# 0.1-5.925GHz SPDT Switch for 3G/4G/5G RX

## Features

- Broadband frequency range: 0.1 to 5.925GHz
- Low insertion loss: 0.33dB@4.2GHz
- High isolation: 29dB@4.2GHz
- Integrated logic
- DFN 1.1X0.7-6L package

## Applications

- Cellular 3G/4G/5G RX
- Cellular modems , tablets and USB Devices
- Other RF front-end modules

## General Description

The AW13012HDNR is a SPDT switch with low insertion loss and high Isolation. It can be used to support band switching and mode switching for cellular 3G/4G/5G, data cards and tablets.

The symmetrical design of internal ports makes it convenient for PCB routing and adjustment of receiving and transmitting signals. The band/mode switching is realized by the GPIO pins as referenced in the chip block diagram and the control logic.

The AW13012HDNR is provided in a compact DFN 1.1X0.7-6L package.



## Typical Application Circuit

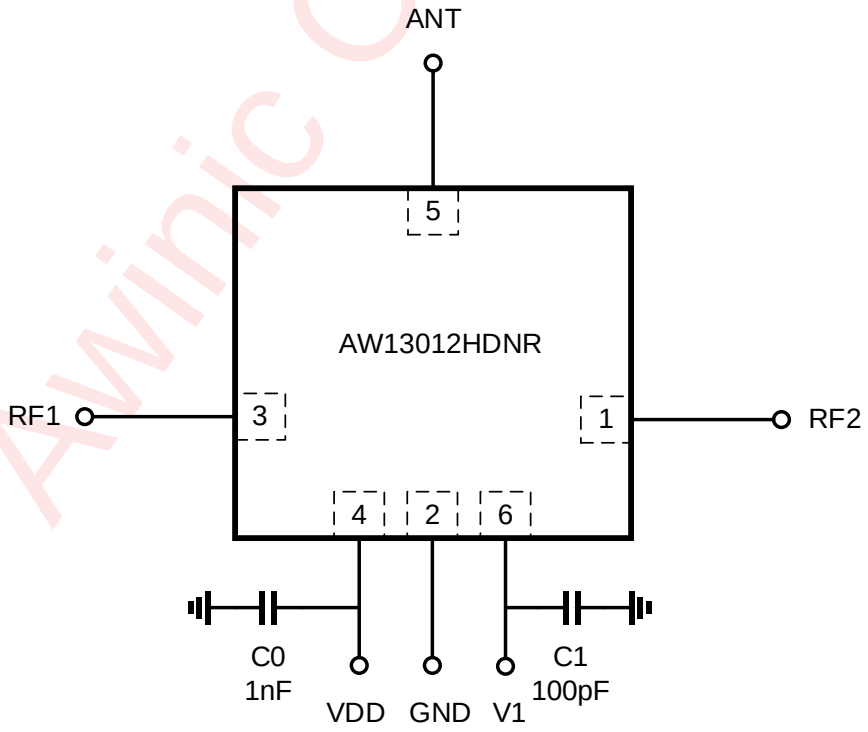
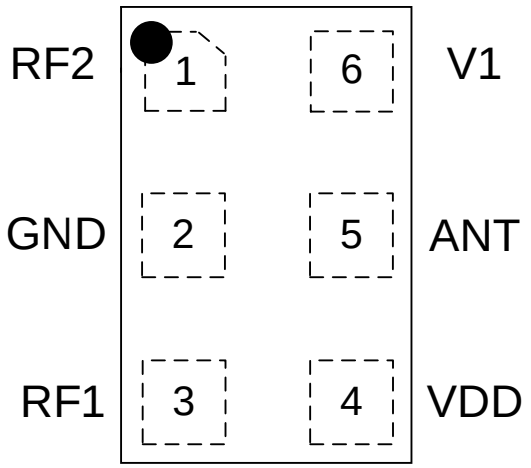


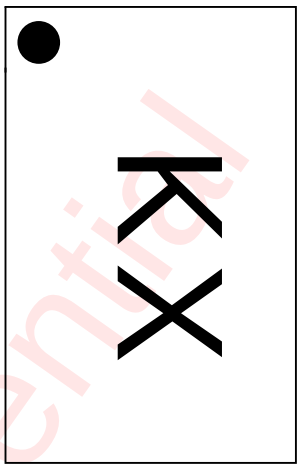

**Figure 1 Typical Application Circuit of AW13012HDNR**

## Pin Configuration And Top Mark

AW13012HDNR
(Top View)




AW13012HDNR Marking
(Top View)




K – AW13012HDNR
X – Production Tracing Code

**Figure 2 Pin Configuration and Top Mark**

## Pin Definition

| No. | NAME | DESCRIPTION |
|---|---|---|
| 1 | RF2 | RF I/O path 2 |
| 2 | GND | Ground |
| 3 | RF1 | RF I/O path 1 |
| 4 | VDD | DC power supply |
| 5 | ANT | Antenna port |
| 6 | V1 | DC control voltage 1 |



## Functional Block Diagram

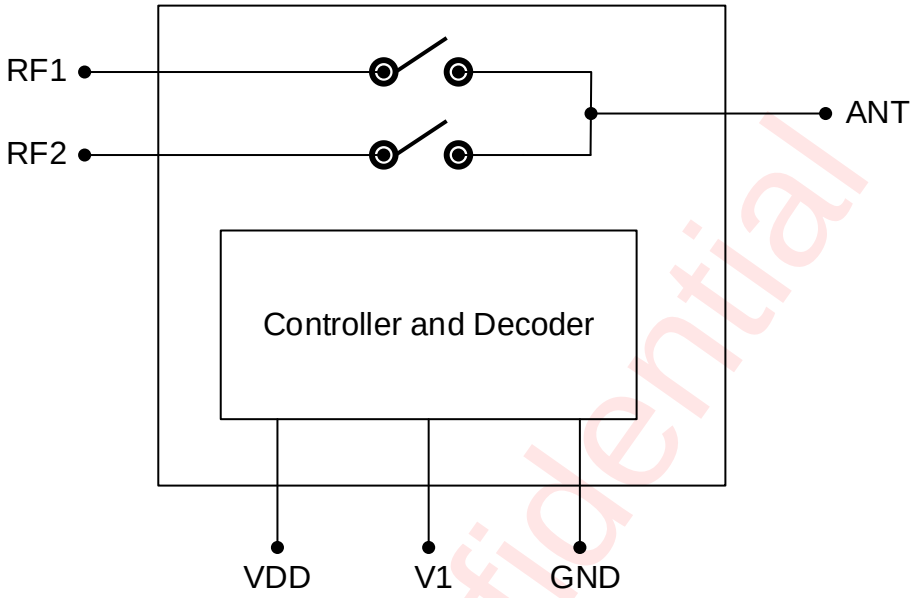



**Figure 3 Functional Block Diagram**

## Ordering Information

| Part Number | Temperature | Package | Marking | Moisture Sensitivity Level | Environmental Information | Delivery Form |
|---|---|---|---|---|---|---|
| AW13012HDNR | -40°C~105°C | DFN 1.1X0.7-6L | K | MSL1 | ROHS+HF | 9000 units/ Tape and Reel |



## Absolute Maximum Ratings(NOTE1)

| PARAMETERS | | RANGE |
|---|---|---|
| Supply Voltage Range VDD | | -0.3V to 3.6V |
| Control Voltage Range | V1 | -0.3V to 3.6V |
| RF input power(RF1/RF2) | | 31dBm |
| Operating Free-air Temperature Range | | -40°C to 105°C |
| Storage Temperature $T_{STG}$ | | -65°C to 150°C |
| Lead Temperature (Soldering 10 Seconds) | | 260°C |
| ESD (NOTE 2) | | |
| HBM | | ±1000V |
| CDM | | ±1000V |

NOTE1: Conditions out of those ranges listed in "absolute maximum ratings" may cause permanent damages to the device. In spite of the limits above, functional operation conditions of the device should within the ranges listed in "recommended operating conditions". Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.

*NOTE2: The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin.*
*HBM Test method: ESDA/JEDEC JS-001-2023. CDM Test method: ESDA/JEDEC JS-002-2022.*



## Electrical Characteristics

DC Characteristics

| PARAMETER | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| VDD | Supply Voltage | 1.65 | 1.8 | 3.3 | V |
| IDD | Supply Current | | 45 | 120 | μA |
| VCTL_H | Control logic High | 0.75 | | VDD | V |
| VCTL_L | Control logic Low | 0 | | 0.4 | V |
| ICTL | Control Current | | 0.1 | 1 | μA |

VDD=1.8V, V1=0/1.8V, PIN=0dBm, TEMP=+25°C, $Z_0$=50Ω. (unless otherwise noted)

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $T_{SW}$ | Switching On/Off Time | 50% of final control voltage to 10%/90% of final RF power, switching between RF1/2 | | 185 | 300 | ns |
| IL | Insertion loss(ANT pin to RF1/RF2) | 0.1-0.96GHz<br>0.96-2.2GHz<br>2.3-2.7GHz<br>3.3-4.2GHz<br>4.4-5GHz<br>5.15-5.925GHz | | 0.20<br>0.23<br>0.28<br>0.33<br>0.40<br>0.50 | 0.30<br>0.35<br>0.5<br>0.55<br>0.60<br>0.75 | dB<br>dB<br>dB<br>dB<br>dB<br>dB |
| ISO | Isolation (ANT pin to RF1/RF2) | 0.1-0.96GHz<br>0.96-2.2GHz<br>2.3-2.7GHz<br>3.3-4.2GHz<br>4.4-5GHz<br>5.15-5.925GHz | 30<br>28<br>25<br>23<br>20<br>18 | 35<br>31<br>30<br>29<br>24<br>22 | | dB<br>dB<br>dB<br>dB<br>dB<br>dB |
| RL | Input return loss (ANT pin to RF1/RF2) | 0.1-0.96GHz<br>0.96-2.2GHz<br>2.3-2.7GHz<br>3.3-4.2GHz<br>4.4-5GHz<br>5.15-5.925GHz | 30<br>26<br>23<br>20<br>18<br>15 | 35<br>29<br>27<br>24<br>23<br>22 | | dB<br>dB<br>dB<br>dB<br>dB<br>dB |
| 2fo | Second harmonics (ANT pin to RF1/RF2) | PIN=+26dBm, 900MHz | | -65 | -55 | dBm |
| 3fo | Third harmonics (ANT pin to RF1/RF2) | PIN=+26dBm, 900MHz | | -70 | -60 | dBm |
| 2fo | Second harmonics (ANT pin to RF1/RF2) | PIN=+26dBm, 1900MHz | | -70 | -60 | dBm |
| 3fo | Third harmonics (ANT pin to RF1/RF2) | PIN=+26dBm, 1900MHz | | -65 | -55 | dBm |
| 2fo | Second harmonics (ANT pin to RF1/RF2) | PIN=+26dBm, 2400MHz | | -75 | -65 | dBm |
| 3fo | Third harmonics (ANT pin to RF1/RF2) | PIN=+26dBm, 2400MHz | | -65 | -55 | dBm |
| $P_{0.1dB}$ | 0.1dB Compression Point (ANT pin to RF1/RF2) | 0.1GHz–5.925GHz 25% DC | 31 | | | dBm |



## Timing Diagram (Power ON and OFF sequence)

It is very important that the user adheres to the correct power-on/off sequence in order to avoid damaging the device. The control signal V1 should be set to 0V unless VDD is set in the operating voltage range.

Power ON:

1) Apply voltage supply --- VDD
2) Set Controls---V1
3) Apply RF input

Change switch position from one RF port to another:

1) Remove RF input
2) Change control voltages V1 to set the switch to desired RF port
3) Apply RF input

Power OFF:

1) Remove RF input
2) Remove control voltages-V1
3) Remove VDD input

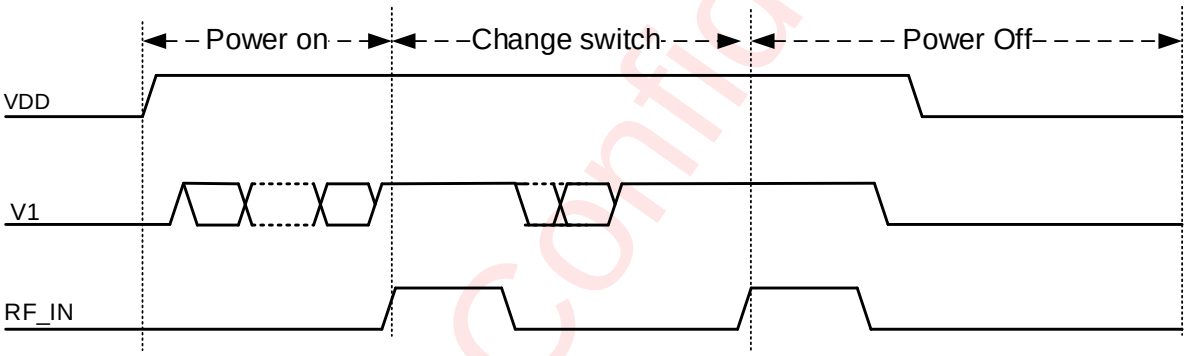



**Figure 4 Power on/Change switch/Power off sequence**

## Control Logic

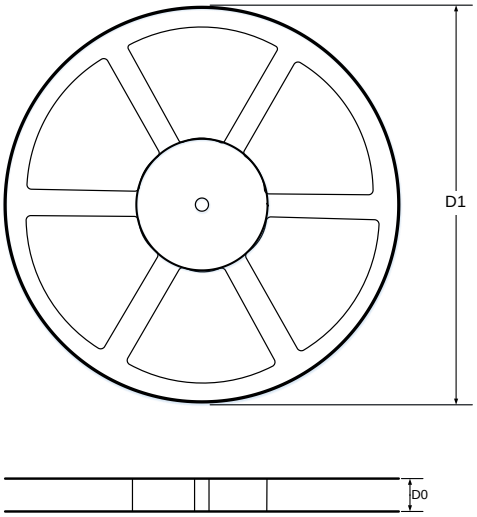
| State | Active Path | V1 |
|---|---|---|
| 0 | ANT to RF1 | 0 |
| 1 | ANT to RF2 | 1 |



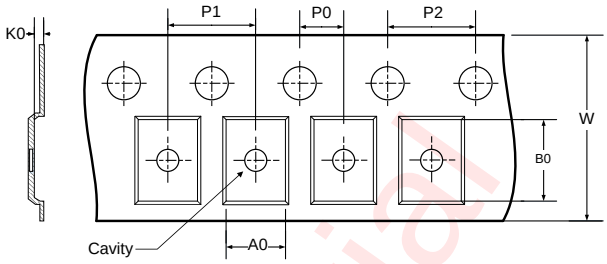
 

# Tape and Reel Information

REEL DIMENSIONS

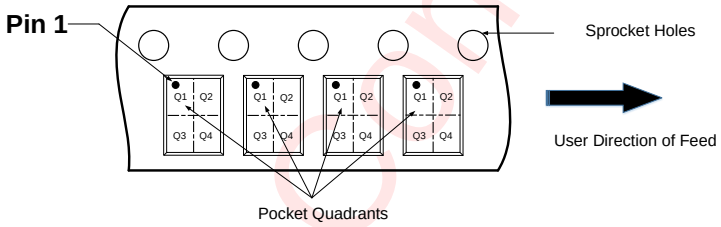



TAPE DIMENSIONS




A0：Dimension designed to accommodate the component width
B0：Dimension designed to accommodate the component length
K0：Dimension designed to accommodate the component thickness
W：Overall width of the carrier tape
P0：Pitch between successive cavity centers and sprocket hole
P1：Pitch between successive cavity centers
P2：Pitch between sprocket hole
D1：Reel Diameter
D0：Reel Width

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE




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 | 8.4 | 0.82 | 1.22 | 0.66 | 2 | 2 | 4 | 8 | Q1 |

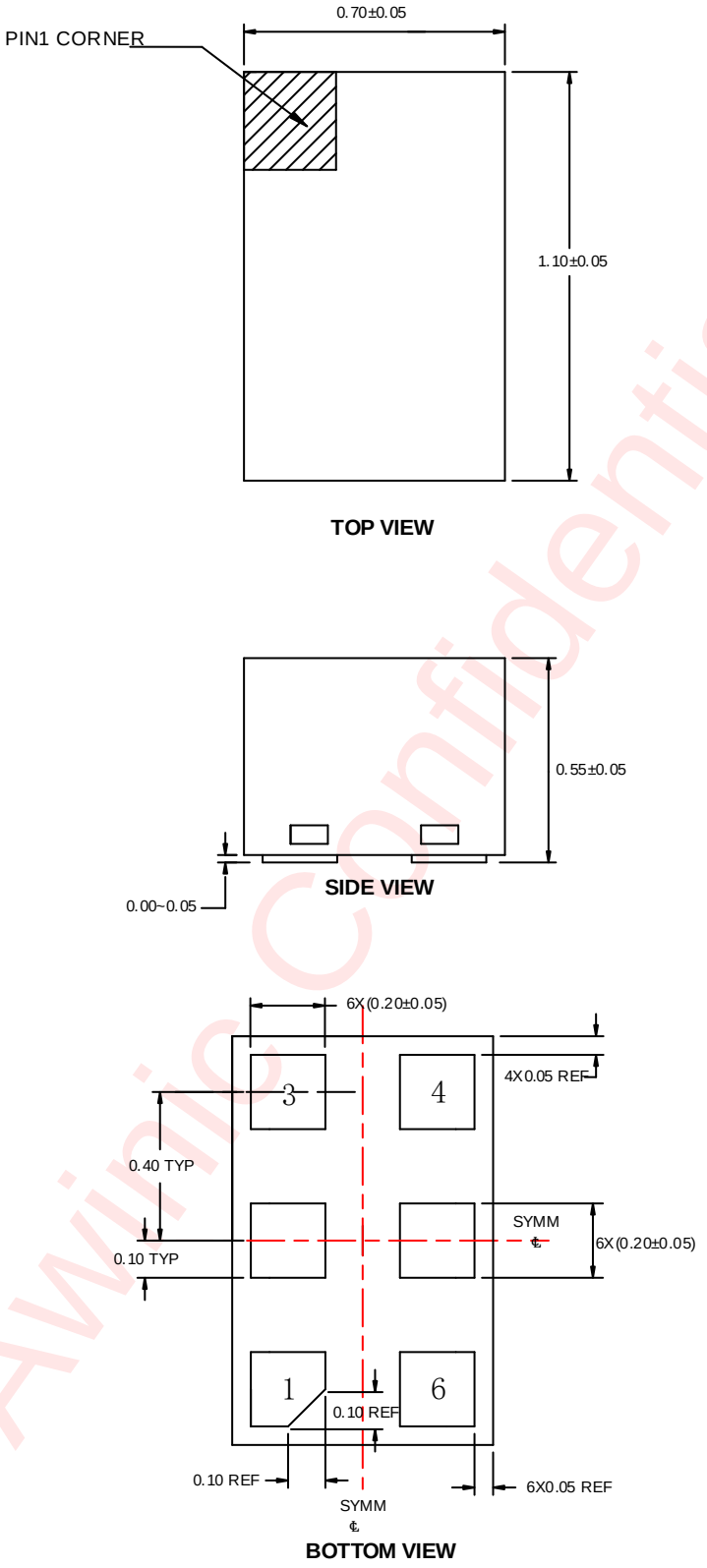
**All dimensions are nominal**

**Figure 5 Tape and Reel**



## Package Description




Unit: mm

**Figure 6 Package Outline**



## Land Pattern Data

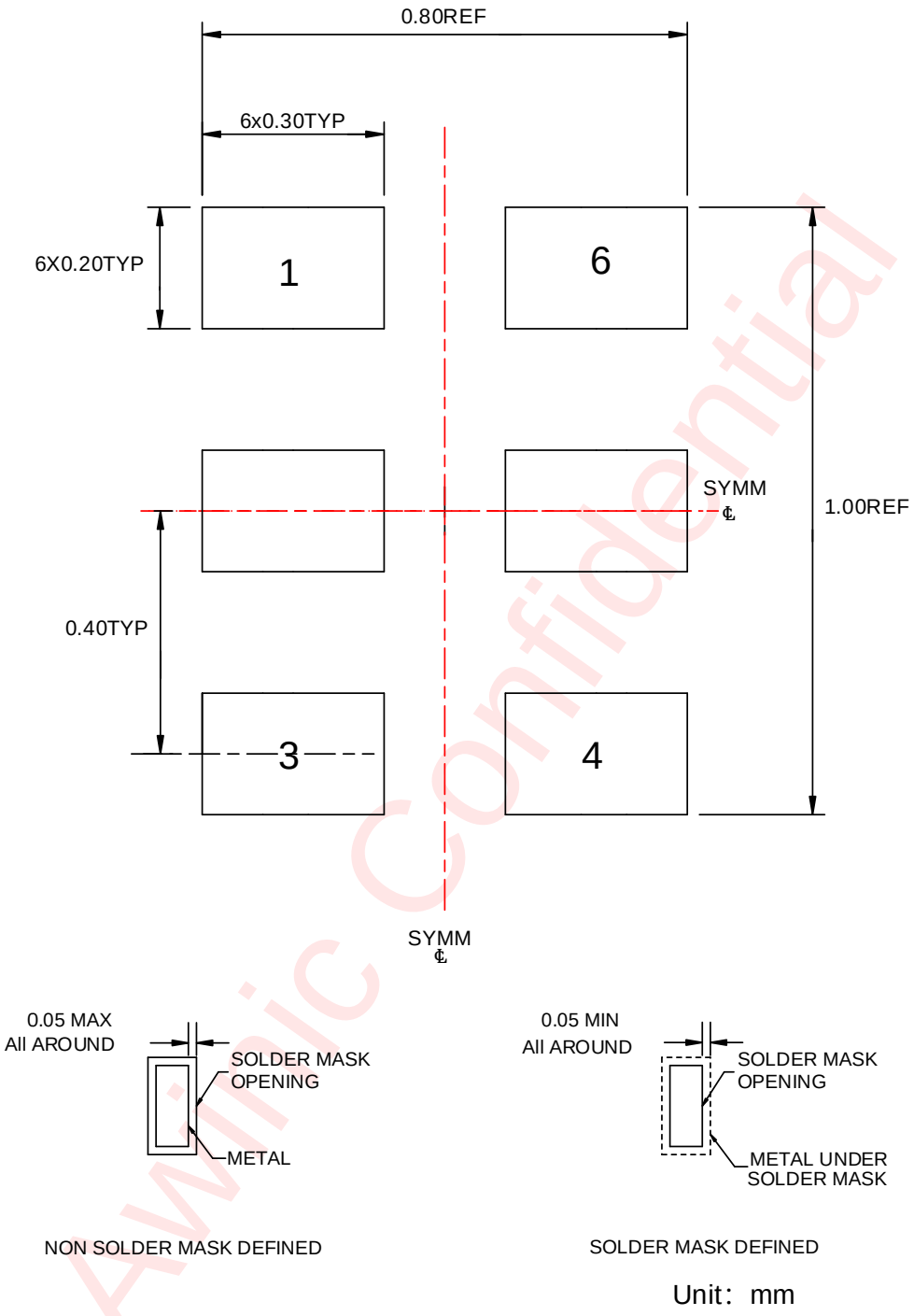



**Figure 7 Land Pattern**



## Revision History

| Version | Date | Change Record |
|---|---|---|
| V1.0 | Aug. 2024 | Officially Released |
| V1.1 | Apr. 2025 | Update frequency range and limit |



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