



USER MANUAL

SN6507 Development Kit

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

CAUTIONS AND WARNINGS



For safe and correct usage, please follow these instructions. Keep them for future reference.



CAUTION

PCB Surfaces may become hot during operation! Wait at least 2 minutes following power-down before handling the board again.



CAUTION

This product contains parts that are ESD sensitive. Follow appropriate ESD procedures and guidelines when handling the evaluation board.



NOTE

Use only input supply voltage and output load current levels within the range stated in the Specification section of this document for each configuration of the evaluation board. Operation above these limits may cause erratic behavior and irreversible damage of the evaluation board.

Ambient temperature range: 5°C to 30°C. To reduce the likelihood of short circuits please keep away from paper clips, screws or any other electrical conductive parts. Put the PCBs on a stable flat surface. Keep away from dust and humidity

CE conformity declaration

Würth Elektronik herewith declares that the product fully complies with the relevant guidelines for CE conformity. The complete text of the CE conformity declaration together with the listed relevant guidelines can be viewed at the following website: www.we-online.com/doc

Before getting started with the SN6507 Development Kit read the Terms of Use for Evaluation Boards, Kits or Modules carefully. These SN6507 Development Kit boards are not intended for resale and/or use in final customer applications or products.



WARNING: ONLY qualified personnel* should operate this board!

* Qualified personnel (skilled persons) is defined as an individual with relevant technical education, training, or experience to enable perceiving risks and avoiding hazards occurring during use of this product (Source: IEEE 82079-1 3.36).

Abbreviations

PCB	Printed Circuit Board
ESD	Electrostatic Discharge
CE	conformité européenne
IEEE	Institute of Electrical and Electronics Engineers
WE	Würth Elektronik
LDO	Low Dropout Regulator
CISPR	Comité International Spécial des Perturbations Radioélectriques
IC	Integrated Circuit

Ns	Number of Secondary Turns
Np	Number of Primary Turns
P/N	Part Number
DC	Direct Current
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
GND	Ground
UVLO	Undervoltage Lockout
EMC	Electromagnetic Compatibility

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1. INTENDED USE

The SN6507 Development Kit, created in collaboration with Texas Instruments, provides engineers with a complete solution to evaluate the performance of the SN6507 IC, featuring the WE-PPTI transformer line. The kit includes two boards: a fixed board (650796) offering $24 V_{IN} - 15 V_{OUT}$ with transformer 750319696, and a configurable board (650700) designed to support various application needs by allowing users to select between different transformers included in the kit.

This kit is intended for use in evaluating the SN6507 for applications such as motor drives, isolated power supplies for communication protocols (CAN, RS-485, RS-422, RS-232, SPI, I2C), medical instruments, solar inverters, and automation systems. The Würth Elektronik version of the boards is fully EMI compliant, meeting CISPR32 standards, ensuring optimal performance in a wide range of industrial and medical environments.

3. EVALUATION KIT CONTENTS

The SN6507 development kit includes the following:

- Board-1: 650796 (fixed design tailored to Würth Elektronik transformer 750319696)
- Board-2: 650700 (configurable design allows evaluation of different transformers and specifications)
- 16 Transformer samples (see Table 1 for a list of all parts included and corresponding specifications)

2. INTRODUCTION

This user guide describes the contents, specifications, configuration, and use of the SN6507 development kit. The kit is based on Texas Instruments' evaluation board SN6507DGQEVMM, a push-pull converter using the SN6507 driver IC together with Würth Elektronik's **WE-PPTI Push-Pull Transformers** and passive components.

The **SN6507 development kit** helps designers to easily test and assess the performance of a push-pull auxiliary supply with different configurations.

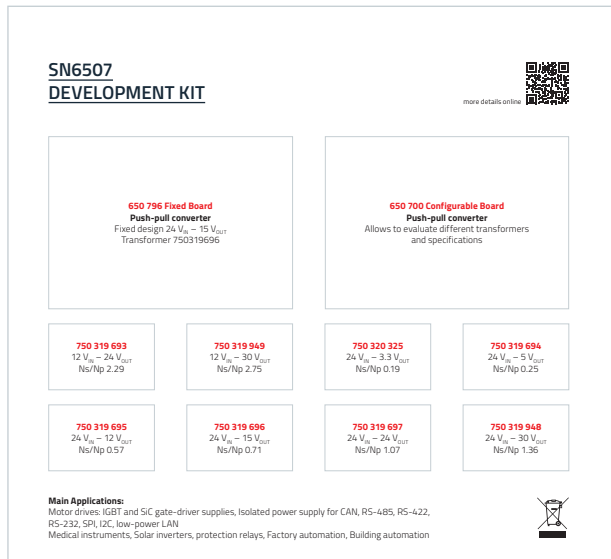


Fig. 1: SN6507 Development kit – Inner compartment

Short specification:

Board-1: Fixed version (650796)

For the absolute maximum ratings read **5. Specification and recommended use**

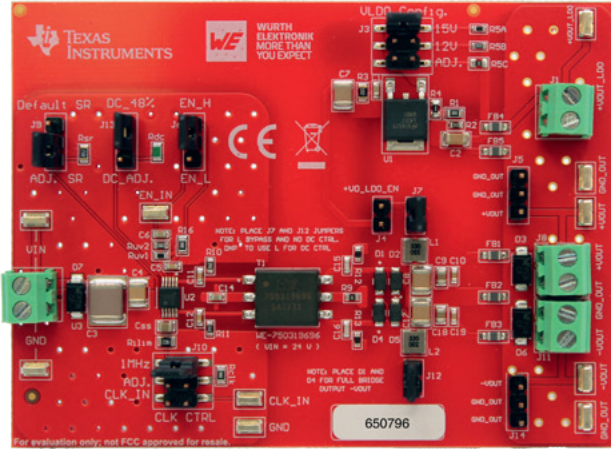


Fig. 2: Board-1: 650796 (fixed)

Board-2: Configurable version (650700)

For the absolute maximum ratings read **6. Specification and recommended use**

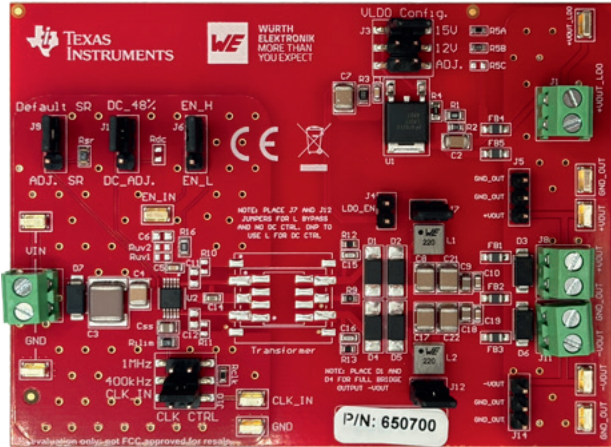


Fig. 3: Board-2: 650700 (configurable)

WE-PPTI Push-Pull Transformers

A series of transformers has been built and tailored for use with the configurable board of the **SN6507 Development kit**. They come in two variants: Toroid 1308 and EPX6 assemblies (figure 4). Table 1 lists the 24 transformers suitable for use with the configurable board of the **SN6507 Development kit** at their corresponding input and output voltages with a switching frequency of 400 kHz. The parts highlighted are included in the kit (2 units from each), whereas samples of the other transformers in table 1 can be readily ordered.

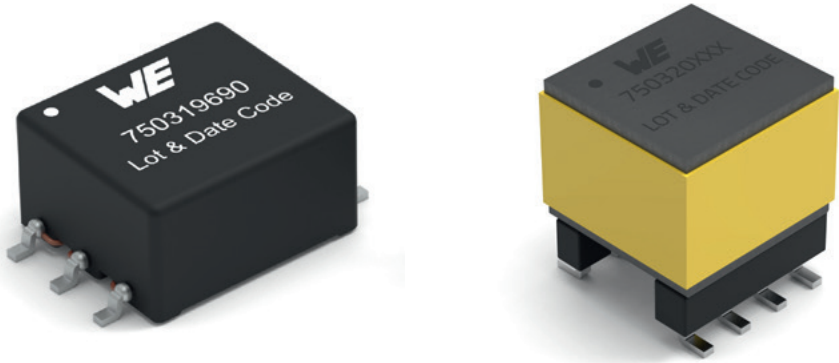


Fig. 4: WE Transformers for SN6507 Development kit: Toroid 1308 (left) and EPX6 bobbin (right)

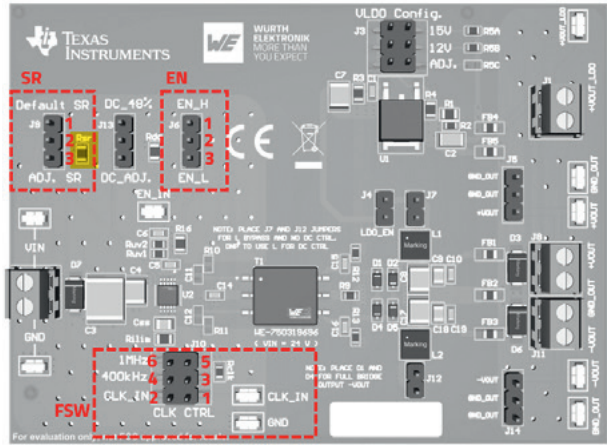
V_{in} (V)	V_{out} (V)	Transformer	Type	Ns/Np	Transformer	Type	Ns/Np
12	3.3	750320324	1308	0.42	750320396	EPX6	0.42
12	5	750319690		0.57	750320397		0.58
12	12	750319691		1.14	750320398		1.22
12	15	750319692		1.33	750320399		1.44
12	24	750319693		2.29	750320400		2.33
12	30	750319949		2.75	750320401		2.89
24	3.3	750320325		0.19	750320402		0.19
24	5	750319694		0.25	750320403		0.28
24	12	750319695		0.57	750320404		0.56
24	15	750319696		0.71	750320375		0.73
24	24	750319697		1.07	750320405		1.13
24	30	750319948		1.36	750320383		1.4

Table 1: Transformers P/N and specification suitable for use with the configurable board of this evaluation kit (highlighted parts are included in the kit)

4. BOARD CONFIGURATION

The two boards included in the kit allow for easy evaluation of the DC-DC push-pull converter topology with different operating modes and output voltage configurations. These can be selected via jumpers and/or by adjusting the value of some resistors, as specified in this section.

Fig. 5: Relevant Jumpers and connections for EN, SR and FSW Setup 650796



Enable switching (EN)

Pin header J6 allows to enable or disable the SN6507 IC with a jumper, as follows (figure 5):

- **Disable SN6507:**
Connect pins 2 and 3 together with a jumper
- **Enable SN6507 without UVLO (*):** Connect pins 1 and 2 together with a jumper
- **Enable SN6507 with UVLO (*):** Leave all J6 pins unconnected. Ruv1 and Ruv2 must be populated (**)
- **Enable SN6507 with external signal:** Leave all J6 pins unconnected. Ruv1 and Ruv2 must be removed. An external signal must be applied to EN_IN for operation (see SN6507 datasheet for signal voltage levels).

(*) UVLO is the abbreviation for "undervoltage lockout".

(**) On board-1 650796 (fixed version), Ruv1=499kΩ and Ruv2=100kΩ are populated. This enables the SN6507 once the input voltage rises above 9 V. On board-2 (configurable), Ruv1 and Ruv2 are not populated. See page 18 of SN6507 datasheet (Ref[1]) for the calculation of UVLO resistors if used.

Slew-rate control (SR)

The slew-rate of the turn on and off transitions of the internal MOSFET transistors of the SN6507 can be set via pin header J9 and the resistor Rsr, as follows (figure 5):

- **Set default slew-rate:**
Connect pins 1 and 2 together (sets default slew-rate of SN6507).
- **Set different slew-rate:**
Connect pins 2 and 3 together and add Rsr of the required value.

Note: the resistor Rsr is populated on both boards with a value of 20.5 kΩ, which sets a slew-rate of 218 V/μs for the 750319696 transformer. See section 8.3.5 of SN6507 datasheet for guidance on adjusting Rsr for different slew-rates.

Switching frequency (FSW)

The switching frequency (fsw) is set via pin header J10 and resistor Rclk, as follows (figure 5):

- **Set fsw=1 MHz:**
Connect pins 5 and 6 together.
- **Set fsw=400 kHz:**
Connect pins 3 and 4 together.
- **Use external clock:**
Connect pins 1 and 2 together and input external clock signal across CLK_IN and GND.

Note: Würth Elektronik transformers included in the kit have been optimized for a switching frequency of 400 kHz, and it is therefore advised to operate at this switching frequency. Both boards use Rclk=30 kΩ by default to set fsw=400 kHz. On page 15 of SN6507 datasheet, details on selecting Rclk for a different switching frequency are given. Note that if no jumper is used on J10, the controller will stop switching. If using an external clock, please follow guidance provided on section 8.4.4 of SN6507 datasheet.

Duty cycle control setup (Figure 6)

The 'duty-cycle control' is an optional feature of the SN6507 which allows to improve line regulation, making the output voltage level less dependent on input voltage variations. This is achieved by generating the duty-cycle as a function of the input voltage (see SN6507 datasheet for more details). The pin header J13 allows the use of jumpers to enable and disable the duty-cycle control function (DC). With figure 6 as a reference, observe the following:

- **Disable DC control:**
Connect pins 1 and 2 together of J13
- **Enable DC control:**
Connect pins 2 and 3 together from J13. Rdc and Rcl must be populated. For single output configuration, jumper J7 must be open, allowing L1 into the circuit. For bipolar output configuration, both jumpers J7 and J12 must be open, allowing L1 and L2 into the circuit.

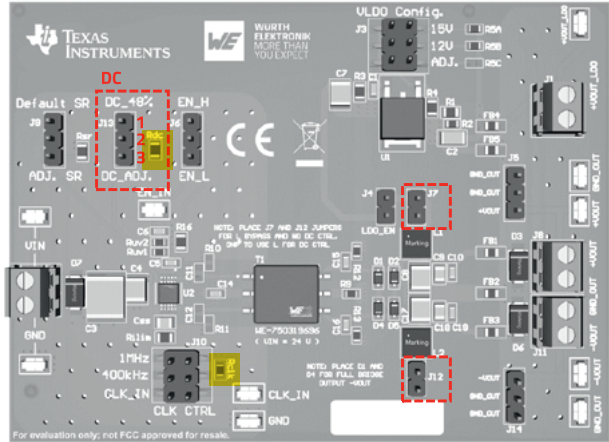


Fig. 6: Relevant jumpers and connections for duty-cycle control setup

Important notes when using duty-cycle control:

- On 650796 board, populated resistors are $R_{cl}=30\text{ k}\Omega$ and $R_{dc}=50.5\text{ k}\Omega$. They set a duty cycle of 0.25 at the nominal input voltage (24 V).
- On the configurable board, Rdc and Rcl are not populated. The value of R_{DC} must be calculated based on SN6507 datasheet guidelines depending on the transformer used and converter specification.
- The default value of inductors L1 and L2 on both boards is $22\text{ }\mu\text{H}$ (WE-MAPI 74438356220). The minimum inductance value for a set specification can be calculated with the formulae provided in SN6507 datasheet.



Regulated output setup

When using the standard single output voltage configuration, the linear voltage (U1) can be used to obtain a tightly regulated output voltage, taken from J1 terminal. For this, the jumper on J4 must be in place.

- **Enable regulated output:**
Connect J4 jumper and select output voltage with J3 jumper (*)
- **Disable regulated output:**
Disconnect J4 jumper

(*) The pin header J3 within the regulator section of figure 7 allows to select the regulated output voltage, as follows:

- For $V_{out} = 15\text{ V}$, connect pins 1 and 2 (default jumper connection on the board).
- For $V_{out} = 12\text{ V}$, connect pins 3 and 4.
- For a different V_{out} , connect pins 5 and 6 and populate a resistor R5C of the required value based on the LM317AM datasheet.

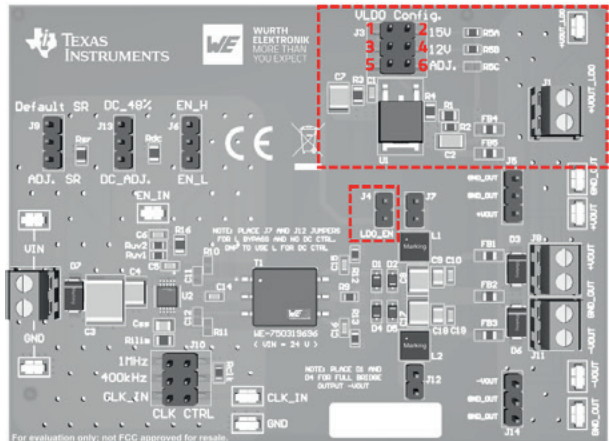


Fig. 7: Relevant jumpers and connections for regulated output setup

Pin headers J5 and J14

Pin headers J5 and J14 (figure 8) serve as additional test points. **Do not connect any jumpers!**

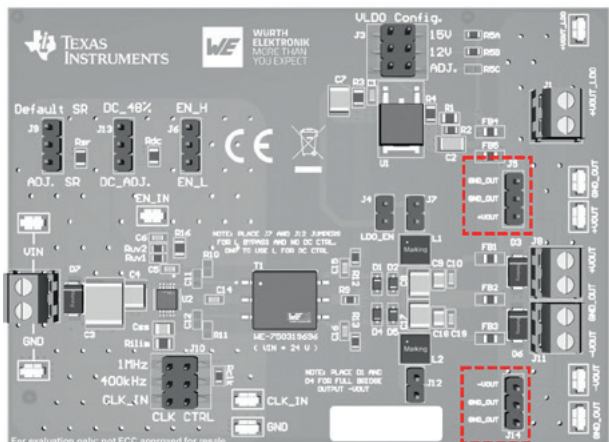


Fig. 8: J5 and J14 pin headers – to use only as test points

Output voltage configuration

The output stage of the push-pull converter can be set in **three** different configurations, as explained in this section.

1. Single output configuration

For single output (figure 9), D2, D5 and R9 must be populated, connecting the center tap of the secondary winding to GND_OUT. The load is then connected across J8. This configuration allows the use of 'duty-cycle control' as well as regulated output with the appropriate jumper setup explained in previous section.

The output voltage is calculated as

$$V_{OUT} = n \cdot V_{IN}$$

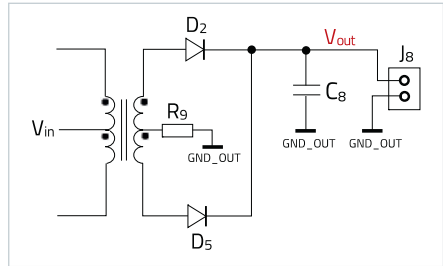


Fig. 9: Circuit diagram detail single output configuration

2. Bipolar output configuration

For bipolar output voltage (figure 10), diodes D1, D2, D4, D5 as well as R9 must all be populated. The loads for the positive and negative output voltage rails are connected to J8 and J11, respectively. Note that the regulated output could also be used here for the positive output voltage rail.

The positive and negative output voltages are calculated respectively as: $V_{OUT_P} = n \cdot V_{IN}$ and

$$V_{OUT_N} = n \cdot V_{IN}$$

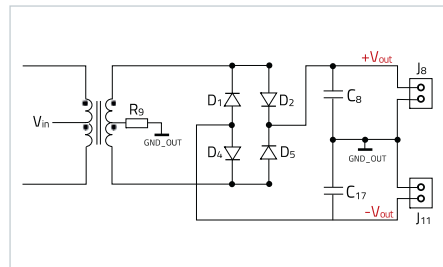


Fig. 10: Circuit diagram detail bipolar output configuration

3. Voltage doubling configuration

In this configuration (figure 11), the output voltage obtained is around twice as high as for the single voltage configuration. The center tap of the secondary winding is floating and a full-wave output rectifier is used. For this, all diodes D1, D2, D4 and D5 must be populated and R9 removed.

Note that in this case the output voltage is taken from pin 2 of J8 (+Vout) to pin 1 of J11 (identified as '-Vout' on the board, but taken in this configuration as the output current return (ISO_REF)). The load must be connected across the mentioned pins. The regulated output cannot be used in this configuration, since 'GND_OUT' is floating.

The output voltage is calculated as:

$$V_{OUT_D} = 2 \cdot n \cdot V_{IN}$$

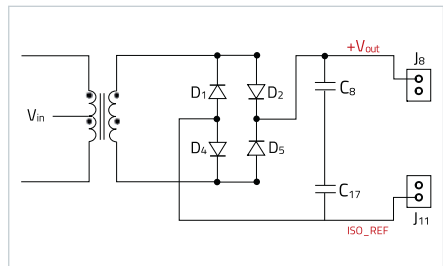


Fig. 11: Circuit diagram detail output voltage doubling

5. TEST GUIDELINES

Test setup

This section shows the connection setup to test each output configuration as well as the recommended equipment and basic test procedure.



WARNING:

Do not short circuit the output of the DC/DC converter. Do not connect the input of the DC/DC converter in reverse polarity. To avoid damage, do not change jumpers while the board is in operation. Remove power from the board before changing jumper connections.

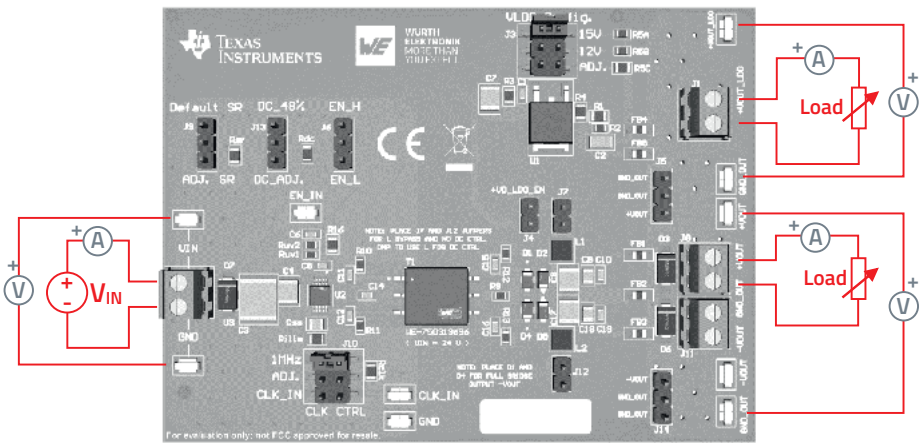


Fig. 12: Test connections for single output voltage configuration (regulated output optional)

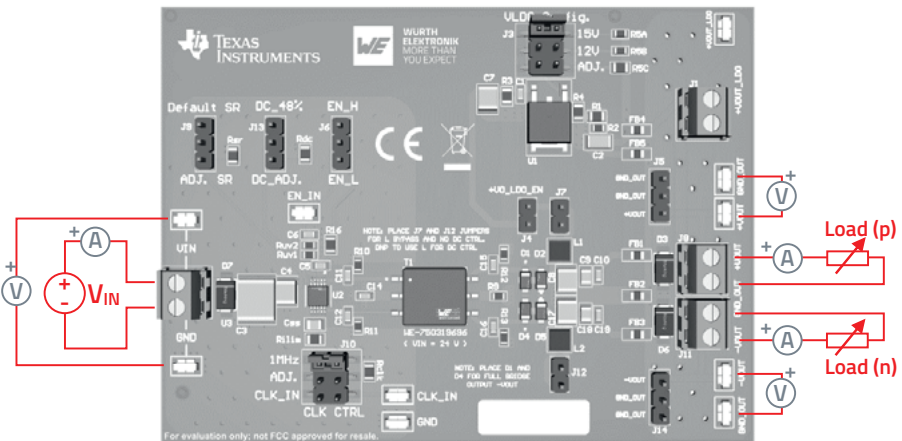


Fig. 13: Test connections for bipolar output voltage configuration

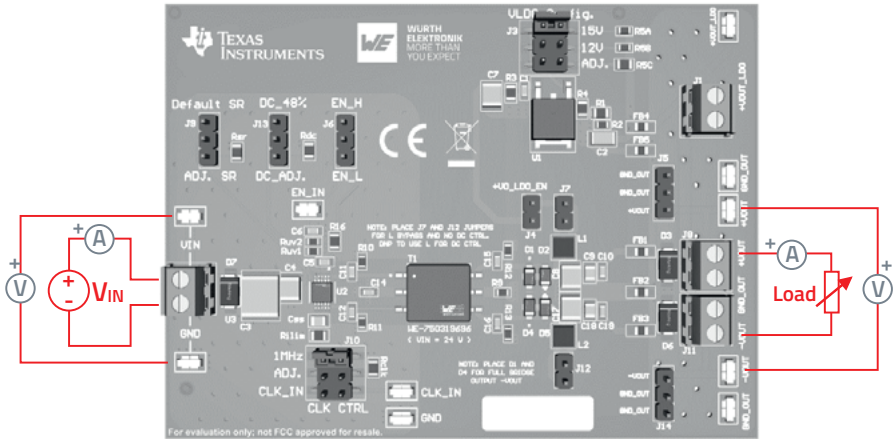


Fig. 14: Test connections for output voltage doubling configuration

Test equipment

- Power source (recommended 30 V, 1 A or higher ratings, with current limiting capability)
- Electronic load(s) (recommended 40 V, 2 A or higher ratings)
- Digital multimeters or power analyzer
- Oscilloscope (200 MHz or higher bandwidth)

Recommended steps for power up and power down of the board

Power-up

1. Set the jumpers based on the target test configuration (see section 3.0)
2. Set current limit on the power supply to 0.1 A
3. Turn on the power source at the recommended input voltage (tables 2 and 3)
 - a) If the input current is at the limit 0.1 A, then there is a problem on the board. Proceed to turn off the power source, recheck connections, and correct the fault.
 - b) If the input current is below 0.1 A, then increase the power source current limit replace with: (max. 1.5 A, depending on configuration).
4. Turn on electronic load(s) and proceed with tests.

Power-down

1. Turn off power source
2. Turn off electronic load(s)
3. Wait for **at least 2 minutes** to allow the components to cool down before handling the board again

6. SPECIFICATION AND RECOMMENDED USE

In this section, the recommended specification and usage considerations of each board in the kit are provided

Board-1: Fixed version (650796)

Board-1 is operated from a fixed 24 V input voltage supply with the design optimized for the 750319696 transformer at a switching frequency of 400 kHz. Note that **only when using duty-cycle control**, a switching frequency of 1 MHz must be selected with the jumper J10.

The current limit of the SN6507 IC is set by default to around 1.6 A in order to allow full-range testing to the user. However, this level is excessive for some configurations based on thermals. For safety considerations, when operating the board 'on-the-bench'; at an ambient temperature of 20°C and without forced air cooling, limiting the output current to the value shown in table 2 for each specific configuration will ensure that the maximum surface temperature of any component on the board will be at a maximum of around 70 to 75°C. Note that the board can operate above these limits, but special attention to thermals would be required.

NOTE: For board-1, it is recommended to set the current limit of the input supply source to **0.8 A**.

Output Configuration	V _{in} (V)	SR (J9)	F _{sw} (kHz)	Linear regulator	DC Control	I _{out_1_max} (A) (75°C)	I _{out_2_max} (A) (75°C)	I _{out_REG_max} (A) (75°C)
Single Output	24	Open	400	No	No	0.45	X	X
					15 V	X	X	0.25
					12 V	X	X	0.12
Bipolar Output (I _{out_1} =I _{out_2})			1000		No	0.45	X	X
					Yes	0.5	X	X
					No	400	0.4	0.4
1000			0.35			0.35	X	
1000			Yes			0.35	0.35	X
Voltage Doubling			400		No	0.35	X	X
	1000	0.35		X		X		

Table 2: Output current limit of board-1 for a maximum surface temperature of any component below around 75°C

Board-2: Configurable version (650700)

The second board in the **SN6507 Development kit** offers a high-degree of design flexibility. Users have the option to select a suitable transformer from those listed in previous table 1 and test it in the desired configuration. As a reference and similar to the previous case, in table 3 the maximum output current to keep the surface temperature of any component below 70 to 75 °C (with an ambient temperature of around 20 °C) is provided, alongside the limiting component(s). These results were obtained with single output configuration and 400 kHz switching frequency.

Transformer	V _{in} (V)	V _{out} (V)	Type	F _{sw} (kHz)	I _{out_1} (A) (75 °C)	Component (75 °C)
750320396	12	3.3	EPX6	400	0.9	D2, D5
750320397	12	5			0.9	D2, D5
750320398	12	12			0.75	D2, D5, U2
750320399	12	15			0.65	U2
750320400	12	24			0.4	U2
750320401	12	30			0.30	U2
750320402	24	3.3			1	D2, D5
750320403	24	5			0.85	D2, D5
750320404	24	12			0.85	D2, D5
750320375	24	15			0.85	D2, D5
750320405	24	24			0.65	U2, T1
750320383	24	30			0.4	U2
750320324	12	3.3	Toroid-1308		0.9	D2, D5
750319690	12	5			0.8	D2, D5
750319691	12	12			0.6	T1
750319692	12	15			0.65	U2
750319693	12	24			0.4	U2
750319949	12	30			0.3	U2, T1
750320325	24	3.3			0.9	D2, D5
750319694	24	5			0.85	D2, D5
750319695	24	12		0.8	D2, D5, T1	
750319697	24	24		0.5	T1	
750319948	24	30		0.3	T1	

Table 3: Output current limit of board-2 for a maximum surface temperature of any component below around 75 °C



CAUTION:

Components surfaces may become very hot. Do not touch the board while in operation and wait at least 2 min after power-down before handling the board again.

7. EMC TEST RESULTS

The board-1 (650796) has been tested for electromagnetic emissions based on CISPR-32 Class B standard and limits. Components C20, L3 and FB1 to FB5 were added to pass the test. Note that these results provide insights into the EMC signature of the board, but the EMC performance when the auxiliary supply is integrated into a larger PCB and into a product may differ.

Board-1 (650796) test configuration: $V_{in} = 24\text{ V}$, $V_{out} = 15\text{ V}$, $F_{sw} = 400\text{ kHz}$, $I_{out} = 0.5\text{ A}$, single output



Fig. 15:
CISPR-32 Conducted emissions setup

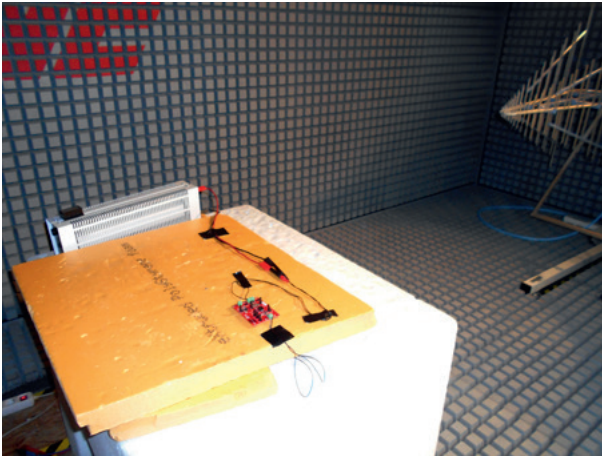


Fig. 16:
CISPR-32 Radiated emissions setup

Conducted emissions results (CISPR-32 Class B limits)

The switching frequency harmonic at 800 kHz (mostly differential mode noise) and the common-mode noise close to 30 MHz caused a failed test (figure 17), but they were corrected by adding L3 and C20 (figure 18).

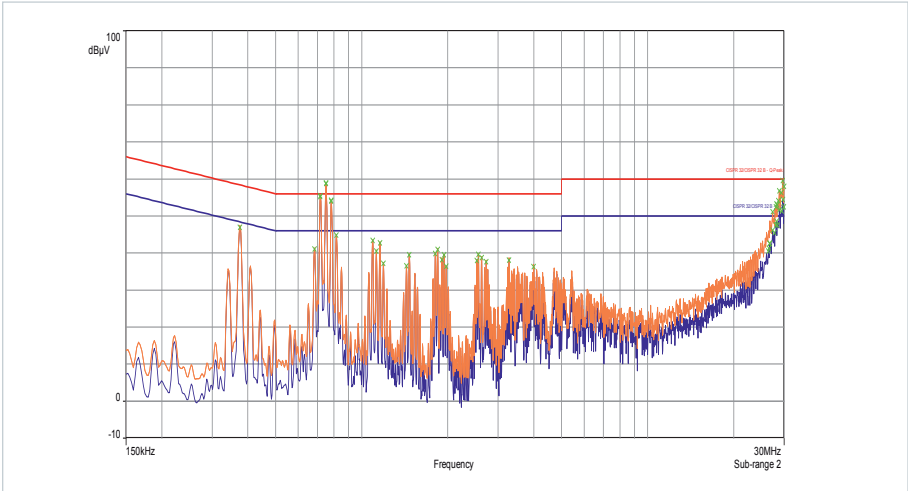


Fig. 17: CISPR-32 Class B - Conducted emissions results without L3 and C20

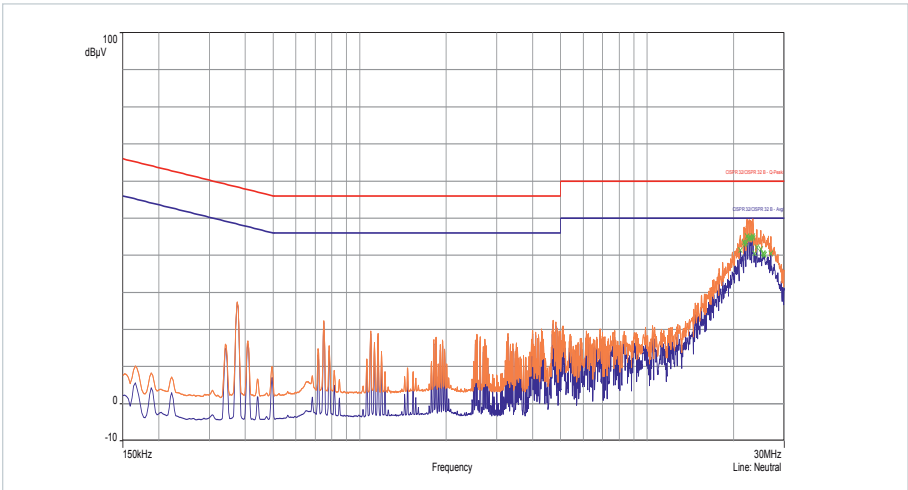


Fig. 18: CISPR-32 Class B Conducted emissions results with L3 and C20

Radiated emissions results (CISPR-32 Class B limits)

The radiated emissions signature shows high common-mode noise between 40 and 100 MHz (mainly due to the output diodes characteristics) and around 200 MHz (due to GND planes on the board acting as antenna), both causing a failed test. These were corrected with C20 and FB1 to FB5 ferrite beads.

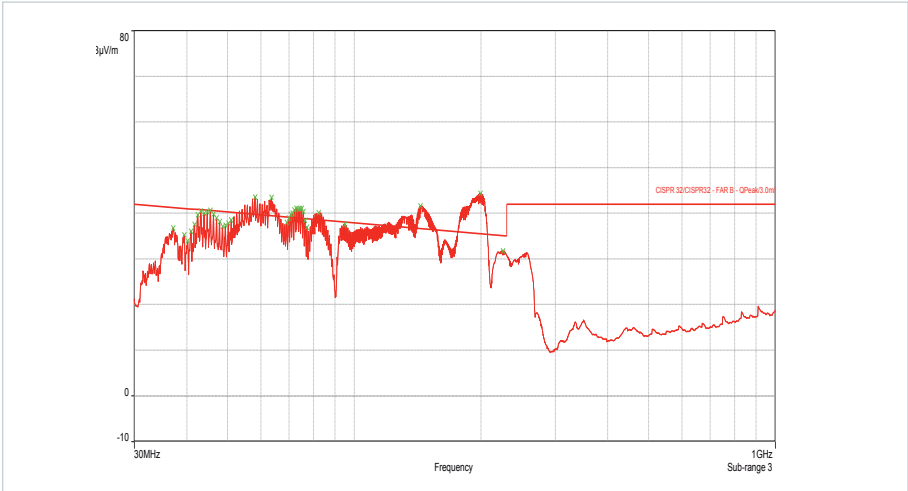


Fig. 19: CISPR-32 Class B Radiated emissions results without C20, L3, FB1 to FB5

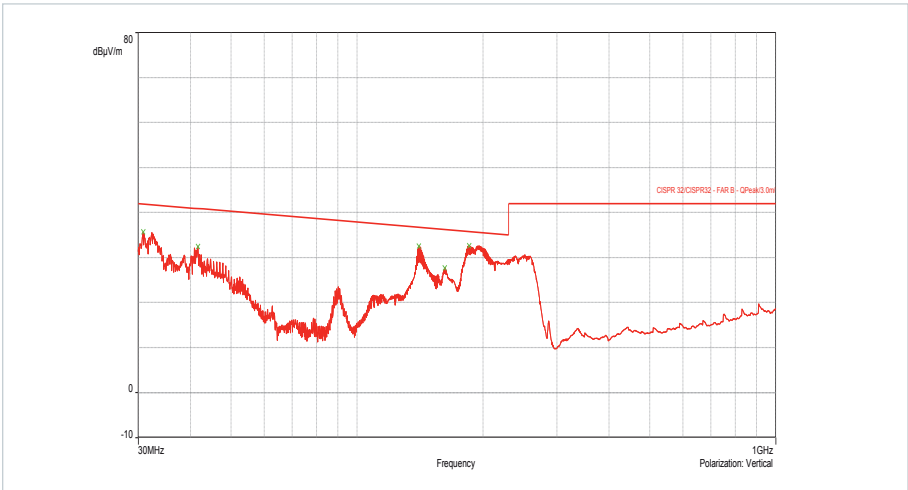


Fig. 20: CISPR-32 Class B Radiated emissions results with C20, L3, FB1 to FB5

8. SCHEMATIC

The generic schematic of both boards is shown below. The only difference is that C21 and C22 are not present in board-1. The PCB layout and bill-of-materials (BoM) of each board are shown in sections 8 and 9.

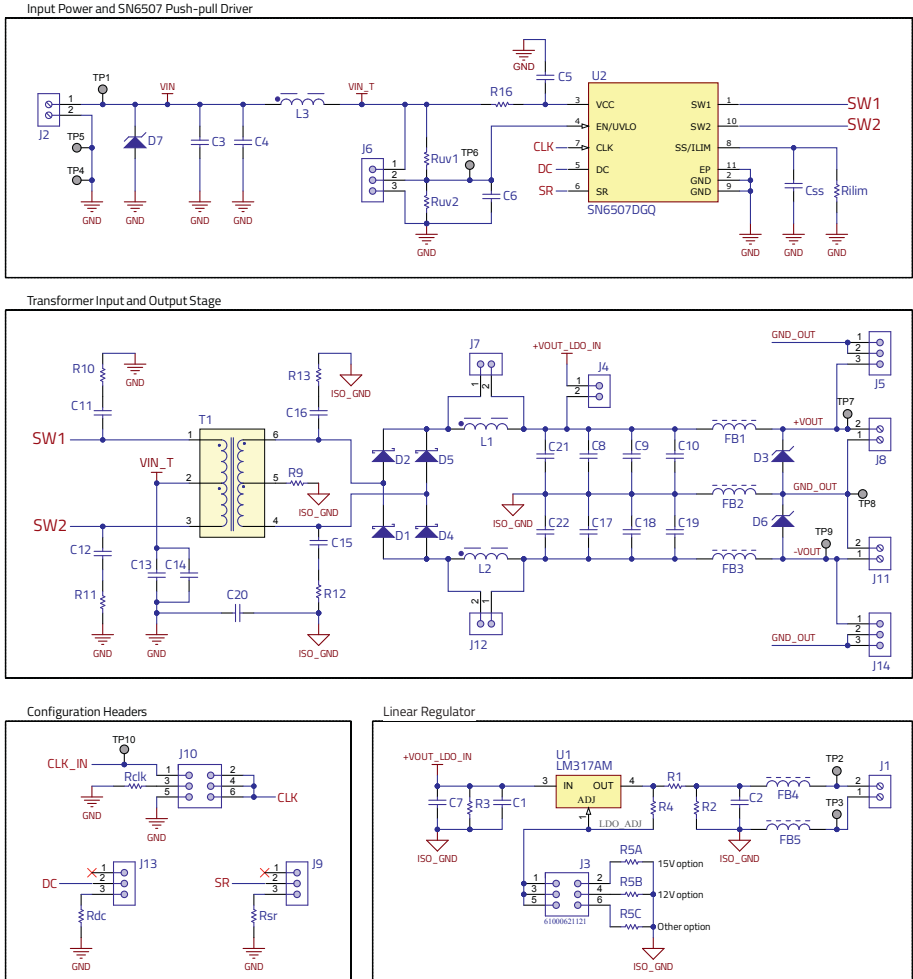


Fig. 21: Generic schematic of board-1 (650796) and board-2 (650700) (C21 and C22 not present in board-1)

9. PCB LAYOUT

Board-1: 650796 (Fixed version)

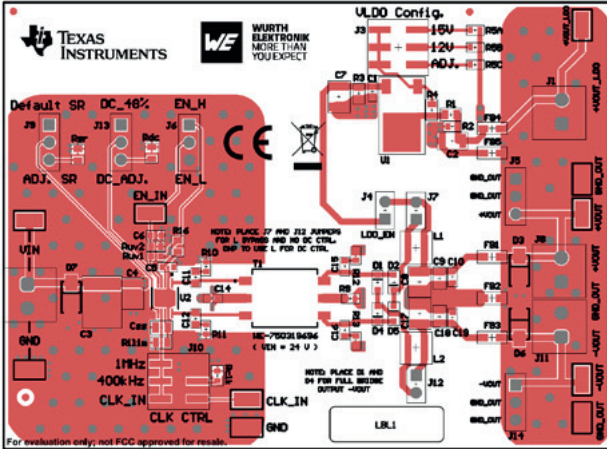


Fig. 22: Top layer copper of board-1

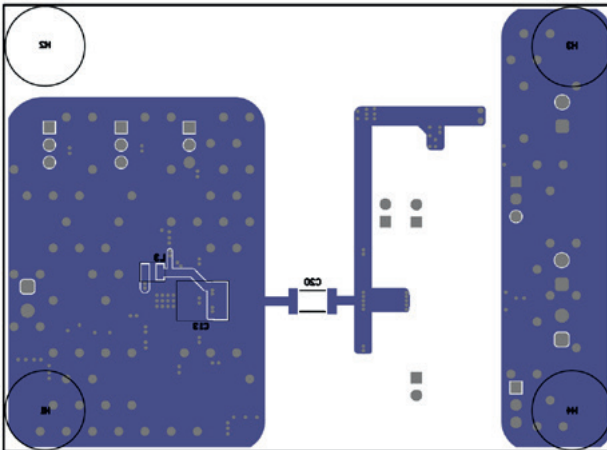


Fig. 23: Bottom layer copper of board-1

Board-2: 650700 (Configurable version)

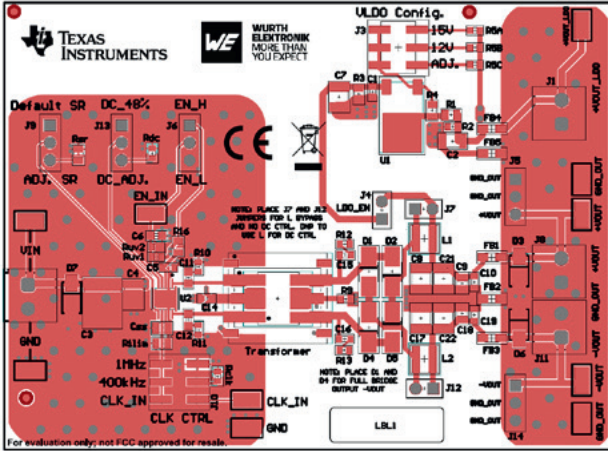


Fig. 24: Top layer copper of board-2

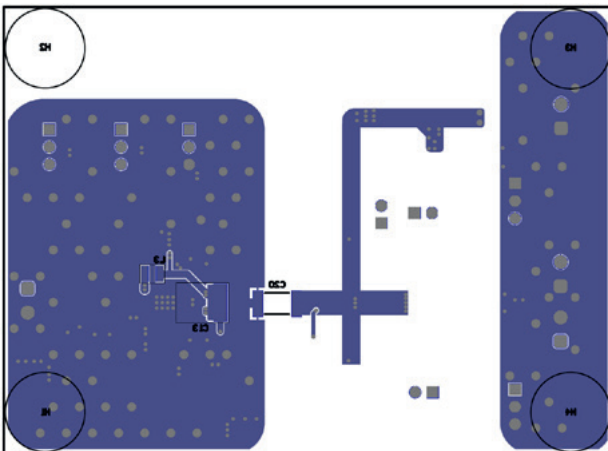


Fig. 25: Bottom layer copper of board-2

10. BILL OF MATERIALS (BOM)

Bill-of-materials for BOARD-1 (650796)				
Reference	Description	Package	Manufacturer	Order Code
C1, C5, C6, C14	WCAP-CSGP 100nF, 100VDC	0603	Würth Elektronik	885012206120
C2	WCAP-CSGP 10uF, 50VDC	1206	Würth Elektronik	885012108022
C3, C13	WCAP-CSGP 10uF, 100VDC	2220	Würth Elektronik	885012214006
C4	WCAP-CSGP 1uF, 100VDC	1210	Würth Elektronik	885012209069
C7, C8, C17	WCAP-CSGP 10uF, 50VDC	1210	Würth Elektronik	885012209073
C9, C18	WCAP-CSGP 1uF, 50VDC, 0805	0805	Würth Elektronik	885012207103
C10, C19	WCAP-CSGP 100nF, 50VDC	0603	Würth Elektronik	885012206095
C11, C12	Not populated	0603	Würth Elektronik	N/A
C15, C16	WCAP-CSGP 68pF, 100VDC	0603	Würth Elektronik	885012006078
C20	WCAP-CSSA 2.2nF, 250VAC, X1/Y2	2211	Würth Elektronik	8853522130151
Css	WCAP-CSGP 2.2uF, 10VDC	0805	Würth Elektronik	885012207024
FB1 to FB5	WE-CBF-HC 1.5 k Ω @ 100MHz, 1A	0805	Würth Elektronik	742792097
D1, D2, D4, D5	40 V, 0.75 A Schottky rectifier	SOD-323	Nexperia	BAT165AX
D3, D6, D7	WE-TVSP 36VDC, 6.9Apeak	SMA	Würth Elektronik	824500361
J1, J2, J8, J11	WR-TBL 2 pin, 3.5mm, 10A, 300VAC	THT	Würth Elektronik	691214110002
J3, J10	WR-PHD 6 pin, dual row, 2.54mm, Vertical	SMT	Würth Elektronik	61000621121
J4, J7, J12	WR-PHD 2 pin, 2.54mm, Vertical	THT	Würth Elektronik	61300211121
J5, J6, J9, J13, J14	WR-PHD 3 pin, 2.54mm, Vertical	THT	Würth Elektronik	61300311121
H1 to H4	Bump on, Hemisphere, 0.44 X 0.20, Clear	N/A	3M	SJ-5303 (CLEAR)
L1, L2	WE-MAPI 4020 22 μ H, 1.85 A, 0.25 Ω	SMD	Würth Elektronik	74438356220
L3	Power Inductor	1050	Würth Elektronik	74479887222A
LBL1	Thermal Printable Label, 0.650" x 0.200"	N/A	Brady	THT-14-423-10
R1, R16	Resistor 0, 0.125 W	0805	Würth Elektronik	560112120002
R2	Resistor 10 k, 0.1 W, 5%	0603	Würth Elektronik	560112116012
R3	Resistor 10 k, 0.25 W, 1%	0805	Würth Elektronik	560112120004
R4	Resistor 240, 0.1 W, 1%	0603	Würth Elektronik	560112116089
R5A	Resistor 2.67 k, 1%, 0.1 W	0603	Würth Elektronik	560112116127
R5B	Resistor 2 k, 1%, 0.1 W	0603	Würth Elektronik	560112116091
R9, R5C	Resistor 0, 5%, 0.1 W	0603	Würth Elektronik	560112116001
R10, R11	Not populated	0603	Würth Elektronik	N/A
R12, R13	Resistor 100, 0.1 W, 5%	0603	Würth Elektronik	560112116008
Rclk	Resistor 30k, 0.1 W, 1%	0603	Würth Elektronik	560112116107
Rilim	Resistor 18.2 k, 0.125 W, 1%	0805	Panasonic	ERJ-6ENF1822V
Rsr	Resistor 20.5 k, 0.125 W, 1%	0805	Panasonic	ERJ-6ENF2052V
Ruv1	Resistor 499 k, 1%, 0.1 W	0603	Yageo	RC0603FR-07499KL
Ruv2	Resistor 100 k, 1%, 0.1 W	0603	Würth Elektronik	560112116004
Rdc	Resistor 50.5 k, 0.1%, 0.125 W, 0805	0805	Yageo	RT0805BRD0750K5L
SH-J1 to SH-J7	Shunt, 100 mil, Gold plated, Black	N/A	Würth Elektronik	609002115121
T1	Push-pull Transformer 24V to 15V, 2.5kVac	SMD	Würth Elektronik	750319696
TP1 to TP10	Test Point, Miniature	SMD	Keystone	5019
U1	Adjustable Linear Regulator 1.5 A, 1%	TO-252-3	Texas Instruments	LM317AMDT
U2	36 V Push-Pull Transformer Driver	HVSSOP	Texas Instruments	SN6507DGQ

Table 4: Bill-of-materials for board-1 (650796)

Bill-of-materials for BOARD-1 (650700)				
Reference	Description	Package	Manufacturer	Order Code
C1, C5, C14	WCAP-CSGP 100nF, 100VDC	0603	Würth Elektronik	885012206120
C2	WCAP-CSGP 10uF, 50VDC	1206	Würth Elektronik	885012108022
C3, C13	WCAP-CSGP 10uF, 100VDC	2220	Würth Elektronik	885012214006
C4	WCAP-CSGP 1uF, 100VDC	1210	Würth Elektronik	885012209069
C6, C11, C12	Not populated	0603	Würth Elektronik	N/A
C7, C8, C17, C21, C22	WCAP-CSGP 10uF, 50VDC	1210	Würth Elektronik	885012209073
C9, C18	WCAP-CSGP 1uF, 50VDC, 0805	0805	Würth Elektronik	885012207103
C10, C19	WCAP-CSGP 100nF, 50VDC	0603	Würth Elektronik	885012206095
C15, C16	WCAP-CSGP 68pF, 100VDC	0603	Würth Elektronik	885012006078
C20	WCAP-CSSA 2.2nF, 250VAC, X1/Y2	2211	Würth Elektronik	8853522130151
Css	WCAP-CSGP 2.2µF, 10VDC	0805	Würth Elektronik	885012207024
FB1 to FB5	WE-CBF-HC 1.5 kΩ @ 100MHz, 1A	0805	Würth Elektronik	742792097
D1, D2, D4, D5	100 V, 2 A Schottky barrier rectifier	SOD-323	Nexperia	PMEG10020AELP
D3, D6, D7	WE-TVSP 36VDC, 6.9Apeak	SMA	Würth Elektronik	824500361
J1, J2, J8, J11	WR-TBL 2 pin, 3.5mm, 10A, 300VAC	THT	Würth Elektronik	691214110002
J3, J10	WR-PHD 6 pin, dual row, 2.54mm, Vertical	SMT	Würth Elektronik	61000621121
J4, J7, J12	WR-PHD 2 pin, 2.54mm, Vertical	THT	Würth Elektronik	61300211121
J5, J6, J9, J13, J14	WR-PHD 3 pin, 2.54mm, Vertical	THT	Würth Elektronik	61300311121
H1 to H4	Bump on, Hemisphere, 0.44 X 0.20, Clear	N/A	3M	SJ-5303 (CLEAR)
L1, L2	WE-MAPI 4020 22µH, 1.85 A, 0.25 Ω	SMD	Würth Elektronik	74438356220
L3	Power Inductor	1050	Würth Elektronik	74479887222A
LBL1	Thermal Printable Label, 0.650" x 0.200"	N/A	Brady	THT-14-423-10
R1, R16	Resistor 0, 0.125 W	0805	Würth Elektronik	560112120002
R2	Resistor 10 k, 0.1 W, 5%	0603	Würth Elektronik	560112116012
R3	Resistor 10 k, 0.25 W, 1%	0805	Würth Elektronik	560112120004
R4	Resistor 240, 0.1 W, 1%	0603	Würth Elektronik	560112116089
R5A	Resistor 2.67 k, 1%, 0.1 W	0603	Würth Elektronik	560112116127
R5B	Resistor 2 k, 1%, 0.1 W	0603	Würth Elektronik	560112116091
R9	Resistor 0, 5%, 0.1 W	0603	Würth Elektronik	560112116001
R5C, R10, R11, Rdc, Ruv1, Ruv2	Not populated	0603	Würth Elektronik	N/A
R12, R13	Resistor 100, 0.1 W, 5%	0603	Würth Elektronik	560112116008
Rclk	Resistor 30k, 0.1 W, 1%	0603	Würth Elektronik	560112116107
Rilim	Resistor 18.2 k, 0.125 W, 1%	0805	Panasonic	ERJ-6ENF1822V
Rsr	Resistor 20.5 k, 0.125 W, 1%	0805	Panasonic	ERJ-6ENF2052V
SH-J1 to SH-J7	Shunt, 100 mil, Gold plated, Black	N/A	Würth Elektronik	609002115121
T1	Not populated	SMD	Würth Elektronik	Select
TP1 to TP10	Test Point, Miniature	SMD	Keystone	5019
U1	Adjustable Linear Regulator 1.5 A, 1%	TO-252-3	Texas Instruments	LM317AMDT
U2	36 V Push-Pull Transformer Driver	HVSSOP	Texas Instruments	SN6507DGQ

Table 5: Bill-of-materials for board-2 (650700 Configurable)

11. IMPORTANT NOTES

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