

## FlatLink™ RECEIVER

Check for Samples: [SN75LVDS82](#)

### FEATURES

- 4:28 Data Channel Expansion at up to 238 Mbytes/s Throughput
- Suited for SVGA, XGA, or SXGA Display Data Transmission From Controller to Display With Very Low EMI
- Four Data Channels and Clock Low-Voltage Differential Channels In and 28 Data and Clock Low-Voltage TTL Channels Out
- Operates From a Single 3.3-V Supply With 250 mW (Typ)
- 5-V Tolerant SHTDN Input
- Falling Clock-Edge-Triggered Outputs
- Packaged in Thin Shrink Small-Outline Package (TSSOP) With 20-Mil Terminal Pitch
- Consumes Less Than 1 mW When Disabled
- Wide Phase-Lock Input Frequency Range . . . 31 MHz to 68 MHz
- No External Components Required for PLL
- Inputs Meet or Exceed the Requirements of ANSI EIA/TIA-644 Standard
- Improved Replacement for the National™ DS90C582

### DESCRIPTION

The SN75LVDS82 FlatLink™ receiver contains four serial-in, 7-bit parallel-out shift registers, a 7× clock synthesizer, and five low-voltage differential signaling (LVDS) line receivers in a single integrated circuit.

**DGG PACKAGE  
(TOP VIEW)**

|                               |    |    |                 |
|-------------------------------|----|----|-----------------|
| D22                           | 1  | 56 | V <sub>CC</sub> |
| D23                           | 2  | 55 | D21             |
| D24                           | 3  | 54 | D20             |
| GND                           | 4  | 53 | D19             |
| D25                           | 5  | 52 | GND             |
| D26                           | 6  | 51 | D18             |
| D27                           | 7  | 50 | D17             |
| LVDSGND                       | 8  | 49 | D16             |
| A0M                           | 9  | 48 | V <sub>CC</sub> |
| A0P                           | 10 | 47 | D15             |
| A1M                           | 11 | 46 | D14             |
| A1P                           | 12 | 45 | D13             |
| LVDSV <sub>CC</sub>           | 13 | 44 | GND             |
| LVDSGND                       | 14 | 43 | D12             |
| A2M                           | 15 | 42 | D11             |
| A2P                           | 16 | 41 | D10             |
| CLKINM                        | 17 | 40 | V <sub>CC</sub> |
| CLKINP                        | 18 | 39 | D9              |
| A3M                           | 19 | 38 | D8              |
| A3P                           | 20 | 37 | D7              |
| LVDSGND                       | 21 | 36 | GND             |
| PLL <sub>GND</sub>            | 22 | 35 | D6              |
| PLL <sub>V<sub>CC</sub></sub> | 23 | 34 | D5              |
| PLL <sub>GND</sub>            | 24 | 33 | D4              |
| SHTDN                         | 25 | 32 | D3              |
| CLKOUT                        | 26 | 31 | V <sub>CC</sub> |
| D0                            | 27 | 30 | D2              |
| GND                           | 28 | 29 | D1              |

These functions allow receipt of synchronous data from a compatible transmitter, such as the SN75LVDS81, over five balanced-pair conductors, and expansion to 28 bits of single-ended low-voltage TTL (LVTTTL) synchronous data at a lower transfer rate. The SN75LVDS82 can also be used with the SN75LVDS84 or SN75LVDS85 for 21-bit transfers.

When receiving, the high-speed LVDS data is received and loaded into registers at the rate of seven times (7×) the LVDS input clock (CLKIN). The data is then unloaded to a 28-bit-wide LVTTTL parallel bus at the CLKIN rate. A phase-locked loop (PLL) clock synthesizer circuit generates a 7× clock for internal clocking and an output clock for the expanded data. The SN75LVDS82 presents valid data on the falling edge of the output clock (CLKOUT).



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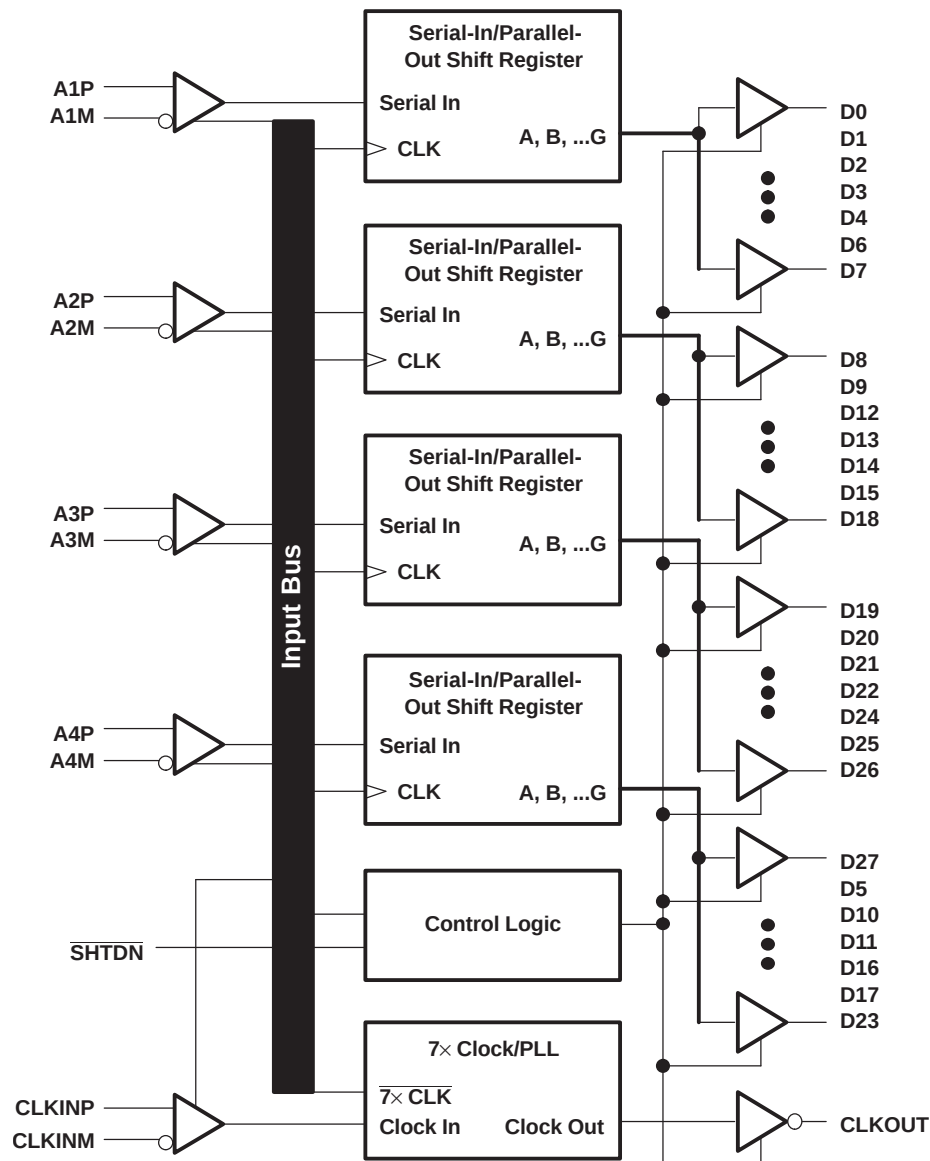
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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The SN75LVDS82 requires only five line-termination resistors for the differential inputs and little or no control. The data bus appears the same at the input to the transmitter and output of the receiver with the data transmission transparent to the user. The only possible user intervention is the use of the shutdown/clear (SHTDN) active-low input to inhibit the clock and shut off the LVDS receivers for lower power consumption. A low-level on SHTDN clears all internal registers to a low level and places the CMOS outputs in a high-impedance state.

The SN75LVDS82 is characterized for operation over ambient air temperatures of 0°C to 70°C.

### FUNCTIONAL BLOCK DIAGRAM



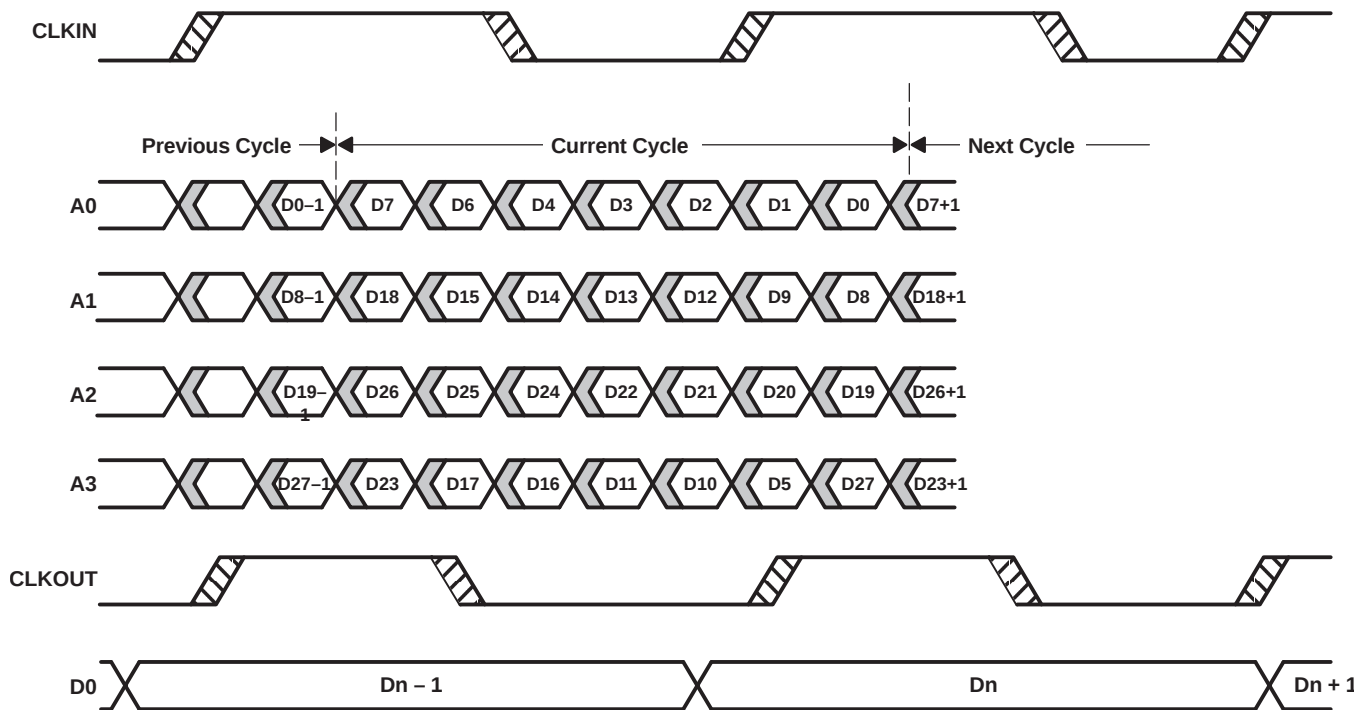
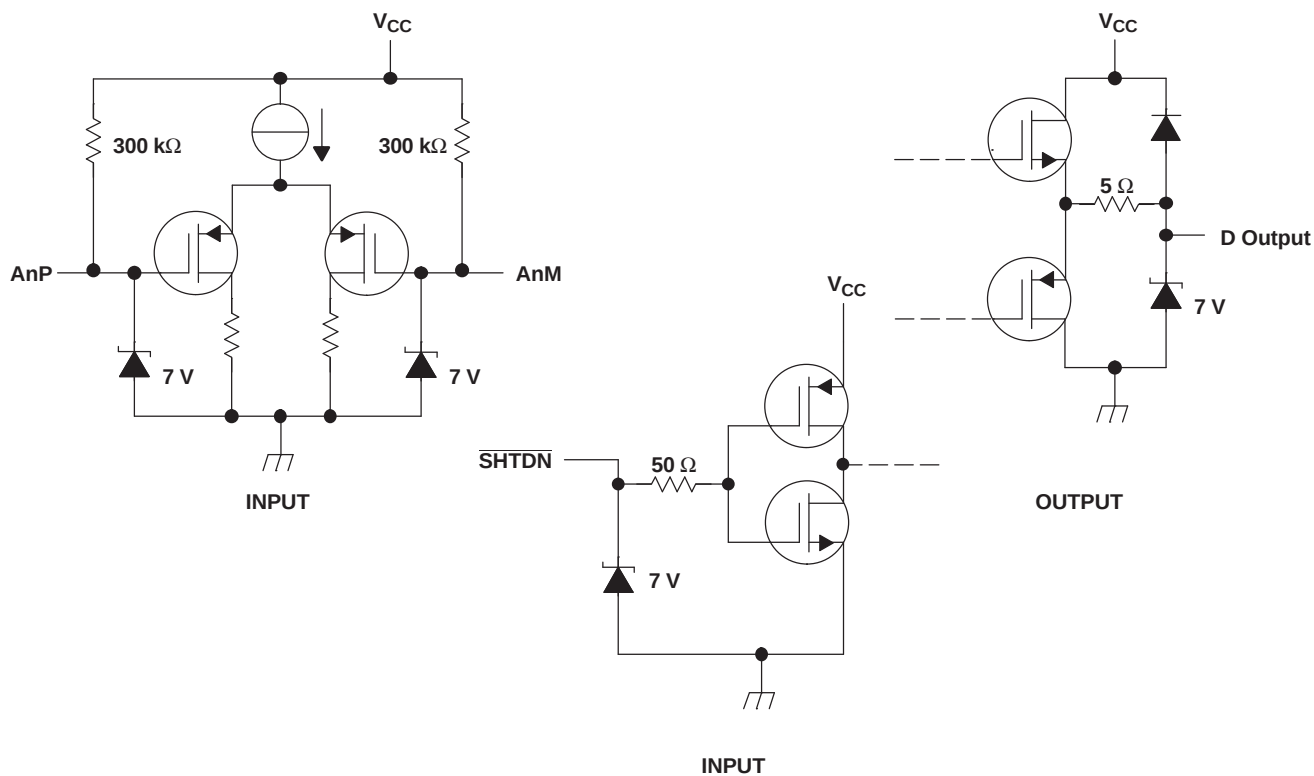


Figure 1. SN75LVDS82 Load and Shift Timing Sequences

## EQUIVALENT INPUT AND OUTPUT SCHEMATIC DIAGRAMS



**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

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

|                                                      |                                      |                                               | UNIT                              |
|------------------------------------------------------|--------------------------------------|-----------------------------------------------|-----------------------------------|
| V <sub>CC</sub>                                      | Supply voltage range <sup>(2)</sup>  |                                               | –0.5 V to 4 V                     |
| V <sub>O</sub>                                       | Output voltage range (Dxx terminals) |                                               | –0.5 V to V <sub>CC</sub> + 0.5 V |
| V <sub>I</sub>                                       | Input voltage range                  | Any terminal except $\overline{\text{SHTDN}}$ | –0.5 V to V <sub>CC</sub> + 0.5 V |
|                                                      |                                      | $\overline{\text{SHTDN}}$                     | –0.5 V to 5.5 V                   |
| Continuous total power dissipation                   |                                      |                                               | See Dissipation Rating Table      |
| T <sub>A</sub>                                       | Operating temperature range          |                                               | 0°C to 70°C                       |
| T <sub>stg</sub>                                     | Storage temperature range            |                                               | –65°C to 150°C                    |
| Lead temperature 1,6 mm (1/16 in) from case for 10 s |                                      |                                               | 260°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 "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values are with respect to GND, unless otherwise noted.

**DISSIPATION RATING TABLE**

| PACKAGE | T <sub>A</sub> ≤ 25°C<br>POWER RATING | DERATING FACTOR <sup>(1)</sup><br>ABOVE T <sub>A</sub> = 25°C | T <sub>A</sub> = 70°C<br>POWER RATING |
|---------|---------------------------------------|---------------------------------------------------------------|---------------------------------------|
| DGG     | 1377 mW                               | 11.0 mW/°C                                                    | 822 mW                                |

- (1) This is the inverse of the junction-to-ambient thermal resistance when board mounted and with no air flow.

**RECOMMENDED OPERATING CONDITIONS**

|                 |                                                                                        | MIN                  | NOM                  | MAX                   | UNIT |
|-----------------|----------------------------------------------------------------------------------------|----------------------|----------------------|-----------------------|------|
| V <sub>CC</sub> | Supply voltage                                                                         | 3                    | 3.3                  | 3.6                   | V    |
| V <sub>IH</sub> | High-level input voltage ( $\overline{\text{SHTDN}}$ )                                 | 2                    |                      |                       | V    |
| V <sub>IL</sub> | Low-level input voltage ( $\overline{\text{SHTDN}}$ )                                  |                      |                      | 0.8                   | V    |
| V <sub>ID</sub> | Differential input voltage                                                             | 0.1                  |                      | 0.6                   | V    |
| V <sub>IC</sub> | Common-mode input voltage (see <a href="#">Figure 2</a> and <a href="#">Figure 3</a> ) | $\frac{ V_{ID} }{2}$ | $\frac{ V_{ID} }{2}$ | 2.4 -                 | V    |
|                 |                                                                                        |                      |                      | V <sub>CC</sub> – 0.8 |      |
|                 |                                                                                        |                      |                      |                       |      |
| T <sub>A</sub>  | Operating free-air temperature                                                         | 0                    |                      | 70                    | °C   |

**TIMING REQUIREMENTS**

|                  |                                                   | MIN  | MAX  | UNIT |
|------------------|---------------------------------------------------|------|------|------|
| t <sub>c</sub>   | Cycle time, input clock <sup>(1)</sup>            | 14.7 | 32.3 | ns   |
| t <sub>su1</sub> | Setup time, input (see <a href="#">Figure 7</a> ) | 600  |      | ps   |
| t <sub>h1</sub>  | Hold time, input (see <a href="#">Figure 7</a> )  | 600  |      | ps   |

- (1) Parameter t<sub>c</sub> is defined as the mean duration of a minimum of 32000 clock cycles.

## ELECTRICAL CHARACTERISTICS

over recommended operating conditions (unless otherwise noted)

| PARAMETER                                                                           | TEST CONDITIONS                                                                              | MIN  | TYP <sup>(1)</sup> | MAX | UNIT |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------|--------------------|-----|------|
| V <sub>IT+</sub> Positive-going differential input threshold voltage                |                                                                                              |      |                    | 100 | mV   |
| V <sub>IT−</sub> Negative-going differential input threshold voltage <sup>(2)</sup> |                                                                                              | −100 |                    |     | mV   |
| V <sub>OH</sub> High-level output voltage                                           | I <sub>OH</sub> = −4 mA                                                                      | 2.4  |                    |     | V    |
| V <sub>OL</sub> Low-level output voltage                                            | I <sub>OL</sub> = 4 mA                                                                       |      |                    | 0.4 | V    |
| I <sub>CC</sub> Quiescent current (average)                                         | Disabled, All inputs open                                                                    |      |                    | 280 | μA   |
|                                                                                     | Enabled, AnP = 1 V, AnM = 1.4 V, t <sub>c</sub> = 15.38 ns                                   |      | 60                 | 74  | mA   |
|                                                                                     | Enabled, C <sub>L</sub> = 8 pF, Grayscale pattern (see Figure 4), t <sub>c</sub> = 15.38 ns  |      | 74                 |     |      |
|                                                                                     | Enabled, C <sub>L</sub> = 8 pF, Worst-case pattern (see Figure 5), t <sub>c</sub> = 15.38 ns |      | 107                |     |      |
| I <sub>IH</sub> High-level input current ( $\overline{\text{SHTDN}}$ )              | V <sub>IH</sub> = V <sub>CC</sub>                                                            |      |                    | ±20 | μA   |
| I <sub>IL</sub> Low-level input current ( $\overline{\text{SHTDN}}$ )               | V <sub>IL</sub> = 0                                                                          |      |                    | ±20 | μA   |
| I <sub>IN</sub> Input current (LVDS input terminals A and CLKIN)                    | 0 ≤ V <sub>I</sub> ≤ 2.4 V                                                                   |      |                    | ±20 | μA   |
| I <sub>OZ</sub> High-impedance output current                                       | V <sub>O</sub> = 0 or V <sub>CC</sub>                                                        |      |                    | ±10 | μA   |

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

(2) The algebraic convention, in which the less-positive (more-negative) limit is designed minimum, is used in this data sheet for the negative-going input voltage threshold only.

## SWITCHING CHARACTERISTICS

over recommended operating conditions (unless otherwise noted)

| PARAMETER                                                                             | TEST CONDITIONS                                                                 | MIN | TYP <sup>(1)</sup>  | MAX | UNIT |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----|---------------------|-----|------|
| t <sub>su2</sub> Setup time, D0–D27 valid to CLKOUT↓                                  | C <sub>L</sub> = 8 pF, See Figure 6                                             | 5   |                     |     | ns   |
| t <sub>h2</sub> Hold time, CLKOUT↓ to D0–D27 valid                                    | C <sub>L</sub> = 8 pF, See Figure 6                                             | 5   |                     |     | ns   |
| t <sub>RSKM</sub> Receiver input skew margin <sup>(2)</sup> (see Figure 7)            | t <sub>c</sub> = 15.38 ns (± 0.2%),  Input clock jitter  < 50 ps <sup>(3)</sup> | 490 |                     |     | ps   |
| t <sub>d</sub> Delay time, CLKIN↑ to CLKOUT↓ (see Figure 7)                           | t <sub>c</sub> = 15.38 ns (± 0.2%), C <sub>L</sub> = 8 pF                       |     | 3.7                 |     | ns   |
| Δt <sub>c(o)</sub> Cycle time, change in output clock period <sup>(4)</sup>           | t <sub>c</sub> = 15.38 + 0.75 sin (2π500E3t) ± 0.05 ns, See Figure 8            |     | ±80                 |     | ps   |
|                                                                                       | t <sub>c</sub> = 15.38 + 0.75 sin (2π3E6t) ± 0.05 ns, See Figure 8              |     | ±300                |     |      |
| t <sub>en</sub> Enable time, $\overline{\text{SHTDN}}$ ↑ to Dn valid                  | See Figure 9                                                                    |     | 1                   |     | ms   |
| t <sub>dis</sub> Disable time, $\overline{\text{SHTDN}}$ ↓ to off state               | See Figure 10                                                                   |     | 400                 |     | ns   |
| t <sub>t</sub> Transition time, output (10% to 90% t <sub>r</sub> or t <sub>f</sub> ) | C <sub>L</sub> = 8 pF                                                           |     | 3                   |     | ns   |
| t <sub>w</sub> Pulse duration, output clock                                           |                                                                                 |     | 0.43 t <sub>c</sub> |     | ns   |

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

(2) The parameter t<sub>RSKM</sub> is the timing margin available to the transmitter and interconnection skews and clock jitter. It is defined by t<sub>c</sub>/14 − t<sub>su1</sub>/t<sub>h1</sub>.

(3) |Input clock jitter| is the magnitude of the change in input clock period.

(4) Δt<sub>c(o)</sub> is the change in the output clock period from one cycle to the next cycle observed over 15000 cycles.

## PARAMETER MEASUREMENT INFORMATION

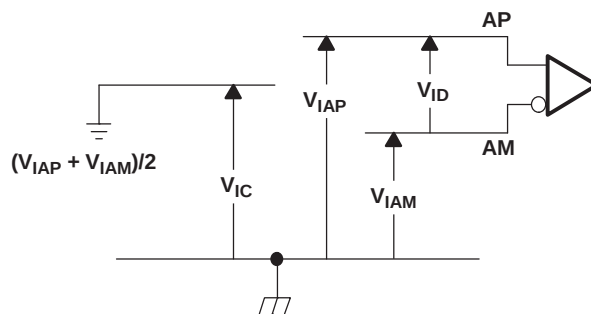


Figure 2. Voltage Definitions

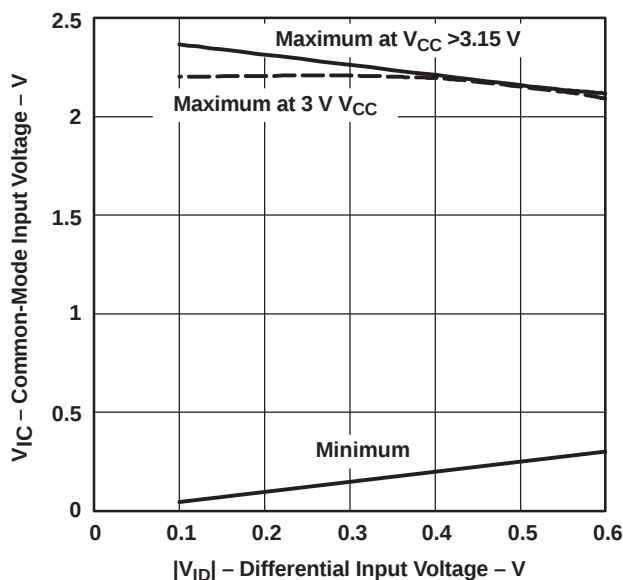
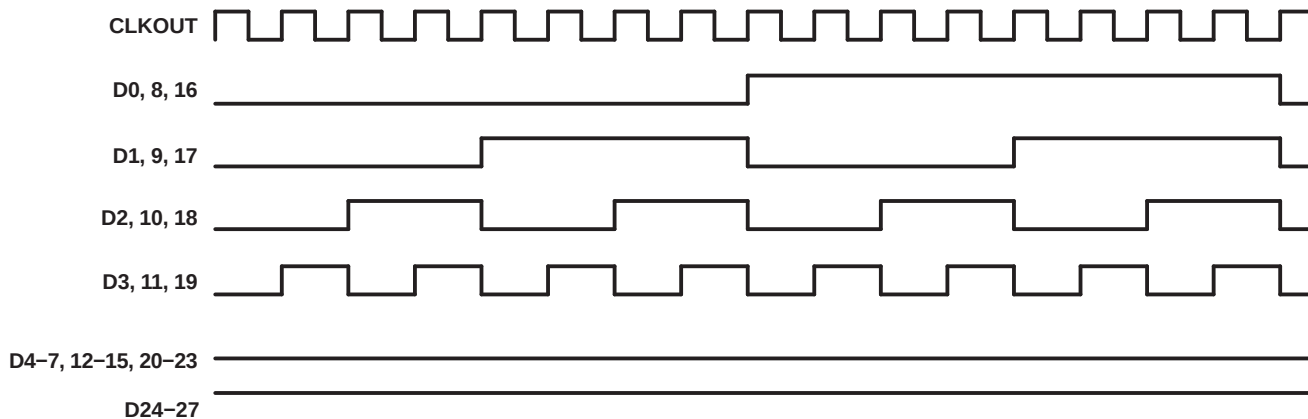


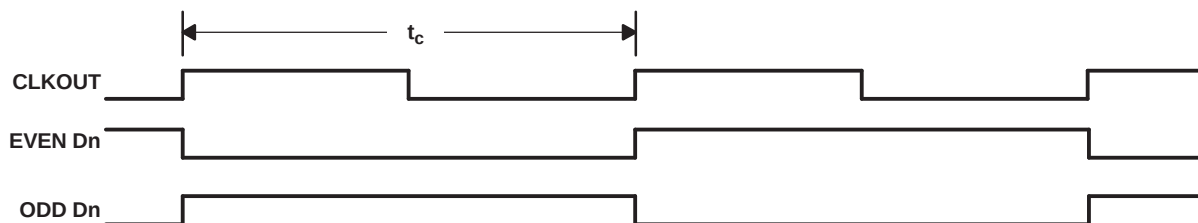
Figure 3. Common-Mode Input Voltage vs Differential Input Voltage



NOTE A: The 16-grayscale test-pattern tests device power consumption for a typical display pattern.

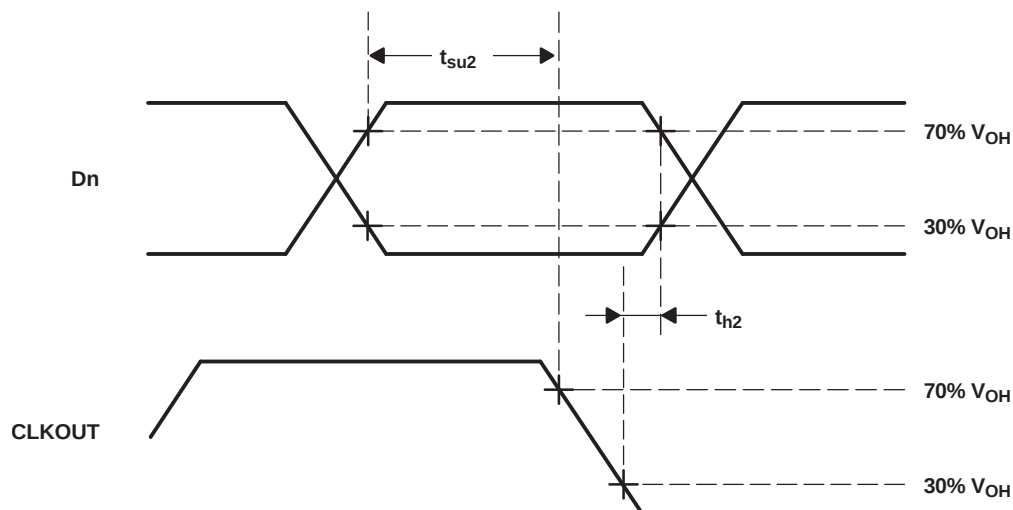
Figure 4. 16-Grayscale Test-Pattern Waveforms

**PARAMETER MEASUREMENT INFORMATION (continued)**

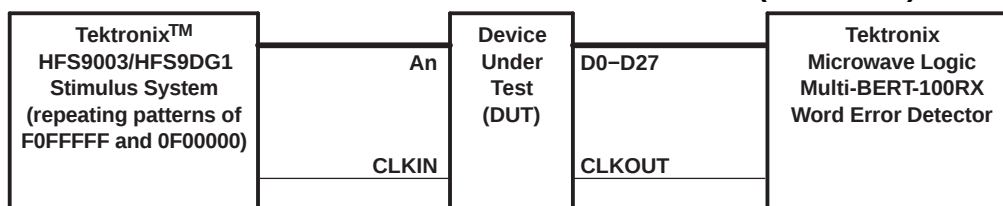


NOTE A: The worst-case test pattern produces the maximum switching frequency for all of the outputs.

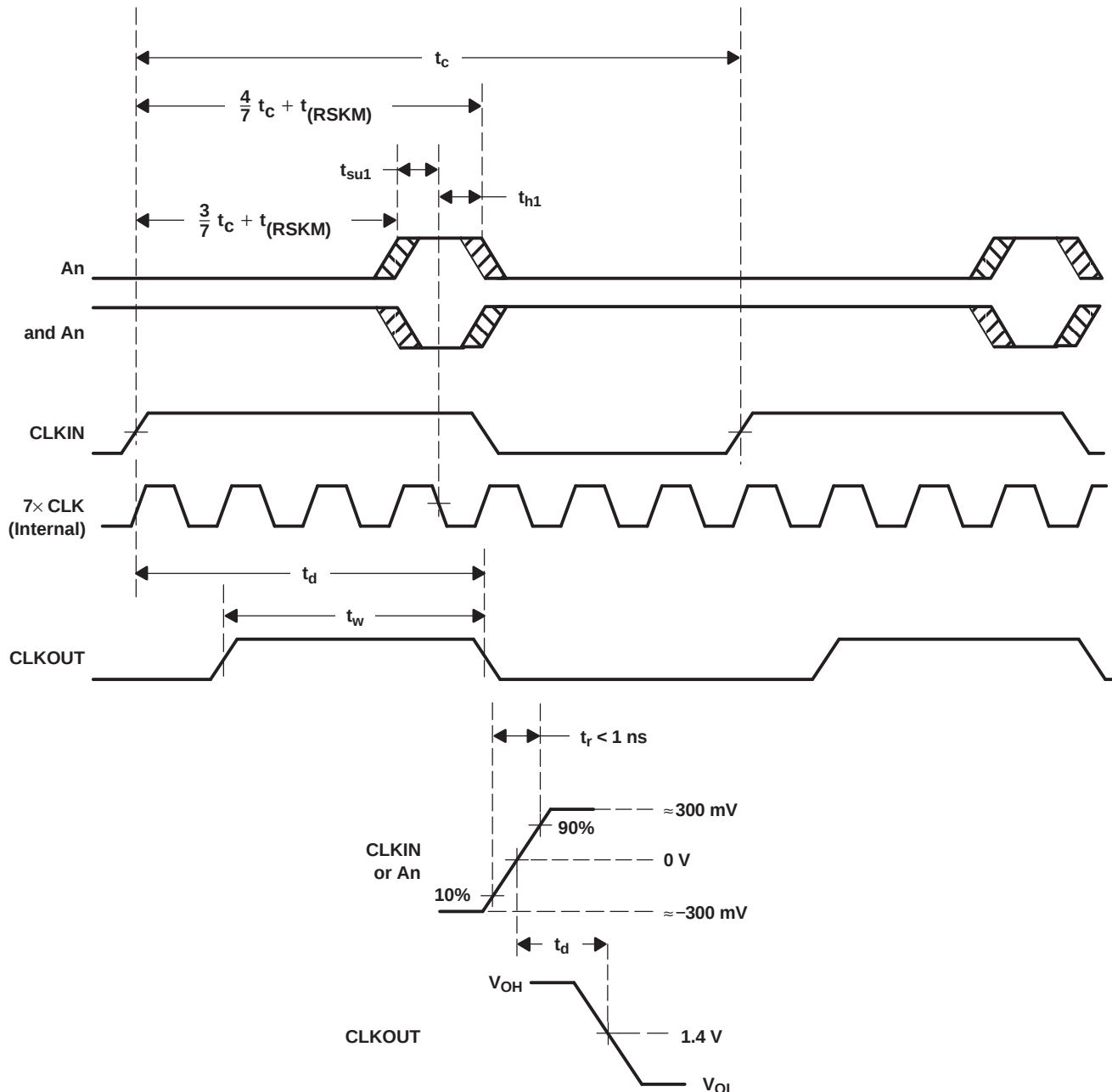
**Figure 5. Worst-Case Test-Pattern Waveforms**



**Figure 6. Setup and Hold Time Waveforms**

**PARAMETER MEASUREMENT INFORMATION (continued)**

- A. CLKIN is advanced or delayed with respect to data until errors are observed at the receiver outputs. The magnitude of the advance or delay is  $t_{(RSKM)}$ .



**Figure 7. Receiver Input Skew Margin and Delay Timing Waveforms**

# PARAMETER MEASUREMENT INFORMATION (continued)

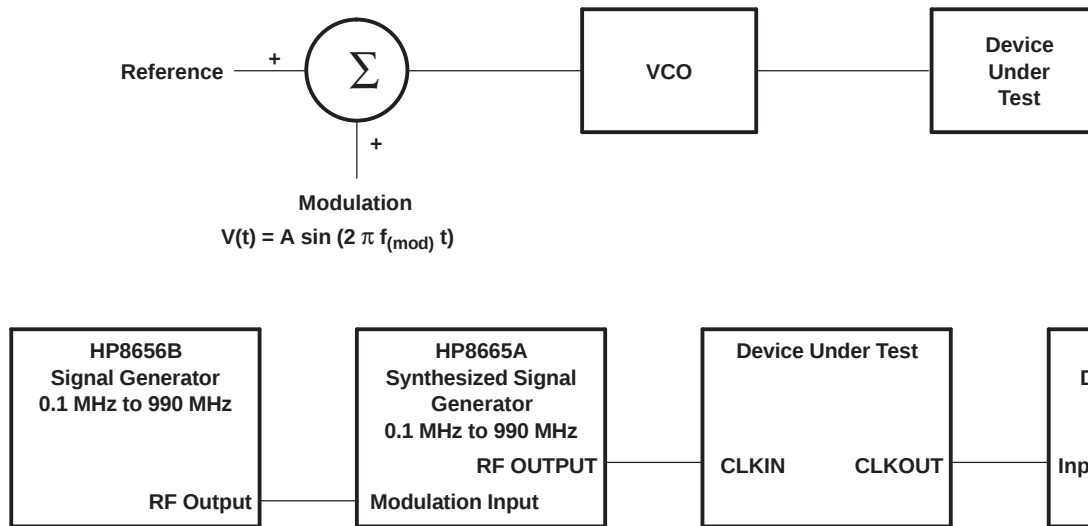


Figure 8. Input Clock Jitter Test

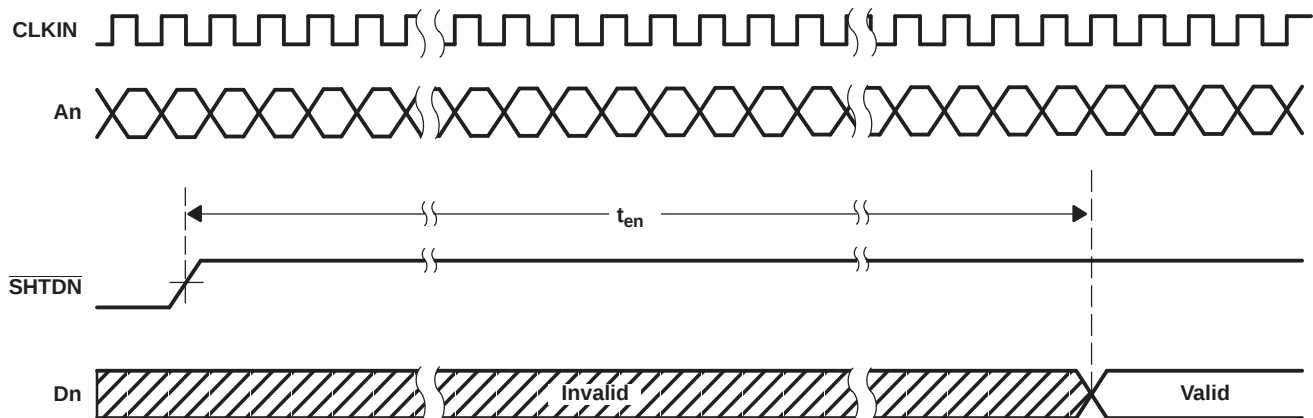


Figure 9. Enable Time Waveforms

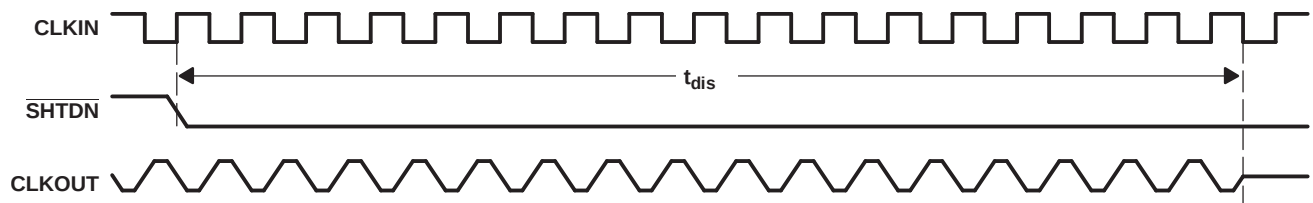


Figure 10. Disable Time Waveforms

## TYPICAL CHARACTERISTICS

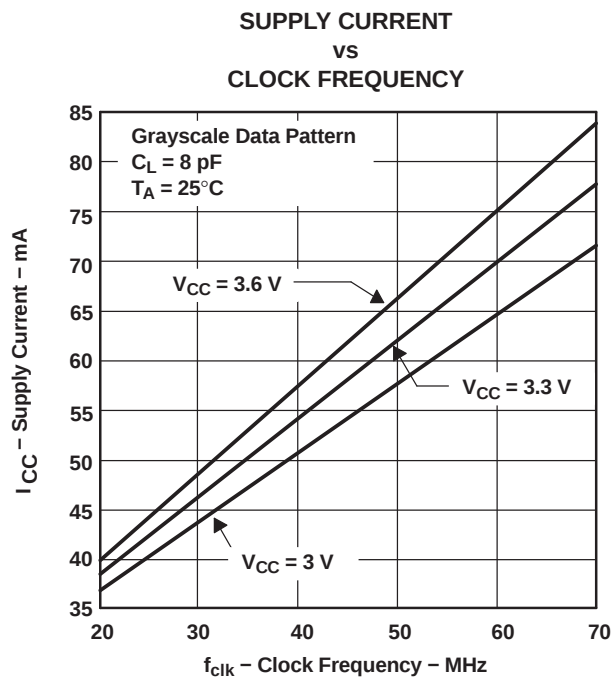


Figure 11.

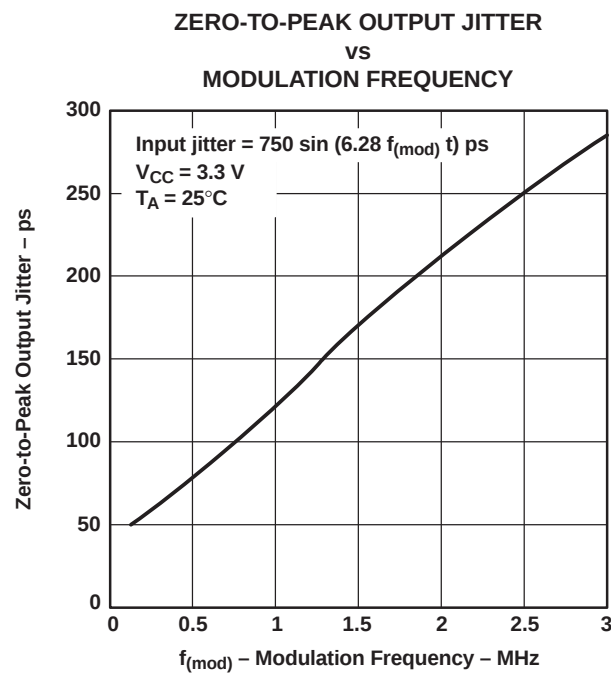
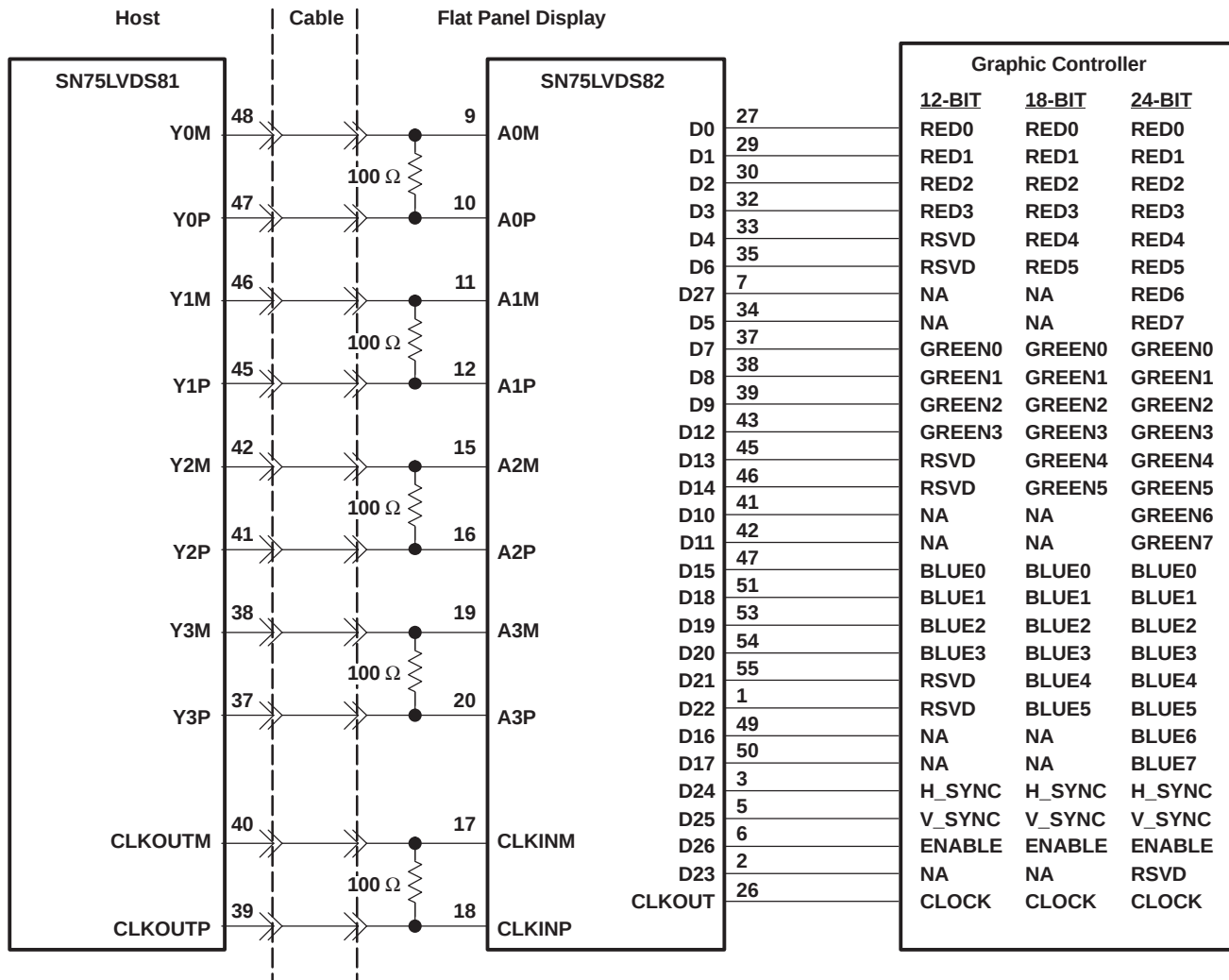


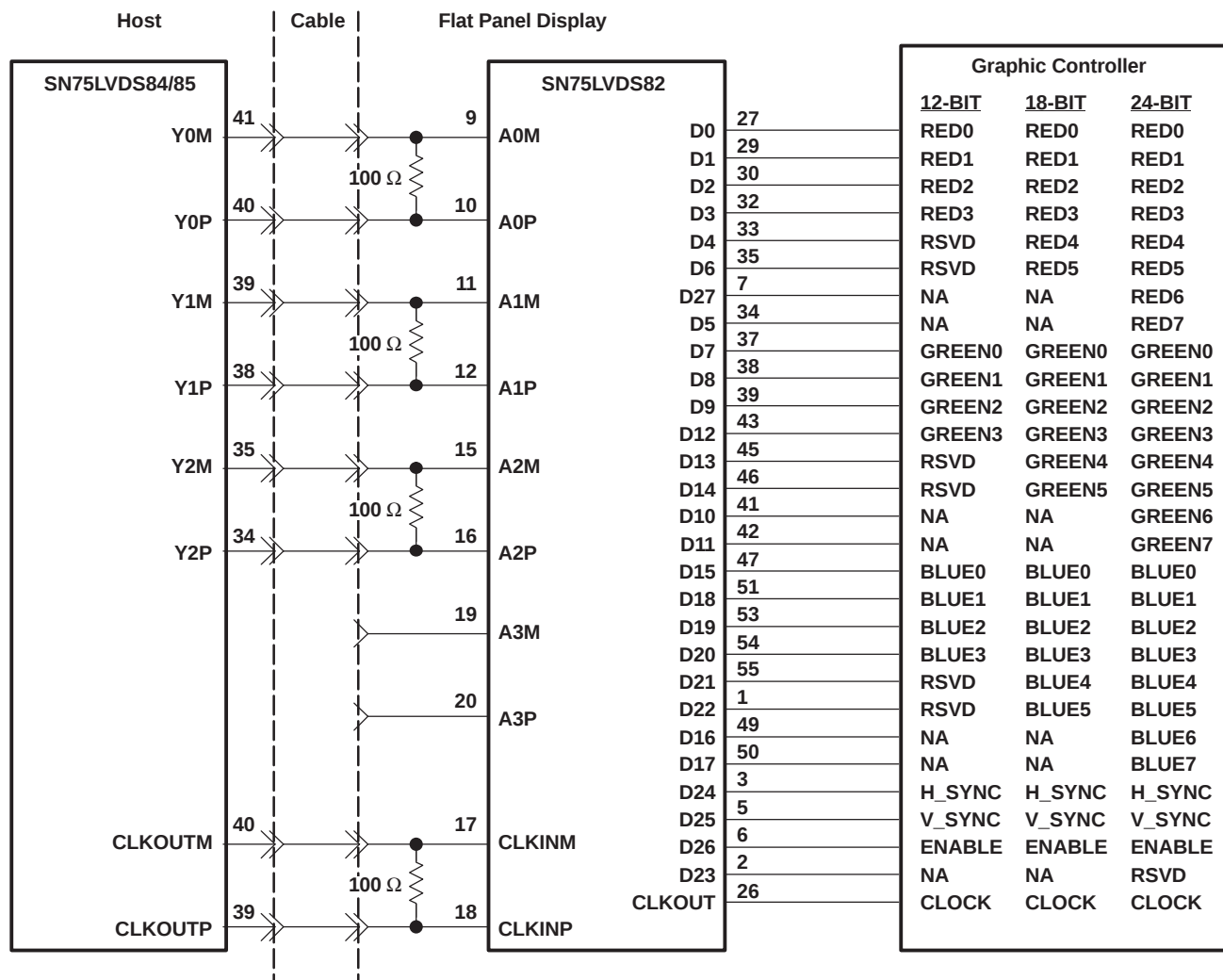
Figure 12.

# APPLICATION INFORMATION



- A. The five 100-Ω terminating resistors are recommended to be 0603 types.
- B. NA — not applicable, these unused inputs should be left open.

**Figure 13. 24-Bit Color Host to 24-Bit LCD Flat Panel Display Application**



A. The four 100-Ω terminating resistors are recommended to be 0603 types.

B. NA — not applicable, these unused inputs should be left open.

**Figure 14. 18-Bit Color Host to 24-Bit Color LCD Panel Display Application**

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4) | Samples                 |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| SN75LVDS82DGG    | ACTIVE        | TSSOP        | DGG                | 56   | 35          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR  | 0 to 70      | SN75LVDS82               | <a href="#">Samples</a> |
| SN75LVDS82DGGG4  | ACTIVE        | TSSOP        | DGG                | 56   | 35          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR  | 0 to 70      | SN75LVDS82               | <a href="#">Samples</a> |
| SN75LVDS82DGGGR  | ACTIVE        | TSSOP        | DGG                | 56   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR  | 0 to 70      | SN75LVDS82               | <a href="#">Samples</a> |
| SN75LVDS82DGGRG4 | ACTIVE        | TSSOP        | DGG                | 56   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR  | 0 to 70      | SN75LVDS82               | <a href="#">Samples</a> |

(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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

(4) Only one of markings shown within the brackets will appear on the physical device.

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## DGG (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE PACKAGE

48 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 protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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### Products

|                              |                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------|
| Audio                        | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                               |
| Amplifiers                   | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
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| DLP® Products                | <a href="http://www.dlp.com">www.dlp.com</a>                                         |
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| RFID                         | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Applications Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity        | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |                                                                                          |
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| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
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