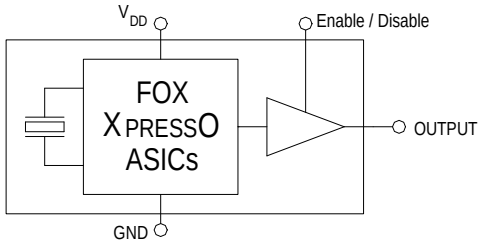
Model: FXO-PC33 SERIES

LVPECL 3.2 x 2.5mm 3.3V Oscillator — Freq: 0.75 MHz to 160 MHz

Rev. 03/24/2015

Features

- XTREMELY Low Jitter
- Low Cost
- XPRESS Delivery
- Frequency Resolution to six decimal places
- Stabilities to ± 50 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 an oscillator
- SONET
- Ethernet
- Storage Area Network
- Broadband Access
- Microprocessors / DSP / FPGA
- Industrial Controllers
- Test and Measurement Equipment
- Fiber Channel

Description

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

The 3rd order Delta Sigma Modulator reduces noise to the levels that are comparable to traditional Bulk Quartz and SAW oscillators. The ASICs family has ability to select the output type, input voltages, and temperature performance features.

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

Finished XPRESSO parts are 100% final tested.

Contents

**Tighter stabilities may be 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

F X O – P C 3 3 5 R – 156.25 Frequency (in MHz)

Resolutions to 6 places past the decimal point

H = HCMOS L = LVDS P = **LVPECL** M = LVDS *(pin 2 E/D)* Q = **LVPECL *(pin 2 E/D)*** X = HCMOS *(comp 2nd Output)*	C = **Ceramic**	**3 =3. 2 x 2.5 mm** 5 = 5 x 3.2 mm 7 = 7 x 5 mm	3 = **3.3 V** 2 = 2.5 V	0 = ± 100 PPM 5 = ± 50 PPM	*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)

875 – 156.25 – 2

The 1st Field
Product Code #
875 = FXO–PC3
875B = FXO-QC3

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, FXO-PC335R-156.25 = LVPECL Output, Ceramic, 3.2 x2. 5mm 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		0.750 MHz to 160 MHz
Frequency Stability [1]			100, 50 PPM
Temperature Range	T_O T_{STG}	Standard operating *Optional operating* Storage	-20°C to +70°C *-40°C to +85°C* -55°C to +125°C
Supply Voltage	V_{DD}	Standard	3.3 V ± 5%
Input Current (@ Standard Load)	I_{DD}	Standard Load	120 mA
Output Load	I	Standard	50 Ohms into V_{DD}-2V_{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 – Stability is inclusive of 25°C tolerance, operating temperature range, input voltage change, load change, aging, shock and vibration.

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

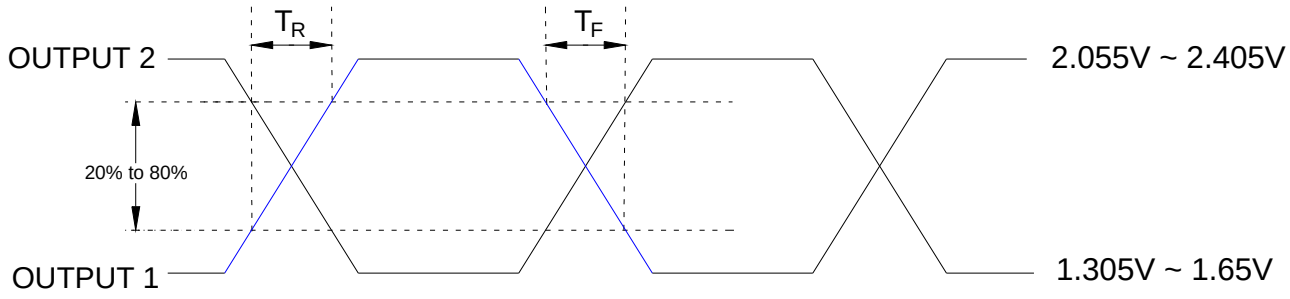
Parameters	Symbol	Condition	Maximum Value (unless otherwise noted)
Input Voltage	V_{DD}		–0.5V to +5.0V
Operating Temperature	T_{AMAX}		–55°C to +105°C
Storage Temperature	T_{STG}		–55°C to +125°C
Junction Temperature			+125°C
ESD Sensitivity	HBM	Human Body Model	1 kV

Output Wave Characteristics

Parameters	Symbol	Condition	Maximum Value (unless otherwise noted)
Low Output Voltage	V_{OL}	0.75 MHz to 160 MHz	1.305V ~ 1.65V
High Output Voltage	V_{OH}	0.75 MHz to 160 MHz	2.055V ~ 2.405V
Typical Complimentary Difference	V_{P-P}	0.75 MHz to 160 MHz	0.750 V_{P-P} Typ
Output Symmetry (See Drawing Below)		@ 50% V_{P-P} Level	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 (See Drawing Below)	T_R	0.75 MHz to 160 MHz	400 pS (20%~80%)
Cycle Fall Time (See Drawing Below)	T_F	0.75 MHz to 160 MHz	400 pS (80%~20%)

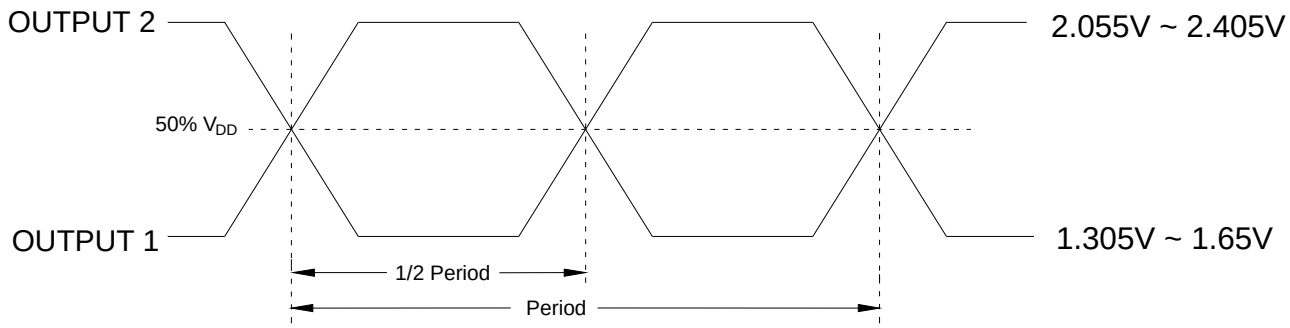
Note1 *An optional PIN # 2 as Enable / Disable is available – see Model Selection Guide (page 2)*

Rise Time / Fall Time Measurements

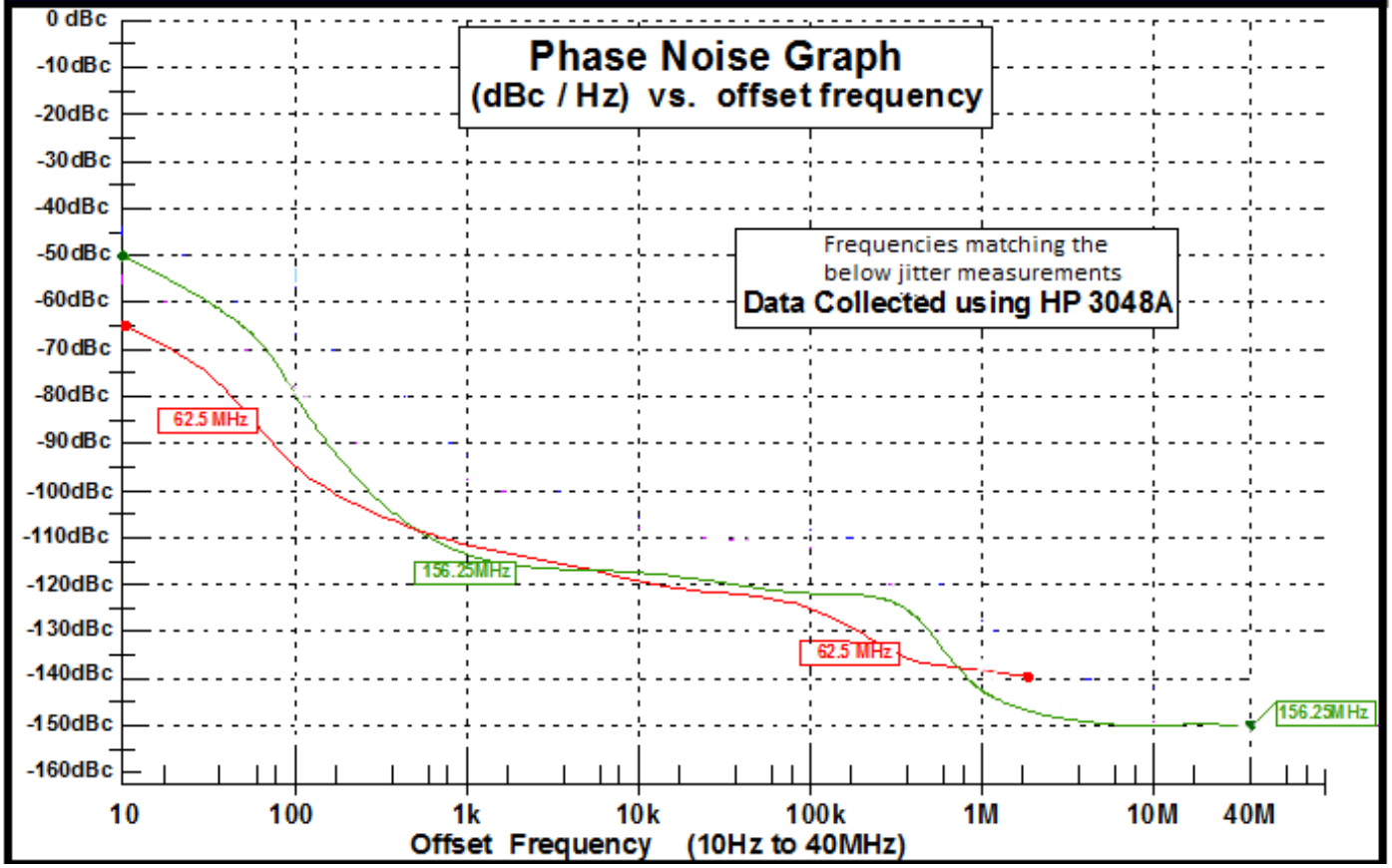


Oscillator Symmetry

Ideally, Symmetry should be 50/50 for 1/2 period -- Other expressions are 45/55 or 55/45



Phase Noise



Jitter is frequency dependent. Below are typical values at select frequencies.

LVPECL Phase Jitter & Time Interval Error (TIE)

Frequency	Phase Jitter (12kHz to 20MHz)	T I E (Sigma of Jitter Distribution)	Units
62.5 MHz	1.01	3.1	pS RMS
156.25 MHz	0.86	3.5	pS RMS

Phase Jitter is integrated from HP3048 Phase Noise Measurement System; 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)*

LVPECL Random & Deterministic Jitter Composition

Frequency	Random (Rj) (pS RMS)	Deterministic (Dj) (pS P-P)	Total Jitter (Tj) (14 x Rj) + Dj
62.5 MHz	1.27	8.1	26.2 pS
156.25 MHz	1.29	9.3	27.7 pS

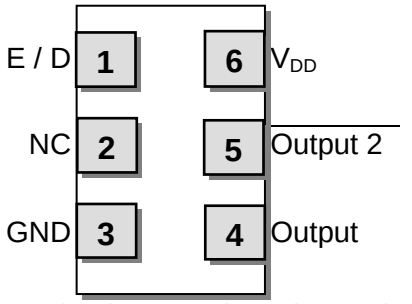
Rj and Dj, measured on LeCroy LC684 Digital Storage Scope, directly into 50 ohm input, with Amherst M1 software.
*Per **MJSQ** spec (Methodologies for Jitter and Signal Quality specifications)*

Pin Description and Recommended Circuit

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

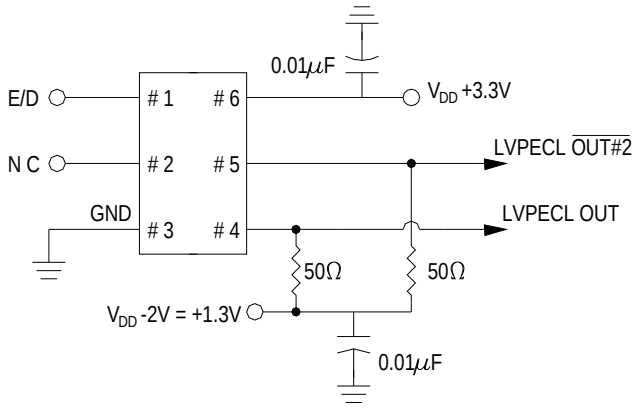
NOTES:

[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

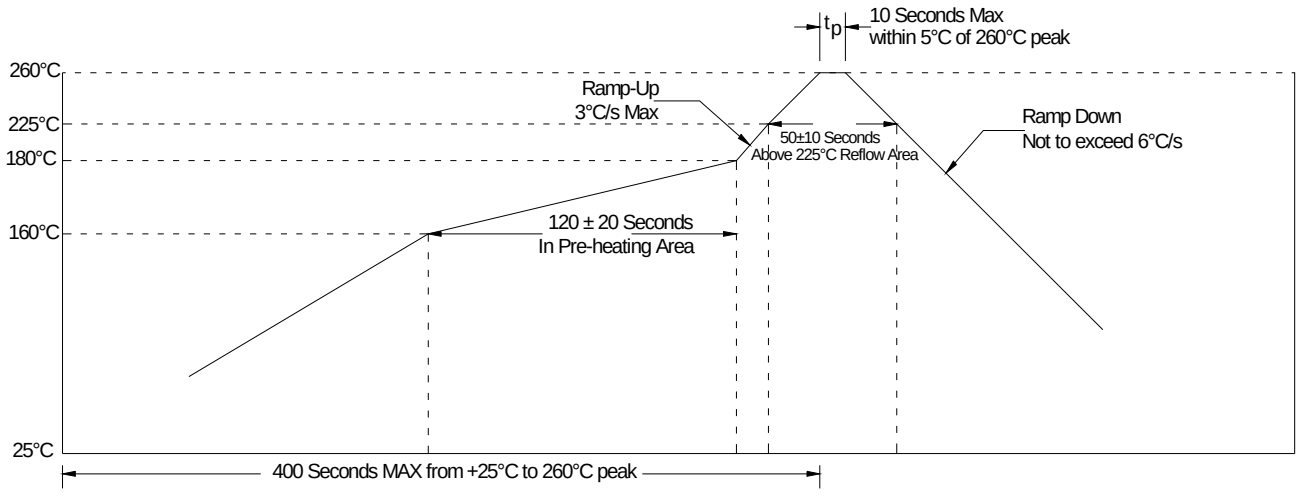
NOTE: XPRESSO LVPECL XOs are designed to fit on Industry Standard, 6 pad layouts



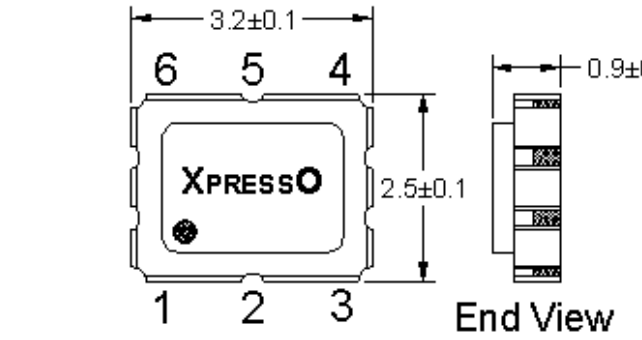
Enable / Disable Control

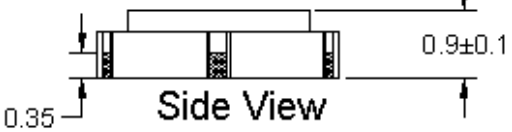
	Pin # 1 (state)	Output (Pin # 4, Pin # 5)
	OPEN (No Connection)	ACTIVE Output
	"1" Level $V_{IH} \geq 70\%$ V_{DD}	ACTIVE Output
	"0" Level $V_{IL} \leq 30\%$ V_{DD}	High Impedance

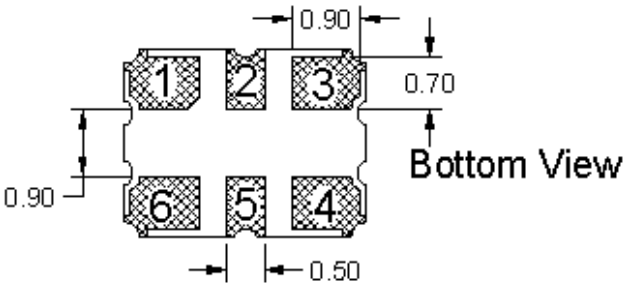
Soldering Reflow Profile (2 times Maximum at 260°C for 10 seconds MAX)



Mechanical Dimensional Drawing & Pad Layout



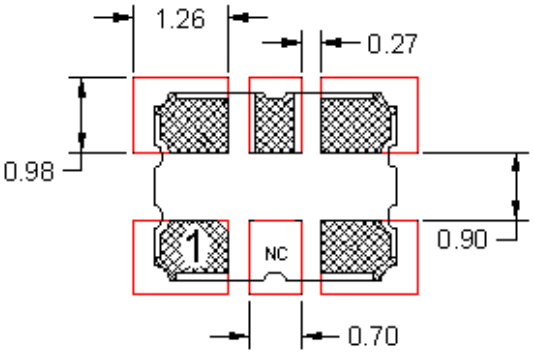




Actual part marking is depicted.

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

Recommended Solder Pad Layout

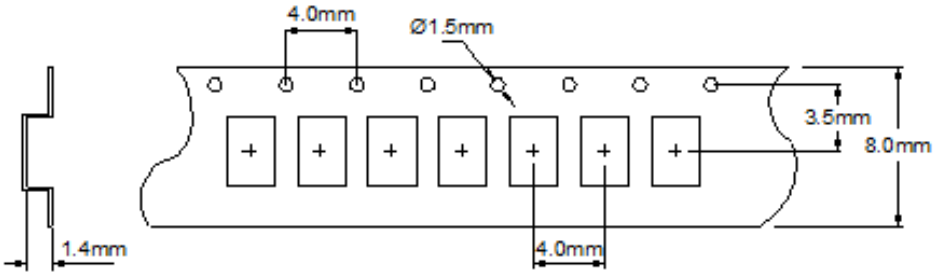


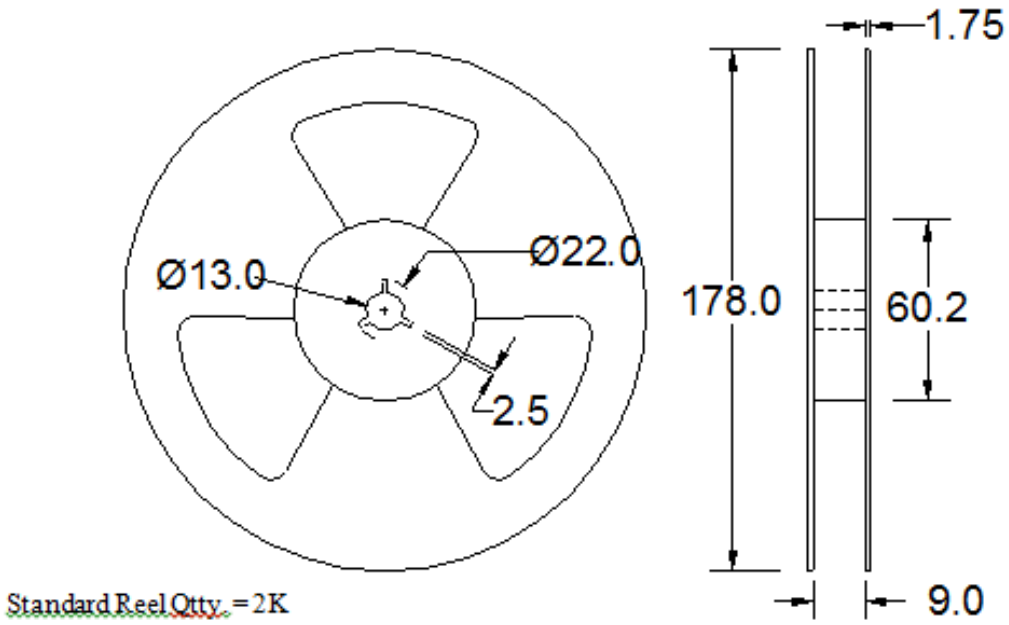
Pin Connections

#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

Tape and Reel Dimensions

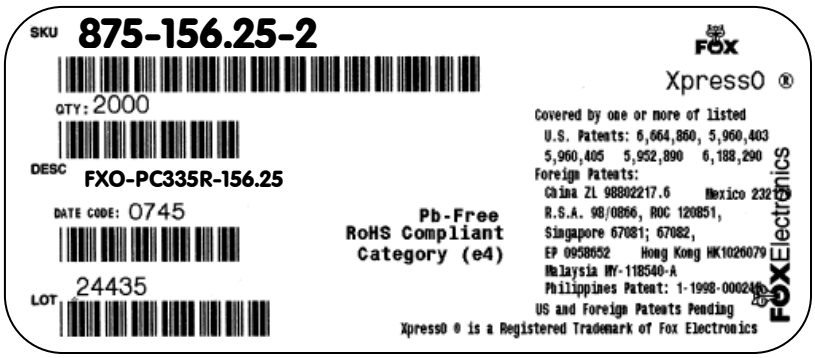




Standard Reel Qtty. = 2K

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

- Fox Part Number: **875-156.25-2**
- Quantity: **2000** pieces
- Description: **FXO-PC335R-156.25**
- Date Code **0745**
  (YYWW 2007 45th wk)
- LOT # **24435**
  If traceability should become necessary



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

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 part. XPRESSO 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 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 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 part. The Serial ID is unique for each and every XPRESSO part, and can be read by special Fox equipment.

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

- Equipment that the XPRESSO part was configured on
- Raw material used to configure the XPRESSO 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 part produced and can then obtain the information from above within 24 hours

Mechanical Testing

Parameter	Test Method
Mechanical Shock	Drop from 75cm to hardwood surface – 3 times
Mechanical Vibration	10~55Hz, 1.5mm amplitude, 1 Minute Sweep 2 Hours each in 3 Directions (X, Y, Z)
High Temperature Burn-in	Under Power @ 125°C for 2000 Hours (results below)
Hermetic Seal	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
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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.