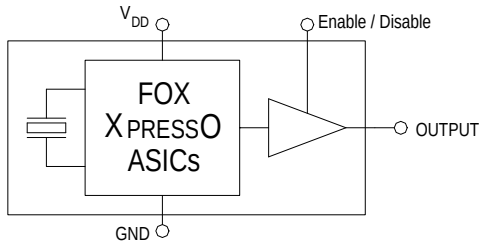
**Model: FXU-HC73 SERIES**

# HCMOS 7 x 5mm 3.3V Oscillator Freq: 0.016 MHz to 167MHz

*Rev. 7/21/2015*

## 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


Need a Sample

RoHS Compliant

## Applications

- ANY application requiring a high performance HCMOS 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.

## Contents





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An Integrated Device Technology, Inc. company FOXonline.com

## Model Selection Guide & Fox Part Number

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

### Model Description

FXU – H C 7 3 5 R – 156.25 Frequency (in MHz)

*Resolutions to 6 places past the decimal point*

- H = **HCMOS**
- X = **HCMOS** ***(comp 2nd output)***
- C = **Ceramic**
- **7 = 7 x 5mm**
- 3 = **3.3 V**
- 0 = **± 100 PPM**
- 5 = **± 50 PPM**
- 6 = **± 25 PPM**
- **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)*

855 – 156.25 – 3

**The 1st Field**
**Product Code #**
855 = FXU–HC7
855E = FXU-XC7

**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-HC735R-156.25 = HCMOS Output, Ceramic, 7 x5mm Package, 3.3V, ±50 PPM Stability, -40 to +85°C Temperature Range, at 156.25 MHz***

## Electrical Characteristics

| Parameters | Symbol | Condition | Maximum Value (unless otherwise noted) |
|---|---|---|---|
| Frequency Range | $F_O$ | | 0.016 MHz to 167 MHz |
| Frequency Stability [1] | | 0.016 MHz to 167 MHz | 100, 50, 25, 20[2] PPM |
| Temperature Range | $T_O$<br><br>$T_{STG}$ | Standard operating<br>*Optional operating*<br>Storage | -20°C to +70°C<br>*-40°C to +85°C*<br>-55°C to +125°C |
| Supply Voltage | $V_{DD}$ | Standard | 3.3 V ± 5% |
| Input Current (@ Standard Load) | $I_{DD}$ | 0.016 to 62.5 MHZ<br>62.5+ to 167 MHz | 98 mA<br>108 mA |
| Output Load | | Standard | 15 pF |
| Start-Up Time | $T_S$ | | 10 mS |
| Output Enable / Disable Time | | | 100 nS |
| Moisture Sensitivity Level | MSL | *JEDEC J-STD-20* | 1 |
| Termination Finish | | | Au |

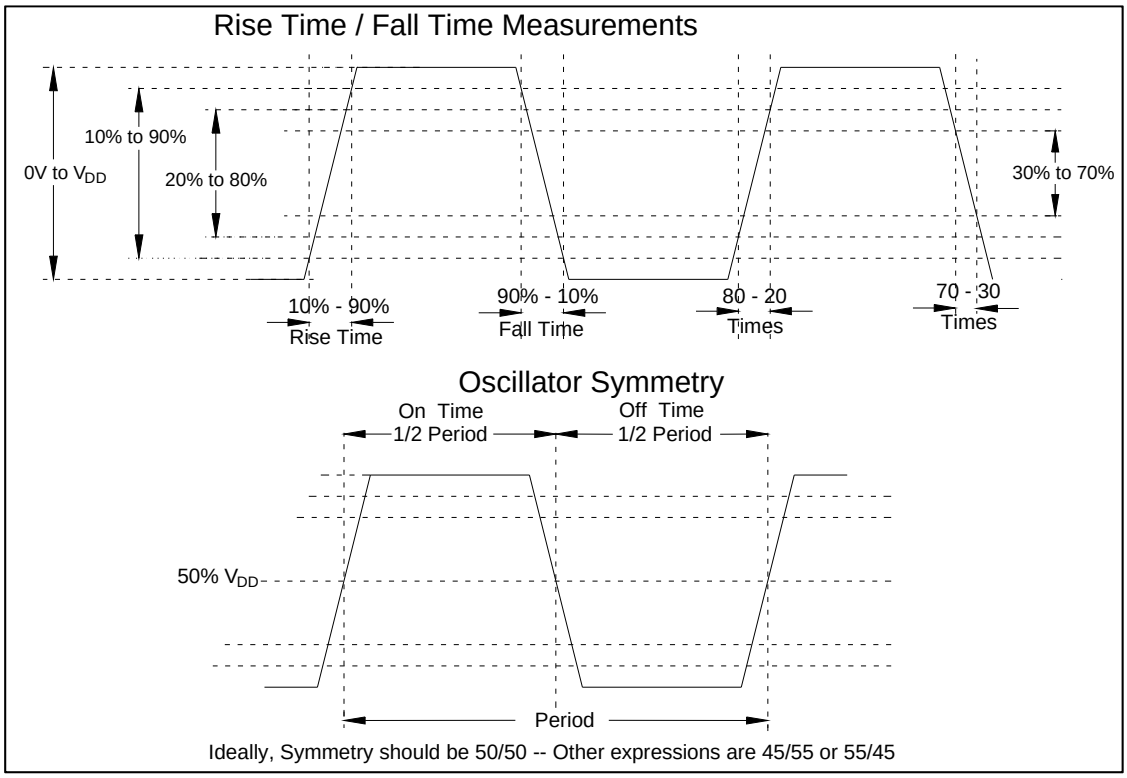
Note 1 – Stability is inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, aging, shock and vibration.
Note 2 –. ±20 PPM stability -20°C to +70°C only.

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

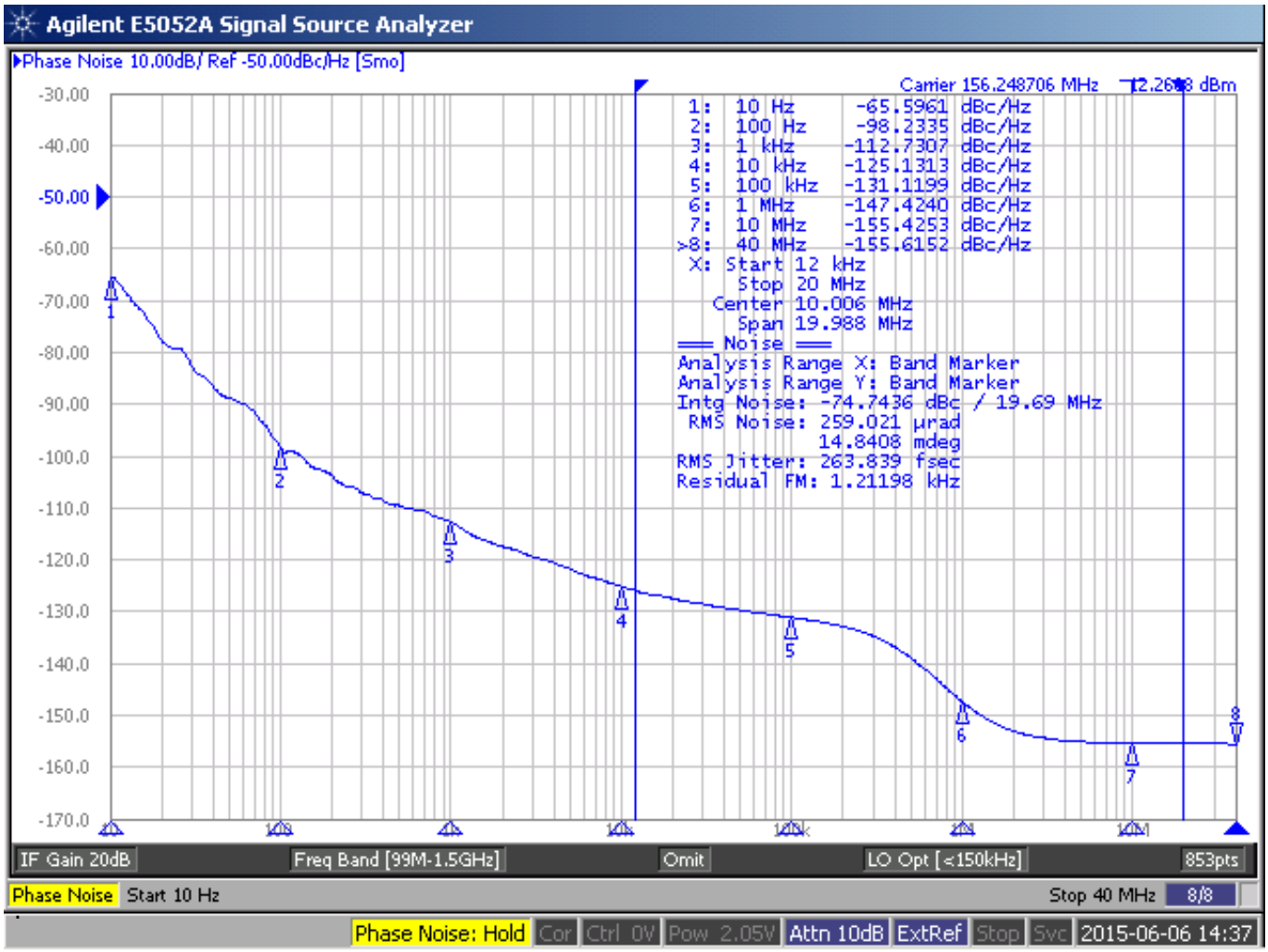
| Parameters | Symbol | Condition | Maximum Value (unless otherwise noted) |
|---|---|---|---|
| Input Voltage | $V_{DD}$ | | –0.5V to +5.0V |
| Operating Temperature | $T_{AMAX}$ | | –55°C to +105°C |
| Storage Temperature | $T_{STG}$ | | –55°C to +125°C |
| Junction Temperature | | | 125°C |
| ESD Sensitivity | HBM | Human Body Model | 1 kV |

## Output Wave Characteristics

| Parameters | Symbol | Condition | Maximum Value (unless otherwise noted) |
|---|---|---|---|
| Low Output Voltage | $V_{OL}$ | 0.016 MHz to 167 MHz | 10%$V_{DD}$ |
| High Output Voltage | $V_{OH}$ | 0.016 MHz to 167 MHz | 90%$V_{DD}$ Minimum |
| Output Symmetry @ 50% $V_{P-P}$ Level (See Drawing Below) | | 0.016 to to 167 MHz | 45% ~ 55% |
| 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 (10%~90%$V_{DD}$ - See Drawing Below) | $T_R$ | 0.016 MHz to 167 MHz | 2.5 nS |
| Cycle Fall Time (90%~10%$V_{DD}$ - See Drawing Below) | $T_F$ | 0.016 MHz to 167 MHz | 2.5 nS |



## Phase Noise (typical measurements at 156.25 MHz)




Jitter is frequency dependent. Below are typical values at 156.25 MHz.

## HCMOS Phase Jitter & Time Interval Error (TIE)

| Frequency | Phase Jitter (pS) (12kHz to 20MHz) | TIE (pS) (sigma of jitter distribution) |
|---|---|---|
| 156.25 MHz | 0.26 | 1.7 |

**Phase Jitter** is integrated from Agilent 5052A Signal Noise Analyzer; measured directly into 50 ohm input; $V_{DD}$ = 3.3V.
**TIE** was measured on LeCroy LC684 Digital Storage Scope, directly into 50 ohm input, with Amherst M1 software; $V_{DD}$ = 3.3V.
*Per **MJSQ** spec (Methodologies for Jitter and Signal Quality specifications)*

## HCMOS Random & Deterministic Jitter Composition

| Frequency | Random (Rj) (pS RMS) | Deterministic (Dj) (pS P-P) | Total Jitter (Tj) (14 x Rj) + Dj |
|---|---|---|---|
| 156.25 MHz | 0.6 | 6.1 | 14.8 |

**Rj and Dj**, measured on LeCroy SDA-6000A Digital Storage Scope, directly into 50 ohm input, with Amherst M1 software.
*Per **MJSQ** spec (Methodologies for Jitter and Signal Quality specifications)*

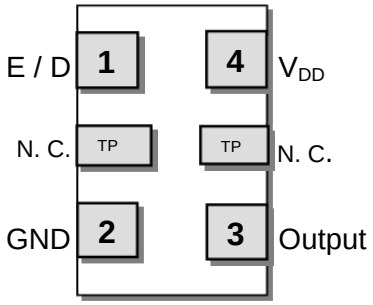
## Pin Description and Recommended Circuit

| Pin # | Name | Type | Function |
|---|---|---|---|
| 1 | E / D [1] | Logic | Enable / Disable Control of Output (0 = Disabled) |
| 2 | GND | Ground | Electrical Ground for VDD |
| 3 | Output | Output | HCMOS Oscillator Output |
| 4 | VDD [2] | Power | Power Supply Source Voltage |
| Test Points | *N. C.* | *Hi Z* | *No Connection (Factory Use ONLY)* |

**NOTES:**

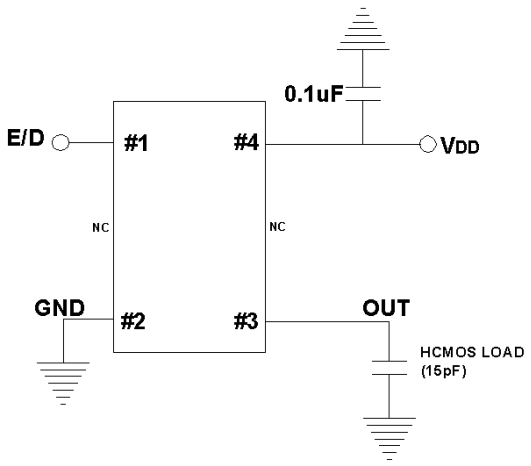
[1] Includes pull-up resistor to $V_{DD}$ to provide output when the pin (1) is No Connect.

[2] Installation should include a 0.1µF bypass capacitor placed between $V_{DD}$ (Pin 4) and GND (Pin 2) to minimize power supply line noise.




Terminations as viewed from the Top

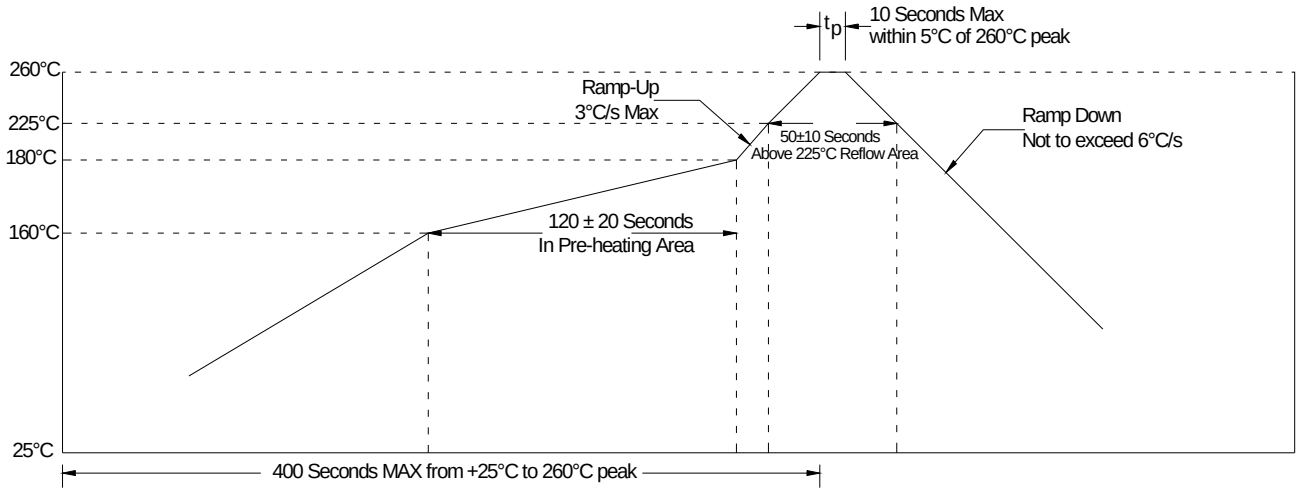
**NOTE:** XPRESSO-Ultra HCMOS XOs are designed to fit on Industry Standard, 4 pad layouts

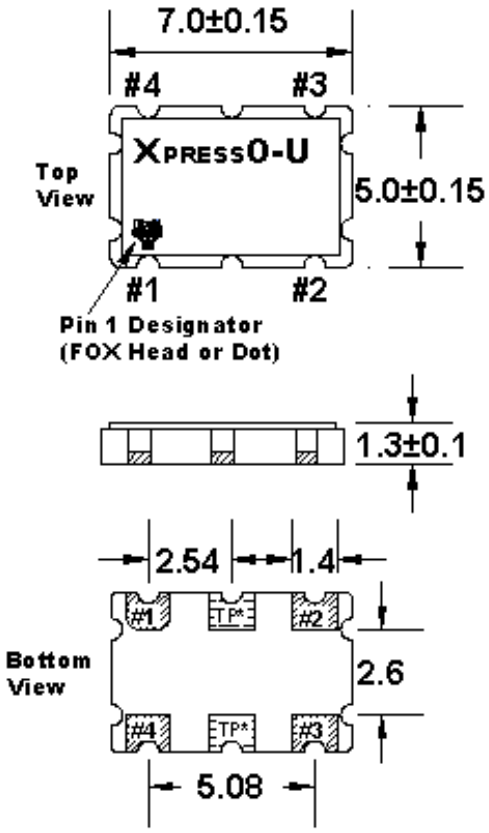



## Enable / Disable Control

| | Pin # 1 (state) | Output (Pin #3) |
|---|---|---|
| | 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 |

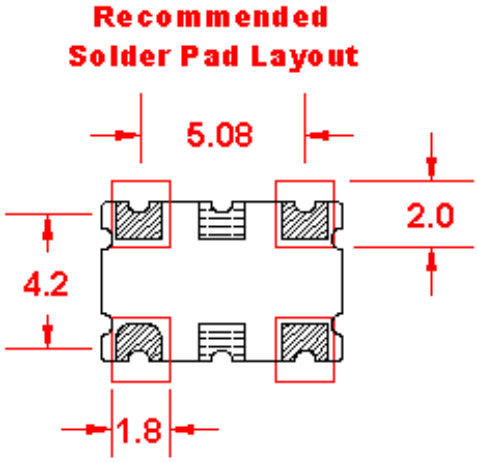
## Soldering Reflow Profile (2 times Maximum at 260°C for 10 seconds MAX)






**Actual part marking is depicted.**

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




Pin Connections

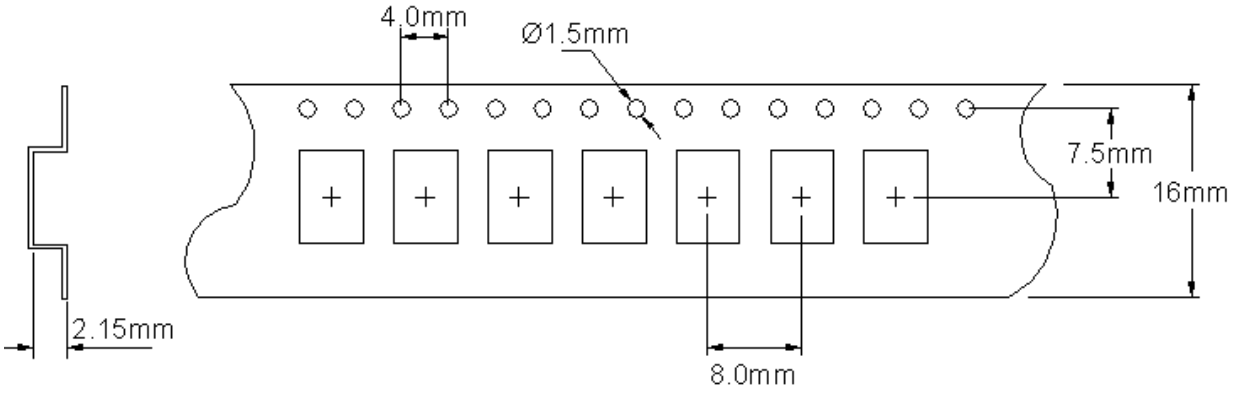
#1) E/D #3) Output

#2) GND #4) $V_{DD}$

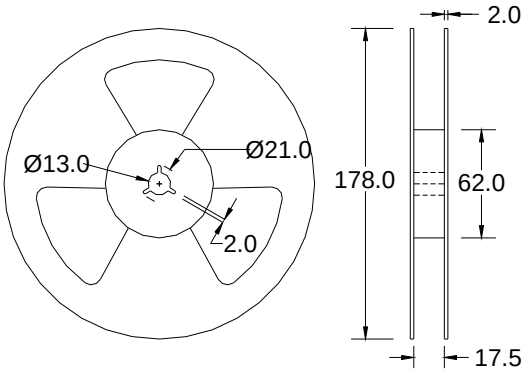
*TP are test points and are NC.

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

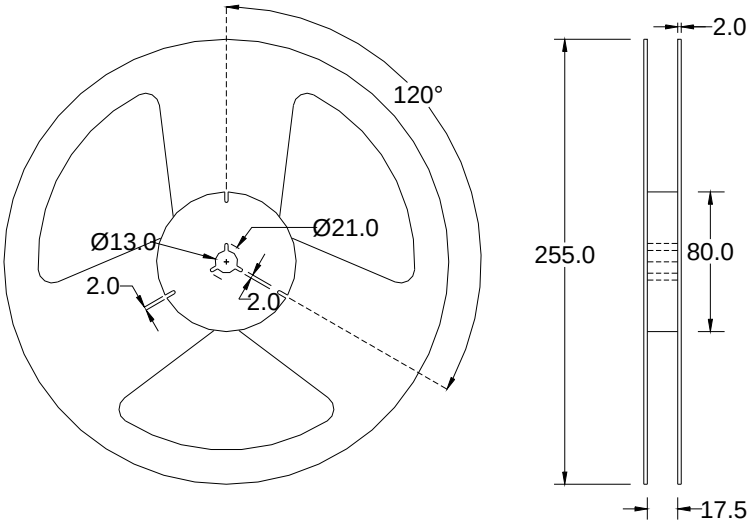
## Tape and Reel Dimensions




### 1k Reel Dimensions in mm

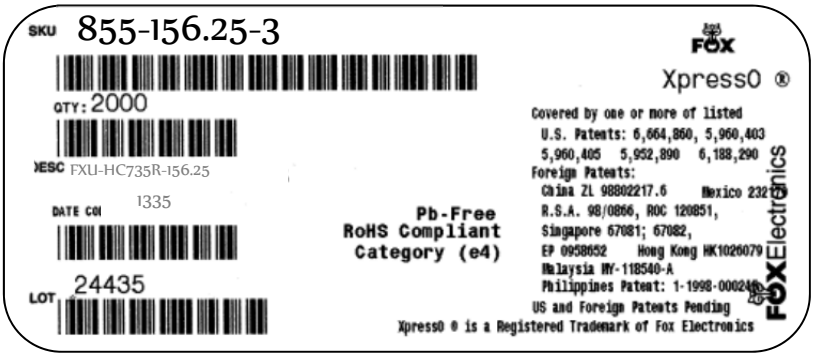



### 2k Reel Dimensions in mm




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

- **Fox Part Number: 855-156.25-3**
- **Quantity: 2000 pieces**
- **Description: FXU-HC735R-156.25**
- **Date Code 1335**
  **(YYWW 2013 35th wk)**
- **LOT # 24435**



# Traceability – LOT Number & Serial Identification

## LOT Number

The LOT Number has direct ties to the customer purchase order. The LOT Number is stored internally in non-volatile memory. XPRESSO-ULTRA parts are packaged in Cut Tape or Tape and Reel and placed in an ESD bag. The package label containing the Lot number is affixed to the ESD bag, and in the case of Tape and Reel it is attached to the reel as well

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

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## 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

## 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 | MIL-STD-202F: Method 112D<br>Test condition C<br>He pressure: 4 ±1 kgf / $cm^2$ 2 Hour soak |

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
XpressO® Fox Electronics

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The above specifications, having been carefully prepared and checked, is believed to be accurate at the time of publication; however, no responsibility is assumed by Fox Electronics for inaccuracies.