



## DP1205 – C433/868/915

### 433, 868 and 915 MHz Drop-In RF Transceiver Modules

### Combine Small Form Factor with High Performance

#### GENERAL DESCRIPTION

The DP1205s are complete Radio Transceiver Modules operating in the 433, 868 and 915 MHz license free ISM (Industrial Scientific and Medical) frequency bands. Based on the XE1205 transceiver, the DP1205 offers the unique advantage of both narrow-band and wide-band communication. Offering high output power and exceptional receiver sensitivity, the radio module is suitable for applications seeking to satisfy the European (ETSI EN300-220-1 and EN301 439-3) or the North American (FCC part 15.247 and 15.249) regulatory standards.

The DP1205 is suitable for operation in the European social alarm bands (25 kHz channel spacing). Its built-in 16-byte FIFO and full SPI simplify interfacing to the host controller.

#### APPLICATIONS

- Narrow-band and wide-band security systems
- Voice and data over an RF link
- Process and building control
- Access control
- Home automation
- Home appliance interconnections

#### KEY PRODUCT FEATURES

- No RF knowledge required
- Direct Digital interface
- Fully assembled and tested
- Surface mount
- 30.5 mm x 18.5 mm
- Supply voltage 2.4 V – 3.6 V
- Frequency synthesizer steps 500 Hz
- Output power is programmable up to 15 dBm
- High Rx 0.1 % sensitivity down to -113 dBm at 4.8 kbps
- Data rate up to 152.3 kbit/s
- Current consumption Tx = 62 mA at 15 dBm
- Current consumption Rx = 14 mA
- 16-byte FIFO
- Digital RSSI (Received Signal Strength Indicator)
- Digital FEI (Frequency Error Indicator)

#### DEVICE OPTIONS

Part Number	Frequency band	Package
DP1205C433LF	433 - 435 MHz	Board
DP1205C915LF	902 - 928 MHz	Board
DP1205C868LF	868 - 870 MHz	Board

## Table of Contents

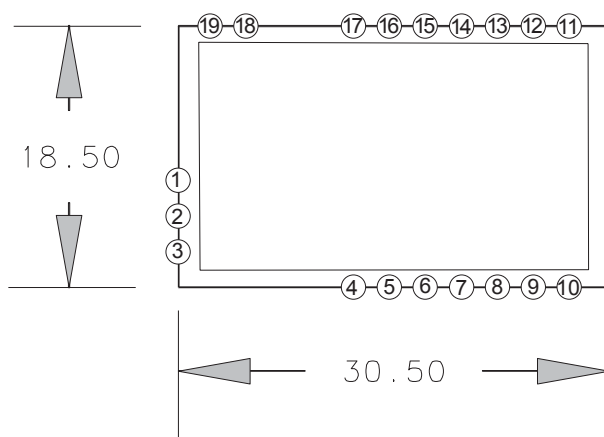
<b>1</b>	<b>Non-Conformance .....</b>	<b>3</b>
<b>2</b>	<b>Pin Description .....</b>	<b>3</b>
<b>3</b>	<b>Electrical Characteristics .....</b>	<b>4</b>
3.1	Absolute maximum operating ranges .....	4
3.2	Specifications .....	5
<b>4</b>	<b>Functional Description .....</b>	<b>6</b>
<b>5</b>	<b>Data operation modes.....</b>	<b>7</b>
<b>6</b>	<b>Serial Control Interface .....</b>	<b>8</b>
<b>7</b>	<b>Operating Modes .....</b>	<b>9</b>
<b>8</b>	<b>Typical Application.....</b>	<b>10</b>
<b>9</b>	<b>Mechanical Dimensions.....</b>	<b>11</b>
<b>10</b>	<b>Packaging Information.....</b>	<b>12</b>

## 1 NON-CONFORMANCE

Please note that the leaded version of this product exhibits a non-conformance. The non-conformance affects the CLKOUT signal of the DP1205 which is not enabled at power-up of the module. It is also recommended to program all registers after power-up of the module. The Lead-Free version (suffix "LF") of this product does not exhibit these non-conformances.

Please note that all products whose date-codes are before 0706 (wwyy) exhibit a non-conformance to specification. The non-conformance affects the FIFO buffer of the XE1205 transceiver contained in this module as described in section 5 - Data operation modes. For these date-codes, please use the FIFO in this product only in conjunction with the Technical Note TN1205.01 (available from the SEMTECH web site). All other date-codes are in conformance with the specification.

## 2 PIN DESCRIPTION



PIN	NAME	I/O	DESCRIPTION
1	GND		Ground
2	RF_IN_OUT	IN/OUT	RF Input / Output terminal
3	GND		Ground
4	VDDA		Supply Voltage
5	GND		Ground
6	VDD		Supply Voltage
7	NSS_CONFIG	IN	SPI SELECT CONFIG
8	NSS_DATA	IN	SPI SELECT DATA / DATAIN
9	IRQ0	OUT	Interrupt (PATTERN/FIFOEMPTY)
10	GND		Ground
11	GND		Ground
12	IRQ1	OUT	Interrupt (DCLK/FIFOFULL)
13	DATA	IN/OUT	Data
14	CLKOUT	OUT	Output clock at reference frequency divided by 2, 4, 8, 16, 32
15	MISO	OUT	SPI Master Input Slave Output
16	MOSI	IN	SPI Master Output Slave Input
17	SCK	IN	SPI CLOCK
18	SW(0)	IN/OUT	Transmit/Receive/Stand-by/Sleep Mode Select
19	SW(1)	IN/OUT	Transmit/Receive/Stand-by/Sleep Mode Select

### 3 ELECTRICAL CHARACTERISTICS

#### 3.1 ABSOLUTE MAXIMUM OPERATING RANGES

Description	Min	Max	Unit
Supply voltage	2.4	3.6	V
Operating temperature	-40	+85	°C
Storage temperature	-55	125	°C
Soldering temperature (max 15 sec)		260	°C



CAUTION: ESD sensitive device.  
Precaution should be taken when handling the device in order to prevent permanent damage



#### Life Support Policy and Use in Safety Critical Applications

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.

### 3.2 SPECIFICATIONS

The table below gives the specifications of the DP1205 modules under the following conditions:

Supply voltage VDD = 3.3V, temperature = 25°C, frequency deviation  $\Delta f$  = 5 kHz, Bit-rate = 4.8 kbit/s, base-band filter bandwidth BW<sub>SSB</sub> = 10 kHz, carrier frequency f<sub>c</sub> = 434 MHz for the DP1205C433LF, f<sub>c</sub> = 869 MHz for the DP1205C868LF and f<sub>c</sub> = 915 MHz for the DP1205C915LF, bit error rate BER = 0.1% (measured at the output of the bit synchronizer), antenna output matched at 50 Ω.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
FR	Synthesizer Frequency Range	DP1205C433LF	433	-	435	MHz
		DP1205C868LF	868	-	870	MHz
		DP1205C915LF	902	-	928	MHz

IDDSL	Sleep mode supply current		-	0.2	1	μA
IDDST	Standby mode supply current	39 MHz running	-	0.85	1.1	mA
IDDR	RX mode supply current			14	16.5	mA
IDDT	TX mode supply current	P <sub>RF</sub> = 5 dBm		33	40	mA
		P <sub>RF</sub> = 15dBm		62	75	mA

RFS	RF Sensitivity	A-mode		-113	-110	dBm
RFS_12	RF Sensitivity at 1.2kbit/s	A-mode, BER = 0.1%		-118	-115	dBm

FDA	Frequency Deviation	Programmable	1	-	255	kHz
BR	Bit rate	Programmable	1.2	-	152.3	Kb/s

RFOP	RF output power	Programmable.				
		RFOP1	-3	0	-	dBm
		RFOP2	+2	+5	-	dBm
		RFOP3	+7	+10	-	dBm
		RFOP4	+12	+15	-	dBm

TS_STR	Transmitter wake-up time	From oscillator enabled	-	250	350	μs
TS_SRE	Receiver wake up time	From oscillator enabled	-	700	850	μs
TS_OS	Quartz oscillator wake up time	Fundamental	-	1	2	ms

XTAL	Quartz oscillator frequency			39		MHz
------	-----------------------------	--	--	----	--	-----

VIH	Digital input level high	% VDD	75	-	-	%
VIL	Digital input level low	% VDD	-	-	25	%

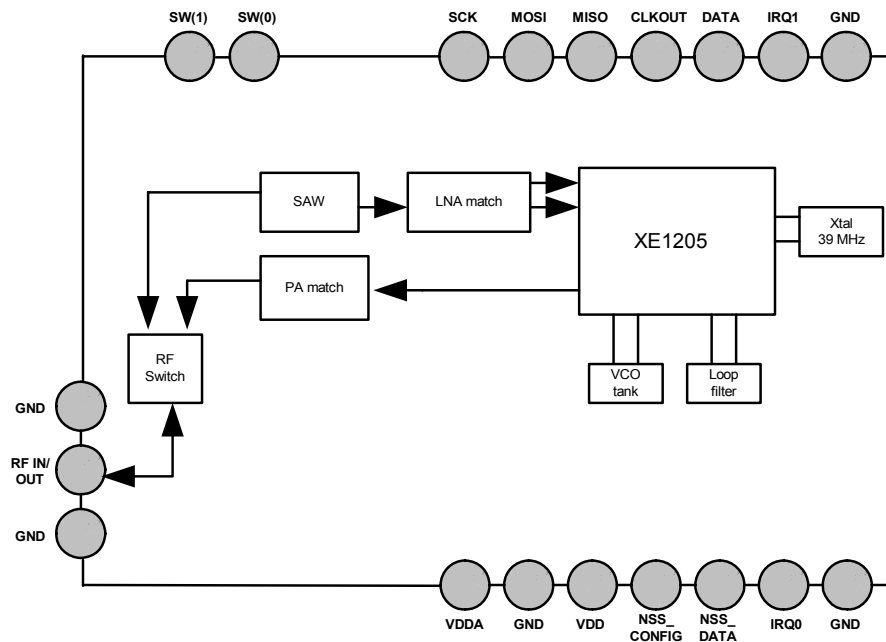
## 4 FUNCTIONAL DESCRIPTION

The TrueRF™ DP1205 is a cost effective high performance radio transceiver module designed for the wireless transmission of digital information over distances up to 8 km.

The module is based on the RF transceiver circuit from Semtech, the TrueRF XE1205. For more information on the XE1205, please refer to the datasheet, available from the Semtech website:

<http://www.semtech.com>

The module also incorporates an antenna switch and a SAW filter placed on the Rx path.



## 5 DATA OPERATION MODES

The XE1205 is user-programmable between two modes of operation:

**Continuous mode:** each bit transmitted or received is accessed directly at the DATA input/output pin.

**Buffered mode:** a 16-byte FIFO is used to store each data byte transmitted or received. This data is written to/read from the FIFO via the SPI bus. It reduces processor overhead and reduces connections (the DATA input/output pin is not used in this operation mode)

In receiver mode, two lines are dedicated to interrupt information. The interrupt pins are IRQ0 and IRQ1. IRQ0 has 3 selectable sources. IRQ1 has 2 selectable sources. The two following tables summarize the interrupt management.

IRQParam_RX_irq_0	MCPParam_Buffered_mode	IRQ0	IRQ0 Interrupt source
00	1	Output	No interrupt available
01	1	Output	Write_byte
10	1	Output	/fifoempty
11	1	Output	Pattern
00	0	Output	Pattern
01	0	Output	RSSI_irq
10	0	Output	Pattern
11	0	Output	Pattern

Table 1: IRQ0 interrupt sources in receive mode.

IRQParam_RX_irq_1	MCPParam_Buffered_mode	IRQ1	IRQ1 Interrupt source
00	1	Output	No interrupt available
01	1	Output	FifoFull
10	1	Output	RSSI_irq
11	1	Output	RSSI_irq
00	0	Output	DCLK
01	0	Output	DCLK
10	0	Output	DCLK
11	0	Output	DCLK

Table 2: IRQ1 interrupt sources in receive mode.

For more information about the data operation modes, please refer to the XE1205 datasheet chapter: *Description*. You can find this at <http://www.semtech.com>.

## 6 SERIAL CONTROL INTERFACE

The XE1205 contains two SPI-compatible serial interfaces, one to send and read the chip configuration, the other to send and receive data in buffered mode. Both interfaces are configured in slave mode and share the same pins MISO (Master In Slave Out), MOSI (Master Out Slave In), SCK (Serial Clock). Two additional pins are required to select the SPI interface: NSS\_CONFIG to change or read the transceiver configuration, and NSS\_DATA to send or read data.

Figure 1 shows the connections between the transceiver and a microcontroller when buffered mode is used.

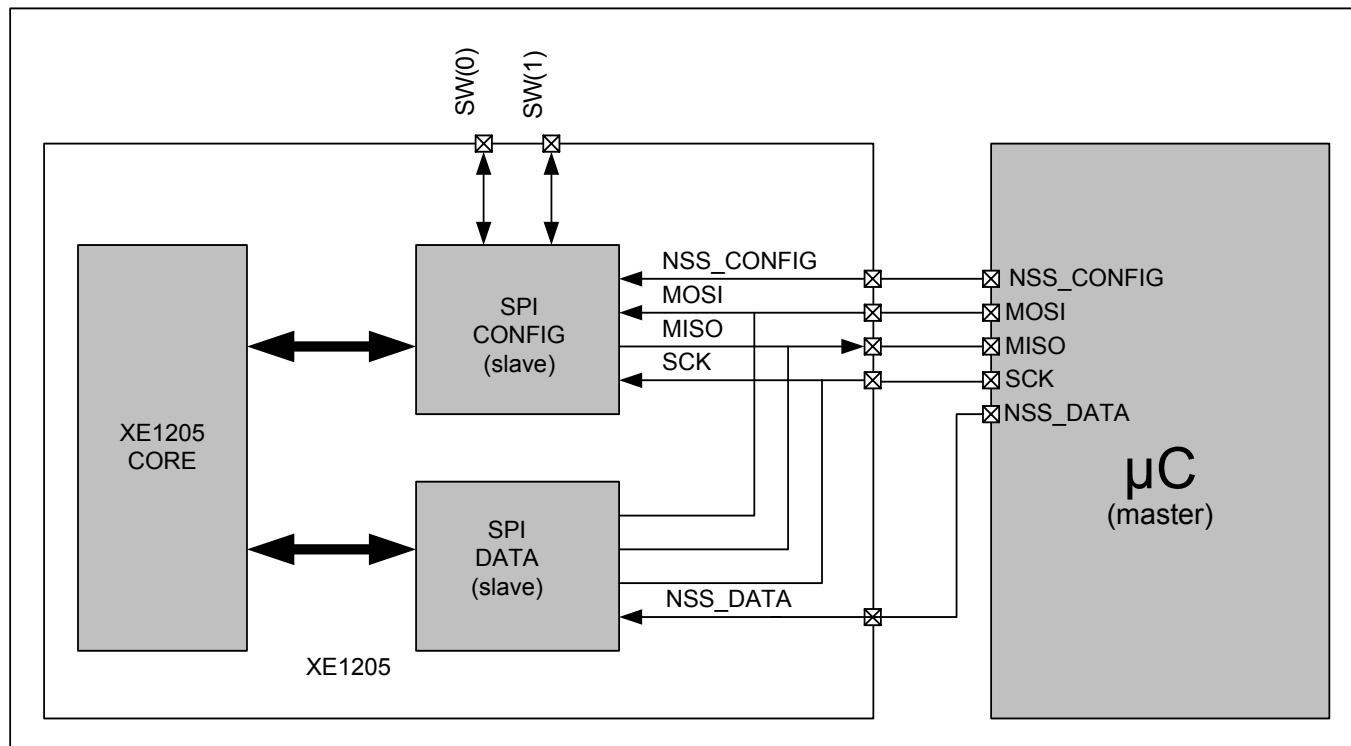


Figure 1: Connection between SPI DATA, SPI CONFIG and a microcontroller

For more information about the serial interface, please refer to the XE1205 datasheet chapter: *Serial Interface definition and principle of operation*. You can find this at <http://www.semtech.com>.



## 7 OPERATING MODES

By default, the serial control interface is used for configuration. It is also possible to change between the four modes (sleep, stand-by, receive, transmit) by using the two-bit signal SW(1:0). This option is enabled by setting the bit MCPParam\_Select\_mode to '1' in the configuration register.

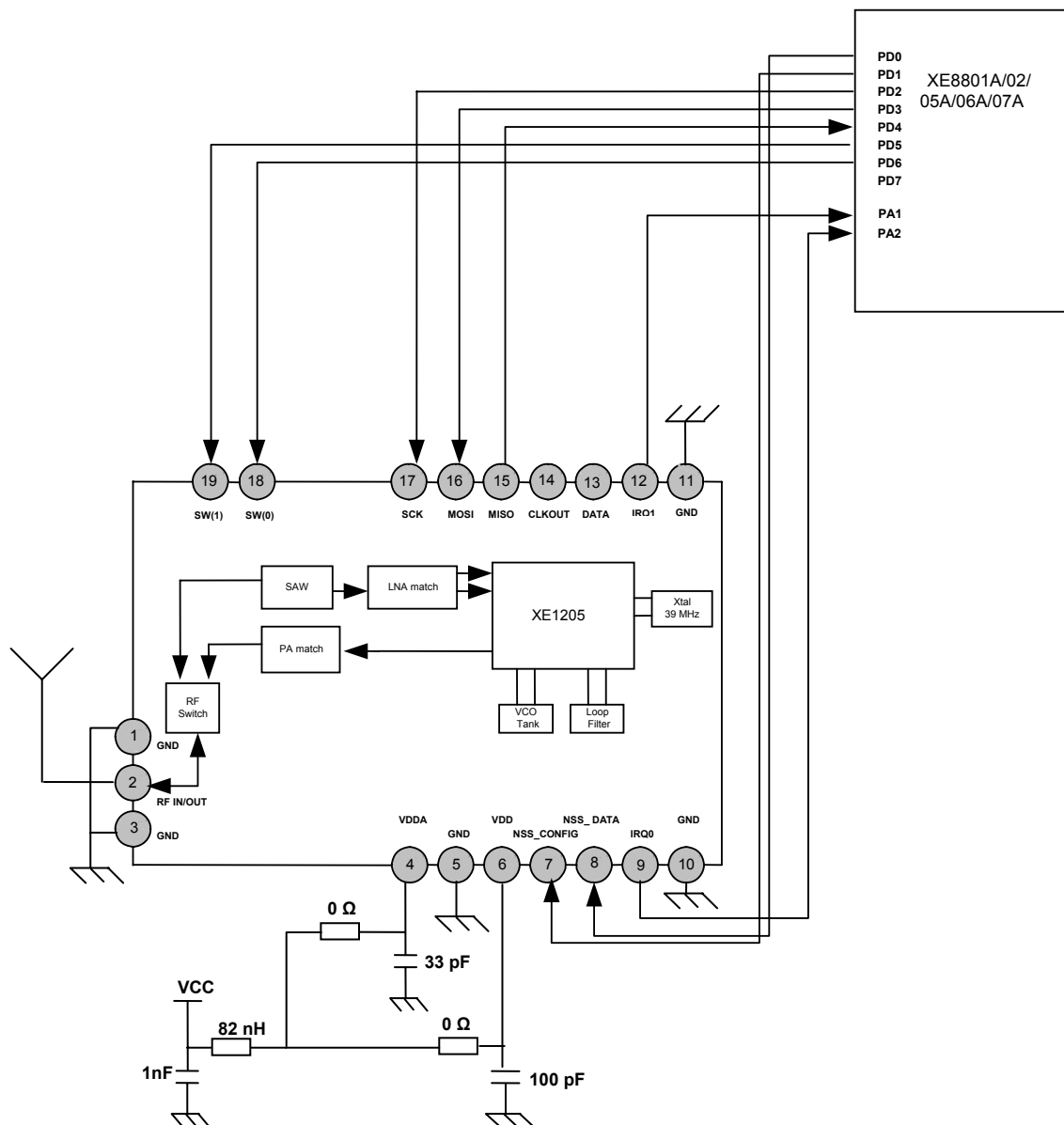
If MCPParam\_Select\_mode is low, the modes are defined by the register through the SPI\_CONFIG interface and SW(1:0) may be used as an output to control, for example, an antenna switch.

<b>MCPParam_Select_mode</b> Bit 5, Address 0	<b>SWITCH (pin)</b> <b>SW(1:0)</b>	<b>MCPParam_chip_mode</b> Bit 7-6, Address 0
0	Set in Output sleep mode -> SW(1:0) = "00" receiver mode -> SW(1:0) = "01" transmitter mode -> SW(1:0) = "10" stand-by mode -> SW(1:0) = "00"	00 -> sleep mode 01 -> receive mode 10 -> transmit mode 11 -> stand-by mode
1	SW(1:0) = 00 -> sleep mode SW(1:0) = 01 -> receive mode SW(1:0) = 10 -> transmit mode SW(1:0) = 11 -> stand-by mode	x

For more information about the modes of operation, please refer to the XE1205 Datasheet on the Semtech website <http://www.semtech.com>.

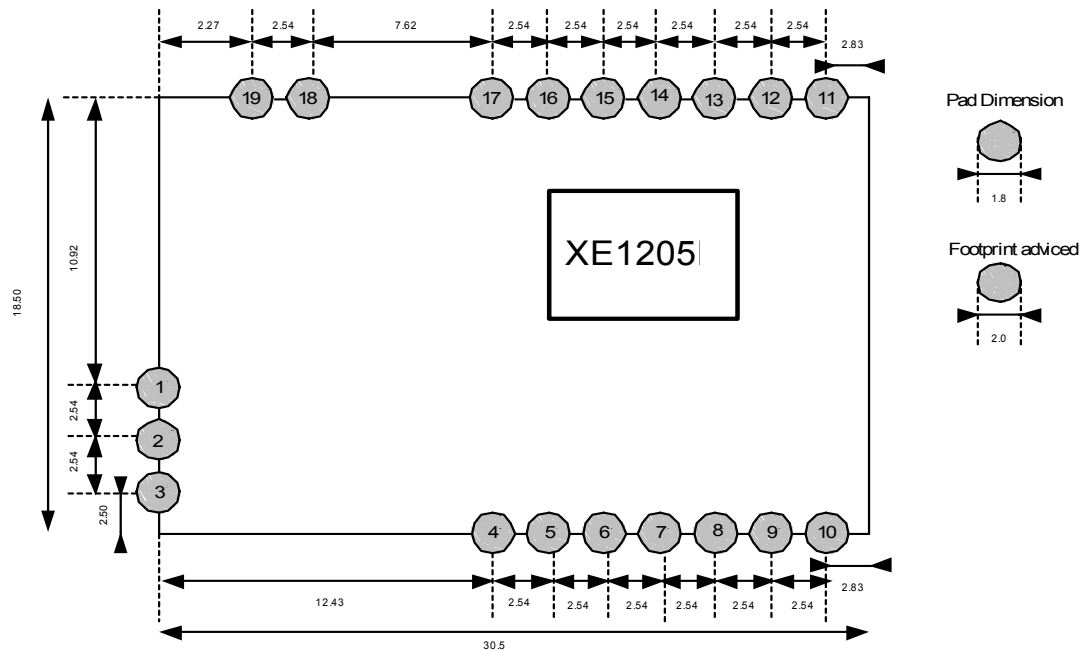
## 8 TYPICAL APPLICATION

The schematic below shows the DP1205 interfaced with a Semtech microcontroller XE8801A/02/05A/06A/07A and the XE1205 used in buffered mode.



## 9 MECHANICAL DIMENSIONS

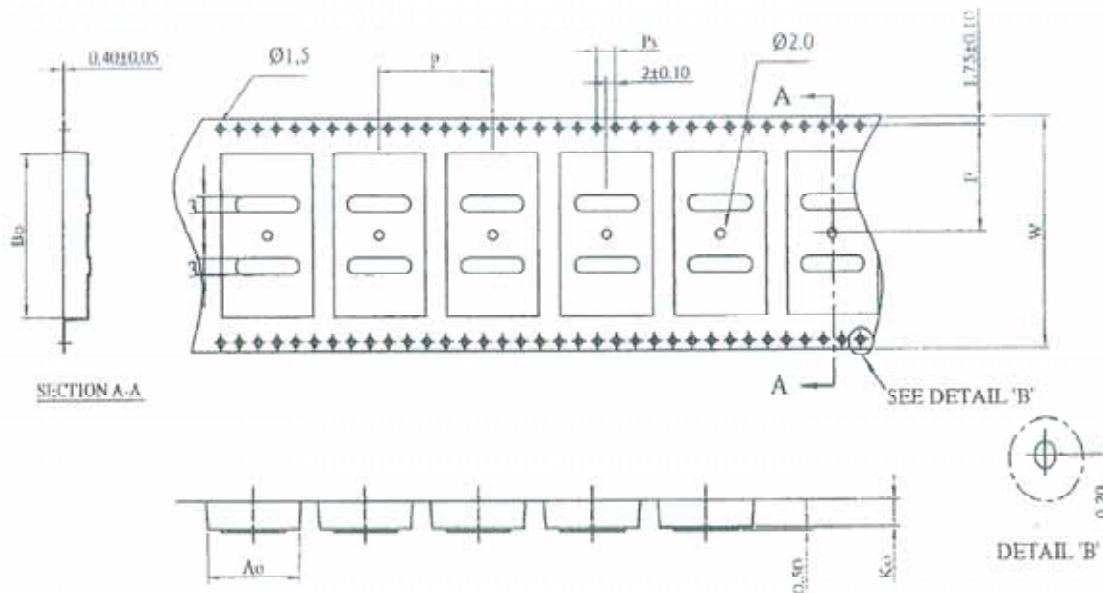
The following diagram shows the physical footprint and dimensions of the DP1205 drop-in module, which should be implemented on the mother board.



## 10 PACKAGING INFORMATION

MATERIAL TYPE : HIGH IMPACT POLYSTYRENE (CONDUCTIVE, BLACK)

CARRIER TAPE DRAWING:



DIMENSIONS	W	P	A <sub>0</sub>	B <sub>0</sub>	K <sub>0</sub>	P <sub>s</sub>	F
SPECS Nominal	44.00	24.00	19.50	31.10	5.30	4.00	20.20
Tolerance +/-	0.30	0.10	0.10	0.10	0.10	0.10	0.10

- All dimensions are in mm.
- Canbers do not exceed 1.0 mm in 100mm
- The maximum cumulative tolerance is +/-0.2 for 10 sprocket hole pitch
- The thickness of carrier tape is 0.4mm

© Semtech 2006

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  
Wireless and Sensing Products Division  
200 Flynn Road, Camarillo, CA 93012  
Phone (805) 498-2111 Fax : (805) 498-3804