Summary

HighFive is a single component multivibrator providing low-cost simple timing applications while occupying a tiny real-estate.

HighFive is firmware for the PIC10F202 microcontroller and is available as a firmware download from *www.hexwax.com*. Individual devices are programmed in-circuit using the TEAclipper programming clip.

Applications

- *Clocks*
- *Pulse shaping*
- *Audio testing*

Features

- *Versatile operating mode options:*
  - *Bistable multivibrator*
  - *Long period bistable*
  - *Rising-edge monostable*
  - *Falling-edge monostable*
  - *Further modes by customer demand*
- *Q and not-Q outputs*
- *Trigger input*
- *Timing range from 62.5 KHz to ~1 day*
- *Sleep input for nanoWatt sleep state*
- *Single-component implementation*

Table 1. Pinout Table	
Name	***Description***
Sleep	Shutdown control, sleeps when high TEAclipper programming pin 4
nQ	Inverted multivibrator output TEAclipper programming pin 3
Q	Multivibrator output
Trig	Trigger input TEAclipper programming pin 2
Vdd	2.0V – 5.5V supply
Vss	Power supply ground

FIRMWARE FACTORY

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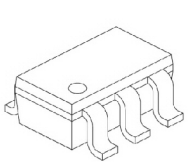
Mechanical Specifications



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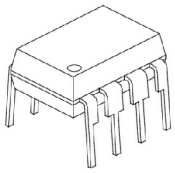

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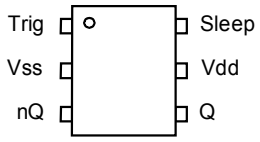

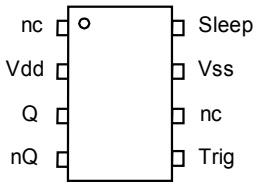

Electrical Specifications

Table 2. Electrical Specifications	
Voltage on *Vdd* (Normal use)	*2.0 – 5.5* VDC
Voltage on *Vdd* during programming	*4.5 – 5.5* VDC
Typical supply current, active	175µA Vdd = 2V 630µA Vdd = 5V
Typical supply current, sleep	100nA Vdd = 2V 350nA Vdd = 5V
Operating Temperature, Ind	–40°C to 85°C
Operating Temperature, Ext	–40°C to 125°C*
Accuracy, Vdd = 3.5V @ 25°C, Ind	±1%
Accuracy, Vdd = 2.5V – 5V, Ind	±2%
Accuracy, Vdd = 2.0V – 5V, Ind / Ext	±5%
Accuracy, Extended	–40°C to 125°C*
*Higher maximum current figures may apply.	

Operational Settings

Rather than using external components, operational settings are set at the time the TEAclipper programming clip is charged with HighFive licenses.

Operational settings are specified by 7 bytes (14 hexadecimal digits) as described in table 3.

Table 3. Operational Settings	
Byte(s)	***Description***
1	Operating mode
2-4	Period P_A, most significant byte first
5-7	Period P_B, most significant byte first

The operating modes are:

00: Bistable Multivibrator

In this mode, the output *Q* is in the on state for Period P_A and then in the off state for period P_B.

This pattern repeats continuously. The exact periods of P_A and P_B are given by:

$$16 + 3\,P + 2\,INT(P/256) + 2\,INT(P/65536) \quad \mu s$$

or, approximately:

$$16 + 3\,P \quad \mu s$$

01: Long Period Bistable Multivibrator

In this mode, the output *Q* is in the on state for Period P_A and then in the off state for period P_B. This pattern repeats continuously. The exact periods of P_A and P_B are given by:

$$784 + 770\,P + 2\,INT(P/256) + 2\,INT(P/65536) \quad \mu s$$

or, approximately:

$$770\,(P+1) \quad \mu s$$

02: Rising Edge Monostable

In this mode, the output *Q* is in the off state until *Trig* transitions from low to high. It will then stay in the on state, regardless of the state of *Trig*, for a period P_A. It will then return to the off state. This pattern repeats continuously. The exact period P_A is given by:

$$8 + 3\,P_A + 2\,INT(P_A/256) + 2\,INT(P_A/65536) \quad \mu s$$

or, approximately:

$$8 + 3\,P_A \quad \mu s$$

After *Q* goes low, a minimum period of 20 µs must pass before *Trig* can trigger another pulse on *Q*.

03: Falling Edge Monostable

In this mode, the output *Q* is in the off state until *Trig* transitions from high to low. It will then stay in the on state, regardless of the state of *Trig*, for a period P_A. It will then return to the off state. This pattern repeats continuously. The exact period P_A is given by:

$$8 + 3\,P_A + 2\,INT(P_A/256) + 2\,INT(P_A/65536) \quad \mu s$$

or, approximately:

$$8 + 3\,P_A \quad \mu s$$

After *Q* goes low, a minimum period of 20 µs must pass before *Trig* can trigger another pulse on *Q*.

Other Operating Modes

There is ROM available to add further operating modes according to customer request. Contact technical support for details.

Sleep

When Sleep is high, the device will enter a nanoWatt sleep state. Sleep state will not be entered while *Q* is in the on state. During sleep, changes in state on the *Trig* input will temporarily wake the device, so if unused, it should be biased high or low. During sleep, *Q* and *nQ* enter a high-impedance state.

Rather than using external components, operational settings are set at the time the TEAclipper programming clip is charged with HighFive licenses.

Firmware Delivery

The HighFive firmware is available as an encrypted firmware download from *www.hexwax.com*. To download it you will need a TEAclipper/PIC HV and a TEAclipper/USB adapter.

To load the firmware onto the TEAclipper, start the HexWax Explorer firmware and log in. Then download the HighFive firmware pack from the *hexwax.com* products section. When download completes, a HighFive folder will appear in the Local Files section of HexWax Explorer. In this folder is the *HighFive.wax* file that contains the firmware.

You will need HighFive license credits in order to decrypt the *HighFive.wax* file. Contact *hexwax.com* for details of payment options and how to obtain free samples.

Once you have license credits, select the *HighFive.wax* file and insert a TEAclipper/PIC HV into the TEAclipper/USB adapter. Press the *Charge Now…* button. Referring to figure 1, select how many licenses you wish to load onto the TEAclipper. Additionally, select the desired Operational Settings as specified in Table 3. Finally press OK to obtain a decryption key and to charge the TEAclipper with the decrypted firmware.

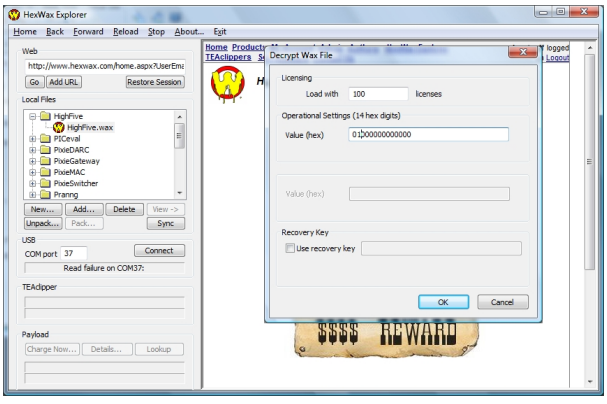

Figure 1: *Decrypting the HighFive.wax file*

Programming HighFive

HighFive may be programmed in-circuit provided the programming signals are protected against contention. In particular, note that the *Sleep* line is subject to a voltage of 13V during programming. An example circuit is shown in figure 2.

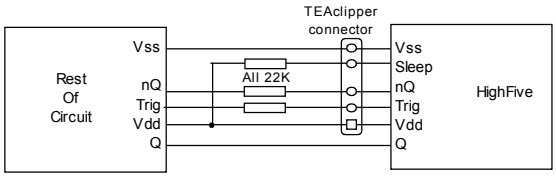

Figure 2. Recommended connection to permit in-circuit programming

HighFive is programmed into the microcontroller simply by inserting the TEAclipper into its connector. The circuit must be powered and the TEAclipper must be held in place until the LEDs stop flashing and the green LED glows steadily.

Since the programming time is very fast, no programming socket is required for the TEAclipper. It may be leaned against five plate-through holes as depicted in figure 3.

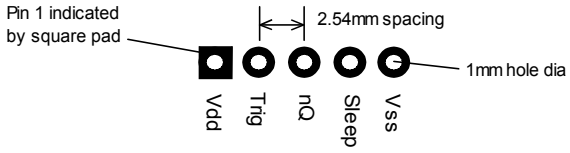

Figure 3. Recommended plate-through connector design

The TEAclipper requires a minimum supply to the HighFive of 4.5V during programming. If the rest of the circuit cannot tolerate a Vdd of 5V during programming, then a supply of 5V may be temporarily applied in an isolated fashion as shown in figure 4. (The host *Vdd* should be powered as normal during programming.)

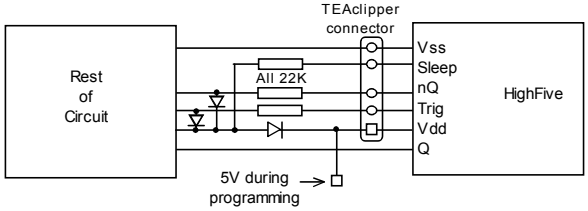

Figure 4. Recommended connection to permit in-circuit programming when the rest of the circuit cannot tolerate Vdd of 5V. Resistors and diodes on SSn and SCK are only required if these pins connect to the rest of the circuit.

Evaluation Guide

The TEAclipper Evaluation Board contains a PIC10F202 microcontroller originally intended for TEAleaf evaluation. It may also be used for evaluating HighFive. See Table 4 for a labeling key.

Table 4. Evaluation Board Labeling Guide

HighFive Pin Name	***Evaluation Board Label***	***TEAclipper Connection***
Trig	PGD	PGD
nQ	PGC	PGC
Sleep	nRST	Vpp
Q	Dat	-
Vdd	Vdd	Vdd
Vss	Vss	Vss

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