

# AMMP-6546

18 to 40 GHz GaAs MMIC Sub-Harmonic Mixer  
In SMT Package



## Data Sheet

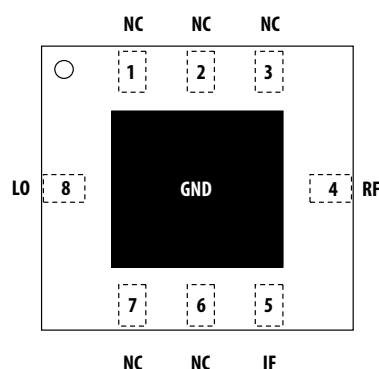
### Description

Avago's AMMP-6546 is an easy-to-use broadband sub-harmonic mixer, with the LO injected at half of the frequency of that required by a conventional mixer. AMMP-6546 is similar to AMMP-6545 except that the layout is a mirror image designed to ease integration into transmitter or receiver designs. The MMIC includes an 180° balanced diode based mixer. The MMIC is fabricated using PHEMT technology. The surface mount package allows elimination of "chip & wire" assembly for lower cost. This MMIC is a cost effective alternative to multi-chip solution that have higher loss and complex assembly.

### Applications

- Microwave radio systems
- Satellite VSAT, DBS up/down link
- LMDS & Pt-Pt mmW long haul
- Broadband wireless access (including 802.16 and 802.20 WiMax)
- WLL and MMDS loops

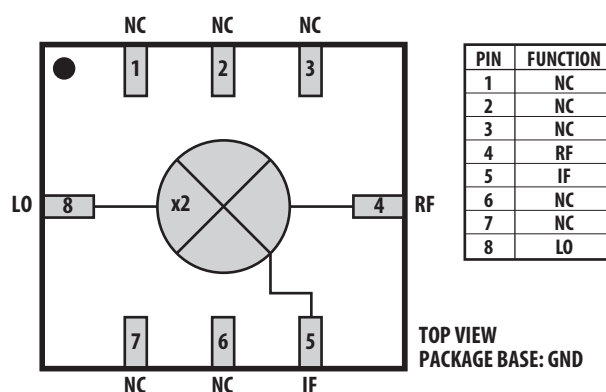
### Package Diagram



### Features

- RF Frequency : 18-40 GHz
- LO Frequency : 9-20 GHz
- IF Frequency : DC-3.5 GHz
- 5x5 mm Surface Mount Package
- Suitable for Up and Down Conversion
- Diode Mixer
- **Typical Performance at RF= 21GHz**  
Conversion Loss : 11 dB  
IIP3 : +12 dBm  
2LO-R Leakage : -44 dBm  
2LO-I Leakage : -61 dBm
- **Typical Performance at RF= 23GHz**  
Conversion Loss : 10 dB  
IIP3 : +11.7 dBm  
2LO-R Leakage : -40 dBm  
2LO-I Leakage : -64 dBm
- **Typical Performance at RF= 26GHz**  
Conversion Loss : 11 dB  
IIP3 : +11.8 dBm  
2LO-R Leakage : -42 dBm  
2LO-I Leakage : -60 dBm

### Functional Block Diagram



**Attention: Observe precautions for handling electrostatic sensitive devices.**  
ESD Machine Model (Class A) : 30V  
ESD Human Body Model (Class 0) : 100V  
Refer to Avago Application Note A004R: Electrostatic Discharge, Damage and Control.

## Electrical Specifications

1. Small/Large -signal data measured in a fully de-embedded test fixture form TA = 25°C.
2. Pre-assembly into package performance verified 100% on-wafer.
3. This final package part performance is verified by a functional test correlated to actual performance at one or more frequencies.
4. Specifications are derived from measurements in a 50  $\Omega$  test environment. Aspects of the amplifier performance may be improved over a more narrow bandwidth by application of additional conjugate, linearity, or low noise (Gopt) matching.
5. NF is measure on-wafer. Additional bond wires (-0.2nH) at Input could improve NF at some frequencies.

**Table 1. RF Electrical Characteristics** <sup>[1,2]</sup>

TA=25°C, Zo=50 Ω, LO=+15dBm, IF=2GHz

| Parameter                         | RF=21GHz, LO=11.5GHz    |     |       | RF=23GHz, LO=12.5GHz     |      |       | RF=26GHz, LO=14GHz |      |     | Unit |
|-----------------------------------|-------------------------|-----|-------|--------------------------|------|-------|--------------------|------|-----|------|
|                                   | Min                     | Typ | Max   | Min                      | Typ  | Max   | Min                | Typ  | Max |      |
| Conversion Loss, CL               |                         | 11  | 12    |                          | 10   | 12    |                    | 11   | 12  | dB   |
| Input Third Order Intercept, IIP3 | 11                      | 12  |       | 10.5                     | 11.7 |       | 8.5                | 11.8 |     | dB   |
| 2LO-R Leakage, 2LO-R              |                         | -44 | -35   |                          | -40  | -35   |                    | -42  | -30 | dBm  |
| 2LO-I Leakage, 2LO-I              |                         | -61 | -52.5 |                          | -64  | -51.7 |                    | -60  | -54 | dBm  |
|                                   | RF=18-30GHz, LO=9-15GHz |     |       | RF=30-40GHz, LO=15-20GHz |      |       |                    |      |     |      |
| L-R Leakage, L-R                  |                         | -30 |       |                          | -35  |       |                    |      |     | dB   |
| L-I Leakage, L-I                  |                         | -35 |       |                          | -30  |       |                    |      |     | dB   |

Note:

1. Production RF tested at 21, 23 and 26 GHz in up-converter configuration at Low Side LO.
2. All tested parameters are guaranteed with the following measurement accuracy:  
 RF=21GHz:  $\pm 1$  dBm for RF-leakage,  $\pm 0.0$  dBm for IF-leakage,  $\pm 0.5$ dB for Conversion Loss,  $\pm 0.5$  dBm for IIP3  
 RF=23GHz:  $\pm 1$  dBm for RF-leakage,  $\pm 2.5$  dBm for IF-leakage,  $\pm 0.5$ dB for Conversion Loss,  $\pm 0.5$  dBm for IIP3  
 RF=26GHz:  $\pm 1$  dBm for RF-leakage,  $\pm 2.5$  dBm for IF-leakage,  $\pm 0.5$ dB for Conversion Loss,  $\pm 0.5$  dBm for IIP3

### Table 2. Recommended Operating Range

1. Ambient operational temperature  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Parameter            | Min. | Typical | Max. | Unit | Comments |
|----------------------|------|---------|------|------|----------|
| RF Frequency, RFfreq | 18   |         | 40   | GHz  |          |
| LO Frequency, LOfreq | 9    |         | 20   | GHz  |          |
| IF Frequency, IFfreq | DC   |         | 3.5  | GHz  |          |
| LO Power, LO         | +12  | +15     | +22  | dBm  |          |

### Absolute Minimum and Maximum Ratings

### Table 3. Minimum and Maximum Ratings

| Parameter                          | Min. | Max. | Unit | Comments          |
|------------------------------------|------|------|------|-------------------|
| RF CW Input Power, Pin             |      | +25  | dB   |                   |
| Storage Temperature, Tstg          | -65  | +150 | °C   |                   |
| Maximum Assembly Temperature, Tmax |      | 300  | °C   | 60 second maximum |

Notes:

1. Operation in excess of any one of these conditions may result in permanent damage to this device.

## AMMP-6546 Typical Performance Curves

( $T_A = +25^\circ\text{C}$ ,  $Z_{in}=Z_{out}=50\Omega$ , IF Freq = 2GHz, LO Power = +15dBm unless noted)

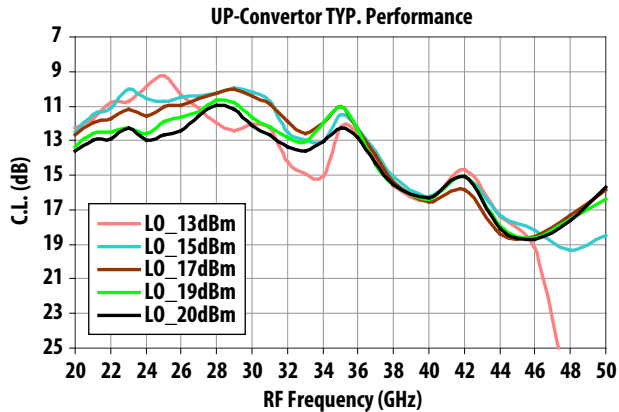


Figure 1. Up-conversion loss at LO = +13 to +20 dBm (high side LO)

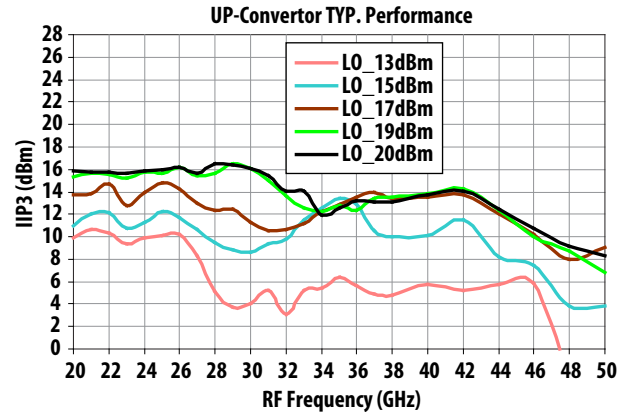


Figure 2. Up-conversion IIP3 at LO = +13 to +20 dBm (high side LO)

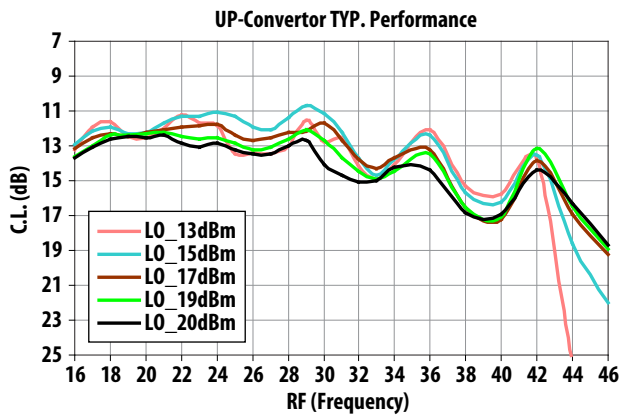


Figure 3. Up-conversion loss at LO = +13 to +20 dBm (low side LO)

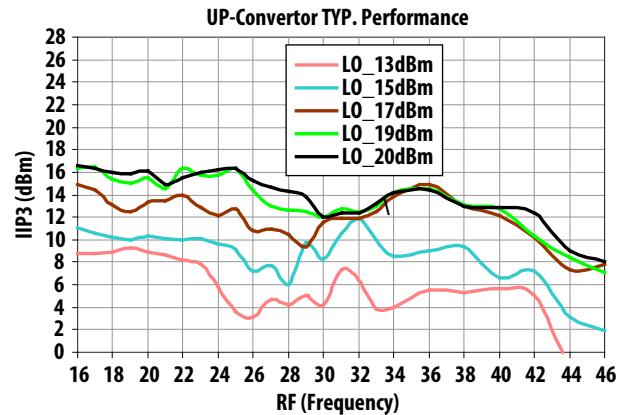


Figure 4. Up-conversion IIP3 at LO = +13 to +20 dBm (low side LO)

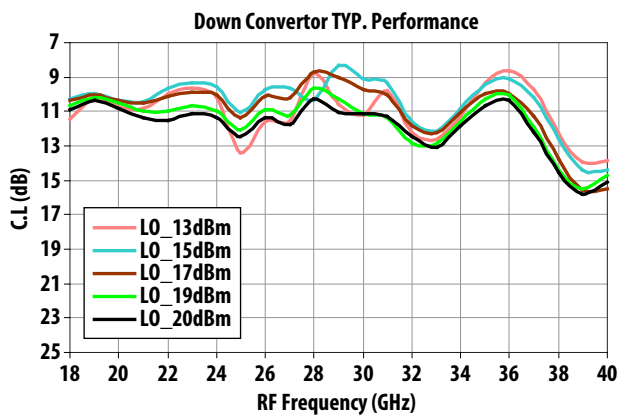


Figure 5. Down-conversion loss at LO = +13 to +20 dB (low side LO)

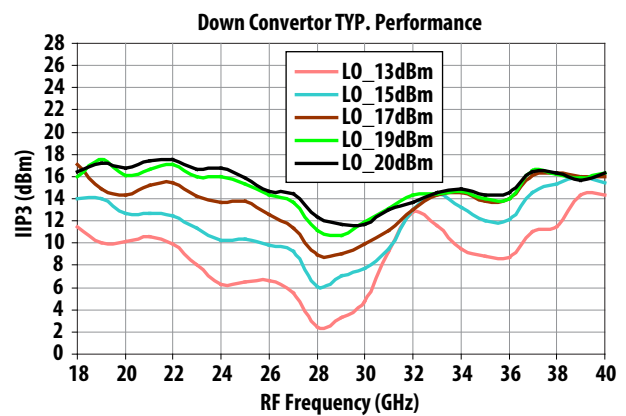


Figure 6. Down-conversion IIP3 at LO = +13 to +20 dBm (low side LO)

Notes:

1. Typical values were derived using limited samples during initial product characterization and may not be representative of the overall distribution.

## AMMP-6546 Typical Performance Curves

( $T_A = +25^\circ\text{C}$ ,  $Z_{in}=Z_{out}=50\Omega$ , IF Freq = 2GHz, LO Power = +15dBm unless noted)

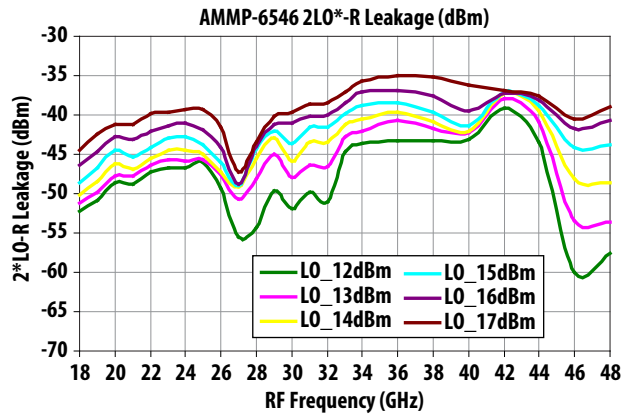


Figure 7. 2\*LO-R leakage at LO = +12 to +17 dBm

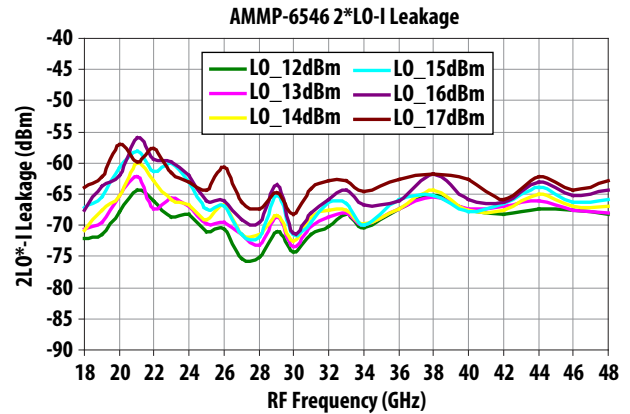


Figure 8. 2\*LO-I leakage at LO = +12 to +17 dBm

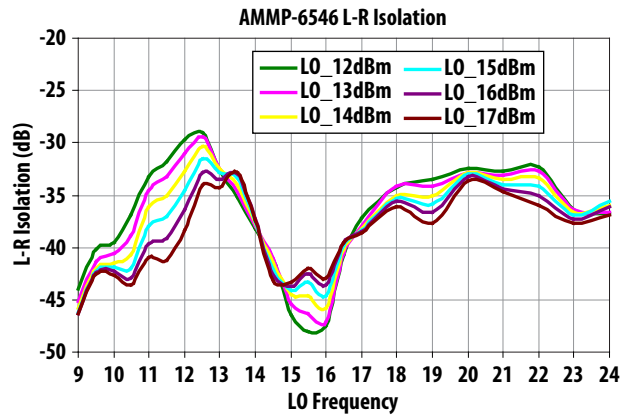


Figure 9. L-R isolation at LO = +12 to +17dBm

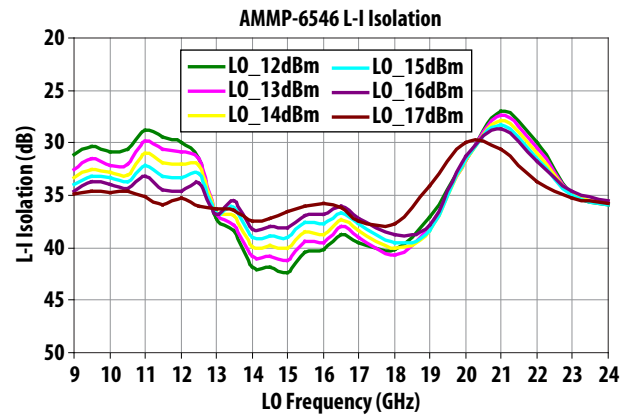


Figure 10. L-I isolation at LO = +12 to +17dBm

Notes:

1. Typical values were derived using limited samples during initial product characterization and may not be representative of the overall distribution.

## AMMP-6546 Application and Usage

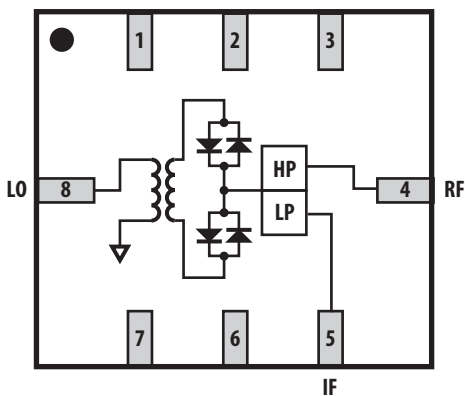


Figure 11. Simplified schematic of the mixer

## Package Dimension, PCB Layout and Tape and Reel information

Please refer to Avago Technologies Application Note 5520, AMxP-xxxx production Assembly Process (Land Pattern A).

### AMMP-6546 Part Number Ordering Information

| Part Number    | No. of Devices | Container      |
|----------------|----------------|----------------|
| AMMP-6546-BLKG | 10             | antistatic bag |
| AMMP-6546-TR1G | 100            | 7" Reel        |
| AMMP-6546-TR2G | 500            | 7" Reel        |

For product information and a complete list of distributors, please go to our web site: [www.avagotech.com](http://www.avagotech.com)

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