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## 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	PD	1040	mW
8-SOIC		480	
Operating Temperature			
LM393/LM393A		0 ~ +70	
LM2903	TOPR	-40 ~ +105	C
LM293A		-25 ~ +85	
Storage Temperature	TSTG	-65 ~ +150	C

## Thermal Data

## Electrical Characteristics

( $V_{CC} = 5V$ ,  $T_A = 25\text{ C}$ , unless otherwise specified)

Parameter	Symbol	Conditions	LM293A/LM393A			LM393			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Offset Voltage	$V_{IO}$	$V_{O(P)} = 1.4V$ , $R_S = 0$	-	1	2	-	1	5	mV
		$V_{CM} = 0$ to $1.5V$   Note1	-	-	4.0	-	-	9.0	
Input Offset Current	$I_{IO}$		-	5	50	-	5	50	nA
		Note1	-	-	150	-	-	150	
Input Bias Current	$I_{BIAS}$		-	65	250	-	65	250	nA
		Note1	-	-	400	-	-	400	
Input Common Mode Voltage Range	$V_{I(R)}$		0	-	$V_{CC} - 1.5$	0	-	$V_{CC} - 1.5$	V
		Note1	0	-	$V_{CC} - 2$	0	-	$V_{CC} - 2$	
Supply Current	$I_{CC}$	$R_L = \text{---}$ , $V_{CC} = 5V$	-	0.6	1	-	0.6	1	mA
		$R_L = \text{---}$ , $V_{CC} = 30V$	-	0.8	2.5	-	0.8	2.5	
Voltage Gain	$G_V$	$V_{CC} = 15V$ , $R_L = 15k$ (for large $V_{O(P-P)}$ swing)	50	200	-	50	200	-	V/mV
Large Signal Response Time	$T_{LRES}$	$V_I = \text{TTL Logic Swing}$ $V_{REF} = 1.4V$ , $V_{RL} = 5V$ , $R_L = 5.1k$	-	350	-	-	350	-	nS
Response Time	$T_{RES}$	$V_{RL} = 5V$ , $R_L = 5.1k$	-	1.4	-	-	1.4	-	S
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
		$I_{SINK} = 4mA$   Note1	-	-	700	-	-	700	
Output Leakage Current	$I_{O(LKG)}$	$V_{I(-)} = 0V$ , $V_{I(+)} = 1V$		0.1	-	-	0.1	-	nA
		$V_{O(P)} = 5V$ $V_{O(P)} = 30V$	-	-	1.0	-	-	1.0	A

### Note1

LM393/LM393A: 0  $T_A$  +70 C

LM2903: -40  $T_A$  +105 C

LM293A : -25  $T_A$  +85 C

**Electrical Characteristics** (Continued)(V<sub>CC</sub> = 5V, T<sub>A</sub> = 25 °C, unless otherwise specified)

Parameter	Symbol	Conditions	LM2903			Unit
			Min.	Typ.	Max.	
Input Offset Voltage	V <sub>IO</sub>	V <sub>O(P)</sub> = 1.4V, R <sub>S</sub> = 0	-	1	7	mV
		V <sub>CM</sub> = 0 to 1.5V	Note1	-	9	
Input Offset Current	I <sub>IO</sub>		-	5	50	nA
		Note1	-	50	200	
Input Bias Current	I <sub>BIAS</sub>		-	65	250	nA
		Note1	-	-	500	
Input Common Mode Voltage Range	V <sub>I(R)</sub>		0	-	V <sub>CC</sub> -1.5	V
		Note1	0	-	V <sub>CC</sub> -2	
Supply Current	I <sub>CC</sub>	R <sub>L</sub> = , V <sub>CC</sub> = 5V	-	0.6	1	mA
		R <sub>L</sub> = , V <sub>CC</sub> = 30V	-	1	2.5	
Voltage Gain	GV	V <sub>CC</sub> = 15V, R <sub>L</sub> = 15k (for large V <sub>O(P-P)</sub> swing)	25	100	-	V/mV
Large Signal Response Time	T <sub>LR</sub>	V <sub>I</sub> = TTL Logic Swing V <sub>REF</sub> = 1.4V, V <sub>R</sub> = 5V, R <sub>L</sub> = 5.1k	-	350	-	nS
Response Time	T <sub>R</sub>	V <sub>R</sub> = 5V, R <sub>L</sub> = 5.1k	-	1.5	-	S
Output Sink Current	I <sub>SINK</sub>	V <sub>I(-)</sub> = 1V, V <sub>I(+)</sub> = 0V, V <sub>O(P)</sub> = 1.5V	6	16	-	mA
Output Saturation Voltage	V <sub>SAT</sub>	V <sub>I(-)</sub> = 1V, V <sub>I(+)</sub> = 0V	-	160	400	mV
		I <sub>SINK</sub> = 4mA	Note1	-	-	
Output Leakage Current	I <sub>O(LKG)</sub>	V <sub>I(-)</sub> = 0V, V <sub>O(P)</sub> = 5V	-	0.1	-	nA
		V <sub>I(+)</sub> = 1V, V <sub>O(P)</sub> = 30V	-	-	1.0	A

**Note1**

LM393/LM393A: 0 °C to +70 °C

LM2903: -40 °C to +105 °C

LM293A: -25 °C to +85 °C

# Typical Performance Characteristics

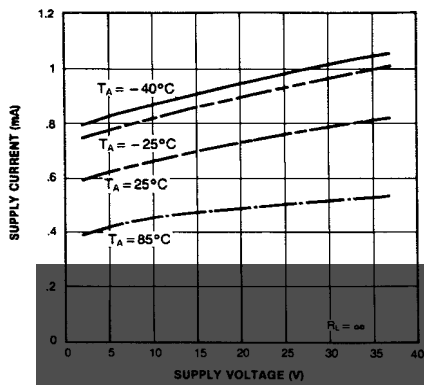


Figure 1. Supply Current vs Supply Voltage

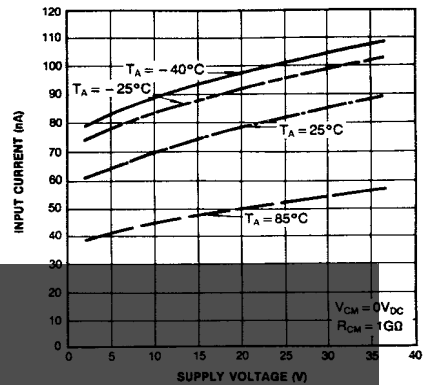


Figure 2. Input Current vs Supply Voltage

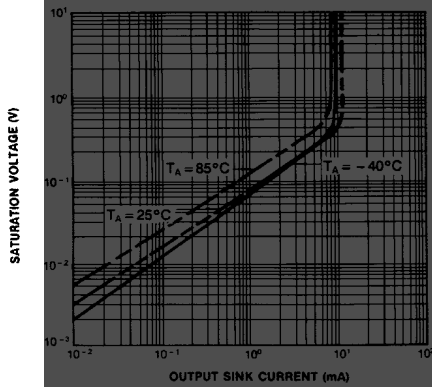


Figure 3. Output Saturation Voltage vs Sink Current

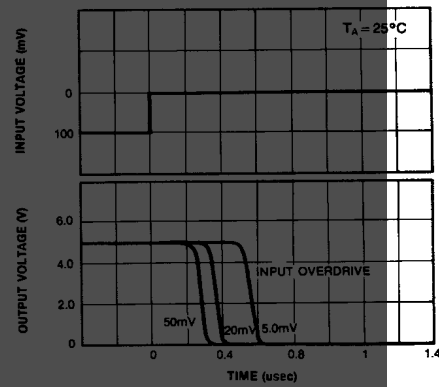


Figure 4. Response Time for Various Input Overdrive-Negative Transition

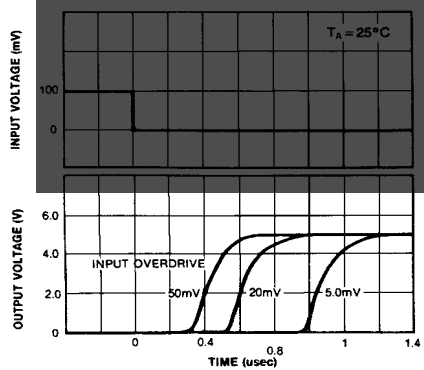


Figure 5. Response Time for Various Input Overdrive-Positive Transition

# Mechanical Dimensions

## Package

Dimensions in millimeters





## **Mechanical Dimensions** (Continued)

**Package**

**Dimensions in millimeters**

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