AM7808 High-Efficiency Quad-Band Transmit Dual-Band Receive GSM / GPRS CMOS TX Module

- **Extended Power Added Efficiency**
  - **47% PAE EGSM850 at 33.0 dBm**
  - **47% PAE EGSM900 at 33.0 dBm**
  - **40% PAE for DCS1800 at 30.0 dBm**
  - **40% PAE for PCS1900 at 30.0 dBm**
  - **Up to 40% longer talk and data transmit time than present best in class TXMs due to high efficiency and ability to operate down to 2.7V**
- **RF Performance**
  - **Less than 0.5dB output power variation across frequency band**
  - **Ultra low loss RX insertion loss**
  - **Interchangeable RX ports**
- **Assembled in ultra-small form factor: 5.25mm x 5.30mm x 1.0mm LGA package**
- **Robust Operation**
  - **TRP compliant at 3:1 VSWR with ±1 dB power variation**
  - **Integrated thermal, over-voltage and over-current protection**
  - **ESD protection on all pins (including RF) greater than 1500V HBM and 100V MM**
  - **ESD protection up to 8kV on antenna port**
- **Integrated Control and Protection**
  - **V_{BAT} Operating range 2.7V to 4.5V**
  - **Ultra low power standby mode**

- **Applications**
  - **Quad-Band GSM/GPRS Mobile Handsets**
  - **GSM850/EGSM900/DCS/PCS Products**
  - **GPRS Class 12 Multi-slot Operation**

Product Description

The AM7808 is a complete CMOS high-power, high-efficiency transmit module for Quad-band GSM/GPRS mobile handsets. The device is packaged in an ultra small LGA package (5.25mm x 5.30mm x 1.0mm) using a BT laminate substrate that is RoHS compliant and lead-free.

The device's patent-pending AdaptiveRF™ architecture has been designed specifically to use standard CMOS technology to generate high output power at high efficiency over the phone's full operational range. AdaptiveRF™ architecture allows the transmit module to achieve high efficiency over a broad output power range.

The on-chip regulators are designed to support compliant operation down to 2.7V to enable additional battery capacity to be utilized.

In operation, where output power is dynamic and subject to non-ideal loads, these improvements result in a talk-time increase of up to 40%.

The integrated antenna switch with its interchangeable RX ports has low insertion loss improving receive sensitivity.

Internal 50Ω matching, DC blocking on TX and RX ports and harmonic filtering on RF terminals eliminate the need for external components, simplifying layout and reducing board space.

Advanced digital power control ensures stable, controlled and repeatable output power over all operating conditions, and enables simplified calibration. Immunity to load mismatches and advanced thermal, over-voltage and low-battery protection ensures robust operation. Power variation for 3:1 loads is ±1dB. No external compensation for temperature, frequency or Vbatt is needed to meet RF performance over various conditions.

All pins of the AM7808 including the RF pins are protected from ESD pulses greater than 1,500V per the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) and 100V Machine Model (MM) to help eliminate handling-related yield loss in manufacturing. The AM7808 also integrates an ESD filter on the antenna port to provide protection to 8kV per IEC61000-4-2.

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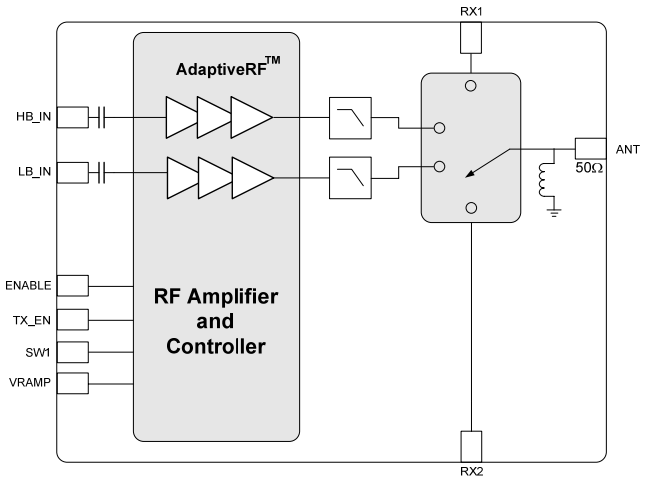
Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (see Note 1)	-0.5 to 5.5	V_{DC}
Ramp Voltage (VRAMP)	-0.5 to 3.0	V
Input RF Power	10	dBm
Max Duty Cycle	50	%
Operating Case Temperature	-20 to 85	°C
Storage Temperature	-55 to 150	°C
ESD All Pins (Human Body Model, MIL-STD-883, Method 3015)	1,500	V
ESD All Pins (Machine Model)	100	V
ESD Antenna port (IEC 61000-4-2)	8	kV



Functional Block Diagram

Electrical Specifications – Overall

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Power Supply (V_{BAT})					
Supply Voltage Range	2.7	3.5	4.5	V	No output power reduction: $3.5V \leq V_{BAT} \leq 4.5V$
Supply Current (Receive Mode)		20		µA	$V_{BAT} \leq 4.5V$, Temp= +25°C
Supply Current (Standby Mode)		2	10	µA	$V_{BAT} \leq 4.5V$, Temp= +25°C

Power Control (V_{RAMP})					
V_{RAMP} max			1.5V	V	Voltage supplied to input for Output Power control
V_{RAMP} min		0.10		V	
Input Capacitance		5	68	pF	
Input Current			40	µA	V_{RAMP} = V_{RAMP} max
Turn On/Off Time			2	µs	V_{RAMP} = V_{RAMP} min to V_{RAMP} max
Pedestal (pre-ramp) Voltage, Vped		160		mV	V_{RAMP} = Vped prior to onset of ramp-up

Control Signals					ENABLE, TX_EN, SW1
Input Voltage – Logic 'Low'			0.50	V	
Input Voltage – Logic 'High'	1.4	1.8	2.8	V	
Input Current – Logic 'High'		10	30	µA	

Note 1: Maximum Supply Voltage rating defined with ENABLE = TX_EN = logic "Low", and Vramp = 0V

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Electrical Specifications – GSM850

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – GSM850 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, V_{BAT} = 3.5V, P_{IN} = 3dBm Frequency = 824 MHz to 849 MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'Low'
Operating Frequency	824	—	849	MHz	
Output Power					V_{RAMP} up to 1.5V
Maximum Nominal	33.0			dBm	Temp= 25°C, V_{BAT}=3.5V
Maximum Extreme 1	30.5			dBm	Temp= 85°C, V_{BAT}=3.0V, P_{IN} = 0dBm
Maximum Extreme 2	28.5			dBm	Temp= 85°C, V_{BAT}=2.7V, P_{IN} = 0dBm
Power-Added Efficiency And Supply Current					
PAE at Rated Power		47		%	At P_{OUT} = 33.0dBm typ.
PAE at Maximum Power		48		%	At P_{OUT} = 33.5dBm typ.
PAE at Backed-Off Power		35		%	At P_{OUT} = 29.0dBm
Supply Current at Rated Power			1300	mA	Peak current at P_{OUT} = 33.0dBm
TRP					P_{OUT} set to 33.0dBm into 1:1 VSWR
Output Power Variation		±1.0		dB	3:1 VSWR, all phases
Minimum Power		30.0		dBm	3:1 VSWR, all phases
Maximum Supply Current		1500		mA	3:1 VSWR, all phases
Spurious					
Output Noise Power		-86	-84	dBm	RBW=100kHz, $P_{OUT} \leq$ 33.0dBm, P_{IN} = 0 to 6dBm f = 869MHz to 894MHz
		-86	-84	dBm	RBW=100kHz, $P_{OUT} \leq$ 33.0dBm, P_{IN} = 0 to 6dBm f = 1930MHz to 1990MHz
Forward Isolation 1		-55	-40	dBm	TX_EN=SW1='Low', V_{RAMP} = 0.18V
Forward Isolation 2		-25	-22	dBm	TX_EN=SW1='High', V_{RAMP} = 0.18V
2nd thru 13th harmonic distortion		-40	-33	dBm	P_{OUT} = 5dBm to 33.0dBm
All Other Non-Harmonic Spurious			-36	dBm	
Output Load VSWR Stability	10:1				Spurious < -36dBm, with P_{OUT} set to $\leq$ 33.0dBm into 50Ω load, all phases, RBW=3MHz
Output Load VSWR Ruggedness	20:1				P_{OUT} set to $\leq$ 33.0dBm into 50Ω load. No damage or permanent degradation. All phases.
Output Load Impedance		50		Ω	Load impedance presented at Antenna pad

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Electrical Specifications – GSM850 (cont.)

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – GSM850 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, V_{BAT} = 3.5V, P_{IN} = 3dBm Frequency = 824 MHz to 849 MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'Low'
Input Port Characteristics					
Input Power Range	0		6	dBm	Max output guaranteed at Min drive level
Input Impedance		50		Ω	
Input VSWR			2.5:1		P_{OUT} = 5dBm to 33.0dBm $P_{IN} \leq$ 6dBm
Power Control					
Power Control Range	55	60		dB	$V_{RAMP} = V_{RAMP}$ min to V_{RAMP} max
Power Output Variation from nominal conditions P_{OUT} = 15dBm to 28.5dBm	-2.5		1.5	dB	P_{IN} = 0 to 6dBm, Temp = -20°C to +85°C 2.7V $\leq V_{BAT} \leq$ 4.5V Relative to Nominal Output Power Condition: V_{BAT}=3.5V, LB_IN = 3dBm, f = 836.5MHz
P_{OUT} = 5dBm to 15dBm	-3		3	dB	
Switch Section					
Coupled power P_{OUT} to RX1 and RX2 ports		5	8	dBm	P_{OUT}=33.0dBm
Insertion Loss ANT to RX1 and RX2		1.1	1.3	dB	Freq=869 MHz to 894 MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2
Input VSWR ANT-RX1 and RX2		1.5:1			Freq=869 MHz to 894 MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2

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Electrical Specifications – GSM900

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – EGSM900 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, V_{BAT} = 3.5V, P_{IN} = 3dBm Frequency = 880MHz to 915MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'Low'
Operating Frequency	880	—	915	MHz	
Output Power					V_{RAMP} up to 1.5V
Maximum Nominal	33.0			dBm	Temp= 25°C, V_{BAT}=3.5V
Maximum Extreme 1	30.5			dBm	Temp= 85°C, V_{BAT}=3.0V, P_{IN} = 0dBm
Maximum Extreme 2	28.5			dBm	Temp= 85°C, V_{BAT}=2.7V, P_{IN} = 0dBm
Power-Added Efficiency And Supply Current					
PAE at Rated Power		47		%	At P_{OUT} = 33.0dBm typ.
PAE at Maximum Power		48		%	At P_{OUT} = 33.5dBm typ.
PAE at Backed-Off Power		35		%	At P_{OUT} = 29.0dBm
Supply Current at Rated Power			1300	mA	Peak current at P_{OUT} = 33.0dBm
TRP					P_{OUT} set to 33.0dBm into 1:1 VSWR
Output Power Variation		±1.0		dB	3:1 VSWR, all phases
Minimum Power		30.0		dBm	3:1 VSWR, all phases
Maximum Supply Current		1500		mA	3:1 VSWR, all phases
Spurious					
Output Noise Power		-76	-72	dBm	RBW=100kHz, $P_{OUT} \leq$ 33.0dBm, P_{IN} = 0 to 6dBm f = 925MHz to 935MHz
		-86	-84	dBm	RBW=100kHz, $P_{OUT} \leq$ 33.0dBm, P_{IN} = 0 to 6dBm f = 935MHz to 960MHz
		-82	-80	dBm	RBW=100kHz, $P_{OUT} \leq$ 33.0dBm, P_{IN} = 0 to 6dBm f = 1805MHz to 1880MHz
Forward Isolation 1		-55	-40	dBm	TX_EN=SW1='Low', V_{RAMP} = 0.18V
Forward Isolation 2		-25	-22	dBm	TX_EN=SW1='High', V_{RAMP} = 0.18V
2nd thru 13th harmonic distortion		-40	-33	dBm	P_{OUT} = 5dBm to 33.0dBm
All Other Non-Harmonic Spurious			-36	dBm	
Output Load VSWR Stability	10:1				Spurious < -36dBm, with P_{OUT} set to $\leq$ 33.0dBm into 50Ω load, all phases, RBW=3MHz
Output Load VSWR Ruggedness	20:1				P_{OUT} set to $\leq$ 33.0dBm into 50Ω load. No damage or permanent degradation. All phases.
Output Load Impedance		50		Ω	Load impedance presented at Antenna pad

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Electrical Specifications – GSM900 (cont.)

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – EGSM900 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, V_{BAT} = 3.5V, P_{IN} = 3dBm Frequency = 880MHz to 915MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'Low'
Input Port Characteristics					
Input Power Range	0		6	dBm	Max output guaranteed at Min drive level
Input Impedance		50		Ω	
Input VSWR			2.5:1		P_{OUT} = 5dBm to 33.0dBm $P_{IN} \leq$ 6dBm
Power Control					
Power Control Range	55	60		dB	$V_{RAMP} = V_{RAMP}$ min to V_{RAMP} max
Power Output Variation from nominal conditions P_{OUT} = 15dBm to 28.5dBm	-2.5		1.5	dB	P_{IN} = 0 to 6dBm, Temp = -20°C to +85°C 2.7V $\leq V_{BAT} \leq$ 4.5V Relative to Nominal Output Power Condition: V_{BAT}=3.5V, LB_IN = 3dBm, f = 897.5MHz
P_{OUT} = 5dBm to 15dBm	-3		3	dB	
Switch Section					
Coupled power P_{OUT} to RX1 and RX2 ports		5	8	dBm	P_{OUT}=33.0dBm
Insertion Loss ANT to RX1 and RX2		1.1	1.3	dB	Freq=925MHz to 960MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2
Input VSWR ANT-RX1 and RX2		1.5:1			Freq=925MHz to 960MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2

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Electrical Specifications – DCS1800

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – DCS1800 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, V_{BAT} = 3.5V, P_{IN} = 3dBm Frequency = 1710MHz to 1785MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'High'
Operating Frequency	1710	—	1785	MHz	
Output Power					V_{RAMP} up to 1.5V
Maximum Nominal	30.0			dBm	Temp= 25°C, V_{BAT}=3.5V
Maximum Extreme 1	28.5			dBm	Temp= 85°C, V_{BAT}=2.7V, P_{IN} = 0dBm
Maximum Extreme 2	27.5			dBm	Temp= 85°C, V_{BAT}=2.7V, P_{IN} = 0dBm
Power-Added Efficiency And Supply Current					
PAE at Rated Power		40		%	At P_{OUT} = 30.0dBm typ.
PAE at Maximum Power		41		%	At P_{OUT} = 31.0dBm typ.
PAE at Backed-Off Power		34		%	At P_{OUT} = 28.0dBm typ.
Supply Current at Max Power			800	mA	Peak current at P_{OUT} = 30.0dBm
TRP					P_{OUT} set to 30.0dBm into 1:1 VSWR
Output Power Variation		±1.0		dB	3:1 VSWR, all phases
Minimum Power		27.0		dBm	3:1 VSWR, all phases
Maximum Supply Current		1100		mA	3:1 VSWR, all phases
Spurious					
Output Noise Power		-82	-80	dBm	RBW=100kHz, $P_{OUT} \leq$ 30.0dBm, P_{IN} = 0 to 6dBm f = 1805MHz to 1880MHz
		-86	-84	dBm	RBW=100kHz, $P_{OUT} \leq$ 30.0dBm, P_{IN} = 0 to 6dB f = 925MHz to 960MHz
Forward Isolation 1		-60	-52	dBm	TX_EN=SW1='Low', V_{RAMP} = 0.18V
Forward Isolation 2		-30	-25	dBm	TX_EN=SW1='High', V_{RAMP} = 0.18V
2nd thru 7th harmonic distortion		-40	-33	dBm	P_{OUT} = 0dBm to 30.0dBm
All Other Non-Harmonic Spurious			-36	dBm	
Output Load VSWR Stability	10:1				Spurious < -36dBm, with P_{OUT} set to ≤ 30.0dBm into 50Ω load, all phases, RBW=3MHz
Output Load VSWR Ruggedness	20:1				P_{OUT} set to ≤ 30.0dBm into 50Ω load. No damage or permanent degradation. All phases.
Output Load Impedance		50		Ω	Load impedance presented at Antenna pad

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Electrical Specifications – DCS1800 (cont.)

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – DCS1800 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, V_{BAT} = 3.5V, P_{IN} = 3dBm Frequency = 1710MHz to 1785MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'High'
Input Port Characteristics					
Input Power Range	0		6	dBm	Max output guaranteed at Min drive level
Input Impedance		50		Ω	
Input VSWR			2.5:1		P_{OUT} = 0dBm to 30.0dBm $P_{IN} \leq$ 6dBm
Power Control					
Power Control Range	55	60		dB	$V_{RAMP} = V_{RAMP}$ min to V_{RAMP} max
Power Output Variation from nominal conditions P_{OUT} = 16dBm to 28.5dBm	-2.0		1.5	dB	P_{IN} = 0 to 6dBm, Temp = -20°C to +85°C 2.7V $\leq V_{BAT} \leq$ 4.5V Relative to Nominal Output Power Condition: V_{BAT}=3.5V, HB_IN = 3dBm, f = 1747.5MHz
P_{OUT} = 0dBm to 16dBm	-2.5		1.5	dB	
Switch Section					
Coupled power P_{OUT} to RX1 and RX2 ports		4	6	dBm	P_{OUT}=30.0dBm
Insertion Loss ANT to RX1 and RX2		1.3	1.5	dB	Freq=1805MHz to 1880MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2
Input VSWR ANT-RX1 and RX2		1.5:1			Freq=1805MHz to 1880MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2

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Electrical Specifications – PCS1900

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – PCS1900 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, V_{BAT} = 3.5V, P_{IN} = 3dBm Frequency = 1850 MHz to 1910 MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'High'
Operating Frequency	1850	—	1910	MHz	
Output Power					V_{RAMP} up to 1.5V
Maximum Nominal	30.0			dBm	Temp= 25°C, V_{BAT}=3.5V
Maximum Extreme 1	28.5			dBm	Temp= 85°C, V_{BAT}=2.7V, P_{IN} = 0dBm
Maximum Extreme 2	27.5			dBm	Temp= 85°C, V_{BAT}=2.7V, P_{IN} = 0dBm
Power-Added Efficiency And Supply Current					
PAE at Rated Power		40		%	At P_{OUT} = 30.0dBm typ.
PAE at Maximum Power		41		%	At P_{OUT} = 31.0dBm typ.
PAE at Backed-Off Power		34		%	At P_{OUT} = 28.0dBm typ.
Supply Current at Max Power			800	mA	Peak current at P_{OUT} = 30.0dBm
TRP					P_{OUT} set to 30.0dBm into 1:1 VSWR
Output Power Variation		±1.0		dB	3:1 VSWR, all phases
Minimum Power		27.0		dBm	3:1 VSWR, all phases
Maximum Supply Current		1100		mA	3:1 VSWR, all phases
Spurious					
Output Noise Power		-82	-80	dBm	RBW=100kHz, $P_{OUT} \leq$ 30.0dBm, P_{IN} = 0 to 6dBm f = 1930 MHz to 1990 MHz, RBW=100kHz,
		-86	-84	dBm	RBW=100kHz, $P_{OUT} \leq$ 30.0dBm, P_{IN} = 0 to 6dB f = 869 MHz to 894 MHz
Forward Isolation 1		-60	-52	dBm	TX_EN=SW1='Low', V_{RAMP} = 0.18V
Forward Isolation 2		-30	-25	dBm	TX_EN=SW1='High', V_{RAMP} = 0.18V
2nd thru 7th harmonic distortion		-40	-33	dBm	P_{OUT} = 0dBm to 30.0dBm
All Other Non-Harmonic Spurious			-36	dBm	
Output Load VSWR Stability	10:1				Spurious < -36dBm, with P_{OUT} set to $\leq$ 30.0dBm into 50Ω load, all phases, RBW=3MHz
Output Load VSWR Ruggedness	20:1				P_{OUT} set to $\leq$ 30.0dBm into 50Ω load. No damage or permanent degradation. All phases.
Output Load Impedance		50		Ω	Load impedance presented at Antenna pad

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Electrical Specifications – DCS1800 (cont.)

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Overall – PCS1900 Band					Nominal Conditions (unless otherwise stated) Temperature = 25°C, $V_{BA\,T}$ = 3.5V, P_{IN} = 3dBm Frequency = 1850 MHz to 1910 MHz 12.5% Duty Cycle, Pulse Width = 577µs, TX_EN = ENABLE= 'High', SW1 = 'High'
Input Port Characteristics					
Input Power Range	0		6	dBm	Max output guaranteed at Min drive level
Input Impedance		50		Ω	
Input VSWR			2.5:1		P_{OUT} = 0dBm to 30.0dBm $P_{IN} \leq$ 6dBm
Power Control					
Power Control Range	55	60		dB	$V_{RAMP} = V_{RAMP}$ min to V_{RAMP} max
Power Output Variation from nominal conditions P_{OUT} = 16dBm to 28.5dBm	-2.0		1.5	dB	P_{IN} = 0 to 6dBm, Temp = -20°C to +85°C 2.7V $\leq V_{BAT} \leq$ 4.5V Relative to Nominal Output Power Condition: V_{BAT}=3.5V, HB_IN = 3dBm, f = 1880 MHz
P_{OUT} = 0dBm to 16dBm	-2.5		1.5	dB	
Switch Section					
Coupled power P_{OUT} to RX1 and RX2 ports		4	6	dBm	P_{OUT}=30.0dBm
Insertion Loss ANT to RX1 and RX2		1.3	1.5	dB	Freq=1930 MHz to 1990 MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2
Input VSWR ANT-RX1 and RX2		1.5:1			Freq=1930 MHz to 1990 MHz, ENABLE='High', TX-ENABLE='Low", SW1= 'Low' for RX1 and 'High' for RX2

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Timing and VRAMP Profile

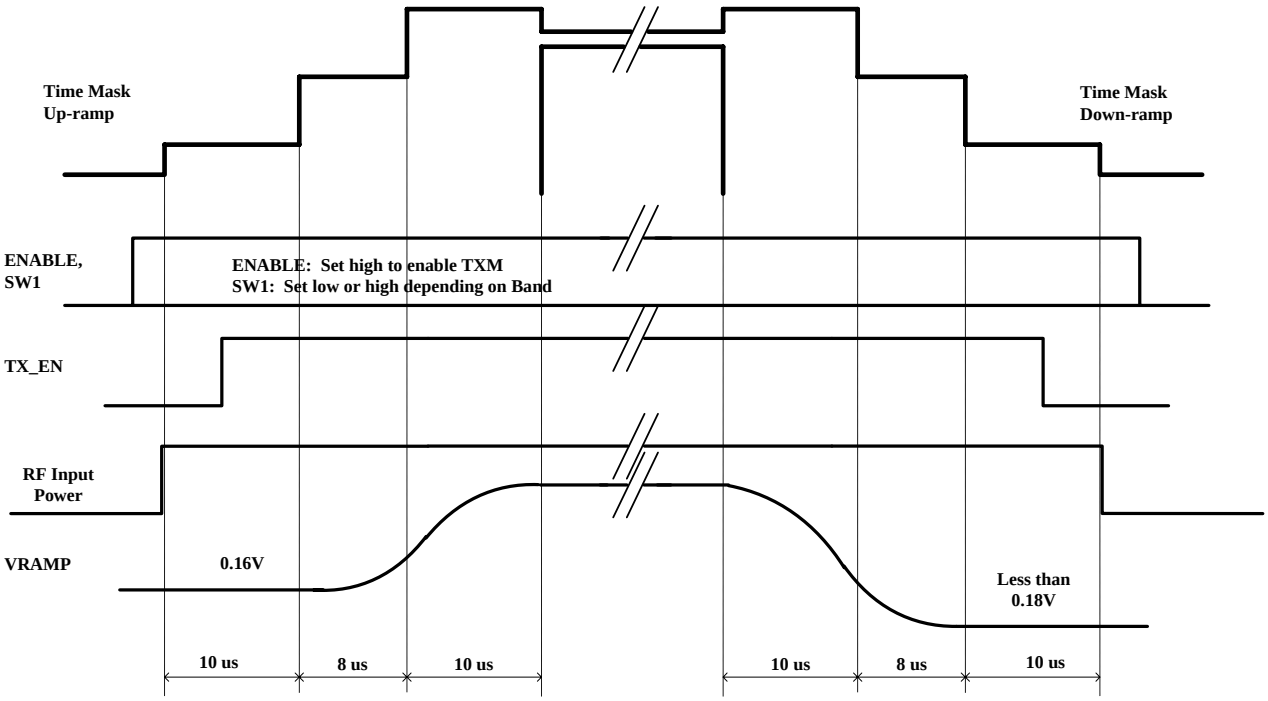

Figure 1. AM7808 Timing Diagram for VRAMP, TX_EN, SW1 and ENABLE.

Note on Pedestal Voltage: The VRAMP profile should set the pedestal voltage at the nominal value prior to the onset of the ramp-up to ensure that the output power tracks the VRAMP control voltage. The nominal value has been optimized to ensure good performance over the entire dynamic power range of the amplifier.

For information of power calibration and VRAMP profiles, see separate application notes.

Note on the Down-Ramp: The trailing edge of the VRAMP waveform should be brought down as low as the TCVR/base band allows, typically 0.10V before TX_EN, ENABLE and SW1 are set low to minimize spurious emissions from being generated.

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Pin-Out Information

Pin	Name	Description	Details
1, 2, 4, 5, 8, 9, 13, 16, 17, 18, 19, 20, 21, 23, 28, 29, 30, 31, 32	GND	Ground	
3	VBAT2	Secondary Power Supply	This should be connected directly to the battery
6	RFIN_HB	RF Input – DCS1800/PCS1900	50Ω input, DC blocked
7	RFIN_LB	RF Input – GSM850/900	50Ω input, DC blocked
10	TX_EN	Enable power core for output power	Logic 'Low'=Disabled or RX mode Logic 'High'=Enable Output Power This pin is a high impedance CMOS input with no pull-up or pull-down resistors.
11	VRAMP	Analog Power Control Signal Input	350kHz Low-Pass filter is integrated into the device. No external filtering is required.
12	SW1	Control signal selecting band of operation	Logic 'Low'=Low-band Logic 'High'=High-band This pin is a high impedance CMOS input with no pull-up or pull-down resistors.
14	ENABLE	Standby control	Logic 'Low'=Standby Mode Logic 'High'=TX or RX mode This pin is a high impedance CMOS input with no pull-up or pull-down resistors.
15	VBAT1	Primary Power Supply	This should be connected directly to the battery
22	ANT	Antenna port	50Ω input/output
24, 27	NC	No Connect	Do not connect these pins
25	RX1	RX Port. RX1 interchangeable with RX2	50Ω input/output
26	RX2	RX Port. RX2 interchangeable with RX1	50Ω input/output

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Pin-Out Diagram

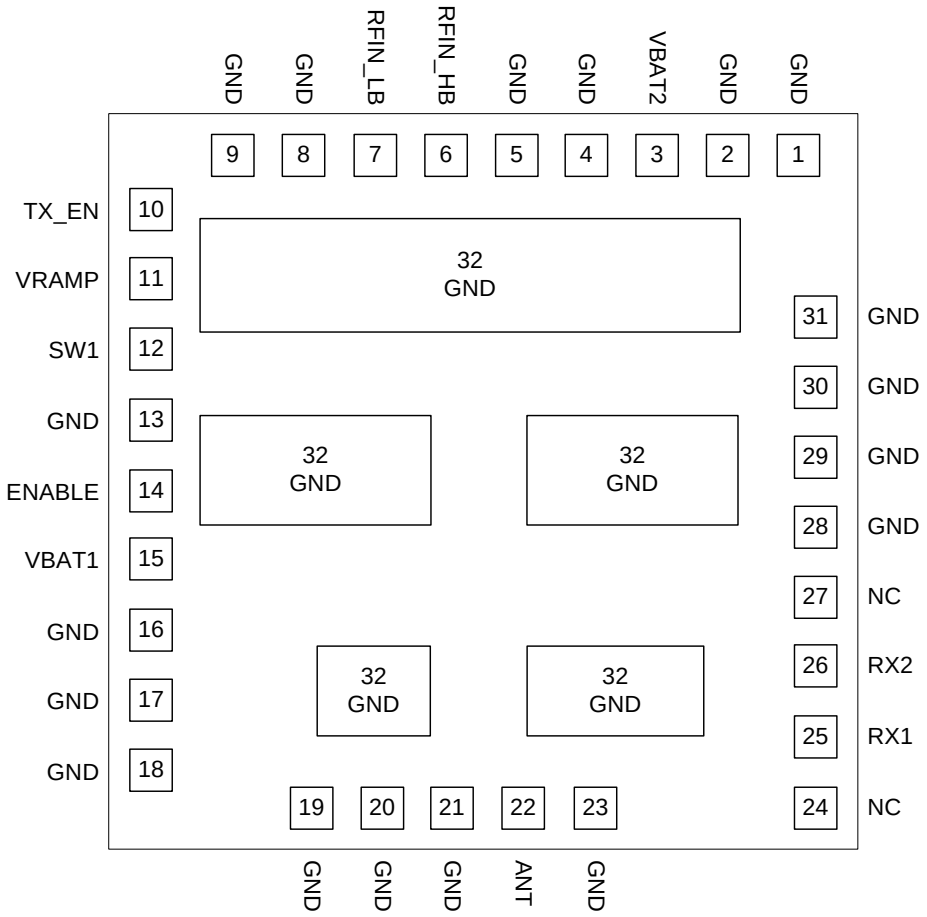

Figure 2. Top view AM7808.

Mode Control Logic

Mode	ENABLE	TX_ENABLE	SW1
Standby	0	0	0
TX LB	1	1	0
TX HB	1	1	1
RX1	1	0	0
RX2	1	0	1

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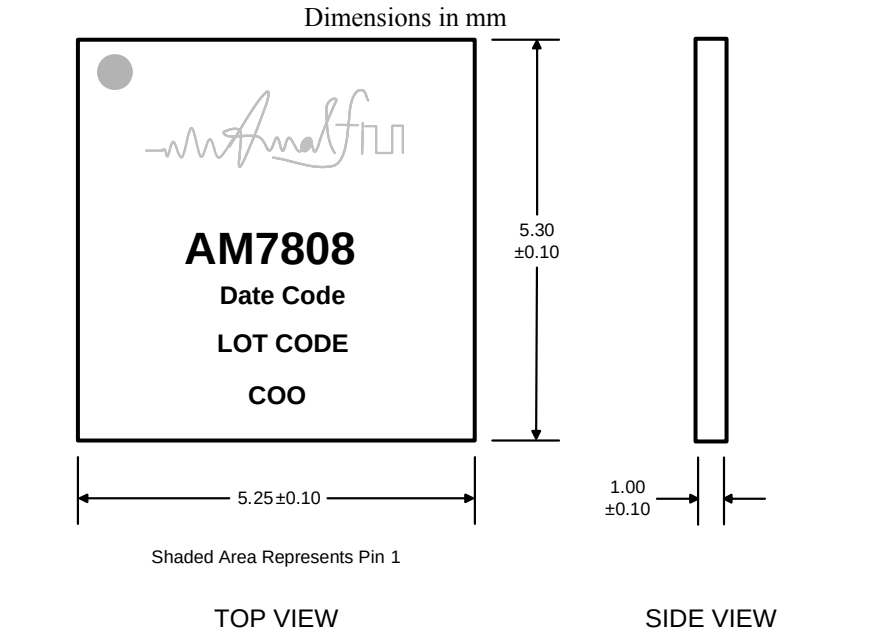
Package Drawing

The AM7808 is encapsulated in a 5.25×5.30×1.0mm Land Grid Array (LGA) package on a BT laminate substrate. The AM7808 is RoHS compliant and lead-free.



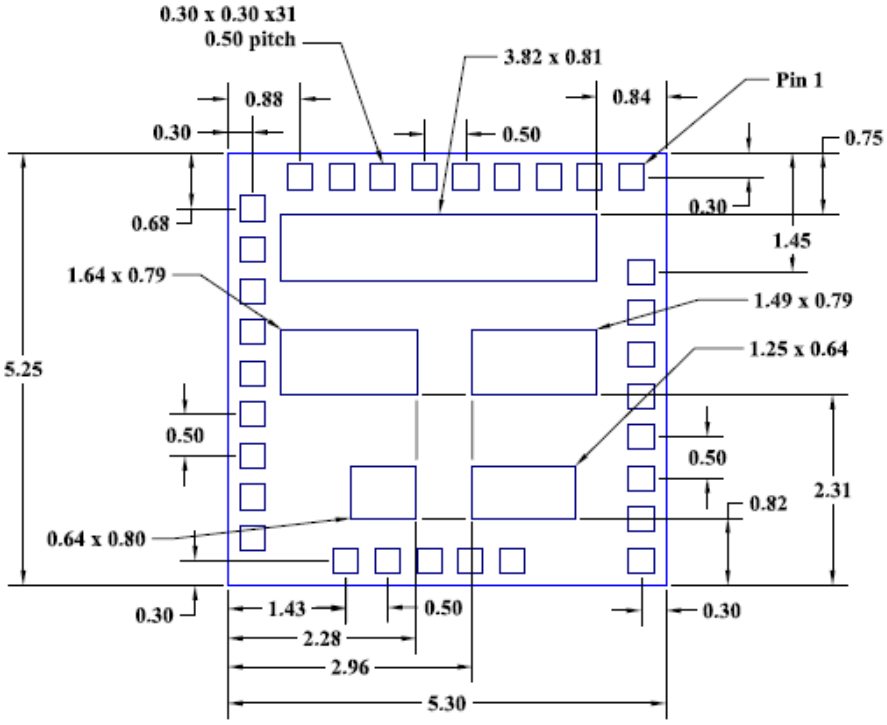


Figure 3. Simplified package drawing for AM7808
(dimensioned drawing is pads-down, note Pin 1)

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Application Schematic

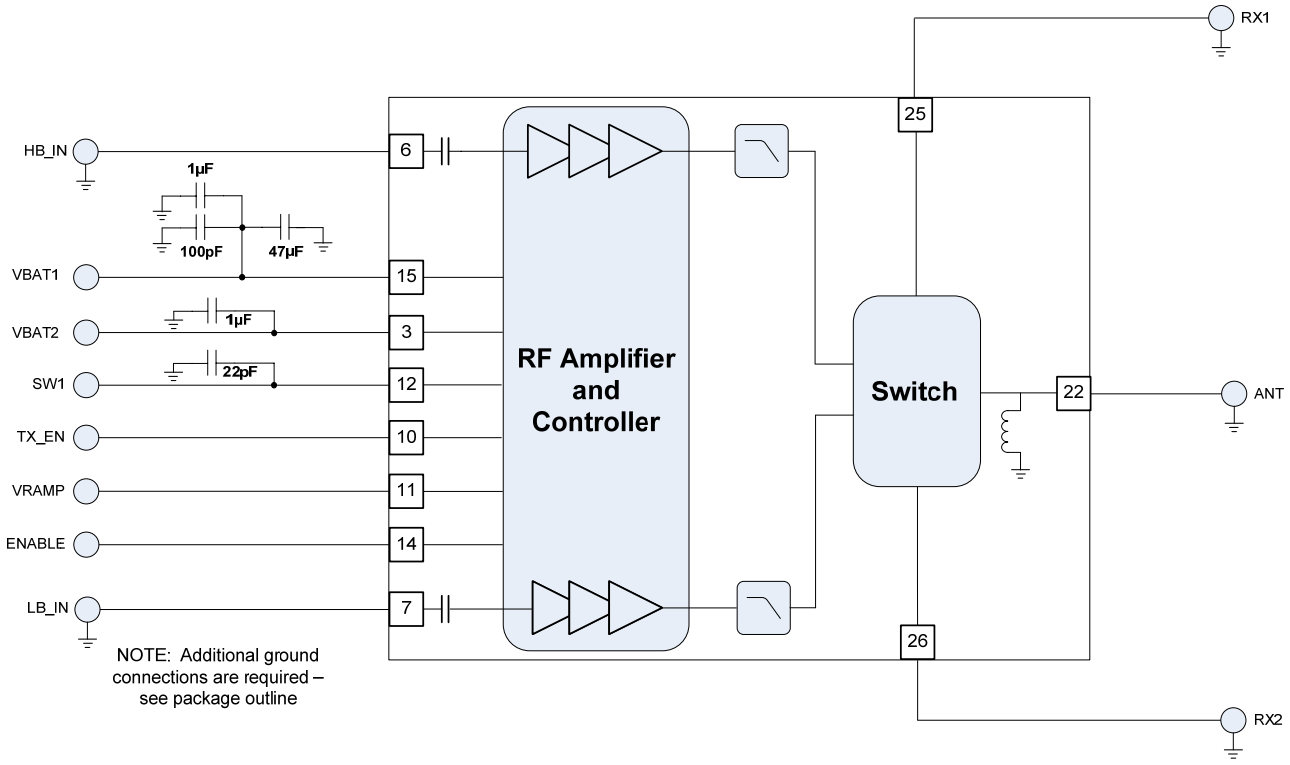

Figure 4. Application Schematic Diagram for AM7808.

Note: It is recommended to place the 100 pF capacitor as close to the device as possible.

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Evaluation Board Layout

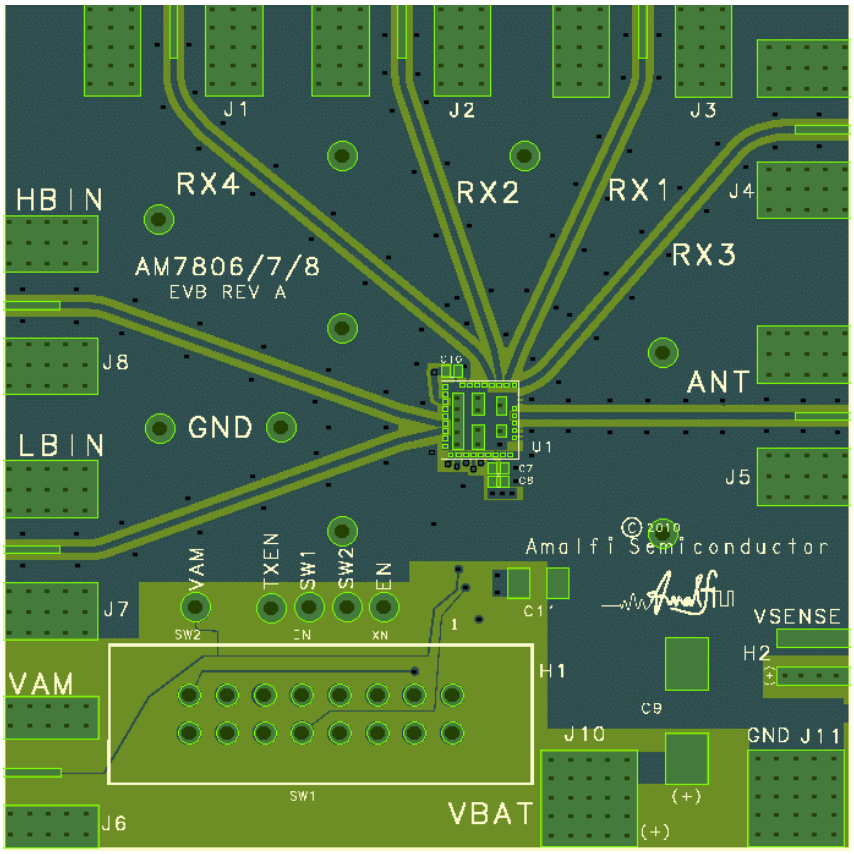

Figure 5. PCB Layout for AM7808 Evaluation Board.

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PCB and Stencil Drawing Design Requirements

PCB Surface Finish

Amalfi Semiconductor used an electroless nickel, immersion gold PCB finish in its qualification process. The typical thickness is 0.076µm to 0.203µm gold over 4.572µm nickel.

PCB Land Pattern Recommendation

The PCB land patterns used for the AM7808 are based on the IPC-SM-782 standards. The patterns below have been developed and tested for optimized assembly at Amalfi. However, each company has its own specific assembly processes and requirements and therefore may require modifications to address these items. The PCB land patterns were designed to accommodate for the LGA's lead and package tolerances.

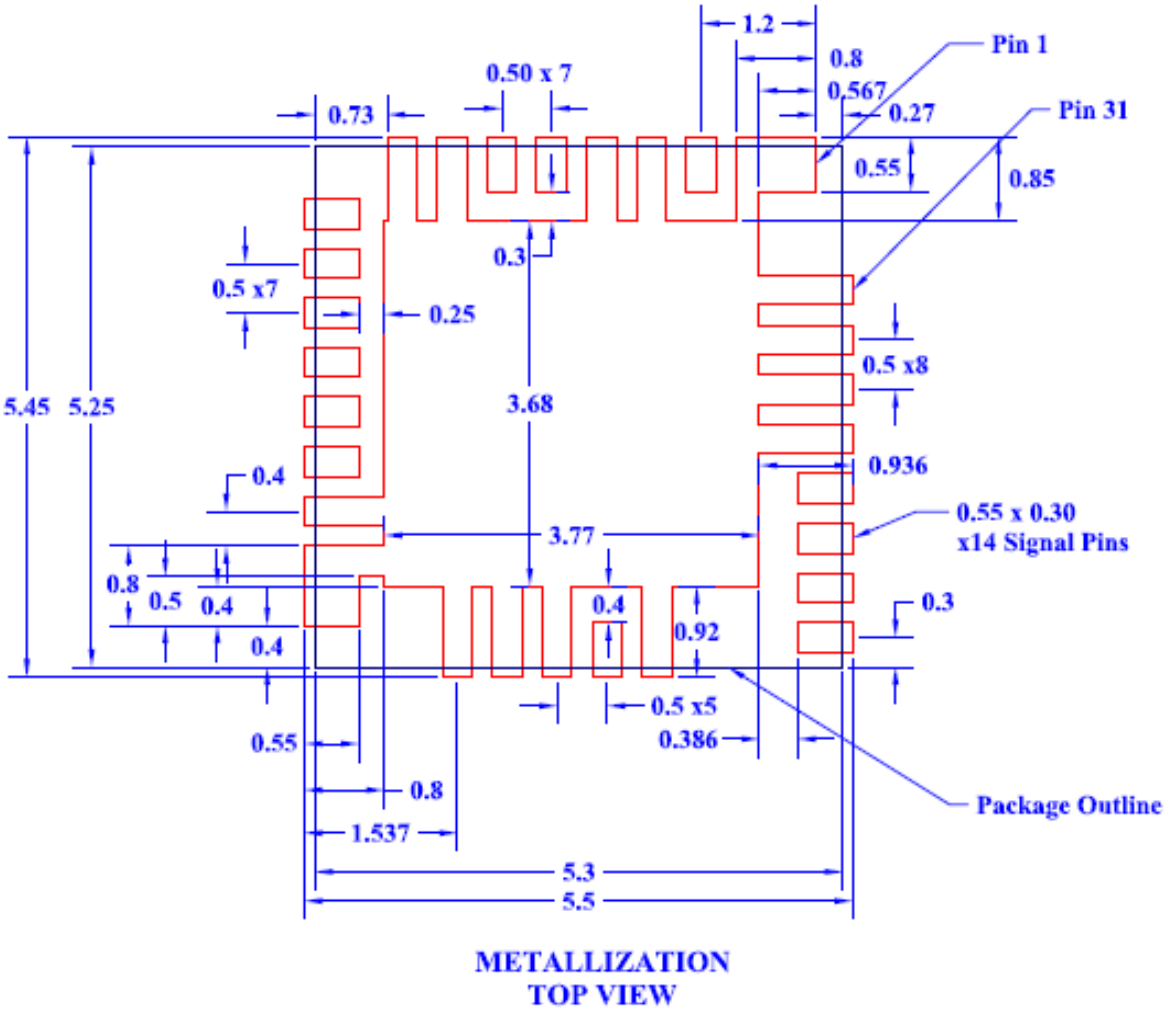

Figure 6a: PCB top metal pattern

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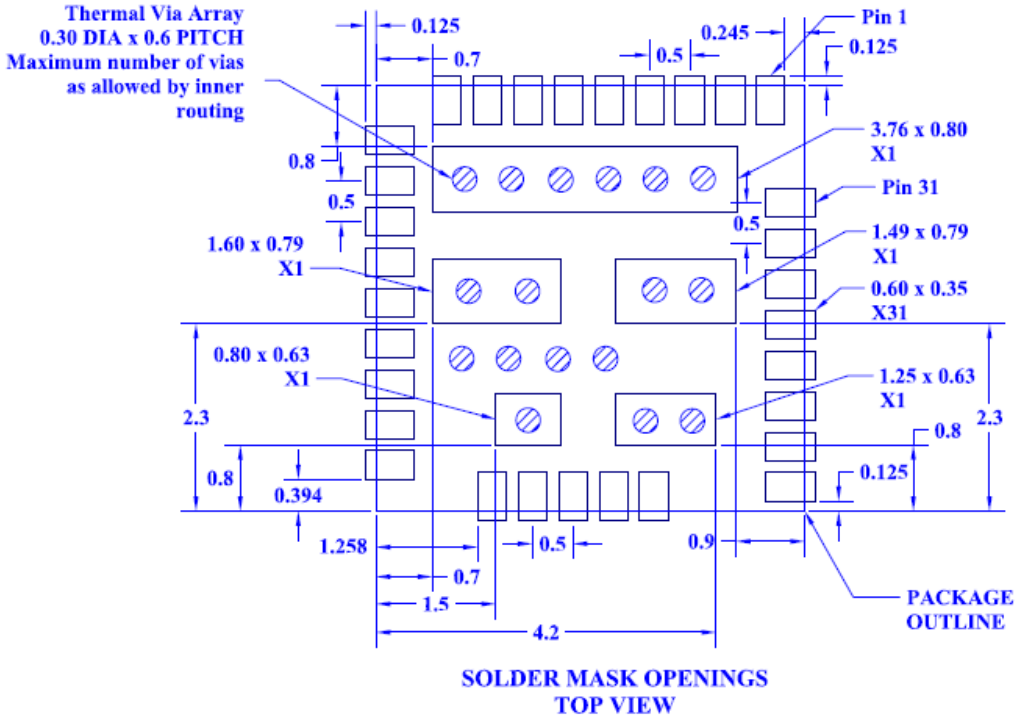

Figure 6b: SM openings

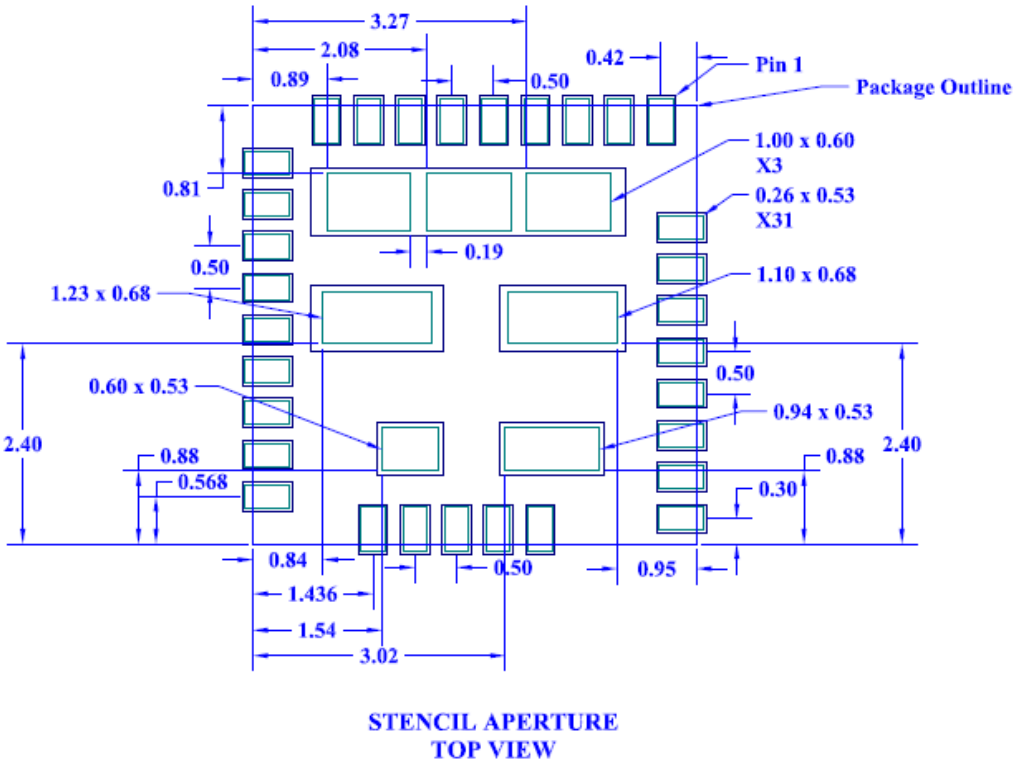

Figure 6c: Stencil paste openings

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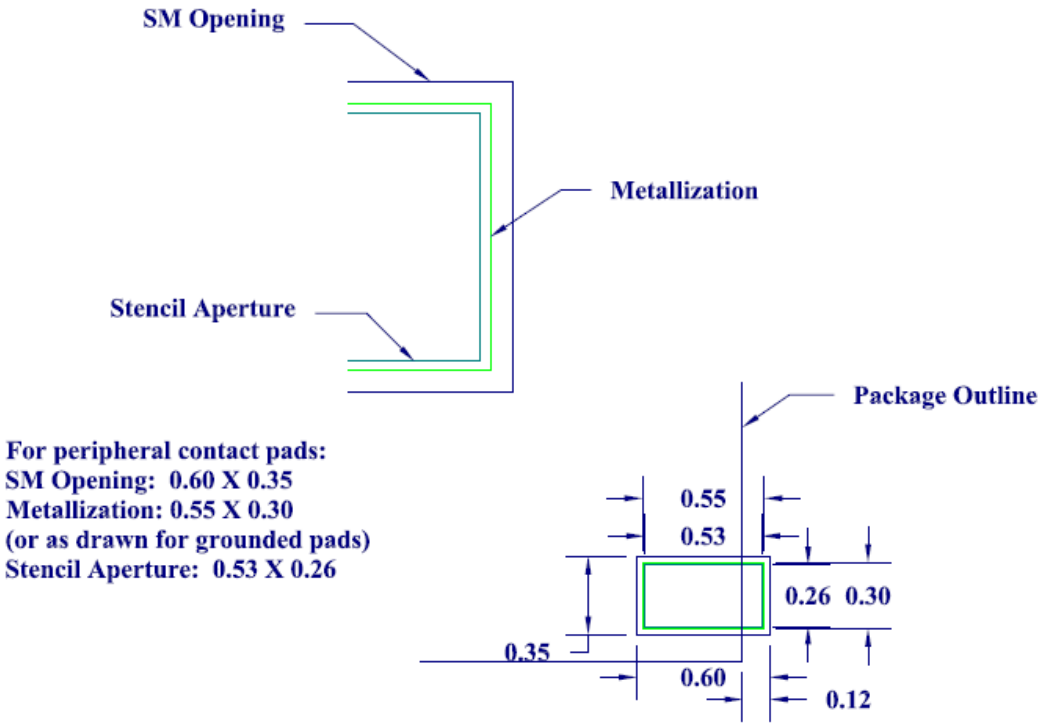

Figure 6d: Detail

Figure 6 a-d. Recommended PCB, solder mask and solder stencil. Non-solder mask Defined (NSMD) artwork assumed. All dimensions in mm.

Thermal Pad and Via Design

Thermal vias are required for the PCB layout of the AM7808 to effectively conduct heat away from the package. The via pattern in Figure 5b was designed with these considerations: thermal, power dissipation, and electrical requirements of the AM7808 plus PCB routing strategies.

Amalfi Semiconductor uses a via pattern based upon thru-hole vias with 0.203mm to 0.303mm finished hole size with 0.25mm plating for on the via walls. If micro vias are implemented in a design, Amalfi recommends that the number of vias be increased by a 4:1 ratio in order to achieve equivalent results.

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Ordering Information

Ordering Part Number	Quantity	Description
AM7808-CLT	3,000	Quad-Band TX Dual band RX CMOS Transmit Module, Commercial – Full Tape & Reel
AM7808-CLS	200	Quad-Band TX Dual band RX CMOS Transmit Module, Commercial – Small Tape & Reel
AM7808-CLZ	10	Quad-Band TX Dual band RX CMOS Transmit Module, Commercial – Waffle Pack
AM7808-EVB	1	Fully Assembled Evaluation Board

Tape & Reel Specifications

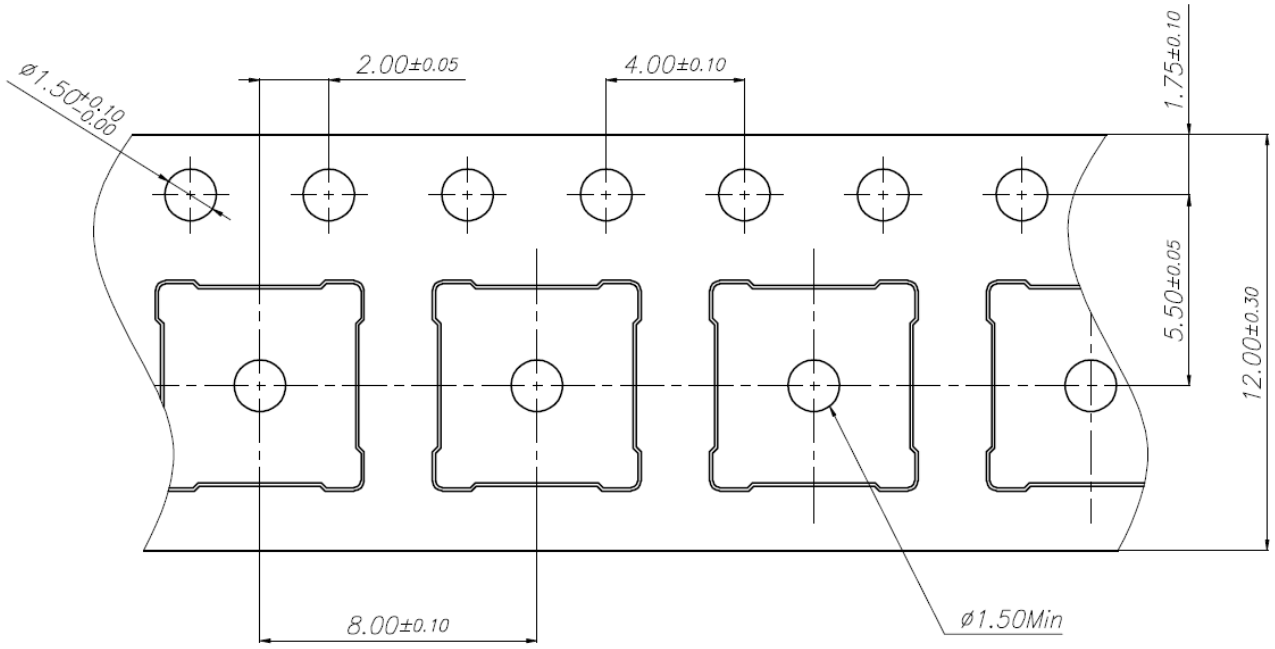

Figure 7. Tape and Reel Specifications for AM7808.

Forming Format	Flatbed
Estimated Max. Length	142 meter/22B3 reel
Material	Conductive Polystyrene (IV)

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