## Features

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


3 x 6 mm DFN

## 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 high power GaN on Silicon Carbide HEMT D-mode amplifier. The device is suitable for pulsed operation with output power levels of 60W (47.8 dBm) in a DFN Package.

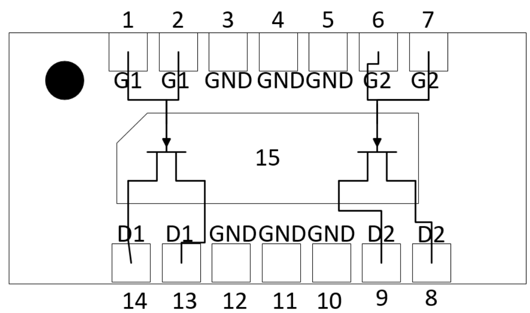
## Typical Performance:

Measured Evaluation Test Fixture at $P_{IN}$ = 34 dBm, 100 µs pulse width, 10% duty cycle,

- $V_{DS}$ = 28 V, $I_{DQ}$ = 400 mA, $T_C$ = 25°C

| Frequency (GHz) | Output Power (dBm) | Gain (dB) | $\eta_D$ (%) |
|---|---|---|---|
| 2.60 | 47.8 | 13.8 | 77.0 |
| 2.65 | 47.5 | 13.7 | 77.0 |
| 2.70 | 47.2 | 13.3 | 76.0 |

## Functional Schematic




## Pin Configuration[1]

| 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 |

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

## Ordering Information

| Part Number | Package |
|---|---|
| MAPC-A3025-ABPPR | Bulk Quantity |
| MAPC-A3025-SBPPR | Sample Board |

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



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

| Parameter | Test Conditions | Symbol | Min. | Typ. | 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 | $\eta_{SAT}$ | — | 77.0 | — | % |
| Saturated Output Power | Pulsed[2], 2.6 GHz, $P_{IN}$ = 34 dBm | $P_{SAT}$ | — | 47.8 | — | dBm |
| Ruggedness: Output Mismatch | All phase angles | Ψ | VSWR = 10:1; No Damage | | | |

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

| Parameter | Test Conditions | Symbol | Min. | Typ. | 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 | $\eta_{SAT}$ | 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 | Symbol | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Drain-Source Leakage Current | $V_{GS}$ = -8 V, $V_{DS}$ = 10 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 V, $I_D$ = 14.4 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.
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 $10^6$ hours.
6. Operating at nominal conditions with $T_{CH}$ ≤ 225°C will ensure MTTF > 2 x $10^6$ hours.

## Thermal Characteristics

| Parameter | Test Conditions | Symbol | Typical | Units |
|---|---|---|---|---|
| Thermal Resistance using Finite Element Analysis | $V_{DS}$ = 28 V, $P_{DISS}$ = 43.2 W<br>$T_C$ = 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<br>$T_C$ = 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 devices.



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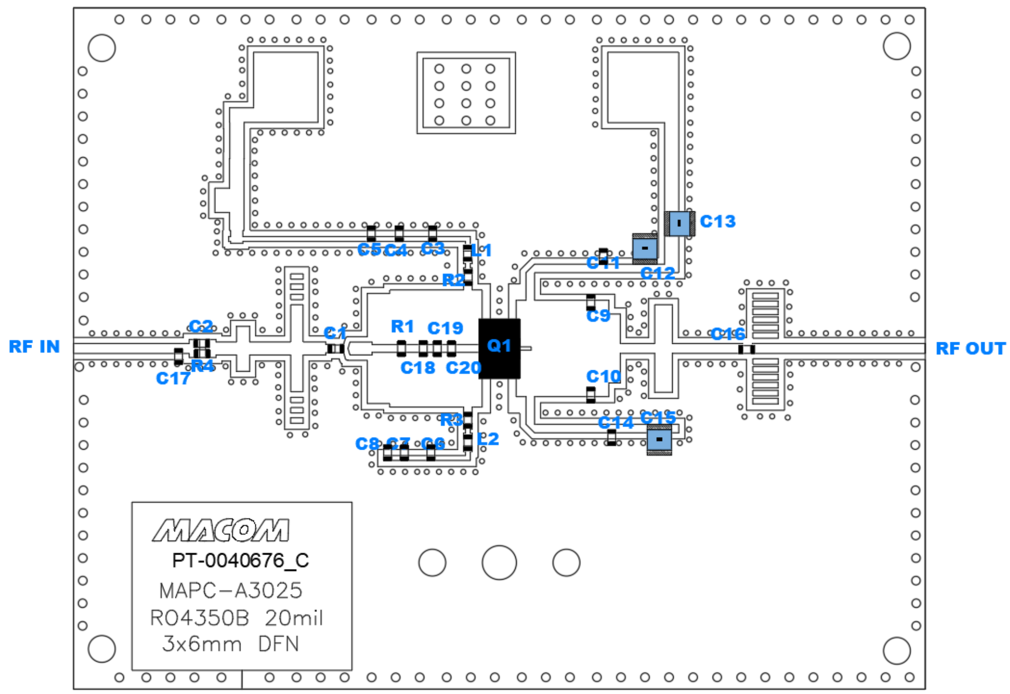
## Evaluation Board and Recommended Tuning Solution 2.6 - 2.7GHz




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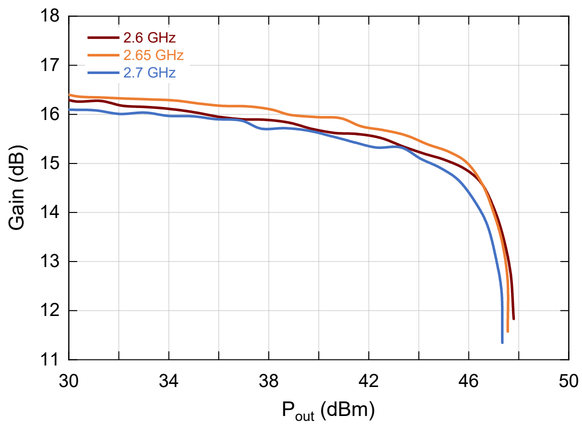
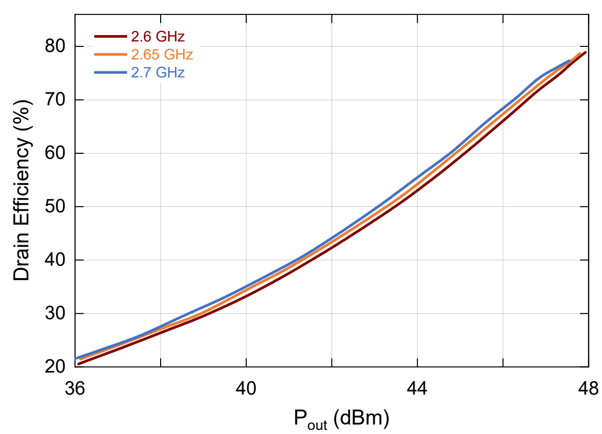
## Typical Performance Curves as Measured in the 2.6 - 2.7 GHz Evaluation Board: Pulsed[2] , $V_{DS}$ = 28 V, $I_{DQ}$ = 400 mA, $T_C$ = 25°C (Unless Otherwise Noted)

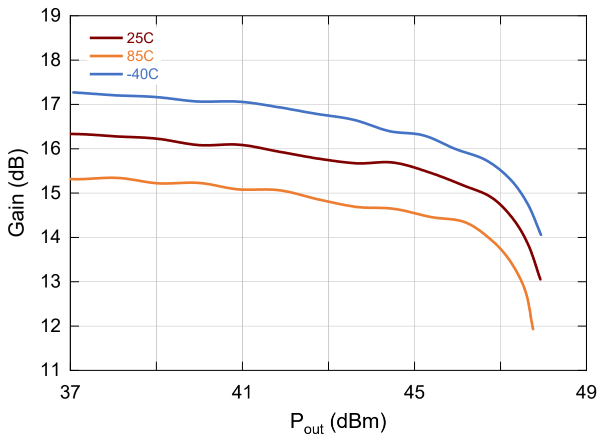
*Gain vs. Output Power and Frequency*



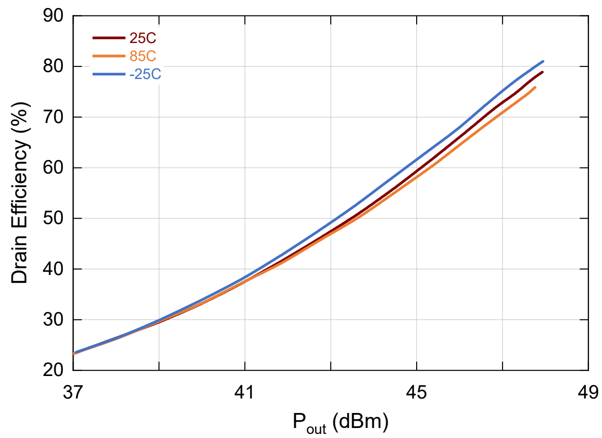

*Drain Efficiency vs. Output Power and Frequency*




*Gain vs. Output Power and $T_{C}$, 2.6 GHz*




*Drain Efficiency vs. Output Power and $T_{C}$, 2.6 GHz*



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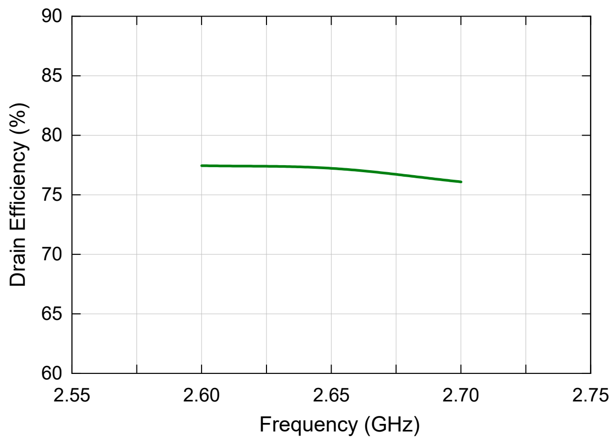
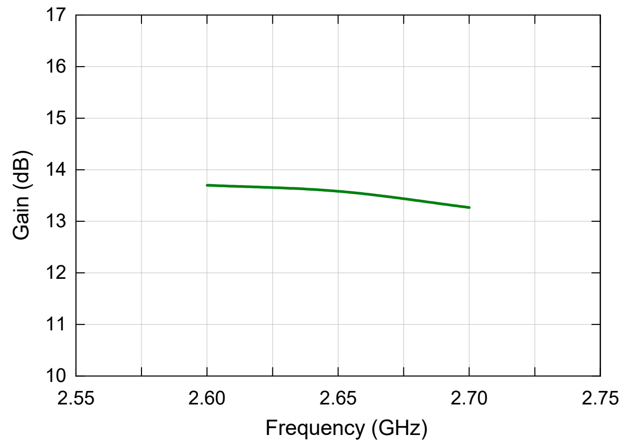
## Typical Performance Curves as Measured in the 2.6 - 2.7 GHz Evaluation Board: Pulsed[2], 2.6 GHz, $V_{DS}$ = 28 V, $I_{DQ}$ = 400 mA, $T_C$= 25°C (Unless Otherwise Noted)

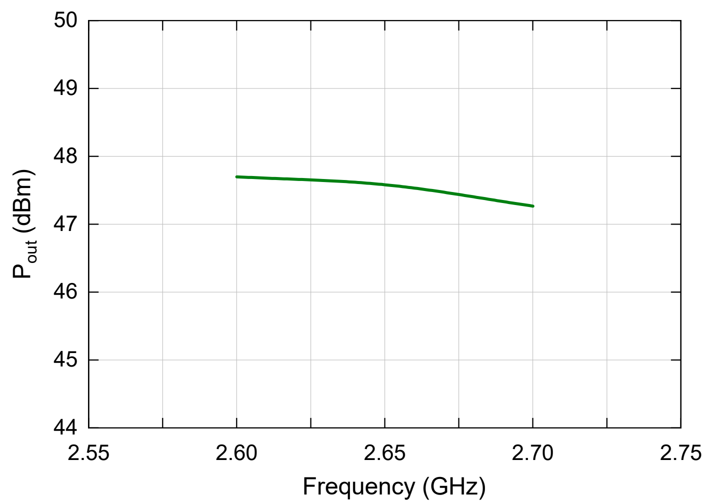
*Gain vs. Frequency, Fixed $P_{IN}$ = 34 dBm*




*Drain Efficiency vs. Frequency, Fixed $P_{IN}$ = 34 dBm*




*Output Power vs. Frequency, Fixed $P_{IN}$ = 34 dBm*



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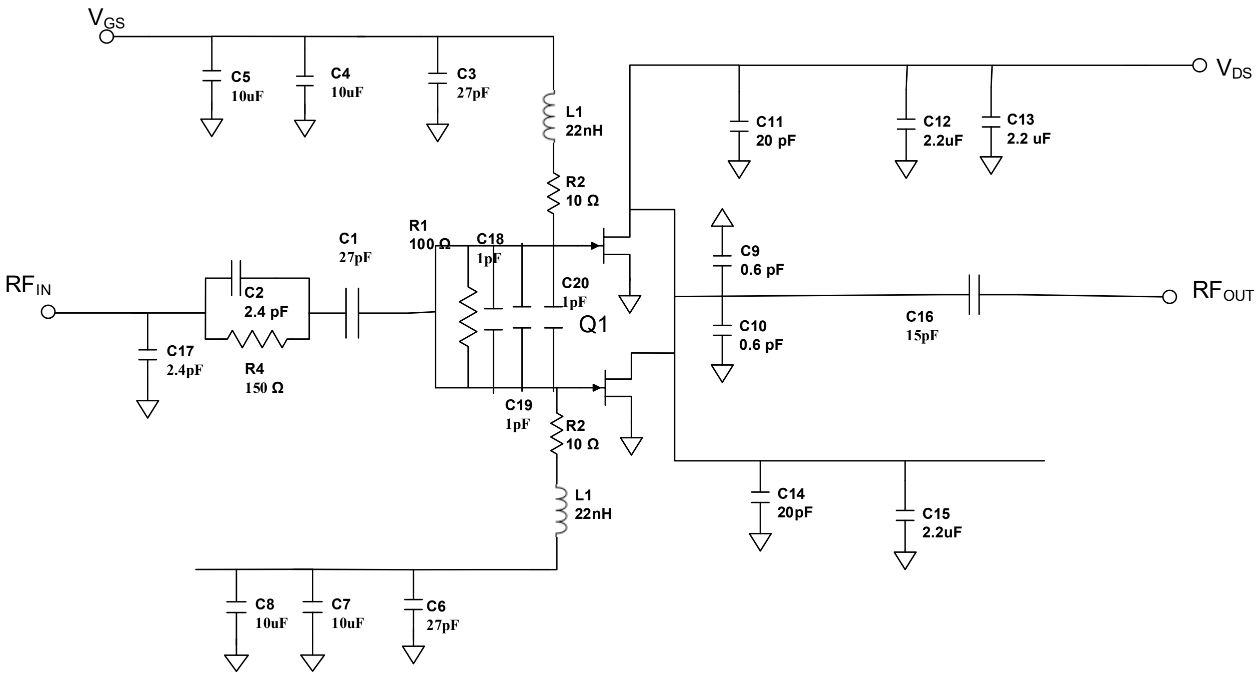
## Evaluation Test Fixture and Recommended Tuning Solution 2.6 - 2.7 GHz




## 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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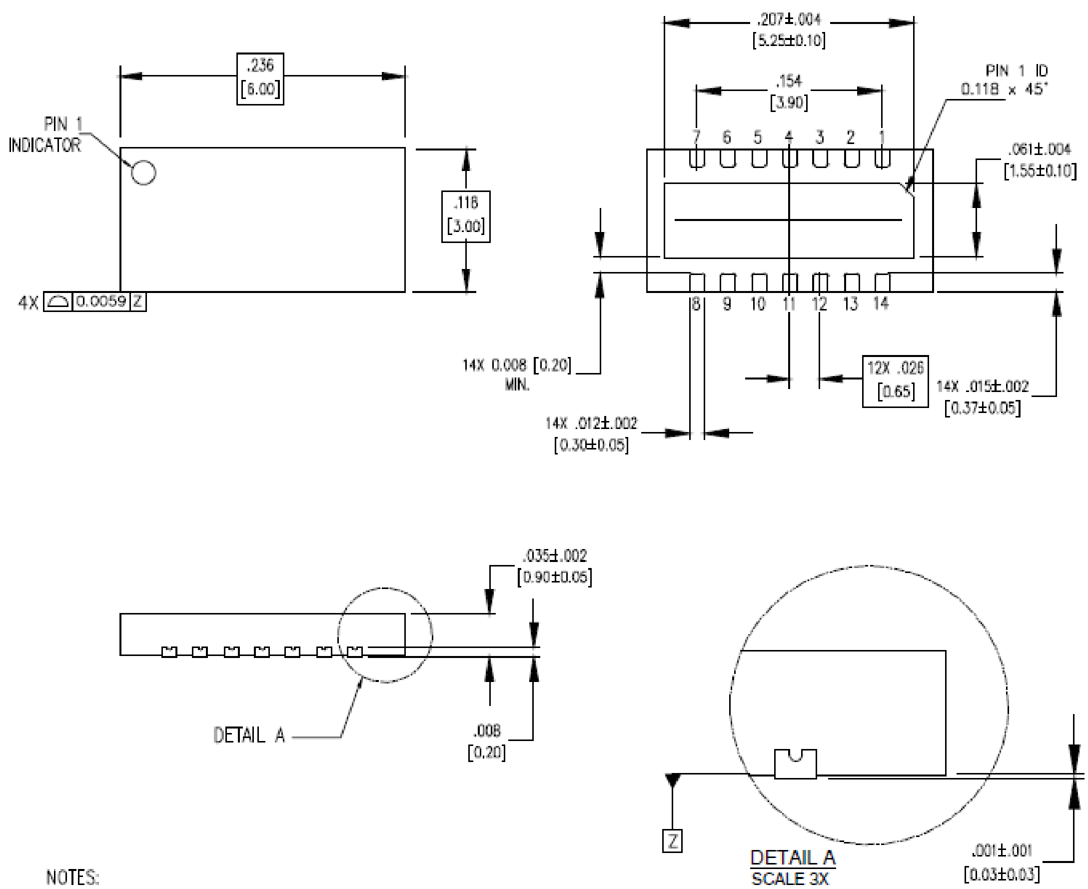
DC-0035305

## Lead-Free 3 x 6 mm 14-Lead DFN†




NOTES:
1. 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.



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