

# LMV331 SINGLE, LMV393 DUAL, LMV339 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

SLCS136H – AUGUST 1999 – REVISED JANUARY 2003

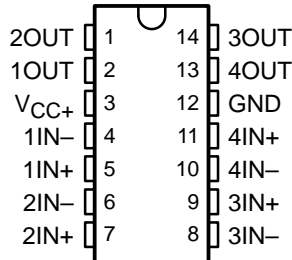
- **2.7-V and 5-V Performance**
- **Low Supply Current:**  
 LMV331 . . . 60  $\mu$ A Typ  
 LMV393 . . . 100  $\mu$ A Typ  
 LMV339 . . . 170  $\mu$ A Typ
- **Input Common-Mode Voltage Range Includes Ground**
- **Low Output Saturation Voltage . . . 200 mV Typ**

## description/ordering information

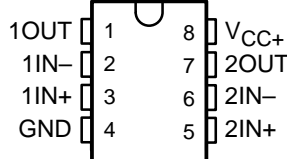
The LMV393 and LMV339 devices are low-voltage (2.7 V to 5.5 V) versions of the dual and quad comparators, LM393 and LM339, which operate from 5 V to 30 V. The LMV331 is the single-comparator version.

The LMV331, LMV339, and LMV393 are the most cost-effective solutions for applications where low-voltage operation, low power, space saving, and price are the primary specifications in circuit design for portable consumer products. These devices offer specifications that meet or exceed the familiar LM339 and LM393 devices at a fraction of the supply current.

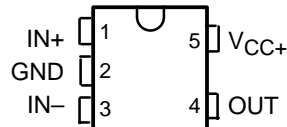
LMV339 . . . D OR PW PACKAGE  
(TOP VIEW)



LMV393 . . . D, DGK, OR PW PACKAGE  
(TOP VIEW)



LMV331 . . . DBV OR DCK PACKAGE  
(TOP VIEW)



## ORDERING INFORMATION

TA		PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING‡		
-40°C to 85°C	Single	SC-70 (DCK)	Reel of 3000	LMV331DCKR	R2_		
			Reel of 250	LMV331DCKT			
		SOT23-5 (DBV)	Reel of 3000	LMV331DBVR	R11_		
	Dual	MSOP/VSSOP (DGK)	Reel of 2500	LMV393IDGKR	R9R		
			SOIC (D)	Tube of 75		LMV393ID	MV393I
				Reel of 2500		LMV393IDR	
		TSSOP (PW)	Tube of 90	LMV393IPW	MV393I		
			Reel of 2000	LMV393IPWR			
		Quad	SOIC (D)	Tube of 50	LMV339ID	LMV339I	
	Reel of 2500			LMV339IDR			
	TSSOP (PW)		Tube of 150	LMV339IPW	MV339I		
			Reel of 2000	LMV339IPWR			

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

‡ DBV/DCK: The actual top-side marking has one additional character that designates the assembly/test site.



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

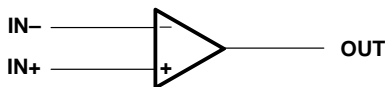
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# LMV331 SINGLE, LMV393 DUAL, LMV339 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

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## symbol (each comparator)



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, $V_{CC+}$ (see Note 1)	5.5 V
Differential input voltage, $V_{ID}$ (see Note 2)	$\pm 5.5$ V
Input voltage range, $V_I$ (either input)	0 V to 5.5 V
Package thermal impedance, $\theta_{JA}$ (see Notes 3 and 4):	
D (8-pin) package	97°C/W
D (14-pin) package	86°C/W
DBV package	206°C/W
DCK package	252°C/W
DGK package	172°C/W
PW (8-pin) package	149°C/W
PW (14-pin) package	113°C/W
Maximum junction temperature, $T_J$	150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or PW package	260°C
Storage temperature range, $T_{stg}$	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values (except differential voltages and  $V_{CC+}$  specified for the measurement of  $I_{OS}$ ) are with respect to the network GND.
  2. Differential voltages are at IN+ with respect to IN-.
  3. Maximum power dissipation is a function of  $T_{J(max)}$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_{J(max)} - T_A) / \theta_{JA}$ . Selecting the maximum of 150°C can affect reliability.
  4. The package thermal impedance is calculated in accordance with JESD 51-7.

## recommended operating conditions

	MIN	MAX	UNIT
$V_{CC+}$ Supply voltage (single-supply operation)	2.7	5.5	V
$T_A$ Operating free-air temperature	-40	85	°C

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**electrical characteristics at specified free-air temperature,  $V_{CC+} = 2.7\text{ V}$ ,  $GND = 0\text{ V}$  (unless otherwise noted)**

PARAMETER		TEST CONDITIONS	$T_A$	MIN	TYP	MAX	UNIT
$V_{IO}$	Input offset voltage		25°C		1.7	7	mV
$\alpha_{V_{IO}}$	Average temperature coefficient of input offset voltage		-40°C to 85°C		5		$\mu\text{V}/^\circ\text{C}$
$I_{IB}$	Input bias current		25°C		10	250	nA
			-40°C to 85°C			400	
$I_{IO}$	Input offset current		25°C		5	50	nA
			-40°C to 85°C			150	
$I_O$	Output current	$V_O \leq 1.5\text{ V}$	25°C	5	23		mA
	Output leakage current		25°C		0.003		$\mu\text{A}$
			-40°C to 85°C			1	
$V_{ICR}$	Common-mode input voltage range		25°C	-0.1 to 2			V
$V_{SAT}$	Saturation voltage	$I_O \leq 1\text{ mA}$	25°C		200		mV
$I_{CC}$	Supply current	LMV331	25°C		40	100	$\mu\text{A}$
		LMV393 (both comparators)	25°C		70	140	
		LMV339 (all four comparators)	25°C		140	200	

**switching characteristics,  $T_A = 25^\circ\text{C}$ ,  $V_{CC+} = 2.7\text{ V}$ ,  $R_L = 5.1\text{ k}\Omega$ ,  $GND = 0\text{ V}$  (unless otherwise noted)**

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PHL}$	Propagation delay, high- to low-level output switching	Input overdrive = 10 mV		1000		ns
		Input overdrive = 100 mV		350		
$t_{PLH}$	Propagation delay, low- to high-level output switching	Input overdrive = 10 mV		500		ns
		Input overdrive = 100 mV		400		

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electrical characteristics at specified free-air temperature,  $V_{CC+} = 5\text{ V}$ ,  $GND = 0\text{ V}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS	$T_A$	MIN	TYP	MAX	UNIT
$V_{IO}$	Input offset voltage		25°C		1.7	7	mV
			-40°C to 85°C			9	
$\alpha_{V_{IO}}$	Average temperature coefficient of input offset voltage		25°C		5		$\mu\text{V}/^\circ\text{C}$
$I_{IB}$	Input bias current		25°C		25	250	nA
			-40°C to 85°C			400	
$I_{IO}$	Input offset current		25°C		2	50	nA
			-40°C to 85°C			150	
$I_O$	Output current	$V_O \leq 1.5\text{ V}$	25°C	10	84		mA
	Output leakage current		25°C		0.003		$\mu\text{A}$
			-40°C to 85°C			1	
$V_{ICR}$	Common-mode input voltage range		25°C	-0.1 to 4.2			V
$A_{VD}$	Large-signal differential voltage gain		25°C	20	50		V/mV
$V_{SAT}$	Saturation voltage	$I_O \leq 4\text{ mA}$	25°C		200	400	mV
			-40°C to 85°C			700	
$I_{CC}$	Supply current	LMV331	25°C		60	120	$\mu\text{A}$
			-40°C to 85°C			150	
		LMV393 (both comparators)	25°C		100	200	
			-40°C to 85°C			250	
		LMV339 (all four comparators)	25°C		170	300	
			-40°C to 85°C			350	

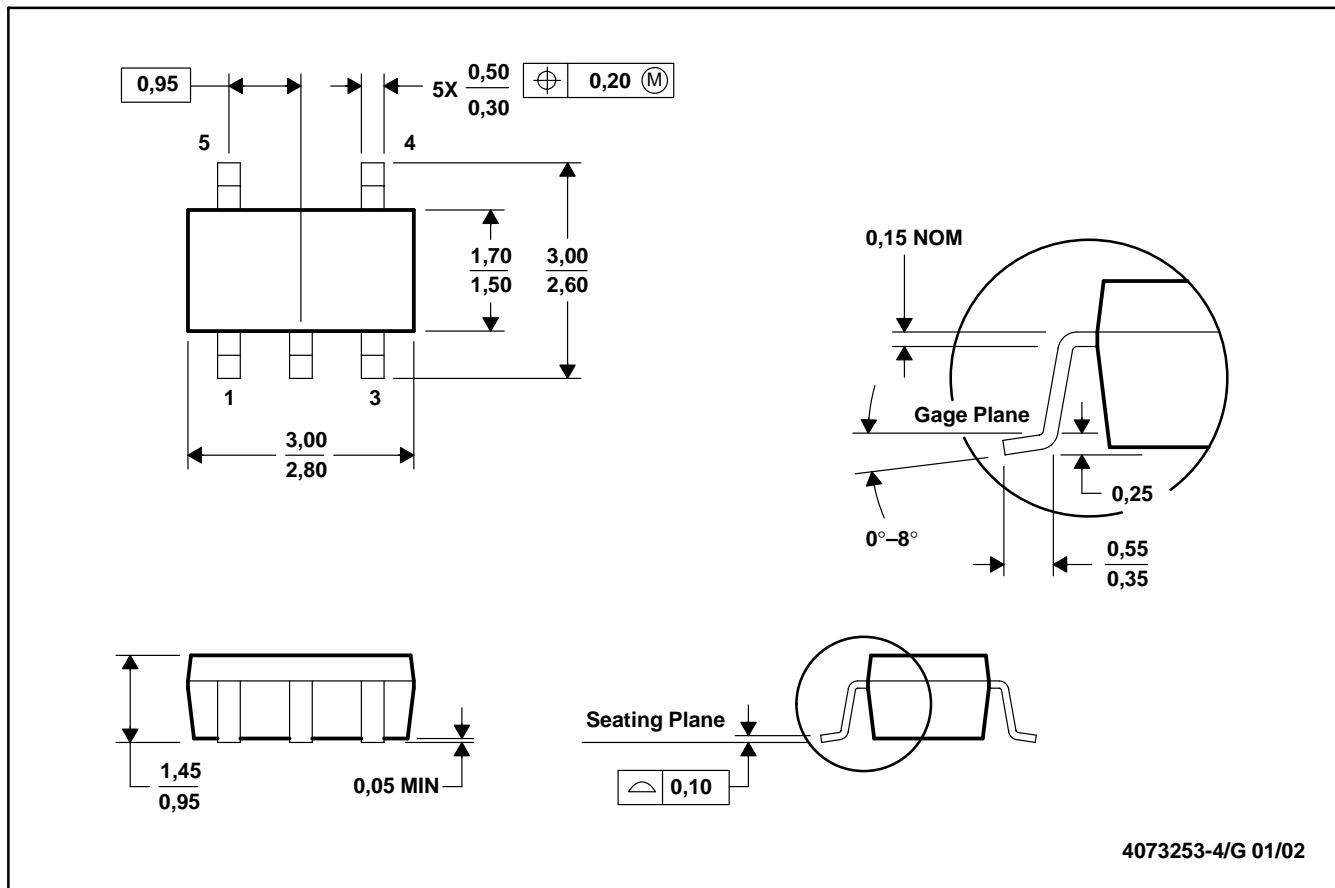
switching characteristics,  $T_A = 25^\circ\text{C}$ ,  $V_{CC+} = 5\text{ V}$ ,  $R_L = 5.1\text{ k}\Omega$ ,  $GND = 0\text{ V}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PHL}$	Propagation delay, high- to low-level output switching	Input overdrive = 10 mV		600		ns
		Input overdrive = 100 mV		200		
$t_{PLH}$	Propagation delay, low- to high-level output switching	Input overdrive = 10 mV		450		ns
		Input overdrive = 100 mV		300		



DBV (R-PDSO-G5)

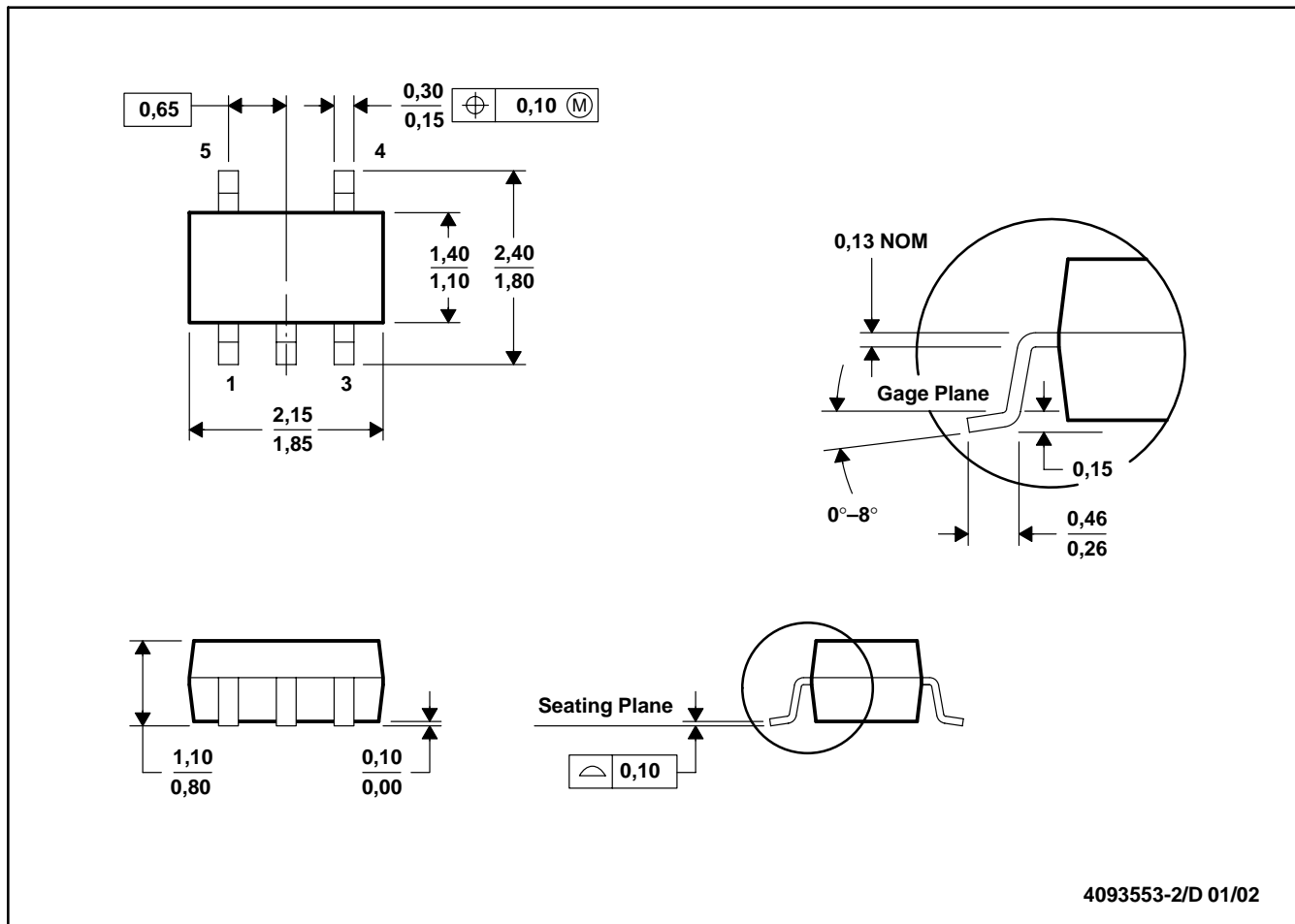
PLASTIC SMALL-OUTLINE



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion.  
 D. Falls within JEDEC MO-178

DCK (R-PDSO-G5)

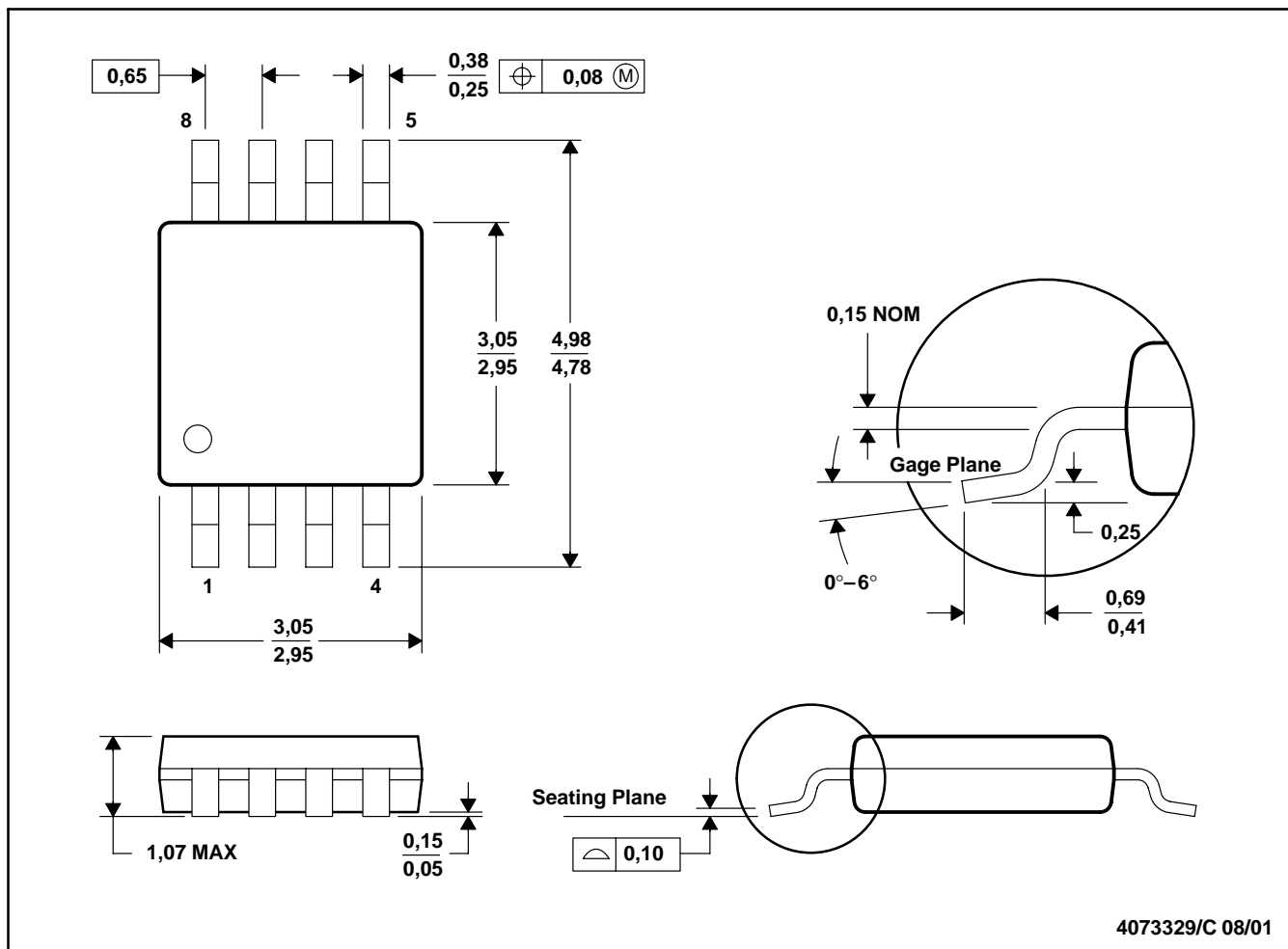
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion.  
 D. Falls within JEDEC MO-203

DGK (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion.  
 D. Falls within JEDEC MO-187

D (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

8 PINS SHOWN



4040047/E 09/01

- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).  
 D. Falls within JEDEC MS-012



PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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