



2.7Gbps Dual Mux/Buffer with Loopback

MAX3783

General Description

The MAX3783 is a dual serial multiplexer (mux) and buffer with selectable line-side loopback for system interconnect and serial backplane applications up to 2.7Gbps. Each independent channel consists of a transmitter with fanout of two and a receiver with a 2:1 input mux. Selectable loopback paths support system testing.

Operating from a single 3.3V supply, this device has current-mode logic (CML) inputs and outputs, which can be AC-coupled for PECL compatibility, if desired. The IC is packaged in a compact 48-pin TQFP-EP package with exposed pad. Typical power consumption is 1.12W.

Applications

2.7Gbps Serial Communications
System Interconnect
Serial Backplane
Fail-Over and Protection Switching

Features

- ◆ Provides Redundant Serial I/O
- ◆ 11ps Deterministic Jitter
- ◆ Selectable Loopback
- ◆ On-Chip 50Ω Termination Resistors
- ◆ 3.3V Power Supply
- ◆ Two-Port Integration

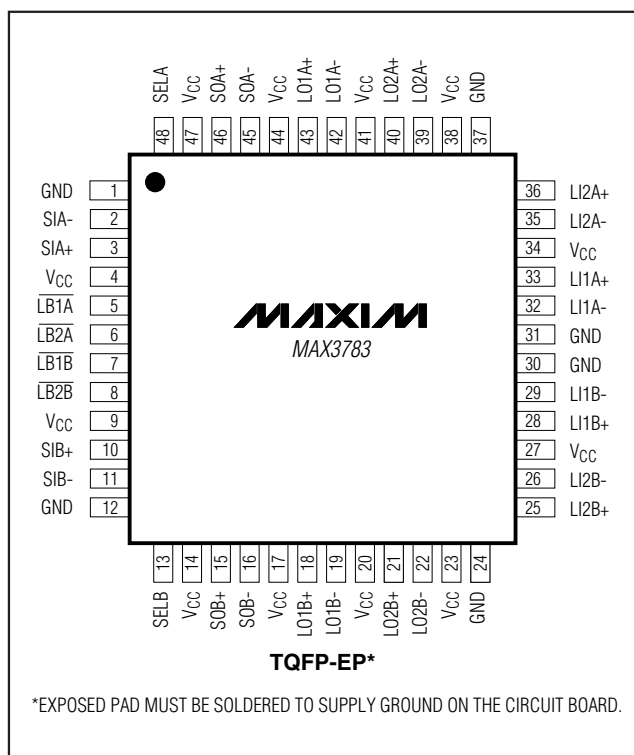
Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MAX3783UCM	0°C to +85°C	48 TQFP-EP*
MAX3783UCM+	0°C to +85°C	48 TQFP-EP*

*EP = Exposed pad.

+ Denotes a lead-free package.

Pin Configuration



Typical Application Circuit appears at end of data sheet.

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ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} -0.5V to 4.0V
 Continuous Current at Serial Outputs $\pm 36\text{mA}$
 Voltage at SEL_- , LB_- Pins -0.5V to ($V_{CC} + 0.5\text{V}$)
 Common-Mode Input Voltage (SI_- , LI_-) -0.5V to ($V_{CC} + 0.5\text{V}$)
 Differential Input Voltage (SI_- , LI_-) (Note 1) $\pm 2.8\text{V}$

Continuous Power Dissipation ($T_A = +85^\circ\text{C}$)
 48-Pin TQFP-EP (derate 27mW/ $^\circ\text{C}$ above $+85^\circ\text{C}$) 1.76W
 Storage Ambient Temperature -55°C to $+150^\circ\text{C}$
 Lead Temperature (soldering, 10s) $+300^\circ\text{C}$

Note 1: The sum of the common-mode voltage and differential voltage on any input pin must be within -0.5V to ($V_{CC} + 0.5\text{V}$).

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.

ELECTRICAL CHARACTERISTICS

($V_{CC} = 3.0\text{V}$ to 3.6V , serial data rate = 2.75Gbps, $T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$. Typical values at $V_{CC} = 3.3\text{V}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.)

Maximum Serial Data Rate			2.75	3.125	Gbps
Power Dissipation		AC-coupled inputs, outputs	1.12	1.68	W
Supply Current	I_{CC}		340	466	mA
CML Differential Output Voltage	V_{OD}	$R_L = 50\Omega$ to V_{CC} , or 100Ω differential (Note 2)	1200	1500	2200
CML Differential Input Voltage	V_{ID}		200	1600	2200
CML Output Impedance	R_{OUT}	Single ended	42.5	50	57.5
CML Input Impedance	R_{IN}	Differential	85	100	116
Random Jitter		(Note 3)	1	2	psRMS
Deterministic Jitter		(Notes 3, 4, 5)	11	25	psp-p
CML Output Edge Speed (20% to 80%)	t_R, t_F	2.5Gbps input (Note 6)	70	135	ps
		1.25Gbps input (Note 3)	80	200	
Propagation Delay		LI_- to SO_- , SI_- to LO_- , LI_- to LO_- (Note 3)	340	500	ps
Multiplexer Switch Time		SEL_- or LB_- to valid output	9		ns
TTL Input Current High		$V_{IH} = +2.0\text{V}$ to ($V_{CC} + 0.3\text{V}$)		180	μA
TTL Input Current Low		$V_{IL} = -0.3\text{V}$ to $+0.8\text{V}$		440	μA

Note 2: Tested using a repeating 1010 pattern at 500Mbps.

Note 3: AC specifications are guaranteed by design and characterization.

Note 4: Deterministic jitter is measured with a repeating K28.5 pattern.

Note 5: With the peak-to-peak input swing on the selected (transmitted) CML input equal to or greater than that on the nonselected inputs.

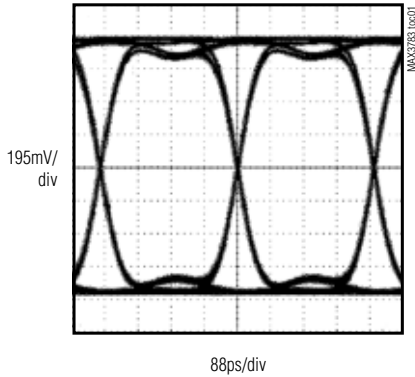
Note 6: AC specifications are guaranteed by test.

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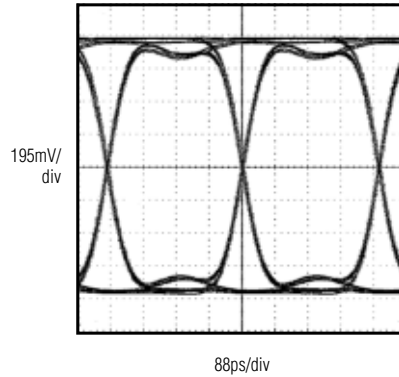
Typical Operating Characteristics

($V_{CC} = 3.3V$, $T_A = +25^\circ C$, unless otherwise noted.)

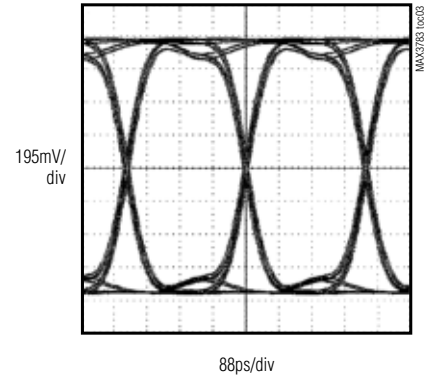
ELECTRICAL EYE DIAGRAM
2.75 Gbps, 2²³ - 1 PRBS PATTERN



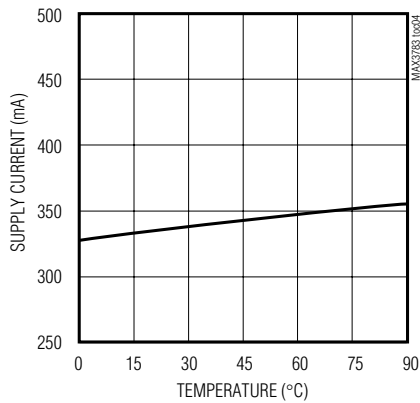
ELECTRICAL EYE DIAGRAM
2.75 Gbps, K28.5 PATTERN



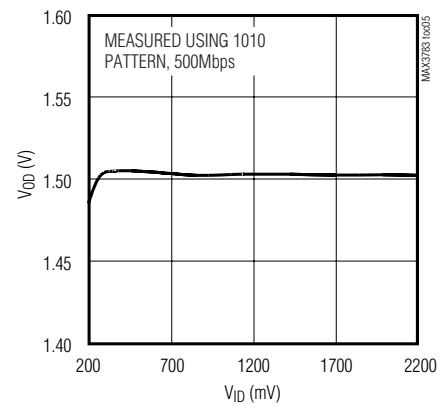
ELECTRICAL EYE DIAGRAM
3.125 Gbps, K28.5 PATTERN



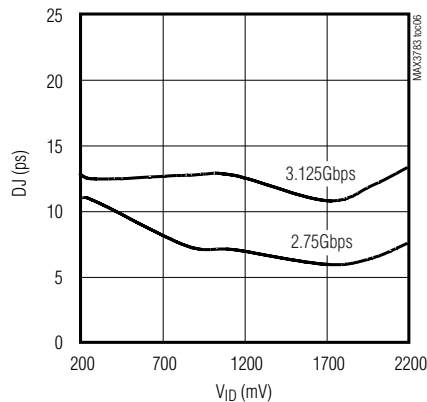
SUPPLY CURRENT vs. TEMPERATURE



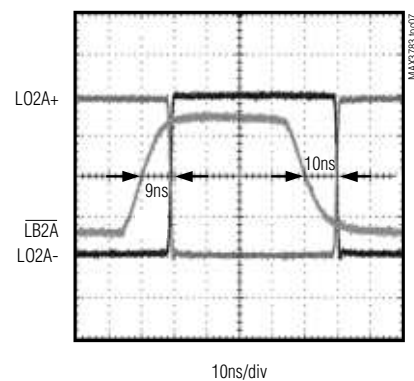
CML DIFFERENTIAL OUTPUT VOLTAGE vs. CML DIFFERENTIAL INPUT VOLTAGE



DETERMINISTIC JITTER vs. CML DIFFERENTIAL INPUT VOLTAGE



MULTIPLEXER SWITCH TIME



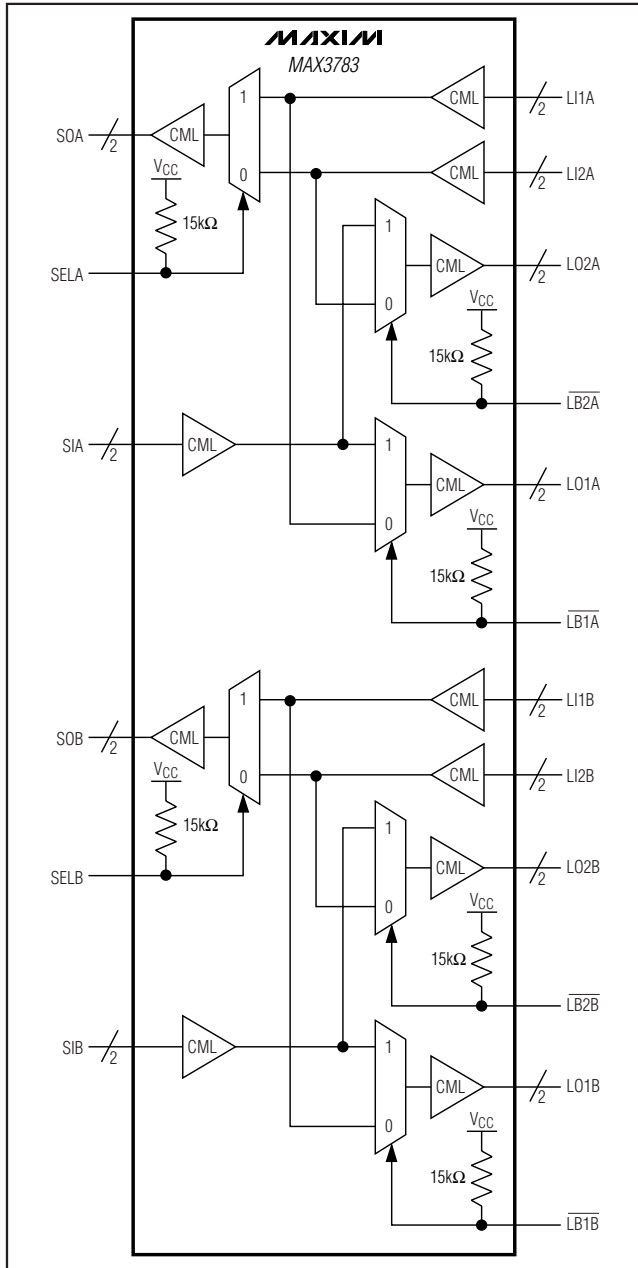
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Pin Description

1, 12, 24, 30, 31, 37	GND	Supply Ground
2	SIA-	Serial Input A Negative, CML
3	SIA+	Serial Input A Positive, CML
4, 9, 14, 17, 20, 23, 27, 34, 38, 41, 44, 47	VCC	+3.3V Supply
5	$\overline{\text{LB1A}}$	Line Out 1A Loopback Mode Select. TTL low selects loopback.
6	$\overline{\text{LB2A}}$	Line Out 2A Loopback Mode Select. TTL low selects loopback.
7	$\overline{\text{LB1B}}$	Line Out 1B Loopback Mode Select. TTL low selects loopback.
8	$\overline{\text{LB2B}}$	Line Out 2B Loopback Mode Select. TTL low selects loopback.
10	SIB+	Serial Input B Positive, CML
11	SIB-	Serial Input B Negative, CML
13	SELB	Serial Output B Input Select, TTL
15	SOB+	Serial Output B Positive, CML
16	SOB-	Serial Output B Negative, CML
18	LO1B+	Line Out 1B Positive, CML
19	LO1B-	Line Out 1B Negative, CML
21	LO2B+	Line Out 2B Positive, CML
22	LO2B-	Line Out 2B Negative, CML
25	LI2B+	Line In 2B Positive, CML
26	LI2B-	Line In 2B Negative, CML
28	LI1B+	Line In 1B Positive, CML
29	LI1B-	Line In 1B Negative, CML
32	LI1A-	Line In 1A Negative, CML
33	LI1A+	Line In 1A Positive, CML
35	LI2A-	Line In 2A Negative, CML
36	LI2A+	Line In 2A Positive, CML
39	LO2A-	Line Out 2A Negative, CML
40	LO2A+	Line Out 2A Positive, CML
42	LO1A-	Line Out 1A Negative, CML
43	LO1A+	Line Out 1A Positive, CML
45	SOA-	Serial Output A Negative, CML
46	SOA+	Serial Output A Positive, CML
48	SELA	Serial Out A Input Select, TTL
EP	Exposed Pad	Ground. Must be soldered to the circuit board for proper thermal and electrical performance (see the <i>Exposed-Pad (EP) Package</i> section).

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Functional Diagram



Detailed Description

The MAX3783 is a 2.7Gbps dual serial mux/buffer with selectable line-side loopback for system test. Each half of the MAX3783 provides a transmitter with a fanout of two and a receiver with a 2:1 mux, as shown in the functional diagram.

Input Stages

The input amplifiers accept CML or AC-coupled PECL signals and each input has an on-chip 100Ω differential impedance for optimal termination, as shown in Figure 1.

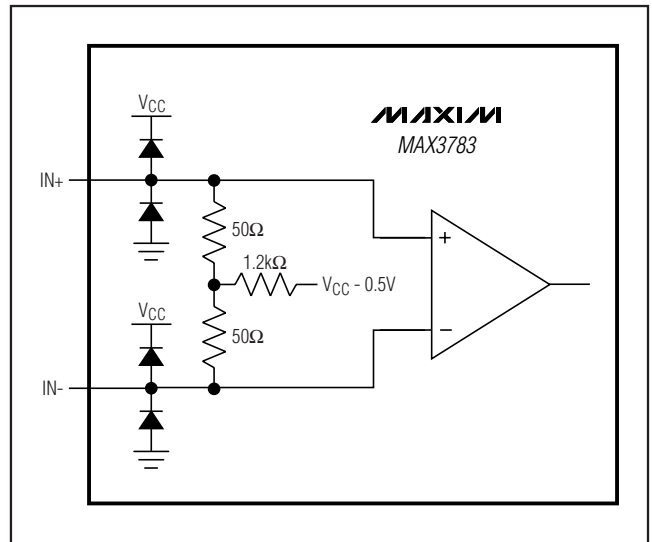


Figure 1. Input Structure

Control Lines

TTL-compatible control lines are provided to select the MAX3783's operating mode (Table 1). SELA and SELB set the mux for channels A and B, respectively, to select LI1_ or LI2_ to connect to the SO_ output. LB1A, LB1B, LB2A, and LB2B enable loopback mode for each of the four LO_ outputs. All control lines are internally pulled high through 15kΩ resistors.

Table 1. Operating Modes

SEL_	SO_	LB_	LO_
0	LI2_	0	LI_
1	LI1_	1	SI_

Output Buffers

The outputs are high-speed CML interfaces with 50Ω back termination, as shown in Figure 2.

Exposed-Pad (EP) Package

The exposed pad on the 48-pin TQFP-EP provides a very low thermal-resistance path for heat removal from the IC. The pad is also electrical ground on the MAX3783 and must be soldered to the circuit board for proper thermal and electrical performance.

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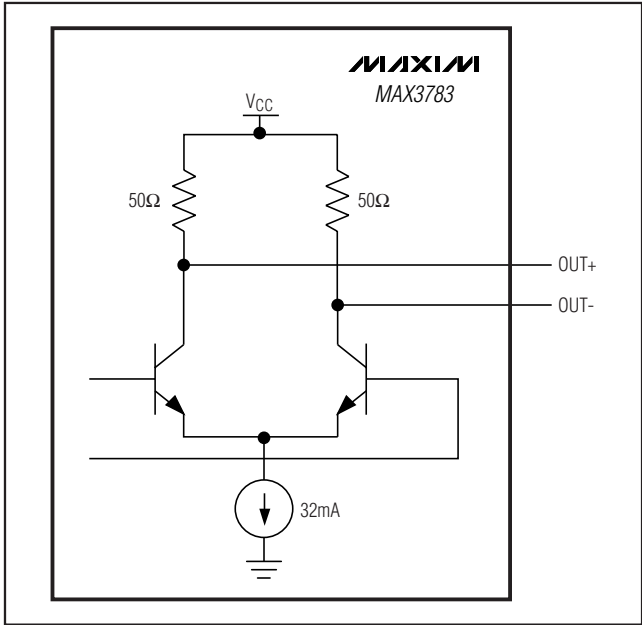


Figure 2. CML Output Structure

Chip Information

TRANSISTOR COUNT: 2816

PROCESS: BiPOLAR

Package Information

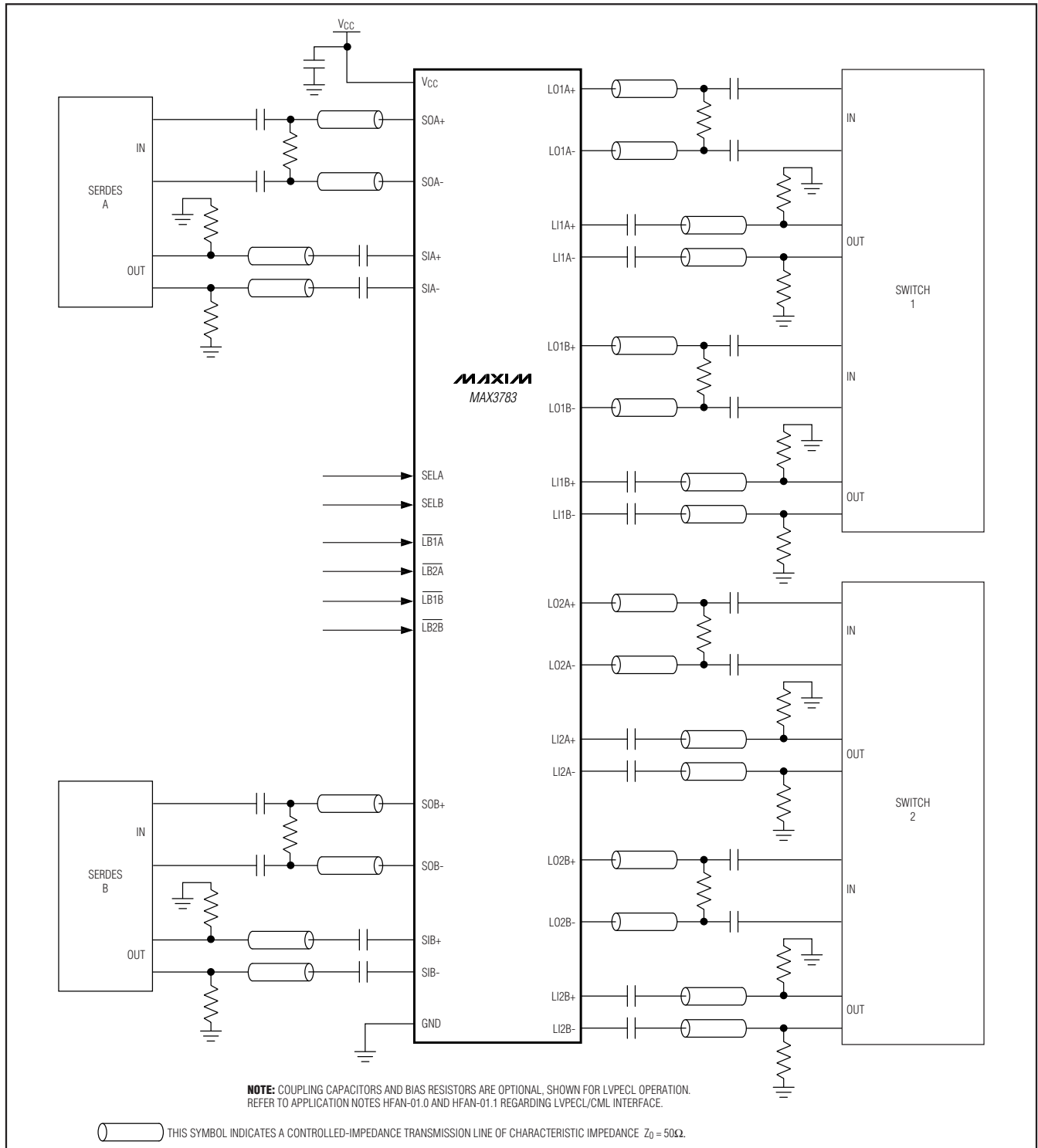
(For the latest package outline information, go to www.maxim-ic.com/packages.)

PACKAGE TYPE	DOCUMENT NO.
48 TQFP-EP	21-0065

2.7Gbps Dual Mux/Buffer with Loopback

Typical Application Circuit

MAX3783



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Revision History

NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/01	Initial release.	—
1	3/06	Added lead-free device to the Ordering Information table.	1
2	1/08	In the Electrical Characteristics table, modified Note 2 and added Note 6 for t_R , t_F ; replaced package outline drawings with table.	2, 8, 9

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