TAOGLAS


Datasheet

# High Performance Multiband GNSS Hybrid Coupler

**Part No:**
**HC125A**

**Description:**

Low Profile, 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

| | | |
|---|---|---|
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# 1. Introduction


The Taoglas HC125A is a low profile, 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.

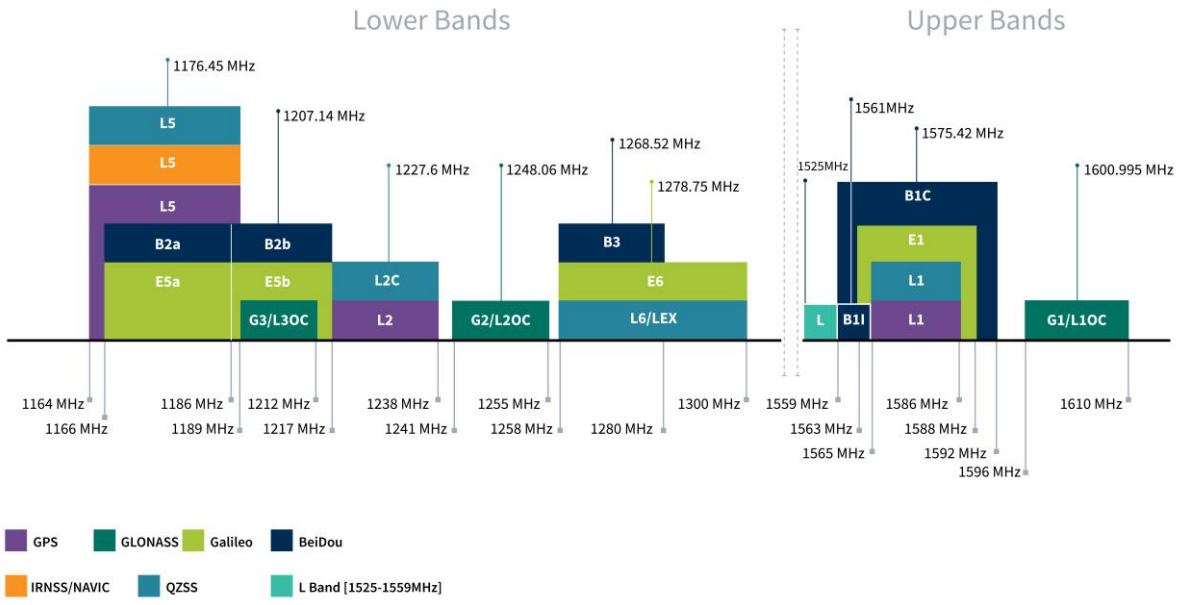
The HC125A has been subjected to rigorous qualification testing and it is manufactured using materials with coefficients of thermal expansion (CTE) compatible with common substrates such as FR4, G-10, RF-35, RO4350 and polyimide.

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. Specifications

| GNSS Frequency Bands Covered | | | | | | | |
|---|---|---|---|---|---|---|---|
| **GPS** | L1 | L2 | L5 | | | | |
| | ■ | ■ | ■ | | | | |
| **GLONASS** | G1 | G2 | G3 | | | | |
| | ■ | ■ | ■ | | | | |
| **Galileo** | E1 | E5a | E5b | E6 | | | |
| | ■ | ■ | ■ | ■ | | | |
| **BeiDou** | B1 | B2a | B2b | B3 | | | |
| | ■ | ■ | ■ | ■ | | | |
| **QZSS (Regional)** | L1 | L2C | L5 | L6 | | | |
| | ■ | ■ | ■ | ■ | | | |
| **IRNSS (Regional)** | L5 | | | | | | |
| | ■ | | | | | | |
| **SBAS** | L1/E1/B1 | L5/B2a/E5a | G1 | G2 | G3 | | |
| | ■ | ■ | ■ | ■ | ■ | | |

*SBAS systems: WASS(L1/L5), EGNOSS(E1/E5a), SDCM(G1/G2/G3), SNAS(B1,B2a), GAGAN(L1/L5), QZSS(L1/L5), KAZZ(L1/L5).




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. |

Note: All of the above data is based on HCD125A evaluation board.

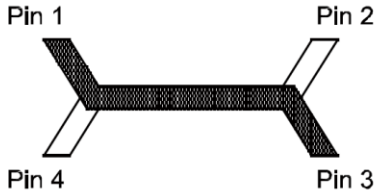
| Mechanical | |
|---|---|
| Dimensions | 6.35 x 5.08 x 1.5mm |
| Weight | 1 g |
| **Environmental** | |
| Temperature Range | -55°C to +125°C |
| RoHS & REACH Compliant | Yes |

# 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

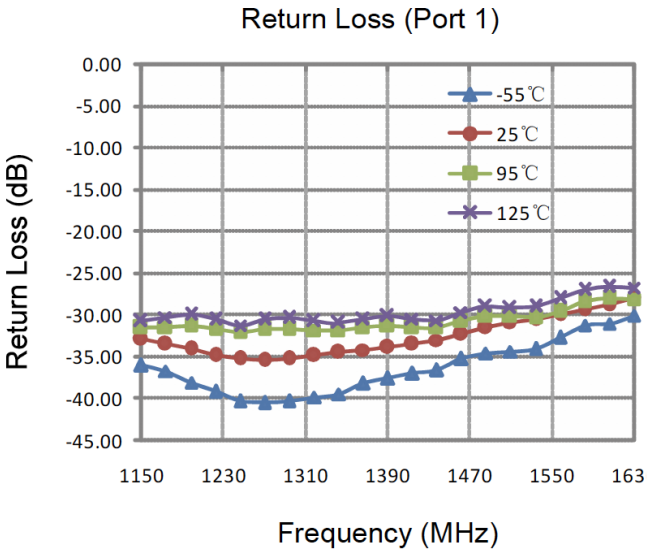
The HC125A has an orientation marker to denote Pin 1. Once port one has been identified the other ports are known automatically. Please see the chart below for clarification:

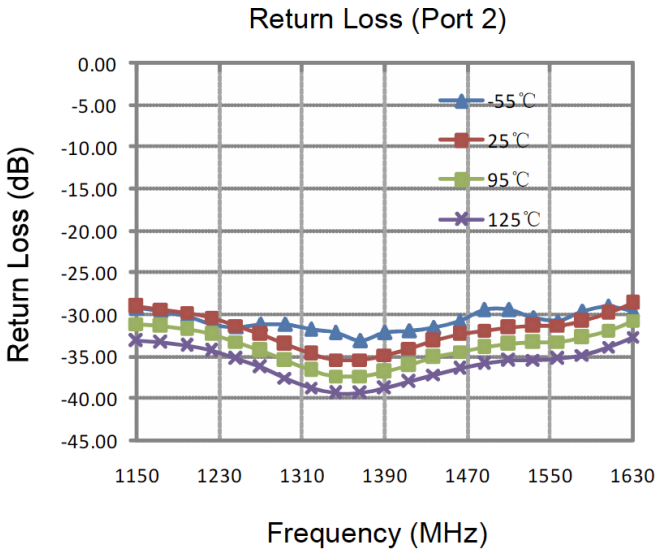


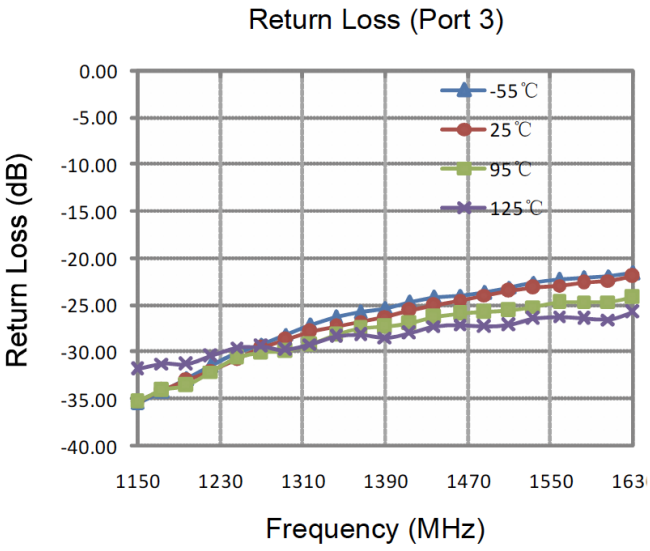

| Configuration | Pin 1 | Pin 2 | Pin 3 | Pin 4 |
|---|---|---|---|---|
| **Splitter** | Input | Isolated | -3dB $\angle\theta - 90$ | -3dB $\angle\theta$ |
| **Splitter** | Isolated | Input | -3dB $\angle\theta$ | -3dB $\angle\theta - 90$ |
| **Splitter** | -3dB $\angle\theta - 90$ | -3dB $\angle\theta$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

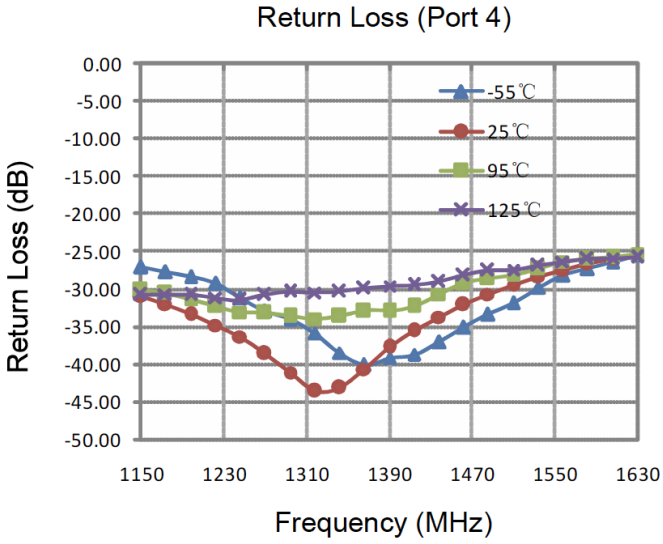
Note:
The "A" is the amplitude of the applied signals. When two quadrature signals with equal amplitudes are applied to the coupler as described in the table, they will combine at the output port. If the amplitudes are not equal, some of the applied energy will be directed to the isolated port.

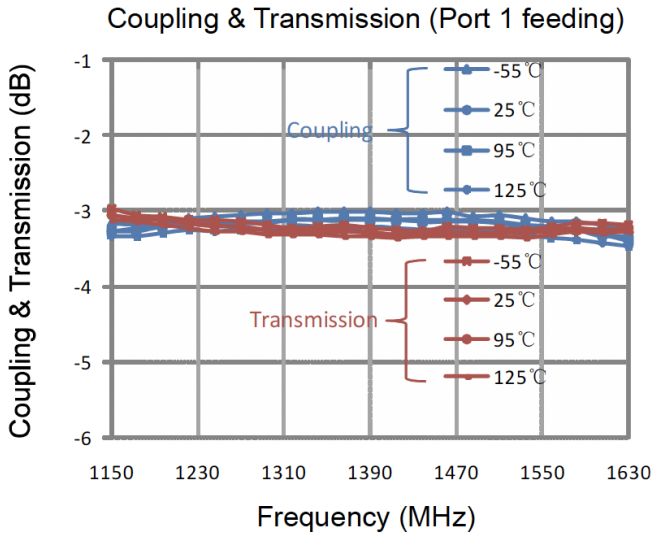
## 5. Typical Performance (-55°C, 25°C, 95°C, 125°C: 1150-1630 MHz)

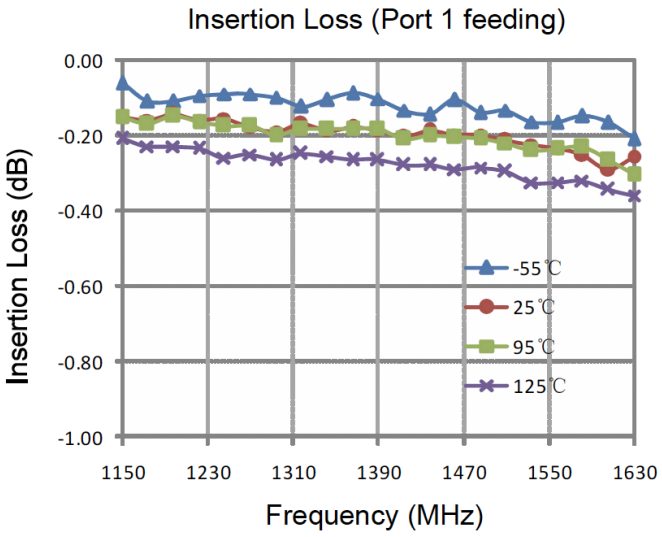


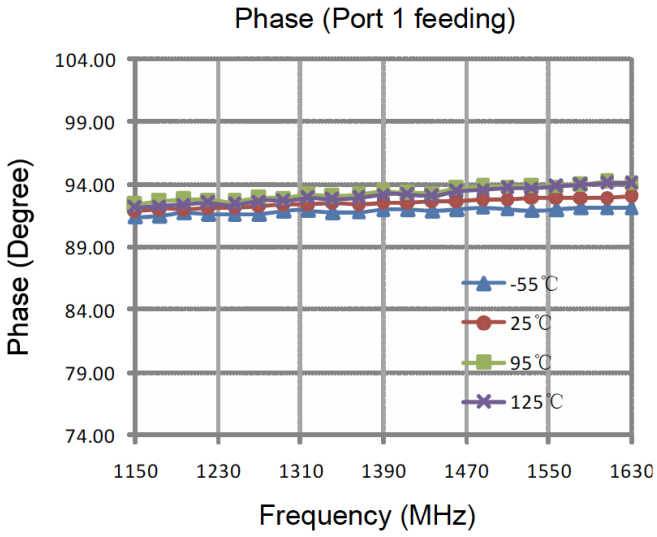



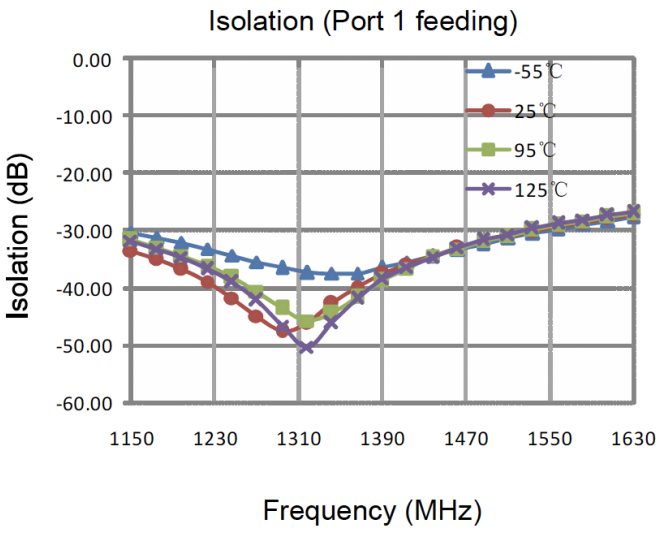




Coupling & Transmission (Port 1 feeding)
Coupling & Transmission (dB)
-1
-2
-3
-4
-5
-6
Coupling
Transmission
-55℃
25℃
95℃
125℃
-55℃
25℃
95℃
125℃
1150
1230
1310
1390
1470
1550
1630
Frequency (MHz)


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)

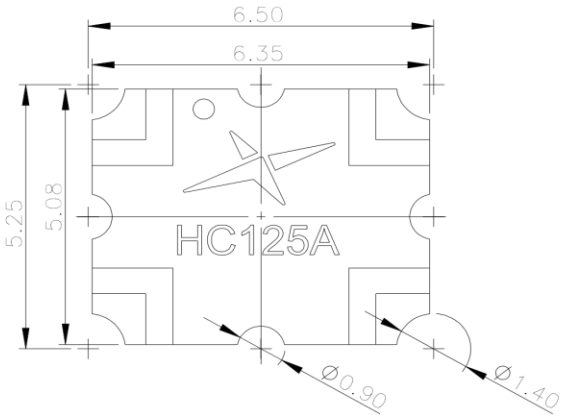

Isolation (Port 1 feeding)
Isolation (dB)
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
-55℃
25℃
95℃
125℃
1150
1230
1310
1390
1470
1550
1630
Frequency (MHz)

# 6. Mechanical Drawing (Units: mm)

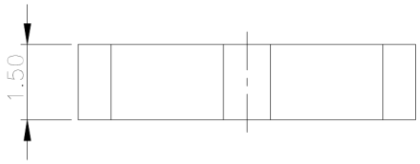
ISO NO.: EDW-20-8-0883
STATE: Release
NOTES: 1.All dimension show in millimeters.
2.RoHS Compliant in accordance with EU Directive(2011/65/EU)
3.Dimension tolersnce:±0.20

| REV | ZONE | DESCRIPTION | ENG | APPROVED | DATE |
|---|---|---|---|---|---|
| D01 | All | Initial design | Aron Yan | Clark | 2020/10/08 |

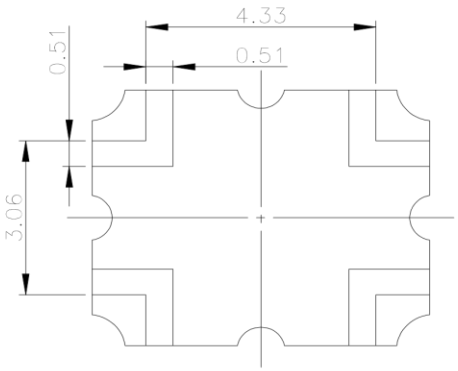
Front View




Side View




Bottom View

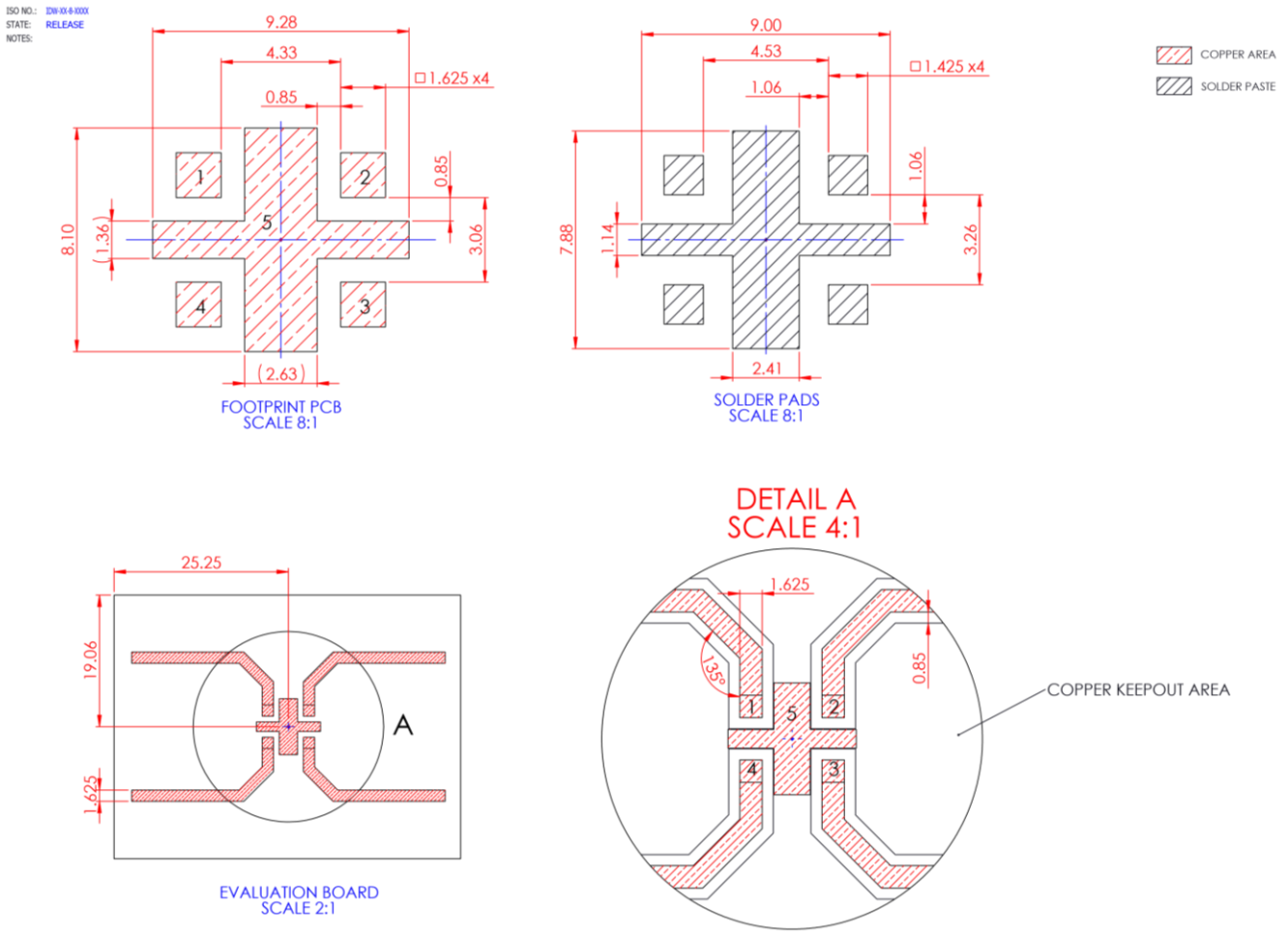




3D View

| | | | | |
|---|---|---|---|---|
| APPROVED BY: Clark | TAOGLAS. TW Design Centre<br>This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas. | | | |
| CHECK BY: Aaron | | | | |
| DRAWN BY: Aron Yan | | | | |
| DATE: 2020/10/8 | TITLE: Low Profile, High-performance 3dB SMD Hybrid Coupler | | | |
| UNLESS OTHERWISE SPECIFIED TOLERANCES ON: XX:±0.5 X:±0.3 .X:±0.2 .XX:±0.1 .XXX:±0.05 | PART NO.: | | | |
| THIRD ANGLE PROJECTION | UNIT: mm | SCALE: 6:1 | PAGES: 1/1 | REV. D01 |

# 7. Recommended PCB Layout

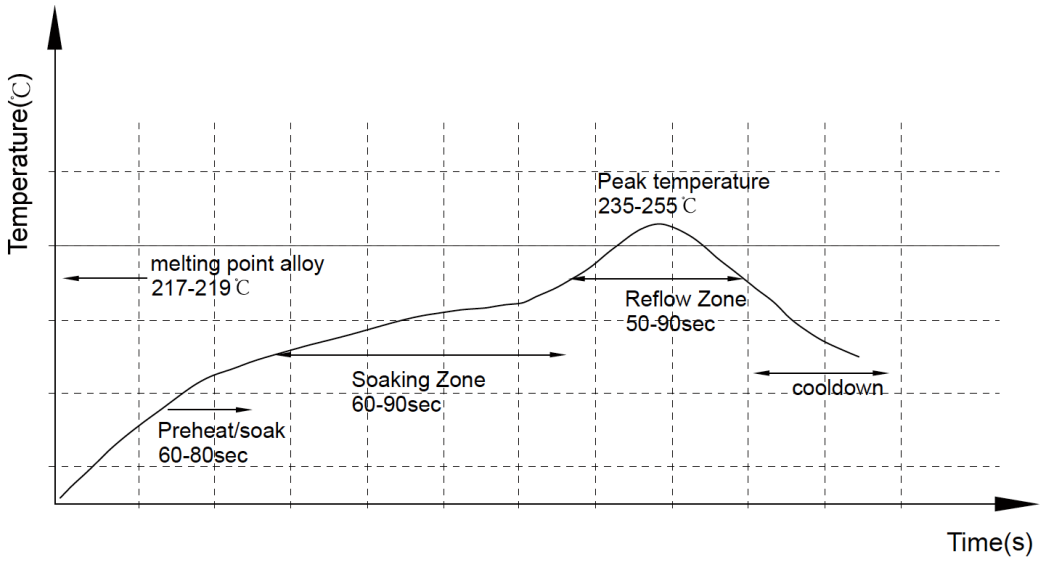



**Notes:**

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. Reflow Profile

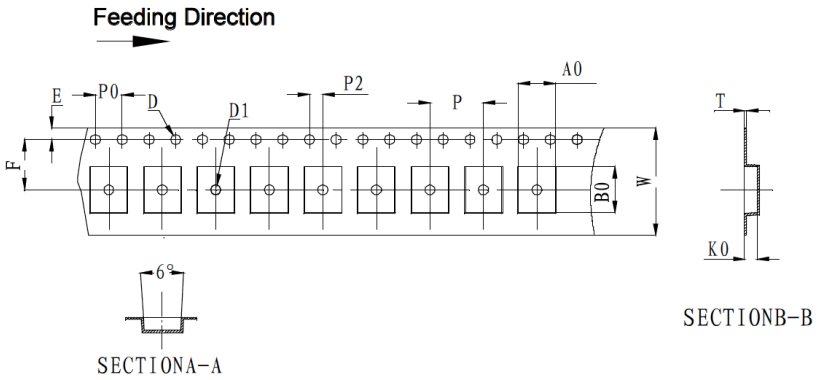
The HC125.A can be assembled by following the recommended soldering temperatures are as follows:



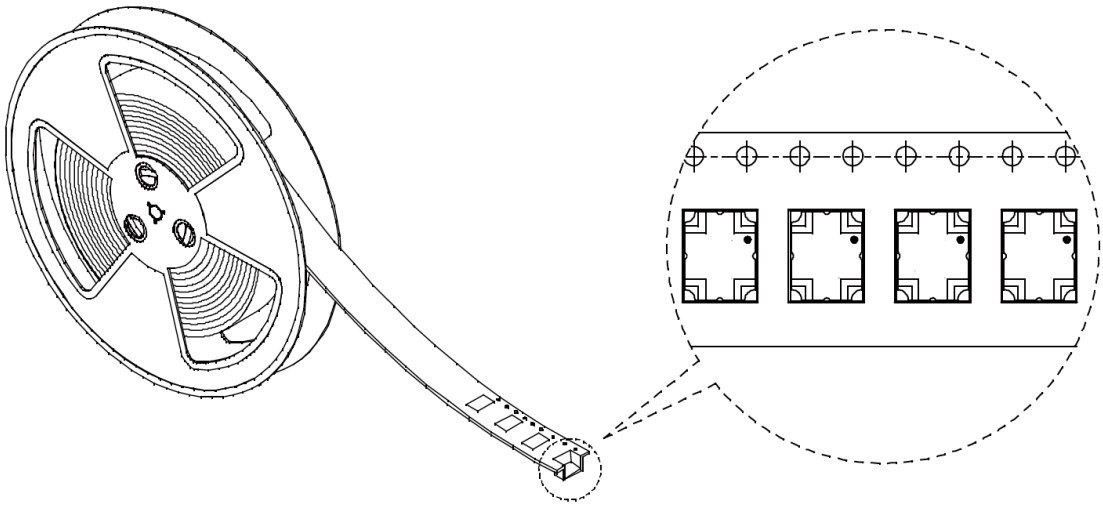
# 9. Packaging

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-20-8-103 – HC125A

| Revision: C (Current Version) | |
|---|---|
| Date: | 2023-09-19 |
| Changes: | Updated PCB layout information. |
| Changes Made by: | Cesar Sousa |

**Previous Revisions**

| 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 |