TIDA-00595

Synchronous DC/DC Converter with Inductor on top of IC for Small Footprint

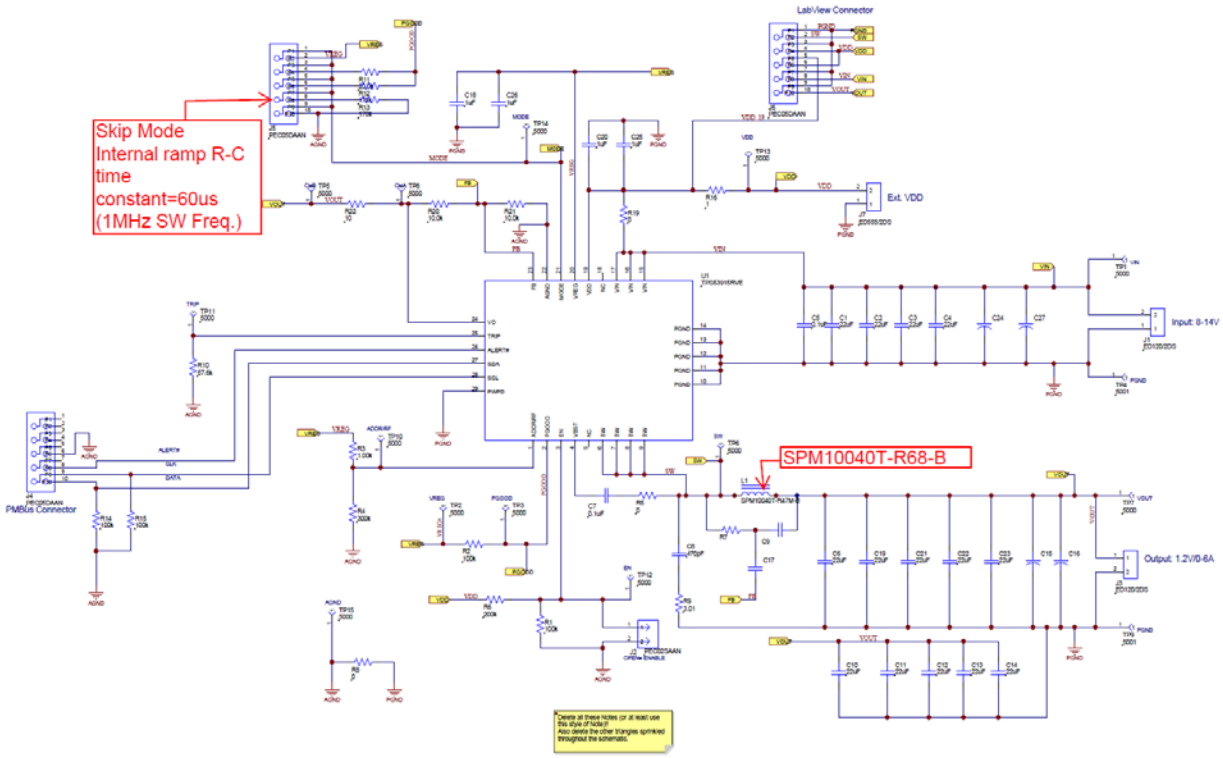
Description

The TPS53515 Inductor-On-Top Step-Down Buck Converter reference design enables reduction of X-Y area while enabling >87% efficiency with 2.6W of power loss @12A load and 12mV of output voltage ripple with only 10x22uF ceramic output caps. This power reference design supports a 12V input and a 1.2V output at 12A and switches at 1MHz.

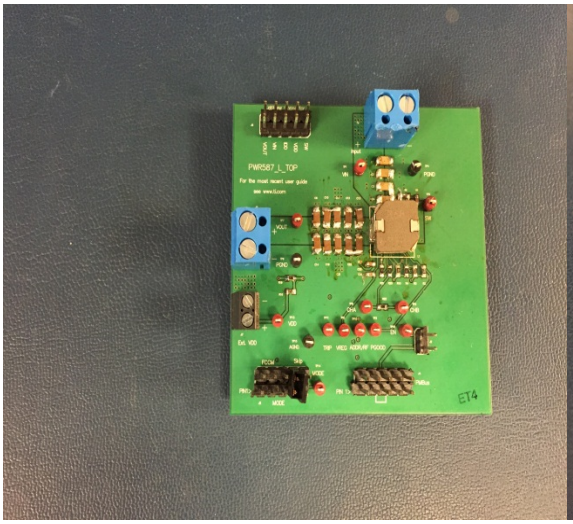
TPS53515EVM Set up

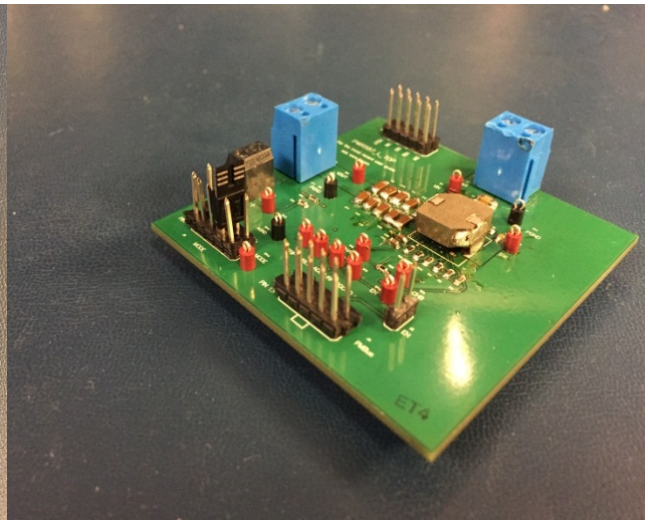
- **VIN**=12V
- **VOUT**=1.2V
- **IOUT**=E-Load Dynamic: 5A to 10A at ~2.5A/µs & Static=5A
- **IOUT_Max**=12A
- **COUT**=10x22µF_Ceramic, 6.3V
- **Inductor**=SPM10040T-R68-B
- **FREQ**=1MHz
- **Temperature**=25°C

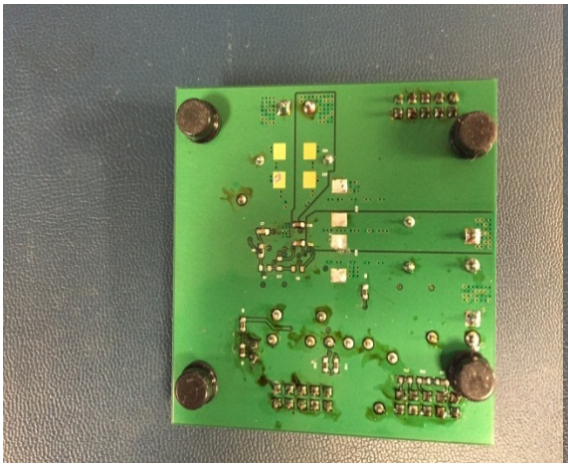
TPS53515 EVM Schematic

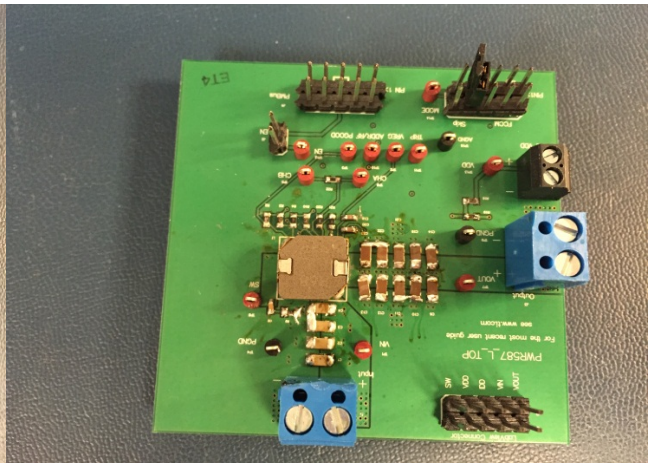


TPS53515 L-TOP Pictures

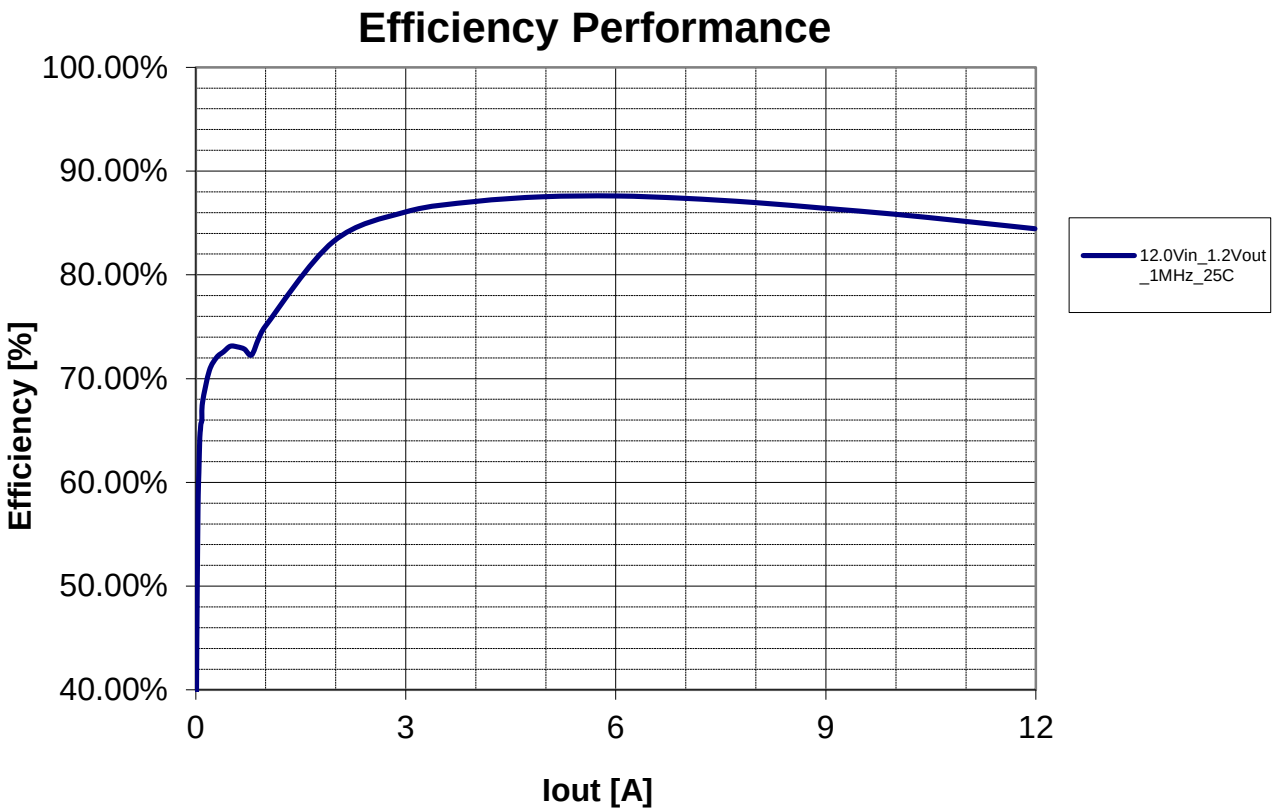




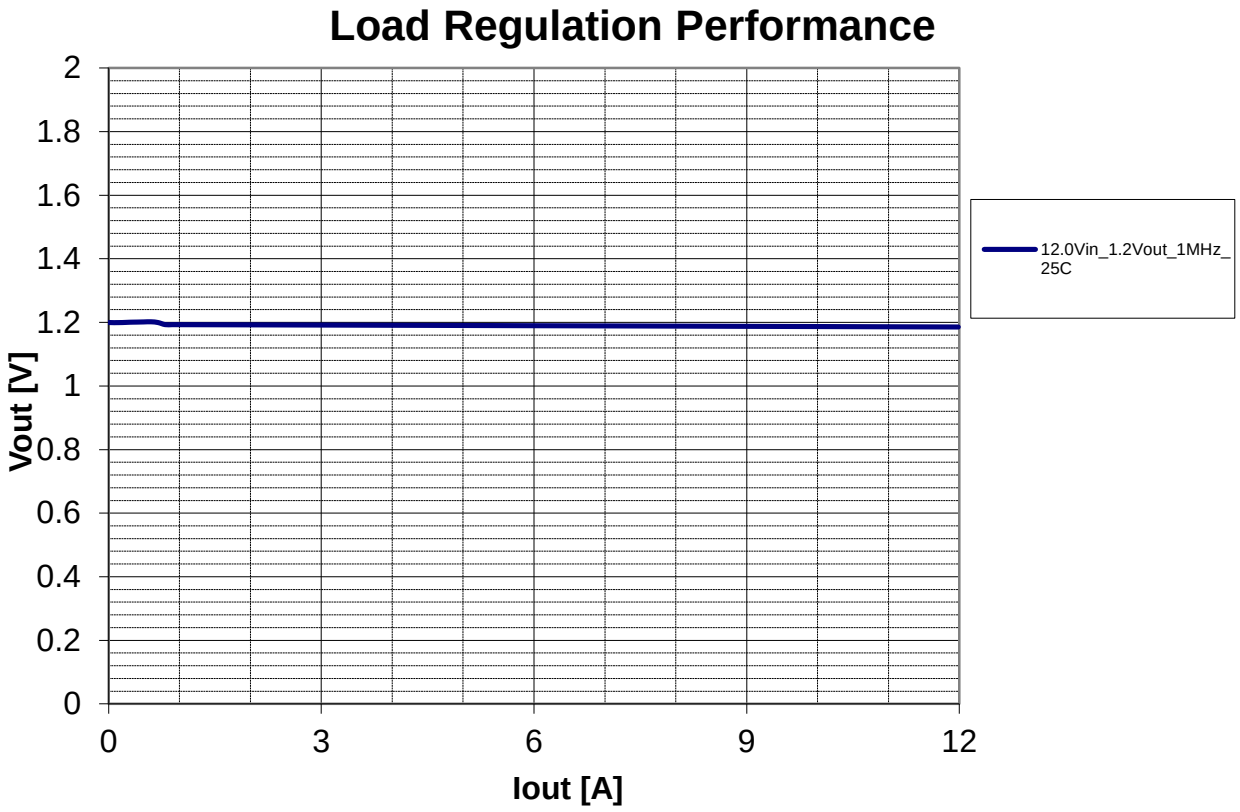


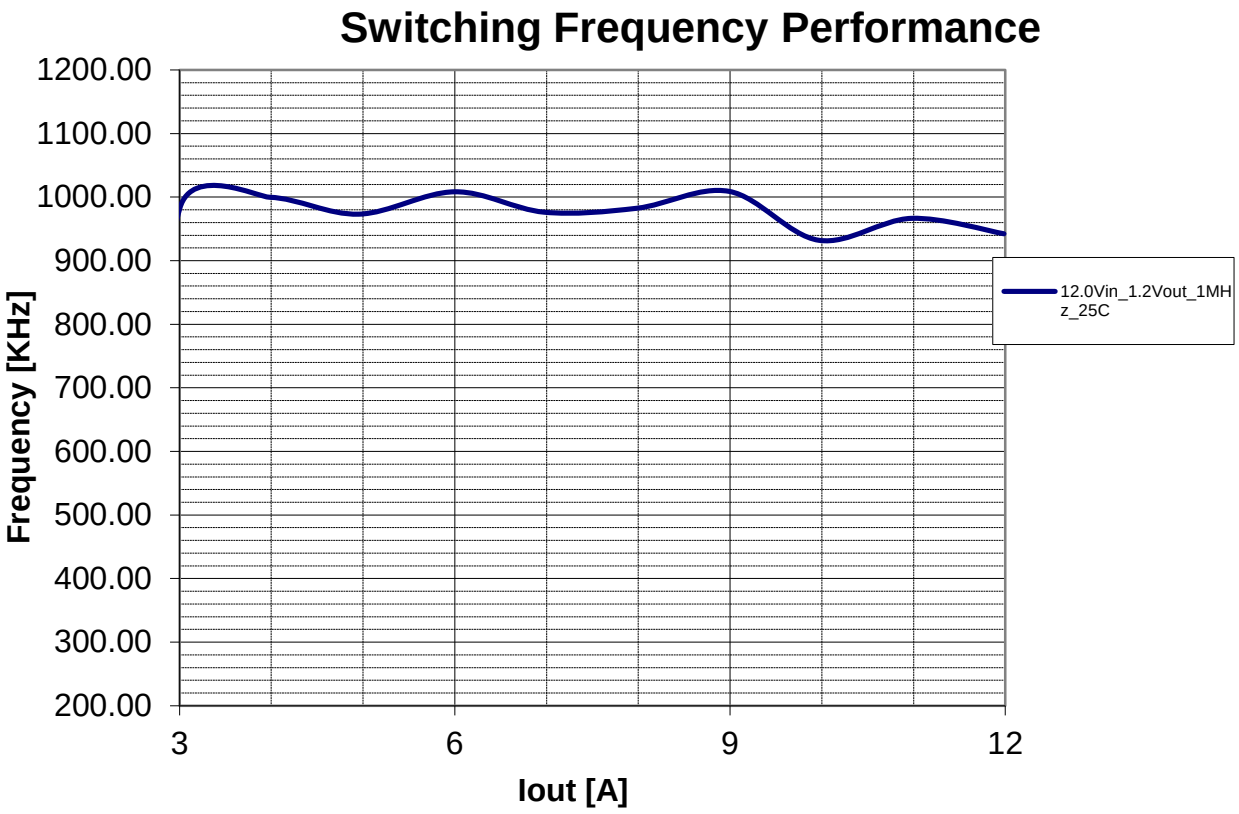


TPS53515 Efficiency Performance

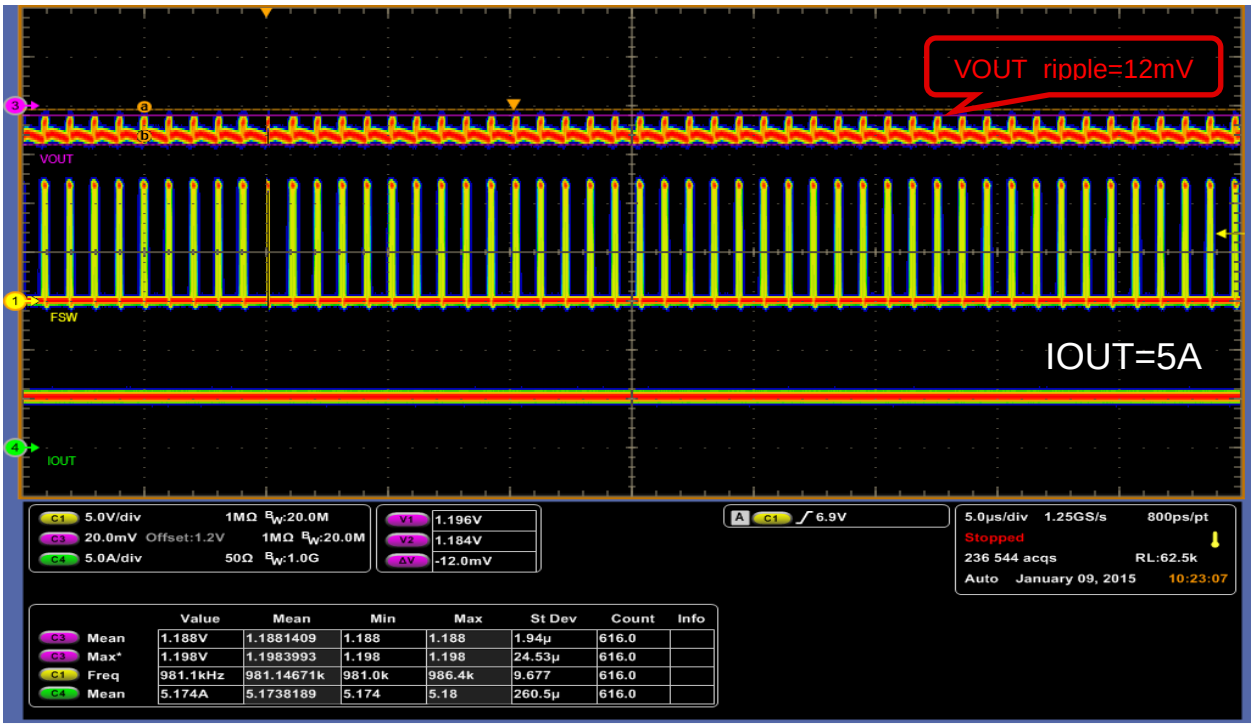


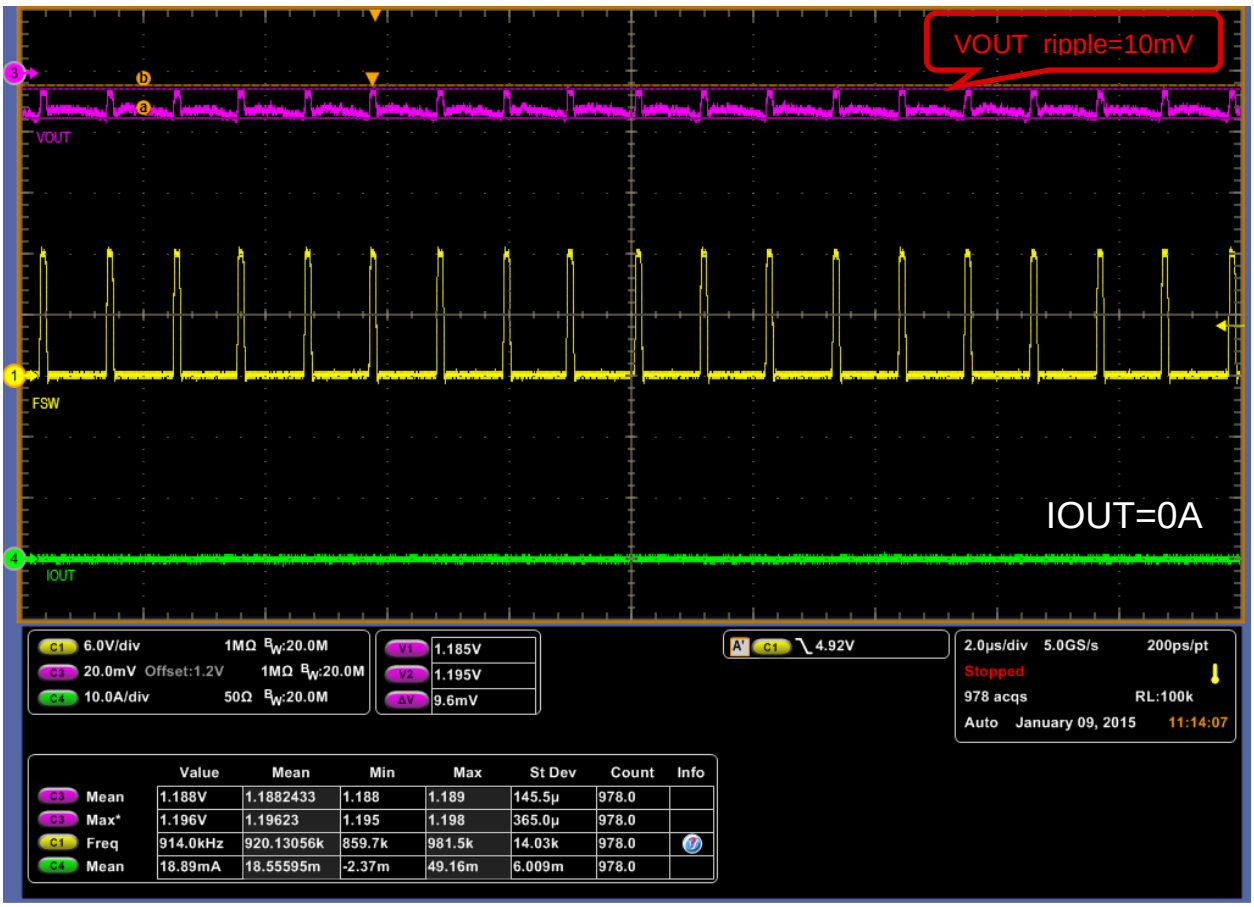

Power Loss Performance
4.00
3.00
2.00
1.00
0.00
Power Loss [W]
0
3
6
9
12
Iout [A]
12.0Vin_1.2Vout_1MHz_25C


Load Regulation Performance
Vout [V]
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
3
6
9
12
Iout [A]
12.0Vin_1.2Vout_1MHz_25C

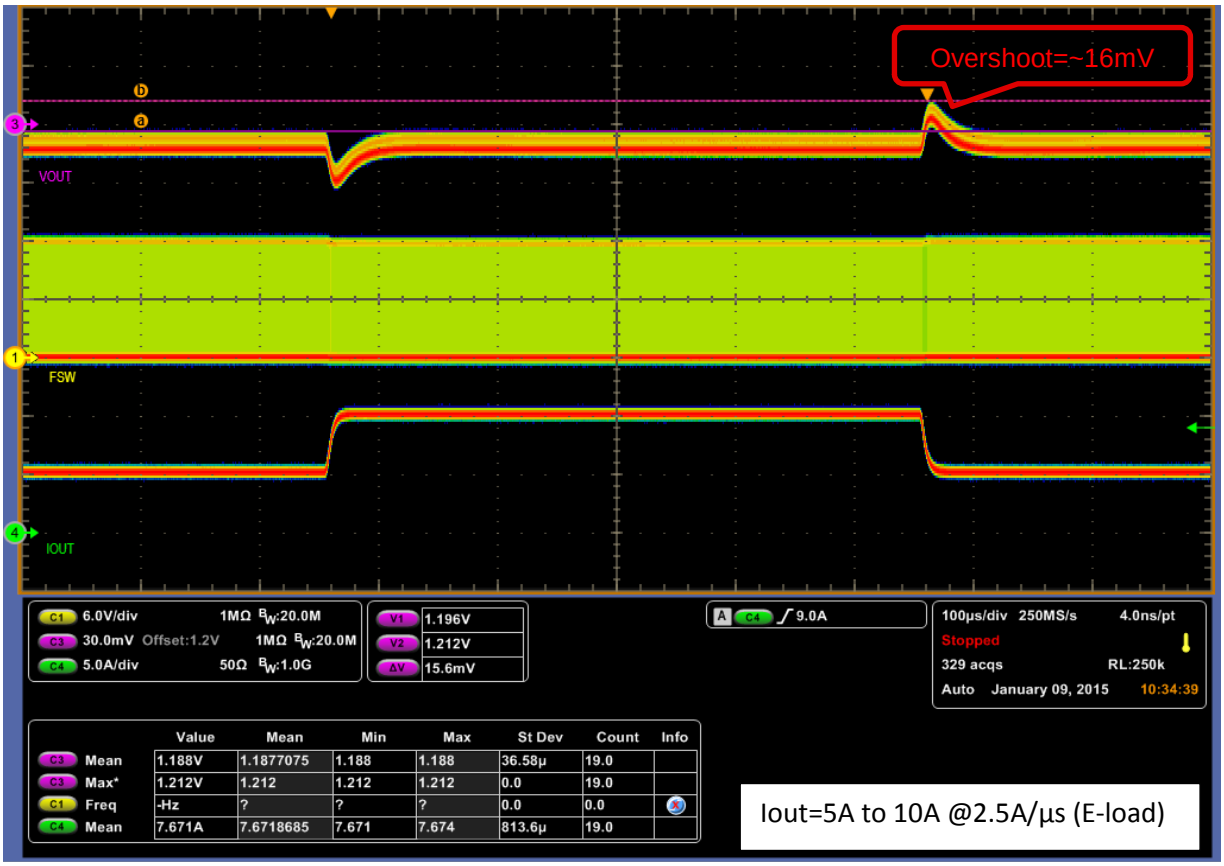

Switching Frequency Performance
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
Frequency [KHz]
3
6
9
12
Iout [A]
12.0Vin_1.2Vout_1MHz_25C

Vout Ripple Test

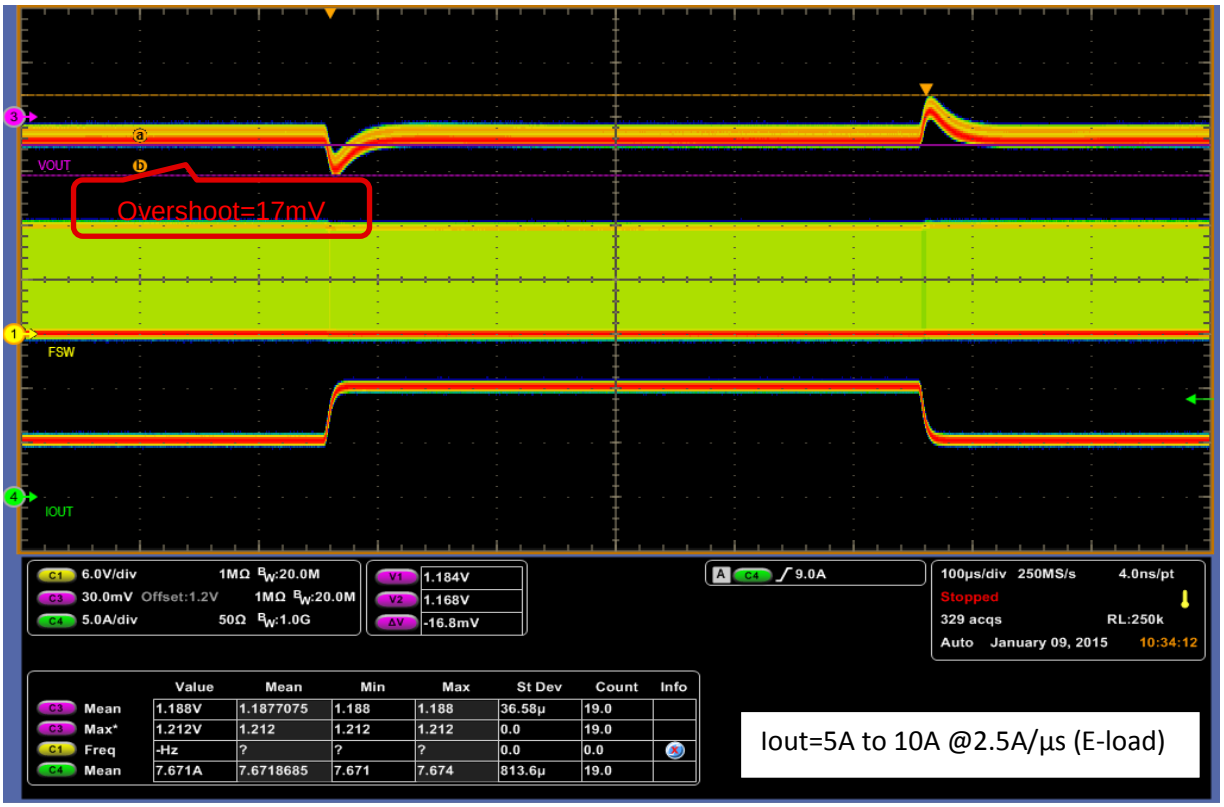




Under/Overshoot Measurements

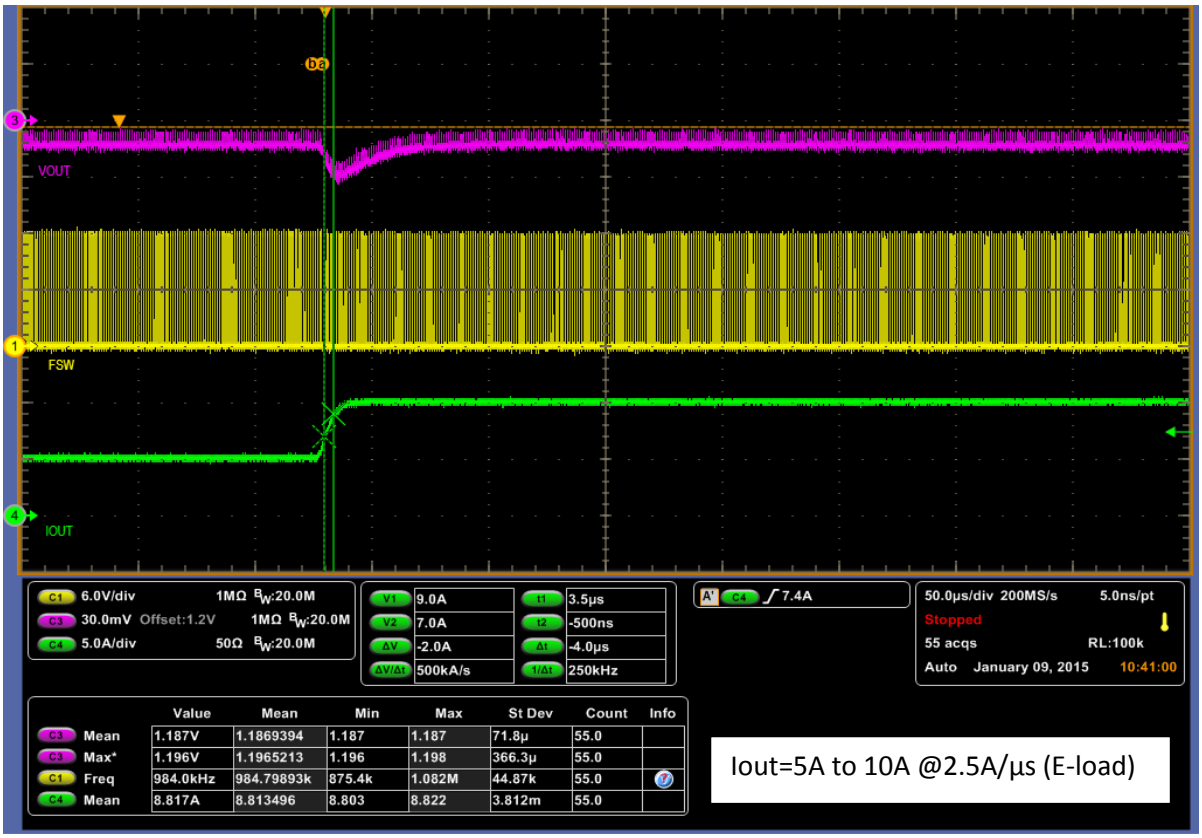


Iout=5A to 10A @2.5A/µs (E-load)

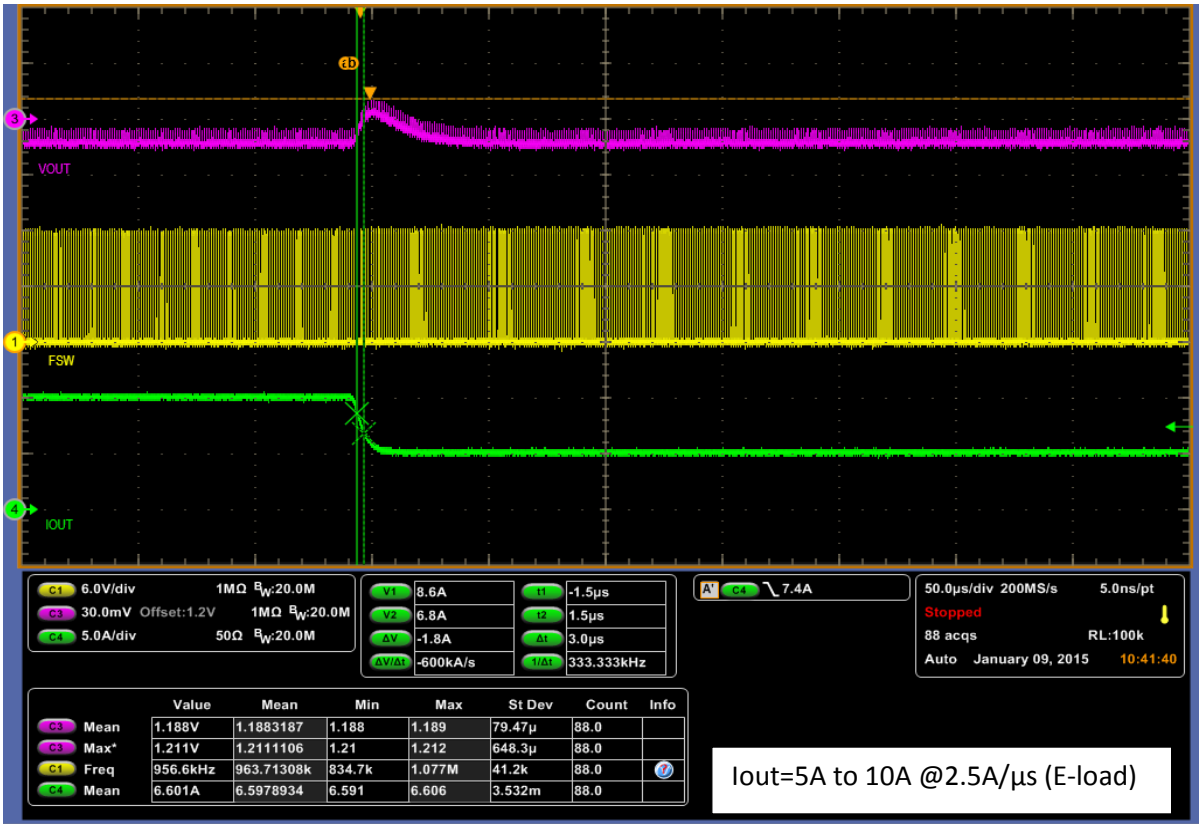


Iout=5A to 10A @2.5A/µs (E-load)

Transient Performance

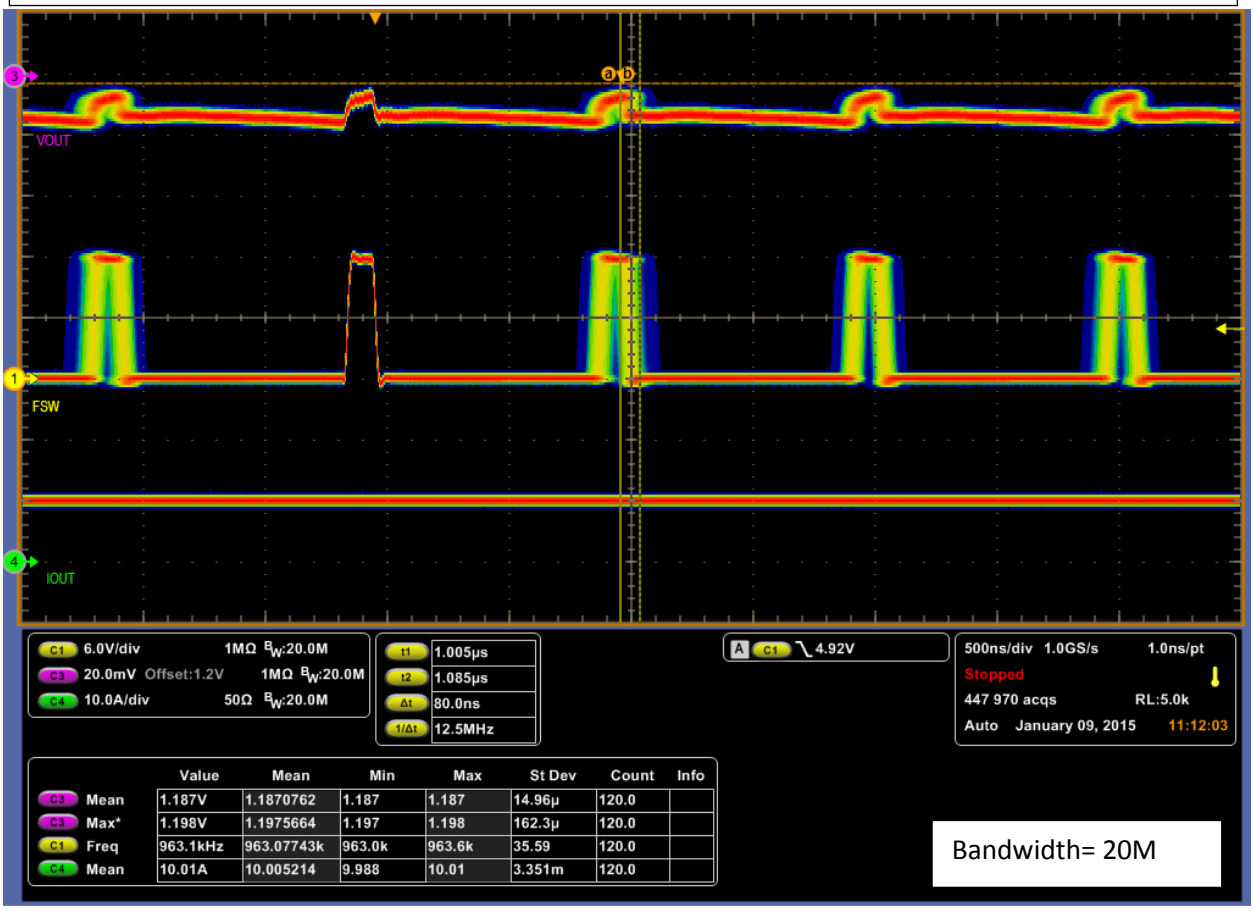


Iout=5A to 10A @2.5A/µs (E-load)

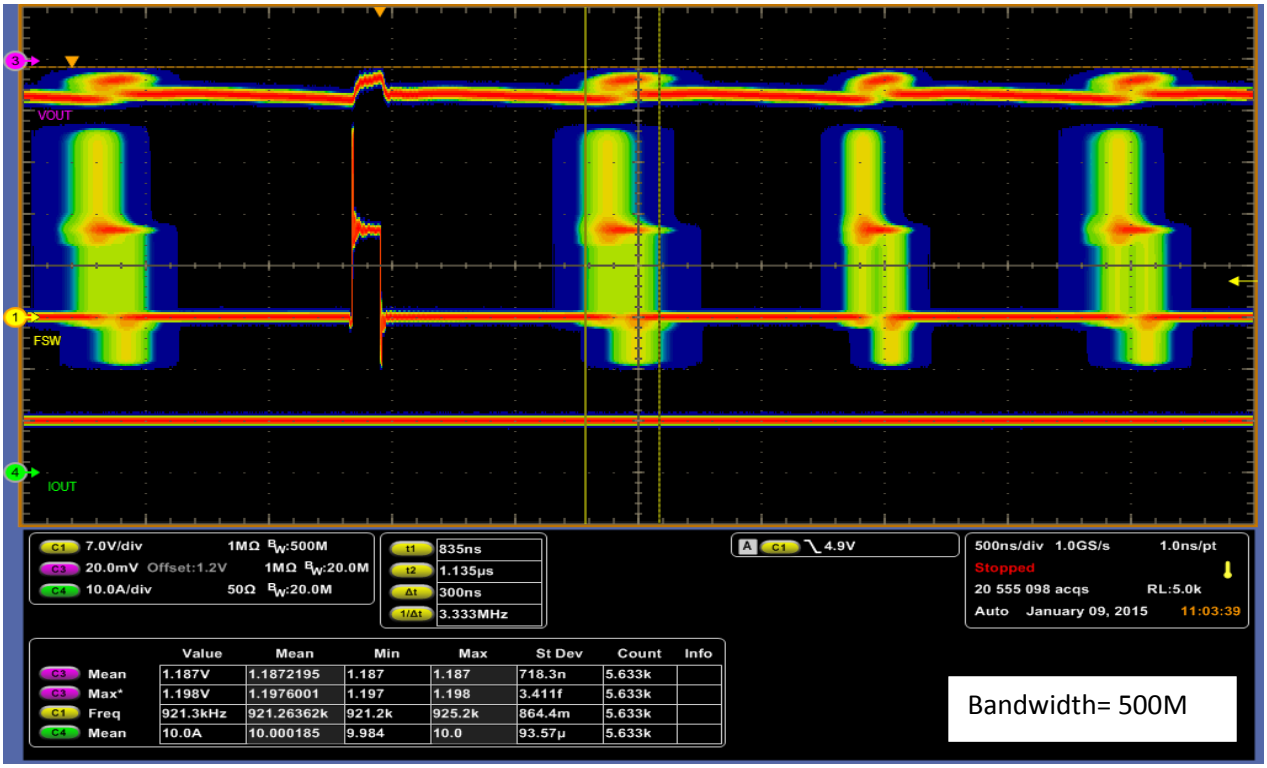


Iout=5A to 10A @2.5A/µs (E-load)

Jitter Performance



Bandwidth= 20M



Bandwidth= 500M

IC Case and Inductor Temperature

Vin=12V, Vout=1.2V, Fsw=1MHz, Ambient=25°C, Waiting time for each load= 10min.

Load (A)	Case Temp (°C)	Inductor(°C)
0	27.2	27
3	32.6	30
6	36.6	32.2
9	42.5	36
12	50	41.3

Inspection Report

Report Date	2/25/2015

Company	Texas Instruments Inc.	Customer
Address		Site Address
Thermographer	Benyam Gebru	Contact Person

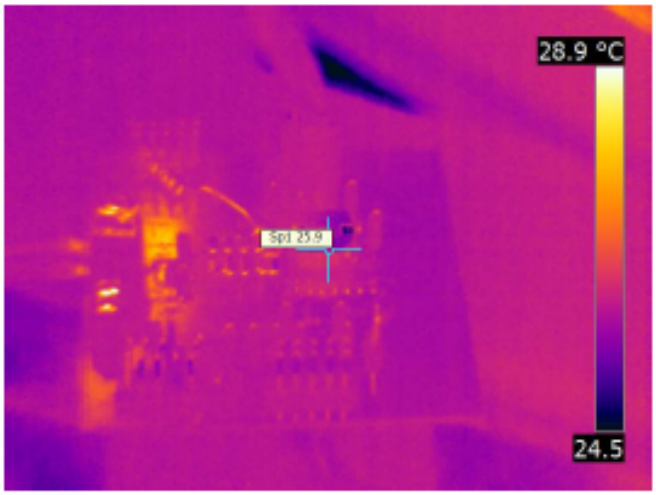


Image and Object Parameters	
Camera Model	FLIR T300
Image Date	2/25/2015 10:46:53 PM
Image Name	IR_0385.jpg
Emissivity	0.98
Reflected apparent temperature	25.0 °C
Object Distance	0.2 m

Text Comments

Due to the location of the IC, the measurement may not be accurate

Description

12Vin_1.2Vout_1MHz_0Aload

Inspection Report

Report Date	2/25/2015

Company	Texas Instruments Inc.	Customer
Address		Site Address
Thermographer	Benyam Gebru	Contact Person

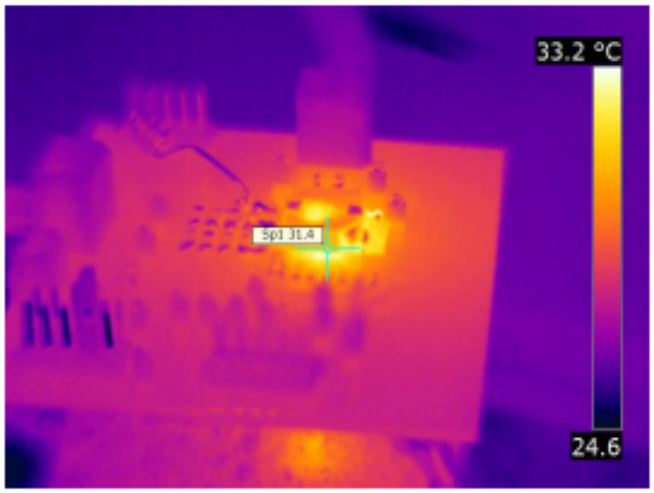


Image and Object Parameters	
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Image Date	2/25/2015 11:03:35 PM
Image Name	IR_0386.jpg
Emissivity	0.98
Reflected apparent temperature	25.0 °C
Object Distance	0.2 m

Text Comments
Due to the location of the IC, the measurement may not be accurate

Description
12Vin_1.2Vout_1MHz_6Aload

Inspection Report

Report Date	2/25/2015

Company	Texas Instruments Inc.	Customer
Address		Site Address
Thermographer	Benyam Gebru	Contact Person

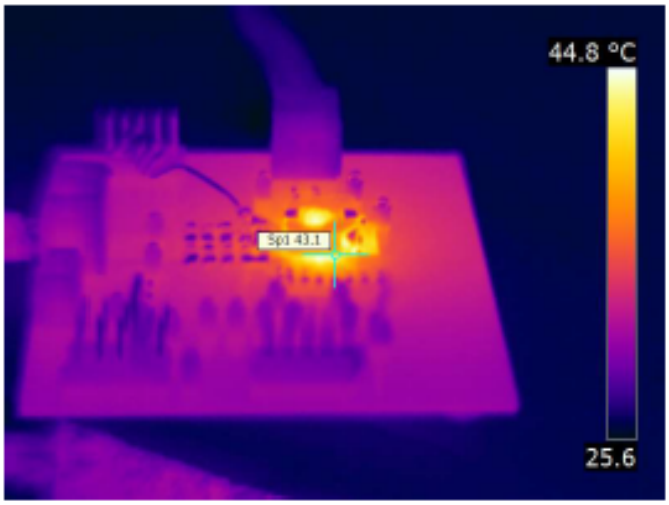

Image and Object Parameters		Text Comments
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Image Date	2/25/2015 11:14:10 PM	
Image Name	IR_0387.jpg	
Emissivity	0.98	
Reflected apparent temperature	25.0 °C	
Object Distance	0.2 m	

Description
12Vin_1.2Vout_1MHz_12Aload

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