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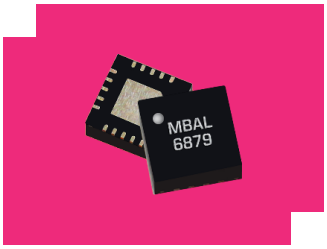
MBAL-1445SM

MMIC 14-45GHz Isolation Balun

DEVICE OVERVIEW

General Description

MBAL-1445 is a high isolation MMIC balun. Passive GaAs MMIC technology allows production of smaller constructions that replace larger form factor circuit board constructions. Tight fabrication tolerances result in less unit to unit variation than traditional balun technologies, allowing for accurate simulations using the provided S3P file taken from measured production units. Baluns are passive reciprocal devices allowing either single ended to differential or differential to single ended conversion. The MBAL-1445SM is available as a 4 X 4 mm QFN package. Evaluation boards are also available.



Download s-parameters here

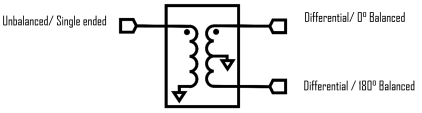
Features

- 2:1 Impedance Ratio
- 14GHz to 45GHz Balun (Balanced to Unbalanced Transformer)
- High Isolation
- High CMRR
- RoHS Compliant

Applications

- High-Speed Track-and-Hold Amplifiers
- Analog to Digital Converters
- Digital to Analog Converters
- Balanced Amplifiers
- Signal Integrity

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
MBAL-1445SM	MMIC 14-45GHz Isolation Balun	QFN	REACH RoHS	Released	EAR99
EVAL-MBAL-1445	Evaluation Board, MMIC 14-45GHz Isolation Balun	EVAL	REACH RoHS	Released	EAR99

Table Of Contents

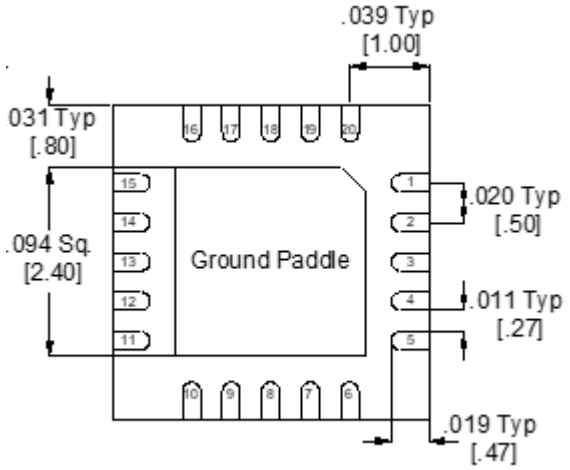
Revision History

Revision Code	Revision Date	Comment
A	2020-12-01	Performance over Temperature plots
-	2022-06-01	Initial Datasheet Release
B	2022-08-01	Updated Max Power Handling
C	2024-10-16	Updated ESD information

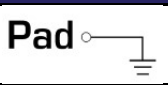
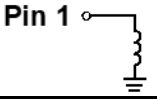
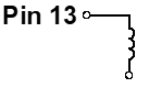
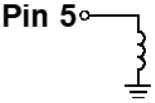
Port Configuration and Functions

Port Diagram

A bottom-up view of the MBAL-1445SM's SM package outline drawing is shown below. The MMIC baluns are passive reciprocal devices allowing either single ended to differential or differential to single ended conversion.



Port Functions

Port	Function	Description	DC Equivalent Circuit
Pad	Ground	SM package ground path is provided through the ground paddle.	
Pin 1	Differential/ 0° Balanced	The 0° port is DC short to ground.	
Pin 13	Unbalanced/ Single ended	The common port is DC open to ground.	
Pin 5	Differential / 180° Balanced	The 180° port is DC short to ground.	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C
Power Handling, at any Port	30	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	4 x 4 mm
Moisture Sensitivity Level	-	MSL 1

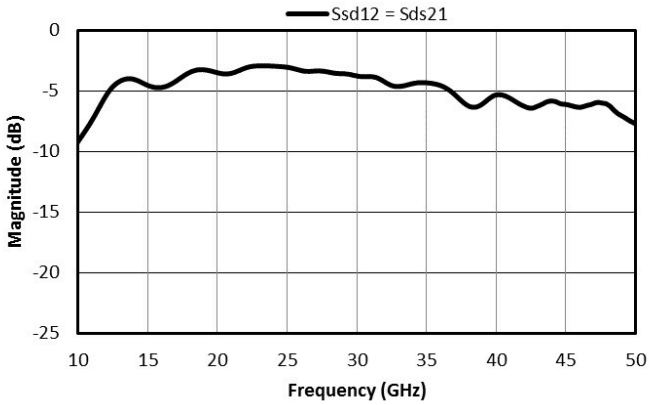
Electrical Specifications

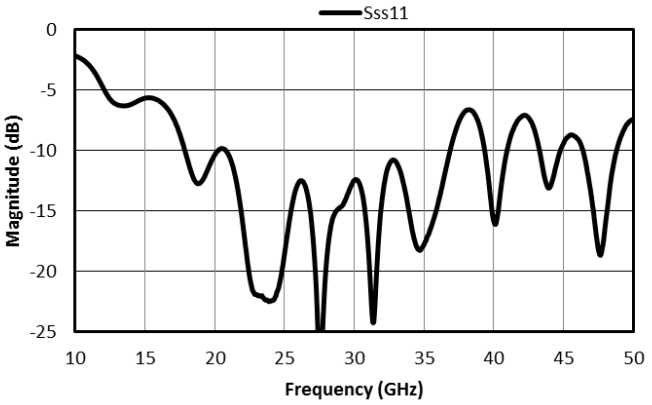
The electrical specifications apply at TA=+25°C in a 50Ω system. Min and Max limits are guaranteed at TA=+25°C. All measured data is taken from the eval board without de-embedding of the connectors and traces.

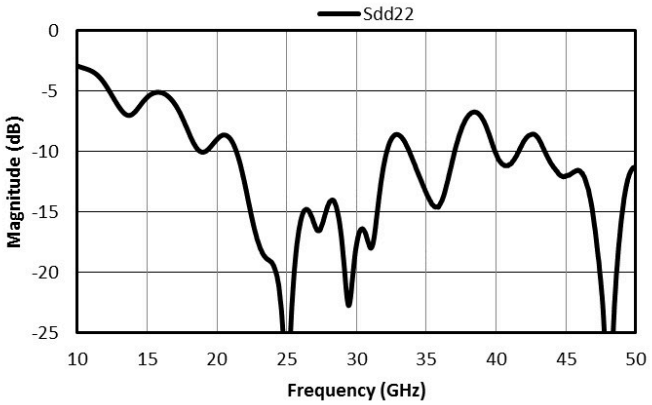
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Amplitude Balance	-	14	40	-	0.2	1	dB
Amplitude Balance	-	40	45	-	0.5	-	dB
Common Mode Rejection	-	14	45	19	33	-	dB
Impedance	-	-	-	-	50	-	Ω
Impedance Ratio	-	-	-	-	2:1	-	
Insertion Loss as a Mode Converter	-	14	45	-	4.5	-	dB
Isolation between differential ports	-	14	45	10	18	-	dB
Nominal Phase Shift	-	14	45	-	180	-	°
Phase Balance	-	14	45	-	2.5	10	°
VSWR	-	14	45	-	1.6	-	

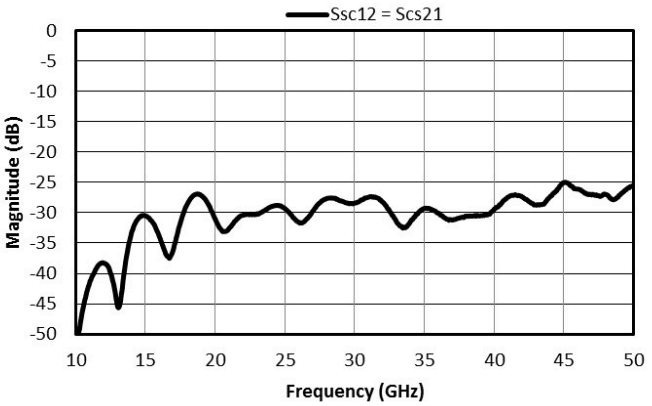
Mixed Mode Scattering Parameters

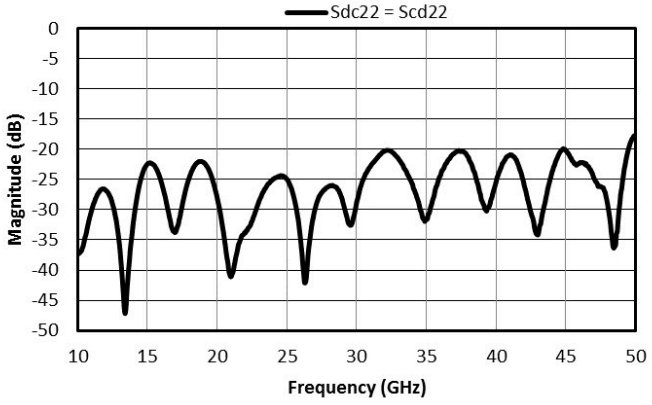
Mixed mode scattering parameters are used to characterize differential circuits. For baluns, this means that the 0° and 180° ports become a single 100Ω differential port and the common port remains the same 50Ω common port. The two-port s-parameters of the balun are then characterized based on differential (d), common mode (c), or single-ended (s) signals. For example: Scs21 is the Common output response given a single ended input.

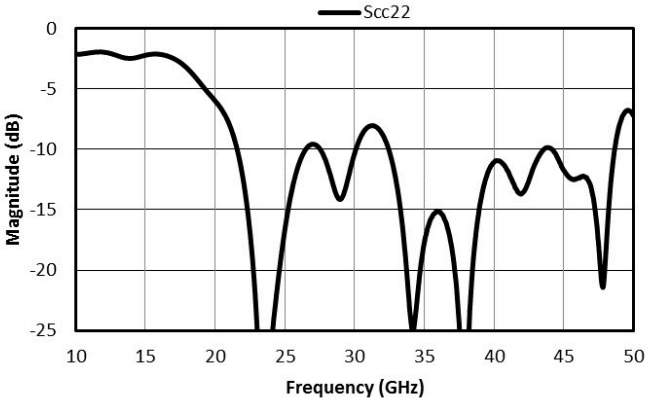






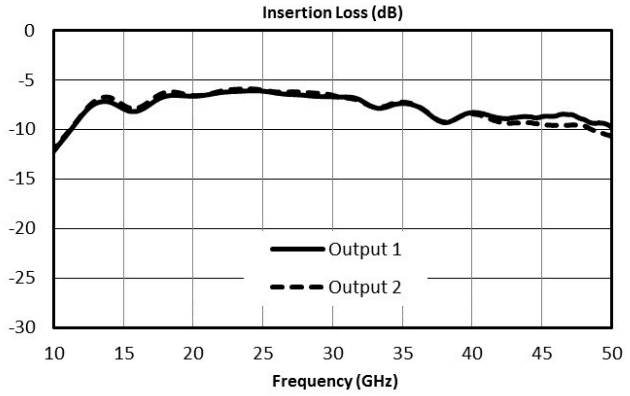


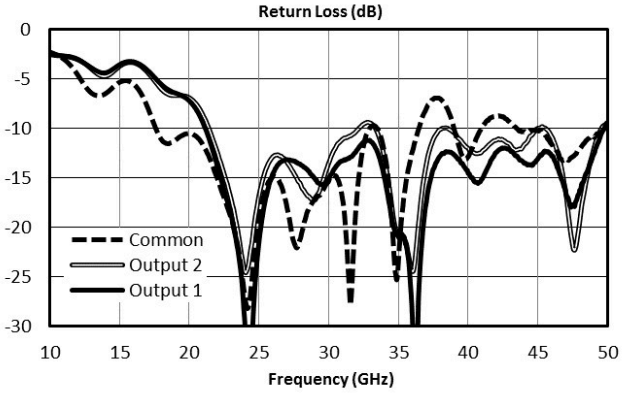


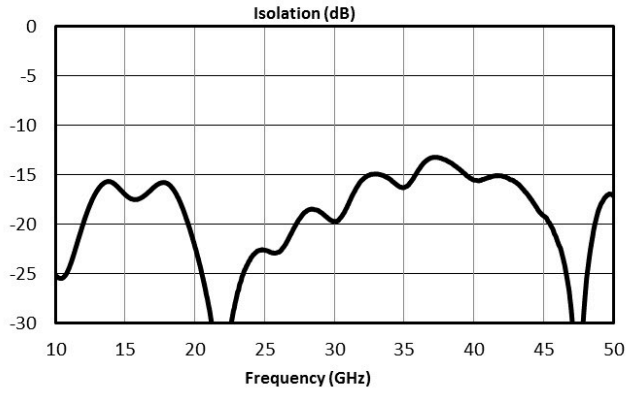


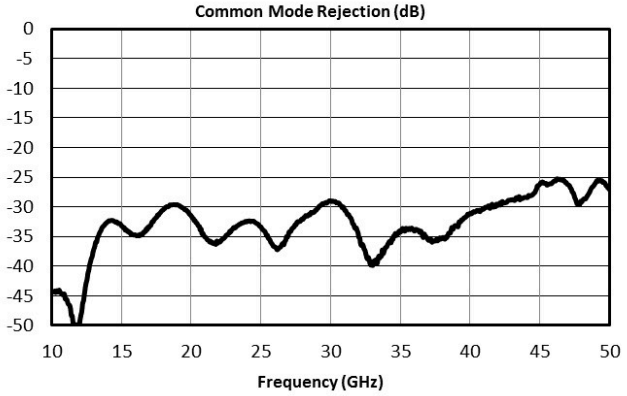
Typical Performance Scattering Parameter

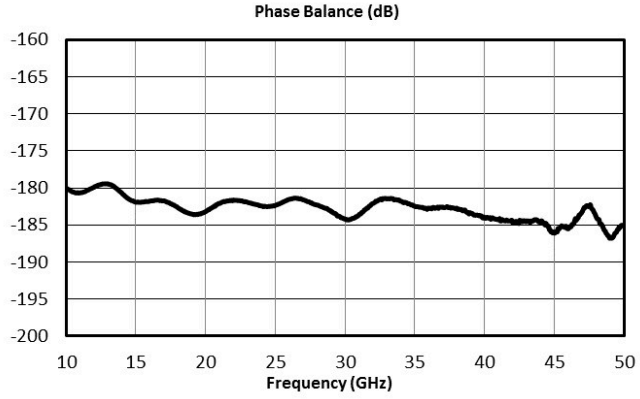
Three port scattering parameters measured as three single-ended 50Ω ports showing relationship between any two ports.

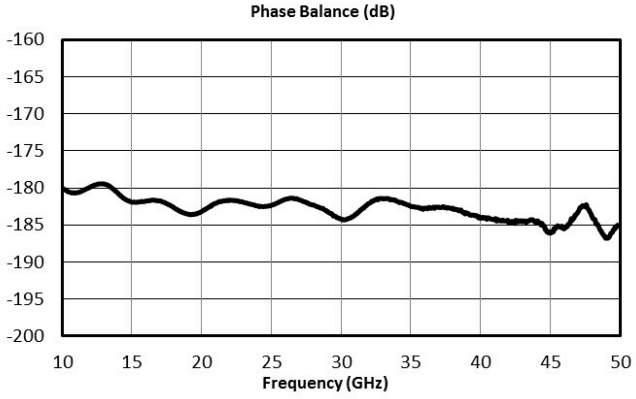




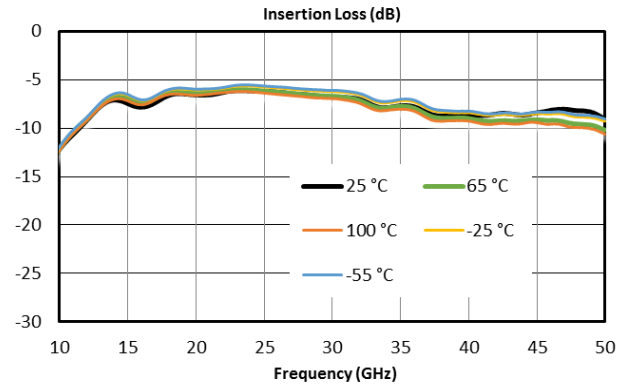


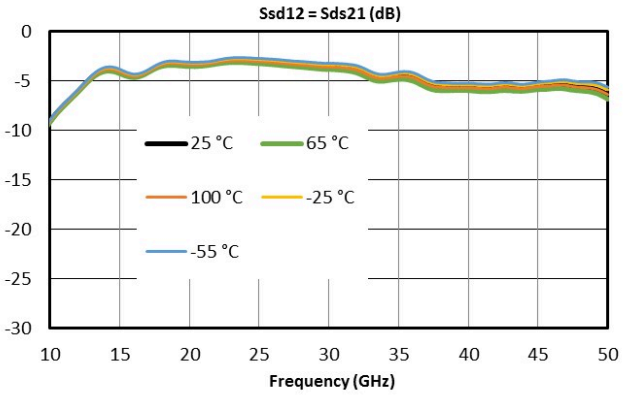


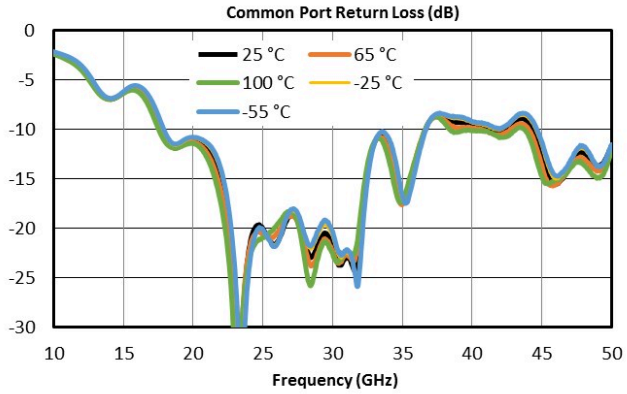


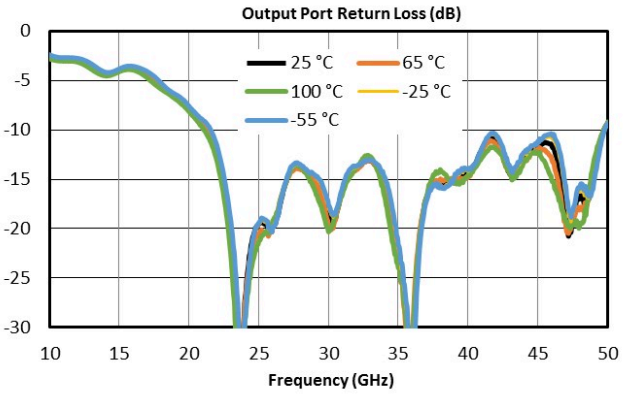


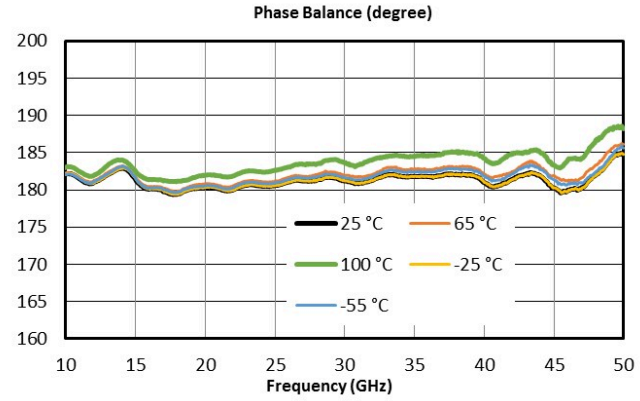
Typical Performance Over Temperature

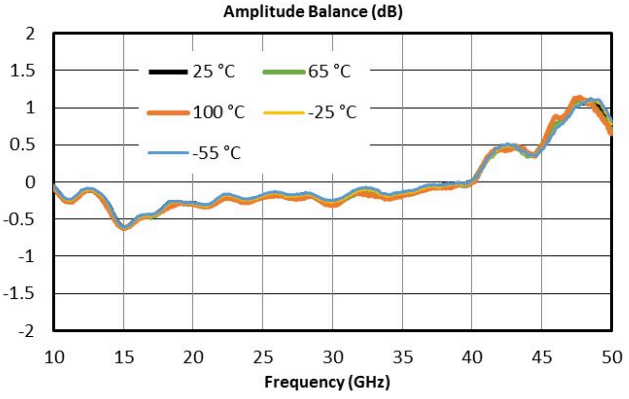


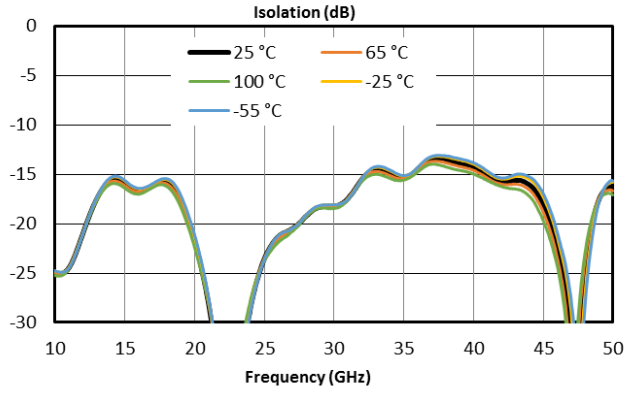


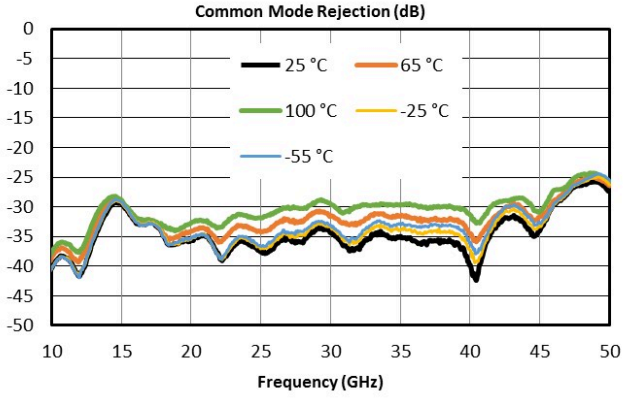








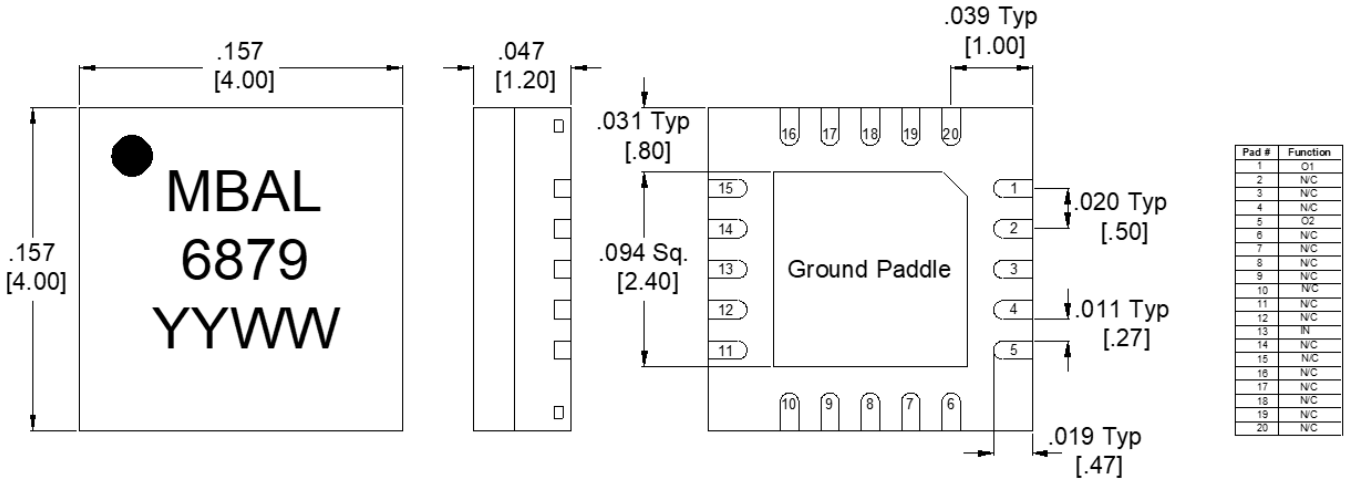




Mechanical Data

Outline Drawing

Download : Outline 3D Drawing | Outline 3D STP



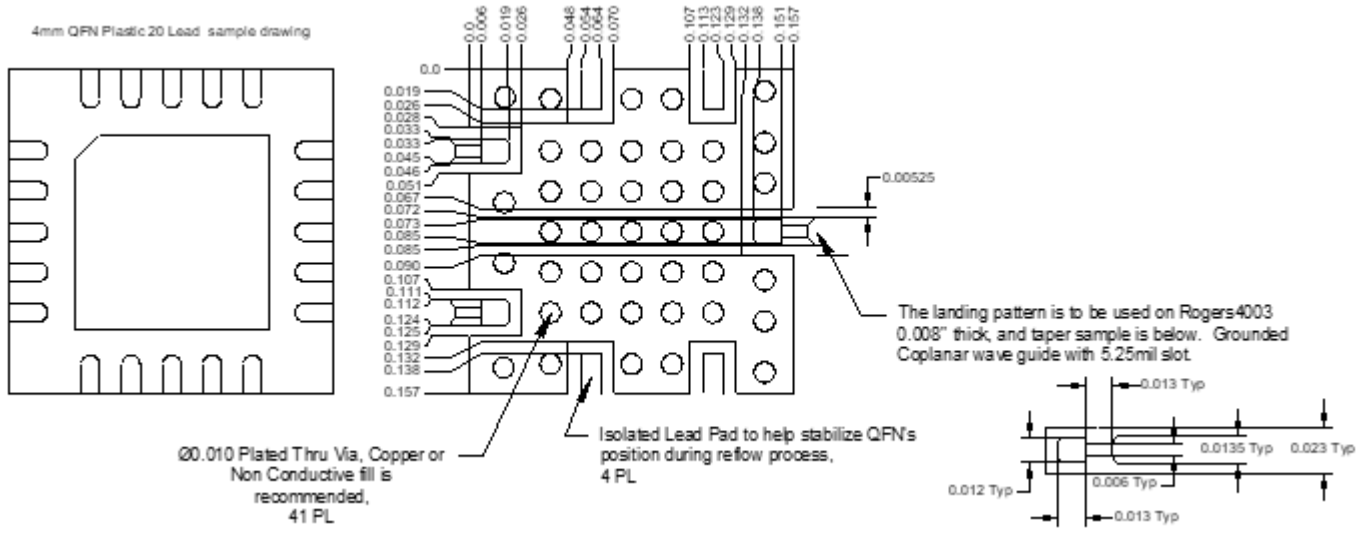
Pad #	Function
1	O1
2	N/C
3	N/C
4	N/C
5	O2
6	N/C
7	N/C
8	N/C
9	N/C
10	N/C
11	N/C
12	N/C
13	IN
14	N/C
15	N/C
16	N/C
17	N/C
18	N/C
19	N/C
20	N/C

Notes:

1. Substrate material is LCP.
2. I/O Leads and Ground Paddle plating is (from base to finish):
   Ni: 0.5um MIN
   Pd: 0.02um MIN
   Au: 0.05um MAX
3. All unconnected pins should be connected to PCB RF ground.

Footprint Image

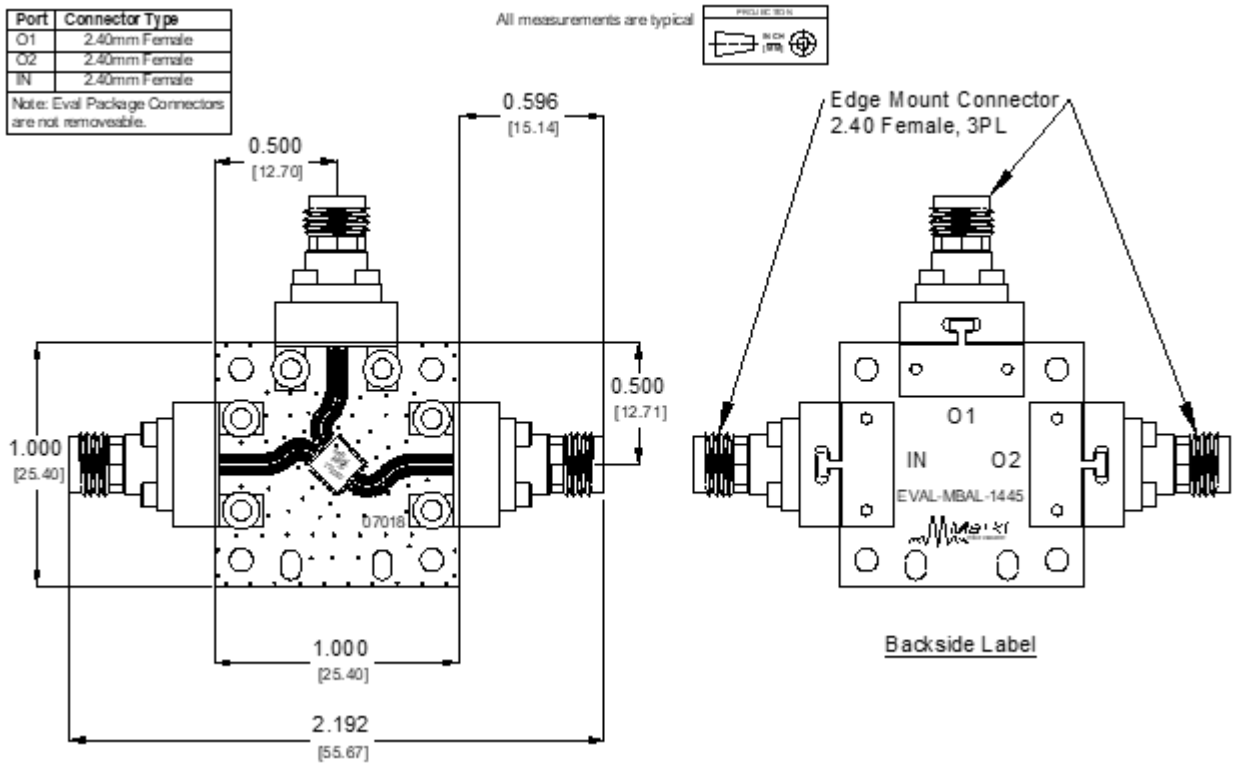
Download : Footprint Drawing



Evaluation Board - Performance Data

Parameter	Test Conditions	Frequency Range (GHz)	Min	Typ	Max	Unit
Impedance Ratio	-	-	-	2	-	

Evaluation Board - Outline Drawing



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