

## 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.

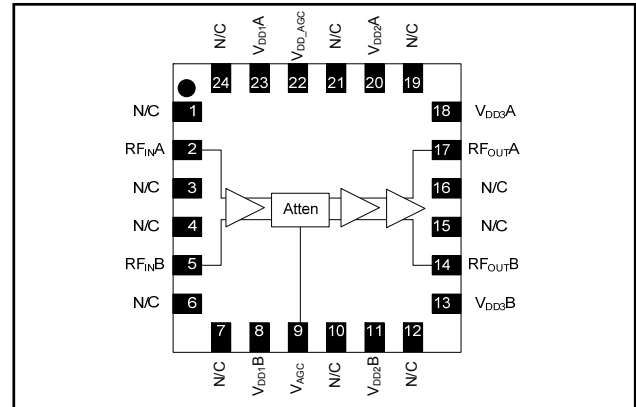
## Ordering Information <sup>1,2</sup>

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 <sup>3</sup>

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<sup>4</sup>: $T_A = 25^\circ\text{C}$ , $V_{DD} = +5\text{ Volts}$ , $Z_0 = 75\ \Omega$

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 <sup>5</sup>	79 channels	dBc	-	-61	-
CSO <sup>5</sup>	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<sup>6,7</sup>

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 <sup>8,9</sup>	+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  $T_J \leq +150^\circ\text{C}$  will ensure MTTF >  $1 \times 10^6$  hours.

9. Junction Temperature ( $T_J$ ) =  $T_C + \Theta_{jc} * ((V * I) - (P_{OUT} - P_{IN}))$   
Typical thermal resistance ( $\Theta_{jc}$ ) =  $19^\circ\text{C/W}$ .

a) For  $T_C = 25^\circ\text{C}$ ,

$T_J = 46^\circ\text{C}$  @ 5 V, 220 mA

b) For  $T_C = 85^\circ\text{C}$ ,

$T_J = 106^\circ\text{C}$  @ 5 V, 220 mA

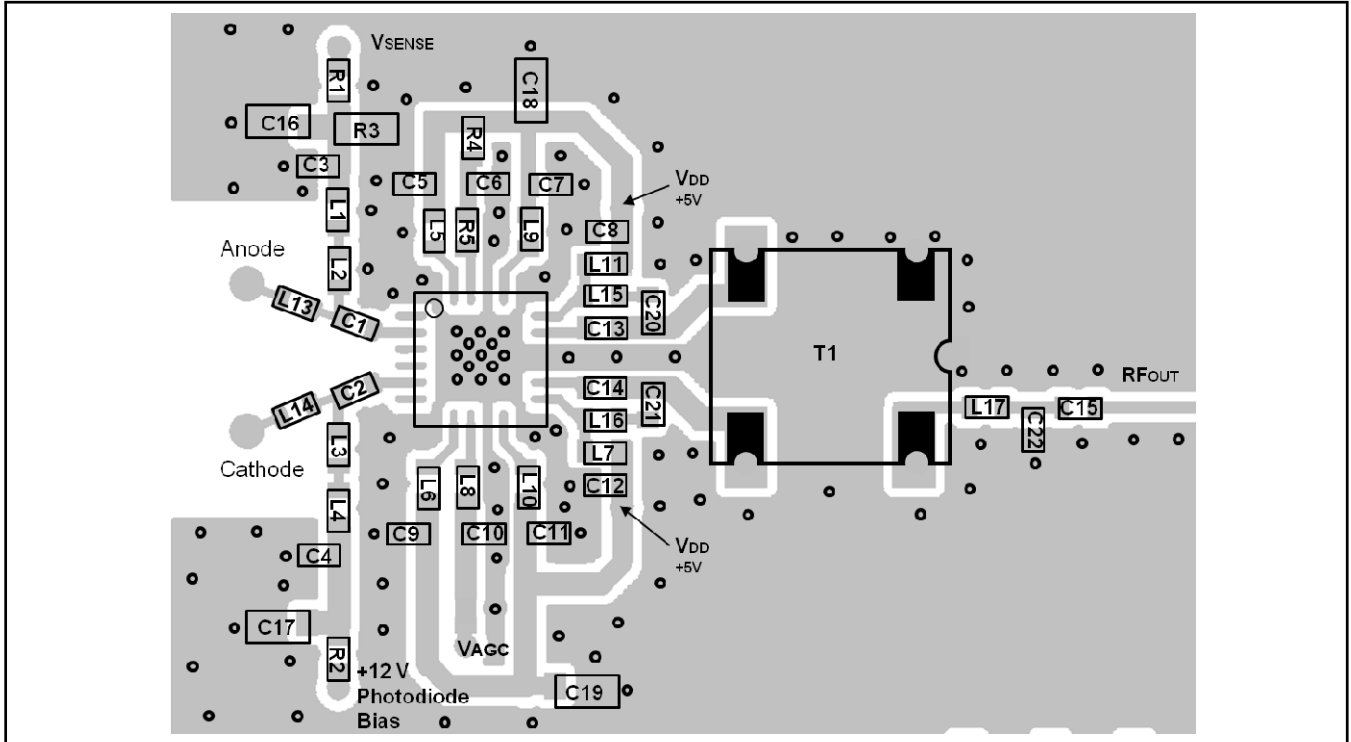
## Handling Procedures

Please observe the following precautions to avoid damage:

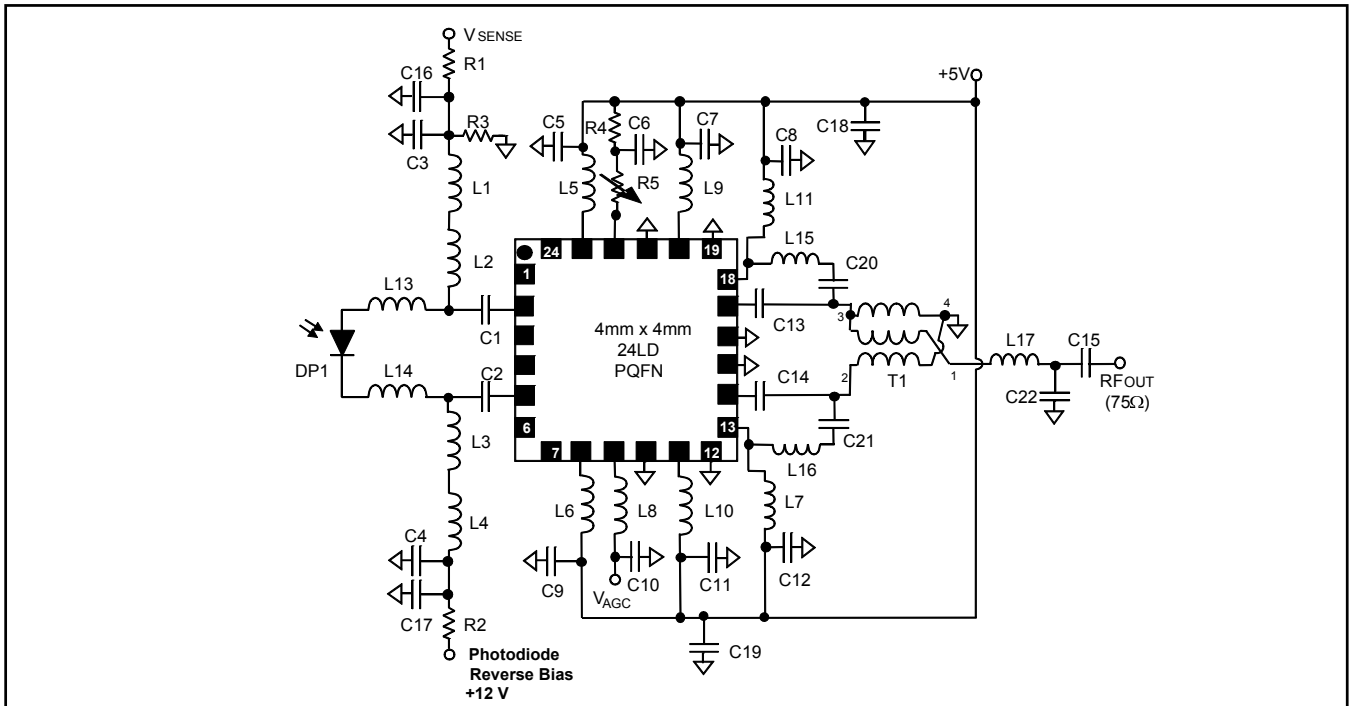
## Static Sensitivity

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.

## Recommended PCB



## Schematic Including Off-Chip Components



3

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## Parts List

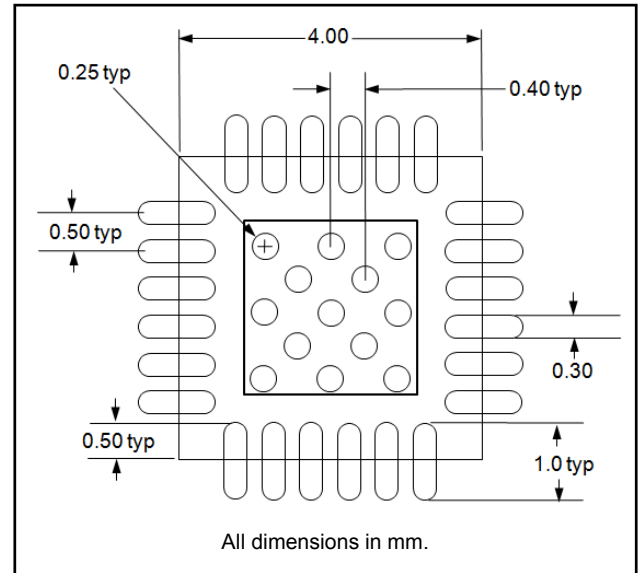
Component	Value	Case Style
L1 - L11 <sup>10</sup>	Ferrite Bead	0402
L13 - L14	18 nH wire wound	0402
L15 - L16	15 nH	0402
L17	4.7 nH	0402
C1 - C15	0.01 $\mu$ F	0402
C16 - C19	1 $\mu$ F	0603
C20,C21	1.2 pF	0402
C22	0.6 pF	0402
R1	1 k $\Omega$	0402
R2	200 $\Omega$	0402
R3	1 k $\Omega$	0603
R4	270 $\Omega$	0402
R5 <sup>11</sup>	120 $\Omega$ , 3300 ppm/ $^{\circ}$ C	0402
T1 <sup>12</sup>	1:1 Balun	SM-118A
DP1	Photodiode	T08

10. Ferrite Bead from Murata, part number BLM15HD182SN

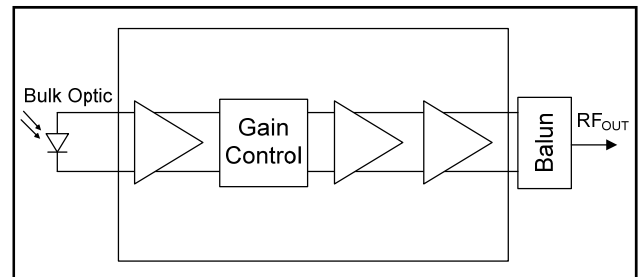
11. R5 is a 120  $\Omega$  , 0402 thermistor, 3300 ppm/ $^{\circ}$ C.  
Part number is ERA-W33J121X from Panasonic.

12. M/A-COM MABA-009210-CT1760 1:1 T<sub>x</sub> Line Balun

## PCB Land Pattern



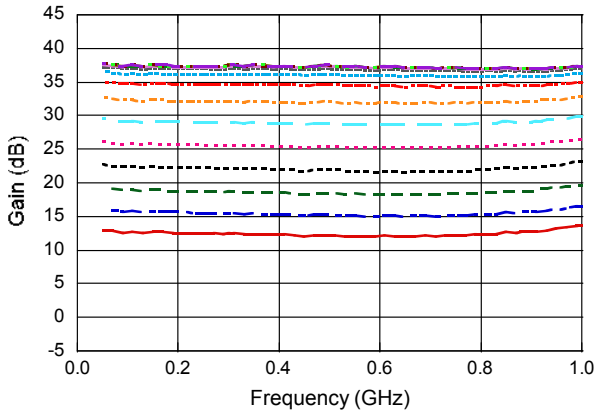
## Application Schematic



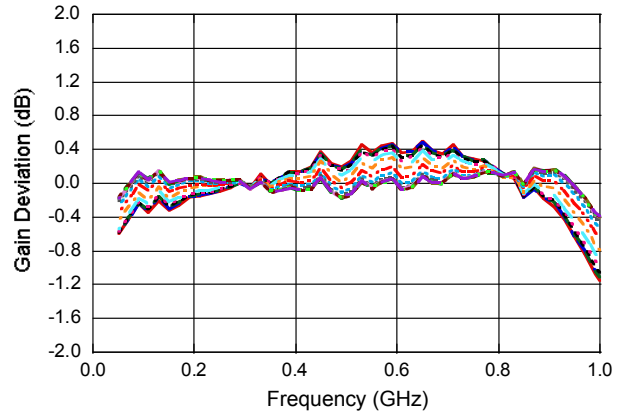
**Typical Performance Curves: VAGC: 0V to 3V in 0.2 V Steps**



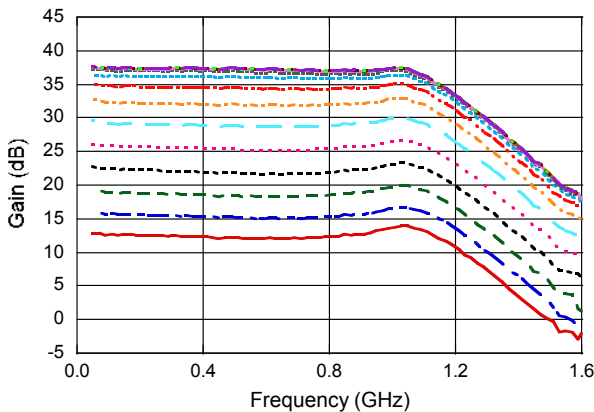
**Gain @ +25°C**



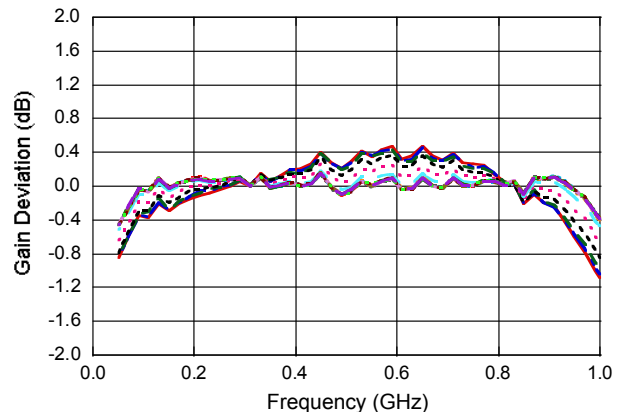
**Gain Flatness Deviation From Best Fit Line @ +25°C**



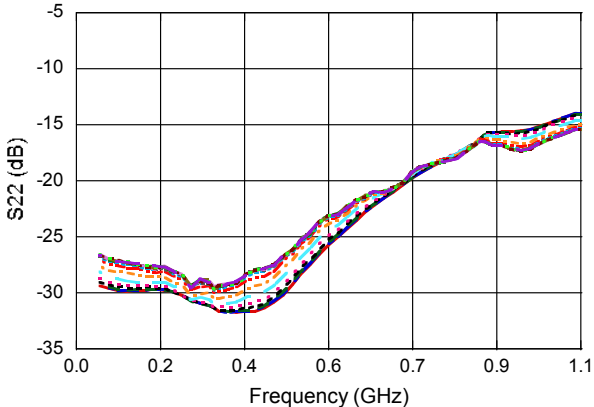
**Gain vs. Frequency to 1.6 GHz @ +25°C**



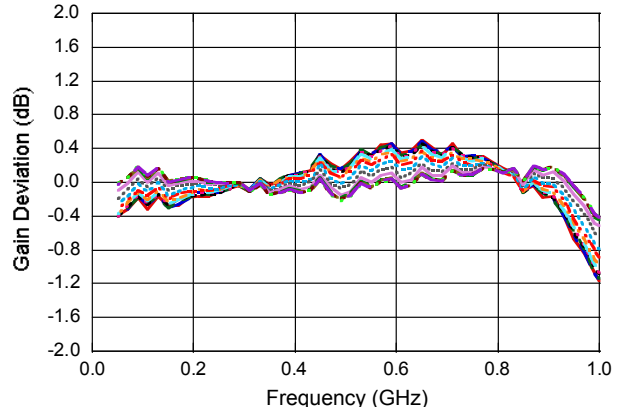
**Gain Flatness Deviation From Best Fit Line @ -40°C**



**Output Return Loss @ +25°C**



**Gain Flatness Deviation From Best Fit Line @ +85°C**



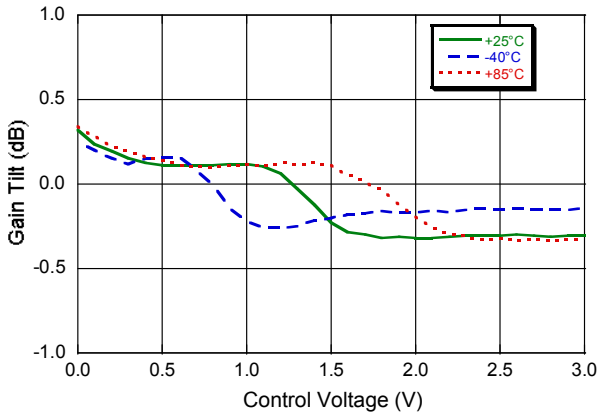
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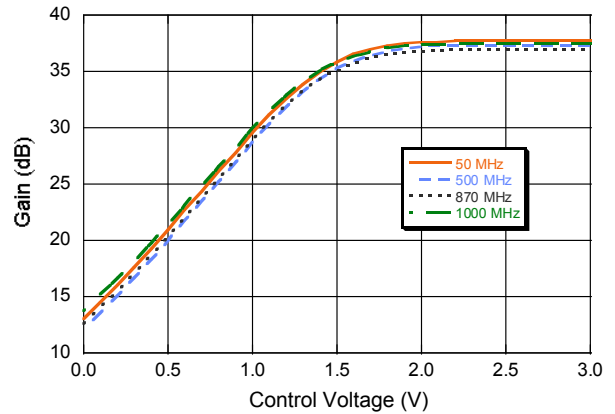
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## Typical Performance Curves

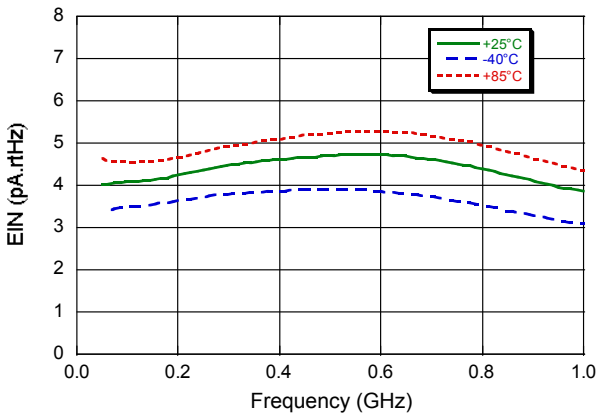
**Gain Tilt Deviation From Average Tilt; Over Temp**  
VAGC: 0V to 3V in 0.2 V Steps



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

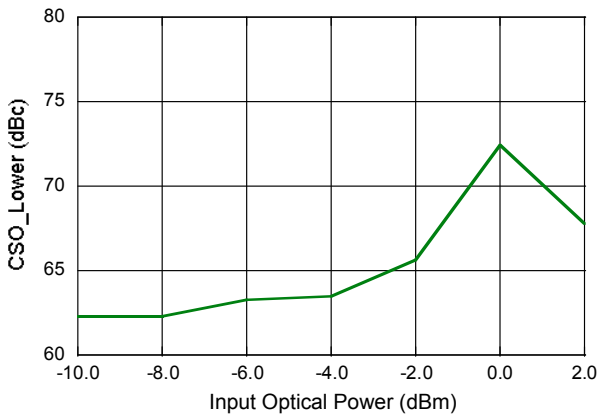


**Equivalent Input Noise; Over Temp;**  
At Max Gain; VAGC = 3.0 V

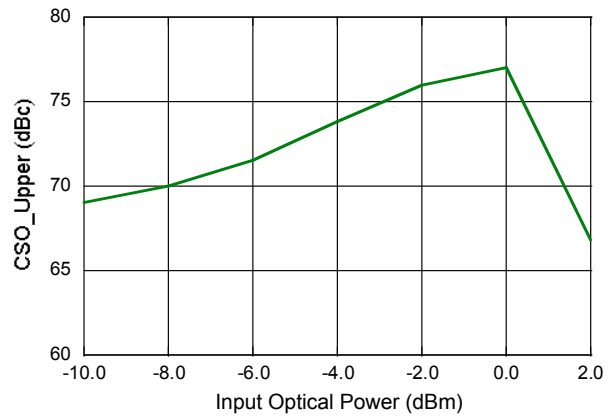


**Typical Performance Curves: 79 Channels; NTSC Frequency Plan, Pout = +20 dBmV/ch**

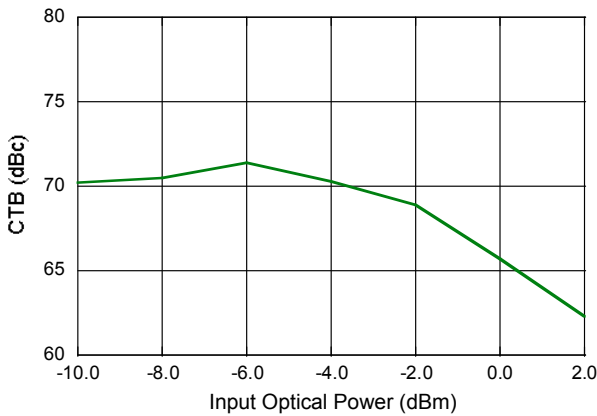
**CSO\_Lower**



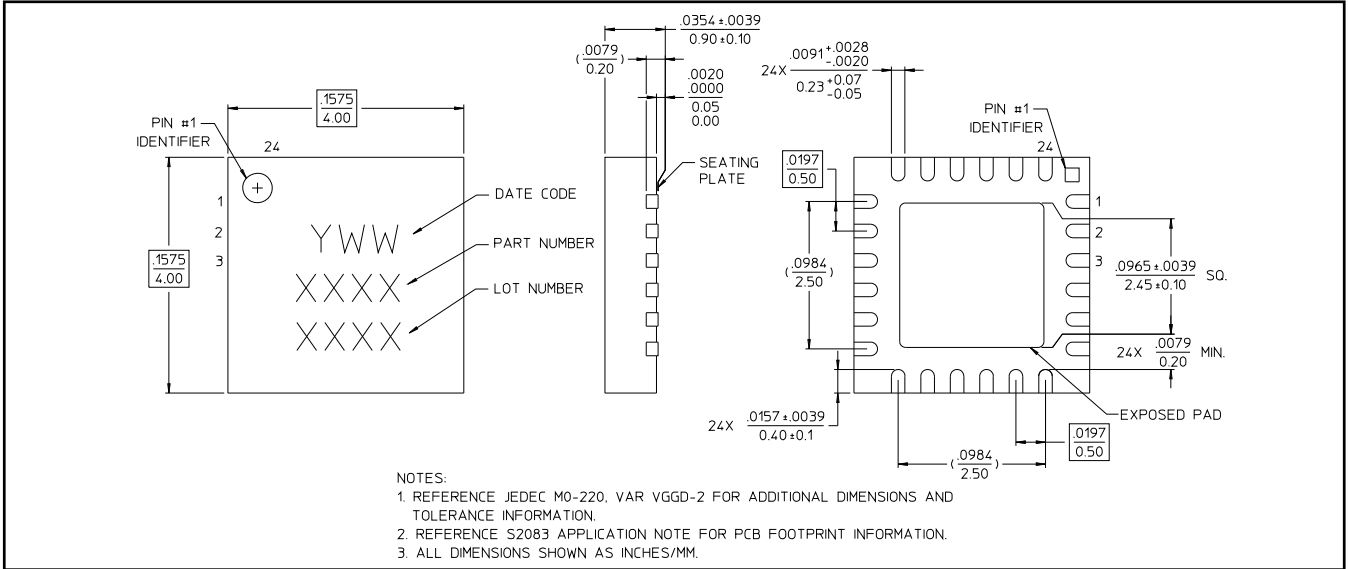
**CSO\_Upper**



**CTB**



## Lead Free 4 mm 24-lead PQFN<sup>†</sup>



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