

Description

The HT647PL(B) is a discrete LDMOS Power Amplifier with 200W saturated output power covering frequency range from 1.8 - 600 MHz.

Features

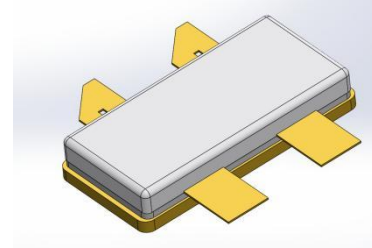
- Operating Frequency Range: 1.8 - 600 MHz
- Operating Drain Voltage: 20-28V
- Saturation Output Power: 200W
- Device can be used on a single-ended or in a push-pull configuration.
- Excellent thermal stability due to low thermal resistance package
- Enhanced robustness design without device degradation

Applications

- Industrial, scientific, medical (ISM)
 - Laser generation
 - Plasma generation
 - Particle accelerators
 - MRI, RF ablation and skin treatment
 - Industrial heating, welding and drying systems

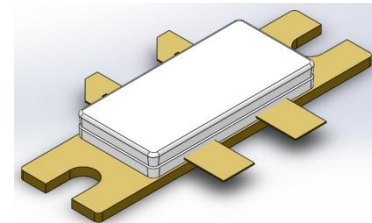
Ordering Information

Part Number	Description
HT647PL(B)	Tray Package
HT647PL(B)EVB	400 - 500 MHz EVB
HT647PL(B)EVB1	100 - 512 MHz EVB



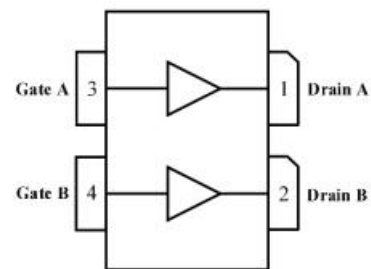
ACC2110S-4L

Earless Flanged balanced
Air Cavity Ceramic Package; 4 Leads
HT647PL



ACC2110B-4L

Flanged balanced
Air Cavity Ceramic Package; 4 Leads,
2 Mounting holes
HT647PLB



(Top View)

Note: Exposed backside of the package is the source terminal for the transistor

Pin Connections

Typical Performance

RF Characteristics (CW)

Freq (MHz)	P1dB (dBm)	Eff (%)@P1dB	Gain (dB)	P3dB (dBm)	Eff(%)@P3dB
400	53.5	73.4	24.6	54.1	77.2
450	53.0	67.9	23.3	53.6	69.8
500	52.7	65.7	24.5	53.4	68.6

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ = 600mA test on WATECH Application Board

RF Characteristics (CW)

Freq (MHz)	P1dB (dBm)	Eff (%)@P1dB	Gain (dB)	P3dB (dBm)	Eff(%)@P3dB
100	51.6	70.6	26.7	52.6	80.2
200	51.9	65.3	24.2	52.6	69.7
300	51.7	67.3	23.4	52.4	71.4
400	51.1	67.8	23.5	51.7	71.0
512	49.5	65.3	25.4	50.0	65.8

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ = 1000mA test on WATECH Application Board

Absolute Maximum Ratings

Parameter	Range/Value	Unit
Drain voltage (V _{DSS})	-0.5 to +65	V
Gate voltage (V _{GS})	-5 to +10	V
Storage Temperature (T _{STG})	-55 to +150	°C
Junction Temperature (T _J)	-40 to +225	°C

Electrical Specification

DC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Breakdown Voltage $V_{(BR)DSS}$	$V_{gs}=0V, I_{ds}=108\mu A$	65	-	-	V
Gate-Source Threshold Voltage $V_{GS(th)}$	$V_{ds}=V_{gs}, I_{ds}=108\mu A$	-	1.5	-	V
Drain Leakage Current I_{DSS}	$V_{gs}=0V, V_{ds}=65V$	-	-	10	μA
Gate Leakage Current I_{GSS}	$V_{gs}=5V, V_{ds}=0V$	-	-	1	μA

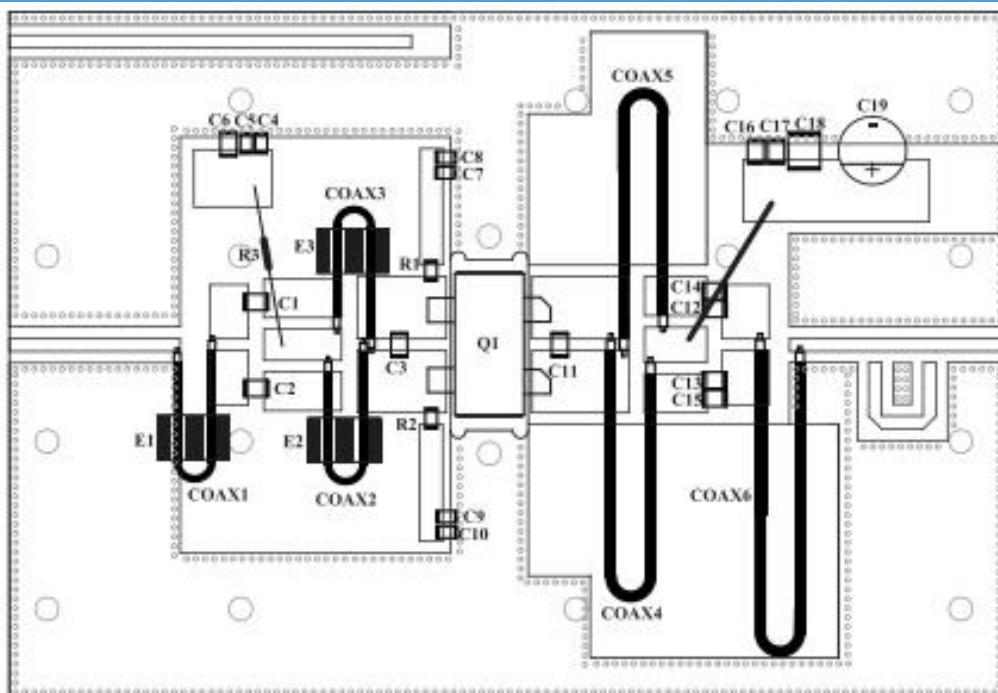
Load Mismatch Test

Condition	Test Result
VSWR=10:1 at all Phase Angles, VDD = +28Vdc, IDQ= 600mA, PAVG = 53 dBm (200W) signal @400 MHz,PW=200us,DC=20%	No Device Degradation

Thermal Information

Parameter	Condition	Value (Typ)	Unit
Thermal Resistance Junction to Case (R_{TH})	$T_{CASE}= 80^{\circ}C, VDD = +28Vdc, IDQ= 600mA, PAVG = 53 dBm (200W), CW signal$	0.4	$^{\circ}C / W$

HT647PL(B) 400 - 500 MHz Reference Design



EVB Layout



HT647PL(B)

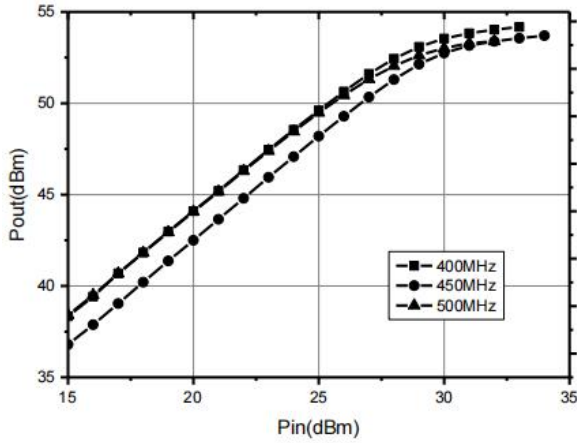
200W, 1.8 - 600 MHz LDMOS Amplifier

Product datasheet

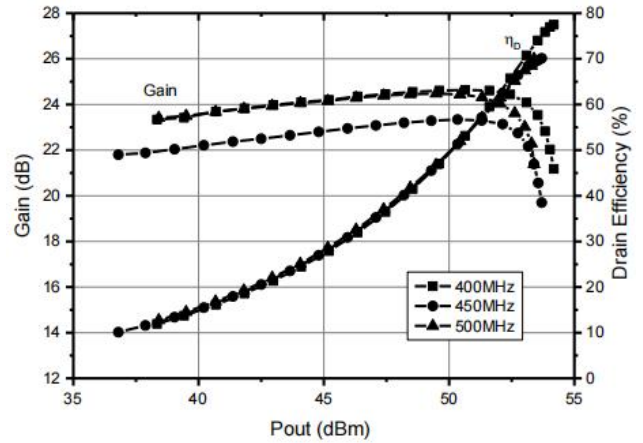
Bill of Materials (BoM) - HT647PL(B) 400 - 500 MHz Reference Design

Reference	Value	Description	Manufacturer	P/N
Q1	-	200W, 1.8 - 600 MHz LDMOS PA	Watech	HT647PL(B)
C1, C2, C3	56pF	MLCC	ATC	ATC100B560JT500XT
C4, C7, C9	100pF	MLCC	Murata	GRM1885C1H101JA01D
C5, C8, C10	10nF	MLCC	Murata	GR321AD72E103KW01D
C6	10uF	MLCC	Murata	GRJ32ER71H106KE11L
C11	12pF	MLCC	ATC	ATC100B120JT500XT
C12, C13, C14, C15, C16	100pF	MLCC	ATC	ATC100B101JT500XT
C17	1000pF	MLCC	ATC	ATC100B102JT500XT
C18	10uF	MLCC	AVX	22201C106MAT2A
C19	470uF	Electrolytic Capacitor	Vishay	MAL203859471E3
R1, R2	50Ω	Thick Film Resistor	YAGEO	RC0805FR-0751RL
R3	1KΩ	Thick Film Resistor Wire Resistors	Vishay	CMF501K0000FHEB
E1, E2, E3	#61 Multi Aperture Core	Ferrite Toroids / Ferrite Rings	Fair-Rite	2861002402
Coax 1	-	16.7Ω SR Coax, 40 mm 2:1	-	-
Coax 2,3	-	16.7Ω SR Coax, 40 mm 4:1	-	-
Coax 4,5	-	16.7Ω SR Coax, 80 mm 4:1	-	-
Coax 6	-	50Ω SR Coax, 146 mm 2:1	-	-
PCB	Taconic RF 35 (er = 3.5), 30 mil (0.762 mm), 35 μm (1oz)			

Performance Plots



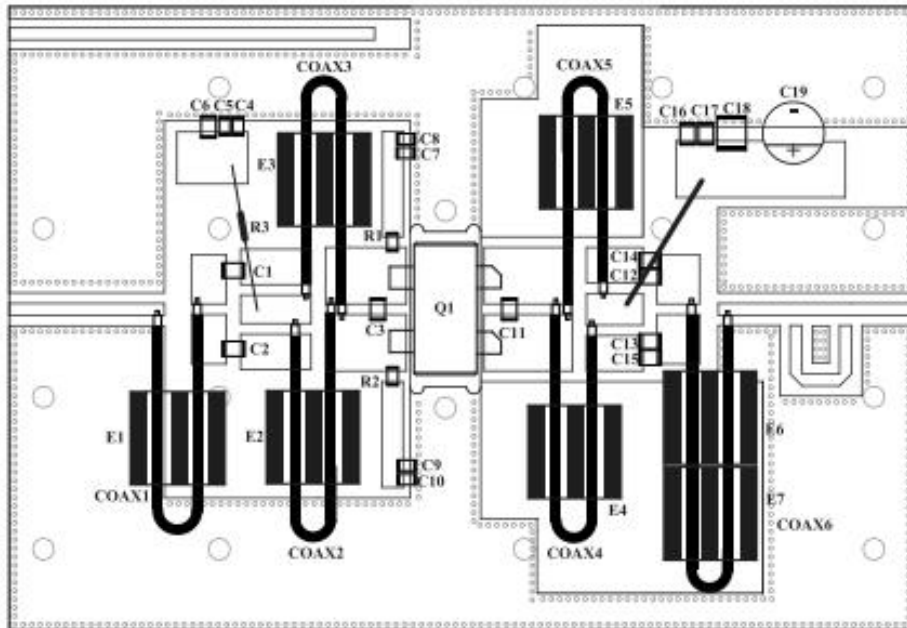
CW, Pout vs Pin



CW, Gain and Efficiency vs Pout

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 600mA test on WATECH Application Board

HT647PL(B) 100 - 512 MHz Reference Design



EVB Layout

Bill of Materials (BoM) - HT647PL(B) 100 - 512 MHz Reference Design

Reference	Value	Description	Manufacturer	P/N
Q1	-	200W, 1.8 - 600 MHz, LDMOS PA	Watech	HT647PL(B)
C1, C2, C3	56pF	MLCC	ATC	ATC100B560JT500XT



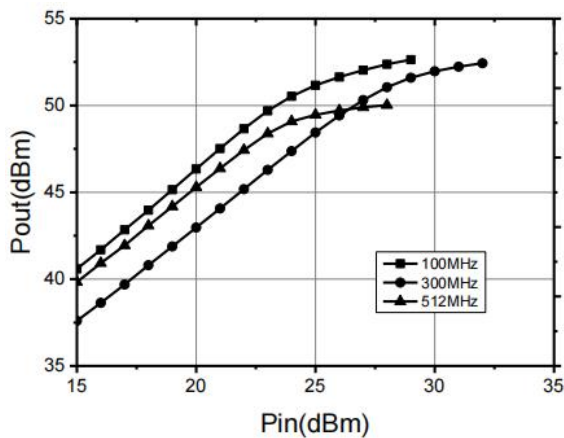
HT647PL(B)

200W, 1.8 - 600 MHz LDMOS Amplifier

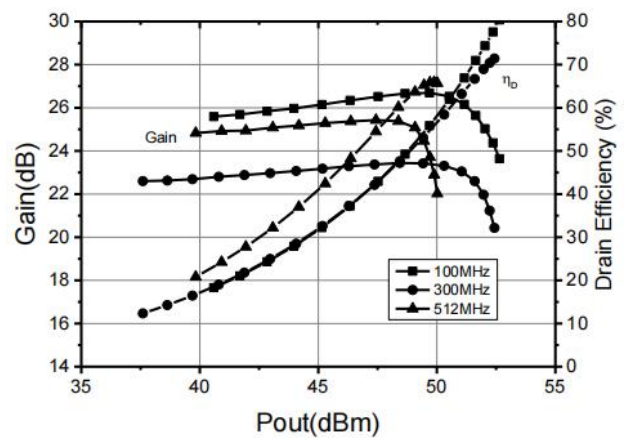
Product datasheet

C4, C7, C9	100pF	MLCC	Murata	GRM1885C1H101JA01D
C5, C8, C10	10nF	MLCC	Murata	GR321AD72E103KW01D
C6	10uF	MLCC	Murata	GRJ32ER71H106KE11L
C11	3pF	MLCC	ATC	ATC100B120JT500XT
C12, C13, C16	100pF	MLCC	ATC	ATC100B101JT500XT
C14, C15, C17	1000pF	MLCC	ATC	ATC100B102JT500XT
C18	10uF	MLCC	AVX	22201C106MAT2A
C19	470uF	Electrolytic Capacitor	Vishay	MAL203859471E3
R1, R2	50Ω	Thick Film Resistor	YAGEO	RC0805FR-0751RL
R3	1KΩ	Thick Film Resistor Wire Resistors	Vishay	CMF501K0000FHEB
E2, E3	#43 Multi Aperture Core	Ferrite Toroids / Ferrite Rings	Fair-Rite	2843000302
E1, E4, E5, E6, E7	#61 Multi Aperture Core	Ferrite Toroids / Ferrite Rings	Fair-Rite	2861000202
Coax 1,6	-	50Ω SR Coax, 120 mm 2:1	-	-
Coax 2,3,4,5,	-	25Ω SR Coax, 120 mm 4:1	-	-
PCB	Taconic RF 35 (er = 3.5), 30 mil (0.762 mm), 35 μm (1oz)			

Performance Plots



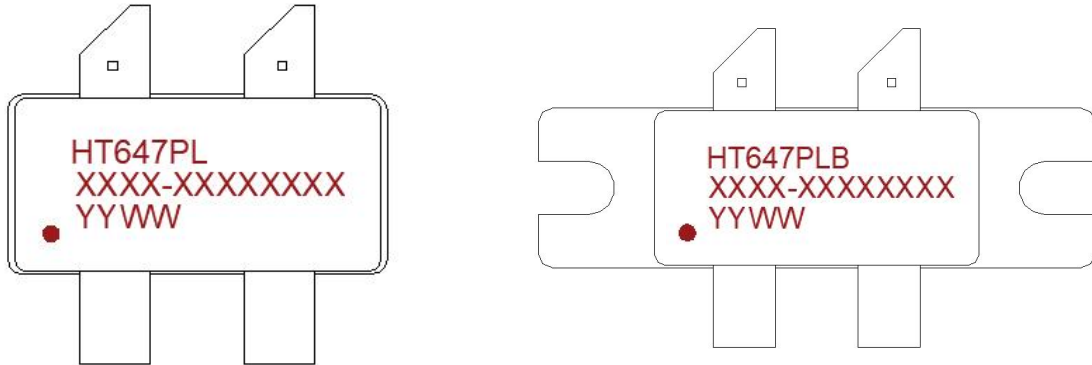
CW, Pout vs Pin



CW, Gain and Efficiency vs Pout

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 1000mA test on WATECH Application Board

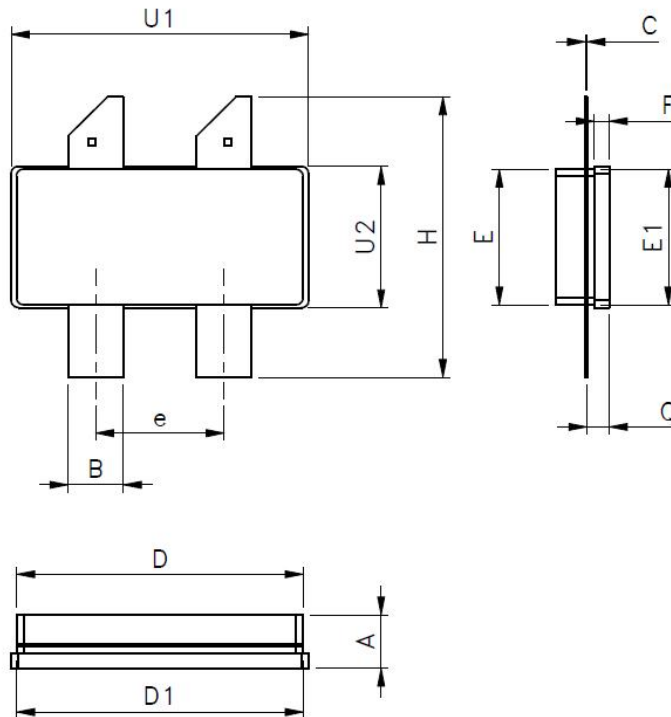
Package Marking and Dimensions



- Line1 (fixed): Device name in W/O
- Line2 (unfixed): Marking Lot No in W/O (Sample: E596-EERA0001)
- Line3 (unfixed): Date Code

This Marking SPEC only stipulates the content of Marking. For marking requirements such as font and size, please refer to the latest version of “Watech Product Printing Specification”

Marking

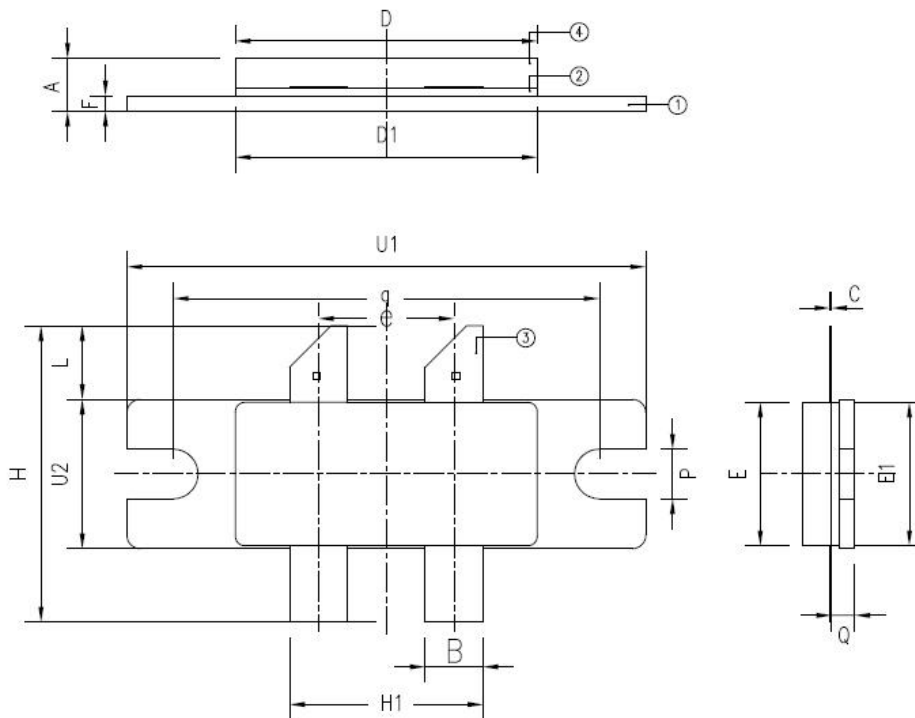


Symbol	Dimesions in Millimeters			Dimesions in Inches		
	Min.	Mon.	Max.	Min.	Mon.	Max.
A	3.12	3.69	4.26	0.123	0.145	0.168

B	3.69	3.81	3.93	0.145	0.150	0.155
C	-	0.11	-	-	0.004	-
D	19.61	19.81	20.01	0.772	0.780	0.788
D1	19.66	19.81	19.96	0.774	0.780	0.786
E	9.273	9.4	9.527	0.365	0.370	0.375
E1	9.28	9.4	9.52	0.365	0.370	0.375
F	0.95	1.02	1.09	0.037	0.040	0.043
H	19.38	19.43	19.48	0.763	0.765	0.767
Q	1.46	1.53	1.6	0.057	0.060	0.063
U1	20.51	20.58	20.65	0.807	0.810	0.813
U2	9.71	9.78	9.85	0.382	0.385	0.388
e	8.77	8.89	9.01	0.345	0.350	0.355

Package Dimensions

ACC2110S-4L Earless Flanged Ceramic Package; 4 leads

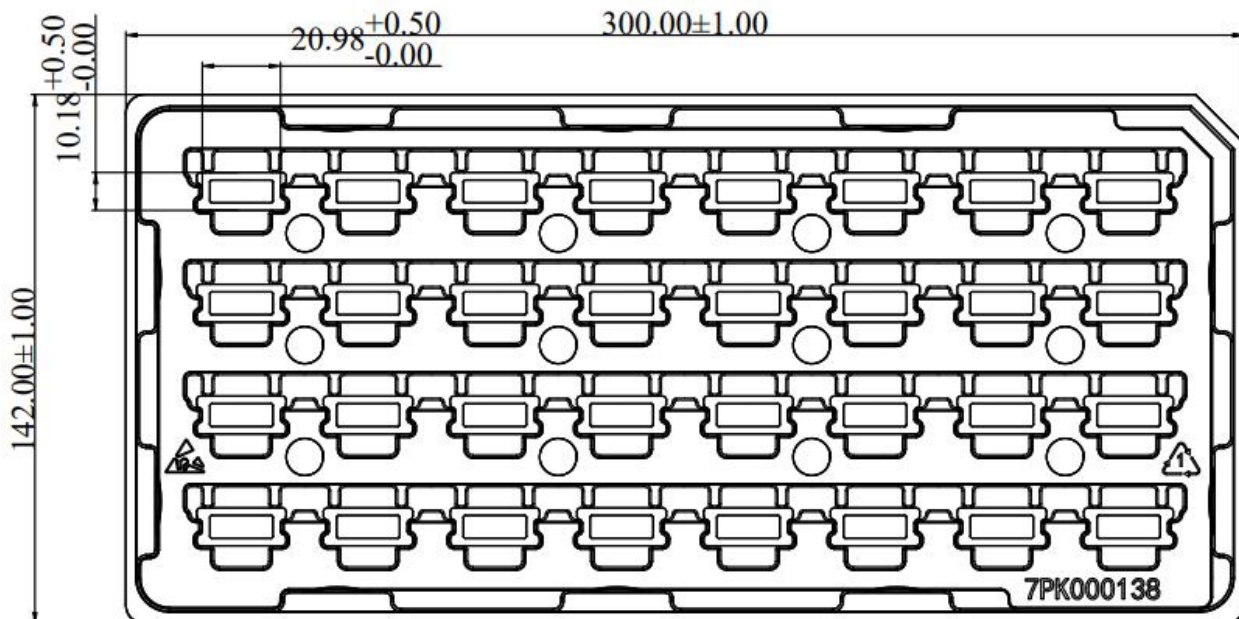


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Mon.	Max.	Min.	Mon.	Max.
A	3.55	3.71	3.86	0.140	0.146	0.152
B	3.68	3.81	3.94	0.145	0.150	0.155
C	0.04	0.11	0.18	0.002	0.004	0.007
D	19.61	19.81	20.01	0.772	0.780	0.788
D1	19.61	19.81	20.01	0.772	0.780	0.788

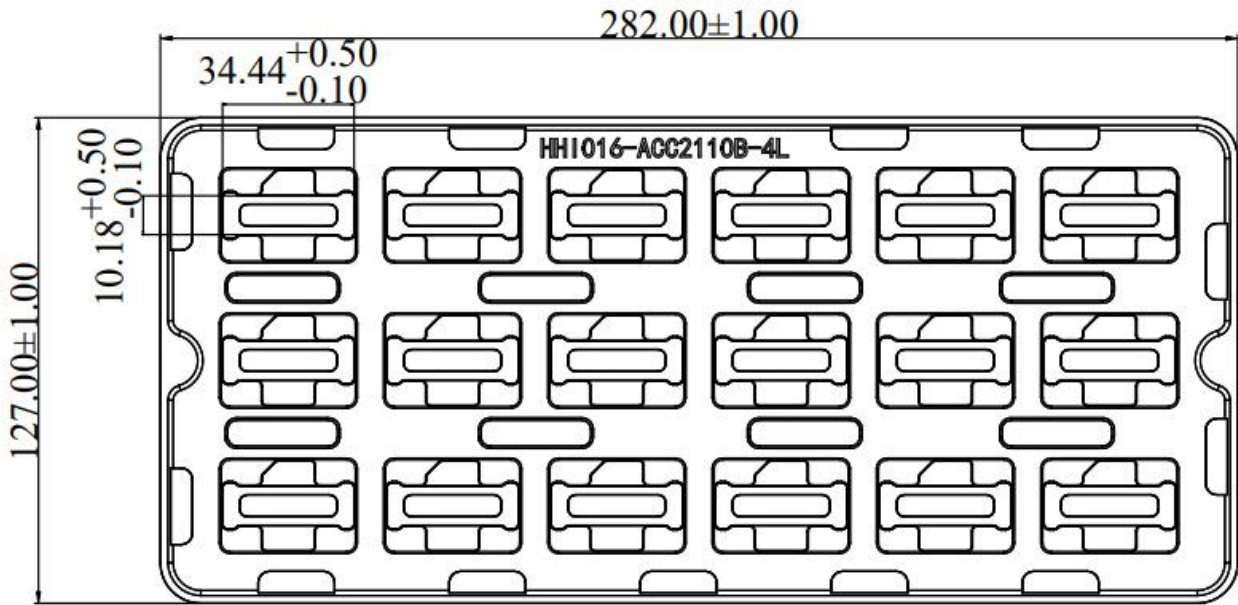
E	9.28	9.40	9.52	0.365	0.370	0.375
E1	9.28	9.40	9.52	0.365	0.370	0.375
F	0.95	1.02	1.09	0.037	0.040	0.043
H	18.93	19.43	19.93	0.745	0.765	0.785
H1	12.57	12.70	12.83	0.495	0.500	0.505
L	4.71	4.83	4.95	0.185	0.190	0.195
P	3.12	3.25	3.38	0.123	0.128	0.133
Q	1.43	1.53	1.63	0.056	0.060	0.064
q	-	27.94	-	-	1.10	-
U1	33.91	34.04	34.16	1.335	1.340	1.345
U2	9.71	9.78	9.85	0.382	0.385	0.388
e	-	8.89	-	-	0.35	-

Package Dimensions
ACC2110B-4L Flanged Ceramic Package; 2 mounting holes; 4 leads
Packing Information
HT647PL:

Package Type	Qty/Tray(pcs)	Qty/Box(pcs)	Qty/Carton(pcs)
ACC2110S-4L	32	160	960


Tray Packaging Descriptions
HT647PLB:

Package Type	Qty/Tray(pcs)	Qty/Box(pcs)	Qty/Carton(pcs)
ACC2110B-4L	18	90	540



Tray Packaging Descriptions

Handling Precautions

Parameter	Grade
Moisture Sensitivity Level MSL	3

Parameter	Rating	Standard	
ESD – Human Body Model (HBM)	Class 1B	JESD22-A114	
ESD – Human Body Model (MM)	Class A	EIA/JESD22-A115	
ESD – Charged Device Model (CDM)	Class III	JESD22-C101	

RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

Datasheet Status

Document status	Product status	Definition
Objective Datasheet	Design simulation	Product objective specification
Preliminary Datasheet	Customer sample	Engineering samples and first test results
Product Datasheet	Mass production	Final product specification

Abbreviations

Acronym	Definition
LDMOS	Laterally-Diffused Metal-Oxide Semiconductor
CW	Continuous Waveform

Revision history

Document ID	Datasheet Status	Release Date	Revision Version
Rev 2.4	Product	Mar. 2023	New format based on English version datasheet
Rev 2.5	Product	Sept. 2023	Update TBD information
Rev 2.6	Product	Dece. 2023	Update Frequency information
Rev 2.7	Product	Mar. 2024	Version released after re review
Rev 2.8	Product	Aug. 2024	Update package information

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations and information about WATECH:

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- Email: MKT@huatai-elec.com

For technical questions and application information:

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