

250 mW Lower S-Band FM Transmitter, 2.2-2.3 GHz

MA05935-XXX

Features

- FM transmitter with PLL, VCO and PA devices
- 3.0 to 3.3 Supply Voltage operation
- Parallel hard-wired frequency selection
- Choice of 32 frequency channels @ 1MHz spacing
- High Saturated Output Power: 24 dBm typ.
- 50 Ω Output Matched
- IRIG 106-00 compliant
- STATEK crystal oscillator
- >12Mbps operation
- High shock compatible
- 10 k ohm input impedance

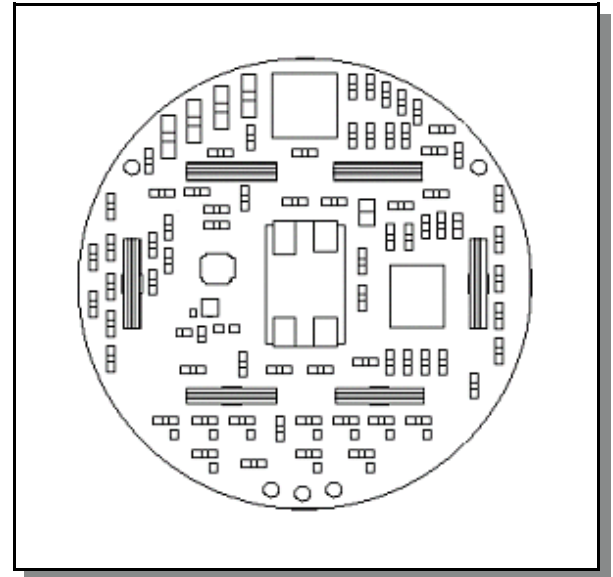
Description

M/A-COM's MA05935-XXX is a miniature, phase-locked, FM transmitter module. The MA05935-XXX is ideally suited for rugged telemetry systems.

The MA05935-XXX contains a shock hardened crystal oscillator, a silicon on sapphire phase-locked loop, and an InGaP HBT VCO and power amplifier, with supply line bypassing. The module requires only a single, positive regulated 3VDC power supply. The MA05935-XXX has a fully matched (50Ω) output network.

M/A-COM's MA05935-XXX is fabricated on standard FR-4 PC board material, employing automatic assembly of the hybrid technology components (silicon on sapphire, InGaP HBT, and SMT). When fully encapsulated, this module will easily survive high shock pulses greater than 30,000G's. This product is 100% RF tested to en-

OUTLINE DRAWING ^{1,2,3}



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

Electrical Specifications: $V_{cc} = +3V$, $Z_o = 50 \text{ Ohms}$, $T_A = 25^\circ C$

| Parameter | Test Conditions | Frequency | Units | Min | Typ | Max |
|------------------------|-----------------|---------------|------------|------|----------|------|
| Supply Voltage | — | — | volts | 2.85 | — | 3.15 |
| Supply Current | — | 2.2 - 2.3 GHz | mA | — | 350 | — |
| Output Power | — | 2.2 - 2.3 GHz | dBm | — | 24 | — |
| 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 | dBc | — | < -25 | — |
| Output Power vs. Temp | -40°C to +85°C | 2.2 - 2.3 GHz | dBm | | ± 0.6 | |
| Phase Noise | — | 2.2 - 2.3 GHz | dBc @50kHz | — | -85 | — |
| Power Added Efficiency | — | 2.2 - 2.3 GHz | % | — | 23 | — |

Absolute Maximum Ratings ^{4,5}

| Parameter | Absolute Maximum |
|----------------------------------|------------------|
| Modulation Voltage (V_{MOD}) | 3.0 V_{PP} |
| V_{CC} | +4 V |
| I_{CC} | 600 mA |
| Max. Dissipation Power | 1350 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

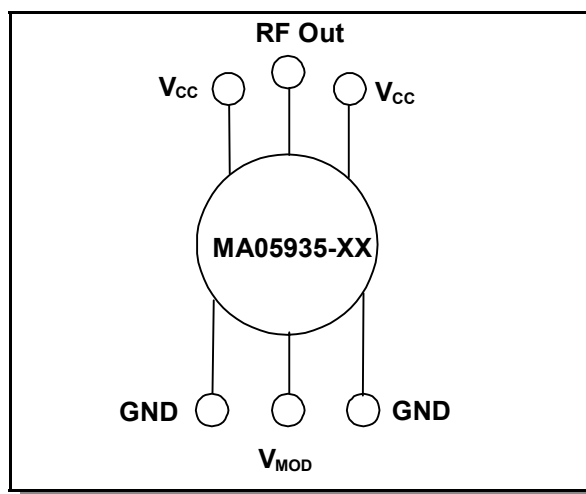
Permanent damage to the MA05935-XXX may occur if the following precautions are not adhered to:

- Static Sensitivity – All die handling equipment and personnel should comply with DOD-STD-1686 Class I.
- Transients – Avoid instruments and power supply transients while bias is connected to the MA05935-XXX. Use shielded signal and bias cables to minimize inductive pick-up.

Mounting

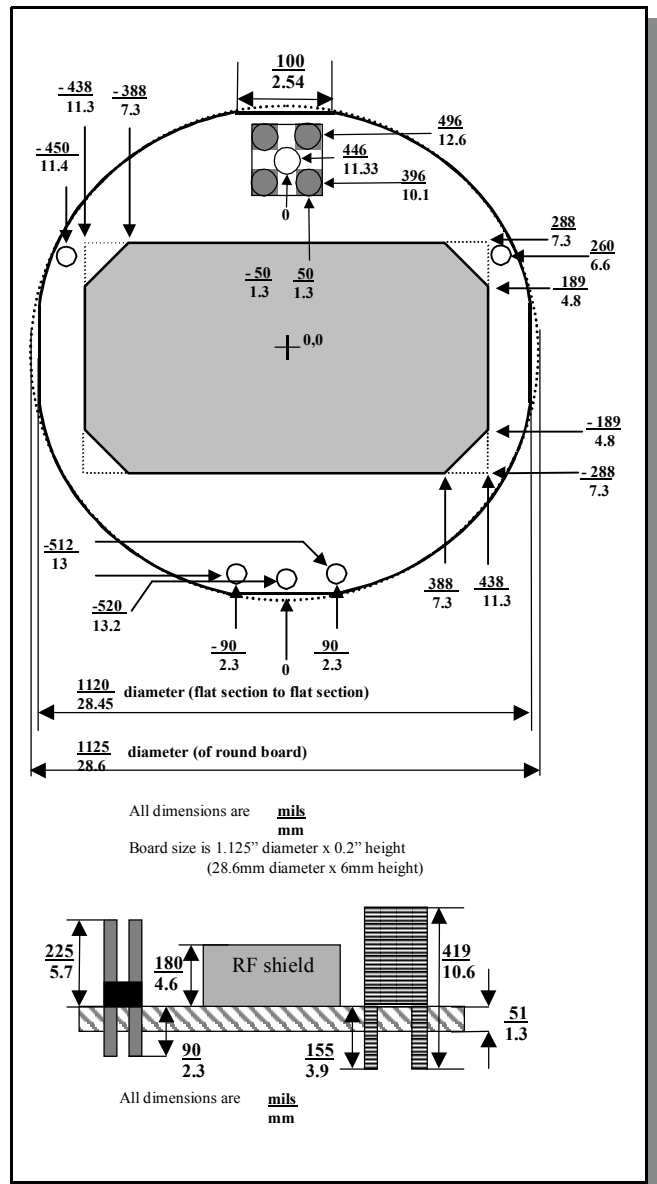
DO NOT expose the MA05935-XXX to temperatures greater than 180°C for more than 20 seconds. Higher temperatures may result in reflow of the Sn63/Pb37 solder used for SMT component attach.

Typical Bias Configuration ^{6,7}



- Apply +3 volts V_{CC} . Apply V_{MOD} .
- V_{CC} bypassing is performed on board.

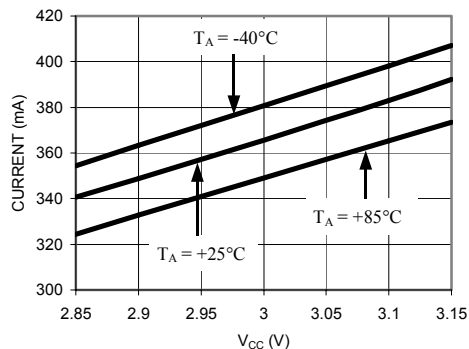
Module Outline



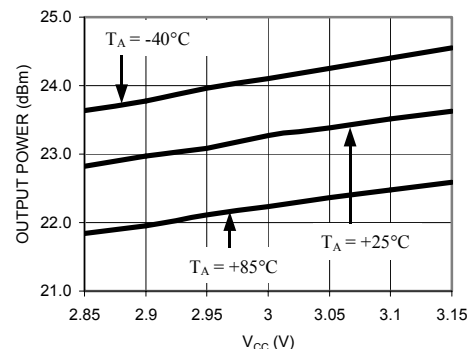
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Typical Performance Curves

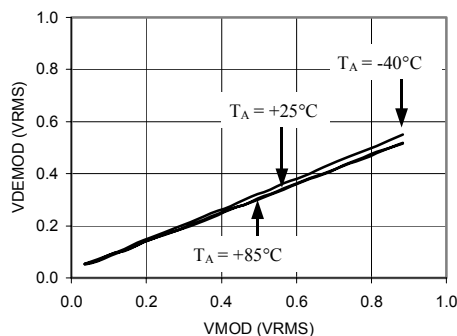
Current vs. Supply Voltage



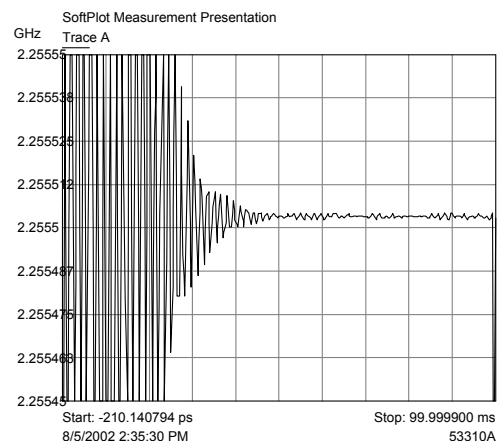
Output Power vs. Supply Voltage



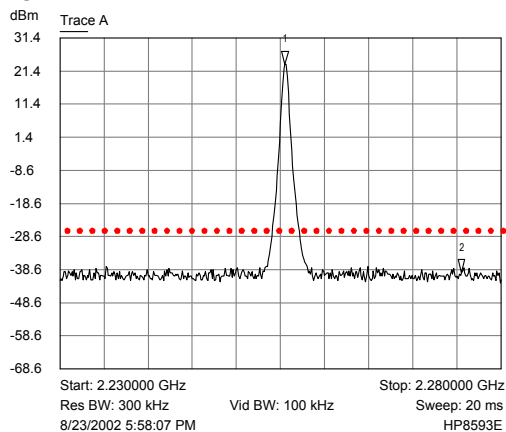
Modulation (ac) Linearity



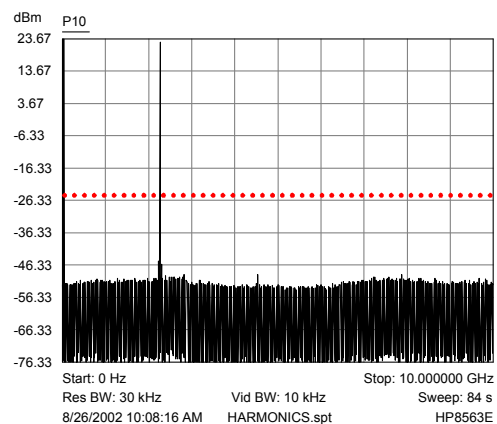
Lock Time



Spurious Emissions



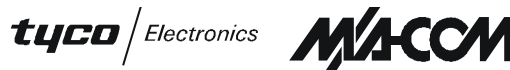
Harmonic spectrum



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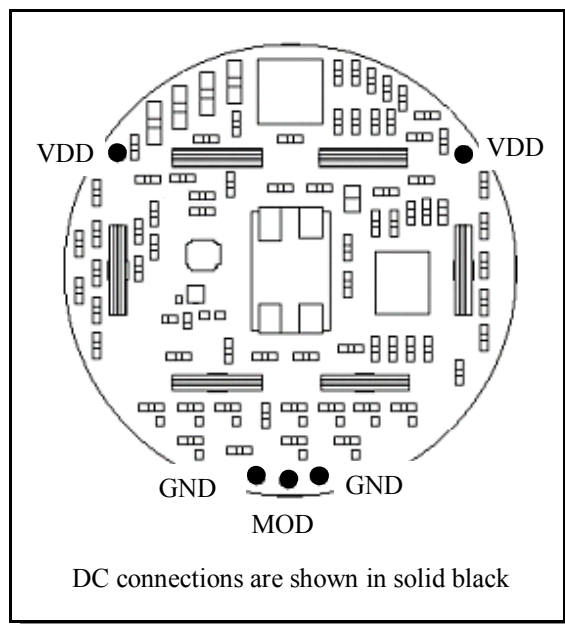
Application Notes

DC connector

The DC connection of the MA05935-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



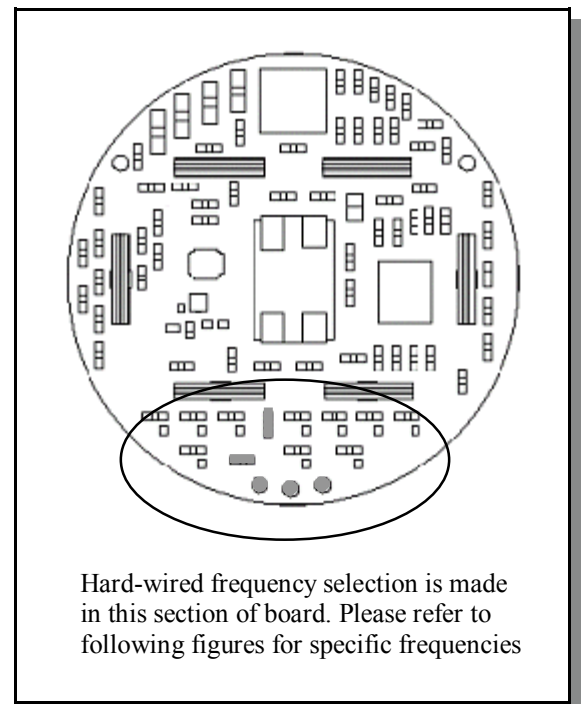
Channel Selection

The PLL determines the frequency of operation of the transmitter. The channels available are listed in the following tables. There are 32 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 SELECTON



RF connector

The RF connector is a standard-sized, through-hole mounted SSMC connector. To afford user flexibility, the RF connector provided with the MA05935 is supplied unattached to the board.

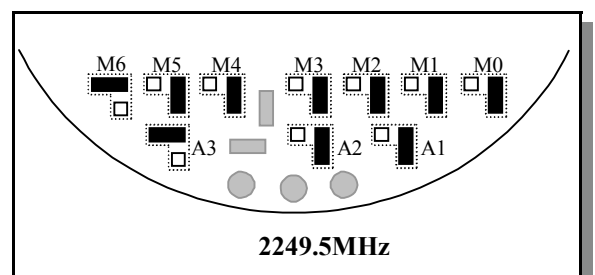
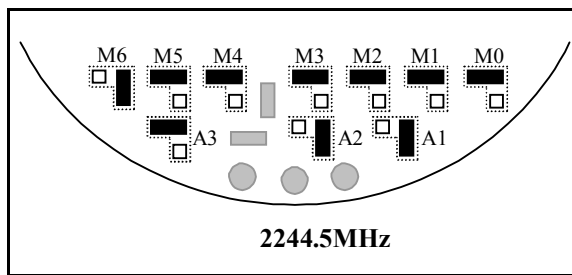
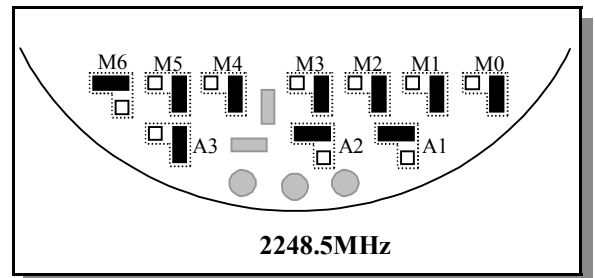
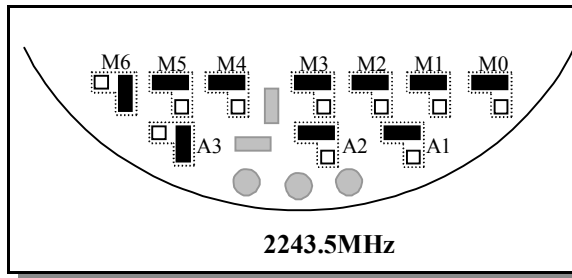
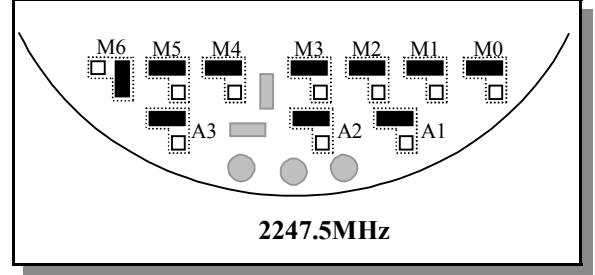
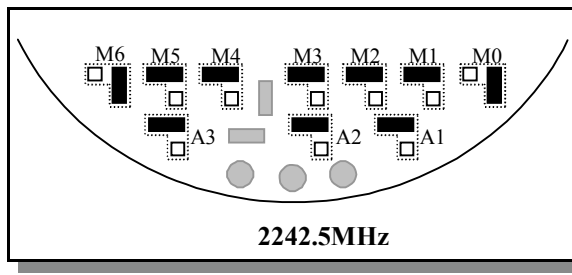
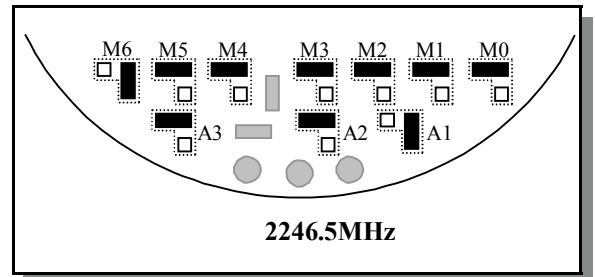
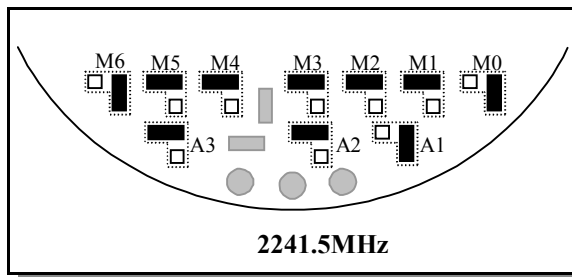
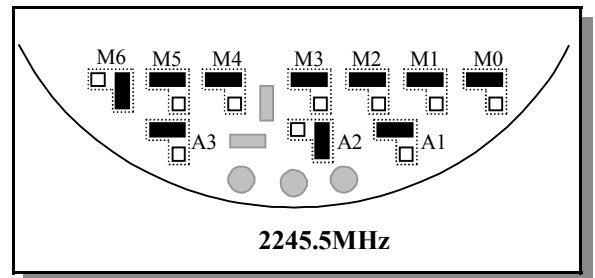
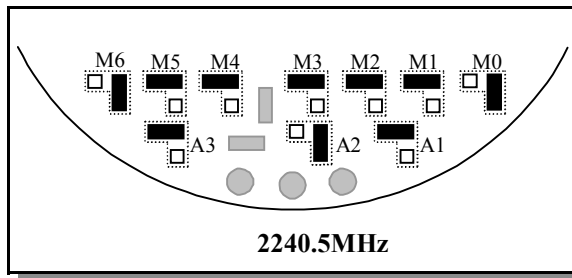
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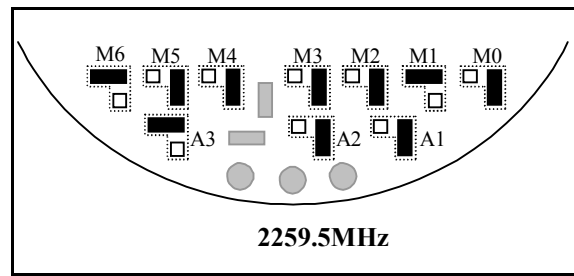
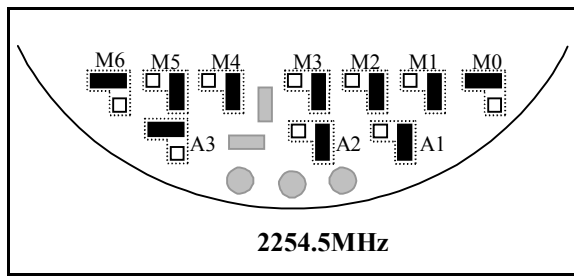
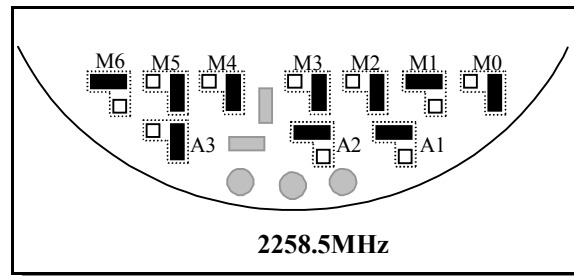
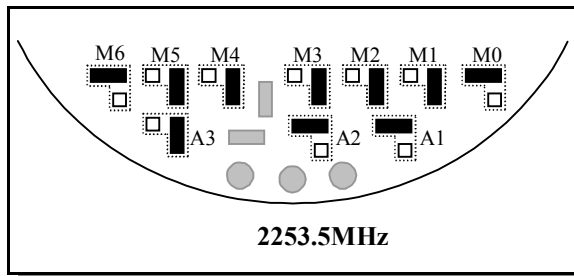
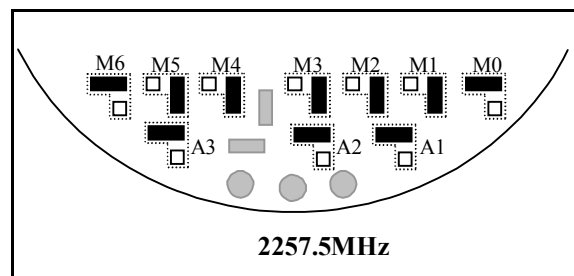
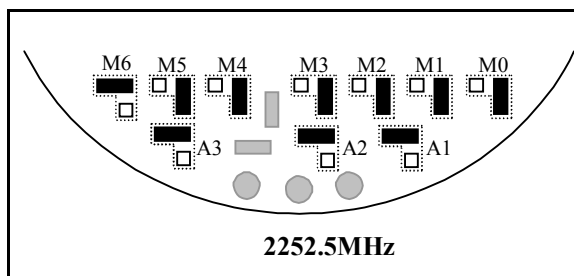
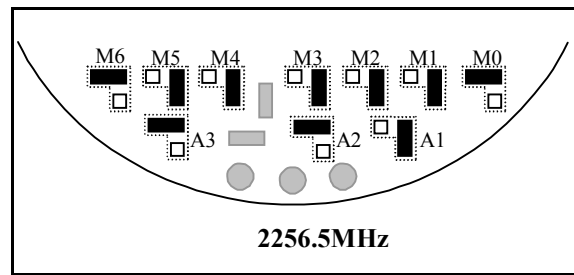
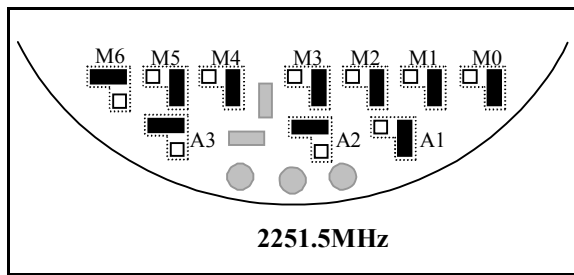
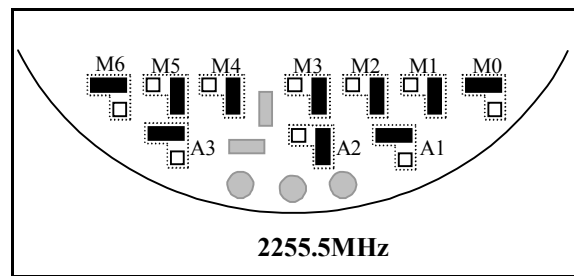
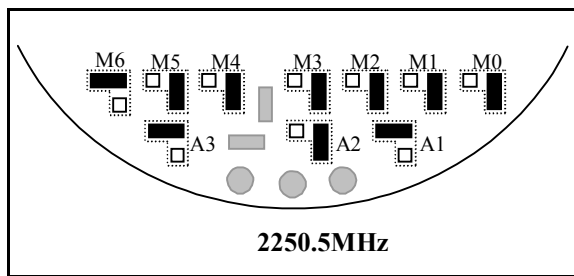
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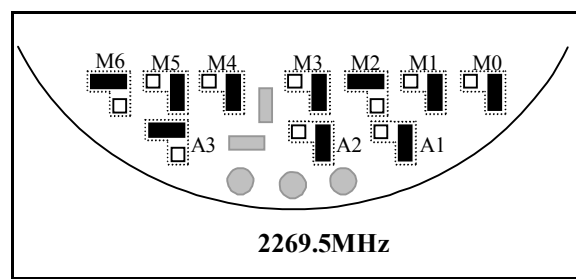
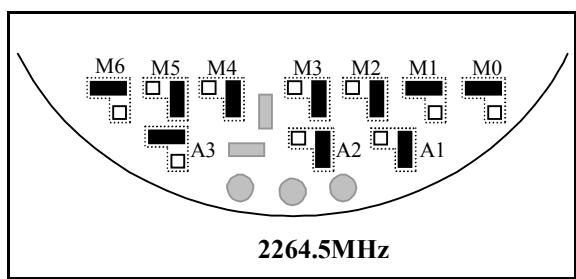
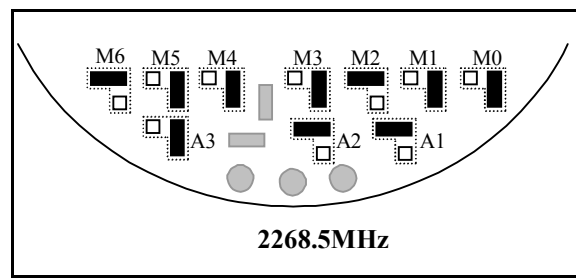
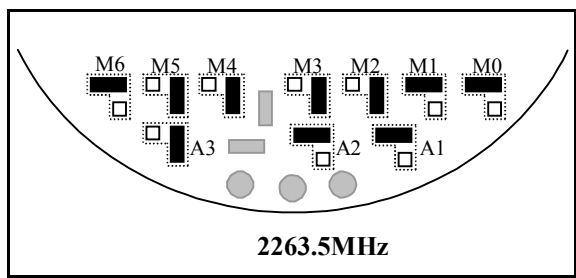
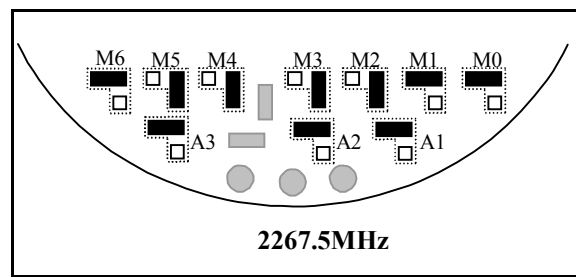
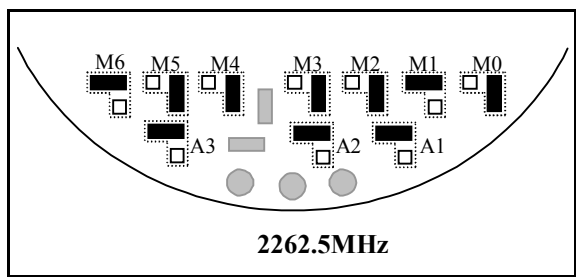
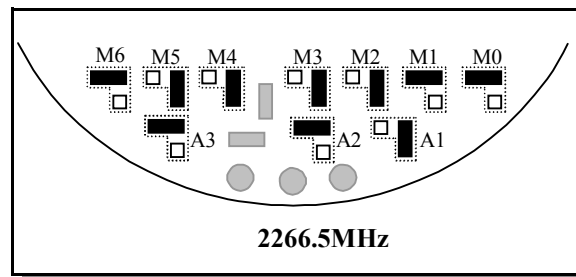
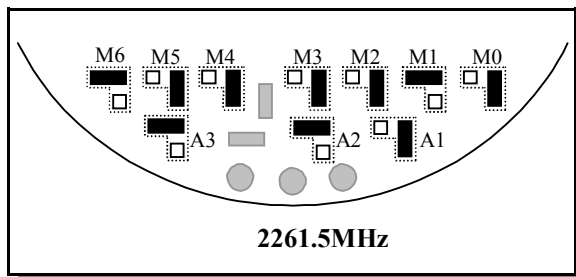
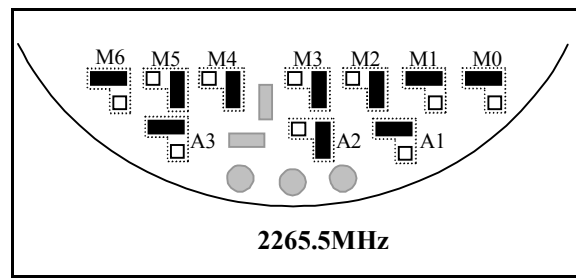
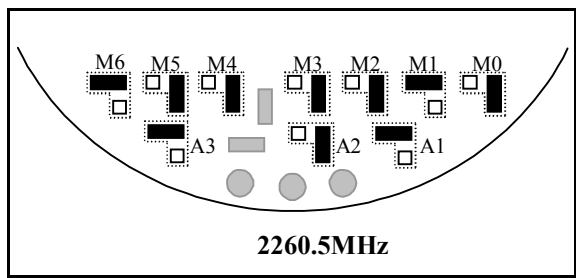
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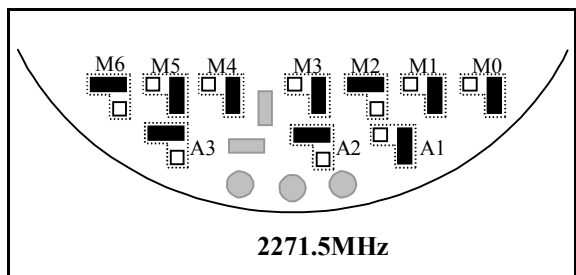
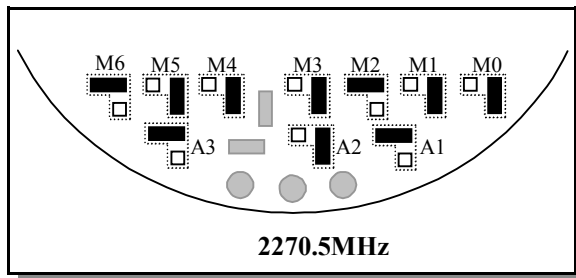
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Ordering Information

| PART NO. | DESCRIPTION |
|-------------|--------------------------------------|
| MA05935-040 | 24dBm module (operates at 2240.5MHz) |
| MA05935-041 | 24dBm module (operates at 2241.5MHz) |
| MA05935-042 | 24dBm module (operates at 2242.5MHz) |
| MA05935-043 | 24dBm module (operates at 2243.5MHz) |
| MA05935-044 | 24dBm module (operates at 2244.5MHz) |
| MA05935-045 | 24dBm module (operates at 2245.5MHz) |
| MA05935-046 | 24dBm module (operates at 2246.5MHz) |
| MA05935-047 | 24dBm module (operates at 2247.5MHz) |
| MA05935-048 | 24dBm module (operates at 2248.5MHz) |
| MA05935-049 | 24dBm module (operates at 2249.5MHz) |
| MA05935-050 | 24dBm module (operates at 2250.5MHz) |
| MA05935-051 | 24dBm module (operates at 2251.5MHz) |
| MA05935-052 | 24dBm module (operates at 2252.5MHz) |
| MA05935-053 | 24dBm module (operates at 2253.5MHz) |
| MA05935-054 | 24dBm module (operates at 2254.5MHz) |
| MA05935-055 | 24dBm module (operates at 2255.5MHz) |
| MA05935-056 | 24dBm module (operates at 2256.5MHz) |
| MA05935-057 | 24dBm module (operates at 2257.5MHz) |
| MA05935-058 | 24dBm module (operates at 2258.5MHz) |
| MA05935-059 | 24dBm module (operates at 2259.5MHz) |
| MA05935-060 | 24dBm module (operates at 2260.5MHz) |
| MA05935-061 | 24dBm module (operates at 2261.5MHz) |
| MA05935-062 | 24dBm module (operates at 2262.5MHz) |
| MA05935-063 | 24dBm module (operates at 2263.5MHz) |
| MA05935-064 | 24dBm module (operates at 2264.5MHz) |
| MA05935-065 | 24dBm module (operates at 2265.5MHz) |
| MA05935-066 | 24dBm module (operates at 2266.5MHz) |
| MA05935-067 | 24dBm module (operates at 2267.5MHz) |
| MA05935-068 | 24dBm module (operates at 2268.5MHz) |
| MA05935-069 | 24dBm module (operates at 2269.5MHz) |
| MA05935-070 | 24dBm module (operates at 2270.5MHz) |
| MA05935-071 | 24dBm module (operates at 2271.5MHz) |

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