

TPS65265 Buck Converter Evaluation Module User's Guide



ABSTRACT

This document presents the information required to operate the TPS65265 PMIC as well as the support documentation including schematic, printed-circuit board (PCB) layout, hardware setup, and bill of materials.

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1 Background

The TPS65265 PMIC is a triple 5-A/3-A/2-A output current, synchronous step-down (buck) converter with an operational range of 4.5 to 17 V. The feedback voltage reference for each buck is 0.6 V. Each buck is independent with dedicated enable and loop compensation. The TPS65265 supports PSM mode and FCC mode.

As there are many possible options to set the converters, [Table 1-1](#) presents the performance specification summary for the EVM.

Table 1-1. Summary of Performance

| Test Conditions | Performance |
|------------------------|-------------------------|
| $V_{IN} = 4.5$ to 17 V | Buck1, 1.2 V, up to 5 A |
| $f_{sw} = 610$ kHz | Buck2, 1.5 V, up to 3 A |
| (25°C ambient) | Buck3, 1.8 V, up to 2 A |

The evaluation module is designed to provide access to the features of the TPS65265. Some modifications can be made to this module to test performance at different input and output voltages, current and switching frequency. Please contact the TI Field Applications Group for advice on these matters.

2 Schematic

Figure 2-1 illustrates the TPS65265EVM-705 EVM schematic.

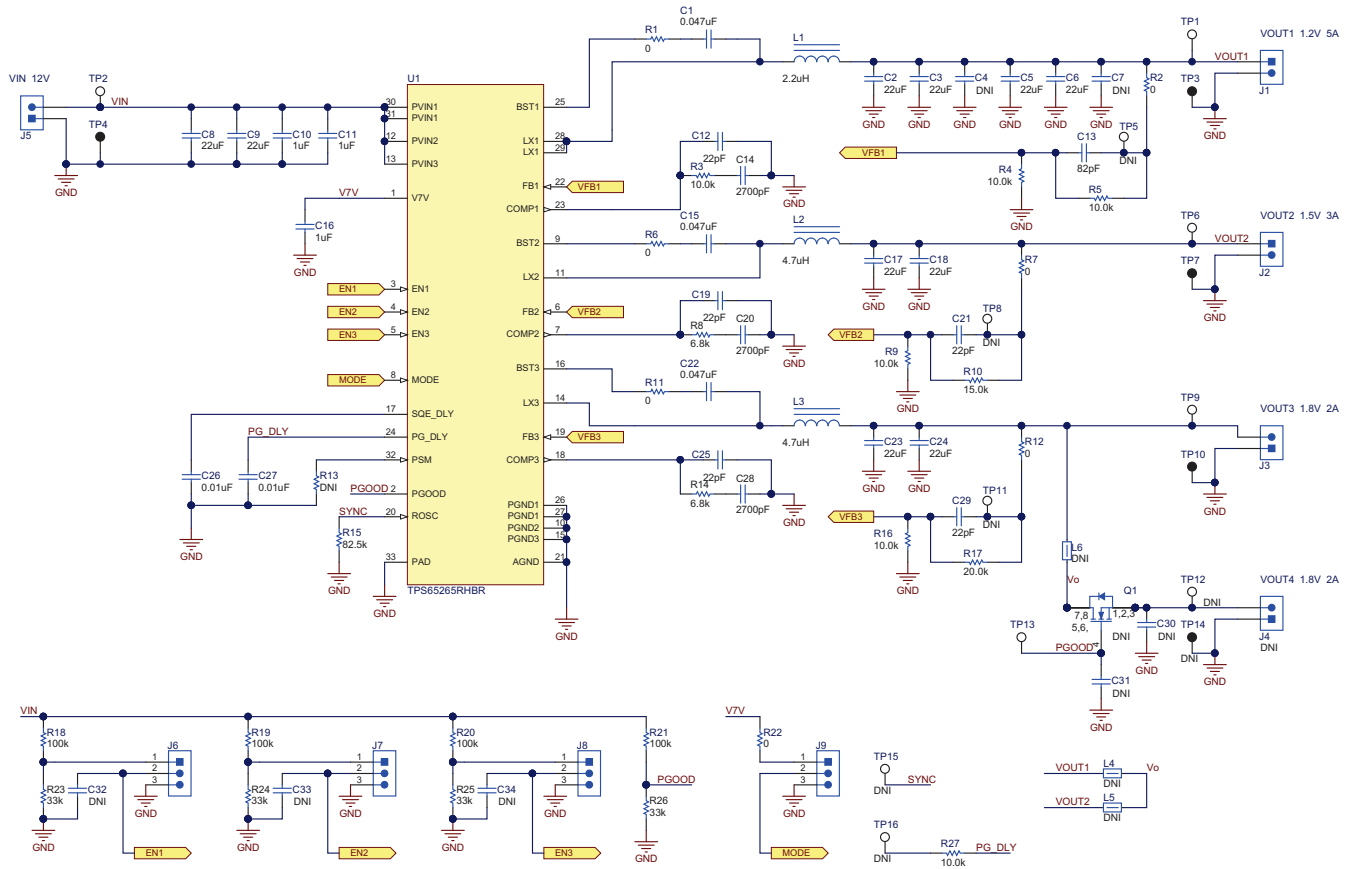


Figure 2-1. TPS65265EVM-705 Schematic

3 Board Layout

Figure 3-1 through Figure 3-5 illustrate the TPS65265EVM-705 PCB layout.

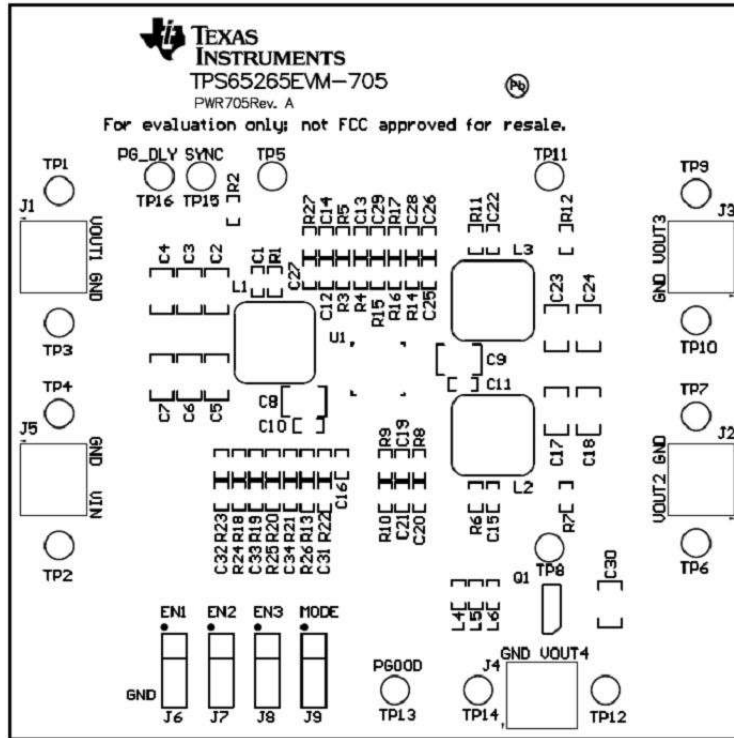


Figure 3-1. Component Placement (Top Layer)

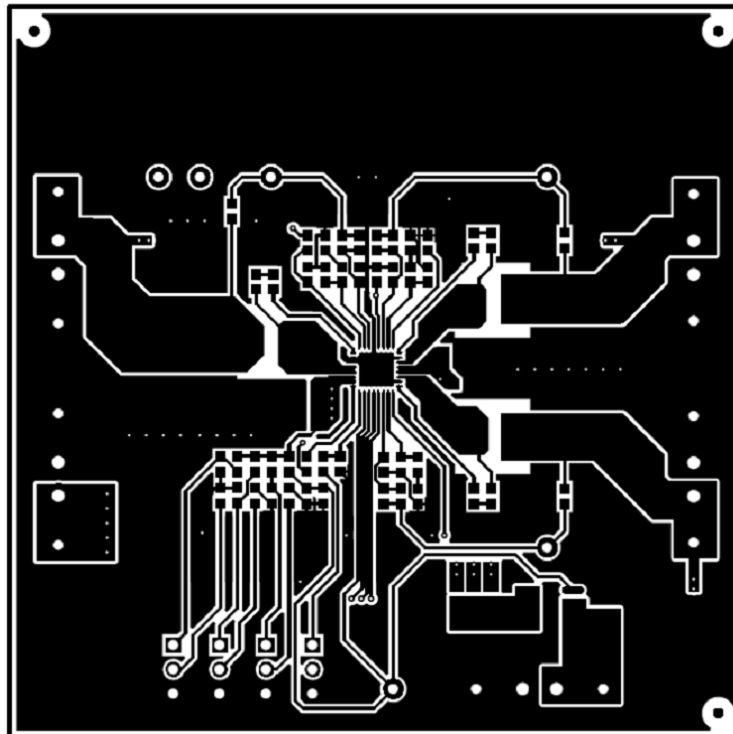


Figure 3-2. Board Layout (Top Layer)

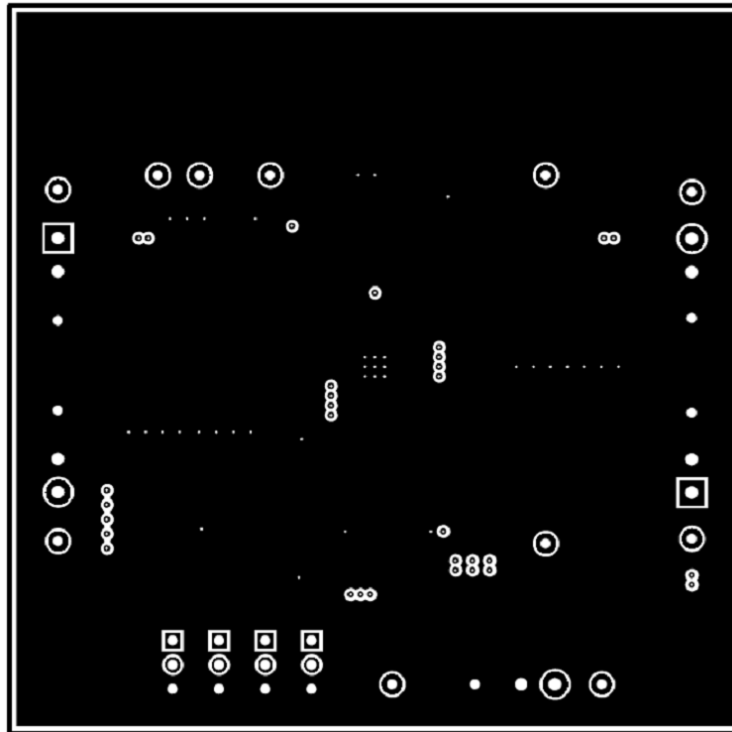


Figure 3-3. Board Layout (Second Layer)

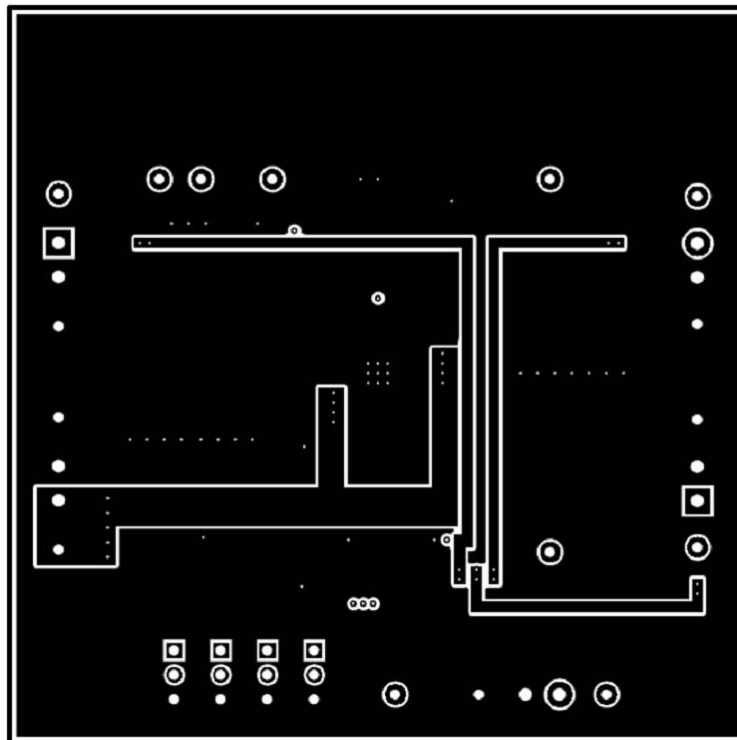


Figure 3-4. Board Layout (Third Layer)

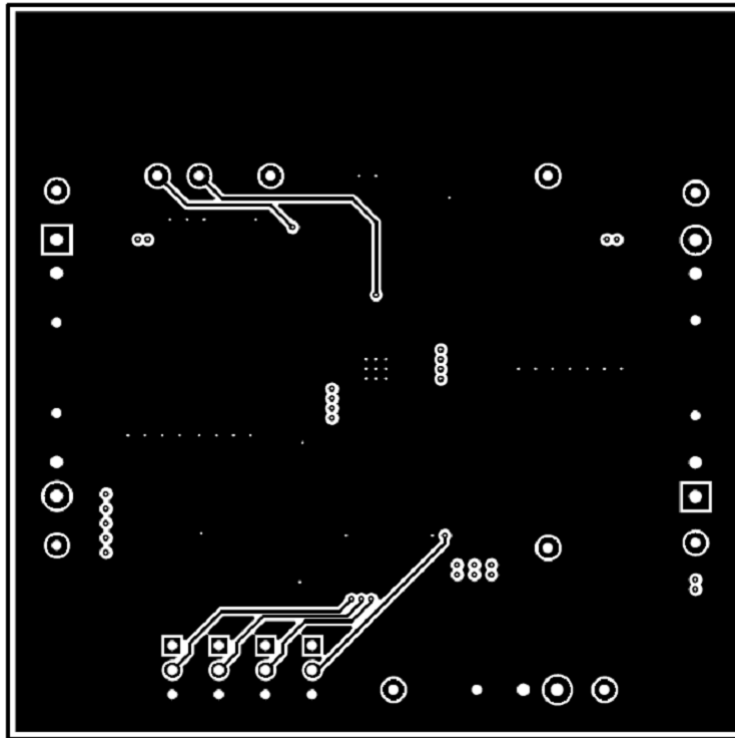


Figure 3-5. Board Layout (Bottom Layer)

4 Bench Test Setup Conditions

4.1 Header Description and Jumper Placement

Figure 4-1 shows the jumper and pin placement on the TPS65265EVM-705 board.

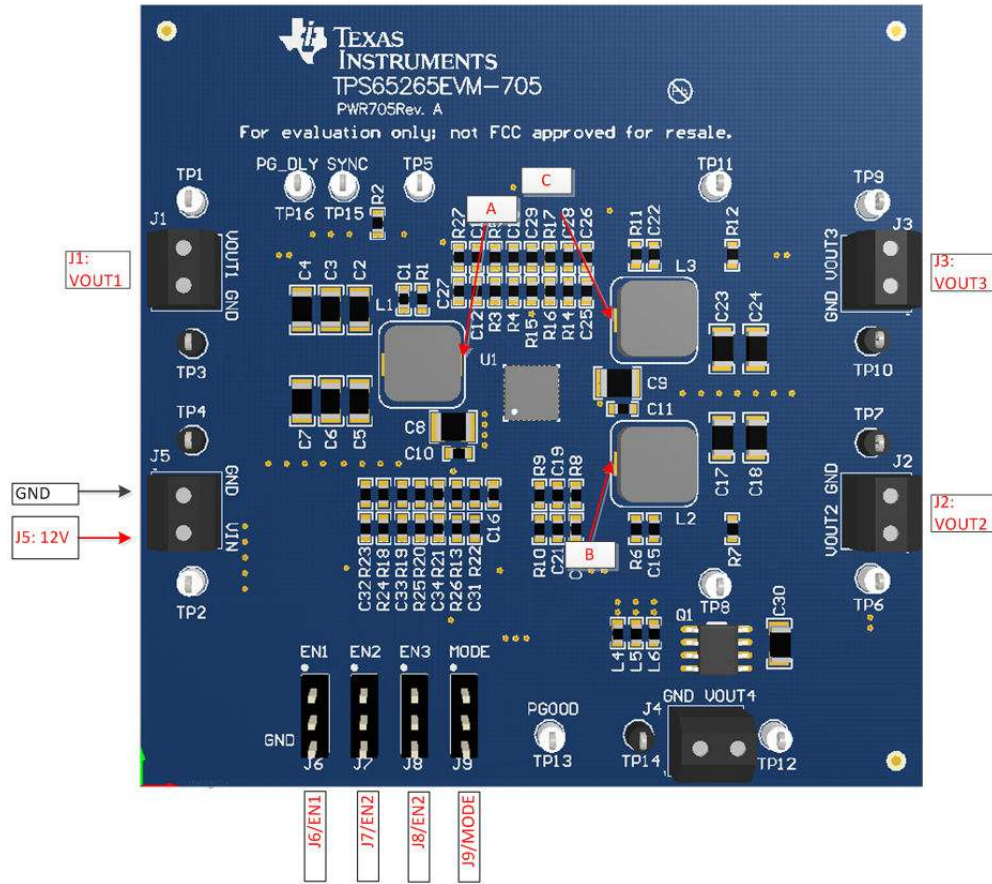


Figure 4-1. TPS65265EVM-705 Header Description and Jumper Placement

Test points:

1. LX of VOUT1
2. LX of VOUT2
3. LX of VOUT3

VOUT1, VOUT2, VOUT3, VIN, PGOOD, PG_DLY, SYNC

Table 4-1. Input/Output Connection

| # | Function | Description |
|----|-----------------|--------------------------------------|
| J1 | Buck1 Connector | Output of Buck1 |
| J2 | Buck2 Connector | Output of Buck2 |
| J3 | Buck3 Connector | Output of Buck3 |
| J5 | VIN Connector | Apply power supply to this connector |

Table 4-2. Jumpers

| # | Function | Placement | Comment |
|----|--------------------|--|---------|
| J6 | Buck1 enable (EN1) | Connect EN1 to GND to disable VOUT1 Connect EN1 to HIGH or leave open to enable VOUT1 | |
| J7 | Buck2 enable (EN2) | Connect EN2 to GND to disable VOUT2 Connect EN2 to HIGH or leave open to enable VOUT2 | |

Table 4-2. Jumpers (continued)

| # | Function | Placement | Comment |
|----|--------------------|--|---------|
| J8 | Buck3 enable (EN3) | Connect EN3 to GND to disable VOUT3 Connect EN3 to HIGH or leave open to enable VOUT3 | |
| J9 | MODE | Power sequencing mode control pin. Connect MODE pin to GND or HIGH, set the power sequence with pre-defined power up and power down sequence. Leave open to set power up and down with dedicated enable pin. | |

5 Power-Up Procedure

Power-up with dedicated enable pin:

1. Apply 4.5 V–17 V to J5
2. Toggle J6 , J7, or J8 to enable VOUT1, VOUT2, and VOUT3, respectively
3. Apply loads to the output connectors

Six bucks power sequence schemes with the pre-defined power up and power down sequence, shown in [Table 5-1](#).

1. Connect J9 to GND or high
2. Connect J6 to High(or Low), J7 to High(or Low)
3. Apply 4.5 V–18 V to J5
4. Toggle J8 to enable VOUT1, VOUT2, and VOUT3 (power up sequence shown in [Table 5-1](#))
5. Apply loads to the output connectors

Table 5-1. Power Sequencing

| Mode | EN1 | EN2 | EN3 | Start Sequencing | Shutdown Sequencing |
|----------|------|------|--------------------------------------|-------------------|---------------------|
| Low | High | High | Used to start/stop bucks in sequence | buck1→buck2→buck3 | Buck3→buck2→buck1 |
| Low | Low | High | | Buck2→buck1→buck3 | Buck3→buck1→buck2 |
| Low | High | Low | | Buck2→buck3→buck1 | Buck1→buck3→buck2 |
| High | High | High | | Buck1→buck3→buck2 | Buck2→buck3→buck1 |
| High | Low | High | | Buck3→buck1→buck2 | Buck2→buck1→buck3 |
| High | High | Low | | Buck3→buck2→buck1 | Buck1→buck2→buck3 |
| High/Low | Low | Low | Reserved | Reserved | Reserved |

6 Bill of Materials

Table 6-1 lists the TPS65265EVM-705 BOM.

Table 6-1. TPS65265EVM-705 Bill of Materials

| # | Value | Qty | Designator | Footprint | Manufacturer | Manufacturer Part Number | Description |
|-------------------|------------------|-----|--|---------------|------------------------|--------------------------|---|
| 1 | 47nF | 3 | C8, C9, C17 | 0603 | Generic | | CAP 47nF 50V CERAMIC X7R 0603 |
| 2 | 10nF | 1 | C7 | 0603 | Generic | | CAP 10nF 50V CERAMIC X7R 0603 |
| 3 | 3.3nF | 1 | C4 | 0603 | Generic | | CAP 3.3nF 50V CERAMIC X7R 0603 |
| 4 | 22uF | 4 | C10, C11, C12, C18 | 1206 | Generic | | CAP 22uF 16V CERAMIC X5R 1206 |
| 5 | 22pF | 3 | C2, C3, C5 | 0603 | Generic | | CAP 22pF 16V CERAMIC X7R 0603 |
| 6 | 82pF | 1 | C1 | 0603 | Generic | | CAP 82pF 50V CERAMIC X7R 0603 |
| 7 | 4.7uF | 2 | C19, C20 | 0603 | Generic | | CAP 4.7uF 50V CERAMIC X7R 0603 |
| 8 | 10uF | 3 | C13, C14, C15 | 1206 | Generic | | CAP 10uF 16V CERAMIC X5R 1206 |
| 9 | 1uF | 3 | C6, C16, C21 | 0603 | Generic | | CAP 1uF 50V CERAMIC X7R 0603 |
| 10 | 4.99K | 1 | R52 | 0603 | Generic | | RES 4.99k OHM 1/10W 1% 0603 SMD |
| 11 | 36.5K | 1 | R51 | 0603 | Generic | | RES 36.5k OHM 1/10W 1% 0603 SMD |
| 12 | 10K | 1 | R42 | 0603 | Generic | | RES 10k OHM 1/10W 1% 0603 SMD |
| 13 | 31.6K | 1 | R41 | 0603 | Generic | | RES 31.6k OHM 1/10W 1% 0603 SMD |
| 14 | 8.67K | 1 | R32 | 0603 | Generic | | RES 8.67k OHM 1/10W 1% 0603 SMD |
| 15 | 19.6K | 1 | R22 | 0603 | Generic | | RES 19.6k OHM 1/10W 1% 0603 SMD |
| 16 | 39K | 2 | R21, R31 | 0603 | Generic | | RES 39k OHM 1/10W 1% 0603 SMD |
| 17 | 51K | 1 | R10 | 0603 | Generic | | RES 51k OHM 1/10W 1% 0603 SMD |
| 18 | 100K | 2 | R8, R9 | 0603 | Generic | | RES 100k OHM 1/10W 1% 0603 SMD |
| 19 | 0 | 6 | R2, R3, R4, R5, R6, R7 | 0603 | Generic | | RES 0k OHM 1/10W 1% 0603 SMD |
| 20 | 20K | 3 | R1, R11, R12 | 0603 | Generic | | RES 20k OHM 1/10W 1% 0603 SMD |
| 21 | 4.7uH | 3 | L1, L2, L3 | IND_744311470 | Würth Electronics Inc | 744311470 | SMT power inductor |
| 22 ⁽¹⁾ | HEADER 3 PIN | 6 | JP1, JP2, JP3, JP4, JP5, JP6 | JMP0.3 | Mil-Max | 800-10-064-10-001000 | Three Pin Header, Break SIPs into groups of 3 |
| 23 | ED500/2 DS | 8 | J1, J2, J3, J4, J5, J6, J7, J8 | TB_2X5.0MM | OnShore Technology Inc | ED500/2DS | Terminal Block, 2-pin, 15-A, 5.0mm |
| 24 | Test Point White | 9 | TP1, TP2, TP3, TP4, TP5, TP6, TP8, TP9 | TP | Keystone | 5002 | TEST POINT PC MINI .040"D WHITE |
| 25 | Test Point Black | 6 | TP10, TP11, TP12, TP13, TP14, TP15 | TP | Keystone | 5001 | TEST POINT PC MINI .040"D BLACK |
| 26 | | 6 | | | | | Jumper, 2.54mm, open top, Applied on item 22 |
| 27 ⁽²⁾ | | 4 | | | 3M | SJ-5303 (CLEAR) | BUMPON HEMISPHERE .44X.20 CLEAR |
| 28 | | 1 | U1 | RHB | Texas Instruments | TPS65262RHBR | |

(1) Item 22: split into 3 pins

(2) Install item 27 on bottom at corners

7 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Revision * (December 2015) to Revision A (May 2021) | Page |
|--|------|
| • Updated user's guide title..... | 2 |
| • Updated the numbering format for tables, figures, and cross-references throughout the document. | 2 |

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