CanaanTek

CAN1418R SP8T Switch

Product Description

Rev 2.2 September, 2018

This datasheet is intended for customer's evaluation and application of the CAN1418R device. Under no circumstances it should be circulated outside the customer's company. This data sheet is preliminary and CanaanTek reserves the right to modify and to improve the data.

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PRODUCT DESCRIPTION

CAN1418R is a Single Pole, Eight-Throw (SP8T) antenna switch. The high linearity performance and low insertion loss achieved by the CAN1418R make it an ideal choice for main/diversity switching commonly used in LTE-based handsets, data cards, and tablets that use antenna diversity solutions.

Switching is controlled by three CMOS/TTL-compatible control voltage inputs (V1, V2, and V3). Depending on the logic voltage level applied to the control pins, the ANT pin is connected to one of eight switched RF outputs (RF1 to RF8) using a low insertion loss path, while the paths between the ANT pin and the other RF pins are in a high isolation state. No external blocking capacitors are required on the RF paths unless VDC is externally applied. The negative voltage generator enables less parasitic switch capacitance, therefore yielding better isolation and less insertion loss.

The CAN1418R is manufactured in a compact, 14-pin 2.0 x 2.0 mm, Quad Flat No-Lead (QFN) package.

FEATURES

- Broadband frequency range: 0.1 to. 2.7 GHz
- Low insertion loss: 0.70 dB typical @ 2.7 GHz
- High isolation: >31 dB @ 2.7 GHz
- Integrated logic
- Small QFN (14-pin, 2.0 x 2.0 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

APPLICATIONS

- Any 2G/3G/4G antenna diversity or LTE (TDD/FDD) transmit/receive system for which GSM transmit is not required.

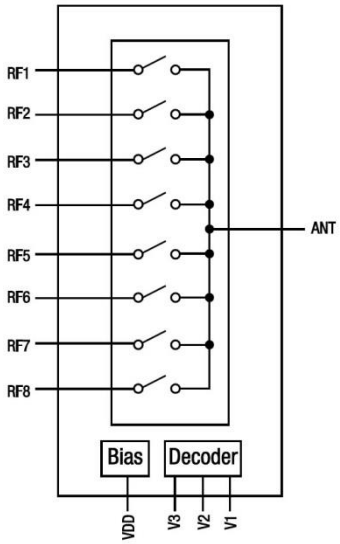

Figure 1. CAN1418R Block Diagram

(Top View)

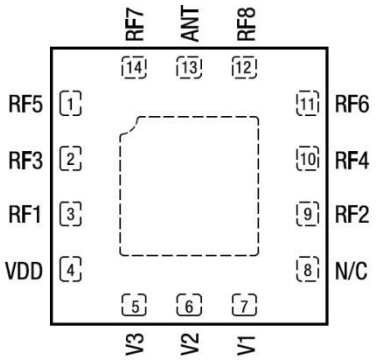

Figure 2. CAN1418R Pinout – 14-Pin QFN

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

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Table 1. CAN1418R Signal Descriptions

Pin#	Name	Description	Pin#	Name	Description
1	RF5	RF I/O path 5	8	N/C	Not connected
2	RF3	RF I/O path 3	9	RF2	RF I/O path 2
3	RF1	RF I/O path 1	10	RF4	RF I/O path 4
4	VDD	DC power supply	11	RF6	RF I/O path 6
5	V3	DC control voltage 3	12	RF8	RF I/O path 8
6	V2	DC control voltage 2	13	ANT	Antenna port
7	V1	DC control voltage 1	14	RF7	RF I/O path 7

Note: Bottom ground paddles must be connected to ground.

Table 2. CAN1418R Absolute Maximum Ratings (Note 1)

	Symbol	Minimum	Maximum	Units
Supply voltage	V_{DD}	2.7	5.0	V
Control voltage (V1, V2, and V3)	V_{CTL}	0	3.30	V
Operating temperature	T_{OP}	-40	+85	℃
Storage temperature	T_{STG}	-55	+150	℃
Electrostatic Discharge, Human Body Model (HBM), Class 1C	ESD		2000	V

Note1: 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.

Functional Description

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The CAN1418R includes an internal negative voltage generator and decoder that eliminate the need for external DC blocking capacitors on the RF ports. No external components are required for proper operation. DC decoupling capacitors may be added on the VDD and control lines if necessary.

Switching is controlled by three control voltage inputs, V1, V2, and V3. Depending on the logic voltage level applied to the control pins, the antenna pin is connected to one of eight switched RF outputs.

The recommended startup sequence is:

1. Apply VDD
2. Apply V1, V2, and V3 voltages
3. Apply RF input

The device must be turned off in reverse order.

Electrical and Mechanical Specifications

The absolute maximum ratings of the CAN1418R are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the CAN1418R is determined by the logic provided in Table 4.

Table 3. CAN1418R General Electrical Specifications (Note 1)

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(VDD = 2.85 V, V1 = V2 = V3 = 0/1.8 V, PIN = 0 dBm, TOP = +25 °C, Characteristic Impedance [Z_O] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition (Note 2)	Min	Typical	Max	Units
DC Specifications						
Supply voltage	V_{DD}		2.7	2.85	5.0	V
Supply current	I_{DD}			21	27	μA
Control voltage: High Low	 V_{CTL}_H V_{CTL}_L		 1.20	 1.80	 3.30 0.4	 V V
Control current	I_{CTL}	V_{CTL} = 1.8 V		0.5	1.0	μA
Turn-on switching time	t_{ON}	50% of final control voltage to 90% of final RF power, switching between RF1/2/3/4/5/6/7/8		1.75	2.2	μs
RF Specifications						
Insertion loss (ANT pin to RF1/2/3/4/5/6 pins)	IL	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz		0.33 0.42 0.70	0.55 0.60 0.85	dB dB dB
Insertion loss (ANT pin to RF7/8 pins)	IL	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz		0.33 0.42 0.70	0.55 0.60 0.85	dB dB dB
Isolation (ANT pin to RF1/2/3/4/5/6 pins)	Iso	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	35 20 25	44 35 31		dB dB dB
Isolation (ANT pin to RF7/8 pins)	Iso	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	35 20 25	44 35 31		dB dB dB
Input return loss (ANT pin to RF1/2/3/4/5/6 pins)	RL	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	20 15 10	24 20 12		dB dB dB
Input return loss (ANT pin to RF7/8 pins)	RL	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	20 15 10	24 20 12		dB dB dB
0.1 dB Compression Point (ANT pin to RF1/2/3/4/5/6/7/8 pins)	P0.1dB	0.1 GHz to 2.7GHz		17.5		dBm

Table 4. CAN1418R Control Logic

Control Pins			Switched RF Outputs							
V1 (Pin 7)	**V2 (Pin 6)**	**V3 (Pin 5)**	**RF1 (Pin 3)**	**RF2 (Pin 9)**	**RF3 (Pin 2)**	**RF4 (Pin 10)**	**RF5 (Pin 1)**	**RF6 (Pin 11)**	**RF7 (Pin 14)**	**RF8 (Pin 12)**
0	0	0	Insertion Loss	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	0	1	Isolation	Insertion Loss	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	0	Isolation	Isolation	Insertion Loss	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	1	Isolation	Isolation	Isolation	Insertion Loss	Isolation	Isolation	Isolation	Isolation
1	0	0	Isolation	Isolation	Isolation	Isolation	Insertion Loss	Isolation	Isolation	Isolation
1	0	1	Isolation	Isolation	Isolation	Isolation	Isolation	Insertion Loss	Isolation	Isolation
1	1	0	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Insertion Loss	Isolation
1	1	1	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Insertion Loss

Notes 1: “High” = 1.8 V; “Low” = 0 V. Any state other than that described in this Table places the switch into an undefined state. An undefined state will not damage the device.

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Evaluation Board Description

The CAN1418R Evaluation Board is used to test the performance of the CAN1418R SP8T Switch. An Evaluation Board schematic diagram is provided in Figure 3. An assembly drawing for the Evaluation Board is shown in Figure 4.

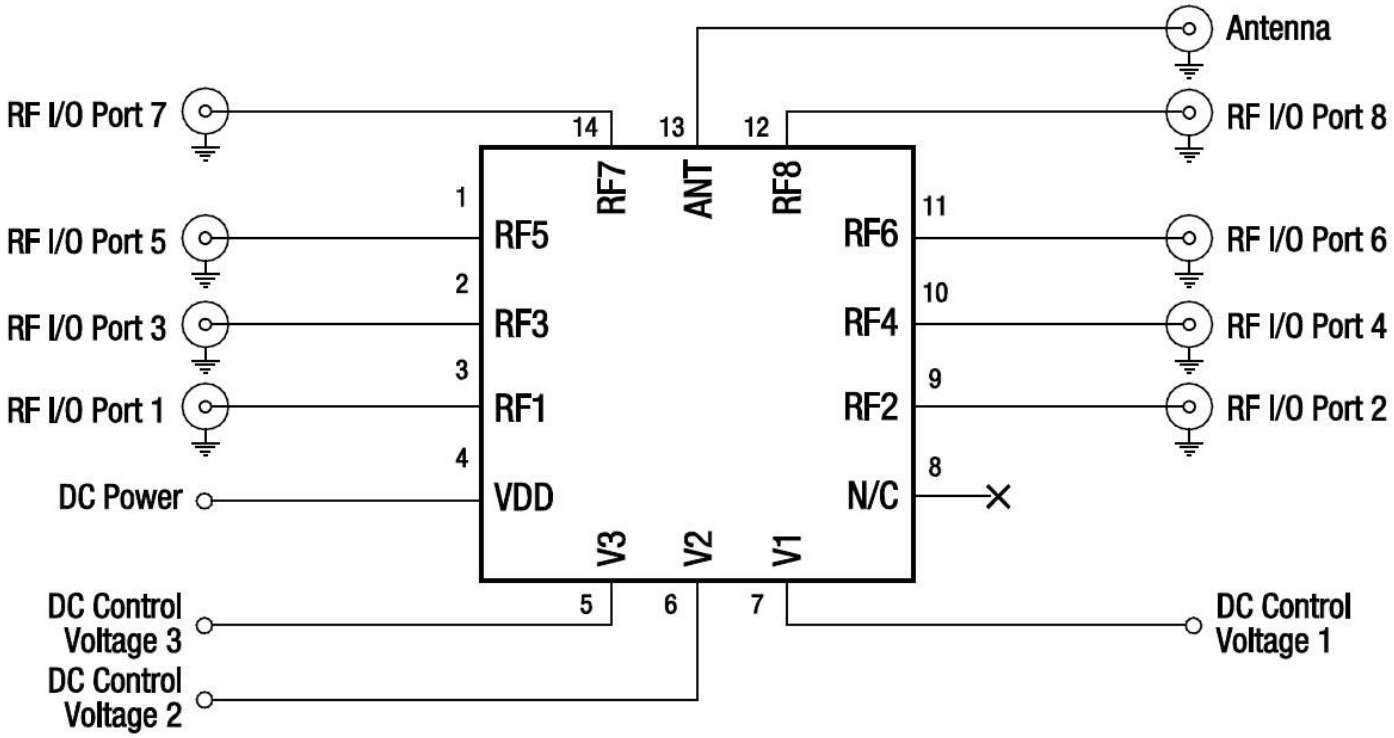

Figure 3. CAN1418R Evaluation Board Schematic

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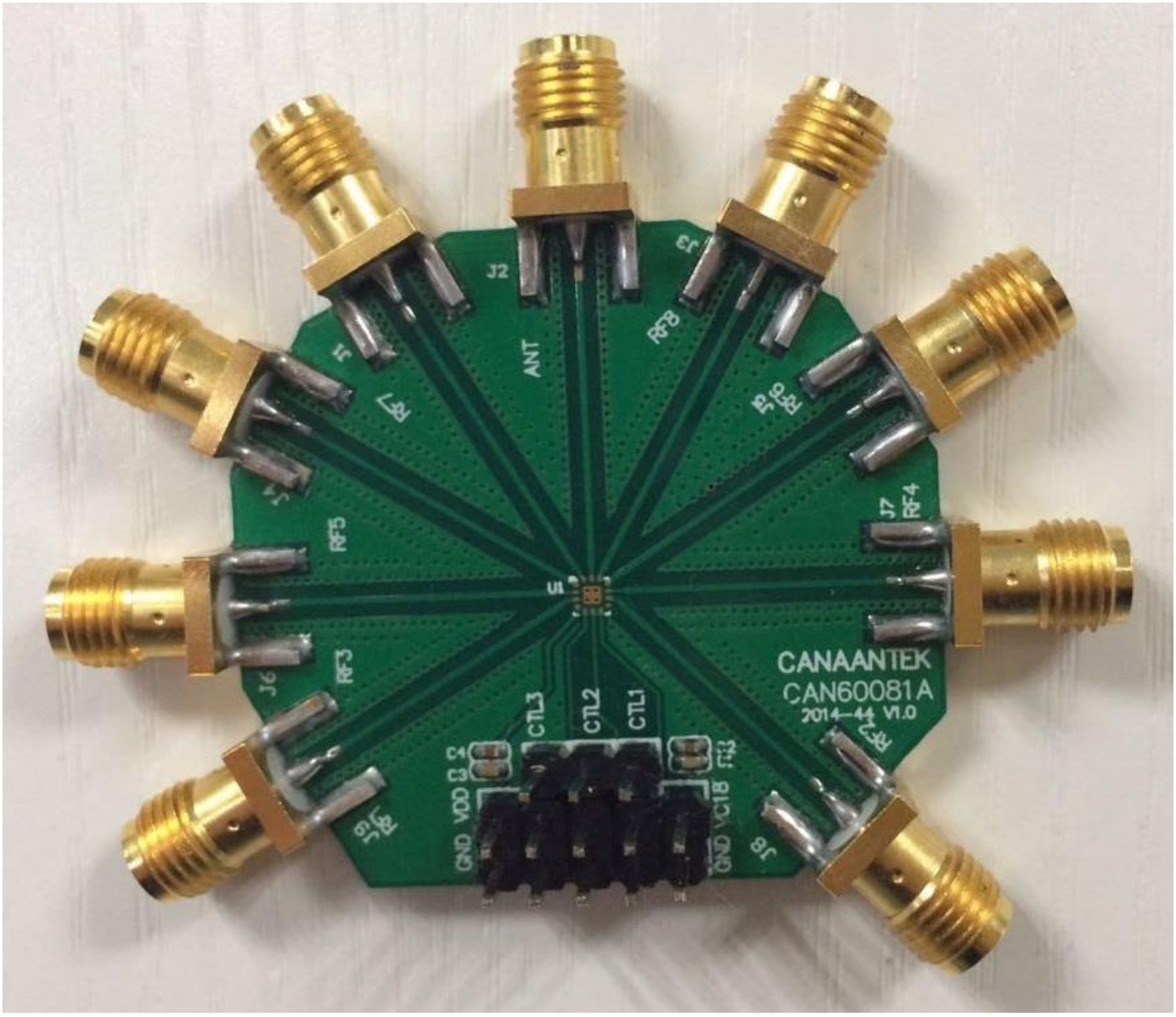

Figure 4. CAN1418R Evaluation Board Assembly Diagram

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Package Dimensions

The PCB layout footprint for the CAN1418R is provided in Figure 5. Typical case markings are shown in Figure 6. Package dimensions for the 14-pin QFN are shown in Figure 7, and tape and reel dimensions are provided in Figure 8.

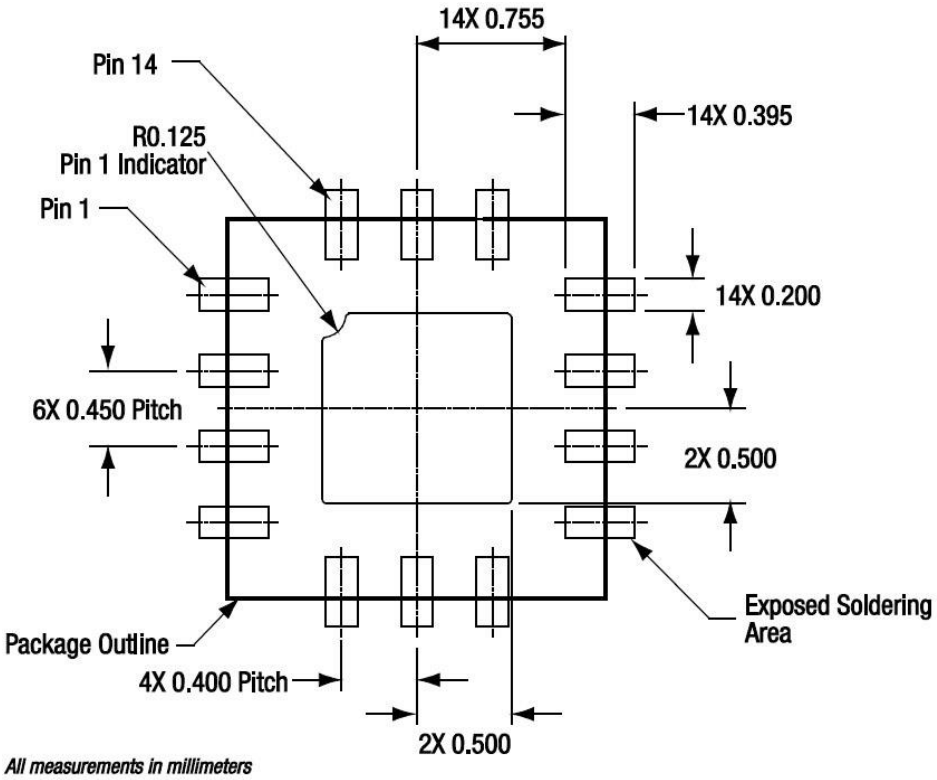

Figure 5. CAN1418R PCB Layout Footprint

(Top View)

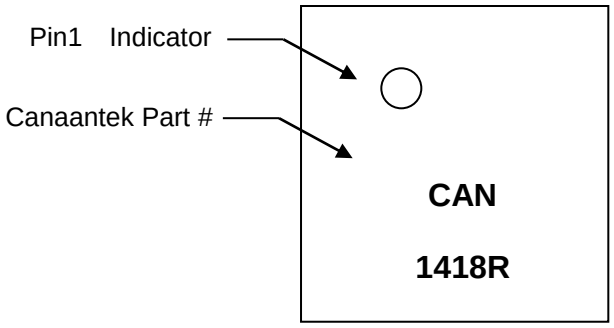

Figure 6. Typical Part Markings

(Top View)

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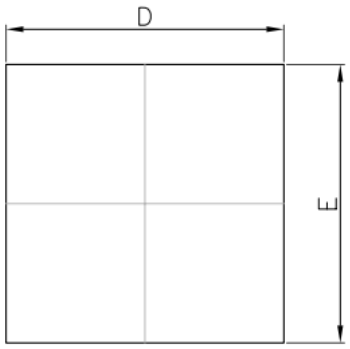
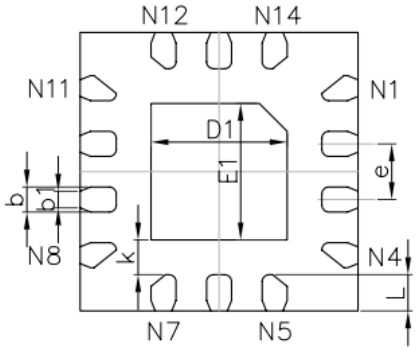
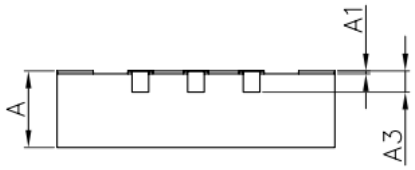


TOP VIEW



BOTTOM VIEW



SIDE VIEW

	MILLMETER		
SYMBOL	MIN	NOR	MAX
A	0.50	0.55	0.60
A1	0.000		0.05
A3	0.152REF		
D	1.90	2.00	2.1
E	1.90	2.00	2.1
D1	0.88	0.98	1.08
E1	0.88	0.98	1.08
b	0.13	0.18	0.23
e	0.40TYP		
k	0.25REF		
L	0.184	0.26	0.336

Figure 7. CAN1418R 14-Pin MCM Package Dimensions

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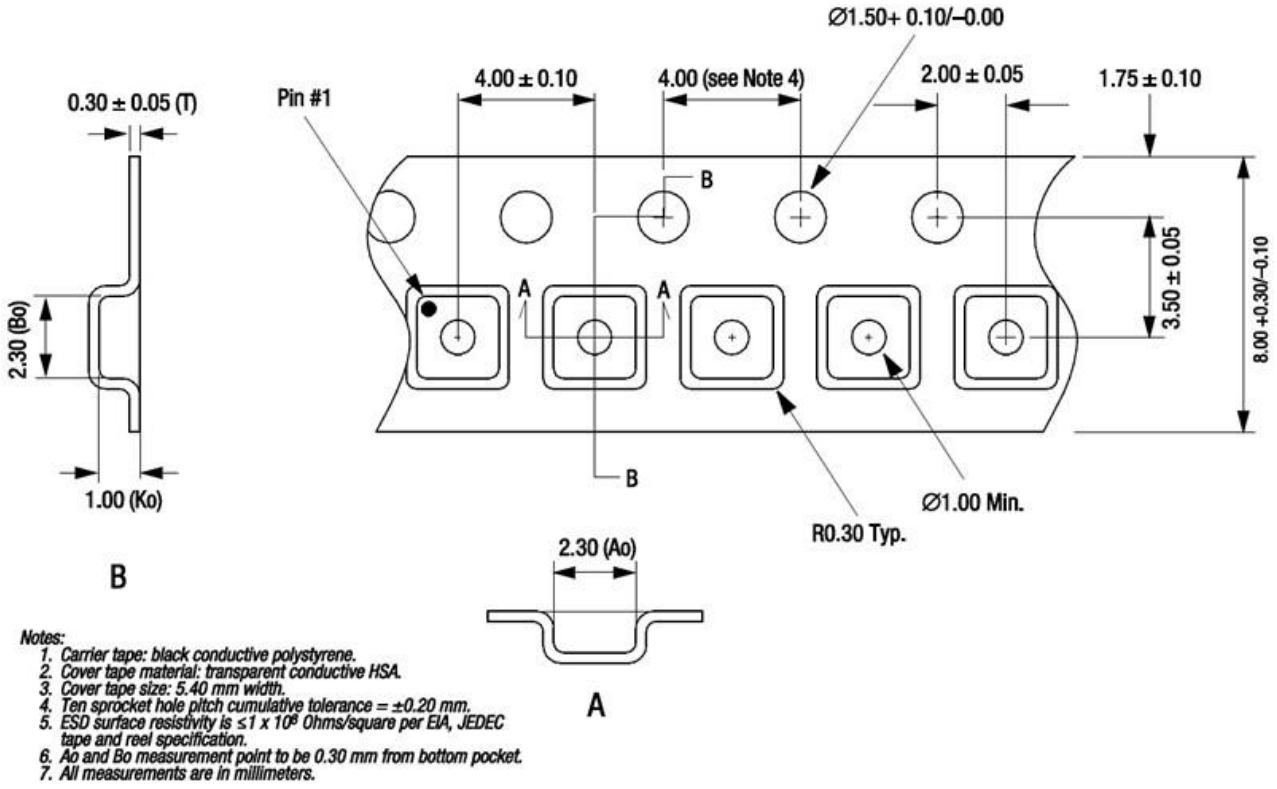

Figure 8. CAN1418R Tape and Reel Dimensions

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

THE CAN1418R is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

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Revision History

Revision	Release Date	Description
REV1.0	2014.12.03	First Version
Rev 2.0	2016.05.20	Second Revision
Rev2.1	2016.12.27	Update POD
Rev2.2	2018.09.21	Update RF specification

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