

## Features

- Ideal for DECT Applications
- Power Set Pin for Adjustable Output Power  
High Power Mode: 25.5 dBm  
Low Power Mode: 17 dBm
- Power Gain: 25 dB Typical
- Voltage Supply Compensation
- Ramp Power Control
- Micro-Amp Shutdown Current
- Operates from 1.8 V to 3.6 V
- Lead-Free 3 mm 12-Lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- RoHS\* Compliant and 260°C Reflow Compatible

## Description

The MAAPSS0076 is a three stage power amplifier designed for Digitally Enhanced Cordless Telephone applications. The power amplifier is available in a lead-free 3 mm 12-lead PQFN plastic package.

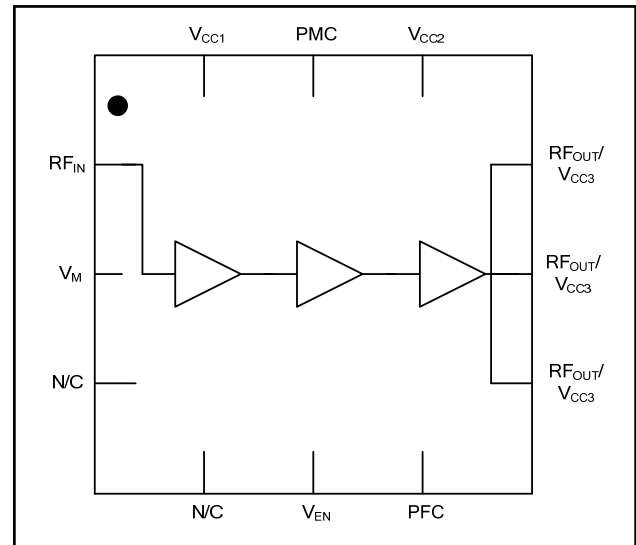
The MAAPSS0076 features an integrated power enable pin (5) for accurate ramp control and a separate power mode pin (2) for current savings in a low power mode state. A voltage compensation circuit is also included for applications where the amplifier supply voltage is not regulated and is directly connected to the battery.

## Ordering Information <sup>1</sup>

Part Number	Package
MAAPSS0076TR-3000	3000 piece reel
MAAPSS0076SMB	Sample Test Board (Includes 5 Samples)

1. Reference Application Note M513 for reel size information.

## Functional Schematic



## Pin Configuration

Pin No.	Pin Name	Description
1	RF <sub>IN</sub>	RF Input
2	V <sub>M</sub>	Power Mode
3	N/C	No Connection
4	N/C	No Connection
5	V <sub>EN</sub>	Power Enable
6	PFC	Power Flatness Control
7	RF <sub>OUT</sub> / V <sub>CC3</sub>	RF Output, 3rd Stage Supply
8	RF <sub>OUT</sub> / V <sub>CC3</sub>	RF Output, 3rd Stage Supply
9	RF <sub>OUT</sub> / V <sub>CC3</sub>	RF Output, 3rd Stage Supply
10	V <sub>CC2</sub>	2nd Stage Supply
11	PMC	Power Mode Control
12	V <sub>CC1</sub>	1st Stage Supply
Pad <sup>2</sup>	GND	RF & DC Ground

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

\* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

**Electrical Specifications: F = 1900 MHz, P<sub>IN</sub> = 0 dBm, V<sub>CC</sub> = 2.4 V, T<sub>A</sub> = 25 °C, Z<sub>0</sub> = 50 Ω**

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Input Return Loss	V <sub>M</sub> = 0 V	dB	—	11	—
	V <sub>M</sub> = 2.5 V	dB	—	8	—
P <sub>OUT</sub> , High Power Mode (HPM)	V <sub>M</sub> = 2.5 V, V <sub>CC</sub> = 3.0 V	dBm	—	26.5	27
	V <sub>CC</sub> = 2.4 V	dBm	—	25.5	—
	V <sub>CC</sub> = 2.0 V	dBm	23	24.0	—
	V <sub>CC</sub> = 1.8 V	dBm	—	23.5	—
P <sub>OUT</sub> vs. Temperature, HPM	T <sub>A</sub> = 0 °C to 50 °C, V <sub>CC</sub> = 2.4 V	dB	—	0.8	—
P <sub>OUT</sub> vs. V <sub>EN</sub>	V <sub>EN</sub> = 1.9 to 2.5 V	dB	—	1.2	—
Current, HPM	V <sub>M</sub> = 2.5 V, V <sub>CC</sub> = 3.0 V	mA	—	320	400
P <sub>OUT</sub> , Low Power Mode (LPM)	V <sub>M</sub> = 0 V, V <sub>CC</sub> = 2.4 V	dBm	14	17	—
Current, LPM	V <sub>M</sub> = 0 V, V <sub>CC</sub> = 2.4 V	mA	—	140	200
Current, Shutdown	V <sub>CC</sub> = 3.0 V, V <sub>EN</sub> = 0.5 V	μA	—	1	10
Control Pins	V <sub>EN</sub> , V <sub>M</sub> low	V	0	—	0.5
	V <sub>EN</sub> , V <sub>M</sub> high	V	2.0	—	2.5
	V <sub>M</sub> current	mA	—	—	1.0
	V <sub>EN</sub> current	mA	—	—	3.0
Harmonics	V <sub>M</sub> = 2.5 V, V <sub>CC</sub> = 2.4 V	2f <sub>o</sub>	—	-50	—
		3f <sub>o</sub>	—	-60	—
Forward Isolation	V <sub>EN</sub> = 0 V	dB		36	
Stability	+1.5 V < V <sub>CC</sub> < +3.5 V, P <sub>OUT</sub> = HPM & LPM, VSWR < 6:1 -20°C < T <sub>A</sub> < +70°C, RBW = 3 MHz max. hold		All spurs < -60 dBc		
Turn on/off time	t <sub>on</sub> : RF burst to (Avg Power – 1 dB)	μS	—	3	—
	t <sub>off</sub> : (Avg Power – 1 dB) to RF off	μS	—	5	—

### Absolute Maximum Ratings <sup>3,4</sup>

Parameter	Absolute Maximum
Input Power	+ 5 dBm
Operating Supply Voltage	+4.0 Volts
Operating Control Voltage	+3.0 Volts
Operating Temperature	-20 °C to +85 °C
Channel Temperature	+150 °C
Storage Temperature	-40 °C to +150 °C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM does not recommend sustained operation near these survivability limits.

### Logic Table <sup>5</sup>

V <sub>EN</sub>	V <sub>M</sub>	State
0	0	OFF
0	1	OFF
1	0	LPM
1	1	HPM

5. 1 = +2.0 V to 2.5 V, 0 = 0 V to 0.5 V.

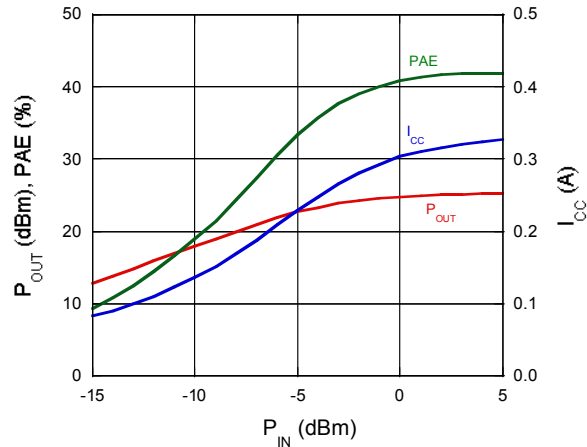
### Operating the MAAPSS0076

The MAAPSS0076 is sensitive to electrostatic discharge (ESD). Use proper ESD control techniques when handling this device. To operate the MAAPSS0076, follow these steps. Ramp down or shut down in reverse order.

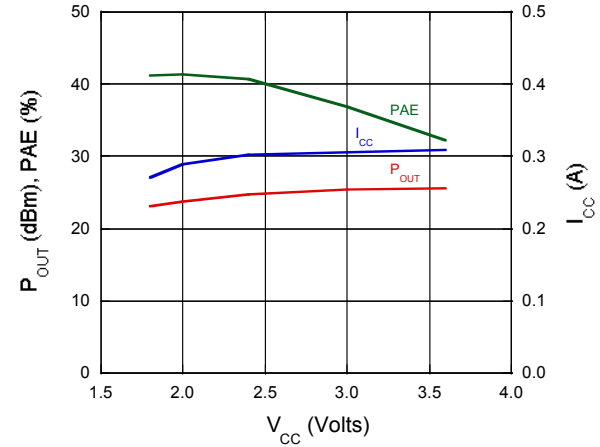
- Apply V<sub>CC</sub> (2.4 V).
- Apply V<sub>M</sub> (0 or 2.5 V).
- Apply P<sub>IN</sub> (-2 to 2 dBm).
- Ramp V<sub>EN</sub> from 0 to 2.5 V.

## High Power Mode Typical Performance, $V_M = 2.5\text{ V}$ (using the supplied sample board BOM)

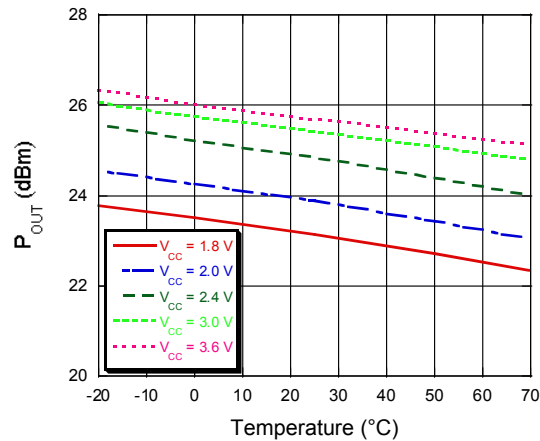
$P_{OUT}$ , PAE,  $I_{CC}$  vs.  $P_{IN}$  @ 2.4 V, 1900 MHz



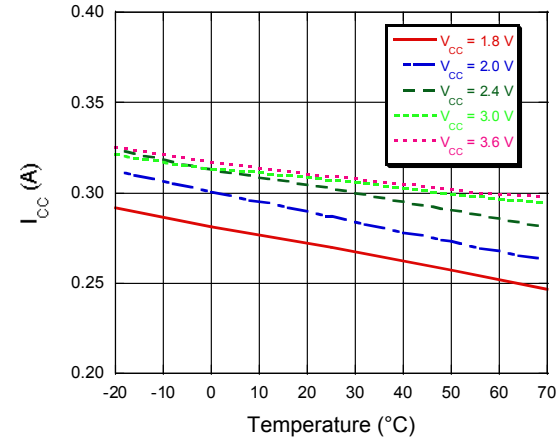
$P_{OUT}$ , PAE,  $I_{CC}$  vs.  $V_{CC}$  @ 1900 MHz



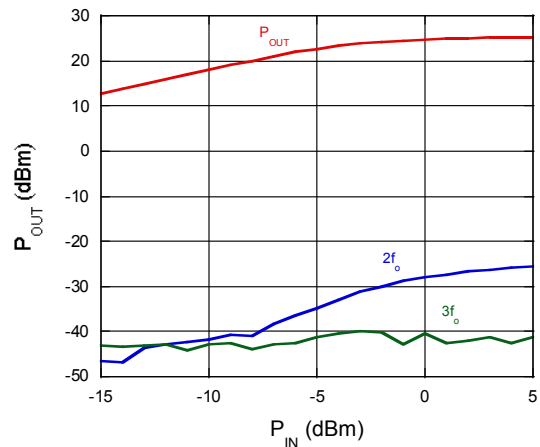
$P_{OUT}$  vs. Temperature @ 1900 MHz,  $P_{IN} = 0\text{ dBm}$



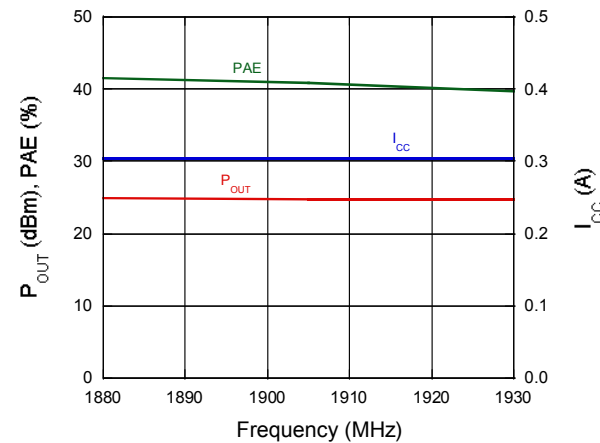
$I_{CC}$  vs. Temperature @ 1900 MHz,  $P_{IN} = 0\text{ dBm}$



$P_{OUT}$ ,  $2f_o$ ,  $3f_o$  vs.  $P_{IN}$  @ 2.4 V



$P_{OUT}$ , PAE,  $I_{CC}$  vs. Frequency @  $V_{CC} = 2.4\text{ V}$ ,  $P_{IN} = 0\text{ dBm}$



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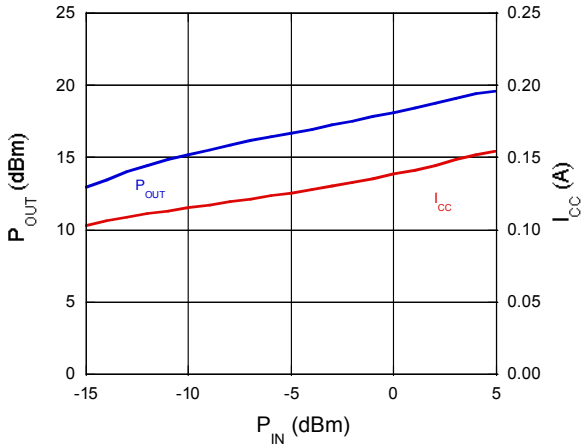
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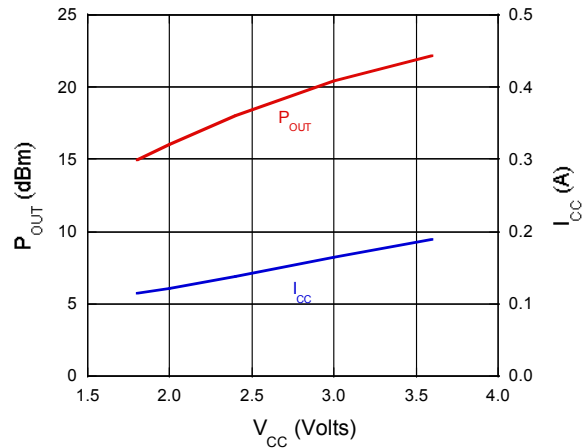
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**Low Power Mode Typical Performance,  $V_M = 0$  V (using the supplied sample board BOM)**

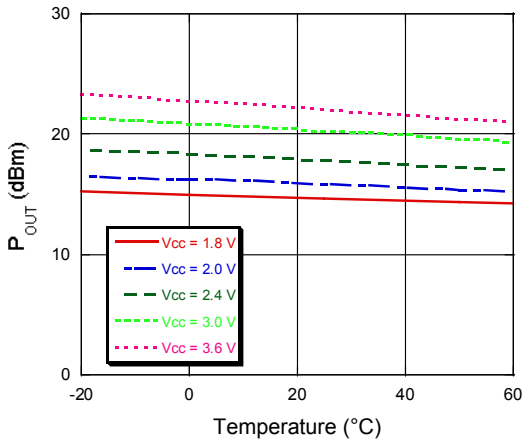
$P_{OUT}$ ,  $I_{CC}$  vs.  $P_{IN}$  @ 2.4 V, 1900 MHz



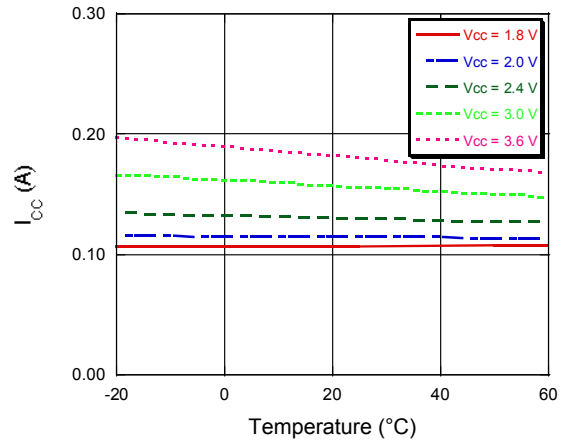
$P_{OUT}$ ,  $I_{CC}$  vs.  $V_{CC}$  @ 1900 MHz



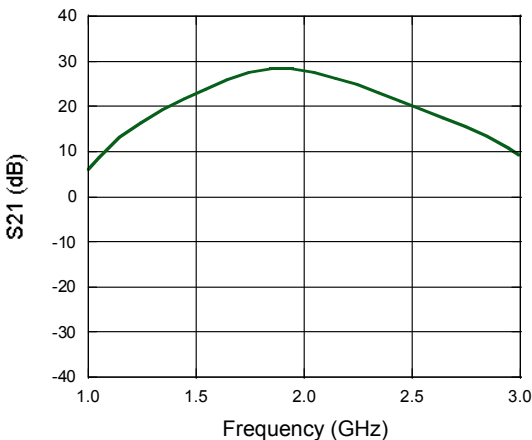
$P_{OUT}$  vs. Temperature @ 1900 MHz,  $P_{IN} = 0$  dBm



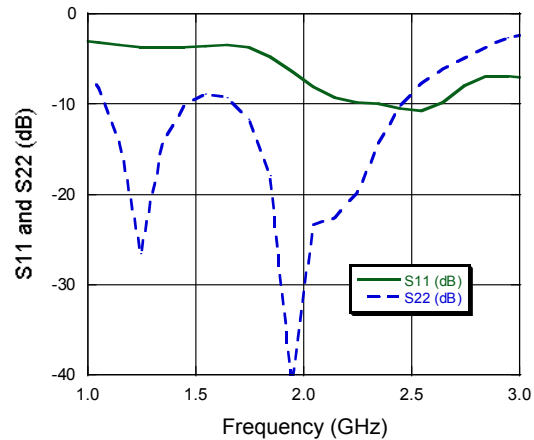
$I_{CC}$  vs. Temperature @ 1900 MHz,  $P_{IN} = 0$  dBm



$S_{21}$  vs. Frequency @  $V_{CC} = 2.4$  V,  $V_M = V_{EN} = 2.5$  V



$S_{11}$ ,  $S_{22}$  vs. Frequency @  $V_{CC} = 2.4$  V,  $V_M = V_{EN} = 2.5$  V



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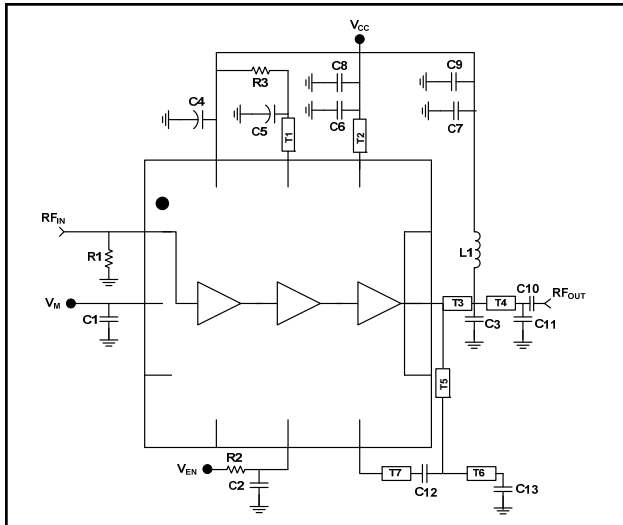
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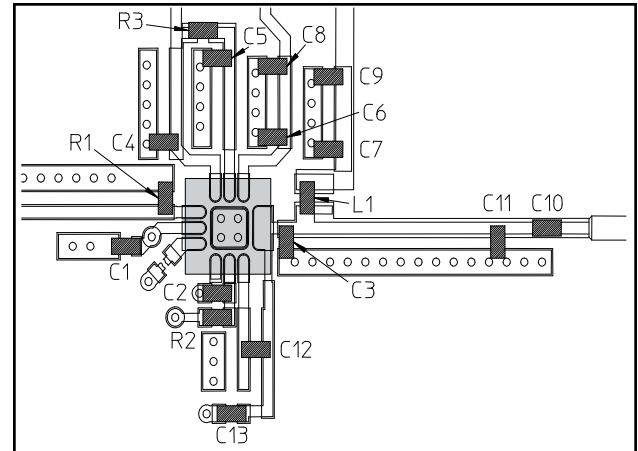
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## Evaluation Board Schematic



## Recommended PCB Configuration



## MAAPSS0076 External Parts List

Designator	Value	Foot Print	Manufacturer	Part Number
C1, C4, C9	100 nF	0402	Murata	GRM155F51C104ZA01B
C2	22 nF	0402	Murata	GRM155R71C223KA01B
C3	4 pF	0402	Murata	GRM155C1H4R0CZ01B
C5, C6	47 pF	0402	Murata	GRM1555C1H470JZ01B
C7	1 nF	0402	Murata	GRM36X7R102K50
C8, C13	1 $\mu$ F	0402	Murata	GRM36Y5V104Z016AQ
C10	100 pF	0402	Murata	GRM36COG101J050AQ
C11	2 pF	0402	Murata	GRM36COG020C050AQ
C12	1.5 pF	0402	Murata	GRM1555C1H1R5CZ01D
L1	10 nH	0402	Coilcraft	0402CS-10NXJB
R1	249 $\Omega$	0402	Panasonic	ERJ-2RKf2490X
R2	402 $\Omega$	0402	Panasonic	ERJ-2RKf4020X
R3	2.15 k $\Omega$	0402	Panasonic	ERJ-2RKf2151X

## Transmission Line Dimensions, 0.20 mm thick FR4

Designator	Length (mm)	Width (mm)
T1	3.76	0.35
T2	2.08	0.35
T3	0.49	0.37
T4 <sup>5</sup>	7.49	0.37
T5	3.05	0.35
T6 <sup>6</sup>	2.29	0.35
T7	2.36	0.35

All dimensions from package edge to center of component (except as noted below).

- From center of C3 to center of C11.
- From center of C12 to center of C13.

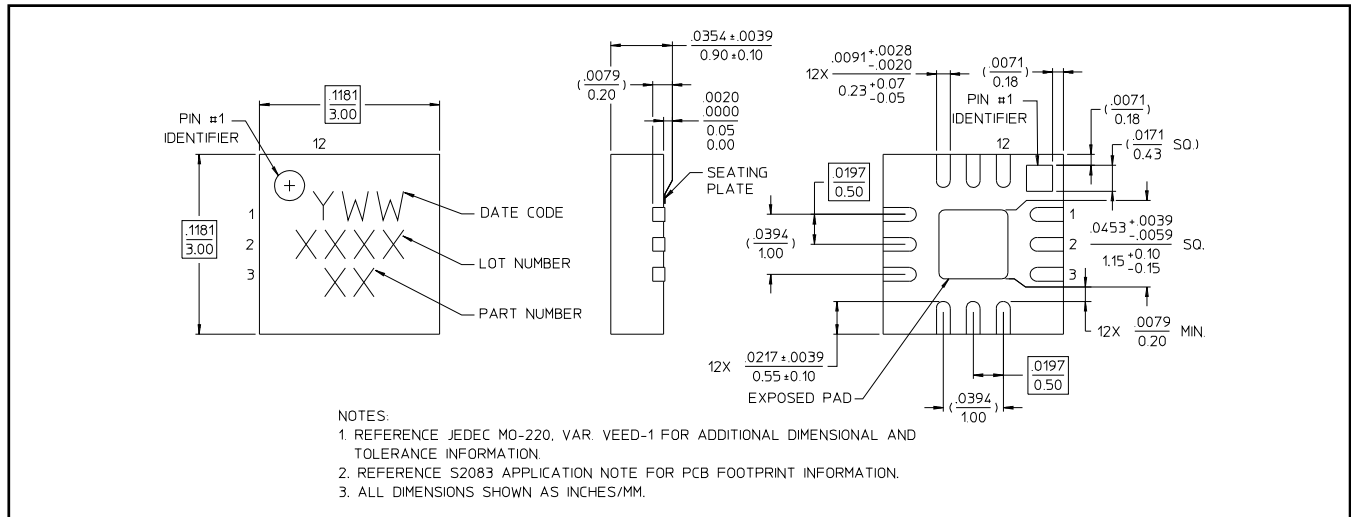
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## Lead-Free 3 mm 12-lead PQFN†



† Reference Application Note M538 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.