gMRX0015B
SMD E-band RX
81-86 (77-86) GHz

FEATURES

- SMD package (WR-12 interface)
- 81-86 GHz
- 25/-2 dBm IIP2/IIP3
- 22 dB gain
- Size: 16 x 18 x 4 mm
- Evaluation board available

APPLICATIONS

- Direct or IF down-conversion
- Point-to-point communication
- Radar and imaging
- Instrumentation
- Fiber over radio

DESCRIPTION

gMRX0015 is a surface-mount GaAs receiver for the 81-86 GHz frequency band. The receiver offers a wide IF bandwidth from DC to 10 GHz suitable for direct conversion or IF modulation/demodulation. The package input features a WR-12 aperture for low-loss connection to a rectangular waveguide.

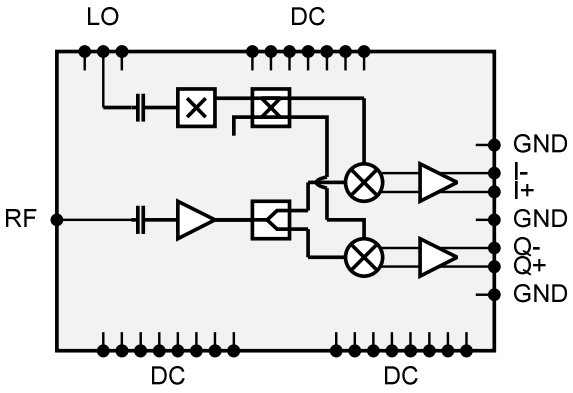

Figure 1. Block diagram

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ELECTRICAL PERFORMANCE

Table 1. Electrical specifications, backside temperature +25 °C, nominal bias

Parameter	Min	Typ	Max	Unit
RF Frequency Range (performance)	81		86	GHz
RF Frequency Range (extended)	77		86	GHz
IF Frequency Range	DC		10	GHz
LO Frequency Range	11.3		14.7	GHz
LO Multiplication Factor		6		
LO Input Power		5		dBm
Conversion Gain		22		dB
Gain Temperature Slope		-0.04		dB/°C
IIP2		25		dBm
IIP3		-2		dBm
NF		5		dB
RF Return Loss		10		dB
IF Return Loss		10		dB
LO Return Loss		10		dB
PDC (quiescent)		1400		mW

Table 2. Absolute maximum ratings

Gate voltage (VG..)	-2.0 V
Drain voltage (VD..) VD_X3 VD1_AMP	+4.5 V +6.0 V +9.0 V
VS_AMP	-4.0 V
Drain currents: VD1_AMP VD2_AMP VD_LNA VD_AMP_X2 VD_X3	 70 mA 70 mA 90 mA (AMP 150 mA, X2 40 mA) 30 mA
RF input power	+10 dBm
Junction temperature (1 million hours MTTF) *Thermal resistance (+85 °C backside temp)*	+150 °C *TBD*
Operating temperature	-40 to +85 °C
Storage temperature	-65 to +150 °C

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PIN CONFIGURATION AND BIAS

Always apply the gate supplies first followed by the drain supplies. It is recommended to initially set all gates to -1.6 V and adjust the gate supplies to obtain the specified drain currents. Read carefully the bias sequence for the IF low noise amplifier in ***. The typical gate voltage can vary by up to 0.2 V from what is noted. The drain currents are listed with all RF input signals off.

Note: Not connected (NC) pins are floating and must not be grounded.

Table 3. Pin functions and electrical settings

Pad No.	Reference	Supply (V)	Current (mA)	Function
1	NC			
2	NC			
3	NC			
4	VG_LNA	-0.5 (typ)		Bias
5	NC			
6	VD_LNA	2.0	75	Bias
7	VG_MIX	-0.8 (typ)		Bias
8	VI-_ADJ**	(-1) – (+1)	<10	Bias
9	VI+_ADJ**	(-1) – (+1)	<10	Bias
10	VQ-_ADJ**	(-1) – (+1)	<10	Bias
11	VQ+_ADJ**	(-1) – (+1)	<10	Bias
12	VD1_AMP	7.0	55-65	Bias
13	VS_AMP	-3.0	110-130	Bias
14	VG1_AMP	-3.45 (typ)		Bias
15	VD2_AMP	3.3	55-65	Bias
16	NC			
17	Q+	Zo = 100Ω differential impedance, DC-coupled		Output
18	Q-			Output
19	I+	Zo = 100Ω differential impedance, DC-coupled		Output
20	I-			Output
21	NC			
22	VTEMP	See temperature sensor		Temperature output
23	NC			
24	VG_AMP_X2	-0.45 (typ)	(105)	Bias
25	VD_AMP_X2	3.3	105+3=108	Bias
26	VG_X2	-0.8 (typ)	(3)	Bias
27	VD_X3*	5.0	8*	Bias
28	VG_X3	-0.75 (typ)		Bias
29	LO	Zo = 50Ω, AC-coupled		LO
30-41	NC			

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42	RF IN	WR-12	Input
43-54	GND		GND

* VD_X3, when pinched off consumes 5 mA, adjust VG_X3 +3mA for a total of 8 mA.

** Mixer offset adjustment (optional). Any small level differential common- or differential mode imbalance can be adjusted by tuning the I+_ADJ, I-_ADJ, Q+_ADJ and Q-_ADJ. If not used, leave open circuited.

*** Bias sequence for the integrated IF low noise amplifier is: 1) VG1_AMP, VS_AMP, VD1_AMP and 2) VD2_AMP. Depending on ac or dc coupled I+, I-, Q+ and Q- output ports, adjust VG1_AMP until either the output voltage of I+,I-,Q+ and Q- ports become zero (dc coupled), or I+_ADJ, I-_ADJ, Q+_ADJ and Q-_ADJ adjust ports become zero (ac-coupled). Note that if the termination impedance is 50 Ω and the IF low noise amplifier is dc coupled, current will flow into the termination load unless the output voltage is zero. The sum of the currents from VD1_AMP and VD2_AMP should equal VS_AMP, and the voltage levels of the output ports I+, I-, Q+ and Q- (dc-coupled) or I+_ADJ, I-_ADJ, Q+_ADJ and Q-_ADJ ports (ac-coupled) are zero, then the IF low noise amplifier is biased correctly.

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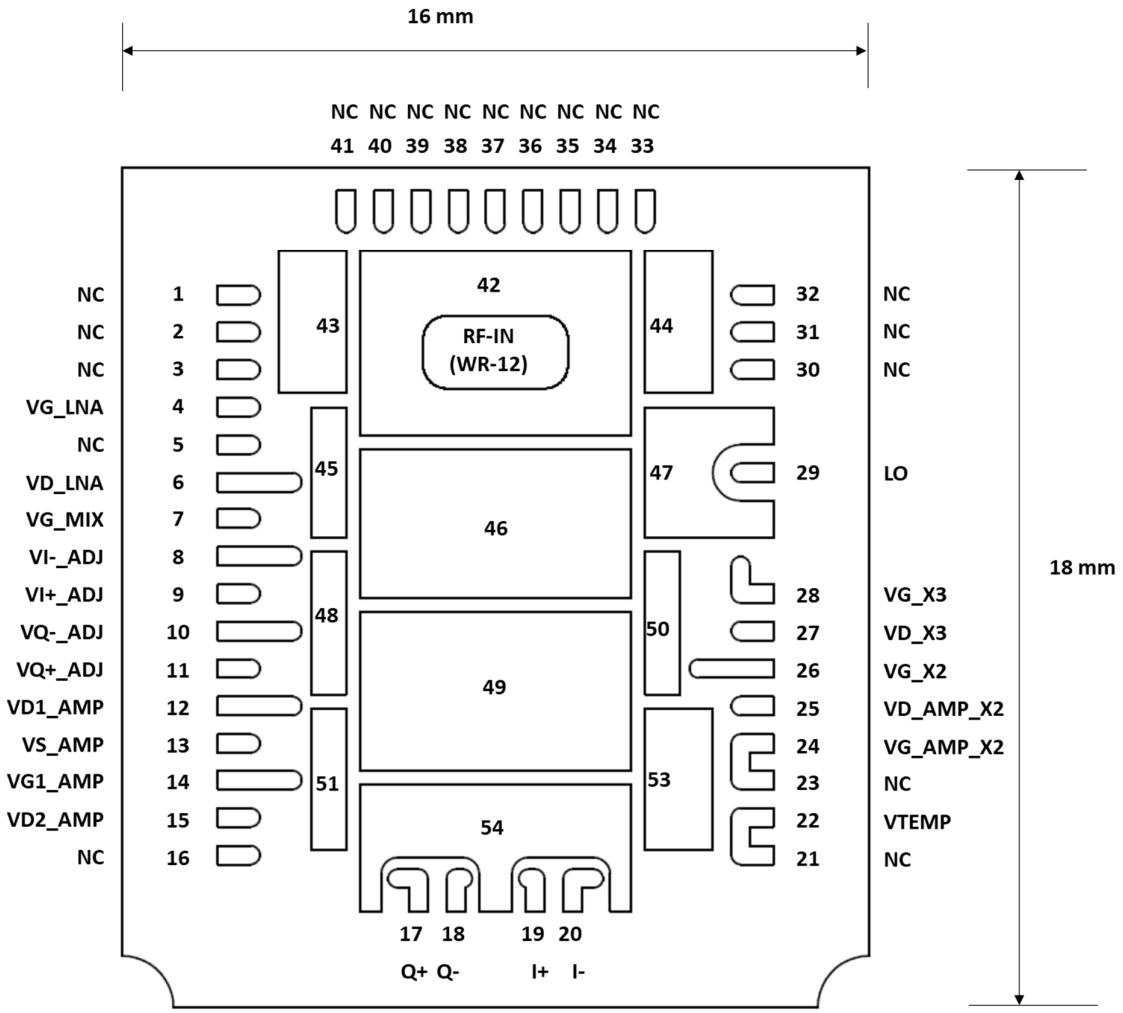

Figure 2. Pin configuration.

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MEASURED PERFORMANCE

Unless otherwise noted, all data presented has been obtained with a test-fixture, at room temperature and at nominal bias. The two-tone RF input signal has a separation frequency of 50 MHz.

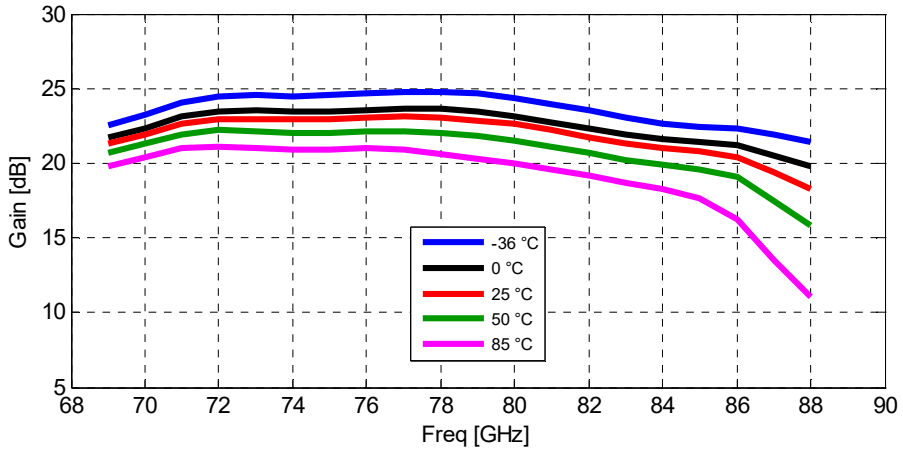

Figure 3. Gain vs RF (LSB) frequency, IF 1 GHz.

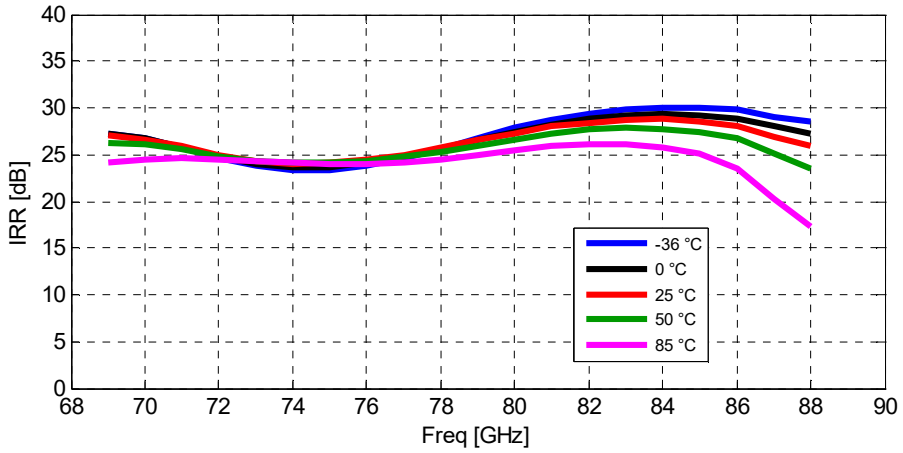

Figure 4. IRR vs RF (LSB) frequency, IF 1 GHz.

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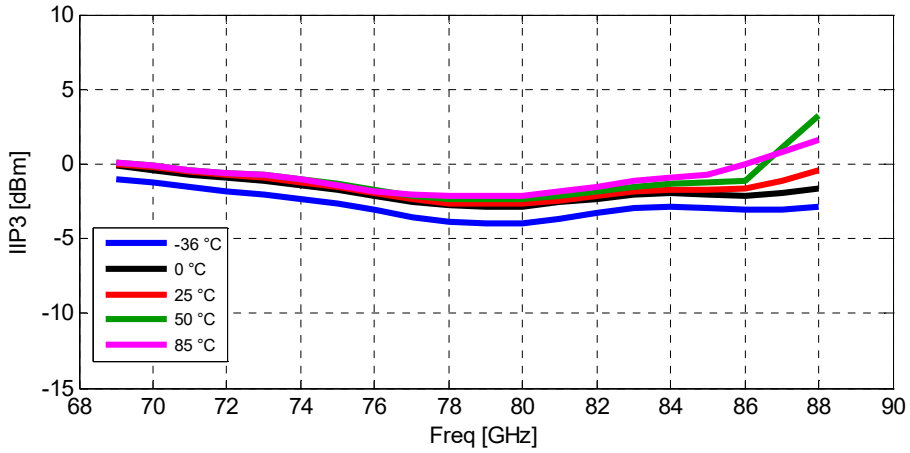

Figure 5. IIP3 vs RF (LSB) frequency, IF 1 GHz.

TEMPERATURE SENSOR

A PN-diode temperature sensor with grounded cathode is available on-chip to monitor package temperature. Typical bias current is 100 uA and can be achieved by connecting eg. a 36.5k resistor between VTEMP and a +5.0 V supply. VTEMP is 1210 mV (typ.) at +25 °C and -1.4 mV/°C.

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