SINGLE/DUAL 1 VOLT HIGH SPEED MICROPOWER TIMER

GENERAL DESCRIPTION

The ALD1504/ALD2504 are high performance single/dual 1 volt operation monolithic timing circuits built with advanced silicon gate CMOS technology. They offer the benefits of high input impedance, thereby allowing smaller timing capacitors and longer timing cycle; high speed, with typical cycle time of 400ns; low power dissipation for battery operated environment; reduced supply current spikes, allowing smaller and lower cost decoupling capacitors.

Each timer is capable of producing accurate time delays and oscillations in both monostable and astable operation, and 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 200KΩ each) that set the threshold and trigger levels at two-thirds and one-third respectively of V_{DD}. 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 threshold input is above the threshold level at the same time the trigger input is above the trigger 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.

FEATURES

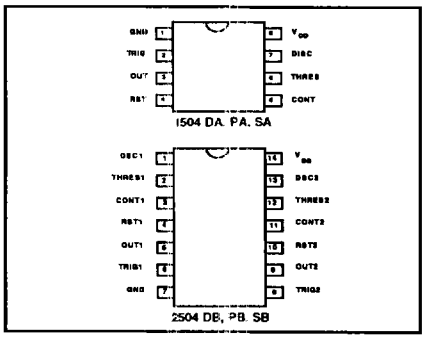
- High speed operation - 2.5 MHz typical oscillation at 5V
- High discharge sinking current 80mA at 5V
- Guaranteed low operating supply voltage of 1 to 12V
- Functional equivalent to NE555/NE556 with greatly expanded high and low frequency ranges
- High speed, low power, monolithic CMOS technology
- Low supply current 35μA typical at 1V operation
- 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

Operating Temperature		
-55°C to +125°C	0° C to +70° C	0° C to +70° C
8-Pin Package 14-Pin Package	8-Pin Package	14-Pin Package
ALD 1504 DA (CDIP) ALD 2504 DB (CDIP)	ALD 1504 PA (PDIP) ALD 1504 SA (SOIC)	ALD 2504 PB (PDIP) ALD 2504 SB (SOIC)

Tel: (408) 720-8737 Fax: (408) 720-8297

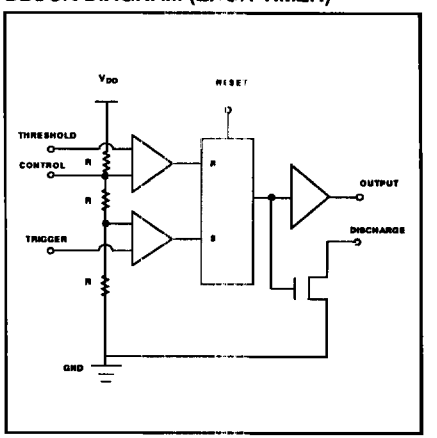
PIN CONFIGURATION



APPLICATIONS

- Ideal for 1.5V battery operated timer
- Micropower timing generator with quiescent power of 35μW per timer
- Power saving emergency flasher controls
- Automatic shut-off of portable instruments
- 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

BLOCK DIAGRAM (EACH TIMER)



ABSOLUTE MAXIMUM RATINGS

Supply voltage, V_{DD} 13.2V
Input voltage range ..... -0.3V to V_{DD}
Power dissipation 600mW
Operating temperature range ALD 1504 PA/ALD 2504 PB ..... 0°C to +70°C
ALD 1504 DA/ALD 2504 DB ..... -55°C to +125°C
Storage temperature range ..... -65°C to +150°C
Lead temperature, 10 seconds ..... 300°C

DC AND OPERATING ELECTRICAL CHARACTERISTICS
V_{DD} = +1V T_A = +25° C unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Supply Current (each timer)	I_{DD}		35	70	µA	Outputs Unloaded
Output Voltage (low)	V_{OL}		0.02	0.4	V	I_{SINK} = 0.2mA
Output Voltage (high)	V_{OH}	0.5	0.8		V	I_{SOURCE} = 0.1 mA
Rise Time	t_r		300		nS	R_{LOAD} = 10MΩ
Fall Time	t_f		100		nS	C_{LOAD} = 10pF
Discharge Output Voltage Drop	V_{DISC}		0.03	0.4	V	$I_{DISCHARGE}$ = 1 mA
Maximum frequency in astable mode	f_{max}		0.5		MHz	

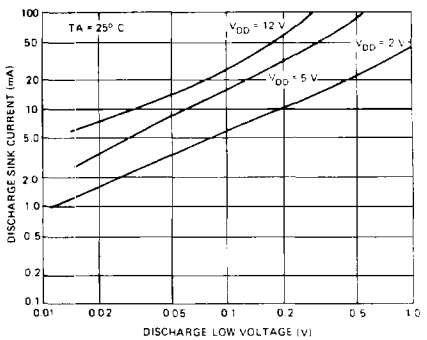
DC AND OPERATING ELECTRICAL CHARACTERISTICS
TA= 25°C V_{DD} = +5V unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Supply voltage	V_{DD}	1		12	V	
Supply current (each timer)	I_{DD}		50	90	µA	Outputs Unloaded
Timing error / Astable mode Initial Accuracy	t_{err}		1.0	2.6	%	C = 0.1µF
Drift with Temperature[1]	$\Delta t/\Delta T$		10.0		ppm/°C	R_A = 1kΩ
Drift with Supply Voltage[1]	$\Delta t/\Delta V_{DD}$		0.2		%/V	R_B = 1kΩ
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 (Low)	V_{OL}		0.2	0.4	V	I_{sink} = 10mA
Output Voltage (High)	V_{OH}	4.2	4.6		V	I_{source} = 2mA
Rise Time of Output[1]	t_r		10	20	ns	R_L = 10MΩ
Fall Time of Output[1]	t_f		10	20	ns	C_L = 10pF
Discharge Transistor Leakage Current	I_{DL}		.01		µA	
Discharge Voltage Drop	V_{DISC}		0.5	1.0	V	$I_{Discharge}$ = 80mA
Min. Trigger Pulse Width[1]	t_{TRIG}		50	100	ns	
Maximum Frequency Astable Mode	f_{max}	1.5	2.5		MHz	R_A= 470Ω R_B = 200Ω C_T = 100pF

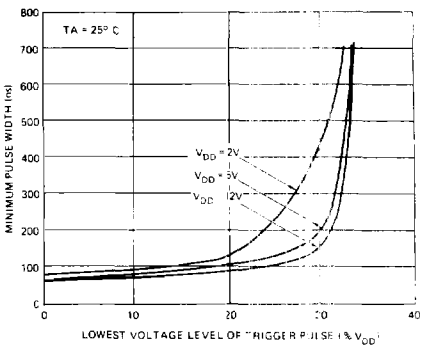
Notes: [1] Sample tested parameters.
[2] Consists of junction leakage currents with strong temperature dependence.

TYPICAL PERFORMANCE CHARACTERISTICS

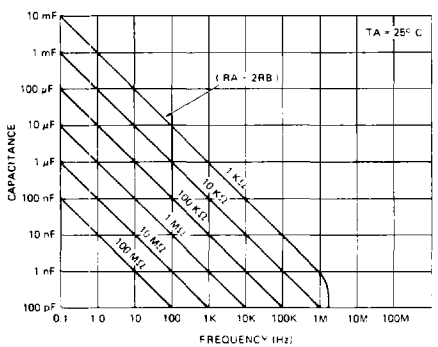
DISCHARGE OUTPUT SINK CURRENT AS A FUNCTION OF DISCHARGE LOW VOLTAGE



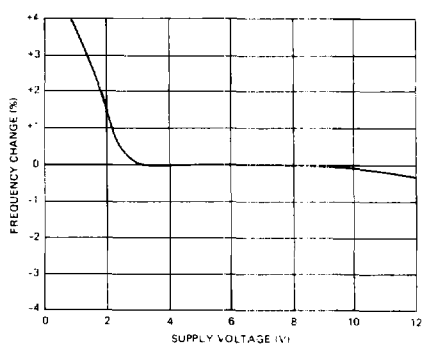
MINIMUM PULSE WIDTH REQUIRED FOR TRIGGERING



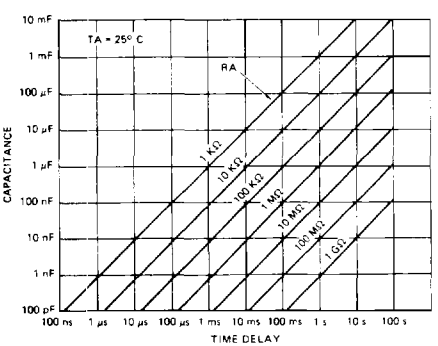
FREE RUNNING FREQUENCY AS A FUNCTION OF R_A, R_B AND C



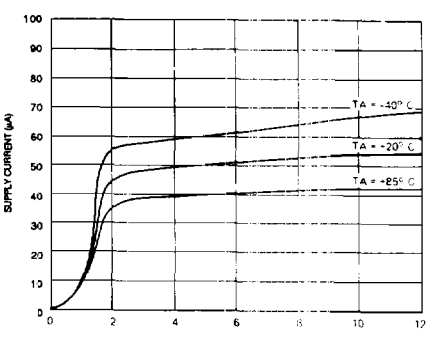
FREQUENCY CHANGE IN THE ASTABLE MODE AS A FUNCTION OF SUPPLY VOLTAGE



TIME DELAY IN THE MONOSTABLE MODE AS A FUNCTION OF R_A AND C

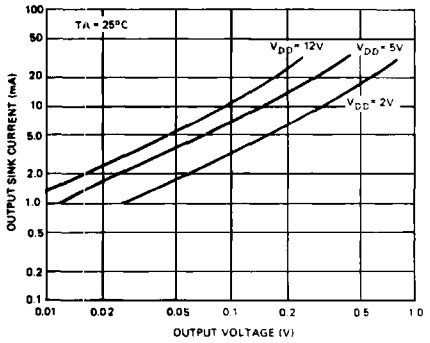


SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE

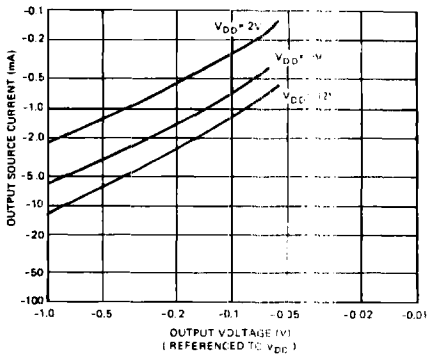


TYPICAL PERFORMANCE CHARACTERISTICS

OUTPUT SINK CURRENT AS A FUNCTION OF OUTPUT VOLTAGE

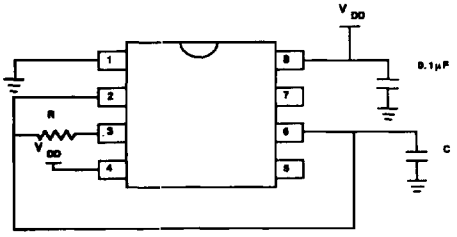


OUTPUT SOURCE CURRENT AS A FUNCTION OF OUTPUT VOLTAGE



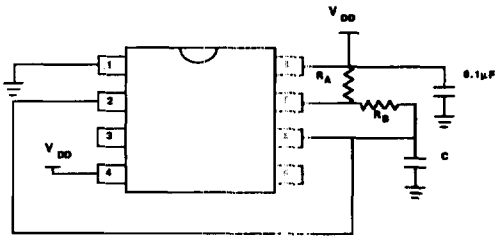
TYPICAL APPLICATIONS (EACH TIMER)

ASTABLE MODE OPERATION 50% DUTY CYCLE



Frequency f = 1/(1.4 RC)

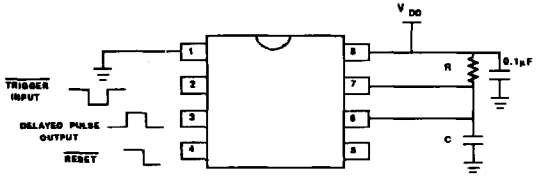
ASTABLE MODE OPERATION (FREE RUNNING OSCILLATOR)



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

MONOSTABLE MODE OPERATION (ONE SHOT PULSE)

Pulse Delay td = 1.1 RC



CHIP TOPOGRAPHY

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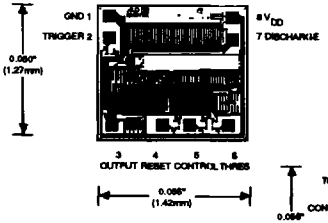

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