

Description

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

Features

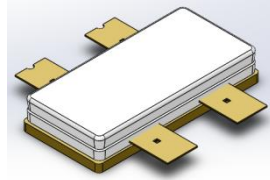
- Operating Frequency Range: 1.8 - 600 MHz
- Operating Drain Voltage: 20-28V
- Saturation Output Power: 200W
- Device can be used on a single-ended or in a push-pull configuration.
- Excellent thermal stability due to low thermal resistance package
- Enhanced robustness design without device degradation

Applications


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

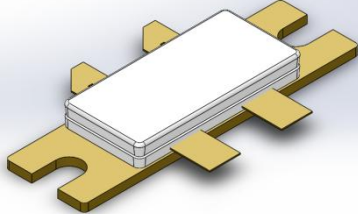
Ordering Information

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




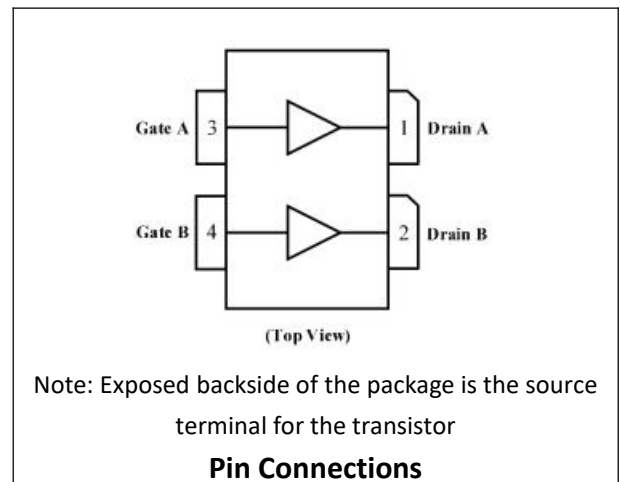
ACC2110S-4L
Earless Flanged balanced
Air Cavity Ceramic Package; 4 Leads
HT647PL





ACC2110B-4L
Flanged balanced
Air Cavity Ceramic Package; 4 Leads,
2 Mounting holes
HT647PLB





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

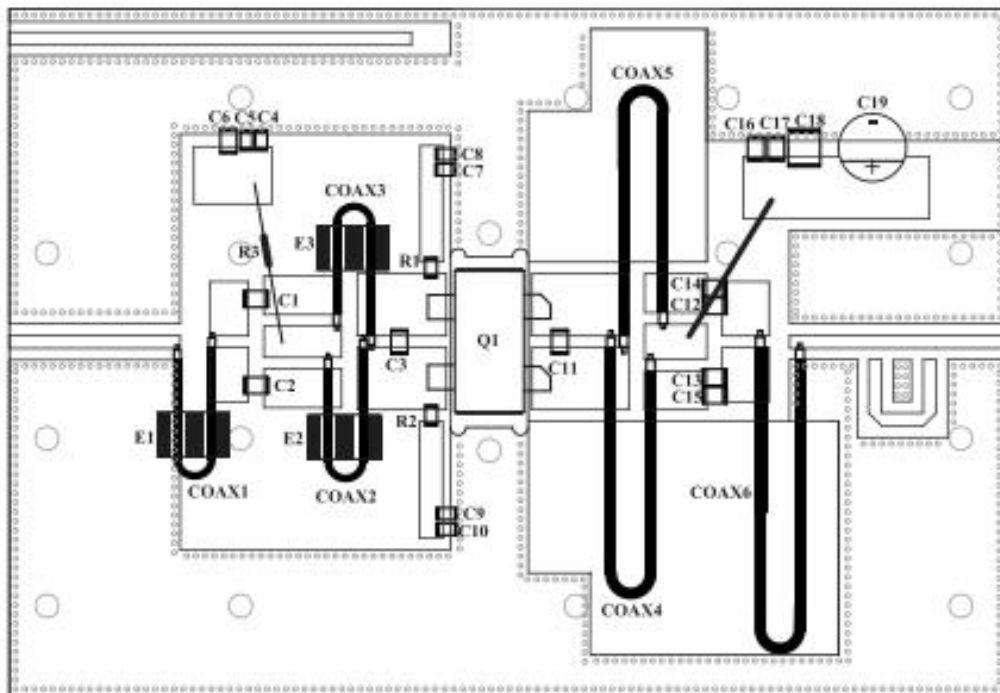
Load Mismatch Test

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

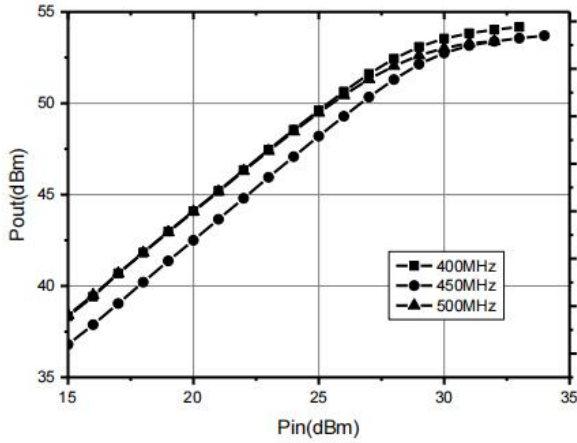


EVB Layout

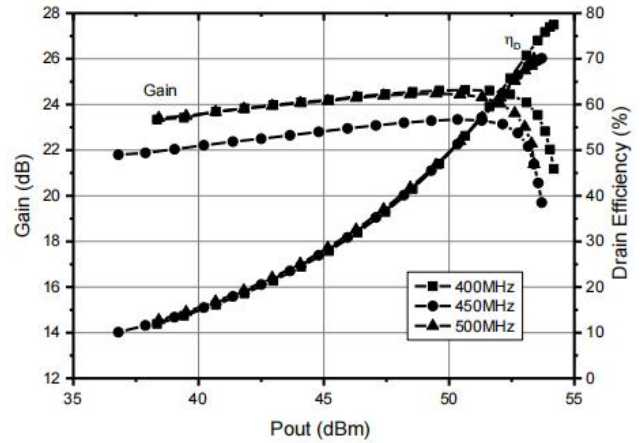
Bill of Materials (BoM) - HT647PL(B) 400 - 500 MHz Reference Design

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



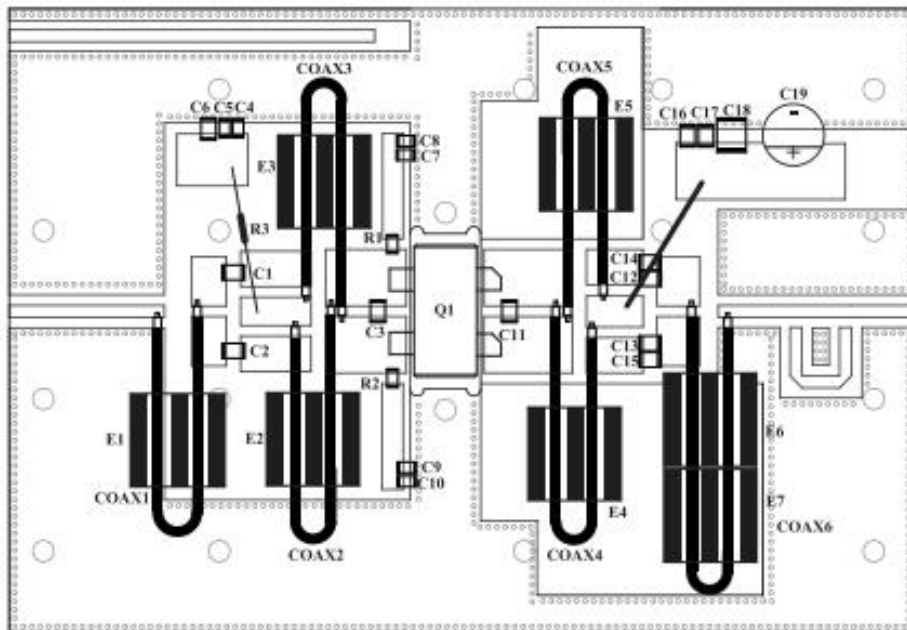
CW, Pout vs Pin



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



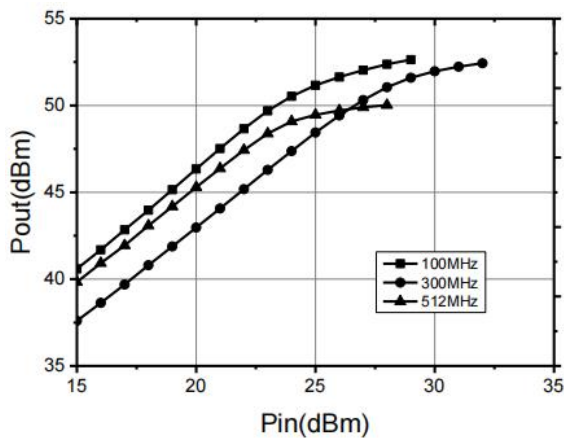
EVB Layout

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

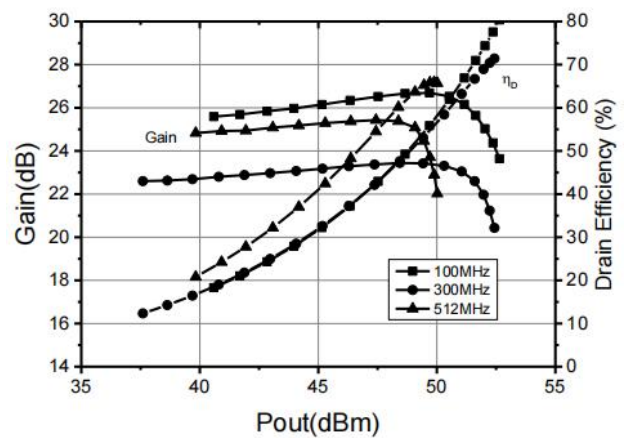
Reference	Value	Description	Manufacturer	P/N
Q1	-	200W, 1.8 - 600 MHz, LDMOS PA	Watech	HT647PL(B)
C1, C2, C3	56pF	MLCC	ATC	ATC100B560JT500XT

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



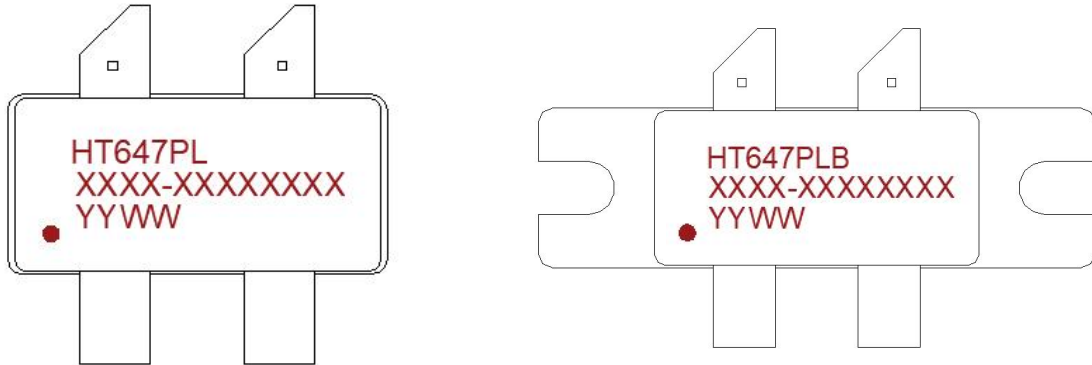
CW, Pout vs Pin



CW, Gain and Efficiency vs Pout

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

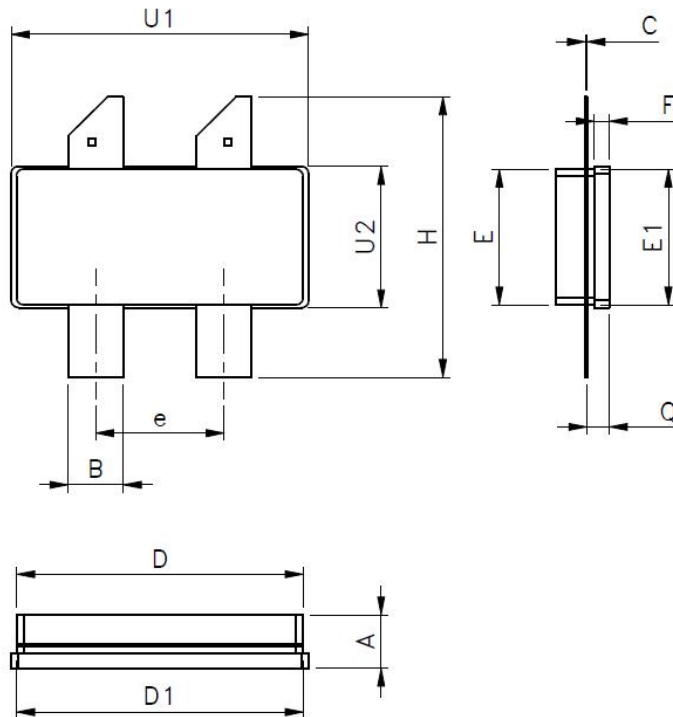
Package Marking and Dimensions



- 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

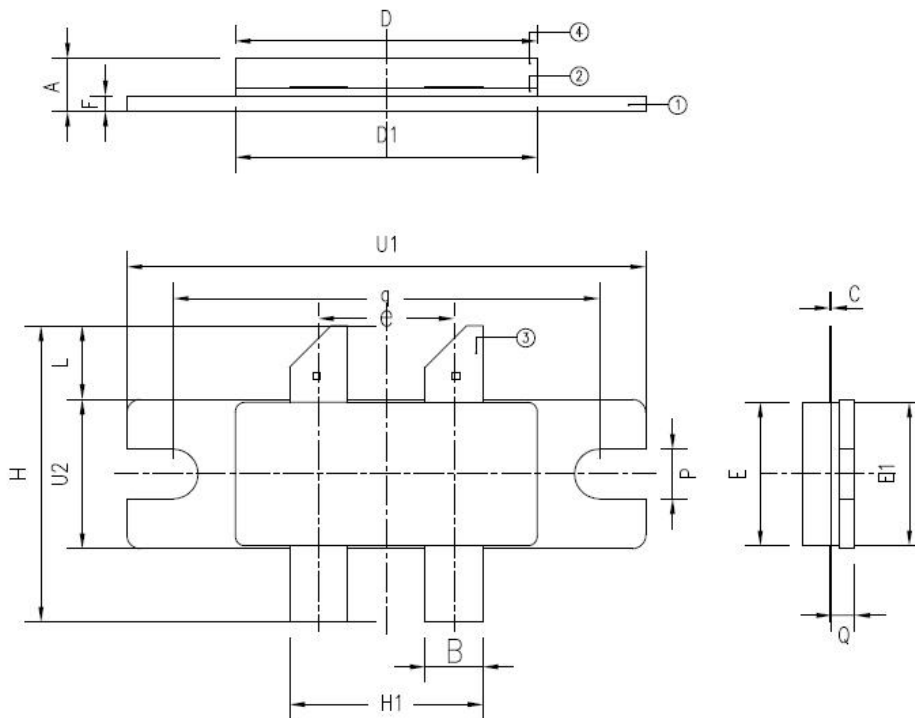


Symbol	Dimesions in Millimeters			Dimesions in Inches		
	Min.	Mon.	Max.	Min.	Mon.	Max.
A	3.12	3.69	4.26	0.123	0.145	0.168

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

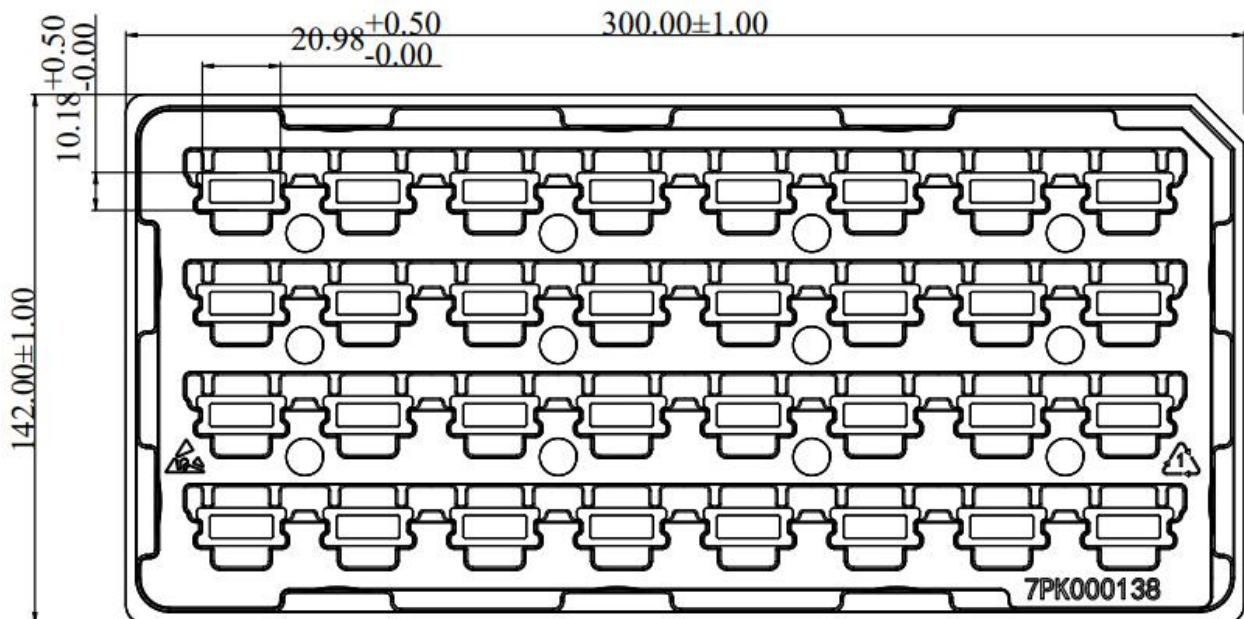


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Mon.	Max.	Min.	Mon.	Max.
A	3.55	3.71	3.86	0.140	0.146	0.152
B	3.68	3.81	3.94	0.145	0.150	0.155
C	0.04	0.11	0.18	0.002	0.004	0.007
D	19.61	19.81	20.01	0.772	0.780	0.788
D1	19.61	19.81	20.01	0.772	0.780	0.788

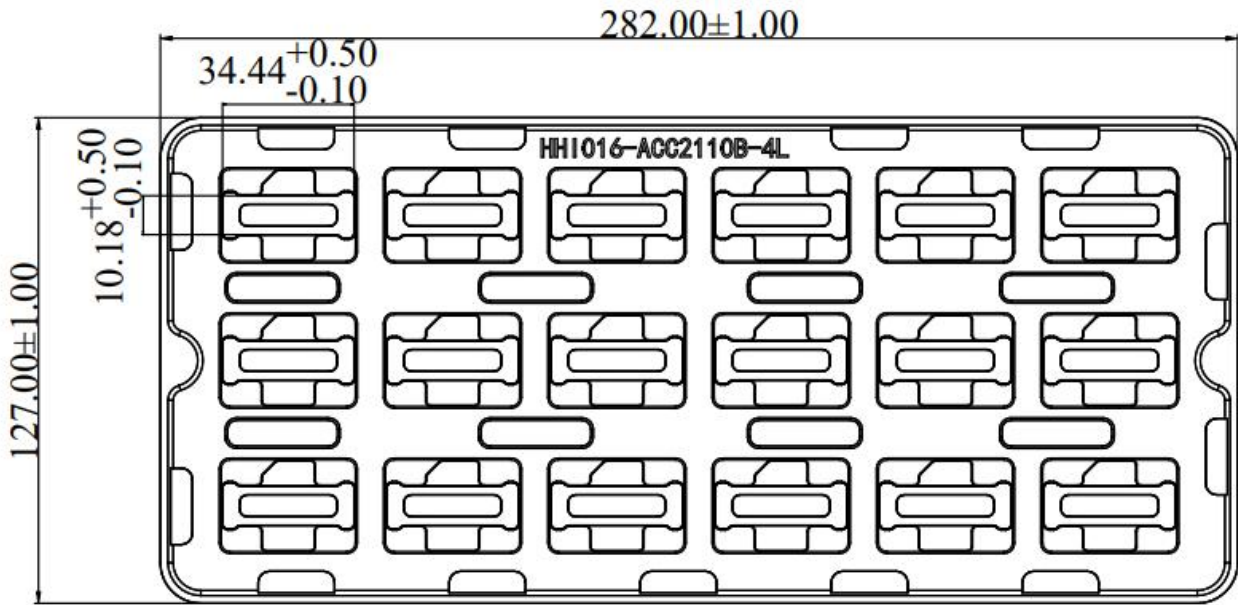
E	9.28	9.40	9.52	0.365	0.370	0.375
E1	9.28	9.40	9.52	0.365	0.370	0.375
F	0.95	1.02	1.09	0.037	0.040	0.043
H	18.93	19.43	19.93	0.745	0.765	0.785
H1	12.57	12.70	12.83	0.495	0.500	0.505
L	4.71	4.83	4.95	0.185	0.190	0.195
P	3.12	3.25	3.38	0.123	0.128	0.133
Q	1.43	1.53	1.63	0.056	0.060	0.064
q	-	27.94	-	-	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

Contact Information

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

- Web: www.watechelectronics.com
- Email: MKT@huatai-elec.com

For technical questions and application information:

- Email: MKT@huatai-elec.com

Important Notice

Information in this document is believed to be accurate and reliable. However, WATECH does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

“Typical” parameters are the average values expected by WATECH in large quantities and are provided for information purposes only. All information and specifications contained herein are subject to change without notice and customers should obtain and verify the latest relevant information before placing orders for WATECH products.

The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information.

Applications that are described herein for any of these products are for illustrative purposes only. WATECH makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using WATECH products, and WATECH accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the WATECH product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third-party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

WATECH products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a WATECH product can reasonably be expected to result in personal injury, death or severe property or environmental damage. This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.