

## FLATLINK™ RECEIVER

### FEATURES

- **4:28 Data Channel Expansion at up to 227.5 Million Bytes per Second (Mbytes/s) Throughput**
- **Suited for SVGA, XGA, or SXGA Display Data Transmission From Controller to Display With Very Low EMI**
- **4 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  $\overline{\text{SHTDN}}$  Input**
- **Falling Clock-Edge-Triggered Outputs**
- **Packaged in Thin Shrink Small-Outline Package With 20-Mil Terminal Pitch**
- **Consumes Less Than 1 mW When Disabled**
- **Wide Phase-Lock Input Frequency Range . . . 20 MHz to 68 MHz**
- **No External Components Required for PLL**
- **Inputs Meet or Exceed the Requirements of the 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.

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 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).

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 ( $\overline{\text{SHTDN}}$ ) active-low input to inhibit the clock and shut off the LVDS receivers for lower power consumption. A low-level on  $\overline{\text{SHTDN}}$  clears all internal registers to a low level.

**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
$\overline{\text{SHTDN}}$	25	32	D3
CLKOUT	26	31	V <sub>CC</sub>
D0	27	30	D2
GND	28	29	D1

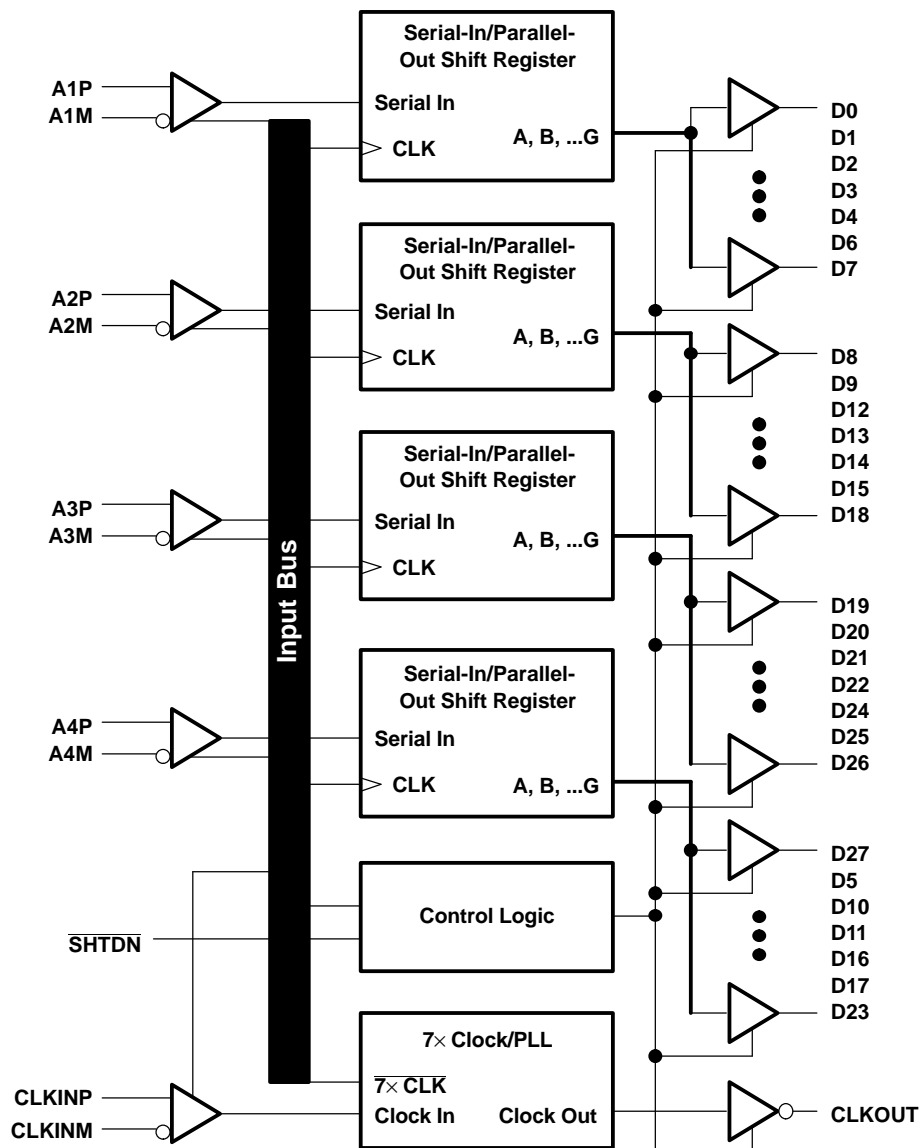


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The SN75LVDS82 is characterized for operation over ambient air temperatures of 0°C to 70°C.

### FUNCTIONAL BLOCK DIAGRAM



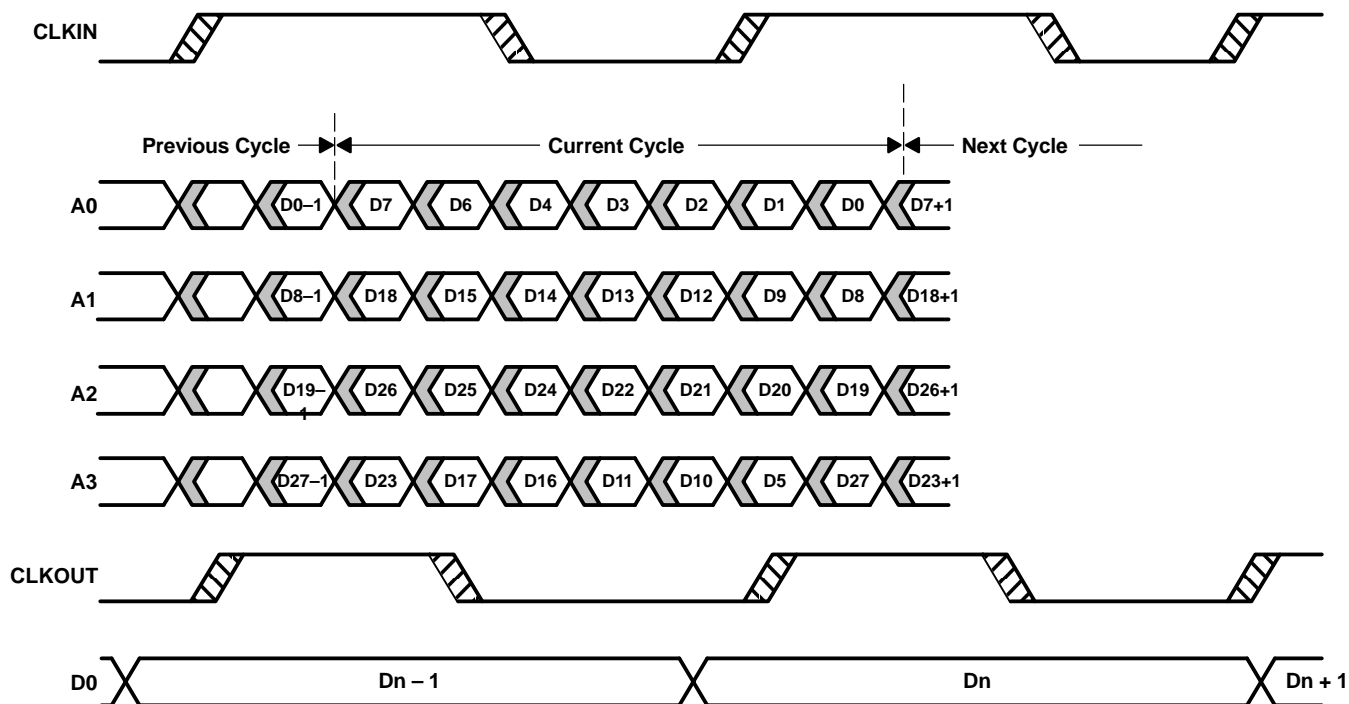
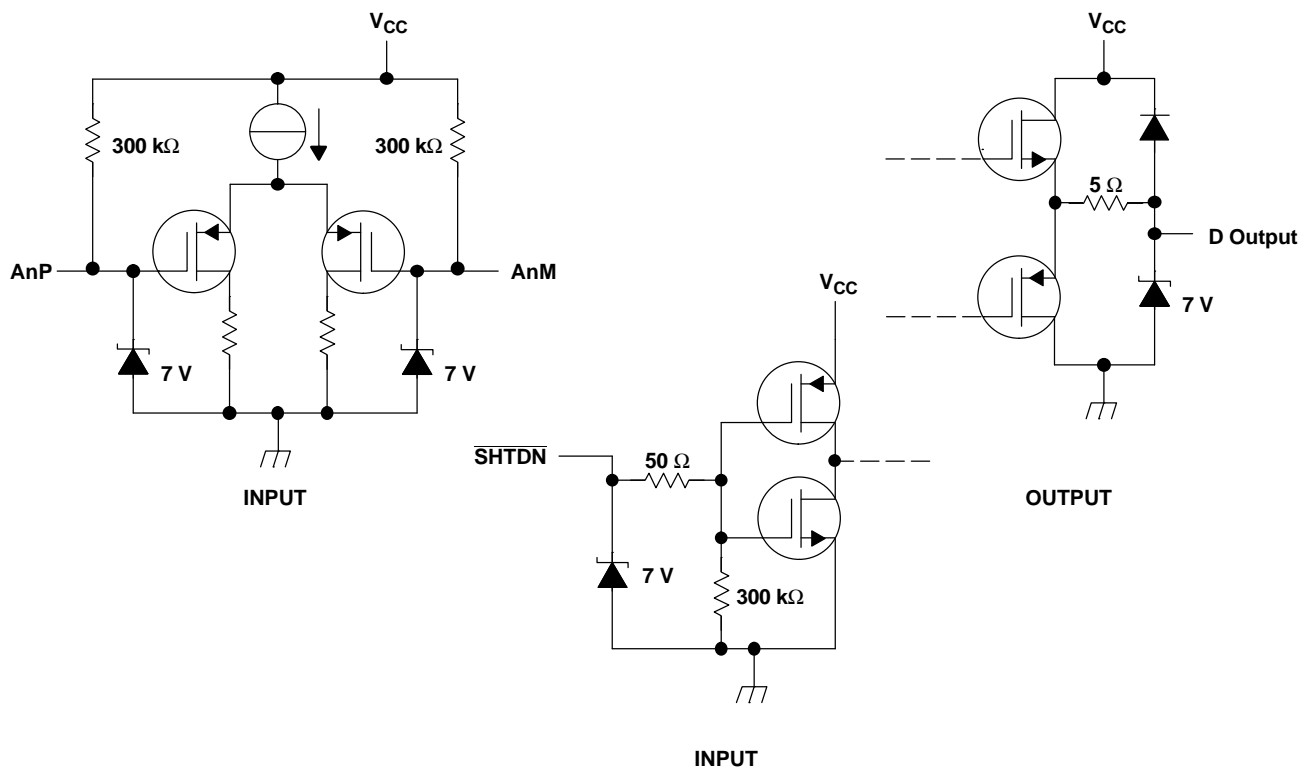


Figure 1. SN75LVDS82 Load and Shift Timing Sequences

## EQUIVALENT INPUT AND OUTPUT SCHEMATIC DIAGRAMS



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

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

	UNIT
$V_{CC}$ Supply voltage range <sup>(2)</sup>	–0.5 V to 4 V
$V_O$ Output voltage range (Dxx terminals)	–0.5 V to $V_{CC} + 0.5$ V
$V_I$ Input voltage range (any terminal except SHTDN)	–0.5 V to $V_{CC} + 0.5$ V
Input voltage range (SHTDN)	–0.5 V to 5.5 V
Continuous total power dissipation	See Dissipation Rating Table
$T_A$ Operating temperature range	0°C to 70°C
$T_{stg}$ Storage temperature range	–65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	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	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR <sup>(1)</sup> ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ 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
$V_{CC}$ Supply voltage	3	3.3	3.6	V
$V_{IH}$ High-level input voltage (SHTDN)	2			V
$V_{IL}$ Low-level input voltage (SHTDN)			0.8	V
$ V_{ID} $ Differential input voltage	0.1		0.6	V
$V_{IC}$ Common-mode input voltage (see Figure 2 and Figure 3)	$\frac{ V_{ID} }{2}$	$2.4 - \frac{ V_{ID} }{2}$		V
		$V_{CC} - 0.8$		
$T_A$ Operating free-air temperature	0		70	°C

**TIMING REQUIREMENTS**

	MIN	NOM	MAX	UNIT
$t_c$ Cycle time, input clock <sup>(1)</sup>	14.7		50.0	ns
$t_{su1}$ Setup time, input (see Figure 7)	600			ps
$t_{h1}$ Hold time, input (see Figure 7)	600			ps

- (1) Parameter  $t_c$  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		mA
	Enabled, C <sub>L</sub> = 8 pF, Worst-case pattern (see Figure 5), t <sub>c</sub> = 15.38 ns		107		mA
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		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

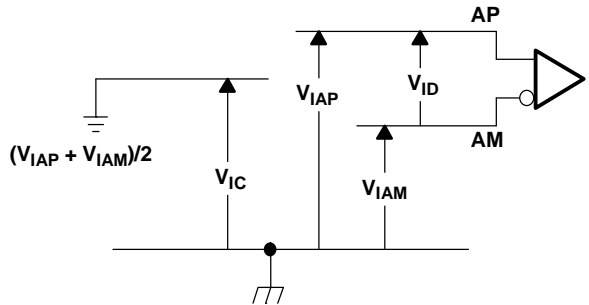


Figure 2. Voltage Definitions

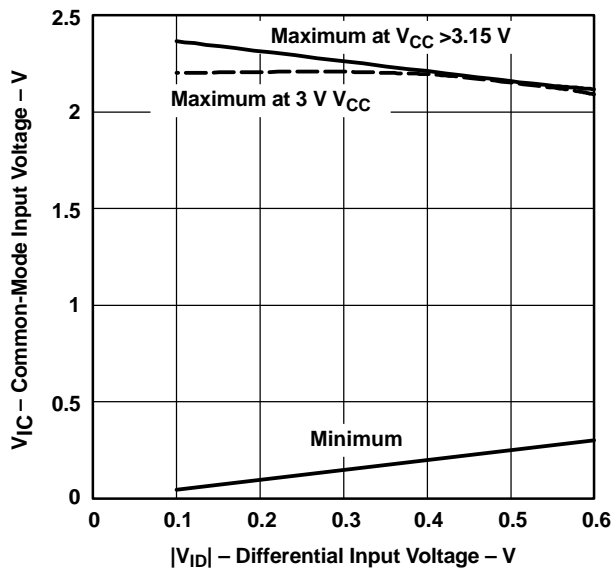
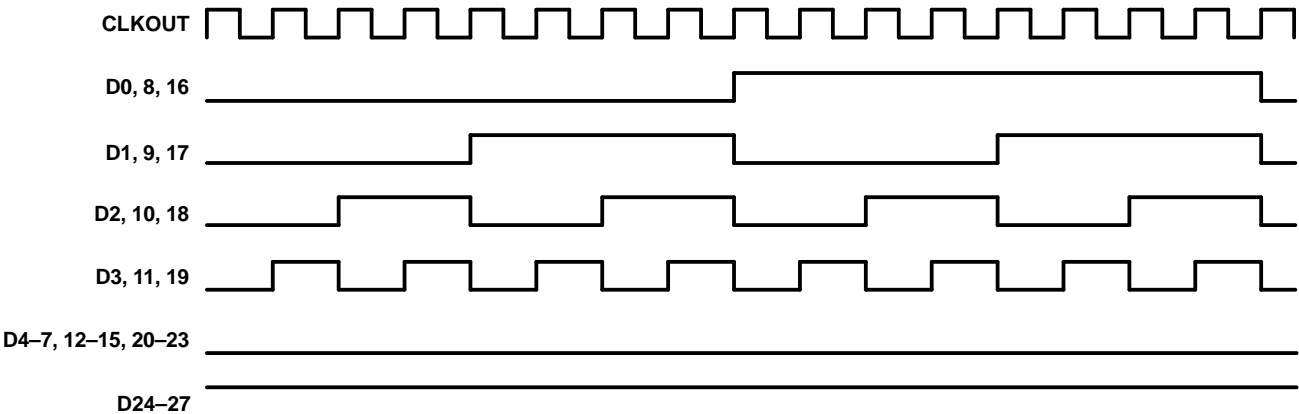


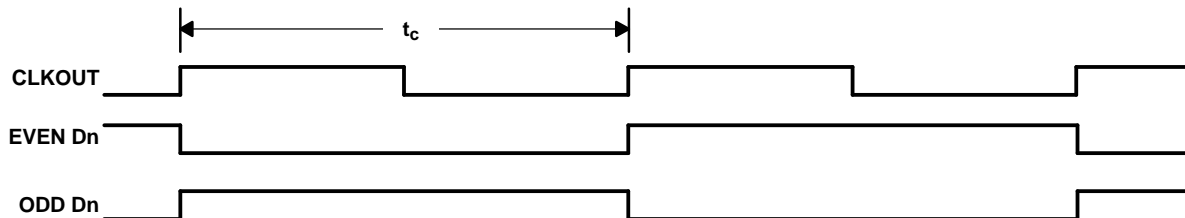
Figure 3. Common-Mode Input Voltage vs Differential Input Voltage



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

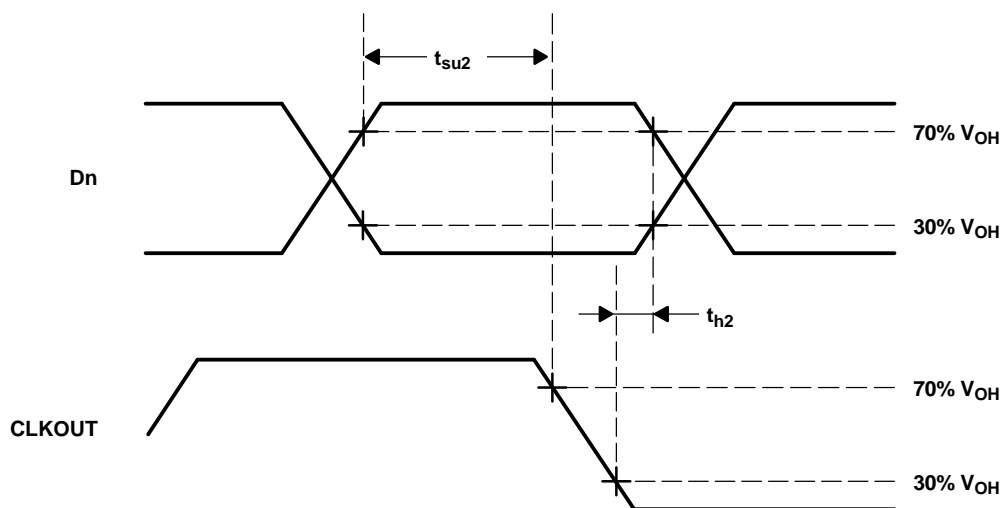
Figure 4. 16-Grayscale Test-Pattern Waveforms

## 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**

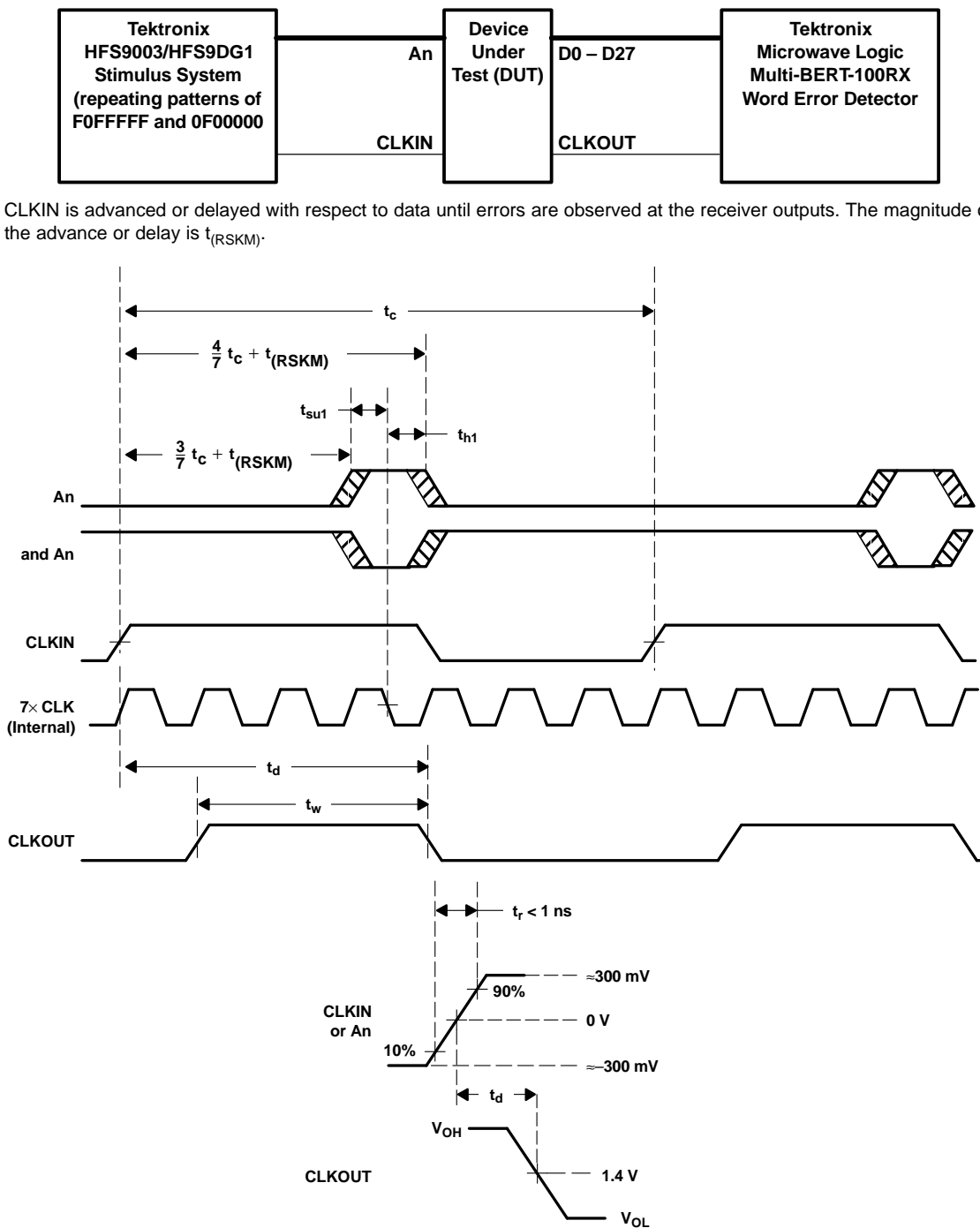


Figure 7. Receiver Input Skew Margin and Delay Timing Waveforms



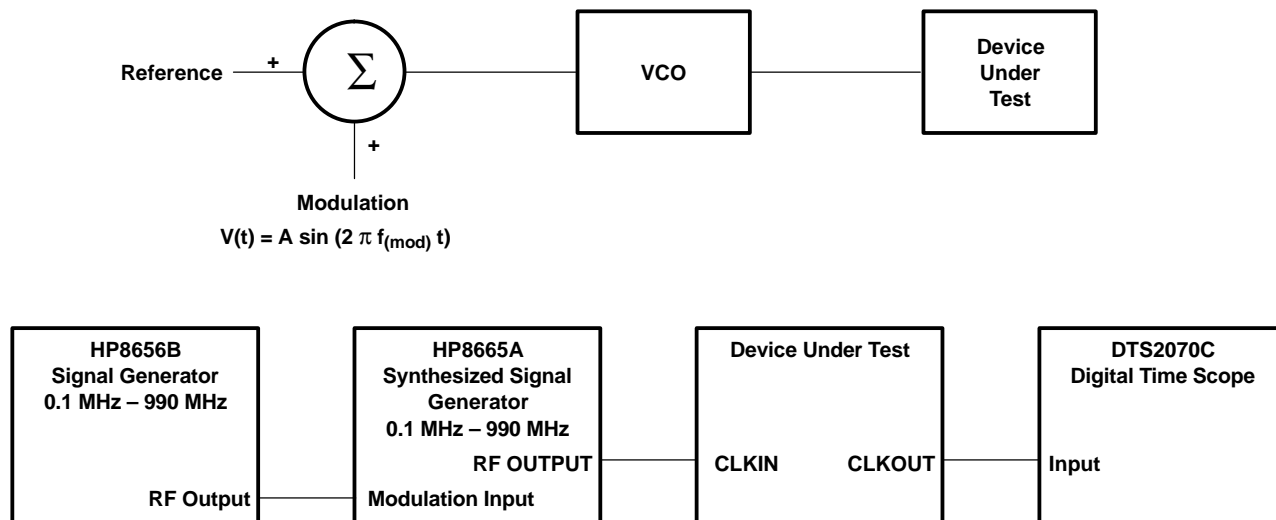


Figure 8. Input Clock Jitter Test

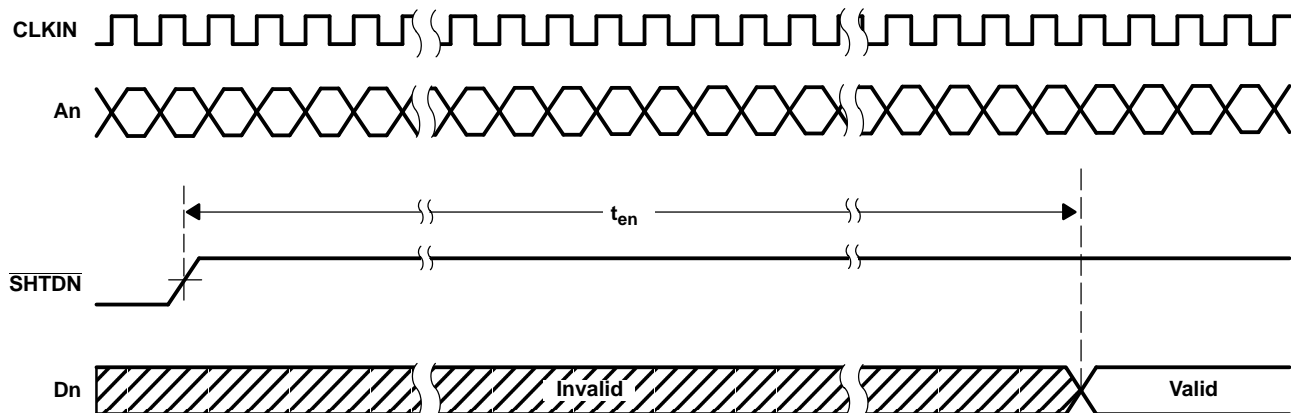


Figure 9. Enable Time Waveforms

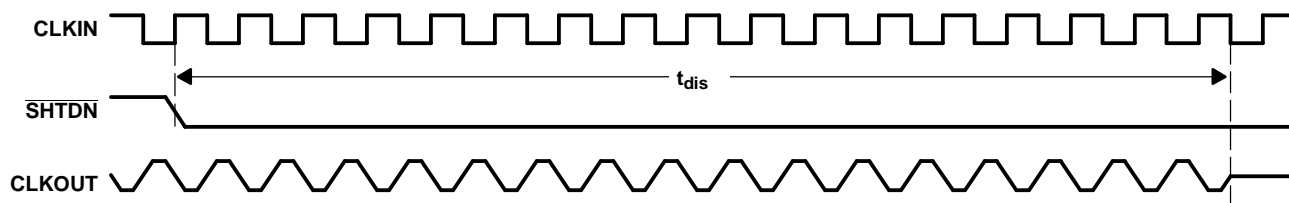


Figure 10. Disable Time Waveforms

**TYPICAL CHARACTERISTICS**  
**SUPPLY CURRENT**  
**vs**  
**CLOCK FREQUENCY**

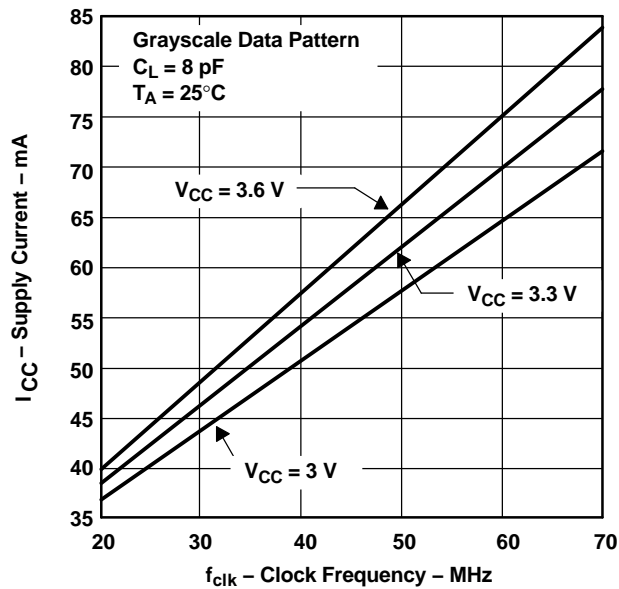


Figure 11.

**ZERO-TO-PEAK OUTPUT JITTER**  
**vs**  
**MODULATION FREQUENCY**

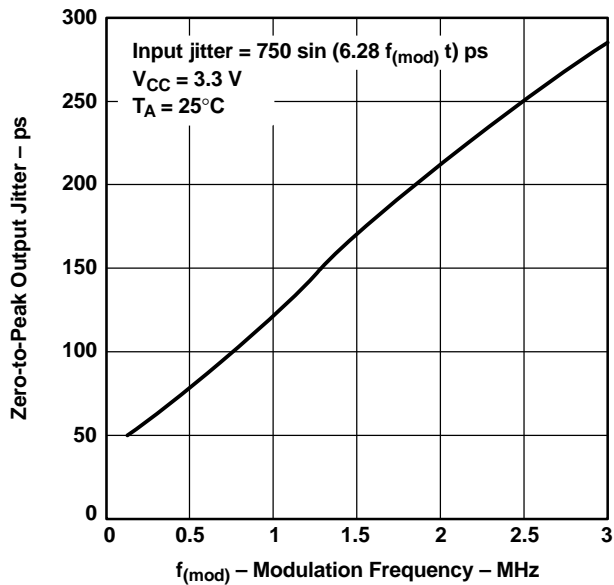
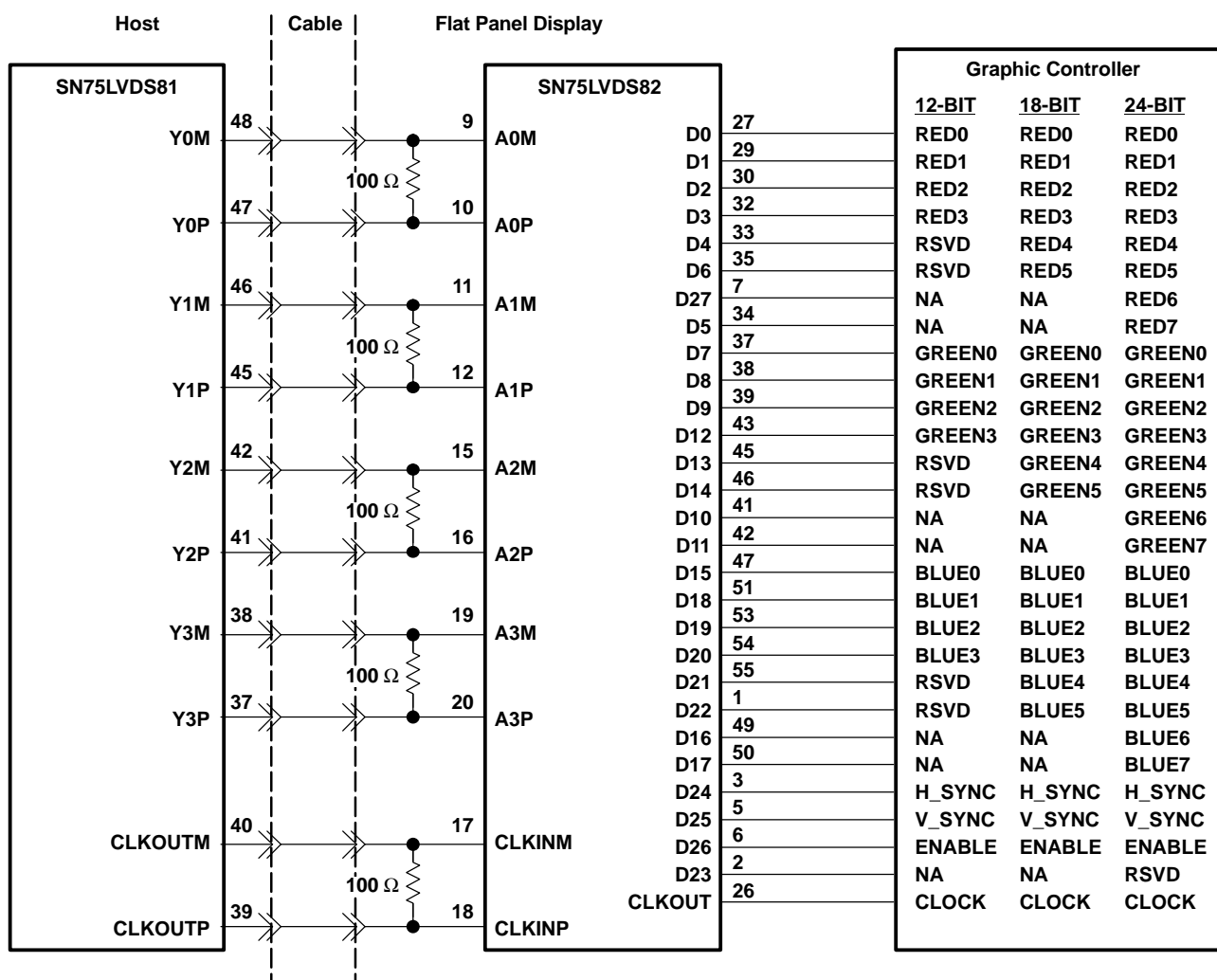


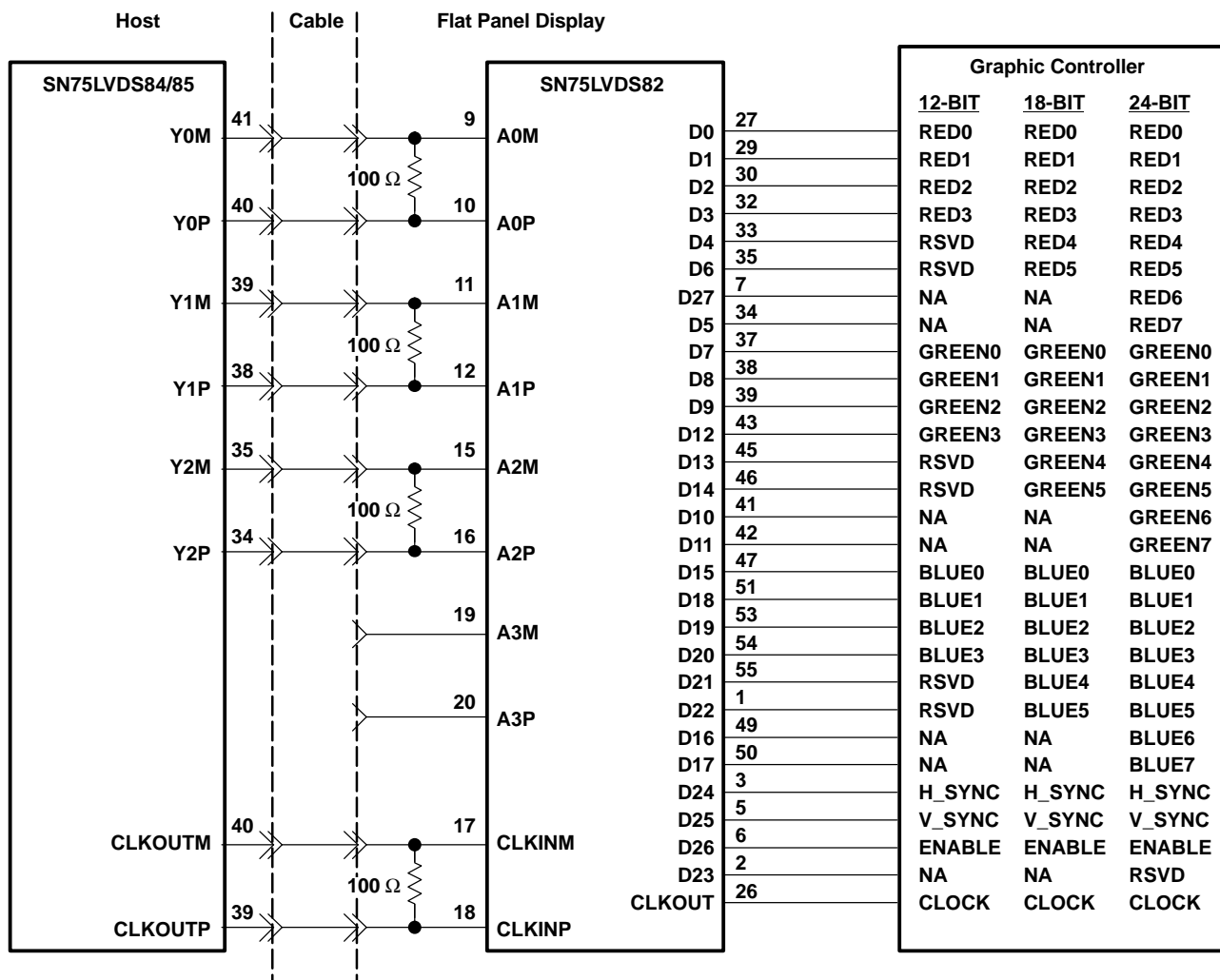
Figure 12.

## 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

**APPLICATION INFORMATION (continued)**

- 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**

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DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
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