ADVANCED
LINEAR
DEVICES, INC.

ALD555

HIGH SPEED CMOS TIMER

GENERAL DESCRIPTION

The ALD555 timer is a high performance 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; reduced supply current spikes, allowing smaller and lower cost decoupling capacitors. It is capable of producing accurate time delays and oscillations in both monostable and astable operation. It operates in the one-shot (mono-stable) 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+ These levels can be adjusted by using the control terminal (pin 5). 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

- Functional equivalent to NE555 with greatly expanded high and low frequency ranges
- High speed, low power, monolithic CMOS technology
- Low supply current 100μA typical
- Extremely low trigger, threshold and reset currents -- 1pA typical
- High speed operation -- 2MHz oscillation
- Low operating supply voltage 2 to 12V
- Operates in both monostable and astable modes
- Fixed 50% duty cycle or adjustable duty cycle CMOS, NMOS and TTL compatible input/output
- High discharge sinking current (80mA)
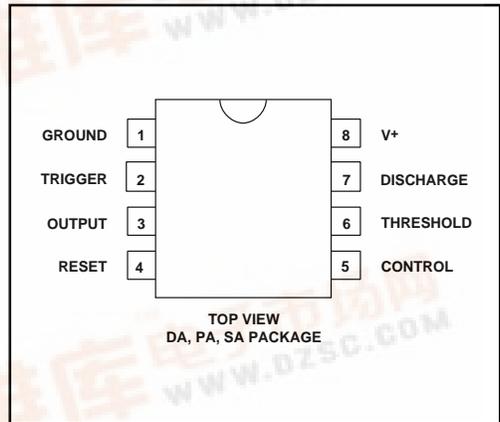- Low supply current spikes

ORDERING INFORMATION

Operating Temperature Range *		
-55°C to +125°C	0°C to +70°C	0°C to +70°C
8-Pin CERDIP Package	8-Pin Small Outline Package (SOIC)	8-Pin Plastic Dip Package
ALD555 DA	ALD555 SA	ALD555 PA

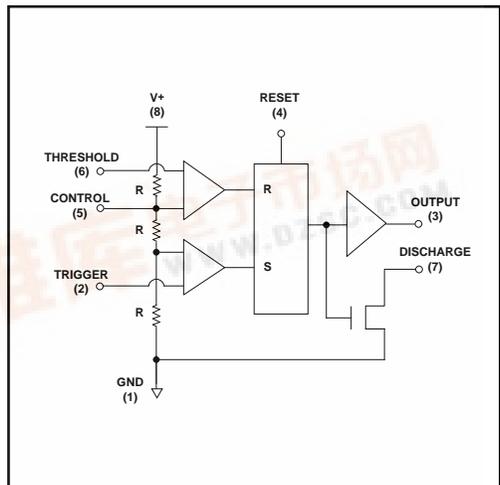* Contact factory for industrial temperature range

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

PIN CONFIGURATION

GROUND	1		8	V+
TRIGGER	2		7	DISCHARGE
OUTPUT	3		6	THRESHOLD
RESET	4		5	CONTROL

TOP VIEW
DA, PA, SA PACKAGE

BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS

Supply voltage, V+ ————————————————————————— 13.2V
Input voltage range ————————————————————————— -0.3V to V+ +0.3V
Power dissipation ————————————————————————— 600 mW
Operating temperature range   PA,SA package ————————————————— 0°C to +70°C
                                              DA package ————————————————— -55°C to +125°C
Storage temperature range ————————————————————— -65°C to +150°C
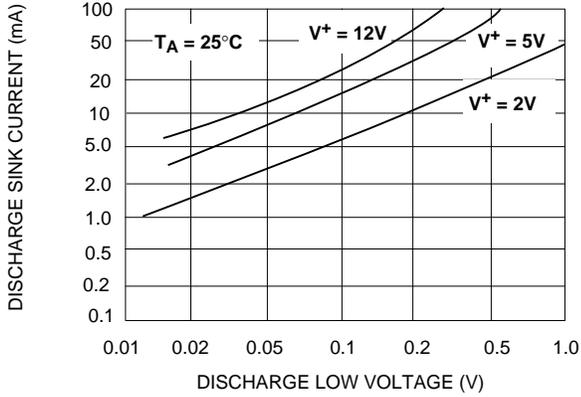Lead temperature, 10 seconds ——————————————————— +260°C

OPERATING ELECTRICAL CHARACTERISTICS
T_A = 25°C V+ = +5V unless otherwise specified

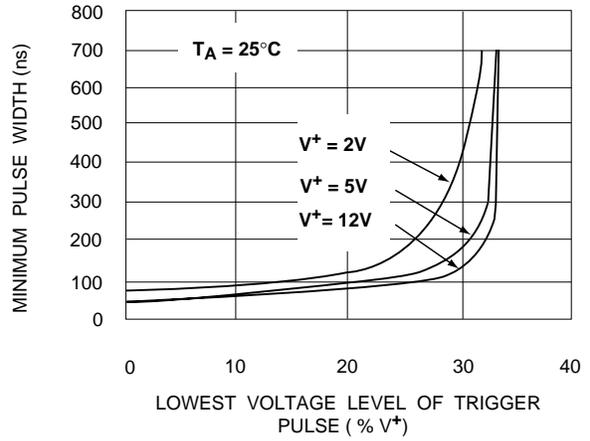| Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Supply Voltage	V+	2		12	V	
Supply Current	I_S		100	180	μA	Outputs Unloaded
Timing error / Astable mode Initial Accuracy	t_{err}		1.0	2.2	%	C = 0.1μF
Drift with Temperature [1] Drift with Supply Voltage [1]	$\Delta t/\Delta T$ $\Delta t/\Delta V^+$		10.0 0.1		ppm/°C %/V	R_A = 1KΩ R_B = 1KΩ
Threshold Voltage	V_{TH}	3.273	3.333	3.393	V	
Trigger Voltage	V_{TRIG}	1.607	1.667	1.737	V	
Trigger Current [2]	I_{TRIG}		.001	0.2	nA	
Reset Voltage	V_{RST}	0.4	0.7	1.0	V	
Reset Current [2]	I_{RST}		.001	0.2	nA	
Threshold Current [2]	I_{TH}		.001	0.2	nA	
Control Voltage Level	V_{CONT}	3.273	3.333	3.393	V	
Output Voltage Drop (Low)	V_{OL}		0.2	0.4	V	I_{SINK} = 10mA
Output Voltage Drop (High)	V_{OH}			4.2	V	I_{SOURCE} = -2mA
Rise Time of Output [1]	t_r		15	30	ns	R_L = 10MΩ
Fall Time of Output [1]	t_f		10	20	ns	C_L = 10pF
Discharge Transistor Leakage Current	I_{DL}		.01		nA	
Discharge Voltage Drop	V_{DISC}		0.5 0.2	1.0 0.4	V V	$I_{DISCHARGE}$ = 80mA $I_{DISCHARGE}$ = 30mA
Maximum Frequency Astable Mode	f_{MAX}	1.4	2		MHz	R_A = 470Ω R_B = 200Ω C_T = 200pF

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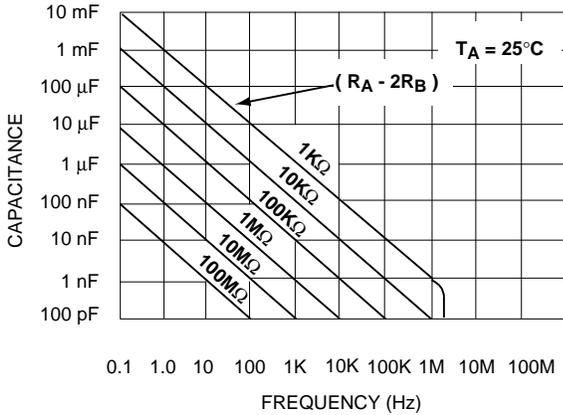
TYPICAL PERFORMANCE CHARACTERISTICS

DISCHARGE OUTPUT SINK CURRENT AS A FUNCTION OF DISCHARGE LOW VOLTAGE
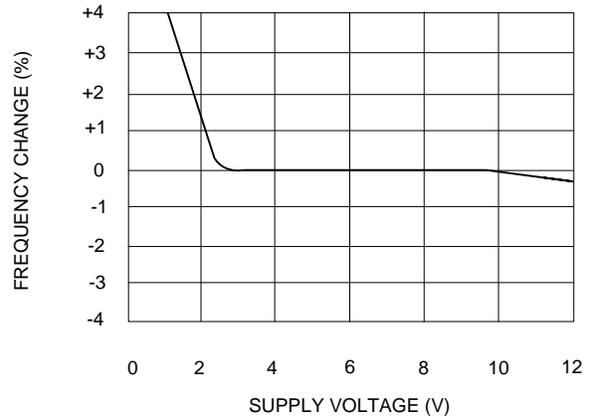
Plot: DISCHARGE SINK CURRENT (mA) vs DISCHARGE LOW VOLTAGE (V). $T_A = 25°C$. Curves for $V^+ = 12V$, $V^+ = 5V$, $V^+ = 2V$.

MINIMUM PULSE WIDTH REQUIRED FOR TRIGGERING

Plot: MINIMUM PULSE WIDTH (ns) vs LOWEST VOLTAGE LEVEL OF TRIGGER PULSE (% V^+). $T_A = 25°C$. Curves for $V^+ = 2V$, $V^+ = 5V$, $V^+ = 12V$.

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

Plot: CAPACITANCE vs FREQUENCY (Hz). $T_A = 25°C$. ($R_A - 2R_B$). Lines: 1KΩ, 10KΩ, 100KΩ, 1MΩ, 10MΩ, 100MΩ.

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

Plot: FREQUENCY CHANGE (%) vs SUPPLY VOLTAGE (V).

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

Plot: CAPACITANCE vs TIME DELAY. $T_A = 25°C$. R_A. Lines: 1KΩ, 10KΩ, 100KΩ, 1MΩ, 10MΩ, 100MΩ, 1GΩ.
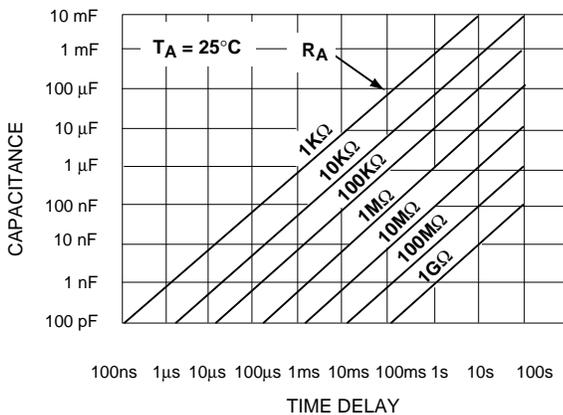
SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE

Plot: SUPPLY CURRENT (uA) vs SUPPLY VOLTAGE (V). Curves for $T_A = -40°C$, $T_A = +20°C$, $T_A = +85°C$.

TYPICAL PERFORMANCE CHARACTERISTICS

OUTPUT SINK CURRENT AS A FUNCTION OF OUTPUT VOLTAGE

$T_A = 25°C$

V+ = 5V
V+ = 12V
V+ = 2V

OUTPUT SINK CURRENT (mA)
OUTPUT VOLTAGE (V)

OUTPUT SOURCE CURRENT AS A FUNCTION OF OUTPUT VOLTAGE

V+ = 2V
V+ = 5V
V+ = 12V

OUTPUT SOURCE CURRENT (mA)
OUTPUT VOLTAGE (V)
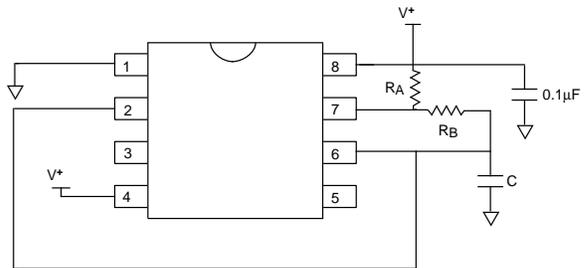(REFERENCED TO V+)
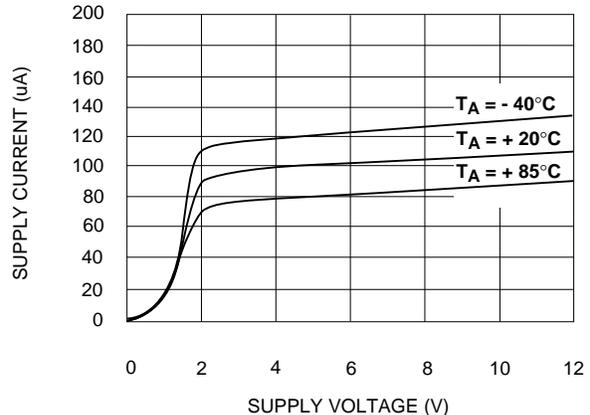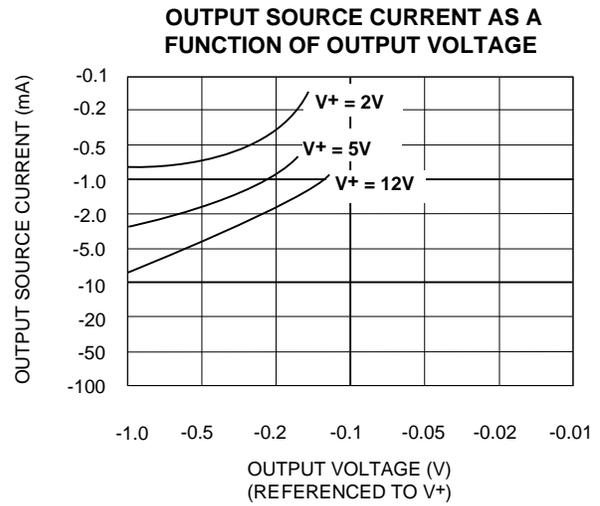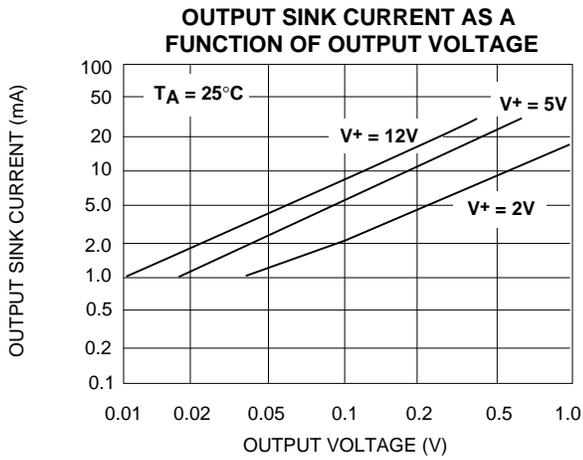
TYPICAL APPLICATIONS

ASTABLE MODE OPERATION 50% DUTY CYCLE

V+
0.1μF
R
V+
C
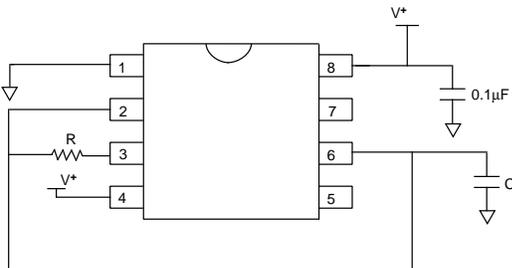
Frequency $f = 1 / (1.4\ R_C)$

ASTABLE MODE OPERATION (FREE RUNNING OSCILLATOR)

V+
R_A
R_B
0.1μF
V+
C

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 $t_d = 1.1\ R_C$

V+
R
0.1μF
TRIGGER INPUT
DELAYED PULSE OUTPUT
RESET
C