MIC2199 Evaluation Board

300kHz SO-8 Synchronous Buck Control IC

Introduction

Micrel's MIC2199 is a high power 300kHz synchronous buck DC-DC controller housed in a small 4mm x 4mm MLF™ 12-lead package. The MIC2199 operates from a wide 4.5V to 32V input and can be programmed for output voltages from 0.8V to 6V. The wide input voltage capability makes the MIC2199 an ideal solution for point-of-load DC-to-DC conversion in 5V, 12V and higher systems.

The 300kHz switching frequency allows the use of small inductor and small output capacitors. The current mode PWM control along with external COMP pin allows for ease of stability compensation and fast transient response across a wide range of applications.

An all N-Channel synchronous architecture and powerful output drivers allow up to 20A of output current capability. For smaller external components, refer to the 500kHz MIC2198.

MIC2199 Evaluation Board Input/Output Voltages and Load Current

The MIC2199 evaluation board is designed to operate from V_{IN} = 5V to 12V at an output voltage of 1.5V, 2.5V, or 3.3V at a load current of up to 5A. This evaluation board can easily be modified to handle up to 32V_{IN} by changing the input capacitor voltage rating; and handle higher load current by paralleling MOSFETs in the Q3 and Q4 slots and lowering the sense resistor value to handle higher load current. Consult the MIC2199 data sheet for more information.

Quick-Start Guide

Refer to Figure 1 for the following:

1. Connect the positive terminal from the power supply to V_{IN} post (J1) on the MIC2199 evaluation board.
2. Connect the GND terminal of the input power supply to GND (J2).
3. Connect a digital voltmeter across V_{OUT} (J3) and GND (J4) to measure output voltage.
4. Program the output voltage by selecting jumper JP1 to be in 3.3V, 2.5V, or 1.5V position.
5. After turning the input supply on, the output voltage should read the programmed output voltage.

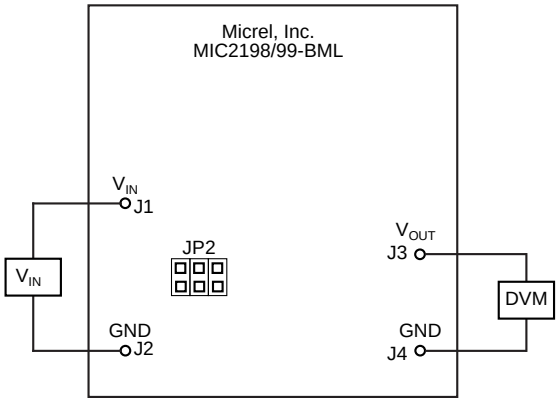

Figure 1. MIC2199 Evaluation Board Hookup

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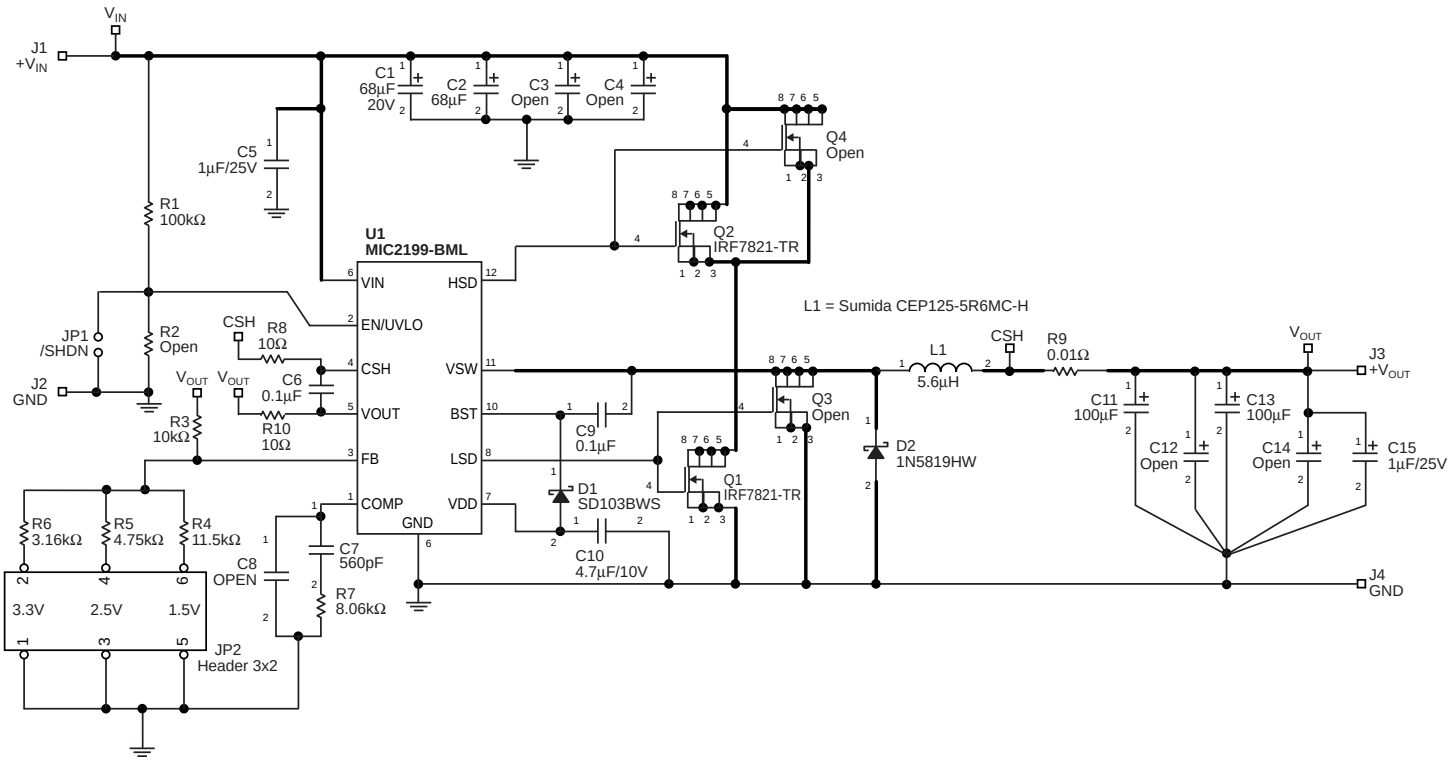
Evaluation Board Schematic



Evaluation Board Efficiency

Figures 2 and 3 show the MIC2199 efficiency for input voltages of 5V and 12V.

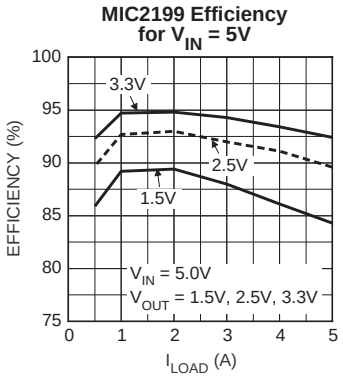


Figure 2. MIC2199 Efficiency for V_{IN} = 5V and V_{OUT} = 1.5V, 2.5V, 3.3V

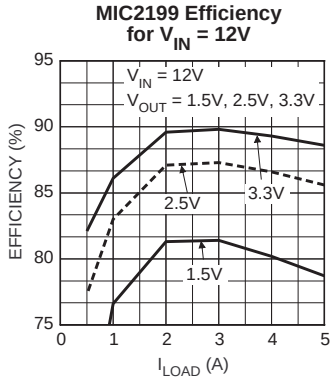


Figure 3. MIC2199 Efficiency for V_{IN} = 12V and V_{OUT} = 1.5V, 2.5V, 3.3V

Transient Response

Figures 4 and 5 show the transient response and output voltage ripple for the MIC2199 evaluation board.

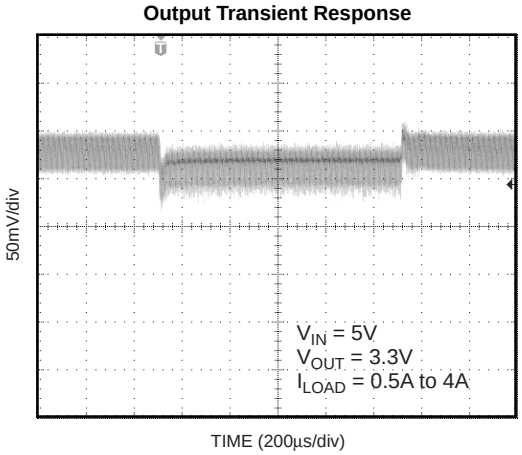


Figure 4. MIC2199 Output Transient Response for V_{IN} = 5V, V_{OUT} = 3.3V, I_{LOAD} = 0.5A to 4A

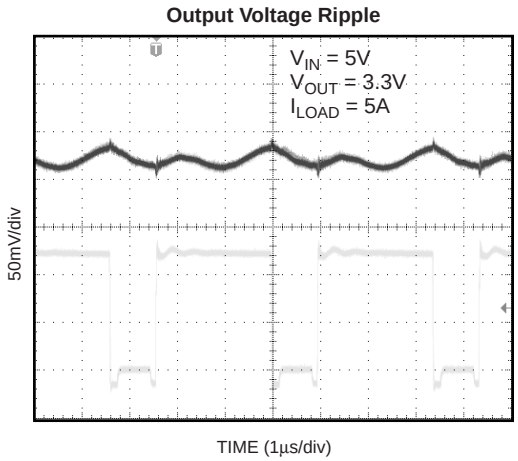


Figure 5. MIC2199 Output Voltage Ripple for V_{IN} = 5V, V_{OUT} = 3.3V, I_{LOAD} = 5A

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1, C2	TPSD686M020R0200 594D686X0020C2T	AVX[1] Vishay[2]	68µF/20V	2 OR
C3, C4			OPEN	0
C5, C15	GRM216R61E105KA12D VJ0603S105KXAAT	Murata[3] Vitramon[2]	1µF/25V, size 0805	1 OR
C6, C9	VJ0603Y104KXXA**T**	Vitramon[2]	0.1µF, size 0603, X7R, 25V	2
C7	VJ0603Y222KXAAT	Vitramon[2]	560pF, size 0603, X7R, 50V	1
C8		Vitramon[2]	OPEN, size 0603	0
C10	GRM188R61A475KE19D VJ0805S225KXAAT	muRata[3] Vitramon[2]	4.7µF, size 0603, 10V	1 OR
C11, C13	TPSJ107K010R0050 594D107KX06R3D2T	AVX[1] Vishay[2]	100µF, 6.3V	2 OR
C12, C14			OPEN	0
D1 D1	CMDSH2-3 SD103AWS	Central Semiconductor[4] Vishay/GS[2]	0.5A, 30V Schottky	1 OR
D2	1N5819HW	Diodes, Inc.[5]	1A, 40V Schottky	1
J1-J4	2551-2-00-01-00-00-07-0	MilMax	Turret Pins	4
JP1	S1010-02-ND	Sullins	1x2 header	1
JP2	S1012-04-ND	Sullins	3x2 header	1
JUMPER	SNT-100-BL-G	Samtec	shorting jumper	1
L1	CEP125-5R6MC-H	Sumida[6]	Sumida 5.6µH	1
Q1, Q2	IRF7821TR SI4888DY	International Rectifirer[7] Vishay Siliconix[2]	N-Channel MOSFET	2 OR
Q3, Q4			OPEN	0
R1	CRCW06031003FRT1	Vishay Dale[2]	100kΩ, size 0603, 1%	1
R2		Vishay Dale[2]	OPEN, size 0603	0
R3	CRCW06031002FRT1	Vishay Dale[2]	10kΩ, size 0603, 1%	1
R4	CRCW06031152FRT1	Vishay Dale[2]	11.5kΩ, size 0603, 1%	1
R5	CRCW06034751FRT1	Vishay Dale[2]	4.75kΩ, size 0603,1%	1
R6	CRCW06033161FRT1	Vishay Dale[2]	3.16kΩ, size 0603, 1%	1
R7	CRCW06038061FRT1	Vishay Dale[2]	8.06kΩ 1%, size 0603	1
R8, R10	CRCW060310R0FRT1	Vishay Dale[2]	10Ω, 1%, size 0603	2
R9	WSL2512-R01-F	Vishay Dale[2]	0.01Ω, size 2512, 1%	1
U1	MIC2199-BML	Micrel Semiconductor[8]	500kHz Sync-Buck Converter	1

Shaded items not being used by evaluation board.

Vendor Phone Numbers:

1. AVX tel: 843-448-9411
2. Vishay tel: 206-452-5664
3. Murata tel: 800-831-9172
4. Central Semiconductor tel: 631-435-1110
5. Diodes, Inc. tel: 805-446-4800
6. Sumida tel: 408-321-9660
7. International Rectifier tel: 310-322-3331
8. **Micrel Semiconductor** tel: 408-944-0800

Printed Circuit Board Layouts

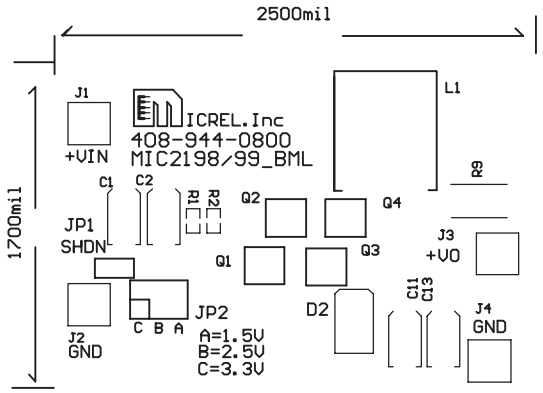


Figure 6a. Top Silkscreen

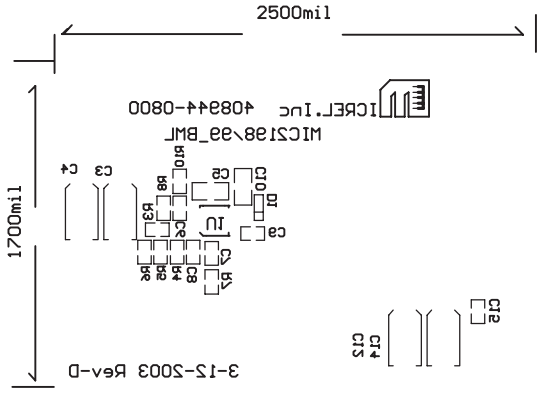


Figure 6c. Bottom Silkscreen

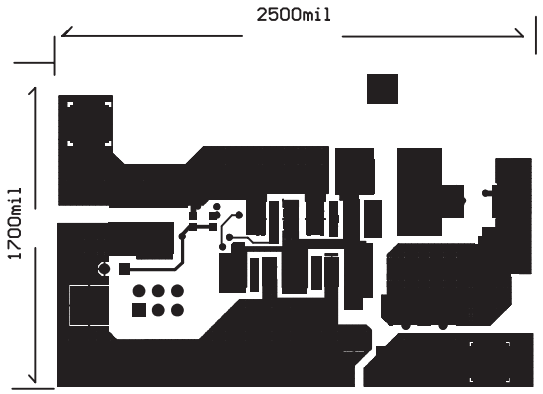


Figure 6b. Top Layer

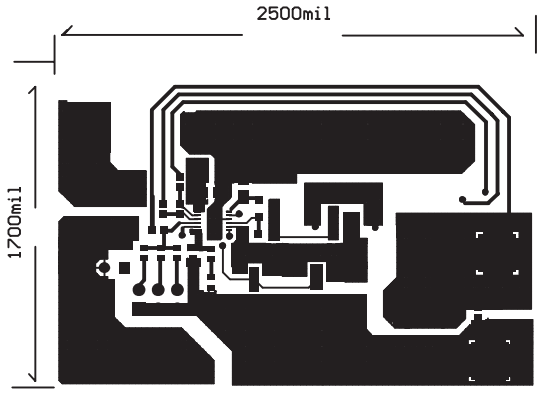


Figure 6d. Bottom Layer

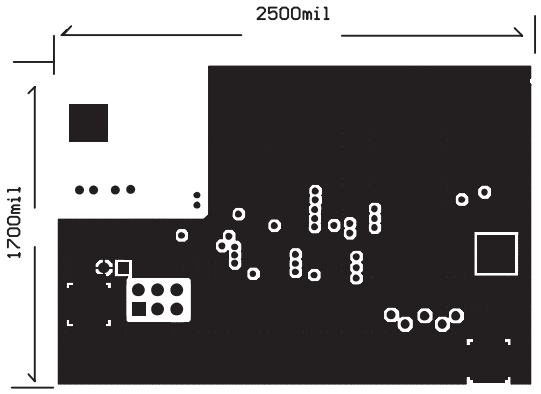


Figure 6e. Midlayer1

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