



## **MXD8680Q**

SP8T Antenna Switch

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### General Description

The MXD8680Q is a low loss, high isolation SP8T switch with performance for antenna diversity receiving.

The MXD8680Q is compatible with +1.0V control logic, which is a key requirement for most cellular transceivers. This part is packaged in a compact 2mm x 2mm x 0.53mm, 14-pin, QFN package which allows for a small solution size with no need for external DC blocking capacitors (when no external DC is applied to the device ports).

### Features

- Excellent insertion loss
  - 0.60 dB Insertion Loss at 2.7GHz
- Broadband frequency range: 0.1 to 3.0 GHz
- No DC blocking capacitors required (unless external DC is applied to the RF ports)
- Compact 2mm x 2mm x 0.53mm in QFN-14 package, MSL1

### Applications

- 2G/3G/4G antenna diversity
- Cellular modems and USB Devices

### Functional Block Diagram and Pin Function

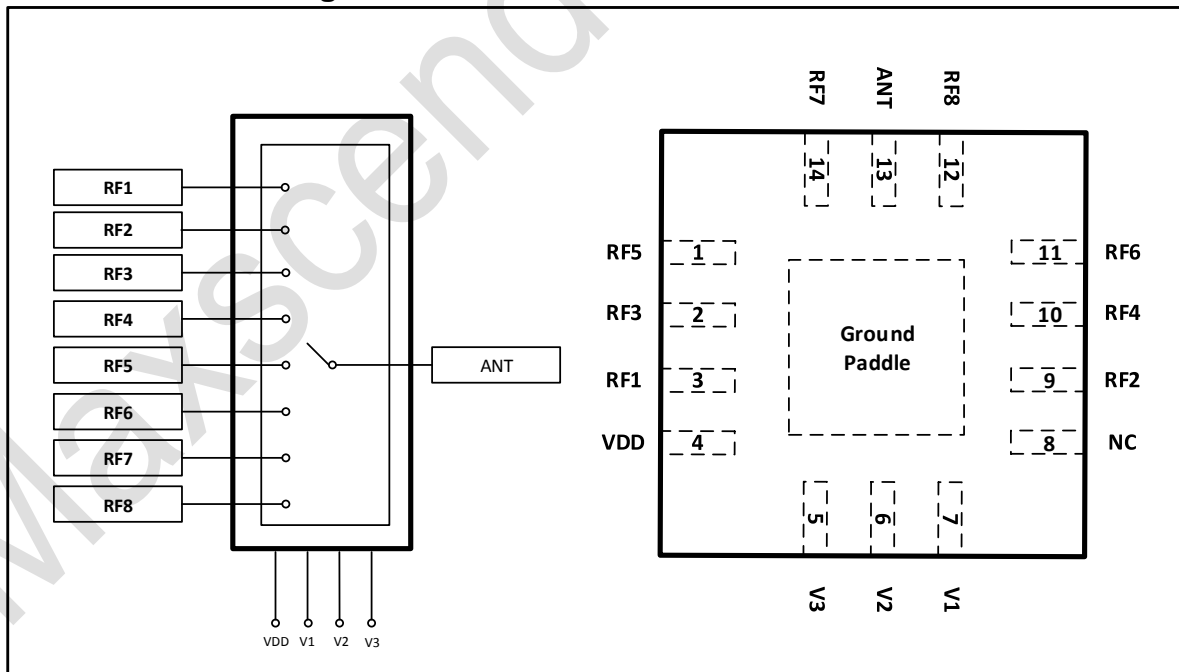


Figure 1. Functional Block Diagram and Pinout (Top View)

## Application Circuit

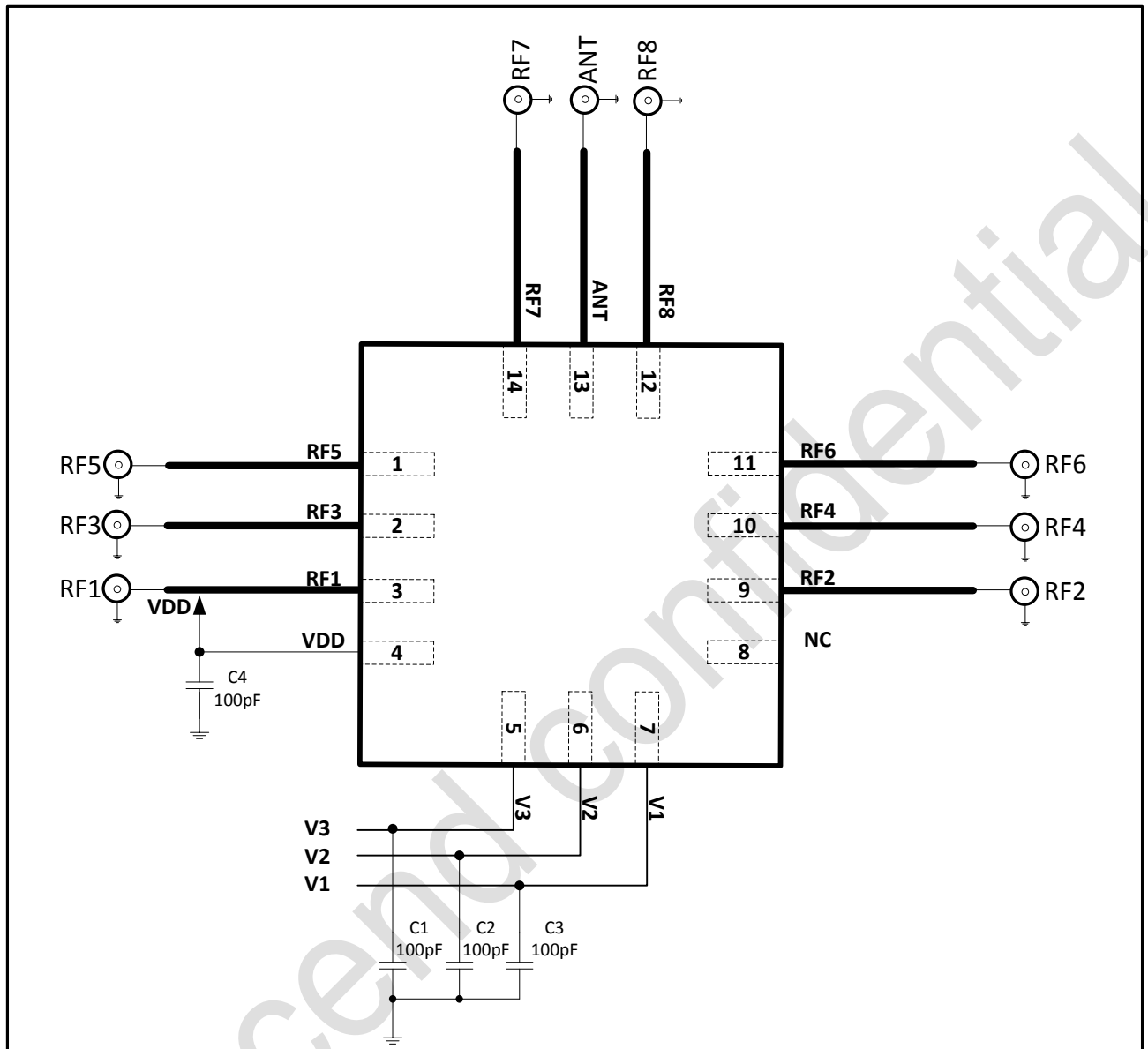


Figure 2. MXD8680Q Evaluation Board Schematic

Table 1. Pin Description

Pin No.	Name	Description	Pin No.	Name	Description
1	RF5	RF port5	8	NC	No connection
2	RF3	RF port3	9	RF2	RF port2
3	RF1	RF port1	10	RF4	RF port4
4	V <sub>DD</sub>	Power supply	11	RF6	RF port6
5	V3	Control logic 3#	12	RF8	RF port8
6	V2	Control logic 2#	13	ANT	Antenna port
7	V1	Control logic 1#	14	RF7	RF port7
Ground Paddle	GND	Ground			

**Note:** Bottom ground paddles must be connected to ground.

**Truth Table**
**Table 2.**

Control pins			Switched RF Outputs							
V1	V2	V3	RF1	RF2	RF3	RF4	RF5	RF6	RF7	RF8
0	0	0	<b>Insertion Loss</b>	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	0	1	Isolation	<b>Insertion Loss</b>	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	0	Isolation	Isolation	<b>Insertion Loss</b>	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	1	Isolation	Isolation	Isolation	<b>Insertion Loss</b>	Isolation	Isolation	Isolation	Isolation
1	0	0	Isolation	Isolation	Isolation	Isolation	<b>Insertion Loss</b>	Isolation	Isolation	Isolation
1	0	1	Isolation	Isolation	Isolation	Isolation	Isolation	<b>Insertion Loss</b>	Isolation	Isolation
1	1	0	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	<b>Insertion Loss</b>	Isolation
1	1	1	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	<b>Insertion Loss</b>

Note: “1” = 1.6 V to 3.0 V. “0” = 0 V to 0.3 V.

**Recommended Operation Range**
**Table 3. Recommended Operation Condition**

Parameters	Symbol	Min	Typ	Max	Units
Operation Frequency	f1	0.1	-	3.0	GHz
Power supply	V <sub>DD</sub>	2.5	2.8	3.0	V
Switch Control Voltage High	V <sub>H</sub>	1.6	1.8	3.0	V
Switch Control Voltage Low	V <sub>L</sub>	0	0	0.3	V

**Specifications**
**Table 4. Electrical Specifications**

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
<b>DC Specifications</b>						
Supply voltage	V <sub>DD</sub>		2.5	2.8	3.0	V
Supply current	I <sub>DD</sub>			25	60	uA
Control voltage	V <sub>CTL_H</sub>		1.6	1.8	3.0	V
	V <sub>CTL_L</sub>		0	0	0.3	V
Control current	I <sub>CTL</sub>	V <sub>CTL</sub> = 1.8 V		1.0	2.0	uA
Switching Speed, on RF to another		10% to 90% RF		1	2	uS
Turn-on time	ton	Time from V <sub>DD</sub> =0V to part ON and RF at 90%		5	10	uS
<b>RF Specifications</b>						
Insertion loss (ANT pin to all RF ports)	IL	0.1 to 1.0 GHz		0.35	0.45	dB
		1.0 to 2.0 GHz		0.45	0.55	dB
		2.0 to 2.7 GHz		0.60	0.75	dB
Isolation (ANT pin to all RF ports)	Iso	0.1 to 1.0 GHz	35	40		dB
		1.0 to 2.0 GHz	25	30		dB
		2.0 to 2.7 GHz	20	24		dB
RF to RF Isolation (Active port to the other RF ports)	Iso	0.1 to 1.0 GHz	27	38		dB
		1.0 to 2.0 GHz	22	30		dB
		2.0 to 2.7 GHz	19	25		dB
Input return loss (ANT pin to all RF ports)	RL	0.1 to 1.0 GHz	20	25		dB
		1.0 to 2.0 GHz	15	20		dB
		2.0 to 2.7 GHz	12	15		dB

0.1 dB Compression Point (ANT pin to all RF ports)	P0.1dB	0.1 GHz to 3.0 GHz	+28	+29		dBm
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**Absolute Maximum Ratings**
**Table 5. Maximum ratings**

Parameters	Symbol	Minimum	Maximum	Units
Supply voltage	V <sub>DD</sub>	+2.5	+3.3	V
Control voltage (V1, V2, and V3)	V <sub>CTL</sub>	0	+3.0	V
RF input power <sup>Note1</sup>	P <sub>IN</sub>		+29	dBm
Operating temperature	T <sub>OP</sub>	-45	+90	°C
Storage temperature	T <sub>STG</sub>	-65	+150	°C
Humidity Grade		MSL1		
Storage Cycle(package)		2		years
Electrostatic Discharge Human body model (HBM), Class 1C	ESD_HBM		1000	V
Machine Model (MM), Class A	ESD_MM		100	V
Charged device model (CDM), Class III	ESD_CDM		500	V

**Note:** 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

**Note1:** Continuous wave for 5000hrs, 50°C

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Package Outline Dimension

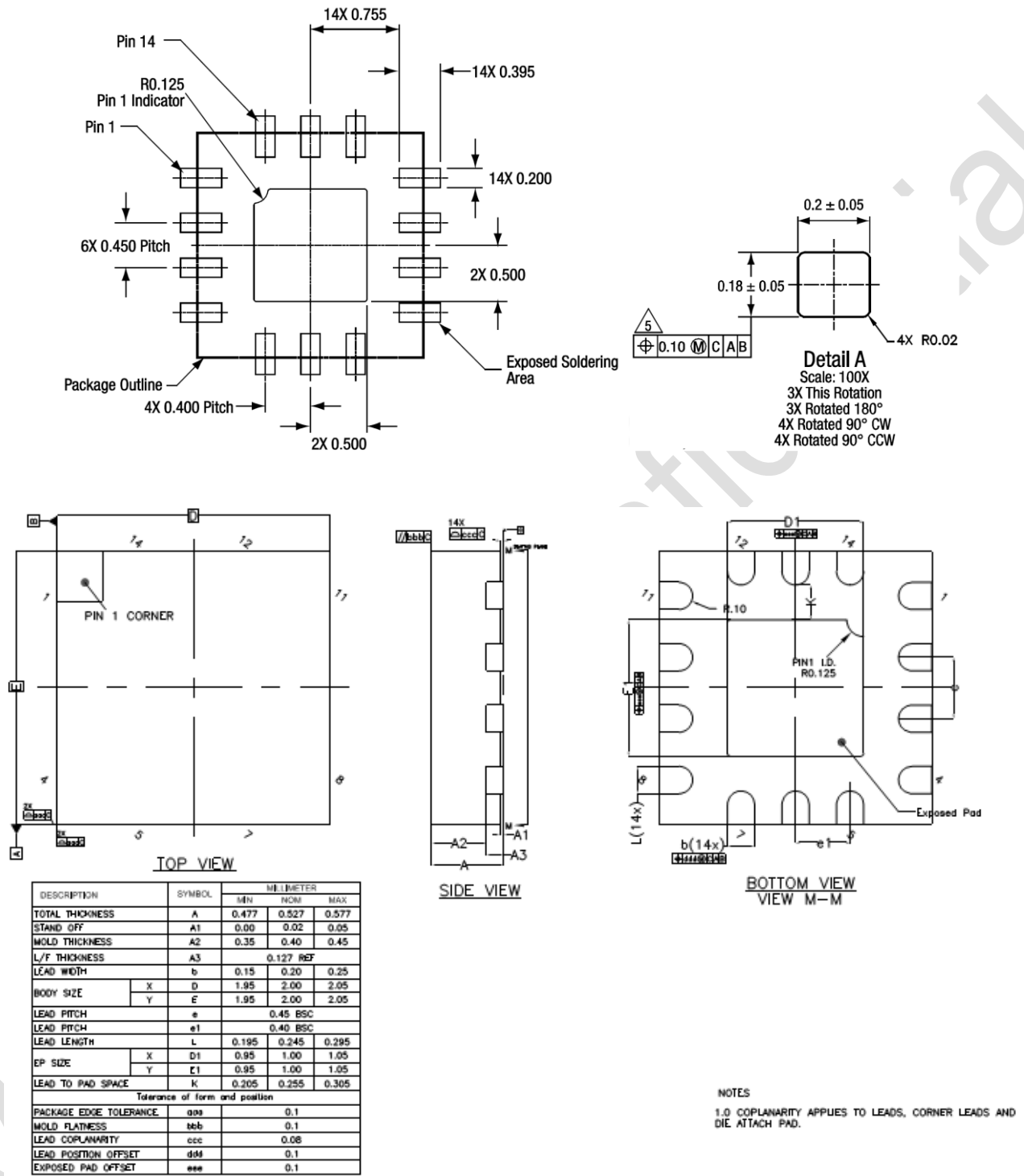


Figure 3. package outline dimension

Marking Specification

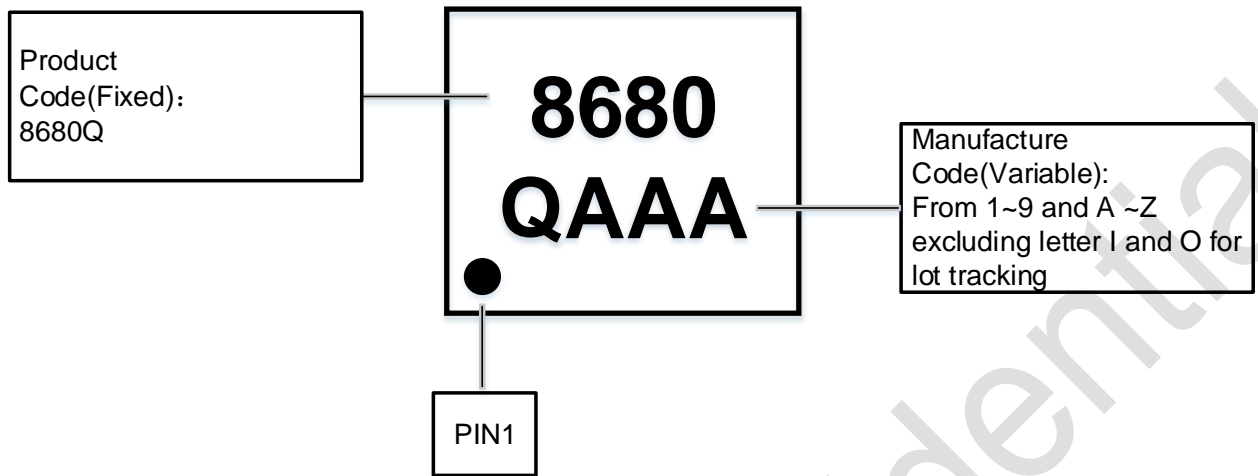


Figure 4. Marking specification (Top View)

Tape and Reel Dimensions

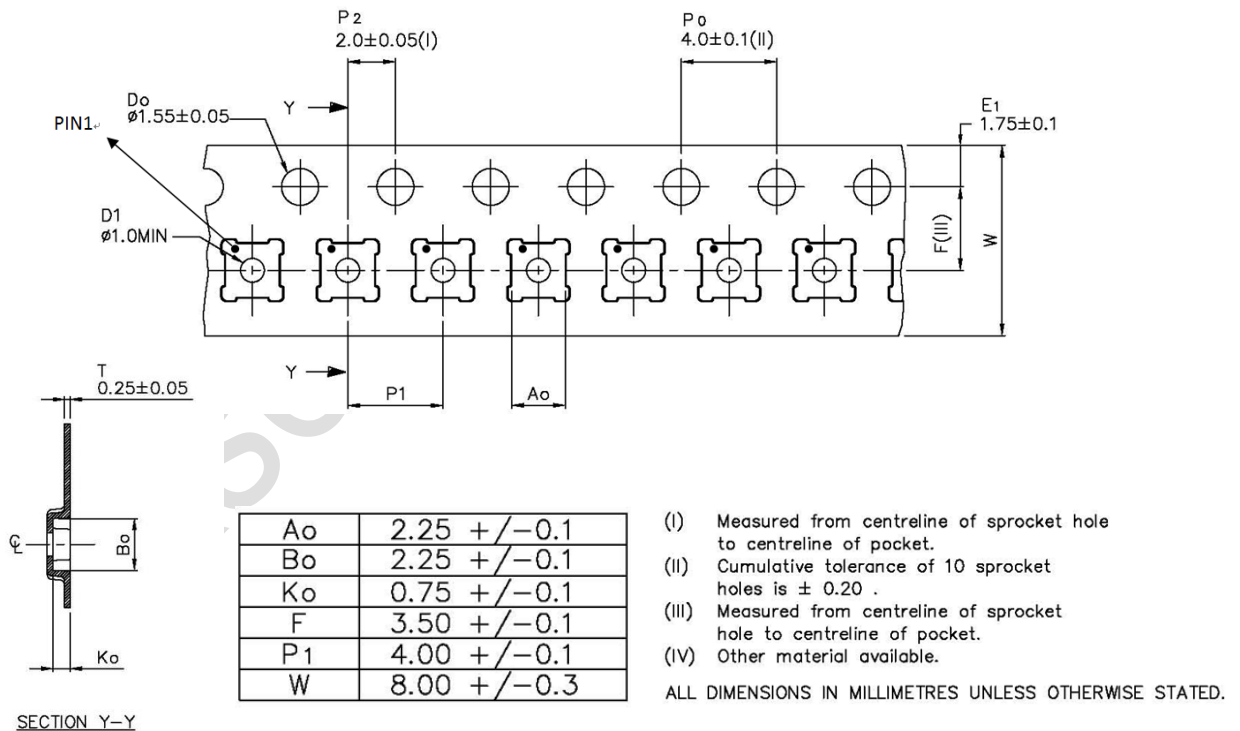


Figure 5. Tape and reel dimensions

## Reflow Chart

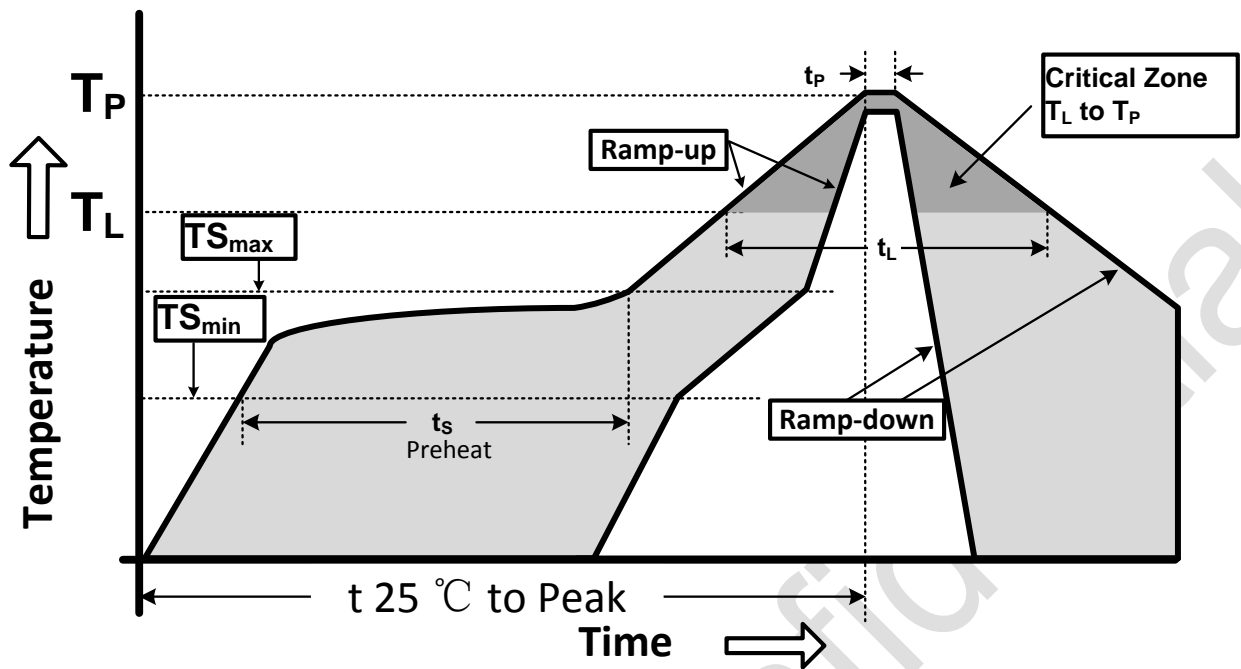


Figure 6. Recommended Lead-Free Reflow Profile

Table 6. Reflow condition

Profile Parameter	Lead-Free Assembly, Convection, IR/Convection
Ramp-up rate ( $T_{S_{max}}$ to $T_P$ )	3°C/second max.
Preheat temperature ( $T_{S_{min}}$ to $T_{S_{max}}$ )	150°C to 200°C
Preheat time ( $t_s$ )	60 - 180 seconds
Time above $T_L$ , 217°C ( $t_L$ )	60 - 150 seconds
Peak temperature ( $T_P$ )	260°C
Time within 5°C of peak temperature( $t_p$ )	20 - 40 seconds
Ramp-down rate	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

### ESD Sensitivity

Integrated circuits are ESD sensitive and can be damaged by static electric charge. Proper ESD protection techniques should be used when handling these devices.

### RoHS Compliant

This product does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), and are considered RoHS compliant.



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