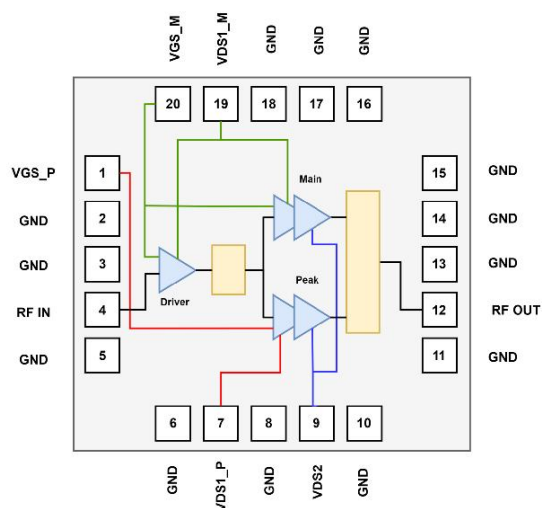


### Description

The H9G4750M12P is a LDMOS MMIC Integrated Asymmetrical Doherty based on 3-Stage with 12W saturated output power covering frequency range from 4.7 to 5.0 GHz.

The amplifier is 50  $\Omega$  Input/Output matched with a small compact footprint 7x7 mm which makes it ideal for integration.

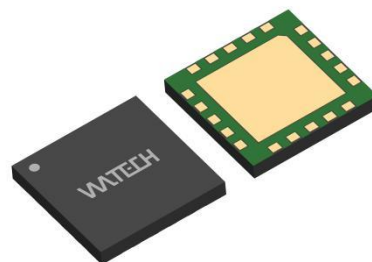
### Block Diagram



H9G4750M12P Block Diagram

### Applications

- 3GPP 5G NR FR1 n79
- Power Amplifier for Small Cells
- Driver Amplifier for Micro and Macro Base Stations
- Active Antenna Array for 5G mMIMO
- Repeaters/DAS
- Mobile Infrastructure



20 Pin LGA 7x7 mm Plastic Package

### Features

- Operating Frequency Range: 4.7 to 5.0 GHz
- Operating Drain Voltage: +28V
- Saturation Output Power: 12W
- 50  $\Omega$  Input/Output matched
- Integrated Output Combiner
- Integrated Asymmetrical Doherty Final Stage
- High Efficiency: 29.1%@4.8GHz, WCDMA
- High Gain: 34dB@4.8 GHz, WCDMA
- Small footprint package: LGA 7x7 mm

### Ordering Information

Part Number	Description
H9G4750M12P	Reel Package
H9G4750M12PEVB	4.7 to 5.0 GHz EVB

#### RF Characteristics (Pulsed CW)

Freq (GHz)	P3dB (dBm)	Gain (dB)	Eff (%)	IRL (dB)
4.8	42.0	34.9	34.9	11.4
4.9	41.9	35.4	35.4	14.9
5.0	41.8	35.3	31.0	17.3

Test conditions unless otherwise noted: 25 °C,  $V_{DD} = +28V_{dc}$ ,  $I_{DQ} = 35mA$ ,  $V_{gsp} = V_{gsm} - 0.55V$ , Pulse Width = 100us, Duty Cycle = 10% test on HOTLO Application Board

#### RF Characteristics (WCDMA)

Freq (GHz)	Gain (dB)	Eff (%)	IRL (dB)	ACPR* @5MHz (dBc)	ACPR* @10MHz (dBc)
4.8	34.0	29.1	11.4	-29.9	-41.3
4.9	34.3	28.3	14.7	-30.5	-41.2
5.0	34.2	27.7	17.8	-29.4	-40.2

Test conditions unless otherwise noted: 25 °C,  $V_{DD} = +28V_{dc}$ ,  $I_{DQ} = 35mA$ ,  $V_{gsp} = V_{gsm} - 0.55V$ ,  $P_{AVG} = 32 dBm$   
1C-WCDMA 5MHz Signal, 7.6 dB PAR @ 0.01% CCDF test on HOTLO Application Board

\*Uncorrected DPD

#### Absolute Maximum Ratings

Parameter	Range/Value	Unit
Drain voltage ( $V_{DSS}$ )	-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

#### DC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Breakdown Voltage $V_{(BR)DSS}$	$V_{GS}=0V, I_{DS}=100\mu A$	65	-	-	V
Gate-Source Threshold Voltage $V_{GS(th)}$	$V_{GS}=V_{DS}, I_{DS}=5.2\mu A$	1.2	-	2.0	V
Drain Leakage Current $I_{DSS}$	$V_{GS}=0V, V_{DS}=28V$	-	-	1.5	$\mu A$
Gate Leakage Current $I_{GSS}$	$V_{GS}=5V, V_{DS}=0V$	-	-	0.2	$\mu A$

#### RF Characteristics (Pulsed CW)

Parameter	Freq (GHz)	Min	Typ.	Max	Unit
P3dB	5.0	40.7	41.2	-	dBm

Test conditions unless otherwise noted: 25 °C,  $V_{DD} = +28Vdc$ ,  $I_{DQ} = 35mA$ ,  $V_{GSP} = V_{GSM}-0.55V$ , Pulse Width = 100us, Duty Cycle = 10% test on HOTLO Production Board

#### RF Characteristics (WCDMA)

Parameter	Conditions	Min	Typ.	Max	Unit
Frequency		5.0			GHz
Gain	$P_{AVG} = 32 \text{ dBm}$	30.5	33.3		dB
Eff	$P_{AVG} = 32 \text{ dBm}$	23	27		%
IRL	$P_{AVG} = 32 \text{ dBm}$	10	15		dB
ACPR@5MHz (Uncorrected)	$P_{AVG} = 32 \text{ dBm}$	-	-30		dBc
VBW	$P_{AVG} = 32 \text{ dBm}$	-	300		MHz
AM/PM	$P_{AVG} = 32 \text{ dBm}$		15		Degree

Test conditions unless otherwise noted: 25 °C,  $V_{DD}=+28Vdc$ ,  $I_{DQ} = 35mA$ ,  $V_{GSP} = V_{GSM}-0.55V$ , 1C-WCDMA 5MHz Signal, 7.6 dB PAR @ 0.01% CCDF test on HOTLO Production Board

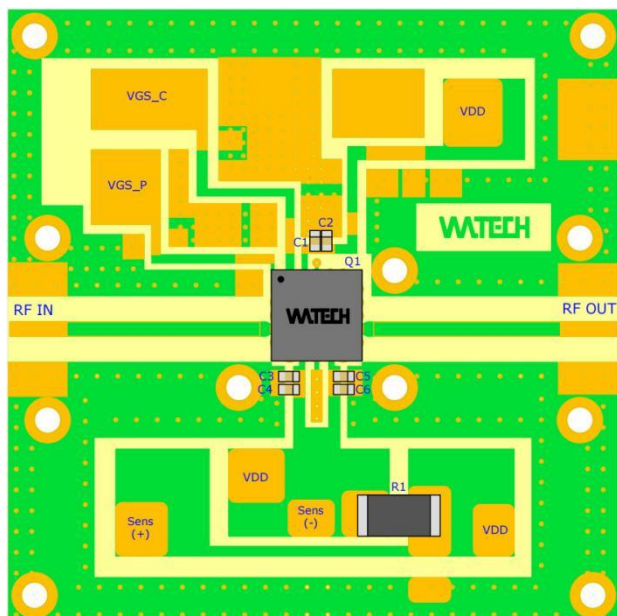
**Load Mismatch Test**

Condition	Test Result
VSWR=10:1, at all Phase Angles, VDD=+28Vdc, IDQ = 35 mA, Vgsp=Vgsm-0.55V, 1C-WCDMA 5MHz Signal, 7.6 dB PAR @ 0.01% CCDF, Frequency tested 4.7, 4.8, 4.9 and 5.0 GHz, P <sub>AVG</sub> = 35 dBm test on HOTLO Application Board	No Device  Degradation
Pin =10dBm, VDD=+28Vdc, IDQ = 35 mA, Vgsp=Vgsm-0.55V, Pulse Width = 100us, Duty Cycle = 10%, Tc= -40°C, 25°C, 85°C, Frequency tested 4.7, 4.8, 4.9 and 5.0 GHz, test on HOTLO Application Board,	No Device  Degradation

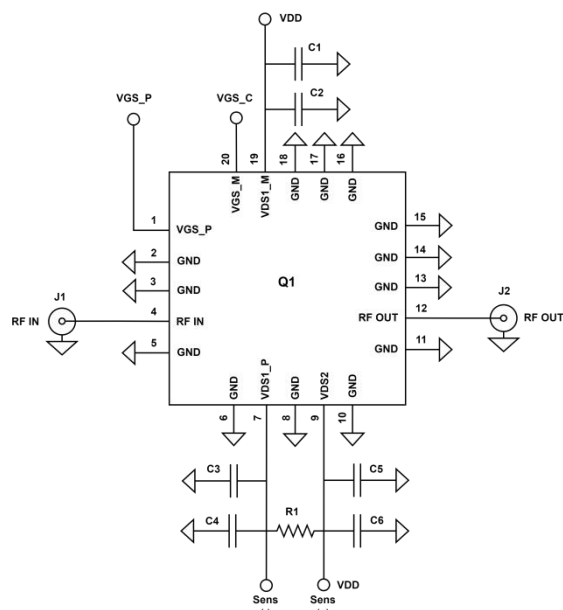
**Thermal Information**

Parameter	Condition	Value (Typ)	Unit
Thermal Resistance Junction to Case (R <sub>TH</sub> )	T <sub>CASE</sub> = 90°C, 1C-WCDMA 5MHz Signal, 7.6 dB PAR, P <sub>AVG</sub> = 32 dBm	9.5	°C /W

### H9G4750M12P 4.7 – 5.0 GHz Reference Design (47 x47 mm)



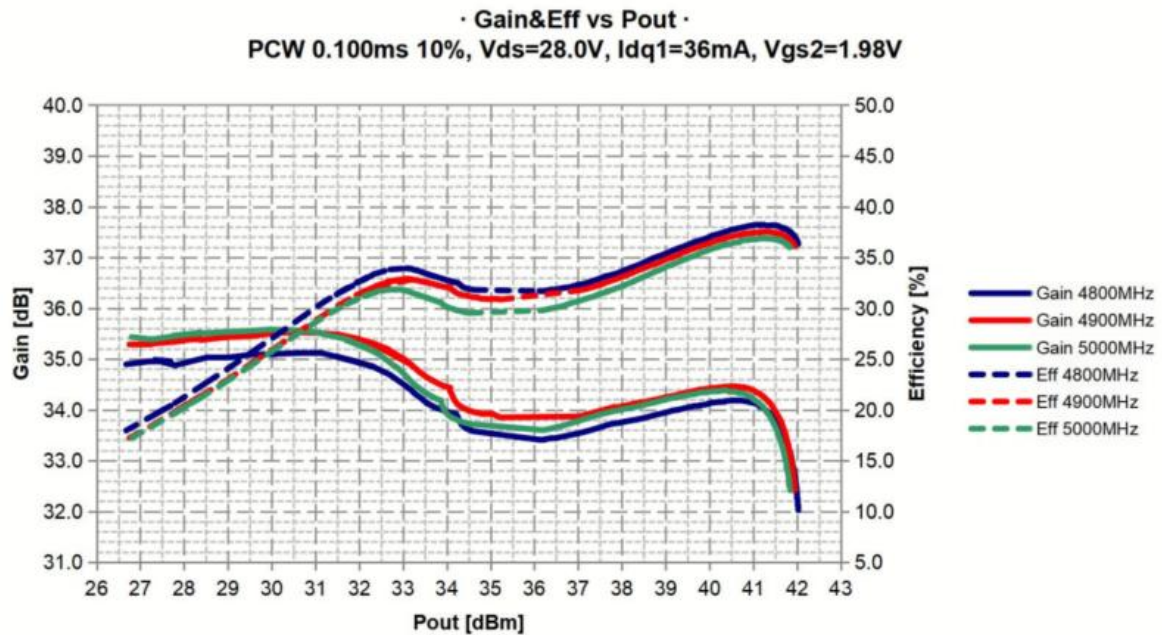
EVb Layout



EVb Schematic

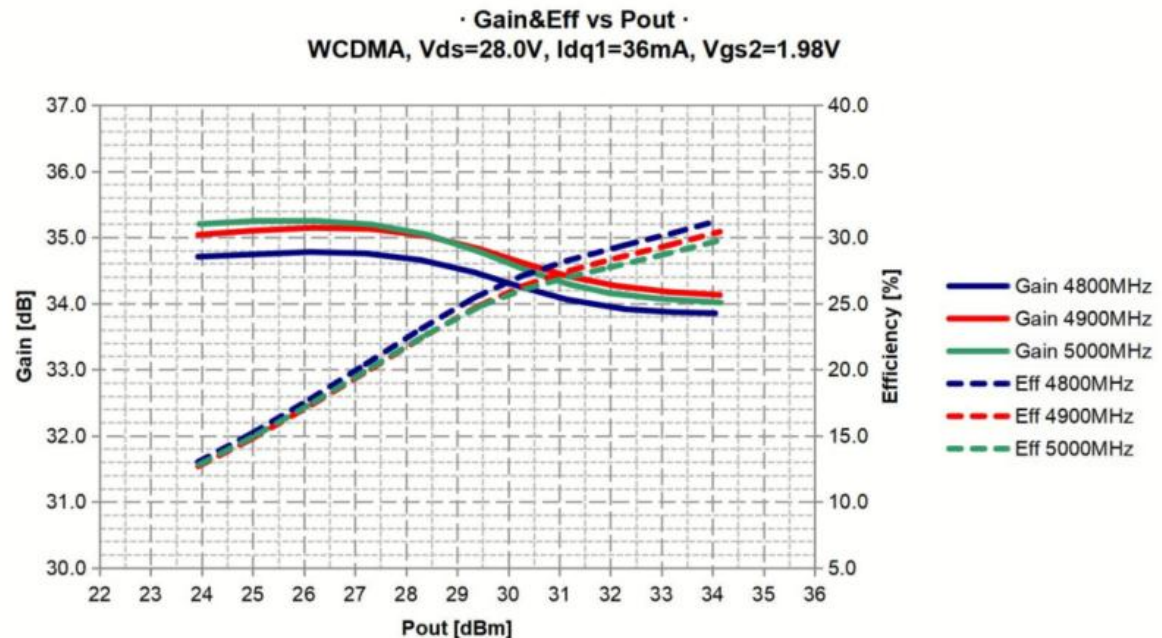
### Bill of Materials (BoM) - H9G4750M12P 4.7 – 5.0 GHz Reference Design

Reference	Value	Description	Manufacturer	P/N
Q1	-	12W, 3.3 3.6 GHz LDMOS MMIC PA	Holto	H9G4750M12P
C1, C3, C5	1uF ±10%, 0603	Multi-Layer Ceramic Capacitor	Murata	GCM188R71E105KA64D
C2, C4, C6	10uF ±20%, 0603	Multi-Layer Ceramic Capacitor	Murata	GRM188R6YA106MA73J
R1	100mΩ/1W, 0.1%	High-Precision Resistor	Vishay	Y44870R10000B0R
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 47x47x10 mm Copper Base-Plate</li> </ul>			



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

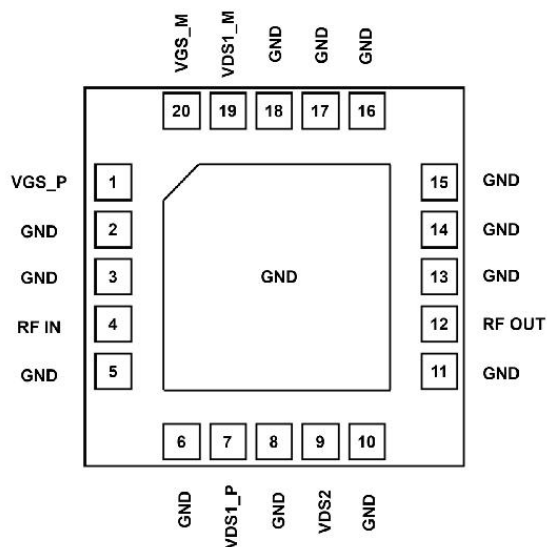
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ = 35mA, Vgsp = Vgsm-0.55V, Pulse Width = 100 us, Duty Cycle = 10% test on HOTLO Application Board



#### WCDMA, Gain and Efficiency vs Pout

Test conditions unless otherwise noted: 25 °C, VDD=+28Vdc, IDQ = 35mA, Vgsp = Vgsm-0.55V, 1C-WCDMA 5MHz Signal, 7.6 dB PAR @ 0.01% CCDF test on HOTLO Application Board

#### Pin Configuration and Description



17	GND	Ground
18	GND	Ground
19	VDS1_M	Drain-Source Voltage Main Driver
20	VGS_M	Gate-Source Voltage Main

Pinout Device Configuration

Pin Number	Label	Description
1	VGS_P	Gate-Source Voltage Peak
2	GND	Ground
3	GND	Ground
4	RFIN	RF Input
5	GND	Ground
6	GND	Ground
7	VDS1_P	Drain-Source Voltage Peak Driver
8	GND	Ground
9	VDS2	Drain-Source Voltage Final Stage
10	GND	Ground
11	GND	Ground
12	RFOUT	RF Output
13	GND	Ground
14	GND	Ground
15	GND	Ground
16	GND	Ground



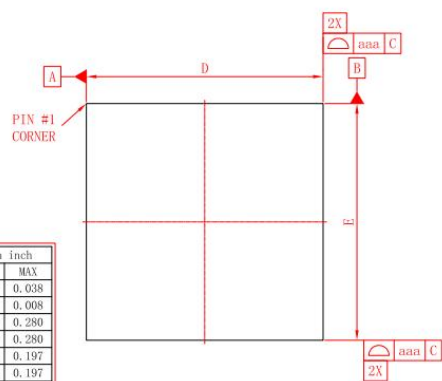
### Package Marking and Dimensions



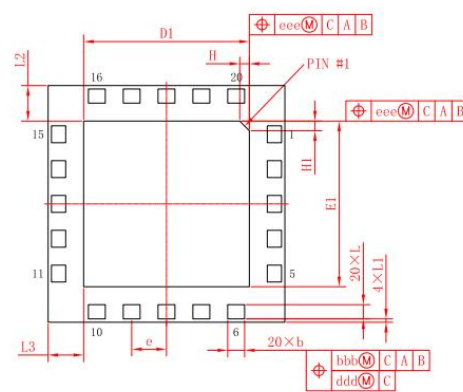
- Line1 (fixed): Device name in W/O
- Line2 (unfixed): Marking Lot No in W/O (Sample: E596-20140001)
- Line3 (unfixed): Date Code + JY
- This Marking SPEC only stipulates the content of Marking. For marking requirements such as font and size, please refer to the latest version of "Holto Product Printing Specification"

### Marking

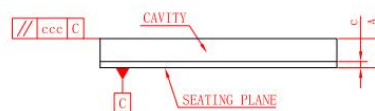
symbol	Dimension in mm			Dimension in inch		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.760	0.860	0.960	0.030	0.034	0.038
c	0.150	0.180	0.210	0.006	0.007	0.008
D	6.900	7.000	7.100	0.272	0.276	0.280
E	6.900	7.000	7.100	0.272	0.276	0.280
D1	4.800	4.900	5.000	0.189	0.193	0.197
E1	4.800	4.900	5.000	0.189	0.193	0.197
H	---	0.286	---	---	0.011	---
H1	---	0.286	---	---	0.011	---
L	0.370	0.420	0.470	0.015	0.017	0.019
L1	0.025	0.100	0.175	0.001	0.004	0.007
L2	0.975	1.050	1.125	0.038	0.041	0.044
L3	0.975	1.050	1.125	0.038	0.041	0.044
e	---	1.030	---	---	0.041	---
b	0.450	0.500	0.550	0.018	0.020	0.022
aaa	---	0.150	---	---	0.006	---
bbb	---	0.150	---	---	0.006	---
ccc	---	0.100	---	---	0.004	---
ddd	---	0.080	---	---	0.003	---
eee	---	0.150	---	---	0.006	---



Top View



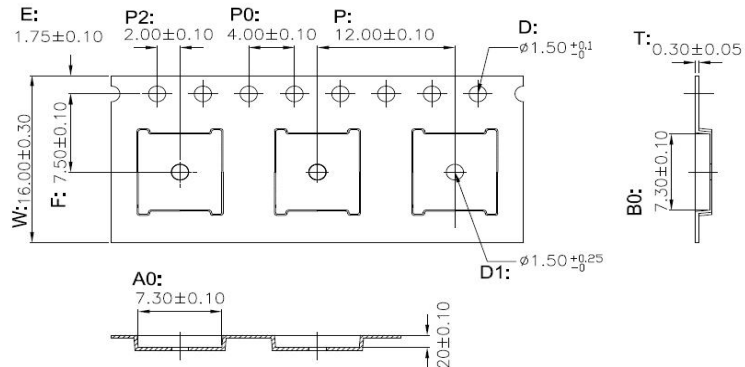
Bottom View



Side View

### Package Dimensions





**Notes:**

1. Carrier tape color: BLACK.
2. Carrier material :PS (Polystyrene).
3. ESD surface resistivity  $< 1 \times 10^{11} \Omega/\text{square}$  per EJA, JEDEC TNR specification.
4. Heat deflection temperature for Tape & Reel material: 62°C
5. Vicat softening temperature (10N) for Tape & Reel material: 95°C
6. Dimension is millimeter.



**Tape & Reel Packaging Descriptions**

**Reflow Profile classification (JEDEC JSTD020E-lead free)**

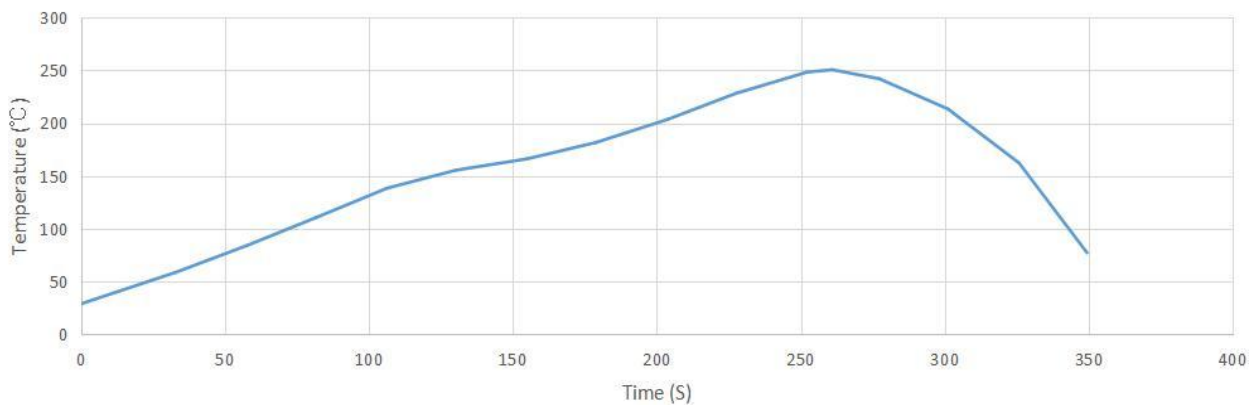
Profile Feature	Classification	Units	Remark
Ramp-up rate (Max)	3	°C /second	
Dwell temperature	150~200	°C	
Dwell time	60~120	second	SAC Liquid is 217 °C
Time above liquid	60~150	second	
Peak temperature	255~260	°C /second	
Peak soak time	30*	second	* Tolerance for peak profile temperature is defined as a supplier minimum and a user maximum.
Ramp-down rate (Max)	6	°C /second	
Time 25 °C to peak temperature(Max)	8	minutes	

**Reflow Oven Settings (reference)**

Belt Speed	Zone #1	Zone #2	Zone #3	Zone #4	Zone #5	Zone #6	Zone #7	Zone #8	Zone #9	Zone #10
75cm/min	85	110	135	160	170	175	200	240	250	260


**Reflow Oven Settings (reference)**

Reflow profile (for reference)



Reflow Profile

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
VSWR	Voltage Standing Wave Ratio

Document ID	Datasheet Status	Release Date	Revision Version
Rev 0.1	Product	Dec. 2021	Product release
Rev 0.2	Product	Dec. 2021	Update 7.1.2
Rev 0.3	Product	Jan. 2022	Update Min. Value of Gain
Rev 1.0	Product	Oct. 2022	Update IDSS&IGSS
Rev 1.1	Product	Nov. 2022	Update General information and Applications
Rev 1.2	Product	Dec. 2022	Update ESD Characteristics
Rev 1.3	Product	Dec. 2022	Update Efficiency Low limit value
Rev 1.4	Product	March 2023	New format based on English version datasheet

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

- Web: [www.andesource.com](http://www.andesource.com)
- Email: [andehk@andesource.com](mailto:andehk@andesource.com)

For technical questions and application information:

- Email: [andetech@andesource.com](mailto:andetech@andesource.com)

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