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|--|-------------------------------|--|---|
|  anon | motion/README: clarify whe... |  d75d945 · 3 months ago |  |
|  doc | initial import: Dell Lati... | 3 months ago | |
|  kernel | kernel: add DKMS sup... | 3 months ago | |
|  motion | motion/README: clari... | 3 months ago | |
|  patches | initial import: Dell Lati... | 3 months ago | |
|  .gitignore | motion: Home Assista... | 3 months ago | |
|  LICENSE | initial import: Dell Lati... | 3 months ago | |
|  README.md | kernel: add DKMS sup... | 3 months ago | |

Dell Latitude 5290 2-in-1 — Linux front camera support

Working support for the integrated OV5670 front camera on the **Dell Latitude 5290 2-in-1** (8th-gen Kaby Lake-R, 2018) under Linux.

As shipped, the front camera does not work on this machine with stock Linux distributions — the Intel IPU3 pipeline needs three independent things all going right at once. This repo provides all three:

1. A one-line kernel boot argument.
2. An out-of-tree backport of the mainline `int3472-tps68470` PMIC driver with a DMI match for the 5290 2-in-1 (mainline ships the same regulator and GPIO layout for the Dell Latitude 7212 — the 5290 2-in-1 reuses it byte-for-byte).
3. An out-of-tree build of the mainline `ipu_bridge` module, for distro kernels that shipped an older snapshot predating `INT3479` (OV5670) support.

A proper upstream-style patch for item (2) lives in [patches/](#) — once merged into mainline and a distro kernel picks it up, item (2) becomes vestigial and only item (1) plus a recent enough in-tree `ipu-bridge` are needed.

Optionally, [motion/](#) is a small kiosk-oriented motion-detect service that uses the camera for auto-blanking / auto-waking a wallboard display — built on top of the now-working camera, included because it's useful on its own and demonstrates the full capture pipeline.

Hardware

- **Chassis:** Dell Latitude 5290 2-in-1, board `0M27Y3`, motherboard DMI product name `Latitude 5290 2-in-1`
- **SoC:** Intel i5-8350U / i7-8650U (Kaby Lake-R)
- **IPU:** Intel IPU3 at PCI `0000:00:14.3`, `ipu3-imgu` at `0000:00:05.0`
- **Front sensor:** Omnivision OV5670 at i2c-3 slave `0x36`, ACPI ID `INT3479:00`, LNK0
- **PMIC:** Texas Instruments TPS68470 at i2c-2 slave `0x4D`, ACPI ID `INT3472:05`, revision `0x21`. Drives a 19.2 MHz `xvclk` for the sensor plus the seven regulator rails.
- **Regulator wiring** (matches Dell 7212): `VS10` → `avdd`, `AUX1` → `dvdd` (1.213V), `AUX2` → `dovdd`
- **GPIOs:** `reset` = `tps68470-gpio pin 3` (active-low), `powerdown` = `tps68470-gpio pin 4` (active-low)


There's also an unused LNK1 sensor (ACPI `INT3477:00`) that appears to be a rear-camera footprint but is not populated on this SKU.

Why it doesn't work out of the box

Three independent blockers, all needed simultaneously:

1. **`acpi_enforce_resources=1ax` boot cmdline.** Without it, the `intel-lpss` driver fails to probe `INT3446:00` (I2C4) because the ACPI GEXP OperationRegion conflicts with its I/O space reservation. No I2C4 means no i2c-3 bus, which means the OV5670 sensor is unreachable. On this SKU the DSDT only uses GEXP for fingerprint and tablet-mode detection — it never calls `SGEP` / `GEPS` for camera power-on — so `1ax` is safe.
2. **DMI match for the TPS68470 PMIC board data.** Mainline `int3472-tps68470` has regulator/GPIO init data for the Dell Latitude 7212 Rugged Extreme Tablet. The 5290 2-in-1 uses the same camera module and same TPS68470 wiring, but the DMI table in mainline (as of this writing) has no entry for the 5290 2-in-1, so probe fails with `No board-data found for this model` and the PMIC rails never come up. The 7-line fix is [patches/0001-*.patch](#).
3. **ipu-bridge support for `INT3479` (OV5670).** This is already upstream, but older distro kernels (e.g. Linux 6.14 as shipped in Ubuntu 24.04 HWE) were snapshotted from a version of `ipu-bridge.c` that only supported `INT343E` / `INT3474` / `INT347A` / `INT347E`. Without an `INT3479` entry the bridge never creates the CSI-2 graph and `ov5670` probe fails with `Endpoint for node get failed (-ENXIO)`. The [kernel/ipu-bridge/](#) tree is the mainline `ipu-bridge.c` source with a tiny `kzalloc_obj` → `kzalloc` backport so it builds against pre-6.15 kernel headers.

Quick start

```
# 1. Kernel cmdline 
sudo sed -i 's/GRUB_CMDLINE_LINUX_DEFAULT="/GRUB_CMDLINE_LINUX_DEFAULT="acpi_enforce_resources=1ax"/' /etc/default/grub
sudo update-grub

# 2. + 3. Out-of-tree modules via DKMS (rebuilds)
sudo apt install -y dkms
sudo ./kernel/install-dkms.sh
sudo reboot

# 4. Verify — after reboot
lsmod | grep -E 'int3472_tps68470|ipu_bridge|ov5670'
dmesg | grep -E 'TPS68470 REVID|Found supported :
ls /dev/media0 /dev/video*
```

If you'd rather not use DKMS, see [kernel/README.md](#) for the manual `make` && `sudo make install` path.

You should see `TPS68470 REVID: 0x21`, `Found supported sensor INT3479:00`, and a `/dev/media0` topology that includes an `ov5670 3-0036` entity.

See [doc/pipeline.md](#) for a full walkthrough of configuring the `media-ctl` pipeline and capturing a frame once the stack is up.







Motion-detect kiosk service

[motion/](#) contains a systemd service that runs a cheap frame-diff loop on `/dev/video0` (or wherever `ipu3-cio2 0`

About

Working OV5670 front-camera support on the Dell Latitude 5290 2-in-1 under Linux

[linux](#) [kernel](#) [camera](#)
[linux-kernel](#) [motion-detection](#)
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Languages

● C 54.0% ● Python 39.1%
 ● Shell 5.7%
 ● Makefile 1.2%

currently lives) and drives `xset dpms force on/off` to auto-blank and auto-wake the display. Configurable via a Tk GUI with live threshold meter. Built for a Home Assistant wallboard use case but not coupled to it.

See [motion/README.md](#) for install and tuning.

Status and upstreaming

- **Item 1** (boot cmdline) is a Linux-wide workaround and is not expected to be needed forever — a proper fix would be for the DSDT camera path to stop claiming the I2C4 registers, but that's a BIOS issue not a Linux issue.
- **Item 2** is a proposed mainline kernel patch; see [patches/](#) for the format-patch ready file. Once it lands and propagates through distro kernels, this repo's tps68470 build is no longer needed.
- **Item 3** is already fixed upstream; this repo's ipu_bridge build is a transitional backport for kernels shipped from older snapshots and is expected to be short-lived.

License

Kernel sources are GPL-2.0, as per the upstream files they are derived from. Userspace tools are GPL-2.0 for consistency. See [LICENSE](#) .

Credits

- Hans de Goede and Dan Scally did the real upstream work on `int3472-tps68470` and `ipu-bridge` . This repo just adds a DMI entry and builds their code out-of-tree for an older distro kernel.
- Original Dell 7212 regulator/GPIO layout discovery: Dan Scally.