# digiLO Wideband PLL Synthesizer

The digiLO is a Wideband Fractional-N / Integer-N PLL Synthesizer based on Maxim's MAX2870 capable of generating signals from 23.5MHz to 6GHz. It measures only 2” x 3” and comes programmed with over a hundred popular frequencies. A connection to an external 10MHz reference is provided. But the digiLO automatically switches to its on-board TCXO reference when its 10MHz external reference is not detected.

The recommended supply voltage for “+V” is 9V. But reliable operation is possible down to 7V. The digiLO is tolerant of supply voltages up to 15V. But operation beyond 9V results in excessive heating of the voltage regulator. So if 12V operation is desired, it is recommended to use a 27 Ohm 2-Watt resistor in series with the power connection. This should drop the voltage to the digiLO to a safer level. A +5V direct connection which bypasses the voltage regulator is also available.

The MAX2870's internal voltage controlled oscillator (VCO) operates from 3GHz to 6GHz. The MAX2870 generates output frequencies lower than 3GHz by inserting dividers after its VCO up to a maximum of 1/128. Every divider slightly increases the MAX2870's current consumption. Therefore, the supply current increases as output frequency decreases. Below 47MHz, supply current is a maximum of 200mA. And above 3GHz, the supply current drops to 130mA.

The 10MHz External Reference should be from a clean and stable source. Keep in mind that the digiLO's output is directly affected by the quality of its reference. The recommended input range for “REF IN” is 0dBm to +13dBm. At levels below 0dBm, the digiLO automatically switches over to its internal TCXO reference.

When the digiLO is locked to its external 10MHz reference, the “LOCK” output switches from 0V to 5V through a 200 Ohm resistor. This output can also serve as a simple indication of which reference (external or internal) is sourcing the digiLO. Up to 20mA can be safely sourced from this connection. Therefore, a LED can be connected directly from the “LOCK” output to ground.

The RF output of the digiLO appears on the “RF OUT” connection. The output level is virtually flat from 23.5MHz up to 2GHz. And it maintains a level of +2dBm ±2dB up to 3GHz. Beyond 3GHz, the output gradually falls to -10dBm at 6GHz.

Refer to digiLO's supplied Frequency Table to select the desired frequency with jumpers or solder bridges. Or install a DIP switch or an external switch. The digiLO's microcontroller constantly monitors for changes in the frequency select jumpers. Therefore, frequencies can be changed at anytime without having to power down the digiLO.

| digiLO Frequency Table for Firmware v25.12.1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| INDEX | FREQ | FREQ SELECT JUMPERS | | | | | | | | SUGGESTED APPLICATION |
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 0 | 116.000 | | | | | | | | | 144-28 |
| 1 | 194.000 | | | | | | | | X | 222-28 |
| 2 | 404.000 | | | | | | | X | | 432-28 |
| 3 | 758.000 | | | | | | | X | X | 902-144 |
| 4 | 874.000 | | | | | | X | | | 902-28 |
| 5 | 759.000 | | | | | | X | | X | 903-144 |
| 6 | 875.000 | | | | | | X | X | | 903-28 |
| 7 | 1152.000 | | | | | | X | X | X | 1296-144 |
| 8 | 1268.000 | | | | | X | | | | 1296-28 |
| 9 | 2160.000 | | | | | X | | | X | 2304-144 |
| 10 | 2276.000 | | | | | X | | X | | 2304-28 |
| 11 | 3256.000 | | | | | X | | X | X | 3400-144 |
| 12 | 3372.000 | | | | | X | X | | | 3400-28 |
| 13 | 5616.000 | | | | | X | X | | X | 5760-144 |
| 14 | 5732.000 | | | | | X | X | X | | 5760-28 |
| | | | | | | | | | | |
| 16 | 130.000 | | | | X | | | | | 144-14 |
| 17 | 208.000 | | | | X | | | | X | 222-14 |
| 18 | 418.000 | | | | X | | | X | | 432-14 |
| 19 | 757.000 | | | | X | | | X | X | 902-145 |
| 20 | 1151.000 | | | | X | | X | | | 1296-145 |
| 21 | 2159.000 | | | | X | | X | | X | 2304-145 |
| 22 | 3255.000 | | | | X | | X | X | | 3400-145 |
| 23 | 5615.000 | | | | X | | X | X | X | 5760-145 |
| 24 | 3407.667 | | | | X | X | | | | (10368-145) / 3 |
| 25 | 1869.000 | | | | X | X | | | X | 2304-435 |
| 26 | 1872.000 | | | | X | X | | X | | 2304-432 |
| 27 | 2965.000 | | | | X | X | | X | X | 3400-435 |
| 28 | 2968.000 | | | | X | X | X | | | 3400-432 |
| 29 | 3350.000 | | | | X | X | X | | X | 3400-50 |
| 30 | 3407.000 | | | | X | X | X | X | | (10368-147) / 3 |
| 31 | 1270.000 | | | | X | X | X | X | X | 1298-28 |

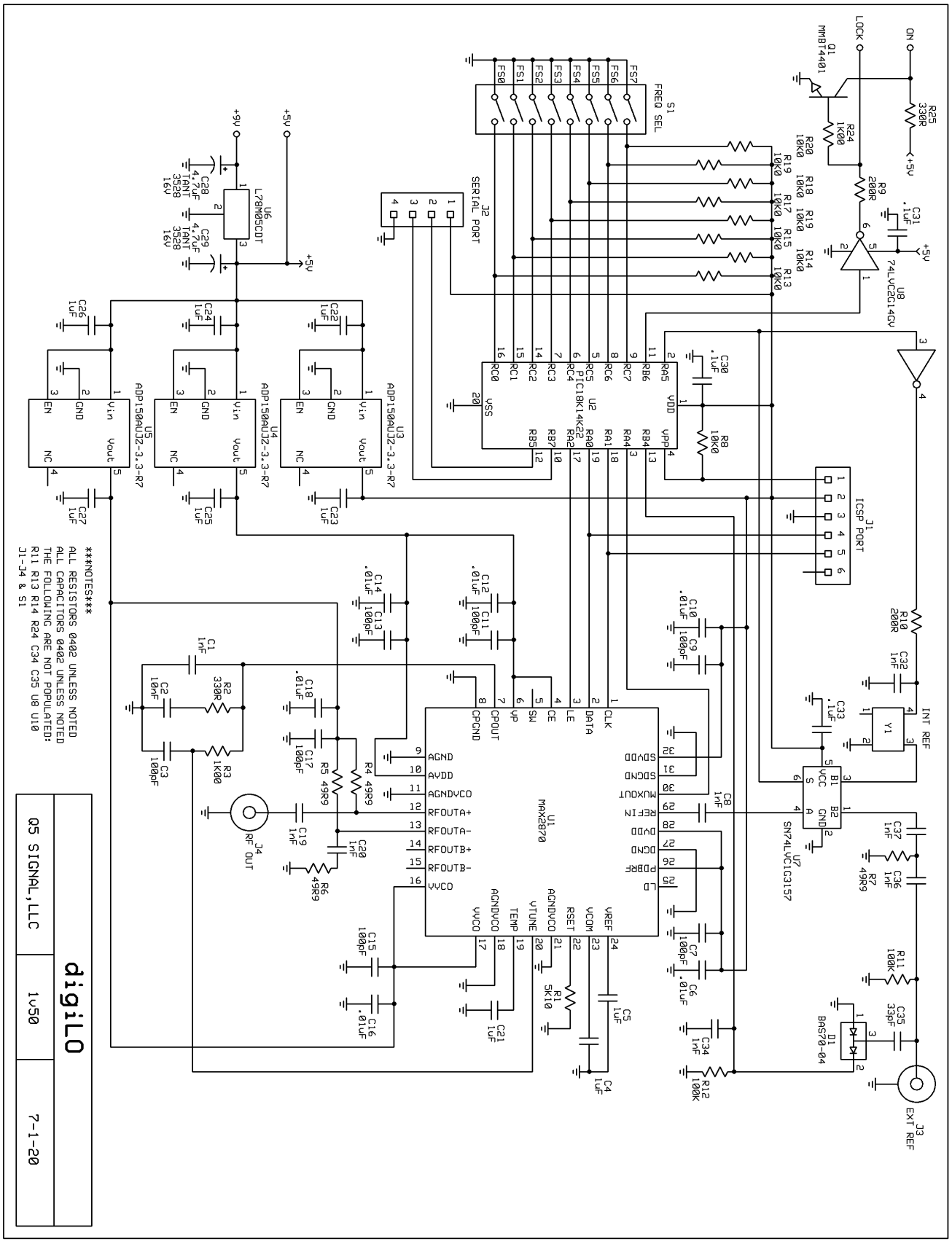
| INDEX | FREQ | FREQ SELECT JUMPERS | | | | | | | | SUGGESTED APPLICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32 | 50.100 | | | X | | | | | | 50.100 MHz WSS |
| 33 | 70.100 | | | X | | | | | X | 70.100 MHz WSS |
| 34 | 144.100 | | | X | | | | X | | 144.100 MHz WSS |
| 35 | 222.100 | | | X | | | | X | X | 222.100 MHz WSS |
| 36 | 432.100 | | | X | | | X | | | 432.100 MHz WSS |
| 37 | 435.100 | | | X | | | X | | X | 435.100 MHz WSS |
| 38 | 902.100 | | | X | | | X | X | | 902.100 MHz WSS |
| 39 | 903.100 | | | X | | | X | X | X | 903.100 MHz WSS |
| 40 | 915.100 | | | X | | X | | | | 915.100 MHz WSS |
| 41 | 1275.100 | | | X | | X | | | X | 1275.100 MHz WSS |
| 42 | 1296.100 | | | X | | X | | X | | 1296.100 MHz WSS |
| 43 | 2304.100 | | | X | | X | | X | X | 2304.100 MHz WSS |
| 44 | 3400.100 | | | X | | X | X | | | 3400.100 MHz WSS |
| 45 | 5760.100 | | | X | | X | X | | X | 5760.100 MHz WSS |
| 46 | 3456.033 | | | X | | X | X | X | | 10368.100 MHz / 3 WSS |
| 47 | 3456.014 | | | X | | X | X | X | X | 24192.100 MHz / 7 WSS |
| 48 | 28.100 | | | X | X | | | | | 28.100 MHz WSS |
| 49 | 1420.000 | | | X | X | | | | X | 1420.000 MHz WSS |
| 50 | 2401.000 | | | X | X | | | X | | 2401.000 MHz WSS |
| 51 | 4838.420 | | | X | X | | | X | X | 24192.100 MHz / 5 WSS |
| 52 | 3139.207 | | | X | X | | X | | | 47088.100 MHz / 15 WSS |
| | | | | | | | | | | |
| 54 | 2292.000 | | | X | X | | X | X | | 2320-28 |
| 55 | 2372.000 | | | X | X | | X | X | X | 2400-28 |
| 56 | 2396.000 | | | X | X | X | | | | 2424-28 |
| 57 | 3311.000 | | | X | X | X | | | X | (10368-435) / 3 |
| 58 | 3312.000 | | | X | X | X | | X | | (10368-432) / 3 |

| INDEX | FREQ | FREQ SELECT JUMPERS | | | | | | | | SUGGESTED APPLICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 112 | 823.000 | | X | X | X | | | | | 1263-430 |
| 113 | 829.000 | | X | X | X | | | | X | 1269-440 |
| 114 | 833.000 | | X | X | X | | | X | | 1263-430 |
| 115 | 839.000 | | X | X | X | | | X | X | 1269-440 |
| 116 | 1117.000 | | X | X | X | | X | | | 1263-144 |
| 117 | 1118.000 | | X | X | X | | X | | X | 1263-145 |
| 118 | 1119.000 | | X | X | X | | X | X | | 1263-146 |
| 119 | 1124.000 | | X | X | X | | X | X | X | 1269-145 |
| 120 | 1125.000 | | X | X | X | X | | | | 1269-146 |
| 121 | 1211.000 | | X | X | X | X | | | X | 1263-52 |
| 122 | 1217.000 | | X | X | X | X | | X | | 1269-52 |
| 123 | 1235.000 | | X | X | X | X | | X | X | 1263-28 |
| 124 | 1236.000 | | X | X | X | X | X | | | 1263-29 |
| 125 | 1241.000 | | X | X | X | X | X | | X | 1269-28 |
| 126 | 2176.000 | | X | X | X | X | X | X | | 2320-144 |
| 127 | 2280.000 | | X | X | X | X | X | X | X | 2424-144 |
| 128 | 42.000 | X | | | | | | | | 70-28 & (50-29) x 2 |
| 129 | 44.000 | X | | | | | | | X | (50-28) x 2 |
| 130 | 77.000 | X | | | | | | X | | 222-145 |
| 131 | 78.000 | X | | | | | | X | X | 222-144 |
| 132 | 79.000 | X | | | | | X | | | 223-144 |
| 133 | 84.000 | X | | | | | X | | X | (50-29) x 4 |
| 134 | 88.000 | X | | | | | X | X | | (50-28) x 4 |
| 135 | 94.000 | X | | | | | X | X | X | 144-50 |
| 136 | 95.250 | X | | | | X | | | | (220-29.5) / 2 |
| 137 | 95.500 | X | | | | X | | | X | (220-29) / 2 |
| 138 | 96.000 | X | | | | X | | X | | (220-28) / 2 |
| 139 | 96.250 | X | | | | X | | X | X | (222-29.5) / 2 |
| 140 | 96.500 | X | | | | X | X | | | (222-29) / 2 |
| 141 | 96.750 | X | | | | X | X | | X | (222-28.5) / 2 |
| 142 | 97.000 | X | | | | X | X | X | | (222-28) / 2 |
| 143 | 97.500 | X | | | | X | X | X | X | (222-27) / 2 |
| 144 | 98.000 | X | | | X | | | | | (222-26) / 2 |
| 145 | 100.625 | X | | | X | | | | X | (432-29.5) / 4 |
| 146 | 100.750 | X | | | X | | | X | | (432-29) / 4 |
| 147 | 100.875 | X | | | X | | | X | X | (432-28.5) / 4 |
| 148 | 101.000 | X | | | X | | X | | | (432-28) / 4 |
| 149 | 101.250 | X | | | X | | X | | X | (432-27) / 4 |
| 150 | 101.500 | X | | | X | | X | X | | (432-26) / 4 |
| 151 | 101.750 | X | | | X | | X | X | X | (435-28) / 4 |
| 152 | 102.000 | X | | | X | X | | | | (435-27) / 4 |
| 153 | 102.250 | X | | | X | X | | | X | (435-26) / 4 |
| 154 | 114.000 | X | | | X | X | | X | | 144-30 |
| 155 | 114.500 | X | | | X | X | | X | X | 144-29.5 |
| 156 | 115.000 | X | | | X | X | X | | | 144-29 |
| 157 | 115.500 | X | | | X | X | X | | X | 144.28.5 |
| 158 | 117.000 | X | | | X | X | X | X | | 144-27 |

| INDEX | FREQ | FREQ SELECT JUMPERS | | | | | | | | SUGGESTED APPLICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 159 | 118.000 | X | | | X | X | X | X | X | 144-26 |
| 160 | 119.000 | X | | X | | | | | | 144-25 |
| 161 | 120.000 | X | | X | | | | | X | 144-24 |
| 162 | 170.000 | X | | X | | | | X | | 220-50 |
| 163 | 171.000 | X | | X | | | | X | X | 222-51 |
| 164 | 172.000 | X | | X | | | X | | | 222-50 |
| 165 | 190.000 | X | | X | | | X | | X | 220-30 |
| 166 | 191.000 | X | | X | | | X | X | | 220-29 |
| 167 | 192.000 | X | | X | | | X | X | X | 220-28 |
| 168 | 192.500 | X | | X | | X | | | | 222-29.5 |
| 169 | 193.000 | X | | X | | X | | | X | 222-29 |
| 170 | 193.500 | X | | X | | X | | X | | 222-28.5 |
| 171 | 195.000 | X | | X | | X | | X | X | 222-27 |
| 172 | 196.000 | X | | X | | X | X | | | 222-26 |
| 173 | 381.000 | X | | X | | X | X | | X | 432-51 |
| 174 | 382.000 | X | | X | | X | X | X | | 432-50 |
| 175 | 383.000 | X | | X | | X | X | X | X | 435-52 |
| 176 | 384.000 | X | | X | X | | | | | 435-51 |
| 177 | 385.000 | X | | X | X | | | | X | 435-50 |
| 178 | 402.000 | X | | X | X | | | X | | 432-30 |
| 179 | 402.500 | X | | X | X | | | X | X | 432-29.5 |
| 180 | 403.000 | X | | X | X | | X | | | 432-29 |
| 181 | 403.500 | X | | X | X | | X | | X | 432-28.5 |
| 182 | 405.000 | X | | X | X | | X | X | | 432-27 |
| 183 | 406.000 | X | | X | X | | X | X | X | 435-29 |
| 184 | 407.000 | X | | X | X | X | | | | 435-28 |
| 185 | 408.000 | X | | X | X | X | | | X | 435-27 |
| 186 | 409.000 | X | | X | X | X | | X | | 435-26 |
| 187 | 850.000 | X | | X | X | X | | X | X | 902-52 |
| 188 | 852.000 | X | | X | X | X | X | | | 902-50 |
| 189 | 853.000 | X | | X | X | X | X | | X | 903-50 |
| | | | | | | | | | | |
| 192 | 984.000 | X | X | | | | | | | (24048-432) / 24 |
| 193 | 990.000 | X | X | | | | | | X | (24192-432) / 24 |
| 194 | 996.000 | X | X | | | | | X | | (24048-144) / 24 |
| 195 | 1002.000 | X | X | | | | | X | X | (24192-144) / 24 |
| 196 | 1008.000 | X | X | | | | X | | | (10368-1296) / 9 |
| 197 | 1022.400 | X | X | | | | X | | X | (10368-144) / 10 |
| 198 | 1065.000 | X | X | | | | X | X | | (5760-435) / 5 |
| 199 | 1065.600 | X | X | | | | X | X | X | (5760-432) / 5 |
| 200 | 1078.000 | X | X | | | X | | | | (2300-144) / 2 |
| 201 | 1079.000 | X | X | | | X | | | X | (2304-146) / 2 |
| 202 | 1080.000 | X | X | | | X | | X | | (2304-144) / 2 |
| 203 | 1088.000 | X | X | | | X | | X | X | (2320-144) / 2 |
| 204 | 1104.000 | X | X | | | X | X | | | (10368-432) / 9 |
| 205 | 1116.000 | X | X | | | X | X | | X | (5760-1296) / 4 |
| 206 | 1122.600 | X | X | | | X | X | X | | (5760-147) / 5 |
| 207 | 1123.000 | X | X | | | X | X | X | X | (5760-145) / 5 |

| INDEX | FREQ | FREQ SELECT JUMPERS | | | | | | | | SUGGESTED APPLICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 208 | 1123.200 | X | X | | X | | | | | (5760-144) / 5 |
| 209 | 1127.000 | X | X | | X | | | | X | (2304-50) / 2 |
| 210 | 1128.000 | X | X | | X | | | X | | (2400-144) / 2 |
| | | | | | | | | | | |
| 212 | 1136.000 | X | X | | X | | X | | | (10368-144) / 9 |
| 213 | 1140.000 | X | X | | X | | X | | X | (2424-144) / 2 |
| 214 | 1142.000 | X | X | | X | | X | X | | (5760-50) / 5 |
| 215 | 1242.000 | X | X | | X | | X | X | X | (10368-432) / 8 |
| 216 | 1244.000 | X | X | | X | X | | | | 1296-52 |
| 217 | 1246.000 | X | X | | X | X | | | X | 1296-50 |
| 218 | 1267.000 | X | X | | X | X | | X | | 1296-29 |
| 219 | 1278.000 | X | X | | X | X | | X | X | (10368-144) / 8 |
| 220 | 1656.000 | X | X | | X | X | X | | | (10368-432) / 6 |
| 221 | 1704.000 | X | X | | X | X | X | | X | (10368-144) / 6 |
| 222 | 1987.200 | X | X | | X | X | X | X | | (10368-432) / 5 |
| 223 | 2044.800 | X | X | | X | X | X | X | X | (10368-144) / 5 |
| 224 | 2252.000 | X | X | X | | | | | | 2304-52 |
| 225 | 2254.000 | X | X | X | | | | | X | 2304-50 |
| 226 | 2256.000 | X | X | X | | | | X | | 2400-144 |
| 227 | 2275.000 | X | X | X | | | | X | X | 2304-29 |
| 228 | 2484.000 | X | X | X | | | X | | | (10368-432) / 4 |
| 229 | 2556.000 | X | X | X | | | X | | X | (10368-144) / 4 |
| 230 | 2624.000 | X | X | X | | | X | X | | (24048-432) / 9 |
| 231 | 2640.000 | X | X | X | | | X | X | X | (24192-432) / 9 |
| 232 | 2656.000 | X | X | X | | X | | | | (24048-144) / 9 |
| 233 | 2672.000 | X | X | X | | X | | | X | (24192-144) / 9 |
| 234 | 2952.000 | X | X | X | | X | | X | | (24048-432) / 8 |
| 235 | 2970.000 | X | X | X | | X | | X | X | (24192-432) / 8 |
| 236 | 2988.000 | X | X | X | | X | X | | | (24048-144) / 8 |
| 237 | 3348.000 | X | X | X | | X | X | | X | 3400-52 |
| 238 | 3371.000 | X | X | X | | X | X | X | | 3400-29 |
| 239 | 3408.000 | X | X | X | | X | X | X | X | (10368-144) / 3 |
| 240 | 3936.000 | X | X | X | X | | | | | (24048-432) / 6 |
| 241 | 3960.000 | X | X | X | X | | | | X | (24192-432) / 6 |
| 242 | 3984.000 | X | X | X | X | | | X | | (24048-144) / 6 |
| 243 | 4008.000 | X | X | X | X | | | X | X | (24192-144) / 6 |
| 244 | 4464.000 | X | X | X | X | | X | | | 5760-1296 |
| 245 | 4752.000 | X | X | X | X | | X | | X | (24192-432) / 5 |
| 246 | 4780.800 | X | X | X | X | | X | X | | (24048-144) / 5 |
| 247 | 4809.600 | X | X | X | X | | X | X | X | (24192-144) / 5 |
| 248 | 4968.000 | X | X | X | X | X | | | | (10368-432) / 2 |
| 249 | 5112.000 | X | X | X | X | X | | | X | (10368-144) / 2 |
| 250 | 5328.000 | X | X | X | X | X | | X | | 5760-432 |
| 251 | 5904.000 | X | X | X | X | X | | X | X | (24048-432) / 4 |
| 252 | 5940.000 | X | X | X | X | X | X | | | (24192-432) / 4 |
| 253 | 5976.000 | X | X | X | X | X | X | | X | (24048-144) / 4 |
| 254 | 100.000 | X | X | X | X | X | X | X | | 100 MHz MARKER |
| 255 | 1000.000 | X | X | X | X | X | X | X | X | 1000 MHz MARKER |

| digiLO 1v50 Bill of Materials | | |
|---|---|---|
| DESIGNATOR | QTY | DESCRIPTION |
| C1,C8,C19,C20,C32,C34,C36,C37 | 8 | 1nF 10% 50V X7R 0402 |
| C2,C6,C10,C12,C14,C16,C18 | 7 | 10nF 10% 16V X7R 0402 |
| C3,C7,C9,C11,C13,C15,C17 | 7 | 100pF 5% 50V NP0 0402 |
| C4,C5,C21,C22,C23,C24,C25,C26,C27 | 9 | 1uF 10% 10v X5R 0402 |
| C28,C29 | 2 | 4.7uF 10% 16V SIZE B TANT |
| C30,C31,C33 | 3 | 0.1uF 10% 16V X7R 0402 |
| C35 | 1 | 33pF 5% 50V NP0 0402 |
| C38,C39,C40 | 3 | 1nF 10% 50V X7R 0603 |
| D1 | 1 | BAS70-04 SOT-23 |
| Q1 | 1 | PMBT2222A,215 SOT-23 |
| R1 | 1 | 5K10 1% 0402 |
| R2 | 1 | 330R 1% 0402 |
| R3,R24 | 2 | 1K00 1% 0402 |
| R4,R5,R6,R7 | 4 | 49R9 1% 0402 |
| R8,R13,R14,R15,R16,R17,R18,R19,R20 | 9 | 10K0 1% 0402 |
| R9,R10 | 2 | 200R 1% 0402 |
| R11,R12 | 2 | 100K 1% 0402 |
| R21 | 1 | 3214W-1-501 |
| R22 | 1 | 1K20 1% 0603 |
| R23 | 1 | 1K00 1% 0603 |
| R25 | 1 | 330R 5% 0603 |
| U1 | 1 | MAX2870ETJ+T |
| U2 | 1 | PIC18LF13K22-I/SS |
| U3,U4,U5 | 3 | AP7343-33W5 |
| U6 | 1 | MC78M05BDTRKG |
| U7 | 1 | SN74LVC1G3157DBVR |
| U8 | 1 | 74LVC2G14GV,125 |
| U9 | 1 | LM4040DEX3-3.3+T |
| Y2 | 1 | TXEAADSANF-20.000000 |


digiLO
Q5 SIGNAL,LLC
1v50
7-1-20
***NOTES***
ALL RESISTORS 0402 UNLESS NOTED
ALL CAPACITORS 0402 UNLESS NOTED
THE FOLLOWING ARE NOT POPULATED:
R11 R13 R14 R24 C34 C35 U8 U10
J1-J4 & S1
FREQ SEL
SERIAL PORT
ICSP PORT
INT REF
EXT REF
RF OUT
LOCK
ON
MAX2870
PIC18K14K22
ADP150AUJZ-3.3-R7
L78M05CDT
74LVC2G14GV
SN74LVC1G157
MMBT4401
BAS70-04