MAFC-010511

Frequency Doubler
16 - 24 GHz Output

Rev. V3

Features

- 16 - 24 GHz Output Frequency Range
- 17 dBm Output Power
- High 1xF_{IN} and 3xF_{IN} Suppression
- High Dynamic Range
- Lead-Free 3 mm, 16-Lead QFN Package
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MAFC-010511 is an active frequency doubler with an output frequency range of 16 - 24GHz. The input power level ranges from -5 to +5 dBm, delivering a typical output power of 17 dBm. The device has excellent input and output return losses, and high 1xF_{in} and 3xF_{in} isolations.

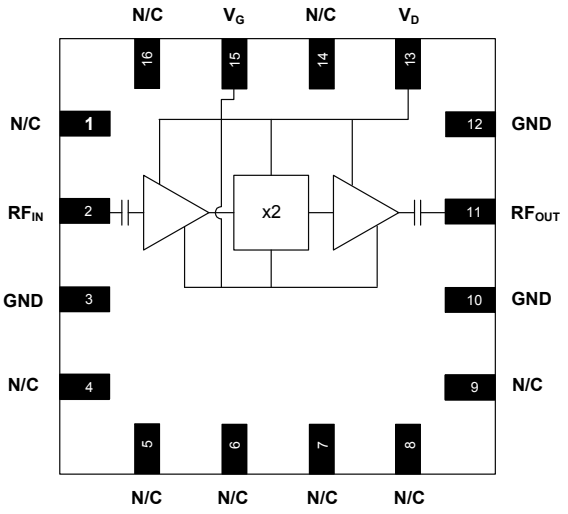
The MAFC-010511 is ideally suited for use in LO chains in point-to-point radios for cellular backhaul applications. The 3mm QFN package is RoHS compliant and compatible with reflow temperatures to 260°C.

Ordering Information[1]

Part Number	Package
MAFC-010511-TR0500	500 piece tape and reel
MAFC-010511-TR3000	3000 piece tape and reel
MAFC-010511-001SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.

Functional Block Diagram



Pin Configuration[2,3]

Pin No.	Function	Pin No.
1	N/C	No Connection
2	RF_{IN}	RF Input
3	GND	Ground
4	N/C	No Connection
5	N/C	No Connection
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection
10	GND	Ground
11	RF_{OUT}	RF Output
12	GND	Ground
13	V_D	Drain Voltage
14	N/C	No Connection
15	V_G	Gate Voltage
16	N/C	No Connection

2. It is recommended that all No Connection pins (N/C) are connected to ground.
3. The exposed pad centered on the package bottom must be connected to RF and DC ground.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

Electrical Specifications[4]: V_D = +5 V, V_G = -0.7 V, P_{IN} = 0 dBm, T_A = +25°C

Parameter	Units	Min.	Typ.	Max.
Frequency (Input)	GHz	8	—	12
Frequency (Output)	GHz	16	—	24
Output Power (P_{OUT})	dBm	+15	+17	—
1xF_{IN} Leakage	dBm	—	-25	—
3xF_{IN} Leakage	dBm	—	-15	—
4xF_{IN} Leakage	dBm	—	-5	—
Input Return Loss	dB	—	12	—
Output Return Loss	dB	—	12	—
Supply Current (I_D)	mA	—	130	—

4. It is recommended to use active bias on gate voltages to keep the drain currents constant in order to maintain the best performance over temperature.

Absolute Maximum Ratings[5,6,7]

Parameter	Absolute Maximum
Input Power	+8 dBm
Drain Voltage	+7 V
Gate Voltage	-1.5 V to 0 V
Storage Temperature	-55°C to +150°C
Case Temperature	-40°C to +85°C
Junction Temperature[8]	+160 ºC

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with $T_J \leq 160°C$ will ensure MTTF > 1 x 10^6 hours.
8. Junction Temperature (T_J) = T_C + Θjc * ((V * I) - (P_{OUT} - P_{IN}))
   Typical thermal resistance (Θjc) = 93°C/W.
   a) For T_C = 25°C,
   T_J = 81°C @ 5 V, 130 mA, P_{IN} = +5 dBm, P_{OUT} = 17 dBm
   b) For T_C = 85°C,
   T_J =141°C @ 5 V, 130 mA, P_{IN} = +5 dBm, P_{OUT} = 17 dBm

Handling Procedures

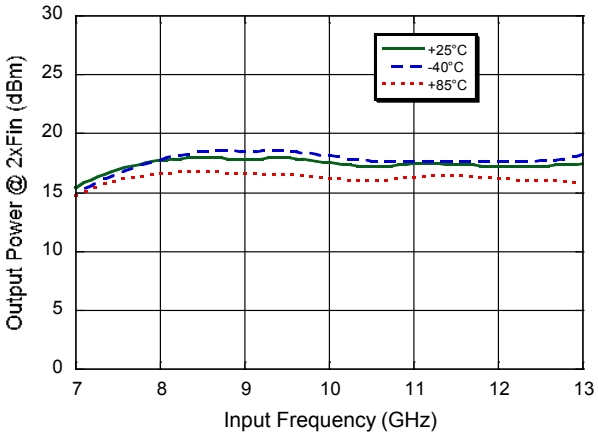
The following precautions should be observed to avoid damage:

Static Sensitivity

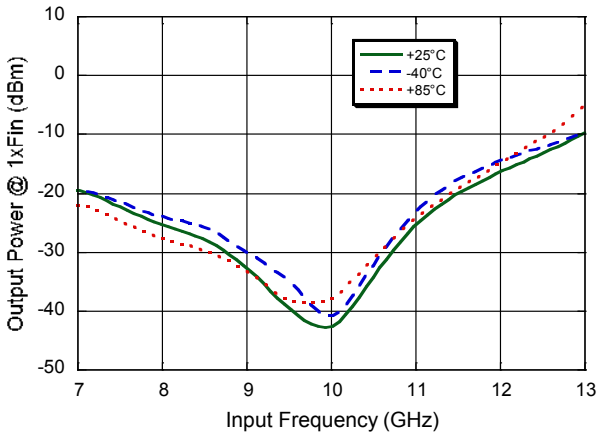
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1A devices.

Typical Performance Curves: V_D = +5 V, V_G = -0.7 V, Z_0 = 50 Ω

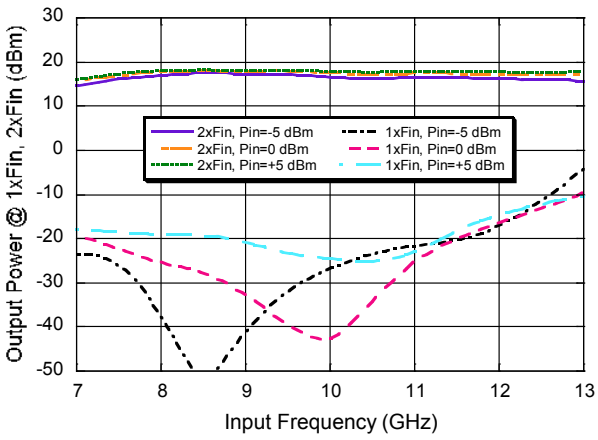
Output Power @ 2xF_{IN} vs. Temp., P_{IN} = 0 dBm



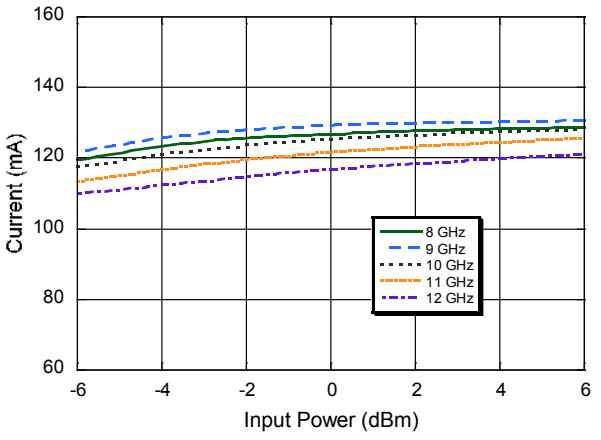
Output Power @ 1xF_{IN} vs. Temp., P_{IN} = 0 dBm



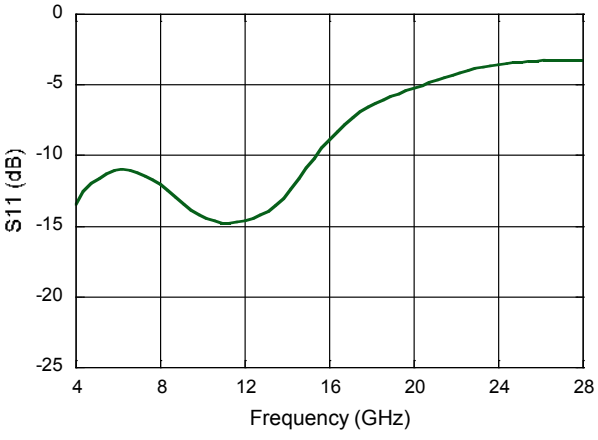
Output Power @ 1xF_{IN} and 2xF_{IN}, P_{IN} = -5 to +5 dBm



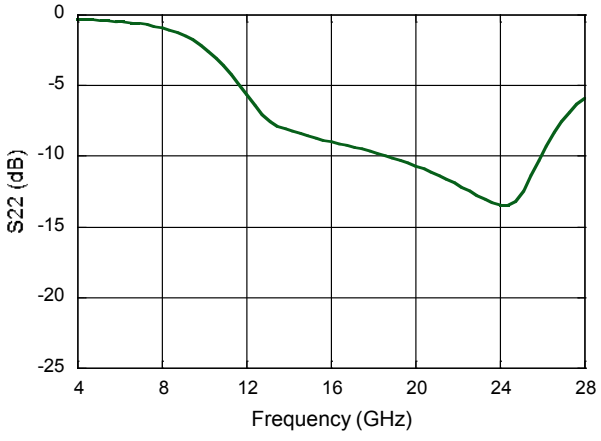
Supply Current



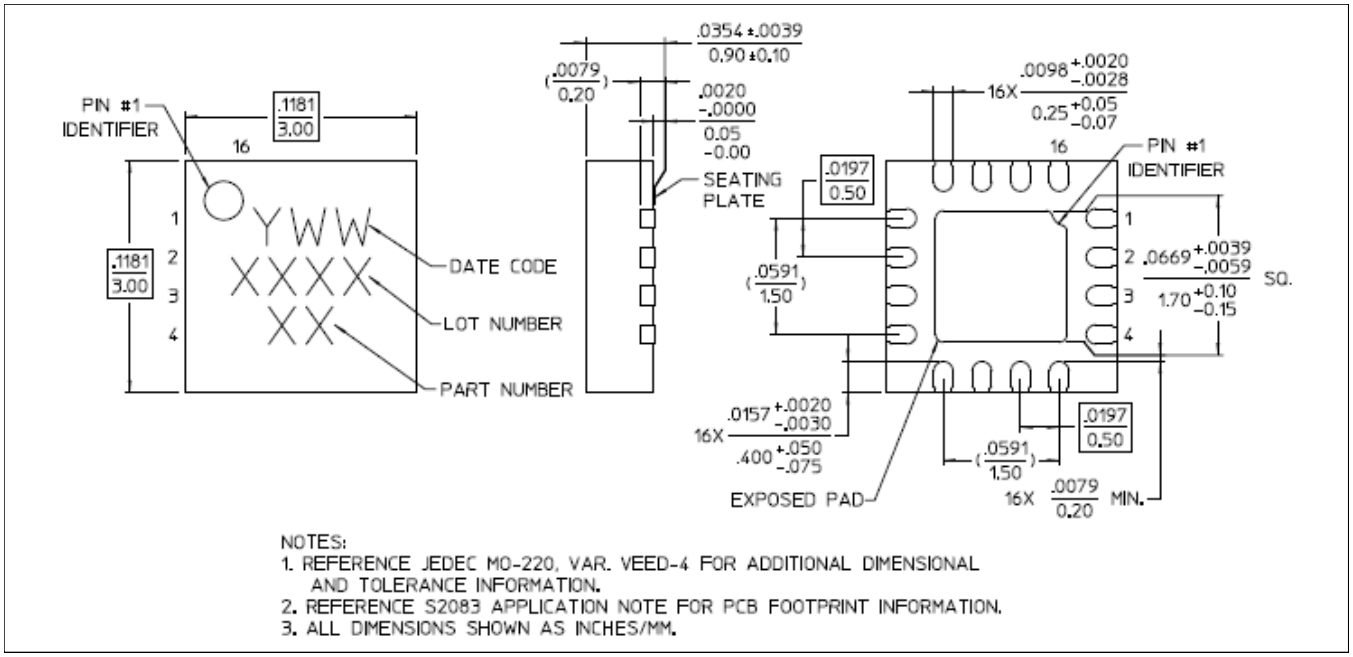
Input Return Loss



Output Return Loss



Lead-Free 3 mm 16-Lead PQFN†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin plating over copper