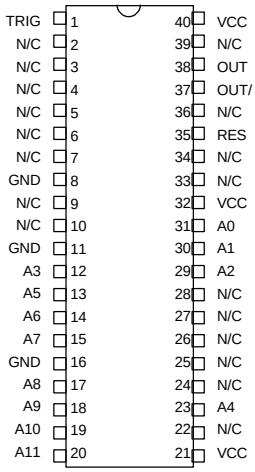
# 12-BIT PROGRAMMABLE PULSE GENERATOR (SERIES PPG312F)

## 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 $T^2L$ 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 ± 2ns
- **Operating temperature:** 0° to 70° C
- **Supply voltage $V_{CC}$:** 5VDC ± 5%
- **Supply current:** $I_{CC}$ = 200ma typical

## DASH NUMBER SPECIFICATIONS

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

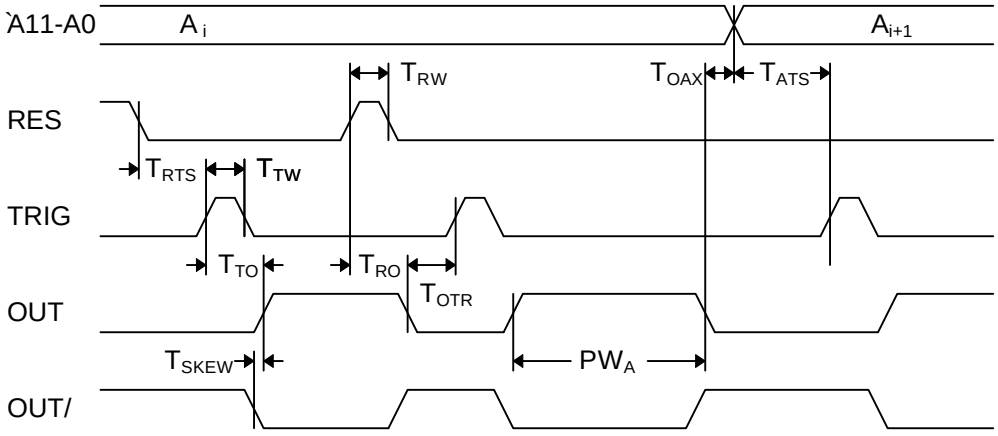



**Figure 1: Timing Diagram**

# 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

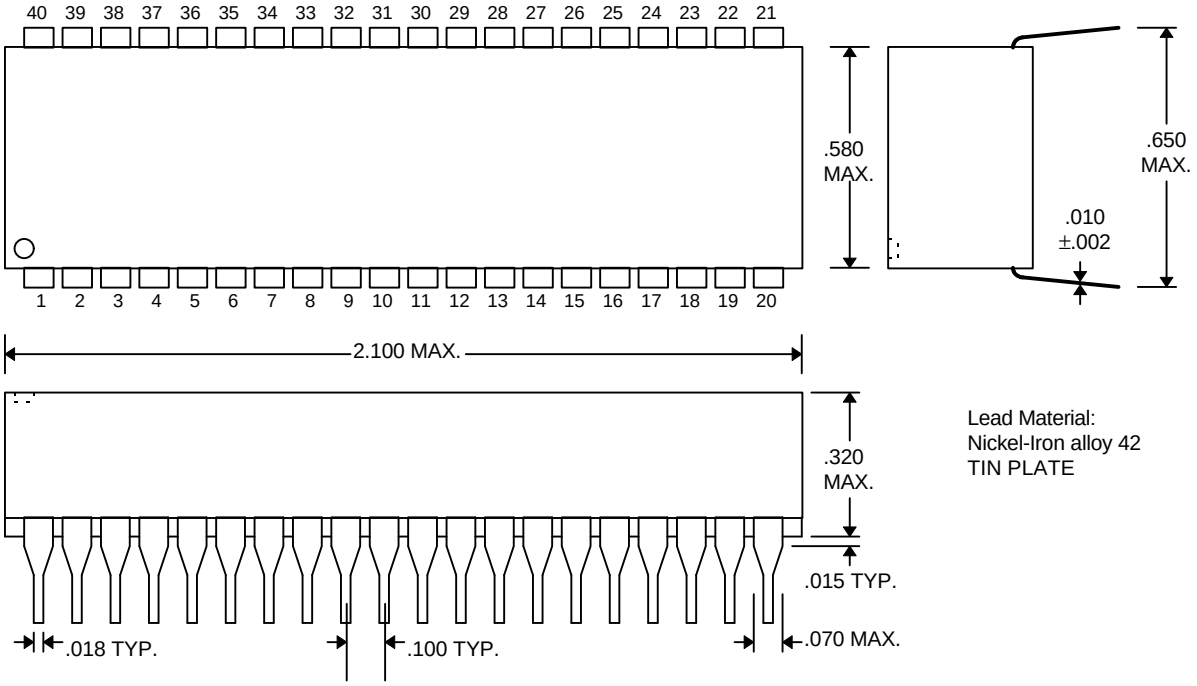
| PARAMETER | SYMBOL | MIN | MAX | UNITS | NOTES |
|---|---|---|---|---|---|
| DC Supply Voltage | $V_{CC}$ | -0.3 | 7.0 | V | |
| Input Pin Voltage | $V_{IN}$ | -0.3 | $V_{DD}$+0.3 | V | |
| Storage Temperature | $T_{STRG}$ | -55 | 150 | C | |
| Lead Temperature | $T_{LEAD}$ | | 300 | C | 10 sec |

## TABLE 3: DC ELECTRICAL CHARACTERISTICS

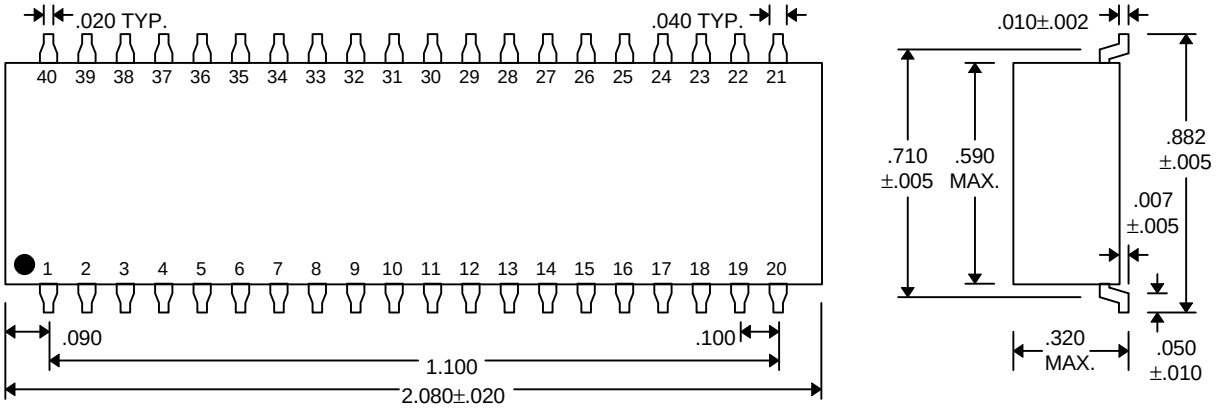
(0C to 70C, 4.75V to 5.25V)

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNITS | NOTES |
|---|---|---|---|---|---|---|
| High Level Output Voltage | $V_{OH}$ | 2.5 | 3.4 | | V | $V_{CC}$ = MIN, $I_{OH}$ = MAX<br>$V_{IH}$ = MIN, $V_{IL}$ = MAX |
| Low Level Output Voltage | $V_{OL}$ | | 0.35 | 0.5 | V | $V_{CC}$ = MIN, $I_{OL}$ = MAX<br>$V_{IH}$ = MIN, $V_{IL}$ = 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 | $V_{CC}$ = MIN, $I_I$ = $I_{IK}$ |
| Input Current at Maximum Input Voltage | $I_{IHH}$ | | | 0.1 | mA | $V_{CC}$ = MAX, $V_I$ = 7.0V |
| High Level Input Current | $I_{IH}$ | | | 20 | µA | $V_{CC}$ = MAX, $V_I$ = 2.7V |
| Low Level Input Current | $I_{IL}$ | | | -0.6 | mA | $V_{CC}$ = MAX, $V_I$ = 0.5V |
| Short-circuit Output Current | $I_{OS}$ | -60 | | -150 | mA | $V_{CC}$ = MAX |
| Output High Fan-out | | | | 25 | Unit | |
| Output Low Fan-out | | | | 12.5 | Load | |

# PACKAGE DIMENSIONS




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



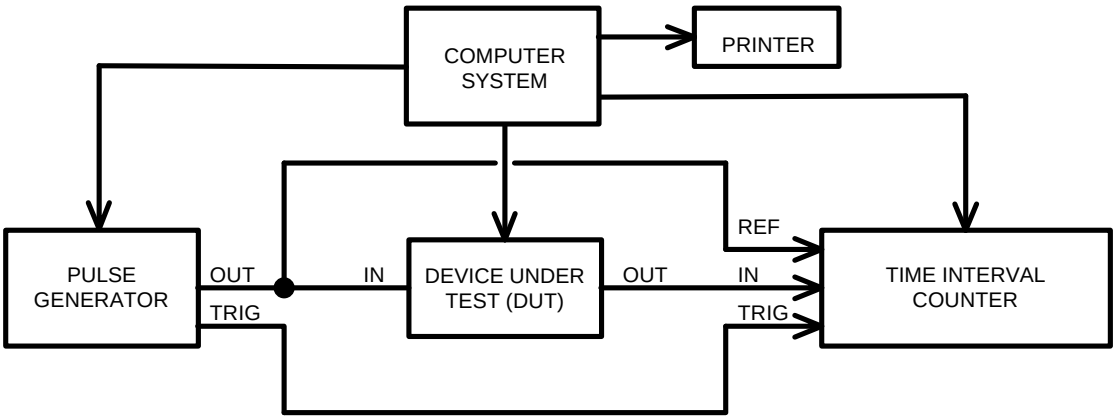

**Gull-Wing (PPG312F-xxC5, PPG312F-xxMC5)**

# DELAY LINE AUTOMATED TESTING

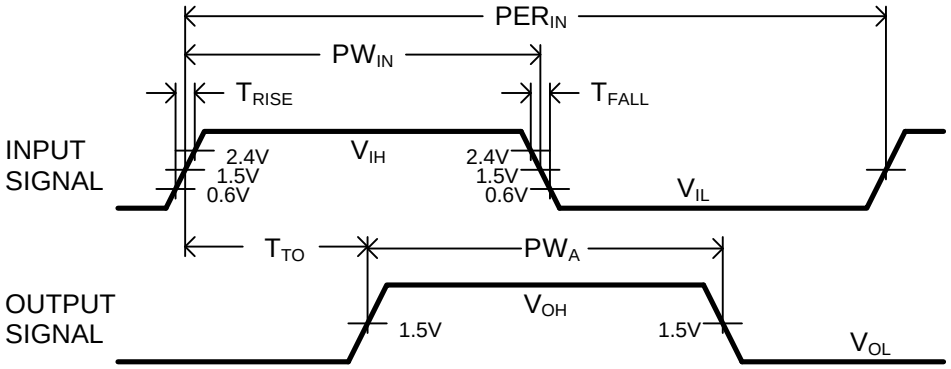
## TEST CONDITIONS

| | | | |
|---|---|---|---|
| **INPUT:** | | **OUTPUT:** | |
| **Ambient Temperature:** | 25°C ± 3°C | **Load:** | 1 FAST-TTL Gate |
| **Supply Voltage (Vcc):** | 5.0V ± 0.1V | **$C_{load}$:** | 5pf ± 10% |
| **Input Pulse:** | High = 3.0V ± 0.1V<br>Low = 0.0V ± 0.1V | **Threshold:** | 1.5V (Rising & Falling) |
| **Source Impedance:** | 50Ω Max. | | |
| **Rise/Fall Time:** | 3.0 ns Max. (measured between 0.6V and 2.4V ) | | |
| **Pulse Width:** | $PW_{IN}$ = 10ns | | |
| **Period:** | $PER_{IN}$ = 2 x Max. Pulse Width | | |

**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**