

Quick Start Guide:

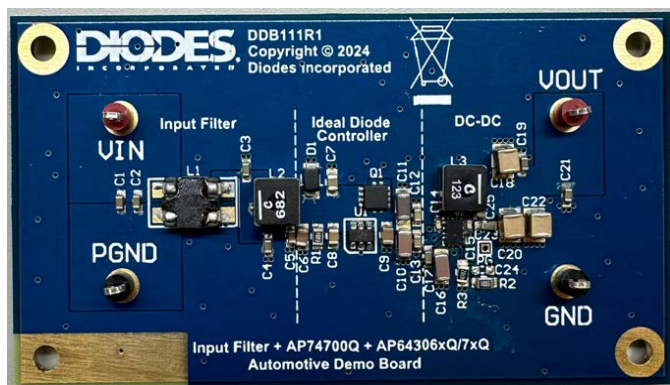


Figure 1: DDB111R1 Demo Board

Pin Description	
Pin	Description
Vin	3.8 V – 36 V Supply In
GND	Common PCB ground
PGND	PCB Input GND
Vout	Output voltage (5V)
PG	Configure internal or external soft start using jumpers

Table 1: DDB111R1 Demo Board Pin Description

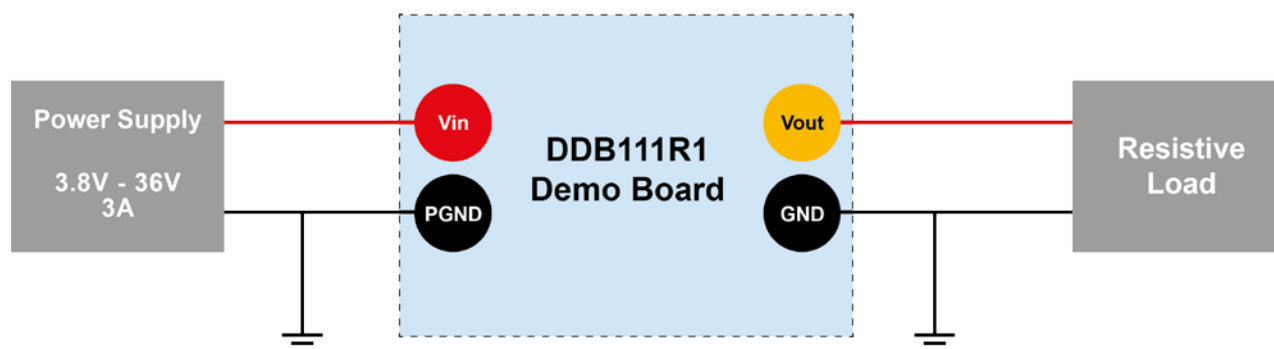


Figure 2: DDB111R1 Demo Board Test Setup

The DDB111R1 demo board has a simple layout and allows access to the appropriate signals through test points. To evaluate the performance of the DDB111R1, follow the procedure below:

- 1) Connect a DC power supply between the VIN and PGND terminals.
- 2) Connect the load to the VOUT and GND terminals (be sure it does not exceed the current limit of the device).
- 3) Check all connections, then turn on the power supply.
- 4) The EVM board should now power up with a 5V output voltage.

Header Description:

	PG	Description
	Header on PG	Outputs a power good signal

Description:

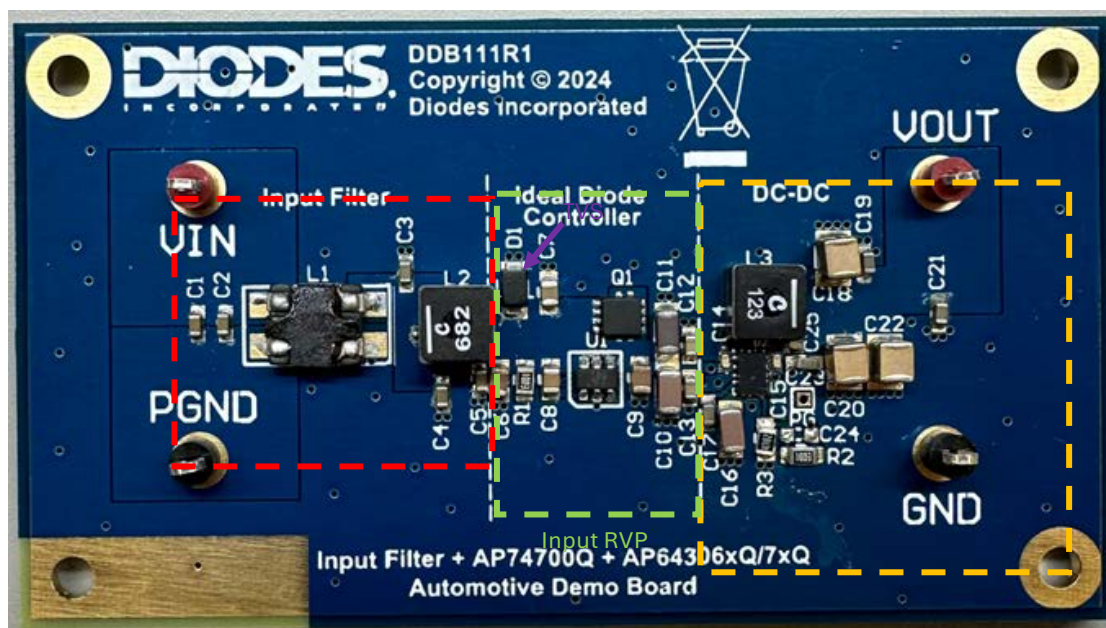


Figure 3: Picture of the DDB111R1 Demo Board

The DDB111R1 Demo Board showcases the **AP64306xQ/7xQ** DC-DC buck converter family, the [AP74700Q](#) ideal diode controller, as well as the use of an EMI input filter. It demonstrates a system-level solution with reverse voltage protection, ISO 7637-2 transient pulse protection (using a suitable TVS), EMI filtering that passes CISPR 25 Class 4, as well as the DC-DC buck converter.

The input filter (as shown in figure 3 within the red square) contains a common mode choke, with capacitors on either side of it in a Pi configuration. This is connected in series with an LC low pass filter, containing an inductor and a capacitor. This combination makes the board CISPR 25 class 4 compliant.

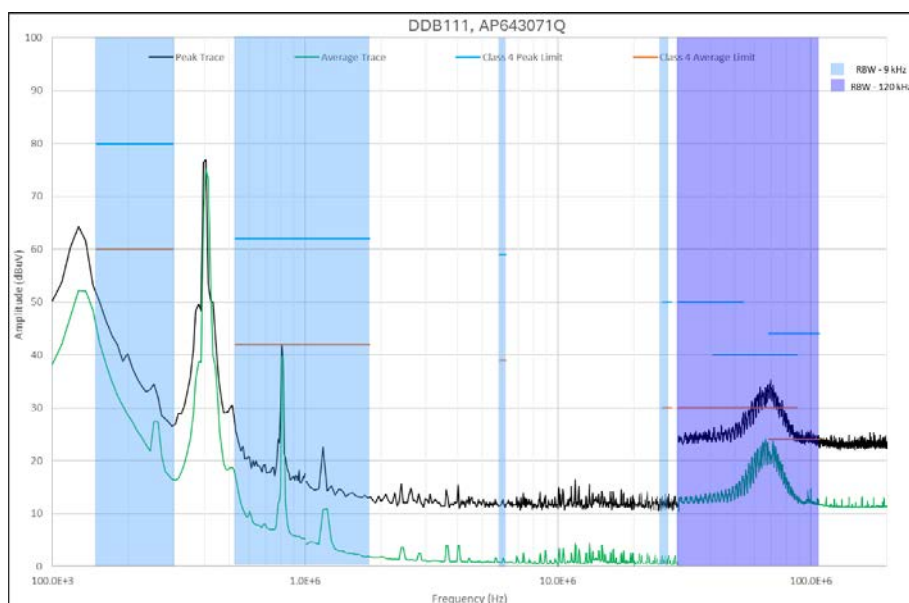


Figure 4: EMC Sweep of DDB111R1, with the AP643071Q installed, from 100 kHz – 200 MHz, 13.5V_{in}, 3A load, against CISPR 25 Class 4 limits.

The TVS is highlighted in purple. This provides the board with ISO7367-2 pulse protection. The SMF4L30CAQ is a suitable choice for the TVS.

The input RVP section of the board is highlighted in green and consists of the **AP74700Q**.

Description (continued):

The AP74700Q is a $\pm 65\text{V}$ ideal diode MOSFET controller which provides reverse voltage protection and has a low-loss 20mV forward voltage drop rectifier in unidirectional power paths. AP74700Q supports wide input operation range from 3.2V to 65V, allowing control of many popular DC rail voltage such as 12V, 24V or higher automotive battery systems. The 3.2V input voltage support fits for severe cold crank requirements in automotive systems. The AP74700Q can withstand and protect the loads from reverse voltages down to -65V.

The MOSFET design requirements of the AP74700Q are:

- 60V $V_{DS(MAX)}$ and $\pm 20V$ $V_{GS(MAX)}$
- $R_{DS(ON)}$ @ $I_{Load(Nominal)}$: $(20\text{ mV} / I_{Load(Nominal)}) \leq R_{DS(ON)}$
- MOSFET gate threshold voltage V_{TH} : 2V maximum

The PowerD®I3333-8 footprint on the DDB111R1 and the design requirements of the AP74700Q mean that the recommended MOSFET is the DMTH6016LFVWQ.

The **AP64306xQ/7xQ** family, highlighted in yellow, is a series of automotive-compliant, 3A, synchronous buck converters with an input voltage of up to 36V. The devices fully integrate a high-side power MOSFET and a low-side power MOSFET to provide high-efficiency step-down DC-DC conversion. The AP64306xQ/7xQ devices adopt current-mode control and have an integrated loop compensation network making them easy to use. The device range is available in the QFN2030-12 or SO-8EP package.

Schematic Diagram:

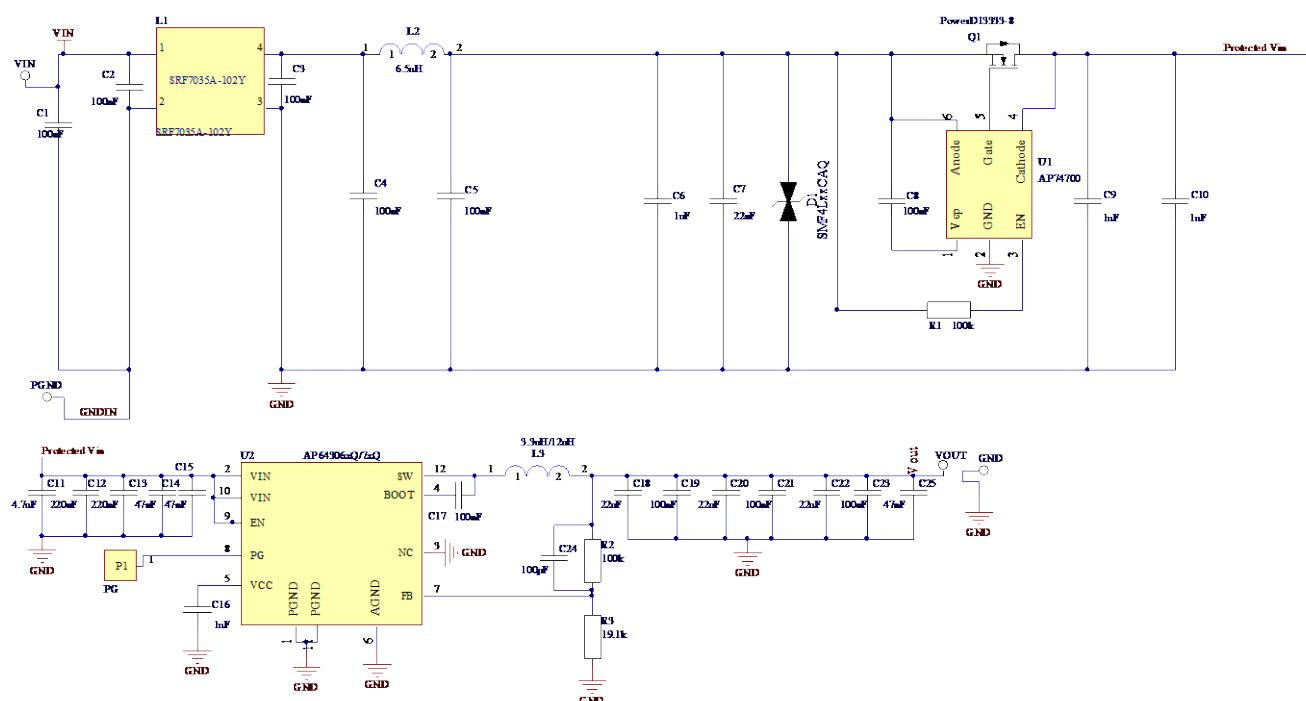
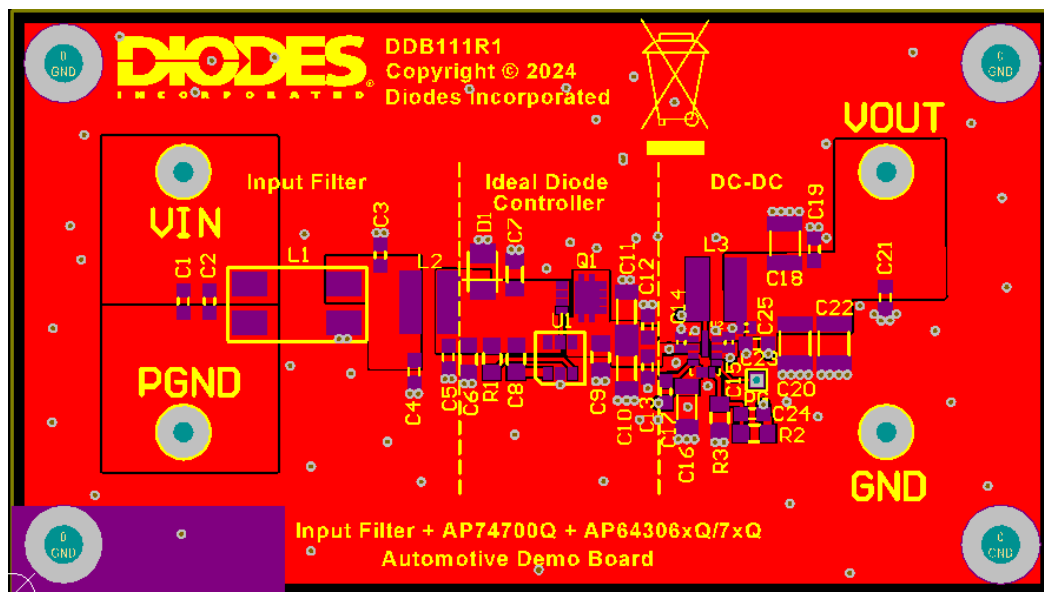


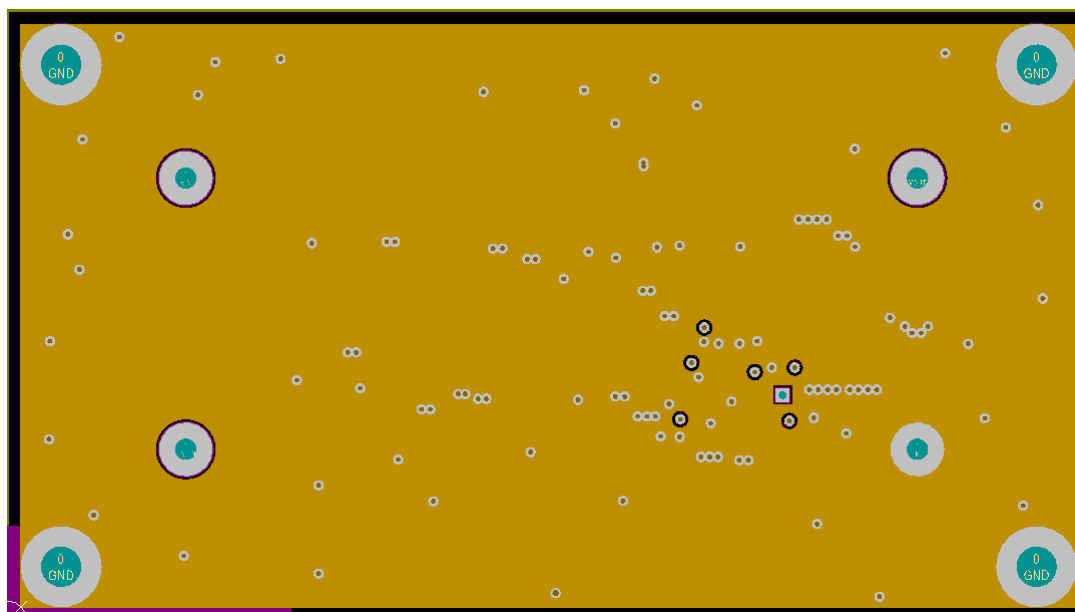
Figure 5: Schematic Diagram of the DDB111R1 Demo Board

Board Layers (Top View):

Top Layer:



Mid Layer 1:

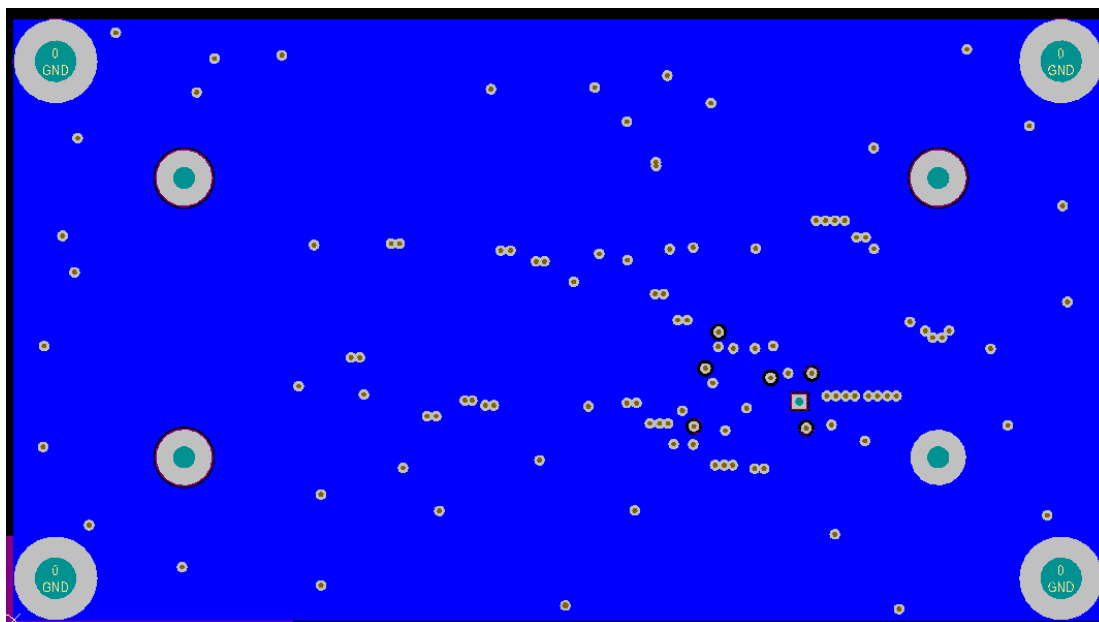


Board Layers (Top View) (continued):

Mid Layer 2:



Bottom Layer:



Bill of Materials:

Quantity	Idents	Description	Footprint
1	U2	AP64306xQ/7xQ	QFN2030-12/SO8-EP
1	U1	AP74700Q	SOT26
1	Q1	DMTH6016LFVWQ	PowerDI3333-8
1	D1	SMF4LxxxAQ	DO219-AA
1	C10, C16	1uF X7R Ceramic SMD Capacitor	1206
1	C11	4.7uF X7R Ceramic SMD Capacitor	1206
2	C18, C20, C22	22uF X7R Ceramic Capacitor	1210
1	C8	100nF X7R Ceramic Capacitor	0805
1	C24	100pF X7R Ceramic Capacitor	0603
1	C7	22nF X7R Ceramic Capacitor	0805
2	C3, C4	47nF X7R Ceramic Capacitor	0603
2	C6, C9	1uF X7R Ceramic SMD Capacitor	0805
9	C1, C2, C3, C4, C5, C17, C19, C21, C23	100nF X7R Ceramic SMD Capacitor	0603C
1	C22	10nF X7R Ceramic SMD Capacitor (optional)	0603C
4	PG	1 pin header	Test pin_1
1	L1	Common-mode Choke, BOURNS SRF7035A-102Y	7mm x 6mm x 3.5mm
1	L2	Coilcraft XGL5050-682MEC, 6.8uH, 6.2A	5050
1	L3	Coilcraft XGL5030-123MEC, 12uH, 4A (AP643061Q/AP643071Q) Coilcraft XGL4030-322MEC, 3.3uH, 5.3A (AP643063Q/AP643073Q)	5030/4030
5	R1, R2, R3	SMD Thick Film Resistor	0805
4	Vin, Vout, PGND, GND	Test Eyelets	1.6mm test eyelets

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