



QUAD PRECISION HIGH SPEED MICROPOWER TIMER

GENERAL DESCRIPTION

The ALD4501 timer is a high performance QUAD monolithic timing circuit built with advanced silicon gate CMOS technology. It offers the benefits of high input impedance, thereby allowing smaller timing capacitors and longer timing cycle; high speed with typical cycle time of 500ns; low power dissipation for battery operated environment; and reduced supply current spikes allowing smaller and lower cost decoupling capacitors. Each of the four timers can be independently operated in either the monostable, astable, or 50% duty cycle mode.

Each timer is capable of producing accurate time delays and oscillations in both monostable and astable operation. It operates in the one-shot (monostable) mode or 50% duty cycle free running oscillation mode with a single resistor and one capacitor. The inputs and outputs are fully compatible with CMOS, NMOS or TTL logic.

There are three matched internal resistors (approximately 200K Ω each) that set the threshold and trigger levels at two-thirds and one-third respectively of V^+ . These levels can be adjusted by using the control terminal. When the trigger input is below the trigger level, the output is in the high state and sourcing 2mA. When the threshold input is above the threshold level, the internal flip-flop is reset, the output goes to the low state and sinks up to 10mA. The reset input overrides all other inputs and when it is active (reset voltage less than 1V), the output is in the low state. All four timers share the same control and reset pins so that timing functions are synchronized.

FEATURES

- High speed operation -- 2MHz typical oscillation at 5V
- Each discharge output sinking current: 40mA at 5V
- Guaranteed low operating supply voltage of 2 to 12V
- Each timer is functionally equivalent to NE555 with greatly expanded high and low frequency ranges
- High speed, low power, monolithic CMOS technology
- Low supply current: 150 μ A typical
- Extremely low trigger, threshold and reset currents: 10pA typical
- Operates in both monostable and astable modes
- Fixed 50% duty cycle or adjustable duty cycle
- CMOS, NMOS and TTL compatible input/output
- Low supply current spikes

ORDERING INFORMATION ("L" suffix denotes lead-free (RoHS))

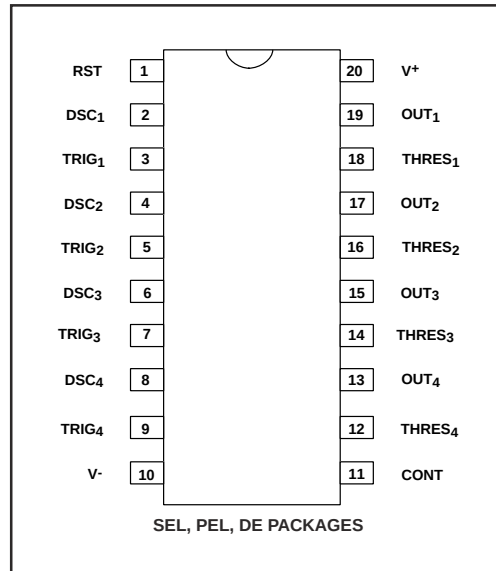
Operating Temperature Range *		
0°C to +70°C	0°C to +70°C	-55°C to +125°C
20-Pin Small Outline Package (SOIC)	20-Pin Plastic DIP Package	20-Pin Cerdip Package
ALD4501SEL	ALD4501PEL	ALD4501DE

* Contact factory for leaded (non-RoHS) or high temperature versions.

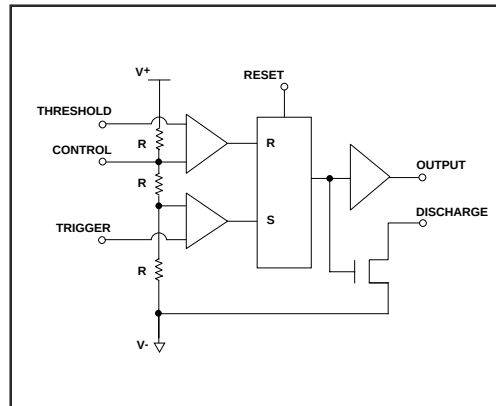
APPLICATIONS.

- High speed one-shot (monostable) pulse generation
- Precision timing
- Sequential timing
- Long delay timer
- Pulse width and pulse position modulation
- Missing pulse detector
- Frequency divider
- Synchronized timer

PIN CONFIGURATION



BLOCK DIAGRAM (EACH TIMER)



ABSOLUTE MAXIMUM RATINGS

Supply voltage, V^+ _____ 13.2V
 Input voltage range _____ -0.3V to V^+ +0.3V
 Power dissipation _____ 600 mW
 Operating temperature range SEL, PEL packages _____ 0°C to + 70°C
 DE package _____ -55°C to +125°C
 Storage temperature range _____ -65°C to +150°C
 Lead temperature, 10 seconds _____ +260°C

OPERATING ELECTRICAL CHARACTERISTICS

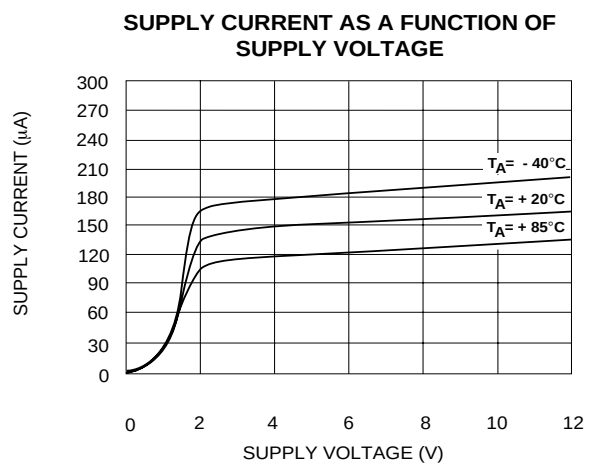
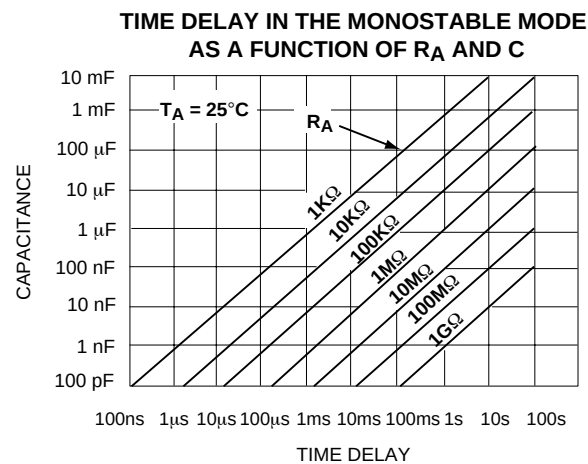
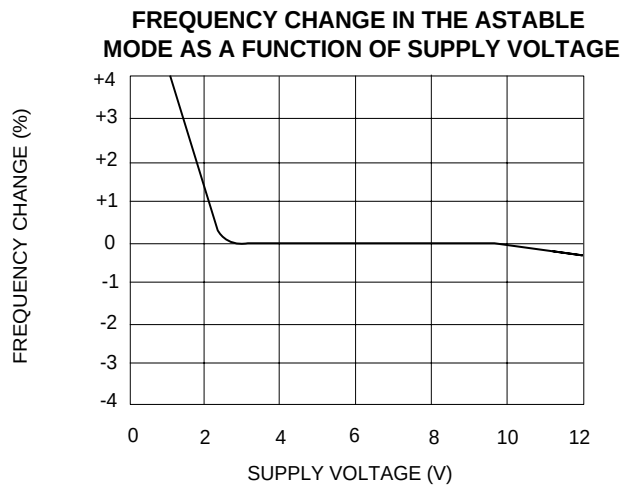
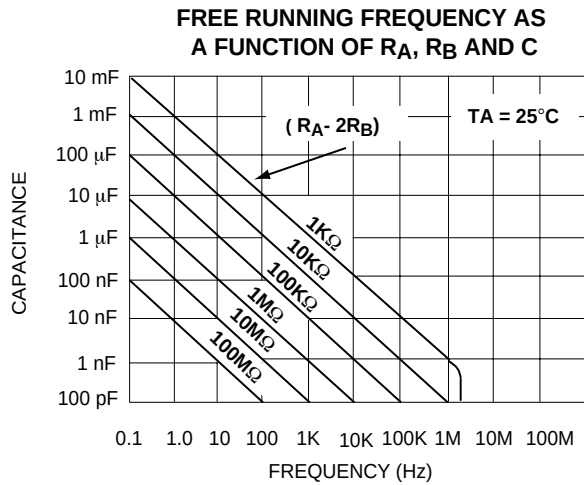
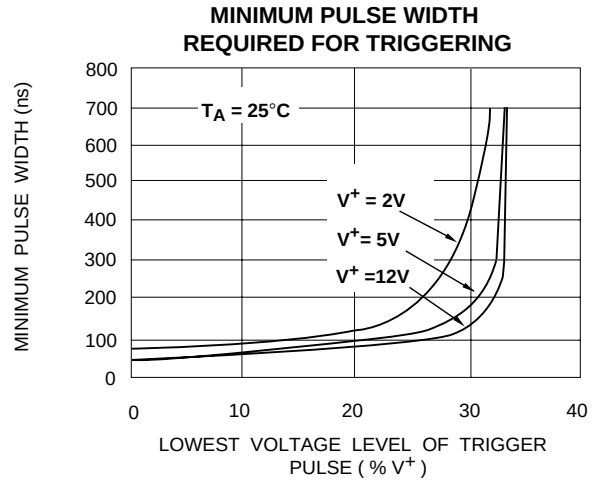
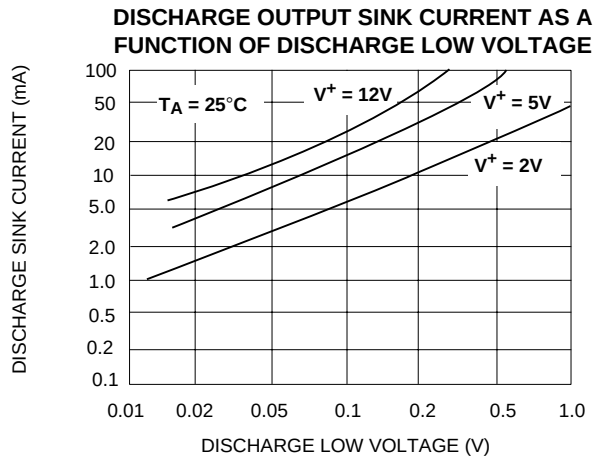
$T_A = 25^\circ\text{C}$ $V^+ = +5\text{V}$ unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Supply Voltage	V^+	2		12	V	
Supply Current	I_S		150	270	μA	Outputs Unloaded
Timing error / Astable mode Initial Accuracy	t_{err}		1.0	2.6	%	$C = 0.1\mu\text{F}$
Drift with Temperature ¹ Drift with Supply Voltage ¹	$\Delta t/\Delta T$ $\Delta t/\Delta V^+$		10.0 0.1		ppm/ $^\circ\text{C}$ %/V	$R_A = 1\text{K}\Omega$ $R_B = 1\text{K}\Omega$
Threshold Voltage	V_{TH}	3.233	3.333	3.433	V	
Trigger Voltage	V_{TRIG}	1.567	1.667	1.767	V	
Trigger Current ²	I_{TRIG}		.01	0.4	nA	
Reset Voltage	V_{RST}	0.4	0.7	1.0	V	
Reset Current ²	I_{RST}		.01	0.4	nA	
Threshold Current ²	I_{TH}		.01	0.4	nA	
Control Voltage Level	V_{CONT}	3.233	3.333	3.433	V	
Output Voltage Drop (Low)	V_{OL}		0.2	0.4	V	$I_{SINK} = 10\text{mA}$
Output Voltage Drop (High)	V_{OH}	4.2	4.6		V	$I_{SOURCE} = -2\text{mA}$
Rise Time of Output ¹	t_r		10	20	ns	$R_L = 10\text{M}\Omega$
Fall Time of Output ¹	t_f		10	20	ns	$C_L = 10\text{pF}$
Discharge Transistor Leakage Current	I_{DL}		.01		nA	
Discharge Voltage Drop	V_{DISC}		0.5 0.2	1.0 0.4	V V	$I_{DISCHARGE} = 40\text{mA}$ $I_{DISCHARGE} = 15\text{mA}$
Maximum Frequency Astable Mode	f_{MAX}		2		MHz	$R_A = 470\Omega$ $R_B = 200\Omega$ $C_T = 100\text{pF}$
Minimum Trigger Pulse Width ¹	t_{TRIG}		50	100	ns	

Notes: ¹ Sample tested parameters.

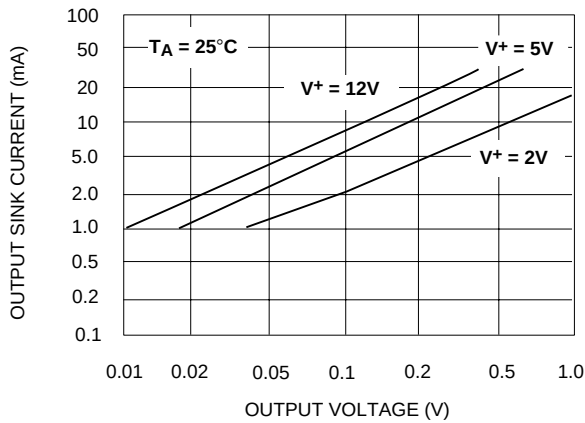
² Consists of junction leakage currents with strong temperature dependence.

TYPICAL PERFORMANCE CHARACTERISTICS

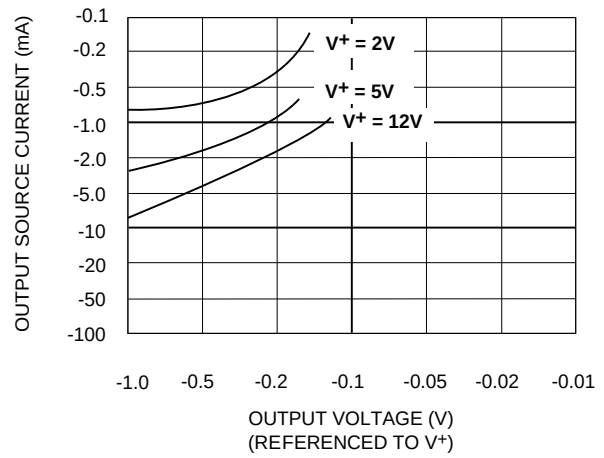


TYPICAL PERFORMANCE CHARACTERISTICS (cont'd)

OUTPUT SINK CURRENT AS A FUNCTION OF OUTPUT VOLTAGE

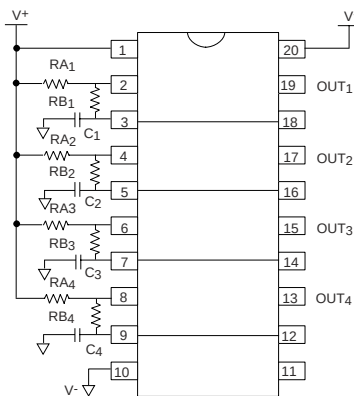


OUTPUT SOURCE CURRENT AS A FUNCTION OF OUTPUT VOLTAGE



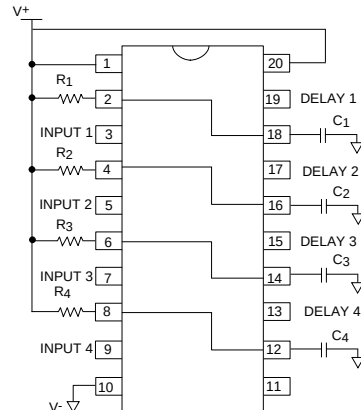
TYPICAL APPLICATIONS

QUAD ASTABLE MODE OPERATION
(FREE RUNNING OSCILLATOR)



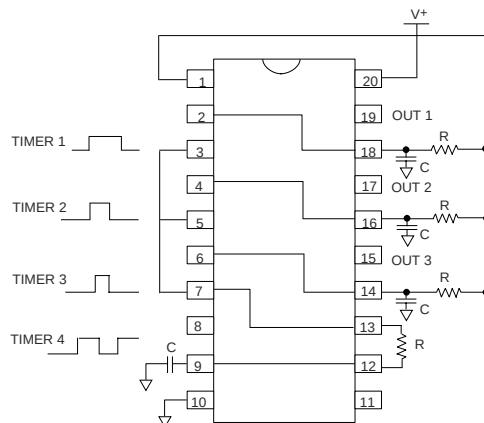
Frequency $f = 1.46 / (R_A + 2R_B) C$
Duty Cycle $DC = R_B / (R_A + 2R_B)$

QUAD MONOSTABLE MODE OPERATION
(ONE SHOT PULSE)



Pulse Delay $t_d = 1.1RC$

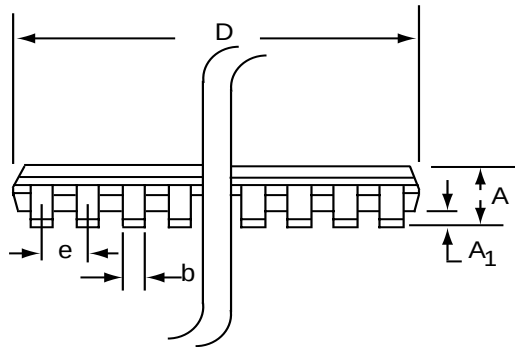
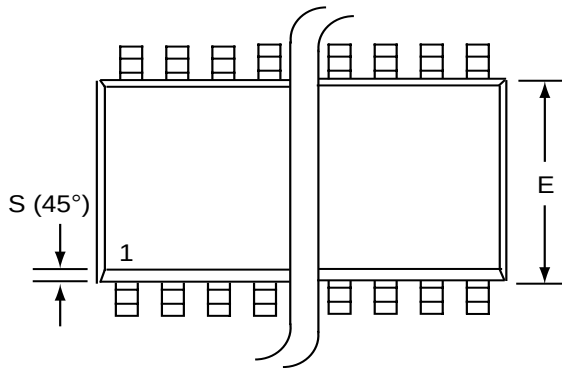
SYNCHRONIZED TIMING GENERATORS



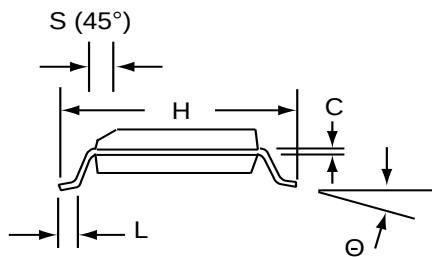
Timer 4 oscillates in free running mode (50 % Duty Cycle) and drives the trigger inputs of timers 1,2,3, each with independently set time delays.

SOIC-20 PACKAGE DRAWING

20 Pin Plastic SOIC Package

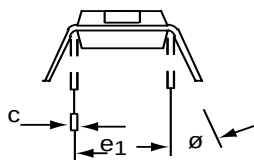
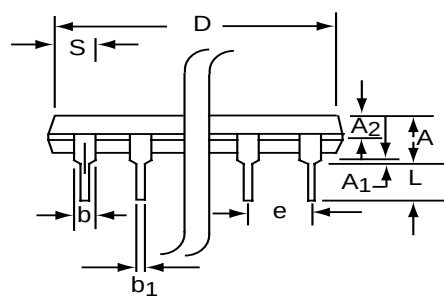
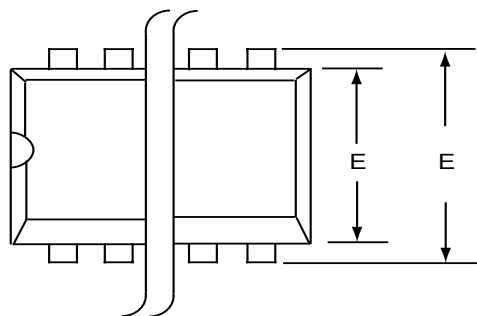


Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	2.15	2.90	0.085	0.114
A ₁	0.10	0.30	0.004	0.012
b	0.35	0.45	0.014	0.018
c	0.23	0.28	0.009	0.011
D-20	12.50	13.30	0.492	0.524
E	7.25	8.00	0.285	0.315
e	1.27 BSC		0.050 BSC	
H	9.80	10.60	0.386	0.417
L	0.60	2.937	0.024	0.037
Ø	0°	8°	0°	8°
S	0.25	0.75	0.010	0.030



PDIP-20 PACKAGE DRAWING

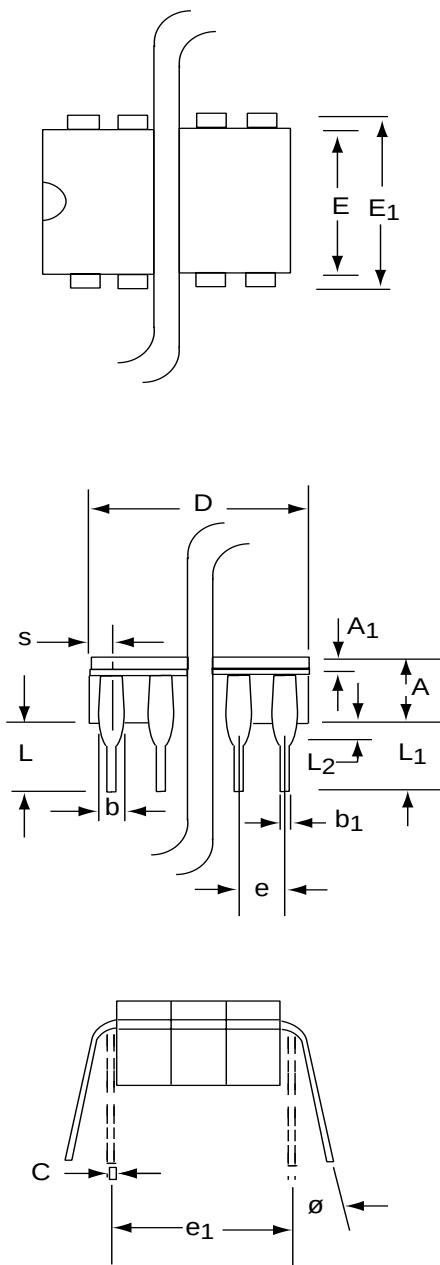
20 Pin Plastic DIP Package



Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	3.81	5.08	0.105	0.200
A₁	0.38	1.27	0.015	0.050
A₂	1.27	2.03	0.050	0.080
b	0.89	1.65	0.035	0.065
b₁	0.38	0.51	0.015	0.020
c	0.20	0.30	0.008	0.012
D-20	24.89	26.92	0.980	1.060
E	5.59	7.11	0.220	0.280
E₁	7.62	8.26	0.300	0.325
e	2.29	2.79	0.090	0.110
e₁	7.37	7.87	0.290	0.310
L	2.79	3.81	0.110	0.150
S-20	1.02	2.03	0.040	0.080
ø	0°	15°	0°	15°

CERDIP-20 PACKAGE DRAWING

20 Pin CERDIP Package



Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	3.55	5.08	0.140	0.200
A₁	1.27	2.16	0.050	0.085
b	0.97	1.65	0.038	0.065
b₁	0.36	0.58	0.014	0.023
C	0.20	0.38	0.008	0.015
D-20	--	26.92	--	1.060
E	5.59	7.87	0.220	0.310
E₁	7.73	8.26	0.290	0.325
e	2.54 BSC		0.100 BSC	
e₁	7.62 BSC		0.300 BSC	
L	3.81	5.08	0.150	0.200
L₁	3.18	--	0.125	--
L₂	0.38	1.78	0.015	0.070
S	--	2.49	--	0.098
Ø	0°	15°	0°	15°