

Introduction

The MIC45M235 is a 16V rated, 35A Power Module that combines a PWM controller, a MOSFET driver with power MOSFETs, an inductor, and passives into a compact Land Grid Array (LGA) package.

Features

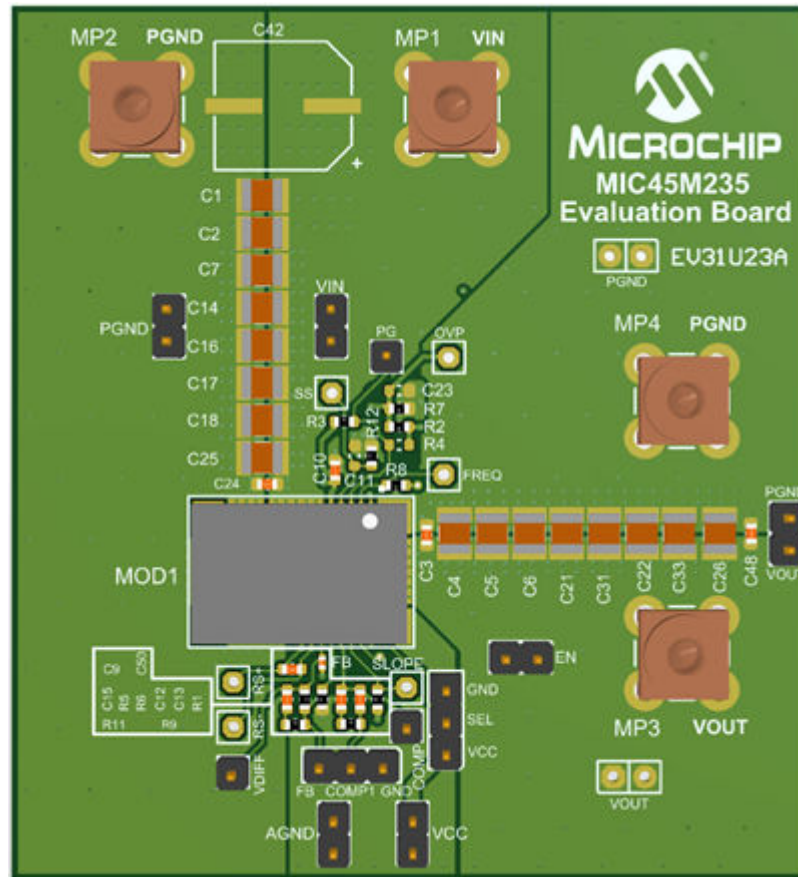
- POL Module with Integrated Inductor
- 35A Continuous Output Rating
- High Efficiency
- Differential Remote Voltage Sensing
- 4.5V to 16V Input Voltage Range
- Adjustable Output from 0.6V to 3.46V
 - Recommended Range: 0.6V to 1.8V
- Enable Input
- Programmable Valley Current Mode or Voltage Mode Control
- Adjustable Switching Frequency: 200 kHz to 2 MHz
 - Recommended Range: 300 to 700 kHz
- Power Good output
- Overvoltage and Overcurrent Protection
- Thermal Shutdown with Hysteresis
- Programmable Soft-Start
- Supports Start-up into Pre-bias Output
- -40 °C to 85 °C Ambient Temperature Range
- 11 x 17 x 6.46 mm LGA Package

Kit Contents

The MIC45M235 Evaluation Board kit includes:

- MIC45M235 Evaluation Board

Figure 1. MIC45M235 Evaluation Board (Top View)



1. Setup and Configuration

The following sections include information on connecting to the Evaluation board and general hardware description.

1.1. Connection to the Evaluation Board

Verify that the jumper on J2 is connected as shown in [Figure 1-1](#), connecting COMP1 and FB, the proper configuration for Voltage Mode control. Connect a 12V, 10A typical power supply and a DC electronic load (capable of up to 35A) to the board, as shown below in [Figure 1-2](#). Turn on the power supply and then the load. Adjust the load current as desired.

Figure 1-1. Jumper J2 Position

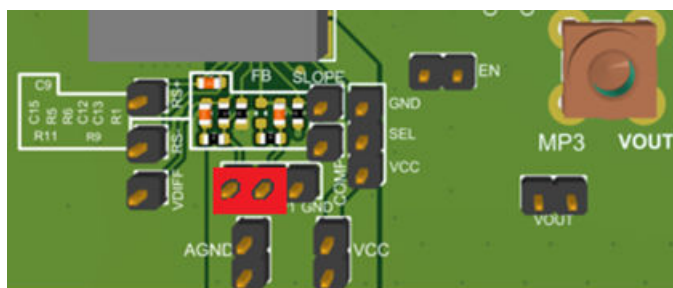
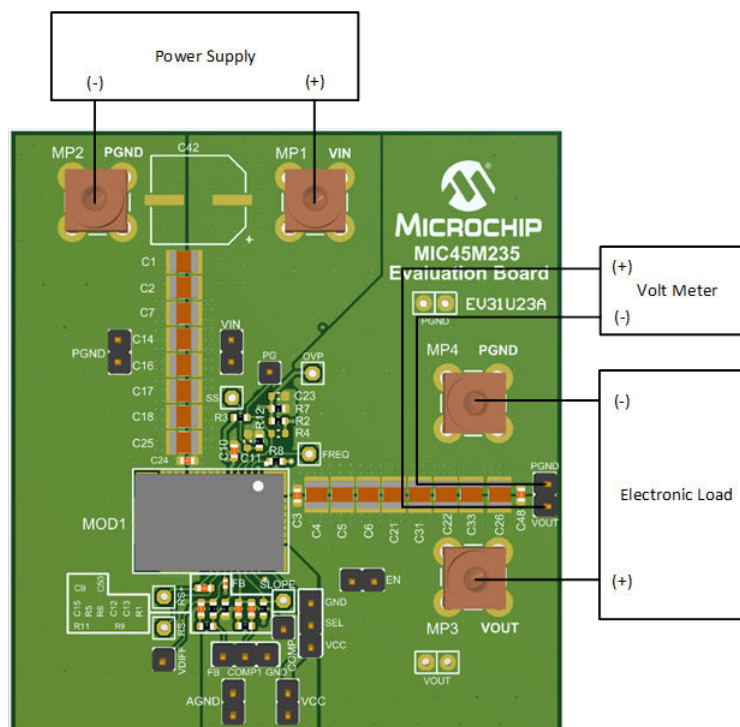


Figure 1-2. External Test Equipment Connections



1.2. Hardware Description

The MIC45M235 Evaluation Board is a six-layer board with 2oz. copper on all layers. VIN, VOUT, and multiple PGND test points are provided close to the actual circuit for measuring input and output voltages, for use in efficiency and regulation measurements. The voltmeter connections shown in [Figure 1-2](#) demonstrate how to connect to measure VOUT.

2. Board Design

This section contains the following schematic and layouts for the MIC45M235 Evaluation Board.

- [Schematic](#)
- [Top Silk](#)
- [Top Copper and Silk](#)
- [Top Copper](#)
- [Mid Layer 1](#)
- [Mid Layer 2](#)
- [Mid Layer 3](#)
- [Mid Layer 4](#)
- [Bottom Copper](#)
- [Bottom Copper and Silk](#)
- [Bottom Silk](#)

Figure 2-1. Schematic



2.2. Layouts

Figure 2-2. Top Silk

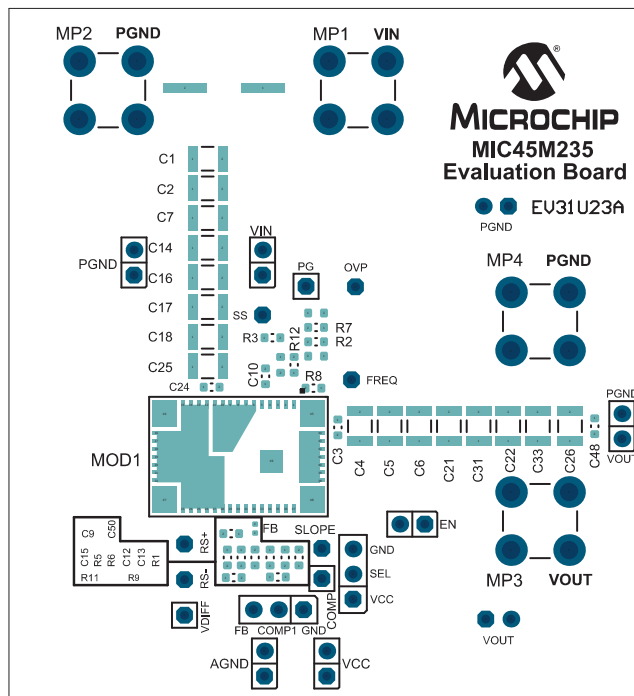


Figure 2-3. Top Copper and Silk

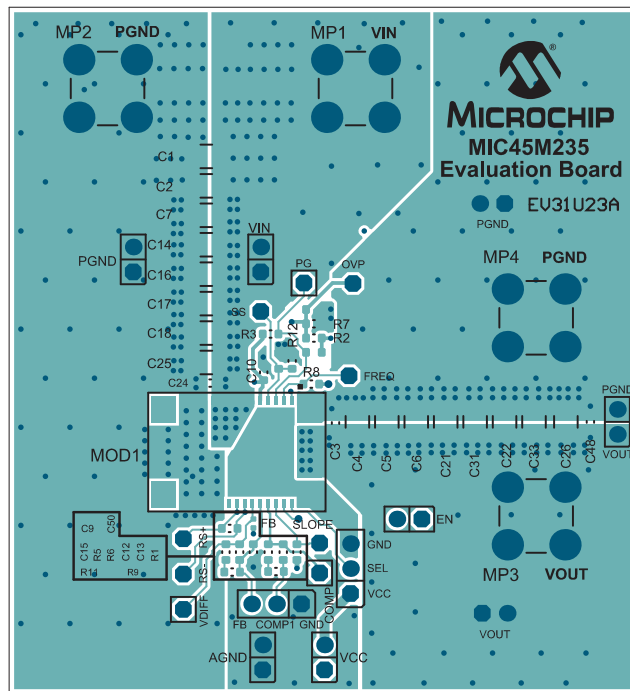


Figure 2-4. Top Copper

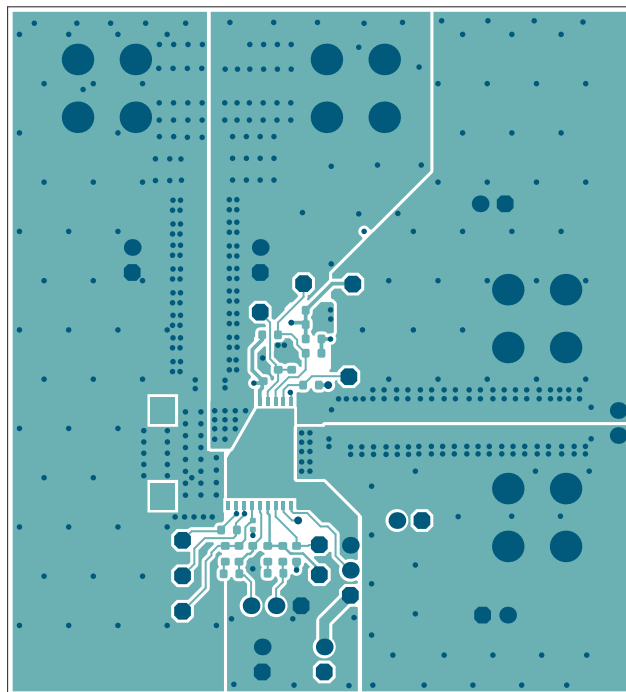


Figure 2-5. Mid Layer 1

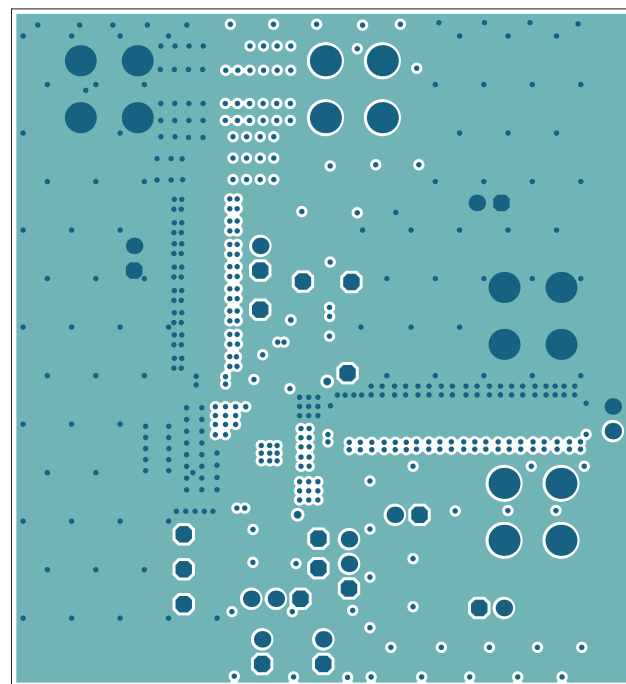


Figure 2-6. Mid Layer 2

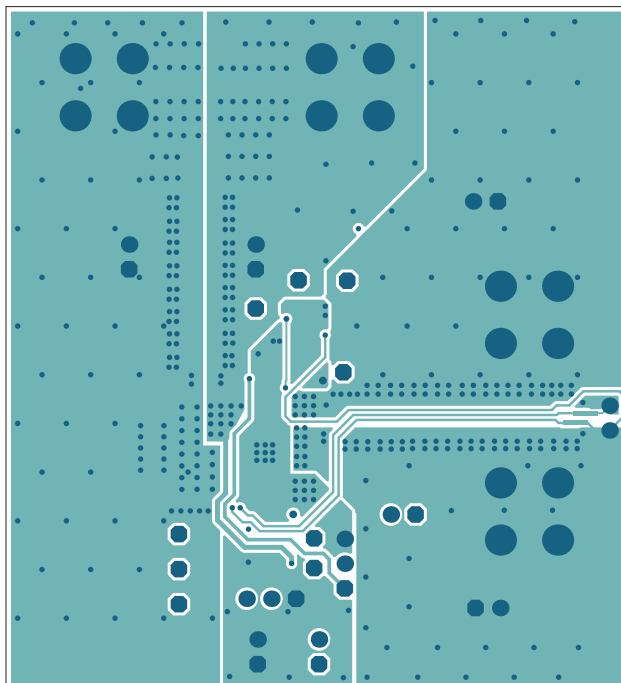


Figure 2-7. Mid Layer 3

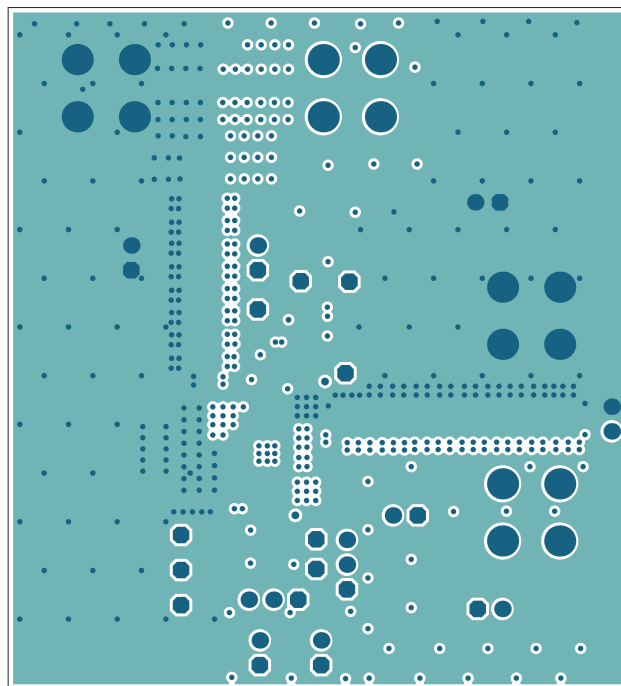


Figure 2-8. Mid Layer 4

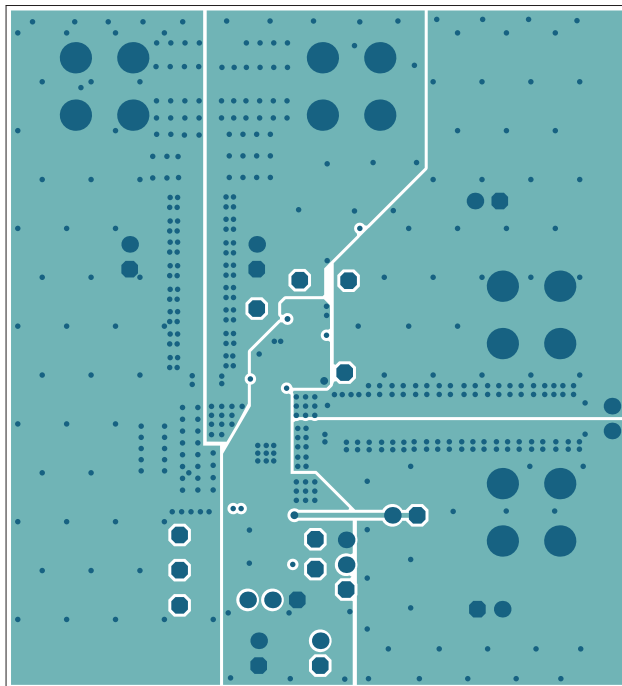


Figure 2-9. Bottom Copper

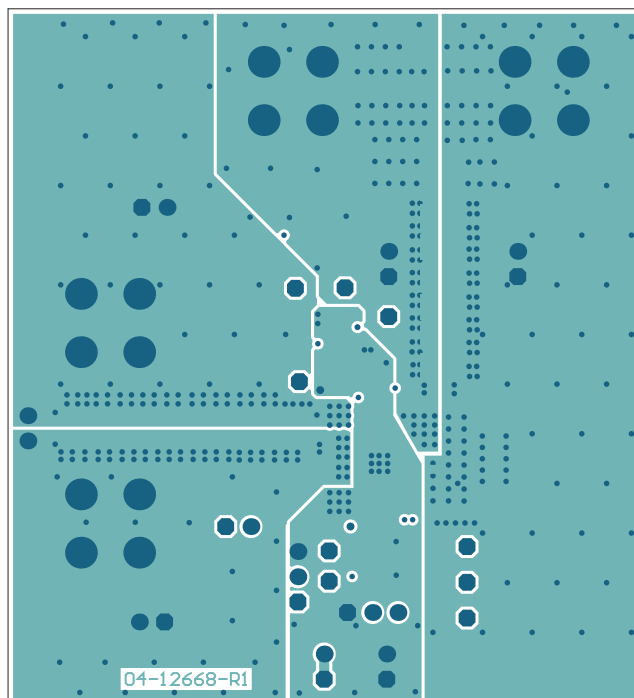


Figure 2-10. Bottom Copper and Silk

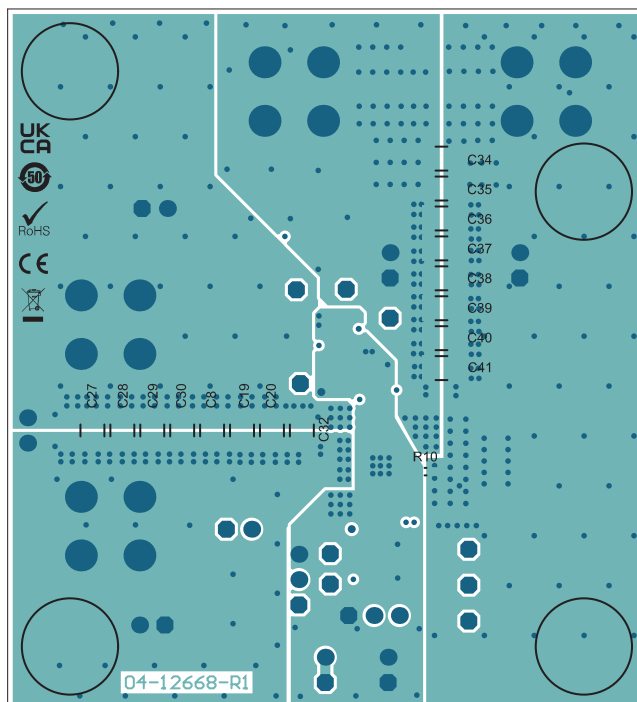
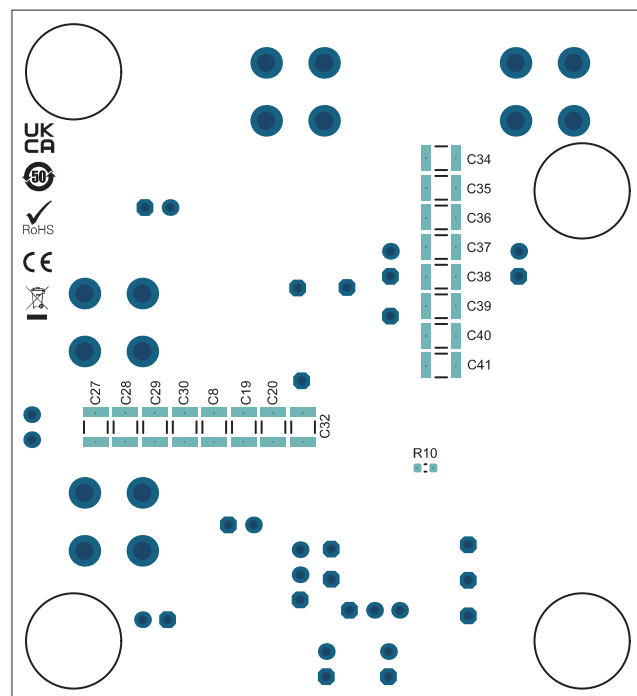


Figure 2-11. Bottom Silk



3. Bill of Materials (BOM)

Table 3-1. Bill of Materials

Qty	Reference	Description	Manufacturer	Part Number
16	C1, C2, C7, C14, C16, C17, C18, C25, C34-C41	Capacitor, Ceramic, 22 uF, 25V, 10%, X7R, SMD, 1210	Samsung Electro-Mechanics America, Inc.	CL32B226KAJNFNE
3	C3, C24, C48	Capacitor, Ceramic, 0.1 uF, 25V, 10%, X7R, SMD, 0603	TDK Corporation	C1608X7R1E104K080AA
16	C4, C5, C6, C8, C19, C20, C21, C22, C26-C33	Capacitor, Ceramic, 100 uF, 6.3V, 20%, X7S, SMD, 1210	Murata Electronics*	GRM32EC70J107ME15L
1	C9	Capacitor, Ceramic, 33 pF, 50V, 5%, C0G, SMD, 0603	Murata Electronics	GRM1885C1H330JA01D
1	C10	Capacitor, Ceramic, 1 uF, 16V, 10%, X7R, SMD, 0603	Samsung Electro-Mechanics America, Inc	CL10B105K08NNNC
1	C12	Capacitor, Ceramic, 2700 pF, 50V, 5%, C0G, SMD, 0603	Murata Electronics	GRM1885C1H272JA01J
1	C13	Capacitor, Ceramic, 68 pF, 50V, 5%, NP0, SMD, 0603	Wurth Elektronik	885012006056
1	C15	Capacitor, Ceramic, 390 pF, 50V, 5%, C0G, SMD, 0603	Yageo Corporation	CC0603JRNPO9BN391
1	C50	Capacitor, Ceramic, 100 pF, 50V, 1%, C0G, SMD, 0402	Kyocera AVX	04025A101FAT2A
1	J1	Connector, HDR-2.54, Male, 1x2, Tin, 5.84 MH, TH Vertical	Sullins Connector Solutions	PREC002SAAN-RC
2	J2, J3	Connector, HDR-2.54, Male, 1x3, Gold, 6.0 MH, TH Vertical	Adam Tech	PH1-03-UA
5	J5, J6, J7, J10, J12	Connector, HDR-2.54, Male, 1x2, Gold, 5.84 MH, TH Vertical	Multicomp Pro	SPC20481
3	J15, J16, J20	Connector, HDR-2.54, Male, 1x1, Gold, 5.84 MH, TH Vertical	Samtec, Inc.	TSW-101-07-G-S
1	JP1	Mech HW Jumper, 2.54 mm, 1x2	Sullins Connector Solutions	STC02SYAN
4	MP1, MP2, MP3, MP4	Connector, Terminal Screw, 50A, Female, 1x1, M4, TH Vertical	Wurth Elektronik	74650174R
4	PAD1, PAD2, PAD3, PAD4	Mech HW Rubber Pad, Cylindrical, D9.53H5.97	3M	SJ61A2
1	R1	Resistor, TKF, 300k, 1%, 1/10W, SMD 0603	Panasonic	ERJ-3EKF3003V
1	R2	Resistor, TKF, 8.45k, 1%, 1/10W, SMD 0603	Yageo Corporation	RC0603FR-078K45L
2	R3, R9	Resistor, TKF, 10k, 1%, 1/10W, SMD 0603	NIC Components Corp.	NRC06F1002TRF
1	R5	Resistor, TKF, 34k, 1%, 1/10W, SMD 0603	Vishay	CRCW060334K0FKEA
1	R6	Resistor, TKF, 49.9k, 1%, 1/10W, SMD 0603	Panasonic	ERJ-3EKF4992V
1	R7	Resistor, TKF, 5.62k, 1%, 1/10W, SMD 0603	Panasonic	ERJ-3EKF5621V
1	R8	Resistor, TKF, 249k, 1%, 1/10W, SMD 0603	Panasonic	ERJ-3EKF2493V
1	R10	Resistor, TKF, 0R, 1/10W, SMD 0603	Yageo Corporation	RC0603FR-070RL
1	R11	Resistor, TKF, 1.4k, 1%, 1/10W, SMD 0603	Panasonic	ERJ-3EKF1401V
1	R12	Resistor, TKF, 120k, 1%, 1/10W, SMD 0603, AEC-Q200	KOA Speer Electronics, Inc.	RK73H1JTTD1203F
1	MOD1	Module, 20V, 35A	Microchip Technology Inc.	MIC45M235T-E/5JW

Table 3-2. Do Not Populate

Qty	Reference	Description	Manufacturer	Part Number
2	C11, C23	Capacitor, Ceramic, 0.022 μ F, 50V, 10%, X7R, SMD, 0603	Yageo Corporation	CC0603KRX7R9BB223
1	C42	Capacitor, Aluminum, 220 μ F, 25V, 20%, SMD G	Wurth Elektronik	875075561008
2	J8, J9	Connector, HDR-2.54, Male, 1x2, Gold, 5.84 MH, TH Vertical	Multicomp Pro	SPC20481
1	J11, J13, J14, J17, J18, J19	Connector, HDR-2.54, Male, 1x1, Gold, 5.84 MH, TH Vertical	Samtec, Inc.	TSW-101-07-S-S
1	R4	Resistor, TKF, 10k, 1%, 1/10W, SMD 0603, AEC-Q200	Panasonic	ERJ-3EKF1002V

4. Performance

This section provides specific operation waveforms and graphs. Refer to the MIC45M235 Data Sheet (DS2000xxxx) for more information.

Figure 4-1. Efficiency ($V_{OUT} = 1.0V$, $F_{SW} = 400\text{ kHz}$)

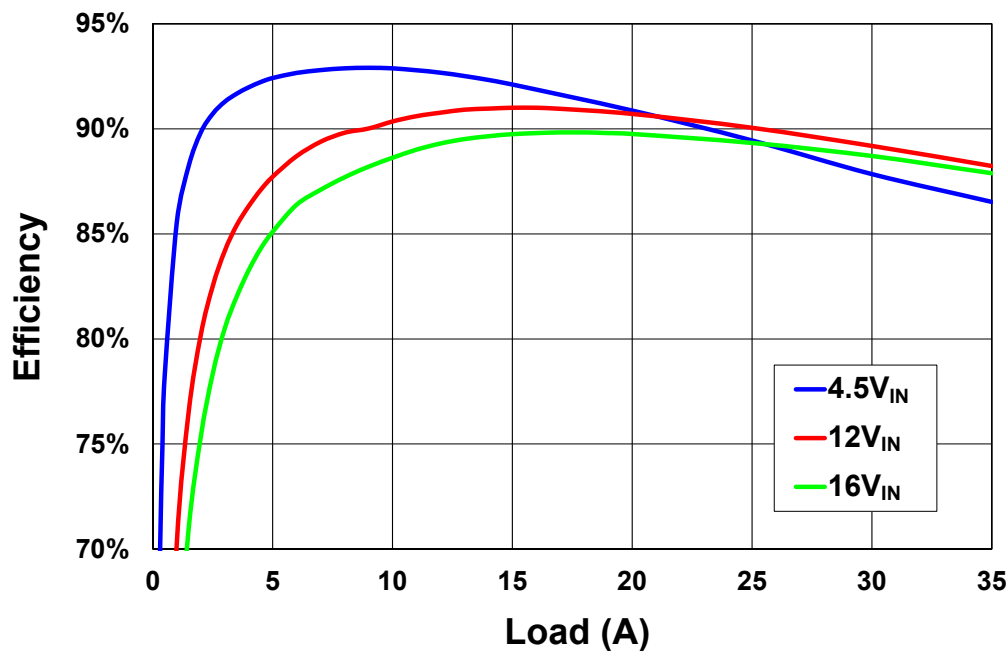


Figure 4-2. Efficiency ($V_{IN} = 12V$, $V_{OUT} = 1.0V$)

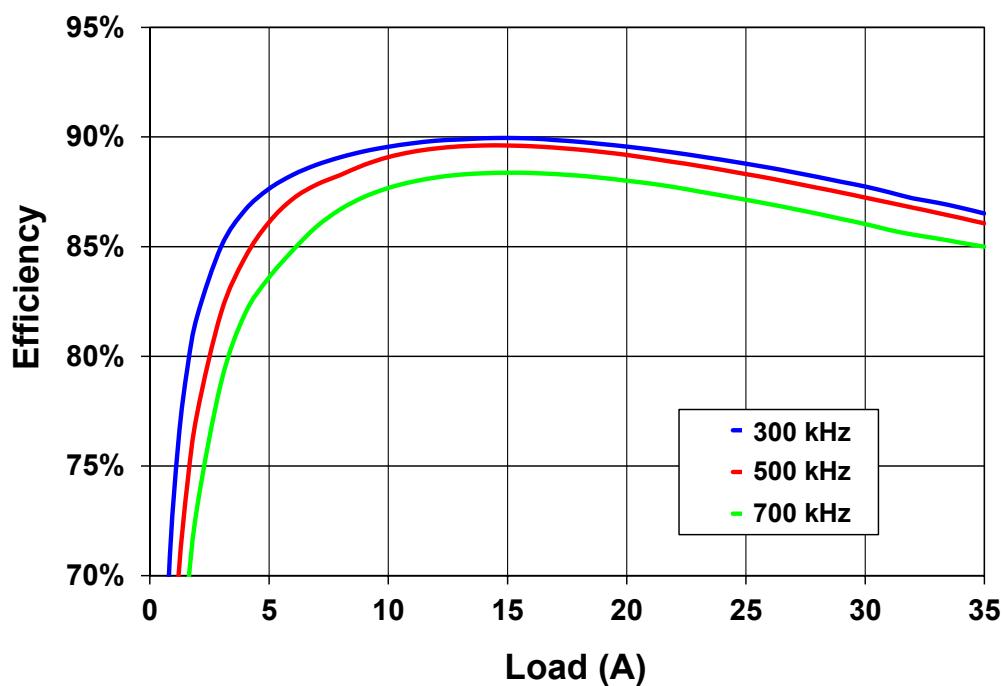


Figure 4-3. Efficiency ($V_{IN} = 12V$, $F_{SW} = 400\text{ kHz}$)

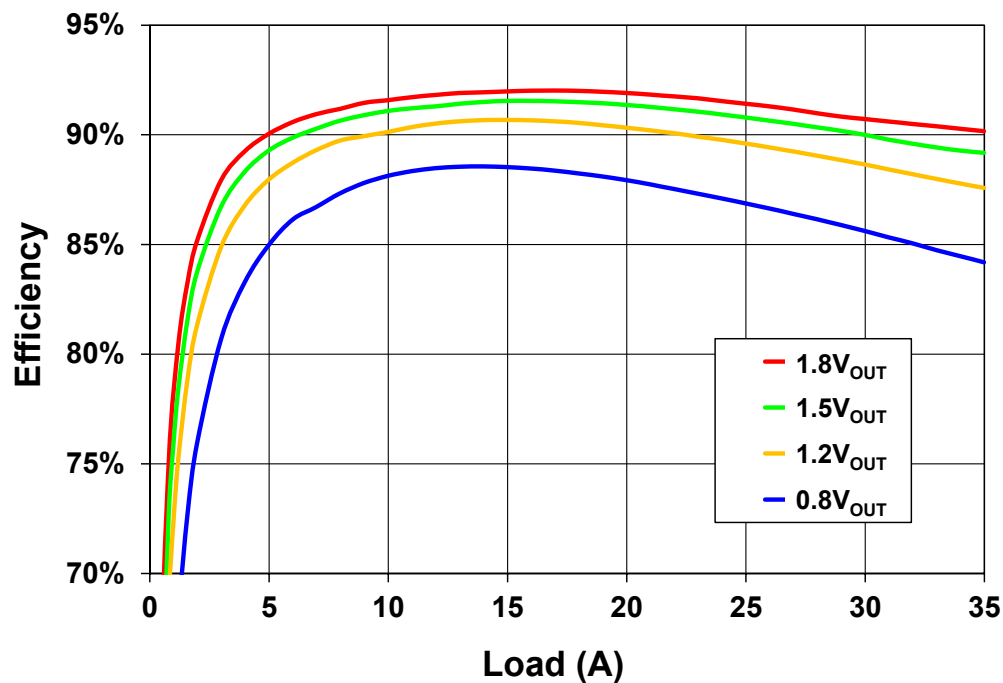


Figure 4-4. Startup ($I_{OUT} = 20A$, $R_{SS} = 120\text{ k}\Omega$)

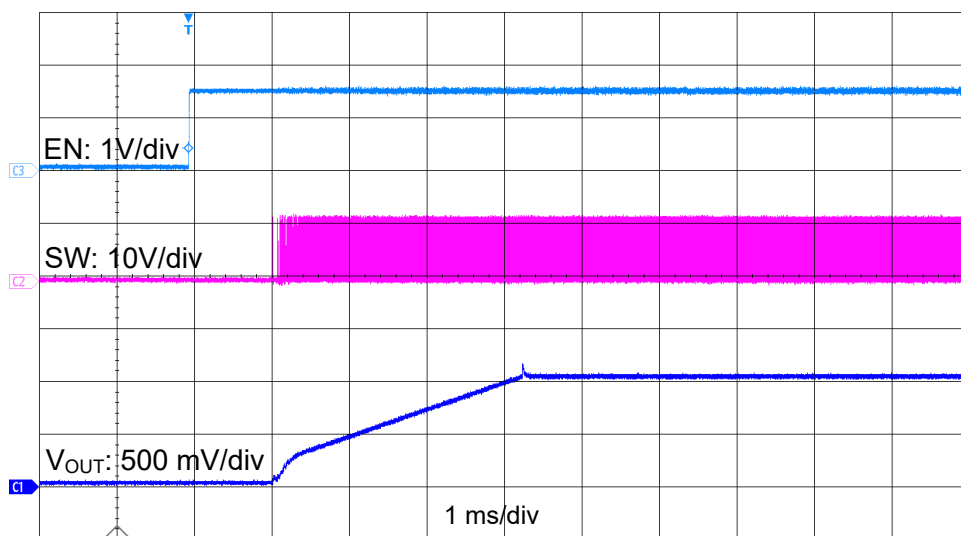


Figure 4-5. Startup ($I_{OUT} = 24A$, $R_{SS} = 10\text{ k}\Omega$)

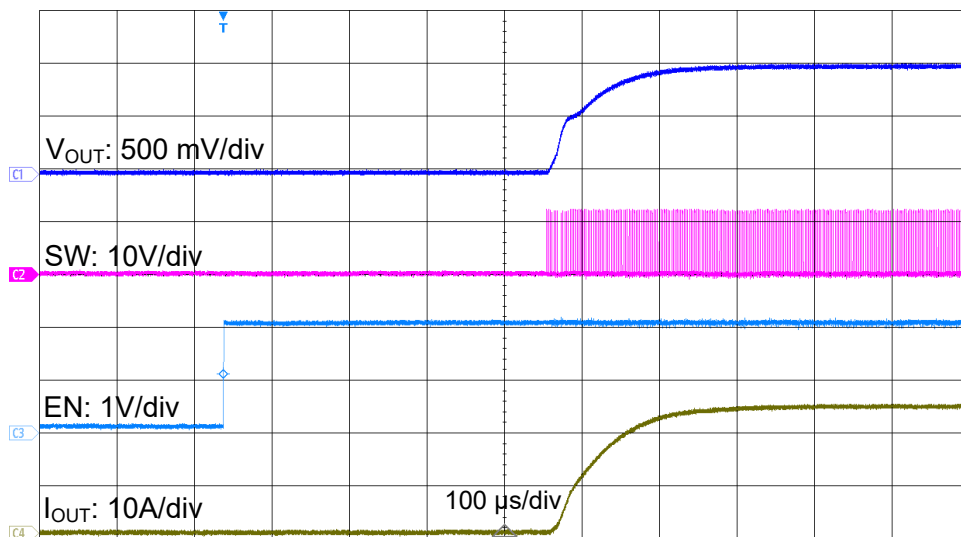


Figure 4-6. Switching Waveform

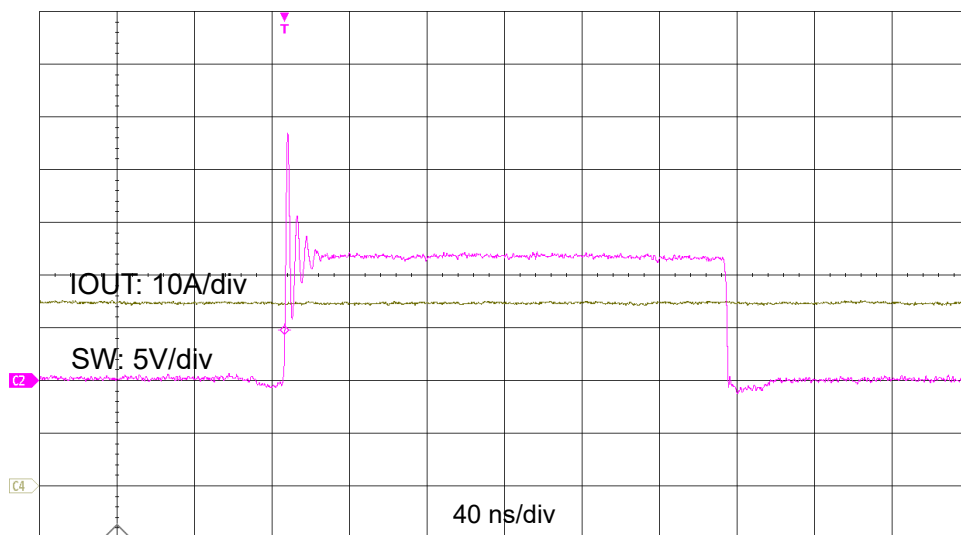


Figure 4-7. Load Transient (17A to 35A)

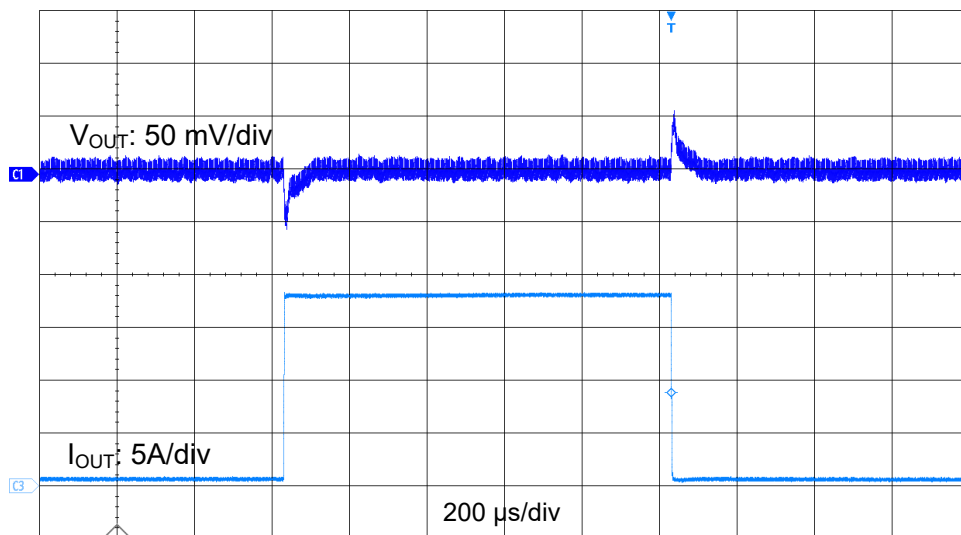


Figure 4-8. V_{OUT} Ripple

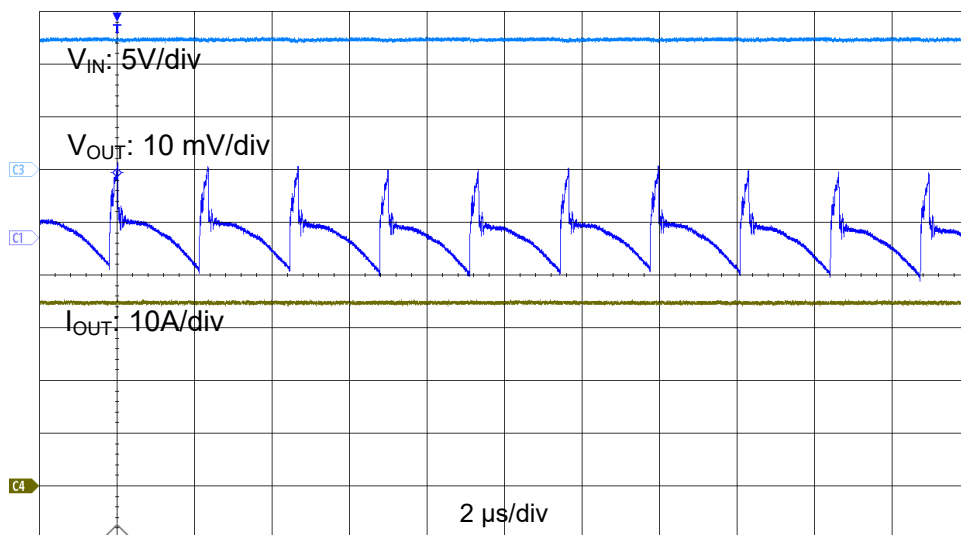
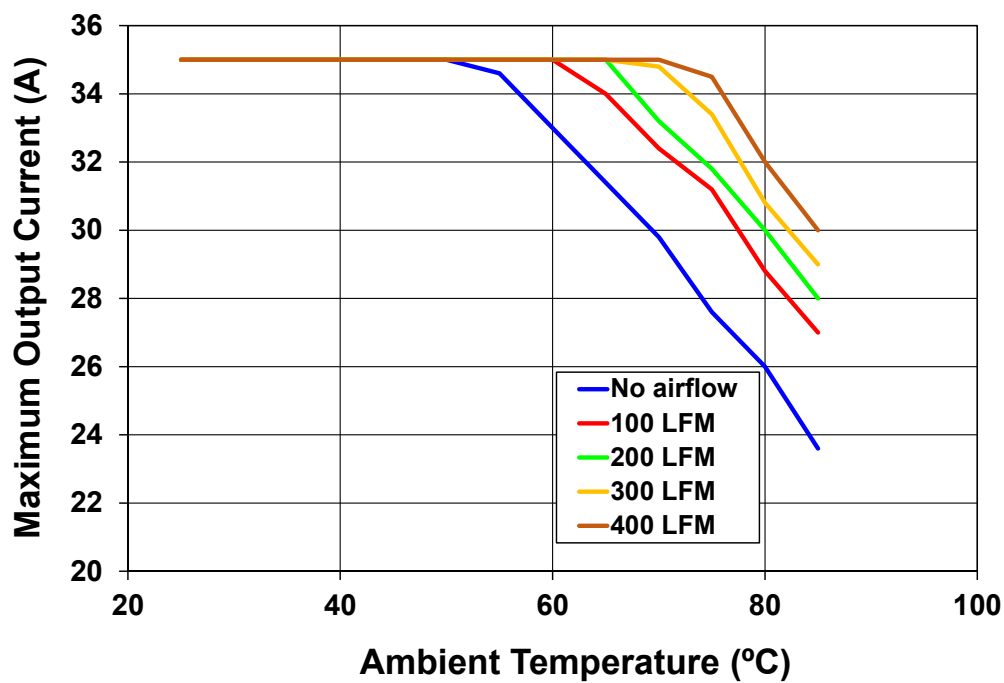


Figure 4-9. Current Derating vs. Temperature (Limit Power-stage Case Temperature to 120°C)

5. References

Table 5-1. Recommended Reading

Source	Document Title	Literature Number	Available
Microchip Technology, Inc.	MIC45M235 Data Sheet	DS-20007104A	

6. Revision History

Doc. Rev.	Date	Comments
A	March 2026	Initial release of this document.

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