

1.0 Reference and Address			
Report Number	2307A0920HAN-001S	Original Issued: 20-Jun-2023	Revised: 8-Jan-2024
Standard(s)	Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [UL 61730-1:2022 Ed.2] Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [UL 61730-2:2022 Ed.2+R:25Apr2023] Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [CSA C22.2#61730-1:2019 Ed.2] Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [CSA C22.2#61730-2:2019 Ed.2] Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1: Test Requirements [UL 61215-1:2021 Ed.2] Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-1: Special Requirements for Testing of Crystalline Silicon Photovoltaic (PV) Modules [UL 61215-1-1:2021 Ed.2] Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 2: Test Procedures [UL 61215-2:2021 Ed.2]		
Applicant	G-Star Pte Ltd	Manufacturer 1	LIGHT&HOPE ENERGY COMPANY LIMITED
Address	6 RAFFLES QUAY, # 14-06 SINGAPORE (048580)	Address	NO. 88/23-25 MU 15 BANG SAOT HONG, SUB-DISTRICT, BANG SAO THONG DISTRICT, SAMUT PRAKARN PROVINCE
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Manufacturer 2	Ocean Energy Company Limited		
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2.0 Product Description	
Product	Crystalline Silicon Photovoltaic Module
Brand name	Gstar, STDARD
Description	<p>The product covered by this report are terrestrial used photovoltaic modules which convert elements of the electromagnetic spectrum to DC electrical power. The basic construction consists of a laminated assembly of solar cells, mostly Bifacial solar cells, which are interconnected with conductive material such as ribbons, and encapsulated within an insulating material. This encapsulated assembly is sandwiched between two transparent glass flat sheets. The laminated assembly mostly be supported by an anodized Aluminum frame. Field wiring connections to the module are made via a factory installed junction box with polarized mating cables and connectors. The modules include a weatherproof junction box with mating connectors only provided for field-connection. The modules are manufactured from the factory and shipped fully assembled. An installation manual is provided. The modules must be mounted over a fire resistant roof covering material rated for the application. Internal buss ribbon wires, and cross buss ribbon wires are enclosed within the module front cover and back substrate. Bypass diodes are provided inside the junction box. Modules are intended to be installed in accordance with the National Electrical Code, NFPA 70 and Canadian Electrical Code (CEC) respectively.</p>
Models	<p>GSD7S followed by 78T-; followed by 610, 615, 620, 625, 630, 635 or 640; followed by WT or BT. GSD7S followed by 72T-; followed by 565, 570, 575, 580, 585 or 590; followed by WT or BT. GSD7S followed by 66T-; followed by 515, 520, 525, 530, 535 or 540; followed by WT or BT. GSD7S followed by 60T-; followed by 470, 475, 480, 485 or 490; followed by WT or BT. GSD7S followed by 54T-; followed by 420, 425, 430, 435 or 440; followed by WT or BT. GSD8J66M followed by 650, 655, 660, 665, 670 or 675; followed by WT or BT. GSD8J60M followed by 590, 595, 600, 605 or 610; followed by WT or BT. GSD7G78M followed by 575, 580, 585, 590, 595, 600, 605 or 610; followed by WT or BT. GSD7G72M followed by 530, 535, 540, 545, 550, 555 or 560; followed by WT or BT. GSD7G66M followed by 485, 490, 495, 500, 505, 510 or 515; followed by WT or BT. GSD7G60M followed by 440, 445, 450, 455, 460, 465 or 470; followed by WT or BT. GSD7G54M followed by 395, 400, 405, 410, 415 or 420; followed by WT or BT.</p>
Model Similarity	<p>All Models have similar structure. For Model name 'GSDaabbcc-xxxdd' where, aa = denotes cell size, '7S' means 182mm solar cell with 16 busbars, '7G' means 182mm solar cell with 10 busbars, '8J' means 210mm solar cell with 12 busbars. bb = denotes quantity of solar cell, could be 78, 72, 66, 60 or 54, represent 156, 144, 132, 120 or 108 pieces solar cell, respectively. c = denotes cell technology, 'T' means Topcon, 'M' means monocrystalline PERC xxx = Pmax dd = backsheet color, can be blank or 'WT' or 'BT', where 'WT' means backsheet glass has white mesh, and 'BT' means black mesh.</p>

2.0 Product Description

Model	GSD7S54T-420WT		Model	GSD7S54T-425WT		Model	GSD7S54T-430WT	
STC	Pmax (±3%)	420	STC	Pmax (±3%)	425	STC	Pmax (±3%)	430
	Voc (±3%)	38.11		Voc (±3%)	38.3		Voc (±3%)	38.49
	Isc (±3%)	14.07		Isc (±3%)	14.15		Isc (±3%)	14.23
	Vmp	31.51		Vmp	31.7		Vmp	31.88
	Imp	13.33		Imp	13.41		Imp	13.49
BNPI	Pmax (±3%)	465	BNPI	Pmax (±3%)	470	BNPI	Pmax (±3%)	475
	Voc (±3%)	38.11		Voc (±3%)	38.3		Voc (±3%)	38.49
	Isc (±3%)	15.58		Isc (±3%)	15.67		Isc (±3%)	15.76
BSI	Isc (±3%)	17.45	BSI	Isc (±3%)	17.55	BSI	Isc (±3%)	17.65
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S54T-435WT		Model	GSD7S54T-440WT		Model	GSD7S60T-470WT	
STC	Pmax (±3%)	435	STC	Pmax (±3%)	440	STC	Pmax (±3%)	470
	Voc (±3%)	38.68		Voc (±3%)	38.87		Voc (±3%)	42.38
	Isc (±3%)	14.31		Isc (±3%)	14.39		Isc (±3%)	14.15
	Vmp	32.06		Vmp	32.24		Vmp	35.05
	Imp	13.57		Imp	13.65		Imp	13.41
BNPI	Pmax (±3%)	480	BNPI	Pmax (±3%)	485	BNPI	Pmax (±3%)	520
	Voc (±3%)	38.68		Voc (±3%)	38.87		Voc (±3%)	42.38
	Isc (±3%)	15.81		Isc (±3%)	15.93		Isc (±3%)	15.67
BSI	Isc (±3%)	17.75	BSI	Isc (±3%)	17.85	BSI	Isc (±3%)	17.55
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S60T-475WT		Model	GSD7S60T-480WT		Model	GSD7S60T-485WT	
STC	Pmax (±3%)	475	STC	Pmax (±3%)	480	STC	Pmax (±3%)	485
	Voc (±3%)	42.54		Voc (±3%)	42.71		Voc (±3%)	42.88
	Isc (±3%)	14.23		Isc (±3%)	14.31		Isc (±3%)	14.39
	Vmp	35.21		Vmp	35.38		Vmp	35.55
	Imp	13.49		Imp	13.57		Imp	13.65
BNPI	Pmax (±3%)	525	BNPI	Pmax (±3%)	530	BNPI	Pmax (±3%)	535
	Voc (±3%)	42.54		Voc (±3%)	42.71		Voc (±3%)	42.88
	Isc (±3%)	15.76		Isc (±3%)	15.81		Isc (±3%)	15.93
BSI	Isc (±3%)	17.65	BSI	Isc (±3%)	17.75	BSI	Isc (±3%)	17.85
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S60T-490WT		Model	GSD7S66T-515WT		Model	GSD7S66T-520WT	
STC	Pmax (±3%)	490	STC	Pmax (±3%)	515	STC	Pmax (±3%)	520
	Voc (±3%)	43.06		Voc (±3%)	46.78		Voc (±3%)	46.96
	Isc (±3%)	13.03		Isc (±3%)	14.09		Isc (±3%)	14.17
	Vmp	35.72		Vmp	38.68		Vmp	38.86
	Imp	13.72		Imp	13.32		Imp	13.39
BNPI	Pmax (±3%)	540	BNPI	Pmax (±3%)	570	BNPI	Pmax (±3%)	575
	Voc (±3%)	43.06		Voc (±3%)	46.78		Voc (±3%)	46.96
	Isc (±3%)	14.43		Isc (±3%)	15.6		Isc (±3%)	15.69
BSI	Isc (±3%)	16.16	BSI	Isc (±3%)	17.48	BSI	Isc (±3%)	17.58
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

2.0 Product Description

Ratings	Model	GSD7S66T-525WT		Model	GSD7S66T-530WT		Model	GSD7S66T-535WT				
	STC	Pmax (±3%)	525	STC	Pmax (±3%)	530	STC	Pmax (±3%)	535			
		Voc (±3%)	47.14		Voc (±3%)	47.32		Voc (±3%)	47.5			
		Isc (±3%)	14.25		Isc (±3%)	14.33		Isc (±3%)	14.41			
		Vmp	39.04		Vmp	39.22		Vmp	39.4			
		Imp	13.45		Imp	13.52		Imp	13.58			
	BNPI	Pmax (±3%)	580	BNPI	Pmax (±3%)	585	BNPI	Pmax (±3%)	590			
		Voc (±3%)	47.14		Voc (±3%)	47.32		Voc (±3%)	47.5			
		Isc (±3%)	15.78		Isc (±3%)	15.87		Isc (±3%)	15.96			
	BSI	Isc (±3%)	17.61	BSI	Isc (±3%)	17.77	BSI	Isc (±3%)	17.87			
	Max. series fuse		30		Max. series fuse		30		Max. series fuse		30	
	Vsys		1500		Vsys		1500		Vsys		1500	
	Model	GSD7S66T-540WT		Model	GSD7S72T-565WT		Model	GSD7S72T-570WT				
	STC	Pmax (±3%)	540	STC	Pmax (±3%)	565	STC	Pmax (±3%)	570			
		Voc (±3%)	47.68		Voc (±3%)	50.6		Voc (±3%)	50.74			
		Isc (±3%)	14.49		Isc (±3%)	14.23		Isc (±3%)	14.31			
		Vmp	39.58		Vmp	41.92		Vmp	42.07			
		Imp	13.65		Imp	13.48		Imp	13.55			
	BNPI	Pmax (±3%)	595	BNPI	Pmax (±3%)	625	BNPI	Pmax (±3%)	630			
		Voc (±3%)	47.68		Voc (±3%)	50.6		Voc (±3%)	50.74			
		Isc (±3%)	16.04		Isc (±3%)	15.76		Isc (±3%)	15.81			
	BSI	Isc (±3%)	17.97	BSI	Isc (±3%)	17.65	BSI	Isc (±3%)	17.75			
	Max. series fuse		30		Max. series fuse		30		Max. series fuse		30	
	Vsys		1500		Vsys		1500		Vsys		1500	
	Model	GSD7S72T-575WT		Model	GSD7S72T-580WT		Model	GSD7S72T-585WT				
	STC	Pmax (±3%)	575	STC	Pmax (±3%)	580	STC	Pmax (±3%)	585			
		Voc (±3%)	50.88		Voc (±3%)	51.02		Voc (±3%)	51.16			
		Isc (±3%)	14.39		Isc (±3%)	14.47		Isc (±3%)	14.55			
		Vmp	42.22		Vmp	42.37		Vmp	42.52			
		Imp	13.62		Imp	13.69		Imp	13.76			
	BNPI	Pmax (±3%)	635	BNPI	Pmax (±3%)	640	BNPI	Pmax (±3%)	645			
		Voc (±3%)	50.88		Voc (±3%)	51.02		Voc (±3%)	51.16			
		Isc (±3%)	15.93		Isc (±3%)	16.02		Isc (±3%)	16.11			
	BSI	Isc (±3%)	17.85	BSI	Isc (±3%)	17.95	BSI	Isc (±3%)	18.05			
	Max. series fuse		30		Max. series fuse		30		Max. series fuse		30	
	Vsys		1500		Vsys		1500		Vsys		1500	
	Model	GSD7S72T-590WT		Model	GSD7S78T-610WT		Model	GSD7S78T-615WT				
	STC	Pmax (±3%)	590	STC	Pmax (±3%)	610	STC	Pmax (±3%)	615			
		Voc (±3%)	51.3		Voc (±3%)	55.31		Voc (±3%)	55.44			
		Isc (±3%)	14.63		Isc (±3%)	14.03		Isc (±3%)	14.11			
		Vmp	42.67		Vmp	45.6		Vmp	45.77			
		Imp	13.83		Imp	13.38		Imp	13.44			
	BNPI	Pmax (±3%)	650	BNPI	Pmax (±3%)	675	BNPI	Pmax (±3%)	680			
		Voc (±3%)	51.3		Voc (±3%)	55.31		Voc (±3%)	55.44			
		Isc (±3%)	16.2		Isc (±3%)	15.51		Isc (±3%)	15.62			
BSI	Isc (±3%)	18.15	BSI	Isc (±3%)	17.4	BSI	Isc (±3%)	17.5				
Max. series fuse		30		Max. series fuse		30		Max. series fuse		30		
Vsys		1500		Vsys		1500		Vsys		1500		

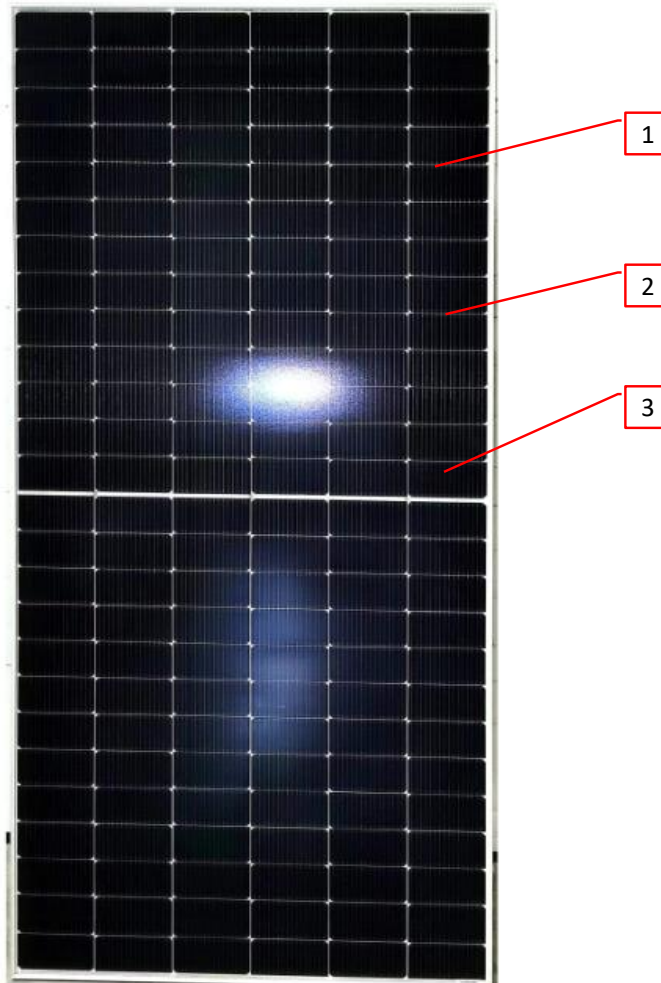
2.0 Product Description

Model	GSD7S78T-620WT		Model	GSD7S78T-625WT		Model	GSD7S78T-630WT	
STC	Pmax (±3%)	620	STC	Pmax (±3%)	625	STC	Pmax (±3%)	630
	Voc (±3%)	55.58		Voc (±3%)	55.72		Voc (±3%)	55.86
	Isc (±3%)	14.19		Isc (±3%)	14.27		Isc (±3%)	14.35
	Vmp	45.93		Vmp	46.1		Vmp	46.26
	Imp	13.5		Imp	13.56		Imp	13.62
BNPI	Pmax (±3%)	685	BNPI	Pmax (±3%)	690	BNPI	Pmax (±3%)	695
	Voc (±3%)	55.58		Voc (±3%)	55.72		Voc (±3%)	55.86
	Isc (±3%)	15.71		Isc (±3%)	15.8		Isc (±3%)	15.89
BSI	Isc (±3%)	17.6	BSI	Isc (±3%)	17.7	BSI	Isc (±3%)	17.8
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S78T-635WT		Model	GSD7S78T-640WT		Model	GSD7S54T-420BT	
STC	Pmax (±3%)	635	STC	Pmax (±3%)	640	STC	Pmax (±3%)	420
	Voc (±3%)	56		Voc (±3%)	56.15		Voc (±3%)	38.11
	Isc (±3%)	14.43		Isc (±3%)	14.51		Isc (±3%)	14.07
	Vmp	46.42		Vmp	46.58		Vmp	31.51
	Imp	13.68		Imp	13.74		Imp	13.33
BNPI	Pmax (±3%)	700	BNPI	Pmax (±3%)	705	BNPI	Pmax (±3%)	465
	Voc (±3%)	56		Voc (±3%)	56.15		Voc (±3%)	38.11
	Isc (±3%)	15.98		Isc (±3%)	16.07		Isc (±3%)	15.58
BSI	Isc (±3%)	17.9	BSI	Isc (±3%)	18	BSI	Isc (±3%)	17.45
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S54T-425BT		Model	GSD7S54T-430BT		Model	GSD7S54T-435BT	
STC	Pmax (±3%)	425	STC	Pmax (±3%)	430	STC	Pmax (±3%)	435
	Voc (±3%)	38.3		Voc (±3%)	38.49		Voc (±3%)	38.68
	Isc (±3%)	14.15		Isc (±3%)	14.23		Isc (±3%)	14.31
	Vmp	31.7		Vmp	31.88		Vmp	32.06
	Imp	13.41		Imp	13.49		Imp	13.57
BNPI	Pmax (±3%)	470	BNPI	Pmax (±3%)	475	BNPI	Pmax (±3%)	480
	Voc (±3%)	38.3		Voc (±3%)	38.49		Voc (±3%)	38.68
	Isc (±3%)	15.67		Isc (±3%)	15.76		Isc (±3%)	15.81
BSI	Isc (±3%)	17.55	BSI	Isc (±3%)	17.65	BSI	Isc (±3%)	17.75
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S54T-440BT		Model	GSD7S60T-470BT		Model	GSD7S60T-475BT	
STC	Pmax (±3%)	440	STC	Pmax (±3%)	470	STC	Pmax (±3%)	475
	Voc (±3%)	38.87		Voc (±3%)	42.38		Voc (±3%)	42.54
	Isc (±3%)	14.39		Isc (±3%)	14.15		Isc (±3%)	14.23
	Vmp	32.24		Vmp	35.05		Vmp	35.21
	Imp	13.65		Imp	13.41		Imp	13.49
BNPI	Pmax (±3%)	485	BNPI	Pmax (±3%)	520	BNPI	Pmax (±3%)	525
	Voc (±3%)	38.87		Voc (±3%)	42.38		Voc (±3%)	42.54
	Isc (±3%)	15.93		Isc (±3%)	15.67		Isc (±3%)	15.76
BSI	Isc (±3%)	17.85	BSI	Isc (±3%)	17.55	BSI	Isc (±3%)	17.65
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Other Ratings refer to ILL7-ILL7I								

2.0 Product Description				
Other Ratings	Module fire performance: Type 29 Front side design load = 3600 Pa Back side design load = 1600 Pa Protection Class: Class II (Classified as per IEC 61140) Pollution degree: 1 Altitude up to 2000m Maximum system voltage: 1500V			
	Bifaciality factor:	Pmax	ISC	Voc
	Module with Topcon solar cell	80%	80%	98%
	Module with PREC solar cell	70%	80%	98%

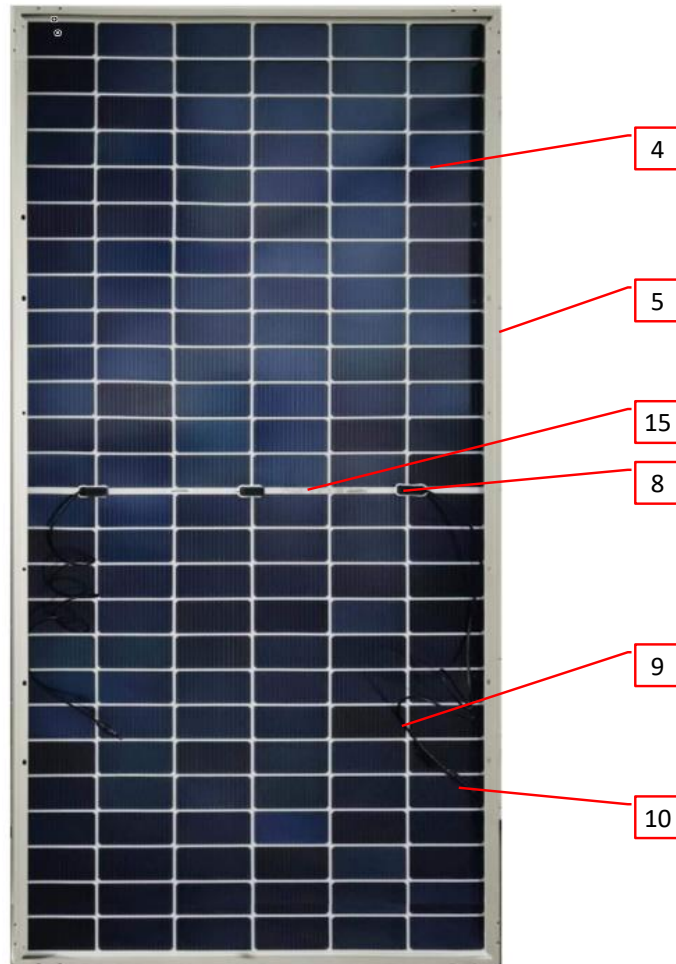
3.0 Product Photographs

Photo 1 - Front view of model GSD7S78T-620WT



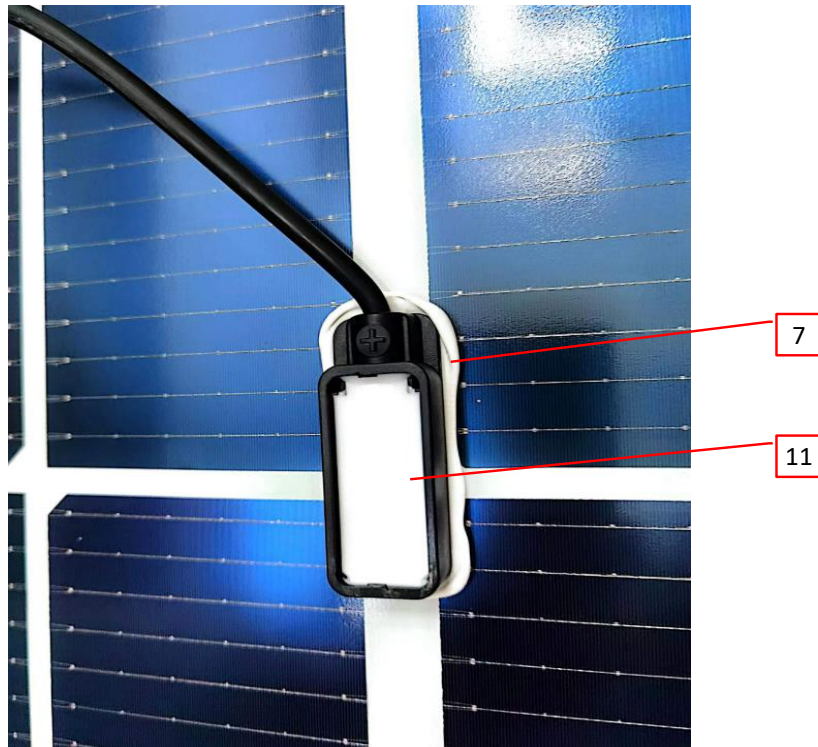
3.0 Product Photographs

Photo 2 - Rear view of model GSD7S78T-620WT



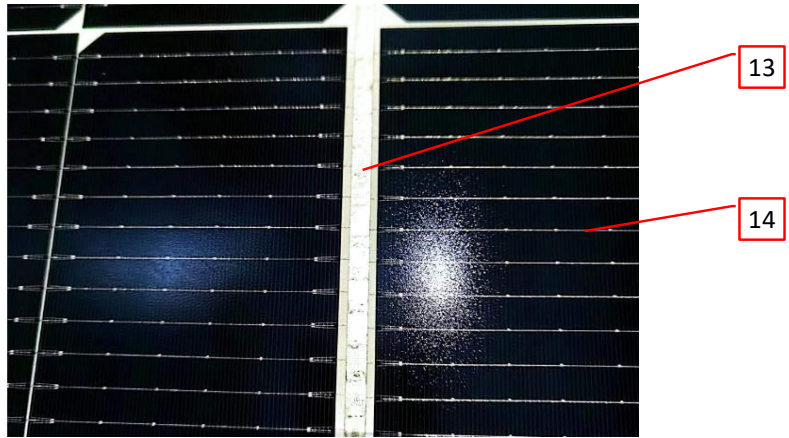
3.0 Product Photographs

Photo 3 - Detail view of Junction Box



3.0 Product Photographs

Photo 4 - Detail view of Cell connector and String connector



4.0 Critical Components						
Photo #	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
1	1	Frontsheet	Flat (Vietnam) Co., Ltd.	AR Coated Heat Strengthened Glass	2.0mm thick, ironless Tempered Glass with AR Coating	NR
			Anhui Flat Solar Glass Co., Ltd.	AR Coated Heat Strengthened Glass	2.0mm thick, ironless Tempered Glass with AR Coating	NR
1	2	Solar Cell	T.S Solar Energy Co.,Ltd.	TS-TM1016	N type, Topcon Mono silicon bifacial solar cell, 16 busbars, dimension 182*91mm(±0.5mm). Thickness 160±16µm	NR
				TS-PM1010	P type, Monosilicon bifacial PERC solar cell, 10 busbars, dimension 182*91mm(±0.5mm). Thickness 175±17.5µm	NR
				TS-PM1212	P type, Monosilicon bifacial PERC solar cell, 12 Busbars, dimension 210*105mm(±0.25mm). Thickness 170±17µm	NR
1	3	Encapsulate	First Material Science (Thailand) Co., Ltd. (E503041)	EP304	EVA/POE/EVA, provided at frontsheet side,thickness 0.55mm	UR
				F406PS	EVA, provided at backsheet side,thickness 0.55mm	UR
			HANGZHOU FIRST APPLIED MATERIAL CO., LTD (E3263470)	EP304	EVA/POE/EVA, provided at frontsheet side,thickness 0.55mm	UR
				F406PS	EVA, provided at backsheet side,thickness 0.55mm	UR
2	4	Backsheet	Flat (Vietnam) Co., Ltd.	Semi-tempered photovoltaic glass	2.0mm thick, Semi-tempered photovoltaic glass with white or black grid	NR
			Anhui Flat Solar Glass Co., Ltd.	Semi-tempered photovoltaic glass	2.0mm thick, Semi-tempered photovoltaic glass with white or black grid	NR
2	5	Frame	Changzhou Kaihong Aluminum Industrial Co., Ltd	6005-T6	anodized aluminium alloy, Secured together by Corner Keyswith CrimpingColor: silver or black	NR
			YIYIN ENERGY VIETNAM CO.,LTD	6005-T6	anodized aluminium alloy, Secured together by Corner Keyswith CrimpingColor: silver or black	NR
			YIYIN ENERGY THAILAND CO.,LTD.	6005-T6	anodized aluminium alloy, Secured together by Corner Keyswith CrimpingColor: silver or black	NR

4.0 Critical Components						
Photo #	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
1	6	Adhesive of frame (Not Shown)	Shanghai Huitian New Material Co Ltd (E248611)	HT906Z	RTI(Elec, Imp, Str)=105°C. Silicone "Room Temperature Vulcanizing" (RTV), furnished as two liquid components(usually divided as A and B).White or black color	UR
3	7	Adhesive (between junction box and backsheet)	Shanghai Huitian New Material Co Ltd (E248611)	HT906Z	RTI(Elec, Imp, Str)=105°C. Silicone "Room Temperature Vulcanizing" (RTV), furnished as two liquid components(usually divided as A and B).White or black color	UR
2	8	Junction Box	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd (E337337)	JM07w-ABCDE series	where w can be 8, A can be 1, B can be 10 or 11, C can be 1, D can be 1, 2, 3, 4, 8, 9, 10 or 11, E can be 2, 3 or 4. Rated 1500 VDC, 30 A Max. Provide with three separate bodies.	UR
2	9	Cable	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd (E343893)	PV Wire	12 AWG, 2000V, sunlight resistant, -40~90°C wet or dry	UR
2	10	Connectors	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd (E341975)	PV-JM601A	1500 V dc, 35 A max with 12AWG PV cable	UR
				PV-JM608	1500 V dc, 35 A max with 12AWG PV cable	UR
			STAUBLI ELECTRICAL CONNECTORS AG (E343181)	PV-KBT4-EVO 2/2.5, 6 or 10, followed by I, X, II, III or IV, followed by -UR.	1500 V dc, 39 A max with 12 AWG cable, With IEC62852 Cert. TUV Rheinland R60127169	UR
				PV-KST4-EVO 2/2.5, 6 or 10, followed by I, X, II, III or IV, followed by -UR.	1500 V dc, 39 A max with 12 AWG cable, With IEC62852 Cert. TUV Rheinland R60127169	UR
				PV-KBT4-EVO 2A/2.5, 6 or 10, followed by I, X, II, III or IV.	1500 V dc, 39 A max with 12 AWG cable, With IEC62852 Cert. TUV SUD B 112370 0007	UR
			PV-KST4-EVO 2A/2.5, 6 or 10, followed by I, X, II, III or IV.	1500 V dc, 39 A max with 12 AWG cable, With IEC62852 Cert. TUV SUD B 112370 0007	UR	
3	11	Potting Material	Shanghai Huitian New Material Co Ltd (E248611)	5299W-S	RTI (Elec, Imp, Str)=105°C, CTI=0, Frame class V=0, HWI=1, HAI=0. White or black.	UR

4.0 Critical Components						
Photo #	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
2	12	Bypass Diode (Not Shown)	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd.	RT4550	Rated 45A, 50V. Max. junction temperature: 200°C	NR
4	13	String Connector	TaiCang JuRen PV Material Co., Ltd.	4mm wide by 0.3m thick	TU1 (99.97%) base plated with solder material Sn60Pb40, Coating thickness 0.025mm Elongation≥25% Tensile Strength≥190Mpa	NR
				7mm wide by 0.3m thick	TU1 (99.97%) base plated with solder material Sn60Pb40, Coating thickness 0.025mm Elongation≥25% Tensile Strength≥190Mpa	NR
			Suzhou Boneed Photovoltaic Technology Co., Ltd	4mm wide by 0.3m thick	TU1 (99.97%) base plated with solder material Sn60Pb40, Coating thickness 0.025mm Elongation≥25% Tensile Strength≥190Mpa	NR
				7mm wide by 0.3m thick	TU1 (99.97%) base plated with solder material Sn60Pb40, Coating thickness 0.025mm Elongation≥25% Tensile Strength≥190Mpa	NR
4	14	Cell Connector	Taicang Juren International Trade Co., ltd	Φ0.26mm	TU1 (99.97%) base plated with solder material Sn60Pb40, Coating thickness 0.025mm Elongation≥20% Tensile Strength≥150Mpa Yield Strength≤ 80Mpa	NR
			Suzhou Boneed Photovoltaic Technology Co., Ltd	Φ0.26mm	TU1 (99.97%) base plated with solder material Sn60Pb40, Coating thickness 0.025mm Elongation≥20% Tensile Strength≥150Mpa Yield Strength≤ 80Mpa	NR
2	15	Label	Jiangsu OPT Barcode Label Co., Ltd	AVERY PET	Application Temperature: -40°C~60°C	NR
1	16	Fixing Tape (Not Shown)	Suzhou temosun PV Material Co., Ltd.	F1510	Anti-UV PET Tape, Color: clear Thickness: 0.060 mm Used to fix the cells before laminate.	UR
1	17	Flux (Not Shown)	Singapore Asahi Chemical & Solder Industries Pte Ltd	SF105	Liquid, in which the cell interconnector and string connector are immersed to enhance the soldering quality.	NR
<p>NOTES:</p> <p>1) Not all item numbers are indicated (called out) in the photos, as their location is obvious.</p> <p>2) "Various" means any type, from any manufacturer that complies with the "Technical data and securement means" and meets the "Mark(s) of conformity" can be used.</p> <p>3) Indicates specific marks to be verified, which assures the agreed level of surveillance for the component. "NR" - indicates Unlisted and only visual examination is necessary. "See 5.0" indicates Unlisted components or assemblies to be evaluated periodically refer to section 5.0 for details.</p> <p>4) Specific components combination requirements refer ILL4 and ILL5 in section 7</p>						

5.0 Critical Unlisted CEC Components

No Unlisted CEC components are used in this report.

6.0 Critical Features

Recognized Component - A component part, which has been previously evaluated by an accredited body with restrictions and must be evaluated as part of the basic product considering the restrictions as specified by the Conditions of Acceptability.

Listed Component - A component part, which has been previously Listed or Certified by an accredited Certification Organization with no restrictions and is used in the intended application within its ratings.

Unlisted Component - A part that has not been previously evaluated to the appropriate designated component standard. It may also be a Listed or Recognized component that is being used outside of its evaluated Listing or component recognition.

Critical Features/Components - An essential part, material, subassembly, system, software, or accessory of a product that has a direct bearing on the product's conformance to applicable requirements of the product standard.

Construction Details - For specific construction details, reference should be made to the photographs and descriptions. All dimensions are approximate unless specified as exact or within a tolerance. In addition to the specific construction details described in this Report, the following general requirements also apply.

1. Spacing - At the wiring terminals, a minimum of 19.4mm* through air and 10.4mm over surface spacing is provided between uninsulated live parts of opposite polarity (the negative and positive load terminals). At the module edges, a minimum of 19.4mm* through air and 10.4mm over surface spacing is provided between the live parts including cells and interconnecting ribbons and the edges of the laminate before attachment of the frame. There are no grounded metal parts within the wiring compartment.
2. Mechanical Assembly - The components of the laminate portion of the module are monolithically adhered with encapsulation material. The junction box is secured to the rear cover with adhesive and the junction box internal tabs are secured in place by pressure fit contact rails. The tabbing entering the junction box and the wire end connectors are secured with cable gland so they cannot be separated. The frame is form fitted around the perimeter of the laminate and adhered in place with adhesive. All of the parts of this module are secured in a way that prevents any shifting, rotating or turning of components.
3. Corrosion Protection - All ferrous metal parts are protected against corrosion by painting, plating or the equivalent. These modules are made of a glass front cover and durable rear cover with all internal wiring fully encapsulated in a corrosion resistant package. The enclosures of junction box, wire leads and connectors are made of polymeric materials, and the frame is made of anodized Aluminum, each of which are inherently resistant to corrosion. Since all of the components of the modules are composed of such materials no additional corrosion protection is employed.
4. Accessibility of Live Parts - All uninsulated live parts in primary circuitry are housed within a non-metallic enclosure constructed with no openings other than those specifically described in Sections 4 and 5. All uninsulated live parts in primary circuitry are housed within the junction box which is factory sealed and not user serviceable in the field therefore there are no accessible live parts.
5. Grounding - All exposed dead-metal parts and all dead-metal parts within the enclosure that are exposed are connected to the equipment grounding terminal. Module with metal frame is clearly indicated with the appropriate ground connection point with a ground symbol marking. The means of grounding is specified in the installation instructions, see Illustration 3 in section 7.0.
6. Polarized Connection - Modules are provided with leads identified by the symbols (+) for Positive lead and (-) for negative lead on the lead. Each connector is polarized and cannot be joined to create an improper connection.
7. Internal Wiring - Internal wiring is routed away from sharp or moving parts. Internal wiring leads terminating in soldered connections are made mechanically secure prior to soldering. Recognized Component separable (quick disconnect) connectors of the positive detent type, closed loop connectors, or other types specifically described in the text of this report are also acceptable as internal wiring terminals. At points where internal wiring passes through metal walls or partitions, the wiring insulation is protected against abrasion or damage by plastic bushings or grommets. The internal wiring such as cell connectors and string connectors on the module is within the encapsulation material or within the sealed junction box neither of which is designed for field accessibility nor service. Internal wiring is routed away from sharp or moving parts.
8. Schematics - Refer to ILL1A~ILL2A in section 7 for schematics requiring verification during field representative Inspection Audits.
9. Markings - The product is marked on a labeling system as described in item no. 15 of Section 4.0, information on the marking shall include:

6.0 Critical Features

- a) name, registered brand name of applicant;
 - b) model number designation;
 - c) serial number;
 - d) date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture, and won't repeat in 10 years;
 - e) polarity of terminals or leads, PV connectors or wiring shall be marked in accordance to IEC 62852 with a symbol „Do not disconnect under load“;
 - f) “Maximum system voltage” or “V_{sys}”;
 - g) Class of protection against electrical shock: Class II, or marked with a symbol instead, refer to ILL8C in section 7.0 for the symbol.
 - h) “voltage at open-circuit” or “Voc” including manufacturing tolerances;
 - i) “current at short-circuit,” or “Isc” including manufacturing tolerances;
 - j) “PV module maximum power” or “Pmax” including manufacturing tolerances;
 - k) “Maximum overcurrent protection rating”
 - l) “PV module may be marked with “Fire Type: ____ . See Installation Instructions for Installation Requirements to Achieve a Specified System Fire Class Rating with this Product”.”
- All electrical data shall be shown as relative to standard test conditions (STC) (1000 W/m², (25 ± 2) °C, AM 1,5 according to IEC 60904-3).

10. Cautionary Markings - The following is required:

All cautionary text shall be marked in both english and french.

- a) PV module shall be marked 'Do not disconnect under load' and 'Ne vous déconnectez pas sous la charge.', or marked with a symbol instead. Refer to ILL6 or ILL6A in section 7 for the symbol. Symbol or warning notice shall be imprinted or labelled close to connector. PV connectors shall be clearly marked '+' and '-' to indicating the terminal polarity.
- b) Symbol of Caution, risk of electric shock shall be applied near the PV module electrical connection means. Refer to ILL6B in section 7 for the symbol.
- c) PV modules shall be marked to indicate the protective class , refer to ILL6C in section 7 for the symbol.

6.0 Critical Features

11. Installation, Operating and Safety Instructions - Instructions for installation and use of this product are provided by the applicant:

PV modules shall be supplied with documentation describing the methods of electrical and mechanical installation as well as the electrical ratings of the PV module. The documentation shall state the Class under which the PV module was qualified and any specific limitations required for that Class. The documentation shall state the environmental conditions to which the module has been qualified, which by default includes a temperature range of $-40\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$ and wind/snow load including safety factor. It shall be ensured that appropriate documentation for safe installation, use, and maintenance is available to installers and operators.

For identical PV modules it is considered to be sufficient that one set of documentation is supplied with the PV module shipping unit. The module is considered to be in compliance with this standard only when the module is mounted in the manner specified by the mounting instructions. A module with exposed conductive parts is considered to be in compliance with this standard only when it is electrically grounded in accordance with the applicant's instructions and the requirements of the National Electrical Code, ANSI/NFPA 70 (2014-2017).

Environmental conditions to which a PV module has been qualified may include IEC 61701 or IEC 62716.

- recommended maximum series/parallel PV module configurations;
- the current rating of overcurrent protection, as determined in MST 26. Guidance to determine current rating may be given in IEC 60269-6;
- applicant's stated tolerance for V_{oc} , I_{sc} and maximum power output P_{max} under standard test conditions;
- temperature coefficient for voltage at open-circuit, maximum power and short-circuit current.

All electrical data shall be shown as relative to standard test conditions (1000 W/m^2 , $(25 \pm 2)\text{ }^{\circ}\text{C}$, AM 1.5 according to IEC 60904-3).

International symbols shall be used where applicable.

The electrical documentation shall include a detailed description of the electrical installation wiring method to be used. This description shall include :

- any limitations on wiring methods and wire management that apply to the junction box for the PV module;
- specific PV connector model/types and manufacturer to which the PV module connectors can be mated;
- the bonding and grounding method(s) to be used (if applicable) shall be specified. All provided or specified hardware shall be identified in the documentation;
- the type and rating of bypass-diodes to be used as well as the installation instructions for those diodes (if applicable);
- limitations to the mounting situation (e.g. slope, mounting means, cooling);
- a statement indicating the fire rating(s) and the applied standard, or a statement that resistance to external resources was not evaluated, as well as the limitations to that rating (e.g. installation slope, substructure or other applicable installation information);
- a statement indicating the minimum mechanical means for securing the PV module (as evaluated during the mechanical load test (MST 34)); and
- a statement indicating the maximum altitude the PV module is designed for. De-ratings can be applied.

The documentation for roof mounting shall include:

- a statement indicating the minimum mechanical means for securing the PV module to the roof (as evaluated during the mechanical load test according (MST 34));
- details of the specific parameter(s) when the fire rating is dependent on a specific mounting structure, specific spacing, or specific means of attachment to the roof or structure.

The documentation shall include a statement advising that external or otherwise artificially concentrated sunlight shall not be directed onto the front or back face of the PV module (if not qualified for).

Assembly instructions shall be provided with a product shipped in subassemblies and shall be detailed and adequate to the degree required to facilitate complete and safe assembly of the product to specific cations set forth in the IEC 61730 standard series.

6.0 Critical Features

To facilitate proper system sizing the applicant shall include relevant parameters in the installation instructions that allow system layout based not only on STC values given in the documentation. For example a safety factor for Voc and Isc of 1,25 is recommended since irradiance is often higher than 1000 W/m² and temperature below 25 °C may raise Voc.

The following or equivalent statement shall be included:

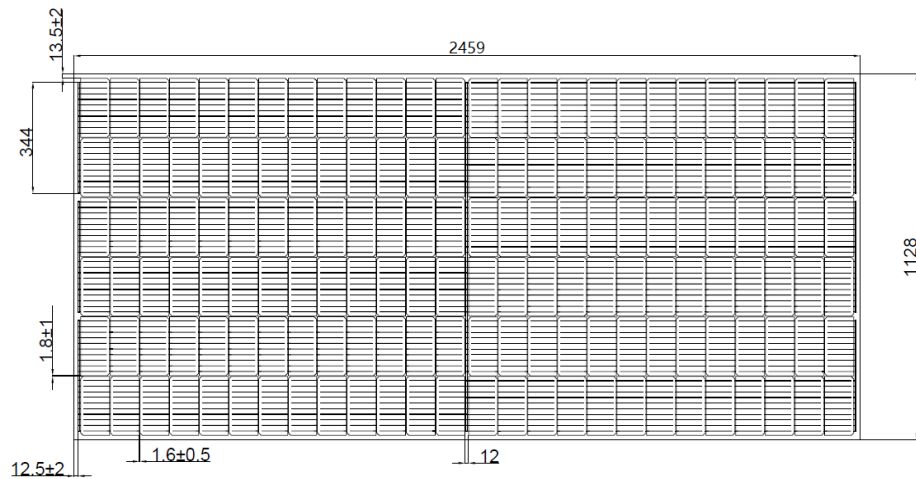
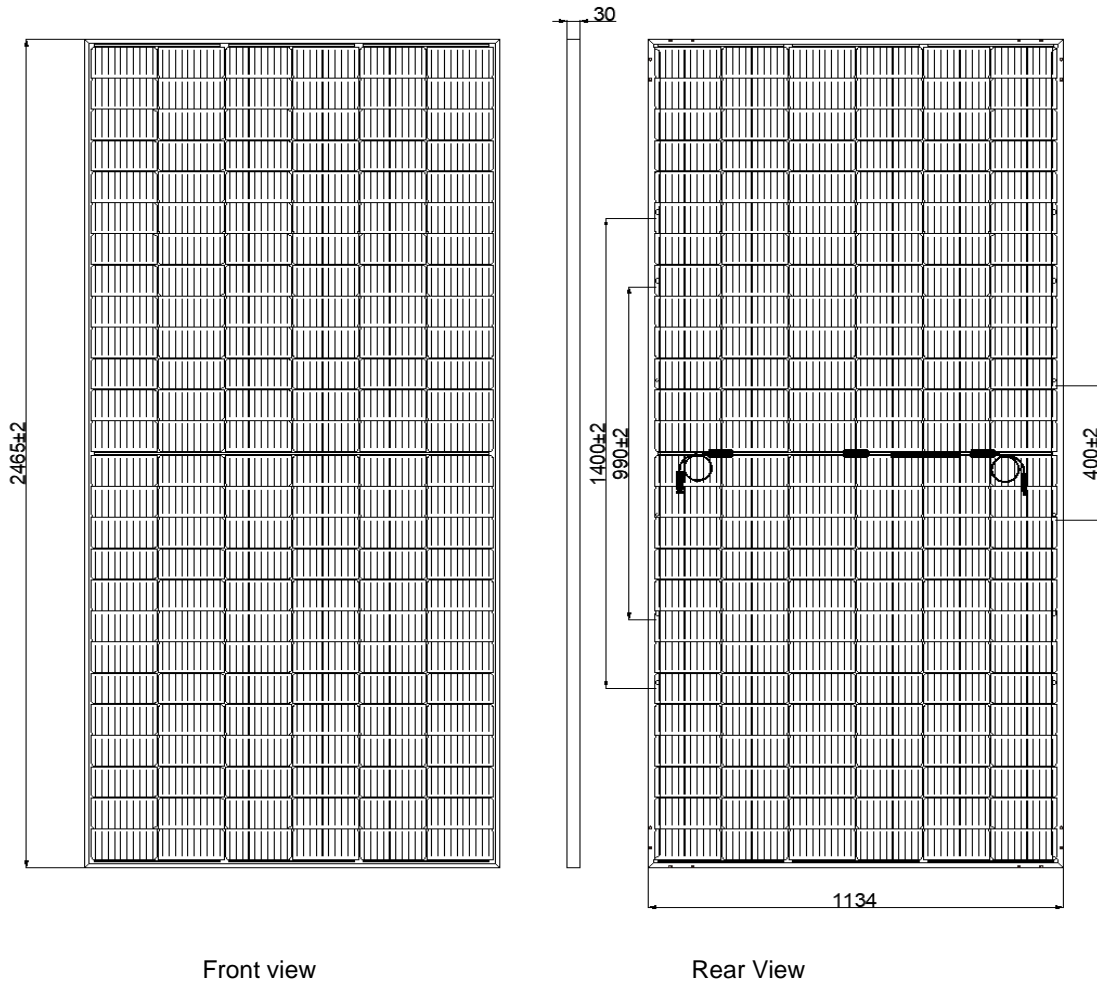
"Under normal conditions, a photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Accordingly, the values of Isc and Voc marked on this PV module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, and size of controls (e.g. inverter) connected to the PV output."

The safety factor of 1,25 for the minimum voltage rating of the components can be modified during the design of a system according to the minimum temperature of the location of the installation and the temperature coefficient for Voc. Isc can be adjusted based on maximal temperature, irradiance and orientation of the module. To this end a full simulation for the specific location is required using long term weather data.

Refer to ILL3 in section 7 for Installation manual.

7.0 Illustrations

Illustration 1A - Drawings of model with 156 pieces 182*91 solar cells

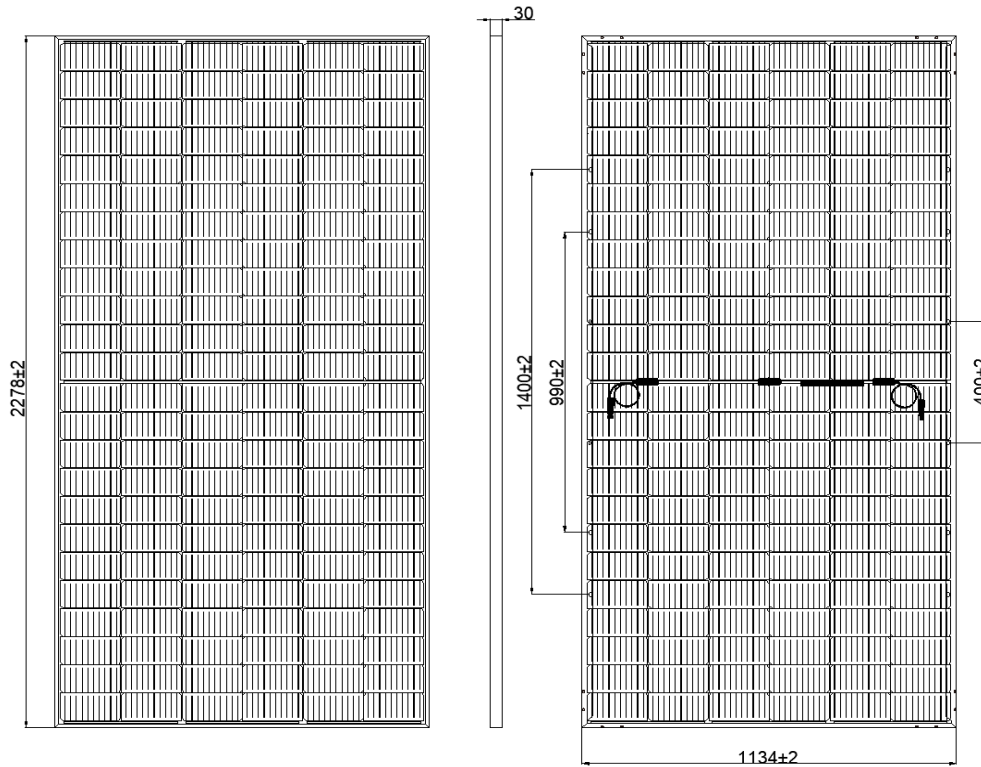


Lamination

Note: Thickness could also be 35mm

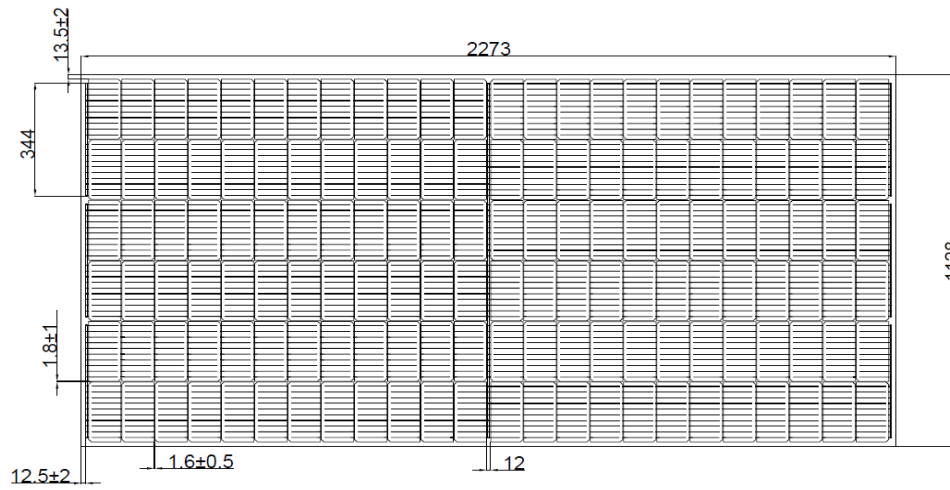
7.0 Illustrations

Illustration 1B - Drawings of model with 144 pieces 182*91 solar cells



Front view

Rear View

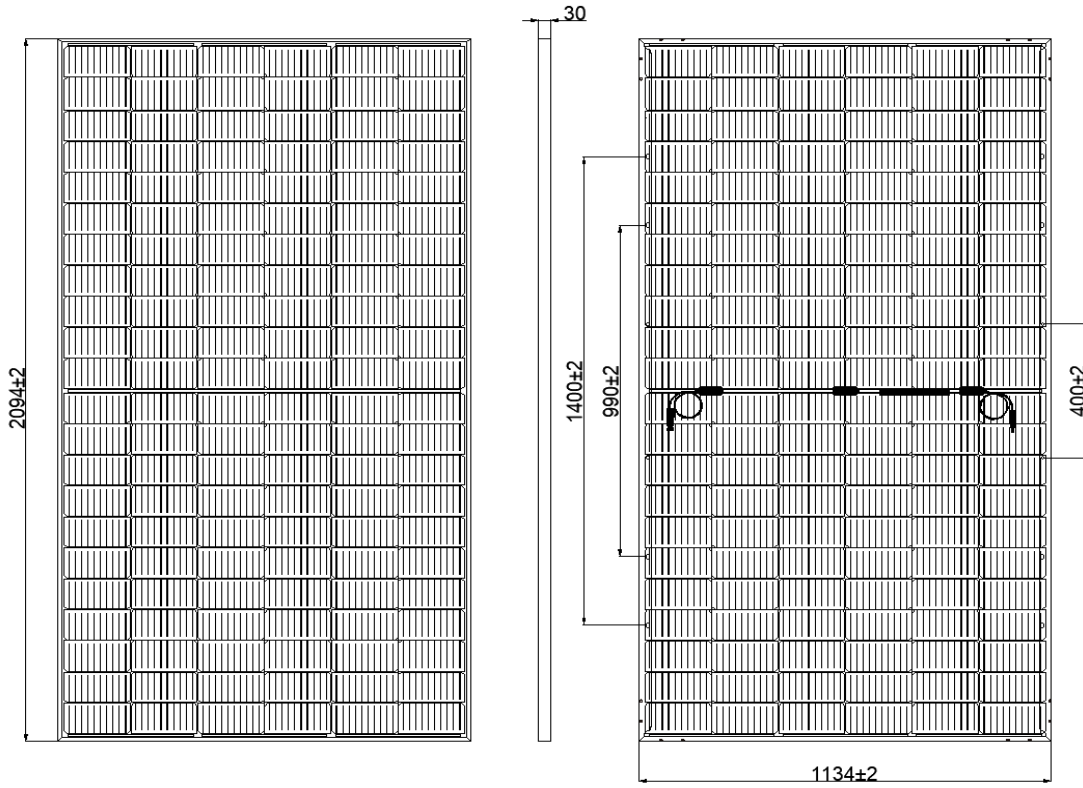


Lamination

Note: Thickness could also be 35mm

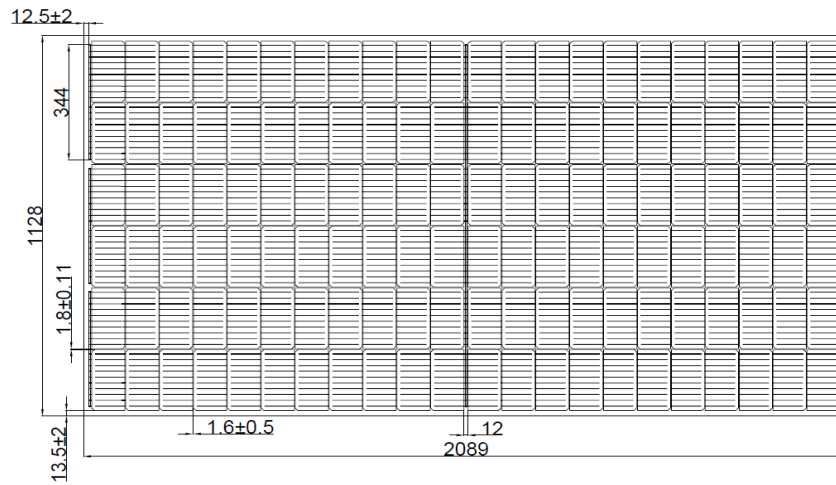
7.0 Illustrations

Illustration 1C - Drawings of model with 132 pieces 182*91 solar cells



Front view

Rear View

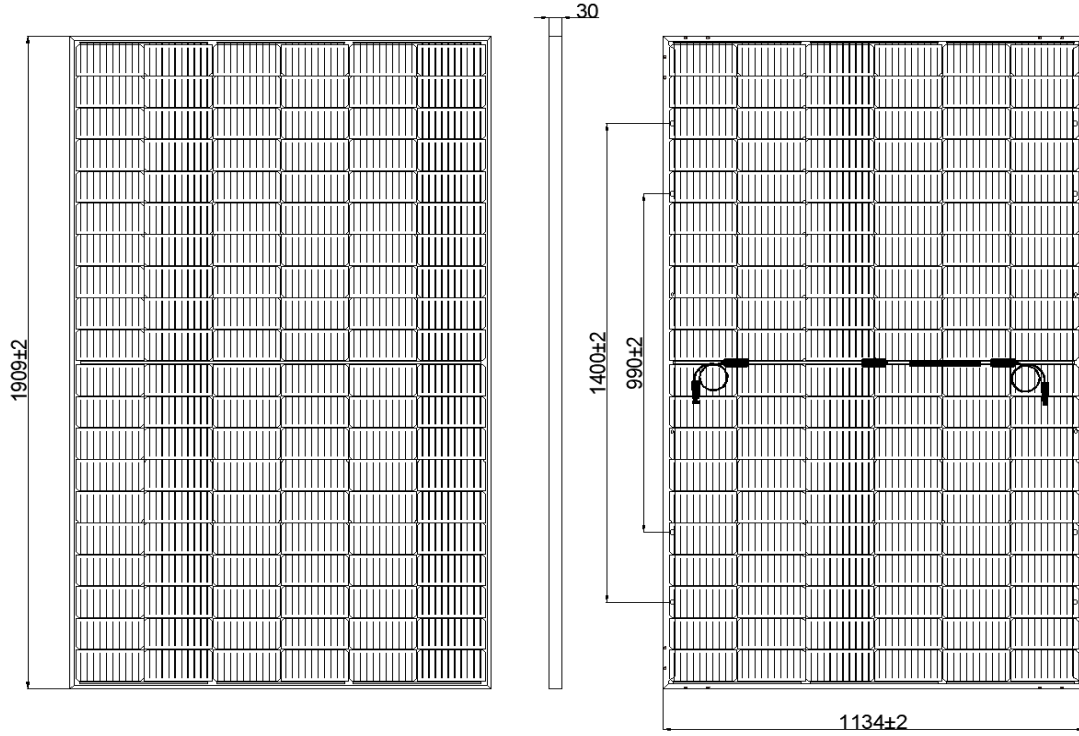


Lamination

Note: Thickness could also be 35mm

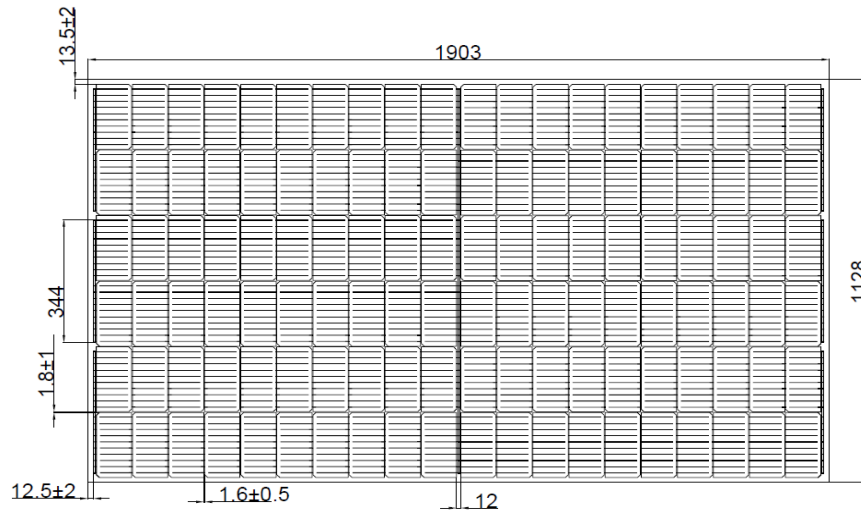
7.0 Illustrations

Illustration 1D - Drawings of model with 120 pieces 182*91 solar cells



Front view

Rear View

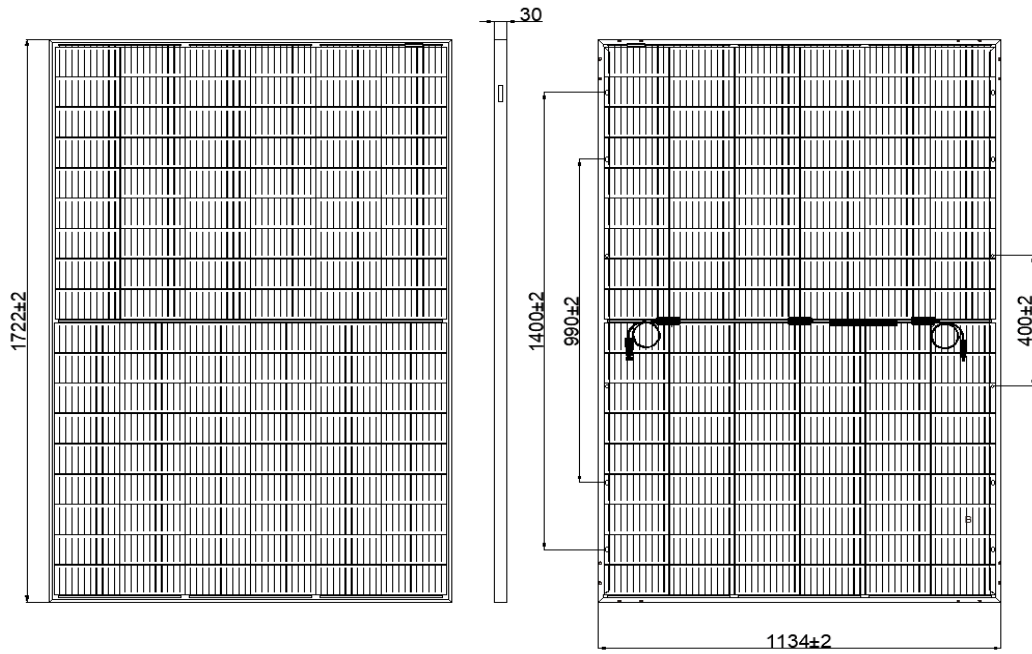


Lamination

Note: Thickness could also be 35mm

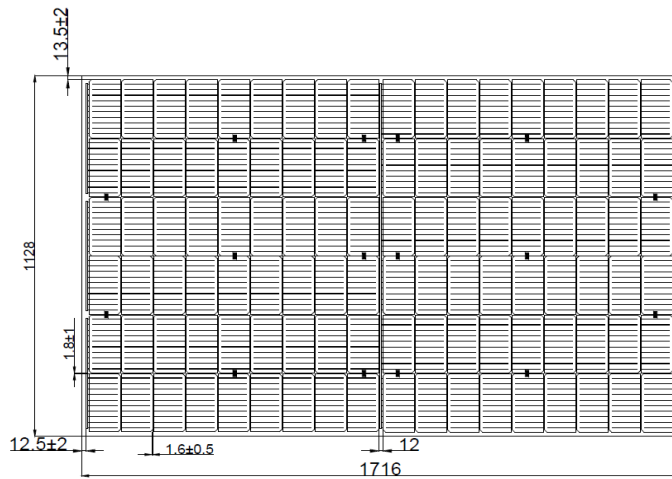
7.0 Illustrations

Illustration 1E - Drawings of model with 108 pieces 182*91 solar cells



Front view

Rear View

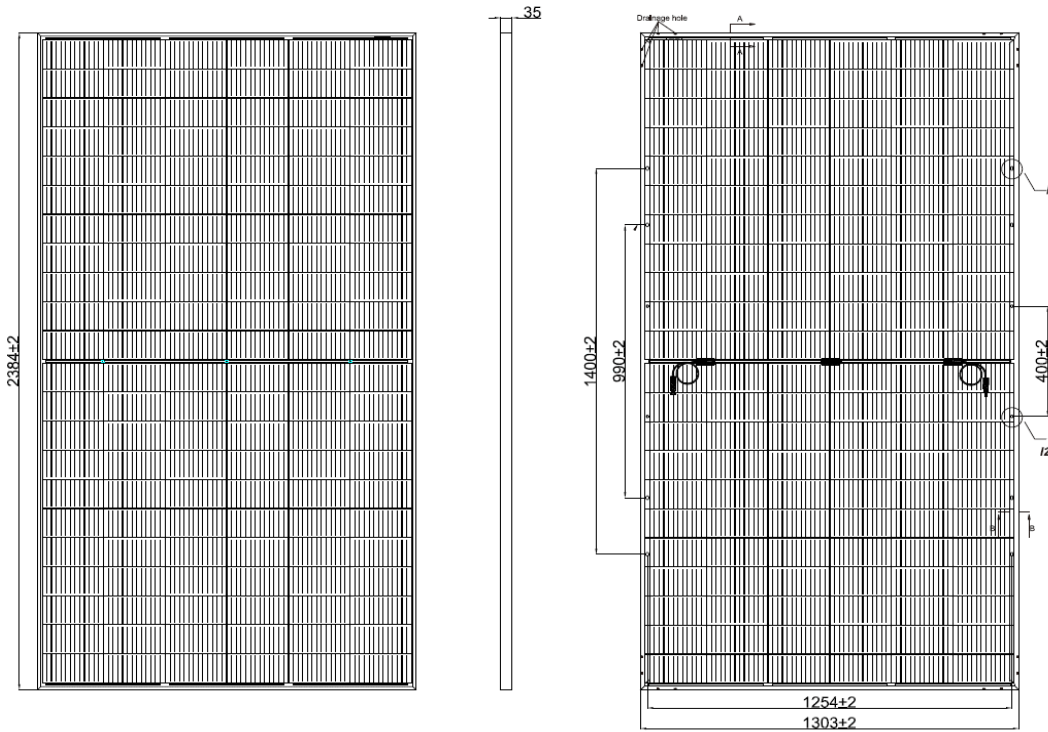


Lamination

Note: Thickness could also be 35mm

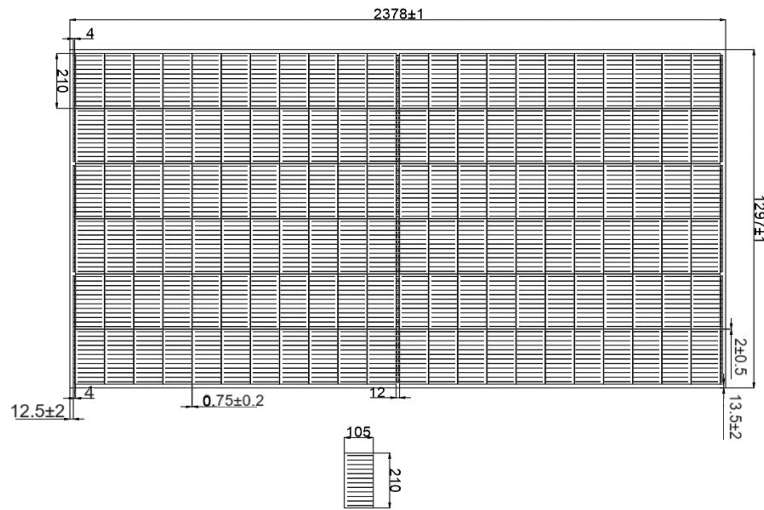
7.0 Illustrations

Illustration 1F - Drawings of model with 132 pieces 210*105 solar cells



Front view

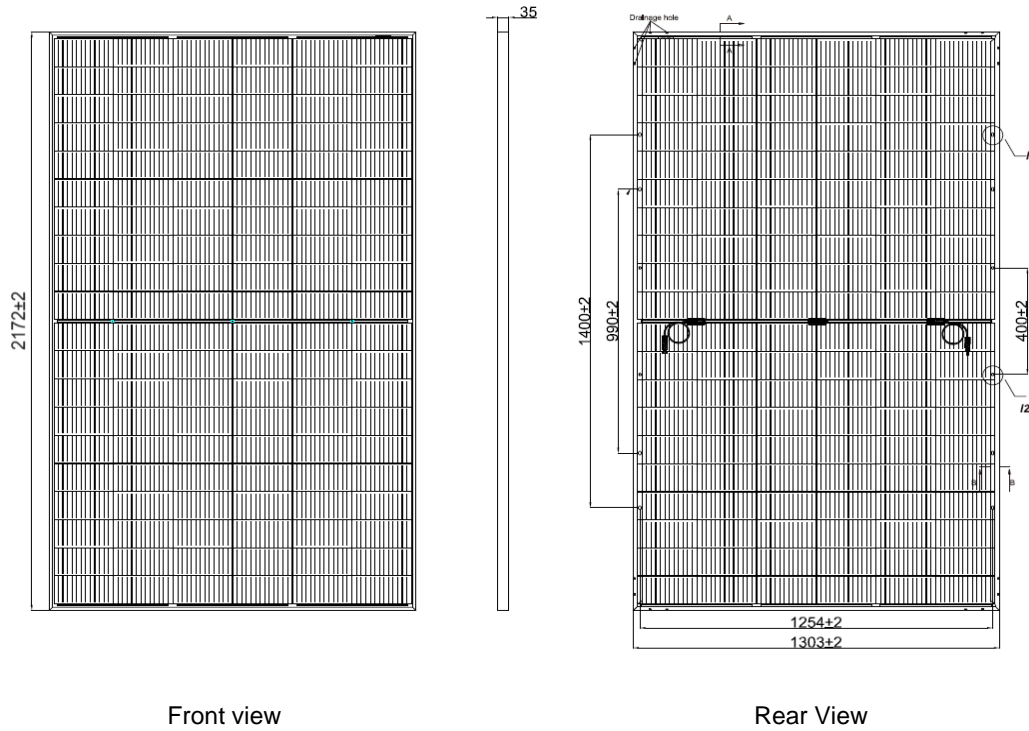
Rear View



Lamination

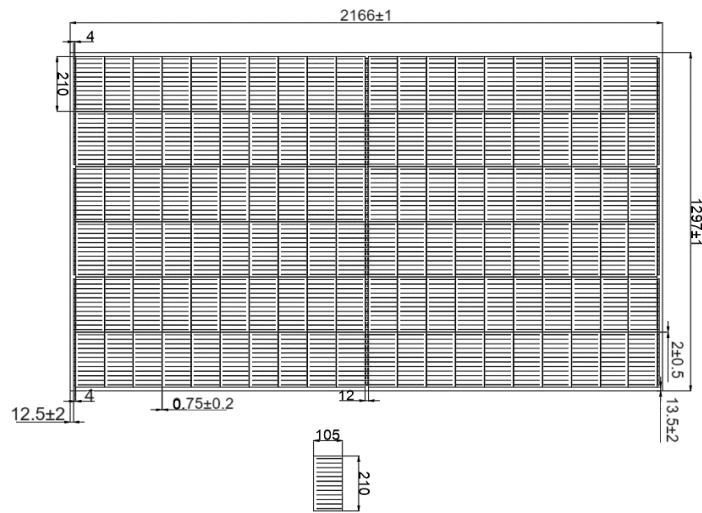
7.0 Illustrations

Illustration 1G - Drawings of model with 120 pieces 210*105 solar cells



Front view

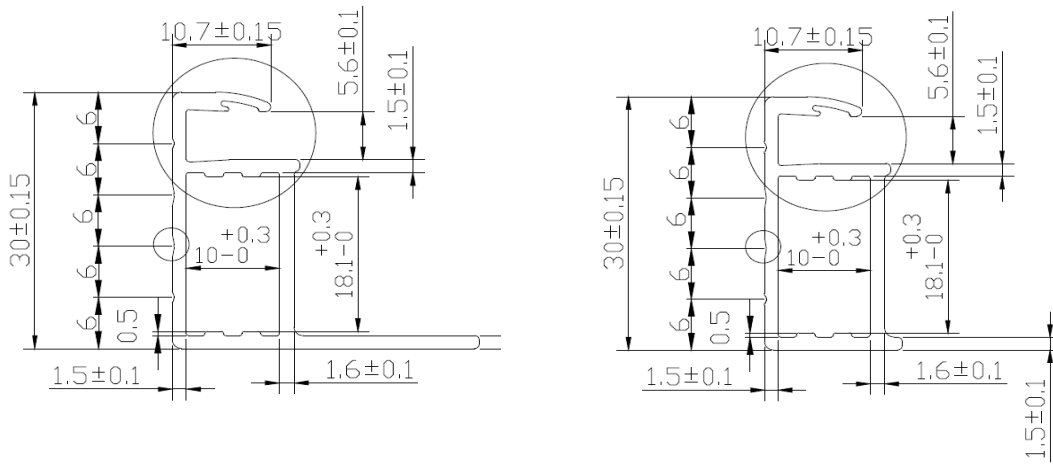
Rear View



Lamination

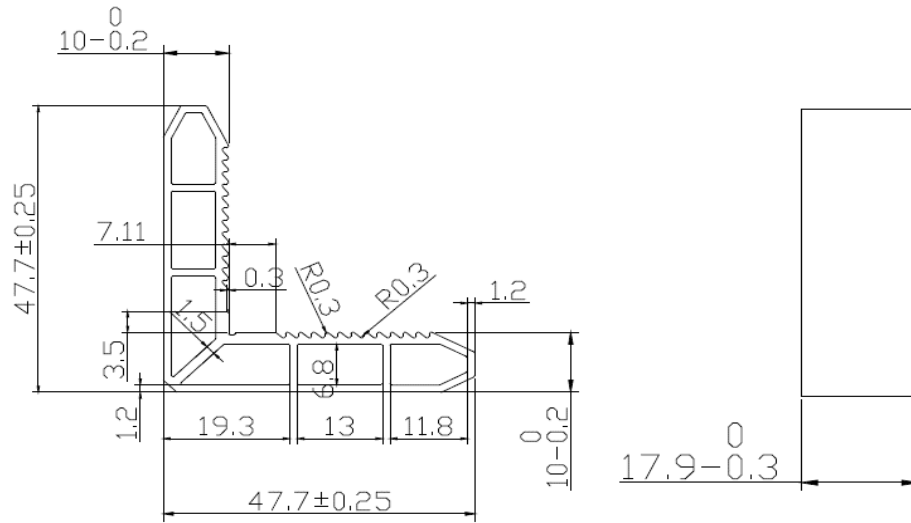
7.0 Illustrations

Illustration 2 - Drawings of 30mm frame and corner key



Long side

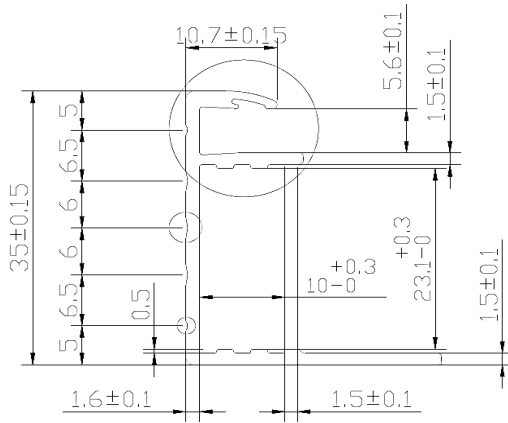
short side



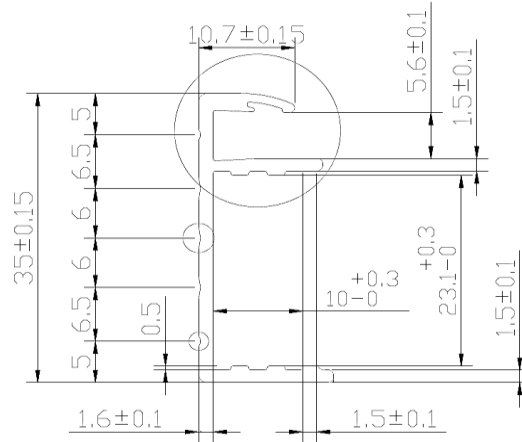
Corner Key

7.0 Illustrations

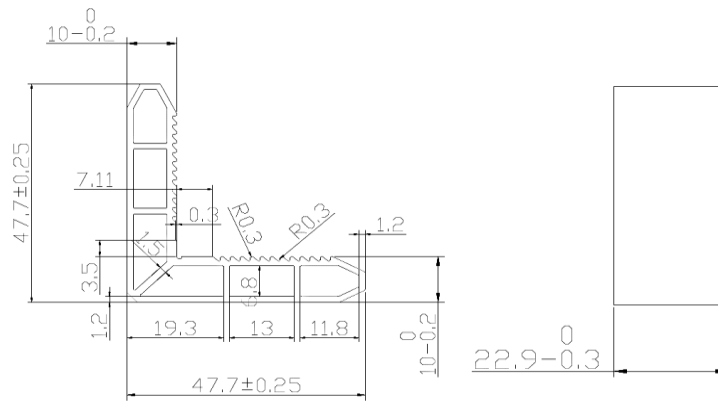
Illustration 2A - Drawings of 35mm frame and corner key



Long side



Short Side



Corner key

7.0 Illustrations

Illustration 3 - Cover page of Installation Manual



安装使用手册

INSTALLATION MANUAL

适用于G-STAR系列双玻光伏组件
For G-STAR PV Double Glass Modules

版本编号 Version Number: TG/G-TD-0101 A0
修订日期 Revision Date : 2022-11-18

7.0 Illustrations

Illustration 4 - Controlled combination of material solar cell and encapsulation

1	Encapsulation (frontsheet side)	First Material Science (Thailand) Co., Ltd. HANGZHOU FIRST APPLIED MATERIAL CO., LTD	EP304
	Solar Cell	T.S Solar Energy Co.,Ltd.	TS-TM1016
			TS-PM1010
			TS-PM1212
Encapsulation (Backsheet side)	First Material Science (Thailand) Co., Ltd. HANGZHOU FIRST APPLIED MATERIAL CO., LTD	F406PS	

7.0 Illustrations

Illustration 5 - Controlled combination of material for junction box JM07w-ABCDE series

Component Name	Manufacturer	Type
Junction Box	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd	JM07w-ABCDE series
Cable	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd	PV Wire
Connector	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd	PV-JM601A PV-JM608
	STAUBLI ELECTRICAL CONNECTORS AG.	PV-KBT4-EVO 2/2.5, 6 or 10, followed by I, X, II, III or IV, followed by -UR. PV-KST4-EVO 2/2.5, 6 or 10, followed by I, X, II, III or IV, followed by -UR. PV-KBT4-EVO 2A/2.5, 6 or 10, followed by I, X, II, III or IV. PV-KST4-EVO 2A/2.5, 6 or 10, followed by I, X, II, III or IV.
Potting Material	TONSAN ADHESIVE, INC.	5299W-S
Adhesive (between Junction Box and backsheet)	TONSAN ADHESIVE, INC.	HT906Z
Bypass Diode	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd.	RT4550

7.0 Illustrations

Illustration 6 - Cautionary Markings 'Do not disconnect under load'

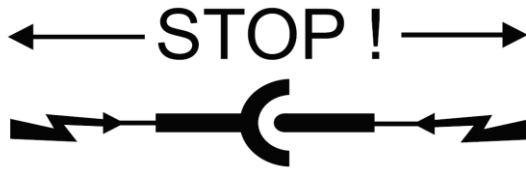


Illustration 6A - Cautionary Markings 'Do not disconnect under load'

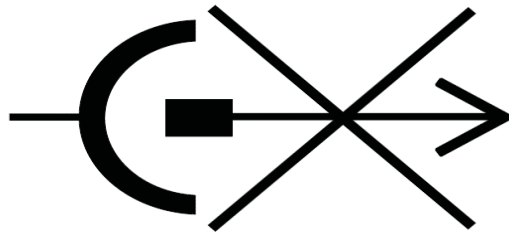


Illustration 6B - Cautionary Markings 'risk of electric shock'

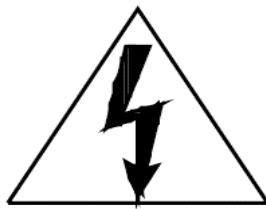


Illustration 6C - Cautionary Markings 'Classification'



7.0 Illustrations

Illustration 7 - Ratings

Model	GSD7S60T-480BT		Model	GSD7S60T-485BT		Model	GSD7S60T-490BT	
STC	Pmax (±3%)	480	STC	Pmax (±3%)	485	STC	Pmax (±3%)	490
	Voc (±3%)	42.71		Voc (±3%)	42.88		Voc (±3%)	43.06
	Isc (±3%)	14.31		Isc (±3%)	14.39		Isc (±3%)	13.03
	Vmp	35.38		Vmp	35.55		Vmp	35.72
	Imp	13.57		Imp	13.65		Imp	13.72
BNPI	Pmax (±3%)	530	BNPI	Pmax (±3%)	535	BNPI	Pmax (±3%)	540
	Voc (±3%)	42.71		Voc (±3%)	42.88		Voc (±3%)	43.06
	Isc (±3%)	15.81		Isc (±3%)	15.93		Isc (±3%)	14.43
BSI	Isc (±3%)	17.75	BSI	Isc (±3%)	17.85	BSI	Isc (±3%)	16.16
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S66T-515BT		Model	GSD7S66T-520BT		Model	GSD7S66T-525BT	
STC	Pmax (±3%)	515	STC	Pmax (±3%)	520	STC	Pmax (±3%)	525
	Voc (±3%)	46.78		Voc (±3%)	46.96		Voc (±3%)	47.14
	Isc (±3%)	14.09		Isc (±3%)	14.17		Isc (±3%)	14.25
	Vmp	38.68		Vmp	38.86		Vmp	39.04
	Imp	13.32		Imp	13.39		Imp	13.45
BNPI	Pmax (±3%)	570	BNPI	Pmax (±3%)	575	BNPI	Pmax (±3%)	580
	Voc (±3%)	46.78		Voc (±3%)	46.96		Voc (±3%)	47.14
	Isc (±3%)	15.6		Isc (±3%)	15.69		Isc (±3%)	15.78
BSI	Isc (±3%)	17.48	BSI	Isc (±3%)	17.58	BSI	Isc (±3%)	17.61
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S66T-530BT		Model	GSD7S66T-535BT		Model	GSD7S66T-540BT	
STC	Pmax (±3%)	530	STC	Pmax (±3%)	535	STC	Pmax (±3%)	540
	Voc (±3%)	47.32		Voc (±3%)	47.5		Voc (±3%)	47.68
	Isc (±3%)	14.33		Isc (±3%)	14.41		Isc (±3%)	14.49
	Vmp	39.22		Vmp	39.4		Vmp	39.58
	Imp	13.52		Imp	13.58		Imp	13.65
BNPI	Pmax (±3%)	585	BNPI	Pmax (±3%)	590	BNPI	Pmax (±3%)	595
	Voc (±3%)	47.32		Voc (±3%)	47.5		Voc (±3%)	47.68
	Isc (±3%)	15.87		Isc (±3%)	15.96		Isc (±3%)	16.04
BSI	Isc (±3%)	17.77	BSI	Isc (±3%)	17.87	BSI	Isc (±3%)	17.97
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S72T-565BT		Model	GSD7S72T-570BT		Model	GSD7S72T-575BT	
STC	Pmax (±3%)	565	STC	Pmax (±3%)	570	STC	Pmax (±3%)	575
	Voc (±3%)	50.6		Voc (±3%)	50.74		Voc (±3%)	50.88
	Isc (±3%)	14.23		Isc (±3%)	14.31		Isc (±3%)	14.39
	Vmp	41.92		Vmp	42.07		Vmp	42.22
	Imp	13.48		Imp	13.55		Imp	13.62
BNPI	Pmax (±3%)	625	BNPI	Pmax (±3%)	630	BNPI	Pmax (±3%)	635
	Voc (±3%)	50.6		Voc (±3%)	50.74		Voc (±3%)	50.88
	Isc (±3%)	15.76		Isc (±3%)	15.81		Isc (±3%)	15.93
BSI	Isc (±3%)	17.65	BSI	Isc (±3%)	17.75	BSI	Isc (±3%)	17.85
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

7.0 Illustrations

Illustration 7A - Ratings

Model	GSD7S72T-580BT		Model	GSD7S72T-585BT		Model	GSD7S72T-590BT	
STC	Pmax (±3%)	580	STC	Pmax (±3%)	585	STC	Pmax (±3%)	590
	Voc (±3%)	51.02		Voc (±3%)	51.16		Voc (±3%)	51.3
	Isc (±3%)	14.47		Isc (±3%)	14.55		Isc (±3%)	14.63
	Vmp	42.37		Vmp	42.52		Vmp	42.67
	Imp	13.69		Imp	13.76		Imp	13.83
BNPI	Pmax (±3%)	640	BNPI	Pmax (±3%)	645	BNPI	Pmax (±3%)	650
	Voc (±3%)	51.02		Voc (±3%)	51.16		Voc (±3%)	51.3
	Isc (±3%)	16.02		Isc (±3%)	16.11		Isc (±3%)	16.2
BSI	Isc (±3%)	17.95	BSI	Isc (±3%)	18.05	BSI	Isc (±3%)	18.15
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S78T-610BT		Model	GSD7S78T-615BT		Model	GSD7S78T-620BT	
STC	Pmax (±3%)	610	STC	Pmax (±3%)	615	STC	Pmax (±3%)	620
	Voc (±3%)	55.31		Voc (±3%)	55.44		Voc (±3%)	55.58
	Isc (±3%)	14.03		Isc (±3%)	14.11		Isc (±3%)	14.19
	Vmp	45.6		Vmp	45.77		Vmp	45.93
	Imp	13.38		Imp	13.44		Imp	13.5
BNPI	Pmax (±3%)	675	BNPI	Pmax (±3%)	680	BNPI	Pmax (±3%)	685
	Voc (±3%)	55.31		Voc (±3%)	55.44		Voc (±3%)	55.58
	Isc (±3%)	15.51		Isc (±3%)	15.62		Isc (±3%)	15.71
BSI	Isc (±3%)	17.4	BSI	Isc (±3%)	17.5	BSI	Isc (±3%)	17.6
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S78T-625BT		Model	GSD7S78T-630BT		Model	GSD7S78T-635BT	
STC	Pmax (±3%)	625	STC	Pmax (±3%)	630	STC	Pmax (±3%)	635
	Voc (±3%)	55.72		Voc (±3%)	55.86		Voc (±3%)	56
	Isc (±3%)	14.27		Isc (±3%)	14.35		Isc (±3%)	14.43
	Vmp	46.1		Vmp	46.26		Vmp	46.42
	Imp	13.56		Imp	13.62		Imp	13.68
BNPI	Pmax (±3%)	690	BNPI	Pmax (±3%)	695	BNPI	Pmax (±3%)	700
	Voc (±3%)	55.72		Voc (±3%)	55.86		Voc (±3%)	56
	Isc (±3%)	15.8		Isc (±3%)	15.89		Isc (±3%)	15.98
BSI	Isc (±3%)	17.7	BSI	Isc (±3%)	17.8	BSI	Isc (±3%)	17.9
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7S78T-640BT		Model	GSD8J66M-650WT		Model	GSD8J66M-655WT	
STC	Pmax (±3%)	640	STC	Pmax (±3%)	650	STC	Pmax (±3%)	655
	Voc (±3%)	56.15		Voc (±3%)	45.4		Voc (±3%)	45.6
	Isc (±3%)	14.51		Isc (±3%)	18.21		Isc (±3%)	18.26
	Vmp	46.58		Vmp	37.6		Vmp	37.8
	Imp	13.74		Imp	17.29		Imp	17.33
BNPI	Pmax (±3%)	705	BNPI	Pmax (±3%)	710	BNPI	Pmax (±3%)	715
	Voc (±3%)	56.15		Voc (±3%)	45.4		Voc (±3%)	45.6
	Isc (±3%)	16.07		Isc (±3%)	20.16		Isc (±3%)	20.22
BSI	Isc (±3%)	18	BSI	Isc (±3%)	22.51	BSI	Isc (±3%)	22.65
Max. series fuse		30	Max. series fuse		35	Max. series fuse		35
Vsys		1500	Vsys		1500	Vsys		1500

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Illustration 7B - Ratings

Model	GSD8J66M-660WT		Model	GSD8J66M-665WT		Model	GSD8J66M-670WT	
STC	Pmax (±3%)	660	STC	Pmax (±3%)	665	STC	Pmax (±3%)	670
	Voc (±3%)	45.8		Voc (±3%)	46		Voc (±3%)	46.2
	Isc (±3%)	18.31		Isc (±3%)	18.36		Isc (±3%)	18.41
	Vmp	38		Vmp	38.2		Vmp	38.4
	Imp	17.37		Imp	17.41		Imp	17.45
BNPI	Pmax (±3%)	720	BNPI	Pmax (±3%)	725	BNPI	Pmax (±3%)	730
	Voc (±3%)	45.8		Voc (±3%)	46		Voc (±3%)	46.2
	Isc (±3%)	20.27		Isc (±3%)	20.33		Isc (±3%)	20.38
BSI	Isc (±3%)	22.71	BSI	Isc (±3%)	22.77	BSI	Isc (±3%)	22.83
Max. series fuse		35	Max. series fuse		35	Max. series fuse		35
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD8J66M-675WT		Model	GSD8J66M-650BT		Model	GSD8J66M-655BT	
STC	Pmax (±3%)	675	STC	Pmax (±3%)	650	STC	Pmax (±3%)	655
	Voc (±3%)	46.4		Voc (±3%)	45.4		Voc (±3%)	45.6
	Isc (±3%)	18.46		Isc (±3%)	18.21		Isc (±3%)	18.26
	Vmp	38.6		Vmp	37.6		Vmp	37.8
	Imp	17.49		Imp	17.29		Imp	17.33
BNPI	Pmax (±3%)	735	BNPI	Pmax (±3%)	710	BNPI	Pmax (±3%)	715
	Voc (±3%)	46.4		Voc (±3%)	45.4		Voc (±3%)	45.6
	Isc (±3%)	20.44		Isc (±3%)	20.16		Isc (±3%)	20.22
BSI	Isc (±3%)	22.81	BSI	Isc (±3%)	22.51	BSI	Isc (±3%)	22.65
Max. series fuse		35	Max. series fuse		35	Max. series fuse		35
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD8J66M-660BT		Model	GSD8J66M-665BT		Model	GSD8J66M-670BT	
STC	Pmax (±3%)	660	STC	Pmax (±3%)	665	STC	Pmax (±3%)	670
	Voc (±3%)	45.8		Voc (±3%)	46		Voc (±3%)	46.2
	Isc (±3%)	18.31		Isc (±3%)	18.36		Isc (±3%)	18.41
	Vmp	38		Vmp	38.2		Vmp	38.4
	Imp	17.37		Imp	17.41		Imp	17.45
BNPI	Pmax (±3%)	720	BNPI	Pmax (±3%)	725	BNPI	Pmax (±3%)	730
	Voc (±3%)	45.8		Voc (±3%)	46		Voc (±3%)	46.2
	Isc (±3%)	20.27		Isc (±3%)	20.33		Isc (±3%)	20.38
BSI	Isc (±3%)	22.71	BSI	Isc (±3%)	22.77	BSI	Isc (±3%)	22.83
Max. series fuse		35	Max. series fuse		35	Max. series fuse		35
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD8J66M-675BT		Model	GSD8J60M-590WT		Model	GSD8J60M-595WT	
STC	Pmax (±3%)	675	STC	Pmax (±3%)	590	STC	Pmax (±3%)	595
	Voc (±3%)	46.4		Voc (±3%)	41.2		Voc (±3%)	41.4
	Isc (±3%)	18.46		Isc (±3%)	18.3		Isc (±3%)	18.34
	Vmp	38.6		Vmp	34.3		Vmp	34.5
	Imp	17.49		Imp	17.21		Imp	17.25
BNPI	Pmax (±3%)	735	BNPI	Pmax (±3%)	645	BNPI	Pmax (±3%)	650
	Voc (±3%)	46.4		Voc (±3%)	41.2		Voc (±3%)	41.4
	Isc (±3%)	20.44		Isc (±3%)	20.26		Isc (±3%)	20.31
BSI	Isc (±3%)	22.81	BSI	Isc (±3%)	22.7	BSI	Isc (±3%)	22.75
Max. series fuse		35	Max. series fuse		35	Max. series fuse		35
Vsys		1500	Vsys		1500	Vsys		1500

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Illustration 7C - Ratings

Model	GSD8J60M-600WT		Model	GSD8J60M-605WT		Model	GSD8J60M-610WT	
STC	Pmax (±3%)	600	STC	Pmax (±3%)	605	STC	Pmax (±3%)	610
	Voc (±3%)	41.6		Voc (±3%)	41.8		Voc (±3%)	42
	Isc (±3%)	18.39		Isc (±3%)	18.43		Isc (±3%)	18.48
	Vmp	34.7		Vmp	34.9		Vmp	35.1
	Imp	17.3		Imp	17.34		Imp	17.38
BNPI	Pmax (±3%)	655	BNPI	Pmax (±3%)	660	BNPI	Pmax (±3%)	665
	Voc (±3%)	41.6		Voc (±3%)	41.8		Voc (±3%)	42
	Isc (±3%)	20.36		Isc (±3%)	20.41		Isc (±3%)	20.46
BSI	Isc (±3%)	22.81	BSI	Isc (±3%)	22.86	BSI	Isc (±3%)	22.92
Max. series fuse		35	Max. series fuse		35	Max. series fuse		35
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD8J60M-590BT		Model	GSD8J60M-595BT		Model	GSD8J60M-600BT	
STC	Pmax (±3%)	590	STC	Pmax (±3%)	595	STC	Pmax (±3%)	600
	Voc (±3%)	41.2		Voc (±3%)	41.4		Voc (±3%)	41.6
	Isc (±3%)	18.3		Isc (±3%)	18.34		Isc (±3%)	18.39
	Vmp	34.3		Vmp	34.5		Vmp	34.7
	Imp	17.21		Imp	17.25		Imp	17.3
BNPI	Pmax (±3%)	645	BNPI	Pmax (±3%)	650	BNPI	Pmax (±3%)	655
	Voc (±3%)	41.2		Voc (±3%)	41.4		Voc (±3%)	41.6
	Isc (±3%)	20.26		Isc (±3%)	20.31		Isc (±3%)	20.36
BSI	Isc (±3%)	22.7	BSI	Isc (±3%)	22.75	BSI	Isc (±3%)	22.81
Max. series fuse		35	Max. series fuse		35	Max. series fuse		35
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD8J60M-605BT		Model	GSD8J60M-610BT		Model	GSD7G78M-575WT	
STC	Pmax (±3%)	605	STC	Pmax (±3%)	610	STC	Pmax (±3%)	575
	Voc (±3%)	41.8		Voc (±3%)	42		Voc (±3%)	53.54
	Isc (±3%)	18.43		Isc (±3%)	18.48		Isc (±3%)	13.72
	Vmp	34.9		Vmp	35.1		Vmp	44.83
	Imp	17.34		Imp	17.38		Imp	12.83
BNPI	Pmax (±3%)	660	BNPI	Pmax (±3%)	665	BNPI	Pmax (±3%)	630
	Voc (±3%)	41.8		Voc (±3%)	42		Voc (±3%)	53.54
	Isc (±3%)	20.41		Isc (±3%)	20.46		Isc (±3%)	15.19
BSI	Isc (±3%)	22.86	BSI	Isc (±3%)	22.92	BSI	Isc (±3%)	17.02
Max. series fuse		35	Max. series fuse		35	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G78M-580WT		Model	GSD7G78M-585WT		Model	GSD7G78M-590WT	
STC	Pmax (±3%)	580	STC	Pmax (±3%)	585	STC	Pmax (±3%)	590
	Voc (±3%)	53.59		Voc (±3%)	53.73		Voc (±3%)	53.87
	Isc (±3%)	13.79		Isc (±3%)	13.86		Isc (±3%)	13.93
	Vmp	44.97		Vmp	45.11		Vmp	45.25
	Imp	12.9		Imp	12.97		Imp	13.04
BNPI	Pmax (±3%)	635	BNPI	Pmax (±3%)	640	BNPI	Pmax (±3%)	645
	Voc (±3%)	53.59		Voc (±3%)	53.73		Voc (±3%)	53.87
	Isc (±3%)	15.27		Isc (±3%)	15.35		Isc (±3%)	15.42
BSI	Isc (±3%)	17.01	BSI	Isc (±3%)	17.19	BSI	Isc (±3%)	17.28
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

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Illustration 7D - Ratings

Model	GSD7G78M-595WT		Model	GSD7G78M-600WT		Model	GSD7G78M-605WT	
STC	Pmax (±3%)	595	STC	Pmax (±3%)	600	STC	Pmax (±3%)	605
	Voc (±3%)	54.01		Voc (±3%)	54.15		Voc (±3%)	54.29
	Isc (±3%)	14		Isc (±3%)	14.07		Isc (±3%)	14.14
	Vmp	45.39		Vmp	45.53		Vmp	45.67
	Imp	13.11		Imp	13.18		Imp	13.25
BNPI	Pmax (±3%)	650	BNPI	Pmax (±3%)	655	BNPI	Pmax (±3%)	660
	Voc (±3%)	54.01		Voc (±3%)	54.15		Voc (±3%)	54.29
	Isc (±3%)	15.5		Isc (±3%)	15.58		Isc (±3%)	15.66
BSI	Isc (±3%)	17.31	BSI	Isc (±3%)	17.45	BSI	Isc (±3%)	17.54
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G78M-610WT		Model	GSD7G78M-575BT		Model	GSD7G78M-580BT	
STC	Pmax (±3%)	610	STC	Pmax (±3%)	575	STC	Pmax (±3%)	580
	Voc (±3%)	54.43		Voc (±3%)	53.54		Voc (±3%)	53.59
	Isc (±3%)	14.21		Isc (±3%)	13.72		Isc (±3%)	13.79
	Vmp	45.81		Vmp	44.83		Vmp	44.97
	Imp	13.32		Imp	12.83		Imp	12.9
BNPI	Pmax (±3%)	665	BNPI	Pmax (±3%)	630	BNPI	Pmax (±3%)	635
	Voc (±3%)	54.43		Voc (±3%)	53.54		Voc (±3%)	53.59
	Isc (±3%)	15.73		Isc (±3%)	15.19		Isc (±3%)	15.27
BSI	Isc (±3%)	17.61	BSI	Isc (±3%)	17.02	BSI	Isc (±3%)	17.01
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G78M-585BT		Model	GSD7G78M-590BT		Model	GSD7G78M-595BT	
STC	Pmax (±3%)	585	STC	Pmax (±3%)	590	STC	Pmax (±3%)	595
	Voc (±3%)	53.73		Voc (±3%)	53.87		Voc (±3%)	54.01
	Isc (±3%)	13.86		Isc (±3%)	13.93		Isc (±3%)	14
	Vmp	45.11		Vmp	45.25		Vmp	45.39
	Imp	12.97		Imp	13.04		Imp	13.11
BNPI	Pmax (±3%)	640	BNPI	Pmax (±3%)	645	BNPI	Pmax (±3%)	650
	Voc (±3%)	53.73		Voc (±3%)	53.87		Voc (±3%)	54.01
	Isc (±3%)	15.35		Isc (±3%)	15.42		Isc (±3%)	15.5
BSI	Isc (±3%)	17.19	BSI	Isc (±3%)	17.28	BSI	Isc (±3%)	17.31
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G78M-600BT		Model	GSD7G78M-605BT		Model	GSD7G78M-610BT	
STC	Pmax (±3%)	600	STC	Pmax (±3%)	605	STC	Pmax (±3%)	610
	Voc (±3%)	54.15		Voc (±3%)	54.29		Voc (±3%)	54.43
	Isc (±3%)	14.07		Isc (±3%)	14.14		Isc (±3%)	14.21
	Vmp	45.53		Vmp	45.67		Vmp	45.81
	Imp	13.18		Imp	13.25		Imp	13.32
BNPI	Pmax (±3%)	655	BNPI	Pmax (±3%)	660	BNPI	Pmax (±3%)	665
	Voc (±3%)	54.15		Voc (±3%)	54.29		Voc (±3%)	54.43
	Isc (±3%)	15.58		Isc (±3%)	15.66		Isc (±3%)	15.73
BSI	Isc (±3%)	17.45	BSI	Isc (±3%)	17.54	BSI	Isc (±3%)	17.61
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

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Illustration 7E - Ratings

Model	GSD7G72M-530WT		Model	GSD7G72M-535WT		Model	GSD7G72M-540WT	
STC	Pmax (±3%)	530	STC	Pmax (±3%)	535	STC	Pmax (±3%)	540
	Voc (±3%)	49.32		Voc (±3%)	49.46		Voc (±3%)	49.6
	Isc (±3%)	13.72		Isc (±3%)	13.7		Isc (±3%)	13.86
	Vmp	41.32		Vmp	41.48		Vmp	41.64
	Imp	12.83		Imp	12.9		Imp	12.97
BNPI	Pmax (±3%)	580	BNPI	Pmax (±3%)	585	BNPI	Pmax (±3%)	590
	Voc (±3%)	49.32		Voc (±3%)	49.46		Voc (±3%)	49.6
	Isc (±3%)	15.19		Isc (±3%)	15.17		Isc (±3%)	15.35
BSI	Isc (±3%)	17.02	BSI	Isc (±3%)	16.99	BSI	Isc (±3%)	17.19
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G72M-545WT		Model	GSD7G72M-550WT		Model	GSD7G72M-555WT	
STC	Pmax (±3%)	545	STC	Pmax (±3%)	550	STC	Pmax (±3%)	555
	Voc (±3%)	49.76		Voc (±3%)	49.92		Voc (±3%)	50.08
	Isc (±3%)	13.93		Isc (±3%)	14		Isc (±3%)	14.07
	Vmp	41.8		Vmp	41.96		Vmp	42.12
	Imp	13.04		Imp	13.11		Imp	13.18
BNPI	Pmax (±3%)	595	BNPI	Pmax (±3%)	600	BNPI	Pmax (±3%)	605
	Voc (±3%)	49.76		Voc (±3%)	49.92		Voc (±3%)	50.08
	Isc (±3%)	15.42		Isc (±3%)	15.5		Isc (±3%)	15.58
BSI	Isc (±3%)	17.28	BSI	Isc (±3%)	17.31	BSI	Isc (±3%)	17.45
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G72M-560WT		Model	GSD7G72M-530BT		Model	GSD7G72M-535BT	
STC	Pmax (±3%)	560	STC	Pmax (±3%)	530	STC	Pmax (±3%)	535
	Voc (±3%)	50.24		Voc (±3%)	49.32		Voc (±3%)	49.46
	Isc (±3%)	14.14		Isc (±3%)	13.72		Isc (±3%)	13.7
	Vmp	42.28		Vmp	41.32		Vmp	41.48
	Imp	13.25		Imp	12.83		Imp	12.9
BNPI	Pmax (±3%)	610	BNPI	Pmax (±3%)	580	BNPI	Pmax (±3%)	585
	Voc (±3%)	50.24		Voc (±3%)	49.32		Voc (±3%)	49.46
	Isc (±3%)	15.66		Isc (±3%)	15.19		Isc (±3%)	15.17
BSI	Isc (±3%)	17.54	BSI	Isc (±3%)	17.02	BSI	Isc (±3%)	16.99
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G72M-540BT		Model	GSD7G72M-545BT		Model	GSD7G72M-550BT	
STC	Pmax (±3%)	540	STC	Pmax (±3%)	545	STC	Pmax (±3%)	550
	Voc (±3%)	49.6		Voc (±3%)	49.76		Voc (±3%)	49.92
	Isc (±3%)	13.86		Isc (±3%)	13.93		Isc (±3%)	14
	Vmp	41.64		Vmp	41.8		Vmp	41.96
	Imp	12.97		Imp	13.04		Imp	13.11
BNPI	Pmax (±3%)	590	BNPI	Pmax (±3%)	595	BNPI	Pmax (±3%)	600
	Voc (±3%)	49.6		Voc (±3%)	49.76		Voc (±3%)	49.92
	Isc (±3%)	15.35		Isc (±3%)	15.42		Isc (±3%)	15.5
BSI	Isc (±3%)	17.19	BSI	Isc (±3%)	17.28	BSI	Isc (±3%)	17.31
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

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Illustration 7F - Ratings

Model	GSD7G72M-555BT		Model	GSD7G72M-560BT		Model	GSD7G66M-485WT	
STC	Pmax (±3%)	555	STC	Pmax (±3%)	560	STC	Pmax (±3%)	485
	Voc (±3%)	50.08		Voc (±3%)	50.24		Voc (±3%)	45.16
	Isc (±3%)	14.07		Isc (±3%)	14.14		Isc (±3%)	13.7
	Vmp	42.12		Vmp	42.28		Vmp	37.87
	Imp	13.18		Imp	13.25		Imp	12.81
BNPI	Pmax (±3%)	605	BNPI	Pmax (±3%)	610	BNPI	Pmax (±3%)	530
	Voc (±3%)	50.08		Voc (±3%)	50.24		Voc (±3%)	45.16
	Isc (±3%)	15.58		Isc (±3%)	15.66		Isc (±3%)	15.17
BSI	Isc (±3%)	17.45	BSI	Isc (±3%)	17.54	BSI	Isc (±3%)	16.99
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G66M-490WT		Model	GSD7G66M-495WT		Model	GSD7G66M-500WT	
STC	Pmax (±3%)	490	STC	Pmax (±3%)	495	STC	Pmax (±3%)	500
	Voc (±3%)	45.31		Voc (±3%)	45.46		Voc (±3%)	45.61
	Isc (±3%)	13.78		Isc (±3%)	13.86		Isc (±3%)	13.94
	Vmp	38.02		Vmp	38.17		Vmp	38.32
	Imp	12.89		Imp	12.97		Imp	13.05
BNPI	Pmax (±3%)	535	BNPI	Pmax (±3%)	540	BNPI	Pmax (±3%)	545
	Voc (±3%)	45.31		Voc (±3%)	45.46		Voc (±3%)	45.61
	Isc (±3%)	15.26		Isc (±3%)	15.35		Isc (±3%)	15.41
BSI	Isc (±3%)	17.09	BSI	Isc (±3%)	17.19	BSI	Isc (±3%)	17.29
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G66M-505WT		Model	GSD7G66M-510WT		Model	GSD7G66M-515WT	
STC	Pmax (±3%)	505	STC	Pmax (±3%)	510	STC	Pmax (±3%)	515
	Voc (±3%)	45.76		Voc (±3%)	45.81		Voc (±3%)	45.96
	Isc (±3%)	14.02		Isc (±3%)	14.1		Isc (±3%)	14.18
	Vmp	38.47		Vmp	38.62		Vmp	38.77
	Imp	13.13		Imp	13.21		Imp	13.29
BNPI	Pmax (±3%)	550	BNPI	Pmax (±3%)	555	BNPI	Pmax (±3%)	560
	Voc (±3%)	45.76		Voc (±3%)	45.81		Voc (±3%)	45.96
	Isc (±3%)	15.52		Isc (±3%)	15.61		Isc (±3%)	15.7
BSI	Isc (±3%)	17.39	BSI	Isc (±3%)	17.49	BSI	Isc (±3%)	17.59
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G66M-485BT		Model	GSD7G66M-490BT		Model	GSD7G66M-495BT	
STC	Pmax (±3%)	485	STC	Pmax (±3%)	490	STC	Pmax (±3%)	495
	Voc (±3%)	45.16		Voc (±3%)	45.31		Voc (±3%)	45.46
	Isc (±3%)	13.7		Isc (±3%)	13.78		Isc (±3%)	13.86
	Vmp	37.87		Vmp	38.02		Vmp	38.17
	Imp	12.81		Imp	12.89		Imp	12.97
BNPI	Pmax (±3%)	530	BNPI	Pmax (±3%)	535	BNPI	Pmax (±3%)	540
	Voc (±3%)	45.16		Voc (±3%)	45.31		Voc (±3%)	45.46
	Isc (±3%)	15.17		Isc (±3%)	15.26		Isc (±3%)	15.35
BSI	Isc (±3%)	16.99	BSI	Isc (±3%)	17.09	BSI	Isc (±3%)	17.19
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

7.0 Illustrations

Illustration 7G - Ratings

Model	GSD7G66M-500BT		Model	GSD7G66M-505BT		Model	GSD7G66M-510BT	
STC	Pmax (±3%)	500	STC	Pmax (±3%)	505	STC	Pmax (±3%)	510
	Voc (±3%)	45.61		Voc (±3%)	45.76		Voc (±3%)	45.81
	Isc (±3%)	13.94		Isc (±3%)	14.02		Isc (±3%)	14.1
	Vmp	38.32		Vmp	38.47		Vmp	38.62
	Imp	13.05		Imp	13.13		Imp	13.21
BNPI	Pmax (±3%)	545	BNPI	Pmax (±3%)	550	BNPI	Pmax (±3%)	555
	Voc (±3%)	45.61		Voc (±3%)	45.76		Voc (±3%)	45.81
	Isc (±3%)	15.41		Isc (±3%)	15.52		Isc (±3%)	15.61
BSI	Isc (±3%)	17.29	BSI	Isc (±3%)	17.39	BSI	Isc (±3%)	17.49
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G66M-515BT		Model	GSD7G60M-440WT		Model	GSD7G60M-445WT	
STC	Pmax (±3%)	515	STC	Pmax (±3%)	440	STC	Pmax (±3%)	445
	Voc (±3%)	45.96		Voc (±3%)	40.99		Voc (±3%)	41.16
	Isc (±3%)	14.18		Isc (±3%)	13.69		Isc (±3%)	13.78
	Vmp	38.77		Vmp	34.35		Vmp	34.53
	Imp	13.29		Imp	12.81		Imp	12.89
BNPI	Pmax (±3%)	560	BNPI	Pmax (±3%)	480	BNPI	Pmax (±3%)	485
	Voc (±3%)	45.96		Voc (±3%)	40.99		Voc (±3%)	41.16
	Isc (±3%)	15.7		Isc (±3%)	15.16		Isc (±3%)	15.26
BSI	Isc (±3%)	17.59	BSI	Isc (±3%)	16.98	BSI	Isc (±3%)	17.09
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G60M-450WT		Model	GSD7G60M-455WT		Model	GSD7G60M-460WT	
STC	Pmax (±3%)	450	STC	Pmax (±3%)	455	STC	Pmax (±3%)	460
	Voc (±3%)	41.33		Voc (±3%)	41.5		Voc (±3%)	41.67
	Isc (±3%)	13.86		Isc (±3%)	13.94		Isc (±3%)	14.02
	Vmp	34.7		Vmp	34.87		Vmp	35.04
	Imp	12.97		Imp	13.05		Imp	13.13
BNPI	Pmax (±3%)	490	BNPI	Pmax (±3%)	495	BNPI	Pmax (±3%)	500
	Voc (±3%)	41.33		Voc (±3%)	41.5		Voc (±3%)	41.67
	Isc (±3%)	15.35		Isc (±3%)	15.41		Isc (±3%)	15.52
BSI	Isc (±3%)	17.19	BSI	Isc (±3%)	17.29	BSI	Isc (±3%)	17.39
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G60M-465WT		Model	GSD7G60M-470WT		Model	GSD7G60M-440BT	
STC	Pmax (±3%)	465	STC	Pmax (±3%)	470	STC	Pmax (±3%)	440
	Voc (±3%)	41.84		Voc (±3%)	42.01		Voc (±3%)	40.99
	Isc (±3%)	14.1		Isc (±3%)	14.18		Isc (±3%)	13.69
	Vmp	35.21		Vmp	35.38		Vmp	34.35
	Imp	13.21		Imp	13.29		Imp	12.81
BNPI	Pmax (±3%)	505	BNPI	Pmax (±3%)	510	BNPI	Pmax (±3%)	480
	Voc (±3%)	41.84		Voc (±3%)	42.01		Voc (±3%)	40.99
	Isc (±3%)	15.61		Isc (±3%)	15.7		Isc (±3%)	15.16
BSI	Isc (±3%)	17.49	BSI	Isc (±3%)	17.59	BSI	Isc (±3%)	16.98
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

7.0 Illustrations

Illustration 7H - Ratings

Model	GSD7G60M-445BT		Model	GSD7G60M-450BT		Model	GSD7G60M-455BT	
STC	Pmax (±3%)	445	STC	Pmax (±3%)	450	STC	Pmax (±3%)	455
	Voc (±3%)	41.16		Voc (±3%)	41.33		Voc (±3%)	41.5
	Isc (±3%)	13.78		Isc (±3%)	13.86		Isc (±3%)	13.94
	Vmp	34.53		Vmp	34.7		Vmp	34.87
	Imp	12.89		Imp	12.97		Imp	13.05
BNPI	Pmax (±3%)	485	BNPI	Pmax (±3%)	490	BNPI	Pmax (±3%)	495
	Voc (±3%)	41.16		Voc (±3%)	41.33		Voc (±3%)	41.5
	Isc (±3%)	15.26		Isc (±3%)	15.35		Isc (±3%)	15.41
BSI	Isc (±3%)	17.09	BSI	Isc (±3%)	17.19	BSI	Isc (±3%)	17.29
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G60M-460BT		Model	GSD7G60M-465BT		Model	GSD7G60M-470BT	
STC	Pmax (±3%)	460	STC	Pmax (±3%)	465	STC	Pmax (±3%)	470
	Voc (±3%)	41.67		Voc (±3%)	41.84		Voc (±3%)	42.01
	Isc (±3%)	14.02		Isc (±3%)	14.1		Isc (±3%)	14.18
	Vmp	35.04		Vmp	35.21		Vmp	35.38
	Imp	13.13		Imp	13.21		Imp	13.29
BNPI	Pmax (±3%)	500	BNPI	Pmax (±3%)	505	BNPI	Pmax (±3%)	510
	Voc (±3%)	41.67		Voc (±3%)	41.84		Voc (±3%)	42.01
	Isc (±3%)	15.52		Isc (±3%)	15.61		Isc (±3%)	15.7
BSI	Isc (±3%)	17.39	BSI	Isc (±3%)	17.49	BSI	Isc (±3%)	17.59
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G54M-395WT		Model	GSD7G54M-400WT		Model	GSD7G54M-405WT	
STC	Pmax (±3%)	395	STC	Pmax (±3%)	400	STC	Pmax (±3%)	405
	Voc (±3%)	36.75		Voc (±3%)	37		Voc (±3%)	37.25
	Isc (±3%)	13.69		Isc (±3%)	13.78		Isc (±3%)	13.86
	Vmp	30.85		Vmp	31.05		Vmp	31.24
	Imp	12.81		Imp	12.89		Imp	12.97
BNPI	Pmax (±3%)	430	BNPI	Pmax (±3%)	435	BNPI	Pmax (±3%)	440
	Voc (±3%)	36.75		Voc (±3%)	37		Voc (±3%)	37.25
	Isc (±3%)	15.16		Isc (±3%)	15.26		Isc (±3%)	15.35
BSI	Isc (±3%)	16.98	BSI	Isc (±3%)	17.09	BSI	Isc (±3%)	17.19
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G54M-410WT		Model	GSD7G54M-415WT		Model	GSD7G54M-420WT	
STC	Pmax (±3%)	410	STC	Pmax (±3%)	415	STC	Pmax (±3%)	420
	Voc (±3%)	37.5		Voc (±3%)	37.75		Voc (±3%)	38
	Isc (±3%)	13.94		Isc (±3%)	14.02		Isc (±3%)	14.1
	Vmp	31.43		Vmp	31.64		Vmp	31.79
	Imp	13.05		Imp	13.13		Imp	13.22
BNPI	Pmax (±3%)	445	BNPI	Pmax (±3%)	450	BNPI	Pmax (±3%)	455
	Voc (±3%)	37.5		Voc (±3%)	37.75		Voc (±3%)	38
	Isc (±3%)	15.41		Isc (±3%)	15.52		Isc (±3%)	15.61
BSI	Isc (±3%)	17.29	BSI	Isc (±3%)	17.39	BSI	Isc (±3%)	17.49
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

7.0 Illustrations

Illustration 71 - Ratings

Model	GSD7G54M-395BT		Model	GSD7G54M-400BT		Model	GSD7G54M-405BT	
STC	Pmax (±3%)	395	STC	Pmax (±3%)	400	STC	Pmax (±3%)	405
	Voc (±3%)	36.75		Voc (±3%)	37		Voc (±3%)	37.25
	Isc (±3%)	13.69		Isc (±3%)	13.78		Isc (±3%)	13.86
	Vmp	30.85		Vmp	31.05		Vmp	31.24
	Imp	12.81		Imp	12.89		Imp	12.97
BNPI	Pmax (±3%)	430	BNPI	Pmax (±3%)	435	BNPI	Pmax (±3%)	440
	Voc (±3%)	36.75		Voc (±3%)	37		Voc (±3%)	37.25
	Isc (±3%)	15.16		Isc (±3%)	15.26		Isc (±3%)	15.35
BSI	Isc (±3%)	16.98	BSI	Isc (±3%)	17.09	BSI	Isc (±3%)	17.19
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500
Model	GSD7G54M-410BT		Model	GSD7G54M-415BT		Model	GSD7G54M-420BT	
STC	Pmax (±3%)	410	STC	Pmax (±3%)	415	STC	Pmax (±3%)	420
	Voc (±3%)	37.5		Voc (±3%)	37.75		Voc (±3%)	38
	Isc (±3%)	13.94		Isc (±3%)	14.02		Isc (±3%)	14.1
	Vmp	31.43		Vmp	31.64		Vmp	31.79
	Imp	13.05		Imp	13.13		Imp	13.22
BNPI	Pmax (±3%)	445	BNPI	Pmax (±3%)	450	BNPI	Pmax (±3%)	455
	Voc (±3%)	37.5		Voc (±3%)	37.75		Voc (±3%)	38
	Isc (±3%)	15.41		Isc (±3%)	15.52		Isc (±3%)	15.61
BSI	Isc (±3%)	17.29	BSI	Isc (±3%)	17.39	BSI	Isc (±3%)	17.49
Max. series fuse		30	Max. series fuse		30	Max. series fuse		30
Vsys		1500	Vsys		1500	Vsys		1500

8.0 Test Summary			
Evaluation Period	March 31, 2023 to June 06, 2023		Project No. 2307A0920HAN
Sample Rec. Date	31-Mar-2023	Condition Prototype	Sample ID. 0230331-50
Test Location	Building No.2, No. 500 East Shuiyueting Road, Haining City, Zhejiang Province, China		
Test Procedure	Testing Lab		
Determination of the result includes consideration of measurement uncertainty from the test equipment and methods. The product was tested as indicated below with results in conformance to the relevant test criteria.			
<p>The following tests were performed on GSD7S78T-620WT to verify components below:</p> <ol style="list-style-type: none"> 1. Frontsheet AR Coated Heat Strengthened Glass manufactured by Flat (Vietnam) Co., Ltd. 2. Solar Cell TS-TM1016 manufactured by T.S Solar Energy Co.,Ltd. 3. Encapsulate F406PS manufactured by HANGZHOU FIRST APPLIED MATERIAL CO., LTD 4. Encapsulate EP304 manufactured by HANGZHOU FIRST APPLIED MATERIAL CO., LTD 5. Backsheet Heat Strengthened Glass with white grid manufactured by Flat (Vietnam) Co., Ltd. 6. Frame 6005-T6 manufactured by Changzhou Kaihong Aluminum Industrial Co., Ltd or YIYIN ENERGY VIETNAM CO.,LTD 7. Adhesive of frame HT906Z manufactured by Shanghai Huitian New Material Co Ltd 8. Adhesive (between junction box and backsheet) HT906Z manufactured by Shanghai Huitian New Material Co Ltd 9. Junction Box JM07w-ABCDE series manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd 10. Cable PV Wire manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd 11. Connectors PV-JM601A manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd 12. Potting Material 5299W-S manufactured by Shanghai Huitian New Material Co Ltd 13. Bypass Diode RT4550 manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd. 14. String Connector 4mm wide by 0.3m thick and 7mm wide by 0.3m thick manufactured by TaiCang JuRen PV Material Co., Ltd. 15. Cell Connector Φ0.26mm manufactured by Taicang Juren International Trade Co., ltd 16. Label AVERY PET manufactured by Jiangsu OPT Barcode Label Co., Ltd 17. Fixing Tape F1510 manufactured by Suzhou temosun PV Material Co., Ltd. 18. Flux SF105 manufactured by Singapore Asahi Chemical & Solder Industries Pte Ltd <p>Power ranges were verified on model GSD7S78T-610WT to GSD7S78T-640WT.</p>			
Test Description	[CSA C22.2#61730-2:2019 Ed.2] Clause	[UL 61730-2:2017 Ed.1+R:30Apr2020] Clause	[UL 61215-2:2017 Ed.1] Clause
Visual inspection	10.2	10.2	4.1
Performance at STC and NMOT (only STC condition)	10.3	10.3	4.6
Maximum power determination	10.4	10.4	4.2
Durability of markings	10.6	10.6	-
Sharp edge test	10.7	10.7	-
Bypass diode functionality test	10.8	10.8	4.18.2
Accessibility test	10.9	10.9	-
Continuity test of equipotential bonding	10.11	10.11	-
Impulse voltage test	10.12	10.12	-
Insulation test	10.13	10.13	4.3
Wet leakage current test	10.14	10.14	4.15
Temperature test	10.15	10.15	-
Hot-spot endurance test	10.16	10.16	4.9
Bypass diode thermal test	10.19	10.19	4.18.1
Reverse current overload test	10.20	10.20	-
Module breakage test	10.21	10.21	-
Static mechanical load test (front 5400Pa, rear 2400Pa)	10.23	10.23	4.16
Materials creep test	10.26	10.26	-
Robustness of terminations test (only retention of junction box, 156N)	10.27	10.27	4.14
Thermal cycling test	10.28	10.28	4.11
Humidity freeze test	10.29	10.29	4.12
Damp heat test	10.30	10.30	4.13

8.0 Test Summary			
UV test		10.31	4.10
Cold conditioning		10.32	-
Dry heat conditioning		10.33	-
Measurement of temperature coefficients		-	4.4
Performance at low irradiance		-	4.7
Outdoor exposure test		-	4.8
Hail test		-	4.17
Stabilization		-	4.19
The following tests were performed on GSD7S78T-620BT to verified the Backsheet Heat Strengthened Glass with black color grid manufactured by Flat (Vietnam) Co., Ltd. Power ranges were verified on model GSD7S78T-610BT to GSD7S78T-640BT.			
Test Description	[CSA C22.2#61730-2:2019 Ed.2] Clause	[UL 61730-2:2017 Ed.1+R:30Apr2020] Clause	[UL 61215-2:2017 Ed.1] Clause
Visual inspection	10.2	10.2	4.1
Maximum power determination	10.4	10.4	4.2
Durability of markings	10.6	10.6	-
Sharp edge test	10.7	10.7	-
Bypass diode functionality test	10.8	10.8	4.18.2
Temperature test	10.15	10.15	-

Evaluation Period	June 05, 2023 to June 13, 2023		Project No.	2307A0920HAN
Sample Rec. Date	31-Mar-2023	Condition	Prototype	Sample ID. 0230331-50
Test Location	Plant 5, No. 6958 Daye Road, Fengxian District, Shanghai, China			
Test Procedure	Testing Lab			
Determination of the result includes consideration of measurement uncertainty from the test equipment and methods. The product was tested as indicated below with results in conformance to the relevant test criteria.				
Tests were performed on GSD7S72T-565WT to verified the fire performance and Ignitability of components below:				
<ol style="list-style-type: none"> 1. Frontsheet AR Coated Heat Strengthened manufactured by Flat (Vietnam) Co., Ltd. 3. Encapsulate F406PS manufactured by First Material Science (Thailand) Co., Ltd. 4. Encapsulate EP304 manufactured by First Material Science (Thailand) Co., Ltd. 5. Backsheet Heat Strengthened Glass with white grid manufactured by Flat (Vietnam) Co., Ltd. 6. Adhesive (between junction box and backsheet) HT906Z manufactured by Shanghai Huitian New Material Co Ltd 				
Test Description	[CSA C22.2#61730-2:2019 Ed.2] Clause	[UL 61730-2:2017 Ed.1+R:30Apr2020] Clause	[UL 61215-2:2017 Ed.1] Clause	
Fire test (Type 29)	10.17	10.17	-	-
Ignitability Test	10.18	-	-	-
Evaluation Period	August 18, 2023 to October 13, 2023		Project No.	2309A0182SHA
Sample Rec. Date	14-Aug-2023	Condition	Prototype	Sample ID. 0230814-44
Test Location	Building No.2, No. 500 East Shuiyueting Road, Haining City, Zhejiang Province, China			
Test Procedure	Testing Lab			
Determination of the result includes consideration of measurement uncertainty from the test equipment and methods. The product was tested as indicated below with results in conformance to the relevant test criteria.				
Tests were performed on GSD8J66M-660WT to verified components below:				
<ol style="list-style-type: none"> 1. Added Solar cell 'TS-PM1212' manufactured by T.S Solar Energy Co.,Ltd. 2. Added Manufacturer 'YIYIN ENERGY THAILAND CO.,LTD.' 3. Added 35mm thickness frame cross section, refer to ILL2A 				
Power ranges were verified on model 'GSD8J66M650WT' and 'GSD8J66M675WT'.				

8.0 Test Summary			
Test Description	[CSA C22.2#61730-2:2019 Ed.2] Clause	[UL 61730-2:2017 Ed.1+R:30Apr2020] Clause	[UL 61215-2:2017 Ed.1] Clause
Visual inspection	10.2	10.2	4.1
Performance at STC	10.3	10.3	4.6
Maximum power determination	10.4	10.4	4.2
Durability of markings	10.6	10.6	-
Sharp edge test	10.7	10.7	-
Bypass diode functionality test	10.8	10.8	4.18.2
Accessibility test	10.9	10.9	-
Continuity test of equipotential bonding	10.11	10.11	-
Insulation test	10.13	10.13	4.3
Wet leakage current test	10.14	10.14	4.15
Temperature test	10.15	10.15	-
Hot-spot endurance test	10.16	10.16	4.9
Bypass diode thermal test	10.19	10.19	4.18.1
Reverse current overload test	10.20	10.20	-
Static mechanical load test (front 5400Pa, rear 2400Pa)	10.23	10.23	4.16
Thermal cycling test	10.28	10.28	4.11
Damp heat test	10.30	10.30	4.13
Stabilization	-	-	4.19
Tests were performed on GSD7G78M-590WT to verified components below: 1. Added Solar cell 'TS-PM1010' manufactured by T.S Solar Energy Co.,Ltd. Power ranges were verified on model 'GSD7G78M-575WT' and 'GSD7G78M-610WT'.			
Test Description	[CSA C22.2#61730-2:2019 Ed.2] Clause	[UL 61730-2:2017 Ed.1+R:30Apr2020] Clause	[UL 61215-2:2017 Ed.1] Clause
Visual inspection	10.2	10.2	4.1
Performance at STC	10.3	10.3	4.6
Maximum power determination	10.4	10.4	4.2
Durability of markings	10.6	10.6	-
Sharp edge test	10.7	10.7	-
Bypass diode functionality test	10.8	10.8	4.18.2
Accessibility test	10.9	10.9	-
Continuity test of equipotential bonding	10.11	10.11	-
Insulation test	10.13	10.13	4.3
Wet leakage current test	10.14	10.14	4.15
Temperature test	10.15	10.15	-
Hot-spot endurance test	10.16	10.16	4.9
Reverse current overload test	10.20	10.20	-
Thermal cycling test	10.28	10.28	4.11
Stabilization	-	-	4.19
Evaluation Period	October 16, 2023 to December 15, 2023		Project No. 2401B0238SHA
Sample Rec. Date	13-Oct-2023	Condition Prototype	Sample ID. A231013-38
Test Location	Building No.2, No. 500 East Shuiyueting Road, Haining City, Zhejiang Province, China		
Test Procedure	Testing Lab		
Determination of the result includes consideration of measurement uncertainty from the test equipment and methods. The product was tested as indicated below with results in conformance to the relevant test criteria.			
The following tests were performed on Model GSD7S78T-625WT to update standard from [UL 61730-1:2017 Ed.1+R:30Apr2020], [UL 61730-2:2017 Ed.1+R:30Apr2020], [UL 61215-1:2017 Ed.1], [UL 61215-1-1:2017 Ed.1], [UL 61215-2:2017 Ed.1] to Photovoltaic [UL 61730-1:2022 Ed.2], [UL 61730-2:2022 Ed.2+R:25Apr2023], [CSA C22.2#61730-1:2019 Ed.2], [CSA C22.2#61730-2:2019 Ed.2], [UL 61215-1:2021 Ed.2], [UL 61215-1-1:2021 Ed.2] and [UL 61215-2:2021 Ed.2] for component below: 1. Frontsheet AR Coated Heat Strengthened Glass manufactured by Flat (Vietnam) Co., Ltd. 2. Solar Cell TS-TM1016 manufactured by T.S Solar Energy Co.,Ltd.			

8.0 Test Summary

3. Encapsulate F406PS manufactured by HANGZHOU FIRST APPLIED MATERIAL CO., LTD
 4. Encapsulate EP304 manufactured by HANGZHOU FIRST APPLIED MATERIAL CO., LTD
 5. Backsheet Heat Strengthened Glass with white grid manufactured by Flat (Vietnam) Co., Ltd.
 6. Frame 6005-T6 manufactured by Changzhou Kaihong Aluminum Industrial Co., Ltd or YIYIN ENERGY VIETNAM CO.,LTD
 7. Adhesive of frame HT906Z manufactured by Shanghai Huitian New Material Co Ltd
 8. Adhesive (between junction box and backsheet) HT906Z manufactured by Shanghai Huitian New Material Co Ltd
 9. Junction Box JM07w-ABCDE series manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd
 10. Cable PV Wire manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd
 11. Connectors PV-JM601A manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd
 12. Potting Material 5299W-S manufactured by Shanghai Huitian New Material Co Ltd
 13. Bypass Diode RT4550 manufactured by Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd.
 14. String Connector 4mm wide by 0.3m thick and 7mm wide by 0.3m thick manufactured by TaiCang JuRen PV Material Co., Ltd.
 15. Cell Connector Φ0.26mm manufactured by Taicang Juren International Trade Co., ltd
 16. Label AVERY PET manufactured by Jiangsu OPT Barcode Label Co., Ltd
 17. Fixing Tape F1510 manufactured by Suzhou temosun PV Material Co., Ltd.
 18. Flux SF105 manufactured by Singapore Asahi Chemical & Solder Industries Pte Ltd
- Power ranges were verified on model GSD7S78T-610WT to GSD7S78T-640WT.



Test Description	[CSA C22.2#61730-2:2019 Ed.2] Clause	[UL 61730-2:2017 Ed.2+R:25Apr2023] Clause	[UL 61215-2:2021 Ed.2] Clause
Visual inspection	10.2	10.2	4.1
Performance at STC	10.3	10.3	4.6
Maximum power determination	10.4	10.4	4.2
Durability of markings	10.6	10.6	-
Sharp edge test	10.7	10.7	-
Bypass diode functionality test	10.8	10.8	4.18.2
Insulation test	10.13	10.13	4.3
Wet leakage current test	10.14	10.14	4.15
Hot-spot endurance test	10.16	10.16	4.9
Bypass diode thermal test	10.19	10.19	4.18.1
Robustness of terminations test	10.27	10.27	4.14
Thermal cycling test	10.28	10.28	4.11
Humidity freeze test	10.29	10.29	4.12
UV test	10.31	10.31	4.10
Performance at low irradiance	-	-	4.7
Stabilization	-	-	4.19
Cyclic (dynamic) mechanical load test	-	-	4.20
Potential induced degradation test	-	-	4.21

Additional tests were performed on model GSD8J66M-660WT to update standard from [UL 61730-1:2017 Ed.1+R:30Apr2020], [UL 61730-2:2017 Ed.1+R:30Apr2020], [UL 61215-1:2017 Ed.1], [UL 61215-1-1:2017 Ed.1], [UL 61215-2:2017 Ed.1] to Photovoltaic [UL 61730-1:2022 Ed.2], [UL 61730-2:2022 Ed.2+R:25Apr2023], [CSA C22.2#61730-1:2019 Ed.2], [CSA C22.2#61730-2:2019 Ed.2], [UL 61215-1:2021 Ed.2], [UL 61215-1-1:2021 Ed.2] and [UL 61215-2:2021 Ed.2] for component below:

1. Added Solar cell 'TS-PM1212' manufactured by T.S Solar Energy Co.,Ltd. Same manufactured different size Cell 'TS-PM1010' was covered by cell 'TS-PM1212'
2. Added 35mm thickness frame cross section, refer to ILL2A

Power ranges were verified on model 'GSD8J66M650WT' and 'GSD8J66M675WT'.
Power ranges were verified on model 'GSD7G78M-575WT' and 'GSD7G78M-610WT'.

8.0 Test Summary			
Test Description	[CSA C22.2#61730-2:2019 Ed.2] Clause	[UL 61730-2:2017 Ed.2+R:25Apr2023] Clause	[UL 61215-2:2021 Ed.2] Clause
Visual inspection	10.2	10.2	4.1
Performance at STC	10.3	10.3	4.6
Maximum power determination	10.4	10.4	4.2
Durability of markings	10.6	10.6	-
Sharp edge test	10.7	10.7	-
Bypass diode functionality test	10.8	10.8	4.18.2
Continuity test of equipotential bonding	10.11	10.11	-
Insulation test	10.13	10.13	4.3
Wet leakage current test	10.14	10.14	4.15
Hot-spot endurance test	10.16	10.16	4.9
Bypass diode thermal test	10.19	10.19	4.18.1
Robustness of terminations test	10.27	10.27	4.14
Thermal cycling test	10.28	10.28	4.11
Humidity freeze test	10.29	10.29	4.12
Stabilization	-	-	4.19
Cyclic (dynamic) mechanical load test	-	-	4.20
Potential induced degradation test	-	-	4.21

8.1 Signatures			
A representative sample of the product covered by this report has been evaluated and found to comply with the applicable requirements of the standards indicated in Section 1.0.			
Completed by:	Sherwin Zhu	Reviewed by:	Ken Gu
Title:	Engineer	Title:	Reviewer
Signature:		Signature:	

9.0 Correlation Page For Multiple Listings	
The following products, which are identical to those identified in this report except for model number and Listee name, are authorized to bear the ETL label under provisions of the Intertek Multiple Listing Program.	
BASIC LISTEE	G-Star Pte Ltd
Address	6 RAFFLES QUAY, # 14-06 SINGAPORE (048580)
Country	SINGAPORE
Product	Crystalline Silicon Photovoltaic Module

MULTIPLE LISTEE 1	Bluesun Solar Co., Ltd.
Address	1499 Zhenxing Road, Shushan District, Hefei City, Anhui Province, 230071
Country	China
Brand Name	BLUESUN

ASSOCIATED MANUFACTURER	All manufacturers shown in Section 1.0
Address	
Country	

MULTIPLE LISTEE 1 MODELS	BASIC LISTEE MODELS
BSM followed by 610, 615, 620, 625, 630, 635 or 640; followed by M10-78HNNH.	GSD7S followed by 78T-; followed by 610, 615, 620, 625, 630, 635 or 640; followed by WT or BT.
BSM followed by 565, 570, 575, 580, 585 or 590; followed by M10-72HNNH.	GSD7S followed by 72T-; followed by 565, 570, 575, 580, 585 or 590; followed by WT or BT.
BSM followed by 515, 520, 525, 530, 535 or 540; followed by M10-66HNNH.	GSD7S followed by 66T-; followed by 515, 520, 525, 530, 535 or 540; followed by WT or BT.
BSM followed by 470, 475, 480, 485 or 490; followed by M10-60HNNH.	GSD7S followed by 60T-; followed by 470, 475, 480, 485 or 490; followed by WT or BT.
BSM followed by 420, 425, 430, 435 or 440; followed by M10-54HNNH.	GSD7S followed by 54T-; followed by 420, 425, 430, 435 or 440; followed by WT or BT.
BSM followed by 650, 655, 660, 665, 670 or 675; followed by G12-66HBD.	GSD8J66M followed by 650, 655, 660, 665, 670 or 675; followed by WT or BT.
BSM followed by 590, 595, 600, 605 or 610; followed by G12-60HBD.	GSD8J60M followed by 590, 595, 600, 605 or 610; followed by WT or BT.
BSM followed by 575, 580, 585, 590, 595, 600, 605 or 610; followed by M10-78HBD.	GSD7G78M followed by 575, 580, 585, 590, 595, 600, 605 or 610; followed by WT or BT.
BSM followed by 530, 535, 540, 545, 550, 555 or 560; followed by M10-72HBD.	GSD7G72M followed by 530, 535, 540, 545, 550, 555 or 560; followed by WT or BT.
BSM followed by 485, 490, 495, 500, 505, 510 or 515; followed by M10-66HBD.	GSD7G66M followed by 485, 490, 495, 500, 505, 510 or 515; followed by WT or BT.
BSM followed by 440, 445, 450, 455, 460, 465 or 470; followed by M10-60HBD.	GSD7G60M followed by 440, 445, 450, 455, 460, 465 or 470; followed by WT or BT.
BSM followed by 395, 400, 405, 410, 415 or 420; followed by M10-54HBD.	GSD7G54M followed by 395, 400, 405, 410, 415 or 420; followed by WT or BT.

MULTIPLE LISTEE 2	None
Address	
Country	
Brand Name	

ASSOCIATED MANUFACTURER	
Address	
Country	

MULTIPLE LISTEE 2 MODELS	BASIC LISTEE MODELS

9.0 Correlation Page For Multiple Listings	
MULTIPLE LISTEE 3	None
Address	
Country	
Brand Name	
ASSOCIATED MANUFACTURER	
Address	
Country	
MULTIPLE LISTEE 3 MODELS	BASIC LISTEE MODELS

10.0 General Information

The Applicant and Manufacturer have agreed to produce, test and label ETL Listed products in accordance with the requirements of this Report. The Manufacturer has also agreed to notify Intertek and to request authorization prior to using alternate parts, components or materials.

COMPONENTS

Components used shall be those itemized in this Intertek report covering the product, including any amendments and/or

LISTING MARK

The ETL Listing mark applied to the products shall either be separable in form, such as labels purchased from Intertek, or on a product nameplate or other media only as specifically authorized by Intertek. Use of the mark is subject to the control of Intertek.

The mark must include the following four items:

- 1) applicable country identifiers "US" and/or "C" or "US", "C" and "EU"
- 2) the word "Listed" or "Classified" or "Recognized Component" (whichever is appropriate)
- 3) a control number issued by Intertek
- 4) a product descriptor that identifies the standards used for certification. Example:

For US standards, the words, "Conforms to" shall appear with the standard number along with the word, "Standard" or "Std." Example: "Conforms to ANSI/UL Std. XX."

For Canadian standards, the words "Certified to CAN/CSA Standard CXX No. XX." shall be used, or abbreviated, "Cert. to CAN/CSA Std. CXX No. XX."

Can be used together when both standards are used.

If all standards on the ATM have the same standard title, the shared title or its abbreviation may be used in place of the examples above. Example: "Medical Electrical Equipment" or "MEE"; "Information Technology Equipment" or "ITE"; "Audio/Video Information And Communication Technology Equipment" or "A/V ICTE".

Note: A facsimile must be submitted to Intertek, Attn: Follow-up Services for approval prior to use.

The facsimile need not have a control number. A control number will be issued **after signed Certification**

Agreements have been received by the Follow-up Services office, approval of the facsimile of your proposed Listing Mark, satisfactory completion of the Listing Report, and scheduling of a factory

MANUFACTURING AND PRODUCTION TESTS

Manufacturing and Production Tests shall be performed as required in this Report.

FOLLOW-UP SERVICE

Periodic unannounced audits of the manufacturing facility (and any locations authorized to apply the mark) shall be scheduled by Intertek. An audit report shall be issued after each visit. Special attention will be given to the following:

1. Conformance of the manufactured product to the descriptions in this Report.
2. Conformance of the use of the ETL mark with the requirements of this Report and the Certification Agreement.
3. Manufacturing changes.
4. Performance of specified Manufacturing and Production Tests.

In the event that the Intertek representative identifies non-conformance(s) to any provision of this Report, the Applicant shall take one or more of the following actions:

1. Correct the non-conformance.
2. Remove the ETL Mark from non-conforming product.
3. Contact the issuing product safety evaluation center for instructions.

10.1 Evaluation of Unlisted Components

Because Unlisted Components are uncontrolled, and they do not fall under a third party follow up program, Intertek may require these components to be tested and/or evaluated at least once annually, more often for certain components, as part of the independent certification process. The Unlisted Components in Section 5.0 require testing and/or evaluation as indicated.

The Applicant will be notified, in writing, via the applicable contact methods, as defined in Section 1.0, when these components must be selected and sent to Component Evaluation Center (CEC) for re-evaluation.

Due to particular testing requirements, some components may be requested to be shipped to specific labs. Thus, specific shipment destination(s) for each sample will be provided in the written notification.

Managing CEC Location:
Intertek Testing Services Shanghai Limited
ETL Component Evaluation Center
Building No. 86, 1198 Qinzhou Road (North)
Shanghai 200233, China
Attn: Ms. Emiliana Zhou

Sample Disposition: Due to the destructive nature of the testing, all samples will be discarded at the conclusion of testing unless, the manufacturer specifically requests the return of the samples. The request for return must accompany the initial component shipment.

11.0 Manufacturing and Production Tests

The manufacturer agrees to conduct the following Manufacturing and Production Tests as specified:

Required Tests

- Insulation Test
- Module Output Power Test
- Bypass Diode Functionality Test
- Continuity test of equipotential bonding Test
- Visual Inspection

11.1 Insulation Test

Method

Each module (100%) shall withstand for 1 second without electrical breakdown as a routine production line test, the application of a dc test potential of $1.2 \times (2 \times V_{SYS} + 1000V)$ where V_{SYS} is the maximum rated system voltage. The voltage shall be applied between the active circuit of the module and accessible metal parts. The test is to be conducted when the module is complete and ready for packing, or when it is complete except for covers or other parts that may interfere with the performance of the test.

Test Equipment

The test equipment is to include a means of indicating the test voltage that is being applied to the product under test and a means of effectively indicating unacceptable performance. A leakage current of greater than 50 μA represents a failure.

Products Requiring Insulation Test:

	<u>Test Voltage</u>	<u>Test Time</u>
All products covered by this Report with 1500V system voltage	4000V or 4800V	60 s 1 s

11.2 Module Output Power Test

Method

Check the results from I-V curve measurements to verify that the output power, current and voltage rating falls within the specification. All production values of I_{sc} and V_{oc} shall be covered by the tolerances of the product qualified under UL 61730. Possible stabilization effects shall be considered if changes of I_{sc} and V_{oc} are expected during operation in sunlight. This test will also verify that bypass diodes are not shorted.

Products Requiring Module Output Power Test:

All products covered by this report.

11.3 Bypass Diode Functionality Test

Method

Verification that bypass diodes are working properly shall be performed on all modules.

Three alternative test methods can be applied:

- a) Perform successive additional I-V measurements in conjunction with maximum power determination with one cell of each string in the interconnection circuit completely shaded. The bypass diode belonging to this string is working properly, if the characteristic bend in the I-V curve is observed.
- b) A conductivity test can be performed with the PV module terminals connected in reverse polarity to a current source. The current flow and voltage drop across the PV module terminals can be used as indicator that the diodes are working properly.
- c) The I-V characteristics of all diodes can be verified just before their assembly. If the bypass diodes are in the junction box this could be done through measurement at the corresponding terminals of the junction box. A precondition for the latter method is an appropriate plan to mitigate possible influence of electrostatic discharges on the diodes in production.

Products Requiring Bypass Diode Functionality Test:

All products covered by this report.

11.4 Continuity test of equipotential bonding Test

Method

PV modules provided with a connection for equipotential bonding are subjected to a continuity test for equipotential bonding (MST 13). At a sampling rate of 1 PV module per framing station per working shift demonstrate the electrical continuity between the grounding connection and all accessible conductive parts. Any appropriate indication device is able to be employed (current supply in conjunction with current and voltage measurement).

PV modules that have no frames or equipotential bonding locations identified shall be exempt from this requirement.

Products Requiring Continuity test of equipotential bonding Test:

1 PV module per framing station per working shift

11.5 Visual inspection

Method


Verify the clearance distances (distances of live parts to PV module edges) are within the product specification.

It is recommended to do this inspection before the framing process if applicable.

Products Requiring Visual inspection:

All products covered by this report.

12.0 Revision Summary						
The following changes are in compliance with the declaration of Section 8.1:						
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change		
16-Oct-2023	Sherwin Zhu/ Ken Gu	2	Brand Name	Added new brand name 'STDARD'		
2309A0182S HA			-	Added new models: GSD8J66M followed by 650, 655, 660, 665, 670 or 675; followed by WT or BT. GSD8J60M followed by 590, 595, 600, 605 or 610; followed by WT or BT. GSD7G78M followed by 575, 580, 585, 590, 595, 600, 605 or 610; followed by WT or BT. GSD7G72M followed by 530, 535, 540, 545, 550, 555 or 560; followed by WT or BT. GSD7G66M followed by 485, 490, 495, 500, 505, 510 or 515; followed by WT or BT. GSD7G60M followed by 440, 445, 450, 455, 460, 465 or 470; followed by WT or BT. GSD7G54M followed by 395, 400, 405, 410, 415 or 420; followed by WT or BT.		
			4	2	Added solar cell 'TS-PM1010' and 'TS-PM1212' manufactured by 'T.S Solar Energy Co.,Ltd.'	
			5	Added frame Manufacturer 'YIYIN ENERGY THAILAND CO.,LTD.'		
		7	1F, 1G	Added Drawings due to new models added		
			2A	Added Drawings of 35mm frame and corner key		
			4	Updated Controled combination of material solar cell and encapsulation due to new cell added		
		8	-	Added new evaluation period from August 18, 2023 to October 13, 2023		
			-	Revised with new signature.		
27-Oct-2023	Sherwin Zhu/ Ken Gu	9	1	Added Multiple Listee 1: Bluesun Solar Co., Ltd. Brand name: BLUESUN Models: BSM followed by 610, 615, 620, 625, 630, 635 or 640; followed by M10-78HNN. BSM followed by 565, 570, 575, 580, 585 or 590; followed by M10-72HNN. BSM followed by 515, 520, 525, 530, 535 or 540; followed by M10-66HNN. BSM followed by 470, 475, 480, 485 or 490; followed by M10-60HNN. BSM followed by 420, 425, 430, 435 or 440; followed by M10-54HNN. BSM followed by 650, 655, 660, 665, 670 or 675; followed by G12-66HBD. BSM followed by 590, 595, 600, 605 or 610; followed by G12-60HBD. BSM followed by 575, 580, 585, 590, 595, 600, 605 or 610; followed by M10-78HBD. BSM followed by 530, 535, 540, 545, 550, 555 or 560; followed by M10-72HBD. BSM followed by 485, 490, 495, 500, 505, 510 or 515; followed by M10-66HBD. BSM followed by 440, 445, 450, 455, 460, 465 or 470; followed by M10-60HBD. BSM followed by 395, 400, 405, 410, 415 or 420; followed by M10-54HBD.		
231000466S HA						

12.0 Revision Summary				
The following changes are in compliance with the declaration of Section 8.1:				
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change
8-Jan-2024	Sherwin Zhu/ Ken Gu			Updated standard from: Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [UL 61730-1:2017 Ed.1+R:30Apr2020] Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [UL 61730-2:2017 Ed.1+R:30Apr2020] Terrestrial Photovoltaic (Pv) Modules - Design Qualification And Type Approval - Part 1: Test Requirements [UL 61215-1:2017 Ed.1] Terrestrial Photovoltaic (PV) Modules - Design Qualification And Type Approval - Part 1-1: Special Requirements For Testing of Crystalline Silicon Photovoltaic (PV) Modules [UL 61215-1-1:2017 Ed.1] Terrestrial Photovoltaic (Pv) Modules - Design Qualification And Type Approval - Part 2: Test Procedures [UL 61215-2:2017 Ed.1] to: Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [UL 61730-1:2022 Ed.2] Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [UL 61730-2:2022 Ed.2+R:25Apr2023] Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1: Test Requirements [UL 61215-1:2021 Ed.2] Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-1: Special Requirements for Testing of Crystalline Silicon Photovoltaic (PV) Modules [UL 61215-1-1:2021 Ed.2] Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 2: Test Procedures [UL 61215-2:2021 Ed.2]
2401B0238S HA	<i>Sherwin Zhu</i> 			
		1	-	
		2	-	Ratings updated due to standard updated Other Ratings updated due to standard updated
		7	7-7I	Ratings more than 3 pages were moved here
		8	-	Added new evaluation period from October 16, 2023 to December 15, 2023
			-	Revised with new signature.