

PIN Diode SPDT 120 Watt Switch for 0.05 - 6.0 GHz Higher Power Applications

Rev. V1

Features

- Exceptional Broadband Performance
- Low Insertion Loss: $T_x = 0.20$ dB @ 2.7 GHz
- High Isolation: $R_x = 51$ dB @ 2.7 GHz
- High T_x RF Input Power = 120 W C.W. @ 2.7 GHz, 85°C
- Suitable for High Power LTE, TD-SCDMA, WiMAX, and Military Radio Applications
- Surface Mount 4mm PQFN Package
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MASW-000936 is a SPDT high power, broadband, high linearity, PIN diode T/R switch for 0.05 – 6.0 GHz applications, including WiMAX & WiFi. The device is provided in an industry standard lead free 4mm PQFN plastic package.

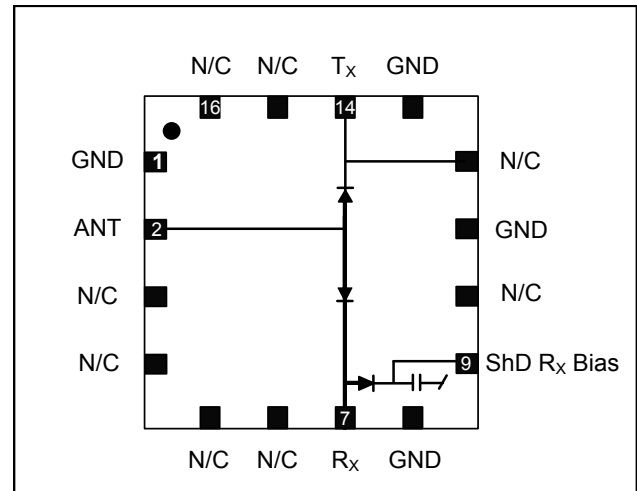
This device incorporates PIN diode die fabricated with M/A-COM Technology Solutions' Low Loss, High Isolation Switching Diode processes.

Ordering Information¹

| Part Number | Package |
|--------------------|--------------------|
| MASW-000936-14000T | Tape and Reel (1K) |
| MASW-000936-001SMB | Sample Board |

1. Reference Application Note M513 for reel size information.

Functional Diagram (Top View)



Pin Configuration²

| Pin | Pin Name | Description |
|-----------------|-------------|-------------------|
| 1 | GND | Ground |
| 2 | ANT | Antenna |
| 3 | N/C | Connect to Ground |
| 4 | N/C | No Connection |
| 5 | N/C | No Connection |
| 6 | N/C | Connect to Ground |
| 7 | RX | Receive |
| 8 | GND | Ground |
| 9 | ShD RX Bias | ShD RX Bias |
| 10 | N/C | No Connection |
| 11 | GND | Ground |
| 12 ³ | N/C | Do Not Use |
| 13 | GND | Ground |
| 14 | TX | Transmit |
| 15 | N/C | Connect to Ground |
| 16 | N/C | No Connection |

2. The exposed pad centered on the package bottom must be connected to RF, DC and Thermal ground.
3. Do not connect to ground or other metal trace.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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Electrical Specifications⁴: Freq. = 2.0, 2.7, 3.5 GHz, T_A = 25°C, Bias = 100 mA / 28 V

| Parameter | Test Conditions | Units | Min. | Typ. | Max. | |
|--|---|---------|------|------------|------|----|
| Insertion Loss ⁴ Pin= 0 dBm | R _X , 0.8 GHz | dB | — | 0.20 | — | |
| | T _X , 0.8 GHz | | | 0.07 | — | |
| | R _X , 2.0 GHz | | | 0.35 | 0.55 | |
| | T _X , 2.0 GHz | | | 0.15 | — | |
| | R _X , 2.7 GHz | | | 0.50 | 0.75 | |
| | T _X , 2.7 GHz | | | 0.20 | — | |
| | R _X , 3.5 GHz | | | 0.70 | 0.90 | |
| Isolation ⁴ Pin= 0 dBm | R _X to Antenna, 2.0 GHz | dB | 41 | 45 | — | |
| | T _X to Antenna, 2.0 GHz | | | 16 | | |
| | R _X to Antenna, 2.7 GHz | | | 40 | | 50 |
| | T _X to Antenna, 2.7 GHz | | | — | | 13 |
| | R _X to Antenna, 3.5 GHz | | | 33 | | 40 |
| Input Return Loss ⁴ Pin= 0 dBm | R _X | dB | — | 23 | — | |
| | T _X | | | 34 | | |
| T _X Input P0.1dB | T _X to Antenna | dBm | — | >50 | — | |
| T _X IIP3 Pin = +30 dBm | F1 = 2010 MHz, F2 = 2020 MHz | dBm | — | 72 | — | |
| T _X C.W. Input Power | 85°C Base plate | dBm / W | — | 50.8 / 120 | — | |
| | 2.0 GHz | | | 50 / 100 | | |
| | 2.7 GHz | | | 49 / 80 | | |
| R _X C.W. Input Power | — | dBm | — | 41.5 | — | |
| | | W | | 14 | | |
| T _X RF Switching Speed | (10-90% RF Voltage) 1 MHz Rep Rate in Modulating Mode | ns | — | 200 | — | |

4. See Bias Table

Absolute Maximum Ratings^{5,6}

@ T_A = +25 °C (unless otherwise specified)

| Parameter | Absolute Maximum |
|------------------------------------|--|
| Forward Current | 150 mA |
| Reverse Voltage (RF & D.C.) | 160 V |
| Operating Temperature | -40 °C to +85 °C |
| Storage Temperature | -55 °C to +150 °C |
| Junction Temperature | +175 °C |
| T _X Incident C.W. Power | 50.8 dBm (120 W) ⁷ @ 2.0 GHz, 85°C |

5. Exceeding these limits may cause permanent damage.

6. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.

7. Base-plate temperature must be controlled to a constant +85°C.

Handling Procedures

Please observe the following precautions to avoid damage:

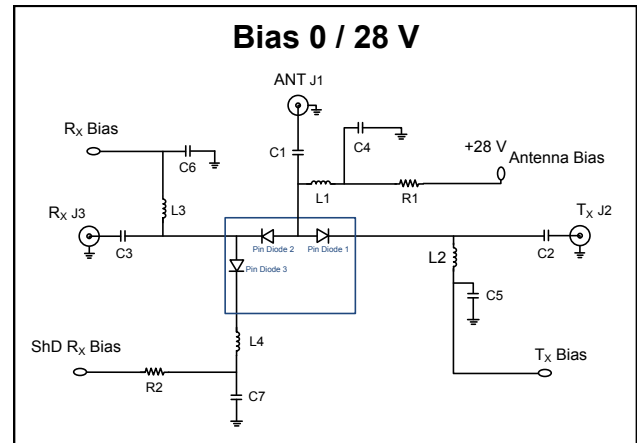
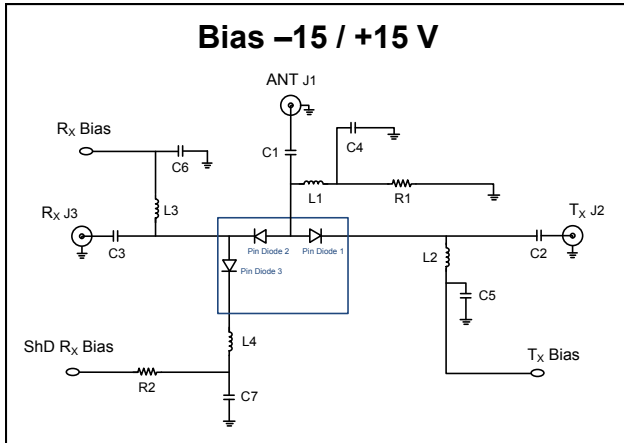
Static Sensitivity

Silicon Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1C Human Body devices.

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Bias Diagrams & Tables



Bias -15 / +15 V

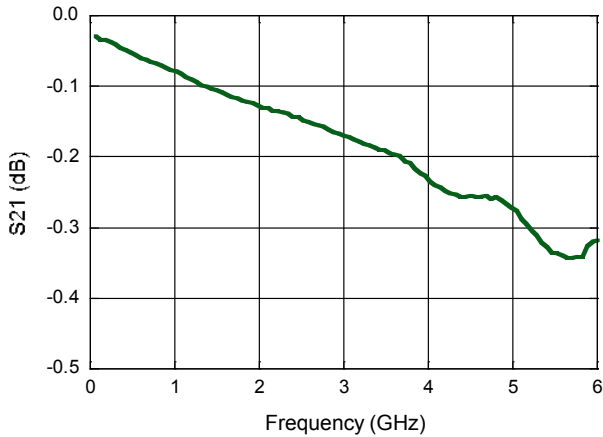
| Bias Table | T _x | R _x | R _x ShdBias | ANT |
|------------------------------------|------------------|------------------|------------------------|-------|
| Pin | Pin 14 | Pin 7 | Pin 9 | Pin 2 |
| T _x -ANT Isolation | (+15 V), 0 mA | (-15 V), -100 mA | GND | GND |
| T _x -ANT Insertion Loss | (-15 V), -100 mA | (+15 V), 100 mA | GND | GND |
| R _x -ANT Isolation | (-15 V), -100 mA | (+15 V), 100 mA | GND | GND |
| R _x -ANT Insertion Loss | (+15 V), 0 mA | (-15 V), 100 mA | GND | GND |

Bias 0 / 28 V

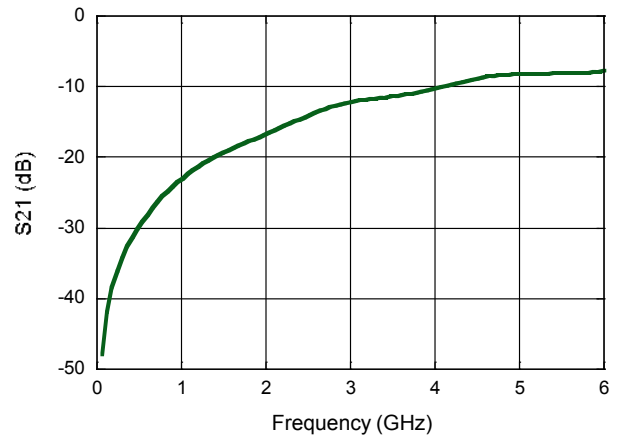
| Bias Table | T _x | R _x | R _x ShdBias | ANT |
|------------------------------------|----------------|-----------------|------------------------|-------|
| Pin | Pin 14 | Pin 7 | Pin 9 | Pin 2 |
| T _x -ANT Isolation | (+28 V), 0 mA | (GND), -100 mA | (+28 V), 0 mA | +28 V |
| T _x -ANT Insertion Loss | (GND), -100 mA | (+28 V), 100 mA | (GND), -100 mA | +28 V |
| R _x -ANT Isolation | (GND), -100 mA | (+28 V), 100 mA | (GND), -100 mA | +28 V |
| R _x -ANT Insertion Loss | (+28 V), 0 mA | (GND), -100 mA | (+28 V), 0 mA | +28 V |

**Typical Performance Curves (RF-probed parts),
 T_x (100 mA Bias Current)**

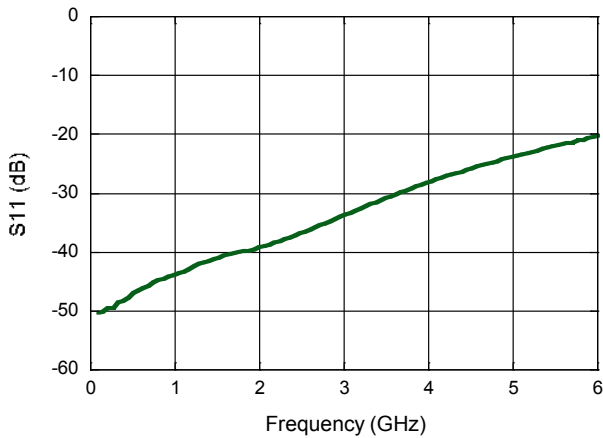
Insertion Loss, T_x



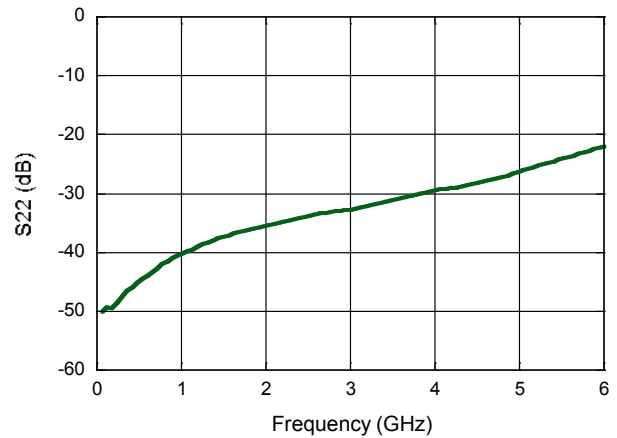
Isolation, T_x



Input Return Loss, T_x

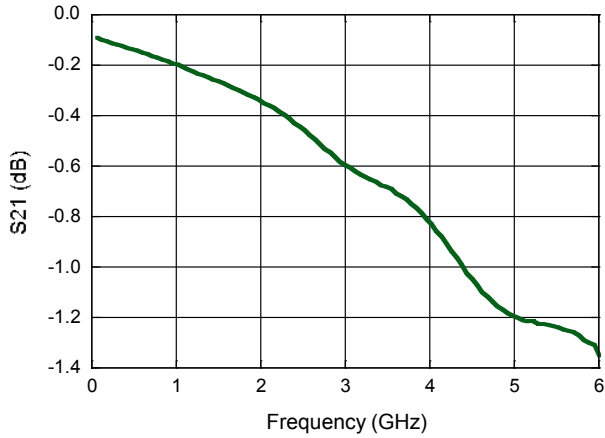


Output Return Loss, T_x

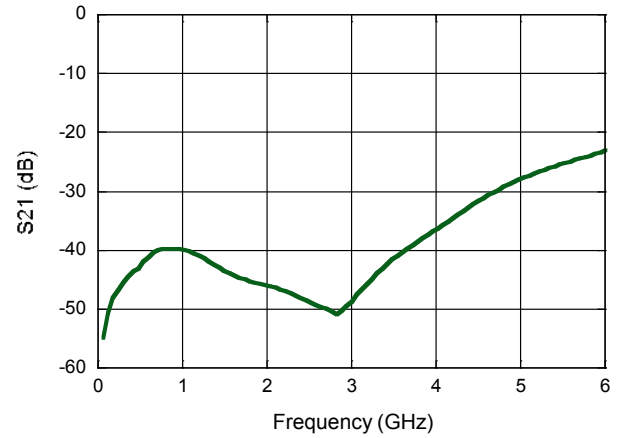


**Typical Performance Curves (RF-probed parts),
 R_x (100 mA Bias Current)**

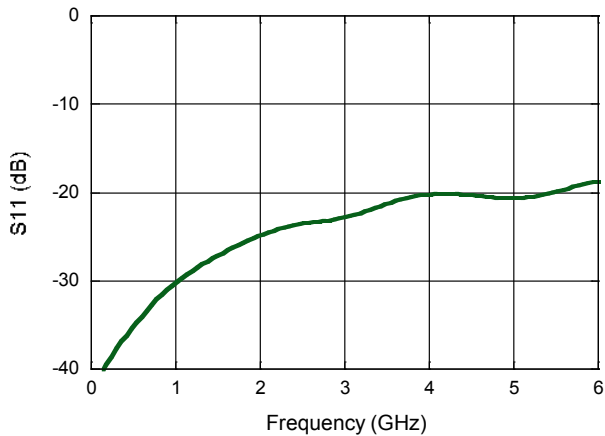
Insertion Loss, R_x



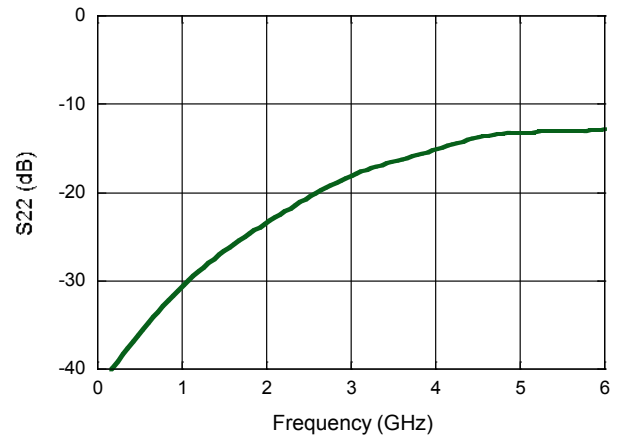
Isolation, R_x



Input Return Loss, R_x



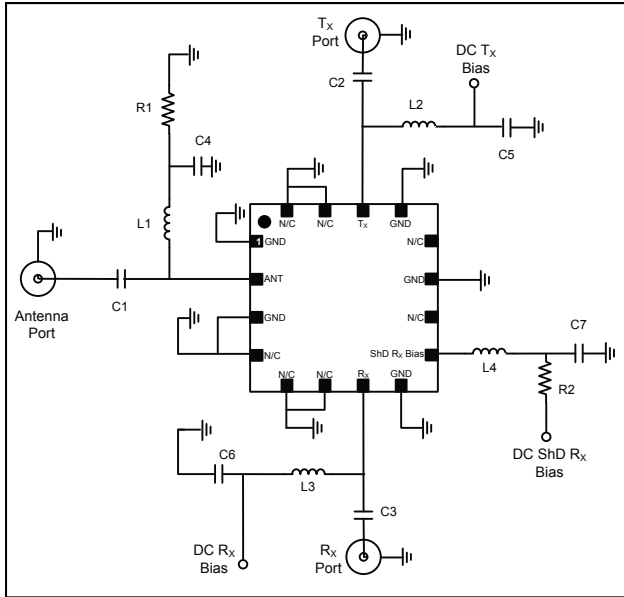
Output Return Loss, R_x



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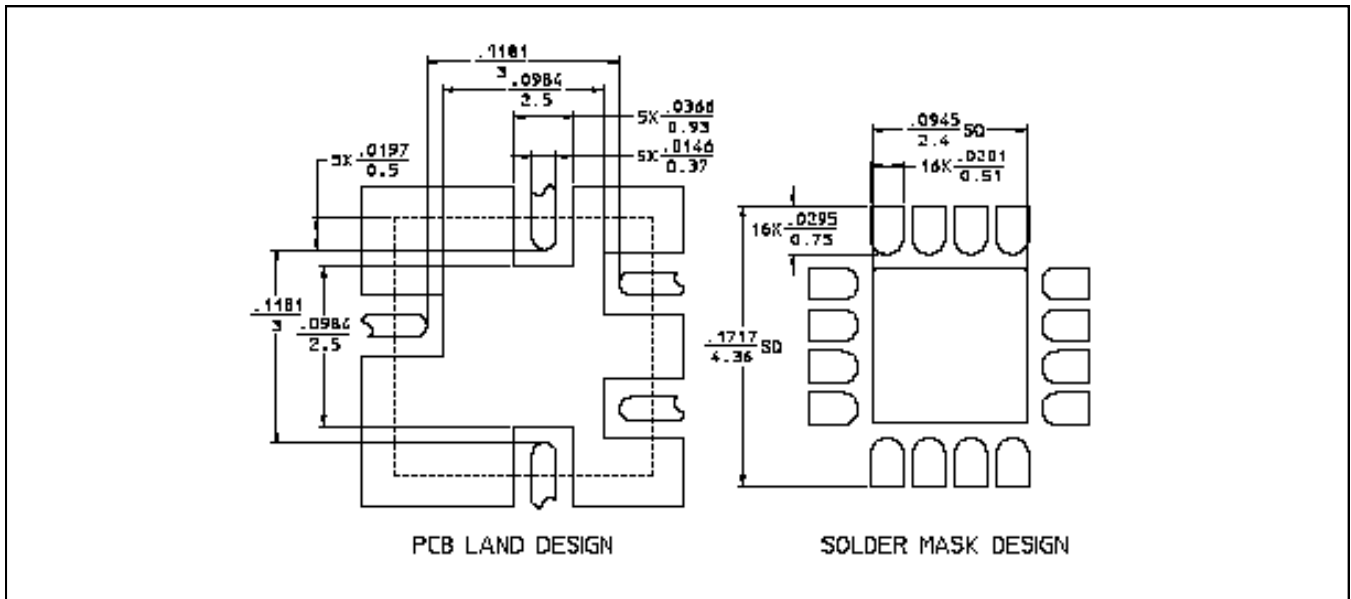
Application Schematic



Parts List

| Component | Value | Package |
|-----------|-------|---------|
| C1-C3 | 22 pF | 0603 |
| C4-C6 | 27 pF | 0603 |
| L1-L4 | 68 nH | 0603 |
| R1, R2 | 137 Ω | 0603 |

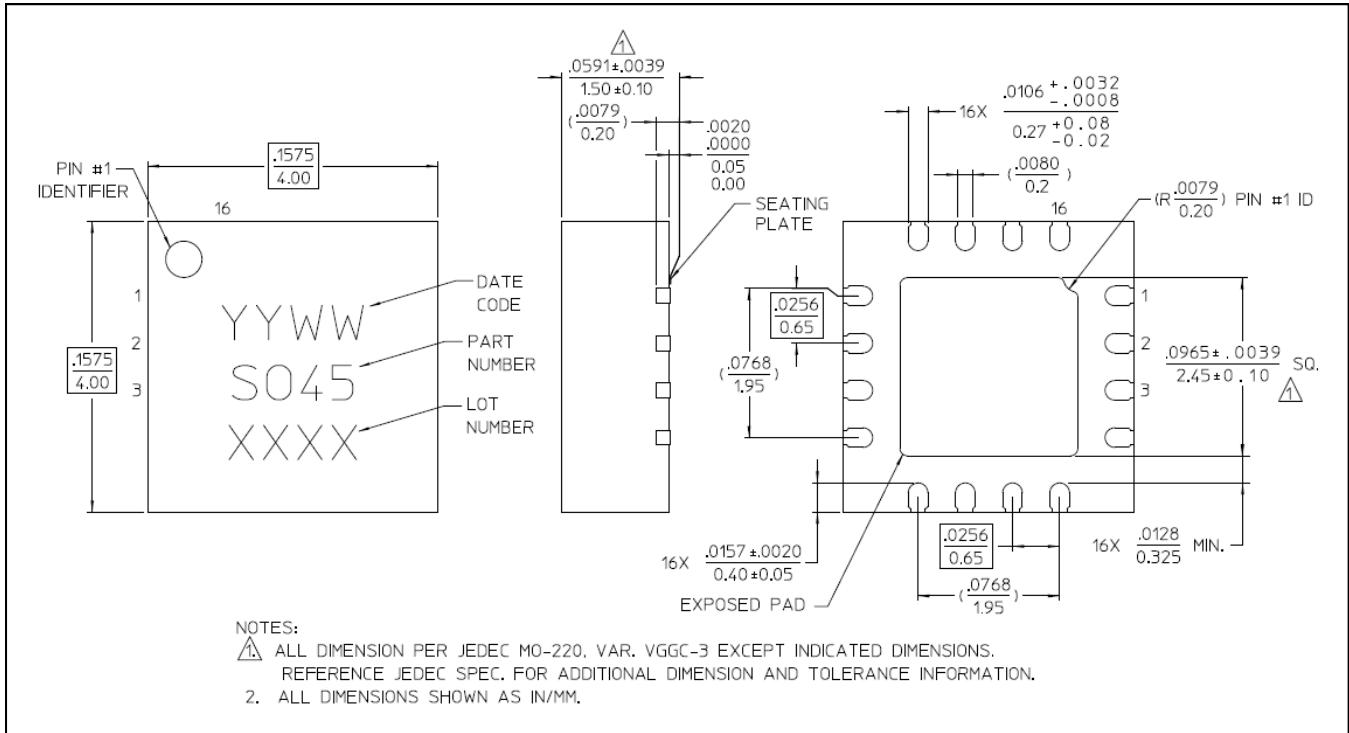
PCB Footprint



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Lead Free 4 mm 16-Lead PQFN †



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is NiPdAuAg.