REFERENCES

(1) Graeme, J.G. Tobey, G.E. and Huelsman (ed.) L.P. Operational Amplifiers Design and Application McGraw-Hill Book Co., 1971.

(2) Graeme, J.G. Applications Of Operational Amplifier McGraw-Hill Book Co., 1971.

(3) Huelsman (ed.) L.P. Active Filters : Lumped, Distributed Integrated Digital and Parametric McGraw-Hill Book Co., 1970.

(4) Hilburn, J.L. and Johnson, D.E. Manual Of Active Filter Design McGraw-Hill Book Co., 1973.

(5) Millman, J and Halkias Christor C. Integrated Electronics, Analog and Digital Circuits and Systems McGraw-Hill : Kogakusha, 1972.

(6) The Engineering Staff Of Motorola The Integrated Circuit Data Book Semiconductor Products Inc., 1968.

(7) The Engineering Staff Of ORTEC Incorporated 1976 Radiation Spectroscopy and Analysis Instruments For Research and Industry.

Operational Amplifiers

LM318 operational amplifier

general description

The LM318 is a precision high speed operational amplifier designed for applications requiring wide bandwidth and high slew rate. It features a factor of ten increase in speed over general purpose devices without sacrificing DC performance.

features

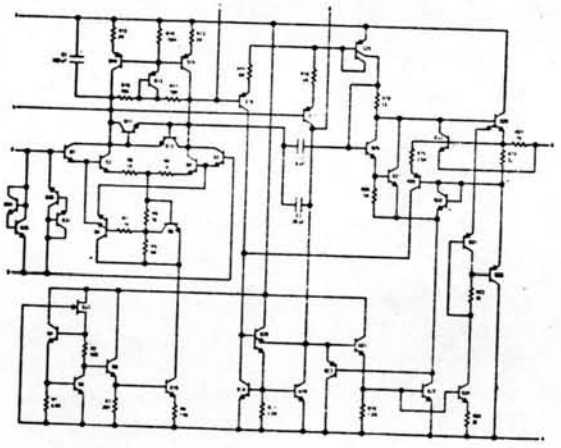
- 15 MHz small signal bandwidth
- Guaranteed 50V/μs slew rate
- Maximum bias current of 500 nA
- Operates from supplies of ±5V to ±20V
- Internal frequency compensation
- Input and output overload protected
- Pin compatible with general purpose op amps

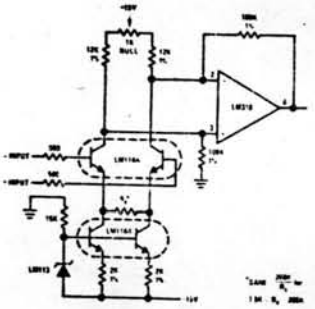
The LM318 has internal unity gain frequency compensation. This considerably simplifies its application since no external components are necessary for operation. However, unlike most internally compensated amplifiers, external frequency compensation may be added for optimum performance. For inverting applications, feedforward compensation will boost the slew rate to over 150V/μs and almost double the bandwidth. Overcompensation can be used with the amplifier for greater stability when maximum bandwidth is not needed. Further, a single capacitor can be added to reduce the 0.1% settling time to under 1 μs.

The high speed and fast settling time of these op amps make them useful in A/D converters, oscillators, active filters, sample and hold circuits, or general purpose amplifiers. These devices are easy to apply and offer an order of magnitude better AC performance than industry standards such as the LM709.

The LM318 is specified for operation over 0°C to 70°C.

schematic diagram and typical application

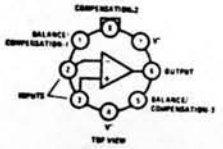




Instrumentation Amplifier

connection diagrams

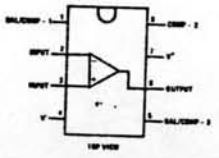
Metal Can Package*



*Pin connections shown on schematic diagram and typical applications are for TO-5 package.

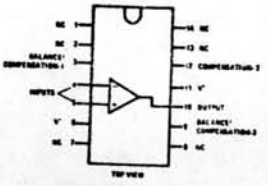
Order Number LM318H
See Package 11

Dual-In-Line Package



Order Number LM318N
See Package 20

Dual-In-Line Package



Order Number LM318D
See Package 1

absolute maximum ratings

Supply Voltage	±20V
Power Dissipation (Note 1)	500 mW
Differential Input Current (Note 2)	±10 mA
Input Voltage (Note 3)	±15V
Output Short-Circuit Duration	Indefinite
Operating Temperature Range	0°C to 70°C
Storage Temperature Range	−65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

electrical characteristics (Note 4)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$T_A = 25°C$		4	10	mV
Input Offset Current	$T_A = 25°C$		30	200	nA
Input Bias Current	$T_A = 25°C$		150	500	nA
Input Resistance	$T_A = 25°C$	0.5	3		MΩ
Supply Current	$T_A = 25°C$		5	10	mA
Large Signal Voltage Gain	$T_A = 25°C$, $V_S = ±15V$ $V_{OUT} = ±10V$, $R_L \geq 2\ k\Omega$	25	200		V/mV
Slew Rate	$T_A = 25°C$, $V_S = ±15V$, $A_V = 1$	50	70		V/μs
Small Signal Bandwidth	$T_A = 25°C$, $V_S = ±15V$		15		MHz
Input Offset Voltage				15	mV
Input Offset Current				300	nA
Input Bias Current				750	nA
Large Signal Voltage Gain	$V_S = ±15V$, $V_{OUT} = ±10V$ $R_L \geq 2\ k\Omega$	20			V/mV
Output Voltage Swing	$V_S = ±15V$, $R_L = 2\ k\Omega$	±12	±13		V
Input Voltage Range	$V_S = ±15V$	±11.5			V
Common Mode Rejection Ratio		70	100		dB
Supply Voltage Rejection Ratio		65	80		dB

Note 1: The maximum junction temperature of the LM318 is 85°C. For operating at elevated temperatures, devices in the TO-5 package must be derated based on a thermal resistance of 150°C/W, junction to ambient, or 45°C/W, junction to case. The thermal resistance of the dual-in-line package is 100°C/W, junction to ambient.

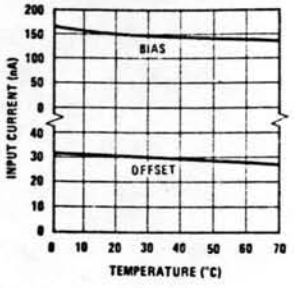
Note 2: The inputs are shunted with back-to-back diodes for overvoltage protection. Therefore, excessive current will flow if a differential input voltage in excess of 1V is applied between the inputs unless some limiting resistance is used.

Note 3: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

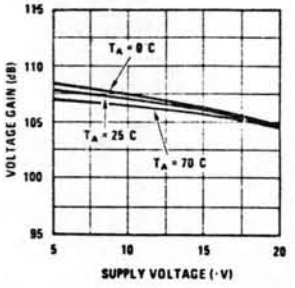
Note 4: These specifications apply for $±5V \leq V_S \leq ±20V$ and $0°C \leq T_A \leq 70°C$, unless otherwise specified. For proper operation, the power supplies must be bypassed with 0.1 μF disc capacitors.

typical performance characteristics

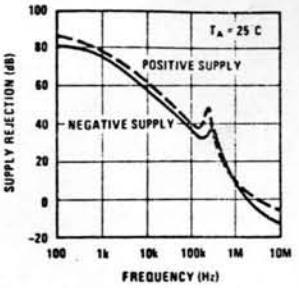
Input Current



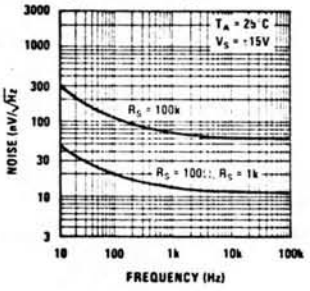
Voltage Gain



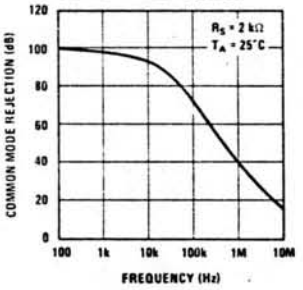
Power Supply Rejection



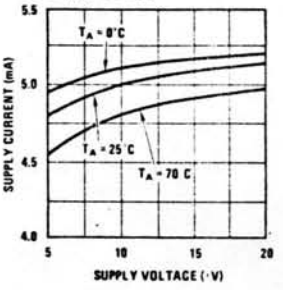
Input Noise Voltage



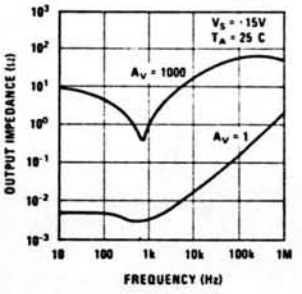
Common Mode Rejection



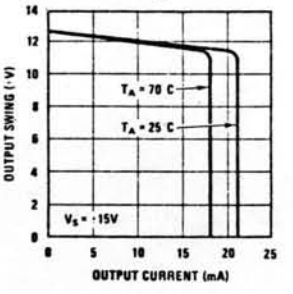
Supply Current



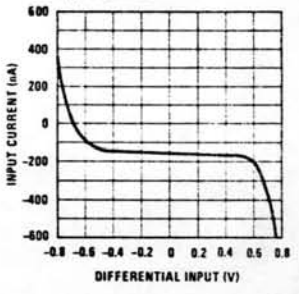
Closed Loop Output Impedance



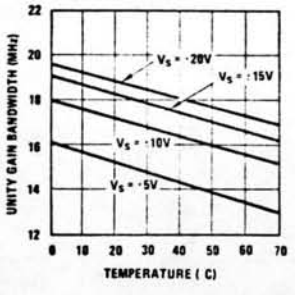
Current Limiting



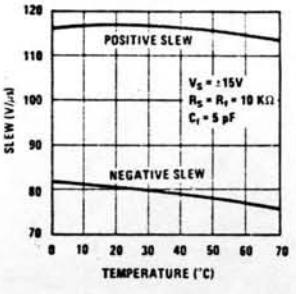
Input Current



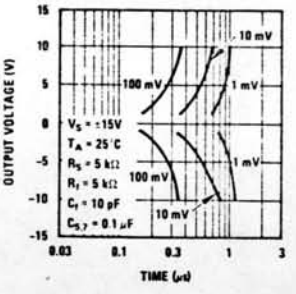
Unit Gain Bandwidth



Voltage Follower Slew Rate

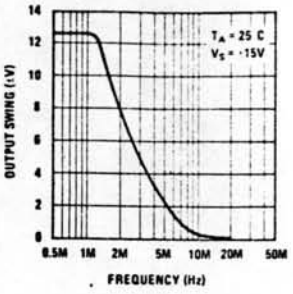


Inverter Settling Time

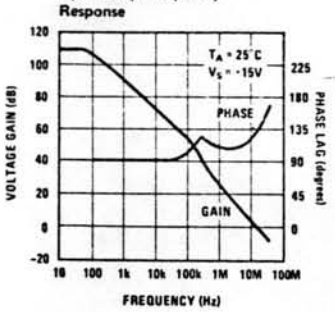


typical performance characteristics (con't)

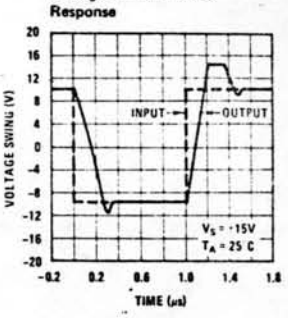
Large Signal Frequency Response



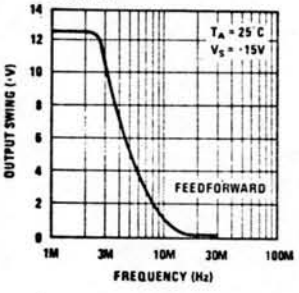
Open Loop Frequency Response



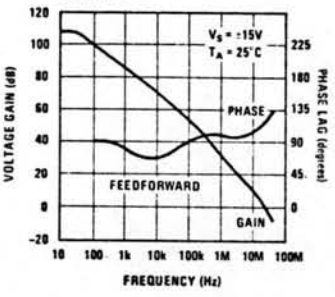
Voltage Follower Pulse Response



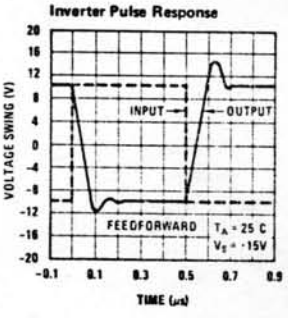
Large Signal Frequency Response



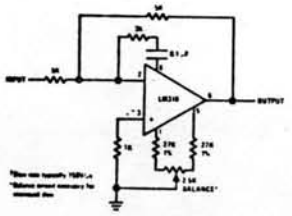
Open Loop Frequency Response



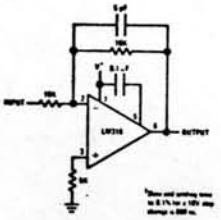
Inverter Pulse Response



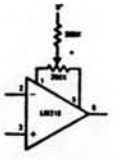
auxiliary circuits



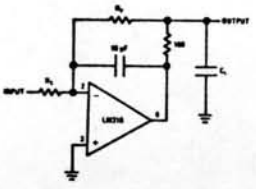
Feedforward Compensation for Greater Inverting Slew Rate†



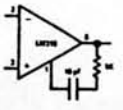
Compensation for Minimum Settling† Time



Offset Balancing

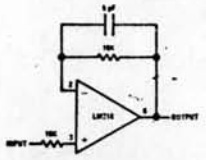


Isolating Large Capacitive Loads

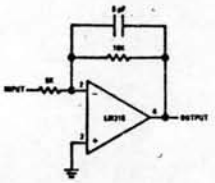


Overcompensation

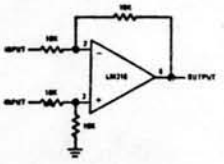
typical applications (con't)



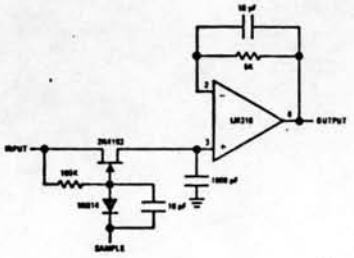
Fast Voltage Follower



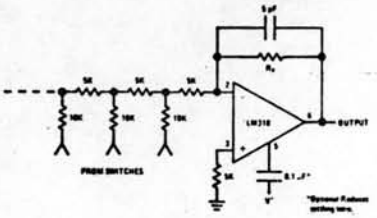
Fast Summing Amplifier



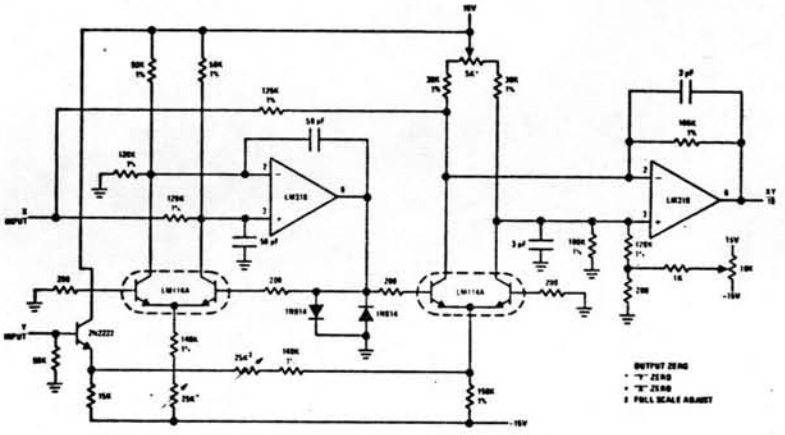
Differential Amplifier



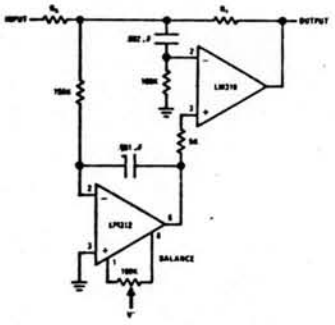
Fast Sample and Hold



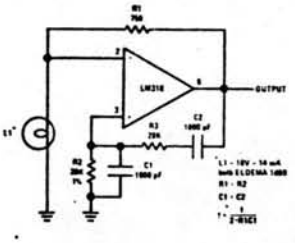
D/A Converter Using Ladder Network



Four Quadrant Multiplier



Fast Summing Amplifer with Low Input Current



Wein Bridge Sine Wave Oscillator

Operational Amplifiers

LM741/LM741C operational amplifier

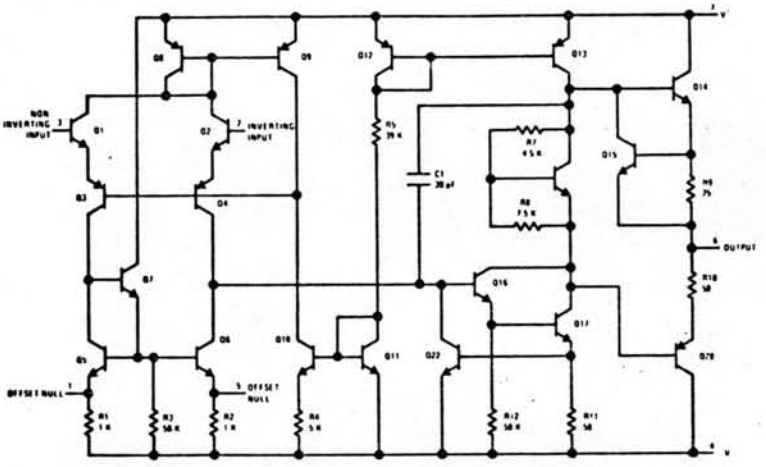
general description

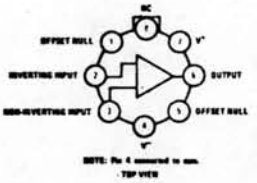
The LM741 and LM741C are general purpose operational amplifiers which feature improved performance over industry standards like the LM709. They are direct, plug-in replacements for the 709C, LM201, MC1439 and 748 in most applications.

The offset voltage and offset current are guaranteed over the entire common mode range. The amplifiers also offer many features which make their application nearly foolproof: overload protection on the input and output, no latch-up when the common mode range is exceeded, as well as freedom from oscillations.

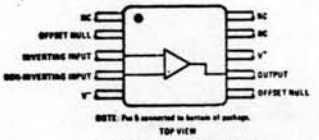
The LM741C is identical to the LM741 except that the LM741C has its performance guaranteed over a 0°C to 70°C temperature range, instead of −55°C to 125°C.

schematic and connection diagrams

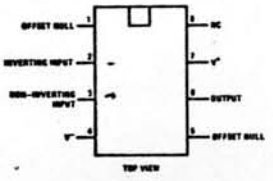




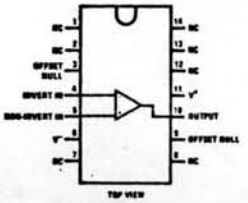
Order Number LM741H or LM741CH
See Package 11



Order Number LM741F
See Package 3



Order Number LM741CN
See Package 20



Order Number
LM741CD or LM741CN-14
See Package 1 See Package 22

absolute maximum ratings

Supply Voltage	LM741	±22V
	LM741C	±18V
Power Dissipation (Note 1)		500 mW
Differential Input Voltage		±30V
Input Voltage (Note 2)		±15V
Output Short-Circuit Duration		Indefinite
Operating Temperature Range	LM741	−55°C to 125°C
	LM741C	0°C to 70°C
Storage Temperature Range		−65°C to 150°C
Lead Temperature (Soldering, 10 sec)		300°C

electrical characteristics (Note 3)

PARAMETER	CONDITIONS	LM741			LM741C			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	$T_A = 25°C$, $R_S \leq 10\,k\Omega$		1.0	5.0		1.0	6.0	mV
Input Offset Current	$T_A = 25°C$		30	200		30	200	nA
Input Bias Current	$T_A = 25°C$		200	500		200	500	nA
Input Resistance	$T_A = 25°C$	0.3	1.0		0.3	1.0		MΩ
Supply Current	$T_A = 25°C$, $V_S = ±15V$		1.7	2.8		1.7	2.8	mA
Large Signal Voltage Gain	$T_A = 25°C$, $V_S = ±15V$ $V_{OUT} = ±10V$, $R_L \geq 2\,k\Omega$	50	160		25	160		V/mV
Input Offset Voltage	$R_S \leq 10\,k\Omega$			6.0			7.5	mV
Input Offset Current				500			300	nA
Input Bias Current				1.5			0.8	μA
Large Signal Voltage Gain	$V_S = ±15V$, $V_{OUT} = ±10V$ $R_L \geq 2\,k\Omega$	25			15			V/mV
Output Voltage Swing	$V_S = ±15V$, $R_L = 10\,k\Omega$	±12	±14		±12	±14		V
	$R_L = 2\,k\Omega$	±10	±13		±10	±13		V
Input Voltage Range	$V_S = ±15V$	±12			±12			V
Common Mode Rejection Ratio	$R_S \leq 10\,k\Omega$	70	90		70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10\,k\Omega$	77	96		77	96		dB

Note 1: The maximum junction temperature of the LM741 is 150°C, while that of the LM741C is 100°C. For operating at elevated temperatures, devices in the TO-5 package must be derated based on a thermal resistance of 150°C/W, junction to case.

Note 2: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

Note 3: These specifications apply for $V_S = ±15V$ and $-55°C \leq T_A \leq 125°C$, unless otherwise specified. With the LM741C, however, all specifications are limited to $0°C \leq T_A \leq 70°C$ and $V_S = ±15V$.

Interface Circuits

LM710C voltage comparator

general description

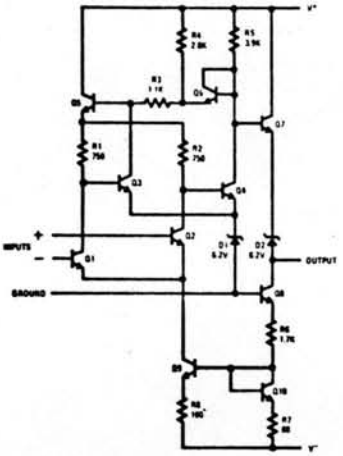
The LM710C is a high-speed voltage comparator intended for use as an accurate, low-level digital level sensor or as a replacement for operational amplifiers in comparator applications where speed is of prime importance. The circuit has a differential input and a single-ended output, with saturated output 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.

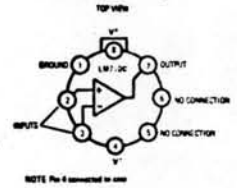
The LM710C is useful as a pulse height discriminator, a voltage comparator in high-speed A/D converters or a go, no-go detector in automatic test equipment. It also has applications in digital systems as an adjustable threshold line receiver or an interface between logic types. In addition, the low cost of the unit suggests it for applications replacing relatively simple discrete component circuitry.

The LM710C is the commercial/industrial version of the LM710. It is identical to the LM710 except that operation is specified over a 0°C to 70°C temperature range.

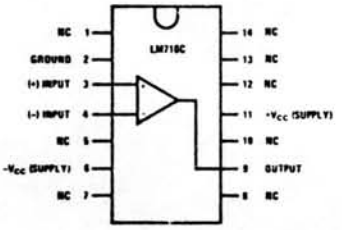
schematic and connection diagrams



Metal Can Package

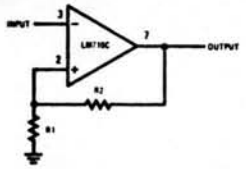


Dual-In-Line Package

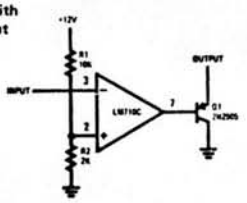


typical applications

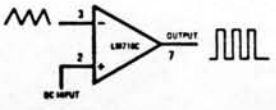
Schmidt Trigger



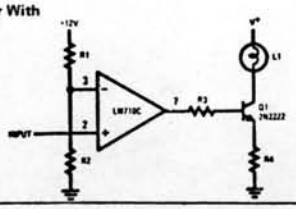
Line Receiver With Increased Output Sink Current



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	0°C to 70°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 10 sec)	300°C

electrical characteristics (Note 2)

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Offset Voltage	$T_A = 25°C$, $R_S < 200\Omega$ $V_{OUT} = 1.4V$		1.6	5.0	mV
Input Offset Current	$T_A = 25°C$, $V_{OUT} = 1.4V$		1.8	5.0	μA
Input Bias Current	$T_A = 25°C$		16	25	μA
Voltage Gain	$T_A = 25°C$	1000	1500		
Output Resistance	$T_A = 25°C$		200		Ω
Output Sink Current	$T_A = 25°C$, $\Delta V_{IN} \geq 5$ mV $V_{OUT} = 0$	1.7	2.5		mA
Response Time (Note 3)			40		ns
Input Offset Voltage	$R_S \leq 200\Omega$			6.5	mV
Average Temperature Coefficient of Input Offset Voltage	$0°C \leq T_A \leq 70°C$ $R_S \leq 50\Omega$		5.0	20	μV/°C
Input Offset Current				7.5	μA
Average Temperature Coefficient of Input Offset Current	$25°C \leq T_A \leq 70°C$ $0°C \leq T_A \leq 25°C$		15 24	50 100	nA/°C nA/°C
Common Mode Rejection Ratio	$R_S \leq 200\Omega$	70	98		
Input Bias Current	$T_A = 0°C$		25	40	μA
Input Voltage Range	$V^- = -7.0V$	±5.0			V
Differential Input Voltage Range		±5.0			V
Voltage Gain		800			
Positive Output Level	$V_{IN} \geq 5$ mV, $0 \leq I_{OUT} \leq -5$ mA	2.5	3.2	4.0	V
Negative Output Level	$V_{IN} \leq -10$ mV	−1.0	−0.5	0	V
Output Sink Current	$V_{IN} \leq -10$ mV, $V_{OUT} = 0$	0.5			mA
Positive Supply Current	$V_{IN} \leq -10$ mV		5.2	9	mA
Negative Supply Current			4.6	7.0	mA
Power Consumption				150	mW

Note 1: Ratings apply for ambient temperatures to 70°C.
Note 2: These specifications apply for $V^+ = 12.0V$, $V^- = 6.0V$, $0°C \leq T_A \leq 70°C$ and for a logic threshold voltage of 1.5V at 0°C, 1.4V at 25°C and 1.2V at 70°C unless otherwise specified.
Note 3: The response time specified (see definitions) is for a 100 mV input step with 5 mV overdrive.

Series 54/74

DM54121/DM74121(SN54121/SN74121) monostable multivibrator

general description

The DM54121/DM74121 TTL monostable multivibrator features DC triggering from positive or gated negative-going inputs with inhibit facility. Both positive and negative-going output pulses are provided with full fan-out to 10 normalized loads.

Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. Schmitt-trigger input circuitry for the B input allows jitter-free triggering from inputs with transition times as slow as 1V per second, providing the circuit with an excellent noise immunity of typically 1.2V. A high immunity to V_{CC} noise of typically 1.5V is also provided by internal latching circuitry.

Once fired, the outputs are independent of further transitions on the inputs and are a function only of the timing components. Input pulses may be of any duration relative to the output pulse. Output pulse lengths may be varied from 30 ns to 40 seconds by choosing appropriate timing components.

Jitter-free operation is maintained over the full temperature and V_{CC} range for more than six decades of timing capacitance (10 pF to 10 μF) and more than one decade of timing resistance (2 kΩ to 40 kΩ). Throughout these ranges, pulse width is defined by the relationship $t_{p(OUT)} = C_T R_T \log_e 2$.

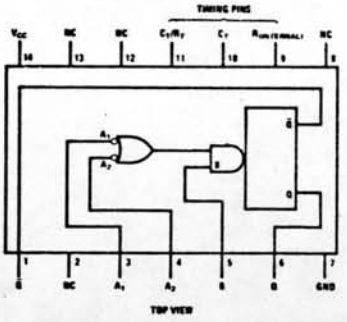
Duty cycles as high as 90% are achieved when using R_T = 40 kΩ. Higher duty cycles are achievable if a certain amount of pulse width jitter is allowed.

features

- Series 54/74 compatibility
- DC triggering
- Schmitt trigger inputs
- Positive-going or negative-going triggering
- Pulse width variation from 30 ns to 40 sec
- Pulse width virtually independent of V_{CC} and temperature
- Typical power dissipation
  90 mW (50% duty cycle)
  65 mW (Quiescent state)
- Output pulse width independent of input pulse width

connection diagram

Dual-In-Line and Flat Package



TOP VIEW

truth table

t_n INPUT			t_{n+1} INPUT			OUTPUT
A_1	A_2	B	A_1	A_2	B	
1	1	0	1	1	1	Inhibit
0	X	1	0	X	0	Inhibit
X	0	1	X	0	0	Inhibit
0	X	0	0	X	1	One Shot
X	0	0	X	0	1	One Shot
1	1	1	X	0	1	One Shot
1	1	1	0	X	1	One Shot
X	0	0	X	1	0	Inhibit
0	X	0	1	X	0	Inhibit
X	0	1	1	1	1	Inhibit
0	X	1	1	1	1	Inhibit
1	1	0	X	0	0	Inhibit
1	1	0	0	X	0	Inhibit

NOTES:
t_n = Time before input transition
t_{n+1} = Time after input transition
X = Don't care

absolute maximum ratings (Note 1)

V_{CC}		7.0V
Input Voltage		5.5V
Operating Temperature Range	DM54121	−55°C to +125°C
	DM74121	0°C to 75°C
Storage Temperature Range		−65°C to +150°C
Lead Temperature (Soldering, 10 sec)		300°C

electrical characteristics (Note 2)

PARAMETER		CONDITIONS		LIMITS (Note 2) MIN	TYP	MAX	UNITS
Positive-Going Threshold Voltage at A Input, V_{T+}	DM54121	V_{CC} = 4.5V			1.4	2	V
	DM74121	V_{CC} = 4.75V					
Negative Going Threshold Voltage at A Input, V_{T-}	DM54121	V_{CC} = 4.5V		0.8	1.4		V
	DM74121	V_{CC} = 4.75V					
Positive-Going Threshold Voltage at B Input, V_{T+}	DM54121	V_{CC} = 4.5V			1.55	2	V
	DM74121	V_{CC} = 4.75V					
Negative-Going Threshold Voltage at B Input, V_{T-}	DM54121	V_{CC} = 4.5V		0.8	1.35		V
	DM74121	V_{CC} = 4.75V					
Logical "0" Output Voltage, $V_{OUT(0)}$	DM54121	V_{CC} = 4.5V	I_{SINK} = 16 mA		0.23	0.4	V
	DM74121	V_{CC} = 4.75V					
Logical "1" Output Voltage, $V_{OUT(1)}$	DM54121	V_{CC} = 4.5V	I_{LOAD} = −400 μA	2.4	3.3		V
	DM74121	V_{CC} = 4.75V					
Logical "0" Level Input Current at A1 or A2, $I_{IN(0)}$	DM54121	V_{CC} = 5.5V	V_{IN} = 0.4V		−1	−1.6	mA
	DM74121	V_{CC} = 5.25V					
Logical "0" Level Input Current at B, $I_{IN(0)}$	DM54121	V_{CC} = 5.5V	V_{IN} = 0.4V		−2	−3.2	mA
	DM74121	V_{CC} = 5.25V					
Logical "1" Level Input Current at A1 or A2, $I_{IN(1)}$	DM54121	V_{CC} = 5.5V	V_{IN} = 2.4V		1.5	40	μA
	DM74121	V_{CC} = 5.25V	V_{IN} = 5.5V		0.02	1	mA
Logical "1" Level Input Current at B, $I_{IN(1)}$	DM54121	V_{CC} = 5.5V	V_{IN} = 2.4V		3	80	μA
	DM74121	V_{CC} = 5.25V	V_{IN} = 5.5V		0.05	1	mA
Short Circuit Output Current at Q or $\overline{Q}$, I_{OS} (Note 3)	DM54121	V_{CC} = 5.5V		−20		−55	mA
	DM74121	V_{CC} = 5.25V		−18		−55	mA
Power Supply Current in Quiescent (Unfired) State, I_{CC}	DM54121	V_{CC} = 5.5V			13	25	mA
	DM74121	V_{CC} = 5.25V					
Power Supply Current in Fired State, I_{CC}	DM54121	V_{CC} = 5.5V			23	40	mA
	DM74121	V_{CC} = 5.25V					

switching characteristics V_{CC} = 5V, T_A = 25°C

		MIN	TYP	MAX	UNITS
Propagation Delay Time to Logical "1" Level from B Input to Q Output, t_{pd1}	C_L = 15 pF, C_T = 80 pF, R_T = Internal	15	25	55	ns
Propagation Delay Time to Logical "1" Level from A1/A2 Inputs to Q Output, t_{pd1}	C_L = 15 pF, C_T = 80 pF, R_T = Internal	25	34	70	ns
Propagation Delay Time to Logical "0" Level from B Input to $\overline{Q}$ Output, t_{pd0}	C_L = 15 pF, C_T = 80 pF	20	32	65	ns
Propagation Delay Time to Logical "0" Level from A1/A2 Inputs to $\overline{Q}$ Output, t_{pd0}	C_L = 15 pF, C_T = 80 pF	30	39	80	ns
Pulse Width Obtained Using Internal Timing Resistor, $t_{p(OUT)}$	C_L = 15 pF, C_T = 80 pF, R_T = Open, Pin 9 to V_{CC}	70	110	150	ns
Pulse Width Obtained with Zero Timing Capacitance, $t_{p(OUT)}$	C_L = 15 pF, C_T = 0, R_T = Open, Pin 9 to V_{CC}	17	23	50	ns
Pulse Width Obtained Using External Timing Resistor, $t_{p(OUT)}$	C_L = 15 pF, C_T = 100 pF, R_T = 10 kΩ, Pin 9 Open	600	700	800	ns
Pulse Width Obtained Using External Timing Resistor, $t_{p(OUT)}$	C_L = 15 pF, C_T = 1 μF, R_T = 10 kΩ, Pin 9 Open	6	7	8	ms
Minimum Duration of Trigger Pulse, t_{HOLD}	C_L = 15 pF, C_T = 80 pF, R_T = Open, Pin 9 to V_{CC}		22	50	ns

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the −55°C to +125°C temperature range for the DM54121 and across the 0°C to 70°C range for the DM74121. All typicals are given for V_{CC} = 5.0V and T_A = 25°C.

Note 3: Only one output at a time should be shorted.

Series 54/74

DM5400/DM7400(SN5400/SN7400) quadruple 2-input NAND gate
DM5410/DM7410(SN5410/SN7410) triple 3-input NAND gate
DM5420/DM7420(SN5420/SN7420) dual 4-input NAND gate

general description

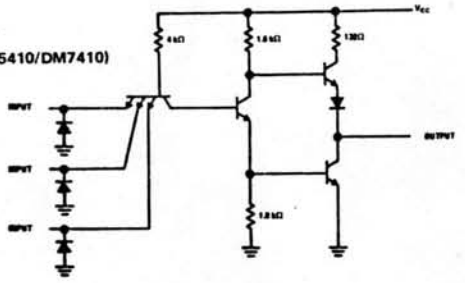
Employing TTL (Transistor-Transistor-Logic) to achieve high speed at moderate power dissipation, these gates provide the basic functions used in the implementation of digital integrated circuit systems. Characteristics of the circuits include high noise immunity, low output impedance, good capacitive drive capability, and minimal variation in switching times with temperature. The gates are compatible with and interchangeable with Series 54/74 equivalent.

features

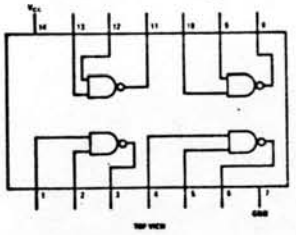
- Typical Noise Immunity 1V
- Guaranteed Noise Immunity 400 mV
- Fan Out 10
- Average Propagation Delay 13 ns
- Average Power Dissipation 10 mW per gate

schematic and connection diagrams

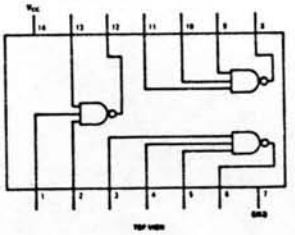
(shown for DM5410/DM7410)



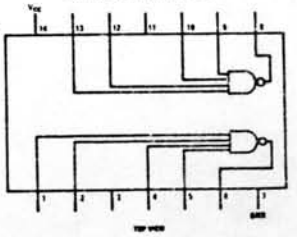
DM5400/DM7400
Dual-In-Line Package



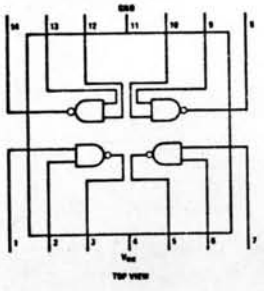
DM5410/DM7410
Dual-In-Line Package



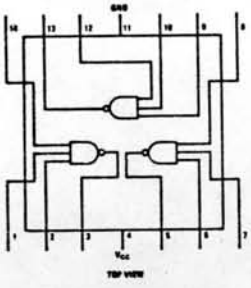
DM5420/DM7420
Dual-In-Line Package



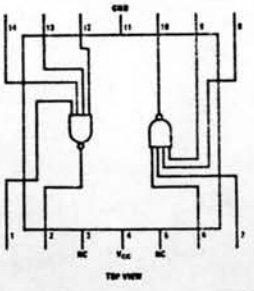
DM5400
Flat Package



DM5410
Flat Package



DM5420
Flat Package



absolute maximum ratings

V_{CC}	7.0V
Input Voltage	5.5V
Storage Temperature Range	−65°C to +150°C
Fan-Out	10
Lead Temperature (Soldering, 10 sec)	300°C

operating conditions

	MIN	MAX	UNITS
Supply Voltage (V_{CC})			
DM54XX	4.5	5.5	V
DM74XX	4.75	5.25	V
Temperature (T_A)			
DM54XX	−55	+125	°C
DM74XX	0	70	°C

electrical characteristics (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Diode Clamp Voltage	V_{CC} = 5.0V, T_A = 25°C, I_{IN} = −12 mA			−1.5	V
Logical "1" Input Voltage	V_{CC} = Min	2.0			V
Logical "0" Input Voltage	V_{CC} = Min			0.8	V
Logical "1" Output Voltage	V_{CC} = Min V_{IN} = 0.8V, I_{OUT} = −400 μA	2.4			V
Logical "0" Output Voltage	V_{CC} = Min V_{IN} = 2.0V, I_{OUT} = 16 mA			0.4	V
Logical "1" Input Current	V_{CC} = Max V_{IN} = 2.4V			40	μA
Logical "1" Input Current	V_{CC} = Max V_{IN} = 5.5V			1	mA
Logical "0" Input Current	V_{CC} = Max V_{IN} = 0.4V			−1.6	mA
Output Short Circuit Current (Note 2)	V_{CC} = Max V_{IN} = 0V, V_O = 0V DM74XX DM54XX	−20 −18		−55 −57	mA mA
Supply Current— Logical "0" (Note 3)	V_{CC} = Max V_{IN} = 5.0V		3	5.1	mA
Supply Current— Logical "1" (Note 3)	V_{CC} = Max V_{IN} = 0V		1	1.8	mA
Propagation Delay Time to Logical "0", t_{pd0}	V_{CC} = 5.0V, T_A = 25°C, C = 50 pF		8	15	ns
Propagation Delay Time to Logical "1", t_{pd1}	V_{CC} = 5.0V, T_A = 25°C, C = 50 pF		13	25	ns

Note 1: Unless otherwise specified min/max limits apply across the −55°C to +125°C temperature range for the DM54XX and across the 0°C to 70°C range for the DM74XX. All typicals are given for V_{CC} = 5.0V and T_A = 25°C.

Note 2: Not more than 1 output should be shorted at a time.

Note 3: Each gate.

Series 54/74

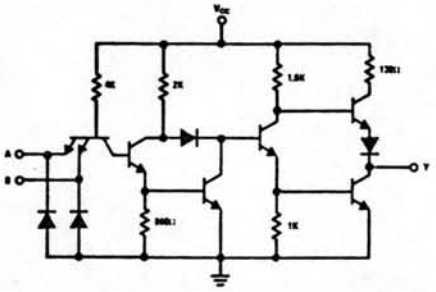
DM5408/DM7408(SN5408/SN7408) quad 2-input AND gate
DM5409/DM7409(SN5409/SN7409) quad 2-input AND gate (open collector)

general description

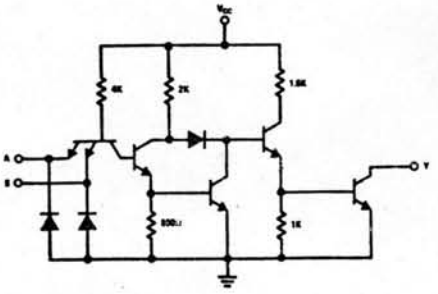
The DM5408/DM7408 and DM5409/DM7409 provide the non-inverting AND function in the popular quad 2-input pin configuration.

schematic and connection diagrams

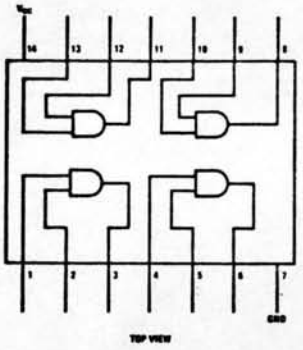
DM5408, DM7408



DM5409, DM7409



Dual-In-Line and Flat Package



absolute maximum ratings (Note 1)

Supply Voltage	7V
Input Voltage	5.5V
Output Voltage	5.5V
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 10 sec)	300°C

operating conditions

	MIN	MAX	UNITS
Supply Voltage (V_{CC})			
DM5408, DM5409	4.5	5.5	V
DM7408, DM7409	4.75	5.25	V
Temperature (T_A)			
DM5408, DM5409	−55	+125	°C
DM7408, DM7409	0	70	°C

electrical characteristics (Note 2)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Logical "1" Input Voltage	V_{CC} = Min	2			V
Logical "0" Input Voltage	V_{CC} = Min			0.8	V
Logical "1" Output Voltage (DM5408 / DM7408)	V_{CC} = Min, V_{IN} = 2V, I_{OUT} = −800 μA	2.4			V
Logical "1" Output Current (DM5409 / DM7409)	V_{CC} = Min, V_{OUT} = 5.5V, V_{IN} = 2.0V			250	μA
Logical "0" Output Voltage	V_{CC} = Min, V_{IN} = 0.8V, I_{OUT} = 16 mA			0.4	V
Logical "1" Input Current	V_{CC} = Max, V_{IN} = 2.4V			40	μA
	V_{CC} = Max, V_{IN} = 5.5V			1	mA
Logical "0" Input Current	V_{CC} = Max, V_{IN} = 0.4V			−1.6	mA
Output Short Circuit Current (Note 3)	V_{CC} = Max (DM5408 / DM7408)	−20 / −18		−55 / −55	mA
Supply Current — Logical "1" (each device)	V_{CC} = Max, V_{IN} = 5V		11	21	mA
Logical "0"	V_{CC} = Max, V_{IN} = 0V		20	33	mA
Input Clamp Voltage	V_{CC} = 5.0V, T_A = 25°C, I_{IN} = −12 mA		−1.0	−1.5	V
Propagation Delay to a Logical "0" from DM5408/DM7408 Any Input to Output, t_{pd0}	V_{CC} = 5.0V, T_A = 25°C		14	19	ns
Propagation Delay to a Logical "0" from DM5409/DM7409 Any Input to Output, t_{pd0}	V_{CC} = 5.0V, T_A = 25°C		15	24	ns
Propagation Delay to a Logical "1" from DM5408/DM7408 Any Input to Output, t_{pd1}	V_{CC} = 5.0V, T_A = 25°C		13	27	ns
Propagation Delay to a Logical "1" From DM5409/DM7409 Any Input to Output, t_{pd1}	V_{CC} = 5.0V, T_A = 25°C		17	32	ns

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the −55°C to +125°C temperature range for the DM5408, DM5409 and across the 0°C to 70°C range for the DM7408, DM7409. All typicals are given for V_{CC} = 5.0V and T_A = 25°C.

Note 3: Only one output at a time should be shorted.

VITA

Mr. Suphon Phoihiran attended the college of Engineering, Chulalongkorn University in 1963 where he received his Bachelor of Engineering (Electrical Communication Engineering) in 1968. After graduation he was appointed as the 1st class Electronic Engineer at the Communication Division, the Electricity Generating Authority of Thailand. From June 1972 to March 1977, he was admitted to take the "Nuclear Science and Technology" course at the Chulalongkorn University. Now he is working as the Electrical Engineer at The Siam Kraft Paper Co., Ltd.