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Tech Support: support@markimicrowave.com

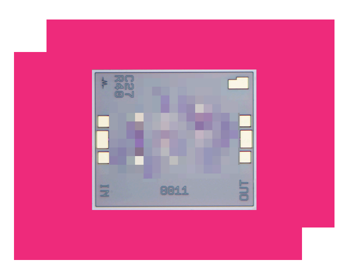
HLM-8011CH

Low Flat Leakage DC-30GHz Limiter

DEVICE OVERVIEW

General Description

The HLM-8011 is a high-power GaAs Schottky diode signal limiter featuring high IP3 and high power handling. It offers low insertion loss and low return loss from DC through Ka band and has a typical 1dB compression point of +9dBm. Its low flat leakage makes it ideal for protecting sensitive components and for applications requiring high linearity. It is available as a wire bondable die and as a connectorized module.



Download s-parameters here

Features

- DC to 30 GHz limiter
- 4.5W Peak Power (pulsed), 30dBm CW
- +7dBm Flat Leakage @ 1W CW
- Typical P1dB of +9dBm

Applications

N/A

Functional Block Diagram

Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
HLM-8011U	Low Flat Leakage DC-30GHz Limiter	U	Standard	REACH RoHS	Released	EAR99
HLM-8011CH	Low Flat Leakage DC-30GHz Limiter	CH	-	REACH RoHS	Released	EAR99

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Revision History

Revision Code	Revision Date	Comment
-	2023-03-01	Initial Release
A	2025-03-19	Updated Catalog Outline | ECN 24096

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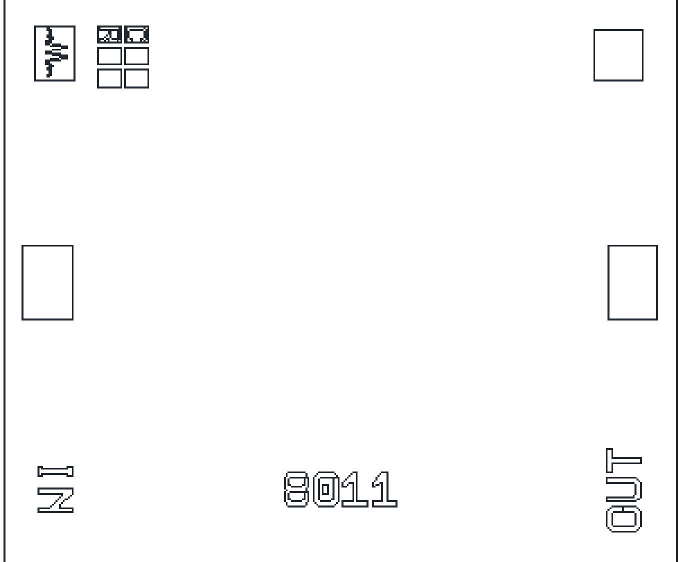
Port Configuration and Functions

Port Diagram

A top-down view of the HLM-8011's CH package outline drawing is shown below. The HLM-8011 has the input and output ports given in Port Functions.



Port Functions

Port	Function	Description	DC Equivalent Circuit
GND	Ground	CH package ground path is provided through the substrate and ground bond pads.	GND
IN	Input	The input port is diode connected for the CH package.	IN
OUT	Output	The output port is diode connected for the CH package.	OUT

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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
Average Power Handling at Input Port [1]	30	dBm
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C
Peak Power Handling at Input Port [2]	4.5	W
RF Power Handling , Average	1	W
RF Power Handling , Peak	4.5	W

[1] See Input Power at Observed Failure for basis of average power handling specs. 33.5dBm at 2GHz derated linearly to 30dBm at 30GHz.
[2] See Input Power at Observed Failure for basis of peak power handling specs. 6.5W at 2GHz derated linearly to 4.5W at 18GHz.

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	1.38x1.17 mm

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Electrical Specifications

The electrical specifications apply at TA=+25°C in a 50Ω system. Typical data shown is for the connectorized U-package limiter unless otherwise specified. Linear Specifications valid for input power up to the 0.1dB compression point. See typical performance plots for P0.1dB graph. Min and Max limits are guaranteed at TA=+25°C.

Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Flat Leakage at 1W	DC – 30GHz	0	30	-	7	-	dBm
Input P1dB	DC – 30GHz	0	30	-	10	-	dBm
Insertion Loss	DC – 30GHz	0	30	-	0.4	1.5	dB
Return Loss	DC – 30GHz	0	30	-	23	-	dB
Flat Leakage	-	-	-	-	7	-	dBm
Flat Leakage	-	-	-	-	7	-	dBm
Input P1dB	-	-	-	-	10	-	dBm
Input P1dB	-	-	-	-	10	-	dBm

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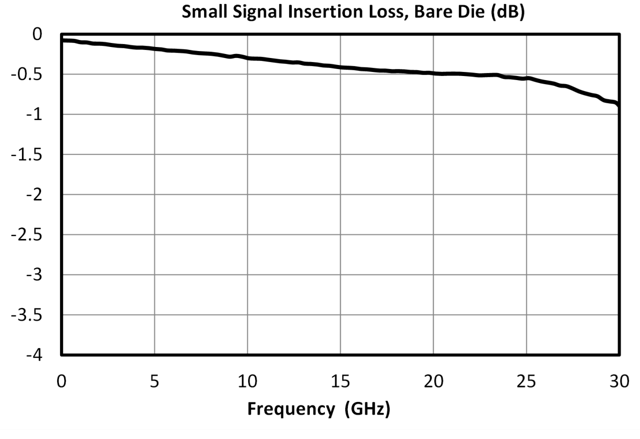
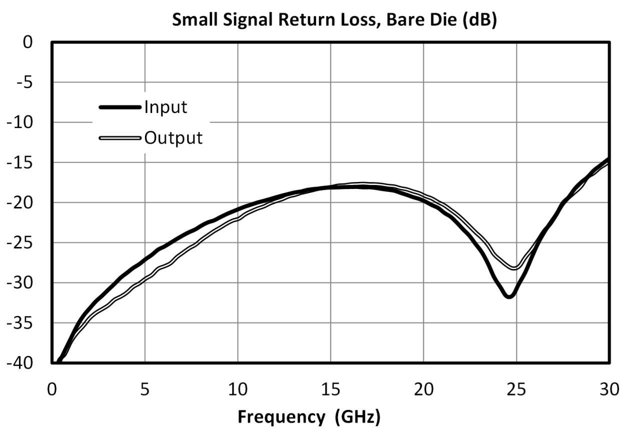
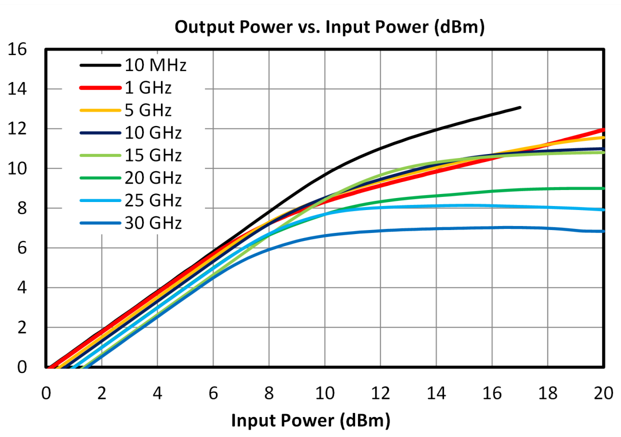
HLM-8011CH

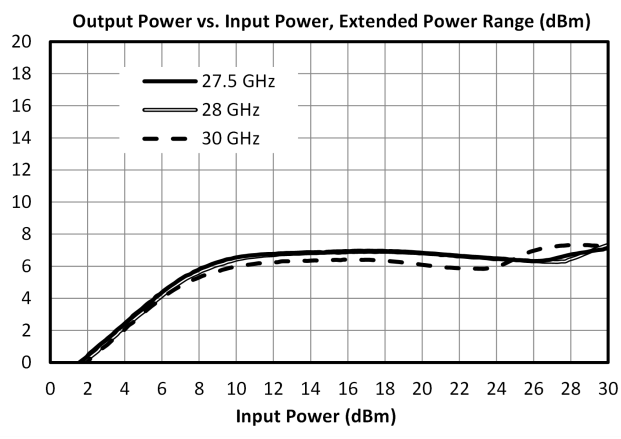
Low Flat Leakage DC-30GHz Limiter

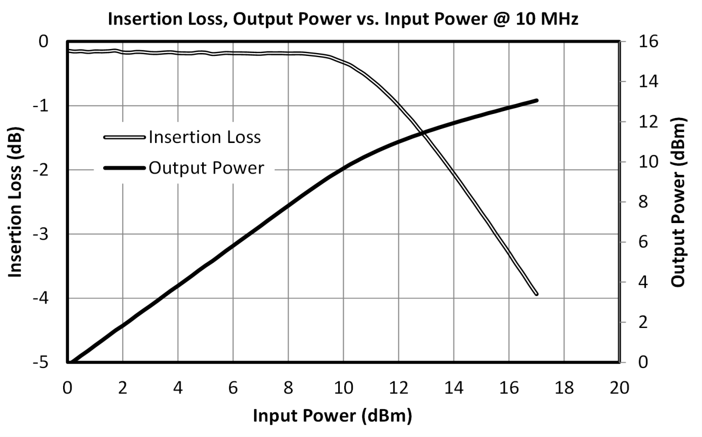
Typical Performance Plots

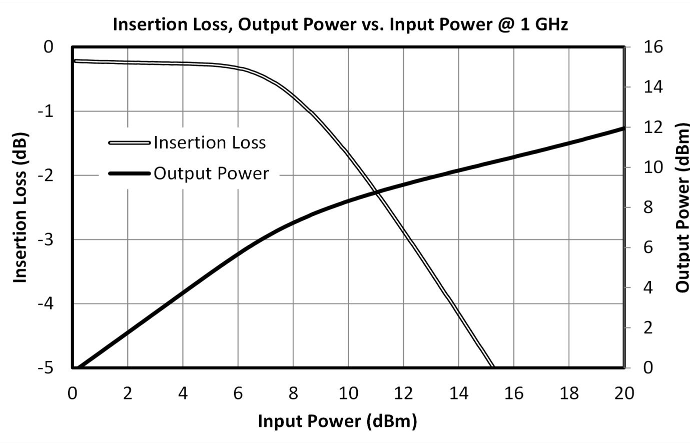


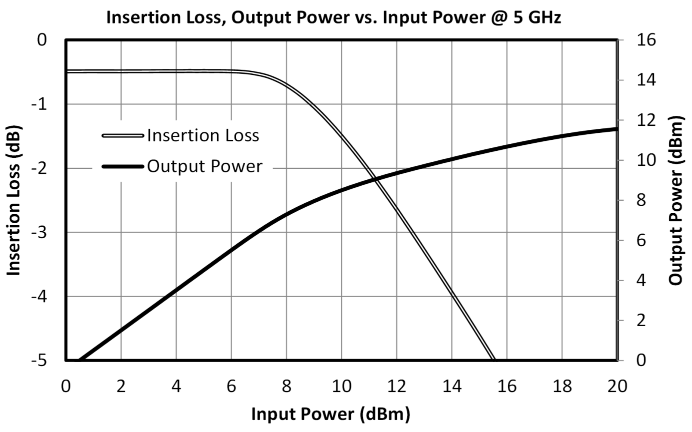


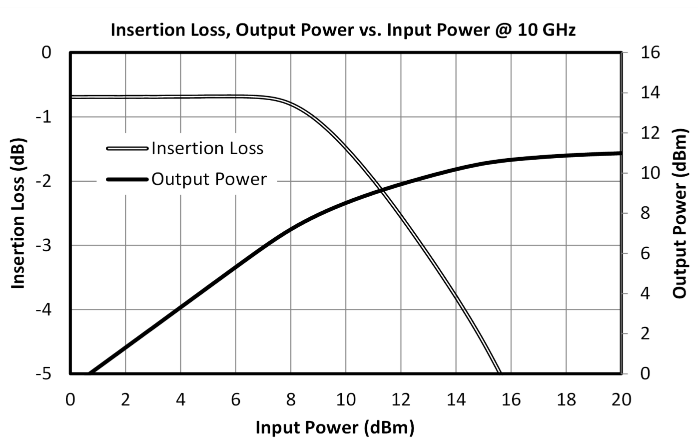












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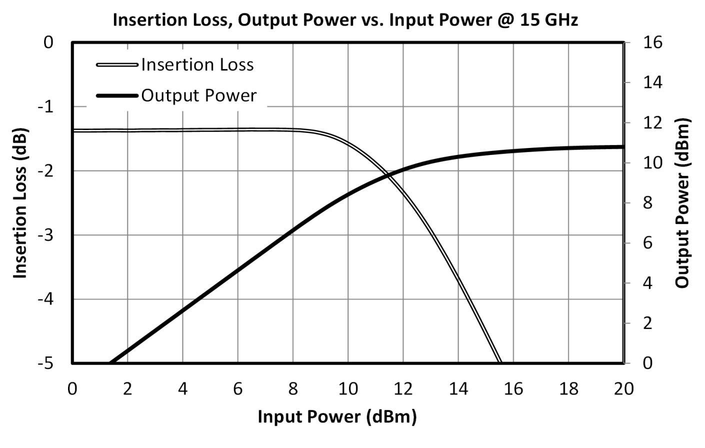

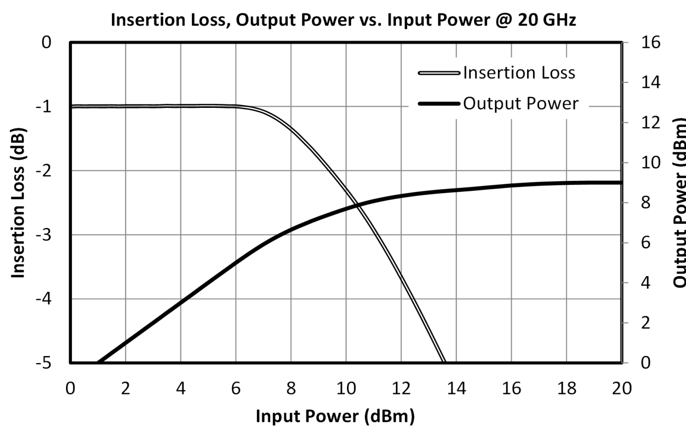

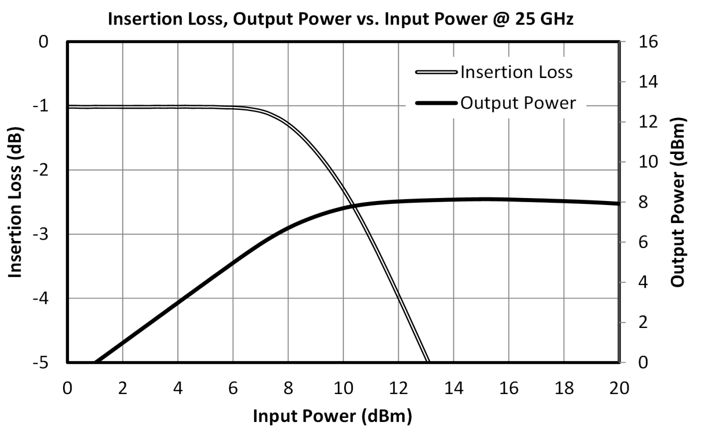

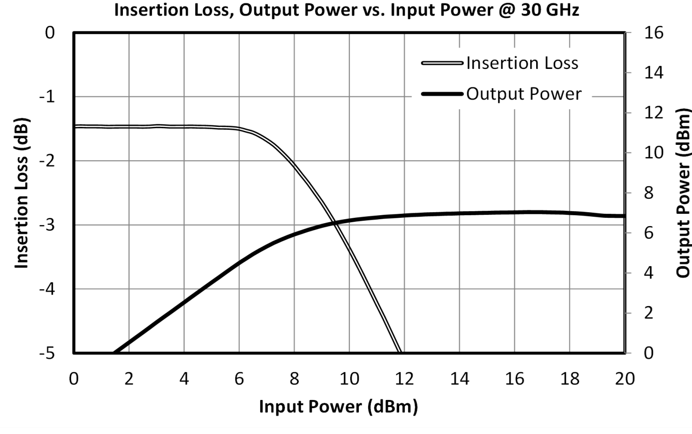

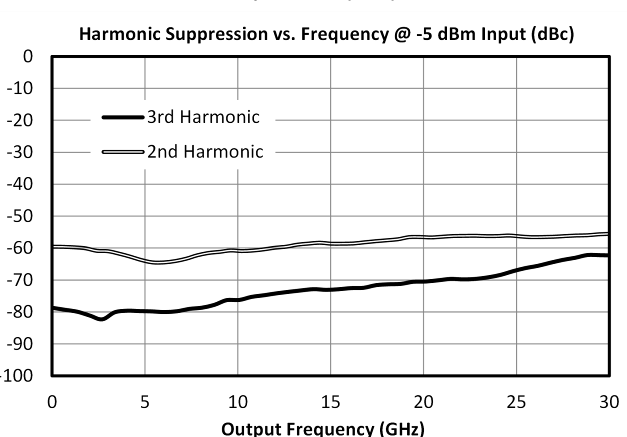

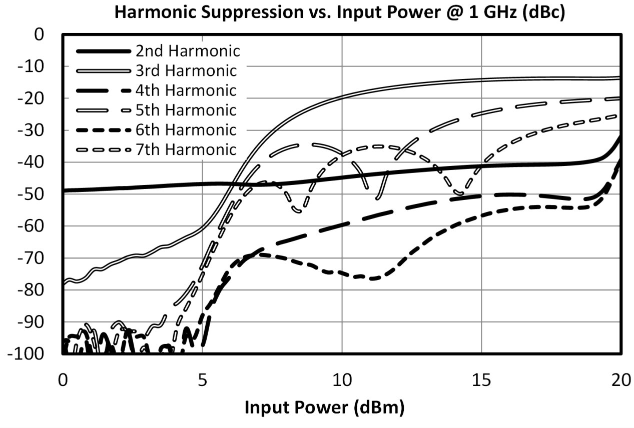

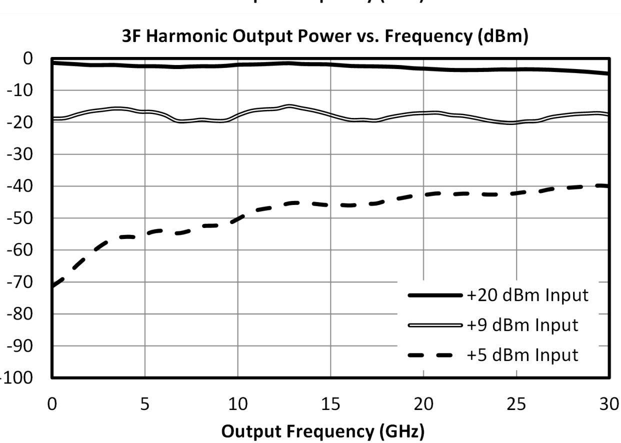

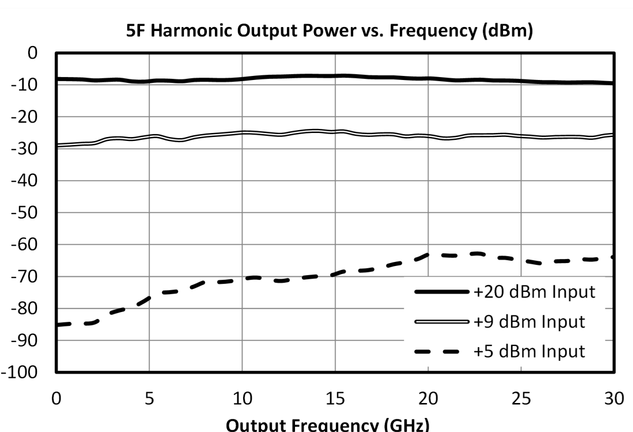

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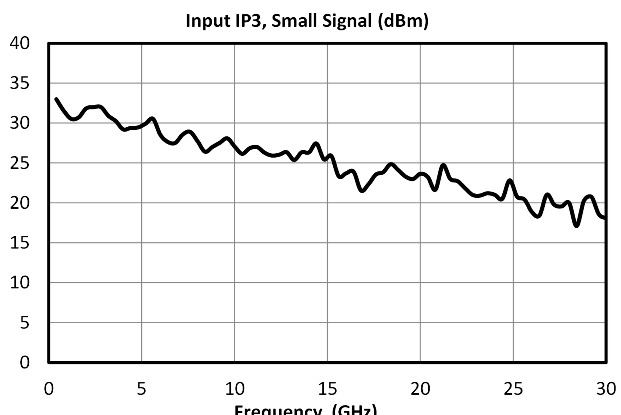

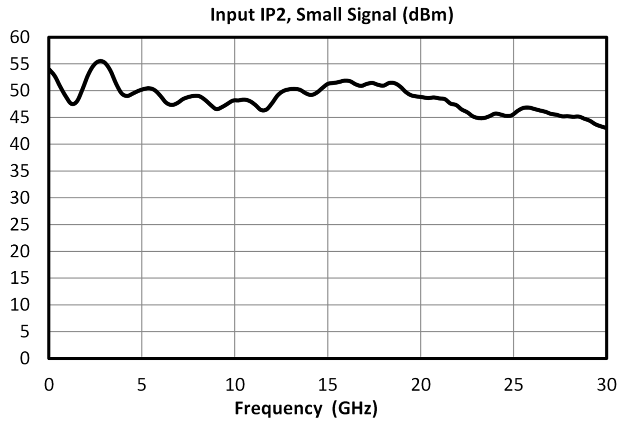

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Input Power at Observed Failure

Power handling specification is based on tests performed at different combinations of room temperature and frequency. Input power was increased until catastrophic failure was observed. Results are shown in the following table. The power handling specification listed in Absolute Maximum Ratings is based on the worst observed power handling derated by 3dB.

Frequency	Maximum Average Power Handling	Unit
2 GHz	+36.5	dBm
30 GHz	+33.0	dBm

Frequency	Maximum Peak Power Handling[4]	Unit
2 GHz	13	W
18 GHz	9	W

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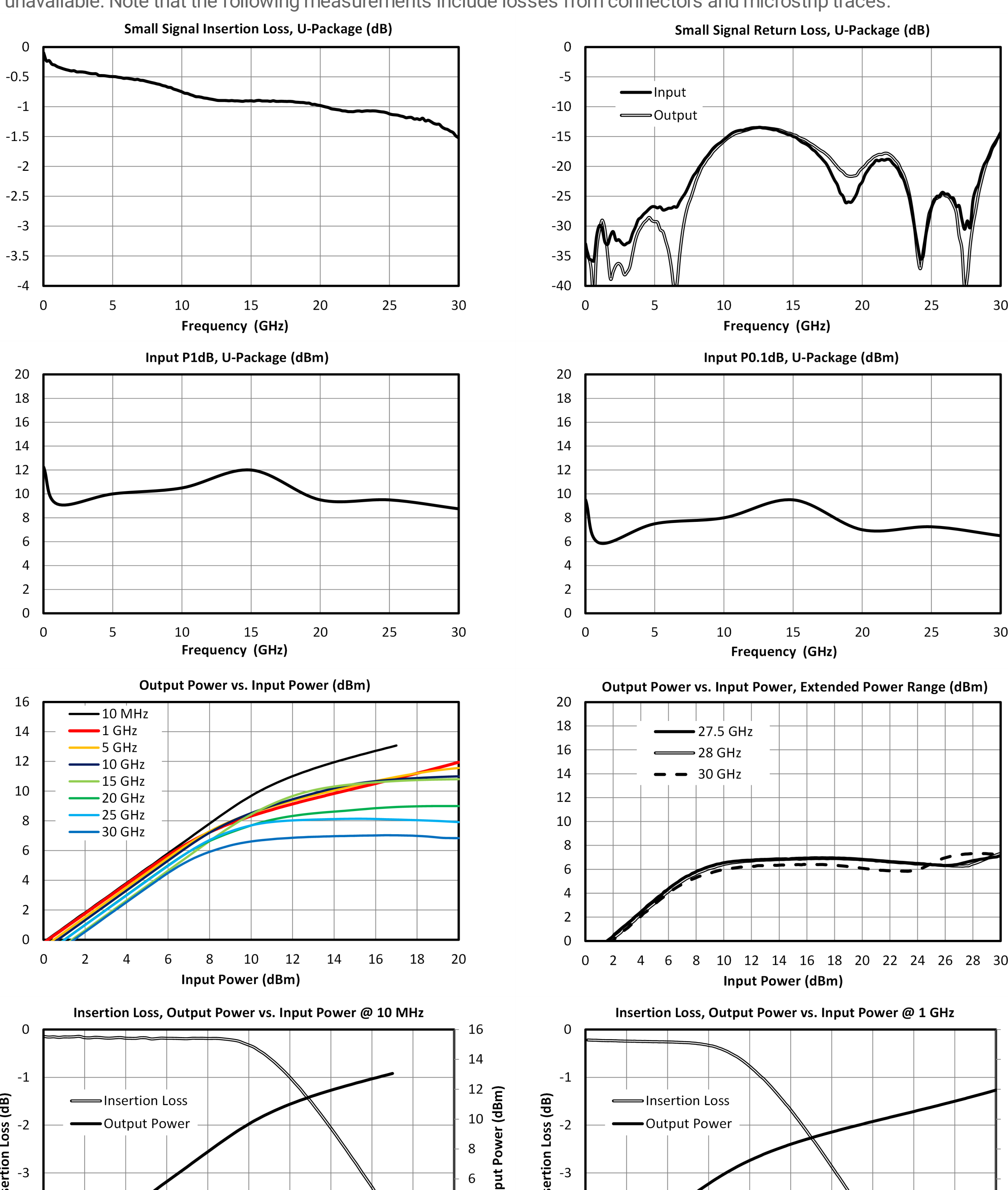
HLM-8011U - Typical Performance Plots

Performance plots for the connectorized module are shown for measurements where directly probed measurements of the die are unavailable. Note that the following measurements include losses from connectors and microstrip traces.



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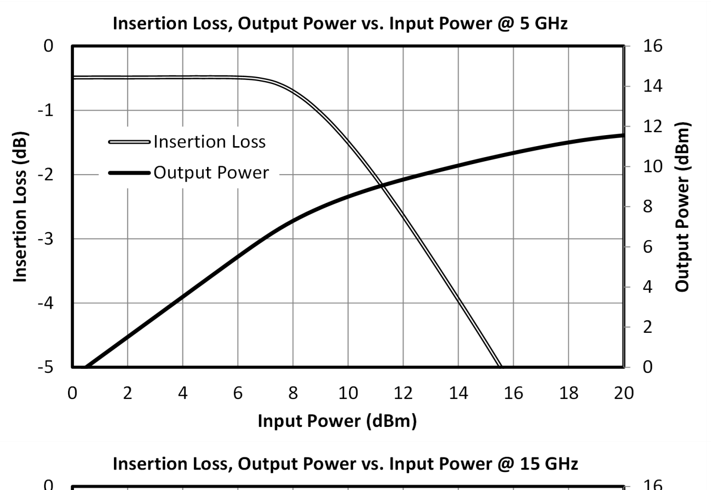
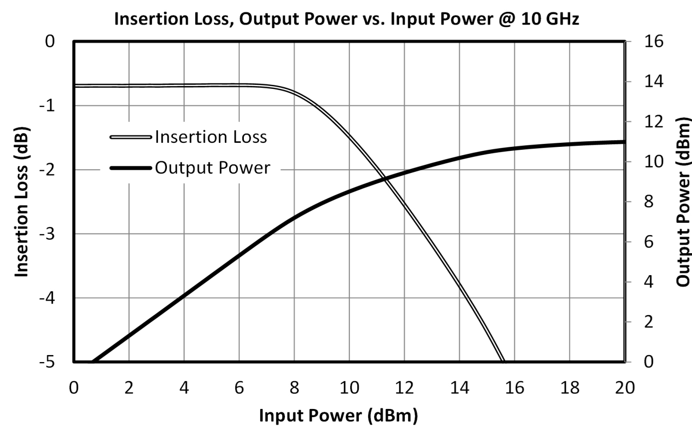
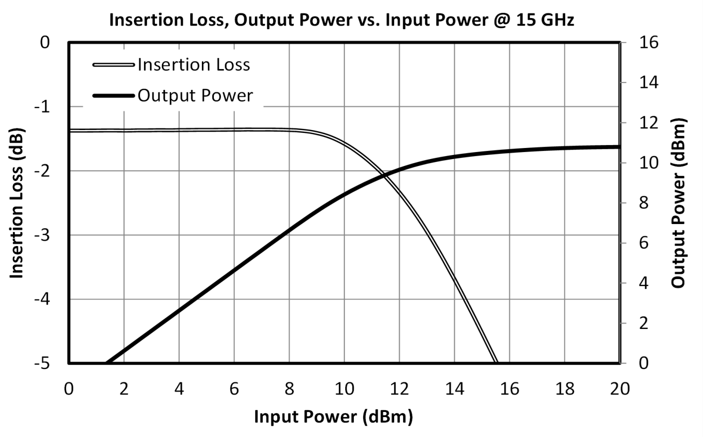
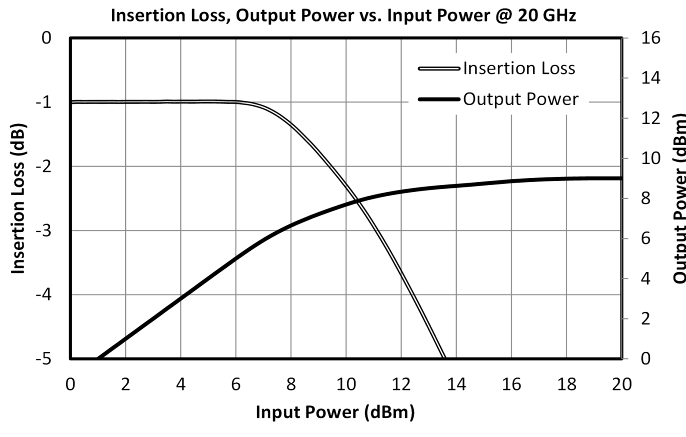
HLM-8011CH

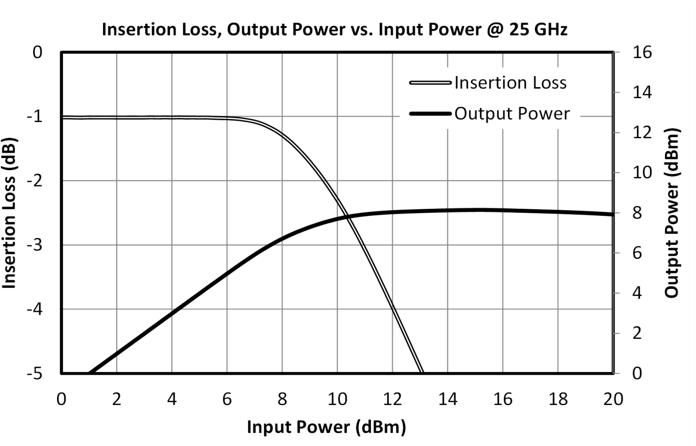
Low Flat Leakage DC-30GHz Limiter

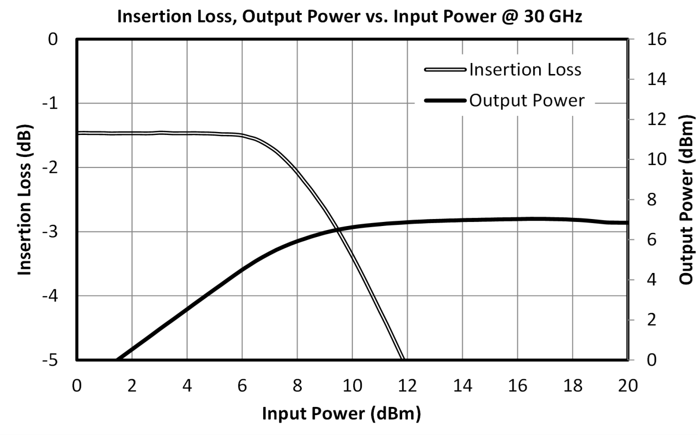


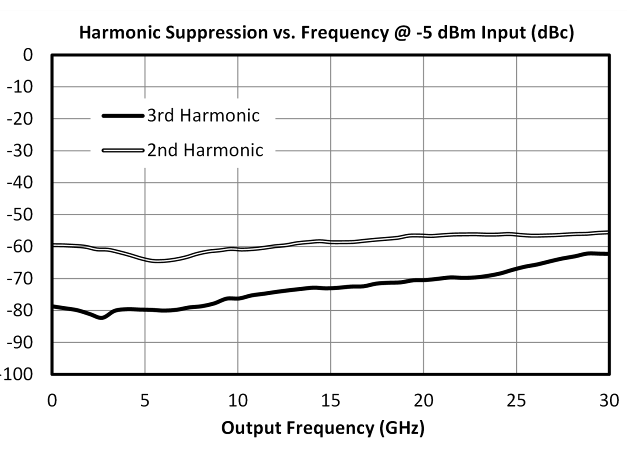


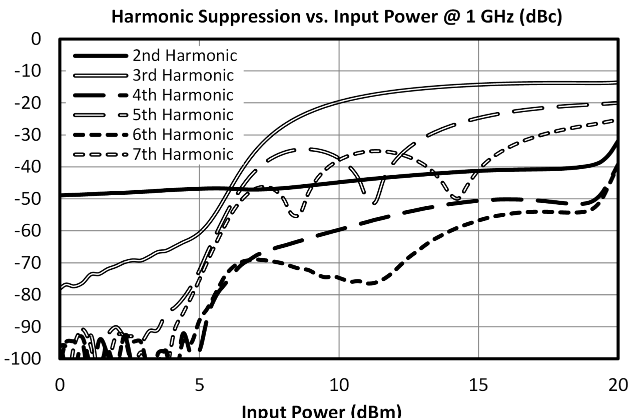












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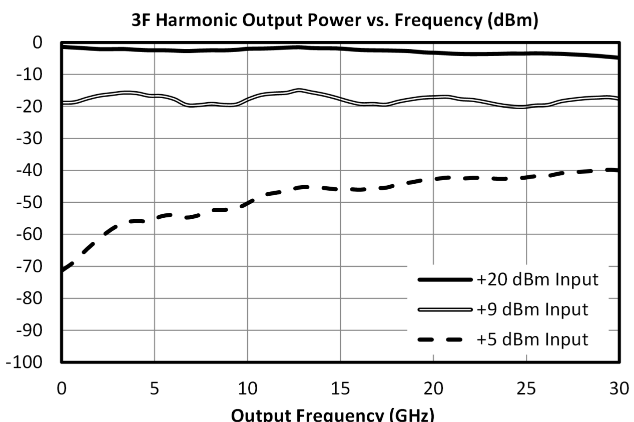

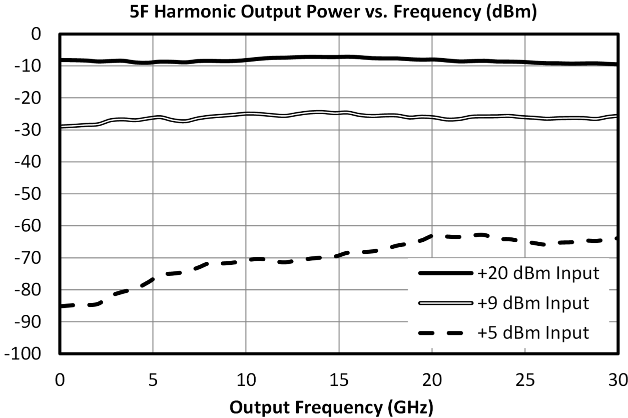

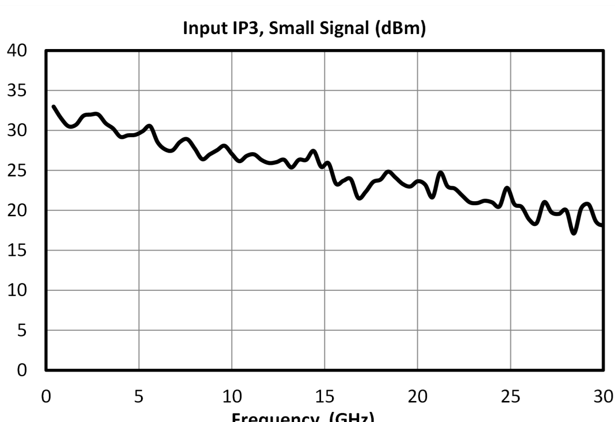

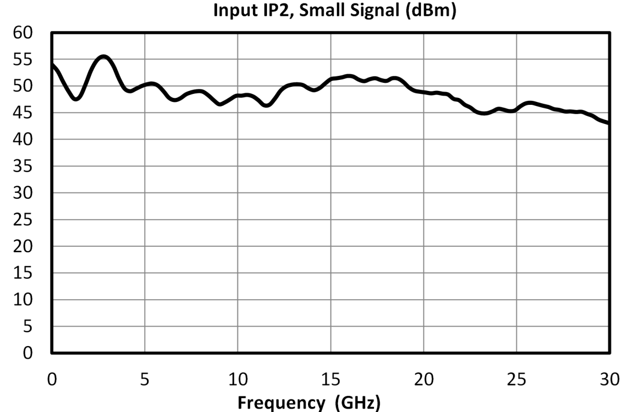

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30 GHz	+33.0	dBm

Frequency	Maximum Peak Power Handling	Unit
2 GHz	13	W
18 GHz	9	W

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Die Mounting Recommendations

Mounting and Bonding Recommendations

Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This will prevent resonances and permit the best possible electrical performance. Datasheet performance is only guaranteed in an environment with a low electrical impedance ground.

Mounting- To epoxy the chip, apply a minimum amount of conductive epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip. Cure epoxy according to manufacturer instructions.

Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31 mm (12 mils).

Circuit Considerations – 50 Ω transmission lines should be used for all high frequency connections in and out of the chip. Wirebonds should be kept as short as possible, with multiple wirebonds recommended for higher frequency connections to reduce parasitic inductance. In circumstances where the chip more than .001” thinner than the substrate, a heat spreading spacer tab is optional to further reduce bondwire length and parasitic inductance.

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Handling Precautions

General Handling
Chips should be handled with care using tweezers or a vacuum collet. Users should take precautions to protect chips from direct human contact that can deposit contaminants, like perspiration and skin oils on any of the chip's surfaces.

Static Sensitivity
GaAs MMIC devices are sensitive to ESD and should be handled, assembled, tested, and transported only in static protected environments.

Cleaning and Storage: Do not attempt to clean the chip with a liquid cleaning system or expose the bare chips to liquid. Once the ESD sensitive bags the chips are stored in are opened, chips should be stored in a dry nitrogen atmosphere.

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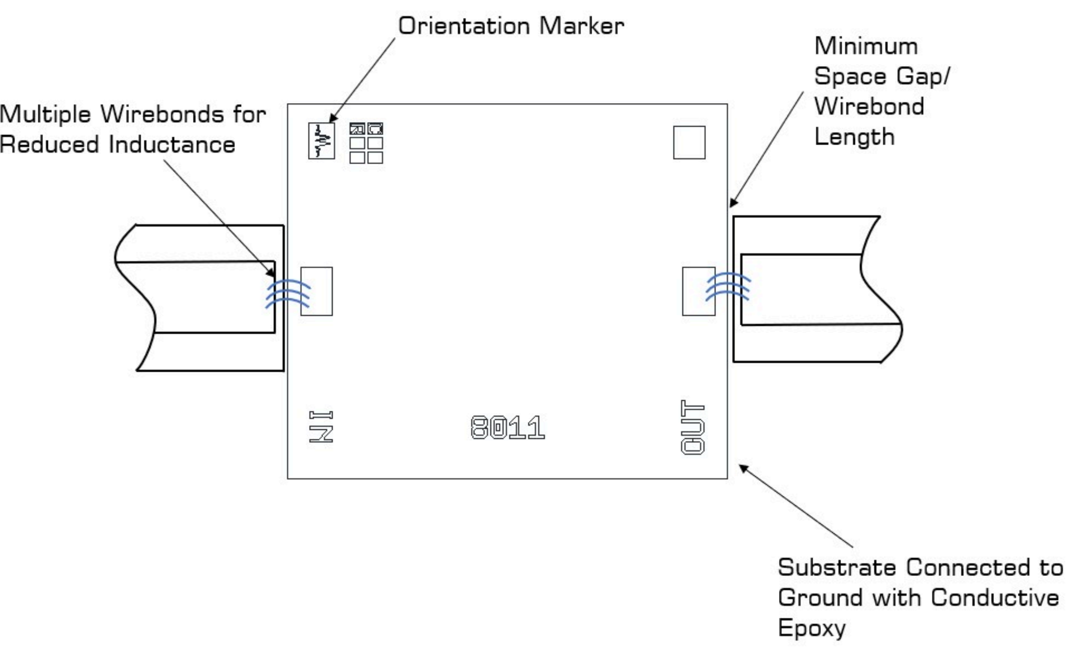
Bonding Diagram



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Mechanical Data

Outline Drawing

Download : Outline 2D Drawing

PROJECTION INCH [MM]

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVALS
A	ECN 24096 remove gel-pak info.	9/19/24	AT

0.054 [1.38]

0.005 [0.12]

Marki Logo

Column, Row

.004 [0.10] x .004 [0.10] Ground Pad

0.005 [0.13] Min Clearance

0.023 [0.59]

0.005 [0.12]

0.046 [1.17]

.004 [0.10] x .006 [0.15] Bond Pad, 2 PL

IN

8011

OUT

0.004 [0.09]

0.004 [0.10]

Notes:

1. CH substrate is .004 in Thick GaAs.
2. I/O trace is 4 microns Au. Ground is 5 microns Au.
3. Tolerance for X, Y dimensions is ± 0.002 in.
   Tolerance for Z dimension is ± 0.0005 in.
   Tolerance for pad location is ± 0.0001 in.

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: HOLE SIZE DECIMALS .XX± .01 .XXX± .002 ANGLES ± 63

MATERIAL: 210-08011-R/0

FINISH: See notes.

DO NOT SCALE DRAWING

NOTES:

DRAWN BY	DATE
OG	8/31/22

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Outline MMIC Limiter

SIZE A | CAGE CODE 0UC32 | DWG. NO. HLM-8011CH

SCALE 40/1 | SHEET 1 OF 1

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