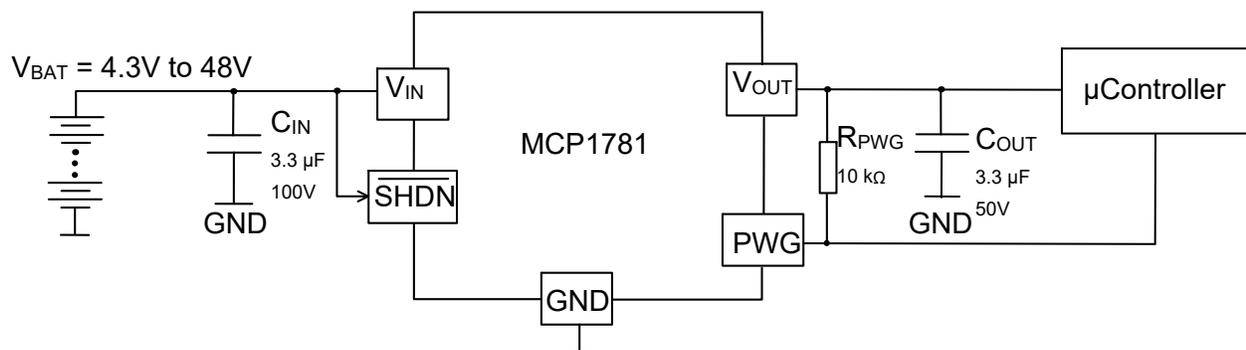


## Introduction

The MCP1781 Evaluation Board was developed to showcase the MCP1781 device's performances over a wide input voltage range and load current range. The board comes with both the 3.3V and 5V MCP1781 output voltage options, and access is given to the input and output pins, the  $\overline{\text{SHDN}}$  pin, the PWG pin, and the Ground pin. The MCP1781 is powered ON when the input voltage is at least 2.75V and the voltage on the  $\overline{\text{SHDN}}$  pin exceeds 1.13V. The device can be turned OFF by asserting the  $\overline{\text{SHDN}}$  voltage below 0.79V.

**Figure 1.** MCP1781 Typical Application



The user can experiment with different types of capacitors and values by replacing the existing ones. The evaluation board is available with both types of packages for MCP1781, allowing for the testing of power dissipation capabilities on each package.

The MCP1781 is a high-voltage, low dropout (LDO) regulator, capable of supplying 200 mA of output current. The input voltage range of 4.3V to 55V makes it suitable for 12V to 48V power rails, such as those found in high-voltage battery packs or automotive applications where it can maintain regulation through large transients, including load dump events.

A low UVLO at shutdown of 2.3V makes it adequate for cold cranking conditions in automotive applications.

The MCP1781 comes in two standard fixed output voltage versions: 3.3V and 5.0V. The regulator output is stable with 3.3 µF ceramic capacitors. The device is protected from short-circuit events by the current foldback function and from overheating by means of thermal shutdown protection.

The MCP1781 has two 5-lead package options: the SOT-223, recommended for smaller-sized applications, and the TO-252, recommended for environments where a better power dissipation capability is required. The device itself has a ground current of 85 µA typical, while delivering maximum output current of 200 mA.

## Features

- AEC-Q100 Automotive Qualified (Grade 0, PPAP Capable)
- Wide Input Voltage Range: 4.3V to 55V
  - Undervoltage lock-out (UVLO): 2.7V typical
- Extended Junction Temperature Range:  $-40^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- Standard Output Regulated Voltages ( $V_R$ ): 3.3V and 5.0V (Note)
  - Tolerance  $\pm 2.0\%$  over temperature
- Open Drain Power Good Pin
- Low Quiescent Current: 34  $\mu\text{A}$  Typical
- Low Shutdown Current: 3.5  $\mu\text{A}$  Typical
- Output Current Capability: 200 mA Typical
- Short Circuit Current Foldback Protection
- Thermal Shutdown Protection:  $169^{\circ}\text{C}$  Typical
- Stable with Ceramic Output Capacitor: 3.3  $\mu\text{F}$
- High PSRR for  $V_{IN} = 14.5\text{V}$  and  $I_{OUT} = 100\text{ mA}$ :
  - $-80\text{ dB}$  @ 100 Hz typical
  - $-36\text{ dB}$  @ 100 kHz typical
- Available in the following Packages:
  - 5-Lead TO-252
  - 5-Lead SOT-223

**Note:** For other voltage options, contact your local sales office

## Kit Contents

The MCP1781 Evaluation Board kit includes the following items:

- MCP1781 Evaluation Board (EV78D55A) PCB
- Important Information Sheet

## 1. Setup and Configuration

The MCP1781 Evaluation Board is fully assembled and tested to evaluate and demonstrate the characteristics of the MCP1781.

The MCP1781 Evaluation Board operates with an input supply voltage range of 4.3V, up to 55V, and 3.3V/5V outputs voltages according to the MCP1781 rating.

The board comes with test points that allow for easy integration into a test setup. The board is available in two output versions and both packages, allowing customers to select the most appropriate option based on their specific application requirements or power dissipation needs.

### 1.1. Powering the MCP1781 Evaluation Board

Apply the positive input voltage to the test point marked as VIN and the return ground connection to the test point marked as GND. The input voltage needs to be a minimum of 4.3V in order to test the 3.3V output voltage option ( $V_{IN} = V_R + 1V$ ) and 6V in order to test the 5V output voltage option. DO NOT APPLY a voltage higher than 55V or you may damage the part. As a default option, the devices will turn ON when powering them through the input pin, but they can be turned OFF by connecting a jumper on the  $\overline{SHDN}$  connectors.

The output can also be monitored using the PWG pin, which can be connected either to the output voltage, with a jumper placed on the PG connector, or to an external source, through the Vext\_PG connector.



**CAUTION** DO NOT CONNECT the jumper on the PG connector while using an external source.

---

The output current capabilities can be tested using resistive loads or an electronic load set to constant resistance or constant current. The positive terminal of the load must be connected to VOUT and the negative terminal to the corresponding test point marked with GND.

**Note:** Note that an electronic load will have the tendency to sink a current when the output of the LDO is 0V.

### 1.2. Testing the Default Configuration – Top Side of the Board

To test the board, follow these steps:

1. Apply the appropriate input voltage,  $V_{IN} = 14V$
2. Use a multimeter and measure the input voltage and output voltage.  $V_{OUT}$  should be 3.3V/5V.
3. Connect a resistor with  $66\Omega/100\Omega$  to the VOUT and GND terminal as a load and measure  $V_{OUT}$ ; it should be 3.3V/5V.
4. Connect a jumper to the  $\overline{SHDN}$  header. Measure  $V_{OUT}$ ; it should be 0V.
5. Remove the jumper from the  $\overline{SHDN}$  header;  $V_{OUT}$  should be 3.3/5V.

By adjusting the input voltage or load, while still maintaining nominal operating conditions, the LDO will remain in regulation.

## 2. Board Design

This chapter contains the following schematic and layouts for the MCP1781 Evaluation Board:

- Schematic
- Top Silk
- Top Copper and Silk
- Top Copper
- Bottom Copper
- Bottom Copper and Silk
- Bottom Silk

Figure 2-1. Schematic.

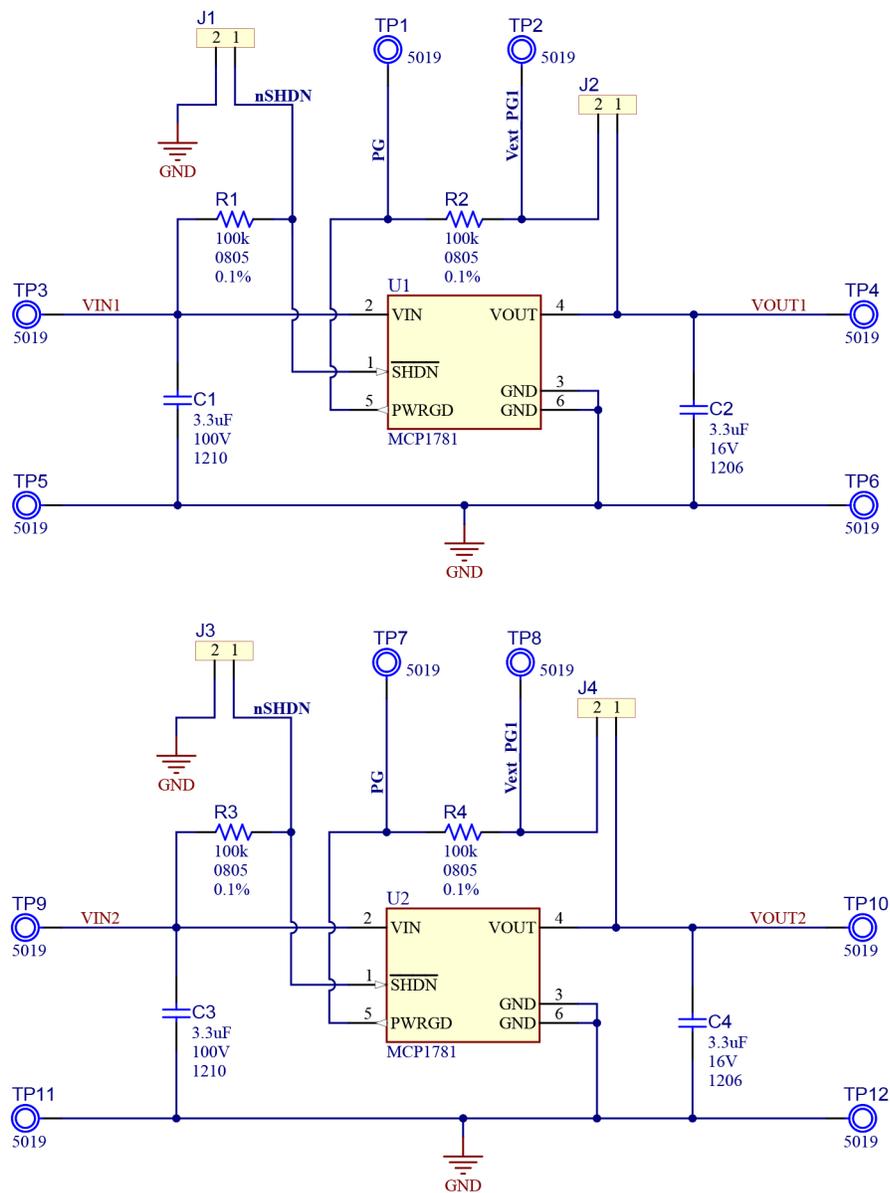


Figure 2-2. Top Silk

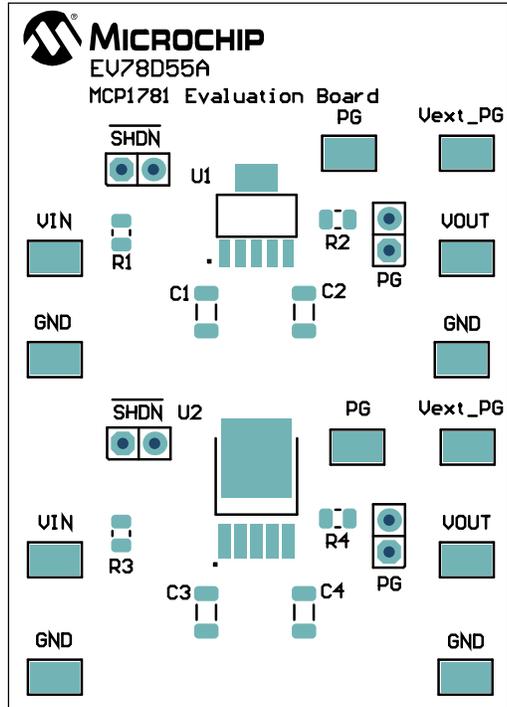


Figure 2-3. Top Copper and Silk

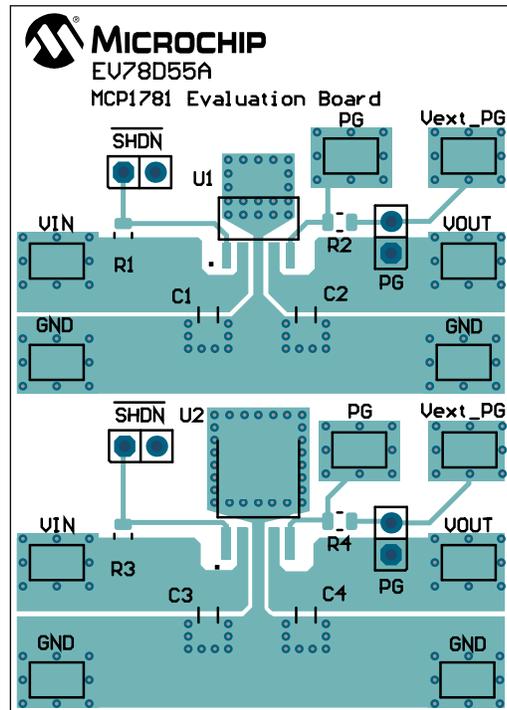


Figure 2-4. Top Copper

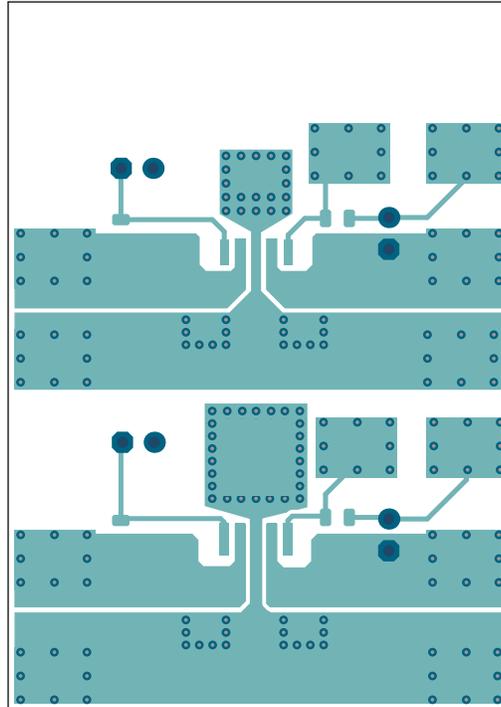


Figure 2-5. Bottom Copper

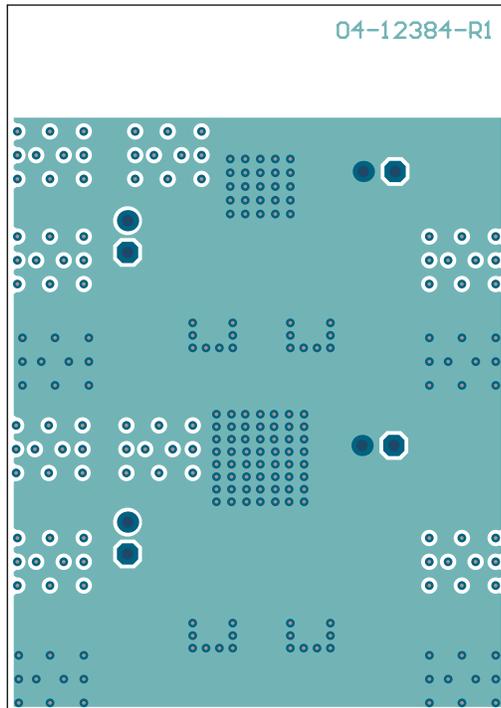


Figure 2-6. Bottom Copper and Silk

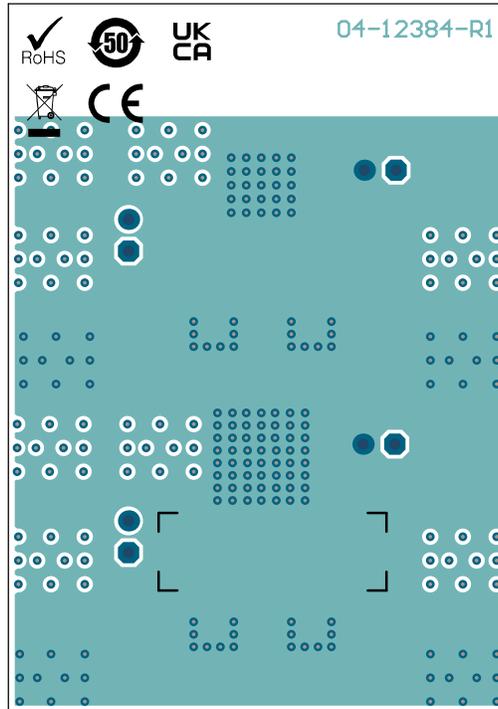
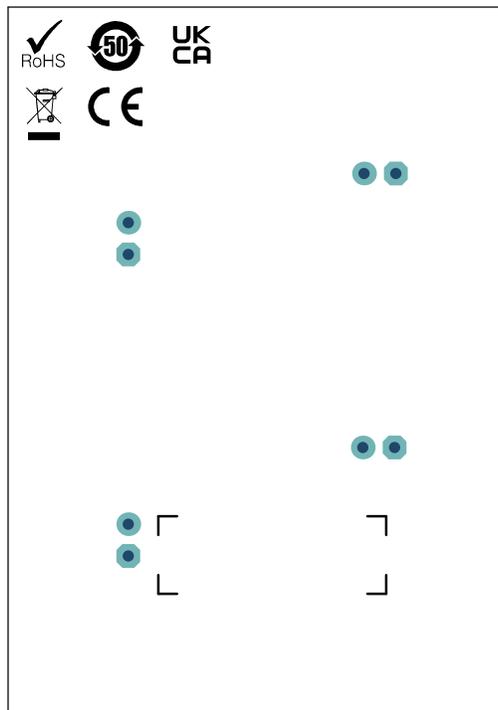


Figure 2-7. Bottom Silk



### 3. Bill of Materials (BOM)

**Table 3-1.** Bill of Materials (BOM)

Qty.	Reference	Description	Manufacturer	Part Number
2	C1, C3	Capacitor, Ceramic, 3.3 $\mu$ F, 100V, 20%, X7S, SMD, 1206, AEC-Q200	TDK Corporation	CGA5L3X7S2A335M160AB
2	C2, C4	Capacitor, Ceramic, 3.3 $\mu$ F, 16V, 10%, X8L, SMD, 1206, AEC-Q200	Murata Electronics*	GCJ31CL81C335KA01K
4	J1, J2, J3, J4	Connector, Unshrouded Header, HDR 2, Position 2.54 mm, Male, 1x2, Gold, Thru-Hole	Amphenol ICC (FCI)	68000-202HLF
4	R1, R2, R3, R4	Resistor, Thin Film, 100k, 0.1%, 1/8W, SMD, 0805	Panasonic* - ECG	ERA-6AEB104V
12	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12	Connector, Test Pont, Silver, Miniature, Size 3.8 x 2.03, Height 2.29 mm, SMD	Keystone* Electronics Corp.	5019
2	JP1, JP2	Mechanical HW Jumper, 2.54 mm, 1x2	3M	969102-0000-DA
1	LABEL1	Label, PCBA, Size 18 x 6 mm, Datamatrix "Assy#/Rev/Serial/Date"	ACT Logimark AS	505462
1	PCB1	Printed Circuit Board		04-12384-R1

**Table 3-2.** Bill of Materials (BOM) – Microchip Parts

Qty.	Reference	Description	Manufacturer	Part Number
1	U1	LDO, Analog, SOT-223-5, AEC-Q100 Qualified	Microchip Technology, Inc.	MCP1781-3302H/DBVAO
1	U2	LDO, Analog, TO-252-5, AEC-Q100 Qualified	Microchip Technology, Inc.	MCP1781-5002H/9EAVAO

## 4. References

**Table 4-1.** Recommended Reading

Source	Document Title	Literature Number	Available
Microchip Technology, Inc.	MCP1781 Data Sheet	DS20007050	

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