

# MAXIM

## MAX3772–MAX3775 Evaluation Kits

### General Description

The MAX3772–MAX3775 evaluation kits (EV kits) simplify evaluation of the MAX3772–MAX3775 Fibre Channel repeater ICs. These fully assembled and factory-tested EV kits enable testing of all the devices' functions. 50Ω SMA connectors and controlled-impedance transmission lines are provided for the differential data inputs and outputs, as well as the voltage-controlled oscillator (VCO) clock outputs. A test/calibration path enables the user to calibrate test equipment so accurate measurements can be taken. On-board 75Ω to 50Ω impedance-transformation networks simplify interfacing with standard 50Ω test equipment. Jumpers allow the user to enable or disable the repeater IC frequency lock indicator and the VCO's clock outputs. The VCO frequency lock can be monitored at the LOCK test point.

### Component Suppliers

SUPPLIER	PHONE	FAX
AVX	843-946-0238	843-626-3123
Coilcraft	847-639-6400	847-639-1469
Murata	770-436-1300	770-436-3030
Venkel	800-950-8365	512-794-0087

**Note:** Please indicate that you are using the MAX3772–MAX3775 when contacting these component suppliers.

### Features

- ◆ SMA Connectors for All High-Speed Inputs and Outputs
- ◆ On-Board 75Ω to 50Ω Impedance-Conversion Networks
- ◆ Jumpers for Controlling the Clock Output and Rate Select Function
- ◆ Frequency Lock Indicator
- ◆ Test Strip for Board Characterization
- ◆ Fully Assembled and Tested

### Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX3772EVKI	0°C to +70°C	16 QSOP-EP*
MAX3773EVKI	0°C to +70°C	16 QSOP-EP*
MAX3774EVKI	0°C to +70°C	16 QSOP-EP*
MAX3775EVKI	0°C to +70°C	16 QSOP-EP*

### Selector Guide

PART	DIFFERENTIAL INPUT TERMINATION	DIFFERENTIAL OUTPUT TERMINATION
MAX3772EVKIT	100Ω	100Ω
MAX3773EVKIT	150Ω	100Ω
MAX3774EVKIT	100Ω	150Ω
MAX3775EVKIT	150Ω	150Ω

### MAX3772 Component List

DESIGNATION	QTY	DESCRIPTION
C1–C6, C8, C9, C12–C15	12	0.1μF ±10% ceramic capacitors (0805) Murata GRM21BR71E104KA01C
C7	1	0.047μF ±10% ceramic capacitor (0603) Murata GRM188R71E473KA01B
C10	1	2.2μF ±10% ceramic capacitor (1206) Murata GRM31MR71C225KC11B

DESIGNATION	QTY	DESCRIPTION
C11	1	33μF tantalum capacitor AVX TAJC336K016R
J1–J6, J10–J13	10	SMA connectors (edge mount)
J8, J9	2	3-pin headers (0.1in centers)
L1	1	56nH inductor Coilcraft 0805HT-56NTKBC
R1, R2, R4, R5, R7, R8, R11, R12, R14, R15	10	0Ω resistors (0402)

Evaluate: MAX3772–MAX3775

# MAX3772-MAX3775 Evaluation Kits

## MAX3772 Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R3, R6, R9, R13, R16	5	Open
VCC, GND, J7	3	Test points
U1	1	MAX3772CEE 16-pin QSOP-EP
None	2	Shunts for J8 and J9
None	1	MAX3772-MAX3775 data sheet
None	1	MAX3772-MAX3775 EV kit circuit board, rev B

## MAX3773 Component List

DESIGNATION	QTY	DESCRIPTION
C1-C6, C8, C9, C12-C15	12	0.1 $\mu$ F $\pm$ 10% ceramic capacitors (0805) Murata GRM21BR71E104KA01C
C7	1	0.047 $\mu$ F $\pm$ 10% ceramic capacitor (0603) Murata GRM188R71E473KA01B
C10	1	2.2 $\mu$ F $\pm$ 10% ceramic capacitor (1206) Murata GRM31MR71C225KC11B
C11	1	33 $\mu$ F tantalum capacitor AVX TAJC336K016R
J1-J6, J10-J13	10	SMA connectors (edge mount)
J8, J9	2	3-pin headers (0.1in centers)
L1	1	56nH inductor Coilcraft 0805HT-56NTKBC
R1, R2	2	43.2 $\Omega$ $\pm$ 1% resistors (0402)
R3	1	178 $\Omega$ $\pm$ 1% resistor (0402)
R4, R5, R7, R8, R11, R12, R14, R15	8	0 $\Omega$ resistors (0402)
R6, R9, R13, R16	4	Open
VCC, GND, J7	3	Test points
U1	1	MAX3773CEE 16-pin QSOP-EP
None	2	Shunts for J8 and J9
None	1	MAX3772-MAX3775 data sheet
None	1	MAX3772-MAX3775 EV kit circuit board, rev B

## MAX3774 Component List

DESIGNATION	QTY	DESCRIPTION
C1-C6, C8, C9, C12-C15	12	0.1 $\mu$ F $\pm$ 10% ceramic capacitors (0805) Murata GRM21BR71E104KA01C
C7	1	0.047 $\mu$ F $\pm$ 10% ceramic capacitor (0603) Murata GRM188R71E473KA01B
C10	1	2.2 $\mu$ F $\pm$ 10% ceramic capacitor (1206) Murata GRM31MR71C225KC11B
C11	1	33 $\mu$ F tantalum capacitor AVX TAJC336K016R
J1-J6, J10-J13	10	SMA connectors (edge mount)
J8, J9	2	3-pin headers (0.1in centers)
L1	1	56nH inductor Coilcraft 0805HT-56NTKBC
R1, R2, R11, R12, R14, R15	6	0 $\Omega$ resistors (0402)
R3, R13, R16	3	Open
R4, R5, R7, R8	4	43.2 $\Omega$ $\pm$ 1% resistors (0402)
R6, R9	2	178 $\Omega$ $\pm$ 1% resistors (0402)
VCC, GND, J7	3	Test points
U1	1	MAX3774CEE 16-pin QSOP-EP
None	2	Shunts for J8 and J9
None	1	MAX3772-MAX3775 data sheet
None	1	MAX3772-MAX3775 EV kit circuit board, rev B

## MAX3775 Component List

DESIGNATION	QTY	DESCRIPTION
C1-C6, C8, C9, C12-C15	12	0.1 $\mu$ F $\pm$ 10% ceramic capacitors (0805) Murata GRM21BR71E104KA01C
C7	1	0.047 $\mu$ F $\pm$ 10% ceramic capacitor (0603) Murata GRM188R71E473KA01B
C10	1	2.2 $\mu$ F $\pm$ 10% ceramic capacitor (1206) Murata GRM31MR71C225KC11B

# MAX3772-MAX3775 Evaluation Kits

## MAX3775 Component List (continued)

DESIGNATION	QTY	DESCRIPTION
C11	1	33 $\mu$ F tantalum capacitor AVX TAJC336K016R
J1-J6, J10-J13	10	SMA connectors (edge mount)
J8, J9	2	3-pin headers (0.1in centers)
L1	1	56nH inductor Coilcraft 0805HT-56NTKBC
R1, R2, R4, R5, R7, R8, R11, R12, R14, R15	10	43.2 $\Omega$ $\pm$ 1% resistors (0402)
R3, R6, R9, R13, R16	5	178 $\Omega$ $\pm$ 1% resistors (0402)
VCC, GND, J7	3	Test points
U1	1	MAX3775CEE 16-pin QSOP-EP
None	2	Shunts for J8 and J9
None	1	MAX3772-MAX3775 data sheet
None	1	MAX3772-MAX3775 EV kit circuit board, rev B

## Quick Start

- 1) Select the data rate with J8 (see Table 1). Shorting pins 2 and 3 connects RATESEL to VCC for 2.125Gbps operation. Shorting pins 1 and 2 connects RATESEL to GND for 1.0625Gbps operation.
- 2) Connect a differential signal source to the SMA connectors at IN+ and IN-. Set the differential signal amplitude to 500mV<sub>P-P</sub>. Set the input signal's data rate to 2.125Gbps or 1.0625Gbps, depending on the selected data rate.
- 3) Connect a shunt across pins 2 and 3 of J9 to connect CLKEN to VCC to enable the clock output. Shunt pins 1 and 2 to connect CLKEN to GND if no clock output is desired (see Table 1).

- 4) Connect the data and the clock outputs (OUT+, OUT-, CLK+, and CLK-) through a 50 $\Omega$  matched-impedance cable to a 50 $\Omega$  oscilloscope with a bandwidth of at least 3GHz.
- 5) Power up the EV kit with a 3.3V supply. The scope shows an output waveform for the MAX3772/MAX3773 of approximately 1400mV<sub>P-P</sub>, while the MAX3774/MAX3775 shows approximately 600mV<sub>P-P</sub>. Some high-speed sampling oscilloscopes are not capable of displaying input voltages of this magnitude. Use appropriate attenuators to ensure the waveforms are not visually distorted.

## Detailed Description

The MAX3772-MAX3775 EV kits simplify the evaluation of the MAX3772-MAX3775 Fibre Channel compliant repeaters. The EV kits operate from a single 3.3V power supply and come complete with all the external components necessary to interface with 50 $\Omega$  test equipment.

## Connections

SMA connectors are provided for all high-speed inputs and outputs. All 75 $\Omega$  inputs and outputs are AC-coupled through a 75 $\Omega$  to 50 $\Omega$  impedance-conversion network, while devices with 50 $\Omega$  terminations are connected only through AC-coupling capacitors and 0 $\Omega$  series resistors to the input SMAs. SMA connectors are also provided for the calibration test strip.

Power-supply connections (VCC and ground) are provided through a 2-pin header. A test point is provided to monitor the frequency LOCK output. The control inputs (RATESEL and CLKEN, see Table 1) are connected to individual 3-pin headers that allow the selection of VCC or GND with a shunt.

## Control Functions

The MAX3772-MAX3775 EV kits are equipped with two 3-pin headers that allow the user to enable/disable the clock output, and select the data rate. Pin 1 is connected to ground for both headers, pin 2 is connected to the device's control inputs, and pin 3 is connected to VCC. See Table 1 for RATESEL and CLKEN selections.

Table 1. Controls and LOCK Indicator

HEADER	NAME	FUNCTION	
		SHUNT POSITIONS 1 AND 2	SHUNT POSITIONS 2 AND 3
J8	RATESEL	1.0625Gbps operation	2.125Gbps operation
J9	CLKEN	Disable clock output at CLK $\pm$ (normal operating mode)	Enable clock output at CLK $\pm$ (test mode)

# MAX3772-MAX3775 Evaluation Kits

## Input and Output Impedance Conversion

This Maxim family of dual-rate CDRs is designed to operate in 50Ω, 75Ω, and mixed impedance environments. Impedance-conversion networks are included on the MAX3773/MAX3774/MAX3775 EV kits for interfacing to standard 50Ω test equipment. An EV kit for a device with a 50Ω input and/or 50Ω outputs has the pads for an impedance-conversion network, but the pads are populated only with 0Ω series resistors to keep the impedance seen by test equipment to 50Ω (see Figures 1–4 for the MAX3772–MAX3775 schematics).

The impedance-transformation networks introduce signal attenuation when converting from a 75Ω to a 50Ω environment. The input signal is attenuated by a factor of 0.64, and the output signal is attenuated by a factor of 0.43. For example, a 600mV differential signal applied to the input terminals of the MAX3775 EV kit will produce a 381mV differential input signal across the device's input pins. If a 600mV differential signal is observed at the output terminals of the MAX3775 EV kit, the device's actual output is a 1400mV differential signal.

## Test/Calibration Circuit

The test/calibration signal path contains the same type of SMA connectors, transmission line layout, and

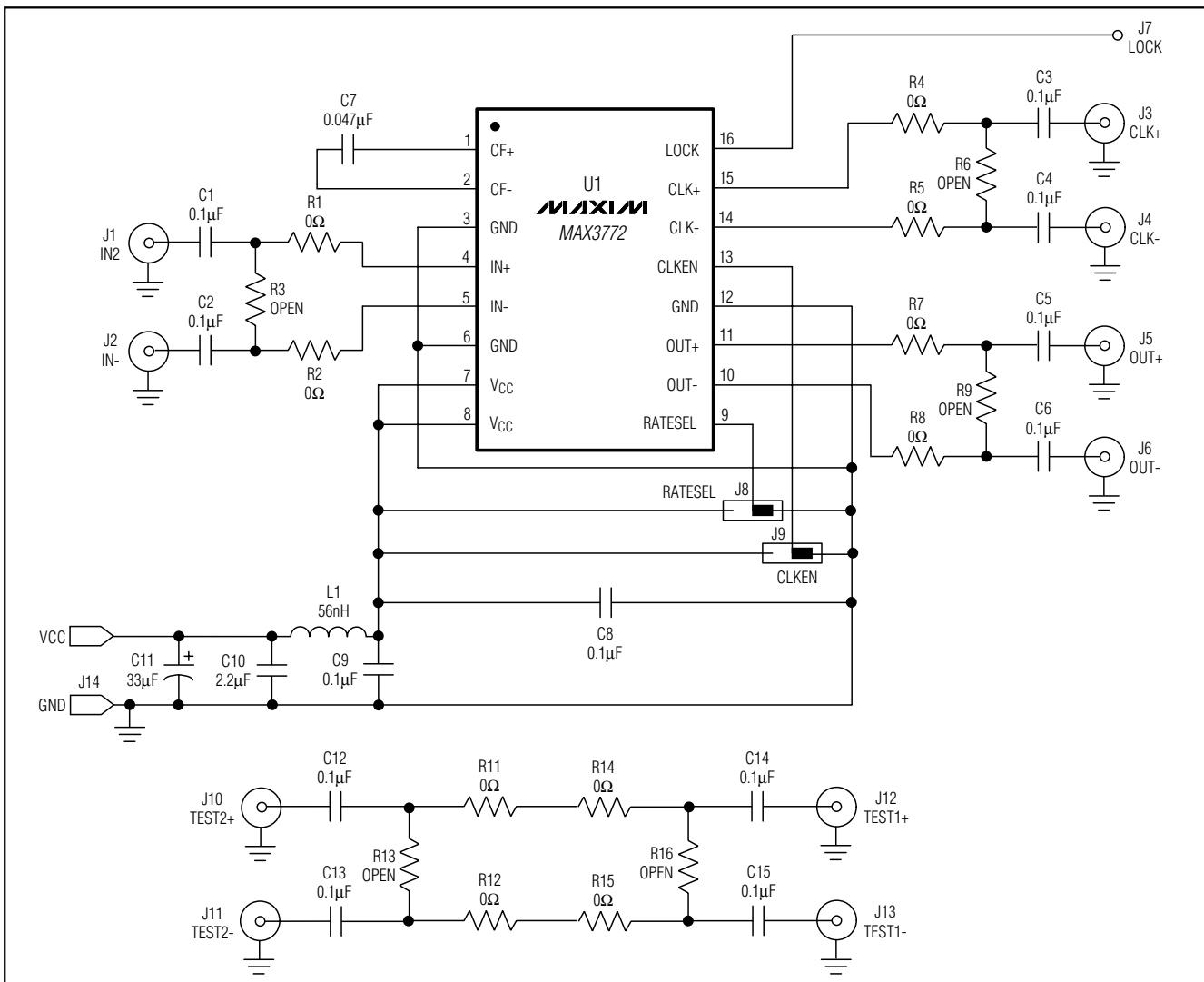


Figure 1. MAX3772 EV Kit Schematic

# MAX3772-MAX3775 Evaluation Kits

impedance-transformation networks as provided for the data repeater IC's signal I/Os. The test/calibration circuit can be used for PC board characterization and jitter calibration.

## Lock Monitor

The MAX3772-MAX3775 EV kits are provided with a frequency lock test point. A logic-level low indicates that the phase-lock loop has lost lock to the incoming data frequency. A logic-level high indicates that the device is locked to the incoming data, or the input signal amplitude is below the phase-detector threshold and the VCO is free-running.

## Layout Considerations

The performance of these dual-rate repeaters can be greatly affected by circuit board layout and design. Use good high-frequency design technique; including minimizing ground inductances and using fixed-impedance transmission lines on the data and clock signals.

Evaluate: MAX3772-MAX3775

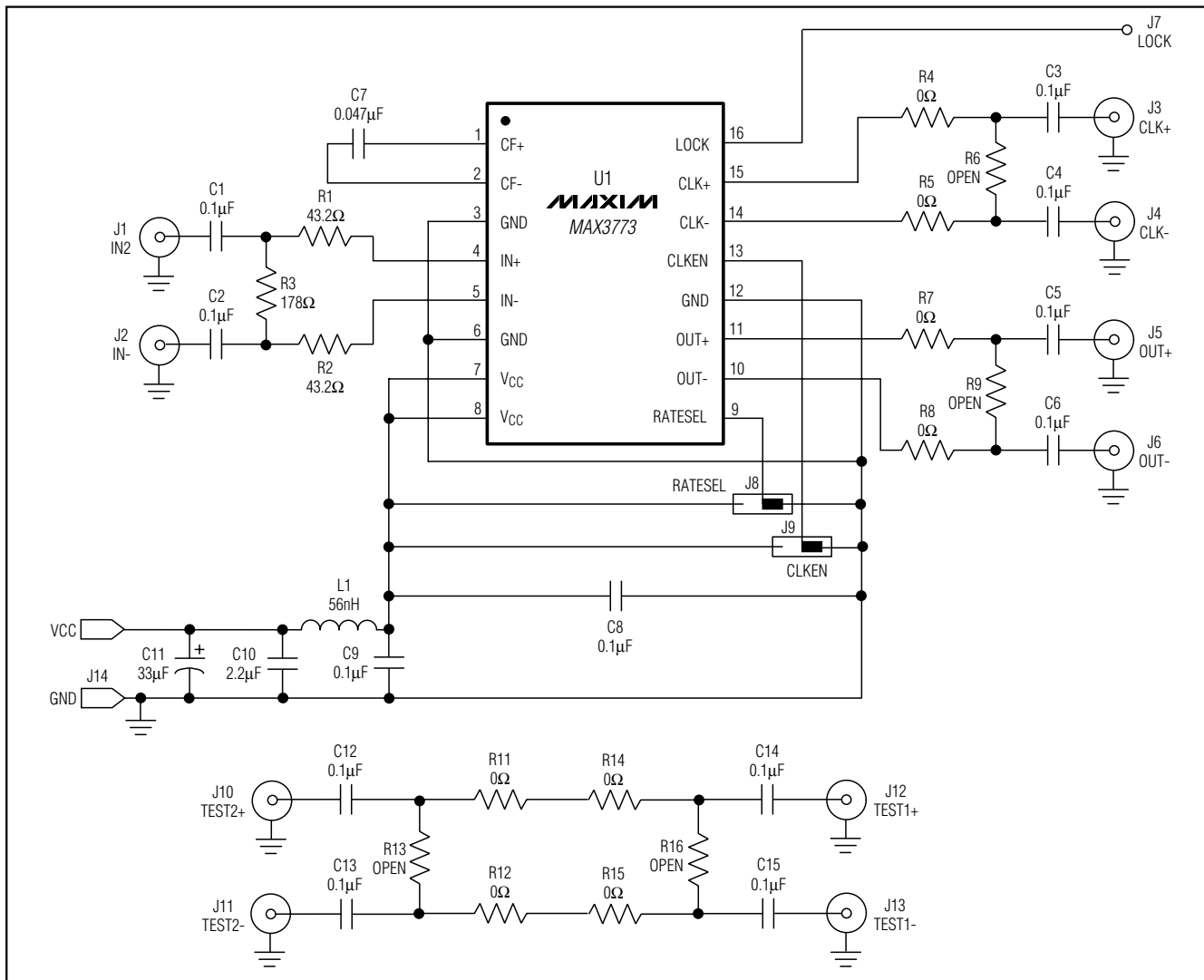


Figure 2. MAX3773 EV Kit Schematic



# MAX3772-MAX3775 Evaluation Kits

Evaluate: MAX3772-MAX3775

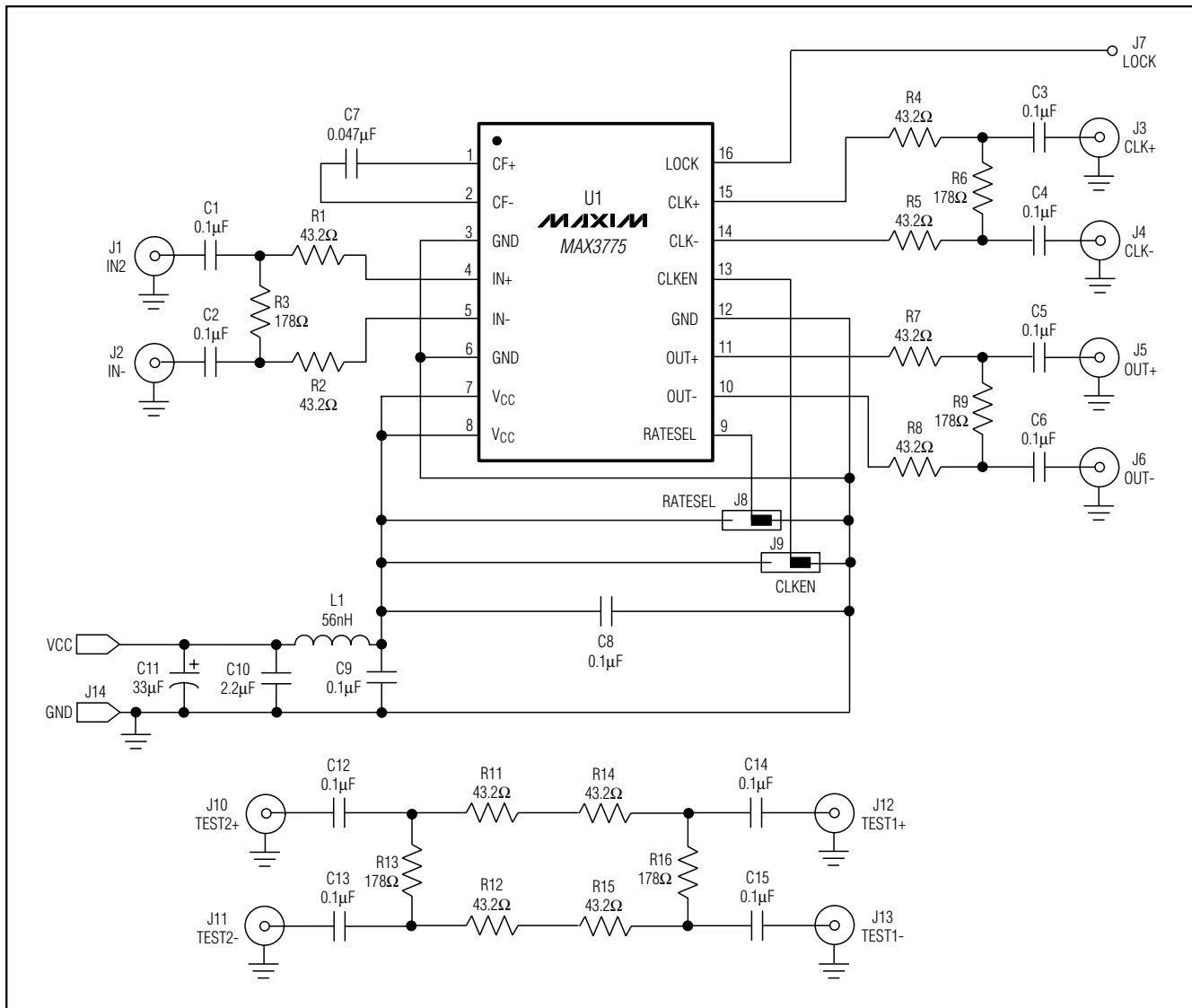


Figure 4. MAX3775 EV Kit Schematic

# MAX3772-MAX3775 Evaluation Kits

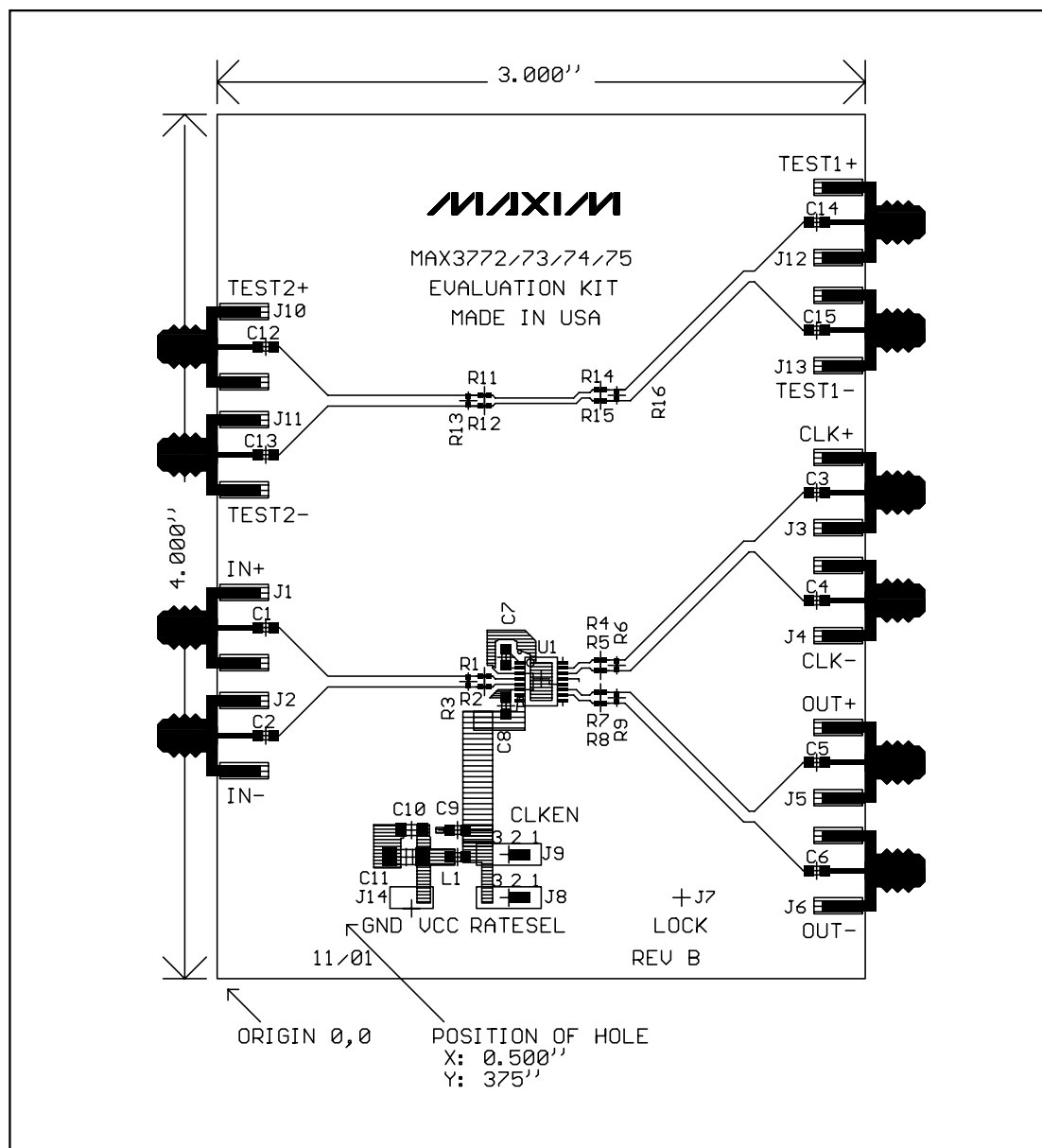


Figure 5. MAX3772-MAX3775 EV Kit Component Placement Guide—Component Side



## MAX3772–MAX3775 Evaluation Kits

**Evaluate: MAX3772–MAX3775**

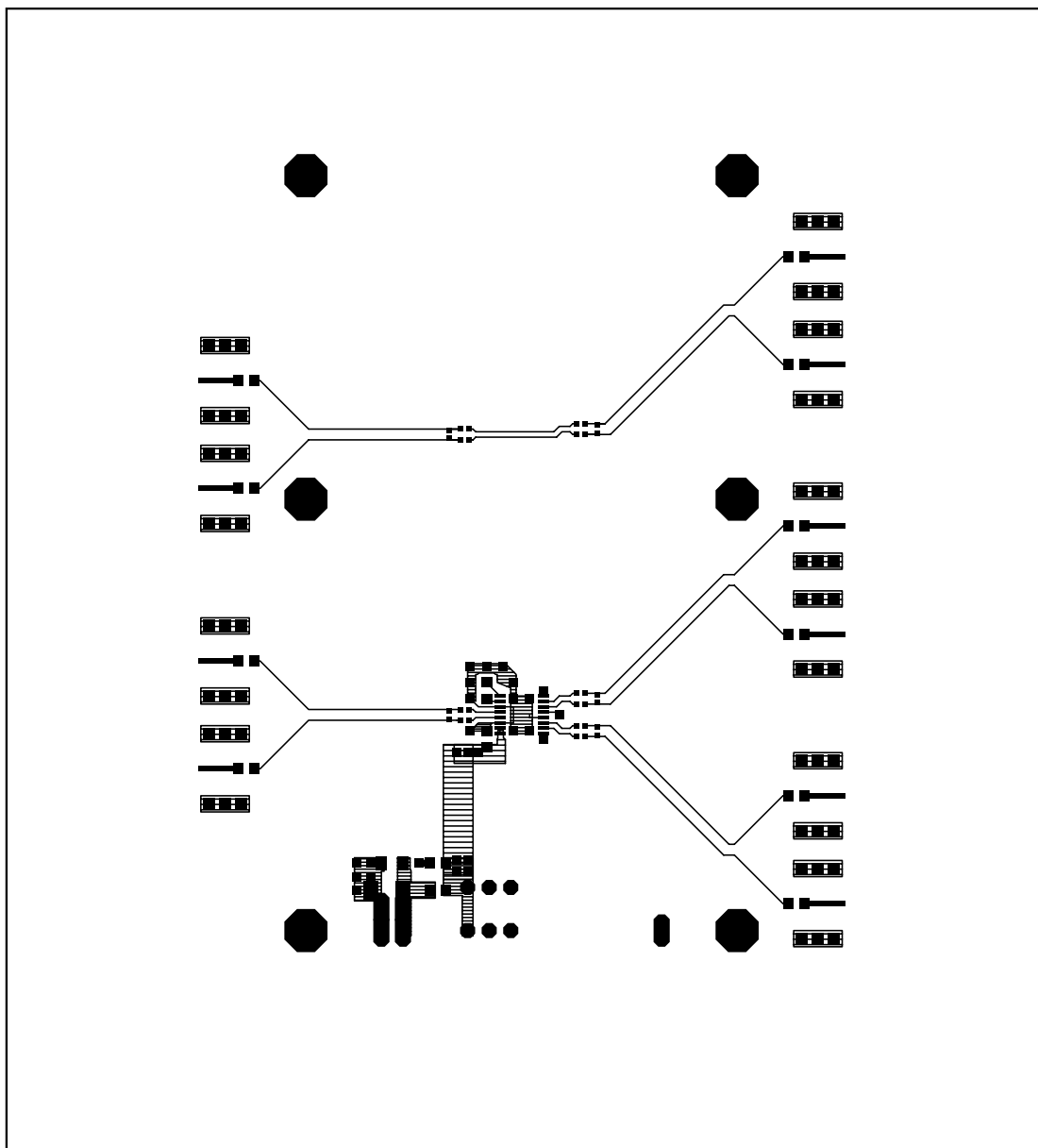


Figure 6. MAX3772–MAX3775 EV Kit PC Board Layout—Component Side

# MAX3772-MAX3775 Evaluation Kits

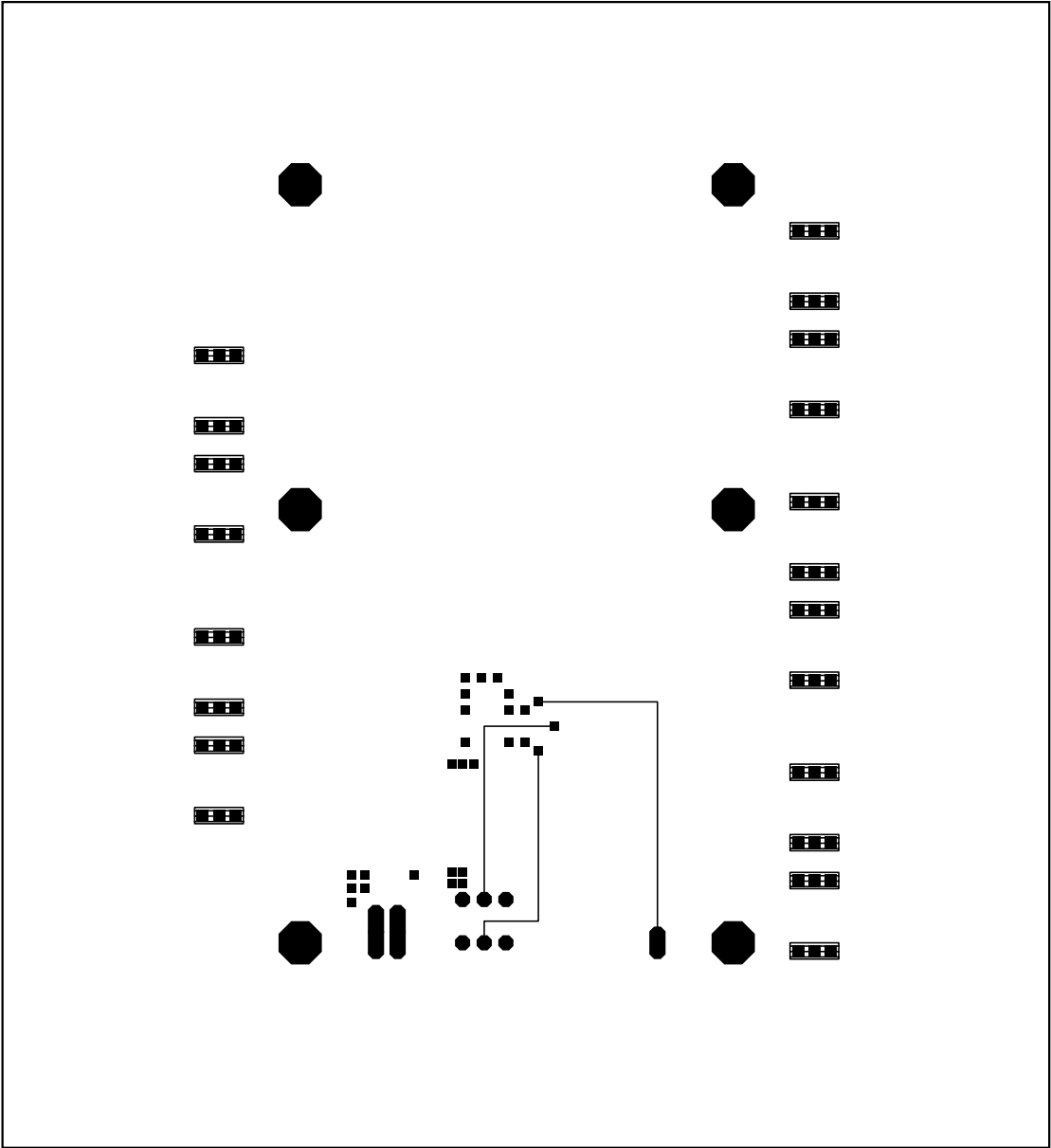


Figure 7. MAX3772-MAX3775 EV Kit PC Board Layout—Solder Side

## MAX3772–MAX3775 Evaluation Kits

**Evaluate: MAX3772–MAX3775**

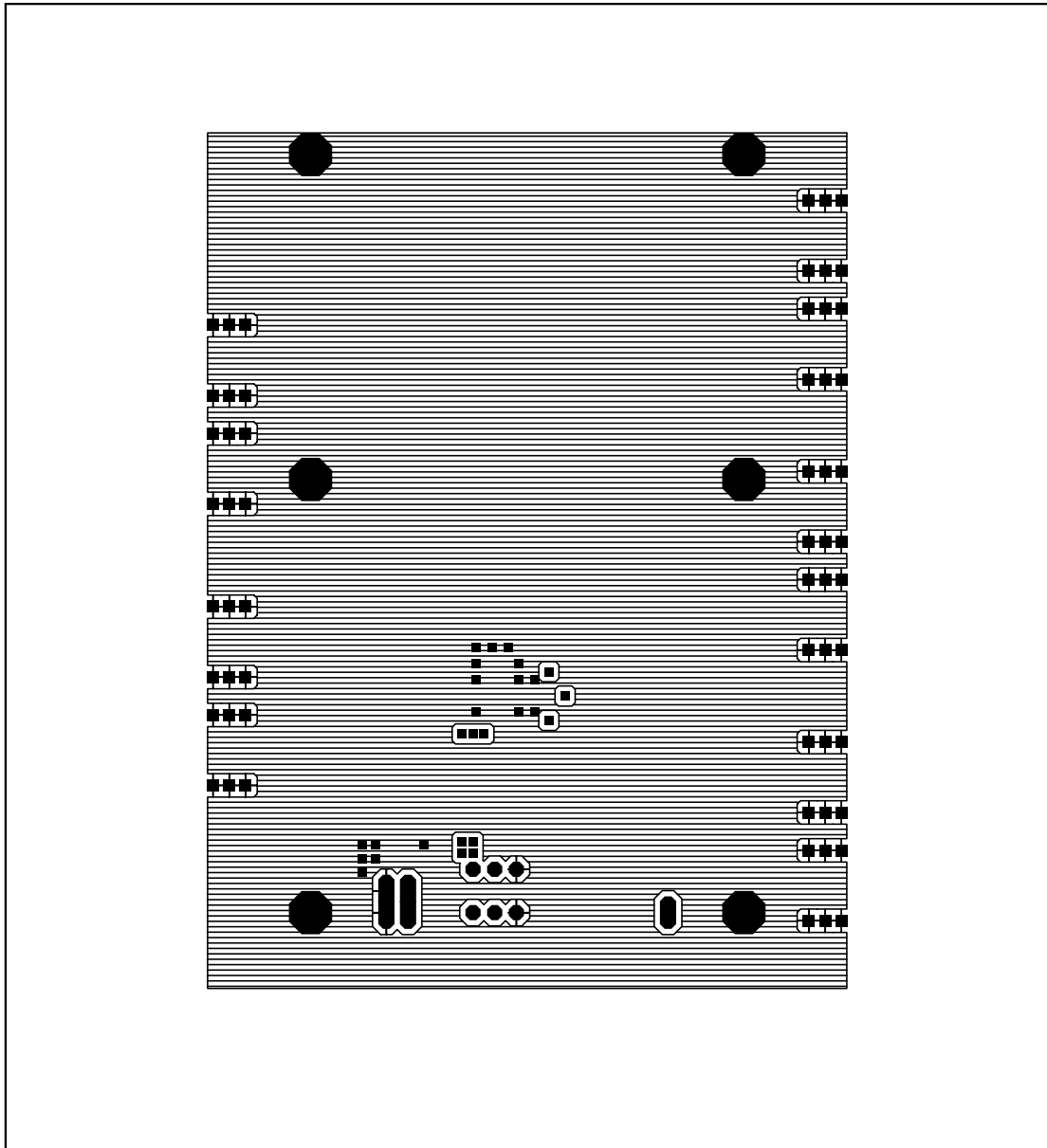


Figure 8. MAX3772–MAX3775 EV Kit PC Board Layout—Ground Plane

## MAX3772-MAX3775 Evaluation Kits

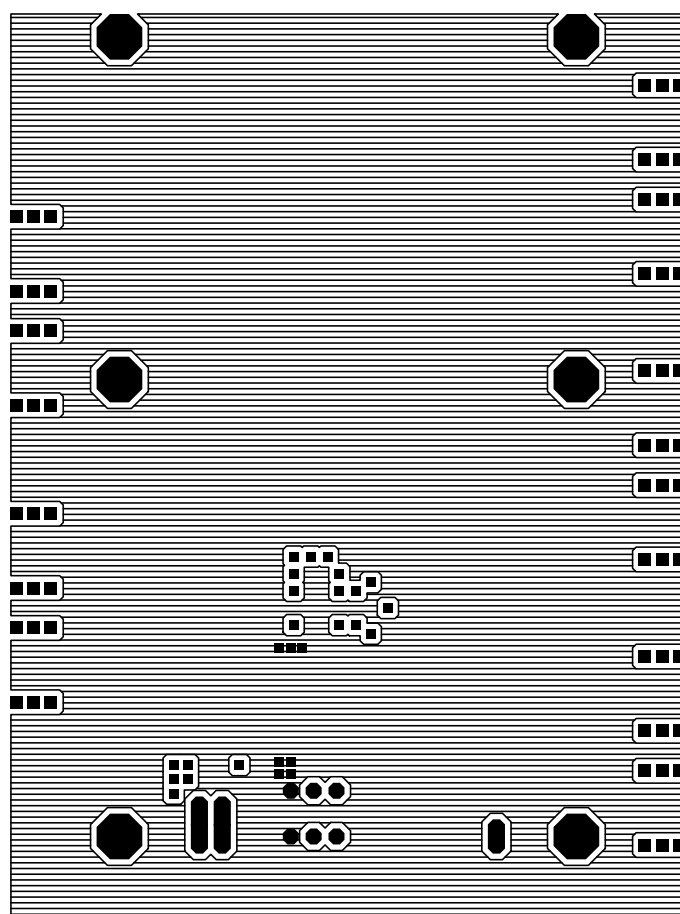


Figure 9. MAX3772-MAX3775 EV Kit PC Board Layout—Power Plane

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