

GK7206V12A Datasheet

Version 1.1

Goke Microelectronics Co., Ltd

Version History

Version	Note	Author	Date
V1.0	Initial version	Goke IPC Team	2025/5/28
V1.1	Update SDIO, package, FE PHY and voltage Update the maximum performance of the BT.656 video output interface to 720p@30fps Update the maximum performance of the BT.1120 video output interface to 1080p@30fps	Goke IPC Team	2025/12/2

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1. Introduction

The GK7206V12A chip is a next-generation IP Camera SoC launched by GOKE, targeting professional security, consumer markets, operator markets, and in-vehicle markets. The chip integrates GOKE's fully self-developed ISP pipeline, H.265/H.264 encoder, and a general-purpose NPU with 1.0T computing power, providing customers with high-quality, low-bitrate, low-memory, low-latency, and low-power solutions. It supports a wide range of products, including single-lens box cameras, dome cameras, dual-lens box and dome cameras, long and short-focus cameras, wide-angle stitching, and top-bottom stitching cameras. The GK7206V12A also features AI noise reduction and dual 3D noise reduction, significantly enhancing image quality in low-light scenarios and enabling customers to achieve low-cost black-light solutions.

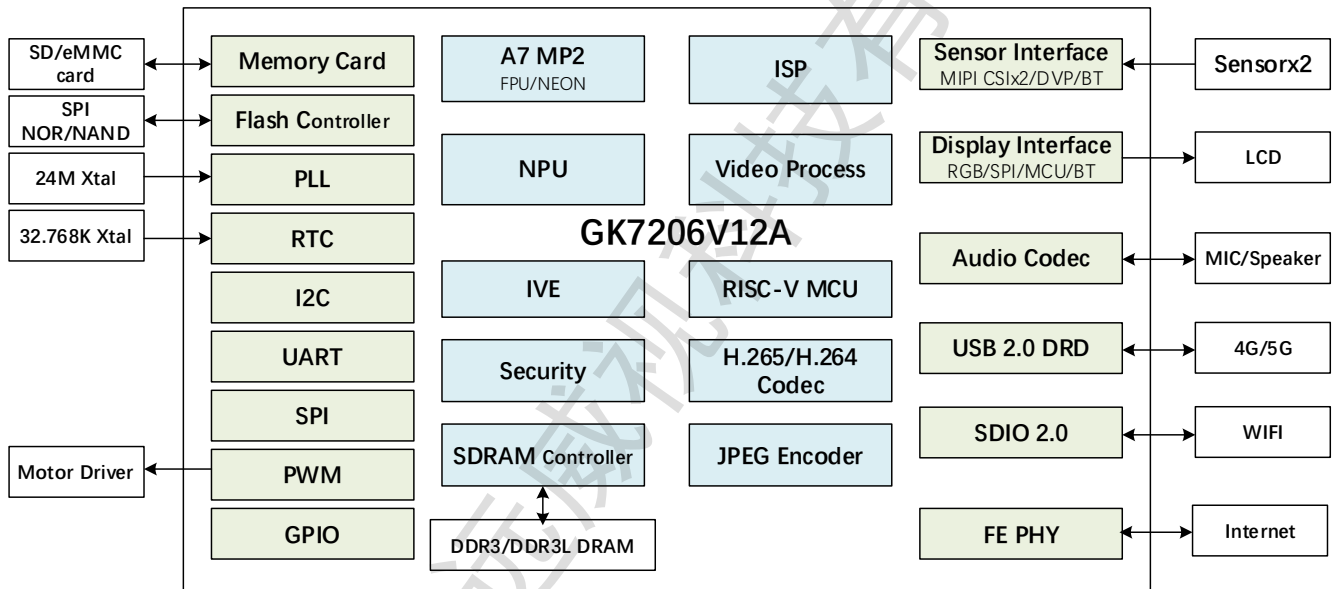


Figure1-1: GK7206V12A Functional Block Diagram

2. Specifications

Processor Core

- ARM Cortex-A7 MP2, up to 1.0GHz
- 32KB I-Cache, 32KB D-Cache, 128KB L2 Cache
- Supports Neon and FPU

MCU

- Integrated RISC-V coprocessor, up to 400MHz
- 8KB I-Cache, 8KB D-Cache

Intelligent Processing

- Integrated Neural Network Processing Unit (NPU), max computing power 1.0 Tops
 - Supports mainstream AI frameworks: ONNX, PyTorch, TensorFlow
 - Supports AIBNR model
 - Supports mainstream CNN models: YOLOv10, ResNet50 (for object detection and classification)
 - Supports INT16/INT8/INT4 mixed quantization
 - Supports per-channel and per-layer quantization
 - Built-in lightweight multimodal models: CLIP and YOLO-World
 - Built-in algorithms: Human/Vehicle/Object detection, Package detection, Pet detection, Fire/Smoke detection
- Supports IVE

- Common operators: Single/Dual source, Filtering, Sobel gradient, CCL, GMM, LK optical flow, ST corner detection

Video Input

- MIPI RX interface
 - 4 data lanes + 2 clock lanes
 - Supports MIPI D-PHY1.1/CSI-2, max 1.5Gbps/lane
 - Single sensor supports up to 2F-WDR 3840×2160@20fps input
- 8/10/12-bit parallel DVP video input
- BT.601/BT.656 video input
 - Max IO speed: 148.5MHz dual-edge sampling
 - Supports BT.656 interface AHD bridge chip, AHD 2-channel composite timing, max 1920×1080@30fps (single channel mode)

Video Output

- Max display: 720p@60fps/1920×480@60fps
- Supports 1 HD video layer
- Supports 1 HD graphics layer
- Supports video-graphics overlay
- Compatible with video display devices

Display Interfaces

- 6/8-bit serial RGB screen (DPI interface), max 480p@60fps
- 16/18/24-bit parallel RGB output, max

720p@60fps

- BT.656 video output, max 720p@30fps
- BT.1120 video output, max 1080p@30fps
- MCU screen (DBI-Type B), max 240p@30fps
- SPI screen (DBI-Type C), max 240p@30fps

ISP

- AI noise reduction
- 3DNR (Bayer domain)
- 3DNR (YUV domain)
- 2F-WDR fusion
- Built-in WDR
- 3A (AE/AWB/AF)
- Fixed Pattern Noise (FPN) removal
- Bad pixel correction (static/dynamic)
- Lens Shading Correction (LSC)
- Image dynamic contrast and edge enhancement
- Chromatic aberration correction (purple fringe removal)
- Defogging
- Lens Distortion Correction (LDC)
 - LDC_H: Online
 - LDC_V: Offline
- DRC
- Demosaic
- Mono sensor processing

Video Processing

- Scaling
- OSD overlay
- Drawing (lines/rectangles)

- 2D graphics acceleration
- Video format conversion

Video Codec

- H.265 (Main/Base Profile, Level 5): Max 3840×2160@25fps
 - H.264 (High/Main Profile, Level 5.1):
 - Max 3840×2160@25fps + 1920×1080@25fps + 480×360@25fps
 - Real-time upscaling:
 - 1920×1080 → 2560×1440
 - 1920×1080 → 3840×2160
 - 2560×1440 → 3840×2160
 - MJPEG/JPEG Baseline encoding:
 - Max resolution: 8192×8192
 - Input format: SP420/400
 - Output format: SP420/SP422/400
 - Max performance: 3840×2160@30fps (SP420)
 - I/P frames
 - Rate control: CBR/VBR/AVBR/FIXQP/QPMAP
 - GOP modes: SmartP, NormalP
 - Max bitrate: 60Mbps
 - 8 ROI encoding regions
 - 8 OSD overlay regions
 - 8 Mosaic regions
 - 8 Cover regions
- ## Audio Interfaces & Codec
- Integrated Audio Codec:
 - 2ch single-ended or 1ch differential input

- 2ch line-out
- 4ch DMIC input
- I2S interface
- Software audio codecs: G.711, G.726, ADPCM, AAC, MP3
- Audio 3A (AEC/ANR/AGC)
- Wind noise reduction
- AI audio noise reduction

External Memory Interface

- SDRAM
 - Built-in 2Gb 16-bit DDR3/DDR3L KGD
 - Max speed: 2133Mbps
- SPI Nor Flash
 - 1/2/4-wire mode
 - Boot-adaptive page size/block size
 - Max capacity: 256MB, max speed: 99MHz
- SPI Nand Flash
 - 1/2/4-wire mode
 - Boot-adaptive page size/block size
 - Max capacity: 1GB, max speed: 99MHz
- eMMC 4.5
 - 1/4/8-bit mode
 - DDR52 mode: max 100MB/s (8-bit)
 - HS200 mode: max 100MB/s (8-bit)

Boot

- SPI NOR/NAND, eMMC boot
- SD card/USB device flashing
- Secure boot

Security

- Hardware AES/SHA/RSA encryption/decryption
- 4Kbit OTP
- TRNG (True Random Number Generator)

Peripheral Interfaces

- 1× USB 2.0 DRD (Dual Role Device) interface:
 - Host/Device static switching
 - Host/Device software switching
- 2× SDIO 2.0 interfaces:
 - Supports SD2.0 cards
 - DS/HS modes, max 25MB/s
 - Supports external WiFi modules
- Integrated FE PHY
 - Supports 10M/100Mbps
- Up to 1 independent 12-bit LSADC channel (3 input pins)
- Multiple PWM interfaces
- 2× UART interfaces
- Up to 4× I2C interfaces
- Up to 3× SPI interfaces
- 4× EDMA channels
- Multiple GPIO interfaces
- Always-on RTC
- PMC
 - 2 external wake-up sources
 - 1 output power sequence control

Physical Specifications

- Operating voltage:
 - Core: 0.9V (typical)

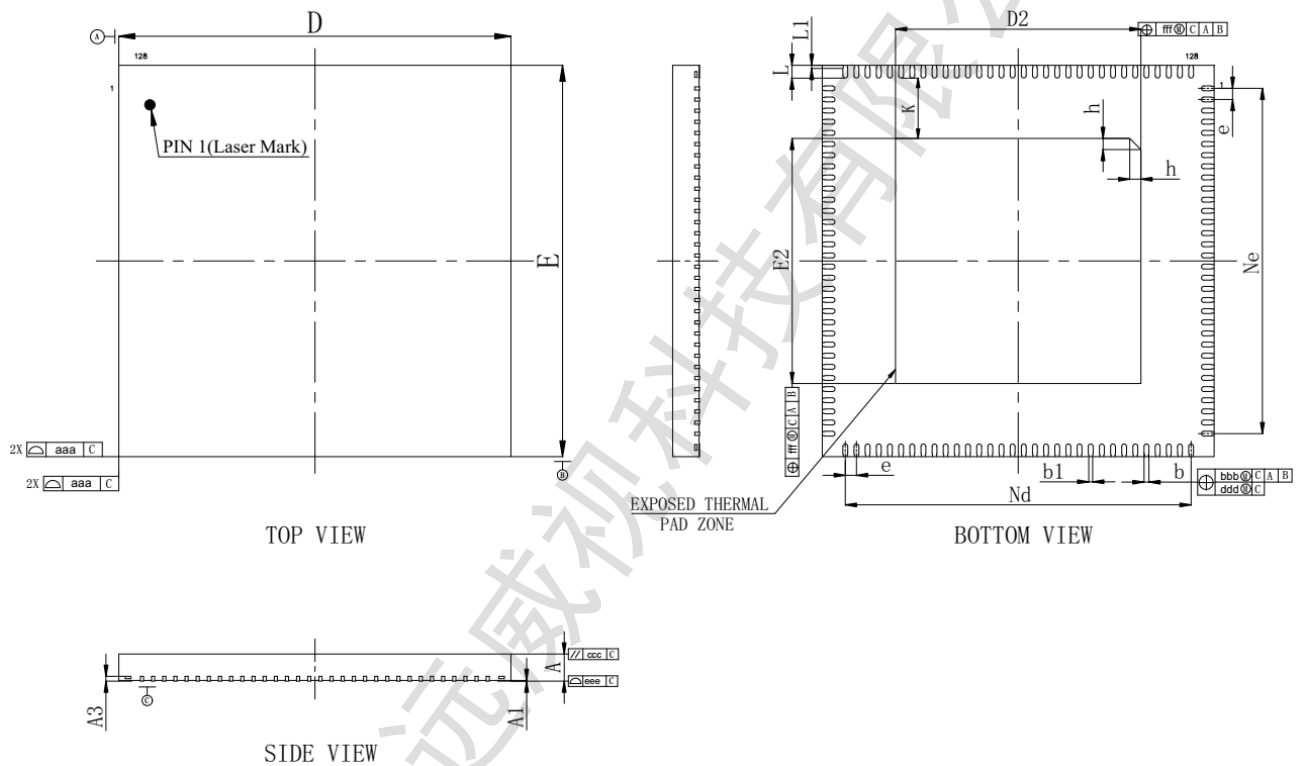
- I/O: 3.3V/1.8V
- DDR: 1.5V (DDR3)/1.35V (DDR3L)
- Package:
 - QFN 12.3mm×12.3mm, 128-pin

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3. Package and Pinout

3.1. Package

GK7206V12A uses QFN package method, the package size is 12.3mm×12.3mm, the pin spacing is 0.35mm, there are totally 128 pins, the details is as bellow.



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0	0.02	0.05
b	0.10	0.15	0.20
b1	0.10REF		
A3	0.152REF		
D	12.20	12.30	12.40
D2	7.60	7.70	7.80
e	0.35BSC		
Nd	10.85BSC		
E	12.20	12.30	12.40
E2	7.60	7.70	7.80
Ne	10.85BSC		
L	0.30	0.40	0.50
L1	0.10REF		
h	0.30	0.35	0.40
K	1.90REF		
aaa	0.10		
bbb	0.07		
ccc	0.10		
ddd	0.05		
eee	0.08		
fff	0.10		

Figure3-1 GK7206V12A package details

[illegible]

Figure3-2 GK7206V12A pinout

4. Hardware Specification

4.1. Soldering Suggestion

4.1.1. Requirements of Lead-free reflow soldering

The process curve of lead-free reflow soldering is as below:

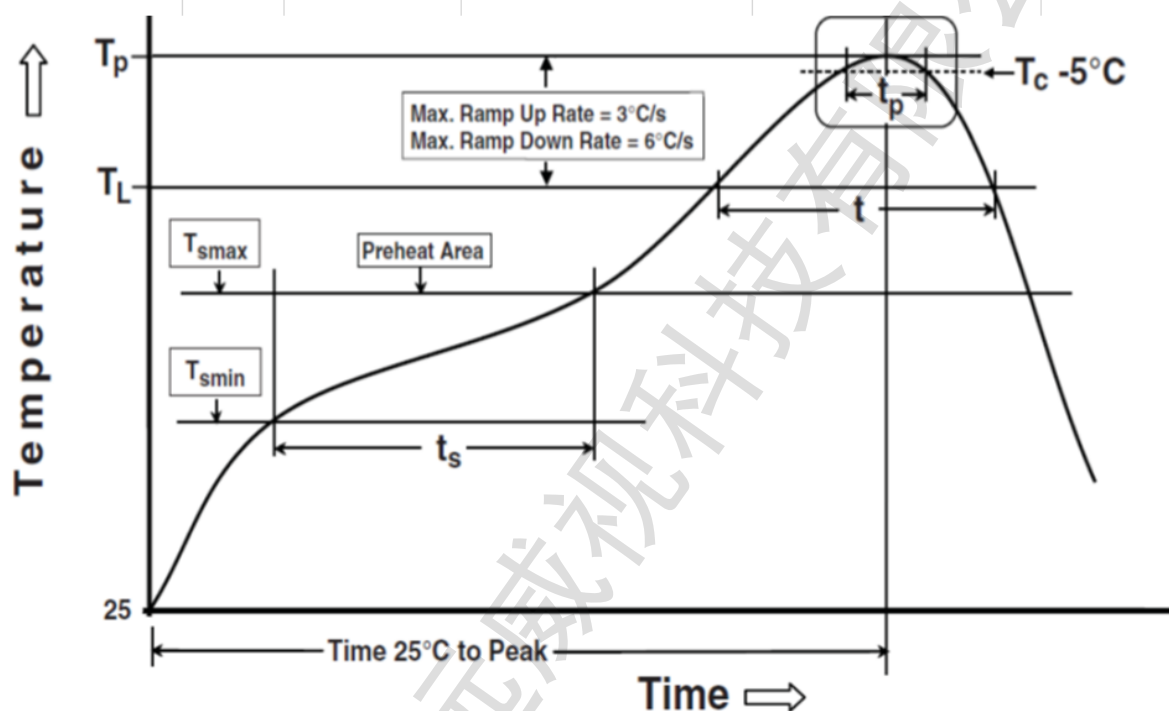


Figure4-1 Process curve of lead-free reflow soldering

The reflow soldering curve is only the recommended value, and you need to make corresponding adjustments according to the actual production situation.

The parameters and related temperature settings of lead-free reflow soldering are as below:

Feature Vector	Curve Setting Requirements
Temperature min (T _{smin})	150 °C
Temperature max (T _{smax})	200 °C
Time (T _{smin} to T _{smax}) (t _s)	60 seconds –120 seconds
Ramp-up Rate (T _L to T _p)	3 °C/second max
Liquidous Temperature (T _L)	217 °C

Time at Liquidous (tL)	60 seconds – 150 seconds
Peak Package Body Temperature (Tp)	Refer to Table4-2
Time (tp) within 5 °C of the Specified Classification Temperature (Tc)	30 seconds
Ramp-down Rate (Tp to TL)	6 °C /second max
Time 25 °C to Peak Temperature	8 minutes max.

Table4-1 Parameters of lead-free reflow soldering

Package Thickness	Volume (mm3) <350	Volume (mm3) 350~2000	Volume (mm3) ≥2000
<1.6mm	260°C	260°C	260°C
1.6mm~2.5mm	260°C	250°C	245°C
≥2.5mm	250°C	245°C	245°C

Table4-2 Requirements for setting the peak temperature of lead-free reflow soldering

4.2. Moisture sensitivity parameters

This chapter specifies the principle of IC (moisture sensitivity products).

【moisture sensitivity level】

The moisture sensitivity level of this product is level 3.

4.2.1. Moisture package

4.2.1.1. Package information

The dry vacuum packaging material contains:

- Humidity indicator card (HIC)
- Moisture barrier bag (MBB)
- Desiccant



Figure4-2 Diagram of dry vacuum packaging materials

4.2.1.2. Moisture sensitive product checking before use

Before use the chipset, please do the following check:

- If the color of HIC 10%RH dot changes, the product shall be rebaked according to Table 4-4.

4.2.2. Storage and use

【Storage Environment】

It is recommended that the product be stored in $<30^{\circ}\text{C}/60\% \text{ RH}$ by vacuum packaging.

【Shelf Life】

If the product is stored in $<30^{\circ}\text{C}/60\% \text{ RH}$ by vacuum packaging. The shelf life will not more than 12 months.

【Floor Life】

If the environment is $\leq 30^{\circ}\text{C}/60\%$, the floor life is as below:

MSL	Floor life(out of bag) at factory ambient $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ or as stated
1	Unlimited at $\leq 30^{\circ}\text{C}/85\% \text{ RH}$
2	1 year
2a	4 weeks

MSL	Floor life(out of bag) at factory ambient $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ or as stated
3	168 hours
4	72 hours
5	48 hours
5a	24 hours
6	Mandatory bake before use, must be reflowed within the time limit specified on the label

Table4-3 Floor life diagram

【moisture sensitive product usage】

If the product continuous or cumulative exposure under the $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ environment more than 12 hours, it is recommended to rebake and then vacuum packing with moisture-proof agent.

If the product continuous or cumulative exposure under the $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ environment less than 12 hours, it is unneeded to rebake but recommended to replace the moisture-proof agent.

Please also refer to **JEDEC J-STD-033A** for more rules.

4.2.3. Rebake

【Scope】

For the moisture sensitive products which need rebaked.

【Rebake reference table】

Moisture Sensitivity Level	Baking conditions
4	125°C/12 hours
3	125°C/8 hours
1	NA

Table4-4 Rebake reference table

5. Electrical Performance

5.1. Extreme working conditions

Permanent damage may occur when the chip operates at the maximum rating beyond the limit operating conditions. The operation shall be limited to the conditions given in the "recommended operating conditions" section. Working under extreme working conditions for a long time may affect the reliability of the equipment. The chip junction temperature exceeds the destructive junction temperature, which may cause physical damage to the chip.

Parameters	Symbols	Range	Unit
supply voltage	0V9	-0.2 to +1.17	V
	1V35	-0.2 to +1.8	
	1V5	-0.2 to +1.8	
	1V8	-0.2 to +2.16	
	3V3	-0.2 to +3.63	
Destructive junction temperature	TJ	125	°C

Table5-1 Extreme working conditions (VSS=0V)

5.2. Recommended working conditions

Parameters	Symbols	Requirements			Unit
		Minimum Value	Typical Value	Maximum Value	
supply voltage	0V9	TBD	0.9	TBD	V
	1V35	1.2825	1.35	1.4175	
	1V5	1.425	1.5	1.575	
	1V8	1.71	1.8	1.89	
	3V3	3.135	3.3	3.465	
Environment temperature	TA	-20	-	70	°C
Destructive junction temperature	TJ	-	-	105	°C

Table5-2 Recommended working conditions

5.3. DC electrical parameters

The DC electrical parameters of GK7206V12A is as below:

Parameters	Symbols	Condition	Minimum Value	Typical Value	Maximum Value	Unit
3.3V mode Post-driver voltage	VDDPST3318	IO voltage =3.3V	3.135	3.3	3.465	V
High level output voltage	VOH		2.4	-	-	
Low level output voltage	VOL		-	-	0.4	
High level input voltage	VIH		2	-	3.465	
Low level input voltage	VIL		-0.3	-	0.8	
High level output voltage	VOH	IO voltage =1.8V	1.3	-	-	
Low level output voltage	VOL		-	-	0.45	
High level input voltage	VIH		1.2	-	1.89	
Low level input voltage	VIL		-0.3	-	0.6	

Table5-3 DC electrical parameters

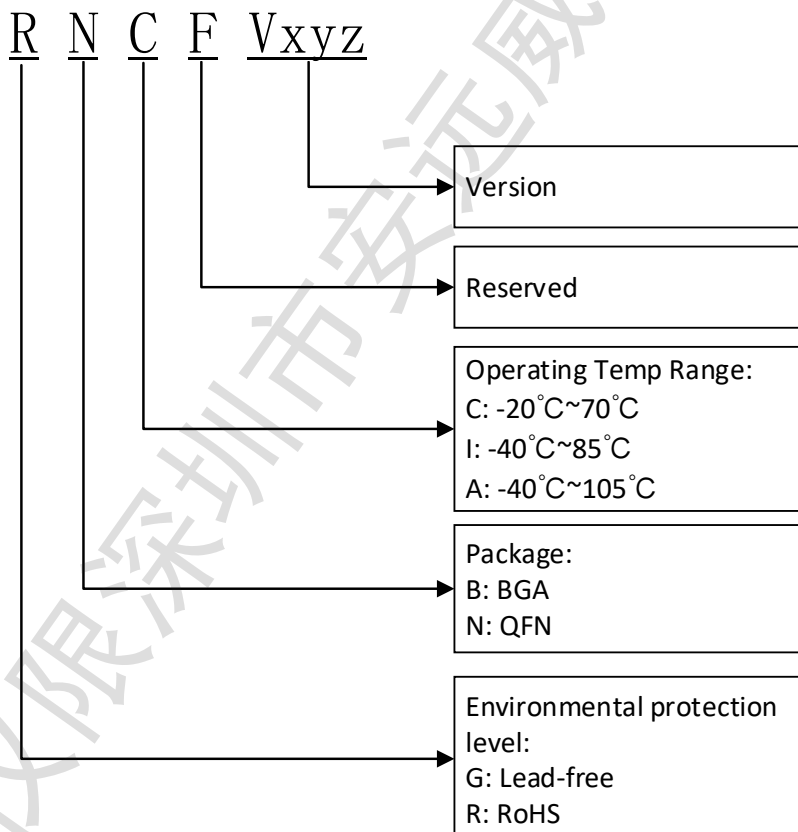
6. Ordering Information

6.1. Chipset mark & definition

Chipset mark



Extension code definition



7. RoHS Declare

All the GK7206V12A products are RoHS products.

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