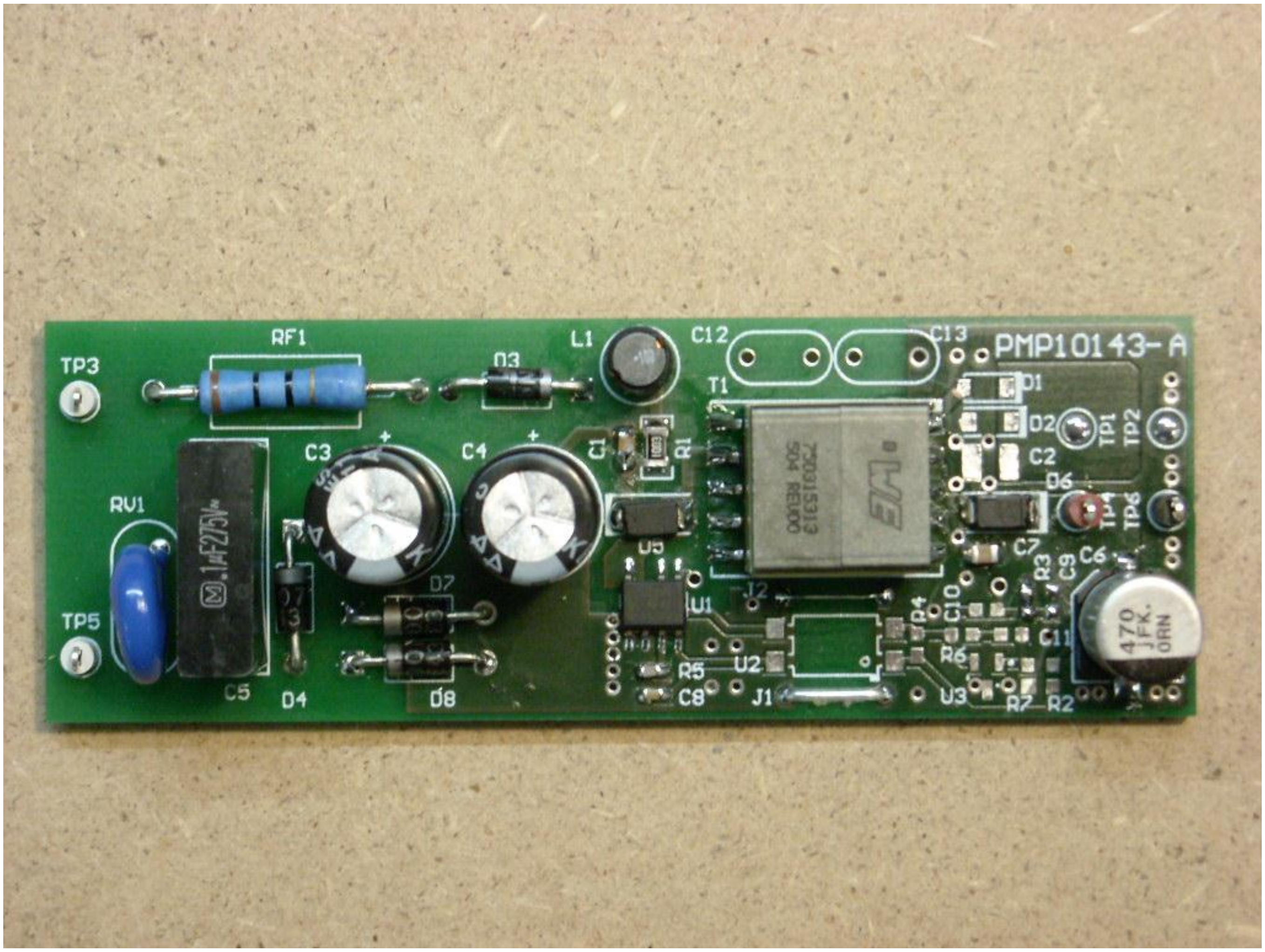
PHOTO OF THE PROTOTYPE

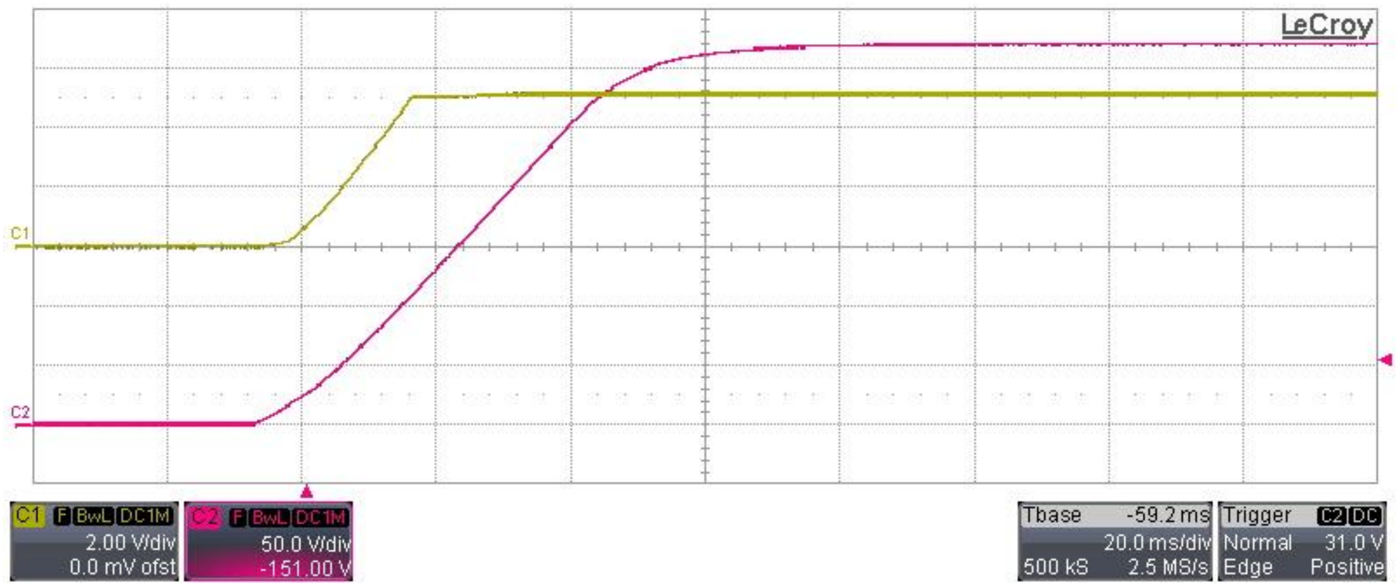


The PMP10175 PCB is the same as the PCB for TI’s PMP10143 design

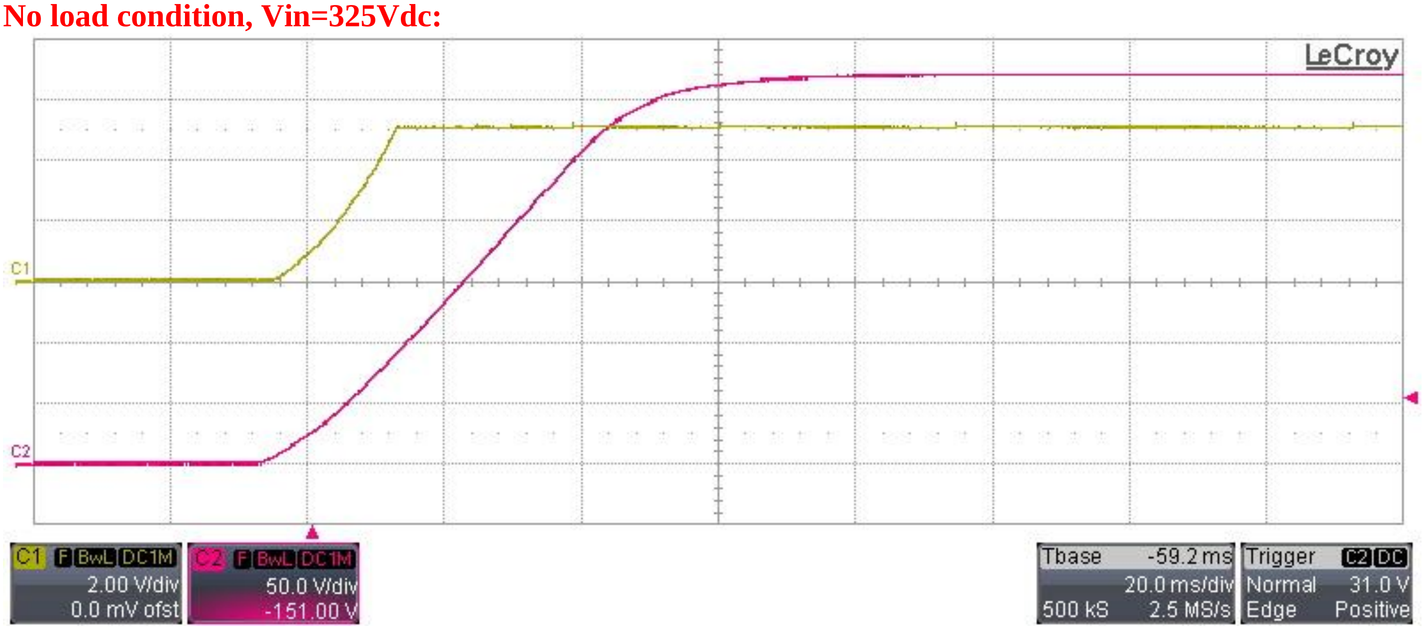
1 Output Voltage at Startup

The output voltage ramp-up behavior and input voltage is shown in the pictures below. The input voltage has been set to 325Vdc for the first two pictures and 127Vdc for the last two.

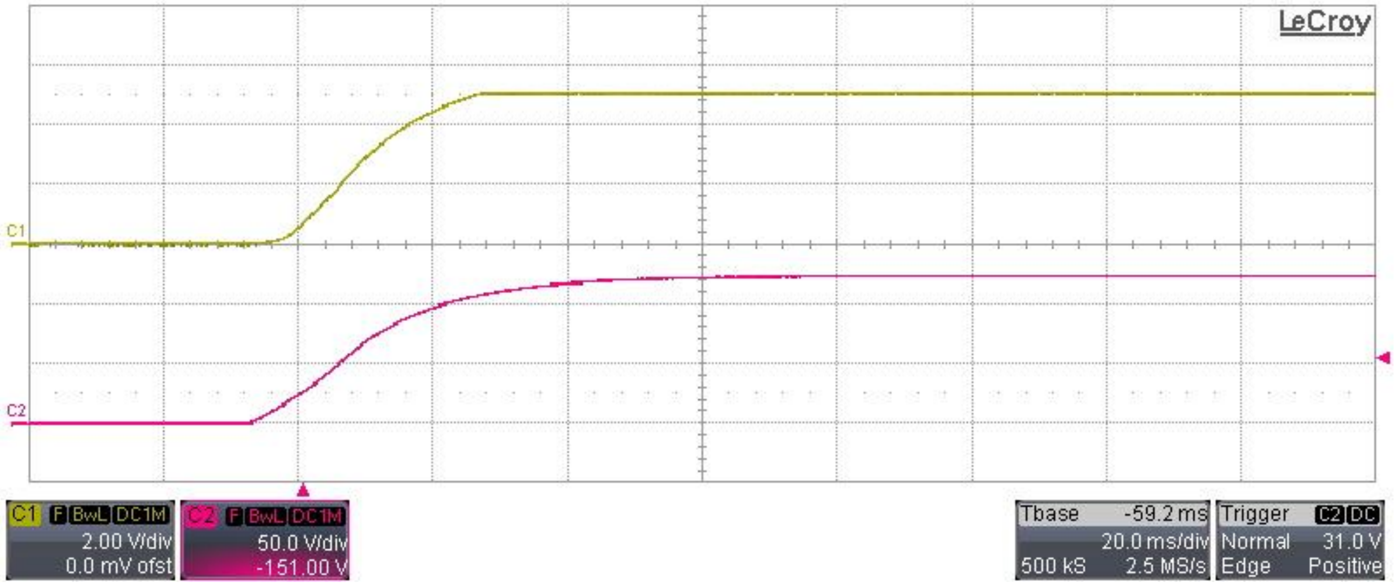
Ch1: Vout (2V/div, 20MHz BWL, 20msec/div)
Ch2: Vin (50V/div, 20MHz BWL)
Full load condition, Vin=325Vdc:



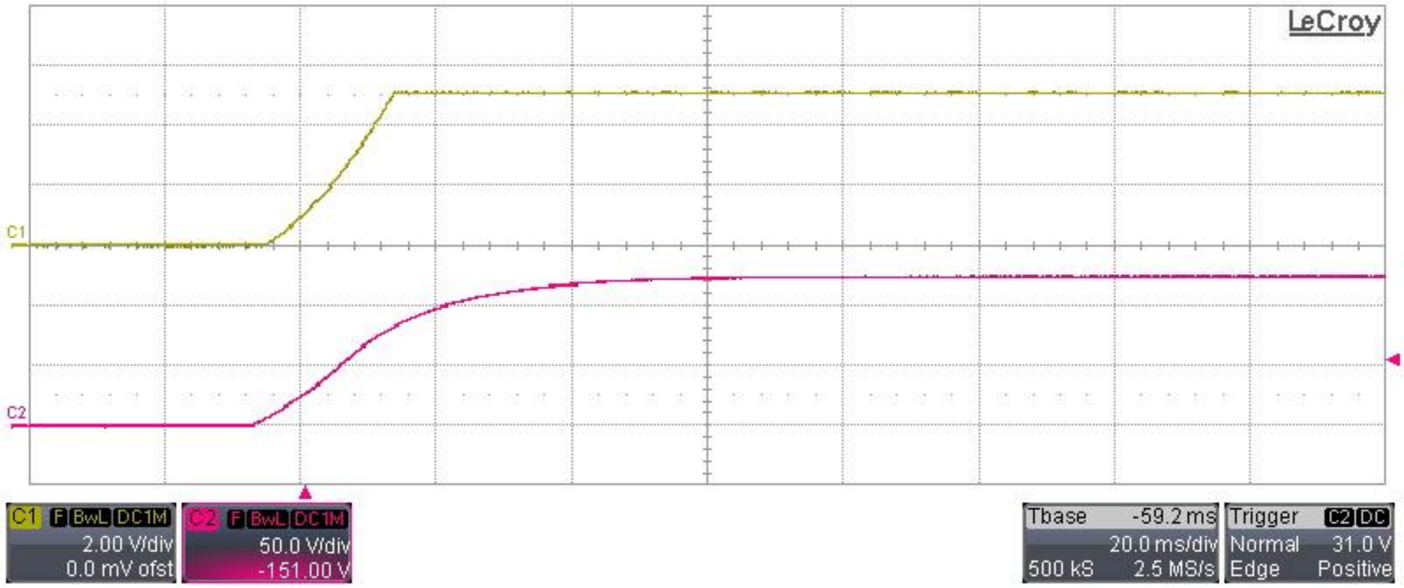
Ch1: Vout (2V/div, 20MHz BWL, 20msec/div)
Ch2: Vin (50V/div, 20MHz BWL)
No load condition, Vin=325Vdc:



Ch1: Vout (2V/div, 20MHz BWL, 20msec/div)
Ch2: Vin (50V/div, 20MHz BWL)
Full load condition, Vin=127Vdc:

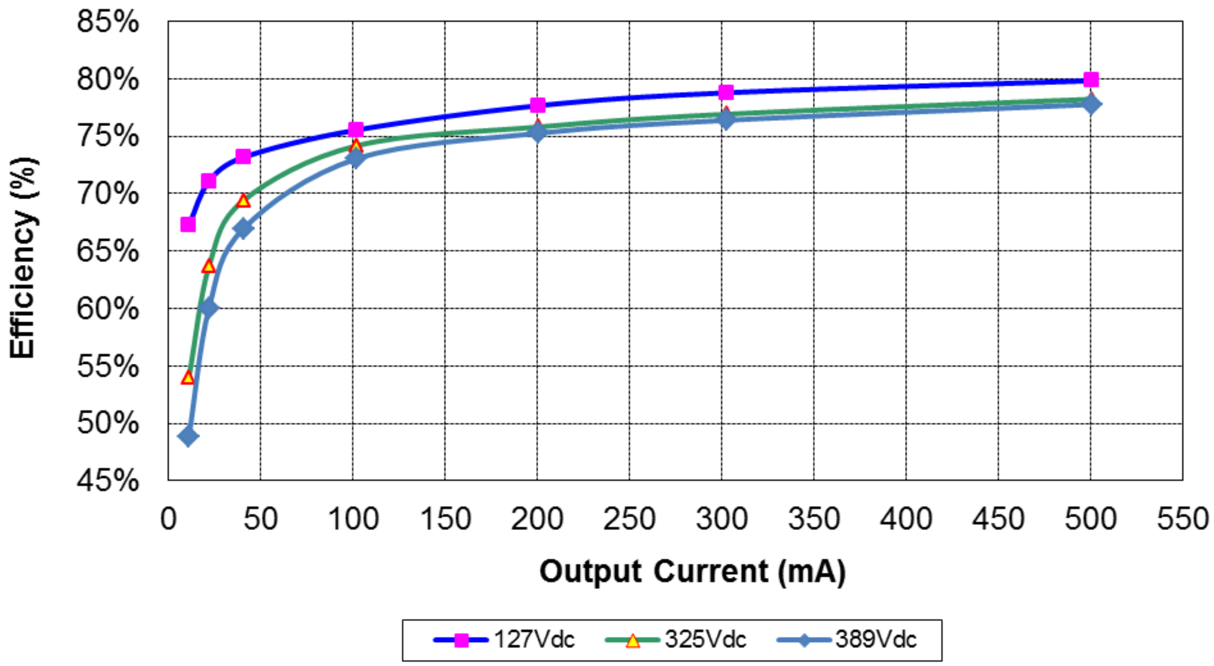


Ch1: Vout (2V/div, 20MHz BWL, 20msec/div)
Ch2: Vin (50V/div, 20MHz BWL)
No load condition, Vin=127Vdc:



2 Efficiency

The efficiency data are shown in the tables and graphs below. In order to get a good input power measurement precision, a DC input voltage has been applied, with the value respectively equal to the peak of the input AC range.



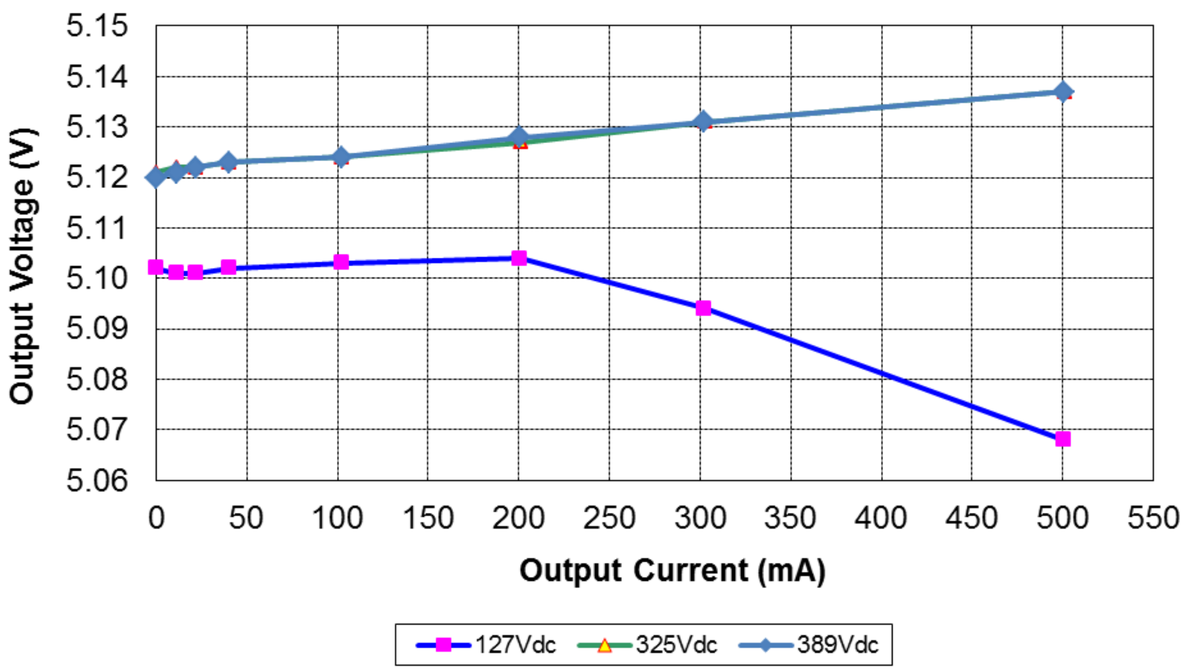
Vin (Vdc)	Vin (Vac)	Iin (mA)	Pin (W)	Vout (V)	Iout (mA)	Pout (W)	Ploss (W)	Eff (%)
127	90	0.076	0.010	5.102	0	0.000	0.0097	0.0%
127	90	0.657	0.083	5.101	11.0	0.056	0.027	67.2%
127	90	1.232	0.156	5.101	21.8	0.111	0.045	71.1%
127	90	2.23	0.283	5.102	40.6	0.207	0.076	73.2%
127	90	5.43	0.690	5.103	102.1	0.521	0.169	75.6%
127	90	10.39	1.320	5.104	200.8	1.025	0.295	77.7%
127	90	15.40	1.956	5.094	302.5	1.541	0.415	78.8%
127	90	25.03	3.179	5.068	500.8	2.538	0.641	79.8%

Vin (Vdc)	Vin (Vac)	Iin (mA)	Pin (W)	Vout (V)	Iout (mA)	Pout (W)	Ploss (W)	Eff (%)
325	230	0.100	0.033	5.121	0	0.000	0.0326	0.0%
325	230	0.321	0.104	5.122	11.0	0.056	0.048	54.0%
325	230	0.542	0.176	5.122	21.9	0.112	0.064	63.7%
325	230	0.922	0.300	5.123	40.6	0.208	0.092	69.4%
325	230	2.17	0.705	5.124	102.1	0.523	0.182	74.2%
325	230	4.18	1.359	5.127	200.9	1.030	0.328	75.8%
325	230	6.21	2.018	5.131	302.6	1.553	0.466	76.9%
325	230	10.12	3.289	5.137	500.9	2.573	0.716	78.2%

Vin (Vdc)	Vin (Vac)	Iin (mA)	Pin (W)	Vout (V)	Iout (mA)	Pout (W)	Ploss (W)	Eff (%)
389	275	0.114	0.044	5.120	0	0.000	0.0442	0.0%
389	275	0.296	0.115	5.121	11.0	0.056	0.059	48.9%
389	275	0.479	0.186	5.122	21.8	0.112	0.075	60.0%
389	275	0.80	0.311	5.123	40.6	0.208	0.103	67.0%
389	275	1.84	0.716	5.124	102.1	0.523	0.193	73.1%
389	275	3.52	1.368	5.128	200.8	1.030	0.338	75.3%
389	275	5.22	2.032	5.131	302.5	1.552	0.480	76.4%
389	275	8.504	3.308	5.137	500.8	2.573	0.735	77.8%

3 Output Voltage Regulation vs. Load

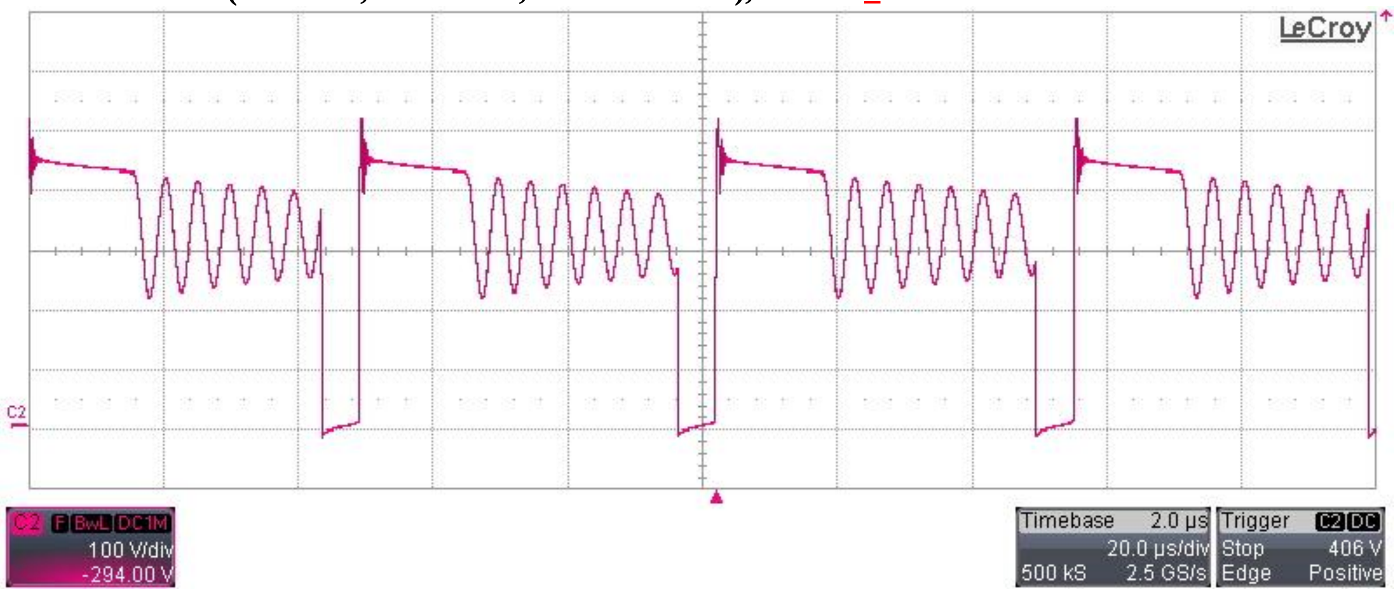
The output voltage variation versus load has been plotted in the graph below.



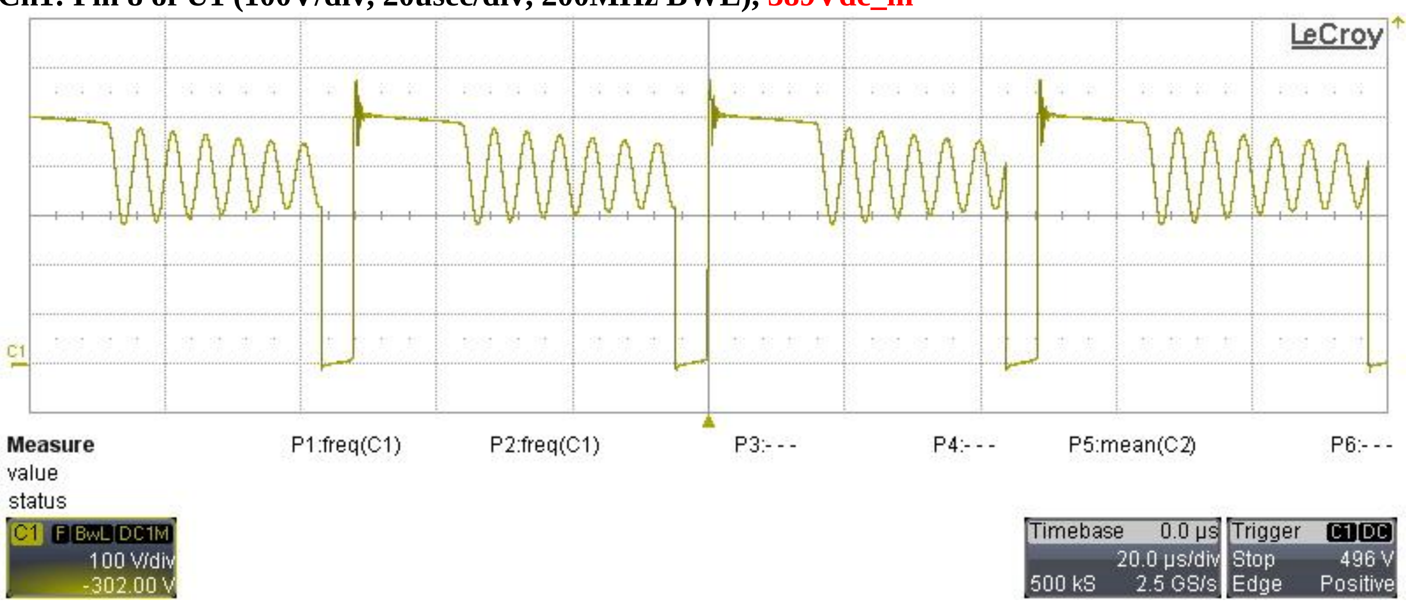
4 Switching Node Waveforms

The images below show the voltage on switch node (pin 8 of U1) at 325Vdc and 389Vdc input voltage and full load conditions.

Ch2: Pin 8 of U1 (100V/div, 20usec/div, 200MHz BWL), 325Vdc_in



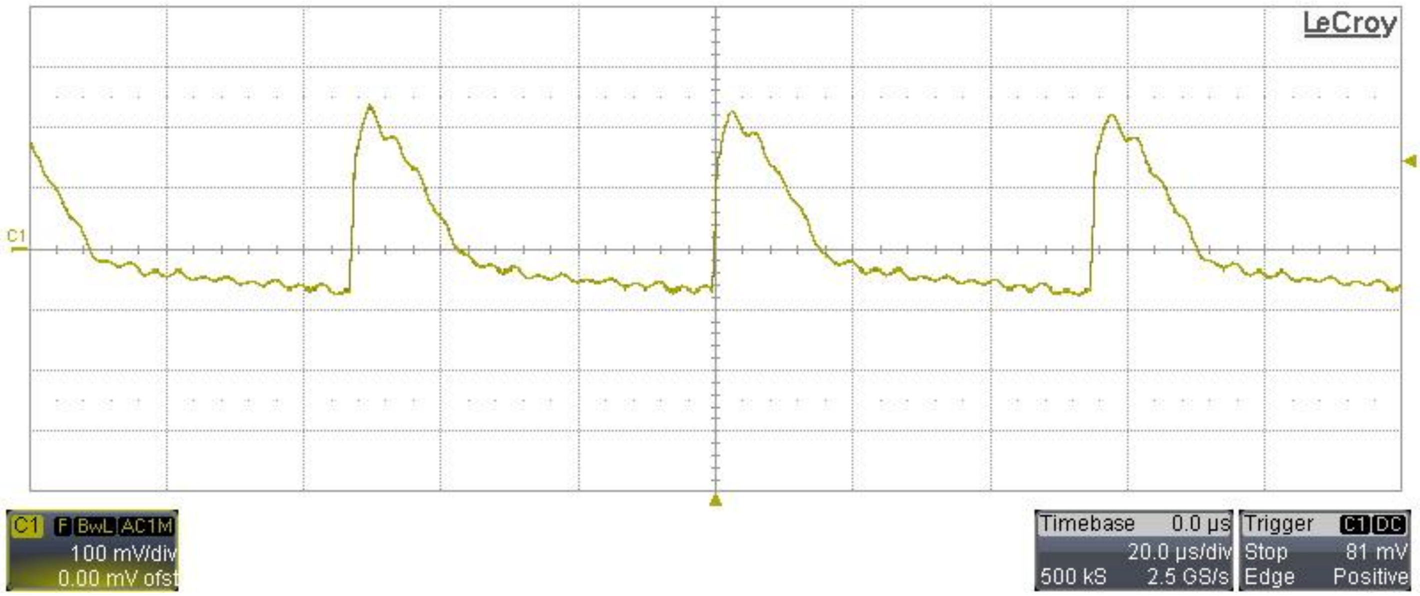
Ch1: Pin 8 of U1 (100V/div, 20usec/div, 200MHz BWL), 389Vdc_in



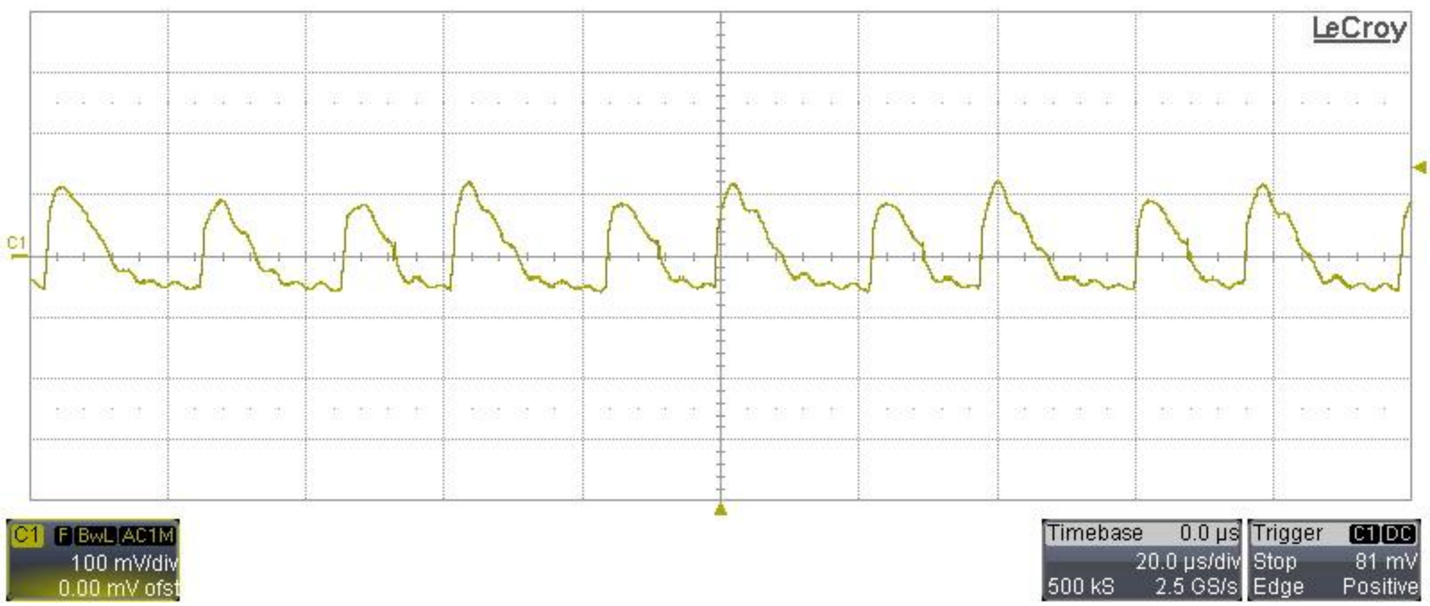
5 Output Ripple Voltage

The images below show the output ripple voltage taken respectively at 325Vdc and 127Vdc input. An electronic load has been connected to the output and set to 500mA in constant current mode.

Ch1: Vout (100mV/div, 20MHz BWL, AC coupling, 20usec/div)
Vin = 325Vdc



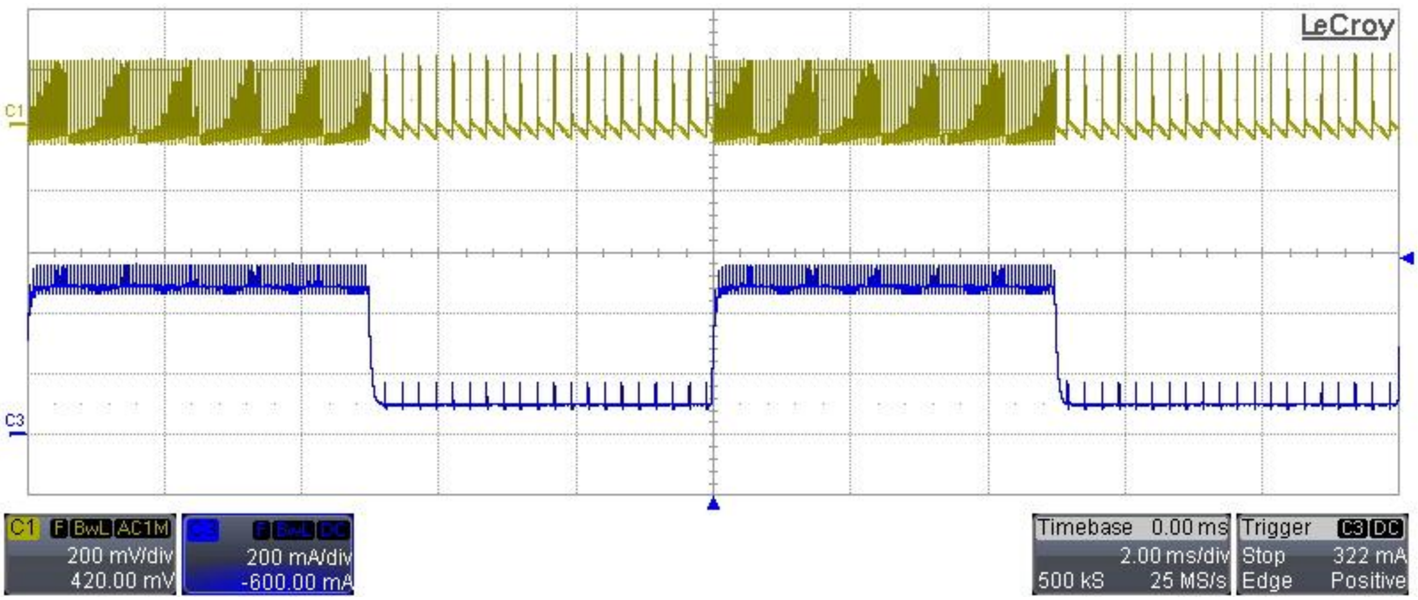
Ch1: Vout (100mV/div, 20MHz BWL, AC coupling, 20usec/div)
Vin = 127Vdc



6 Transient Response

The output voltage variation versus transient load is shown below. The input voltage has been set to 325Vdc and the load switched between 100A and 500mA.

Ch1: Vout (200mV/div, 20MHz BWL, AC coupling, 2msec/div)
Ch3: Output current (200mA/div, 20MHz BWL, DC coupling)



7 Thermal Analysis

The thermal analysis of the converter shows the temperatures for each component, in the graphs below. The converter has been placed horizontally on the bench without any forced convection. The input voltage was 325Vdc with fully loaded output. The ambient temperature was 23C.

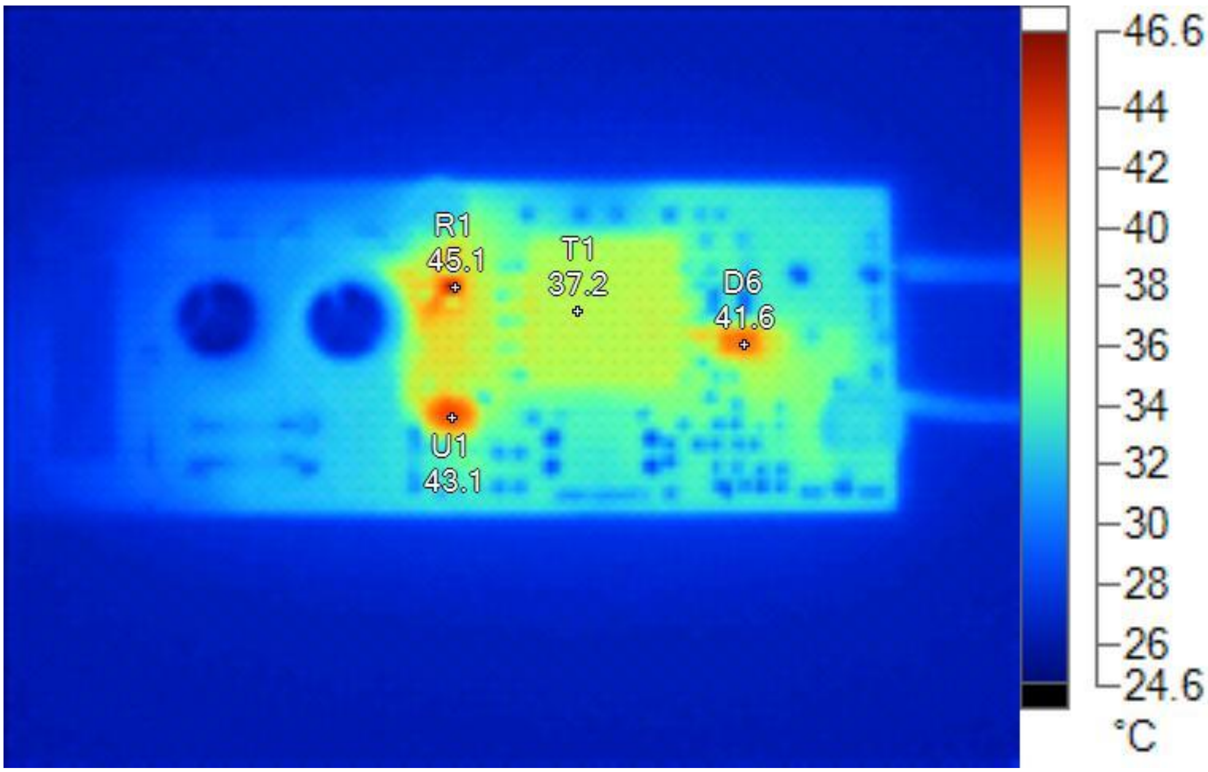


Image Info

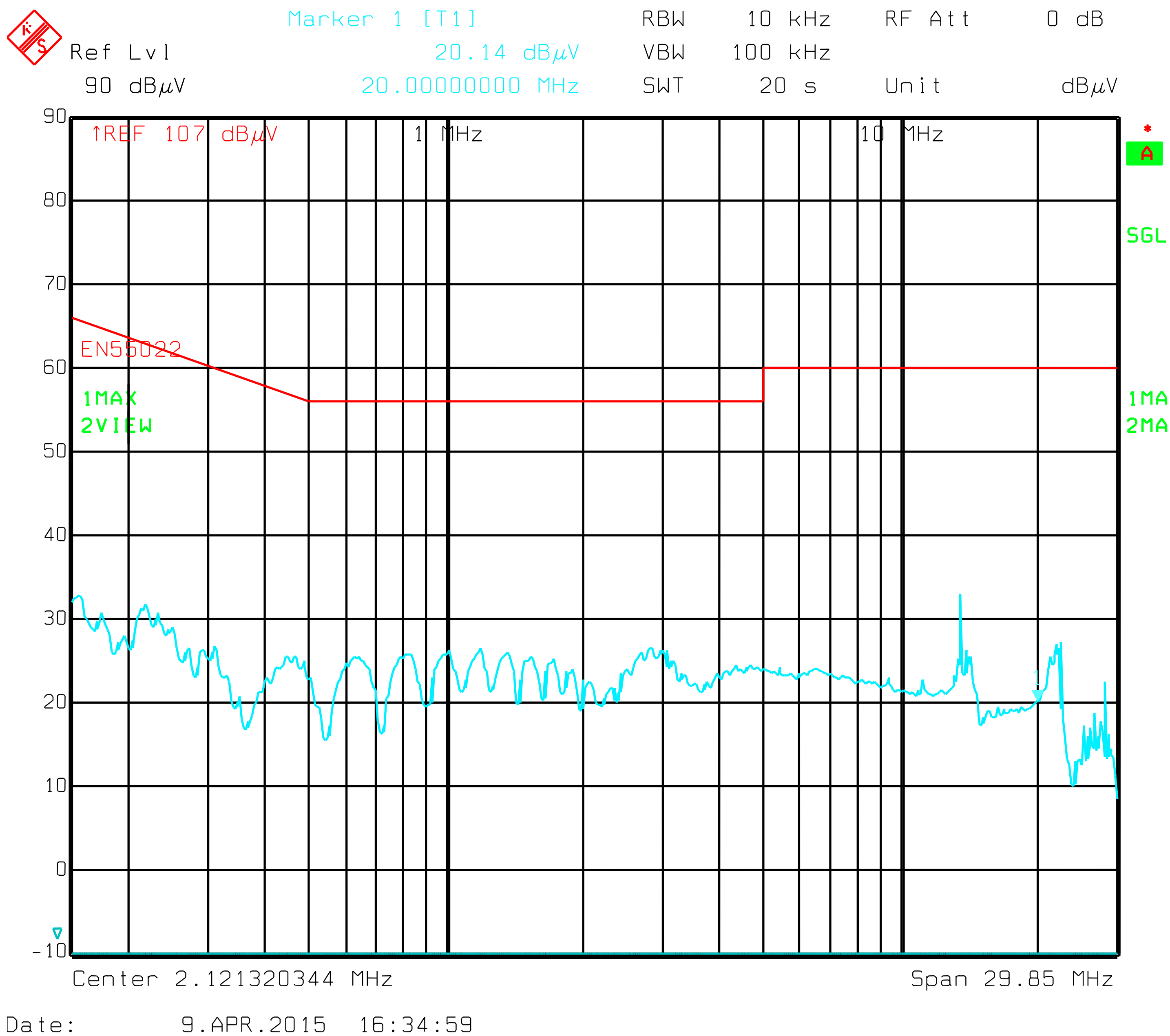
Background temperature	23.0°C
Average Temperature	28.7°C
Image Range	25.5°C to 45.4°C
Camera Model	Ti40FT
Camera Manufacturer	Fluke
Image Time	3/5/2015 6:59:30 PM

Main Image Markers

Name	Temperature
R1	45.1°C
U1	43.1°C
T1	37.2°C
D6	41.6°C

8 EMI Measurement

The graph below shows the EMI conducted emission measurement. The board has been supplied @ 230Vac by means of an isolation transformer BR350, a LISN Hameg HM6050-2 and the Rohde & Schwarz receiver 9KHz…3.5GHz measured the EMI signature. The load was a passive resistor. Since the converter is not isolated, the load hasn't been connected to the ground of the LISN. The limit shows the EN55022 Grade B and the receiver detector was set to "quasi peak".



General Texas Instruments High Voltage Evaluation (TI HV EVM) User Safety Guidelines

WARNING:

Always follow TI's set-up and application instructions, including use of all interface components within their recommended electrical rated voltage and power limits. Always use electrical safety precautions to help ensure your personal safety and those working around you. Contact TI's Product Information Center http://support/ti./com for further information.

Save all warnings and instructions for future reference.

Failure to follow warnings and instructions may result in personal injury, property damage or death due to electrical shock and burn hazards.

The term TI HV EVM refers to an electronic device typically provided as an open framed, unenclosed printed circuit board assembly. It is intended strictly for use in development laboratory environments, solely for qualified professional users having training, expertise and knowledge of electrical safety risks in development and application of high voltage electrical circuits. Any other use and/or application are strictly prohibited by Texas Instruments. If you are not suitable qualified, you should immediately stop from further use of the HV EVM.

1. Work Area Safety:
    a. Keep work area clean and orderly.
    b. Qualified observer(s) must be present anytime circuits are energized.
    c. Effective barriers and signage must be present in the area where the TI HV EVM and its interface electronics are energized, indicating operation of accessible high voltages may be present, for the purpose of protecting inadvertent access i
    d. All interface circuits, power supplies, evaluation modules, instruments, meters, scopes and other related apparatus used in a development environment exceeding 50Vrms/75VDC must be electrically located within a protected Emergency Power Off EPO protected power strip.
    e. Use stable and non conductive work surface.
    f. Use adequately insulated clamps and wires to attach measurement probes and instruments. No freehand testing whenever possible.

2. Electrical safety:
    As a precautionary measure, it is always a good engineering practice to assume that the entire EVM may have fully accessible and active high voltages.
    a. De-energize the TI HV EVM and all its inputs, outputs and electrical loads before performing any electrical or other diagnostic measurements. Revalidate that TI HV EVM power has been safely de-energized.
    b. With the EVM confirmed de-energized, proceed with required electrical circuit configurations, wiring, measurement equipment hook-ups and other application needs, while still assuming the EVM circuit and measuring instruments are electrically live.
    c. Once EVM readiness is complete, energize the EVM as intended.

WARNING: WHILE THE EVM IS ENERGIZED, NEVER TOUCH THE EVM OR ITS ELECTRICAL CIRCUITS AS THEY COULD BE AT HIGH VOLTAGES CAPABLE OF CAUSING ELECTRICAL SHOCK HAZARD.

3. Personal Safety
    a. Wear personal protective equipment e.g. latex gloves or safety glasses with side shields or protect EVM in an adequate lucent plastic box with interlocks from accidental touch.

Limitation for safe use:
EVMs are not to be used as all or part of a production unit.

TI HV EVM Safety Instruction, 19.09.2011