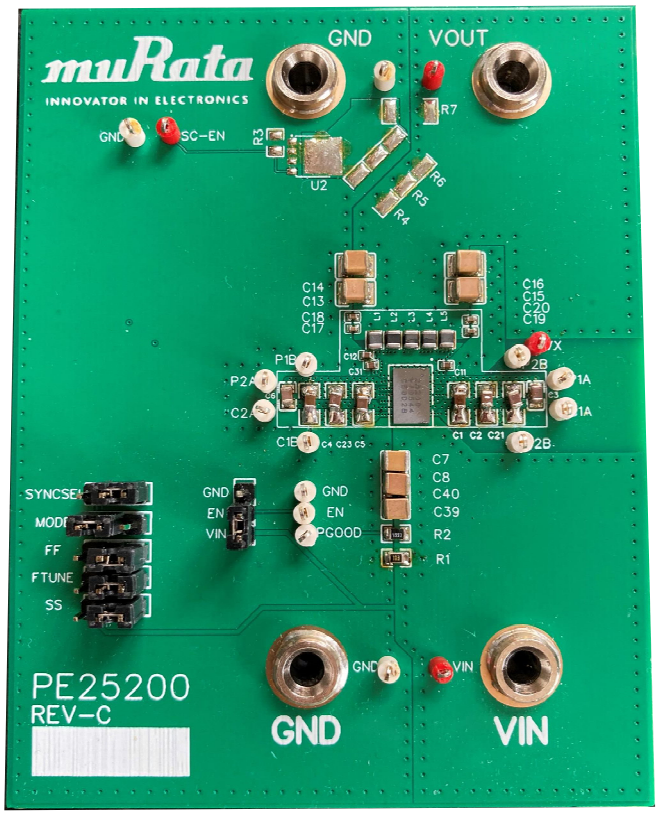
PE25200 Evaluation Kit (EVK) User's Manual

10A High Efficiency
Vin 5.5—10V Divide-by-2
Vin 8.2—15V Divide-by-3
DC-DC Converter



Introduction

The PE25200 is an ultra-high efficiency DC-DC converter solution that divides down an input voltage by either a factor of 2 or 3 and delivers up to 45W output at up to 95.4% peak efficiency. The PE25200 supports an input voltage range of 15V max in divide-by-3 mode or 10V max in divide-by-2 mode and is available in a WLCSP package.

Evaluation Kit Overview

The PE25200 evaluation kit (EVK) is a hardware platform that allows customers to test the step-down DC-DC converter. High-current connections are via 4 mm sockets (banana plug style) with test hoops for connecting sensing and test equipment probes. A number of customer-adjustable links can be used to invoke alternate operational modes.

Evaluation Kit User's Manual Overview

This user's manual includes information about the external hardware required to control and evaluate the functionality of the DC-DC converter.

Evaluation Kit Contents and Requirements

Kit Contents

The PE25200 EVK includes the following hardware platform required to evaluate the DC-DC converter.

QUANTITY	DESCRIPTION
1	PE25200 DC-DC converter evaluation board assembly (PE25200 REV-C)

Table 1. Evaluation Kit Contents

Hardware Requirements

In order to evaluate the performance of the evaluation board, the following equipment is required:

- Bench supply capable of providing 10V–15V at 5A minimum with sense lines
- Two digital multi-meters
- Four-channel oscilloscope with probes (optional to view waveforms)
- Electrical load

Caution: The PE25200 DC-DC converter EVK contains components that might be damaged by exposure to voltages in excess of the specified voltage, including voltages produced by electrostatic discharges. Handle the board in accordance with procedures for handling static-sensitive components. Avoid applying excessive voltages to the power supply terminals or signal inputs or outputs.

In particular, note that the **input is at the bottom of the board marked in bold GND and VIN.**

When connecting the EVK to the source power supply, ensure the power supply is off. Connecting the EVK to a live power supply unit may cause failures. Ensure the output load is disconnected.

Quick Start Guide

Quick Start Overview

The evaluation board is designed to ease customer evaluation of the PE25200 DC-DC converter. This section guides you through configuring the hardware and the startup procedures.

Evaluation Board Overview

The evaluation board is designed to ease customer evaluation of Murata's products. The board contains:

- Input/output terminals
- Test point hoops for voltage sense points and connection of voltmeters, oscilloscopes, etc.
- Jumper links for changing the mode of operation

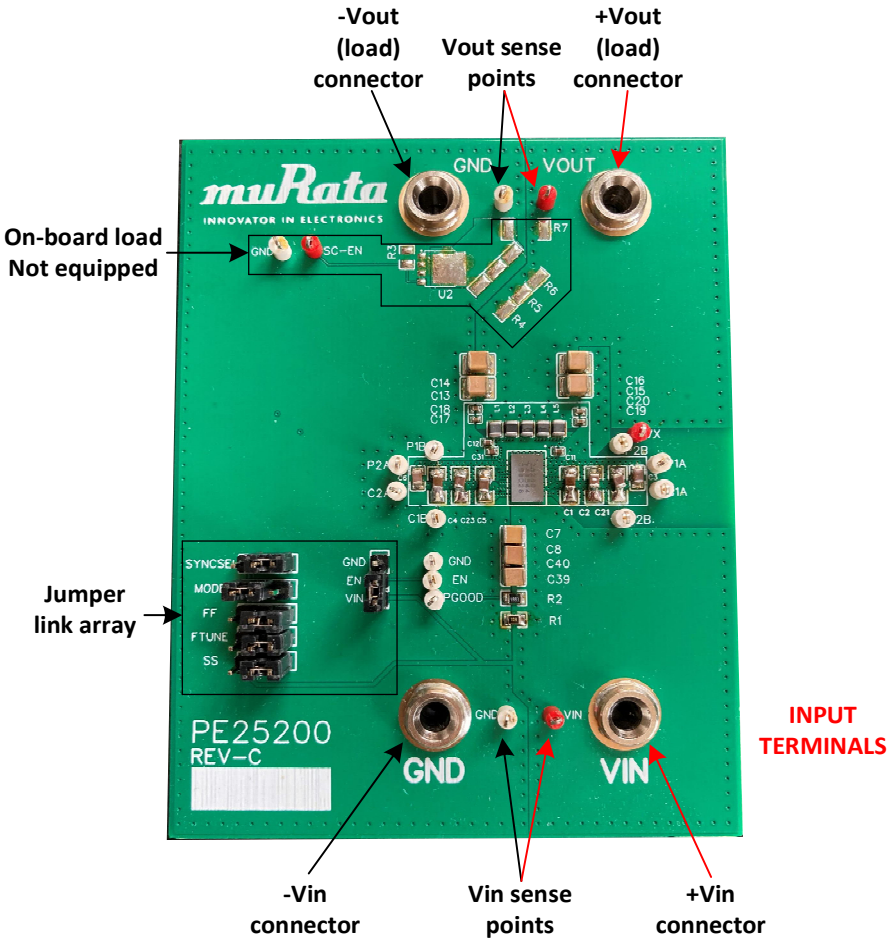


Figure 1. PE25200 Evaluation Board Assembly

Jumper Link Array Settings

The EN (Enable) link settings allow on-board control to enable the EVK by connecting the EN pin directly to the VIN potential. The EN pin may be driven externally by connecting a potential between EN and GND.

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VIN	FUNCTION
< 0.4V	Disabled
> 1.3V	Enabled

Table 2. VIN and Enable Function

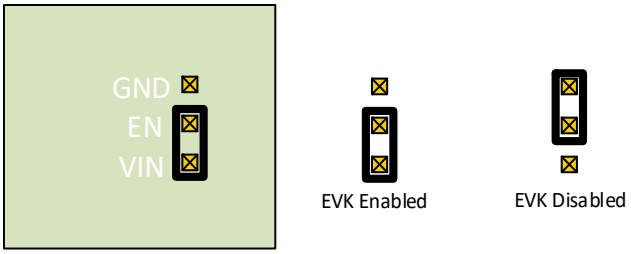

Figure 2. EN Jumper Link Settings

Other jumper links allow for:

- **SYNCSEL**—Not functional for this version of the EVK.
- **Mode**—Sets the VIN to VOUT ratio by divide-by-2 or divide-by-3. Note: VIN divide-by-2 max = 10V; divide-by-3 max = 15V.
- **FF**—Sets fixed, asynchronous or cycle skip operation. Note: All pins open have functionality.
- **FTUNE**—Sets nominal, plus 15% or minus 15% of operational frequency. Note: All pins open have functionality.
- **SS**—Sets the soft start current at 600 mA, 2.1A or 1.1A. . Note: All pins open have functionality.

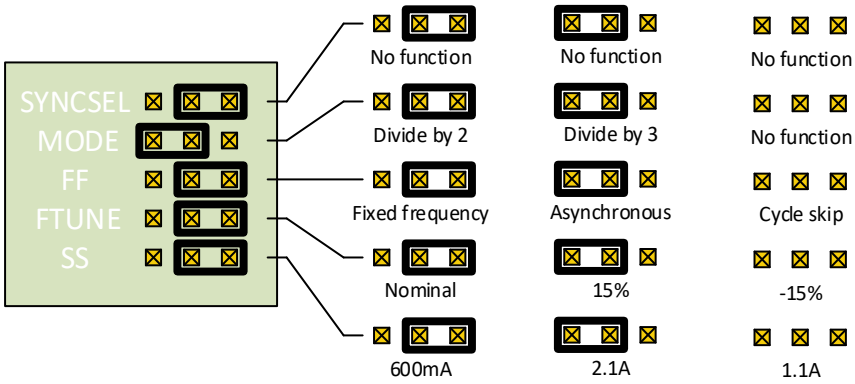

Figure 3. Typical Jumper Settings and Options

EVK Connection

Connect the EVK and the measuring equipment as shown in Figure 4.

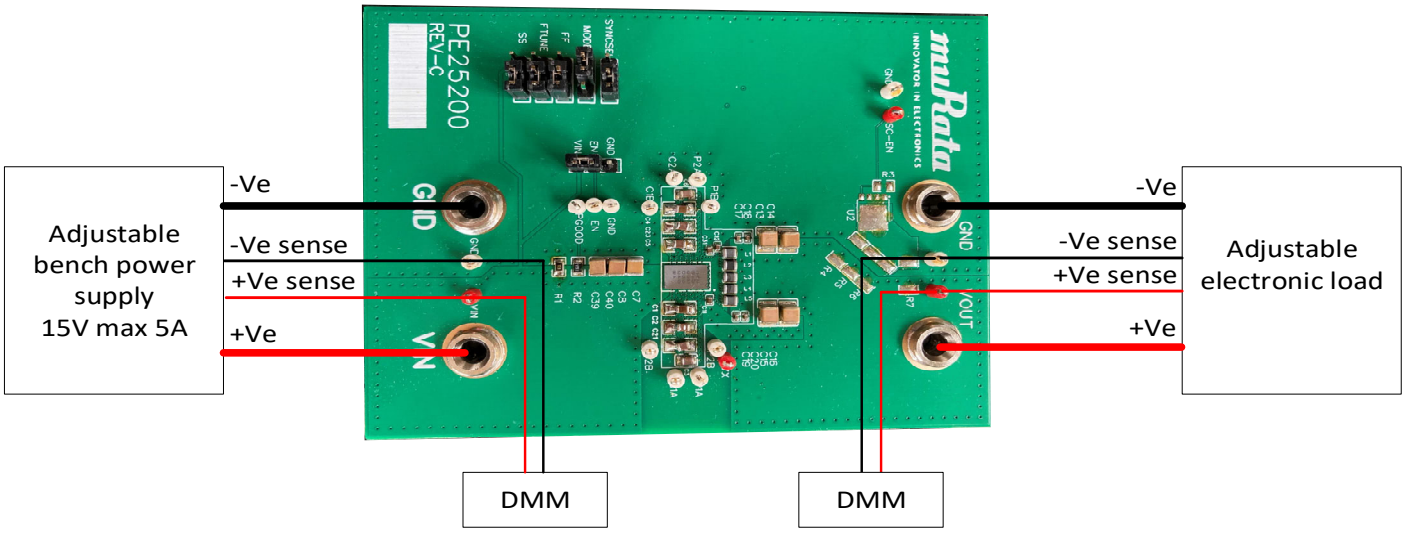

Figure 4. EVK Connectors

Hardware Operation

The general guidelines for operating the hardware evaluation board are listed in this section. Follow the steps below to configure the hardware properly for the stated performance.

1. Ensure the jumpers are set as appropriate for the desired mode and division ratio.
2. Provide input voltage to the input terminals.
3. Apply output load after PGOOD goes high.

Figure 5 shows typical startup sequence traces.

- Yellow trace = 15V from source
- Green trace = PGOOD
- Blue trace = Vout

Figure 5. Typical Startup Sequence

EVK Startup

When starting the EVK, be sure to start it with no load.

If the EVK is powered up with a load, it may not start due to the soft-start current limit being exceeded.

Test Results

The following test results show the typical performance of the PE25200 evaluation board.

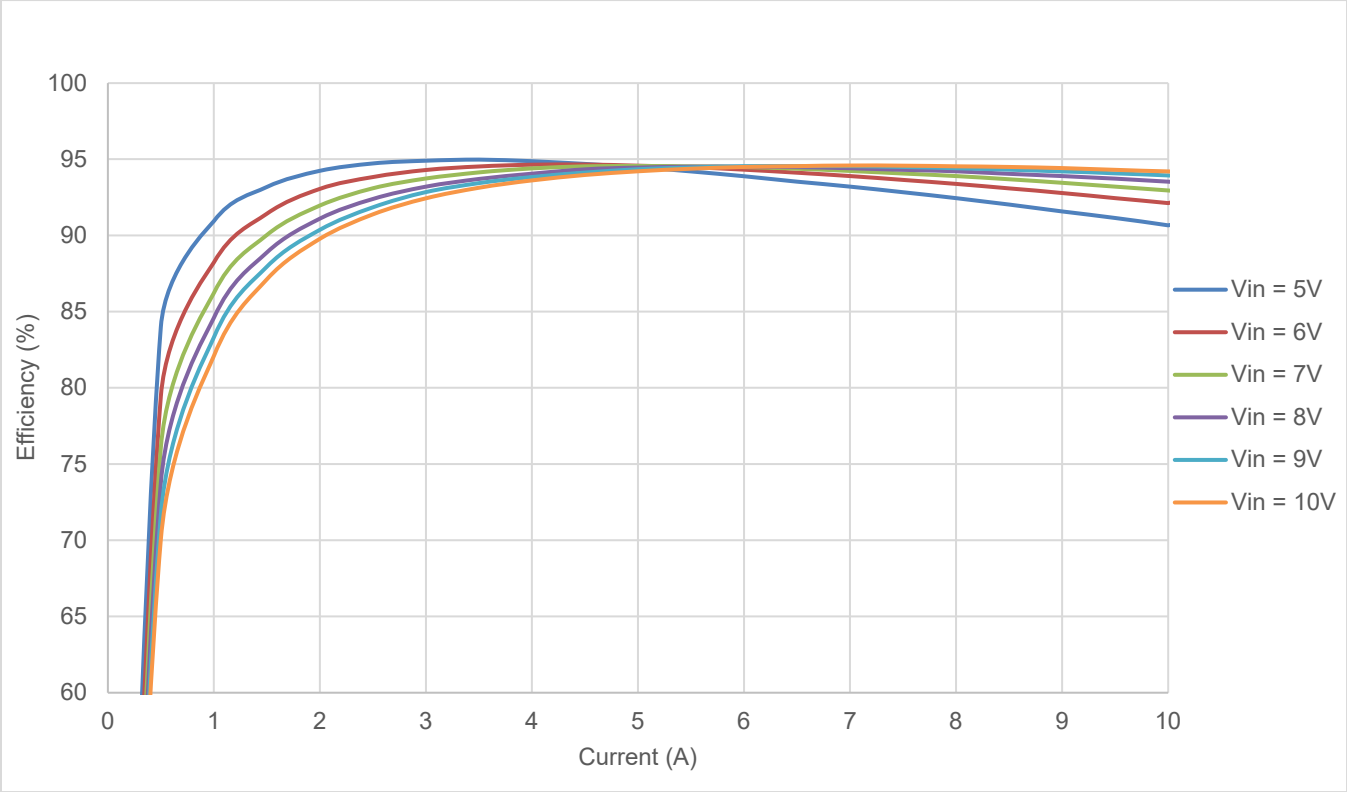

Figure 6. Divide-by-2 Internal Sync Efficiency vs. Output Current

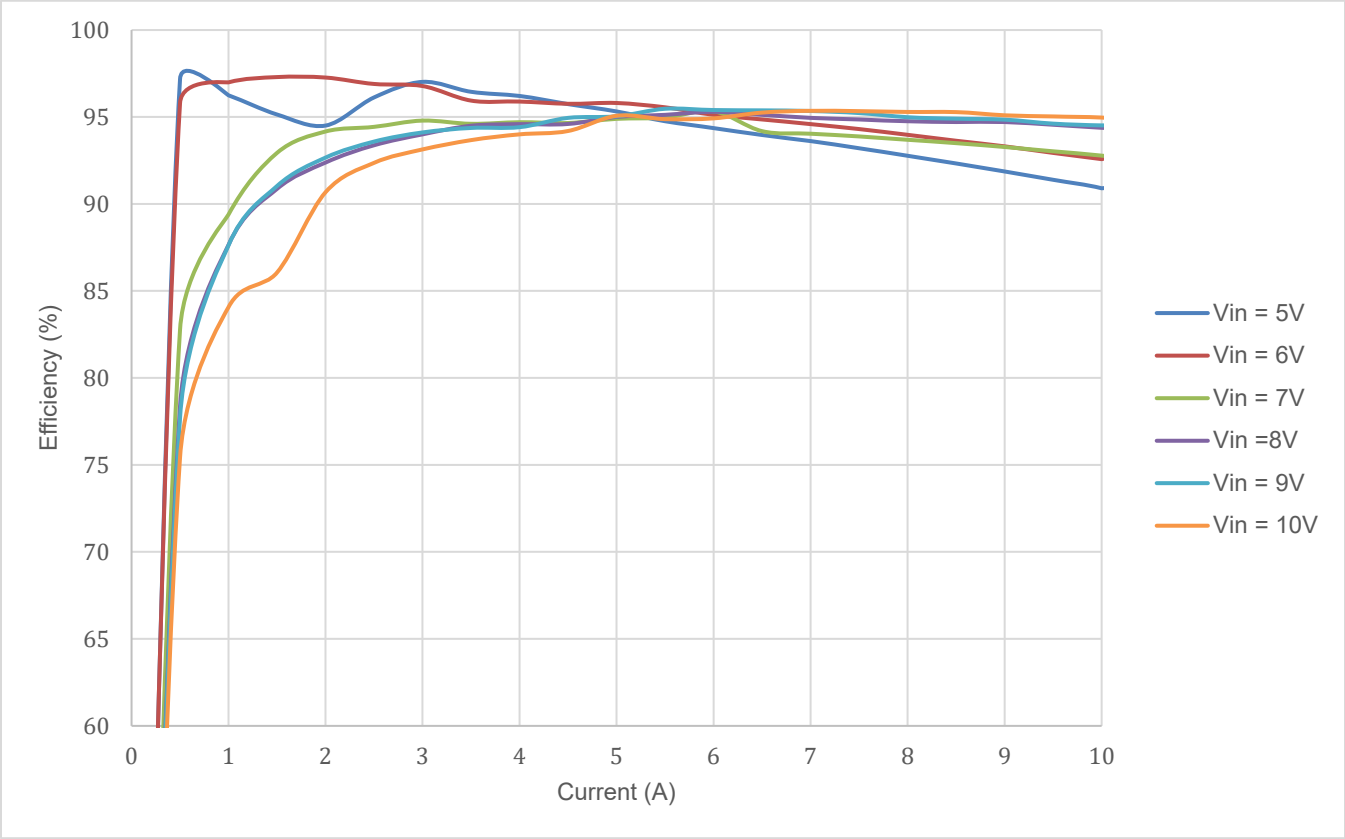

Figure 7. Divide-by-2 Internal Sync Cycle Skip Efficiency vs. Output Current

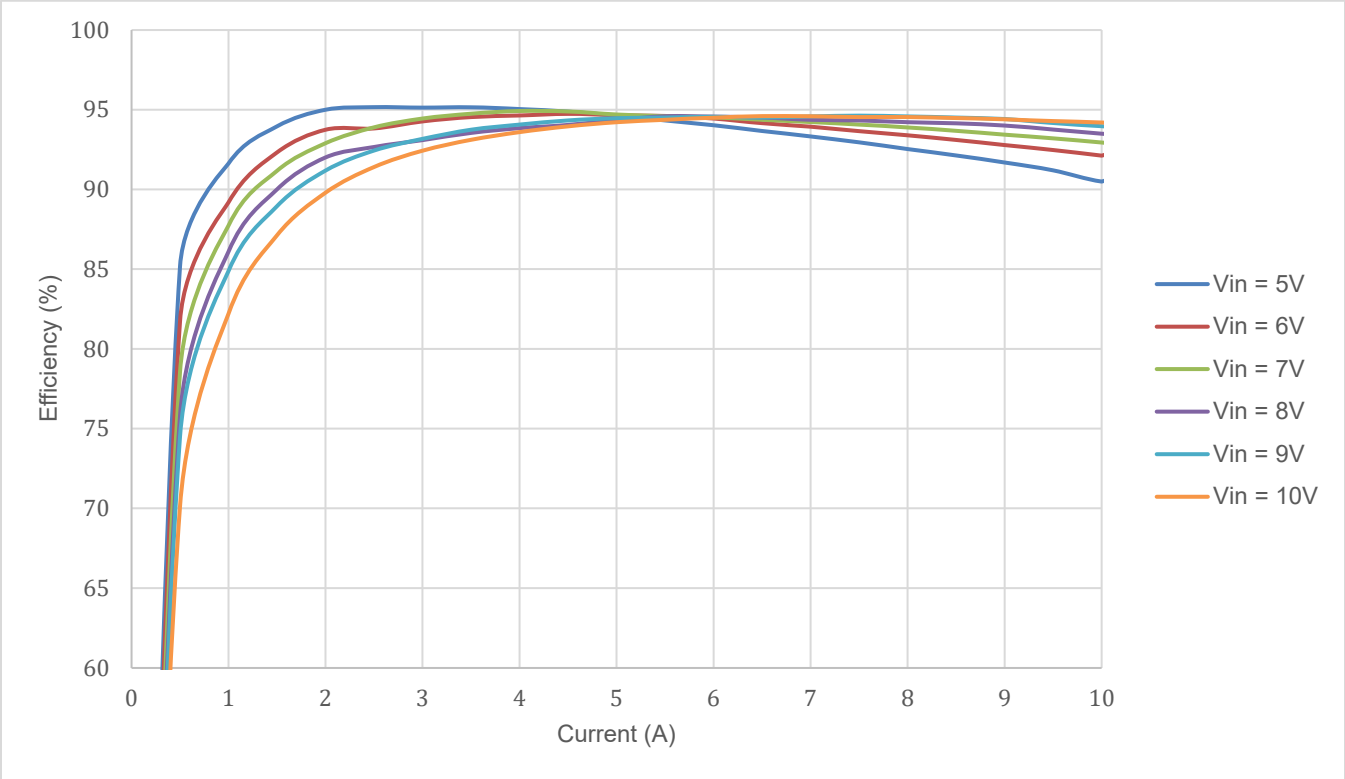

Figure 8. Divide-by-2 Internal Sync Async Efficiency vs. Output Current

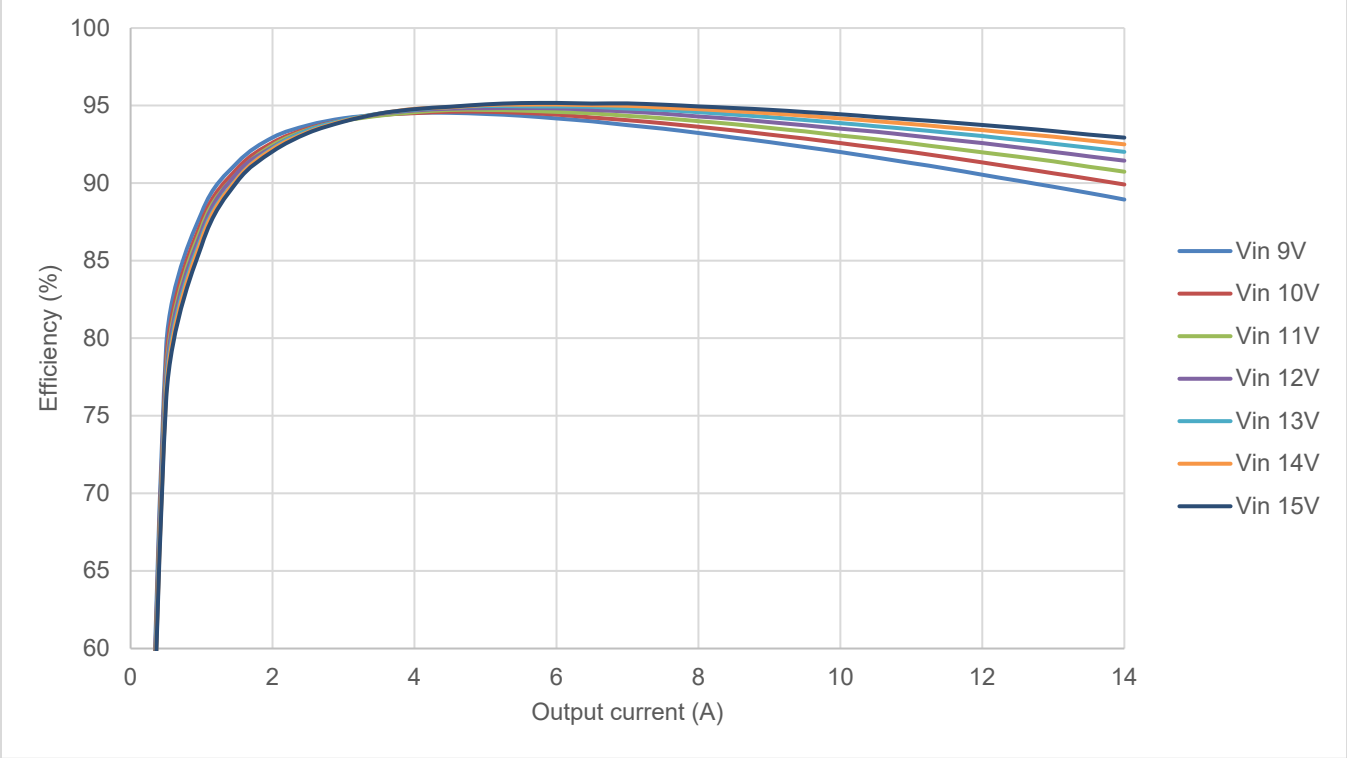

Figure 9. Divide-by-3 Internal Sync Efficiency vs. Output Current

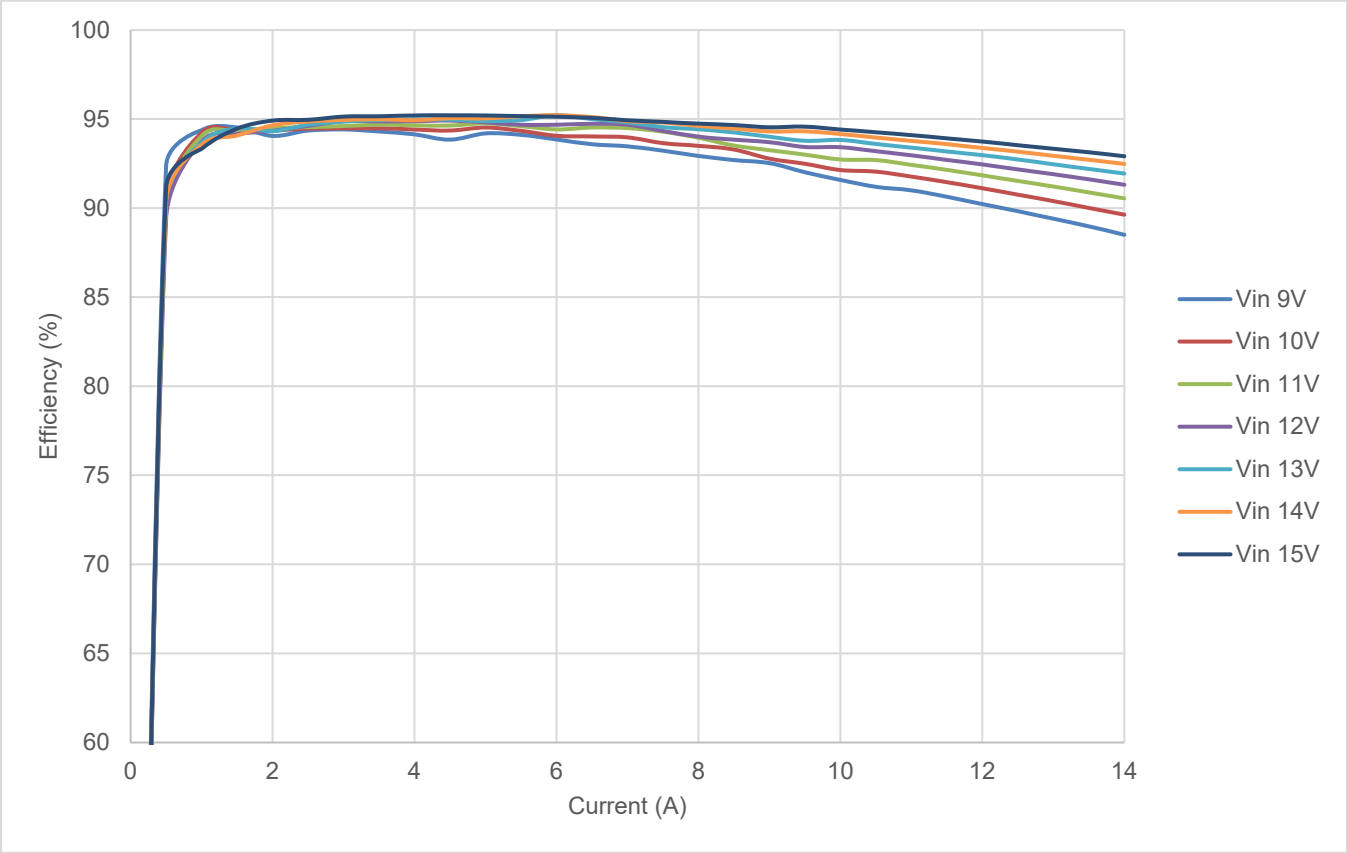

Figure 10. Divide-by-3 Internal Sync Cycle Skip Efficiency vs. Output Current

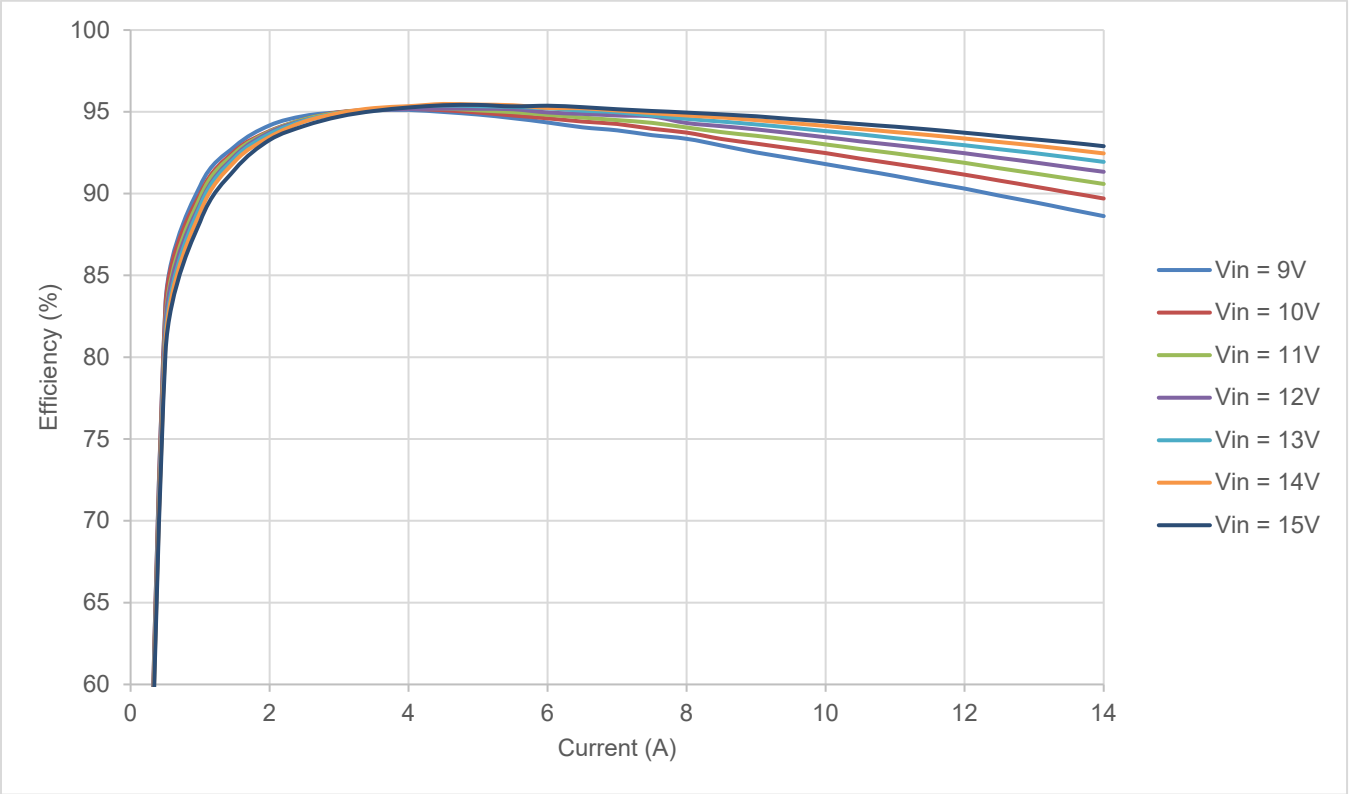

Figure 11. Divide-by-3 Internal Sync Async Efficiency vs. Output Current

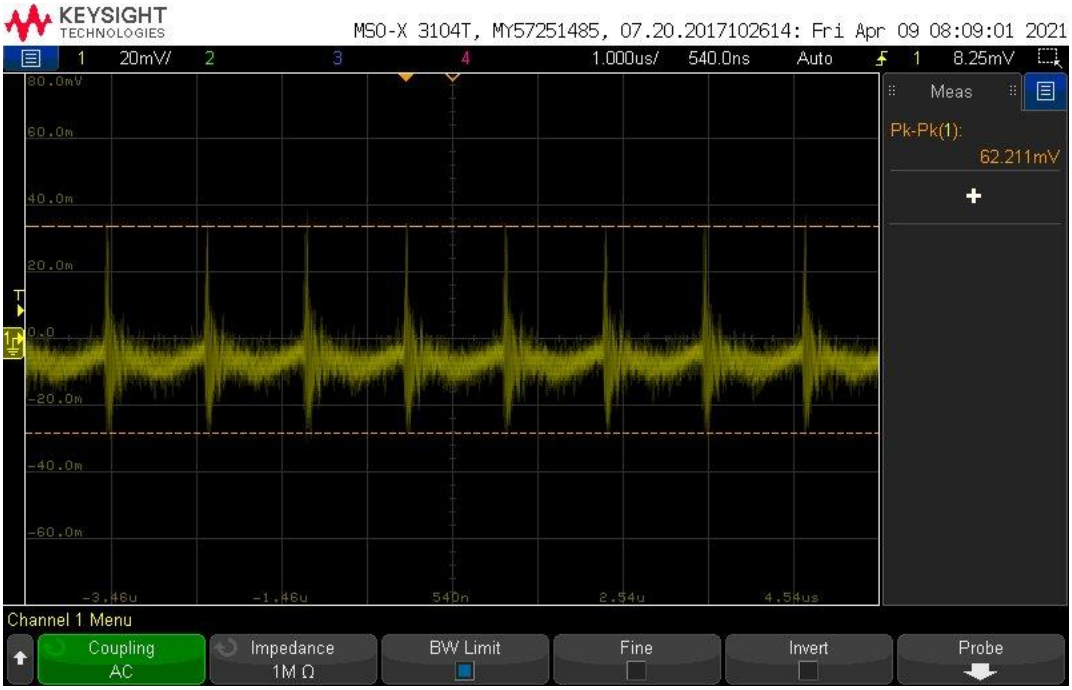

Figure 12. Output Ripple Divide-by-3, No Load

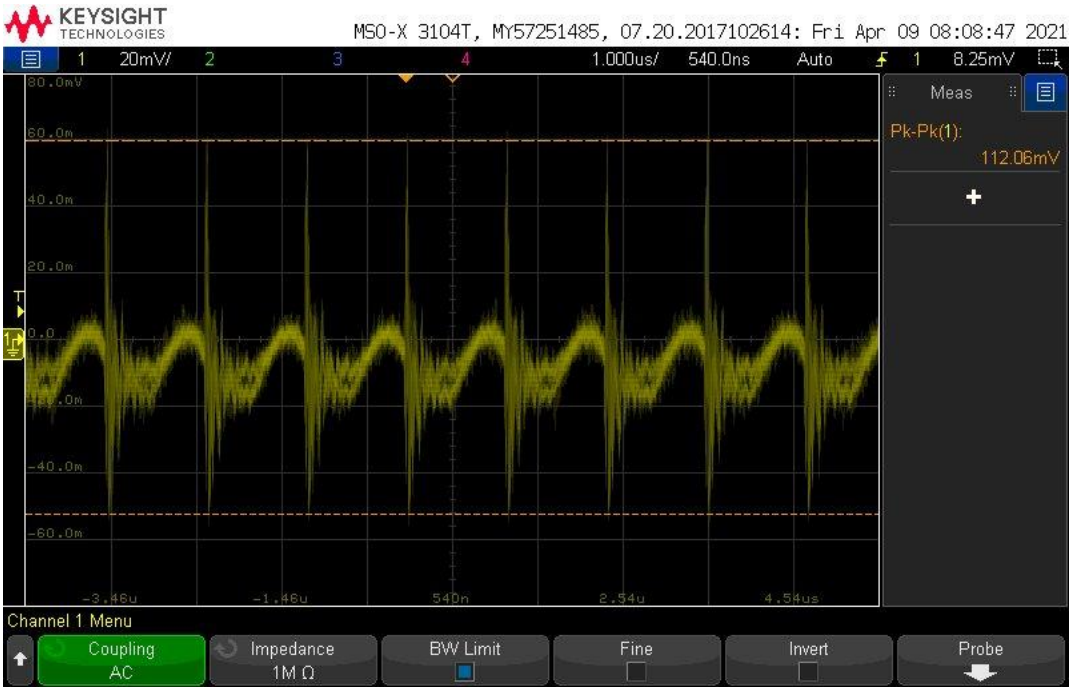

Figure 13. Output Ripple Divide-by-3, 10A

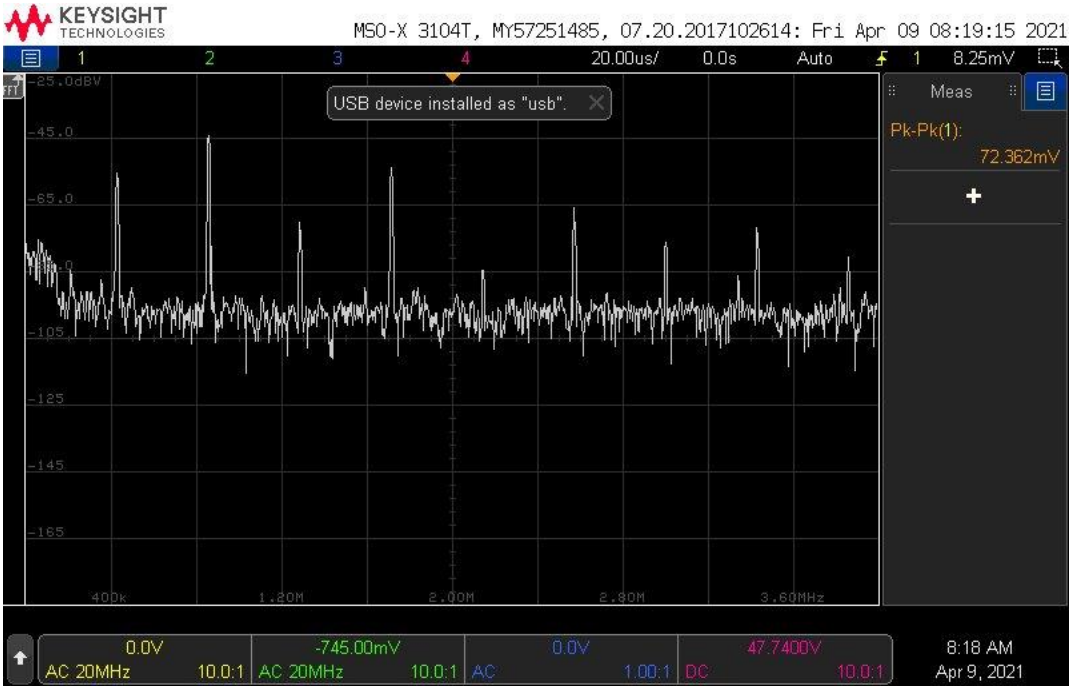

Figure 14. 15V Input Noise, No Load

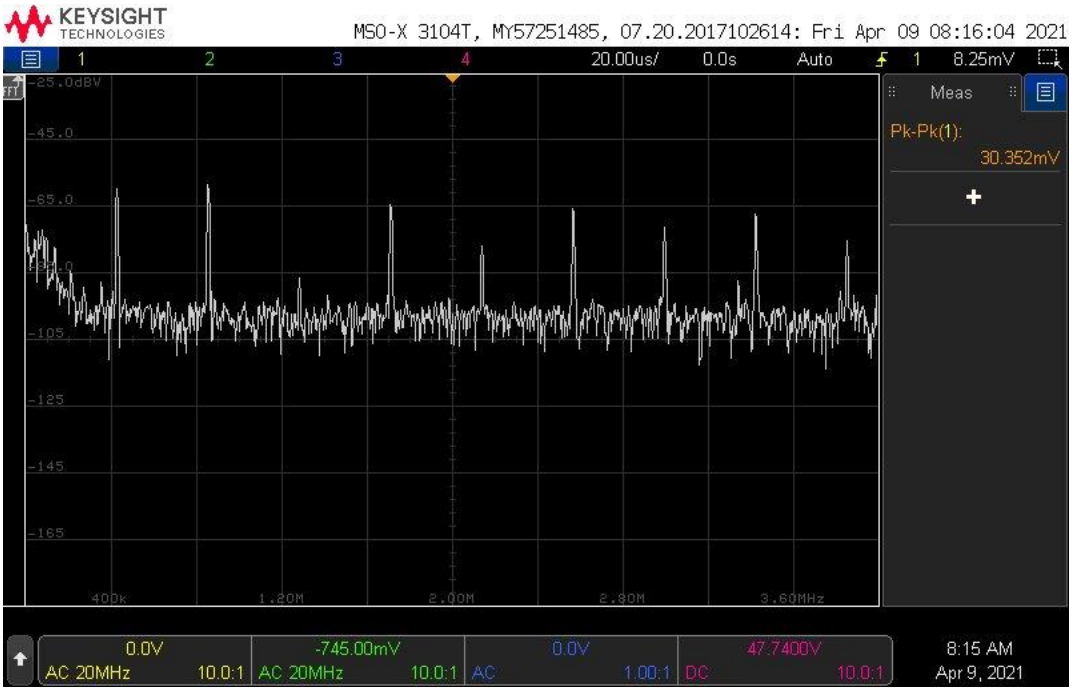

Figure 15. 15V Output Noise, No Load

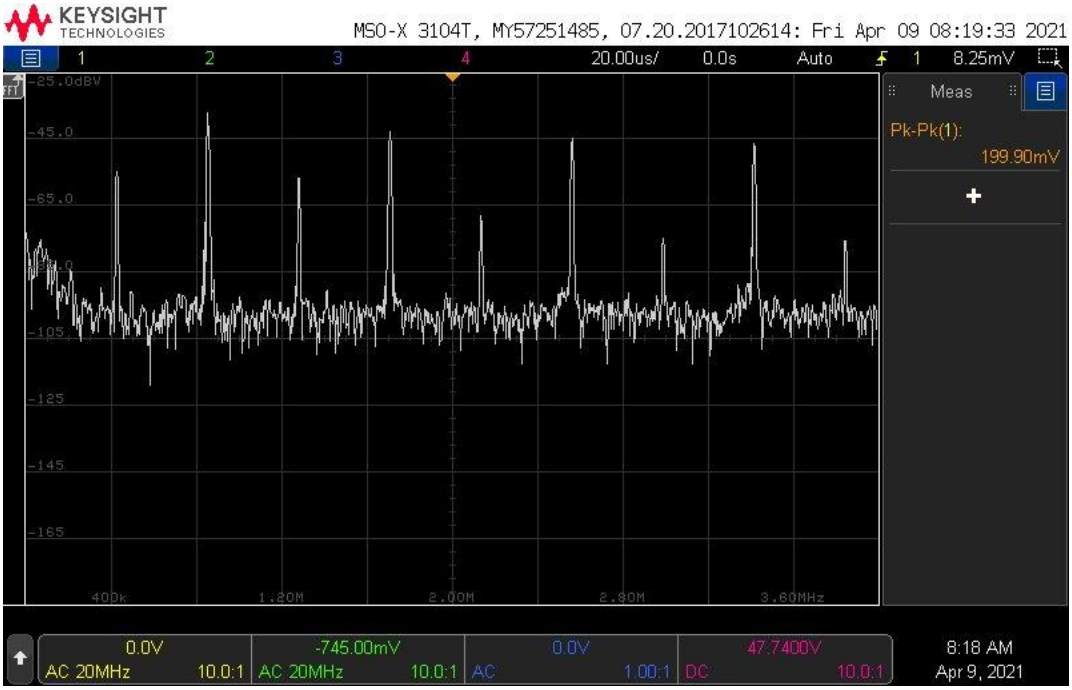

Figure 16. 15V Input Noise, 10A

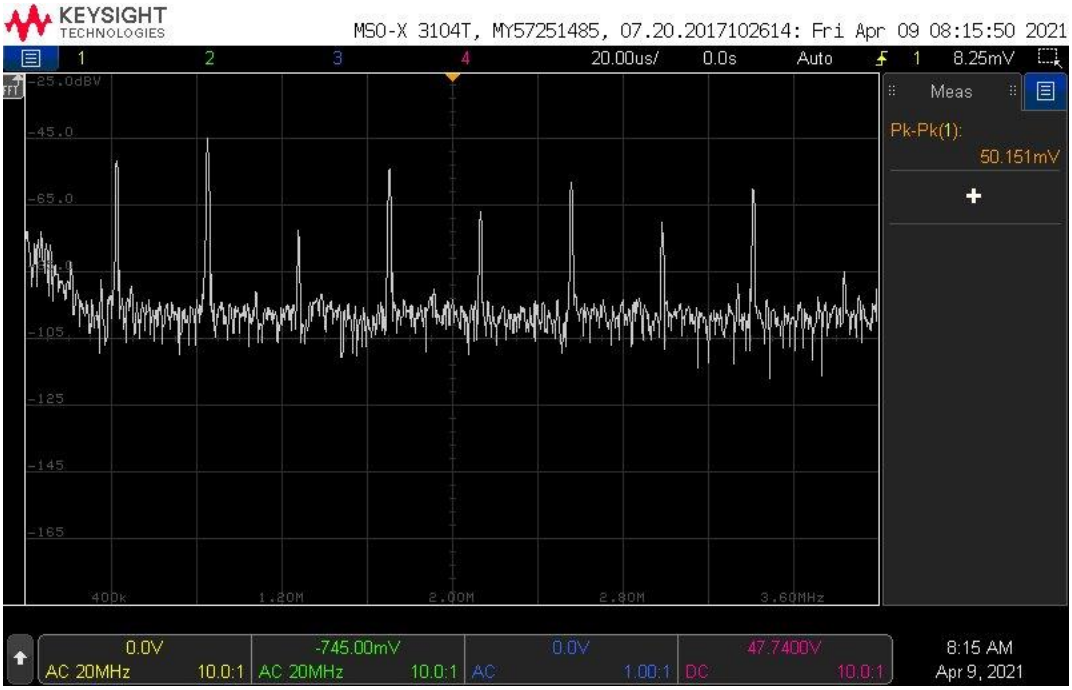

Figure 17. 15V Output Noise, 10A

Figure 18 shows a 1A to 9A dynamic load applied at 1 kHz. The output voltage variation is typically 400 mV.

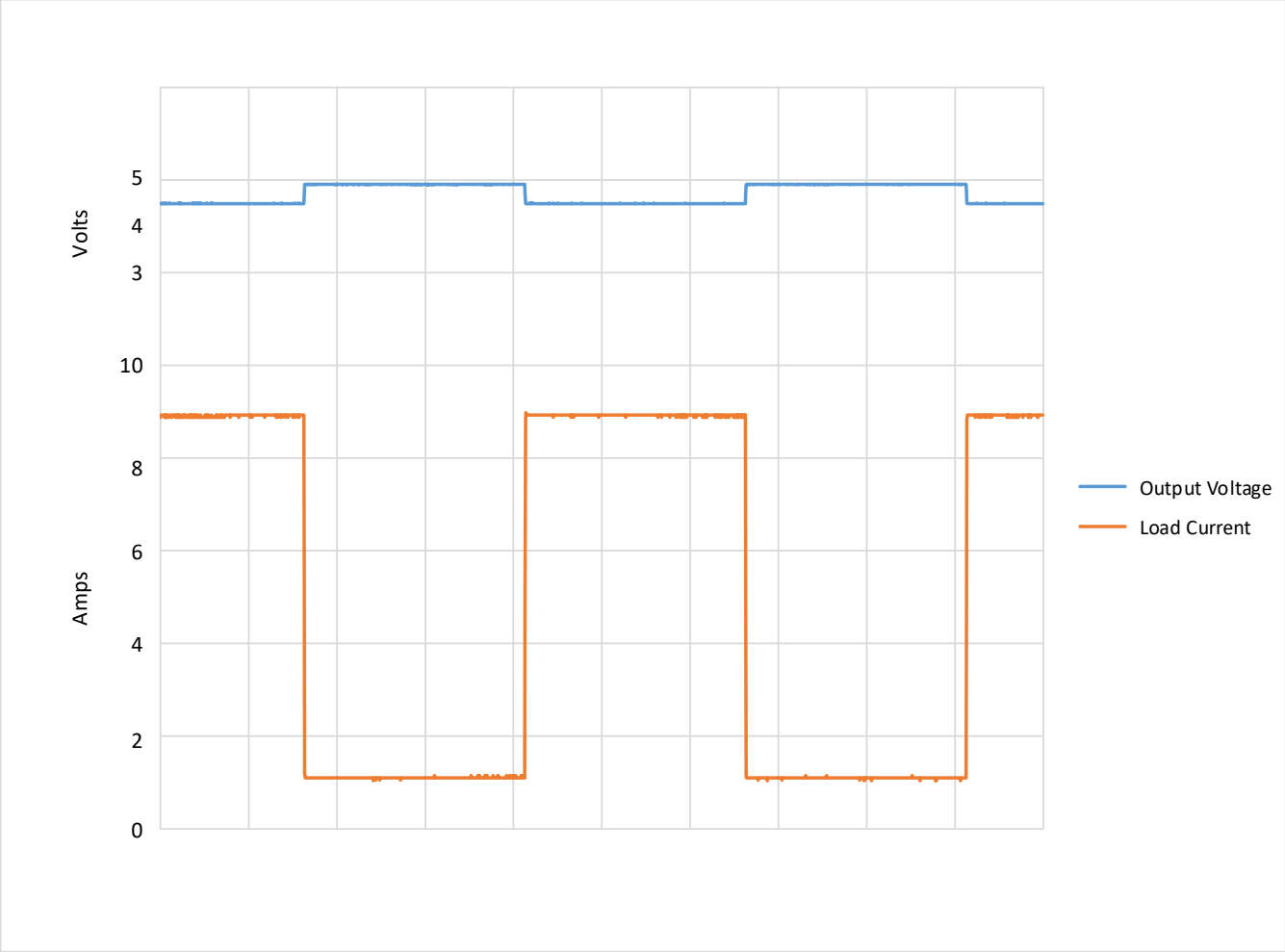

Figure 18. Transient Load Response

Information

PE25200 EVK PCB Layout

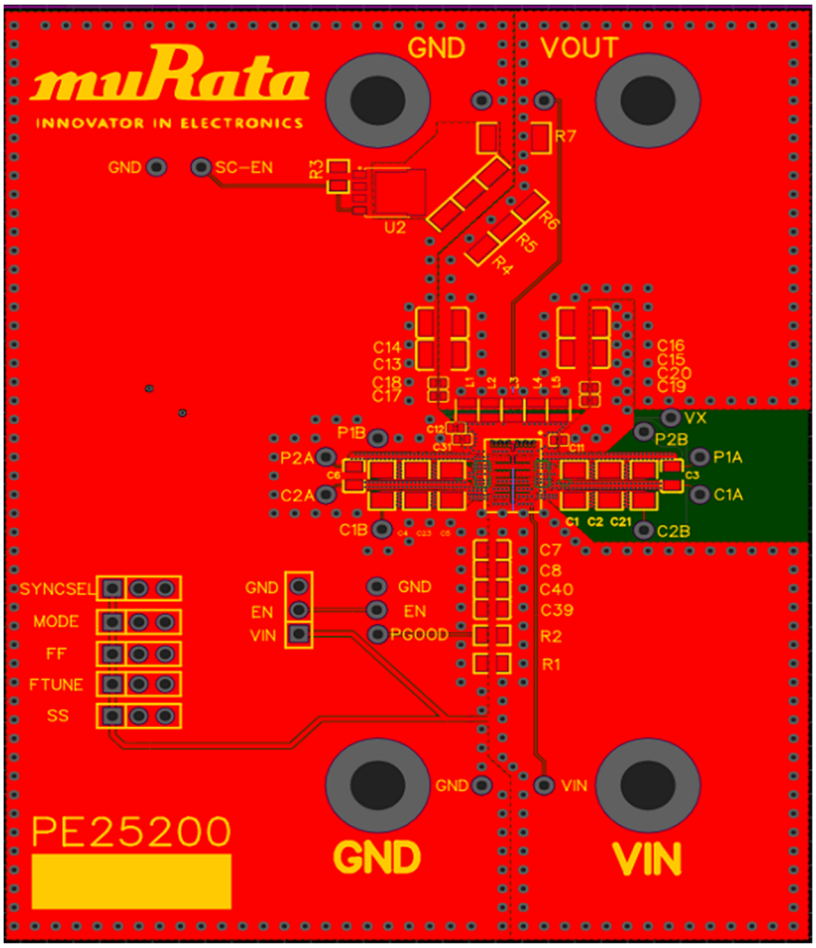

Figure 19. Evaluation Board Layout (Top)

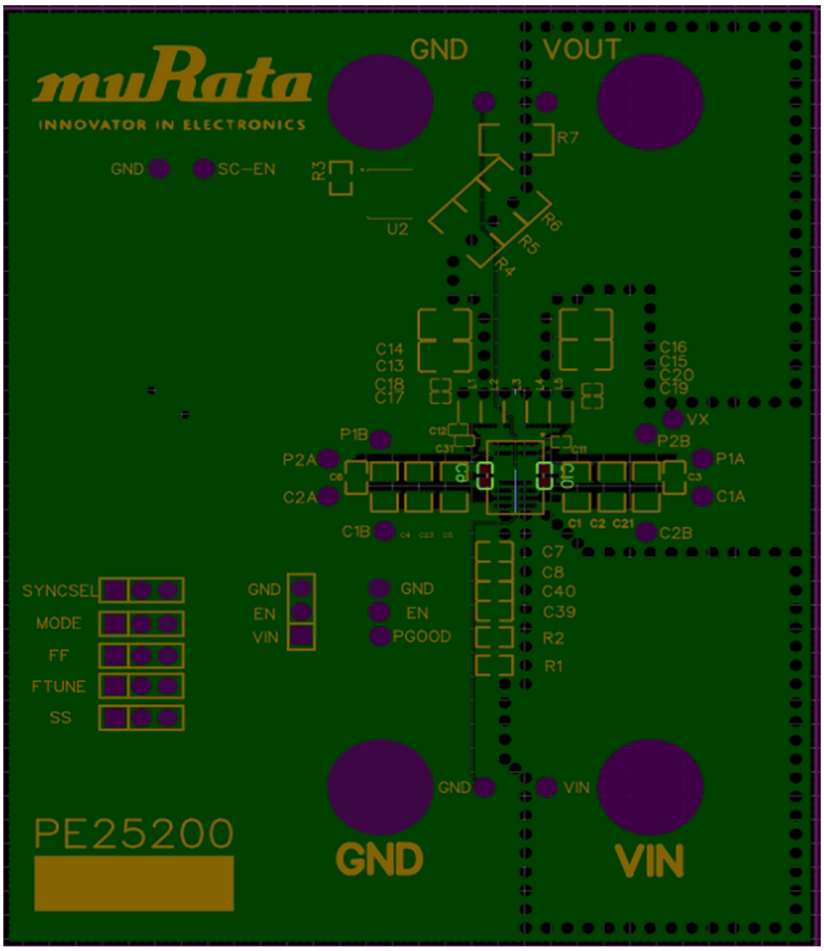

Figure 20. Evaluation Board Layout (Inner 1)

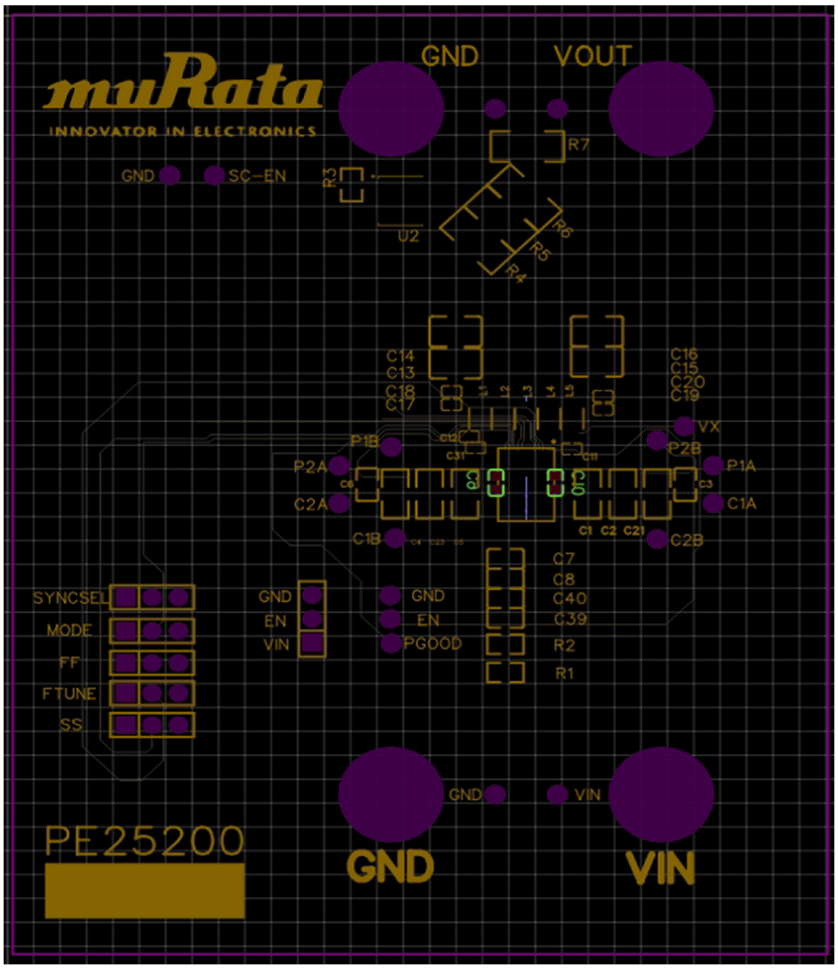

Figure 21. Evaluation Board Layout (Inner 2)

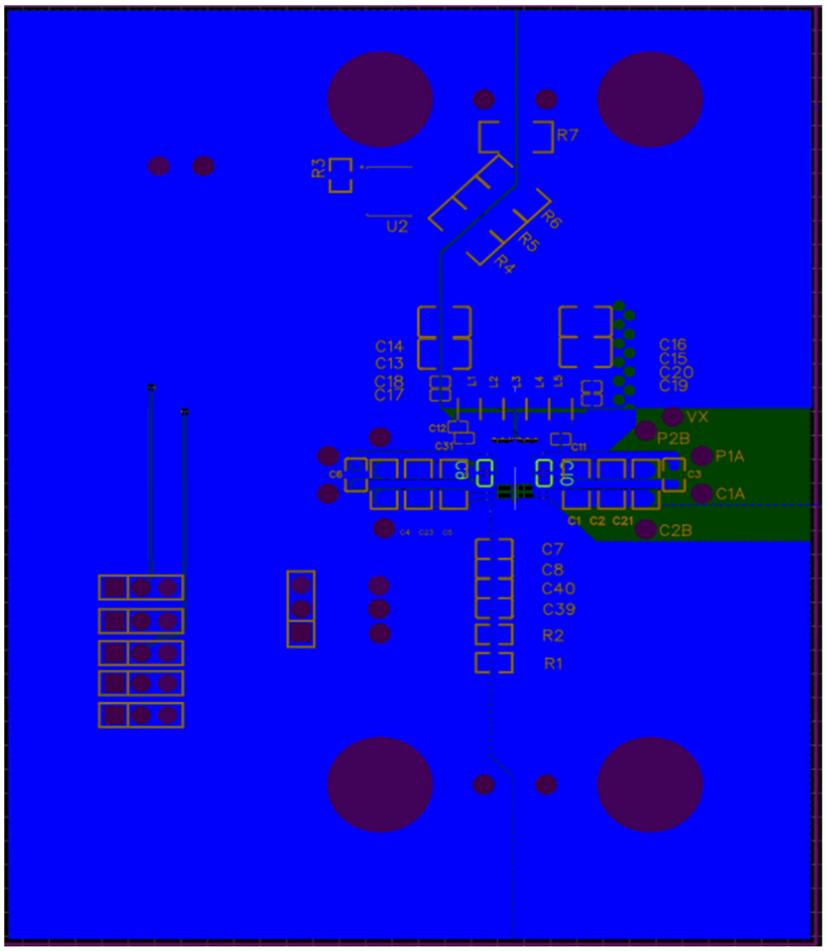

Figure 22. Evaluation Board Layout (Bottom)

PE25200 EVK PCB Schematic

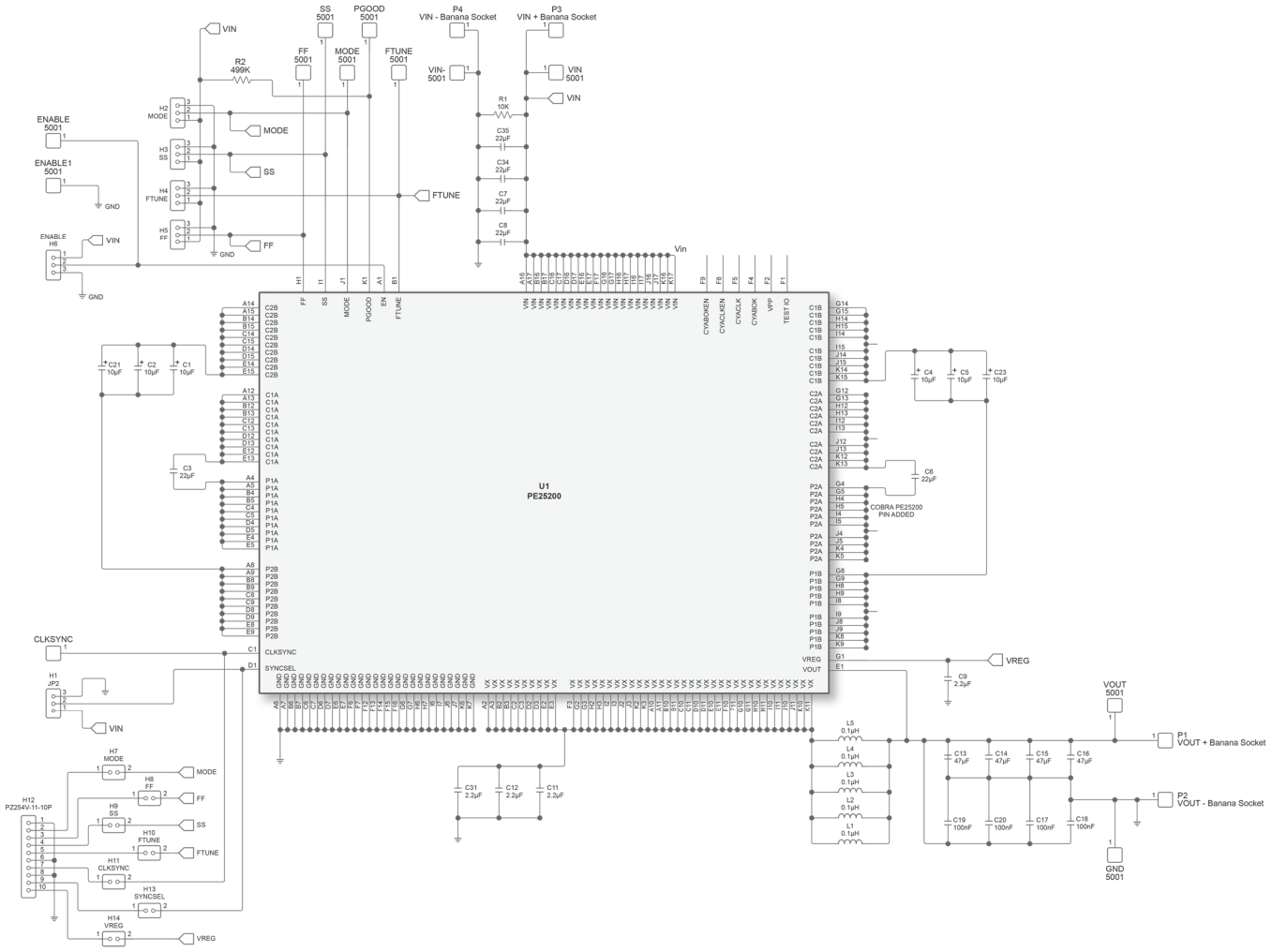

Figure 23. Evaluation Board Schematic

PE25200 BOM Listing

PART REFERENCE	VALUE	DESCRIPTION	MANUFACTURER PN
C1 C2 C4 C5 C21 C23	10 µF	CAP, SMD, CER, 10 µF, 16V, +/- 10%, X7S, 0805 (2012 Metric)	GRM21BC71C106KE11L
C3 C6	22 µF	CAP, SMD, CER, 22 µF, 6.3V, +/- 20%, X7T, 0805 (2012 Metric)	GRM21BD70J226ME44L
C7 C8 C34 C35	22 µF	CAP, SMD, CER, 22 µF, 25V, +/- 20%, X6S, 1206 (3216 Metric)	GRM31CC81E226ME11L
C9 C11 C12 C31	2.2 µF	CAP, SMD, CER, 2.2 µF, 10V, +/- 10%, X7R, 0402 (1005 Metric)	GRM155C71A225KE11D
C13-C16	47 µF	CAP, SMD, CER, 47 µF, 6.3V, +/- 10%, X7R, 1210 (3225 Metric)	GCM32ER70J476KE19L
C17-C20	0.1 µF	CAP, SMD, CER, 0.1 µF, 25V, +/- 20%, X7R, 0402 (1005 Metric)	GRM155R71E104ME14D
C1A C1B C2A C2B CLK CYABOK CYABOKEN CYACLK CYACLKEN EN_TP FF FTUNE MODE P1A P1B P2A P2B PGOOD SS TESTIO VPP	5002	CONN, Test Points, PC Test Point, Miniature, Test Point TH, Male, THM, 5002 - White	5002
C22 C24 C27 C30	DNI	DNI	DNI
C25 C26 C28 C29	DNI	DNI	DNI
JP2 JP6 JP7 JP15-JP18	TSW-103-07-G-S	CONN, Rectangular Connectors - Headers, Male Pins, Header, TH, Male, TSW, (3-POS)	TSW-103-07-G-S
L1-L5	0.1 µH	IND, SMD, Multilayer - Power - Automotive, LQM2MPZ_JH, 0.1uH, 4000mA(85 C), 3000mA(125 C), 0.019 Ohms, 0806 (2016 metric)	LQM2MPZR10MJH
P1	PREC010SAAN-RC	CONN, Rectangular Connectors - Headers, Male Pins, Header, TH, Male, 0.100" (2.54mm), 10 POS	PREC010SAAN-RC
PCB1	PCB	MISC, DOC, PCB, PE25200 DEVICE EVK	PRT-72806-01
R1	10K	RES, SMD, Thick Film, 10K, +/-1%, 1/8W, 0805 (2012 metric)	CRCW080510K0FKEA

PART REFERENCE	VALUE	DESCRIPTION	MANUFACTURER PN
R2	499K	RES, SMD, Thick Film, 499K, +/-1%, 1/8W, 0805 (2012 Metric)	CRCW0805499KFKEA
R3 R4	DNI	DNI	DNI
TP1	5016	CONN, Test Points, PC Test Point, Compact, Test Point SMD, Male	5016
U1	PE25200	IC, SMD, pSemi IC, BGA	EK.25200-HDI

Table 3. EVK BOM List

Technical Resources

Additional technical resources are available by contacting Sales at https://www.murata.com/contactform. These include the product specification datasheet, zip file, evaluation kit schematic and bill of materials, software, material declaration form and PC-compatible software file. Trademarks are subject to trademark claims.

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- Surgical implants
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- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Application of similar complexity and/or reliability requirements to the applications listed in the above

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