

# 500 mW Lower S-Band FM Transmitter, 2.2-2.3 GHz

MA05836-XXX

## Features

- FM transmitter with PLL, VCO and PA devices
- 3.0 - 3.3 Volt operation
- Parallel hard-wired frequency selection
- Choice of 43 frequency channels @ 1MHz spacing
- High Saturated Output Power: 27 dBm min.(@3.3V)
- 50 Ω Output Matched
- IRIG 106-00 compliant
- 41% average efficiency (over temperature)
- > 12Mbps operation
- High shock compatible
- 10 k ohm input impedance

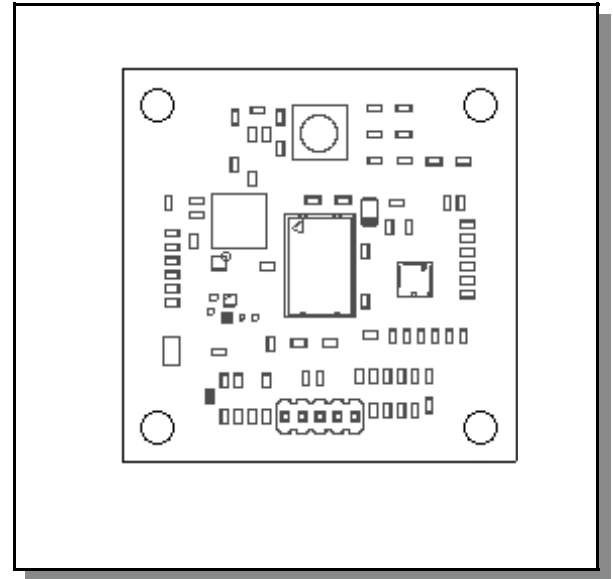
## Description

M/A-COM's MA05836 is a 500mW miniature, phase-locked, FM transmitter module. The MA05836 is ideally suited for rugged telemetry systems.

The MA05836 contains a shock hardened crystal oscillator, a silicon on sapphire phase-locked loop, and an *iHBT*<sup>TM</sup> VCO and power amplifier, with supply line bypassing. The module requires only a single, positive regulated +3.0VDC to +3.3VDC power supply. The MA05836 has a fully matched (50Ω) output network.

M/A-COM's MA05836 is fabricated on standard FR-4 PC board material, employing automatic assembly of the hybrid technology components (silicon on sapphire, *iHBT*<sup>TM</sup>, and SMT). When fully encapsulated, this module will easily survive high shock pulses greater than 30,000G. This product is 100% RF tested to ensure compliance to performance specifications.

## OUTLINE DRAWING <sup>1,2,3</sup>



1. Module size = 1.125" x 1.125"
2. Module height = 0.2"
3. Module weight = 3 grams typical

## Electrical Specifications: $Z_o = 50 \text{ Ohms}$ , $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Frequency	Units	Typ @ 3.3V
Supply Current	—	2.2 - 2.3 GHz	mA	450
Output Power	—	2.2 - 2.3 GHz	dBm	27 min
Output VSWR	—	2.2 - 2.3 GHz		< 2:1
Stability	-40°C to +85°C	2.2 - 2.3 GHz	%	<± 0.002
Lock Time	—	2.2 - 2.3 GHz	ms	< 30
Harmonics	—	2.2 - 2.3 GHz	dBm	< -25
Output Power vs. Temp	-40°C to +85°C	2.2 - 2.3 GHz	dBm	± 0.6
Power Added Efficiency	—	2.2 - 2.3 GHz	%	41

### Absolute Maximum Ratings <sup>4,5</sup>

Parameter	Absolute Maximum
Modulation Voltage ( $V_{MOD}$ )	3.0 V <sub>PP</sub>
$V_{CC}$	+3.5 V
$I_{CC}$	1000 mA
Max. Dissipation Power	3500 mW
Channel Temperature	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

- Operation of this device above any one of these parameters may cause permanent damage.
- Adequate heat sinking and grounding required.

### Handling

Permanent damage to the MA05836 may occur if the following precautions are not adhered to:

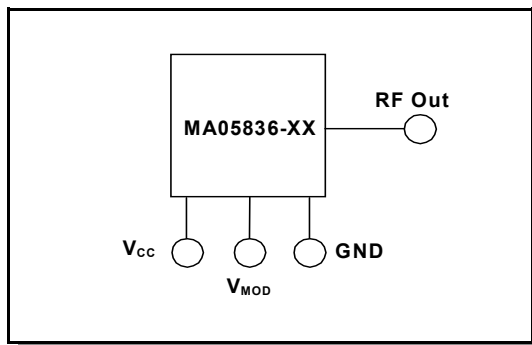
A. Static Sensitivity – All die handling equipment and personnel should comply with DOD-STD-1686 Class I.

B. Transients – Avoid instruments and power supply transients while bias is connected to the MA05836. Use shielded signal and bias cables to minimize inductive pick-up.

### Mounting

DO NOT expose the MA05836 to temperatures greater than 180°C for more than 20 seconds. Higher temperatures may result in reflow of the Sn63/Pb37 solder used for SMT component attach.

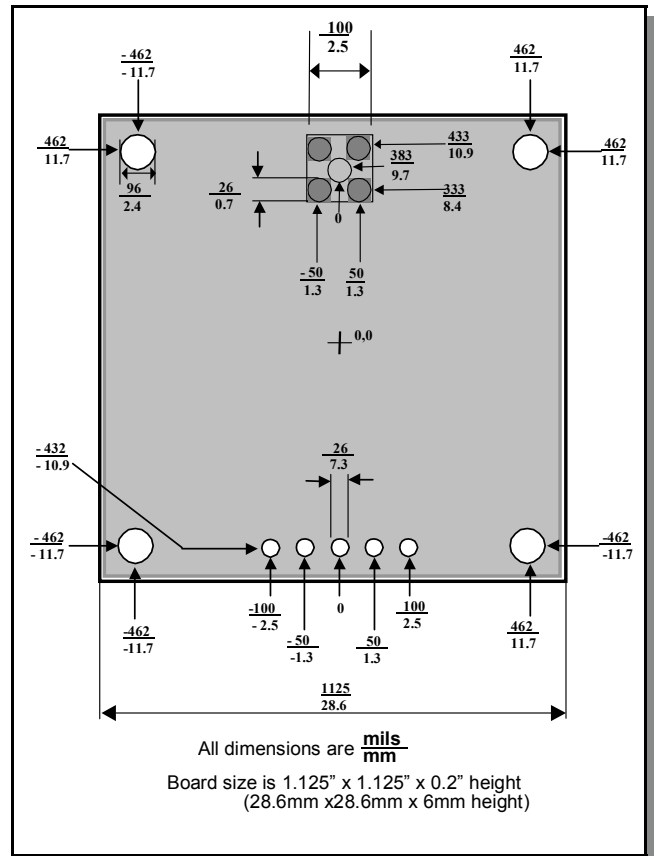
### Typical Bias Configuration <sup>6,7</sup>



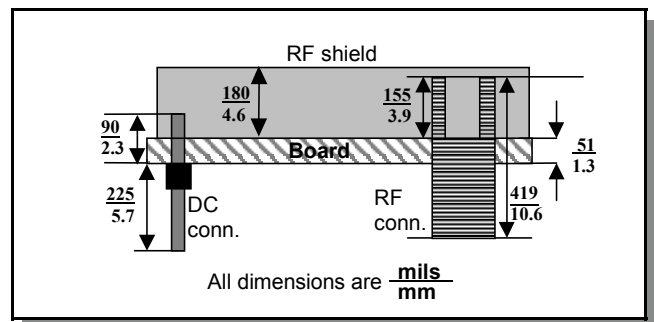
- Apply  $V_{CC}$  before applying  $V_{MOD}$ .
- $V_{CC}$  bypassing is performed on board.

### Module Outline

### Preliminary



### Side View of Transmitter

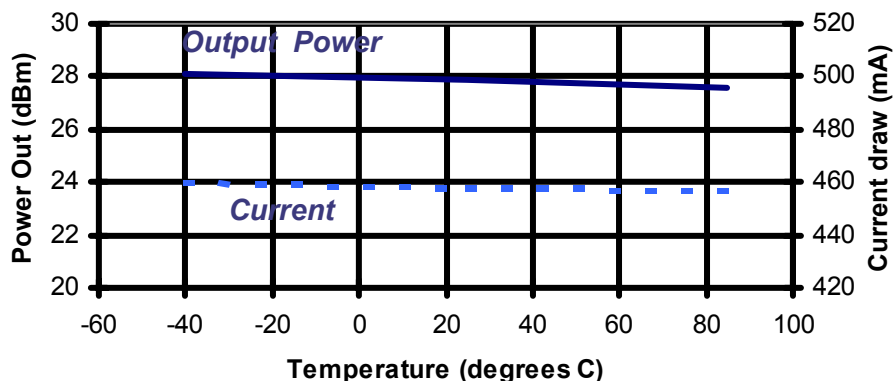


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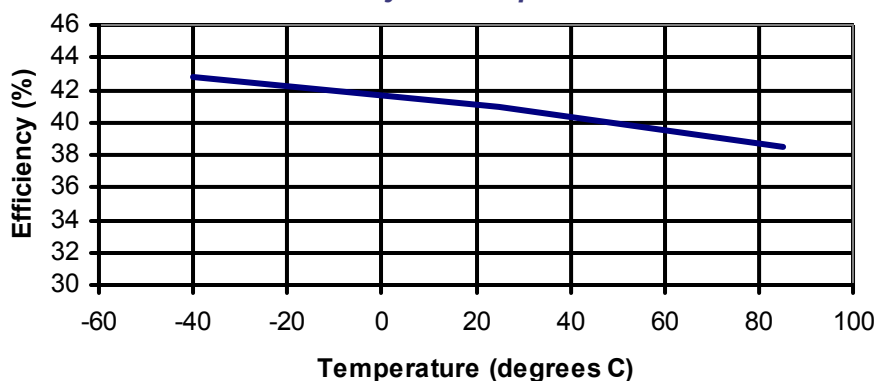
Typical Performance Curves

Preliminary

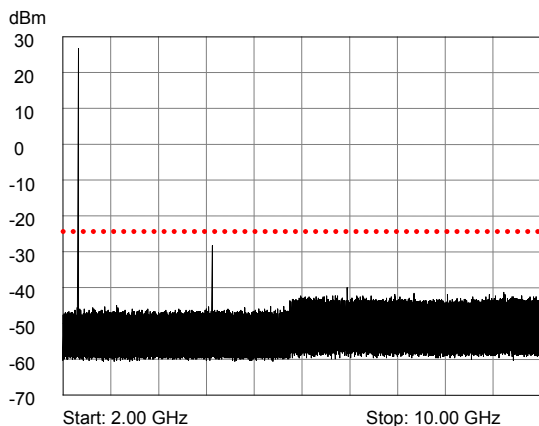
Output Power and Current vs. Temperature



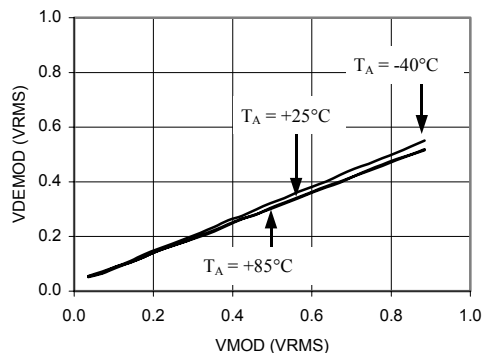
Efficiency vs. Temperature



Spurious Emissions



Modulation (ac) Linearity



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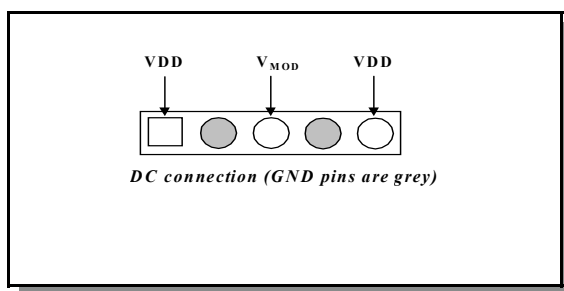
**Application Notes**

**DC connector**

The DC connection of the MA05836-XXX is made thru five single pin connectors. Each pin is a thru hole of 0.020" diameter. The pin assignments are shown in the figure below.

The through-hole connector was chosen to allow freedom in mounting; this connector may be either placed or omitted to allow use of other connector types.

**DC CONNECTOR PINOUT**



**RF connector**

The RF connector is a standard-sized, through-hole mounted SSMC connector. To afford user flexibility, the RF connector can be provided with the MA05836 unattached to the board.

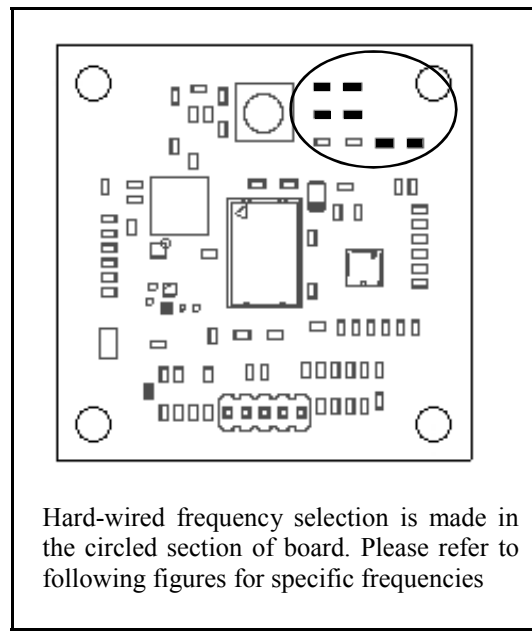
**Channel Selection**

The PLL determines the frequency of operation of the transmitter. The channels available are listed in the table on page 9. There are 43 frequencies available, at 1MHz spacing.

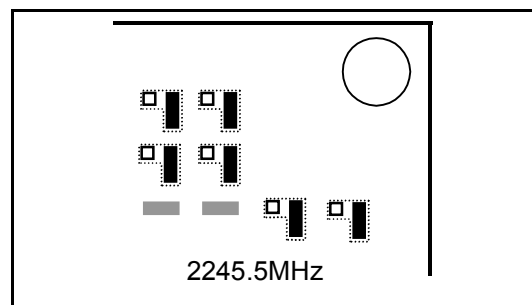
The channel selection on the board is performed through the use of 0402 SMT zero ohm resistors, connected to the parallel input lines of the PLL. See the following pages for frequency choices, and the required resistor positions.

**FREQUENCY SELECTOR**

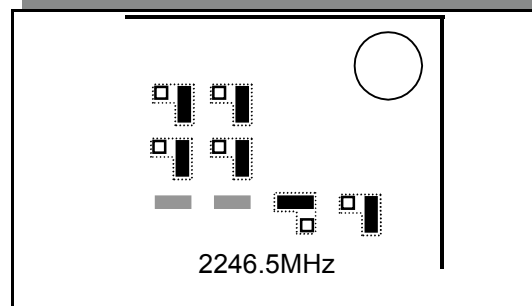
Preliminary



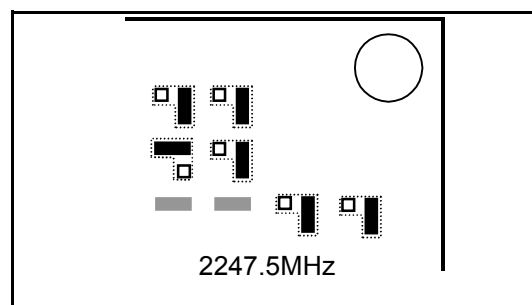
Hard-wired frequency selection is made in the circled section of board. Please refer to following figures for specific frequencies



2245.5MHz



2246.5MHz

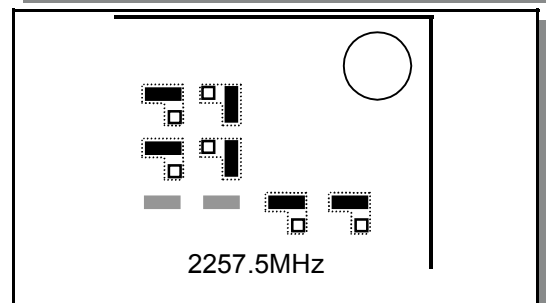
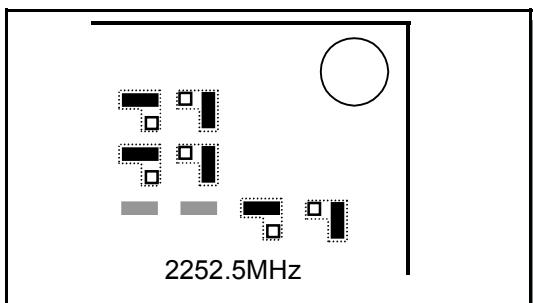
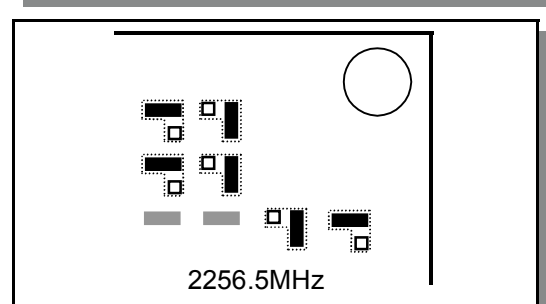
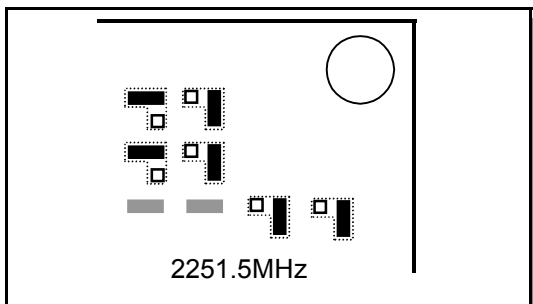
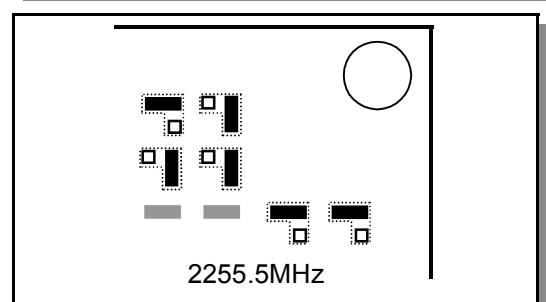
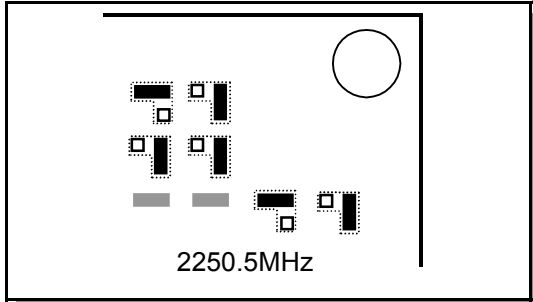
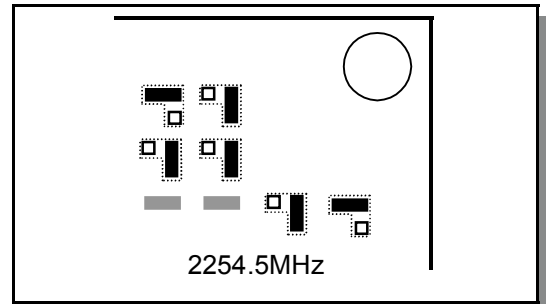
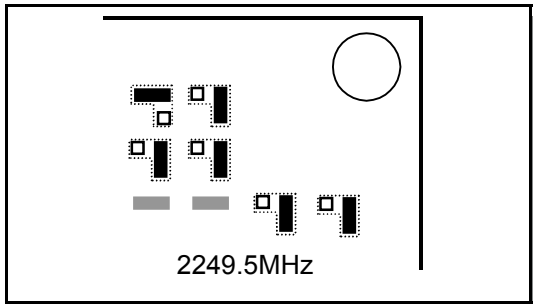
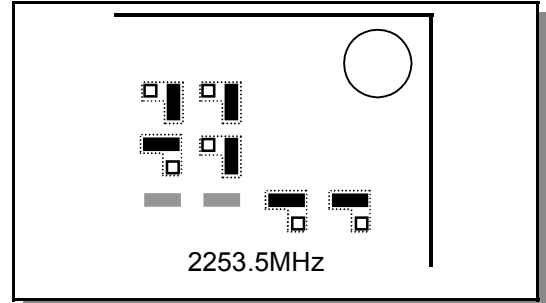
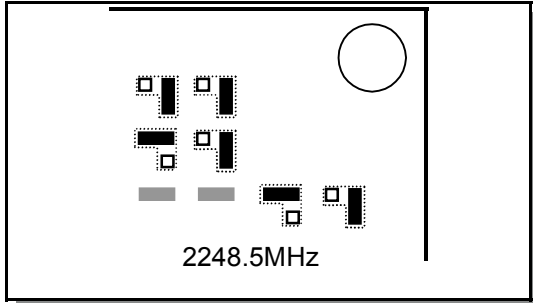


2247.5MHz

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Frequency selection for  $S_{LOWER}$  band, cont'd

Preliminary

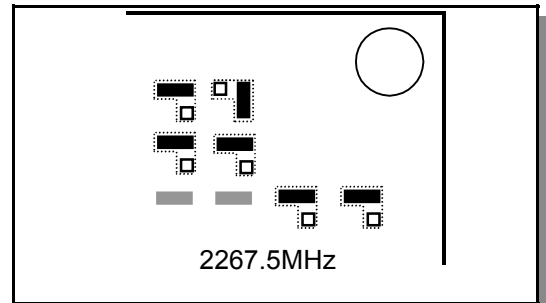
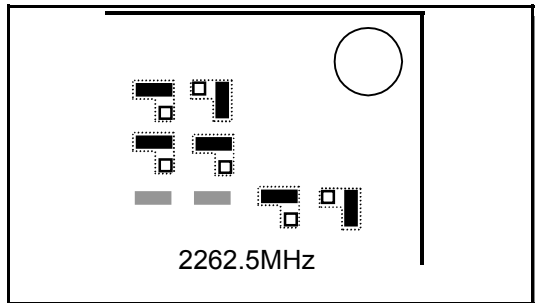
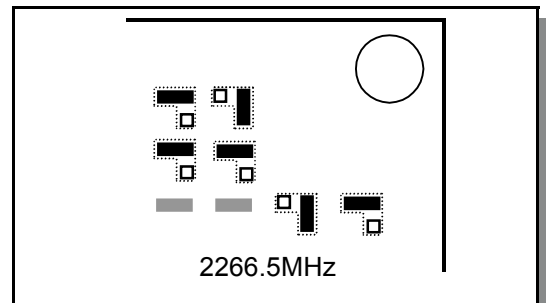
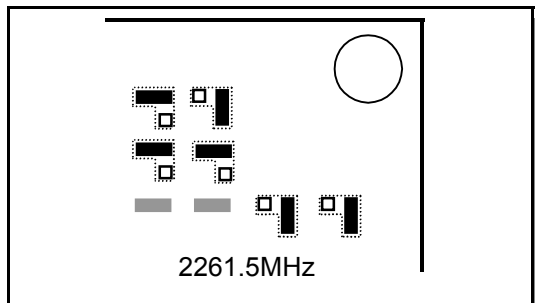
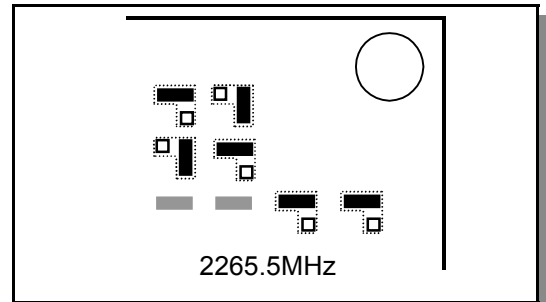
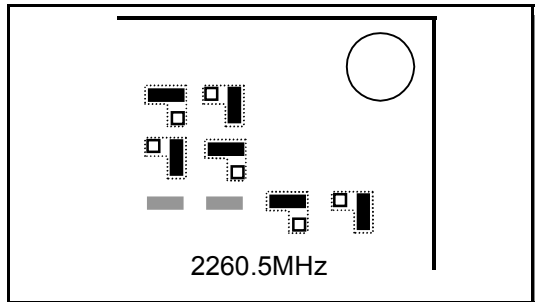
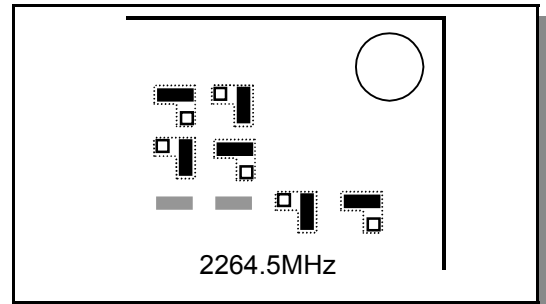
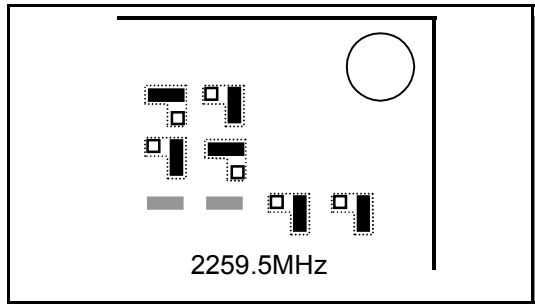
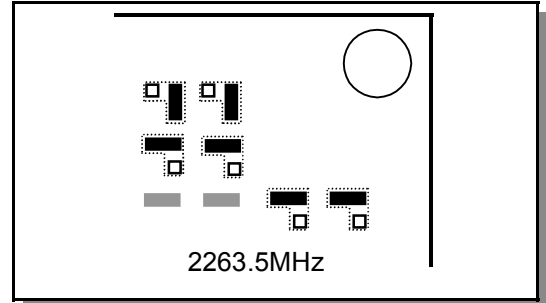
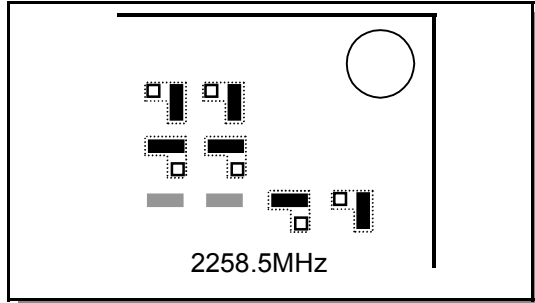


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Frequency selection for  $S_{LOWER}$  band, cont'd

Preliminary

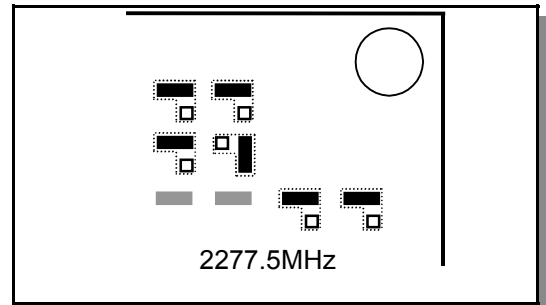
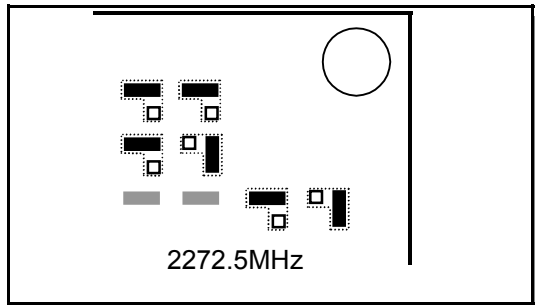
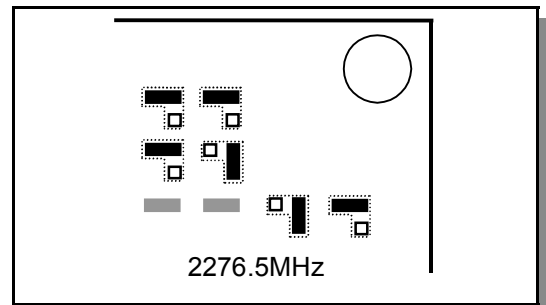
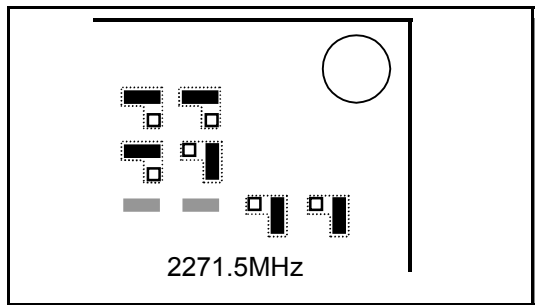
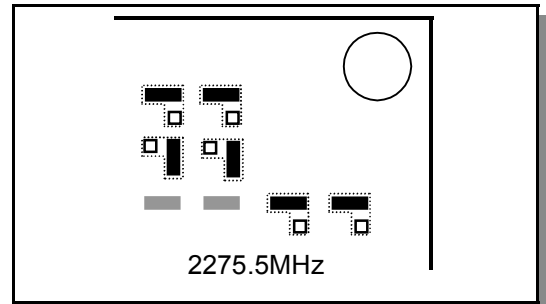
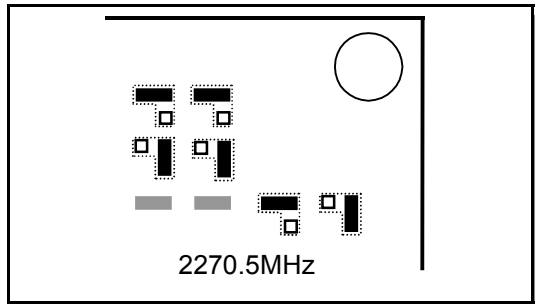
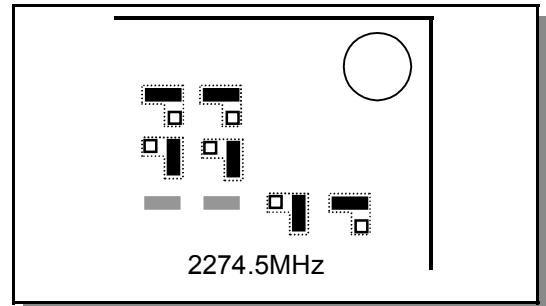
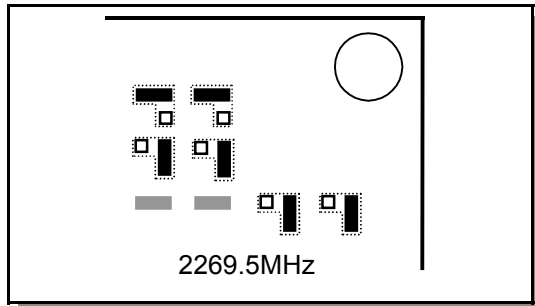
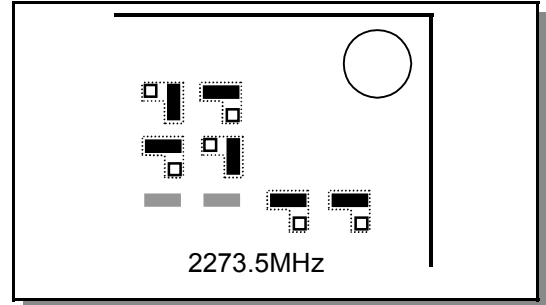
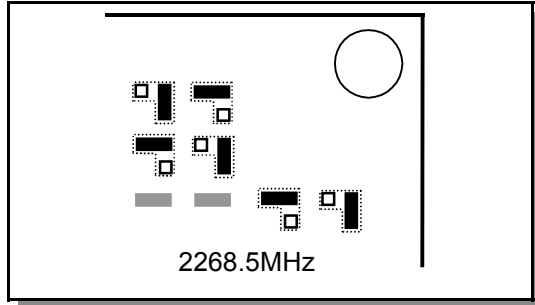


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Frequency selection for  $S_{LOWER}$  band, cont'd

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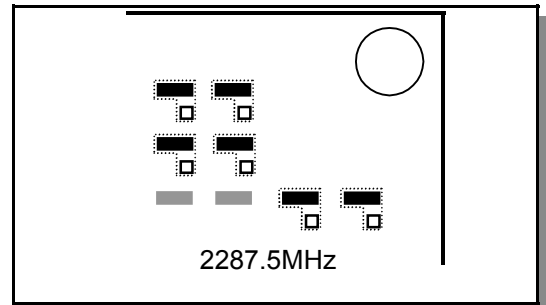
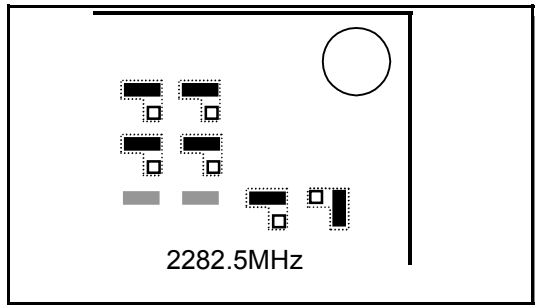
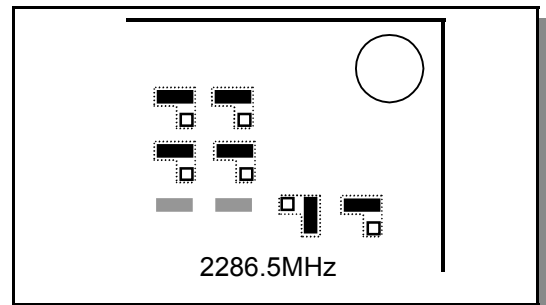
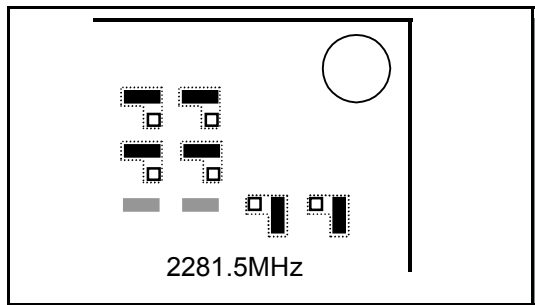
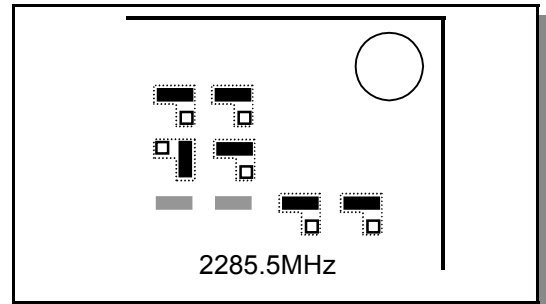
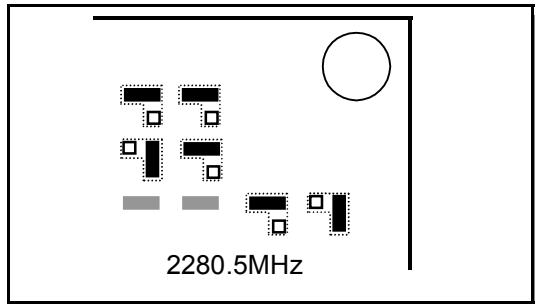
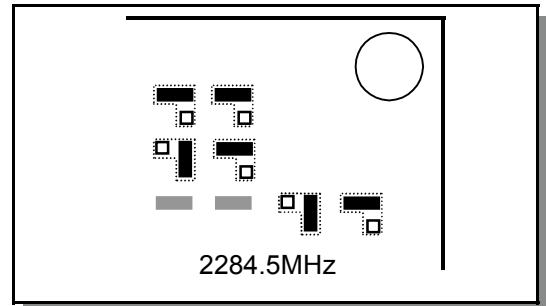
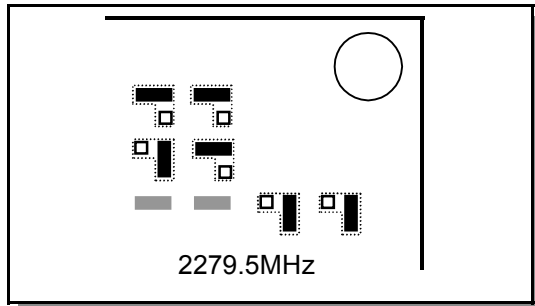
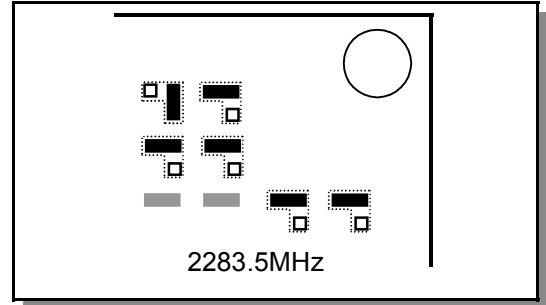
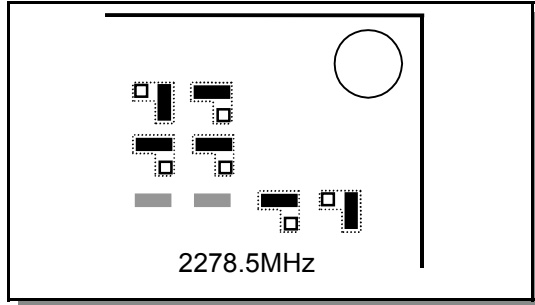


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Frequency selection for  $S_{LOWER}$  band, cont'd

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## Ordering Information

PART NO.	DESCRIPTION
MA05836-045	27dBm module (operates at 2245.5MHz)
MA05836-046	27dBm module (operates at 2246.5MHz)
MA05836-047	27dBm module (operates at 2247.5MHz)
MA05836-048	27dBm module (operates at 2248.5MHz)
MA05836-049	27dBm module (operates at 2249.5MHz)
MA05836-050	27dBm module (operates at 2250.5MHz)
MA05836-051	27dBm module (operates at 2251.5MHz)
MA05836-052	27dBm module (operates at 2252.5MHz)
MA05836-053	27dBm module (operates at 2253.5MHz)
MA05836-054	27dBm module (operates at 2254.5MHz)
MA05836-055	27dBm module (operates at 2255.5MHz)
MA05836-056	27dBm module (operates at 2256.5MHz)
MA05836-057	27dBm module (operates at 2257.5MHz)
MA05836-058	27dBm module (operates at 2258.5MHz)
MA05836-059	27dBm module (operates at 2259.5MHz)
MA05836-060	27dBm module (operates at 2260.5MHz)
MA05836-061	27dBm module (operates at 2261.5MHz)
MA05836-062	27dBm module (operates at 2262.5MHz)
MA05836-063	27dBm module (operates at 2263.5MHz)
MA05836-064	27dBm module (operates at 2264.5MHz)
MA05836-065	27dBm module (operates at 2265.5MHz)
MA05836-066	27dBm module (operates at 2266.5MHz)
MA05836-067	27dBm module (operates at 2267.5MHz)
MA05836-068	27dBm module (operates at 2268.5MHz)
MA05836-069	27dBm module (operates at 2269.5MHz)
MA05836-070	27dBm module (operates at 2270.5MHz)
MA05836-071	27dBm module (operates at 2271.5MHz)
MA05836-072	27dBm module (operates at 2272.5MHz)
MA05836-073	27dBm module (operates at 2273.5MHz)
MA05836-074	27dBm module (operates at 2274.5MHz)
MA05836-075	27dBm module (operates at 2275.5MHz)
MA05836-076	27dBm module (operates at 2276.5MHz)
MA05836-077	27dBm module (operates at 2277.5MHz)
MA05836-078	27dBm module (operates at 2278.5MHz)
MA05836-079	27dBm module (operates at 2279.5MHz)

## Preliminary

PART NO.	DESCRIPTION
MA05836-080	27dBm module (operates at 2280.5MHz)
MA05836-081	27dBm module (operates at 2281.5MHz)
MA05836-082	27dBm module (operates at 2282.5MHz)
MA05836-083	27dBm module (operates at 2283.5MHz)
MA05836-084	27dBm module (operates at 2284.5MHz)
MA05836-085	27dBm module (operates at 2285.5MHz)
MA05836-086	27dBm module (operates at 2286.5MHz)
MA05836-087	27dBm module (operates at 2287.5MHz)

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