IXOLAR™ High Efficiency SolarBIT

Description

IXOLAR™ SolarBIT is an ANYSOLAR product line of SolarBIT made of monocrystalline, high efficiency solar cells. The IXOLAR™ SolarBIT is an ideal for charging various battery powered and handheld consumer products such as mobile phones, cameras, RF-ID Tag, PDAs, MP3-Players and toys. They are also suitable for industrial applications such as wireless sensors, portable instrumentation and for charging emergency backup batteries.

With a cell efficiency of typically 25% measured at a wafer level, SolarBIT gives the ability to extend run time even in "low light" conditions and increase battery life and run time in a small footprint, which can be easily accommodated in the design of portable products. The design allows connecting SolaBIT flexibly in series and/or parallel to perfectly meet the custom-specific application's power requirements.

IXOLAR™ products have a very good photonic response over a wide range of wavelength and therefore can be used in both indoor and outdoor applications.

Product and Ordering Information

Part Number	Open Circuit Voltage [V]	Short Circuit Current [mA]	Typ. Voltage @ P_{mpp} [V]	Typ. Current @ P_{mpp} [mA]
KXOB411K04F	2.76	175	2.28	150

(Parameters given are typical values)
Dimensions (W x L x H): 42 x 43 x 1.8 ± 0.3 [mm]
SolarBIT Weight: 6.18 grams
Storage Temperature: -40°C ~ +90°C
Operation Temperature: -40°C ~ +90°C
SolarBIT is compliant to the RoHS Norm.

Electrical Characteristics

Symbol	Cell Parameter	Typical Ratings *)	Units
V_{oc}	open circuit voltage	2.76	V
I_{sc}	short circuit current	175	mA
V_{mpp}	voltage at max. power point	2.28	V
I_{mpp}	current at max. power point	150	mA
P_{mpp}	maximum peak power	342	mW
FF	fill factor	> 70	%
η	solar cell efficiency	25	%
$\Delta V_{oc}/\Delta T$	open circuit voltage temp. coefficient	-6.96	mV/K
$\Delta I_{sc}/\Delta T$	short circuit current temp. coefficient	76.4	uA/K

*) All values measured at Standard Condition: 1 sun (= 100 mW/cm²), Air Mass 1.5, 25°C

Features

- Monocrystalline silicon technology
- High efficiency outdoor and indoor
- Long life and stable output
- Sealed Package
- High mechanical robustness
- Surface Mount Package
- Reflow Solderable

Applications

- Battery chargers for portables such as cell phones, PDAs, GPS-Systems, …
- "Green" electricity generation
- Power backup for UPS, Sensors, Wearables

Advantages

- Automatic Pick & Place Mounting
- One Product for Multiple Applications
- Flexible Integration into the Application

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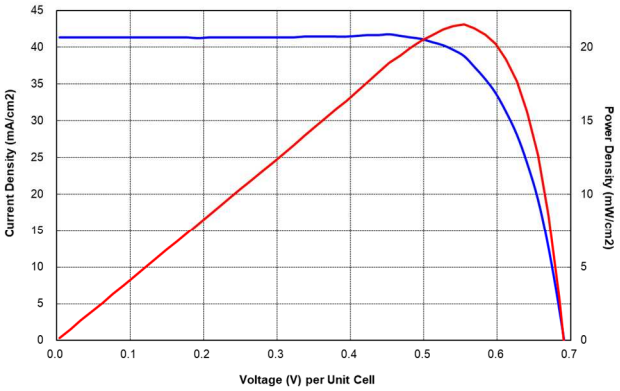
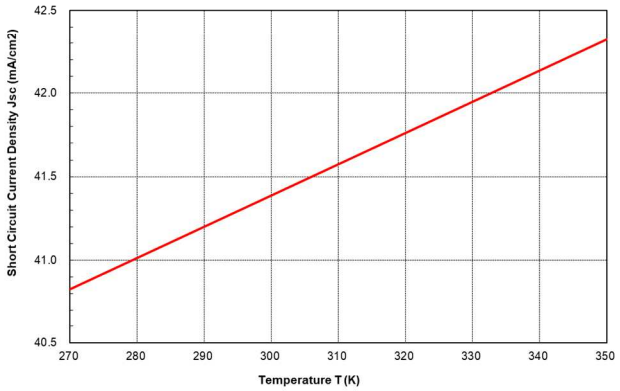
Typical SolarBIT Performance Data

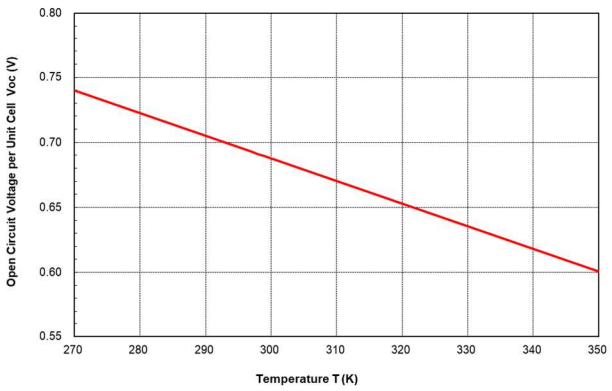
Current-Voltage Characteristics



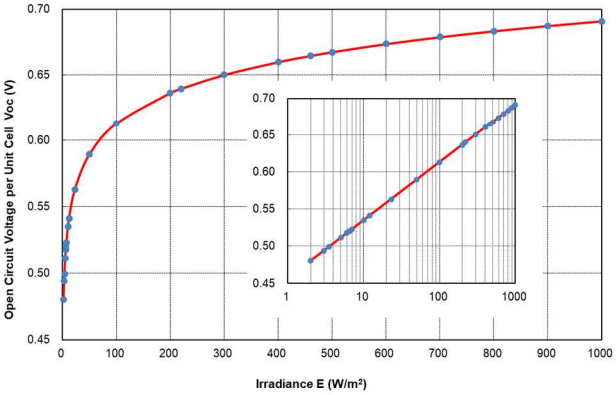
Short Circuit Current Density vs. Temperature



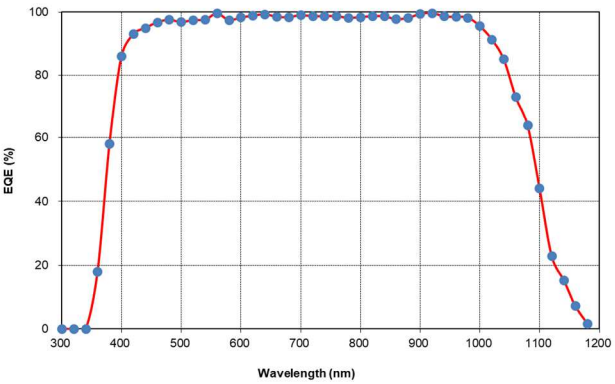
Open Circuit Voltage vs. Temperature



Open Circuit Voltage vs. Irradiance



External Quantum Efficiency



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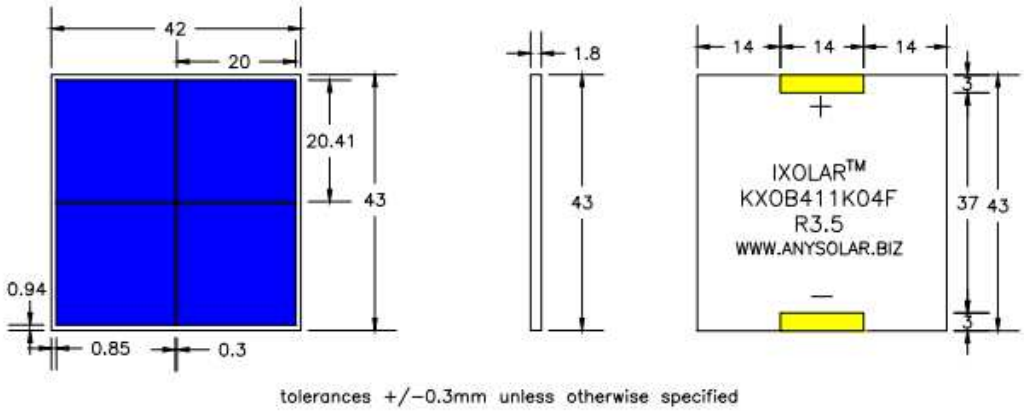
Package front-side and back-side view. (dimensions in millimeters)



Front-side View details **Back-side View details**

Moisture Sensitivity, Reflow Soldering and Washing Information

ANYSOLAR has characterized the moisture reflow sensitivity of the SolarBIT. Moisture uptake from atmospheric humidity occurs by diffusion. During the solder reflow process of SolarBIT being soldered to the PCB, the whole body of the SolarBIT is exposed to high process temperatures. The combination of moisture uptake and high reflow soldering temperatures may lead to moisture induced delamination or blistering of the SolarBIT.

For a reflow solder, we recommend to use low temperature solder alloy like lead-free Sn-42 / Bi-58 compound. For instance, we recommend the lead-free solder paste TLF-401-11 manufactured by TAMURA CORPORATION, where **it recommends 220°C peak temperatures at the reflow zone above 175°C for about 50 seconds.**

Otherwise, manual soldering is recommended for 5 sec below 400°C. If cleaning is required, it is recommended to use lukewarm water. All chemical detergents, including IPA, may damage the film, so please apply them to a small area in advance to check for stability before use.

★ **IF YOU HAVE ANY DIFFICULTIES WITH SOLDERING, PLEASE CONTACT US AT THE EMAIL;**
techdevelop@anysolar.biz

Packaging & Moisture caution

SolarBITs are shipped in a Tape and reel and it contains 400 devices. SolarBITs are characterized as the moisture sensitivity level 3. To prevent from moisture induced blistering or delamination during the high temperature solder reflow process, the tape and reel packages containing SolarBITs are vacuum sealed in a plastic package to keep them dry from atmospheric humidity. When vacuum package sealing is found broken, prebaking is recommended in a dry oven according to IPC/JEDEC J-STD-033C (Table 4-1 in Section 4 Drying, 1.4mm<thickness<2.0mm).

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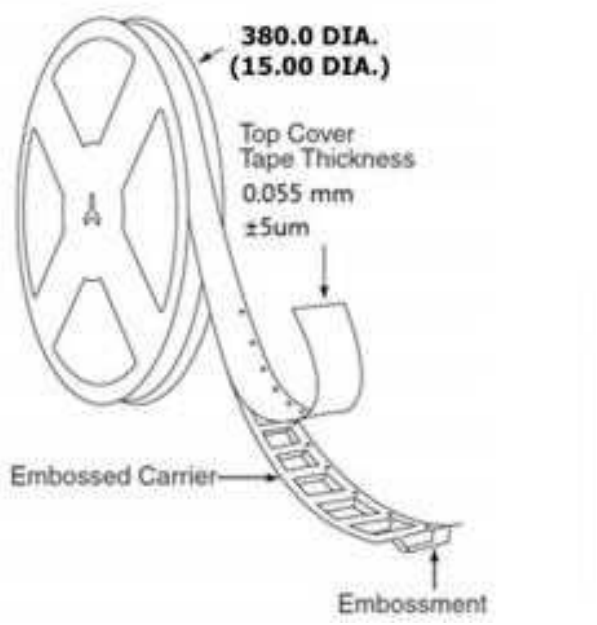
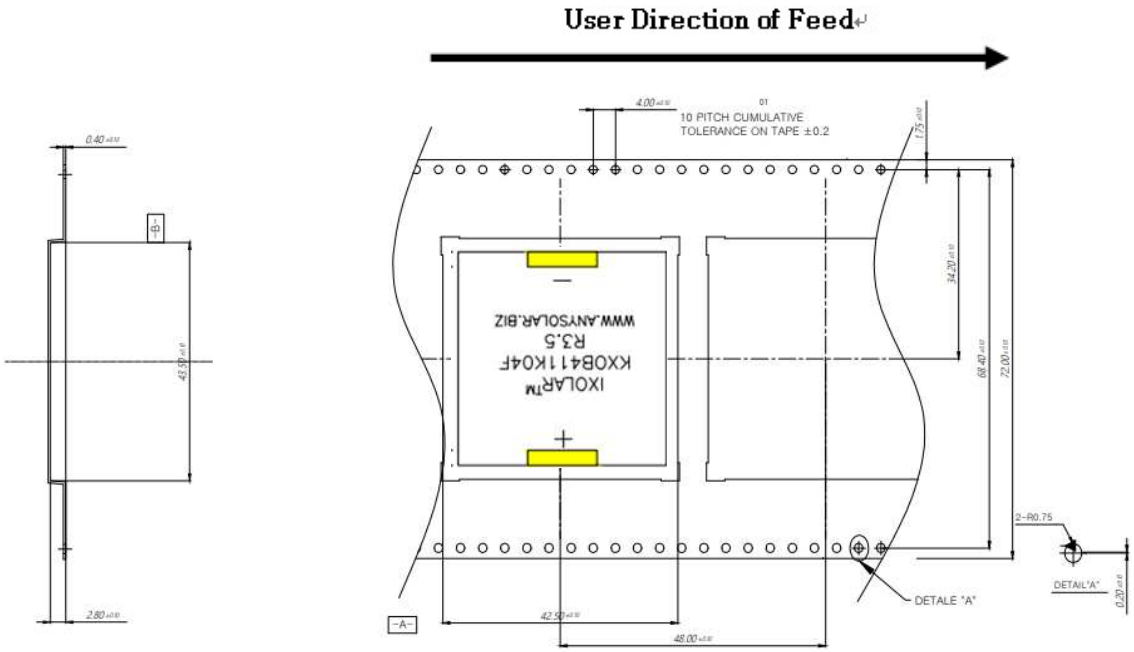
Tape & Reel Information for TR Packages. (Dimensions in millimeters)

KXOB411K04F packaging contains 400 pieces on a 15" reel.





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Background

Some basic information needs to be covered to better understand what to expect in terms of the SolarBIT's performance with regards to solar cell type, lighting conditions in terms of power density, and general industry standards as they relate to battery charging.

Solar Cell Types

Keep in mind these cost and performance tradeoffs when comparing various solar cell materials:

Polycrystalline cells are commonly found in outdoor applications and have a spectral sensitivity range of 500nm to 1100nm. They're in the medium price range and typically offer a 13% power conversion efficiency.

Monocrystalline cells, such as the ANYSOLAR SolarBIT, have a spectral sensitivity range from 300 nm (near-ultraviolet) to 1100 nm (near-infrared), which includes visible light (400 to 700 nm). Due to this wide spectral range, they can be used in both indoor and outdoor applications. Monocrystalline or single-crystalline material is the most expensive but it does not contain impurities, and as such the power conversion efficiency does not degrade over operating time. The power conversion efficiency of commercially available monocrystalline cells ranges from 15 to 25%. The surface of these cells is a homogenous dark blue or dark grey.

Finally, amorphous cells, which work in the spectral range of 300nm to 600nm, are used predominantly indoors in products such as solar powered calculators since they are not sensitive to the upper light spectrum and cannot take advantage of natural sunlight. They offer about 5% power conversion efficiency and are mostly used with ultra low power devices like clocks and electronic calculators. Amorphous cells, like polycrystalline cells, suffer from efficiency degradation.

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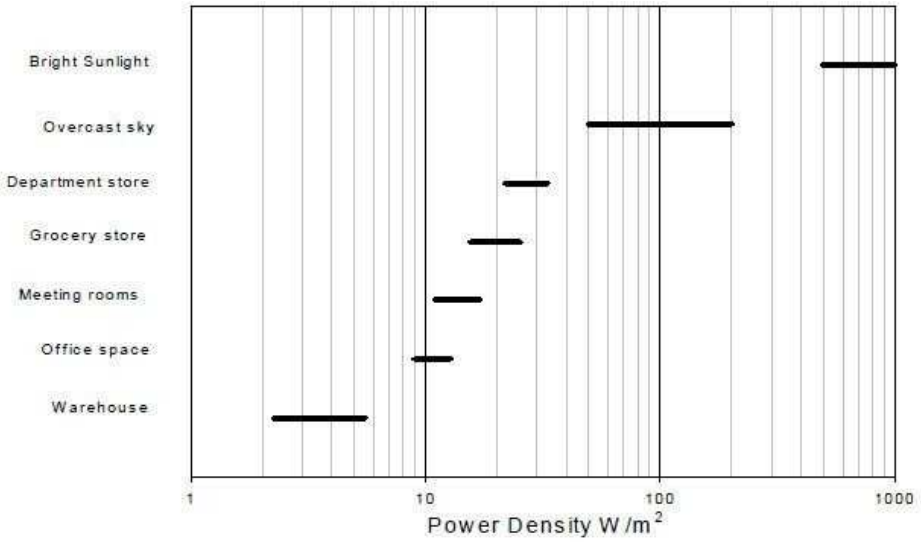
SolaBIT Description

SolarBIT is made of monocrystalline, high-efficiency solar cells in a surface mountable package. They're robust and can be used in harsh environments. Solar cells used in SolarBIT have a very high (25%) power conversion efficiency, which means that 25% of the light energy is converted into electrical energy. They're extremely useful in applications requiring solar power generation in a limited space.

Monocrystalline cells can be used in indoor and outdoor applications because they have a wide spectral sensitivity, 300 to 1100 nm. However, the output power of a solar cell is proportional (over a wide range) to the incoming light energy, and irradiance is generally much higher outdoors. The values in the datasheet are measured at "standard condition" of 1 sun, which is equal to 1000W per square meter sunlight irradiance at a defined light spectrum (air mass of 1.5) and 25°C cell temperature.



Relative Light Power Densities

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Relative Lighting Power Density

The figure above compares relative power density for various lighting conditions in units of Watts per square meter (W/m^2). The reference standard condition is 1 Sun and is equal to 1000 Watts per square meter of sunlight irradiance at a constant 25°C cell temperature and at 1.5 Air Mass (Air Mass stands for a well defined light spectrum which appears if the sunlight goes through the earth's atmosphere at a defined angle).

As the chart clearly shows, the power density of typical indoor lighting is dramatically lower than that of sunlight. Not only is irradiance from indirect and artificial light lower; the spectrum is also narrower. In typical Office Space lighting with a spectrum produced from incandescent or halogen light bulbs, the power output may be roughly 100 times less than bright sunlight. It may be 200 to 500 times less with fluorescent lighting due to the further limited spectrum.

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