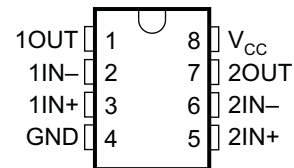


FEATURES

- **Controlled Baseline**
 - One Assembly
 - Test Site
 - One Fabrication Site
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product Change Notification**
- **Qualification Pedigree ⁽¹⁾**
- **Single Supply or Dual Supplies**
- **Wide Range of Supply Voltage**
 - Max Rating . . . 2 V to 36 V
 - Tested to 30 V
- **Low Supply-Current Drain Independent of Supply Voltage . . . 0.4 mA Typical Per Comparator**
- **Low Input Bias Current . . . 25 nA Typical**
- **Low Input Offset Voltage . . . 2 mV Typical**
- **Common-Mode Input Voltage Range Includes Ground**
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . ±36 V**
- **Low Output Saturation Voltage**
- **Output Compatible With TTL, MOS, and CMOS**

(1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold-compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

LM293 . . . D PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

This device consist of two independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies also is possible as long as the difference between the two supplies is 2 V to 36 V, and V_{CC} is at least 1.5 V more positive than the input common-mode voltage. Current drain is independent of the supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

The LM293-EP is characterized for operation from –55°C to 125°C.

ORDERING INFORMATION⁽¹⁾

T _A	V _{IOmax} AT 25°C	MAX V _{CC}	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	TOPSIDE MARKING
–55°C to 125°C	5 mV	30 V	SOIC – D	Reel of 2500	LM293MDREP	LM293E

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.
 (2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

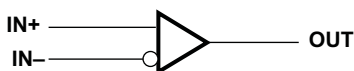


Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

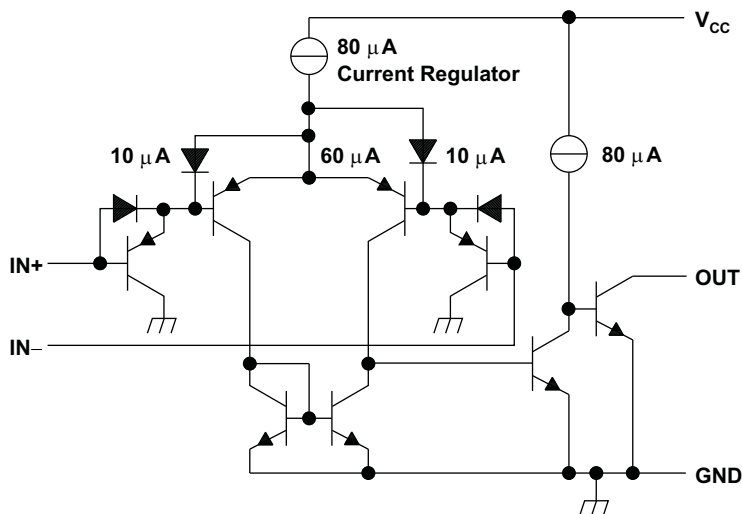
LM293-EP DUAL DIFFERENTIAL COMPARATOR

SLCS155–OCTOBER 2007

Symbol (Each Comparator)



Schematic (Each Comparator)



COMPONENT COUNT	
Epi-FET	1
Diodes	2
Resistors	2
Transistors	30

Current values shown are nominal.

Absolute Maximum Ratings⁽¹⁾

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
V_{CC}	Supply voltage ⁽²⁾		36	V
V_{ID}	Differential input voltage ⁽³⁾		± 36	V
V_I	Input voltage range (either input)	-0.3	36	V
V_O	Output voltage		36	V
I_O	Output current		20	mA
	Duration of output short-circuit to ground ⁽⁴⁾		Unlimited	
θ_{JA}	Package thermal impedance ⁽⁵⁾⁽⁶⁾		97	$^{\circ}\text{C}/\text{W}$
T_J	Operating virtual junction temperature		150	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-65	150	$^{\circ}\text{C}$

- (1) 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.
- (2) All voltage values, except differential voltages, are with respect to GND.
- (3) Differential voltages are at IN+, with respect to IN-.
- (4) Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.
- (5) Maximum power dissipation is a function of $T_J(\text{max})$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150 $^{\circ}\text{C}$ can affect reliability.
- (6) The package thermal impedance is calculated in accordance with JESD 51-7.

Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	$T_A^{(1)}$	LM293			UNIT	
			MIN	TYP	MAX		
V_{IO} Input offset voltage	$V_{CC} = 5\text{ V to }30\text{ V}$, $V_O = 1.4\text{ V}$, $V_{IC} = V_{IC(min)}$	25°C		2	5	mV	
		Full range			9		
I_{IO} Input offset current	$V_O = 1.4\text{ V}$	25°C		5	50	nA	
		Full range			250		
I_{IB} Input bias current	$V_O = 1.4\text{ V}$	25°C		-25	-250	nA	
		Full range			-400		
V_{ICR} Common-mode input voltage range ⁽²⁾		25°C		0 to $V_{CC} - 1.5$		V	
		Full range		0 to $V_{CC} - 2$			
A_{VD} Large-signal differential-voltage amplification	$V_{CC} = 15\text{ V}$, $V_O = 1.4\text{ V to }11.4\text{ V}$, $R_L \geq 15\text{ k}\Omega$ to V_{CC}	25°C	50	200		V/mV	
I_{OH} High-level output current	$V_{OH} = 5\text{ V}$,	$V_{ID} = 1\text{ V}$	25°C		0.1	50	nA
	$V_{OH} = 30\text{ V}$,	$V_{ID} = 1\text{ V}$	Full range			1	μA
V_{OL} Low-level output voltage	$I_{OL} = 4\text{ mA}$,	$V_{ID} = -1\text{ V}$	25°C		150	400	mV
			Full range			700	
I_{OL} Low-level output current	$V_{OL} = 1.5\text{ V}$,	$V_{ID} = -1\text{ V}$	25°C	6			mA
I_{CC} Supply current	$R_L = \infty$	$V_{CC} = 5\text{ V}$	25°C		0.8	1	mA
		$V_{CC} = 30\text{ V}$	Full range			2.5	

- (1) Full range (MIN or MAX) for LM293 is -55°C to 125°C . All characteristics are measured with zero common-mode input voltage, unless otherwise specified.
- (2) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is $V_{CC+} - 1.5\text{ V}$ for the inverting input (-), and the non-inverting input (+) can exceed the V_{CC} level; the comparator provides a proper output state. Either or both inputs can go to 30 V without damage.

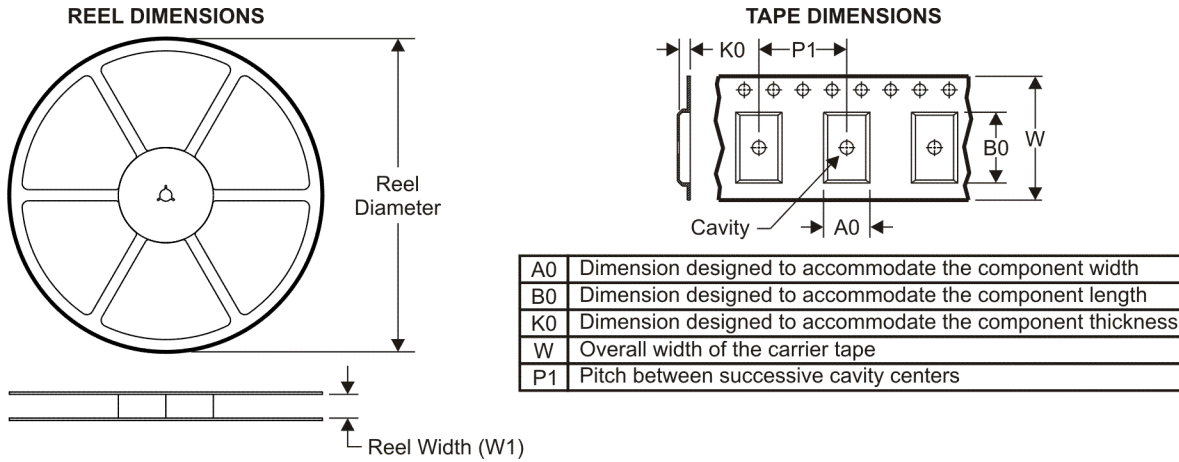
Switching Characteristics

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

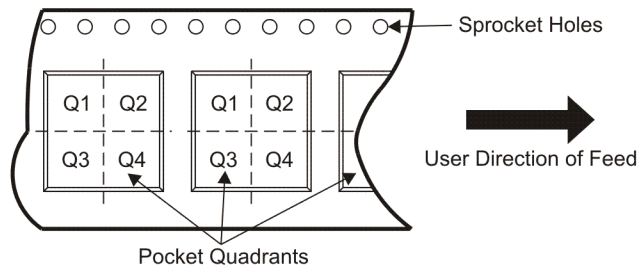
PARAMETER	TEST CONDITIONS	LM293	UNIT	
		TYP		
Response time	R_L connected to 5 V through 5.2 k Ω , $C_L = 15\text{ pF}^{(1)}$, See ⁽²⁾	100 mV input step with 5 mV overdrive	1.3	μs
		TTL-level input step	0.3	

- (1) C_L includes probe and jig capacitance.
- (2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

TAPE AND REEL INFORMATION



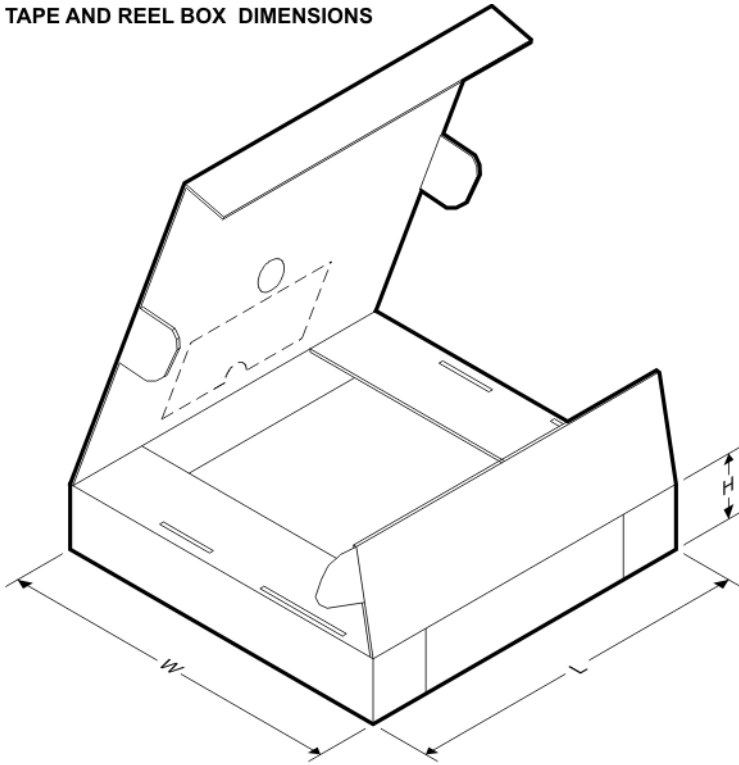
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM293MDREP	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

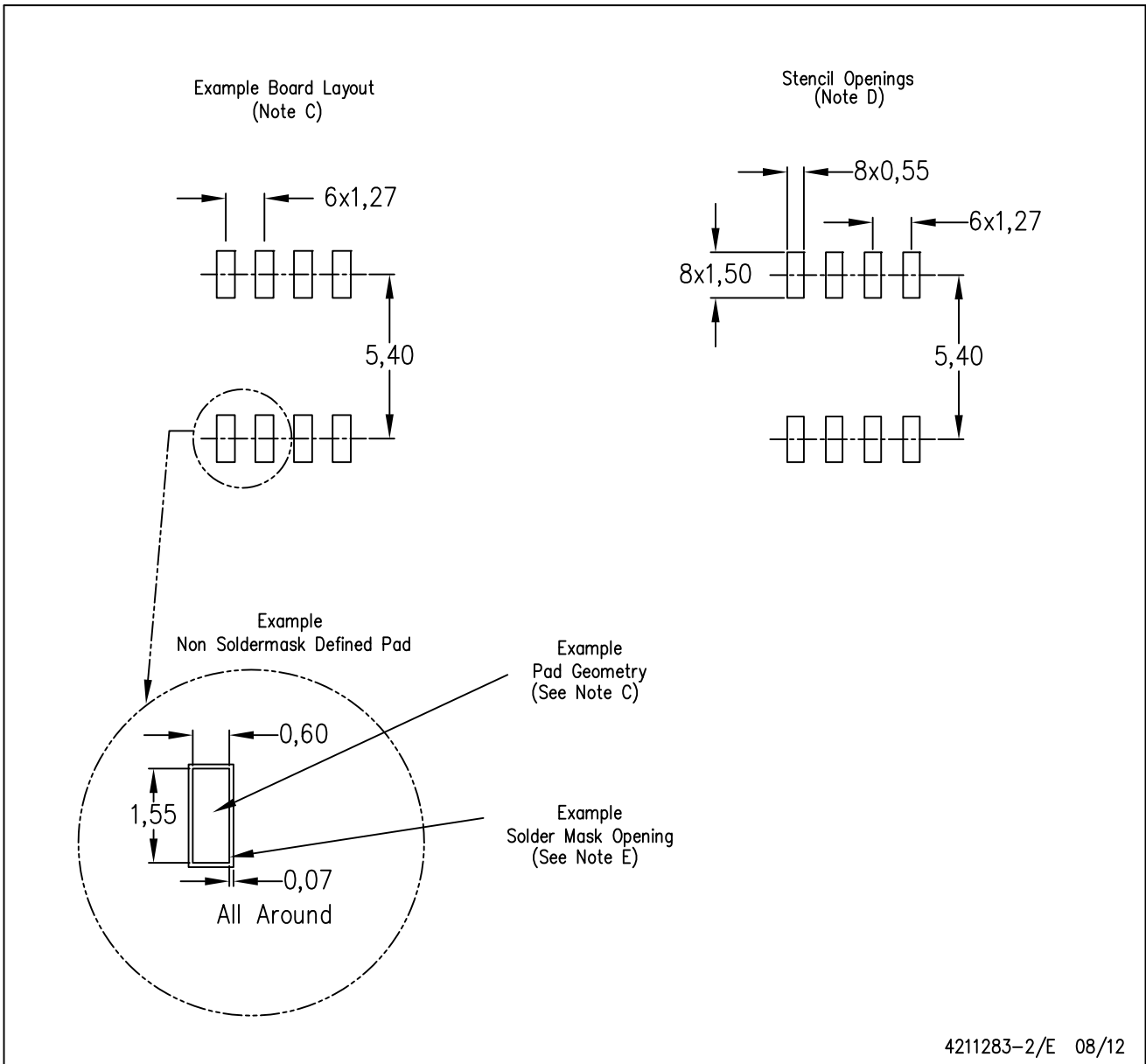


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM293MDREP	SOIC	D	8	2500	340.5	338.1	20.6

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



4211283-2/E 08/12

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46C and to discontinue any product or service per JESD48B. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components which meet ISO/TS16949 requirements, mainly for automotive use. Components which have not been so designated are neither designed nor intended for automotive use; and TI will not be responsible for any failure of such components to meet such requirements.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Mobile Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community e2e.ti.com

AMEYA360

Components Supply Platform

Authorized Distribution Brand :



Website :

Welcome to visit www.ameya360.com

Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype [ameyasales1](#) [ameyasales2](#)

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com