TPS65252 High Current, Synchronous Step Down Two Buck Switcher Evaluation Module

User's Guide

Literature Number: SLVU438
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1 Introduction

This document presents the information required to power the TPS65252 PMIC as well as the support documentation including schematic and bill of materials.

2 Background

The TPS65252 PMIC is designed to provide 3-A and 2-A continuous outputs with an operational range of 4.5 V to 18 V and a externally set switching frequency ranging from 300 kHz to 2.2 MHz. When the PMIC is not fully loaded, buck1 can be loaded to 3.5 A and buck 2 to 2.5 A. It also features a power distribution switch with selectable current limit.

As there are many possible options to set the converters, Table 1 presents the performance specification summary for the EVM.

Table 1. Input Voltage and Output Current Summary

EVM	TEST CONDITIONS	OUTPUT CURRENT RANGE
TPS65252EVM	V_{IN} = 4.5 V to 16 V f_{sw} = 500 kHz	Buck1, 1.2 V, 3 A Buck2, 1.8 V, 2 A (25°C ambient)

This evaluation module is designed to provide access to the features of the TPS65252. Some modifications can be made to this module to test performance at different input and output voltages, current and frequency operation. Please contact TI Field Applications Group for advice on these matters.

3 Schematic

See next page.

The resistor and capacitor values have been chosen according to the guidelines presented on the TPS65252 spec available at http://focus.ti.com/docs/prod/folders/print/TPS65252.html.

Note that for the purpose of gains-phase measurements R9 and R11 (0 Ω on the EVM) need to be replaced by suitable low value resistors as per the network analyzer setup required. Test points are provided on either end of the resistors to allow for easy measurement.

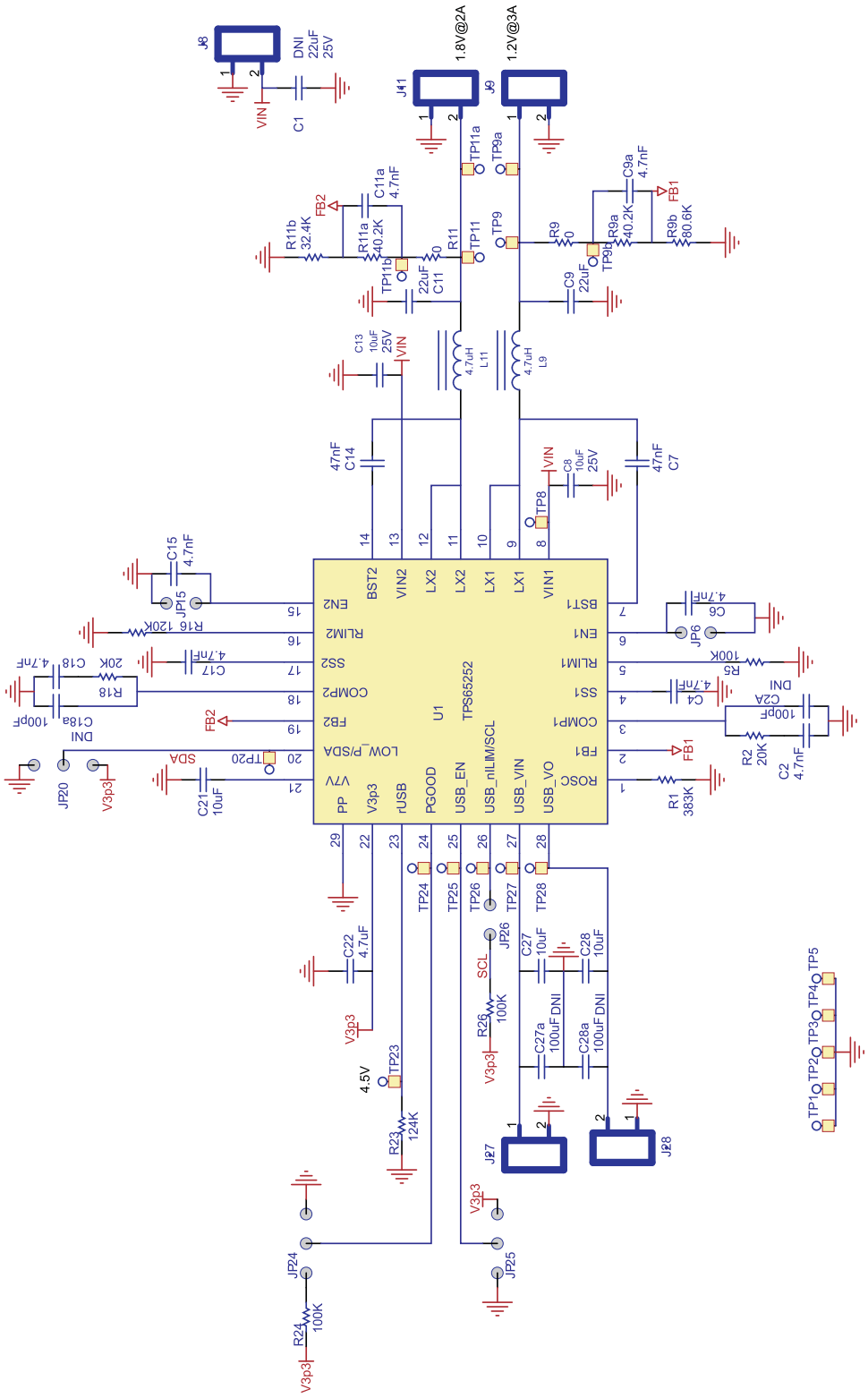

Figure 1. TPS65252 Schematic

4 Placement

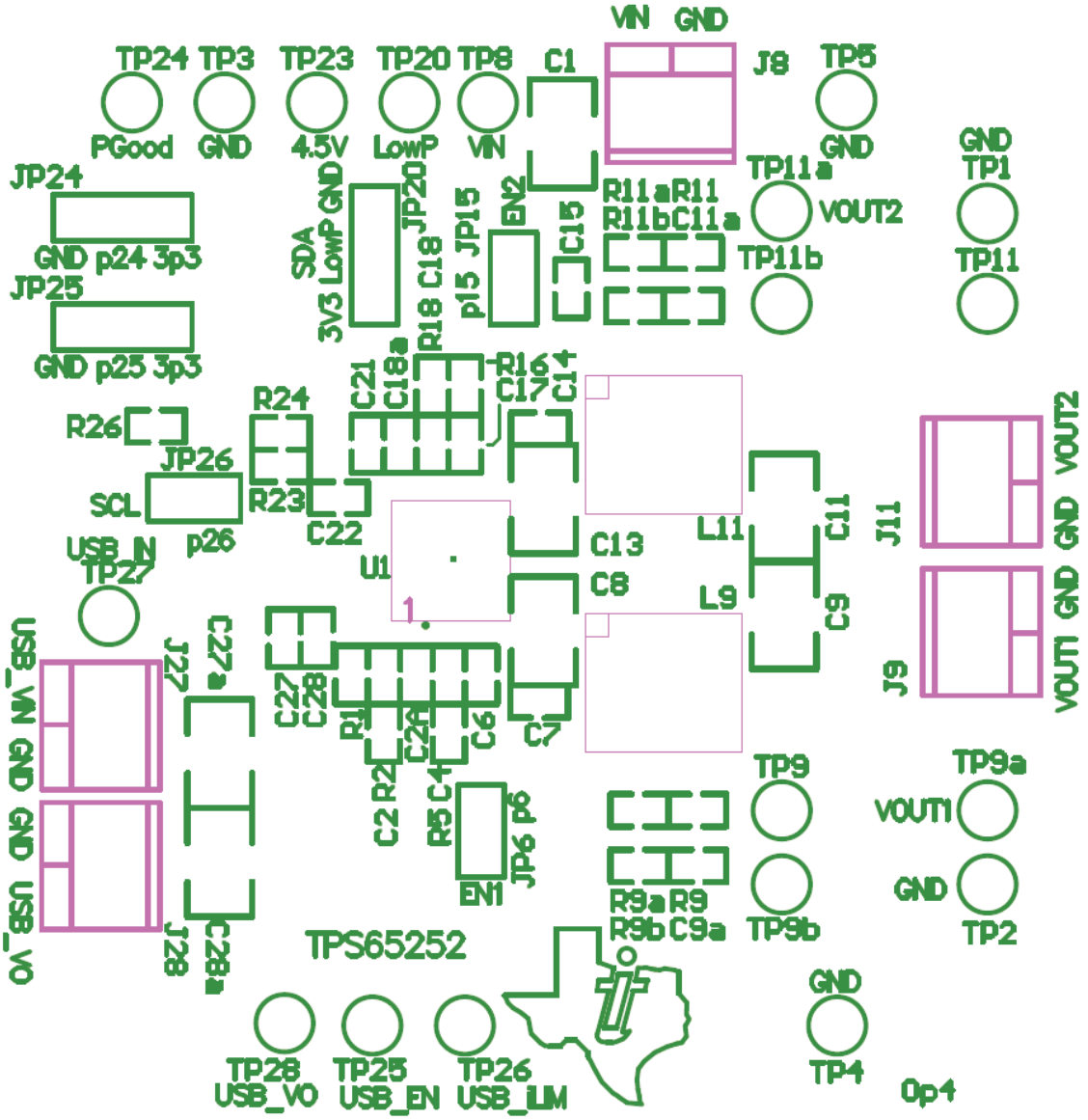

Figure 2. Top Layer

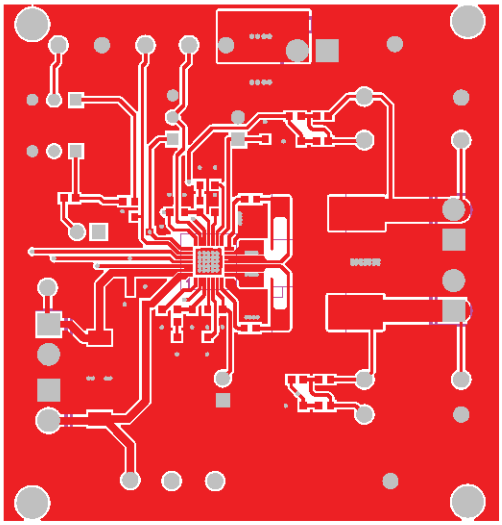

Figure 3. Layer 1

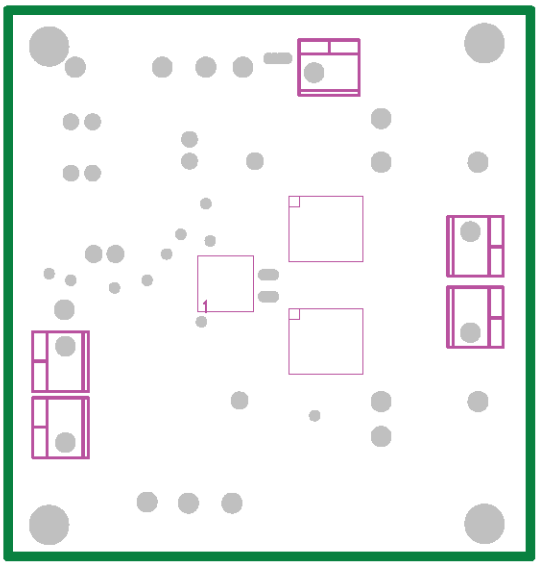

Figure 4. Layer 2

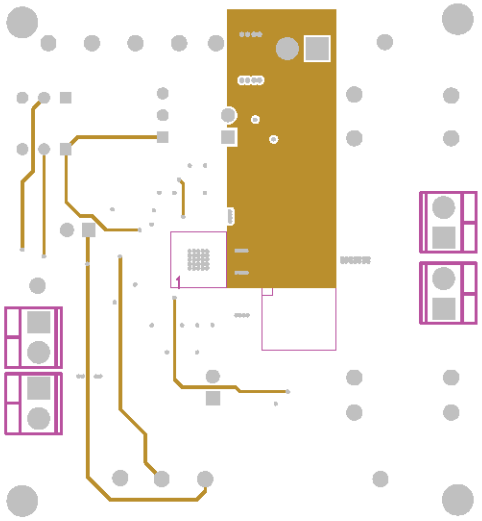

Figure 5. Layer 3

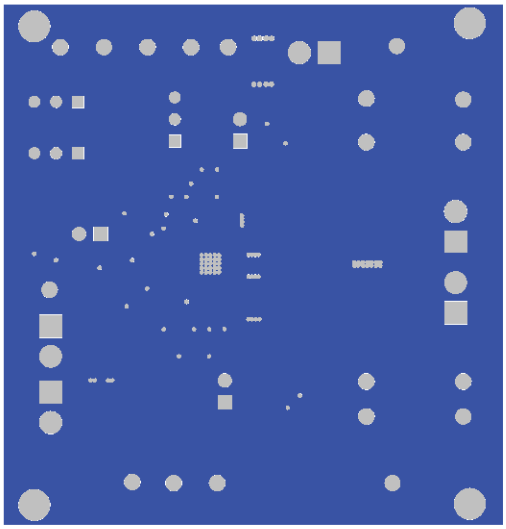

Figure 6. Layer 4

5 Bench Test Setup Conditions

5.1 Headers Description and Jumper Placement

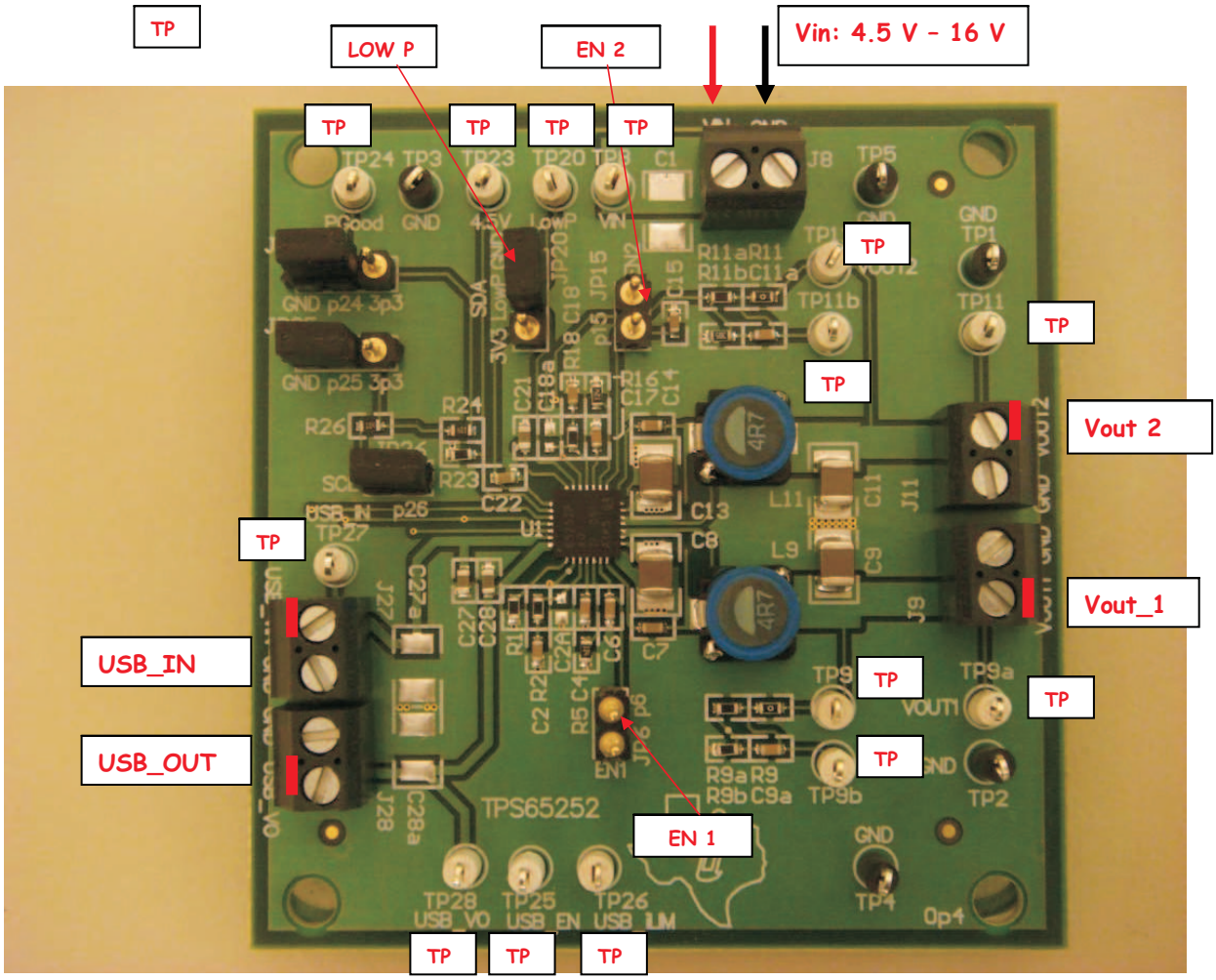

Figure 7. Headers Description and Jumper Placement

Test points:

Black – GND

White – Each output, feed-back, power good and V_{IN}. All marking on PCB.

5.2 Jumpers

Table 2. Jumpers

JUMPER NO.	FUNCTION	PLACEMENT	COMMENT
JP15	BUCK1 enable (EN1)	For sequencing do not fit jumper. To disable converter fit jumper to GND.	Fit according to test requirement
JP6	BUCK2 enable (EN2)	For sequencing do not fit jumper. To disable converter fit jumper to GND.	Fit according to test requirement
JP20	LOW_P	Low power: Power save mode ON/OFF. If need low power mode test, should connect V3V.	Fit according to test requirement. During normal operation jumper must be fitted.
JP24	PGOOD	Pulls PGOOD signal to internal 3V3 rail or grounds pin	Fit according to test requirement
JP25	USB_EN	Enables power switch when tied to 3v3. Disables power switch when tied to GND.	Fit according to test requirement
JP26	USB_nILIM	When fitted connects USB switch alarm to internal 3V3 rail	Fit according to test requirement

5.3 Test Points and Placement

Buck converter outputs are white and have a label for easy location. Close to any of these test points there are black ground test points to allow for DVM measurement or to use a metal exposed scope probe to reduce common mode noise measurements. All test points are described in Table 3.

Table 3. Test Points and Placement

TEST POINT	NAME	SIGNAL	COLOR	COMMENT
TP1, TPS, TP3, TP4, TP5	GND	Ground	Black	
TP8	VIN	Input supply	White	
TP9, TP9A	VOUT1	Buck1 output	White	
TP9B		Input for gain-phase measurement Buck1	White	Normally not used
TP11, TP11A	VOUT2	Buck2 output	White	
TP11B		Input for gain-phase measurement Buck2	White	Normally not used
TP20	LowP	Low Power input	White	
TP23	rUSB	USB switch current set pin	White	
TP24	PGOOD	Power Good (open drain connected to Buck1 output)	White	
TP25	USB_EN	Enable pin for USB swtich	White	
TP26	USB_nILIM	USB switch alarm pin	White	
TP27	USB_VIN	USB switch input	White	
TP28	USB_Vo	USB switch output	White	

6 Power-Up Procedure

1. Define which converters are to be enabled or disabled by connecting the correct jumpers accordingly.
2. Apply a DC voltage to jumper J8. Polarity is clearly marked on the silk-screen.
3. Verify that the relevant converters are powered up by the output voltages. The whole start-up process will take less than 100 ms. PGOOD will be asserted after 256 ms.
4. Apply loads to the output connectors.
5. To power the USB switch apply a suitable voltage to jumper 27 and enable the switch by connecting JP25 to 3V3 or leave it open.

7 Bill of Materials

Table 4. Bill of Materials

ITEM	QUANTITY	DESIGNATOR	VALUE	FOOTPRINT	MANUFACTURER	MANUFACTURER PART NO.	VENDER PART NO.	DESCRIPTION
1	2	DNI: C2A, C18a	Do not install 100 pF	603	Panasonic-ECG	ECJ-1VC1H101J	PCC101ACVDKR-ND	CAP CERAMIC 100 pF 50 V 0603 SMD
2	2	C7, C14	47 nF	603	Panasonic-ECG	ECJ-1VB1E473K	PCC1771DKR-ND	CAP 47000 pF 25 V CERM X7R 0603
3	2	C8, C13	10 µF	1210	Murata Electroics North America	GRM32ER7YA106KA12L	490-5314-6-ND	CAP CER 10 µF 35 V X7R 10% 1210
4	2	C9, C11	22 µF	1210	Panasonic-ECG	ECJ-4YB1E226M	PCC2333DKR-ND	CAP CERAMIC 22 µF 25 V X5R 1210
5	3	C21, C27, C28	10 µF	603	Panasonic-ECG	ECJ-1VB1A106M	PCC2479DKR-ND	CAP CERAMIC 10 µF 10 V 0603 X5R
6	1	C22	4.7 µF	603	Panasonic-ECG	ECJ-1VB0J475M	PCC2318DKR-ND	CAP CERAMIC 4.7 µF 6.3 V X5R 0603
7	2	DNI: C27A, C28A	Do not purchase item		Do not purchase item		Do not purchase item	Do not purchase item
8	5	J8, J9, J11, J27, J28	ED555/2DS	TB_2X3.5MM	On Shore Technology	ED555/2DS	ED1514-ND	TERMINAL BLOCK 3.5 mm 2POS PCB
9	3	JP6, JP15, JP26		JMP0.2	Mil-Max	800-10-064-10-001000	ED7264-ND	SIP HEADER 64 POS STRAIGHT PCB
10	3	JP20, JP24, JP25		JMP0.3	Mil-Max	800-10-064-10-001000	ED7264-ND	SIP HEADER 64 POS STRAIGHT PCB
11	2	L9, L11	4.7 µH	IND_SLF7055	TDK Corporation	SLF7055T-4R7N3R1-3PF	445-4563-2-ND	Magnetic-Core Inductor
12	1	R1	383 kΩ	603	Panasonic-ECG	ERJ-3EKF3833V	P383KHDKR-ND	RES 383 kΩ 1/10 W 1% 0603 SMD
13	2	R2, R18	20 kΩ	603	Panasonic-ECG	ERJ-3EKF2002V	P20.0KHCT-ND	RES 20 kΩ 1/10 W 1% 0603 SMD
14	3	R5, R24, R26	100 kΩ	603	Panasonic-ECG	ERJ-3EKF1003V	P100KHCT-ND	RES 100 kΩ 1/10 W 1% 0603 SMD
15	2	R9, R11	0	603	Vishay/Dale	CRCW06030000Z0EA	541-0.0GDKR-ND	RES 0 Ω 1/10 W 5% 0603 SMD
16	2	R9a, R11a	40.2 kΩ	603	Panasonic-ECG	ERJ-3EKF4022V	P40.2KHDKR-ND	RES 40.2 kΩ 1/10 W 1% 0603 SMD
17	1	R9b	80.6 kΩ	603	Panasonic-ECG	ERJ-3EKF8062V	P80.6KHDKR-ND	RES 80.6 kΩ 1/10 W 1% 0603 SMD
18	1	R11b	32.4 kΩ	603	Yageo	RC0603FR-0732K4L	311-32.4KHRDKR-ND	RES 32.4 kΩ 1/10 W 1% 0603 SMD
19	1	R16	120 kΩ	603	Panasonic-ECG	ERA-3AEB124V	P120KDBDKR-ND	RES 120 kΩ 1/10 W .1% 0603 SMD

Table 4. Bill of Materials (continued)

ITEM	QUANTITY	DESIGNATOR	VALUE	FOOTPRINT	MANUFACTURER	MANUFACTURER PART NO.	VENDER PART NO.	DESCRIPTION
20	1	R23	124 kΩ	603	Panasonic-ECG	ERJ-3EKF1243V	P124KHDKR-ND	RES 124 kΩ 1/10 W 1% 0603 SMD
21	14	TP8, TP9, TP9A, TP9B, TP11, TP11A, TP11B, TP20, TP23, TP24, TP25, TP26, TP27, TP28		TEST POINT 0.042	Keystone Electronics	5002	5002K-ND	TEST POINT PC MINI .040" D WHITE
22	5	TP1, TP2, TP3, TP4, TP5		TEST POINT 0.042	Keystone Electronics	5001	5001K-ND	TEST POINT PC MINI .040" D BLACK
23	1	U1		QFN28 [RHD]		TPS65252		
25	8	C2, C4, C6, C9A, C1, 1A, C15, C17, C18	4.7 nF	603	Panasonic-ECG	ECJ-1VB1H472K	PCC1780TR-ND	CAP 4700 pF 50 V CERAMIC X7R 0603
26	1	C1, Do not install	DNI: 22 µF	1210	AVX Corp	12103D226KAT2A	478-5999-6-ND	CAP CER 22 µF 25 V X5R 10% 1210

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