IXOLAR™ High Efficiency SolarBIT.

Description

IXOLAR™ SolarBITs are IXYS' product line of SolarBITs made of monocrystalline, high efficiency solar cells. The IXOLAR™ SolarBITs is an ideal for charging various battery powered and handheld consumer products such as mobile phones, cameras, 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 22% measured at a wafer level, SolarBITs give 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 SolarBITs flexibly in series and/or parallel to perfectly meet the application's power requirements.

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

Product and Ordering Information (Package Level)

Part Number	Open Circuit Voltage [V]	Short Circuit Current [mA]	Typ. Voltage @ P_{mpp} [V]	Typ. Current @ P_{mpp} [mA]
KXOB22-01X8F	4.70	4.4	3.40	3.8



(parameters given are typical values)
Dimensions (L x W x H): 22 x 7 x 1.8 [mm]
SolarBITs Weight: 0.5 grams
SolarBITs are compliant to the RoHS Norm.

Electrical Characteristics

Symbol	Cell Parameter	Typical Ratings *	Units
V_{oc}	open circuit voltage	4.70	V
J_{sc}	short circuit current density (wafer level)	42.4	mA/cm²
V_{mpp}	voltage at max. power point	3.40	V
J_{mpp}	current density at max. power point(wafer level)	37.2	mA/cm²
P_{mpp}	maximum peak power(wafer level)	18.6	mW/cm²
FF	fill factor	> 60	%
η	solar cell efficiency(wafer level)	22	%
$\Delta V_{oc}/\Delta T$	open circuit voltage temp. coefficient(wafer level)	-2.1	mV/K
$\Delta J_{sc}/\Delta T$	short circuit current temp. coefficient(wafer level)	0.12	mA/(cm²K)

* 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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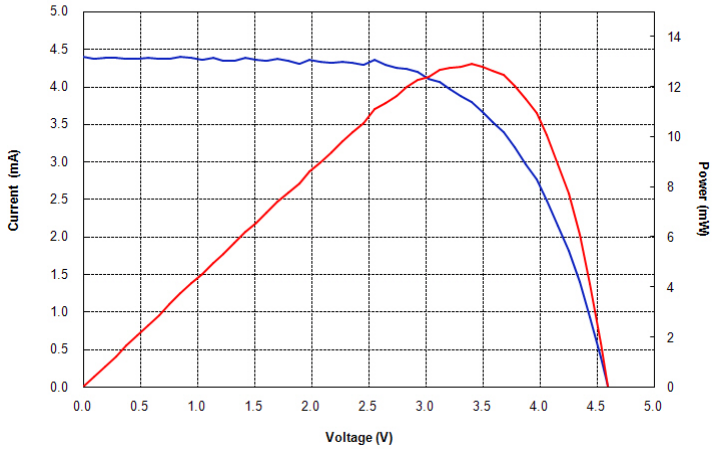
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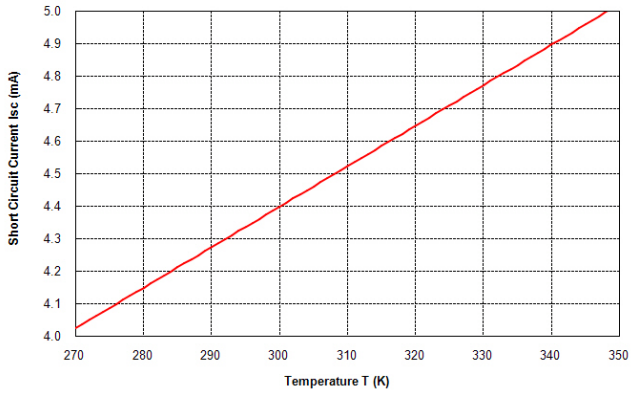
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Typical SolarBIT Performance Data

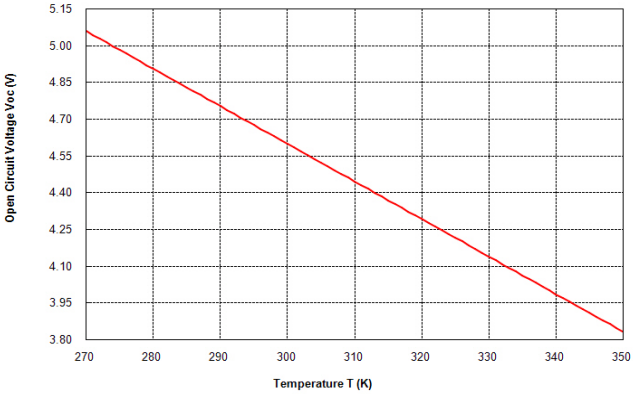
Current-Voltage Characteristics



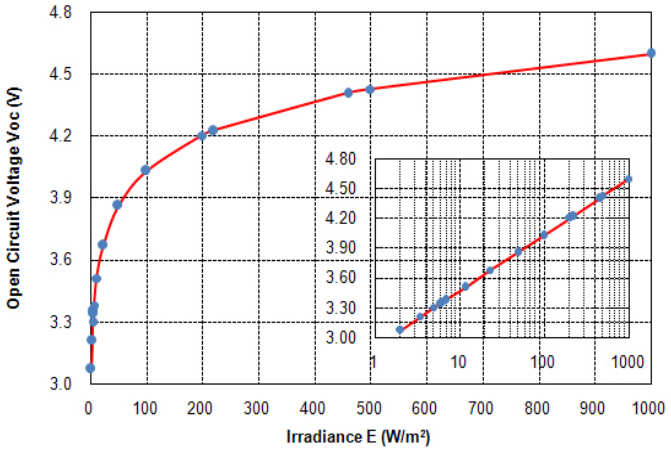
Short Circuit Current Density vs. Temperature



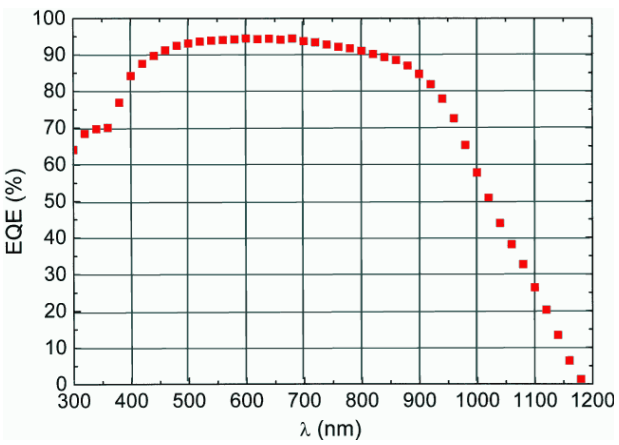
Open Circuit Voltage vs. Temperature



Open Circuit Voltage vs. Irradiance



External Quantum Efficiency



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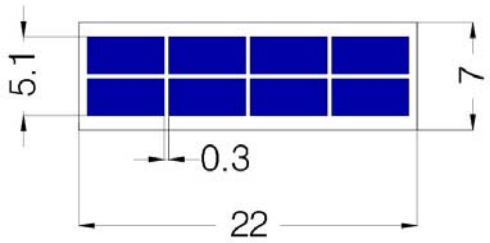
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Package front-side and back-side view.

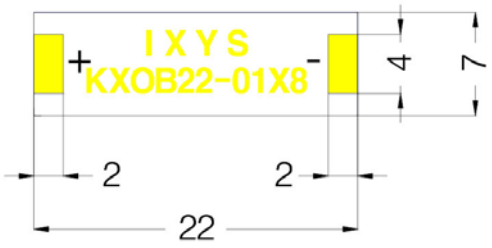




SolarBIT Pad Design. (Dimensions in millimeters)



Front-side View details



Back-side View details

SolarBIT PCB Layout Recommendation:

The PCB layout foot print should be equivalent to the layout of the SolarBIT but on the contact pads on the short end(s) it should be half a millimeter larger than the SolarBIT. For the KXOB22-01x8F one may use two pads of (4 x 2.5)mm size with 18mm spacing.

Moisture Sensitivity, Reflow Soldering and Washing Information

IXYS has characterized the moisture reflow sensitivity of the SolarBIT using IPC/JEDEC standard J-STD-020. Moisture uptake from atmospheric humidity occurs by diffusion. During the solder reflow process, in which the component is attached to the PCB, the whole body of the component is exposed to high process temperatures. The combination of moisture uptake and high reflow soldering temperatures may lead to moisture induced delamination and cracking of the component. To prevent this, this component must be handled in accordance with IPC/JEDEC standard J-STD-020 per the labeled moisture sensitivity level (MSL), level 1. IXYS does not recommend the use of chlorinated solvents.

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

Tube Carrier Packaging

SolarBITs are shipped in 460 mm long clear PVC carrier tubes with antistatic coating. A tube contains 20 SolarBIT devices.

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Background

Some basic information needs to be covered to better understand what to expect in terms of the SolarBITs 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 IXYS SolarMD, 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 22%. 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.

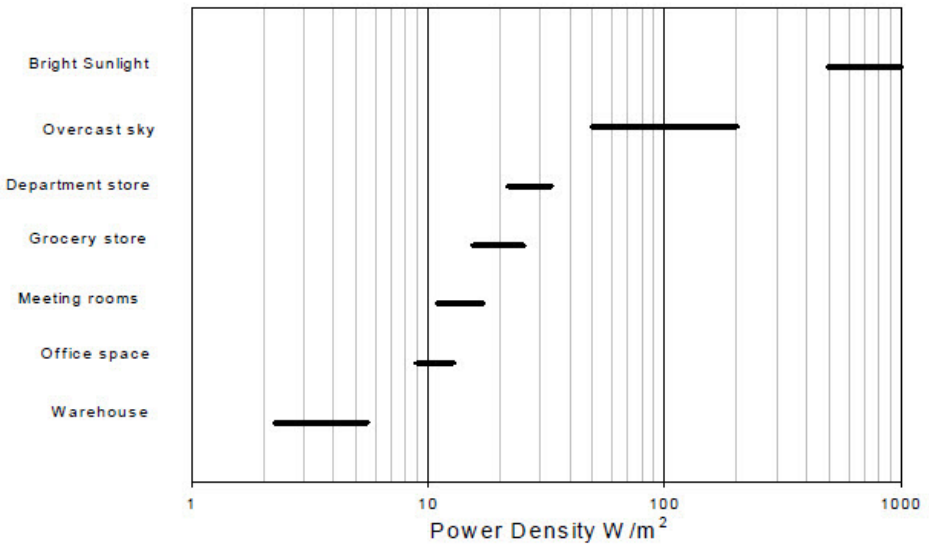
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SolarBit Description

SolarBITs are monocrystalline, high-efficiency solar cells in a surface mount package. They're robust and can be used in harsh environments. SolarBITs have a very high (22%) power conversion efficiency, which means that 22% 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 data sheet 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 athmosphere 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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