

Part No. EC477 Active Steering™ Processor

Active Steering Controller for High-Performance Wi-Fi Applications



APPLICATIONS

- Access Points
- Set-top Boxes
- Wi-Fi Clients
- Wi-Fi Extenders
- Smart Appliances

KEY BENEFITS

- Higher throughput, longer range, and broader signal coverage
- More reliable connections and reduction of Wi-Fi “dead spots”
- Flexible antenna placement and seamless design integration
- Reduced system cost
- Scalability to 802.11ax standard

Active Steering Technology

- Real-time optimization of Wi-Fi radio link performance
- Up to 3dB improvement in radio link signal gain
- Per-antenna / per-client / per-packet optimization
- Low latency adaptation algorithm

Designed for High-Performance Wi-Fi Devices

- Up to 4x4 MIMO 802.11ac support
- Scalability to support 802.11ax standards

Data-Over-Coax (DOC) Interface

- Flexible antenna placement with optimal cost
- Allows any combination of active + passive antennas in system design

Small Footprint

- 24-pin QFN package
- 3.5 x 3.5 mm Package Size

KYOCERA AVX RF Switch EC477™ a high-performance processor with a cost-optimized antenna control interface to deliver the proven “2x” performance and coverage benefits of Wi-Fi Active Steering in a flexible and cost-reduced system offering. The EC477 works in conjunction with the EC624 Active Steering switch to provide greater throughput and longer range for access point, gateway, and client applications.

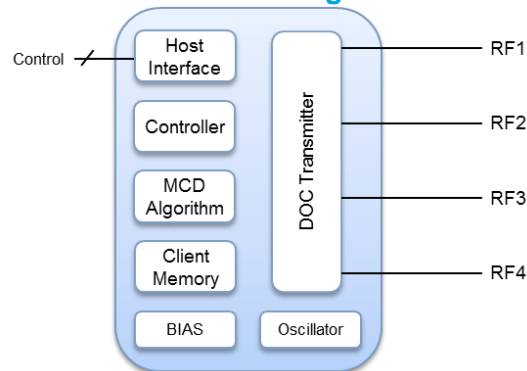
TECHNOLOGY ADVANTAGES

The EC477 works with the system Wi-Fi radio to deliver real-time radio link performance optimization for access point, gateway, and client applications. The EC477 supports the processing and control functionality to enable radio link optimization on a per-antenna / per-client / per-packet basis. KYOCERA AVX patented Active Steering technology enables up to 3 dB radio link signal gain on a per-antenna basis to maximize throughput and coverage and is additive to performance gains realized via Wi-Fi MIMO and beamforming techniques. In addition, KYOCERA AVX Active Steering Technology provides solution scalability to support next-generation 802.11ax applications.

DESIGN ADVANTAGES

The EC477 introduces KYOCERA AVX Data-Over-Coax (DOC) interface, which allows Active Steering signaling on the same physical cable as the primary RF feed without impacting the main Wi-Fi radio signal. The DOC interface eliminates the need for custom connectors and cables, which reduces the system bill of materials, enables easier placement of off-PCB antennas, and provides seamless integration of any combination of Active and passive antennas into device designs.

EC477 Block Diagram



Mechanical Specifications & Ordering Part Number

Ordering Part Number	EC477
Dimensions (mm)	3.5 x 3.5 x 0.75
Operating Temperature (°C)	-40 to + 85
Package	24- Pin QFN
MSL Rating	MSL1

Active Steering™ Processor specifications
KYOCERA AVX produces a wide variety of standard chipset to meet user needs

Main specifications

Data-Over-Coax (DOC) TX Electrical specification at 25 °C, V_{DD} = 3.3 V

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Carrier Frequency	F _C	216	240	264	MHz	
Baud Rate	BR		15		MB	
Number of DOC TX Channels	MIMO	1		4		Reconfigurable
DOC TX Output Voltage, DC	DOC_TX _{DCout}	2.42	2.60	2.78	V	
Internal Processor Clock Frequency	F _{clk}		120		MHz	
RF Supply Current (Per Channel) ¹	I _{RF}		2		mA	Only During DOC Communication

Note 1: Min/Max values correspond to alarm thresholds for under/over current

Operating Ranges¹

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V _{DD}	3.0	3.3	3.6	V
Active Baseline Current	I _{AC}		2 + TX		mA
Standby Baseline Current	I _{SB}		2 + TX		mA
Deep Sleep Current	I _{DS}		100		µA
TX Active Current ⁴	I _{TA}	1	1.75	3.5	mA
TX Standby Current ⁴	I _{TS}		1		mA
Input Control Voltage High ²	V _{IH}	0.7 X VDD_DIG			V
Input Control Voltage Low ²	V _{IL}			0.3 X VDD_DIG	V
Output Sink Current ^{1,2,3}	I _S		10		mA
Operating Temperature	T _{OP}	-40		+85	°C
Storage Temperature	T _{ST}	-65		+150	°C

Note 1: Operation should be restricted to the limits in the Operating Ranges table.

Note 2: At VDD = 2.5V

Note 3: VOH > 1.8V

Note 4: Includes current sourced to remote EC624 devices through DOC_{ET}. Per antenna value.

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Absolute Maximum Ratings

Exceeding maximum ratings may cause permanent damage.

Parameter	Symbol	Minimum	Maximum	Unit
Supply Voltage	V_{DD}	0	3.9	V
Control Voltage	V_I	0	3.9	V
ESD Voltage, CDM (all pins)	CDM		500	V
ESD Voltage, HBM (all pins)	HBM		1000	V

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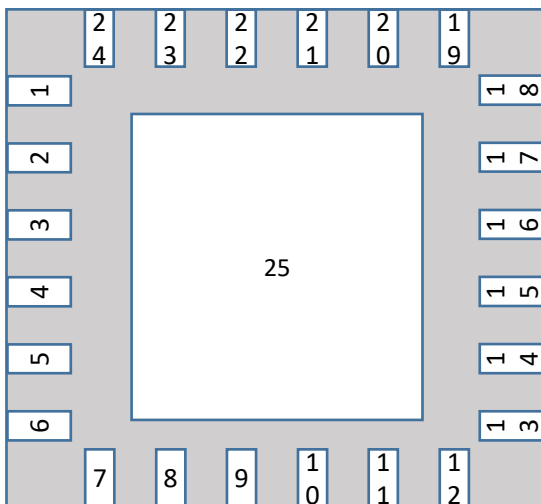
Host Interface and Support

The EC477 digital interfaces support a bidirectional 2, 3 or 4 wire SPI protocol. The EC477 connects to the existing T/R control signal in the application for system timing context. In addition, client identification bits (4) are input to the EC477 to direct the system to optimize for the correct client. Sixteen active clients are supported in hardware memory with expanded capacity in software (driver) memory. KYOCERA AVX Active Steering technology provides a driver that resides on the Wi-Fi host processor to provide signal quality metrics and client identifier information to the EC477 in order to optimize Active Steering performance on a per-antenna / per-client / per-packet basis.

Antenna System and Application Support

KYOCERA AVX provides a full solution for Active Steering™ technology. In addition to the EC477 + EC624 Active Steering ICs, KYOCERA AVX provides flexible offerings to deliver optimized antenna solutions for customer applications, including standard and customized Active Steering antennas, customized firmware, and extensive RF testing and performance characterization services.

Mechanical Overview and Pin Configuration (Top View)



Size (mm)	3.5 x 3.5 x 0.75
Mounting	Surface Mount
Packaging	Tape & Reel

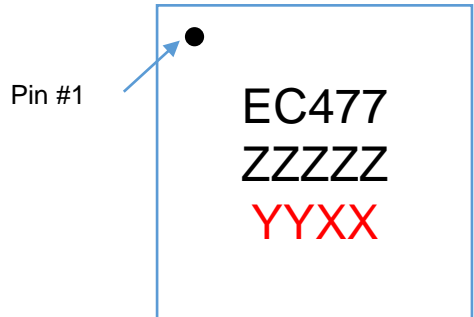
Pin Description

Pin #	Pin Name	Pin Type	Description
1	MOSI	Input	SPI Data Input
2	ET1	Input/Output	ET1
3	I2C_SEL	Input	1: I2C , 2:SPI
4	VDD_RF	Power	RF Power Supply
5	REGOUT	Input/Output	Supply Cap , short to 6
6	VDDMOD	Input/Output	Supply Cap , short to 5
7	TX0	Output	Transmit Output , Channel 0
8	TX1	Output	Transmit Output , Channel 1
9	TX2	Output	Transmit Output , Channel 2
10	TX3	Output	Transmit Output , Channel 3
11	AMUX	Output	Do Not Connect
12	POR	Input	Time Constant Cap
13	RES	Output	Bias Resistor
14	TESTMODE	Output	Do Not Connect
15	ET0	Output	Do Not Connect
16	VDD_DIG	Power	Digital Power Supply
17	CLT3	Input	Client Select Bit 3
18	CLT2	Input	Client Select Bit 2
19	T/R	Input	Transmit/Receive
20	CLT1	Input	Client Select Bit 1
21	CLT0	Input	Client Select Bit 0
22	SCLK	Input	SPI Clock Input
23	MISO	Output	SPI DATA output
24	SELB	Input	SPI Select Input
Paddle	GND	Power	Ground

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Product Marking Codes and Ordering Information

Order Code	Package	Shipping Method
EC477	24-Lead QFN 3.5 x 3.5 x 0.75 mm ³	1500 units/T&R



Pin #1 Indicator Diameter = 0.2 mm

Code	Description
ZZZZZ	Last 5 Digits of Lot Code
YYXX	Date Code