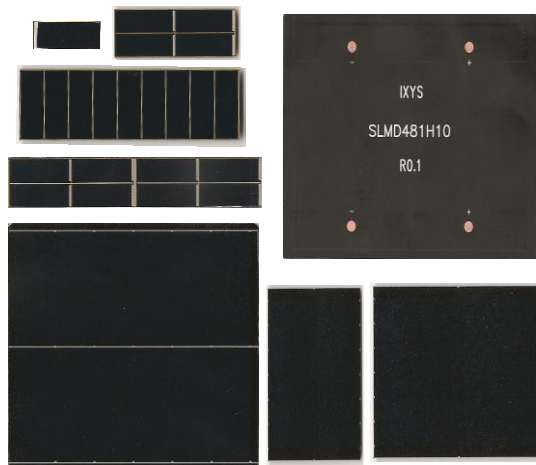




by IXYS Korea

Main Products
IXOLAR™ SolarBIT
IXOLAR™ SolarMD
IXOLAR™ SolarET
Typical Applications
Sales and Marketing





SERVING CUSTOMERS WORLDWIDE

Products cover entire power spectrum

Focused direct sales force

Broad sales representative and distributor relationships



High Efficiency Solar Cell 22%
Monocrystalline Silicon



IXOLAR™ SolarBIT

- Surface Mountable Solar Bits
- Reflow Solderable
- Epoxy Coated Encapsulation
- Form Factor : 22mm x 7mm x 1.6mm

IXOLAR™ SolarMD

- Manual Solderable Mini Solar Modules
- Film Laminated Encapsulation
- Customized Voltage/Current Ratings
- Various Module Sizes

IXOLAR™ SolarET

- Solar Electronics powered by High Efficiency SolarMD
- Smart MCU Controlled.
- High Efficiency High Brightness LED flashlight
- Alkaline Battery or Li-Battery Bank
- Laser Pointer



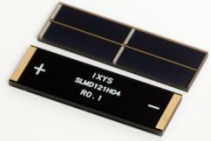
IXOLAR™ BIT/MD Technology Roadmap



KXOB22-12X1



SLMD121H04L



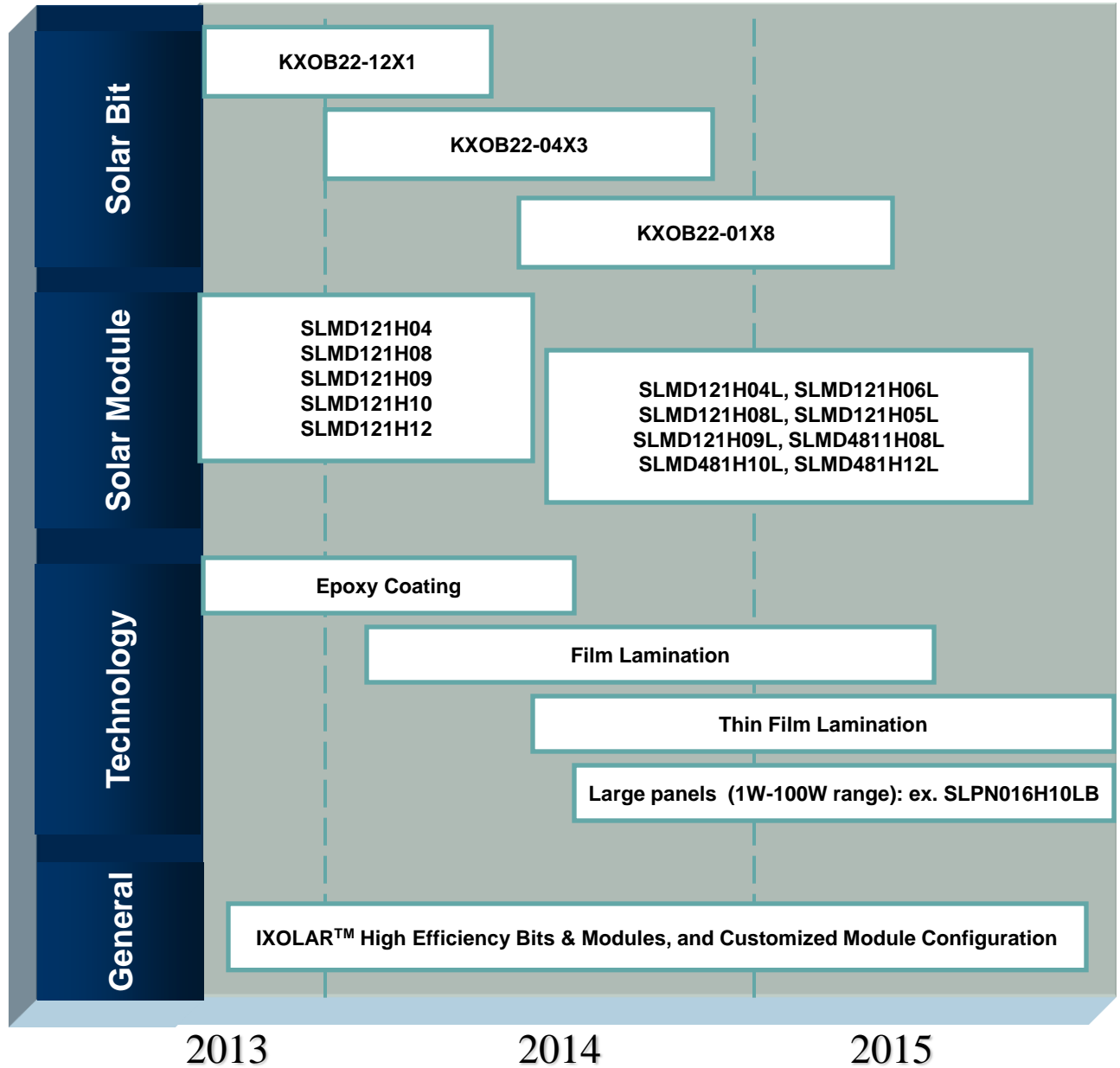
SLMD121H09L



SLMD960H12L



SLMD481H10L



IXOLAR™ ET Technology Roadmap

Solar Pad



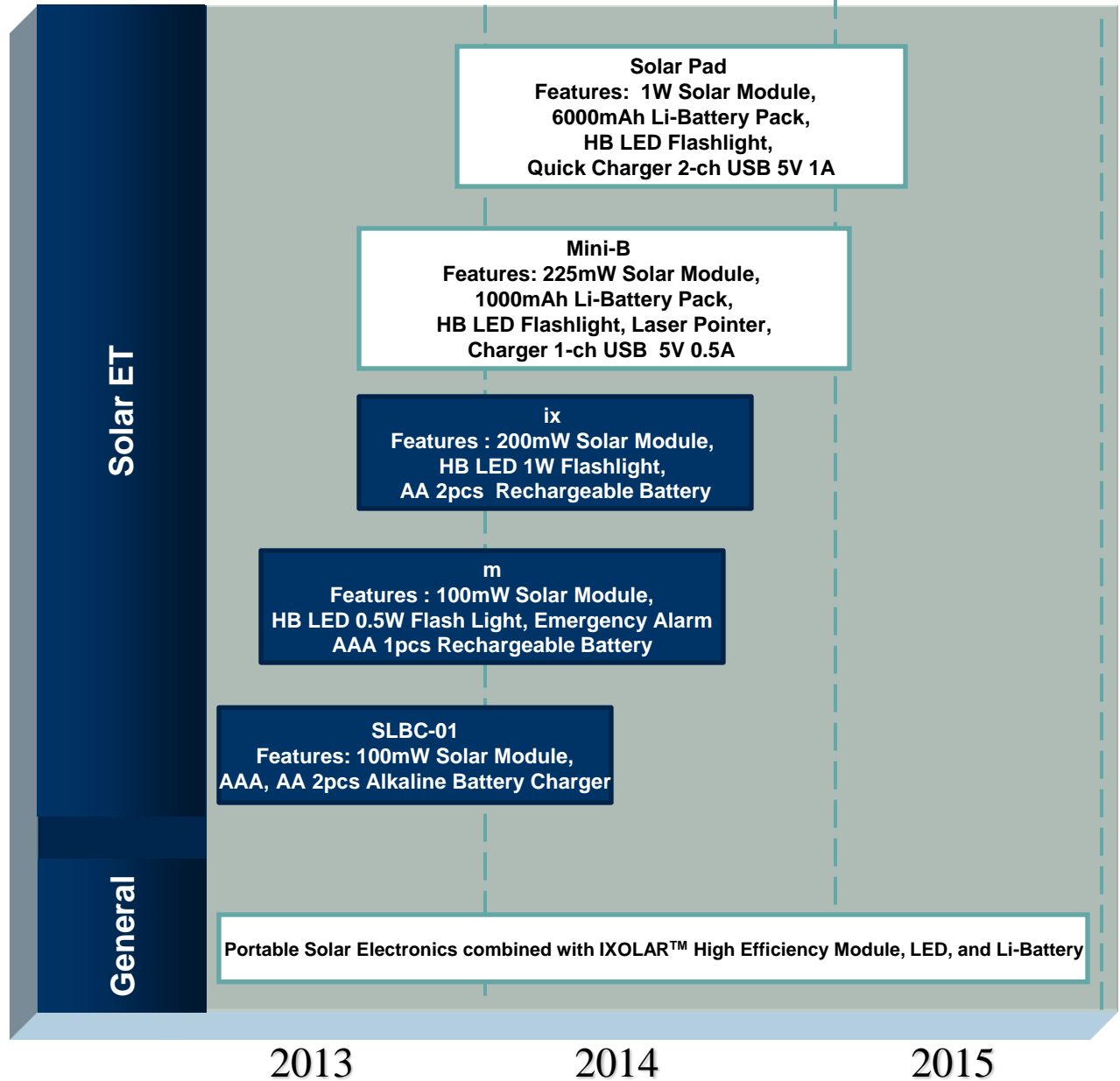
designtree

Mini-B



ix

m

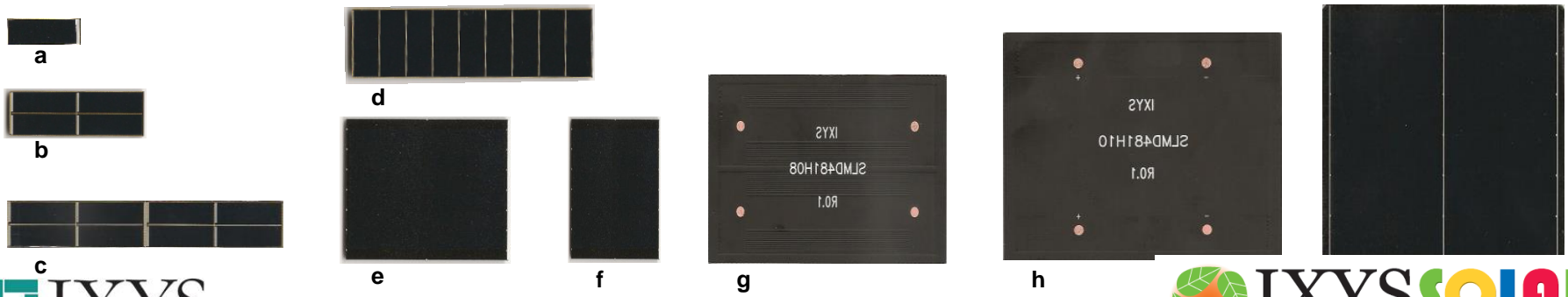


PRODUCTS: IXOLAR™ BIT&MODULE



Symbol	Unit	IXOLAR™ High Efficiency SolarBIT			IXOLAR™ High Efficiency SolarMD										
		KXOB22-12X1	KXOB22-04X3	KXOB22-01X8	SLMD121H4	SLMD121H8	SLMD121H9	SLMD960H12 (SLMD4235)	SLMD480H12	SLMD121H10	SLMD121H10 L	SLMD600H10	SLMD481H08	SLMD481H10	SLMD481H12
1.Voc	V	0.63	1.89	4.7	2.52	5.04	5.67	7.56	7.56	6.30	6.30	6.30	5.04	6.30	7.56
2.Isc	mA	50.0	15	4.4	50.0	50.0	50.0	40.0	20.0	50.0	50.0	25.0	200.0	200.0	200
3.Pmax	mW	22.3	20.07	12.92	89.2	178.4	200.7	218.2	109.1	223.0	223.0	111.5	713.6	892.0	1081.1
4.Vmax	V	0.50	1.5	3.4	2.00	4.00	4.50	6.06	6.06	5.00	5.00	5.00	4.00	5.00	6.06
5.Imax	mA	44.6	13.38	3.8	44.6	44.6	44.6	36.0	18.0	44.6	44.6	22.3	178.4	178.4	178.4
6.Jsc	mA/cm ²	42.4	42.4		42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.4
7.Fill Factor	%	> 70	> 65	> 60	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70
8.Cell Efficiency	%	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
9.ΔVOC/ΔT	mV/K	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10	-2.10
10.ΔJSC/ΔT	mA/(cm ² K)	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
11.Dimensions	mm(LxWxH)	22x7x1.6	22x7x1.8	22x7x1.8	43x14x2	86x14x2	62x21x2	42x35x2	22x35x2	42x35x2	42x35x2	22x35x2	89x55x2	89x67x2	90x79x2
12.Unit cell size	mm(LxW)	20x6	6x6	5x2.4	20x6	20x6	20x6	20x4.8	10x4.8	20x6	20x6	10x6	20x12X2	20x12X2	20x12X2
13.Cells in series	cells	1	3	8	4	8	9	12	12	10	10	10	8	10	12
14.Package	-	a	a	a	b	c	d	e	f	e	e	f	g	h	i
15.Pack quantity	-	20/tube	20/tube	20/tube	40/blister	20/blister	20/blister	25/blister	50/blister	25/blister	25/blister	50/blister	20/blister	20/blister	20/blister
16.Weight	grams	0.5	0.5	0.5	2.5	5.0	5.5	4.5	2.5	4.5	4.5	2.5	18.0	20.0	22.0
17.Unit cell area	mm ² (LxW)	120.00	36.00	12.00	120.00	120.00	120.00	96.00	48.00	120.00	120.00	60.00	480.00	480.00	480.00
18.Datasheet	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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



PRODUCTS: SolarET



SLBC-01-GRN



SLBC-01-PNK



SLBC-01-YEL



SLFL-M-BLK



SLFL-M-BLU



SLFL-M-PNK



SLFL-M-WHT



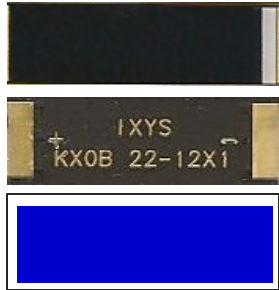
SLFL-IX-WHT



SLFL-IX-BLK



SLUC-01-WHT

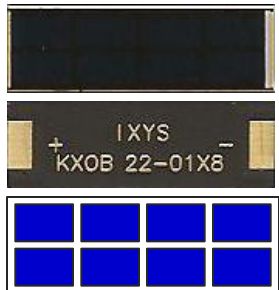
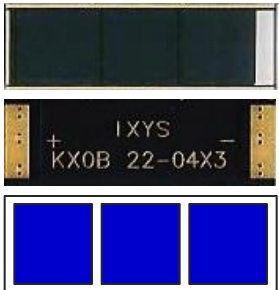


SolarBIT

- KXOB22-12X1 : a single cell
- KXOB22-04X3 : 4 cells in series
- KXOB22-01X8 : 8 cells in series

SPECIFICATIONS:

Symbol	Unit	KXOB22-12X1	KXOB22-04X3	KXOB22-01X8
Voc	V	0.63	1.89	4.7
Isc	mA	50.0	15	4.4
Pmax	mW	22.3	20.07	12.92
Vmax	V	0.50	1.5	3.4
Imax	mA	44.6	13.38	3.8
Dimensions	mm(LxWxH)	22x7x1.8	22x7x1.8	22x7x1.8
Unit cell area	mm ² (LxW)	120.00	36.00	12.00



APPLICATIONS:

- Battery chargers for portables such as cell phones, MP3-players, PDAs, and toys
- Energy harvesting
- Power backup for Zigbee, Nanonet, Bluetooth, sensors, wearables, etc.

SolarMD (Examples)

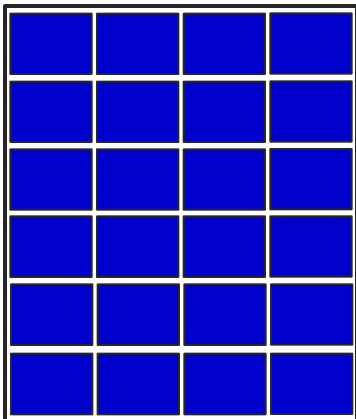
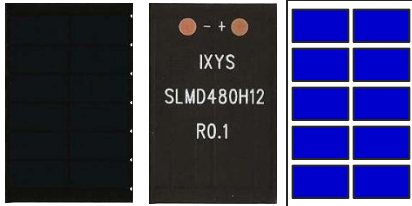
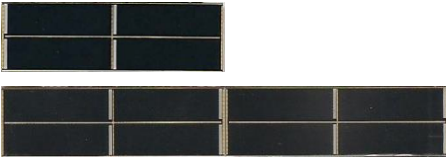
- SLMD121H04L: 20mmx6mm by 4S
- SLMD121H08L: 20mmx6mm by 8S
- SLMD480H12L: 10mmx4.8mm by 12S
- SLMD481H08L: 20mmx12mmx2P by 8S
- SLMD481H12L: 20mmx12mmx2P by 12S

SPECIFICATIONS:

Symbol (unit)	SLMD121H04L	SLMD121H08L	SLMD121H09L	SLMD960H12L	SLMD480H12L	SLMD121H10L	SLMD600H10L	SLMD481H08L	SLMD481H10L	SLMD481H12L
Voc (V)	2.52	5.04	5.67	7.56	7.56	6.30	6.30	5.04	6.30	7.56
Isc (mA)	50.0	50.0	50.0	40.0	20.0	50.0	25.0	200.0	200.0	200
Pmax (mW)	89.2	178.4	200.7	218.2	109.1	223.0	111.5	713.6	892.0	1081.1
Vmax (V)	2.00	4.00	4.50	6.06	6.06	5.00	5.00	4.00	5.00	6.06
Imax (A)	44.6	44.6	44.6	36.0	18.0	44.6	22.3	178.4	178.4	178.4
Dimensions (mm)	43x14x2	86x14x2	62x21x2	42x35x2	22x35x2	42x35x2	22x35x2	89x55x2	89x67x2	90x79x2
Unit cell area (mm ²)	120.00	120.00	120.00	96.00	48.00	120.00	60.00	480.00	480.00	480.00

APPLICATIONS:

- Battery chargers such as ETCs, cell phones, MP3-players, PDAs, and electronic toys
- Emergency backup charging, Energy harvesting, Inductive Loop Vehicle Detection
- Power backup for wireless sensors





SLBC-01-GRN



SLBC-01-PNK



SLBC-01-YEL

SolarET : SLBC-01

- SLBC-01-GRN: Solar Battery Charger, Green
- SLBC-01-PNK: Solar Battery Charger, Pink
- SLBC-01-YEL: Solar Battery Charger, Yellow

FEATURES:

- Portable solar battery charger using IXOLAR™ SolarBIT, 50mA
- Charges primary alkaline battery
- Charges rechargeable alkaline battery
- Charges 2 AAs, 2 AAAs, or one each
- Solar Charger comes with 2AAs, 2 AAAs, and 2 adaptors
- Factory charged and ready to use
- Alkaline battery is eco-friendly

USAGE:

- Various mobile electronics
- Games, electronic toys, remote controllers
- Calculators, cassettes, radios



SolarET : SLFL-M

- SLFL-M-BLK: Solar Flashlight-mini, Green
- SLFL-M-BLU: Solar Flashlight-mini, Blue
- SLFL-M-PNK: Solar Flashlight-mini, Pink
- SLFL-M-WHT: Solar Flashlight-mini, White

FEATURES:

- Portable solar flashlight using IXOLAR™ SolarMD, 50mA
- Eco-friendly rechargeable alkaline battery operated
- High brightness LED, 60 lumen
- Emergency alarm sound (100dB) for child protection
- 3 beacon modes: slow, medium, fast
- One rechargeable alkaline 1000mAh AAAs inside
- Operation hours: 4 hrs in continuous flashlight mode and 15hrs in fast beacon mode.

USAGE:

- Flashlight use at home, offices, car, fishing, hiking, etc.
- Use emergency alarm for child protection
- Use beacon modes in emergency

SolarET : SLFL-IX

- SLFL-IX-WHT: Solar Flashlight-IX, White
- SLFL-IX-BLK: Solar Flashlight-IX, Black



FEATURES:

- Portable solar flashlight using IXOLAR™ SolarMD, 50mA
- Eco-friendly rechargeable alkaline battery operated
- High brightness LED (300mA), 90 lumen
- Dimming mode (75mA) for battery saving
- High light beacon mode
- Two rechargeable alkaline 1500mAh AAs inside
- Operation hours: 5hrs in continuous 300mA high brightness mode and 20hrs in continuous 75mA dimming mode
- Solar charging status indicator by red LED



USAGE:

- Flashlight use at home, offices, car, fishing, hiking, etc.
- Use the beacon mode for emergency signaling
- Company gift or promotion gift

SolarET : SLUC-01-miniB

- SLUC-miniB-WHT: Solar USB charger-miniB, White
- SLUC-miniB-BLK: Solar USB charger-miniB, Black

FEATURES:

- Solar USB battery charger using IXOLAR™ SolarMD, 50mA
- Input : DC 5V, 600mA by micro USB
- Output : DC 5V, 600mA by standard USB
- 3.7V 1000mAh Li-Polymer battery operated
- High brightness LED (75mA), 38 lumen
- Charging time: 90min by USB 5V 600mA and 20hrs by 1sun
- Laser pointer, red
- LED Flashlight: continuous mode, beacon mode



SLUC-01-WHT

USAGE:

- Charges smart phone (iPhone, Galaxy, etc.), MP3 using USB connector
- Flashlight use at home, offices, car, fishing, hiking, etc.
- Laser pointer use at presentation and signaling
- Use the beacon flashlight mode for emergency signaling
- Company gift or promotion gift

- Wireless / Remote Sensors
 - ZIGBEE
 - NANONET
- Portable Electronics such as:
 - Cell Phones
 - GPS Systems
 - Automotive Keypads
 - Sport watches
 - PDAs
- Small and compact PV-arrays for Chargers
- Light Sensors
- Mobile Medical Systems
- ***... any application where extending battery life is a benefit.***

ETC : Electronic Toll Collection, using SLMD960H12L

SEOUL COMMUNICATIONS(a part of SAMSUNG): <http://www.samsungnavi.co.kr/>

AIRPOINT: <http://www.airpoint.co.kr/>

ITRONICS: <http://www.itronics.co.kr/>



Energy Harvesting, using KXOB22-12X1

<http://www.corechips.co.kr/>

Hybrid Energy Harvesting Chip

No external power supply
Energy sources : Piezoelectric, Electromagnetic, Thermoelectric, indoor solar cell, Microwave, Electrostatic
Input voltage : 1.1V - 1kV, Consumption current : under 11uA
Voltage regulation : 3.3V(Fixed)/5.0V(Fixed)/3.0V-5.5V(Adj.)

Power Management / Monitoring

Monitoring : Energy harvesting voltage/current, Stored voltage, Load voltage/current
Input source : AC/DC Energy harvesting
gSensor measurement and analysis
Wireless sensor data display and logging

Energy harvesting

Energy Harvesting Source	Converted Energy (mW)	Frequency (Hz)	Effective Size (cm ²)	Energy Density (mW/cm ²)
Impact Energy	 32	2	400	0.08
Vibration Energy	 1.7	60	0.08	21.3
Strain Energy (Flexible Piezo Patch®)	 3.59	8.3	0.22	16.3
Power Management	Specification			Remark
PowerManagement Chip		입력 전압 : 4.5~5.5V 크기 : 31 X 31 X 3mm Regulating, 충방전 보호, 정전압출력	총전 전류 : 2mA 출력 power : 0.5mA@3.9V	GS Caltex/ GSNanoTech 박막전자용 충방전 최고통합 패키 지 ODM 개발
Solar Powerchip		Solar 충전 광량 : 10,000 lux 이상 크기 : 31 X 31 X 4.7mm	출력 power : 0.5mA@3.9V	

INDUCTIVE LOOP VEHICLE DETECTOR, using SLMD481H12L

<http://www.moru.com/>

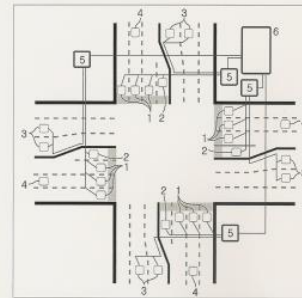
World Best | NexLoop™ is Next Generation Loop Detector

NexLoop™

MP-ILD™ Technology based
Wireless Inductive Loop Vehicle Detector

MP-ILD™ Technology
Micro-power Operable Inductive Loop Vehicle Detect Technology
By MORU Industrial Systems

Why Inductive Loop Vehicle Detector?

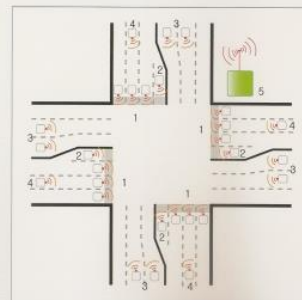


We all know why we mainly used inductive loop vehicle detector for traffic signal control during last 100 years.

The typical reasons are known as

- Widely proved vehicle detect technology
- Best reliability, detect accuracy and economy
- Free to design the microscopic detect area
- Long life

What is NexLoop™?



NexLoop™ is upgraded inductive loop vehicle detector for next 100 years.

The main features are

- Works with traditional inductive loop vehicle detect principle
- Installable on the road surface close to the legacy loop head
- Wireless and micro-power operable with solar energy
- Eliminates troublesome lead in cable



IXOLAR™ SolarBIT

- can connect as many BITs to match an application
- has high mechanical robustness
- is surface mount package
- makes possible automatic pick & place mounting
- requires no hand mounting
- reflow soldering compatible
- tape & reel packaging

Why do IXOLAR™ not degrade over time like other solar technologies?

- IXOLAR™ cells are made from mono-crystalline silicon free from impurities that reduce the output voltage, current and resulting efficiency.
- In comparison polycrystalline, thin film and amorphous materials contain impurities causing an efficiency reduction of 20% in the first 10 to 100 operating hours, following an exponential function.

- KXOB = SolarBIT
- SLMD = SolarMD
- SLUC = SolarET USB Charger
- SLFL = SolarET Flashlight
- SLBC = SolarET Battery Charger

EXAMPLE:

KXOB22- 12X1

SolarBIT

22% cell efficiency

12: 120mm² cell size

1: one cell

EXAMPLE:

SLMD121H10L

SolarMD

121: 120mm² cell size

H: 22% high cell efficiency

10: 10 cells in series

L: film laminated encapsulation

EXAMPLE: **SLUC-01-WHT**

SolarET USB Charger

01: model #

WHT: White color



Preliminary

KXOB22-04X3

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 _{max} [V]	Typ. Current @ P _{max} [mA]
KXOB22-04X3	1.89	15	1.50	13.38

(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	Units
Ratings *			
V _{oc}	open circuit voltage	1.89	V
J _{sc}	short circuit current density (water level)	42.4	mA/cm ²
V _{mp}	voltage at max. power point	1.50	V
J _{mp}	current density at max. power point (water level)	37.2	mA/cm ²
P _{mp}	maximum peak power (water level)	18.6	mW/cm ²
FF	fill factor	> 65	%
η	solar cell efficiency (water level)	22	%
ΔV _{oc} /ΔT	open circuit voltage temp. coefficient (water level)	-2.1	mV/K
ΔJ _{sc} /ΔT	short circuit current temp. coefficient (water level)	0.12	mA/(cm ² 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

IXYS reserves the right to change limits, test conditions and dimensions

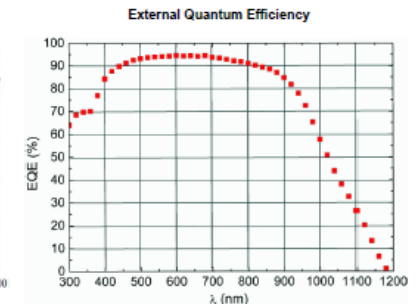
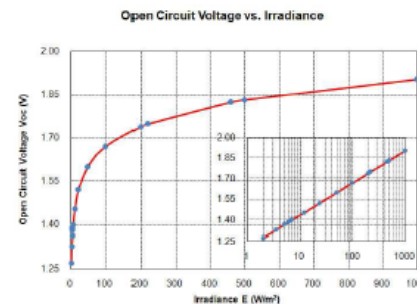
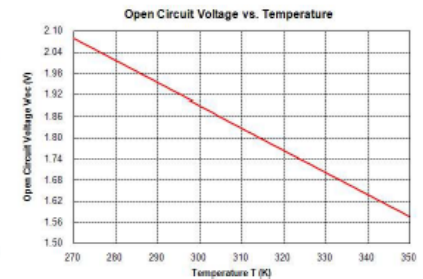
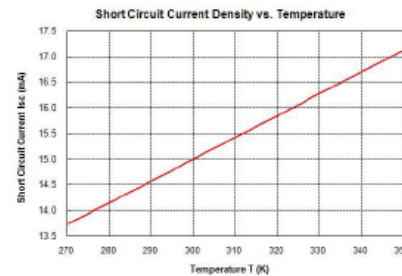
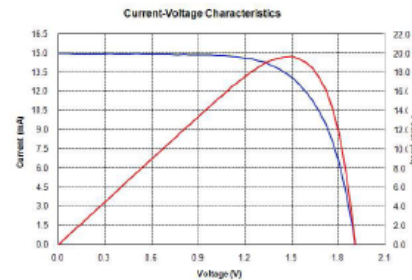
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Preliminary

KXOB22-04X3

Typical SolarBIT Performance Data



North and South AMERICA :

MARKETING: Steve Krausse, IXYS COLORADO

SALES : Ray Segall, IXYS LONGBEACH

EUROPE and Middle EAST :

Marketing : Nick Tarling, IXYS UK

Sales : Nick Tarling, Neil Lejune, Manuel Nardiello, Ludo Huber

ASIA:

Marketing : JW Choi, IXYS KOREA

Sales : Eric Choi, IXYS KOREA

IXOLAR™ Solar Products are Monocrystalline Silicon *resulting in:*

- Higher Efficiency over Thin Film, Amorphous or Polycrystalline Cells
 - **Typically 20% more efficient and higher current density for same surface area**
 - **IXOLAR™ is the most efficient in small SolarBIT and SolarMD applications**
- Conversion of a Wider Frequency Range of Light
 - **Provides usability under most lighting conditions**
 - **Indoors and outdoors**
 - **Incandescent, fluorescent, etc.**
- Consistent Performance Over Time
 - **No degradation of power output**
 - **No loss of frequency response**
- Extended Industrial Temperature Range
- Higher Reliability / Longer Life

