
5.1-5.9 GHz 802.11ac WLAN Power Amplifier

Features

- 50Ω input and output match including DC blocks
- Integrated harmonic filter
- Operating voltage: $V_{CC} = 5.0V$
- Operating frequency: 5.1 to 5.9 GHz
- High linear output power, typical performance:
 - 802.11a OFDM Spectrum mask compliant up to 24 dBm
 - 802.11n HT40 OFDM Spectrum mask compliant up to 23 dBm
 - 3% EVM up to 20 dBm for 802.11a, 54 Mbps signal
 - 2.5% EVM up to 19 dBm for 802.11n, HT40
 - 1.8% EVM up to 18 dBm for 802.11ac, MCS9, 80 MHz BW (bandwidth) signal
- Gain: Typically 31 dB gain across 5.1–5.9 GHz
- Idle current: Typically ~320 mA I_{CQ}
- High-speed power-up/down
 - Turn on/off time (10%-90%) <100 ns
- Shut-down current (~2 μA)
- On-chip power detection
 - >20 dB linear dynamic range
 - VSWR insensitive
- All devices are RoHS compliant

Applications

- WLAN (IEEE 802.11a/n/ac)
- HyperLAN2
- Multimedia

Product Description

SST11CP22 is a 50Ω, RF-matched Power Amplifier Module (PAM) with a FCC-compliant, harmonic filter that is based on the highly-reliable InGaP/GaAs HBT technology.

Operating over the 5.1–5.9 GHz frequency band, SST11CP22 meets 802.11a spectrum mask requirements up to 24 dBm and 802.11n HT40 spectrum mask at 23 dBm. With 802.11a modulation, this PA typically provides up to 20.5 dBm with 3% EVM, and provides 18 dBm with less than 1.8% dynamic EVM using 802.11ac modulation, MCS9, 80 MHz bandwidth.

This power amplifier module also features easy board-level operation, with a simple application circuit requiring only four external components. With its high-speed power-up/-down control, SST11CP22 is controllable directly from the base-band chip.

SST11CP22 also features a wide dynamic-range, linear power detector that is temperature-stable and VSWR-insensitive.

SST11CP22 is offered in 20-contact QFN package. See [Figure 2-1](#) for pin assignments and [Table 2-1](#) for pin descriptions.

TO OUR VALUED CUSTOMERS

It is our intention to provide our valued customers with the best documentation possible to ensure successful use of your Microchip products. To this end, we will continue to improve our publications to better suit your needs. Our publications will be refined and enhanced as new volumes and updates are introduced.

If you have any questions or comments regarding this publication, please contact the Marketing Communications Department via E-mail at docerrors@microchip.com. We welcome your feedback.

Most Current Data Sheet

To obtain the most up-to-date version of this data sheet, please register at our Worldwide Web site at:

<http://www.microchip.com>

You can determine the version of a data sheet by examining its literature number found on the bottom outside corner of any page. The last character of the literature number is the version number, (e.g., DS30000000A is version A of document DS30000000).

Errata

An errata sheet, describing minor operational differences from the data sheet and recommended workarounds, may exist for current devices. As device/documentation issues become known to us, we will publish an errata sheet. The errata will specify the revision of silicon and revision of document to which it applies.

To determine if an errata sheet exists for a particular device, please check with one of the following:

- Microchip's Worldwide Web site; <http://www.microchip.com>
- Your local Microchip sales office (see last page)

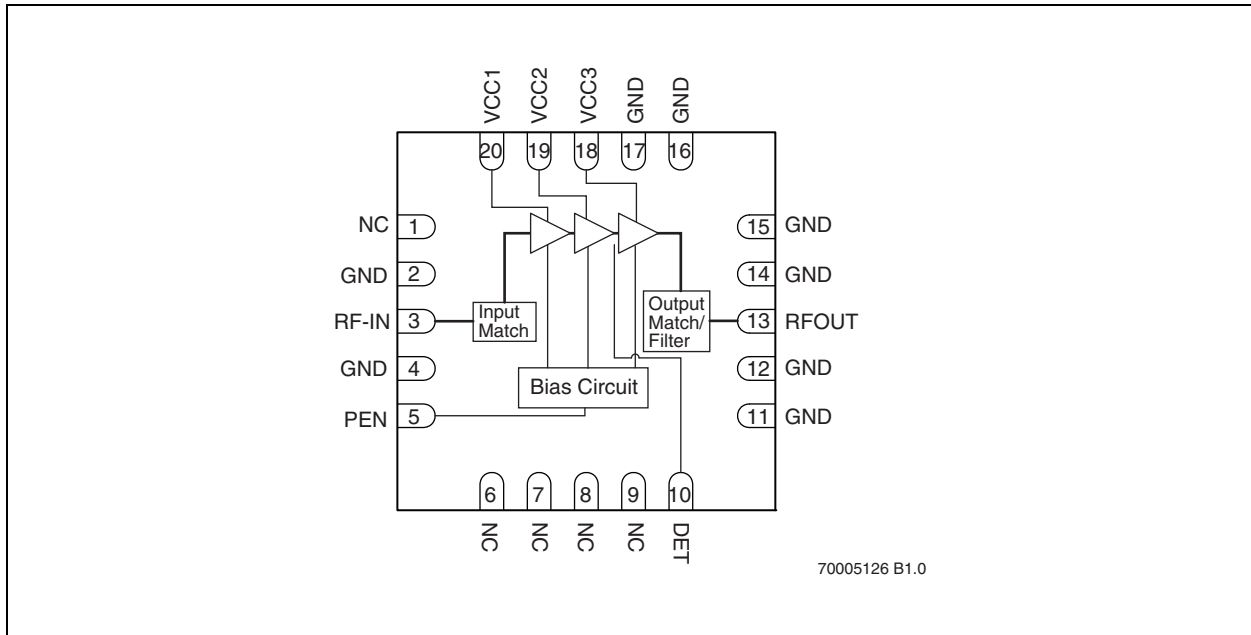
When contacting a sales office, please specify which device, revision of silicon and data sheet (include literature number) you are using.

Customer Notification System

Register on our web site at www.microchip.com to receive the most current information on all of our products.

1.0 FUNCTIONAL BLOCKS

FIGURE 1-1: FUNCTIONAL BLOCK DIAGRAM



2.0 PIN ASSIGNMENTS

FIGURE 2-1: PIN ASSIGNMENTS FOR 20-CONTACT UQFN

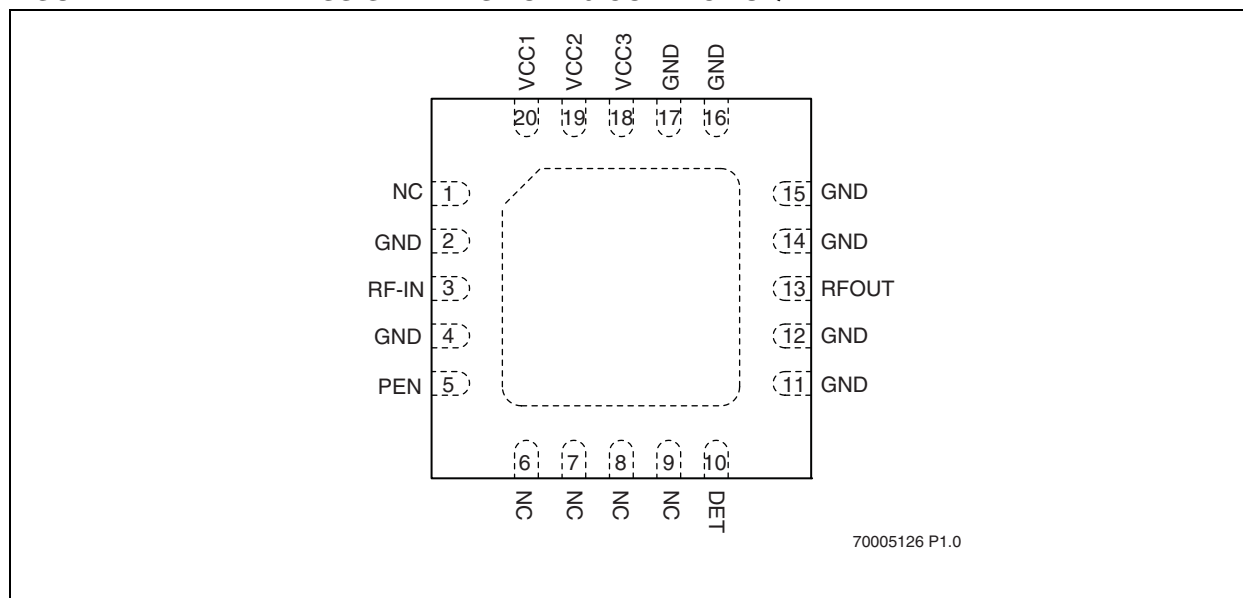


TABLE 2-1: PIN DESCRIPTION

Symbol	Pin No.	Pin Name	Function
GND	0	Center ground contact	The center pad should be connected to RF ground with several low inductance, low resistance vias.
NC	1	No Connection	Unconnected, no internal connection
GND	2	Ground	
RFIN	3	RF input	RF input port
GND	4	Ground	
PEN	5	PA enable	PA enable control input
NC	6	No Connection	Unconnected, no internal connection
NC	7	No Connection	Unconnected, no internal connection
NC	8	No Connection	Unconnected, no internal connection
NC	9	No Connection	Unconnected, no internal connection
DET	10	TX detector output	TX detector output
GND	11	Ground	
GND	12	Ground	
RF OUT	13	RF Out	RF Output port
GND	14	Ground	
GND	15	Ground	
GND	16	Ground	
GND	17	Ground	
VCC3	18	PA supply	PA Supply
VCC2	19	PA supply	PA Supply
VCC1	20	PA supply	PA Supply

3.0 ELECTRICAL SPECIFICATIONS

The AC and DC specifications for the power amplifier interface signals. Refer to [Table 3-2](#) for the DC voltage and current specifications. Refer to [Figures 4-1](#) through [4-7](#) for the RF performance.

Absolute Maximum Stress Ratings (Applied conditions greater than those listed under “Absolute Maximum Stress Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum stress rating conditions may affect device reliability.)

Supply Voltage at pins 18, 19, and 20 (V_{CC})	-0.3V to +6.5V
Supply voltage to pins 5, 6, and 7 (V_{PEN})	-0.3V to +3.6V
DC supply current (I_{CC})	600 mA
Operating Temperature (T_A)	-20°C to +85°C
Storage Temperature (T_{STG})	-40°C to +120°C
Maximum Junction Temperature (T_J)	+150°C
Maximum Output Power	26 dBm
Surface Mount Solder Reflow Temperature	260°C for 10 seconds

TABLE 3-1: OPERATING RANGE

Range	Ambient Temp	V_{CC}
Industrial	-10°C to +85°C	5.0V-6.0V

TABLE 3-2: DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Min.	Typ	Max.	Unit
V_{CC}	Supply Voltage		5.0	6.0	V
I_{CC}	Supply Current @ $P_{OUT} = 20$ dBm		370		mA
I_{CQ}	V_{CC} Quiescent Current		320		mA
I_{OFF}	Shutdown Current		2		μA
V_{PEN}	Recommended Enable Voltage		2.85		V
I_{PEN}	Total Enable Current		8		mA
V_{DET}	RF Power Detector Voltage Output Range, 0 to 23 dBm	0.15		1.0	V
	Voltage at 20 dBm		0.75		V

TABLE 3-3: AC ELECTRICAL CHARACTERISTICS FOR CONFIGURATION $V_{CC} = 5.0V$, $V_{PEN}=2.85V$, 25 °C UNLESS OTHERWISE SPECIFIED

Symbol	Parameter	Min.	Typ	Max.	Unit
F_{L-U}	Frequency range	5.1		5.9	GHz
Linear Power	Output power at 3% EVM at 54 Mbps OFDM signal, 802.11a		20.5		dBm
	Output power at 2.5% dynamic EVM 802.11n HT40		19		dBm
	Output power 1.8% dynamic EVM MCS9 80 MHz BW		18		dBm
	ACPR _A output power level with 802.11a mask compliance @ 6Mbps OFDM		24		dBm
	ACPR _{N40} output power level with 802.11n HT40 mask compliance		23		dBm
G	Power gain from 5.18-5.9 GHz		31		dB
RL	RF input return loss		10		dB
$2f_0$	Second harmonic power density at 24 dBm		-45		dBm/MHz
$3f_0$	Third harmonic power density at 24 dBm		-50		dBm/MHz

4.0 TYPICAL PERFORMANCE CHARACTERISTICS

Test Conditions: $V_{CC} = 5.0V$, $T_A = 25^\circ C$, $V_{PEN} = 2.85V$, 802.11a 54 Mbps OFDM Modulation, 50% Duty Cycle, $25^\circ C$ Unless otherwise specified

FIGURE 4-1: S-PARAMETERS

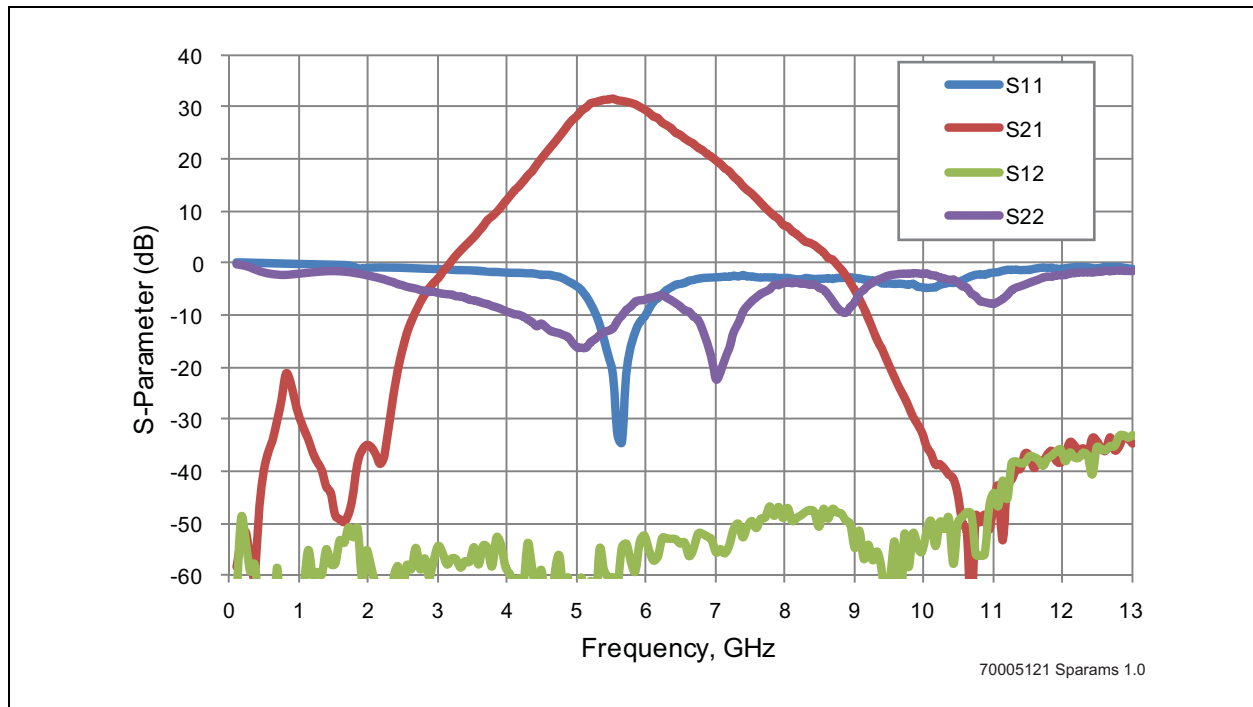


FIGURE 4-2: DYNAMIC EVM VERSUS OUTPUT POWER, 802.11a 54 Mbps, 50% DUTY CYCLE, $V_{PEN}=2.85V$

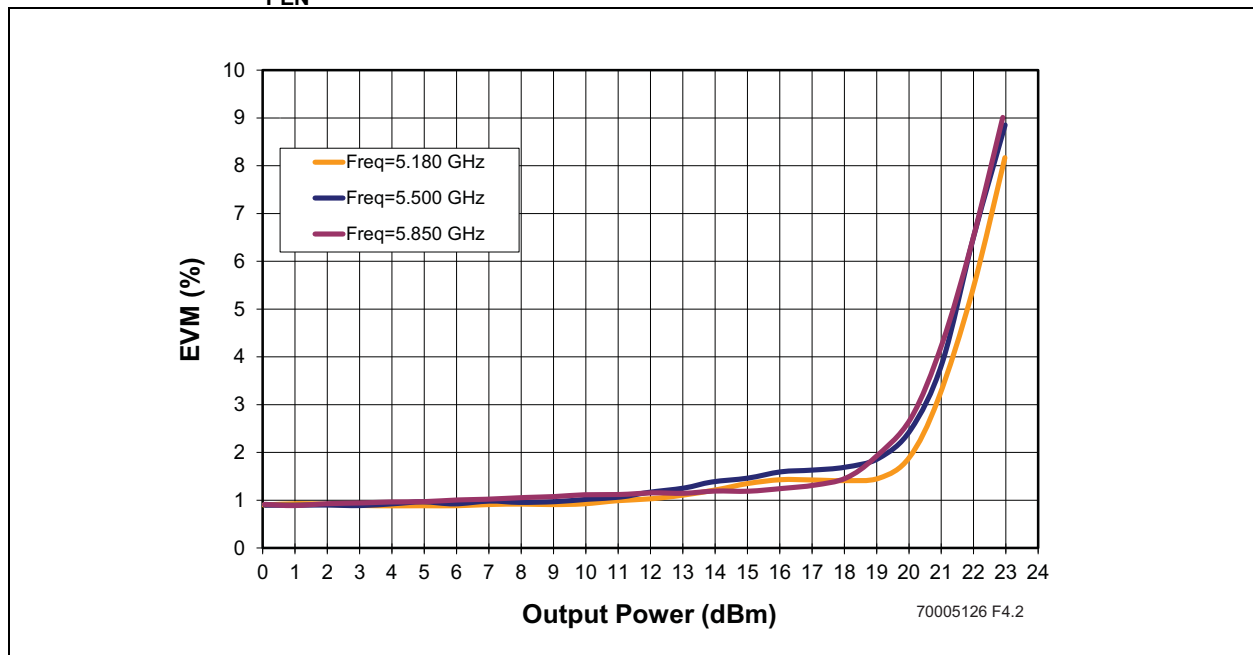


FIGURE 4-3: DYNAMIC EVM VERSUS OUTPUT POWER, 802.11n MCS7-HT40, 40 MHz, 50% DUTY CYCLE, $V_{PEN}=2.85V$

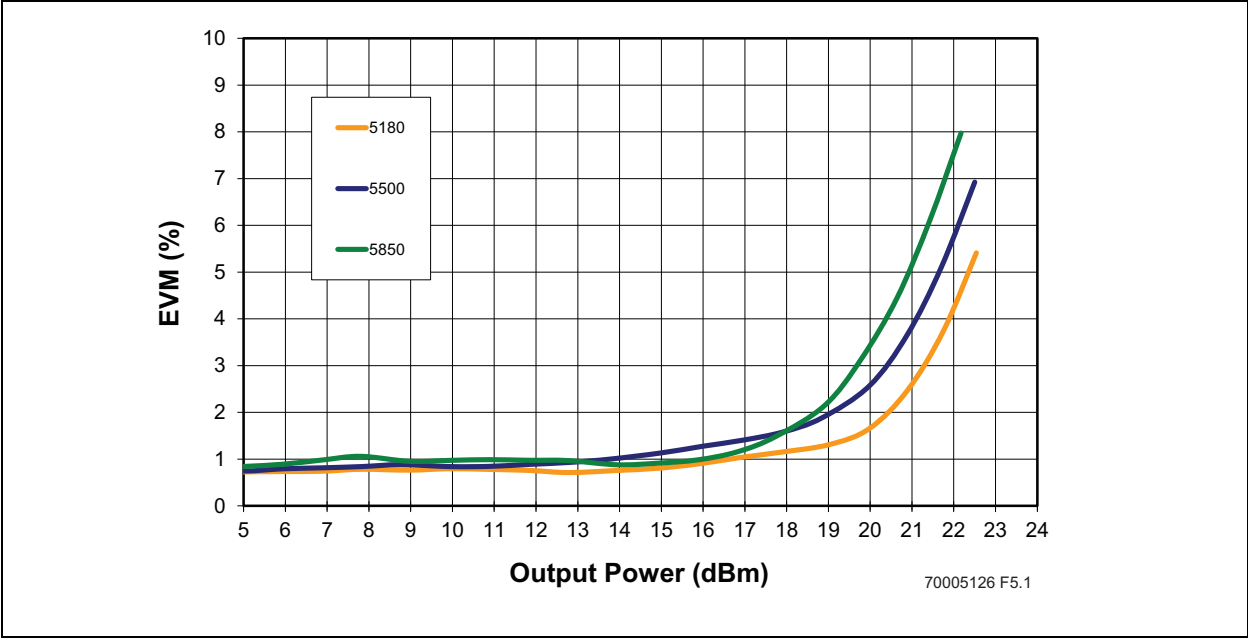


FIGURE 4-4: DYNAMIC EVM VERSUS OUTPUT POWER, 802.11ac MCS9, 80 MHz, 60 μS PULSE, 50% DUTY CYCLE, $V_{PEN}=2.85V$

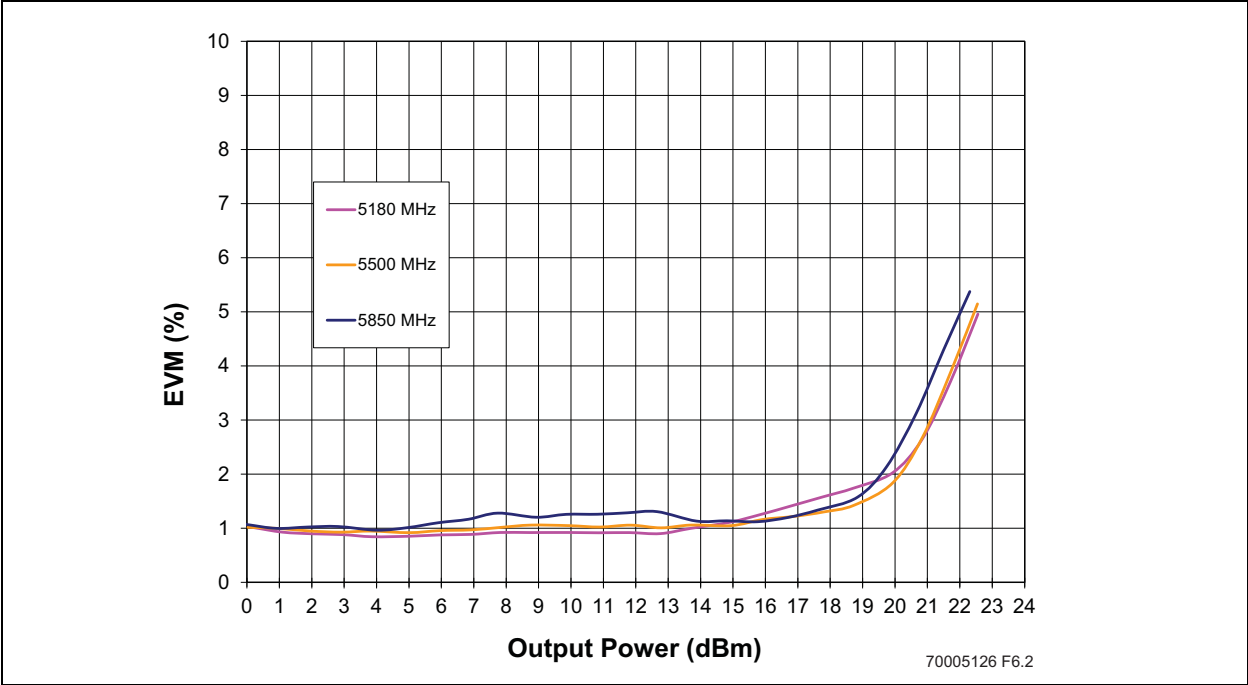


FIGURE 4-5: INSTANTANEOUS POWER SUPPLY CURRENT VERSUS OUTPUT POWER,
 $V_{CC}=5.0V$, 802.11ac MCS9, 80 MHz, 60 μs PULSE, 50% DUTY CYCLE $V_{PEN}=2.85V$

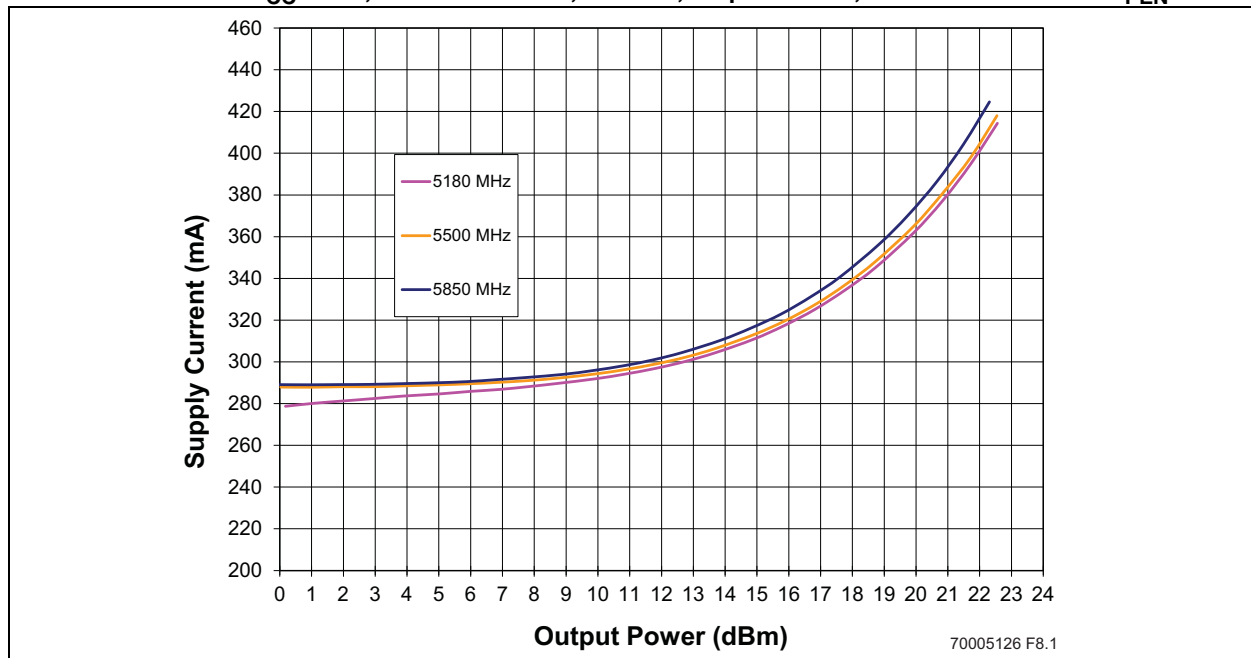


FIGURE 4-6: POWER GAIN VERSUS OUTPUT POWER

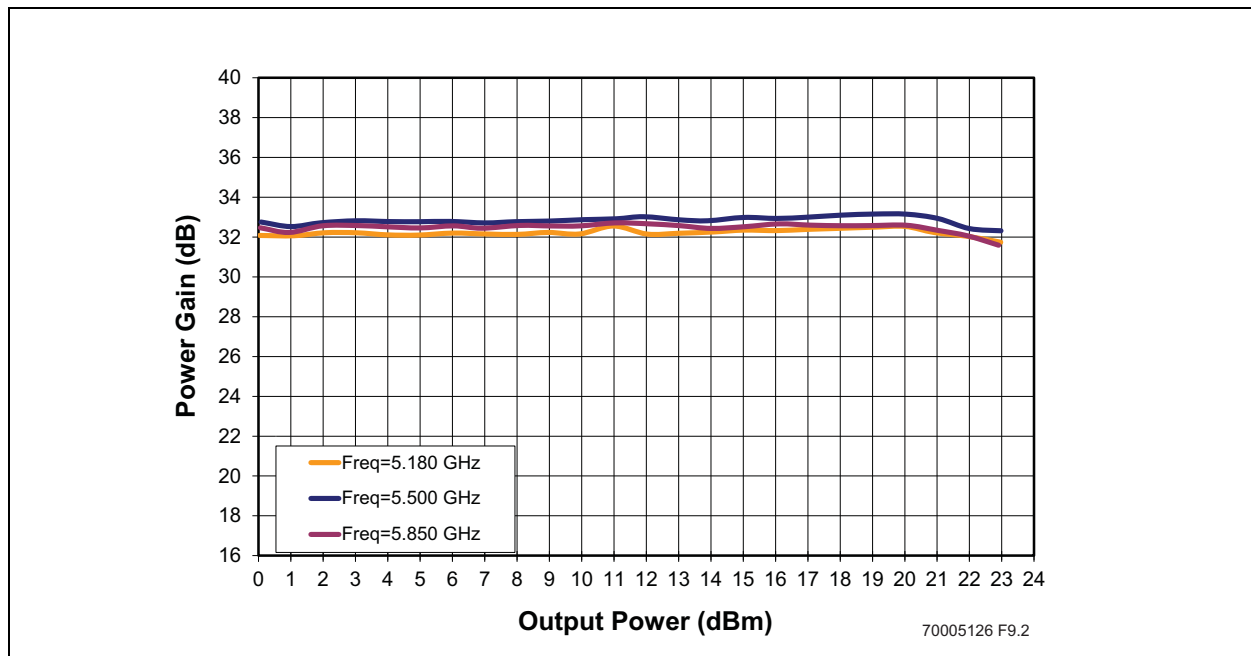


FIGURE 4-7: DETECTOR VOLTAGE VERSUS OUTPUT POWER, $V_{PEN}=2.85V$

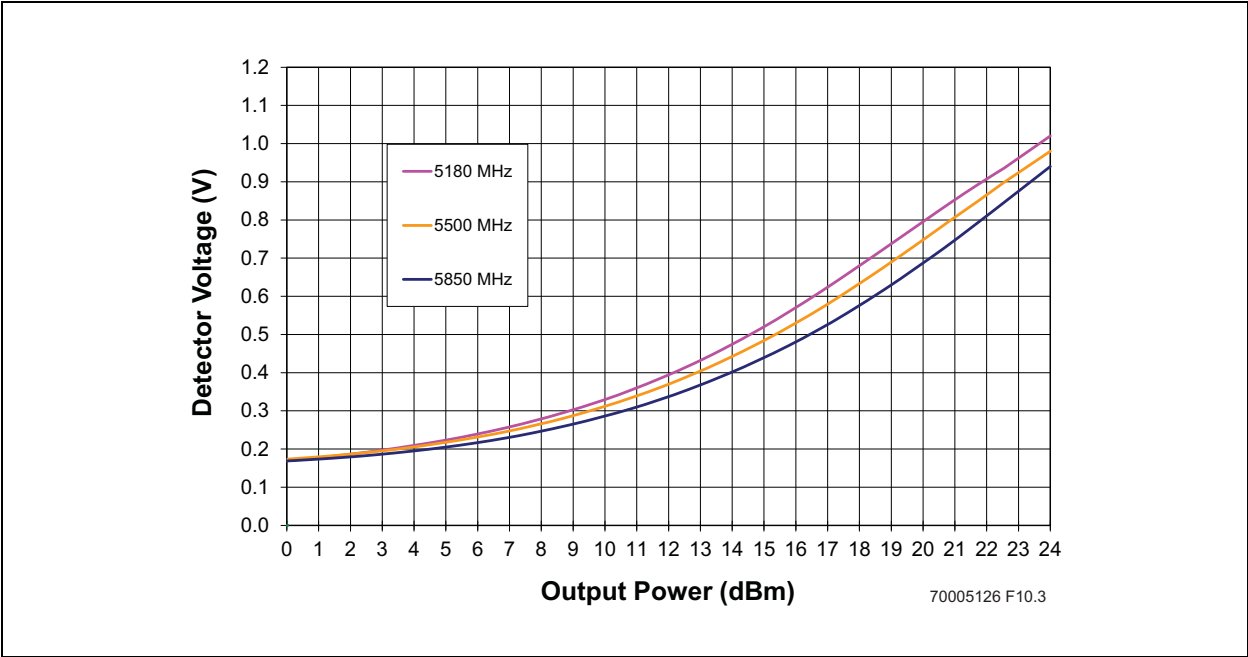
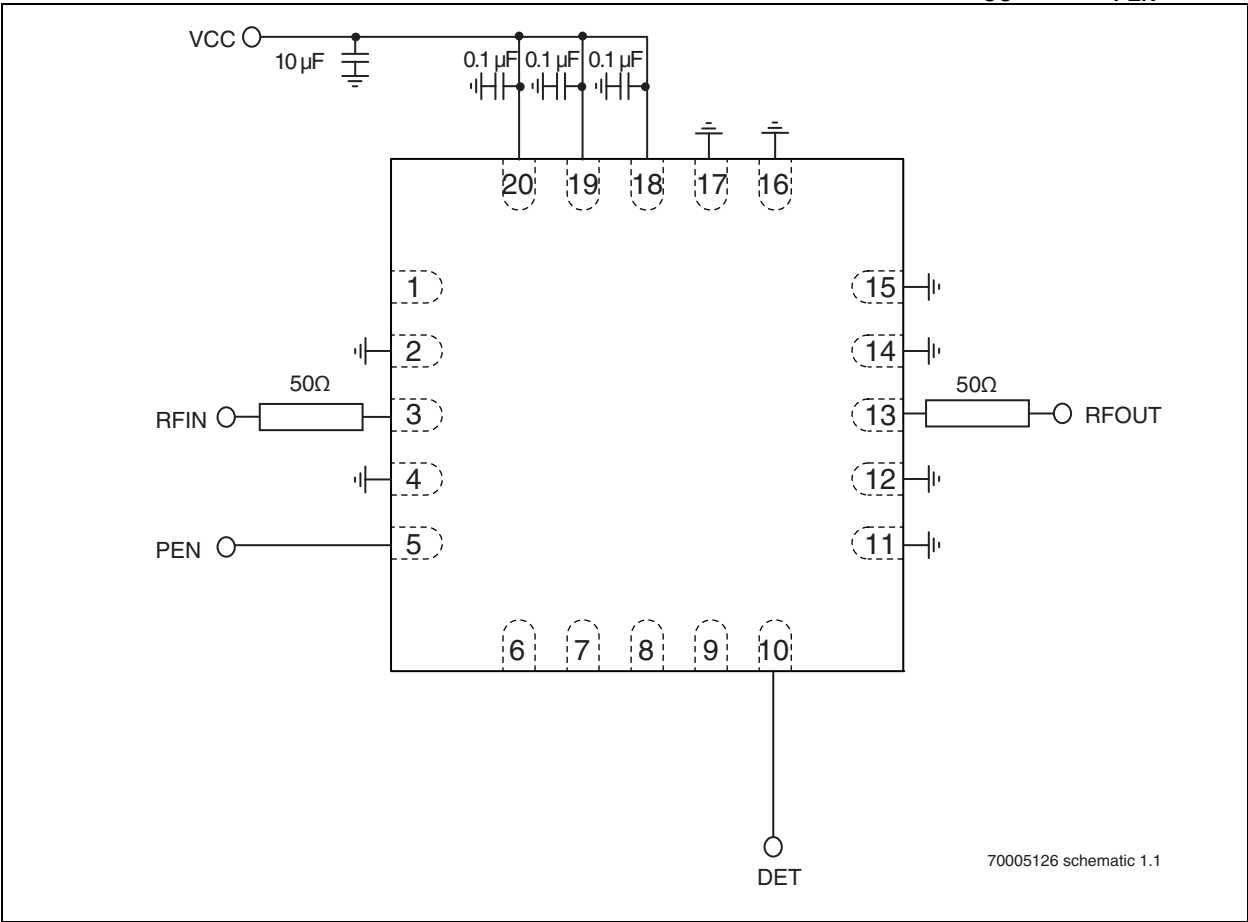


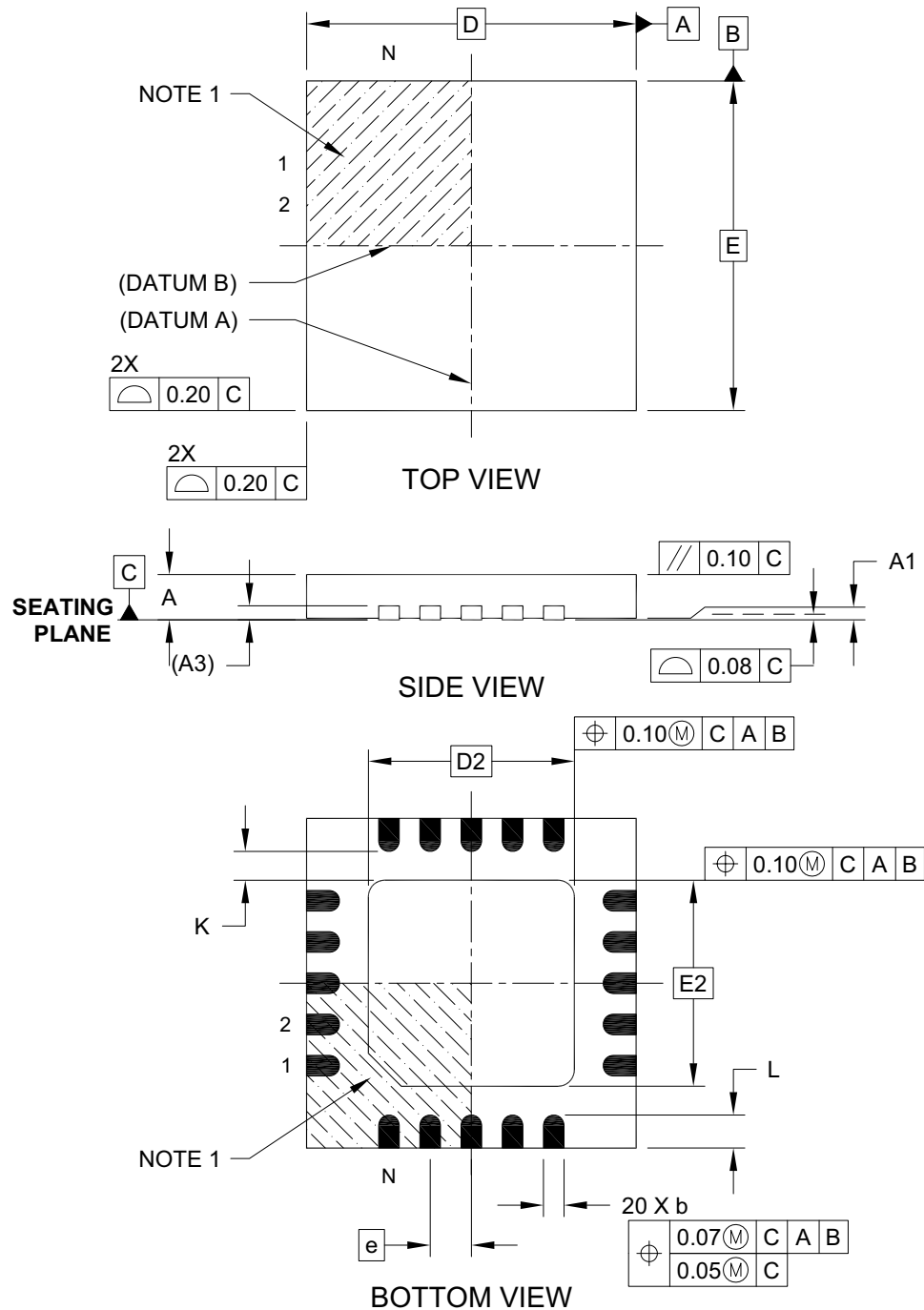
FIGURE 4-8: TYPICAL SCHEMATIC FOR 802.11a/n/ac APPLICATIONS, $V_{CC}=5.0V$, $V_{PEN}=2.85V$



5.0 PACKAGE INFORMATION

20-Lead Ultra Thin Quad Flat Pack, No Lead (GN) - 4x4x0.55 mm Body (UQFN)

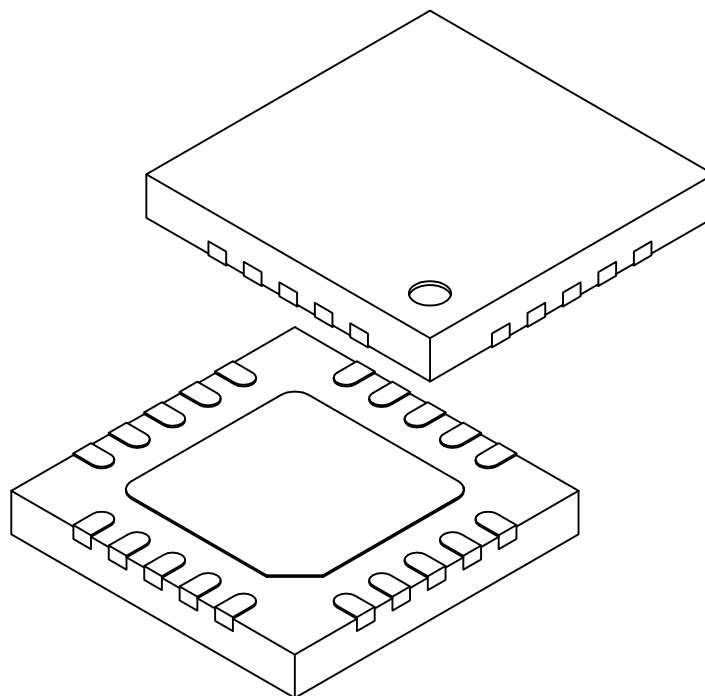
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-252A Sheet 1 of 2

20-Lead Ultra Thin Quad Flat Pack, No Lead (GN) - 4x4x0.55 mm Body (UQFN)

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	20		
Pitch	e	0.50 BSC		
Overall Height	A	0.50	0.55	0.60
Standoff	A1	0.00	0.02	0.05
Terminal Thickness	(A3)	0.15 REF		
Overall Width	E	4.00 BSC		
Exposed Pad Width	E2	2.45	2.50	2.55
Overall Length	D	4.00 BSC		
Exposed Pad Length	D2	2.45	2.50	2.55
Terminal Width	b	0.20	0.25	0.30
Terminal Length	L	0.35	0.40	0.45
Terminal-to-Exposed-Pad	K	0.20	-	-

Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated
- Dimensioning and tolerancing per ASME Y14.5M
 - BSC: Basic Dimension. Theoretically exact value shown without tolerances.
 - REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-252A Sheet 2 of 2

TABLE 5-1: REVISION HISTORY

Revision	Description	Date
A	<ul style="list-style-type: none">Initial release of data sheet	Jul 2013
B	<ul style="list-style-type: none">Revised Product Description on page 1Updated Figures 4-2 to 4-8Updated Tables 3-2 and 3-3	Mar 2015

THE MICROCHIP WEB SITE

Microchip provides online support via our WWW site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at www.microchip.com. Under "Support", click on "Customer Change Notification" and follow the registration instructions.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: <http://microchip.com/support>

6.0 PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>XXX</u>	Valid Combinations:
Device	Package	SST11CP22-GN SST11CP22-GN-K
Device: SST11CP22	= 51.-5.9 GHz Power Amplifier	
Package: GN	= UQFN (4mm x 4mm), 0.6 max thickness 20-contact	
Evaluation Kit K Flag	= Evaluation Kit	

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rPIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MTP, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.


Analog-for-the-Digital Age, Application Maestro, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICKit, PICTail, REAL ICE, rLAB, Select Mode, SQI, Serial Quad I/O, Total Endurance, TSHARC, UniWinDriver, WiperLock, ZENA and Z-Scale are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

GestIC and ULPP are registered trademarks of Microchip Technology Germany II GmbH & Co. & KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2015, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-63277-179-7

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949 ==

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

World Wide Sales and Service

AMERICAS

Corporate Office
 2355 West Chandler Blvd.
 Chandler, AZ 85224-6199
 Tel: 480-792-7200
 Fax: 480-792-7277
 Technical Support:
<http://www.microchip.com/support>
 Web Address:
www.microchip.com

Atlanta
 Duluth, GA
 Tel: 678-957-9614
 Fax: 678-957-1455

Austin, TX
 Tel: 512-257-3370

Boston
 Westborough, MA
 Tel: 774-760-0087
 Fax: 774-760-0088

Chicago
 Itasca, IL
 Tel: 630-285-0071
 Fax: 630-285-0075

Cleveland
 Independence, OH
 Tel: 216-447-0464
 Fax: 216-447-0643

Dallas
 Addison, TX
 Tel: 972-818-7423
 Fax: 972-818-2924

Detroit
 Novi, MI
 Tel: 248-848-4000

Houston, TX
 Tel: 281-894-5983
 Indianapolis

Noblesville, IN
 Tel: 317-773-8323
 Fax: 317-773-5453

Los Angeles
 Mission Viejo, CA
 Tel: 949-462-9523
 Fax: 949-462-9608

New York, NY
 Tel: 631-435-6000

San Jose, CA
 Tel: 408-735-9110

Canada - Toronto
 Tel: 905-673-0699
 Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
 Suites 3707-14, 37th Floor
 Tower 6, The Gateway
 Harbour City, Kowloon

Hong Kong
 Tel: 852-2943-5100
 Fax: 852-2401-3431

Australia - Sydney
 Tel: 61-2-9868-6733
 Fax: 61-2-9868-6755

China - Beijing
 Tel: 86-10-8569-7000
 Fax: 86-10-8528-2104

China - Chengdu
 Tel: 86-28-8665-5511
 Fax: 86-28-8665-7889

China - Chongqing
 Tel: 86-23-8980-9588
 Fax: 86-23-8980-9500

China - Dongguan
 Tel: 86-769-8702-9880

China - Hangzhou
 Tel: 86-571-8792-8115
 Fax: 86-571-8792-8116

China - Hong Kong SAR
 Tel: 852-2943-5100
 Fax: 852-2401-3431

China - Nanjing
 Tel: 86-25-8473-2460
 Fax: 86-25-8473-2470

China - Qingdao
 Tel: 86-532-8502-7355
 Fax: 86-532-8502-7205

China - Shanghai
 Tel: 86-21-5407-5533
 Fax: 86-21-5407-5066

China - Shenyang
 Tel: 86-24-2334-2829
 Fax: 86-24-2334-2393

China - Shenzhen
 Tel: 86-755-8864-2200
 Fax: 86-755-8203-1760

China - Wuhan
 Tel: 86-27-5980-5300
 Fax: 86-27-5980-5118

China - Xian
 Tel: 86-29-8833-7252
 Fax: 86-29-8833-7256

ASIA/PACIFIC

China - Xiamen
 Tel: 86-592-2388138
 Fax: 86-592-2388130

China - Zhuhai
 Tel: 86-756-3210040
 Fax: 86-756-3210049

India - Bangalore
 Tel: 91-80-3090-4444
 Fax: 91-80-3090-4123

India - New Delhi
 Tel: 91-11-4160-8631
 Fax: 91-11-4160-8632

India - Pune
 Tel: 91-20-3019-1500

Japan - Osaka
 Tel: 81-6-6152-7160
 Fax: 81-6-6152-9310

Japan - Tokyo
 Tel: 81-3-6880-3770
 Fax: 81-3-6880-3771

Korea - Daegu
 Tel: 82-53-744-4301
 Fax: 82-53-744-4302

Korea - Seoul
 Tel: 82-2-554-7200
 Fax: 82-2-558-5932 or
 82-2-558-5934

Malaysia - Kuala Lumpur
 Tel: 60-3-6201-9857
 Fax: 60-3-6201-9859

Malaysia - Penang
 Tel: 60-4-227-8870
 Fax: 60-4-227-4068

Philippines - Manila
 Tel: 63-2-634-9065
 Fax: 63-2-634-9069

Singapore
 Tel: 65-6334-8870
 Fax: 65-6334-8850

Taiwan - Hsin Chu
 Tel: 886-3-5778-366
 Fax: 886-3-5770-955

Taiwan - Kaohsiung
 Tel: 886-7-213-7828

Taiwan - Taipei
 Tel: 886-2-2508-8600
 Fax: 886-2-2508-0102

Thailand - Bangkok
 Tel: 66-2-694-1351
 Fax: 66-2-694-1350

EUROPE

Austria - Wels
 Tel: 43-7242-2244-39
 Fax: 43-7242-2244-393

Denmark - Copenhagen
 Tel: 45-4450-2828
 Fax: 45-4485-2829

France - Paris
 Tel: 33-1-69-53-63-20
 Fax: 33-1-69-30-90-79

Germany - Dusseldorf
 Tel: 49-2129-3766400

Germany - Munich
 Tel: 49-89-627-144-0
 Fax: 49-89-627-144-44

Germany - Pforzheim
 Tel: 49-7231-424750

Italy - Milan
 Tel: 39-0331-742611
 Fax: 39-0331-466781

Italy - Venice
 Tel: 39-049-7625286

Netherlands - Drunen
 Tel: 31-416-690399
 Fax: 31-416-690340

Poland - Warsaw
 Tel: 48-22-3325737

Spain - Madrid
 Tel: 34-91-708-08-90
 Fax: 34-91-708-08-91

Sweden - Stockholm
 Tel: 46-8-5090-4654

UK - Wokingham
 Tel: 44-118-921-5800
 Fax: 44-118-921-5820