# Data Sheet

**Type Description :** Dual Operational Amplifier

**Product Name :** EST.4310A

**Reversion :** V1.0

**Reversion Date :** May, 2016

**Page :** 9 Pages

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## GENERAL DESCRIPTION

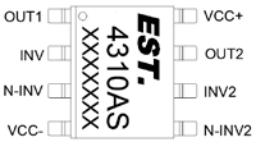
EST.4310A 低功耗雙路運算放大器，電路包含兩個獨立、高增益頻率補償式運算放大器，其設計可採用單電源或分離電源，在寬廣的電壓範圍下操作。

若兩個電源供應器之間的差異為 8V 至 30V，且採用軌道隊軌道設計，VCC 可與輸入共模電壓相同，也可採用分離電源操作。低電源電流損耗不受電源電壓大小影響。

EST.4310A 內建 2.5V 參考電壓

EST.4310A 可提供 SOP-8 封裝

## PIN CONFIGURATION




SOP-8L

## APPLICATION

- 交換式電源
- 通用可攜式交值流轉換充電器
- LED 背光或照明
- 有源濾波器

## FEATURE

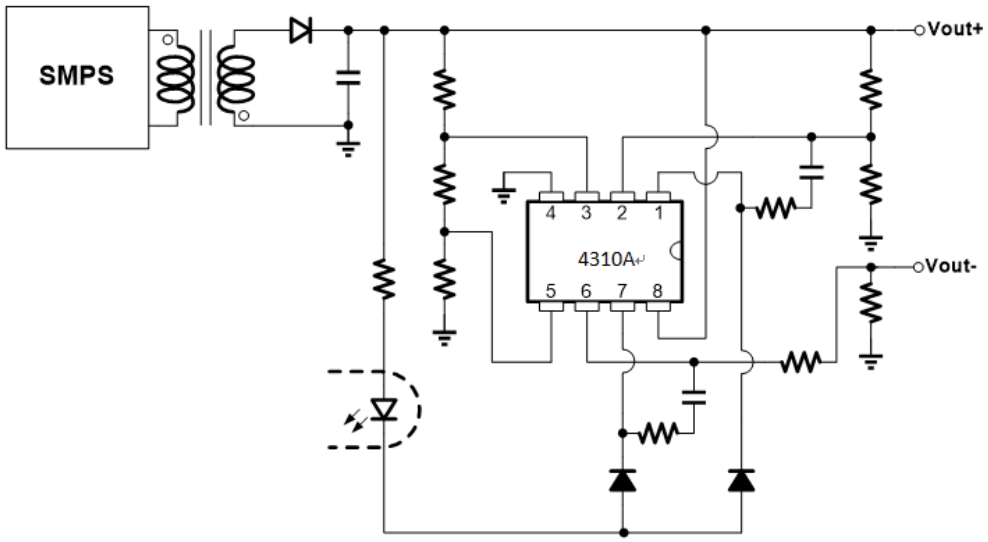
**Operational Amplifier**

- 寬廣電源範圍 : 4.5V to 32V
- 低電源電流損耗，不受電源電壓影響：典型值為 300uA (@ VCC+ =15V)
- 低偏移電壓 :±150Uv
- 軌對軌輸出
- 開回路差動電壓增益: 典型值為 80dB
- Low input offset voltage 寬廣的增益頻寬(Unity gain bandwidth) : 1MHz
- 差動輸入電壓範圍與最大額定電源電壓相同 : 0V~VCC+

**Voltage Reference**

- 內建參考電壓 : 2.5V±0.4%
- 低建立電流 : 20uA
- 灌電流能力 Sink current capability : 150mA

## APPLICATION CIRCUIT



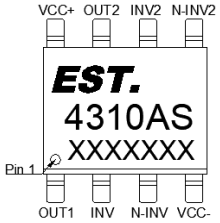

## ORDERING INFORMATION

| Part Number | Package | Packaging | Note |
|---|---|---|---|
| **EST.4310AS** | SOP-8 | Tape & Reel | Green |

Note: EST lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS .EST lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020C for MSL classification at lead-free peak reflow temperature. EST defines “Green” to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed

900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

## PIN DESCRIPTION




| SOP-8 | NAME Description | Description |
|---|---|---|
| 1 | OUT1 | OP1 output 輸出 1 |
| 2 | INV1 | OP1 Inverting Input 負(反相)輸入 1 |
| 3 | NINV1 | OP1 Non-inverting Input 正(同相)輸入 1 |
| 4 | VCC- | Ground for Single supply/ Negative power supply |
| 5 | NINV2 | OP2 Non-inverting Input 負(反相)輸入 2 |
| 6 | INV2 | OP2 Inverting Input 正(同相)輸入 2 |
| 7 | OUT2 | OP2 Output 輸出 2 |
| 8 | VCC+ | Positive power supply 電源 |

## Absolute Maximum Ratings

| Parameter Symbol | | Symbol | Limit Values | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | | Min. | Max | | |
| 操作電壓 Supply Voltage Vcc | | $V_{CC}$ | -0.3 | 32 | V | |
| 差動輸入電壓 Differential Input Voltage | | $V_{ID}$, | | 32 | V | |
| 輸入電壓 Input Voltage | | $V_i$ | -0.6 | 32 | V | |
| 輸出電壓 OP Output Voltage | | $V_o$ | -0.3 | Vcc | mA | |
| 操作溫度 Operation Junction Temperature | | Tj | -40 | 150 | ℃ | |
| 儲存電壓 Storage Temperature | | Tstg | -55 | 150 | ℃ | |
| 封裝熱阻 Package Thermal Resistance | SOP-8 | θJA | - | 160 | ℃/W | |
| 功耗 Power Dissipation @TA=85℃ | SOP-8 | PD | - | 0.85 | W | |
| Lead temperature (Soldering, 10 sec) | | | - | 260 | ℃ | |
| ESD Voltage Protection | HBM | VESD-HBM | - | 3.0 | KV | |
| | MM | VESD-MM | - | 300 | V | |

Stress beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliablity.

*Free standing with no heatsink; withoud copper clad.(Measurement condition – just before junction temperature $T_J$ enters into OTP)

**Measure on the PKG top surface

## DC Electrical Characteristics ($V_{CC}^+$ =15V, $V_{CC}^-$ =0V Ta=25°C)

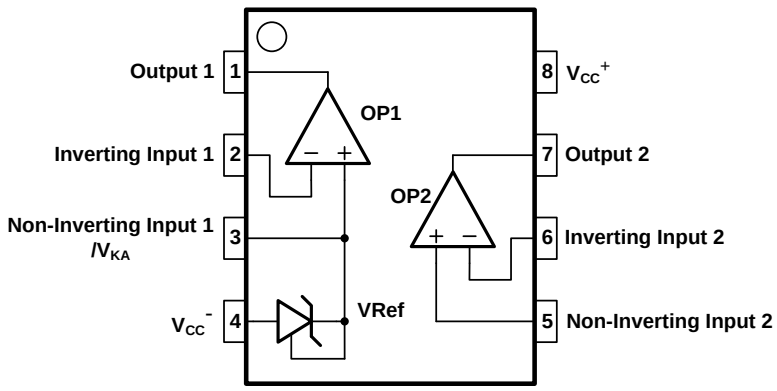
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| 操作電壓 Positive Supply Voltage | $V_{CC}^+$ | 8 | | 30 | V | |
| 電源電流 Total Supply Current | Icc | | | 300 | μA | 1. Vcc = 15V<br>2. no load, |
| 輸入失調電壓 Input Offset Voltage | Vio | -150 | 0 | 150 | μV | 25°C |
| | | -250 | 0 | 250 | | -25~85°C |
| 小訊號增益 Small Signal Gain | Avd | | 80 | | dB | |
| 電源抑制比 Supply Voltage Rejection Ratio | SVR | | 80 | | dB | $VCC^+$ = 9V to 20V |
| 輸入共模電壓範圍 Input Common Mode Voltage Range | Vicm | 0 | | VCC | V | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 共模抑制比<br>Common Mode Rejection Ratio | CMR | | | 80 | dB | |
| 輸出拉電流<br>Output Current Source | Isource | | | 20 | mA | 1. Vid = +1V<br>2. VCC = 15V<br>3. Vo = 2V |
| 輸出灌電流<br>Output Current Sink | Isink | | 15 | | mA | 1. Vid = -1V<br>2. VCC = 15V<br>3. Vo = 2V |
| 高准位元輸出電壓<br>High Level Output Voltage | VOH | | | Vcc | V | 1. RL = 10K<br>2. $VCC^+$ = 20V |
| 低准位元輸出電壓<br>Low Level Output Voltage | VOLz | | 20 | | mV | RL = 10K |
| 壓擺率<br>Slew Rate at Unity Gain | SR | | 0.5 | | V/us | 1. Vi = 0.5 to 3V<br>2. Vcc = 15V<br>3. RL = 2K<br>4. CL = 100pF<br>5. unity gain connection |
| 增益頻寬積<br>Gain Bandwidth Product | GBP | | 1 | | MHz | 1. f = 100KHz<br>2. Vcc =20V<br>3. RL = 2K<br>4. CL = 100pF |

## Voltage Reference :

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| 陰極電流<br>Cathode Current | $I_K$ | 0.02 | | 150 | mA | |
| 參考輸出電壓<br>Reference Output Voltage | $V_{Ref}$ | -- | 2.5 | -- | V | |
| 參考輸入電壓變化<br>Reference Input Voltage Deviation Over Temperature Range | $\Delta V_{Ref}$ | | 7 | | mV | 1. $I_K$ = 10mA<br>2. -55 ~ 150℃ |
| 最小陰極電流調節<br>Minimum Cathode Current for Regulation | $I_{min}$ | | 20 | | uA | VKA = Vref |
| 動態阻抗<br>Dynamic Impedance | $\|Z_{KA}\|$ | | 0.2 | 0.5 | ohm | 1. VKA = Vref<br>2. ΔIK = 1 to 100mA<br>3. Z = ΔVKA/ ΔIK |

## BLOCK DIAGRAM

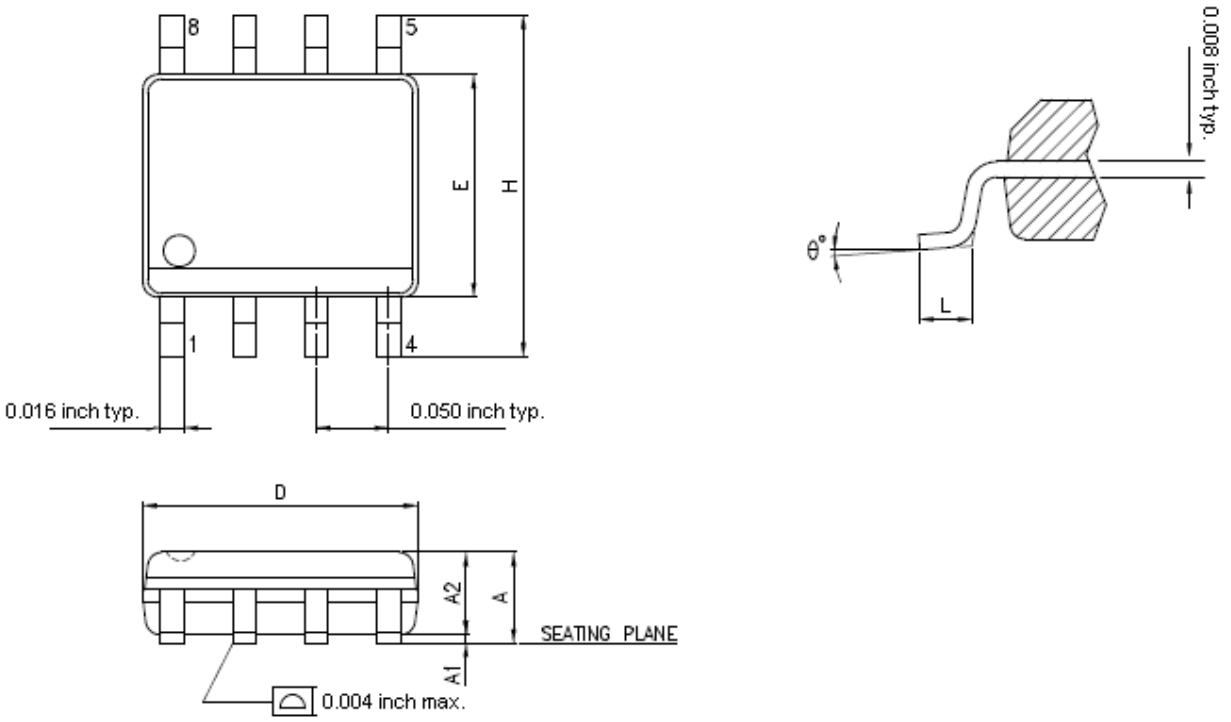



**CAUTION**
This integrated circuit has been designed carefully in the ESD protection ability. Failure to observe proper handling and installation procedures may cause damage. Recommend that all integrated circuits should be handled with appropriate precautions.

## PACKAGE OUTLINES

Small Outline Package
UNIT : inch

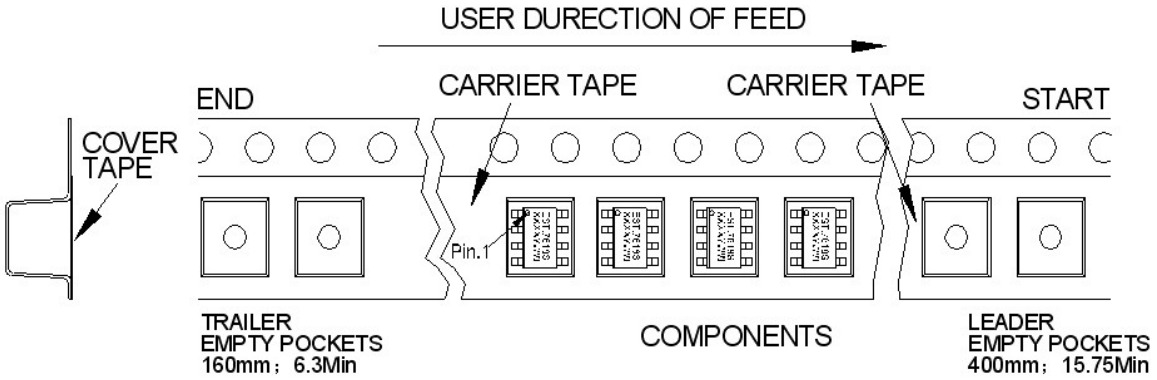
**PACKAGE DIMENSIONS**
**SOP 8**

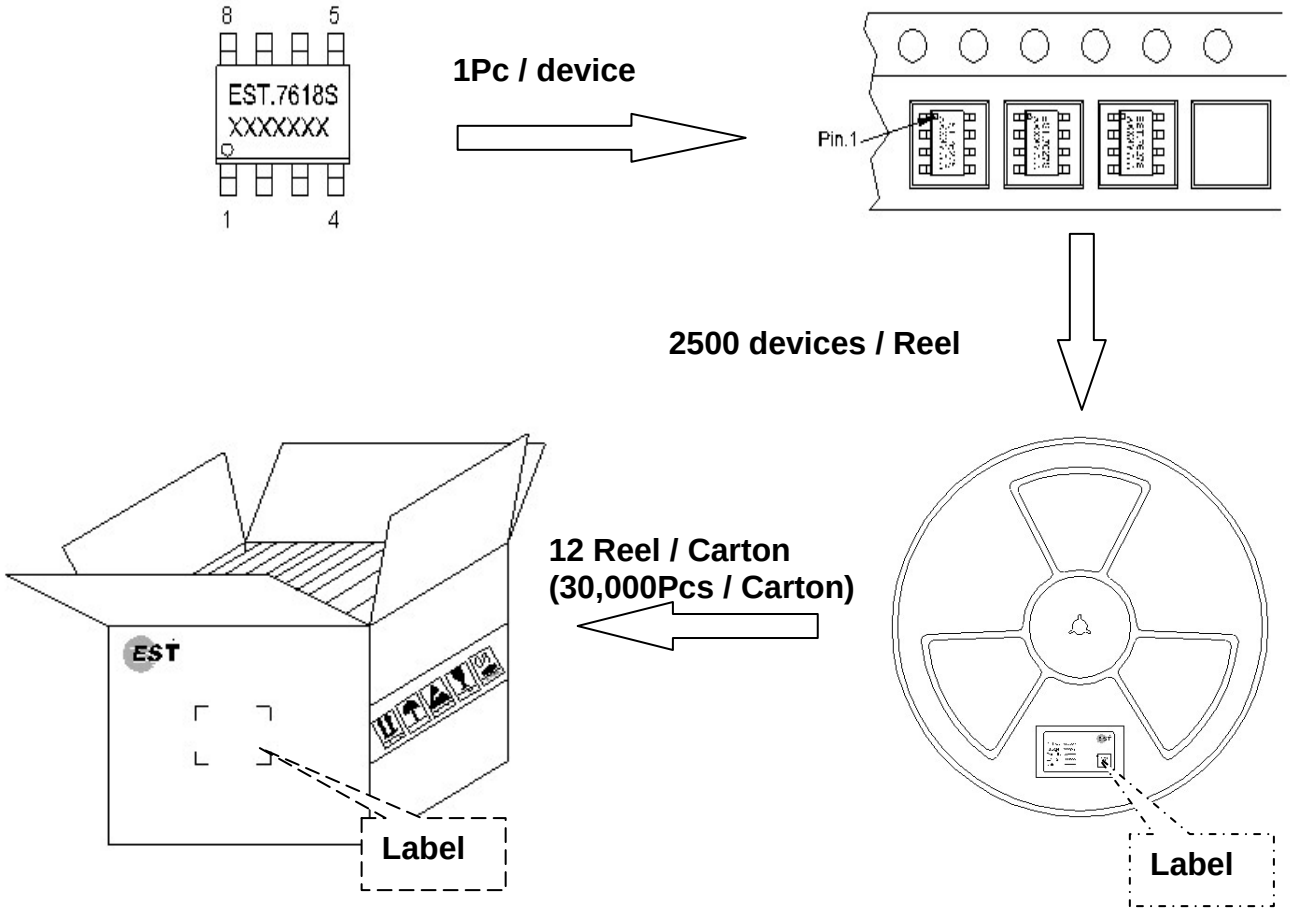



| Symbols | Dimensions In Inches | | | Dimensions In millimeters | | |
|---|---|---|---|---|---|---|
| | MIN. | NOR. | MAX. | MIN. | NOR. | MAX. |
| A | 0.050 | 0.061 | 0.072 | 1.270 | 1.549 | 1.829 |
| A1 | 0.000 | ------ | 0.010 | 0.000 | ------ | 0.254 |
| A2 | ------ | ------ | 0.062 | ------ | ------ | 1.575 |
| D | 0.185 | 0.193 | 0.200 | 4.699 | 4.902 | 5.080 |
| E | 0.147 | 0.154 | 0.160 | 3.734 | 3.912 | 4.064 |
| H | 0.225 | 0.237 | 0.249 | 5.715 | 6.020 | 6.325 |
| L | 0.013 | 0.033 | 0.053 | 0.330 | 0.838 | 1.346 |
| θ | 0° | 4° | 8° | 0° | 4° | 8° |

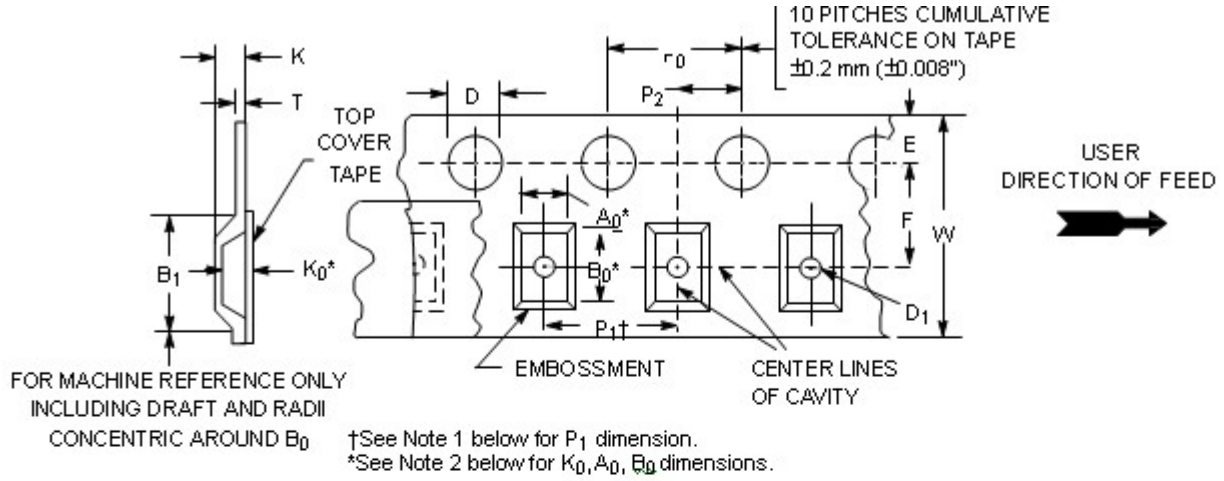
**Shipping packing**：

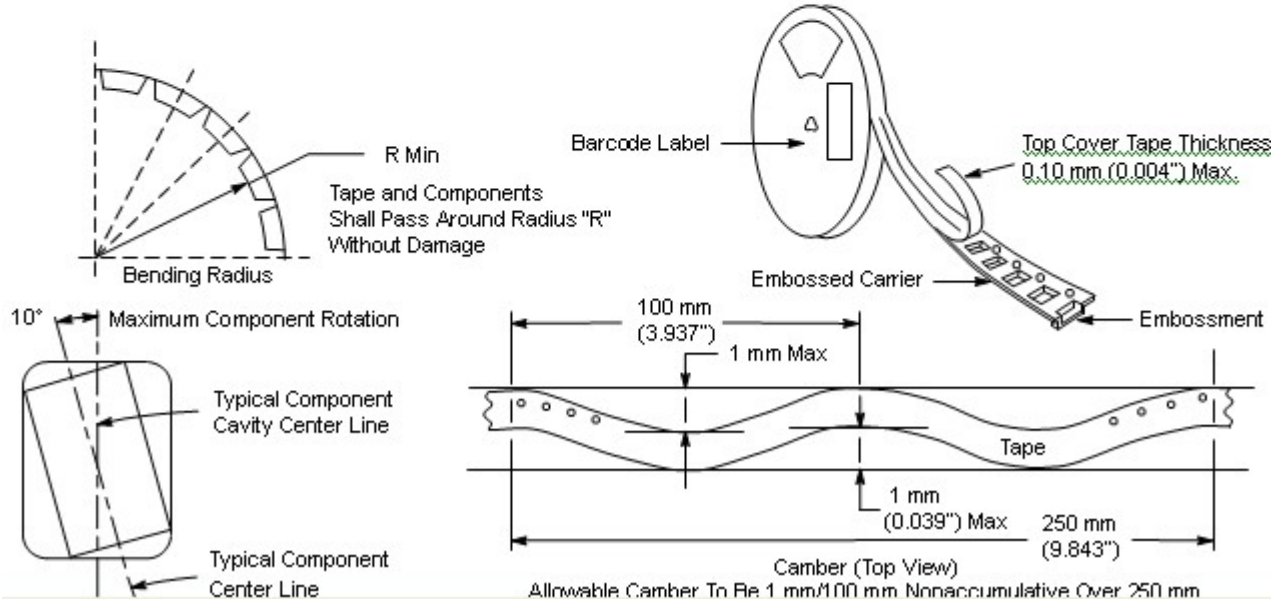
**★SOP-8 tape & Reel:**



## EMBOSSED TAPE AND REEL DATA CARRIER TAPE SPECIFICATIONS

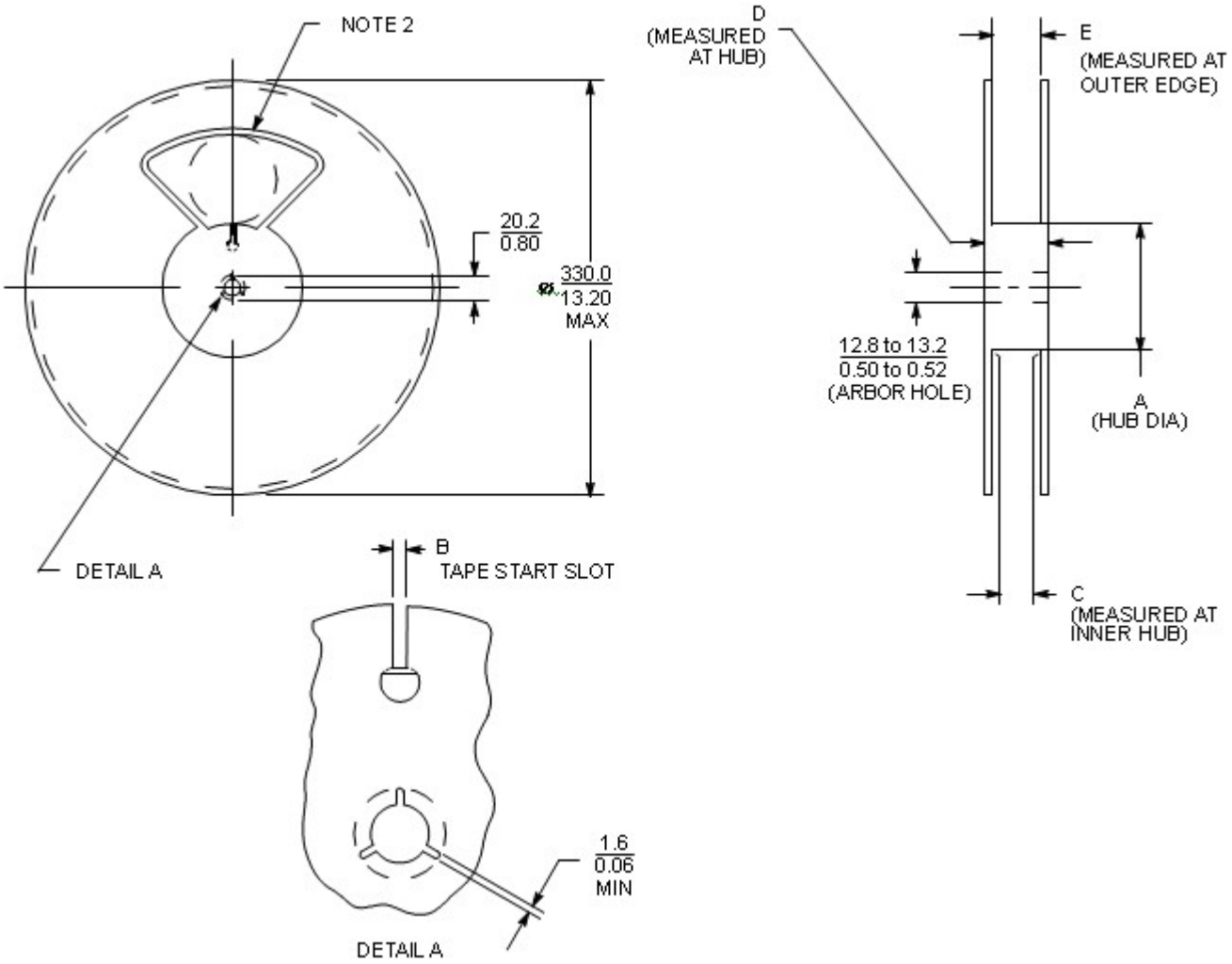



**DIMENSIONS**

| Tape | $B_1$ Max (Note 1) | D | $D_1$ | E | F | K | $P_0$ | $P_2$ | R Min | T Max | W Max |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 mm | 4.55 mm (0.179 3) | 1.5 + 0.1 mm − 0.0 (0.059 + 0.004 3 − 0.0) | 1.0 Min (0.039 3) or 0.5 mm Min (0.020 3) | 1.75 ± 0.1 mm (0.069 ± 0.004 3) | 3.5 ± 0.05 mm (0.138 ± 0.002 3) | 2.4 mm Max (0.094 3) | 4.0 ± 0.1 mm (0.157 ± 0.004 3) | 2.0 ± 0.1 mm (0.079 ± 0.002 3) | 25 mm (0.98 3) | 0.6 mm (0.024 3) | 8.3 mm (0.327 3) |
| 12 mm | 8.2 mm (0.323 3) | | 1.5 mm Min (0.060 3) | | 5.5 ± 0.05 mm (0.217 ± 0.002 3) | 6.4 mm Max (0.252 3) | | | 30 mm (1.18 3) | | 12 ± 0.30 mm (0.470 ± 0.012 3) |
| 16 mm | 12.1 mm (0.476 3) | | | | 7.5 ± 0.10 mm (0.295 ± 0.004 3) | 7.9 mm Max (0.311 3) | | | | | 16.3 mm (0.642 3) |
| 24 mm | 20.1 mm (0.791) | | | | 11.5 ± 0.1 mm (0.453 ± 0.004 3) | 11.9 mm Max (0.468 3) | | | | | 24.3 mm (0.957 3) |

## REEL DIMENSIONS




| Reel | Tape | A | | B | | C | | D | E |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | | |
| 178.0 (7.01) | 16.0 (0.63) | | 50.0 (1.97) | 6.5 (0.26) | 7.5 (0.30) | 16.4 (0.65) | 18.4 (0.72) | 22.4 (0.88) | 19.4 (0.76) |
| **330.0 (12.99)** | **12.0 (0.47)** | **178.0 (7.01)** | | **4.5 (0.18)** | **5.5 (0.22)** | **12.4 (0.49)** | **14.4 (0.57)** | **18.4 (0.72)** | **15.4 (0.61)** |
| 330.0 (12.99) | 56.0 2.20 | 150.0 (5.91) | | 10.0 (0.39) | 11.0 (0.43) | 56.4 (2.22) | 58.4 (2.30) | 62.4 (2.46) | 59.4 (2.34) |
| 330.0 (12.99) | 44.0 (1.73) | 100.0 (3.94) | | 10.0 (0.39) | 11.0 (0.43) | 44.4 (1.75) | 46.4 (1.83) | 62.4 (2.46) | 47.4 (1.87) |
| 330.0 (12.99) | 32.0 (1.26) | 100.0 (3.94) | | 10.0 (0.39) | 11.0 (0.43) | 32.4 (1.28) | 34.4 (1.35) | 38.4 (1.51) | 35.4 (1.39) |
| 330.0 (12.99) | 24.0 (0.94) | 60.0 (2.36) | | 9.5 (0.37) | 10.5 (0.41) | 24.4 (0.96) | 26.4 (1.04) | 30.4 (1.51) | 27.4 (1.08) |
| 330.0 (12.99) | 16.0 (0.63) | | | 6.5 (0.26) | 7.5 (0.30) | 16.4 (0.65) | 18.4 (0.72) | 22.4 (0.88) | 19.4 (0.76) |
| 330.0 (12.99) | 12.0 (0.47) | | | 4.5 (0.18) | 5.5 (0.22) | 12.4 (0.49) | 14.4 (0.57) | 18.4 (0.72) | 15.4 (0.61) |
| 330.0 (12.99) | 8.0 (0.31) | 50.0 (1.97) | | 2.5 (0.10) | 3.5 (0.14) | 8.4 (0.33) | 9.9 (0.39) | 14.4 (0.57) | 10.9 (0.43) |
| 178.0 (7.01) | 12.0 (0.47) | 50.0 (1.97) | | 4.5 (0.18) | 5.5 (0.22) | 12.4 (0.49) | 14.4 (0.57) | 18.4 (0.72) | 15.4 (0.61) |
| 178.0 (7.00) | 8.0 (0.31) | 50.0 (1.97) | | 2.5 (0.10) | 3.5 (0.14) | 8.4 (0.33) | 9.9 (0.39) | 14.4 (0.47) | 10.9 (0.43) |
| 330.0 (12.99) | 8.0 (0.31) | 50.0 (1.97) | | 4.0 (0.16) | 5.0 (0.20) | 8.4 (0.33) | 9.9 (0.39) | 14.4 (0.57) | 10.9 (0.43) |
| 178.0 (7.00) | 8.0 (0.31) | 50.0 (1.97) | | 4.0 (0.16) | 5.0 (0.20) | 8.4 (0.33) | 9.9 (0.39) | 14.4 (0.57) | 10.9 (0.43) |

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