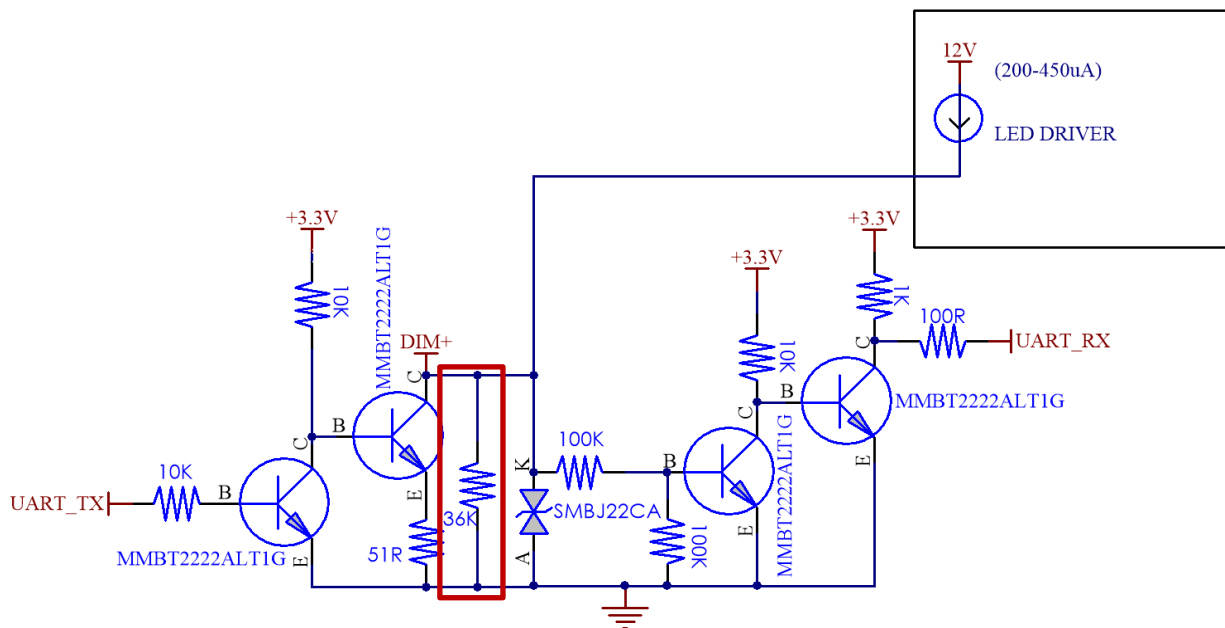


Inventronics Digital Dimming V2.0 Communication Protocol

I. Hardware Interface Design

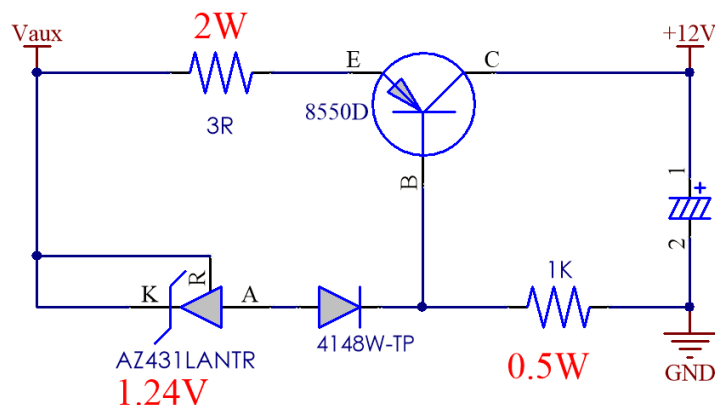
- Digital Dimming utilizes a Master-Slave single line UART communication bus
- To communicate with the driver via UART_TX and UART_RX, a conversion circuit is needed
- DIM+ is internally pulled high by the 12V auxiliary supply, which regulates a 200-450uA constant current supply on the DIM+ line.
- To ensure the reliability of communication, a 36kΩ resistor is required, paralleled between DIM+ and GND.

Reference design shown below:



- For NB-IOT, GPRS, and 4G systems, a current limiting circuit to the controller is required with the current limited to 400mA.

Reference design shown below:



II. Data and Frame Definition

- A standard UART interface is utilized
- Each byte data is consisted of 1 start bit, 8 data bits and 1 stop bit
- The Baud rate is 9600
- The Interval between data frames is a minimum of 120ms with a recommendation of over 150ms. (Including intervals between send-frame and send-frame, send-frame and receive-frame)

III. Software Protocol Definition

- A Data frame includes head, command, offset address, data length, data, checksum, and two ends.
- Checksum = command + offset address + data length + data

Available Commands:

- **Set Max Current**
 - Allows user to set output current as a percentage of the maximum current
- **Read Output Current**
 - Returns actual current in DC mA
- **Read Output Voltage**
 - Returns actual voltage in Vdc
- **Read Digital Dimming Level**
 - Read Digital Dimming brightness level, returns value between 0-200
 - Value = dim percentage * 200
- **Read LED Output Power**
 - Read Active Power for Driver LED Output in Watts
- **Read Driver Input Frequency**
 - Read driver input frequency (Hz)
- **Read Driver Input Current**
 - Read driver input current in AC mA
- **Read Driver Input Voltage**
 - Read driver input voltage in Vac

- **Read Driver Input Power**
 - Read driver input active power in Watts
- **Read Total Lamp-On Time**
 - Read Total Lamp-On Time in hours.
 - Lamp on time is defined as the time that the driver has been powered and not in a dim-to-off state.
- **Read Driver Active Energy**
 - Read driver active energy in Watt Hours
- **Read Internal Temperature**
 - Reads AD value of driver internal NTC, see Appendix 1 for corresponding AD and temperature values
- **Read External Temperature**
 - Reads AD value of driver external NTC, see Appendix 2 for corresponding resistance, AD, and temperature values
- **Read Driver Operating Time**
 - Reads driver operating time, or time that the driver has been powered, without consideration to the dim level
- **Read Driver Power Failure Mode**
 - Detects short or open circuit on driver output
- **Digital Dimming**
 - Allows for dimming of driver over Digital Dimming bus
- **Read Model Information**
 - Returns driver model and rated power level
- **Read Current Ratio**
 - Returns the programmed output current as a percentage of the maximum output current
- **Set Driver Dimming Mode**
 - Allows user to change the driver dimming mode
 -
- **Reset**
 - Power cycles the driver. This is required if the dimming mode is changed when the driver is connected to AC Power.

Information Update Rate:

Without considering UART timing, the driver updates variables approximately every 150ms. If the dimming command or set max current command are used It can take up to 2 seconds for the current and voltage readings to move to their final state. If read before 2 seconds, an intermittent state will be reflected.

Compatible Drivers:

Digital Dimming V2.0 is available on all EUM and ESM drivers ending in Lx.

IV. Command List

Checksum = Command + Offset Address + Data Length + Data Bit

| Header | Command | Offset Address | Data Length | Data | Checksum | End | End | Definition | |
|--------|---------|----------------|-------------|--|----------|------|------|-----------------------------------|---|
| 0x3A | 0x31 | 0x00 | 0x00 | 0x00-0x64 | | 0x0D | 0x0A | Set Maximum Current as percentage | |
| | 0x32 | 0x00 | 0x01 | If right, return 0x55, if wrong, no return | | | | Response to command 0x31 | |
| | 0x3A | 0x3A | 0x00 | 0x01 | 0x02 | | | 0x3D | Read Output Current |
| | | | 0x01 | 0x01 | 0x02 | | | 0x3E | Read Output Voltage |
| | | | 0x05 | 0x01 | 0x01 | | | 0x41 | Read Digital Dimming brightness level 0-200 (percentage * 200) |
| | | | 0x06 | 0x01 | 0x02 | | | 0x43 | Read LED Output Power (W) |
| | | | 0x0B | 0x01 | 0x01 | | | 0x47 | Read driver input frequency (Hz) |
| | | | 0x0C | 0x01 | 0x01 | | | 0x48 | Read driver power factor |
| | | | 0x0D | 0x01 | 0x02 | | | 0x4A | Read driver input current (AC mA) |
| | | | 0x0E | 0x01 | 0x02 | | | 0x4B | Read driver input voltage (Vac) |
| | | | 0x0F | 0x01 | 0x02 | | | 0x4C | Read driver input power (W) (Active Power) |
| | | | 0x10 | 0x01 | 0x03 | | | 0x4E | Read Total Lamp On-Time (h) |
| | | | 0x11 | 0x01 | 0x05 | | | 0x51 | Read driver active energy (Wh) |
| | | | 0x12 | 0x01 | 0x01 | | | 0x4E | Read driver internal temperature (NTC) (°C) |
| | | | 0x13 | 0x01 | 0x01 | | | 0x4F | Read external temperature (NTC) (°C) |
| | | | 0x14 | 0x01 | 0x03 | | | 0x52 | Read total driver operating time (h) |
| | | | 0x15 | 0x01 | 0x01 | | | 0x51 | Read digital LED power failure mode bit0=1: short circuit, bit1 = 1: open circuit |

| Header | Command | Offset Address | Data Length | Data | Checksum | End | End | Definition |
|--------|---------|----------------|-------------|----------------------|----------|------|------|---|
| 0x3A | 0x3C | 0x00 | 0x01 | 0x00 - 0xC8 | | 0x0D | 0x0A | Digital Dimming, (dims the driver, Percentage * 200) |
| | 0x35 | 0x0B | 0x01 | 0x05 | 0x46 | | | Read model information |
| | 0x36 | 0x0B | 0x05 | 5 Bytes | | | | Return model information |
| | 0x37 | 0x34 | 0x01 | See Definition | | | | Set dimming mode |
| | 0x38 | 0x34 | 0x01 | 0x55 (If successful) | 0xC2 | | | Dimming Mode Response |
| | 0x39 | 0x00 | 0x01 | 0x00 | 0x3A | | | After setting the mode, the reset must be sent to take effect |

V. Command Definition

- Command 0x31 - Set Constant Power Max. Current**

Set constant power maximum current to fit for LED applications. This data exists in the EEPROM and is not recommended for frequent use. To dim the driver, please use the 0x3C dimming command.

Example: Set constant power maximum current to 70% of current output (70=0x46)

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x31 | 0x00 | 0x01 | 0x46 | 0x78 | 0x0D | 0x0A |

- Command 0x32 - Response of Command 0x31**

If data received successfully, reply is 0x55. If not, there is no reply.

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x32 | 0x00 | 0x01 | 0x55 | 0x88 | 0x0D | 0x0A |

- **Command 0x3C - Digital Dimming Command**

- Data from 0-200 corresponds to 0-100% dimming level.
- To dim driver off, send command 0. If driver does not support Dim-to-Off, 0 is the minimum dimming level.
- If the minimum dimming level is 10%, then all levels between 0-20 are 10%.
- All values over 200 are 100% dimming level.

Example: dimming to 50% ($50\% * 200 = 100 = 0x64$)

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3C | 0x00 | 0x01 | 0x64 | 0xA1 | 0x0D | 0x0A |

- **Command 0x3D - Response from Digital Dimming Command 0x3C**

If data received successfully, reply is 0x55; if not, no reply.

- **Command 0x3A - Query Command**

The query command requests driver data registers pertaining to driver health and diagnostic information.

- **Read Current:**
Actual current value = Return current value (mA)

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x00 | 0x01 | 0x02 | 0x3D | 0x0D | 0x0A |

- **Read Voltage:**
Actual voltage value = Return voltage value (Vdc)

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x01 | 0x01 | 0x02 | 0xA1 | 0x0D | 0x0A |

- **Read Dimming Level:**

Actual Dimming Level, 0-200

Diming Level = Dimming Percentage * 200

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x05 | 0x01 | 0x01 | 0x41 | 0x0D | 0x0A |

- **Read LED Output Power**

Actual Active Power for Driver Output, in Watts

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x06 | 0x01 | 0x02 | 0x43 | 0x0D | 0x0A |

- **Read Driver Input Frequency**

Actual driver input frequency, in Hertz.

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x0B | 0x01 | 0x01 | 0x47 | 0x0D | 0x0A |

- **Read Driver Power Factor**

Read driver power factor.

Driver power factor = response / 100

Example: a power factor of .98 will read as 0x62; 0x62 = 98, 98/100 = .98

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x0C | 0x01 | 0x01 | 0x48 | 0x0D | 0x0A |

- **Read Driver Input Current**

Actual current value = Return voltage current (AC mA)

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x0D | 0x01 | 0x02 | 0x4A | 0x0D | 0x0A |

- **Read Driver Input Voltage**

Actual voltage value = Return voltage value (Vac)

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x0E | 0x01 | 0x02 | 0x4B | 0x0D | 0x0A |

- **Read Driver Input Active Power**

Actual Driver Active Power, in Watts

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x0F | 0x01 | 0x02 | 0x4C | 0x0D | 0x0A |

- **Read Total Lamp-On Time**

Actual Lamp-on Time = Return Time Value, in Hours

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x10 | 0x01 | 0x03 | 0x4E | 0x0D | 0x0A |

- **Read Driver Active Energy**

Driver active energy, measured in Watt Hours

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x11 | 0x01 | 0x05 | 0x51 | 0x0D | 0x0A |

- **Read Internal Temperature**

AD value of internal driver NTC. See Appendix 1 for correlation between AD value and temperature values in °C.

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x12 | 0x01 | 0x01 | 0x4E | 0x0D | 0x0A |

- **Read External Temperature**

AD value of external driver NTC. See Appendix 2 for correlation between resistance, AD value, and temperature values in °C.

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x13 | 0x01 | 0x01 | 0x4F | 0x0D | 0x0A |

- **Read Total Driver Operating Time**

Total driver operating time, in hours. Total driver operating time is defined as time that the driver has been energized, without regard to the status of the driver output.

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x14 | 0x01 | 0x03 | 0x52 | 0x0D | 0x0A |

- **Read Failure Mode**

Reads driver failure mode.

For short circuit, reply is 0x01

For open circuit, reply is 0x02

If driver is not in failure mode, reply is 0x00

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x3A | 0x15 | 0x01 | 0x01 | 0x51 | 0x0D | 0x0A |

- **Command 0x3B - Query 0x3A Command Response**

Example: Receive response from Query Current Value

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|---------------|----------|------|------|
| 0x3A | 0x3B | 0x00 | 0x02 | 0x04, 0x12 | 0x53 | 0x0D | 0x0A |

The data 0x04 0x12 = 0 x0412 = 1042, is the actual current value (mA)

- **Command 0x35 - Read LED driver information**

Reads the information of the current model, including the rated power and the maximum rated current Iomax.

Example: Read LED Driver Information

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x35 | 0x0B | 0x01 | 0x05 | 0x46 | 0x0D | 0x0A |

Driver will return 3A36 0B 05 **01 00 96 00 69** 46 0D 0A

01 00 96 Expresses EUD150SxxxDTA, 0096 expresses power is 150W.

00 69 express Max current is 105, Iomax is 1.05A.

See data format below:

Data Format:

| Byte | Bit | | | | | | | | Value |
|------|-----|---|---|---|---|---|---|---|---------------|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 0x0B | x | x | x | x | x | x | x | x | Suffix |
| 0x0C | x | x | x | x | x | x | x | x | Prefix |
| 0x0D | x | x | x | x | x | x | x | x | Power Level |
| 0x0E | x | x | x | x | x | x | x | x | Model Current |
| 0x0F | x | x | x | x | x | x | x | x | |

| Data | Bit | | | | | | | | Hex |
|---------------------|-----|---|---|---|---|---|---|---|------|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Suffix (0x0B) | | | | | | | | | |
| xxxSxxxD(T/V) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0x00 |
| xxxSxxxD(T/V)A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0x01 |
| xxxSxxxL(G/T/B) | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0x0F |
| xxxSxxxM(G/T/B) | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0x11 |
| Prefix | | | | | | | | | |
| High 5 bits of 0x0c | | | | | | | | | |
| EUD | 0 | 0 | 0 | 0 | 0 | | | | |
| EUM | 0 | 1 | 0 | 0 | 1 | | | | |
| ESM | 0 | 1 | 0 | 1 | 1 | | | | |
| EBM | 0 | 1 | 1 | 0 | 1 | | | | |

- **Command 0x35 - Read the Maximum Current Setting Ioset**

Example:

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x35 | 0x20 | 0x01 | 0x01 | 0x57 | 0x0D | 0x0A |

LED driver returns 3A 36 20 01 **50** A7 0D 0A

0x50 expresses that the maximum current of the driver is 80% of the maximum rated current, ie Ioset = Iomax * % = 1.05 * 80% = 840mA

- **Command 0x37 - Set Dimming Mode**

This command sets the dimming mode for a Digital Dimming compatible Inventronics driver. Please note that only one dimming mode can be selected at a time. However, OLC is not considered a dimming mode, and can be used in conjunction with any other dimming mode.

The dimming mode Data Bit encoding is as follows:

| Dimming Mode Data Bit | | | |
|-----------------------|-----------------|--------|------------|
| Bit | Setting | 1 | 0 |
| 7 | OLC | Enable | Disable |
| 6 | Set to 1 | 1 | x |
| 5 | Set to 0 | x | 0 |
| 4 | Digital Dimming | Enable | Disable |
| 3 | 0-10v/0-5v | 0-5v | 0-10v |
| 2 | PWM | PWM | 0-10v/0-5v |
| 1 | Timer | Enable | Disable |
| 0 | Set to 1 | 1 | x |

Example: Set driver dimming mode to Digital Dimming:

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|-------------|----------|------|------|
| 0x3A | 0x37 | 0x34 | 0x01 | 0x51 | 0xBD | 0x0D | 0x0A |

- **Command 0x38 - Response of Command 0x37**

If data received successfully, reply is 0x55. If not, there is no reply.

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x38 | 0x34 | 0x01 | 0x55 | 0xC2 | 0x0D | 0x0A |

- **Command 0x39 – Reset Command**

This command must be sent after the dimming mode is changed

| Head | Command | Offset Address | Data Length | Data bit | Checksum | End | End |
|------|---------|----------------|-------------|----------|----------|------|------|
| 0x3A | 0x39 | 0x00 | 0x01 | 0x00 | 0x3A | 0x0D | 0x0A |

Appendix I:

Internal OTP: AD value corresponds to temperature

| AD value | T °C | AD value | T °C | AD value | T °C | AD value | T °C | AD value | T °C | AD value | T °C |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| 15 | 125 | 55 | 76 | 95 | 54 | 135 | 38 | 175 | 23 | 215 | 4 |
| 16 | 123 | 56 | 75 | 96 | 54 | 136 | 38 | 176 | 22 | 216 | 4 |
| 17 | 121 | 57 | 74 | 97 | 53 | 137 | 37 | 177 | 22 | 217 | 3 |
| 18 | 118 | 58 | 74 | 98 | 53 | 138 | 37 | 178 | 22 | 218 | 2 |
| 19 | 116 | 59 | 73 | 99 | 52 | 139 | 37 | 179 | 21 | 219 | 2 |
| 20 | 114 | 60 | 72 | 100 | 52 | 140 | 36 | 180 | 21 | 220 | 1 |
| 21 | 112 | 61 | 72 | 101 | 52 | 141 | 36 | 181 | 20 | 221 | 0 |
| 22 | 111 | 62 | 71 | 102 | 51 | 142 | 36 | 182 | 20 | 222 | 0 |
| 23 | 109 | 63 | 71 | 103 | 51 | 143 | 35 | 183 | 20 | 223 | -1 |
| 24 | 107 | 64 | 70 | 104 | 50 | 144 | 35 | 184 | 19 | 224 | -2 |
| 25 | 105 | 65 | 69 | 105 | 50 | 145 | 34 | 185 | 19 | 225 | -2 |
| 26 | 104 | 66 | 69 | 106 | 50 | 146 | 34 | 186 | 18 | 226 | -3 |
| 27 | 103 | 67 | 68 | 107 | 49 | 147 | 34 | 187 | 18 | 227 | -4 |
| 28 | 101 | 68 | 68 | 108 | 49 | 148 | 33 | 188 | 17 | 228 | -5 |
| 29 | 100 | 69 | 67 | 109 | 48 | 149 | 33 | 189 | 17 | 229 | -5 |
| 30 | 98 | 70 | 66 | 110 | 48 | 150 | 33 | 190 | 17 | 230 | -6 |
| 31 | 97 | 71 | 66 | 111 | 47 | 151 | 32 | 191 | 16 | 231 | -7 |
| 32 | 96 | 72 | 65 | 112 | 47 | 152 | 32 | 192 | 16 | 232 | -8 |
| 33 | 95 | 73 | 65 | 113 | 47 | 153 | 31 | 193 | 15 | 233 | -9 |
| 34 | 94 | 74 | 64 | 114 | 46 | 154 | 31 | 194 | 15 | 234 | -10 |
| 35 | 93 | 75 | 64 | 115 | 46 | 155 | 31 | 195 | 14 | 235 | -11 |
| 36 | 91 | 76 | 63 | 116 | 45 | 156 | 30 | 196 | 14 | 236 | -12 |
| 37 | 90 | 77 | 63 | 117 | 45 | 157 | 30 | 197 | 13 | 237 | -13 |
| 38 | 89 | 78 | 62 | 118 | 45 | 158 | 29 | 198 | 13 | 238 | -14 |
| 39 | 88 | 79 | 62 | 119 | 44 | 159 | 29 | 199 | 13 | 239 | -15 |
| 40 | 88 | 80 | 61 | 120 | 44 | 160 | 29 | 200 | 12 | 240 | -16 |
| 41 | 87 | 81 | 61 | 121 | 44 | 161 | 28 | 201 | 12 | 241 | -17 |
| 42 | 86 | 82 | 60 | 122 | 43 | 162 | 28 | 202 | 11 | 242 | -18 |
| 43 | 85 | 83 | 60 | 123 | 43 | 163 | 28 | 203 | 11 | 243 | -20 |
| 44 | 84 | 84 | 59 | 124 | 42 | 164 | 27 | 204 | 10 | 244 | -21 |
| 45 | 83 | 85 | 59 | 125 | 42 | 165 | 27 | 205 | 10 | 245 | -23 |
| 46 | 82 | 86 | 58 | 126 | 42 | 166 | 26 | 206 | 9 | 246 | -25 |
| 47 | 82 | 87 | 58 | 127 | 41 | 167 | 26 | 207 | 9 | 247 | -27 |
| 48 | 81 | 88 | 57 | 128 | 41 | 168 | 26 | 208 | 8 | 248 | -29 |
| 49 | 80 | 89 | 57 | 129 | 40 | 169 | 25 | 209 | 7 | 249 | -31 |
| 50 | 79 | 90 | 56 | 130 | 40 | 170 | 25 | 210 | 7 | 250 | -34 |
| 51 | 78 | 91 | 56 | 131 | 40 | 171 | 24 | 211 | 6 | 251 | -38 |
| 52 | 78 | 92 | 56 | 132 | 39 | 172 | 24 | 212 | 6 | 252 | -40 |
| 53 | 77 | 93 | 55 | 133 | 39 | 173 | 24 | 213 | 5 | | |
| 54 | 76 | 94 | 55 | 134 | 39 | 174 | 23 | 214 | 5 | | |

Appendix 2:

External OTP: AD value corresponds to temperature

| T °C | R (kΩ) | AD Value | T °C | R (kΩ) | AD Value | T °C | R (kΩ) | AD Value |
|------|--------|-----------|------|--------|------------|------|--------|------------|
| 35 | 6.948 | 10 | 67 | 2.435 | 99 | 99 | 1.00 | 154 |
| 36 | 6.707 | 13 | 68 | 2.364 | 101 | 100 | 0.97 | 155 |
| 37 | 6.475 | 16 | 69 | 2.294 | 103 | 101 | 0.95 | 156 |
| 38 | 6.253 | 19 | 70 | 2.228 | 105 | 102 | 0.93 | 158 |
| 39 | 6.039 | 22 | 71 | 2.163 | 108 | 103 | 0.90 | 159 |
| 40 | 5.834 | 25 | 72 | 2.100 | 110 | 104 | 0.88 | 160 |
| 41 | 5.636 | 28 | 73 | 2.040 | 112 | 105 | 0.86 | 161 |
| 42 | 5.445 | 31 | 74 | 1.981 | 114 | 106 | 0.84 | 162 |
| 43 | 5.262 | 34 | 75 | 1.925 | 116 | 107 | 0.82 | 163 |
| 44 | 5.086 | 37 | 76 | 1.870 | 118 | 108 | 0.80 | 164 |
| 45 | 4.917 | 40 | 77 | 1.817 | 120 | 109 | 0.78 | 165 |
| 46 | 4.754 | 43 | 78 | 1.766 | 122 | 110 | 0.76 | 166 |
| 47 | 4.597 | 46 | 79 | 1.716 | 123 | 111 | 0.74 | 167 |
| 48 | 4.446 | 49 | 80 | 1.669 | 125 | 112 | 0.72 | 168 |
| 49 | 4.301 | 52 | 81 | 1.622 | 127 | 113 | 0.70 | 169 |
| 50 | 4.161 | 55 | 82 | 1.578 | 129 | 114 | 0.69 | 170 |
| 51 | 4.026 | 58 | 83 | 1.535 | 131 | 115 | 0.67 | 170 |
| 52 | 3.896 | 60 | 84 | 1.493 | 132 | 116 | 0.66 | 171 |
| 53 | 3.771 | 63 | 85 | 1.452 | 134 | 117 | 0.64 | 172 |
| 54 | 3.651 | 66 | 86 | 1.413 | 136 | 118 | 0.63 | 173 |
| 55 | 3.535 | 69 | 87 | 1.375 | 137 | 119 | 0.61 | 174 |
| 56 | 3.423 | 71 | 88 | 1.338 | 139 | 120 | 0.60 | 174 |
| 57 | 3.315 | 74 | 89 | 1.303 | 140 | 121 | 0.58 | 175 |
| 58 | 3.211 | 77 | 90 | 1.268 | 142 | 122 | 0.57 | 176 |
| 59 | 3.111 | 79 | 91 | 1.234 | 143 | 123 | 0.56 | 177 |
| 60 | 3.014 | 82 | 92 | 1.202 | 145 | 124 | 0.54 | 177 |
| 61 | 2.922 | 84 | 93 | 1.170 | 146 | 125 | 0.53 | 178 |
| 62 | 2.834 | 87 | 94 | 1.139 | 147 | | | |
| 63 | 2.748 | 89 | 95 | 1.110 | 149 | | | |
| 64 | 2.666 | 92 | 96 | 1.081 | 150 | | | |
| 65 | 2.586 | 94 | 97 | 1.053 | 151 | | | |
| 66 | 2.509 | 96 | 98 | 1.026 | 153 | | | |

Disclaimer

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