GEN3 MAIN TRANSCEIVER 3G/GPS PCB
DESIGNED: May 2016
BY: RASTERVISION Ltd
SCH REVISION: 4.0.0
PCB REVISION: 564-05-04

DESIGN MODIFICATION HISTORY:

PCB No 564-05-02 to 564-04-03 (Version 2 to Version 3):
- Changed SIM socket from Yamaichi to Amphenol (lower cost)
- Fixed SIM card detection fault (incorrectly attached to ESD device))
- Updated level translator IC modification (added bufer and FET)
- Changed Top & Bottom layers GROUND Plane polygon and moved it away from edges
- Moved as many Testpoints to Top Silkscreen layer as possible
- Upgraded all Testpoints to 0.5mm holes (for easier attachment of mods wires)
- Corrected PCB Name
- Adjusted Power & Ground Planes pullback on PCB edges

Colour schemes used for Signals/Info:

Inputs / Bi-directional = Indigo
Outputs = Orange
Comm busses / Eval Notes = Green
General information = Blue
Important issues = Red

PCB1

PCB Assembly / Piggyback Board

564-05-04

Fid1
Fiducial 2 layer (not a part on BOM)

Fid2
Fiducial 2 layer (not a part on BOM)

Fid3
Fiducial 2 layer (not a part on BOM)

DESIGN COMPONENT CHOICES:

- All components have a minimum temperature range of -40/+85 C unless marked otherwsie

Title	Gen3-3GBoard			
Copyright	*Michelin*			A3
	By	Date	Number	
Dwn	R Penderis	May 2016	Revision	4.0.0
Chk	M Leman	May 2016	Sheet	1 of 4
App	P Smith	May 2016	Printed	08/06/2016
Client	Michelin		Time	12:12:02
			Date	08/06/2016
File:	GPS2-Mechanical.SchDoc			

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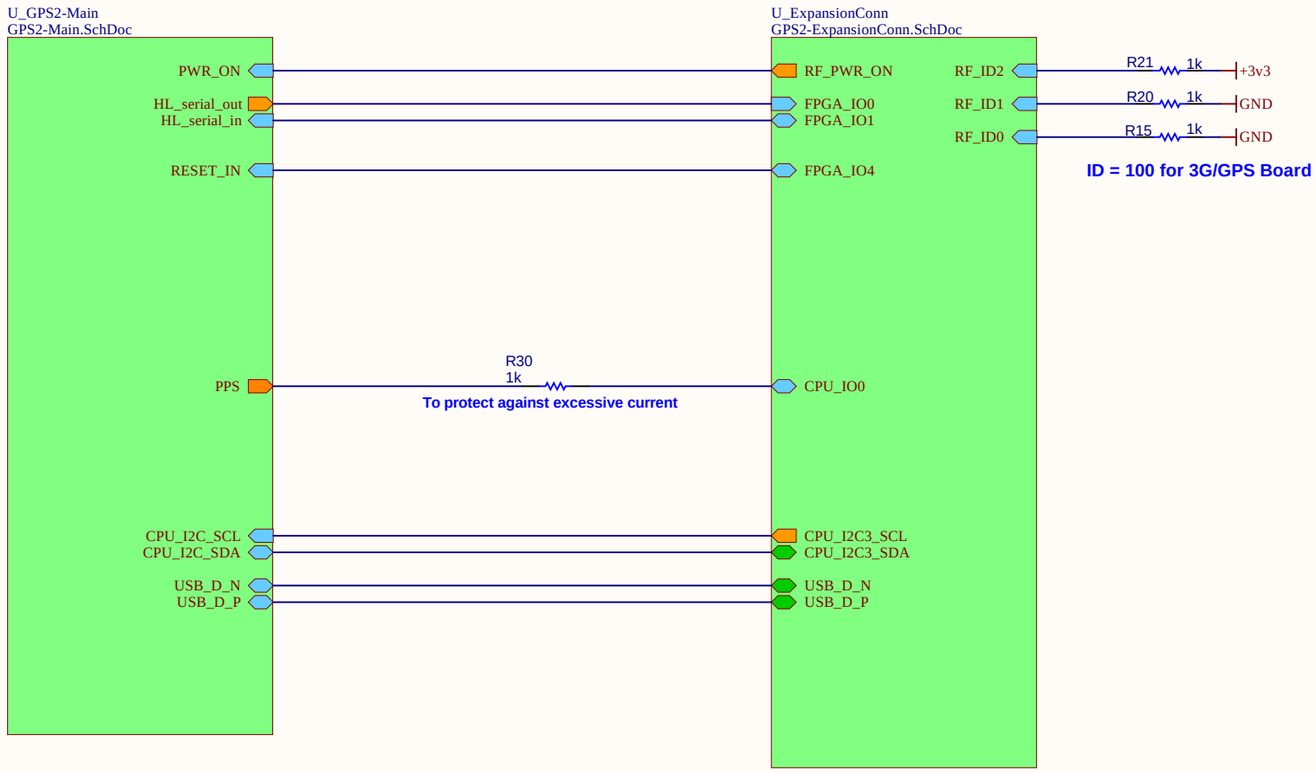
Gen3 3G/GPS Module - TOP Level Block Diagram



U_GPS2-Mechanical
GPS2-Mechanical.SchDoc

Contains ALL PCB Mechanicals

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Gen3 3G/GPS Module - Expansion Connector

Sierra Wireless 3G/GPS Module

VIN= 3.2 - 4.5 Volt
Temp Class A: -30/+70C
Temp Class B: -40/+85C

Power Input

WB1 +5v
WB2 USB_VBUS
Vin

U1
SC4215ASTRT <Semtec>
LDO Regulator very low input & dropout 0.5-3.8V 2A
Vin, En, NC, NC, GP, GND, Vo, FB, NC

C2 22uF 16V X5R Capacitor 1206 MLCC
C3 100nF 50V X7R Capacitor 0603 MLCC
R1 36k
R2 5k6
TP18 VRF
C6 22uF 16V X5R Capacitor 1206 MLCC
C1 100nF 50V X7R Capacitor 0603 MLCC
Inductor multilayer ceramic 1206 Ferrite Bead 0.05R 2.5A
L6
C5 100nF 50V X7R Capacitor 0603 MLCC
C4 22uF 16V X5R Capacitor 1206 MLCC
+3.7V

Ensure plenty of GND plane to take heat

VOut=0.5*(R1+R2) / R2
VOut=0.5*(64k9+10k) / 10k = 3.745 Volt

Reset Circuit

LOW Active
RESET_IN

HIGH Active Power ON signal
PWR_ON
R31 1k
Q1 NX7002AK <NXP>
MOSFET N-Channel small signal 60V 190mA SOT23
R7 10k

LOW Active PWR ON

R4 33k
U7
SN74LVC1G07DBVR <TI>

HL8548 RESET input is internally pulled HIGH

C27 0.33F 5.5Volt Capacitor Super
BATT_RTC
C14 100nF 50V X7R Capacitor 0603 MLCC
+1V8 originates from this pin

C17 100nF 50V X7R Capacitor 0603 MLCC
C16 100nF 50V X7R Capacitor 0603 MLCC

Level Shifter

U5
TXS0108E <TI>
R32 10k
R5 1k
R6 1k
LOW Active
Tx is Input
Rx is output
R33 10k
R34 1k

CPU_I2C_SCL
CPU_I2C_SDA
HL_serial_in
HL_serial_out
PPS

Debug Connector

CN6
826629-2 <TE Connectivity>
DEBUG Connector

+5v
+3v3
PWR_ON
RESET_IN

TP4 GPIO2
TP5 GPIO4
TP6 GPIO8
TP7 GPIO10
TP19 GPIO11
TP20 GPIO12
TP21 PWM1
TP22 GPIO15

TP23 DEBUG_TX
TP24 DEBUG_RX

TP8 TP1
TP9 2G_TX_ON

TP10 PCM_OUT
TP11 PCM_IN
TP12 PCM_SYNC
TP13 PCM_CLK

TP14 26M_CLK R8 100R
TP15 32K_CLK R9 100R

TP16 HSIC_STRB
TP17 HSIC_DATA

USB_VBUS
USB_D_N
USB_D_P

U3
IP4220CZ6 <NXP>
USB Data and VBus ESD protection IC

TP25 GND

Main Module

U2
HL8548 Socket <Sierra Wireless>

nPWR_ON
RESET_IN

GPIO1/I2C_CLK
GPIO5/I2C_SDA

UART1_RI
UART1_RTS
UART1_CTS
UART1_TX
UART1_RX
UART1_DTR
UART1_DCD
UART1_DSR

GPIO2
GPIO4
GPIO8
GPIO10
GPIO11
PWM2/GPIO12
PWM1
GPIO15

PPS

DEBUG_TX
DEBUG_RX

TP1
2G_TX_ON

PCM_OUT
PCM_IN
PCM_SYNC
PCM_CLK

26M_CLKOUT
32M_CLKOUT

HSIC_STRB
HSIC_DATA

USB_VBUS
USB_D-
USB_D+

NC NC NC NC NC NC NC NC1 NC2
BAT_RTC
VGPIO
VBATT
VBATT_PA
VBATT_PA
JTAG_RESET JTAG_TCK JTAG_TDO JTAG_TMS JTAG_TRST JTAG_TDI JTAG_RTCK
UIM1_CLK UIM1_DATA UIM1_RESET UIM1_VCC
GPIO3/UIM1_DET

GND RF_MAIN GND
EXT_LNA_GPS_EN
GND RF_GPS GND

ADC0
GPIO6
ADC1
GPIO7

Expansion Connector

CN3 53398-1071 <Molex>
+1V8
R16 1k
R18 1k
R19 1k
C12 100nF 50V X7R Capacitor 0603 MLCC
R17 1k

Place C9&15 close to pins 61&62
VRF
Capacitor 1210 MLCC 100uF 16V X5R
C8
C9 100pF 25V X7R
C15 100nF 50V X7R Capacitor 0603 MLCC

SIM Socket

U4
IP4220CZ6 <NXP>
USB Data and VBus ESD protection IC

C13 100nF 50V X7R Capacitor 0603 MLCC

CN4
VCC
I/O
CLK
RESET
GND
VPP
SW1
SW2
MP1
MP2
SIM Socket

R12 1k
R13 100k
C11 100nF 50V X7R Capacitor 0603 MLCC

101-00306-82 <Amphenol>
SIM Card Socket SMD 101-00306-82 <Amphenol>
Switch is shorted when SIM Card inserted

GPS Antenna

ADC0
GPIO6
R10 100k
R29 15k
R14 33k
R22 5k6
R11 15k
C18 22pF 25V X7R

L2 0R
C19 33pF 25V X7R
L1 47nH
Resistor 0402 0R
RF_MAIN 50R micro strip - keep short
Z1 0402ESDA-MLP1 <Cooper Bussmann>
CN8 MA02-X800-N01-

U6
LP5907MFX-3.3/NOPB <TI>
Vin LDO FIXED 3.3V 0.25A SOT23-5
Output=250mA
VIN=2.2 - 5.5Volt
Temp-40/+125C
R24 10k
C29 1uF 16V X7R Capacitor 0603 MLCC
C28 1uF 16V X7R Capacitor 0603 MLCC
R25 0R
TP26 GND

This section all from 0402 parts - RF design rules, no Ts in RF line

ADC1
GPIO7
R27 TBD
R28 TBD
R26 TBD
C22 33pF 25V X7R
L3 47nH
C23 33pF 25V X7R
L4 47nH
L5 0R
C24 33pF 25V X7R
RF_GPS 50R micro strip - keep short
Z2 0402ESDA-MLP1 <Cooper Bussmann>
CN7 MA02-X800-N01-

This section all from 0402 parts - RF design rules, no Ts in RF line

These inductors needs to be "high impedance" at GPS frequency (1575.42MHz), i.e minimum 50R/0

NOTE: Pins 38 & 49 need 50 Ohm micro strip impedance
This calculates to 0.37mm track. Chosen 0.2mm clearance

NOTE: SUPERCAP Temperature Range is only -25 to +70 Celcius

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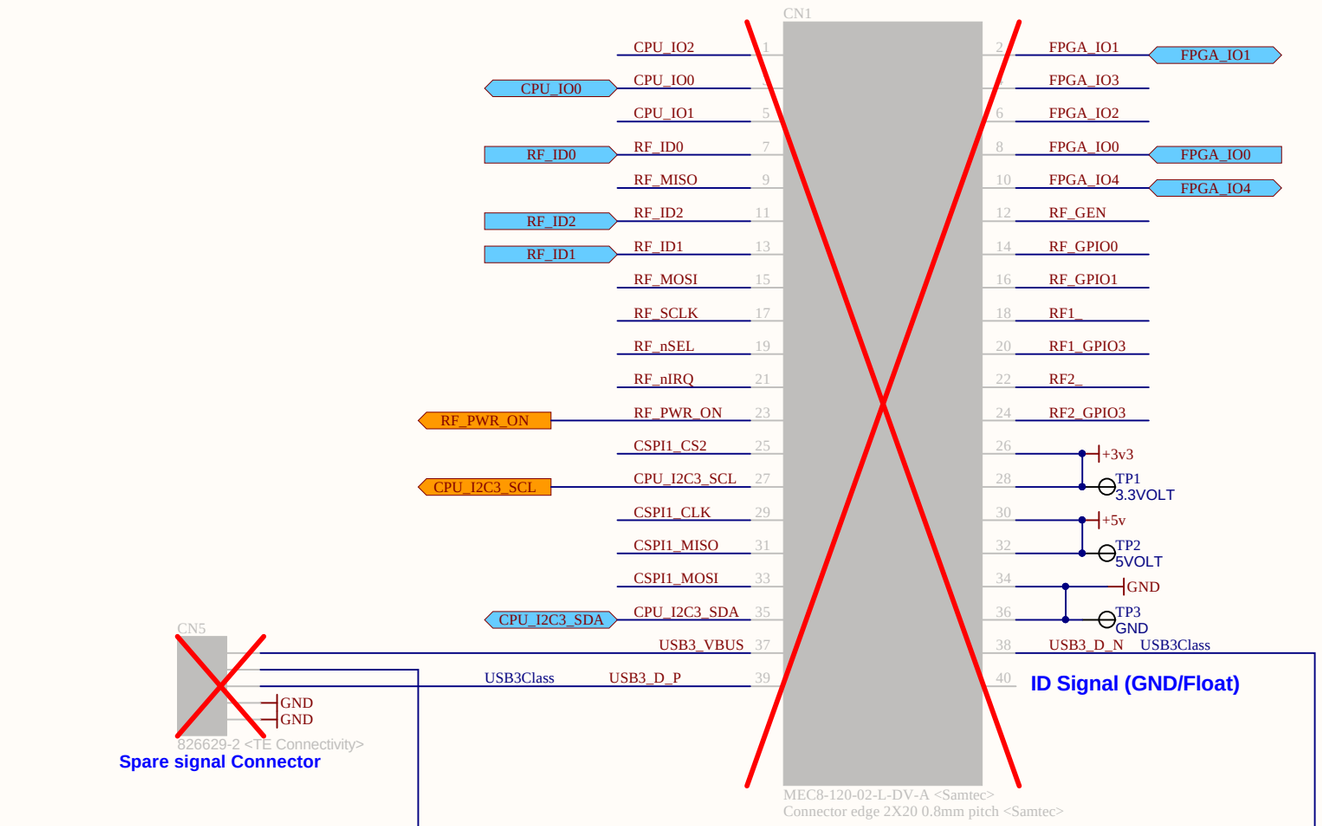
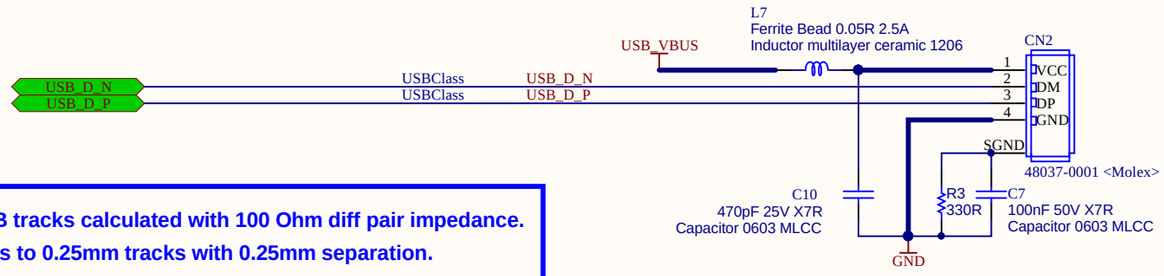
Gen3 3G/GPS Module - Expansion Connector





USB signals from USB Hub controller

NOTE: All USB tracks calculated with 100 Ohm diff pair impedance.
This calculates to 0.25mm tracks with 0.25mm separation.
This is based on the standard RVL 4-Layer Stackup.

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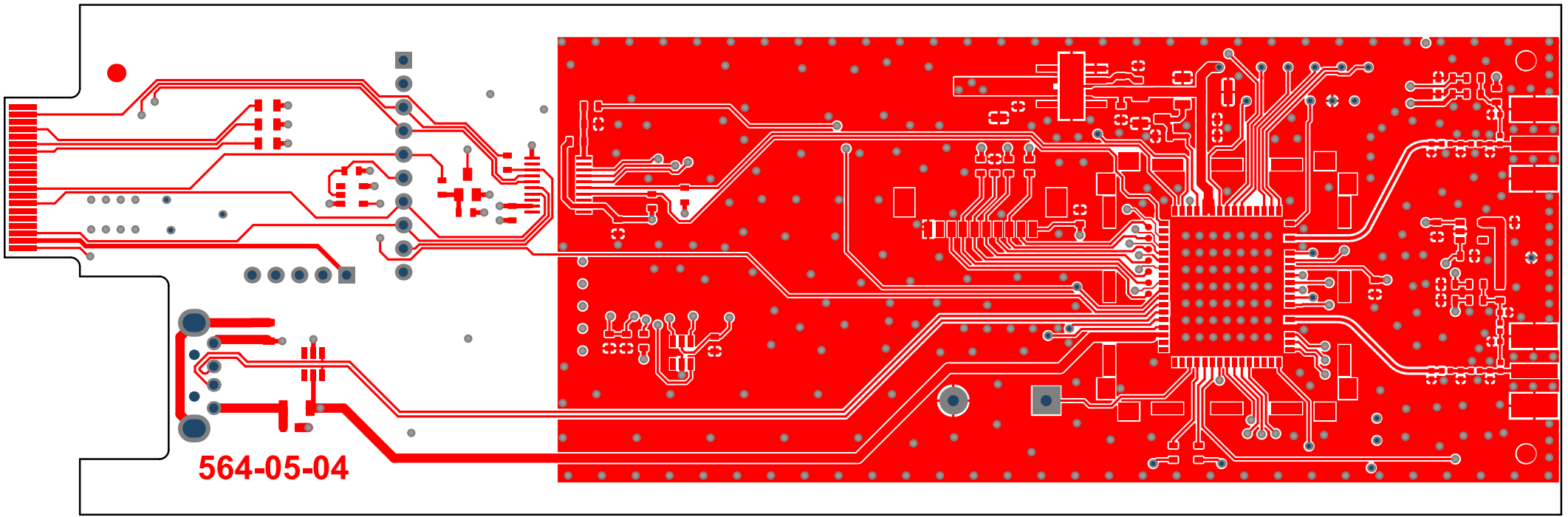
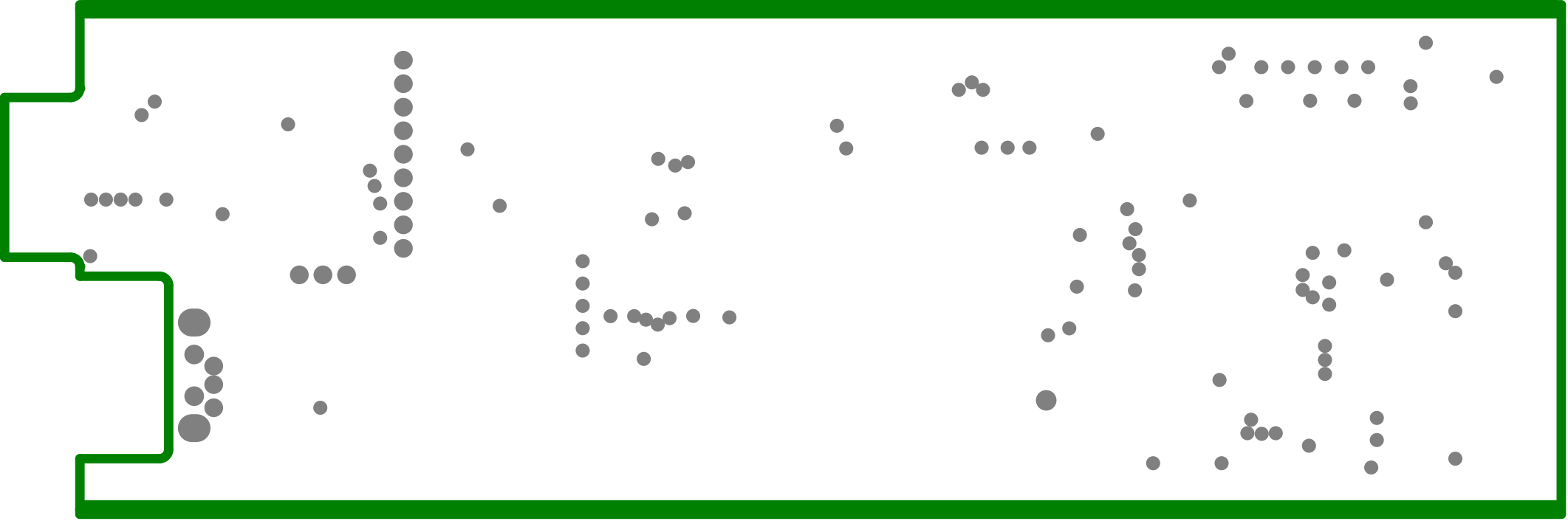


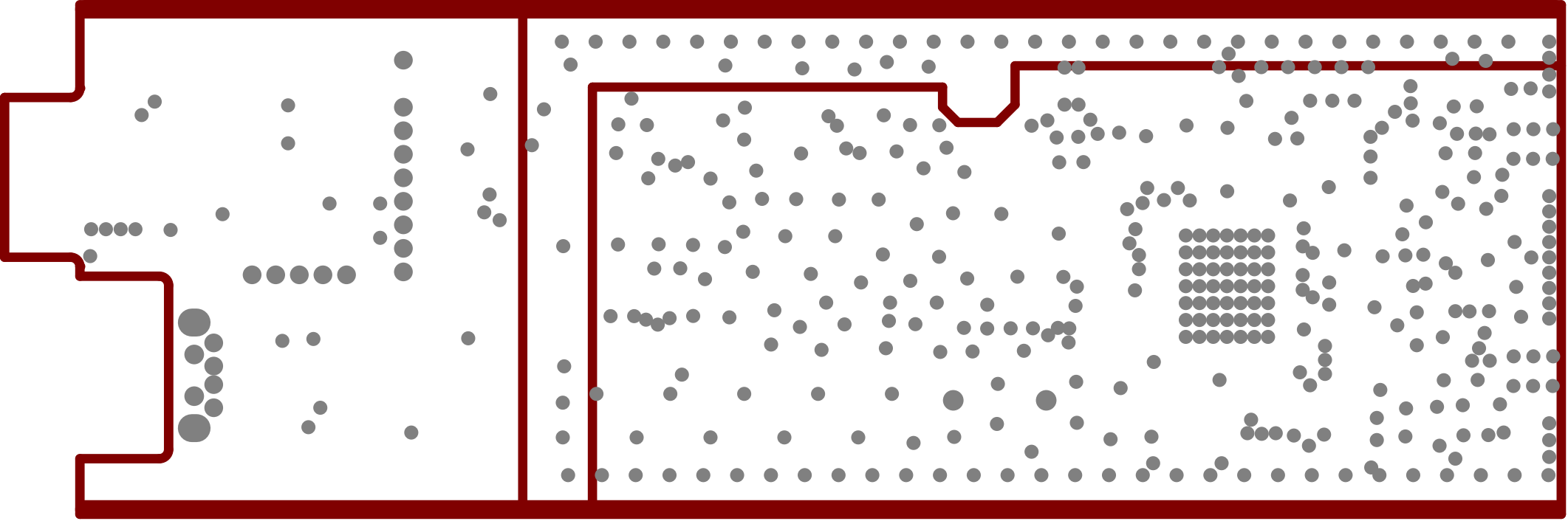
Top Layer

M4-PCBOutline

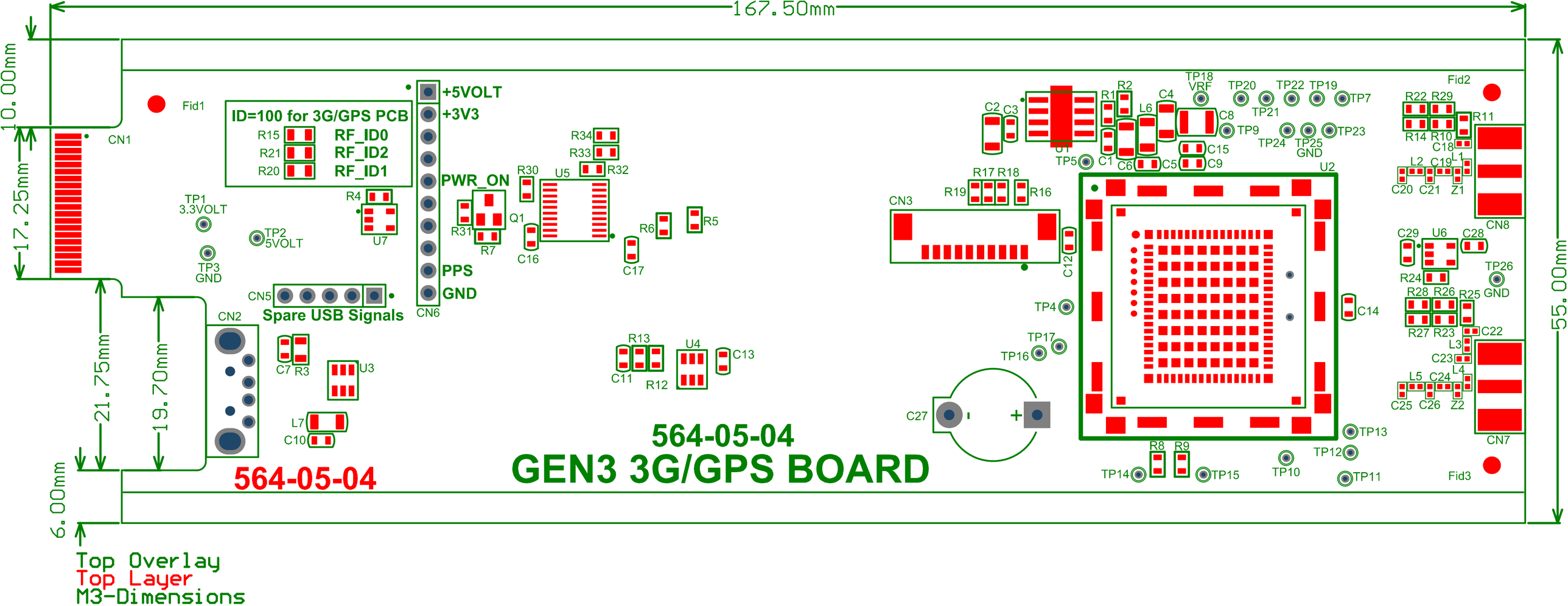
Bottom Layer

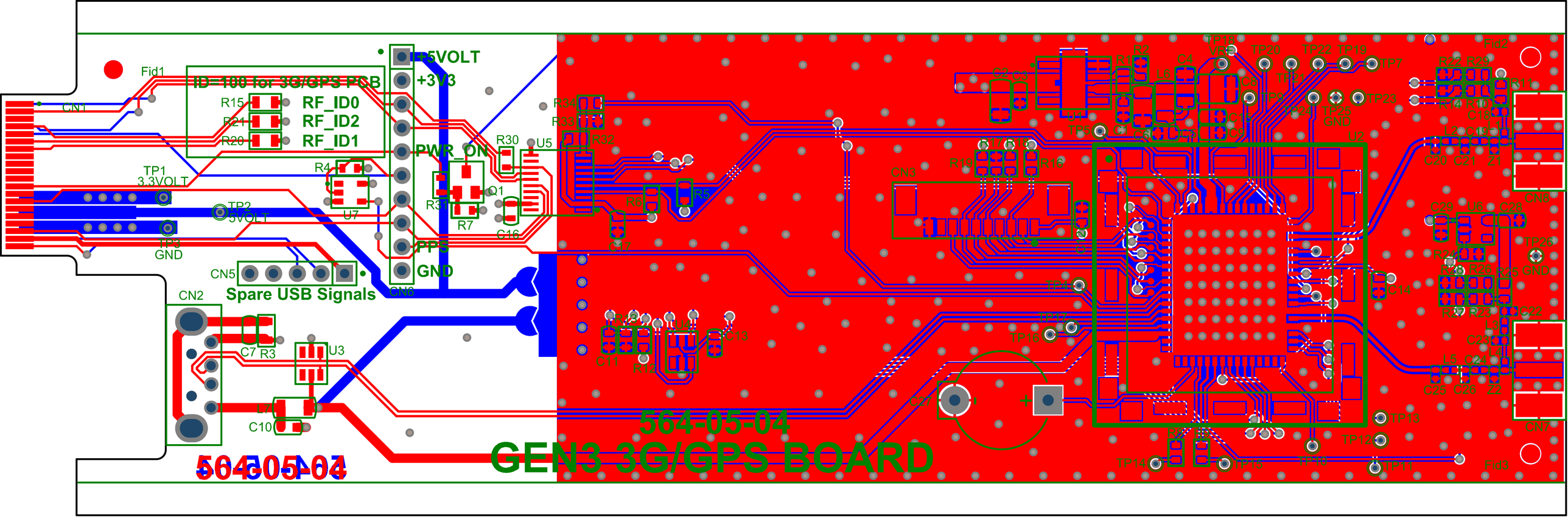
M4-PCBOutline


Ground



Power

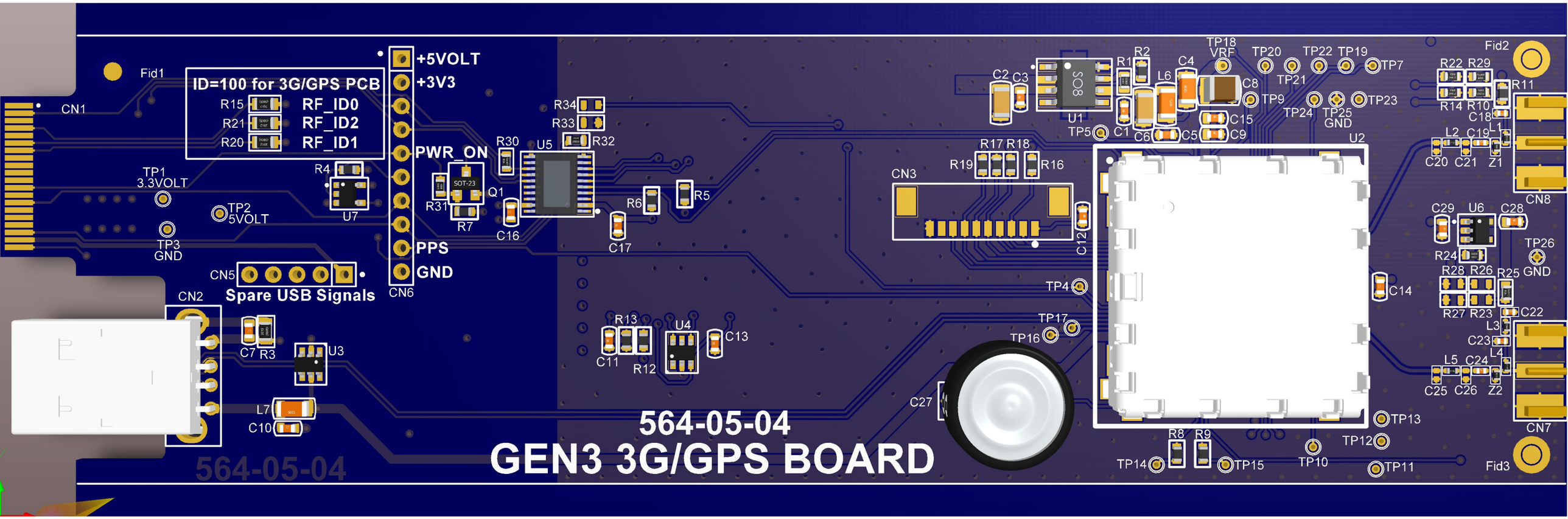

167.50mm
10.00mm
17.25mm
21.75mm
19.70mm
6.00mm
55.00mm
Fid1
CN1
ID=100 for 3G/GPS PCB
R15 RF_ID0
R21 RF_ID2
R20 RF_ID1
+5VOLT
+3V3
PWR_ON
PPS
GND
CN6
TP1 3.3VOLT
TP2 5VOLT
TP3 GND
R4
U7
R34
R33
R32
R30
U5
Q1
R31
R7
C16
R6
R5
C17
CN5
Spare USB Signals
CN2
C7
R3
U3
L7
C10
R13
U4
C13
C11
R12
564-05-04
564-05-04
GEN3 3G/GPS BOARD
C2
C3
U1
R1
R2
L6
C4
TP18 VRF
C8
TP20
TP22
TP19
TP7
TP21
TP9
TP23
TP24
TP25 GND
C15
TP5
C1
C6
C5
C9
U2
R17
R18
R19
R16
CN3
C12
TP4
TP17
TP16
C27
C14
TP13
TP12
TP14
R8
R9
TP15
TP10
TP11
Fid2
R22
R29
R14
R10
R11
C18
L1
L2
C19
C20
C21
Z1
CN8
C29
U6
C28
R24
TP26
GND
R28
R26
R25
R27
R23
C22
L3
C23
L4
L5
C24
C25
C26
Z2
CN7
Fid3
Top Overlay
Top Layer
M3-Dimensions

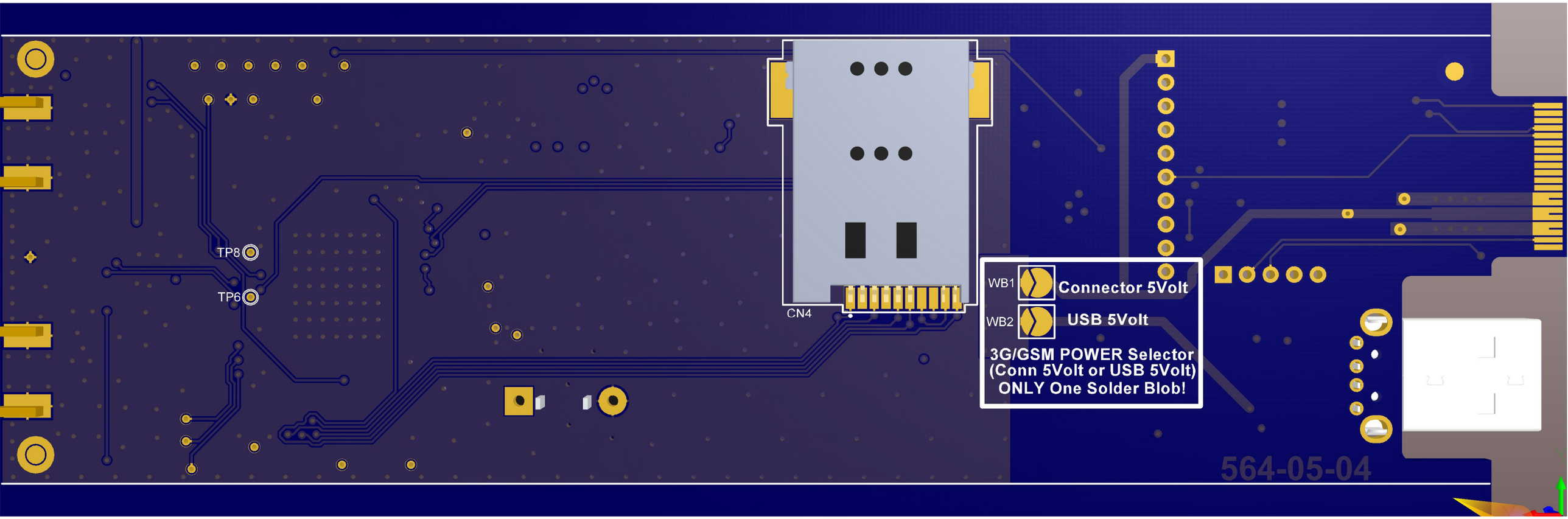


Top Overlay

Bottom Layer

M4-PCBOutline


ID=100 for 3G/GPS PCB
R15 RF_ID0
R21 RF_ID2
R20 RF_ID1
+5VOLT
+3V3
PWR_ON
PPS
GND
Spare USB Signals
564-05-04
GEN3 3G/GPS BOARD
564-05-04


TP8
TP6
CN4
WB1
Connector 5Volt
WB2
USB 5Volt
3G/GSM POWER Selector
(Conn 5Volt or USB 5Volt)
ONLY One Solder Blob!
564-05-04