Mass Production Tool User's Guide – Rev A Board

The PGA450 mass production tool is a reference design that uses the MSP430 LaunchPad as a production programmer. The OTP and EEPROM of five PGA450s can be programmed at once. Note that this is supposed to be used as a reference for the customer's production programmer and will likely need some modifications for use with the customer's system.

The board only needs a 10-15V power supply; all other rails are generated on board. The five sockets are for demo purposes. Screw terminals are available on the board to allow easy connections with the customer's system.

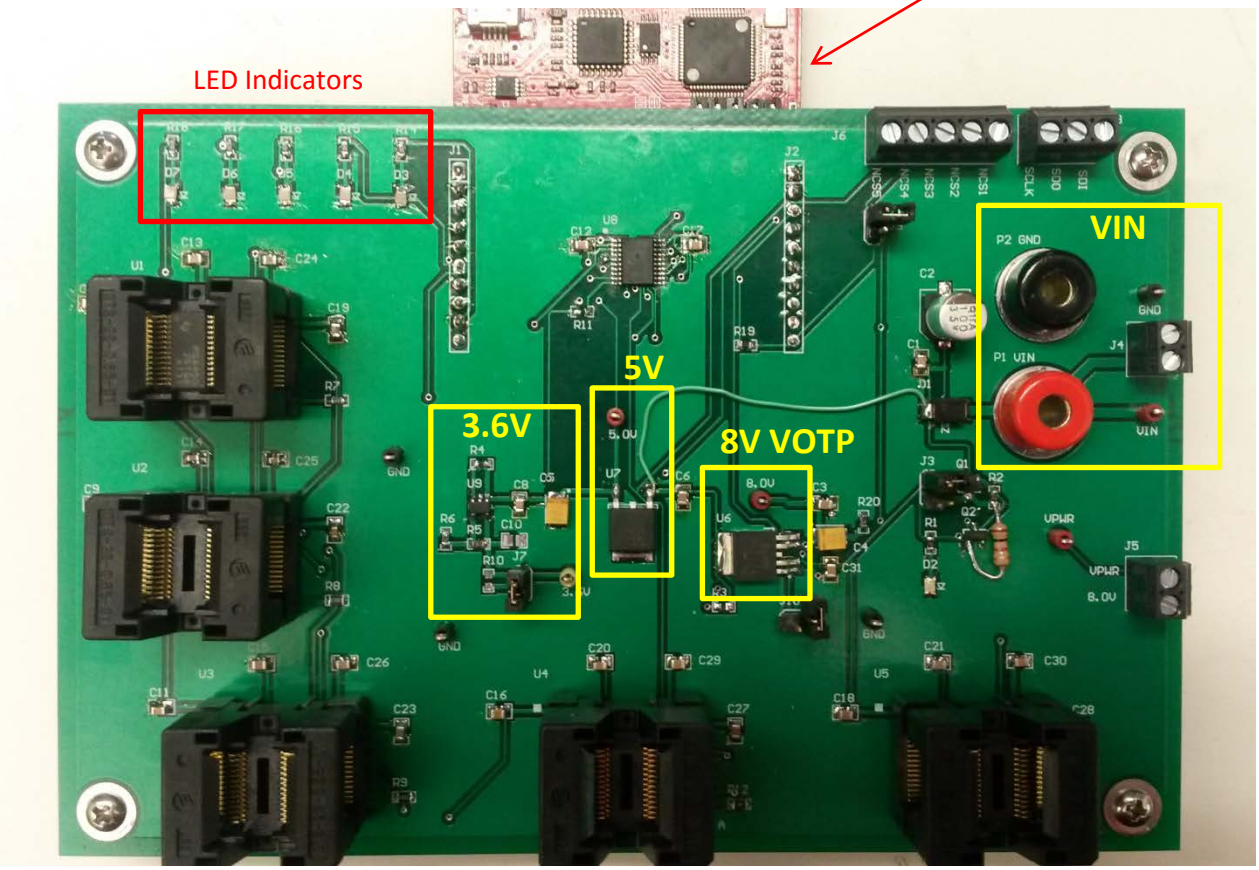
Quick-start Demo Instructions:

1. Fill the five PGA450 sockets with blank PGA450 IC's
2. Ensure jumpers are in accordance with default settings on jumper table
3. Supply 10-15V to VIN (12V nominal)
4. Close Jumper J9 to start the OTP programming sequence
5. LED's D3-D7 will light up to indicate that the IC's have been successfully programmed

Jumper table:

Designator	Description	Default
J3 – VIN to VPWR	**Closed**: VIN connected to VPWR **Open**: Allows VPWR_EN signal to determine whether VPWR is activated or not	Open
J7 – 3.6V to MSP430	**Closed**: 3.6V supplied to MSP430 **Open**: 3.6V not supplied to MSP430 (for use when power is supplied by USB)	Closed
J9 – Start Programming	The MSP430 will initiate the OTP programming sequence whenever this jumper changes states. **Closed -> Open**: Initiate OTP Programming **Open -> Closed**: Initiate OTP Programming	Open
J10 – VOTP_EN	**Closed**: Enables 8V rail for OTP programming **Open**: Allows VOTP_EN signal to determine whether 8V is activated or not	Open

Board Description:



Loading the MSP430 program:

The hex file used to program the PGA450 must first be changed into a C array so that the MSP-EXP430G2 can process it. Note that this only needs to be done once.

Adding Hex file to CCS project:

1. There are 4 files in the Hex2Array folder. Replace the PGA450.hex file with the desired hex file.
2. Run the batch file "h2a.bat" (double click it).
3. This will generate a new "PGA450FW.c" file. Use this file to replace the "PGA450FW.c" file in the CCS project.
    a. Find the directory where the CCS studio project is stored and replace the "PGA450FW.c" file with the new one just generated.

EEPROM:

4. Open the 'PGA450_EEPROM.c' file in the CCS project

5. Change the EEPROM coefficients as desired.

Loading to MSP430

6. Rebuild the CCS project
7. Attach the MSP-EXP430G2 to the computer via a USB cable
8. Run -> Debug (this loads the program to the MSP430)
9. Stop Debugging session and remove USB cable

Programming sequence:

This is the sequence that occurs after the OTP programming is initiated. This descriptions follows the case statements used in the pga450ProgTask function in the 'PGA450Comm.c' file.

1. PGA450_STG_INIT
    a. Resets LEDs to the off position
    b. Turns on VPWR via VPWR_EN signal
2. PGA450_STG_VPWR_ON_DLY:
    a. After a short delay, VOTP is turned on via the VOTP_EN signal
3. PGA450_STG_RESET:
    a. Resets each PGA450 individually
4. PGA450_STG_PROG_OTP:
    a. The OTP program is programmed to all five PGA450s at once
5. PGA450_STG_PROG_EE:
    a. The EEPROM is programmed to all five PGA450s at once
6. PGA450_STG_VERIFY_OTP_EE:
    a. Verifies the OTP and EEPROM of each PGA450 individually.
    b. If the PGA450 was programmed successfully, the corresponding LED will light.
7. PGA450_STG_VOTP_OFF:
    a. Turns off the 8V VOTP
8. PGA450_STG_VOTP_OFF_DLY:
    a. After a short delay, VPWR is turned off

NOTES:

1. Supply set to 12.5V @ 500mA limit. MPTool without LP connected draws 20mA.
2. Without LP, default jumper positions, and no PGA450, measurements at Test Points:
    a. VIN_TP=12V
    b. VPWR_TP=9.67V
    c. 3.6V_TP=3.45V
    d. 5.0V_TP=5V
    e. 8.0V_TP=0V (if J10=Closed, 7.97V)
    f. LED_D2 is ON
3. With LP connected:
    a. VIN_TP=12V, current draw increases to 40mA
    b. VPWR_TP=0.V
    c. 3.6V_TP=3.45V
    d. 5.0V_TP=5V
    e. 8.0V_TP=0V
    f. LED_D2 is OFF (all LEDs are OFF)
4. With LP Connect, and J9 OTP Seq activated:
    a. VIN_TP=12V, current draw increases to 50mA
    b. VPWR_TP=11.2V (for 2.712s)
    c. 3.6V_TP=3.45V
    d. 5.0V_TP=5V
    e. 8.0V_TP=8V (for 1.2s duration, 500ms after VPWR goes active)
    f. LED_D2 is ON for execution duration
5. With LP Connect, and single and two PGA450-Q1 connected:
    a. VIN_TP=12V, current draw increases to 120mA
    b. VPWR_TP=1.1V
    c. 3.6V_TP=3.45V
    d. 5.0V_TP=5V
    e. 8.0V_TP=0V
    f. LED_D2 is OFF
6. With LP Connect, single USSC, and J9 OTP Seq activated:
    a. VIN_TP=12V, current decreases to 60mA
    b. VPWR_TP=11.2V (for 3.296s)
    c. 3.6V_TP=3.45V
    d. 5.0V_TP=5V
    e. 8.0V_TP=8V (for 2.28s duration, 500mA after VPWR goes active)
    f. LED_D2 is ON for execution duration
    g. LED_D3 went ON, and stayed on post-execution. LED_D3 is off after power cycle.
7. With LP Connect, and two PGA450-Q1 connected:
    a. VIN_TP=12V, current draw increases to 40mA
    b. VPWR_TP=1.1V
    c. 3.6V_TP=3.45V
    d. 5.0V_TP=5V
    e. 8.0V_TP=0V
    f. LED_D2 is OFF
8. With LP Connect, two USSC, and J9 OTP Seq activated:
    a. VIN_TP=12V, current decreases to 60mA, returns to 200mA after execution

b. VPWR_TP=11.2V (for 3.832s)
c. 3.6V_TP=3.45V
d. 5.0V_TP=5V
e. 8.0V_TP=8V (for 2.336s duration, 500mA after VPWR goes active)
f. LED_D2 is ON for execution duration
g. LED_D3&D4 went ON, and stayed on post-execution. LED_D3 is off after power cycle.