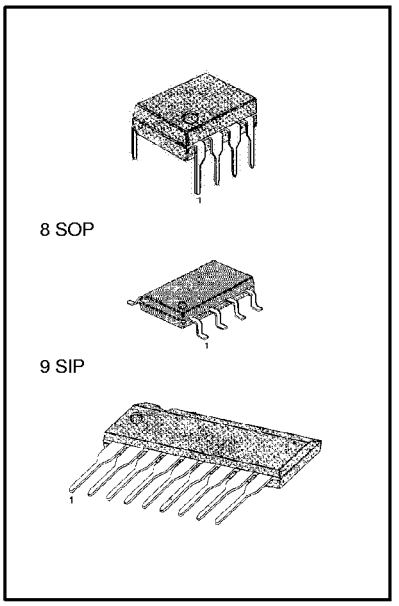
DUAL DIFFERENTIAL COMPARATOR

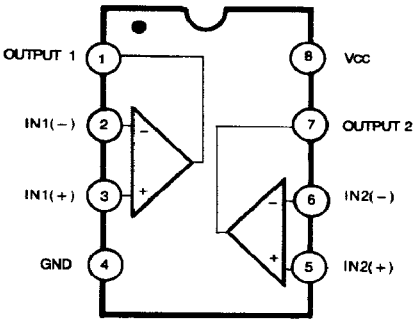
The LM293 series consists of two independent voltage comparators designed to operate from a single power supply over a wide voltage range.

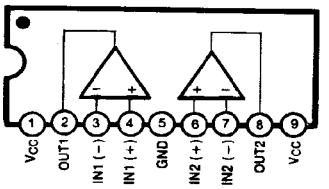
FEATURES

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



BLOCK DIAGRAM

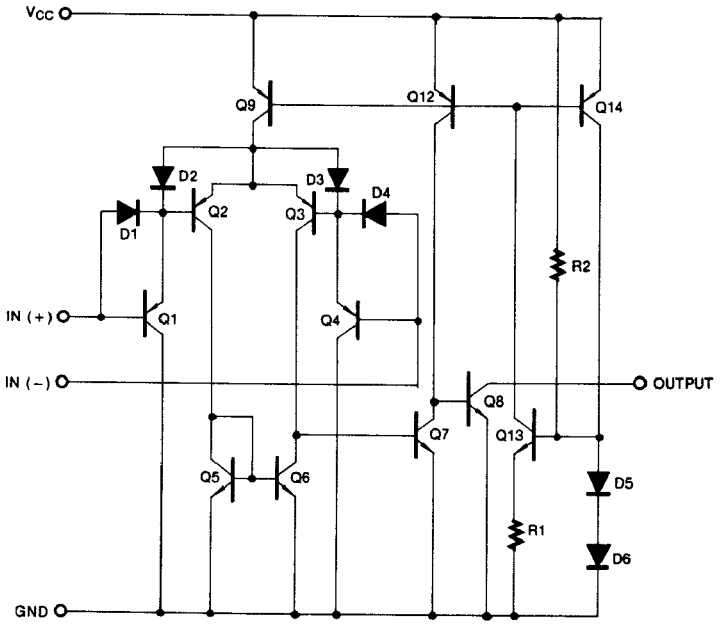




ORDERING INFORMATION

Device	Package	Operating Temperature
LM393N LM393AN	8 DIP	0 ~ + 75°C
LM393S LM393AS	9 SIP	
LM393M LM393AM	8 SOP	
LM293N LM293AN	8 DIP	-25 ~ + 85°C
LM293S LM293AS	9 DIP	
LM293M LM293AM	8 SOP	
LM2903N	8 DIP	-40 ~ + 85°C
LM2903M	8 SOP	
LM2903S	9 SIP	

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	±18 or 36	V
Differential Input Voltage	$V_{I(DIFF)}$	36	V
Input Voltage	V_I	- 0.3 to +36	V
Output Short Circuit to GND		Continuous	
Power Dissipation	P_D	570	mW
Operating Temperature LM393/LM393A LM293/LM293A LM2903	T_{OPR}	 0 ~ + 70 - 25 ~ + 85 - 40 ~ + 85	°C
Storage Temperature	T_{STG}	- 65 ~ + 150	°C

ELECTRICAL CHARACTERISTICS (V_{CC} =5V, T_A=25°C, unless otherwise specified)

Characteristic	Symbol	Test Conditions		LM293A/LM393A			LM293/LM393			Unit
				Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V_{IO}	V_{CM} =0V to V_{CC} =1.5V			±1	±2		±1	±5	mV
		$V_{O(P)}$ =1.4V, R_S =0Ω	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 = ∞			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_{RES}	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, VI(+) =0V			160	400		160	400	mV
		I_{SINK} = 4mA	NOTE 1			700			700	
Output Leakage Current	$I_{O(LKG)}$	$V_{I(-)}$ = 0V,	$V_{O(P)}$ = 5V		0.1			0.1		nA
		$V_{I(+)}$ = 1V	$V_{O(P)}$ = 30V			1.0			1.0	µA

NOTE 1
LM393/A: 0≤T_A≤ +70°C
LM293/A: -25≤T_A≤ +85°C
LM2903: -40≤T_A≤ +85°C

ELECTRICAL CHARACTERISTICS (V_{CC} =5V, T_A=25°C, unless otherwise specified)

Characteristic	Symbol	Test Conditions		LM2903			Unit
				Min	Typ	Max	
Input Offset Voltage	V_{IO}	V_{CM} =0V to V_{CC} =1.5V			±1	±7	mV
		$V_{O(P)}$ =1.4V, R_S =0Ω	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 = ∞			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_{RES}	V_I =TTL Logic Swing V_{REF} =1.4V, V_{RL} =5V, R_L =5.1KΩ			350		ns
Response Time	t_{RES}	V_{RL} =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, VI(+) =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 1
LM393/A: 0≤T_A≤ +70°C
LM293/A: -25≤T_A≤ +85°C
LM2903: -40≤T_A≤ +85°C

TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 1 SUPPLY CURRENT

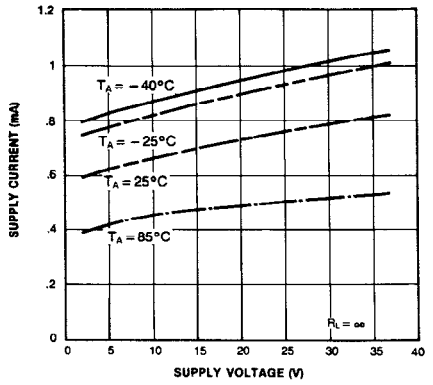


Fig. 2 INPUT CURRENT

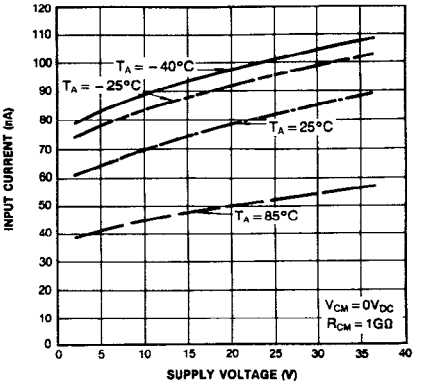


Fig. 3 OUTPUT SATURATION VOLTAGE

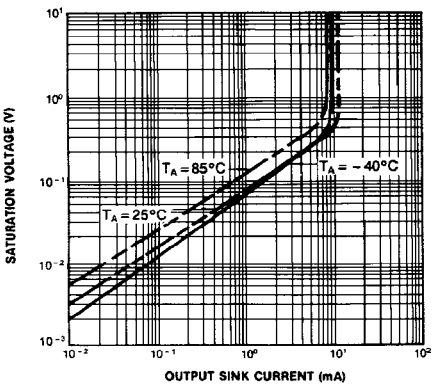


Fig. 4 RESPONSE TIME FOR VARIOUS INPUT OVERDRIVE-NEGATIVE TRANSITION

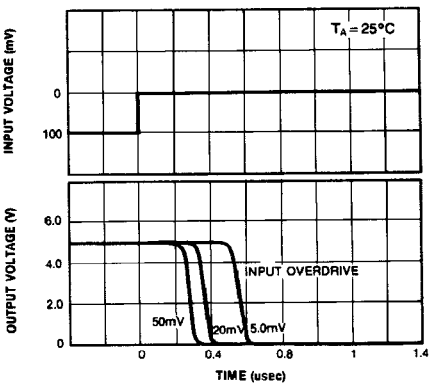
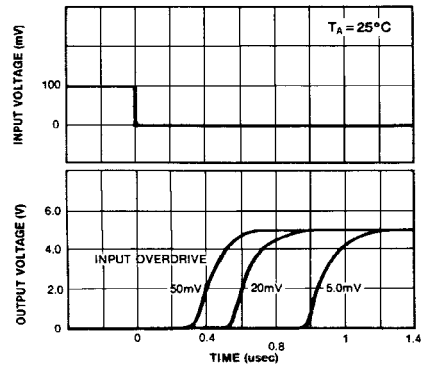


Fig. 5 RESPONSE TIME FOR VARIOUS INPUT OVERDRIVE-POSITIVE TRANSITION



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E²CMOS™
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

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 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, or (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 significant injury to the user.

2. A critical component is 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.