# Agilent ABA-51563
# 3.5 GHz Broadband Silicon RFIC Amplifier
## Data Sheet

### Features
- Operating frequency: DC ~ 3.5 GHz
- 21.5 dB gain
- VSWR < 2.0 throughout operating frequency
- 1.8 dBm output P1dB
- 3.7 dB noise figure
- Unconditionally stable
- Single 5V supply (Id = 18 mA)
- Lead-free option available

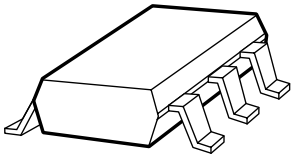
### Applications
- Amplifier for cellular, cordless, special mobile radio, PCS, ISM, wireless LAN, DBS, TVRO, and TV tuner applications

### Description
Agilent's ABA-51563 is an economical, easy-to-use, internally 50-ohm matched silicon monolithic broadband amplifier that offers excellent gain and flat broadband response from DC to 3.5 GHz. Packaged in an ultra-miniature industry-standard SOT-363 package, it requires half the board space of a SOT-143 package.

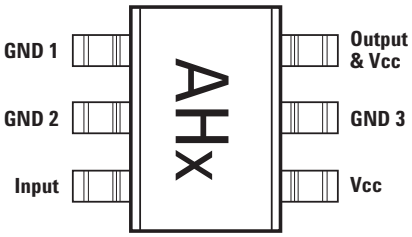
At 2 GHz, the ABA-51563 offers a small-signal gain of 21.5 dB, output P1dB of 1.8 dBm and 11.4 dBm output third order intercept point. It is suitable for use as buffer amplifiers for wideband applications. They are designed for low cost gain blocks in cellular applications, DBS tuners, LNB and other wireless communications systems.

ABA-51563 is fabricated using Agilent's HP25 silicon bipolar process, which employs a double-diffused single polysilicon process with self-aligned submicron emitter geometry. The process is capable of simultaneous high $f_T$ and high NPN breakdown (25 GHz $f_T$ at 6V BVCEO). The process utilizes industry standard device oxide isolation technologies and submicron aluminum multilayer interconnect to achieve superior performance, high uniformity, and proven reliability.

### Surface Mount Package
### SOT-363 / SC70

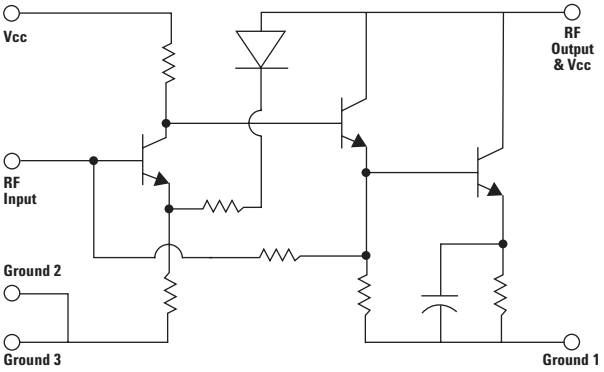


### Pin Connections and Package Marking




**Note:**
Top View. Package marking provides orientation and identification. "x" is character to identify date code.

### Simplified Schematic






**Attention:**
**Observe precautions for handling electrostatic sensitive devices.**

**ESD Machine Model (Class A)**

**ESD Human Body Model (Class 1A)**

**Refer to Agilent Application Note A004R: Electrostatic Discharge Damage and Control.**

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## ABA-51563 Absolute Maximum Ratings[1]

| Symbol | Parameter | Units | Absolute Max. |
|---|---|---|---|
| $V_{cc}$ | Device Voltage, RF output to ground (T = 25°C) | V | +7 |
| $P_{in}$ | CW RF Input Power (Vcc = 5V) | dBm | +20 |
| $P_{diss}$ | Total Power Dissipation[3] | W | 0.3 |
| $T_j$ | Junction Temperature | °C | 150 |
| $T_{STG}$ | Storage Temperature | °C | -65 to 150 |

**Thermal Resistance[2] (Vcc = 5V)**
**$\theta_{jc}$ = 104°C/W**

**Notes:**
1. Operation of this device in excess of any of these limits may cause permanent damage.
2. Thermal resistance measured using 150°C Liquid Crystal Measurement Technique.
3. Board (package belly) temperature, Tb, is 25°C. Derate 2.3 mW/°C for Tb > 120.8°C.

## Electrical Specifications

$T_c$ = +25°C, $Z_o$ = 50 Ω, $P_{in}$ = -30 dBm, $V_{cc}$ = 5V, Freq = 2 GHz, unless stated otherwise.

| Symbol | Parameter and Test Condition | Units | Min. | Typ. | Max. | Std Dev. |
|---|---|---|---|---|---|---|
| Gp[1] | Power Gain ($\|S_{21}\|^2$) | dB | 20 | 21.5 | | 0.2 |
| ΔGp | Power Gain Flatness, f = 0.1 ~ 2.5 GHz<br>f = 0.1 ~ 3.5 GHz | dB | | 1.0<br>1.3 | | |
| NF[1] | Noise Figure | dB | | 3.7 | 4 | 0.12 |
| P1dB[1] | Output Power at 1dB Gain Compression | dBm | | 1.8 | | 0.13 |
| OIP3[1] | Output Third Order Intercept Point | dBm | | 11.4 | | 0.24 |
| $VSWR_{in}$[1] | Input VSWR | | | 1.2 | | |
| $VSWR_{out}$[1] | Output VSWR | | | 1.2 | | |
| Icc[1] | Device Current | mA | | 18 | 28 | 0.3 |
| td[1] | Group Delay | ps | | 140 | | |

**Notes:**
1. Measurements taken on 50Ω test board shown on Figure 1. Excess circuit losses had been de-embedded from actual measurements. Standard deviation and typical data based on at least 500 parts sample size from 6 wafer lots. Future wafers allocated to this product may have nominal values anywhere within the upper and lower spec limits.

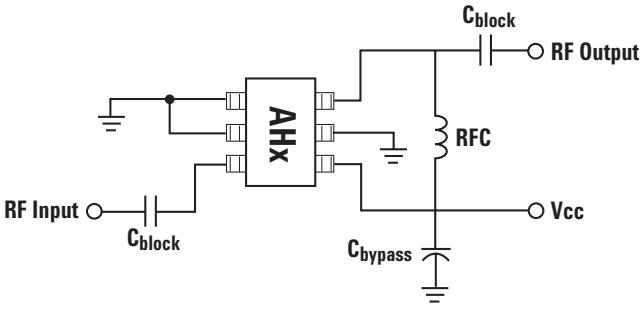



**Figure 1. ABA-51563 Production Test Circuit.**

## ABA-51563 Typical Performance

$T_c$ = +25°C, $Z_o$ = 50Ω, $V_{cc}$ = 5V unless stated otherwise.

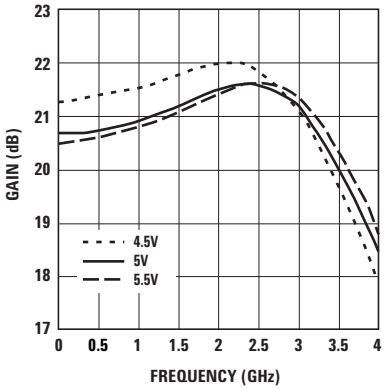



**Figure 2. Gain vs. Frequency and Voltage.**

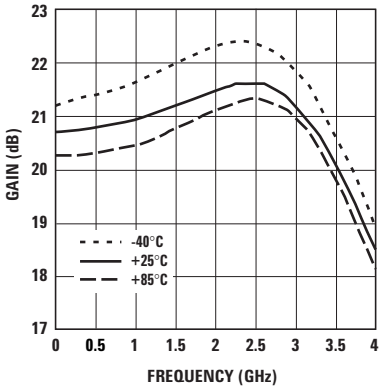



**Figure 3. Gain vs. Frequency and Temperature.**

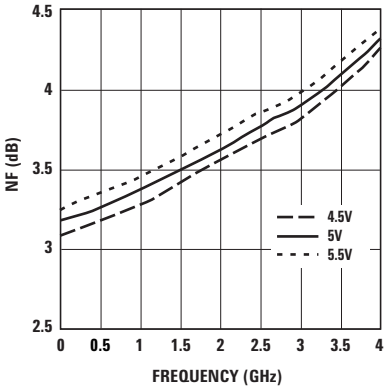



**Figure 4. Noise Figure vs. Frequency and Voltage.**

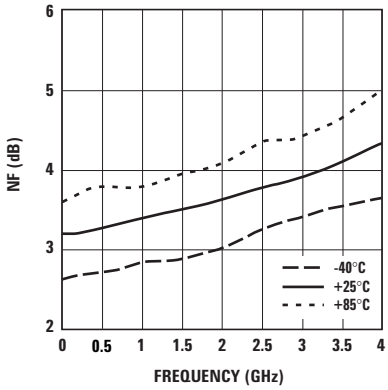



**Figure 5. Noise Figure vs. Frequency and Temperature.**

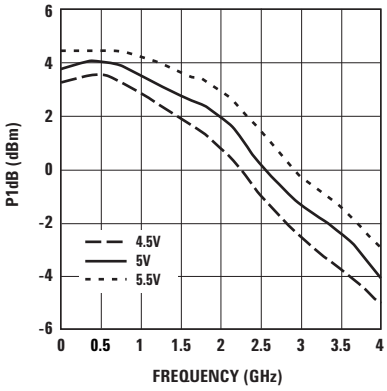



**Figure 6. Output Power for 1 dB Gain Compression vs. Frequency and Voltage.**

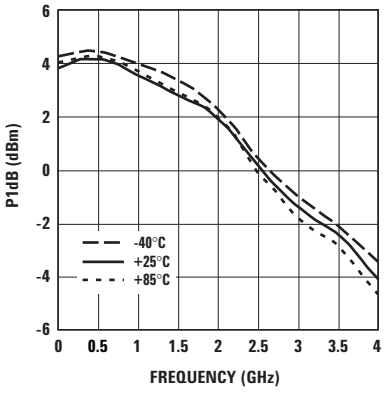



**Figure 7. Output Power for 1 dB Gain Compression vs. Frequency and Temperature.**

## ABA-51563 Typical Performance, continued

$T_c$ = +25°C, $Z_o$ = 50Ω, $V_{cc}$ = 5V unless stated otherwise.

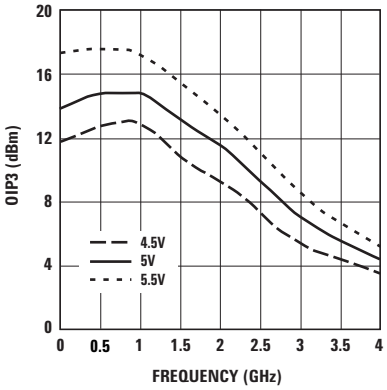



**Figure 8. Output IP3 vs. Frequency and Voltage.**

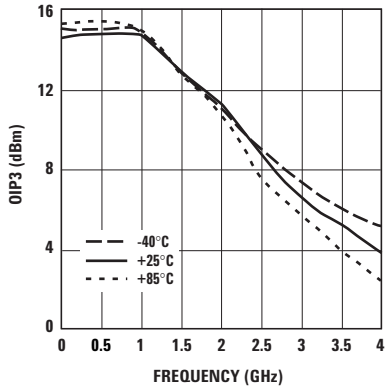



**Figure 9. Output IP3 vs. Frequency and Temperature.**

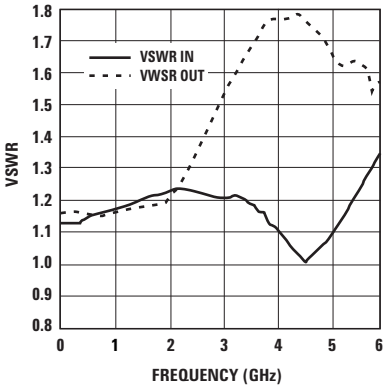



**Figure 10. Input and Output VSWR vs. Frequency.**

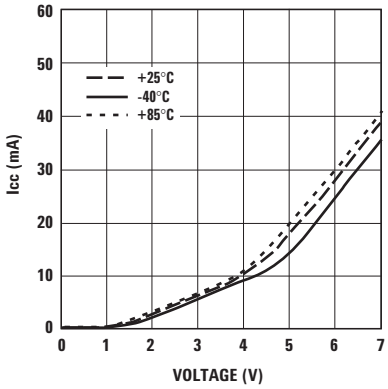



**Figure 11. Supply Current vs. Voltage and Temperature.**

### ABA-51563 Typical Scattering Parameters

$T_C$ = +25°C, $V_{CC}$ = 5V, $Z_O$ = 50 Ω, unless stated otherwise

| Freq (GHz) | $S_{11}$ Mag. | $S_{11}$ Ang. | $S_{21}$ dB | $S_{21}$ Mag. | $S_{21}$ Ang. | $S_{12}$ dB | $S_{12}$ Mag. | $S_{12}$ Ang. | $S_{22}$ Mag. | $S_{22}$ Ang. | K Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.05 | 0.06 | 175.8 | 20.8 | 10.93 | -2.3 | -27.3 | 0.04 | -0.8 | 0.08 | -2.3 | 1.294 |
| 0.10 | 0.06 | 174.1 | 20.7 | 10.88 | -4.4 | -27.3 | 0.04 | -1.4 | 0.08 | -6.0 | 1.297 |
| 0.20 | 0.06 | 170.4 | 20.8 | 10.93 | -8.6 | -27.5 | 0.04 | -2.5 | 0.07 | -11.5 | 1.313 |
| 0.30 | 0.06 | 166.0 | 20.8 | 10.93 | -12.8 | -27.5 | 0.04 | -3.3 | 0.07 | -15.1 | 1.313 |
| 0.40 | 0.06 | 160.6 | 20.8 | 10.97 | -17.1 | -27.7 | 0.04 | -3.8 | 0.07 | -17.7 | 1.331 |
| 0.50 | 0.07 | 161.9 | 20.8 | 10.97 | -21.4 | -27.7 | 0.04 | -4.1 | 0.07 | -17.7 | 1.330 |
| 0.60 | 0.07 | 160.0 | 20.8 | 10.99 | -25.6 | -28.0 | 0.04 | -4.6 | 0.07 | -17.8 | 1.351 |
| 0.70 | 0.07 | 155.8 | 20.9 | 11.04 | -30.0 | -28.0 | 0.04 | -4.8 | 0.07 | -18.9 | 1.346 |
| 0.80 | 0.08 | 153.5 | 20.9 | 11.10 | -34.2 | -28.2 | 0.04 | -5.0 | 0.07 | -18.5 | 1.365 |
| 0.90 | 0.08 | 150.4 | 20.9 | 11.13 | -38.6 | -28.2 | 0.04 | -4.9 | 0.07 | -14.7 | 1.361 |
| 1.00 | 0.08 | 148.0 | 21.0 | 11.20 | -43.0 | -28.4 | 0.04 | -4.9 | 0.08 | -9.9 | 1.380 |
| 1.20 | 0.08 | 132.5 | 21.1 | 11.35 | -52.0 | -28.6 | 0.04 | -4.4 | 0.08 | 11.6 | 1.391 |
| 1.40 | 0.09 | 118.9 | 21.2 | 11.51 | -61.1 | -28.9 | 0.04 | -3.8 | 0.08 | 26.1 | 1.403 |
| 1.60 | 0.09 | 102.9 | 21.4 | 11.69 | -70.7 | -28.9 | 0.04 | -2.7 | 0.08 | 37.7 | 1.386 |
| 1.80 | 0.10 | 86.5 | 21.5 | 11.85 | -80.6 | -29.1 | 0.04 | -1.3 | 0.09 | 44.3 | 1.399 |
| 2.00 | 0.10 | 69.6 | 21.5 | 11.94 | -90.7 | -29.1 | 0.04 | 0.3 | 0.10 | 47.9 | 1.391 |
| 2.20 | 0.11 | 50.6 | 21.6 | 12.04 | -101.2 | -29.1 | 0.04 | 1.9 | 0.11 | 45.1 | 1.382 |
| 2.40 | 0.10 | 38.4 | 21.7 | 12.15 | -112.1 | -29.1 | 0.04 | 3.0 | 0.13 | 41.1 | 1.369 |
| 2.60 | 0.10 | 30.1 | 21.7 | 12.14 | -123.5 | -28.9 | 0.04 | 4.3 | 0.16 | 36.7 | 1.339 |
| 2.80 | 0.10 | 17.8 | 21.6 | 12.00 | -135.3 | -28.9 | 0.04 | 5.7 | 0.19 | 31.6 | 1.341 |
| 3.00 | 0.09 | 10.2 | 21.4 | 11.70 | -147.3 | -28.9 | 0.04 | 7.4 | 0.21 | 26.7 | 1.354 |
| 3.20 | 0.10 | -1.1 | 21.0 | 11.27 | -158.9 | -28.6 | 0.04 | 9.8 | 0.24 | 21.4 | 1.352 |
| 3.40 | 0.09 | -15.7 | 20.6 | 10.73 | -170.5 | -28.2 | 0.04 | 10.8 | 0.25 | 14.4 | 1.343 |
| 3.50 | 0.08 | -20.5 | 20.4 | 10.45 | -176.2 | -28.0 | 0.04 | 11.4 | 0.26 | 11.2 | 1.337 |
| 4.00 | 0.05 | -52.8 | 18.9 | 8.86 | 157.4 | -27.1 | 0.04 | 12.4 | 0.27 | -4.6 | 1.389 |
| 4.50 | 0.00 | -179.7 | 17.4 | 7.40 | 133.1 | -26.2 | 0.05 | 12.3 | 0.27 | -18.4 | 1.457 |
| 5.00 | 0.04 | 127.8 | 15.6 | 6.06 | 112.1 | -25.2 | 0.06 | 11.0 | 0.24 | -32.2 | 1.568 |
| 5.50 | 0.10 | 114.7 | 14.1 | 5.09 | 92.7 | -24.0 | 0.06 | 7.2 | 0.24 | -47.4 | 1.597 |
| 6.00 | 0.16 | 105.3 | 12.7 | 4.30 | 75.7 | -23.0 | 0.07 | 1.9 | 0.20 | -62.0 | 1.657 |

### Device Models

Refer to Agilent's web site
www.agilent.com/view/rf

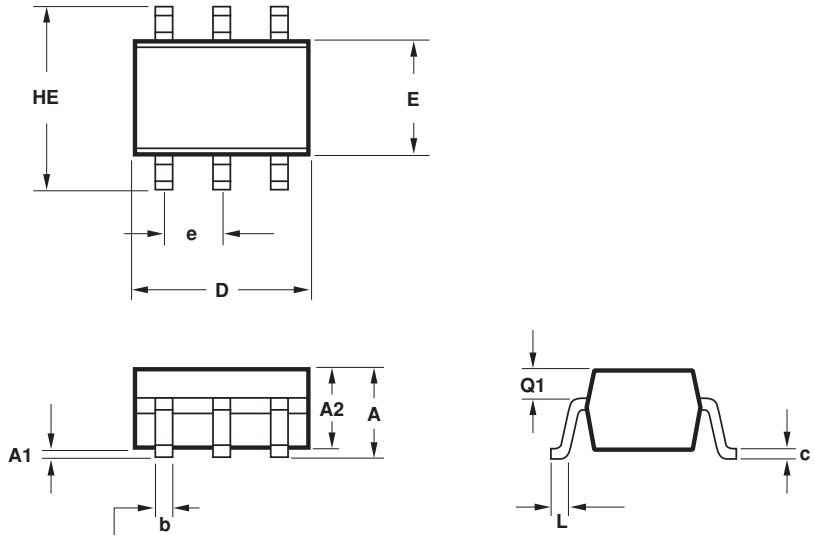
### Ordering Information

| Part Number | Devices per Container | Container |
|---|---|---|
| ABA-51563-TR1 | 3000 | 7" reel |
| ABA-51563-TR2 | 10000 | 13" reel |
| ABA-51563-BLK | 100 | antistatic bag |
| ABA-51563-TR1G | 3000 | 7" reel |
| ABA-51563-TR2G | 10000 | 13" reel |
| ABA-51563-BLKG | 100 | antistatic bag |

Note: For lead-free option,the part number will have the character "G" at the end.

### Package Dimensions

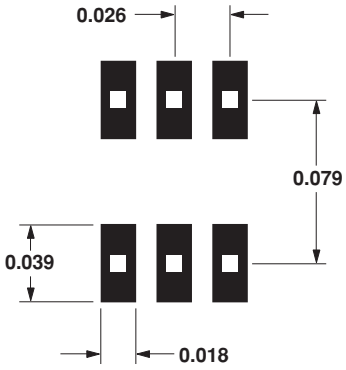
**Outline 63 (SOT-363/SC-70)**




| SYMBOL | DIMENSIONS (mm) MIN. | MAX. |
|---|---|---|
| E | 1.15 | 1.35 |
| D | 1.80 | 2.25 |
| HE | 1.80 | 2.40 |
| A | 0.80 | 1.10 |
| A2 | 0.80 | 1.00 |
| A1 | 0.00 | 0.10 |
| Q1 | 0.10 | 0.40 |
| e | 0.650 BCS | |
| b | 0.15 | 0.30 |
| c | 0.10 | 0.20 |
| L | 0.10 | 0.30 |

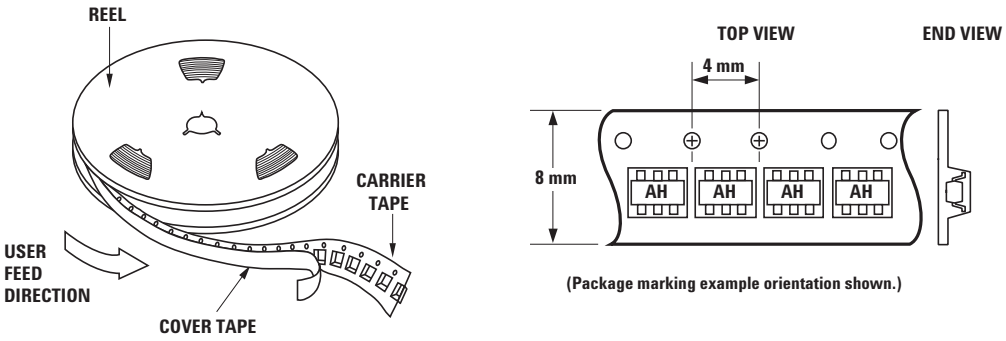
NOTES:
1. All dimensions are in mm.
2. Dimensions are inclusive of plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. All specifications comply to EIAJ SC70.
5. Die is facing up for mold and facing down for trim/form, ie: reverse trim/form.
6. Package surface to be mirror finish.

### Recommended PCB Pad Layout for Agilent's SC70 6L/SOT-363 Products

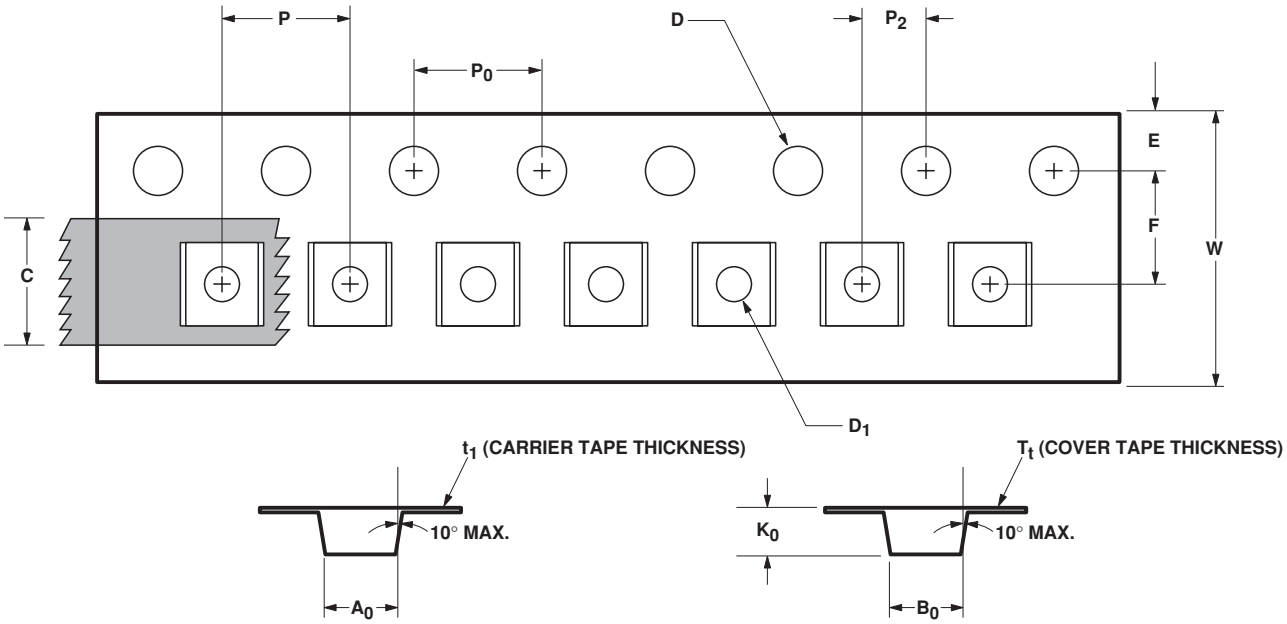



Dimensions in inches.

## Device Orientation




## Tape Dimensions and Product Orientation for Outline 63




| DESCRIPTION | | SYMBOL | SIZE (mm) | SIZE (INCHES) |
|---|---|---|---|---|
| CAVITY | LENGTH | $A_0$ | 2.40 ± 0.10 | 0.094 ± 0.004 |
| | WIDTH | $B_0$ | 2.40 ± 0.10 | 0.094 ± 0.004 |
| | DEPTH | $K_0$ | 1.20 ± 0.10 | 0.047 ± 0.004 |
| | PITCH | P | 4.00 ± 0.10 | 0.157 ± 0.004 |
| | BOTTOM HOLE DIAMETER | $D_1$ | 1.00 + 0.25 | 0.039 + 0.010 |
| PERFORATION | DIAMETER | D | 1.50 ± 0.10 | 0.061 + 0.002 |
| | PITCH | $P_0$ | 4.00 ± 0.10 | 0.157 ± 0.004 |
| | POSITION | E | 1.75 ± 0.10 | 0.069 ± 0.004 |
| CARRIER TAPE | WIDTH | W | 8.00 + 0.30 - 0.10 | 0.315 + 0.012 |
| | THICKNESS | $t_1$ | 0.254 ± 0.02 | 0.0100 ± 0.0008 |
| COVER TAPE | WIDTH | C | 5.40 ± 0.10 | 0.205 + 0.004 |
| | TAPE THICKNESS | $T_t$ | 0.062 ± 0.001 | 0.0025 ± 0.0004 |
| DISTANCE | CAVITY TO PERFORATION (WIDTH DIRECTION) | F | 3.50 ± 0.05 | 0.138 ± 0.002 |
| | CAVITY TO PERFORATION (LENGTH DIRECTION) | $P_2$ | 2.00 ± 0.05 | 0.079 ± 0.002 |

**www.agilent.com/semiconductors**

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**Agilent Technologies**

Стандарт Электрон Связь

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**Наши контакты:**

**Телефон:** +7 812 627 14 35

**Электронная почта:** sales@st-electron.ru

**Адрес:** 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331