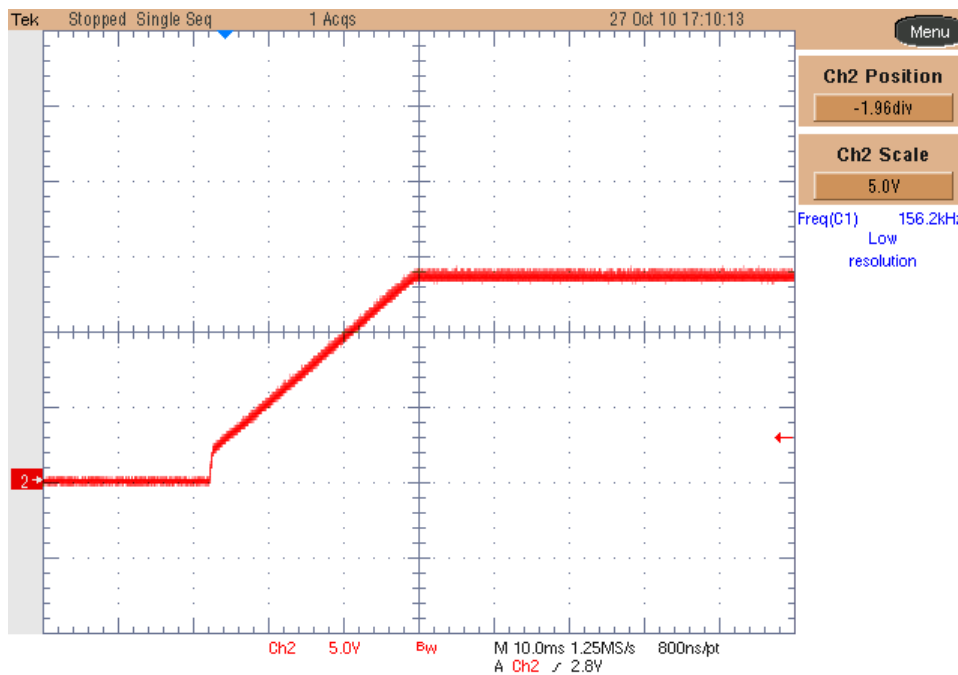
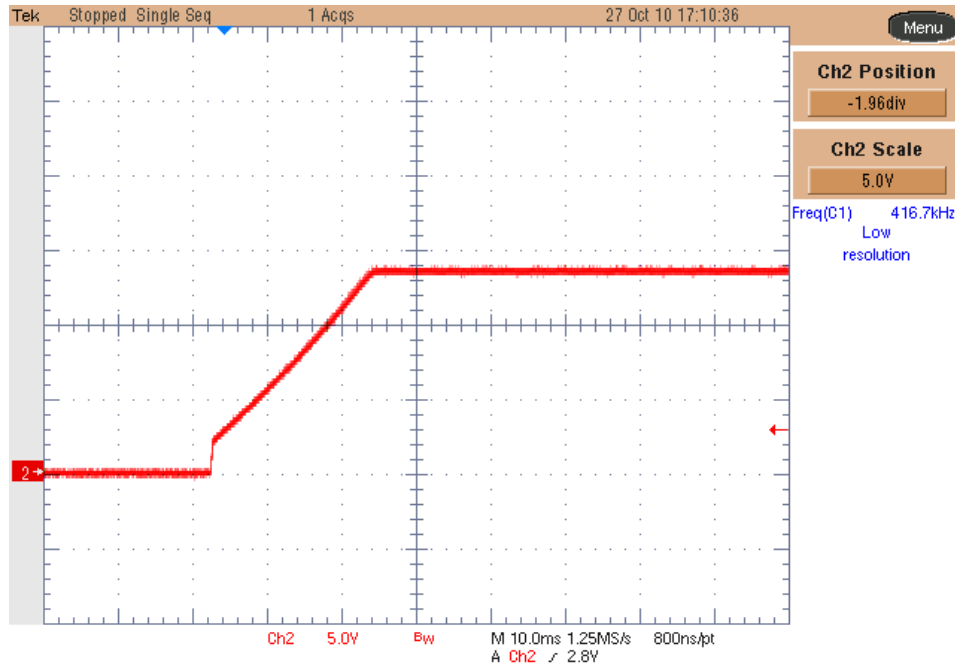


1. Startup

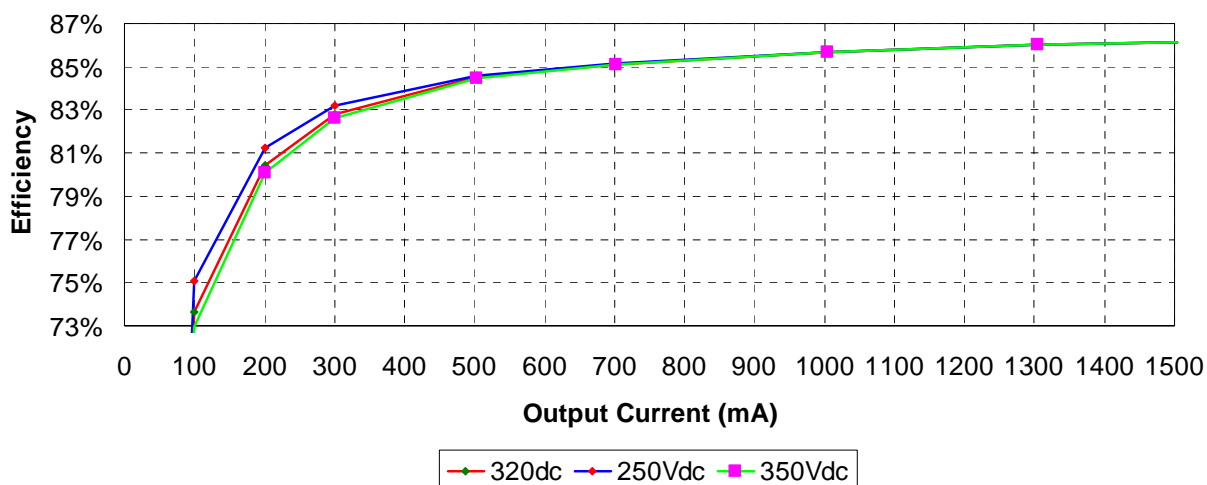
The output voltage at startup is shown in the images below. Input voltage was set to 320Vdc. The output was unloaded (upper picture) and fully loaded (lower picture). Channel 2: Output voltage (5 V/div, 10ms/div).



2. Efficiency

The efficiency data is shown in the tables and graph below. For a better resolution a DC source was set to 250Vdc, 320Vdc and 350Vdc.

The zero load condition was taken with the LED on the output ON.



Iout (mA)	Vout (V)	Pout (W)	Vin (V)	Iin (mA)	Pin (W)	Ploss (W)	Eff
0.0	13.575	0.00	320	0.5071	0.162	0.162	0.00%
100.3	13.576	1.36	320	5.778	1.849	0.487	73.65%
200.2	13.577	2.72	320	10.558	3.379	0.660	80.45%
300.1	13.577	4.07	320	15.384	4.923	0.848	82.77%
502.5	13.579	6.82	320	25.23	8.074	1.250	84.52%
702.2	13.581	9.54	320	35.01	11.203	1.667	85.12%
1004.6	13.584	13.65	320	49.79	15.933	2.286	85.65%
1305.0	13.586	17.73	320	64.42	20.614	2.885	86.01%
1504.0	13.588	20.44	320	74.13	23.722	3.285	86.15%

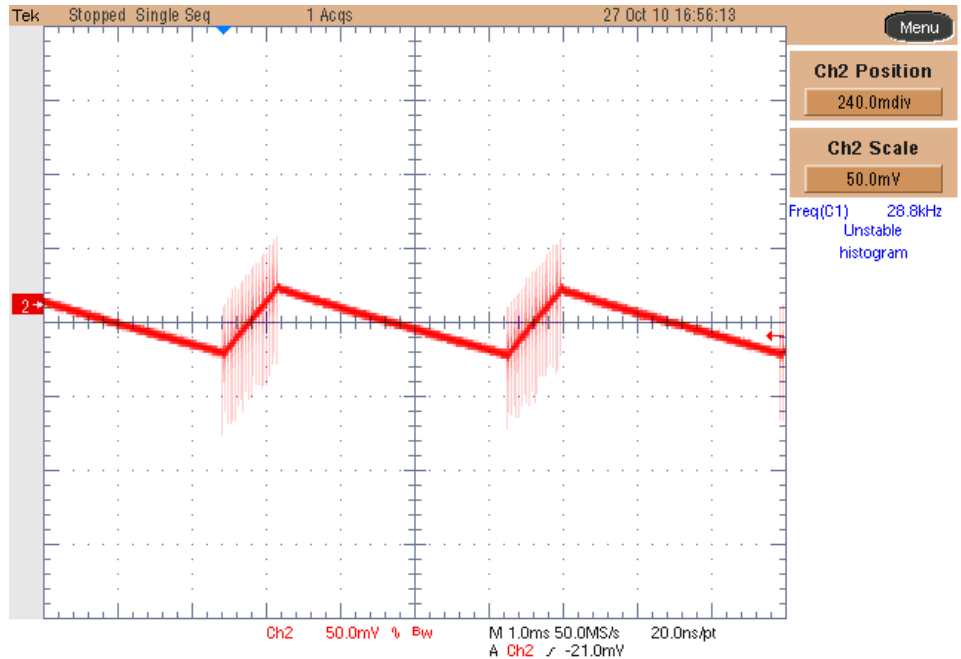
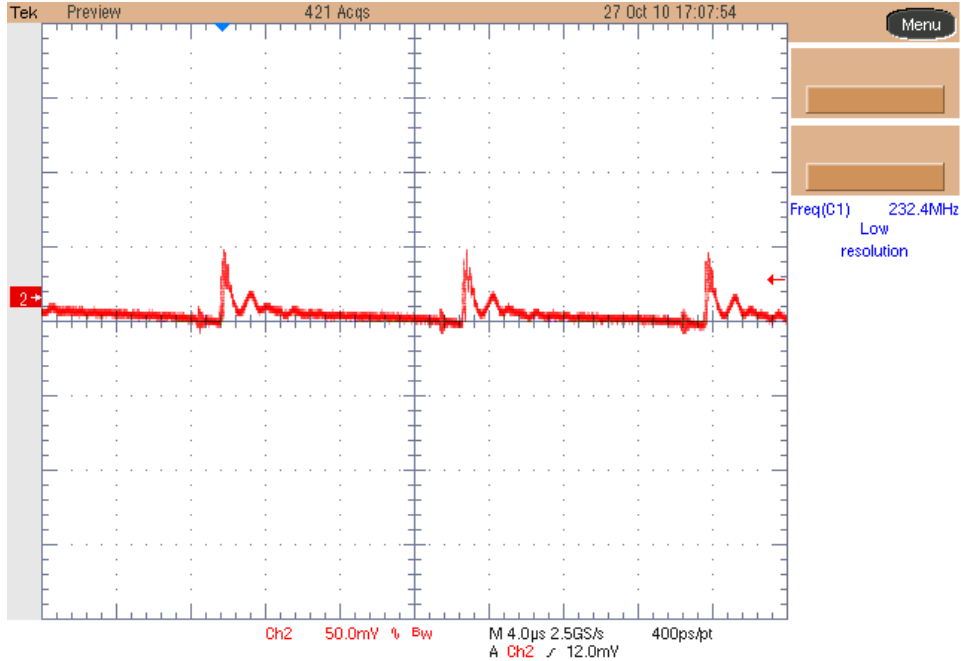
Iout (mA)	Vout (V)	Pout (W)	Vin (V)	Iin (mA)	Pin (W)	Ploss (W)	Eff
0.0	13.576	0.00	250	0.6098	0.152	0.152	0.00%
100.3	13.575	1.36	250	7.252	1.813	0.451	75.10%
200.2	13.576	2.72	250	13.383	3.346	0.628	81.23%
300.1	13.577	4.07	250	19.587	4.897	0.822	83.21%
502.5	13.579	6.82	250	32.26	8.065	1.242	84.61%
702.2	13.580	9.54	250	44.79	11.198	1.662	85.16%
1004.6	13.583	13.65	250	63.72	15.930	2.285	85.66%
1305.0	13.586	17.73	250	82.47	20.618	2.888	85.99%
1504.0	13.588	20.44	250	94.89	23.723	3.286	86.15%

Iout (mA)	Vout (V)	Pout (W)	Vin (V)	Iin (mA)	Pin (W)	Ploss (W)	Eff
0.0	13.576	0.00	350	0.4831	0.169	0.169	0.00%
100.3	13.577	1.36	350	5.335	1.867	0.505	72.93%
200.2	13.577	2.72	350	9.697	3.394	0.676	80.09%
300.1	13.584	4.08	350	14.094	4.933	0.856	82.64%
502.5	13.580	6.82	350	23.09	8.082	1.258	84.44%
702.2	13.581	9.54	350	32.01	11.204	1.667	85.12%
1004.6	13.584	13.65	350	45.52	15.932	2.286	85.65%
1305.0	13.586	17.73	350	58.89	20.612	2.882	86.02%
1504.0	13.588	20.44	350	67.78	23.723	3.287	86.15%

3. Output Ripple Voltage

The output ripple voltage is shown in the plots below. The input was set to 320Vdc and the load was set to Full Load (upper picture) and No Load (lower picture).

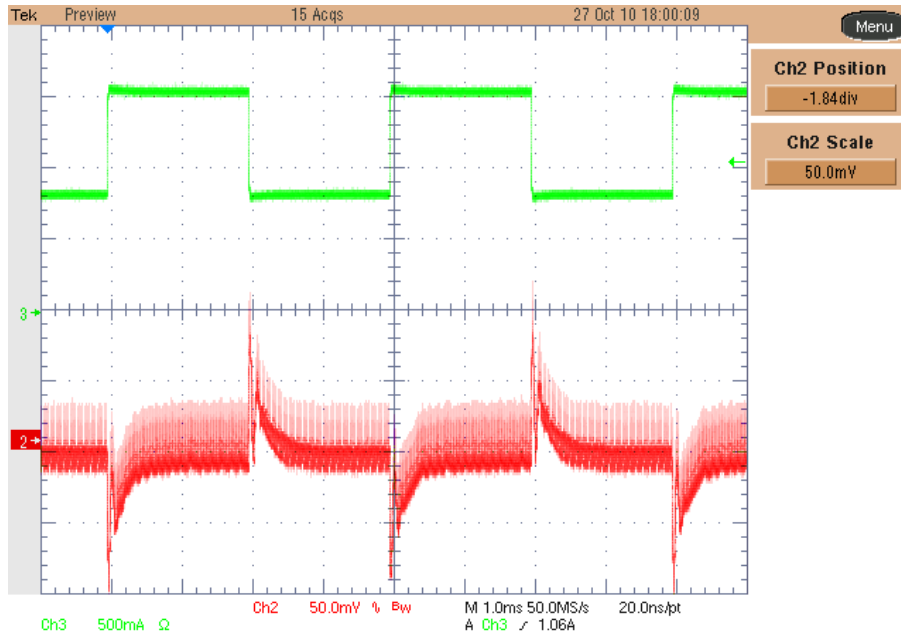
Channel 2: Output voltage (50mV/div, 20MHz BW, 4us/div)



4. Load Transient

The image below shows the response to 50% to 100% load transient on the output voltage. The input voltage was set to 320Vac.

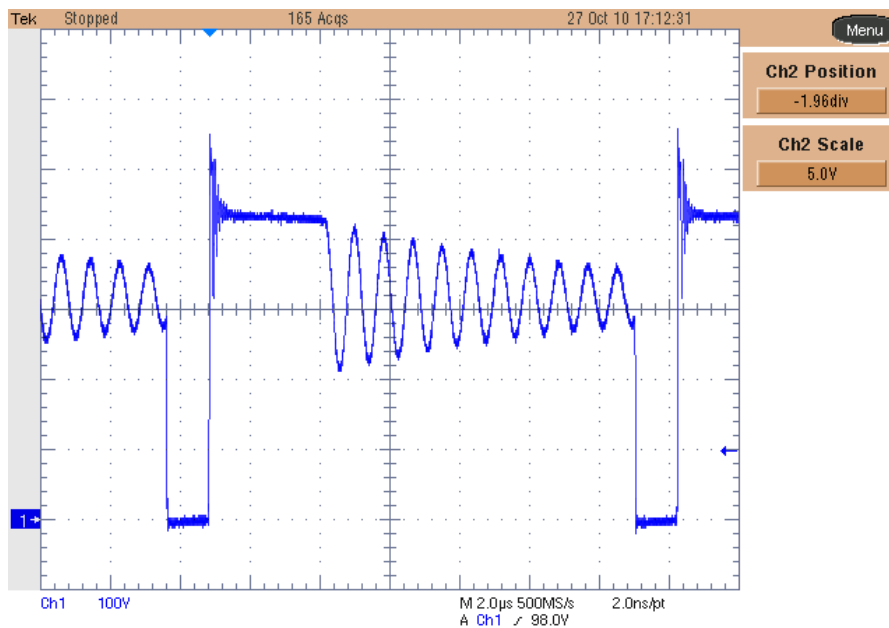
Channel 2: Vout (ac coupled) 50mV/div, Channel 3: Iout 500mA/div, 1ms/div.

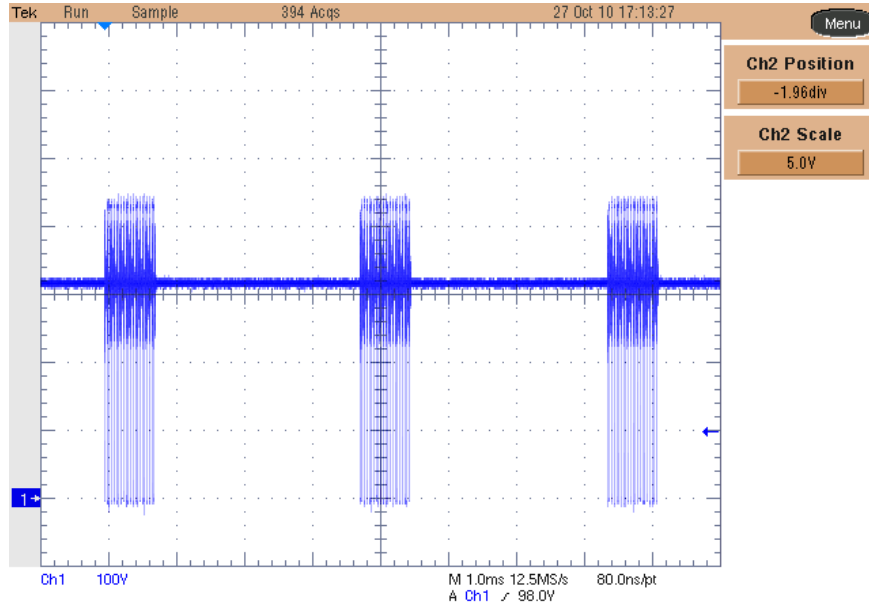


5. Switch-node

The images below show the switch-node waveform at 320Vdc input and full load (upper picture) and no load (lower picture).

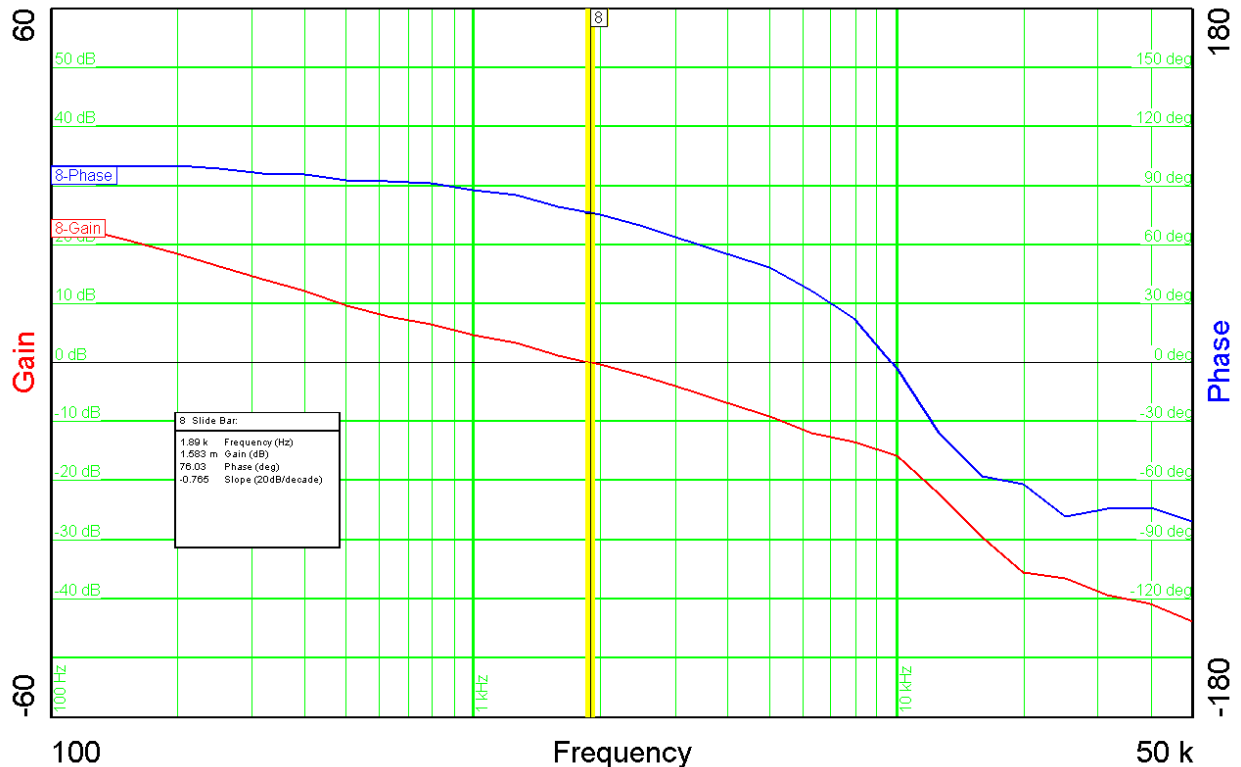
Channel 1: Vds (Q1) (100V/div, 2usec/div).





6. Loop Response

The image below shows the loop response of the converter measured with a 320Vdc input, and full load. Phase margin is 76.03 deg., the crossover frequency is 1.89KHz and the gain margin is 15.57 dB.



7. Thermal Analysis

The image below shows a thermal shot taken with an infrared thermal camera.

The ambient temperature was 23C; the hottest spot was the diode D3, which reached 70.1C.

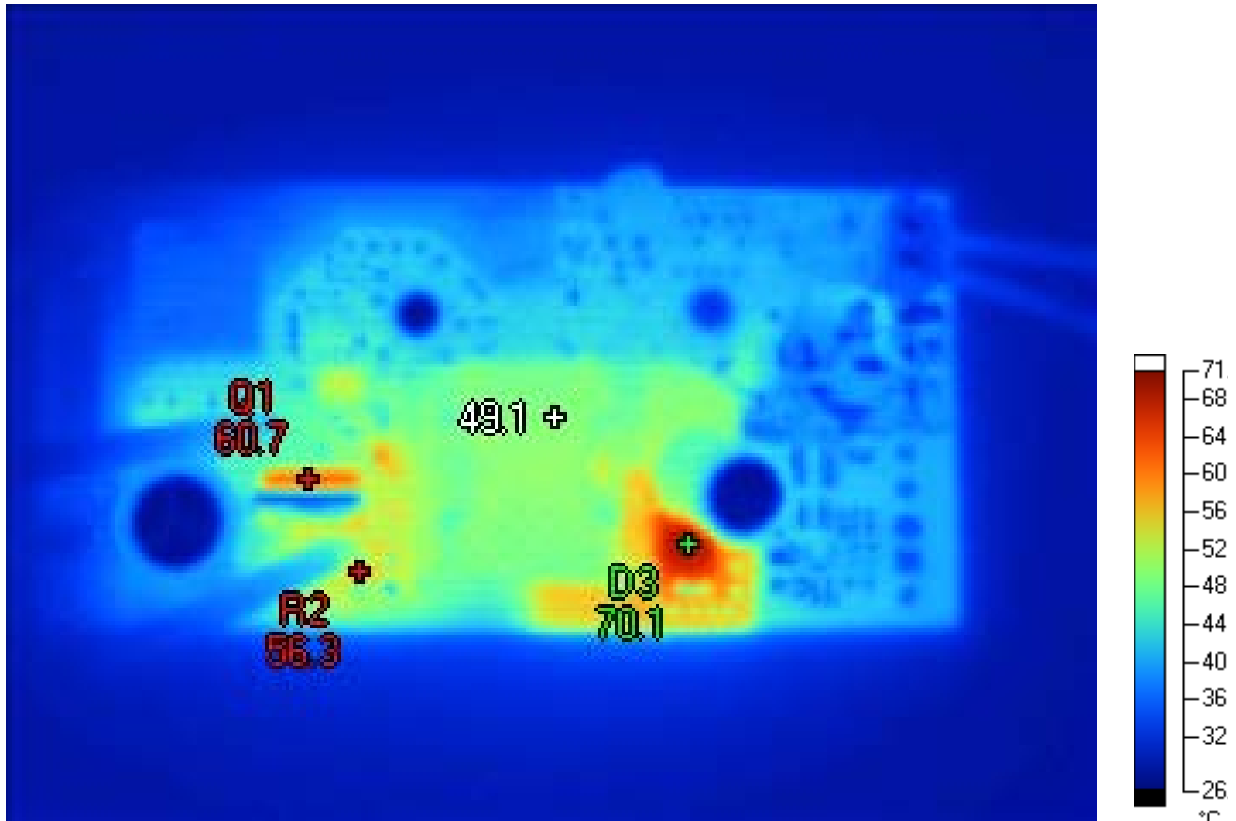


Image Info

Background	23.0 °C
Average Temperature	35.0 °C
Calibration Range	-20.0 °C to 350.0 °C
Camera Model	Ti40FT
Image Range	27.4 °C to 70.1 °C
Image Time	10/27/2010 4:57:30 PM
Lens Serial #	40948-4409
Manufacturer	Fluke
Camera Serial Number	Ti40FT-070263

Markers

Label	Temperature	Emissivity	Background
Center Point	49.1 °C	0.95	23.0 °C
Q1	60.7 °C	0.95	23.0 °C
R2	56.3 °C	0.95	23.0 °C
D3	70.1 °C	0.95	23.0 °C

For Feasibility Evaluation Only, in Laboratory/Development Environments. The EVM is not a complete product. It is intended solely for use for preliminary feasibility evaluation in laboratory / development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical / mechanical components, systems and subsystems. It should not be used as all or part of a production unit.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.

Certain Instructions. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output ranges are maintained at nominal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of this agreement. This obligation shall apply whether Claims arise under the law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate TI components for possible use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Mobile Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated