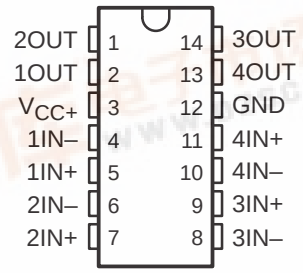
LMV331 SINGLE, LMV393 DUAL, LMV339 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

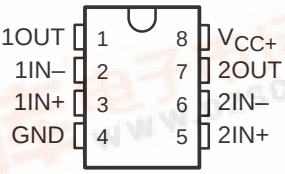
SLCS136C – AUGUST 1999 – REVISED APRIL 2000

- **2.7-V and 5-V Performance**
- **Low Supply Current:**
  - **LMV331 . . . 60 μA Typ**
  - **LMV393 . . . 100 μA Typ**
  - **LMV339 . . . 170 μA Typ**
- **Input Common-Mode Voltage Range Includes Ground**
- **Low Output Saturation Voltage . . . 200 mV Typ**
- **Package Options Include Plastic Small-Outline (D), Small-Outline Transistor (SOT-23 DBV, SC-70 DCK), and Thin Shrink Small-Outline (PW) Packages**

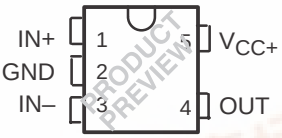
LMV339 . . . D OR PW PACKAGE
(TOP VIEW)



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



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



description

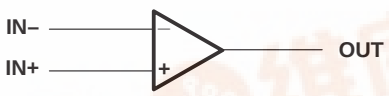
The LMV393 and LMV339 devices are low-voltage (2.7 V to 5.5 V) versions of the dual and quad comparators, LM393 and LM339, which operate from 5 V to 30 V. The LMV331 is the single-comparator version.

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.

The LMV331 is available in the ultra-small DCK package, which is approximately one-half the size of the five-pin DBV package. The DCK package saves space on printed circuit boards and enables the design of small portable electronic devices. It also allows the designer to place the device closer to the signal source to reduce noise pickup and increase signal integrity.

The LMV331I, LMV339I, and LMV393I devices are characterized for operation from –40°C to 85°C.

logic symbol (each comparator)



AVAILABLE OPTIONS

T_A	PACKAGE TYPE	PACKAGED DEVICES		
		SINGLE	DUAL	QUADRUPLE
–40°C to 85°C	5-pin SOT	LMV331IDCKR LMV331IDBVR	— —	— —
	8-pin SOIC 8-pin TSSOP	— —	LMV393ID LMV393IPWR	— —
	14-pin SOIC 14-pin TSSOP	— —	—	LMV339ID LMV339IPWR

The D package is available taped and reeled. Add the suffix R to the device type (e.g., LMV393DR). The DCK, DBV, and PW packages are only available left-end taped and reeled.

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) . . . . . ±5.5 V
Input voltage range, V_I (either input) . . . . . 0 to 5.5°C
Operating virtual junction temperature range . . . . . 0 to 150°C
Package thermal impedance, θ_{JA} (see Notes 3 and 4): D (8-pin) package . . . . . 97°C/W
D (14-pin) package . . . . . 86°C/W
DBV package . . . . . 347°C/W
DCK package . . . . . 389°C/W
PW (8-pin) package . . . . . 149°C/W
PW (14-pin) package . . . . . 113°C/W
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 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 $T_J(max)$, θ_{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.

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

electrical characteristics at specified free-air temperature, V_{CC+} = 2.7 V, GND = 0 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		μV/°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	$V_O \le 1.5$ V	25°C	5	23		mA
	Output leakage current		25°C		0.003		μA
			–40°C to 85°C			1	
V_{ICR}	Common-mode input voltage range		25°C		–0.1 to 2		V
V_{SAT}	Saturation voltage	$I_O \le 1$ mA	25°C		200		mV
I_{CC}	Supply current	LMV331†	25°C		40	100	μA
		LMV393 (both comparators)	25°C		70	140	
		LMV339 (all four comparators)	25°C		140	200	

† This device is product preview.

switching characteristics, T_A = 25°C, V_{CC+} = 2.7 V, R_L = 5.1 kΩ, GND = 0 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		

electrical characteristics at specified free-air temperature, V_{CC+} = 5 V, GND = 0 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		μV/°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	$V_O \le 1.5$ V	25°C	10	84		mA
	Output leakage current		25°C		0.003		μA
			–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	$I_O \le 4$ mA	25°C		200	400	mV
			–40°C to 85°C			700	
I_{CC}	Supply current	LMV331†	25°C		60	120	μA
			–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	

† This device is product preview.

switching characteristics, T_A = 25°C, V_{CC+} = 5 V, R_L = 5.1 kΩ, GND = 0 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		

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