- **4:28 Data Channel Compression at up to 238 MBytes/s Throughput**
- **Suited for SVGA, XGA, or SXGA Display Data Transmission From Controller to Display With Very Low EMI**
- **28 Data Channels and Clock-In Low-Voltage TTL**
- **4 Data Channels and Clock-Out Low-Voltage Differential**
- **Operates From a Single 3.3-V Supply With 250 mW (Typ)**
- **ESD Protection Exceeds 6 kV**
- **5-V Tolerant Data Inputs**
- **Selectable Rising or Falling Edge-Triggered Inputs**
- **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 . . . 31 MHz to 68 MHz**
- **No External Components Required for PLL**
- **Outputs Meet or Exceed the Requirements of ANSI EIA/TIA-644 Standard**
- **Improved Replacement for the DS90C581**

DGG PACKAGE
(TOP VIEW)

V_{CC}	1	56	D4
D5	2	55	D3
D6	3	54	D2
D7	4	53	GND
GND	5	52	D1
D8	6	51	D0
D9	7	50	D27
D10	8	49	LVDSGND
V_{CC}	9	48	Y0M
D11	10	47	Y0P
D12	11	46	Y1M
D13	12	45	Y1P
GND	13	44	$LVDSV_{CC}$
D14	14	43	LVDSGND
D15	15	42	Y2M
D16	16	41	Y2P
CLKSEL	17	40	CLKOUTM
D17	18	39	CLKOUTP
D18	19	38	Y3M
D19	20	37	Y3P
GND	21	36	LVDSGND
D20	22	35	PLLGND
D21	23	34	$PLLV_{CC}$
D22	24	33	PLLGND
D23	25	32	$\overline{\text{SHTDN}}$
V_{CC}	26	31	CLKIN
D24	27	30	D26
D25	28	29	GND

description

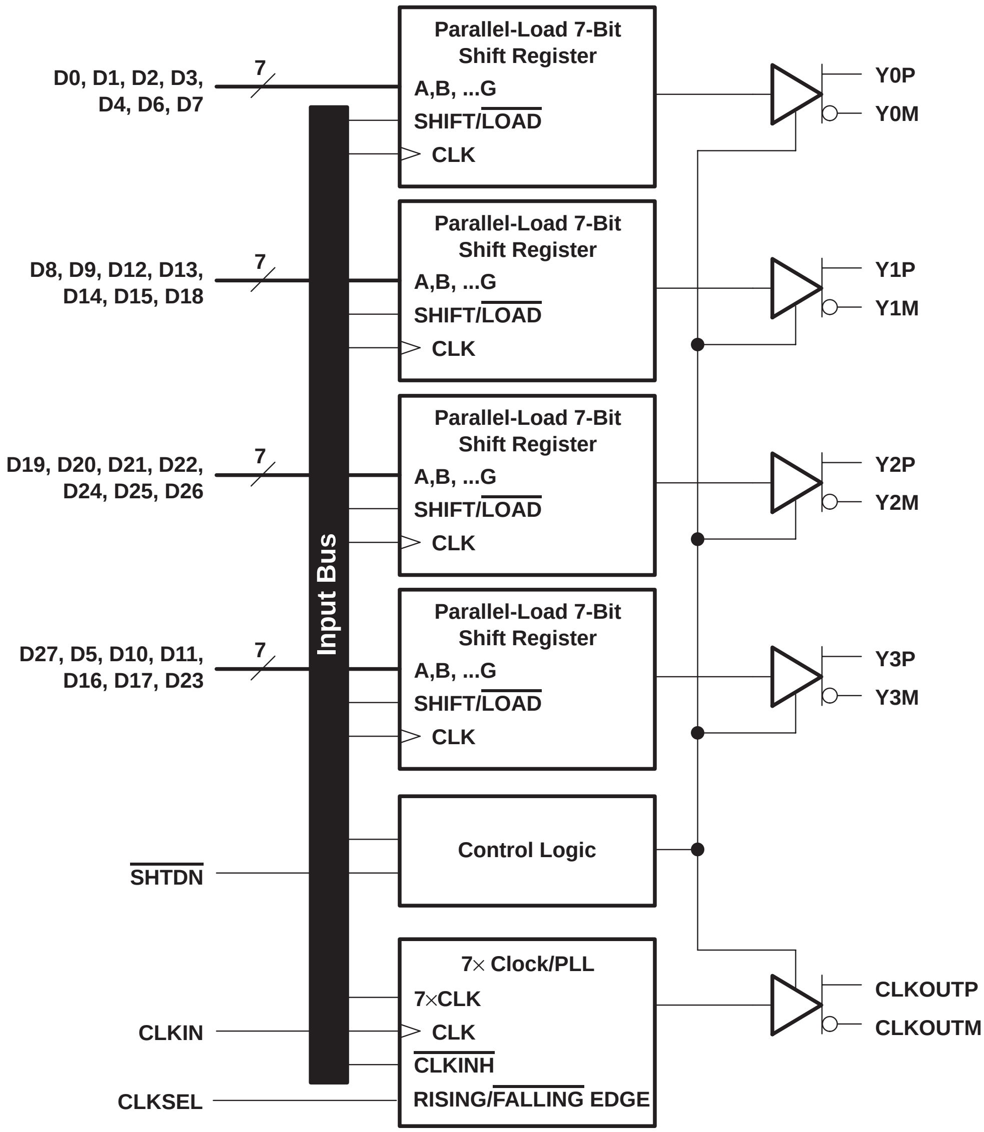
The SN75LVDS83 FlatLink transmitter contains four 7-bit parallel-load serial-out shift registers, a 7× clock synthesizer, and five low-voltage differential-signaling (LVDS) line drivers in a single integrated circuit. These functions allow 28 bits of single-ended low-voltage TTL (LVTTL) data to be synchronously transmitted over five balanced-pair conductors for receipt by a compatible receiver, such as the SN75LVDS82. The SN75LVDS83 can also be used in 21-bit links with the SN75LVDS86 receiver.

When transmitting, data bits D0 through D27 are each loaded into registers upon the edge of the input clock signal (CLKIN). The rising or falling edge of the clock can be selected by way of the clock select (CLKSEL) terminal. The frequency of CLKIN is multiplied seven times (7×) and then used to unload the data registers in 7-bit slices and serially. The four serial streams and a phase-locked clock (CLKOUT) are then output to LVDS output drivers. The frequency of CLKOUT is the same as the input clock, CLKIN.

The SN75LVDS83 requires no external components 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 user intervention is the possible use of the shutdown/clear ($\overline{\text{SHTDN}}$) active-low input to inhibit the clock and shut off the LVDS output drivers for lower power consumption. A low-level signal on $\overline{\text{SHTDN}}$ clears all internal registers to a low level.

The SN75LVDS83 is characterized for operation over free-air temperature ranges of 0°C to 70°C.

functional block diagram



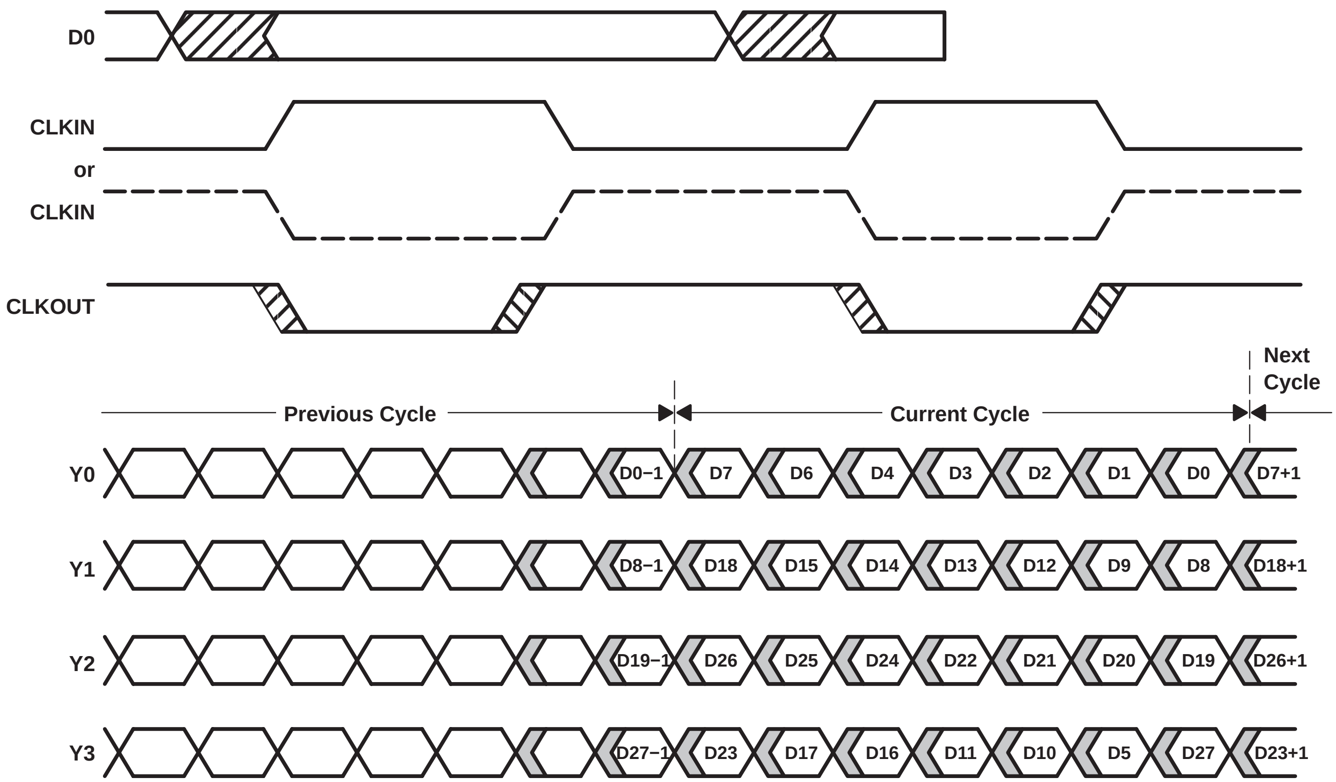
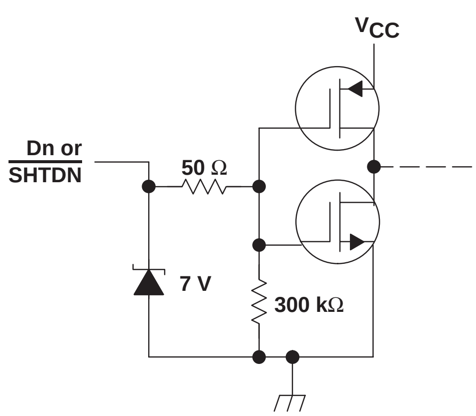
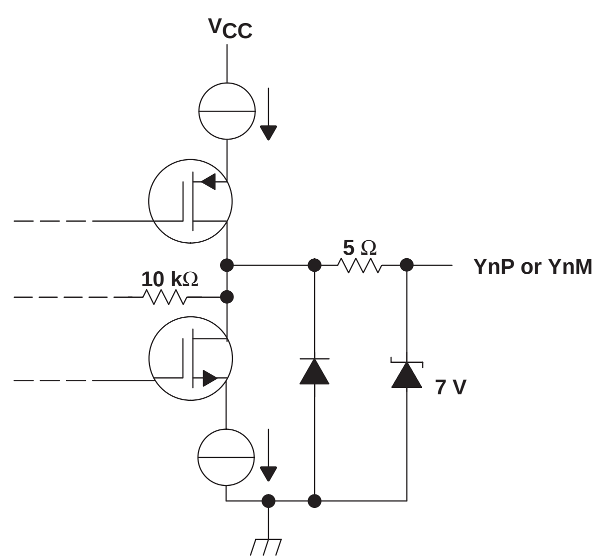


Figure 1. SN75LVDS83 Load and Shift Timing Sequences

equivalent input and output schematic diagrams



INPUT



OUTPUT

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage range, V_{CC} (see Note 1) . . . . −0.5 V to 4 V
Output voltage range, V_O (all terminals) . . . . −0.5 V to V_{CC} + 0.5 V
Input voltage range, V_I (all terminals) . . . . −0.5 V to 5.5 V
Continuous total power dissipation . . . . See Dissipation Rating Table
Storage temperature range, T_{stg} . . . . −65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . 260°C

† 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.

NOTE 1: All voltage values are with respect to the GND terminals.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR‡ ABOVE T_A = 25°C	T_A = 70°C POWER RATING
DGG	1377 mW	11.0 mW/°C	822 mW

‡ 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
Supply voltage, V_{CC}	3	3.3	3.6	V
High-level input voltage, V_{IH}	2			V
Low-level input voltage, V_{IL}			0.8	V
Differential load impedance, Z_L	90		132	Ω
Operating free-air temperature, T_A	0		70	°C

timing requirements

		MIN	NOM	MAX	UNIT
t_c	Cycle time, input clock	14.7		32.3	ns
t_w	Pulse duration, high-level input clock	$0.4t_c$		$0.6t_c$	ns
t_t	Transition time, input signal			5	ns
t_{su}	Setup time, data, D0 − D27 valid before CLKIN↑ or CLKIN↓ (see Figure 2)	3			ns
t_h	Hold time, data, D0 − D27 valid after CLKIN↑ or CLKIN↓ (see Figure 2)	1.5			ns

electrical characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_{IT}	Input threshold voltage			1.4		V
$\lvert V_{OD} \rvert$	Differential steady-state output voltage magnitude	R_L = 100 Ω, See Figure 3	247		454	mV
$\Delta\lvert V_{OD} \rvert$	Change in the steady-state differential output voltage magnitude between opposite binary states	R_L = 100 Ω, See Figure 3			50	mV
$V_{OC(SS)}$	Steady-state common-mode output voltage	See Figure 3	1.125		1.375	V
$V_{OC(PP)}$	Peak-to-peak common-mode output voltage	See Figure 3			150	mV
I_{IH}	High-level input current	$V_{IH} = V_{CC}$			25	µA
I_{IL}	Low-level input current	V_{IL} = 0			±10	µA
I_{OS}	Short-circuit output current	$V_{O(Yn)}$ = 0			±24	mA
		V_{OD} = 0			±12	mA
I_{OZ}	High-impedance state output current	V_O = 0 to V_{CC}			±10	µA
I_{CC}	Quiescent supply current	Disabled, All inputs at GND			280	µA
		Enabled, R_L = 100 Ω, Gray-scale pattern (see Figure 4), V_{CC} = 3.3 V, t_c = 15.38 ns		72	90	mA
		Enabled, R_L = 100 Ω, Worst-case pattern (see Figure 5), t_c = 15.38 ns		85	110	mA
C_I	Input capacitance			3		pF

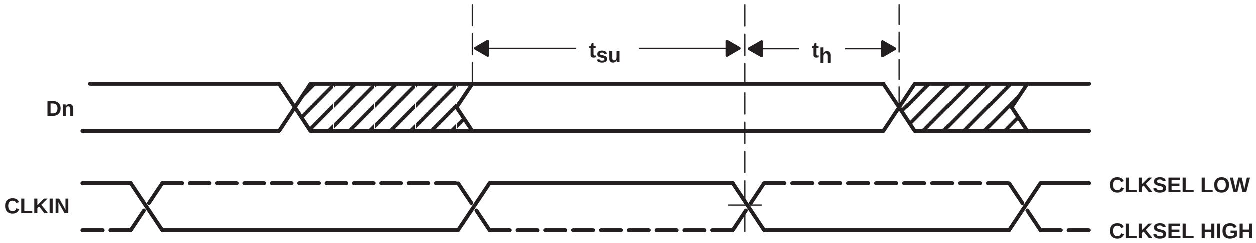
† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

switching characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
t_{d0}	Delay time, CLKOUT↑ to serial bit position 0	t_c = 15.38 ns (± 0.2%), |Input clock jitter| < 50 ps‡, See Figure 6	−0.2	0	0.2	ns
t_{d1}	Delay time, CLKOUT↑ to serial bit position 1		$\frac{1}{7}t_c - 0.2$		$\frac{1}{7}t_c + 0.2$	ns
t_{d2}	Delay time, CLKOUT↑ to serial bit position 2		$\frac{2}{7}t_c - 0.2$		$\frac{2}{7}t_c + 0.2$	ns
t_{d3}	Delay time, CLKOUT↑ to serial bit position 3		$\frac{3}{7}t_c - 0.2$		$\frac{3}{7}t_c + 0.2$	ns
t_{d4}	Delay time, CLKOUT↑ to serial bit position 4		$\frac{4}{7}t_c - 0.2$		$\frac{4}{7}t_c + 0.2$	ns
t_{d5}	Delay time, CLKOUT↑ to serial bit position 5		$\frac{5}{7}t_c - 0.2$		$\frac{5}{7}t_c + 0.2$	ns
t_{d6}	Delay time, CLKOUT↑ to serial bit position 6		$\frac{6}{7}t_c - 0.2$		$\frac{6}{7}t_c + 0.2$	ns
$t_{sk(o)}$	Output skew, $t_n - \frac{n}{7}t_c$		−0.2		0.2	ns
t_{d7}	Delay time, CLKIN↓ to CLKOUT↑	t_c = 18.51 ns (± 0.2%), |Input clock jitter| < 50 ps‡, See Figure 6	3.75	5.6	7.75	ns
$\Delta t_{c(o)}$	Cycle time, output clock jitter§	t_c = 15.38 ± 0.75 sin (2π500E3t) + 0.05 ns, See Figure 7		±70		ps
		t_c = 15.38 ± 0.75 sin (2π3E6t) + 0.05 ns, See Figure 7		±187		ps
t_w	Pulse duration, high-level output clock			$\frac{4}{7}t_c$		ns
t_t	Transition time, differential output (t_r or t_f)	See Figure 3	260	700	1500	ps
t_{en}	Enable time, $\overline{SHTDN}$↑ to phase lock (Yn valid)	See Figure 8		1		ms
t_{dis}	Disable time, $\overline{SHTDN}$↓ to off state (CLKOUT low)	See Figure 9		250		ns

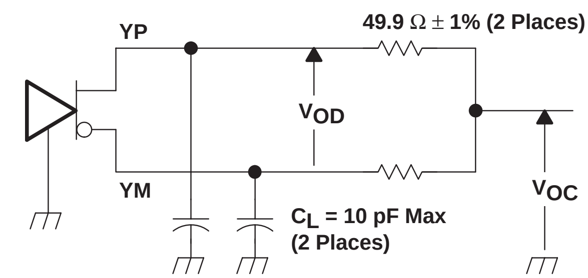
† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.
‡ |Input clock jitter| is the magnitude of the change in the input clock period.
§ Output clock jitter is the change in the output clock period from one cycle to the next cycle observed over 15 000 cycles.

PARAMETER MEASUREMENT INFORMATION



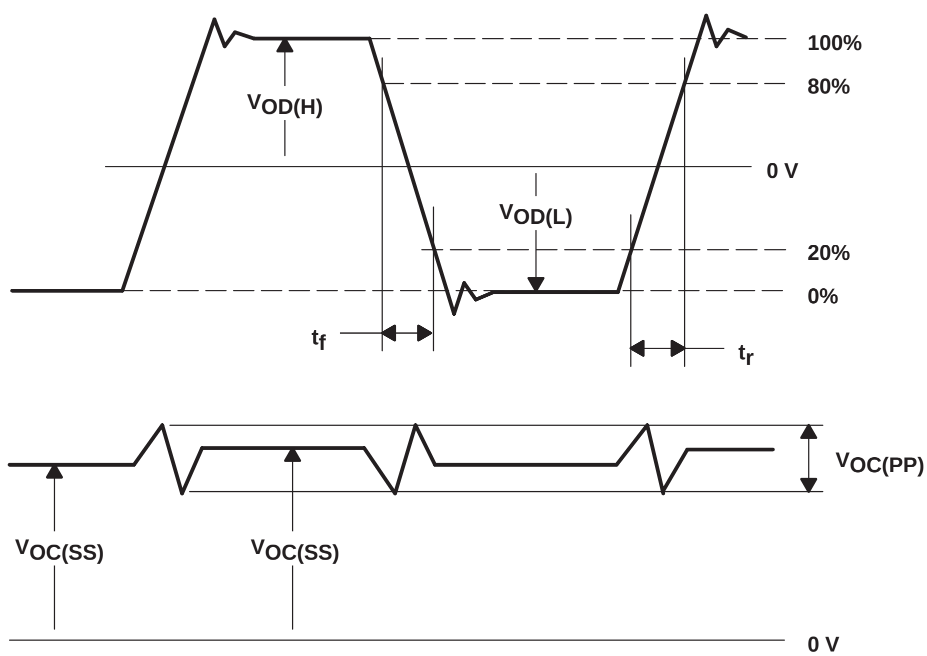
NOTE A: All input timing is defined at 1.4 V on an input signal with a 10%-to-90% rise or fall time of less than 5 ns.

Figure 2. Setup and Hold Time Waveforms



NOTE A: The lumped instrumentation capacitance for any single-ended voltage measurement is less than or equal to 10 pF. When making measurements at YP or YM, the complementary output is similarly loaded.

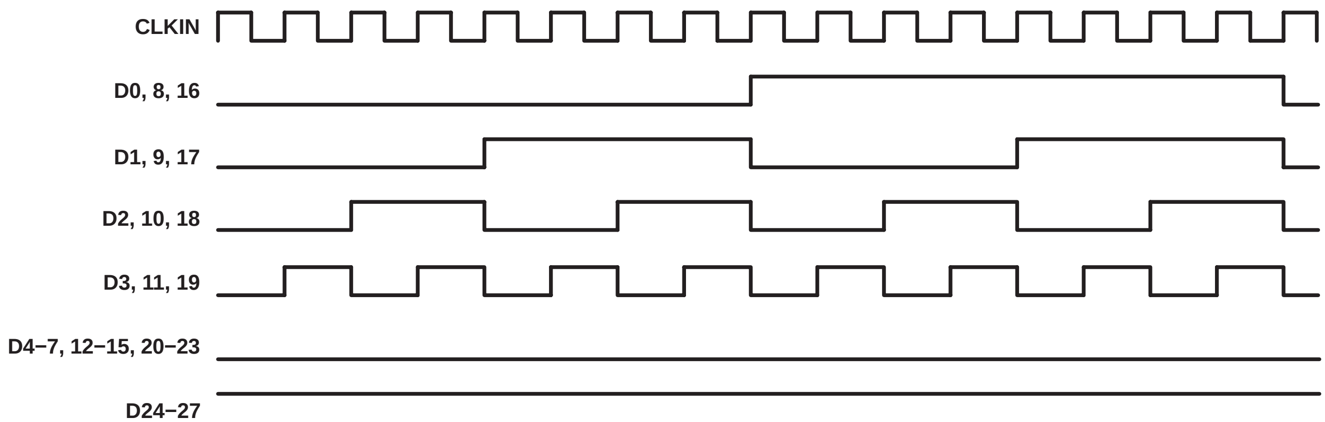
(a) SCHEMATIC



(b) WAVEFORMS

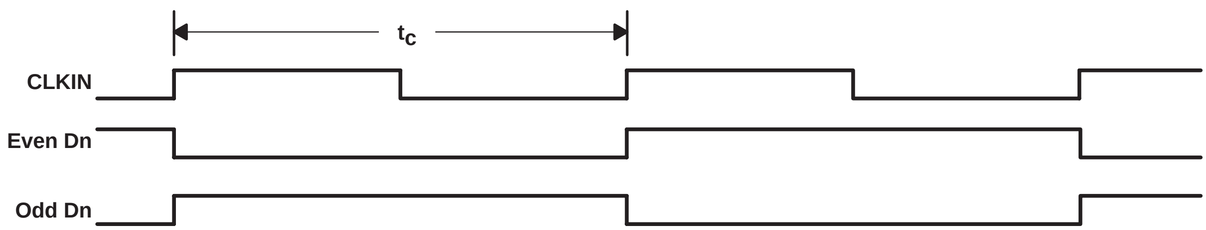
Figure 3. Test Load and Voltage Waveforms for LVDS Outputs

PARAMETER MEASUREMENT INFORMATION



NOTE A: The 16-grayscale test-pattern test device power consumption for a typical display pattern. Pattern with CLKSEL low shown.

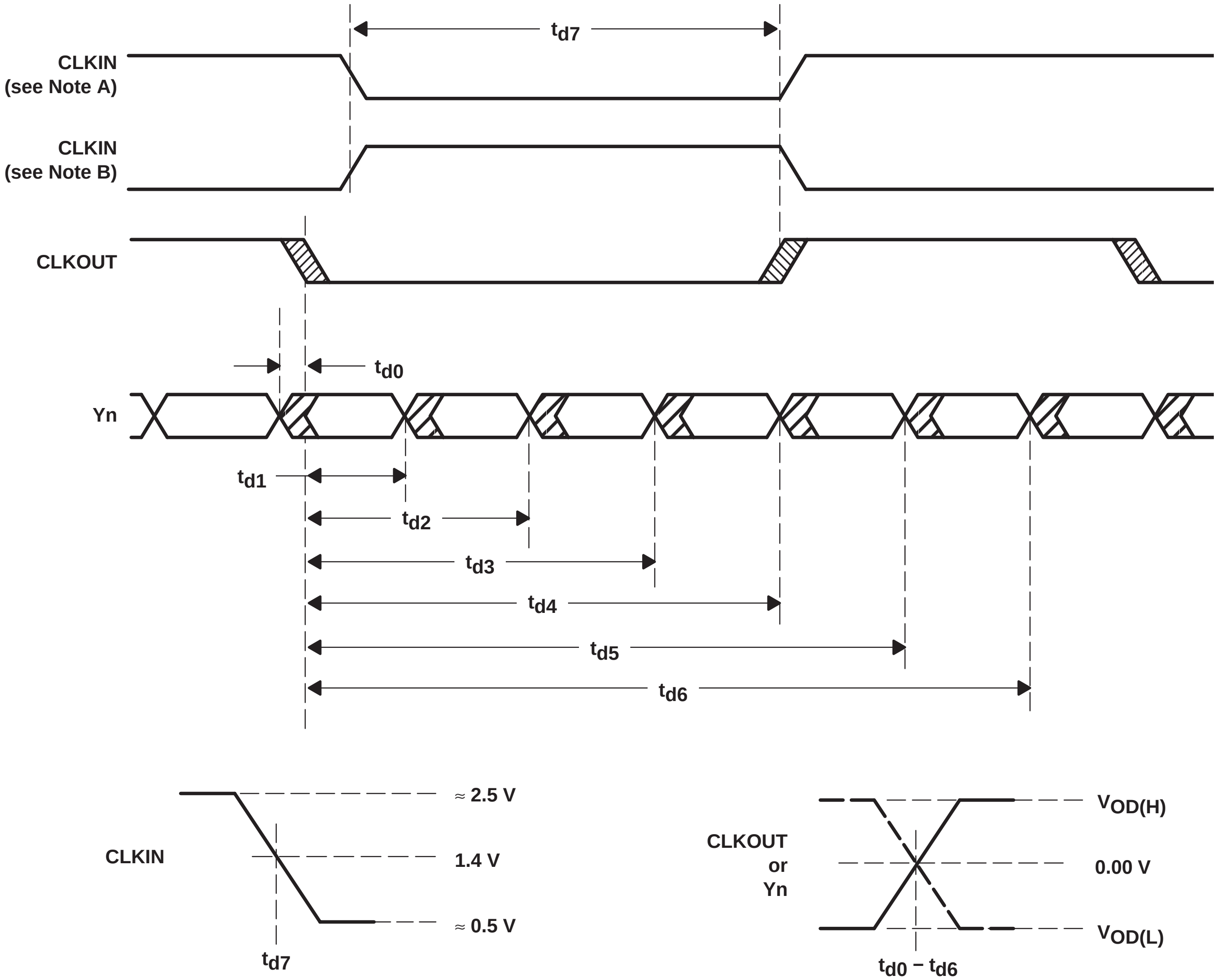
Figure 4. 16-Grayscale Test-Pattern Waveforms



NOTE A: The worst-case test pattern produces nearly the maximum switching frequency for all of the LVDS outputs. Pattern with CLKSEL low shown.

Figure 5. Worst-Case Test-Pattern Waveforms

PARAMETER MEASUREMENT INFORMATION



NOTES: A. This wave form is valid when CLKSEL is low.
B. This wave form is valid when CLKSEL is high.

Figure 6. SN75LVDS83 Timing Waveforms

PARAMETER MEASUREMENT INFORMATION

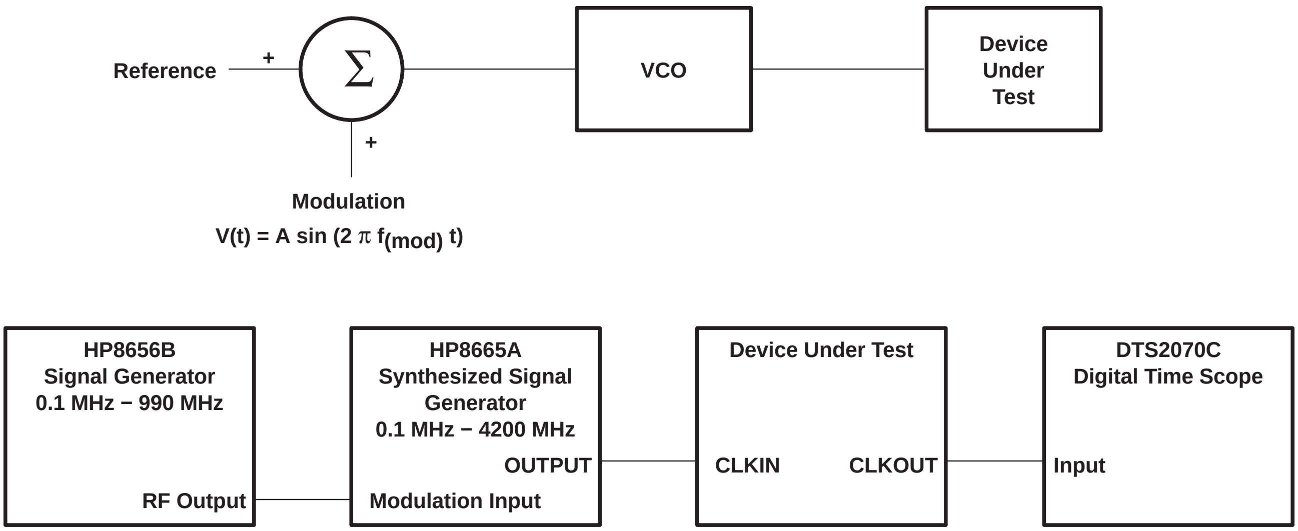


Figure 7. Output Clock Jitter Testing

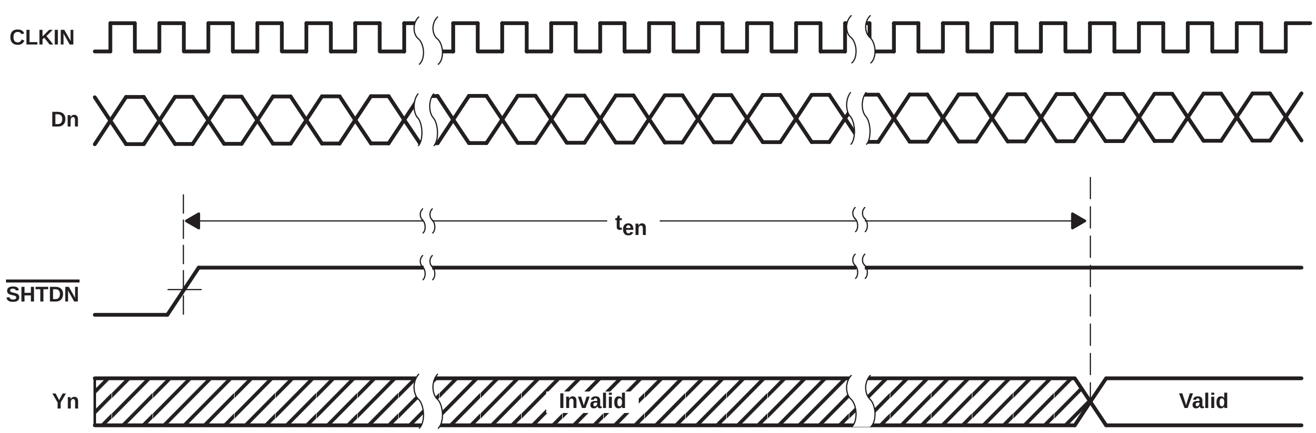


Figure 8. Enable Time Waveforms

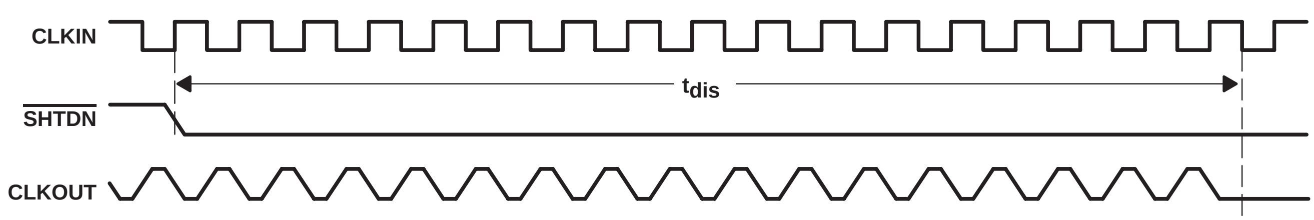


Figure 9. Disable Time Waveforms

TYPICAL CHARACTERISTICS

AVERAGE SUPPLY CURRENT
vs
CLOCK FREQUENCY

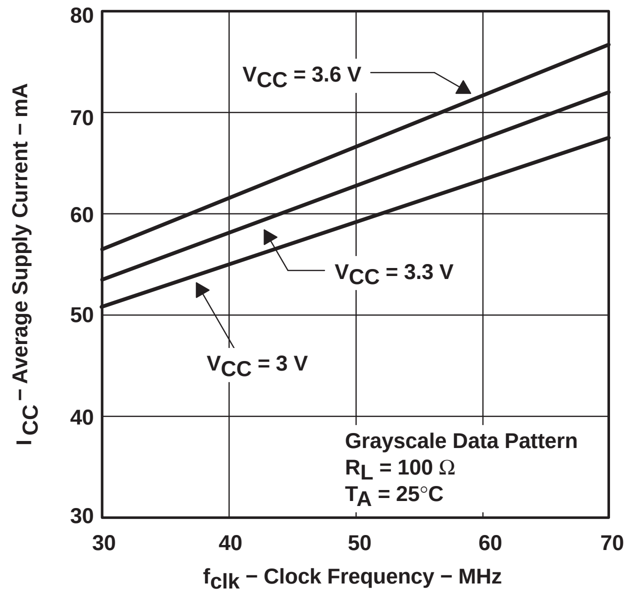


Figure 10

ZERO-TO-PEAK OUTPUT JITTER
vs
MODULATION FREQUENCY

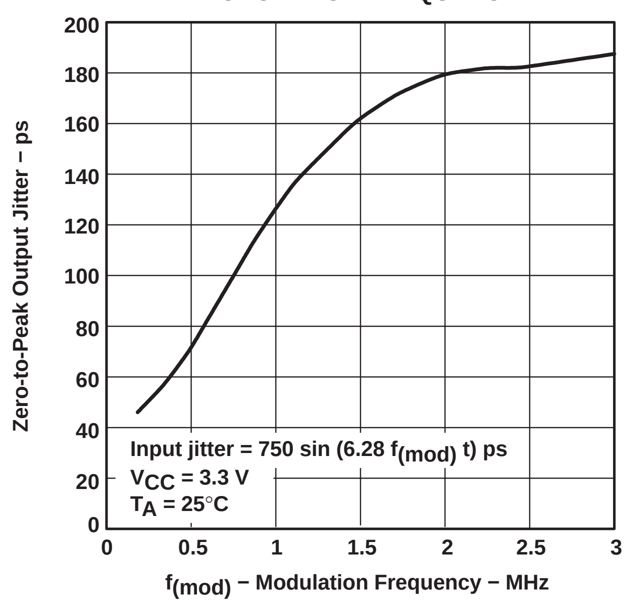
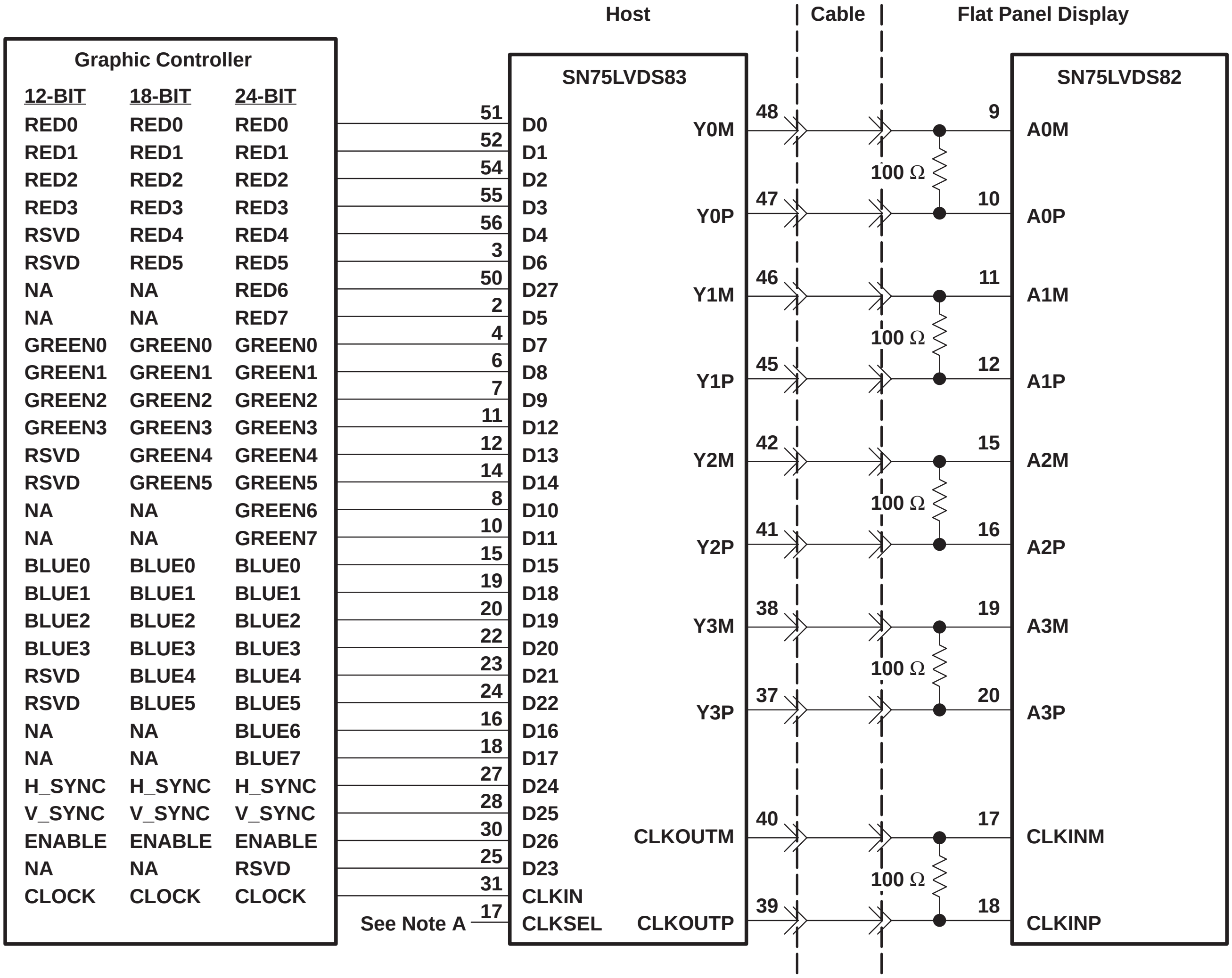


Figure 11

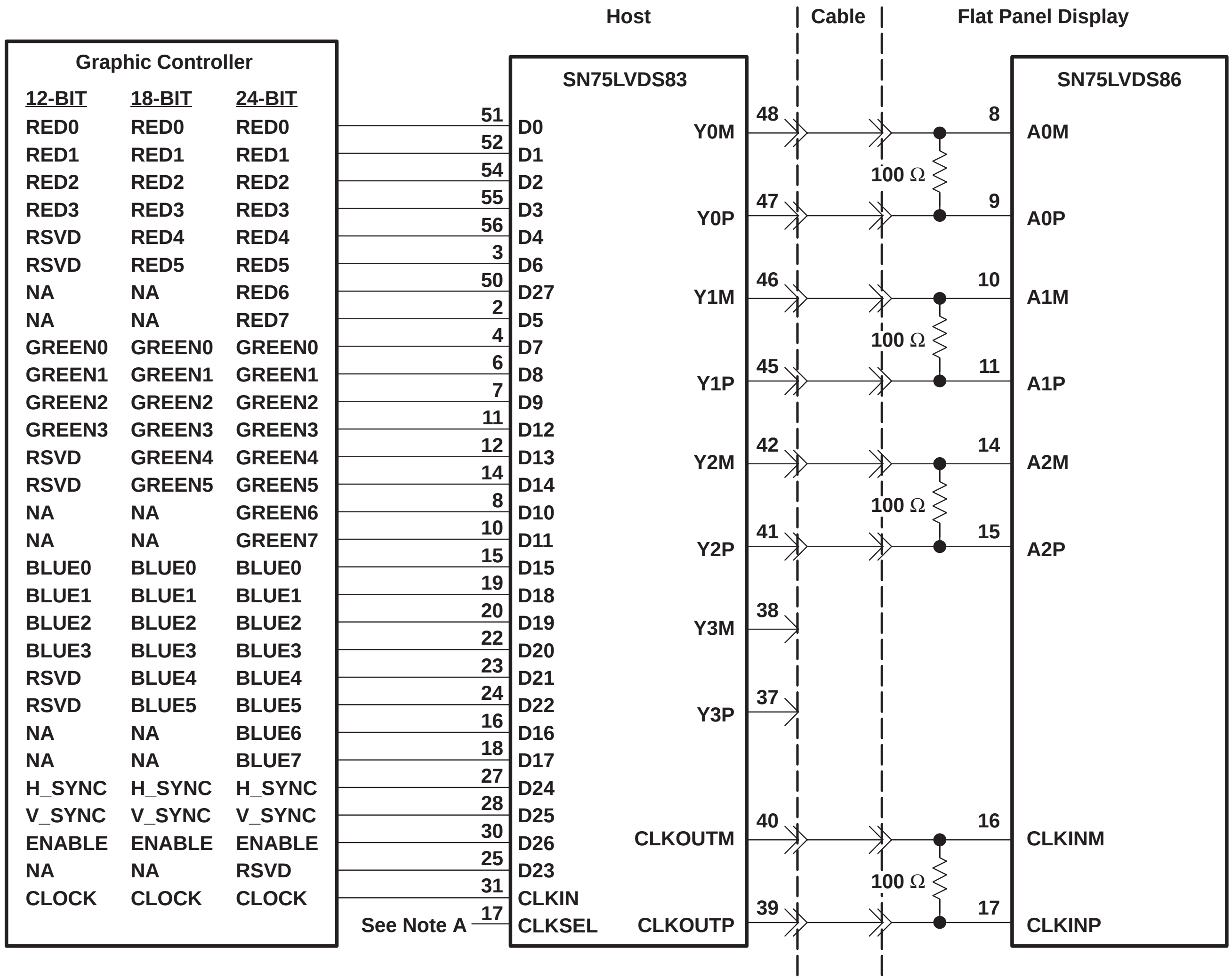
APPLICATION INFORMATION



NOTES: A. Connect this terminal to V_{CC} for triggering to the rising edge of the input clock and to GND for the falling edge.
B. The five 100-Ω terminating resistors are recommended to be 0603 types.

Figure 12. 24-Bit Color Host To 24-Bit LCD Panel Display Application

APPLICATION INFORMATION



NOTES: A. Connect this terminal to V_{CC} for triggering to the rising edge of the input clock and to GND for the falling edge.
B. The four 100-Ω terminating resistors are recommended to be 0603 types.

Figure 13. 24-Bit Color Host To 18-Bit LCD Panel Display Application

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
SN75LVDS83DGG	NRND	TSSOP	DGG	56	35	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	SN75LVDS83	
SN75LVDS83DGGG4	NRND	TSSOP	DGG	56	35	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	SN75LVDS83	
SN75LVDS83DGGR	NRND	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	SN75LVDS83	
SN75LVDS83DGGR-P	NRND	TSSOP	DGG	56		TBD	Call TI	Call TI			
SN75LVDS83DGGRG4	NRND	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	SN75LVDS83	
SN75LVDS83ZQL	NRND	BGA MICROSTAR JUNIOR	ZQL	56		TBD	Call TI	Call TI	-10 to 70		
SN75LVDS83ZQLR	NRND	BGA MICROSTAR JUNIOR	ZQL	52		TBD	Call TI	Call TI	-10 to 70		

(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) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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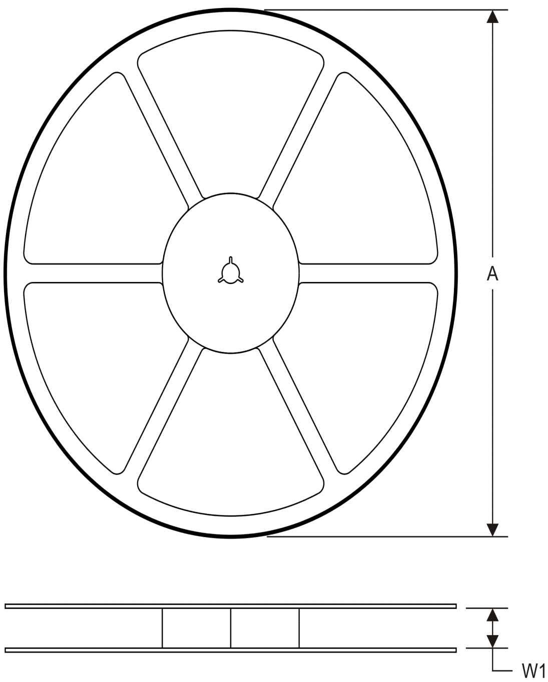
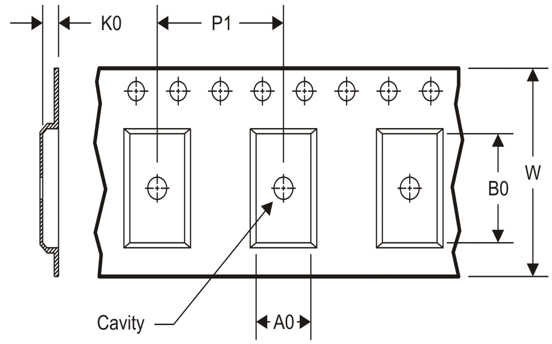
TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



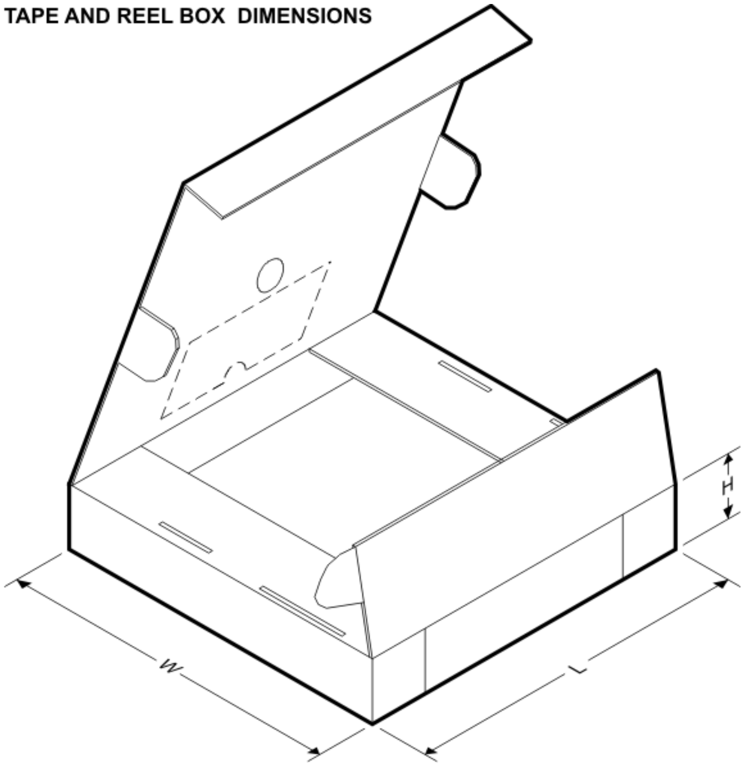
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

TAPE AND REEL INFORMATION

*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
SN75LVDS83DGGR	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1

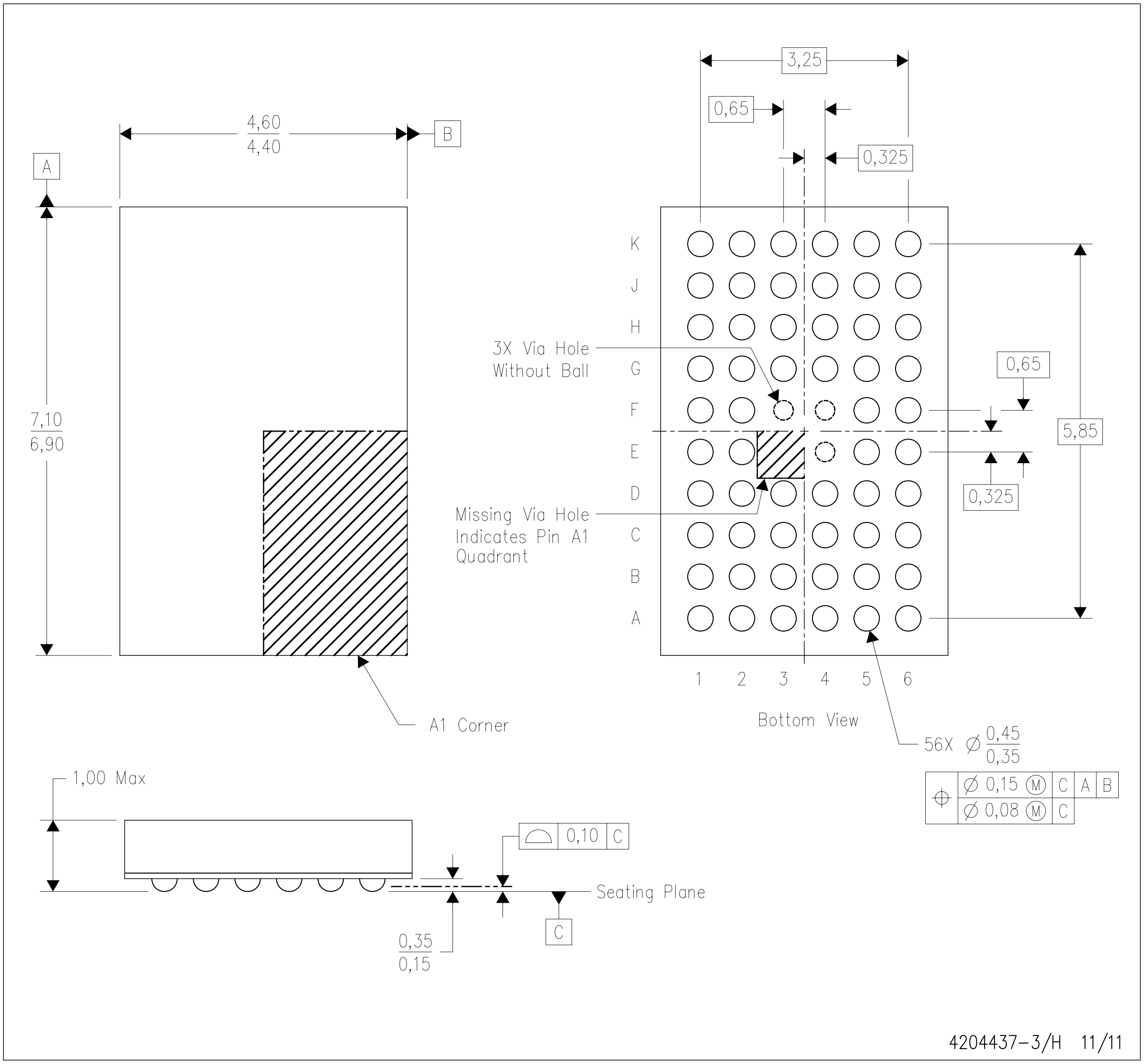
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

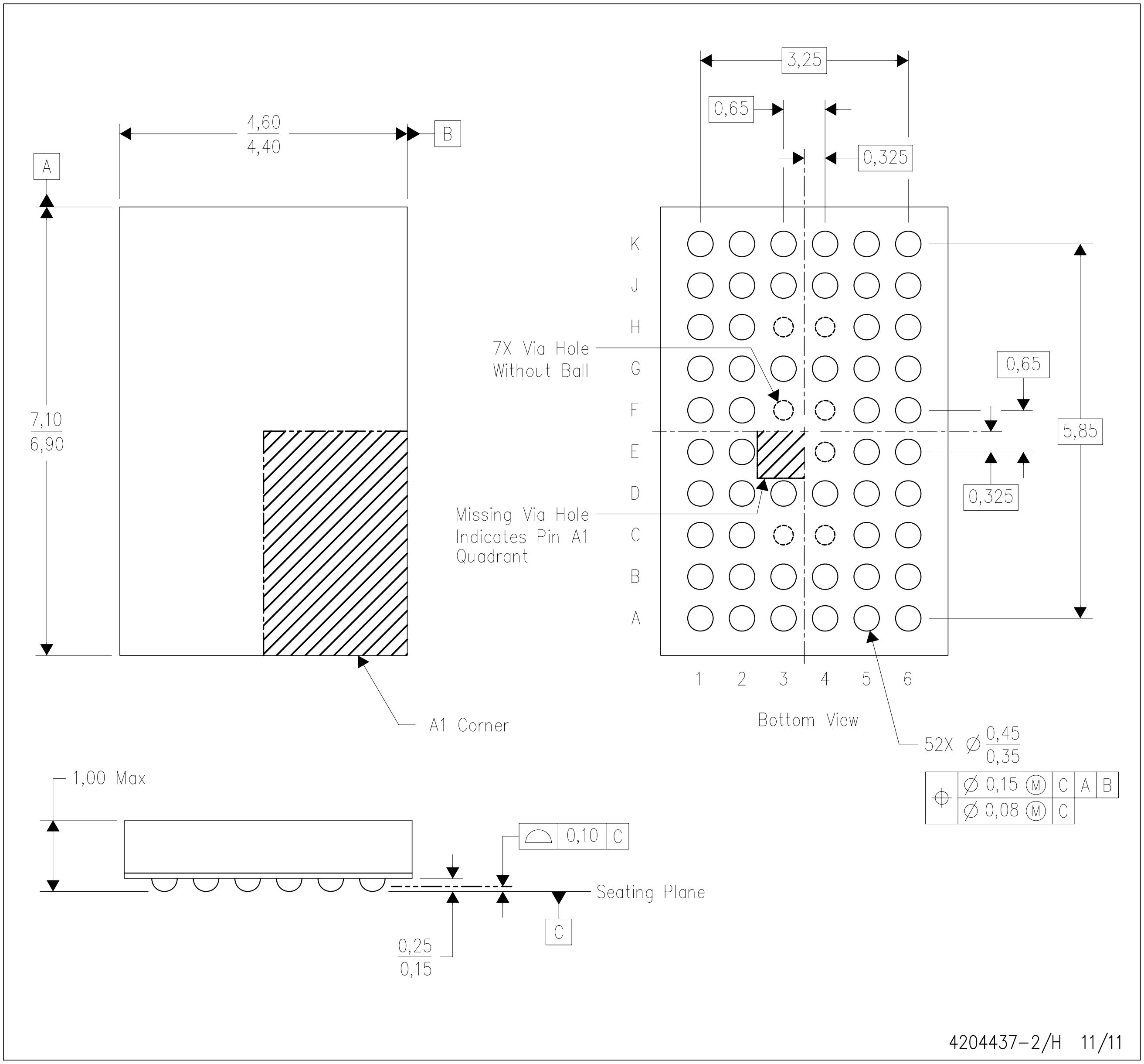
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN75LVDS83DGGR	TSSOP	DGG	56	2000	367.0	367.0	45.0

ZQL (R–PBGA–N56) PLASTIC BALL GRID ARRAY



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. Falls within JEDEC MO–285 variation BA–2.
- D. This package is Pb–free. Refer to the 56 GQL package (drawing 4200583) for tin–lead (SnPb).

ZQL (R–PBGA–N52) PLASTIC BALL GRID ARRAY



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. Falls within JEDEC MO–285 variation BA–2.
D. This package is Pb–free. Refer to the 52 GQL package (drawing 4200583) for tin–lead (SnPb).

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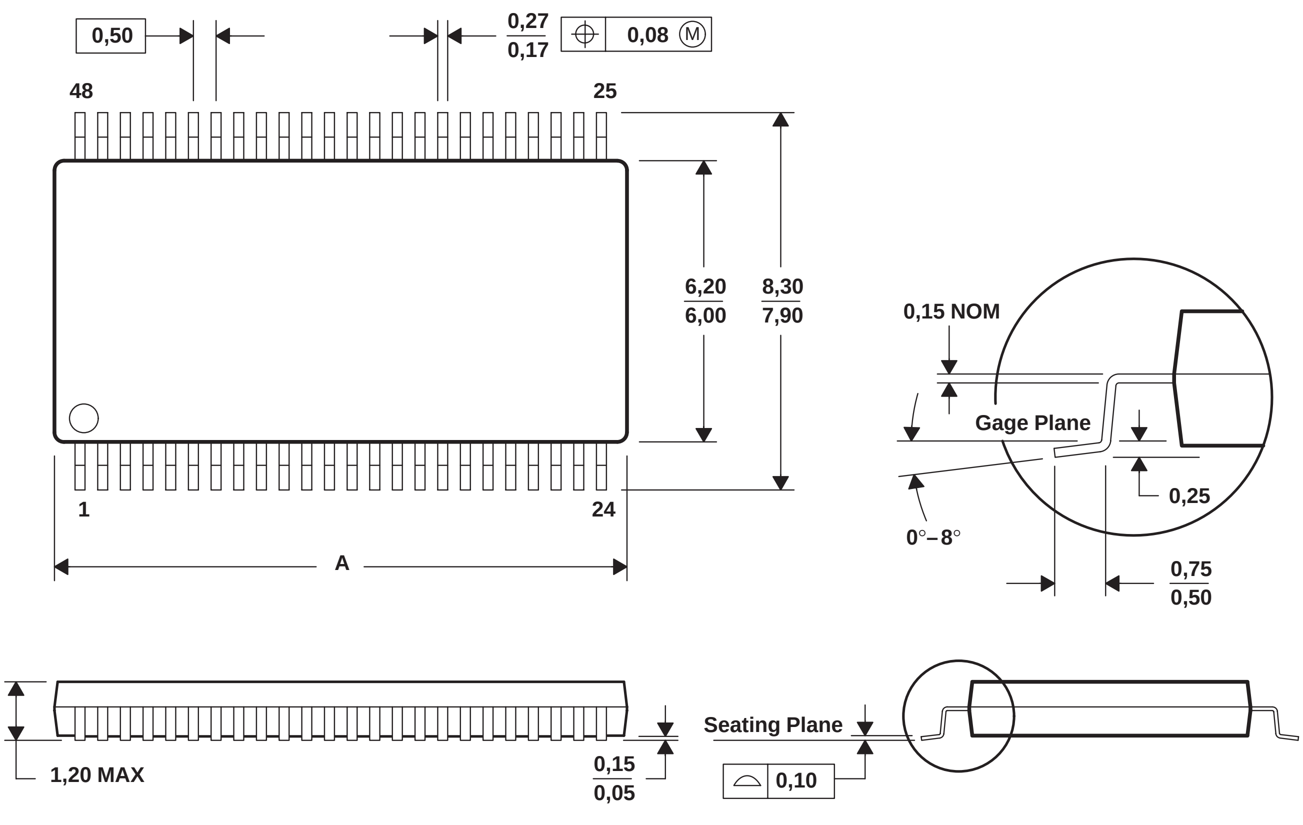
DGG (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

48 PINS SHOWN



DIM \ PINS **	48	56	64
A MAX	12,60	14,10	17,10
A MIN	12,40	13,90	16,90

4040078 / F 12/97

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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