# LM20143 Point of Load Regulator Board

## Description

The circuit is an integrated point of load synchronous buck regulator with a 5V input and a 1.2V/2.5A output. The device uses emulated current mode control, making it simple to create a flat impedance output. Easily accessible 0805 chip size components make it easy to customize or experiment with different component values. This is a fully self-contained demo board using USB input power and an on-board resistive load.

Provisions are included for a Bode plot measurement, with the injection resistor, R5, included as well as test-points for the injection signal and measurement (TP3 and TP4). SMA output connectors are also included to simplify connections for many measurements including the 2-port output impedance measurement, step load and other common measurements.

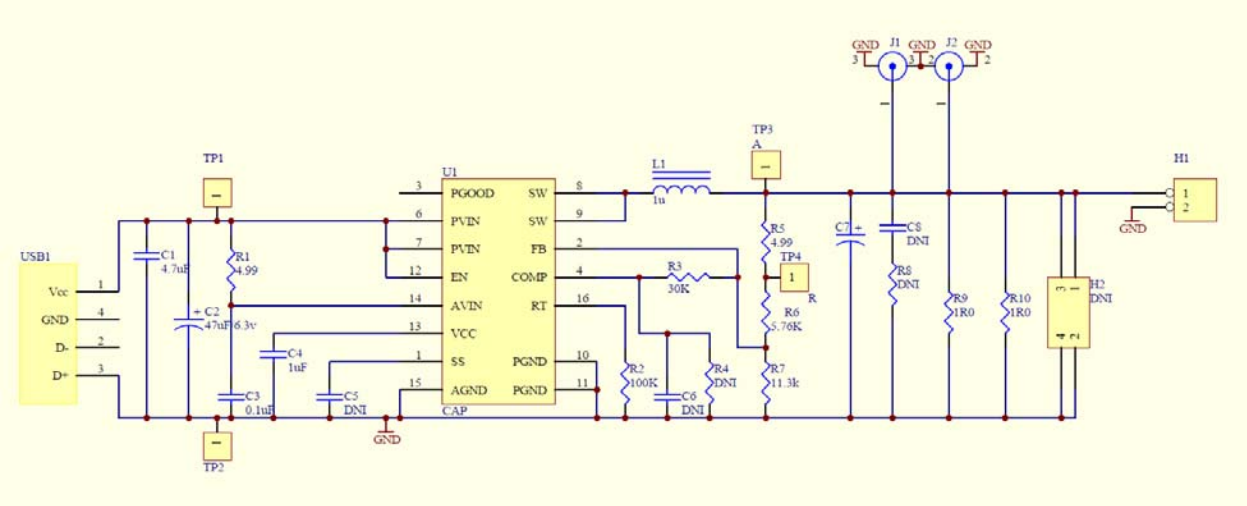



*Figure 1 – schematic diagram*

## Powering the Board

### CAUTION: R9 and R10 GET HOT DO NOT TOUCH

**Step 1:** Connect USB cable with a type B connector to the power connector, USB1.

**Test Points**

- TP1 - Input voltage meter or probe
- TP2 - Ground for meter or probe
- TP3 - Bode injection
- TP4 - Bode injection

## Supported Measurements

This demo board supports the following measurements:

*Table 1 Supported Measurements*

| TEST | SIGNAL INJECTORS NEEDED |
|---|---|
| **2-port output impedance** | J2102A two SMA cables (optional two P2130A or J2130A) |
| **Load Step** | J2111A or J2150A and J2130A or P2130A SMA cable |
| **Ripple and Noise** | J2130A or P2130A SMA cable |
| **Turn on overshoot** | Scope with probe or SMA cable |
| **PSRR** | J2120A or J2111A and two voltage probes |
| **Input Impedance** | J2120A voltage and current probe |
| **Bode Plot** | J2100A or J2101A two voltage probes |

## 2-Port Output Impedance

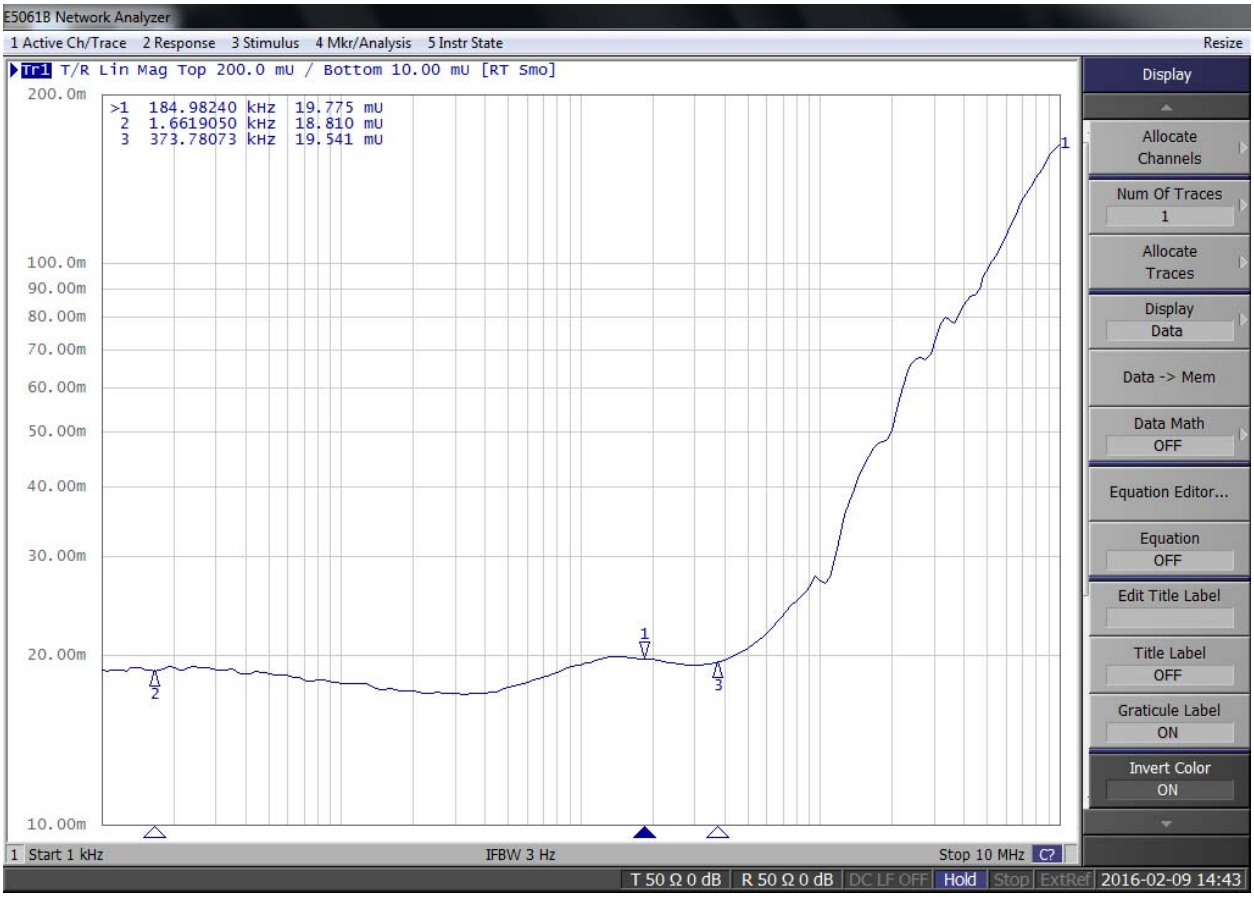



*Figure 2 2-port output impedance The memory (dim) trace is with power OFF and the data (bright) trace is with power ON*

## Load Step Response


*Figure 3 Load Step J2150A mode 5 orange trace is averaged 50Ohm scope input with P2130A 500Hz-8GHz DC block*

## Ripple and Noise Response

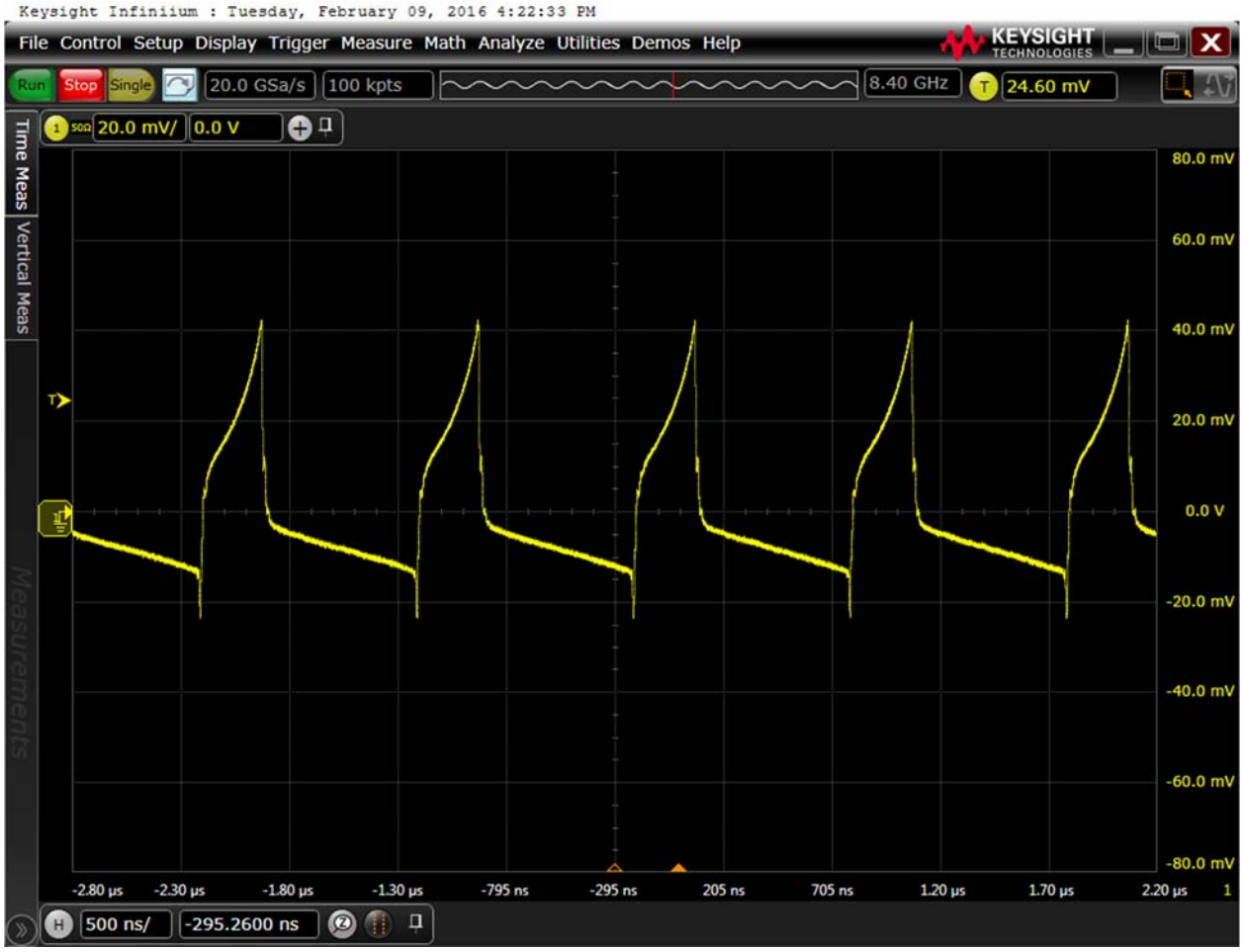
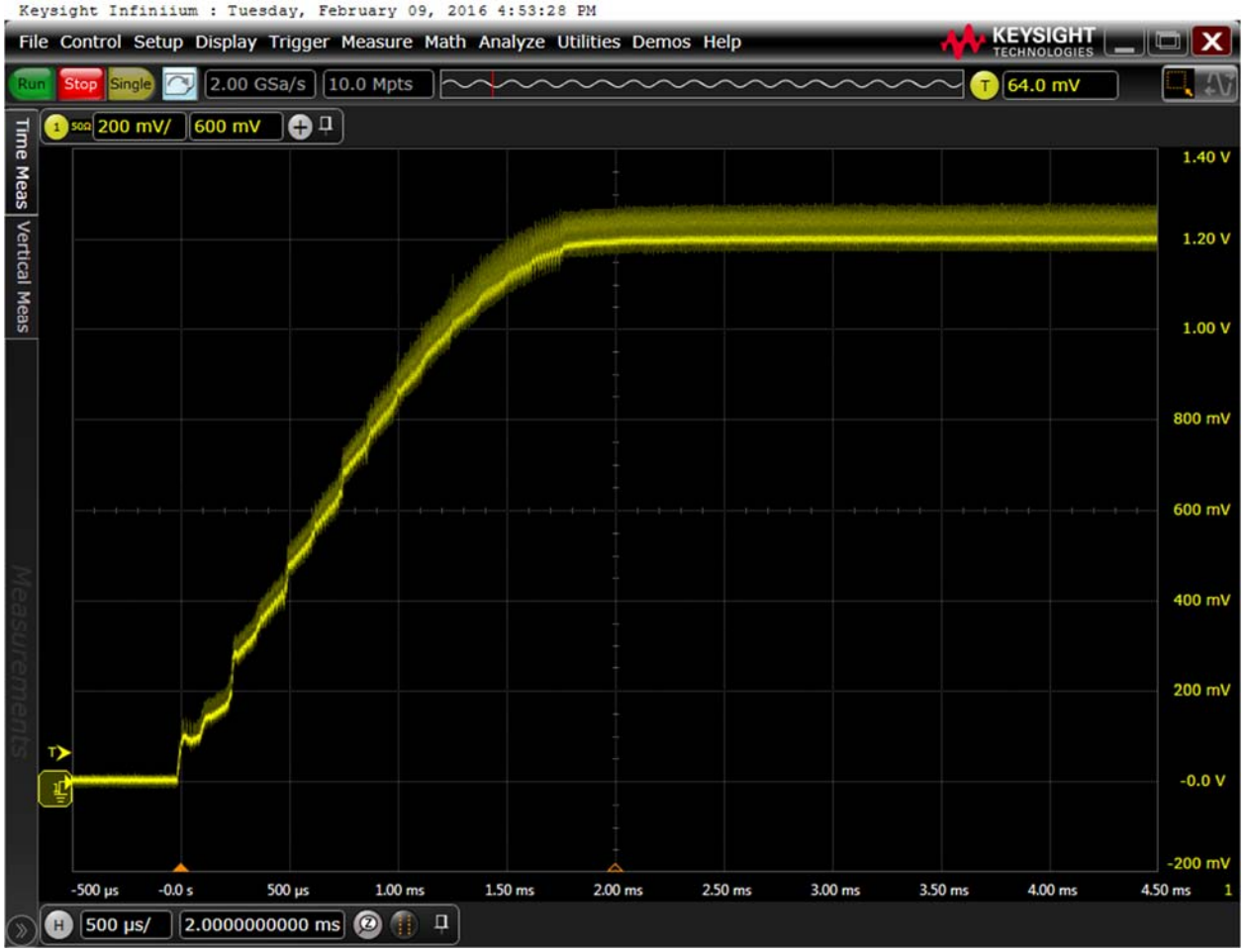


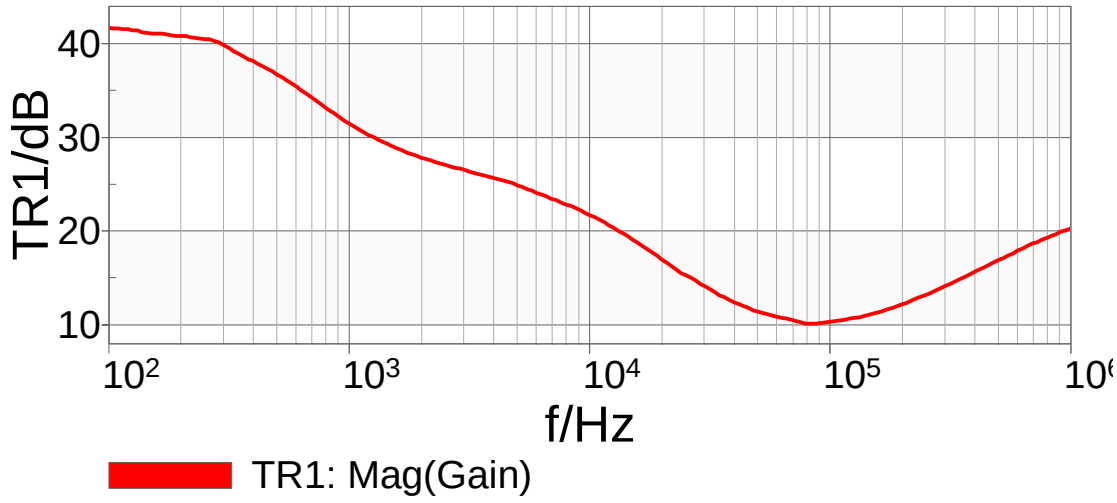

*Figure 4 20MHz Digital Filter 50Ohm scope input with P2130A 500Hz-8GHz DC block*


*Figure 5 Full bandwidth, 50Ohm scope input with P2130A 500Hz-8GHz DC block*

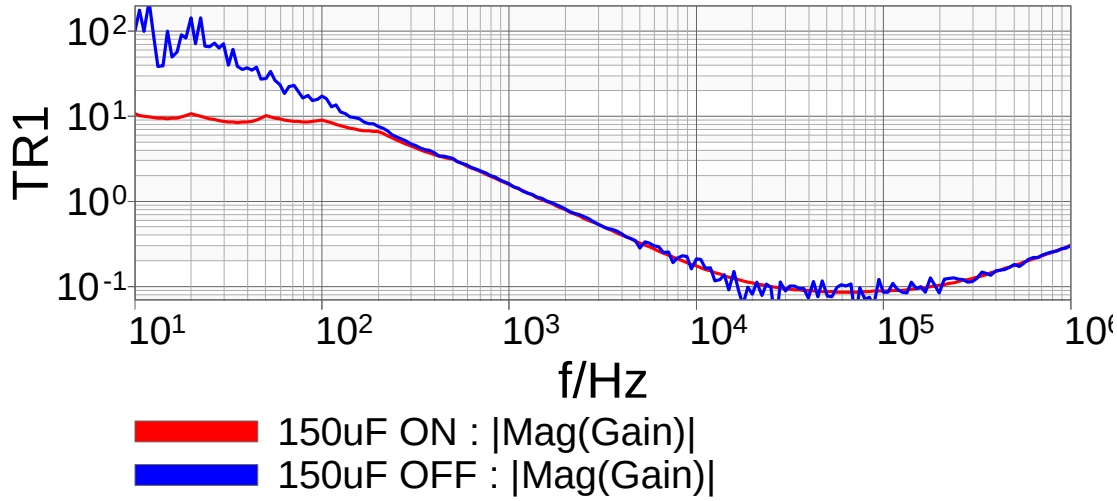
## Turn-on Overshoot Response

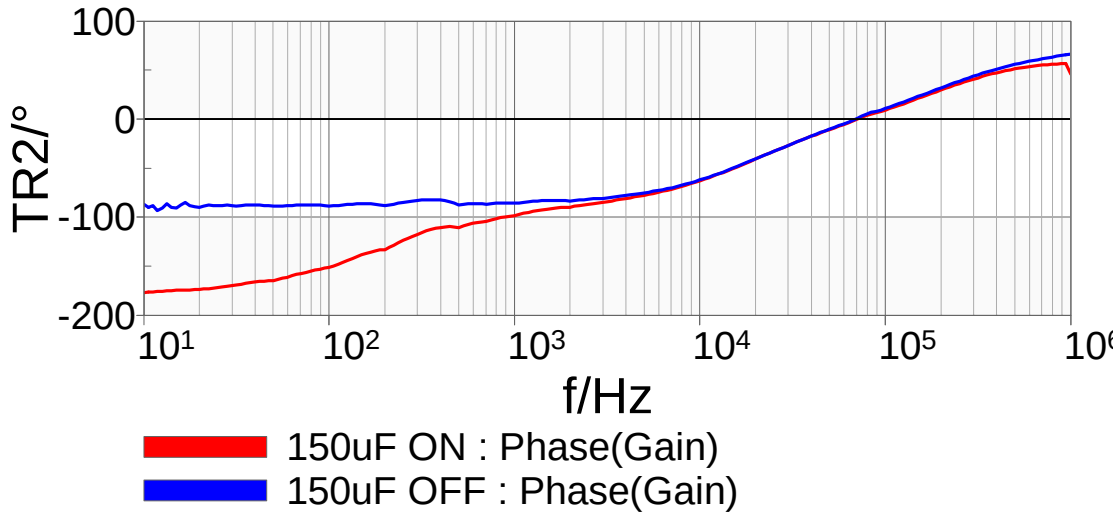



## PSRR Response

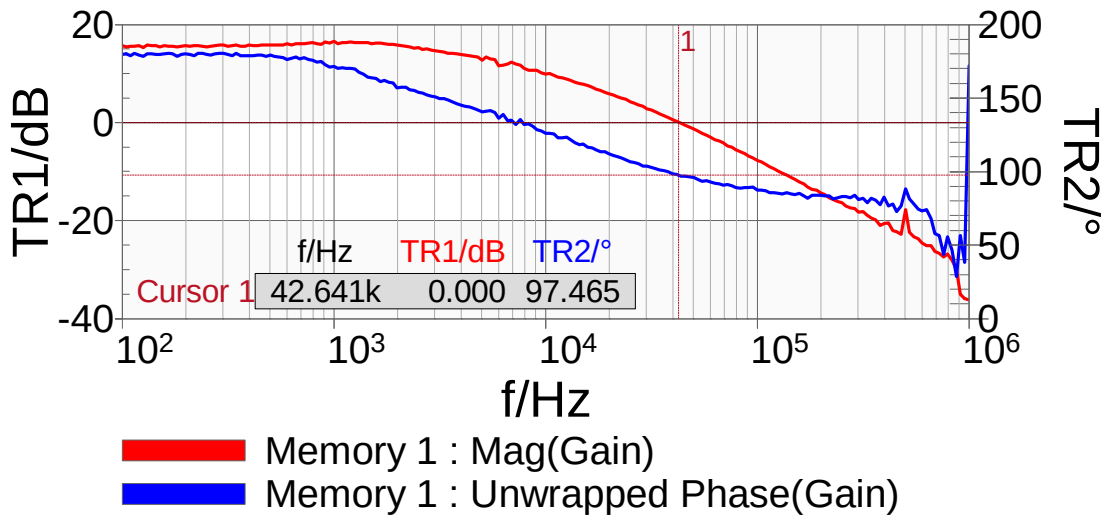


## Input Impedance Response



## Bode Plot Response



# BOM

*Table 2 Bill of Materials*

| Ref Des | Description | Digi-Key Part # |
|---|---|---|
| C1 | ceramic capacitor 4.7uF | 490-3335-1-ND |
| C2 | 47uF/6.3V Aluminum | 732-6390-1-ND |
| C3 | 0.1uF ceramic cap | 1276-1003-1-ND |
| C4 | 1uF ceramic cap | 399-1284-1-ND |
| C5 | DO NOT INSTALL | |
| C6 | DO NOT INSTALL | 399-1284-1-ND |
| C7 | 150uF/6.3V Alum | 732-6395-1-ND |
| C8 | DO NOT INSTALL | |
| J1,J2 | SMA_EDGE | 931-1175-ND or similar |
| L1 | Inductor 1.2uH 3.1A | 732-1093-1-ND |
| R1,R5 | 4.99 Ohm resistor | 311-4.99CRCT-ND |
| R2 | 100k resistor | P100KCCT-ND |
| R3 | 30k resistor | P30.0KCCT-ND |
| R4 | DNI | |
| R6 | 5.76K resistor | P5.76KCCT-ND |
| R7 | 11.3k resistor | P11.3KCCT-ND |
| R8 | DO NOT INSTALL | |
| R9, R10 | 1 Ohm 2W resistor | RCL1.0FCT-ND |
| TP1 | Testpoint RED | 36-5010 |
| TP2 | TESTPOINT BLACK | 36-5011 |
| TP3, TP4 | TESTPOINT YELLOW | 36-5014 |
| U1 | LM20143 | 296-41283-1-ND |
| USB1 | USB Connector | ED2983-ND |