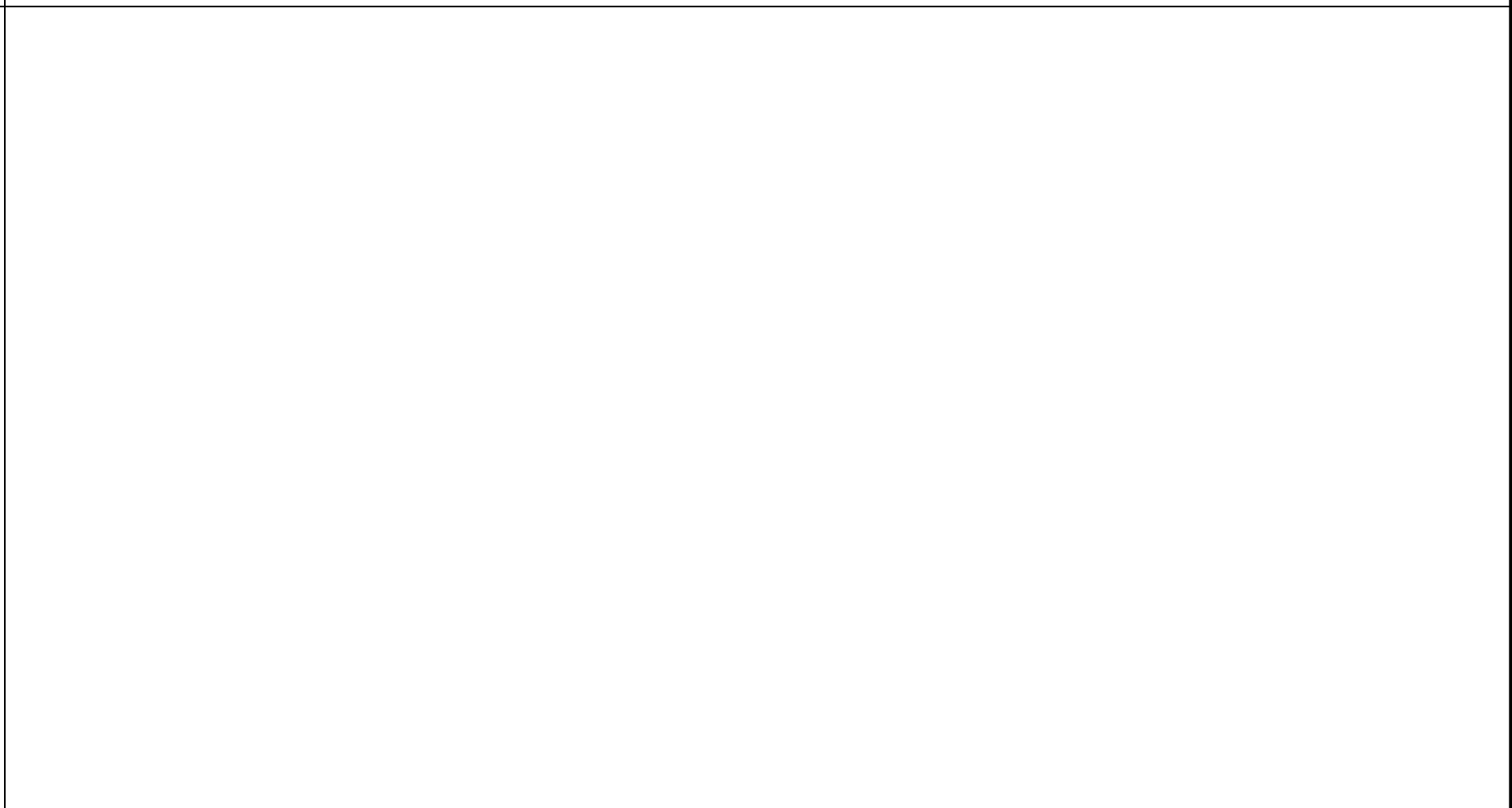


ABBREVIATIONS	ELECTRICAL NOTES	JURISDICTION NOTES
---------------	------------------	--------------------

A AMPERE AC ALTERNATING CURRENT BLDG BUILDING CONC CONCRETE DC DIRECT CURRENT EGC EQUIPMENT GROUNDING CONDUCTOR (E) EXISTING EMT ELECTRICAL METALLIC TUBING FSB FIRE SET-BACK GALV GALVANIZED GEC GROUNDING ELECTRODE CONDUCTOR GND GROUND HDG HOT DIPPED GALVANIZED I CURRENT Imp CURRENT AT MAX POWER Isc SHORT CIRCUIT CURRENT kVA KILOVOLT AMPERE kW KILOWATT LBW LOAD BEARING WALL MIN MINIMUM (N) NEW NEUT NEUTRAL NTS NOT TO SCALE OC ON CENTER PL PROPERTY LINE POI POINT OF INTERCONNECTION PV PHOTOVOLTAIC SCH SCHEDULE S STAINLESS STEEL STC STANDARD TESTING CONDITIONS TYP TYPICAL UPS UNINTERRUPTIBLE POWER SUPPLY V VOLT Vmp VOLTAGE AT MAX POWER Voc VOLTAGE AT OPEN CIRCUIT W WATT 3R NEMA 3R, RAIN TIGHT

1. THIS SYSTEM IS GRID-INTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. A NATIONALLY - RECOGNIZED TESTING LABORATORY SHALL LIST ALL EQUIPMENT IN COMPLIANCE WITH ART. 110.3.
3. WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A SIGN WILL BE PROVIDED WARNING OF THE HAZARDS PER ART. 690.17.
4. EACH UNGROUNDED CONDUCTOR OF THE MULTIWIRE BRANCH CIRCUIT WILL BE IDENTIFIED BY PHASE AND SYSTEM PER ART. 210.5.
5. CIRCUITS OVER 250V TO GROUND SHALL COMPLY WITH ART. 250.97, 250.92(B).
6. DC CONDUCTORS EITHER DO NOT ENTER BUILDING OR ARE RUN IN METALLIC RACEWAYS OR ENCLOSURES TO THE FIRST ACCESSIBLE DC DISCONNECTING MEANS PER ART. 690.31(E).
7. ALL WIRES SHALL BE PROVIDED WITH STRAIN RELIEF AT ALL ENTRY INTO BOXES AS REQUIRED BY UL LISTING.
8. MODULE FRAMES SHALL BE GROUNDED AT THE UL - LISTED LOCATION PROVIDED BY THE MANUFACTURER USING UL LISTED GROUNDING HARDWARE.
9. MODULE FRAMES, RAIL, AND POSTS SHALL BE BONDED WITH EQUIPMENT GROUND CONDUCTORS.



VICINITY MAP

INDEX

Sheet 1	COVER SHEET
Sheet 2	SITE PLAN
Sheet 3	STRUCTURAL VIEWS
Sheet 4	UPLIFT CALCULATIONS
Sheet 5	THREE LINE DIAGRAM
Cutsheets Attached	

LICENSE

GENERAL NOTES

MODULE GROUNDING METHOD: ZEP SOLAR

AHJ: Harnett County

UTILITY: Duke Energy Progress (NC)

1. ALL WORK SHALL COMPLY WITH THE 2018 NORTH CAROLINA RESIDENTIAL CODE.
2. ALL ELECTRICAL WORK SHALL COMPLY WITH THE 2017 NATIONAL ELECTRIC CODE.



REV	BY	DATE	COMMENTS
REV A	NAME	DATE	COMMENTS
*	*	*	*
REV C	RA	4/12/2024	*
REV D	RA	5/3/2024	Customer Named Changed
REV E	RA	5/30/2024	PWs changed from PW3s to PW+ and PW2s

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JOB NUMBER: JB-2752214 00

MOUNTING SYSTEM: ZS Comp V4 w Flashing-Insert

MODULES: (37) Hanwha # Q.PEAK DUO BLK ML-G10+/TS 405

INVERTER: Powerwall+ [240V] #1850000-XX-Y (1538000-XX-Y) 7.6 kW

CUSTOMER: JESSICA ADAMS

219 Harvell Rd
Coats, NC 27521

9105917506

DESCRIPTION: 14.985 KW PV ARRAY
15.2 KW (AC NAMEPLATE) PV ARRAY
54 KWH ENERGY STORAGE SYSTEM

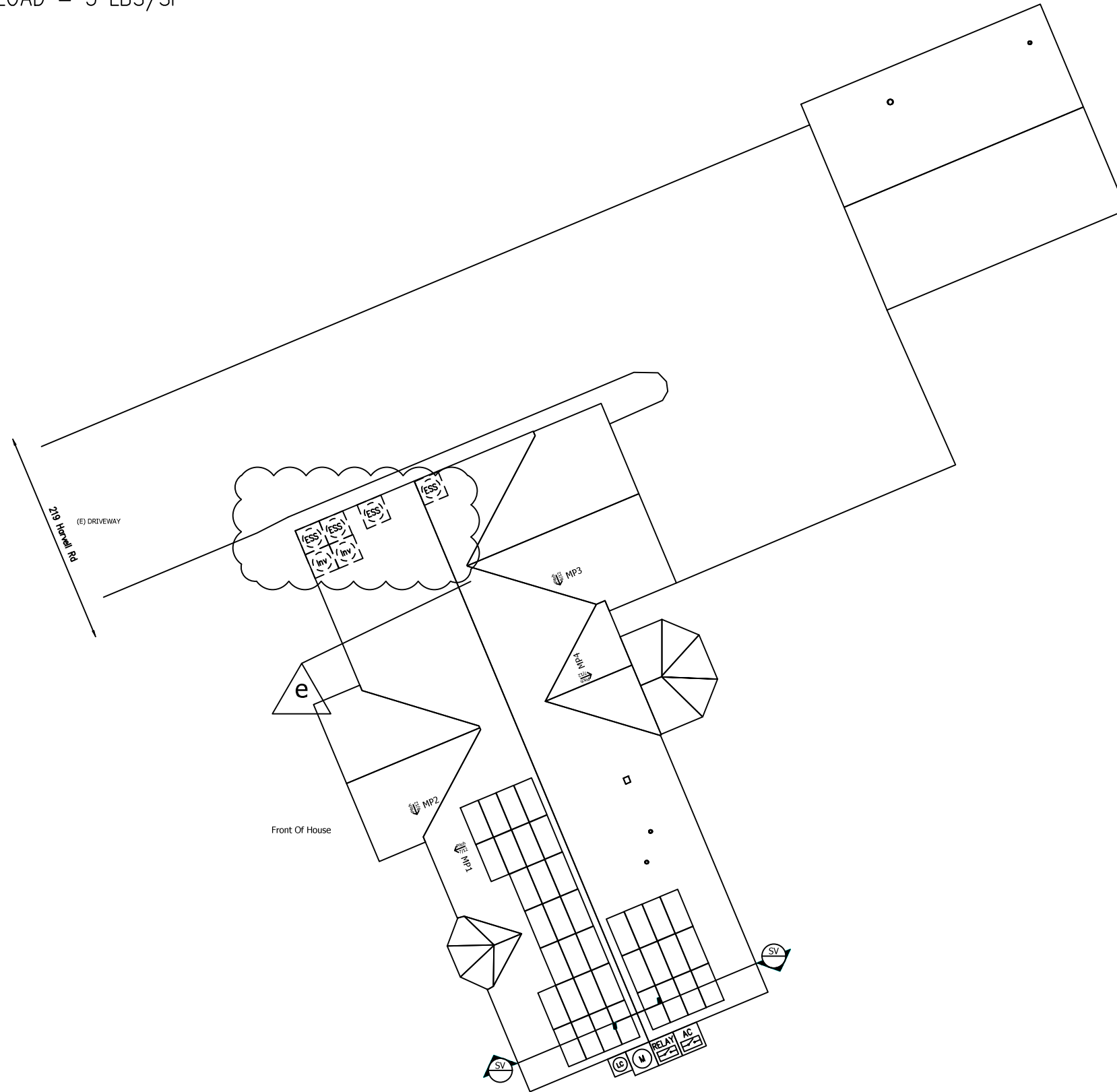
PAGE NAME: COVER SHEET

DESIGN: Ricky Alvarez

SHEET: 1 REV: E DATE: 5/30/2024



PV ARRAY DEAD LOAD = 3 LBS/SF



MP1	PITCH: 30° (7:12) ARRAY PITCH: 30° (7:12) AZIMUTH: 247 ARRAY AZIMUTH: 247 MATERIAL: Comp Shingle STORY: 2 Stories
MP4	PITCH: 30° (7:12) ARRAY PITCH: 30° (7:12) AZIMUTH: 67 ARRAY AZIMUTH: 67 MATERIAL: Comp Shingle STORY: 2 Stories

LEGEND

- (E) UTILITY METER & WARNING LABEL
- INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS
- AUTOMATIC RELAY
- DC DISCONNECT & WARNING LABELS
- AC DISCONNECT & WARNING LABELS
- DC JUNCTION/COMBINER BOX & LABELS
- ENERGY STORAGE SYSTEM FOR STAND ALONE OPERATION
- DISTRIBUTION PANEL & LABELS
- LOAD CENTER & WARNING LABELS
- DEDICATED PV SYSTEM METER
- RAPID SHUTDOWN
- STANDOFF LOCATIONS
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE/FENCE
- HEAT PRODUCING VENTS ARE RED
- INTERIOR EQUIPMENT IS DASHED

SITE PLAN

Scale: 1/16" = 1'



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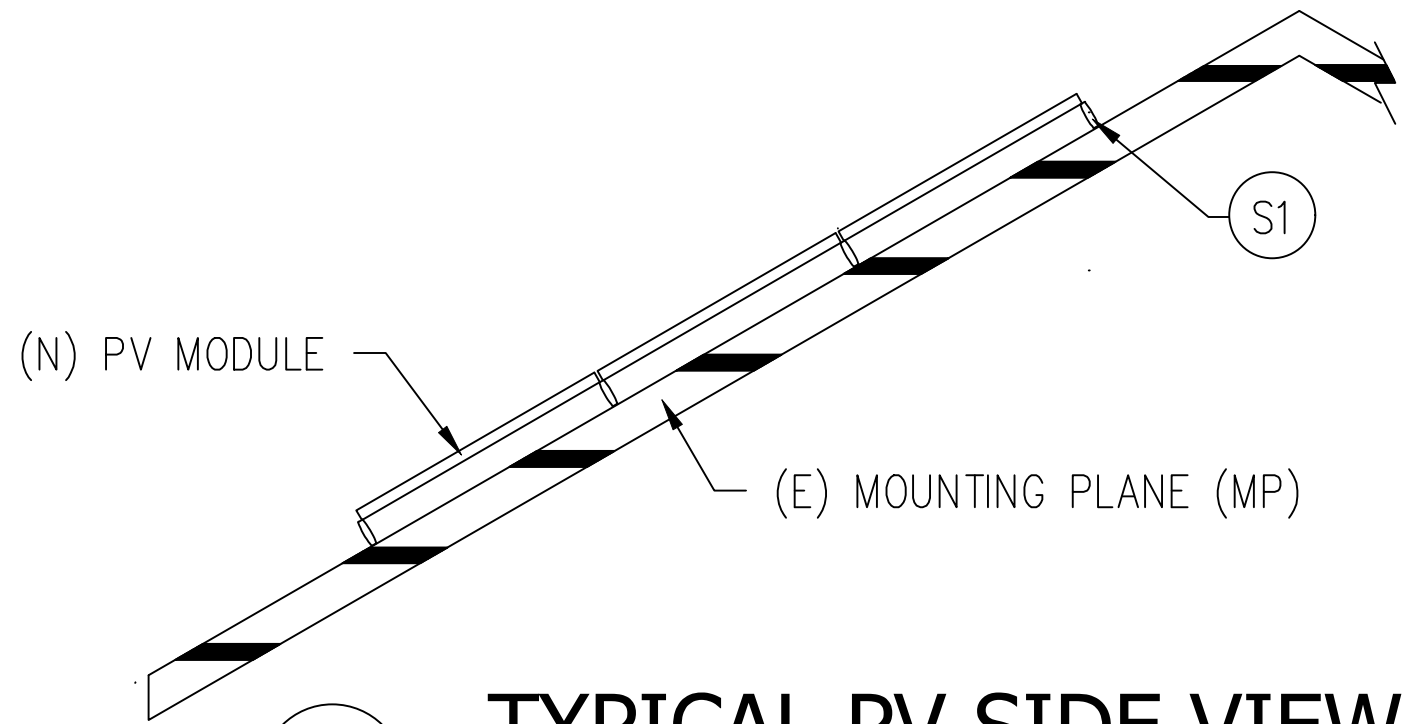
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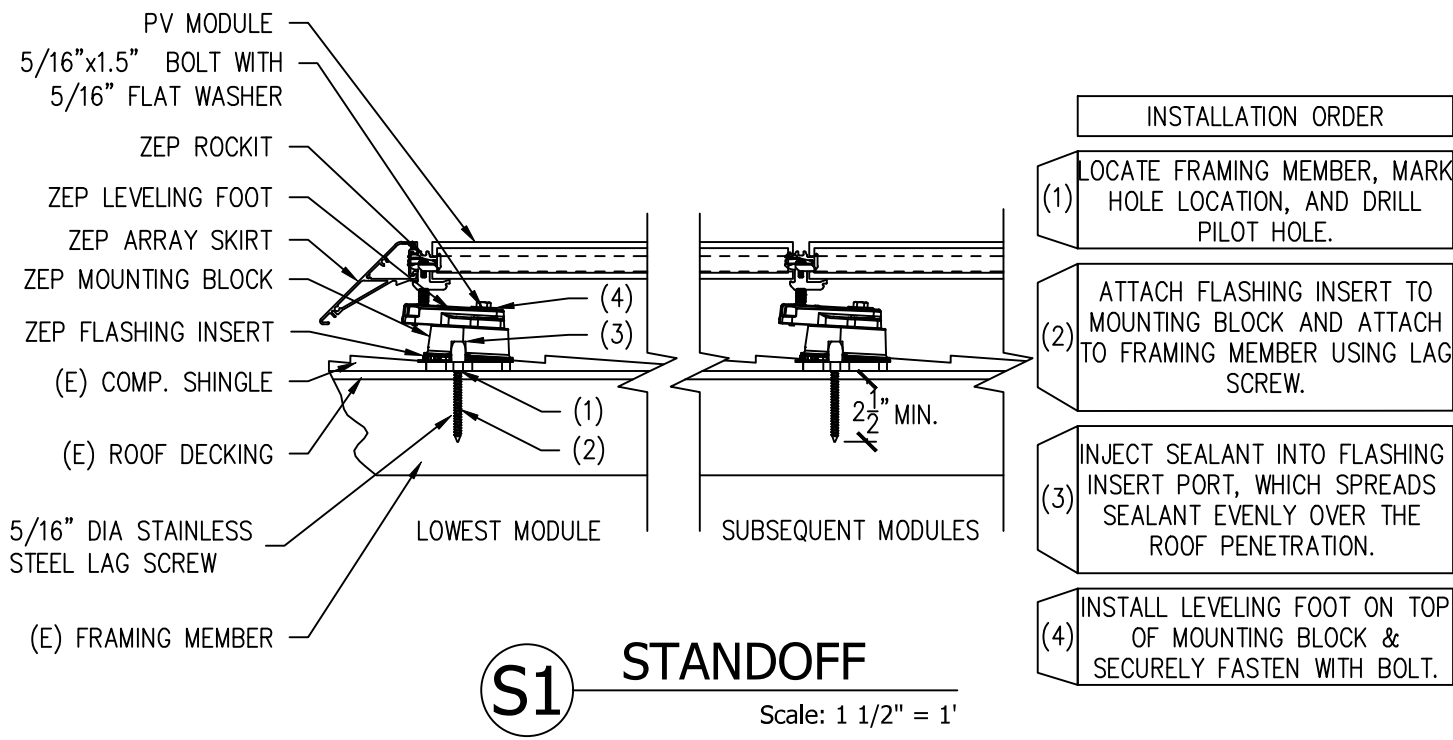
DESIGN:
Ricky Alvarez

SHEET: 2 REV: E DATE: 5/30/2024





SV **TYPICAL PV SIDE VIEW**
NTS



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STRUCTURAL VIEWS

DESIGN:
Ricky Alvarez

SHEET: 3 REV: E DATE: 5/30/2024



Jobsite Specific Design Criteria			
Design Code		ASCE 7-10	
Risk Category		II	Table 1.5-1
Ultimate Wind Speed	V-Ult	120	Fig. 1609A
Exposure Category		C	Section 26.7
Ground Snow Load	pg	20	Table 7-1

MP Specific Design Information		
MP Name	MP1	MP4
Roofing	Comp Shingle	Comp Shingle
Standoff	ZS Comp V4 w Flashing-Insert	ZS Comp V4 w Flashing-Insert
Pitch	30	30
SL/RLL: PV	9.2	9.2
SL/RLL: Non-PV	17.0	17.0
Edge Zone Width	5.9 ft	5.9 ft
Azimuth	247	67
Stories	2	2
Rafter Size/Spacing	2x6 @24" OC	2x6 @24" OC
CJ Size/Spacing	2x6 @24" OC	2x6 @24" OC
Standoff Spacing and Layout		
MP Name	MP1	MP4
Applied Wind Zones ₂	All <input type="checkbox"/>	All <input type="checkbox"/>
Wind Pressure	-19.02	-19.02
Landscape X-Spacing	72	72
Landscape X-Cantilever	24	24
Landscape Y-Spacing	41	41
Landscape Y-Cantilever	-	-
Portrait X-Spacing	48	48
Portrait X-Cantilever	16	16
Portrait Y-Spacing	74	74
Portrait Y-Cantilever	-	-
Layout	Staggered	Staggered
Notes: 1. X and Y are maximums that are always relative to the structure framing that supports the PV. X is across rafters and Y is along rafters. 2. Hatching in Applied Wind Zone rows corresponds to hatching on Site Plan. 3. Table lists consistent conservative standoff specifications and layout requirements across all wind zones to comply with the maximum wind pressure of any zone.		

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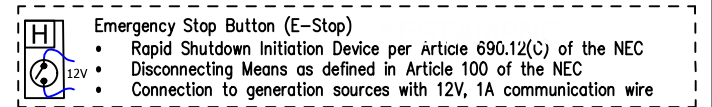
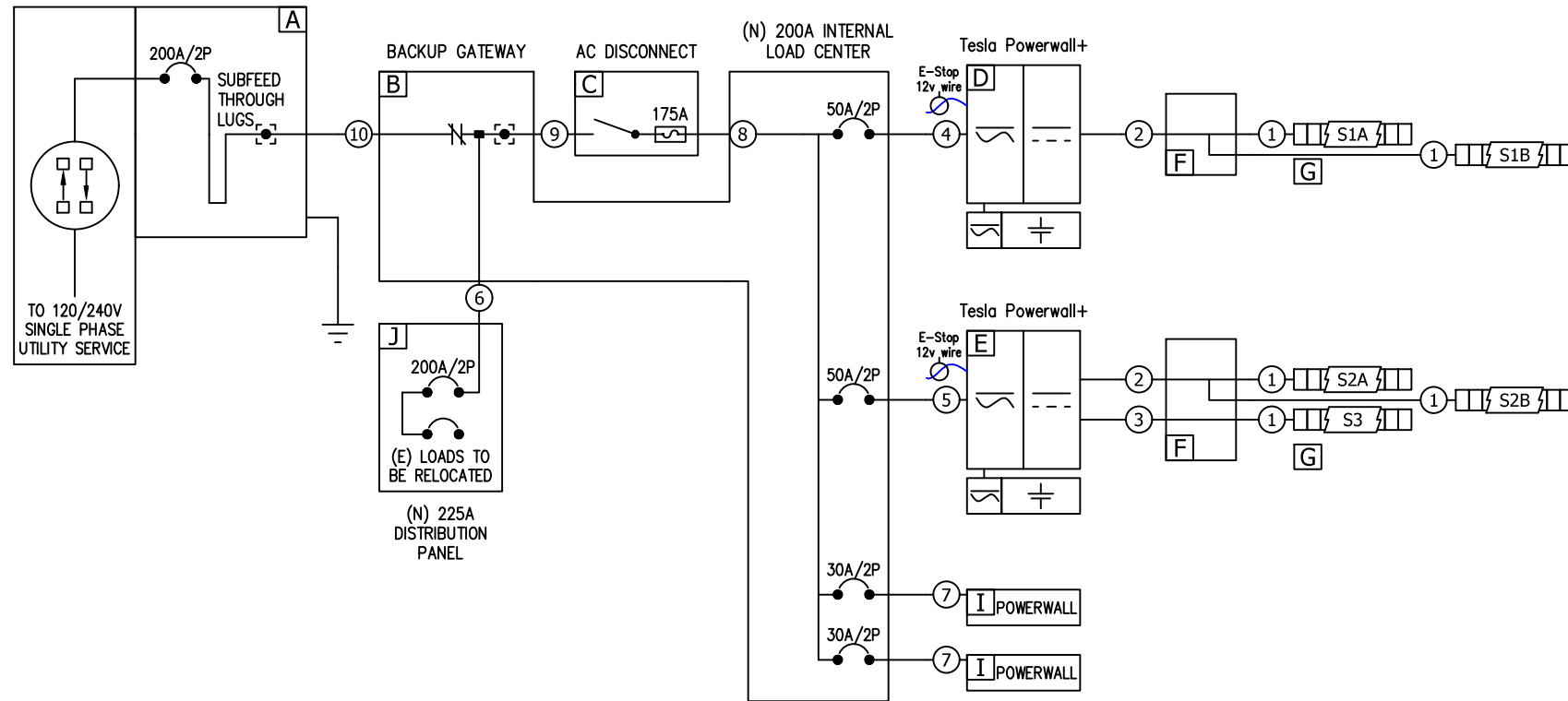
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UPLIFT CALCULATIONS

DESIGN:
Ricky Alvarez
SHEET: 4 REV: E DATE: 5/30/2024





1. CONDUIT RUNS MAY BE CONDENSED DUE TO SITE CONDITIONS AND/OR INSTALLATION EASE. ALL CONDUIT FILL DERATES AND PROPER CALCULATIONS HAVE BEEN COMPLETED PER NEC CHAPTER 9, TABLE 4.
2. SOLAR SHUTDOWN DEVICE TO BE INSTALLED FOR SYSTEM RAPID SHUTDOWN (RSD) IN ACCORDANCE WITH ARTICLE 690 OF THE APPLICABLE NEC.
3. CONDUIT TYPE CAN CHANGE DUE TO SITE CONDITIONS AND WILL FOLLOW THE NEC REQUIREMENTS FOR THAT CONDUIT TYPE.

SITE SPECIFICATIONS		MODULE SPECIFICATIONS	
Main Panel Rating	(E) 200A	Hanwha # Q.PEAK DUO BLK ML-G10+/TS 405: PV Module, 405W, 376.3WPTC, ZEP, Black Frame, MC4, 1000V	Qty 37
Main Breaker Rating	(E) 200A		
General Notes	DC Ungrounded Inverters	Voc	45.34
Panel Number	CMB1212B200BTS	Vmp	37.39
Meter Number	332298478	Isc and Imp are in the DC Conductor Table	
Service Entrance	Underground		

PARTS				DC CONDUCTOR TABLE						STRING TABLE									
Ref	Qty	Description		Ref	Type	Qty	Size (AWG, Cu)	EGC (AWG, Cu)	Conduit	Isc (ADC)	Imp (ADC)	Product Ref	String Ref	Module per String	MCI per String	Voc* (VDC)	Vmp (VDC)	Mounting Plane	
B	1	Panelboard Accessory Kit for GW 2.0 NA: 200A, 6sp/12cir, 120/240V, 1PH		1	PV Wire	2	#10	SBC #10	3/4" EMT	11.17	10.83	D	S1A	9	3	451.03	336.51	MP1	
B	1	Breaker; 30A/2P-30A/2P, 2 Spaces, Quadplex		2	THWN-2/THWN	2	#08	#10	3/4" EMT	22.34	21.66		D	S1B	9	3	451.03	336.51	MP1
B	2	Breaker; 50A/2P, 2 Spaces		3	THWN-2/THWN	2	#10	#10	3/4" EMT	11.17	10.83	E	S2A	6	2	300.69	224.34	MP4	
B	1	Tesla # 1232100-00-G: Back-up Gateway 2.0 NA											E	S2B	6	2	300.69	224.34	MP4
C	1	Tesla # 1232100-00-G: Back-up Gateway 2.0 NA		AC CONDUCTOR TABLE															
C	1	Disconnect; 200A, 240Vac, Fusible, NEMA 3R: 2P, 3W, Lockable		Ref	Type	Qty	Size (AWG) (Cu) (Al)	Min EGC (AWG, Cu)	Conduit (Cu) (Al)	Length (ft)	Imp (AAC)	Vmp (VAC)							
C	1	Ground/Neutral Kit; 200A General, Heavy Duty (DG, DH), NEMA 1, 3R		4	THWN-2	3	#08 #06	#10	3/4" EMT 3/4" EMT	5ft	32	240							
C	2	Fuse; 175A, 250V, Class RK5: Time Delay, 200kA I.R.		5	THWN-2	3	#08 #06	#10	3/4" EMT 3/4" EMT	5ft	32	240							
C	1	Class R Fuse Kit		6	THWN-2	3	#2/0 #4/0	#06	2" PVC 2" PVC	10ft	-	240							
D	1	Powerwall+ [240V] #1850000-XX-Y (1538000-XX-Y) 7.6 kW		7	THWN-2	3	#10 #08	#10	1" EMT 1" EMT	90ft	-	240							
E	1	Powerwall+ [240V] #1850000-XX-Y (1538000-XX-Y) 7.6 kW		8	THWN-2	3	#2/0 #4/0	#06	2" PVC 2" PVC	10ft	-	240							
F	2	JUNCTION BOX, 4 STRING		9	THWN-2	3	#2/0 #4/0	#06	2" PVC 2" PVC	5ft	-	240							
G	7	Tesla MCI, 650V, 12A		10	THWN-2	3	#2/0 #4/0	#06	2" PVC 2" PVC	10ft	-	240							
G	6	Tesla MCI, 650V, 12A																	
H	1	UL 508 Emergency Stop Device - NEMA 4X																	
I	2	AC Powerwall 3012170-05-E; ASY, AC POWERWALL2.2, 50F																	
J	1	Square D # HOM816M200PFTRB:200A MB LC;200A sub feed lugs; 120/240 1PH; 8/16; NEMA3; 22kAIC																	



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 219 Harvell Rd
 Coats, NC 27521
 9105917506

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 PAGE NAME: THREE LINE DIAGRAM

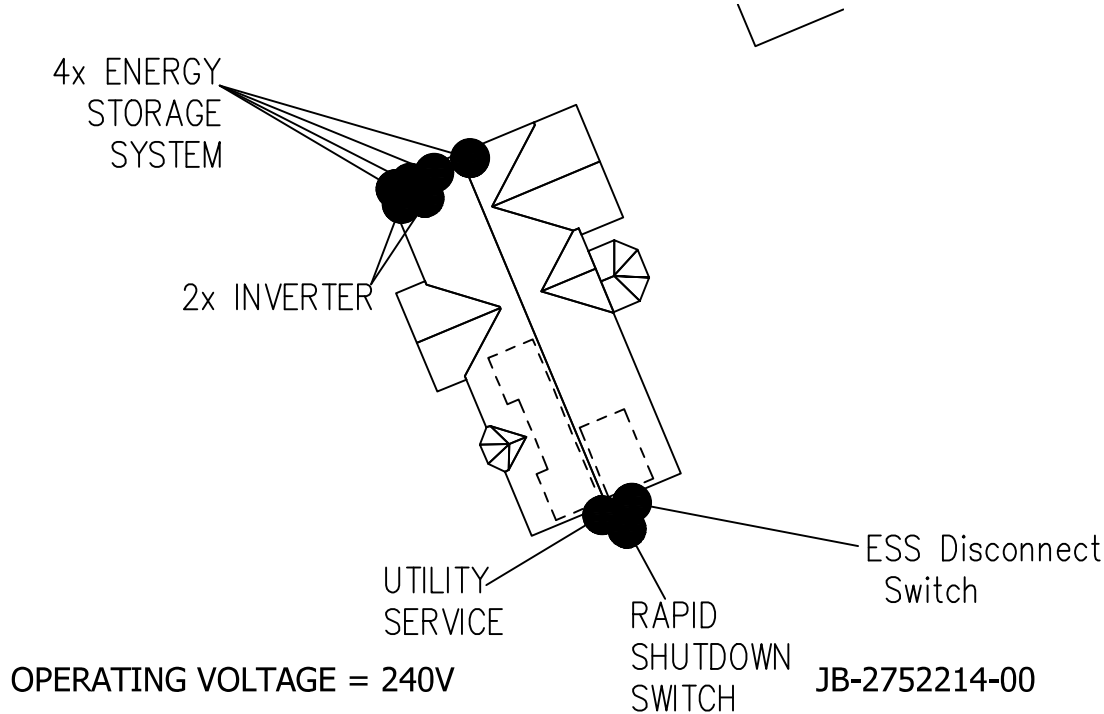
DESIGN: Ricky Alvarez
 SHEET: 5 REV: E DATE: 5/30/2024



SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF"
POSITION TO SHUT DOWN PV SYSTEM AND REDUCE
SHOCK HAZARD IN THE ARRAY
CAUTION: MULTIPLE SOURCES OF POWER

- Address: 219 Harvell Rd



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 PAGE NAME:
 SITE PLAN PLACARD

DESIGN:
 Ricky Alvarez
 SHEET: 6 REV: E DATE: 5/30/2024



WARNING: PHOTOVOLTAIC POWER SOURCE

Label Location:
(C)(CB)(JB)
Per Code:
NEC 690.31.G.3

**DC PHOTOVOLTAIC
DISCONNECT**

Label Location:
(DC)(INV)
Per Code:
NEC 690.13.B

⚠ WARNING

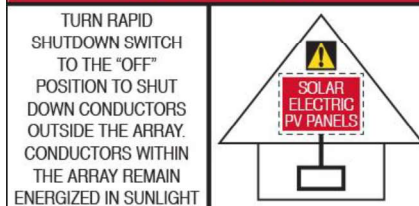
THIS EQUIPMENT FED BY
MULTIPLE SOURCES. TOTAL
RATING OF ALL OVER CURRENT
DEVICES, EXCLUDING MAIN
SUPPLY OVERCURRENT DEVICE,
SHALL NOT EXCEED AMPACITY
OF BUSBAR.

Label Location:
(MSP)
Per Code:
NEC 705.12.B.2.3.C

MAXIMUM POWER-
POINT CURRENT (Imp) A
MAXIMUM POWER-
POINT VOLTAGE (Vmp) V
MAXIMUM SYSTEM
VOLTAGE (Voc) V
SHORT-CIRCUIT
CURRENT (Isc) A

Label Location:
(DC) (INV)
Per Code:
NEC 690.53

**SOLAR PV SYSTEM
EQUIPPED WITH RAPID
SHUTDOWN**

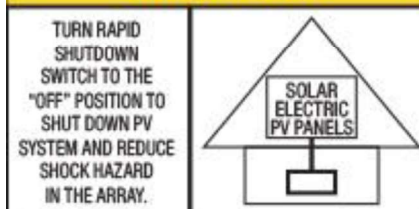


Label Location:
ABB/Delta Solivia Inverter
Per Code:
690.56(C)(1)(b)

**AC PHOTOVOLTAIC
DISCONNECT**

Label Location:
(AC)(POI)
Per Code:
NEC 690.13.B

**SOLAR PV SYSTEM
EQUIPPED WITH RAPID
SHUTDOWN**



Label Location:
SolarEdge and, Delta M-Series and, Telsa Inverter
Per Code:
690.56(C)(1)(a)

MAXIMUM AC
OPERATING CURRENT A
MAXIMUM AC
OPERATING VOLTAGE V

Label Location:
(AC) (POI)
Per Code:
NEC 690.54

⚠ WARNING

ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE
AND LOAD SIDES MAY BE
ENERGIZED IN THE OFF POSITION

Label Location:
(AC)(POI)
Per Code:
690.13.B

⚠ WARNING

INVERTER OUTPUT
CONNECTION
DO NOT RELOCATE
THIS OVERCURRENT
DEVICE

Label Location:
(POI)
Per Code:
NEC 705.12.B.2.3.B

(AC): AC Disconnect
(C): Conduit
(CB): Combiner Box
(D): Distribution Panel
(DC): DC Disconnect
(IC): Interior Run Conduit
(INV): Inverter With Integrated DC Disconnect
(LC): Load Center
(M): Utility Meter
(POI): Point of Interconnection

BACKUP LOAD CENTER

Label Location:
(BLC)
Per Code:
NEC 408.4

CAUTION
TRI POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
THIRD SOURCE IS ENERGY STORAGE SYSTEM

Label Location:
(MSP)
Per Code:
NEC 705.12(B)(3)

CAUTION
DO NOT ADD NEW LOADS

Label Location:
(BLC)
Per Code:
NEC 220

WARNING
THIS EQUIPMENT FED BY
MULTIPLE SOURCES. TOTAL
RATING OF ALL OVER CURRENT
DEVICES, EXCLUDING MAIN
SUPPLY OVERCURRENT DEVICE,
SHALL NOT EXCEED AMPACITY
OF BUSBAR.

Label Location:
(MSP)
Per Code:
NEC 705.12.B.2.3.c

CAUTION
THIS PANEL HAS SPLICED FEED-
THROUGH CONDUCTORS.
LOCATION OF DISCONNECT AT ENERGY
STORAGE BACKUP LOAD PANEL

Label Location:
(MSP)
Per Code:
NEC 312.8.A(3)

NOMINAL ESS VOLTAGE: 120/240V
**MAX AVAILABLE SHORT-
CIRCUIT FROM ESS: 32A**
**ARC FAULT CLEARING
TIME FROM ESS: 67ms**
**DATE OF
CALCULATION:**

Label Location:
(MSP)
Per Code:
Per 706.7(D) label to be marked in field

CAUTION
DUAL POWER SOURCE
SECOND SOURCE IS
ENERGY STORAGE SYSTEM

Label Location:
(MSP)
Per Code:
NEC 705.12(B)(3)

**ENERGY STORAGE SYSTEM ON SITE
LOCATED WITHIN LINE OF SIGHT**

Label Location:
(MSP)
Per Code:

**ENERGY STORAGE SYSTEM ON SITE
LOCATED ON ADJACENT WALL**

Label Location:
(MSP)
Per Code:

**ENERGY STORAGE SYSTEM ON SITE
LOCATED ON OPPOSITE WALL**

Label Location:
(MSP)
Per Code:

**ENERGY STORAGE SYSTEM ON SITE
LOCATED INSIDE**

Label Location:
(MSP)
Per Code:

(AC): AC Disconnect
(BLC): Backup Load Center
(MSP): Main Service Panel

Q.PEAK DUO BLK ML-G10+ SERIES



385-405 Wp | 132 Cells
20.5% Maximum Module Efficiency

MODEL Q.PEAK DUO BLK ML-G10+/TS



Breaking the 20% efficiency barrier

Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.5%.



A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty¹.



Enduring high performance

Long-term yield security with Anti LeTID Technology, Anti PID Technology² and Hot-Spot Protect.



Innovative all-weather technology

Optimal yields, whatever the weather with excellent low-light and temperature behaviour.



Zep compatible™ frame design

High-tech black Zep Compatible™ frame, for improved aesthetics, easy installation and increased safety.



The most thorough testing programme in the industry

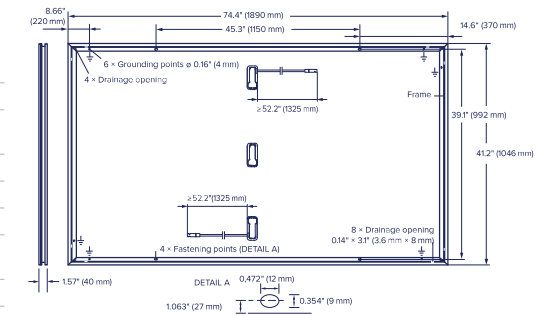
Qcells is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

¹ See data sheet on rear for further information.
² APT test conditions according to IEC/TS 62804-1:2015, method A (-1500 V, 96 h)

Q.PEAK DUO BLK ML-G10+ SERIES

Mechanical Specification

Format	74.4 in × 41.2 in × 1.57 in (including frame) (1890 mm × 1046 mm × 40 mm)
Weight	51.8 lbs (23.5 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodised aluminium
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm ² Solar cable; (+) > 52.2 in (1325 mm), (-) > 52.2 in (1325 mm)
Connector	Stäubli MC4; IP68

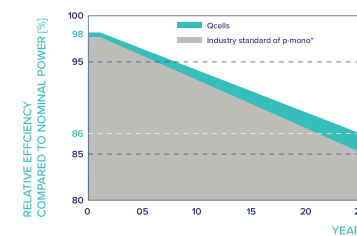


Electrical Characteristics

POWER CLASS		385	390	395	400	405	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5 W/-0 W)							
Minimum	Power at MPP ¹	P_{MPP} [W]	385	390	395	400	405
	Short Circuit Current ¹	I_{SC} [A]	11.04	11.07	11.10	11.14	11.17
	Open Circuit Voltage ¹	V_{OC} [V]	45.19	45.23	45.27	45.3	45.34
	Current at MPP	I_{MPP} [A]	10.59	10.65	10.71	10.77	10.83
	Voltage at MPP	V_{MPP} [V]	36.36	36.62	36.88	37.13	37.39
Efficiency ¹	η [%]	≥ 19.5	≥ 19.7	≥ 20.0	≥ 20.2	≥ 20.5	
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ²							
Minimum	Power at MPP	P_{MPP} [W]	288.8	292.6	296.3	300.1	303.8
	Short Circuit Current	I_{SC} [A]	8.90	8.92	8.95	8.97	9.00
	Open Circuit Voltage	V_{OC} [V]	42.62	42.65	42.69	42.72	42.76
	Current at MPP	I_{MPP} [A]	8.35	8.41	8.46	8.51	8.57
Voltage at MPP	V_{MPP} [V]	34.59	34.81	35.03	35.25	35.46	

¹Measurement tolerances $P_{MPP} \pm 3\%$; I_{SC} ; $V_{OC} \pm 5\%$ at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • ²800 W/m², NMOT, spectrum AM 1.5

Qcells PERFORMANCE WARRANTY

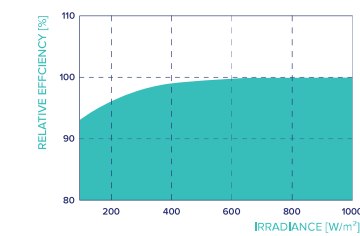


At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Qcells sales organisation of your respective country.

^{*}Standard terms of guarantee for the 5 PV companies with the highest production capacity in 2021 (February 2021)

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α [%/K]	+0.04	Temperature Coefficient of V_{OC}	β [%/K]	-0.27
Temperature Coefficient of P_{MPP}	γ [%/K]	-0.34	Nominal Module Operating Temperature	NMOT [°F]	109 ± 5.4 (43 ± 3 °C)

Properties for System Design

Maximum System Voltage	V_{SYS} [V]	1000 (IEC)/1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI/UL 61730	TYPE 2
Max. Design Load, Push/Pull ³	[lbs/ft ²]	85 (4080 Pa)/85 (4080 Pa)	Permitted Module Temperature on Continuous Duty	-40 °F up to +185 °F (-40 °C up to +85 °C)
Max. Test Load, Push/Pull ³	[lbs/ft ²]	128 (6120 Pa)/128 (6120 Pa)		

³ See Installation Manual

Qualifications and Certificates

UL 61730, CE-compliant, Quality Controlled PV - TÜV Rheinland; IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells)



The ideal solution for:



Qcells pursues minimizing paper output in consideration of the global environment.

Note: Installation instructions must be followed. Contact our technical service for further information on approved installation of this product.
Hanwha Q CELLS America Inc. 400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL hqc-inquiry@qcells.com | WEB www.qcells.com

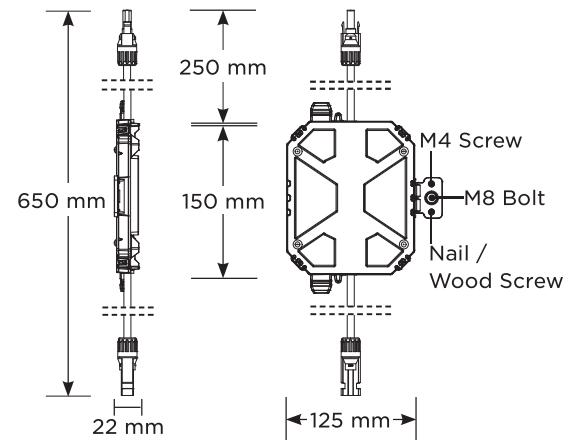


Solar Shutdown Device 1 Technical Specifications

The Solar Shutdown Device is a Mid-Circuit Interrupter (MCI) and is part of the PV system rapid shutdown (RSD) function in accordance with Article 690 of the applicable NEC. When paired with Powerwall+ or Tesla Solar Inverter, solar array shutdown is initiated by any loss of AC power.

Electrical Specifications	Nominal Input DC Current Rating (I_{MP})	12 A
	Maximum Input Short Circuit Current (I_{SC})	19 A
	Maximum System Voltage (PVHCS)	600 V DC
RSD Module Performance	Maximum Number of Devices per String	5
	Control	Power Line Excitation
	Passive State	Normally Open
	Maximum Power Consumption	7 W
	Warranty	25 years
Environmental Specifications	Ambient Temperature	-40°C to 50°C (-40°F to 122°F)
	Storage Temperature	-30°C to 70°C (-22°F to 158°F)
	Enclosure Rating	NEMA 4X / IP65
Compliance Information	Certifications	UL 1741 PVRSE, UL 3741, PVRSA (Photovoltaic Rapid Shutdown Array)
	RSD Initiation Method	PV System AC Breaker or Switch
	Compatible Equipment	See Compatibility Table below

Mechanical Specifications	Model Number	MCI-1
	Electrical Connections	MC4 Connector
	Housing	Plastic
	Dimensions	125 mm x 150 mm x 22 mm (5 in x 6 in x 1 in)
	Weight	350 g (0.77 lb)
	Mounting Options	ZEP Home Run Clip
		M4 Screw (#10) M8 Bolt (5/16") Nail / Wood screw



UL 3741 PV Hazard Control (and PVRSA) Compatibility

Tesla Solar Roof and Tesla/Zep ZS Arrays using the following modules are certified to UL 3741 and UL 1741 PVRSA when installed with Powerwall+ or Tesla Solar Inverter and Solar Shutdown Devices. See [Powerwall+ / Tesla Solar Inverter Rapid Shutdown: Module Selection Based on PV Hazard Control System Listing](#) for guidance on installing other modules.

Brand	Model	Required Solar Shutdown Devices
Tesla	Solar Roof V3	1 Solar Shutdown Device per 10 modules
Tesla	Tesla TxxxS (where xxx = 405 to 450 W, increments of 5) Tesla TxxxH (where xxx = 395 to 415 W, increments of 5)	1 Solar Shutdown Device per 3 modules ¹
Hanwha	Q.PEAK DUO BLK-G5 or Q.PEAK DUO BLK-G6+	1 Solar Shutdown Device per 3 modules

¹ **Exception:** Tesla solar modules installed in locations where the max Voc for three modules at low design temperatures exceeds 165 V shall be limited to two modules between Solar Shutdown Devices.

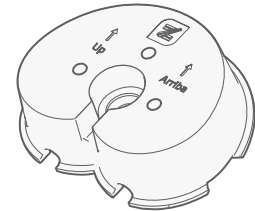
ROOFING SYSTEM SPECIFICATIONS



DESCRIPTION	PV mounting solution for composition shingle roofs.
	Works with all Zep Compatible Modules.
	Auto bonding UL-listed hardware creates structural and electrical bond.
SPECIFICATIONS	Designed for pitched roofs.
	Installs in portrait and landscape orientations.
	Engineered for spans up to 72" and cantilevers up to 24".
	ZS Comp has a UL 1703 Class "A" Fire Rating when installed using modules from any manufacturer certified as "Type 1" or "Type 2".
	Attachment method UL listed to UL 2582 for Wind Driven Rain.
	ZS Comp supports 50 psf (2400 Pa) front and up to 72 psf (3450 Pa) rear side design load rating for Portrait module orientation per UL 2703.
	ZS Comp supports 50 psf (2400 Pa) front side and up to 72 psf (3450 Pa) rear side design load rating for Landscape module orientation.
	Engineered for compliance with ASCE 7-05, 7-10, and 7-16 wind load requirements.
Zep wire management products listed to UL 1565 for wire positioning devices.	
ZS Comp grounding products are listed to UL 2703 and UL 467.	
ZS Comp bonding products are listed to UL 2703.	

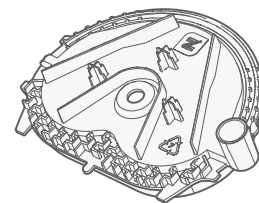
MOUNTING BLOCK

Listed to UL 2703
Part #850-1633



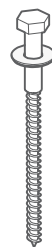
FLASHING INSERT

Listed to UL 2703 and UL 2582 for Wind Driven Rain
Part #850-1628



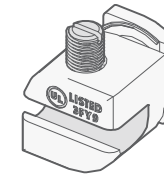
CAPTURED WASHER LAG

Part #850-1631-002 and #850-1631-004



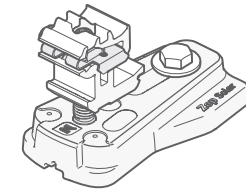
GROUND ZEP

Listed to UL 2703
Part #850-1511



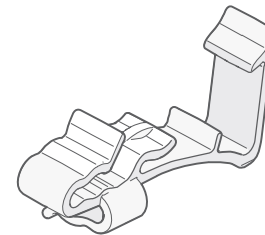
LEVELING FOOT

Listed to UL 2703
Part #850-1397



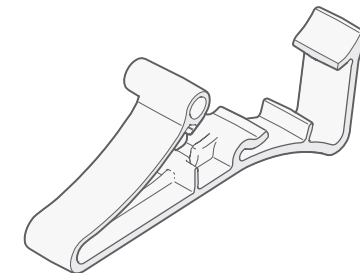
DC WIRE CLIP

Listed to UL 1565
Part #850-1509



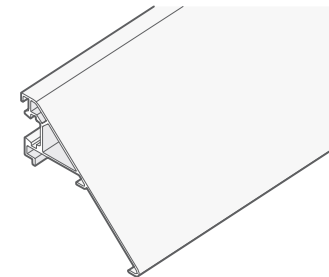
HOME RUN CLIP

Listed to UL 1565
Part #850-1510



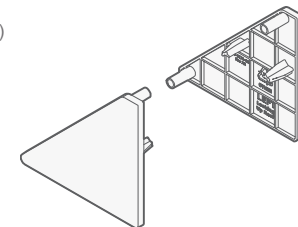
ARRAY SKIRT

Listed to UL 2703
Part #850-1608



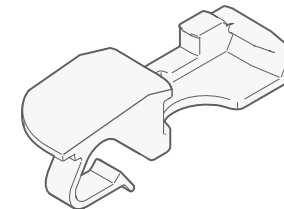
END CAP

Listed to UL 2703
Part #850-1586 (Left)
Part #850-1588 (Right)



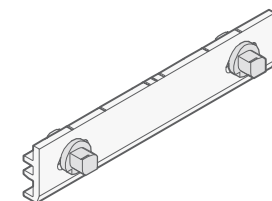
SKIRT GRIP

Listed to UL 2703
Part #850-1606



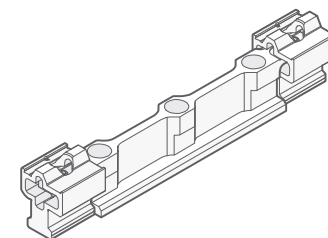
INTERLOCK

Listed to UL 2703
Part #850-1613



HYBRID INTERLOCK

Listed to UL 2703
Part #850-1281



Powerwall+

Powerwall+ is an integrated solar battery system that stores energy from solar production. Powerwall+ has two separate inverters, one for battery and one for solar, that are optimized to work together. Its integrated design and streamlined installation allow for simple connection to any home, and improved surge power capability brings whole home backup in a smaller package. Smart system controls enable owners to customize system behavior to suit their renewable energy needs.

Key Features

- Integrated battery, inverter, and system controller for a more compact install
- A suite of application modes, including self-powered, time-based control, and backup modes
- Wi-Fi, Ethernet, and LTE connectivity with easy over-the-air updates.



Powerwall+ Technical Specifications

Photovoltaic (PV) and Battery Energy Storage (BESS) Specifications

Powerwall+ Model Number	1850000-xx-y
Solar Assembly Model Number	1538000-xx-y
Nominal Battery Energy	13.5 kWh ¹
Nominal Grid Voltage (Input / Output)	120/240 VAC
Grid Voltage Range	211.2 - 264 VAC
Frequency	60 Hz
Phase	240 VAC: 2W+N+GND
Maximum Continuous Power On-Grid	7.6 kVA with sun / 5.8 kVA no sun ^{1,2}
Maximum Continuous Power Off-Grid	9.6 kW with sun / 7 kW no sun ¹
Peak Off-Grid Power (10 s)	22 kW full sun / 10 kW no sun ¹
Maximum Continuous Current On-Grid	32 A output
Maximum Continuous Current Off-Grid	40 A output
Load Start Capability	98 - 118 A LRA ³
Overcurrent Protection Device	50 A breaker
Output Power Factor Rating	+/- 0.9 to 1 ⁴
PV Maximum Input Voltage	600 VDC
PV DC Input Voltage Range	60 - 550 VDC
PV DC MPPT Voltage Range	60 - 480 VDC
MPPTs	4
Input Connectors per MPPT	1-2-1-2
Maximum Current per MPPT (Imp)	13 A ⁵
Maximum Short Circuit Current per MPPT (Isc)	19 A ⁵
Allowable DC/AC Ratio	1.7
Maximum Supply Fault Current	10 kA
Round Trip Efficiency	90% ^{1,6}
Solar Generation CEC Efficiency	97.5% at 208 V 98.0% at 240 V
Customer Interface	Tesla Mobile App
Internet Connectivity	Wi-Fi, Ethernet, Cellular (LTE/4G) ⁷
PV AC Metering	Revenue grade (+/-0.5%)
Protections	Integrated arc fault circuit interrupter (AFCI), PV Rapid Shutdown
Warranty	10 years

¹Values provided for 25°C (77°F), 3.3 kW charge/discharge power.

²7.6 kW with sun / 5 kW no sun at power factor of 1.

³Load start capability may vary.

⁴Power factor rating at max real power.

⁵Where the DC input current exceeds an MPPT rating, jumpers can be used to allow a single MPPT to intake additional DC current up to 26 A Imp / 38 A Isc.

⁶AC to battery to AC, at beginning of life.

⁷Cellular connectivity subject to network service coverage and signal strength.

Powerwall+ Technical Specifications

Environmental Specifications

Operating Temperature	-20°C to 50°C (-4°F to 122°F) ⁸
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	-20°C to 30°C (-4°F to 86°F) Up to 95% RH, non-condensing State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	Type 3R
Solar Assembly Ingress Rating	IP55 (Wiring Compartment)
Battery Assembly Ingress Rating	IP56 (Wiring Compartment) IP67 (Battery & Power Electronics)
Noise Level @ 1 m	< 40 db(A) optimal, < 50 db(A) maximum

⁸Performance may be de-rated at operating temperatures below 10°C (50°F) or greater than 43°C (109°F).

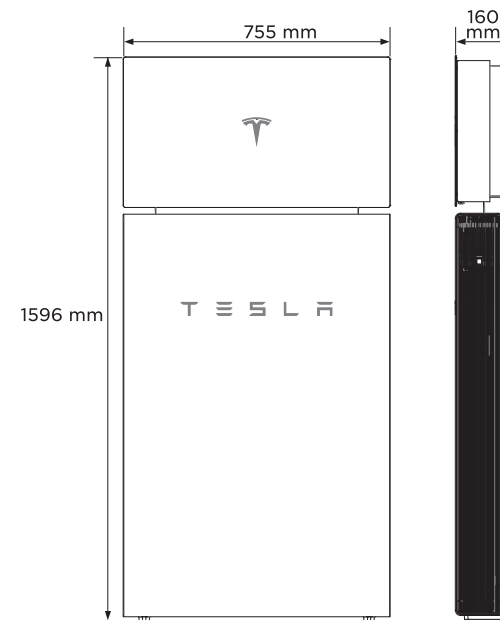
Compliance Information

PV Certifications	UL 1699B, UL 1741, UL 3741, UL 1741 SA, UL 1741 SB, UL 1998 (US), IEEE 1547-2018, IEEE 1547.1
Battery Energy Storage System Certifications	UL 1642, UL 1741, UL 1741 PCS, UL 1741 SA, UL 1741 SB, UL 1973, UL 9540, IEEE 1547-2018, IEEE 1547.1, UN 38.3
Grid Connection	United States
Emissions	FCC Part 15 Class B
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)

Mechanical Specifications

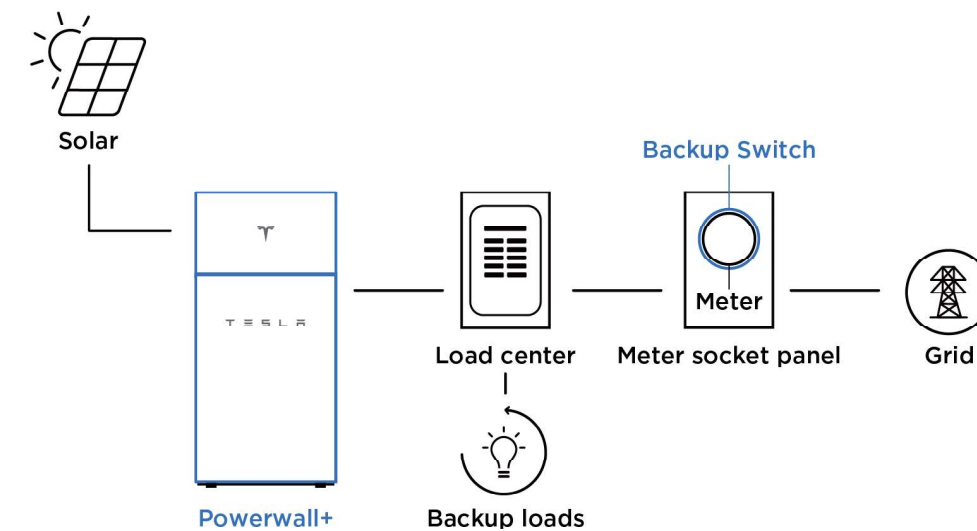
Dimensions	1596 x 755 x 160 mm (62.8 x 29.7 x 6.3 in)
Total Weight	140 kg (310 lb) ⁹
Battery Assembly	118 kg (261 lb)
Solar Assembly	22 kg (49 lb)
Mounting Options	Floor or wall mount

⁹The total weight does not include the Powerwall+ bracket, which weighs an additional 9 kg (20 lb).

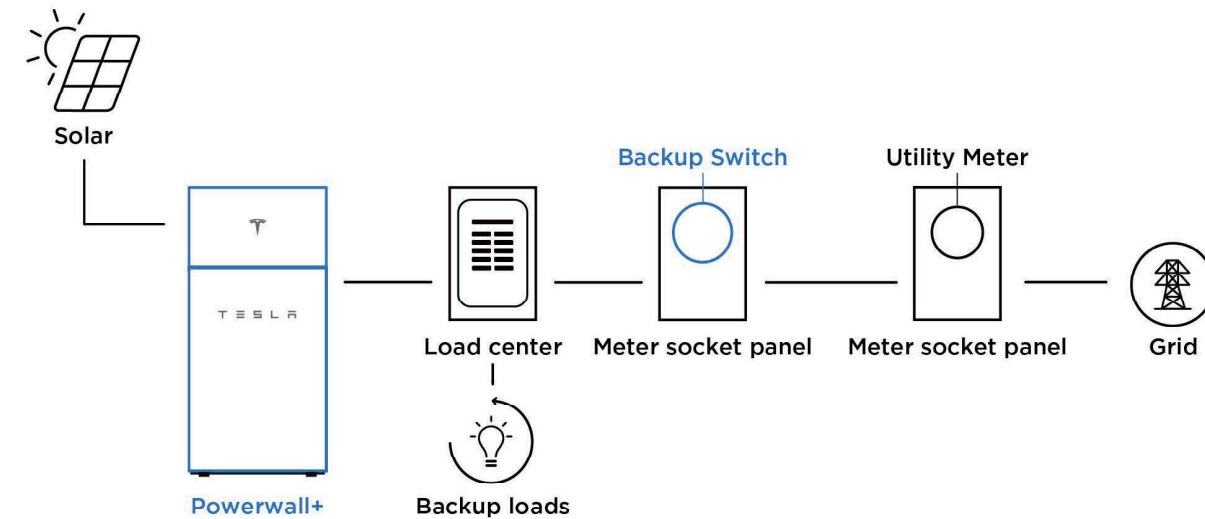


Powerwall+ Example System Configurations

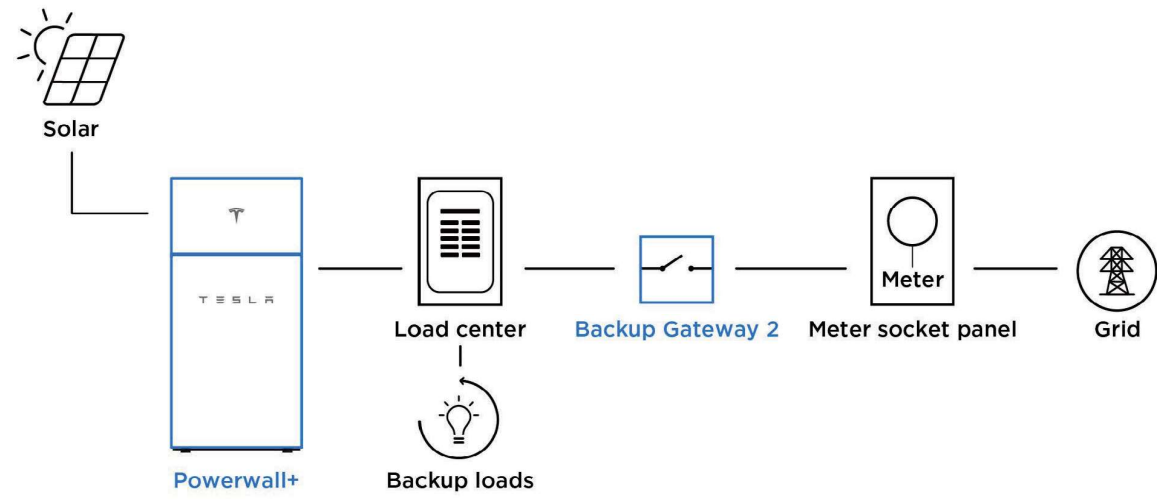
Powerwall+ with Backup Switch Installed Behind Utility Meter



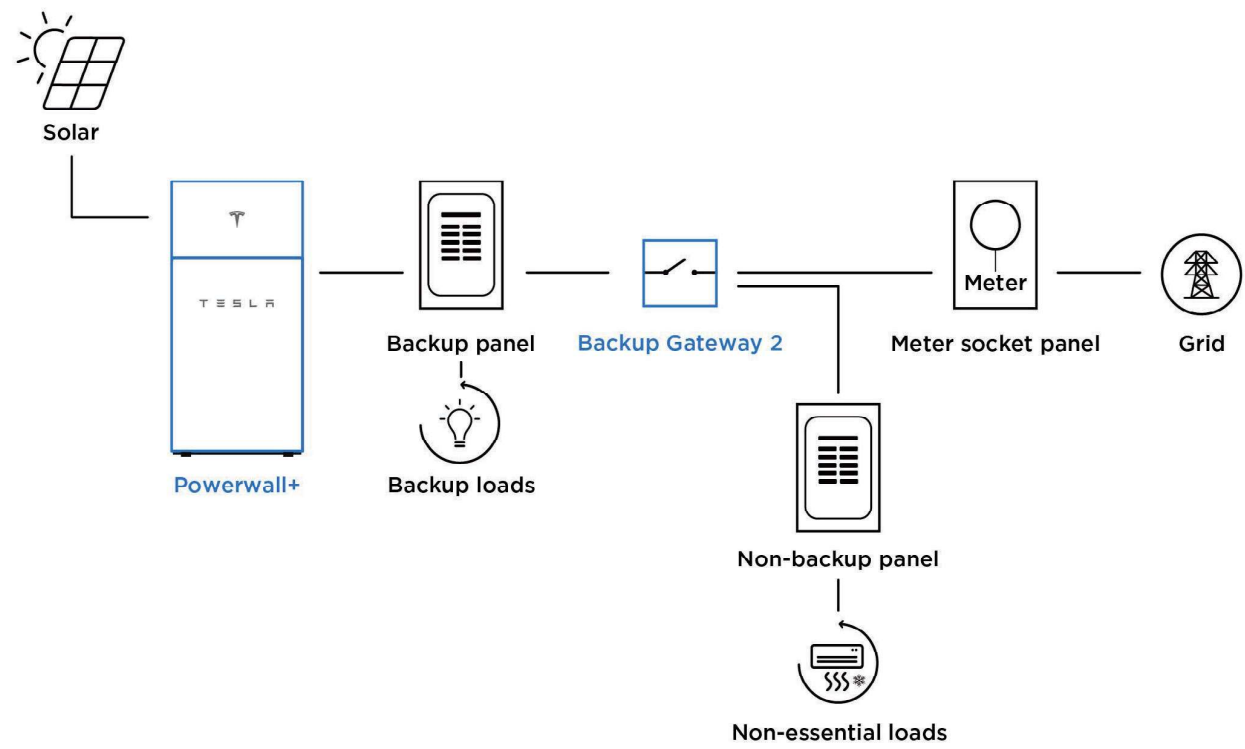
Powerwall+ with Backup Switch Installed Downstream of Utility Meter



Powerwall+ with Backup Gateway 2 for Whole Home Backup



Powerwall+ with Backup Gateway 2 for Partial Home Backup



POWERWALL 2

Tesla Powerwall 2 is a fully-integrated AC battery system for residential or light commercial use. Its rechargeable lithium-ion battery pack provides energy storage for solar self-consumption, time-based control, and backup.

Powerwall's electrical interface provides a simple connection to any home or building. Its revolutionary compact design achieves market-leading energy density and is easy to install, enabling owners to quickly realize the benefits of reliable, clean power.



PERFORMANCE SPECIFICATIONS

Model Numbers	1092170-xx-y, 2012170-xx-y, 3012170-xx-y
AC Voltage (Nominal)	120/240 V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Total Energy	14 kWh ¹
Usable Energy	13.5 kWh ¹
Real Power, max continuous	5 kW (charge and discharge)
Real Power, peak (10s, off-grid/backup)	7 kW (charge and discharge)
Apparent Power, max continuous	5.8 kVA (charge and discharge)
Apparent Power, peak (10s, off-grid/backup)	7.2 kVA (charge and discharge)
Maximum Continuous Current	24 A
Maximum Output Fault Current	32 A
Overcurrent Protection Device	30 A
Load Start Capability	88 - 106 A LRA ²
Imbalance for Split-Phase Loads	100%
Power Factor Output Range	+/- 1.0 adjustable
Power Factor Range (full-rated power)	+/- 0.85
Internal Battery DC Voltage	50 V
Maximum Supply Fault Current	10 kA
Round Trip Efficiency	90% ^{1,3}
Warranty	10 years

¹Values provided for 25°C (77°F), 3.3 kW charge/discharge power.

²Load start capability may vary.

³AC to battery to AC, at beginning of life.

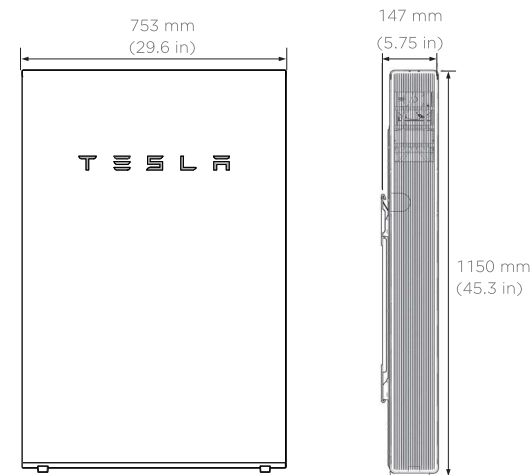
COMPLIANCE INFORMATION

Certifications	UL 1642, UL 1741, UL 1741 SA, UL 1741 SB, UL 1973, UL 9540, IEEE 1547-2018, UN 38.3
Grid Connection	Worldwide Compatibility
Emissions	FCC Part 15 Class B, ICES 003
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)
Fire Testing	Meets the unit level performance criteria of UL 9540A

MECHANICAL SPECIFICATIONS

Dimensions	1150 x 753 x 147 mm (45.3 x 29.6 x 5.75 in) ⁴
Weight	114 kg (251.3 lbs) ⁴
Mounting options	Floor or wall mount

⁴Dimensions and weight differ slightly if manufactured before March 2019. Contact Tesla for additional information.



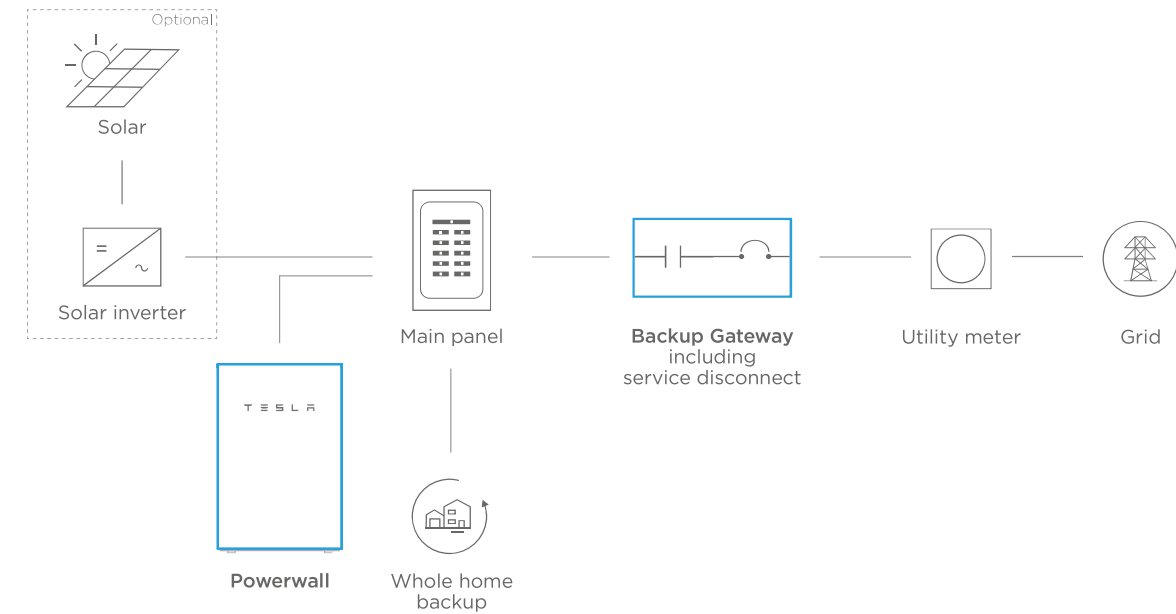
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to 50°C (-4°F to 122°F) ⁵
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	-20°C to 30°C (-4°F to 86°F) Up to 95% RH, non-condensing State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics) IP56 (Wiring Compartment)
Wet Location Rating	Yes
Noise Level @ 1m	< 40 dBA at 30°C (86°F)

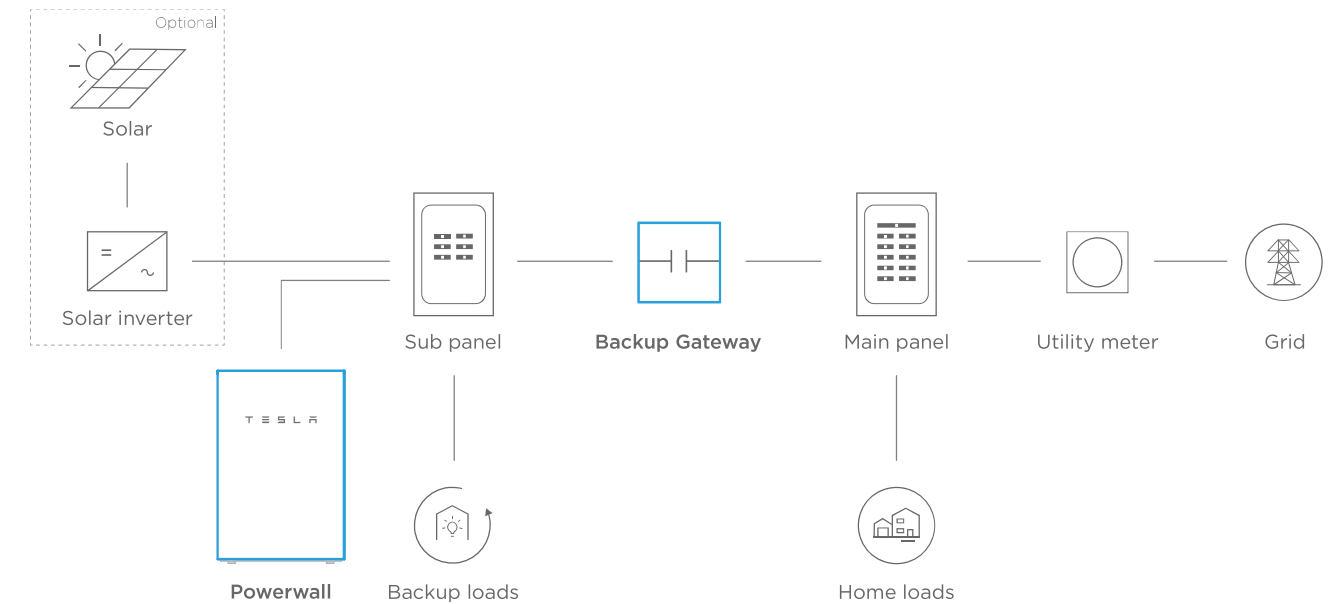
⁵Performance may be de-rated at operating temperatures below 10°C (50°F) or greater than 43°C (109°F).

TYPICAL SYSTEM LAYOUTS

WHOLE HOME BACKUP



PARTIAL HOME BACKUP



POWERWALL

Backup Gateway 2

The Backup Gateway 2 for Tesla Powerwall provides energy management and monitoring for solar self-consumption, time-based control, and backup.

The Backup Gateway 2 controls connection to the grid, automatically detecting outages and providing a seamless transition to backup power. When equipped with a main circuit breaker, the Backup Gateway 2 can be installed at the service entrance. When the optional internal panelboard is installed, the Backup Gateway 2 can also function as a load center.

The Backup Gateway 2 communicates directly with Powerwall, allowing you to monitor energy use and manage backup energy reserves from any mobile device with the Tesla app.



PERFORMANCE SPECIFICATIONS

Model Number	1232100-xx-y
AC Voltage (Nominal)	120/240V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Current Rating	200 A
Maximum Input Short Circuit Current	10 kA ¹
Overcurrent Protection Device	100-200A; Service Entrance Rated ¹
Overvoltage Category	Category IV
AC Meter	Revenue accurate (+/- 0.2 %)
Primary Connectivity	Ethernet, Wi-Fi
Secondary Connectivity	Cellular (3G, LTE/4G) ²
User Interface	Tesla App
Operating Modes	Support for solar self-consumption, time-based control, and backup
Backup Transition	Automatic disconnect for seamless backup
Modularity	Supports up to 10 AC-coupled Powerwalls
Optional Internal Panelboard	200A 6-space / 12 circuit Eaton BR Circuit Breakers
Warranty	10 years

¹ When protected by Class J fuses, Backup Gateway 2 is suitable for use in circuits capable of delivering not more than 22kA symmetrical amperes.

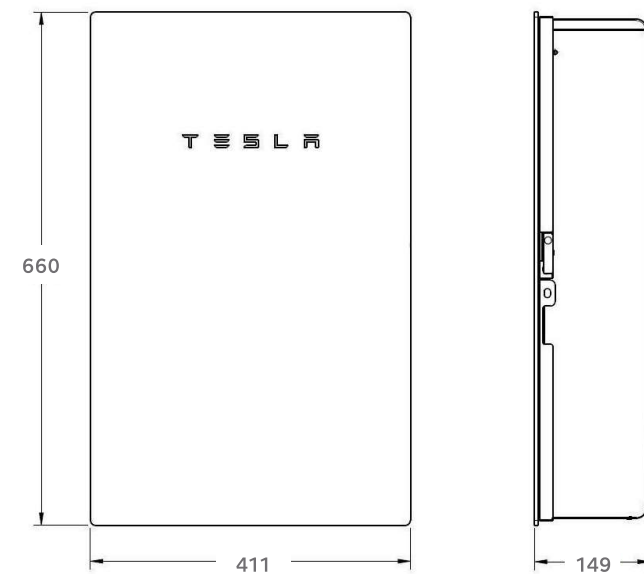
² The customer is expected to provide internet connectivity for Backup Gateway 2; cellular should not be used as the primary mode of connectivity. Cellular connectivity subject to network operator service coverage and signal strength.

COMPLIANCE INFORMATION

Certifications	UL 67, UL 869A, UL 916, UL 1741 PCS CSA 22.2 0.19, CSA 22.2 205
Emissions	FCC Part 15, ICES 003

MECHANICAL SPECIFICATIONS

Dimensions	660 mm x 411 mm x 149 mm (26 in x 16 in x 6 in)
Weight	20.4 kg (45 lb)
Mounting options	Wall mount, Semi-flush mount



ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R

MCI WIRING DETAIL

GENERAL NOTES

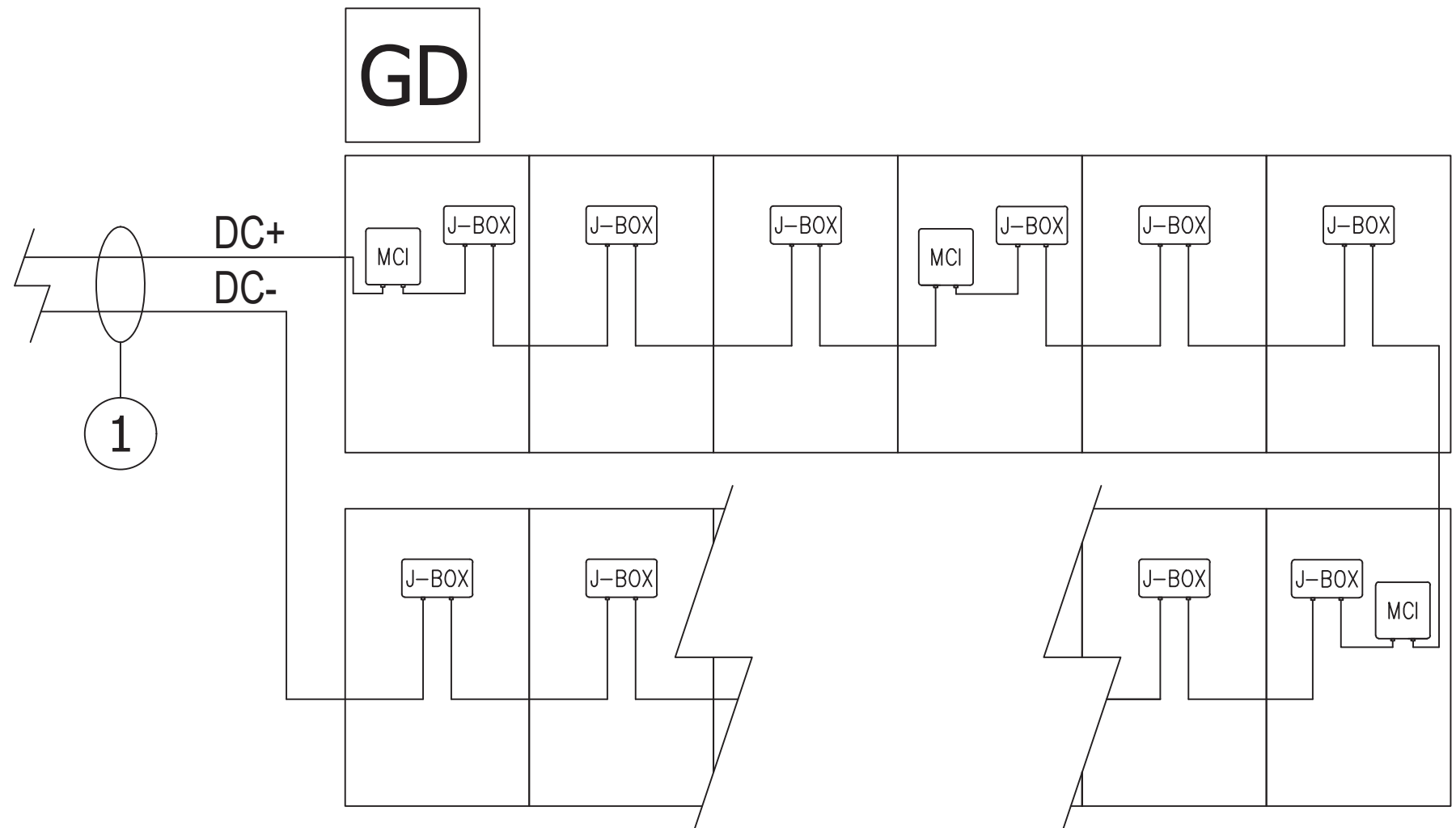
- DRAWING OF STANDARD MCI WIRING DETAIL FOR ANY GIVEN STRING LENGTH
- IF INITIATED, RAPID SHUTDOWN OCCURS WITHIN 30 SECONDS OF ACTIVATION AND LIMITS VOLTAGE ON THE ROOF TO NO GREATER THAN 165V (690.12.B.2.1)
- MID CIRCUIT INTERRUPTER (MCI) IS A UL 1741 PVRSE CERTIFIED RAPID SHUTDOWN DEVICE (RSD)

RETROFIT PV MODULES

- MCIS ARE LOCATED AT ROOF LEVEL, JUST UNDER THE PV MODULES IN ACCORDANCE WITH 690.12 REQUIREMENTS
- THE QUANTITY OF MCIS PER STRING IS DETERMINED BY STRING LENGTH
 - NUMBER OF MODULES BETWEEN MCI UNITS = 0-3
 - MAXIMUM NUMBER OF MODULES PER MCI UNIT = 3
 - MINIMUM NUMBER MCI UNITS = MODULE COUNT/3

*Exception: Tesla (Longi) modules installed in locations where the max Voc for 3 modules at low design temperature exceeds 165V shall be limited to 2 modules between MCIs.

PLEASE REFER TO MCI CUTSHEET AND PVRSA INSERT FOR MORE INFORMATION



① (2)AWG, PV Wire, 600V, Black

DC