

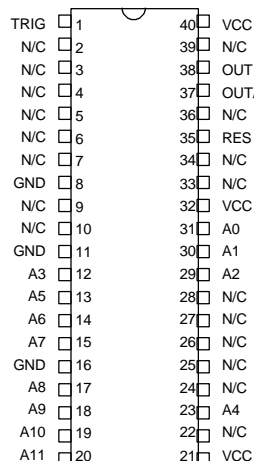
# 12-BIT PROGRAMMABLE PULSE GENERATOR (SERIES PPG312F)



## FEATURES

- Digitally programmable in 4096 steps
- Monotonic pulse-width-vs-address variation
- Rising edge triggered
- Two separate outputs: inverting & non-inverting
- Precise and stable pulse width
- Input & outputs fully TTL interfaced & buffered
- 10 T<sup>2</sup>L fan-out capability
- Fits standard 40-pin DIP socket
- Auto-insertable

## PACKAGES



- PPG312F-xx  
DIP
- PPG312F-xxC5  
Gull-Wing
- PPG312F-xxM  
Military DIP
- PPG312F-xxMC5  
Military Gull-Wing

## FUNCTIONAL DESCRIPTION

The PPG312F-series device is a 12-bit digitally programmable pulse generator. The width,  $PW_A$ , depends on the address code (A11-A0) according to the following formula:

$$PW_A = PW_0 + T_{INC} * A$$

where A is the address code,  $T_{INC}$  is the incremental pulse width of the device, and  $PW_0$  is the inherent pulse width of the device. The incremental width is specified by the dash number of the device and can range from 0.5ns through 400ns, inclusively. RESET is held LOW during normal operation. When it is brought HIGH, OUT and OUT/ are forced into LOW and HIGH states, respectively, and the unit is ready for the next trigger input. The address is not latched and must remain asserted while the output pulse is active.

## PIN DESCRIPTIONS

- TRIG Trigger Input
- OUT Non-inverted Output
- OUT/ Inverted Output
- A0-A11 Address Bits
- RES Reset
- VCC +5 Volts
- GND Ground

## SERIES SPECIFICATIONS

- **Programmed pulse width tolerance:** 5% or 2ns, whichever is greater
- **Inherent width ( $PW_0$ ):** 20ns typical
- **Inherent delay ( $T_{TO}$ ):** 10ns  $\pm$  2ns
- **Operating temperature:** 0° to 70° C
- **Supply voltage  $V_{CC}$ :** 5VDC  $\pm$  5%
- **Supply current:**  $I_{CC}$  = 200ma typical

## DASH NUMBER SPECIFICATIONS

Part Number	Incremental Width Per Step (ns)	Total Width Change (us)
PPG312F-.5	.5 $\pm$ .3	2.048 $\pm$ 0.10
PPG312F-1	1 $\pm$ .5	4.096 $\pm$ 0.20
PPG312F-2	2 $\pm$ .5	8.192 $\pm$ 0.41
PPG312F-5	5 $\pm$ 1.5	20.48 $\pm$ 1.02
PPG312F-10	10 $\pm$ 2.0	40.96 $\pm$ 2.05
PPG312F-20	20 $\pm$ 2.0	81.92 $\pm$ 4.10
PPG312F-50	50 $\pm$ 2.5	204.8 $\pm$ 10.2
PPG312F-100	100 $\pm$ 5.0	409.6 $\pm$ 20.5
PPG312F-200	200 $\pm$ 10.0	819.2 $\pm$ 41.0
PPG312F-400	400 $\pm$ 20.0	1,638.4 $\pm$ 81.9

**NOTE:** Any dash number between .5 and 400 not shown is also available.

## APPLICATION NOTES

### DEVICE TIMING

The timing definitions and restrictions for the PPG312F are shown in Figure 1. The unit is activated by a rising edge on the TRIG input. After a time,  $T_{TO}$  (called the inherent delay), the rising edge of the pulse appears at OUT. The duration of the pulse is given by the above equation. For the duration of the pulse, the device ignores subsequent triggers. Once the falling edge of the pulse has appeared at OUT, an additional time,  $T_{OTR}$ , is required before the device can respond to the next trigger.

At power-up, the state of the PPG312F is unknown. Consequently, after power is applied, the unit may not respond to input triggers for a time equal to the maximum pulse width,  $PW_T$ . After this time, the unit will function properly. If your application requires that the device function immediately, issue a quick reset at power-up.

### POWER SUPPLY BYPASSING

The PPG312F relies on a stable power supply to produce repeatable pulses within the stated tolerances. A 0.1uf capacitor from VCC to GND, located as close as possible to each VCC pin, is recommended. A wide VCC trace should connect all VCC pins externally, and a clean ground plane should be used.

### INCREMENT TOLERANCES

Please note that the increment tolerances listed represent a design goal. Although most increments will fall within tolerance, they are not guaranteed throughout the address range of the unit. Monotonicity is, however, guaranteed over all addresses.

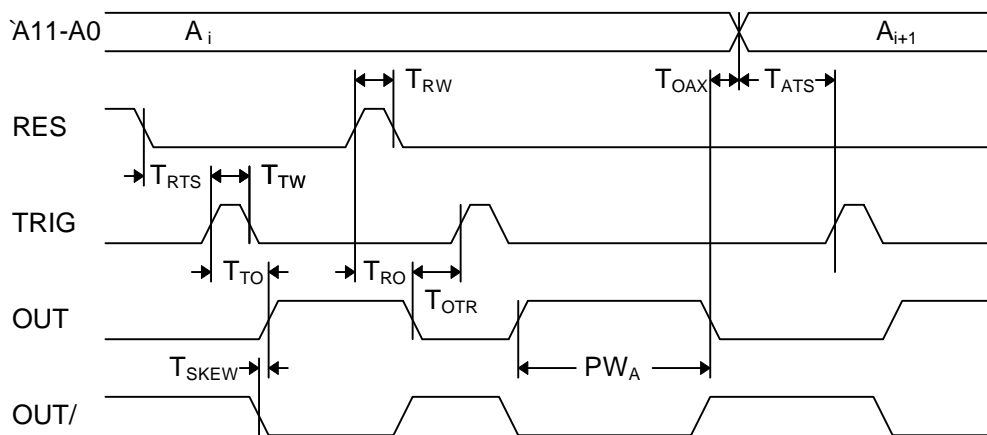


Figure 1: Timing Diagram

## DEVICE SPECIFICATIONS

### TABLE 1: AC CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Total Programmable Pulse Width	$PW_T$		4095		$T_{INC}$
Inherent Pulse Width	$PW_0$	15.0	20.0	27.0	ns
Trigger to Output Delay	$T_{TO}$	8.0	10.0	12.0	ns
Reset to Output Delay	$T_{RO}$			17.0	ns
Output Skew	$T_{SKEW}$		1.5		ns
Trigger Pulse Width	$T_{TW}$	5.0			ns
Reset Pulse Width	$T_{RW}$	10.0			ns
Reset to Trigger Setup Time	$T_{RTS}$	9.0			ns
Address to Trigger Setup Time	$T_{ATS}$	6.0			ns
Output Low to Address Change	$T_{OAX}$	0.0			ns
Output to Trigger Recovery Time	$T_{OTR}$	10.0			ns

### TABLE 2: ABSOLUTE MAXIMUM RATINGS

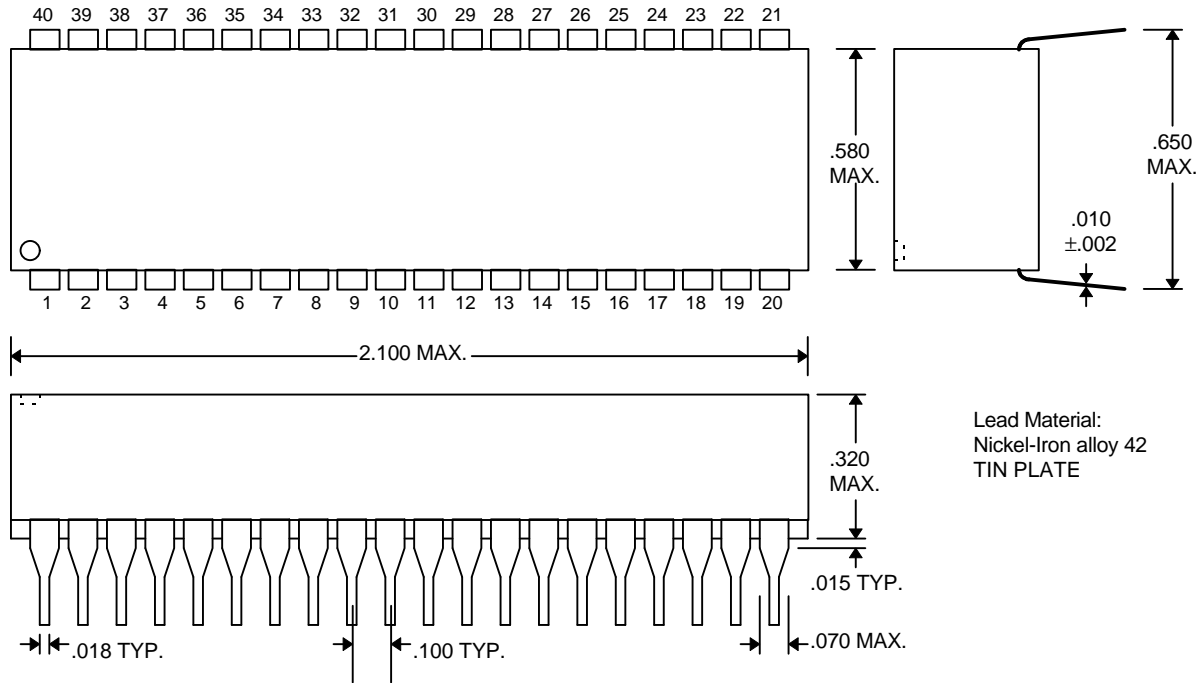
PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTES
DC Supply Voltage	$V_{CC}$	-0.3	7.0	V	
Input Pin Voltage	$V_{IN}$	-0.3	$V_{DD}+0.3$	V	
Storage Temperature	$T_{STRG}$	-55	150	C	
Lead Temperature	$T_{LEAD}$		300	C	10 sec

### TABLE 3: DC ELECTRICAL CHARACTERISTICS

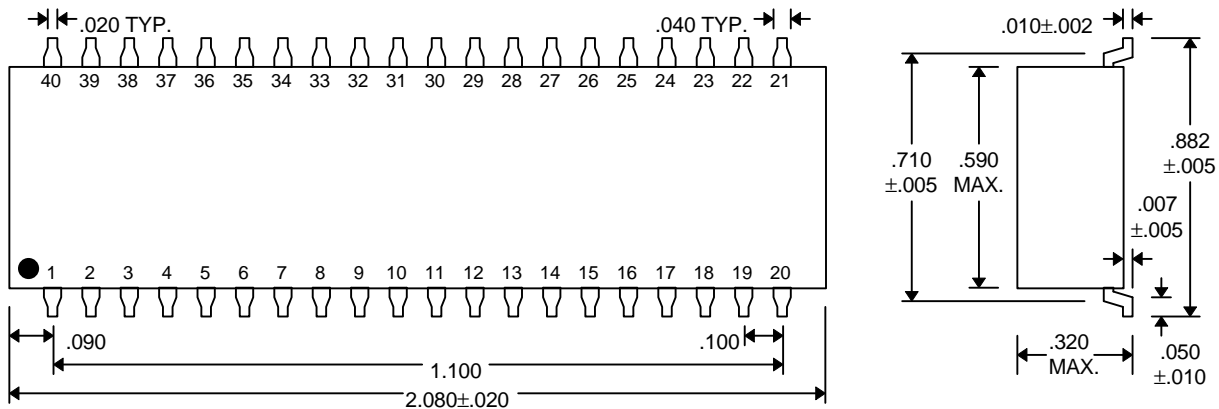
(0C to 70C, 4.75V to 5.25V)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
High Level Output Voltage	$V_{OH}$	2.5	3.4		V	$V_{CC} = \text{MIN}, I_{OH} = \text{MAX}$ $V_{IH} = \text{MIN}, V_{IL} = \text{MAX}$
Low Level Output Voltage	$V_{OL}$		0.35	0.5	V	$V_{CC} = \text{MIN}, I_{OL} = \text{MAX}$ $V_{IH} = \text{MIN}, V_{IL} = \text{MAX}$
High Level Output Current	$I_{OH}$			-1.0	mA	
Low Level Output Current	$I_{OL}$			20.0	mA	
High Level Input Voltage	$V_{IH}$	2.0			V	
Low Level Input Voltage	$V_{IL}$			0.8	V	
Input Clamp Voltage	$V_{IK}$			-1.2	V	$V_{CC} = \text{MIN}, I_I = I_{IK}$
Input Current at Maximum Input Voltage	$I_{IHH}$			0.1	mA	$V_{CC} = \text{MAX}, V_I = 7.0V$
High Level Input Current	$I_{IH}$			20	$\mu A$	$V_{CC} = \text{MAX}, V_I = 2.7V$
Low Level Input Current	$I_{IL}$			-0.6	mA	$V_{CC} = \text{MAX}, V_I = 0.5V$
Short-circuit Output Current	$I_{OS}$	-60		-150	mA	$V_{CC} = \text{MAX}$
Output High Fan-out				25	Unit	
Output Low Fan-out				12.5	Load	

## PACKAGE DIMENSIONS



**DIP (PPG312F-xx, PPG312F-xxM)**



**Gull-Wing (PPG312F-xxC5, PPG312F-xxMC5)**

## DELAY LINE AUTOMATED TESTING

### TEST CONDITIONS

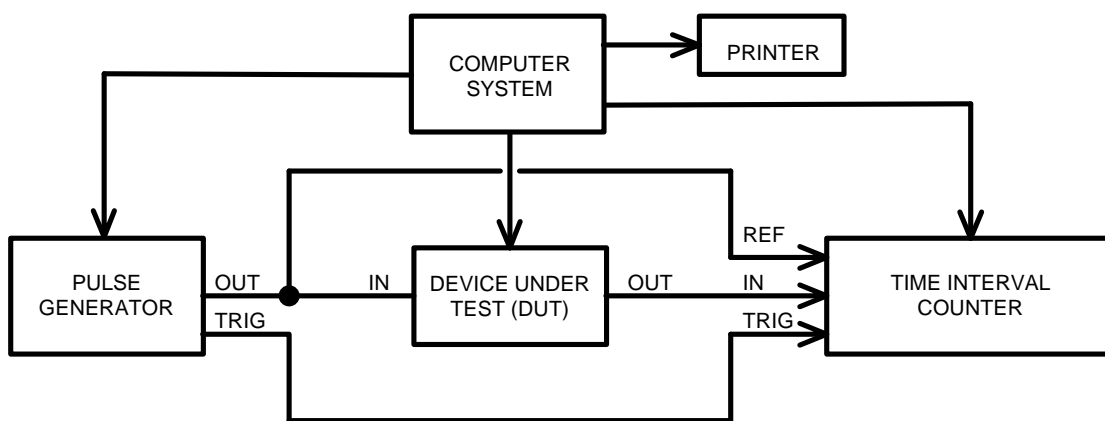
**INPUT:**
**Ambient Temperature:**  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ 
**Supply Voltage (Vcc):**  $5.0\text{V} \pm 0.1\text{V}$ 
**Input Pulse:** High =  $3.0\text{V} \pm 0.1\text{V}$   
 Low =  $0.0\text{V} \pm 0.1\text{V}$ 
**Source Impedance:**  $50\Omega$  Max.

**Rise/Fall Time:**  $3.0\text{ ns Max.}$  (measured  
 between  $0.6\text{V}$  and  $2.4\text{V}$ )

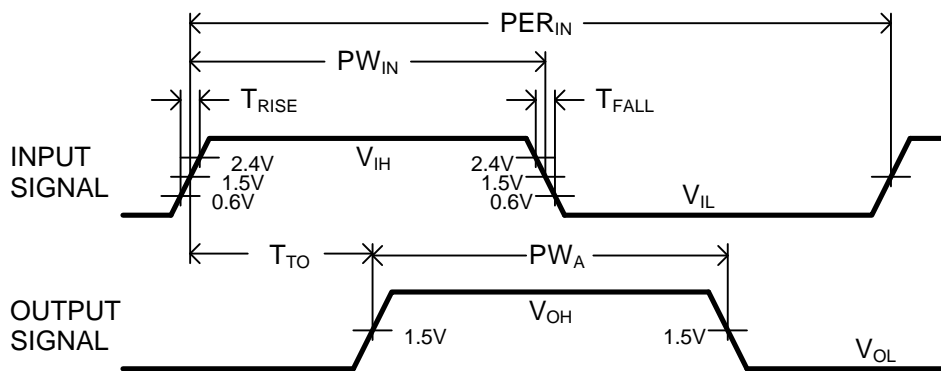
**Pulse Width:**  $PW_{IN} = 10\text{ns}$ 
**Period:**  $PER_{IN} = 2 \times \text{Max. Pulse Width}$ 
**OUTPUT:**
**Load:** 1 FAST-TTL Gate

**C<sub>load</sub>:**  $5\text{pf} \pm 10\%$ 
**Threshold:**  $1.5\text{V}$  (Rising & Falling)

**NOTE:** The above conditions are for test only and do not in any way restrict the operation of the device.



**Test Setup**



**Timing Diagram For Testing**