TPS6305xEVM-180

This user's guide describes the characteristics, operation, and use of the TPS6305xEVM-180 evaluation module (EVM). This EVM is designed to help the user easily evaluate and test the operation and functionality of the TPS63050 and TPS63051. The EVM converts a 2.5-V to 5.5-V input voltage to a regulated 3.3-V output voltage that delivers 500 mA. This document includes setup instructions for the hardware, a schematic diagram, a bill of materials, and printed-circuit board layout drawings for the evaluation module.

Contents

List of Figures

List of Tables

1 Introduction

TI's TPS6305x are highly efficient, single-inductor, buck-boost converters with 1-A switches in a 1.6 mm × 1.2 mm, 12-pin WCSP package. TPS63050 is an adjustable output voltage converter and TPS63051 is a fixed 3.3-V output voltage converter.

1.1 Background

The TPS6305xEVM-180 uses either the TPS63050 adjustable version (PWR180-002) that is programmed with an external feedback divider to an output voltage of 3.3-V or the TPS63051 fixed 3.3-V output voltage version (PWR180-001). Both EVMs operate with an input voltage between 2.5-V and 5.5-V.

1.2 Performance Specification

Table 1 provides a summary of the TPS6305xEVM-180 performance specifications. All specifications are given for operating in a free-air environment of an ambient temperature of 25°C.

Table 1. Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input voltage		2.5		5.5	V
Output voltage	PWM Mode	3.267	3.3	3.33	V
Output current		0		500	mA

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate both the fixed and adjustable versions of this integrated circuit (IC). If the fixed output voltage version (TPS63051) is installed, R1 is replaced with a 0-Ω resistor and R2 is open. If the adjustable version (TPS63050) is installed, R1 and R2 are set per the datasheet.

2 Setup

This section describes how to properly use the TPS6305xEVM-180.

2.1 Input/Output Connector and Header Descriptions

2.1.1 J1 – VIN

This header is the positive connection to the input power supply. The power supply must be connected between J1 and J3 (GND). The leads to the input supply should be twisted and kept as short as possible. The input voltage has to be between 2.5 V and 5.5 V.

2.1.2 J2 – S+/S–

Header J2 can be used to measure the input voltage directly on the input capacitor. Therefore a 4-wire power and sense supply can be connected. The leads to the sensing connector should also be twisted.

2.1.3 J3 – GND

This header is the return connection to the input power supply. Connect the power supply between J3 and J1 (VIN). The leads to the input supply should be twisted and kept as short as possible. The input voltage has to be between 2.5 V and 5.5 V.

2.1.4 J4 – VOUT

This header is the positive connection of the output voltage. The load has to be connected between J4 and J6 (GND).

2.1.5 J5 – S+/S–

Header J5 can be used to measure the output voltage directly on the output capacitor.

2.1.6 J6 – GND

This header is the return connection of the output voltage. Connect the load between J6 and J4 (VOUT).

2.1.7 JP1 – EN

This jumpers enable or disable the TPS6305x on the EVM. Place the jumper across ON and EN to enable the converter. Place the jumper across OFF and EN to disable the converter. A 1-MΩ pullup resistor is connected between VIN and EN. Removing the jumper on JP1 turns on the converter.

2.1.8 JP2 – ILIM1

Together with JP3, this jumper controls the current limit of the TPS6305x. See Table 2.

2.1.9 JP3 – ILIM0

Together with JP2, this jumper controls the current limit of the TPS6305x. See Table 2.

Table 2. Current Limit Settings from ILIMx Pins

ILIM0	ILIM1	Current Limit Setting (Typical)
Low	Low	200 mA
High	Low	300 mA
Low	High	500 mA
High	High	1 A

2.1.10 JP4 – MODE

This jumpers control the operating mode of the TPS6305x on the EVM. Place the jumper across PWM and MODE to enable forced PWM mode with a constant switching frequency. Place the jumper across PFM and MODE to enable power save mode with higher efficiency.

2.1.11 TP1 – PG

This test point outputs the PG (power good) pin of the TPS6305x.

2.1.12 TP2 – SS

This test point outputs the SS (soft start) pin of the TPS6305x.

2.1.13 TP3/4 – GND

These test points are convenient ground connections.

2.2 Setup

To operate the EVM, simply connect an input supply between J1 and J3. Connect a load between J4 and J6. An input supply voltage of 2.5 V to 5.5 V is recommended.

3 Test Results

The TPS6305xEVM-180 was used to take the data in the TPS6305x datasheet, SLVSAM8. See the device datasheet for the performance of this EVM.

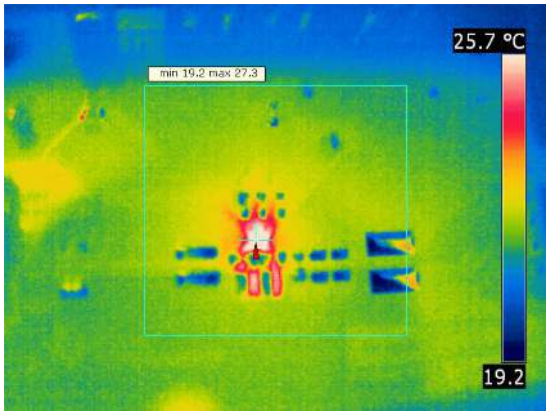

Figure 1. Thermal Performance (Vin = 5.5 V, Load = 500 mA)

4 Board Layout

This section provides the TPS63050xEVM-180 board layout and illustrations. The gerbers are available on the EVM product page: TPS63051EVM-180.

4.1 Layout

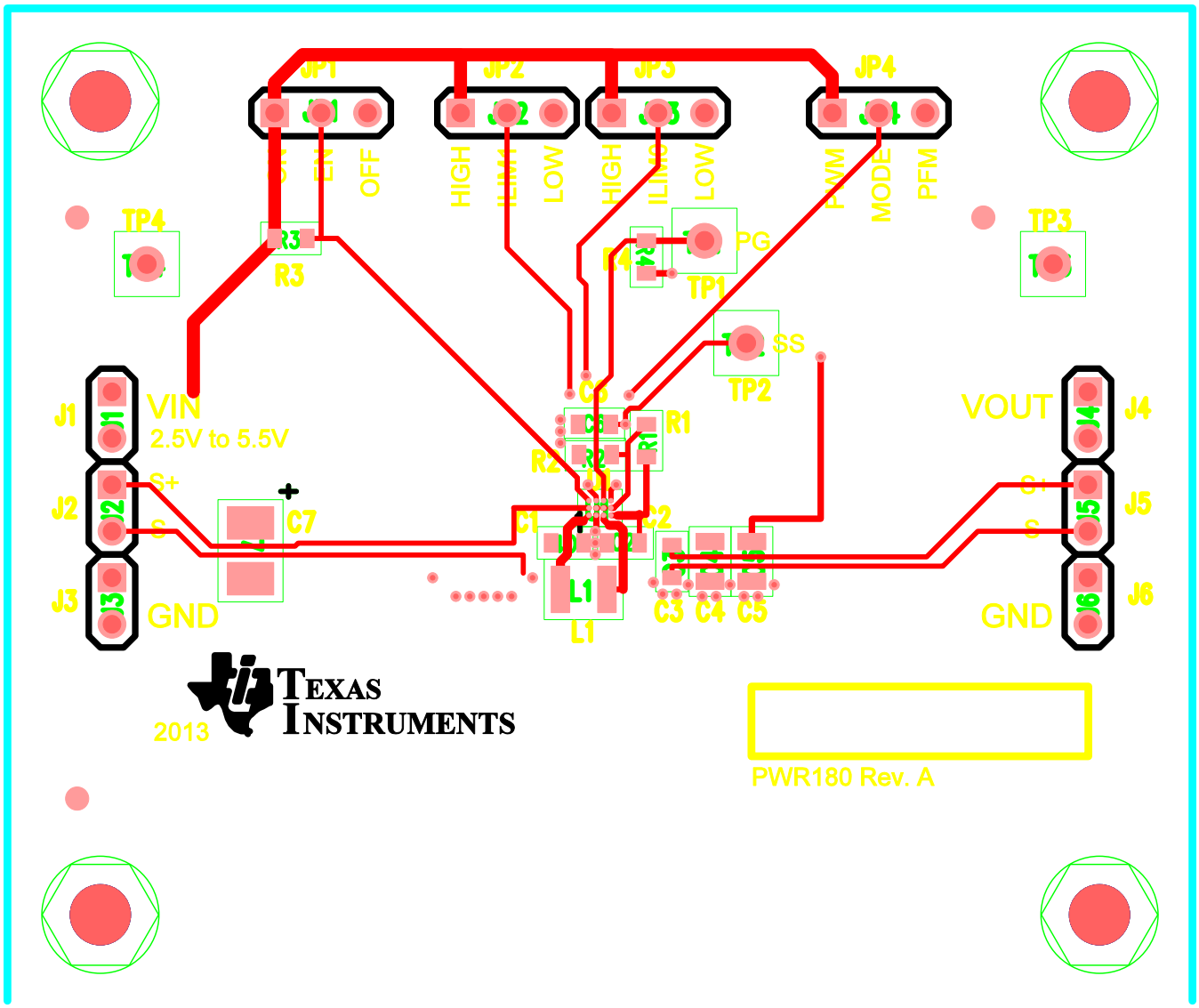

Figure 2. Assembly Layer

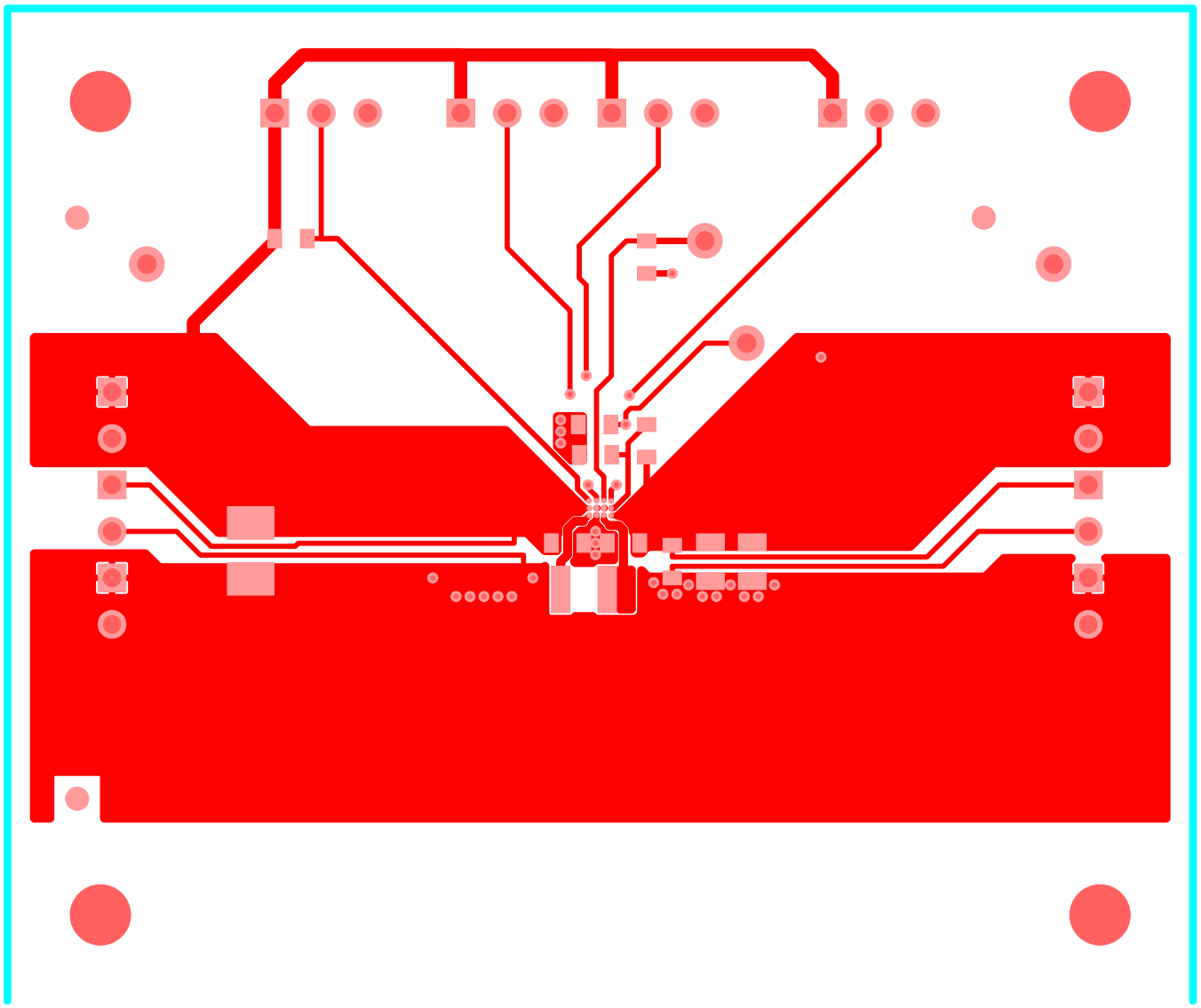

Figure 3. Top Layer Routing

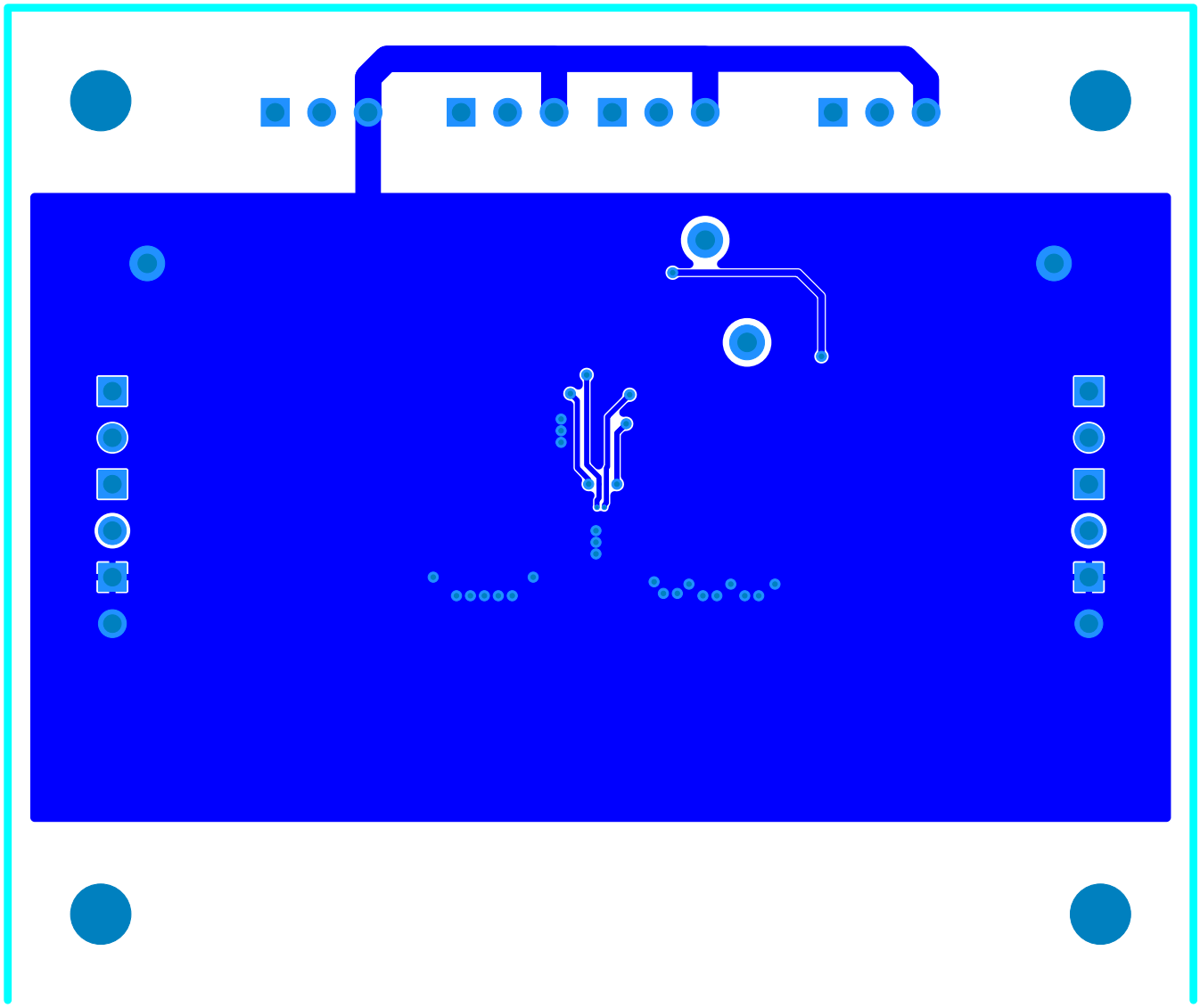

Figure 4. Bottom Layer Routing

5 Schematic and Bill of Materials

This section provides the TPS6305xEVM-180 schematic and bill of materials.

5.1 Schematic

Figure 5 illustrates the schematic for this EVM.

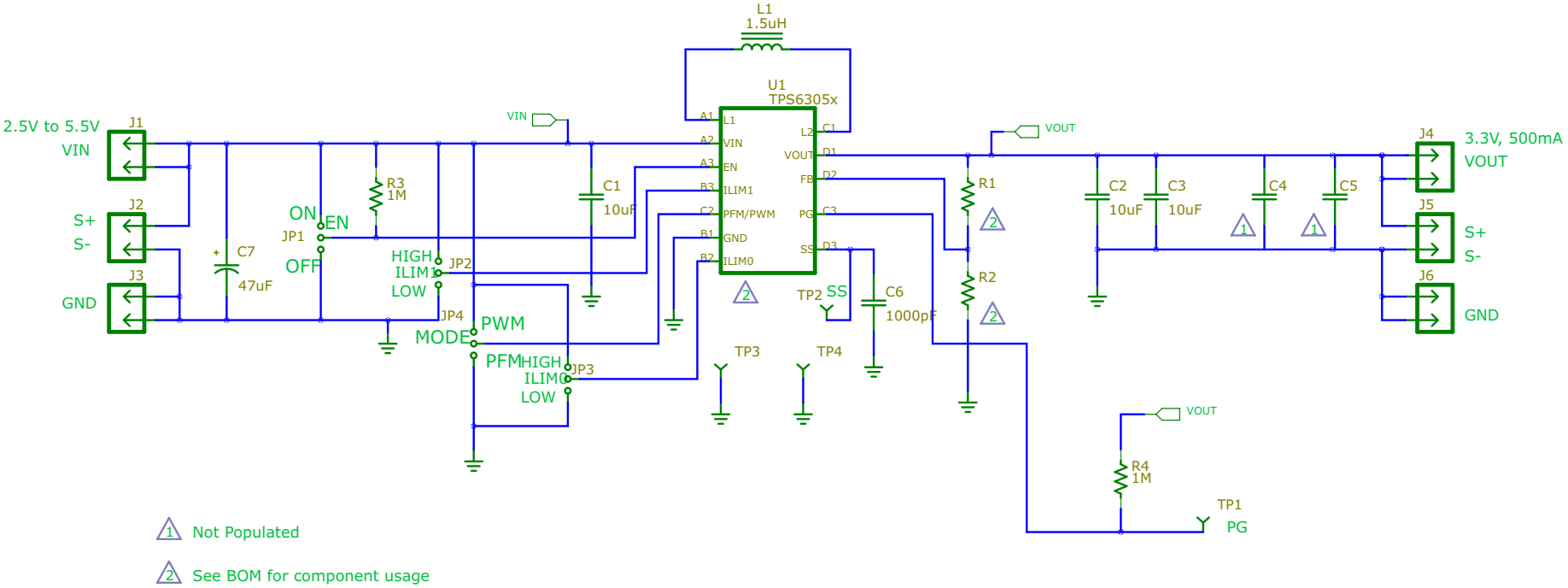

Figure 5. TPS6305xEVM-180 Schematic

5.2 Bill of Materials

Table 3. TPS6305xEVM-180 Bill of Materials

-001	-002	RefDes	Value	Description	Size	Part Number	MFR
3	3	C1-3	10uF	Capacitor, Ceramic Chip, 6.3V, ±20%, X5R	0603	GRM188R60J106ME84	Murata
1	1	C6	1000pF	Capacitor, Ceramic Chip, 50V, ±10%, X5R	0603	CGA3E2X5R1H102K080AA	TDK
1	1	C7	47uF	Capacitor, Tantalum, 8V, 35milliohm, 20%	3528(B)	T520B476M008ATE035	Kemet
1	1	L1	1.5uH	Inductor, SMT ±30%	2520	1269AS-H-1R5M	Toko
1	0	R1	0	Resistor, Chip, 1/10W, 1%	0603	STD	STD
0	0	R2	Open	Resistor, Chip, 1/10W, 1%	0603	STD	STD
0	1	R1	560k	Resistor, Chip, 1/10W, 1%	0603	STD	STD
0	1	R2	180k	Resistor, Chip, 1/10W, 1%	0603	STD	STD
2	2	R3-4	1M	Resistor, Chip, 1/10W, 5%	0603	CRCW06031M00JNEA	Vishay Dale
0	1	U1	--	IC, SINGLE INDUCTOR BUCK-BOOST WITH 1-A SWITCHES AND ADJUSTABLE SOFT START	BGA	TPS63050YFF	TI
1	0	U1	--	IC, SINGLE INDUCTOR BUCK-BOOST WITH 1-A SWITCHES AND ADJUSTABLE SOFT START	BGA	TPS63051YFF	TI

6 Related Documentation From Texas Instruments

Single Inductor Buck-Boost with 1-A Switches and Adjustable Soft Start datasheet (SLVSAM8)

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