# 2.9-3.4GHz / 3.7-4.3GHz Double TIA - ZT>350Ohms

**DATA SHEET** **VWA 5000063 AA**

## General Description

The **VWA5000063AA** is a double transimpedance amplifier designed on a 0.15µm pHEMT process.

The two embedded devices are capable of more than +10dBm of output power at saturation regime. And more than +8dBm of output power at 1dB of gain compression regime. It provides 16dB of linear gain for each sub-band. When operating with $V_D$= +2.5V, with a small consumption of 25mA. The design has been optimized to provide high signal to noise ratio.

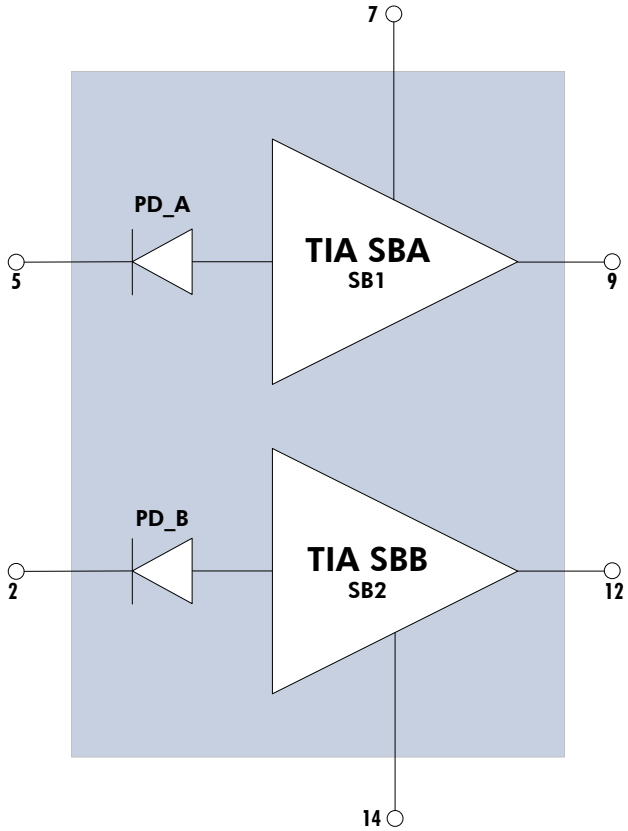
## Features

- Transimpedance amplifier pHEMT GaAs MMIC
- SUB-BAND 1: SBA from 2.9GHz to 3.4GHz.
- SUB-BAND 2: SBB from 3.7GHz to 4.3GHz.
- 50Ω RF Single ended output
- DC coupled In, AC coupled Out
- $P_{1dB}$ >+8dBm.
- $P_{SAT}$ >+10dBm.
- Small signal gain: >16dB.
- Power supply: 25mA @ +2.5V
- Chip size: 2.291 x 1.77 x 0.1 (mm)

## Applications

- Radar / ECM / ECCM
- Test and measurement
- Broadband / datalink communication

## Pins Assignement & Functional Block Diagram




| Symbol | Pad N° |
|---|---|
| PD SBB | 2 |
| PD SBA | 5 |
| $V_D$_SBA | 7 |
| RF SBA Out | 9 |
| RF SBB Out | 12 |
| $V_D$_SBB | 14 |

## Electrical Specifications

**Test conditions unless otherwise noted:**

- Tamb.= +25°C
- $V_D$= 2.5V
- $I_D$= 25mA

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| F_SB1 | Frequency range SB1 | 2.9 | | 3.4 | GHz |
| F_SB2 | Frequency range SB2 | 3.7 | | 4.3 | GHz |
| G | Equivalent gain VS PD loaded by 50Ohms | 16.5 | 17 | | dB |
| Zt | Equivalent Transimpedance | | 350 | | Ohms |
| $I_{EQU}$ | Equivalent noise current at the PD level | | | 9 | pA/Hz ^(0.5) |
| ΔG | Small signal gain flatness | | +/-0.5 | | dB |
| S22 | Output return loss | | -10 | | dB |
| $P_{1dB}$ | Output P1 dB @ Optical Pin =+4dBm (m=1) | | 9 | | dBm |
| $P_{SAT}$ | Saturated output power | | 10 | | dBm |
| $V_D$ | Drain supply voltage | | 2.5 | | V |
| $I_D$ | Supply current | | 25 | | mA |

## Environmental parameters

| Symbol | Parameter | Values | Unit |
|---|---|---|---|
| Ta | Operating temperature range | -40/+85 | °C |
| Tstg | Storage temperature range | -55/+85 | °C |

## Absolute Maximum Ratings

| Symbol | Parameter | Values (max) | Unit |
|---|---|---|---|
| $V_D$ | Positive DC bias voltage | 6 | V |
| $I_{PH\ MAX}$ | Input current (In) | 10 | mA |
| Tj | Junction temperature | 150 | °C |
| Pcw | Continuous power disspation (@85 °C) | 0.3 | W |
| T process | Temperature process max 20 secondes | 325 | °C |

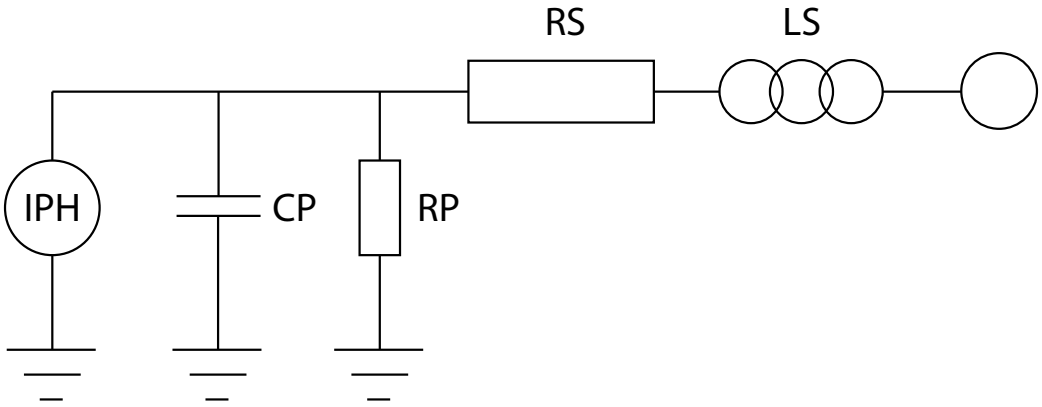
Operation of this device above any of these parameters may cause permanent damage.

# Typical Performance SBA = SB1:2.9-3.4GHz ( Test Under Probes)

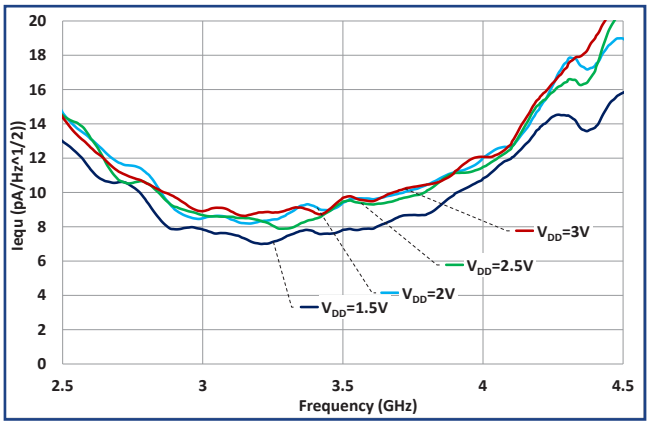
**Test conditions unless otherwise noted:**

- Tamb.= +25°C
- $I_D$= 25mA
- $V_D$= +2.5V

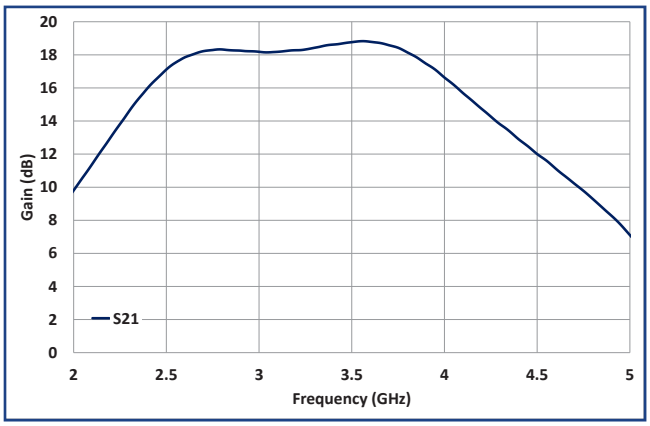
All measurements are done with m=1 and Sr= ~0.8A/W.
The next figures shows the equivalent electrical scheme of the used Photodiode:
Rp> 6KOhms, Rs= 2Ohms, Ls= 75pH, Cp= ~120fF.



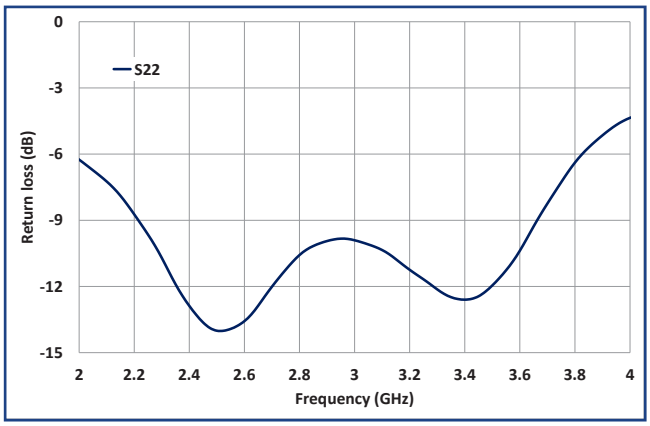

**Equivalent noise current reported at the photodiode level for SB1**



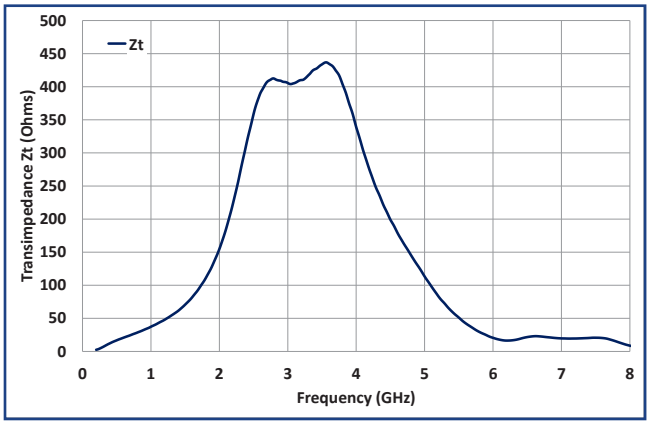
## Gain



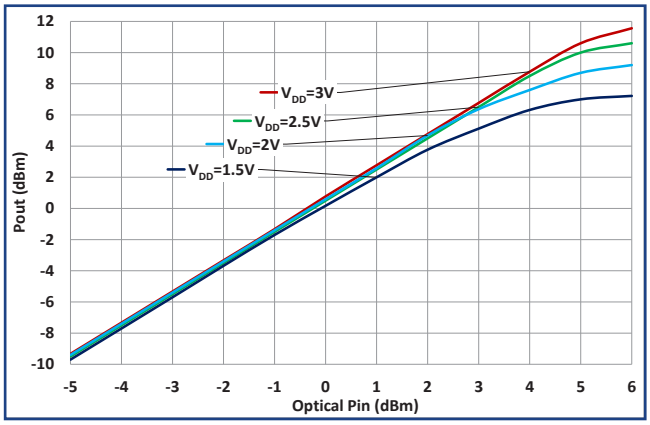

## Output Return Loss




## Transimpedance




## Input Power vs Input Power for various $V_D$ @3.4GHz

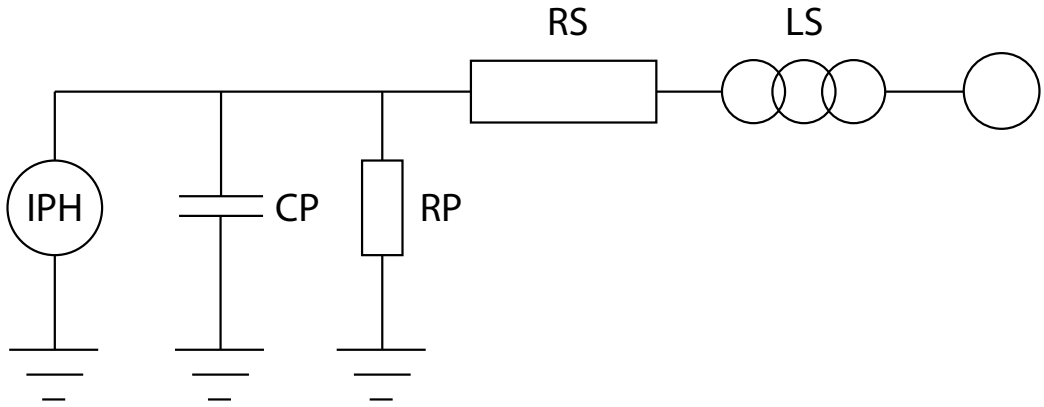


# Typical Performance SBA = SB2:3.7-4.3GHz ( Test Under Probes)

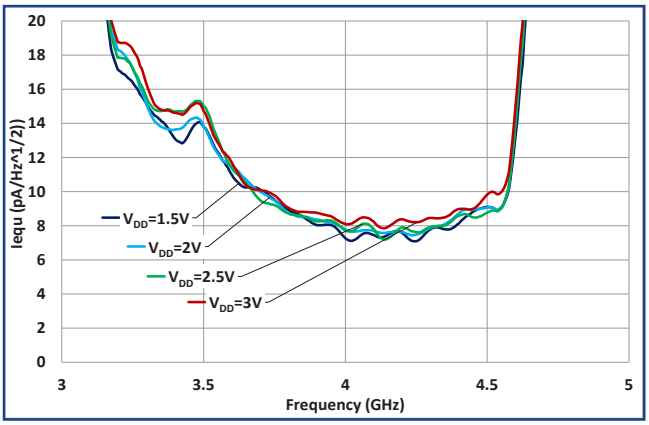
**Test conditions unless otherwise noted :**

- Tamb.= +25°C
- $I_D$ = 25mA
- $V_D$ = +2.5V

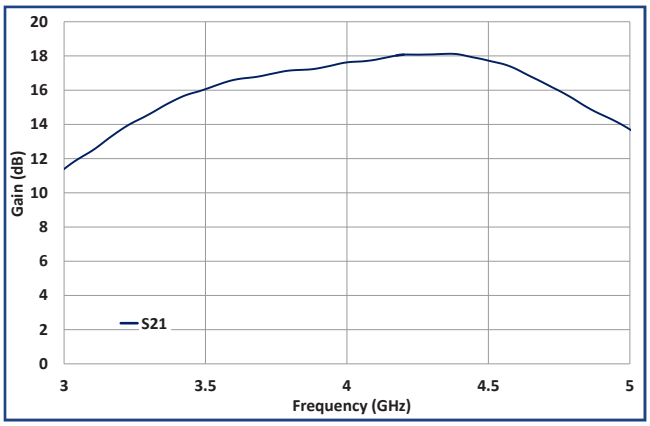
All measurements are done with m=1 and Sr= ~0.8A/W.
The next figures shows the equivalent electrical scheme of the used Photodiode:
Rp> 6KOhms, Rs= 2Ohms, Ls= 75pH, Cp= ~120fF.



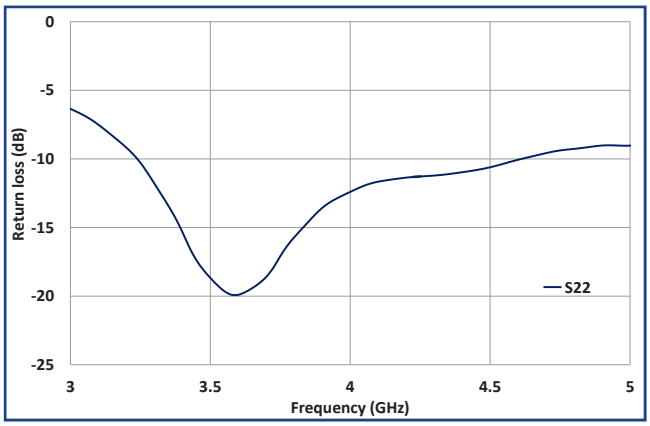

**Equivalent noise current reported at the photodiode level for SB2**



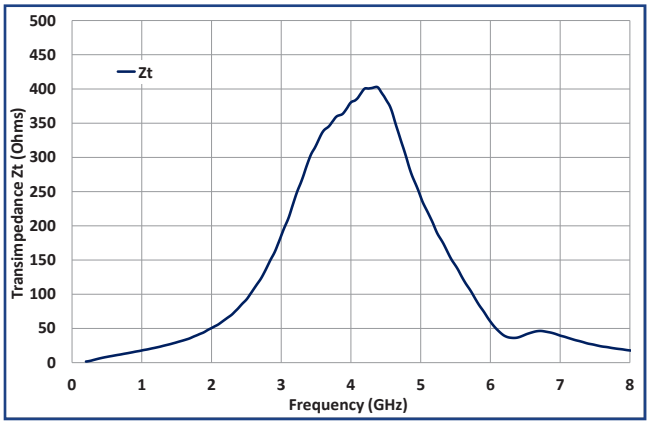
## Gain



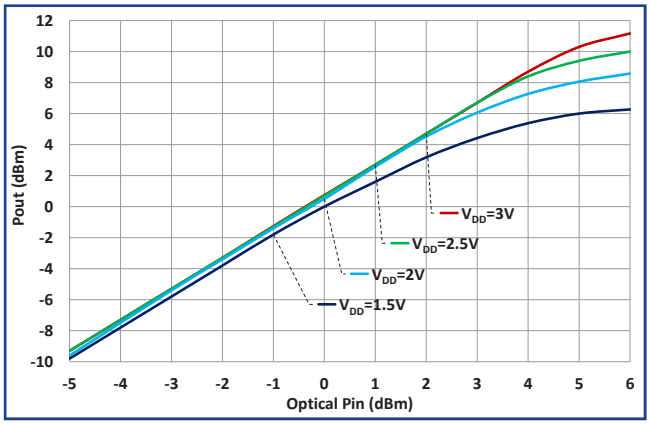

## Output Return Loss



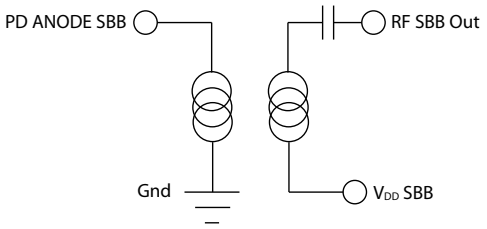
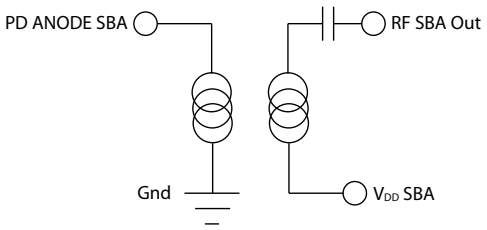
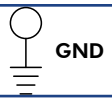

## Transimpedance



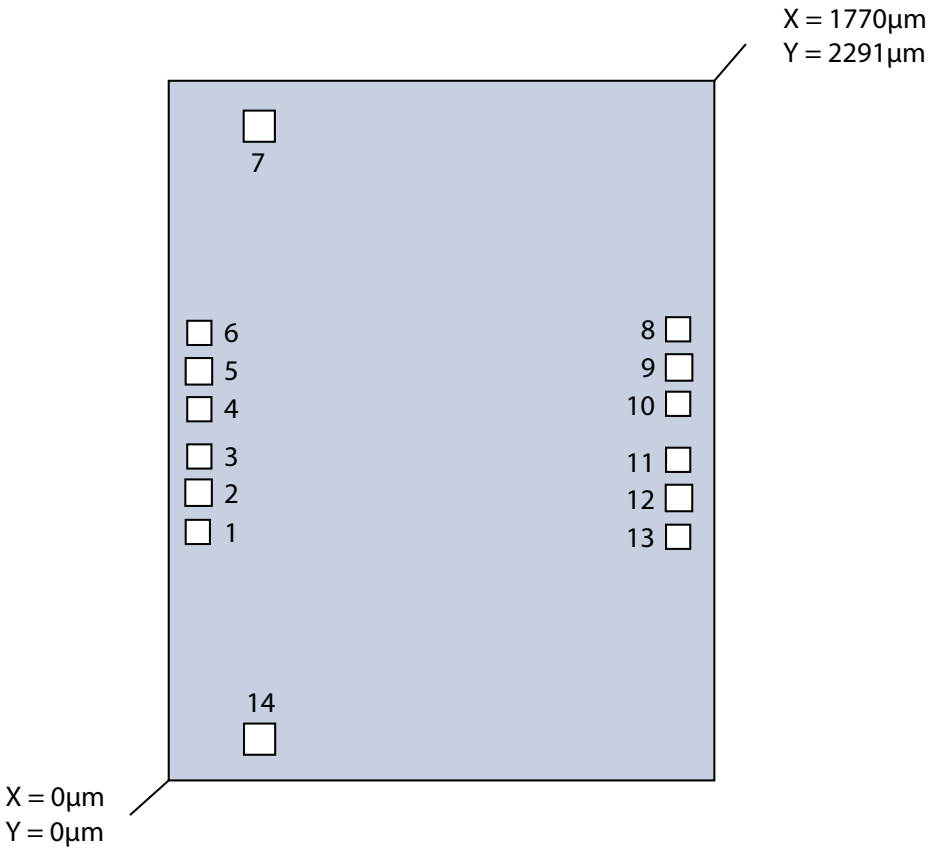

## Input Power vs Input Power for various $V_D$ @4.3GHz



# Access Description

| Pin Number | Name | Description | Electrical interface |
|---|---|---|---|
| 2 | PD Anode SBB | High impedance, SUB-BAND 2 input. The photodiode cathode must be connected to this pad access, using a small inductive link. Typically, a bonding wire of 500µm length can be used for the PD to the TIA connection. |   |
| 12 | RF SBB OUTPUT | 50 Ohms, SUB-BAND 2 RF output. | |
| 14 | $V_D$ SBB | SBB Drain access, it must be decoupled to a MIM capacitor using a small inductive link. | |
| 5 | PD Anode SBA | High impedance, SUB-BAND 1 input. The photodiode cathode must be connected to this pad access, using a small inductive link. Typically, a bonding wire of 500µm length can be used for the PD to the TIA connection. |   |
| 9 | RF SBA OUTPUT | 50 Ohms, SUB-BAND 1 RF output. | |
| 7 | $V_D$ SBB | SBA Drain access, it must be decoupled to a MIM capacitor using a small inductive link. | |
| Die Bottom | | Die must be connected to HF and DC Ground |   |

## Die Layout




## Pinout and Bonding Pad Coordinates

| Die Pin Out | | | | |
|---|---|---|---|---|
| **Pad** | **X (µm)** | **Y (µm)** | **Size (µm x µm)** | **Function** |
| 1 | 90 | 815 | 75x75 | Gnd |
| 2 | 92 | 941 | 80x80 | PD Anode SBB |
| 3 | 92 | 1063 | 75x75 | Gnd |
| 4 | 92 | 1220 | 75x75 | Gnd |
| 5 | 93 | 1341 | 80x80 | PD Anode SBA |
| 6 | 92 | 1467 | 75x75 | Gnd |
| 7 | 289 | 2145 | 100x100 | $V_D$_SBA |
| 8 | 1651 | 1479 | 75x75 | Gnd |
| 9 | 1654 | 1356 | 80x80 | RF SBA Out |
| 10 | 1652 | 1232 | 75x75 | Gnd |
| 11 | 1652 | 1051 | 75x75 | Gnd |
| 12 | 1652 | 927 | 80x80 | RF SBB Out |
| 13 | 1650 | 804 | 75x75 | Gnd |
| 14 | 287 | 137 | 100x100 | $V_D$ SBB |

Die thickness = 100µm
Die bottom must be connected to ground (RF and DC)

## Ordering Information

| Product Code | Definition |
|---|---|
| VWA 5000063 AA | Double TIA 2.9-3.4GHz / 3.7-4.3GHz |

## Associated Material

| Material | Status |
|---|---|
| Packaged die | Contact factory |
| Die Evaluation Board (die EVB) | Contact factory |
| Packaged die Evaluation Board (packaged die EVB) | Contact factory |
| Mechanical files (DXF) | Contact factory |
| Measurents files (S2P) | Contact factory |

## Product Compliance Information

### Solderability :

Use only AuSn (80/20) solder and limit exposure to temperature above 300 °C TO 3 - 4 minutes, maximum

### ESD Sensitivy Rating :

Test : Human Body Model (HBM)
Standard : JEDEC Standard JESD22-A114

**CAUTION ! ESD-Sensitive device**

### RoHS-Compliance :

This part is compliant with EU 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).
This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C15H12Br402) Free
- PFOS Free
- SVHC Free

## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about Vectrawave:

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