### 2.2-5. Counter/Frequency/PWM

#### PWM Introduction

PWM (Pulse width modulation) is a powerful technique for controlling analog circuits. It uses digital outputs to generate a waveform with variant duty cycle and frequency to control analog circuits. I-8088W and I-87088W have 8 PWM output channels and 8 digital inputs. It can be used to develop powerful and cost effective analog control system.

#### PWM Features

- Automatic generation of PWM outputs by hardware, without software intervention.
- Software and hardware trigger mode for PWM output
- Individual and synchronous PWM output
- Burst mode PWM operation for standby
- DI channel can be configured as simple digital input channel or hardware trigger source of the PWM output.

#### Counter/Frequency/PWM Module

<table>
<thead>
<tr>
<th>Model Name</th>
<th>1-7080(D)</th>
<th>1-7080B(D)</th>
<th>1-7083(D)</th>
<th>1-7083B(D)</th>
<th>I-7088</th>
<th>M-7080(D)</th>
<th>M-7080B(D)</th>
<th>M-7088</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pictures</td>
<td><img src="#" alt="Picture 1" /></td>
<td><img src="#" alt="Picture 2" /></td>
<td><img src="#" alt="Picture 3" /></td>
<td><img src="#" alt="Picture 4" /></td>
<td><img src="#" alt="Picture 5" /></td>
<td><img src="#" alt="Picture 6" /></td>
<td><img src="#" alt="Picture 7" /></td>
<td><img src="#" alt="Picture 8" /></td>
</tr>
<tr>
<td>Digital Input</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact</td>
<td>Wet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sink/Source (NPN/PPN)</td>
<td>Sink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Voltage Level</td>
<td>+3.5 ~ +30 Vcc</td>
<td>5 V: +3.5 ~ +5 Vcc</td>
<td>12 V with 1 kΩ external resistor: +5 ~ +12 Vcc</td>
<td>24 V with 2 kΩ external resistor: +7 ~ +24 Vcc</td>
<td>+3.5 ~ +5 Vcc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off Voltage Level</td>
<td>+1 V: Max.</td>
<td>+2 V: Max.</td>
<td></td>
<td></td>
<td>+1 V: Max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programmable Filter</td>
<td>2 us to 65 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programmable Threshold Voltage</td>
<td>+0.1 ~ +5 Vcc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counter/Encoder Bits</td>
<td>32-bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counter Mode</td>
<td>Up</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encoder Mode</td>
<td></td>
<td>CW/CCW, Pulse/Dir., AB Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Mode</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virtual Battery Backup</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Accuracy</td>
<td>1 Hz or 10 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Speed</td>
<td>100 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Output</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Open Collector</td>
<td></td>
<td>PWM, TTL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sink/Source (NPN/PPN)</td>
<td>Sink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Voltage</td>
<td>+3.5 ~ +30 Vcc</td>
<td></td>
<td></td>
<td>+3.5 ~ +5 Vcc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Load Current</td>
<td>30 mA/Channel</td>
<td></td>
<td></td>
<td>10 mA/Channel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power-on Value</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe Value</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PWM</td>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duty Cycle</td>
<td></td>
<td>1 Hz ~ 500 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burst Mode</td>
<td></td>
<td>0.1 ~ 99.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burst Count</td>
<td></td>
<td>Burst, Continuous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trigger Start</td>
<td></td>
<td>1 ~ 65535</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>Dual Watchdog</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESD (IEC 61000-4-2)</td>
<td>+/-4 kV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFT (IEC 61000-4-4)</td>
<td>+/-4 kV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra-Module Isolation, Field-to-Logic</td>
<td>3000 Vcc</td>
<td>2500 Vrms</td>
<td></td>
<td>2500 Vrms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>2.2 W for (D) version</td>
<td>1 W</td>
<td>1.5 W for (D) version</td>
<td>2.4 W</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Applications

- Automatic generation of PWM outputs by hardware, without software intervention.
- Software and hardware trigger mode for PWM output
- Individual and synchronous PWM output
- Burst mode PWM operation for standby
- DI channel can be configured as simple digital input channel or hardware trigger source of the PWM output.

**PWM Introduction**

**Applications**

**Counter/Frequency/PWM Module**

**Digital Input**

- Channel: 2, 3, 8
- Contact: Wet
- Sink/Source (NPN/PPN): Sink

**On Voltage Level**

- +3.5 ~ +30 Vcc
- 5 V: +3.5 ~ +5 Vcc
- 12 V with 1 kΩ external resistor: +5 ~ +12 Vcc
- 24 V with 2 kΩ external resistor: +7 ~ +24 Vcc

**Off Voltage Level**

- +1 V: Max.
- +2 V: Max.
- +1 V: Max.

**Programmable Filter**

- 2 us to 65 ms

**Programmable Threshold Voltage**

- +0.1 ~ +5 Vcc

**Counter/Encoder Bits**

- 32-bit

**Counter Mode**

- Up

**Encoder Mode**

- CW/CCW, Pulse/Dir., AB Phase

**Frequency Mode**

- Yes

**Virtual Battery Backup**

- Yes

**Frequency Accuracy**

- 1 Hz or 10 Hz

**Max. Speed**

- 100 kHz
- 1 MHz

**Digital Output**

- Channel: 2, 3, 8
- Type: Open Collector, PWM, TTL
- Sink/Source (NPN/PPN): Sink

**Load Voltage**

- +3.5 ~ +30 Vcc
- +3.5 ~ +5 Vcc

**Max. Load Current**

- 30 mA/Channel
- 10 mA/Channel

**Power-on Value**

- Yes

**Safe Value**

- Yes

**PWM**

- Frequency
- Duty Cycle
- Burst Mode
- Burst Count
- Trigger Start

**System**

- Dual Watchdog
- ESD (IEC 61000-4-2)
- EFT (IEC 61000-4-4)
- Intra-Module Isolation, Field-to-Logic
- Power Consumption
Internal I/O Structure

**I-7080(D)/M-7080(D)**

- Alarm Output
- DC-DC
- PWM Control
- Encoder Logic Controller (I-7083B only)
- ICP-DAS
- I-7080(D)/M-7080(D)

**I-7083(D)**

- ICP-DAS
- Encoder Logic Controller
- DATA
- Vx
- GND
- INIT
- DATA+
- DATA-
- V+
- GND
- +5V

**I-7083B(D)**

- ICP-DAS
- Encoder Logic Controller
- DATA
- Vx
- GND
- INIT
- DATA+
- DATA-
- V+
- GND
- +5V

**I-7088(D)/M-7088(D)**

- ICP-DAS
- Encoder Logic Controller
- DATA
- Vx
- GND
- INIT
- DATA+
- DATA-
- V+
- GND
- +5V

---

**Datasheet**

RS-485 Remote I/O Modules

**I-7080(D)/M-7080(D)**

- 5-Digit LED (I-7080D)
- 5V
- In0+
- In0-
- Gate0 (TTL)
- Gate1 (TTL)
- In0 (TTL)
- In1 (TTL)
- D/O
- O.C.
- RS-485
- EEPROM
- Counter 1
- Counter 0
- Programmable Digital Filter
- Isolated/Non-isolated input selection
- Isolated/Non-isolated gate selection
- Programmable threshold
- Voltage
- Embedded Controller
- DC
- DC

**I-7083(D)**

- 5-Digit LED
- 5V
- In0+
- In0-
- Gate0 (TTL)
- Gate1 (TTL)
- In0 (TTL)
- In1 (TTL)
- D/O
- O.C.
- RS-485
- EEPROM
- Counter 1
- Counter 0
- Programmable Digital Filter
- Isolated/Non-isolated input selection
- Isolated/Non-isolated gate selection
- Programmable threshold
- Voltage
- Embedded Controller
- DC
- DC

---

**IT and Instrumentation for industry**

Amplicon.com

Sales: +44 (0) 1273 570 220  Website: www.amplicon.com  Email: sales@amplicon.com