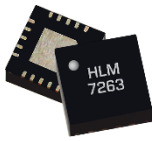
DC - 40GHz Surface Mount Limiter **HLM-40PSM**

1. Device Overview



4x4 mm QFN

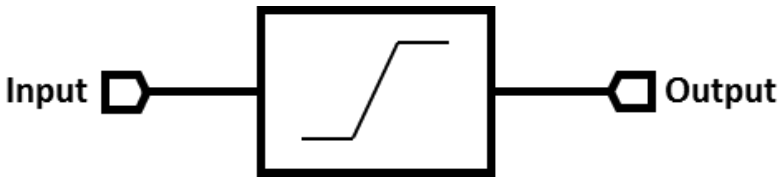
1.1 General Description

The HLM-40PSM is a high-power GaAs Schottky diode signal limiter featuring high IP3 over a broad DC - 40GHz bandwidth. It offers low insertion loss and excellent return loss from DC through Ka band and has a typical 1 dB compression point of 14 dBm. Its high power handling makes it ideal for protecting sensitive components and for applications requiring high linearity. It is available as a plastic surface mount or as a connectorized evaluation board.

1.2 Features

- Low 0.7dB loss at 20 GHz
- 9.5 W Peak Power (pulsed), 2.5 W CW
- +11 to +19 dBm Flat Leakage @ 1 W CW
- Typical P1dB of +14dBm
- Small signal S2P data: HLM-40PSM.zip

1.3 Functional Block Diagram



1.4 Part Ordering Options[1]

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
HLM-40PSM	4x4 mm² QFN	PSM	**RoHS**	Active	EAR99
EVAL-HLM-40P	Connectorized module, QFN reflowed onto PCB	EVAL		Active	EAR99

[1] Refer to our website for a list of definitions for terminology presented in this table.

Table of Contents

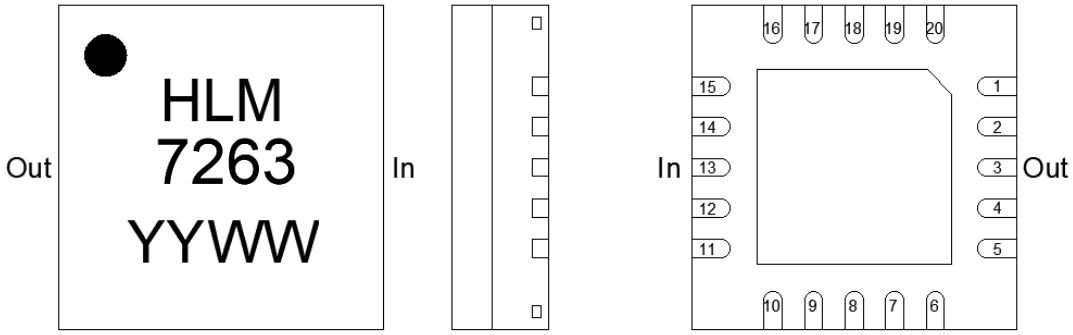
Revision History

Revision Code	Revision Date	Comment
-	September 2021	Datasheet Initial Release

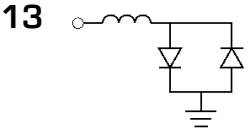
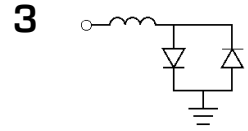
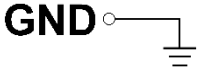
2. Port Configurations and Functions

2.1 Port Diagram

A top-down view of the HLM-40's PSM package outline drawing is shown below. The HLM-40PSM has the input and output ports given in Port Functions.



2.2 Port Functions

Pin	Function	Description	Equivalent Circuit for Package
13	Input	The input port is diode connected for the PSM and EVAL package.	
3	Output	The output port is diode connected for the PSM and EVAL package.	
Ground Paddle	Ground	PSM package ground path is provided through the ground paddle. Unused pics should be connected to RF ground	

3. Specifications

3.1 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	Units
Average Power Handling at input port[2,3]	2.5	W
Peak Power Handling at input port[3]	9.5	W
Operating Temperature	-55 to +100	°C
Storage Temperature	-65 to +125	°C

3.2 Package Information

Parameter	Details	Rating
ESD	Human Body Model (HBM), per MIL-STD-750, Method 1020	1A
Weight	EVAL Package	23.5g

3.3 Linear Regime Electrical Specifications

The electrical specifications apply at T_A=+25°C in a 50Ω system. Typical data shown is for the connectorized EVAL-package limiter unless otherwise specified. PSM-package data shown is deembedded from the EVAL-package data. Linear Specifications valid for input power up to the 0.1dB compression point. See page 5 for P0.1dB graph.

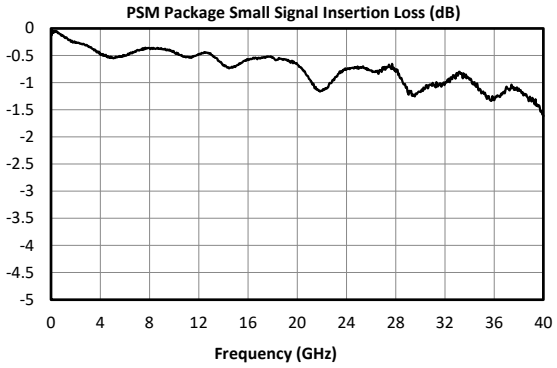
Min and Max limits are guaranteed at T_A=+25°C.

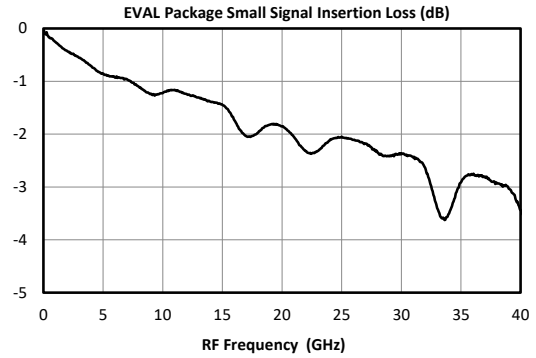
Parameter	Test Conditions	Min	Typical	Max	Units
Insertion Loss, PSM Package	DC – 40GHz		0.5	1.75	dB
Insertion Loss, EVAL package			2		
Return Loss, PSM Package			17		dB
Return Loss, EVAL package			19		
Flat Leakage	1GHz		19		dBm
	20GHz		15		
	40GHz		11		
Input IP3 (IIP3)	DC – 40GHz		See graph		dBm
Input 1dB Gain Compression Point (P1dB)			14		dBm

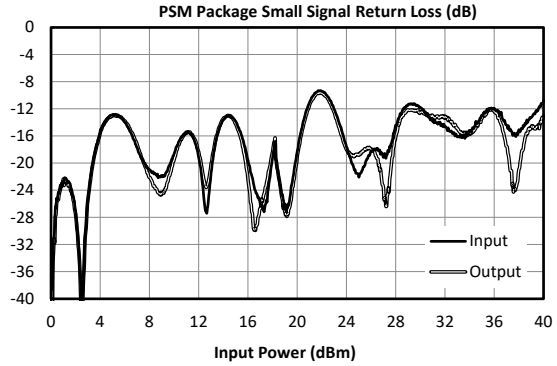
[2] Average power handling derated linearly to +37dBm at 85°C. Power handling spec based on observed power handling at 6GHz.
[3] See section 3.5 for basis of power handling specs.

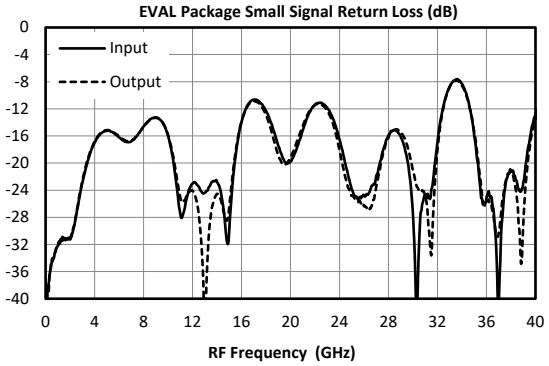
3.4 Typical Performance Plots

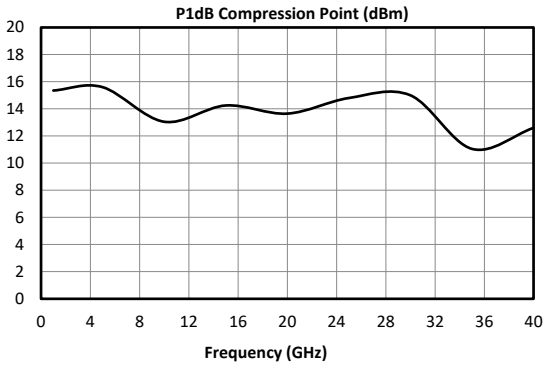
Plots shown are for the connectorized EVAL-package unless otherwise specified

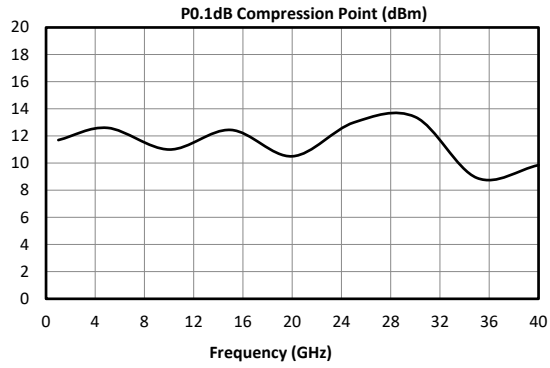


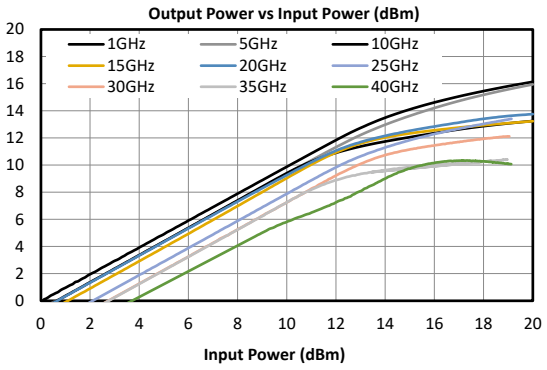


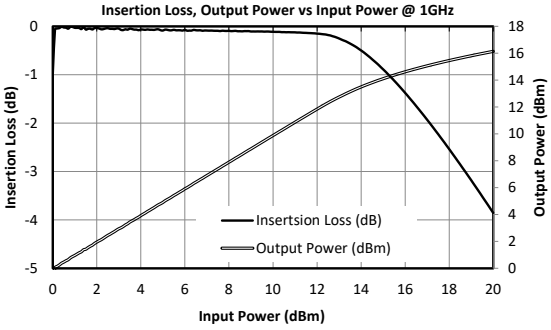




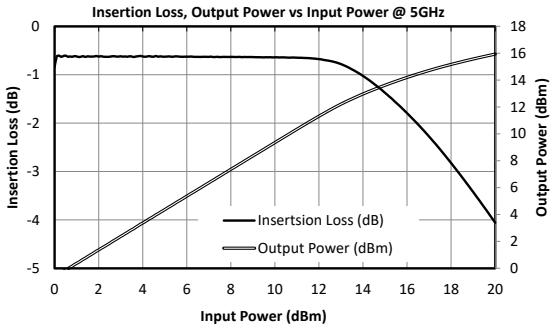




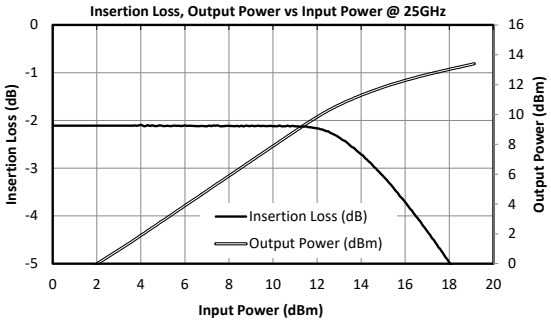




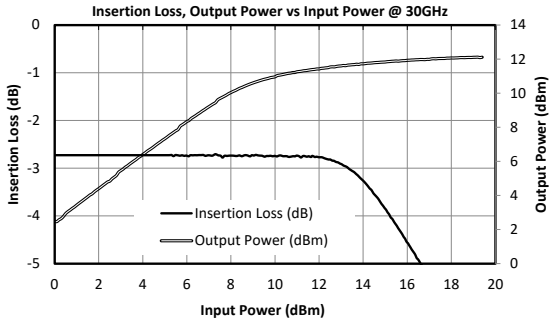
Insertion Loss, Output Power vs Input Power @ 1GHz



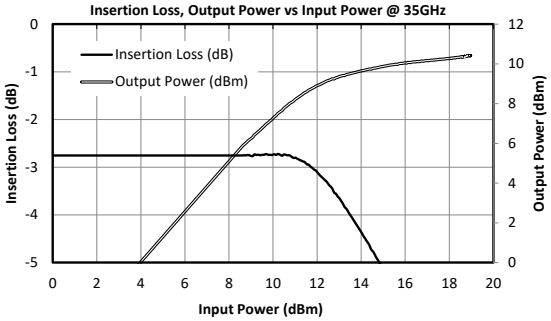
Insertion Loss, Output Power vs Input Power @ 5GHz



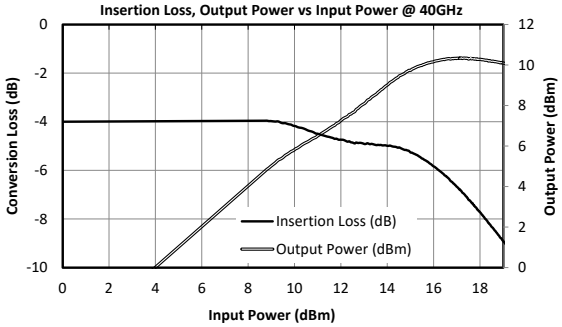
Insertion Loss, Output Power vs Input Power @ 25GHz



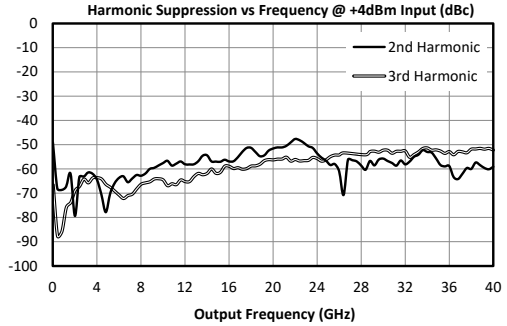
Insertion Loss, Output Power vs Input Power @ 30GHz



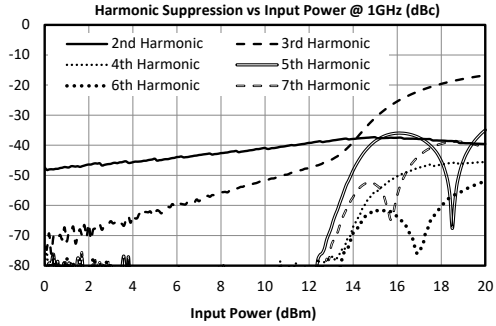
Insertion Loss, Output Power vs Input Power @ 35GHz



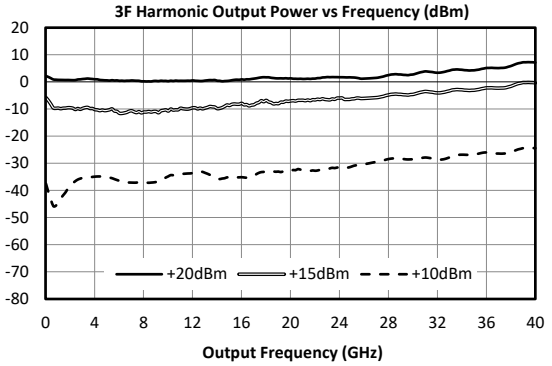
Insertion Loss, Output Power vs Input Power @ 40GHz

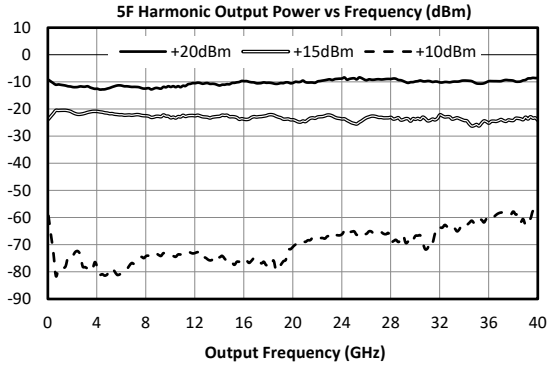


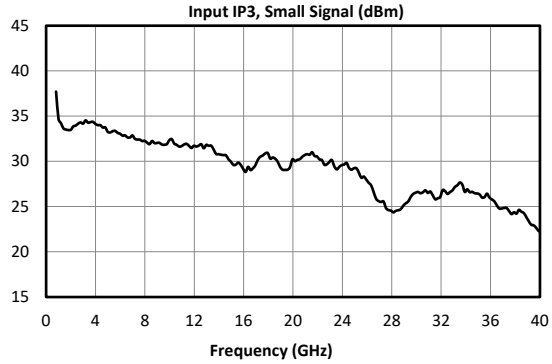
Harmonic Suppression vs Frequency @ +4dBm Input (dBc)



Harmonic Suppression vs Input Power @ 1GHz (dBc)







3.5 Input Power at Observed Failure

Power handling specification is based on tests performed at different combinations of 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 section 3.1 is based on the worst observed power handling derated by 2dB.

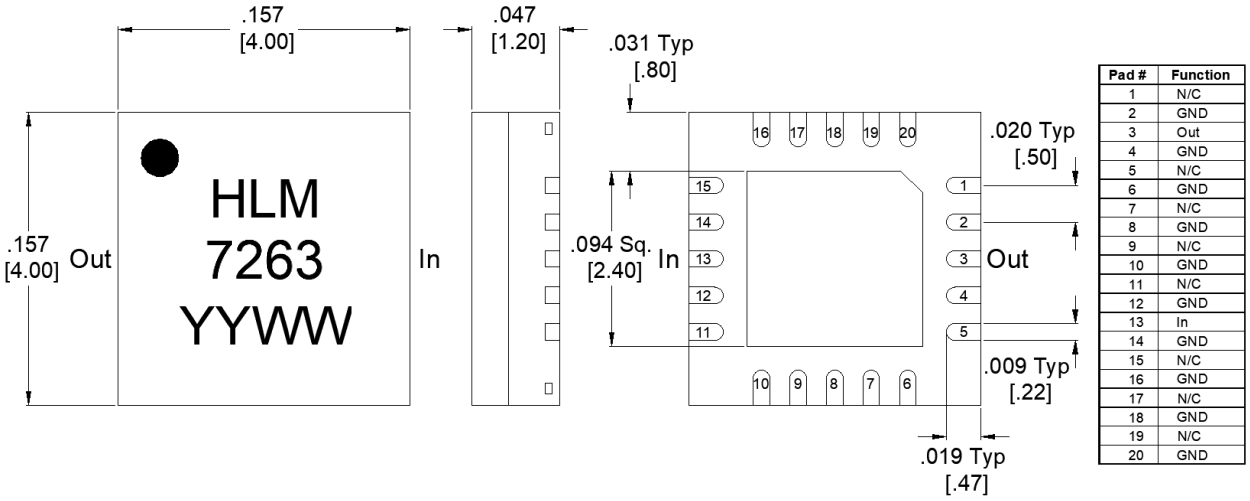
Frequency	Maximum Average Power Handling		Unit
	at 25°C	at 85°C	
0.8 GHz	39	39	dBm
2.5 GHz	38	38	
6 GHz	36	36	

Frequency	Maximum Peak Power Handling[4]	Unit
2 GHz	15	W

[4] Tested using a 1µs pulse, 1% duty cycle at 25°C

4. Mechanical Data

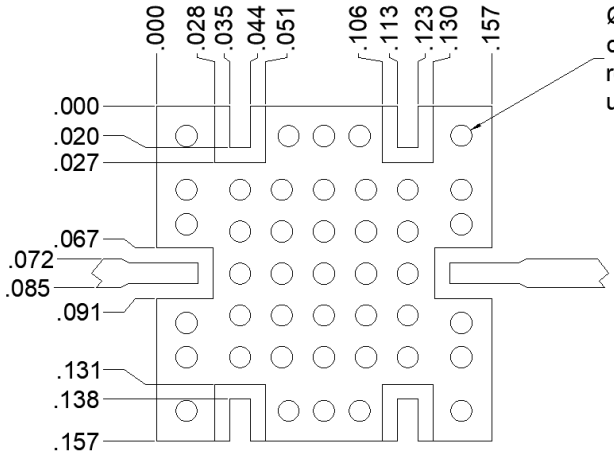
4.1 PSM Package Outline Drawing



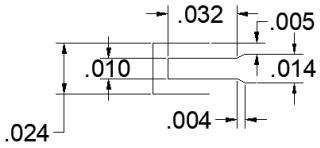
Pad #	Function
1	N/C
2	GND
3	Out
4	GND
5	N/C
6	GND
7	N/C
8	GND
9	N/C
10	GND
11	N/C
12	GND
13	In
14	GND
15	N/C
16	GND
17	N/C
18	GND
19	N/C
20	GND

1. Substrate material is LCP.
2. I/O leads and die paddle are 0.008um – 0.05um gold, over 0.08um – 0.15um Palladium, over 0.5um – 2.0um Nickel.
3. All unconnected pins should be connected to PCB RF ground

4.2 PSM Package Footprint



Ø.010 Plated thru via. Recommended conductive or non-conductive fill, 43 PL. Vias can be added or reduced at PCB designer's discretion, except the 25 underneath the QFN.

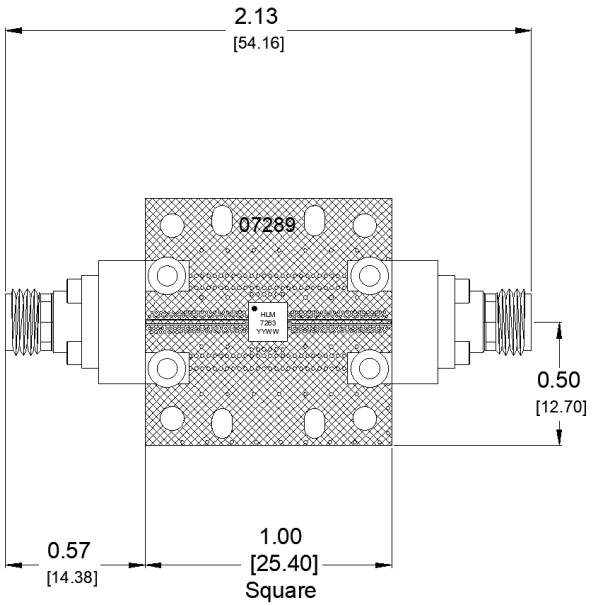


The landing pattern is to be used on Rogers4003, 0.008" thick, $\frac{1}{2}$ Oz Cu. Grounded coplanar wave guide with 0.005" slot,6 PL.

Click here for a DXF download of the landing pattern

4.3 EVAL Package Footprint

All Measurements are Typical
Input and output connectors are 2.92mm F



Backside