

**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR****AZV393****General Description**

The AZV393 is a low voltage 2.5V to 5.5V, dual comparator, which has a very low supply current of 100 $\mu$ A, making the part an excellent choice for portable electronic systems. The device is pin-for-pin compatible replacement of the LMV393.

The AZV393 is built with BiCMOS process with bipolar input and output stages for improved noise performance. It is a cost-effective solution for portable consumer products where space, low voltage, low power and price are the primary specification in circuit design.

The AZV393 is available in standard SOIC-8 and space saving TSSOP-8 and MSOP-8 packages.

**Features**

- Guaranteed 2.5V to 5.5V Performance
- Industrial Temperature Range: -40°C to 85°C
- Low Supply Current: 100 $\mu$ A Typical
- Input Common Mode Voltage Range Includes Ground
- Low Output Saturation Voltage: 200mV Typical
- Open Collector Output for Maximal Flexibility

**Applications**

- Notebook and PDA
- Low Power, Low Voltage Applications
- General Purpose Portable Devices
- Mobile Communications
- Battery Powered Electronics



Figure 1. Package Types of AZV393

**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Pin Configuration**

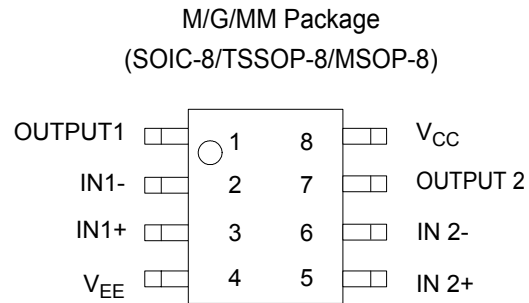


Figure 2. Pin Configuration of AZV393 (Top View)

**Functional Block Diagram**

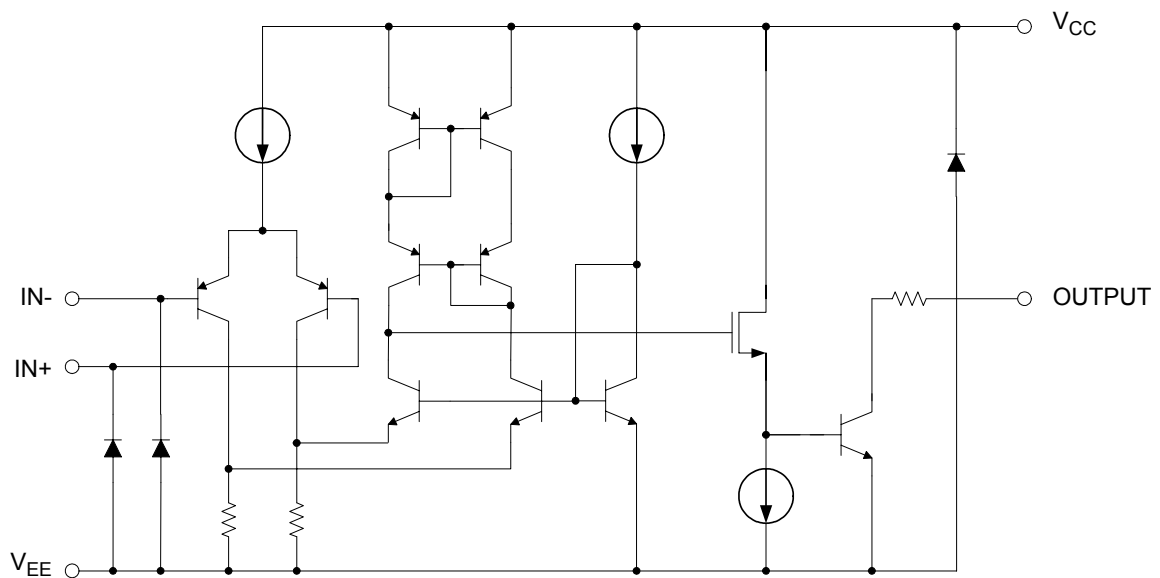
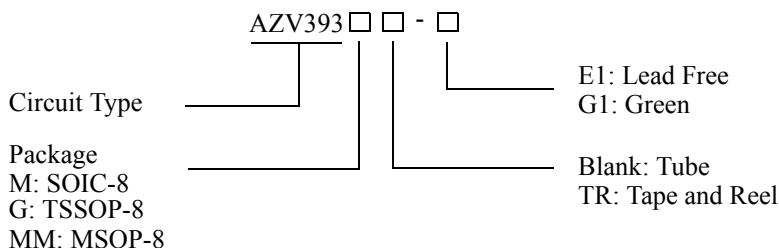


Figure 3. Functional Block Diagram of AZV393 (Each comparator)



**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR** **AZV393**

**Ordering Information**



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
SOIC-8	-40 to 85°C	AZV393M-E1	AZV393M-G1	AZV393M-E1	AZV393M-G1	Tube
		AZV393MTR-E1	AZV393MTR-G1	AZV393M-E1	AZV393M-G1	Tape & Reel
TSSOP-8	-40 to 85°C	AZV393G-E1	AZV393G-G1	EG3D	GG3D	Tube
		AZV393GTR-E1	AZV393GTR-G1	EG3D	GG3D	Tape & Reel
MSOP-8	-40 to 85°C	AZV393MM-E1	AZV393MM-G1	AZV393MM-E1	AZV393MM-G1	Tube
		AZV393MMTR-E1	AZV393MMTR-G1	AZV393MM-E1	AZV393MM-G1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

**Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Power Supply Voltage	V <sub>CC</sub>	6	V
Operation Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-65 to 150	°C
Lead Temperature (Soldering, 10 Seconds)	T <sub>LEAD</sub>	260	°C
ESD (Machine Model)		300	V
ESD (Human Body Model)		4000	V

Note 1: Stresses greater than 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 Ratings" for extended periods may affect device reliability.

**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR****AZV393****Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	$V_{CC}$	2.5	5.5	V
Ambient Operating Temperature Range	$T_A$	-40	85	°C

**2.7V DC Electrical Characteristics**

Limits in standard typeface are guaranteed for  $T_A=25^{\circ}\text{C}$ ,  $V_{CC}=2.7\text{V}$ ,  $V_{EE}=0\text{V}$ ,  $R_L=5.1\text{k}\Omega$  connected to  $V_{CC}$  and  $V_{CM}=0$ , **bold** typeface applies over full temperature ranges, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Offset Voltage	$V_{OS}$			1.7	7	mV
					<b>9</b>	
Input Offset Voltage Average Drift	$TCV_{OS}$			5		$\mu\text{V}/^{\circ}\text{C}$
Input Bias Current	$I_B$	$I_{IN^+}$ or $I_{IN^-}$ with output in linear range, $V_{CM}=0\text{V}$		10	250	nA
					<b>400</b>	
Input Offset Current	$I_{IO}$	$I_{IN^+} - I_{IN^-}$ , $V_{CM}=0\text{V}$		5	50	nA
					<b>150</b>	
Saturation Voltage	$V_{SAT}$	$I_{SINK} \leq 1\text{mA}$		200		mV
					<b>500</b>	
Output Sink Current	$I_{SINK}$	$V_O \leq 1.5\text{V}$	5	23		mA
Input Common-Mode Voltage Range	$V_{CM}$		-0.1		2	V
Supply Current	$I_{CC}$			70	150	$\mu\text{A}$
					<b>200</b>	
Output Leakage Current	$I_{LEAKAGE}$			0.003		$\mu\text{A}$

**2.7V AC Electrical Characteristics**

All limits are guaranteed for  $T_A=25^{\circ}\text{C}$ ,  $V_{CC}=2.7\text{V}$ ,  $V_{EE}=0\text{V}$ ,  $R_L=5.1\text{k}\Omega$  connected to  $V_{CC}$  and  $V_{CM}=0$ , unless otherwise specified.

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



**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**5V DC Electrical Characteristics**

Limits in standard typeface are guaranteed for  $T_A=25^{\circ}\text{C}$ ,  $V_{CC}=5\text{V}$ ,  $V_{EE}=0\text{V}$ ,  $R_L=5.1\text{k}\Omega$  connected to  $V_{CC}$  and  $V_{CM}=0$ , **bold** typeface applies over full temperature ranges, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Offset Voltage	$V_{OS}$			1.7	7	mV
					<b>9</b>	
Input Offset Voltage Average Drift	$TCV_{OS}$			5		$\mu\text{V}/^{\circ}\text{C}$
Input Bias Current	$I_B$	$I_{IN+}$ or $I_{IN-}$ with output in linear range, $V_{CM}=0\text{V}$		25	250	nA
					<b>400</b>	
Input Offset Current	$I_{IO}$	$I_{IN+} - I_{IN-}$ , $V_{CM}=0\text{V}$		2	50	nA
					<b>150</b>	
Saturation Voltage	$V_{SAT}$	$I_{SINK} \leq 4\text{mA}$		200	400	mV
					<b>500</b>	
Output Sink Current	$I_{SINK}$	$V_O \leq 1.5\text{V}$	10	84		mA
Input Common-Mode Voltage Range	$V_{CM}$		-0.1		4.2	V
Voltage Gain	$A_V$		20	50		V/mV
Supply Current	$I_{CC}$			100	200	$\mu\text{A}$
					<b>250</b>	
Output Leakage Current	$I_{LEAKAGE}$			0.003		$\mu\text{A}$

**5V AC Electrical Characteristics**

All limits are guaranteed for  $T_A=25^{\circ}\text{C}$ ,  $V_{CC}=5\text{V}$ ,  $V_{EE}=0\text{V}$ ,  $R_L=5.1\text{k}\Omega$  connected to  $V_{CC}$  and  $V_{CM}=0$ , unless otherwise specified.

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



**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Typical Performance Characteristics**

$T_A=25^{\circ}\text{C}$ , unless otherwise specified.

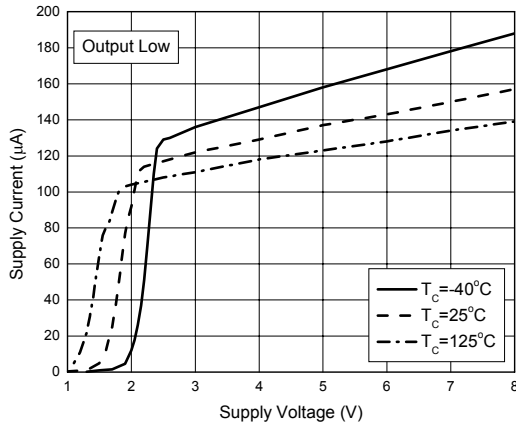


Figure 4. Supply Current vs. Supply Voltage

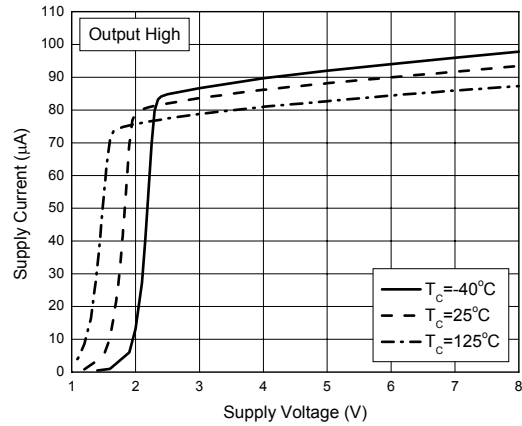


Figure 5. Supply Current vs. Supply Voltage

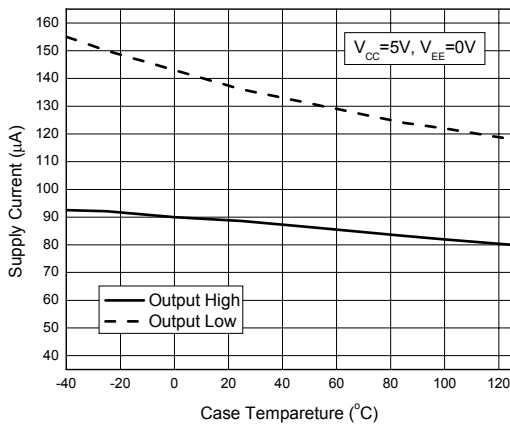


Figure 6. Supply Current vs. Case Temperature

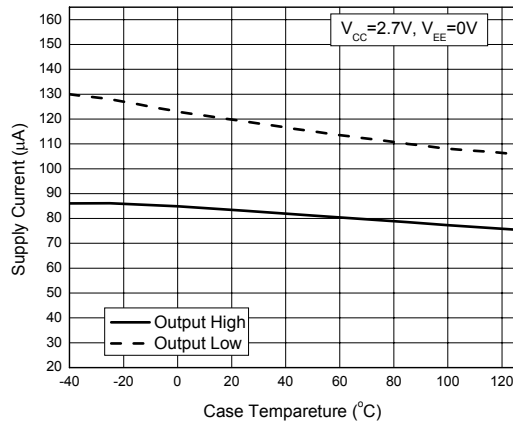


Figure 7. Supply Current vs. Case Temperature



**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Typical Performance Characteristics (Continued)**

$T_A=25^\circ\text{C}$ , unless otherwise specified.

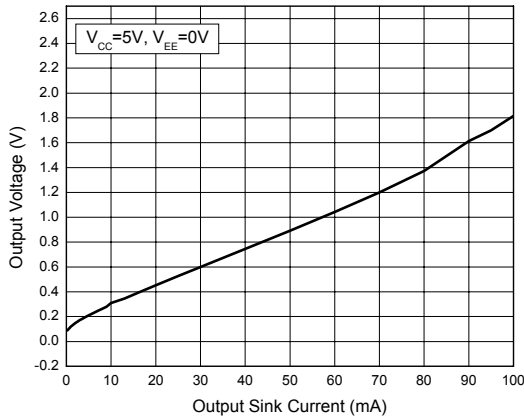


Figure 8. Output Voltage vs. Output Sink Current

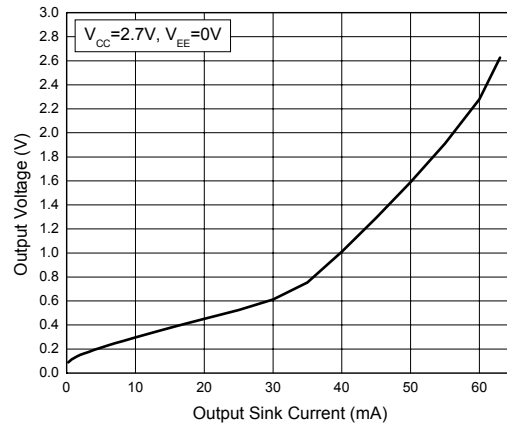


Figure 9. Output Voltage vs. Output Sink Current

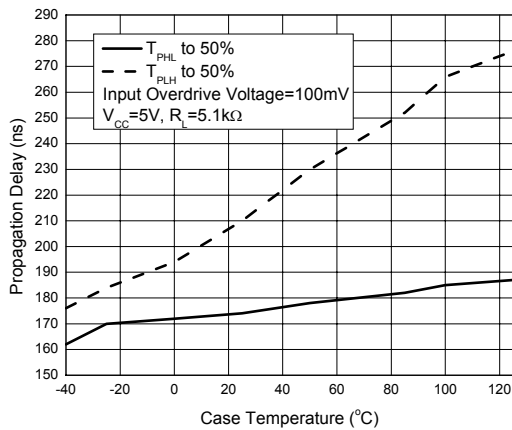


Figure 10. Propagation Delay vs. Temperature

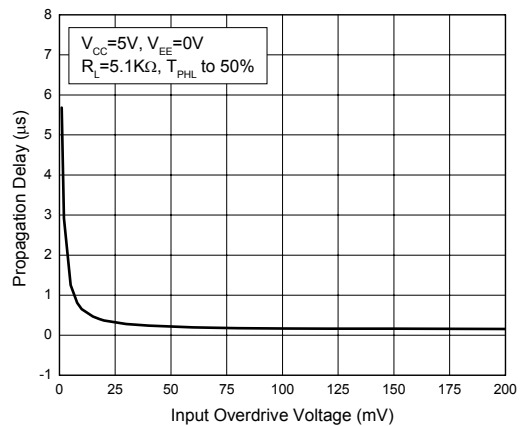


Figure 11. Propagation Delay vs. Input Overdrive Voltage



**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Typical Performance Characteristics (Continued)**

$T_A=25^{\circ}\text{C}$ , unless otherwise specified.

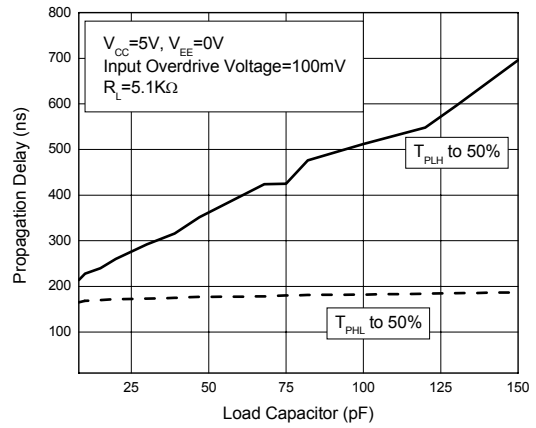
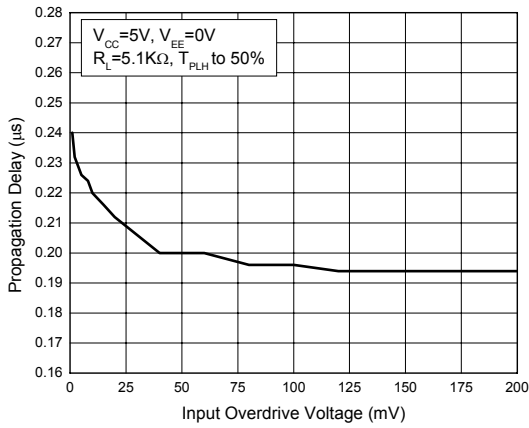


Figure 12. Propagation Delay vs. Input Overdrive Voltage    Figure 13. Propagation Delay vs. Load Capacitor

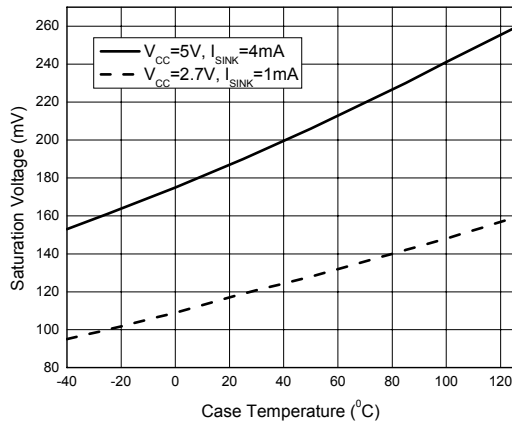


Figure 14. Saturation Voltage vs. Case Temperature



**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Typical Performance Characteristics (Continued)**

$T_A=25^{\circ}\text{C}$ , unless otherwise specified.

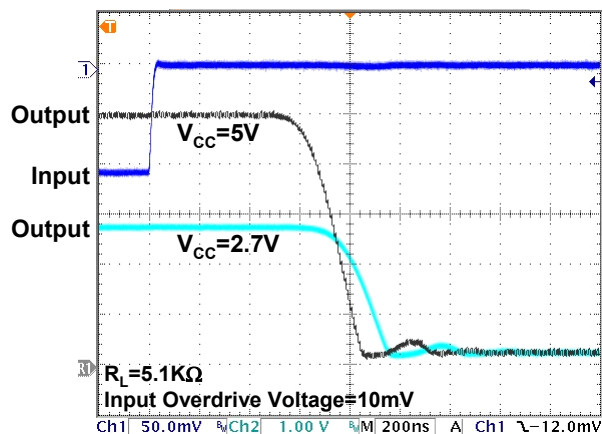


Figure 15. Response Time for Positive Transition

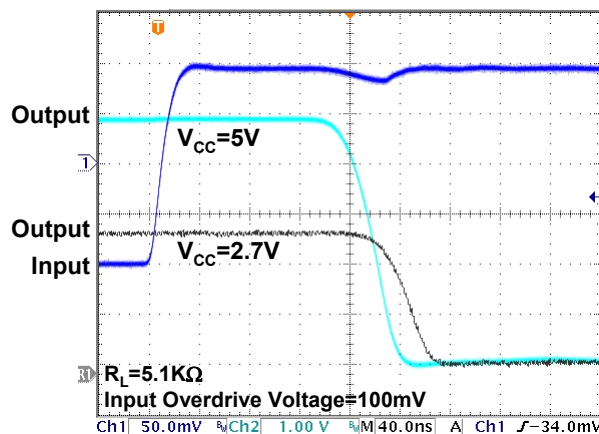


Figure 16. Response Time for Positive Transition

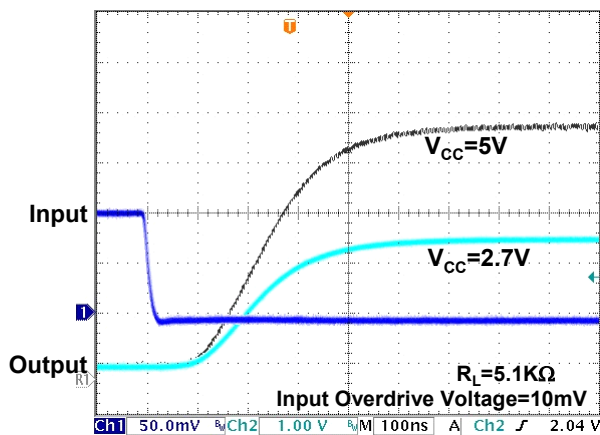


Figure 17. Response Time for Negative Transition

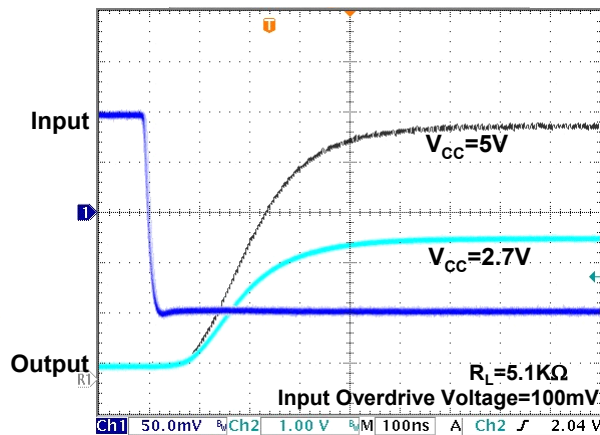


Figure 18. Response Time for Negative Transition



**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Typical Performance Characteristics (Continued)**

$T_A=25^\circ\text{C}$ , unless otherwise specified.

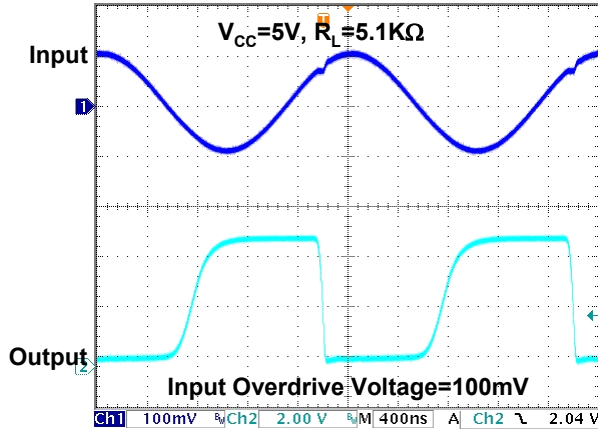


Figure 23. 500kHz Response

**Typical Applications**

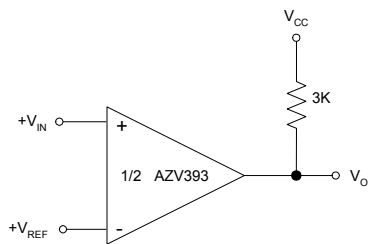


Figure 24. Basic Comparator

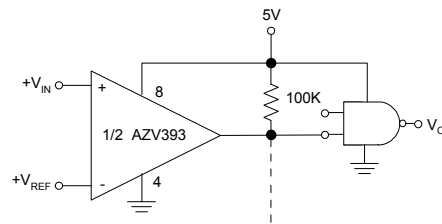


Figure 25. Driving CMOS

**Typical Applications (Continued)**

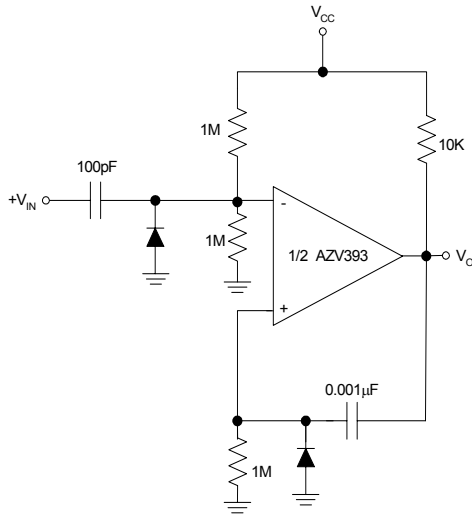


Figure 26. One Shot Multivibrator

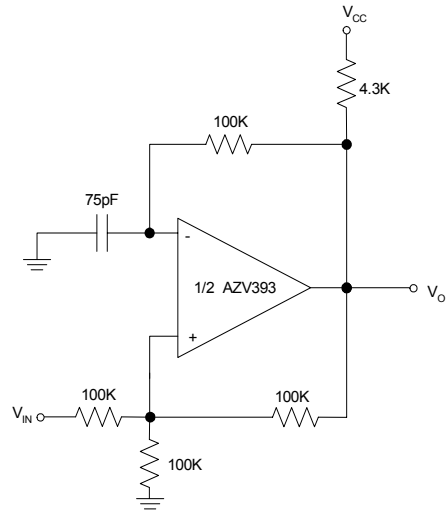


Figure 27. Squarewave Oscillator



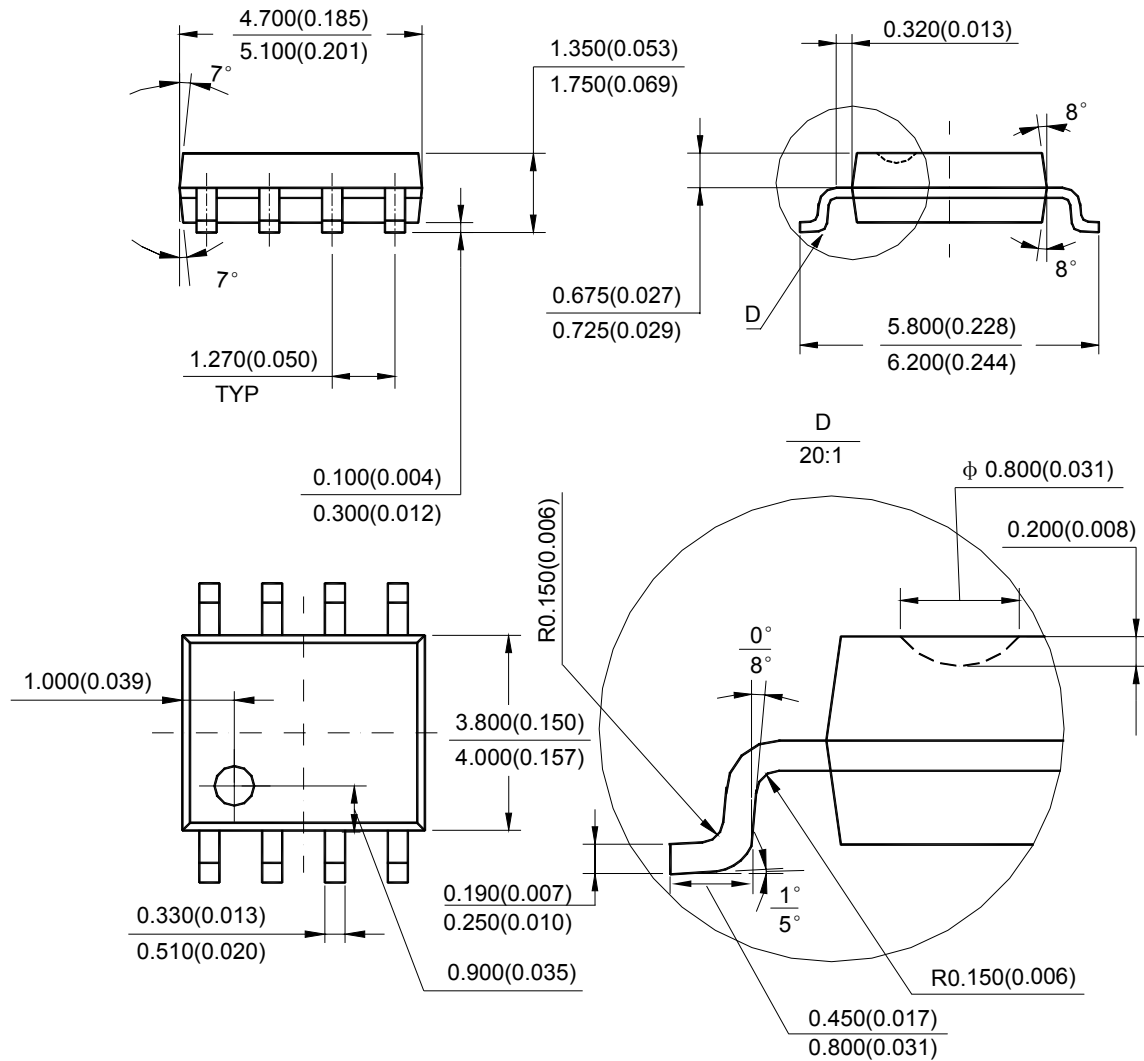
**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Mechanical Dimensions**

**SOIC-8**

**Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.



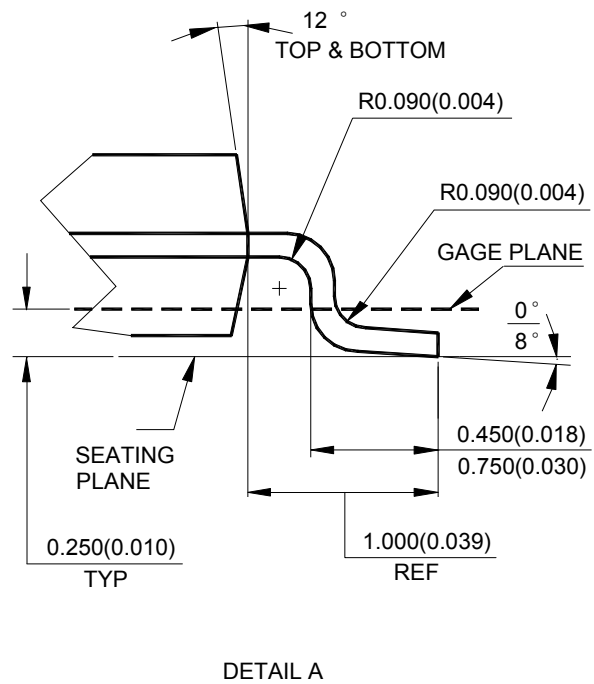
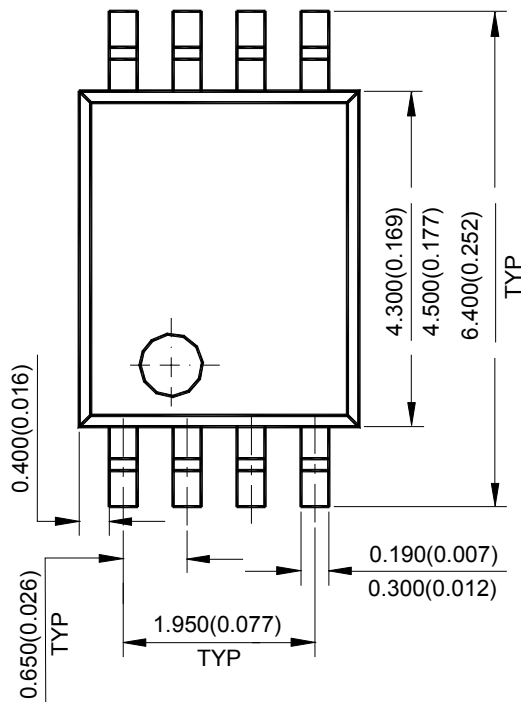
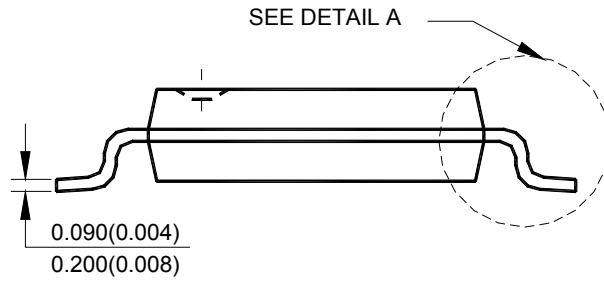
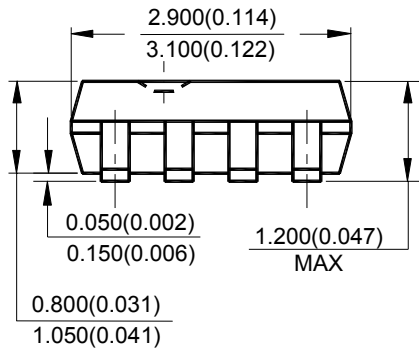
**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Mechanical Dimensions (Continued)**

**TSSOP-8**

**Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

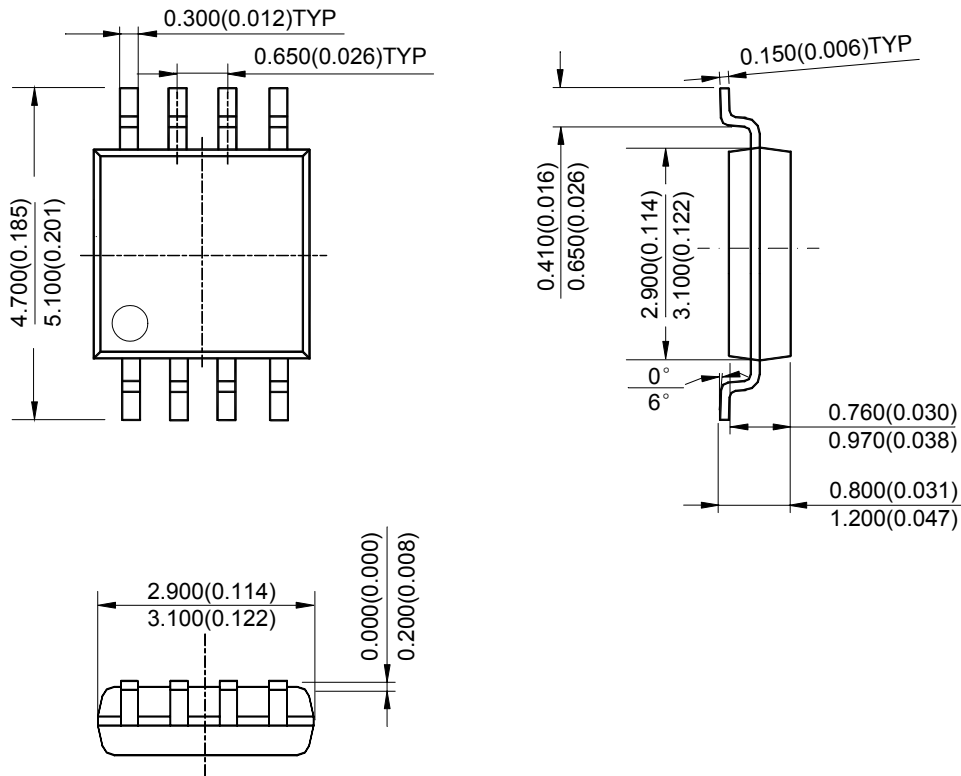
**DUAL GENERAL PURPOSE LOW VOLTAGE COMPARATOR**

**AZV393**

**Mechanical Dimensions (Continued)**

**MSOP-8**

**Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.



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#### **MAIN SITE**

##### **- Headquarters**

##### **BCD Semiconductor Manufacturing Limited**

No. 1600, Zi Xing Road, Shanghai Zizhu Science-based Industrial Park, 200241, China  
Tel: +86-21-24162266, Fax: +86-21-24162277

##### **- Wafer Fab**

##### **Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.**

800 Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

#### **REGIONAL SALES OFFICE**

##### **Shenzhen Office**

**Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd., Shenzhen Office**  
Room E, 5F, Noble Center, No.1006, 3rd Fuzhong Road, Futian District, Shenzhen,  
518026, China  
Tel: +86-755-8826 7951  
Fax: +86-755-8826 7865

##### **Taiwan Office**

**BCD Semiconductor (Taiwan) Company Limited**  
4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei,  
Taiwan  
Tel: +886-2-2656 2808  
Fax: +886-2-2656 2806

##### **USA Office**

**BCD Semiconductor Corp.**  
30920 Huntwood Ave. Hayward,  
CA 94544, USA  
Tel : +1-510-324-2988  
Fax: +1-510-324-2788