NEC
ELECTRON DEVICE

MOS INTEGRATED CIRCUIT
μPD5556

DUAL CMOS TIMER

Description

The μPD5556 is a dual CMOS RC timer providing significantly improved performance over the standard bipolar 556 timer, while at the same time being direct replacement for that device in most applications. Improved parameters include low supply current, wide operating supply voltage range, THRESHOLD, TRIGGER and RESET currents as low as 2 pA, no crowbarring of the power supply during output transitions, higher frequency performance, and no requirement to decouple control voltage for stable operation.

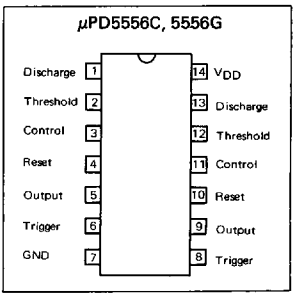
Specifically, the μPD5556 is stable controller capable of producing accurate time delays or frequencies.

In the one-shot mode, the pulse width of each circuit is precisely controlled by one external resistor and capacitor. For astable operation as an oscillator, the free running frequency and the duty cycle are controlled by two external resistors and one capacitor. The circuits can source or sink current large enough to drive TTL loads or provide minimal offsets to drive CMOS loads.

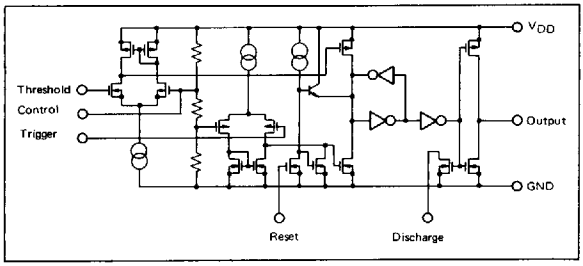
Features

- Exact equivalent in most cases for industry standard 556 timer
- Low supply current
- 3 to 16 V operating voltage range
- Timing from microseconds through hours

CONNECTION DIAGRAM (Top View)



EQUIVALENT CIRCUIT (1/2 circuit)



ORDERING INFORMATION

Part Number	Package
μPD5556C	14 PIN PLASTIC DIP (300 mil)
μPD5556G2	14 PIN PLASTIC SOP (225 mil)

ABSOLUTE MAXIMUM RATINGS (T_a=25 °C)

PARAMETER		SYMBOL	μPD5555	UNIT
Supply Voltage		V_{DD}	18	V
Input Voltage (Trigger, Threshold Reset, Control)		V_{IN}	$GND - 0.3 \leqq V_{IN} \leqq V_{DD} + 0.3$	V
Output Current		I_O	100	mA
Operating Temperature Range		T_{opt}	−20 ~ +70	°C
Storage Temperature Range		T_{stg}	−55 ~ +125	°C
Power Dissipation	C Package	P_T	570	mW
	G Package (Note 1)		550	

Note 1: Thermal derating factor is 5.5 mW/°C when ambient temperature is higher than 25 °C.

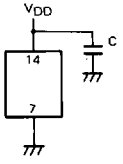
RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Oscillation Frequency				500	kHz
Supply Voltage	V_{DD}	3		16	V
Input Voltage	V_{IN}	0		V_{DD}	V
Output Sink Current	$I_{O\ SINK}$			3.2	mA
Output Source Current	$I_{O\ SOURCE}$			1	mA
Operating Temperature	T_{opt}	−20		70	°C

ELECTRICAL CHARACTERISTICS (T_a=25 °C, V_{DD}=+3~+15 V)

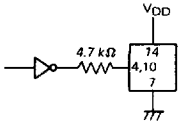
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Supply Current	I_{DD}		150	500	μA	V_{DD}=5 V
			200	700		V_{DD}=15 V
Threshold Voltage	V_{th}		2/3 V_{DD}		V	
Threshold Current	I_{th}		50		pA	V_{DD}=15 V
			10			V_{DD}=5 V
			1			V_{DD}=3 V
Trigger Voltage	V_{tr}		1/3 V_{DD}		V	
Trigger Current	I_{tr}		50		pA	V_{DD}=15 V
			10			V_{DD}=5 V
			1			V_{DD}=3 V
Reset Voltage	V_{reset}	0.6	1.1	2.0	V	V_{DD}=15 V
(V_O becoms low)		0.6	1.1	2.0		V_{DD}=3 V
Reset Current	I_{reset}		100		pA	V_{RESET}=GND, V_{DD}=15 V
			20			V_{RESET}=GND, V_{DD}=5 V
			2			V_{RESET}=GND, V_{DD}=3 V
Output Low Voltage	V_{OL}		0.06	0.4	V	V_{DD}=15 V, I_{SINK}=3.2 mA
			0.14	0.4		V_{DD}=5 V, I_{SINK}=3.2 mA
Output High Voltage	V_{OH}	14.25	14.85		V	V_{DD}=15 V, I_{SOURCE}=1 mA
		4.0	4.7			V_{DD}=5 V, I_{SOURCE}= 1 mA
Output Rise Time	t_{rise}		60		ns	R_L=10 MΩ, C_L=7 pF, V_{DD}=5 V
Output Fall Time	t_{fall}		60		ns	R_L=10 MΩ, C_L=7 pF, V_{DD}=5 V
Max. Oscillation Frequency		500			kHz	Astable Operation
Propagation Delay	t_{pd}		400		ns	Monostable Operation Trigger Level = 0.1 · V_{DD}
Minimum Trigger Pulse Width (V_{DD}=5 V)	t_{tr}		190		ns	Trigger Level = 0.1 · V_{DD}
Control Voltage	V_{cont}		2/3 V_{DD}		V	
Timing Error Initial Accuracy			2		%	R_1, R_2=1 k~100 kΩ C=0.1 μF V_{DD}=5~15 V
Temparature Drift			50		ppm/°C	
Supply Voltage Driff			1		%/V	

Note 1: To reduce transient switching noise on the supply voltage line, install a bypass capacitor from V_{DD} to ground. Connect the capacitor, with value listed below, close to V_{DD}.



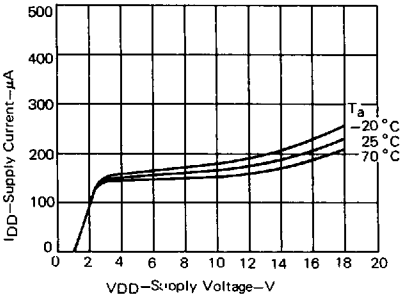
Capacitance $C \geqq 0.047\ \mu F$ $V_{DD} \leqq 10$ V
$C \geqq 0.1\ \mu F$ $V_{DD} \geqq 10$ V

Note 2: Install a series resistor ($R \geqq 4.7$ kΩ) to Reset, when reset is controled by digital devices.

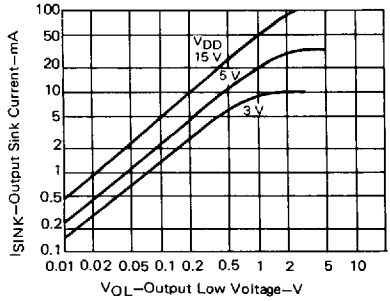


TYPICAL PERFORMANCE CHARACTERISTICS
(T_a=25 °C)

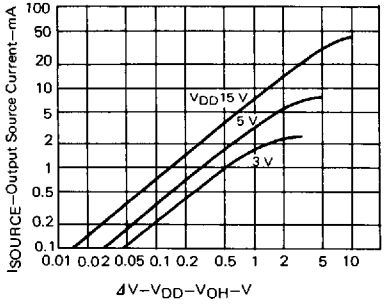
SUPPLY CURRENT



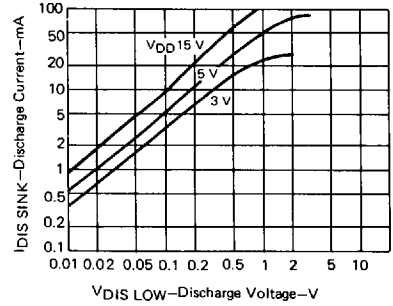
OUTPUT SINK CURRENT



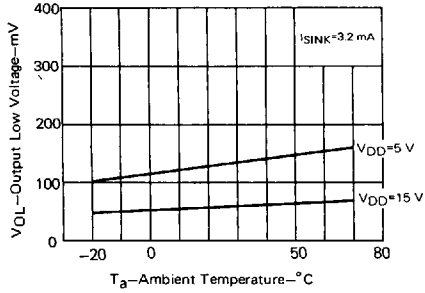
OUTPUT SOURCE CURRENT



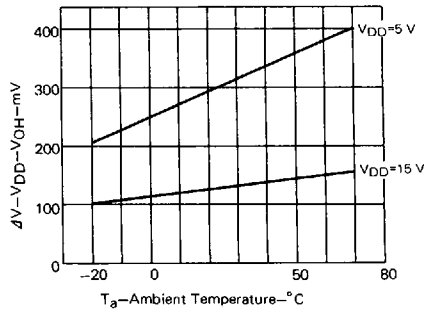
DISCHARGE CURRENT



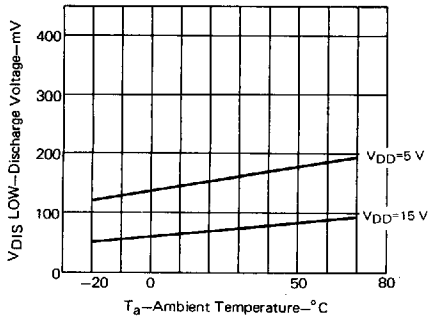
OUTPUT LOW VOLTAGE



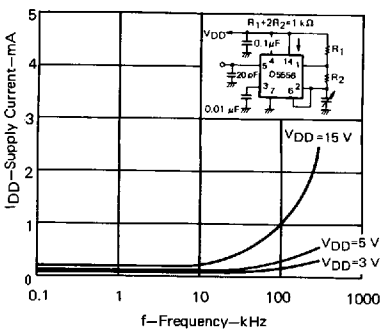
V_{DD}-OUTPUT HIGH VOLTAGE



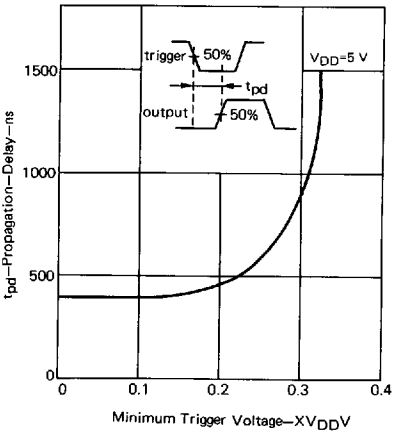
DISCHARGE VOLTAGE



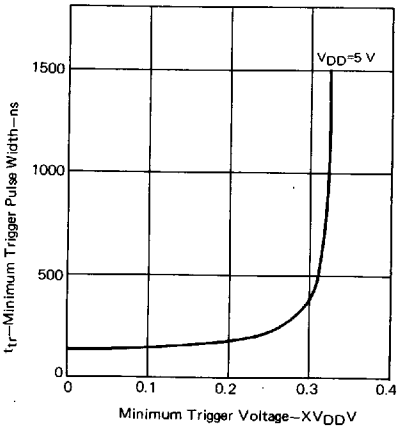
DYNAMIC CURRENT



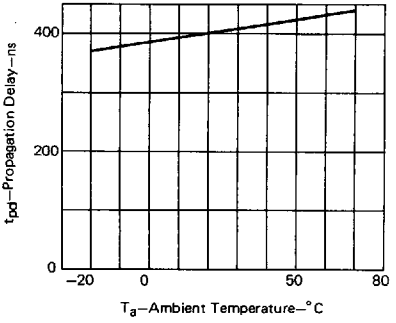
PROPAGATION DELAY



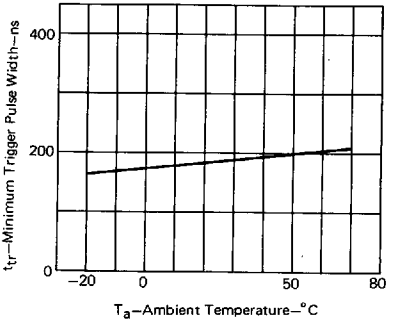
MINIMUM TRIGGER PULSE WIDTH



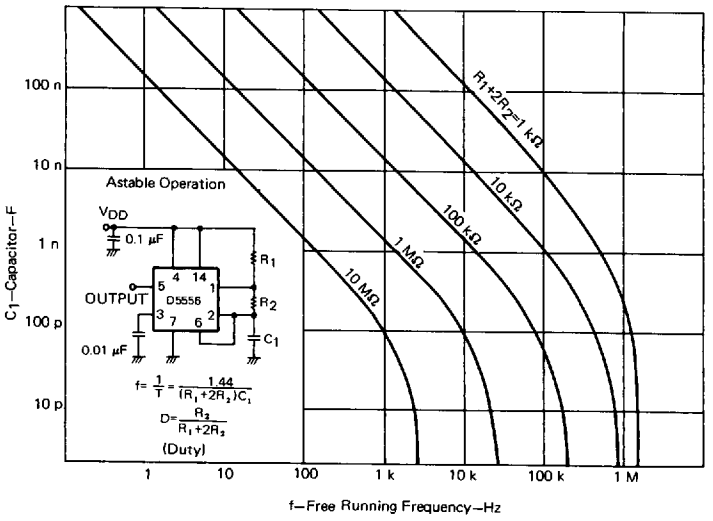
PROPAGATION DELAY



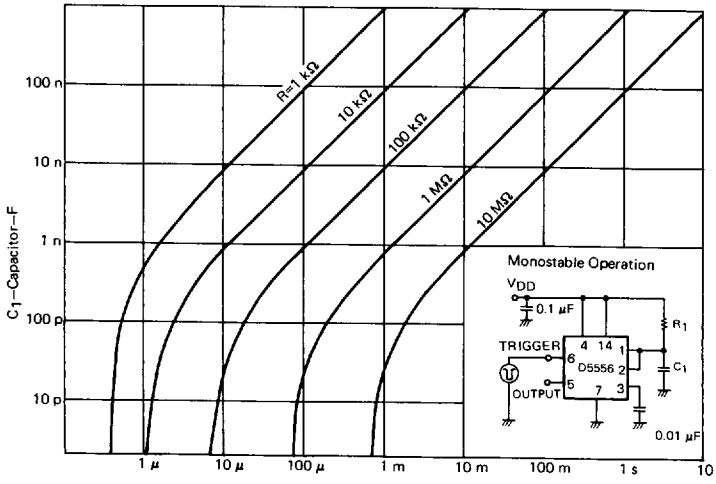
MINIMUM TRIGGER PULSE WIDTH



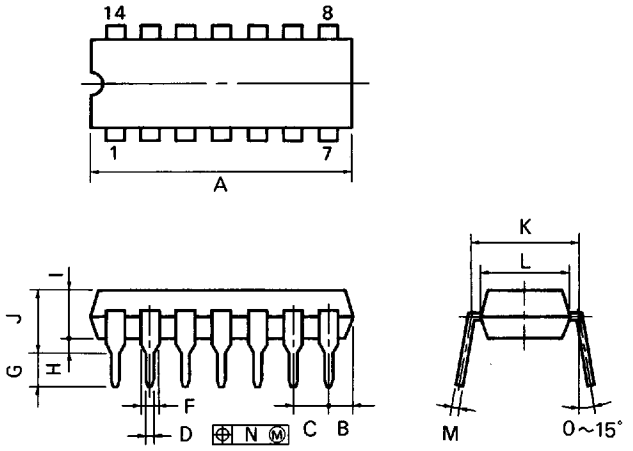
FREE RUNNING FREQUENCY



TIME DELAY



14PIN PLASTIC DIP (300 mil)



P14C-100-300B1

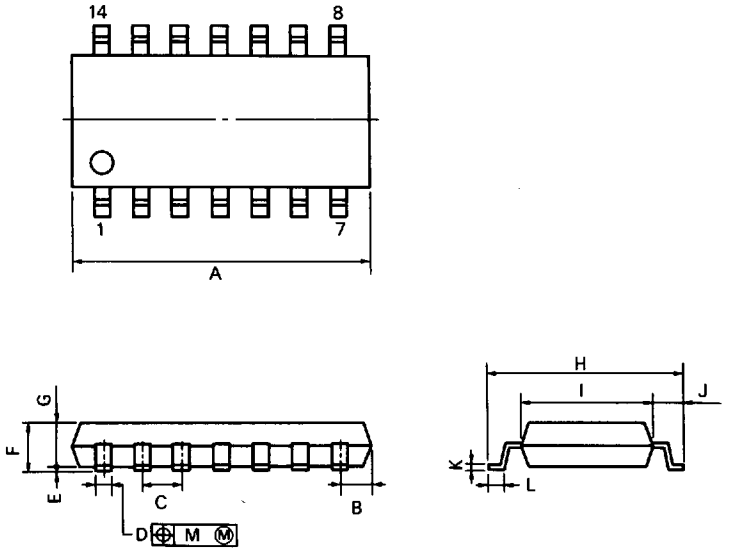
NOTES

1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	20.32 MAX.	0.800 MAX.
B	2.54 MAX.	0.100 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	$0.50^{+0.10}$	$0.020^{+0.004}_{-0.005}$
F	1.2 MIN.	0.047 MIN.
G	$3.6^{\pm0.3}$	$0.142^{\pm0.012}$
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L	6.4	0.252
M	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
N	0.25	0.01

14PIN PLASTIC SOP (225 mil)



S14GM-50-225B, C

NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	10.46 MAX.	0.412 MAX.
B	1.42 MAX.	0.056 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
E	0.1 ± 0.1	0.004 ± 0.004
F	1.8 MAX.	0.071 MAX.
G	1.49	0.059
H	6.5 ± 0.3	0.256 ± 0.012
I	4.4	0.173
J	1.1	0.043
K	$0.15^{+0.10}_{-0.05}$	$0.006^{+0.004}_{-0.002}$
L	0.6 ± 0.2	$0.024^{+0.008}_{-0.009}$
M	0.12	0.005

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