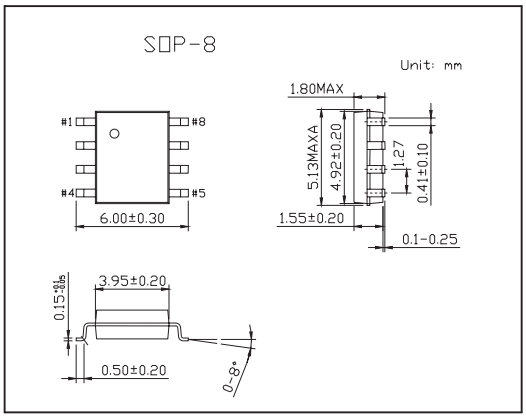
Low Power Low Offset Voltage Dual Comparators

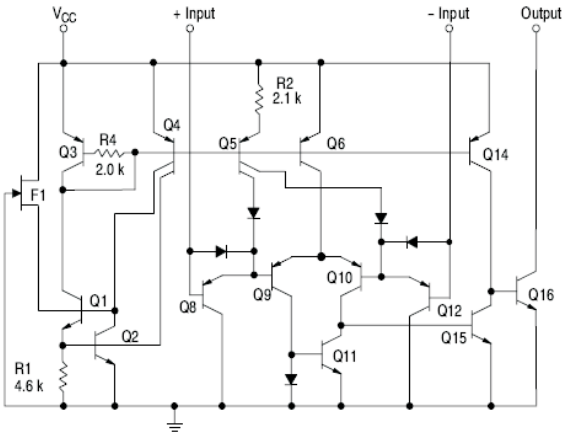
LM393

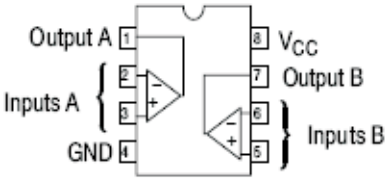
Features

- Wide Single-Supply Range: 2.0 V to 36 V
- Split-Supply Range: ±1.0 V to ±18 V
- Very Low Current Drain Independent of Supply Voltage: 0.4 mA
- Low Input Bias Current: 25 nA
- Low Input Offset Current: 5.0 nA
- Low Input Offset Voltage: 5.0 mV (max)
- Input Common Mode Range to Ground Level
- Differential Input Voltage Range Equal to Power Supply Voltage



Representative Schematic Diagram





Absolute Maximum Ratings Ta = 25℃

Parameter	Symbol	Rating	Unit
Power Supply Voltage	V_{CC}	+36 or ±18	V
Input Differential Voltage Range	V_{IDR}	36	V
Input Common Mode Voltage Range	V_{ICR}	-0.3 to +36	V
Output Short Circuit-to-Ground	I_{SC}	Continuous	mA
Output Sink Current*	I_{Sink}	20	
Power Dissipation @ T_A = 25℃	P_D	570	mW
Derate above 25℃	$1/R_{\theta JA}$	5.7	mW/℃
Operating Ambient Temperature Range	T_A	0 to 70	℃
Maximum Operating Junction Temperature	$T_{J(max)}$	150	℃
Storage Temperature Range	Tstg	-65 to +150	℃
ESD Protection at any Pin - Human Body Model - Machine Model	Vesd	 2000 200	V

* The maximum output current may be as high as 20 mA, independent of the magnitude of V_{CC}, output short circuits to V_{CC} can cause excessive heating and eventual destruction.

LM393

■ Electrical Characteristics (V_{CC} = 5.0 V, 0℃≤ T_A ≤ 70℃, unless otherwise noted.)

Parameter	Symbol	Testconditons	Min	Typ	Max	Unit
Input Offset Voltage*1	V_{IO}	T_A = 25℃ 0℃≤ T_A ≤ 70℃		±1.0	±5.0 9.0	mV
Input Offset Current	I_{IO}	T_A = 25℃ 0℃≤ T_A ≤ 70℃		±5.0	±50 ±150	nA
Input Bias Current *2	I_{IB}	T_A = 25℃ 0℃≤ T_A ≤ 70℃		25	250 400	nA
Input Common Mode Voltage Range *2	V_{ICR}	T_A = 25℃ 0℃≤ T_A ≤ 70℃	0 0		V_{CC} - 1.5 V_{CC} - 2.0	V
Voltage Gain	A_{VOL}	R_L≥15 kΩ, V_{CC} = 15 V, T_A = 25℃	50	200		V/mV
Large Signal Response Time		V_{in} = TTL Logic Swing, V_{ref} = 1.4 V, V_{RL} = 5.0 V, R_L = 5.1 kΩ, T_A = 25℃		300		ns
Response Time *4	t_{TLH}	V_{RL} = 5.0 V, R_L = 5.1 kΩ, TA = 25℃		1.3		μs
Input Differential Voltage *5	V_{ID}	All V_{in}≥GND or V-Supply (if used)			V_{CC}	V
Output Sink Current	I_{Sink}	V_{in}≥1.0 V, V_{in+} = 0 V, V_O ≤ 1.5 V T_A = 25℃	6.0	16		mA
Output Saturation Voltage	V_{OL}	V_{in}≥1.0 V, V_{in+} = 0, I_{Sink} ≤ 4.0 mA, T_A = 25℃		150	400	mV
		0℃≤ TA ≤ 70℃			700	
Output Leakage Current	I_{OL}	V_{in-} = 0 V, V_{in+} ≥1.0 V, V_O = 5.0 V, T_A = 25℃		0.1		nA
		V_{in-} = 0 V, V_{in+}≥1.0 V, V_O = 30 V,0℃≤ T_A ≤ 70℃			1000	
Supply Current	I_{CC}	R_L = ∞ Both Comparators, T_A = 25℃		0.4	1.0	mA
		R_L = ∞ Both Comparators, V_{CC} = 30 V			2.5	

*1. At output switch point, V_O=1.4 V, R_S = 0Ω with V_{CC} from 5.0 V to 30 V, and over the full input common mode range (0 V to V_{CC} = -1.5 V).

*2. Due to the PNP transistor inputs, bias current will flow out of the inputs. This current is essentially constant, independent of the output state, therefore, no loading changes will exist on the input lines.

*3. Input common mode of either input should not be permitted to go more than 0.3 V negative of ground or minus supply. The upper limit of common mode range is V_{CC} -1.5 V.

*4. Response time is specified with a 100 mV step and 5.0 mV of overdrive. With larger magnitudes of overdrive faster response times are obtainable.

*5. The comparator will exhibit proper output state if one of the inputs becomes greater than V_{CC}, the other input must remain within the common mode range. The low input state must not be less than -0.3 V of ground or minus supply.