HTH1D27P800H

800W, 2500 - 2700 MHz GaN Amplifier

Product datasheet

Description

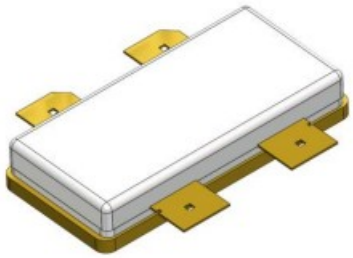
The HTH1D27P800H is a discrete GaN Power Amplifier designed for cellular base station applications with 800W saturated output power covering frequency range from 2500 - 2700 MHz.

Features

- Operating Frequency Range: 2500 - 2700 MHz
- Operating Drain Voltage: +52V
- Saturation Output Power: 800W
- Power Average: 114W
- Asymmetrical Doherty Final Stage
- Excellent thermal stability due to low thermal resistance package
- Enhanced robustness design without device degradation

Applications

- 5G NR
- 4G-LTE
- Amplifier for Macro Base Stations
- Repeaters/DAS
- Mobile Infrastructure

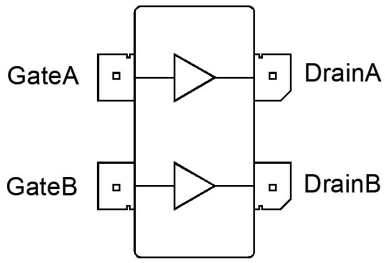


ACC2110S-4L RoHS compliant

Earless Flanged

Air Cavity Spliced Package; 4 Leads

HTH1D27P800H



(Top View)

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

Pin Connections

Ordering Information

Part Number	Description
HTH1D27P800H	Reel
HTH1D27P800H EVB	2515-2675MHz

Typical Performance

RF Characteristics (Pulsed CW)

Freq (MHz)	P5dB (dBm)	Gain (dB)	Eff (%) @P5dB	Eff (%) @50.5dBm
2515	59.1	16.0	61.3	49.5
2595	59.2	16.6	64.2	50.2
2675	59.0	16.8	67.3	50.9

Test conditions unless otherwise noted: 25 °C, VDD = +52Vdc, IDQ_Carrier = 200mA, Vgsp = -5.7V, PW = 100us, DC= 10% test on WATECH Application Board

RF Characteristics (WCDMA)

Freq (MHz)	Gain (dB)	Eff (%)	ACPR* @5MHz (dBc)	ACPR* @10MHz (dBc)
2515	15.1	51.8	-27.1	-44.8
2595	15.7	51.0	-28.5	-46.8
2675	15.7	51.1	-29.6	-47.4

Test conditions unless otherwise noted: 25 °C, VDD = +52Vdc, IDQ_Carrier = 200mA, Vgsp = -5.7V,
P_{AVG} = 50.5dBm 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on WATECH Application Board
**Uncorrected DPD*

Absolute Maximum Ratings

Parameter	Range/Value	Units
Drain voltage (VDSS)	0 to +150	V
Gate voltage (VGS)	-10 to +2	V
Storage Temperature (TSTG)	-60 to +150	℃
Case Temperature (TC)	-40 to +130	℃
Junction Temperature (TJ)	+275	℃

Electrical Specification

DC Characteristics (Carrier)

Parameter	Conditions	Min	Typ	Max	Units
Breakdown voltage V(BR)DSS	VGS=-8V; IDS=39.9mA	150	-	-	Vdc
Gate-Source threshold Voltage VGS(th)	VDS=10V; IDS=39.9mA	-3.5	-2.9	-2.3	Vdc
Drain leakage Current IDSS	VDS=50V; VGS=-10V	-	-	5	mAdc
Gate leakage Current IGSS	VDS=0V; VGS=-10V	-	-	2000	uAdc

DC Characteristics (Peaking)

Parameter	Conditions	Min	Typ	Max	Units
Breakdown voltage V(BR)DSS	VGS=-8V; IDS=58.8mA	150	-	-	Vdc
Gate-Source threshold Voltage VGS(th)	VDS=10V; IDS=58.8mA	-3.5	-2.9	-2.3	Vdc
Drain leakage Current IDSS	VDS=50V; VGS=-8V	-	-	6	mAdc
Gate leakage Current IGSS	VDS=0V; VGS=-10V	-	-	2000	uAdc

RF Characteristics (Pulsed CW)

Parameter	Conditions	Min	Typ	Max	Units
Frequency Range		2.515	-	2.675	GHz
Gain	Pout=50.5dBm	14	16	-	dB
IRL	Pout=50.5dBm	8	-	-	dB
P5dB	Pulse CW	57.9	58.9	-	dBm

Test conditions unless otherwise noted: 25 °C, VDD = +52Vdc, IDQ_Carrier = 160mA, Vgsp = Vgsp(300mA) - 2.6V, PW = 100us, DC= 10%, test on WATECH FT Board

RF Characteristics (WCDMA)

Parameter	Conditions	Min	Typ	Max	Units
Frequency Range	Pout=50.5dBm	2.515	-	2.675	GHz
Gain	Pout=50.5dBm	14	15.5	-	dB
Eff	Pout=50.5dBm	45.5	50.5	-	%
IRL	Pout=50.5dBm	8	-	-	dB
ACLR@5MHz	Pout=50.5dBm	-	-27	-23	dBc

Test conditions unless otherwise noted: 25 °C, VDD = +52Vdc, IDQ_Carrier = 160mA, Vgsp = Vgsp(300mA) - 2.6V, P_{AVG} = 50.5dBm, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF, test on WATECH FT Board

Load Mismatch Test

Condition	Test Result
VSWR=10:1, at all phase angles, VDD = +52Vdc, IDQ_Carrier = 300mA, Vgsp = -5.9V, pulse Signal, Pout = 59 dBm, Frequency=2595MHz, test on WATECH Application Board	Pass

Thermal Information

Parameter	Condition	Value (Typ)	Units
Thermal resistance from active die surface to case by Infrared measurement $Rth_{(S-C)(IR)}$	Active die surface to Case(Rth) , T-Case=80 °C, VDS=52V , IDQ=250mA , Vpeak=-5.5V , Pdis=114W	0.58	K/W
Thermal resistance from active die channel to case by Finite Element Analysis $Rth_{(ch-c))(FEA)}$	T-Case=80 °C, Pdis=114W	0.75	K/W

Load Pull Performance Carrier

Test conditions unless otherwise noted: 25 °C, VDD = +48Vdc, IDQ = 200mA, PW = 40us, DC = 4%

Max Output Power (Carrier)						
Freq (MHz)	**Z_source (Ω)**	**Z_load** [1] **(Ω)**	**Gain (dB)**	**P3dB (dBm)**	**P3dB (W)**	**Eff (%)**
2500	4.3-j15.0	6.0-j0.6	18.9	56.3	426.6	69.1
2600	6.1-j16.3	5.7+j0.2	19.2	56.1	407.4	68.1
2700	11.0-j15.7	3.8-j0.5	19.0	56.0	398.1	65.0

[1] Load impedance for optimum P3dB pout

Max Drain Efficiency (Carrier)						
Freq (MHz)	**Z_source (Ω)**	**Z_load** [2] **(Ω)**	**Gain (dB)**	**P3dB (dBm)**	**P3dB (W)**	**Eff (%)**
2500	4.3-j15.0	6.0-j4.4	19.9	55.2	331.1	77.5
2600	6.1-j16.3	7.8-j3.9	20.4	55.0	316.2	77.5
2700	11.0-j15.7	8.2-j3.1	20.6	54.5	281.8	77.0

[2] Load impedance for optimum P3dB efficiency

Load Pull Performance Peaking

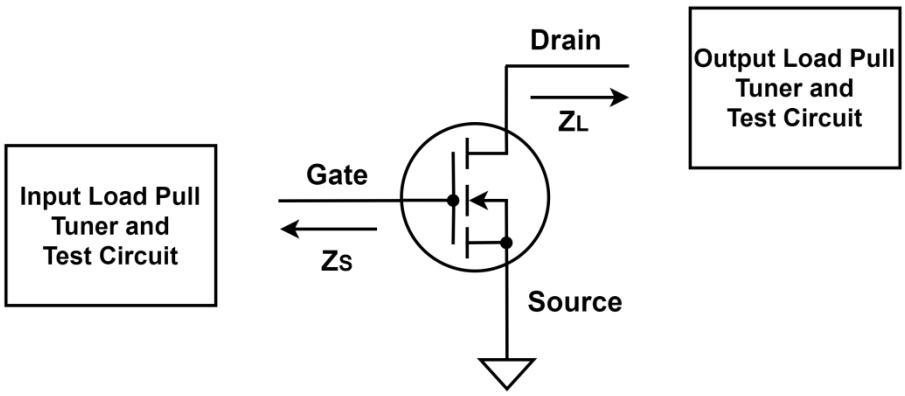
Test conditions unless otherwise noted: 25 °C, VDD = +48Vdc, IDQ= 300mA, PW = 40us, DC = 4%

Max Output Power (Peaking)						
Freq (MHz)	Z_source (Ω)	Z_load [1] (Ω)	Gain (dB)	P3dB (dBm)	P3dB (W)	Eff (%)
2500	5.0-j16.7	6.8-j8.4	16.6	57.6	575.4	64.8
2600	6.8-j19.3	7.1-j9.4	16.6	57.6	575.4	62.2
2700	14.7-j21.8	8.2-j8.8	17.0	57.7	588.8	61.5

[1] Load impedance for optimum P3dB pout

Max Drain Efficiency (Peaking)						
Freq (MHz)	Z_source (Ω)	Z_load [2] (Ω)	Gain (dB)	P3dB (dBm)	P3dB (W)	Eff (%)
2500	5.0-j16.7	4.0-j6.8	18.3	56.4	436.5	71.9
2600	6.8-j19.3	4.4-j7.8	18.3	56.8	478.6	71.5
2700	14.7-j21.8	6.0-j8.8	17.8	56.4	436.5	70.6

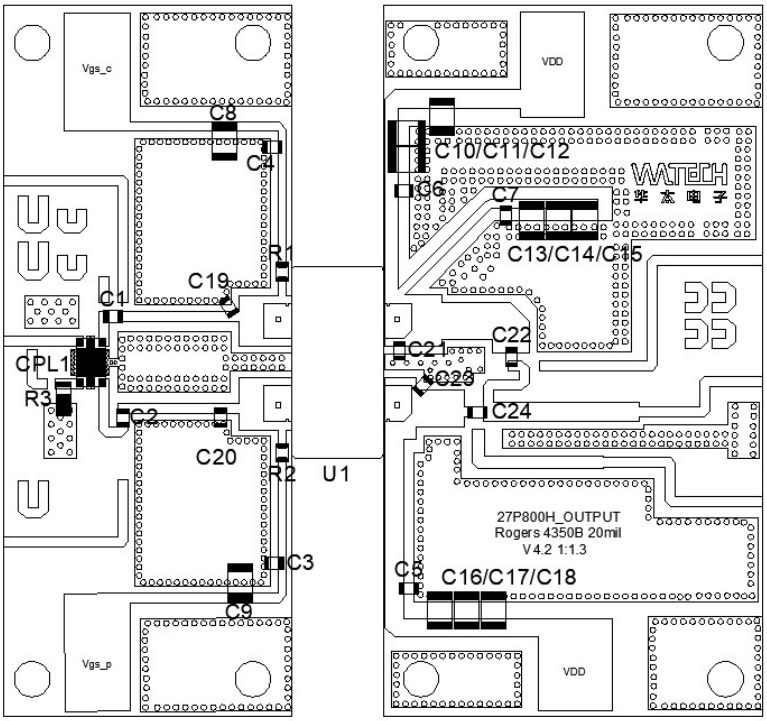
[2] Load impedance for optimum P3dB efficiency



Z_source : Measured impedance presented to the input of the device at the package reference plane

Z_load : Measured impedance presented to the output of the device at the package reference plane

HTH1D27P800H 2515- 2675 MHz Reference Design



Rogers 4350B, thickness=20mil

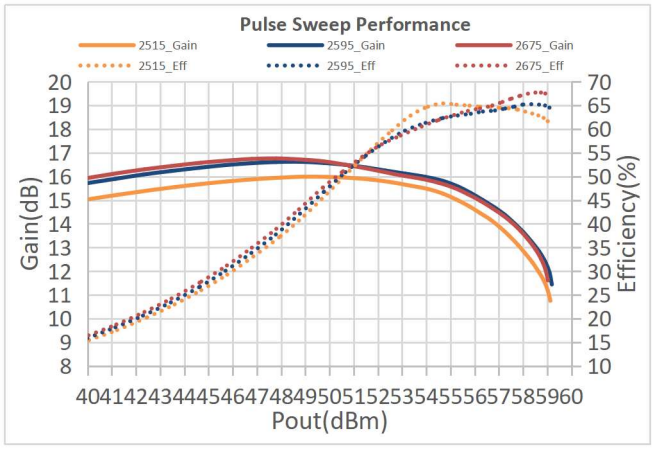
PCB is soldered on a 54 mm by 64 mm copper base plate with 10 mm thickness

EVB Layout

BOM-HTH1D27P800H 2515- 2675 MHz Reference Design

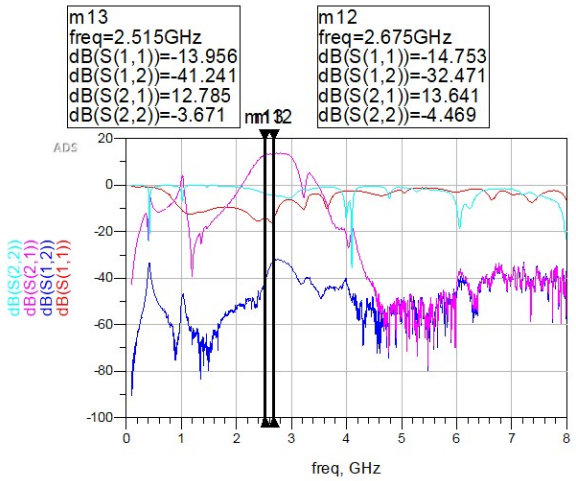
Component	Type	Value	Description	Manufacturer	P/N
U1	Transistor	/	GaN transistor	WATECH	HTH1D27P800H
C1-C7	Capacitor	10pF	0805 MLCC	Murata	GQM2195C2E10RBB12D
C8-C18	Capacitor	10uF	0805 MLCC	Murata	GRM21BC72A106KE01L
C19	Capacitor	1.3pF	0805 MLCC	Murata	GQM2195C2E1R3BB12D
C20	Capacitor	1.1pF	0805 MLCC	Murata	GQM2195C2E1R1BB12D
C21	Capacitor	1.5pF	0805 MLCC	Murata	GQM2195C2E1R5BB12D
C22	Capacitor	6.8pF	0805 MLCC	Murata	GQM2195C2E6R8BB12D
C23	Capacitor	1.3pF	0805 MLCC	Murata	GQM2195C2E1R3BB12D
C24	Capacitor	12pF	0805 MLCC	Murata	GQM2195C2E12RBB12D
R1,R2	Resistor	10Ω	0805 Resistor	YAGEO	RC0805JR-100RL
R3	Resistor	50Ω	16 Watts, 50Ω	Anaren	C16A50Z4
CPL1	Coupler	3dB	Hybrid Coupler	Anaren	X3C25F1-03S

Performance Plots



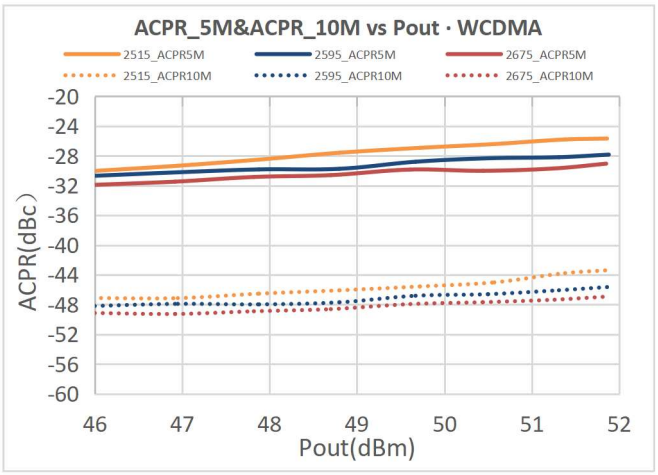
Pulsed-CW performance(Gain+Eff)

Test conditions, unless otherwise noted: 25°C, VDD = 52V, IDQ = 200mA, Vgsp = -5.7V, Pulse Width = 100us, Duty Cycle = 10%, test on WATECH EVB.

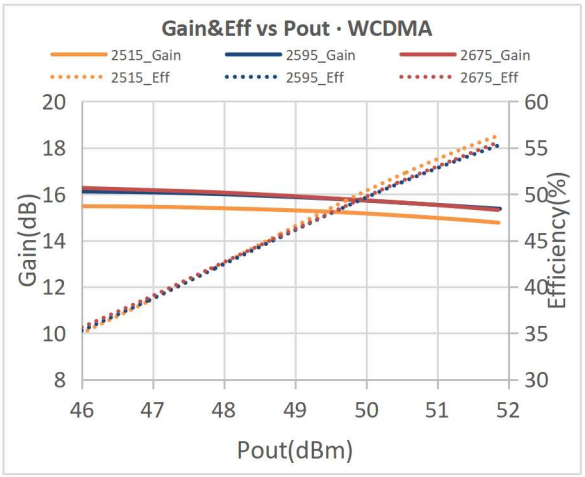


S-Parameter

Test conditions, unless otherwise noted: 25°C, VDD = 52V, IDQ = 200mA, Vgsp = -5.7V, test on WATECH EVB.



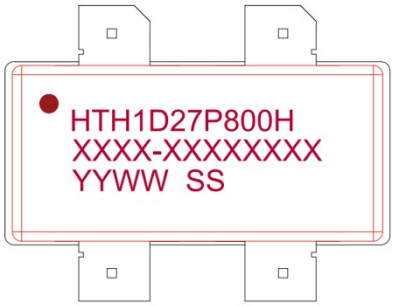
WCDMA performance(ACPR)



WCDMA performance(Gain+Eff)

Test conditions, unless otherwise noted: 25°C, VDD = 52V, IDQ = 200mA, Vgsp = -5.7V, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF, test on WATECH EVB.

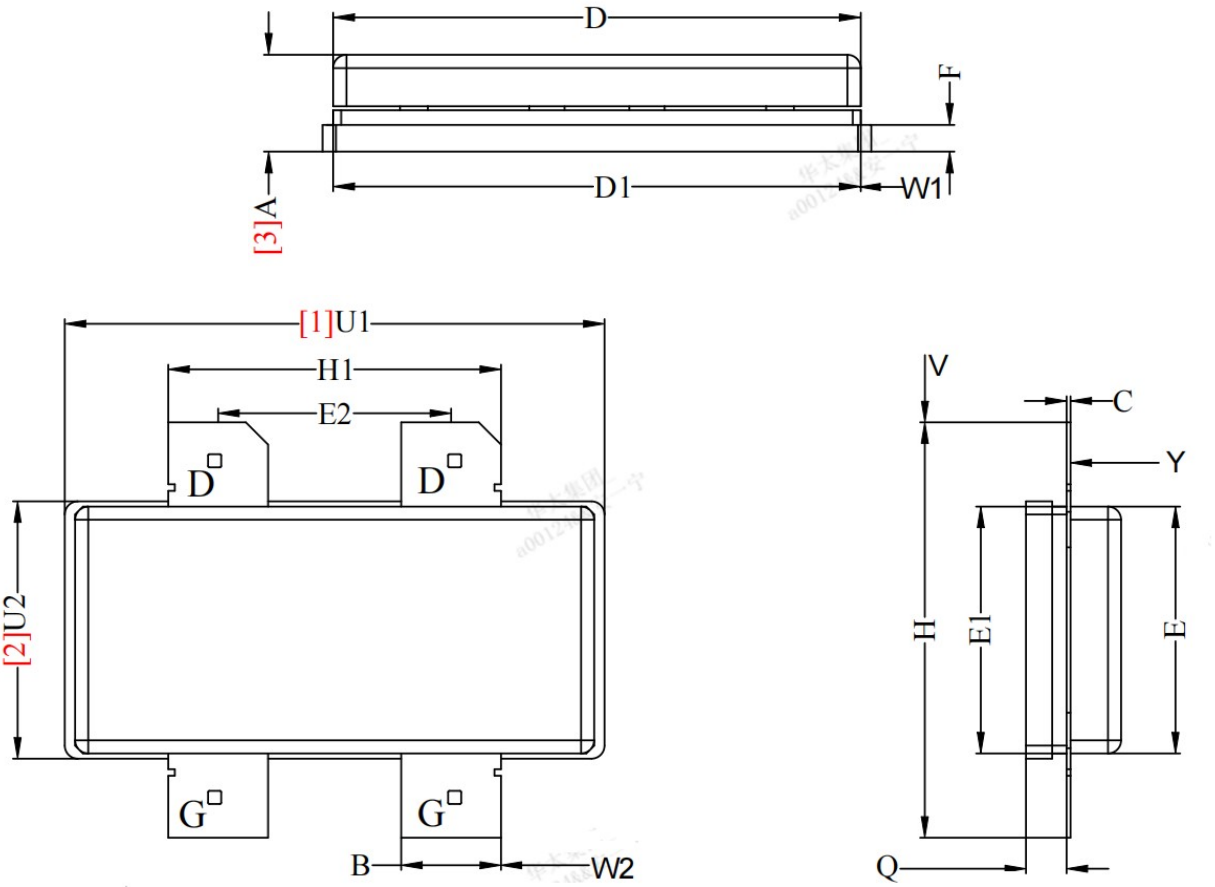
Package Marking and Dimensions



- Line1 (fixed): Device name in W/O
- Line2 (unfixed): Marking Lot No in W/O (Sample: E596-EERA0001)
- Line3 (unfixed): Date Code + SS（last two of LOT No.）

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



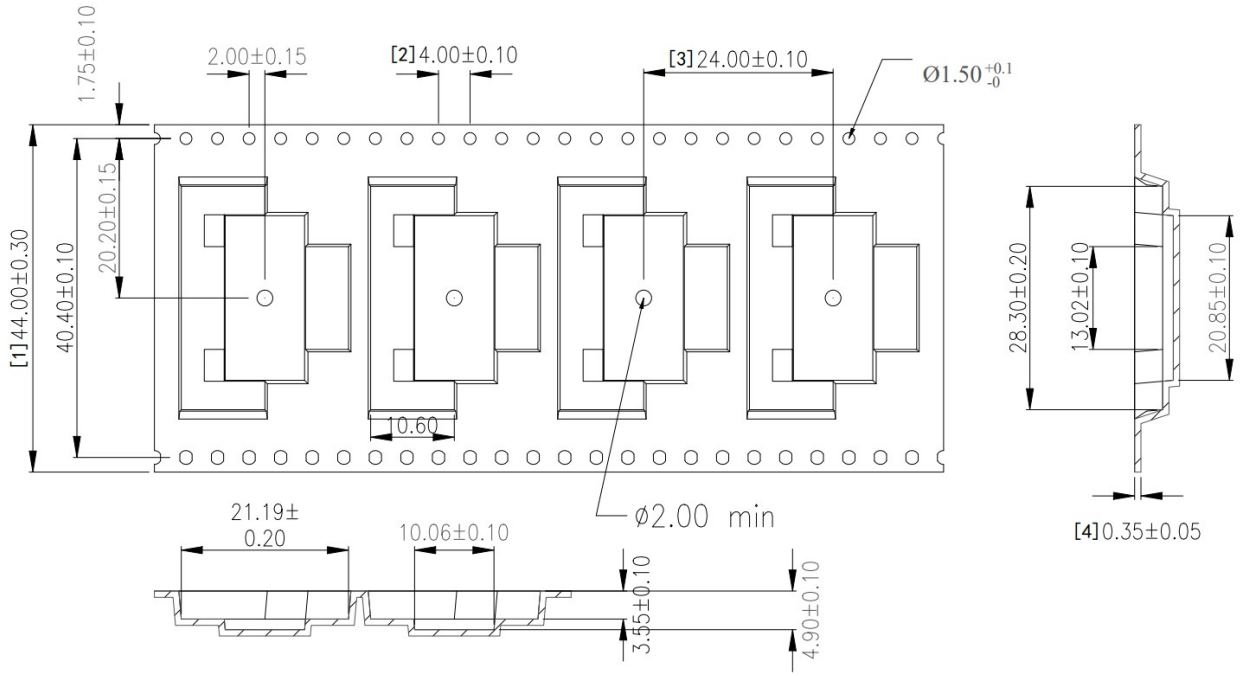
unit: mm

	A	B	C	D	D1	E	E1	E2	F	H	H1	Q	U1	U2	V	W1	W2	Y
max	3.930	3.910	0.175	19.960	19.910	9.550	9.500	/	1.100	15.920	12.830	1.650	20.700	9.900	0.500	0.500	0.500	0.100
nom	3.630	3.810	0.150	19.810	19.810	9.400	9.400	8.890	1.000	15.820	12.700	1.550	20.600	9.800	/	/	/	/
min	3.330	3.710	0.125	19.660	19.710	9.250	9.300	/	0.900	15.720	12.570	1.450	20.500	9.700	/	/	/	/

Package Dimensions

Tape and Reel Information

Package Type	Reel Size(inch)	Qty/Reel(pcs)	Qty/Box(pcs)	Qty/Carton(pcs)
ACC2110S-4L	13	500	500	2500



Tape & Reel Packaging Descriptions

Handling Precautions

Parameter	Grade
Moisture Sensitivity Level MSL	3

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1B	JESD22-A114
ESD – Charged Device Model (CDM)	Class C2a	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
GaN	Gallium Nitride
CW	Continuous Waveform
CCDF	Complementary Cumulative Distribution Function
PAR	Peak-to-Average Ratio
RoHS	Restriction of Hazardous Substances
VSWR	Voltage Standing Wave Ratio
WCDMA	Wideband Code Division Multiple Access

Revision history

Document ID	Datasheet Status	Release Date	Revision Version
Rev 1.0	Preliminary	Apr. 2024	Preliminary
Rev 1.1	Preliminary	Sep.2024	Update
Rev 1.2	Preliminary	Nov.2024	Update
Rev 2.0	Product	Dec.2024	Product

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