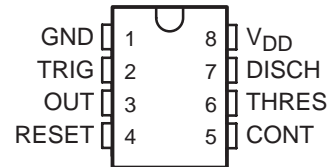


- **Very Low Power Consumption**  
 – 1 mW Typ at  $V_{DD} = 5\text{ V}$
- **Capable of Operation in Astable Mode**
- **CMOS Output Capable of Swinging Rail to Rail**
- **High Output-Current Capability**  
 – Sink 100 mA Typ  
 – Source 10 mA Typ
- **Output Fully Compatible With CMOS, TTL, and MOS**
- **Low Supply Current Reduces Spikes During Output Transitions**
- **Single-Supply Operation From 2 V to 15 V**
- **Functionally Interchangeable With the 555NE; Has Same Pinout**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015.2**
- **Available in Q-Temp Automotive High Reliability Automotive Applications Configuration Control/Print Support Qualification to Automotive Standards**

**description**

The XD/XL555 is a monolithic timing circuit fabricated using the TI LinCMOS™ process. The timer is fully compatible with CMOS, TTL, and MOS logic and operates at frequencies up to 2 MHz. Because of its high input impedance, this device uses smaller timing capacitors than those used by the 555NE. As a result, more accurate time delays and oscillations are possible. Power consumption is low across the full range of power supply voltage.

D, DB, JG, OR P PACKAGE  
 (TOP VIEW)



Like the 555NE, the XD/XL555 has a trigger level equal to approximately one-third of the supply voltage and a threshold level equal to approximately two-thirds of the supply voltage. These levels can be altered by use of the control voltage terminal (CONT). When the trigger input (TRIG) falls below the trigger level, the flip-flop is set and the output goes high. If TRIG is above the trigger level and the threshold input (THRES) is above the threshold level, the flip-flop is reset and the output is low. The reset input (RESET) can override all other inputs and can be used to initiate a new timing cycle. If RESET is low, the flip-flop is reset and the output is low. Whenever the output is low, a low-impedance path is provided between the discharge terminal (DISCH) and GND. All unused inputs should be tied to an appropriate logic level to prevent false triggering.

While the CMOS output is capable of sinking over 100 mA and sourcing over 10 mA, the XD/XL555 exhibits greatly reduced supply-current spikes during output transitions. This minimizes the need for the large decoupling capacitors required by the 555NE.

# XD555 DIP8 / XL555 SOP8

## description (continued)

The XD/XL555 is characterized for operation from 0 °C to 70 °C. The XD/XL555 is characterized for operation from –40 °C to 85 °C. The XD/XL555 is characterized for operation over the automotive temperature range of –40 °C to 125 °C. The XD/XL555 is characterized for operation over the full military temperature range of –55 °C to 125 °C.

### AVAILABLE OPTIONS†

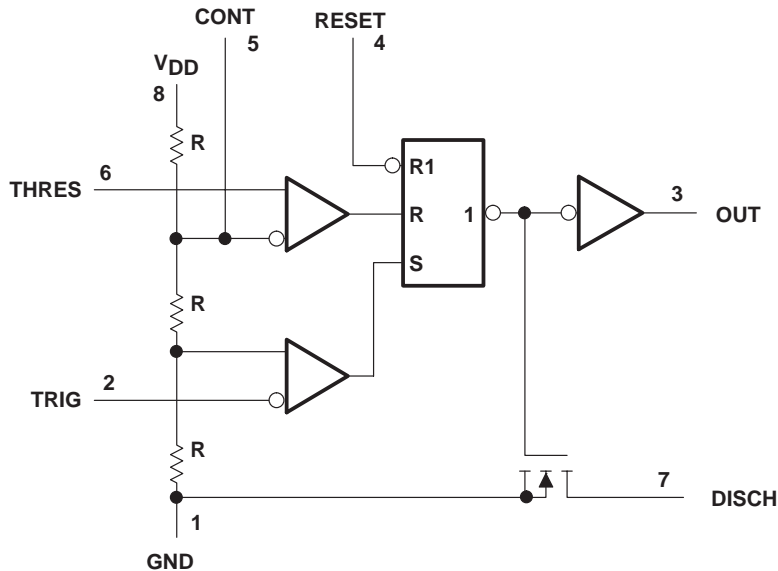
PACKAGED DEVICES							
T <sub>A</sub>	V <sub>DD</sub> RANGE	SMALL OUTLINE (D)‡	SSOP (DB)‡	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	TSSOP (PW)‡
0 °C to 70 °C	2 V to 15 V	XL555	—	—	—	XD555	—
–40 °C to 85 °C	3 V to 15 V		—	—	—	XD555	—
–40 °C to 125 °C	5 V to 15 V		—	—	—	—	—
–55 °C to 125 °C	5 V to 15 V		—	—	—	XD555	—

### FUNCTION TABLE

RESET VOLTAGE‡	TRIGGER VOLTAGE‡	THRESHOLD VOLTAGE‡	OUTPUT	DISCHARGE SWITCH
<MIN	Irrelevant	Irrelevant	L	On
>MAX	<MIN	Irrelevant	H	Off
>MAX	>MAX	>MAX	L	On
>MAX	>MAX	<MIN	As previously established	

‡ For conditions shown as MIN or MAX, use the appropriate value specified under electrical characteristics.

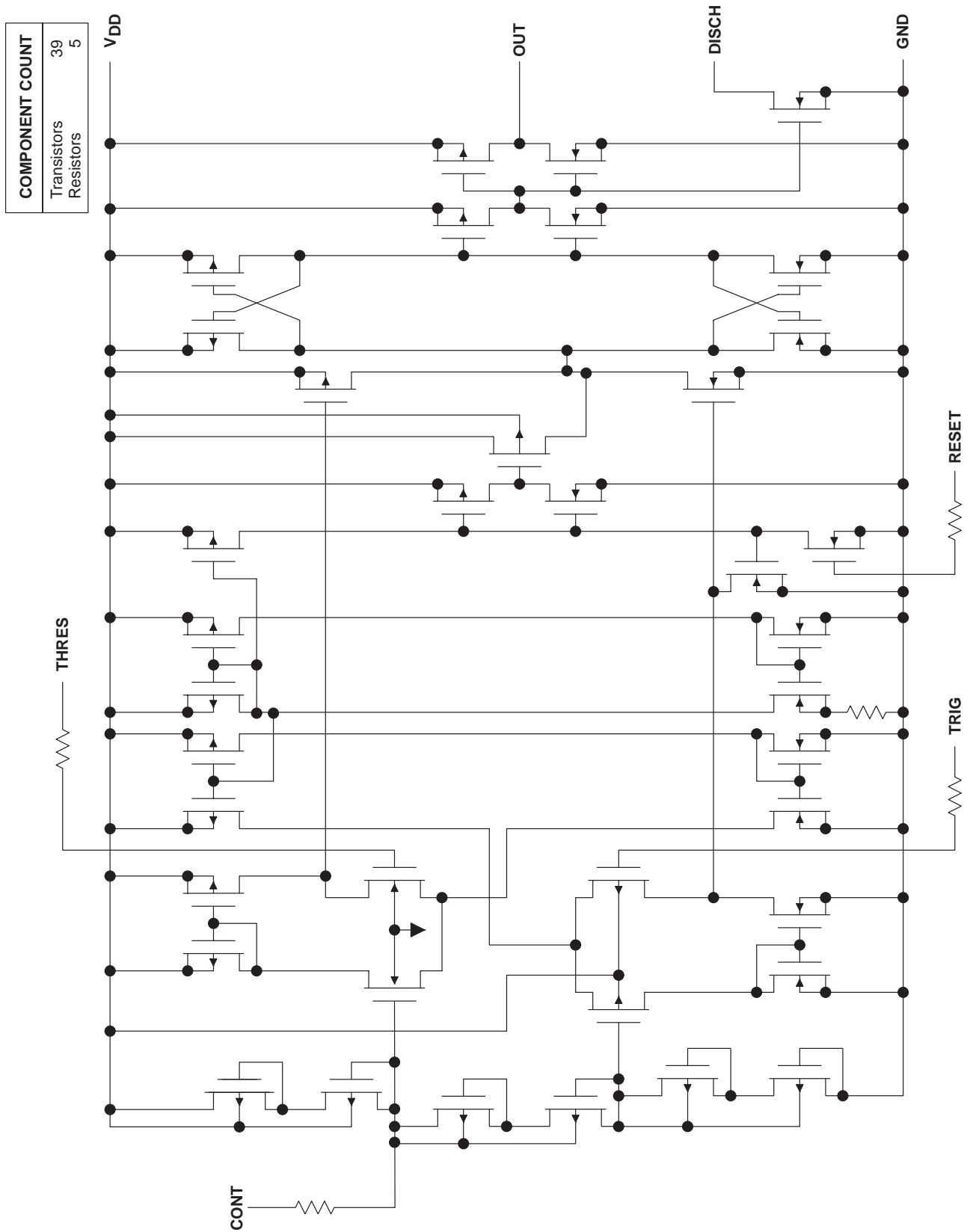
## functional block diagram



Pin numbers are for all packages except the FK package. RESET can override TRIG, which can override THRES.

# XD555 DIP8 / XL555 SOP8

equivalent schematic (each channel)



# XD555 DIP8 / XL555 SOP8

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, $V_{DD}$ (see Note 1)	18 V
Input voltage range, $V_I$ (any input)	-0.3 to $V_{DD}$
Sink current, discharge or output	150 mA
Source current, output, $I_O$	15 mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, $T_A$ : C-suffix	0°C to 70°C
I-suffix	-40°C to 85°C
Q-suffix	-40°C to 125°C
M-suffix	-55°C to 125°C
Storage temperature range	-65°C to 150°C
Case temperature for 60 seconds: FK package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG package	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, DB, P, or PW package	260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values are with respect to network GND.

**DISSIPATION RATING TABLE**

PACKAGE	$T_A \leq 25^\circ\text{C}$	DERATING FACTOR	$T_A = 70^\circ\text{C}$	$T_A = 85^\circ\text{C}$	$T_A = 125^\circ\text{C}$
	POWER RATING	ABOVE $T_A = 25^\circ\text{C}$	POWER RATING	POWER RATING	POWER RATING
D	725 mW	5.8 mW/°C	464 mW	377 mW	145 mW
DB	525 mW	4.2 mW/°C	336 mW	273 mW	105 mW
FK	1375 mW	11.0 mW/°C	880 mW	715 mW	275 mW
JG	1050 mW	8.4 mW/°C	672 mW	546 mW	210 mW
P	1000 mW	8.0 mW/°C	640 mW	520 mW	200 mW
PW	525 mW	4.2 mW/°C	336 mW	273 mW	105 mW

## recommended operating conditions

		MIN	MAX	UNIT
Supply voltage, $V_{DD}$		2	15	V
Operating free-air temperature range, $T_A$	XL555	0	70	°C
		-40	85	
	XL555	-40	125	
		-55	125	

# XD555 DIP8 / XL555 SOP8

electrical characteristics at specified free-air temperature,  $V_{DD} = 2\text{ V}$  for XD/XL555,  $V_{DD} = 3\text{ V}$  for XD/XL555

PARAMETER	TEST CONDITIONS	$T_A$ †	XD555			XL555			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
$V_{IT}$ Threshold voltage		25°C	0.95	1.33	1.65	1.6	2.4	V	
		Full range	0.85		1.75	1.5	2.5		
$I_{IT}$ Threshold current		25°C	10			10			pA
		MAX	75			150			
$V_{I(TRIG)}$ Trigger voltage		25°C	0.4	0.67	0.95	0.71	1	1.29	V
		Full range	0.3		1.05	0.61		1.39	
$I_{I(TRIG)}$ Trigger current		25°C	10			10			pA
		MAX	75			150			
$V_{I(RESET)}$ Reset voltage		25°C	0.4	1.1	1.5	0.4	1.1	1.5	V
		Full range	0.3		2	0.3		1.8	
$I_{I(RESET)}$ Reset current		25°C	10			10			pA
		MAX	75			150			
Control voltage (open circuit) as a percentage of supply voltage		MAX	66.7%			66.7%			
Discharge switch on-stage voltage	$I_{OL} = 1\text{ mA}$	25°C	0.03	0.2		0.03	0.2	V	
		Full range			0.25		0.375		
Discharge switch off-stage current		25°C	0.1			0.1			nA
		MAX	0.5			120			
$V_{OH}$ High-level output voltage	$I_{OH} = -300\text{ }\mu\text{A}$	25°C	1.5	1.9		2.5	2.85	V	
		Full range	1.5			2.5			
$V_{OL}$ Low-level output voltage	$I_{OL} = 1\text{ mA}$	25°C	0.07	0.3		0.07	0.3	V	
		Full range			0.35		0.4		
$I_{DD}$ Supply current	See Note 2	25°C	250			250			$\mu\text{A}$
		Full range	400			500			

† Full range is 0°C to 70°C for the XD555 and -40 °C to 85°C for the XL555. For conditions shown as MAX, use the appropriate value specified in the recommended operating conditions table.

NOTE 2: These values apply for the expected operating configurations in which THRES is connected directly to DISCH or to TRIG.

# XD555 DIP8 / XL555 SOP8

## electrical characteristics at specified free-air temperature, $V_{DD} = 5\text{ V}$

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	XD555			XL555			XD/XL555			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{IT}$ Threshold voltage		25°C	2.8	3.3	3.8	2.8	3.3	3.8	2.8	3.3	3.8	V
		Full range	2.7		3.9	2.7		3.9	2.7		3.9	
$I_{IT}$ Threshold current		25°C	10			10			10			pA
		MAX	75			150			5000			
$V_{I(TRIG)}$ Trigger voltage		25°C	1.36	1.66	1.96	1.36	1.66	1.96	1.36	1.66	1.96	V
		Full range	1.26		2.06	1.26		2.06	1.26		2.06	
$I_{I(TRIG)}$ Trigger current		25°C	10			10			10			pA
		MAX	75			150			5000			
$V_{I(RESET)}$ Reset voltage		25°C	0.4	1.1	1.5	0.4	1.1	1.5	0.4	1.1	1.5	V
		Full range	0.3		1.8	0.3		1.8	0.3		1.8	
$I_{I(RESET)}$ Reset current		25°C	10			10			10			pA
		MAX	75			150			5000			
Control voltage (open circuit) as a percentage of supply voltage		MAX	66.7%			66.7%			66.7%			
Discharge switch on-state voltage	$I_{OL} = 10\text{ mA}$	25°C	0.14		0.5	0.14		0.5	0.14		0.5	V
		Full range			0.6			0.6			0.6	
Discharge switch off-state current		25°C	0.1			0.1			0.1			nA
		MAX	0.5			120			120			
$V_{OH}$ High-level output voltage	$I_{OH} = -1\text{ mA}$	25°C	4.1	4.8		4.1	4.8		4.1	4.8		V
		Full range	4.1			4.1			4.1			
$V_{OL}$ Low-level output voltage	$I_{OL} = 8\text{ mA}$	25°C	0.21		0.4	0.21		0.4	0.21		0.4	V
		Full range			0.5			0.5			0.6	
	$I_{OL} = 5\text{ mA}$	25°C	0.13		0.3	0.13		0.3	0.13		0.3	
		Full range			0.4			0.4			0.45	
	$I_{OL} = 3.2\text{ mA}$	25°C	0.08		0.3	0.08		0.3	0.08		0.3	
		Full range			0.35			0.35			0.4	
$I_{DD}$ Supply current	See Note 2	25°C	170		350	170		350	170		350	$\mu\text{A}$
		Full range			500			600			700	

$^\dagger$  Full range is 0°C to 70°C the for XD/XL555, -40°C to 85°C for the XD/XL555, -40°C to 125°C for the XD/XL555, and -55°C to 125°C for the XD/XL555. For conditions shown as MAX, use the appropriate value specified in the recommended operating conditions table.

NOTE 2: These values apply for the expected operating configurations in which THRES is connected directly to DISCH or TRIG.

# XD555 DIP8 / XL555 SOP8

**electrical characteristics at specified free-air temperature,  $V_{DD} = 15\text{ V}$**

PARAMETER	TEST CONDITIONS	$T_A$ †	XD555			XL555			XD/XL555			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{IT}$ Threshold voltage		25°C	9.45	10	10.55	9.45	10	10.55	9.45	10	10.55	V
		Full range	9.35		10.65	9.35		10.65	9.35		10.65	
$I_{IT}$ Threshold current		25°C	10			10			10			pA
		MAX	75			150			5000			
$V_{I(TRIG)}$ Trigger voltage		25°C	4.65	5	5.35	4.65	5	5.35	4.65	5	5.35	V
		Full range	4.55		5.45	4.55		5.45	4.55		5.45	
$I_{I(TRIG)}$ Trigger current		25°C	10			10			10			pA
		MAX	75			150			5000			
$V_{I(RESET)}$ Reset voltage		25°C	0.4	1.1	1.5	0.4	1.1	1.5	0.4	1.1	1.5	V
		Full range	0.3		1.8	0.3		1.8	0.3		1.8	
$I_{I(RESET)}$ Reset current		25°C	10			10			10			pA
		MAX	75			150			5000			
Control voltage (open circuit) as a percentage of supply voltage		MAX	66.7%			66.7%			66.7%			
Discharge switch on-state voltage	$I_{OL} = 100\text{ mA}$	25°C	0.77		1.7	0.77		1.7	0.77		1.7	V
		Full range			1.8			1.8			1.8	
Discharge switch off-state current		25°C	0.1			0.1			0.1			nA
		MAX	0.5			120			120			
$V_{OH}$ High-level output voltage	$I_{OH} = -10\text{ mA}$	25°C	12.5	14.2		12.5	14.2		12.5	14.2		V
		Full range	12.5			12.5			12.5			
	$I_{OH} = -5\text{ mA}$	25°C	13.5	14.6		13.5	14.6		13.5	14.6		
		Full range	13.5			13.5			13.5			
	$I_{OH} = -1\text{ mA}$	25°C	14.2	14.9		14.2	14.9		14.2	14.9		
		Full range	14.2			14.2			14.2			
$V_{OL}$ Low-level output voltage	$I_{OL} = 100\text{ mA}$	25°C	1.28		3.2	1.28		3.2	1.28		3.2	V
		Full range			3.6			3.7			3.8	
	$I_{OL} = 50\text{ mA}$	25°C	0.63		1	0.63		1	0.63		1	
		Full range			1.3			1.4			1.5	
	$I_{OL} = 10\text{ mA}$	25°C	0.12		0.3	0.12		0.3	0.12		0.3	
		Full range			0.4			0.4			0.45	
$I_{DD}$ Supply current	See Note 2	25°C	360		600	360		600	360		600	$\mu\text{A}$
		Full range			800			900			1000	

† Full range is 0°C to 70°C for XD/XL555, -40°C to 85°C for XD/XL555, -40°C to 125°C for the XD/XL555, and -55°C to 125°C for XD/XL555. For conditions shown as MAX, use the appropriate value specified in the recommended operating conditions table.

NOTE 2: These values apply for the expected operating configurations in which THRES is connected directly to DISCH or TRIG.

# XD555 DIP8 / XL555 SOP8

## operating characteristics, $V_{DD} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Initial error of timing interval‡	$V_{DD} = 5\text{ V to }15\text{ V}$ , $C_T = 0.1\ \mu\text{F}$ , $R_A = R_B = 1\ \text{k}\Omega\text{ to }100\ \text{k}\Omega$ , See Note 3		1%	3%	
Supply voltage sensitivity of timing interval			0.1	0.5	%/V
$t_r$ Output pulse rise time	$R_L = 10\ \text{M}\Omega$ , $C_L = 10\ \text{pF}$		20	75	ns
$t_f$ Output pulse fall time			15	60	
$f_{\text{max}}$ Maximum frequency in astable mode	$R_A = 470\ \Omega$ , $C_T = 200\ \text{pF}$ , $R_B = 200\ \Omega$ , See Note 3	1.2	2.1		MHz

‡ Timing interval error is defined as the difference between the measured value and the average value of a random sample from each process run.

NOTE 3:  $R_A$ ,  $R_B$ , and  $C_T$  are as defined in Figure 1.

## electrical characteristics at $V_{DD} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{IT}$ Threshold voltage		2.8	3.3	3.8	V
$I_{IT}$ Threshold current			10		pA
$V_{I(\text{TRIG})}$ Trigger voltage		1.36	1.66	1.96	V
$I_{I(\text{TRIG})}$ Trigger current			10		pA
$V_{I(\text{RESET})}$ Reset voltage		0.4	1.1	1.5	V
$I_{I(\text{RESET})}$ Reset current			10		pA
Control voltage (open circuit) as a percentage of supply voltage			66.7%		
Discharge switch on-state voltage	$I_{OL} = 10\ \text{mA}$		0.14	0.5	V
Discharge switch off-state current			0.1		nA
$V_{OH}$ High-level output voltage	$I_{OH} = -1\ \text{mA}$	4.1	4.8		V
$V_{OL}$ Low-level output voltage	$I_{OL} = 8\ \text{mA}$		0.21	0.4	V
	$I_{OL} = 5\ \text{mA}$		0.13	0.3	
	$I_{OL} = 3.2\ \text{mA}$		0.08	0.3	
$I_{DD}$ Supply current	See Note 2		170	350	$\mu\text{A}$

NOTE 2: These values apply for the expected operating configurations in which THRES is connected directly to DISCH or TRIG.



# XD555 DIP8 / XL555 SOP8

## TYPICAL CHARACTERISTICS

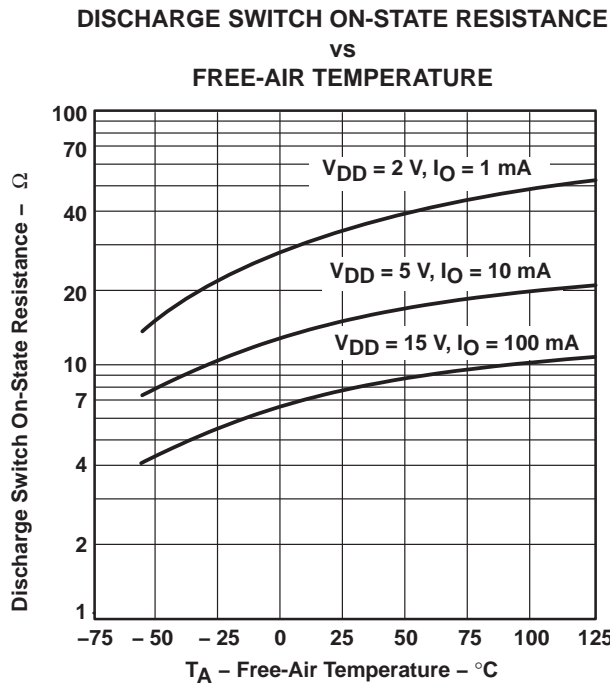
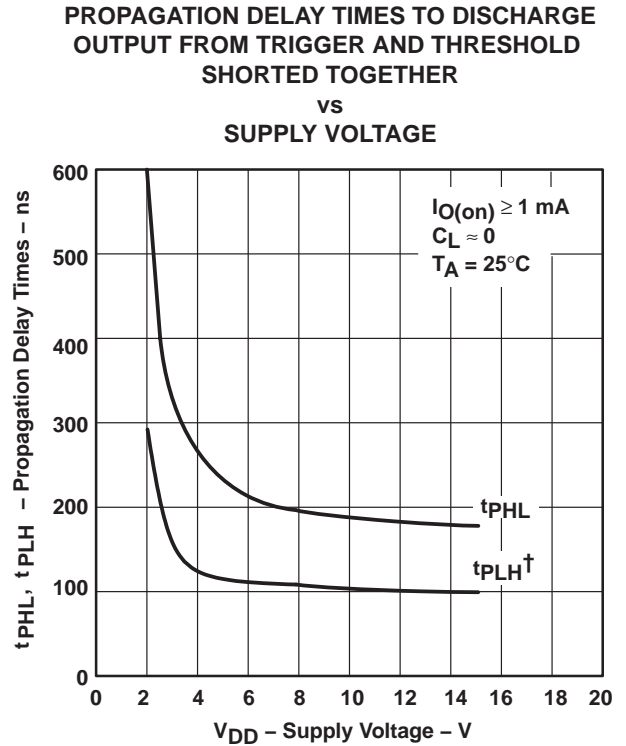


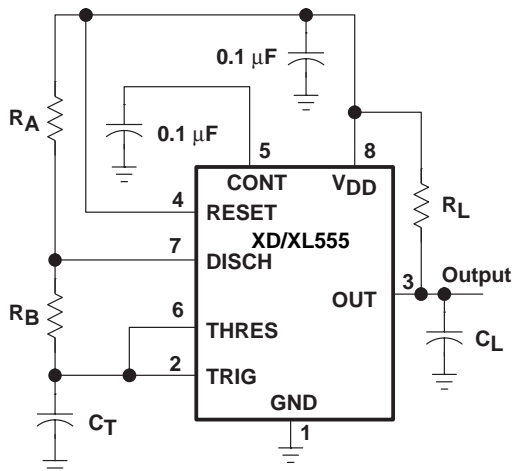
Figure 1



† The effects of the load resistance on these values must be taken into account separately.

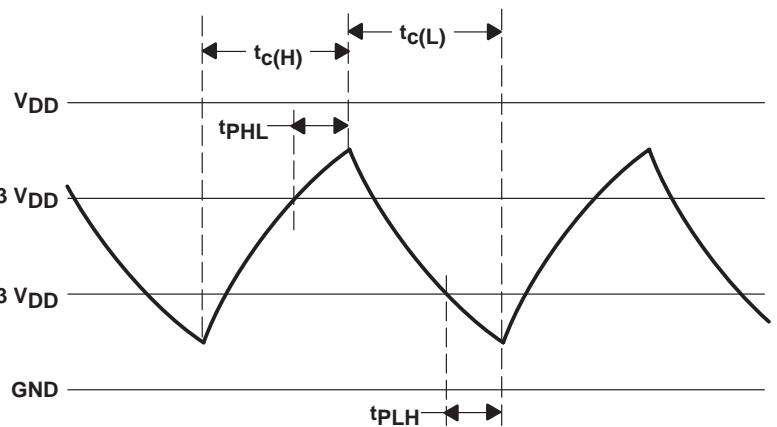
Figure 2

## APPLICATION INFORMATION



Pin numbers shown are for all packages except the FK package.

CIRCUIT



TRIGGER AND THRESHOLD VOLTAGE WAVEFORM

Figure 3. Astable Operation

以上信息仅供参考. 如需帮助联系客服人员。谢谢 XINLUDA

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