

MAPC-A3025

Rev.V2

Features

- · Unmatched, Ideal for Pulsed Operation
- Suitable for Linear & Saturated Applications
- CW & Pulsed Operation: 60 W Output Power
- 28 V Operation

Applications

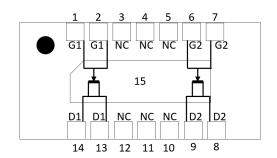
- 2-Way Private Radio
- Broadband Amplifiers
- Cellular Infrastructure
- Test Instrumentation
- Class A, AB, Linear amplifiers suitable for OFDM, W-CDMA, EDGE, CDMA waveforms

Description

The MAPC-A3025 is a 60W packaged, unmatched transistor utilizing high power GaN on SiC production process. The device is suitable for pulsed operation with output power levels of 60W (47.8 dBm) in a DFN Package.

MACOM. 3 x 6 mm DFN

Functional Schematic



Typical RF Performance:

• Measured at pulsed² @P_{SAT} defined at P_{IN} = 34dBm. V_{DS} = 28 V, I_{DQ} = 400 mA, T_{C} = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η _D (%)
2.60	47.8	13.8	77.0
2.65	47.5	13.7	77.0
2.70	47.2	13.3	76.0

Pin Configuration¹

Pin#	Pin Name	Function			
1,2	G1	RF Input / Gate 1			
13,14	D1	RF Output / Drain 1			
6,7	G2	RF Input / Gate 2			
8,9	D2	RF Output / Drain 2			
3,4,5,10,11, 12,15	NC	Ground / Source			

The exposed pad centered on the package bottom must be connected to RF and DC ground.

Ordering Information

Part Number	Package
MAPC-A3025-AD000	Bulk Quantity
MAPC-A3025-SBPPR	Sample Board
MAPC-A3025-ADTR1	Tape and Reel

^{*} Restrictions on Hazardous Substances, compliant to current RoHS EU directive.



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RF Electrical Characteristics: $T_C = 25^{\circ}C$, $V_{DS} = 28$ V, $I_{DQ} = 400$ mA Note: Performance in MACOM Evaluation Test Fixture, 50 Ω system

Parameter	Test Conditions	Symbol	Min.	Тур.	Max.	Units
Power Gain	Pulsed ² , 2.6 GHz, P _{IN} = 34 dBm	G _{SAT}	_	13.8	_	dB
Saturated Drain Efficiency	Pulsed ² , 2.6 GHz, P _{IN} = 34 dBm	η_{SAT}	_	77.0	_	%
Saturated Output Power	Pulsed ² , 2.6 GHz, P _{IN} = 34 dBm	P _{SAT}	_	47.8	_	dBm
Ruggedness: Output Mismatch	Ruggedness: Output Mismatch All phase angles		VSV	VR = 10:	1; No Da	mage

RF Electrical Specifications: $T_A = 25^{\circ}C$, $V_{DS} = 28 \text{ V}$, $I_{DQ} = 400 \text{ mA}$ Note: Performance in MACOM Production Test Fixture, 50 Ω system

Parameter	Test Conditions	Symbol	Min.	Тур.	Max.	Units
Power Gain	Pulsed ² , 2.6 GHz, P _{IN} = 34 dBm	G _{SAT}	13.4	13.7	_	dB
Saturated Drain Efficiency	Pulsed ² , 2.6 GHz, P _{IN} = 34 dBm	η _{SAT}	65	74	_	%
Saturated Output Power	Pulsed ² , 2.6 GHz, P _{IN} = 34 dBm	P _{SAT}	47.4	47.7	_	dBm

^{2.} Pulse details: 100 µs pulse width, 10% Duty Cycle.

DC Electrical Characteristics T_A = 25°C

Parameter	Test Conditions 5		Min.	Тур.	Max.	Units
Drain-Source Leakage Current	$V_{GS} = -8 \text{ V}, V_{DS} = 10 \text{ V}$	I _{DLK}	-	-	2	mA
Gate-Source Leakage Current	V _{GS} = -8 V, V _{DS} = 10 V	I _{GLK}	-2	-	-	mA
Gate Threshold Voltage	$V_{DS} = 28 \text{ V}, I_{D} = 14.4 \text{ mA}$	V _T	-3.6	-3.1	-2.4	V
Gate Quiescent Voltage	V_{DS} = 28 V, I_{D} = 300 mA	V_{GSQ}	-	-2.4	-	V



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Absolute Maximum Ratings 3,4,5,6

Parameter	Absolute Maximum		
Drain Source Voltage, V _{DS}	28 V		
Gate Source Voltage, V _{GS}	-10 to 2 V		
Gate Current, I _G	14 mA		
Storage Temperature Range	-65°C to +150°C		
Case Operating Temperature Range	-40°C to +85°C		
Channel Operating Temperature Range, T _{CH}	-40°C to +225°C		

^{3.} Exceeding any one or combination of these limits may cause permanent damage to this device.

Thermal Characteristics

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Finite Element Analysis	V_{DS} = 28 V, P_{DISS} = 43.2 W T_{C} = 85°C, T_{CH} = 225°C	$R_{\theta}(FEA)$	1.83	°C/W
Thermal Resistance using Finite Element Analysis (per side)	V _{DS} = 28 V, P _{DISS} = 21.6 W T _C = 85°C, T _{CH} = 225°C	$R_{\theta}(FEA)$	3.65	°C/W

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Nitride Circuits 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 1C and CDM Class C3 devices.

^{4.} MACOM does not recommend sustained operation above maximum operating conditions.

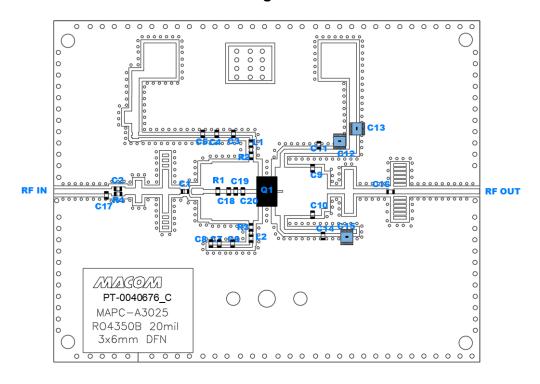
^{5.} Operating at drain source voltage V_{DS} < 28 V will ensure MTTF > 2 x 10⁶ hours. 6. Operating at nominal conditions with $T_{CH} \le 225^{\circ}$ C will ensure MTTF > 2 x 10⁶ hours.



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Evaluation Board and Recommended Tuning Solution 2.6 - 2.7GHz



Reference Designator	Value	Tolerance	Manufacturer	Part Number
C1	27 pF	±5%	Johanson	QSCT251Q270J1GV001E
R1	100 Ω	±5%	Vishay	CRCW12100000Z0EAHP
R2,R3	10 Ω	±1%	Yageo	RC0603FR-0710KL
C2	2.4 pF	±0.1pF	Johanson	QSCT251Q2R4B1GV001E
R4	150 Ω	±5%	Yageo	RC0603JR-13150RL
L1, L2	22 nH	±5%	Coilcraft	0201HL-22NXJRW
C3, C6	27 pF	±5%	Johanson	QSCT251Q270J1GV001E
C7, C4, C12, C15	1000 pF	±10%	Murata	GRM21AR72E102KW01D
C5, C8, C13, C16	2.2 µF	±20%	Murata	GRM21BD72A225ME01K
C9, C10	0.6 pF	±0.05pF	Johanson	QSCT251Q0R6A1GV001E
C11, C14	20 pF	±5%	Johanson	QSCT251Q200J1GV001E
C17	15 pF	±5%	Johanson	QSCT251Q150J1GV001E
C18, C19, C20	1 pF	±0.1pF	Johanson	QSCT251Q1R0B1GV001E

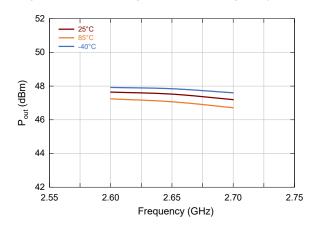


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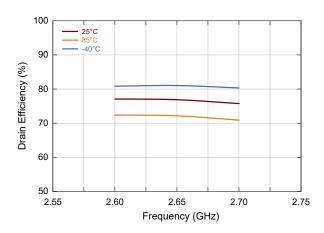
Rev.V2

Typical Performance Curves as Measured in the 2.6 - 2.7 GHz Evaluation Board: Pulsed², V_{DS} = 28 V, I_{DQ} = 400 mA, Pin = 34dBm, T_{C} = 25°C (Unless Otherwise Noted)

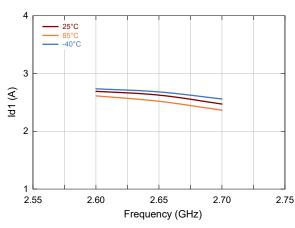
Output Power vs. Temperature and Frequency



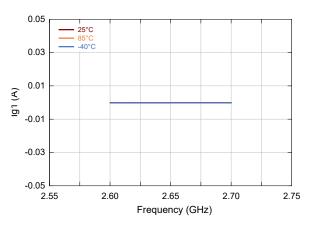
Drain Efficiency vs. Temperature and Frequency



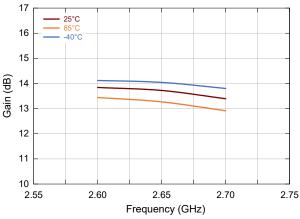
Drain Current vs. Temperature and Frequency



Gate Current vs. Temperature and Frequency



Large Signal Gain vs. Temperature and Frequency



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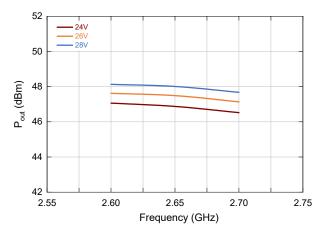


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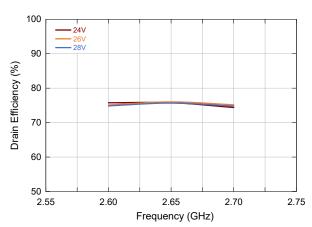
Rev.V2

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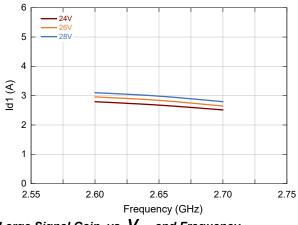
Output Power vs. V_{DS} and Frequency



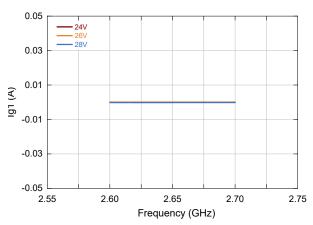
Drain Efficiency vs. $oldsymbol{V}_{ extsf{DS}}$ and Frequency



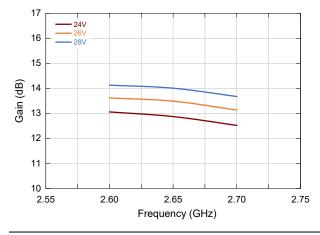
Drain Current vs. $oldsymbol{V}_{DS}$ and Frequency



Gate Current vs. $V_{ m DS}$ and Frequency



Large Signal Gain vs. $V_{ m DS}$ and Frequency



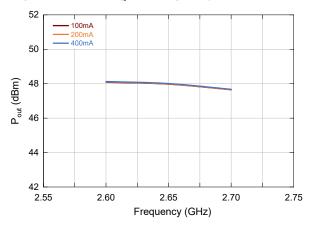


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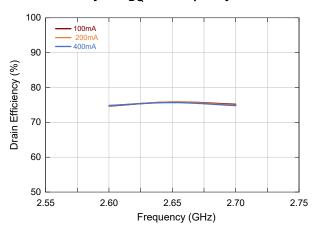
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Typical Performance Curves as Measured in the 2.6 - 2.7 GHz Evaluation Board: $Pulsed^2$, $V_{DS} = 28$ V, $I_{DQ} = 400$ mA, Pin = 34dBm, $T_C = 25$ °C (Unless Otherwise Noted)

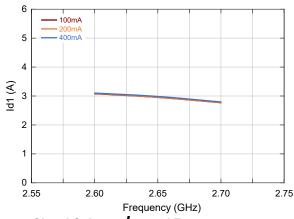
Output Power vs. I_{DQ} and Frequency



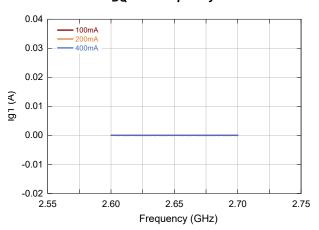
Drain Efficiency vs. I_{DQ} and Frequency



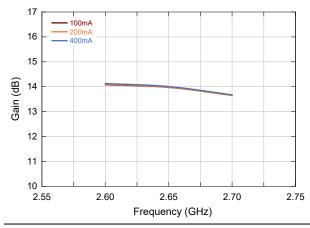
Drain Current vs. IDQ and Frequency



Gate Current vs. IDQ and Frequency



Large Signal Gain vs. I_{DQ} and Frequency



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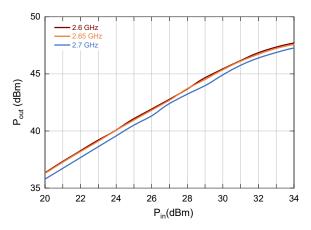


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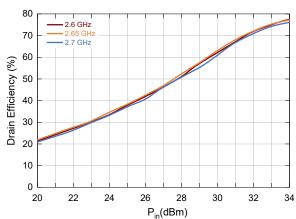
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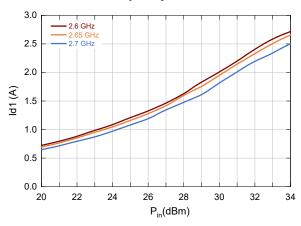
Output Power vs. Frequency and PIN



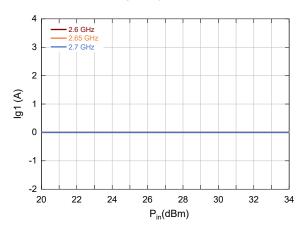
Drain Efficiency vs. Frequency and P_{IN}



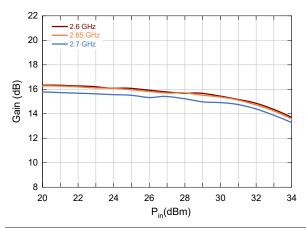
Drain Current vs. Frequency and PIN



Gate Current vs. Frequency and PIN



Large Signal Gain vs. Frequency and PIN



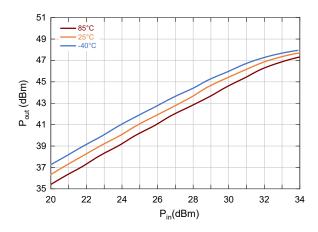


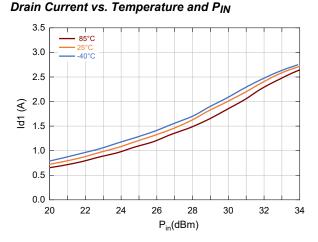
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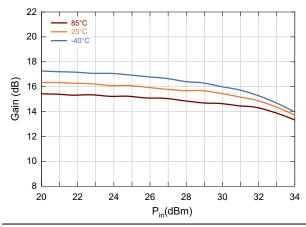
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Output Power vs. Temperature and PIN

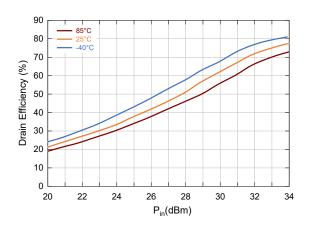




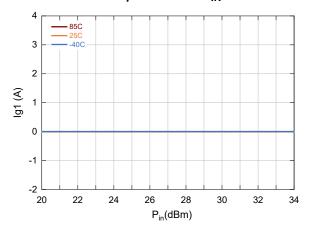
Large Signal Gain vs. Temperature and PIN



Drain Efficiency vs. Temperature and PIN



Gate Current vs. Temperature and PIN



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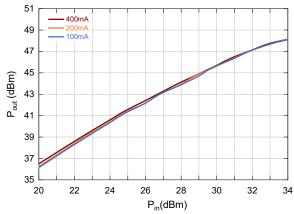


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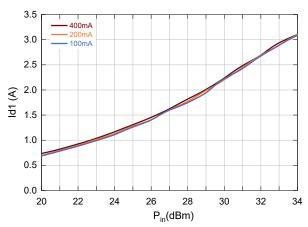
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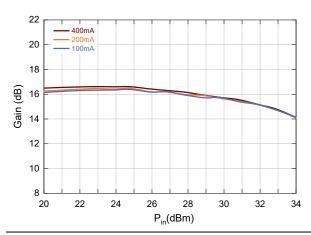
Output Power vs. IDO and PIN



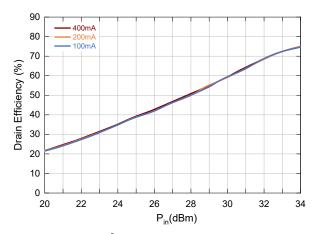
Drain Current vs. I_{DQ} and P_{IN}



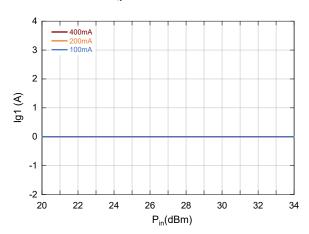
Large Signal Gain vs. I_{DQ} and P_{IN}



Drain Efficiency vs. I_{DQ} and P_{IN}



Gate Current vs. IDQ and PIN



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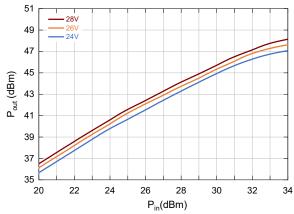


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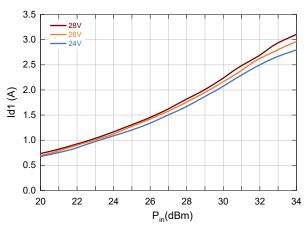
Rev.V2

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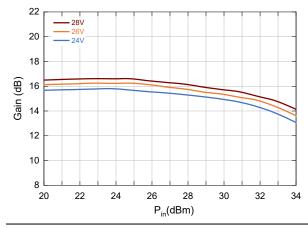
Output Power vs. V_{DS} and P_{IN}



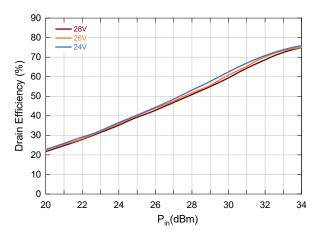
Drain Current vs. V_{DS} and P_{IN}



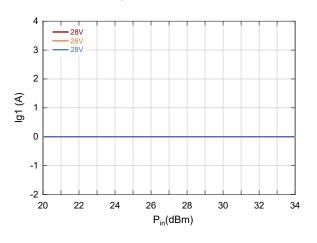
Large Signal Gain vs. V_{DS} and P_{IN}



Drain Efficiency vs. V_{DS} and P_{IN}



Gate Current vs. V_{DS} and P_{IN}



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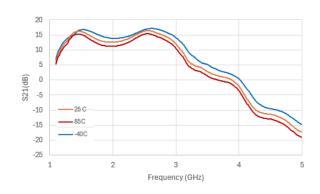


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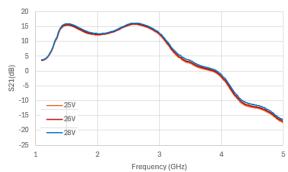
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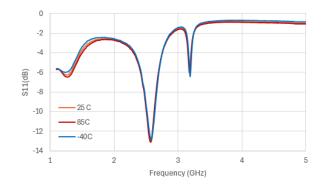
S₂₁ over Temperature vs. Frequency @ 28V



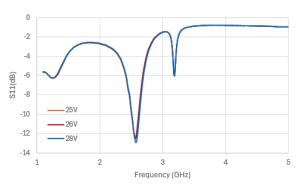
S₂₁ over Voltage vs. Frequency @ 25C



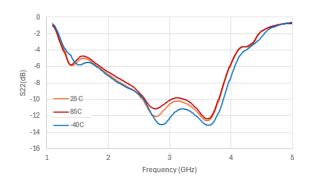
S₁₁ over Temperature vs. Frequency @ 28V



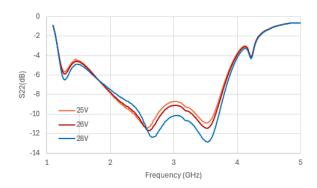
S₁₁ over Voltage vs. Frequency @ 25C



S₂₂ over Temperature vs. Frequency @ 28V



S₂₂ over Voltage vs. Frequency @ 25C



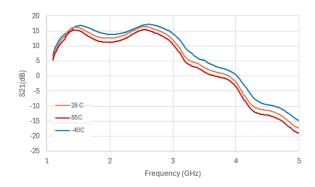


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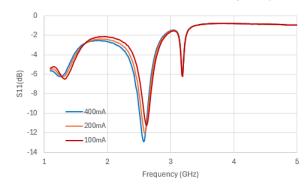
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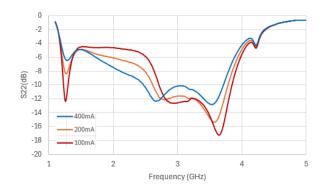
S₂₁ over Quiescent Drain Current vs. Frequency



S₁₁ over Quiescent Drain Current vs. Frequency



S₂₂ over Quiescent Drain Current vs. Frequency

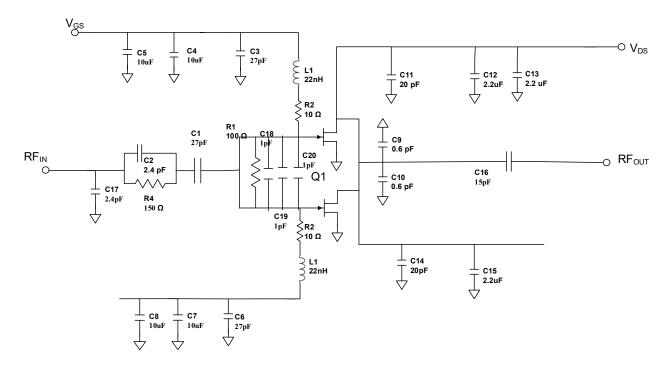




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Evaluation Test Fixture and Recommended Tuning Solution 2.6 - 2.7 GHz



Description

Parts measured on evaluation board (20 mil thick RO4350B). Matching is provided using a combination of lumped elements and transmission lines as shown in the simplified schematic above. Recommended tuning solution component placement, transmission lines, and details are shown on the next page.

Bias Sequencing Turning the device ON

- 1. Set V_{GS} to pinch-off (V_P).
- 2. Turn on V_{DS} to nominal voltage (50 V).
- 3. Increase V_{GS} until I_{DS} current is reached.
- 4. Apply RF power to desired level.

Turning the device OFF

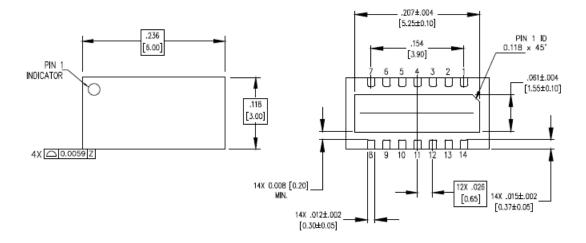
- 1. Turn the RF power OFF.
- 2. Decrease V_{GS} down to V_P pinch-off.
- 3. Decrease V_{DS} down to 0 V.
- 4. Turn off V_{GS}.

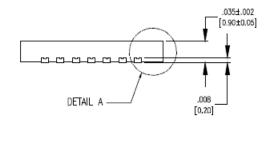


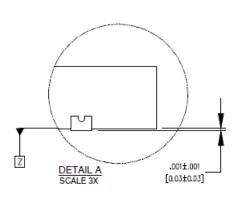
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Lead-Free 3 x 6 mm 14-Lead DFN[†]







NOTES:

- ALL DIMENSIONS SHOWN AS in[mm]. CONTROLLING DIMENSIONS ARE IN in. CONVERTED mm DIMENSIONS ARE NOT NECESSARILY EXACT.
- 2. EXPOSED LEADS: NiPdAu.

[†] Reference Application Note S2083 for lead-free solder reflow recommendations. Meets JEDEC moisture sensitivity level 1 requirements . Plating is Ni/Pd/Au.

GaN Transistor 28 V, 60 W DC - 6 GHz



MACOM PURE CARBIDE

MAPC-A3025

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