LX5518

InGaP HBT 2.4 – 2.5 GHz Power Amplifier

PRODUCTION DATA SHEET

DESCRIPTION

The LX5518 is a high gain and high power amplifier optimized for 802.11b/g/n 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, on-chip input matching, and output pre-matching.

The device is manufactured with an InGaP/GaAs Heterojunction Bipolar Transistor (HBT) IC process (MOCVD). It operates with a single positive voltage supply of 3-5V, and provides a power gain of 30dB and an output power of +26dBm at 5V for 3% EVM in the 2.4-2.5GHz.

LX5518 also features an on-chip power detector at the output port of the PA to help reduce BOM cost and PCB space for implementation of power control in a typical wireless system.

The LX5518 is available in a 16-pin 3mm x 3mm quad flat no lead package (QFN 3×3-16L). The compact footprint, low profile, and excellent thermal capability make the LX5518 an ideal solution for 802.11b/g/n applications.

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

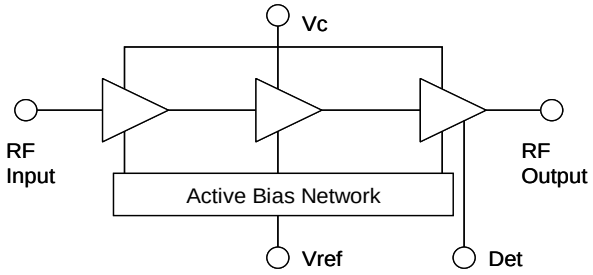
KEY FEATURES

- Advanced InGaP HBT
- 2.4-2.5GHz Operation
- Single-Polarity 3-5V Supply
- Power Gain ~ 30 dB
- 26dBm @3%EVM,802.11g/5V
- 24dBm @3.5%EVM,80211g/3.3V
- 28dBm @CCK,802.11b/5V
- 27dBm @CCK,802.11b/3.3V
- 24.5% Efficiency @28dBm/5V
- Complete On-Chip Input Match
- Simple Output Match for Optimal EVM
- Temperature-Compensated On-Chip Output Power Detector with Wide Dynamic Range
- Small Footprint: 3x3mm^2
- Low Profile: 0.9mm

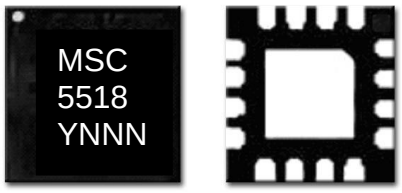
APPLICATIONS

- 802.11b/g/n

BLOCK DIAGRAM



3X3MM MLP PACKAGE



(YNNN : Trace code)

PACKAGE ORDER INFO

LQ	**Plastic QFN 3×3** **16 pin** RoHS Compliant / Pb-free
LX5518LQ	

Note: Available in Tape & Reel. Append the letters "TR" to the part number. (i.e. LX5518LQ-TR)

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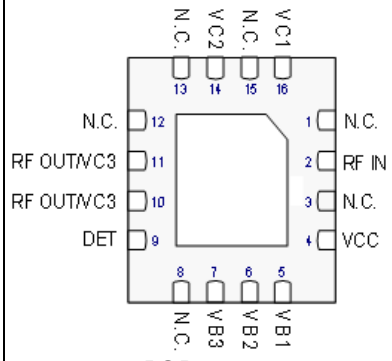
ABSOLUTE MAXIMUM RATINGS

DC Supply Voltage, RF off ..... 6 V
Collector Current ..... 800 mA
Total Power Dissipation ..... 4 W
RF Input Power (With 50 Ohm Load at Output) ..... +10 dBm
Maximum Junction Temperature ($T_{J\ max}$) ..... +150°C
Operation Ambient Temperature (T_A) ..... -40 to +85°C
Storage Temperature ..... -65 to +150°C
Peak Package Temp. for Solder Reflow (40 seconds max 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 QFN 3×3 16-Pin

THERMAL RESISTANCE-JUNCTION TO CASE, θ_{JC}	8.3 °C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	43.7 °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 into the power amplifier. This pin is RF-matched to 50 Ohm, and shorted to ground at DC.
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 to ground for better heat dissipation

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- 2.412-2.484 GHz Application Circuit Data for 802.11 b/g/n

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	LX5518			Units
			Min	Typ	Max	
For Nominal Bias of Vc = 5V, Vref = 2.95V, Icq = 155mA, @Room Temperature						
Frequency Range	f		2.412	2.45	2.484	GHz
Power Gain	Gp	Pout=26.2dBm		30		dB
Power for EVM=3%	EVM	64QAM / 54Mbps		26.2		dBm
Total Current at Pout = 26.2dBm	Total Ic	64QAM / 54Mbps		391		mA
Quiescent Current	Icq			155		mA
Bias Control Reference Current	Iref	For Icq = 155mA		2.1		mA
Gain Flatness	ΔS21	Over 100MHz		0.5		dB
Small Signal Gain	S21			30		dB
Input Return Loss	S11			10		dB
Output Return Loss	S22			10		dB
Reverse Isolation	S12			50		dB
Second Harmonic		Pout = +28dBm		-40		dBc
802.11b mask compliant power		1 Mbps DSSS		28		dBm
Total Current at Pout=28dBm		1 Mbps DSSS		510		mA
VSWR Ruggedness		Pout= +28dBm		10 :1		
Ramp-On Time	t_{ON}	10 ~ 90%		120		ns
Detector Response	DET	Pout = 26.2dBm, 64QAM / 54Mbps		1.34		V

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

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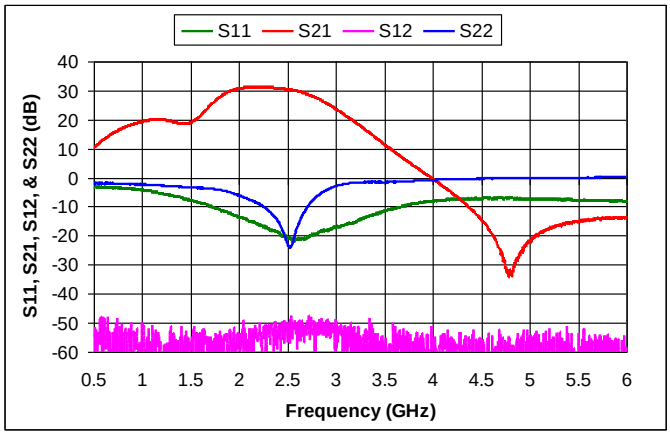
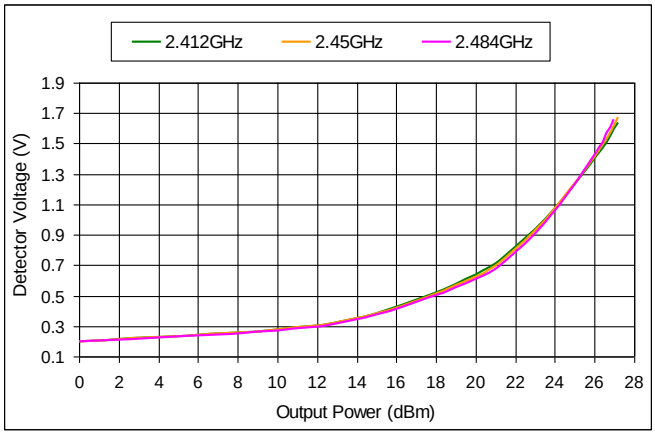
S-PARAMETER



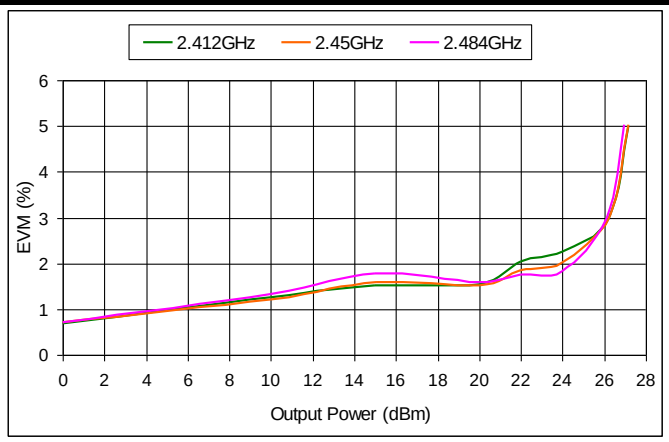
Typical S-Parameter Data at Room Temp.
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA)

DETECTOR VS. POUT @5V



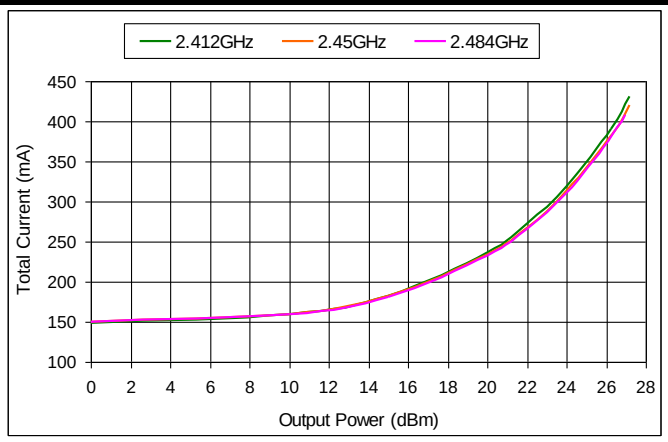
Typical Detector Voltage vs. Pout at Room Temp.
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 64QAM/54Mbps, 90% duty cycle)

EVM VS. POUT @5V



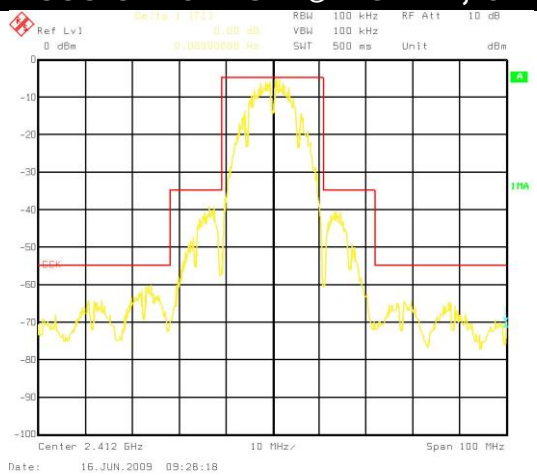
Typical EVM vs. Pout at Room Temp.
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 64QAM/54Mbps, 90% duty cycle)

TOTAL Ic VS. POUT @5V



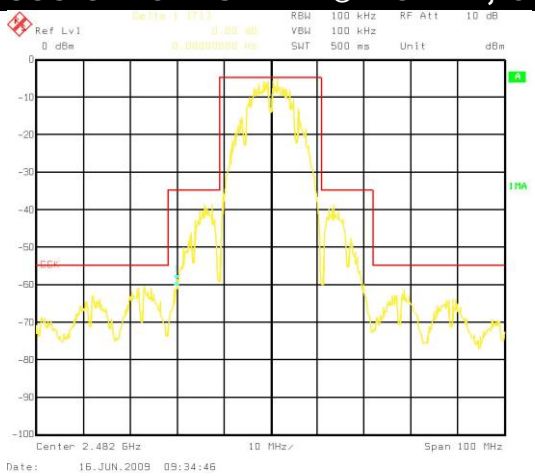
Typical Total Current vs. Pout at Room Temp.
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 64QAM/54Mbps, 90% duty cycle)

DSSS SPECTRUM @+28DBM, 5V



Typical 1Mbps DSSS output spectrum at +28dBm, 2.412GHz
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 1Mbps DSSS)

DSSS SPECTRUM AT @+28DBM, 5V



Typical 1Mbps DSSS output spectrum at +28dBm, 2.484GHz
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 1Mbps DSSS)

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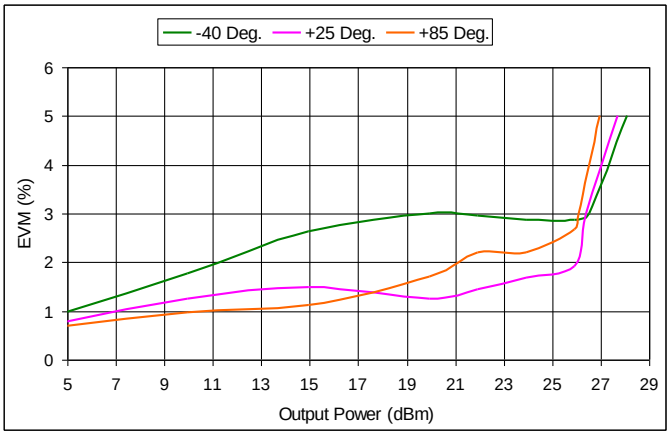
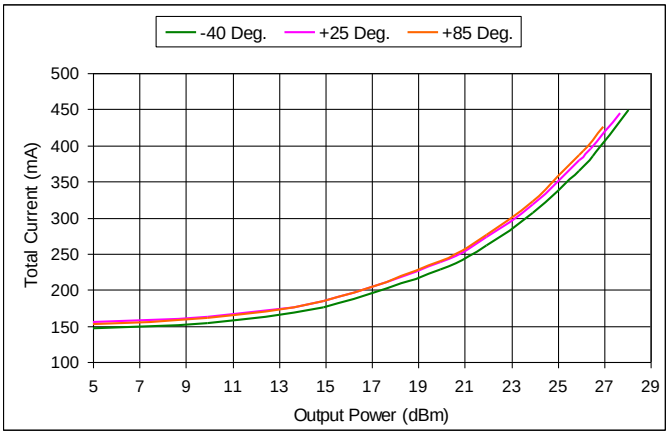
EVM VS. POUT @-40, +25, & +85°C



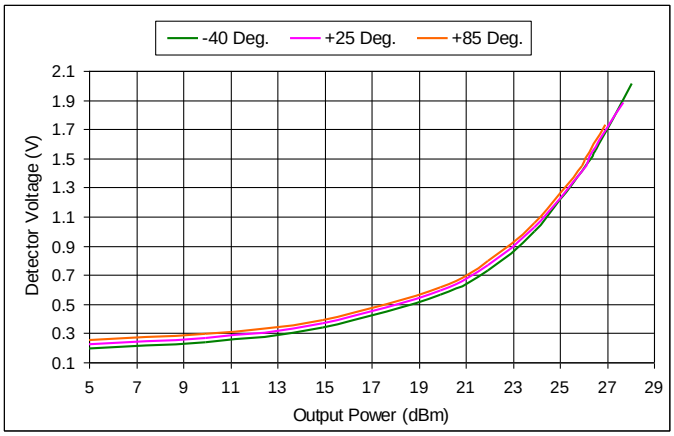
Typical EVM vs. Pout at Room Temp. @F=2.45GHz
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 64QAM/54Mbps, 90% duty cycle)

TOTAL Ic VS. POUT @-40, +25, & +85°C



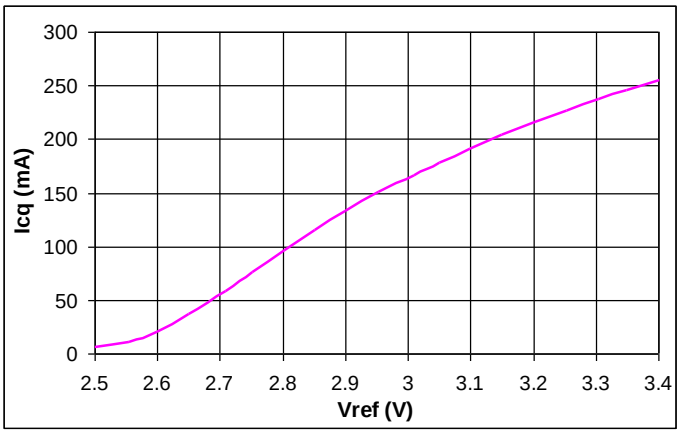
Typical Total Current vs. Pout at Room Temp. @F=2.45GHz
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 64QAM/54Mbps, 90% duty cycle)

DETECTOR VS. POUT @-40, +25, & +85°C



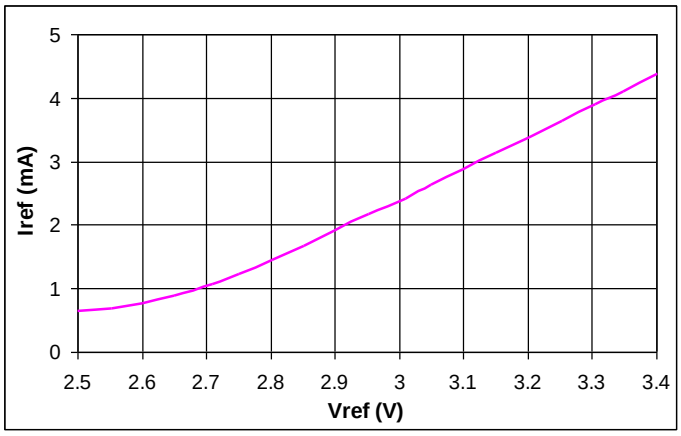
Typical EVM vs. Pout at Room Temp. @F=2.45GHz
(Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA, 64QAM/54Mbps, 90% duty cycle)

QUIESCENT CURRENT VS. BIAS VREF



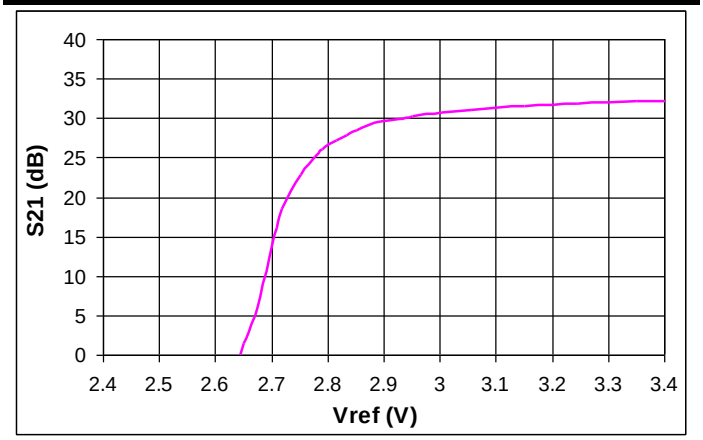
Typical Quiescent Current (Icq) vs. Bias Control Voltage (Vref) at Room Temp.
(Nominal Bias : Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA)

BIAS CONTROL CURRENT VS. BIAS VREF



Typical Bias Control Current (Iref) vs. Bias Control Voltage (Vref) at Room Temp.
(Nominal Bias : Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA)

SMALL SIGNAL GAIN VS. BIAS VREF



Typical Small Signal Gain vs. Bias Control Voltage (Vref) at Room Temp.
(Nominal Bias : Vc = Vcc = 5V, Vref = 2.95V, Icq = 155mA)

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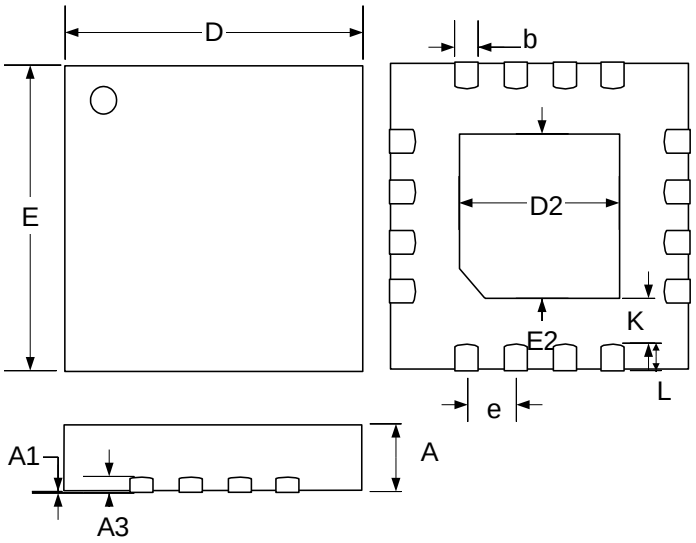
PACKAGE DIMENSIONS

LQ 16-Pin QFN 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	1.55	1.80	0.061	0.071
E2	1.55	1.80	0.061	0.071
K	0.2	-	0.008	-
L	0.20	0.40	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.

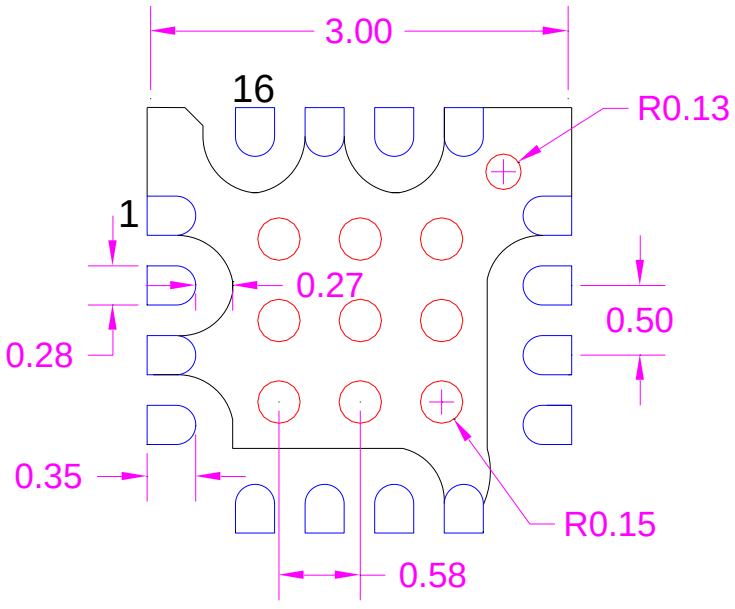


Figure – Recommended Land Pattern (Unit: mm)

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NOTES

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