

Low Noise Amplifier for GNSS

Features

- Operation bands: L1, L2 and L5
- Supply voltage: 1.05V to 3.1V
- Ultra low current: 2.4 mA
- Require only one input matching inductor
- High Power Gain: 17dB@L1
18dB@L2 and L5
- Low noise figure: 0.7dB
- High input power: 30dBm
- DFN 1.1X0.7-6L package

Applications

Wearable Devices

Mobile Phones

Tablet PCs

Personal Navigation Devices

RF Front End Modules

General Description

AW15545DNR is a Low Noise Amplifier designed for Global Navigation Satellite Systems (GNSS) as GPS, BDS, GLONASS and Galileo. AW15545DNR requires only one external input matching inductor, and reduces assembly complexity and the PCB area, enabling a cost-effective solution.

AW15545DNR with patented Smart Linearity Technology (SLT) achieves ultra-low noise figure, high linearity, high gain, over a wide range of supply voltages from 1.05V to 3.1V. These features make AW15545DNR an excellent choice for GNSS LNA as it improves sensitivity with low noise figure and high gain, provide better immunity against out-of-band jammer signals with high linearity, reduces filtering requirement of preceding stage and hence reduces the overall cost of the GNSS receiver.

AW15545DNR is available in a small lead-free, RoHS-Compliant, DFN 1.1X0.7-6L package.

Typical Application Circuit

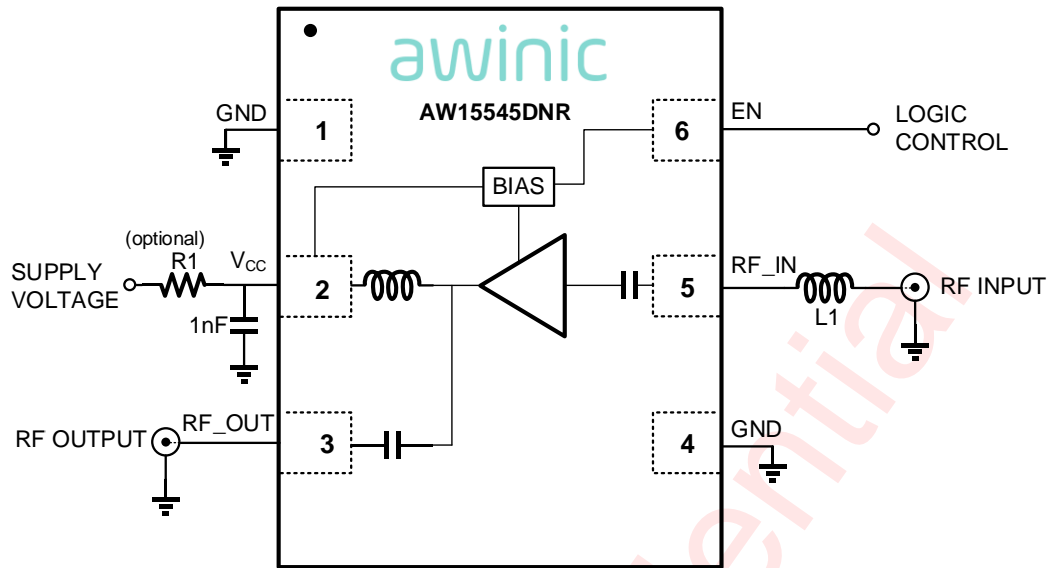


Figure 1 Typical application circuit of AW15545DNR

Recommended Components List

Table 1 list of components for AW15545DNR

| Component | Frequencies Range | Part Number | Inductance | Supplier | Size |
|-----------|--------------------|-------------|------------|----------|------|
| L1 | 1160MHz to 1300MHz | LQW15A | 21nH | Murata | 0402 |
| | 1550MHz to 1615MHz | LQW15A | 13nH | Murata | 0402 |

Pin Configuration And Top Mark

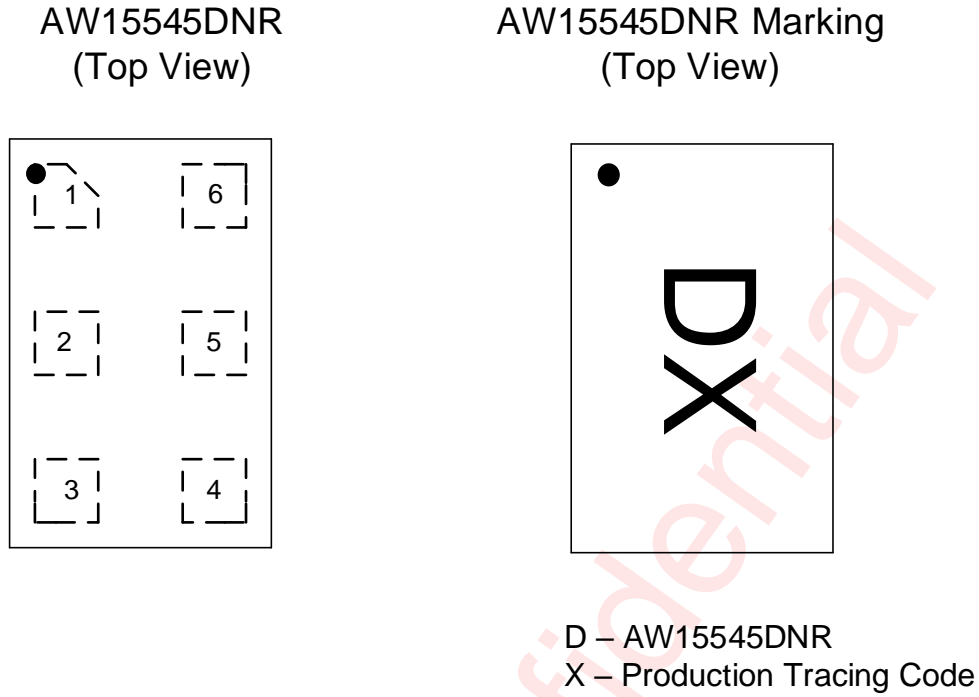


Figure 2 Pin Configuration And Top Mark

Pin Definition

| No. | NAME | DESCRIPTION |
|-----|-----------------|---------------|
| 1 | GND | Ground |
| 2 | V _{CC} | DC Supply |
| 3 | RF_OUT | LNA output |
| 4 | GND | Ground |
| 5 | RF_IN | LNA input |
| 6 | EN | Logic control |

Functional Block Diagram

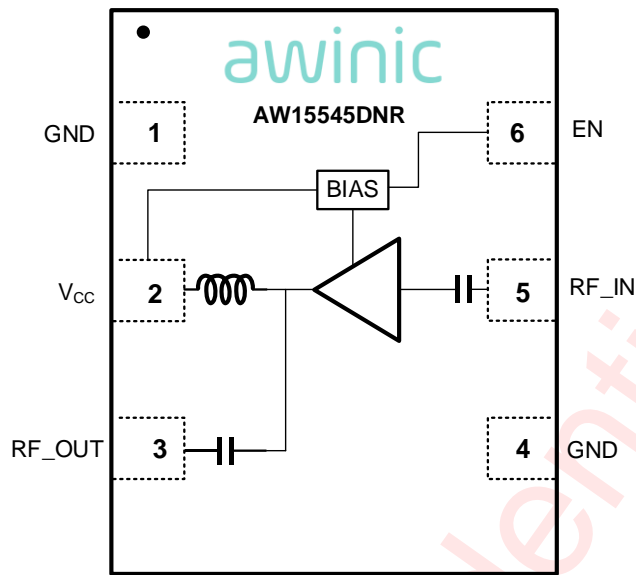


Figure 3 Functional Block Diagram

Ordering Information

| Part Number | Temperature | Package | Marking | Moisture Sensitivity Level | Environmental Information | Delivery Form |
|-------------|-------------|----------------|---------|----------------------------|---------------------------|------------------------------|
| AW15545DNR | -40°C~105°C | DFN 1.1X0.7-6L | D | MSL1 | ROHS+HF | 9000 units/ Tape and Reel |

Absolute Maximum Ratings^[1]

| PARAMETERS | RANGE |
|---|-------------------|
| Supply voltage range V_{CC} | -0.3V to 3.3V |
| $V_{EN}^{[2]}$ | -0.3V to V_{CC} |
| RF input power ^[3] | 30dBm |
| Maximum operating junction temperature T_{JMAX} | 150°C |
| Storage temperature T_{STG} | -65°C to 150°C |
| Ambient temperature T_{amb} | -40°C to 105°C |
| Lead temperature (soldering 10 seconds) | 260°C |
| ESD ^[4] | |
| HBM | ±1500V |
| CDM | ±1000V |

NOTE1: Conditions out of those ranges listed in "absolute maximum ratings" may cause permanent damages to the device. Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.

NOTE2: Warning: due to internal ESD diode protection, the applied DC voltage should not exceed 3.6V in order to avoid excess current.

NOTE3: The RF input and RF output are AC coupled through internal DC blocking capacitor.

NOTE4: HBM standard: ESDA/JEDEC JS-001-2024, CDM standard: ESDA/JEDEC JS-002-2025.

Electrical Characteristics

DC Characteristics and turn-on (off) time

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---------------------------------|---|---|------|------|-----------------|------|
| V _{CC} | Supply Voltage | - | 1.05 | - | 3.1 | V |
| I _{SD} | Shut-Down Current, V _{CC} =1.2V & 1.8V | V _{EN} =Low | - | - | 1 | μA |
| I _{CC} | Supply Current, V _{CC} =1.2V & 1.8V | V _{EN} =V _{CC} | - | 2.4 | 3.5 | mA |
| V _{EN} | Digital Input-Logic High | V _{CC} =1.8V | 1.1 | - | V _{CC} | V |
| | | V _{CC} =1.2V | 0.8 | - | V _{CC} | V |
| V _{EN} | Digital Input-Logic Low | - | - | - | 0.3 | V |
| K ^[2] | Stability factor | f=0.5-10GHz | 1 | - | - | - |
| t _{on} ^[2] | turn-on time, V _{CC} =1.2V&1.8V | time from V _{EN} ON to 90% of the final gain | - | 1.5 | 3 | μs |
| t _{off} ^[2] | turn-off time, V _{CC} =1.2V&1.8V | time from V _{EN} OFF to 10% of the gain | - | 0.35 | 3 | μs |

Typically: V_{CC}=1.8V, V_{EN_H}=1.8V, V_{EN_L}=0V and TA=+25°C, f=1575.42MHz; unless otherwise noted

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|------------------------------------|--|--|-----|------|-----|------|
| G _p | Power Gain | Pin=-30dBm | 15 | 17 | 19 | dB |
| RL _{in} | Input Return Loss | | 6 | 8 | - | dB |
| RL _{out} | Output Return Loss | | 6 | 9 | - | dB |
| ISL | Reverse Isolation | - | 25 | 33 | - | dB |
| NF ^[2] | Noise Figure ^[1] | Z _s =50 ohm; No jammer | - | 0.7 | 1.1 | dB |
| IP1dB ^[2] | Inband input 1dB-compression point | f=1575.42MHz | -14 | -10 | - | dBm |
| IIP3 _{ib} ^[2] | Inband input 3 rd -order intercept point | f1=1574.42MHz; f2=1575.42MHz; Pin=-25dBm | -7 | -3.5 | - | dBm |
| IIP3 _{oob} ^[2] | Out-of-band input 3 rd -order intercept point | -20dBm@f1=1712.7MHz; -65dBm@f2=1850MHz | -4 | 0 | - | dBm |
| H2-input referred ^[2] | LTE band-13 2 nd Harmonic | f=787.76MHz; Pin=-25dBm | - | -53 | -43 | dBm |

Typically: $V_{CC}=1.2V$, $V_{EN_H}=1.2V$, $V_{EN_L}=0V$ and $TA=+25^{\circ}C$, $f=1575.42MHz$; unless otherwise noted^[2]

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|----------------------|--|--|-----|------|-----|------|
| Gp | Power Gain | Pin=-30dBm | 14 | 16 | 18 | dB |
| RL _{in} | Input Return Loss | | 6 | 9 | - | dB |
| RL _{out} | Output Return Loss | | 6 | 9 | - | dB |
| ISL | Reverse Isolation | - | 25 | 32 | - | dB |
| NF | Noise Figure ^[1] | Zs=50 ohm; No jammer | - | 0.7 | 1.1 | dB |
| IP1dB | Inband input 1dB-compression point | f=1575.42MHz | -18 | -14 | - | dBm |
| IIP3 _{ib} | Inband input 3 rd -order intercept point | f1=1574.42MHz; f2=1575.42MHz; Pin=-25dBm | -8 | -4.5 | - | dBm |
| IIP3 _{oob} | Out-of-band input 3 rd -order intercept point | -20dBm@f1=1712.7MHz; -65dBm@f2=1850MHz | -6 | -2 | - | dBm |
| H2-input referred | LTE band-13 2 nd Harmonic | f=787.76MHz; Pin=-25dBm | - | -53 | -43 | dBm |

Typically: $V_{CC}=1.8V$, $V_{EN_H}=1.8V$, $V_{EN_L}=0V$ and $TA=+25^{\circ}C$, $f=1176.45MHz$; unless otherwise noted

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|------------------------------------|---|--|-----|-----|-----|------|
| Gp | Power Gain | Pin=-30dBm | 16 | 18 | 20 | dB |
| RL _{in} | Input Return Loss | | 5 | 6.5 | - | dB |
| RL _{out} | Output Return Loss | | 5 | 9 | - | dB |
| ISL | Reverse Isolation | - | 25 | 35 | - | dB |
| NF ^[2] | Noise Figure ^[1] | Zs=50 ohm; No jammer | - | 0.7 | 1.1 | dB |
| IP1dB ^[2] | Inband input 1dB-compression point | f=1176.45MHz | -16 | -12 | - | dBm |
| IIP3 _{ib} ^[2] | Inband input 3 rd -order intercept point | f1=1175.45MHz; f2=1176.45MHz; Pin=-25dBm | -10 | -6 | - | dBm |
| IIP3 _{oob} ^[2] | Out-of-band input 3 rd -order intercept point | -20dBm@f1=1800MHz; -65dBm@f2=2400MHz | 3 | 8 | - | dBm |

Typically: $V_{CC}=1.2V$, $V_{EN_H}=1.2V$, $V_{EN_L}=0V$ and $TA=+25^{\circ}C$, $f=1176.45MHz$; unless otherwise noted^[2]

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---------------------|---|--|-----|-----|-----|------|
| Gp | Power Gain | Pin=-30dBm | 15 | 17 | 19 | dB |
| RL _{in} | Input Return Loss | | 5 | 6.5 | - | dB |
| RL _{out} | Output Return Loss | | 5 | 9 | - | dB |
| ISL | Reverse Isolation | - | 25 | 35 | - | dB |
| NF | Noise Figure ^[1] | Zs=50 ohm; No jammer | - | 0.7 | 1.1 | dB |
| IP1dB | Inband input 1dB-compression point | f=1176.45MHz | -20 | -16 | - | dBm |
| IIP3 _{ib} | Inband input 3 rd -order intercept point | f1=1175.45MHz; f2=1176.45MHz; Pin=-25dBm | -13 | -9 | - | dBm |
| IIP3 _{oob} | Out-of-band input 3 rd -order intercept point | -20dBm@f1=1800MHz; -65dBm@f2=2400MHz | 3 | 8 | - | dBm |

Typically: $V_{CC}=1.8V$, $V_{EN_H}=1.8V$, $V_{EN_L}=0V$ and $TA=+25^{\circ}C$, $f=1227.6MHz$; unless otherwise noted

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|------------------------------------|---|--|-----|-----|-----|------|
| Gp | Power Gain | Pin=-30dBm | 16 | 18 | 20 | dB |
| RL _{in} | Input Return Loss | | 4 | 6 | - | dB |
| RL _{out} | Output Return Loss | | 5 | 11 | - | dB |
| ISL | Reverse Isolation | - | 25 | 35 | - | dB |
| NF ^[2] | Noise Figure ^[1] | Zs=50 ohm; No jammer | - | 0.7 | 1.1 | dB |
| IP1dB ^[2] | Inband input 1dB-compression point | f=1227.6MHz | -17 | -13 | - | dBm |
| IIP3 _{ib} ^[2] | Inband input 3 rd -order intercept point | f1=1226.6MHz; f2=1227.6MHz; Pin=-25dBm | -10 | -6 | - | dBm |
| IIP3 _{oob} ^[2] | Out-of-band input 3 rd -order intercept point | -20dBm@f1=1850MHz; -65dBm@f2=2485MHz | 8 | 13 | - | dBm |

Typically: $V_{CC}=1.2V$, $V_{EN_H}=1.2V$, $V_{EN_L}=0V$ and $TA=+25^{\circ}C$, $f=1227.6MHz$; unless otherwise noted^[2]

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-------------------|--------------------|----------------|-----|-----|-----|------|
| Gp | Power Gain | Pin=-30dBm | 15 | 17 | 19 | dB |
| RL _{in} | Input Return Loss | | 4 | 6 | - | dB |
| RL _{out} | Output Return Loss | | 5 | 11 | - | dB |

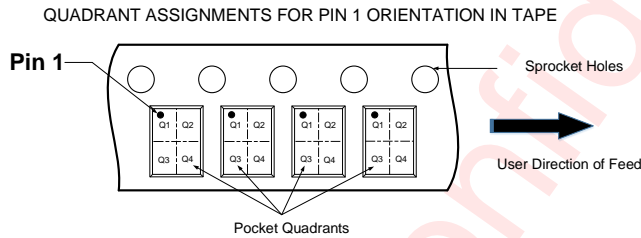
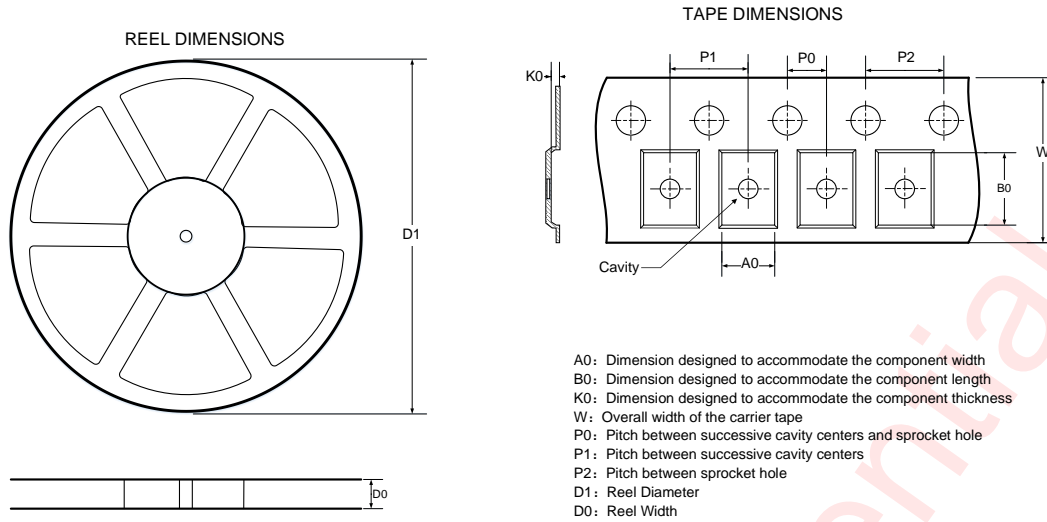
| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---------------------|---|--|-----|-----|-----|------|
| ISL | Reverse Isolation | - | 25 | 35 | - | dB |
| NF | Noise Figure ^[1] | Zs=50 ohm; No jammer | - | 0.7 | 1.1 | dB |
| IP1dB | Inband input 1dB-compression point | f=1227.6MHz | -20 | -16 | - | dBm |
| IIP3 _{ib} | Inband input 3 rd -order intercept point | f1=1226.6MHz; f2=1227.6MHz; Pin=-25dBm | -13 | -9 | - | dBm |
| IIP3 _{oob} | Out-of-band input 3 rd -order intercept point | -20dBm@f1=1850MHz; -65dBm@f2=2485MHz | 6 | 11 | - | dBm |

[1] 0.08dB PCB losses are subtracted.

[2] Minimum and/or maximum limit is guaranteed by design and by statistical analysis of device characterization data. The specification is not guaranteed by production testing.

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Tape And Reel Information



Note: The above picture is for reference only. Please refer to the value in the table below for the actual size

DIMENSIONS AND PIN1 ORIENTATION

| D1 (mm) | D0 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|---------|---------|---------|---------|---------|---------|---------|---------|--------|---------------|
| 178 | 9.5 | 0.8 | 1.2 | 0.55 | 2 | 2 | 4 | 8 | Q1 |

All dimensions are nominal

Figure 4 Tape And Reel Information

Package Description

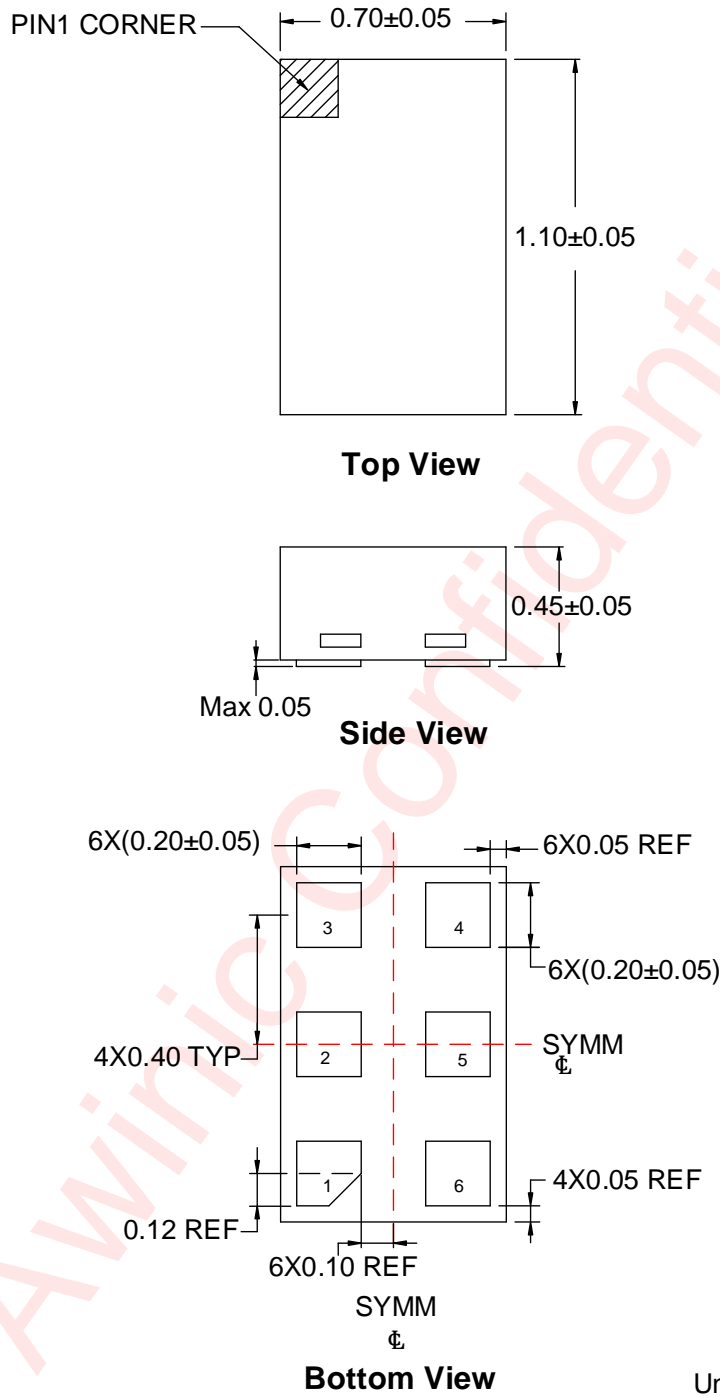


Figure 5 Package Description

Land Pattern Data

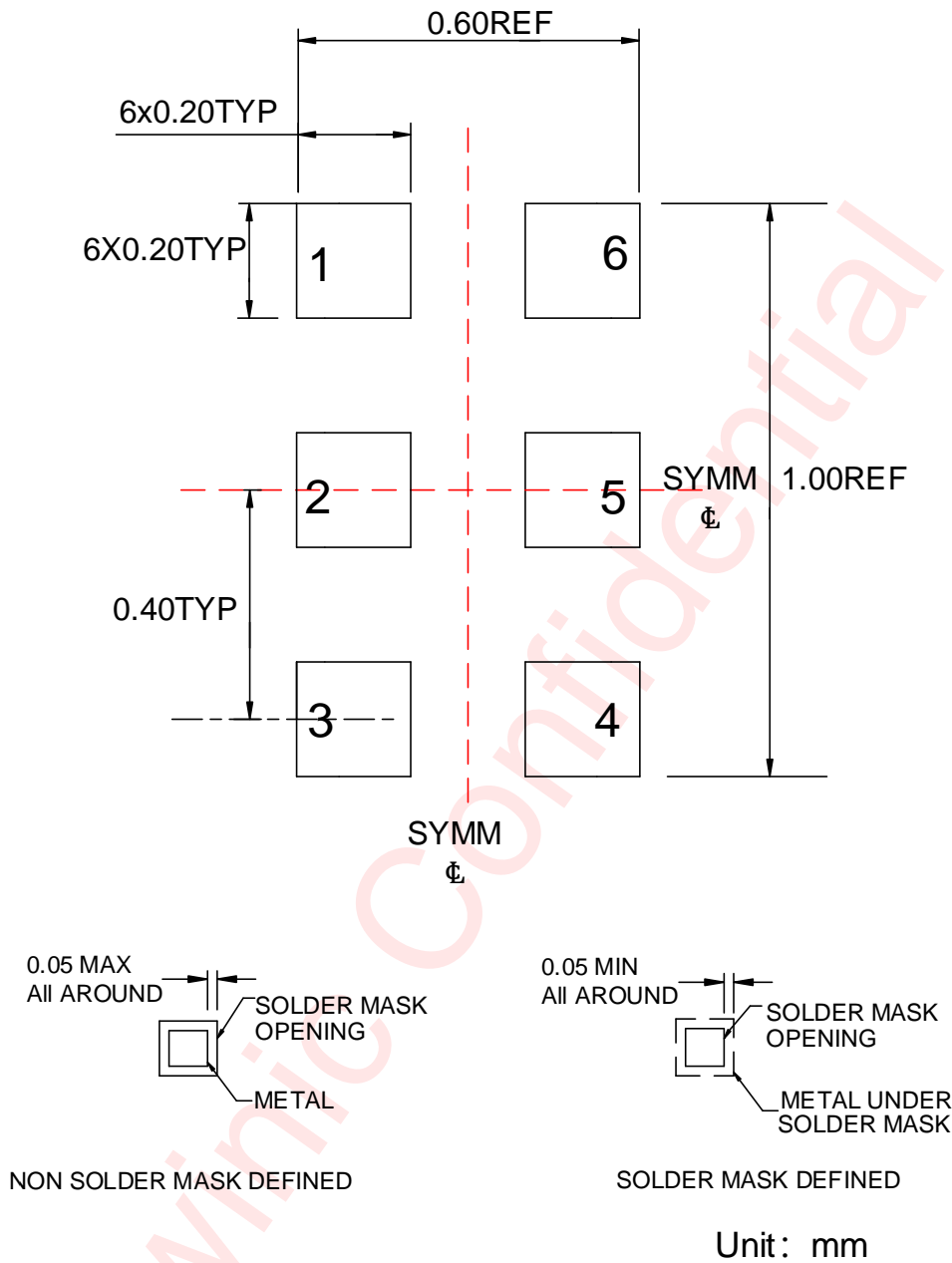


Figure 6 Land Pattern

Revision History

| Version | Date | Change Record |
|---------|-----------|---------------------|
| V1.0 | Jan. 2026 | Officially released |

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