

MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION
STAFF REPORT

Address:	6901 Westmoreland Ave., Takoma Park	Meeting Date:	11/17/2021
Resource:	Contributing Resource Takoma Park Historic District	Report Date:	11/10/2021
Applicant:	Gregory Graham	Public Notice:	11/3/2021
Review:	HAWP	Tax Credit:	n/a
Permit No.:	967908	Staff:	Dan Bruechert
Proposal:	Solar Panel Installation		

STAFF RECOMMENDATION

Staff recommends the HPC **approve with one condition** the HAWP:

1. Approval of the HAWP does not extend to the three panels in the northwest corner of the proposed array and they must be removed, for a total approved array of 17 panels;

ARCHITECTURAL DESCRIPTION

SIGNIFICANCE: Contributing Resource to the Takoma Park Historic District
STYLE: Craftsman/Colonial Revival
DATE: c.1920



Figure 1: 6901 Westmoreland Ave.

PROPOSAL

The applicant proposes to install 20 photovoltaic solar panels on the roof of the subject property.

APPLICABLE GUIDELINES

When reviewing alterations and new construction within the Takoma Park Historic District several documents are to be utilized as guidelines to assist the Commission in developing their decision. These documents include the historic preservation review guidelines in the approved and adopted amendment for the *Takoma Park Historic District (Guidelines)*, *Montgomery County Code Chapter 24A (Chapter 24A)*, and the *Secretary of the Interior's Standards for Rehabilitation (Standards)* and Historic Preservation Commission Policy No. 20-01: ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS. The pertinent information in these documents is outlined below.

Takoma Park Historic District Guidelines

There are two very general, broad planning and design concepts which apply to all categories. These are:

The design review emphasis will be restricted to changes that are at all visible from the public right-of-way, irrespective of landscaping or vegetation (it is expected that the majority of new additions will be reviewed for their impact on the overall district), and,

The importance of assuring that additions and other changes to existing structures act to reinforce and continue existing streetscape, landscape, and building patterns rather than to impair the character of the district.

Contributing Resources should receive a more lenient review than those structures that have been classified as Outstanding. This design review should emphasize the importance of the resource to the overall streetscape and its compatibility with existing patterns rather than focusing on a close scrutiny of architectural detailing. In general, however, changes to Contributing Resources should respect the predominant architectural style of the resource. As stated above, the design review emphasis will be restricted to changes that are *at all visible from the public right-of-way*, irrespective of landscaping or vegetation.

Some of the factors to be considered in reviewing HAWPs on Contributing Resources include:

All exterior alterations, including those to architectural features and details, should be generally consistent with the predominant architectural style and period of the resource and should preserve the predominant architectural features of the resource; exact replication of existing details and features is, however, not required

All changes and additions should respect existing environmental settings, landscaping, and patterns of open space.

Montgomery County Code; Chapter 24A-8

- (a) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to ensure conformity with the purposes and requirements of this chapter, if it finds that:
 - (1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or

- (2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter; or
- (d) In the case of an application for work on an historic resource located within an historic district, the commission shall be lenient in its judgment of plans for structures of little historical or design significance or for plans involving new construction, unless such plans would seriously impair the historic or architectural value of surrounding historic resources or would impair the character of the historic district. (Ord. No. 9-4, § 1; Ord. No. 11-59.)

Secretary of the Interior's Standards for Rehabilitation:

- 2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
- 9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportions, and massing to protect the integrity of the property and its environment.
- 10. New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Historic Preservation Commission Policy No. 20-01: ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS

Now, THEREFORE:

WHEREAS, Historic Area Work Permit decisions are guided by the criteria in Section 24A, The Secretary of the Interior's Standards for Rehabilitation, and pertinent guidance from applicable master plan amendments and/or site or district-specific studies;

WHEREAS, The Secretary of the Interior's Standards for Rehabilitation as interpreted by the National Park Service limit the placement of rooftop solar panels under Standards 2, 9, and 10 to less conspicuous locations;

WHEREAS, the County Council has established a Climate Emergency;

WHEREAS, the Historic Preservation is a body established by the County Executive and County Council;

WHEREAS, Section 24-8(b)(6) states, "In balancing the interest of the public in preserving the historic site or historic resource located within an historic district, with the interests of the public from the use and benefit of the alternative proposal, the general public welfare is better served by granting the permit;"

WHEREAS, the widespread use of solar panels, both for hot water and for electricity production, will reduce greenhouse gases in the county, in accordance with the aims of the Emergency Climate Mobilization resolution (Resolution No.: 18-974), it shall be the policy of the Historic Preservation Commission that:

- 1. The preferred locations for solar panel installation(s) on a designated historic site or an historic resource located within an historic district is a) on the rear of the property, b) on non-historic building additions, c) on accessory structures, or d) in ground-mounted arrays;

2. If it is not feasible to install solar panels in one of the identified preferred locations due to resource orientation or other site limitations; and,
3. The roof is determined to be neither architecturally significant, nor a character-defining feature of the resource, nor is it a slate or tile roof, that unless it can be demonstrated that the solar array will be installed without damaging the historic character of the resource or historic fabric; then
4. The public welfare is better served by approving a Historic Area Work Permit for solar panels on all visible side or front roof slopes under Section 24A-8(b)(6).
5. A Historic Area Work Permit (HAWP) is required for all work referenced in this policy.

STAFF DISCUSSION

The subject property is a side gable house with Colonial Revival and Craftsman elements. The primary entrance to the house is from Westmoreland Ave., but the front of the house is oriented toward the intersection of Walnut Ave., Elm Ave., and Westmoreland Ave. The property to the north is ‘Non-Contributing’ and the other surrounding properties are all ‘Contributing.’

The applicant proposes to install 20 roof-mounted solar panels on the roof.

In considering roof-mounted solar panels to ‘Contributing’ resources to the Takoma Park Historic District, several factors need to be taken into account. First, can the panels be installed on an accessory structure, ground-mounted array, non-historic addition, or rear of the subject property? In this case, the answer to all of these questions is no. The property does not have an accessory structure, is too small for a ground-mounted array, and any additions have been fully integrated into the house’s roof plan. Additionally, due to the house’s orientation, an array on the rear roof slope (north) is infeasible for solar collection. Staff finds that the roof of the subject property is not character-defining or architecturally significant and its asphalt shingles are not a historically significant material. Therefore, the public is better served to approve the HAWP under 24A-8(b)(6).

However, one of the additional considerations when allowing visible solar panels on designated historic properties is, is the arrangement of the panels in a compact form? Staff finds, in this instance, it is not. The arrangement of panels on the lower portion of the roof is a simple rectangle, but there is a large hole in the array to avoid interfering with the chimney (see roof plan below). Staff finds that the gap in the array is an undesirable feature that attracts additional visual attention, rather than blending in with the roof form the way a simple rectangle or square would. Staff recommends the HPC include a condition for approval to this HAWP to remove the three panels that wrap around the chimney. These three panels are located in the northwest corner of the roof and are notated on the roof plan of the Staff Report.

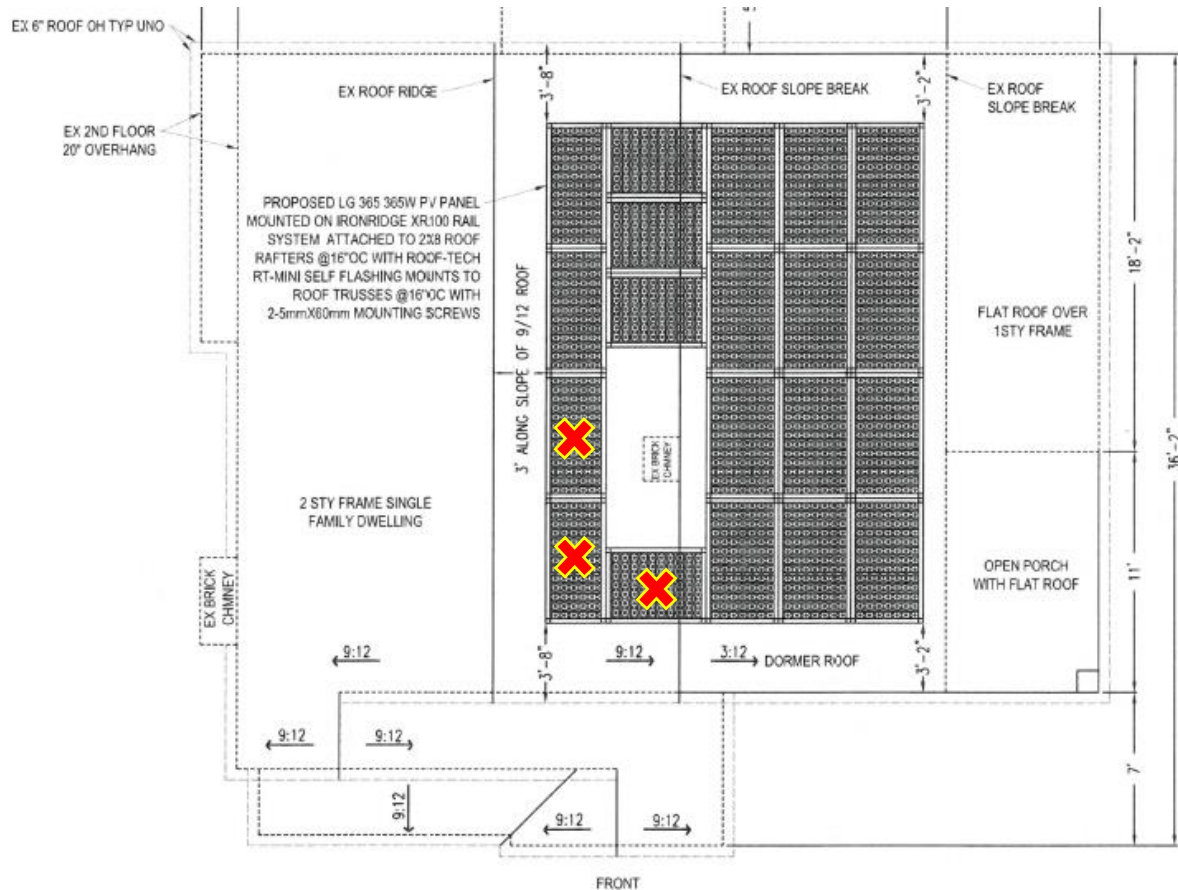


Figure 2: Proposed roof plan with panels Staff recommends be removal notated with an 'X.'

STAFF RECOMMENDATION

Staff recommends that the Commission **approve with one (1) condition** the HAWP application:

2. Approval of the HAWP does not extend to the three panels in the northwest corner of the proposed array and they must be removed, for a total approved array of 17 panels; under the Criteria for Issuance in Chapter 24A-8(b)(2), (6), and (d) of the *Takoma Park Historic District Guidelines*, and the Historic Preservation Commission Policy No. 20-01: ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS, having found that the proposal will not substantially alter the exterior features of the historic resource and is compatible in character with the district and the purposes of Chapter 24A;

and with the *Secretary of the Interior's Standards for Rehabilitation* #2, 9, and 10;

and with the general condition that the applicant shall present an electronic set of drawings, if applicable, to Historic Preservation Commission (HPC) staff for review and stamping prior to submission for the Montgomery County Department of Permitting Services (DPS) building permits;

and with the general condition that final project design details, not specifically delineated by the Commission, shall be approved by HPC staff or brought back to the Commission as a revised HAWP application at staff's discretion;

and with the general condition that the applicant shall notify the Historic Preservation Staff if they propose to make **any alterations** to the approved plans. Once the work is completed the applicant will contact the staff person assigned to this application at 301-563-3400 or

dan.bruechert@montgomeryplanning.org to schedule a follow-up site visit.



APPLICATION FOR
HISTORIC AREA WORK PERMIT
HISTORIC PRESERVATION COMMISSION
301.563.3400

FOR STAFF ONLY:
HAWP# 967908
DATE ASSIGNED

APPLICANT:

Name: Gregory Graham
Address: 6901 Westmoreland Ave
Daytime Phone: 301-665-0635

E-mail: gregoryfrankgraham@gmail.com
City: Takoma Park Zip: 20912
Tax Account No.: 01065843

AGENT/CONTACT (if applicable):

Name: Gailan Wensil-Strow
Address: 221 Gateway Drive
Daytime Phone: 410-557-0555

E-mail: gwensil-strow@adbuild.com
City: Bel Air Zip: 21014
Contractor Registration No.: 1273943

LOCATION OF BUILDING/PREMISE: MIHP # of Historic Property

Is the Property Located within an Historic District? ☒ Yes/District Name Takoma Park Historic District
☐ No/Individual Site Name

Is there an Historic Preservation/Land Trust/Environmental Easement on the Property? If YES, include a map of the easement, and documentation from the Easement Holder supporting this application.
No

Are other Planning and/or Hearing Examiner Approvals /Reviews Required as part of this Application? (Conditional Use, Variance, Record Plat, etc.?) If YES, include information on these reviews as supplemental information. No

Building Number: 6901 Street: Westmoreland Ave

Town/City: Takoma Park Nearest Cross Street: Elm Ave

Lot: P11 Block: F Subdivision: 0025 Parcel: 0000

TYPE OF WORK PROPOSED: See the checklist on Page 4 to verify that all supporting items for proposed work are submitted with this application. Incomplete Applications will not be accepted for review. Check all that apply:

- | | | |
|---|--|--|
| <input type="checkbox"/> New Construction | <input type="checkbox"/> Deck/Porch | <input type="checkbox"/> Shed/Garage/Accessory Structure |
| <input type="checkbox"/> Addition | <input type="checkbox"/> Fence | <input checked="" type="checkbox"/> Solar |
| <input type="checkbox"/> Demolition | <input type="checkbox"/> Hardscape/Landscape | <input type="checkbox"/> Tree removal/planting |
| <input type="checkbox"/> Grading/Excavation | <input type="checkbox"/> Roof | <input type="checkbox"/> Window/Door |
| | | <input type="checkbox"/> Other: |

I hereby certify that I have the authority to make the foregoing application, that the application is correct and accurate and that the construction will comply with plans reviewed and approved by all necessary agencies and hereby acknowledge and accept this to be a condition for the issuance of this permit.

Signature of owner or authorized agent

10/12/2021

Date

HAWP APPLICATION: MAILING ADDRESSES FOR NOTIFING
[Owner, Owner's Agent, Adjacent and Confronting Property Owners]

Owner's mailing address 6901 Westmoreland Ave, Takoma Park, MD 20912	Owner's Agent's mailing address 221 Gateway Drive, Bel Air, MD 21014
Adjacent and confronting Property Owners mailing addresses	
68 Walnut Ave, Takoma Park, MD 20912	6907 Westmoreland Ave, Takoma Park, MD 20912
60 Elm Ave, Takoma Park MD 20912	50 Elm Ave, Takoma Park, MD 20912
65 Walnut Ave, Takoma Park, MD 20912	54 Elm Avenue Takoma Park, MD 20912

49 Elm Avenue
 Takoma Park, MD 20912

Description of Property: Please describe the building and surrounding environment. Include information on significant structures, landscape features, or other significant features of the property:

2 story dwelling facing Westmoreland Ave, surrounded on 3 sides by trees

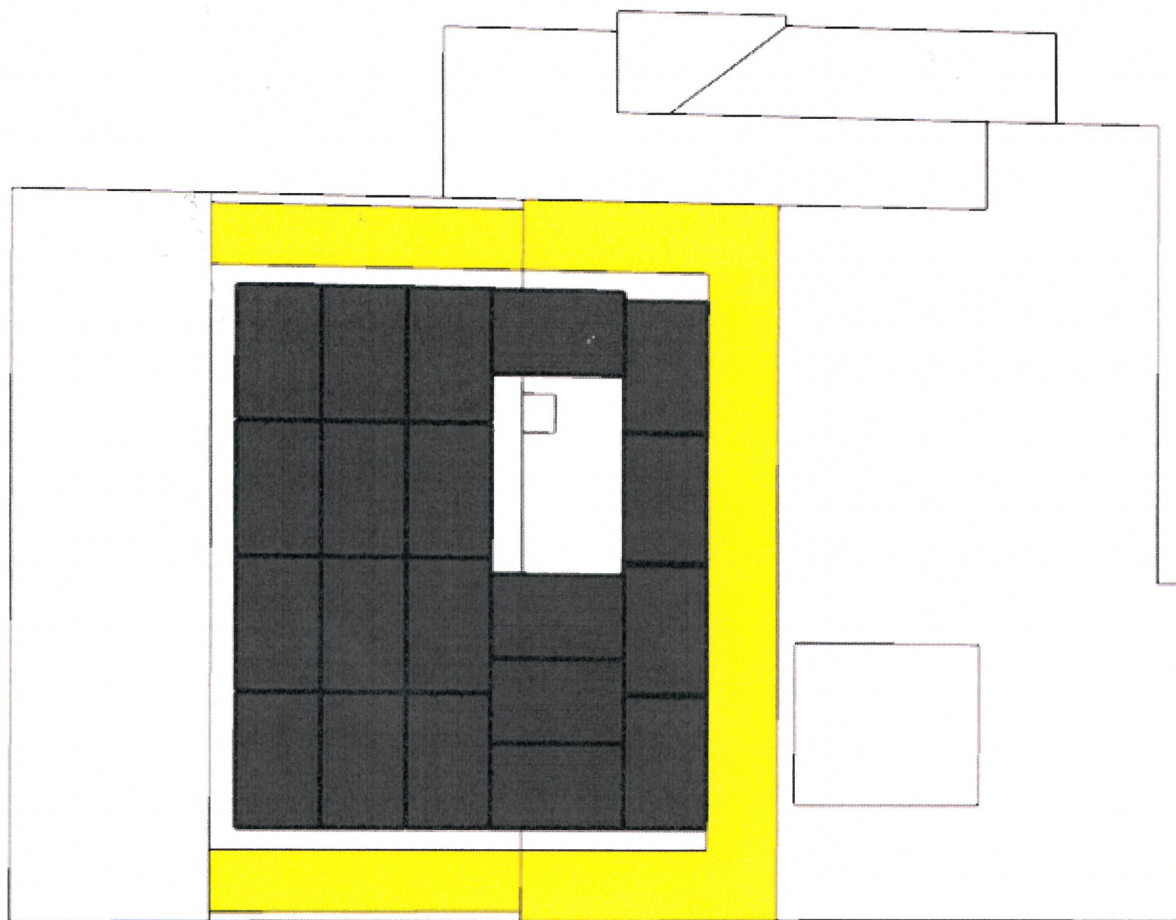
Description of Work Proposed: Please give an overview of the work to be undertaken:

Install 20 panel 7.3kW roof mounted solar PV system on front-facing roof of building

Work Item 1: <u>Solar Panels</u>	
Description of Current Condition: <div>N/A</div>	Proposed Work: <div>Install 20 panels on front roof</div>

Work Item 2: _____	
Description of Current Condition:	Proposed Work:

Work Item 3: _____	
Description of Current Condition:	Proposed Work:

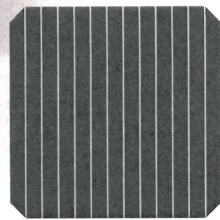


LG NeON[®] 2 Black

LG365N1K-A6

365W

The LG NeON[®] 2 is LG's best selling solar module and one of the most powerful and versatile modules on the market today. The cells are designed to appear all-black at a distance, and the performance warranty guarantees 90.6% of labeled power output at 25 years.



60

Features



Enhanced Performance Warranty

LG NeON[®] 2 Black has an enhanced performance warranty. After 25 years, LG NeON[®] 2 Black is guaranteed at least 90.6% of initial performance.



25-Year Limited Product Warranty

The NeON[®] 2 Black is covered by a 25-year limited product warranty. In addition, up to \$450 of labor costs will be covered in the rare case that a module needs to be repaired or replaced.



Solid Performance on Hot Days

LG NeON[®] 2 Black performs well on hot days due to its low temperature coefficient.



Roof Aesthetics

LG NeON[®] 2 Black has been designed with aesthetics in mind using thinner wires that appear all black at a distance.

When you go solar, ask for the brand you can trust: LG Solar

About LG Electronics USA, Inc.

LG Electronics is a global leader in electronic products in the clean energy markets by offering solar PV panels and energy storage systems. The company first embarked on a solar energy source research program in 1985, supported by LG Group's vast experience in the semi-conductor, LCD, chemistry and materials industries. In 2010, LG Solar successfully released its first MonoX[®] series to the market, which is now available in 32 countries. The NeON[®] (previous MonoX[®] NeON), NeON[®]2, NeON[®]2 BiFacial won the "Intersolar AWARD" in 2013, 2015 and 2016, which demonstrates LG's leadership and innovation in the solar industry.



LG NeON[®]2 Black

LG365N1K-A6

General Data

Cell Properties (Material/Type)	Monocrystalline/N-type
Cell Maker	LG
Cell Configuration	60 Cells (6 x 10)
Number of Busbars	12EA
Module Dimensions (L x W x H)	1,740mm x 1,042mm x 40 mm
Weight	18.6 kg
Glass (Material)	Tempered Glass with AR coating
Backsheet (Color)	Black
Frame (Material)	Anodized Aluminium
Junction Box (Protection Degree)	IP 68 with 3 Bypass Diodes
Cables (Length)	1,100mm x 2EA
Connector (Type/Maker)	MC 4/MC

Certifications and Warranty

Certifications*	IEC 61215-1/-1-1/2 : 2016, IEC 61730-1/2 : 2016, UL 61730-1 : 2017, UL 61730-2 : 2017 ISO 9001, ISO 14001, ISO 50001 OHSAS 18001
Salt Mist Corrosion Test	IEC 61701:2012 Severity 6
Ammonia Corrosion Test	IEC 62716:2013
Module Fire Performance	Type 2 (UL 61730)
Fire Rating	Class C (UL 790, ULC/ORD C 1703)
Solar Module Product Warranty	25 Year Limited
Solar Module Output Warranty	Linear Warranty*

*Improved 1st year 98.5% from 2-24th year -0.33%/year down, 90.6% at year 25

Temperature Characteristics

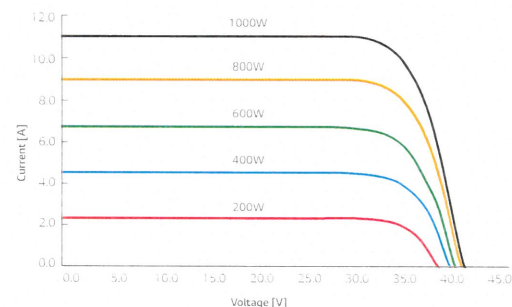
NMOT*	[°C]	42 ± 3
Pmax	[%/°C]	-0.35
Voc	[%/°C]	-0.26
Isc	[%/°C]	0.03

*NMOT (Nominal Module Operating Temperature). Irradiance 800 W/m²; Ambient temperature 20°C, Wind speed 1 m/s, Spectrum AM 1.5

Electrical Properties (NMOT)

Model	LG365N1K-A6	
Maximum Power (Pmax)	[W]	274
MPP Voltage (Vmpp)	[V]	33.0
MPP Current (Impp)	[A]	8.30
Open Circuit Voltage (Voc)	[V]	39.4
Short Circuit Current (Isc)	[A]	8.78

I-V Curves



Electrical Properties (STC*)

Model	LG365N1K-A6	
Maximum Power (Pmax)	[W]	365
MPP Voltage (Vmpp)	[V]	35.1
MPP Current (Impp)	[A]	10.41
Open Circuit Voltage (Voc ± 5%)	[V]	41.8
Short Circuit Current (Isc ± 5%)	[A]	10.92
Module Efficiency	[%]	20.1
Power Tolerance	[%]	0 ~ +3

*STC (Standard Test Condition). Irradiance 1000 W/m²; cell temperature 25°C, AM 1.5
Measurement Tolerance of Pmax ± 3%

Operating Conditions

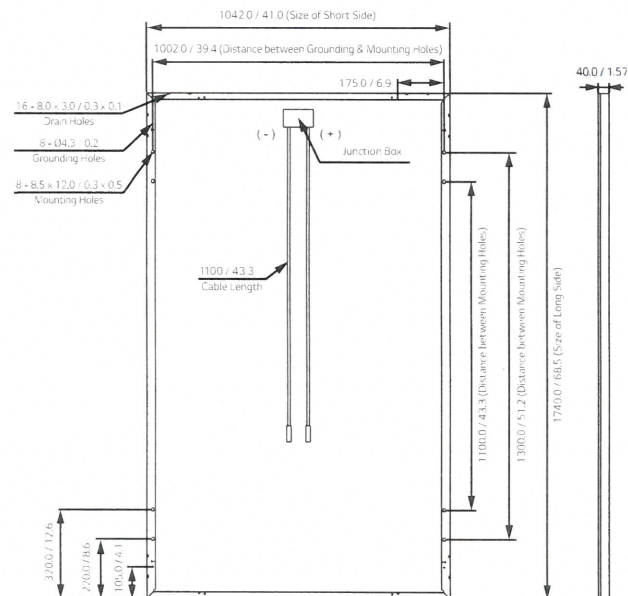
Operating Temperature	[°C]	-40 ~ +85
Maximum System Voltage	[V]	1,000 (UL/IEC)
Maximum Series Fuse Rating	[A]	20
Mechanical Test Load* (Front)	[Pa/psf]	5,400
Mechanical Test Load* (Rear)	[Pa/psf]	4,000

*Based on IEC 61215-2 : 2016 (Test Load = Design Load x Safety Factor (1.5))
Mechanical Test Loads 6,000Pa/5,400Pa based on IEC 61215:2005

Packaging Configuration

Number of Modules per Pallet	[EA]	25
Number of Modules per 40' Container	[EA]	650
Number of Modules per 53' Container	[EA]	850
Packaging Box Dimensions (L x W x H)	[mm]	1,790 x 1,120 x 1,213
Packaging Box Dimensions (L x W x H)	[in]	70.5 x 44.1 x 47.8
Packaging Box Gross Weight	[kg]	500
Packaging Box Gross Weight	[lb]	1,102

Dimensions (mm/inch)

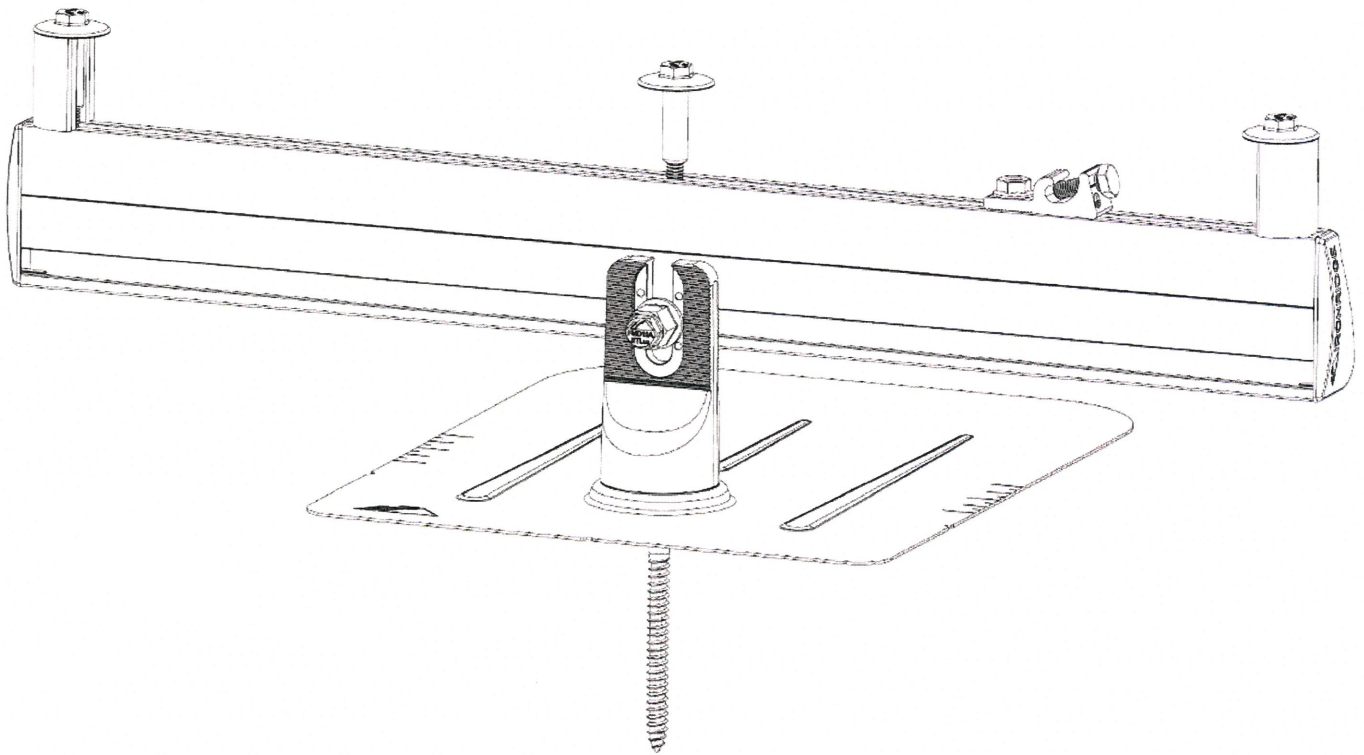


LG Electronics USA, Inc.
Solar Business Division
2000 Millbrook Drive
Lincolnshire, IL 60069
www.lg-solar.com

Product specifications are subject to change without notice.
LG365N1K-A6.pdf
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FLUSH MOUNT



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DISCLAIMER

This manual describes the proper installation procedures and provides minimum standards required for product reliability and warranty. Thoroughly understanding this manual is imperative to proper installation; failure to follow the guidelines set forth can result in property damage, bodily injury, or even death.

IT IS THE INSTALLER'S RESPONSIBILITY TO:

- Ensure that the installation is completed by a licensed solar professional. All electrical installation and procedures should be conducted by a licensed and bonded electrician or solar contractor. Routine maintenance of a module or panel shall not involve breaking or disturbing the bonding path of the system.
- Comply with all applicable local or national building and fire codes, including any that may supersede this manual.
- Ensure all products are appropriate for the installation, environment, and array under the site's loading conditions.
- Use only IronRidge parts or parts recommended by IronRidge; substituting parts may void any applicable warranty.
- Review the [Design Assistant](#) and [Certification Letters](#) to confirm design specifications.
- Refer to Ironridge's Structural Certification letters for state specific design conditions including allowable rail spans, cantilever length, and splice location requirements.
- Comply with all applicable fire codes including, but not limited to, keeping walkways clear and avoiding obstacles
- Ensure provided information is accurate. Issues resulting from inaccurate information are the installer's responsibility.
- Ensure bare copper grounding wire does not contact aluminum and zinc-plated steel components, to prevent risk of galvanic corrosion.
- If loose components or loose fasteners are found during periodic inspection, re-tighten immediately. If corrosion is found, replace affected components immediately.
- Provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.
- Disconnect AC power before servicing or removing microinverters and power optimizers.
- Review module manufacturer's documentation to ensure compatibility and compliance with warranty terms and conditions.

RATINGS

UL 2703 LISTED



#5003288

#5003320

Intertek

#5004376

- Conforms to ANSI/UL 2703 (2015) Standard for Safety First Edition: Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
- Max Overcurrent Protective Device (OCPD) Rating: 25A
- Max Module Size: 24ft²
- Module Orientation: Portrait or Landscape
- Mechanical Load Rating: meets minimum requirements of the standard (10 PSF downward, 5 PSF upward, 5 PSF lateral). Actual system structural capacity is defined by PE stamped certification letters.

CLASS A SYSTEM FIRE RATING PER UL 1703

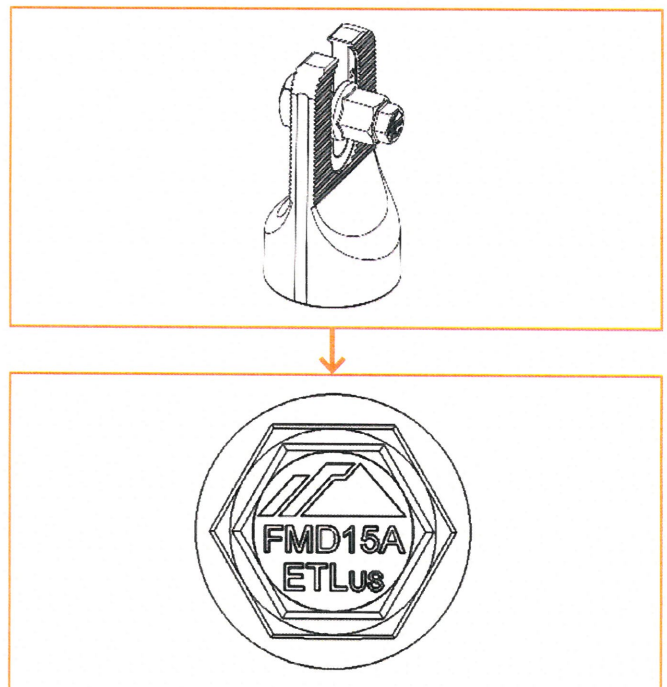
- Any Roof Slope with Module Types 1, 2, and 3
- Any module-to-roof gap is permitted, with no perimeter guarding required. This rating is applicable with any third-party attachment.
- Class A rated PV systems can be installed on Class A, B, and C roofs without affecting the roof fire rating.

STRUCTURAL CERTIFICATION

- Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7

MARKINGS

Product markings are located on the 3/8" flange hex nut.



CHECKLIST

PRE-INSTALLATION

- ☐ Verify module compatibility. See [Page 9](#) for info.

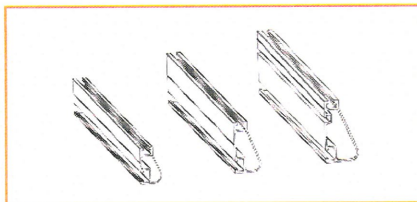
TOOLS REQUIRED

- ☐ Cordless Drill (non-impact)
- ☐ Impact Driver (for lag bolts)
- ☐ Torque Wrench (0-250 in-lbs)
- ☐ 5/16" Socket
- ☐ 7/16" Socket
- ☐ 1/2" Socket
- ☐ String Line

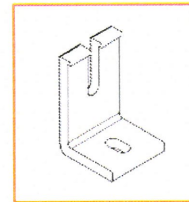
TORQUE VALUES

- ☐ FlashFoot2 Lag Bolts (7/16" Socket): Fully seat
- ☐ Bonded Splice Screws (5/16" Socket): 20 in-lbs
- ☐ Grounding Lug Nuts (7/16" Socket): 80 in-lbs
- ☐ Grounding Lug Terminal Screws (7/16 Socket): 20 in-lbs
- ☐ Universal Fastening Object (7/16" Socket): 80 in-lbs
- ☐ Expansion Joint Nuts (7/16" Socket): 80 in-lbs
- ☐ Flush Standoffs (1/2" Socket): 140 in-lbs
- ☐ Microinverter Kit Nuts (7/16" Socket): 80 in-lbs
- ☐ Frameless Module Kit Nuts (7/16" Socket): 80 in-lbs
- ☐ 3/8" Bonding Hardware Kit Nuts (7/16" Socket): 250 in-lbs

IRONRIDGE COMPONENTS



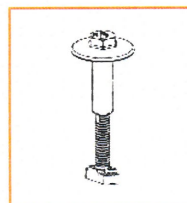
XR Rail



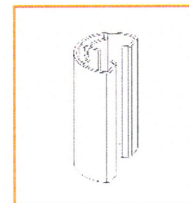
L-Foot



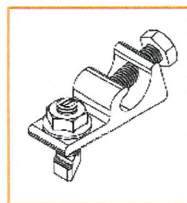
Bonded Splice



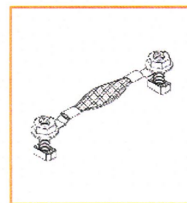
UFO



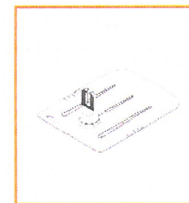
Stopper Sleeve



Grounding Lug



Expansion Joint



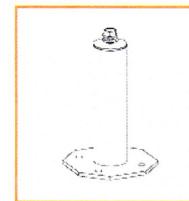
FlashFoot2



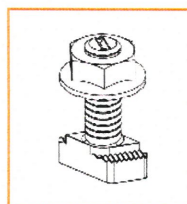
End Cap



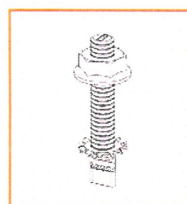
Wire Clip



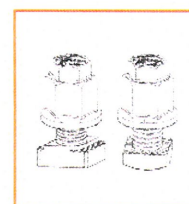
Flush Standoff



Microinverter Kit



Frameless
Module Kit



3/8" Bonding
Hardware Kits

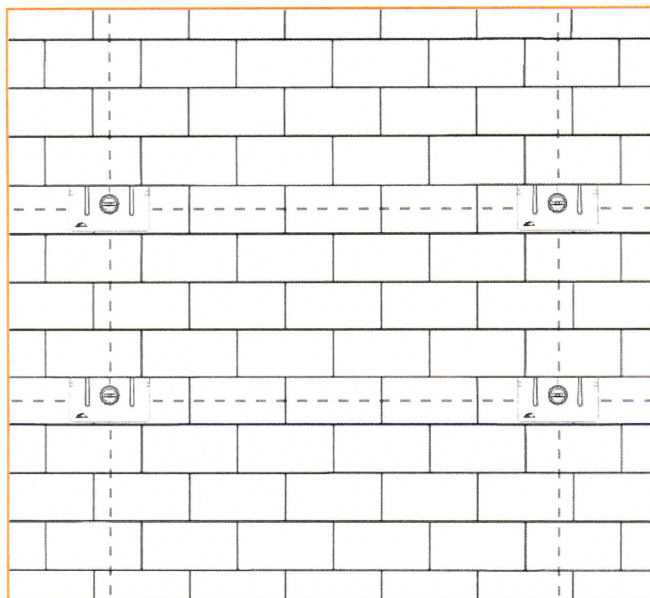
💡 If using previous version of: Integrated Grounding Mid Clamps, Grounding Lug, End Clamps, and Expansion Joints please refer to Alternate Components Addendum (Version 1.10).

1. ATTACH BASES

Install roof attachments. Mount Slotted L-Feet, FlashFoot2, or other compatible roof attachment per manufacturer's instructions.

- 💡 IronRidge's all-in-one FlashFoot2 roof attachment is for pitched, composition shingle roofs. Refer to [Page 7](#) or [provided manual](#).
- 💡 Tested or evaluated third-party roof attachments:
 - [Anchor Products](#) - U-Anchor
 - S-5! [Standing Seam Metal Roof Clamps](#) - Certification of metal roof clamps includes bonding to both painted and galvalume metal roofs. Tighten clamp set screws to 130-150 in-lbs (≥ 24 gauge) or 160-180 in-lbs (22 gauge) roofs. Tighten S-5! M10 bolt to 240 in-lbs or S-5! Mini M8 bolt to 156 in-lbs.
 - EcoFasten [Green Fasten GF-1 Anchors](#)
 - QuickMount PV [Roof Mounts](#) and [Tile Hooks](#) - Tile Hook attaches to XR Rail using 3/8" Bonding Hardware Kit torqued to 250 in-lbs.
 - Quickscrews Solar Roof Hooks, Ejot Aluminum Roof Hooks, or Unirac Creotecc Tile Hooks - Attach to XR Rails using either L-Foot Kit or 3/8" Bonding Hardware Kit torqued to 250 in-lbs.

💡 Refer to [Page 7](#) for installing Standoffs

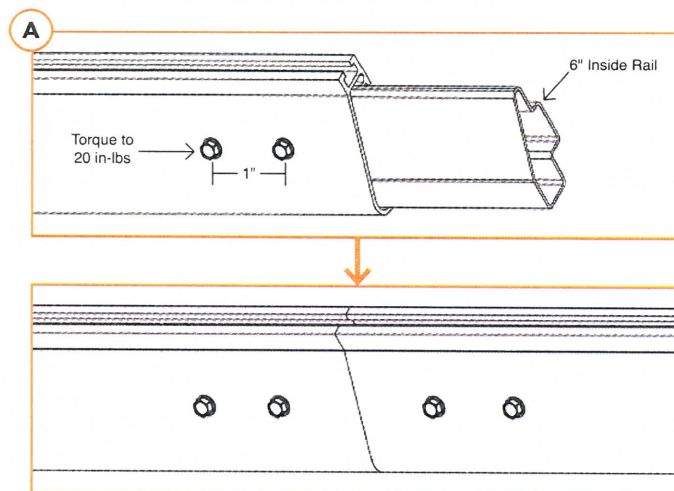


2. PLACE RAILS

A. CONNECT SPLICES

Use Bonded Splices, when needed, to join multiple sections of rail. Insert Bonded Splice 6" into first rail and secure with two self-drilling screws, spacing them approximately 1" apart and tightening to **20 in-lbs**. Slide second rail over Bonded Splice and secure with two more self-drilling screws.

- 💡 Rows exceeding 100 feet of rail must use [Expansion Joints](#).
- 💡 For XR10 and XR100 rails, insert screws along the provided lines.
- 💡 Refer to Structural Certification letters for rail splice location requirements.
- 💡 Screws can be inserted on front or back of rails.



B. PREPARE HARDWARE

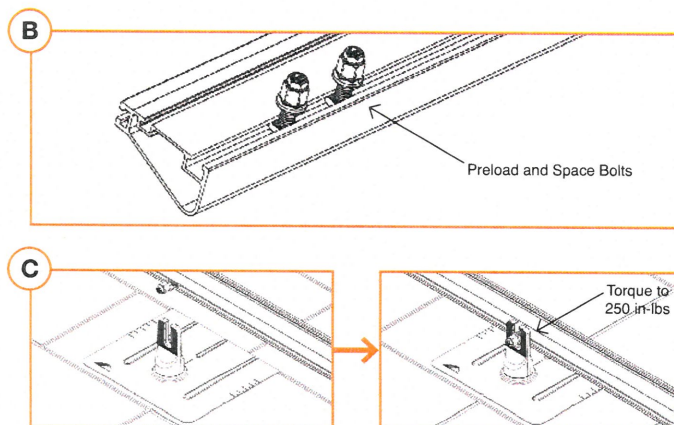
On the ground, slide square-headed or t-bolt hardware into side-facing rail slot. Space out bolts to match attachment spacing.

- 💡 Tape ends of rail, to keep bolts from sliding out while moving.

C. ATTACH RAILS

Drop rail with hardware into roof attachment. Level rail at desired height, then torque to **250 in-lbs**.

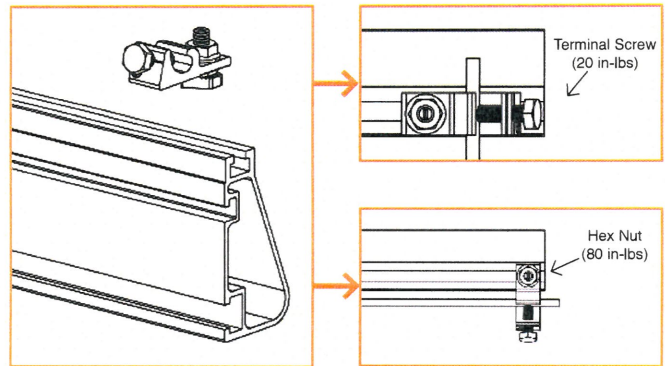
- 💡 Rail can face either upslope or downslope on roof.



3. SECURE LUGS

Insert T-bolt in top rail slot and torque hex nut to **80 in-lbs**. Install a minimum 10 AWG solid copper or stranded grounding wire. Torque terminal screw to **20 in-lbs**.

- 💡 Grounding Lugs are only needed on one rail per row of modules (unless frameless modules are being used, see [Page 8](#)).
- 💡 If using Enphase microinverters, Grounding Lugs may not be needed. See [Page 8](#) for more information.
- 💡 Grounding Lugs can be installed anywhere along the rail and in either orientation shown.

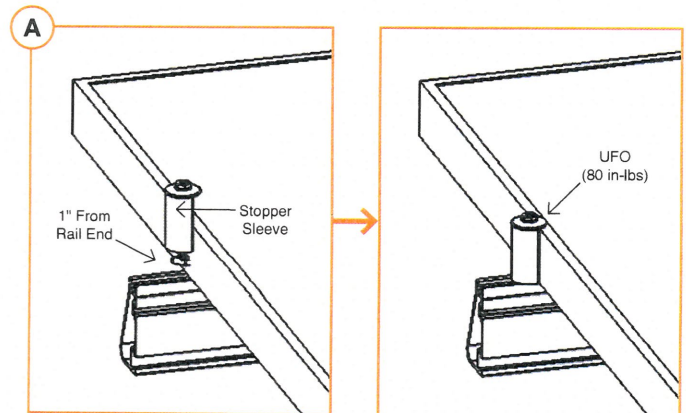


4. SECURE MODULES

A. SECURE FIRST END

Place first module in position on rails, a minimum of 1" from rail ends. Snap Stopper Sleeves onto UFO. Fasten module to rail using the UFO, ensuring that the UFO is hooked over the top of the module. Torque to **80 in-lbs**.

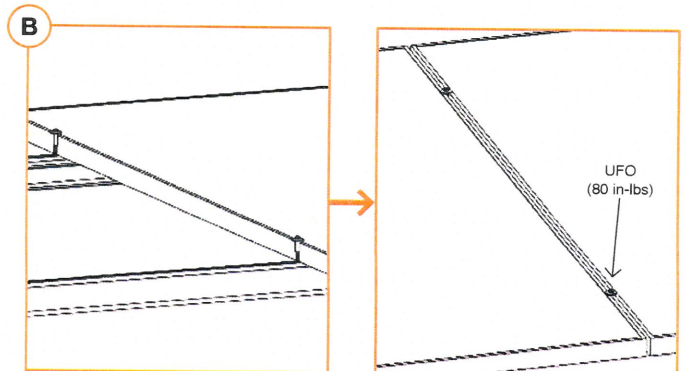
- 💡 Ensure rails are square before placing modules.
- 💡 Hold Stopper Sleeves on end while torquing to prevent rotation.



B. SECURE NEXT MODULES

Place UFO into each rail, placing them flush against first module. Slide second module against UFO. Torque to **80 in-lbs**. Repeat for each following module.

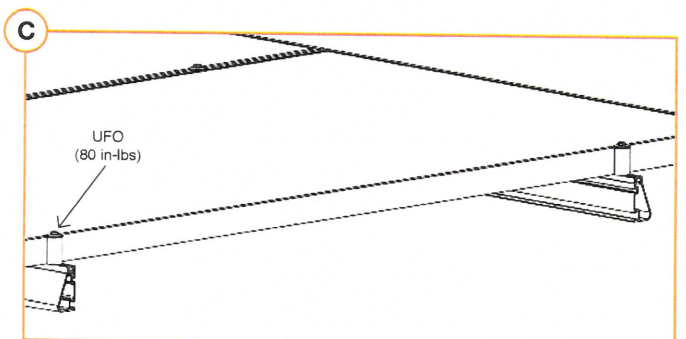
- 💡 When reinstalling UFO, move modules a minimum of 1/16" so UFOs are in contact with a new section of module frame.
- 💡 If using Wire Clips, refer to [Page 7](#).



C. SECURE LAST END

Place last module in position on rails, a minimum of 1" from rail ends. Snap Stopper Sleeves onto UFO. Secure UFO Clamps on rails, ensuring they are hooked over top of module. Torque to **80 in-lbs**.

- 💡 Hold Stopper Sleeves on end while torquing to prevent rotation.
- 💡 Repeat all steps for each following row of modules.



EXPANSION JOINTS

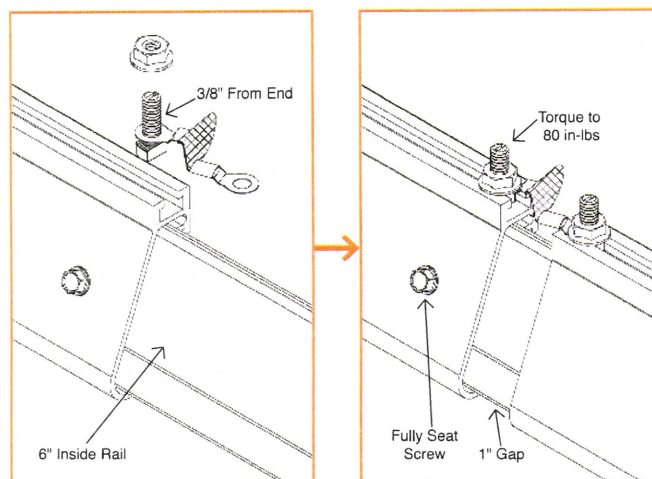
GROUNDING STRAP EXPANSION JOINT

Grounding Strap Expansion Joints are required for thermal expansion of rows exceeding 100 feet of rail.

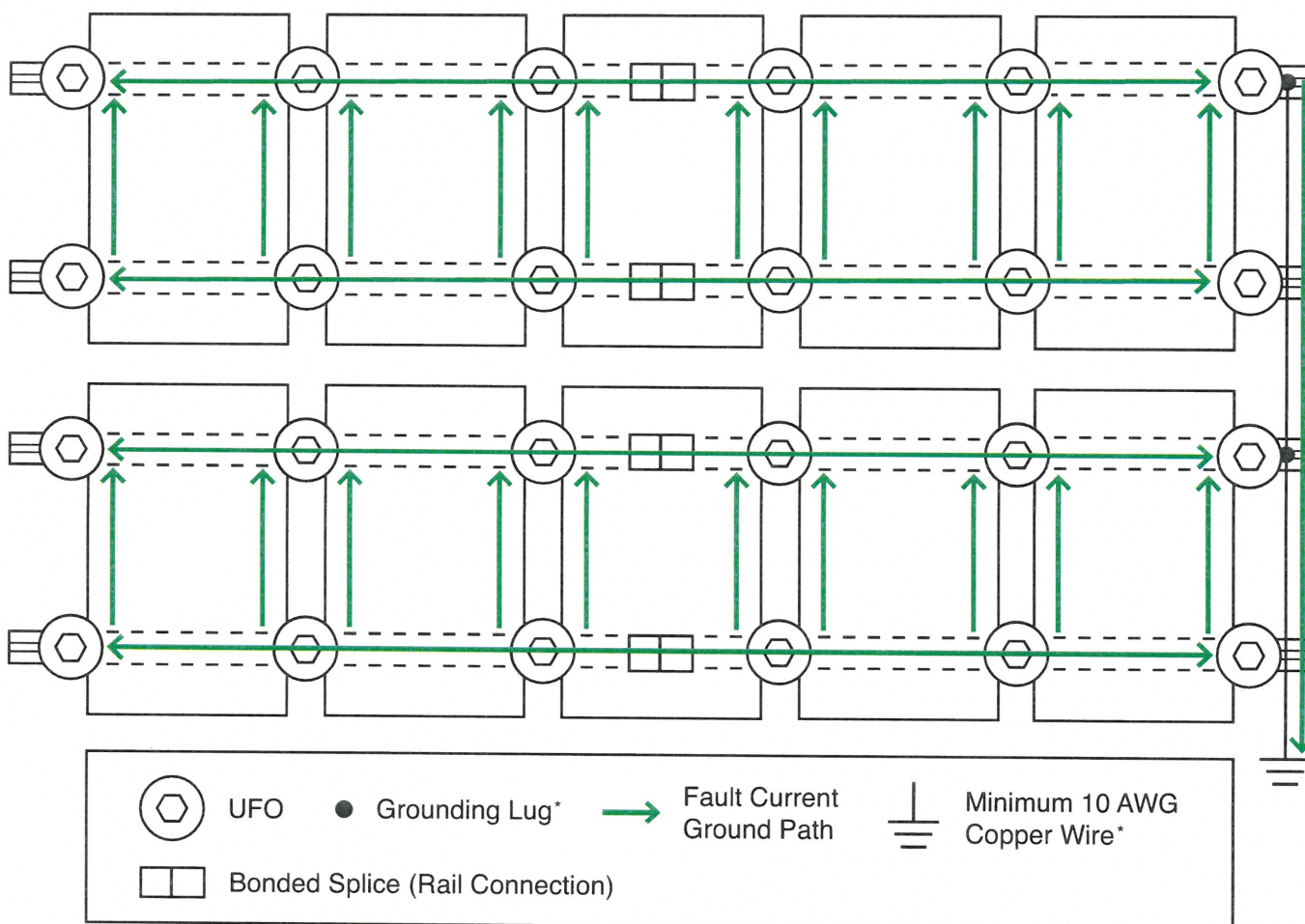
Insert Internal Splice into first rail and secure with screw. Assemble and secure Grounding Strap 3/8" from rail end. Slide second rail over Internal Splice leaving 1" gap between rails. Attach other end of Grounding Strap with hardware, and torque hex nuts to **80 in-lbs**.

💡 Second Bonded Splice screw is not used with Expansion Joints.

💡 Do not install module over top of expansion joint location.



ELECTRICAL DIAGRAM

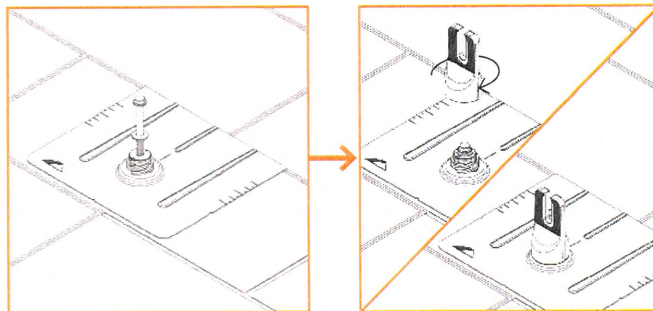


*Grounding Lugs and Wire are not required in systems using Enphase microinverters.

FLASHFOOT2

Locate roof rafters and mark locations on roof. Drill 1/4" pilot holes and backfill with approved sealant. Slide flashing between 1st and 2nd course of shingles, ensuring flashing doesn't overhang the downhill shingle. Line up with pilot hole and insert supplied lag bolt with washer through flashing. Fully seat lag bolt. Place Cap onto flashing in desired orientation for E/W or N/S rails and rotate 180 degrees until it locks into place.

💡 Rail can be installed on either side of FlashFoot2 Cap.

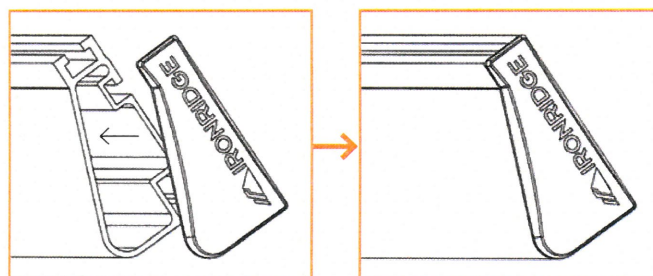


END CAPS

End Caps add a completed look and keep debris and pests from collecting inside rail.

Firmly press End Cap onto rail end.

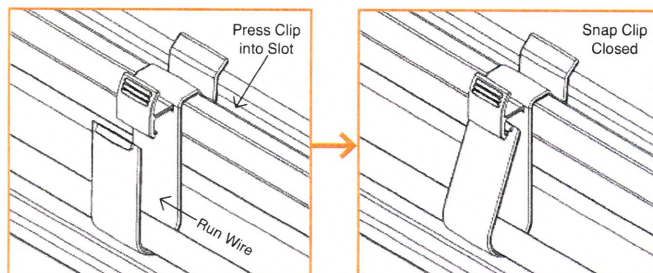
💡 End Caps come in sets of left and right. Check that the proper amount of each has been provided.



WIRE CLIPS

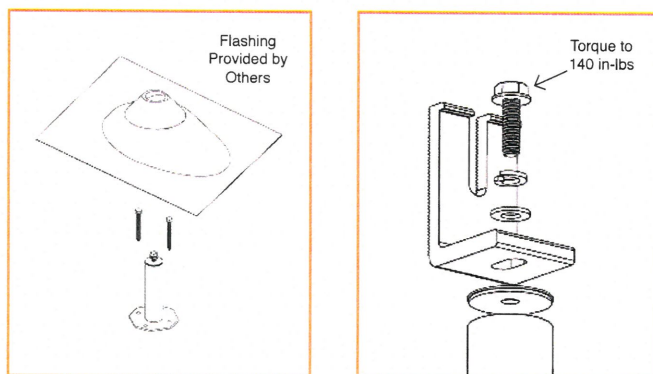
Wire Clips offer a simple wire management solution.

Firmly press Wire Clip into top rail slot. Run electrical wire through open clip. Snap closed once all wires have been placed.



FLUSH STANDOFFS

Attach Standoffs to roof locations with lag bolts (not included). Place flashing over Standoff. Attach L-Foot on Standoff washer with hardware. Torque to **140 in-lbs**.



MICROINVERTER KITS

Use IronRidge's Microinverter Kit to bond compatible microinverters and power optimizers to the racking system.

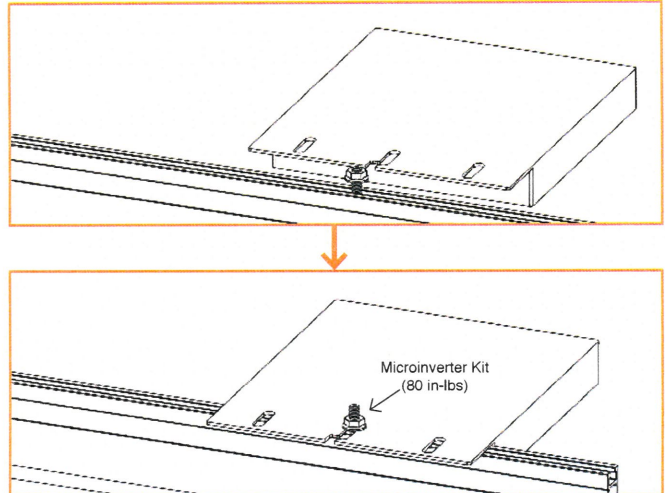
Insert Microinverter Kit T-bolt into top rail slot. Place compatible microinverter or power optimizer into position and tighten hex nut to **80 in-lbs**.

COMPATIBLE PRODUCTS

Enphase - M250-72, M250-60, M215-60, C250-72, S230, S280

Darfon - MIG240, MIG300, G320, G640

Solar Edge - P300, P320, P400, P405, P600, P700, P730, P800p, P800s



SYSTEMS USING ENPHASE MICROINVERTERS

IronRidge systems using approved Enphase products eliminate the need for lay-in lugs and field installed equipment grounding conductors (EGC). This solution meets the requirements of UL 2703 for bonding and grounding and is included in this listing.

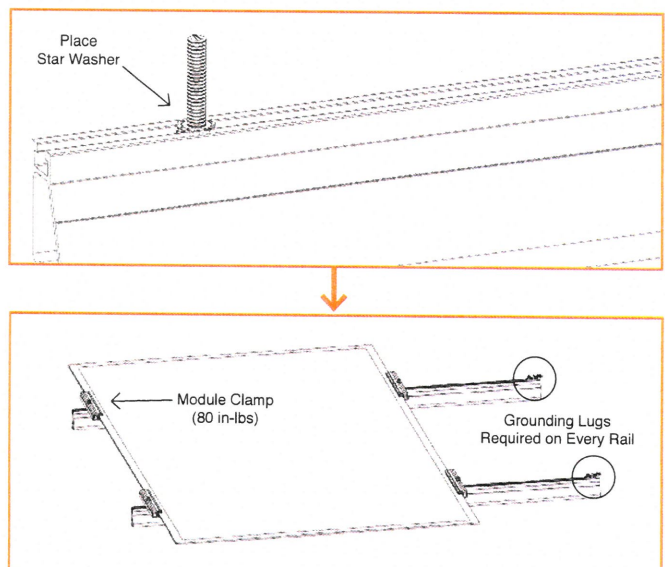
The following Enphase products are included in this listing: Microinverters M250-72, M250-60, M215-60, C250-72, and Engage cables ETXX-240, ETXX-208, ETXX-277.

- 💡 A minimum of two inverters mounted to the same rail and connected to the same Engage cable are required.
- 💡 The microinverters must be used with a maximum 20 A branch rated overcurrent protection device (OCPD).

FRAMELESS MODULE KITS

Insert Frameless Kit T-bolt in top rail slot. Place star washer over T-bolt, allowing it to rest on top of rail. Secure module clamps with a hex nut and torque to **80 in-lbs**.

- 💡 Tested or evaluated third-party module clamps:
 - Sunforson silver or black SFS-UTMC-200(B) mid and SFS-UTEC-200(B) end clamps.
 - Sunpreme silver or black mid and end clamps with part numbers 7500105X where X can be 1, 5, 6 or 7.
 - IronRidge silver or black mid and end clamps with part numbers FMLS-XC-001-Y where X can be "E" or "M" and Y can be "B" or blank.
- 💡 Follow module manufacturer's installation instructions to install the module clamps and additional slide prevention hardware when required.
- 💡 Frameless modules require using a Grounding Lug on every rail.



MODULE COMPATIBILITY

The Flush Mount System may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. Unless otherwise noted, "xxx" refers to the module power rating and both black and silver frames are included in the certification.

MAKE	MODELS
Astronergy Solar	Modules with 35, 40, and 45mm frames and model identifier aaSM66yyPzz-xxx; where "aa" can be CH or A; "yy" can be either 10 or 12; "zz" can be blank or (BL). Frameless modules with model identifier CHSM6610P(DG)-xxx.
Axitec	Modules with 35 and 40mm frames and model identifier AC-xxxY/aa-ZZ; where "Y" can be M or P; "aa" can be 125 or 156; and "ZZ" can be 54S, 60S or 72S.
Canadian Solar	Modules with 40mm frames and model identifier CS6Y-xxxZ; where "Y" can be K, P, V, or X; and "Z" can be M, P, PX, or P-SD. Uframed modules with model identifier CS6Y-xxxP-FG; where "Y" is K or X.
ET Solar	Modules with 35, 40, and 50mm frames and model identifier ET-Y6ZZxxxAA; where "Y" can be P, L, or M; "ZZ" can be 60 or 72; and "AA" can be WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC.
Flex	Modules with 35, 40, and 50mm frames and model identifier FXS-xxxYY-ZZ; where "xxx" is the module power rating; "YY" can be BB or BC; and "ZZ" can be MAA1B, MAA1W, MAB1W, SAA1B, SAA1W, SAC1B, SAC1W, SAD1W, SBA1B, SBA1W, SBC1B, or SBC1W.
GigaWatt Solar	Modules with 40mm frames and model identifier GWxxxYY; where "YY" can be either PB or MB.
Hanwha Solar	Modules with 40, 45, and 50mm frames and model identifier HSLaaP6-YY-1-xxxZ; where "aa" can be either 60 or 72; "YY" can be PA or PB; and "Z" can be blank or B.
Hanwha Q CELLS	Modules with 32, 35, 40, and 42mm frames and model identifier Q.YY-ZZ-xxx; where "YY" can be PLUS, PRO, or PEAK; and "ZZ" can be G3, G4, L-G2, L-G3y, L-G4y, BFR-G3, BLK-G3, BFR-G4, BFR-G4.1, G4/SC, or G4.1/SC.
Hyundai	Modules with 35 and 50mm frames and model identifier HiS-YxxxZZ; where "Y" can be M or S; and "ZZ" can be MI, MF, MG, SG, RI, RG, TI, or TG.
Itek	Modules with 50mm frames and model identifier IT-xxx-YY; where "YY" can be blank, HE, or SE.
JA Solar	Modules with 40 and 45mm frames and model identifier JAyyzz-bb-xxx/aa; where "yy" can be M6 or P6; "zz" can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); "bb" can be 48, 60, or 72; and "aa" can be MP, SI, PR, 3BB, 4BB, 4BB/RE.
Jinko	Modules with 35 and 40mm frames and model identifier JKMYxxxZZ; where "Y" can either be blank or S; and "ZZ" can be M, P, PP, P-B, or P-V. Frameless modules with model identifier JKMxxxPP-DV.
Kyocera	Modules with 46mm frames and model identifier KYxxxZZ-AA; where "Y" can be D or U; "ZZ" can be blank, GX, or SX; and "AA" can be LPU, LFU, UPU, LPS, LPB, LFB, LFB2, LPB2, 3AC, 3BC, 3FC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5UC, 6BC, 6FC, 8BC, 6MCA, or 6MPA.
LG	Modules with 35, 40, and 46mm frames and model identifier LGxxx1z-bb; where "y" can be A, N, or S; "z" can be C or K; and "bb" can be A3, B3, G3, C4 or K4.
Mitsubishi	Modules with 46mm frames and model identifier PV-MYYxxxZZ; where "YY" can be LE or JE; and "ZZ" can be either HD, HD2, or FB.
Motech	IM and XS series modules with 40, 45, and 50mm frames.
Panasonic	Modules with 35mm frames and model identifier VBHNxxxSAY; where "yy" can be either 06, 06B, 11, 11B, 15, 15B, 16 or 16B.
Phono Solar	Modules with 35, 40, or 45mm frames and model identifier PSxxxY-ZZ/A; where "Y" can be M or P; "ZZ" can be 20 or 24; and "A" can be F, T or U.
Prism Solar	Frameless modules with model identifier BiYY-xxxBSTC; where "YY" can be 48 or 60.
REC Solar	Modules with 38 and 45mm frames and model identifier RECxxxYYZZ; where "YY" can be M, PE or TP; and "ZZ" can be blank, BLK, SLV, or 72.
Renesola	Modules with 35, 40 and 50mm frames and model identifier JCxxxY-ZZ; where "Y" can be F, M or S; and "ZZ" can be Ab, Ab-b, Abh, Abh-b, Abv, Abv-b, Bb, Bb-b, Bbh, Bbh-b, Bbv, Bbv-b, Db, or Db-b.
Renogy	Modules with 40 and 50mm frames and model identifier RNG-xxxY; where "Y" can be D or P.
Silfab	Modules with 38mm frames and model identifier SYY-Z-xxx; where "YY" can be SA or LA; SG or LG; and "Z" can be M, P, or X.
SolarWorld	Sunmodule Plus, Protect, XL, Bisun, Bisun XL, may be followed by mono, poly or duo and/or black or bk; modules with 31, 33 or 46mm frames and model identifier SW-xxx.
Stion	Thin film modules with 35mm frames and model identifier STO-xxx or STO-xxxA. Thin film frameless modules with model identifier STL-xxx or STL-xxxA.
SunEdison	Modules with 35, 40, and 50mm frames and model identifier SE-YxxxZABCDE; where "Y" can be B, F, H, P, R, or Z; "Z" can be 0 or 4; "A" can be B, C, D, E, H, I, J, K, L, M, or N; "B" can be B or W; "C" can be A or C; "D" can be 3, 7, 8, or 9; and "E" can be 0, 1 or 2.
Suniva	Modules with 35, 38, 40, 46, and 50mm frames and model identifiers OPTxxx-AA-B-YYY-Z or MVXxxx-AA-B-YYY-Z; where "AA" is either 60 or 72; "B" is either 4 or 5; "YYY" is either 100,101,700,1B0, or 1B1; and "Z" is blank or B.
Sunpower	SPR-A-xx series with standard (G3) or InvisiMount (G5) 46mm frames; where "A" is either E or X; and "xx" is the series number.
Sunpreme	Frameless modules with model identifier GXB-xxxYY; where "YY" can be blank or SL.
Suntech	Vd, Vem, Wdb, Wde, and Wd series modules with 35, 40, and 50mm frames.
Trina	Modules with 35, 40 and 46mm frames and model identifier TSM-xxxYYZZ; where "YY" can be PA05, PC05, PD05, PA14, PC14, PD14, PE14, or DD05; and "ZZ" can be blank, A, A.05, A.08, A.10, A.18, .05, .08, .10, .18, .08D, .18D, 0.82, A.082(II), .002, .00S, 05S, 08S, A(II), A.08(II), A.05(II), A.10(II), or A.18(II). Frameless modules with model identifier TSM-xxxYY; and "Y" can be either PEG5, PEG5.07, PEG14, DEG5(II), DEG5.07(II), or DEG14(II).
Winaico	Modules with 35 and 40mm frames and model identifier Wsy-xxxz6; where "y" can be either P or T; and "z" can be either M or P.
Yingli	Panda, YGE, and YGE-U series modules with 35, 40, and 50 mm frames.

WARRANTY

Effective for Products manufactured after April 1st, 2012, IronRidge provides the following warranties, for Products installed properly and used for the purpose for which the Products are designed:

(a) Products with finishes (ie excluding without limitation Products that are mill finished) shall be free of visible defects, peeling, or cracking, under normal atmospheric conditions, for a period of three years from the earlier of (i) the date of complete installation of the Product or (ii) 30 days after the original purchaser's date of purchase of the Product ("Finish Warranty"); (b) components shall be free of structurally-related defects in materials for a period of ten years from the earlier of (i) the date of complete installation of the Product or (ii) 30 days after the original purchaser's date of purchase of the Product; and (c) components shall be free of functionally-related manufacturing defects for a period of 20 years from date of manufacture.

The Finish Warranty does not apply to: (d) surface oxidation of the galvanized steel components or any foreign residue deposited on Product finish; and (e) Products installed in corrosive atmospheric conditions, as defined solely by IronRidge; corrosive atmospheric conditions include, but are not limited to, conditions where Product is exposed to corrosive chemicals, fumes, cement dust, salt water marine environments or to continual spraying of either salt or fresh water.

The Finish Warranty is VOID if (f) the practices specified by AAMA 609 & 610-02 – "Cleaning and Maintenance for Architecturally Finished Aluminum" (www.aamanet.org) are not followed by Purchaser for IronRidge's aluminum based components; and (g) if the practices specified by ASTM A780 / A780M - 09 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings" are not followed by Purchaser for IronRidge's galvanized steel-based components.

The warranties above do not cover any parts or materials not manufactured by IronRidge, and exclude non-functionally-related defects, as defined solely by IronRidge. The warranties do not cover any defect that has not been reported to IronRidge in writing within 20 days after discovery of such defect.

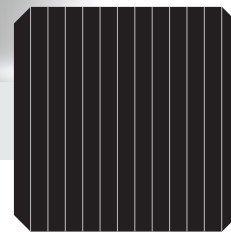
In the event of breach of or non-compliance with the warranties set forth above, IronRidge's sole obligation and liability, and the sole and exclusive remedy for such breach or non-compliance, shall be correction of defects by repair, replacement, or credit, at IronRidge's sole discretion. Such repair, replacement or credit shall completely satisfy and discharge all of IronRidge's liability with respect to these warranties.

Refurbished Product may be used to repair or replace the defective components. Transportation, installation, labor, or any other costs associated with Product replacement are not covered by these warranties and are not reimbursable. These warranties additionally do not cover (h) normal wear, or damage resulting from misuse, overloading, abuse, improper installation (including failure to follow professional instruction and certification), negligence, or accident, or from force majeure acts including any natural disasters, war or criminal acts; and (i) Products that have been altered, modified or repaired without written authorization from IronRidge or its authorized representative; and (j) Products used in a manner or for a purpose other than that specified by IronRidge. A formal document proving the purchase and the purchase date of the Product is required with any warranty claim.

Except as set forth above, IronRidge sells the Products on an "AS IS" basis, which may not be free of errors or defects, and ALL EXPRESS OR IMPLIED REPRESENTATIONS AND WARRANTIES, INCLUDING ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUALITY, WORKMANLIKE EFFORT, CORRESPONDENCE TO DESCRIPTION, DESIGN, TITLE OR NON-INFRINGEMENT, OR ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE OR TRADE PRACTICE, ARE HEREBY DISCLAIMED.

LG NeON[®] 2 Black

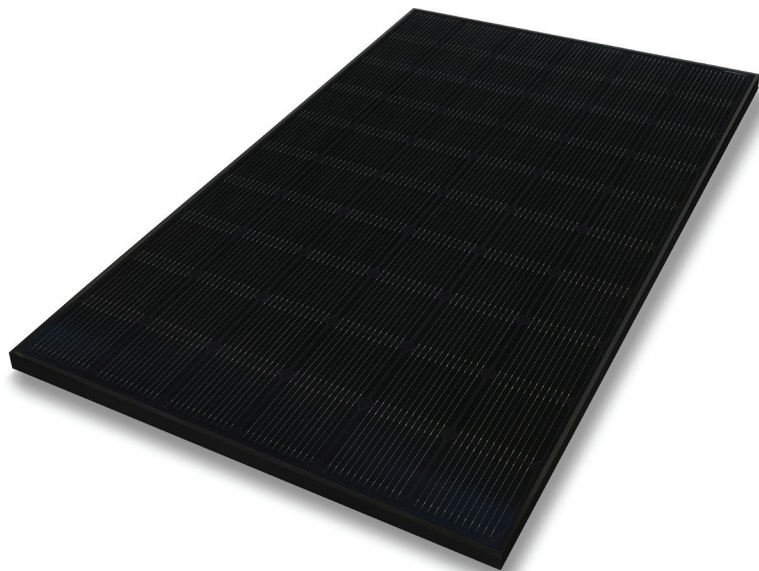
LG365N1K-A6



60

365W

The LG NeON[®] 2 is LG's best selling solar module and one of the most powerful and versatile modules on the market today. The cells are designed to appear all-black at a distance, and the performance warranty guarantees 90.6% of labeled power output at 25 years.



Features



Enhanced Performance Warranty

LG NeON[®] 2 Black has an enhanced performance warranty. After 25 years, LG NeON[®] 2 Black is guaranteed at least 90.6% of initial performance.



25-Year Limited Product Warranty

The NeON[®] 2 Black is covered by a 25-year limited product warranty. In addition, up to \$450 of labor costs will be covered in the rare case that a module needs to be repaired or replaced.



Solid Performance on Hot Days

LG NeON[®] 2 Black performs well on hot days due to its low temperature coefficient.



Roof Aesthetics

LG NeON[®] 2 Black has been designed with aesthetics in mind using thinner wires that appear all black at a distance.

When you go solar, ask for the brand you can trust: LG Solar

About LG Electronics USA, Inc.

LG Electronics is a global leader in electronic products in the clean energy markets by offering solar PV panels and energy storage systems. The company first embarked on a solar energy source research program in 1985, supported by LG Group's vast experience in the semi-conductor, LCD, chemistry and materials industries. In 2010, LG Solar successfully released its first MonoX[®] series to the market, which is now available in 32 countries. The NeON[®] (previous MonoX[®] NeON), NeON[®]2, NeON[®]2 BiFacial won the "Intersolar AWARD" in 2013, 2015 and 2016, which demonstrates LG's leadership and innovation in the solar industry.

LG365N1K-A6

General Data

Cell Properties (Material/Type)	Monocrystalline/N-type
Cell Maker	LG
Cell Configuration	60 Cells (6 x 10)
Number of Busbars	12EA
Module Dimensions (L x W x H)	1,740mm x 1,042mm x 40 mm
Weight	18.6 kg
Glass (Material)	Tempered Glass with AR coating
Backsheet (Color)	Black
Frame (Material)	Anodized Aluminium
Junction Box (Protection Degree)	IP 68 with 3 Bypass Diodes
Cables (Length)	1,100mm x 2EA
Connector (Type/Maker)	MC 4/MC

Certifications and Warranty

Certifications*	IEC 61215-1/-1-1/2 : 2016, IEC 61730-1/2 : 2016, UL 61730-1 : 2017, UL 61730-2 : 2017 ISO 9001, ISO 14001, ISO 50001 OHSAS 18001
Salt Mist Corrosion Test	IEC 61701:2012 Severity 6
Ammonia Corrosion Test	IEC 62716:2013
Module Fire Performance	Type 2 (UL 61730)
Fire Rating	Class C (UL 790, ULC/ORD C 1703)
Solar Module Product Warranty	25 Year Limited
Solar Module Output Warranty	Linear Warranty*

*Improved: 1st year 98.5%, from 2-24th year: -0.33%/year down, 90.6% at year 25

Temperature Characteristics

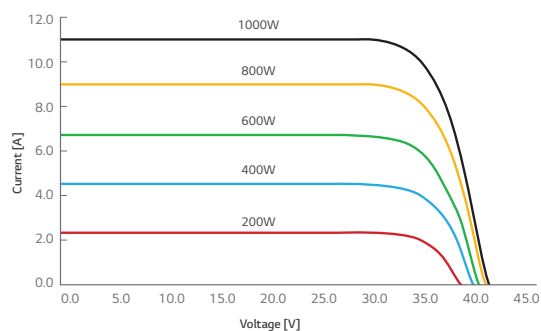
NMOT*	[°C]	42 ± 3
P _{max}	[%/°C]	-0.35
V _{oc}	[%/°C]	-0.26
I _{sc}	[%/°C]	0.03

*NMOT (Nominal Module Operating Temperature): Irradiance 800 W/m², Ambient temperature 20°C, Wind speed 1 m/s, Spectrum AM 1.5

Electrical Properties (NMOT)

Model	LG365N1K-A6	
Maximum Power (P _{max})	[W]	274
MPP Voltage (V _{mpp})	[V]	33.0
MPP Current (I _{mpp})	[A]	8.30
Open Circuit Voltage (V _{oc})	[V]	39.4
Short Circuit Current (I _{sc})	[A]	8.78

I-V Curves



Electrical Properties (STC*)

Model	LG365N1K-A6	
Maximum Power (P _{max})	[W]	365
MPP Voltage (V _{mpp})	[V]	35.1
MPP Current (I _{mpp})	[A]	10.41
Open Circuit Voltage (V _{oc} ± 5%)	[V]	41.8
Short Circuit Current (I _{sc} ± 5%)	[A]	10.92
Module Efficiency	[%]	20.1
Power Tolerance	[%]	0 ~ +3

*STC (Standard Test Condition): Irradiance 1000 W/m², cell temperature 25°C, AM 1.5
Measurement Tolerance of P_{max}: ± 3%

Operating Conditions

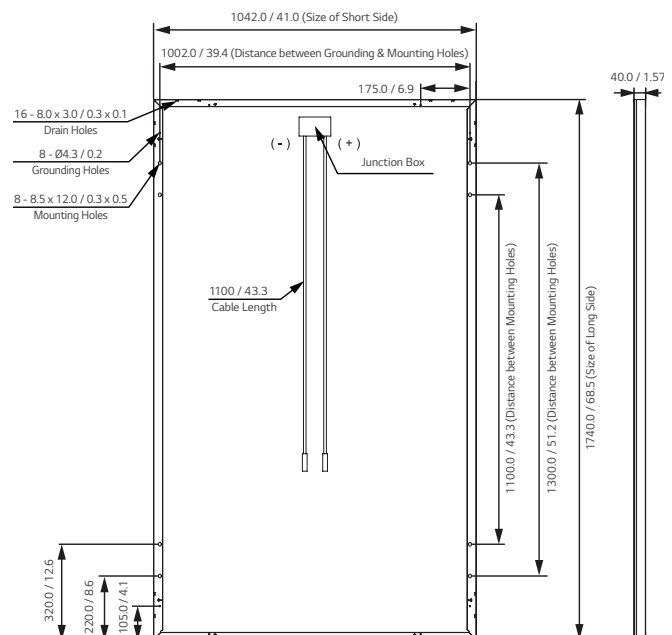
Operating Temperature	[°C]	-40 ~ +85
Maximum System Voltage	[V]	1,000 (UL/IEC)
Maximum Series Fuse Rating	[A]	20
Mechanical Test Load* (Front)	[Pa/psf]	5,400
Mechanical Test Load* (Rear)	[Pa/psf]	4,000

*Based on IEC 61215-2 : 2016 (Test Load = Design Load x Safety Factor (1.5))
Mechanical Test Loads 6,000Pa/5,400Pa based on IEC 61215:2005

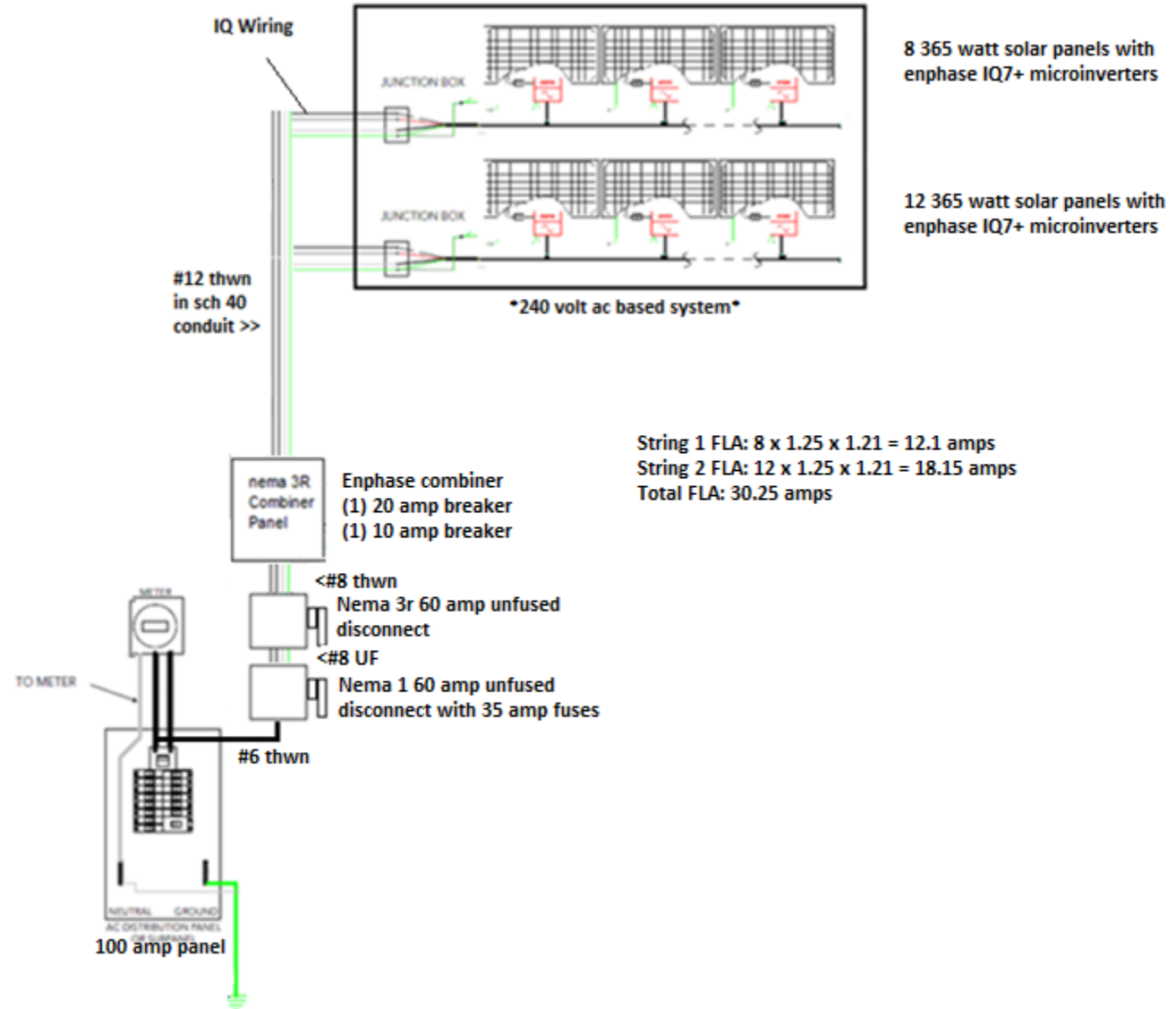
Packaging Configuration

Number of Modules per Pallet	[EA]	25
Number of Modules per 40' Container	[EA]	650
Number of Modules per 53' Container	[EA]	850
Packaging Box Dimensions (L x W x H)	[mm]	1,790 x 1,120 x 1,213
Packaging Box Dimensions (L x W x H)	[in]	70.5 x 44.1 x 47.8
Packaging Box Gross Weight	[kg]	500
Packaging Box Gross Weight	[lb]	1,102

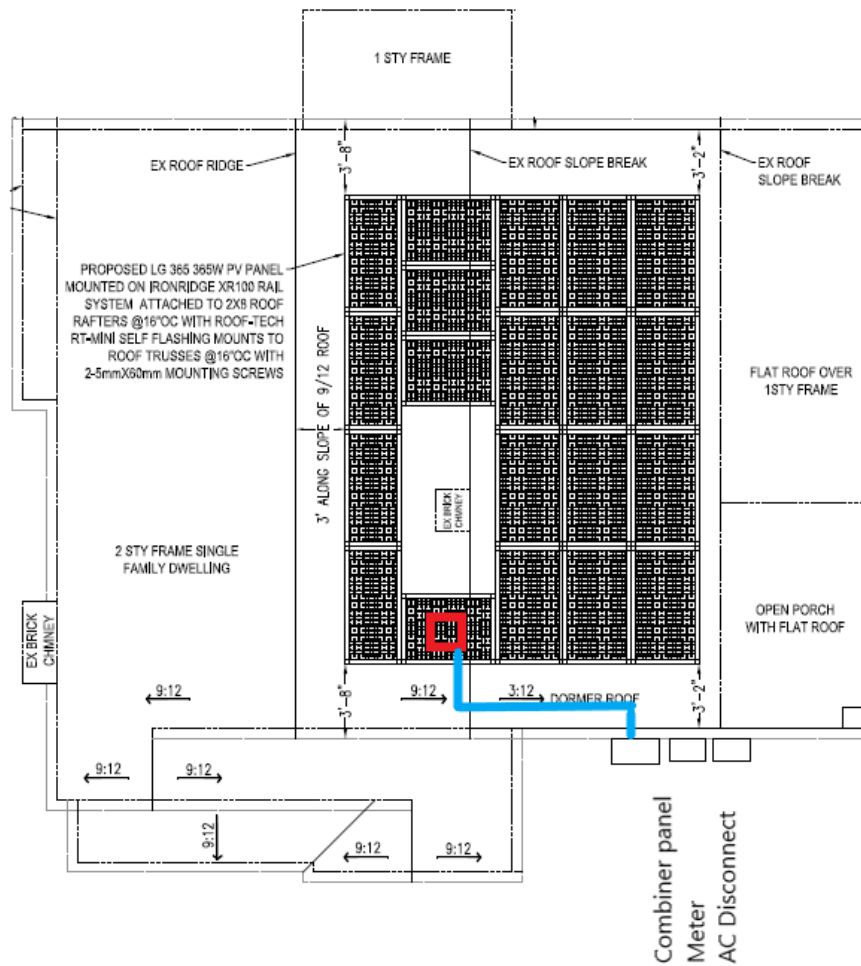
Dimensions (mm/inch)



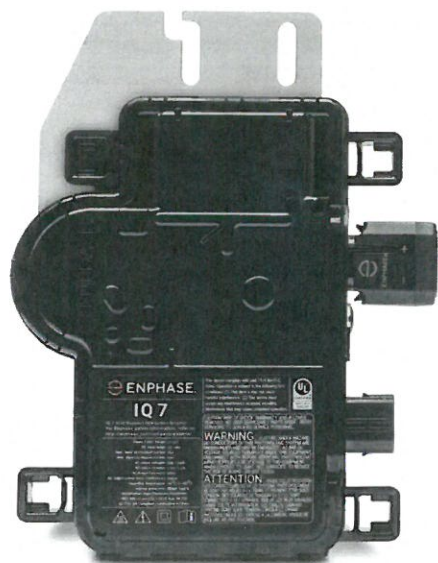
Graham
6901 Westmoreland Avenue
Takoma Park, MD 20912
7.3 KW



#



Enphase IQ 7 and IQ 7+ Microinverters



The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.



To learn more about Enphase offerings, visit enphase.com

Enphase IQ 7 and IQ 7+ Microinverters

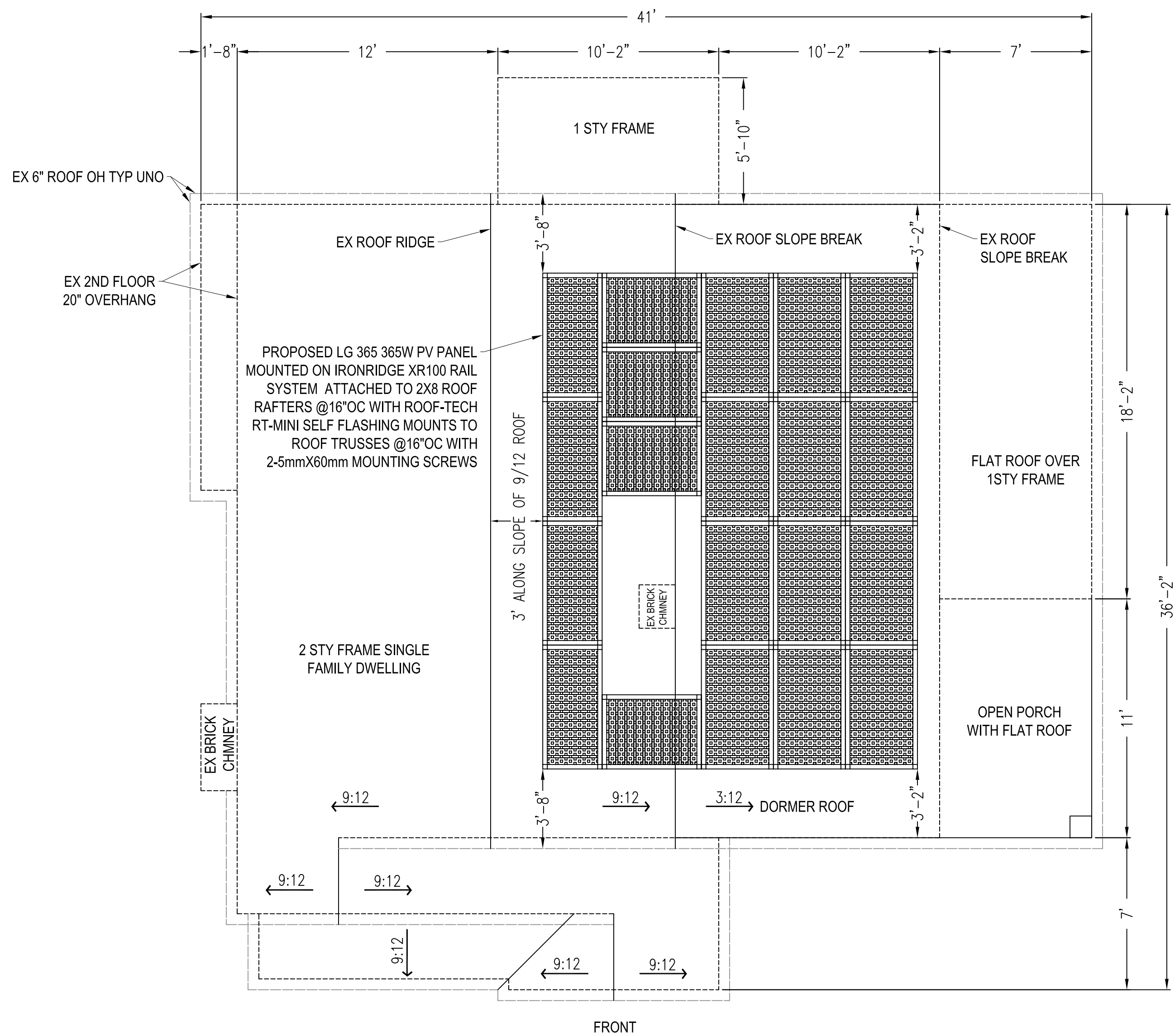
INPUT DATA (DC)	IQ7-60-2-US / IQ7-60-B-US		IQ7PLUS-72-2-US / IQ7PLUS-72-B-US	
Commonly used module pairings ¹	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit			
OUTPUT DATA (AC)	IQ 7 Microinverter		IQ 7+ Microinverter	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range ²	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit ³	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	0 A		0 A	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.7 leading ... 0.7 lagging		0.7 leading ... 0.7 lagging	
EFFICIENCY	@240 V	@208 V	@240 V	@208 V
Peak CEC efficiency	97.6 %	97.6 %	97.5 %	97.3 %
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %
MECHANICAL DATA				
Ambient temperature range	-40°C to +65°C			
Relative humidity range	4% to 100% (condensing)			
Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US)	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)			
Connector type (IQ7-60-B-US & IQ7PLUS-72-B-US)	Friends PV2 (MC4 intermateable). Adaptors for modules with MC4 or UTX connectors: - PV2 to MC4: order ECA-S20-S22 - PV2 to UTX: order ECA-S20-S25			
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)			
Weight	1.08 kg (2.38 lbs)			
Cooling	Natural convection - No fans			
Approved for wet locations	Yes			
Pollution degree	PD3			
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure			
Environmental category / UV exposure rating	NEMA Type 6 / outdoor			
FEATURES				
Communication	Power Line Communication (PLC)			
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.			
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.			
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.			

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.

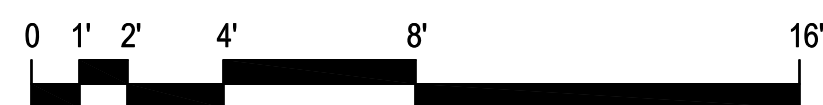
2. Nominal voltage range can be extended beyond nominal if required by the utility.

3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

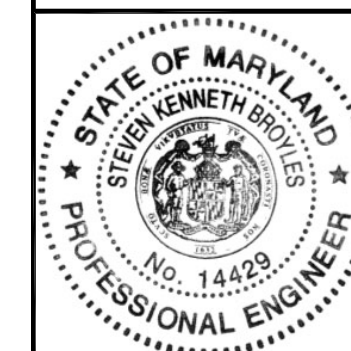
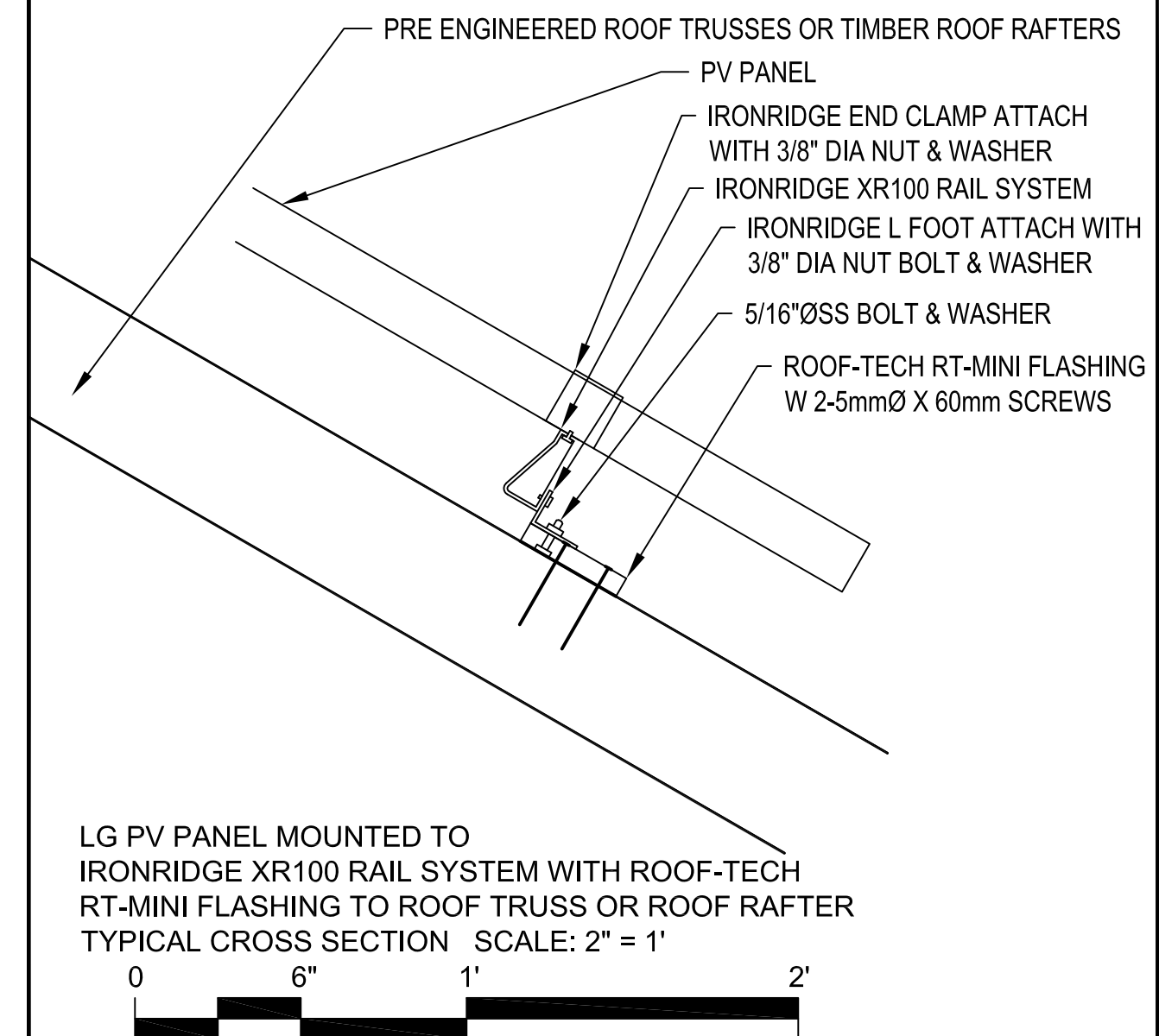
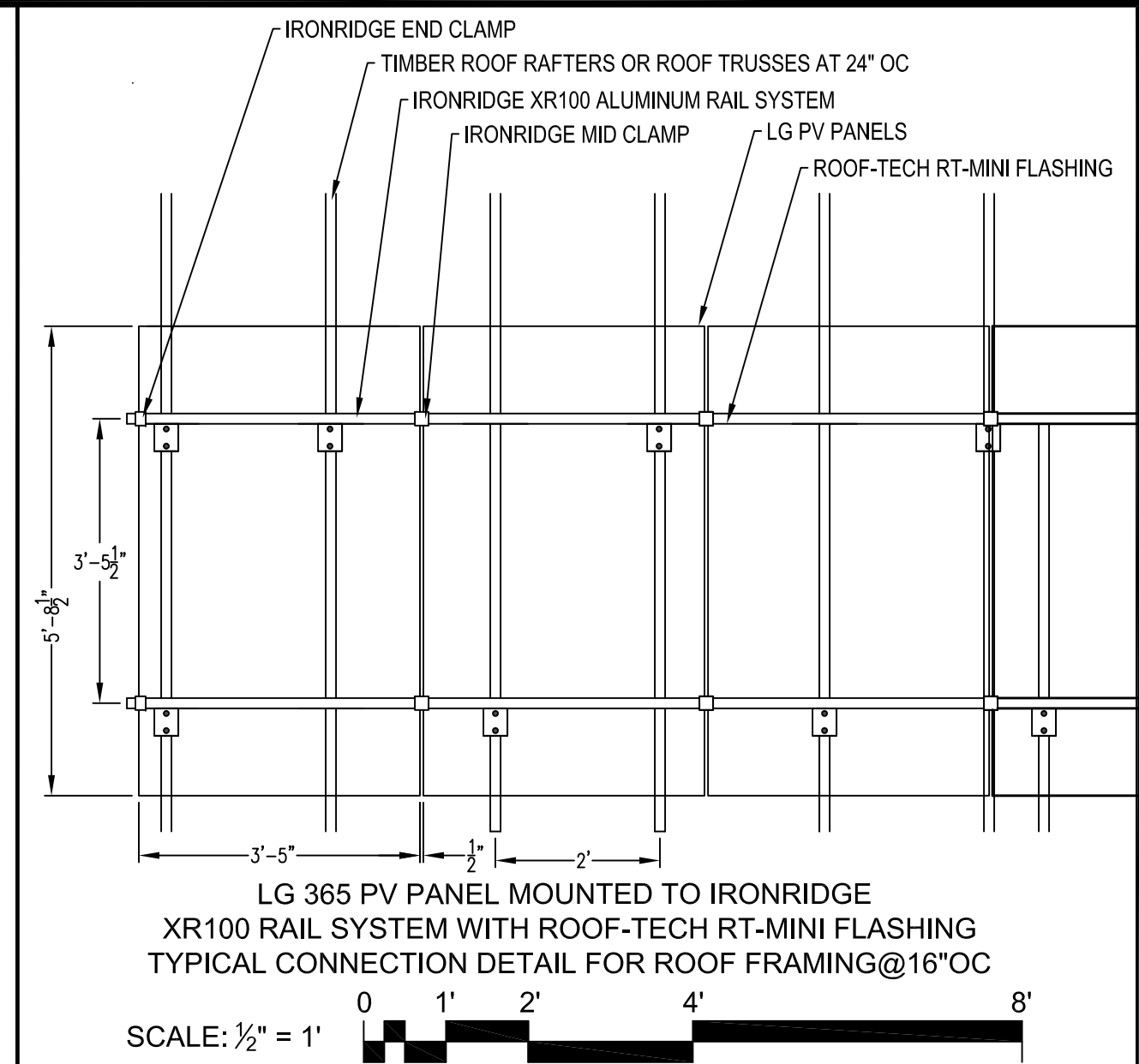
To learn more about Enphase offerings, visit enphase.com



ROOF PLAN PV PANEL LAYOUT 20 LG 365
20-365 WATT PV PANELS = 7.30kW SCALE: 1/4" = 1'



DESIGN LOADS:
GROUND SNOW LOAD: Pg=30psf
SLOPED ROOF DESIGN SNOW LOAD: Ps=30psf
DRIFT SURCHARGE SNOW LOAD: Pd=35psf
DEAD LOAD WITH PANEL & RACKING: DL=12.5psf
BASIC WIND SPEED: V=115mph



STEVEN K. BROYLES & ASSOCIATES
ENGINEERS - LAND PLANNERS - SURVEYORS
2022 BROWN ROAD; FINKSBURG, MD 21048
PHONE: (410) 747-5500 E-MAIL: stevenkbroyles@gmail.com

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 14429, EXPIRATION DATE: 5/09/2023

DATE	REVISIONS	BY
03/29/2021		

PHOTOVOLTAIC SOLAR PANELS FOR GRAHAM RESIDENCE
6901 WESTMORELAND AVENUE; TAKOMA PARK, MD 20912
CLIENT: AMERICAN DESIGN AND BUILD, LTD PROJECT NO. AMDB2021-036
SHEET S001 STRUCTURAL PLAN

STEVEN K. BROYLES & ASSOCIATES

ENGINEERS - LAND PLANNERS - SURVEYORS

2022 Brown Road - Finksburg, Maryland 21048

Phone 410-747-5500 - Fax 443-273-3166 - email stevenkbroyles@gmail.com

March 29, 2021

Job Number: AMDB2020-029

Montgomery County Department of Permitting Services
255 Rockville Pike, 2nd floor
Rockville, Maryland 20850

RE: Structural roof certification Graham residence
6901 Westmoreland Ave
Takoma Park, MD 20912

Applicable Building Code: International Residential Code IRC 2018
National Electrical Code NEC 2017

Dear Montgomery County:

At the request of American Design and Build, I have thoroughly evaluated the timber roof framing system for the single family dwelling at the above referenced site. The existing roof structure is adequate to support all required dead and live loads (Ground Snow Load $P_g=30\text{psf}$ and Basic Wind Speed $V=115\text{mph}$) including the additional 20 new LG® 365 watt solar electric photovoltaic PV panels with a dead load of 2.5psf and a maximum electrical power generation capacity of 7.30kW .

The proposed LG 365 watt solar PV panels shall be mounted to the existing roof with IronRidge® XR100 aluminum rail system (designed by others) and attached in accordance with manufacturer's guidelines. The rail attachment system is installed perpendicular to existing house roof framing system of 2X6 nominal dimension roof rafters at 24" on center, 1X6 timber plank roof sheathing, 30# asphaltic roofing felt and asphalt shingles. The IronRidge rail system is attached to the existing timber roof framing with Roof-Tech RT-Mini® flashing anchored by 2 grade 2, 5mm diameter X 60mm long hexhead anchor screws and 5mm diameter EPDM bonded washer with RT-Butyl flexible flashing.

All existing timber roof framing, supporting walls and foundations are structurally adequate to support all required live and dead loads in conformance with International Residential Code IRC 2018. There are no modifications required to the existing roof system.

Attachments:

Page 2 Uplift wind load calculation for LG 340 PV Panel

**UPLIFT WINDLOAD CALCULATION FOR
LG 365 PHOTOVOLTAIC (PV) SOLAR PANELS**

PV Panel: LG365 365 watt

Racking System: IronRidge XR100 Racking System and Roof-Tech RT-Mini® Flashing.

Applicable Building Codes: International Residential Code IRC 2018 Edition

Design Data:

Timber Grade: #2 Construction Grade SPF

Ground Snow Load: $P_g=30\text{psf}$

Effective Wind Speed: $V=115\text{mph}$

Effective Wind Area: 19.4sf

Height: 0'-50' Maximum

Roof Slope: 0° (flat) - 45° 12:12 Slope

Topographic Factor: 1

Exposure Category: B Urban/Suburban

Height Adjustment Factor: 1.16 from 30' to 50' IRC Table R301.2(3)

Importance Factor: 1 Single Family Dwelling

Maximum Design Wind Uplift Load: -21psf IRC Table R301.2(2)

Panel Model: LG365.

Rail System: IronRidge XR100 Aluminum Rail System

Mounting Mounting System: Roof-Tech RT-Mini Flashing

Panel Size: $5.7' \times 3.4'$

Area: 19.4sf

Uplift: $408\text{lb} = 19.4\text{sf} \times 21\text{psf}$

Dead load: 40.9lbs

Forces on Panel= $367.1\text{lbs} = \text{Wind Uplift} - \text{Dead Load}$

$367.1\text{lbs} = 408\text{lbs} - 40.9\text{lbs}$

Number of Fasteners: 2 Minimum/panel

Type of Fastener: Grade 2 Hexhead 5mm diameter X 60mm long anchor screw 48mm penetration into 1200psi Fb SPF roof truss or roof rafter, allowable pull out Load 5mm dia X 48mm screw= 406lbs

Tension Force for Fasteners:

2 anchor screws X $406\text{lbs/screw} = 812\text{lbs} > 367.1\text{lbs}$ **OK**

I hereby certify the above observations, statements, calculations, conclusions and professional opinions by my seal and signature; furthermore I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, Professional Engineer License No.14429, with expiration date May 9, 2023. If you have any questions please contact me.

Very truly yours,
Steven K. Broyles P.E., L.S.

DocuSigned by:

Steven K. Broyles, P.E.

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