

# 2.4-2.5 GHz Power Amplifier

SST12LP00



EOL Data Sheet

## FEATURES:

- **High Gain:**
  - Typically 28 dB gain across 2.4– 2.5 GHz over temperatures 0– 85°C
- **High linear output power:**
  - >24 dBm P1dB
- **High power-added efficiency/low operating current for Bluetooth applications**
  - ~50% PAE or 115 mA total current consumption @  $P_{out} = 23$  dBm for  $V_{CC} = 3.3V$  and  $GCTL = 3.0V$
- **Low idle current**
  - ~10 mA  $I_{CQ}$
- **Simple input/output matching**
- **Packages available**
  - 6-contact VQFN and UQFN (3 x 1.6mm<sup>2</sup>)

## APPLICATIONS:

- Bluetooth
- USB Dongles
- 2.4 GHz Cordless phones

## PRODUCT DESCRIPTION

The SST12LP00 is a high-power and high-gain power amplifier based on the highly reliable InGaP/GaAs HBT technology. SST12LP00 is easily configured for high-power and high-efficiency applications while operating over the 2.4- 2.5 GHz frequency band. This device typically provides 30 dB gain with better than 50% power added efficiency @  $P_{out} = 23$  dBm.

The SST12LP00's excellent linearity is well suited for Class 1 Bluetooth operation. The power amplifier IC also features easy board-level usage along with high speed power up/down control. A low reference current makes SST12LP00 ideal for the final stage power amplification in battery-powered Bluetooth, USB Dongle, or cordless phone transmitter applications.

The SST12LP00 is offered in both 6-contact VQFN and UQFN packages. See Figure 2 for pin assignments and Table 1 for pin descriptions.



## FUNCTIONAL BLOCKS

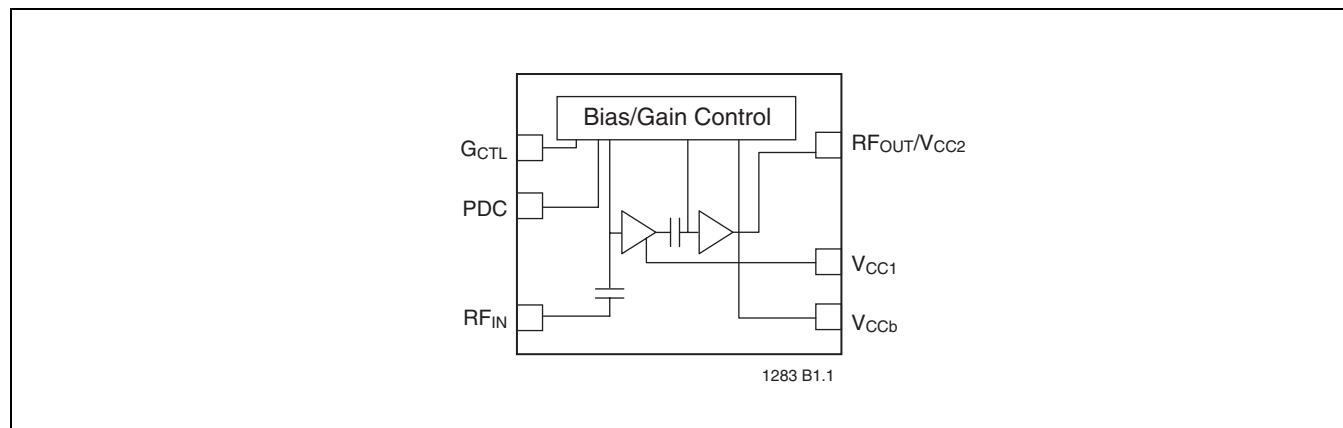


FIGURE 1: Functional Block Diagram

## PIN ASSIGNMENTS

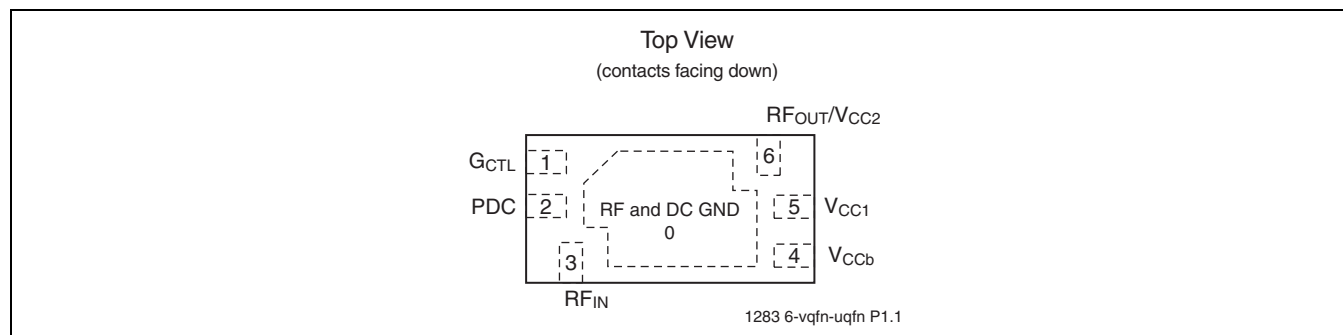


FIGURE 2: Pin Assignments for 6-contact VQFN and UQFN

## PIN DESCRIPTIONS

TABLE 1: Pin Description

| Symbol       | Pin No. | Pin Name     | Type <sup>1</sup> | Function                                                                                          |
|--------------|---------|--------------|-------------------|---------------------------------------------------------------------------------------------------|
| GND          | 0       | Ground       |                   | The center pad should be connected to RF ground with several low inductance, low resistance vias. |
| G_CTL        | 1       |              |                   | Power Amplifier Gain Control                                                                      |
| PDC          | 2       |              |                   | Power-down Control                                                                                |
| RF_IN        | 3       |              | I                 | RF input, DC decoupled                                                                            |
| V_CCb        | 4       | Power Supply | PWR               | Vcc power supply, bias circuit                                                                    |
| V_CC1        | 5       | Power Supply | PWR               | Vcc power supply, 1st stage                                                                       |
| RF_OUT/V_CC2 | 6       |              | O/PWR             | Vcc power supply, 2nd stage                                                                       |

1. I=Input, O=Output



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### ELECTRICAL SPECIFICATIONS

The AC and DC specifications for the power amplifier interface signals. Refer to Table 2 for the DC voltage and current specifications. Refer to Figure 3 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 4, 5, and 6 ( $V_{CC}$ ) ..... -0.3V to +3.6V  
 Power-down Control Voltage (PDC)..... -0.3V to  $V_{CC}$   
 Gain Control Voltage ( $G_{CTL}$ )..... -0.3V to  $V_{CC}$   
 Radio Frequency Input Power ( $RF_{IN}$ )..... +10 dBm  
 Operating Temperature ( $T_A$ )..... -40°C to +85°C  
 Storage Temperature ( $T_{STG}$ ) ..... -40°C to +120°C  
 Maximum Junction Temperature ( $T_J$ )..... +150°C  
 Surface Mount Solder Reflow Temperature ..... 260°C for 10 seconds

#### Operating Range

| Range      | Ambient Temp   | $V_{CC}$ |
|------------|----------------|----------|
| Industrial | -40°C to +85°C | 3.3V     |

**TABLE 2: DC Electrical Characteristics**

| Symbol     | Parameter                            | Min. | Typ | Max. | Unit | Test Conditions |
|------------|--------------------------------------|------|-----|------|------|-----------------|
| $V_{CC}$   | Supply Voltage at pins 4, 5, and 6   | 2.7  | 3.3 | 3.6  | V    |                 |
| $I_{CC}$   | Supply Current @ $P_{OUT} = 23$ dBm  |      | 115 |      | mA   |                 |
| $G_{CTL}$  | Power Amplifier Gain Control Voltage | 0.1  | 3.0 | 3.3  | V    |                 |
| $I_{GCTL}$ | Current through $G_{CTL}$ pin        |      | 55  | 100  | μA   |                 |
| PDC        | Logic High Voltage                   | 2.6  |     |      | V    |                 |
|            | Logic Low Voltage                    |      |     | 0.8  | V    |                 |
| $I_{CQ}$   | Idle Current ( $G_{CTL} = 3.0V$ )    |      | 10  |      | mA   |                 |

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**TABLE 3: AC Electrical Characteristics**

| Symbol    | Parameter                                                            | Min. | Typ | Max. | Unit |
|-----------|----------------------------------------------------------------------|------|-----|------|------|
| $F_{L-U}$ | Frequency range                                                      | 2402 |     | 2480 | MHz  |
| $P_{OUT}$ | Output power<br>@ $PIN = -7$ dBm, $V_{CC} = 3.3V$ , $G_{CTL} = 3.0V$ |      | 23  |      | dBm  |
| G         | Small signal gain                                                    |      | 27  |      | dB   |
| $G_{VAR}$ | Gain variation over band (2400~2485 MHz)                             |      | 0.2 | 0.5  | dB   |

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## TYPICAL PERFORMANCE CHARACTERISTICS

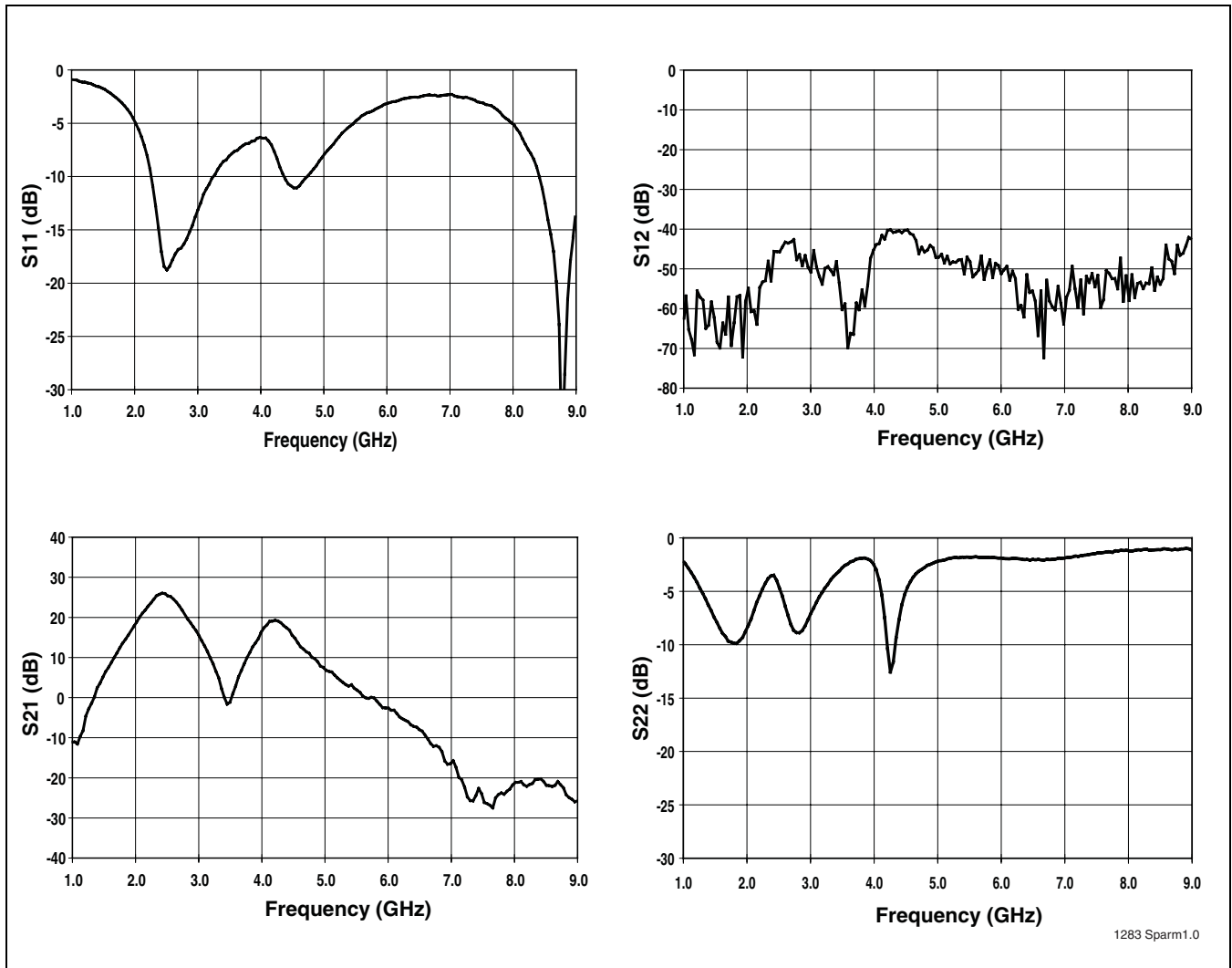
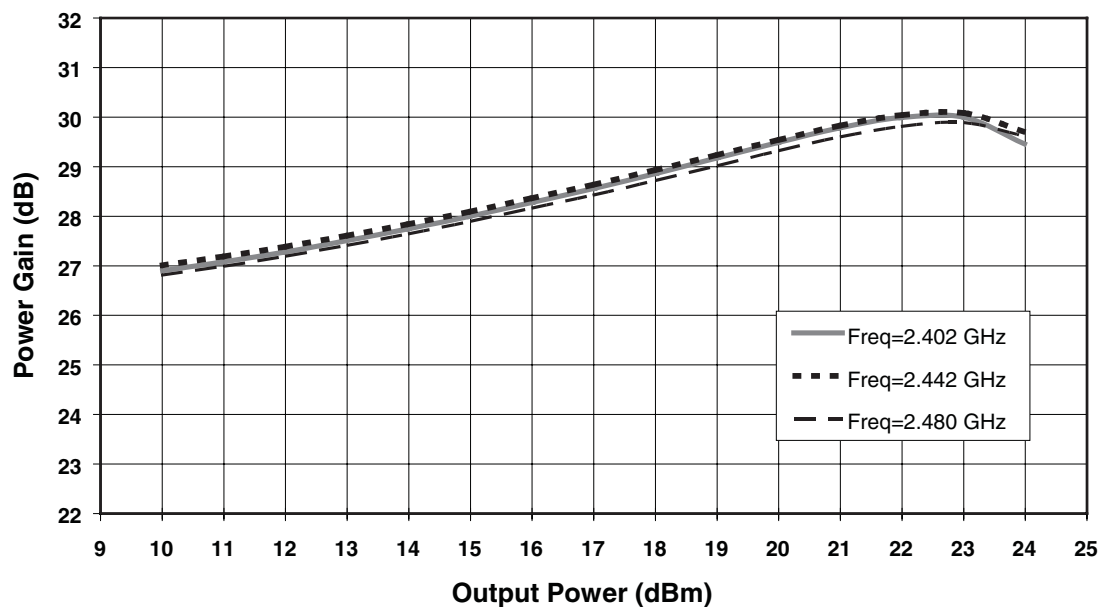
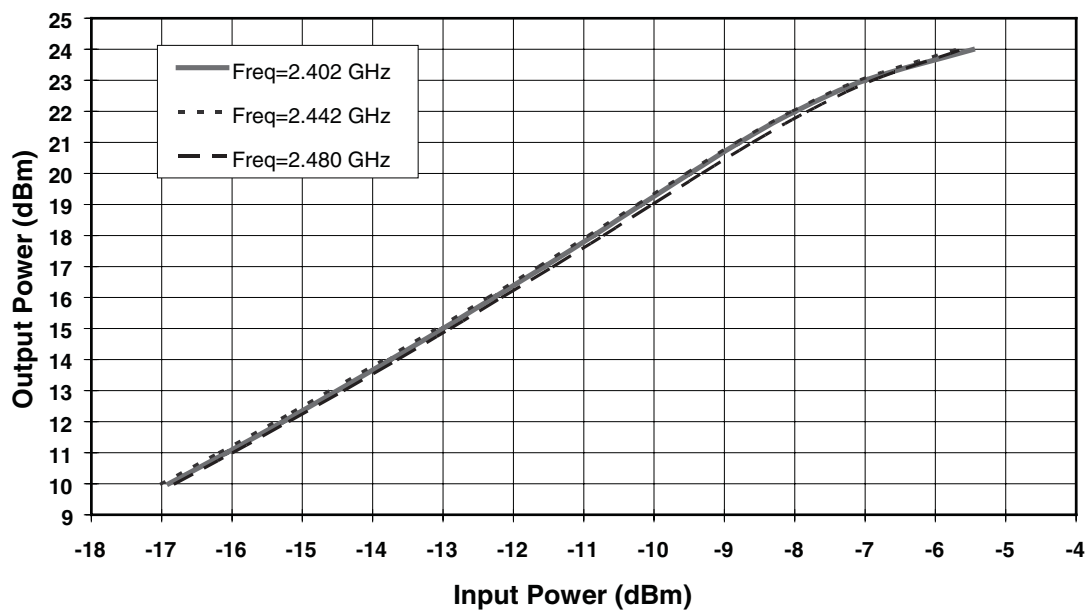


FIGURE 3: S-parameters for SST12LP00



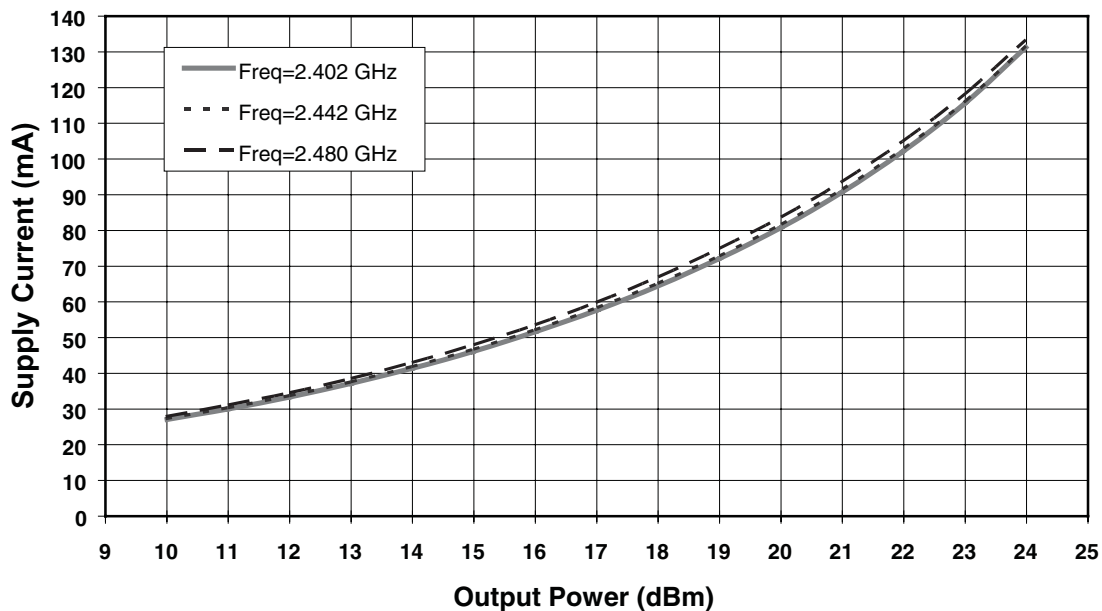
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FIGURE 4: Power Gain versus Output Power



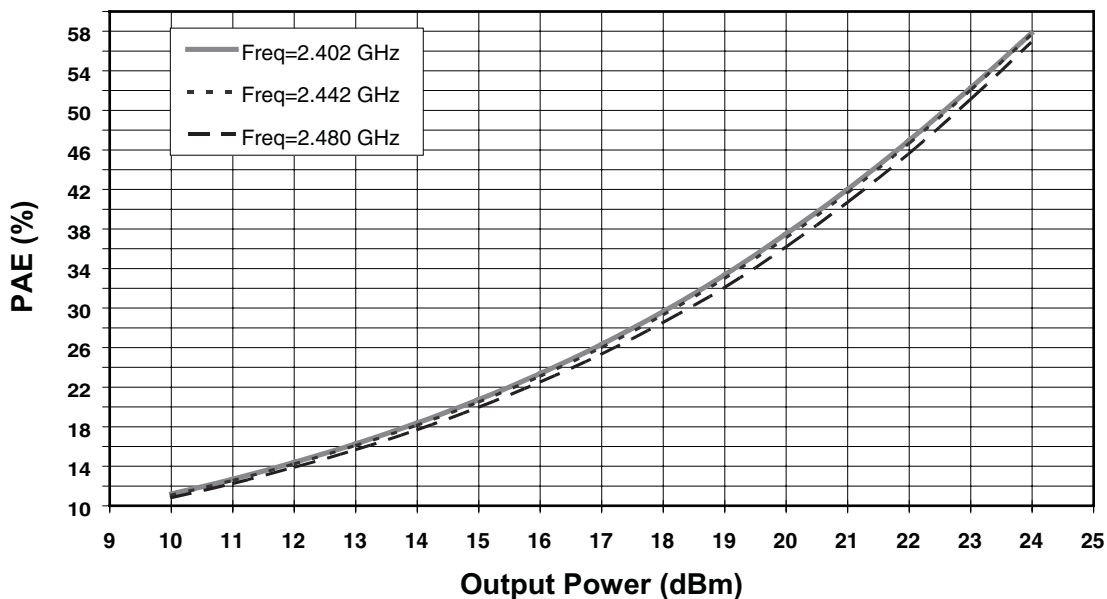
1283 F4.1

FIGURE 5: Output Power versus Input Power



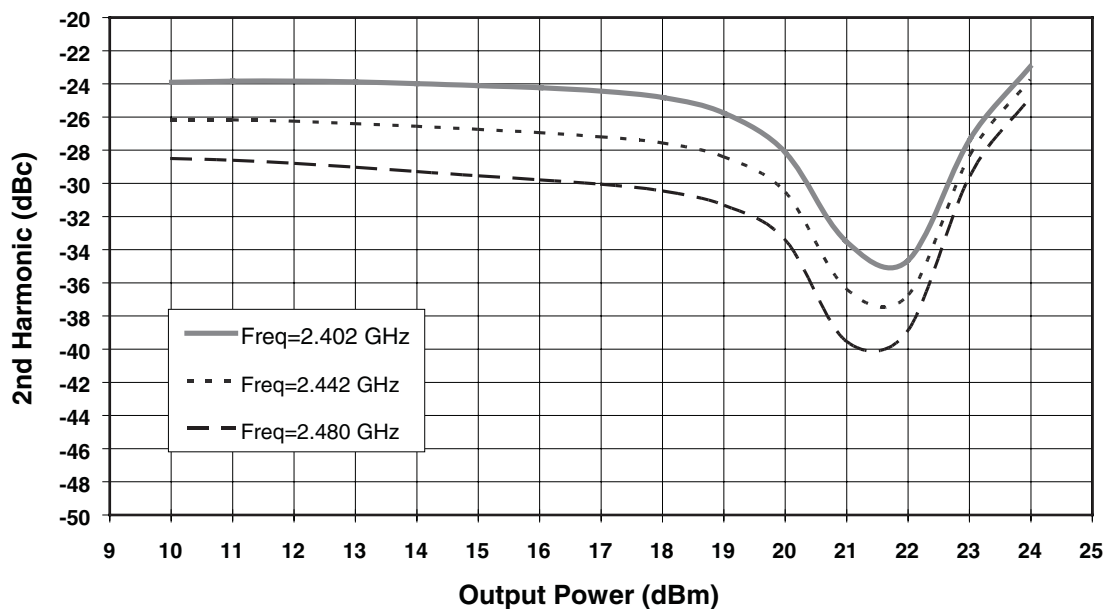
1283 F5.1

FIGURE 6: Supply Current versus Output Power



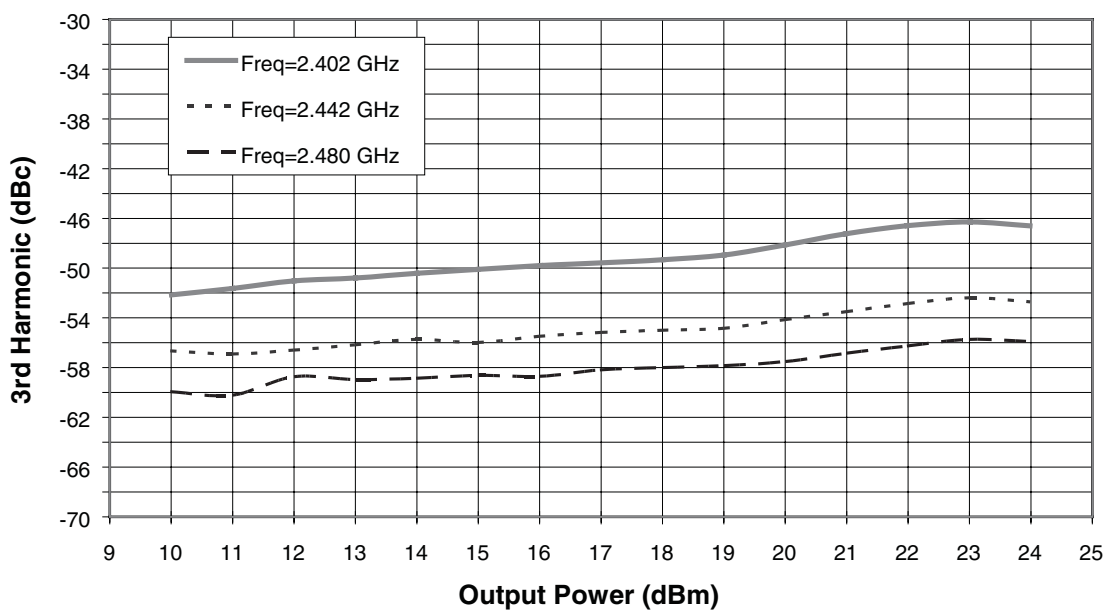
1283 F6.1

FIGURE 7: PAE versus Output Power



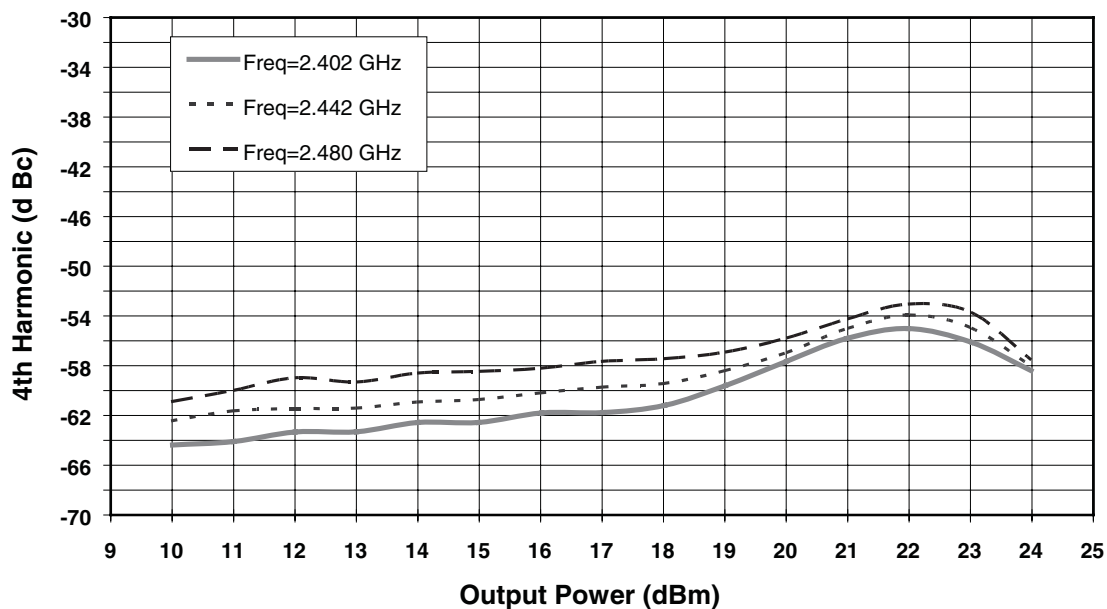
1283 F7.1

FIGURE 8: 2nd Harmonic versus Output Power



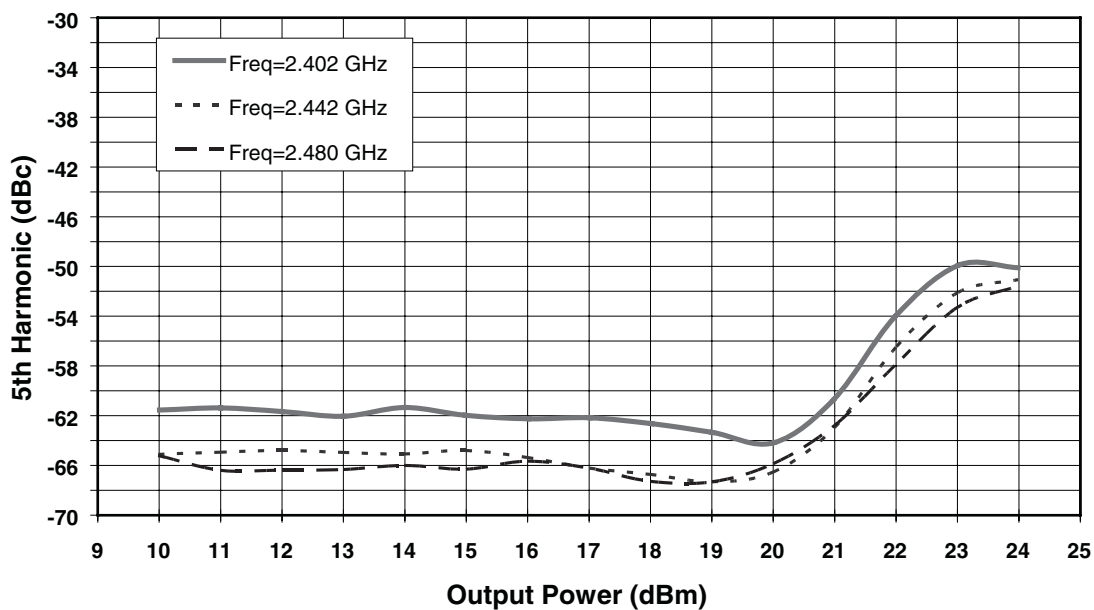
1283 F8.1

FIGURE 9: 3rd Harmonic versus Output Power



1283 F9.1

FIGURE 10: 4th Harmonic versus Output Power



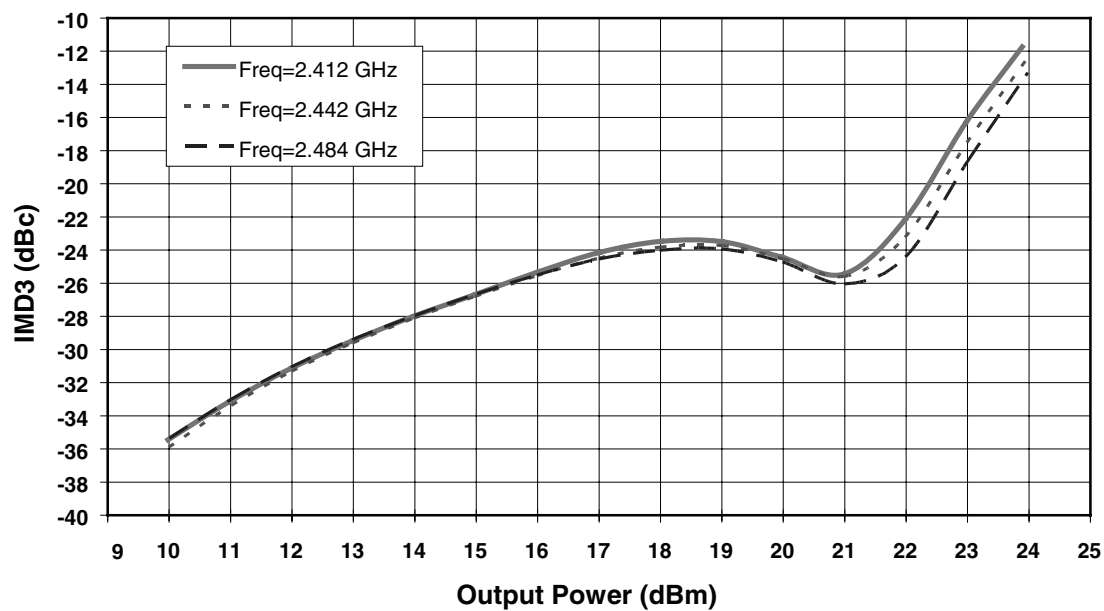
1283 F10.1

FIGURE 11: 5th Harmonic versus Output Power

## 2.4-2.5 GHz Power Amplifier SST12LP00



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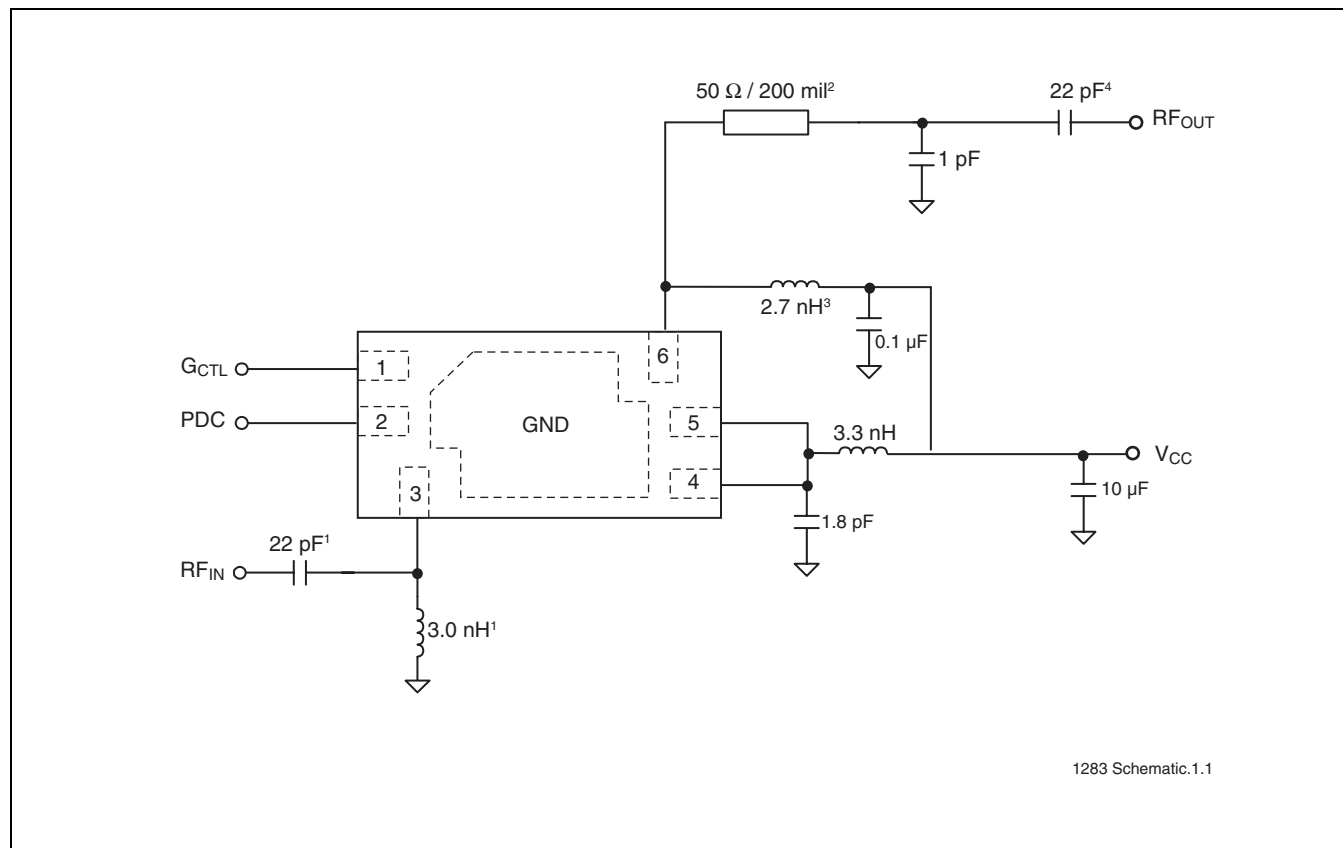


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FIGURE 12: IMD3 versus Output Power



## TYPICAL APPLICATION



1. Optional and only necessary for achieving high input return loss.
2. Replaceable by 1 nH (0402) inductor for compactness.
3. Shunt capacitor can be added to the inductor to lower the 2nd harmonic.
4. LC low-pass filter can be added to lower the 2nd harmonic.

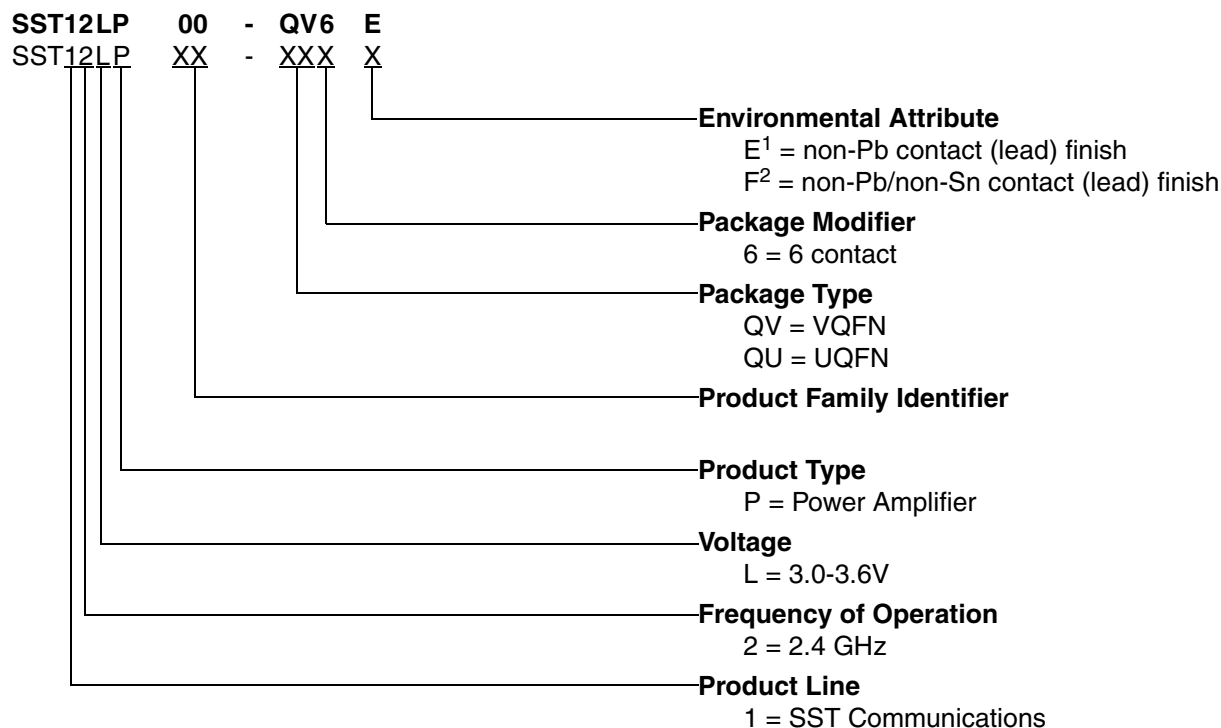
**FIGURE 13: Typical Application Schematic (Top View)**

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### PRODUCT ORDERING INFORMATION



- 
1. Environmental suffix "E" denotes non-Pb solder.  
SST non-Pb solder devices are "RoHS Compliant".
  2. Environmental suffix "F" denotes non-Pb/non-SN solder.  
SST non-Pb/non-Sn solder devices are "RoHS Compliant".

### Valid combinations for SST12LP00

SST12LP00-QV6E                      SST12LP00-QU6F

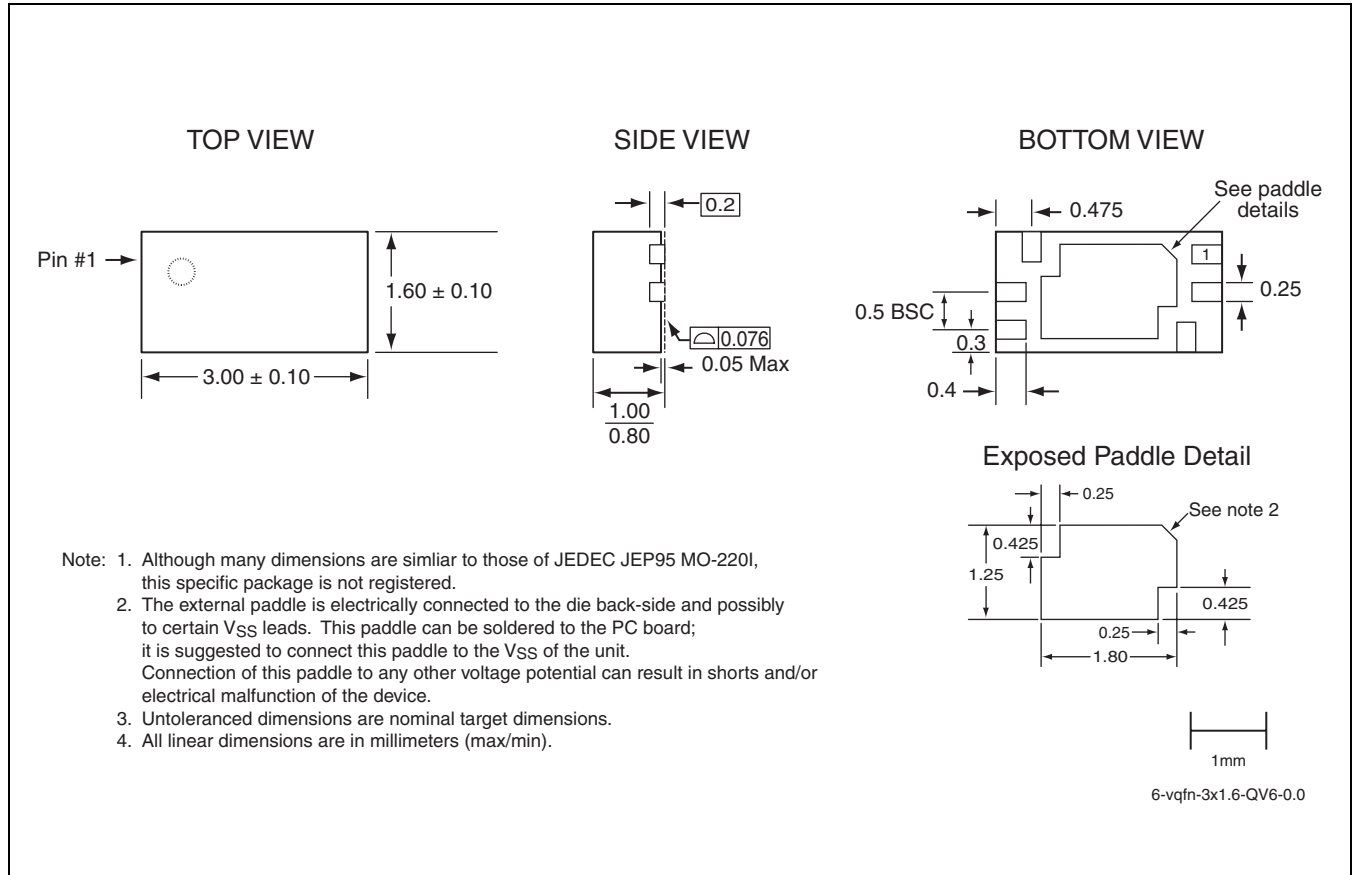
### SST12LP00 Evaluation Kits

SST12LP00-QV6E-K                      SST12LP00-QU6F-K

**Note:** Valid combinations are those products in mass production or will be in mass production. Consult your SST sales representative to confirm availability of valid combinations and to determine availability of new combinations.



## PACKAGING DIAGRAMS



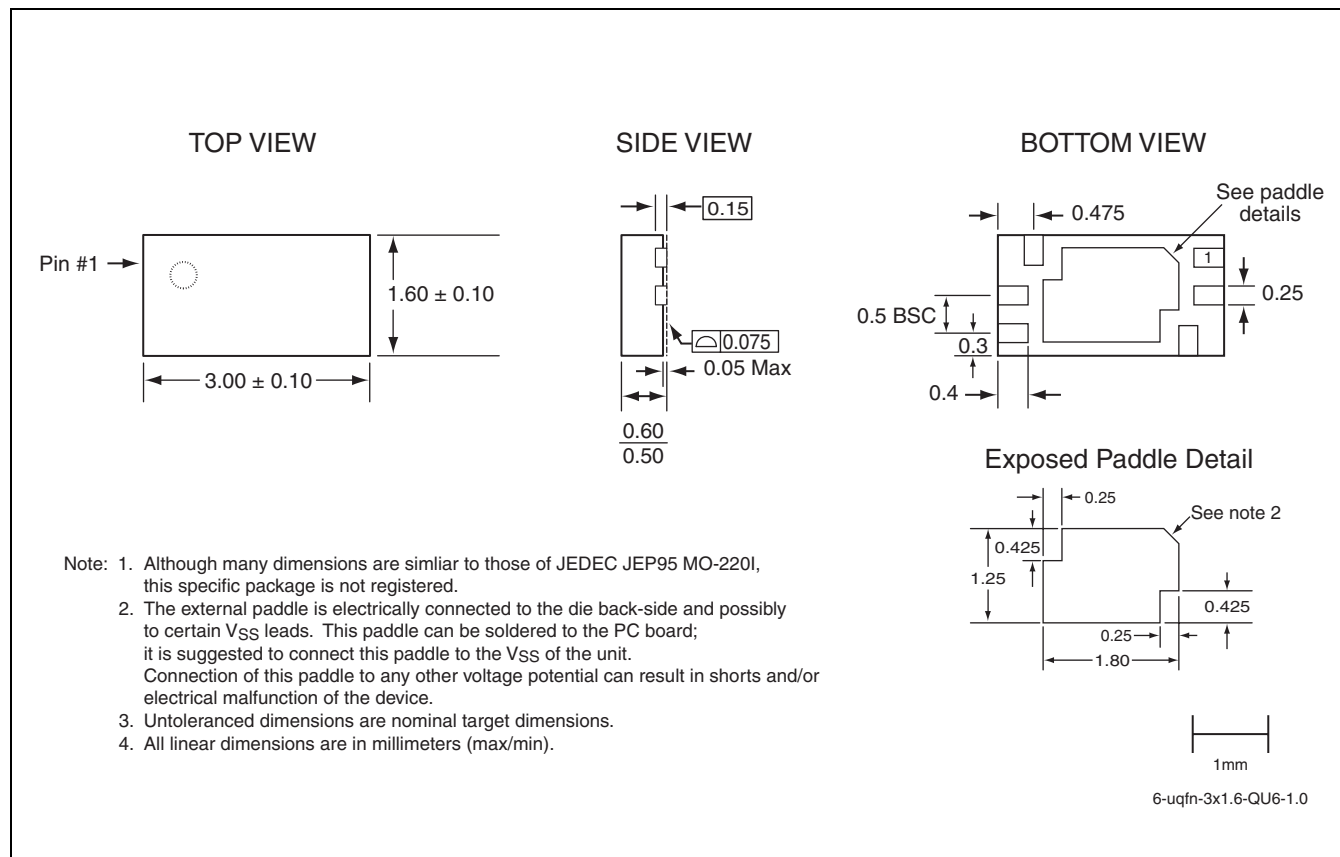
**FIGURE 14: 6-contact Very-thin Quad Flat No-lead (VQFN)  
SST Package Code: QV6**

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**FIGURE 15: 6-Contact Ultra-thin Quad Flat No-lead (UQFN)**  
**SST Package Code: QU6**

**TABLE 4: Revision History**

| Revision | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Date     |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 00       | • S71283: SST conversion of data sheet GP1200                                                                                                                                                                                                                                                                                                                                                                                                                         | Jan 2005 |
| 01       | <ul style="list-style-type: none"> <li>• Made various changes to include UQFN package</li> <li>• Updated Information in “Features:” on page 1</li> <li>• Updated “Product Description” on page 1</li> <li>• Updated Table 1 on page 2</li> <li>• Updated “Electrical Specifications” on page 3</li> <li>• Updated Table 2 on page 3</li> <li>• Updated Table 3 on page 3</li> <li>• Updated Figure 13 on page 10</li> <li>• Applied new formatting styles.</li> </ul> | Mar 2006 |
| 02       | • Updated document status from Preliminary Specification to Data Sheet                                                                                                                                                                                                                                                                                                                                                                                                | Apr 2008 |
| 03       | • Updated “Contact Information” on page 14.                                                                                                                                                                                                                                                                                                                                                                                                                           | Feb 2009 |
| 04       | • End of Life all valid combinations in this data sheet                                                                                                                                                                                                                                                                                                                                                                                                               | Apr 2009 |



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