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Basic GMSL Tuning Procedures

When matching the controller’s deserializer with a GMSL camera, we generally recommend following the steps below.

Understand the Hardware

Understand the serializer and deserializer of the devices you are using,

- Are they matched, GMSL1/2?
- What are their default addresses?
- What is the default communication method, i2c/uart?
- What are the default settings of their cfg?
- Are their pwdn controlled?
- Are the power rails normal?
- Is the oscillator working properly?
- Is POC controlled, and how (I2C, such as max20087, GPIO)?

Preliminary Detection and Verification

After confirming that there are no hardware issues, you can connect the SOC or controller for further verification:

- Use an i2c tool, such as i2cdetect, to check if the deserializer can be detected normally.
- If the default working mode (gmsl1/2, 3G/6Gbps) matches, the serializer should be detectable.
- If the CMOS powers up and works immediately, the CMOS address or EEPROM (if any) should be detectable.

Configuration Mode

If the serializer and deserializer modes do not match, you need to modify the configuration of cfg0/cfg1, or configure through software.

Confirm Configuration

Assuming there are no issues with the serializer and deserializer detection, read the ID of the serializer/deserializer/CMOS, modify some registers, read them back, and confirm that the I2C read/write channels are functioning properly.

Configure Serializer/Deserializer

Based on the camera module design (image format, bit width, etc.), configure the serializer and deserializer. It is recommended to print key registers of the serializer/deserializer, including

- Serializer’s pclk detect
- Deserializer’s link locked
- Deserializer’s video lock
- Deserializer’s video pipelock.

If pclk detect is missing, check the CMOS reset/pwdn/fsyn.

If link locked is missing, check the GMSL mode, whether the link is enabled, and if the POC parameters are reasonable.

If video lock is missing, check if the serializer’s tx-id matches the receiver’s rx-id.

If all the above are normal but the deserializer has no output, check if frame sync is enabled but not synchronized properly.

Measure Deserializer Output

To decouple GMSL configuration issues from CSIRX reception issues, when designing the PCB, add test point on the deserializer output, i.e., the mipi signal line.

When the above key signals are confirmed to be normal, measure the mipi output.

If there is no mipi output, modify the configuration of the serializer/deserializer/CMOS.

If mipi output is normal, troubleshoot the SOC receiver end.

Troubleshooting CSIRX Issues

When the deserializer has output but the application cannot receive data,

- Confirm the receiver end configuration, such as mipi rate, lane quantity,
- Whether the vc (virtual channel) matches.
- Whether the image format matches.