# PRELIMINARY SPECIFICATIONS

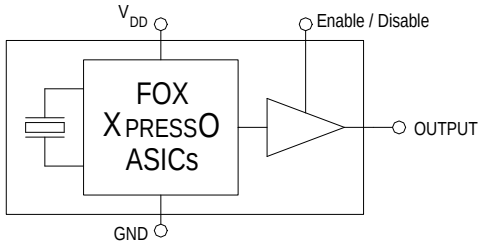
**Model: FXU-PC52 SERIES**

## LVPECL 5 x 3.2mm 2.5V Oscillator Freq: 0.016 MHz to 667 MHz*

*Rev. 03/05/2014*

## Features

- ULTRA Low Jitter
- Low Cost
- XPRESS Delivery
- Frequency Resolution to six decimal places
- Stabilities to ± 20 PPM
- -20 to +70°C or -40 to +85°C operating temperatures
- Tri-State Enable / Disable Feature
- Industry Standard Package, Footprint & Pin-Out
- Fully RoHS compliant
- Gold over Nickel Termination Finish
- Serial ID with Comprehensive Traceability




For more information -- Click on the drawing



## Applications

- ANY application requiring a high performance LVPECL oscillator
- SONET
- Ethernet
- Storage Area Network
- Broadband Access
- Microprocessors / DSP / FPGA
- Industrial Controllers
- Test and Measurement Equipment

## Description

The Fox XPRESSO-ULTRA Crystal Oscillator is a breakthrough in configurable Frequency Control Solutions. XPRESSO-ULTRA utilizes a family of proprietary ASICs, designed and developed by Fox, with a key focus on noise reduction technologies.

The 4th order Delta Sigma Modulator reduces noise to the levels that are comparable to traditional Bulk Quartz and SAW oscillators. The ASICs family has the ability to select the output type and supply voltage.

With the XPRESSO-ULTRA lead-time, low cost, low noise, wide frequency range, excellent ambient performance, XPRESSO-ULTRA is an excellent choice over the conventional technologies.

Finished XPRESSO-ULTRA parts are 100% final tested.

Note * – Higher frequencies are available.
Contact Fox Technical Support for details.

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## Model Selection Guide & Fox Part Number

**STEP #1:** Customer selects the Model Description and provides to Fox Customer Service

### Model Description

FXU – P C 5 2 5 R – 125 Frequency (in MHz)
*Resolutions to 6 places past the decimal point*

**P** = LVPECL
**Q** = LVPECL *(pin 2 E/D)*

**C** = Ceramic

**5** = 5 x 3.2mm

**1** = 1.8V
**2** = 2.5 V
**3** = 3.3 V

**0** = ± 100 PPM
**5** = ± 50 PPM
**6** = ± 25 PPM (0.016 to 212.5 MHz @ -40 to +85°C)
**8** = ± 20 PPM (-20°C to +70°C)

***blank*** = -20°C to +70°C
**R** = -40°C to +85°C

**STEP #2:** The Fox Customer Service team provides a customer specific Part Number for use on their Bill Of Materials (BOM).

### Fox Part Number

*(The assigned Fox Part Number must be on the BOM – not the above Model Description)*
*(This will ensure receipt of the proper part)*

852A – 125 – 3

**The 1st Field**
Product Code #
852A = FXU–PC52
TBD* = FXU-QC52
*Part numbers to be determined.

**The 2nd Field**
The Customer's Frequency

**The 3rd Field**
Fox Internally Generated Number
*(If any specification changes, the last digits change)*
*(The same specs for a different customer also changes the last digits)*

***This example, FXU-PC525R-125 = LVPECL Output, Ceramic, 5 x 3.2mm Package, 2.5V, ±50 PPM Stability, -40 to +85°C Temperature Range, at 125 MHz***


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## Electrical Characteristics

| Parameters | Symbol | Condition | Maximum Value (unless otherwise noted) |
|---|---|---|---|
| Frequency Range[1] | $F_O$ | | 0.016 MHz to 667 MHz |
| Frequency Stability [2] | | | 100, 50, 25[3] 20[4] PPM |
| Temperature Range | $T_O$ | Standard operating 0.016 to 667 MHz | -20°C to +70°C |
| | | Optional operating 0.016 to 667 MHz | *-40°C to +85°C* |
| | $T_{STG}$ | Storage | -55°C to +125°C |
| Supply Voltage | $V_{DD}$ | Standard | 2.5 V ± 5% |
| Input Current (@ Standard Load) | $I_{DD}$ | 0.016 to 125 MHz<br>125+ to 250 MHz<br>250+ MHz to 400 MHz<br>400+ MHz to 667 MHz | 95 mA Typical<br>100 mA Typical<br>110 mA Typical<br>125 mA Typical |
| Output Load | | Standard | 50 Ohms into $V_{DD}$-2$V_{DC}$. TYP. |
| Start-Up Time | $T_S$ | | 10 mS |
| Output Enable / Disable Time | | | 100 nS |
| Moisture Sensitivity Level | MSL | *JEDEC J-STD-020* | 1 |
| Termination Finish | | | Au |

Note 1 – Higher frequencies are available. Contact Fox Technical Support for details.
Note 2 - Stability is inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, aging, shock and vibration
Note 3 - ±25 PPM statility @ -40°C to +85°C available 0.016 MHz to 212.5 MHz.
Note 4 - ±20 PPM stability available -20°C to +70°C.

## Absolute Maximum Ratings *(Useful life may be impaired. For user guidelines only, not tested)*

| Parameters | Symbol | Condition | Maximum Value (unless otherwise noted) |
|---|---|---|---|
| Input Voltage | $V_{DD}$ | | –0.5V to +5.0V |
| Operating Temperature | $T_{AMAX}$ | | –55°C to +85°C |
| Storage Temperature | $T_{STG}$ | | –55°C to +125°C |
| Junction Temperature | | | 125°C |
| ESD Sensitivity | HBM | Human Body Model | 1 kV |

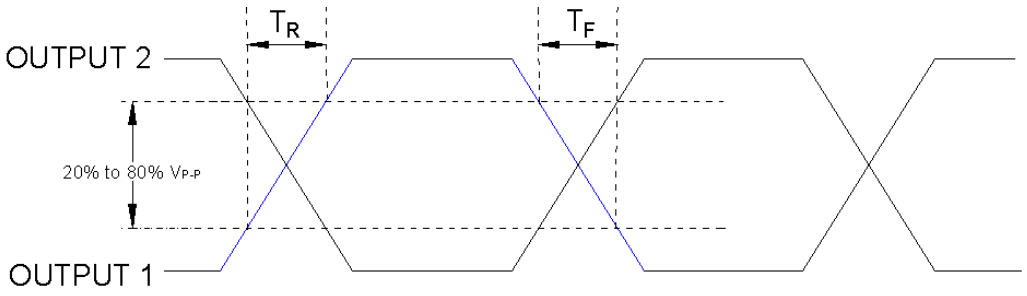

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## Output Wave Characteristics

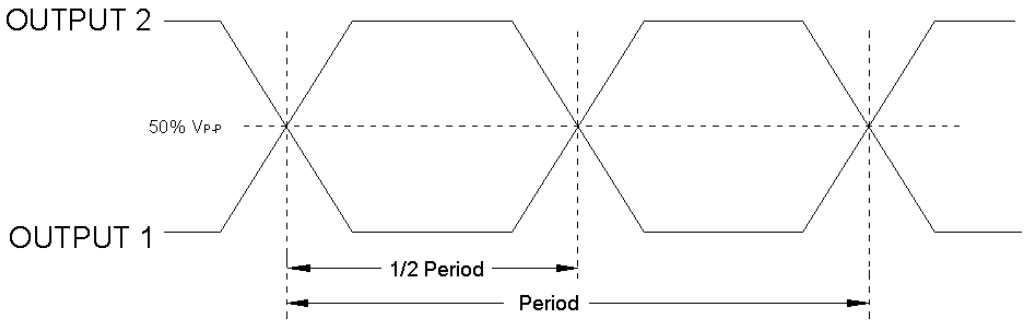
| Parameters | Symbol | Condition | Maximum Value (unless otherwise noted) |
|---|---|---|---|
| Low Output Voltage | $V_{OL}$ | 0.016 MHz to 667 MHz | 0.6V Typical |
| High Output Voltage | $V_{OH}$ | 0.016 MHz to 667 MHz | 1.35V Typical |
| Output Symmetry @ 50% $V_{P-P}$ Level (See Drawing Below) | | 0.016 MHz to 250 MHz<br>250+ MHz to 667 MHz | 45% ~ 55% Typical<br>40% ~ 60% Typical |
| Output Enable Note1 (PIN # 1) Voltage | $V_{IH}$ | | ≥ 70% $V_{DD}$ |
| Output Disable Note1 (PIN # 1) Voltage | $V_{IL}$ | | ≤ 30% $V_{DD}$ |
| Cycle Rise Time (20%~80%$V_{P-P}$ - See Drawing Below) | $T_R$ | 0.016 MHz to 667 MHz | 360 pS Typical |
| Cycle Fall Time (80%~20%$V_{P-P}$ - See Drawing Below) | $T_F$ | 0.016 MHz to 667 MHz | 250 pS Typical |

Note1 *An optional PIN # 2 as Enable / Disable is available – see Model Selection Guide (page 2)*

Rise Time / Fall Time Measurements



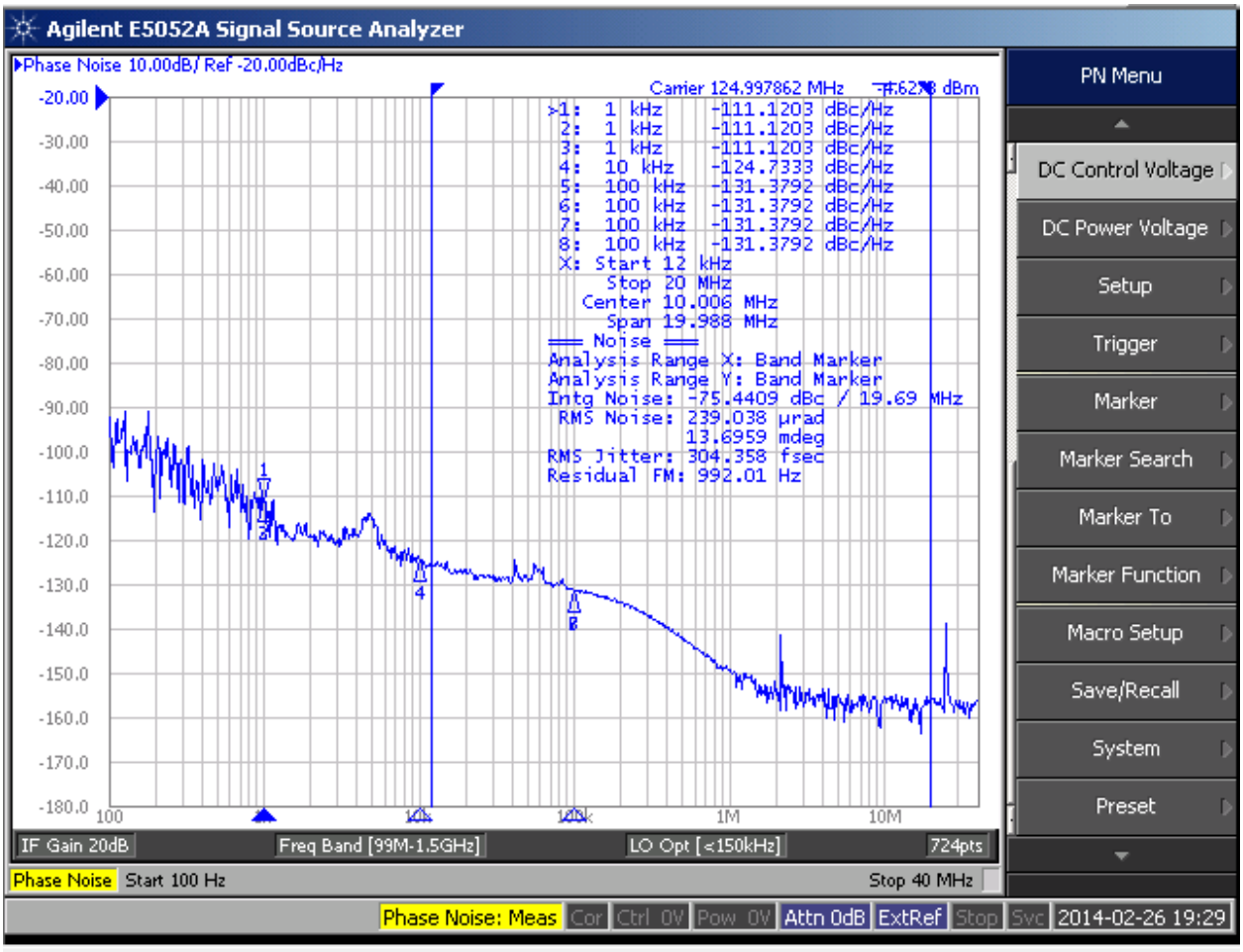

Oscillator Symmetry





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## Phase Noise (typical measurement at 125 MHz)




.

## LVPECL Phase Jitter (typical measurement at 125 MHz)

| Frequency | Phase Jitter (pS) (12kHz to 20MHz) |
|---|---|
| 125 MHz | 0.304 |

**Phase Jitter** is integrated from Agilent 5052A Signal Noise Analyzer; measured directly into 50 ohm input; $V_{DD}$ = 2.5V.

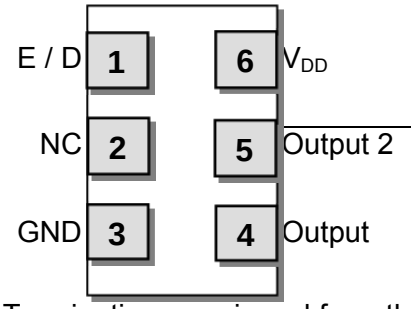

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## Pin Description and Recommended Circuit

| Pin # | Name | Type | Function |
|---|---|---|---|
| 1 | E / D [1] | Input | Enable / Disable Control of Output (0 = Disabled) |
| 2 | NC [2] | | *No Connection – Leave OPEN* |
| 3 | GND | Ground | Electrical Ground for $V_{DD}$ |
| 4 | Output | Output | LVPECL Oscillator Output |
| 5 | Output 2 | Output | Complementary LVPECL Output |
| 6 | $V_{DD}$ [3] | Power | Power Supply Source Voltage |

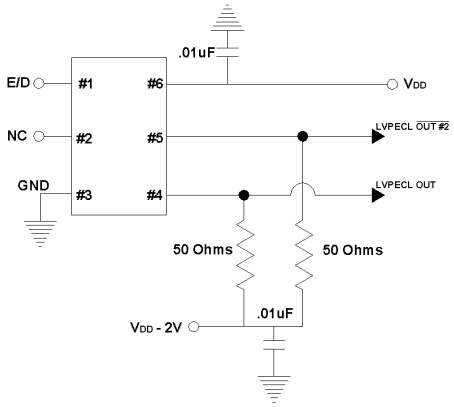
**NOTES:**

[1] Includes pull-up resistor to $V_{DD}$ to provide output when the pin (1) is No Connect. (Also see note 2)
[2] An optional pin # 2 Enable / Disable is available.
[3] Installation should include a 0.01µF bypass capacitor placed between $V_{DD}$ (Pin 6) and GND (Pin 3) to minimize power supply line noise.




Terminations as viewed from the Top

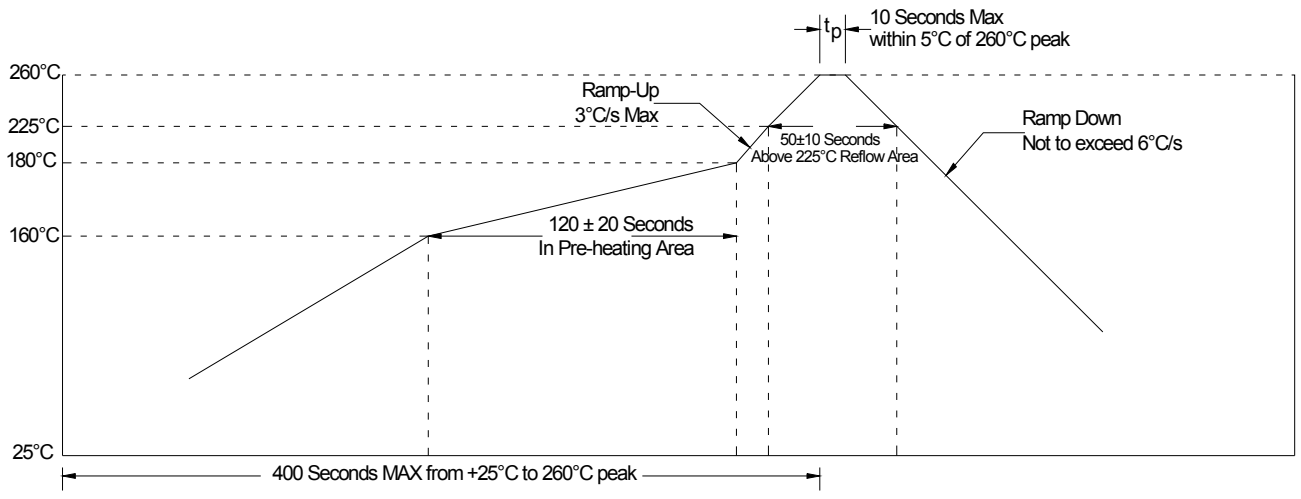
**NOTE:** XPRESSO-ULTRA LVPECL XOs are designed to fit on Industry Standard, 6 pad layouts




## Enable / Disable Control

| | Pin # 1 (state) | Output (Pin # 4, Pin # 5) |
|---|---|---|
| | OPEN (No Connection) | ACTIVE Output |
| | "1" Level $V_{IH} \geq 70\%$ $V_{DD}$ | ACTIVE Output |
| | "0" Level $V_{IL} \leq 30\%$ $V_{DD}$ | High Impedance |

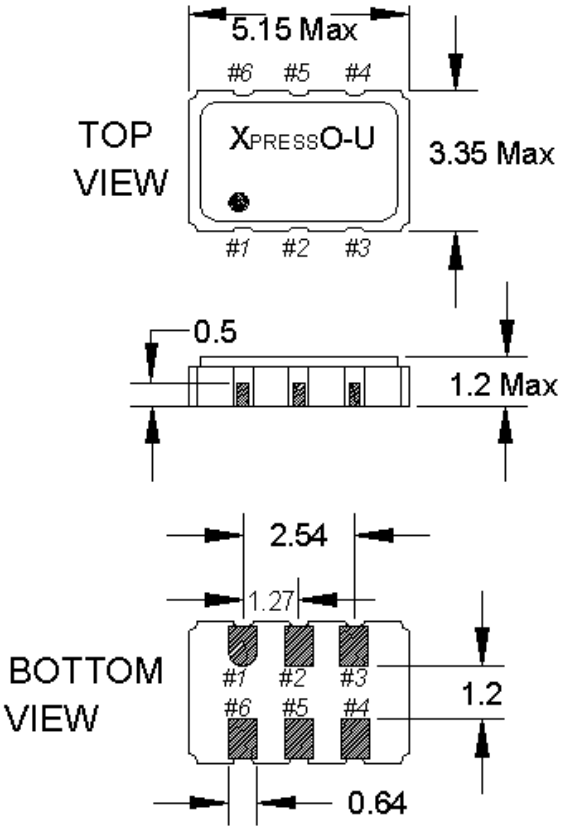
## Soldering Reflow Profile (2 times Maximum at 260°C for 10 seconds MAX)






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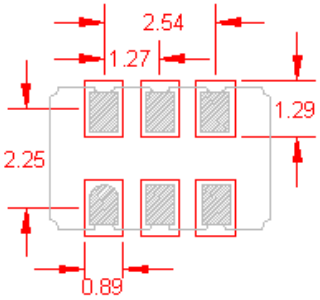
## Mechanical Dimensional Drawing & Pad Layout




**Actual part marking is depicted.**

See **Traceability** *(pg. 9)* for more information

Recommended Solder Pad Layout




**NOTE:** XPRESSO-ULTRA LVPECL XOs are designed to fit on Industry Standard, 6 pad layouts

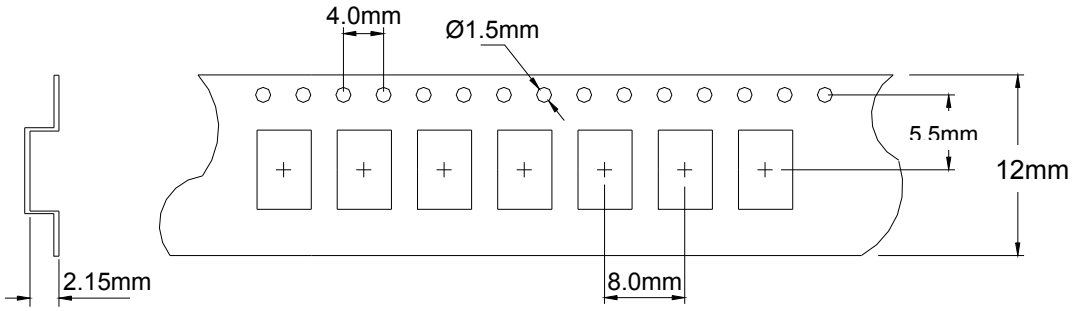
Pin Connections

| | |
|---|---|
| #1) E/D | #4) Output |
| #2) *NC* | #5) Output 2 |
| #3) GND | #6) $V_{DD}$ |

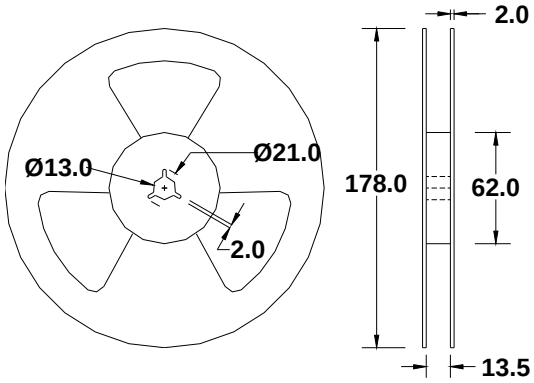
Drawing is for reference to critical specifications defined by size measurements.
Certain non-critical visual attributes, such as side castellations, reference pin shape, etc. may vary


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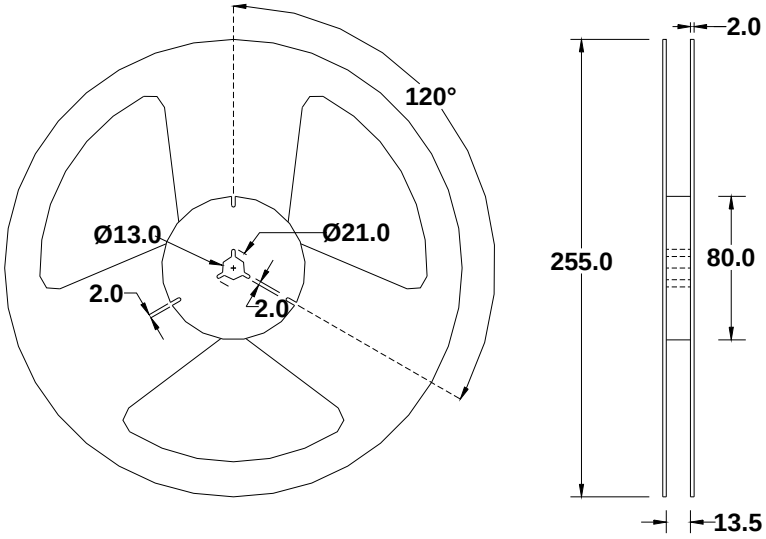
## Tape and Reel Dimensions




### 1k Reel Dimensions in mm

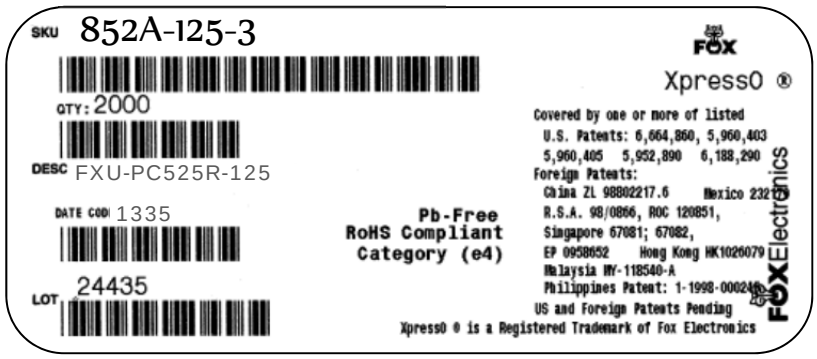



### 2k Reel Dimensions in mm




## Labeling (Reels and smaller packaging are labeled with the below)

- Fox Part Number: 852A-**125-3**
- Quantity: **2000** pieces
- Description: **FXU-PC525R-125**
- Date Code 1335
  (YYWW 2013 35th wk)
- LOT # **24435**
  *If traceability should become necessary*




An additional identification code is contained internally if tracking should ever be necessary


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## Traceability – LOT Number & Serial Identification

### LOT Number

The LOT Number has direct ties to the customer purchase order. The LOT Number is marked on the "Reel" label, and also stored internally on non-volatile memory inside the XPRESSO-ULTRA part. XPRESSO-ULTRA parts that are shipped Tape and Reel, are also placed in an Electro Static Discharge (ESD) bag and will have the LOT Number labeled on the exterior of the ESD bag.

It is recommended that the XPRESSO-ULTRA parts remain in this ESD bag during storage for protection and identification.

If the parts become separated from the label showing the LOT Number, it can be retrieved from inside one of the parts, and the information that can be obtained is listed below:

- Customer Purchase Order Number
- Internal Fox Sales Order Number
- Dates that the XPRESSO-ULTRA part was shipped from the factory
- The assigned customer part number
- The specification that the part was designed for

---

### Serial Identification

The Serial ID is the individualized information about the configuration of that particular XPRESSO-ULTRA part. The Serial ID is unique for each and every XPRESSO-ULTRA part, and can be read by special Fox equipment.

With the Serial ID, the below information can be obtained about that individual, XPRESSO-ULTRA part:

- Equipment that the XPRESSO-ULTRA part was configured on
- Raw material used to configure the XPRESSO-ULTRA part
- Traceability of the raw material back to the foundries manufacturing lot
- Date and Time that the part was configured
- Any optimized electrical parameters based on customer specifications
- Electrical testing of the actual completed part
- Human resource that was monitoring the configuration of the part

Fox has equipment placed at key Fox locations World Wide to read the Lot Identification and Serial Number of any XPRESSO-ULTRA part produced and can then obtain the information from above within 24 hours


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## Mechanical Testing

| Parameter | Test Method |
|---|---|
| Mechanical Shock | MIL-STD-202 Method 213<br>Condition C |
| Mechanical Vibration | MIL-STD-202 Method 204<br>5g's for 20 minutes<br>12 cycles of each 3 orientations: X, Y, Z |
| High Temperature Operating Life (HTOL) | Under Power @ 125°C for 1000 Hours |
| Hermetic Seal | He pressure: 4 ±1 kgf / $cm^2$ 2 Hour soak |


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XpressO-ULTRA Home

XpressO-ULTRA XOs

XpressO Brochure

Patent Numbers:
US 6,664,860, US 5,960,403, US 5,952,890; US 5,960,405; US 6,188,290;
Foreign Patents: R.S.A. 98/0866, R.O.C. 120851; Singapore 67081, 67082; EP 0958652
China ZL 98802217.6, Malaysia MY-118540-A, Philippines 1-1998-000245, Hong Kong #HK1026079, Mexico #232179
US and Foreign Patents Pending
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