

# 33–43 GHz GaAs MMIC Image Rejection Balanced Mixer



AM038R1-00

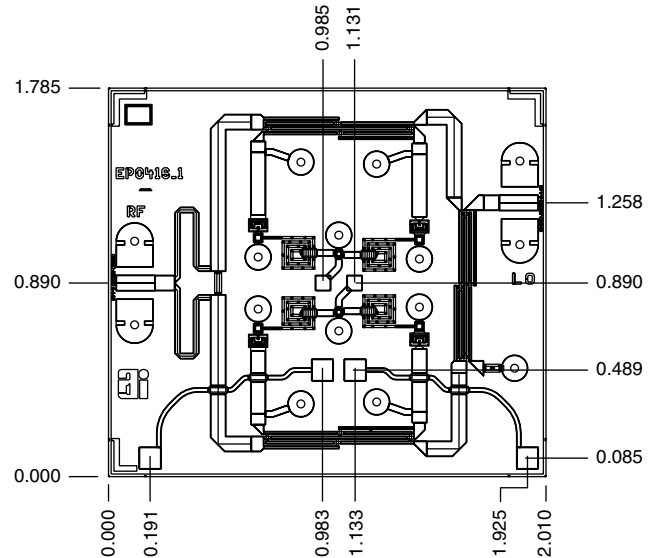
## Features

- Low Conversion Loss, 9 dB
- Low LO Power Requirement, 8 dBm
- Image Rejection, 18 dB
- No DC Bias Required
- Requires External IF 90° Hybrid

## Description

Alpha's image rejection balanced GaAs Schottky diode mixer has a typical conversion loss of 9 dB at an LO power level as low as 8 dBm over the band 33–43 GHz. An external 90° IF hybrid is required to combine the IF<sub>1</sub> and IF<sub>2</sub> signals at the desired IF frequency. The chip uses Alpha's proven Schottky diode technology, and is based upon MBE layers for the highest uniformity and repeatability. The diodes employ surface passivation to ensure a rugged, reliable part with through-substrate via holes and gold-based backside metallization to facilitate an epoxy die attach process. All chips are screened for DC diode parameters and lot samples are RF measured to guarantee performance. This device is recommended for applications requiring down conversion.

## Chip Outline



Dimensions indicated in mm.  
All pads are  $\geq 0.07$  mm wide.  
Chip thickness = 0.1 mm.

## Absolute Maximum Ratings

| Characteristic              | Value           |
|-----------------------------|-----------------|
| Operating Temperature       | -55°C to +125°C |
| Storage Temperature         | -65°C to +150°C |
| Total Input Power (RF + LO) | 23 dBm          |

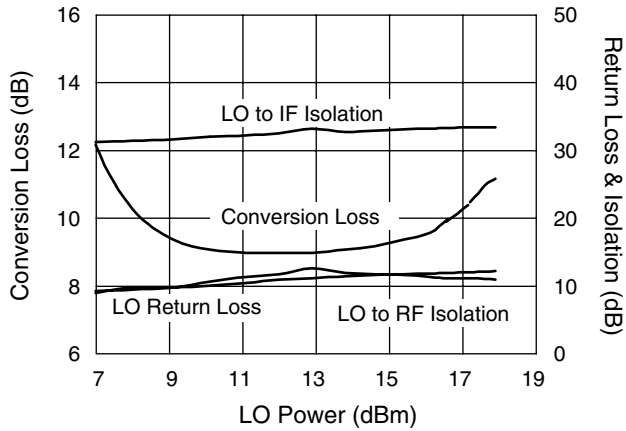
## Electrical Specifications at 25°C

| Parameter                                    | Symbol             | Min. | Typ. <sup>2</sup> | Max. | Unit     |
|--|--------------------|------|-------------------|------|----------|
| RF and LO Frequency Range                    | $F_{RF}, F_{LO}$   |      | 33–43             |      | GHz      |
| IF Frequency Range                           | $F_{IF}$           |      | 0–3               |      | GHz      |
| LO Power Level                               | $P_{LO}$           |      | 8–14              |      | dBm      |
| Conversion Loss <sup>1</sup>                 | $L_C$              |      | 9                 |      | dB       |
| Image Rejection <sup>1</sup>                 | IR                 |      | 18                |      | dB       |
| RF and LO Return Loss <sup>1</sup>           | $RL_{RF}, RL_{LO}$ |      | 12                |      | dB       |
| LO to RF Isolation <sup>1</sup>              | $ISO_{LO-RF}$      |      | 12                |      | dB       |
| LO to IF Isolation <sup>1</sup>              | $ISO_{LO-IF}$      |      | 23                |      | dB       |
| RF Input 1 dB Compression Point <sup>1</sup> | $P_1$ dB           |      | 7                 |      | dBm      |
| Individual Diode Series Resistance           | $R_S$              |      |                   | 3.0  | $\Omega$ |

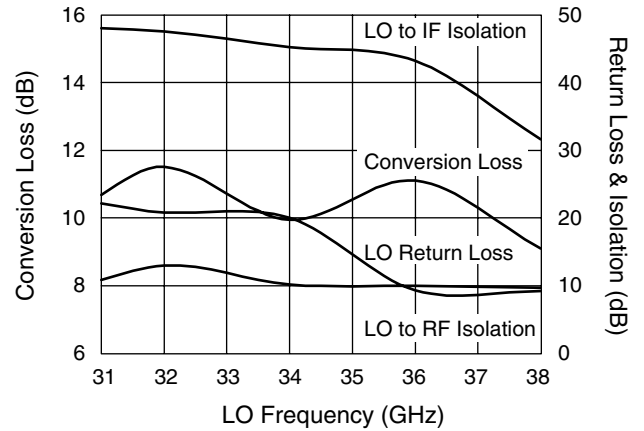
1. Not measured on a 100% basis.

2. Typical represents the median parameter value across the specified frequency range for the median chip.

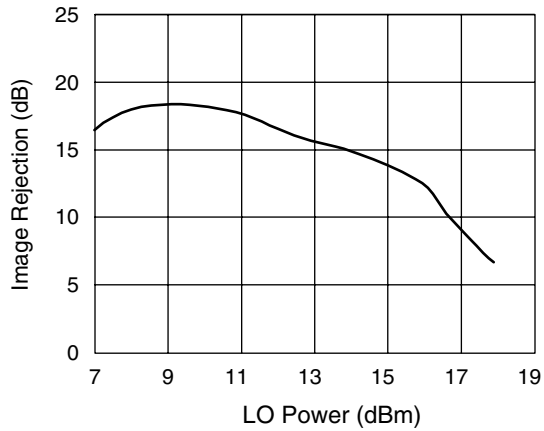
### Typical Performance Data



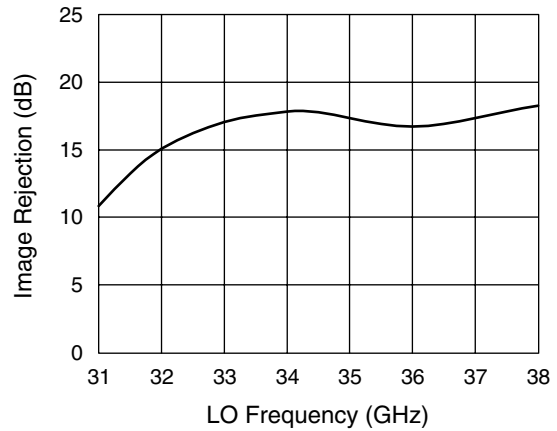
**Performance vs. LO Power**  
 $F_{RF} = 40 \text{ GHz}$ ,  $F_{LO} = 38 \text{ GHz}$ ,  $P_{RF} = -10 \text{ dBm}$



**Performance vs. LO Frequency**  
 $F_{RF} = F_{LO} + 2 \text{ GHz}$ ,  $P_{LO} = 10 \text{ dBm}$

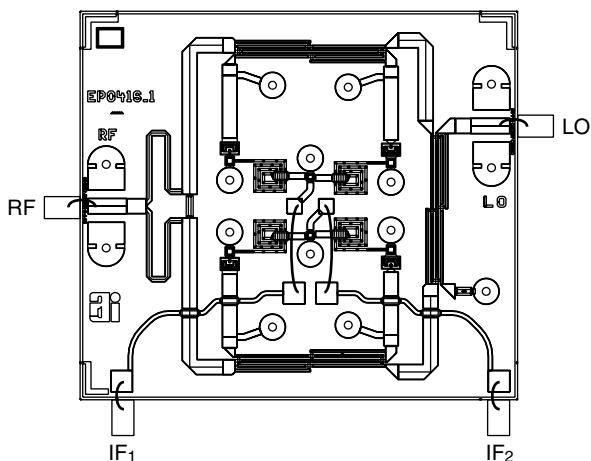


**Image Rejection vs. LO Power**  
 $F_{RF} = 40 \text{ GHz}$ ,  $F_{LO} = 38 \text{ GHz}$ ,  $P_{RF} = -10 \text{ dBm}$   
 Image Frequency = 36 GHz



**Image Rejection vs. LO Frequency**  
 $F_{RF} = F_{LO} + 2 \text{ GHz}$ ,  $P_{LO} = 10 \text{ dBm}$   
 Image Frequency =  $F_{LO} - 2 \text{ GHz}$

### Wire Bonding Configuration



IF ports bonded to IF hybrid.

### Circuit Schematic

