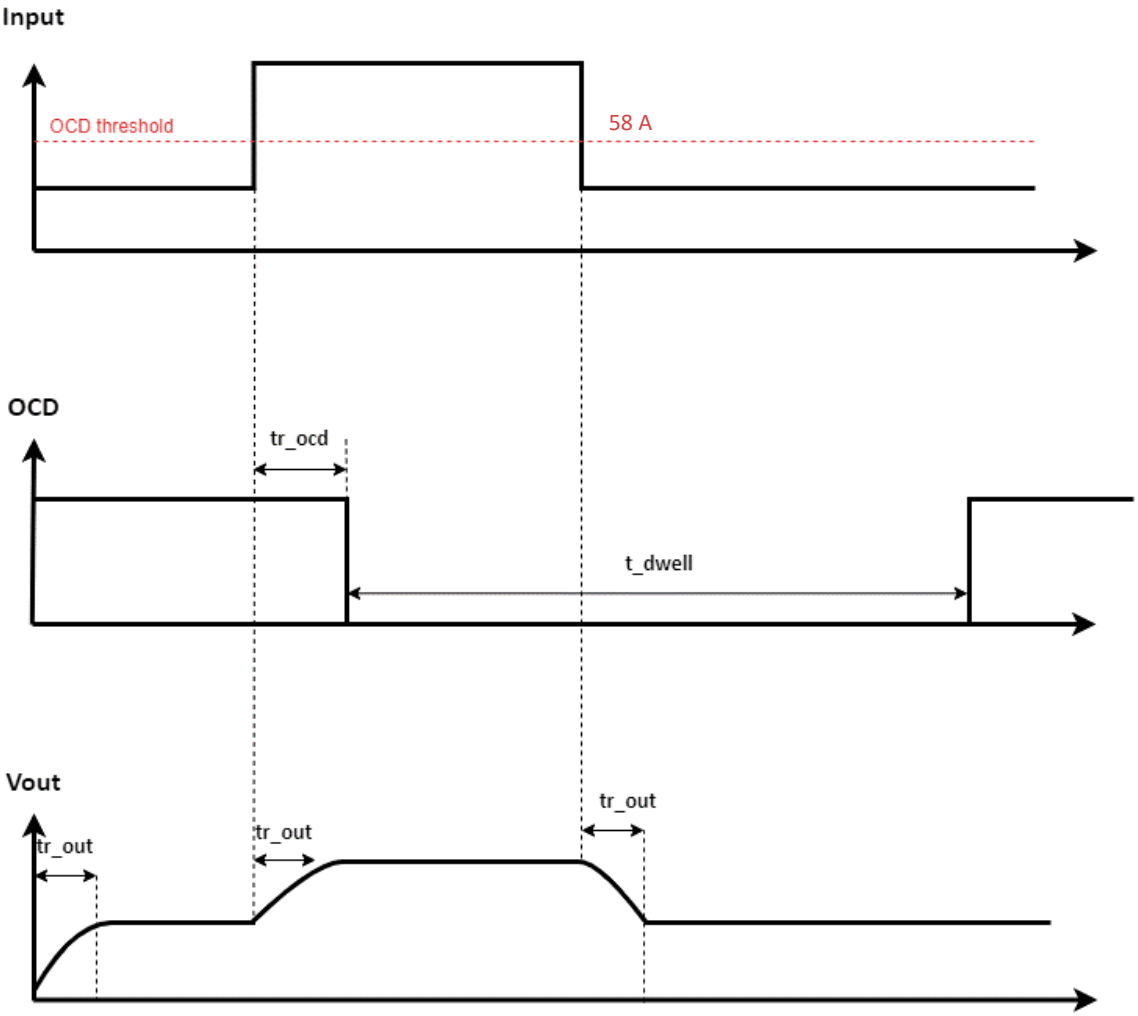

Figure 5: Behavior of OCD_INT

Where **tr_ocd** < 2.1 µs, **t_dwell** = 10 µs and **tr_out** < 3 µs .

5.3.2. External OverCurrent Detection

The voltage level at VOC_EXT determines the threshold of the external OverCurrent threshold. During typical application, OCD_EXT (Pin 3 of the EVB) is pulled-up to VDD. If a current higher than the threshold is detected, the signal OCD_EXT is pulled-down to ground.

The resistive divider (Rext_ref and Rext_bi) determines the threshold level.

$$VOC_{EXT} = V_{REF} * \frac{R_{ext_{bi}}}{R_{ext_{ref}} + R_{ext_{bi}}} = 2.5\,V * \frac{30\,k\Omega}{160\,k\Omega + 30\,k\Omega} = 0.39\,V$$

For MLX91220KDF-ABF-050 which has a sensitivity of 40 mV/A, this corresponds to $\frac{390\,mV - 2500\,mV}{40\,mV/A} = \mathbf{-53\,A}$

The pin OCD_EXT will be pulled-down to ground for $|I| > 53\,A$.

This level can be modified through the resistive divider. Make sure that $R_{ext_{ref}} + R_{ext_{bi}} > 200\,k\Omega$.

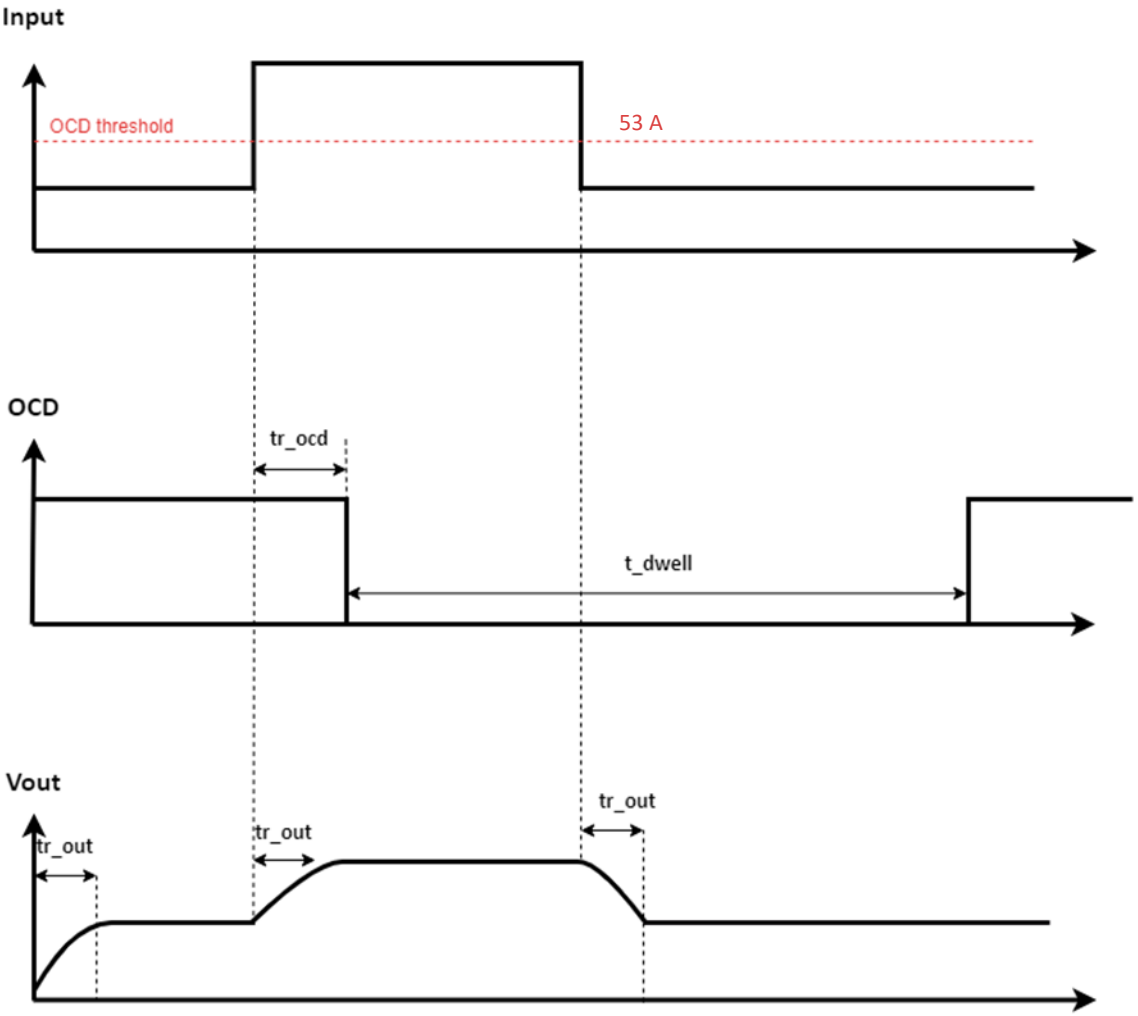

Figure 6: Behavior of OCD_EXT

Where **tr_ocd** = 10 µs, **t_dwell** = 10 µs and **tr_out** < 3 µs .

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