

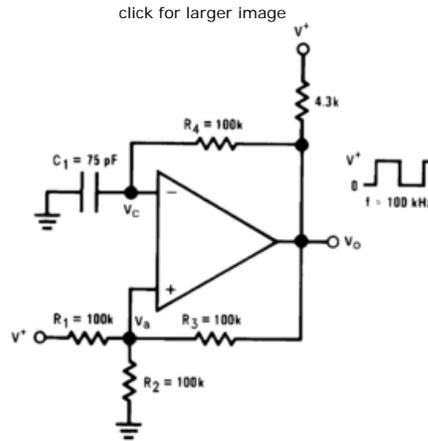
# LMV339 - Quad General Purpose, Low Voltage, Tiny Pack Comparator

## Features

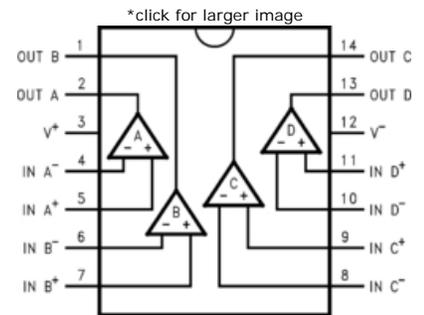
(For 5V supply, typical unless otherwise noted)

Guaranteed 2.7V and 5V performance	
Industrial temperature range	-40°C to +85°C
Low supply current	60 $\mu$ A/Channel
Input common mode voltage range includes ground	
Low output saturation voltage	200 mV
Propagation delay	200 ns
Space saving 5-pin SC70 and 5-Pin SOT23 packages	

## Typical Application



## Connection Diagram



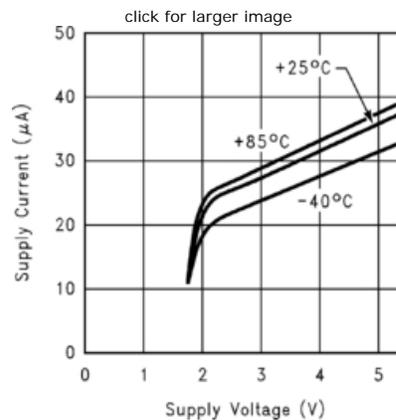
## Applications

- Mobile communications
- Notebooks and PDA's
- Battery powered electronics
- General purpose portable device
- General purpose low voltage applications

## Parametric Table

Response Time	0.2 $\mu$ s
Output Bus	Open Drain
Supply Min	2.7 Volt
Supply Max	5.5 Volt
Channels	4 Channels
Offset Voltage max, 25C	7 mV
Output Current	84 mA
Input Range	Vcm to V-
Supply Current Per Channel	0.05 mA
PowerWise Rating 3	10 $\mu$ A x us
Max Input Bias Current	400 nA
Special Features	Undefined
Temperature Min	-40 deg C
Temperature Max	85 deg C
Function	Comparator
Automotive Selection Guide	Yes
PowerWise	Yes

## Typical Performance





RoHS Compliance Information

LMV331 Single / LMV393 Dual / LMV339 Quad General Purpose, Low Voltage, Tiny Pack Comparators
LMV331 Single / LMV393 Dual / LMV339 Quad General Purpose, Low Voltage, Tiny Pack Comparators (Japanese)

Package Availability, Models

Part Number	Package						Factory Lead Time		Models			Std Pack Size	Package Marking Format
	Type	Pins	Spec.	MSL Rating	Peak Reflow	RoHS Report	Weeks	Qty					
LMV339M	SOIC NARROW	14	STD	1	235	RoHS	Full production		LMV339.MOD			rail of 55	NSUZXYTT LMV339M
			NOPB	1	260		6 weeks	2000					
LMV339MX	SOIC NARROW	14	NOPB	1	260	RoHS	Full production		LMV339.MOD			reel of 2500	NSUZXYTT LMV339M
							6 weeks	15000					
LMV339MT	TSSOP	14	STD	1	260	RoHS	Full production		LMV339.MOD			rail of 94	NSUZXYTT LMV339 MT
			NOPB	1	260		6 weeks	2000					
LMV339MTX	TSSOP	14	STD	1	260	RoHS	Full production		LMV339.MOD			reel of 2500	NSUZXYTT LMV339 MT
			NOPB	1	260		6 weeks	7500					

General Description

The LMV393 and LMV339 are low voltage (2.7-5V) versions of the dual and quad comparators, LM393/339, which are specified at 5-30V. The LMV331 is the single version, which is available in space saving 5-pin SC70 and 5-pin SOT23 packages. The 5-pin SC70 is approximately half the size of the 5-pin SOT23.

The LMV393 is available in 8-pin SOIC and MSOP. The LMV339 is available in 14-pin SOIC and TSSOP.

The LMV331/393/339 is the most cost-effective solution where space, low voltage, low power and price are the primary specification in circuit design for portable consumer products. They offer specifications that meet or exceed the familiar LM393/339 at a fraction of the supply current.

The chips are built with National's advanced Submicron Silicon-Gate BiCMOS process. The LMV331/393/339 have bipolar input and output stages for improved noise performance.

Reliability Metrics

Part Number	Process	EFR Reject	EFR Sample Size	PPM *	LTA Rejects	LTA Device Hours	FITS	MTTF (Hours)
LMV339M	CS080	0	29095	0	0	2720500	2	771949303
LMV339MT	CS080	0	29095	0	0	2720500	2	771949303
LMV339MTX	CS080	0	29095	0	0	2720500	2	771949303
LMV339MX	CS080	0	29095	0	0	2720500	2	771949303

Note: The Early Failure Rates were calculated as point estimates. The Long Term Failure Rates were calculated at 60% confidence using the Arrhenius equation at 0.7eV activation energy and derating the assumed stress temperature of 150°C to an application temperature of 55°C.

# LMV331 Single / LMV393 Dual / LMV339 Quad General Purpose, Low Voltage, Tiny Pack Comparators

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## Features

(For 5V supply, typical unless otherwise noted)

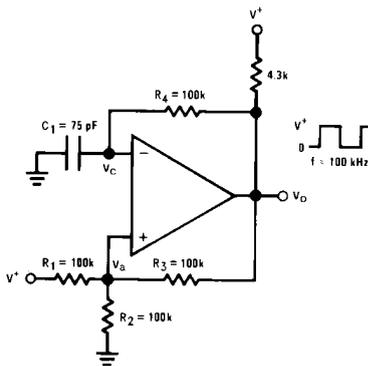
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- Low output saturation voltage 200 mV
- Propagation delay 200 ns
- Space saving 5-pin SC70 and 5-Pin SOT23 packages

## Applications

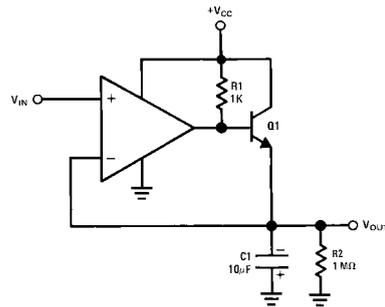
- Mobile communications
- Notebooks and PDA's
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- General purpose low voltage applications

## Typical Applications

**Squarewave Oscillator**

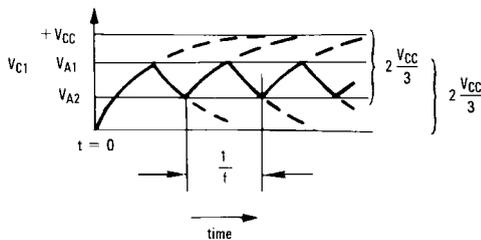


10008008



**Positive Peak Detector**

10008017



10008024

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

ESD Tolerance (Note 2)	
Human Body Model	
LMV331/393/339	800V
Machine Model	
LMV331/339/393	120V
Differential Input Voltage	±Supply Voltage
Voltage on any pin (referred to V <sup>-</sup> pin)	5.5V
Soldering Information	
Infrared or Convection (20 sec)	235°C
Storage Temp. Range	-65°C to +150°C
Junction Temperature (Note 3)	150°C

## Operating Ratings (Note 1)

Supply Voltage	2.7V to 5.0V
Temperature Range (Note 3)	
LMV393, LMV339, LMV331	-40°C to +85°C
Thermal Resistance ( $\theta_{JA}$ )	
5-Pin SC70	478°C/W
5-Pin SOT23	265°C/W
8-Pin SOIC	190°C/W
8-Pin MSOP	235°C/W
14-Pin SOIC	145°C/W
14-Pin TSSOP	155°C/W

## 2.7V DC Electrical Characteristics

Unless otherwise specified, all limits guaranteed for  $T_J = 25^\circ\text{C}$ ,  $V^+ = 2.7\text{V}$ ,  $V^- = 0\text{V}$ . **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
$V_{OS}$	Input Offset Voltage			1.7	7	mV
$TCV_{OS}$	Input Offset Voltage Average Drift			<b>5</b>		$\mu\text{V}/^\circ\text{C}$
$I_B$	Input Bias Current			10	250 <b>400</b>	nA
$I_{OS}$	Input Offset Current			5	50 <b>150</b>	nA
$V_{CM}$	Input Voltage Range			-0.1		V
				2.0		V
$V_{SAT}$	Saturation Voltage	$I_{SINK} \leq 1\text{ mA}$		120		mV
$I_O$	Output Sink Current	$V_O \leq 1.5\text{V}$	5	23		mA
$I_S$	Supply Current	LMV331		40	100	$\mu\text{A}$
		LMV393 Both Comparators		70	140	$\mu\text{A}$
		LMV339 All four Comparators		140	200	$\mu\text{A}$
	Output Leakage Current			.003	<b>1</b>	$\mu\text{A}$

## 2.7V AC Electrical Characteristics

$T_J = 25^\circ\text{C}$ ,  $V^+ = 2.7\text{V}$ ,  $R_L = 5.1\text{ k}\Omega$ ,  $V^- = 0\text{V}$ .

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
$t_{PHL}$	Propagation Delay (High to Low)	Input Overdrive = 10 mV		1000		ns
		Input Overdrive = 100 mV		350		ns
$t_{PLH}$	Propagation Delay (Low to High)	Input Overdrive = 10 mV		500		ns
		Input Overdrive = 100 mV		400		ns

## 5V DC Electrical Characteristics

Unless otherwise specified, all limits guaranteed for  $T_J = 25^\circ\text{C}$ ,  $V^+ = 5\text{V}$ ,  $V^- = 0\text{V}$ . **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	max (Note 5)	Units
$V_{OS}$	Input Offset Voltage			1.7	7 <b>9</b>	mV
$TCV_{OS}$	Input Offset Voltage Average Drift			5		$\mu\text{V}/^\circ\text{C}$
$I_B$	Input Bias Current			25	250 <b>400</b>	nA
$I_{OS}$	Input Offset Current			2	50 <b>150</b>	nA
$V_{CM}$	Input Voltage Range			-0.1		V
				4.2		V
$A_V$	Voltage Gain		20	50		V/mV
$V_{sat}$	Saturation Voltage	$I_{SINK} \leq 4\text{ mA}$		200	400 <b>700</b>	mV
$I_O$	Output Sink Current	$V_O \leq 1.5\text{V}$		84	10	mA
$I_S$	Supply Current	LMV331		60	120 <b>150</b>	$\mu\text{A}$
		LMV393 Both Comparators		100	200 <b>250</b>	$\mu\text{A}$
		LMV339 All four Comparators		170	300 <b>350</b>	$\mu\text{A}$
	Output Leakage Current			.003	<b>1</b>	$\mu\text{A}$

## 5V AC Electrical Characteristics

$T_J = 25^\circ\text{C}$ ,  $V^+ = 5\text{V}$ ,  $R_L = 5.1\text{ k}\Omega$ ,  $V^- = 0\text{V}$ .

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
$t_{PHL}$	Propagation Delay (High to Low)	Input Overdrive = 10 mV		600		ns
		Input Overdrive = 100 mV		200		ns
$t_{PLH}$	Propagation Delay (Low to High)	Input Overdrive = 10 mV		450		ns
		Input Overdrive = 100 mV		300		ns

**Note 1:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical characteristics.

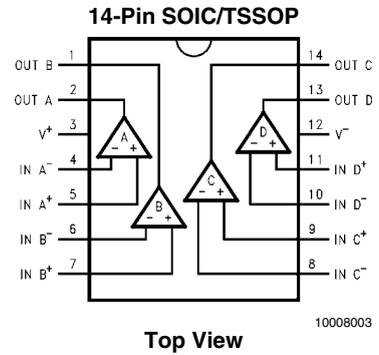
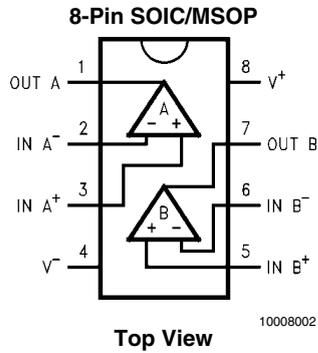
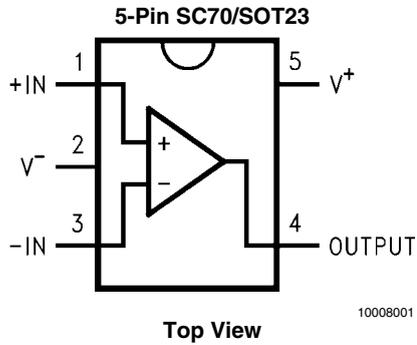
**Note 2:** Human Body Model, applicable std. MIL-STD-883, Method 3015.7. Machine Model, applicable std. JESD22-A115-A (ESD MM std. of JEDEC). Field-Induced Charge-Device Model, applicable std. JESD22-C101-C (ESD FICDM std. of JEDEC).

**Note 3:** The maximum power dissipation is a function of  $T_{J(MAX)}$ ,  $\theta_{JA}$ . The maximum allowable power dissipation at any ambient temperature is  $P_D = (T_{J(MAX)} - T_A)/\theta_{JA}$ . All numbers apply for packages soldered directly onto a PC board.

**Note 4:** Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration. The typical values are not tested and are not guaranteed on shipped production material.

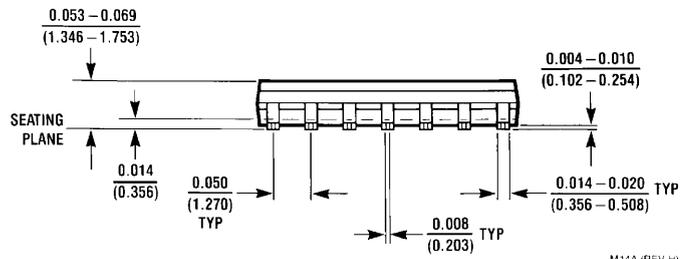
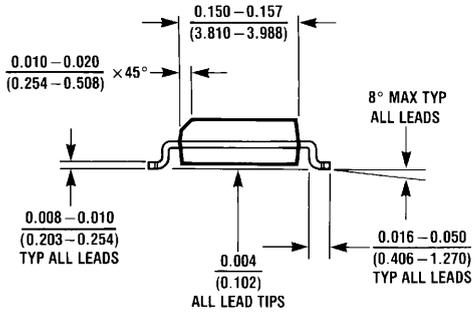
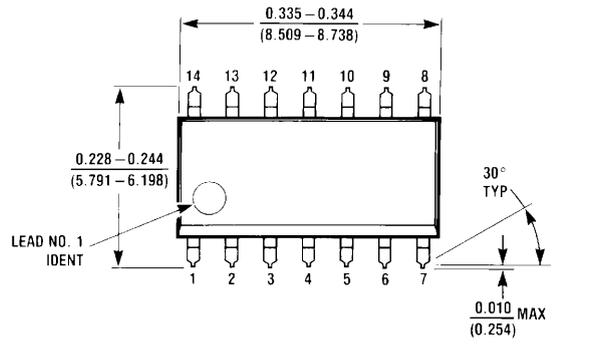
**Note 5:** All limits are guaranteed by testing or statistical analysis.

## Connection Diagrams



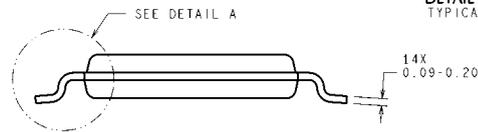
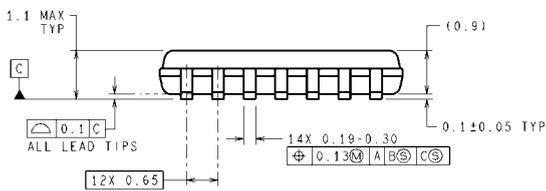
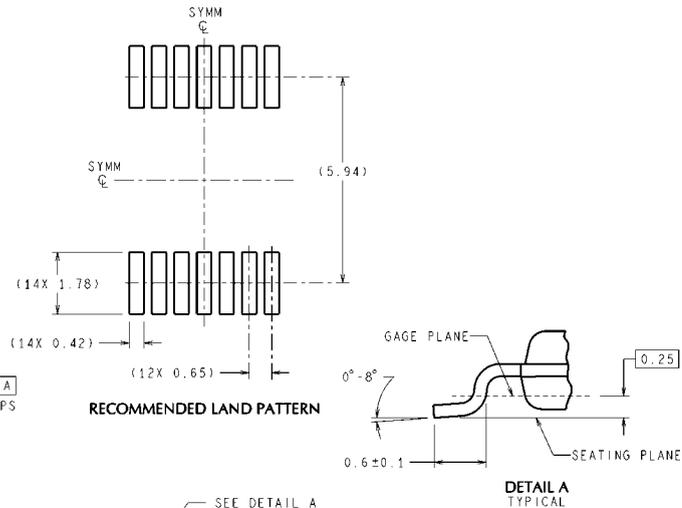
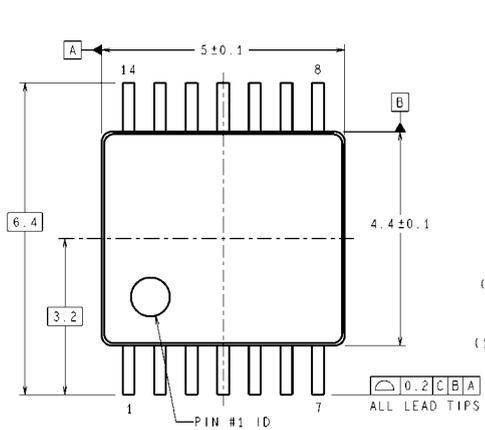
## Ordering Information

Package	Temperature Range	Packaging Marking	Transport Media	NSC Drawing
	Industrial -40°C to +85°C			
5-Pin SC70	LMV331M7	C13	1k Units Tape and Reel	MAA05A
	LMV331M7X	C13	3k Units Tape and Reel	
5-Pin SOT23	LMV331M5	C12	1k Units Tape and Reel	MF05A
	LMV331M5X	C12	3k Units Tape and Reel	
8-Pin SOIC	LMV393M	LMV393M	Rails	M08A
	LMV393MX	LMV393M	2.5k Units Tape and Reel	
8-Pin MSOP	LMV393MM	V393	1k Units Tape and Reel	MUA08A
	LMV393MMX	V393	3.5k Units Tape and Reel	
14-Pin SOIC	LMV339M	LMV339M	Rails	M14A
	LMV339MX	LMV339M	2.5k Units Tape and Reel	
14-Pin TSSOP	LMV339MT	LMV339MT	Rails	MTC14
	LMV339MTX	LMV339MT	2.5k Units Tape and Reel	



M14A (REV H)

14-Pin SOIC  
NS Package Number M14A



DIMENSIONS ARE IN MILLIMETERS  
DIMENSIONS IN ( ) FOR REFERENCE ONLY

MTC14 (Rev D)

14-Pin TSSOP  
NS Package Number MTC14