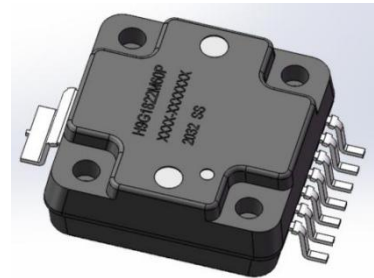


### Description

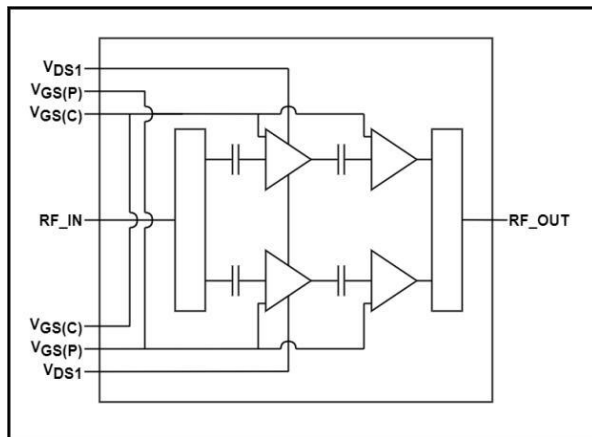
The H9G1822M60P is a LDMOS MMIC Integrated Asymmetrical Doherty based on 2-Stage with 60W saturated output power covering frequency range from 1.8 - 2.2 GHz.

The amplifier is 50  $\Omega$  Input matched with integrated input divider and output combiner into a small compact footprint which makes it ideal for integration.



Over Molded Plastic Package 8 pin

### Block Diagram



H9G1822M60P Block Diagram

### Features

- Operating Frequency Range: 1.8 - 2.2 GHz
- Operating Drain Voltage: +28V
- Saturation Output Power: 60W
- Power Average: 3.15W
- 50  $\Omega$  Input matched
- Integrated Input Divider
- Integrated Output Combiner
- Integrated Asymmetrical Doherty Final Stage
- High Efficiency: 30%@2.19GHz, WCDMA
- High Gain: 28dB@2.19GHz, WCDMA
- Small footprint: OMP400-8, 10.3x10.3mm

### Applications

- 3GPP 5G NR FR1 n1/34/39/65/66/70 and 4G-LTE B1/2/3/4/34/37/39/65/66/70
- Power Amplifier for Small Cells
- Driver Amplifier for Micro and Macro Base Stations
- Active Antenna Array for 5G mMIMO
- Repeaters/DAS
- Mobile Infrastructure

### Ordering Information

Part Number	Description
H9G1822M60P	Reel Package
H9G1822M60PEVB	1.8 - 2.2 GHz EVB



# H9G1822M60P

## 60W, 1.8 - 2.2 GHz LDMOS MMIC Amplifier

Product datasheet

### Typical Performance

#### RF Characteristics (Pulsed CW)

Freq (GHz)	P3dB (dBm)	Gain (dB)	Eff (%)	IRL (dB)
1.805	48.25	29.06	30.31	14.6
1.8425	48.17	28.89	29.21	15.7
1.880	48.21	28.95	29.90	17.1
2.100	48.43	28.62	31.29	22.8
2.150	48.16	28.38	28.70	21.8
2.200	47.98	28.67	29.37	18.8

Test conditions unless otherwise noted: 25 °C,  $V_{DD} = +28V_{dc}$ ,  $IDQ_{Carrier} = 100mA$ ,  $IDQ_{Peak} = 17mA$ ,  $PW = 100\mu s$ ,  $DC = 10\%$  test on WATECH Application Board

#### RF Characteristics (WCDMA)

Freq (GHz)	Gain (dB)	Eff (%)	ACPR* @5MHz (dBc)	ACPR* @10MHz (dBc)
1.805	29.05	29.49	-32.92	-52.58
1.8425	28.84	29.36	-33.22	-51.83
1.880	28.78	30.45	-33.15	-51.03
2.100	28.43	30.52	-36.18	-50.03
2.150	28.33	28.76	-37.55	-50.47
2.200	28.54	29.75	-36.86	-50.82

Test conditions unless otherwise noted: 25 °C,  $V_{DD} = +28V_{dc}$ ,  $IDQ_{Carrier} = 100mA$ ,  $IDQ_{Peak} = 17mA$ ,  $P_{AVG} = 35 dBm$   
1C-WCDMA 5MHz Signal, 7.6 dB PAR @ 0.01% CCDF test on WATECH Application Board

\*Uncorrected DPD

### Absolute Maximum Ratings

Parameter	Range/Value	Unit
Drain voltage ( $V_{DS}$ )	-0.5 to +65	V
Gate voltage ( $V_{GS}$ )	-5 to +10	V
Drain voltage ( $V_{DD}$ )	0 to +28	V
Storage Temperature ( $T_{STG}$ )	-55 to +150	°C
Case Temperature ( $T_C$ )	-40 to +125	°C
Junction Temperature ( $T_J$ )	-40 to +175	°C

### Electrical Specification

#### DC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Breakdown Voltage $V_{(BR)DSS}$ [2]	$V_{GS}=0V$ , $I_{DS}=100\mu A$	65	-	-	V
Gate-Source Threshold Voltage $V_{GS(th)}$ [1]	$V_{DS}=28V$ , $I_{DS}=17\mu A$	1.2	-	2.0	V
Drain Leakage Current $I_{DSS}$ [2]	$V_{GS}=0V$ , $V_{DS}=28V$	-	-	0.5	$\mu A$
Gate Leakage Current $I_{GSS}$ [1]	$V_{GS}=10V$ , $V_{DS}=0V$	-	-	0.05	$\mu A$

[1] Including Driver and Final stage

[2] Including Carrier and Peak

#### RF Characteristics (Pulsed CW)

Parameter	Freq (GHz)	Min	Typ.	Max	Unit
P3dB	2.2	47.5	48.0	-	dBm

Test conditions unless otherwise noted: 25 °C,  $V_{DD} = +28V_{dc}$ ,  $I_{DQ\_Carrier} = 100mA$ ,  $I_{DQ\_Peak} = 17mA$ ,  $PW = 100\mu s$ ,  $DC = 10\%$  test on WATECH Production Board

#### RF Characteristics (WCDMA)

Parameter	Conditions	Min	Typ.	Max	Unit
Frequency	2.19				GHz
Gain	$PAVG = 35\text{ dBm}$	26.5	28	32	dB
Eff	$PAVG = 35\text{ dBm}$	27	30	35	%
ACPR@5MHz*	$PAVG = 35\text{ dBm}$	-40	-36	-28	dBc

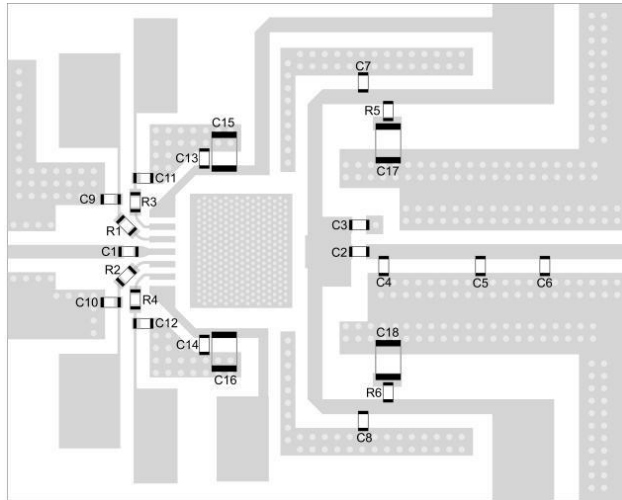
Test conditions unless otherwise noted: 25 °C,  $V_{DD} = +28V_{dc}$ ,  $I_{DQ\_Carrier} = 100mA$ ,  $I_{DQ\_Peak} = 17mA$ , 1C-WCDMA 20MHz Signal, 7.6 dB PAR @ 0.01% CCDF test on WATECH Production Board

\*Uncorrected DPD

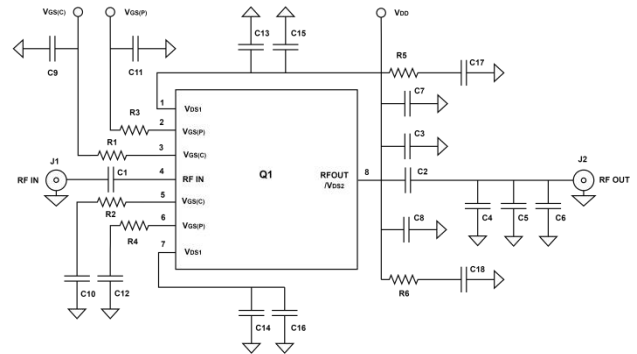
#### Thermal Information

Parameter	Condition	Value (Typ)	Unit
Thermal Resistance Junction to Case ( $R_{TH}$ )	$T_{CASE} = 90^{\circ}C$ , 1C-WCDMA 5MHz Signal, 7.6 dB PAR, $PAVG = 35\text{ dBm}$	2.5	$^{\circ}C/W$

### H9G1822M60P 1.8 - 2.2 GHz Reference Design (50 x40 mm)



EVb Layout

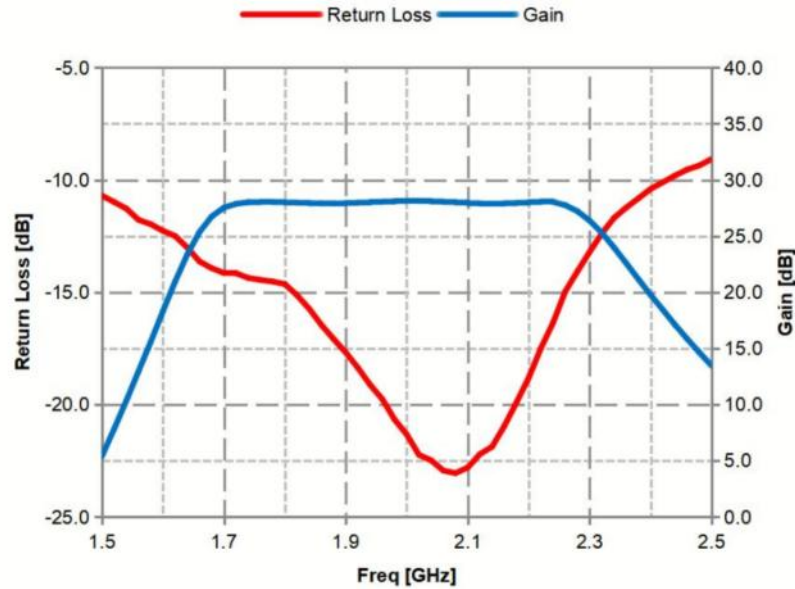


EVb Schematic

### Bill of Materials (BoM) - H9G1822M60P 1.8 - 2.2 GHz Reference Design

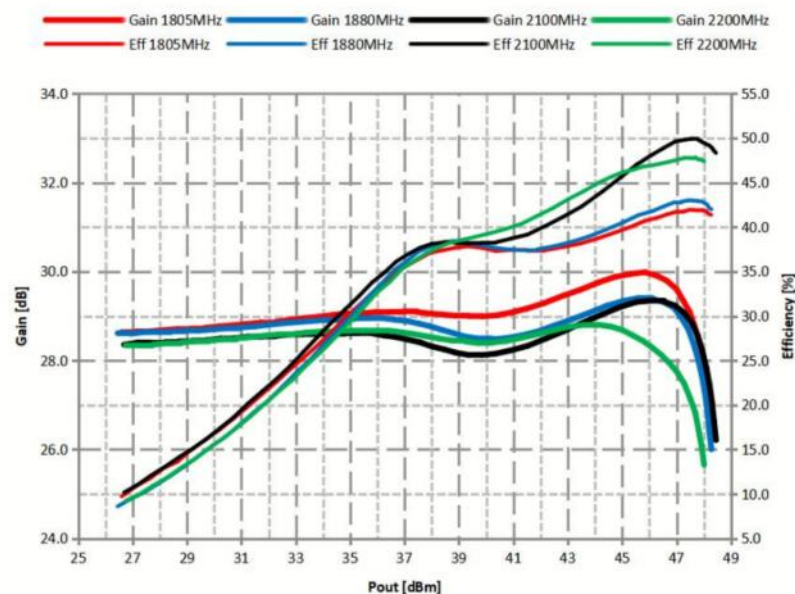
Reference	Value	Description	Manufacturer	P/N
Q1	-	60W, 1.8 - 2.2 GHz LDMOS MMIC PA	Watech	H9G1822M60P
C1, C4	2p7F	Multi-Layer Ceramic Capacitor	Murata	GQM2195C2E2R7BB12
C2	2p4F	Multi-Layer Ceramic Capacitor	Murata	GQM2195C2E2R4BB12
C3, C6	1p5F	Multi-Layer Ceramic Capacitor	Murata	GQM2195C2E1R5BB12
C5	3pF	Multi-Layer Ceramic Capacitor	Murata	GQM2195C2E3R0BB12
C7, C8	15pF	Multi-Layer Ceramic Capacitor	Murata	GQM2195C2E150GB12
C9-C14	1nF	Multi-Layer Ceramic Capacitor	Murata	GRM21A5C2E102JWA1
C15-C18	10uF	Multi-Layer Ceramic Capacitor	Murata	GRM32EC72A106KE05
R1-R4	33Ω	Thick Film Resistor	YAGEO	RC0805FR-0733RL
R5, R6	10Ω	Thick Film Resistor	YAGEO	RC0805FR-0710RL
PCB	<ul style="list-style-type: none"> <li>Rogers 4350B, er = 3.66; Thickness= 20 mil (0.508 mm); Thickness copper plating = 35 μm (1oz)</li> <li>Soldered on a 50x40x10 mm Copper Base-Plate</li> </ul>			

### Performance Plots



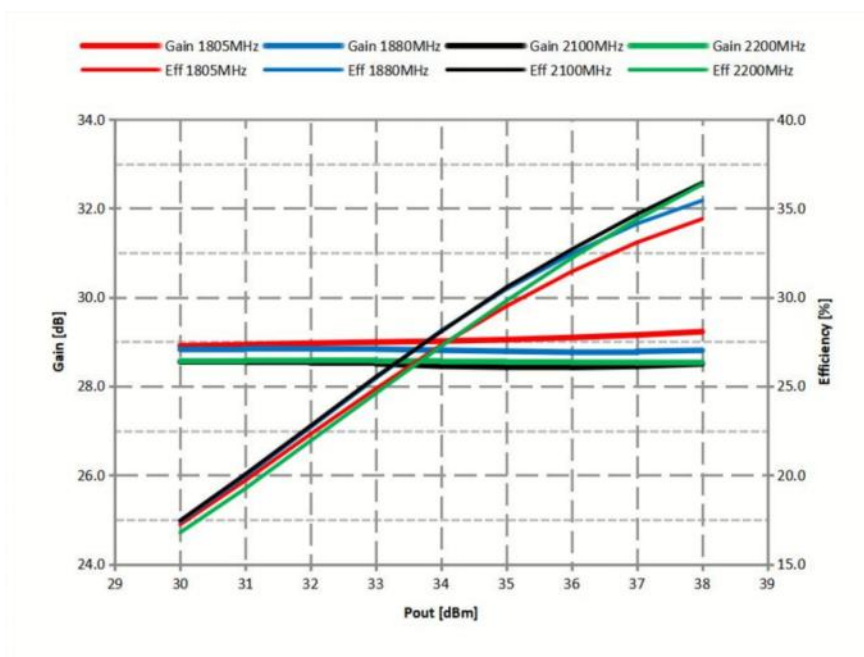
**Small Signal, Gain and Return Loss vs Frequency**

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ\_Carrier= 100mA, IDQ\_Peak= 17mA test on WATECH Application Board



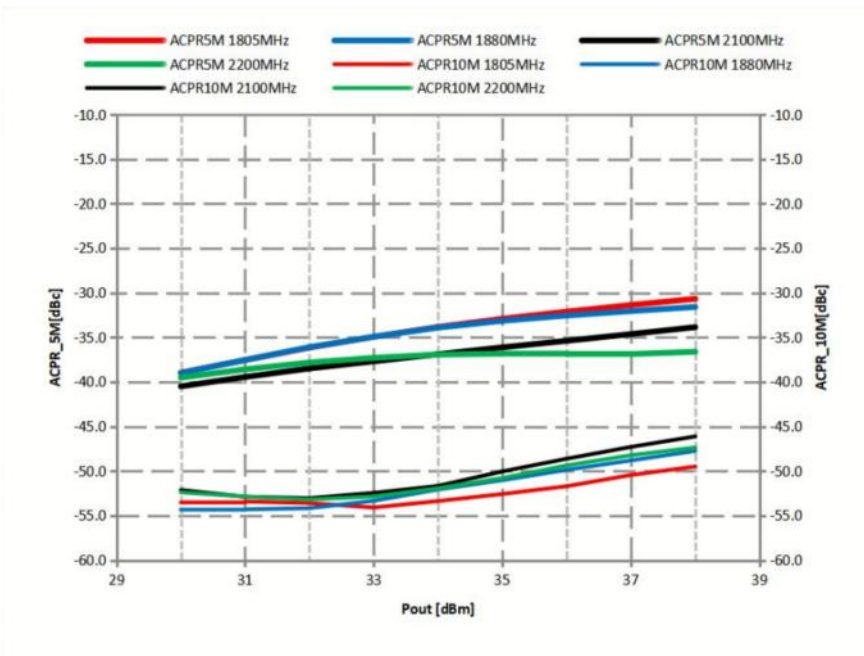
**Pulsed CW, Gain and Efficiency vs Pout**

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ\_Carrier= 100mA, IDQ\_Peak= 17mA, PW = 100us, DC= 10% test on WATECH Application Board



**WCDMA, Gain and Efficiency vs Pout**

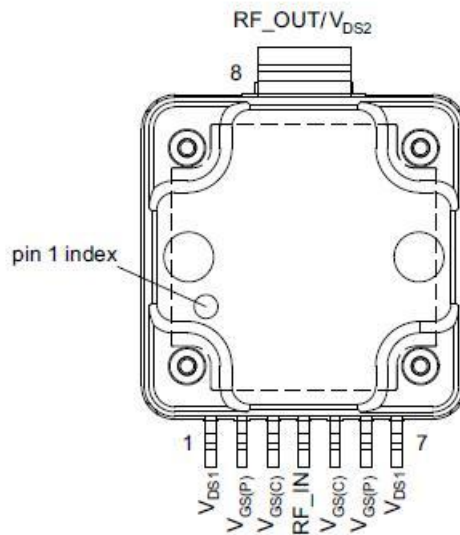
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ\_Carrier= 100mA, IDQ\_Peak= 17mA, 1C-WCDMA 5MHz Signal, 7.6 dB PAR @ 0.01% CCDF test on WATECH Application Board



**WCDMA, ACPR\_5MHz, ACPR\_10MHz vs Pout**

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ\_Carrier= 100mA, IDQ\_Peak= 17mA, 1C-WCDMA 5MHz Signal, 7.6 dB PAR @ 0.01% CCDF test on WATECH Application Board

### Pin Configuration and Description

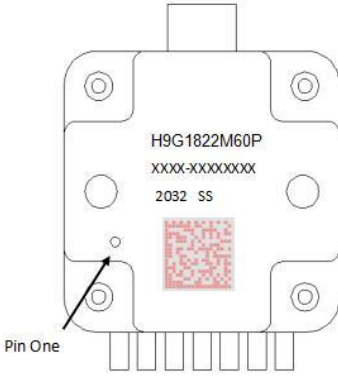


Pinout Device Configuration

Pin Number	Label	Description
1	VDS1	Drain-Source Voltage Driver Stage
2	VGS(P)	Gate-Source Voltage Peak
3	VGS(C)	Gate-Source Voltage Main
4	RF IN	RF Input
5	VGS(C)	Gate-Source Voltage Main
6	VGS(P)	Gate-Source Voltage Peak
7	VDS1	Drain-Source Voltage Driver Stage
8	RF OUT/VDS2	RF Output & Drain-Source Voltage Final Stage

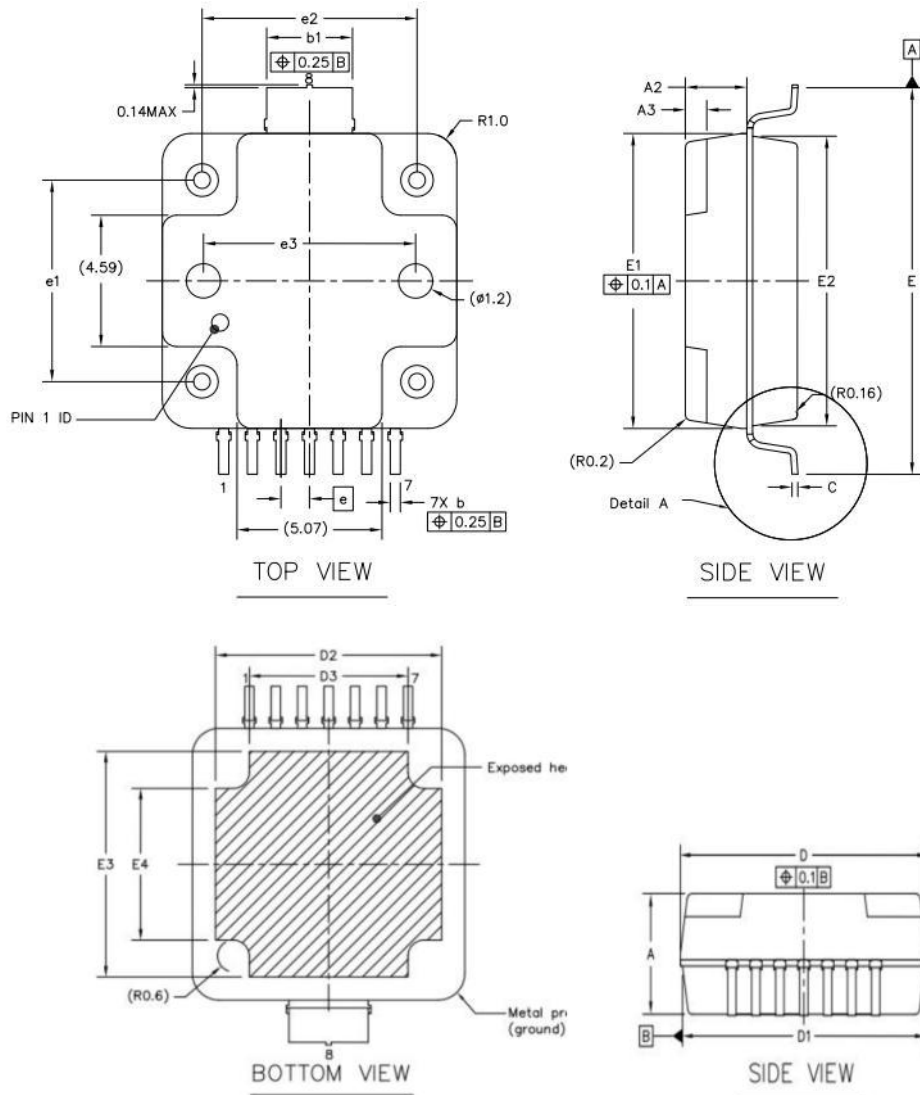


### Package Marking and Dimensions

Marking Spec No.	H9G1822M60P Marking spec_V1
Marking Spec	
<div> <div>marking sample</div>  </div>	
<div> <div>Line1: fixed : H9G1822M60P (Device name in W/O)</div> <div>Line2 :unfixed: Marking Lot No in W/O (Sample:E596-EEEE0001)</div> <div>Line3 : fixed DC (2032) +Sub Lot No</div> <div> <div>Line4 :unfixed: 2D Code (21 digits)</div> <div>1~13:Mark Lot No</div> <div>14~15: Sub Lot No</div> <div>16~17: Strip No</div> <div>18~21: Unit On Strip(XXYY)</div> </div> </div>	
<p>●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".</p>	

### Marking



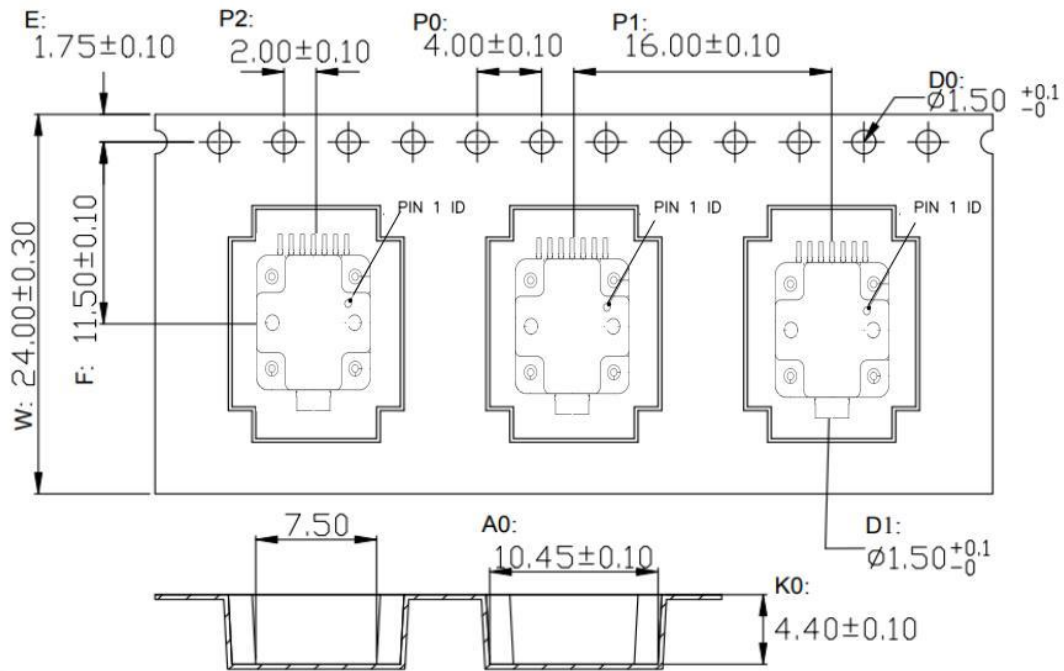


SYMBOL	MIN	NOM	MAX
A	3.87	3.92	4
A1	-0.02	0	0.06
A2	2.15 REF		
A3	0.75 REF		
A4	1.57 REF		
b	0.3	0.35	0.4
b1	2.95	3	3.05
D	10.25	10.3	10.35
D1	10.07	10.12	10.17
D2	8.4	8.55	8.7
D3	5.8	6	6.2
E	13.2	13.5	13.8
E1	10.25	10.3	10.35
E2	10.07	10.12	10.17
E3	8.4	8.55	8.7
E4	5.55	5.75	5.95
e	1 BSC		
e1	7.04 REF		
e2	7.52 REF		
e3	7.42 REF		
L	0.8	0.95	1.1
C	0.17	0.22	0.27
θ	0°	3°	7°

### Package Dimensions

### Tape and Reel Information


Package Type	Reel Size(inch)	Qty/Reel(pcs)	Qty/Box(pcs)	Qty/Carton(pcs)
OM400-8L	13	600	600	3000



Tape & Reel Packaging Descriptions

### Handling Precautions

Parameter	Grade
Moisture Sensitivity Level MSL	3

Parameter	Rating	Standard	 <p>ATTENTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES</p>
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	



# H9G1822M60P

## 60W, 1.8 - 2.2 GHz LDMOS MMIC Amplifier

Product datasheet

### 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
MMIC	Monolithic Microwave Integrated Circuit

### Revision history

Document ID	Datasheet Status	Release Date	Revision Version
Rev 2.0	Product	Nov 2022	Product release
Rev 2.1	Product	March 2023	New format based on English version datasheet
Rev 2.2	Product	August 2024	Update format & Vth test condition



# H9G1822M60P

## 60W, 1.8 - 2.2 GHz LDMOS MMIC Amplifier

Product datasheet

### Contact Information

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

- Web: [www.watechelectronics.com](http://www.watechelectronics.com)
- Email: [MKT@huatai-elec.com](mailto:MKT@huatai-elec.com)

For technical questions and application information:

- Email: [MKT@huatai-elec.com](mailto:MKT@huatai-elec.com)

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