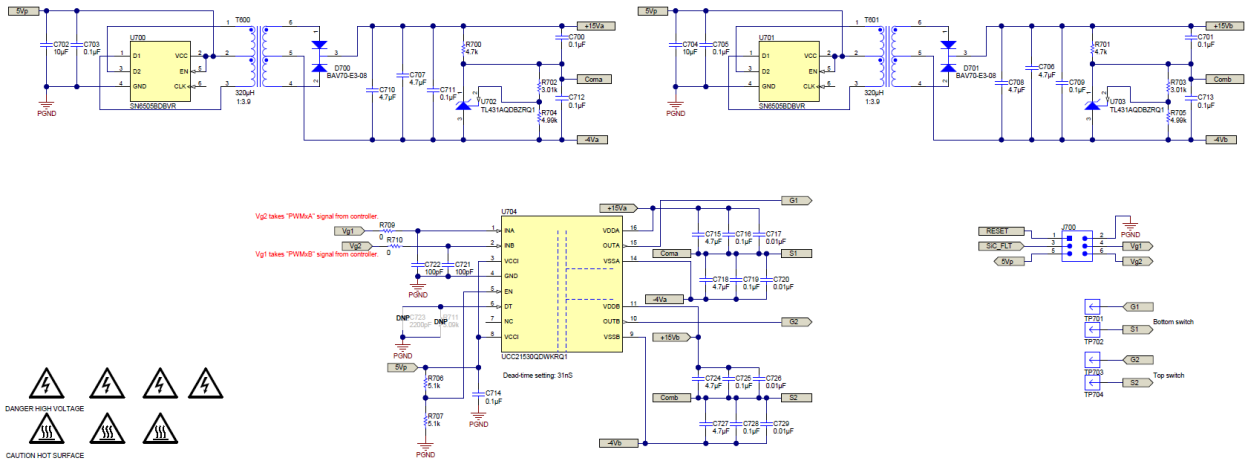
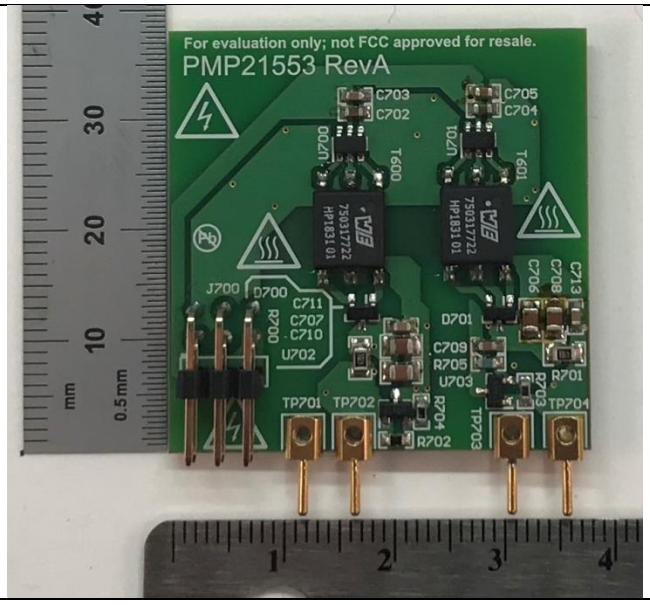
Test Report: PMP21553
Safety Isolated Primary SiC MOSFET Driver Reference Design

Description

The PMP21553 provides an integrated high and low side isolated primary gate driver solution for an automotive battery charging system incorporating two push-pull SN6505B transformer drivers and the isolated dual-channel gate driver UCC21530-Q1.





1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1. Voltage and Current Requirements

Parameter	Specifications
V_{IN}	5.0V
V_{OUT} 1 SN6505B	19.0V @ 120mA Split +15.0V / -4.0V
V_{OUT} 2 SN6505B	19.0V @ 120mA Split +15.0V / -4.0V

1.2 Equipment Used

- Lab power supply Agilant 6654A
- Electronic load Kikusui PLZ164WA
- Electronic load PLZ303W
- Multimeter Hewlett Packard 34401A (2x)
- Multimeter Keithley 2700 Integra Series (2x)
- Oscilliscope LeCroy waveSurfer 424

1.3 Board Dimensions

1.500” x 1.500”

2 Testing and Results

2.1 Efficiency Graphs

Efficiency was tested at nominal input voltage with load current sweeping from minimum to maximum designed value.

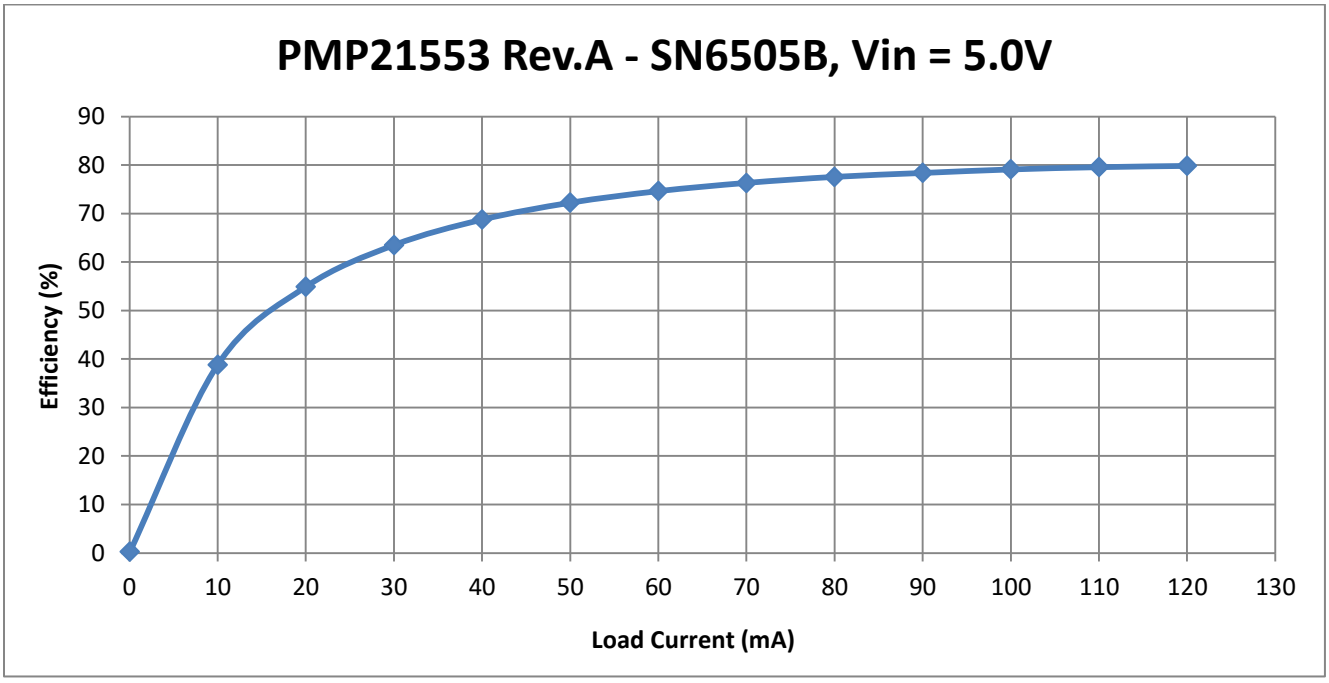


Figure 1. 19.0V Output SN6505B Efficiency with 5.0V Input

2.2 Efficiency Data

Table 2 shows the SN6505B efficiency data for 5V input

Table 2. SN6505B Efficiency Data for 5V Input

Input			Output			Calculations	
Voltage (V)	Current (A)	Power (W)	Voltage (V)	Current (A)	Power (W)	Losses (W)	Efficiency (%)
5.007	0.057	0.287	18.833	0.000	0.001	0.286	0.24
5.006	0.096	0.481	18.674	0.010	0.187	0.294	38.82
5.001	0.135	0.675	18.529	0.020	0.371	0.305	54.90
5.004	0.174	0.871	18.429	0.030	0.553	0.318	63.49
5.007	0.213	1.067	18.334	0.040	0.733	0.333	68.75
5.001	0.252	1.260	18.200	0.050	0.910	0.350	72.23
5.004	0.291	1.456	18.110	0.060	1.087	0.370	74.62
5.007	0.330	1.653	18.018	0.070	1.261	0.391	76.31
5.001	0.369	1.845	17.889	0.080	1.431	0.414	77.56
5.010	0.408	2.045	17.801	0.090	1.602	0.442	78.37
5.008	0.447	2.239	17.711	0.100	1.771	0.468	79.09
5.001	0.486	2.431	17.582	0.110	1.934	0.497	79.56
5.004	0.525	2.629	17.487	0.120	2.099	0.530	79.82

2.3 Load Regulation

Load Regulation was tested at nominal input voltage with the load current sweeping from minimum to maximum designed value.

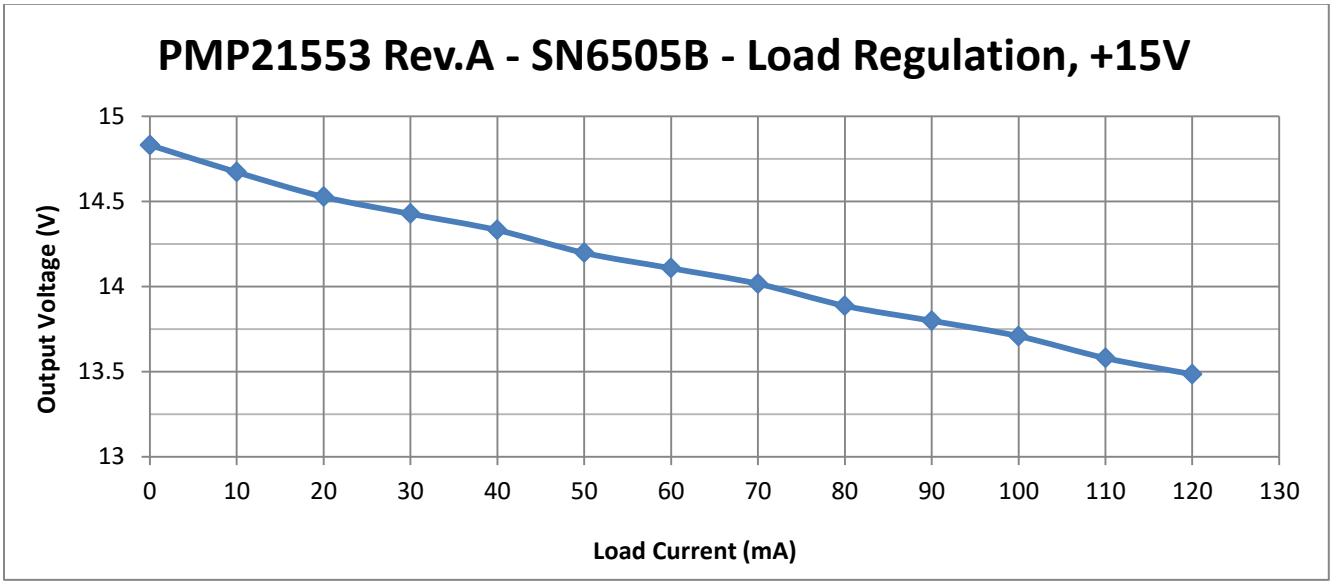


Figure 2. SN6505B Load Regulation for 5V Input, +15V Output

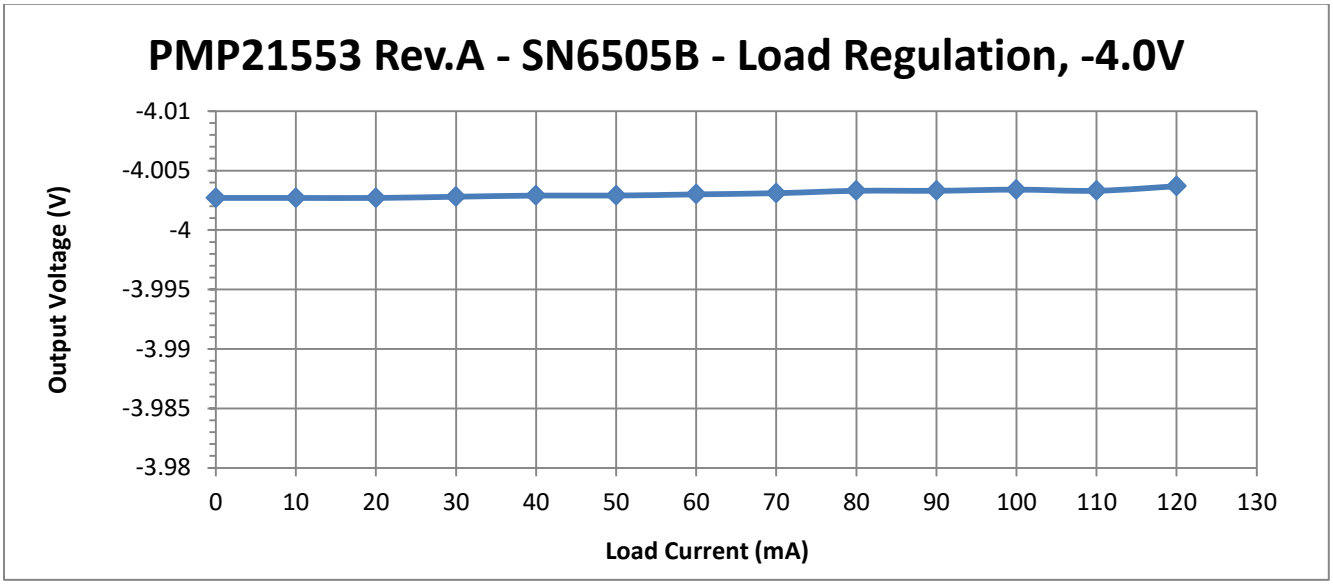


Figure 3. SN6505B Load Regulation for 5V Input, -4V Output

2.4 Thermal Images

Figure 4 shows the circuit at ambient temperature of 20°C with an input voltage of 5.0V and no load on the output. Figure 5 shows the circuit at ambient temperature of 20°C with an input voltage of 5.0V and 120mA load on the output.

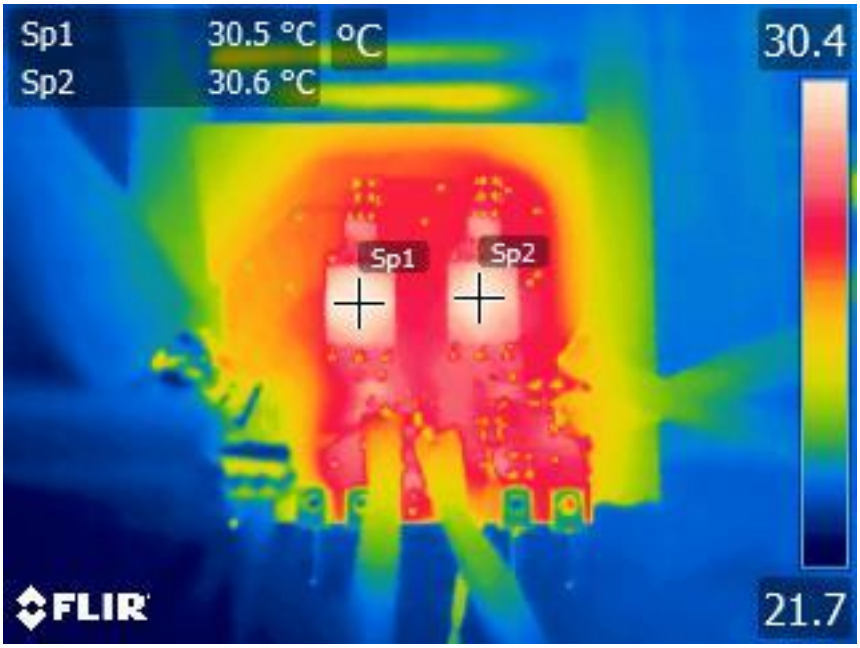


Figure 4. SN6505B Thermal Image at No Load

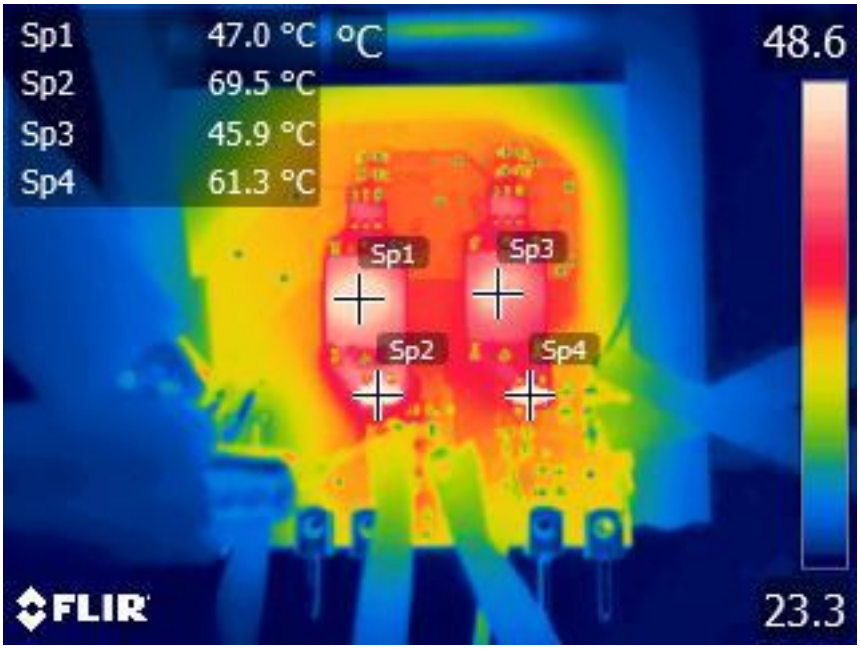


Figure 5. SN6505B Thermal Image at 120mA Load

3 Waveforms

3.1 Output Voltage Ripple

Figure 6 shows the output voltage ripple of the SN6505B for 5.0V input measured at 120mA load. Figure 7 shows the output voltage ripple of the SN6505B for 5.0V input measured at no load. Output voltage ripple measurements taken with AC 1MΩ coupled, 20MHz bandwidth.

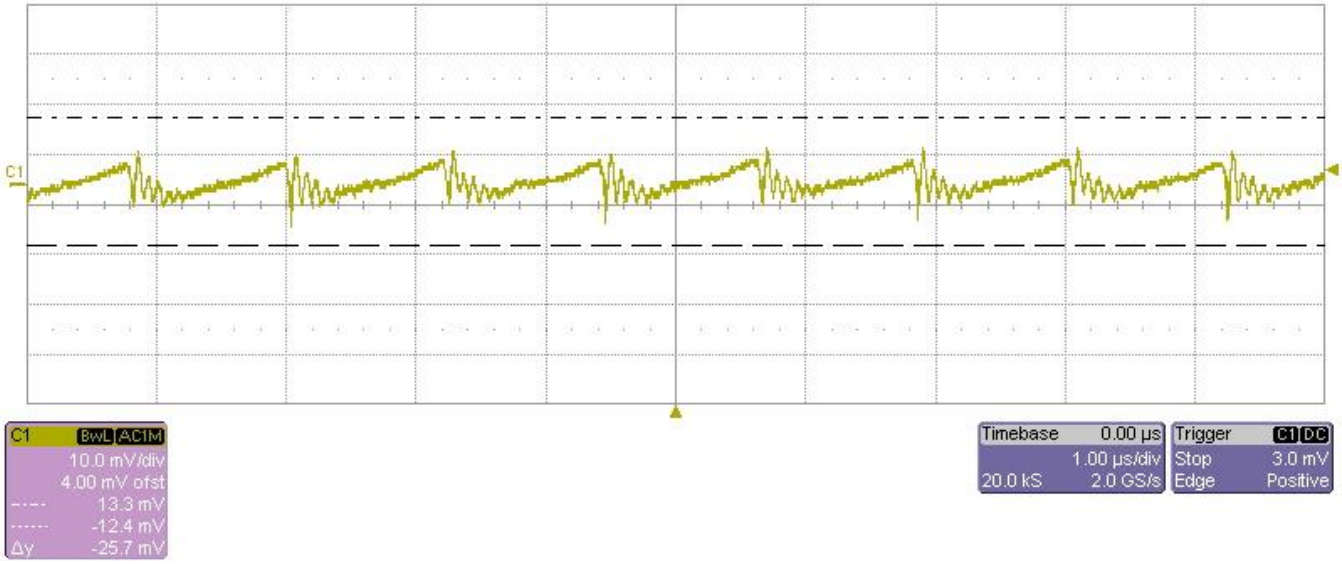


Figure 6. SN6505B Output Voltage Ripple for 5.0V Input at 120mA Load

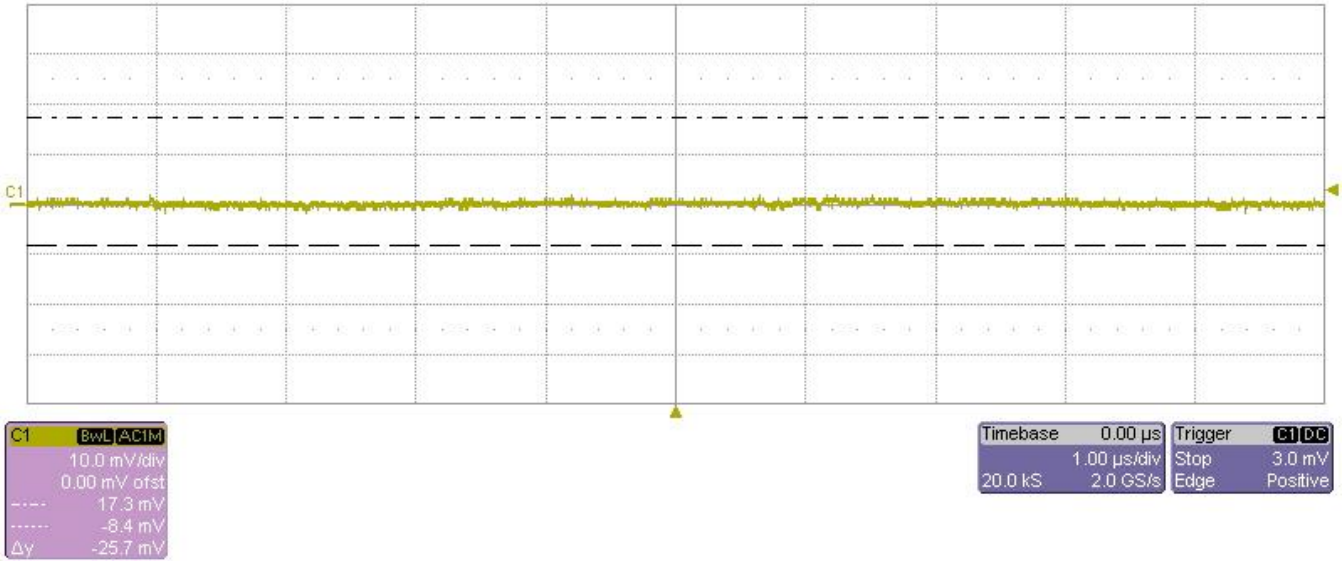


Figure 7. SN6505B Output Voltage Ripple for 5.0V Input at No Load

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