TAOGLAS®

Datasheet

High Performance Multiband GNSS Hybrid Coupler

Part No:
HC125A

Description

Low-Profile (1.5 mm Height), High-Performance Multiband GNSS Hybrid Coupler

Features:

Frequencies Covered: 1150-1630 MHz
Low Insertion Loss
Tight amplitude balance and high isolation
Low VSWR
Au surface plated to prevent oxidation
Supplied on Tape & Reel
Dimensions: 6.35 x 5.08 x 1.5mm
RoHS & Reach Compliant

1. Introduction

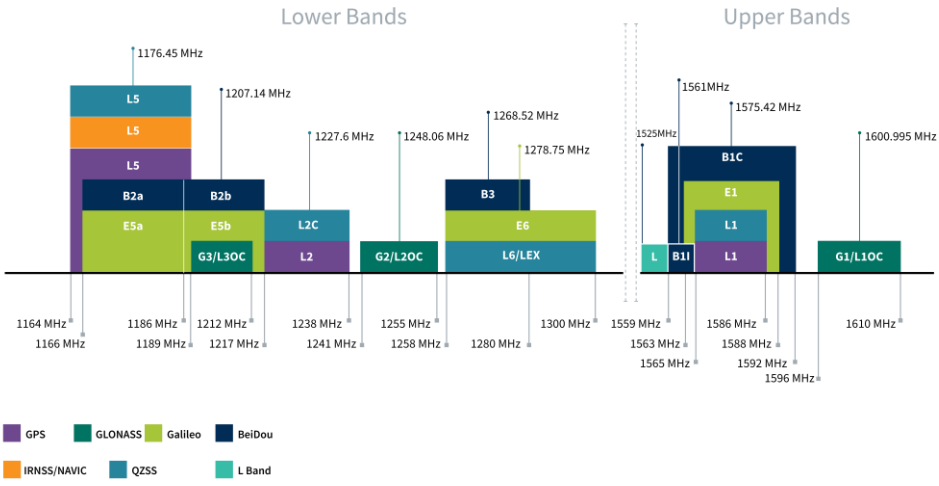
The Taoglas HC125A is a low profile (1.5mm height), high performance, 3dB hybrid coupler in an easy to integrate surface mount package. It is designed for multi feed GNSS applications. The HC125A is particularly used for applications where balanced power and low noise amplifiers are required. It has low insertion loss and tight amplitude and can be used in power applications up to 30 Watts. It has been engineered to cover the full GNSS bandwidth of 1150 – 1630MHz.

The HC125A has been subjected to rigorous qualification testing and it is manufactured using materials with coefficients of thermal expansion (CTE) compatible with common substrates such as FR4, G-10, RF-35, RO4350 and polyimide.

The HC125A is the perfect companion to ensure successful integration of multi feed high performance, high precision GNSS patches from Taoglas such as the full band GPDF5012.A or the dual L1 feed GPDF254.A. Integration details are included in specific product datasheets but for further information regarding the HC125A or it's integration with any of our antennas, please contact your regional Taoglas customer support team.

2. Specification

GNSS Frequency Bands					
GPS	L1 1575.42 MHz	L2 1227.6 MHz	L5 1176.45 MHz		
	■	■	■		
GLONASS	G1 1602 MHz	G2 1248 MHz	G3 1207 MHz		
	■	■	■		
Galileo	E1 1575.24 MHz	E5a 1176.45 MHz	E5b 1201.5 MHz	E6 1278.75 MHz	
	■	■	■	■	
BeiDou	B1C 1575.42 MHz	B1I 1561 MHz	B2a 1176.45 MHz	B2b 1207.14 MHz	B3 1268.52 MHz
	■	■	■	■	■
L-Band	L-Band 1542 MHz				
	■				
QZSS (Regional)	L1 1575.42 MHz	L2C 1227.6 MHz	L5 1176.45 MHz	L6 1278.75e6	
	■	■	■	■	
IRNSS (Regional)	L5 1176.45 MHz				
	■				
SBAS	L1/E1/B1 1575.42 MHz	L5/B2a/E5a 1176.45 MHz	G1 1602 MHz	G2 1248 MHz	G3 1207 MHz
	■	■	■	■	■



GNSS Bands and Constellations

Electrical Specifications	
Parameter	**Value**
Frequency	1150 – 1630MHz
Isolation	22dB Min
Insertion Loss	0.3 dB Max
VSWR	1.2
Amplitude Balance	+/- 0.35 dB Max
Phase Balance	90 Degrees
Power	30 CW Watts Avg.

Mechanical	
Dimensions	6.35 x 5.08 x 1.5mm
Weight	1 g

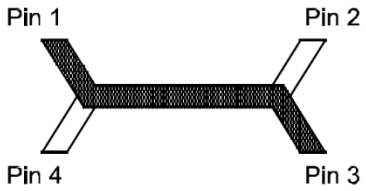
Environmental	
Operation Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
RoHS & REACH Compliant	Yes
Moisture Sensitivity Level (MSL)	3 (168 Hours)

3. Typical Performance Data (@25°C)

Frequency (MHz)	Coupling (dB)	Transmission (dB)	Insertion Loss (dB)	Isolation (dB)	Amplitude Balance (dB)	Phase (degree)	Return Loss(dB)			
							S11	S22	S33	S44
1150	-3.27	-3.06	-0.15	-33.46	-0.21	91.90	-32.97	-29.08	-35.22	-30.96
1174	-3.23	-3.11	-0.16	-34.97	-0.12	92.06	-33.44	-29.33	-34.10	-32.00
1198	-3.19	-3.12	-0.14	-36.64	-0.07	92.03	-34.09	-29.71	-33.10	-33.40
1222	-3.18	-3.16	-0.16	-38.85	-0.02	92.09	-34.80	-30.32	-31.94	-34.84
1246	-3.14	-3.19	-0.15	-41.64	0.05	92.18	-35.31	-31.26	-30.72	-36.39
1270	-3.15	-3.23	-0.18	-44.79	0.08	92.25	-35.47	-32.31	-29.61	-38.58
1294	-3.14	-3.26	-0.19	-47.45	0.12	92.42	-35.29	-33.51	-28.71	-41.10
1318	-3.11	-3.25	-0.17	-46.04	0.14	92.46	-34.85	-34.69	-27.90	-43.59
1342	-3.11	-3.29	-0.19	-42.59	0.18	92.50	-34.47	-35.35	-27.28	-43.20
1366	-3.10	-3.28	-0.18	-39.71	0.18	92.43	-34.16	-35.35	-26.71	-40.66
1390	-3.10	-3.30	-0.19	-37.53	0.20	92.50	-33.91	-34.81	-26.20	-37.79
1414	-3.11	-3.32	-0.20	-35.73	0.21	92.58	-33.55	-34.00	-25.62	-35.65
1438	-3.11	-3.29	-0.19	-34.27	0.18	92.66	-33.01	-33.13	-25.07	-33.77
1462	-3.12	-3.30	-0.20	-32.98	0.18	92.71	-32.29	-32.39	-24.47	-32.10
1486	-3.13	-3.29	-0.20	-31.87	0.16	92.78	-31.60	-31.85	-23.93	-30.71
1510	-3.15	-3.30	-0.21	-30.92	0.15	92.84	-31.00	-31.52	-23.51	-29.41
1534	-3.18	-3.29	-0.22	-30.06	0.11	92.96	-30.51	-31.38	-23.18	-28.35
1558	-3.21	-3.28	-0.23	-29.29	0.07	92.89	-30.02	-31.25	-22.88	-27.47
1582	-3.25	-3.27	-0.25	-28.57	0.02	92.97	-29.36	-30.78	-22.63	-26.65
1606	-3.33	-3.27	-0.29	-27.95	-0.06	92.98	-28.73	-29.84	-22.36	-25.93
1630	-3.33	-3.20	-0.25	-27.34	-0.13	92.99	-28.00	-28.67	-21.99	-25.27

4. Pin Configuration

The HC125A has an orientation marker to denote Pin 1. Once port one has been identified the other ports are known automatically. Please see the chart below for clarification:

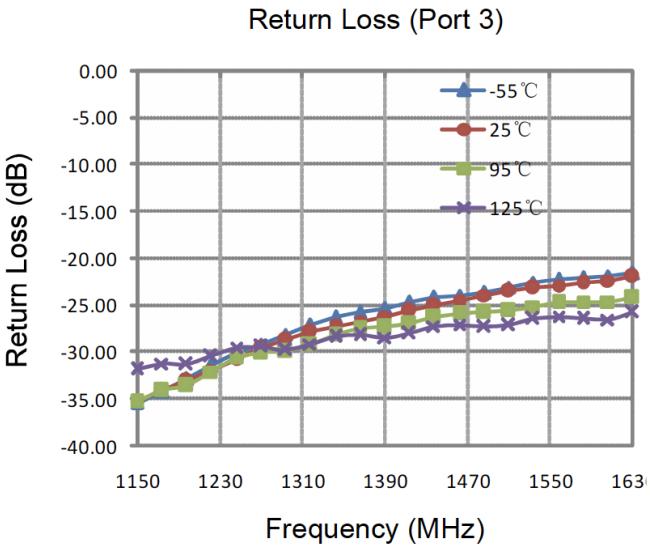


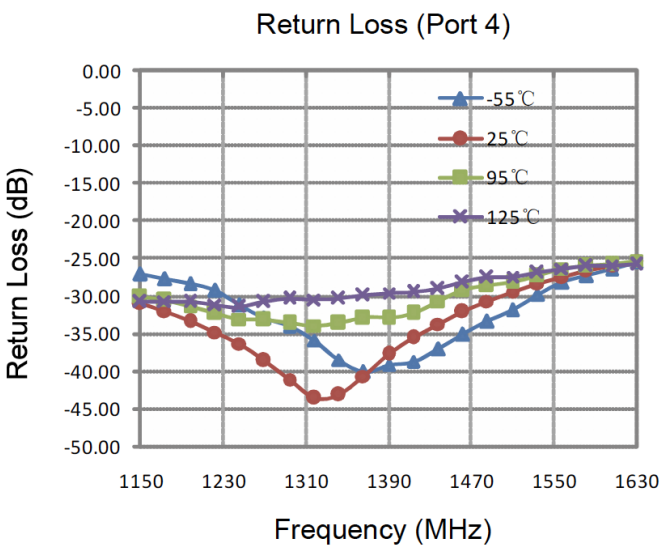
Configuration	Pin 1	Pin 2	Pin 3	Pin 4
Splitter	Input	Isolated	-3dB $\angle\theta - 90$	-3dB $\angle\theta$
Splitter	Isolated	Input	-3dB $\angle\theta$	-3dB $\angle\theta - 90$
Splitter	-3dB $\angle\theta - 90$	-3dB $\angle\theta$	Input	Isolated
Splitter	-3dB $\angle\theta$	-3dB $\angle\theta - 90$	Isolated	Input
***Combiner**	A $\angle\theta - 90$	A $\angle\theta$	Isolated	Output
***Combiner**	A $\angle\theta$	A $\angle\theta - 90$	Output	Isolated
***Combiner**	Isolated	Output	A $\angle\theta - 90$	A $\angle\theta$
***Combiner**	Output	Isolated	A $\angle\theta$	A $\angle\theta - 90$

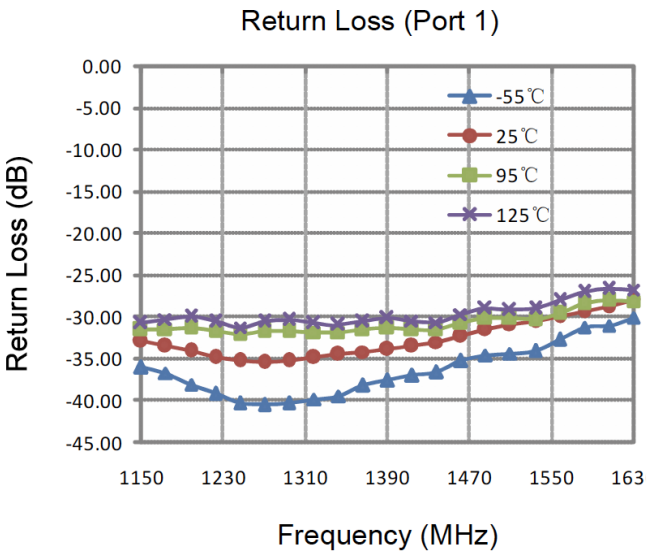
Note:
The "A" is the amplitude of the applied signals. When two quadrature signals with equal amplitudes are applied to the coupler as described in the table, they will combine at the output port. If the amplitudes are not equal, some of the applied energy will be directed to the isolated port.

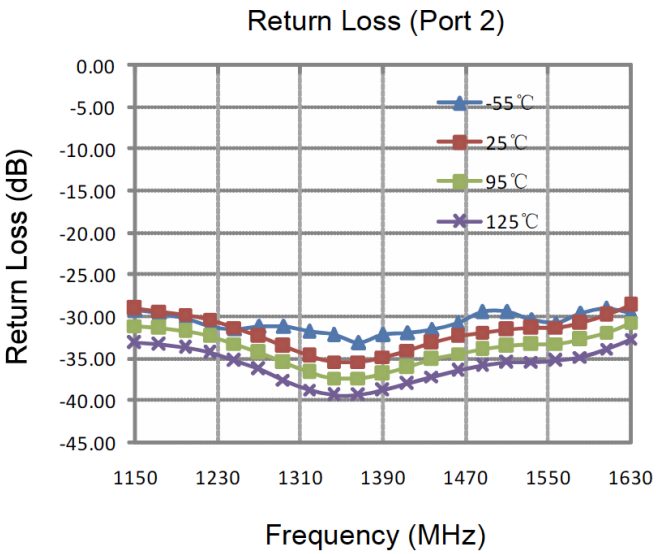
5. Typical Performance

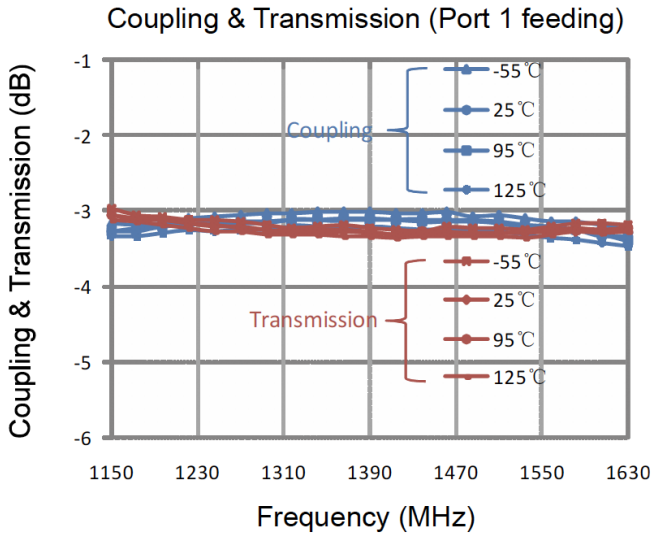
Typical Performance (-55°C, 25°C, 95°C, 125°C: 1150-1630 MHz)

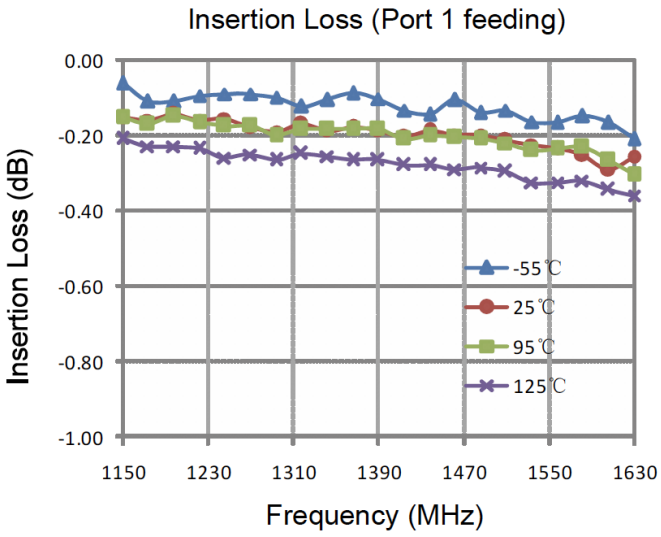


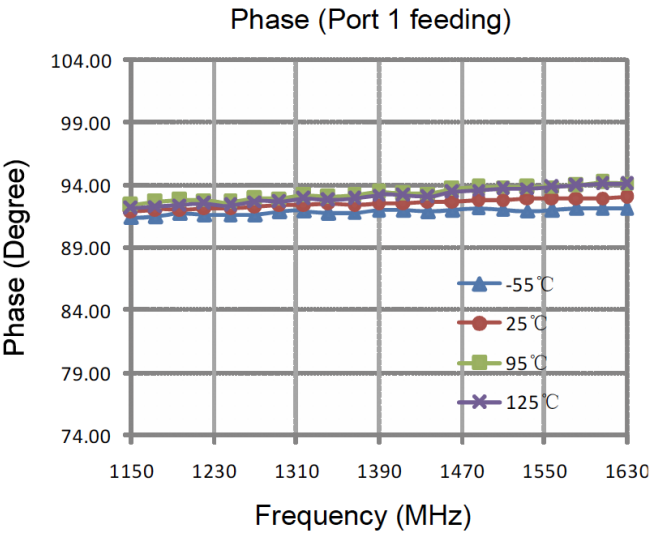


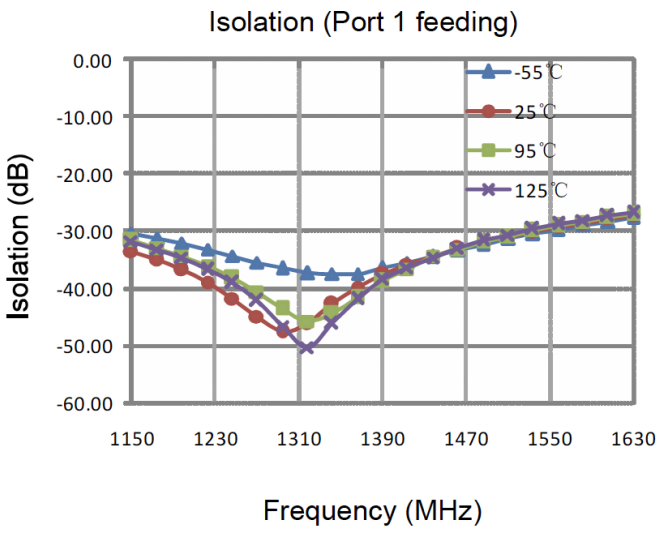




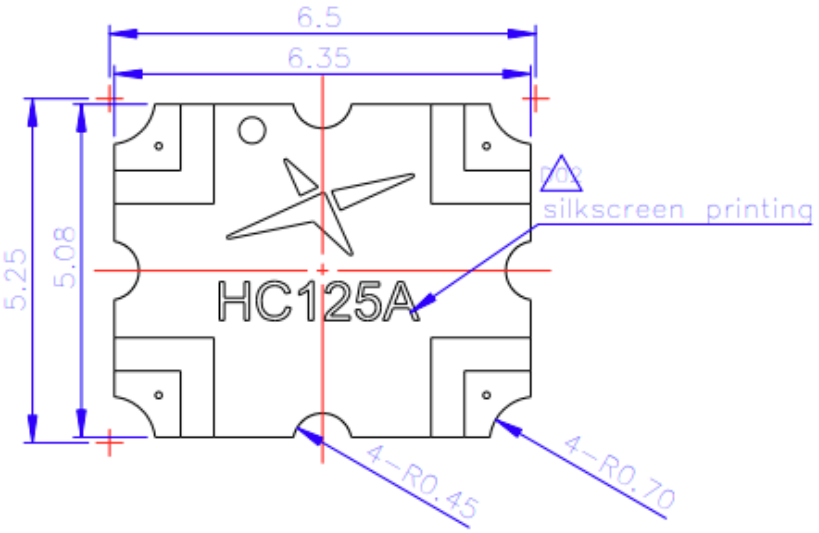

Coupling & Transmission (Port 1 feeding)
Coupling & Transmission (dB)
-1
-2
-3
-4
-5
-6
Coupling
Transmission
-55℃
25℃
95℃
125℃
-55℃
25℃
95℃
125℃
1150
1230
1310
1390
1470
1550
1630
Frequency (MHz)


Insertion Loss (Port 1 feeding)
Insertion Loss (dB)
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
-55℃
25℃
95℃
125℃
1150
1230
1310
1390
1470
1550
1630
Frequency (MHz)

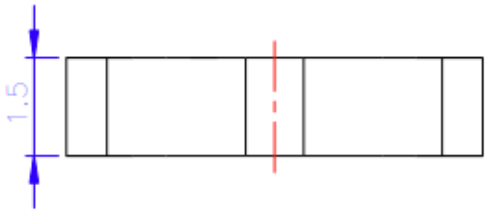

Phase (Port 1 feeding)
Phase (Degree)
104.00
99.00
94.00
89.00
84.00
79.00
74.00
-55℃
25℃
95℃
125℃
1150
1230
1310
1390
1470
1550
1630
Frequency (MHz)


Isolation (Port 1 feeding)
Isolation (dB)
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
-55℃
25℃
95℃
125℃
1150
1230
1310
1390
1470
1550
1630
Frequency (MHz)

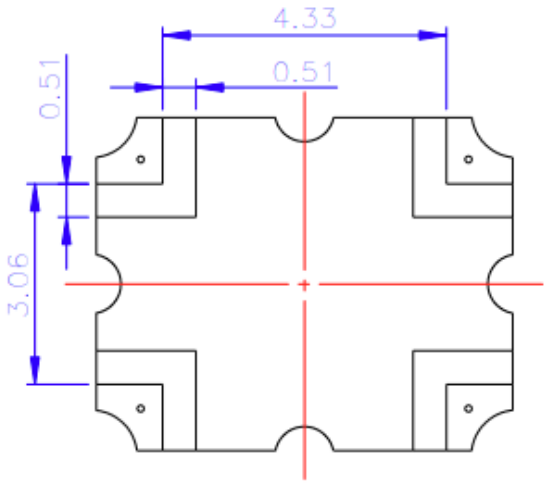
6. Mechanical Drawing



Front View



Side View

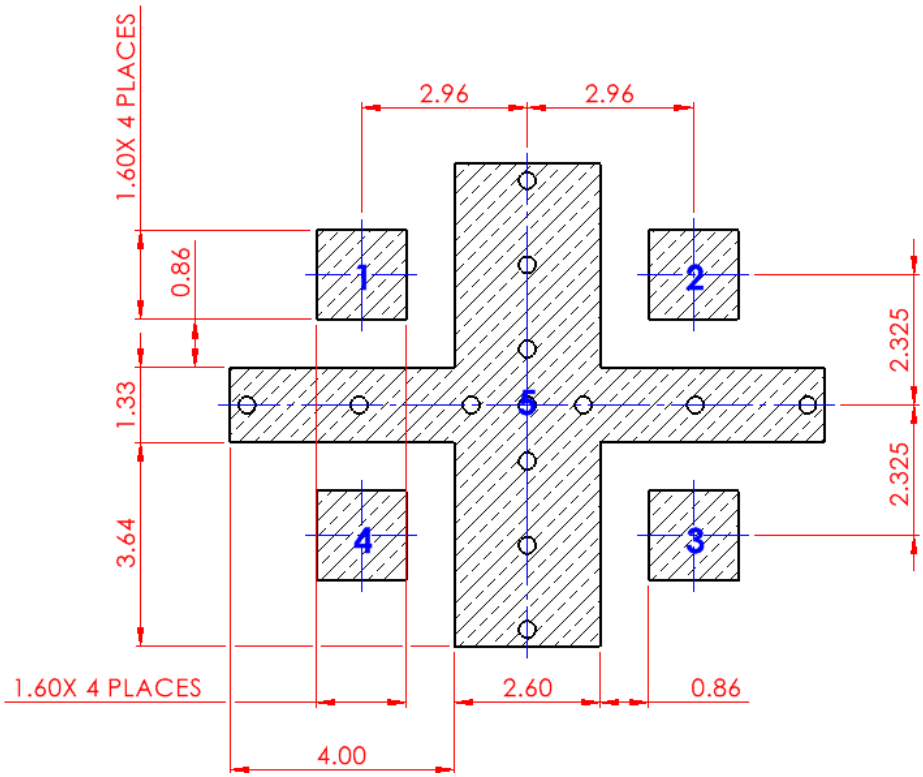


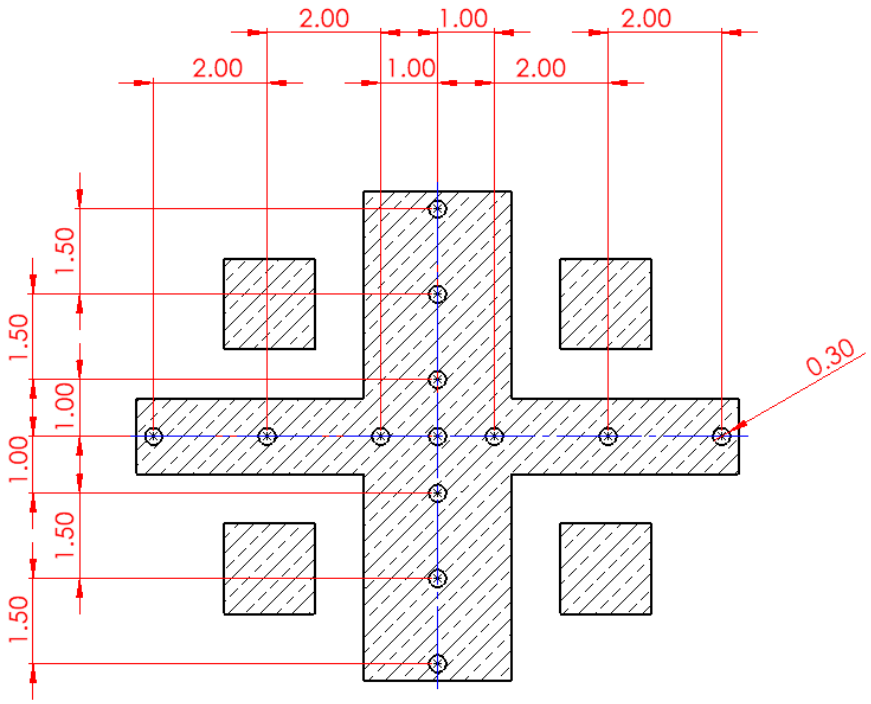
Bottom View

3D View

7. Recommended PCB Layout

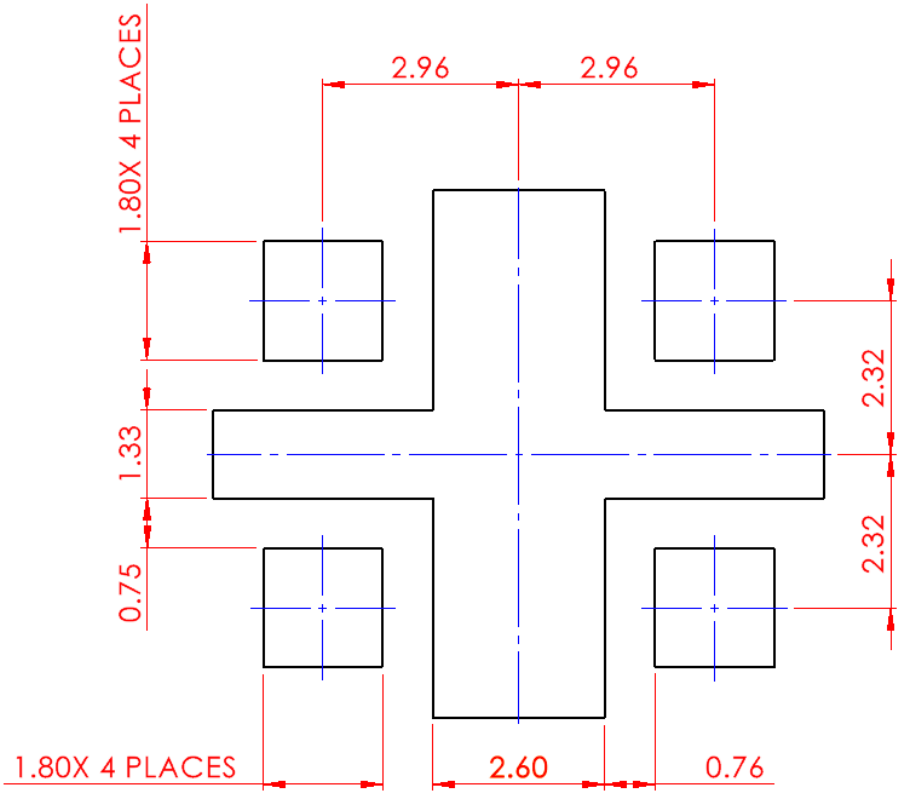
7.1 Footprint



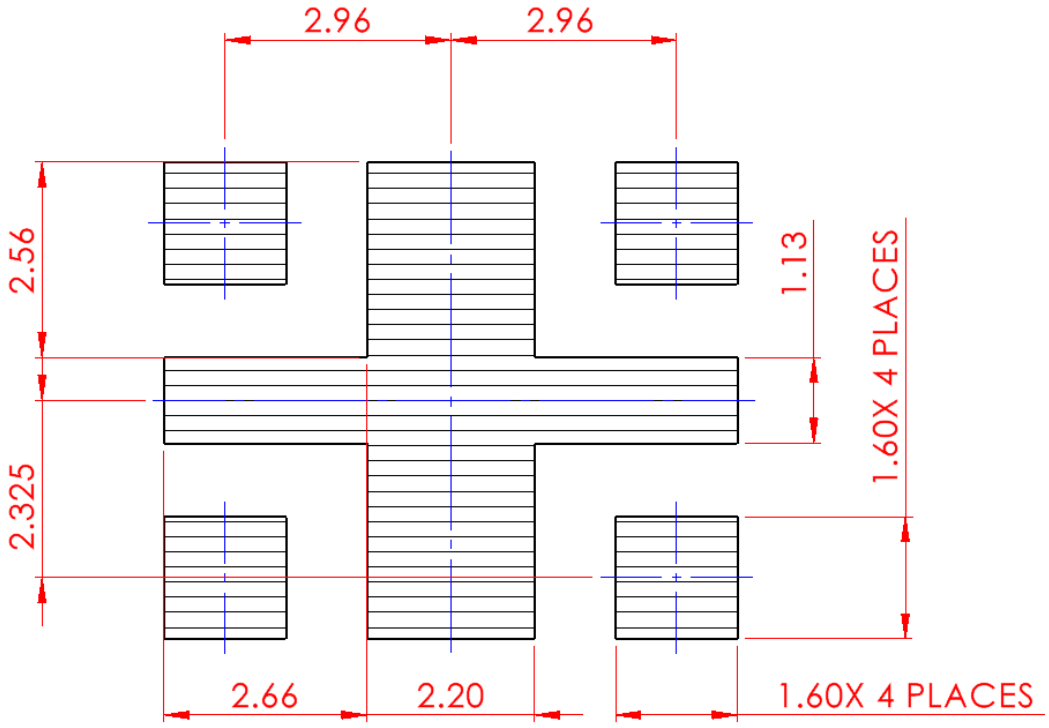


VIA Dimensions

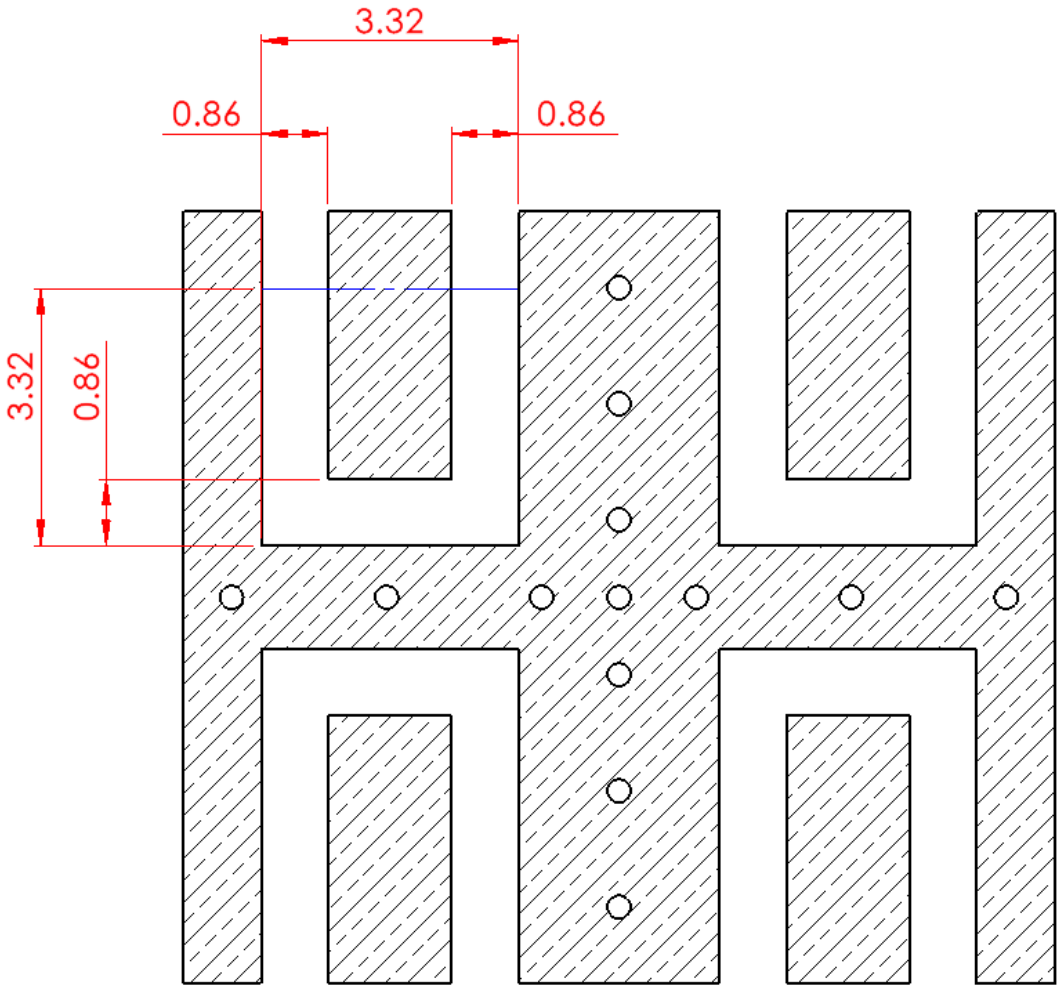
7.2 Top Solder Mask



7.3 Top Solder Paste



7.4 Copper Keep out

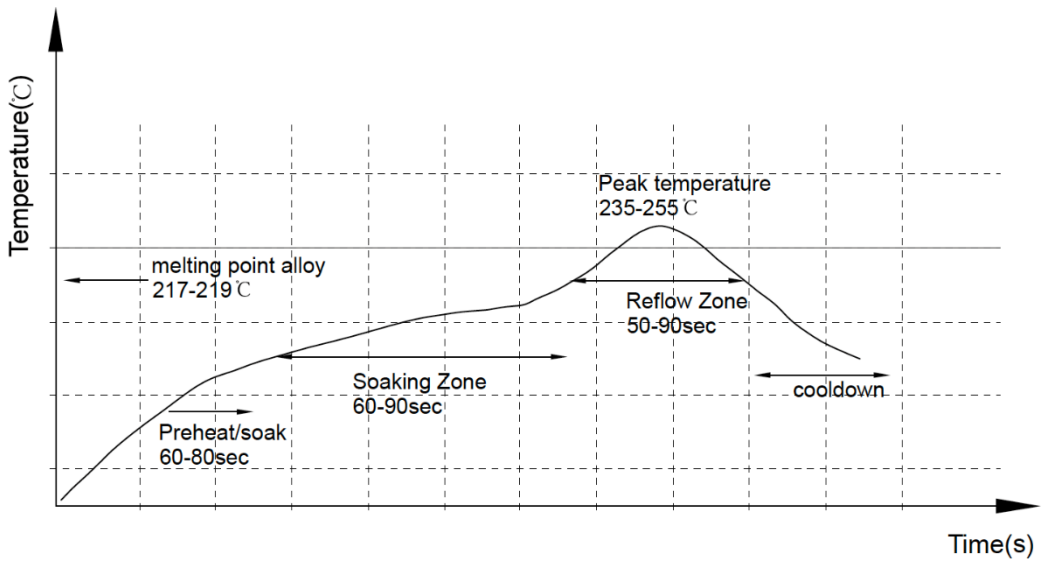


Notes:

1. 50Ω line width is shown above designing from RO4350B dielectric thickness 0.762mm; copper 1 OZ
2. Bottom side of the PCB is continuous ground plane.
3. All dimensions shown in mm.

8. Solder Reflow Profile

The HC125A can be assembled by following the recommended soldering temperatures are as follows:



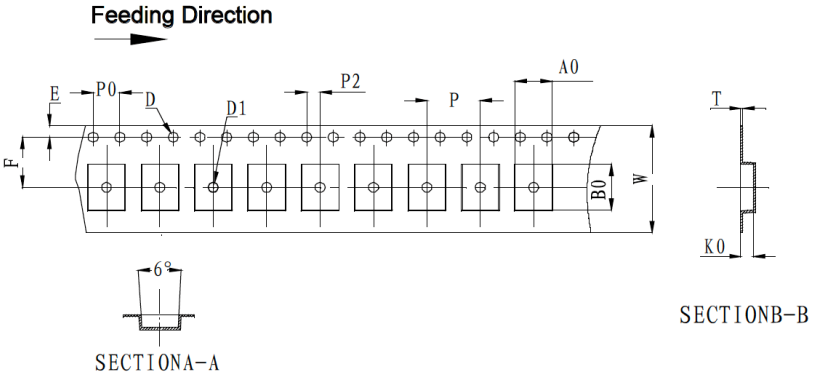
*Temperatures listed within a tolerance of +/- 10º C

Smaller components are typically mounted on the first pass, however, we do advise mounting the HC125A when placing larger components on the board during subsequent reflows.

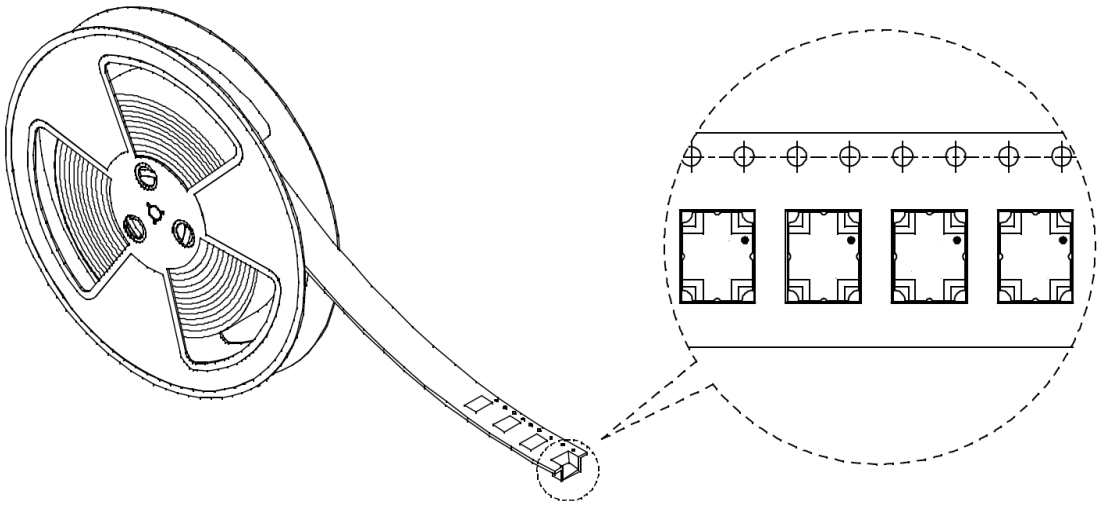
9. Packaging

1,000 pcs HC125A per Reel
Reel Dimensions: Ø177 x 20.1mm
Weight: 1.1Kg

A.10 Sprocket hole pitch cumulative tolerance is 0.2mm.
B. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
C. All dimensions meet EIA-418-B requirements
D. A0 & B0 measured as indicated.
E. K0 measured from a place on the inside bottom of the pocket to top surface of carrier.
F. Material: PE 100
G. Thickness: 0.30±0.05mm
H. 1000 units (maximum) / T&R



Symbol	Dimensions	
	(mm)	(inch)
W	16.5±0.4	0.65
A	177±0.5	7.0
N	63±0.3	2.48
T	1.8±0.2	0.071
E	2.1±0.3	0.083
F	10.75±0.3	0.423
D	13.5+0.5/-0.2	0.531



Changelog for the datasheet

SPE-20-8-104 – HC125A

Revision: E (Current Version)	
Date:	2025-07-10
Changes:	Updated product photos based on EC notification.
Changes Made by:	Paul Liu

Previous Revisions

Revision: D (Current Version)	
Date:	2025-04-30
Changes:	Updated Mechanical Integration drawings and datasheet template.
Changes Made by:	Gary West

Revision: C	
Date:	2023-09-19
Changes:	Updated PCB layout information.
Changes Made by:	Cesar Sousa

Revision: B	
Date:	2021-01-02
Changes:	Updated Part number
Changes Made by:	Jack Conroy

Revision: A (Original First Release)	
Date:	2020-10-28
Notes:	Initial Release
Author:	David Connolly

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