4.5-V to 18-V Input, 5-A and 5-A Dual Synchronous Step-Down Converter Evaluation Module

This document is provided with the TPS65279 PMIC evaluation module (EVM) as a supplement to the TPS65279 data sheet. This user's guide includes the schematic, hardware setup, software installation and bill of materials (BOM).

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1 Introduction

This document presents the information required to operate the TPS65279 PMIC as well as the support documentation including schematic, layout, hardware setup, software installation and bill of materials.

2 Background

The TPS65279 PMIC is designed to provide dual (5 A and 5 A) continuous currents with an operational range of 4.5 to 18 V. The TPS65279 features externally programmed switching frequency ranging from 200 kHz to 1.6 MHz, external compensation, soft-start and enable.

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

Table 1. Summary of Performance

Test Conditions	Performance
V_{IN} = 4.5 V to 18 V	Buck1 : 1.2 V, up to 5 A,
f_{sw} = 500 kHz (25°C ambient)	Buck2 : 1.8 V, up to 5 A

The EVM is designed to provide access to the features of the TPS65279. Some modifications can be made to this module to test performance at different input and output voltages, current and switching frequency. Contact TI Field Applications Group for advice on these matters.

3 TPS65276V Schematic

Figure 1 shows the TPS65279 PMIC EVM schematic.

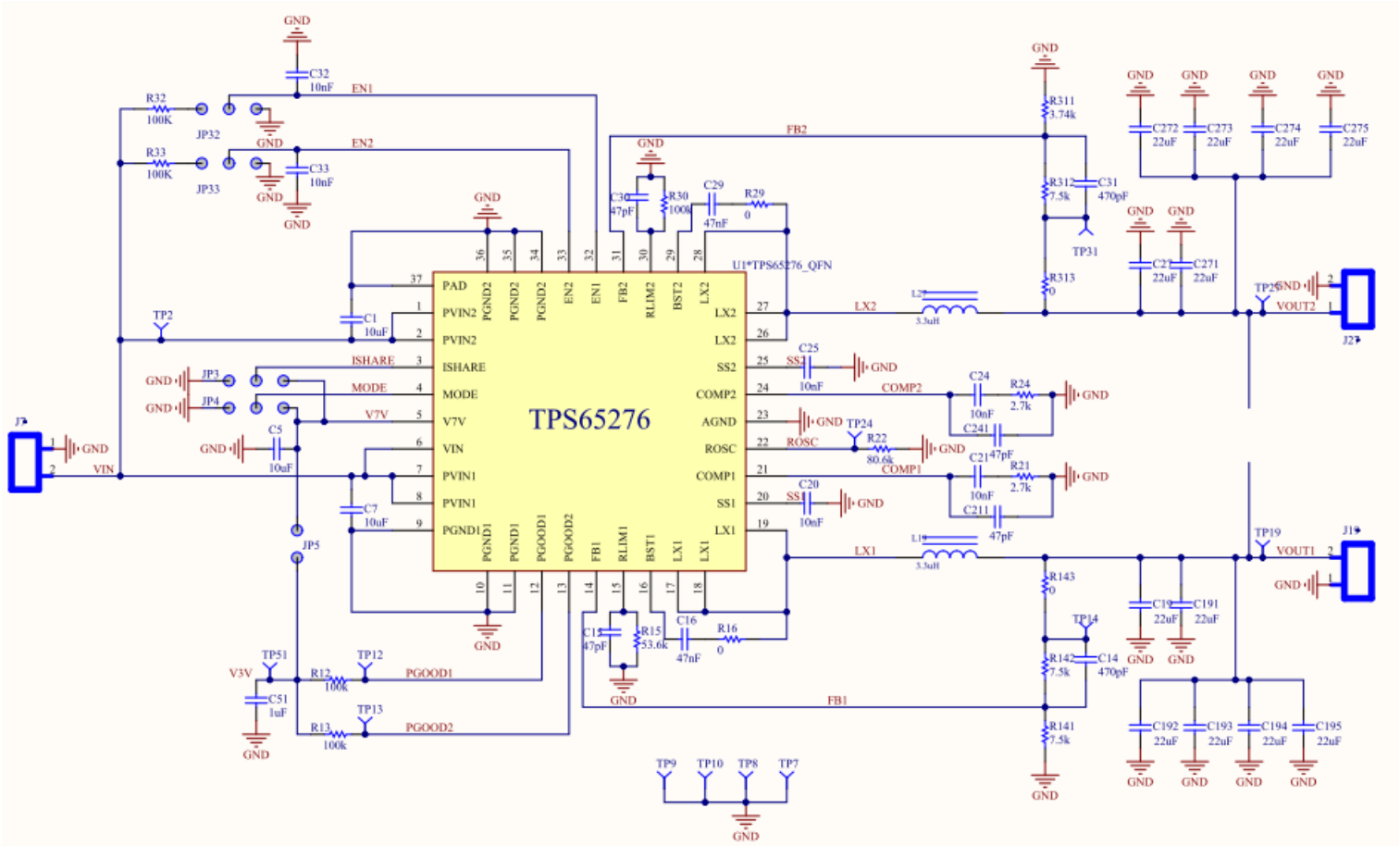


Figure 1. TPS65279 Schematic

4 Board Layout

Figure 2 through Figure 6 illustrate the printed-circuit boards for this EVM.

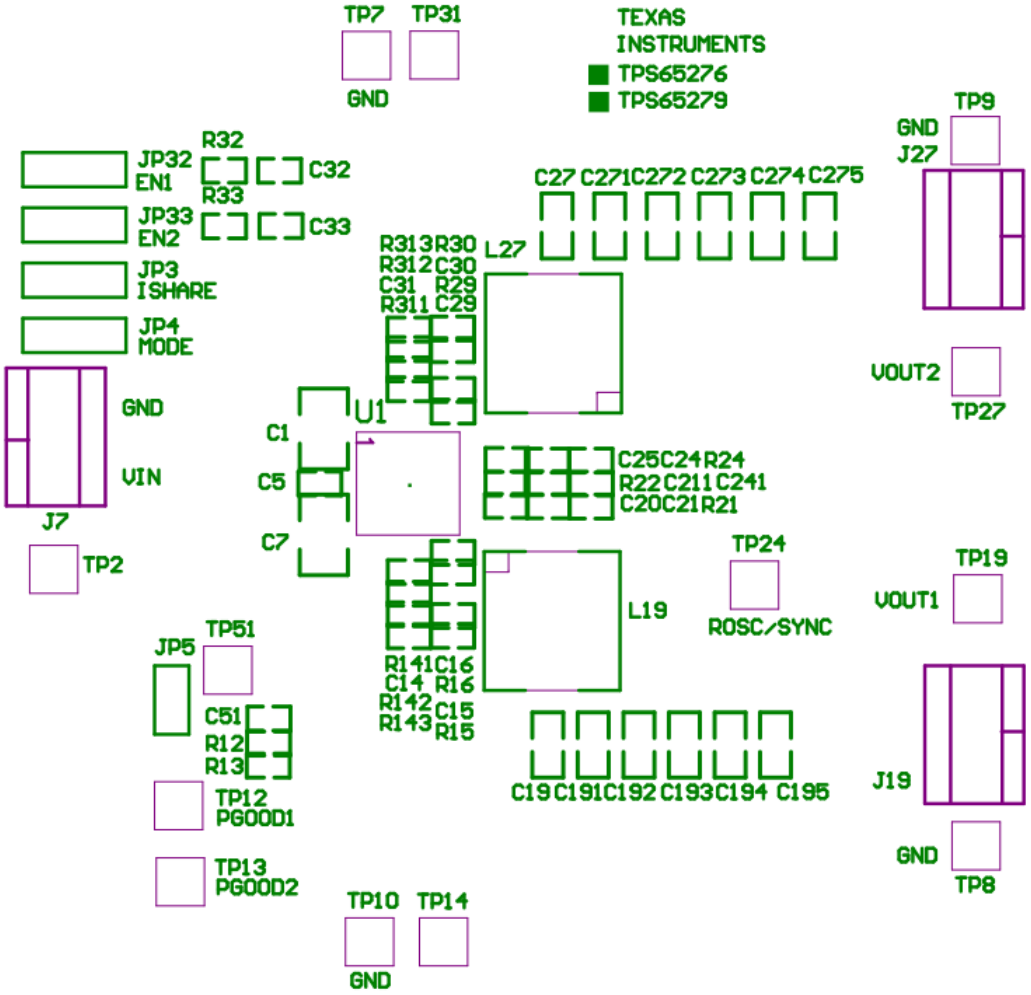


Figure 2. Component Placement (Top Layer)

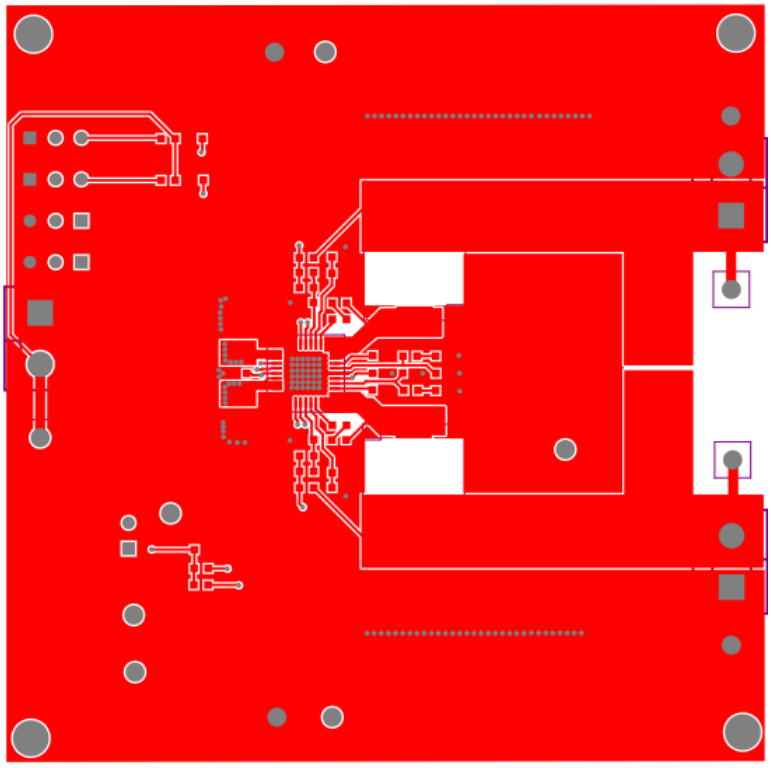


Figure 3. Board Layout (Top Layer)

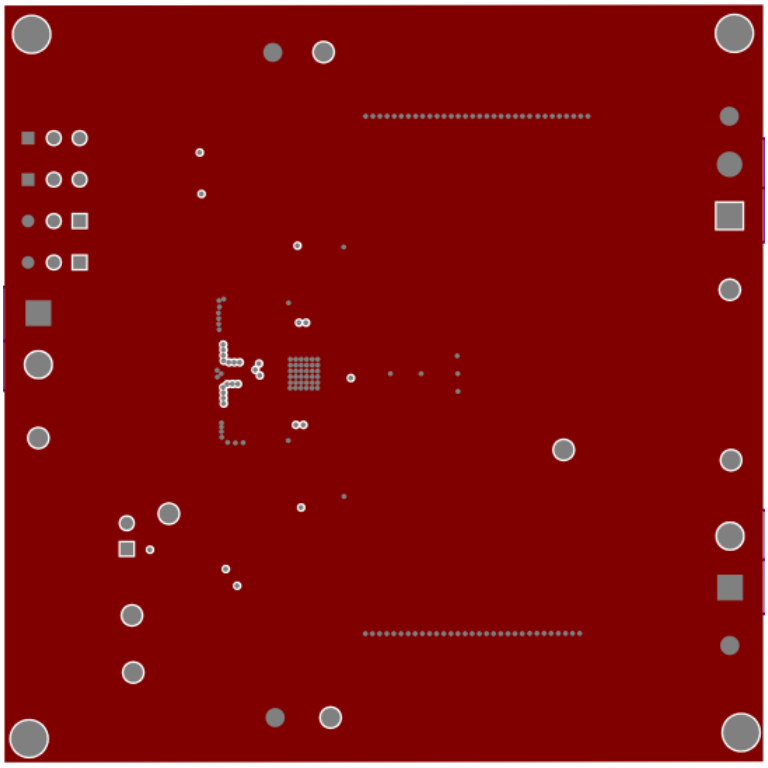


Figure 4. Board Layout (Second Layer)

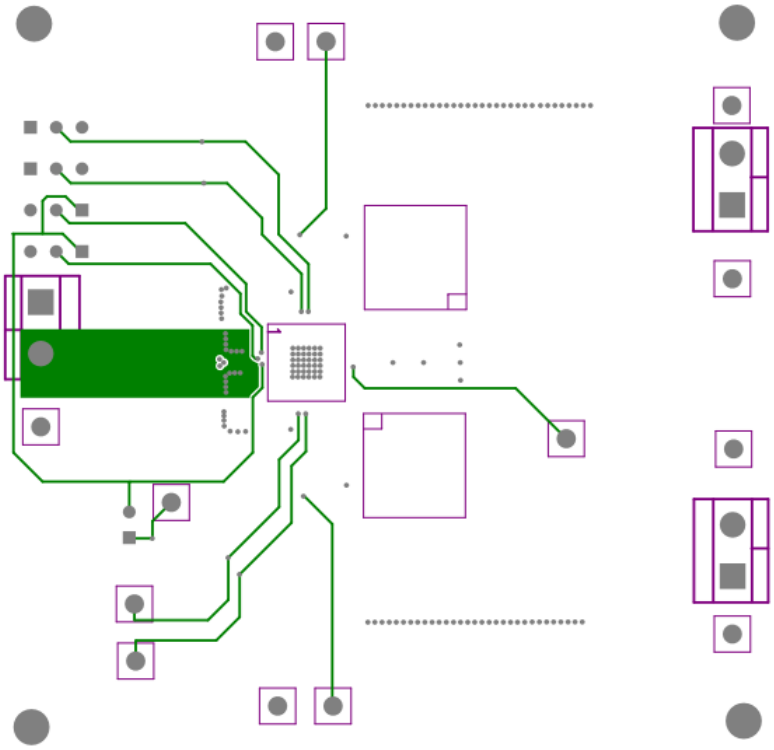


Figure 5. Board Layout (Third Layer)

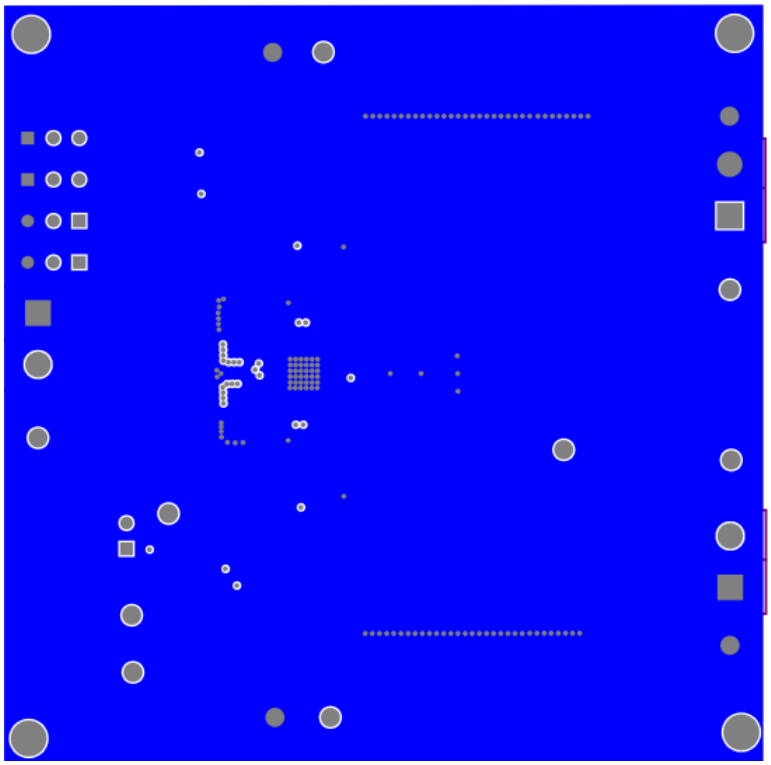
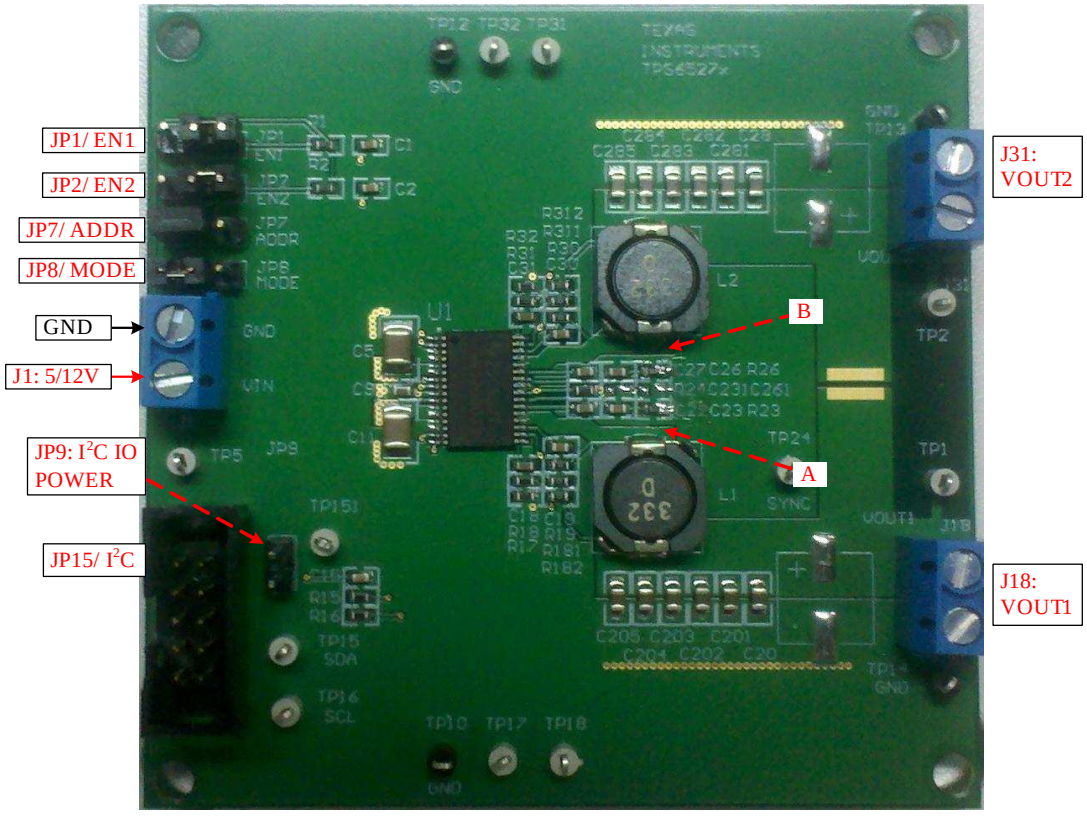


Figure 6. Board Layout (Bottom Layer)

5 Bench Test Setup Conditions

5.1 Header Description and Jumper Placement

Figure 7 illustrates the header description and jumper placement for the EVM.



Test points:

A: LX of Vout1

B: LX of Vout2

Vout1, Vout2

Figure 7. Header Description and Jumper Placement

Table 2 shows the I/O connections for the EVM.

Table 2. Input/Output Connection

Jumper Number	Function	Description
J1	Vin Connector	Apply power supply to this connector
J18	Buck1 Connector	Output of Buck1
J31	Buck2 Connector	Output of Buck2

Table 3 shows the jumpers and switches for the EVM.

Table 3. Jumpers and Switches

Jumper Number	Function	Placement	Comment
JP1	Buck1 enable (EN1)	Connect EN1 to GND to disable Vout1, connect EN1 to Vin through a 100-kΩ resistor to enable Vout1; Leave open to enable Vout1	
JP2	Buck2 enable (EN2)	Connect EN2 to GND to disable Vout2, connect EN2 to Vin through a 100-kΩ resistor to enable Vout2; Leave open to enable Vout2	
JP7	ISHARE	Logic pin to configure current share mode, tie to high to parallel two buck converters, in current share mode, buck 1 will be used; tie to low to run in separate mode.	
JP8	Mode	Operation mode control pin. Connect this pin to GND to set forced PWM mode; leave the pin open to set auto PSM-PWM.	
JP9	PGOOD power	Power connected to the PGOOD pull-up resistor.	On board V_{CC} is 6.25 V

6 Power-Up Procedure

Use the following steps to power-up the EVM:

1. Apply 12 V to J1
2. Toggle JP1 or JP2 to enable Vout1 and Vout2, respectively
3. Apply loads to the output connectors.

7 EVM Bill of Materials

Table 4 is the BOM for the EVM.

Table 4. EVM Bill of Materials

#	Value	Quantity	Designator	Footprint	Manufacturer	Manufacturer Part Number	Description
1	10nF	6	C20, C21, C24, C25, C32, C33	0603	Panasonic -ECG	ECJ-1VB1H103K	CAP 10nF 50V CERAMIC X7R 0603
2	10uF	2	C1, C7	1210	Panasonic -ECG	ECJ-4YB1E106M	CAP 10UF 25V CERAMIC X5R 1210
3	10uF	1	C5	0603	Panasonic -ECG	ECJ-1VB1A106M	CAP 10UF 10V CERAMIC X5R 0603
4	1uF	1	C51	0603	Panasonic -ECG	ECJ-BVB1A105K	CAP 1UF 10V 10% X5R 0603
5	470pF	2	C14, C31	0603	Panasonic -ECG	ECJ-1VC1H471J	CAP 470pF 50V CERAMIC X7R 0603
6	47nF	2	C16, C29	0603	Panasonic -ECG	ECJ-1VF1H473Z	CAP 47nF 50V CERAMIC X7R 0603
7	22uF	12	C19, C27, C191, C192, C193, C194, C195, C271, C272, C273, C274, C275	0805	Panasonic -ECJ	ECJ-2F60J226M	CAP CER 22F 6.3V 20% X6S 0805
8	470uF		C204, C284	E_CAP_D8_L6.7	Nichicon	RHA0J471MCN1GS	CAP ALUM 470UF 6.3V 20% SMD
9	47pF	2	C15, C30	0603	Panasonic -ECG	ECJ-0EC1H470	CAP 47pF 50V CERAMIC X7R 0603
10	47pF		C211, C241	0603	Panasonic -ECG	ECJ-0EC1H470	CAP 47pF 50V CERAMIC X7R 0603
11	ED500/2DS	3	J7, J19, J27	TB_2X5.0MM	OnShoreTechnology Inc	ED500/2DS	Terminal Block, 2-pin, 15-A, 5.0mm
12	HEADER 3 PIN(1)	4	JP3, JP4, JP32, JP33	JMP0.3	Mil-Max	800-10-064-10-001000	Three Pin Header, Break SIPs into groups of 3
13	HEADER 2 PIN(2)	1	JP5	JMP0.2	Mil-Max	800-10-064-10-001000	Two Pin Header, Break SIPs into groups of 2
14	3.3uH	2	L19, L27	IND3	Coilcraft	MSS1048-332NLB	SMT power inductor
15	100K	4	R12, R13, R32, R33	0603	Panasonic -ECG	ERJ-3EKF1003V	RES 100k OHM 1/10W 1% 0603 SMD
16	80.6k	1	R22	0603	Panasonic -ECG	ERJ-3EKF8062V	RES 80.6k OHM 1/10W 1% 0603 SMD
17	60.4k	2	R15, R30	0603	Panasonic -ECG	ERJ-3EKF6042V	RES 60.4k OHM 1/10W 1% 0603 SMD
18	7.5k	3	R141, R142, R312	0603	Panasonic -ECG	ERJ-3EKF7501V	RES 7.5k OHM 1/10W 1% 0603 SMD
19	3.74k	1	R311	0603	Panasonic -ECG	ERJ-3EKF3741V	RES 3.74k OHM 1/10W 1% 0603 SMD
20	0	4	R16, R29, R143, R313	0603	Panasonic -ECG	ERJ-3GEY0R00V	RES 0 OHM 1/10W 1% 0603 SMD
21	2.7k	2	R21, R24	0603	Panasonic -ECG	ERJ-3EKF2701V	RES 2.70K OHM 1/10W 1% 0603 SMD
22	Test Point White	9	'TP2, TP12, TP13, TP14, TP19, TP24, TP27, TP31, TP51	TP	Keystone	5002	TEST POINT PC MINI .040"D WHITE
23	Test Point Black	4	TP7, TP8, TP9, TP10	TP	Keystone	5001	TEST POINT PC MINI .040"D BLACK
24		5					Jumper, 2.54mm, open top, Applied on item 12, 13
25(3)		4			3M	SJ-5303 (CLEAR)	BUMPON HEMISPHERE .44X.20 CLEAR
26		1	U1		Texas Instruments	TPS65279RHHR	

(1) Item 12: split into 3 pins
(2) Item 13: split into 2 pins
(3) Install item 25 on bottom at corners

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User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

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If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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