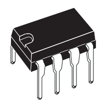
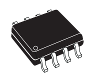
3V LOW POWER SINGLE TIMERS

- DEDICATED TO **3.3V** OR **BATTERY SUPPLY** (Specified at 3V and 5V)
- VERY LOW POWER CONSUMPTION : **90µA typ at V_{CC} = 3V**
- WIDE SINGLE SUPPLY RANGE : **+2.7V to +16V**
- HIGH OUTPUT CURRENT CAPABILITY
- SUPPLY CURRENT SPIKES REDUCED DURING OUTPUT TRANSITIONS
- HIGH INPUT IMPEDANCE : **$10^{12}\Omega$**
- PIN-TO-PIN AND FUNCTIONALLY COMPATIBLE WITH BIPOLAR NE555 AND CMOS TS555
- OUTPUT COMPATIBLE WITH TTL,CMOS AND LOGIC MOS

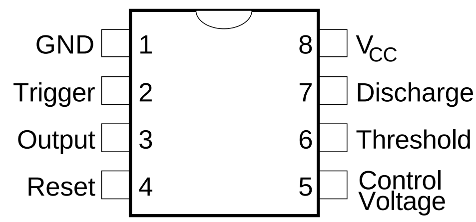


N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)

PIN CONNECTIONS (top view)



DESCRIPTION

The TS3V555 with its low consumption (90µA at V_{CC} = 3V) is a single CMOS timer dedicated to 3.3V or battery supply (specified at 3V and 5V) offering also a high frequency ($f_{(max)}$ 2MHz at V_{CC} = 3V and 2.7MHz at V_{CC} = 5V). Thus, either in monosatble or astable mode, timing remains very accurate.

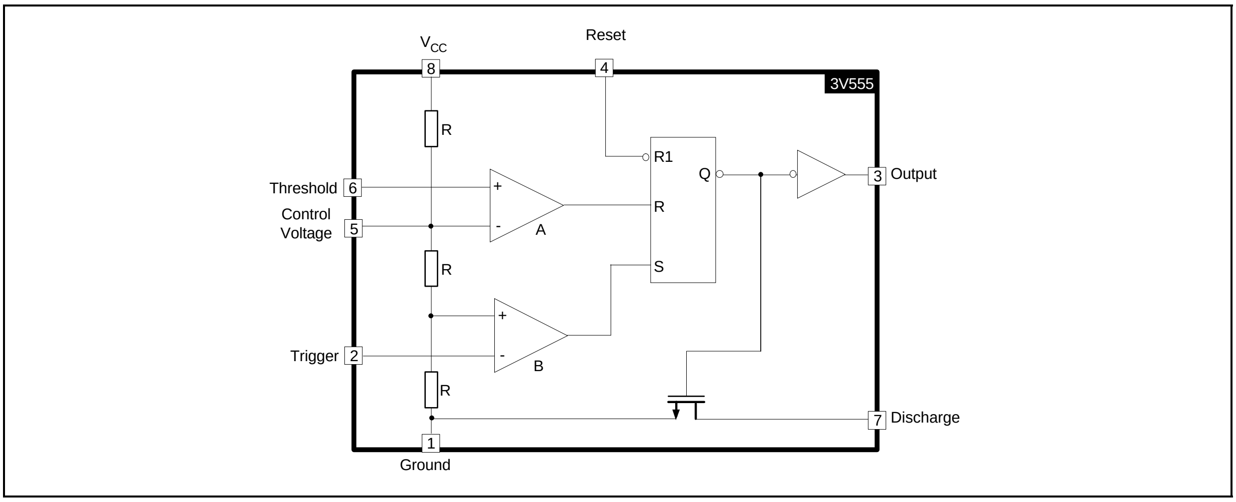
Timing capacitors can also be minimized due to high input impedance ($10^{12}\Omega$).

ORDER CODE

Part Number	Temperature Range	Package	
		N	D
TS3V555I	-40, +125°C	•	•

N = Dual in Line Package (DIP)
D = Small Outline Package (SO) - also available in Tape & Reel (DT)
P = Thin Shrink Small Outline Package (TSSOP) - only available in Tape & Reel (PT)

BLOCK DIAGRAM



RESET	TRIGGER	THRESHOLD	OUTPUT
Low	x	x	Low
High	Low	x	High
High	High	High	Low
High	High	Low	Previous State

LOW <-----> Level Voltage ≤ Min voltage specificed
HIGH <-----> Level Voltage ≥ Max voltage specificed
x <-----> Irrelevant

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	+18	V
T_j	Junction Temperature	+150	°C

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
T_{oper}	Operating Free Air Temperature Range TS3V555I, AI	-40 to 125	°C
T_{stg}	Storage Temperature Range	-65 to +150	°C

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	+2.7 to +16	V

ELECTRICAL CHARACTERISTICS

V_{CC} = +3V, T_{amb} = +25°C, Reset to V_{CC} (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current (no load, High and Low States) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		90	230 230	µA
V_{CL}	Control Voltage Level T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	1.8 1.7	2	2.2 2.3	V
V_{dis}	Discharge Stauration Voltage (I_{dis} = 1mA) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		0.05	0.2 0.25	V
V_{OL}	Low Level Output Voltage (I_{sink} = 1mA) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		0.1	0.3 0.35	V
V_{OH}	High Level Output Voltage (I_{source} = -0.3mA) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	2.5 2.5	2.9		V
V_{trig}	Trigger Voltage T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	0.9 0.8	1	1.1 1.2	V
I_{trig}	Trigger Current		10		pA
I_{TH}	Threshold Current		10		pA
V_{reset}	Reset Voltage T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	0.4 0.3	1.1	1.5 2.0	V
I_{reset}	Reset Current		10		pA
I_{dis}	Discharge Pin Leakage Current		1	100	nA

DYNAMIC

Symbol	Parameter	Min.	Typ.	Max.	Unit
	Timing Accuracy (Monostable) - note 1) R = 10kΩ, C = 0.1µF		1		%
	Timing Shift with Supply Voltage Variations (Monostable R = 10kΩ, C = 0.1µF,V_{CC} = +3V ±0.3V - see note 1		0.5		%/V
	Timing Shift with Temperature - see note 1 $T_{min.} \le T_{amb} \le T_{max}$.5		75		ppm/°C
f_{max}	Maximum Astable Frequency - note 2) R_A = 470Ω, R_B = 200Ω, C = 200pF		2		MHz
	Astable Frequency Accuracy - see note 2 R_A =R_B = 1kΩ to 100kΩ, C = 0.1µF		5		%
	Timing Shift with Supply Voltage Variations (Astable mode) - see note 2 R_A =R_B = 1kΩ to 100kΩ, C = 0.1µF, V_{CC} = +3 to +5V		0.5		%/V
tr	Output Rise Time (C_{load} = 10pF)		25		ns
tf	Output Fall Time (C_{load} = 10pF)		20	-	ns
tpd	Trigger Propagation Delay)		100		ns
trpw	Minimum Reset Pulse Width (V_{trig} = +3V)		350		ns

1. see figure 2
2. see figure 4

ELECTRICAL CHARACTERISTICS

V_{CC} = +5V, T_{amb} = +25°C, Reset to V_{CC} (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current (no load, High and Low States) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		110	250 250	µA
V_{CL}	Control Voltage Level T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	2.9 2.8	3.3	3.8 3.9	V
V_{dis}	Discharge Stauration Voltage (I_{dis} = 10mA) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		0.2	0.3 0.35	V
V_{OL}	Low Level Output Voltage (I_{sink} = 8mA) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$		0.3	0.6 0.8	V
V_{OH}	High Level Output Voltage (I_{source} = -2mA) T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	4.4 4.4	4.6		V
V_{trig}	Trigger Voltage T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	1.36 1.26	1.67	1.96 2.06	V
I_{trig}	Trigger Current		10		pA
I_{TH}	Threshold Current		10		pA
V_{reset}	Reset Voltage T_{amb} = +25°C $T_{min.} \le T_{amb} \le T_{max.}$	0.4 0.3	1.1	1.5 2.0	V
I_{reset}	Reset Current		10		pA
I_{dis}	Discharge Pin Leakage Current		1	100	nA

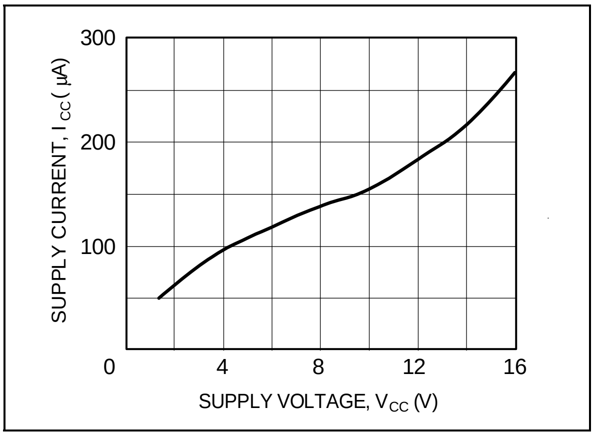
DYNAMIC

Symbol	Parameter	Min.	Typ.	Max.	Unit
	Timing Accuracy (Monostable) - note 1) R = 10kΩ, C = 0.1µF		2		%
	Timing Shift with Supply Voltage Variations (Monostable R = 10kΩ, C = 0.1µF,V_{CC} = +5V ±1V - see note 1		0.38		%/V
	Timing Shift with Temperature - see note 1 $T_{min.} \le T_{amb} \le T_{max}$.5		75		ppm/°C
f_{max}	Maximum Astable Frequency - note 2) R_A = 470Ω, R_B = 200Ω, C = 200pF		2.7		MHz
	Astable Frequency Accuracy - see note 2 R_A =R_B = 1kΩ to 100kΩ, C = 0.1µF		3		%
	Timing Shift with Supply Voltage Variations (Astable mode) - see note 2 R_A =R_B = 10kΩ, C = 0.1µF, V_{CC} = +5 to +12V		0.1		%/V
tr	Output Rise Time (C_{load} = 10pF)		25		ns
tf	Output Fall Time (C_{load} = 10pF)		20	-	ns
tpd	Trigger Propagation Delay)		100		ns
trpw	Minimum Reset Pulse Width (V_{trig} = +5V)		350		ns

1. see figure 2
2. see figure 4

TYPICAL CHARACTERISTICS

Figure 1 : Supply Current (each timer) versus Supply Voltage

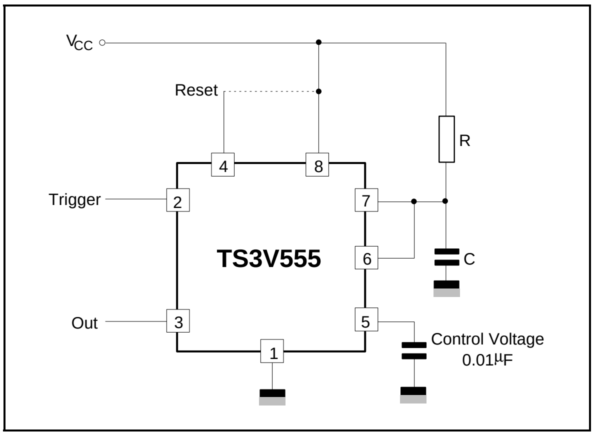


APPLICATION INFORMATION

MONOSTABLE OPERATION

In the monostable mode,the timer functions as a one-shot. Referring to figure 2 the external capacitor is initially held discharged by a transistor inside the timer.

Figure 2 :



The circuit triggers on a negative-going input signal when the level reaches 1/3 V_{CC}. Once triggered,the circuit remains in this state until the set time has elapsed,even if it is triggered again during this interval. The duration of the output HIGH state is given by t = 1.1 R x C.

Notice that since the charge rate and the threshold level of the comparator are both directly proportional to supply voltage, the timing interval is independent of supply. Applying a negative pulse simultaneously to the Reset terminal (pin 4) and the Trigger terminal (pin 2) during the timing cycle discharges the external capacitor and causes the cycle to start over. The timing cycle now starts on the positive edge of the reset pulse. During the time the reset pulse is applied, the output is driven to its LOW state.

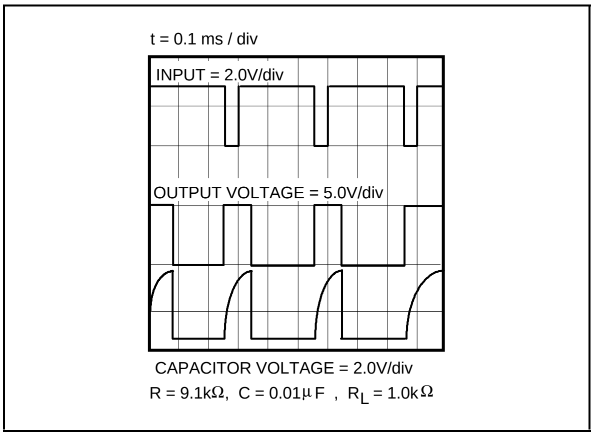
When a negative trigger pulse is applied to pin 2, the flip-flop is set, releasing the short circuit across the external capacitor and driving the output HIGH. The voltage across the capacitor increases exponentially with the time constant τ = R x C.

When the voltage across the capacitor equals 2/3 V_{CC}, the comparator resets the flip-flop which then discharges the capacitor rapidly and drives the output to its LOW state.

Figure 3 shows the actual waveforms generated in this mode of operation.

When Reset is not used, it should be tied high to avoid any possible or false triggering.

Figure 3 :



ASTABLE OPERATION

When the circuit is connected as shown in figure 4 (pin 2 and 6 connected) it triggers itself and free runs as a multivibrator. The external capacitor charges through R_A and R_B and discharges through R_B only. Thus the duty cycle may be precisely set by the ratio of these two resistors.

In the astable mode of operation, C charges and discharges between 1/3 V_{CC} and 2/3 V_{CC}. As in the triggered mode, the charge and discharge times and therefore frequency, are independent of the supply voltage.

Figure 5 shows actual waveforms generated in this mode of operation.
The charge time (output HIGH) is given by :
$t1 = 0.693\ (R_A + R_B)\ C$
and the discharge time (output LOW) by :
$t2 = 0.693\ (R_B)\ C$
Thus the total period T is given by :
$T = t1 + t2 = 0.693\ (R^A + 2R_B)\ C$
The frequency of oscillation is then :

$$f = \frac{1}{T} = \frac{1.44}{(RA + 2RB)C}$$

The duty cycle is given by :

$$D = \frac{RB}{RA + 2RB}$$

Figure 4 :

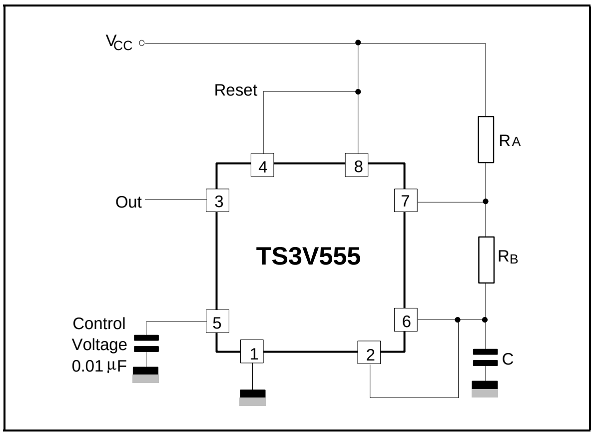
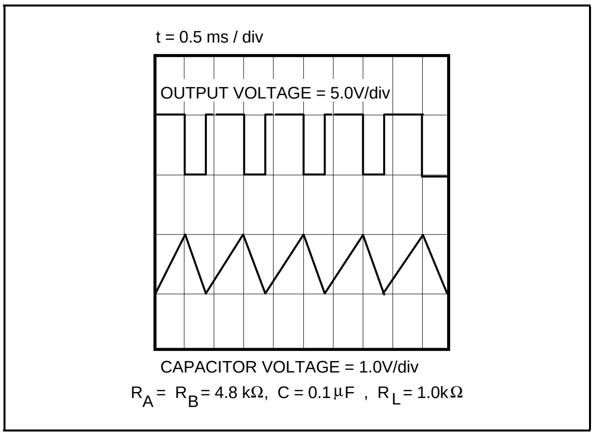


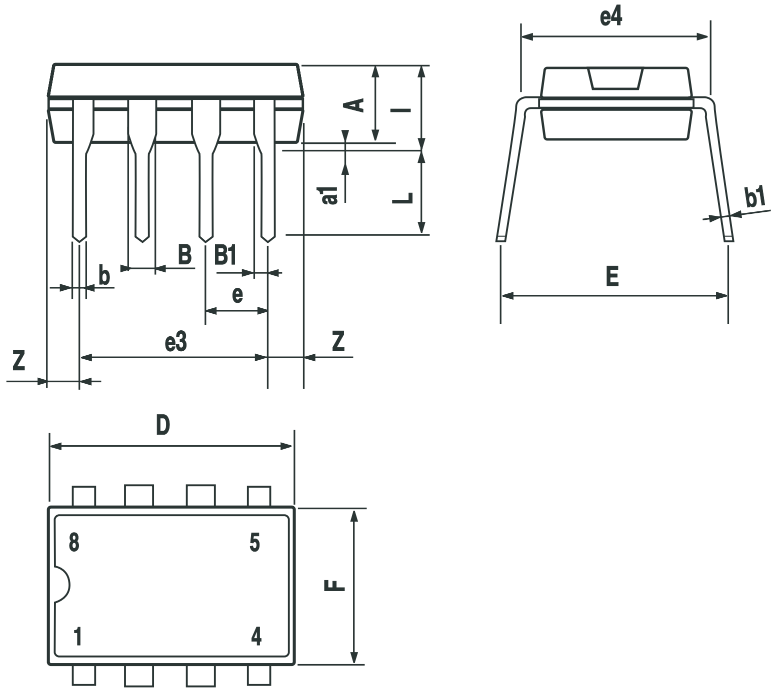
Figure 5 :



PACKAGE MECHANICAL DATA

Plastic DIP-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063

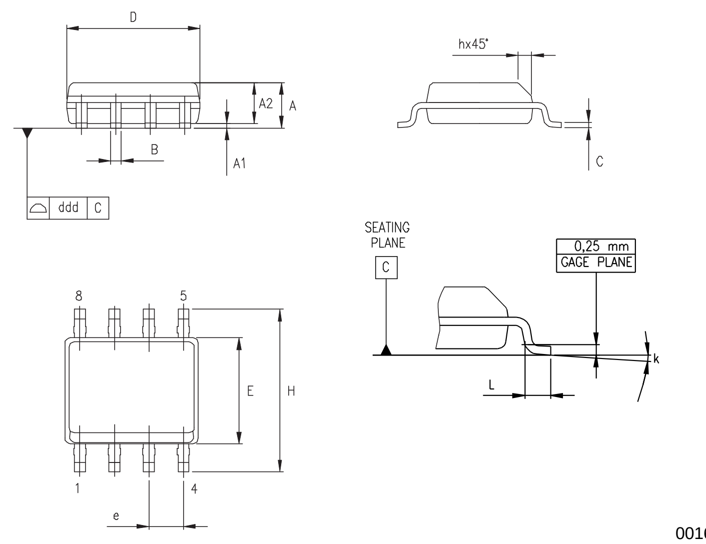


P001F

PACKAGE MECHANICAL DATA

SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	8° (max.)					
ddd			0.1			0.04



0016023/C