

Ultra-Compact Isolated Bias Reference Design With UCC25800



Description

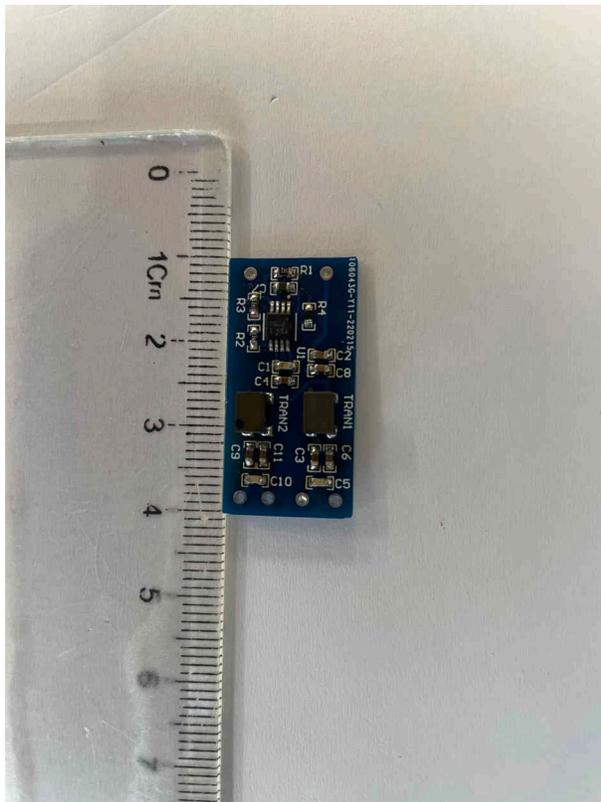
This reference design demonstrates ultra-compact isolated bias power, which can be used for the half-bridge of TI GaN. The design uses the UCC25800 to generate two isolated 12-V power supplies for the two FETs of the half-bridge, and converts the single 12-V DC into two 12-V DC lines with isolation. The UCC25800 features a 1-MHz switching ability, LLC resonant topology, and an ultra-compact transformer (4.5 mm × 3.2 mm × 3.5 mm). Using these features of the device, 1.2 W of power with relatively high efficiency can be delivered to the reference design.

Features

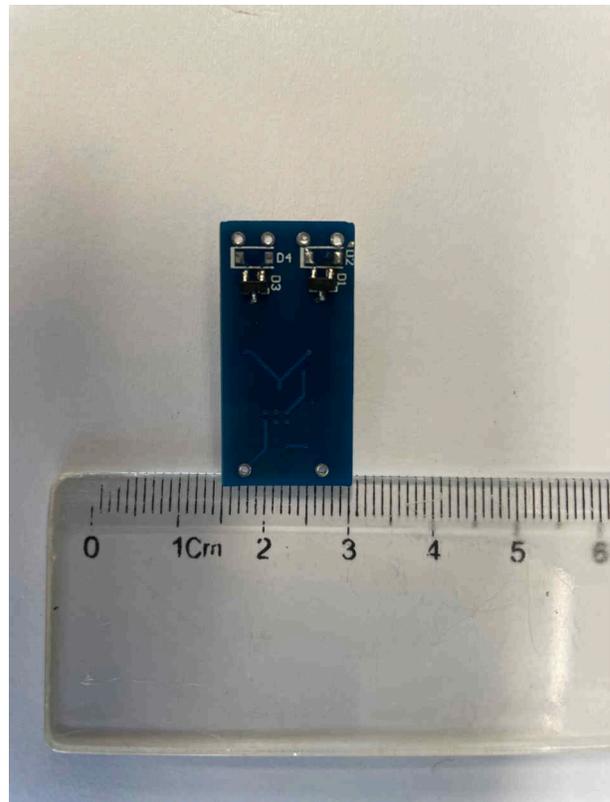
- Provides two 12-V power sources with isolation from 12-V input
- Ultra-small transformer:
4.5 mm × 3.2 mm × 3.5 mm
- Switching frequency up to 900 kHz
- High efficiency with fixed frequency resonant converter

Applications

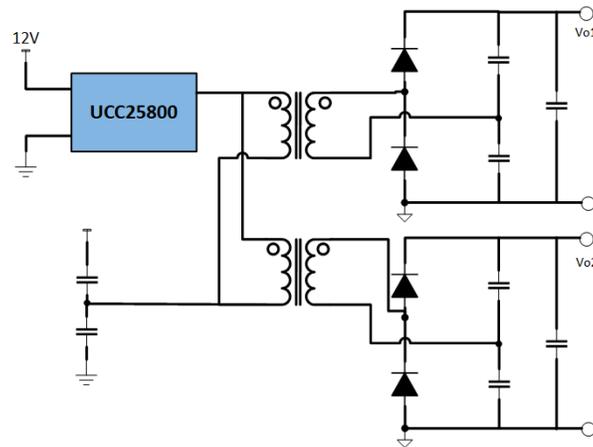
- [Merchant network and server PSU](#)
- [Merchant telecom rectifiers](#)
- [Single phase online UPS](#)



PMP41034 Top Photo



PMP41034 Bottom Photo



PMP41034 Block Diagram

1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1-1. Voltage and Current Requirements

Parameter	Specifications
V_{IN}	12 V _{DC}
I_{IN}	0.5 A
V_{OUT1}	8 V to 13 V
I_{OUT1}	0 A to 0.15 A
V_{OUT2}	8 V to 13 V
I_{OUT2}	0 A to 0.15 A

1.2 Required Equipment

- Programmable DC power supply
- Multichannel electric load
- Multimeters, or power meter
- Oscilloscope

1.3 Board Dimensions

The board dimensions are 4.5 mm × 3.2 mm × 3.5 mm.

1.4 Test Setup

Figure 1-1 shows the test setup. During efficiency testing, all voltages *must* be tested at the board terminal. Avoid including the extra loss from current meter and power cable.

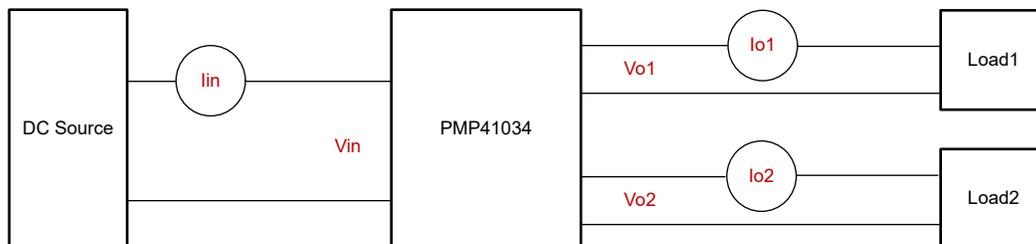


Figure 1-1. Test Setup

2 Testing and Results

2.1 Efficiency Graphs

Efficiency is shown in the following figure.

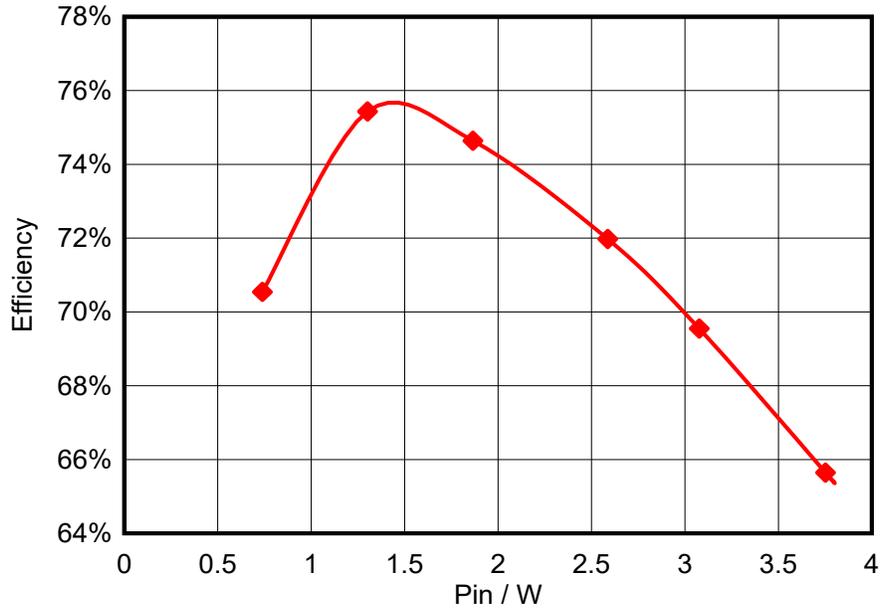


Figure 2-1. Efficiency Graph

2.2 Efficiency Data

Efficiency data is shown in the following table.

V _{IN} (V)	I _{IN} (A)	V _{OUT1} (V)	I _{OUT1} (A)	V _{OUT2} (V)	I _{OUT2} (A)	P _{IN} (W)	P _{OUT} (W)	Efficiency (%)
12.151	0.0608	10.7875	0.024	10.7487	0.0244	0.7387808	0.52116828	70.54%
11.875	0.10962	9.993	0.049	9.8656	0.0499	1.3017375	0.98195044	75.43%
12.4	0.15043	10.1065	0.069	9.928	0.07	1.865332	1.3923085	74.64%
12.364	0.20924	9.48	0.099	9.217	0.1002	2.58704336	1.8620634	71.98%
12.338	0.24937	9.06	0.12	8.75	0.1203	3.07672706	2.139825	69.55%
12.3	0.30506	8.51	0.147	8.06	0.1504	3.752238	2.463194	65.65%

2.3 Load Regulation and Cross Regulation

Load regulation and cross regulation graphs are shown in the following figures.

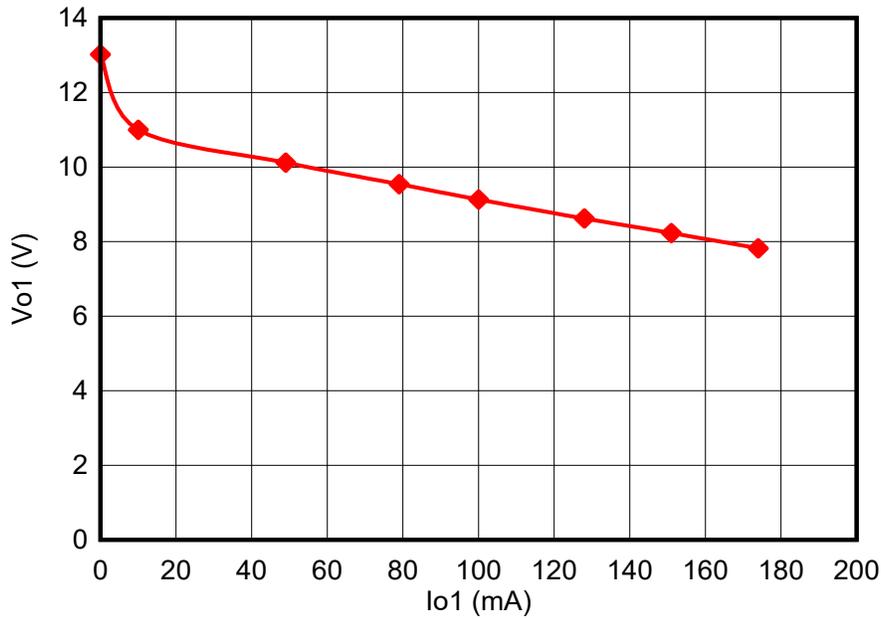


Figure 2-2. Load Regulation

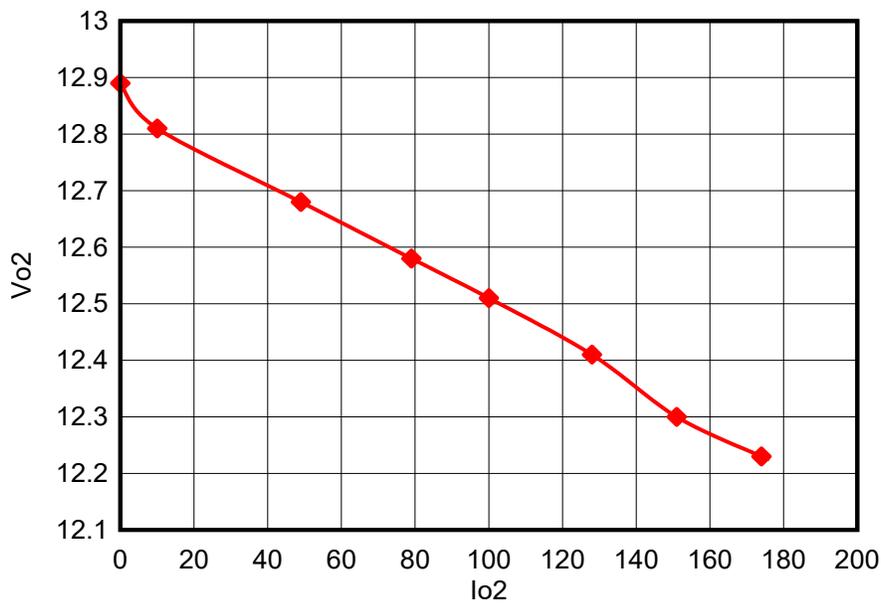


Figure 2-3. Cross Regulation Under 0-A Load

2.4 Regulation Test Data

Table 2-1 lists the regulation test data.

Table 2-1. Test Data

V_{IN} (V)	I_{IN} (A)	V_{OUT1} (V)	I_{OUT1} (A)	V_{OUT2} (V)	I_{OUT2} (A)
12.3	0.30506	8.51	0.147	8.06	0.1504
12.318	0.28147	8.89	0.124	8.138	0.1504
12.3334	0.2579	9.3	0.099	8.222	0.1504
12.349	0.23287	9.745	0.073	8.304	0.1503
12.363	0.20926	10.187	0.05	8.377	0.1503
12.379	0.18416	10.705	0.024	8.455	0.1503
12.394	0.15917	12.86	0	8.535	0.1503
12.395	0.15919	12.86	0	8.535	0.1503
12.41	0.13496	12.843	0	9.026	0.1252
12.425	0.11047	12.875	0	9.5201	0.1002
12.01	0.08567	12.522	0	9.5986	0.0751
12.015	0.06085	12.736	0	10.246	0.0499
12.292	0.03574	12.93	0	10.946	0.02444
12.427	0.011921	13.175	0	12.881	0

2.5 Thermal Images

Thermal image is shown in the following figure.

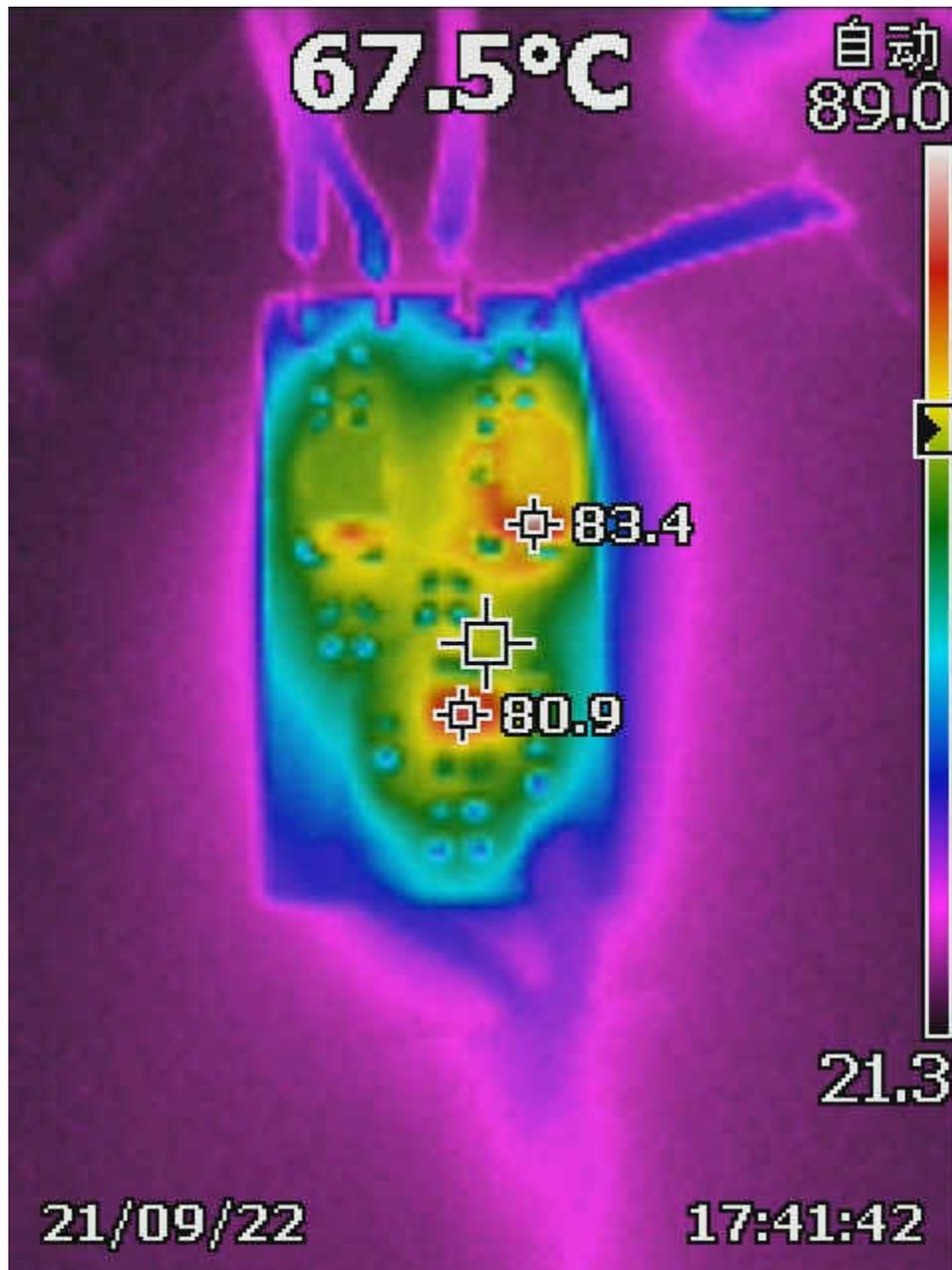


Figure 2-4. Thermal Image

3 Waveforms

3.1 Switching

Switching behavior is shown in the following figure.

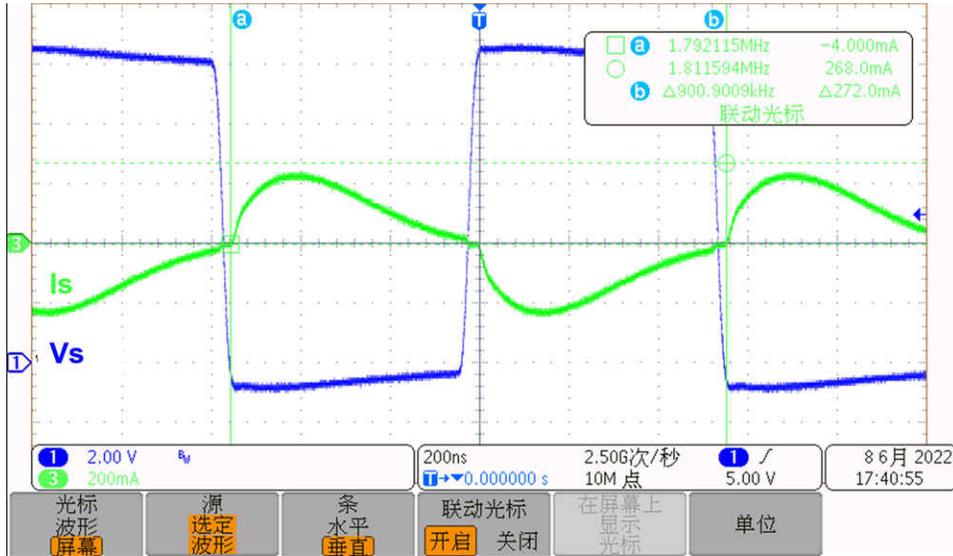


Figure 3-1. Switching Waveform

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