DESCRIPTION

The IS32PM3420B regulator is a fully integrated and high frequency synchronous step-down DC-DC converter that can drive a load current of up to 3A. It can operate within an input voltage range of 3.8V to 36V. The IS32PM3420B provides exceptional efficiency, output accuracy and drop-out voltage in a very small solution size. Constant on-time control mode is employed to achieve simple control-loop compensation and fast transient response. The IS32PM3420B supports both Forced Continuous Conduction Mode (FCCM) and Pulse Frequency Modulation mode (PFM) at light-load condition, which is selected by the FPWM pin. It requires few external components. Pin arrangement allows simple, optimum PCB layout. Protection features include thermal shutdown, VDD under-voltage lockout, cycle-by-cycle current limit, over-voltage and output short-circuit protection.

The IS32PM3420B device is available in the SOP-8- EP package with an exposed pad for enhanced thermal dissipation.

FEATURES

- Input voltage range from 3.8V to 36V
- 1μA (Typ.) shutdown current
- 25μA quiescent current (typical, no switching)
- Up to 3A output current capability
- Adjustable output voltage, 1V to 24V
- Output regulation accuracy:
  - ±1% at 25°C
  - ±2% over -40°C ~150°C
- 91% efficiency at full load (5V/3A)
- >90% efficiency at light load (5V/100mA)
- Integrated synchronous rectifier
- Fixed operating frequency: 400kHz
- Pin-selectable FCCM or PFM operation mode
- Spread spectrum to minimize EMI
- Few external components
  - Internal loop compensation
  - Internal soft-start
- Fault protections
  - Cycle by cycle current limit
  - Precision enable to program system UVLO
  - Output short-circuit protection with hiccup mode
  - Output over-voltage protection
  - VDD under-voltage lockout
  - Thermal shutdown protection
- Operating junction temperature range from -40°C ~ +150°C
- SOP-8-EP compact package
- RoHS & Halogen-Free Compliance
- TSCA Compliance
- AEC-Q100 Qualified with Temperature Grade 1: -40°C to 125°C

QUICK START

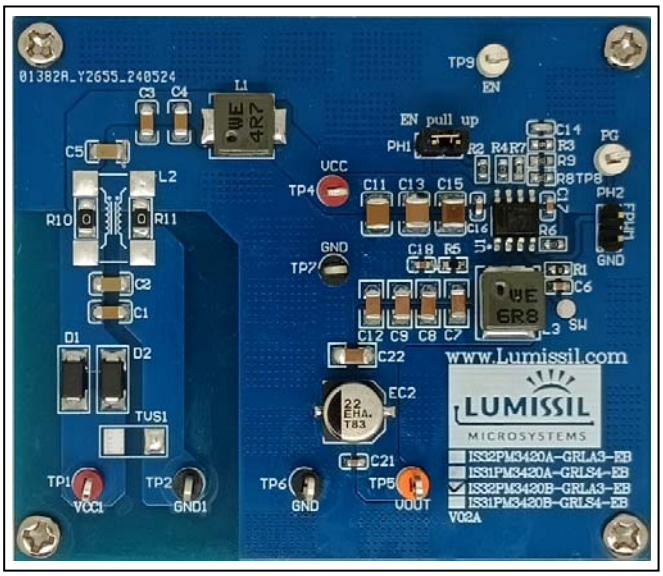

Figure 1 *Photo of IS32PM3420B Evaluation Board*

APPLICATIONS

- General-purpose power supply
- Automotive LED lighting system
- Automotive body electronics

DEMO INFORMATIONS

- Input: 9V~16VDC
- Output: 5V/0~3A

Note: If the output voltage set by the demo board is not what you want, you can change the output voltage you want through the design method described below.

ABSOLUTE MAXIMUM RATINGS

- Input voltage ≤ 36VDC

Caution: Do not exceed the conditions listed above, otherwise the board will be damaged.

PROCEDURE

The IS32PM3420B DEMO Board is fully assembled and tested. Follow the steps listed below to verify board operation.

Caution: Do not turn on the power supply until all connections are completed.

1) Connect the positive terminal of the power supply to the VCC1 of the board and the negative terminal of the power supply to the GND1 of the board.
2) Connect the electronic load (or adjustable resistor load) to the VOUT terminal and GND terminal of board.
3) Connect the PH1 to pull up EN pin, the chip will be enabled.

4) This demo board is set to work in FCCM mode by default when the chip is under light load. If you want to change it to PFM mode, please remove R6 and use a jump cap to connect PH2.

ORDER INFORMATION

Part No.	Temperature Range	Package
IS32PM3420B-GRLA3-EB	-40°C to +125°C (Automotive)	SOP-8-EP, Lead-free

Table 1 *Ordering Information*

For pricing, delivery, and ordering information, please contacts Lumissil's analog marketing team at analog@Lumissil.com or (408) 969-6600.

DESIGN INFORMATION

SETTING THE OUTPUT VOLTAGE

The external resistor divider, R_{FBT} and R_{FBB}, is used to set the output voltage (As shown in Figure 2), according to the following equation:

$$V_{OUT} = \frac{(R_{FBB}+R_{FBT})}{R_{FBB}} \times V_{FB\_TH} \qquad (1)$$

Where V_{FB_TH}=1V (Typ.).

Choosing a value for the resistor R_{FBB} should be reasonable. Usually, a small R_{FBB} leads to considerable quiescent current loss, while a large R_{FBB} makes the FB pin noise-sensitive and voltage errors from the V_{FB} input current are noticeable.

In order to have an accurate output voltage, precision resistors are preferred (±1% recommended). The R_{FBT} and R_{FBB} resistors should be placed as close as possible to the IS32PM3420B with minimal trace length to the FB and AGND pins.

In addition, it should be noted that the resistor R_T and capacitor C_{FF} are required. The R_T is fixed at 1kΩ, while the C_{FF} is fixed at 33pF.

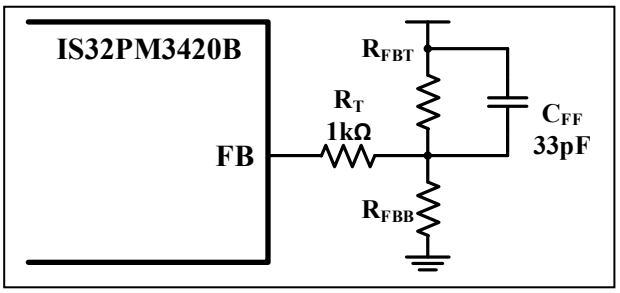

Figure 2 Feedback Network

Table 1 R_{FB} Resistance Versus Output Voltage

V_{OUT} (V)	R_{FBB} (kΩ)	R_{FBT} (kΩ)
3.3	43.5	100
5	25	100
8	14.3	100

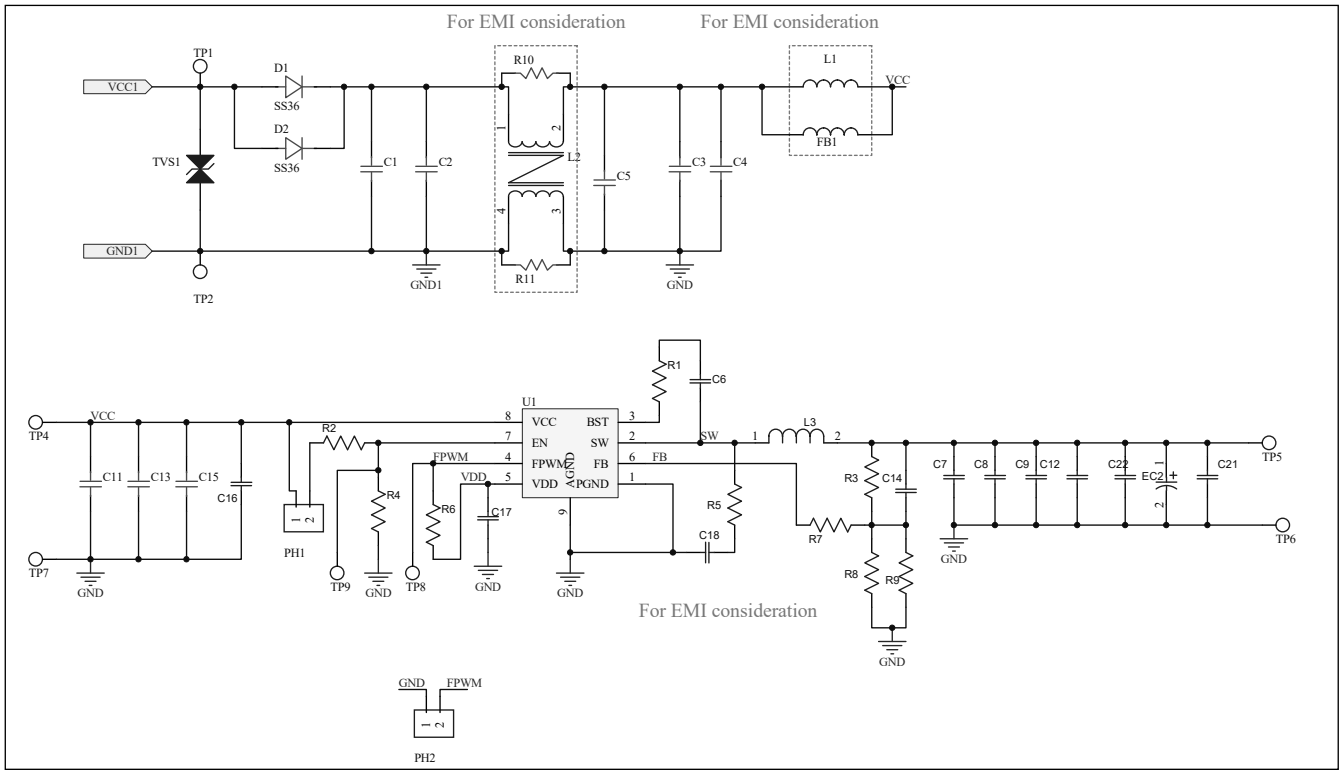

Figure 3 *IS32PM3420B Demo Board Schematic*

BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
IC	U1	Constant voltage chip	1	Lumissil	IS32PM3420B-GRLA3-TR
Capacitor	C1, C3, C4	CAP,2.2μF,50V, ±10%, SMD	3	Yageo	CC1206KKX7R9BB225
Capacitor	C2, C5	CAP,100nF,50V, ±10%, SMD	2	Yageo	CC1206KRX7R9BB104
Capacitor	C11, C13	CAP,10μF,50V, ±10%, SMD	2	Yageo	CC1210KKX7R9BB106
Capacitor	C15	CAP,4.7μF,50V, ±10%, SMD	1	Yageo	CC1210KKX7R9BB475
Capacitor	C6, C16, C21	CAP,0.1μF,50V, ±10%, SMD	3	Yageo	CC0603KRX7R9BB104
Capacitor	C17	CAP,1μF,16V, ±10%, SMD	1	Yageo	CC0603KRX7R7BB105
Capacitor	C18	CAP,1nF,50V, ±10%, SMD	1	Yageo	CC0603KRX7R9BB102
Capacitor	C14	CAP,33pF,25V, ±10%, SMD	1	Yageo	CC0603JRNPO8BN330
Capacitor	C7, C8, C9, C12, C22	CAP,10μF,25V, ±10%, SMD	5	Yageo	CC1206KKX5R9BB106
Resistor	R2, R4	RES,47k,1/10W, ±5%, SMD	2	Yageo	RC0603JR-0747KL
Resistor	R1	RES,0R,1/10W, ±5%, SMD	1	Yageo	RC0603JR-070RL
Resistor	R5	RES,2R,1/10W, ±5%, SMD	1	Yageo	RC0603JR-072RL
Resistor	R6	RES,10k,1/10W, ±5%, SMD	1	Yageo	RC0603FR-0710KL
Resistor	R7	RES,1k,1/10W, ±1%, SMD	1	Yageo	RC0603FR-071KL
Resistor	R8	RES,47k,1/10W, ±1%, SMD	1	Yageo	RC0603FR-0747KL
Resistor	R9	RES,51k,1/10W, ±1%, SMD	1	Yageo	RC0603FR-0751KL
Resistor	R10, R11	RES,0R, 1/4W, ±1%, SMD	2	Yageo	RC1206FR-070RL
Resistor	R3	RES,100k,1/10W, ±1%, SMD	1	Yageo	RC0603FR-07100KL
Diode	D1, D2	3A, 60V, SMA	2	Diodes	SS36
SMD Inductor	L1	4.7μH±20%, I_{sat}=5.9A	1	Wurth	74437336047
SMD Inductor	L2	NC			
Headers	PH1, PH2	2 pin Headers 2.54mm	2		
Terminal	VCC1, GND1, VCC, GND×2, VOUT, EN, PG		8		
SMD Inductor	L3	6.8μH±20%, I_{sat}=5.65A,10% SMD	1	Wurth	78439346068
Capacitor	EC2	E-CAP,22μF,25V, ±10%, SMD	1	Panasonic	EEEHA1E220P
SMD Magnetic Bead	FB1	NC			
SMD TVS	TVS1	NC			

Note: Bill of materials refers to Figure 3 above.

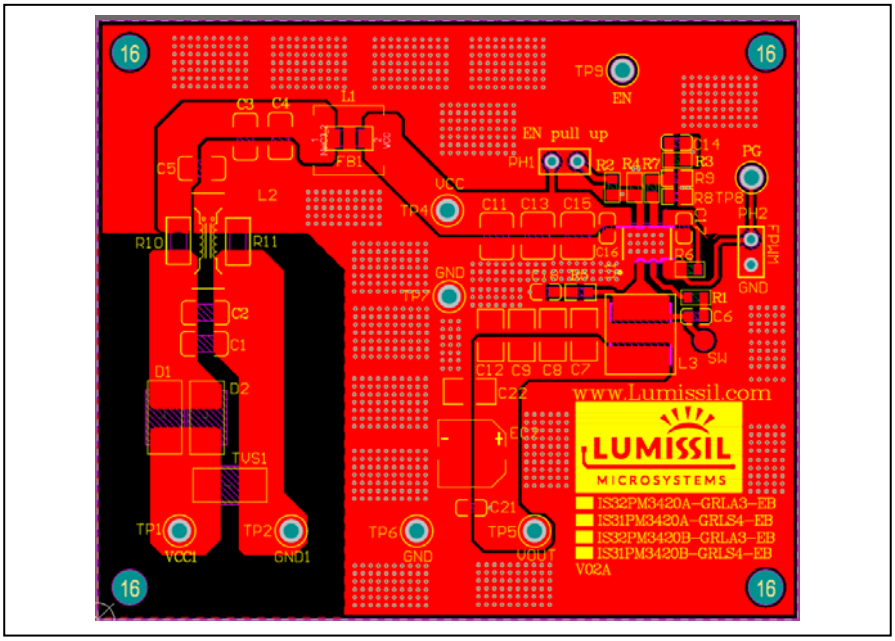

Figure 4 *Board PCB Layout - Top Layer*

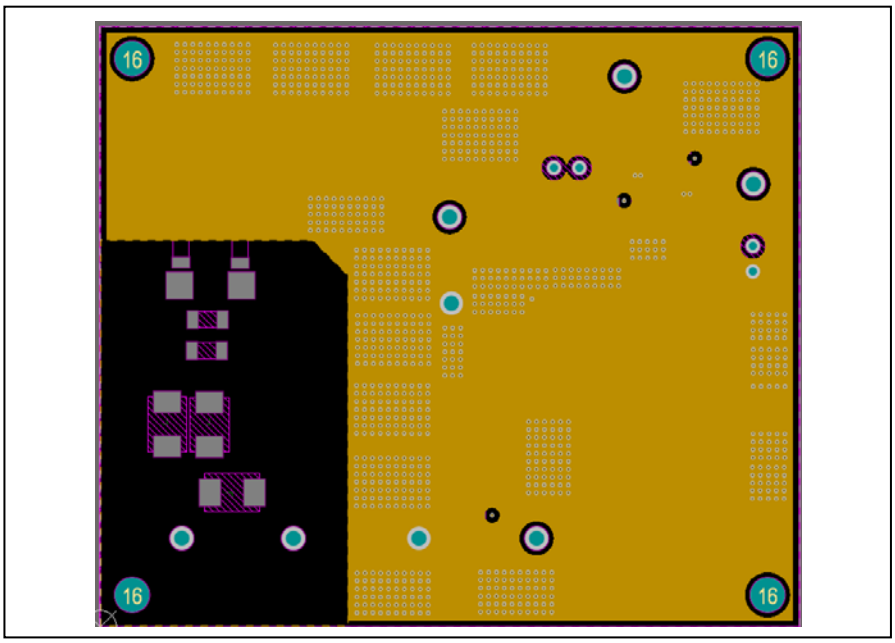

Figure 5 *Board PCB Layout - Mid-Layer 1*

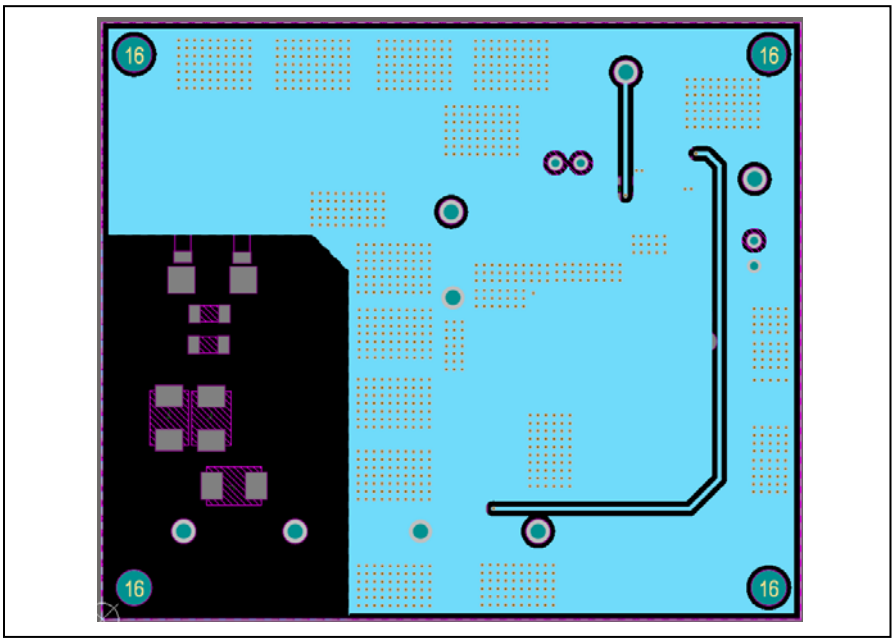

Figure 6 *Board PCB Layout - Mid-Layer 2*

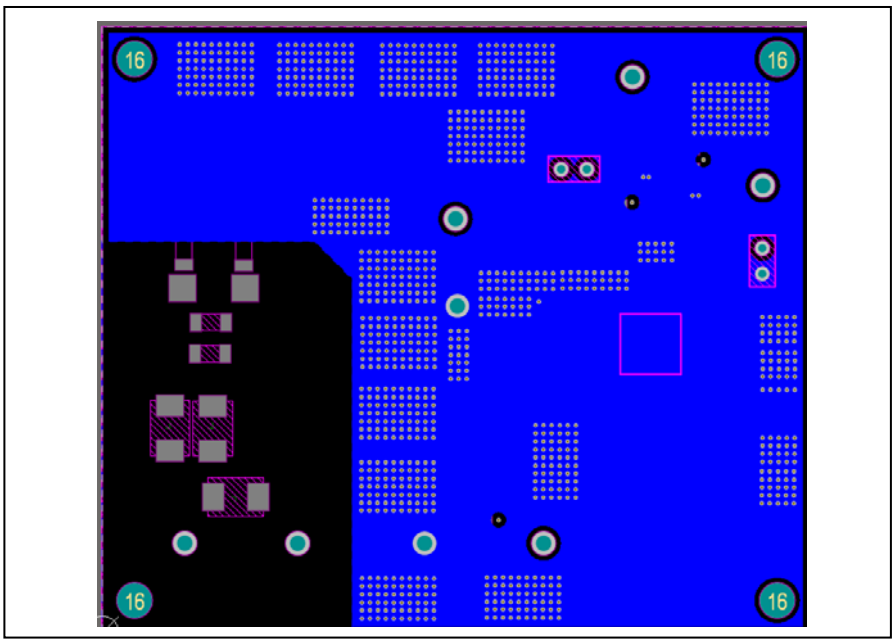

Figure 7 *Board PCB Layout - Bottom Layer*

CONDUCTED EMI PERFORMANCE

Test condition: V_{CC}= 12V, V_{OUT}= 5V, I_{OUT}= 3A, f_{SW}= 400kHz, naked board without any shielding.

Test standard: CISPR-25 Class 5 conducted EMI (Blue: Peak scanning, Red: Average scanning).

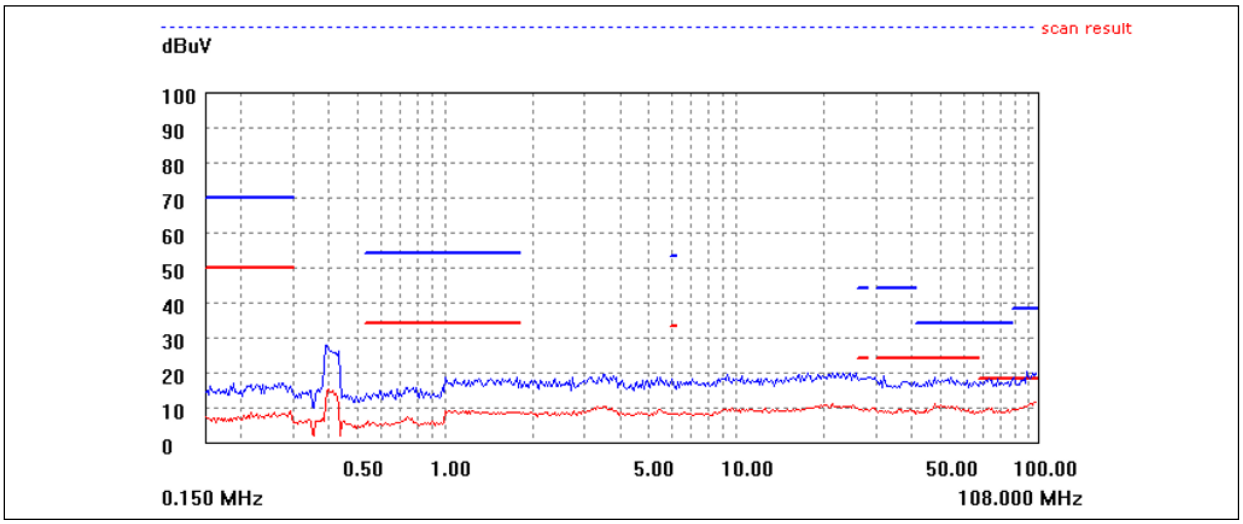

Figure 8 *CISPR-25 Class 5 Conducted EMI Scan (VCC)*

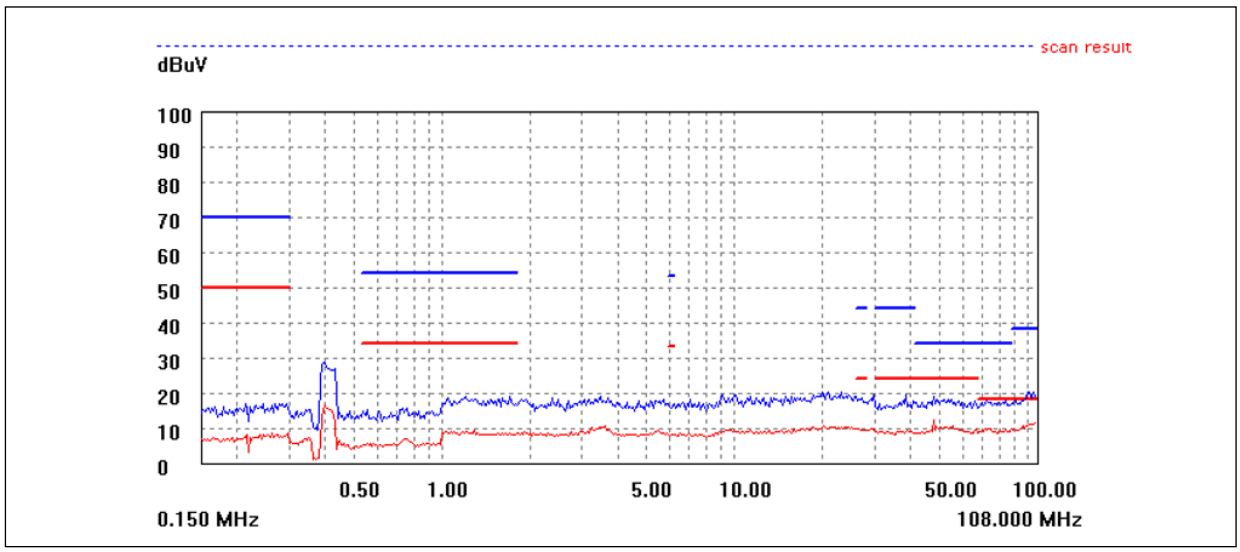

Figure 9 *CISPR-25 Class 5 Conducted EMI Scan (GND)*

REVISION HISTORY

Revision	Detail Information	Date
A	Initial release	2024.08.08