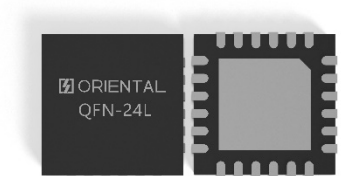


## QFN-24L

QFN-24L (常写作 QFN-4x4-24) 是四边扁平无引脚、4×4mm、24 引脚、底部带大散热焊盘的表面贴片封装，属于 QFN (Quad Flat No-lead) 家族，密度高、散热好、寄生参数低，广泛用于 MCU、电源管理、模拟 / 混合信号、射频与高速接口芯片。

QFN-24L (also commonly marked as QFN-4x4-24) is a quad flat no-lead surface-mount package measuring 4×4 mm with 24 pins and a large thermal pad on the bottom. As a member of the QFN (Quad Flat No-lead) family, it features high packaging density, excellent heat dissipation and low parasitic parameters. It is widely adopted for MCUs, power management ICs, analog/mixed-signal chips, RF devices and high-speed interface ICs.



### 一、核心物理规格 (标准值)

#### Core Physical Specifications (Typical Values)

- 外形尺寸: 4.0 mm × 4.0 mm (长 × 宽), 厚度 0.75–0.9 mm  
External dimensions: 4.0 mm × 4.0 mm (length × width), thickness: 0.75–0.9 mm
- 引脚数: 24 脚, 四边均匀分布 (每边 6 脚)  
Pin count: 24 pins, evenly arranged on four sides (6 pins per side)
- 引脚间距 (Pitch): 0.5 mm (主流), 部分型号为 0.4 mm  
Pitch: 0.5 mm (mainstream), 0.4 mm for partial models.
- 引脚宽度: 约 0.2 mm  
Lead width: approx. 0.2 mm
- 底部散热焊盘 (E-PAD/DAP): 典型 2.2×2.2 mm ~ 2.8×2.8 mm, 裸露金属, 必须接地 + 散热过孔  
Exposed Pad (EPAD/DAP): Typical size 2.2×2.2 mm ~ 2.8×2.8 mm. The exposed metal pad shall be connected to ground and fitted with thermal vias.

6. 封装材质: 塑料、无铅、符合 RoHS

Package material: Plastic, lead-free, RoHS compliant.

7. 引脚排列: 逆时针编号, 左下角为 1 脚

Pinout: Numbered counterclockwise, with Pin 1 at the bottom-left corner.



## 二、结构与关键特性

### Structure & Key Characteristics

1. 无引脚设计: 焊点在封装底部边缘, 无侧向引脚, 寄生电感 / 电容极小, 适合高频、高速、低噪声电路

Leadless design: Solder joints are located on the bottom edges of the package with no side leads. It features extremely low parasitic inductance and capacitance, ideal for high-frequency, high-speed and low-noise circuits.

2. 四边引脚: 相比 DFN (仅两侧), I/O 数量更多、布局更灵活

Four-side pin layout: Offers more I/O pins and greater layout flexibility compared with dual-sided DFN packages.

3. 底部大散热焊盘: 直接接触 PCB 地平面, 热阻低 ( $\theta_{jc} \approx 10\text{--}20\text{ }^{\circ}\text{C/W}$ ), 可支持数瓦级功耗芯片

Large bottom exposed thermal pad: Directly contacts the PCB ground plane with low thermal resistance ( $\theta_{jc} \approx 10\text{--}20\text{ }^{\circ}\text{C/W}$ ), supporting chips with power consumption up to several watts.

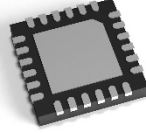
4. 高密度贴片: 0.5 mm 间距适配 SMT 自动化, PCB 占位小、布线密度高

High-density mounting: The 0.5 mm pitch suits automated SMT assembly, featuring small PCB footprint and high routing density.

5. 薄型化: 厚度  $\leq 0.9\text{ mm}$ , 适合平板、模块、穿戴设备等薄型产品

Low profile: Thickness  $\leq 0.9\text{ mm}$ , suitable for slim products such as tablets, modules

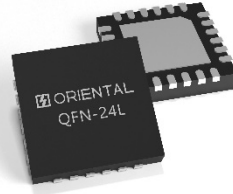
and wearable devices.



### 三、典型应用场景

#### Typical Application Scenarios

1. 微控制器 (MCU): 32 位工业 / 车载 MCU、无线 SoC (如蓝牙 / BLE、LoRa)  
Microcontrollers (MCU): 32-bit industrial and automotive MCUs, wireless SoCs (e.g., Bluetooth/BLE, LoRa).
2. 电源管理: 多通道 DC-DC、负载开关、电池管理、PMIC  
Power management: Multi-channel DC-DC converters, load switches, battery management systems and PMICs.
3. 模拟 / 混合信号: 数据采集 (ADC/DAC)、运放、音频 Codec、电机驱动  
Analog/Mixed-signal: Data acquisition (ADC/DAC), operational amplifiers, audio codecs and motor drivers.
4. 射频与高速: 光模块、USB/HDMI 接口、以太网 PHY、高频放大器  
RF & high-speed applications: Optical modules, USB/HDMI interfaces, Ethernet PHYs and high-frequency amplifiers.
5. 传感器: 六轴 IMU (如 MPU-6050)、环境传感器模组  
Sensors: 6-axis IMUs (e.g., MPU6050) and environmental sensor modules.



#### 四、与相近封装对比

##### Comparison with Similar Packages

1. QFN-24L vs DFN2×2-8L: 面积大 4 倍、引脚多 3 倍, 功能更强、功耗更高

QFN-24L vs DFN2×2 8L: 4 times larger in area and 3 times more pins, delivering stronger performance and supporting higher power consumption.

2. QFN-24L vs QFN3×3-20L: 面积 + 78%、引脚 + 20%, 散热与 I/O 能力显著提升

QFN-24L vs QFN3×3 20L: 78% larger in area and 20% more pins, with greatly improved heat dissipation and I/O capacity.

3. QFN-24L vs SOP-24: 面积 $\approx$ 1/3、厚度 $\approx$ 1/2、散热与高频性能碾压

QFN-24L vs SOP24: Roughly one-third the area and half the thickness, with far superior heat dissipation and high-frequency performance.