InGaP HBT 2.4 – 2.5 GHz Power Amplifier

PRODUCTION DATA SHEET

DESCRIPTION

The LX5535 is a power amplifier optimized for WLAN applications in the 2.4-2.5 GHz frequency range. The PA is implemented as a three-stage monolithic microwave integrated circuit (MMIC) with active bias and output pre-matching.

The device is manufactured with an InGaP/GaAs Heterojunction Bipolar Transistor (HBT) IC process (MOCVD). With single low voltage supply of 5V, it provides 32 dB power gain between 2.4-2.5GHz, at a low quiescent current of 120mA.

The output power for EVM(Error Vector Magnitude) of 3.5% is 25dBm (64QAM/54Mbps), where the PA consumes 260mA total DC current.

The LX5535 is available in a 16-pin 3mm x 3mm micro-lead package (MLPQ-16L). The compact footprint, low profile, and thermal capability of the MLP package makes the LX5535 an ideal solution for high-gain power amplifier requirements for IEEE 802.11b/g and WiMAX applications.

IMPORTANT: For the most current data, consult *MICROSEMI*'s website: http://www.microsemi.com

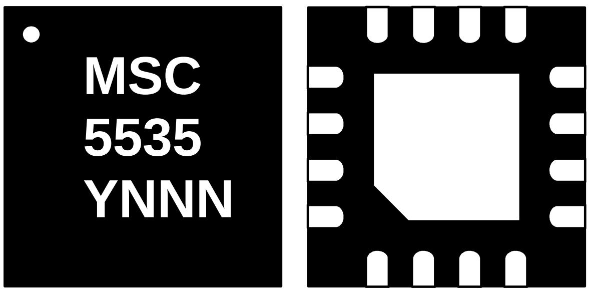
KEY FEATURES

- Advanced InGaP HBT
- 2.4-2.5GHz Operation
- Single-Polarity 3-5V Supply
- Quiescent Current 120mA
- Power Gain 32 dB
- Power for EVM~3.5 % 54Mbps/64QAM : 25dBm
- Total Current 260mA for Pout=25dBm, 802.11g
- 802.11b mask-compliant power : 28dBm
- Total Current 370mA for Pout=+28dBm, 802.11b
- Small Footprint: 3x3mm^2
- Low Profile: 0.9mm

APPLICATIONS

- IEEE 802.11b/g
- IEEE 802.16 WiMAX

PRODUCT HIGHLIGHT



(YNNN : Trace code)

PACKAGE ORDER INFO

LQ	Plastic MLPQ 3×3 16 pin RoHS Compliant / Pb-free
	LX5535LQ

Note: Available in Tape & Reel.
Append the letter "TR" to the part number.
(i.e. LX5535LQ-TR)

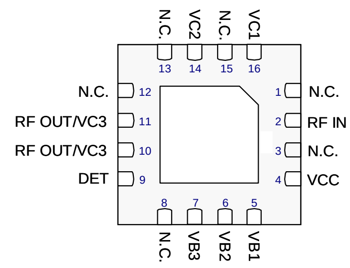
Microsemi
Analog Mixed Signal Group
One Enterprise, Aliso Viejo, CA 92656 949-380-6100, fax 949-215-4996

ABSOLUTE MAXIMUM RATINGS

DC Supply Voltage, RF off	6.0V
Collector Current	800mA
Total Power Dissipation	4W
RF Input Power (With 50 Ohm Load at Output)	+15dbm
Maximum Operating Junction Temperature (T_{Jmax})	+150°C
Operation Ambient Temperature Range (T_A)	-40 to +85°C
Storage Temperature	-65 to +150°C
Package Peak Temp. for Solder Reflow (40 seconds maximum exposure)	+260°C (+0,-5)

Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

PACKAGE PIN OUT



LQ PACKAGE
(Bottom View)

RoHS / Pb-free 100% matte Tin Lead Finish

THERMAL DATA

LQ **Plastic MLP16L 16-Pin**

THERMAL RESISTANCE-JUNCTION TO CASE, θ_{JC}	25.3 °C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	80.5 °C/W

Junction Temperature Calculation : $T_J = T_A + (P_D \times \theta_{JA})$.

The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

FUNCTIONAL PIN DESCRIPTION

Name	Pin	Description
RF IN	2	RF input for the power amplifier. This pin is DC-shorted to GND but AC-coupled to the transistor base of the first stage.
VB1	5	Bias current control voltage for the first stage.
VB2	6	Bias current control voltage for the second stage.
VB3	7	Bias current control voltage for the third stage.
VCC	4	Supply voltage for the bias reference and control circuits.
RF OUT	10, 11	RF output and power supply for the third stage amplifier.
VC1	16	Power supply for the first stage amplifier.
VC2	14	Power supply for the second stage amplifier.
DET	9	DETECTOR output.
GND	Center Metal	The center metal base of the MLP package provides both DC and RF ground as well as heat sink for the power amplifier.
NC	1, 3, 8, 12, 13, 15	These pins are unused and not connected to the device inside the package. They can be treated either as open pins, or connected for ground for better heat dissipation

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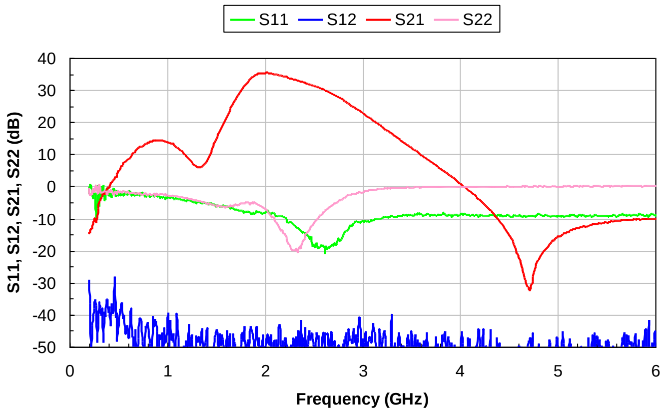
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply for the following test conditions:
Vc = Vcc = 5V, Vref = 2.9V, Icq = 120mA, T_A = 25°C

Parameter	Symbol	Test Conditions	LX5535 Min	LX5535 Typ	LX5535 Max	Units
SECTION HEADER						
Frequency Range	f		2.4	2.45	2.5	GHz
Power Gain	Gp	Pout=25dBm		32		dB
Power for EVM = 3.5%		64QAM / 54Mbps		25		dBm
Total Current at Pout = 25dBm		64QAM / 54Mbps		260		mA
Quiescent Current	Icq			120		mA
Bias Control Reference Current	Iref	For Icq = 120mA		2		mA
Small-Signal Gain	S21			32		dB
Gain Flatness	ΔS21	Over 200MHz		2		dB
Input Return Loss	S11			10		dB
Output Return Loss	S22			10		dB
Reverse Isolation	S12			50		dB
Second Harmonic		Pout = 28dBm, CW		-40		dBc
802.11b mask compliant power		1 Mbps DSSS		28		dBm
Total Current at Pout=28dBm		1 Mbps DSSS		370		mA
Ramp-On Time	t_{ON}	10 ~ 90%		100		ns
Detector Response	DET	Pout = 25dBm, 64QAM / 54Mbps		1.5		V

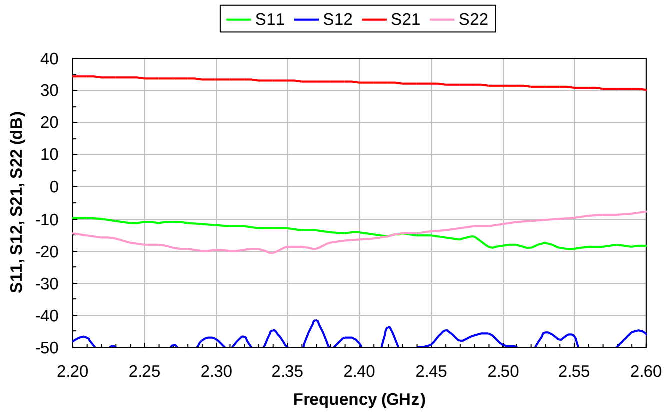
Note: All measured data was obtained on a 10 mil GETEK evaluation board without heat sink.

S-PARAMETER



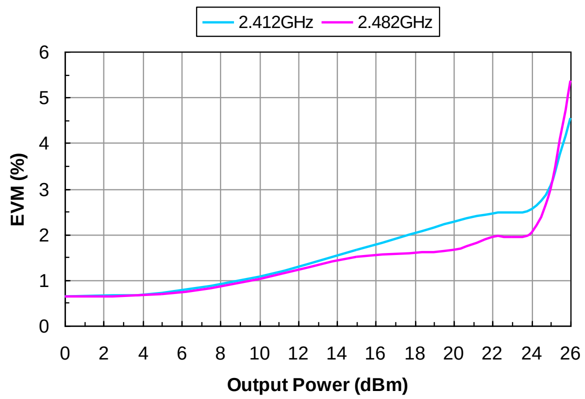
Typical S-Parameter Data at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA)

IN-BAND S-PARAMETER



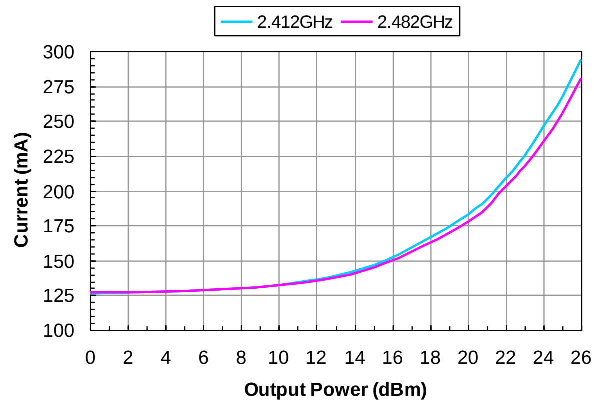
Typical S-Parameter Data at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA)

EVM VS. POUT



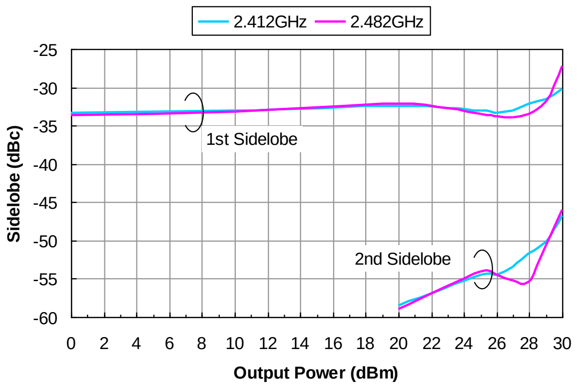
Typical EVM vs. Pout at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA, 64QAM/54Mbps, 90% duty cycle)

TOTAL CURRENT VS. POUT (OFDM)



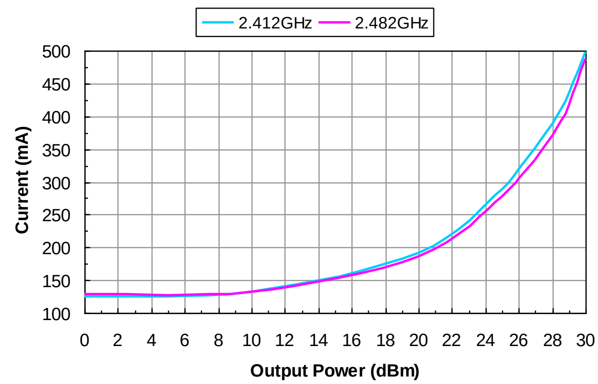
Typical Current vs. Pout at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA, 64QAM/54Mbps, 90% duty cycle)

1MBPS DSSS SIDELOBE VS. POUT



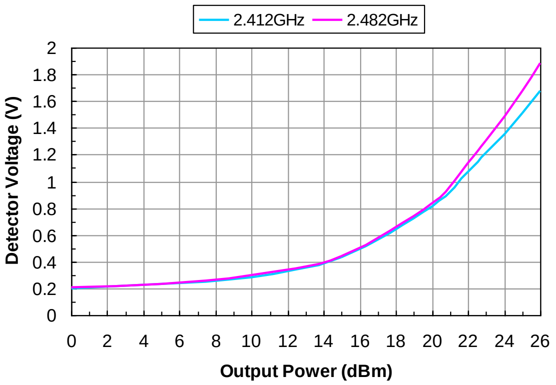
Typical 1Mbps DSSS Sidelobe vs. Pout at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA, 1Mbps DSSS, 99% duty cycle)

TOTAL CURRENT VS. POUT (DSSS)



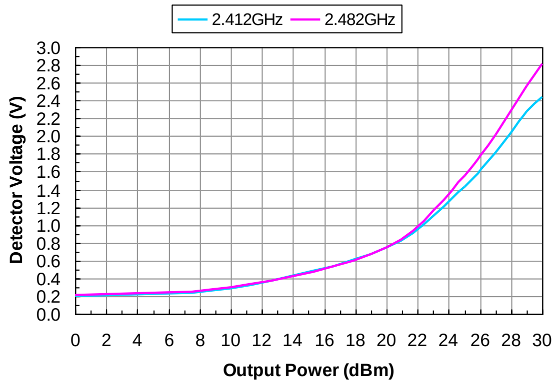
Typical Current vs. Pout at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA, 1Mbps DSSS, 99% duty cycle)

DETECTOR VS. POUT (OFDM)



Typical Detector Output vs. Pout at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA, 64QAM/54Mbps, 90% duty cycle)

DETECTOR VS. POUT (DSSS)



Typical Detector Output vs. Pout at Room Temp.
(Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA, 1Mbps DSSS, 99% duty cycle)

OFDM SPECTRUM AT +29DBM, 2.412GHZ

Typical OFDM Output Spectrum at +29dBm, 2.412GHz
(Vc = Vcc = 5.0V, vref=2.9V, Icq = 120mA, 64QAM/54Mbps)

OFDM SPECTRUM AT +29DBM, 2.482GHZ

Typical OFDM Output Spectrum at +29dBm, 2.482GHz
(Vc = Vcc = 5.0V, Vref=2.9V, Icq = 120mA, 64QAM/54Mbps)

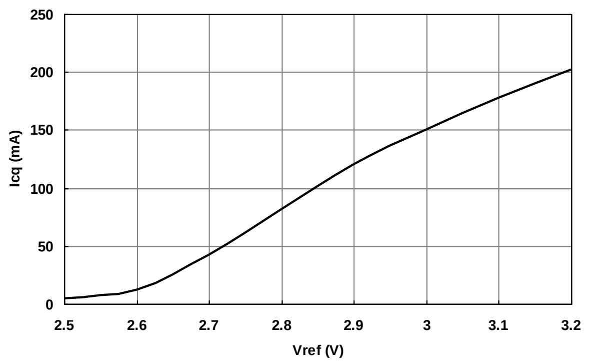
DSSS SPECTRUM AT +28DBM, 2.412GHZ

Typical 1Mbps DSSS output spectrum at +28dBm, 2.412GHz
(Vc = Vcc = 5.0V, Vref=2.9V, Icq =120mA, 1Mbps DSSS)

DSSS SPECTRUM AT +28DBM, 2.482GHZ

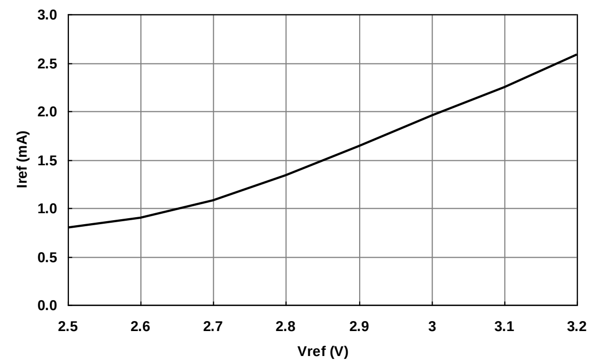
Typical 1Mbps DSSS output spectrum at +28dBm, 2.482GHz
(Vc = Vcc = 5.0V, Vref=2.9V, Icq = 120mA, 1Mbps DSSS)

QUIESCENT CURRENT VS. BIAS VREF



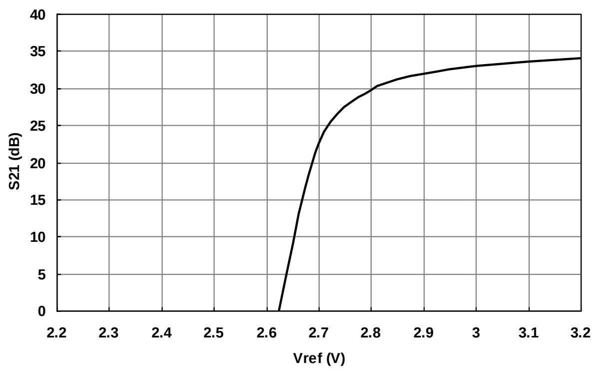
Typical Quiescent Current (Icq) vs. Bias Control Volgate (Vref) at Room Temp.
(Nominal Bias : Vc = Vcc = 5.0V, Vref=2.9V, Icq = 120mA)

BIAS CONTROL CURRENT VS. BIAS VREF



Typical Bias Control Current (Iref) vs. Bias Control Volgate (Vref) at Room Temp.
(Nominal Bias : Vc = Vcc = 5.0V, Vref = 2.9V, Icq = 120mA)

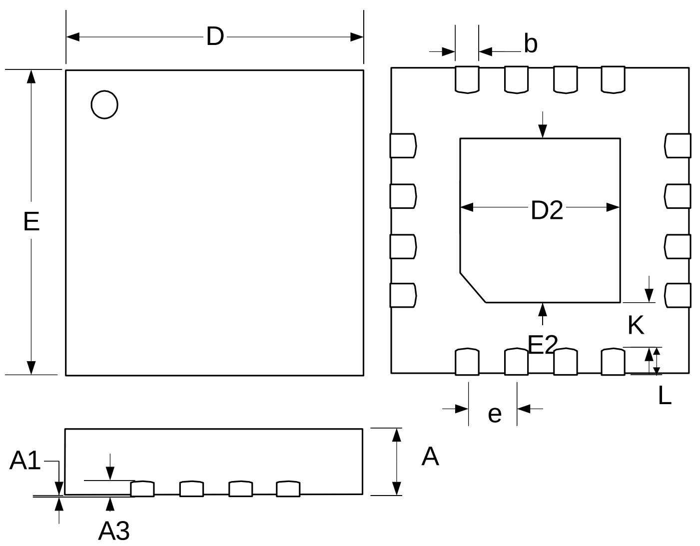
SMALL SIGNAL GAIN VS. BIAS VREF



Typical Small Signal Gain vs. Bias Control Volgate (Vref) at Room Temp.
(Nominal Bias : Vc = Vcc = 5.0V, Vref=2.9V, Icq = 120mA)

PACKAGE DIMENSIONS

LQ 16-Pin MLPQ 3x3



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.80	1.00	0.031	0.039
A1	0	0.05	0	0.002
A3	0.20 REF		0.008 REF	
b	0.18	0.30	0.007	0.012
D	3.00 BSC		0.118 BSC	
E	3.00 BSC		0.118 BSC	
e	0.50 BSC		0.020 BSC	
D2	1.30	1.55	0.051	0.061
E2	1.30	1.55	0.051	0.061
K	0.2	-	0.008	-
L	0.35	0.50	0.012	0.020

Note:

1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006”) on any side. Lead dimension shall not include solder coverage.

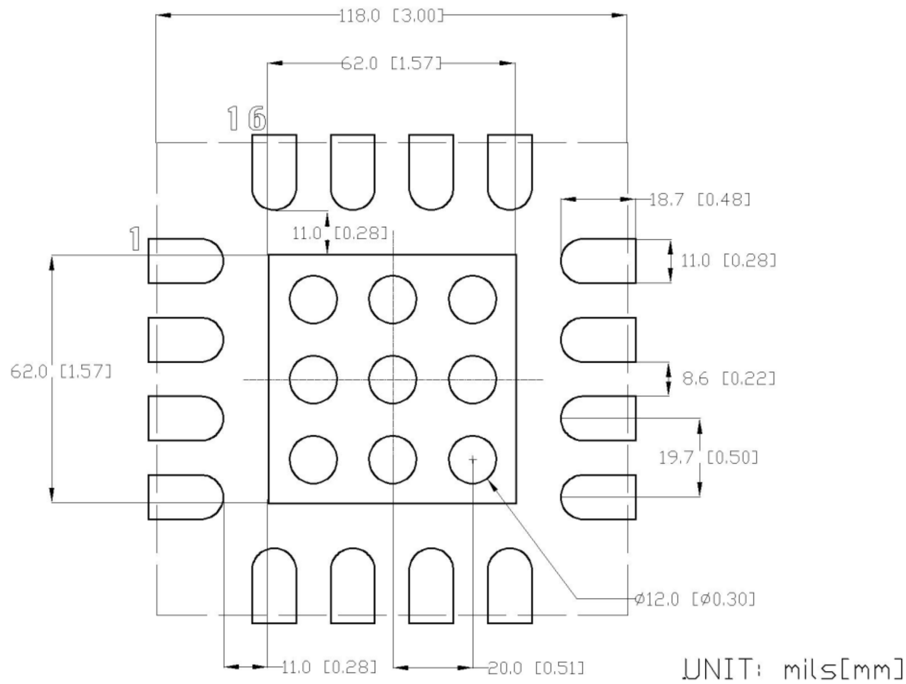


Figure – Recommended Land Pattern

NOTES