



LED Driver for Automotive Exterior lamps

**1ch High Current LED Controller
Boost LED Driver for Automotive
BD18353EFV-M Evaluation Board**

REFLED008, REFLED009, REFLED010

User's Guide

<High Voltage Safety Precautions>

◇ Read all safety precautions before use

Please note that this document covers only the **BD18353EFV-M** evaluation board and its functions. For additional information, please refer to the datasheet.

To ensure safe operation, please carefully read all precautions before handling the evaluation board



Depending on the configuration of the board and voltages used,

Potentially lethal voltages may be generated.

Therefore, please make sure to read and observe all safety precautions described in the red box below.

Before Use

- [1] Verify that the parts/components are not damaged or missing (i.e. due to the drops).
- [2] Check that there are no conductive foreign objects on the board.
- [3] Be careful when performing soldering on the module and/or evaluation board to ensure that solder splash does not occur.
- [4] Check that there is no condensation or water droplets on the circuit board.

During Use

- [5] Be careful to not allow conductive objects to come into contact with the board.
- [6] **Brief accidental contact or even bringing your hand close to the board may result in discharge and lead to severe injury or death.**

Therefore, DO NOT touch the board with your bare hands or bring them too close to the board.

In addition, as mentioned above please exercise extreme caution when using conductive tools such as tweezers and screwdrivers.

- [7] If used under conditions beyond its rated voltage, it may cause defects such as short-circuit or, depending on the circumstances, explosion or other permanent damages.
- [8] Be sure to wear insulated gloves when handling is required during operation.

After Use

- [9] The ROHM Evaluation Board contains the circuits which store the high voltage. Since it stores the charges even after the connected power circuits are cut, please discharge the electricity after using it, and please deal with it after confirming such electric discharge.
- [10] Protect against electric shocks by wearing insulated gloves when handling.

This evaluation board is intended for use only in research and development facilities and should be handled **only by qualified personnel familiar with all safety and operating procedures.**

We recommend carrying out operation in a safe environment that includes the use of high voltage signage at all entrances, safety interlocks, and protective glasses.

LED Driver for Automotive Exterior lamps

1ch High Current LED Controller Boost LED Driver for Automotive BD18353EFV-M Evaluation Board

REFLED008, REFLED009, REFLED010

Introduction

This user's guide will provide the necessary steps to operate the Evaluation Board of ROHM's BD18353EFV-M LED Driver. This document includes the external parts, operating procedures and application data.

Description

This Evaluation Board was developed for ROHM's LED Driver BD18353EFV-M. BD18353EFV-M is a 1ch LED Controller. High side current detection amplifier is built-in. PWM dimming duty can be freely set with built-in PWM generation circuit. PWM dimming realizes by driving an external P-ch MOSFET. Outputs abnormal LED status to the FAULT_B pin. Two systems of analog dimming are built-in. High precision 3.0V output power supply for analog dimming and PWM dimming setting is built-in.

Application

Automotive Exterior Lamps (Rear, Turn, DRL/Position, Fog, High/Low Beam etc.)

Reference designs

Reference designs with the following specifications are listed. PCB and Parts List can be jumped from the links in the table.

Table 1. Reference Designs

Reference Design No.*	Reference Board No.*	Topology	LED series number	LED current [mA]	Nch MOS Package (for Switching)	Pch MOS Package (for Dimming)	Parts List	Board Layout	Evaluation Data
REFLED008	-EVK-001	Boost to Vin	4	1000	TO-252	DFN2020	✓	✓	✓
REFLED008	-EVK-002	Boost to Vin	4	1000	HPLF5060	DFN2020		✓	-
REFLED008	-EVK-003	Boost to Vin	4	1000	TO-252	HSMT8AG		✓	-
REFLED008	-EVK-004	Boost to Vin	4	1000	HPLF5060	HSMT8AG		✓	-
REFLED009	-EVK-001	SEPIC	8	750	TO-252	DFN2020	✓	✓	✓
REFLED009	-EVK-002	SEPIC	8	750	HPLF5060	DFN2020		✓	-
REFLED009	-EVK-003	SEPIC	8	750	TO-252	HSMT8AG		✓	-
REFLED009	-EVK-004	SEPIC	8	750	HPLF5060	HSMT8AG		✓	-
REFLED010	-EVK-001	Boost	12	500	TO-252	DFN2020	✓	✓	✓
REFLED010	-EVK-002	Boost	12	500	HPLF5060	DFN2020		✓	-
REFLED010	-EVK-003	Boost	12	500	TO-252	HSMT8AG		✓	-
REFLED010	-EVK-004	Boost	12	500	HPLF5060	HSMT8AG		✓	-

*The name of the Reference Board No. is the Reference Design No. followed by "-EVK-00x".

Ex.) REFLED008-EVK-001

Evaluation board operating condition (Boost to Vin board setting)

Table 2. Evaluation board operating condition (default setting)

Parameter	Min	Typ	Max	Unit
Power supply voltage ^{*1}	8	13.5	18	V
LEDs in series	-	4	-	pcs
Output voltage ^{*2}	-	25.5	-	V
Output current	-	1042	-	mA
Switching frequency	-	413 ^{*3}	-	kHz
Over voltage limit	-	51.8	-	V
Over current limit	-	8.3	-	A

*1 This indicates the voltage near the VCC pin. Be careful of voltage drop by the impedance of power line.

*2 Since this evaluation board has a Boost to Vin-configuration, Output voltage is determined by the Vf value of the connected LED and the numbers of series plus Vin voltage. Also, output voltage should be lower than OVP voltage.

*3 The default frequency is set to 413kHz so that it is higher than the EMC standard (LW: 150kHz to 300kHz) even if variations and SSFM functions are considered.

Evaluation board operating condition (SEPIC board setting)

Table 3. Evaluation board operating condition (default setting)

Parameter	Min	Typ	Max	Unit
Power supply voltage ^{*1}	8	13.5	18	V
LEDs in series	-	8	-	pcs
Output voltage ^{*2}	-	24.0	-	V
Output current	-	757	-	mA
Switching frequency	-	413 ^{*3}	-	kHz
Over voltage limit	-	57.0	-	V
Over current limit	-	6.8	-	A

*1 This indicates the voltage near the VCC pin. Be careful of voltage drop by the impedance of power line.

*2 Since this evaluation board has a SEPIC-configuration, Output voltage is determined by the Vf value of the connected LED and the numbers of series voltage. Also, output voltage should be lower than OVP voltage.

*3 The default frequency is set to 413kHz so that it is higher than the EMC standard (LW: 150kHz to 300kHz) even if variations and SSFM functions are considered.

Evaluation board operating condition (Boost board setting)

Table 4. Evaluation board operating condition (default setting)

Parameter	Min	Typ	Max	Unit
Power supply voltage ^{*1}	8	13.5	18	V
LEDs in series	-	12	-	pcs
Output voltage ^{*2}	-	36.0	-	V
Output current	-	505	-	mA
Switching frequency	-	413 ^{*3}	-	kHz
Over voltage limit	-	57.0	-	V
Over current limit	-	6.9	-	A

*1 This indicates the voltage near the VCC pin. Be careful of voltage drop by the impedance of power line.

*2 Output voltage is determined by the Vf value of the connected LED and the numbers of series. Since this evaluation board has a Boost-configuration, output voltage should be higher than input voltage. Also, output voltage should be lower than OVP voltage.

*3 The default frequency is set to 413kHz so that it is higher than the EMC standard (LW: 150kHz to 300kHz) even if variations and SSFM functions are considered.

Evaluation board (Boost to Vin)

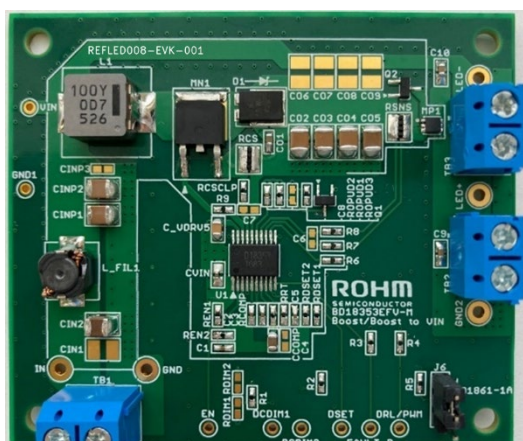


Figure 1. Top view

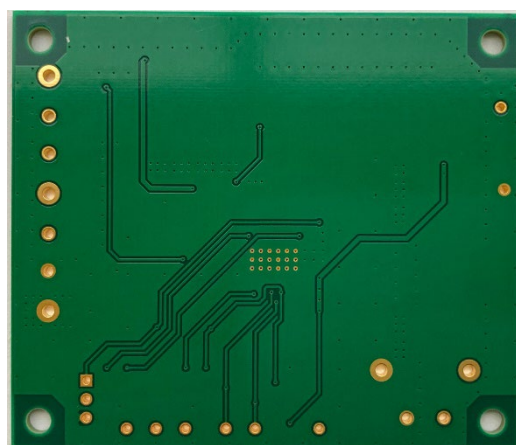


Figure 2. Bottom view

Evaluation board setup

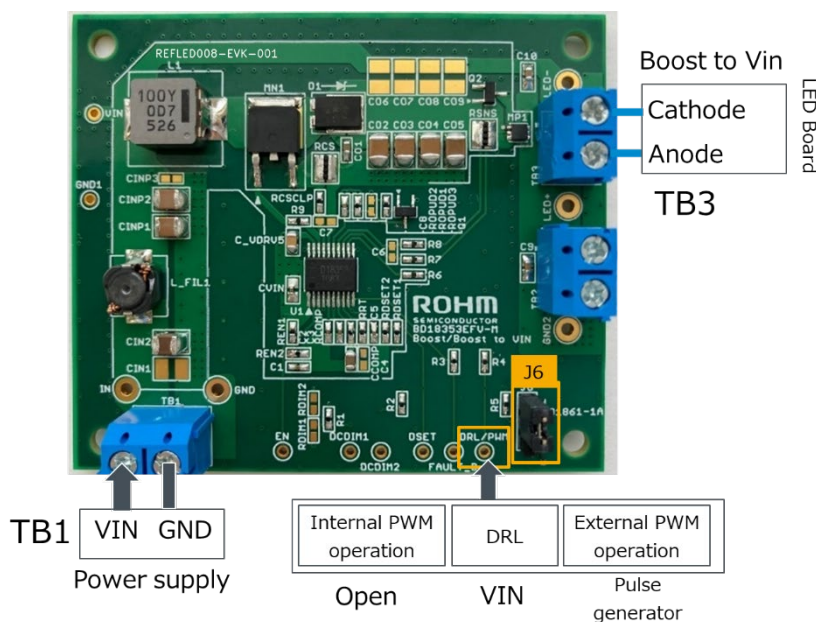


Figure 3. Evaluation board setup

Operating procedure

1. Connect LEDs to evaluation board.
Boost to Vin connecting: TB3(Anode to LED+ pin. Cathode to LED- pin)
2. Connect power supply to TB1(VIN pin and GND pin) of the evaluation board.
3. Connect power supply to DRL/PWM pin when 100% PWM duty using.
4. Connect pulse generator to DRL/PWM pin when PWM Dimming by external pulse signal input using.
5. Turn on the power supply for TB1(VIN pin and GND pin).
6. Turn on the pulse generator for DRL/PWM pin when PWM Dimming by external pulse signal input using.

Evaluation board (SEPIC)



Figure 4. Top view

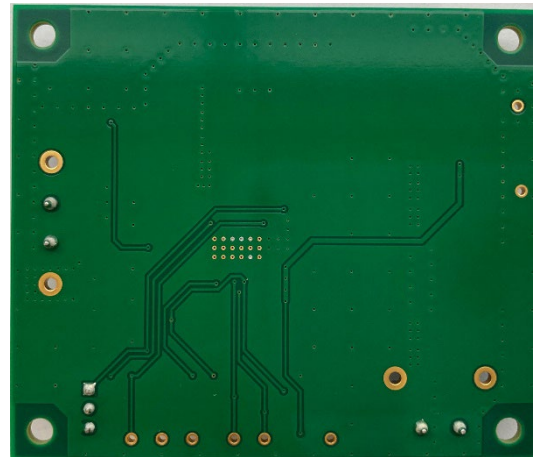


Figure 5. Bottom view

Evaluation board setup

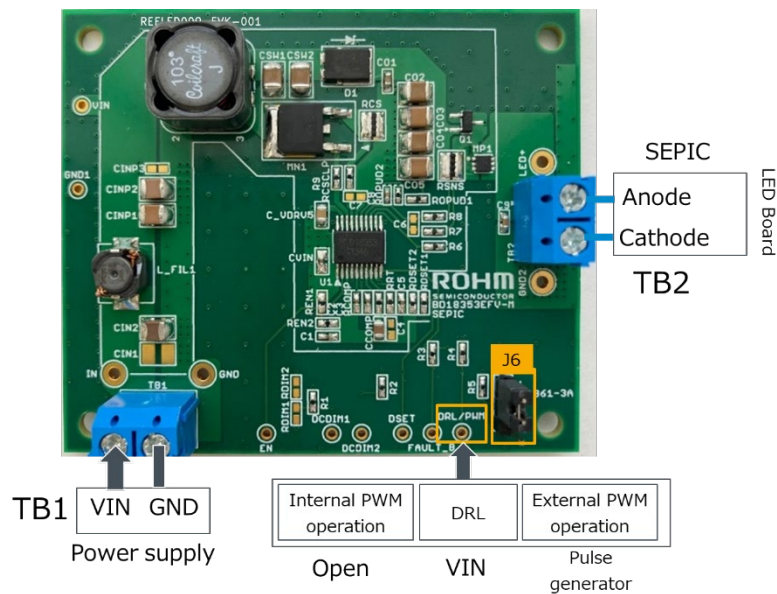


Figure 6. Evaluation board setup

Operating procedure

1. Connect LEDs to evaluation board.
SEPIC connecting: TB2(Anode to LED+ pin. Cathode to GND pin)
2. Connect power supply to TB1(VIN pin and GND pin) of the evaluation board.
3. Connect power supply to DRL/PWM pin when 100% PWM duty using.
4. Connect pulse generator to DRL/PWM pin when PWM Dimming by external pulse signal input using.
5. Turn on the power supply for TB1(VIN pin and GND pin).
6. Turn on the pulse generator for DRL/PWM pin when PWM Dimming by external pulse signal input using.

Evaluation board (Boost)

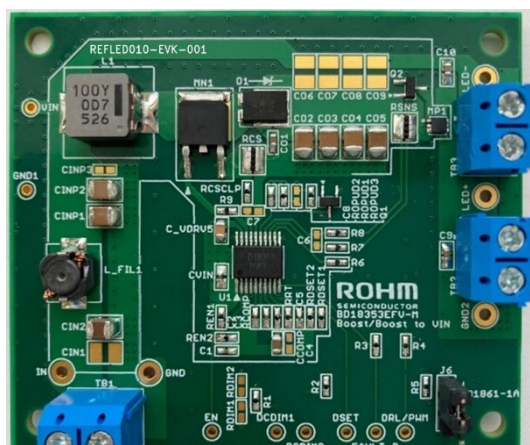


Figure 7. Top view

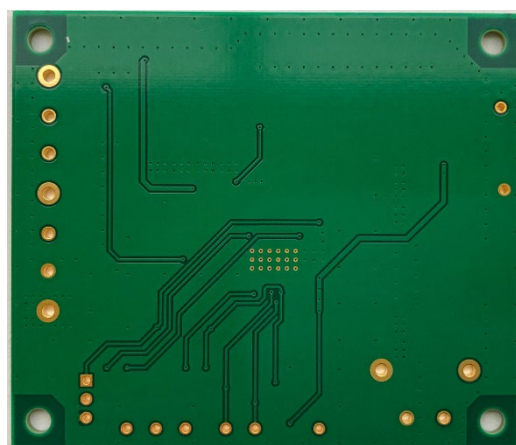


Figure 8. Bottom view

Evaluation board setup

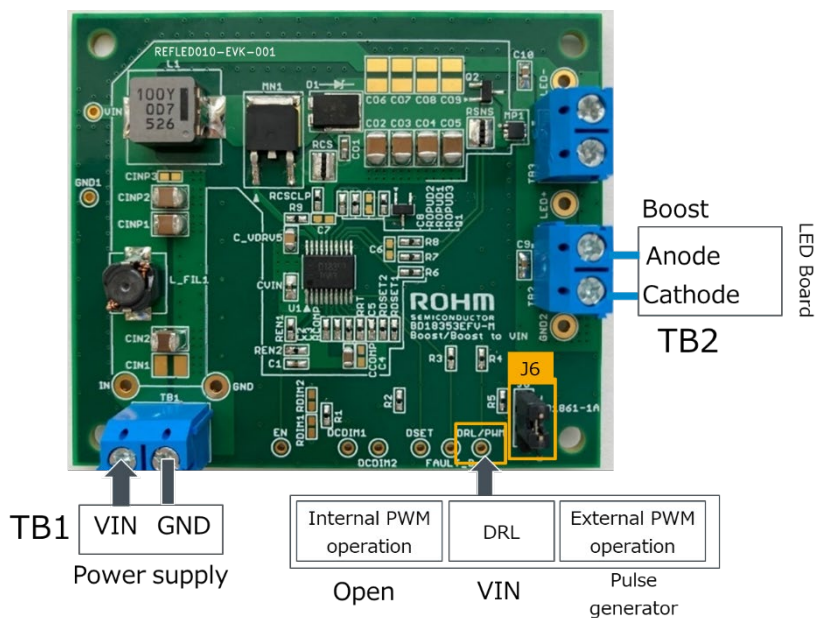


Figure 9. Evaluation board setup

Operating procedure

1. Connect LEDs to evaluation board.
Boost connecting: TB2(Anode to LED+ pin. Cathode to GND pin)
2. Connect power supply to TB1(VIN pin and GND pin) of the evaluation board.
3. Connect power supply to DRL/PWM pin when 100% PWM duty using.
4. Connect pulse generator to DRL/PWM pin when PWM Dimming by external pulse signal input using.
5. Turn on the power supply for TB1(VIN pin and GND pin).
6. Turn on the pulse generator for DRL/PWM pin when PWM Dimming by external pulse signal input using.

Operation mode settings

The table below describes the settings for J6(SSFM_B) terminals.

Table 5. SSFM Mode settings

Terminal	Setting	Function
J6 (SSFM_B)	H(SSFM_B to VDRV5)	Fixed Frequency Mode Determined by RRT
	L(SSFM_B to GND)	Spread spectrum frequency modulation(SSFM) enable. Frequency determined by RRT

The table below describes the settings for DRL/PWM terminal.

Table 6. PWM Mode settings

Terminal	Setting	Function
DRL/PWM	Not connect	PWM Dimming by Internal setting operation.
	Connect VIN	DRL(100% Duty)
	Connect Pulse generator (R4:Open)	PWM Dimming by external pulse signal input

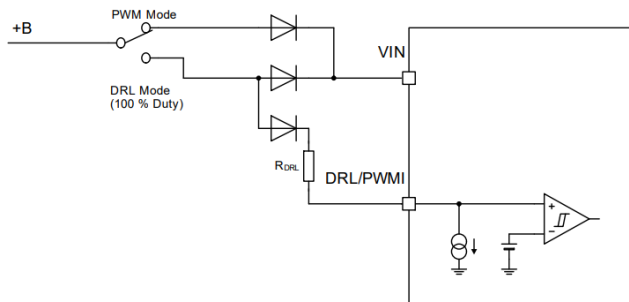


Figure 10. DRL Mode(100% Duty)

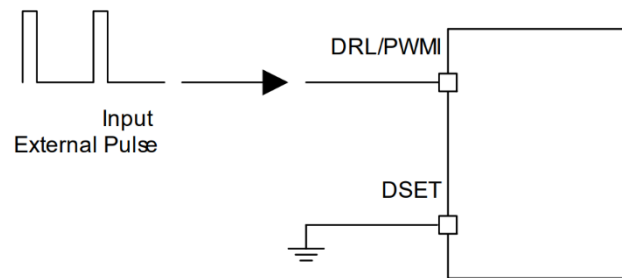


Figure 11. PWM Dimming by External Pulse Signal

Pin configuration

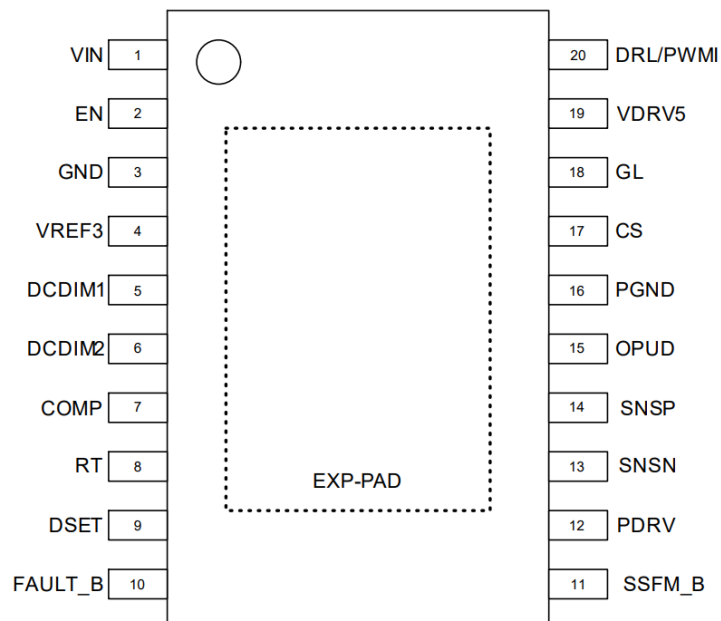


Figure 12. Pin configuration

Evaluation board schematic REFLED008(Boost to Vin) and REFLED010(Boost)

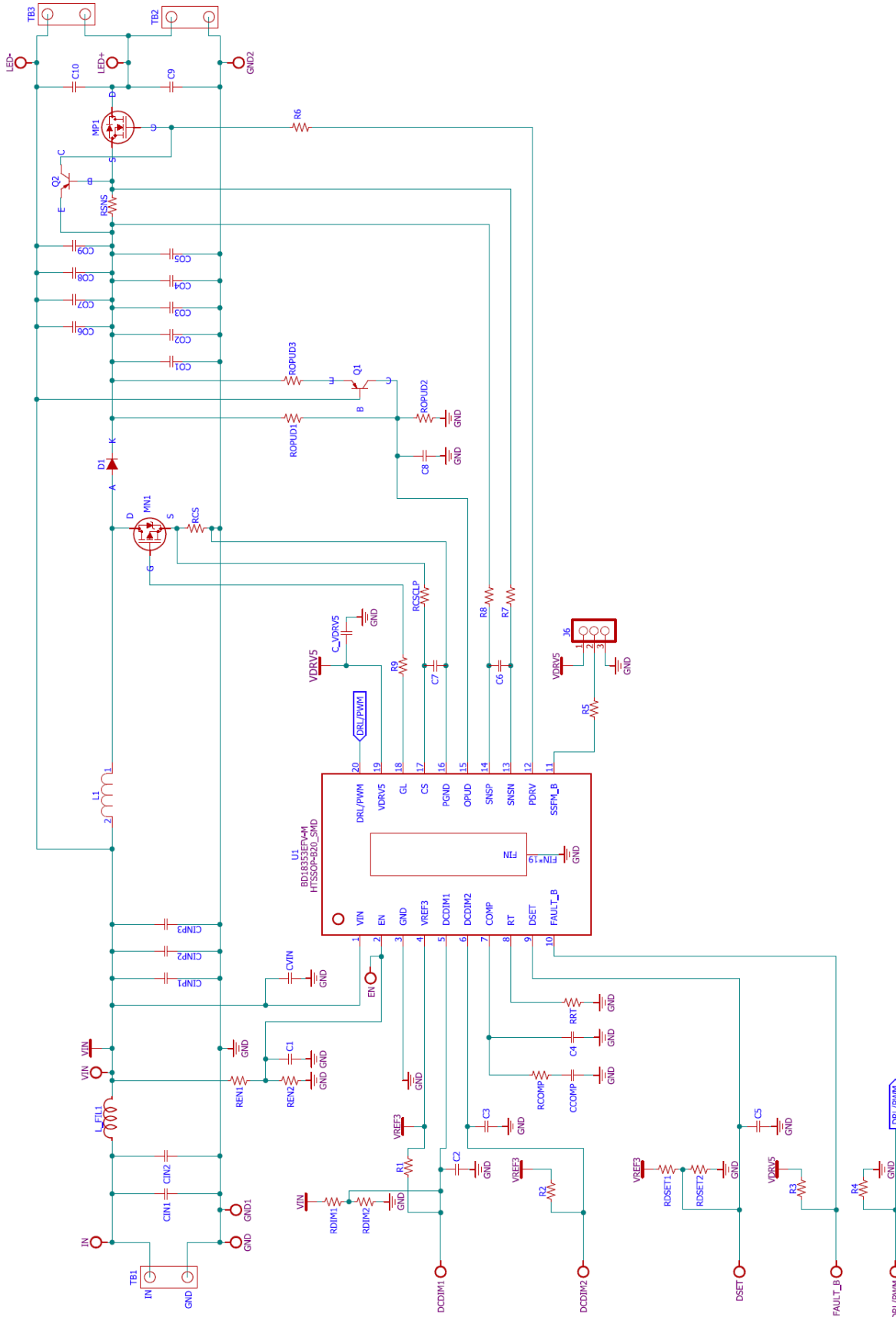


Figure 13. Evaluation board schematic

Evaluation board schematic REFLED009 (SEPIC)

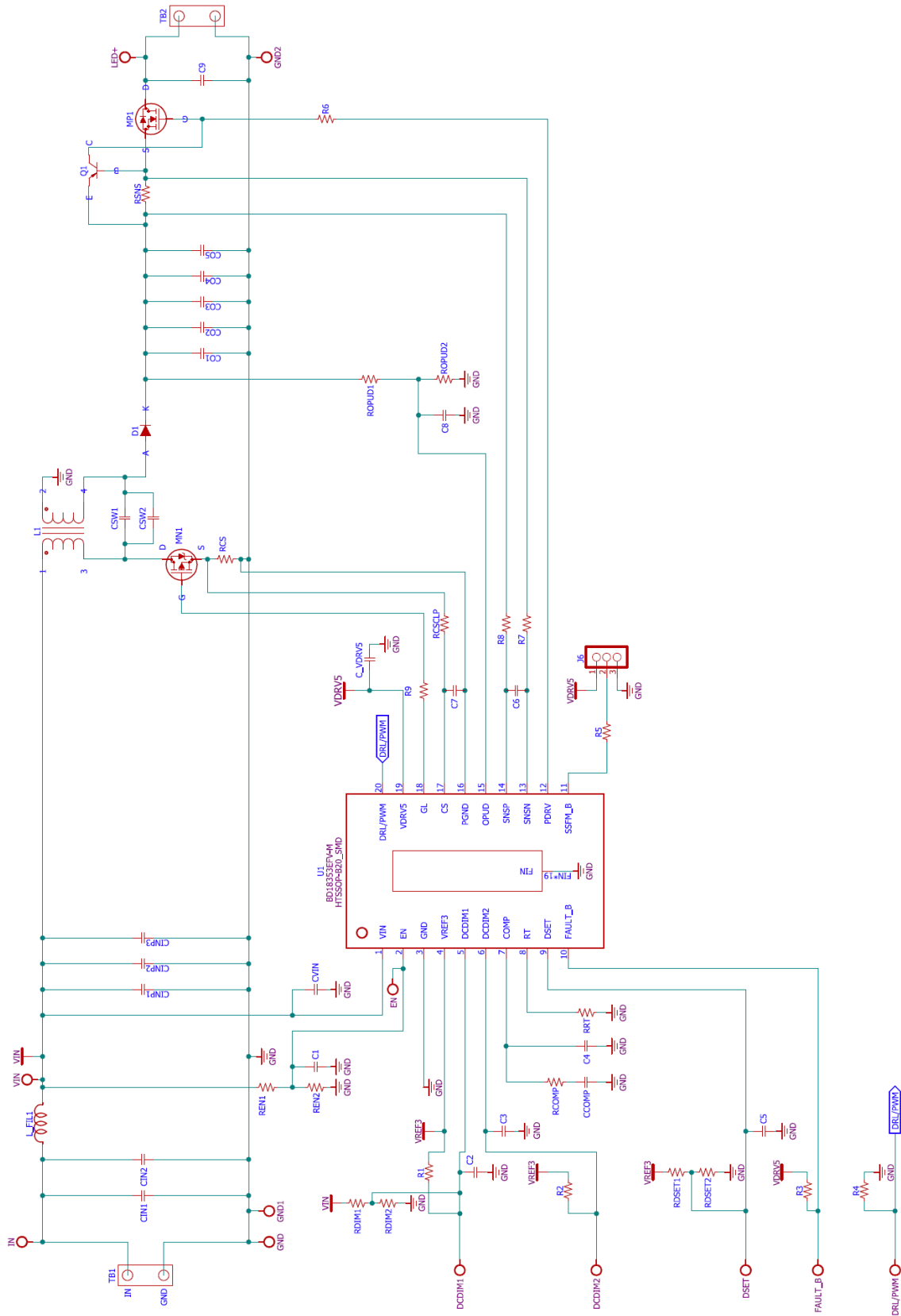


Figure 14. Evaluation board schematic

Parts list REFLED008-EVK-001 to 004(Boost to Vin)

Table 7. Parts list

No	Package	Parameters	Part name(series)	Type	Manufacturer
CIN1	-	Open	-	-	-
CIN2	3225	10 μ F, X7S, 50V	GCM32EC71H106KA	Ceramic	Murata
CINP1	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CINP2	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CINP3	-	Open	-	-	-
CVIN	1005	0.1 μ F, X7R, 50V	GCM155R71H104KE	Ceramic	Murata
CCOMP	2012	1 μ F, R, 25V	GCM21BR11E105KA	Ceramic	Murata
CVDRV5	2012	2.2 μ F, X7R, 25V	GCM21BR71E225KA	Ceramic	Murata
C1	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C2	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C3	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C4	-	Open	-	-	-
C5	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C6	-	Open	-	-	-
C7	-	Open	-	-	-
C8	1005	1000pF, X7R, 100V	GCM155R72A102KA	Ceramic	Murata
C9	1608	0.01 μ F, X7R, 100V	GCM188R72A103KA	Ceramic	Murata
C10	1608	0.01 μ F, X7R, 100V	GCM188R72A103KA	Ceramic	Murata
CO1	1608	0.1 μ F, X7R, 100V	GCJ188R72A104KA	Ceramic	Murata
CO2	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO3	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO4	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO5	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
L1	W8.5×L8.0×H5.0mm	10 μ H	ETQP5M100YFK	Inductor	Panasonic
L-FIL1	W6.0×L6.0×H4.5mm	2.2 μ H	CLF6045NIT-2R2N-D	Inductor	TDK
U1	W6.5×L6.4×H1.0mm	-	BD18353EFV-M	IC	ROHM
REN1	1005	51k Ω	MCR01 Series	Resistor	ROHM
REN2	1005	10k Ω	MCR01 Series	Resistor	ROHM
RDIM1	-	Open	-	-	-
RDIM2	-	Open	-	-	-
RCOMP	1005	33 Ω	MCR01 Series	Resistor	ROHM
RRT	1005	24k Ω	MCR01 Series	Resistor	ROHM
RDSET1	1005	39k Ω	MCR01 Series	Resistor	ROHM
RDSET2	1005	10k Ω	MCR01 Series	Resistor	ROHM
RSNS	1632	0.16 Ω , 1W	LTR18 Series	Resistor	ROHM
ROPUD1	-	Open	-	-	-
ROPUD2	1005	18k Ω	MCR01 Series	Resistor	ROHM

Parts list REFLED008-EVK-001 to 004(Boost to Vin) - continued

Table 8. Parts list - continued

No	Package	Parameters	Part name(series)	Type	Manufacturer
ROPUD3	1005	680k Ω	MCR01 Series	Resistor	ROHM
RCS	1632	0.024 Ω , 1W	LTR18 series	Resistor	ROHM
RCSSLP	1005	2.4k Ω	MCR01 Series	Resistor	ROHM
R1	1005	47k Ω	MCR01 Series	Resistor	ROHM
R2	1005	47k Ω	MCR01 Series	Resistor	ROHM
R3	1005	10k Ω	MCR01 Series	Resistor	ROHM
R4	1005	47k Ω	MCR01 Series	Resistor	ROHM
R5	1005	47k Ω	MCR01 Series	Resistor	ROHM
R6	-	Short	-	-	-
R7	-	Short	-	-	-
R8	-	Short	-	-	-
R9	1005	10 Ω	MCR01 Series	Resistor	ROHM
D1	TO-277	100V, 8A	RB048RSM10S	Diode	ROHM
Q1	SOT-23	-60V, -0.6A	SSTA56HZG	Bipolar	ROHM
Q2	SOT-23	-60V, -0.6A	SSTA56HZG	Bipolar	ROHM

Since MN1 for switching and MP1 for dimming are MOSFETs, the package combination differs depending on the Reference board No. The table below shows the MOSFET combinations on each board.

Table 9. the MOSFET combinations on Boost to Vin board

No		Reference Board No. REFLED008-EVK-xxx			
		001	002	003	004
MN1	Part name	RD3P06BBKFRA	AG052FPS4FRA	RD3P06BBKFRA	AG052FPS4FRA
	Package	TO-252	HPLF5060	TO-252	HPLF5060
	Parameters	100V, 56A	100V, 53A	100V, 56A	100V, 53A
	Type	MOSFET	MOSFET	MOSFET	MOSFET
	Manufacturer	ROHM	ROHM	ROHM	ROHM
MP1	Part name	RF9L120BJFRA	RF9L120BJFRA	RQ3L270BJFRA	RQ3L270BJFRA
	Package	DFN2020WF-L7	DFN2020WF-L7	HSMT8AG	HSMT8AG
	Parameters	-60V, -12A	-60V, -12A	-60V, -27A	-60V, -27A
	Type	MOSFET	MOSFET	MOSFET	MOSFET
	Manufacturer	ROHM	ROHM	ROHM	ROHM

Parts list REFLED009-EVK-001 to 004(SEPIC)

Table 10. Parts list

No	Package	Parameters	Part name(series)	Type	Manufacturer
CIN1	-	Open	-	-	-
CIN2	3225	10 μ F, X7S, 50V	GCM32EC71H106KA	Ceramic	Murata
CINP1	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CINP2	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CINP3	-	Open	-	-	-
CSW1	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CSW2	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CVIN	1005	0.1 μ F, X7R, 50V	GCM155R71H104KE	Ceramic	Murata
CCOMP	2012	1 μ F, R, 25V	GCM21BR11E105KA	Ceramic	Murata
CVDRV5	2012	2.2 μ F, X7R, 25V	GCM21BR71E225KA	Ceramic	Murata
C1	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C2	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C3	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C4	-	Open	-	-	-
C5	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C6	-	Open	-	-	-
C7	-	Open	-	-	-
C8	1005	1000pF, X7R, 100V	GCM155R72A102KA	Ceramic	Murata
C9	1608	0.01 μ F, X7R, 100V	GCM188R72A103KA	Ceramic	Murata
C10	1608	0.01 μ F, X7R, 100V	GCM188R72A103KA	Ceramic	Murata
CO1	1608	0.1 μ F, X7R, 100V	GCJ188R72A104KA	Ceramic	Murata
CO2	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO3	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO4	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO5	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
L1	W12.3×L12.3×H8.05mm	10 μ H	MSD1278T-103MLB	Inductor	Coilcraft
L-FIL1	W6.0×L6.0×H4.5mm	2.2 μ H	CLF6045NIT-2R2N-D	Inductor	TDK
U1	W6.5×L6.4×H1.0mm	-	BD18353EFV-M	IC	ROHM
REN1	1005	51k Ω	MCR01 Series	Resistor	ROHM
REN2	1005	10k Ω	MCR01 Series	Resistor	ROHM
RDIM1	-	Open	-	-	-
RDIM2	-	Open	-	-	-
RCOMP	1005	33 Ω	MCR01 Series	Resistor	ROHM
RRT	1005	24k Ω	MCR01 Series	Resistor	ROHM
RDSET1	1005	39k Ω	MCR01 Series	Resistor	ROHM
RDSET2	1005	10k Ω	MCR01 Series	Resistor	ROHM
RSNS	1632	0.22 Ω , 1W	LTR18 Series	Resistor	ROHM
ROPUD1	1005	560k Ω	MCR01 Series	Resistor	ROHM
ROPUD2	1005	10k Ω	MCR01 Series	Resistor	ROHM

Parts list REFLED009-EVK-001 to 004(SEPIC)- continued

Table 11. Parts list - continued

No	Package	Parameters	Part name(series)	Type	Manufacturer
RCS	1632	0.024Ω, 1W	LTR18 series	Resistor	ROHM
RCSLSP	1005	2.4kΩ	MCR01 Series	Resistor	ROHM
R1	1005	47kΩ	MCR01 Series	Resistor	ROHM
R2	1005	47kΩ	MCR01 Series	Resistor	ROHM
R3	1005	10kΩ	MCR01 Series	Resistor	ROHM
R4	1005	47kΩ	MCR01 Series	Resistor	ROHM
R5	1005	47kΩ	MCR01 Series	Resistor	ROHM
R6	-	Short	-	-	-
R7	-	Short	-	-	-
R8	-	Short	-	-	-
R9	1005	10Ω	MCR01 Series	Resistor	ROHM
D1	TO-277	100V, 8A	RB048RSM10S	Diode	ROHM
Q1	SOT-23	-60V, -0.6A	SSTA56HZG	Bipolar	ROHM

Since MN1 for switching and MP1 for dimming are MOSFETs, the package combination differs depending on the Reference board No. The table below shows the MOSFET combinations on each board.

Table 12. the MOSFET combinations on SEPIC board

No		Reference Board No. REFLED009-EVK-xxx			
		001	002	003	004
MN1	Part name	RD3P06BBKFRA	AG052FPS4FRA	RD3P06BBKFRA	AG052FPS4FRA
	Package	TO-252	HPLF5060	TO-252	HPLF5060
	Parameters	100V, 56A	100V, 53A	100V, 56A	100V, 53A
	Type	MOSFET	MOSFET	MOSFET	MOSFET
	Manufacturer	ROHM	ROHM	ROHM	ROHM
MP1	Part name	RF9L120BJFRA	RF9L120BJFRA	RQ3L270BJFRA	RQ3L270BJFRA
	Package	DFN2020WF-L7	DFN2020WF-L7	HSMT8AG	HSMT8AG
	Parameters	-60V, -12A	-60V, -12A	-60V, -27A	-60V, -27A
	Type	MOSFET	MOSFET	MOSFET	MOSFET
	Manufacturer	ROHM	ROHM	ROHM	ROHM

Parts list REFLED010-EVK001 to 004(Boost)

Table 13. Parts list

No	Package	Parameters	Part name(series)	Type	Manufacturer
CIN1	-	Open	-	-	-
CIN2	3225	10 μ F, X7S, 50V	GCM32EC71H106KA	Ceramic	Murata
CINP1	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CINP2	3225	4.7 μ F, X7R, 50V	GCM32ER71H475KA	Ceramic	Murata
CINP3	-	Open	-	-	-
CVIN	1005	0.1 μ F, X7R, 50V	GCM155R71H104KE	Ceramic	Murata
CCOMP	2012	1 μ F, R, 25V	GCM21BR11E105KA	Ceramic	Murata
CVDRV5	2012	2.2 μ F, X7R, 25V	GCM21BR71E225KA	Ceramic	Murata
C1	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C2	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C3	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C4	-	Open	-	-	-
C5	1005	0.01 μ F, X7R, 50V	GCM155R71H103KA	Ceramic	Murata
C6	-	Open	-	-	-
C7	-	Open	-	-	-
C8	1005	1000pF, X7R, 100V	GCM155R72A102KA	Ceramic	Murata
C9	1608	0.01 μ F, X7R, 100V	GCM188R72A103KA	Ceramic	Murata
C10	1608	0.01 μ F, X7R, 100V	GCM188R72A103KA	Ceramic	Murata
CO1	1608	0.1 μ F, X7R, 100V	GCJ188R72A104KA	Ceramic	Murata
CO2	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO3	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO4	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
CO5	3225	4.7 μ F, X7S, 100V	GCM32DC72A475KE	Ceramic	Murata
L1	W8.5×L8.0×H5.0mm	10 μ H	ETQP5M100YFK	Inductor	Panasonic
L-FIL1	W6.0×L6.0×H4.5mm	2.2 μ H	CLF6045NIT-2R2N-D	Inductor	TDK
U1	W6.5×L6.4×H1.0mm	-	BD18353EFV-M	IC	ROHM
REN1	1005	51k Ω	MCR01 Series	Resistor	ROHM
REN2	1005	10k Ω	MCR01 Series	Resistor	ROHM
RDIM1	-	Open	-	-	-
RDIM2	-	Open	-	-	-
RCOMP	1005	33 Ω	MCR01 Series	Resistor	ROHM
RRT	1005	24k Ω	MCR01 Series	Resistor	ROHM
RDSET1	1005	39k Ω	MCR01 Series	Resistor	ROHM
RDSET2	1005	10k Ω	MCR01 Series	Resistor	ROHM
RSNS	1632	0.33 Ω , 1W	LTR18 Series	Resistor	ROHM
ROPUD1	-	Open	-	-	-
ROPUD2	1005	10k Ω	MCR01 Series	Resistor	ROHM

Parts list REFLED010-EVK001 to 004(Boost) - continued

Table 14. Parts list - continued

No	Package	Parameters	Part name(series)	Type	Manufacturer
ROPUD3	1005	560k Ω	MCR01 Series	Resistor	ROHM
RCS	1632	0.024 Ω , 1W	LTR18 series	Resistor	ROHM
RCSSLP	1005	2.4k Ω	MCR01 Series	Resistor	ROHM
R1	1005	47k Ω	MCR01 Series	Resistor	ROHM
R2	1005	47k Ω	MCR01 Series	Resistor	ROHM
R3	1005	10k Ω	MCR01 Series	Resistor	ROHM
R4	1005	47k Ω	MCR01 Series	Resistor	ROHM
R5	1005	47k Ω	MCR01 Series	Resistor	ROHM
R6	-	Short	-	-	-
R7	-	Short	-	-	-
R8	-	Short	-	-	-
R9	1005	10 Ω	MCR01 Series	Resistor	ROHM
MN1	TO-252	100V, 56A	RD3P06BBKFRA	MOSFET	ROHM
MP1	DFN2020WF-L7	-60V, -12A	RF9L120BJFRA	MOSFET	ROHM
D1	TO-277	100V, 8A	RB048RSM10S	Diode	ROHM
Q1	SOT-23	-60V, -0.6A	SSTA56HZG	Bipolar	ROHM
Q2	-	Open	-	-	-

Since MN1 for switching and MP1 for dimming are MOSFETs, the package combination differs depending on the Reference board No. The table below shows the MOSFET combinations on each board.

Table 15. the MOSFET combinations on Boost board

No		Reference Board No. REFLED010-EVK-xxx			
		001	002	003	004
MN1	Part name	RD3P06BBKFRA	AG052FPS4FRA	RD3P06BBKFRA	AG052FPS4FRA
	Package	TO-252	HPLF5060	TO-252	HPLF5060
	Parameters	100V, 56A	100V, 53A	100V, 56A	100V, 53A
	Type	MOSFET	MOSFET	MOSFET	MOSFET
	Manufacturer	ROHM	ROHM	ROHM	ROHM
MP1	Part name	RF9L120BJFRA	RF9L120BJFRA	RQ3L270BJFRA	RQ3L270BJFRA
	Package	DFN2020WF-L7	DFN2020WF-L7	HSMT8AG	HSMT8AG
	Parameters	-60V, -12A	-60V, -12A	-60V, -27A	-60V, -27A
	Type	MOSFET	MOSFET	MOSFET	MOSFET
	Manufacturer	ROHM	ROHM	ROHM	ROHM

Board layout REFLED008-EVK-001(Boost to Vin), REFLED010-EVK-001(Boost)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below

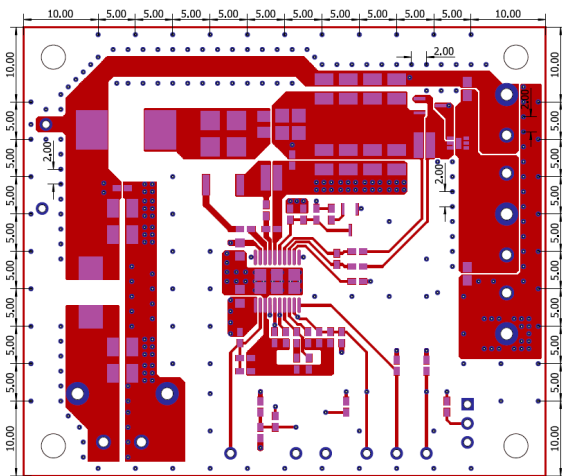


Figure 15. Top layer layout
(Top view)

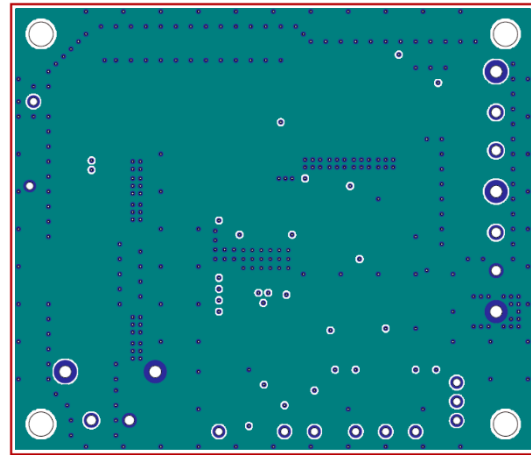


Figure 16. 2nd layer layout
(Top view)

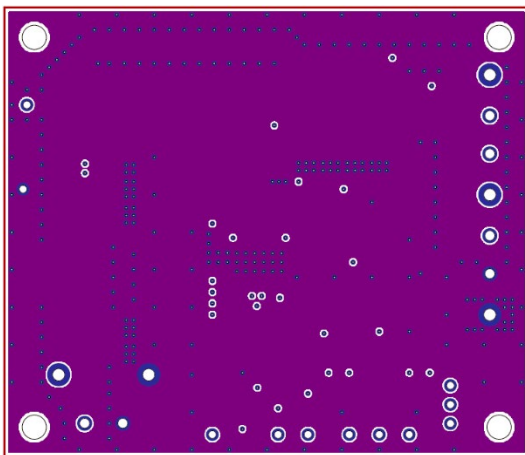


Figure 17. 3rd layer layout
(Top view)

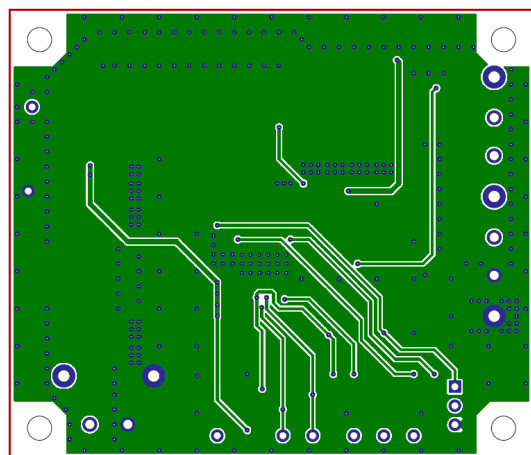


Figure 18. Bottom layer layout
(Top view)

Board layout REFLED008-EVK-002(Boost to Vin), REFLED010-EVK-002(Boost)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below.

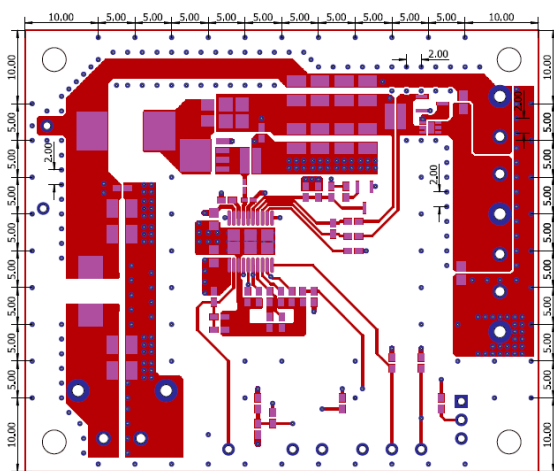


Figure 19. Top layer layout
(Top view)

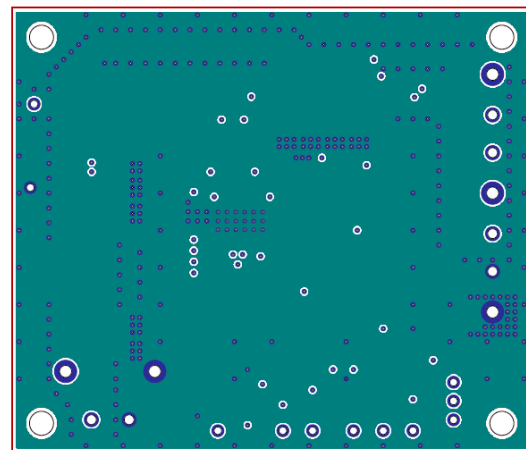


Figure 20. 2nd layer layout
(Top view)

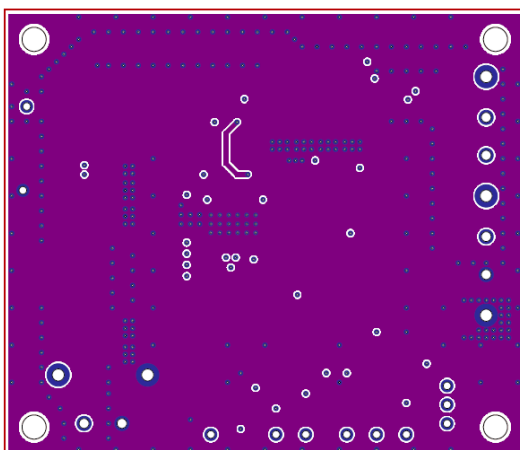


Figure 21. 3rd layer layout
(Top view)

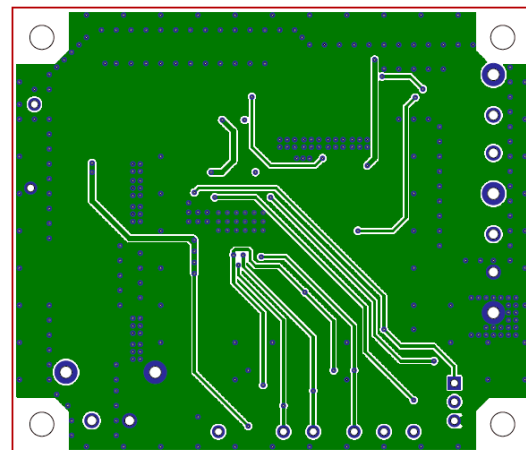


Figure 22. Bottom layer layout
(Top view)

Board layout REFLED008-EVK-003(Boost to Vin), REFLED010-EVK-003(Boost)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below.

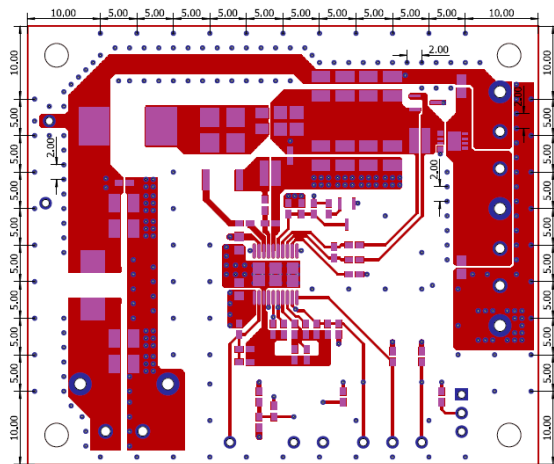


Figure 23. Top layer layout
(Top view)

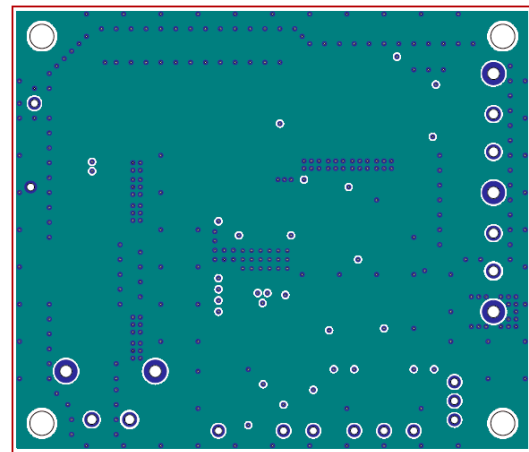


Figure 24. 2nd layer layout
(Top view)

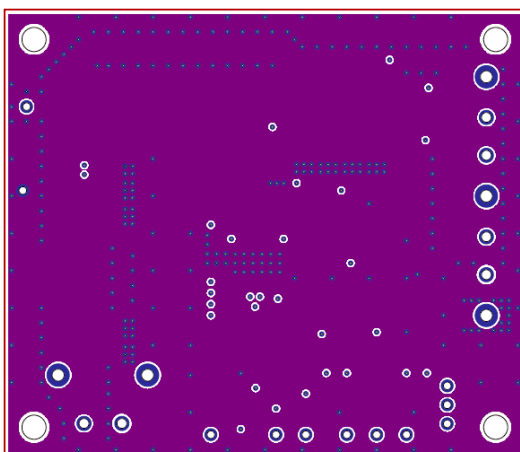


Figure 25. 3rd layer layout
(Top view)

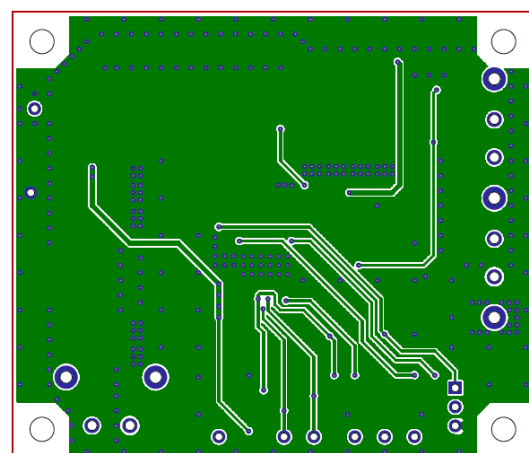


Figure 26. Bottom layer layout
(Top view)

Board layout REFLED008-EVK-004(Boost to Vin), REFLED010-EVK-004(Boost)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below.

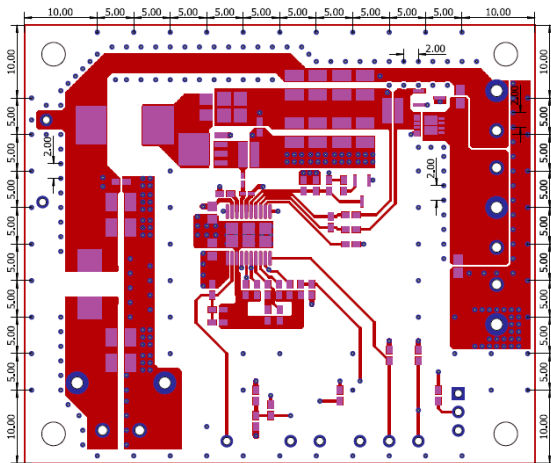


Figure 27. Top layer layout
(Top view)

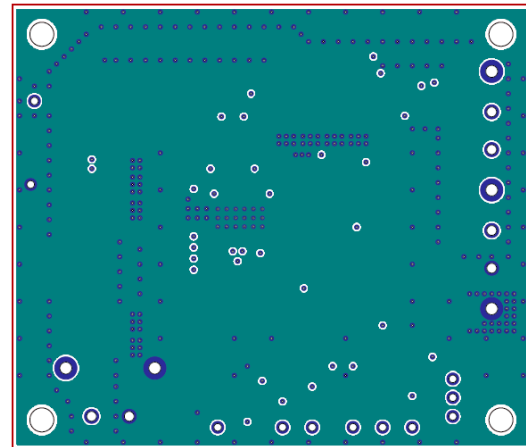


Figure 28. 2nd layer layout
(Top view)

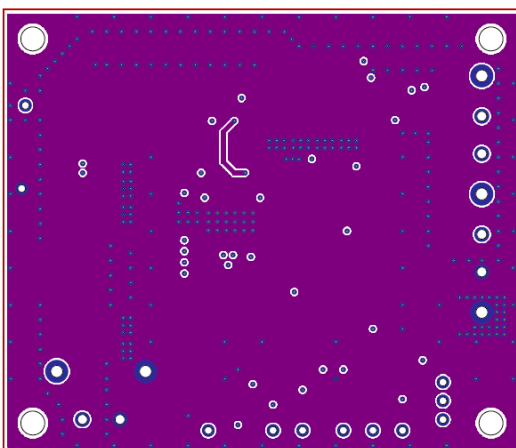


Figure 29. 3rd layer layout
(Top view)

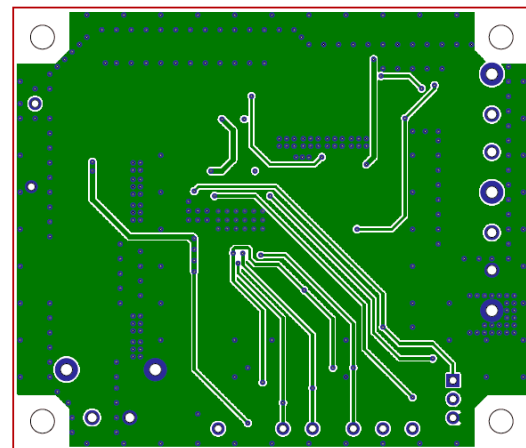


Figure 30. Bottom layer layout
(Top view)

Board layout REFLED009-EVK-001 (SEPIC)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below

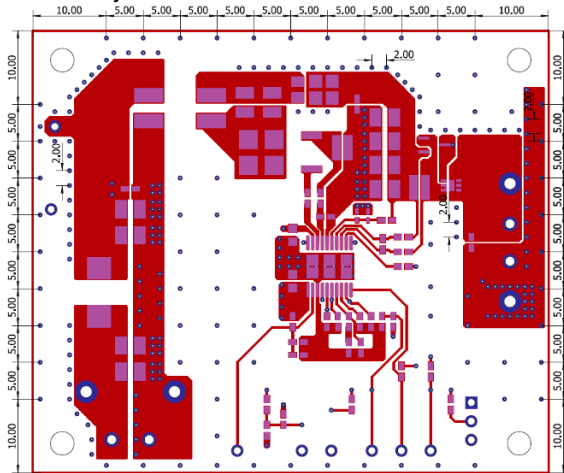


Figure 31. Top layer layout
(Top view)

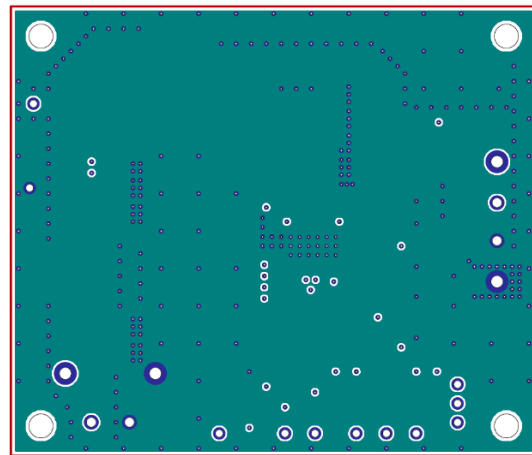


Figure 32. 2nd layer layout
(Top view)

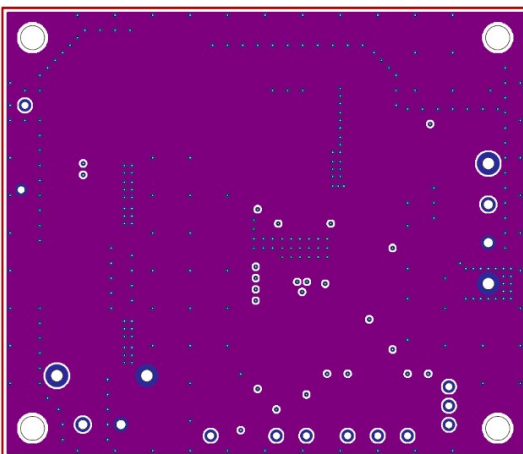


Figure 33. 3rd layer layout
(Top view)

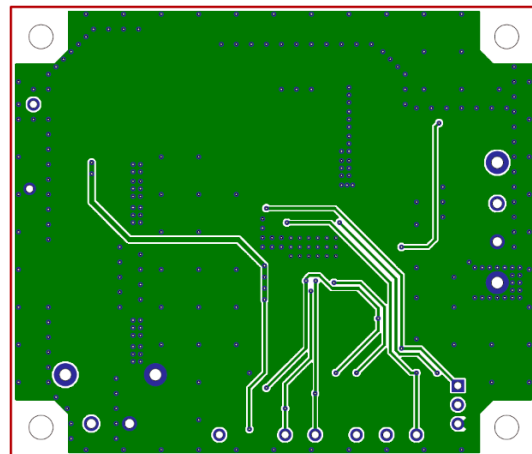


Figure 34. Bottom layer layout
(Top view)

Board layout REFLED009-EVK-002(SEPIC)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below.

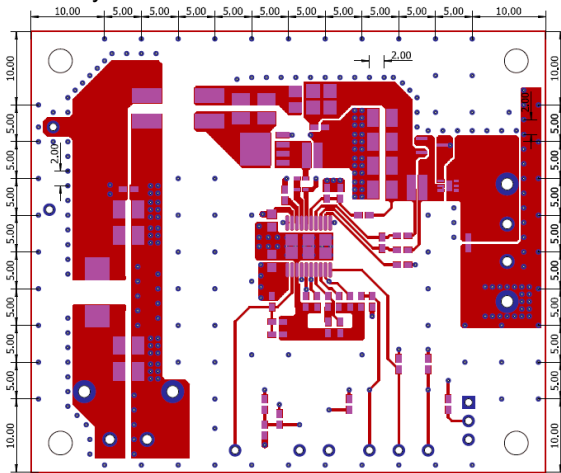


Figure 35. Top layer layout
(Top view)

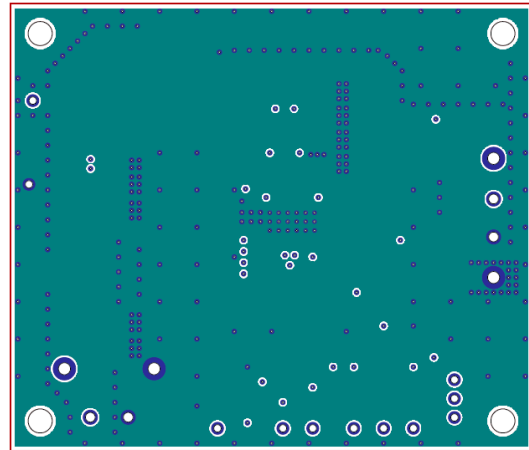


Figure 36. 2nd layer layout
(Top view)

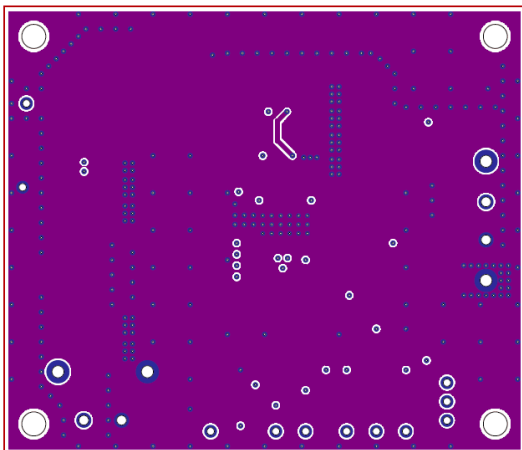


Figure 37. 3rd layer layout
(Top view)

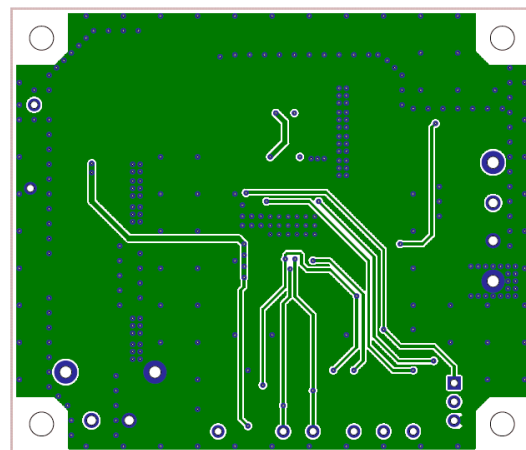


Figure 38. Bottom layer layout
(Top view)

Board layout REFLED009-EVK-003(SEPIC)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below.

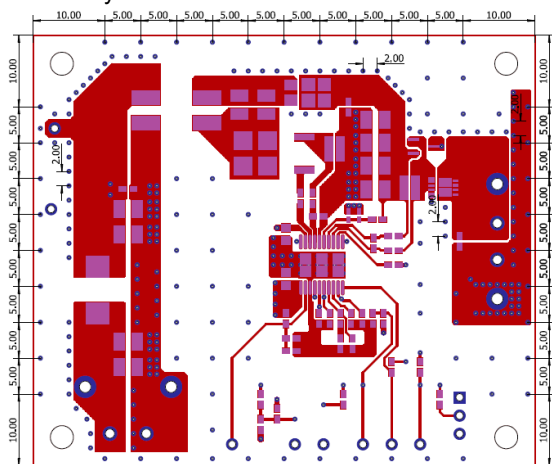


Figure 39. Top layer layout
(Top view)

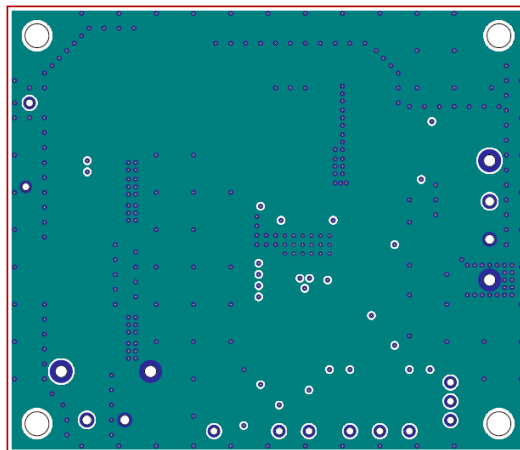


Figure 40. 2nd layer layout
(Top view)

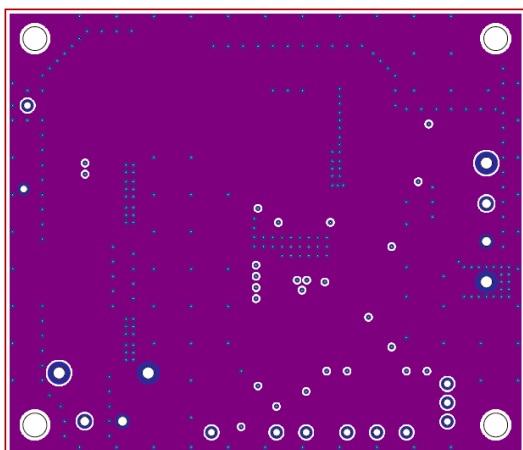


Figure 41. 3rd layer layout
(Top view)

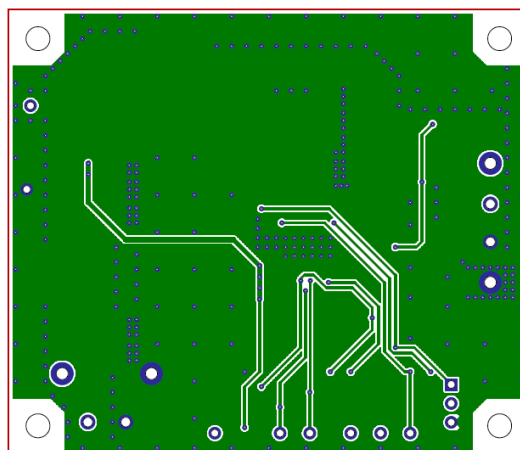


Figure 42. Bottom layer layout
(Top view)

Board layout REFLED009-EVK-004(SEPIC)

Evaluation board PCB information

Material	FR-4
Board thickness	1.6mm
Copper thickness	1 oz
Number of layers	4
Board size	70X60mm
Minimum copper width	0.15mm
Minimum air gap	0.15mm
Minimum hole size	0.3mm

The layout of BD18353EFV-M is shown below.

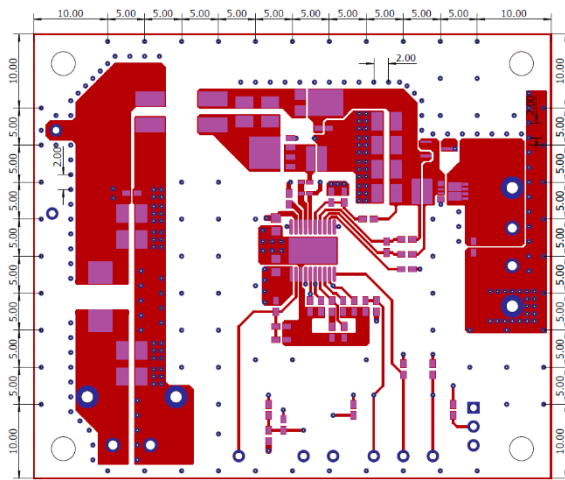


Figure 43. Top layer layout
(Top view)

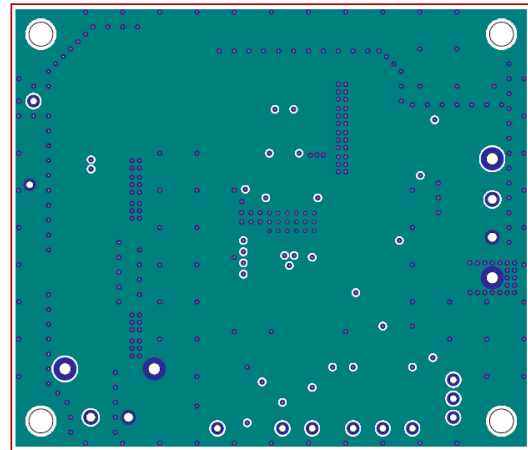


Figure 44. 2nd layer layout
(Top view)

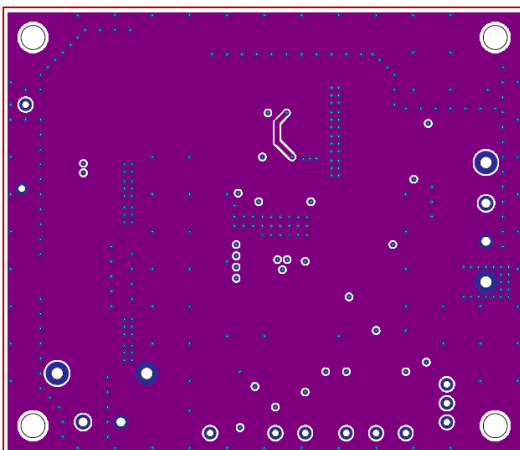


Figure 45. 3rd layer layout
(Top view)

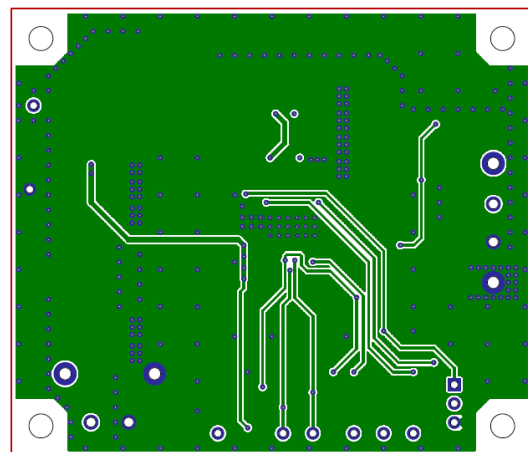


Figure 46. Bottom layer layout
(Top view)

Reference application data REFLED008-EVK-001(Boost to Vin)
(Ta=25°C, Output voltage=25.5V(at Vin=13.5V)(4LEDs), ILED=1042mA)

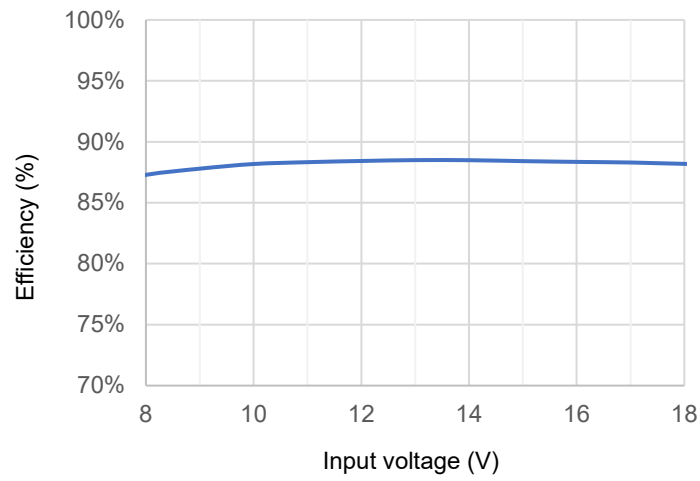


Figure 47. Efficiency vs Input voltage

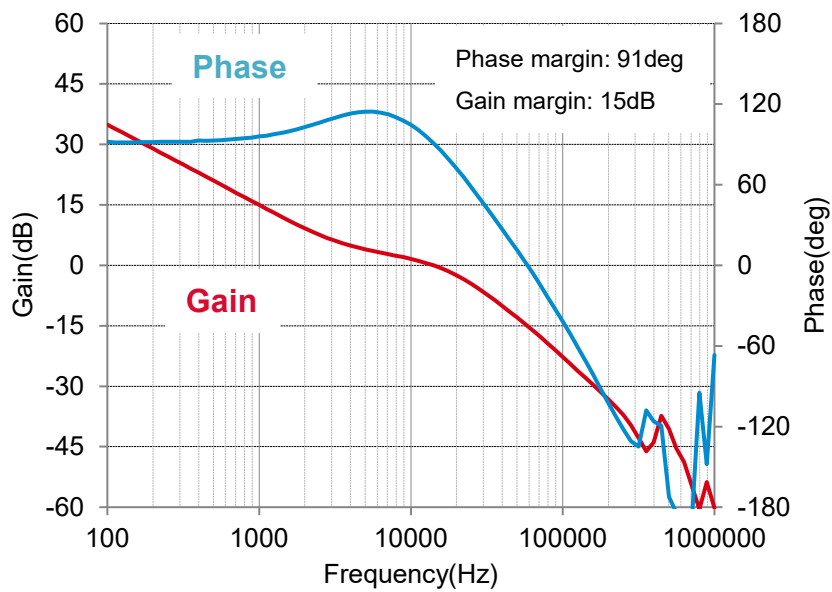


Figure 48. Gain, Phase vs Frequency (VIN=13.5V)

Reference application data REFLED008-EVK-001- continued

(Ta=25°C, Output voltage=25.5V(at Vin=13.5V)(4LEDs), ILED=1042mA)

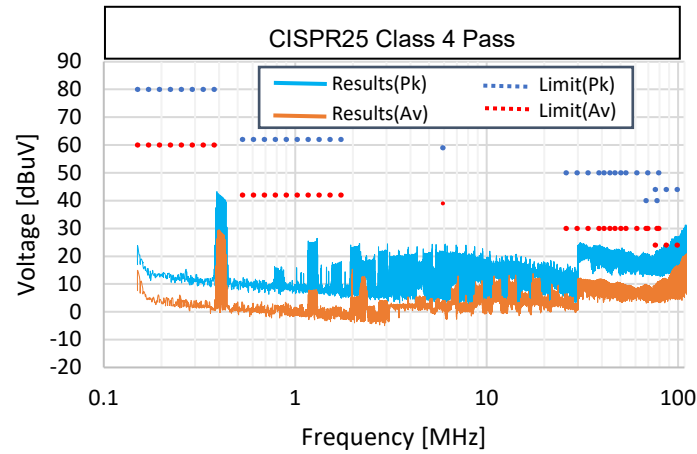


Figure 49. Conducted Emission Based on CISPR25 Class 4 Limits(SSFM Enabled)

(Note 1) Blue colored line indicates Peak limit value of CISPR25 Class4.

(Note 2) Orange colored line indicates Average limit value of CISPR25 Class4.

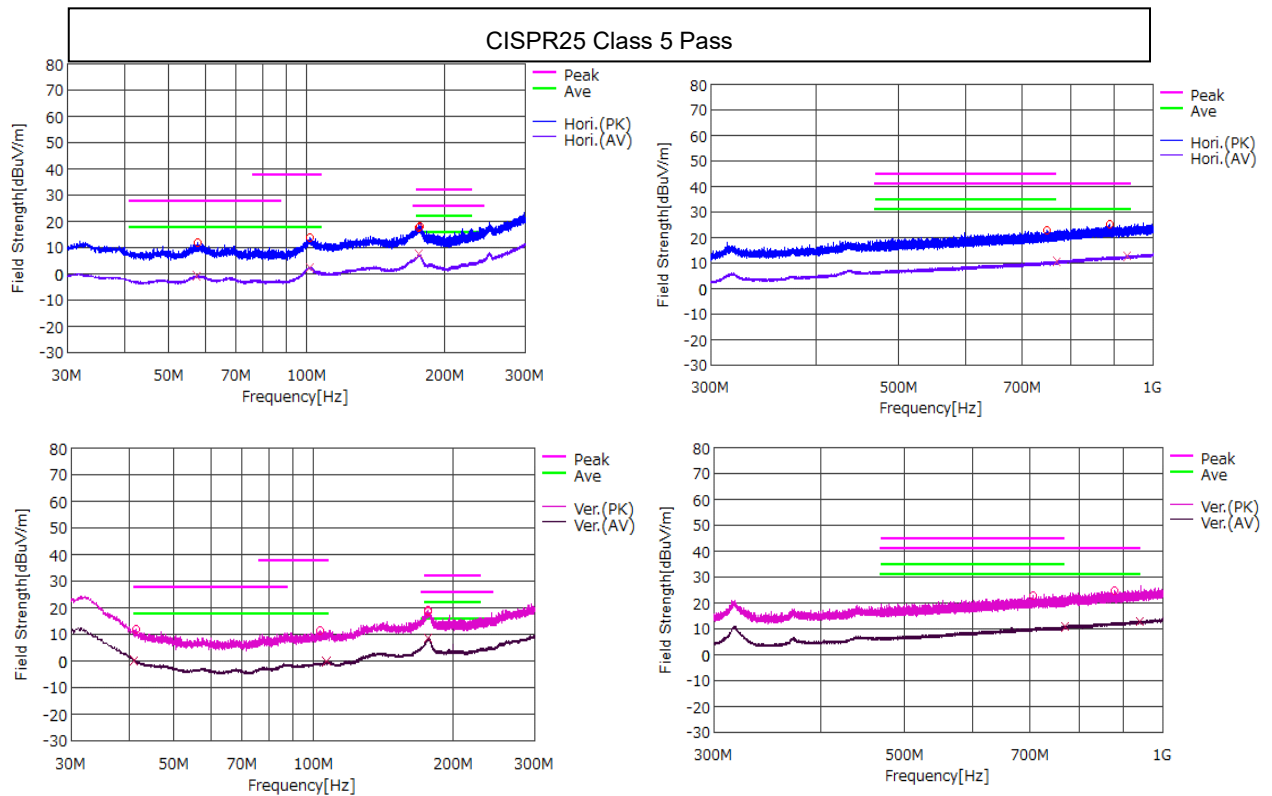


Figure 50. Radiated Emission Based on CISPR25 Class 5 Limits(SSFM Enabled)

(Note 1) Pink colored line indicates Peak limit value of CISPR25 Class5.

(Note 2) Green colored line indicates Average limit value of CISPR25 Class5.

Reference application data REFLED009-EVK-001 (SEPIC)
($T_a=25^{\circ}\text{C}$, Output voltage=24.0V(8LEDs), $I_{LED}=757\text{mA}$)

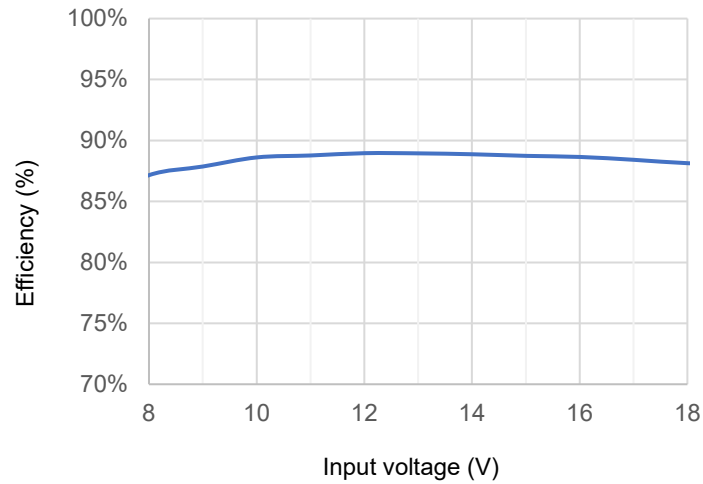


Figure 51. Efficiency vs Input voltage

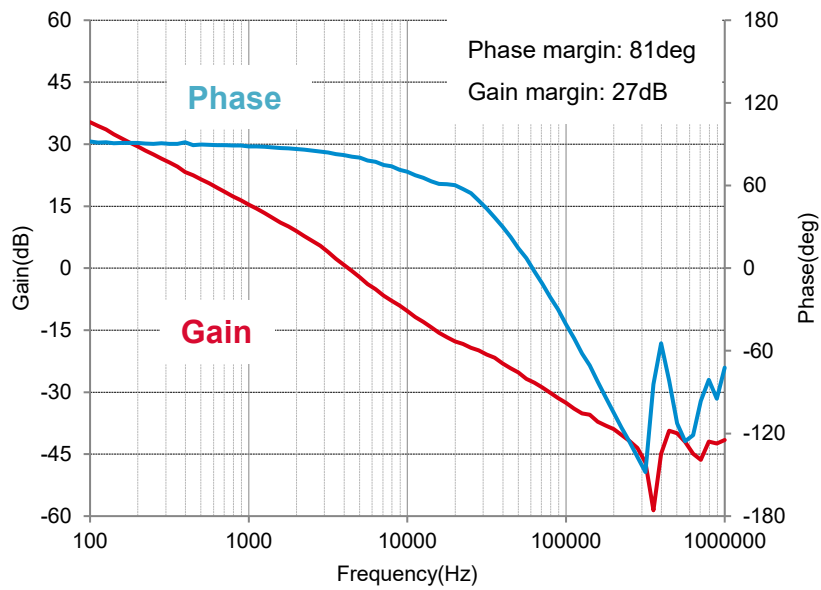


Figure 52. Gain, Phase vs Frequency ($V_{IN}=13.5\text{V}$)

Reference application data REFLED009-EVK-001 (SEPIC)

(Ta=25°C, Output voltage=24.0V(8LEDs), ILED=757mA)

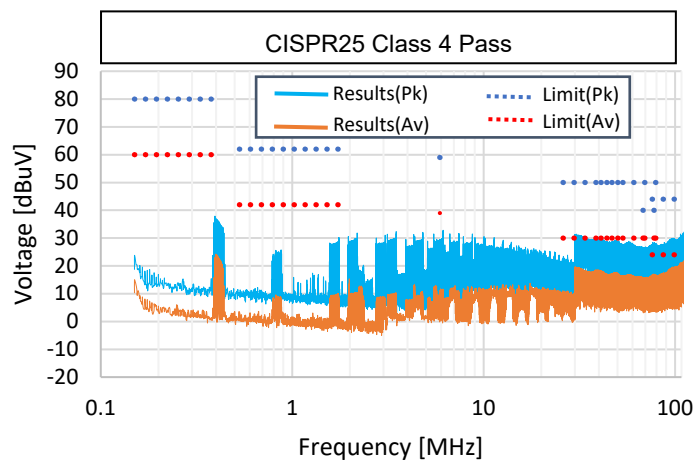


Figure 53. Conducted Emission Based on CISPR25 Class 4 Limits(SSFM Enabled)

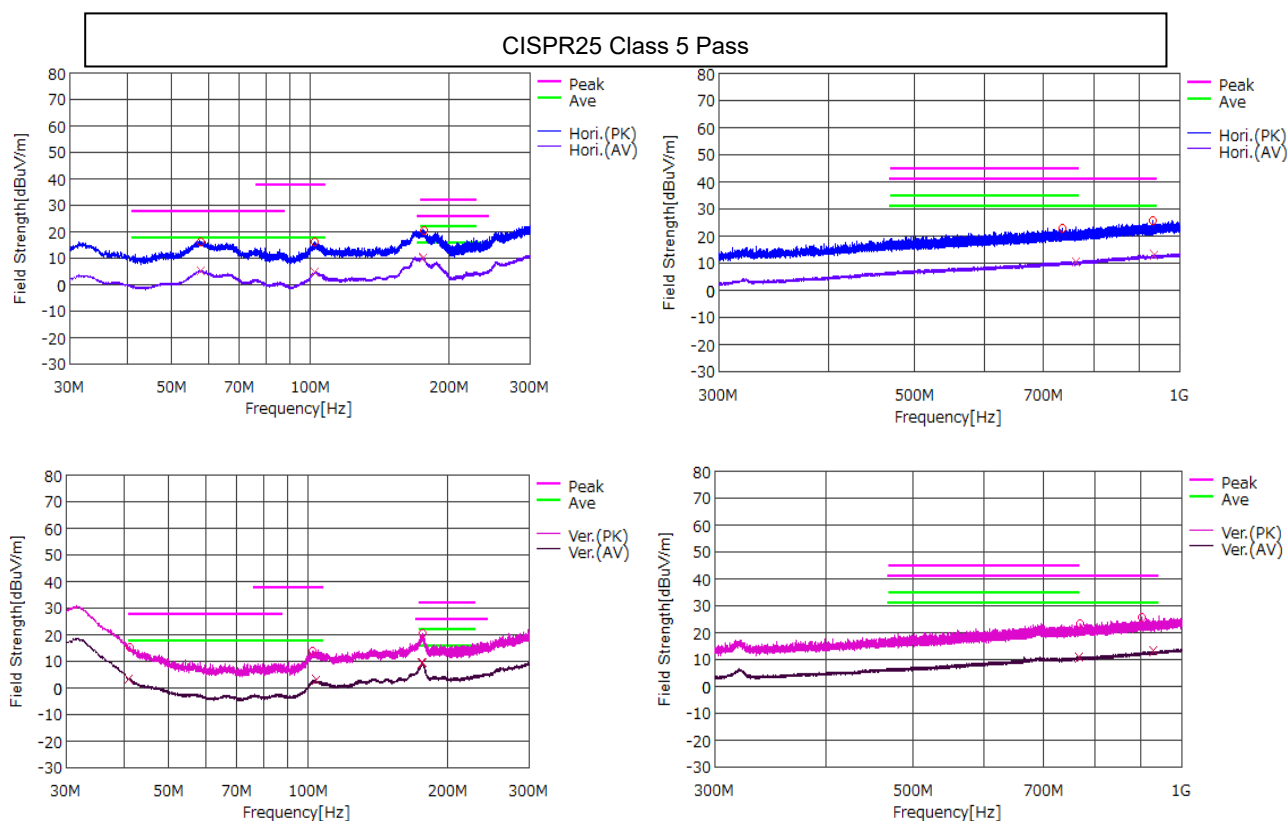
(Note 1) Blue colored line indicates Peak limit value of CISPR25 Class4.*(Note 2)* Orange colored line indicates Average limit value of CISPR25 Class4.

Figure 54. Radiated Emission Based on CISPR25 Class 5 Limits(SSFM Enabled)

(Note 1) Pink colored line indicates Peak limit value of CISPR25 Class5.*(Note 2)* Green colored line indicates Average limit value of CISPR25 Class5.

Reference application data REFLED010-EVK-001(Boost)
 (Ta=25°C, Output voltage=36.0V(12LEDs), ILED=505mA)

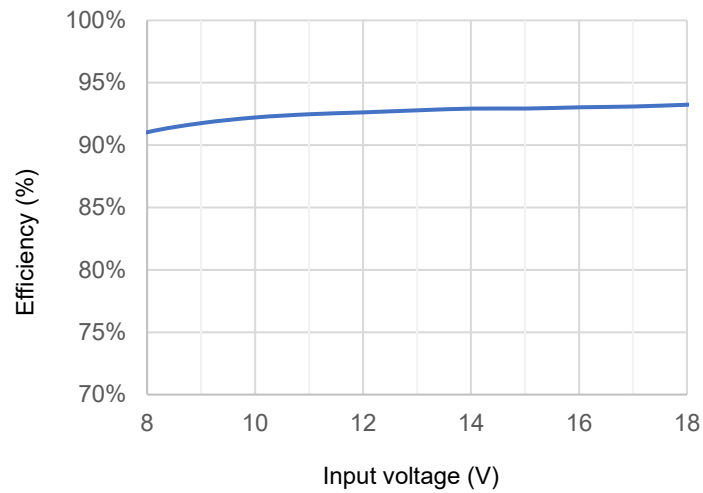


Figure 55. Efficiency vs Input voltage

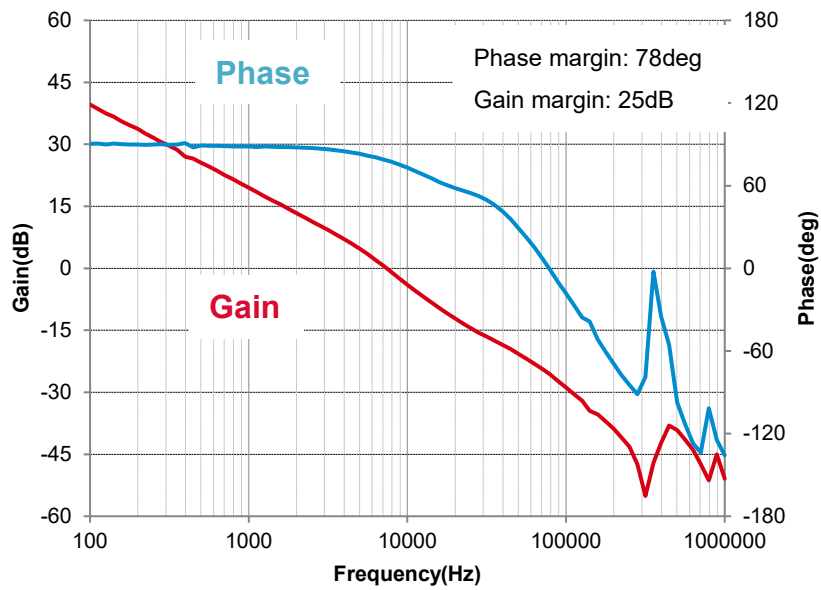


Figure 56. Gain, Phase vs Frequency (VIN=13.5V)

Reference application data REFLED010-EVK-001(Boost) - continued

(Ta=25°C, Output voltage=36.0V(12LEDs), ILED=505mA)

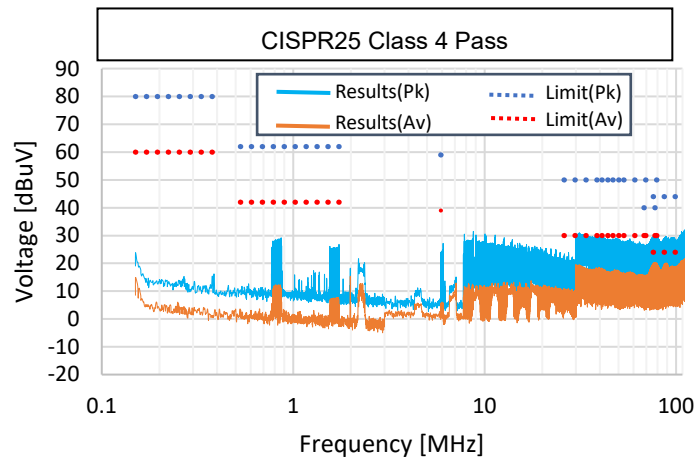


Figure 57. Conducted Emission Based on CISPR25 Class 4 Limits(SSFM Enabled)

(Note 1) Blue colored line indicates Peak limit value of CISPR25 Class4.

(Note 2) Orange colored line indicates Average limit value of CISPR25 Class4.

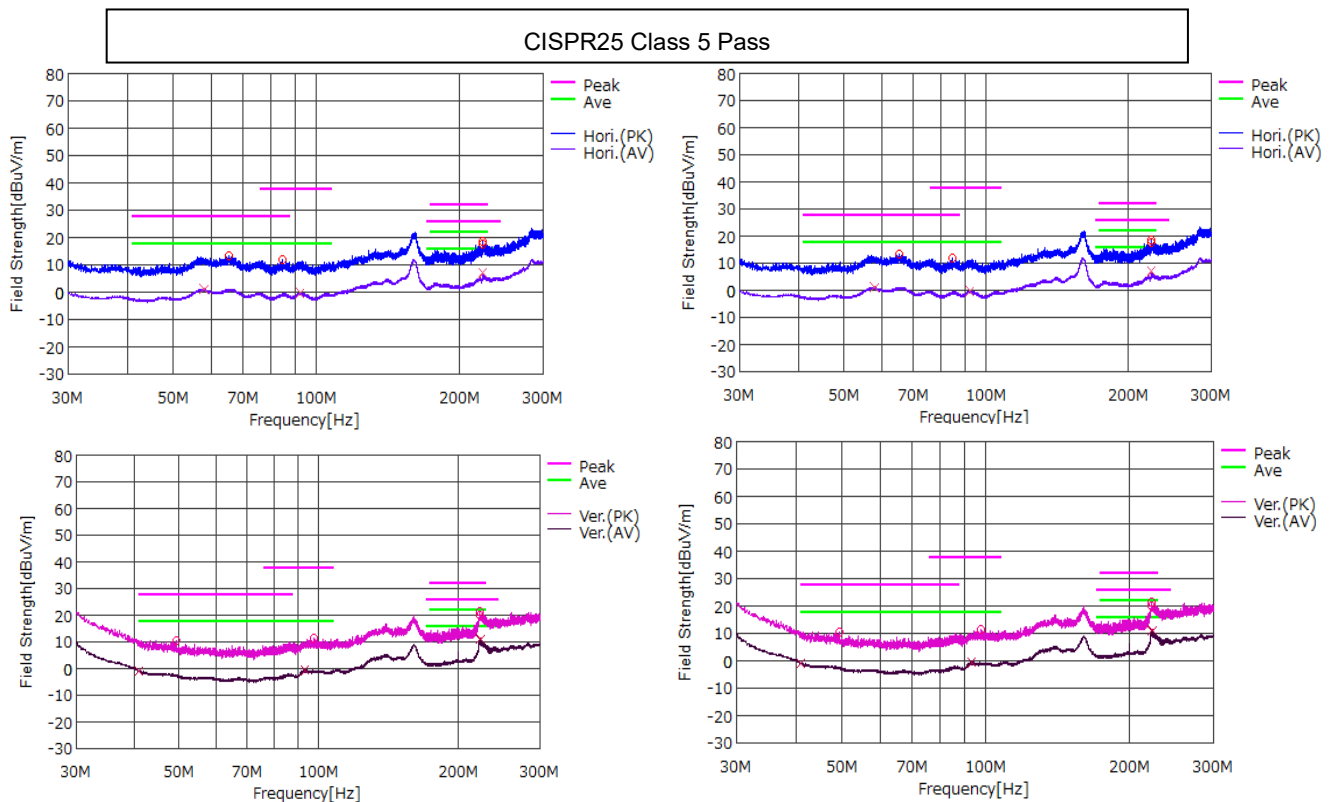


Figure 58. Radiated Emission Based on CISPR25 Class 5 Limits(SSFM Enabled)

(Note 1) Pink colored line indicates Peak limit value of CISPR25 Class5.

(Note 2) Green colored line indicates Average limit value of CISPR25 Class5.

Revision history

Date	Revision number	Description
21. Feb. 2023	001	Initial release
09. Feb. 2024	002	P.10, P.12, P.14 : Changed part parameter of CO1 from "0.01 μ F" to "0.1 μ F". P.10, P.12, P.14 : Changed part parameter of RCOMP from "33k Ω " to "33 Ω ". P.11, P.13, P.15 : Changed part parameter of R9 from "10k Ω " to "10 Ω " P.11, P.13, P.15 : Changed part name of MN1 from "RS4P06BBKFRA" to "AG052FPS4FRA" P.11, P.13, P.15 : Changed part parameter of R9 from "10k Ω " to "10 Ω " P.12 : Changed part parameter of RSNS from "0.16 Ω " to "0.22 Ω ". P.14 : Changed part parameter of RSNS from "0.16 Ω " to "0.33 Ω ".

Notice

- 1) The information contained in this document is intended to introduce ROHM Group (hereafter referred to as ROHM) products. When using ROHM products, please verify the latest specifications or datasheets before use.
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