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NanoTritium™ Betavoltaic
P100a Series
Extended-Life Models

About City Labs

City Labs, Inc. designs, develops, and manufactures tritium-based power products for microelectronics, sensors, and other small devices commonly used in aerospace & defense, medical implant, and homeland security markets. City Labs, is located in Miami, Florida, was founded in April, 2005, and is a privately held Florida corporation.

The NanoTritium™ Betavoltaic

City Labs has developed a tritium betavoltaic with a lifetime of over 20 years that can power a range of devices where battery replacement is difficult or impossible. The City Labs NanoTritium™ betavoltaic is resilient under varying temperatures and other environmental conditions, because it is based on the decay of tritium. Tritium is a radioisotope used as an illumination source for Exit signs commonly found in schools, theatres, commercial buildings, and aircraft.

City Labs' NanoTritium™ betavoltaic technology is Generally Licensed for sale and distribution within the U.S. and is available for distribution to end-users without requirements for any specialized radiological training. Potential applications for the NanoTritium™ betavoltaic exist in numerous markets, where long-lasting, continuous low power sources are crucial to mission success and operating requirements:

- Homeland Security / Intelligence Sensors
- Structural Integrity Sensors
- Sub-Sea Sensors & Actuators
- Space Satellite & Probe Power Sources
- Medical Devices & Implants
- Defense Microelectronics

NanoTritium™ Betavoltaic: Operational Parameters

The NanoTritium™ betavoltaic is robust in its design to withstand a broad range of conditions that extend beyond the capabilities of conventional chemical battery solutions. Most notably, the NanoTritium™ betavoltaic can operate without deleterious effects over a broad range of extreme temperatures of -40°C to 80°C.

Temperature Range:	**-40°C to +80°C**
External Pressure:	**3.6 psi (0.245 atm) to 14.7 psi (1.0 atm)**
Vibration:	**25 Hz to 500 Hz at 5g Peak Amplitude**

City Labs has pioneered the development of a proprietary semiconductor tailored to maximizing the energy harvested from tritium radioactive decay. Increasing the efficiency of the energy harvesting and transport allows increased power density and design flexibility.

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NanoTritium™ Betavoltaic P100a Series Performance Characteristics

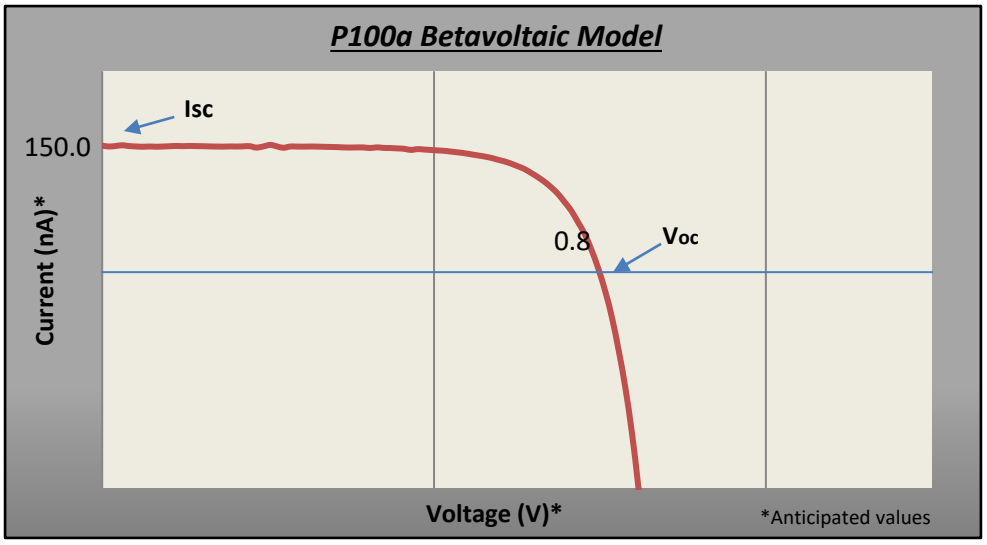
Typical power response for a standard P100a betavoltaic. Designers should take in to account the End-Of-Life power requirements when choosing a NanoTritium™ betavoltaic for their platform.

When used in conjunction with a super capacitor or a trickle-charge scenario, the power characteristics of the charging system and storage devices employed must be considered. Please contact City Labs for applications where burst power or power storage are required platform design goals.

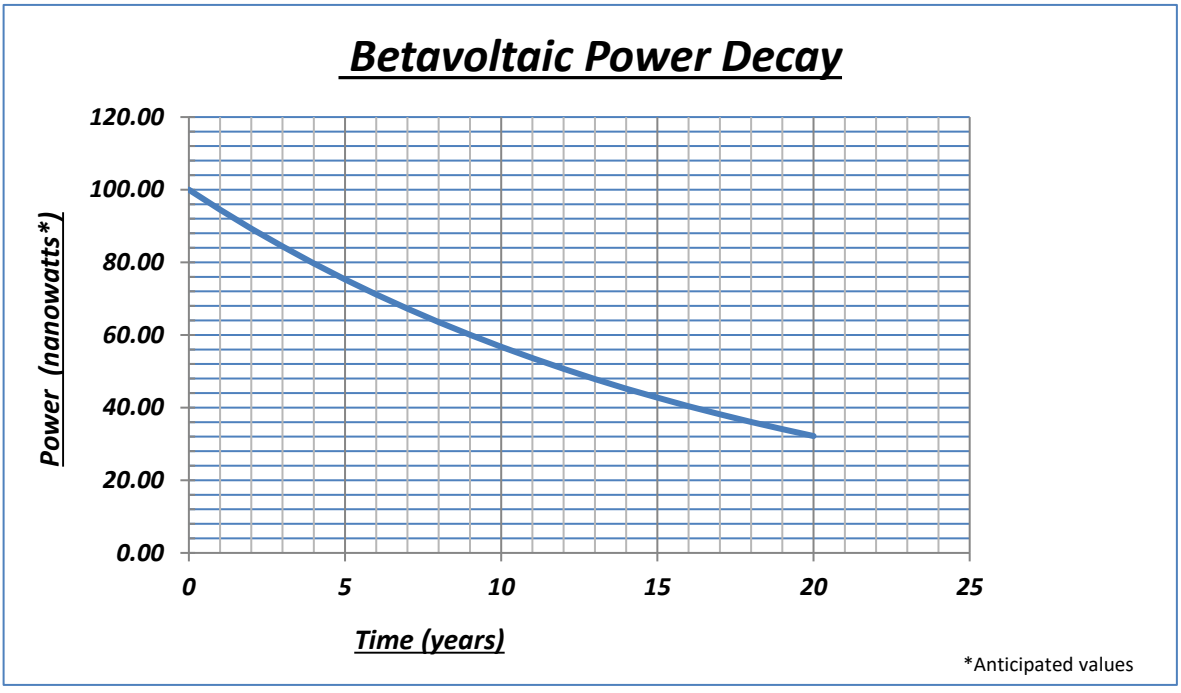
This power decay curve is a function of the exhaustion of the tritium supply contained in the battery over the usable lifetime of the platform in which the device is embedded. Power decay curves can be tailored to match platform requirements.

Electrical Properties	BOL	Year 12	Year 20
Voc*	0.8 volts	0.8 volts	0.8 volts
Isc*	150 nanoamps	75 nanoamps	32 nanoamps

*Anticipated values



Time(yrs)	Power(nW)
0	100.00
1	94.49
2	89.28
3	84.36
4	79.72
5	75.32
6	71.17
7	67.25
8	63.55
9	60.04
10	56.74
11	53.61
12	50.66
13	47.86
14	45.23
15	42.74
16	40.38
17	38.16
18	36.05
19	34.07
20	32.19



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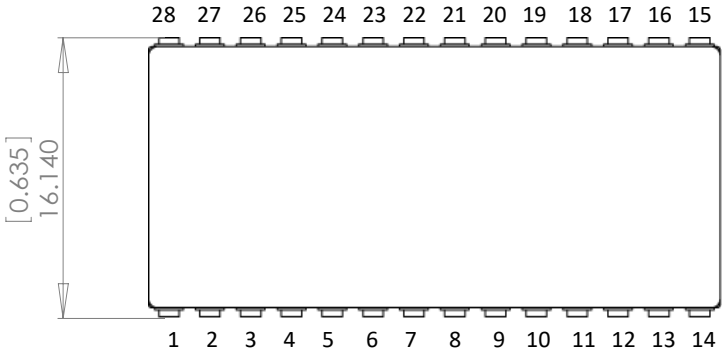
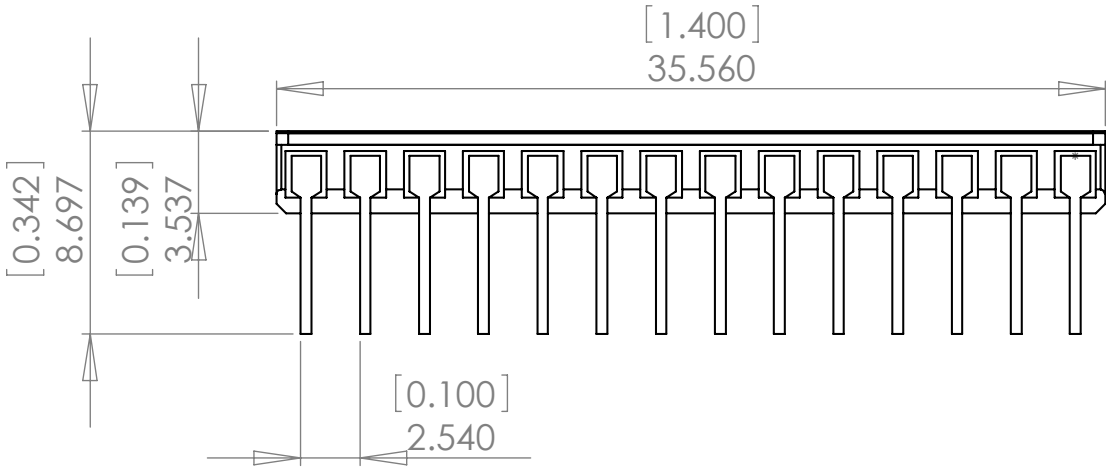
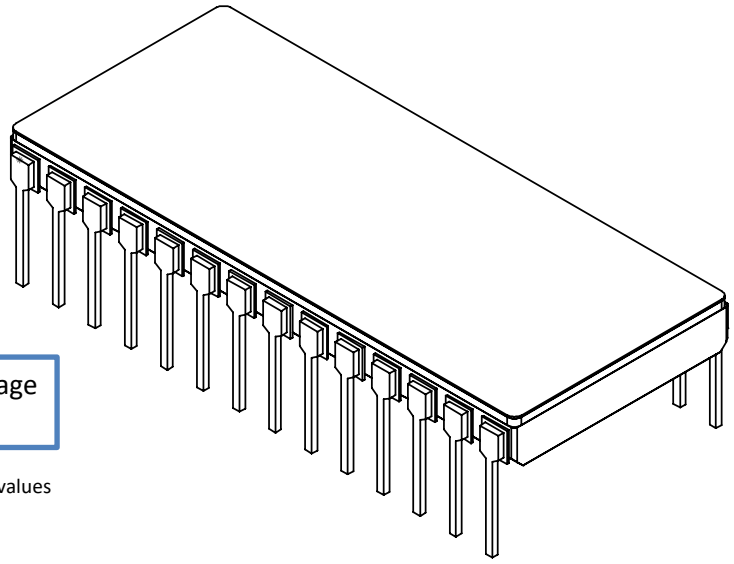
NanoTritium™ Betavoltaic P100a Series Package Specifications

The P100a betavoltaic package is a 28 pin CERDIP package.

28 Pin CERDIP	
Pin Number	Function
1	(+)
15	(-)







P100a betavoltaic package weight: 7.54 grams*.

*Anticipated values

All units in millimeters [inches]

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NanoTritium™ Betavoltaic P100a Series Power and Configurations

High-power battery array can be designed to interface with existing platforms or configured for inclusion in newly-designed platforms. An array is a bundle of P100a units, that when connected in various series or parallel configuration, yield a desired higher power output with specific voltages or currents in mind. For instance, if a 3.75 µA array at 0.8 Voc is desired (~2.5 µW) then approximately 25 model P100a Betavoltaics configured to 0.8 Voc internally could be connected in parallel to reach the desired 3.75 µA current level.