

FAIRCHILD
SEMICONDUCTOR®

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KA293/KA293A, KA393/KA393A, KA2903

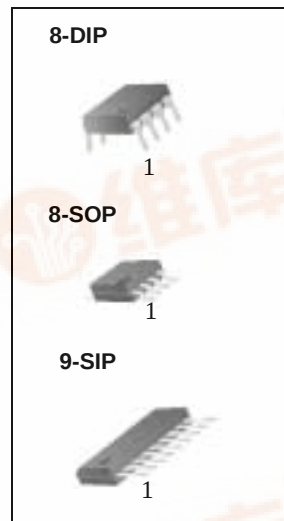
Dual Differential Comparator

Features

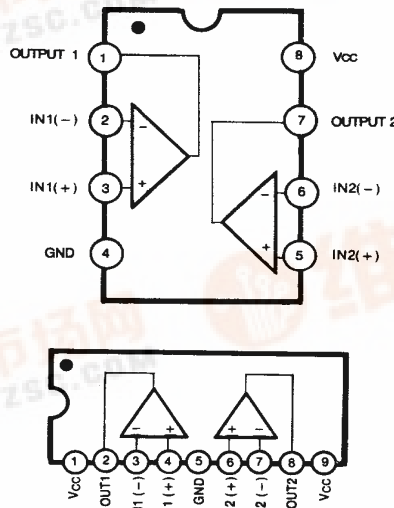
- Single Supply Operation: 2V to 36V
- Dual Supply Operation: $\pm 1\text{V}$ to $\pm 18\text{V}$
- Allow Comparison of Voltages Near Ground Potential
- Low Current Drain $800\mu\text{A}$ Typ.
- Compatible with all Forms of Logic
- Low Input Bias Current 25nA Typ.
- Low Input Offset Current $\pm 5\text{nA}$ Typ.
- Low Offset Voltage $\pm 1\text{mV}$ Typ.

Description

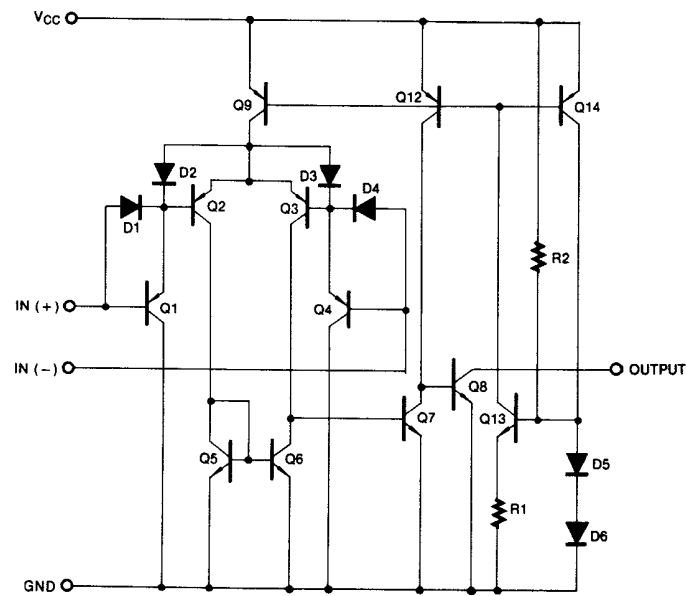
The KA293 series consists of two independent voltage comparators designed to operate from a single power supply over a wide voltage range.



Internal Block Diagram



Schematic Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power Supply Voltage	VCC	±18 or 36	V
Differential Input Voltage	VI(DIFF)	36	V
Input Voltage	VI	- 0.3 to +36	V
Output Short Circuit to GND	-	Continuous	-
Power Dissipation, Ta = 25°C 8-DIP 8-SOP	PD	1040 480	mW
Operating Temperature KA393/KA393A KA293/KA293A KA2903	TOPR	0 ~ + 70 - 25 ~ + 85 - 40 ~ + 85	°C
Storage Temperature	TSTG	- 65 ~ + 150	°C

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-Ambient Max. 8-DIP 8-SOP	Rθja	120 260	°C/W

Electrical Characteristics

(VCC = 5V, TA = 25°C, unless otherwise specified)

Parameter	Symbol	Conditions	KA293A/KA393A			KA293/KA393			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Offset Voltage	V _{IO}	V _{O(P)} = 1.4V, R _S = 0Ω	-	±1	±2	-	±1	±5	mV
		V _{CM} = 0 to 1.5V Note 1	-	-	±4.0	-	-	±9.0	
Input Offset Current	I _{IO}		-	±5	±50	-	±5	±50	nA
		Note 1	-	-	±150	-	-	±150	
Input Bias Current	I _{BIAS}		-	65	250	-	65	250	nA
		Note 1	-	-	400	-	-	400	
Input Common Mode Voltage Range	V _{I(R)}		0	-	V _{CC} - 1.5	0	-	V _{CC} - 1.5	V
		Note 1	0	-	V _{CC} - 2	0	-	V _{CC} - 2	
Supply Current	I _{CC}	R _L = ∞, V _{CC} = 5V	-	0.6	1	-	0.6	1	mA
		R _L = ∞, V _{CC} = 30V	-	0.8	2.5	-	0.8	2.5	
Voltage Gain	G _V	V _{CC} = 15V, R _L ≥ 15KΩ (for large V _{O(P-P)} swing)	50	200	-	50	200	-	V/mV
Large Signal Response Time	T _{LRES}	V _I = TTL Logic Swing V _{REF} = 1.4V, V _{RL} = 5V, R _L = 5.1KΩ	-	350	-	-	350	-	nS
Response Time	T _{RES}	V _{RL} = 5V, R _L = 5.1KΩ	-	1.4	-	-	1.4	-	μS
Output Sink Current	I _{SINK}	V _{I(-)} ≥ 1V, V _{I(+)} = 0V, V _{O(P)} ≤ 1.5V	6	18	-	6	18	-	mA
Output Saturation Voltage	V _{SAT}	V _{I(-)} ≥ 1V, V _{I(+)} = 0V	-	160	400	-	160	400	mV
		I _{SINK} = 4mA Note 1	-	-	700	-	-	700	
Output Leakage Current	I _{O(LKG)}	V _{I(-)} = 0V, V _{I(+)} = 1V	-	0.1	-	-	0.1	-	nA
		V _{O(P)} = 30V	-	-	1.0	-	-	1.0	μA

NOTE 1

KA393 / KA393A : 0 ≤ T_A ≤ +70°C

KA293 / KA293A : -25 ≤ T_A ≤ +85°C

KA2903 : -40 ≤ T_A ≤ +85°C

Electrical Characteristics (Continued)

(VCC = 5V, TA = 25°C, unless otherwise specified)

Parameter	Symbol	Conditions		KA2903			Unit
				Min.	Typ.	Max.	
Input Offset Voltage	VIO	VO(P) = 1.4V, RS = 0Ω		-	±1	±7	mV
		VCM = 0 to 1.5V	Note 1	-	±9	±15	
Input Offset Current	IIO			-	±5	±50	nA
			Note 1	-	±50	±200	
Input Bias Current	IBIAS			-	65	250	nA
			Note 1	-	-	500	
Input Common Mode Voltage Range	VI(R)			0	-	VCC-1.5	V
			Note 1	0	-	VCC-2	
Supply Current	ICC	RL = ∞, VCC = 5V		-	0.6	1	mA
		RL = ∞, VCC = 30V		-	1	2.5	
Voltage Gain	GV	VCC = 15V, RL ≥ 15KΩ (for large VO(P-P)swing)		25	100	-	V/mV
Large Signal Response Time	TLRES	VI = TTL Logic Swing VREF = 1.4V, VRL = 5V, RL = 5.1KΩ		-	350	-	nS
Response Time	TRES	VRL = 5V, RL = 5.1KΩ		-	1.5	-	μS
Output Sink Current	ISINK	VI(-) ≥ 1V, VI(+) = 0V, VO(P) ≤ 1.5V		6	16	-	mA
Output Saturation Voltage	VSAT	VI(-) ≥ 1V, VI(+) = 0V		-	160	400	mV
		ISINK = 4mA	NOTE 1	-	-	700	
Output Leakage Current	IO(LKG)	VI(-) = 0V,	VO(P) = 5V	-	0.1	-	nA
		VI(+) = 1V	VO(P) = 30V	-	-	1.0	μA

NOTE 1

KA393 / KA393A : 0 ≤ TA ≤ +70°C

KA293 / KA293A : -25 ≤ TA ≤ +85°C

KA2903 : -40 ≤ TA ≤ +85°C

Typical Performance Characteristics

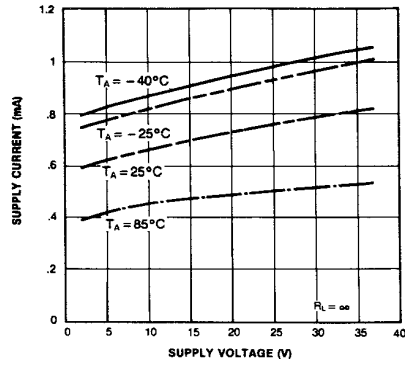


Figure 1. Supply Current vs Supply Voltage

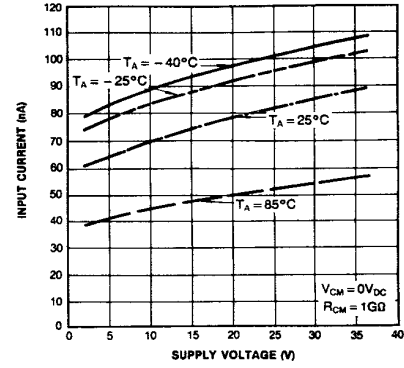


Figure 2. Input Current vs Supply Voltage

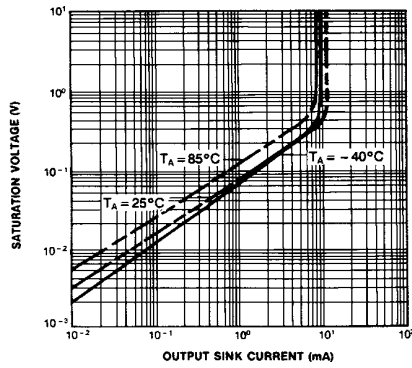


Figure 3. Output Saturation Voltage vs Sink Current

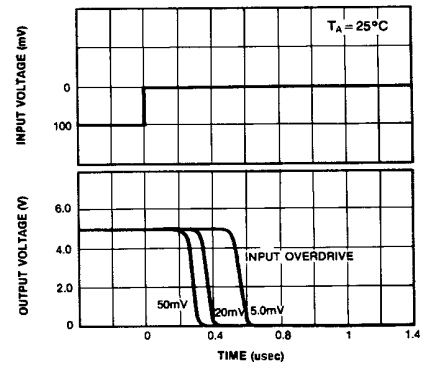


Figure 4. Response Time for Various Input Overdrive-Negative Transition

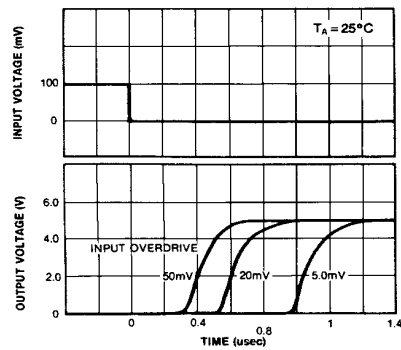


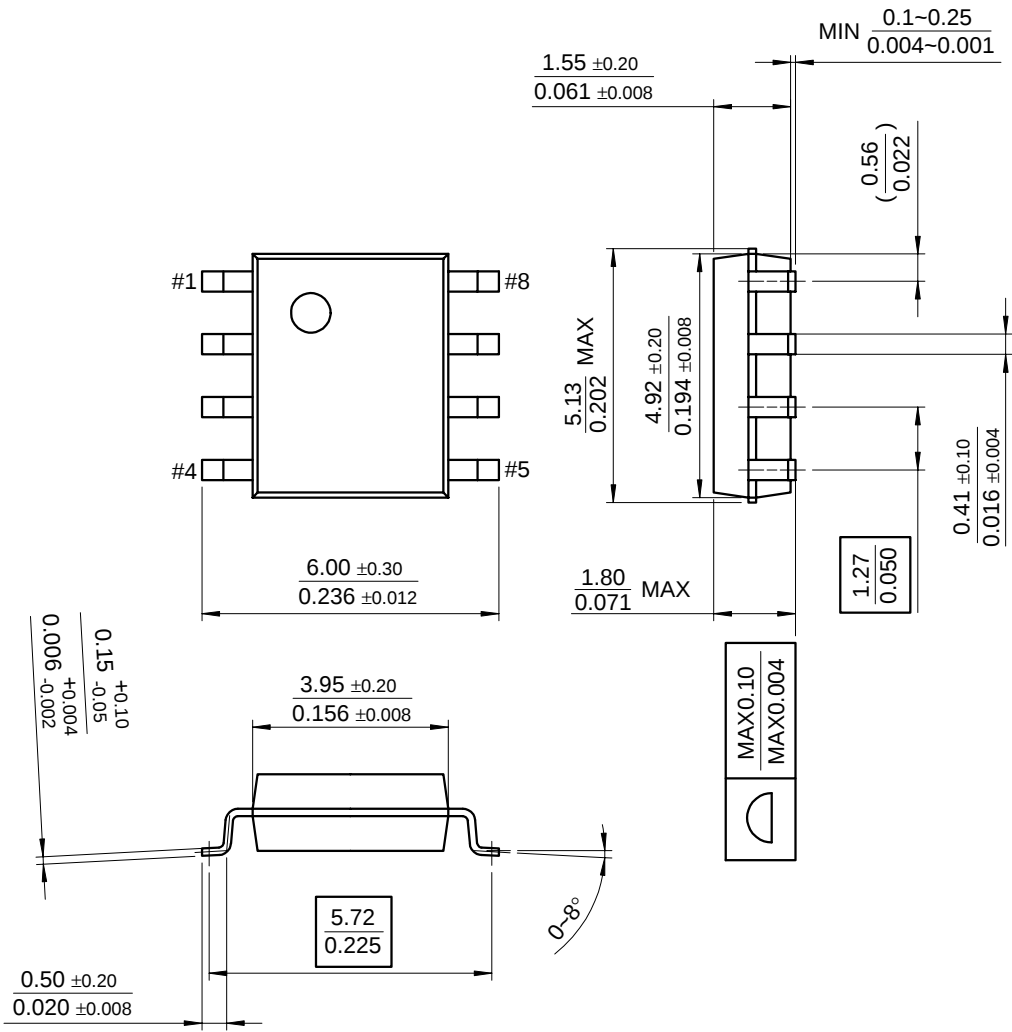
Figure 5. Response Time for Various Input Overdrive-Positive Transition

Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

8-SOP

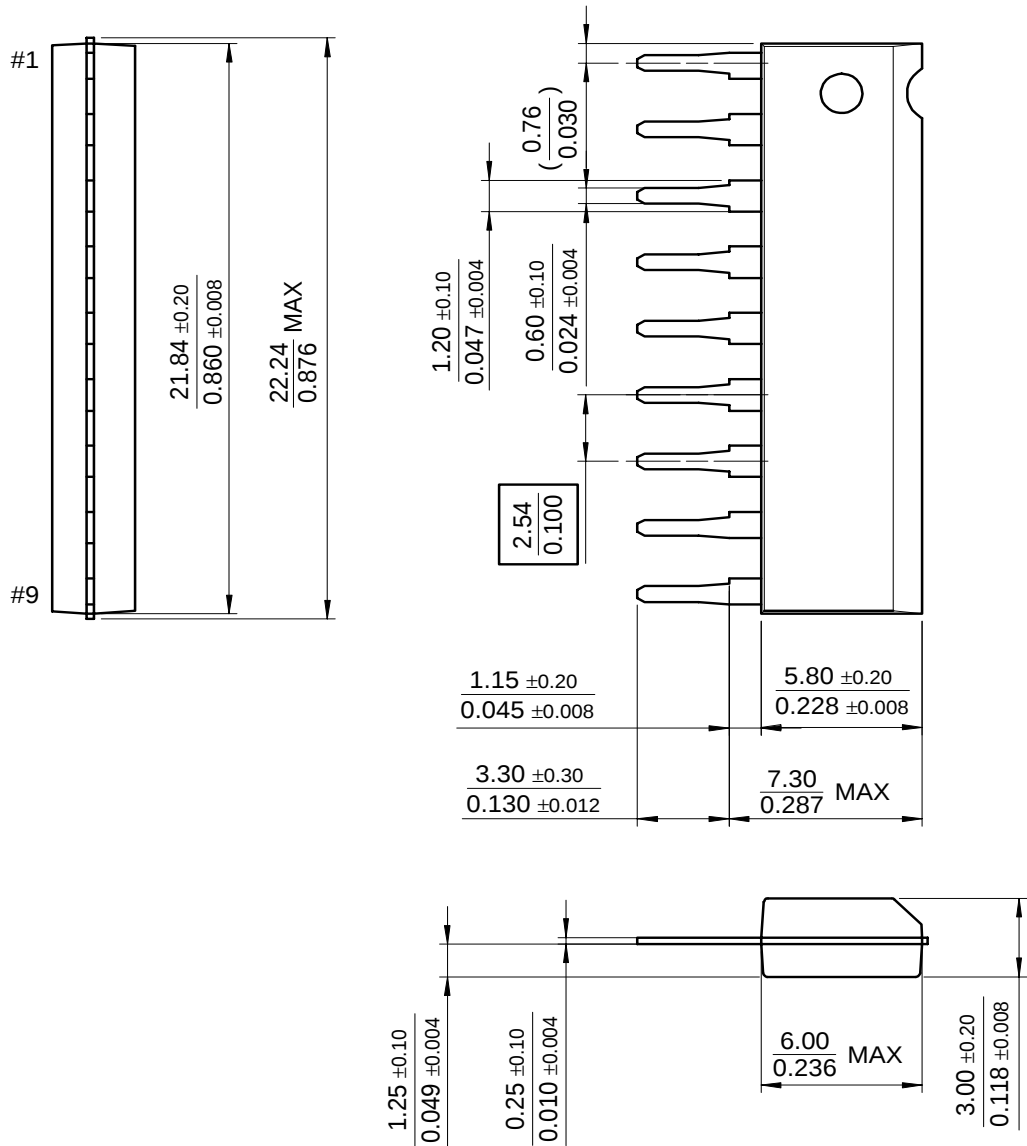


Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

9-SIP



Ordering Information

Product Number	Package	Operating Temperature
KA393	8-DIP	0 ~ + 70°C
KA393A		
KA393D	8-SOP	
KA393AD		
KA393S	9-SIP	
KA293	8-DIP	-25 ~ + 85°C
KA293A		
KA293D	8-SOP	
KA293AD		
KA2903	8-DIP	-40 ~ + 85°C
KA2903D	8-SOP	

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.