

Receiver
27 - 34 GHz

Rev. V2

Electrical Specifications: 27 - 34 GHz (RF), $T_A = +25^\circ\text{C}$

Parameter	Units	Min.	Typ.	Max.
Frequency Range (LO)	GHz	12.5	-	18.0
Frequency Range (IF)	GHz	DC	-	2.0
Conversion Gain (CG)	dB	-	13	-
Noise Figure (NF)	dB	-	2.5	-
Input Third Order Intercept (IIP3)	dBm	-	-2	-
Image Rejection	dBc	-	20	-
LO Input Drive	dBm	3	4	9
2×LO to RF Isolation	dBm	-	-25	-
RF Input Return Loss	dB	-	10	-
LO Input Return Loss	dB	-	10	-
IF Return Loss	dB	-	12	-
Drain Bias Voltage ($V_{D1,2,3}$)	VDC	-	3	-
Gate Bias Voltage ($V_{G1,2,3}$) ³	VDC	-	-0.35	-
Gate Bias Voltage (V_{G4}) ⁴	VDC	-3.8	-3.0	-2.0
Supply Current (I_{D1})	mA	-	7.5	-
Supply Current (I_{D2})	mA	-	30	-
Supply Current (I_{D3})	mA	-	90	-
Supply Current (I_{G4})	mA	-	10	-

3. $V_{G1,2}$ and 3 are adjusted to achieve constant drain current regulation.4. V_{G4} provides mixer bias and is fixed at -3.0 V.

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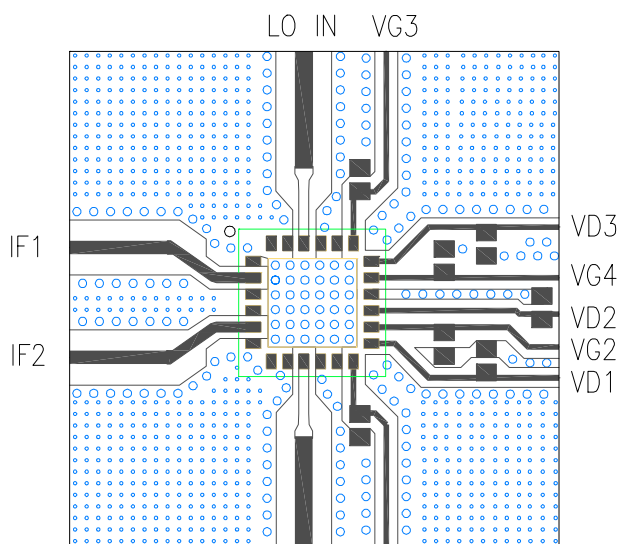
Absolute Maximum Ratings^{5,6}

Parameter	Absolute Maximum
Supply Voltage ($V_{D1,2,3}$)	+4.3 V
Supply Current ($I_{D1,2,3}$)	200 mA
Gate Bias Voltage ($V_{G1,2,3}$)	-1.7 V min., 0 V max.
Gate Bias Voltage (V_{G4})	-4 V
RF Input Power	+5 dBm
LO Input Power	+13 dBm
Storage Temperature (Tstg)	-65°C to +150°C
Operating Temperature (Ta)	-55°C to +85°C
Channel Temperature (Tch)	+150°C
ESD-Machine Model	Class A
ESD-Human Body Model	Class 1A
Moisture Sensitivity Level	MSL3

5. Operation of this device above any one of these parameters may cause permanent damage.

6. Channel temperature directly affects a device's MTTF. Channel temperature should be kept as low as possible to maximize lifetime.

Recommended Board Layout



Recommended Decoupling Capacitors: 100pF 0402
10uF 0805

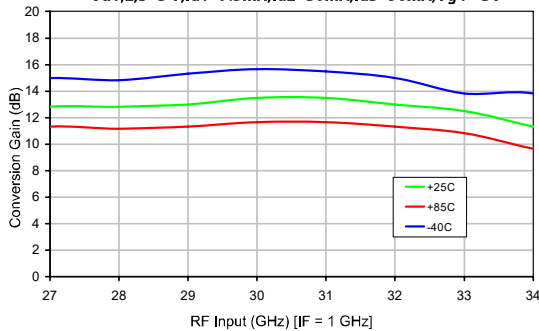
Recommend to externally ground all NC pins

App Note [1] Biasing - As shown in the Pin Designations table, the device is operated by biasing $V_{D1,2,3}$ at 3.0 V with 7.5, 30, 90 mA respectively. Additionally, a fixed voltage bias of -3 V is required for mixer bias. It is recommended to use active bias to keep the currents constant in order to maintain the best performance over temperature. Depending on the supply voltage available and the power dissipation constraints, the bias circuit may be a single transistor or a low power operational amplifier, with a low value resistor in series with the drain supply used to sense the current. The gate of the pHEMT is controlled to maintain correct drain current and thus drain voltage. The typical gate voltage needed to do this is -0.35 V. Make sure to sequence the applied voltage to ensure negative gate bias is available before applying the positive drain supply.

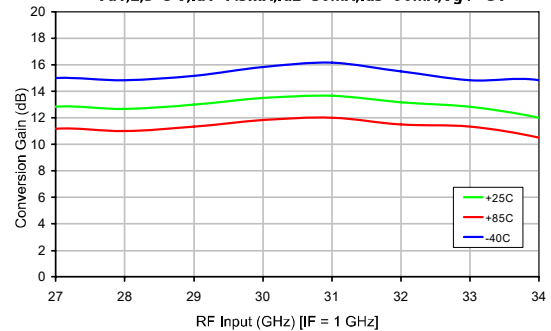
App Note [2] Board Layout - As shown in the board layout, it is recommended to provide 100 pF decoupling caps as close to the bias pins as possible, with additional 10 μ F decoupling caps.

Typical Performance Curves

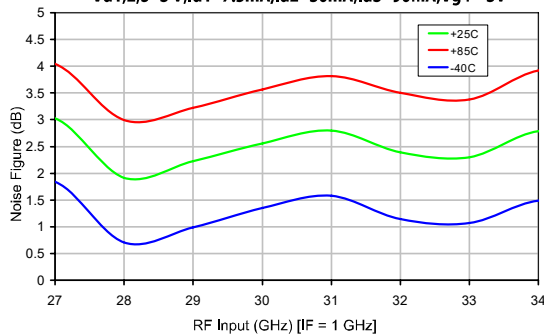
XR1019-QH: LSB Conv. Gain vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



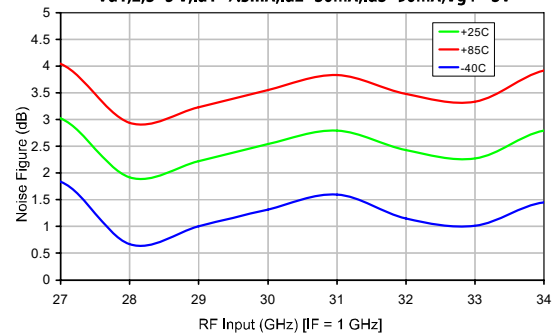
XR1019-QH: USB Conv. Gain vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



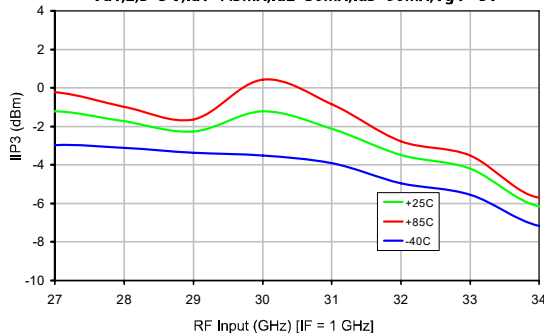
XR1019-QH: LSB Noise Figure vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



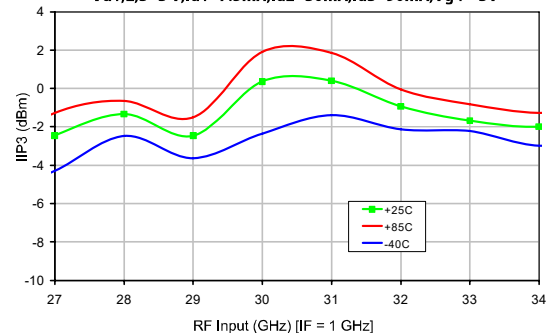
XR1019-QH: USB Noise Figure vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



XR1019-QH: LSB IIP3 vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V

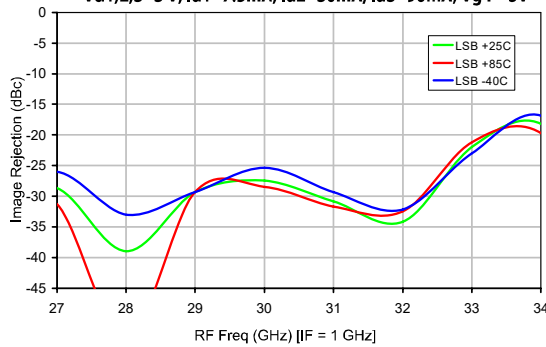


XR1019-QH: USB IIP3 vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V

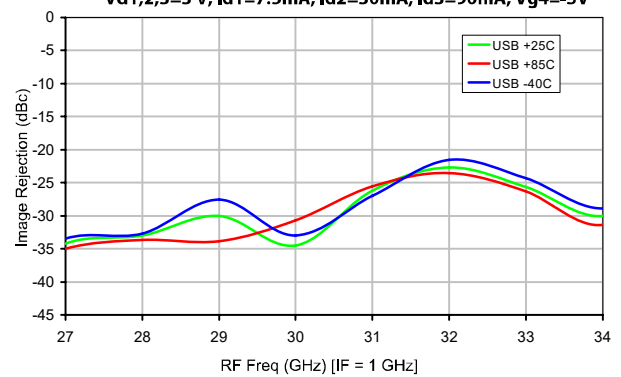


Typical Performance Curves (cont.)

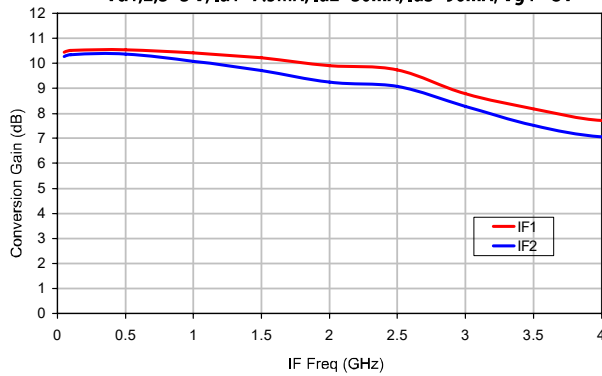
XR1019-QH: LSB Image Rejection vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



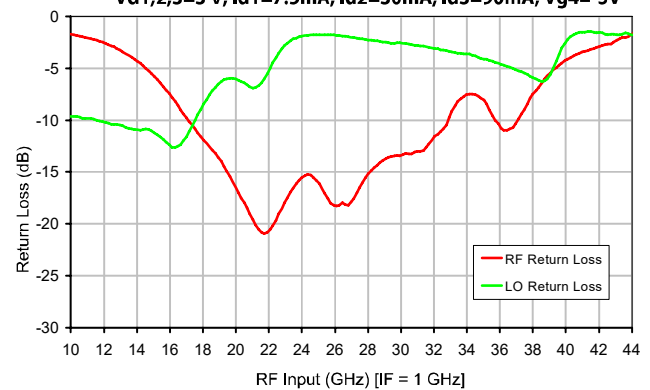
XR1019-QH: USB Image Rejection vs. Freq (GHz), Over Temp
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



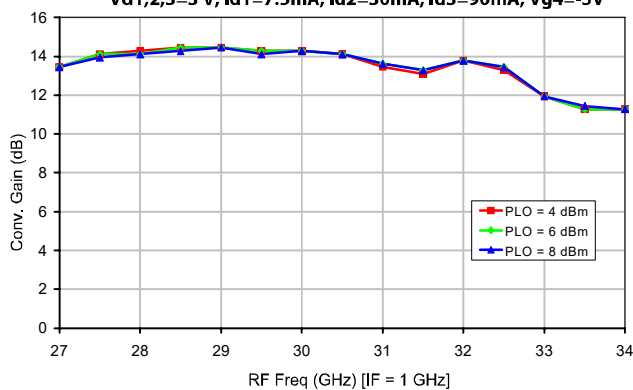
XR1019-QH: Conv. Gain vs IF Freq (GHz)
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



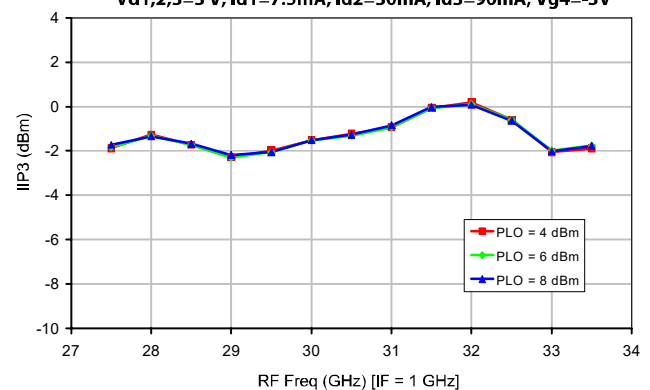
XR1019-QH: RF and LO Return Loss vs. Freq (GHz)
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



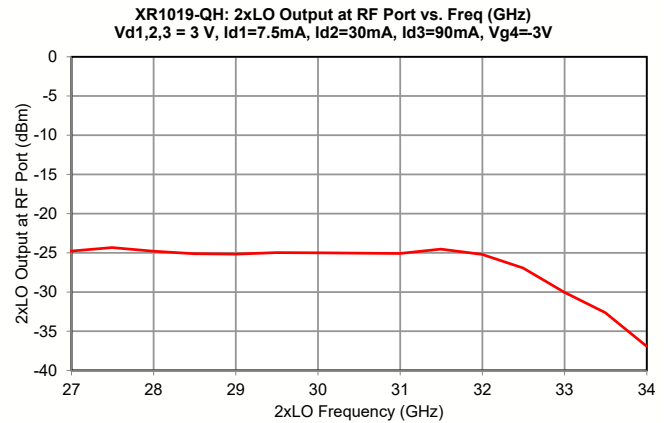
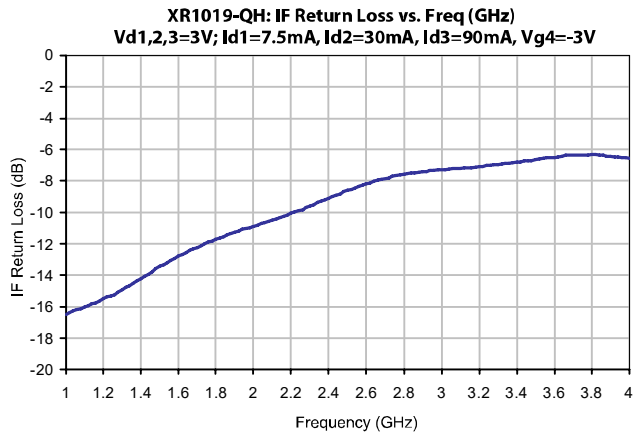
XR1019-QH: USB Conv. Gain vs Freq (GHz), Varying LO Power
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



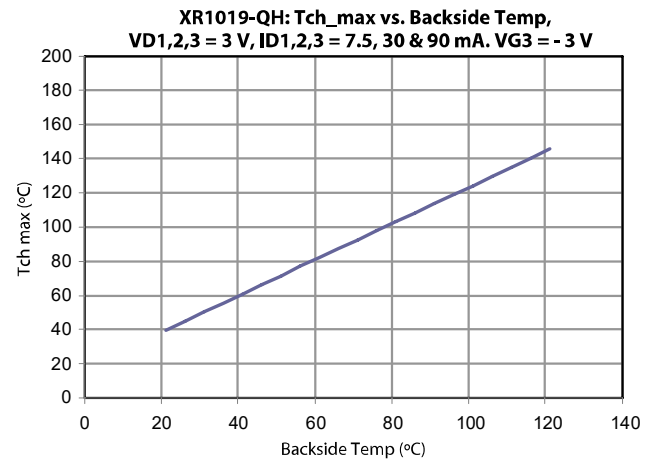
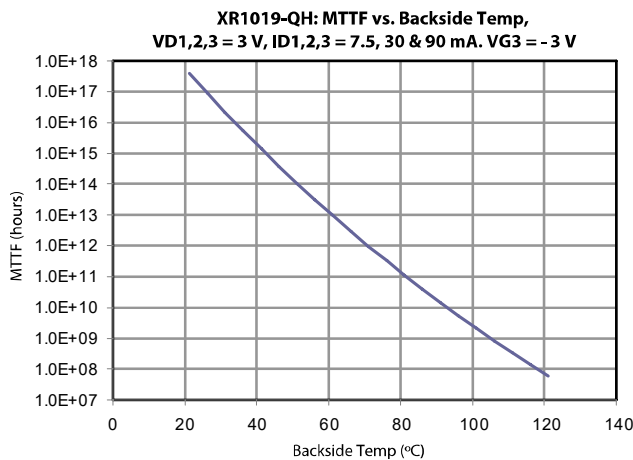
XR1019-QH: USB IIP3 vs Freq (GHz), Varying LO Power
Vd1,2,3=3 V; Id1=7.5mA, Id2=30mA, Id3=90mA, Vg4=-3V



Typical Performance Curves (cont.)



MTTF

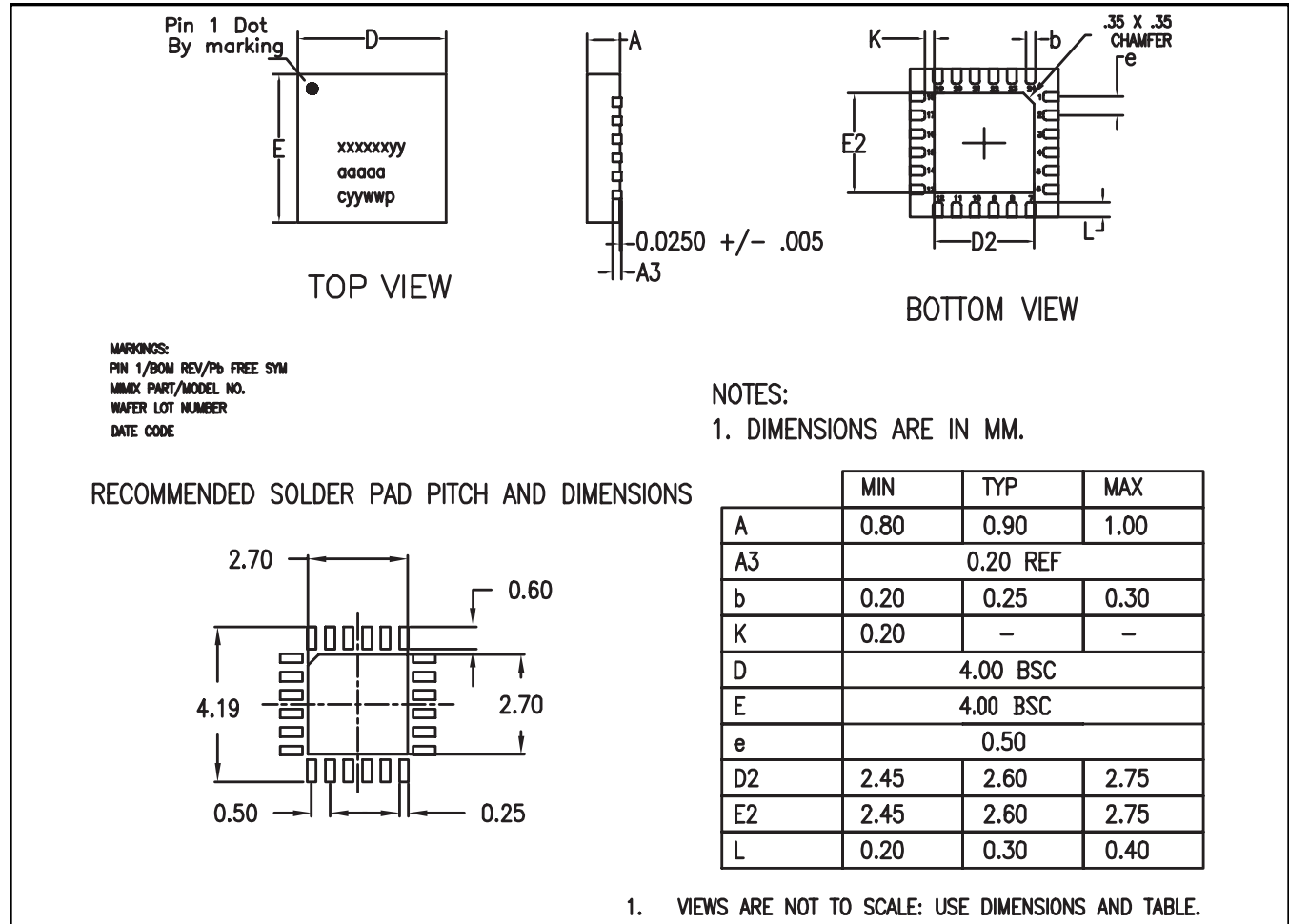


MTTF is calculated from accelerated life-time data of single devices and assumes an isothermal back-plate.

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Lead-Free 4 mm 24-Lead PQFN[†]



[†] Reference Application Note S2083 for lead-free solder reflow recommendations.
Plating is 100% matte tin over copper.

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