

### SX1242 - Low Cost Integrated Transmitter IC

### 344.940 MHz RF Transmitter

#### GENERAL DESCRIPTION

The SX1242 is an ultra-low-cost, fully integrated standalone OOK transmitter suitable for operation at 344.940 MHz

The SX1242 is designed for use without the requirement for configuration via an MCU.

The SX1242 offers integrated radio performance with cost efficiency and is suited for operation in North America (FCC part 15.231).

#### ORDERING INFORMATION

Part Number	Temperature Range	Qty. per Reel	Package
SX1242ISETRT	-40 °C to +85 °C	2500	SOIC8-EP

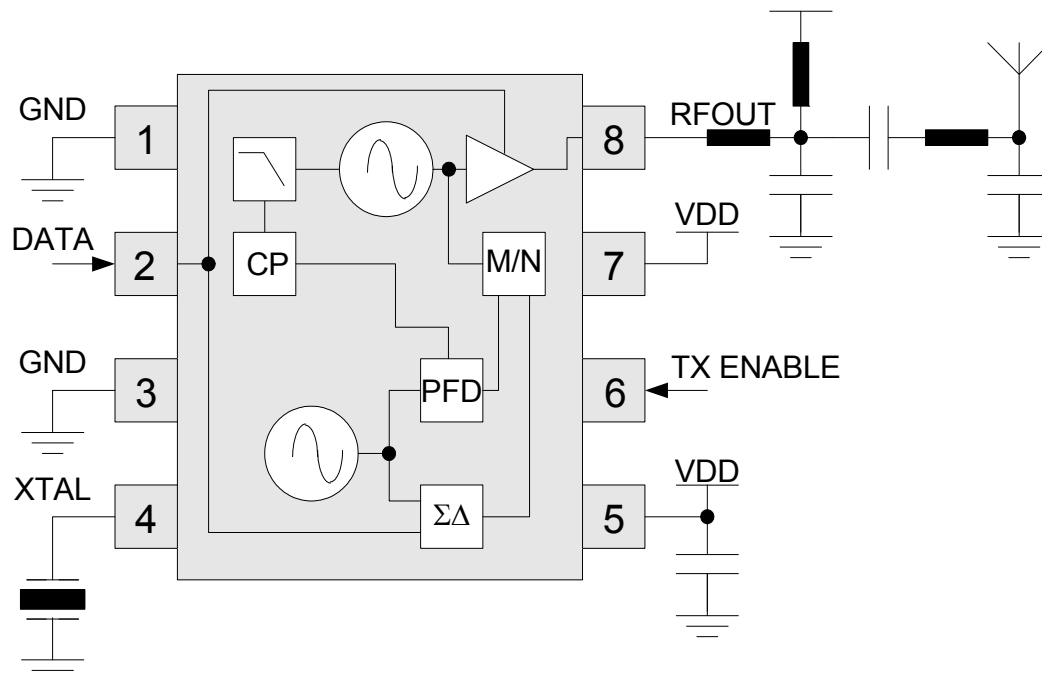
Pb-Free, Halogen Free, RoHS/WEEE compliant product.

#### APPLICATIONS

- ◆ Low-Cost Consumer Electronic Applications
- ◆ Remote Keyless Entry (RKE)
- ◆ Remote Control / Security Systems
- ◆ Audio Accessories
- ◆ Process and building / home control

#### KEY PRODUCT FEATURES

- ◆ +12 dBm Output Power
- ◆ 344.940 MHz Operation
- ◆ OOK Bit Rates up to 10 kbps
- ◆ Pre-Configured Modes for Operation without MCU
- ◆ 1.8 to 3.7 V Supply Range
- ◆ Low BOM Fully Integrated TX



**Table of contents**

Section	Page
1. General Description .....	3
1.1. Pin Diagram .....	3
1.2. Marking Diagram.....	4
1.3. Pin Description.....	4
2. Electrical Characteristics .....	5
2.1. ESD Notice .....	5
2.2. Absolute Maximum Ratings .....	5
2.3. Operating Range.....	5
2.4. Electrical Specifications .....	6
3. Circuit Description.....	7
4. Application Information .....	9
4.1. Crystal Specification .....	9
4.2. Reference Design Schematic .....	9
4.3. Reference Design PCB Layout .....	10
4.4. Reference Design BOM .....	10
5. Packaging Information .....	11
5.1. Package Outline Drawing .....	11
5.2. Land Pattern .....	11
5.3. Thermal Impedance .....	12
5.4. Tape & Reel Specification.....	12
6. Revision History.....	13

This product datasheet contains a detailed description of the SX1242 performance and functionality.

## 1. General Description

The SX1242 is a fully-integrated multi-band, single chip transmitter IC capable of OOK modulation of an input data stream. The SX1242 is configured, by default, to operate without a microcontroller at a pre-configured RF setting of 344.940 MHz.

Another key feature of the SX1242 is its low current consumption in transmit and sleep modes and its wide voltage operating range from 1.8 V to 3.7 V. This makes the SX1242 suitable for low-cost battery chemistries or energy harvesting applications.

The internal architecture of the SX1242 is shown in Figure 1. The SX1242 comprises a low-consumption PLL and power amplifier. OOK Modulation is performed via ramping of the PA reference DAC.

The SX1242 is designed for use with a variety of low-cost antenna technologies including PCB-etched loop or electrically-short stub.

Further application information may be found in Section 4.

### 1.1. Pin Diagram

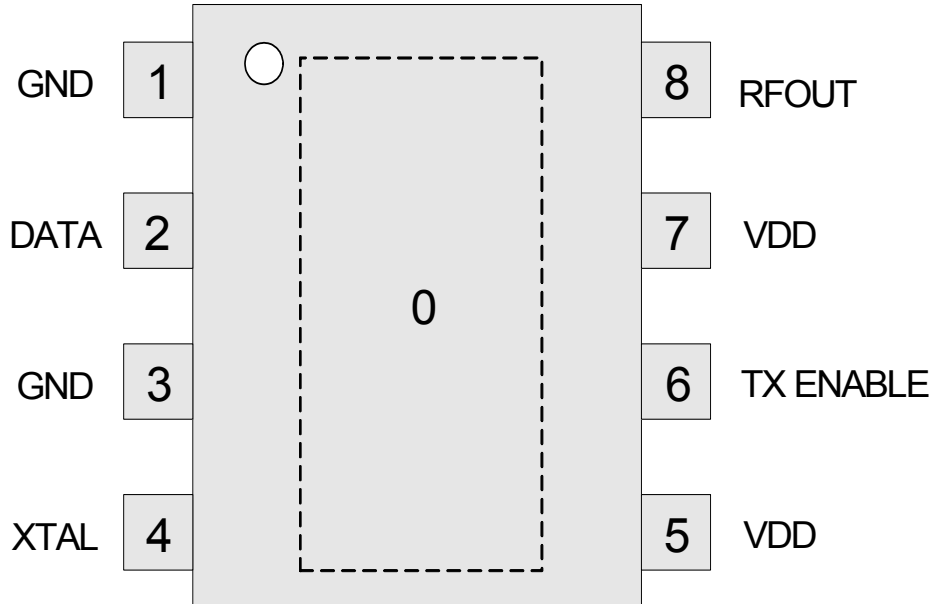


Figure 1. Pinouts, Top View

## 1.2. Marking Diagram

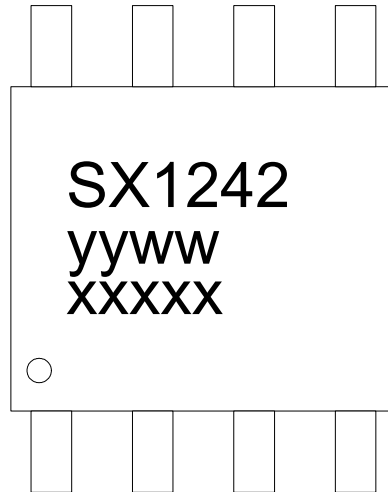


Figure 2. Marking Diagram

**Notes:**

*yyww* refers to the date code

*xxxxx* refers to lot numbers

## 1.3. Pin Description

Table 1 SX1242 Pinout Description

Number	Name	Type	Function
0	GND	I	Exposed Pad, Ground
1	GND	I	Ground
2	DATA	I	Transmit Data
3	GND	I	Ground
4	XTAL	I/O	Reference Crystal
5	VDD	I	Power Supply, 1.8 V to 3.7 V
6	TX ENABLE	I	Control Pin for Transmitter
7	VDD	I	Power Supply, 1.8 V to 3.7 V
8	RFOUT	O	Transmitter RF Output

## 2. Electrical Characteristics

### 2.1. ESD Notice

The SX1242 is a high performance radio frequency device, and satisfies Class 2 of the JEDEC standard JESD22-A114-B (human body model) on all pins.

It should thus be handled with all necessary ESD precautions to avoid any permanent damage.



### 2.2. Absolute Maximum Ratings

Stresses above the values listed below may cause permanent device failure. Exposure to absolute maximum ratings for extended periods may affect device reliability.

*Table 2 Absolute Maximum Ratings*

Symbol	Description	Min	Max	Unit
VDDmr	Supply Voltage	-0.5	3.9	V
Tmr	Temperature	-55	+115	° C
Tjunc	Junction Temperature	-55	+125	° C
Tstor	Storage Temperature	-55	150	° C

### 2.3. Operating Range

Operating ranges define the limits for functional operation and the parametric characteristics of the device as described in this section. Functionality outside these limits is not implied.

*Table 3 Operating Range*

Symbol	Description	Min	Max	Unit
VDDop	Supply voltage	1.8	3.7	V
Top	Operational temperature range	-40	85	° C
Clop	Load capacitance on digital ports	-	25	pF

## 2.4. Electrical Specifications

The table below gives the electrical specifications of the transmitter under the following conditions: Supply voltage = 3.3 V, temperature = 25 °C,  $f_{XOSC} = 26$  MHz,  $f_{RF} = 344.94$  MHz, bit rate = 5 kbit/s and output power = +12 dBm terminated in a matched 50 ohm impedance, unless otherwise specified.

Table 4 Transmitter Specifications

Symbol	Description	Conditions	Min	Typ	Max	Unit
<b>Current Consumption</b>						
IDDSL	Supply current in sleep mode		-	0.5	1	µA
IDDT	Supply current in transmit mode with appropriate external matching.	Logic "1" or "Mark" frequency transmitted*	-	22	-	mA
<b>RF and Baseband Specifications</b>						
BRO	Bit rate, OOK	Permissible range	0.5	-	10	kbps
OOK_B	OOK modulation depth		-	50	-	dB
RFOP	RF output power into 50 ohms	Optimized matching network	9	12	-	dBm
DRFOPV	Variation in RF output power with supply voltage	2.5 V to 3.3 V	-	-	3	dB
		1.8 V to 3.7 V	-	-	7	dB
PHN	Transmitter phase noise	100 kHz Offset from carrier	-	-	-76	dBc/Hz
FCN	Carrier frequency		-	344.94	-	MHz
FXOSC	Crystal Oscillator Frequency		26	26	26	MHz
DFXOSC	Frequency Variation of the Oscillator Circuit	No crystal contribution	-	-	+/-25	ppm
<b>Timing Specifications</b>						
TS_TR	Time from Sleep to Tx mode		-	-	2	ms
RAMP	PA Ramp up and down time**		-	20	-	us

\* Logic "1" transmission indicated by transmission of carrier frequency at power level RFOP.

\*\* Ramp-up time of the internal regulator turning the PA on. The typical 10% - 90% power ramp-up time is 10us

### 3. Circuit Description

The SX1242 comprises a low-consumption fractional-N Sigma-Delta type PLL and power amplifier.

A simplified block diagram of the internal architecture and application schematic is illustrated below in Figure 3

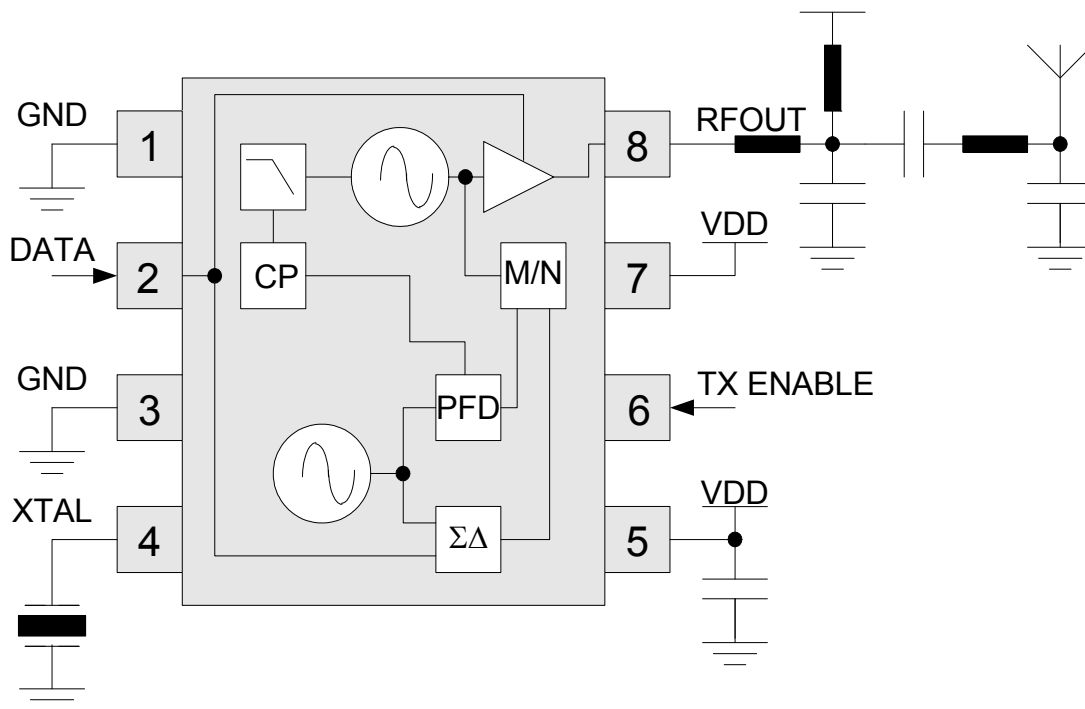


Figure 3. SX1242 Simplified Block Diagram and Application Schematic

#### 3.1. PLL

The VCO operates at twice the RF channel frequency and is derived from a 26 MHz crystal oscillator reference

#### 3.2. Transmitter

The Power Amplifier (PA) is connected to the RFOUT pin and delivers 12 dBm in a 50 ohm load. The bit stream to be transmitted over the air is sent to the chip via the pin DATA. During modulation, the rising and falling transitions are smoothed with a ramp-up/ramp-down time of typically 20  $\mu$ s via the PA reference DAC.

#### 3.3. SX1242 Operating Modes

The SX1242 operating modes are defined by the status of the pin TX ENABLE and are documented in Table 5.

Table 5 SX1242 Operating Modes

TX Enable Status	Mode	Enabled Blocks
0 (GND)	Sleep	All blocks are off
1 (VDD)	Transmit	The blocks are switched on according to a predefined sequence and the data is transmitted once the sequence is completed

The behavior of the SX1242 is illustrated in the timing diagram below:

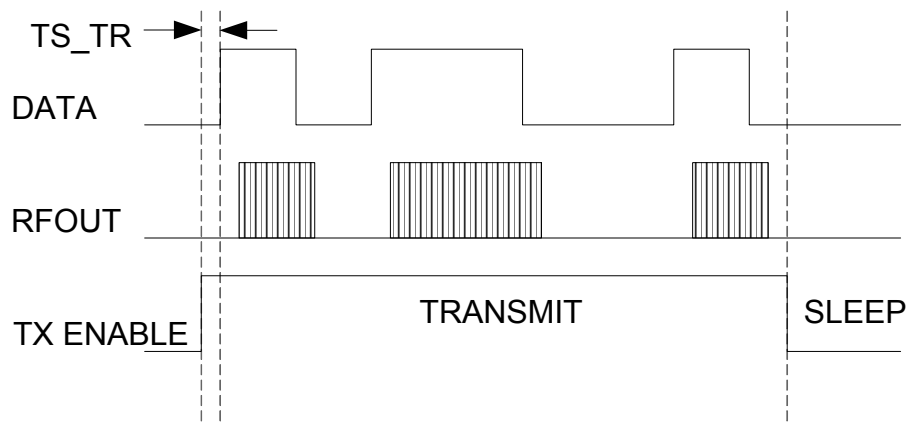


Figure 4. SX1242 Timing Diagram(Not to scale)



## 4. Application Information

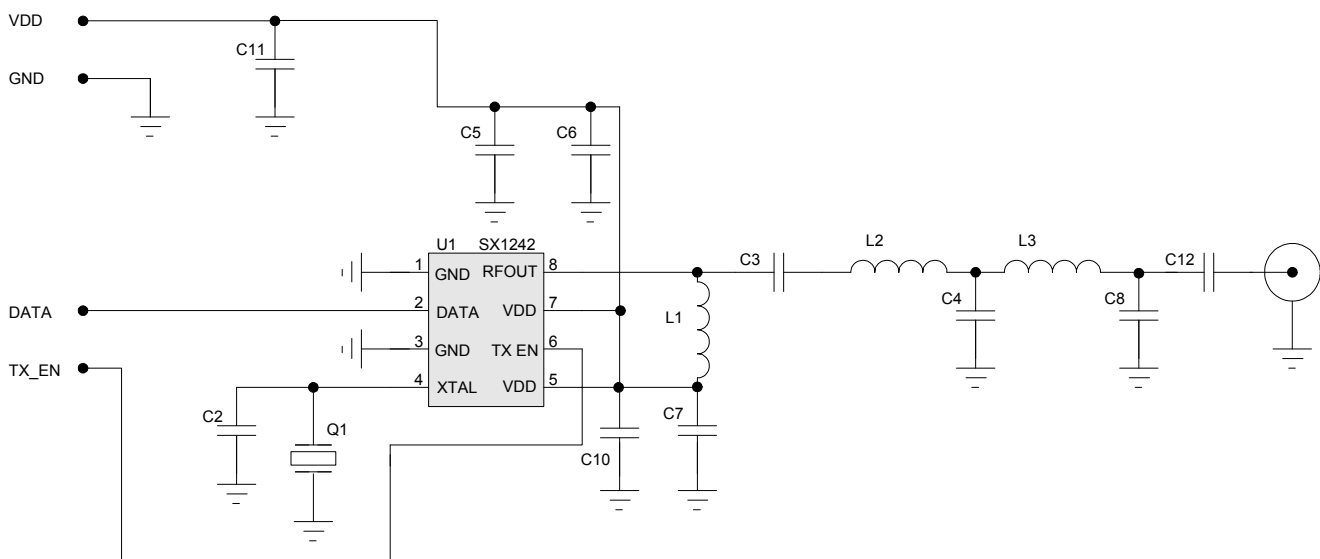
### 4.1. Crystal Specification

The SX1242 is designed to operate with a low-cost 26 MHz crystal. The recommended crystal specification is tabulated below in Table 6.

*Table 6 SX1242 Quartz Crystal Reference Oscillator Specification*

Symbol	Description	Conditions	Min	Typ	Max	Unit
FXOSC	Crystal Frequency		26	26	26	MHz
LM	Crystal Motional Inductance		-	12.655	-	mH
CM	Crystal Motional Capacitance		-	2.962	-	fF
RS	Crystal Serial Resistance		-	20	100	Ohms
C0	Crystal Shunt Capacitance		-	1.0	7.0	pF
CL	Load Capacitance		-	15	-	pF

### 4.2. Reference Design Schematic



*Figure 5. Application Module Schematic*

### 4.3. Reference Design PCB Layout

The SX1242 reference design PCB layout is illustrated below:

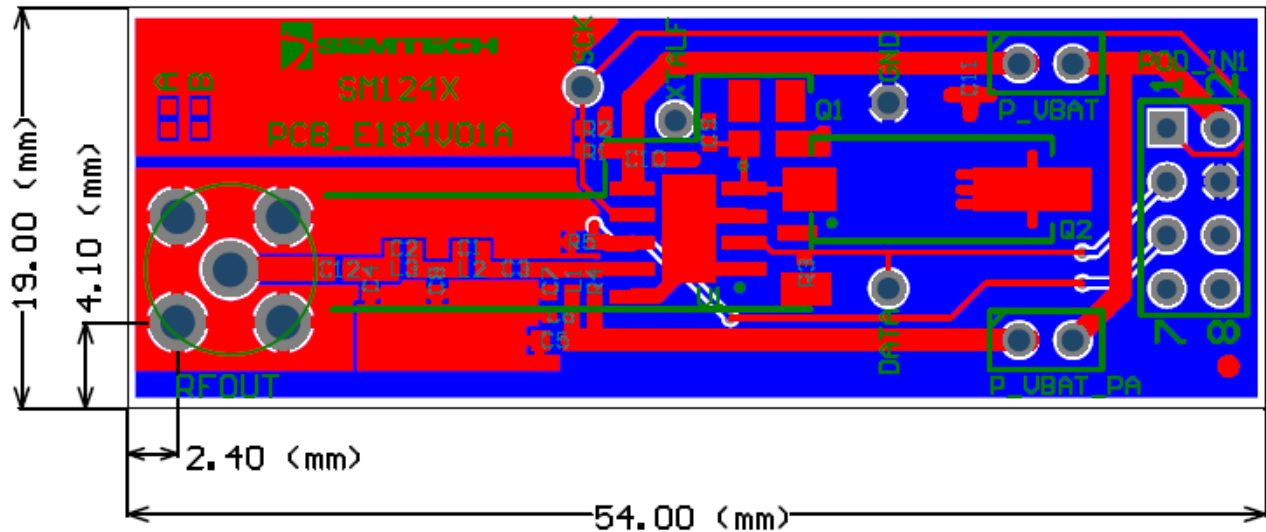


Figure 6. Reference Design PCB Layout

### 4.4. Reference Design BOM

The following table summarizes the reference design BOM:

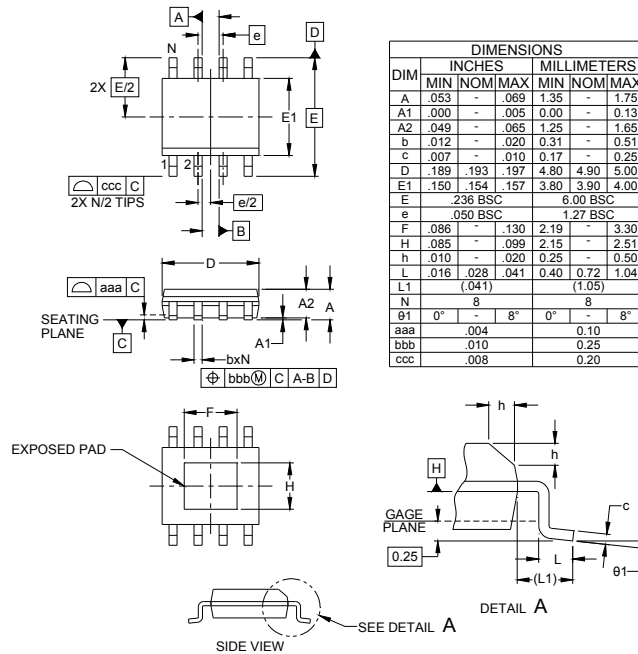
Table 7 Reference Design BOM

RefDes	MPN	Package	Value	Qty	Description
U1	<b>SX1242ISETRT</b>	SO8	SX1242	1	RF transmitter IC
Q1	-	HC49	26 MHz	1	Crystal 26 MHz CL= 15 pF
C3	-	0402	100pF	1	Capacitor NPO (+/-5%)
C4	-	0402	12pF	1	Capacitor NPO (+/-5%)
C5	-	0402	100nF	1	Capacitor X7R (+/-5%)
C6	-	0402	100pF	1	Capacitor NPO (+/-5%)
C7	-	0402	4.7pF	1	Capacitor NPO (+/-0.25pF)
C8	-	0402	12pF	1	Capacitor NPO (+/-5%)
C9	-	0402	2.2pF	1	Capacitor NPO (+/-0.25pF)
C10	-	0402	100nF	1	Capacitor X7R (+/-5%)
C11	-	0402	1uF	1	Capacitor X5R (+/-5%)
C12	-	0402	Zero ohm	1	Resistor Zero Ohm
L1	LQG15- or equivalent	0402	120nH	1	Multilayer chip inductor (+/-5%)
L2	LQG15- or equivalent	0402	39nH	1	Multilayer chip inductor (+/-5%)
L3	LQG15- or equivalent	0402	22n	1	Multilayer chip inductor (+/-5%)

## 5. Packaging Information

The SX1242 is delivered in an SOIC package with 8 leads and an exposed pad. See details below.

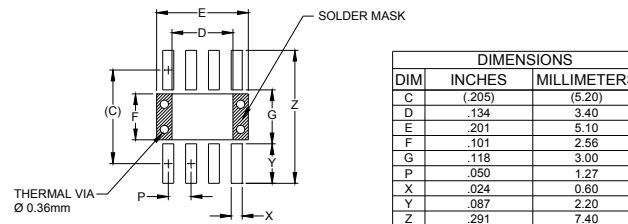
### 5.1. Package Outline Drawing



- NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
  2. DATUMS **[A]** AND **[B]** TO BE DETERMINED AT DATUM PLANE **[H]**.
  3. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

*Figure 7. Package Outline Drawing*

### 5.2. Land Pattern



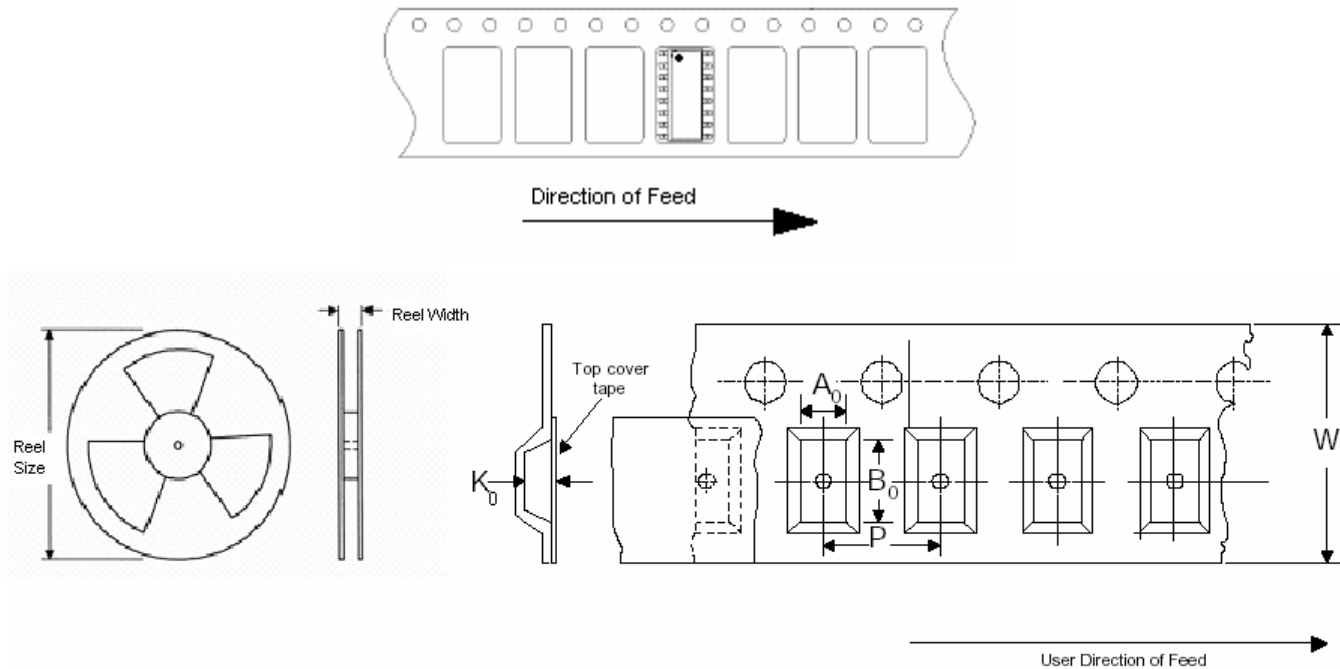
- NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
  2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.
  3. REFERENCE IPC-SM-782A, RLP NO. 300A.
  4. THERMAL VIAS IN THE LAND PATTERN OF THE EXPOSED PAD SHALL BE CONNECTED TO A SYSTEM GROUND PLANE. FAILURE TO DO SO MAY COMPROMISE THE THERMAL AND/OR FUNCTIONAL PERFORMANCE OF THE DEVICE.

*Figure 8. Land Pattern*

### 5.3. Thermal Impedance

The thermal impedance of this package is: **Theta ja = 36° C/W typ.**, calculated from a package in still air, on a 4-layer FR4 PCB, as per the Jedec standard.

### 5.4. Tape & Reel Specification



Carrier Tape				Reel					
Tape Width (W)	Pocket Pitch (P)	Ao / Bo	Ko	Reel Size	Reel Width	Min. Trailer Length	Min. Leader Length	QTY per	Unit
12 +/-0.30	8 +/-0.10	6.5 / 5.4 +/-0.30	2.00 +/-0.15	330.2	12.4	400	400	2500	mm

*Figure 9. Tape & Reel Specification*

*Note* Single Sprocket Holes

## 6. Revision History

Table 8 Revision History

Revision	Date	Comment
1	November 2010	First FINAL datasheet version
2	March 2011	Modified Application Schematic (Figure 5)

© Semtech 2010

All rights reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent or other industrial or intellectual property rights. Semtech assumes no responsibility or liability whatsoever for any failure or unexpected operation resulting from misuse, neglect improper installation, repair or improper handling or unusual physical or electrical stress including, but not limited to, exposure to parameters beyond the specified maximum ratings or operation outside the specified range.

SEMTECH PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF SEMTECH PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE UNDERTAKEN SOLELY AT THE CUSTOMER'S OWN RISK. Should a customer purchase or use Semtech products for any such unauthorized application, the customer shall indemnify and hold Semtech and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs damages and attorney fees which could arise.

## Contact information

### Semtech Corporation Advanced Communications & Sensing Products

Taiwan	Tel: 886-2-2748-3380 Fax: 886-2-2748-3390	Switzerland	Tel: 41-32-729-4000 Fax: 41-32-729-4001
Korea	Tel: 82-2-527-4377 Fax: 82-2-527-4376	United Kingdom	Tel: 44-1794-527-600 Fax: 44-1794-527-601
Shanghai	Tel: 86-21-6391-0830 Fax: 86-21-6391-0831	France	Tel: 33-(0)169-28-22-00 Fax: 33-(0)169-28-12-98
Japan	Tel: 81-3-6408-0950 Fax: 81-3-6408-0951	Germany	Tel: 49-(0)8161-140-123 Fax: 49-(0)8161-140-124