DATA SHEET

SE2622L: 2.4 GHz, 256 QAM Power Amplifier

Applications

- DSSS 2.4 GHz WLAN (IEEE 802.11b)
- OFDM 2.4 GHz WLAN (IEEE 802.11g)
- OFDM 2.4 GHz WLAN (IEEE 802.11n)
- OFDM 2.4 GHz WLAN (256 QAM)
- Access points, PCMCIA, PC cards

Features

- Single 3.3 V supply operation:
  - 18 dBm, EVM = –35 dB, 256 QAM OFDM
  - 20 dBm, EVM = –30 dB, 802.11n
  - 23 dBm, ACPR < –32 dBc, 802.11b
- Small signal gain: 31 dB typical
- Integrated temperature compensated power detector
- Digital power amplifier enable pin (V_{EN})
- Lead Free, Halogen Free and RoHS compliant
- Small footprint QFN (16-pin, 3 × 3 × 0.9 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

Description

The SE2622L is a 2.4 GHz power amplifier designed for use in the 2.4 GHz ISM band for wireless LAN applications. The device incorporates a power detector for closed loop monitoring of the output power.

The SE2622L includes a digital enable control for device on/off control.

The SE2622L temperature compensated power detector is highly immune to mismatch at its output with less than 1.5 dB of variation with a 2:1 mismatch. The device package and pinout for the 16-pin QFN are shown in Figure 1. A block diagram of the SE2622L is shown in Figure 2.

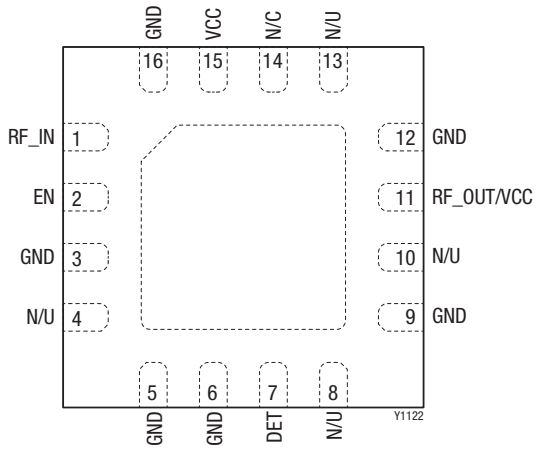


Figure 1. SE2622L Pinout – 16-Pin QFN (Top View)

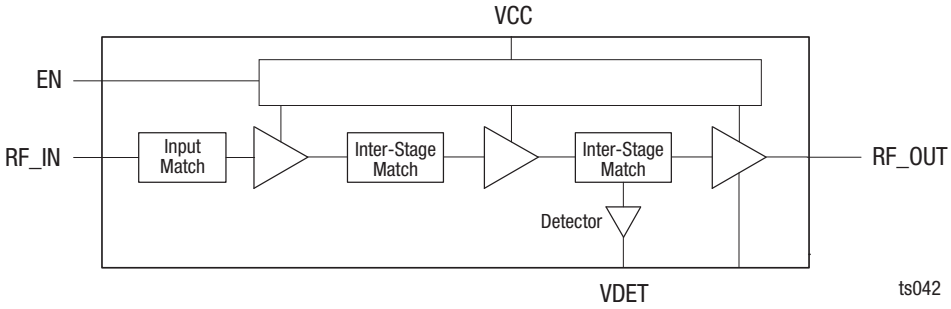


Figure 2. SE2622L Block Diagram

Electrical and Mechanical Specifications

Signal pin assignments and functional pin descriptions are described in Table 1. The absolute maximum ratings of the SE2622L are provided in Table 2. Recommended operating conditions are specified in Table 3. Electrical specifications are provided in Tables 4, 5, and 6.

Typical performance characteristics of the SE2622L are illustrated in Figure 3.

Table 1. SE2622L Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RF_IN	Power amplifier RF input; DC block required	10	N/U	Not used
2	EN	Digital pin used to power up and power down the IC	11	RF_OUT/VCC	Power Amplifier RF output / Final stage collector supply
3	GND	Ground	12	GND	Ground
4	N/U	Not used	13	N/U	Not used
5,6	GND	Ground	14	N/C	No connect
7	DET	Analog power detector output	15	VCC	Stages 1, 2 collector supply
8	N/U	Not used	16	GND	Ground
9	GND	Ground	Paddle	GND	Exposed die paddle; electrical and thermal ground

Table 2. SE2622L Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage on pins V_{CC}	V_{CC}	–0.3	+4	V
Power amplifier enable	V_{EN}	–0.3	+3.6	V
RF input power, RF_OUT terminated into 50 Ω match	RF_{IN}		+10	dBm
Storage temperature range	T_{STG}	–40	+150	°C
Electrostatic discharge: Human Body Model (HBM), Class 1B	ESD		500	V

Note 1: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

***CAUTION**: Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.*

Table 3. SE2622L Recommended Operating Conditions

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	V_{CC}	3.0	3.6	V
Supply voltage on pins VCC3	V_{CC3}	3.0	3.6	V
Ambient temperature	T_A	–40	85	°C

Table 4. SE2622L Electrical Specifications: DC Characteristics (Note 1)
(V_{CC} = V_{CC3} = V_{EN} = 3.3 V, T_A = +25 °C, as Measured on Evaluation Board, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Supply current (Sum of Vcc0, Vcc, Vcc3)	Icc-802.11b	P_{OUT} = +23 dBm, 11 Mbps CCK signal, BT = 0.45, V_{CC} = V_{CC3} = 3.3 V		250		mA
Supply current (Sum of Vcc, Vcc3)	Icc-802.11g	Pout = +19 dBm, 54 Mbps OFDM signal, Vcc = Vcc3 = 3.3 V		175		mA
Supply current (Sum of Vcc, Vcc3)	I_{CQ}	No RF		125		mA
Supply current	I_{OFF}	V_{EN} = 0 V, No RF		2	10	µA
Logic high voltage	V_{ENH}		1.3		V_{CC}	V
Logic low voltage	V_{ENL}		0		0.5	V
Input current logic high voltage	I_{ENH}			300		µA
Input current logic low voltage	I_{ENL}			<1		µA
Enable pin input impedance	Z_{EN}	Passive pull down		10		kΩ

Note 1: Performance is guaranteed only under the conditions listed in this table.

Table 5. SE2622L Electrical Specifications: AC Characteristics (Note 1)
(V_{CC} = V_{CC3} = V_{EN} = 3.3 V, f = 2.45 GHz, T_A = +25 °C, as Measured on Evaluation Board, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Frequency range	f		2400		2500	MHz
Output power	P_{OUT}	OFDM, 256 QAM, HT40, –35 dB EVM		+18		dBm
		OFDM, 256 QAM, HT20, –35 dB EVM		+19		
		OFDM, 256 QAM, HT40, –38 dB EVM		+16		
		OFDM, 64 QAM, HT20, –30 dB EVM		+20		
		CCK signal, BT = 0.045, Mask		+23		
		802.11n, HT20, all data rates, Mask		+23		
		802.11n, HT40, all data rates, Mask		+22		
Output 1dB compression point	P_{1dB}	No modulation	+24.5	+27		dBm
Input return loss	S_{11}			–12	–10	dB
Small signal gain	S_{21}	P_{IN} = –25 dBm	26	31	34	dB
Gain Variation over band	ΔS_{21}	P_{IN} = –25 dBm, f = 2400 to 2500 MHz		1		dB
Harmonic	2f	P_{OUT} = +23 dBm, CW		–50		dBm/MHz
	3f			–50		dBm/MHz
Rise and fall time	t_R, t_F			0.5		µs
Stability	STAB	P_{OUT} = +23 dBm, 54 Mbps OFDM signal, 64 QAM, VSWR = 6:1. All Phases	All non-harmonically related outputs less than –50 dBc/100 kHz			
Tolerance to output load mismatching	VSVR	P_{OUT} = +23 dBm, 54 Mbps OFDM signal, 64 QAM, VSWR = 10:1. All Phases	No damage			

Note 1: Performance is guaranteed only under the conditions listed in this table.

Table 6. SE2622L Electrical Specifications: Power Detector Characteristics (Note 1)
(V_{CC} = V_{CC3} = V_{EN} = 3.3 V, f = 2.45 GHz, T_A = +25 °C, as Measured on Evaluation Board, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
P_{OUT} detect range	PDR		0		P_{1dB}	dBm
Detector voltage	VDET	P_{OUT} = +23 dBm		1.04		V
Detector voltage	VDET	P_{OUT} = +21 dBm		0.87		V
Detector voltage	VDET	P_{OUT} = No RF		0.33		V
Output impedance	PDZ_{OUT}			2.3		kΩ
DC load impedance	PDZ_{LOAD}		10			kΩ

Note 1: Performance is guaranteed only under the conditions listed in this table.

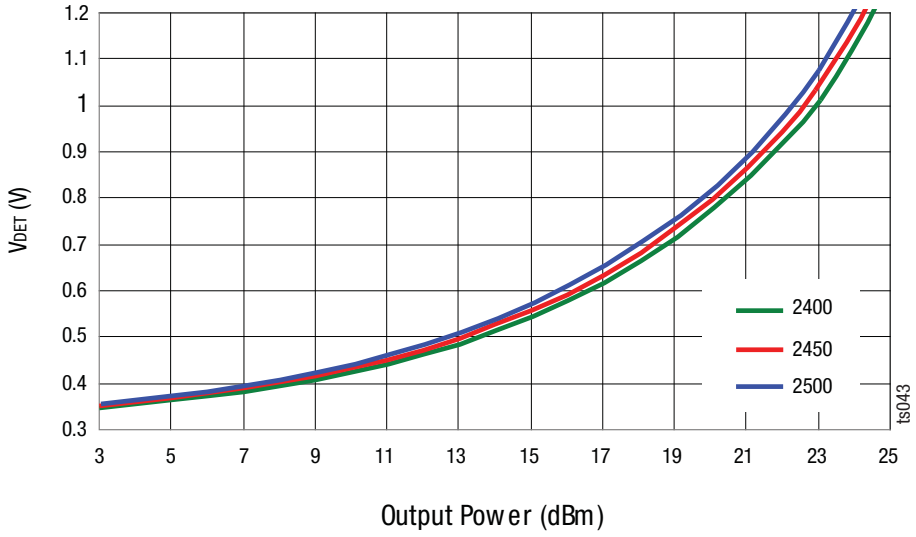


Figure 3. SE2622L Power Detector Characteristics

Evaluation Board Description

The SE2622L-EK1 Evaluation Board is used to test the performance of the SE2622L-R PA. A typical application schematic diagram is provided in Figure 4. Table 7 provides the Bill of Materials (BOM) list for Evaluation Board components.

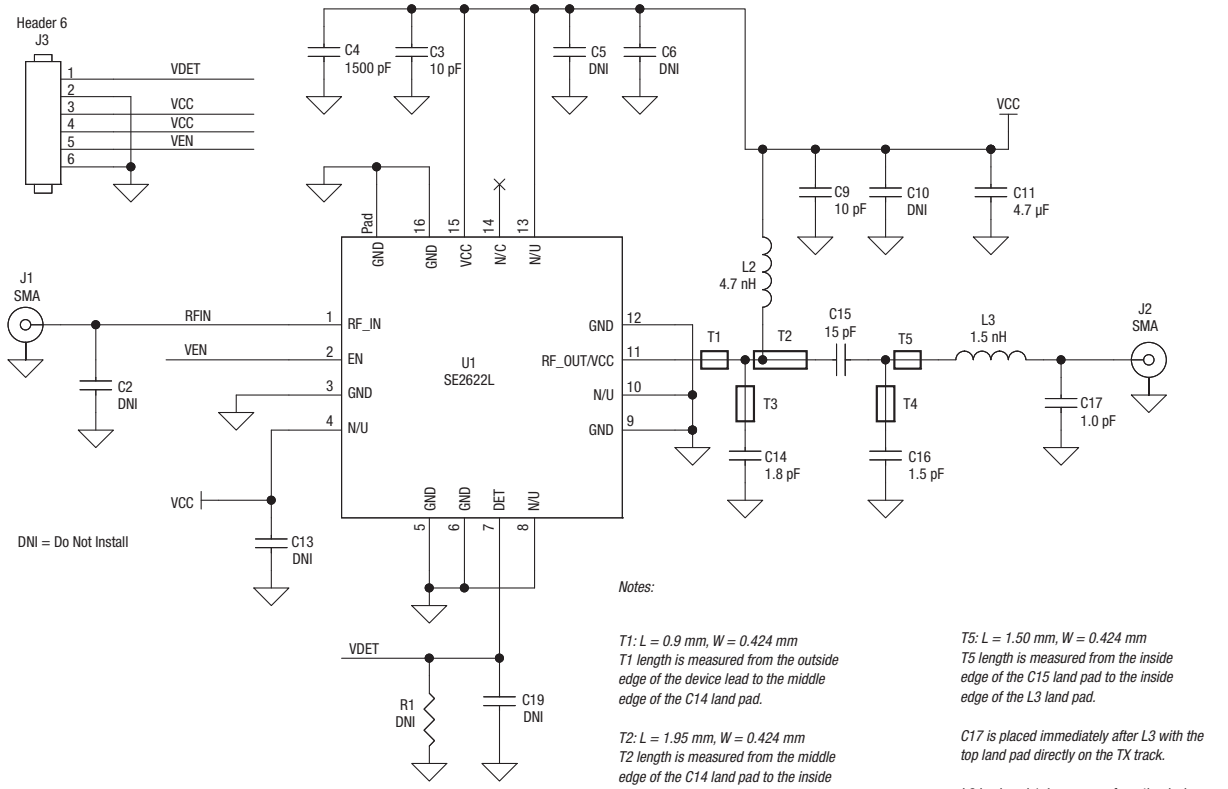


Figure 4. SE2622L Evaluation Board Schematic

Circuit Design Considerations

The following design considerations are general in nature and must be followed regardless of final use or configuration:

- Paths to ground should be made as short as possible.
- The ground pad of the SE2622L-R has special electrical and thermal grounding requirements. This pad is the main thermal conduit for heat dissipation. Since the circuit board acts as the heat sink, it must shunt as much heat as possible from the device. Therefore, design the connection to the ground pad to dissipate the maximum wattage produced by the circuit board. Multiple vias to the grounding layer are required. For further information, refer to the Skyworks Application Note, *PCB Design Guidelines for High Power Dissipation Packages*, document number 201211.
- Bypass capacitors should be used on the DC supply lines. An RF inductor is required on the VCC supply line to block RF signals from the DC supply. Refer to the schematic drawing below for further details.
- The RF lines should be well separated from each other with solid ground between traces to maximize input-to-output isolation.

Evaluation Board Test Procedure

1. Connect GND to all ground pins.
2. Connect a power supply to the VCC1, VCC2, and the two RF_OUT pins.
3. If desired, connect a voltage meter to the VDET pin.
4. Connect a +3.3 V supply to EN pin.
5. Connect a signal generator to the RF signal input port. Set it to the desired RF frequency at a power level of –30 dBm or less to the Evaluation Board. DO NOT enable the RF signal.
6. Connect a spectrum analyzer to the RF signal output port.
7. Enable the power supply.
8. Enable the RF signal.
9. Take measurements.

CAUTION: *If the input signal exceeds the rated power, the Evaluation Board can be permanently damaged.*

NOTE: *It is important to adjust the VCC voltage source so that the target supply voltage (+5) is measured at the board. The high collector currents will drop the collector voltage significantly if long leads are used. Adjust the bias voltage to compensate."*

Table 7. SE2622L Evaluation Board Bill of Materials

Component	Part number	Description	Manufacturer
U1	SE2622L		Skyworks
PCB	Z053-B		Skyworks
R1, C2, C5, C6, C10, C13, C19	DNI		
C3, C9	10 pF	GRM1555C1H100JZ01	Murata
C4	1500 pF	GRM155R71H152KA01	Murata
C11	4.7 μF	GRM188R60J475KE19	Murata
C14	1.8 pF	GRM1555C1H1R8CZ01	Murata
C15	15 pF	GRM1555C1H150JZ01	Murata
C16	1.5 pF	GRM1555C1H1R5CZ01	Murata
C17	1.0 pF	GRM1555C1H1R0CZ01	Murata
J1, J2	SMA	142-0701-851	Johnson
J3	HEADER 6	22-28-4063	Molex
L2	4.7 nH	LQG18HN4N7S00D	Murata
L3	1.5 nH	LQG15HN1N5S02D	Murata

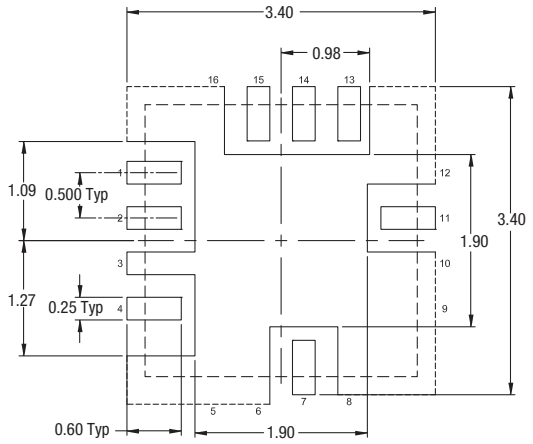
Package Dimensions

The PCB layout footprint for the SE2622L is provided in Figure 5. Typical case markings are shown in Figure 6. Package dimensions for the 16-pin QFN are shown in Figure 7, and tape and reel dimensions are provided in Figure 8.

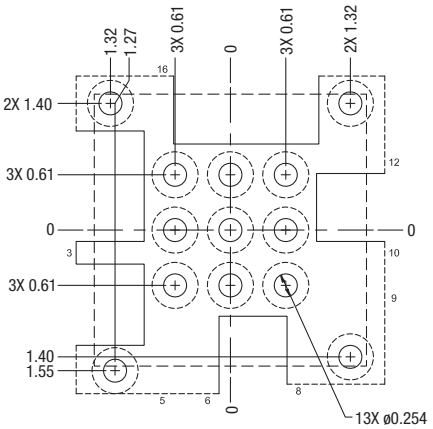
Package and Handling Information

Because of its sensitivity to moisture absorption, instructions on the shipping container label must be followed regarding exposure to moisture after the container seal is broken, otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly. The SE2622L is capable of withstanding a Pb free solder reflow. Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. If the part is manually attached, precaution should be taken to insure that the device is not subjected to temperatures above its rated peak temperature for an extended period of time. For details on both attachment techniques, precautions, and handling procedures recommended by Skyworks, please refer to:

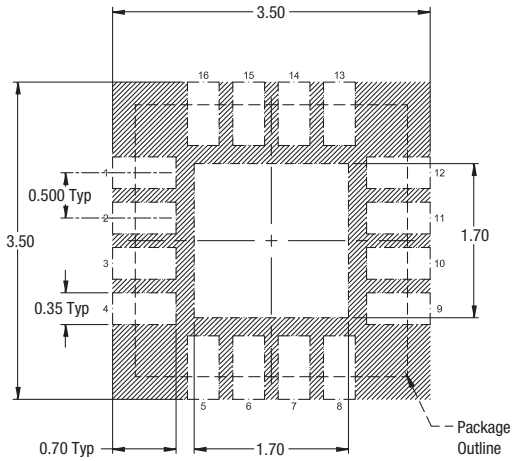
- Skyworks Application Note: *Quad Flat No-Lead Module Solder Reflow & Rework Information*, Document Number QAD-00045.
- Skyworks Application Note: *Handling, Packing, Shipping and Use of Moisture Sensitive QFN*, Document Number QAD-00044.



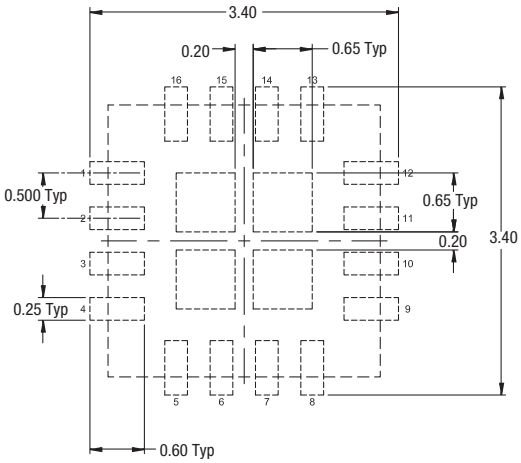
Board Metal



Via Pattern
(Note 4)



Solder Mask Pattern
(Note 6)



Stencil Pattern
(Note 5)

58% solder coverage
on center pad

Notes:

1. *All dimensions are in millimeters.*
2. *Dimensions and tolerances according to ASME Y14.5M-1994.*
3. *Unless specified, dimensions are symmetrical about center lines.*
4. *Via hole recommendations: 0.025 mm Cu via wall plating (minimum), via hole to be filled with conductive paste and plated over.*
5. *Stencil recommendations: 0.125 mm stencil thickness, laser cut apertures, trapezoidal walls and rounded corners offer better paste release.*
6. *Solder mask recommendations: contact board fabricator for recommended solder mask offset and tolerance.*

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Figure 5. PCB Layout Footprint for the SE2622L

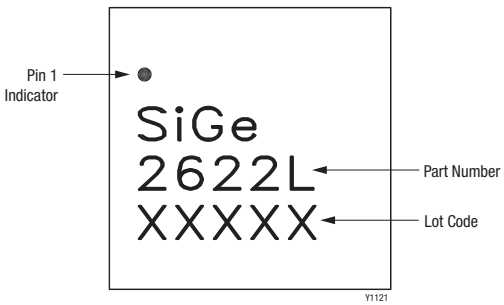
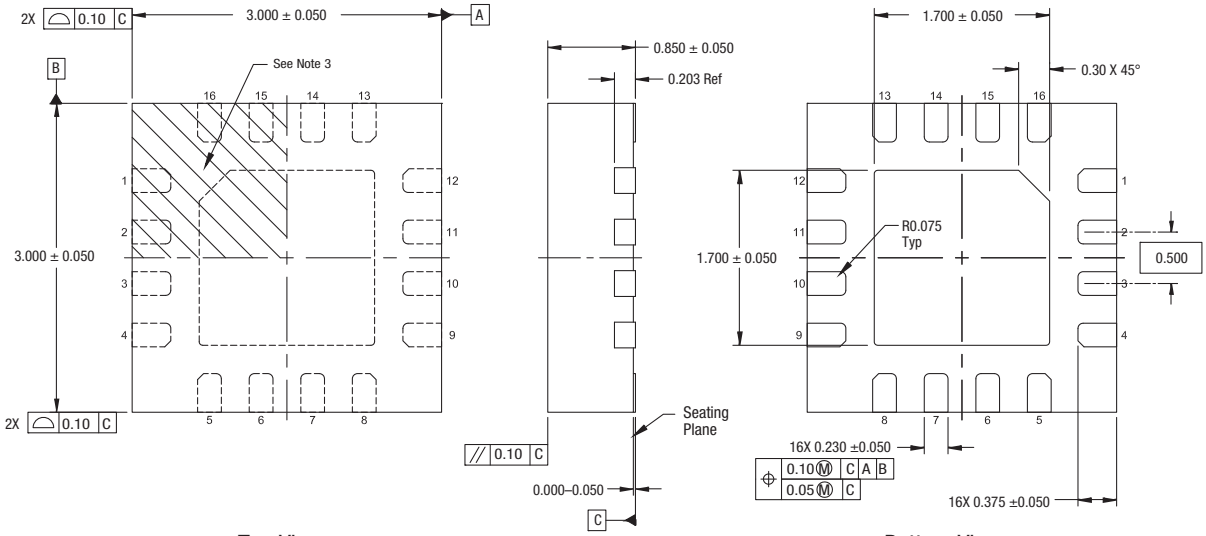


Figure 6. Typical Case Markings
(Top View)



Notes:

1. *Dimensions and tolerances according to ASME Y14.5M-1994.*
2. *All measurements are in millimeters.*
   Unless otherwise specified, the following values apply:

Decimal Tolerance:	*Angular Tolerance:*
X.X (1 place) ± 0.1 mm	*± 0.5°*
X.XX (2 places) ± 0.05 mm	
X.XXX (3 places) ± 0.025 mm	

3. *Terminal 1 identification mark located within marked area.*
4. *Unless specified, dimensions are symmetrical about center lines.*

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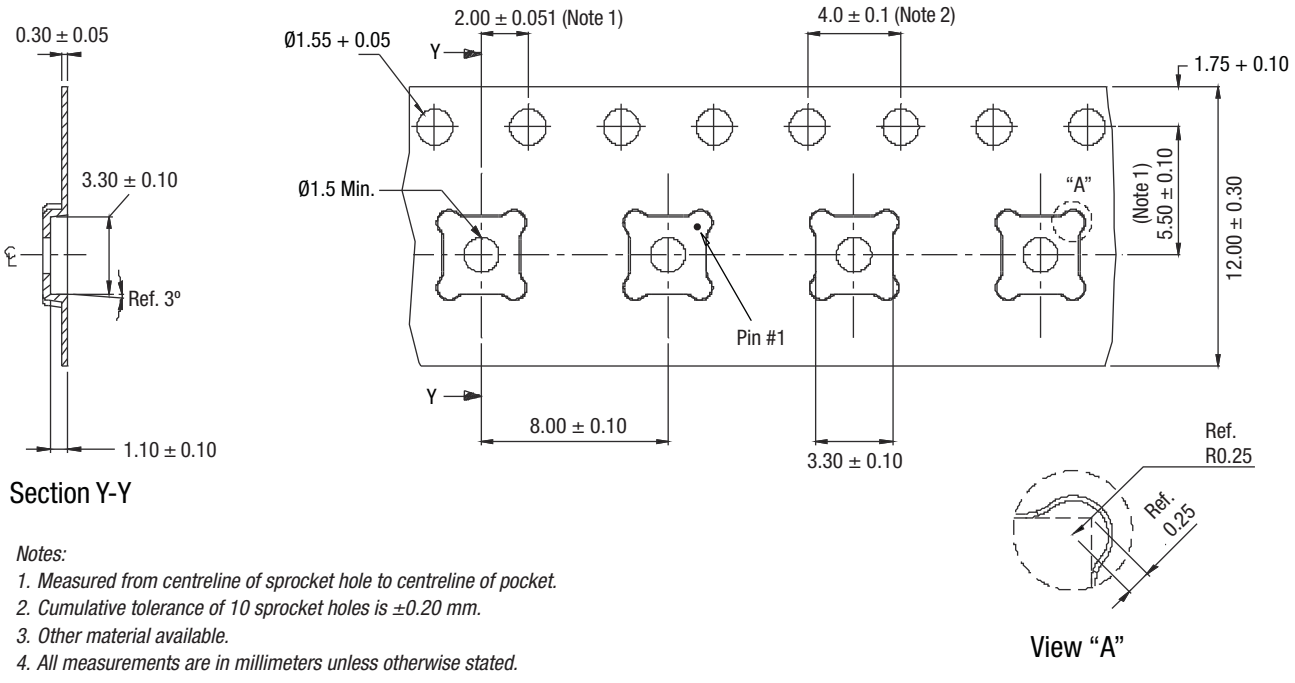
Figure 7. SE2622L 16-Pin QFN Package Dimensions



Notes:

1. *Measured from centreline of sprocket hole to centreline of pocket.*
2. *Cumulative tolerance of 10 sprocket holes is ±0.20 mm.*
3. *Other material available.*
4. *All measurements are in millimeters unless otherwise stated.*

ts019

Figure 8. SE2622L Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SE2622L 2.4 GHz, 256 QAM Power Amplifier	SE2622L	SE2622L-EK1

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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