LDC501 Current Source Response to Modulation Signals

This application note shows some examples of the LDC501 Current Source response to modulation input signals. The experimental setup is shown in Fig. 1.

The modulation signal from a function generator is fed into the LDC501 modulation input and the Ch1 of an oscilloscope. A 17.4 Ω resistor is used as the current source load which is made with several resistors in parallel to achieve high power of over 4 W. The voltage signal across this resistor is fed to Ch2 of the scope. Ch2 is inverted in order to easily compare with the input signal.

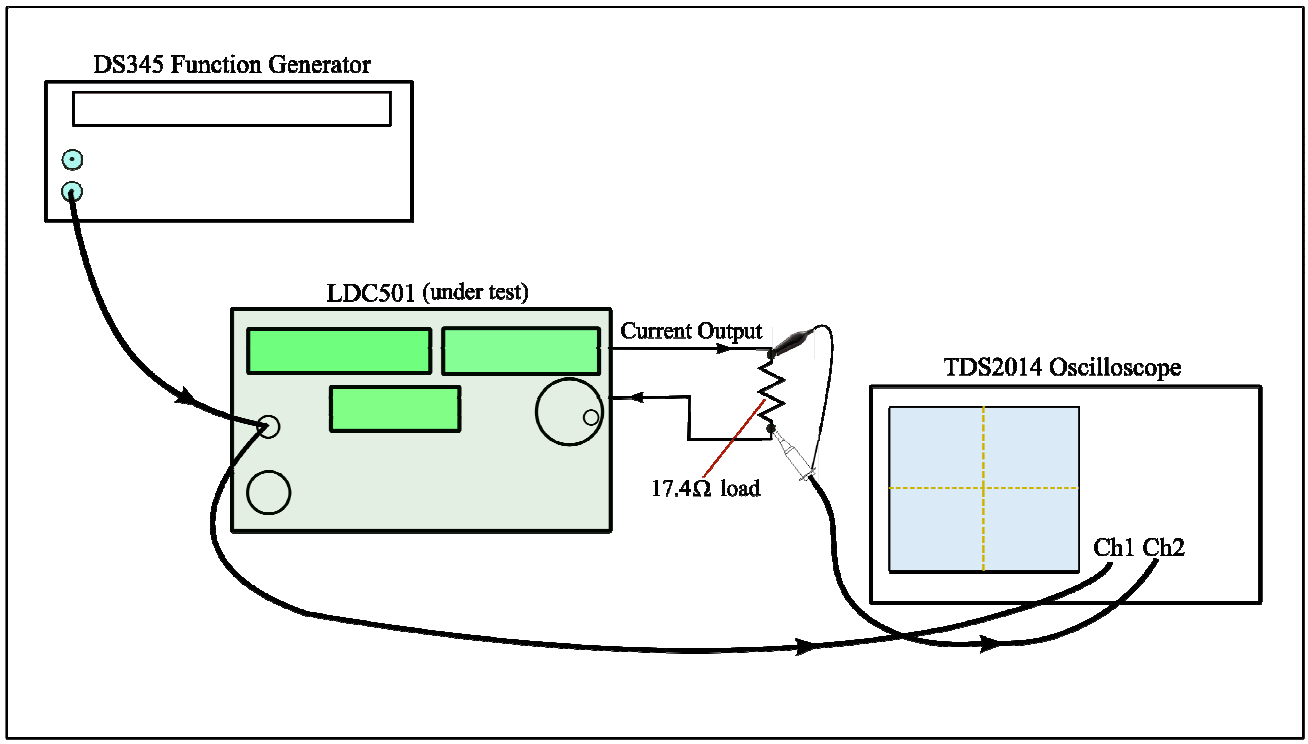

Fig. 1: Setup for LDC501 current source response to modulation input

1. Sine and Triangle wave response

In Fig.2 the LDC501 output current setpoint is 250 mA.The blue trace is the input signal which is 100 kHz and 6 Vpp. The red trace is the output voltage across 17.4 Ω. The vertical axis is 0.87 V/div which corresponds to 50 mA/div (=0.87/17.4).

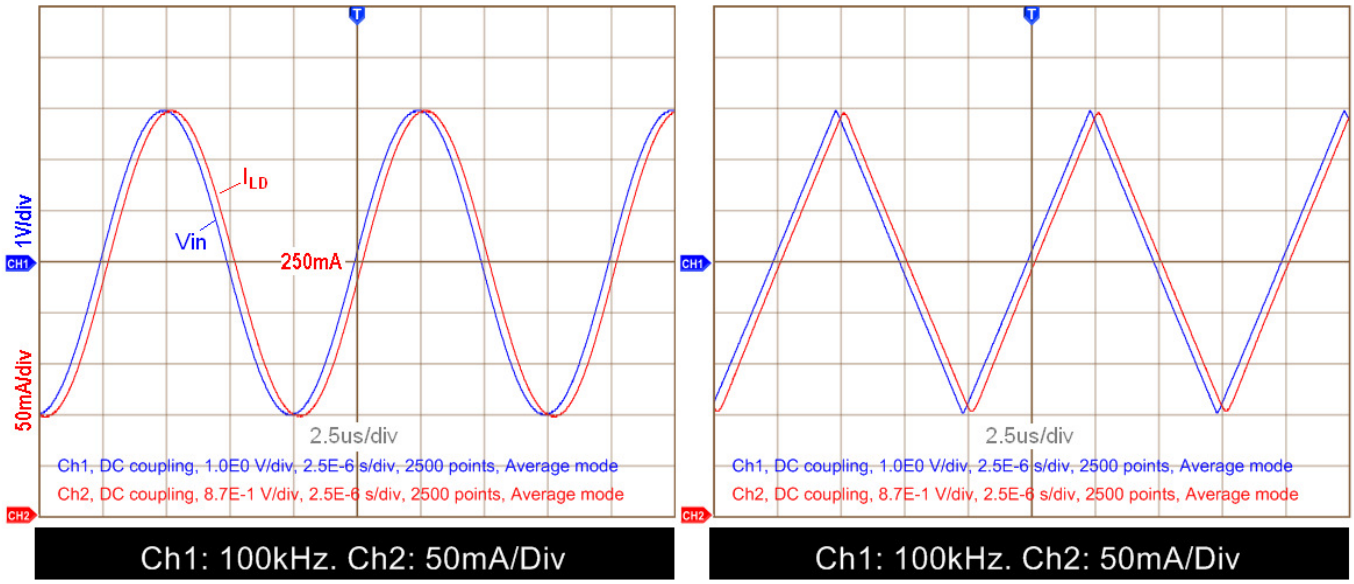

Fig. 2: LDC501 response to 100 kHz sine wave and triangle wave

2. Square wave and step response

In Fig.3, the blue trace is the input square wave which is 100 kHz and 6 Vpp. The red trace is the output voltage across 17.4 Ω. The vertical axis is 0.87 V/div which corresponds to 50 mA/div. The rising edge is about 0.3 us corresponding to 1.17 MHz (= 0.35/0.3) bandwidth.

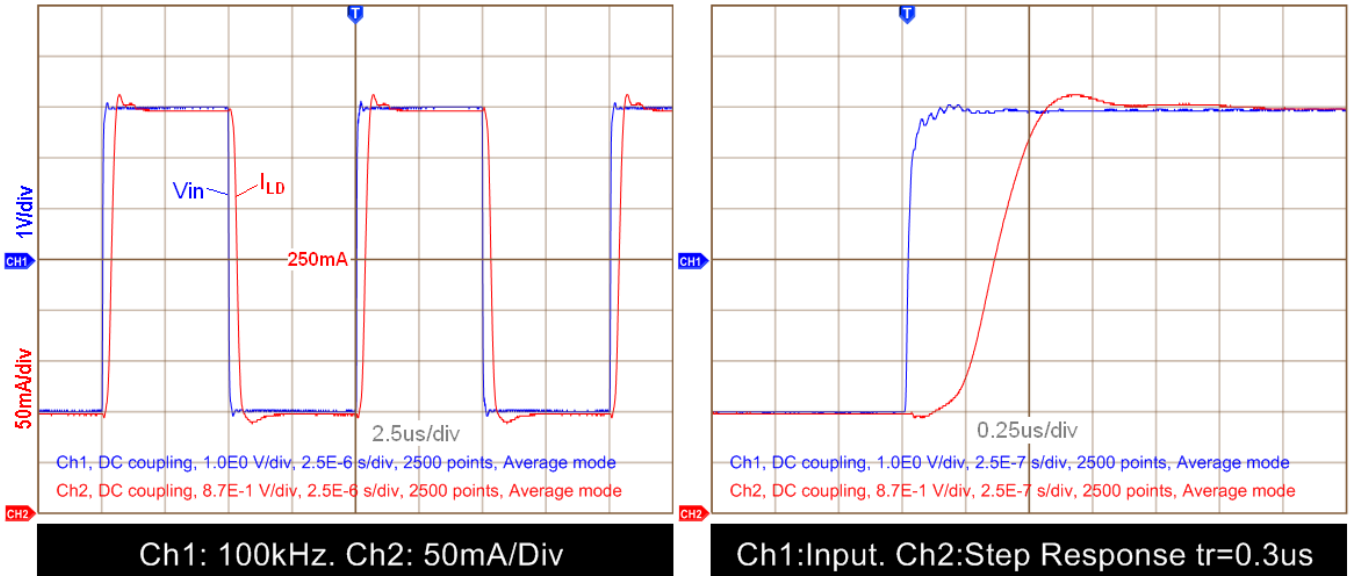

Fig.3 LDC501 response to 100 kHz square wave and step response

3. Limited output

In Fig.4 the output current setpoint is 250 mA and current limit setting is 300 mA. The blue trace is the modulation input signal whose amplitude is 6 Vpp with 10 kHz, 50 kHz, 100 kHz and 500 kHz frequencies. The red traces are the output voltages across the 17.4 Ω resistor load.

The overshoot is dependent on the cable parasitic parameters and the slew rate of the input signal.

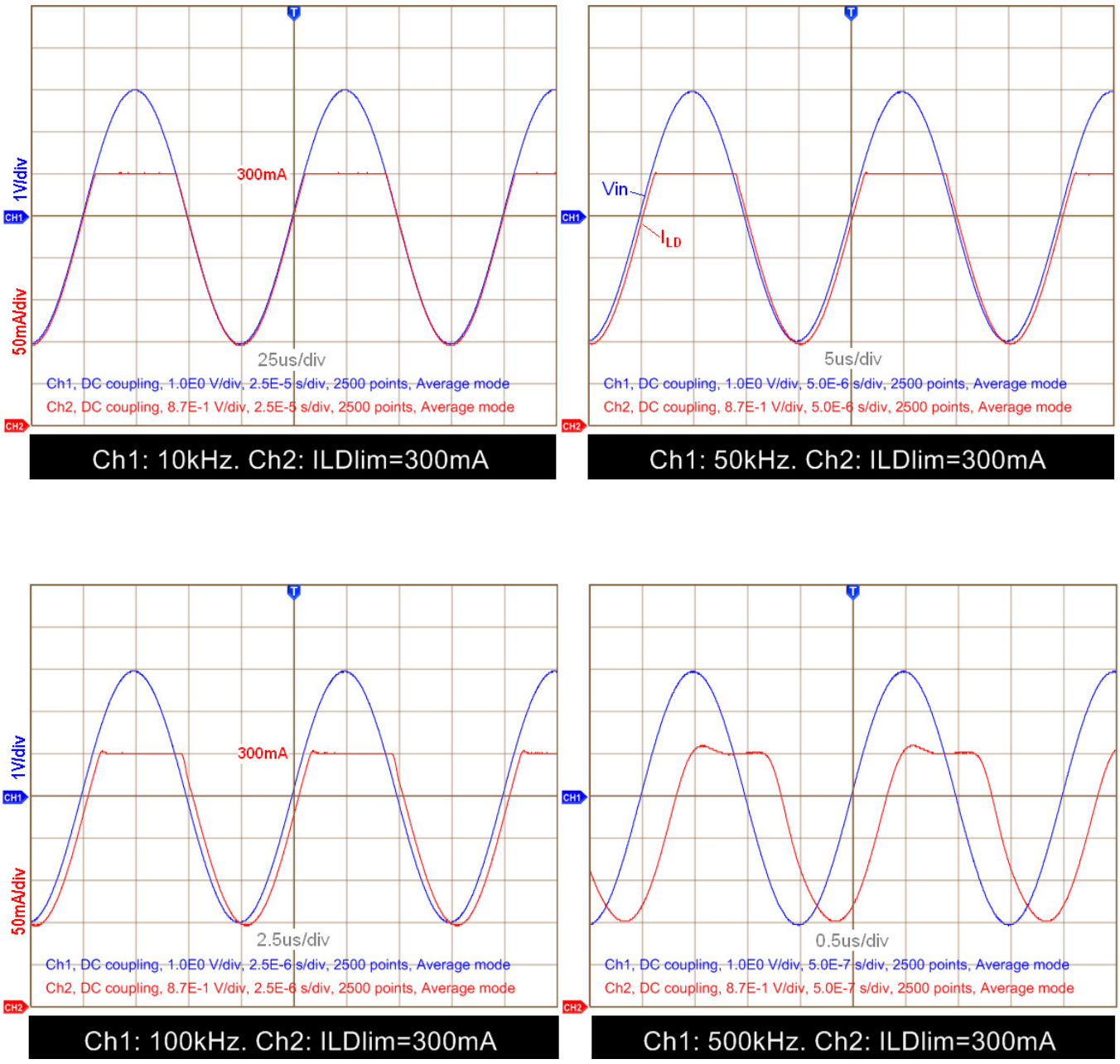

Fig.4 LDC501 limits the output current to 300 mA.

4. Recovery from 0 mA

In Fig.5 the output current will not go below 0 mA. When modulation pushes output to go to 0 mA, a short recovery time is required to allow the internal current source to get out of saturation.

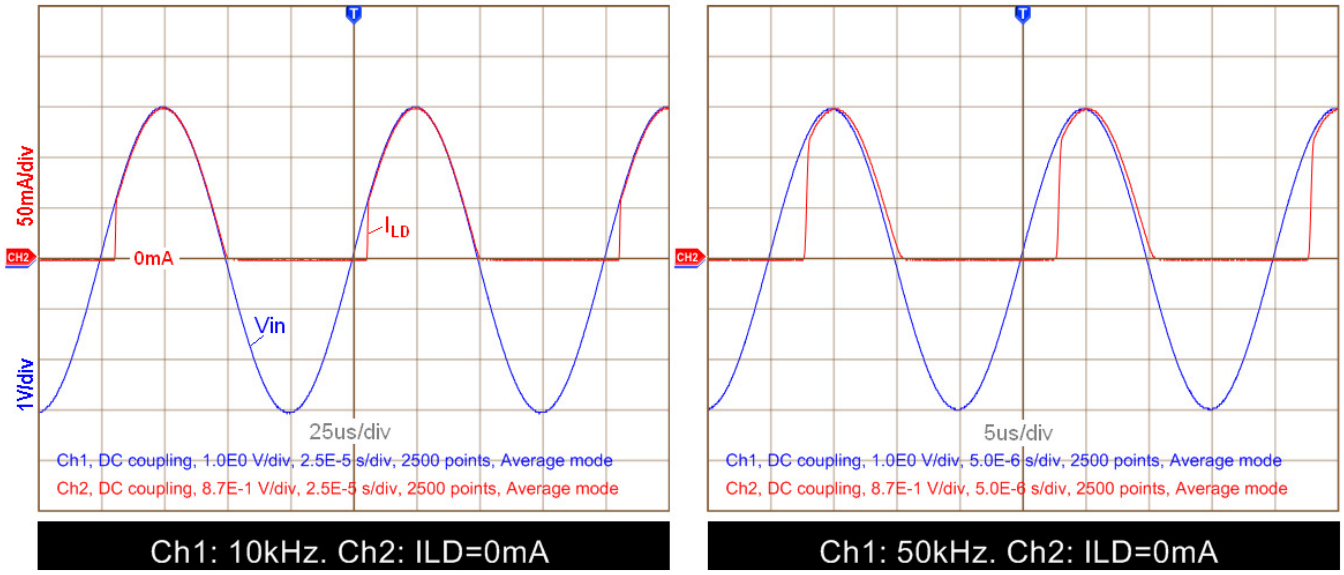

Fig.5 LDC501 recovers from 0 mA output.

5. Bandwidth change

A smooth transition will occur during bandwidth changes. In Fig.6, a bandwidth change will not cause output current glitches.

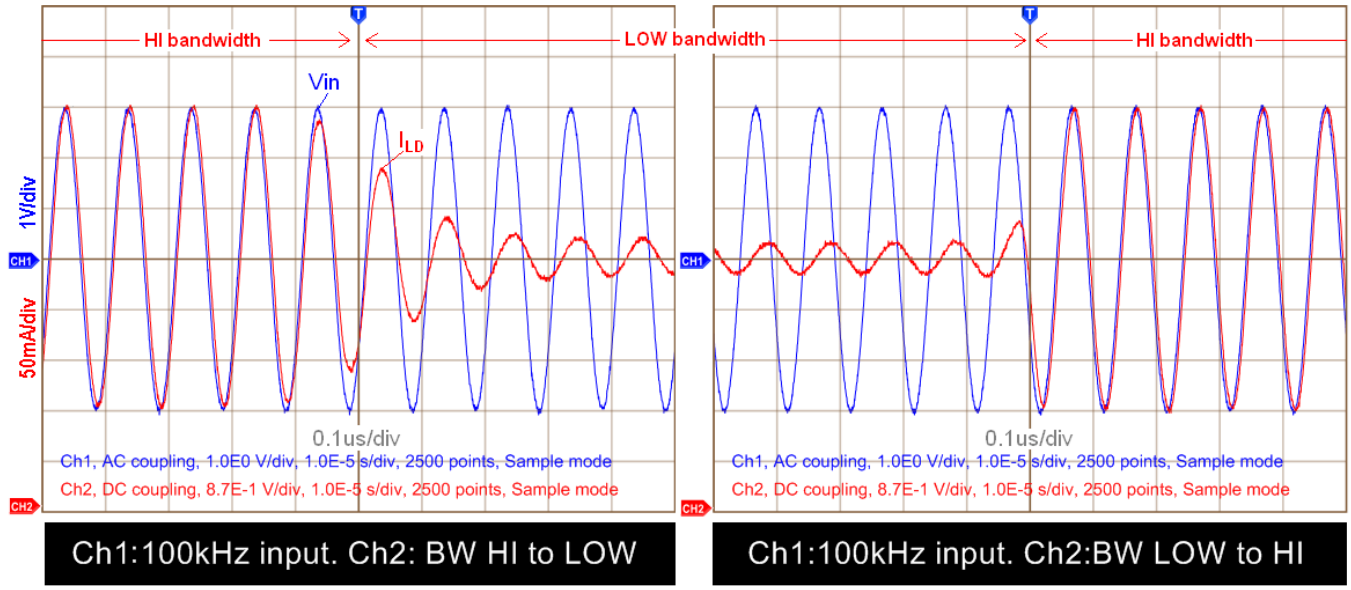

Fig.6 LDC501 bandwidth change from 1.2 MHz to 10 kHz and back.

6. Mode change

CC to CP, or CP to CC mode changes can be done while the laser is on. A smooth transition will occur without glitches in the output current. In Fig.7 the input modulation signal is 5 kHz. In CC mode, the LDC501 has a bandwidth of 1.2 MHz whereas CP mode has lower bandwidth of 5 kHz and also has a different transfer function.

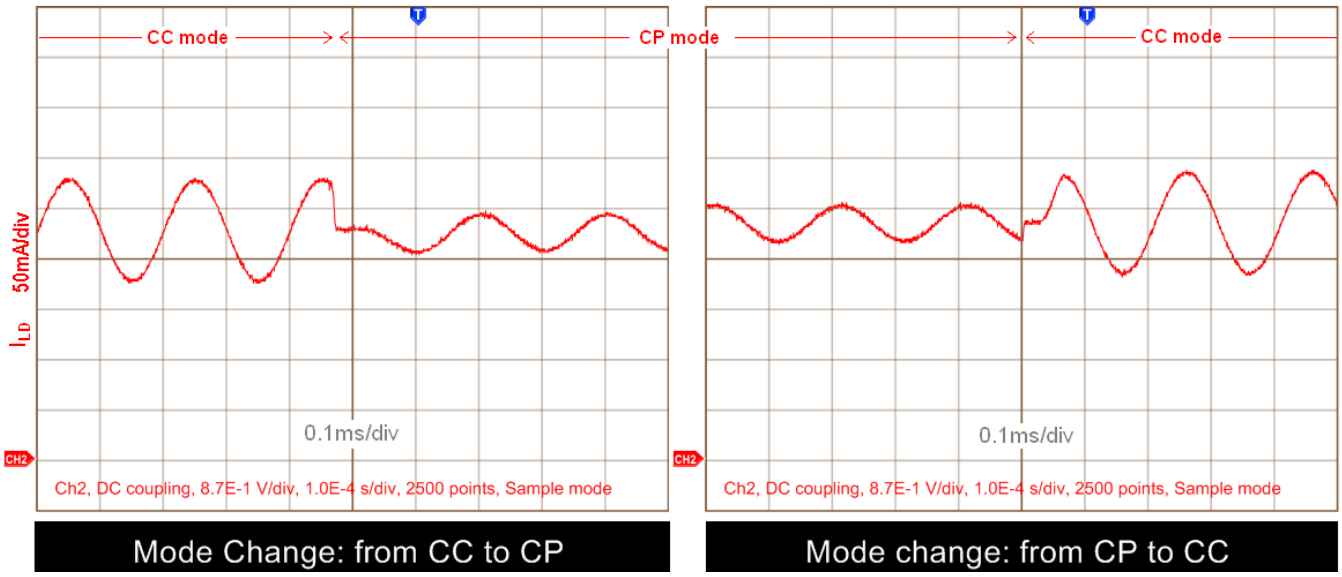

Fig.7 CC to CP, and CP to CC mode change.

7. Soft start and turn-off of the current source

When LDC501 is turned ON, the output current will softly rise to its setting point (250 mA in Fig.8 and is modulated). When it's turned OFF, the output current will shut off immediately.

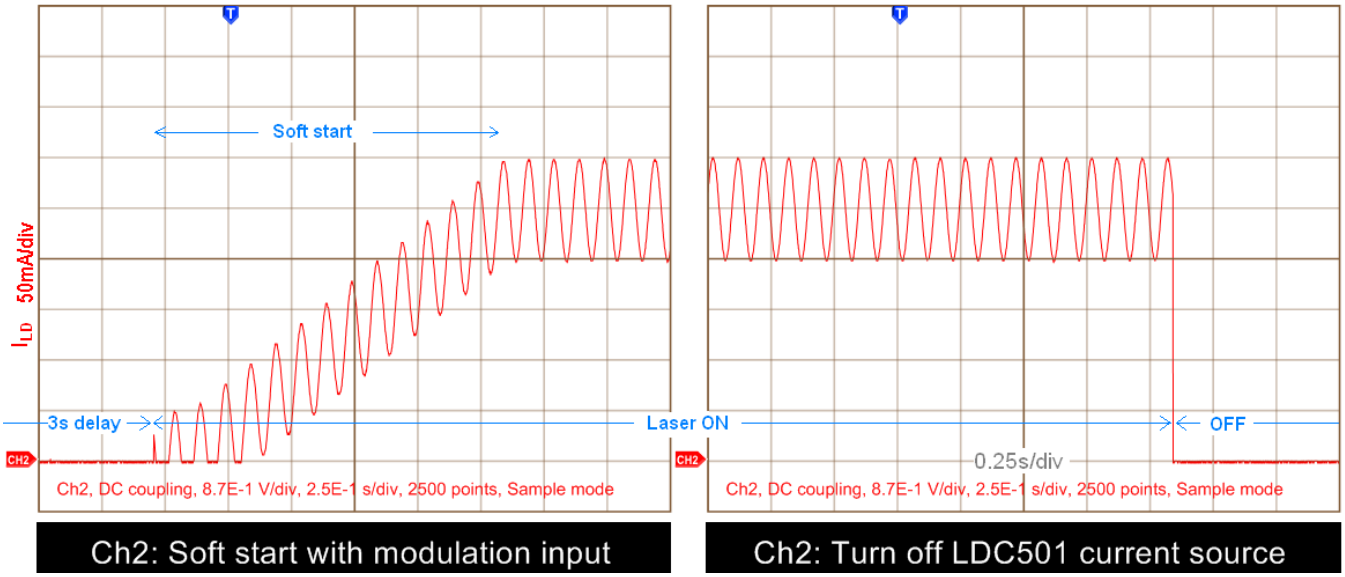

Fig.8 LDC501 soft start with modulation input and the fast turn-off.