GaN on SiC Transistor, 15 W, 28 V
DC - 8 GHz

MACOM PURE CARBIDE™

WST4100D
Rev. V1

Features

- 17 dB Small Signal Gain @ 4 GHz
- 15 W P_{SAT}
- 28 V Operation
- High Breakdown Voltage
- High Temperature Operation
- Up to 8 GHz Operation
- High Efficiency

Applications

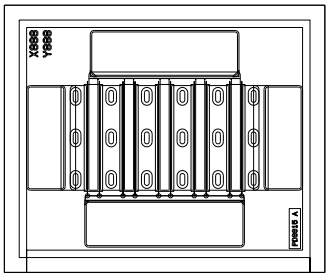
- 2-Way Private Radio
- Broadband Amplifiers
- Cellular Infrastructure
- Test Instrumentation
- Class A, AB, Linear amplifiers suitable for OFDM, W-CDMA, EDGE, CDMA waveforms
- Radar, Electronic Warfare

Description

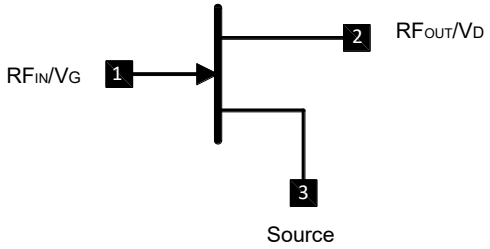
The WST4100D is a gallium nitride (GaN) high electron mobility transistor (HEMT). GaN has superior properties compared to silicon or gallium arsenide, including higher breakdown voltage, higher saturated electron drift velocity, and higher thermal conductivity. GaN HEMTs offer greater power density and wider bandwidths compared to Si and GaAs transistors.

Ordering Information

Part Number	MOQ Increment
WST4100D	bulk
WST4100D-GP4	10 pc Gel-Pak



Functional Schematic



Pin Configuration

Pin #	Pin Name	Function
1	RF_{IN} / V_G	RF Input / Gate
2	RF_{OUT} / V_D	RF Output / Drain
3	Source	Ground / Source

- Restrictions on Hazardous Substances, compliant to current RoHS EU directive.
- Proprietary RF Large Signal Models Available for ADS and MWO

DC Electrical Specifications @ T_C = +25 °C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 3.6 mA	V_T	-2.6	-2.0	-1.6	V
Gate Quiescent Voltage	V_{DS} = 28 V, I_D = 100 mA	V_{GSQ}	—	-1.8	—	V
Saturated Drain Current	V_{GS} = 6 V, V_{GS} = 2.0 V	I_{DSS}	3.6	4.3	—	A
Drain-Source Breakdown Voltage	V_{DS} = -8 V, I_D = 3.6 mA	V_{BDS}	84	—	—	V
On Resistance	V_{DS} = 0.05 V, V_{GS} = 0 V	R_{ON}	0.3	0.44	—	Ω
Gate Forward Voltage	V_{DS} = 0 V, I_D = 3.6 µA	$V_{G(ON)}$	0.4	—	—	V

Absolute Maximum Ratings[1,2]

Parameter	Absolute Maximum
Drain-Source Voltage	84 V
Gate Voltage	-10, +2 V
Drain Current	1.5 A
Gate Current	4 mA
Storage Temperature	-55°C to +150°C
Mounting Temperature	+320°C, 30 seconds
Junction Temperature[3,4]	+225°C
Operating Temperature	-40°C to +85°C

1. Exceeding any one or combination of these limits may cause permanent damage to this device.
2. MACOM does not recommend sustained operation near these survivability limits.
3. Operating at nominal conditions with $T_J \leq$ +225 °C will ensure MTTF > 1 x 10^6 hours.
4. Junction Temperature (T_J) = T_C + Θjc * (V * I)
   Typical thermal resistance (Θjc) = 5.1 °C/W for CW.
   a) For T_C = +25°C,
   T_J = 96 °C @ P_{DISS} = 14 W
   b) For T_C = +85°C,
   T_J = 156 °C @ P_{DISS} = 14 W

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1A devices.

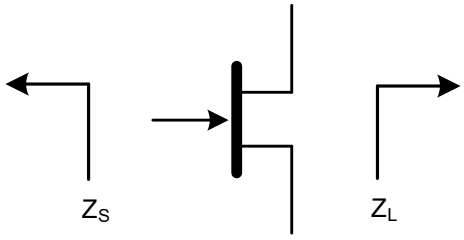
CW Load-Pull Performance: Reference Plane at Device Bond Pads

For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

Frequency (GHz)	Z_{SOURCE} (Ω)	Maximum Output Power				
		V_{DS} = 28 V, I_{DQ} = 0.1 A, T_C = 25°C, P_{SAT}				
		Z_{LOAD} (Ω)	Gain (dB)	P_{OUT} (dBm)	P_{OUT} (W)	h_D (%)
0.5	4.4 + j24	13 + j14	22.5	44.5	28.18	75
1	4 + j12	12.4 + j10	20.8	44.8	30.20	75
2	3.7 + j7	11 + j9	17.8	44.8	30.20	75
4	2.6 + j4	10 + j7.5	12.5	44.5	28.18	66
6	2.1 + j2.9	6 + j6.6	9.5	44.5	28.18	64
8	1.9 + j1.6	4.6 + j5.6	7	44	25.12	55

Frequency (GHz)	Z_{SOURCE} (Ω)	Maximum Drain Efficiency				
		V_{DS} = 28 V, I_{DQ} = 0.1 A, T_C = 25°C, P_{SAT}				
		Z_{LOAD} (Ω)	Gain (dB)	P_{OUT} (dBm)	P_{OUT} (W)	h_D (%)
0.5	4.4 + j24	25 + j28	21	43	19.95	87
1	4 + j12	19 + j20	19	43	19.95	86
2	3.7 + j7	9.2 + j16.7	16	43	19.95	82
4	2.6 + j4	6.7 + j14	11	43	19.95	78
6	2.1 + j2.9	3 + j9	8	43	19.95	75
8	1.9 + j1.6	2.9 + j6.5	6	43	19.95	63

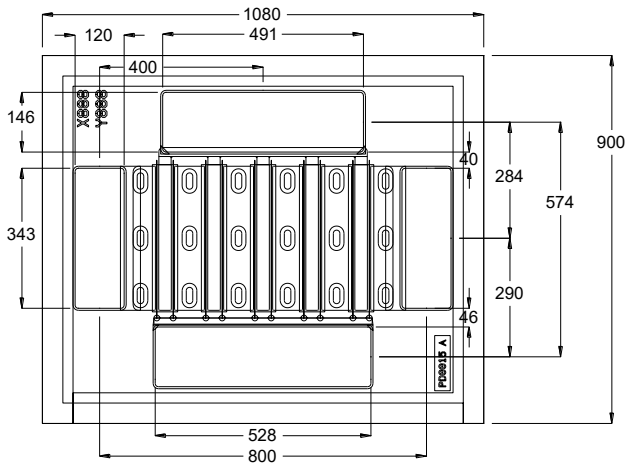
Impedance Reference



Z_{SOURCE} = Measured impedance presented to the input of the device at bond pad reference plane.
Z_{LOAD} = Measured impedance presented to the output of the device at bond pad reference plane.

Die Dimensions (units in microns)

Drain



Gate

Assembly Notes:

- Recommended solder is AuSn (80/20) solder. Refer to website for the Eutectic Die Bond Procedure application note.
- Vacuum Collet is the preferred method of pick-up.
- Die thickness is 3 mils.
- The backside of the die is the Source (ground) contact.
- Die back side gold plating is 5 microns thick minimum.
- Thermosonic ball or wedge bonding are the preferred connection methods.
- Gold wire must be used for connections.
- Use the die label (XXX-YYY) for correct orientation.

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