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MAXLINEAR

MxL7704
Five Output Universal PMIC
EVB User Manual

Revision History

Revision	Release Date	Change Description
1A	2/28/18	Initial Release
019UMR00	11/22/19	Correct inductor count in MxL7704-X BOM. Update cover page.

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Introduction

The MxL7704 evaluation board provides a platform to evaluate the features and performance of the MxL7704. The MxL7704 is a five output Universal PMIC optimized for powering low power FPGAs, DSPs, and microprocessors from 5V inputs.

The MxL7704 power module and evaluation board come in two configurations which are summarized in Table 1.

Please refer to the MxL7704 datasheet for additional information about the MxL7704.

Ordering Information

Table 1: Evaluation Board Ordering Part Numbers(1)

PMIC	Evaluation Board	Channel	Output Voltage (V)	Switching Frequency (MHz)
MxL7704-AQB-T	MxL7704-A-EVB	V_{OUT1}	3.3	1.5
		V_{OUT2}	1.8	
		V_{OUT3}	1.35	
		V_{OUT4}	1.2	
MxL7704-XQB-T	MxL7704-X-EVB	V_{OUT1}	3.3	1
		V_{OUT2}	1.8	
		V_{OUT3}	1.35	
		V_{OUT4}	0.85	

NOTE:

1. Refer to www.exar.com/MxL7704 for most up-to-date Ordering Information

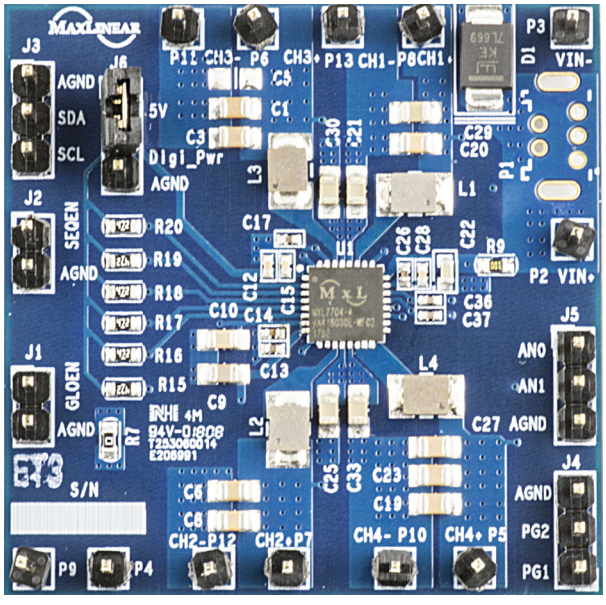


Figure 1: Top View of MxL7704-A-EVB

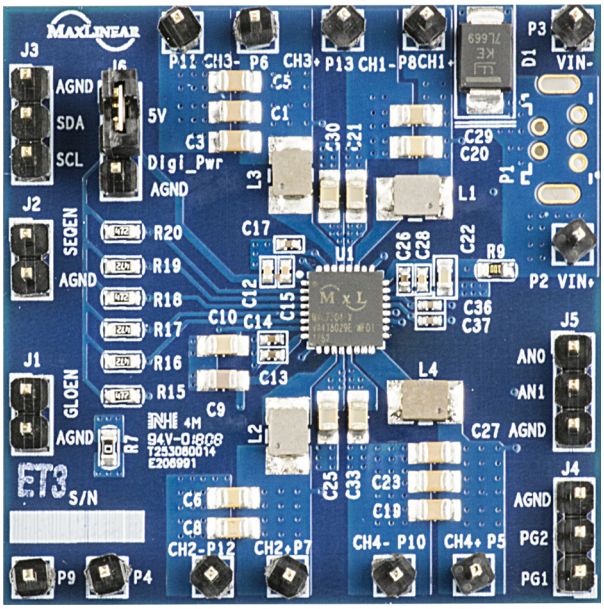


Figure 2: Top View of MxL7704-X-EVB

Evaluation Board Overview

The block diagram shown in Figure 3 illustrates the connection points.

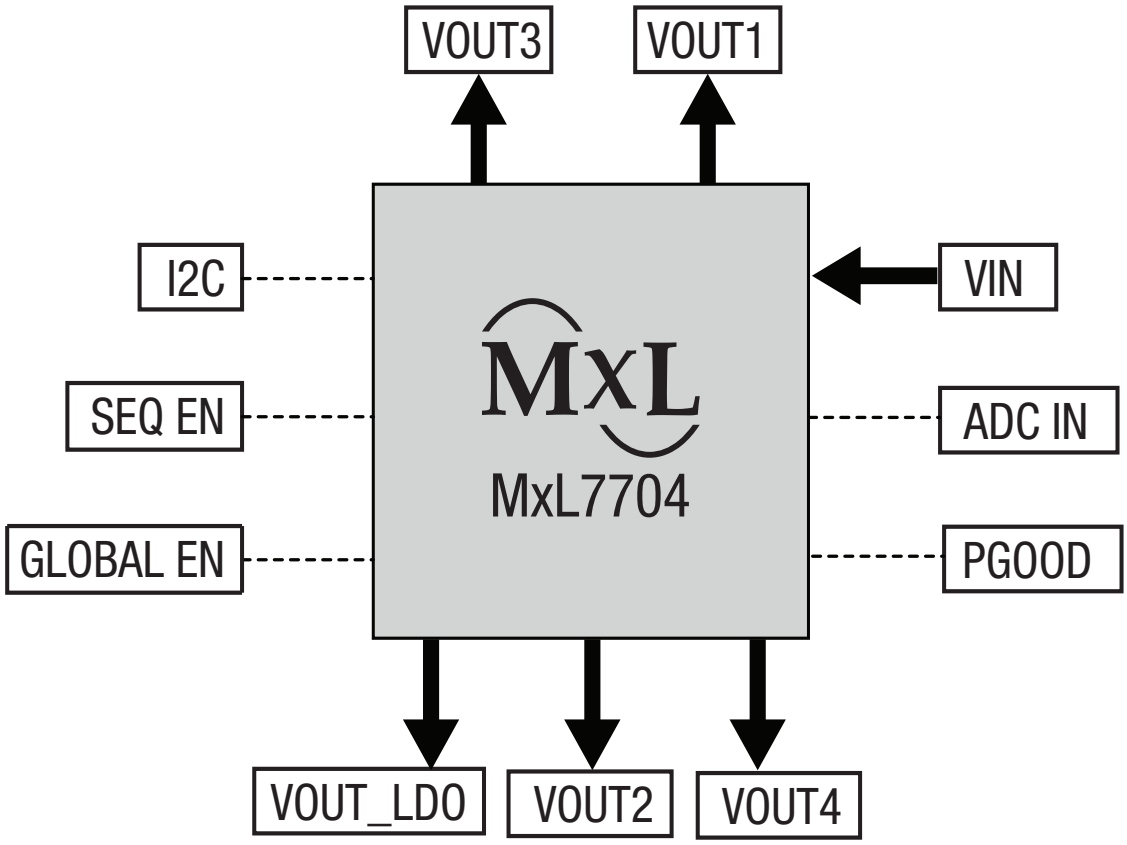


Figure 3: Block Diagram MxL7704 EVB

System Set-Up

Jumpers are factory installed per Table 2 to configure the EVB for operation. Jumper and testing options are described in the next sections. Refer to the product data sheet for additional information.

***Table 2:* Factory Settings**

Jumper	Factory Setting	Description
Digi_Pwr to P5V	J6, Jumper 1-2	Enables all pull-up resistors.

Powering Up the Evaluation Board

- Connect P2 (VIN+) and P3 (VIN-) to a 5V power supply. See Note A.
- Turn on the power supply. The EVB will power up and regulate the outputs as follows:
  - Channel 1: 3.3V
  - Channel 2: 1.8V
  - Channel 3: 1.35V
  - Channel 4: 1.2V (MXL7704-A-EVB) or 0.85V (MXL7704-X-EVB)
  - LDO: 3.3V

Monitoring or Testing V_{OUT}

- The outputs may be left open or connected to an external load. A low impedance connection will provide the best load regulation.

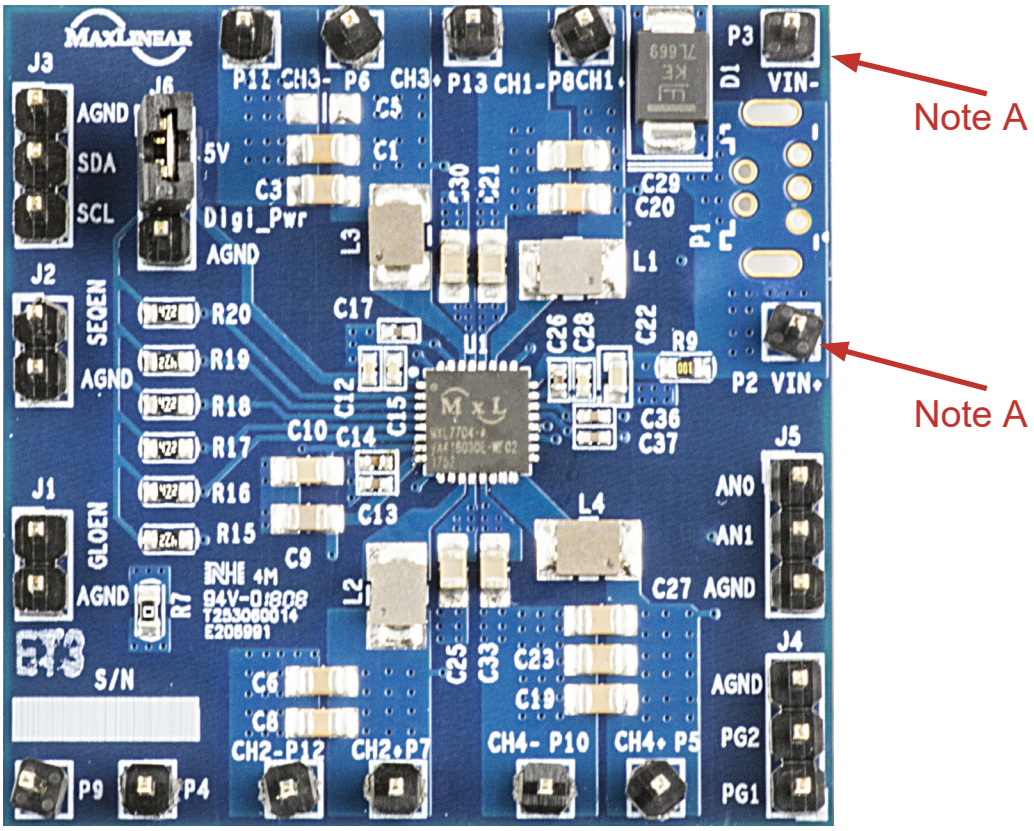
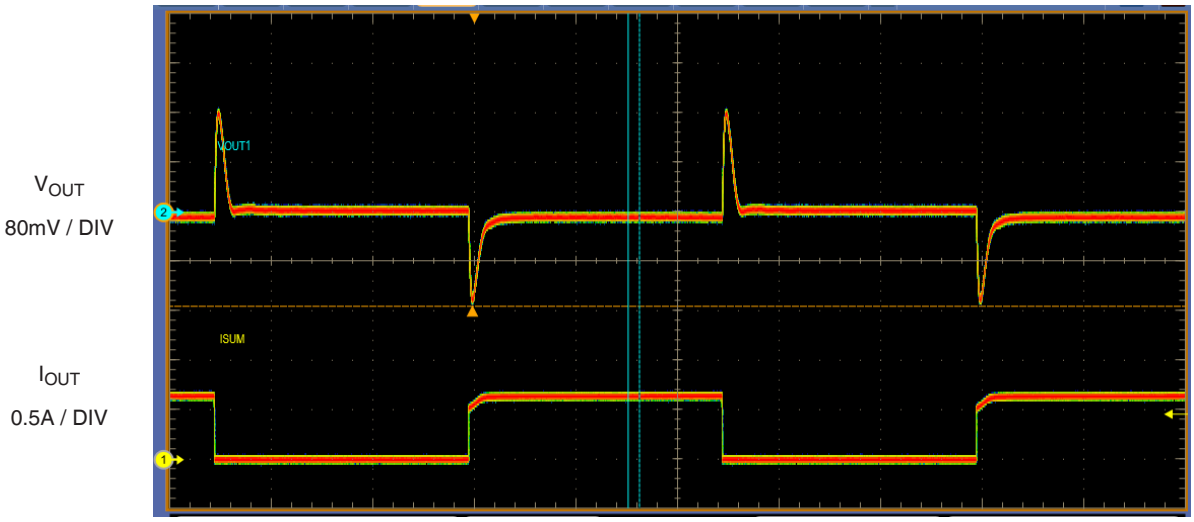


Figure 4: V_{IN} Connection

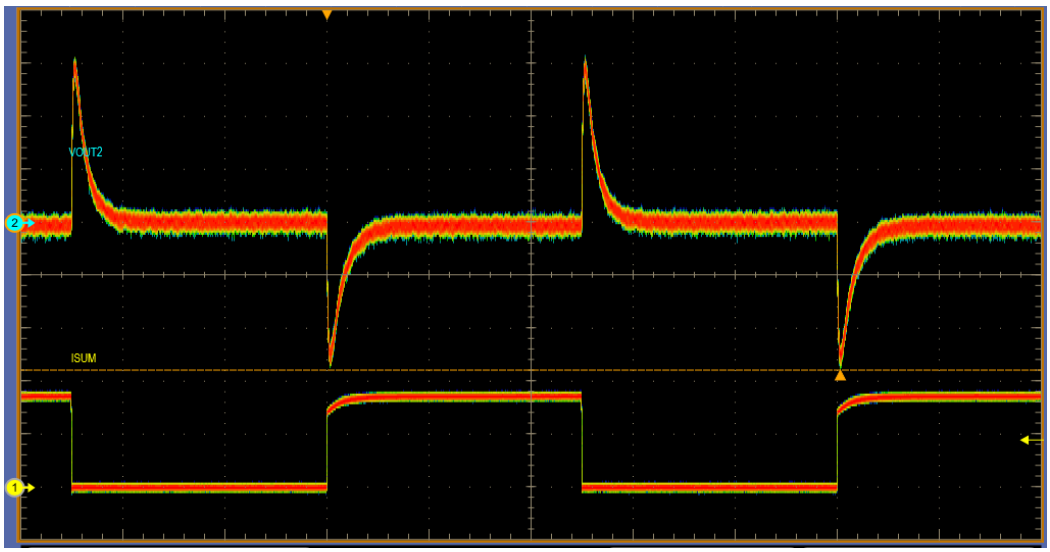
Typical Output Transient Response

The following waveforms were captured on the MXL7704-A-EVB and MXL7704-X-EVB.



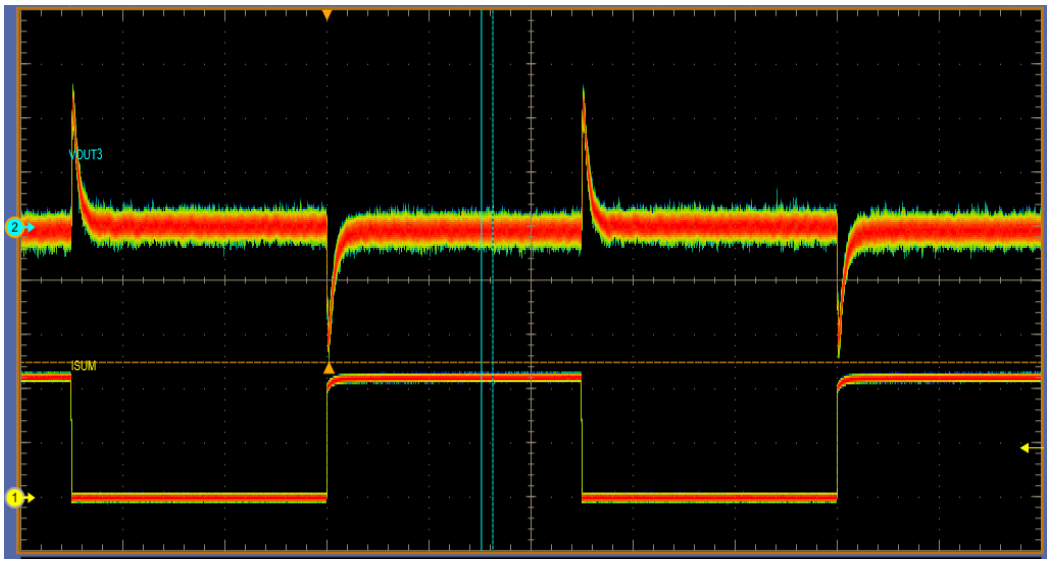
V_{IN} = 5V, V_{OUT} = 3.3V at 1A/µs Load Step
f = 1kHz
L_{OUT} = 2.2µH
C_{OUT} = 22µF, 6.3V X5R Ceramic
C_{OUT} = 2 x 10µF, 6.3V X5R Ceramic

Figure 5: 3.3V Output Transient Response on Channel 1



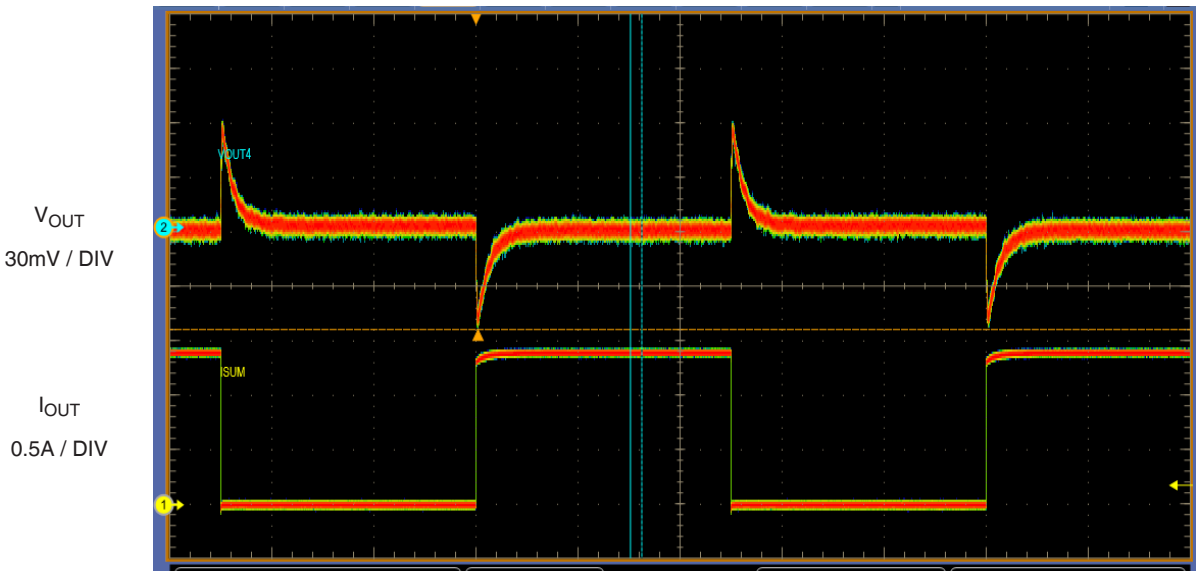
V_{IN} = 5V, V_{OUT} = 1.8V at 1A/µs Load Step
f = 1kHz
L_{OUT} = 1µH
C_{OUT} = 2 x 22µF, 6.3V X5R Ceramic
C_{OUT} = 10µF, 6.3V X5R Ceramic

Figure 6: 1.8V Output Transient Response on Channel 2



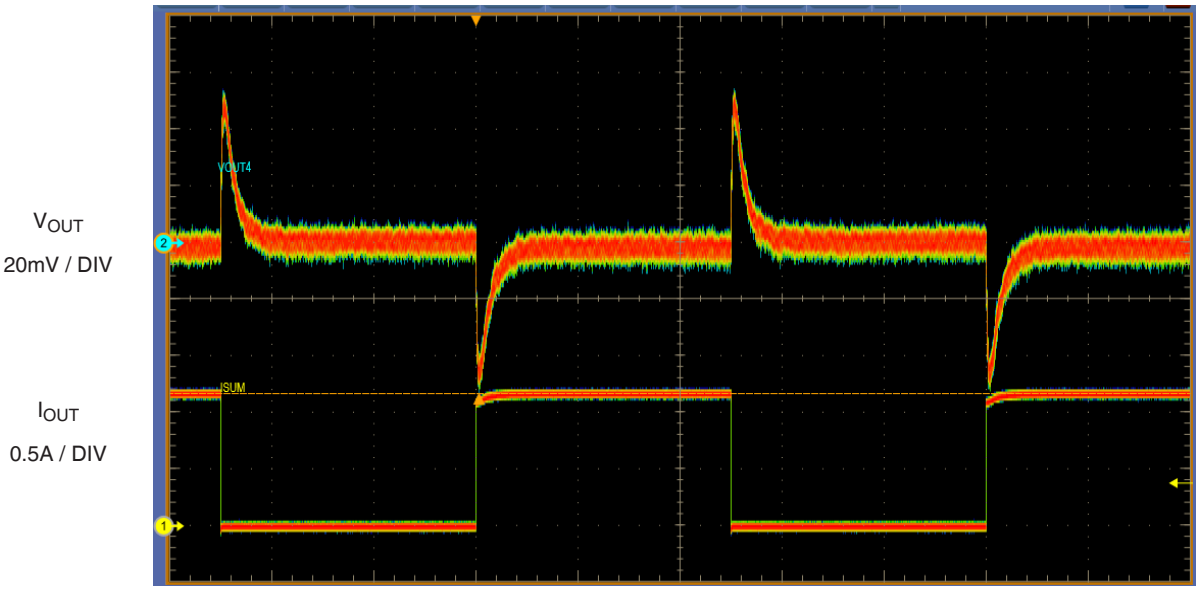
V_{IN} = 5V, V_{OUT} = 1.35V at 1A/µs Load Step
f = 1kHz
L_{OUT} = 0.47µH
C_{OUT} = 2 x 22µF, 6.3V X5R Ceramic

Figure 7: 1.35V Output Transient Response on Channel 3



V_{IN} = 5V, V_{OUT} = 1.2V at 10A/µs Load Step
f = 1kHz
L_{OUT} = 0.47µH
C_{OUT} = 3 x 47µF, 6.3V X5R Ceramic

Figure 8: MxL7704-AQB 1.2V Output Transient Response on Channel 4



V_{IN} = 5V, V_{OUT} = 0.85V at 10A/µs Load Step
f = 1kHz
L_{OUT} = 0.47µH
C_{OUT} = 5 x 47µF, 6.3V X5R Ceramic

Figure 9: MxL7704-XQB 0.85V Output Transient Response on Channel 4

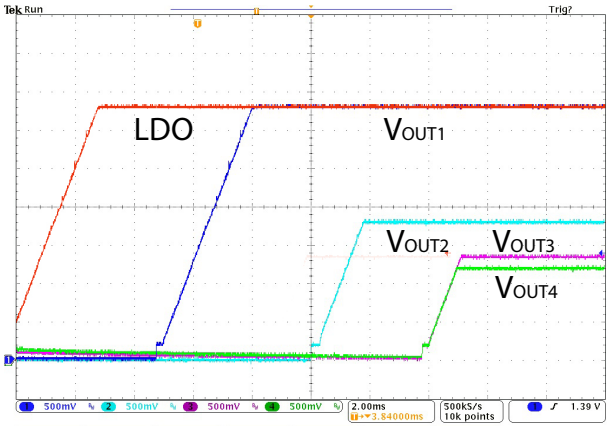


Figure 10: MxL7704-AQB Power-Up Sequencing

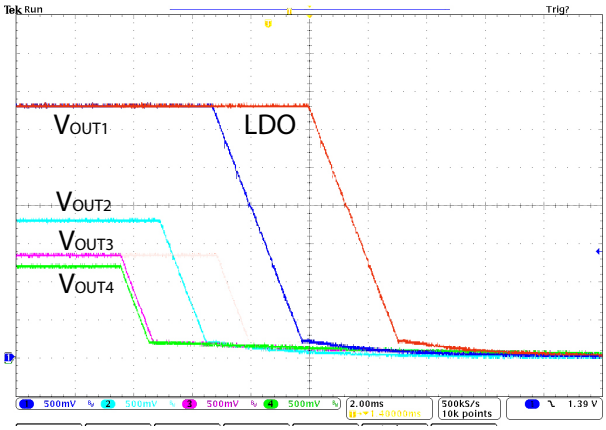


Figure 11: MxL7704-AQB Power-Down Sequencing

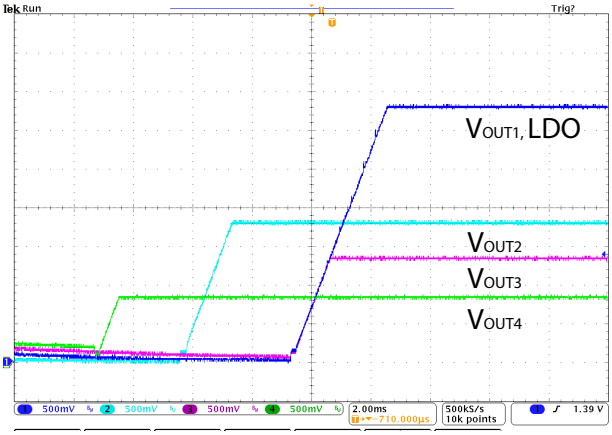


Figure 12: MxL7704-XQB Power-Up Sequencing

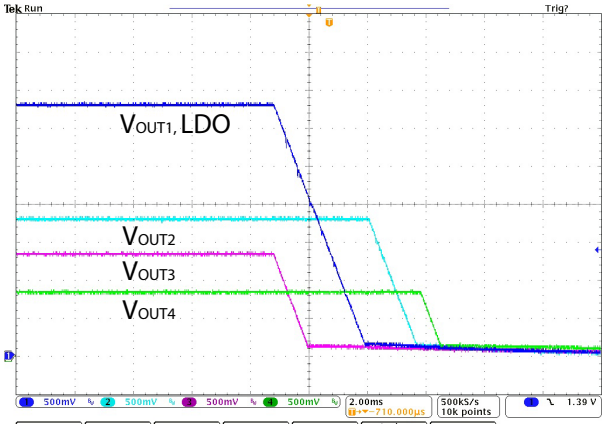
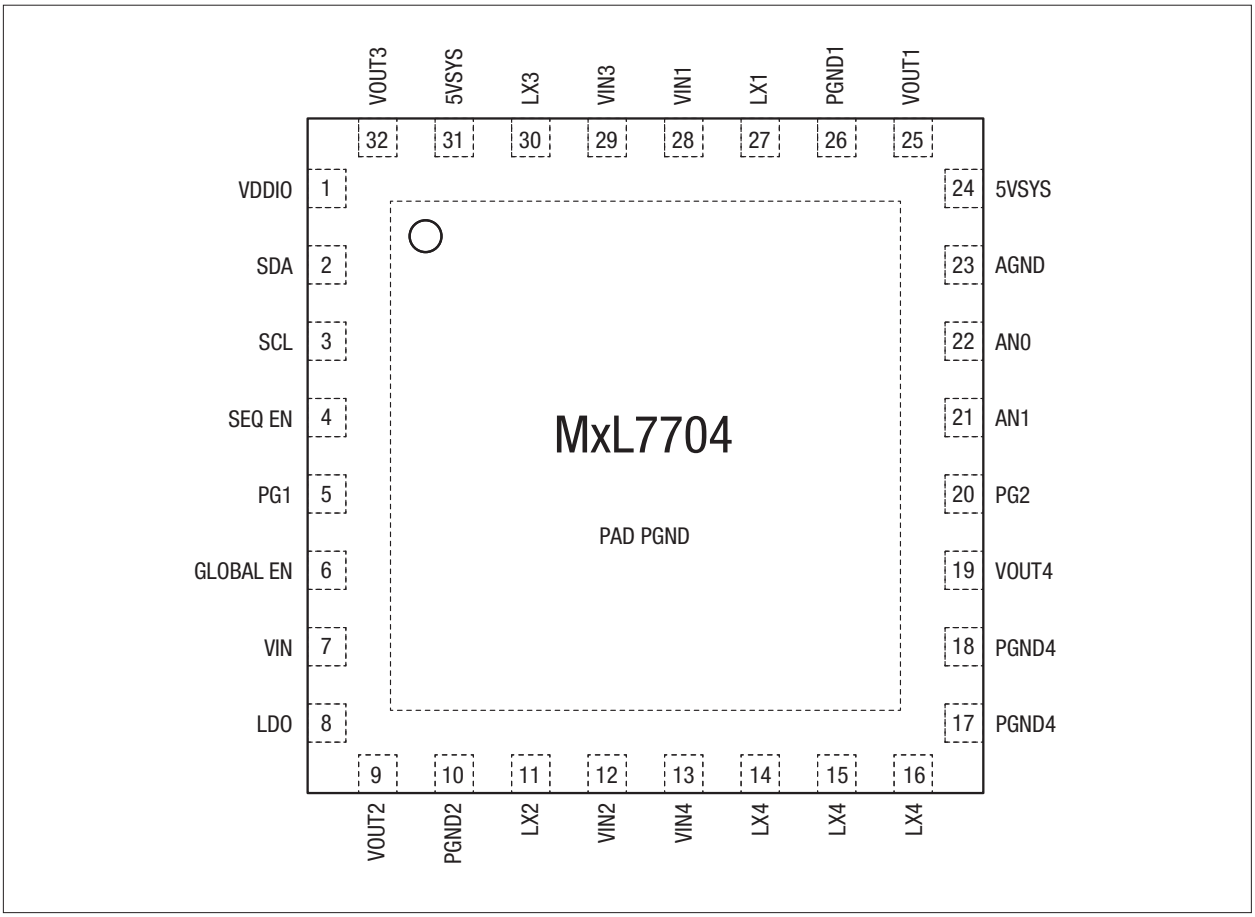


Figure 13: MxL7704-XQB Power-Down Sequencing

Pin Configuration



Top View, 5mm x 5mm QFN-32

Figure 14: Pin Configuration

MxL7704-A-EVB Schematic

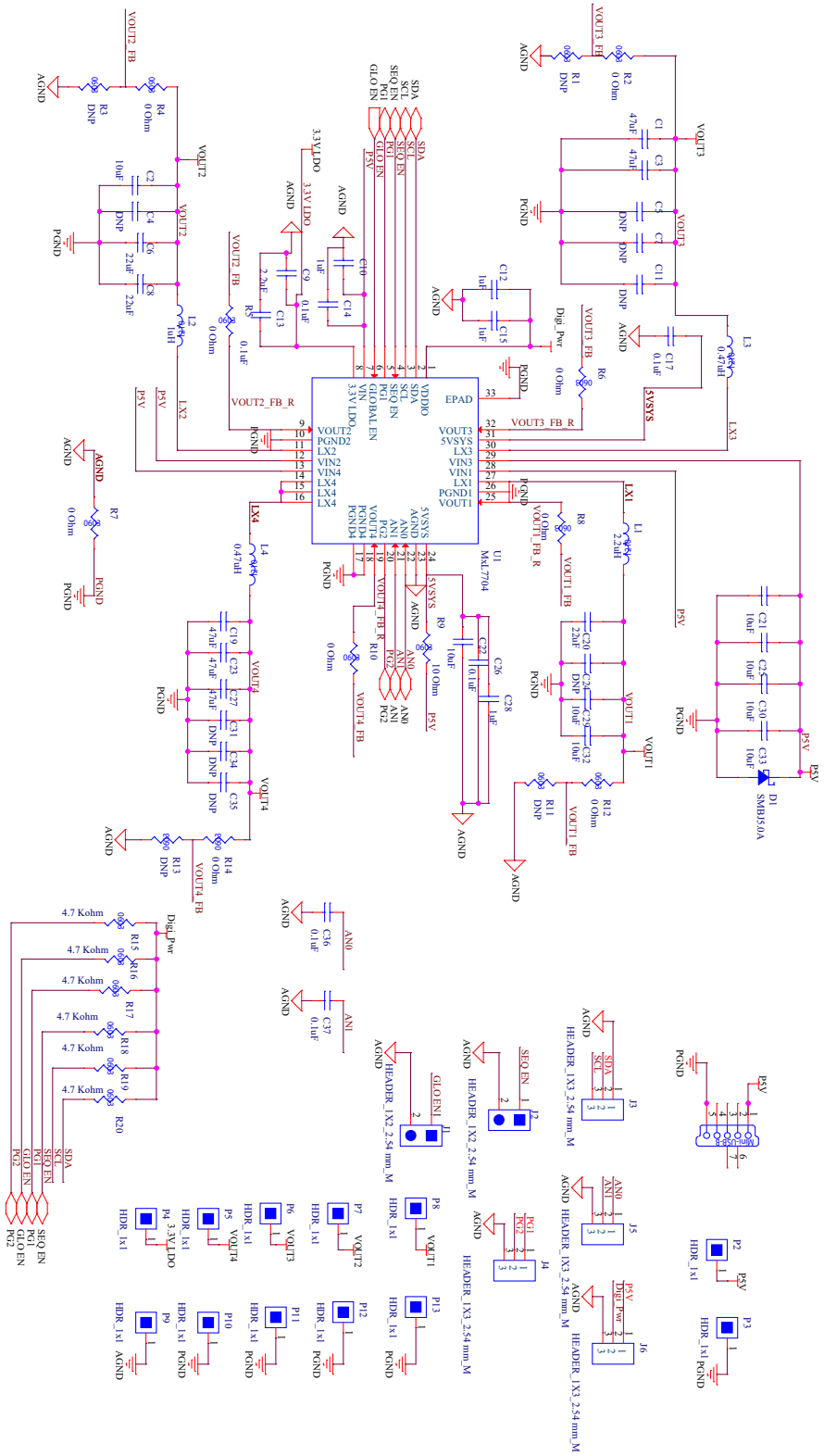


Figure 15: MxL7704-A-EVB Schematic

MxL7704-X-EVB Schematic

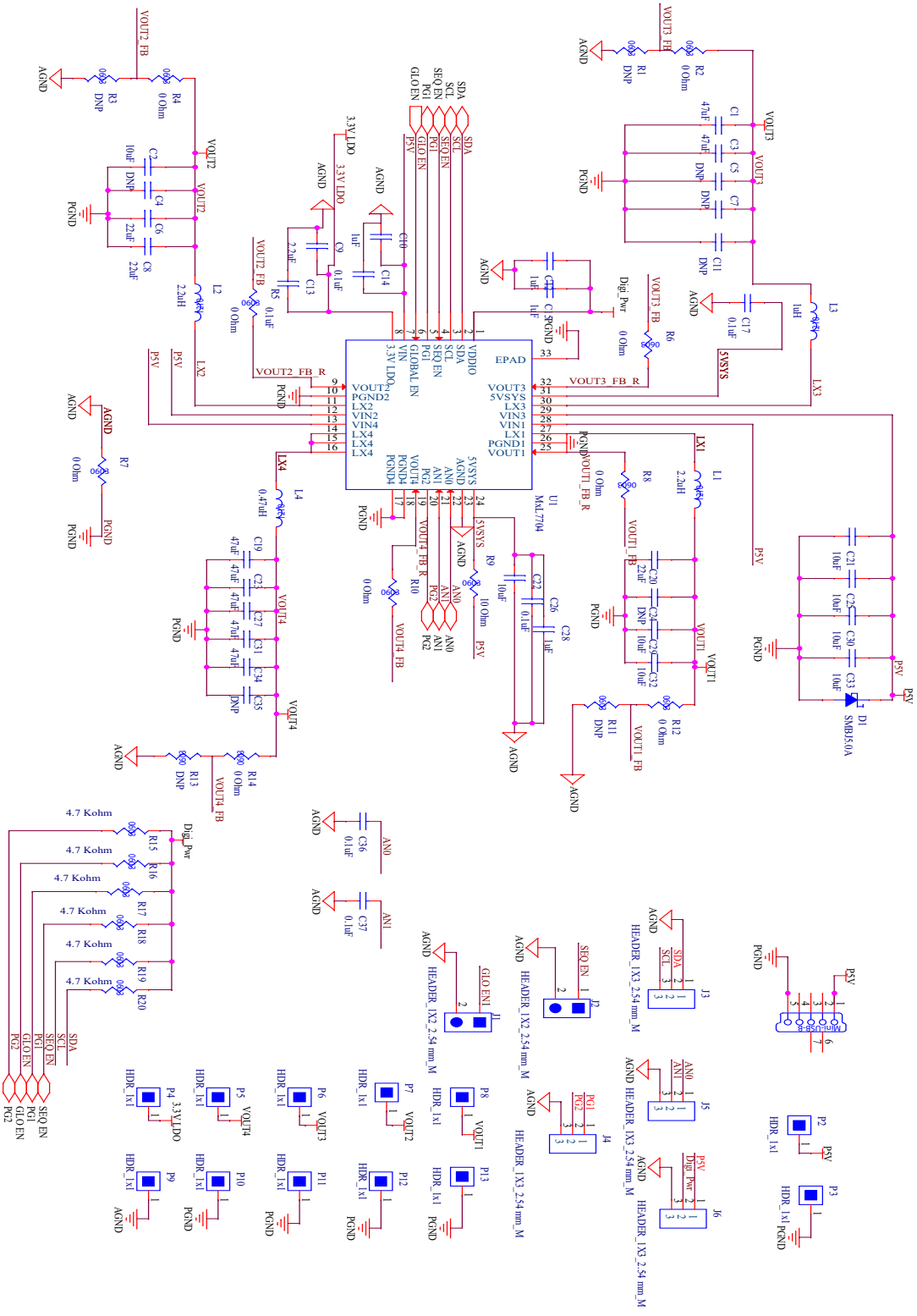


Figure 16: MxL7704-X-EVB Schematic

MxL7704 EVB PCB Layers

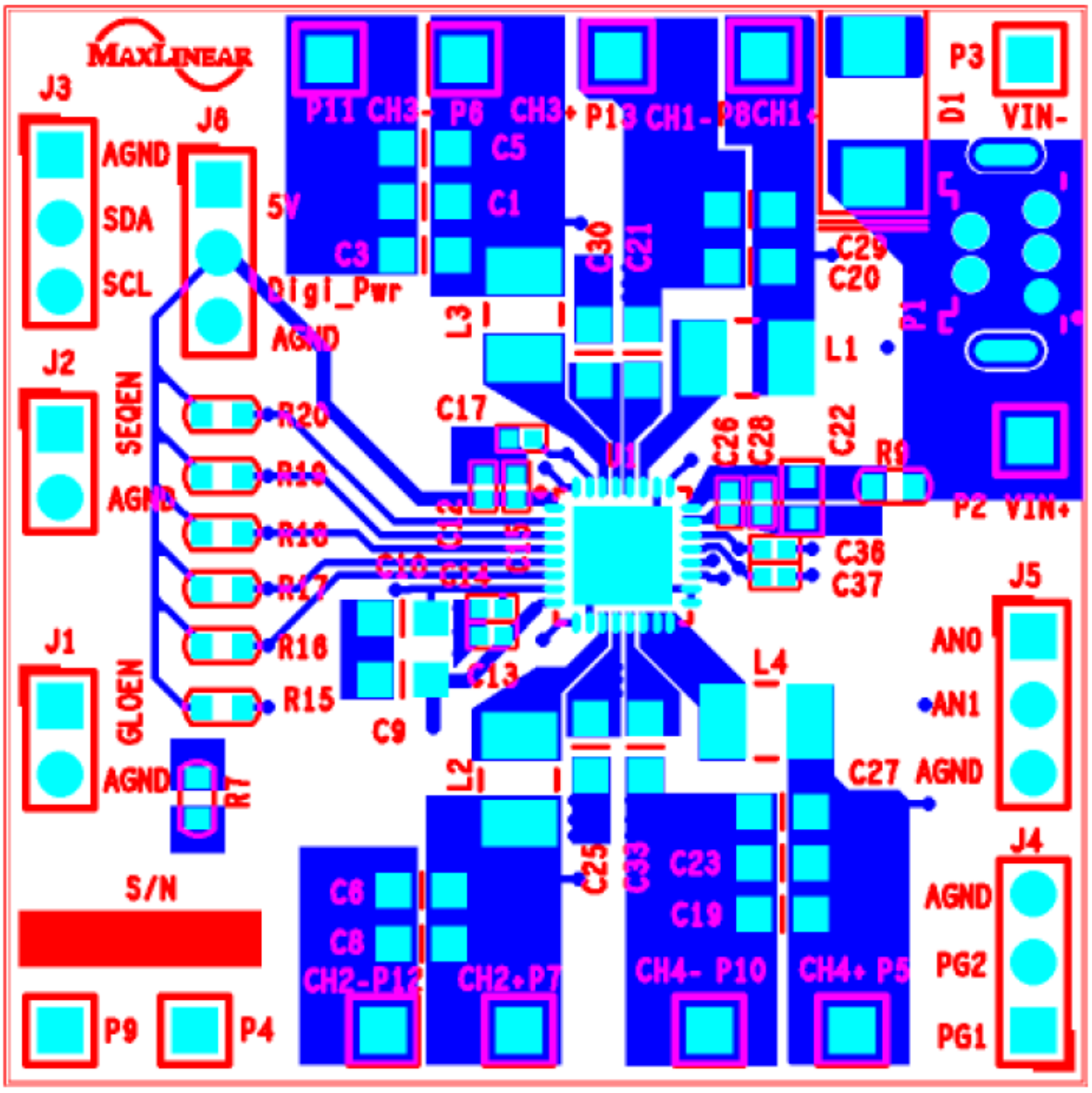


Figure 17: EVB PCB, Top View

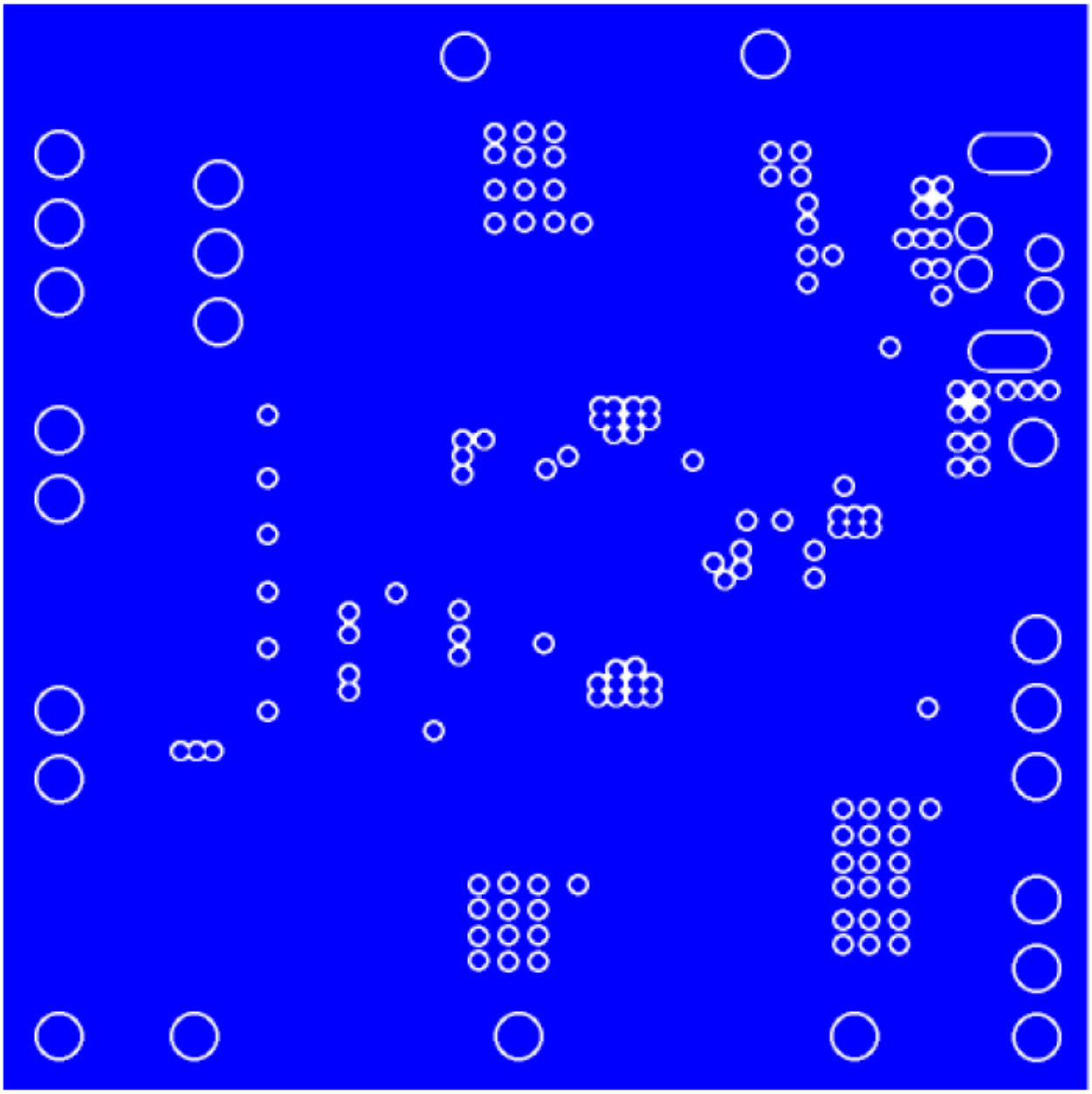


Figure 18: EVB PCB Layer 2, Ground Plane

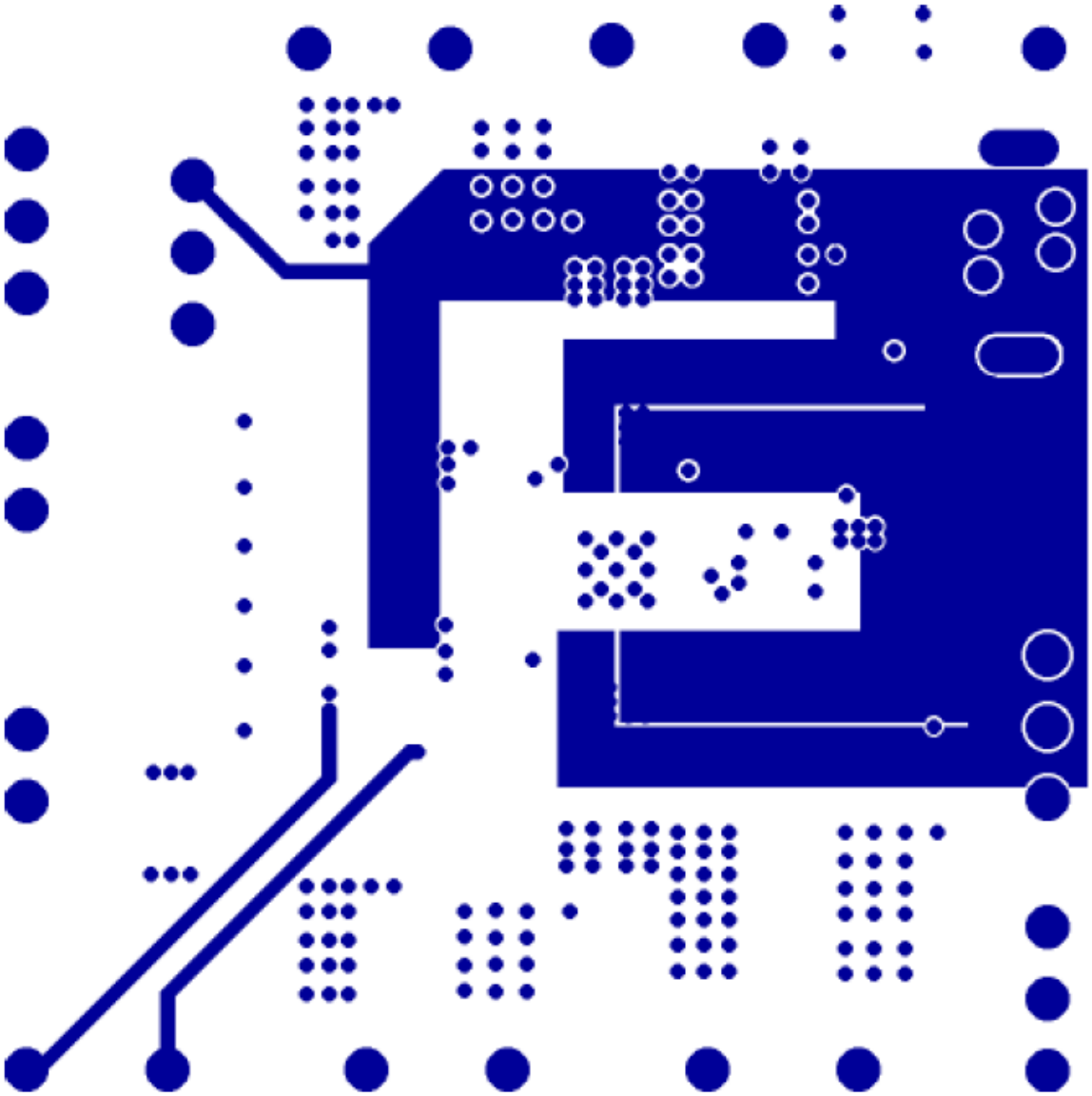


Figure 19: EVB PCB Layer 3, Signal Plane

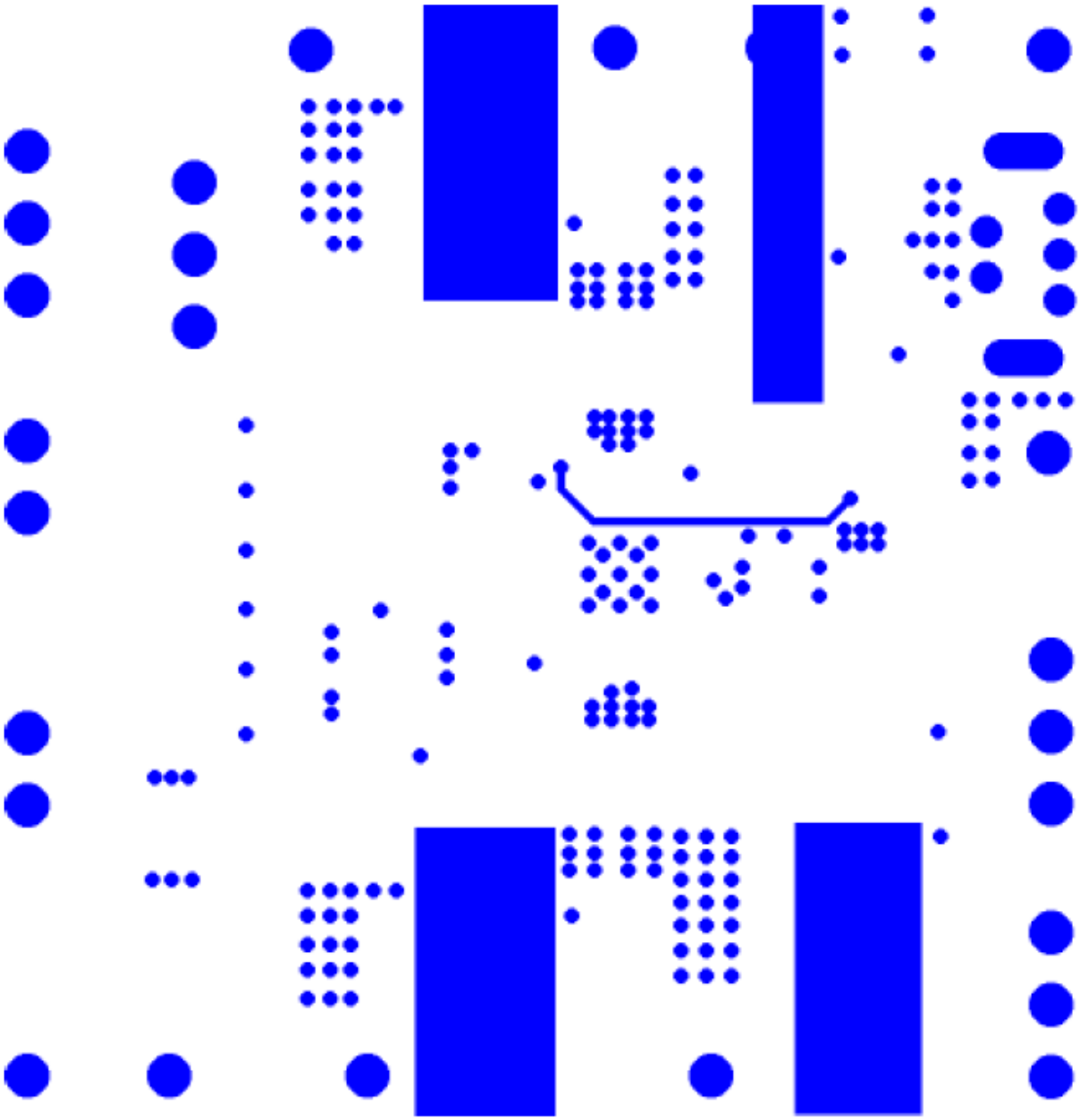


Figure 20: EVB PCB, Layer 4 Signal Plane

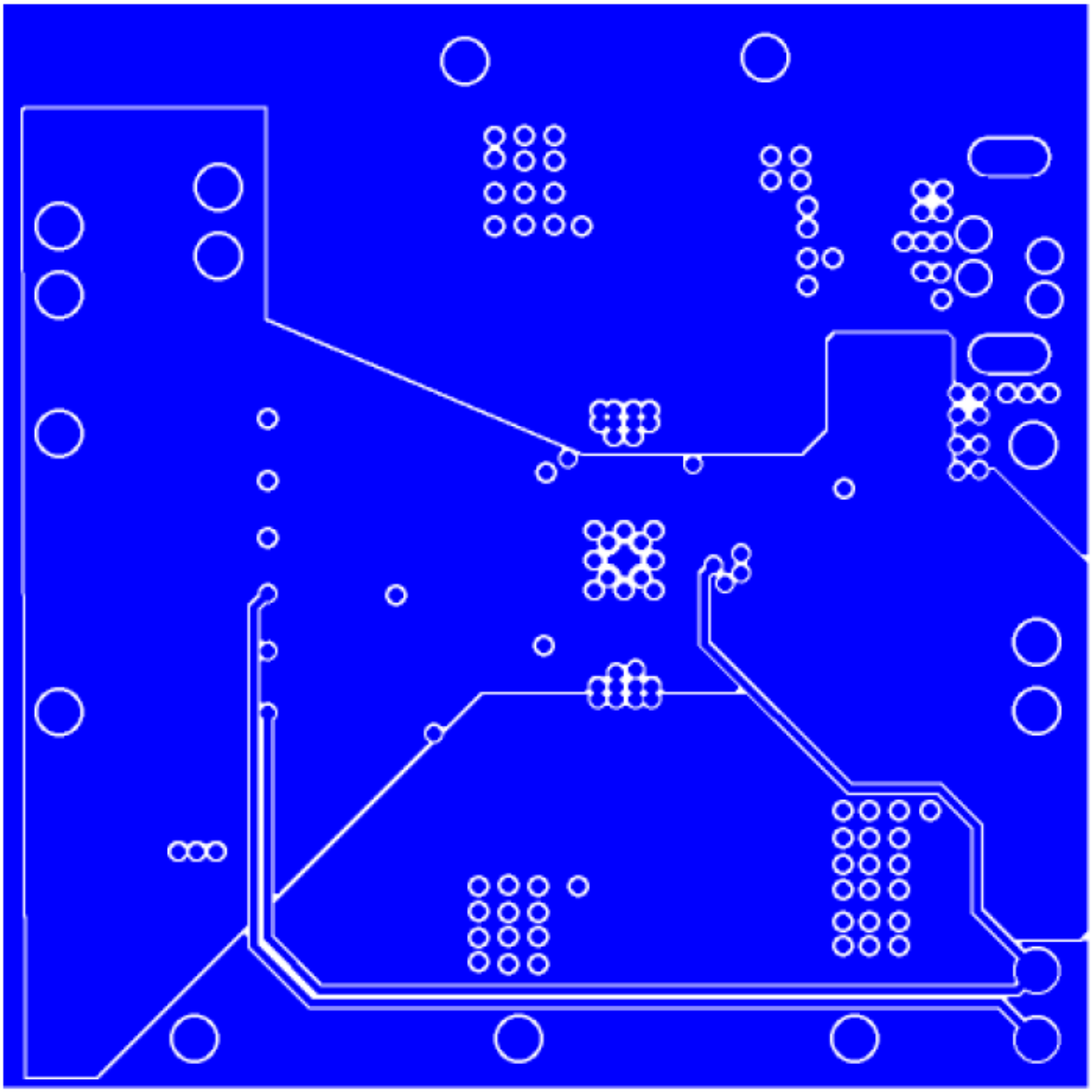


Figure 21: EVB PCB, Layer 5 Ground Planes

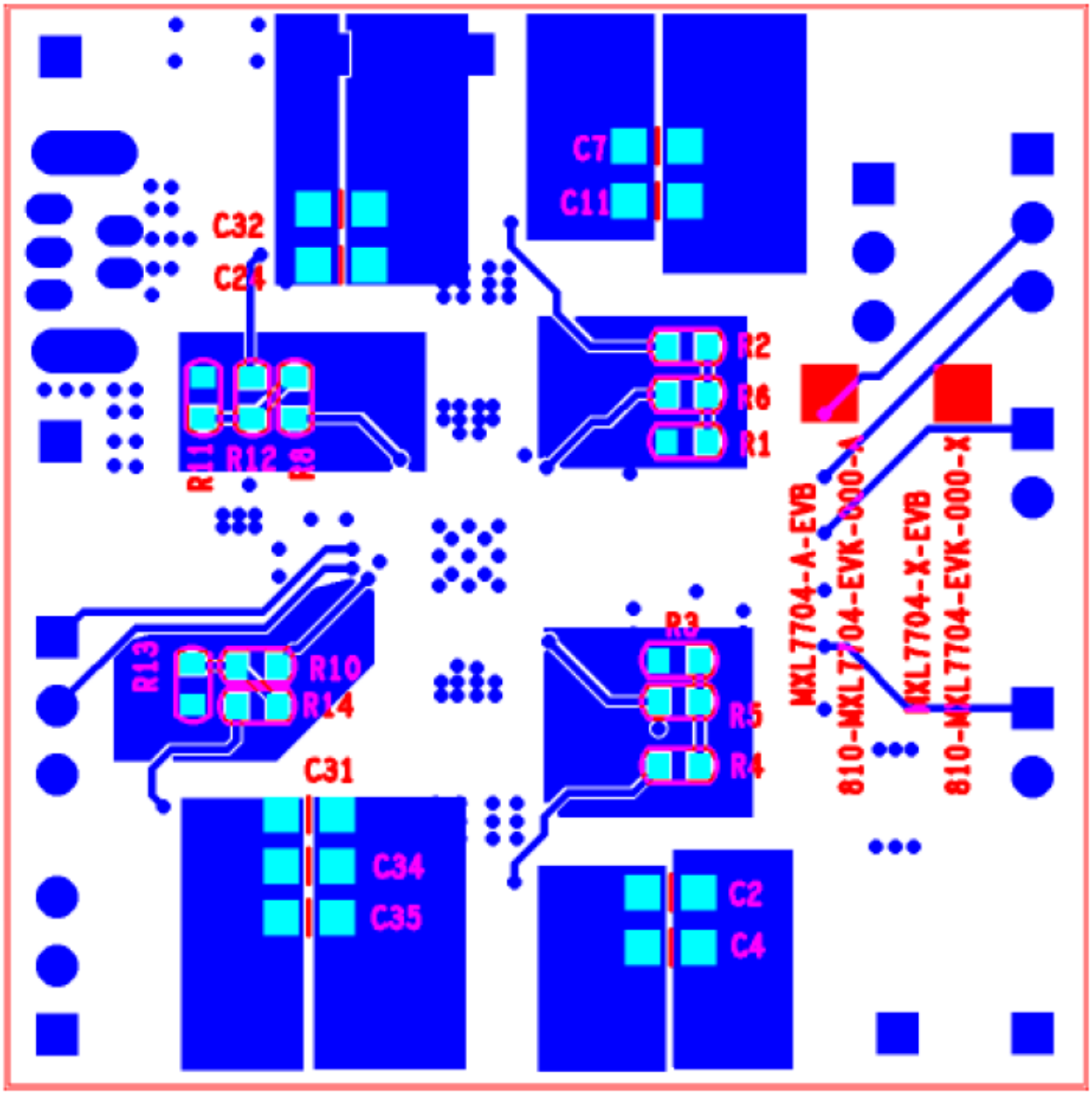


Figure 22: EVB PCB, Bottom View

MxL7704 EVB Bill of Materials

***Table 3:** MxL7704-A-EVB Bill of Materials*

Item	Qty	Reference Designator		Manufacturer	Part Number	Package Size	Component
1	1	PCB		MaxLinear		PCB	MxL7704EVB Evaluation Board
2	1	U1		MaxLinear	MXL7704-AQB-T	5mm x 5mm x 0.9mm 32-pin QFN	MxL7704 Five Output Universal PMIC with 8-bit ADC
3	5	C1 C3 C19 C23 C27		Murata	GRM219R60J476ME44	0805	CAP CER 47UF 6.3V X5R
4	3	C2 C29 C32		Murata	GRM21BR60J106ME19	0805	CAP CER 10UF 6.3V X5R
5	1	C4	DNP	Murata	GRM21BR60J106ME19	0805	CAP CER 10UF 6.3V X5R
6	6	C5 C7 C11 C31 C34 C35	DNP	Murata	GRM219R60J476ME44	0805	CAP CER 47UF 6.3V X5R
7	3	C6 C8 C20		Murata	GRM21BR60J226ME39	0805	CAP CER 22UF 6.3V X5R
8	1	C9		Murata	GRM21BR60J225KA01	0805	CAP CER 2.2UF 6.3V X5R
9	1	C10		Murata	GRM219R61A105KA01	0805	CAP CER 1UF 10V X5R
10	3	C12 C15 C28		Murata	GRM155R60J105KE19D	0402	CAP CER 1UF 6.3V X5R
11	6	C13 C14 C17 C26 C36 C37		Murata	GRM155R61A104MA01	0402	CAP CER 0.1UF 10V X5R
12	4	C21 C25 C30 C33		Murata	GRM219R61A106ME47	0805	CAP CER 10UF 10V X5R
13	1	C22		Murata	GRM188R60J106ME47D	1608[0603]	CAP CER 10UF 6.3V X5R
14	1	C24	DNP	Murata	GRM21BR60J226ME39	0805	CAP CER 22UF 6.3V X5R
15	1	D1		Littlefuse	SMBJ5.0A	SMBJ	Schottky Rectifier
16	4	J1 J2 J3 J6		Wurth Elektronik	61300311121	2.54mm	Header, 3-Pin
17	2	J4 J5		Wurth Elektronik	61300311121	2.54mm	Header, 3-Pin
18	1	L1		Delta	HMME32251E-2R2MSR	HMME32251E INDM3225X15M	Inductor
19	1	L2		Delta	HMME32251E-1R0MSR	HMME32251E INDM3225X15M	Inductor
20	2	L3 L4		Delta	HMME32251E-R47MSR	HMME32251E INDM3225X15M	Inductor

MxL7704 EVB Bill of Materials (continued)

Table 3: ***MxL7704-A-EVB Bill of Materials (continued)***

Item	Qty	Reference Designator		Manufacturer	Part Number	Package Size	Component
21	1	P1	DNP	Molex	5000750517	Mini B	USB Mini-B Receptacle, Right Angle, Thru-Hole
22	12	P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13		Wurth Elektronik	7471287	0.32x0.10in	Blade connectors
23	4	R1 R3 R11 R13	DNP	Panasonic	ERJ-PA3F1003V	ERA-0603	Resistor
24	9	R2 R4 R5 R6 R7 R8 R10 R12 R14		Panasonic	ERJ-3GEY0R00V	ERA-0603	Resistor
25	1	R9		Panasonic	ERJ-3GEYJ100V	ERA-0603	Resistor
26	6	R15 R16 R17 R18 R19 R20		Panasonic	ERJ-3GEYJ472V	ERA-0603	Resistor

Table 4: ***MxL7704-X-EVB Bill of Materials***

Item	Qty	Reference Designator		Manufacturer	Part Number	Package Size	Component
1	1	PCB		MaxLinear		PCB	MxL7704EVB Evaluation Board
2	1	U1		MaxLinear	MXL7704-XQB-T	5mm x 5mm x 0.9mm 32-pin QFN	MxL7704 Five Output Universal PMIC with 8-bit ADC
3	5	C1 C3 C5 C19 C23 C27 C31 C34		Murata	GRM219R60J476ME44	0805	CAP CER 47UF 6.3V X5R
4	3	C2 C29 C32		Murata	GRM21BR60J106ME19	0805	CAP CER 10UF 6.3V X5R
5	1	C4	DNP	Murata	GRM21BR60J106ME19	0805	CAP CER 10UF 6.3V X5R
6	6	C6 C8 C20		Murata	GRM21BR60J226ME39	0805	CAP CER 22UF 6.3V X5R

MxL7704 EVB Bill of Materials (continued)

***Table 4:** MxL7704-X-EVB Bill of Materials (continued)*

Item	Qty	Reference Designator		Manufacturer	Part Number	Package Size	Component
7	3	C7 C11 C35	DNP	Murata	GRM219R60J476ME44	0805	CAP CER 47UF 6.3V X5R
8	1	C9		Murata	GRM21BR60J225KA01	0805	CAP CER 2.2UF 6.3V X5R
9	1	C10		Murata	GRM219R61A105KA01	0805	CAP CER 1UF 10V X5R
10	3	C12 C15 C28		Murata	GRM155R60J105KE19D	0402	CAP CER 1UF 6.3V X5R
11	6	C13 C14 C17 C26 C36 C37		Murata	GRM155R61A104MA01	0402	CAP CER 0.1UF 10V X5R
12	4	C21 C25 C30 C33		Murata	GRM219R61A106ME47	0805	CAP CER 10UF 10V X5R
13	1	C22		Murata	GRM188R60J106ME47D	1608[0603]	CAP CER 10UF 6.3V X5R
14	1	C24	DNP	Murata	GRM21BR60J226ME39	0805	CAP CER 22UF 6.3V X5R
15	1	D1		Littlefuse	SMBJ5.0A	SMBJ	Schottky Rectifier
16	4	J1 J2 J3 J6		Wurth Elektronik	61300311121	2.54mm	Header, 3-Pin
17	2	J4 J5		Wurth Elektronik	61300311121	2.54mm	Header, 3-Pin
18	2	L1 L2		Delta	HMME32251E-2R2MSR	HMME32251E INDM3225X15M	Inductor
19	1	L3		Delta	HMME32251E-1R0MSR	HMME32251E INDM3225X15M	Inductor
20	1	L4		Delta	HMME32251E-R47MSR	HMME32251E INDM3225X15M	Inductor
21	1	P1	DNP	Molex	Mini-USB 5000750517	Mini B	USB Mini-B Receptacle, Right Angle, Thru-Hole
22	12	P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13		Wurth Elektronik	7471287	0.32x0.10in	Blade connectors
23	4	R1 R3 R11 R13	DNP	Panasonic	ERJ-PA3F1003V	ERA-0603	RES SMD 100K OHM 1% 1/4W
24	9	R2 R4 R5 R6 R7 R8 R10 R12 R14		Panasonic	ERJ-3GEY0R00V	ERA-0603	RES SMD 0 OHM JUMPER 1/10W

MxL7704 EVB Bill of Materials (continued)

***Table 4:** MxL7704-X-EVB Bill of Materials (continued)*

Item	Qty	Reference Designator		Manufacturer	Part Number	Package Size	Component
25	1	R9		Panasonic	ERJ-3GEYJ100V	ERA-0603	RES SMD 10 OHM 5% 1/10W
26	6	R15 R16 R17 R18 R19 R20		Panasonic	ERJ-3GEYJ472V	ERA-0603	RES SMD 4.7K OHM 5% 1/10W

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