

High Power SPDT Reflective Switch, 10 W

0.5 - 7.5 GHz



MASW-011191

Rev. V1

Features

- 0.4 dB @ 4 GHz TX Insertion Loss
- 0.54 dB @ 4 GHz RX Insertion Loss
- 41 dBm Input P0.1dB on TX Path
- 18 dB Typical Return Loss at Each RF Port
- Compatible with 1.8V CMOS Logic
- 3 mm 16-Lead PQFN Package
- RoHS* Compliant

Applications

- Wireless Infrastructure
- ISM
- Multi Market

Description

The MASW-011191 is a single pole double throw (SPDT) switch with 0.4 dB of insertion loss in the TX path and 0.54 dB insertion loss in the RX path @ 4 GHz. The TX path is capable of handling 10 W input power. The input and output return losses in the thru path are typically 20 dB. The logic levels are standard 1.8 V CMOS. Only a single positive supply of +5 V is required.

The MASW-011191 is designed for transmit/receive applications between 500 MHz and 7.5 GHz. The 3 mm PQFN package is lead free and RoHS compliant. 0.5 dB of insertion loss in the TX path and 0.5 dB insertion loss in the RX path. The TX path is capable of handling 10 W input power. The input and output return losses in the thru path are typically 18 dB. The logic levels are standard 1.8 V CMOS. Only a single positive supply of +5 V is required.

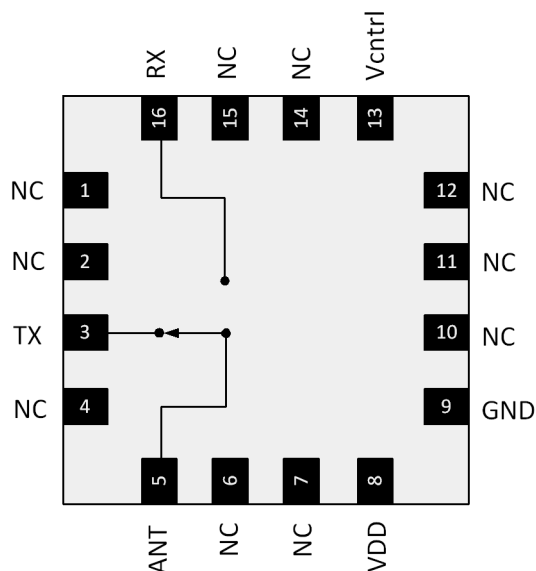
The MASW-011191 is designed for transmit/receive applications between 500 MHz and 7.5 GHz. The 3 mm PQFN package is lead free and RoHS compliant.

Ordering Information¹

Part Number	Package
MASW-011191-TR1000	1000 part Reel
MASW-011191-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Names^{2,3}

Pin #	Function
1,2,4,6,7,10,11,12,14,15	No Connection
3	TX Input/Output
5	ANT Common Port
8	VDD/+5 V
9	GND
13	Vcntrl Control Input
16	RX Input/Output

2. MACOM recommends connecting unused package pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

1 * Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Pin Description

Pin #	Name	Description
1	NC	Not connected internally
2	NC	Not connected internally
3	TX	This pin is DC-decoupled and matched to 50Ω. A DC-blocking capacitor is not be required on this pin
4	NC	Not connected internally
5	ANT	This pin is dc-decoupled and matched to 50Ω. A DC-blocking capacitor is not be required on this pin
6	NC	Not connected internally
7	NC	Not connected internally
8	VDD	Supply Voltage. Place bypass capacitor as close to pin as possible.
9	GND	This pin is grounded internally
10	NC	Not connected internally
11	NC	Not connected internally
12	NC	Not connected internally
13	Vcntrl	Switch Control Input
14	NC	Not connected internally
15	NC	Not connected internally
16	RX	This pin is DC-coupled and matched to 50Ω. A DC-blocking capacitor is required on this pin when DC value is not zero
Paddle	GND	Exposed Pad. The exposed pad must be connected to a large RF/DC ground island providing thermal capabilities for heat dissipation.

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Electrical Specifications: $P_{IN} = 0$ dBm, $T_A = 25^\circ\text{C}$, $V_{CC} = +5$ V, $Z_0 = 50 \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss, ANT to TX	1.0 GHz	dB	—	0.32	—
	2.5 GHz			0.34	0.9
	5.0 GHz			0.45	1.0
	6.0 GHz			0.50	1.2
Insertion Loss, ANT to RX	1.0 GHz	dB	—	0.65	—
	2.5 GHz			0.50	1.0
	5.0 GHz			0.63	1.2
	6.0 GHz			0.75	1.3
Isolation, ANT to RX in TX Mode	1.0 GHz	dB	—	39.5	—
	2.5 GHz		30	36.0	
	5.0 GHz		26	31.0	
	6.0 GHz		25	29.5	
Isolation, TX to RX in TX Mode	1.0 GHz	dB	—	39.0	—
	2.5 GHz			34.0	—
	5.0 GHz			29.0	—
	6.0 GHz			27.5	—
Isolation, ANT to TX in RX Mode	1.0 GHz	dB	—	36.0	—
	2.5 GHz		23	28.0	
	5.0 GHz		15	19.0	
	6.0 GHz		13	17.0	
Isolation, TX to RX in RX Mode	1.0 GHz	dB	—	39.0	—
	2.5 GHz			32.5	—
	5.0 GHz			23.0	—
	6.0 GHz			20.0	—
ANT Port Return Loss in TX Mode	1.0 GHz	dB	—	22.0	—
	2.5 GHz			23.0	—
	5.0 GHz			23.0	—
	6.0 GHz			24.0	—
ANT Port Return Loss in RX Mode	1.0 GHz	dB	—	13.0	—
	2.5 GHz			20.0	—
	5.0 GHz			21.0	—
	6.0 GHz			21.0	—
TX Port Return Loss in TX Mode	1.0 GHz	dB	—	20.0	—
	2.5 GHz			23.0	—
	5.0 GHz			24.0	—
	6.0 GHz			23.5	—
RX Port Return Loss in RX Mode	1.0 GHz	dB	—	11.5	—
	2.5 GHz			20.0	—
	5.0 GHz			22.5	—
	6.0 GHz			21.5	—
TX Input P0.1dB	1 - 5 GHz	dBm	—	41	—
RX Input P0.1dB	1 - 5 GHz	dBm	—	30.5	—
TX Input IP3	+34 dBm per tone, 10 MHz spacing 2.5 GHz	dBm	—	67.5	—
RX Input IP3	+34 dBm per tone, 10 MHz spacing 2.5 GHz	dBm	—	67.0	—

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DC Electrical Specifications: $V_{CC} = +5 V$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Switching Speed, TX Mode					
T_{ON}	50% control to 90% Voltage	ns	—	410	—
T_{OFF}	50% control to 10% Voltage			135	
T_{RISE}	10% to 90% Voltage			140	
T_{FALL}	90% to 10% Voltage			45	
Switching Speed, RX Mode					
T_{ON}	50% control to 90% Voltage	ns	—	190	—
T_{OFF}	50% control to 10% Voltage			80	
T_{RISE}	10% to 90% Voltage			40	
T_{FALL}	90% to 10% Voltage			26	
Supply Voltage, VDD	—	V	+4.75	+5.0	+5.25
VDD Quiescent Current	TX Mode RX Mode	mA	—	1.4 1.0	—
Vcntrl Control Voltage	Logic High, V_{IH} Logic Low, V_{IL}	V	—	+1.8 0	—
T/R Logic Input Current	Logic High, V_{IH} Logic Low, V_{IL}	μA	—	40 0.04	—

Truth Table

Control Input	T/R Path	
	RX	TX
Vcntrl		
V_{IH}	On	Off
V_{IL}	Off	On

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1C, CDM Class C3 devices.

Recommended Operating Conditions

Parameter	Maximum
Input Power, TX Path	37 dBm LTE (7 dB PAR) 40 dBm CW
Input Power, RX Path	26 dBm LTE (7 dB PAR) 29 dBm CW
DC Supply VDD	4.75 V to 5.25 V
Junction Temperature ⁴	125°C
Operating Temperature ^{5,6}	-40°C to 105°C

- Junction Temperature (T_J) = $T_C + \Theta_{jc} * (V * I)$, Typical thermal resistance $\Theta_{jc} = 9.8^\circ C/W$.
- Operating at nominal conditions with $T_J \leq +125^\circ C$ will ensure MTTF $\gg 1 \times 10^6$ hours.
- Operating/Case temperature (T_C) is the temperature of the exposed paddle.

Absolute Maximum Ratings^{7,8,9}

Parameter	Absolute Maximum
Antenna Input Power Freq. = 3.75 GHz: TX Mode	39 dBm LTE (8 dB PAR) 42 dBm CW
Antenna Input Power Freq. = 3.75 GHz: RX Mode	28 dBm LTE (8 dB PAR) 31 dBm CW
DC Supply VDD	-0.5 V to 5.5 V
Control Voltage	-0.5 V to 2.75 V
Junction Temperature ⁴	140°C
Storage Temperature	-55°C to 125°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- Single event, up to 10 seconds duration.

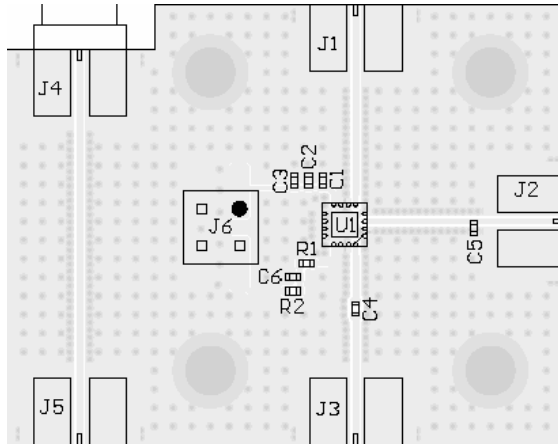
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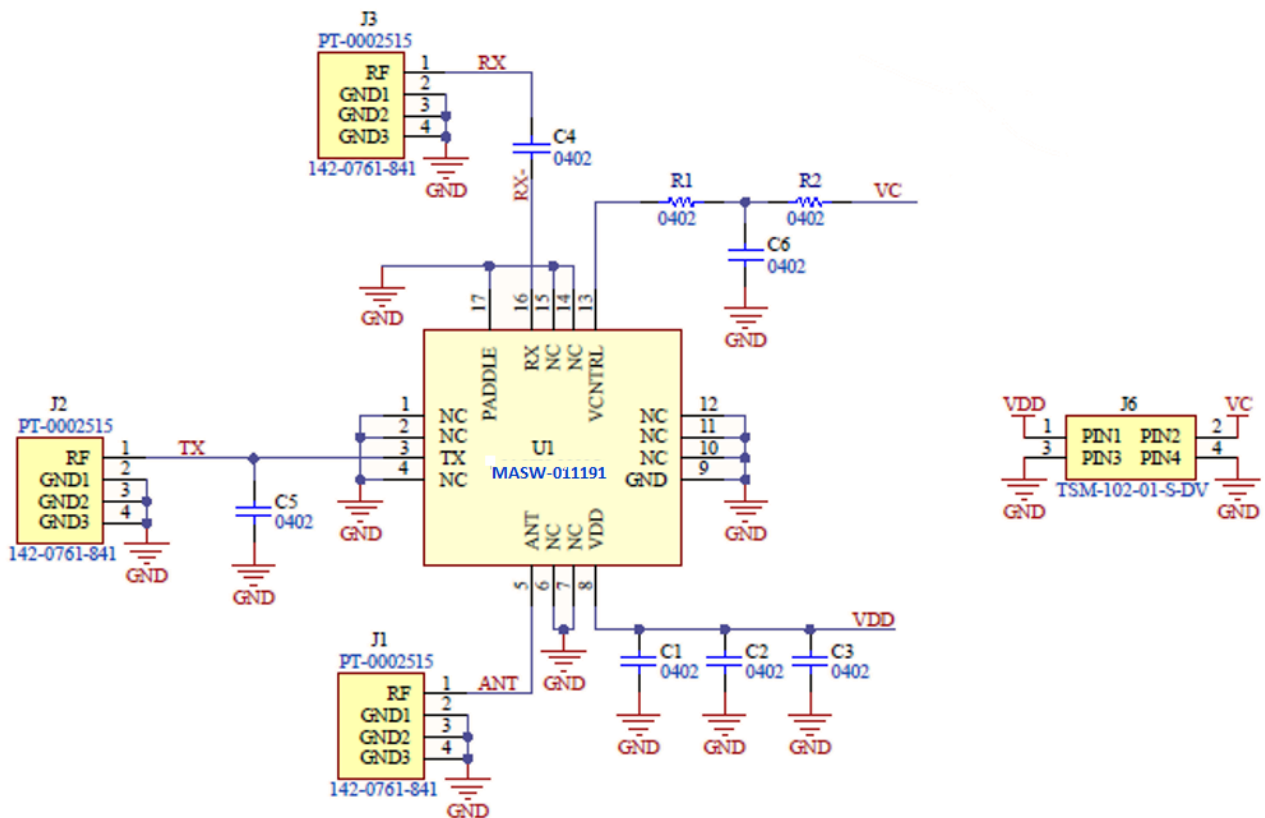
PCB Layout



Parts List

Part	Value	Case Style
C1	10 pF	0402
C2	1000 pF	0402
C3	1 μ F	0402
C4	6.2 pF	0402
C5	DNP	0402
C6	5 pF	0402
R1,R2	0 Ω	0402
J1 - J5	142-0761-841	SMA, End Launch

Application Schematic



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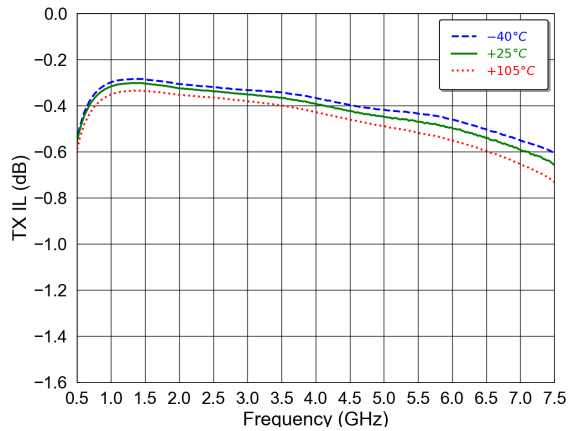


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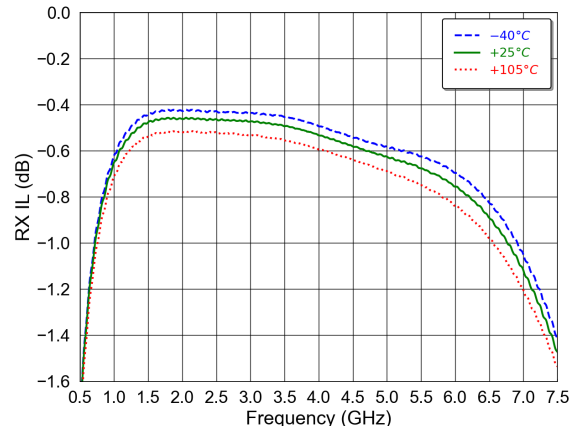
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Typical Performance Curves

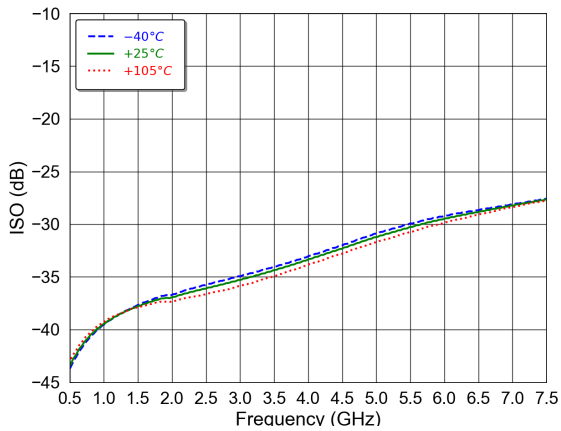
Insertion Loss, ANT to TX



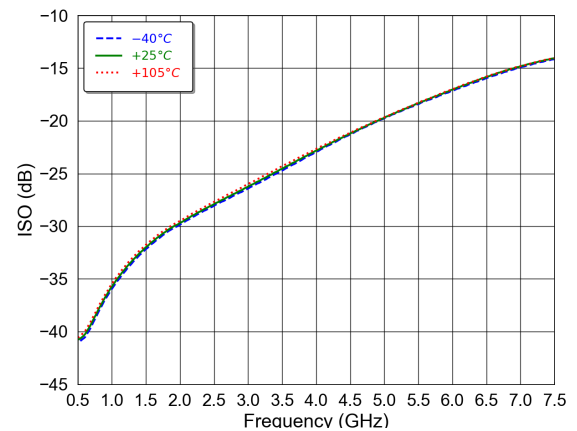
Insertion Loss, ANT to RX



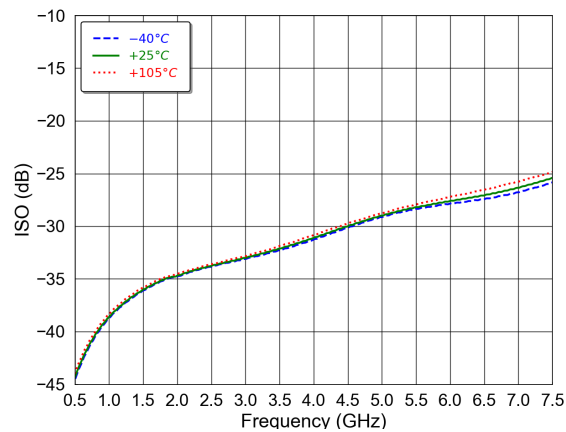
Isolation, ANT to RX in TX Mode



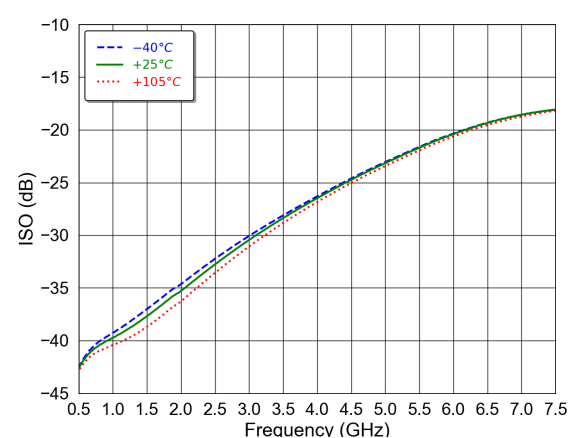
Isolation, ANT to TX in RX Mode



Isolation, TX to RX in TX Mode



Isolation, RX to TX in RX Mode



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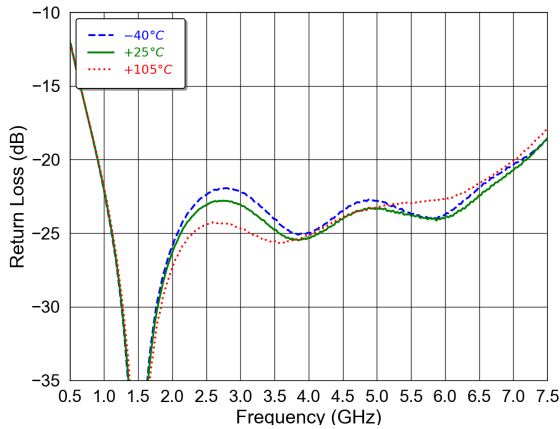


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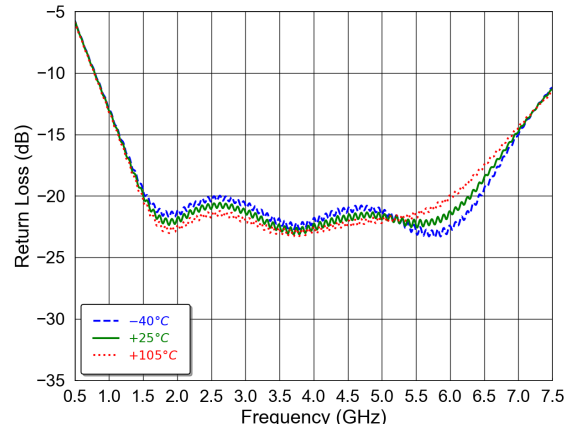
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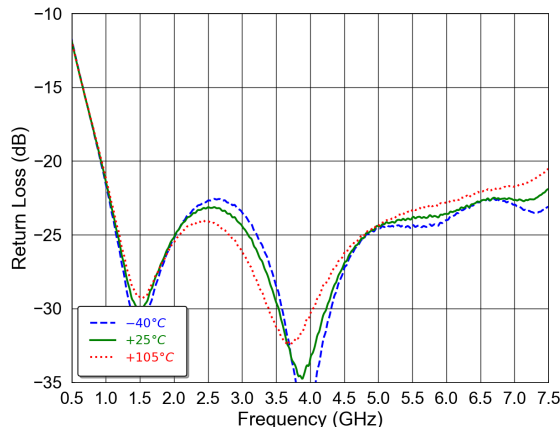
ANT Return Loss in TX Mode



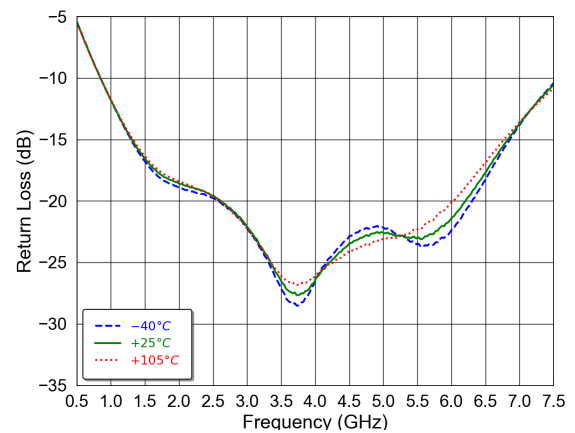
ANT Return Loss in RX Mode



TX Return Loss



RX Return Loss



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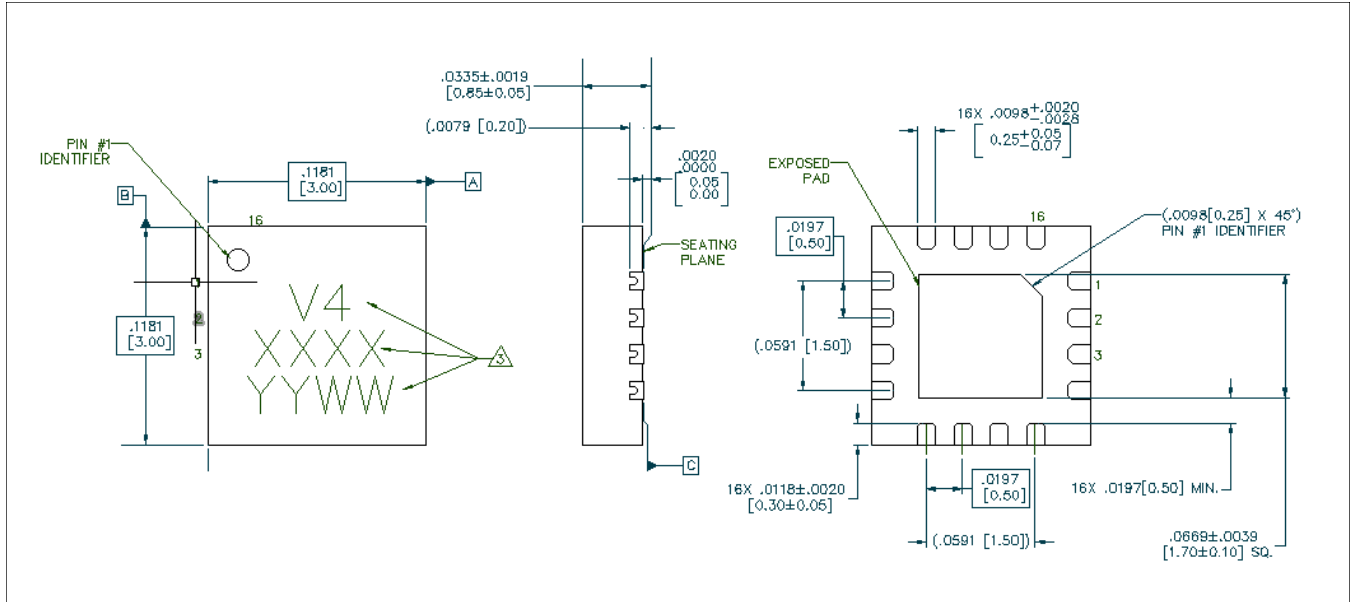
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Lead-Free 3 mm 16-Lead PQFN[†]



[†] Reference Application Note S2083 for lead-free solder reflow recommendations.
 Meets JEDEC moisture sensitivity level 1 requirements in accordance to JEDEC J-STD-020D.
 Plating is NiPdAu over Copper

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