iVcan.com | PRODUCT DATASHEET

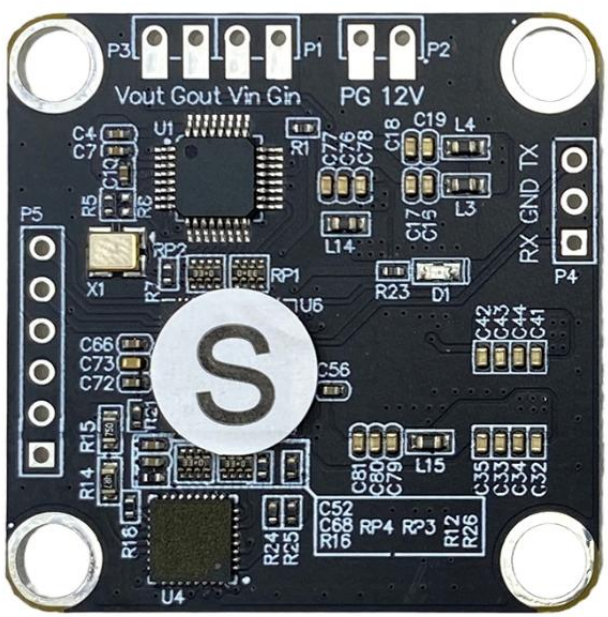
FPV Analog Video Scrambler & Descrambler Module

Hardware Baseband Video Encryption & Decryption Board for FPV Drones, UAVs & CCTV

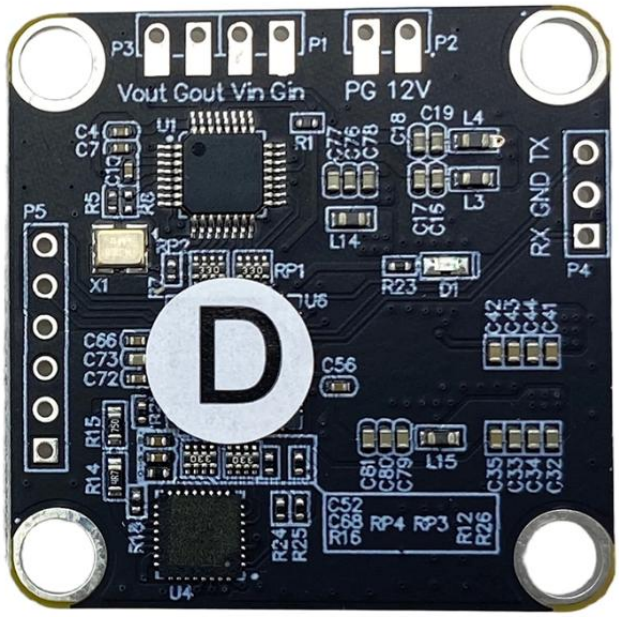
MODEL / SKU
VCAN2028S

1. PRODUCT OVERVIEW

Scrambler for VTX



Descrambler for VTX



The iVcan VCAN2028S is a compact, ultra-lightweight (6.1 g) hardware analog video scrambling and descrambling module engineered to protect live Composite Video Broadcast Signal (CVBS) feeds against unauthorized interception. Designed with a 36 × 36 mm square footprint for seamless integration with FPV video transmitters (VTX), UAV avionics stacks, and analog CCTV systems, the VCAN2028S delivers real-time baseband video encryption with negligible latency (< 0.1 ms) and full compatibility across all analog RF carrier frequencies (1.2 GHz, 2.4 GHz, 5.8 GHz, etc.).

Both the Air-Unit Scrambler (TX side) and Ground-Unit Descrambler (RX side) share identical unified hardware. Using the PC-based CVBS Scrambling Assistant software, integrators can assign each board's operating role and program user-defined encryption seeds (supporting over 100,000+ selectable algorithm combinations), ensuring only authorized receivers with the matching key can restore the video feed.

2. KEY FEATURES & TYPICAL APPLICATIONS

Core Product Advantages

- **Unified TX/RX Hardware:** Same board configures as Air Unit (VTX) or Ground Unit (VRX) via PC software.
- **100,000+ Custom Encryption Seeds:** User-programmable keys prevent unauthorized decoding by third-party receivers.
- **Ultra-Low Latency (< 0.1 ms):** Preserves real-time responsiveness for high-speed FPV flight.
- **True-Color Video Restoration:** Optimized video processing maintains crisp color fidelity and minimal distortion.
- **RF Frequency Agnostic:** Scrambles baseband CVBS

Target Application Scenarios

- **FPV Drones & Racing UAVs:** Protects live pilot video feeds from unauthorized viewing and spectator interception.
- **Law Enforcement & Public Safety:** Secures covert surveillance, policing, and emergency response video links.
- **Defense & Tactical UAVs:** Prevents hostile interception of sensitive reconnaissance video transmissions.
- **Industrial Infrastructure Inspection:** Protects video data across power plants, pipelines, and chemical facilities.
- **Private Aerial Filming:** Safeguards proprietary commercial

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signal; compatible with any analog VTX/VRX frequency.
- **Enhanced Firmware & Anti-Interference:** Improved firmware retention stability, faster response, and onboard status LED.

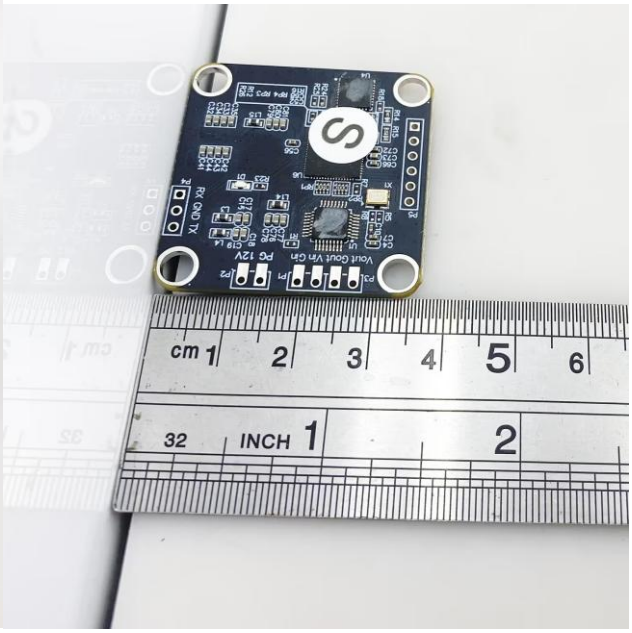
broadcast footage during aerial shoots.
- **Analog CCTV & Border Monitoring:** Drop-in baseband security for wired or wireless analog surveillance systems.

3. TECHNICAL SPECIFICATIONS (VCAN2028S)

Parameter	Specification
Model / SKU	VCAN2028S
Hardware Architecture	Unified TX/RX Baseband Analog Video Scrambler & Descrambler Board
Form Factor & Dimensions	36 × 36 mm (Square layout, optimized for VTX stack mounting)
Gross Weight	6.1 g
Operating Voltage	DC 5V – 15V / 6V – 16V (12V nominal; must exceed 5V for stable operation)
Power Consumption	12V @ < 60 mA (~0.72 W)
Added Video Latency	< 0.1 ms (Negligible real-time FPV latency)
Supported Video Signal	Standard Definition Analog CVBS (Composite Video)
Video Standards & Resolution	PAL / NTSC (480p – 576p SD; software selectable; not for HD AHD/CVI/HDMI)
Audio Support	Video scrambling only (Does not encrypt audio channels)
Encryption Algorithm & Seeds	Line inversion, phase shift & digital scrambling; 100,000+ / 130,000+ selectable seeds (Default: 7679 or 12345)
RF Frequency Compatibility	RF-agnostic (Works with 1.2 GHz, 2.4 GHz, 5.8 GHz, and any analog VTX/VRX)
Transmission Range Impact	Zero range reduction (Effective distance depends solely on VTX RF output power)
Configuration Software	CVBS Scrambling Assistant v2.1+ (Windows PC via USB-to-TTL serial adapter)
Diagnostic LED Indicator	Onboard status LED (Flashing = Normal operation; Solid On = Self-diagnosis fault)
Environmental Rating	Non-waterproof open PCBA (Additional housing or conformal coating advised for outdoor use)

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4. OPERATING PRINCIPLE & SIGNAL FLOW

The VCAN2028S operates strictly on the baseband composite video wire between the camera/VTX on the air side and the VRX/display on the ground side. Because it does not modify RF modulation or frequency hopping protocols, it integrates cleanly into any analog wireless link without affecting range.

1. Video Source	2. Air Unit (TX Side)	3. Wireless RF Link	4. Ground Unit (RX Side)	5. Display / DVR
Analog FPV Camera (CVBS Out, PAL/NTSC)	VCAN2028S Board (Scramble Mode) Baseband Encryption	Any Analog VTX & VRX (1.2G / 2.4G / 5.8G) Transmits Scrambled Feed	VCAN2028S Board (Descramble Mode) Matching Key Decode	FPV Goggles, Monitor, or Analog DVR (Clean Restored Video)

- **Scrambler (Transmitter Side):** Accepts standard CVBS output from the FPV camera, applies line/phase inversion and digital scrambling algorithms using the programmed seed, and outputs a distorted video signal to the VTX. Any unauthorized receiver without the matching descrambler and key sees only scrambled stripes.
- **Descrambler (Receiver Side):** Accepts the scrambled CVBS signal from the ground VRX, decodes it using the identical seed, and outputs clean, true-color video to FPV goggles, field monitors, or analog DVRs.

5. HARDWARE INTERFACES & PINOUT DEFINITION

VCAN2028S features clearly labeled pin headers (P1–P5) for straightforward wiring between camera, VTX/VRX, power supply, and PC configuration tool:

Connector	Pin Labels	Signal Description & Electrical Notes
P1 (Video Input)	**Vin / Gin**	Analog CVBS Video Input (from Camera on TX, or from VRX on RX) & Video Ground.
P2 (Power Input)	**PG / 12V**	Power Ground & DC Power Input (5V–15V / 6V–16V; < 60 mA). Must exceed 5V (12V optimal).
P3 (Video Output)	**Vout / Gout**	Analog CVBS Video Output (to VTX on TX, or to Goggles/Monitor/DVR on RX) & Video Ground.
P4 (UART Config)	**TX / GND / RX**	TTL Serial Interface for PC configuration via USB-to-TTL serial adapter.
P5 (Debug Port)	**Factory Debug**	Reserved engineering debugging interface (leave unconnected during normal operation).

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6. SOFTWARE CONFIGURATION & FIELD DIAGNOSTICS

6.1 Parameter Programming (CVBS Scrambling Assistant v2.1+)

Connect the board's P4 UART header (TX, RX, GND) to a Windows PC using the included USB-to-TTL serial programmer (cross-connect TX to RX, RX to TX, and GND to GND), then configure via CVBS Scrambling Assistant v2.1:

- **Step 1 — Connect & Read:** Open CVBS Scrambling Assistant, select the assigned COM port, open the serial port, and click 'Read' to retrieve current board parameters.
- **Step 2 — Set Role, Video Standard & Encryption Seed:** Assign the module as Air Unit ('Scramble') or Ground Unit ('Descramble'), select PAL or NTSC video format, and input a custom encryption seed (up to 100,000+ selectable seeds on boards produced from March 2025 onward; factory default test keys are 7679 or 12345).
- **Step 3 — Write & Pair:** Click 'Write' to save configuration. Both TX and RX boards must be programmed with the exact same seed to decode video properly. Multiple drones can be assigned unique keys to maintain channel exclusivity.

6.2 LED Self-Diagnosis & Operational Notes

- **LED Status Indicator:** Upon power-up, a flashing LED confirms normal self-diagnosis and active operation. A solid (always-on) LED indicates a self-diagnosis or firmware fault.
- **Voltage Requirement:** Power the module from a clean DC source above 5V (12V recommended, 6–16V supported). Supplying less than 5V may cause sync instability or abnormal video output.
- **Firmware Policy:** Field firmware flashing is locked to protect encryption integrity. In the event of hardware or firmware damage, contact iVcan support for factory chip replacement or board service.

7. ORDERING INFORMATION, PACKAGING & OEM/ODM CUSTOMIZATION

Item / Category	Details & Customization Options
Standard Pair Configuration	1 Pair = 2 Modules: 1× Scrambler (Air Unit VTX) + 1× Descrambler (Ground Unit VRX).
Standard Shipping Kit	Scrambler/Descrambler module(s), USB-to-TTL serial programmer, DuPont jumper wires, anti-static gloves.
OEM/ODM Engineering	Custom encryption algorithms, hardware bypass switch (on/off scrambling), custom PCB form factors, and direct PCB integration.
Interface & Hardware Options	Custom JST, SMA, or RCA connectors; custom input voltage ranges (e.g., 5.5V, 12V, 6–16V); conformal waterproofing/dustproofing; multi-channel presets.
Standard Bulk Lead Time	2 – 4 weeks depending on order volume and customization requirements.

Sales, Technical Support & OEM/ODM Inquiries — iVcan.com
Website: https://ivcan.com | Support Channels: WhatsApp, Telegram, WeChat & Direct Engineering Consultation
Note: For HD digital video links (HDMI / SDI / IP Ethernet) requiring built-in AES128 encryption, please inquire about the iVcan COFDM Digital Wireless Series.

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