

# A5G26H605W19N

## Airfast RF Power GaN Transistor

Rev. 1 — 21 December 2023

Product data sheet

This 85 W asymmetrical Doherty RF power GaN transistor is designed for cellular base station applications requiring very wide instantaneous bandwidth capability covering the frequency range of 2496 to 2690 MHz.

This part is characterized and performance is guaranteed for applications operating in the 2496 to 2690 MHz band. There is no guarantee of performance when this part is used in applications designed outside of these frequencies.

### 2600 MHz

- Typical Doherty Single-Carrier W-CDMA Reference Circuit Performance:  $V_{DD} = 48$  Vdc,  $I_{DQA} = 300$  mA,  $V_{GSB} = -5.4$  Vdc,  $P_{out} = 85$  W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. <sup>(1)</sup>

Frequency	$G_{ps}$ (dB)	$\eta_D$ (%)	Output PAR (dB)	ACPR (dBc)
2620 MHz	15.1	52.5	8.4	-30.0
2655 MHz	15.3	52.3	8.2	-31.0
2690 MHz	15.0	52.1	8.1	-32.0

1. All data measured with device soldered to NXP reference circuit.

### Features

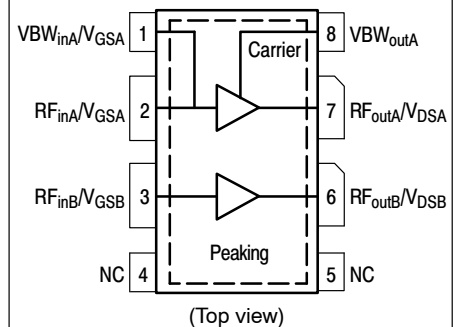
- High terminal impedances for optimal broadband performance
- Advanced high performance in-package Doherty
- Improved linearized error vector magnitude with next generation signal
- Able to withstand extremely high output VSWR and broadband operating conditions
- Plastic package

## A5G26H605W19N

2496–2690 MHz, 85 W Avg., 48 V  
AIRFAST RF POWER GaN  
TRANSISTOR



OM-780-4S4S  
PLASTIC



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

Figure 1. Pin Connections



**Table 1. Maximum Ratings**

Rating	Symbol	Value	Unit
Drain–Source Voltage	$V_{DSS}$	125	Vdc
Gate–Source Voltage	$V_{GS}$	–16, 0	Vdc
Operating Voltage	$V_{DD}$	55	Vdc
Maximum Forward Gate Current, $I_{G(A+B)}$ , @ $T_C = 25^\circ\text{C}$	$I_{GMAX}$	90	mA
Storage Temperature Range	$T_{stg}$	–65 to +150	$^\circ\text{C}$
Case Operating Temperature Range	$T_C$	–55 to +150	$^\circ\text{C}$
Maximum Channel Temperature	$T_{CH}$	225	$^\circ\text{C}$

**Table 2. Recommended Operating Conditions**

Characteristic	Symbol	Value	Unit
Operating Voltage	$V_{DD}$	48	Vdc

**Table 3. Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Thermal Resistance by Infrared Measurement, Active Die Surface–to–Case (Case Temperature $123^\circ\text{C}$ , $P_{D-Global} = 119\text{ W}$ )	$R_{\theta SC}(\text{IR})$	0.36 (1)	$^\circ\text{C/W}$
Thermal Resistance by Finite Element Analysis, Channel–to–Case Carrier (Case Temperature $121^\circ\text{C}$ , $P_D = 47.9\text{ W}$ ) Peaking (Case Temperature $123^\circ\text{C}$ , $P_D = 47.9\text{ W}$ )	$R_{\theta CHC}(\text{FEA})$	1.3 (1, 2) 1.0 (1, 2)	$^\circ\text{C/W}$

**Table 4. ESD Protection Characteristics**

Test Methodology	Class
Human Body Model (per JS–001–2017)	1B
Charge Device Model (per JS–002–2014)	C3

**Table 5. Moisture Sensitivity Level**

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD22–A113, IPC/JEDEC J–STD–020	3	245	$^\circ\text{C}$

**Table 6. Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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**Off Characteristics** (3)

Off–State Drain Leakage ( $V_{DS} = 150\text{ Vdc}$ , $V_{GS} = -8\text{ Vdc}$ )	$I_{D(BR)}$	Carrier	—	—	13.2	mAdc
( $V_{DS} = 150\text{ Vdc}$ , $V_{GS} = -8\text{ Vdc}$ )		Peaking	—	—	26.4	

**On Characteristics — Side A, Carrier**

Gate Threshold Voltage ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 30\text{ mAdc}$ )	$V_{GS(th)}$	–4.6	–2.5	–1.9	Vdc
Gate Quiescent Voltage ( $V_{DD} = 48\text{ Vdc}$ , $I_{DA} = 300\text{ mAdc}$ , Measured in Functional Test)	$V_{GSA(Q)}$	–3.1	–2.7	–2.1	Vdc

**On Characteristics — Side B, Peaking**

Gate Threshold Voltage ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 60\text{ mAdc}$ )	$V_{GS(th)}$	–4.6	–2.7	–1.9	Vdc
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1. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.nxp.com/RF> and search for AN1955.
2.  $R_{\theta CHC}(\text{FEA})$  must be used for purposes related to reliability and limitations on maximum channel temperature. MTTF may be estimated by the expression  $MTTF(\text{hours}) = 10^{[A + B/(T + 273)]}$ , where T is the channel temperature in degrees Celsius, A = –11.6 and B = 9129.
3. Each side of device measured separately.

(continued)

**Table 6. Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>Functional Tests</b> (In NXP Doherty Production Test Fixture, 50 ohm system) <sup>(1)</sup> $V_{DD} = 48\text{ Vdc}$ , $I_{DQA} = 300\text{ mA}$ , $V_{GSB} = (V_t - 1.87)\text{ Vdc}$ , $P_{out} = 85\text{ W Avg.}$ , $f = 2620\text{ MHz}$ , Single-Carrier W-CDMA, IQ Magnitude Clipping, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ $\pm 5\text{ MHz}$ Offset.					
Power Gain	$G_{ps}$	13.0	14.2	16.6	dB
Drain Efficiency	$\eta_D$	40.0	48.5	—	%
Saturated Power (Pulsed CW, 5% Duty Cycle)	$P_{sat}$	55.7	57.0	—	dBm
Adjacent Channel Power Ratio	ACPR	—	-27.5	-22.0	dBc

**Wideband Ruggedness** (In NXP Doherty Production Test Fixture, 50 ohm system)  $I_{DQA} = 300\text{ mA}$ ,  $V_{GSB} = -5.4\text{ Vdc}$ ,  $f = 2655\text{ MHz}$ , Additive White Gaussian Noise (AWGN) with 10 dB PAR

ISBW of 400 MHz at 55 Vdc, 105 W Avg. Modulated Output Power (3 dB Input Overdrive from 85 W Avg. Modulated Output Power)	No Device Degradation
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**Typical Performance** (In NXP Doherty Reference Circuit, 50 ohm system)  $V_{DD} = 48\text{ Vdc}$ ,  $I_{DQA} = 300\text{ mA}$ ,  $V_{GSB} = -5.4\text{ Vdc}$ , 2620–2690 MHz Bandwidth

<b>Pulsed CW, 10% Duty Cycle</b>					
Saturated Power <sup>(2)</sup>	$P_{sat}$	—	624	—	W
AM/PM <sup>(2)</sup> (Phase deviation from rated power to saturated power. Maximum value measured across the 2620–2690 MHz bandwidth)	$\Phi$	—	-11	—	°
Gain Variation @ Avg. Power over Temperature (-40°C to +85°C)	$\Delta G$	—	0.018	—	dB/°C
Output Power Variation @ Saturated Power over Temperature (-40°C to +85°C)	$\Delta P_{sat}$	—	0.003	—	dB/°C
<b>Single-Carrier W-CDMA, Unclipped</b>					
Gain Flatness in 70 MHz Bandwidth @ $P_{out} = 85\text{ W Avg.}$ <sup>(2)</sup>	$G_F$	—	0.5	—	dB
<b>2-Tone CW</b>					
VBW Resonance Point <sup>(2)</sup> (IMD Third Order Intermodulation Inflection Point)	$VBW_{res}$	—	290	—	MHz

**Table 7. Ordering Information**

Device	Tape and Reel Information	Package
A5G26H605W19NR3	R3 Suffix = 250 Units, 44 mm Tape Width, 13-inch Reel	OM-780-4S4S

- Internally matched part.
- All data measured with device soldered to NXP reference circuit.

## Correct Biasing Sequence for GaN Depletion Mode Transistors in a Doherty Configuration

### Bias ON the device

- Set gate voltage  $V_{GSA}$  and  $V_{GSB}$  to -5 V.
- Set drain voltage  $V_{DSA}$  and  $V_{DSB}$  to nominal supply voltage (+48 V).
- Increase  $V_{GSA}$  (carrier side) until  $I_{DQA}$  current is attained.
- Increase  $V_{GSB}$  (peaking side) to target bias voltage.
- Apply RF input power to desired level.

### Bias OFF the device

- Disable RF input power.
- Adjust gate voltage  $V_{GSA}$  and  $V_{GSB}$  to -5 V.
- Adjust drain voltage  $V_{DSA}$  and  $V_{DSB}$  to 0 V. Allow adequate time for drain voltage to reduce to 0 V from external drain capacitors.
- Disable  $V_{GSA}$  and  $V_{GSB}$ .

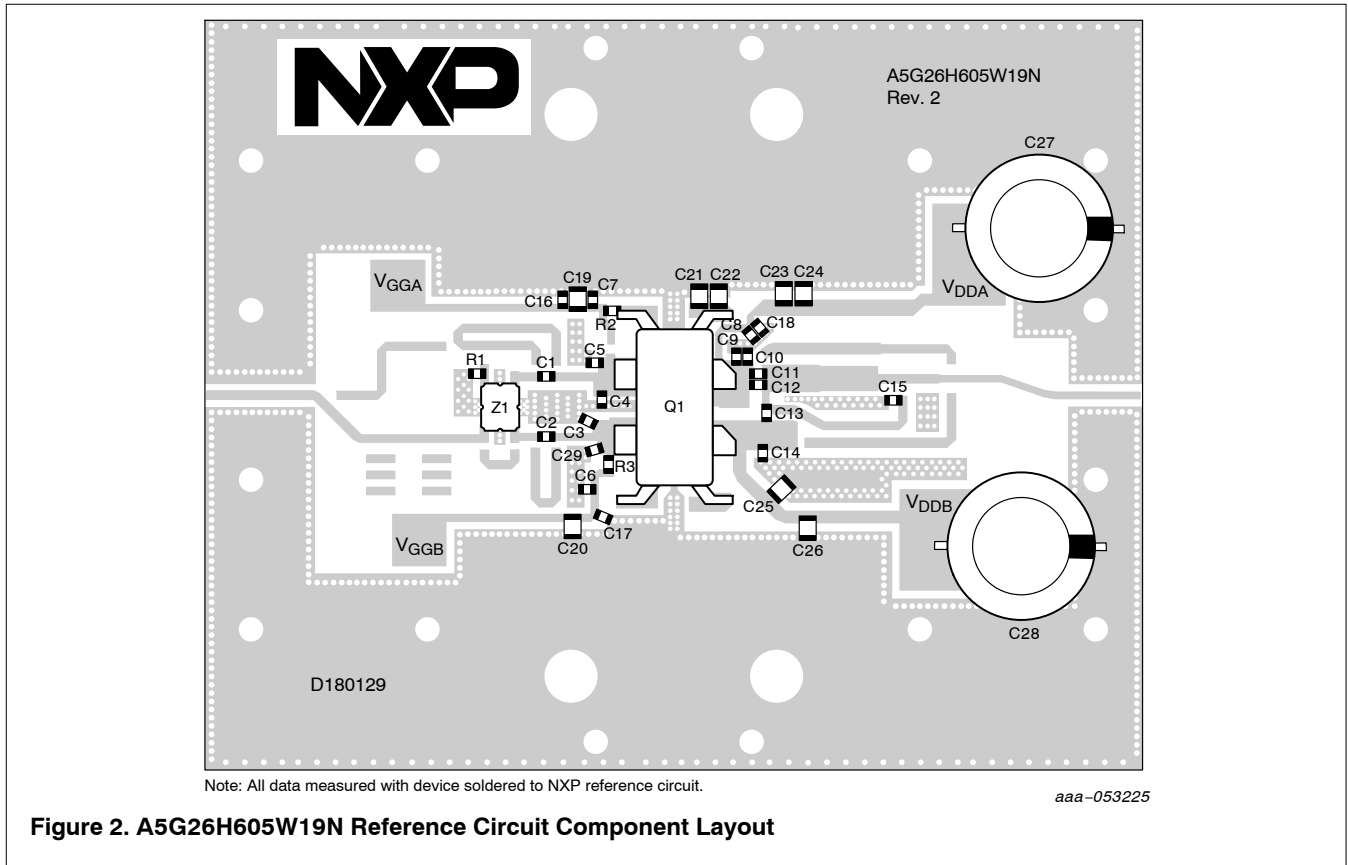
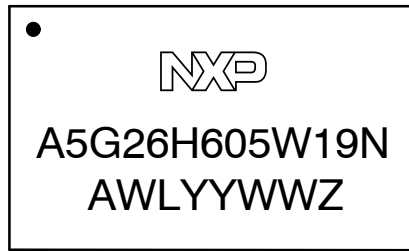


Figure 2. A5G26H605W19N Reference Circuit Component Layout

Table 8. A5G26H605W19N Reference Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	8.2 pF Chip Capacitor	600F8R2BT250XT	ATC
C2	2.4 pF Chip Capacitor	600F2R4BT250XT	ATC
C3, C4	0.6 pF Chip Capacitor	600F0R6BT250XT	ATC
C5, C9, C10, C29	1 pF Chip Capacitor	600F1R0BT250XT	ATC
C6, C7, C8	12 pF Chip Capacitor	600F120JT250XT	ATC
C11, C12	1.8 pF Chip Capacitor	600F1R8BT250XT	ATC
C13	2.7 pF Chip Capacitor	600F2R7BT250XT	ATC
C14	1.2 pF Chip Capacitor	600F1R2BT250XT	ATC
C15	3.3 pF Chip Capacitor	600F3R3BT250XT	ATC
C16, C17, C18	0.1 $\mu$ F Chip Capacitor	C1206C104K1RACTU	Kemet
C19, C20, C21, C22, C23, C24, C25, C26	10 $\mu$ F Chip Capacitor	GRM32EC72A106KE05L	Murata
C27, C28	220 $\mu$ F, 100 V Electrolytic Chip Capacitor	EEV-FK2A221M	Panasonic
R1	50 $\Omega$ , 10 W Termination Chip Resistor	81A7031-50-5F	Florida RF Labs
R2, R3	2.2 $\Omega$ , 1/8 W Chip Resistor	CRCW08052R20JNEA	Vishay
Q1	RF Power GaN Transistor	A5G26H605W19N	NXP
Z1	2300–2900 MHz, 90°, 3 dB Hybrid Coupler	X3C26P1-03S	Anaren
PCB	Rogers RO4350B, 0.020", $\epsilon_r = 3.66$	D180129	MTL



**Figure 3. Product Marking**

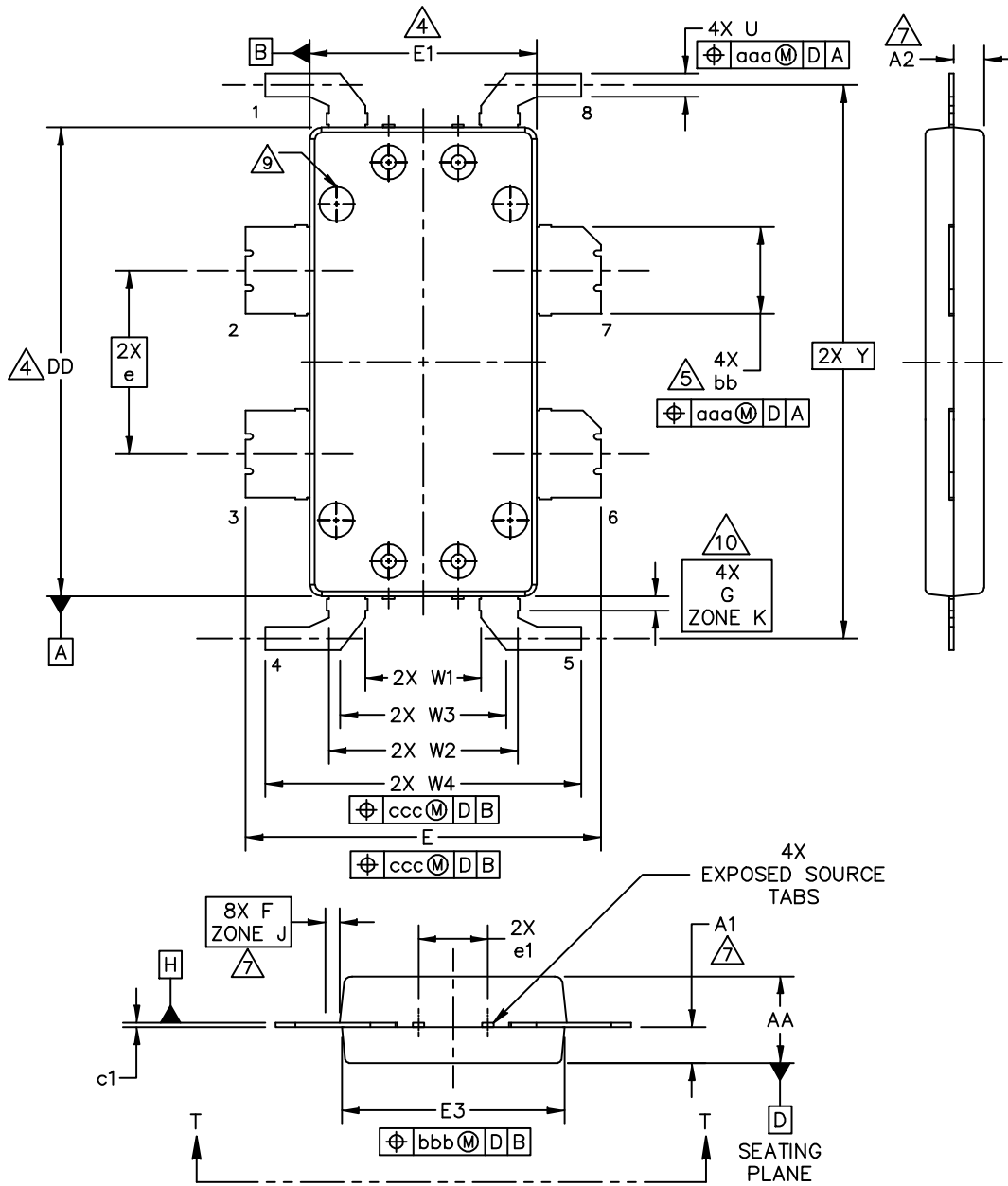
**Table 9. Product Marking Trace Code**

Identifier	Description
A	Assembly location
WL	Wafer lot indicator
YYWW	Date code
Z	Assembly lot

# Package Information

OM-780-4S4S

SOT2082-1



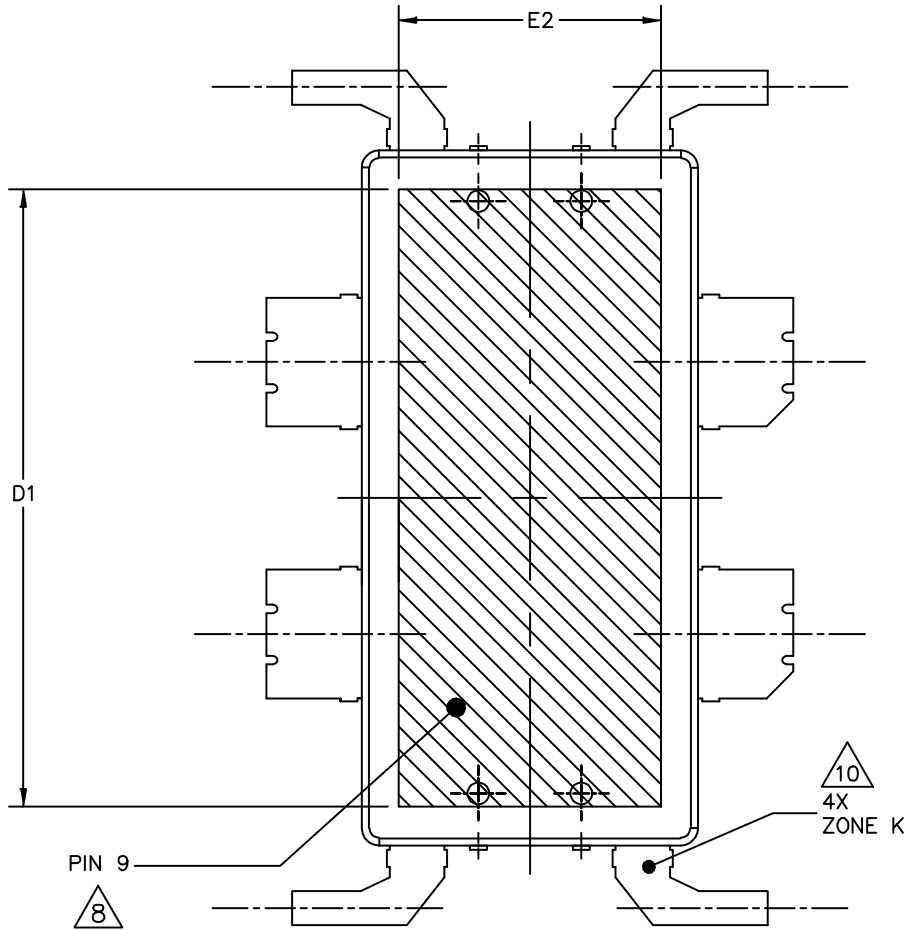
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OM-780-4S4S

SOT2082-1



BOTTOM VIEW  
VIEW T-T

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NOTES:

1. CONTROLLING DIMENSION: INCH
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
3. DATUM PLANE H IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS DD AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 INCH (0.15 MM) PER SIDE. DIMENSIONS DD AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H.
5. DIMENSION bb DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 INCH (0.13 MM) TOTAL IN EXCESS OF THE bb DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.
7. DIMENSIONS A1 AND A2 APPLIES WITHIN ZONE J ONLY. A1 APPLIES TO PINS 2, 3, 6 AND 7. A2 APPLIES TO PINS 1, 4, 5 AND 8.
8. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG. THE DIMENSIONS D1 AND E2 REPRESENT THE VALUES BETWEEN THE TWO OPPOSITE POINTS ALONG THE EDGES OF EXPOSED AREA OF HEAT SLUG.
9. DIMPLED HOLE REPRESENTS INPUT SIDE.
10. ZONE K REPRESENTS NON-SOLDERABLE REGION WHERE MOLD FLASH AND RESIN BLEED ARE PERMITTED ON BOTH SIDES OF THE LEADS.

DIM	INCH		MILLIMETER		DIM	INCH		MILLIMETER	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
AA	.148	.152	3.76	3.86	W2	.321	.331	8.15	8.41
A1	.059	.065	1.50	1.65	W3	.281	.291	7.14	7.39
A2	.056	.068	1.42	1.73	W4	.538	.554	13.67	14.07
DD	.808	.812	20.52	20.62	U	.037	.043	0.94	1.09
D1	.720	----	18.29	----	Y	.956 BSC		24.28 BSC	
E	.610	.618	15.49	15.70	bb	.147	.153	3.73	3.89
E1	.390	.394	9.91	10.01	c1	.007	.011	0.18	0.28
E2	.306	----	7.77	----	e	.317 BSC		8.05 BSC	
E3	.383	.387	9.73	9.83	e1	.116	.124	2.95	3.15
F	.025 BSC		0.64 BSC		aaa	.004		0.10	
G	.030 BSC		0.76 BSC		bbb	.006		0.15	
W1	.195	.205	4.95	5.21	ccc	.010		0.25	

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## Product Documentation, Software and Tools

Refer to the following resources to aid your design process.

### Application Notes

- AN1907: Solder Reflow Attach Method for High Power RF Devices in Plastic Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

### Software

- .s2p File

### Development Tools

- Printed Circuit Boards

## Revision History

The following table summarizes revisions to this document.

Revision	Date	Description
0	25 October 2023	<ul style="list-style-type: none"><li>• Initial release of data sheet</li></ul>
1	21 December 2023	<ul style="list-style-type: none"><li>• Table 5, Moisture Sensitivity Level: package peak temperature updated to reflect actual test data, p. 2</li></ul>

## Legal information

### Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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