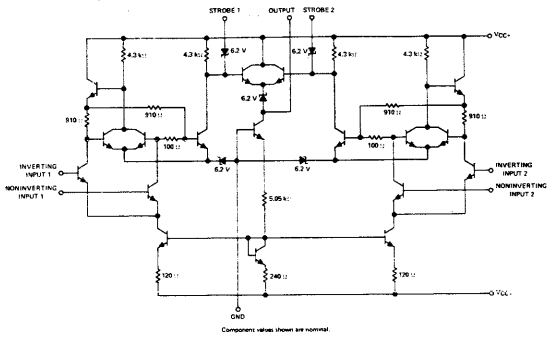
CIRCUIT TYPES SN52711, SN72711 DUAL-CHANNEL DIFFERENTIAL COMPARATORS WITH STROBES

- Fast Response Times
- Low Offset Characteristics
- Output Compatible with Most TTL and DTL Circuits
- Designed to be Interchangeable with Fairchild μA711 and μA711C

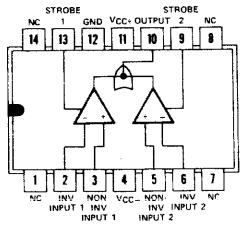
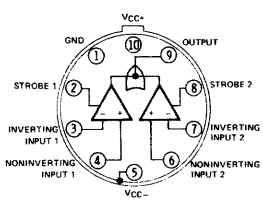
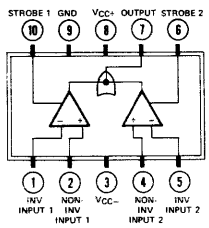
description

The SN52711 and SN72711 circuits are high-speed dual-channel comparators with differential inputs and a low-impedance output. Component matching, inherent with silicon monolithic circuit fabrication techniques, produces a comparator circuit with low-drift and low-offset characteristics. An independent strobe input is provided for each of the two channels, which when taken low, inhibits the associated channel. If both strobes are simultaneously low, the output will be low regardless of the conditions applied to the differential inputs. The comparator output puise width may be "stretched" by varying the capacitive loading. These dual comparators are particularly useful for applications requiring an amplitude-discriminating sense amplifier with an adjustable threshold voltage. The SN52711 is characterized for operation over the full military temperature range of −55°C to 125°C; the SN72711 is characterized for operation from 0°C to 70°C.

schematic



terminal assignments

J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)	L PLUG-IN PACKAGE (TOP VIEW)	S FLAT PACKAGE (TOP VIEW)
		
	PIN 5 IS IN ELECTRICAL CONTACT WITH THE CASE	PIN 3 IS IN ELECTRICAL CONTACT WITH THE CASE

NC—No Internal Connection

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

		SN52711	SN72711	UNIT
Supply voltage V_{CC+} (see Note 1)		14	14	V
Supply voltage V_{CC-} (see Note 1)		−7	−7	V
Differential input voltage (see Note 2)		±5	±5	V
Input voltage (either input, see Note 1)		±7	±7	V
Strobe voltage (see Note 1)		6	6	V
Peak output current ($t_w \leq 1$ s)		50	50	mA
Continuous total power dissipation at (or below) 70°C free-air temperature (see Note 3)		300	300	mW
Operating free-air temperature range		−55 to 125	0 to 70	°C
Storage temperature range		−65 to 150	−65 to 150	°C
Lead temperature 1/16 inch from case for 60 seconds	J, L, or S package	300	300	°C
Lead temperature 1/16 inch from case for 10 seconds	N package	260	260	°C

NOTES: 1. All voltage values, except differential voltages, are with respect to network ground terminal.
2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
3. For operation of SN52711 above 70°C free-air temperature, refer to Dissipation Derating Curve, Figure 9.

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electrical characteristics at specified free-air temperature, V_{CC+} = 12 V, V_{CC-} = −6 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		SN52711			SN72711			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$R_S \leq 200\ \Omega$, V_{IC} = 0, See Note 4	25°C		1	3.5		1	5	mV
			Full range			4.5			6	
		$R_S \leq 200\ \Omega$, See Note 4	25°C		1	5		1	7.5	
			Full range			6			10	
α_{VIO}	Average temperature coefficient of input offset voltage	$R_S \leq 200\ \Omega$, V_{IC} = 0, See Note 4	Full range		5			5		μV/°C
I_{IO}	Input offset current	See Note 4	25°C		0.5	10		0.5	15	μA
			Full range			20			25	
I_{IB}	Input bias current	See Note 4	25°C		25	75		25	100	μA
			Full range			150			150	
I_{SL}	Low-level strobe current	$V_{(strobe)}$ = 0, V_{ID} = 10 mV	25°C		−1.2	−2.5		−1.2	−2.5	mA
V_I	Input voltage range	V_{CC-} = −7 V	25°C	±5			±5			V
V_{ID}	Differential input voltage range		25°C	±5			±5			V
A_{VD}	Large-signal differential voltage amplification	No load, V_O = 0 to 2.5 V	25°C	750	1500		700	1500		
			Full range	500			500			
V_{OH}	High-level output voltage	V_{ID} = 10 mV, I_{OH} = 0	25°C		4.5	5		4.5	5	V
		V_{ID} = 10 mV, I_{OH} = −5 mA	25°C	2.5	3.5		2.5	3.5		
V_{OL}	Low-level output voltage	V_{ID} = −10 mV, I_{OL} = 0	25°C	−1	−0.5	0‡	−1	−0.5	0‡	V
		V_{ID} = 10 mV, $V_{(strobe)}$ = 0.3 V, I_{OL} = 0	25°C	−1		0‡	−1		0‡	
I_{OL}	Low-level output current	V_{ID} = −10 mV, V_O = 0	25°C	0.5	0.8		0.5	0.8		mA
r_o	Output resistance	V_O = 1.4 V	25°C		200			200		Ω
CMRR	Common-mode rejection ratio	$R_S \leq 200\ \Omega$	25°C	70	90		65	90		dB
I_{CC+}	Supply current from V_{CC+}	V_{ID} = −5 V to 5 V (−10 mV for typ), Strobes alternately grounded, No load	25°C		9			9		mA
I_{CC-}	Supply current from V_{CC-}		25°C		−4			−4		mA
P_D	Total power dissipation		25°C		130	200		130	230	mW

NOTE 4: These characteristics are verified by measurements at the following temperatures and output voltage levels: for SN52711, V_O = 1.8 V at T_A = −55°C, V_O = 1.4 V at T_A = 25°C, and V_O = 1 V at T_A = 125°C; for SN72711, V_O = 1.5 V at T_A = 0°C, V_O = 1.4 V at T_A = 25°C, and V_O = 1.2 V at 70°C. These output voltage levels were selected to approximate the logic threshold voltages of the types of digital logic circuits these comparators are intended to drive.

†Unless otherwise noted, all characteristics are measured with the strobe of the channel under test open. The strobe of the other channel is grounded. Full range for SN52711 is −55°C to 125°C and for the SN72711 is 0°C to 70°C.

‡The algebraic convention where the most-positive (least-negative) limit is designated as maximum is used in this data sheet for logic levels only, e.g., when 0 V is the maximum, the minimum limit is a more-negative voltage.

switching characteristics, V_{CC+} = 12 V, V_{CC-} = −6 V, T_A = 25°C

PARAMETER	TEST CONDITIONS		SN52711			SN72711			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Response time	No load,	See Note 5		40	80		40		ns
Strobe release time	No load,	See Note 6		7	25		7		ns

NOTES: 5. The response time specified is for a 100-mV input step with 5-mV overdrive.

6. For testing purposes, the input bias conditions are selected to produce an output voltage of 1.4 V. A 5-mV overdrive is then added to the input bias voltage to produce an output voltage which rises above 1.4 V. The time interval is measured from the 50% point of the strobe voltage curve to the point where the overdriven output voltage crosses the 1.4 V level.

DEFINITION OF TERMS

Input Offset Voltage (V_{IO}) The d-c voltage which must be applied between the input terminals to force the quiescent d-c output voltage to the specified level. The input offset voltage may also be defined for the case where two equal resistances (R_S) are inserted in series with the input leads.

Average Temperature Coefficient of Input Offset Voltage (α_{VIO}) The ratio of the change in input offset voltage to the change in free-air temperature. This is an average value for the specified temperature range.

$$\alpha_{VIO} = \left| \frac{(V_{IO} @ T_{A(1)}) - (V_{IO} @ T_{A(2)})}{T_{A(1)} - T_{A(2)}} \right|$$ where $T_{A(1)}$ and $T_{A(2)}$ are the specified temperature extremes.

Input offset Current (I_{IO}) The difference between the currents into the two input terminals with the output at the specified level.

Input Bias Current (I_{IB}) The average of the currents into the two input terminals with the output at the specified level.

3

Low-Level Strobe Current (I_{SL}) The current flowing out of the strobe at a low-level voltage.

Input Voltage Range (V_I) The range of voltage which if exceeded at either input terminal will cause the comparator to cease functioning properly.

Differential Input Voltage Range (V_{ID}) The range of voltage between the two input terminals which if exceeded will cause the comparator to cease functioning properly.

Large-Signal Differential Voltage Amplification (A_{VD}) The ratio of the change in output voltage to the change in differential input voltage producing it.

High-Level Output Voltage (V_{OH}) The voltage at the output with the specified input conditions applied which should establish a high level at the output.

Low-Level Output Voltage (V_{OL}) The voltage at the output with the specified input conditions applied which should establish a low level at the output.

Low-Level Output Current (I_{OL}) The current flowing into the output at a specified low-level output voltage.

Output Resistance (r_o) The resistance between the output terminal and ground.

Common-Mode Rejection Ratio (CMRR) The ratio of differential voltage amplification to common-mode voltage amplification. This is measured by determining the ratio of a change in input common-mode voltage to the resulting change in input offset voltage.

Total Power Dissipation (P_D) The total d-c power supplied to the device less any power delivered from the device to a load. At no load: $P_D = V_{CC+} \cdot I_{CC+} + V_{CC-} \cdot I_{CC-}$.

Response Time The interval between the application of an input step function and the time when the output crosses the logic threshold voltage. The input step drives the comparator from some initial condition sufficient to saturate the output to an input level just barely in excess of that required to bring the output back to the logic threshold voltage. This excess is referred to as the voltage overdrive.

Strobe Release Time The time required for the output to rise to the logic threshold voltage after the strobe terminal has been driven from the low logic level to the high logic level. Appropriate input conditions are assumed.

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TYPICAL CHARACTERISTICS

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREE-AIR TEMPERATURE

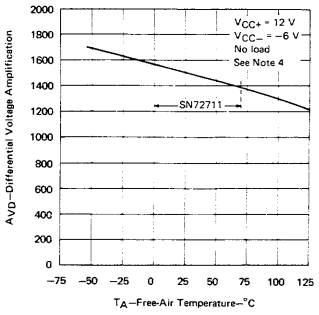

FIGURE 1

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs SUPPLY VOLTAGE

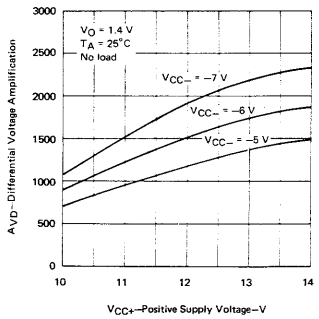

FIGURE 2

INPUT BIAS CURRENT vs FREE-AIR TEMPERATURE

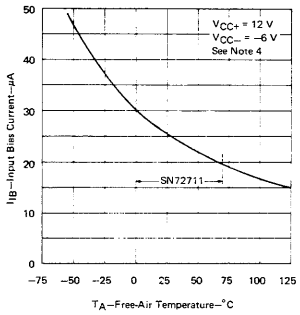

FIGURE 3

TOTAL POWER DISSIPATION vs FREE-AIR TEMPERATURE

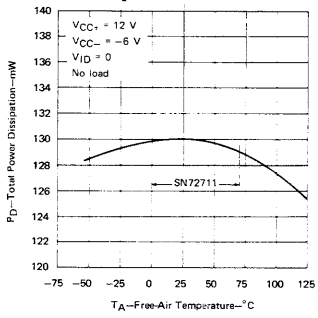

FIGURE 4

SN52711 VOLTAGE TRANSFER CHARACTERISTICS

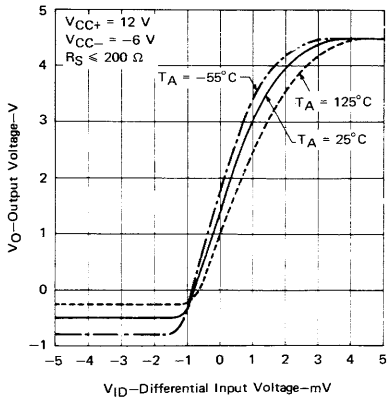

FIGURE 5

SN72711 VOLTAGE TRANSFER CHARACTERISTICS

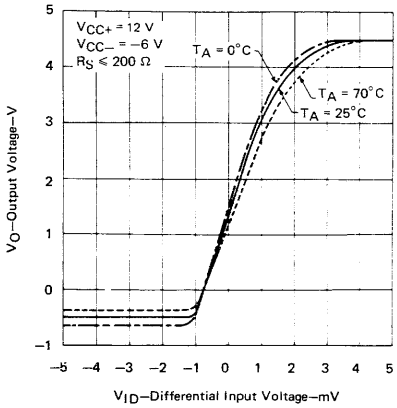

FIGURE 6

NOTE 4: These characteristics are verified by measurements at the following temperatures and output voltage levels: for SN52711, V_O = 1.8 V at T_A = −55°C, V_O = 1.4 V at T_A = 25°C, and V_O = 1 V at T_A = 125°C; for SN72711, V_O = 1.5 V at T_A = 0°C, V_O = 1.4 V at T_A = 25°C, and V_O = 1.2 V at 70°C. These output voltage levels were selected to approximate the logic threshold voltages of the types of digital logic circuits these comparators are intended to drive.

TYPICAL CHARACTERISTICS

OUTPUT RESPONSE FOR
VARIOUS INPUT OVERDRIVES

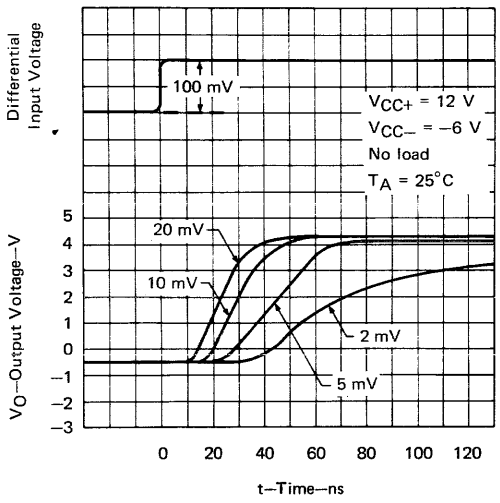

FIGURE 7

STROBE RELEASE TIME
FOR VARIOUS INPUT OVERDRIVES

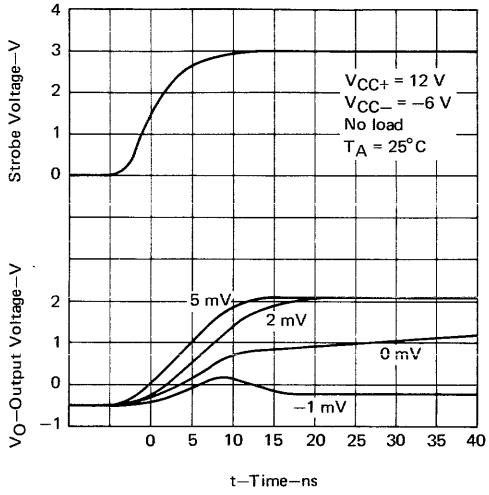

FIGURE 8

THERMAL INFORMATION

SN52711
DISSIPATION DERATING CURVE

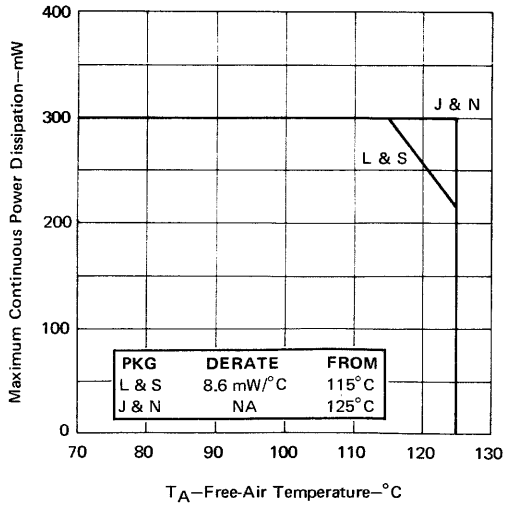

FIGURE 9

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