# Comparators

## High Speed

### Single Supply

| | Maximum Propagation Delay |
|---|---|
| **LT1719, UltraFast™, Ground Sensing Rail-Rail, Hysteresis** | **6.5ns** NEW! |
| **LT1720**, UltraFast, Rail-Rail, Ground-Sensing, 3V/5V, **Dual** | 6.5ns |
| **LT1721, UltraFast, Ground Sensing Rail-Rail, Hysteresis, Quad** | **6.5ns** NEW! |
| **LT1394**, Ground-Sensing, Stable for Slow Signals | 9ns |
| **LT1015**, Line Receiver, Single Supply, Output Latch, **Dual** | 14ns |
| **LT1016**, Output Latch, Stable with Slow Moving Signal | 14ns |
| **LT1116**, Output Latch, Inputs Can Exceed V+ by 15V | 16ns |
| **LT1671**, Output Latch, Ground Sensing, High Gain | 80ns |
| **LT1011/A**, Improved LM111, ±30V Diff. Inputs, | 250ns |

### Split Supply

| | Maximum Propagation Delay |
|---|---|
| **LT1719, UltraFast, Ground Sensing Rail-Rail, Hysteresis** | **6.5ns** NEW! |
| **LT685**, Improved Am685, ECL Outputs, Low Offset, High Resolution | 6.5ns |
| **LT1394**, Ground-Sensing, Stable for Slow Signals | 9ns |
| **LT1016**, Output Latch, Stable with Slow Moving Signal | 14ns |
| **LT1116**, Output Latch, Inputs Can Exceed V+ by 15V | 16ns |
| **LT1671**, Output Latch, Ground-Sensing, High Gain | 80ns |
| **LT1011/A**, Improved LM111, ±30V Diff. Inputs, | 250ns |

## Micropower

**LTC1540**, Ref, Output, adj. Hysteresis, 40mA Output
**LTC1440**, Adj. Hysteresis, Ref Output, Ultralow Supply Current
**LTC1441**, Ref, Output, adj. Hysteresis, 40mA Output, **Dual**
**LTC1442**, Ref, Output, adj. Hysteresis, 40mA Output, **Dual**
**LTC1841**, 2V to 11V Supplies Ground-Sensing, Hysteresis, **Dual**
**LTC1842/43,** Built-in Reference, Ground-Sensing, Hysteresis, **Dual**
**LTC1541/42**, Hysteresis, Ref and op amp, Rail-Rail, Ground-Sensing
**LTC1443**, 1.182V ref. Output, adj. Hysteresis, 40mA Output, **Quad**
**LTC1444**, 1.182V ref. Output, adj. Hysteresis, 40mA Output, **Quad**
**LTC1445**, 1.221V ref. Output, adj. Hysteresis, 40mA Output, **Quad**
**LT1017**, Micropower, Drives Loads Above V+, **Dual**
**LT1018**, Higher Power, High-Speed than LT1017, **Dual**
**LTC1040**, 1.5µW, Common Mode to Both Rails, **Dual**

## Special Functions

| | Function |
|---|---|
| **LT1015**, Line Receiver, Single Supply, Output Latch, **Dual** | Line Receiver |
| **LTC1531**, 3kV Isolation, Self Powered Across Isolation, 2.5V ref. | 3kV Isolation |
| **LTC1041**, High Accuracy, 1.5µW, 2 Independent Control Inputs | Bang Bang Controller |
| **LTC1042**, 1High Accuracy, 1.5µW, 2 Independent Control Inputs | Window Comparator |
| **LTC1541/42**, Hysteresis, Ref and op amp, Rail-Rail, Ground-Sensing | With Reference & Op Amp |

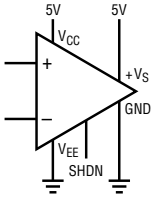
### With Reference Output

| | Reference Voltage |
|---|---|
| **LTC1531**, 3kV Isolation, Self Powered Across Isolation, 2.5V ref. | 2.5V |
| **LTC1440**, Adj. Hysteresis, Ref Output, Ultralow Supply Current | 1.182V |
| **LTC1441**, Ref, Output, adj. Hysteresis, 40mA Output, **Dual** | 1.182V |
| **LTC1442**, Ref, Output, adj. Hysteresis, 40mA Output, **Dual** | 1.182V |
| **LTC1443**, 1.182V ref. Output, adj. Hysteresis, 40mA Output, **Quad** | 1.182V |
| **LTC1444**, 1.182V ref. Output, adj. Hysteresis, 40mA Output, **Quad** | 1.221V |
| **LTC1445**, 1.22V ref. Output, adj. Hysteresis, 40mA Output, **Quad** | 1.221V |
| **LTC1540**, Ref, Output, adj. Hysteresis, 40mA Output | 1.182V |
| **LTC1541/42**, Hysteresis, Ref and op amp, Rail-Rail, Ground-Sensing | 1.2V |
| **LTC1842/43**, Built-in Reference, Ground-Sensing, Hysteresis, **Dual** | 1.182V |

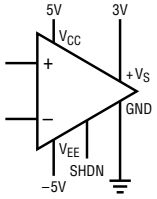
## Duals

**LT1015**, Line Receiver, Single Supply, Output Latch
**LT1017**, Micropower, Drives Loads Above V+
**LT1018**, Higher Power, Higher Speed than LT1017
**LT1720**, UltraFast, Rail-Rail, Ground-Sensing, 3V/5V
**LTC1040**, Micropower, Common Mode to Both Rails
**LTC1441**, Ref, Output, adj. Hysteresis, 40mA Output
**LTC1442**, Ref, Output, adj. Hysteresis, 40mA Output
**LTC1841**, 2V to 11V Supply Range, Ground-Sensing, adj. Hysteresis
**LTC1842/43**, Built-in Reference, Ground-Sensing, adj. Hysteresis

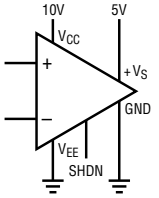
## *LT1719 Single Supply, 4.5ns, Rail-to-Rail Output, Comparator with Independent Input and Output Supplies*



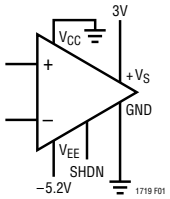

**Single 5V Supply**




**±5V Input/3V Output Supplies**




**10V/5V Supplies**




**–5.2V/3V Supplies**

***Features:***

- UltraFast: 4.5ns Prop Delay with 20mV Overdrive
- Independent Input and Output Supplies: Easy Interface from Real World Analog Signals to Any Logic
- Tolerant of Any Power Supply Sequencing: Use Independent Supplies Without Special or Restrictive Power Supply Start-Up
- Input Hysteresis: Clean Outputs from Slow Moving Input Signals
- Rail-to-Rail Output: Compatible with Low Voltage Logic
- Wide Input Range: Extends 100mV Below Ground to Allow Single Supply Operation
- Shielded Input Pinout: Minimizes Parasitic Feedback from Fast Switching Output
- Shutdown: Power Saving Shutdown (0.1µA)

## Comparators†

| RESPONSE TIME | P/N | MAX $V_{OS}$ | OPERATING VOLTAGES | OPEN DRAIN/ OPEN COLLECTOR | GROUND SENSE | DIFF. INPUT | SINGLE | DUAL | QUAD | SUPPLY CURRENT | REFERENCE VOLTAGE | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.5ns | LT1719 | 2.5mV | 3V, 5V | | ✓ | | LT1719 | | | 4.2mA | | UltraFast, Rail-to-Rail, Hysteresis |
| | LT1720 | 3mV | 3V, 5V | | ✓ | | | LT1720 | | 4mA | | UltraFast, Low Power, Rail-to-Rail |
| | LT1721 | 3mV | 3V, 5V | | ✓ | | | | LT1721 | 4mA | | UltraFast, Rail-to-Rail, Hysteresis |
| | LT685 | 2mV | ±5V | | | ±6V | LT685 | | | 22mA | | Latched ECL Outputs |
| 9ns | LT1394 | 2.5mV | 5V, ±5V | | ✓ | ±12V | LT1394 | | | 8.5mA | | UltraFast, Low Power |
| 12ns | LT1016 | 2mV | 5V, ±5V | | | ±5V | LT1016 | | | 35mA | | Stable with Slow Moving Signals |
| 14ns | LT1116 | 3mV | 5V, ±5V | | ✓ | ±15V | LT1116 | | | 38mA | | Inputs Can Exceed V+ by 15V |
| | LT1015 | 20mV | 5V | | | 5V | | LT1015 | | 70mA | | Line Receiver |
| 80ns | LT1671 | 2.5mV | 5V, ±5V | | ✓ | ±12V | LT1671 | | | 800µA | | Complementary Outputs and Latch |
| 250ns | LT1011 | 1.5mV | 5V, ±5V, ±15V | | | ±30V | LT1011 | | | 4mA | | 12-Bit Accurate |
| | LT1011A | 0.5mV | 5V, ±5V, ±15V | | | ±30V | LT1011A | | | 4mA | | Improved LM111 |
| 4µs | LT1018 | 1mV | 5V, ±5V, ±15V | | ✓ | 40V | | LT1018 | | 250µA | | Operates to 1.1V |
| 12µs | LTC1841 | 10mV | 2.5V to 11V | LTC1841 | ✓ | | | LTC1841 | | 5.7µA | | Ultralow Power |
| | LTC1842/43 | | ±1.25V to ±5.5V | LTC1842/43 | ✓ | | | LTC1842/43 | | 5.7µA | 1.182V | Built In Reference |
| 14µs | LTC1440 | 10mV | 3V, 5V, ±5V | | ✓ | | LTC1440 | | | 3.7µA* | 1.182V | Built In Reference |
| | LTC1442 | 10mV | 3V, 5V, ±5V | | ✓ | | | LTC1442 | | 5.7µA* | 1.182V | Built In Reference |
| | LTC1441 | 10mV | 3V, 5V, ±5V | | ✓ | | | LTC1441 | | 5.7µA* | 1.182V | Built In Reference |
| | LTC1443 | 10mV | 3V, 5V, ±5V | | | | | | LTC1443 | 8.5µA | 1.182V | Built In Reference |
| | LTC1444/45 | 10mV | 3V, 5V, ±5V | LTC1444 | | | | | LTC1444/5 | 8.5µA | 1.221V | Built In Reference |
| 15µs | LT1017 | 1mV | 5V, ±5V, ±15V | LT1017** | ✓ | 40V | | LT1017 | | 60µA | | Operates to 1.1V |
| 20µs (typ) | LTC1541/42 | 1mV | 3V, 5V, ±5V | | ✓ | | LTC1541/42 | | | 7.5µA | 1.2V | With Op Amp and Reference |
| 50µs | LTC1540 | 12mV | 3V, 5V, ±5V | | ✓ | | LTC1540 | | | 0.7µA | | Built In Reference |
| 100µs | LTC1042 | 10mV | 3V, 5V, ±5V | | ✓ | | LTC1042 | | | 5.7µA | | Sampling Window Comparator |
| | LTC1041 | 10mV | 3V, 5V, ±5V | | ✓ | | LTC1041 | | | 5.7µA | | 1.5µW at 1 Sample/Second |
| | LTC1040 | 0.5mV | 3V, 5V, ±5V | | ✓ | | | LTC1040 | | 3mA* | | 1.5µW at 1 Sample/Second |
| | LTC1531 | 4mV | 5V | | ✓ | | LTC1531 | | | 14mA | 2.5V | 3kV Isolation; Self Powered |

* 0.5µA in off state

** Functional equivalent

† Specifications shown are guaranteed limits unless otherwise noted. See data sheets for details.

## Micropower Comparator Reference Guide

| | PRODUCT FUNCTION | | | | | | | | | | PACKAGES TYPE AND PIN COUNT | | | | | TEMPERATURE RANGE (°C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | COMPARATOR | | | | REFERENCE | | | | | | | | | | | | | |
| PART NUMBER | NUMBER | INPUT OFFSET (mV)* | CM RANGE (V)* | PROP DELAY (µs) typ. | $V_{OUT}$ (V) | ACCURACY (%)* | OP AMP | SUPPLY CURRENT (µA) | SUPPLY VOLTAGE RANGE (V) | HYSTERESIS | SO S | MSOP MS8 | DIP N | CDIP J | TO5 H | 0 TO 70 | –40 TO 85 | –40 TO 125 |
| LTC1440 | Single | 10 | V– to (V+ –1.3V) | 8 | 1.182 | 1 | No | 3.7 | 2 to 11 | Programmable | 8 | 8 | 8 | | | ✓ | ✓ | |
| LTC1540 | Single | 12 | V– to (V+ –1.3V) | 50 | 1.182 | 2 | No | 0.7 | 2 to 11 | Programmable | 8 | 8 | | | | ✓ | ✓ | |
| LTC1541 | Single | 1.5 | V– to (V+ –1.3V) | 8 | 1.2 | 0.83 | Yes | 10 | 2.5 to 12.6 | Fixed | 8 | 8 | | | | ✓ | ✓ | |
| LTC1542 | Single | 2 | V– to (V+ –1.3V) | 8 | No | No | Yes | 10 | 2.5 to 12.6 | Fixed | 8 | 8 | | | | ✓ | ✓ | |
| LTC1441 | Dual | 10 | V– to (V+ –1.3V) | 8 | No | No | No | 5.7 | 2 to 11 | Programmable | 8 | | 8 | | | ✓ | ✓ | |
| LTC1442 | Dual | 10 | V– to (V+ –1.3V) | 8 | 1.182 | 1 | No | 5.7 | 2 to 11 | Programmable | 8 | | 8 | | | ✓ | ✓ | |
| LTC1841 | Dual | 10 | V– to (V+ –1.3V) | 4 | No | No | No | 5.7 | 2 to 11 | | 8 | | | | | ✓ | ✓ | |
| LTC1842 | Dual | 10 | V– to (V+ –1.3V) | 4 | 1.182 | 1 | No | 5.7 | 2.5 to 11 | Programmable | 8 | | | | | ✓ | ✓ | |
| LTC1843 | Dual | 10 | V– to (V+ –1.3V) | 4 | 1.182 | 1 | No | 5.7 | 2.5 to 11 | Programmable | 8 | | | | | ✓ | ✓ | |
| LTC1040 | Dual | 0.75 | V– to V+ | 80 | No | No | No | 5.7 | 2.8 to 16 | | 18W | | 18 | | | ✓ | ✓ | |
| LT1017 | Dual | 1.4 | V– to (V+ –0.9V) | 22 | No | No | No | 80 | 1.2 to 40 | | 8/16W | | 8 | 8 | 8 | ✓ | ✓ | ✓ |
| LT1018 | Dual | 1.4 | V– to (V+ –0.9V) | 6 | No | No | No | 250 | 1.2 to 40 | | 8/16W | | 8 | 8 | 8 | ✓ | ✓ | ✓ |
| LTC1443 | Quad | 10 | V– to (V+ –1.3V) | 4 | 1.182 | 1 | No | 8.5 | 2 to 11 | | 16 | | 16 | | | ✓ | ✓ | |
| LTC1444 | Quad | 10 | V– to (V+ –1.3V) | 4 | 1.221 | 1 | No | 8.5 | 2 to 11 | Programmable | 16 | | 16 | | | ✓ | ✓ | |
| LTC1445 | Quad | 10 | V– to (V+ –1.3V) | 4 | 1.221 | 1 | No | 8.5 | 2 to 11 | Programmable | 16 | | 16 | | | ✓ | ✓ | |

* Guaranteed values. See datasheets for details.

## LTC1540 Maintains Nanoamp Supply Current Over Industrial Temperature Range

**Supply Current vs Temperature**