# Low Power Low Offset Voltage Quad Comparators

## Features

- Wide Supply Voltage Range:
  Single Supply: 2.0V to 36V
  Dual Supplies: ±1.0V to ±18V
- Low Supply Current Drain: 0.9mA
- Low Input Bias Current: 25nA (Typical)
- Low Input Offset Current: ±5.0nA (Typical)
- Low Input Offset Voltage: 2.0mV (Typical)
- Input Common Mode Voltage Range
  Includes Ground
- Differential Input Voltage Range Equals to
  the Power Supply Voltage
- Low Output Saturation Voltage:200mV at 4mA
- Open Collector Output
- Available in Green SOIC-14(SOP-14)
  and TSSOP-14 Package

## Applications

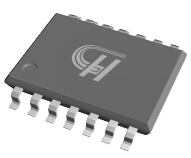
- Battery Charger
- Cordless Telephone
- Switching Power Supply
- DC-DC Module
- PC Motherboard
- Communication Equipment

## General Description

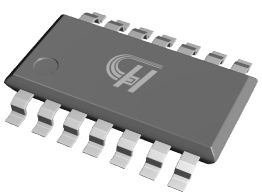
The LM239/LM339 consist of four independent precision voltage comparators with a typical offset voltage of 2.0mV and high gain. They are specifically designed to operate from a single power supply over wide range of voltage. Operation from split power supply is also possible and the low power supply current drain is independent of the megnitude of the power supply voltage.

The LM239/LM339 series are compatible with industry standard 339. The LM239 has more stringent input offset voltage than the LM339.

The LM339 is available in SOIC14(SOP-14) and TSSOP-14 package, and the LM239 is available in SOIC-14(SOP-14) package.



TSSOP-14



SOIC-14

Figure 1. Package Type of LM239/LM339

# Low Power Low Offset Voltage Quad Comparators

## Pin Configuration

SOIC-14(SOP-14) / TSSOP-14

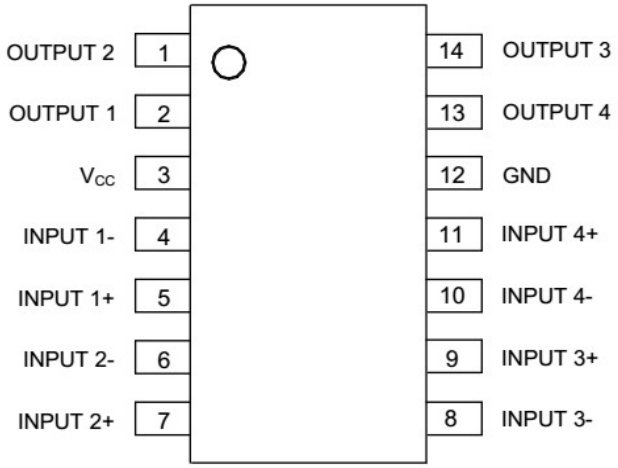



**Figure 2. Pin Configuration of LM239/LM339 (Top View )**

## Pin Function Table

| SOIC-14 (SOP-14) | TSSOP-14 | Name | Function |
|---|---|---|---|
| 1,2,13,14 | 1,2,13,14 | Output 1/Output 2 Output 3/Output 4 | Outputs |
| 12 | 12 | GND | Negative Power Supply |
| 5,7,9,11 | 5,7,9,11 | Input 1+/Input 2+ /Input 3+/Input 4+ | Non-inverting Inputs |
| 4,6,8,10 | 4,6,8,10 | Input 1-/Input 2- /Input 3-/Input 4- | Inverting Inputs |
| 3 | 3 | +Vcc | Positive Power Supply |

## Ordering Information

**Circuit Type**

Type:
LM339
/LM239

TR : Tape and Reel

Package:
DM14: SOIC-14 (SOP-14)
TM14: TSSOP-14

## Ordering Code note b

| Part Number | Marking ID | Temperature Range | Package | Package Type |
|---|---|---|---|---|
| LM339DM14TR | LM339DXX | -40'C to +85'C | SOIC-14 (SOP-14) | 2500pcs/TR |
| LM339TM14TR | LM339TXX | -40'C to +85'C | TSSOP-14 | 2500pcs/TR |
| LM239DM14TR | LM239DXX | -40'C to +125'C | SOIC-14 (SOP-14) | 2500pcs/TR |

note a. marking information: XX, the 1ST X is date code-Year(A=2010, B=2011,...)

the 2nd X is date code-month(A=Jan, B=Feb,...L=Dec). for example: S5BBA ( 2011,January )

# Low Power Low Offset Voltage Quad Comparators

## Absolute Maximum Ratings Note 1

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Supply Voltage | | $V_{CC}$ | 40 | V |
| Input Voltage | | $V_{IN}$ | -0.3 to 40 | V |
| Difference Input Voltage | | $V_{ID}$ | 40 | V |
| Input Current ($V_{IN}$<-0.3V) | | $I_{IN}$ | 50 | mA |
| Output Short-Circuit to Ground | | - | Continuous | - |
| Power Dissipation @$T_A$=+25'C | SOIC-14 (SOP-14) | $P_D$ | 890 | mW |
| | TSSOP-14 | | 790 | |
| Storage Temperature Range | | $T_{STG}$ | -65 to 150 | 'C |
| Operating Junction Temperature | | $T_J$ | +150 | 'C |
| Lead Temperature (Soldering, 10s) | | $T_{LEAD}$ | +260 | 'C |

Note 1: Stresses above those listed under"Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

## Recommended Operating Conditions

| Parameter | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| Supply Voltage | | $V_{CC}$ | 2 | 36 | V |
| Operating Temperature Range | LM339 | $V_{IN}$ | -40 | +85 | 'C |
| | LM239 | | -40 | +125 | 'C |

# Low Power Low Offset Voltage Quad Comparators

## Electrical Characteristics:

**(Limits in standard typeface are for TA=25 `C, bold tyeface applies over TA=-40'C to +85'C[note2] VCC=5V, GND=0V, unless otherwise noted.)**

| Parameter | Symbol | Conditions | | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|---|
| Input Offset Voltage | VOS | LM339 | VO=1.4V, RS=0Ω, VCC from 5V to 30V | - | 2 | 5 | mV |
| | | | | - | - | 7 | |
| | | LM239 | | - | 2 | 3 | |
| | | | | - | - | 5 | |
| Input Bias Current | IBC | IIN+ or IIN- with output in linear Range, VCM=0V | | - | 25 | 250 | nA |
| | | | | - | - | 400 | |
| Input Offset Current | IOC | IIN+ - IIN-, VCM = 0V | | - | 5.0 | 50 | nA |
| | | | | - | - | 200 | |
| Input Common Mode Voltage Range[note3] | VCM | VCC=30V | | 0 | - | VCC-1.5 | V |
| Supply Current | IO | VCC=5V | RL = ∞ | - | 0.9 | 2.0 | mA |
| | | | | - | - | 3.0 | |
| | | VCC=30V | | - | 1.2 | 2.5 | |
| | | | | - | - | 3.5 | |
| Voltage Gain | AVO | RL>=15KΩ, VCC=15V, VO=1V to 11V | | 50 | 200 | - | V/mV |
| Large Signal Response Time | Tr | VIN=TTL Logic Swing, VREF=1.4V, VRL=5V, RL=5.1KΩ | | - | 200 | - | ns |
| Response Time | TRS | VRL=5V, RL=5.1KΩ | | - | 1.3 | - | us |
| Output Sink Current | ISC | VIN- =1V, VIN+=0, VO=1.5V | | 6.0 | 16 | - | mA |
| Output Leakage Current | ILeakage | VIN- =0V, VIN+=1V, VO=5V | | - | 0.1 | - | nA |
| | | VIN- =0V, VIN+=1V, VO=30V | | - | - | 1.0 | uA |
| Saturation Voltage | VS | VIN- =1V, VIN+=0, ISINK<=4mA | | - | 200 | 400 | mV |
| | | | | - | - | 500 | |
| Thermal Resistance (Junction to Case) | θJC | SOIC-14(SOP-14) | | - | 15 | - | 'C/W |
| | | TSSOP-14 | | - | 6 | - | |
| Thermal Resistance (Junction to Ambient) | θJA | SOIC-14(SOP-14) | | - | 89 | - | 'C/W |
| | | TSSOP-14 | | - | 125 | - | |

note 2. Limites over the full temperature are guaranteed by design, but not tested in production.

3. The input common-mode voltage of either input signal should not be allowed to go negatively by more than 0.3V (at +25'C). The upper end of the common-mode voltage range is VCC-1.5V (at +25'C), but either or both inputs can go to +36V without damages, independent of the magnitude of the VCC.

# Low Power Low Offset Voltage Quad Comparators

## Typical Performance Characteristics (Unless Otherwise Specified.)

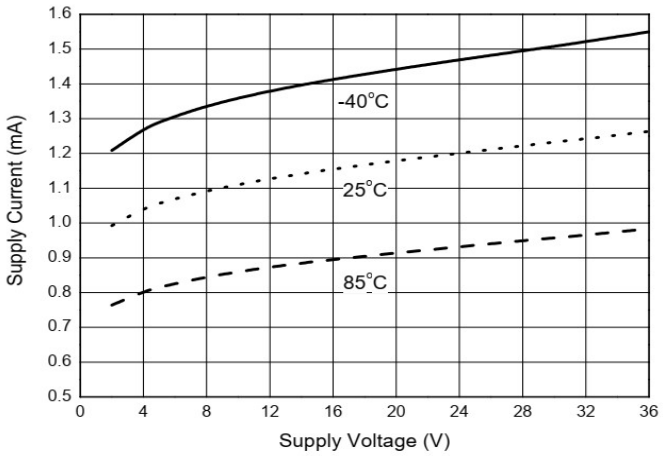



Figure 3. Supply Voltage vs. Supply Current

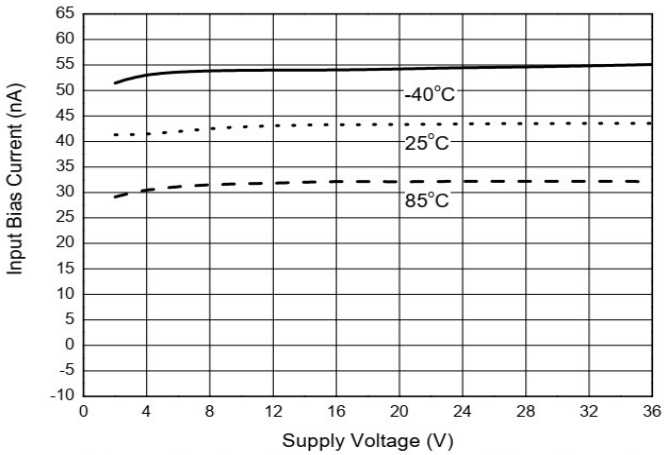



Figure 4. Supply Voltage vs. Input Bias Current

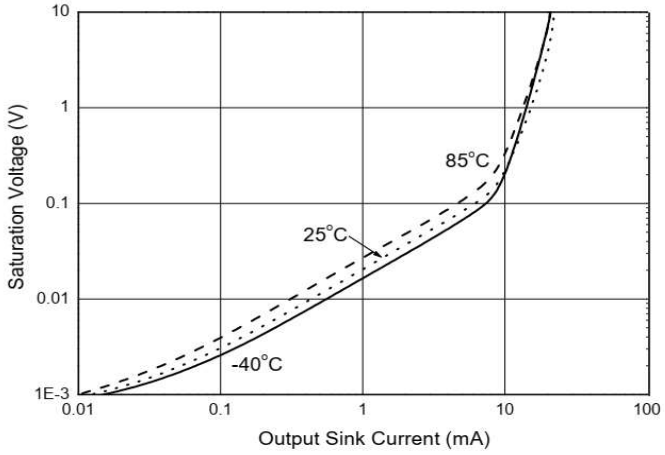



Figure 5. Output Sink Current vs. Saturation Voltage

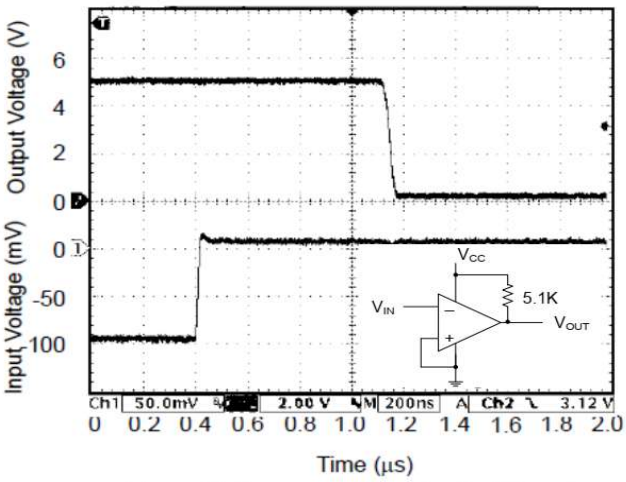



Figure 6. Response Time for 5mV Input Overdrive - Negative Transition

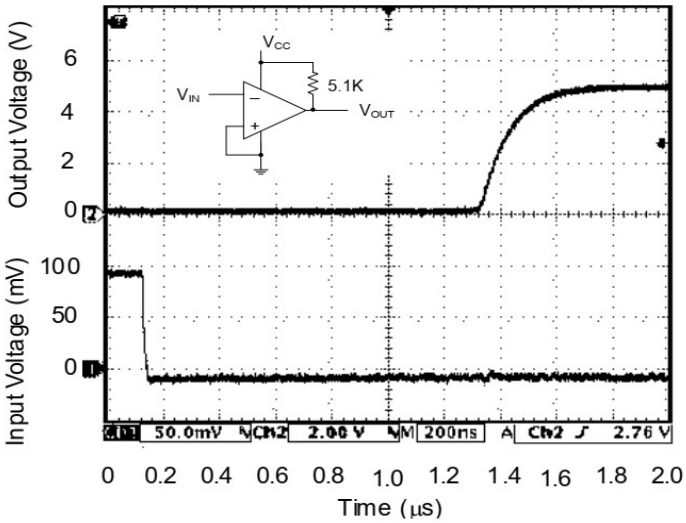



Figure 7. Response Time for 5mV Input Overdrive - Positive Transition

# Low Power Low Offset Voltage Quad Comparators

## Functional Block Diagram

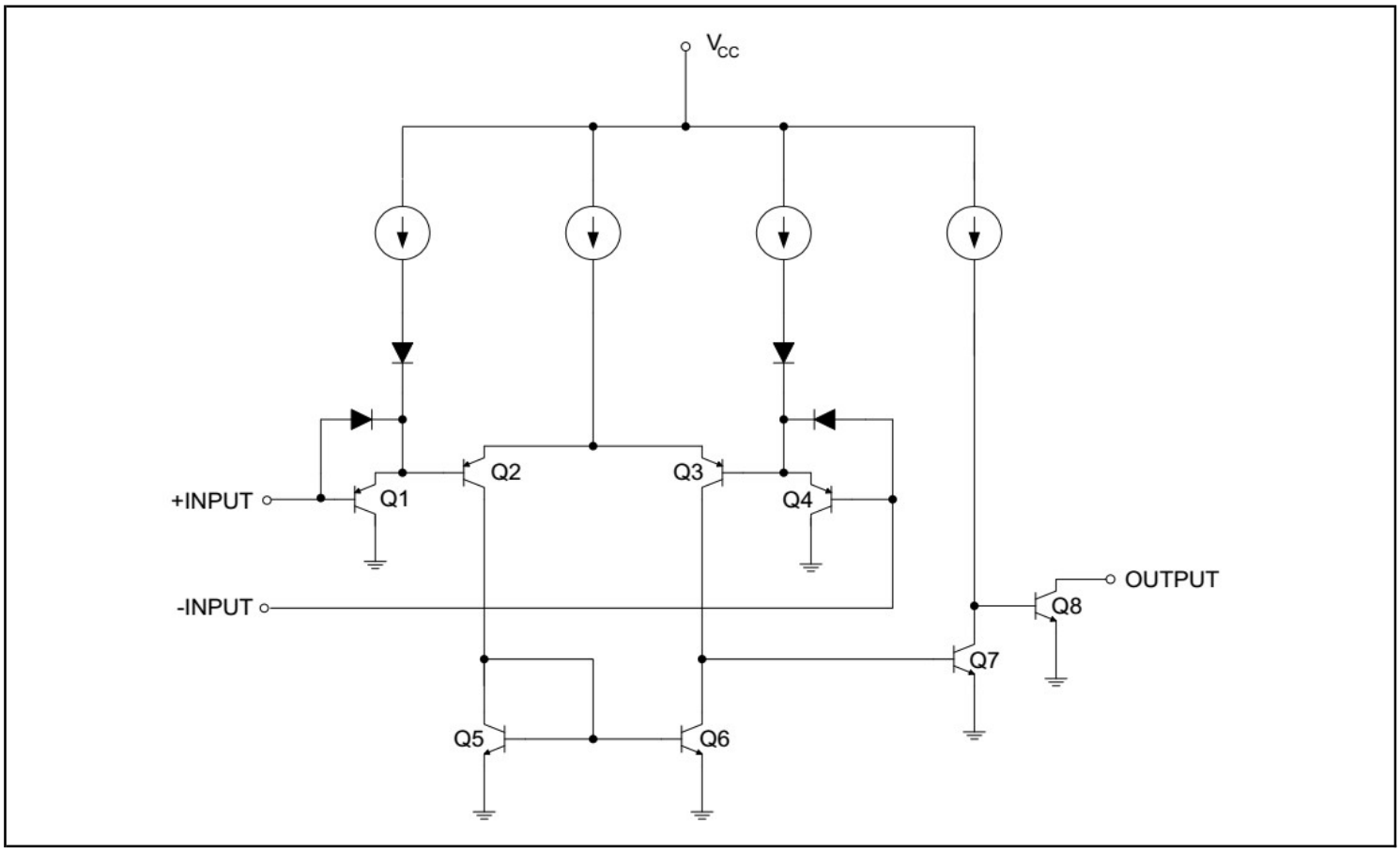
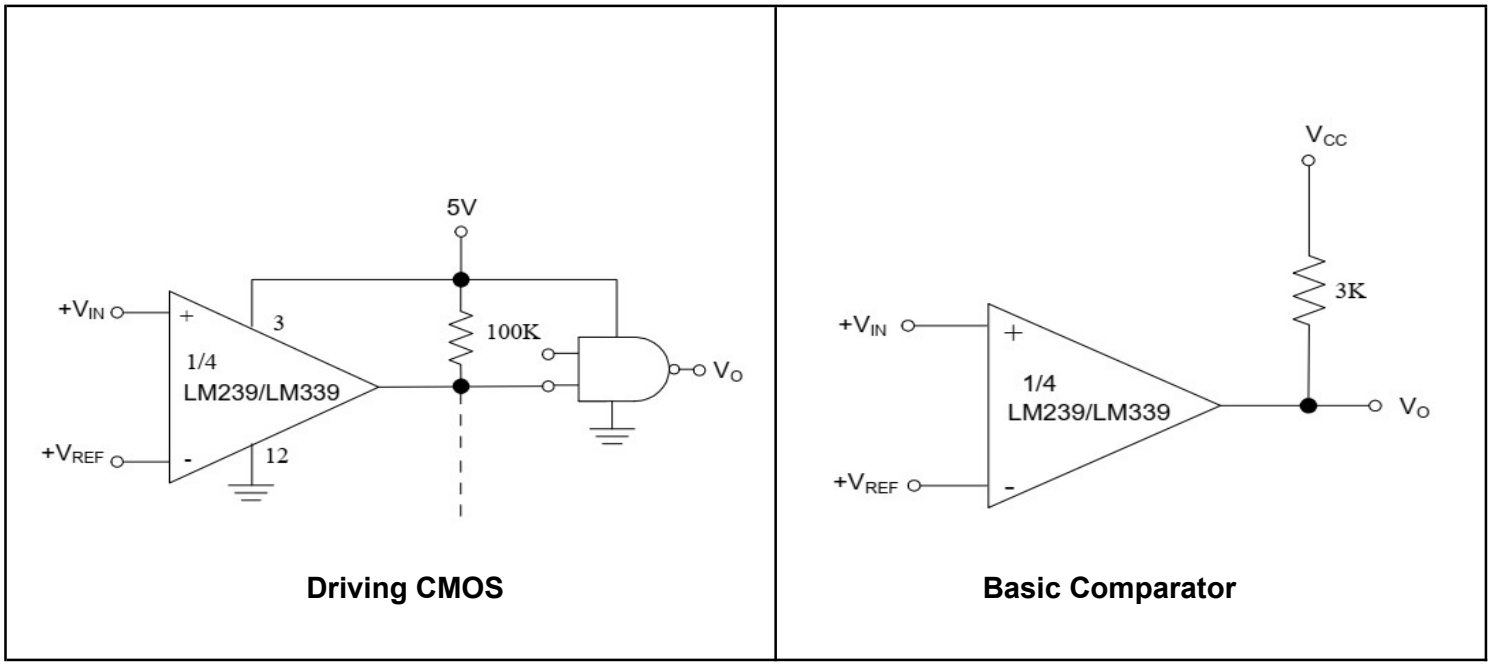



Figure 8. Functional Block Diagram of LM239/LM339

## Typical Application Circuit

### - Driving CMOS & Basic Comparator




Driving CMOS

Basic Comparator

Figure 9. Driving CMOS & Basic Comparator of LM239/LM339

# Low Power Low Offset Voltage Quad Comparators

## Typical Application Circuit(Con.)

### - One Shot Multivibrator

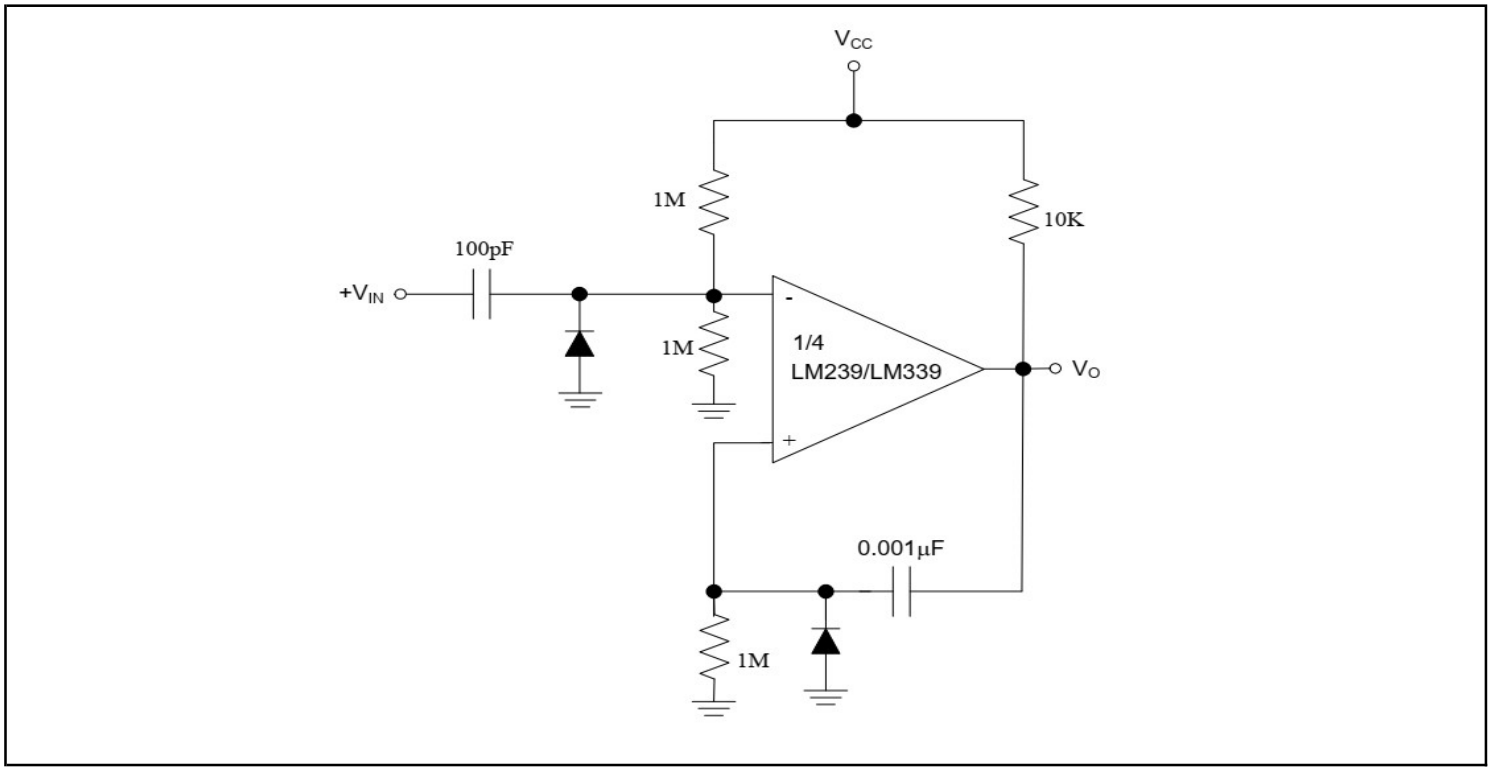



Figure 10. One Shot Multivibrator

### - Squarewave Oscillator

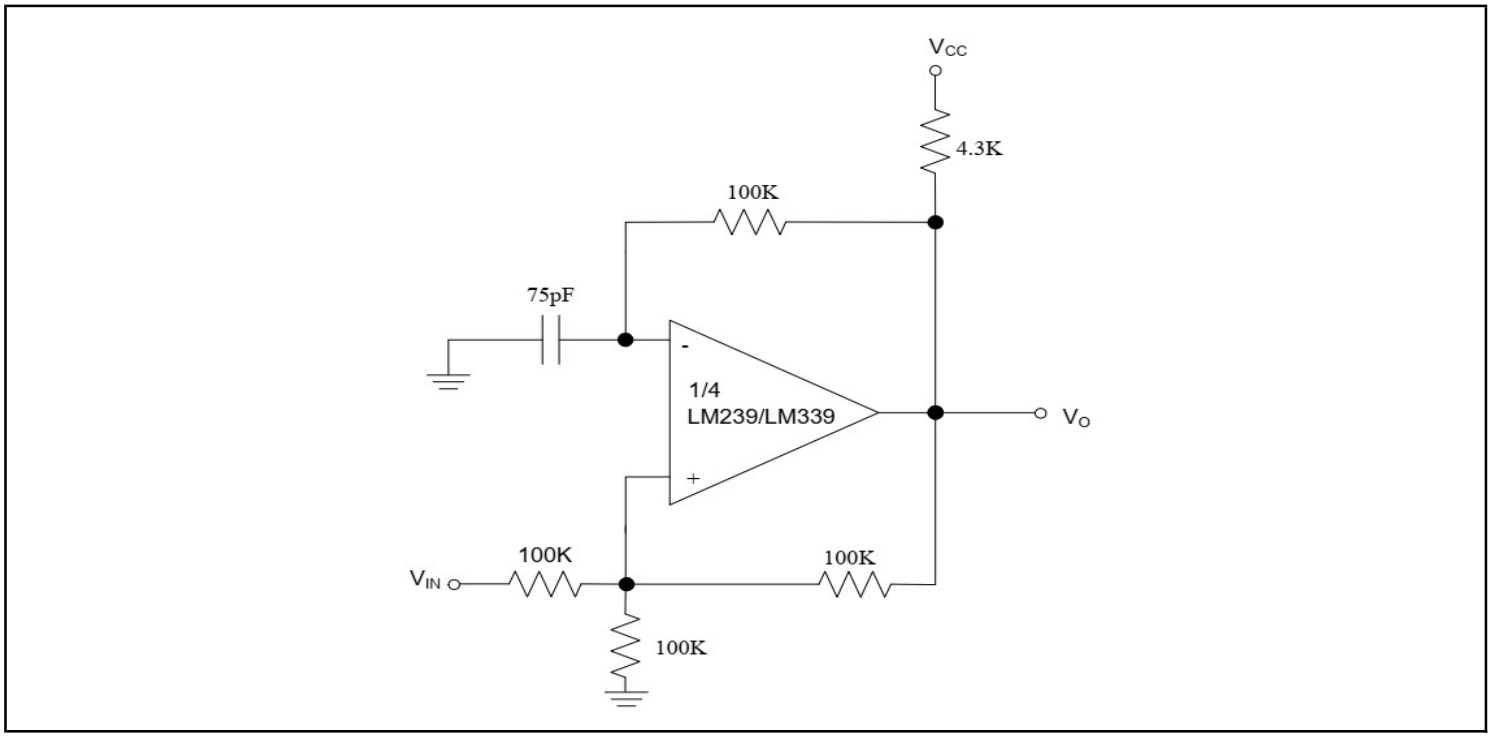


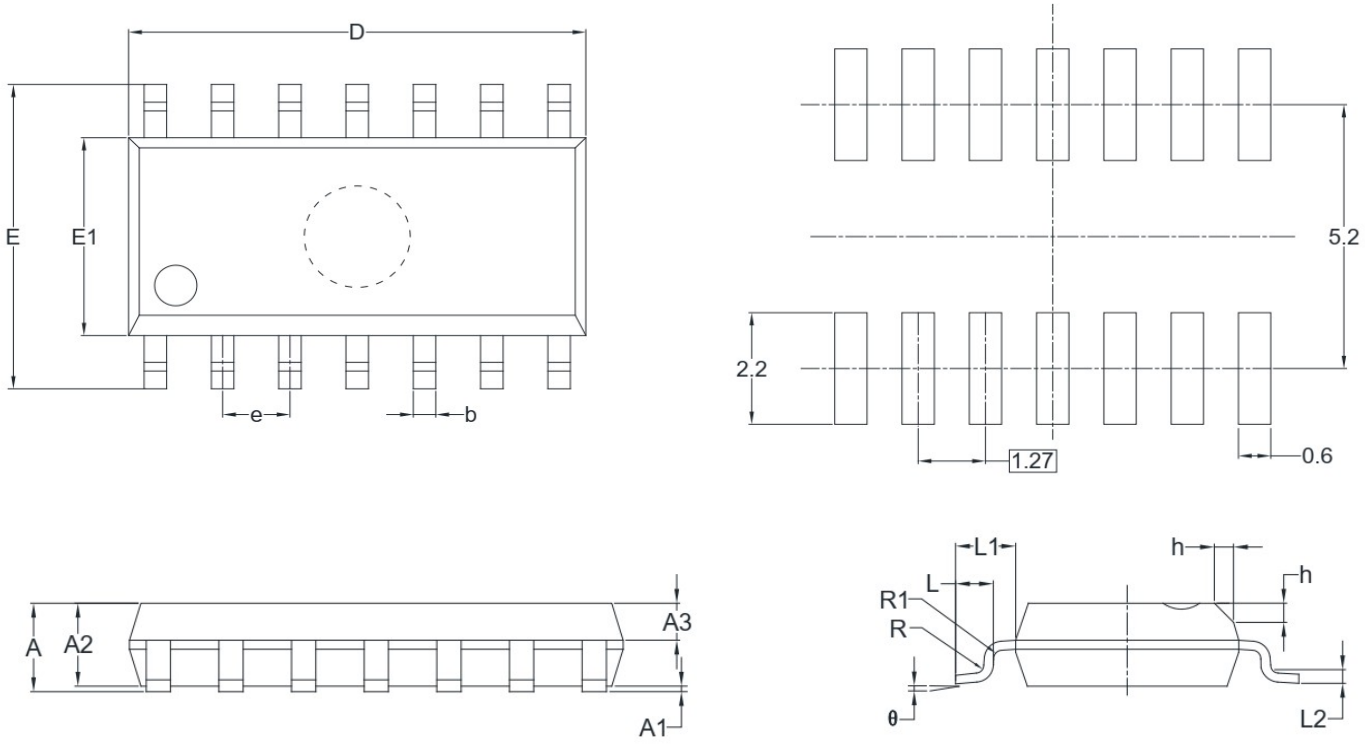

Figure 11. Squarewave Oscillator

# Low Power Low Offset Voltage Quad Comparators

## Mechanical Dimensions

**PKG: SOIC-14(SOP-14) (DM14)**

**Unit: mm (inch )**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A1 | 0.10 | 0.25 | 0.004 | 0.010 |
| A2 | 1.25 | 1.65 | 0.049 | 0.065 |
| A3 | 0.55 | 0.75 | 0.022 | 0.030 |
| b | 0.36 | 0.49 | 0.014 | 0.019 |
| D | 8.53 | 8.73 | 0.336 | 0.344 |
| E | 5.80 | 6.20 | 0.228 | 0.244 |
| E1 | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| L | 0.45 | 0.80 | 0.018 | 0.032 |
| L1 | 1.04 REF | | 0.040 REF | |
| L2 | 0.25 BSC | | 0.01 BSC | |
| R | 0.07 | | 0.003 | |
| R1 | 0.07 | | 0.003 | |
| h | 0.30 | 0.50 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |

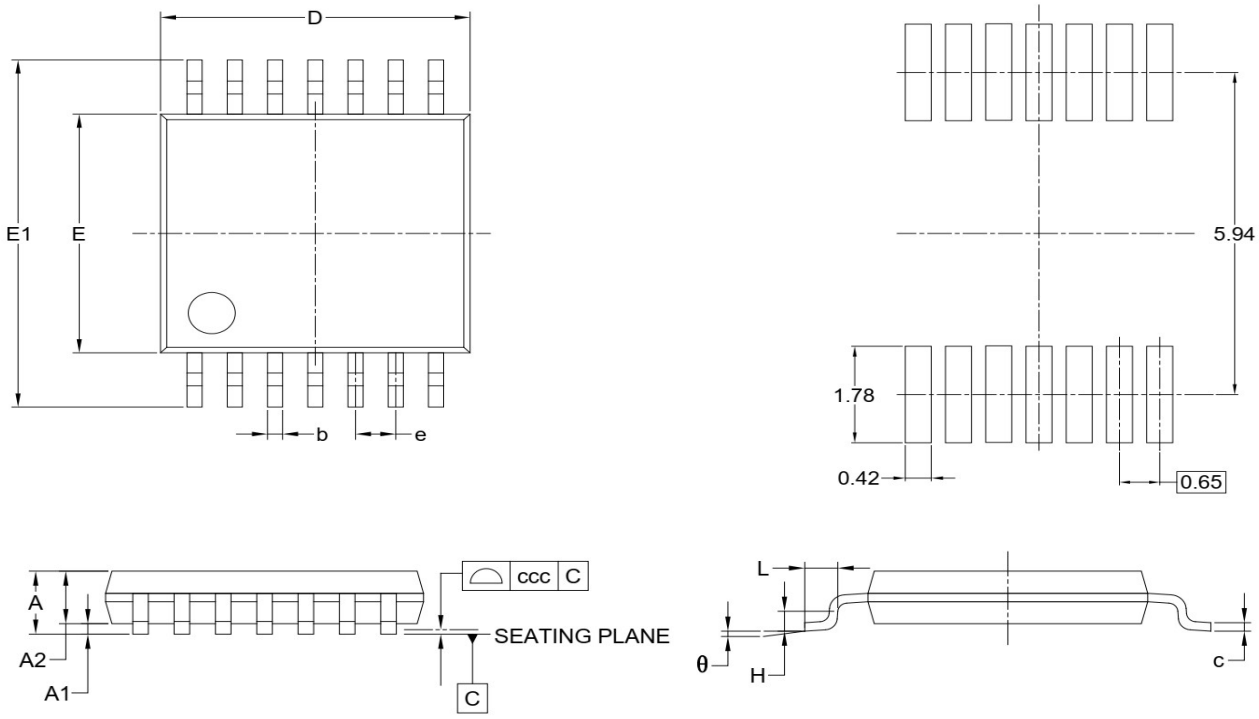
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

# Low Power Low Offset Voltage Quad Comparators

## Mechanical Dimensions(Con.)

**PKG: TSSOP-14 (TM14)**

**Unit: mm (inch )**

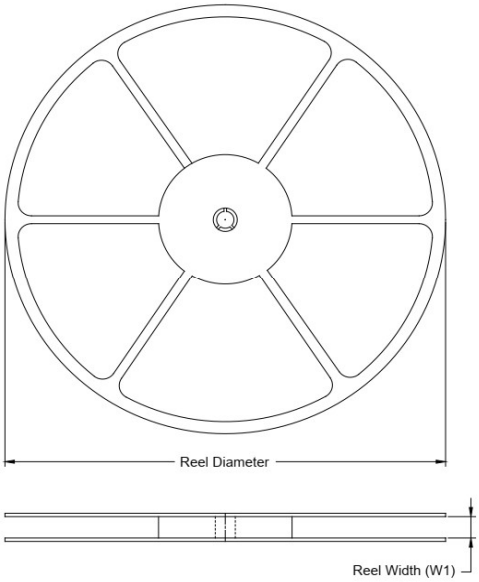



| Symbol | Dimensions In Millimeters | | |
|---|---|---|---|
| | MIN | MOD | MAX |
| A | - | - | 1.200 |
| A1 | 0.050 | - | 0.150 |
| A2 | 0.800 | - | 1.050 |
| b | 0.190 | - | 0.300 |
| c | 0.090 | - | 0.200 |
| D | 4.860 | - | 5.100 |
| E | 4.300 | - | 4.500 |
| E1 | 6.200 | - | 6.600 |
| e | 0.650 BSC | | |
| L | 0.450 | - | 0.750 |
| H | 0.250 TYP | | |
| θ | 0° | - | 8° |
| ccc | 0.100 | | |

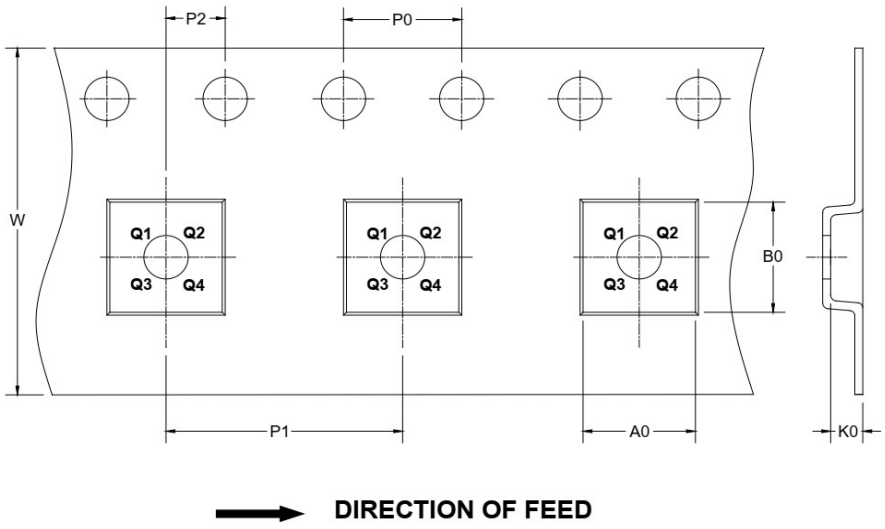
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-153.

# TAPE AND REEL INFORMATION

## REEL DIMENSIONS




## TAPE DIMENSIONS

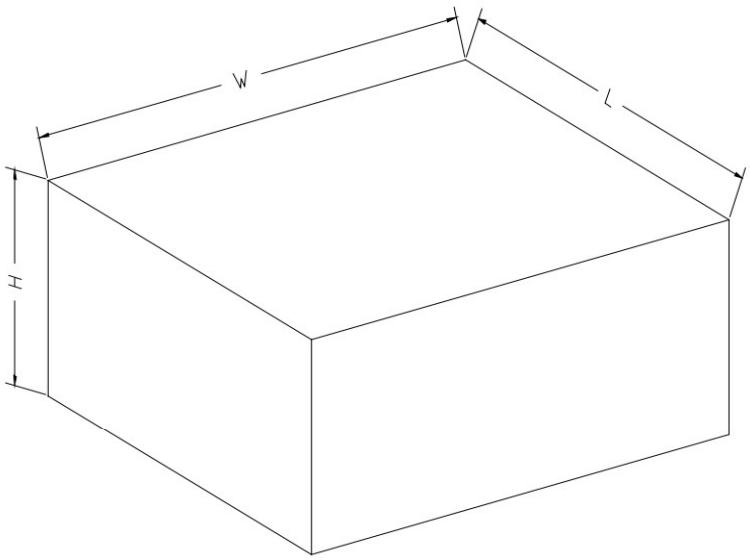



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|
| SOIC-14 | 13" | 16.4 | 6.60 | 9.30 | 2.10 | 4.0 | 8.0 | 2.0 | 16.0 | Q1 |
| TSSOP-14 | 13" | 12.4 | 6.80 | 5.40 | 1.50 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |

## CARTON BOX DIMENSIONS




NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

| Reel Type | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|---|---|---|---|---|
| 13″ | 386 | 280 | 370 | 5 |

## Statements And Notes

### The name and content of Hazardous substances or Elements in the product

| Part name | Hazardous substances or Elements | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Lead and lead compounds | Mercury and mercury compounds | Cadmium and cadmium compounds | Hexavalent chromium compounds | Ploybrominated biphenyls | Polybrominated biphenyl ethers | Dibutyl phthalate | Butylbenzyl phthalate | Di-2-ethylhexyl phthalate | Diisobutyl phthalate |
| Lead frame | o | o | o | o | o | o | o | o | o | o |
| Plsatic resin | o | o | o | o | o | o | o | o | o | o |
| Chip | o | o | o | o | o | o | o | o | o | o |
| The lead | o | o | o | o | o | o | o | o | o | o |
| Plastic sheet installed | o | o | o | o | o | o | o | o | o | o |
| explanation | o: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard.<br>X: Indicates that the content of hazardous substances or elemuents exceeding the SJ/T11363-2006 Standard limit requirements. | | | | | | | | | |

## Notion

Recommended carefully reading this information before the use of this product;

The information in this document are subject to change without notice;

This information is using to the reference only, the company is not responsible for any loss;

The company is not responsible for the any infringement of the third party patents or other rights of the responsibility.