MAAM-008863

FTTx RF Amplifier
50 - 1000 MHz

Rev. V3

Features

- -8 dBm to +2 dBm Optical Input Range
- Low Equivalent Input Noise (EIN): 4.8 pA/rtHz
- +5 V Bias
- 37 dB Gain; Flat from 55 MHz to 1000 MHz
- 25 dB Gain Control Range
- +20 dBmV/ch Flat Output
- Lead-Free 4 mm PQFN-24LD Plastic Package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MAAM-008863 provides high gain, low noise and low distortion amplification of the downstream CATV signal in fiber-to-the-home (FTTH) applications. This device is ideally suited for interfacing with the RF video output of optical triplexers used within optical network terminals (ONTs).

The MAAM-008863 is fabricated using M/A-COM Technology Solutions' low noise GaAs pHEMT technology in a lead-free 4 mm 24-lead package. The amplifier requires a minimal number of off-chip components resulting in a highly integrated low cost solution.

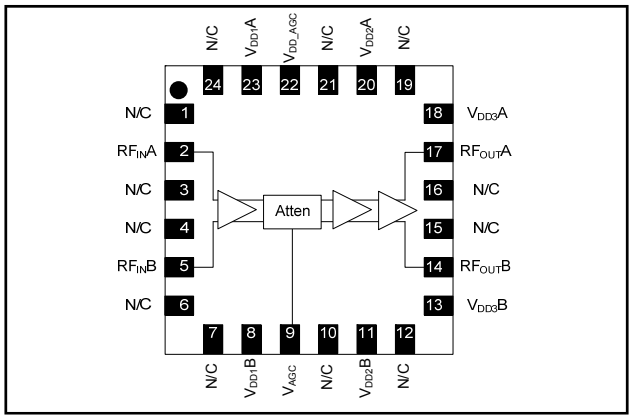
Ordering Information [1,2]

Part Number	Package
MAAM-008863-TR1000	1000 Piece Reel
MAAM-008863-TR3000	3000 Piece Reel
MAAM-008863-002SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.
2. All sample kits include photodiode and 5 loose parts.

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

Functional Schematic



Pin Configuration [3]

Pin No.	Pin Name	Description
1	N/C	No Connection
2	RFIN A	RF Input A
3	N/C	No Connection
4	N/C	No Connection
5	RFIN B	RF Input B
6	N/C	No Connection
7	N/C	No Connection
8	VDD1 B	+ 5V Bias Voltage
9	VAGC	AGC Control Voltage: 0V to 3V
10	N/C	No Connection
11	VDD2 B	+ 5V Bias Voltage
12	N/C	No Connection
13	VDD3 B	+ 5V Bias Voltage
14	RFOUT B	RF Output B
15	N/C	No Connection
16	N/C	No Connection
17	RFOUT A	RF Output A
18	VDD3 A	+ 5V Bias Voltage
19	N/C	No Connection
20	VDD2 A	+ 5V Bias Voltage
21	N/C	No Connection
22	VDD_AGC	+ 5V AGC Bias Voltage
23	VDD1 A	+ 5V Bias Voltage
24	N/C	No Connection
25	Paddle	RF and DC Ground

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

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Electrical Specifications[4]: T_A = 25°C, V_{DD} = +5 Volts, Z_0 = 75 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	50 - 1000 MHz, AGC = +3 V	dB	34.5	37	39.5
Gain Tilt	Within AGC control voltage range	dB	-	0	-
Gain Control Range	50 - 1000 MHz, AGC = +0 V to +3 V	dB	23	25	30
AGC Control Voltage Range	—	V	0	-	+3
EIN	—	pA/rtHz	-	4.8	-
Output Return Loss	—	dB	-	16	-
CTB[5]	79 channels	dBc	-	-61	-
CSO[5]	79 channels	dBc	-	-62	-
Current Consumption	+5 V V_{DD}	mA	-	220	250

4. Performance is specified using JDSU Photodiode EPM-745 or equivalent (EPM705) and output balun # MABA-009210-CT1760.
5. OMI = 3.5%; Pout = +20 dBmV/ch; Optical input power range: -8 dBm to +2 dBm.

Absolute Maximum Ratings [6,7]

Parameter	Absolute Maximum
Input Power	+3 dBm Optical
Operating Voltage	+15 volts
AGC Voltage	+5 volts
Operating Temperature	-40°C to +85°C
Junction Temperature[8,9]	+150°C
Storage Temperature	-65°C to +150°C

6. Exceeding any one or combination of these limits may cause permanent damage to this device.
7. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
8. Operating at nominal conditions with $T_J \leq$ +150°C will ensure MTTF > 1 x 10^6 hours.
9. Junction Temperature (T_J) = T_C + Θjc * ((V * I) - (P_{OUT} - P_{IN}))
   Typical thermal resistance (Θjc) = 19° C/W.
   a) For T_C = 25°C,
   T_J = 46 °C @ 5 V, 220 mA
   b) For T_C = 85°C,
   T_J = 106 °C @ 5 V, 220 mA

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated 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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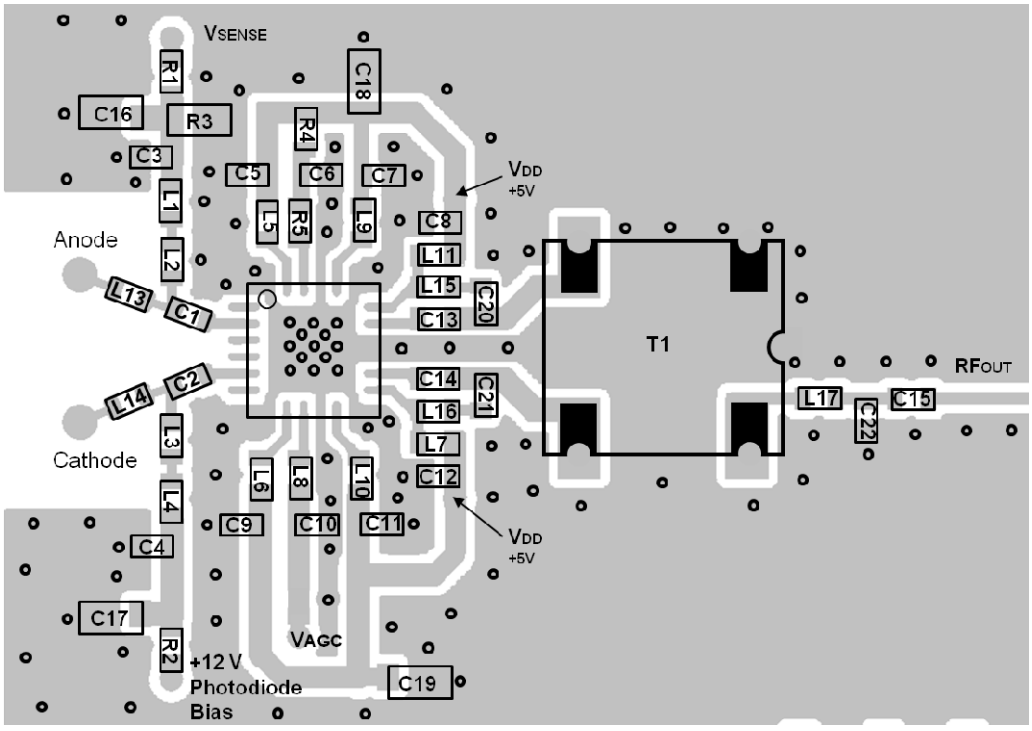
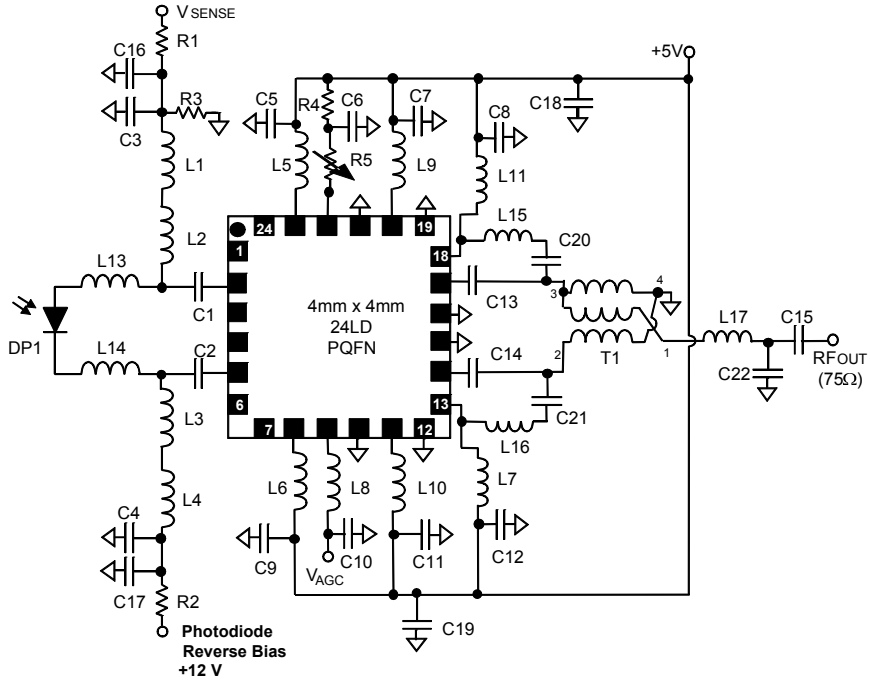
Recommended PCB



Schematic Including Off-Chip Components



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Parts List

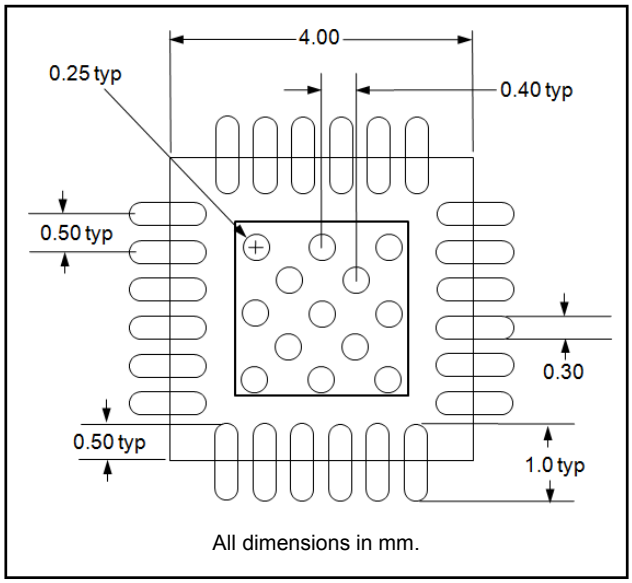
Component	Value	Case Style
L1 - L11[10]	Ferrite Bead	0402
L13 - L14	18 nH wire wound	0402
L15 - L16	15 nH	0402
L17	4.7 nH	0402
C1 - C15	0.01 µF	0402
C16 - C19	1 µF	0603
C20,C21	1.2 pF	0402
C22	0.6 pF	0402
R1	1 kΩ	0402
R2	200 Ω	0402
R3	1 kΩ	0603
R4	270 Ω	0402
R5[11]	120 Ω, 3300 ppm/°C	0402
T1[12]	1:1 Balun	SM-118A
DP1	Photodiode	T08

10. Ferrite Bead from Murata, part number BLM15HD182SN

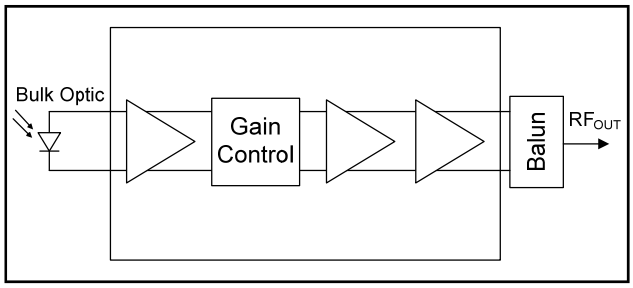
11. R5 is a 120 Ω , 0402 thermistor, 3300 ppm/°C.
Part number is ERA-W33J121X from Panasonic.

12. M/A-COM MABA-009210-CT1760 1:1 T_X Line Balun

PCB Land Pattern



Application Schematic



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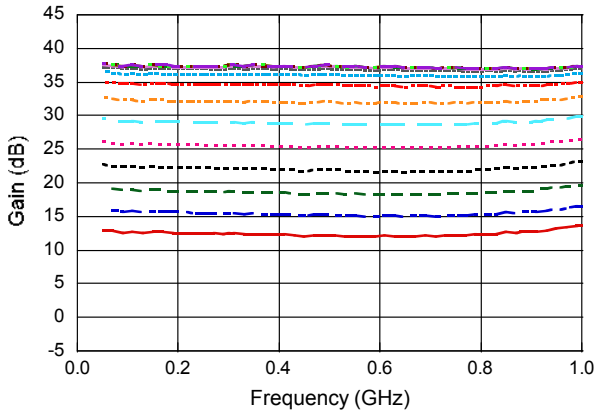
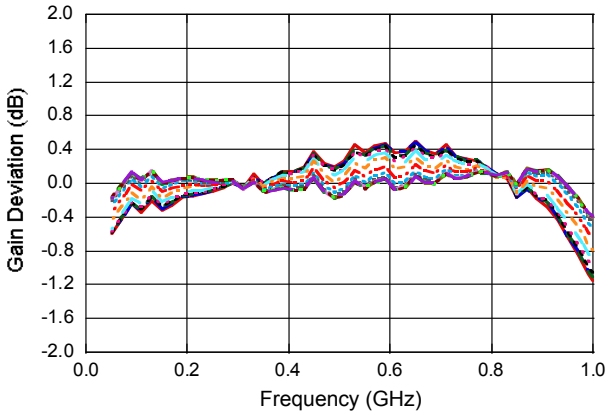
Typical Performance Curves: *VAGC: 0V to 3V in 0.2 V Steps*

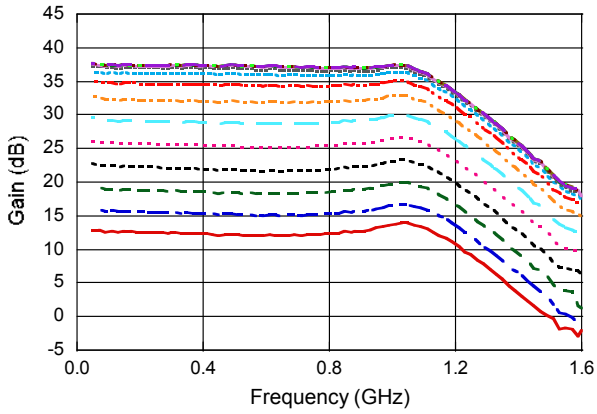
Gain @ +25℃



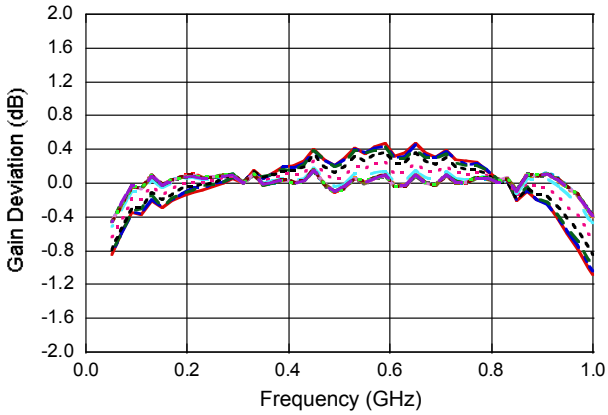
Gain Flatness Deviation From Best Fit Line @ +25℃



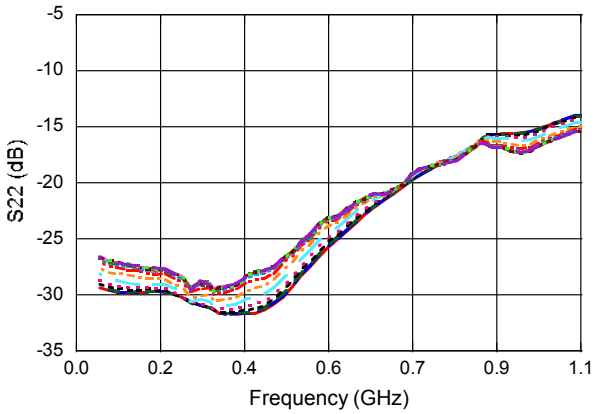
Gain vs. Frequency to 1.6 GHz @ +25℃



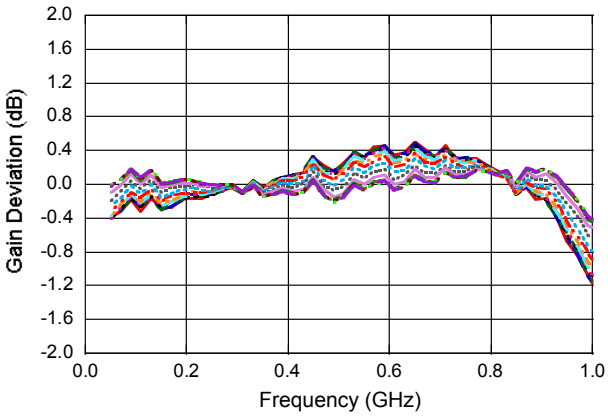
Gain Flatness Deviation From Best Fit Line @ -40℃



Output Return Loss @ +25℃



Gain Flatness Deviation From Best Fit Line @ +85℃



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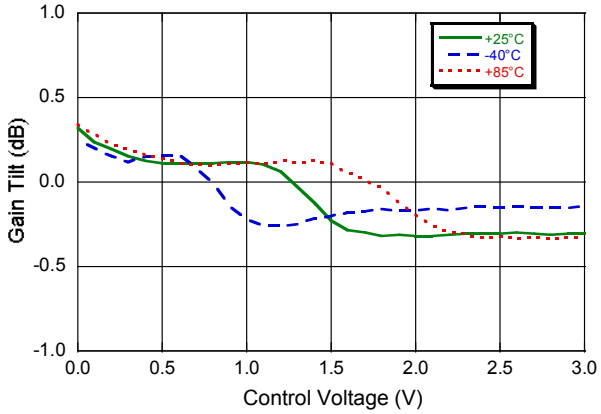
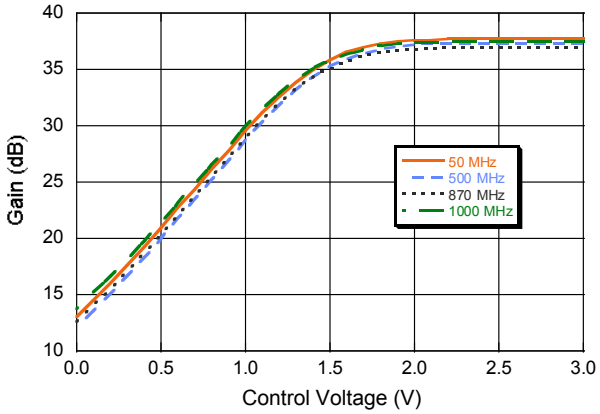
Typical Performance Curves

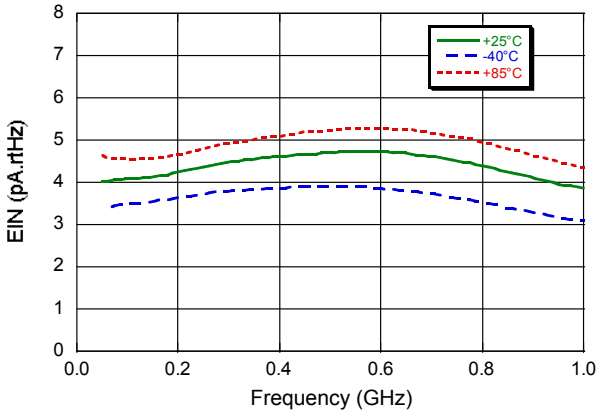
Gain Tilt Deviation From Average Tilt; Over Temp
VAGC: 0V to 3V in 0.2 V Steps



Gain vs. VAGC; At 4 Frequencies
VAGC: 0V to 3V in 0.2 V Steps

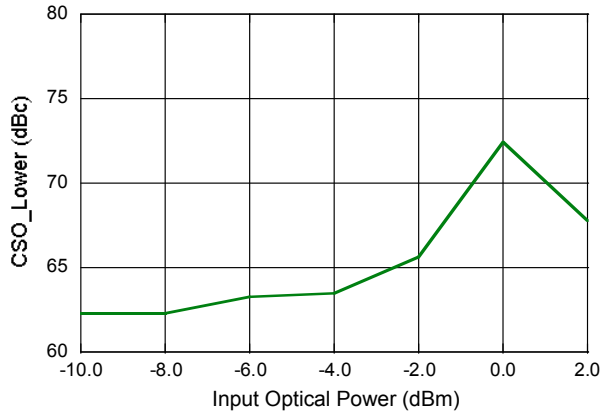


Equivalent Input Noise; Over Temp;
At Max Gain; VAGC = 3.0 V

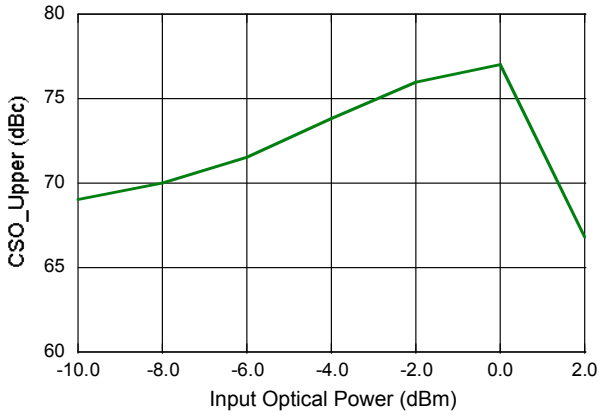


Typical Performance Curves: *79 Channels; NTSC Frequency Plan, Pout = +20 dBmV/ch*

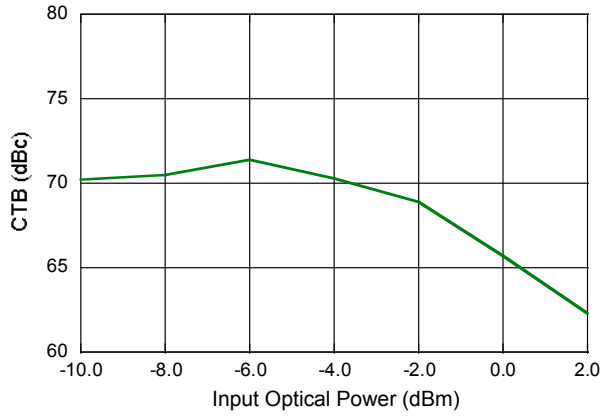
CSO_Lower



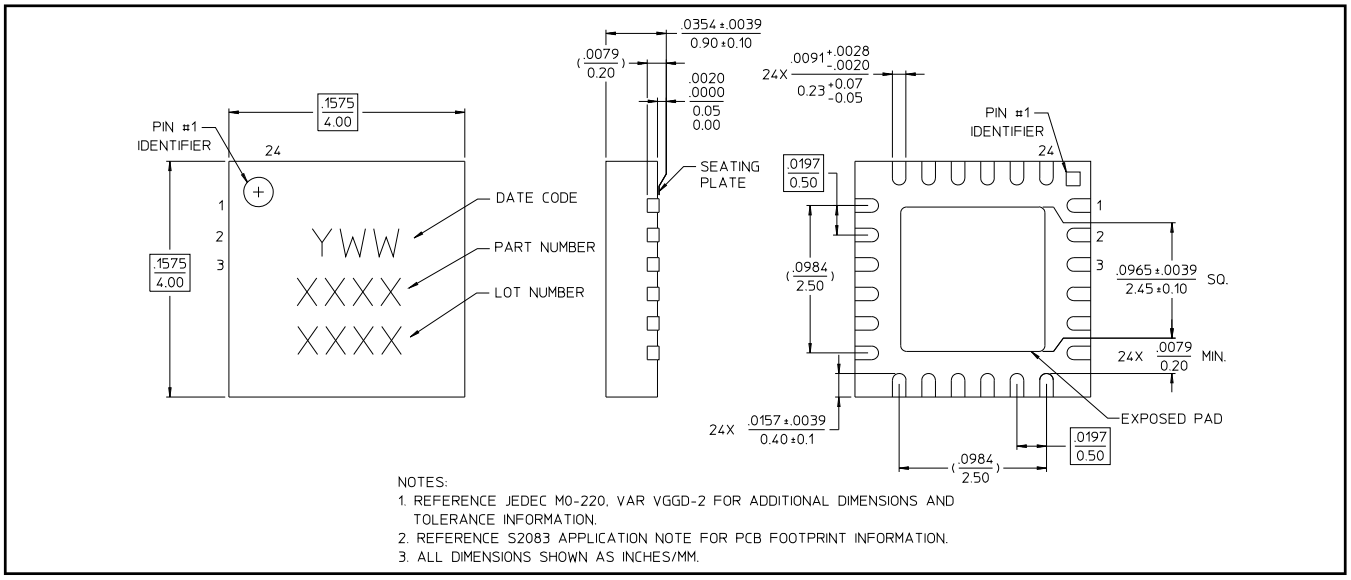
CSO_Upper



CTB



Lead Free 4 mm 24-lead PQFN†



† Reference Application Note S2082 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

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