19-4792; Rev 2; 5/04

EVALUATION KIT AVAILABLE

+3.3V, 2.125Gbps/1.0625Gbps Fibre Channel Port Bypass ICs

General Description

The MAX3750/MAX3751 are +3.3V, Fibre Channel port bypass ICs that include a high-speed multiplexer and output buffer stage for hot swapping a storage device. These devices are optimized for use in a Fibre Channel arbitrated loop topology.

The MAX3750 has a 2.125Gbps data rate, while the MAX3751's data rate is 1.0625Gbps. Total power consumption (including output currents) is low: just 190mW for the MAX3750 and 180mW for the MAX3751. Low 10ps jitter makes these devices ideal for cascaded topologies. The output driver circuitry is tolerant of load mismatches commonly caused by board vias and inductive connectors. On-chip termination reduces external part count and simplifies board layout.

Applications

2.125Gbps Fibre Channel Arbitrated Loop

1.0625Gbps Fibre Channel Arbitrated Loop

Mass Storage Systems

RAID/JBOD Applications

Features

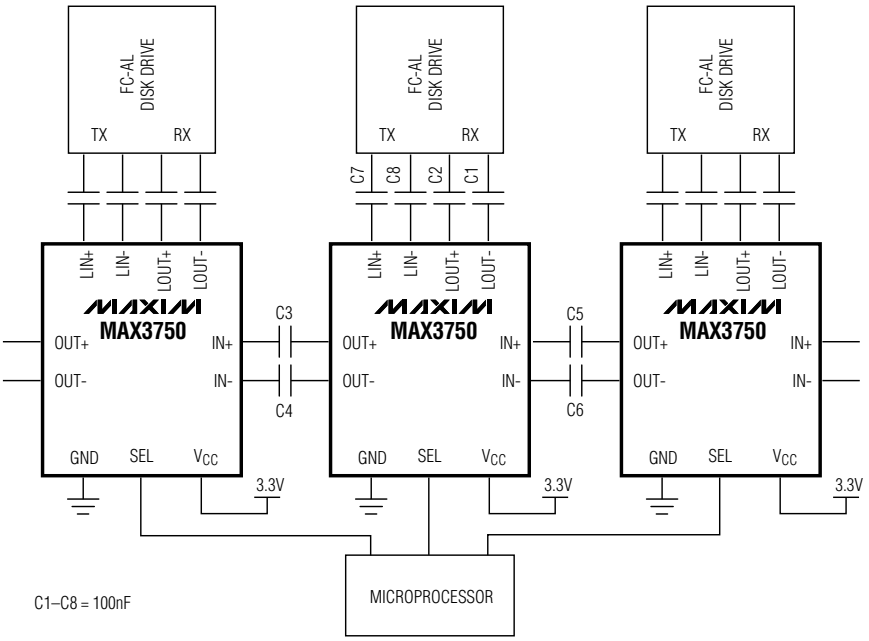
- **Single +3.3V Supply**
- **Low Jitter: 10ps**
- **Low Power Consumption**
  190mW (MAX3750)
  180mW (MAX3751)
- **Large Output Signal Swing: >1000mVp-p**
- **Mismatch Tolerant Output Driver Stage**
- **150Ω Differential On-Chip Termination on All Inputs**
- **150Ω On-Chip Back Termination on All Output Ports**

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MAX3750CEE	0°C to +70°C	16 QSOP
MAX3750CEE†	0°C to +70°C	16 QSOP
MAX3751CEE	0°C to +70°C	16 QSOP

†Denotes lead-free package.

Typical Application Circuit



THREE MAX3750/MAX3751s CASCADED IN AN FC-AL APPLICATION

Pin Configuration appears at end of data sheet.

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ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC}.....-0.5V to +5.0V
Voltage at LOUT+, LOUT-,
OUT+, OUT-.....(V_{CC} - 1.65V) to (V_{CC} + 0.5V)
Current Out of LOUT+, LOUT-, OUT+, OUT-.....±22mA
Voltage at SEL, LIN+, LIN-, IN+, IN-.....-0.5V to (V_{CC} + 0.5V)
Differential Voltage at (LIN+ - LIN-), (IN+ - IN-).....±2V

Continuous Power Dissipation (T_A = +70°C)
16 QSOP (derate 8.3mW/°C above +70°C).....667mW
Operating Temperature Range .....-40°C to +85°C
Storage Temperature Range .....-55°C to 150°C
Lead Soldering Temperature (soldering, 10s).....+300°C

DC ELECTRICAL CHARACTERISTICS

(V_{CC} = +3.0V to +3.6V, T_A = 0°C to +70°C, unless otherwise noted. Typical values are at V_{CC} = +3.3V and T_A = +25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	MAX3750 (Note 1)		57	84	mA
	MAX3751 (Note 1)		54	78	
Data Input Voltage Swing	Total differential signal, peak-to-peak	200		2200	mV
Differential Input Impedance		132	150	172	Ω
Output Voltage at LOUT± and OUT±	150Ω load, total differential signal, peak-to-peak	1000		1600	mV
TTL Input Current		-10		10	µA
TTL Input Low		-0.3		0.8	V
TTL Input High		2		V_{CC} + 0.3	V

Note 1: Output currents included.

AC ELECTRICAL CHARACTERISTICS

(V_{CC} = +3.0V to +3.6V, T_A = 0°C to +70°C, unless otherwise noted. Typical values are at V_{CC} = +3.3V and T_A = +25°C.)

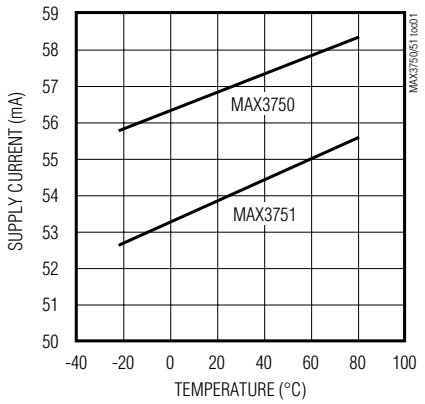
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Data Rate	MAX3750		2.125		Gbps
	MAX3751		1.0625		
Data Input Voltage Swing	Total differential signal, peak-to-peak	200		2200	mV
Output Edge Speed IN± →OUT±, IN± →LOUT±	MAX3750			160	ps
	MAX3751			325	
Deterministic Jitter IN± →OUT±, IN± →LOUT±, LIN± →OUT±	MAX3750, peak-to-peak (Notes 2, 4)		10		ps
	MAX3751, peak-to-peak (Notes 3, 4)		10		
Random Jitter IN± →OUT±, IN± →LOUT±, LIN± →OUT±	MAX3750, RMS (Note 2)			1.6	ps
	MAX3751, RMS (Note 3)			1.6	
Prop Delay IN± →OUT±, IN± →LOUT±, LIN± →OUT±	MAX3750		300		ps
	MAX3751		442		

Note 2: Input t_R and t_F < 150ps, 20% to 80%.
Note 3: Input t_R and t_F < 300ps, 20% to 80%.
Note 4: Deterministic jitter is measured with 20 bits of the k28.5 pattern (00111110101100000101).

Typical Operating Characteristics

(V_{CC} = 3.3V, T_A = +25°C, unless otherwise noted.)

SUPPLY CURRENT vs. TEMPERATURE



Pin Description

PIN	NAME	FUNCTION
1, 4, 5, 8, 16	GND	Electrical Ground
2	LOUT+	Noninverted Port Data Output
3	LOUT-	Inverted Port Data Output
6	OUT+	Noninverted Data Output
7	OUT-	Inverted Data Output
9	SEL	Select Input: SEL = Low: IN± → OUT± SEL = High: LIN± → OUT±
10	LIN-	Inverted Port Data Input
11	LIN+	Noninverted Port Data Input
12, 13	V_{CC}	Positive Supply Voltage
14	IN-	Inverted Data Input
15	IN+	Noninverted Data Input

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Circuit Description

A simplified block diagram of the single port bypass is shown in Figure 1. IN+ and IN- drive an input buffer (INBUFF) with 150Ω of internal differential input termination. INBUFF drives an output buffer (LOBUFF) and an input to a multiplexer (MUX).

A low TTL input at SEL selects the signal path of INBUFF through MUX to the output buffer (OUTBUFF). When SEL has a high TTL logic level present the signal path is into LIBUFF, through MUX, to OUTBUFF.

Low-Frequency Cutoff

The low-frequency cutoff is determined by the input resistance and the coupling capacitor as illustrated by the following equation:

$$f_C = 1 / (2\pi RC)$$

In a typical system where R = 150Ω and C = 100nF, resulting in f_C = 10kHz.

Layout Techniques

The MAX3750/MAX3751 are high-frequency products. The performance of the circuit is largely dependent upon layout of the circuit board. Use a multilayer circuit board with dedicated ground and V_{CC} planes. Power supplies should be capacitively bypassed to the ground plane with surface-mount capacitors placed near the power-supply pins.

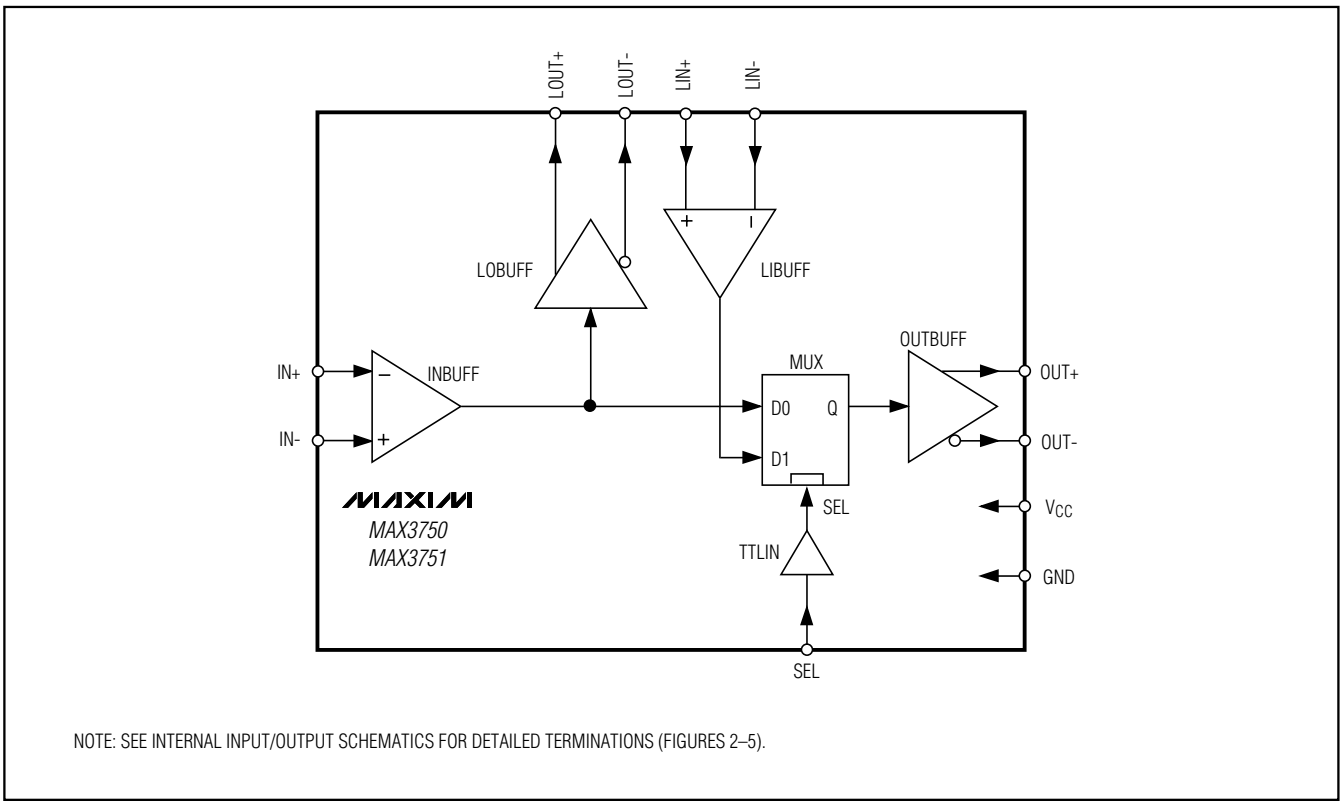

Figure 1. MAX3750/MAX3751 Block Diagram

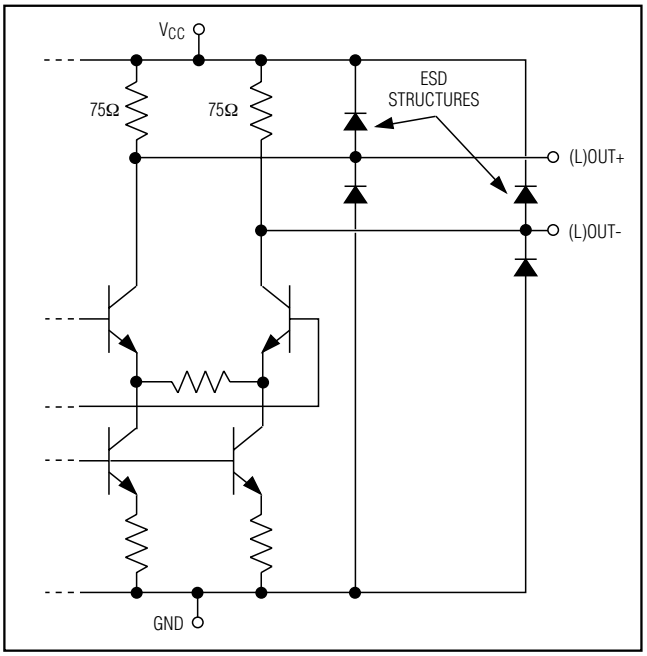

Figure 2. LOUT/OUT Pins Internal Input/Output Schematic

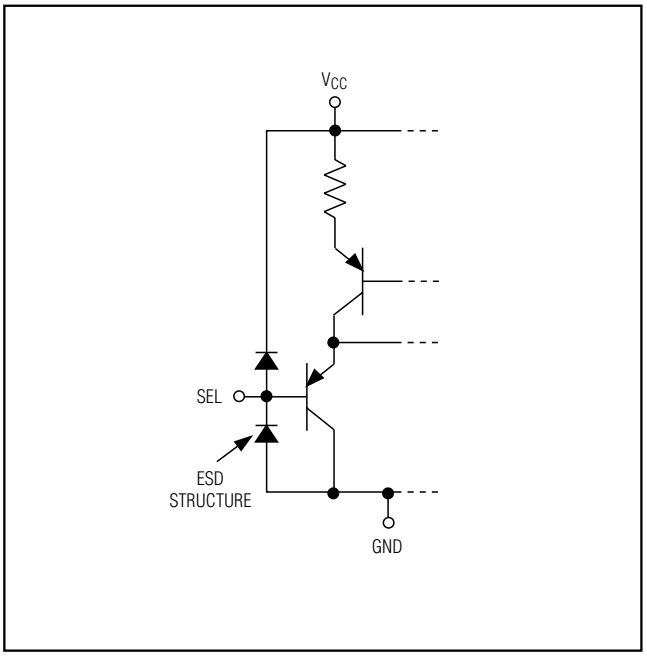

Figure 3. SEL Pin Internal Input/Output Schematic

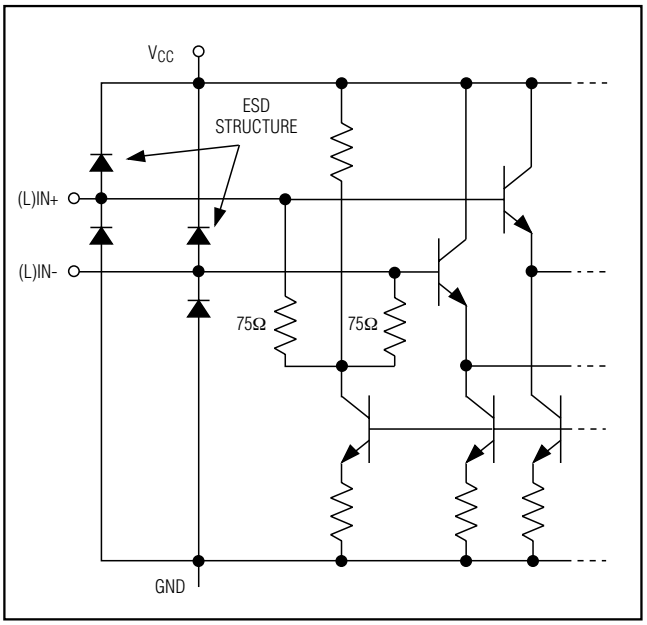

Figure 4. LIN/IN Pins Internal Input/Output Schematic

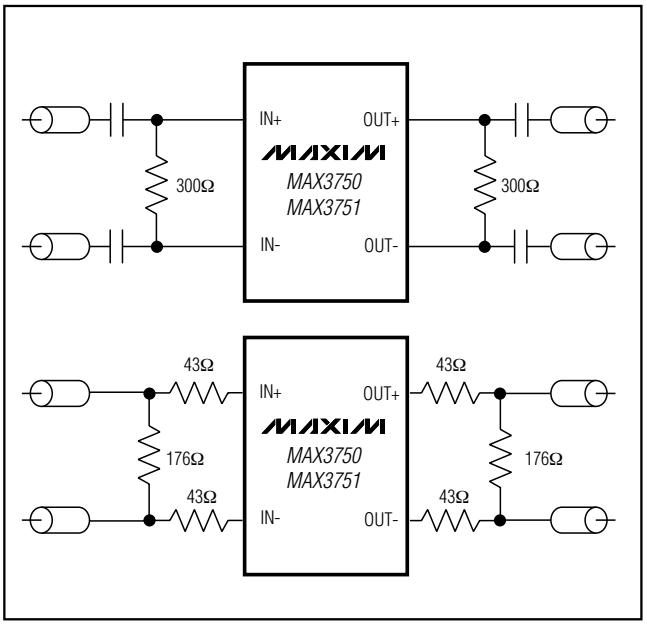

Figure 5. 50Ω Termination Applications

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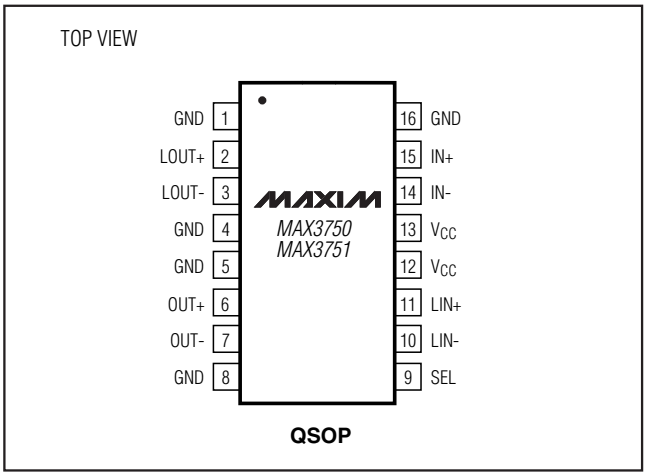
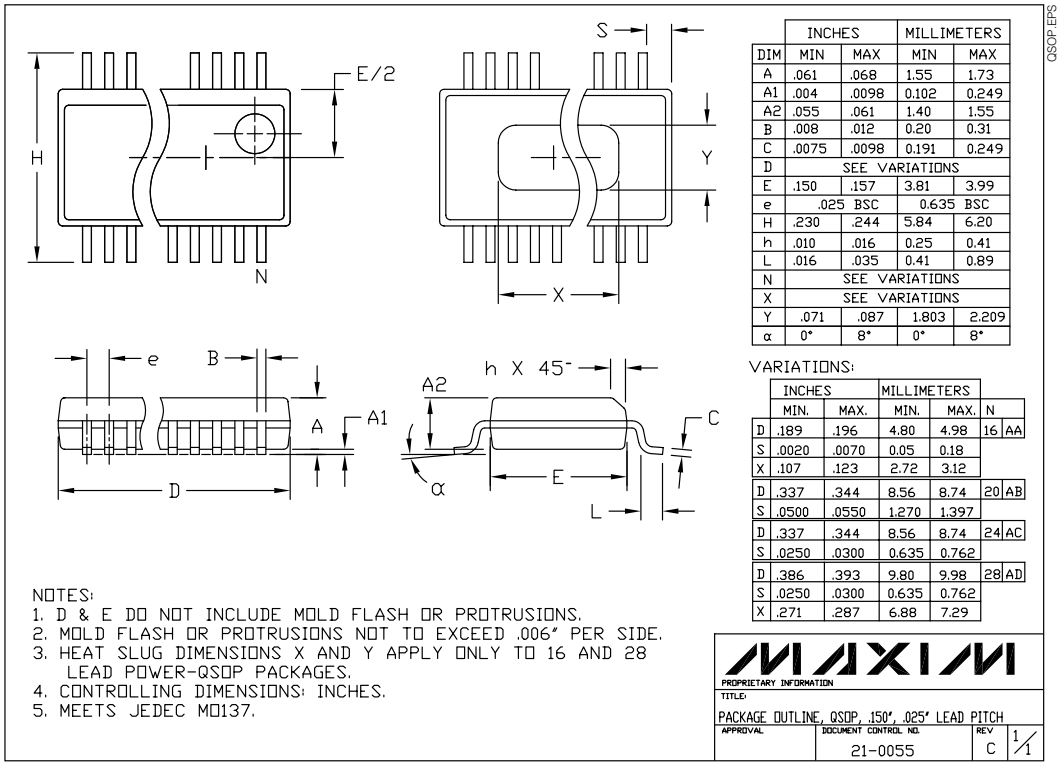
Pin Configuration



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**.)



DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.061	.068	1.55	1.73
A1	.004	.0098	0.102	0.249
A2	.055	.061	1.40	1.55
B	.008	.012	0.20	0.31
C	.0075	.0098	0.191	0.249
D	SEE VARIATIONS			
E	.150	.157	3.81	3.99
e	.025 BSC		0.635 BSC	
H	.230	.244	5.84	6.20
h	.010	.016	0.25	0.41
L	.016	.035	0.41	0.89
N	SEE VARIATIONS			
X	SEE VARIATIONS			
Y	.071	.087	1.803	2.209
α	0°	8°	0°	8°

VARIATIONS:

	INCHES MIN.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS MAX.	N	
D	.189	.196	4.80	4.98	16	AA
S	.0020	.0070	0.05	0.18		
X	.107	.123	2.72	3.12		
D	.337	.344	8.56	8.74	20	AB
S	.0500	.0550	1.270	1.397		
D	.337	.344	8.56	8.74	24	AC
S	.0250	.0300	0.635	0.762		
D	.386	.393	9.80	9.98	28	AD
S	.0250	.0300	0.635	0.762		
X	.271	.287	6.88	7.29		

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