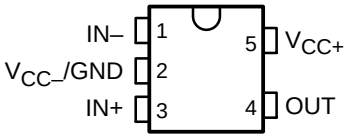
- **Low-Voltage and Single-Supply Operation V_{CC} = 2 V to 7 V**
- **Common-Mode Voltage Range Includes Ground**
- **Fast Response Time . . . 0.7 μs Typ**
- **Low Supply Current . . . 80 μA Typ and 150 μA Max**
- **Fully Specified at 3-V and 5-V Supply Voltages**

DBV PACKAGE
(TOP VIEW)



description/ordering informaton

The TLV1391 is a differential comparator built using a Texas Instruments low-voltage, high-speed bipolar process. These devices have been developed specifically for low-voltage, single-supply applications. Their enhanced performance makes them excellent replacements for the LM393 in the improved 3-V and 5-V system designs.

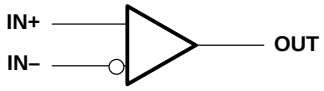
The TLV1391, with its typical supply current of only 80 μA, is ideal for low-power systems. Response time also has been improved to 0.7 μs.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–0°C to 70°C	SOT-23-5 (DBV)	Reel of 3000	TLV1391CDBVR	VABC
		Reel of 250	TLV1391CDBVT	
–40°C to 85°C	SOT-23-5 (DBV)	Reel of 3000	TLV1391IDBVR	VABI
		Reel of 250	TLV1391IDBVT	

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

symbol (each comparator)



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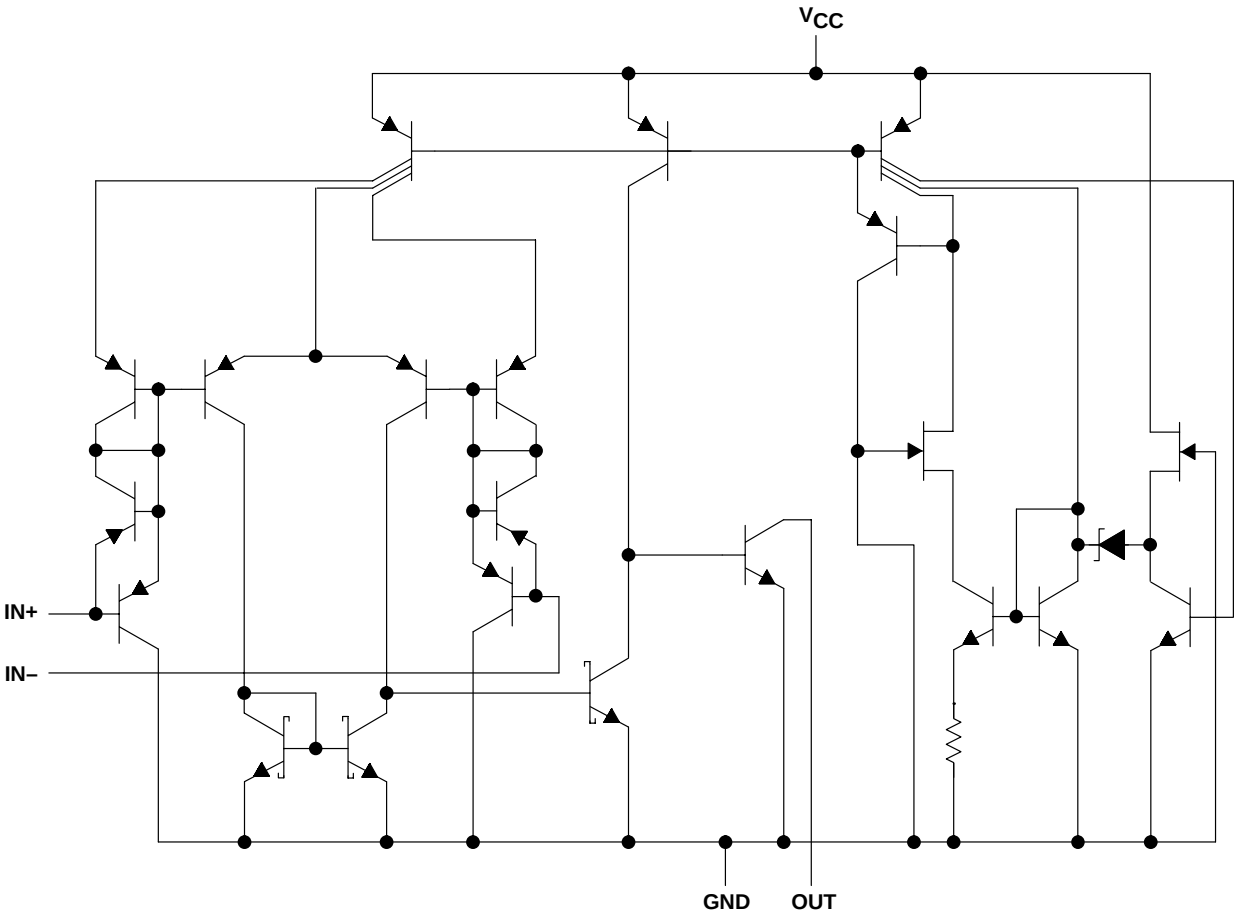
equivalent schematic



COMPONENT COUNT	
Transistors	26
Resistors	1
Diodes	4
Epi-FET	1

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

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Differential input voltage, V_{ID} (see Note 2) . . . . . ±7 V
Input voltage range, V_I (any input) . . . . . –0.3 V to V_{CC}
Output voltage, V_O . . . . . 7 V
Output current, I_O (each output) . . . . . 20 mA
Duration of short-circuit current to GND (see Note 3) . . . . . Unlimited
Package thermal impedance, θ_{JA} (see Note 4 and 5) . . . . . 206°C/W
Operating virtual junction temperature, T_J . . . . . 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 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, are with respect to the network GND.
2. Differential voltages are at the noninverting input with respect to the inverting input.
3. Short circuits from the outputs to V_{CC} can cause excessive heating and eventual destruction of the chip.
4. 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 $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can impact reliability.
5. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

			MIN	MAX	UNIT
V_{CC}	Supply voltage		2	7	V
T_A	Operating free-air temperature	TLV1391C	0	70	°C
		TLV1391I	–40	85	

electrical characteristics, V_{CC} = 3 V

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	V_O = 1.4 V, V_{IC} = V_{ICR}(min)	25°C		1.5	5	mV
			Full range			9	
V_{ICR}	Common-mode input voltage range		25°C	0 to V_{CC}–1.5	0 to V_{CC}–1.2		V
			Full range	0 to V_{CC}–2			
V_{OL}	Low-level output voltage	V_{ID} = –1 V, I_{OL} = 500 µA	Full range		120	300	mV
I_{IO}	Input offset current	V_O = 1.4 V	25°C		5	50	nA
			Full range			150	
I_{IB}	Input bias current	V_O = 1.4 V	25°C		–40	–250	nA
			Full range			–400	
I_{OH}	High-level output current	V_{ID} = 1 V, V_{OH} = 3 V	25°C		0.1		nA
		V_{ID} = 1 V, V_{OH} = 5 V	Full range			100	
I_{OL}	Low-level output current	V_{ID} = –1 V, V_{OL} = 1.5 V	25°C	500			µA
$I_{CC(H)}$	High-level supply current	V_O = V_{OH}	25°C		80	125	µA
			Full range			150	
$I_{CC(L)}$	Low-level supply current	V_O = V_{OL}	25°C		80	125	µA
			Full range			150	

switching characteristics, V_{CC} = 3 V, C_L = 15 pF†, T_A = 25°C

PARAMETER	TEST CONDITIONS		TYP	UNIT
Response time	100-mV input step with 5-mV overdrive,	R_L = 5.1 kΩ	0.7	µs

† C_L includes the probe and jig capacitance.

electrical characteristics, V_{CC} = 5 V

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	V_O = 1.4 V, V_{IC} = V_{ICR}(min)	25°C		1.5	5	mV
			Full range			9	
V_{ICR}	Common-mode input voltage range		25°C	0 to V_{CC}–1.5	0 to V_{CC}–1.2		V
			Full range	0 to V_{CC}–2			
V_{OL}	Low-level output voltage	V_{ID} = –1 V, I_{OL} = 500 µA	Full range		120	300	mV
I_{IO}	Input offset current	V_O = 1.4 V	25°C		5	50	nA
			Full range			150	
I_{IB}	Input bias current	V_O = 1.4 V	25°C		–40	–250	nA
			Full range			–400	
I_{OH}	High-level output current	V_{ID} = 1 V, V_{OH} = 3 V	25°C		0.1		nA
		V_{ID} = 1 V, V_{OH} = 5 V	Full range			100	
I_{OL}	Low-level output current	V_{ID} = –1 V, V_{OL} = 1.5 V	25°C	600			µA
$I_{CC(H)}$	High-level supply current	V_O = V_{OH}	25°C		100	150	µA
			Full range			175	
$I_{CC(L)}$	Low-level supply current	V_O = V_{OL}	25°C		100	150	µA
			Full range			175	

switching characteristics, V_{CC} = 5 V, C_L = 15 pF†, T_A = 25°C

PARAMETER	TEST CONDITIONS		TYP	UNIT
Response time	100-mV input step with 5-mV overdrive,	R_L = 5.1 kΩ	0.65	µs
	TTL-level input step,	R_L = 5.1 kΩ	0.18	

† C_L includes the probe and jig capacitance.

TYPICAL CHARACTERISTICS

LOW-TO HIGH-LEVEL OUTPUT
RESPONSE FOR VARIOUS INPUT OVERDRIVES

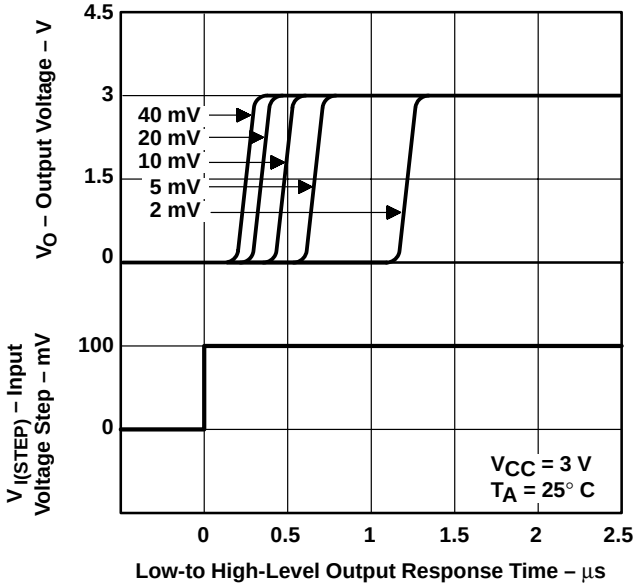


Figure 1

HIGH-TO LOW-LEVEL OUTPUT
RESPONSE FOR VARIOUS INPUT OVERDRIVES

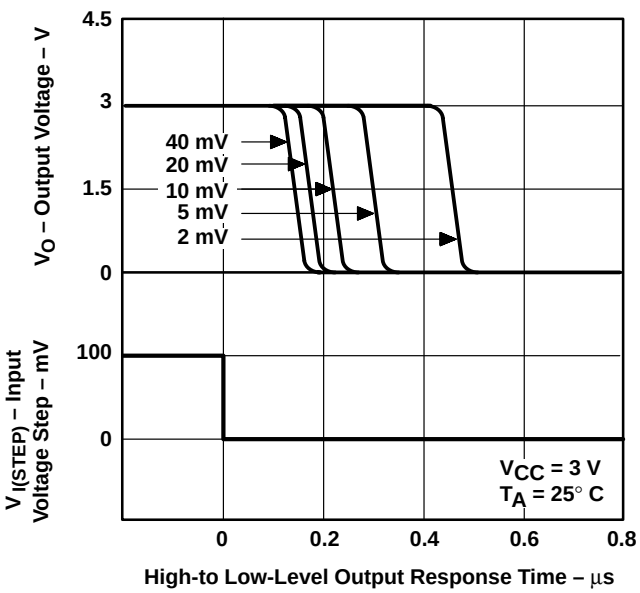


Figure 2

LOW-TO HIGH-LEVEL OUTPUT
RESPONSE FOR VARIOUS INPUT OVERDRIVES

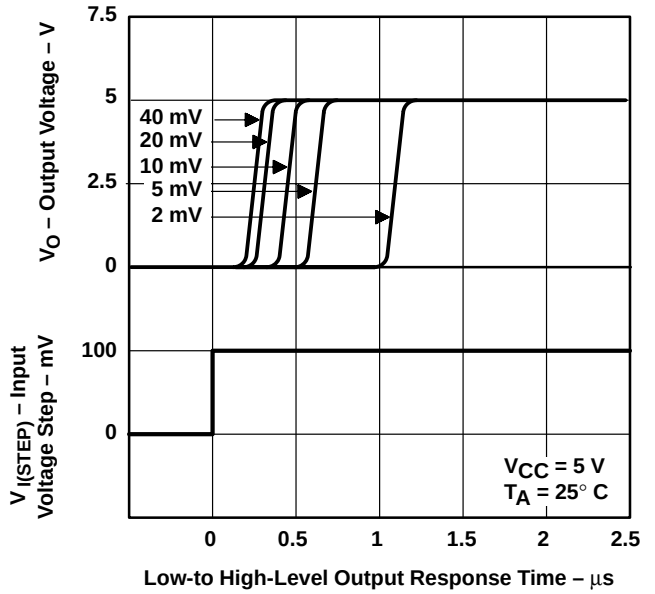


Figure 3

HIGH-TO LOW-LEVEL OUTPUT
RESPONSE FOR VARIOUS INPUT OVERDRIVES

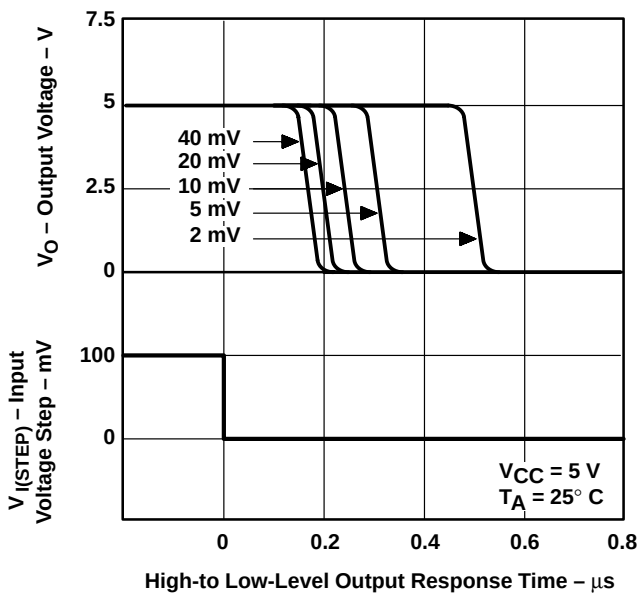
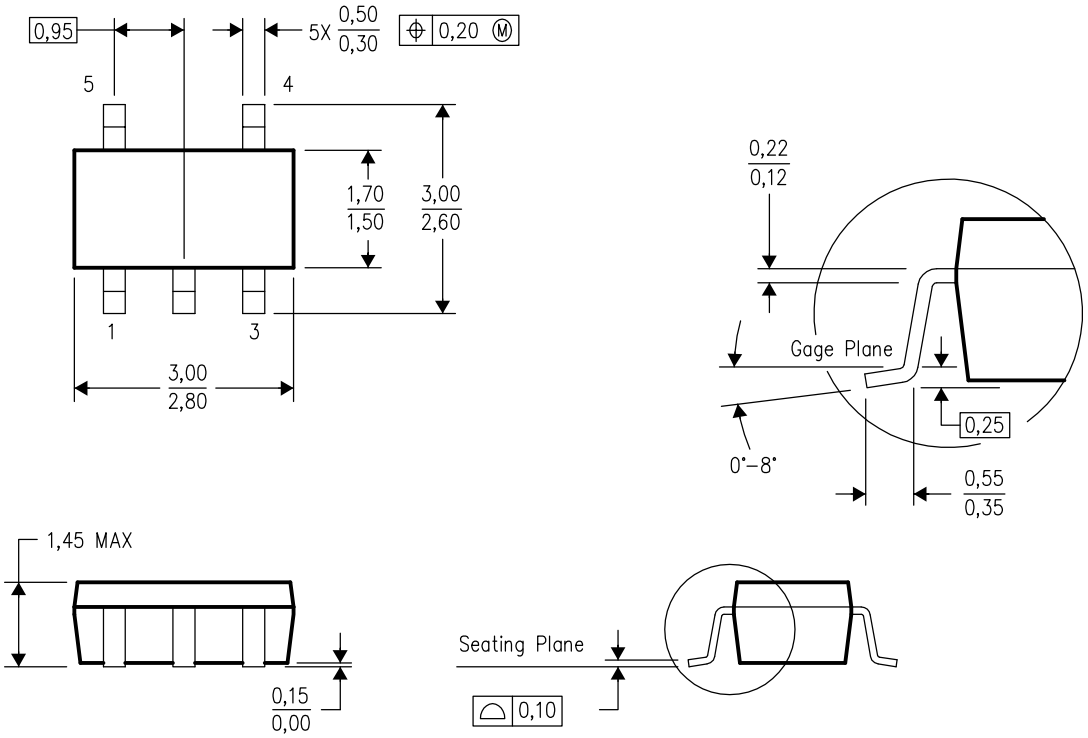


Figure 4

DBV (R–PDSO–G5) PLASTIC SMALL–OUTLINE PACKAGE



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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 Variation AA.

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