

KA293/KA293A, KA393/KA393A, KA2903

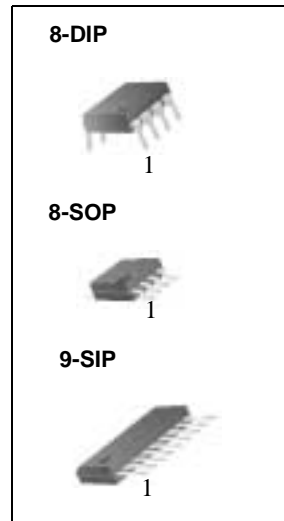
Dual Differential Comparator

Features

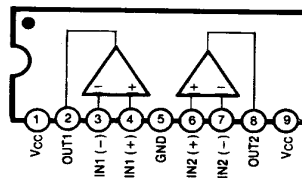
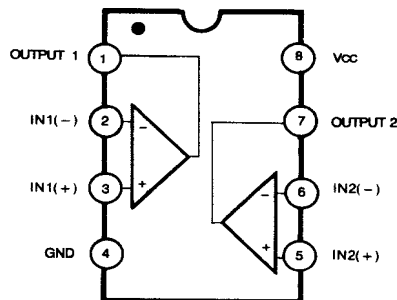
- Single Supply Operation: 2V to 36V
- Dual Supply Operation: $\pm 1V$ to $\pm 18V$
- Allow Comparison of Voltages Near Ground Potential
- Low Current Drain 800 μA Typ.
- Compatible with all Forms of Logic
- Low Input Bias Current 25nA Typ.
- Low Input Offset Current $\pm 5nA$ Typ.
- Low Offset Voltage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

Description

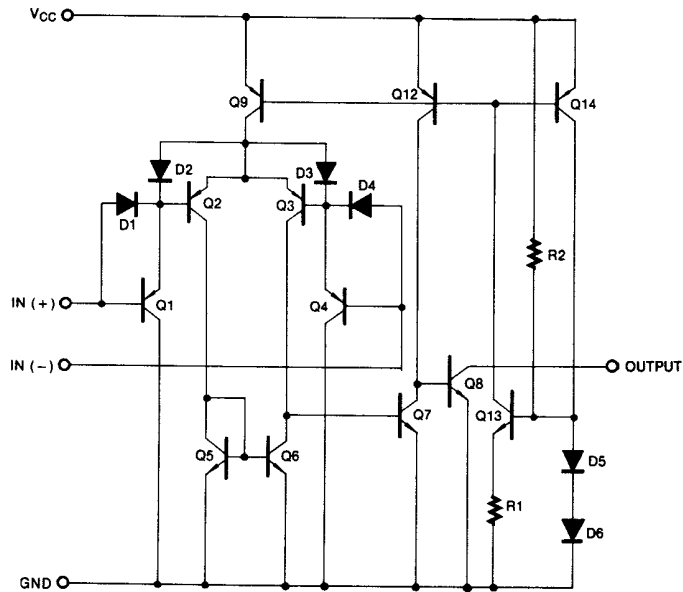
The KA293 series consists of two independent voltage comparators designed to operate from a single power supply over a wide voltage range.



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	PD	1040	mW
8-DIP		480	
Operating Temperature	TOPR	0 ~ + 70	°C
KA393/KA393A		- 25 ~ + 85	
KA293/KA293A KA2903		- 40 ~ + 85	
Storage Temperature	TSTG	- 65 ~ + 150	°C

Thermal Data

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

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 _R = 5V, R _L = 5.1KΩ	-	350	-	-	350	-	nS	
Response Time	T _{RES}	V _R = 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	V _{O(P)} = 5V	-	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	V _{IO}	V _{O(P)} =1.4V, R _S =0Ω	-	±1	±7	mV
		V _{CM} = 0 to 1.5V Note 1	-	±9	±15	
Input Offset Current	I _{IO}		-	±5	±50	nA
		Note 1	-	±50	±200	
Input Bias Current	I _{BIAS}		-	65	250	nA
		Note 1	-	-	500	
Input Common Mode Voltage Range	V _{I(R)}		0	-	V _{CC} -1.5	V
		Note 1	0	-	V _{CC} -2	
Supply Current	I _{CC}	R _L = ∞, V _{CC} = 5V	-	0.6	1	mA
		R _L = ∞, V _{CC} = 30V	-	1	2.5	
Voltage Gain	G _V	V _{CC} =15V, R _L ≥15KΩ (for large V _{O(P-P)} swing)	25	100	-	V/mV
Large Signal Response Time	T _{LRRES}	V _I =TTL Logic Swing V _{REF} =1.4V, V _{R_L} =5V, R _L =5.1KΩ	-	350	-	nS
Response Time	T _{RES}	V _{R_L} =5V, R _L =5.1KΩ	-	1.5	-	μS
Output Sink Current	I _{SINK}	V _{I(-)} ≥1V, V _{I(+)} =0V, V _{O(P)} ≤1.5V	6	16	-	mA
Output Saturation Voltage	V _{SAT}	V _{I(-)} ≥1V, V _{I(+)} =0V	-	160	400	mV
		I _{SINK} = 4mA NOTE 1	-	-	700	
Output Leakage Current	I _{O(LKG)}	V _{I(-)} = 0V, V _{O(P)} = 5V	-	0.1	-	nA
		V _{I(+)} = 1V, V _{O(P)} = 30V	-	-	1.0	μA

NOTE 1KA393 / KA393A : 0 ≤ T_A ≤ +70°CKA293 / KA293A : -25 ≤ T_A ≤ +85°CKA2903 : -40 ≤ T_A ≤ +85°C

Typical Performance Characteristics

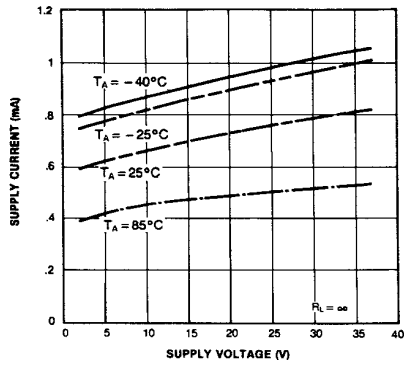


Figure 1. Supply Current vs Supply Voltage

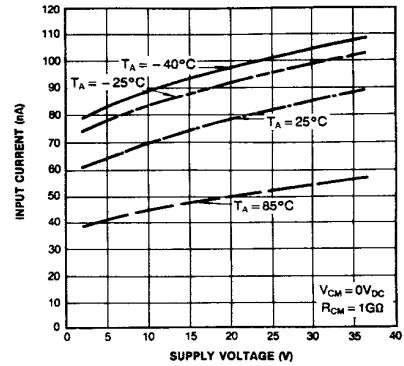


Figure 2. Input Current vs Supply Voltage

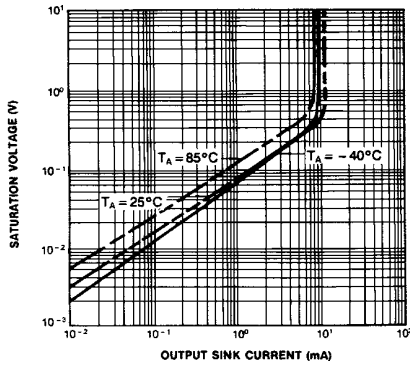


Figure 3. Output Saturation Voltage vs Sink Current

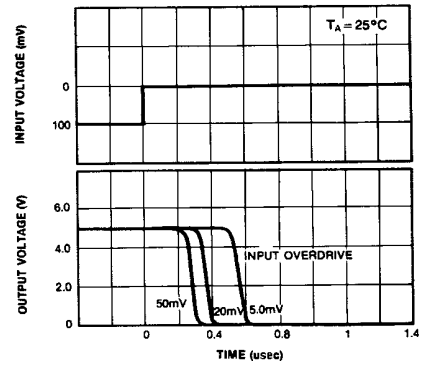


Figure 4. Response Time for Various Input Overdrive-Negative Transition

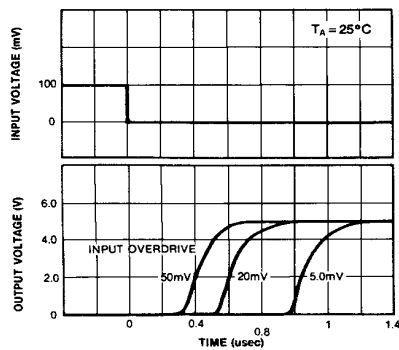


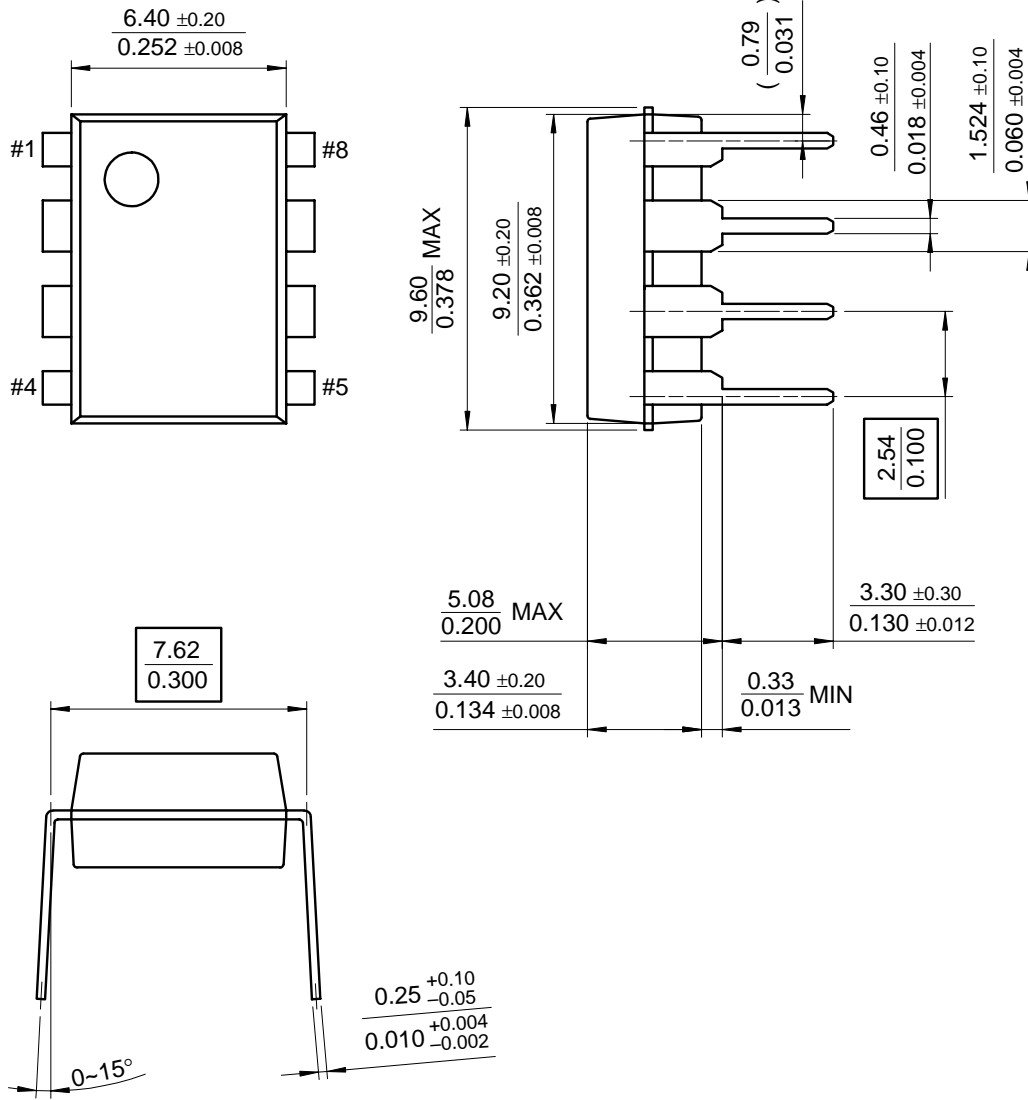
Figure 5. Response Time for Various Input Overdrive-Positive Transition

Mechanical Dimensions

Package

Dimensions in millimeters

8-DIP

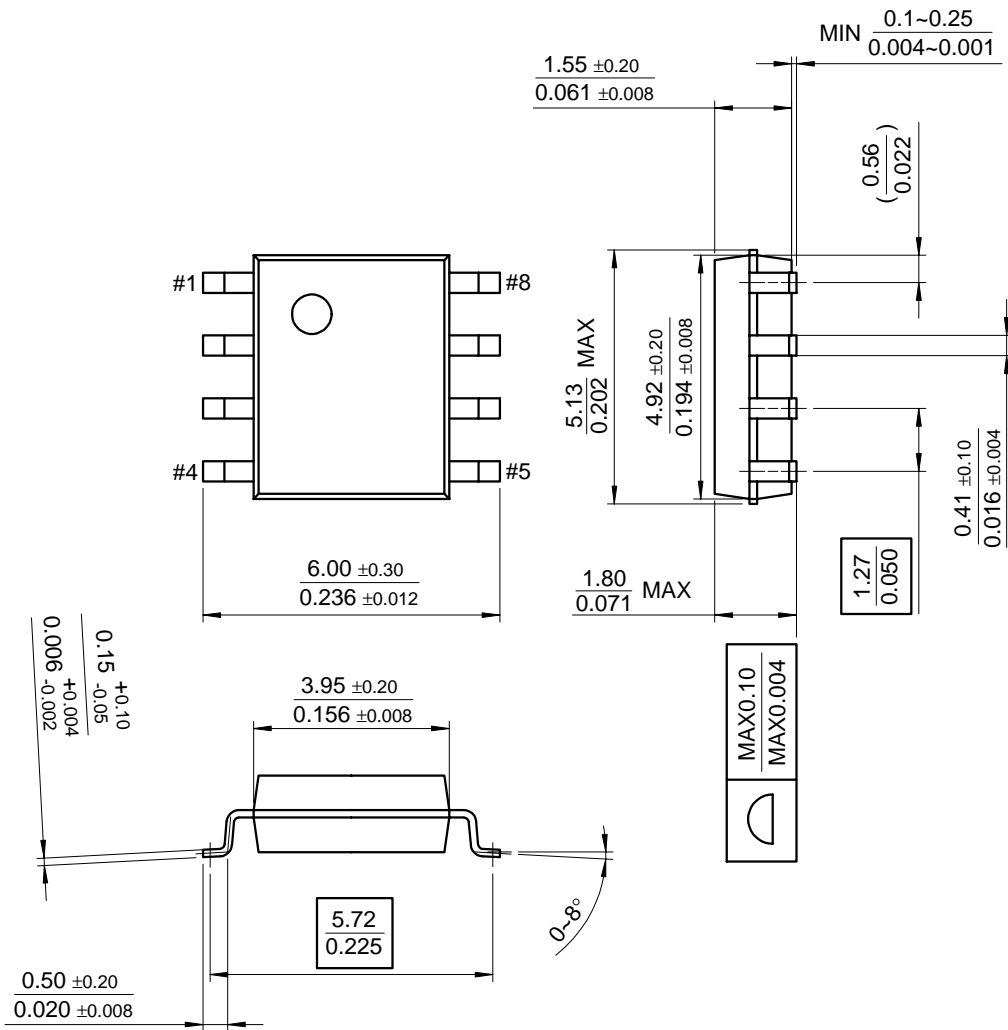


Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

8-SOP

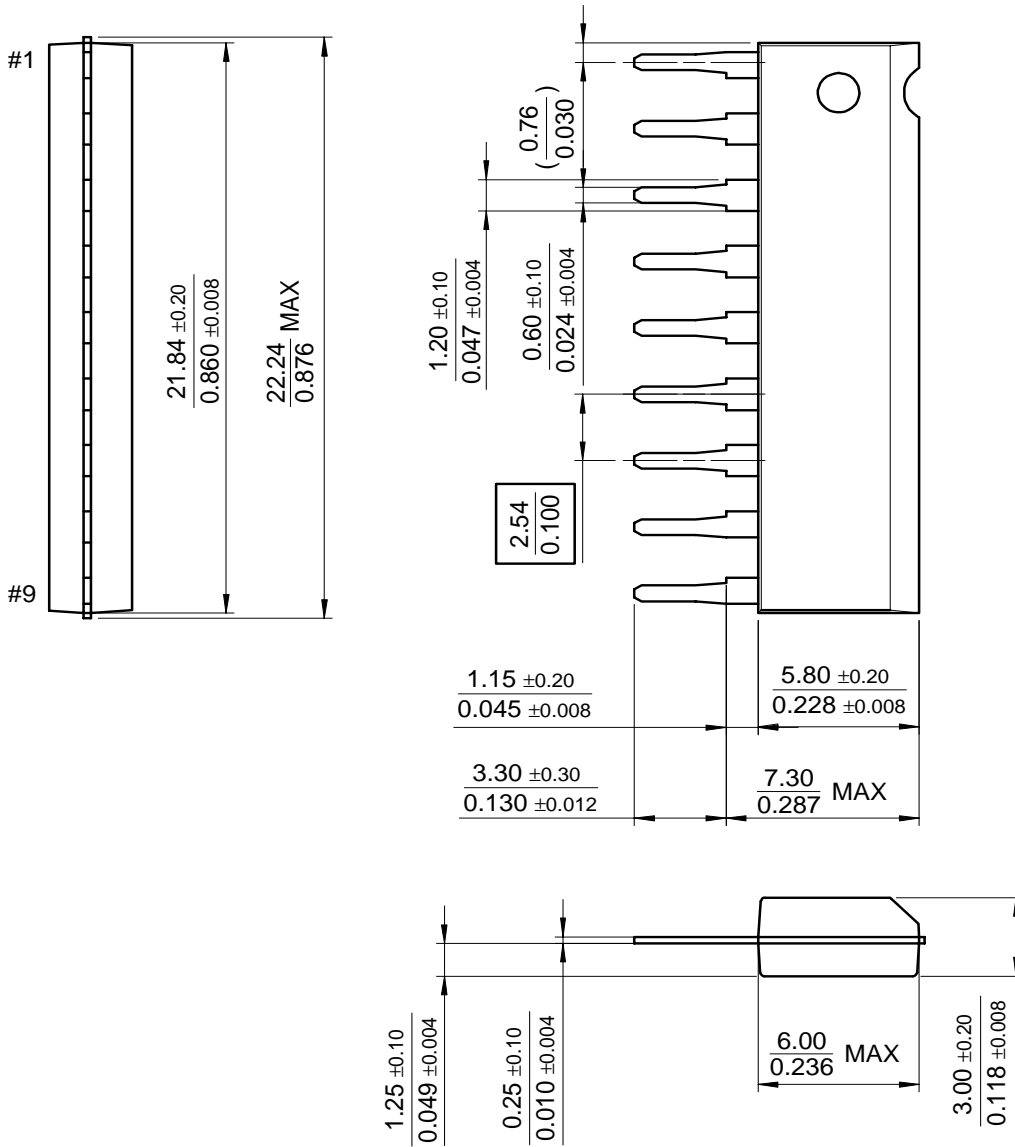


Mechanical Dimensions (Continued)

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	

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
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.