M33-Series Users Design Notes (HW)

Version: 1.0.2

2009/04/20

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M33(A)G Users Design Notice (Hardware)

- ✓ M33 vs. M23 Pin-outs
- ✓ Recommended UART Interface (Level Shift)
- ✓ SIM Interface Circuit
- ✓ Acoustic Design Notes
- ✓ Antenna Connection

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M33(A)G Users Design Notice (Hardware)

M33(A)G pin-outs vs. M23(A)G

- M33(A)G has a hardware reset pin – ONnOFF which replaced ROW4 pin of M23
- M33(A)G has USB interface for software re-download and debug trace log
- Recommend to route USB interface to a reserved USB connector on board for future software download or debug use

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M33	M23				M33
Signal Name	Signal Name	Pin Number		Signal Name	Signal Name
VBATTBB	VBATTBB	1	44	GND	GND
GND	GND	2	43	VBATTRF	VBATTRF
GND	GND	3	42	VBATTRF	VBATTRF
GND	GND	4	41	VBATTRF	VBATTRF
GND	GND	5	40	GND	GND
LEDA	LEDA	6	39	IO10	GPIO15
OnnOFF	ROW4	7	38	PWON	PWON
USB_DP	TXD2	8	37	RXD2	**USB_DM**
GPIO0_DCD	DCD	9	36	BUZZ	**VBUS**
GND	GND	10	35	GND	GND
SIM_CLK	SIM_CLK	11	34	TXD	TXD
SIM_IO	SIM_IO	12	33	RXD	RXD
SIM_RST	SIM_RST	13	32	RTS	RTS
NC	NC	14	31	CTS	CTS
MICBIAS	MICBIAS	15	30	DSR	DSR
MICIP	MICIP	16	29	DTR	DTR
MICIIN	MICIIN	17	28	IO13	GPIO1
HSMIC	AUXI	18	27	IO11	GPIO2
GND	GND	19	26	GND	GND
EARP	EARP	20	25	IO6	GPIO7
EARN	EARN	21	24	RI	RI
HSOL	AUXOP	22	23	VRSIM	VRSIM

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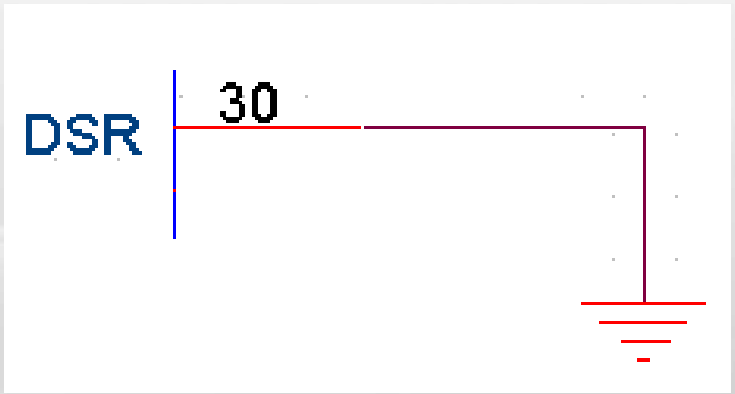
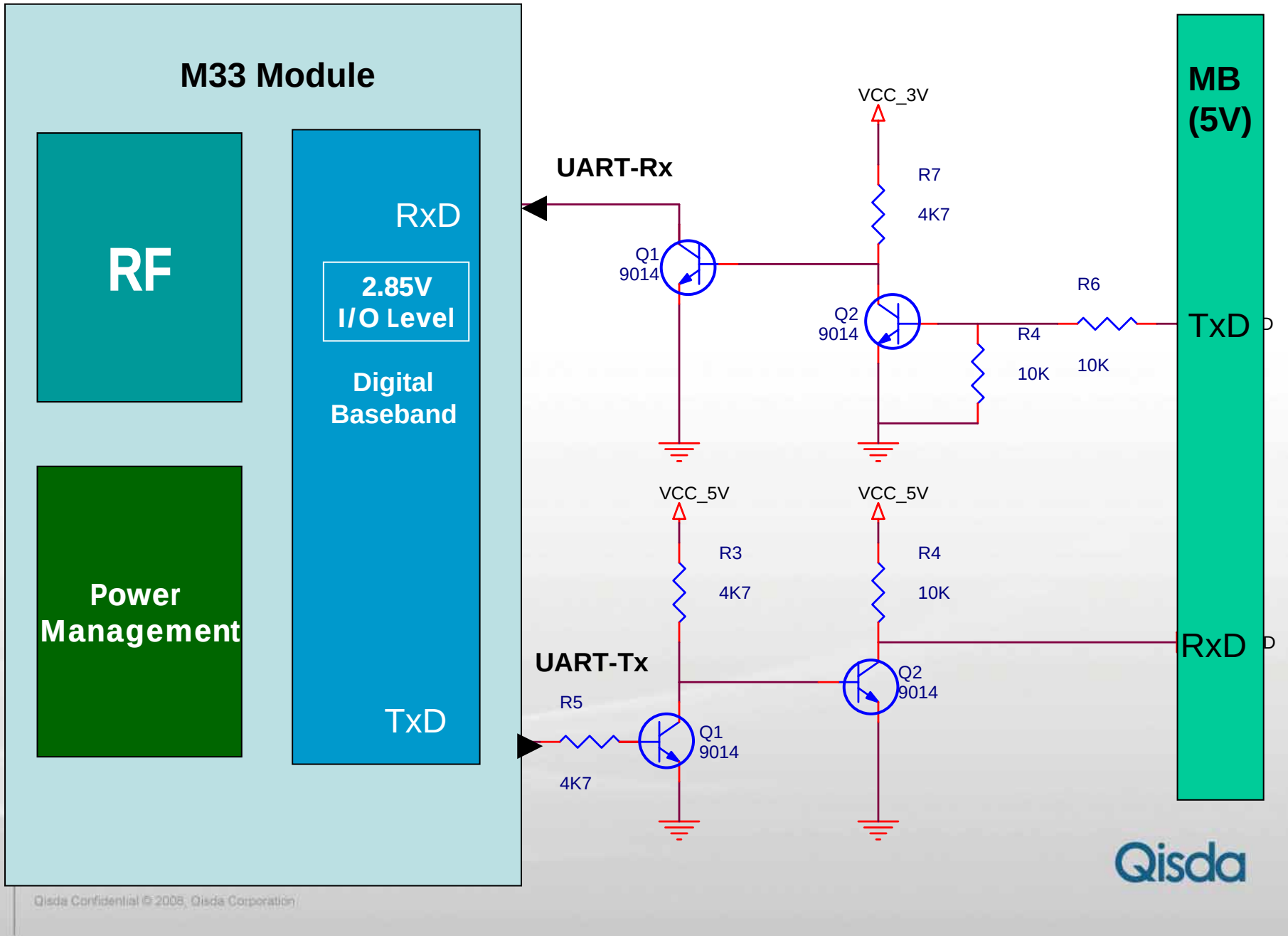
M33(A)G Users Design Notice (Hardware)

UART Interface

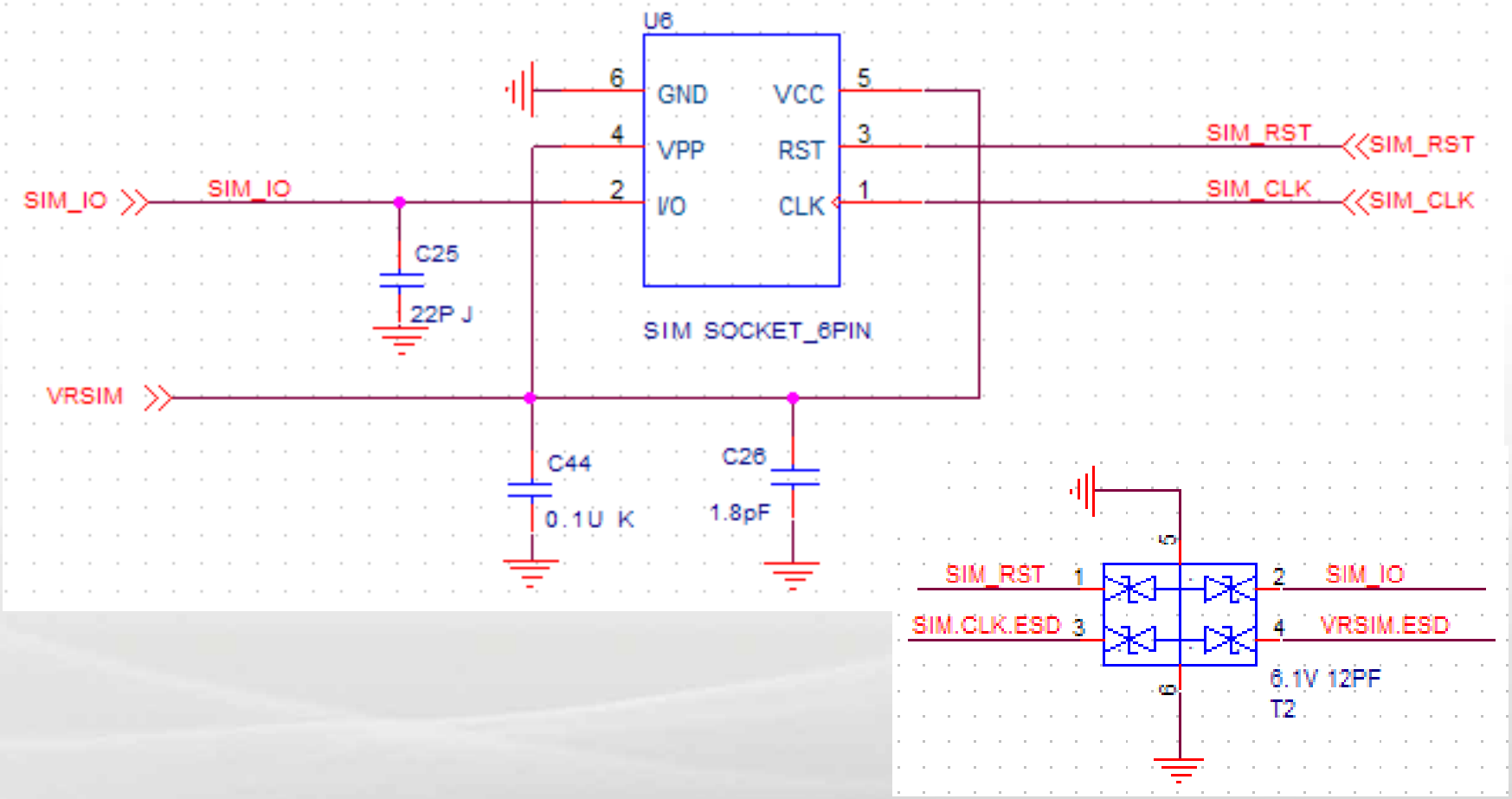
- Recommend to use 3V interface
- If different voltage level interface required, the following level shift circuit can be used for a reference
- If you don't use the DSR function, please keep DSR in low status. You may make the DSR short-circuited to Ground.



Recommended UART Interface Level Shift Schematics



Recommended M33 SIM Schematics



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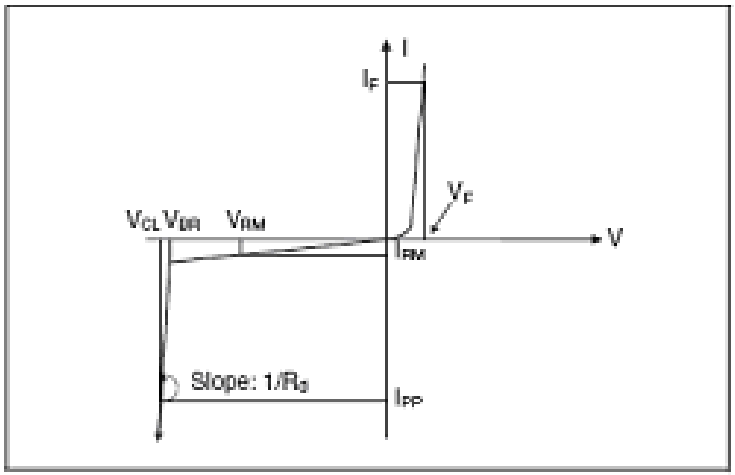
ESD Protection Component Spec. Recommended

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C)

Symbol	Parameter
V_{RM}	Stand-off voltage
V_{BR}	Breakdown voltage
V_{CL}	Clamping voltage
I_{RM}	Leakage current
I_{PP}	Peak pulse current
αT	Voltage temperature coefficient
V_F	Forward voltage drop
C	Capacitance
Rd	Dynamic resistance



V_{BR} @ I_R			I_{RM} @ V_{RM}		R_d	αT	C
min.	max.		max.		typ.	max.	typ. @ 0V
V	V	mA	µA	V	Ω	10^{-4}/°C	pF
6.1	7.2	1	0.5	3	1.5	4.5	12

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ESD Protection Component Reference

ESDALC6V1P6

ASD™

QUAD LOW CAPACITANCE TRANSIL™ ARRAY FOR ESD PROTECTION

MAIN APPLICATIONS

Where transient overvoltage protection in ESD sensitive equipment is required, such as :

- Computers
- Printers
- Communication systems and cellular phones
- Video equipment

This device is particularly adapted to the protection of symmetrical signals.

FEATURES

- 4 Unidirectional Transil™ functions
- Breakdown voltage V_{BR} = 6.1 V min.
- Low diode capacitance (12pF @ 0V)
- Low leakage current < 500 nA
- Very small PCB area < 2.6 mm^2

DESCRIPTION

The ESDALC6V1P6 is a monolithic array designed to protect up to 4 lines against ESD transients.

The device is ideal for situations where board space saving is required.

BENEFITS

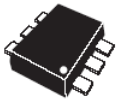
- High ESD protection level
- High integration
- Suitable for high density boards

COMPLIES WITH THE FOLLOWING STANDARDS:

- IEC61000-4-2 level 4:
  15kV (air discharge)
  8kV (contact discharge)
- MIL STD 883E-Method 3015-7: class3
  25kV HBM (Human Body Model)

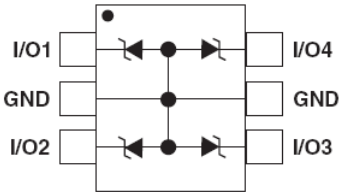
Order Codes

Part Number	Marking
ESDALC6V1P6	D



SOT-666IP
(Internal Pad)

FUNCTIONAL DIAGRAM



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M33(A)G Users Design Notice (Hardware)

Acoustic Design

- Microphone Interface Specifications
- Design Notice for Microphone Circuit
- Receiver Interface Specifications
- Two Receiver Channels Design
- Layout Notice
- Grounding

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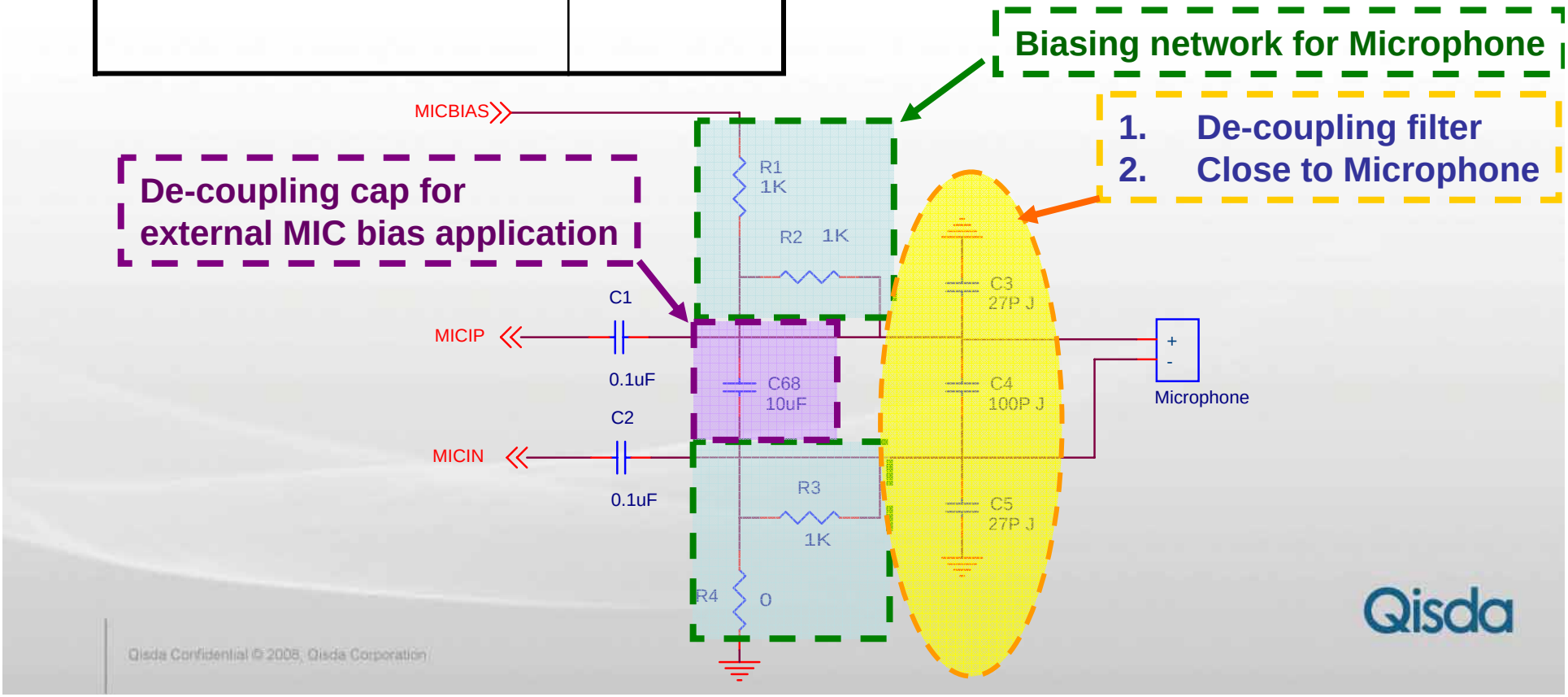
Microphone Interface Specifications

(MICIP-MICIN)		Unit
Maximum input range	32.5	mVrms
Micro-amplifier Gain	25.6	dB
Differential input resistance	36	kΩ
DC level at MICBIAS	2 /2.5	V
reference documents		

Valid MIC specifications

- **Load Impedance <= 2.2KOhm**
- **Freq. Response : 20 – 16KHz**
- **Standard operation voltage: 2.0V or 2.5V**
- **Sensitivity:-45+-4dB(1KHz)**
- **SN ratio: >=58dB**



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Design Notice for Microphone Circuits

1. Use differential traces for microphone
2. Keep the microphone traces as short as possible
3. If you need a external bias voltage, please add an de-coupling capacitor to reduce the noise from power supply.
4. Keep the microphone traces away from high-speed, high-current density or noisy trace (Ex: Power traces, clock..)
5. Isolate microphone traces on inner layers from non-audio traces by a ground trace with enough via holes to act as a faraday shield
6. If the microphone is placed outside of the PCB, please use twisted pairs to reduce the external interference.
7. Keep the microphone traces away from the antenna.
8. Choose the microphone with a embedded de-coupling capacitor which value is about 33pF.

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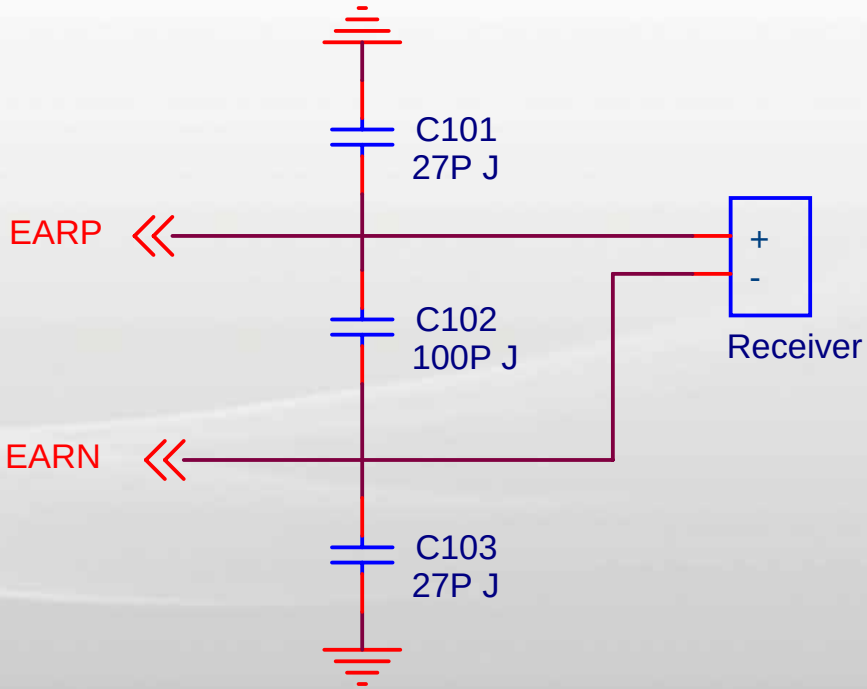
Receiver Interface Specifications

(EARN – EARP)		Unit
Maximum output swing	1.5	Vpp
Earphone amplifier Gain	1	dB
Differential Minimum resistance(R//)	33	Ω
Differential Maximum capacitor(C//)	100	pF
reference documents		



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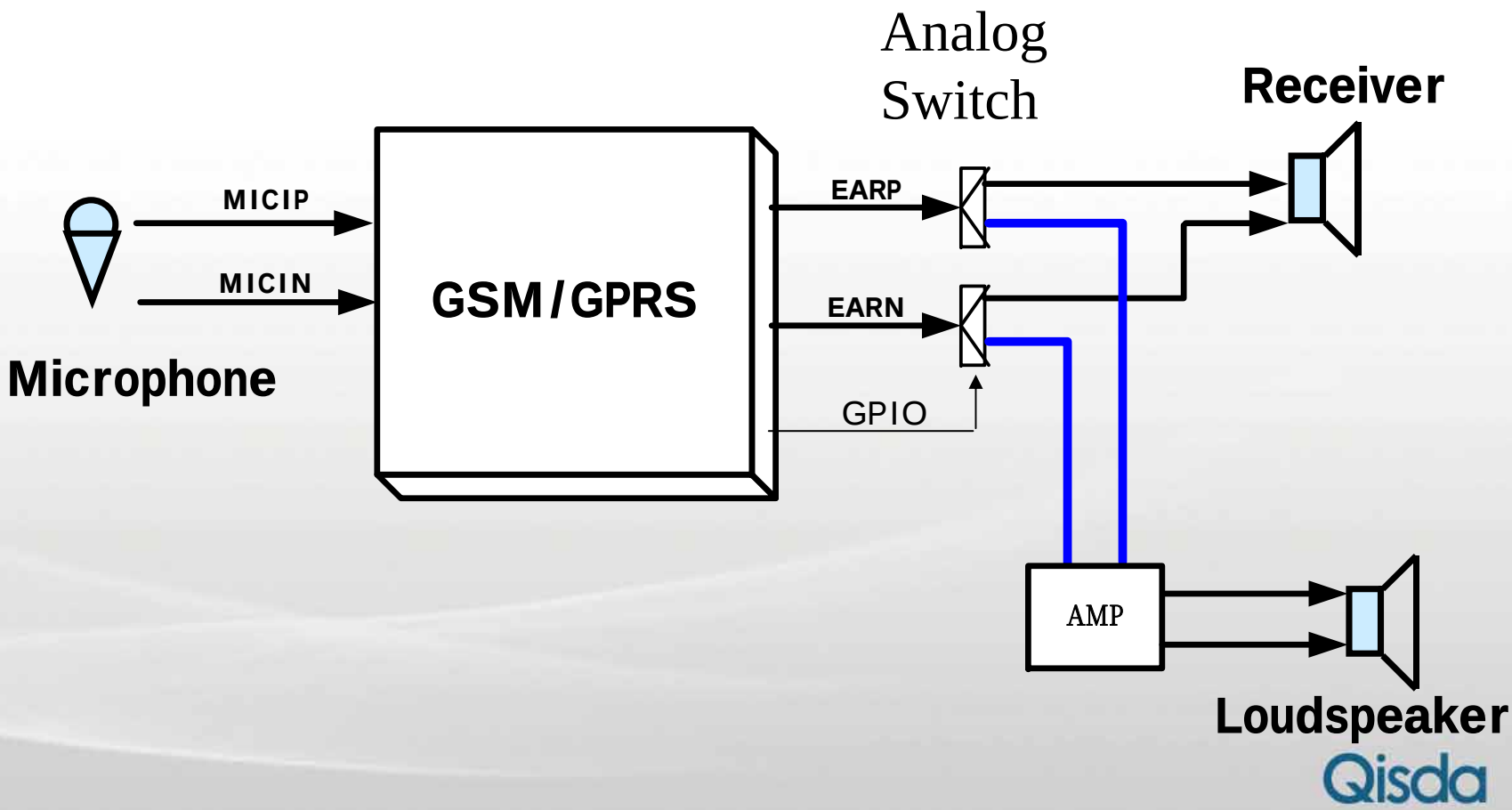
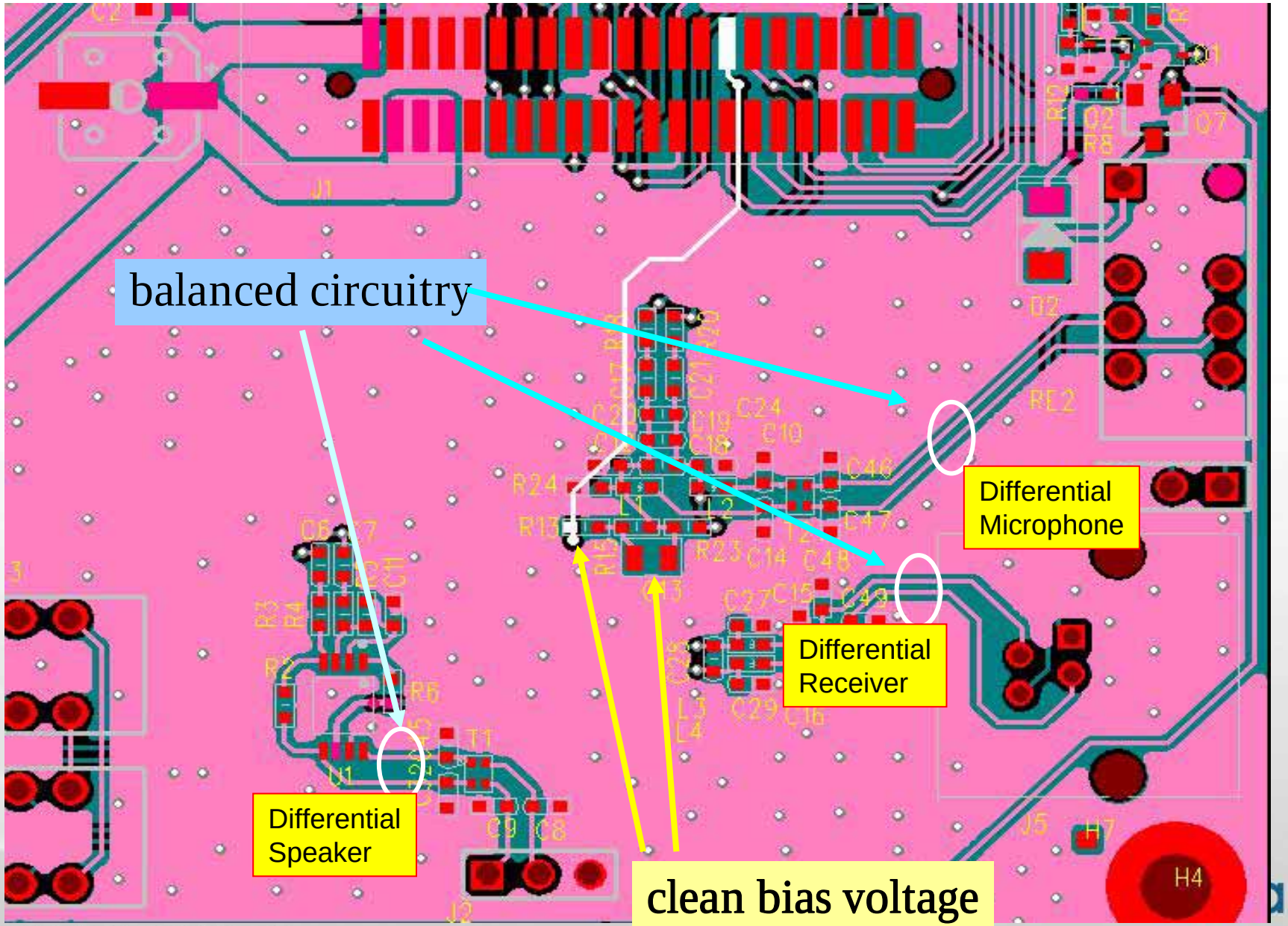
Two Receiver Channels - Switch for Differential Outputs

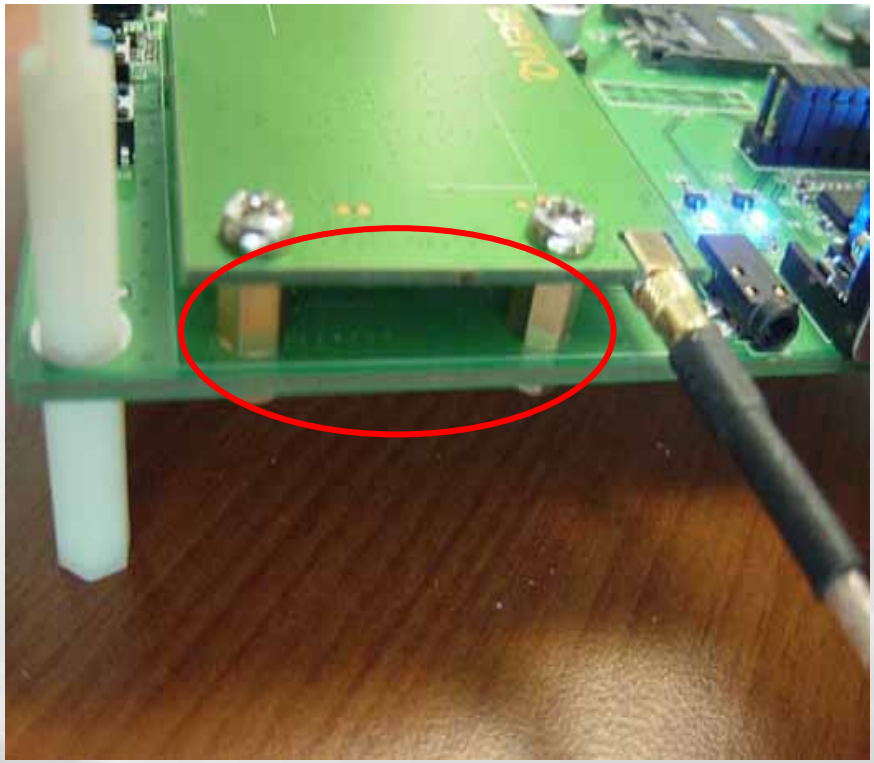
1. The RF interference immunity of differential type audio path is better than single-ended one
2. The same switch can be used for differential microphone.

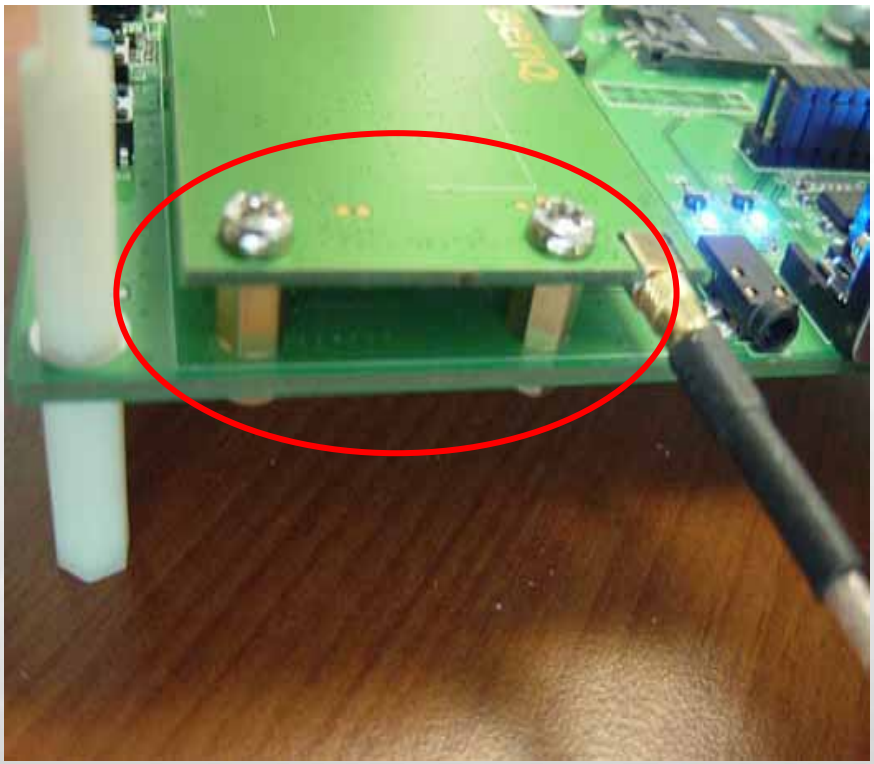


Layout Notes for Audio Path

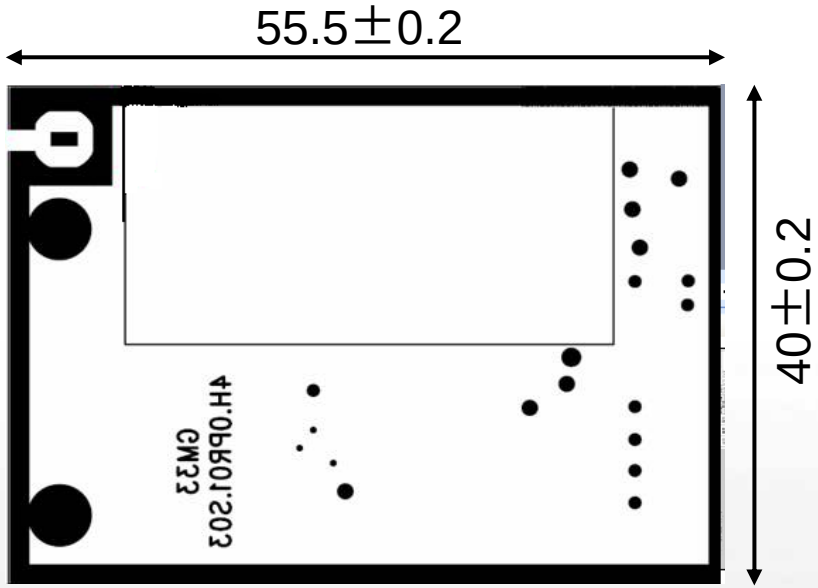


Grounding

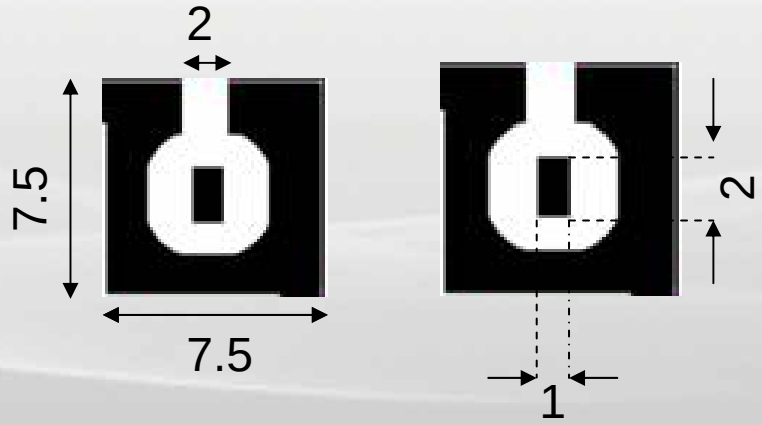




M33(A)G Antenna Connection



Antenna Pad



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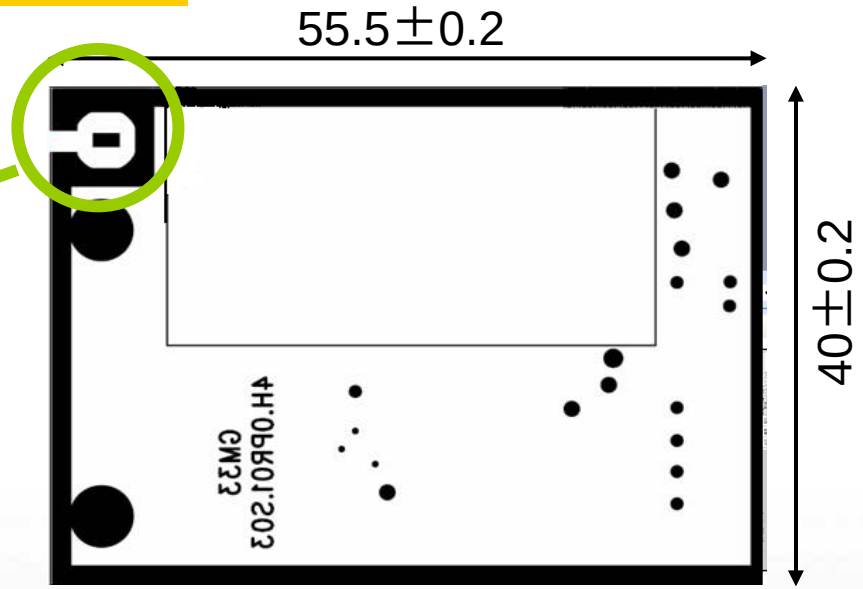
M33(A)G Antenna Connection

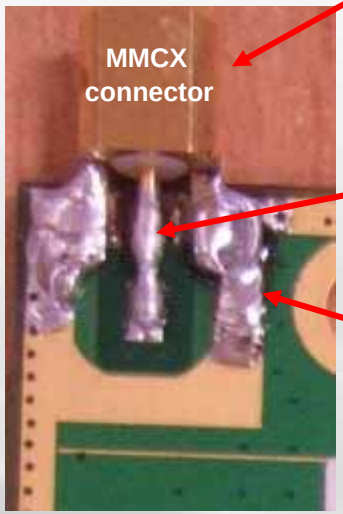
Antenna Pad



Note:

It is possible to solder coaxial cable directly or MMCX connector but it has some matters needing attention.

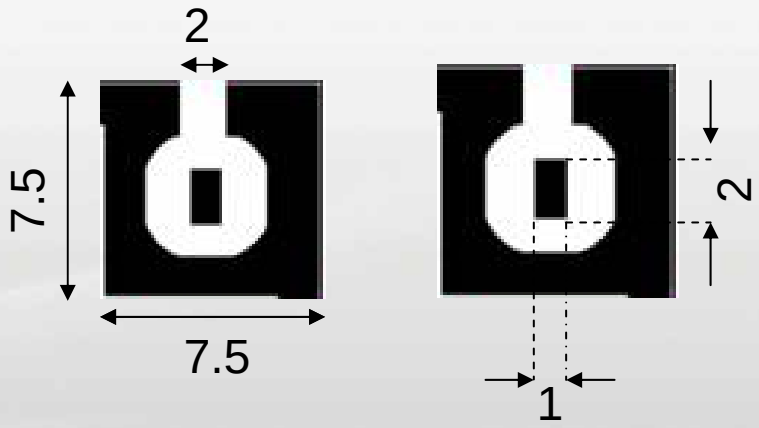
[Bottom View]



Avoid connector to be struck by force

Signal trace does not touch ground pad

Well soldering would reinforce connector connection



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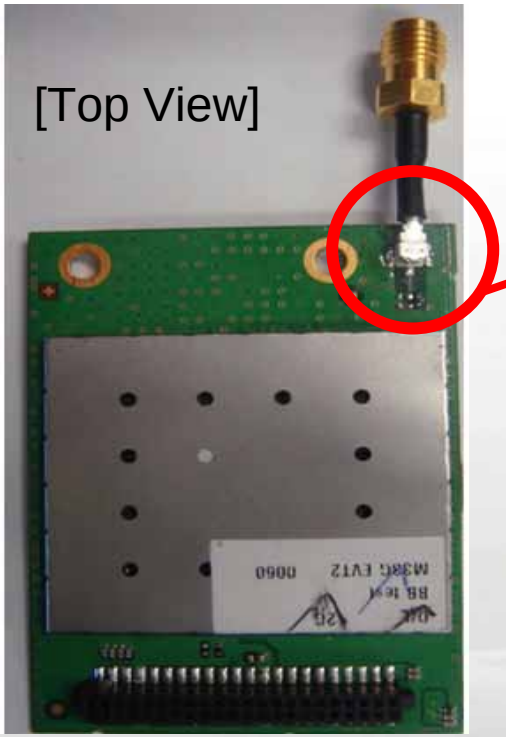
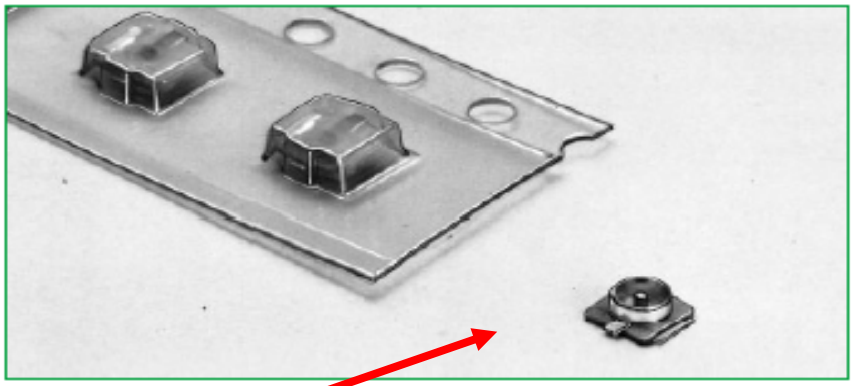
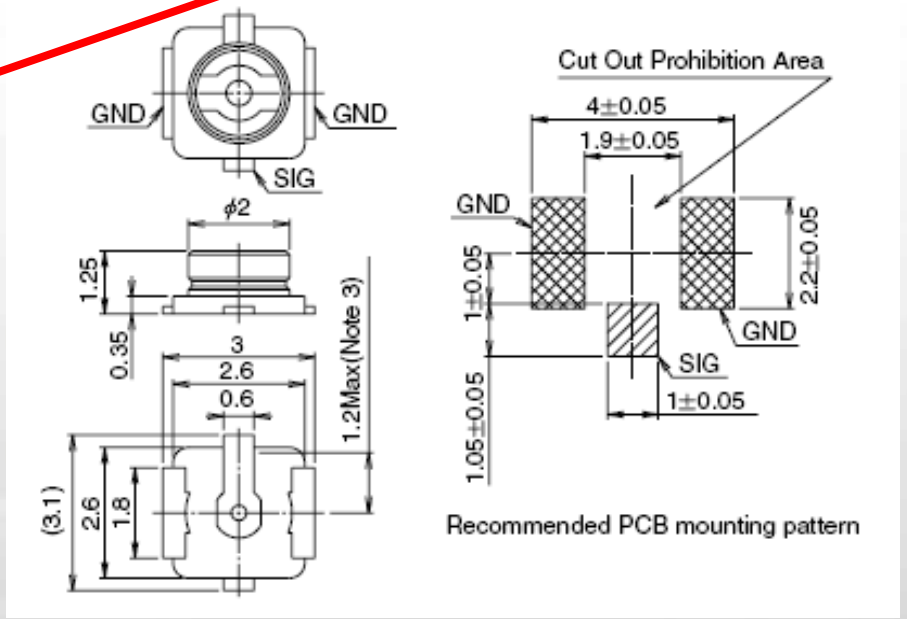
M33(A)G-C Antenna Connecter (U.FL-R-SMT)

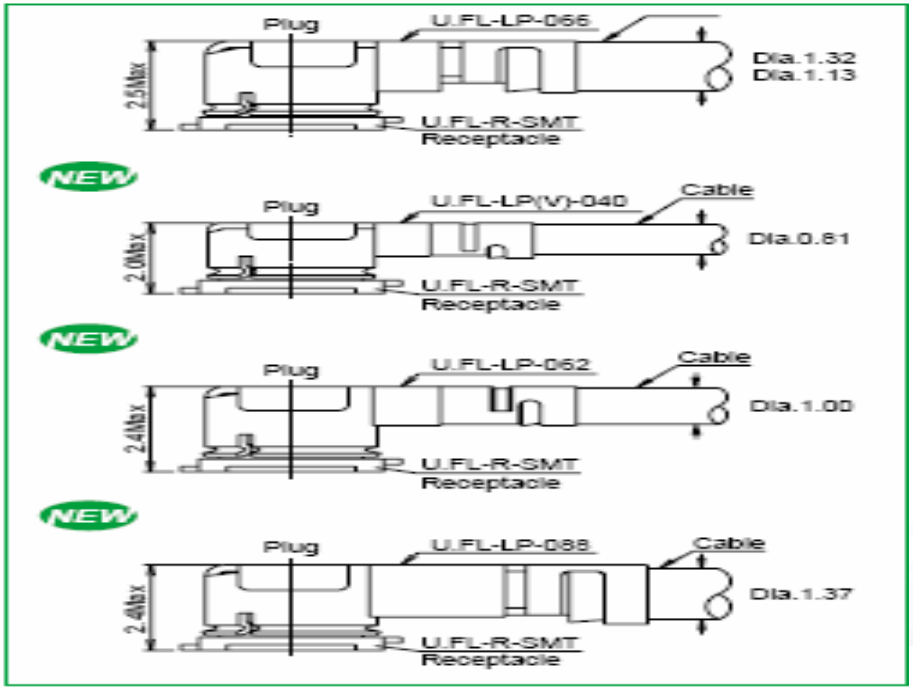


■Receptacles





M33(A)G-C Antenna Cable Reference [Hirose]



●Cable Guide

Description	Cable Type	Cable Specification						
		Inner Conductor*	Dielectric Diameter	Outer Conductor*	Jacket Diameter	Nominal Impedance	Nominal attenuation	
							At 3GHz	At 6GHz
Dia.1.13mm Coaxial Cable	068	7/0.08 SA (AWG32)	Dia.0.68 FEP	Single Shield SA[TA]	Dia.1.13 FEP	50 ohms	3.43dB/m [3.73dB/m]	5.13dB/m [5.44dB/m]
Dia.1.32mm Coaxial Cable	066	7/0.08 SA (AWG32)	Dia.0.66 FEP	Double Shield TA	Dia.1.32 FEP	50 ohms	3.8dB/m	5.6dB/m
Dia.1mm Coaxial Cable	062	7/0.071 SA (AWG33)	Dia.0.62 FEP	Tape, single Shield TAT	Dia.1 FEP	50 ohms	3.1dB/m	4.4dB/m
Dia.1.37mm Coaxial Cable	088	7/0.102 SA (AWG30)	Dia.0.88 FEP	Single Shield TA	Dia.1.37 FEP	50 ohms	2.8dB/m	4.3dB/m

(data as provided by cable suppliers, for reference only)
* SA : Silver plated annealed copper wire, TA : Tin plated annealed copper wire, TAT : Tin plated copper wire alloyed with tin

Quality
Innovation
Speed

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