Part No. EC696

SP4T RF Switch

100 MHz to 3000 MHz

Supports: Cellular, LTE/5G, BT, Wi-Fi, RFID, ISM, LPWA, LTE-M, NB-IoT

Covering Cellular, LTE/5G, BT, LPWA, Wi-Fi, ISM, and RFID bands

100 MHz to 3000 MHz

KEY BENEFITS

Operation Frequency:

100 MHz to 3000 MHz

RF Switch:

Ultra-low loss SP4T (shunt less architecture)

Exceptional Linearity (II3P+ 80 dBm)

Wide Power Supply Range:

2.3-4.8 V

End user advantages:

Ability to re-tune the antenna across bands.

System Approach-easy integration

Total solution. The antenna, RFIC and algorithms are co-designed and optimized as a system to provide an easy to integrate, cost effective solution

APPLICATIONS

- Wearables
- Tablets and Notebooks
- IoT/M2M Products
- Other Wireless Devices

KYOCERA AVX EC696 uses Ether Switch&Tune™ technology and high-performance RF switching to solve the challenges facing today's wireless industry and product designers. EC696 allows the RF front-end to cover global bands and seamlessly improve performance in a dynamically changing RF environment by employing active tuning. EC696 can be used in a variety of applications including wearables, cell phones, or IoT/M2M products.

Ether Switch&Tune™ technology and the EC696 provide wider global band coverage (including LTE/5G) with a single antenna element using parasitic loading and active tuning techniques to improve RF front-end performance, especially for stringent low band antenna efficiency requirements. Combining KYOCERA AVX extensive antenna systems expertise and proprietary algorithms, the EC696 can seamlessly adjust the characteristics of a wireless antenna to:

- Cover all 4G/5G cellular, LPWA, BT, Wi-Fi, ISM and RFID bands
- Retune the antenna for frequency shifts
- Reduce the antenna's physical volume by up to 50 percent without performance tradeoffs.

Global Operation and Design Support

EC696 is supported by a full set of product documentation, and when needed, by the expertise of RF engineers who have integrated hundreds of antenna and RF system designs into wireless devices.

KYOCERA AVX global operations encompass an integrated network of design centers that provide local customer support.

Mechanical Specifications & Ordering Part Number

Ordering Part Number	EC696
Dimensions (mm)	1.10 x 1.50 x 0.45
Operating Temperature (ºC)	-40 to + 85
Package	10- Pin LGA Package

SP4T RF switch specifications
KYOCERA AVX produces a wide variety of standard products to meet user needs

Main Specifications

Electrical specification at 25 ºc, Vdd = 2.8 V, 50 ohms Com= Ground
RF Performance measured using reflected power method through ports RF1 through FR4

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Operating Frequency	f0	700		3000	MHz	
Startup Time	tsu			30	us	Time from VDD within specification to all performance within specification. DC path to ground at RF ports.
Ron	Ron		1.3		Ω	RFC to ON RF Port
Coff	Coff		200		fF	OFF RF Port to ground
Second Harmonic	2f0	-67			dBm	f0 @ 836 MHz, + 35 dBm
Third Harmonic	3f0	-61			dBm	f0 @ 836 MHz, + 35 dBm
Third Order Intercept Point	IIP3		82		dBm	836 MHz
			75		dBm	1910 MHz
Second Order Intercept Point	IIP2		125		dBm	836 MHz
			126		dBm	1950 MHz
Harmonic Knee Point	HKP		41		dBm	836 MHz, OFF condition
Switching Time	tsw		5		us	50% control to 10%/90% RF. DC path to ground at RF ports.

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Operating Ranges

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

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Supply Voltage	V_{DD}	2.3	2.8	4.8	V	
Supply Current	I_{DD}		94		µA	
Control Voltage High	V_{IH}	1.3			V	
Control Voltage Low	V_{IL}			0.4	V	
Operating Temperature	T_{OP}	-40		+85	°C	
Storage Temperature	T_{ST}	-65		+150	°C	
Input Control Current	V_{IH}			1	µA	High Control State

Absolute Maximum Ratings

Exceeding maximum ratings may cause permanent damage.

Parameter	Symbol	Min	Max	Unit
Supply Voltage	VDD	-0.5	5	V
Control Voltage	VI	-0.5	3.3	V
ESD Voltage	HBM	1k		V

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Digital Interface

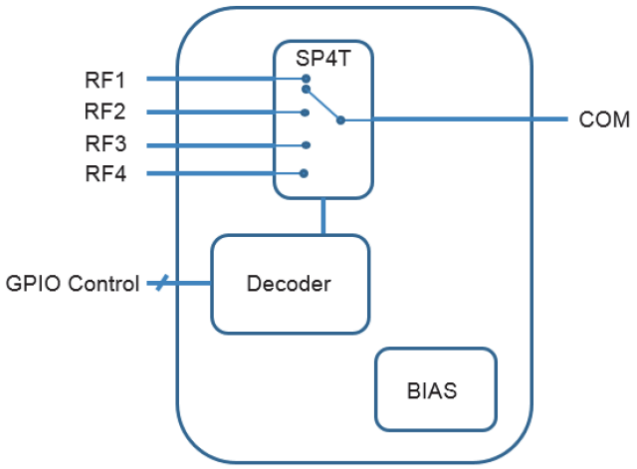
The EC696 supports a GPIO digital interface.

RF Switch Truth Table

S1	S0	RF1	RF2	RF3	RF4
Low	Low	ON	OFF	OFF	OFF
Low	High	OFF	ON	OFF	OFF
High	Low	OFF	OFF	ON	OFF
High	High	OFF	OFF	OFF	ON

Block Diagram

The EC696 block diagram provides a versatile implementation for many antenna configurations supported by KYOCERA AVX antennas.



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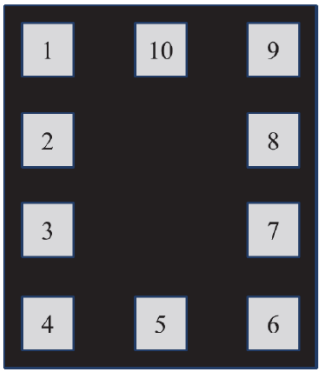
Mechanical Overview and Pin Configuration (Top View)

Size (mm)	1.10 x 1.50 x 0.45
Mounting	Surface Mount
Packaging	Tape & Reel



EC696 Footprint
-Top View-

Pin Description

Pin Number	Pin Name	Pin Type	Description
1	RF1	RF	RF Switch Port1
2	RF2	RF	RF Switch Port2
3	GND	Ground	Ground
4	VDD	Power	Power Supply
5	GPIO0	RF	Switch Control 0
6	GPIO1	RF	Switch Control 1
7	GND	Ground	Ground
8	RF4	RF	RF Switch Port 4
9	RF3	RF	RF Switch Port 3
10	COM	RF	RF Common

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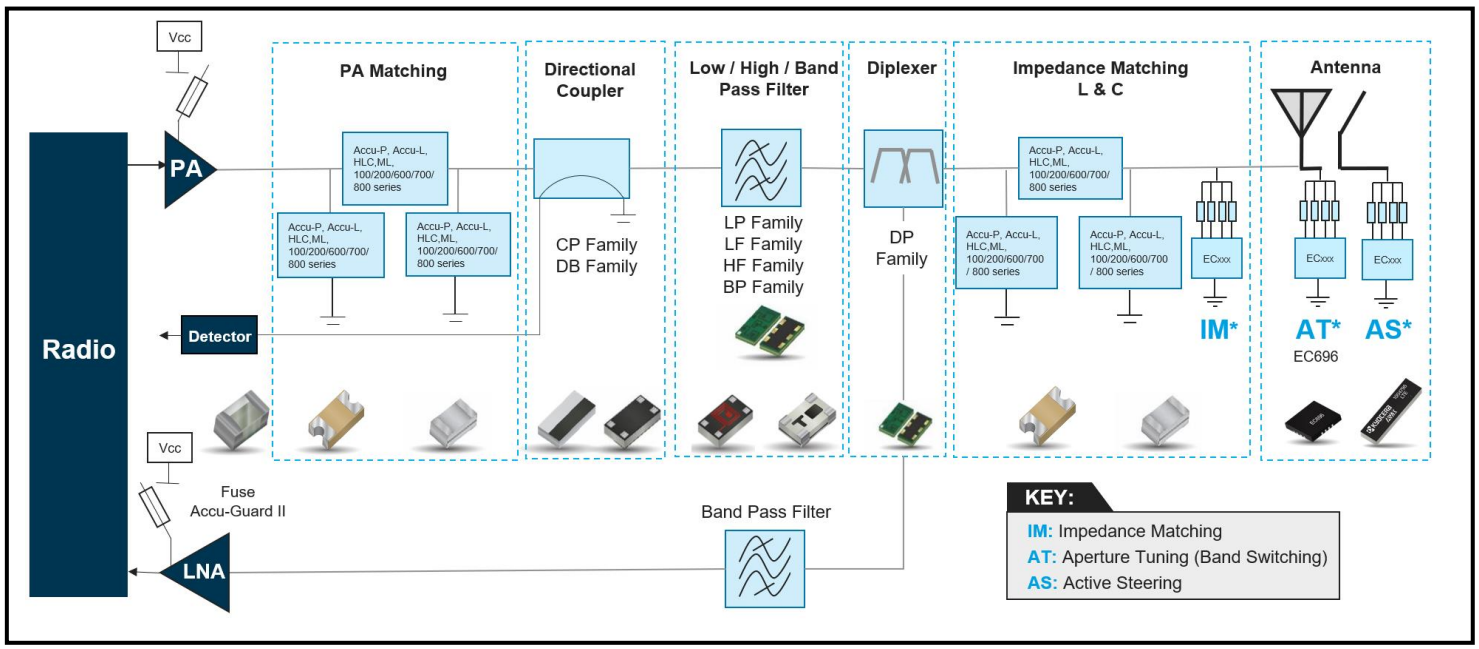
Application Support

KYOCERA AVX provides a broad range of components and products to meet the needs of high-performance RF front-end solutions across the increasing diversity of wireless applications. Supported applications and functions include power amplifier matching, directional coupling, filtering and duplexing, impedance matching, and active and passive antenna solutions.

As shown in the diagram below, the EC696 RF switch is particularly well-suited for active antenna tuning applications. KYOCERA AVX will work with your engineering team to create an optimal solution for your application, including custom antennas (using KYOCERA AVX's proprietary antenna technology), custom software as needed, and an EC696 implementation configured for your specific performance requirements.



KYOCERA AVX RF Front-End Product Families

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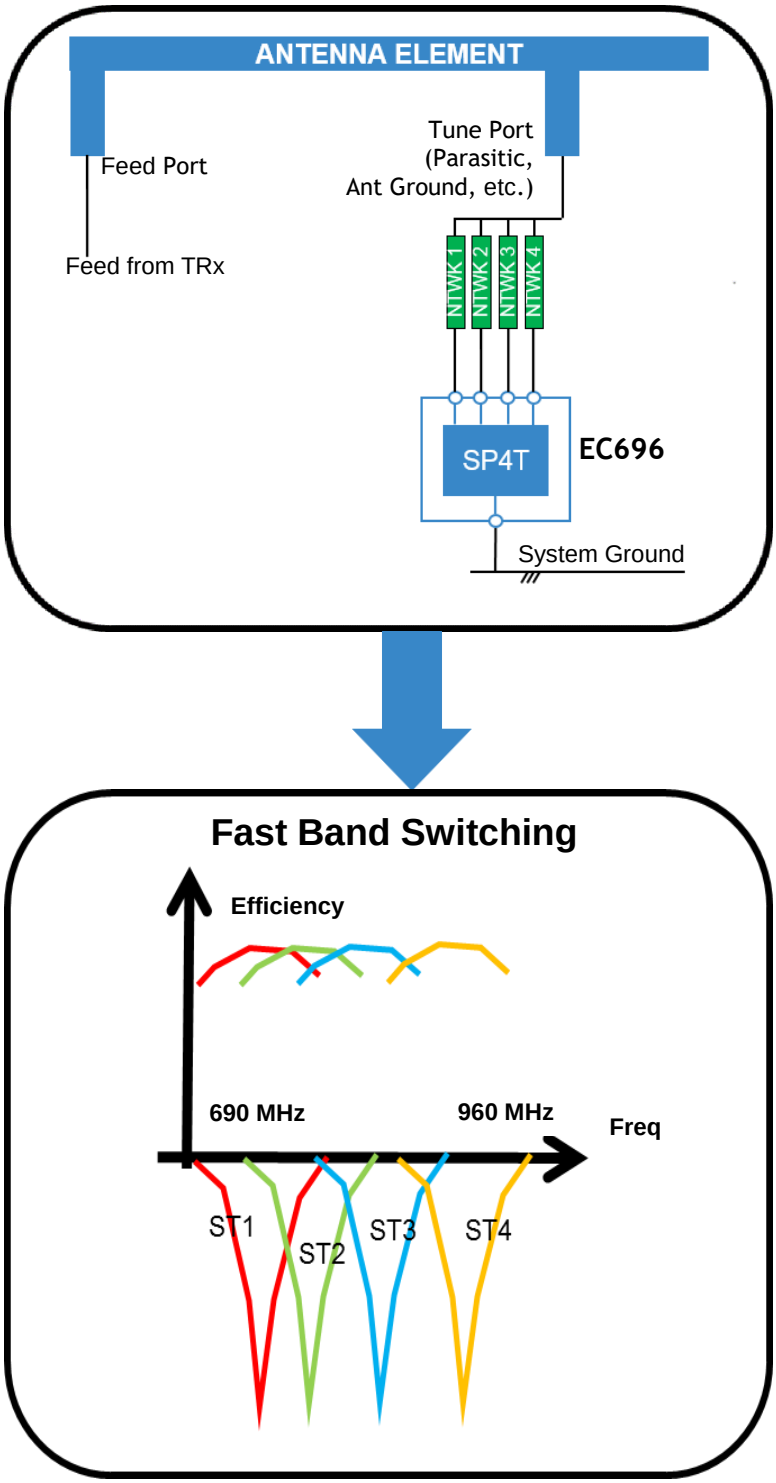
Application Example



NTWK 1-4 are tuning networks (Typically Single L, C or an open)
Only RF connections shown

Grounding the RFC port is the recommended configuration providing high integrity RF board layout and best performance.

There are many potential applications. In the commonly used low band, band switching example shown, application designs must be adjusted to the specific antenna characteristics.

Please contact our FAE for additional support.

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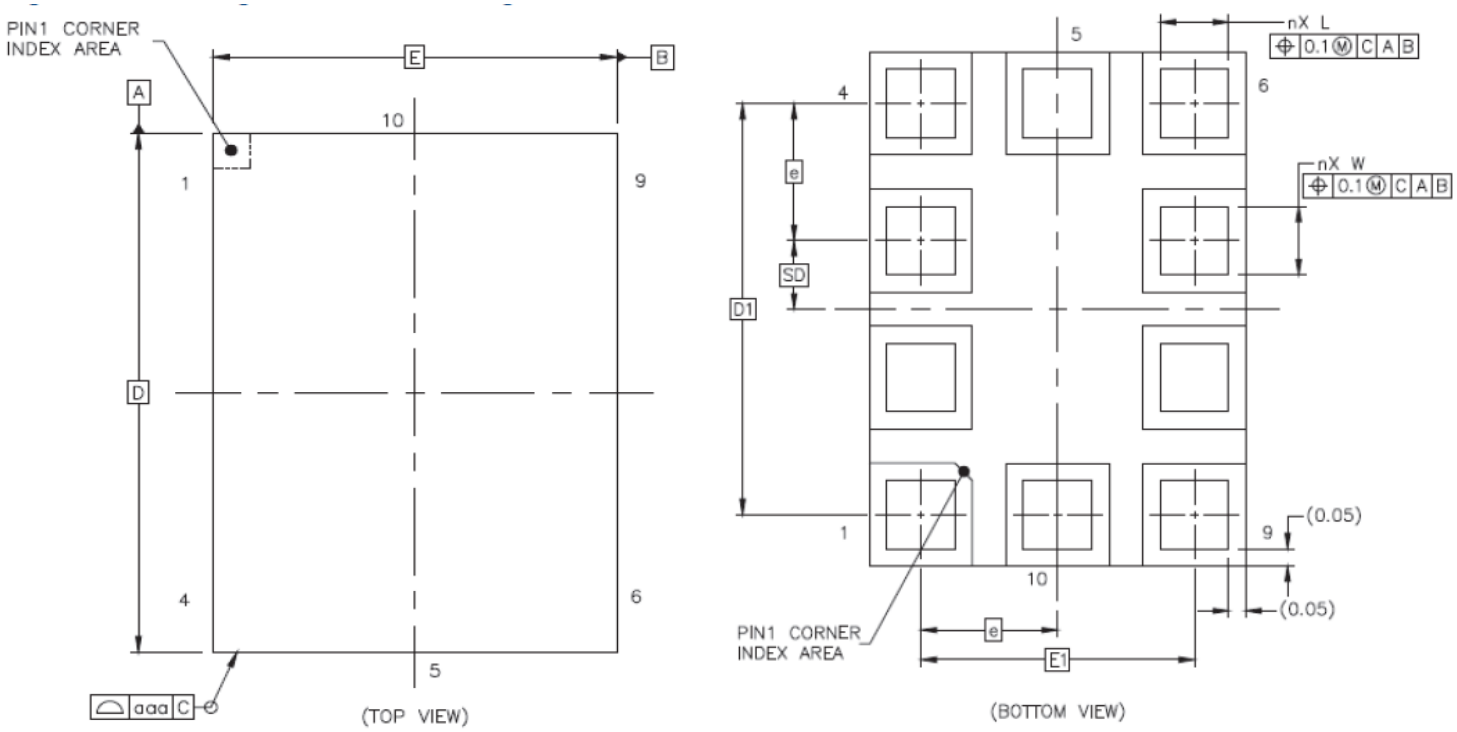
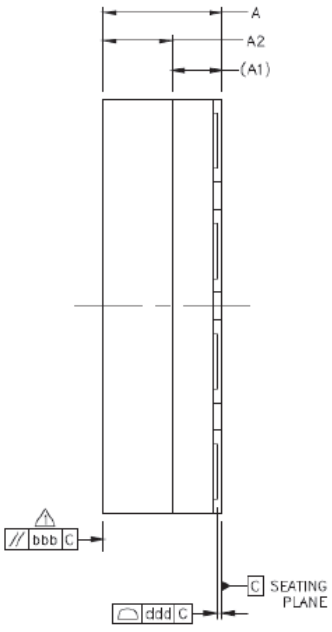
Package Outline Drawing





	Symbols	Dimensions in Millimeters		
		MIN	NOM	MAX
Total thickness	A	---	---	0.5
Substrate Thickness	A1	0	0.18	REF
Mold thickness	A2		0.25	REF
Body size	D	1.5		BSC
	E	1.1		BSC
Lead pitch	e	0.4 BSC		
Lead length	L	0.15	0.2	0.25
Lead Width	W	0.15	0.2	0.25
Lead Count	n	10		
EDGE BALL CENTER TO CENTER	D1	1.2 BSC		
	E1	0.8 BSC		
BODY CENTER TO CONTACT BALL	SD	0.2 BSC		
	SE	--- BSC		
Package edge tolerance	aaa	0.1		
Mold flatness	bbb	0.1		
Coplanarity	ddd	0.08		

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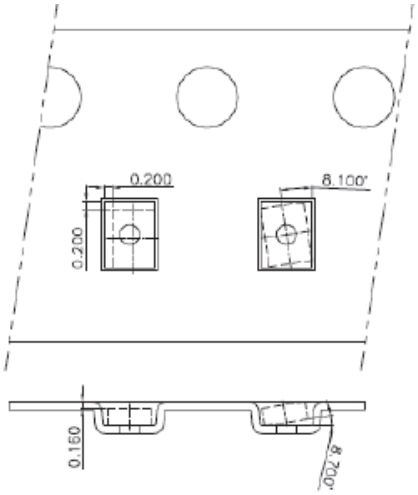
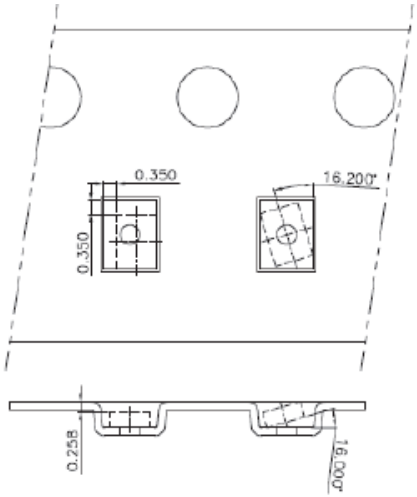
Packaging Information

Tape & Reel specifications



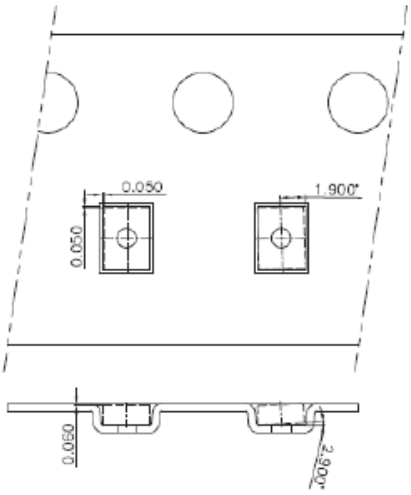
NOM POCKET
Ao = 1.30
Bo = 1.70
Ko = 0.61

NOM PART
E = 1.10
D = 1.50
A = 0.45



MAX POCKET
Ao = 1.35
Bo = 1.75
Ko = 0.66

MIN PART
E = 1.00
D = 1.40
A = 0.40



MIN POCKET
Ao – 1.25
Bo = 1.65
Ko = 0.56

MAX PART
E – 1.20
D = 1.60
A = 0.50

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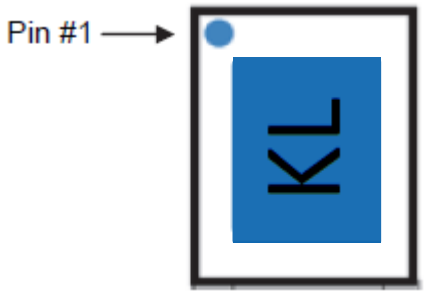
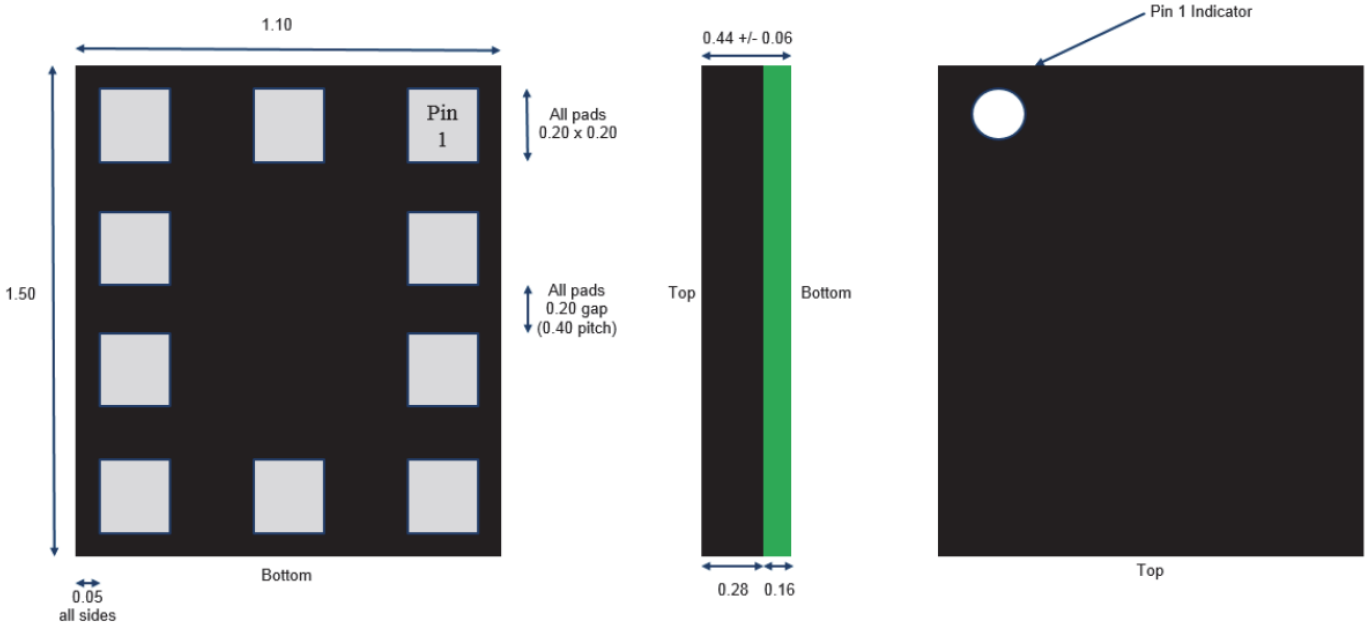
Product Marking Codes and Ordering Information

Marking Codes KL (GPIO)



Order Code	Package	Model Description	Shipping Method
EC696	10-Lead SMT 1.10 X 1.50 X 0.45 mm^3	GPIO	3000 units/T&R

Mechanical Specification



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