

SN74AVC4T245 具有可配置电压转换和三态输出的 2 位总线收发器

1 特性

- 控制输入 V_{IH}/V_{IL} 电平以 V_{CCA} 电压为基准
- 完全可配置的双轨设计，支持各个端口在 1.2V 至 3.6V 的整个电源电压范围内运行
- I/O 可耐受 4.6V 电压
- I_{off} 支持局部断电模式运行
- 最大数据速率：
 - 380Mbps (1.8V 至 3.3V 转换)
 - 200Mbps (< 1.8V 至 3.3V 转换)
 - 200Mbps (转换至 2.5V 或 1.8V)
 - 150Mbps (转换至 1.5V)
 - 100Mbps (转换至 1.2V)
- 闩锁性能超过 100mA，符合 JESD 78 II 类规范的要求
- ESD 保护性能超过 JESD 22 规范要求：
 - 8000V 人体放电模型 (A114-A)
 - 150V 机器放电模型 (A115-A)
 - 1000V 充电器件模型 (C101)

2 应用

- [个人电子产品](#)
- [工业](#)
- [企业](#)
- [电信](#)

3 说明

这款 4 位同相总线收发器使用两个独立的可配置电源轨。A 端口旨在跟踪 V_{CCA} ， V_{CCA} 电源电压为 1.2V 至 3.6V。B 端口旨在用于跟踪 V_{CCB} ， V_{CCB} 电源电压为 1.2V 至 3.6V。SN74AVC4T245 经过优化，可在 V_{CCA}/V_{CCB} 设置为 1.4V 至 3.6V 的范围内正常运行。该器件可在 V_{CCA}/V_{CCB} 低至 1.2V 的情况下正常运行，因此可在 1.2V、1.5V、1.8V、2.5V 和 3.3V 电压节点之间进行通用的低电压双向转换。

SN74AVC4T245 器件旨在实现两条数据总线间的异步通信。方向控制 (DIR) 输入和输出使能 (\overline{OE}) 输入的逻辑电平激活 B 端口输出或者 A 端口输出，或者将两个输出端口都置于高阻抗模式。当 B 端口输出被激活时，此器件将数据从 A 总线发送到 B 总线，而当 A 端口输出被激活时，此器件将数据从 B 总线发送到 A 总线。A 端口和 B 端口上的输入电路一直处于激活状态并且必须施加一个逻辑高或低电平，从而防止过大的 I_{CC} 和 I_{CCZ} 。

SN74AVC4T245 器件旨在使 V_{CCA} 为控制引脚 (1DIR、2DIR、1OE 和 2OE) 供电。

该器件专用于使用 I_{off} 的局部断电应用。 I_{off} 电路可禁用输出，以防在器件断电时电流回流对器件造成损坏。

V_{CC} 隔离特性可确保任一 V_{CC} 输入接地时，两个端口都处于高阻抗状态。

要在上电或断电期间将器件置于高阻抗状态，应通过一个上拉电阻器将 \overline{OE} 连接至 V_{CC} ；该电阻器的最小值由驱动器的电流灌入能力决定。

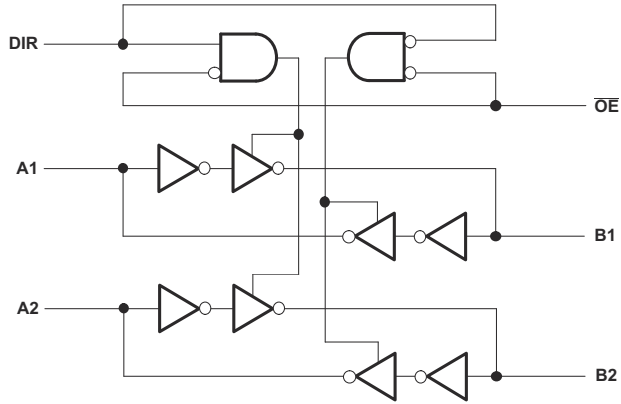
封装信息

| 器件型号 | 封装 ⁽¹⁾ | 封装尺寸 ⁽²⁾ |
|--------------|--------------------|---------------------|
| SN74AVC4T245 | D (SOIC , 16) | 9.9mm × 6mm |
| | DGV (TVSOP , 16) | 3.6mm × 6.4mm |
| | PW (TSSOP , 16) | 5mm × 6.4mm |
| | RGY (WQFN , 16) | 4mm × 3.5mm |
| | RSV (UQFN , 16) | 2.6mm × 1.8mm |
| | BQB (WQFN , 16) | 3.5mm × 2.5mm |
| | DYY (SOT , 16) | 4.2mm × 2mm |

(1) 有关更多信息，请参阅节 11。

(2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。





SN74AVC4T245 半侧逻辑图 (正逻辑) :

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4 Pin Configuration and Functions

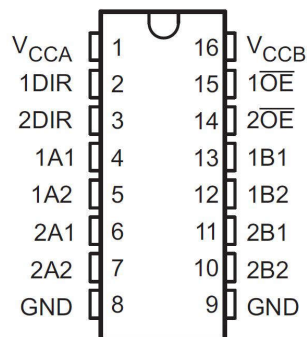


图 4-1. D, DGV, or PW Package, 16-Pin SOIC, TVSOP, or PW (Top View)

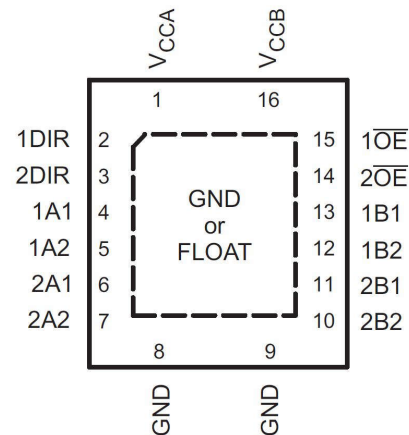


图 4-2. RGY Package, 16-Pin WQFN (Top View)

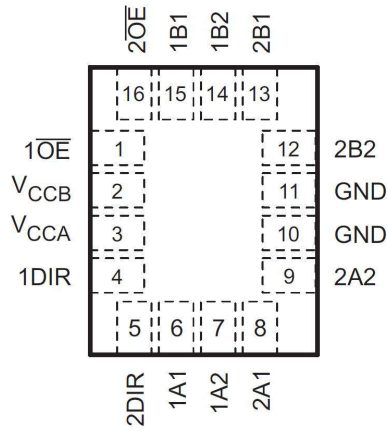


图 4-3. RSV Package, 16-Pin UQFN (Top View)

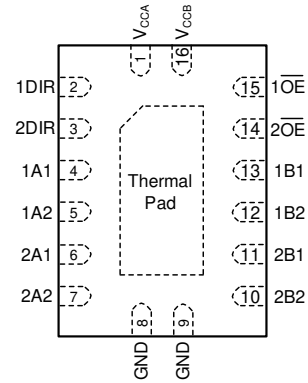


图 4-4. BQB/WBQB Package, 16-Pin WQFN (Transparent Top View)

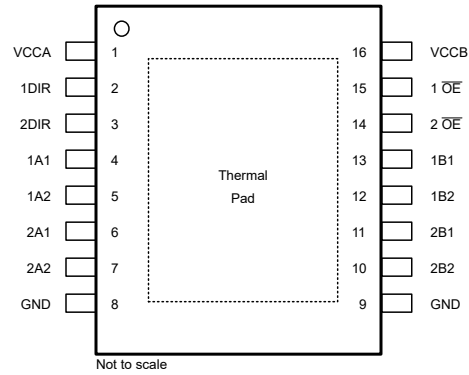


图 4-5. DYY Package, 16-Pin SOT (Top View)

表 4-1. Pin Functions

| PIN NAME | NO. | | TYPE ⁽¹⁾ | DESCRIPTION |
|-------------|--------------------|--------|---------------------|--|
| | D, DGV, PW, RGY | RSV | | |
| 1A1 | 4 | 6 | I/O | Input/output 1A1. Referenced to V_{CCA} . |
| 1A2 | 5 | 7 | I/O | Input/output 1A2. Referenced to V_{CCA} . |
| 1B1 | 13 | 15 | I/O | Input/output 1B1. Referenced to V_{CCB} . |
| 1B2 | 12 | 14 | I/O | Input/output 1B2. Referenced to V_{CCB} . |
| 1DIR | 2 | 4 | I | Direction-control input for '1' ports |
| 1 OE | 15 | 1 | I | 3-state output-mode enables. Pull \overline{OE} high to place '1' outputs in 3-state mode. Referenced to V_{CCA} . |
| 2A1 | 6 | 8 | I/O | Input/output 2A1. Referenced to V_{CCA} . |
| 2A2 | 7 | 9 | I/O | Input/output 2A2. Referenced to V_{CCA} . |
| 2B1 | 11 | 13 | I/O | Input/output 2B1. Referenced to V_{CCB} . |
| 2B2 | 10 | 12 | I/O | Input/output 2B2. Referenced to V_{CCB} . |
| 2DIR | 3 | 5 | I | Direction-control input for '2' ports |
| 2 OE | 14 | 16 | I | 3-state output-mode enables. Pull \overline{OE} high to place '2' outputs in 3-state mode. Referenced to V_{CCA} . |
| GND | 8, 9 | 10, 11 | — | Ground |
| V_{CCA} | 1 | 3 | — | A-port power supply voltage. $1.2V \leq V_{CCA} \leq 3.6V$ |
| V_{CCB} | 16 | 2 | — | B-port power supply voltage. $1.2V \leq V_{CCB} \leq 3.6V$ |

(1) I = input, O = output

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)

| | | MIN ⁽¹⁾ | MAX | UNIT | |
|------------------------|---|--------------------|-------|-----------------|---|
| V_{CCA} V_{CCB} | Supply voltage range | - 0.5 | 4.6 | V | |
| V_I | Input voltage range ⁽²⁾ | I/O ports (A port) | - 0.5 | 4.6 | V |
| | | I/O ports (B port) | - 0.5 | 4.6 | |
| | | Control inputs | - 0.5 | 4.6 | |
| V_O | Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾ | A port | - 0.5 | 4.6 | V |
| | | B port | - 0.5 | 4.6 | |
| V_O | Voltage range applied to any output in the high or low state ^{(2) (3)} | A port | - 0.5 | $V_{CCA} + 0.5$ | V |
| | | B port | - 0.5 | $V_{CCB} + 0.5$ | |
| I_{IK} | Input clamp current | $V_I < 0$ | - 50 | mA | |
| I_{OK} | Output clamp current | $V_O < 0$ | - 50 | mA | |
| I_O | Continuous output current | | ±50 | mA | |
| | Continuous current through V_{CCA} , V_{CCB} , or GND | | ±100 | mA | |

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.
- (2) The input voltage and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The output positive-voltage rating may be exceeded up to 4.6V maximum if the output current rating is observed.

5.2 ESD Ratings

| | | MIN | MAX | UNIT |
|-------------|---------------------------|--|-----|------|
| T_{stg} | Storage temperature range | - 65 | 150 | °C |
| $V_{(ESD)}$ | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾ | 8 | kV |
| | | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾ | 1 | |
| | | Machine model (C101) | 150 | V |

- (1) JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process.

5.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)^{(1) (2) (3)}

| | | V_{CCI} | V_{CCO} | MIN | MAX | UNIT |
|-----------------------|------------------------------------|---|----------------|-----|-----------------------|------|
| V_{CCA} | Supply voltage | | | 1.2 | 3.6 | V |
| V_{CCB} | Supply voltage | | | 1.2 | 3.6 | V |
| V_{IH} | High-level input voltage | Data inputs ⁽⁴⁾ | 1.2V to 1.95V | | $V_{CCI} \times 0.65$ | V |
| | | | 1.95V to 2.7V | | 1.6 | |
| | | | 2.7V to 3.6V | | 2 | |
| V_{IL} | Low-level input voltage | Data inputs ⁽⁴⁾ | 1.2V to 1.95V | | $V_{CCI} \times 0.35$ | V |
| | | | 1.95V to 2.7V | | 0.7 | |
| | | | 2.7V to 3.6V | | 0.8 | |
| V_{IH} | High-level input voltage | DIR (referenced to V_{CCA}) ⁽⁵⁾ | 1.2V to 1.95V | | $V_{CCA} \times 0.65$ | V |
| | | | 1.95V to 2.7V | | 1.6 | |
| | | | 2.7V to 3.6V | | 2 | |
| V_{IL} | Low-level input voltage | DIR (referenced to V_{CCA}) ⁽⁵⁾ | 1.2V to 1.95V | | $V_{CCA} \times 0.35$ | V |
| | | | 1.95V to 2.7V | | 0.7 | |
| | | | 2.7V to 3.6V | | 0.8 | |
| V_I | Input voltage | | | 0 | 3.6 | V |
| V_O | Output voltage | Active state | | 0 | V_{CCO} | V |
| | | 3-state | | 0 | 3.6 | |
| I_{OH} | High-level output current | | 1.2V | | -3 | mA |
| | | | 1.4V to 1.6V | | -6 | |
| | | | 1.65V to 1.95V | | -8 | |
| | | | 2.3V to 2.7V | | -9 | |
| | | | 3V to 3.6V | | -12 | |
| I_{OL} | Low-level output current | | 1.1V to 1.2V | | 3 | mA |
| | | | 1.4V to 1.6V | | 6 | |
| | | | 1.65V to 1.95V | | 8 | |
| | | | 2.3V to 2.7V | | 9 | |
| | | | 3V to 3.6V | | 12 | |
| $\Delta t / \Delta v$ | Input transition rise or fall rate | | | | 5 | ns/V |
| T_A | Operating free-air temperature | | | -40 | 85 | °C |

- (1) V_{CCI} is the V_{CC} associated with the input port.
- (2) V_{CCO} is the V_{CC} associated with the output port.
- (3) All unused data inputs of the device must be held at V_{CCI} or GND for proper device operation. Refer to the [Implications of Slow or Floating CMOS Inputs](#) application report.
- (4) For V_{CCI} values not specified in the data sheet, $V_{IH} \text{ min} = V_{CCI} \times 0.7V$, $V_{IL} \text{ max} = V_{CCI} \times 0.3V$
- (5) For V_{CCI} values not specified in the data sheet, $V_{IH} \text{ min} = V_{CCA} \times 0.7V$, $V_{IL} \text{ max} = V_{CCA} \times 0.3V$

5.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | SN74AVC4T245 | | | | | | | UNIT |
|---|--------------|------|-------|-------|-------|------|-------|------|
| | D | BQB | DYY | DGV | PW | RGY | RSV | |
| | 16 PINS | | | | | | | |
| $R_{\theta JA}$ Junction-to-ambient thermal resistance | 85.5 | 80.8 | 163.4 | 126.0 | 101.8 | 37.5 | 146.9 | °C/W |
| $R_{\theta JC(top)}$ Junction-to-case (top) thermal resistance | 46.9 | 77.9 | 90.0 | 50.8 | 37.2 | 54.5 | 53.6 | |
| $R_{\theta JB}$ Junction-to-board thermal resistance | 43.0 | 50.7 | 93.1 | 57.7 | 60.6 | 15.6 | 75.6 | |
| ψ_{JT} Junction-to-top characterization parameter | 13.4 | 7.4 | 10.9 | 5.7 | 1.6 | 0.5 | 13.5 | |
| ψ_{JB} Junction-to-board characterization parameter | 42.7 | 50.6 | 92.1 | 57.2 | 60.0 | 15.8 | 75.6 | |
| $R_{\theta JC(bot)}$ Junction-to-case (bottom) thermal resistance | — | 28.4 | — | — | — | 3.5 | — | |

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report ([SPRA953](#)).

5.5 Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER ⁽¹⁾ (2) | TEST CONDITIONS | V _{CCA} | V _{CCB} | T _A = 25°C | | | - 40°C to 85°C | | UNIT | |
|-------------------------------------|--|--|------------------|-----------------------|------|--------|----------------|------------------------|------|----|
| | | | | MIN | TYP | MAX | MIN | MAX | | |
| V _{OH} | I _{OH} = - 100 μA I _{OH} = - 3mA I _{OH} = - 6mA I _{OH} = - 8mA I _{OH} = - 9mA I _{OH} = - 12mA | V _I = V _{IH} | 1.2V to 3.6V | 1.2V to 3.6V | | | | V _{CCO} - 0.2 | V | |
| | | | 1.2V | 1.2V | 0.95 | | | | | |
| | | | 1.4V | 1.4V | | 1.05 | | | | |
| | | | 1.65V | 1.65V | | 1.2 | | | | |
| | | | 2.3V | 2.3V | | 1.75 | | | | |
| | | | 3V | 3V | | 2.3 | | | | |
| V _{OL} | I _{OL} = 100 μA I _{OL} = 3mA I _{OL} = 6mA I _{OL} = 8mA I _{OL} = 9mA I _{OL} = 12mA | V _I = V _{IL} | 1.2V to 3.6V | 1.2V to 3.6V | | | | 0.2 | V | |
| | | | 1.2V | 1.2V | 0.25 | | | | | |
| | | | 1.4V | 1.4V | | 0.35 | | | | |
| | | | 1.65V | 1.65V | | 0.45 | | | | |
| | | | 2.3V | 2.3V | | 0.55 | | | | |
| | | | 3V | 3V | | 0.7 | | | | |
| I _I | Control inputs | V _I = V _{CCA} or GND | 1.2V to 3.6V | 1.2V to 3.6V | | ±0.025 | ±0.25 | | ±1 | μA |
| I _{off} | A or B port | V _I or V _O = 0 to 3.6V | 0V | 0V to 3.6V | | ±0.1 | ±1 | | ±5 | μA |
| | | | 0V to 3.6V | 0V | | ±0.1 | ±1 | | ±5 | |
| I _{OZ} | A or B port | V _O = V _{CCO} or GND, V _I = V _{CCI} or GND, \overline{OE} = V _{IH} | 3.6V | 3.6V | | ±0.5 | ±2.5 | | ±5 | μA |
| I _{CCA} | | V _I = V _{CCI} or GND, I _O = 0 | 1.2V to 3.6V | 1.2V to 3.6V | | | | | 8 | μA |
| | | | 0V | 0V to 3.6V | | | | | -2 | |
| | | | 0V to 3.6V | 0V | | | | | 8 | |
| I _{CCB} | | V _I = V _{CCI} or GND, I _O = 0 | 1.2V to 3.6V | 1.2V to 3.6V | | | | | 8 | μA |
| | | | 0V | 0V to 3.6V | | | | | 8 | |
| | | | 0V to 3.6V | 0V | | | | | -2 | |
| I _{CCA} + I _{CCB} | | V _I = V _{CCI} or GND, I _O = 0 | 1.2V to 3.6V | 1.2V to 3.6V | | | | | 16 | μA |
| C _i | Control inputs | V _I = 3.3V or GND | 3.3V | 3.3V | | 3.5 | | | 4.5 | pF |
| C _{io} | A or B port | V _O = 3.3V or GND | 3.3V | 3.3V | | 6 | | | 7 | pF |

- (1) V_{CCI} is the V_{CC} associated with the input port.
(2) V_{CCO} is the V_{CC} associated with the output port.

5.6 Operating Characteristics

 $T_A = 25^\circ\text{C}$

| PARAMETER | | | TEST CONDITIONS | $V_{CCA} =$ $V_{CCB} = 1.2\text{V}$ | $V_{CCA} =$ $V_{CCB} = 1.5\text{V}$ | $V_{CCA} =$ $V_{CCB} = 1.8\text{V}$ | $V_{CCA} =$ $V_{CCB} = 2.5\text{V}$ | $V_{CCA} =$ $V_{CCB} = 3.3\text{V}$ | UNIT |
|--------------------------|--------|------------------|---|--|--|--|--|--|------|
| | | | | TYP | TYP | TYP | TYP | TYP | |
| C_{pdA} ⁽¹⁾ | A to B | Outputs enabled | $C_L = 0,$ $f = 10\text{MHz},$ $t_r = t_f = 1\text{ns}$ | 1 | 1 | 1 | 1.5 | 2 | pF |
| | | Outputs disabled | | 1 | 1 | 1 | 1 | 1 | |
| | B to A | Outputs enabled | | 12 | 12.5 | 13 | 14 | 15 | |
| | | Outputs disabled | | 1 | 1 | 1 | 1 | 1 | |
| C_{pdB} ⁽¹⁾ | A to B | Outputs enabled | $C_L = 0,$ $f = 10\text{MHz},$ $t_r = t_f = 1\text{ns}$ | 12 | 12.5 | 13 | 14 | 15 | pF |
| | | Outputs disabled | | 1 | 1 | 1 | 1 | 1 | |
| | B to A | Outputs enabled | | 1 | 1 | 1 | 1 | 2 | |
| | | Outputs disabled | | 1 | 1 | 1 | 1 | 1 | |

(1) Power dissipation capacitance per transceiver

5.7 Switching Characteristics: $V_{CCA} = 1.2\text{V}$

over recommended operating free-air temperature range, $V_{CCA} = 1.2\text{V}$ (unless otherwise noted) (see [图 6-1](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2\text{V}$ | $V_{CCB} = 1.5\text{V}$ $\pm 0.1\text{V}$ | $V_{CCB} = 1.8\text{V}$ $\pm 0.15\text{V}$ | $V_{CCB} = 2.5\text{V}$ $\pm 0.2\text{V}$ | $V_{CCB} = 3.3\text{V}$ $\pm 0.3\text{V}$ | UNIT |
|-----------|------------------------|----------------|-------------------------|--|---|--|--|------|
| | | | TYP | TYP | TYP | TYP | TYP | |
| t_{PLH} | A | B | 3.4 | 2.9 | 2.7 | 2.6 | 2.8 | ns |
| t_{PHL} | | | 3.4 | 2.9 | 2.7 | 2.6 | 2.8 | |
| t_{PLH} | B | A | 3.6 | 3.1 | 2.8 | 2.6 | 2.6 | ns |
| t_{PHL} | | | 3.6 | 3.1 | 2.8 | 2.6 | 2.6 | |
| t_{PZH} | $\overline{\text{OE}}$ | A | 5.6 | 4.7 | 4.3 | 3.9 | 3.7 | ns |
| t_{PZL} | | | 5.6 | 4.7 | 4.3 | 3.9 | 3.7 | |
| t_{PZH} | $\overline{\text{OE}}$ | B | 5 | 4.3 | 3.9 | 3.6 | 3.6 | ns |
| t_{PZL} | | | 5 | 4.3 | 3.9 | 3.6 | 3.6 | |
| t_{PHZ} | $\overline{\text{OE}}$ | A | 6.2 | 5.2 | 5.2 | 4.3 | 4.8 | ns |
| t_{PLZ} | | | 6.2 | 5.2 | 5.2 | 4.3 | 4.8 | |
| t_{PHZ} | $\overline{\text{OE}}$ | B | 5.9 | 5.1 | 5 | 4.7 | 5.5 | ns |
| t_{PLZ} | | | 5.9 | 5.1 | 5 | 4.7 | 5.5 | |

5.8 Switching Characteristics: $V_{CCA} = 1.5V \pm 0.1V$

over recommended operating free-air temperature range, $V_{CCA} = 1.5V \pm 0.1V$ (see 图 6-1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2V$ | $V_{CCB} = 1.5V \pm 0.1V$ | | $V_{CCB} = 1.8V \pm 0.15V$ | | $V_{CCB} = 2.5V \pm 0.2V$ | | $V_{CCB} = 3.3V \pm 0.3V$ | | UNIT |
|-----------|-----------------|-------------|------------------|---------------------------|------|----------------------------|------|---------------------------|------|---------------------------|------|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 3.2 | 0.3 | 6.3 | 0.3 | 5.2 | 0.4 | 4.2 | 0.4 | 4.2 | ns |
| t_{PHL} | | | 3.2 | 0.3 | 6.3 | 0.3 | 5.2 | 0.4 | 4.2 | 0.4 | 4.2 | |
| t_{PLH} | B | A | 3.3 | 0.7 | 6.3 | 0.5 | 6 | 0.4 | 5.7 | 0.3 | 5.6 | ns |
| t_{PHL} | | | 3.3 | 0.7 | 6.3 | 0.5 | 6 | 0.4 | 5.7 | 0.3 | 5.6 | |
| t_{PZH} | \overline{OE} | A | 4.9 | 1.4 | 9.6 | 1.1 | 9.5 | 0.7 | 9.4 | 0.4 | 9.4 | ns |
| t_{PZL} | | | 4.9 | 1.4 | 9.6 | 1.1 | 9.5 | 0.7 | 9.4 | 0.4 | 9.4 | |
| t_{PZH} | \overline{OE} | B | 4.5 | 1.4 | 9.6 | 1.1 | 7.7 | 0.9 | 5.8 | 0.9 | 5.6 | ns |
| t_{PZL} | | | 4.5 | 1.4 | 9.6 | 1.1 | 7.7 | 0.9 | 5.8 | 0.9 | 5.6 | |
| t_{PHZ} | \overline{OE} | A | 5.6 | 1.8 | 10.2 | 1.5 | 10.2 | 1.3 | 10.2 | 1.6 | 10.2 | ns |
| t_{PLZ} | | | 5.6 | 1.8 | 10.2 | 1.5 | 10.2 | 1.3 | 10.2 | 1.6 | 10.2 | |
| t_{PHZ} | \overline{OE} | B | 5.2 | 1.9 | 10.3 | 1.9 | 9.1 | 1.4 | 7.4 | 1.2 | 7.6 | ns |
| t_{PLZ} | | | 5.2 | 1.9 | 10.3 | 1.9 | 9.1 | 1.4 | 7.4 | 1.2 | 7.6 | |

5.9 Switching Characteristics: $V_{CCA} = 1.8V \pm 0.15V$

over recommended operating free-air temperature range, $V_{CCA} = 1.8V \pm 0.15V$ (see 图 6-1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2V$ | $V_{CCB} = 1.5V \pm 0.1V$ | | $V_{CCB} = 1.8V \pm 0.15V$ | | $V_{CCB} = 2.5V \pm 0.2V$ | | $V_{CCB} = 3.3V \pm 0.3V$ | | UNIT |
|-----------|-----------------|-------------|------------------|---------------------------|-----|----------------------------|-----|---------------------------|-----|---------------------------|-----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 2.9 | 0.1 | 6 | 0.1 | 4.9 | 0.1 | 3.9 | 0.3 | 3.9 | ns |
| t_{PHL} | | | 2.9 | 0.1 | 6 | 0.1 | 4.9 | 0.1 | 3.9 | 0.3 | 3.9 | |
| t_{PLH} | B | A | 3 | 0.6 | 5.3 | 0.5 | 4.9 | 0.3 | 4.6 | 0.3 | 4.5 | ns |
| t_{PHL} | | | 3 | 0.6 | 5.3 | 0.5 | 4.9 | 0.3 | 4.6 | 0.3 | 4.5 | |
| t_{PZH} | \overline{OE} | A | 4.4 | 1 | 7.4 | 1 | 7.3 | 0.6 | 7.3 | 0.4 | 7.2 | ns |
| t_{PZL} | | | 4.4 | 1 | 7.4 | 1 | 7.3 | 0.6 | 7.3 | 0.4 | 7.2 | |
| t_{PZH} | \overline{OE} | B | 4.1 | 1.2 | 9.2 | 1 | 7.4 | 0.8 | 5.3 | 0.8 | 4.6 | ns |
| t_{PZL} | | | 4.1 | 1.2 | 9.2 | 1 | 7.4 | 0.8 | 5.3 | 0.8 | 4.6 | |
| t_{PHZ} | \overline{OE} | A | 5.4 | 1.6 | 8.6 | 1.8 | 8.7 | 1.3 | 8.7 | 1.6 | 8.7 | ns |
| t_{PLZ} | | | 5.4 | 1.6 | 8.6 | 1.8 | 8.7 | 1.3 | 8.7 | 1.6 | 8.7 | |
| t_{PHZ} | \overline{OE} | B | 5 | 1.7 | 9.9 | 1.6 | 8.7 | 1.2 | 6.9 | 1 | 6.9 | ns |
| t_{PLZ} | | | 5 | 1.7 | 9.9 | 1.6 | 8.7 | 1.2 | 6.9 | 1 | 6.9 | |

5.10 Switching Characteristics: $V_{CCA} = 2.5V \pm 0.2V$

over recommended operating free-air temperature range, $V_{CCA} = 2.5V \pm 0.2V$ (see 图 6-1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2V$ | $V_{CCB} = 1.5V \pm 0.1V$ | | $V_{CCB} = 1.8V \pm 0.15V$ | | $V_{CCB} = 2.5V \pm 0.2V$ | | $V_{CCB} = 3.3V \pm 0.3V$ | | UNIT |
|-----------|-----------------|-------------|------------------|---------------------------|-----|----------------------------|-----|---------------------------|-----|---------------------------|-----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 2.8 | 0.1 | 5.7 | 0.1 | 4.6 | 0.2 | 3.5 | 0.1 | 3.6 | ns |
| t_{PHL} | | | 2.8 | 0.1 | 5.7 | 0.1 | 4.6 | 0.2 | 3.5 | 0.1 | 3.6 | |
| t_{PLH} | B | A | 2.7 | 0.6 | 4.2 | 0.4 | 3.9 | 0.2 | 3.4 | 0.2 | 3.3 | ns |
| t_{PHL} | | | 2.7 | 0.6 | 4.2 | 0.4 | 3.9 | 0.2 | 3.4 | 0.2 | 3.3 | |
| t_{PZH} | \overline{OE} | A | 4 | 0.7 | 6.5 | 0.7 | 5.2 | 0.6 | 4.8 | 0.4 | 4.8 | ns |
| t_{PZL} | | | 4 | 0.7 | 6.5 | 0.7 | 5.2 | 0.6 | 4.8 | 0.4 | 4.8 | |
| t_{PZH} | \overline{OE} | B | 3.8 | 0.9 | 8.8 | 0.8 | 7 | 0.6 | 4.8 | 0.6 | 4 | ns |
| t_{PZL} | | | 3.8 | 0.9 | 8.8 | 0.8 | 7 | 0.6 | 4.8 | 0.6 | 4 | |
| t_{PHZ} | \overline{OE} | A | 4.7 | 1 | 8.4 | 1 | 8.4 | 1 | 6.2 | 1 | 6.6 | ns |
| t_{PLZ} | | | 4.7 | 1 | 8.4 | 1 | 8.4 | 1 | 6.2 | 1 | 6.6 | |
| t_{PHZ} | \overline{OE} | B | 4.5 | 1.5 | 9.4 | 1.3 | 8.2 | 1.1 | 6.2 | 0.9 | 5.2 | ns |
| t_{PLZ} | | | 4.5 | 1.5 | 9.4 | 1.3 | 8.2 | 1.1 | 6.2 | 0.9 | 5.2 | |

5.11 Switching Characteristics: $V_{CCA} = 3.3V \pm 0.3V$

over recommended operating free-air temperature range, $V_{CCA} = 3.3V \pm 0.3V$ (see 图 6-1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2V$ | $V_{CCB} = 1.5V \pm 0.1V$ | | $V_{CCB} = 1.8V \pm 0.15V$ | | $V_{CCB} = 2.5V \pm 0.2V$ | | $V_{CCB} = 3.3V \pm 0.3V$ | | UNIT |
|-----------|-----------------|-------------|------------------|---------------------------|-----|----------------------------|-----|---------------------------|-----|---------------------------|-----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 2.9 | 0.1 | 5.6 | 0.1 | 4.5 | 0.1 | 3.3 | 0.1 | 2.9 | ns |
| t_{PHL} | | | 2.9 | 0.1 | 5.6 | 0.1 | 4.5 | 0.1 | 3.3 | 0.1 | 2.9 | |
| t_{PLH} | B | A | 2.6 | 0.6 | 4.2 | 0.4 | 3.4 | 0.2 | 3 | 0.1 | 2.8 | ns |
| t_{PHL} | | | 2.6 | 0.6 | 4.2 | 0.4 | 3.4 | 0.2 | 3 | 0.1 | 2.8 | |
| t_{PZH} | \overline{OE} | A | 3.8 | 0.6 | 8.7 | 0.6 | 5.2 | 0.6 | 3.8 | 0.4 | 3.8 | ns |
| t_{PZL} | | | 3.8 | 0.6 | 8.7 | 0.6 | 5.2 | 0.6 | 3.8 | 0.4 | 3.8 | |
| t_{PZH} | \overline{OE} | B | 3.7 | 0.8 | 8.7 | 0.6 | 6.8 | 0.5 | 4.7 | 0.5 | 3.8 | ns |
| t_{PZL} | | | 3.7 | 0.8 | 8.7 | 0.6 | 6.8 | 0.5 | 4.7 | 0.5 | 3.8 | |
| t_{PHZ} | \overline{OE} | A | 4.8 | 0.7 | 9.3 | 0.7 | 8.3 | 0.7 | 5.6 | 0.7 | 6.6 | ns |
| t_{PLZ} | | | 4.8 | 0.7 | 9.3 | 0.7 | 8.3 | 0.7 | 5.6 | 0.7 | 6.6 | |
| t_{PHZ} | \overline{OE} | B | 5.3 | 1.4 | 9.3 | 1.2 | 8.1 | 1 | 6.4 | 0.8 | 6.2 | ns |
| t_{PLZ} | | | 5.3 | 1.4 | 9.3 | 1.2 | 8.1 | 1 | 6.4 | 0.8 | 6.2 | |

5.12 Typical Characteristics

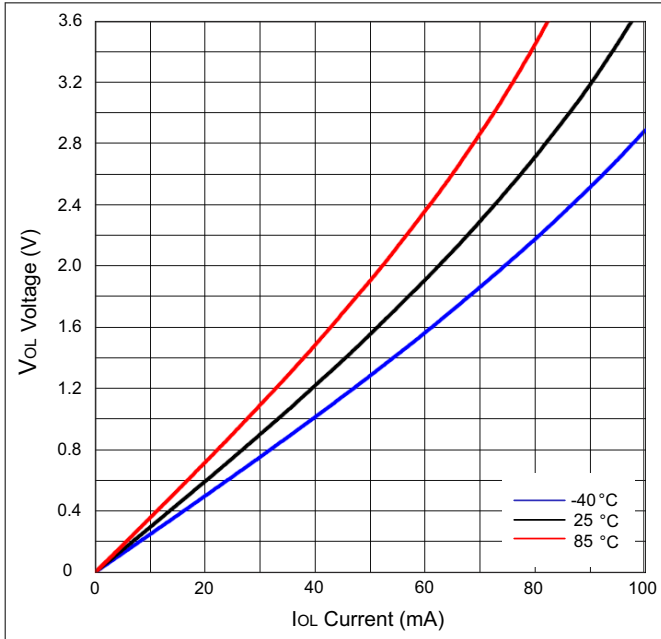


图 5-1. Low-Level Output Voltage (V_{OL}) vs Low-Level Current (I_{OL})

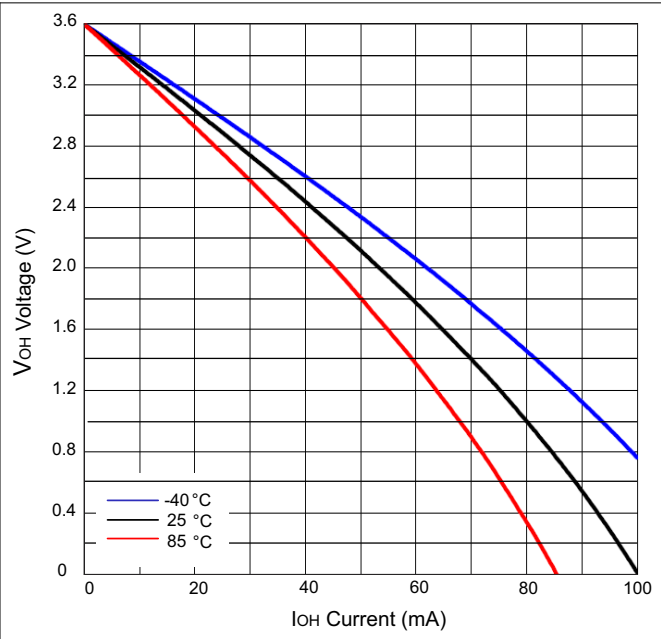
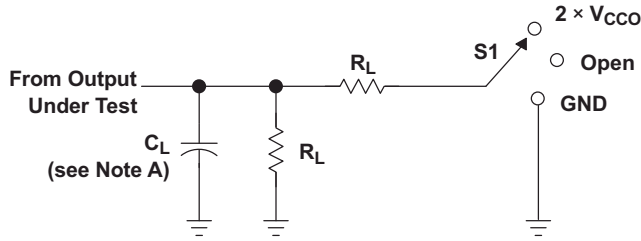


图 5-2. High-Level Output Voltage (V_{OH}) vs High-Level Current (I_{OH})

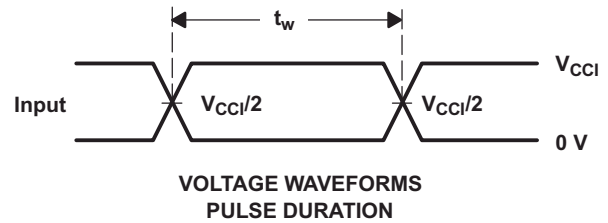
6 Parameter Measurement Information



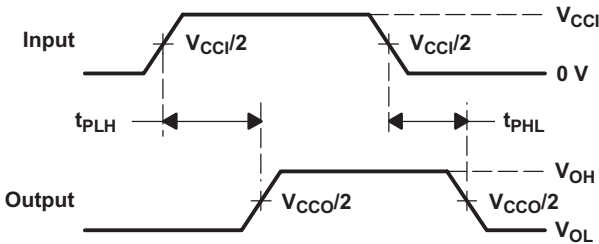
LOAD CIRCUIT

| V_{CCO} | C_L | R_L | V_{TP} |
|--------------------|-------|--------------|----------|
| 1.2 V | 15 pF | 2 k Ω | 0.1 V |
| 1.5 V \pm 0.1 V | 15 pF | 2 k Ω | 0.1 V |
| 1.8 V \pm 0.15 V | 15 pF | 2 k Ω | 0.15 V |
| 2.5 V \pm 0.2 V | 15 pF | 2 k Ω | 0.15 V |
| 3.3 V \pm 0.3 V | 15 pF | 2 k Ω | 0.3 V |

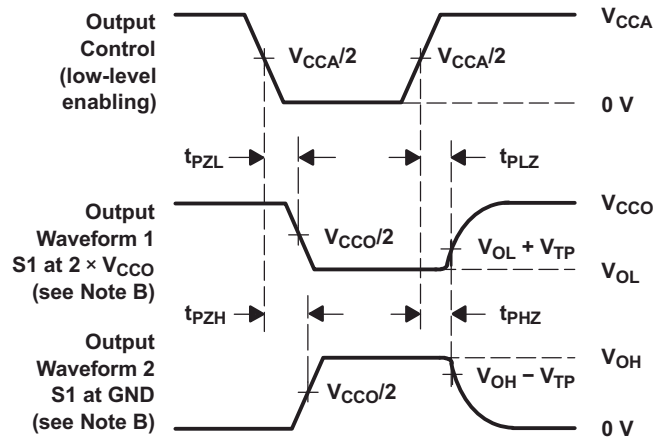
| TEST | S1 |
|-------------------|--------------------|
| t_{pd} | Open |
| t_{PLZ}/t_{PZL} | $2 \times V_{CCO}$ |
| t_{PHZ}/t_{PZH} | GND |



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: PRR = 10 MHz, $Z_O = 50\ \Omega$, $dv/dt \geq 1\text{ V/ns}$.
 - D. The outputs are measured one at a time, with one transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .
 - H. V_{CC1} is the V_{CC} associated with the input port.
 - I. V_{CCO} is the V_{CC} associated with the output port.

图 6-1. Load and Circuit and Voltage Waveforms

7 Detailed Description

7.1 Overview

The SN74AVC4T245 is a 4-bit, dual-supply noninverting bidirectional voltage level translation device. V_{CCA} supports the Ax pins and control pins (1DIR, 2DIR, 1 \overline{OE} , and 2 \overline{OE}), and V_{CCB} supports the Bx pins. The A port can accept I/O voltages ranging from 1.2V to 3.6V, while the B port can accept I/O voltages from 1.2V to 3.6V. A high on DIR allows data transmission from Ax to Bx and a low on DIR allows data transmission from Bx to Ax when \overline{OE} is set to low. When \overline{OE} is set to high, both Ax and Bx pins are in the high-impedance state.

7.2 Functional Block Diagram

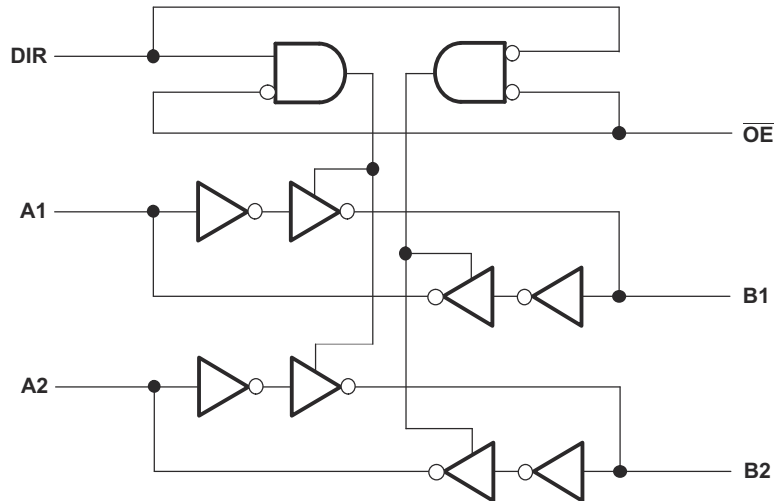


图 7-1. Logic Diagram (Positive Logic) for 1/2 of SN74AVC4T245

7.3 Feature Description

7.3.1 Fully Configurable Dual-Rail Design

The fully configurable dual-rail design allows each port to operate over the full 1.2V to 3.6V power-supply range. Both V_{CCA} and V_{CCB} can be supplied at any voltage between 1.2V and 3.6V; thus, making the device an excellent choice for translating between any of the low voltage nodes (1.2V, 1.8V, 2.5V, and 3.3V).

7.3.2 Supports High Speed Translation

The SN74AVC4T245 device can support high data rate applications. The translated signal data rate can be up to 380Mbps when the signal is translated from 1.8V to 3.3V.

7.3.3 I_{off} Supports Partial-Power-Down Mode Operation

I_{off} will prevent backflow current by disabling I/O output circuits when the device is in partial-power-down mode.

7.4 Device Functional Modes

表 7-1. Function Table
(Each 2-Bit Section)

| CONTROL INPUTS | | OUTPUT CIRCUITS | | OPERATION ⁽¹⁾ |
|-----------------|-----|-----------------|---------|--------------------------|
| \overline{OE} | DIR | A PORT | B PORT | |
| L | L | Enabled | Hi-Z | B data to A bus |
| L | H | Hi-Z | Enabled | A data to B bus |
| H | X | Hi-Z | Hi-Z | Isolation |

(1) Input circuits of the data I/Os are always active.

8 Application and Implementation

备注

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

8.1 Application Information

The SN74AVC4T245 device can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another. The SN74AVC4T245 device is an excellent choice for applications where a push-pull driver is connected to the data I/Os. The maximum data rate can be up to 380Mbps when device translates a signal from 1.8V to 3.3V.

8.2 Typical Application

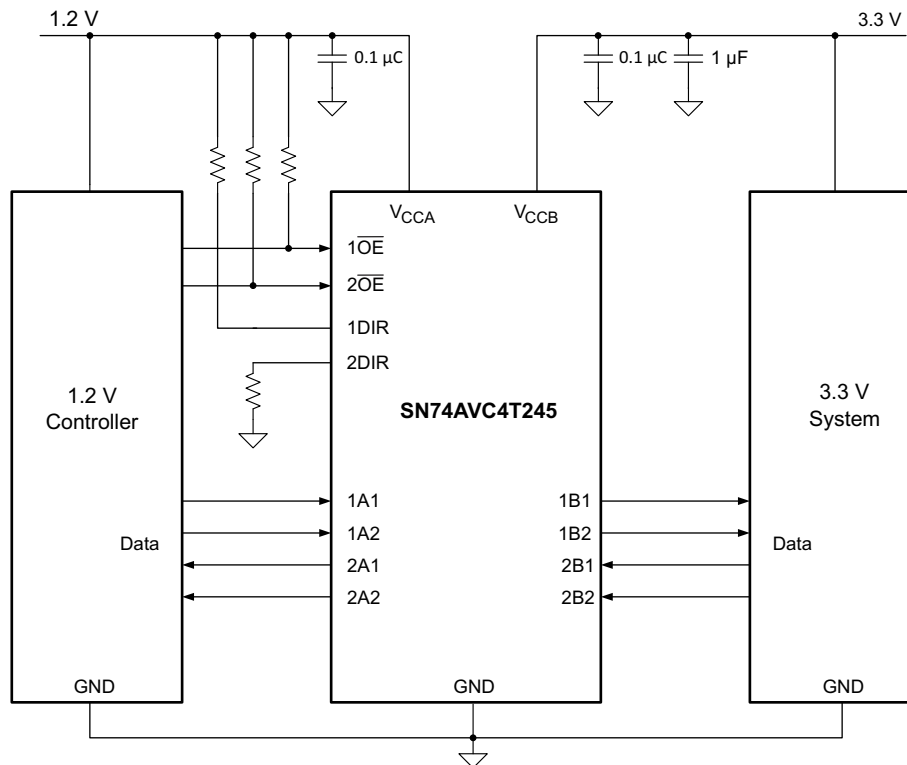


图 8-1. Typical Application Diagram

8.2.1 Design Requirements

For the design example shown in 节 8.2 use the parameters listed in 表 8-1.

表 8-1. Design Parameters

| DESIGN PARAMETER | EXAMPLE VALUE |
|----------------------|---------------|
| Input voltage range | 1.2V to 3.6V |
| Output voltage range | 1.2V to 3.6V |

8.2.2 Detailed Design Procedure

To begin the design process, determine the following:

- Input voltage range
 - Use the supply voltage of the device that is driving the SN74AVC4T245 device to determine the input voltage range. For a valid logic high, the value must exceed the V_{IH} of the input port. For a valid logic low, the value must be less than the V_{IL} of the input port.
- Output voltage range
 - Use the supply voltage of the device that the SN74AVC4T245 device is driving to determine the output voltage range.

8.2.3 Application Curves

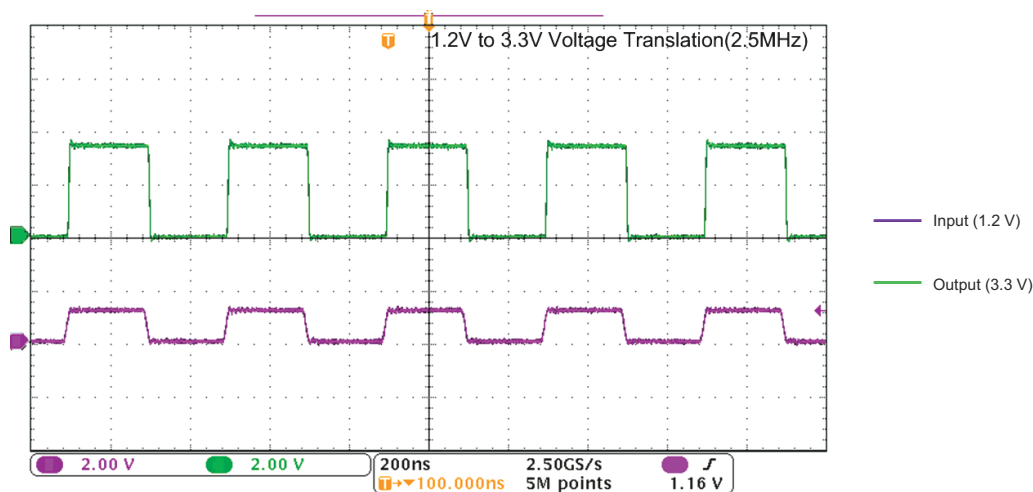


图 8-2. Translation Up (1.2V to 3.3V) at 2.5MHz

8.3 Power Supply Recommendations

The SN74AVC4T245 device uses two separate configurable power-supply rails, V_{CCA} and V_{CCB} . V_{CCA} accepts any supply voltage from 1.2V to 3.6V and V_{CCB} accepts any supply voltage from 1.2V to 3.6V. The A port and B port are designed to track V_{CCA} and V_{CCB} respectively allowing for low-voltage bidirectional translation between any of the 1.2V, 1.5V, 1.8V, 2.5V and 3.3V voltage nodes.

The output-enable (\overline{OE}) input circuit is designed so that V_{CCA} supplies \overline{OE} , and when the \overline{OE} input is high, all outputs are placed in the high-impedance state. To put the outputs in the high-impedance state during power up or power down, the \overline{OE} input pin must be tied to V_{CCA} through a pullup resistor and must not be enabled until V_{CCA} and V_{CCB} are fully ramped and stable. The current-sinking capability of the driver determines the minimum value of the pullup resistor to V_{CCA} .

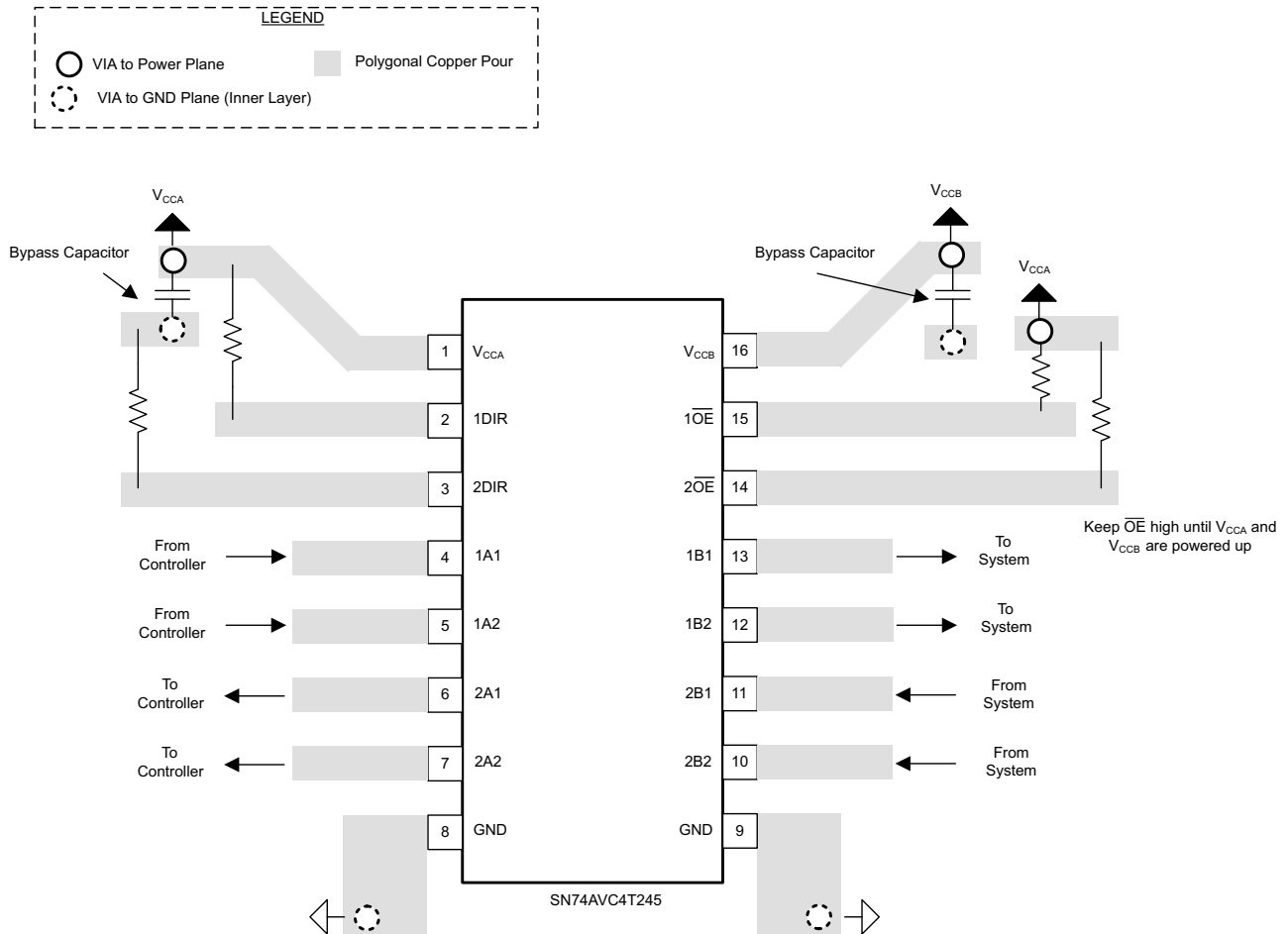
8.4 Layout

8.4.1 Layout Guidelines

For device reliability, it is recommended to follow common printed-circuit board layout guidelines, such as follows:

- Bypass capacitors should be used on power supplies.
- Short trace lengths should be used to avoid excessive loading.
- Place pads on the signal paths for loading capacitors or pullup resistors to help adjust rise and fall times of signals, depending on the system requirements.

8.4.2 Layout Example



9 Device and Documentation Support

9.1 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击 [通知](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

9.2 支持资源

[TI E2E™ 中文支持论坛](#) 是工程师的重要参考资料，可直接从专家处获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题，获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [使用条款](#)。

9.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

9.4 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

9.5 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

10 Revision History

注：以前版本的页码可能与当前版本的页码不同

| Changes from Revision G (November 2014) to Revision H (March 2024) | Page |
|--|------|
| • 更新了整个文档中的表格、图和交叉参考的编号格式..... | 1 |
| • 在整个数据表中添加了 BQB 和 DYY 封装信息..... | 1 |
| • 更新了封装信息表以包含封装引线尺寸..... | 1 |

| Changes from Revision F (October 2014) to Revision G (November 2014) | Page |
|--|------|
| • Changed <i>Pin Functions</i> table. | 3 |
| • Changed <i>Typical Application</i> schematic. | 17 |

| Changes from Revision E (December 2011) to Revision F (October 2014) | Page |
|--|------|
| • 添加了 <i>应用、引脚配置和功能</i> 部分、 <i>处理等级表</i> 、 <i>热性能信息表</i> 、 <i>特性说明</i> 部分、 <i>典型特性</i> 部分、 <i>器件功能模式</i> 、 <i>应用和实施</i> 部分、 <i>电源相关建议</i> 部分、 <i>布局</i> 部分、 <i>器件和文档支持</i> 部分以及 <i>机械、封装和可订购信息</i> 部分..... | 1 |

| Changes from Revision D (September 2007) to Revision E (December 2011) | Page |
|--|------|
| • Fixed t_{PZL} $V_{CCB} = 3.3V$ parameter typographical error from 36.6 to 3.6..... | 10 |

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|--------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| 74AVC4T245DGVRE4 | ACTIVE | TVSOP | DGV | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| 74AVC4T245RGYRG4 | ACTIVE | VQFN | RGY | 16 | 3000 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | -40 to 85 | WT245 | Samples |
| 74AVC4T245RSVR-NT | ACTIVE | UQFN | RSV | 16 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ZWU | Samples |
| 74AVC4T245RSVRG4 | ACTIVE | UQFN | RSV | 16 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ZWU | Samples |
| SN74AVC4T245BQBR | ACTIVE | WQFN | BQB | 16 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | WT245 | Samples |
| SN74AVC4T245D | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AVC4T245 | Samples |
| SN74AVC4T245DGVR | ACTIVE | TVSOP | DGV | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245DR | ACTIVE | SOIC | D | 16 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AVC4T245 | Samples |
| SN74AVC4T245DRE4 | ACTIVE | SOIC | D | 16 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AVC4T245 | Samples |
| SN74AVC4T245DT | ACTIVE | SOIC | D | 16 | 250 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AVC4T245 | Samples |
| SN74AVC4T245DYR | ACTIVE | SOT-23-THIN | DYY | 16 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | WT245 | Samples |
| SN74AVC4T245PW | ACTIVE | TSSOP | PW | 16 | 90 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWE4 | ACTIVE | TSSOP | PW | 16 | 90 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWR | ACTIVE | TSSOP | PW | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWRE4 | ACTIVE | TSSOP | PW | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWRG4 | ACTIVE | TSSOP | PW | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWT | ACTIVE | TSSOP | PW | 16 | 250 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWTE4 | ACTIVE | TSSOP | PW | 16 | 250 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWTEG4 | ACTIVE | TSSOP | PW | 16 | 250 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245PWTEG4 | ACTIVE | TSSOP | PW | 16 | 250 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | WT245 | Samples |
| SN74AVC4T245RGYR | ACTIVE | VQFN | RGY | 16 | 3000 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | -40 to 85 | WT245 | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|---------|
| SN74AVC4T245RSVR | ACTIVE | UQFN | RSV | 16 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ZWU | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN74AVC4T245 :

- Automotive : [SN74AVC4T245-Q1](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 74AVC4T245RSVR-NT | UQFN | RSV | 16 | 3000 | 180.0 | 8.4 | 2.0 | 2.8 | 0.7 | 4.0 | 8.0 | Q1 |
| 74AVC4T245RSVR-NT | UQFN | RSV | 16 | 3000 | 180.0 | 9.5 | 2.1 | 2.9 | 0.75 | 4.0 | 8.0 | Q1 |
| SN74AVC4T245BQBR | WQFN | BQB | 16 | 3000 | 180.0 | 12.4 | 2.8 | 3.8 | 1.2 | 4.0 | 12.0 | Q1 |
| SN74AVC4T245DGVR | TVSOP | DGV | 16 | 2000 | 330.0 | 12.4 | 6.8 | 4.0 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74AVC4T245DR | SOIC | D | 16 | 2500 | 330.0 | 16.4 | 6.5 | 10.3 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74AVC4T245DYYR | SOT-23-THIN | DYY | 16 | 3000 | 330.0 | 12.4 | 4.8 | 3.6 | 1.6 | 8.0 | 12.0 | Q3 |
| SN74AVC4T245PWR | TSSOP | PW | 16 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74AVC4T245PWT | TSSOP | PW | 16 | 250 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74AVC4T245RGYR | VQFN | RGY | 16 | 3000 | 330.0 | 12.4 | 3.8 | 4.3 | 1.5 | 8.0 | 12.0 | Q1 |
| SN74AVC4T245RSVR | UQFN | RSV | 16 | 3000 | 178.0 | 13.5 | 2.1 | 2.9 | 0.75 | 4.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 74AVC4T245RSVR-NT | UQFN | RSV | 16 | 3000 | 200.0 | 183.0 | 25.0 |
| 74AVC4T245RSVR-NT | UQFN | RSV | 16 | 3000 | 189.0 | 185.0 | 36.0 |
| SN74AVC4T245BQBR | WQFN | BQB | 16 | 3000 | 210.0 | 185.0 | 35.0 |
| SN74AVC4T245DGVR | TVSOP | DGV | 16 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74AVC4T245DR | SOIC | D | 16 | 2500 | 353.0 | 353.0 | 32.0 |
| SN74AVC4T245DYYR | SOT-23-THIN | DYY | 16 | 3000 | 336.6 | 336.6 | 31.8 |
| SN74AVC4T245PWR | TSSOP | PW | 16 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74AVC4T245PWT | TSSOP | PW | 16 | 250 | 356.0 | 356.0 | 35.0 |
| SN74AVC4T245RGYR | VQFN | RGY | 16 | 3000 | 356.0 | 356.0 | 35.0 |
| SN74AVC4T245RSVR | UQFN | RSV | 16 | 3000 | 189.0 | 185.0 | 36.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74AVC4T245D | D | SOIC | 16 | 40 | 507 | 8 | 3940 | 4.32 |
| SN74AVC4T245PW | PW | TSSOP | 16 | 90 | 530 | 10.2 | 3600 | 3.5 |
| SN74AVC4T245PWE4 | PW | TSSOP | 16 | 90 | 530 | 10.2 | 3600 | 3.5 |

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AC.



4220204/A 02/2017

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220204/A 02/2017

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220204/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 - D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
 - E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
 - F. Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
 - G. Package complies to JEDEC MO-241 variation BA.

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

Exposed Thermal Pad Dimensions

4206353-3/P 03/14

NOTE: All linear dimensions are in millimeters

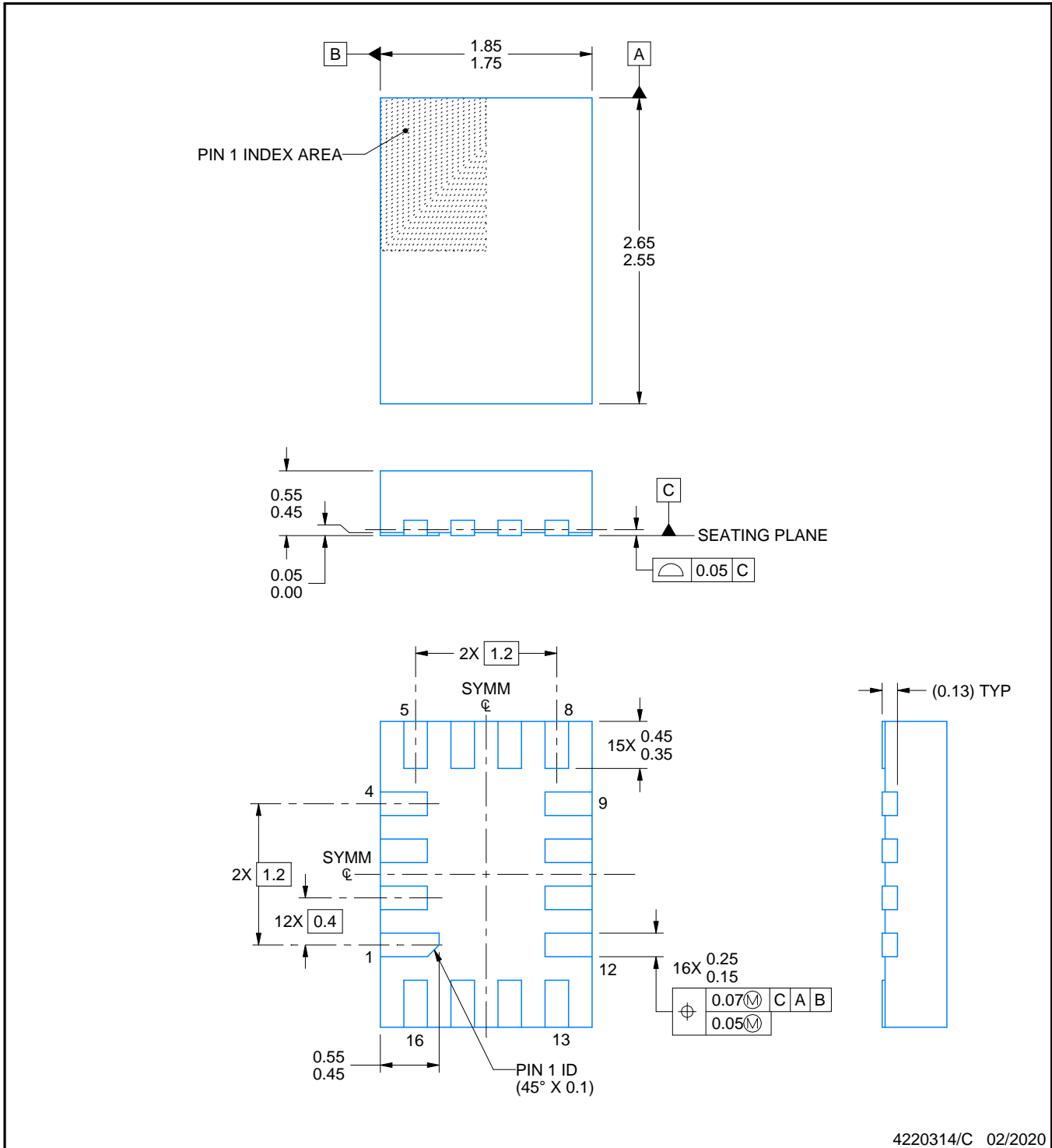
RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



4208122-3/P 03/14

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>.
 - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.



4220314/C 02/2020

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

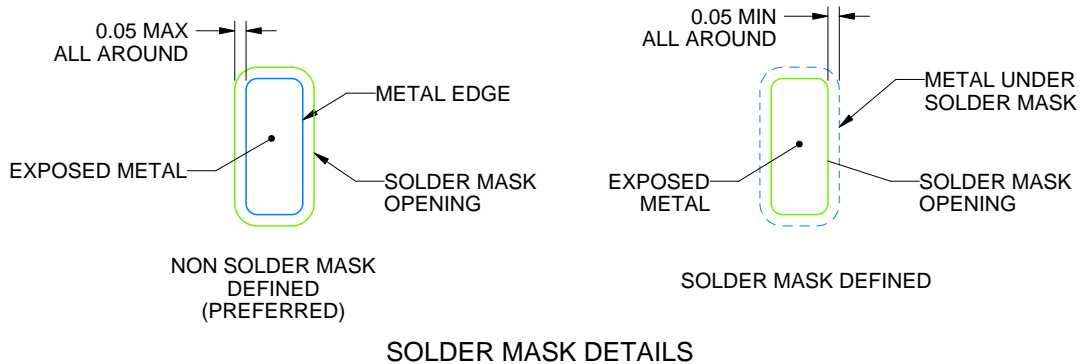
RSV0016A

UQFN - 0.55 mm max height

ULTRA THIN QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 25X



4220314/C 02/2020

NOTES: (continued)

3. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).

EXAMPLE STENCIL DESIGN

RSV0016A

UQFN - 0.55 mm max height

ULTRA THIN QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE: 25X

4220314/C 02/2020

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



4073251/E 08/00

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

GENERIC PACKAGE VIEW

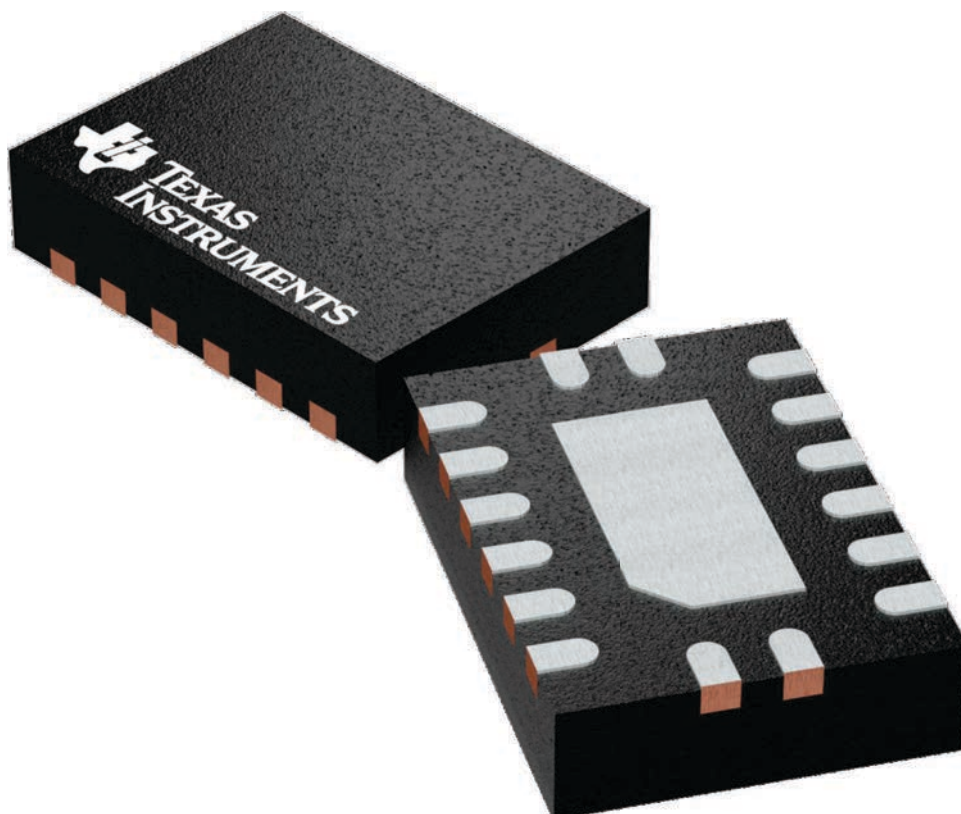
BQB 16

WQFN - 0.8 mm max height

2.5 x 3.5, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



4226161/A



4224640/A 11/2018

NOTES:

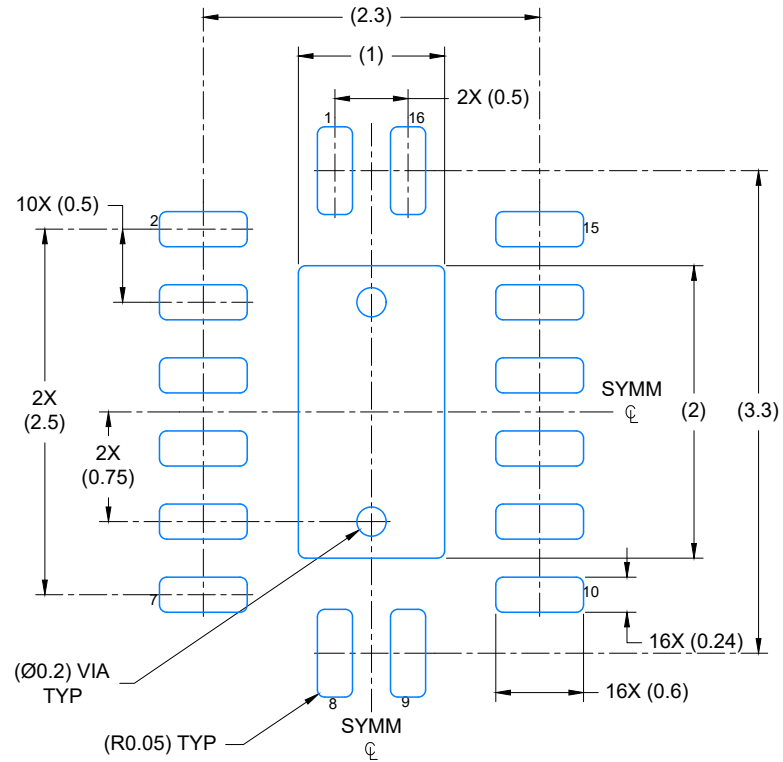
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for optimal thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

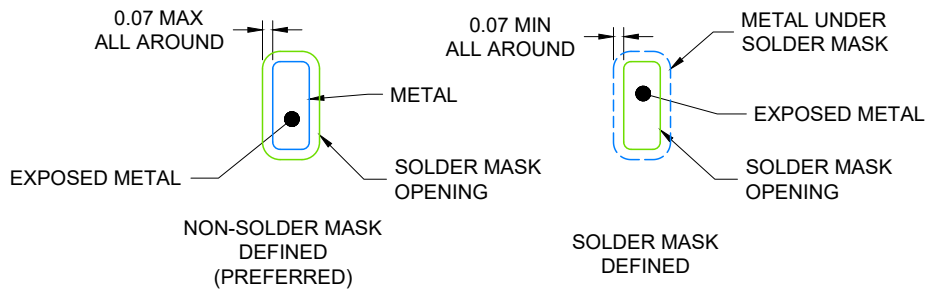
BQB0016A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X



4224640/A 11/2018

NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sluea271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

BQB0016A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



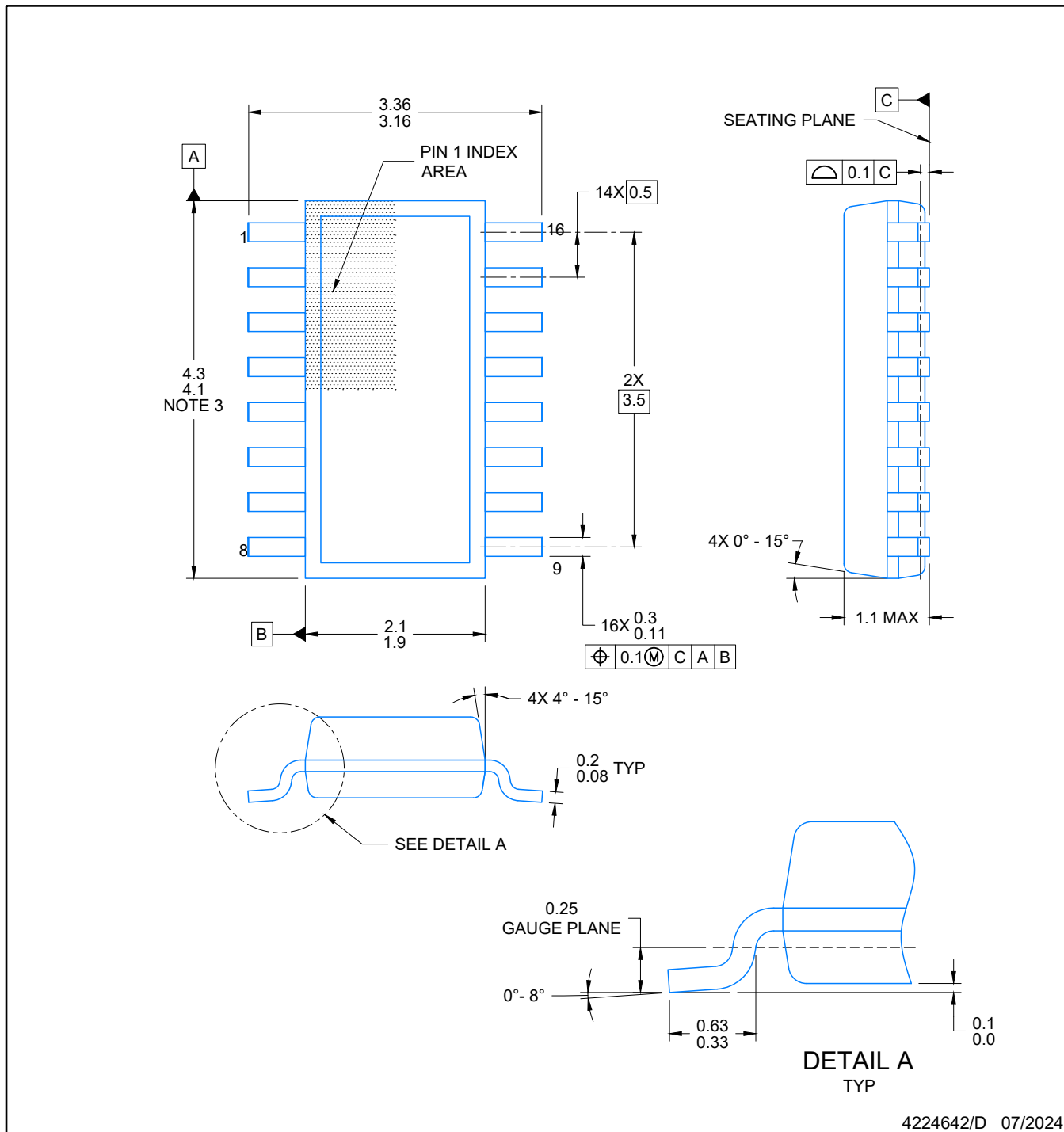
SOLDER PASTE EXAMPLE
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD
 85% PRINTED COVERAGE BY AREA
 SCALE: 20X

4224640/A 11/2018

NOTES: (continued)

- 6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.



4224642/D 07/2024

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
5. Reference JEDEC Registration MO-345, Variation AA



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X



4224642/D 07/2024

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 20X

4224642/D 07/2024

NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.

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