TIDA-00741 UPOE High-Efficiency Flyback Converter (12V/3.8A) for Forced 4-Pair PoE PD Applications

1 Introduction

TIDA-00741 is a high power four-pair solution for Power-over-Ethernet (PoE) applications requiring power in excess as defined in the current IEEE 802.3at standard. It is compliant with Cisco UPOE Forced Four-Pair designs.

2 Configurable features

1.1 Features

- Excellent efficiency, driven, synchronous flyback design.
- Forced Four-Pair UPOE compliant
- 12V @ 3.8A DC output (4.2A capable)

1.2 Applications

- Universal Power Over Ethernet (UPOE) Compliant Devices
- Video and VoIP telephones
- Multiband access points
- Security cameras
- Pico-base stations

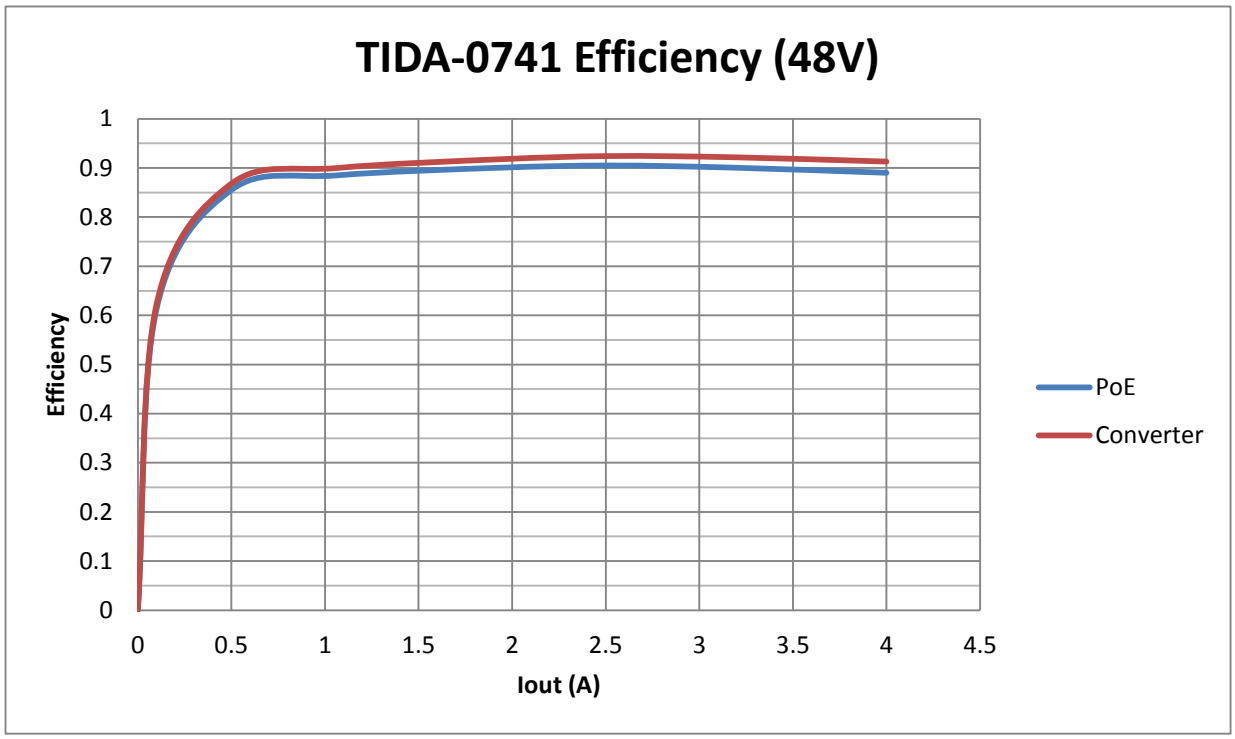
3 Electrical specifications

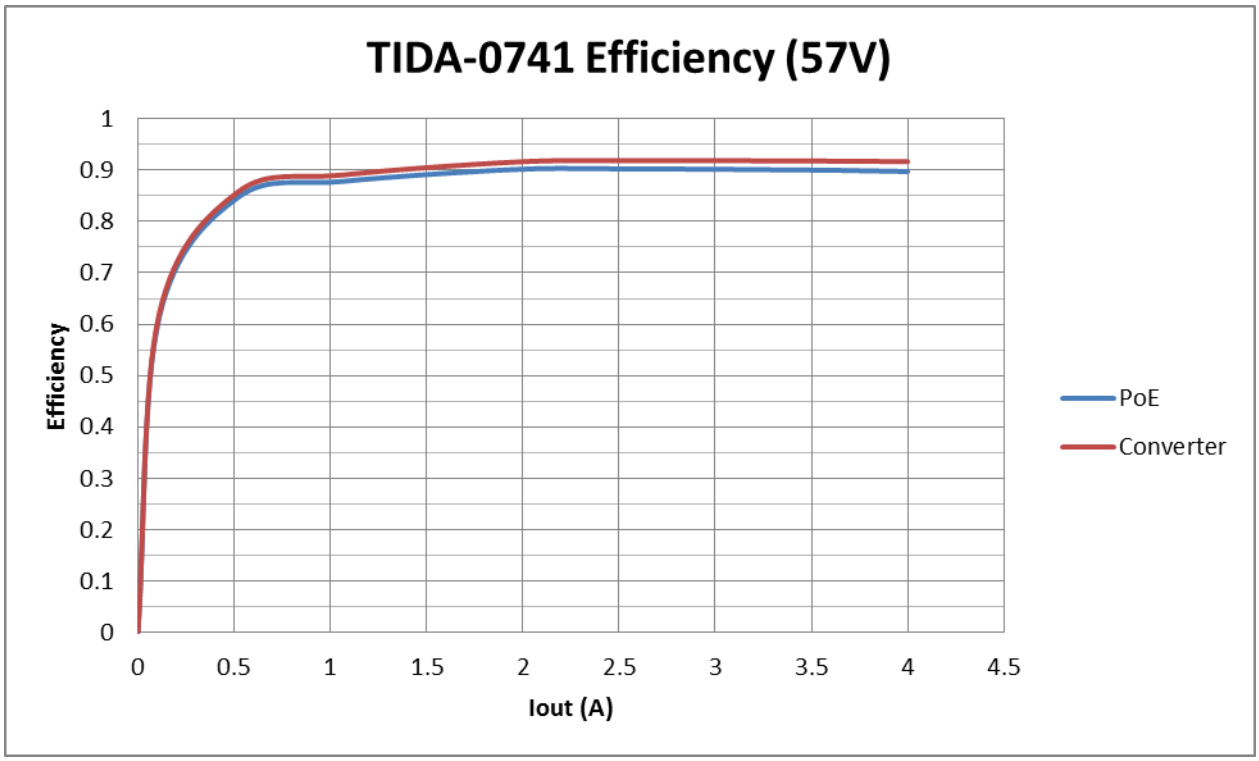
TIDA-00741 Electrical and Performance Specifications

(1)Per TPS2378 PD

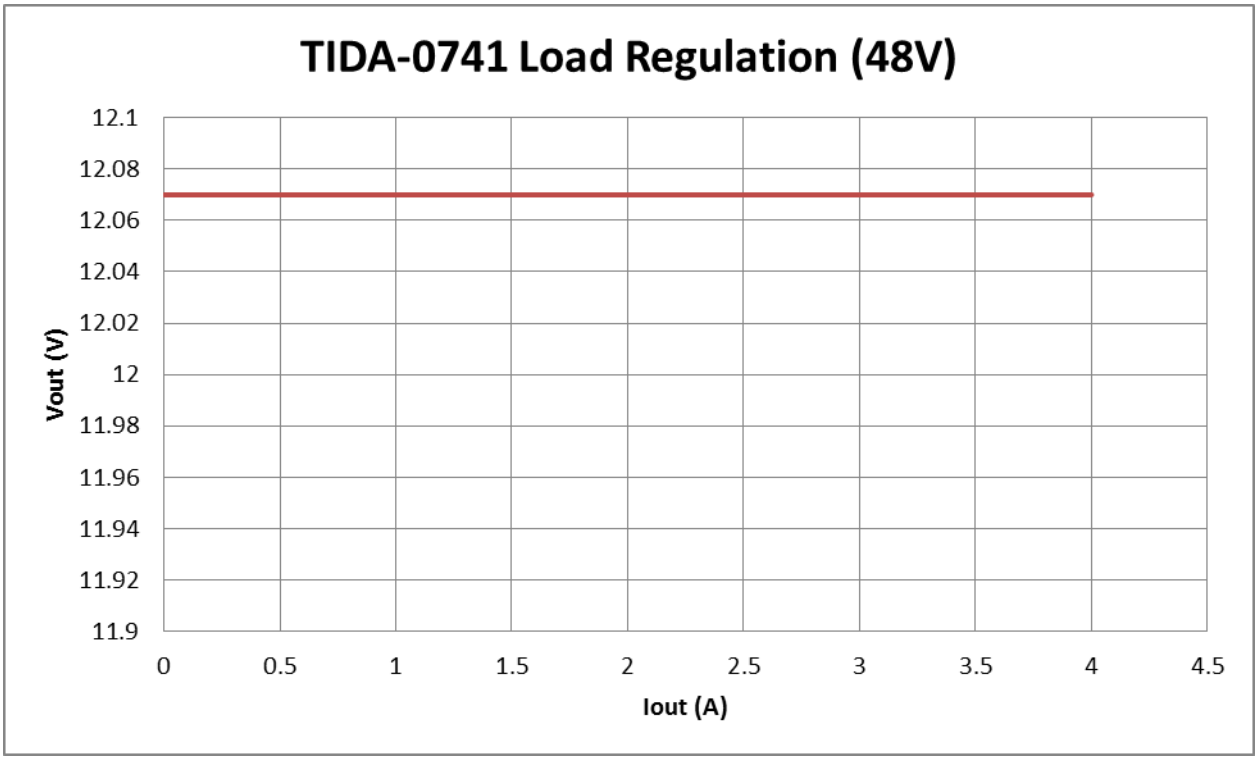
Parameter	Condition	Min	Typ	Max	Units
Power Interface					
Input Voltage	Applied to the power pins of connectors J1 or J3	42.5	-	57	Volts
Operating Voltage (1)	After start up.	30	-	57	
Input UVLO, POE input J1 (1)	Rising input voltage	-	-	40	
	Falling input voltage	30	-	-	
Detection voltage (1)	@ device terminals	1.4	-	10.1	
Classification voltage (1)	@ device terminals	11.9	-	23.0	
Classification current (1)	Rclass = 63.4 ohms	38	-	42	mA
Inrush current-limit (1)		100	-	180	
Operating current-limit (1)		850	-	1200	
DC/DC Converter					
Output Voltage	42.5 ≤ Vin ≤ 57V, ILOAD ≤ ILOAD (max)	12V output	-	12.07	-	Volts
Output Current	42.5 ≤ Vin ≤ 57V	12V output	-	-	3.8	Amps
Output ripple voltage, pk-to-pk	Vin = 48V, ILOAD = 3.8A	12V output	-	170	-	mV
Efficiency, dc-dc converter	Vin = 48V, ILOAD = 3.8A	12V output	-	92	-	%
Efficiency, end-to-end	Vin = 48V, ILOAD = 3.8A	12V output	-	90	-	%
Switching frequency			225	-	270	kHz

4 Efficiency



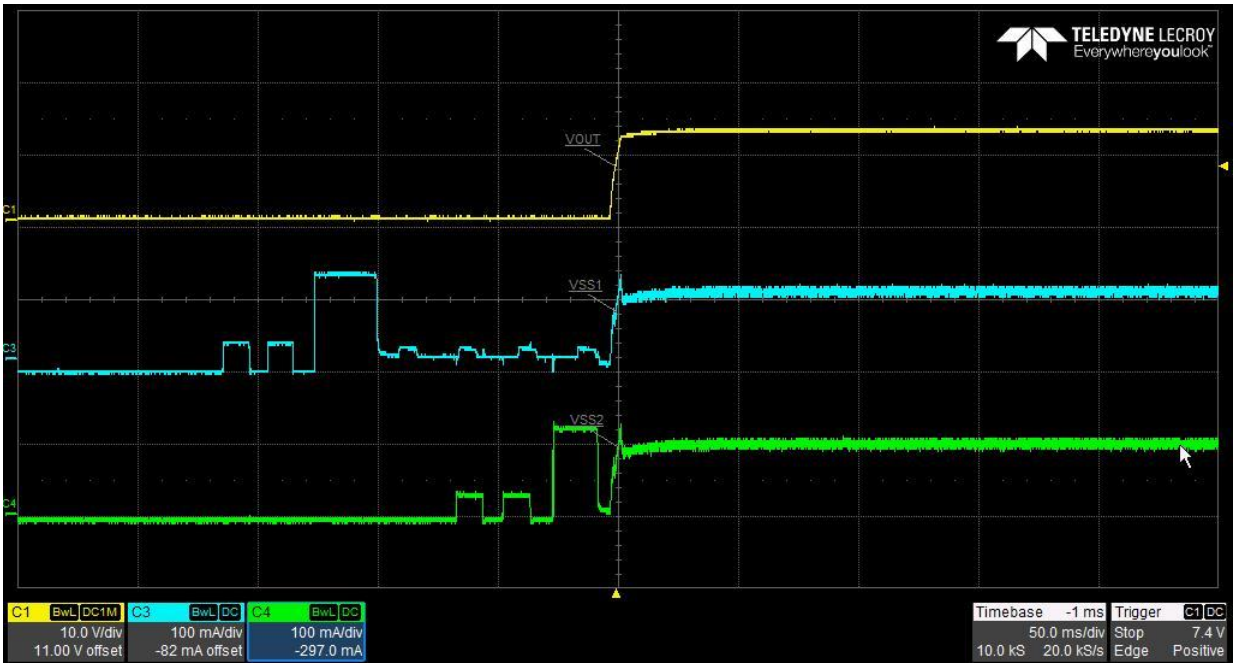


5 Load Regulation



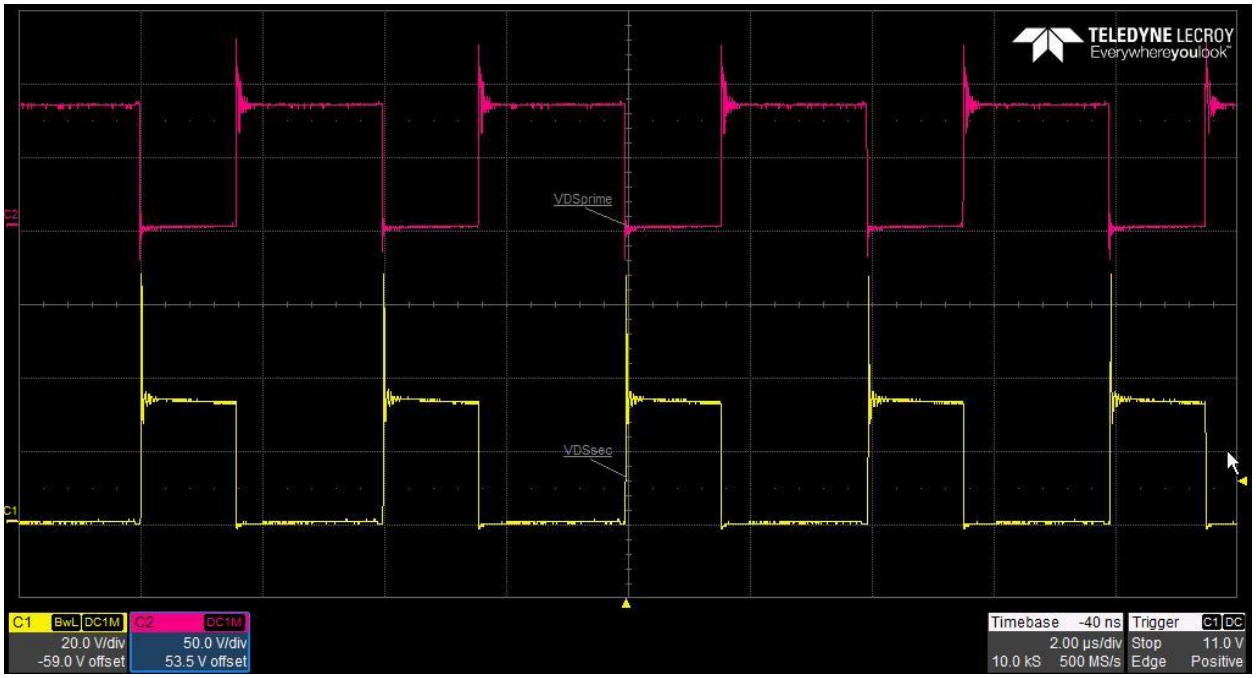
6 Start up

The below graph shows independent detection, classification, startup of the converter (Vout), and current between the two PDs (VSS1 and VSS2) for a 10W output load.



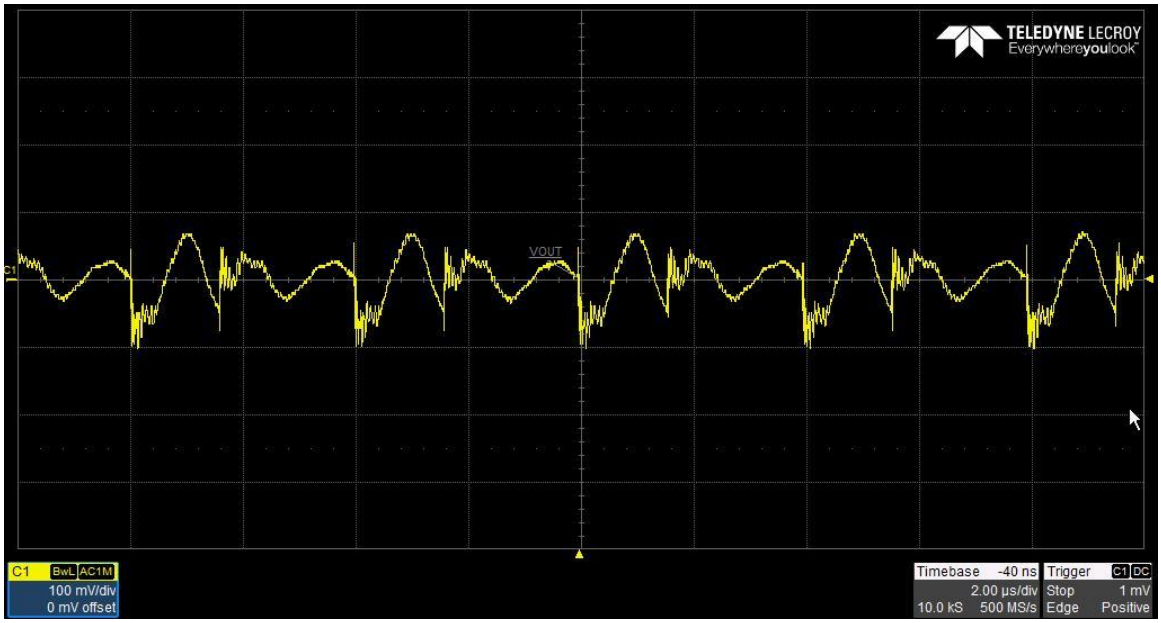
7 Switch Node Waveforms

The below waveform shows the primary FET and secondary VDS voltage at 48V input and 3.8A output current.



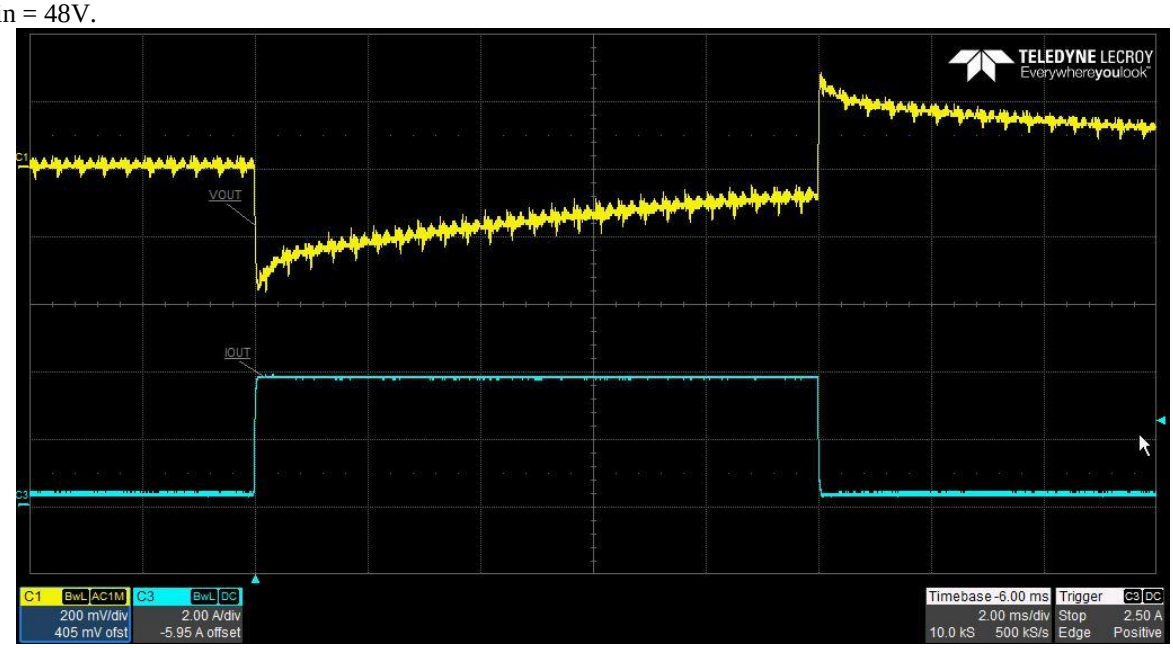
8 Output Ripple Voltage

The 12V output ripple voltage is shown in the scope plot below. The waveform was taken with the output loaded to 3.8A and Vin = 48V.



9 Load Transients

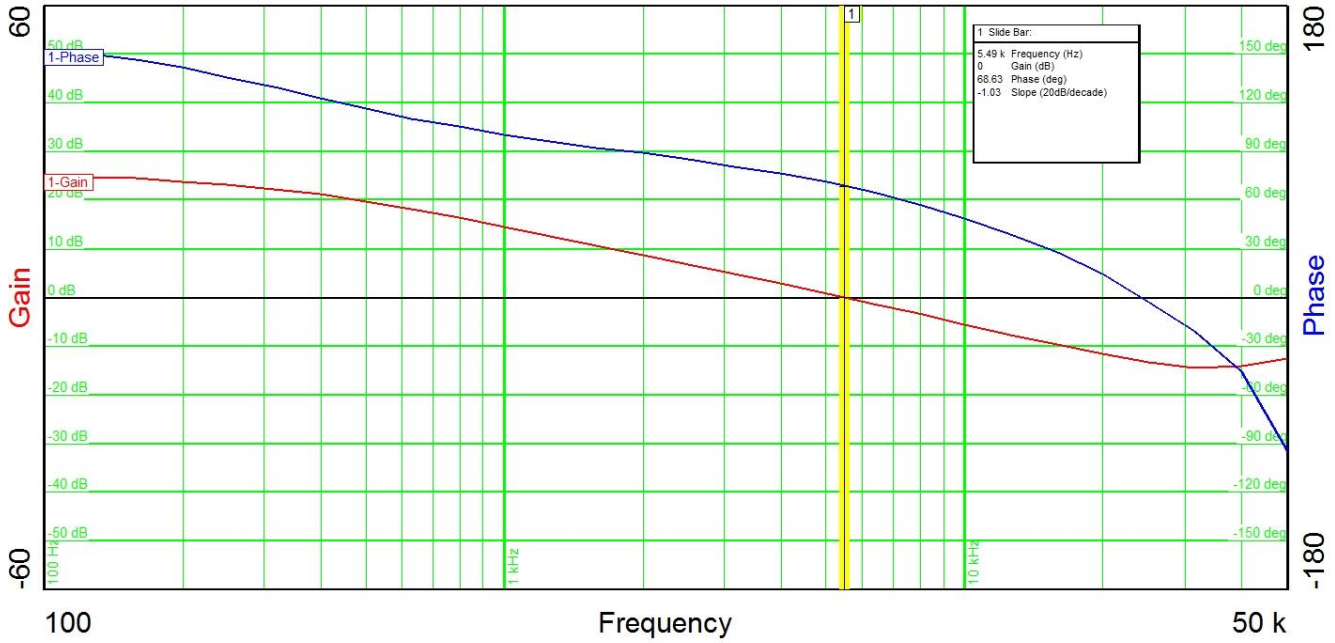
The scope plots below shows the 12V output voltage when the load current is pulsed from 0.38 to 3.8A at a 300A/ms slew rate. Vin = 48V.



10 Control Loop Gain / Stability

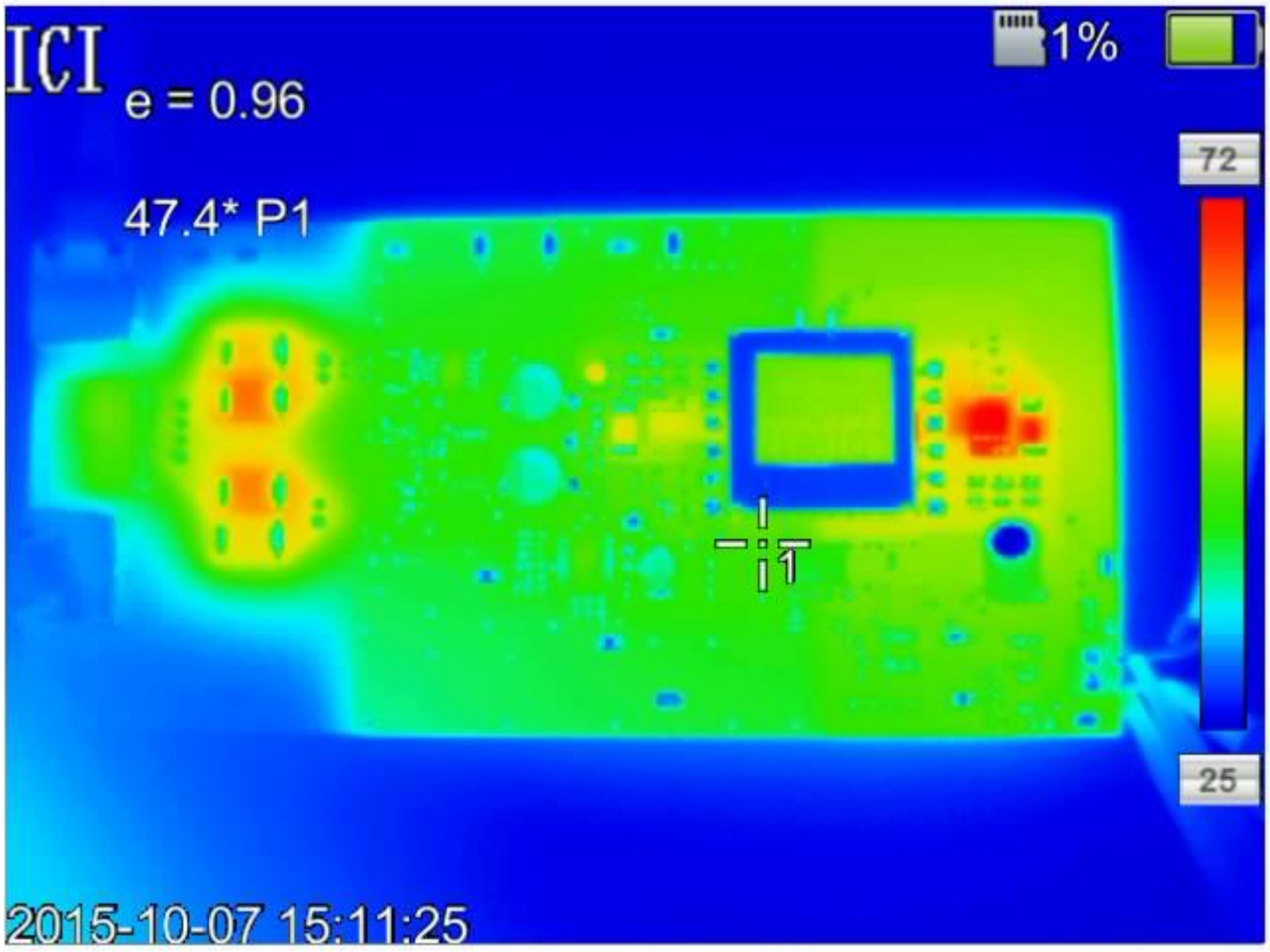
The table below shows the loop gain and phase margin. The output was loaded to 3.8A with a resistive load.

Input voltage	48VDC	
Gain/Phase	Crossover	Phase Margin
TIDA-00741	5.5kHz	69°



11 Thermal

The image below shows the thermal performance of TIDA-00741 at full load with 48V input.



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