



# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## General Description

The MAX9317/MAX9317A/MAX9317B/MAX9317C low-skew, dual 1-to-5 differential drivers are designed for clock and data distribution. The differential input is reproduced at five LVDS outputs with a low output-to-output skew of 5ps.

The MAX9317/MAX9317A are designed for low-voltage operation from a 2.375V to 2.625V power supply for use in 2.5V systems. The MAX9317B/MAX9317C operate from a 3.0V to 3.6V power supply for use in 3.3V systems. The MAX9317A/MAX9317C feature 50Ω input termination resistors to reduce component count.

The MAX9317 family is available in 32-pin 7mm × 7mm TQFP and space-saving 5mm × 5mm QFN packages and operate across the extended temperature range of -40°C to +85°C. The MAX9317A is pin compatible with ON Semiconductor's MC100EP210S.

## Applications

- Precision Clock Distribution
- Low-Jitter Data Repeaters
- Data and Clock Drivers and Buffers
- Central-Office Backplane Clock Distribution
- DSLAM Backplanes
- Base Stations
- ATE

Pin Configurations appear at end of data sheet.

## Features

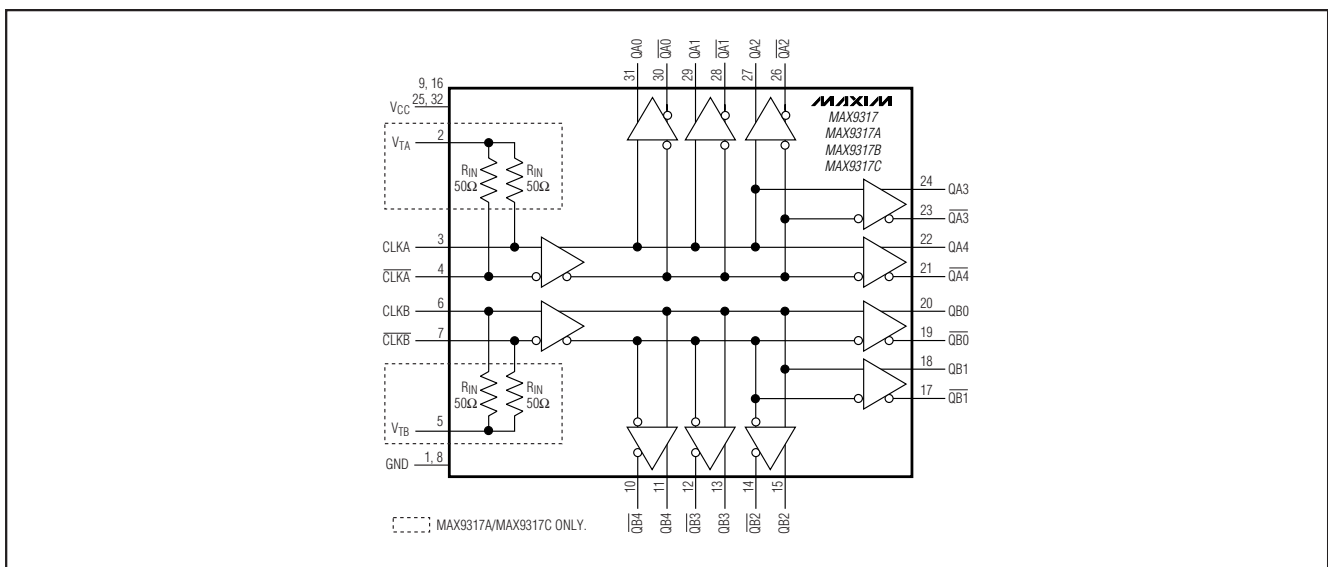
- ◆ Guaranteed 1.0GHz Operating Frequency
- ◆ 145ps (max) Part-to-Part Skew
- ◆ 5ps Output-to-Output Skew
- ◆ 330ps Propagation Delay from CLK<sub>\_</sub> to Q<sub>\_</sub>
- ◆ 2.375V to 2.625V Operation (MAX9317/MAX9317A)
- ◆ 3.0V to 3.6V Operation (MAX9317B/MAX9317C)
- ◆ ESD Protection: ±2kV (Human Body Model)
- ◆ Internal 50Ω Input Termination Resistors (MAX9317A/MAX9317C)

## Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	NOMINAL SUPPLY VOLTAGE (V)
MAX9317ETJ*	-40°C to +85°C	32 Thin QFN	2.5
MAX9317ECJ	-40°C to +85°C	32 TQFP	2.5
MAX9317AETJ*	-40°C to +85°C	32 Thin QFN	2.5
MAX9317AECJ	-40°C to +85°C	32 TQFP	2.5
MAX9317BETJ*	-40°C to +85°C	32 Thin QFN	3.3
MAX9317BECJ	-40°C to +85°C	32 TQFP	3.3
MAX9317CETJ*	-40°C to +85°C	32 Thin QFN	3.3
MAX9317CECJ	-40°C to +85°C	32 TQFP	3.3

\*Future product—contact factory for availability.

## Functional Diagram



For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).

MAX9317/MAX9317A/MAX9317B/MAX9317C

# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## ABSOLUTE MAXIMUM RATINGS

V <sub>CC</sub> to GND	-0.3V to +4.1V	Junction-to-Ambient Thermal Resistance in Still Air	
Input Pins to GND	-0.3V to (V <sub>CC</sub> + 0.3V)	32-Pin, 7mm × 7mm TQFP	+48.4°C/W
Differential Input Voltage	V <sub>CC</sub> or 3.0V, whichever is less	32-Pin, 5mm × 5mm QFN	+47°C/W
Continuous Output Current	28mA	Junction-to-Case Thermal Resistance	
Surge Output Current	50mA	32-Pin, 7mm × 7mm TQFP	+12°C/W
Continuous Power Dissipation (T <sub>A</sub> = +70°C)		32-Pin, 5mm × 5mm QFN	+2°C/W
32-Pin, 7mm × 7mm TQFP		Operating Temperature Range	-40°C to +85°C
(derate 20.7mW/°C above +70°C)	1.65W	Junction Temperature	+150°C
32-Pin 5mm × 5mm QFN		Storage Temperature Range	-65°C to +150°C
(derate 21.3mW/°C above +70°C)	1.7W	ESD Protection	
		Human Body Model (CLK <sub>-</sub> , $\overline{\text{CLK}}_{-}$ , Q <sub>-</sub> , $\overline{\text{Q}}_{-}$ , V <sub>T-</sub> )	±2kV
		Soldering Temperature (10s)	+300°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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## DC ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = 2.375V to 2.625V (MAX9317/MAX9317A), V<sub>CC</sub> = 3.0V to 3.6V (MAX9317B/MAX9317C), all outputs loaded 100Ω ±1% between Q<sub>-</sub> and  $\overline{\text{Q}}_{-}$ , unless otherwise noted. Typical values are at V<sub>CC</sub> = 2.5V (MAX9317/MAX9317A), V<sub>CC</sub> = 3.3V (MAX9317B/MAX9317C), V<sub>IHD</sub> = V<sub>CC</sub> - 1.0V, V<sub>ILD</sub> = V<sub>CC</sub> - 1.5V, unless otherwise noted.) (Notes 1, 2, and 3)

PARAMETER	SYMBOL	CONDITIONS	-40°C			+25°C			+85°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
<b>INPUTS (CLK<sub>-</sub>, <math>\overline{\text{CLK}}_{-}</math>)</b>												
Differential Input High Voltage	V <sub>IHD</sub>	Figure 1	1.2		V <sub>CC</sub>	1.2		V <sub>CC</sub>	1.2		V <sub>CC</sub>	V
Differential Input Low Voltage	V <sub>ILD</sub>	Figure 1	0		V <sub>CC</sub> - 0.1	0		V <sub>CC</sub> - 0.1	0		V <sub>CC</sub> - 0.1	V
Differential Input Voltage	V <sub>ID</sub>	V <sub>IHD</sub> - V <sub>ILD</sub>	MAX9317/MAX9317A		0.1	V <sub>CC</sub>	0.1	V <sub>CC</sub>	0.1	V <sub>CC</sub>		V
			MAX9317B/MAX9317C		0.1	3.0	0.1	3.0	0.1	3.0		
Input Current	I <sub>IH</sub> , I <sub>IL</sub>	CLK <sub>-</sub> or $\overline{\text{CLK}}_{-}$ = V <sub>IHD</sub> or V <sub>ILD</sub> , MAX9317/MAX9317B	-60		+60	-60		+60	-60		+60	μA
Input Termination Resistance	R <sub>IN</sub>	MAX9317A/MAX9317C, Figure 2 (Note 4)	43	50	57	43	50	57	43	50	57	Ω
<b>OUTPUTS (Q<sub>-</sub>, <math>\overline{\text{Q}}_{-}</math>)</b>												
Output High Voltage	V <sub>OH</sub>	Figure 1			1.6			1.6			1.6	V
Output Low Voltage	V <sub>OL</sub>	Figure 1	0.9			0.9			0.9			V

# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## DC ELECTRICAL CHARACTERISTICS (continued)

(V<sub>CC</sub> = 2.375V to 2.625V (MAX9317/MAX9317A), V<sub>CC</sub> = 3.0V to 3.6V (MAX9317B/MAX9317C), all outputs loaded 100Ω ±1% between Q<sub>-</sub> and Q<sub>-</sub>, unless otherwise noted. Typical values are at V<sub>CC</sub> = 2.5V (MAX9317/MAX9317A), V<sub>CC</sub> = 3.3V (MAX9317B/MAX9317C), V<sub>IHD</sub> = V<sub>CC</sub> - 1.0V, V<sub>ILD</sub> = V<sub>CC</sub> - 1.5V, unless otherwise noted.) (Notes 1, 2, and 3)

PARAMETER	SYMBOL	CONDITIONS	-40°C			+25°C			+85°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Differential Output Voltage	V <sub>OD</sub>	Figure 1	250	350	450	250	350	450	250	350	450	mV
Change in V <sub>OD</sub> Between Complementary Output States	ΔV <sub>OD</sub>			7	50		6	50		6	50	mV
Output Offset Voltage	V <sub>OS</sub>		1.125	1.25	1.375	1.125	1.25	1.375	1.125	1.25	1.375	V
Change in V <sub>OS</sub> Between Complementary Output States	ΔV <sub>OS</sub>				25			25			25	mV
Output Short-Circuit Current	I <sub>OSC</sub>	Q <sub>-</sub> shorted to Q <sub>-</sub>			12			12			12	mA
		Q <sub>-</sub> or Q <sub>-</sub> shorted to GND			28			28			28	
<b>POWER SUPPLY</b>												
Power-Supply Current (Note 5)	I <sub>CC</sub>	MAX9317/9317A		69	107		75	107		80	107	mA
		MAX9317B/9317C		75	107		81	107		86	107	

## AC ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = 2.375V to 2.625V (MAX9317/MAX9317A) or V<sub>CC</sub> = 3.0V to 3.6V (MAX9317B/MAX9317C), all outputs loaded with 100Ω ±1%, between Q<sub>-</sub> and Q<sub>-</sub>, f<sub>IN</sub> ≤ 1.0GHz, input transition time = 125ps (20% to 80%), V<sub>IHD</sub> - V<sub>ILD</sub> = 0.15V to V<sub>CC</sub>, unless otherwise noted. Typical values are at V<sub>CC</sub> = 2.5V (MAX9317/MAX9317A), V<sub>CC</sub> = 3.3V (MAX9317B/MAX9317C), f<sub>IN</sub> = 1.0GHz, V<sub>IHD</sub> = V<sub>CC</sub> - 1.0V, V<sub>ILD</sub> = V<sub>CC</sub> - 1.5V, unless otherwise noted.) (Notes 1 and 4)

PARAMETER	SYMBOL	CONDITIONS	-40°C			+25°C			+85°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay CLK <sub>-</sub> , CLK <sub>-</sub> to Q <sub>-</sub> , Q <sub>-</sub>	t <sub>PHL</sub> t <sub>PLH</sub>	Figure 1	250	310	600	250	330	600	250	335	600	ps
Output-to-Output Skew	t <sub>SKEW1</sub>	(Note 6)		9	55		5	45		4	25	ps
Part-to-Part Skew	t <sub>SKEW2</sub>	(Note 7)			145			145			145	ps
Added Random Jitter	t <sub>RJ</sub>	f <sub>IN</sub> = 1.0GHz, clock pattern (Note 8)		0.8	2.0		0.8	2.0		0.8	2.0	ps(RMS)
Added Deterministic Jitter	t <sub>DJ</sub>	f <sub>IN</sub> = 1.0GHz, 2 <sup>23</sup> - 1 PRBS pattern (Note 8)		80	105		80	105		80	105	ps(P-P)
Operating Frequency	f <sub>MAX</sub>	V <sub>OD</sub> ≥ 250mV		1.0			1.0			1.0		GHz

# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## AC ELECTRICAL CHARACTERISTICS (continued)

( $V_{CC} = 2.375V$  to  $2.625V$  (MAX9317/MAX9317A) or  $V_{CC} = 3.0V$  to  $3.6V$  (MAX9317B/MAX9317C), all outputs loaded with  $100\Omega \pm 1\%$ , between  $Q_-$  and  $\bar{Q}_-$ ,  $f_{IN} \leq 1.0GHz$ , input transition time =  $125ps$  (20% to 80%),  $V_{IHD} - V_{ILD} = 0.15V$  to  $V_{CC}$ , unless otherwise noted. Typical values are at  $V_{CC} = 2.5V$  (MAX9317/MAX9317A),  $V_{CC} = 3.3V$  (MAX9317B/MAX9317C),  $f_{IN} = 1.0GHz$ ,  $V_{IHD} = V_{CC} - 1.0V$ ,  $V_{ILD} = V_{CC} - 1.5V$ , unless otherwise noted.) (Notes 1 and 4)

PARAMETER	SYMBOL	CONDITIONS	-40°C			+25°C			+85°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Differential Output Rise/Fall Time	$t_r/t_f$	20% to 80%, Figure 1	140	200	300	140	205	300	140	205	300	ps

**Note 1:** Measurements are made with the device in thermal equilibrium.

**Note 2:** Current into a pin is defined as positive. Current out of a pin is defined as negative.

**Note 3:** DC parameters are production tested at +25°C. DC limits are guaranteed by design and characterization over the full operating temperature range.

**Note 4:** Guaranteed by design and characterization, and are not production tested. Limits are set to  $\pm 6$  sigma.

**Note 5:** All outputs loaded with  $100\Omega$  differential, all inputs biased differential high or low except  $V_{T-}$ .

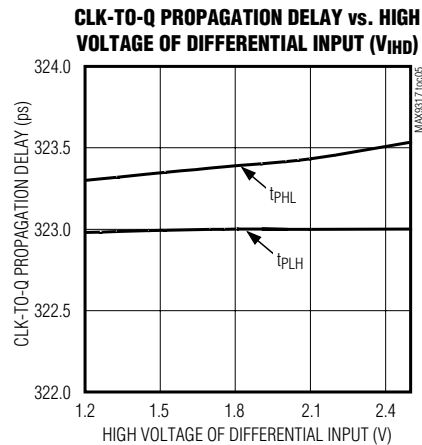
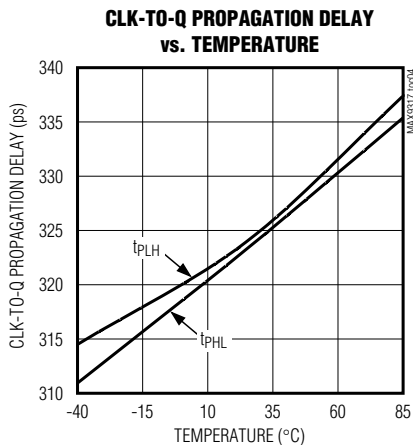
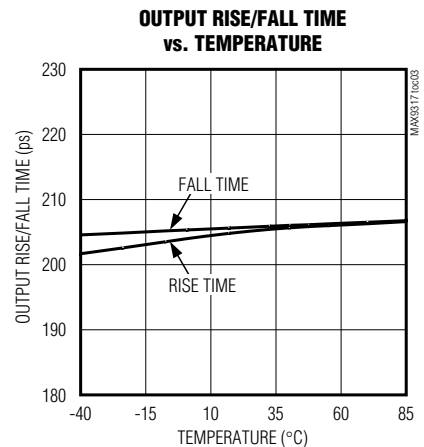
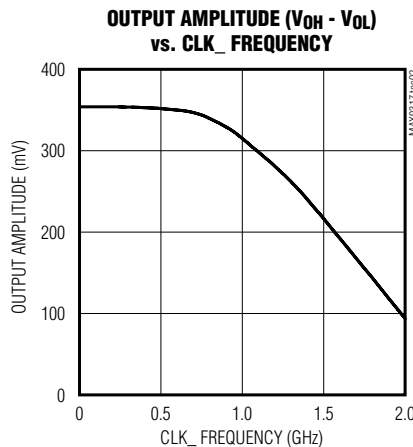
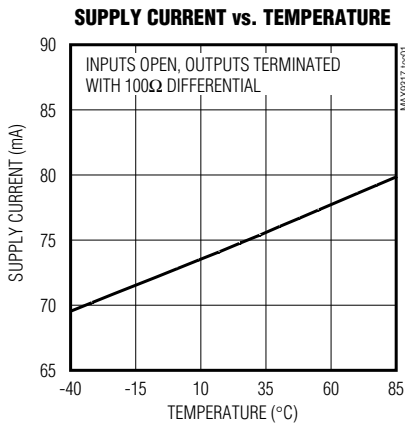
**Note 6:** Measured between outputs of the same device at the signal crossing points for a same-edge transition.

**Note 7:** Measured between outputs on different devices for identical transitions and  $V_{CC}$  levels.

**Note 8:** Device jitter added to the input signal.

## Typical Operating Characteristics

(MAX9317,  $V_{CC} = 2.5V$ , all outputs loaded with  $100\Omega \pm 1\%$ , between  $Q_-$  and  $\bar{Q}_-$ ,  $f_{IN} = 1.0GHz$ , input transition time =  $125ps$  (20% to 80%),  $V_{IHD} = V_{CC} - 1.0V$ ,  $V_{ILD} = V_{CC} - 1.5V$ , unless otherwise noted.)



# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## Pin Description

PIN	NAME		FUNCTION
	MAX9317 MAX9317B	MAX9317A MAX9317C	
1, 8	GND	GND	Ground
2	N.C.	—	No Connection. Connect this pin to ground or leave floating.
	—	V <sub>TA</sub>	CLKA Input Termination Voltage. This pin is connected to CLK <sub>A</sub> and $\overline{\text{CLK}}_{\text{A}}$ through 50Ω termination resistors. Connect this pin to V <sub>CC</sub> - 2V for an LVPECL input signal on CLK <sub>A</sub> or leave floating for an LVDS input signal.
3	CLKA	CLKA	Noninverting Differential Clock Input A
4	$\overline{\text{CLK}}_{\text{A}}$	$\overline{\text{CLK}}_{\text{A}}$	Inverting Differential Clock Input A
5	N.C.	—	No Connection. Connect this pin to ground or leave floating.
	—	V <sub>TB</sub>	CLKB Input Termination Voltage. This pin is connected to CLK <sub>B</sub> and $\overline{\text{CLK}}_{\text{B}}$ through 50Ω termination resistors. Connect this pin to V <sub>CC</sub> - 2V for an LVPECL input signal on CLK <sub>B</sub> or leave floating for an LVDS input signal.
6	CLKB	CLKB	Noninverting Differential Clock Input B
7	$\overline{\text{CLK}}_{\text{B}}$	$\overline{\text{CLK}}_{\text{B}}$	Inverting Differential Clock Input B
9, 16, 25, 32	V <sub>CC</sub>	V <sub>CC</sub>	Positive Supply Voltage. Bypass each V <sub>CC</sub> pin to ground with 0.1μF and 0.01μF ceramic capacitors. Place the capacitors as close to the device as possible with the 0.01μF capacitor closest to the device.
10	$\overline{\text{QB}}_{\text{4}}$	$\overline{\text{QB}}_{\text{4}}$	CLKB Inverting Differential Output 4. Terminate with 100Ω to QB <sub>4</sub> .
11	QB <sub>4</sub>	QB <sub>4</sub>	CLKB Noninverting Differential Output 4. Terminate with 100Ω to $\overline{\text{QB}}_{\text{4}}$ .
12	$\overline{\text{QB}}_{\text{3}}$	$\overline{\text{QB}}_{\text{3}}$	CLKB Inverting Differential Output 3. Terminate with 100Ω to QB <sub>3</sub> .
13	QB <sub>3</sub>	QB <sub>3</sub>	CLKB Noninverting Differential Output 3. Terminate with 100Ω to $\overline{\text{QB}}_{\text{3}}$ .
14	$\overline{\text{QB}}_{\text{2}}$	$\overline{\text{QB}}_{\text{2}}$	CLKB Inverting Differential Output 2. Terminate with 100Ω to QB <sub>2</sub> .
15	QB <sub>2</sub>	QB <sub>2</sub>	CLKB Noninverting Differential Output 2. Terminate with 100Ω to $\overline{\text{QB}}_{\text{2}}$ .
17	$\overline{\text{QB}}_{\text{1}}$	$\overline{\text{QB}}_{\text{1}}$	CLKB Inverting Differential Output 1. Terminate with 100Ω to QB <sub>1</sub> .
18	QB <sub>1</sub>	QB <sub>1</sub>	CLKB Noninverting Differential Output 1. Terminate with 100Ω to $\overline{\text{QB}}_{\text{1}}$ .
19	$\overline{\text{QB}}_{\text{0}}$	$\overline{\text{QB}}_{\text{0}}$	CLKB Inverting Differential Output 0. Terminate with 100Ω to QB <sub>0</sub> .
20	QB <sub>0</sub>	QB <sub>0</sub>	CLKB Noninverting Differential Output 0. Terminate with 100Ω to $\overline{\text{QB}}_{\text{0}}$ .
21	$\overline{\text{QA}}_{\text{4}}$	$\overline{\text{QA}}_{\text{4}}$	CLKA Inverting Differential Output 4. Terminate with 100Ω to QA <sub>4</sub> .
22	QA <sub>4</sub>	QA <sub>4</sub>	CLKA Noninverting Differential Output 4. Terminate with 100Ω to $\overline{\text{QA}}_{\text{4}}$ .
23	$\overline{\text{QA}}_{\text{3}}$	$\overline{\text{QA}}_{\text{3}}$	CLKA Inverting Differential Output 3. Terminate with 100Ω to QA <sub>3</sub> .
24	QA <sub>3</sub>	QA <sub>3</sub>	CLKA Noninverting Differential Output 3. Terminate with 100Ω to $\overline{\text{QA}}_{\text{3}}$ .
26	$\overline{\text{QA}}_{\text{2}}$	$\overline{\text{QA}}_{\text{2}}$	CLKA Inverting Differential Output 2. Terminate with 100Ω to QA <sub>2</sub> .
27	QA <sub>2</sub>	QA <sub>2</sub>	CLKA Noninverting Differential Output 2. Terminate with 100Ω to $\overline{\text{QA}}_{\text{2}}$ .
28	$\overline{\text{QA}}_{\text{1}}$	$\overline{\text{QA}}_{\text{1}}$	CLKA Inverting Differential Output 1. Terminate with 100Ω to QA <sub>1</sub> .
29	QA <sub>1</sub>	QA <sub>1</sub>	CLKA Noninverting Differential Output 1. Terminate with 100Ω to $\overline{\text{QA}}_{\text{1}}$ .
30	$\overline{\text{QA}}_{\text{0}}$	$\overline{\text{QA}}_{\text{0}}$	CLKA Inverting Differential Output 0. Terminate with 100Ω to QA <sub>0</sub> .
31	QA <sub>0</sub>	QA <sub>0</sub>	CLKA Noninverting Differential Output 0. Terminate with 100Ω to $\overline{\text{QA}}_{\text{0}}$ .
—	EP	EP	Exposed Pad. QFN package only. Internally connected to ground.

MAX9317/MAX9317A/MAX9317B/MAX9317C

# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

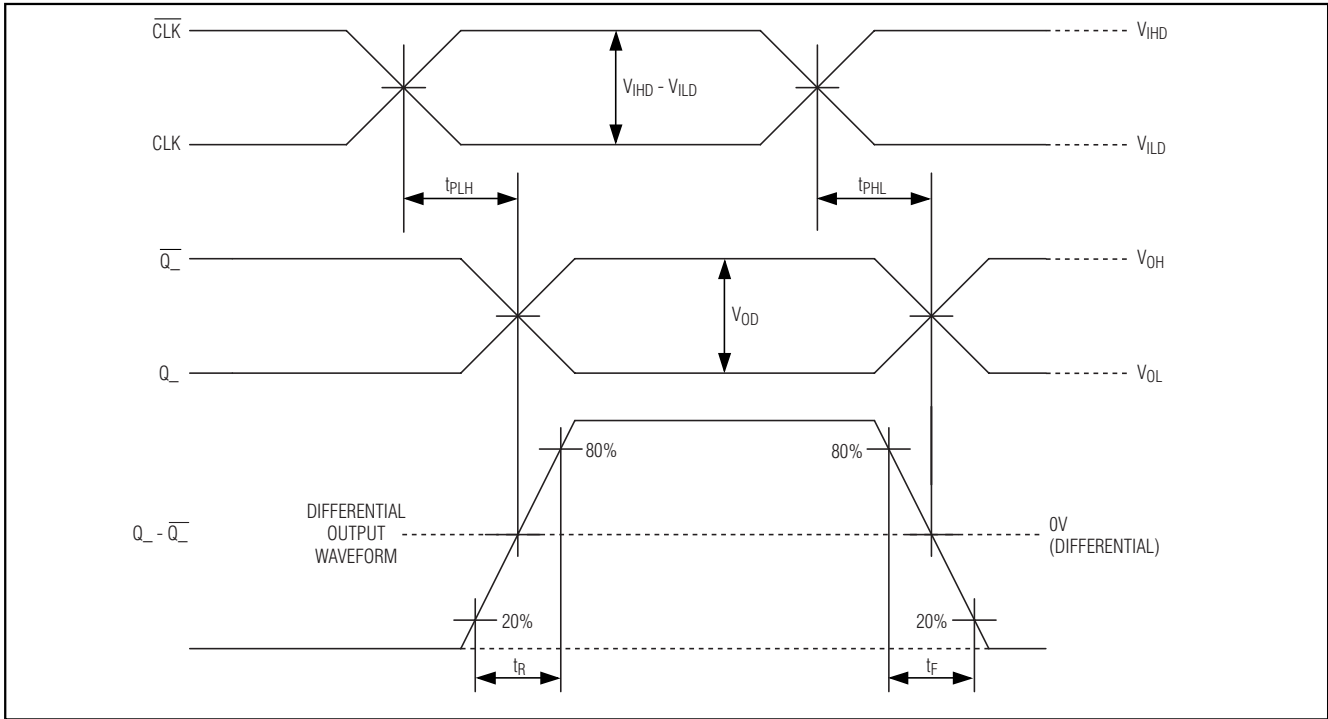


Figure 1. MAX9317 Timing Diagram

## Detailed Description

The MAX9317 family of low-skew, 1-to-5 dual differential drivers are designed for clock or data distribution. Two independent 1-to-5 splitters accept a differential input signal and reproduce it on five separate differential LVDS outputs. The output drivers are guaranteed to operate at frequencies up to 1.0GHz with the LVDS output levels conforming to the EIA/TIA-644 standard.

The MAX9317/MAX9317A operate from a 2.375V to 2.625V power supply for use in 2.5V systems. The MAX9317B/MAX9317C operate from a 3.0V to 3.6V supply for 3.3V systems.

### Differential LVPECL and LVDS Input

The MAX9317 family has two input differential pairs:  $\overline{\text{CLKA}}$  and  $\text{CLKA}$ , and  $\overline{\text{CLKB}}$  and  $\text{CLKB}$ . Each differential input pair can be configured or terminated independently. The inputs are designed to be driven by either LVPECL or LVDS signals with a maximum differential voltage of  $V_{CC}$  or 3.0V, whichever is less.

The MAX9317A/MAX9317C reduce external component count by having the input  $50\Omega$  termination resistors on chip. Configure the MAX9317A/MAX9317C to receive LVPECL signals by connecting  $V_{T-}$  to  $V_{CC} - 2V$  (Figure 2(a)). Leaving the  $V_{T-}$  input floating configures the

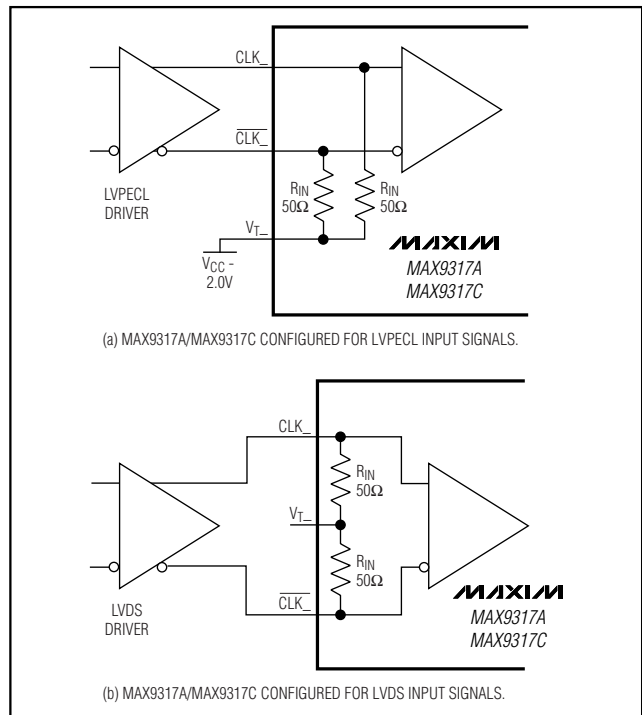


Figure 2. MAX9317A/MAX9317C Input Terminations

# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

respective input with a differential 100Ω termination to receive LVDS signals (Figure 2(b)).

The MAX9317/MAX9317B accept LVPECL if the inputs are externally terminated with 50Ω resistors from CLKA and  $\overline{\text{CLKA}}$  or CLKB and  $\overline{\text{CLKB}}$  to  $V_{CC} - 2V$ . Alternatively, if the inputs are differentially terminated with 100Ω, they accept an LVDS input signal.

The LVDS input signal must adhere to the specifications given in the *Electrical Characteristics* table. Note that the signal must be at least 1.2V to be a valid logic HIGH.

## Applications Information

### Output Termination

Terminate the outputs with 100Ω across each differential pair ( $Q_{-}$  to  $\overline{Q}_{-}$ ). Ensure that output currents do not exceed the current limits as specified in the *Absolute Maximum Ratings* table. Under all operating conditions, observe the device's total thermal limits.

### Power-Supply Bypassing

Bypass each  $V_{CC}$  pin to ground with high-frequency surface-mount ceramic 0.1μF and 0.01μF capacitors in parallel and as close to the device as possible, with the 0.01μF capacitor closest to the device. Use multiple parallel vias to minimize parasitic inductance and reduce power-supply bounce with high-current transients.

## Circuit Board Traces

Circuit board trace layout is very important to maintain the signal integrity of high-speed differential signals. Use 50Ω traces for  $\text{CLK}_{-}$ ,  $\overline{\text{CLK}}_{-}$ ,  $Q_{-}$ , and  $\overline{Q}_{-}$ . Maintaining integrity is accomplished in part by reducing signal reflections and skew, and increasing common-mode noise immunity by keeping the differential traces close together.

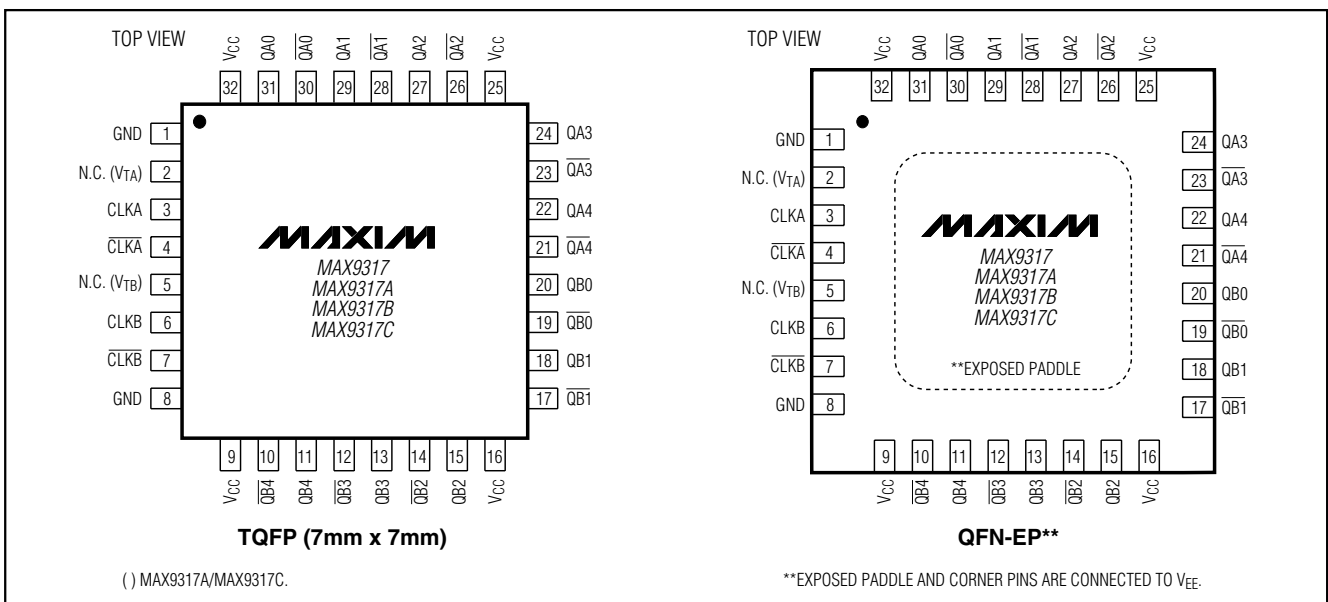
Signal reflections are caused by discontinuities in the 50Ω characteristic impedance of the traces. Avoid discontinuities by maintaining the distance between differential traces, and not using sharp corners or vias. Maintaining distance between the traces also increases common-mode noise immunity. Reducing signal skew is accomplished by matching the electrical length of the differential traces.

## Chip Information

TRANSISTOR COUNT: 1119

PROCESS: Bipolar

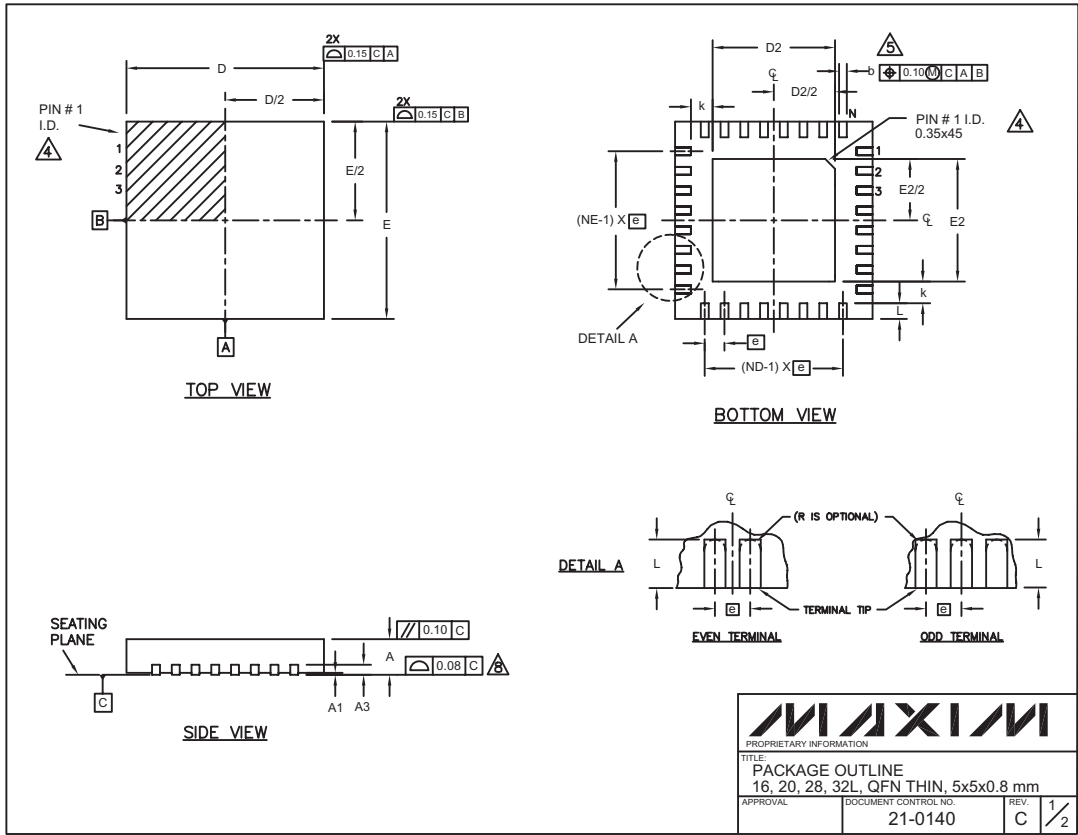
## Pin Configurations



# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)





# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)

COMMON DIMENSIONS												
PKG. SYMBOL	16L 5x5			20L 5x5			28L 5x5			32L 5x5		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80
A1	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05
A3	0.20 REF.			0.20 REF.			0.20 REF.			0.20 REF.		
b	0.25	0.30	0.35	0.25	0.30	0.35	0.20	0.25	0.30	0.20	0.25	0.30
D	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10
E	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10
e	0.80 BSC.			0.65 BSC.			0.50 BSC.			0.50 BSC.		
k	0.25	-	-	0.25	-	-	0.25	-	-	0.25	-	-
L	0.45	0.55	0.65	0.45	0.55	0.65	0.45	0.55	0.65	0.30	0.40	0.50
N	16			20			28			32		
ND	4			5			7			8		
NE	4			5			7			8		
JEDEC	WHHB			WHHC			WHHD-1			WHHD-2		

EXPOSED PAD VARIATIONS						
PKG. CODES	D2			E2		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
T1655-1	3.00	3.10	3.20	3.00	3.10	3.20
T2055-2	3.00	3.10	3.20	3.00	3.10	3.20
T2855-1	3.15	3.25	3.35	3.15	3.25	3.35
T2855-2	2.60	2.70	2.80	2.60	2.70	2.80
T3255-2	3.00	3.10	3.20	3.00	3.10	3.20

NOTES:

- DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
- N IS THE TOTAL NUMBER OF TERMINALS.
- THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.
- DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.
- ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.
- DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.
- COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.
- DRAWING CONFORMS TO JEDEC MO220.
- WARPAGE SHALL NOT EXCEED 0.10 mm.

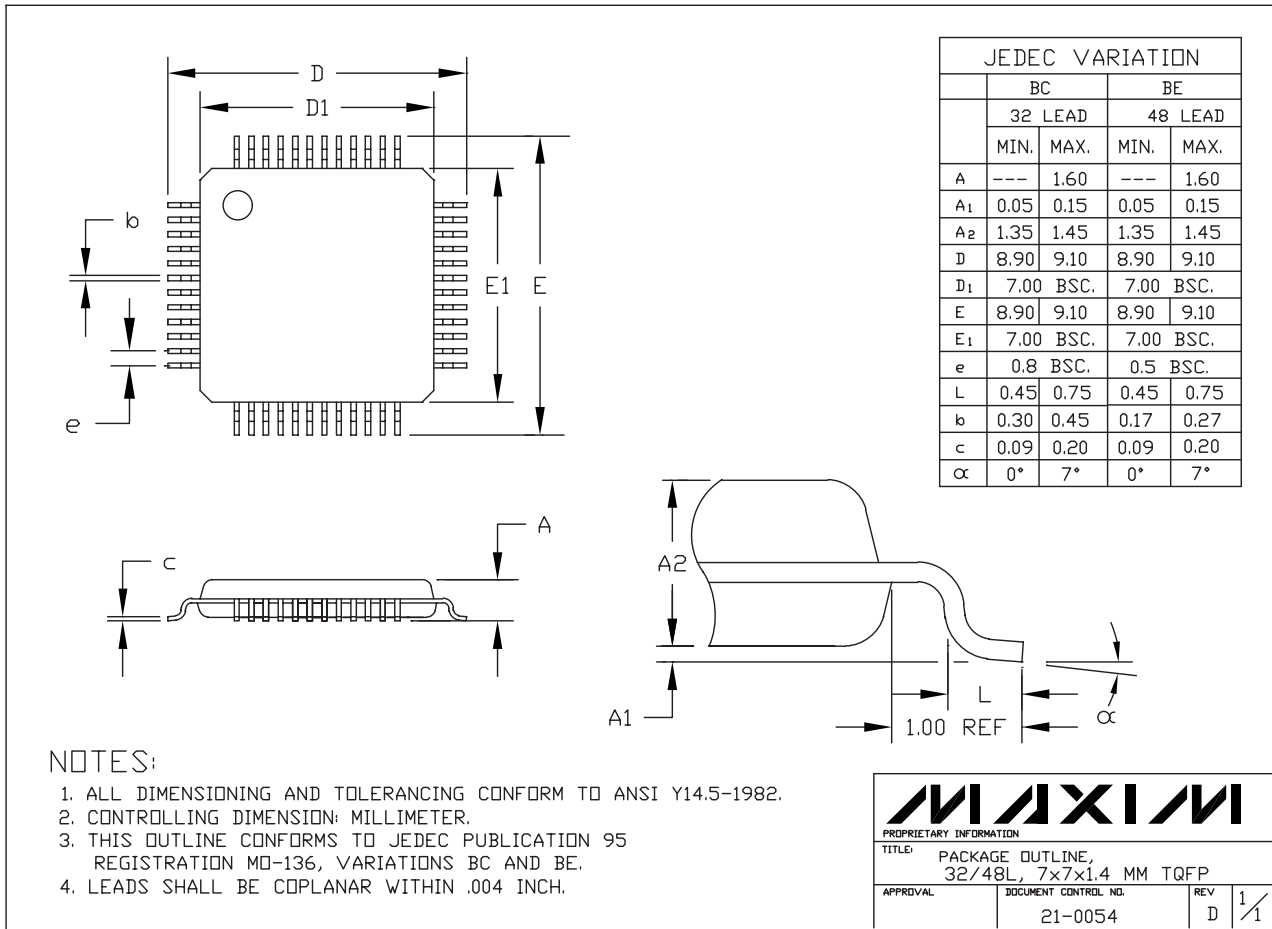
<b>MAXIM</b>		
PROPRIETARY INFORMATION		
TITLE: PACKAGE OUTLINE 16, 20, 28, 32L, QFN THIN, 5x5x0.8 mm		
APPROVAL:	DOCUMENT CONTROL NO: 21-0140	REV: C 2/2

MAX9317/MAX9317A/MAX9317B/MAX9317C

# Dual 1:5 Differential Clock Drivers with LVPECL Inputs and LVDS Outputs

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)



32L/48L\_TQFP:EPS

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