10. June 2016

# *Application Note*

## For Plastic Logic's UC8156 based displays

## "Waveform and Temperature handling"


2 Waveform Types

The UC8156 controller is supporting 2 waveform types. Plastic Logic has defined them as:
Type1: "high-quality 4 grey-level waveform" -> update time 0.5sec … 1sec
Type2: "fast 2 grey-level (only black&white) waveform" -> update time 0.2sec … 0.4sec

| Waveform Type | Supported grey level | Time needed for an update [1] |
|---------------|---------------------|------------------------------|
| Type1 | 4 | 0.5sec … 1sec |
| Type2 | 2 (black&white only) | 0.2sec … 0.4sec |

[1] *exact update time is depending on specific waveform design*

Switching between those 2 waveform types can be done using Reg[40h].bit1 (MARS bit):
MARS=0 -> Type1 waveform is selected
MARS=1 -> Type2 waveform is selected

The waveform selection using the MARS bit must be done in advance to the update trigger command Reg[14h].bit0 (DWTRG).
In order to trigger the correct update of the waveform from the MTP into the waveform LUT it is necessary to enable the "Read MTP to Update LUT setting" bit which is in (the undocumented) Reg[44h].bit6 -> Reg[44h]=0x60. This needs to be done only once after power-up together with the general register over-writes.

Temperature handling

The UC8156 can do the temperature waveform variant selection automatically using its internal temperature sensor.
This can be controlled by Reg[07h]:

**(8) Temperature Sensor Configuration  (Index: 07h) (Default: 00h)**

| Action | R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|--------|-----|----|----|----|----|----|----|----|----|
| Config. Temp. Sensor | R/W | - | - | - | - | TDSS[1:0] | | TAR | TRO |

This command selects temperature device source.
**TDSS[1:0]:** Temperature Device Source Select.
    00, 01: Direct refer TV[7:0] setting
    10: Using internal temperature sensor.
    11: Using external temperature sensor. External temperature sensor must be connection to GPIO[3:2] port.
**TAR:** Temperature Auto Retrieval.
    This bit determines whether the internal or external temperature is auto retrieved at the beginning of an update.
    0: temperature retrieval is disabled.
    1: temperature retrieval is enabled.
**TRO:** Temperature sensor read operation. (Write only)
    0: No effect.
    1: Trigger an temperature sensor read operation and also update the temperature value to TV[7:0] at operation end.
      TDSS[1] must set to '1'.

For automatic temperature handling the following setting should be used:
TDSS=10b, TAR=1, TRO=0 -> Reg[07h]=0x0A