Voltage Comparators/Buffers

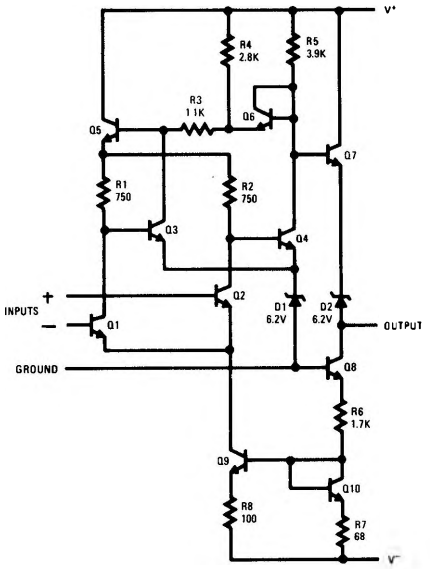
LM710A voltage comparator general description

The LM710A is a high-speed voltage comparator intended for use as an accurate, low-level digital level sensor or as a replacement for operational amplifiers in comparator applications where speed is of prime importance. The circuit has a differential input and a single-ended output, with saturated output levels compatible with practically all types of integrated logic.

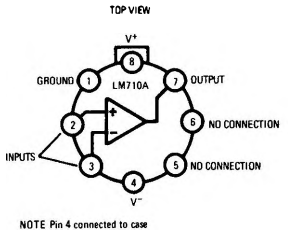
The device is built on a single silicon chip which insures low offset and thermal drift. The use of a minimum number of stages along with minority-carrier lifetime control (gold doping) makes the circuit much faster than operational amplifiers in saturating comparator applications. In fact, the low stray and wiring capacitances that can be realized with monolithic construction make the device difficult to duplicate with discrete components operating at equivalent power levels.

The LM710A is useful as a pulse height discriminator, a voltage comparator in high-speed A/D converters or a go, no-go detector in automatic test equipment. It also has applications in digital systems as an adjustable-threshold line receiver or an interface between logic types. In addition, the low cost of the unit suggests it for applications replacing relatively simple discrete component circuitry.

schematic and connection diagrams



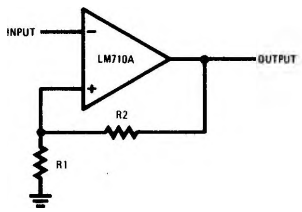
Metal Can



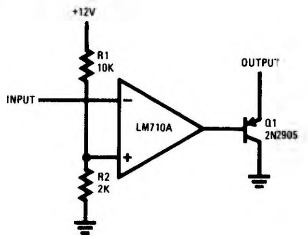
NOTE Pin 4 connected to case

typical applications

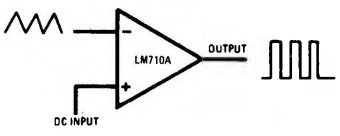
Schmidt Trigger



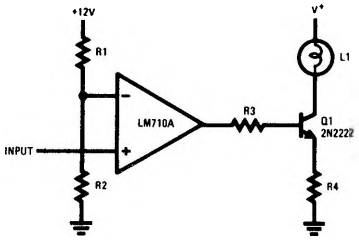
Line Receiver With Increased Output Sink Current



Pulse Width Modulator



Level Detector With Lamp Driver



absolute maximum ratings

Positive Supply Voltage	14.0V
Negative Supply Voltage	−7.0V
Differential Input Voltage	±5.0V
Input Voltage	±7.0V
Power Dissipation (Note 1)	300 mW
Output Short Circuit Duration	10 sec
Operating Temperature Range	−55°C to +125°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (soldering, 60 sec)	300°C

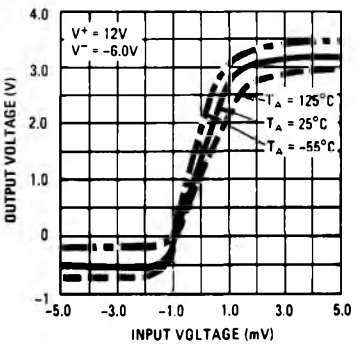
electrical characteristics (Note 2)

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Offset Voltage	$T_A = 25°C$, $R_S \leq 200\Omega$ $V_{OUT} = 1.4V$		0.6	2.0	mV
Input Offset Current	$T_A = 25°C$, $V_{OUT} = 1.4V$		0.75	3.0	μA
Input Bias Current	$T_A = 25°C$		13	20	μA
Voltage Gain	$T_A = 25°C$	1250	1700		
Output Resistance	$T_A = 25°C$		200		Ω
Output Sink Current	$T_A = 25°C$, $\Delta V_{IN} \geq 5$ mV $V_{OUT} = 0$	2.0	2.5		mA
Response Time (Note 3)			40		ns
Input Offset Voltage	$R_S \leq 200\Omega$			3.0	mV
Average Temperature Coefficient of Input Offset Voltage	$-55°C \leq T_A \leq 125°C$ $R_S \leq 50\Omega$		3.0	10	μV/°C
Input Offset Current	$T_A = 125°C$		0.25	3.0	μA
	$T_A = -55°C$		1.8	7.0	μA
Average Temperature Coefficient of Input Offset Current	$25°C \leq T_A \leq 125°C$		5.0	25	nA/°C
	$-55°C \leq T_A \leq 25°C$		15	75	nA/°C
Input Bias Current	$T_A = -55°C$		27	45	μA
Input Voltage Range	$V^- = -7.0V$	±5.0			V
Differential Input Voltage Range		±5.0V			V
Voltage Gain		1000			
Positive Output Level	$\Delta V_{IN} \geq 5$ mV, $0 \leq I_{OUT} \leq 5$ mA	2.5	3.2	4.0	V
Negative Output Level	$\Delta V_{IN} \geq 5$ mV	−1.0	−0.5	0	V
Output Sink Current	$T_A = 125°C$, $\Delta V_{IN} \geq 5$ mV $V_{OUT} = 0.2V$	−1.6	−2.2		mA
	$T_A = -55°C$, $\Delta V_{IN} \geq 5$ mV $V_{OUT} = 0$	−1.6	−2.3		mA
Positive Supply Current	$-5V \leq \Delta V_{IN} \leq 5V$, $I_{OUT} \leq 0$			11	mA
Negative Supply Current			4.6	7.0	mA
Power Consumption	$T_A = 125°C$, $I_{OUT} \leq 0$ $-5V \leq \Delta V_{IN} \leq 5V$			160	mW

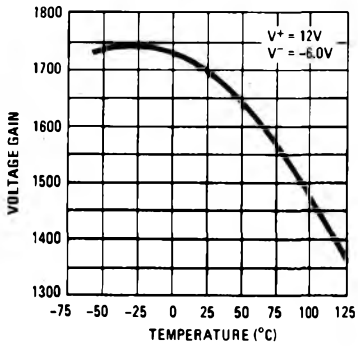
Note 1: For operating at elevated temperatures, the device must be derated based on a 160°C maximum junction temperature and a thermal resistance of 45°C/W junction to case or 150°C/W junction to ambient for the metal-can package. For the flat package, the derating is based on a thermal resistance of 185°C/W when mounted on a 1/16-inch-thick, epoxy-glass board with ten, 0.03-inch-wide, 2-ounce copper conductors (see curve).
Note 2: These specifications apply for $V^+ = 12.0V$, $V^- = -6.0V$, $-55°C \leq T_A \leq 125°C$ and for a logic threshold voltage of 1.8V at −55°C, 1.4V at 25°C and 1.0V at 125°C unless otherwise specified.
Note 3: The response time specified (see definitions) is for a 100 mV input step with 5 mV overdrive.

typical performance characteristics

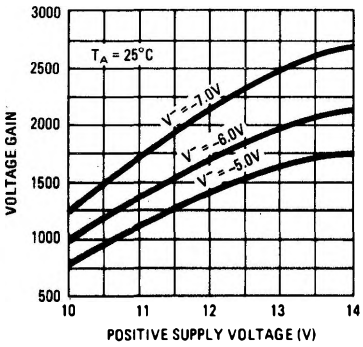
Transfer Function



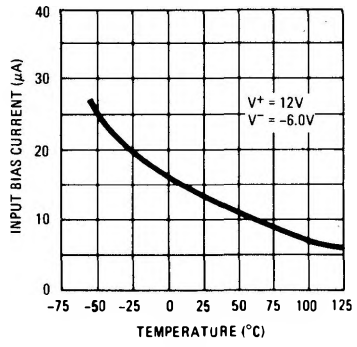
Voltage Gain



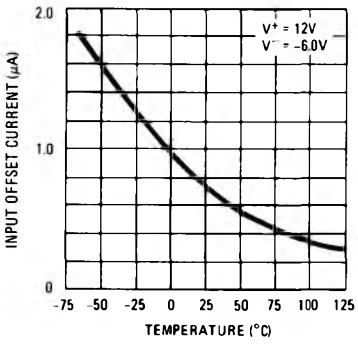
Voltage Gain



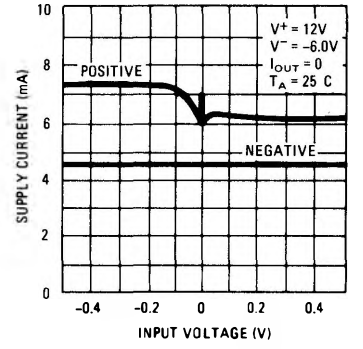
Input Bias Current



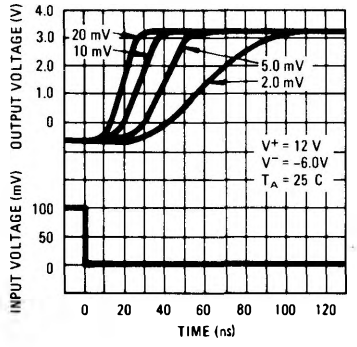
Input Offset Current



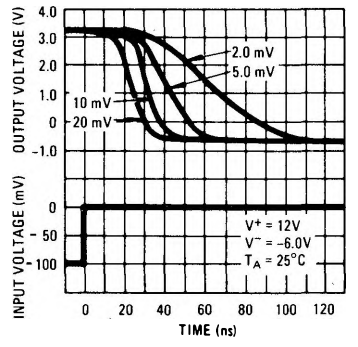
Supply Current



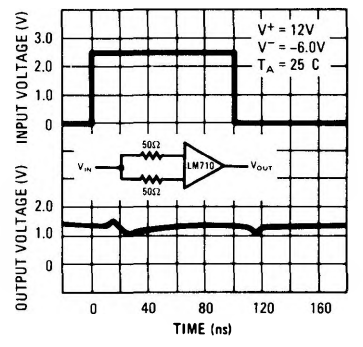
Response Time For Various Input Overdrives



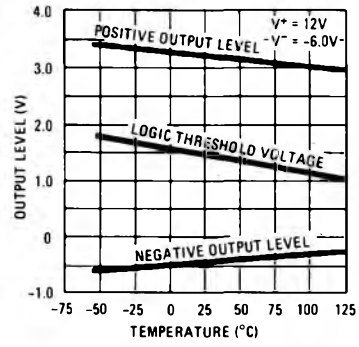
Response Time For Various Input Overdrives



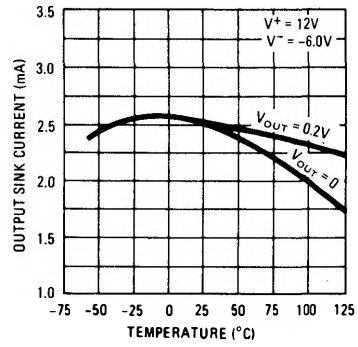
Common Mode Pulse Response



Output Voltage Level



Output Sink Current



Maximum Power Dissipation