

SNx4AHC374 3 ステート出力、オクタールエッジトリガ D タイプフリップフロップ

1 特長

- 2V~5.5V の V_{CC} で動作
- 3 ステート出力はバスラインを直接駆動
- JESD 17 準拠で 250mA 超のラッチアップ性能
- MIL-PRF-38535 準拠の製品については、特に記述のない限り、すべてのパラメータはテスト済みです。その他のすべての製品については、量産プロセスにすべてのパラメータのテストが含まれているとは限りません。
- JESD 22 を上回る ESD 保護
 - 人体モデルで 2000V
 - マシン モデルで 200V
 - 荷電デバイス モデルで 1500V

2 アプリケーション

- プリンタ
- ネットワーク スイッチ
- 試験および測定機器
- ワイヤレス インフラ
- モータ制御
- サーバー マザーボード

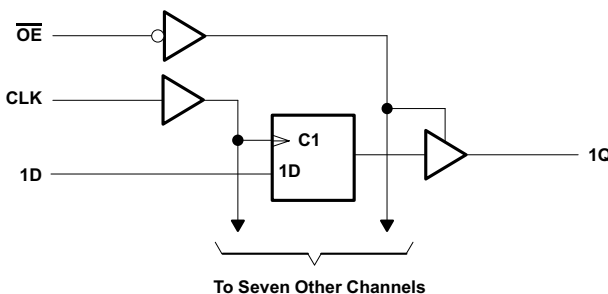
3 概要

SNx4AHC374 デバイスは、オクタール エッジトリガ D タイプ フリップフロップで、大きい容量性負荷または比較的低いインピーダンスの負荷の駆動用に設計された 3 ステート出力を備えています。特に、バッファ レジスタ、I/O ポート、双方向バスドライバ、作業レジスタの実装に適しています。

製品情報

| 部品番号 | パッケージ (1) | パッケージ サイズ(2) | 本体サイズ (3) |
|------------|-----------------|------------------|------------------|
| SNx4AHC374 | DB (SSOP, 20) | 7.2mm × 7.8mm | 7.2mm × 5.30mm |
| | DGV (TVSOP, 20) | 5.00mm × 6.4mm | 5.00mm × 4.40mm |
| | DW (SOIC, 20) | 12.80mm × 10.3mm | 12.8mm × 7.5mm |
| | N (PDIP, 20) | 24.33mm × 9.4mm | 24.33mm × 6.35mm |
| | PW (TSSOP, 20) | 6.50mm × 6.4mm | 6.50mm × 4.40mm |
| | J (CDIP, 20) | 24.2mm × 7.62mm | 24.2mm × 6.92mm |
| | W (CFP, 20) | 13.09mm × 8.13mm | 13.09mm × 6.92mm |
| | FK (LCCC, 20) | 8.89mm × 8.89mm | 8.89mm × 8.89mm |

- (1) 詳細については、[セクション 11](#) を参照してください。
- (2) パッケージ サイズ (長さ × 幅) は公称値であり、該当する場合はピンも含まれます。
- (3) 本体サイズ (長さ×幅) は公称値であり、ピンは含まれません。



To Seven Other Channels
概略回路図



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4 Pin Configuration and Functions

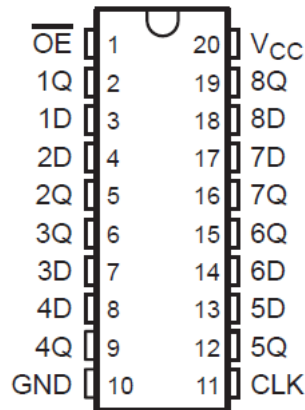


図 4-1. SN54AHC374 J or W Package; SN74AHC374 DB, DGV, DW, N, or PW ; 20-Pin CDIP, CFP, SSOP, TVSOP, SOIC, PDIP, or TSSOP

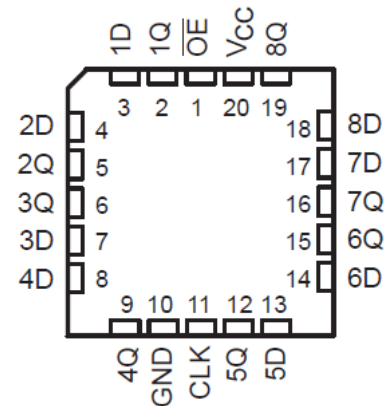


図 4-2. SN54AHC374 FK Package, 20-Pin LCCC

表 4-1. Pin Functions

| NO. | PIN | | TYPE | DESCRIPTION |
|-----|-----|-----------------|------|---------------|
| | | NAME | | |
| 1 | | OE | I | Output Enable |
| 2 | | 1Q | O | 1Q Output |
| 3 | | 1D | I | 1D Input |
| 4 | | 2D | I | 2D Input |
| 5 | | 2Q | O | 2Q Output |
| 6 | | 3Q | O | 3Q Output |
| 7 | | 3D | I | 3D Input |
| 8 | | 4D | I | 4D Input |
| 9 | | 4Q | O | 4Q Output |
| 10 | | GND | — | Ground |
| 11 | | CLK | I | Clock Pin |
| 12 | | 5Q | O | 5Q Output |
| 13 | | 5D | I | 5D Input |
| 14 | | 6D | I | 6D Input |
| 15 | | 6Q | O | 6Q Output |
| 16 | | 7Q | O | 7Q Output |
| 17 | | 7D | I | 7D Input |
| 18 | | 8D | I | 8D Input |
| 19 | | 8Q | O | 8Q Output |
| 20 | | V _{CC} | — | Power Pin |

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

| | | MIN | MAX | UNIT |
|------------------|---|--|-----------------------|------|
| V _{CC} | Supply voltage range | -0.5 | 7 | V |
| V _I | Input voltage range ⁽²⁾ | -0.5 | 7 | V |
| V _O | Output voltage range ⁽²⁾ | -0.5 | V _{CC} + 0.5 | V |
| I _{IK} | Input clamp current | V _I < 0 | -20 | mA |
| I _{OK} | Output clamp current | V _O < 0 or V _O > V _{CC} | ±20 | mA |
| I _O | Continuous output current | V _O = 0 to V _{CC} | ±25 | mA |
| | Continuous current through V _{CC} or GND | | ±75 | mA |
| T _{stg} | Storage temperature range | -65 | 150 | °C |

- (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 [セクション 5.3](#) is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 ESD Ratings

| | | VALUE | UNIT |
|--------------------|--|-------|------|
| V _(ESD) | Electrostatic discharge | | |
| | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾ | 2000 | V |
| | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾ | 1500 | |
| Machine Model (MM) | 200 | | |

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

| | | SN54AHC374 | | SN74AHC374 | | UNIT |
|-----------------|------------------------------------|---------------------------------|-----------------|------------|-----------------|------|
| | | MIN | MAX | MIN | MAX | |
| V _{CC} | Supply voltage | 2 | 5.5 | 2 | 5.5 | V |
| V _{IH} | High-level input voltage | V _{CC} = 2 V | 1.5 | 1.5 | | V |
| | | V _{CC} = 3 V | 2.1 | 2.1 | | |
| | | V _{CC} = 5.5 V | 3.85 | 3.85 | | |
| V _{IL} | Low-level input voltage | V _{CC} = 2 V | | 0.5 | 0.5 | V |
| | | V _{CC} = 3 V | | 0.9 | 0.9 | |
| | | V _{CC} = 5.5 V | | 1.65 | 1.65 | |
| V _I | Input voltage | 0 | 5.5 | 0 | 5.5 | V |
| V _O | Output voltage | 0 | V _{CC} | 0 | V _{CC} | V |
| I _{OH} | High-level output current | V _{CC} = 2 V | | -50 | -50 | μA |
| | | V _{CC} = 3.3 V ± 0.3 V | | -4 | -4 | mA |
| | | V _{CC} = 5 V ± 5.5 V | | -8 | -8 | |
| I _{OL} | Low-level output current | V _{CC} = 2 V | | 50 | 50 | μA |
| | | V _{CC} = 3.3 V ± 0.3 V | | 4 | 4 | mA |
| | | V _{CC} = 5 V ± 5.5 V | | 8 | 8 | |
| Δt/Δv | Input transition rise or fall rate | V _{CC} = 3.3 V ± 0.3 V | | 100 | 100 | ns/V |
| | | V _{CC} = 5 V ± 5.5 V | | 20 | 20 | |

5.3 Recommended Operating Conditions (続き)

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

| | | SN54AHC374 | | SN74AHC374 | | UNIT |
|----------------|--------------------------------|------------|-----|------------|-----|------|
| | | MIN | MAX | MIN | MAX | |
| T _A | Operating free-air temperature | -55 | 125 | -40 | 125 | °C |

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs (SCBA004)*.

5.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | | SN74AHC374 | | | | | | UNIT |
|-------------------------------|--|------------|-------|------|------|------|-------|------|
| | | DB | DGV | DW | N | NS | PW | |
| | | 20 PINS | | | | | | |
| R _{θJA} | Junction-to-ambient thermal resistance | 97.9 | 117.2 | 79.4 | 53.3 | 79.2 | 116.8 | °C/W |
| R _{θJC(top)} | Junction-to-case (top) thermal resistance | 59.6 | 32.7 | 45.7 | 40.0 | 45.7 | 58.5 | |
| R _{θJB} | Junction-to-board thermal resistance | 53.1 | 58.7 | 46.9 | 34.2 | 46.8 | 78.7 | |
| ψ _{JT} | Junction-to-top characterization parameter | 21.3 | 1.15 | 18.7 | 26.4 | 19.3 | 12.6 | |
| ψ _{JB} | Junction-to-board characterization parameter | 52.7 | 58.0 | 46.5 | 34.1 | 46.4 | 77.9 | |
| R _{θJC(bot)} | Junction-to-case (bottom) thermal resistance | N/A | N/A | N/A | N/A | N/A | N/A | |

(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 | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | SN74AHC374 | | | | | | UNIT |
|-----------------|--|-----------------|-----------------------|-----|-------|---------------|-------------------|---------------|------|----------------|-----|------|
| | | | | | | -40°C to 85°C | | -40°C to 85°C | | -40°C to 125°C | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | I _{OH} = -50 μA | 2 V | 1.9 | 2 | 1.9 | | 1.9 | | 1.9 | | V | |
| | | 3 V | 2.9 | 3 | 2.9 | | 2.9 | | 2.9 | | | |
| | | 4.5 V | 4.4 | 4.5 | 4.4 | | 4.4 | | 4.4 | | | |
| | I _{OH} = -4 mA | 3 V | 2.58 | | 2.48 | | 2.48 | | 2.48 | | | |
| | I _{OH} = -8 mA | 4.5 V | 3.94 | | 3.8 | | 3.8 | | 3.8 | | | |
| V _{OL} | I _{OL} = 50 μA | 2 V | | | 0.1 | | 0.1 | | 0.1 | | V | |
| | | 3 V | | | 0.1 | | 0.1 | | 0.1 | | | |
| | | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | | | |
| | I _{OL} = 4 mA | 3 V | | | 0.36 | | 0.5 | | 0.44 | | | |
| | I _{OL} = 8 mA | 4.5 V | | | 0.36 | | 0.5 | | 0.44 | | | |
| I _I | V _I = 5.5 V or GND | 0 V to 5.5 V | | | ±0.1 | | ±1 ⁽¹⁾ | | ±1 | | μA | |
| I _{OZ} | V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND | 5.5 V | | | ±0.25 | | ±2.5 | | ±2.5 | | μA | |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 4 | | 40 | | 40 | | μA | |
| C _i | V _I = V _{CC} or GND | 5 V | | | 4 | | | | 10 | | pF | |
| C _o | V _O = V _{CC} or GND | 5 V | | | 6 | | | | | | pF | |

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested at V_{CC} = 0 V.

5.6 Timing Requirements, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | $T_A = 25^\circ\text{C}$ | SN54AHC374 | | SN74AHC374 | | | | UNIT |
|---|--------------------------|---------------|-----|---------------|-----|----------------|-----|------|
| | | –40°C to 85°C | | –40°C to 85°C | | –40°C to 125°C | | |
| | | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_w Pulse duration, CLK high or low | 5 | 5.5 | 5.5 | 6.5 | 6.5 | 6.5 | 6.5 | ns |
| t_{su} Setup time, data before CLK \uparrow | 4.5 | 4 | 4 | 4 | 4.5 | 4.5 | 4.5 | ns |
| t_h Hold time, data after CLK \uparrow | 2 | 2 | 2 | 2 | 2.5 | 2.5 | 2.5 | ns |

5.7 Timing Requirements, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | $T_A = 25^\circ\text{C}$ | SN54AHC374 | | SN74AHC374 | | | | UNIT |
|---|--------------------------|---------------|-----|---------------|-----|----------------|-----|------|
| | | –40°C to 85°C | | –40°C to 85°C | | –40°C to 125°C | | |
| | | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_w Pulse duration, CLK high or low | 5 | 5 | 5 | 5.5 | 5.5 | 5.5 | 5.5 | ns |
| t_{su} Setup time, data before CLK \uparrow | 3 | 3 | 3 | 3 | 3 | 3 | 3 | ns |
| t_h Hold time, data after CLK \uparrow | 2 | 2 | 2 | 2 | 2 | 2 | 2 | ns |

5.8 Switching Characteristics, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | $T_A = 25^\circ\text{C}$ | | | SN54AHC374 | | SN74AHC374 | | | | UNIT |
|-------------|-----------------|-------------|----------------------|--------------------------|---------------------|-----|-------------------|---------------------|---------------|------|----------------|------|------|
| | | | | –40°C to 85°C | | | –40°C to 85°C | | –40°C to 85°C | | –40°C to 125°C | | |
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| f_{MAX} | | | $C_L = 15\text{ pF}$ | 80 ⁽¹⁾ | 130 ⁽¹⁾ | | 70 ⁽¹⁾ | 70 | 70 | 70 | 70 | MHz | |
| | | | $C_L = 50\text{ pF}$ | 55 | 85 | | 50 | 50 | 50 | 50 | 50 | | |
| t_{PLH} | CLK | Q | $C_L = 15\text{ pF}$ | 8.1 ⁽¹⁾ | 12.7 ⁽¹⁾ | | 1 ⁽¹⁾ | 15 ⁽¹⁾ | 1 | 15 | 1 | 16.5 | ns |
| t_{PHL} | | | | 8.1 ⁽¹⁾ | 12.7 ⁽¹⁾ | | 1 ⁽¹⁾ | 15 ⁽¹⁾ | 1 | 15 | 1 | 16.5 | |
| t_{PZH} | \overline{OE} | Q | $C_L = 15\text{ pF}$ | 7.1 ⁽¹⁾ | 11 ⁽¹⁾ | | 1 ⁽¹⁾ | 13 ⁽¹⁾ | 1 | 13 | 1 | 14 | ns |
| t_{PZL} | | | | 7.1 ⁽¹⁾ | 11 ⁽¹⁾ | | 1 ⁽¹⁾ | 13 ⁽¹⁾ | 1 | 13 | 1 | 14 | |
| t_{PHZ} | \overline{OE} | Q | $C_L = 15\text{ pF}$ | 7.5 ⁽¹⁾ | 10.5 ⁽¹⁾ | | 1 ⁽¹⁾ | 12.5 ⁽¹⁾ | 1 | 12.5 | 1 | 13.5 | ns |
| t_{PLZ} | | | | 7.5 ⁽¹⁾ | 10.5 ⁽¹⁾ | | 1 ⁽¹⁾ | 12.5 ⁽¹⁾ | 1 | 12.5 | 1 | 13.5 | |
| t_{PLH} | CLK | Q | $C_L = 50\text{ pF}$ | 10.6 | 16.2 | | 1 | 18.5 | 1 | 18.5 | 1 | 20 | ns |
| t_{PHL} | | | | 10.6 | 16.2 | | 1 | 18.5 | 1 | 18.5 | 1 | 20 | |
| t_{PZH} | \overline{OE} | Q | $C_L = 50\text{ pF}$ | 9.6 | 14.5 | | 1 | 16.5 | 1 | 16.5 | 1 | 17.5 | ns |
| t_{PZL} | | | | 9.6 | 14.5 | | 1 | 16.5 | 1 | 16.5 | 1 | 17.5 | |
| t_{PHZ} | \overline{OE} | Q | $C_L = 50\text{ pF}$ | 10.2 | 14 | | 1 | 16 | 1 | 16 | 1 | 17 | ns |
| t_{PLZ} | | | | 10.2 | 14 | | 1 | 16 | 1 | 16 | 1 | 17 | |
| $t_{sk(o)}$ | | | $C_L = 50\text{ pF}$ | | 1.5 ⁽²⁾ | | | | 1.5 | | 1.5 | ns | |

- (1) On products compliant to MIL-PRF-38535, this parameter is not production tested.
- (2) On products compliant to MIL-PRF-38535, this parameter does not apply.

5.9 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | $T_A = 25^\circ\text{C}$ | | | SN54AHC374 | | SN74AHC374 | | | UNIT | |
|--------------------|------------------------|----------------|----------------------|--------------------------|--------------------|--------------------|--------------------|--------------------|---------------|------|----------------|------|-----|
| | | | | | | | -40°C to 85°C | | -40°C to 85°C | | -40°C to 125°C | | |
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | MIN | | MAX |
| f_{MAX} | | | $C_L = 15\text{ pF}$ | 130 ⁽¹⁾ | 185 ⁽¹⁾ | | 110 ⁽¹⁾ | | 110 | | 110 | MHz | |
| | | | $C_L = 50\text{ pF}$ | 85 | 120 | | 75 | | 75 | | 75 | | |
| t_{PLH} | CLK | Q | $C_L = 15\text{ pF}$ | | 5.4 ⁽¹⁾ | 8.1 ⁽¹⁾ | 1 ⁽¹⁾ | 9.5 ⁽¹⁾ | 1 | 9.5 | 1 | 10.5 | ns |
| t_{PHL} | | | | | 5.4 ⁽¹⁾ | 8.1 ⁽¹⁾ | 1 ⁽¹⁾ | 9.5 ⁽¹⁾ | 1 | 9.5 | 1 | 10.5 | |
| t_{PZH} | $\overline{\text{OE}}$ | Q | $C_L = 15\text{ pF}$ | | 5.1 ⁽¹⁾ | 7.6 ⁽¹⁾ | 1 ⁽¹⁾ | 9 ⁽¹⁾ | 1 | 9 | 1 | 10 | ns |
| t_{PZL} | | | | | 5.1 ⁽¹⁾ | 7.6 ⁽¹⁾ | 1 ⁽¹⁾ | 9 ⁽¹⁾ | 1 | 9 | 1 | 10 | |
| t_{PHZ} | $\overline{\text{OE}}$ | Q | $C_L = 15\text{ pF}$ | | 4.6 ⁽¹⁾ | 6.8 ⁽¹⁾ | 1 ⁽¹⁾ | 8 ⁽¹⁾ | 1 | 8 | 1 | 9 | ns |
| t_{PLZ} | | | | | 4.6 ⁽¹⁾ | 6.8 ⁽¹⁾ | 1 ⁽¹⁾ | 8 ⁽¹⁾ | 1 | 8 | 1 | 9 | |
| t_{PLH} | CLK | Q | $C_L = 50\text{ pF}$ | | 6.9 | 10.1 | 1 | 11.5 | 1 | 11.5 | 1 | 12.5 | ns |
| t_{PHL} | | | | | 6.9 | 10.1 | 1 | 11.5 | 1 | 11.5 | 1 | 12.5 | |
| t_{PZH} | $\overline{\text{OE}}$ | Q | $C_L = 50\text{ pF}$ | | 6.6 | 9.6 | 1 | 11 | 1 | 11 | 1 | 12 | ns |
| t_{PZL} | | | | | 6.6 | 9.6 | 1 | 11 | 1 | 11 | 1 | 12 | |
| t_{PHZ} | $\overline{\text{OE}}$ | Q | $C_L = 50\text{ pF}$ | | 6.1 | 8.8 | 1 | 10 | 1 | 10 | 1 | 11 | ns |
| t_{PLZ} | | | | | 6.1 | 8.8 | 1 | 10 | 1 | 10 | 1 | 11 | |
| $t_{\text{sk(o)}}$ | | | $C_L = 50\text{ pF}$ | | | 1 ⁽²⁾ | | | | 1 | | 1.5 | ns |

- (1) On products compliant to MIL-PRF-38535, this parameter is not production tested.
(2) On products compliant to MIL-PRF-38535, this parameter does not apply.

5.10 Noise Characteristics

$V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ ⁽¹⁾

| PARAMETER | | SN74AHC374 | | | UNIT |
|--------------------|---|------------|------|------|------|
| | | MIN | TYP | MAX | |
| $V_{\text{OL(P)}}$ | Quiet output, maximum dynamic V_{OL} | | 0.5 | 1 | V |
| $V_{\text{OL(V)}}$ | Quiet output, minimum dynamic V_{OL} | | -0.5 | -0.8 | V |
| $V_{\text{OH(V)}}$ | Quiet output, minimum dynamic V_{OH} | | 4 | | V |
| $V_{\text{IH(D)}}$ | High-level dynamic input voltage | | 3.5 | | V |
| $V_{\text{IL(D)}}$ | Low-level dynamic input voltage | | | 1.5 | V |

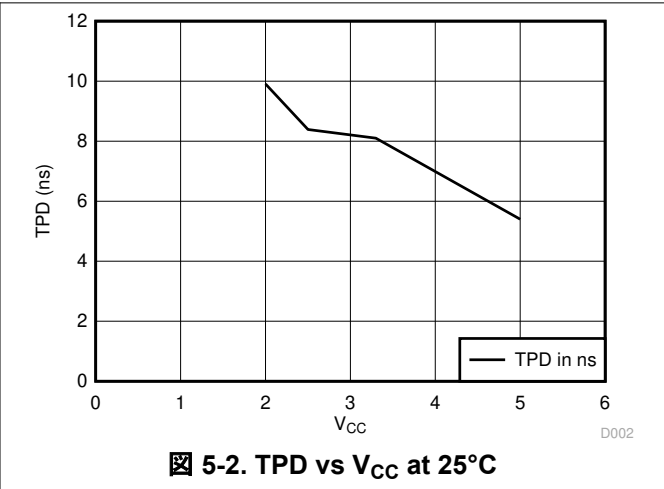
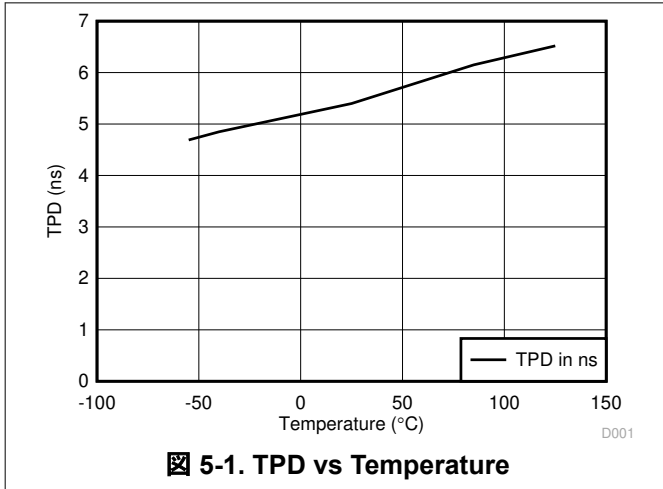
- (1) Characteristics are for surface-mount packages only.

5.11 Operating Characteristics

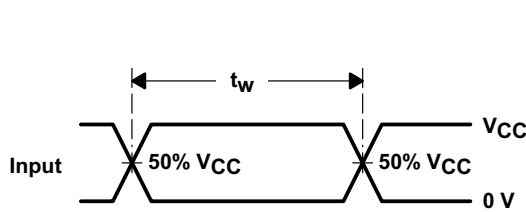
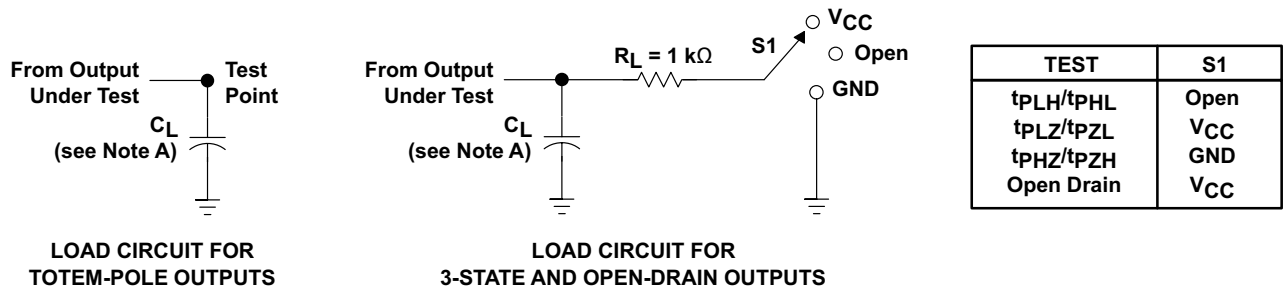
$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | | TYP | UNIT |
|-----------------|-------------------------------|-----------------|--------------------|-----|------|
| C_{pd} | Power dissipation capacitance | No load, | $f = 1\text{ MHz}$ | 32 | pF |

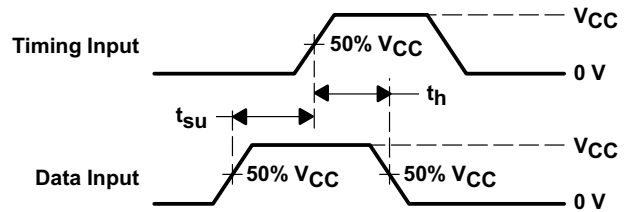
5.12 Typical Characteristics



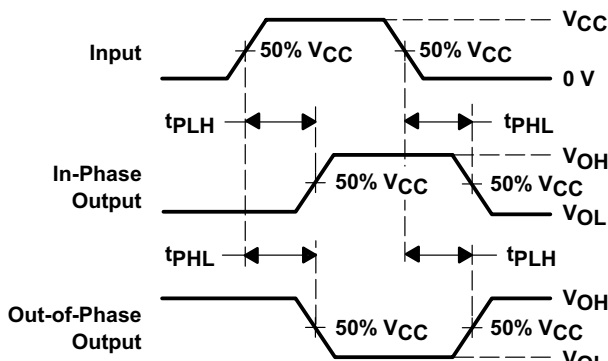
6 Parameter Measurement Information



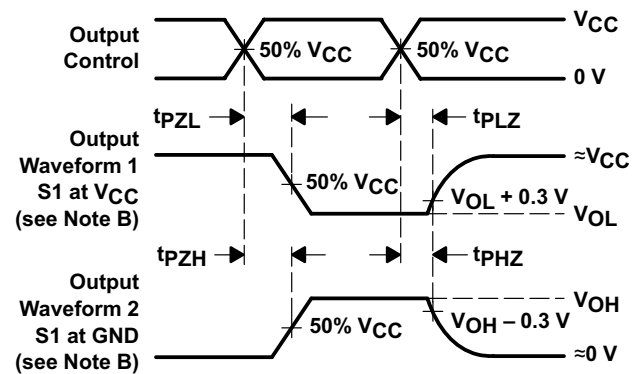
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- 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: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 D. The outputs are measured one at a time with one input transition per measurement.
 E. All parameters and waveforms are not applicable to all devices.

6-1. Load Circuit and Voltage Waveforms

7 Detailed Description

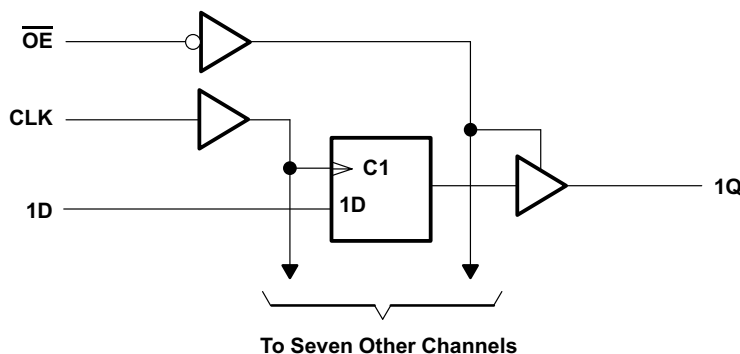
7.1 Overview

The SNx4AHC374 devices are octal edge-triggered D-type flip-flops that feature 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. These devices are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

On the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels of the data (D) inputs.

A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and the increased drive provide the capability to drive bus lines without interface or pull-up components.

7.2 Functional Block Diagram



7.3 Feature Description

- Wide operating voltage range
 - Operates from 2 V to 5.5 V
- Allows down-voltage translation
 - Inputs accept voltages to 5.5 V
- Slow edges reduce output ringing

7.4 Device Functional Modes

表 7-1. Function Table
(Each Flip-Flop)

| INPUTS | | | OUTPUT |
|-----------------|--------|---|--------|
| \overline{OE} | CLK | D | Q |
| L | ↑ | H | H |
| L | ↑ | L | L |
| L | H or L | X | Q_0 |
| H | X | X | Z |

8 Application and Implementation

注

以下のアプリケーション情報は、TI の製品仕様に含まれるものではなく、TI ではその正確性または完全性を保証いたしません。個々の目的に対する製品の適合性については、お客様の責任で判断していただくこととなります。お客様は自身の設計実装を検証しテストすることで、システムの機能を確認する必要があります。

8.1 Application Information

SNx4AHC374 is a low-drive CMOS device that can be used for a multitude of bus interface type applications where output ringing is a concern. The low drive and slow edge rates will minimize overshoot and undershoot on the outputs. The inputs are tolerant to 5.5 V at any valid V_{CC} . This feature makes it ideal for translating down to the V_{CC} level. [図 8-2](#) shows the reduction in ringing compared to higher drive parts such as AC.

8.2 Typical Application

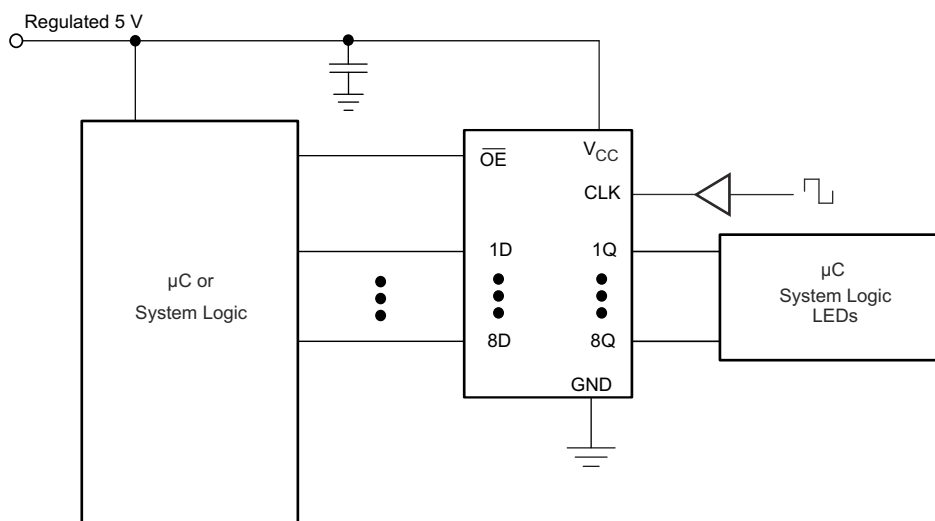


図 8-1. Typical Application Schematic

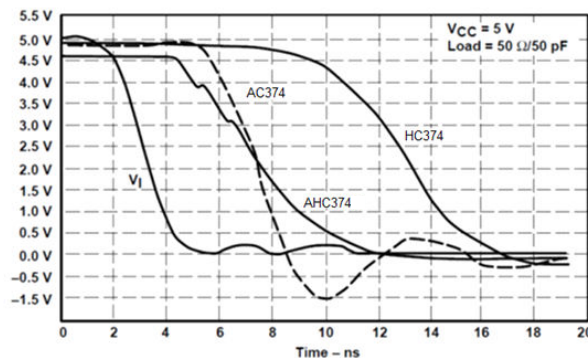
8.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

8.2.2 Detailed Design Procedure

1. Recommended Input Conditions
 - For rise time and fall time specifications, see $\Delta t/\Delta V$ in the [セクション 5.3](#) table.
 - For specified High and low levels, see V_{IH} and V_{IL} in the [セクション 5.3](#) table.
 - Inputs are overvoltage tolerant allowing them to go as high as 5.5 V at any valid V_{CC} .
2. Recommend Output Conditions
 - Load currents should not exceed 25 mA per output and 75 mA total for the part.
 - Outputs should not be pulled above V_{CC} .

8.2.3 Application Curves



8-2. Switching Characteristics Comparison

8.3 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the [セクション 5.3](#) table.

Each V_{CC} pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, $0.1\ \mu\text{F}$ is recommended. If there are multiple V_{CC} pins, $0.01\ \mu\text{F}$ or $0.022\ \mu\text{F}$ is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A $0.1\ \mu\text{F}$ and $1\ \mu\text{F}$ are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

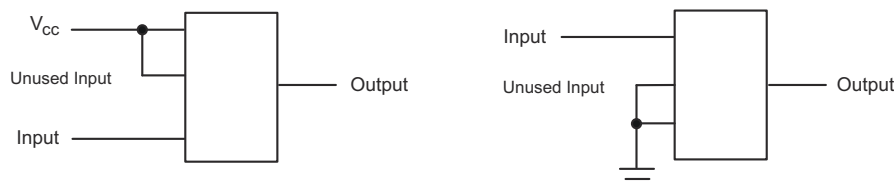
8.4 Layout

8.4.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states.

Specified in [8-3](#) are rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or V_{CC} , whichever makes more sense or is more convenient. It is acceptable to float outputs unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the outputs section of the part when asserted. This will not disable the input section of the I/Os so they also cannot float when disabled.

8.4.2 Layout Example



8-3. Layout Diagram

9 Device and Documentation Support

9.1 Documentation Support

9.1.1 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

表 9-1. Related Links

| PARTS | PRODUCT FOLDER | SAMPLE & BUY | TECHNICAL DOCUMENTS | TOOLS & SOFTWARE | SUPPORT & COMMUNITY |
|------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| SN54AHC374 | Click here | Click here | Click here | Click here | Click here |
| SN74AHC374 | Click here | Click here | Click here | Click here | Click here |

9.2 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、www.tij.co.jp のデバイス製品フォルダを開いてください。[通知] をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取ることができます。変更の詳細については、改訂されたドキュメントに含まれている改訂履歴をご覧ください。

9.3 サポート・リソース

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9.6 用語集

[テキサス・インスツルメンツ用語集](#) この用語集には、用語や略語の一覧および定義が記載されています。

10 Revision History

| Changes from Revision J (December 2014) to Revision K (July 2024) | Page |
|---|------|
| 「製品情報」の表にパッケージ サイズとミラタリー パッケージを追加..... | 1 |
| Updated thermal values for PW package from RθJA = 103.3 to 116.8, RθJC(top) = 37.8 to 58.5, RθJB = 54.3 to 78.7, ΨJT = 2.9 to 12.6, ΨJB = 53.8 to 77.9, RθJC(bot) = N/A, all values in °C/W | 5 |

Changes from Revision I (July 2003) to Revision J (December 2014)
Page

| | |
|--|---|
| • 「アプリケーション」、「製品情報」の表、「ピンの機能」表、「ESD 定格」表、「熱に関する情報」表、「代表的特性」、「機能説明」セクション、「デバイスの機能モード」、「アプリケーションと実装」セクション、「電源に関する推奨事項」セクション、「レイアウト」セクション、「デバイスおよびドキュメントのサポート」セクション、および「メカニカル、パッケージ、および注文情報」セクションを追加。 | 1 |
| • 「注文情報」表を削除。 | 1 |
| • 「特長」の一覧に軍事利用についての免責事項を追加。 | 1 |
| • Changed MAX operating temperature to 125°C in <i>Recommended Operating Conditions</i> table. | 4 |

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.

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郵送先住所: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

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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 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|--------------------------------------|-------------------------|
| 5962-9686401Q2A | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9686401Q2A SNJ54AHC 374FK | Samples |
| 5962-9686401QRA | ACTIVE | CDIP | J | 20 | 20 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9686401QR A SNJ54AHC374J | Samples |
| 5962-9686401QSA | ACTIVE | CFP | W | 20 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9686401QS A SNJ54AHC374W | Samples |
| SN74AHC374DBR | ACTIVE | SSOP | DB | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | HA374 | Samples |
| SN74AHC374DW | OBSOLETE | SOIC | DW | 20 | | TBD | Call TI | Call TI | -40 to 125 | AHC374 | |
| SN74AHC374DWR | ACTIVE | SOIC | DW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | AHC374 | Samples |
| SN74AHC374N | ACTIVE | PDIP | N | 20 | 20 | RoHS & Green | NIPDAU | N / A for Pkg Type | -40 to 125 | SN74AHC374N | Samples |
| SN74AHC374NSR | ACTIVE | SOP | NS | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | AHC374 | Samples |
| SN74AHC374PW | OBSOLETE | TSSOP | PW | 20 | | TBD | Call TI | Call TI | -40 to 125 | HA374 | |
| SN74AHC374PWR | ACTIVE | TSSOP | PW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | HA374 | Samples |
| SN74AHC374PWRG4 | ACTIVE | TSSOP | PW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | HA374 | Samples |
| SNJ54AHC374FK | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9686401Q2A SNJ54AHC 374FK | Samples |
| SNJ54AHC374J | ACTIVE | CDIP | J | 20 | 20 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9686401QR A SNJ54AHC374J | Samples |
| SNJ54AHC374W | ACTIVE | CFP | W | 20 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9686401QS A SNJ54AHC374W | 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.

OBSELETE: 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 SN54AHC374, SN74AHC374 :

● Catalog : [SN74AHC374](#)

● Military : [SN54AHC374](#)

NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

- Military - QML certified for Military and Defense Applications

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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHC374DBR | SSOP | DB | 20 | 2000 | 330.0 | 16.4 | 8.2 | 7.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74AHC374DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.3 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74AHC374NSR | SOP | NS | 20 | 2000 | 330.0 | 24.4 | 8.4 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74AHC374PWR | TSSOP | PW | 20 | 2000 | 330.0 | 16.4 | 6.95 | 7.1 | 1.6 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHC374DBR | SSOP | DB | 20 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74AHC374DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74AHC374NSR | SOP | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74AHC374PWR | TSSOP | PW | 20 | 2000 | 356.0 | 356.0 | 35.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 5962-9686401Q2A | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| 5962-9686401QSA | W | CFP | 20 | 25 | 506.98 | 26.16 | 6220 | NA |
| SN74AHC374N | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |
| SNJ54AHC374FK | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| SNJ54AHC374W | W | CFP | 20 | 25 | 506.98 | 26.16 | 6220 | NA |

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within Mil-Std 1835 GDFP2-F20

PW0020A



PACKAGE OUTLINE

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220206/A 02/2017

NOTES:

- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- 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.
- This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220206/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

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220206/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.



4214851/B 08/2019

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-150.

EXAMPLE BOARD LAYOUT

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4214851/B 08/2019

NOTES: (continued)

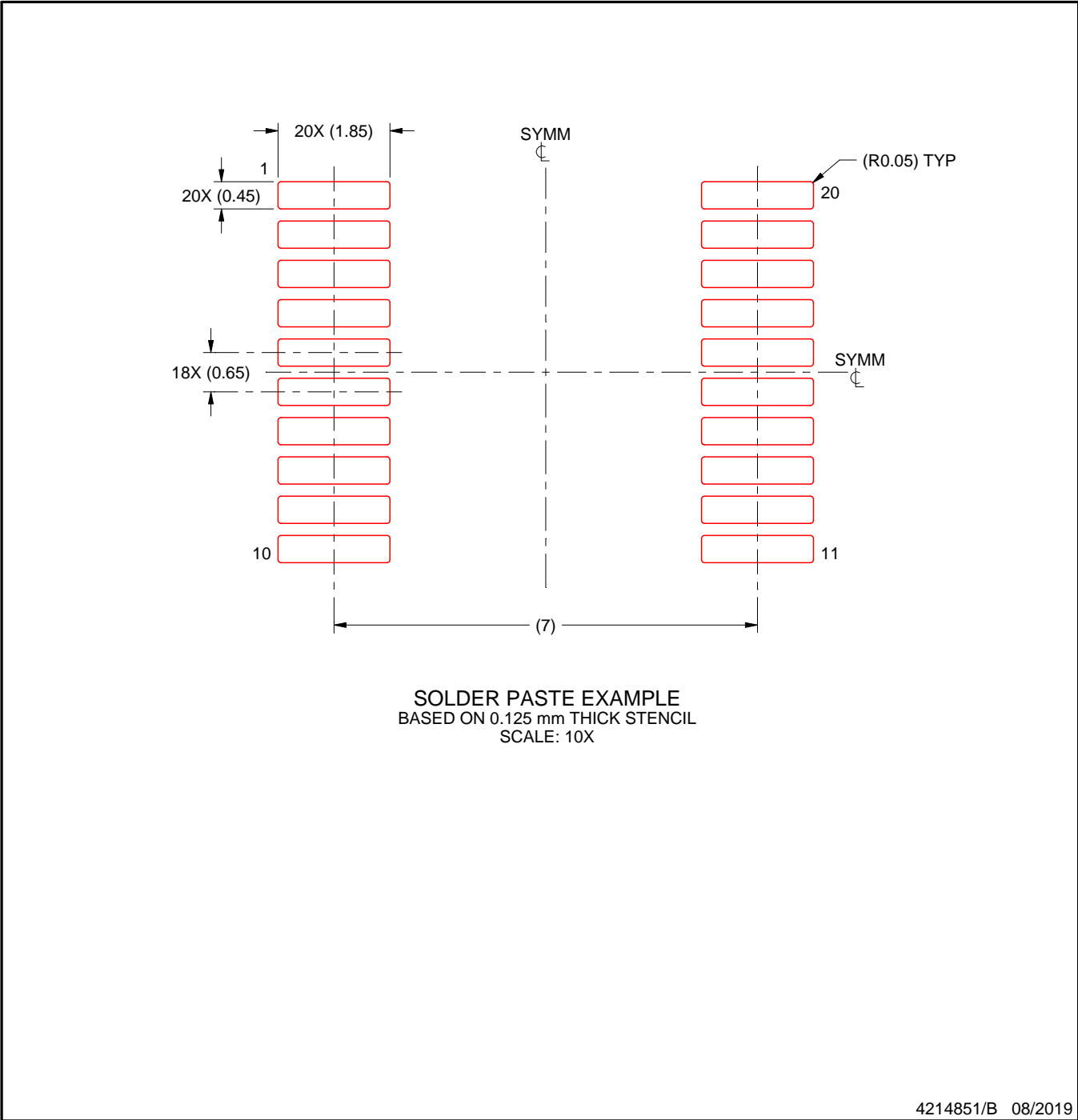
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- 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.

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

GENERIC PACKAGE VIEW

FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

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



4229370VA\

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

NOTES:

1. All linear dimensions are in millimeters. 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 0.43 mm per side.
5. Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

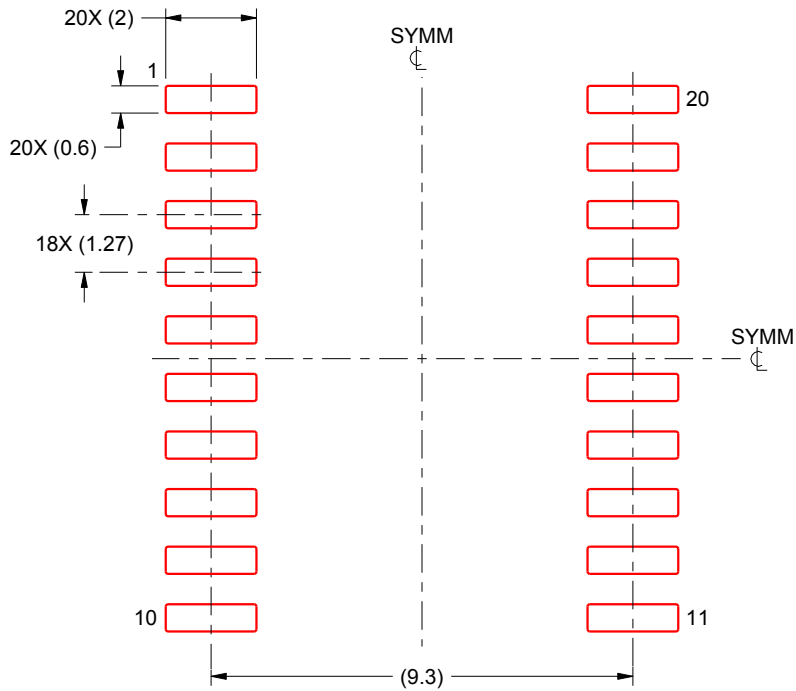
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

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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