SIM7600_Series_SGMII-Reference_Design_V1.00

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Revision History

Data	Version	Description of change	Author
2019-03-08	1.00	Original	Xutao.Jiang

1 Reference Design

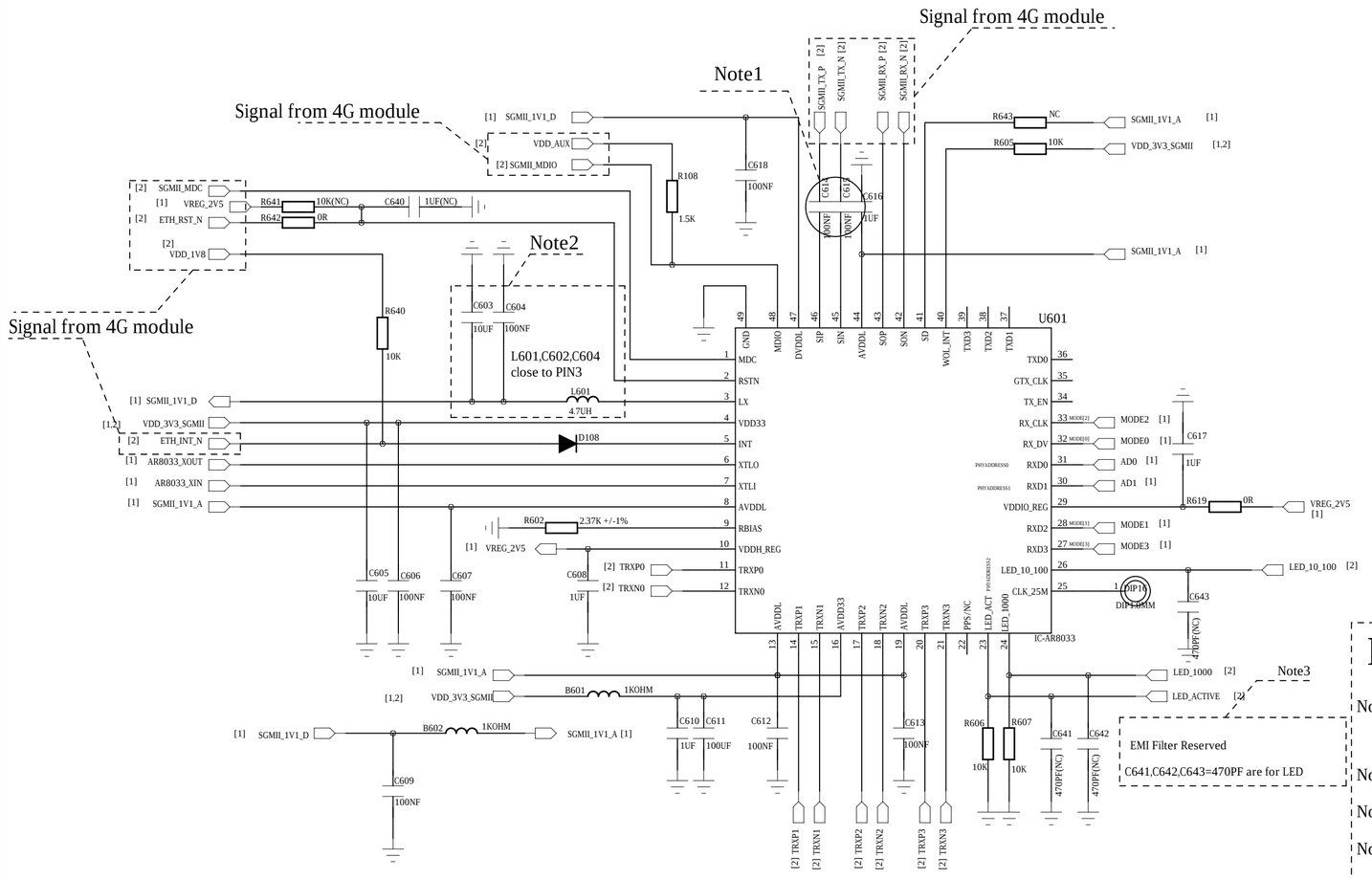
1.1 Introduction

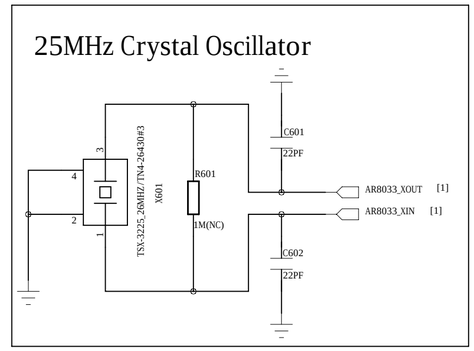
This document includes a schematic and a parts list for the SIM7600X series module reference design. This reference schematic is designed for SIM7600 module. The schematic and parts list included in this document are preliminary and are intended only as a reference.
With the help of this document and other software application notes/user guides, users can understand and use module to design and develop Ethernet applications quickly.

1.2 Reference schematic

AR8033 SGMII Design (Part 1)

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:





Notes:

Note1:For SGMII Rx signals, AC coupling capacitors (0402, 100NF) should be used between the transmitter and receiver, and should be placed as close as possible to the SIP/SIN.

Note2:SGMII_MDIO requires an external 1.5 kohm pull-up to VDD_AUX for IEEE specification compliance.

Note3:C641,C642,C643=470PF are for EMI Filter Reserved

Note4:XTAL should be placed close to the AR8033 with equal length CLKP/CLKN traces.

Note5:SGMII signals data rate up to 1.25Gbps,to reduce crosstalk, the Tx Lane to Rx Lane trace must >3 x width ,and SGMII to all other signals >3 x line width.

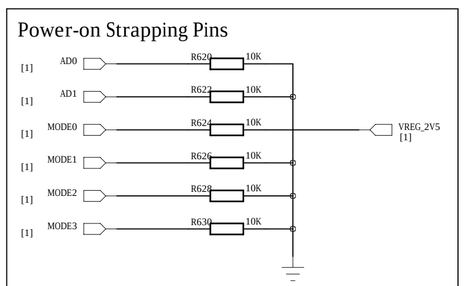
Note6:For SGMII Tx/Rx signals, Routed with a differential impedance of 80-120 ohm,for SGMII differential signals intra pair match <0.7mm

Note7:Do not route Differential pair P/N in top layer for better EMI

PHY Address: 5b'00000

MODE[3:0]:0001 10BASE-Te/100BASE-TX/1000BASE-T, SGMII

PHY pin	PHY core configuration signal	Description	Default internal weak pull-up/down	Application external pull-up/down
RXD0	PHYADDRESS0	LED_ACT and RXD[1:0] set the lower three bits of the physical address. The upper two bits of the physical address are set to 00.	1	0
RXD1	PHYADDRESS1		0	0
LED_ACT	PHYADDRESS2		0	0
RX_DV	MODE[0]	Mode select bit 0	0	0
RXD2	MODE[1]	Mode select bit 1	0	0
RX_CLK	MODE[2]	Mode select bit 2	0	0
RXD3	MODE[3]	Mode select bit 3	0	1



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AR8033 SGMII Design (Part 2)

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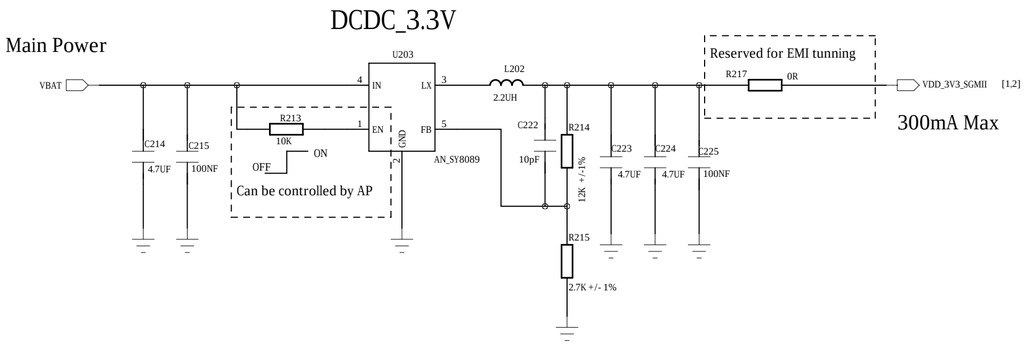
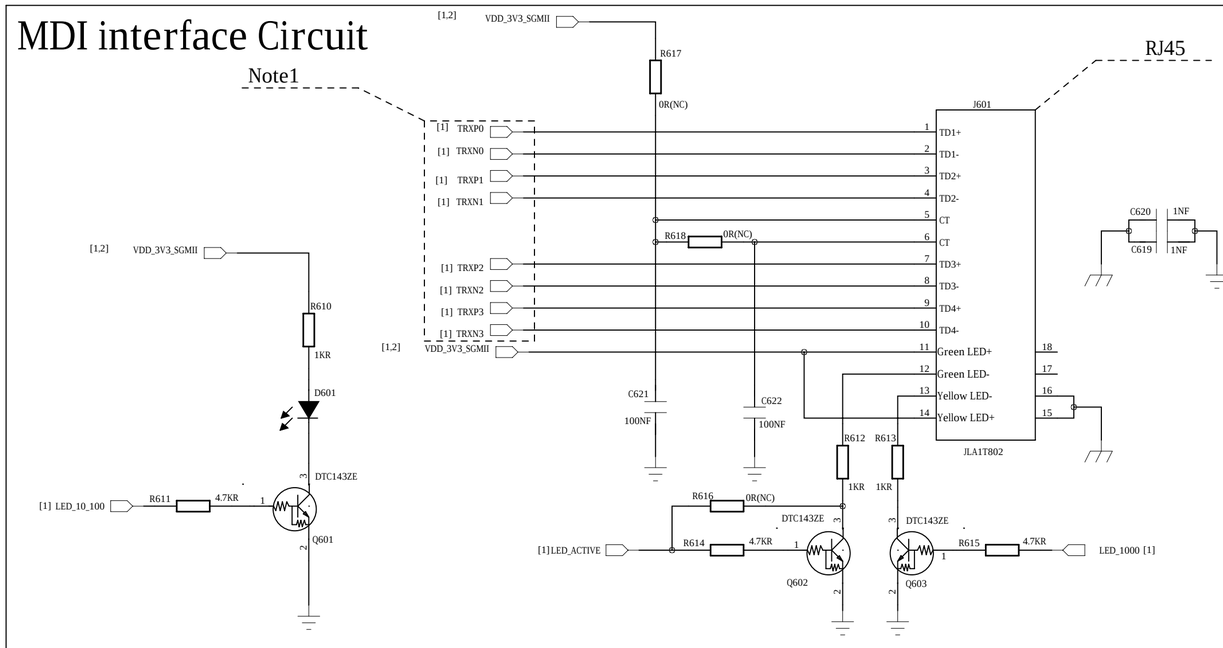
SGMII Power Circuit

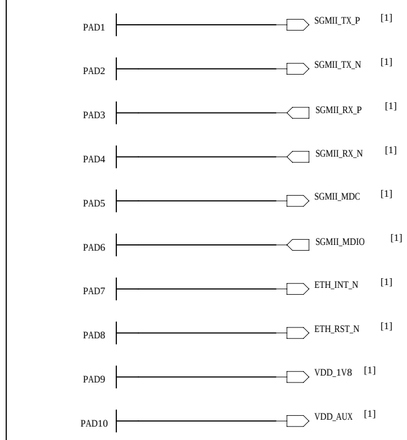


MDI interface Circuit



Symbol	10M link	10M active	100M link	100M active	1000M link	1000M active
LED_10_100	OFF	OFF	ON	ON	OFF	OFF
LED_1000	OFF	OFF	OFF	OFF	ON	ON
LED_ACT	ON	BLINK	ON	BLINK	ON	BLINK
ON = active; OFF = inactive						

Interface with 4G Module



Notes:

Note1:For MDI signals can connected a transformers for long distance transfer and procted PHY betterly

Note2:MDI signals trace routed between the PHY and the RJ45 should have a characteristic differential impedance of 100 ohm +/-10%

Note3:Route differential pairs such that the TRXP and TRXN signals are closely spaced.Do not use serpentines to make the traces match.Route pairs without changing layer(s) as much as possible.

Note4:To minimize cross talk, the space between separate adjacent pairs that are on the same layer must be equal to or larger than 40 mils.

Note5:Differential pair P/N skew must be less than 20 mils

Note6:Recommended magnetic: Pulse Electronics H5007

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BCM89820 Design (Part 1)

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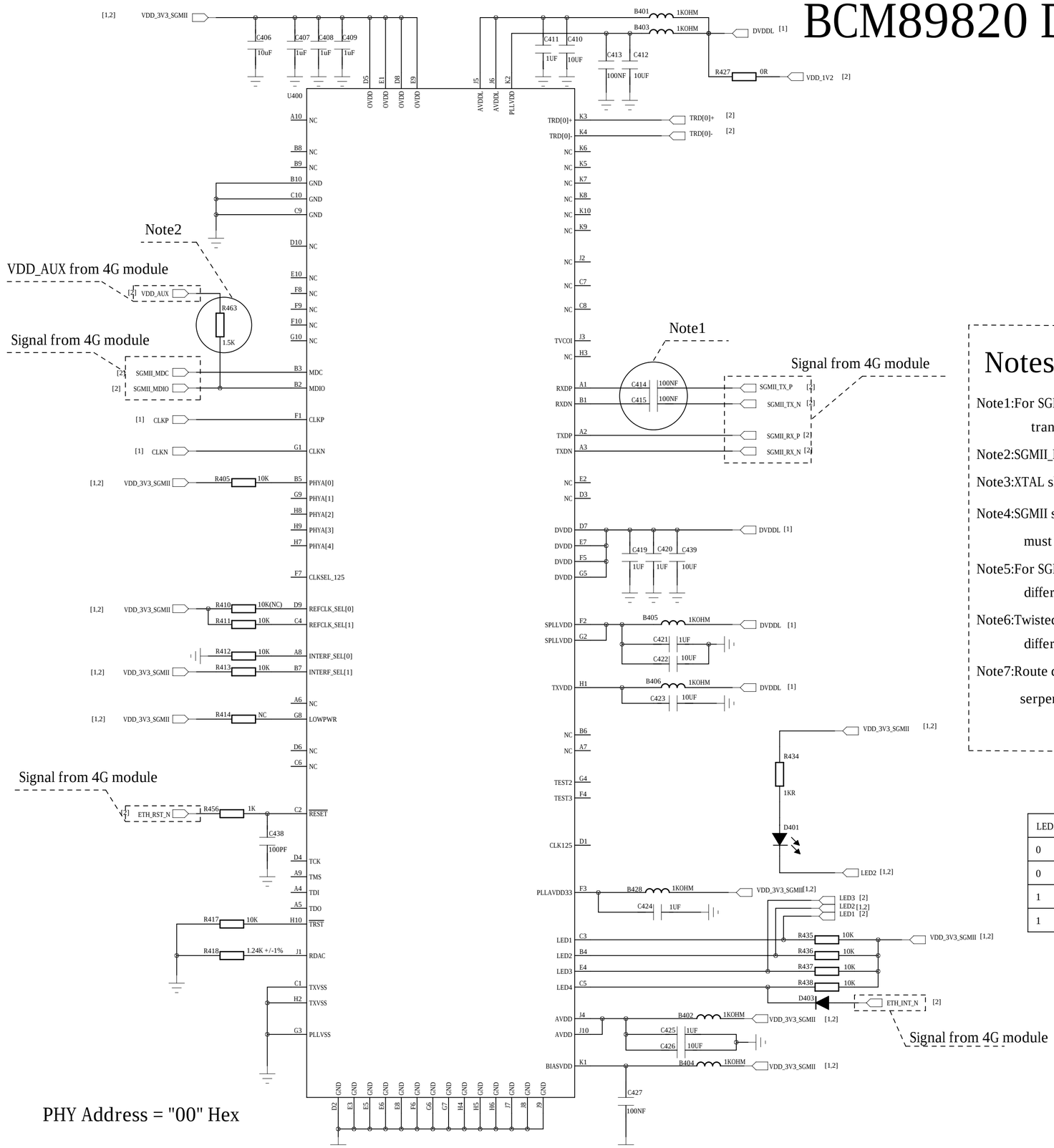


Notes:

Note1:For SGMII Rx signals, AC coupling capacitors (0402, 100NF) should be used between the transmitter and receiver, and should be placed as close as possible to the RXDP/RXDN.

Note2:SGMII_MDIO requires an external 1.5kohm pull-up to VDD_AUX for IEEE specification compliance.

Note3:XTAL should be placed close to the BCM89820 with equal length CLKP/CLKN traces.

Note4:SGMII signals data rate up to 1.25Gbps,to reduce crosstalk, the Tx Lane to Rx Lane trace must >3 x width ,and SGMII to all other signals >3 x line width.

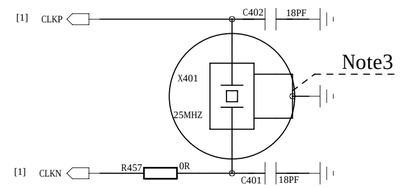
Note5:For SGMII Tx/Rx signals, Routed with a differential impedance of 80-120 ohm,for SGMII differential signals intra pair match <0.7mm

Note6:Twisted-Pair signals trace routed between the PHY and the hybrid should have a characteristic differential impedance of 100ohm +/-10%

Note7:Route differential pairs such that the TRD+ and TRD- signals are closely spaced.Do not use serpentines to make the traces match.Route pairs without changing layers as much as possible.

LED2	LED1	Link/Speed
0	0	N/A
0	1	Linked@100Mb/s BroadR-Reach
1	0	N/A
1	1	NO LINK

25MHz Crystal Oscillator



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BCM89820 Design (Part 2)

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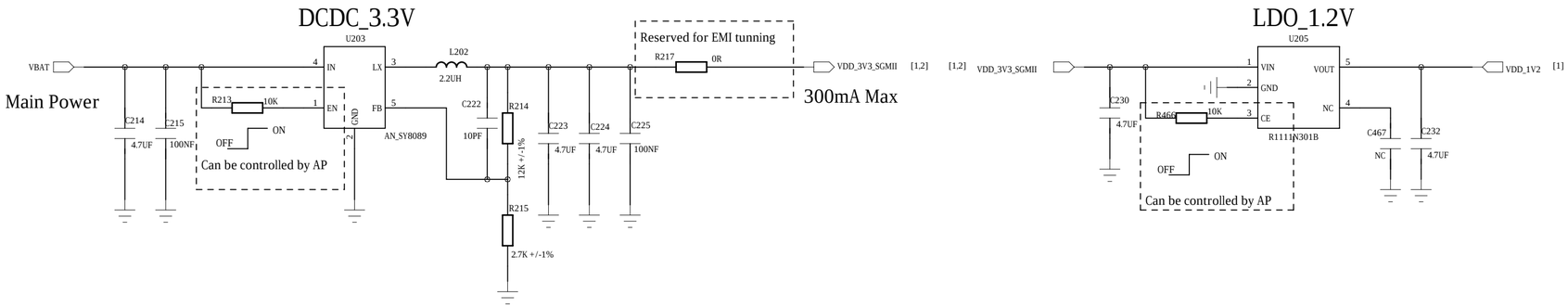
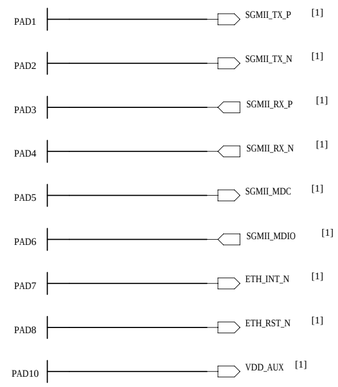
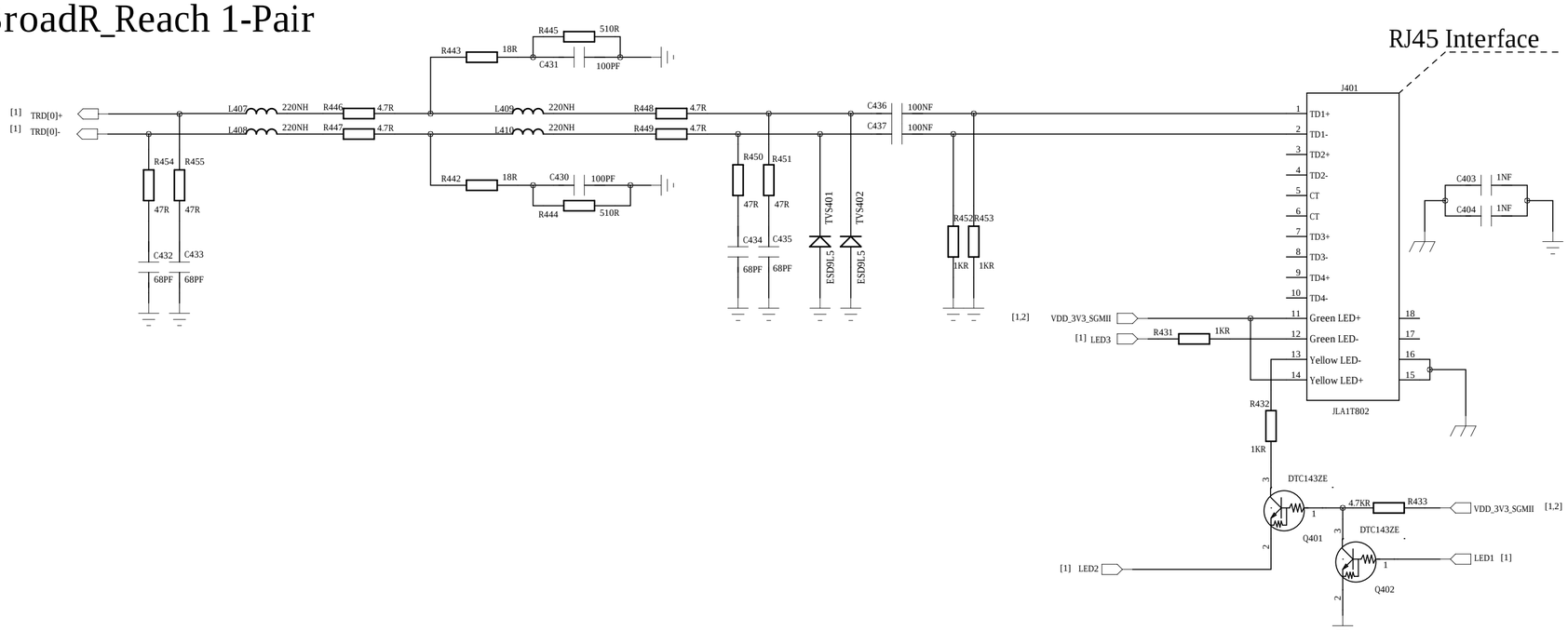
SGMII Power Circuit



Interface with 4G Module



BroadR_Reach 1-Pair



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1.3 Parts list

AR8033_Reference_Design_BOM				
No	Vendor No	Part Description	Count	Refer No
10	RC0402JR-070RL	RES MF 0R +/-5% 1/16W CH 0402 RO	3	R217 R619 R642
20	RC0402JR-071KL	RES MF 1KR +/-5% 1/16W CH 0402 RO	3	R610 R612 R613
30	MCR01-MZS-J-152	RES MF 1.5KR +/-5% 1/16W CH 0402 RO	1	R108
40	MCR01-MZS-J-472	RES MF 4.7KR +/-5% 1/16W CH 0402 RO	3	R611 R614 R615
50	MCR01-MZS-J-103	RES MF 10KR +/-5% 1/16W CH 0402 RO	10	R213 R606 R607 R620 R622 R624 R626 R628 R630 R605
60	RC0402FR-072K37L	RES MF 2.37K +/-1% 1/16W CH0402 RO	1	R602
70	MCR01-MZS-J-272	RES MF 2.7KR +/-5% 1/16W CH 0402 RO	1	R215
80	RC0402FR-0710KL	RES MF 10KR +/-1% 1/16W CH 0402 RO	1	R640
90	RC0402FR-0712KL	RES MF 12KR +/-1% 1/16W CH 0402 RO	1	R214
100	GRM1555C1H100JA01D	CAP COG 10PF +/-5% 50V CH0402 RO	1	C222
110	GRM1555C1H180JA01D	CAP COG 18PF +/-5% 50V CH0402 RO	2	C601 C602
120	GRM155R71C104KA88D	CAP X7R 100NF +/-10% 16V CH0402 RO	14	C215 C225 C604 C614 C615 C618 C606 C607 C609 C611 C612 C613 C621 C622
130	GRM155R61A105KE15D	CAP X5R 1UF +/-10% 10V CH0402 RO	4	C617 C608 C610 C616
140	GRM188R61A475KE15D	CAP X5R 4.7UF +/-10% 10V CH0603 RO	3	C214 C223 C224
150	GRM188R60J106ME47D	CAP X5R 10UF +/-20% 6.3V CH0603 RO	2	C603 C605
160	GR431BR7LA102KW66L	CAP X7R 1NF +/-10% 2000V CH1206 RO	2	C619 C620
170	SPH252012H2R2MT	IND WIRE WOUND 2.2UH ± 20% 1.7A 2.5*2 RO	2	L202
180	LQM2HPN4R7MG0D	IND LOW 4.7UH +/-20% CH 2.5*2.0 RO	1	L601
190	BLM15BD102SN1	BEAD 1KOHM@100MHZ +/-25% 0.2A 0402 RO	2	B602 B601
200	AOT-0603P-R01-HO	DIO RED LED CH0603 RO	1	D601
210	DTC143ZETL	NPN 50V 100MA R1=4.7K R2=47K SC75 RO	3	Q601 Q602 Q603
220	1C225000BC0J	CRY XO 25M 20PPM 10PF CH3225 RO	1	X601
230	SY8089AAAC	DC/DC BUCK 2.7-5.5V ADJ/2A SOT23-5 RO	1	U203
240	AR8033-AL1B-R	10/100/1000MBIT ETHERNET TRANSCEIVER RO	1	U601
250	RJ450019300	RJ45 WITH 1000BASE-TX MAGETICS RO	1	J601
260	RB520S30T1G	DIO SCHOTTKY VR=30V IF=200MA SOD523 RO	1	D108

BCM89820_Reference_Design_BOM

No	Vendor No	Part Description	Count	Refer No
10	RC0402JR-070RL	RES MF 0R +/-5% 1/16W CH 0402 RO	3	R217 R457 R427
20	MCR01MZPJ4R7	RES MF 4.7R +/-5% 1/16W CH0402 RO	4	R446 R447 R448 R449
30	MCR01MZPJ180	RES MF 18R +/-5% 1/16W CH 0402 RO	2	R442 R443
40	MCR01MZPJ470	RES MF 47R +/-5% 1/16W CH 0402 RO	4	R450 R451 R454 R455
50	RC0402JR-07510RL	RES MF 510R +/-5% 1/16W CH 0402 RO	2	R444 R445
60	MCR01-MZS-J-102	RES MF 1KR +/-5% 1/16W CH 0402 RO	6	R431 R432 R434 R456 R452 R453
70	MCR01-MZS-J-472	RES MF 4.7KR +/-5% 1/16W CH 0402 RO	1	R433
80	MCR01-MZS-J-103	RES MF 10KR +/-5% 1/16W CH 0402 RO	11	R412 R413 R417 R435 R436 R437 R438 R405 R411 R466 R213
90	RC0402FR-071K24L	RES MF 1.24K ±1% 1/16W CH0402 RO	1	R418
100	GRM1555C1H180JA01D	CAP COG 18PF +/-5% 50V CH0402 RO	2	C401 C402
110	GRM1555C1H680JA01D	CAP COG 68PF +/-5% 50V CH0402 RO	4	C432 C433 C434 C435
120	GRM1555C1H101JA01D	CAP COG 100PF +/-5% 50V CH0402 RO	3	C438 C430 C431
130	GRM155R71C104KA88D	CAP X7R 100NF +/-10% 16V CH0402 RO	8	C215 C413 C414 C415 C427 C436 C437 C225
140	GRM155R61C105KA12D	CAP X5R 1UF +/-10% 16V CH0402 RO	9	C407 C409 C408 C411 C419 C420 C421 C424 C425
150	GRM188R60J106ME47D	CAP X5R 10UF +/-20% 6.3V CH0603 RO	7	C406 C412 C426 C410 C422 C439 C423
160	GR431BR7LA102KW66L	CAP X7R 1NF +/-10% 2000V CH1206 RO	2	C403 C404
170	LQG15HSR22J02D	电感220NH（0402） RO	4	L407 L408 L409 L410
180	BLM15BD102SN1	BEAD 1KOHM@100MHZ +/-25% 0.2A 0402 RO	7	B402 B403 B404 B406 B401 B405 B428
190	ESD9L5.0ST5G	TVS 5V 0.5PF SOD-923 RO	2	TVS401 TVS402
200	AOT-0603P-R01-HO	DIO RED LED CH0603 RO	1	D401
210	DTC143ZETL	NPN 50V 100MA R1=4.7K R2=47K SC75 RO	2	Q401 Q402
220	1C225000BC0J	CRY XO 25M 20PPM 10PF CH3225 RO	1	X401
230	BCM89820A2BFBG	10/100MBIT ETHERNET TRANSCEIVER AUTO RO	1	U401
240	RJ450019300	RJ45 WITH 1000BASE-TX MAGETICS RO	1	J401
250	LC1463CB5ATR12	LDO 1.0-4.5V 1.2V/300MA SOT23-5 RO	1	U205
260	GRM188R61A475KE15D	CAP X5R 4.7UF +/-10% 10V CH0603 RO	5	C230 C232 C214 C223 C224
270	MCR01-MZS-J-152	RES MF 1.5KR +/-5% 1/16W CH 0402 RO	1	R463
280	RB520S30T1G	DIO SCHOTTKY VR=30V IF=200MA SOD523 RO	1	D403

290	SY8089AAAC	DC/DC BUCK 2.7-5.5V ADJ/2A SOT23-5 RO	1	U203
300	SPH252012H2R2MT	IND WIRE WOUND 2.2UH ± 20% 1.7A 2.5*2 RO	1	L202
310	GRM1555C1H100JA01D	CAP COG 10PF +/-5% 50V CH0402 RO	1	C222
320	RC0402FR-0712KL	RES MF 12KR +/-1% 1/16W CH 0402 RO	1	R214
330	MCR01-MZS-J-272	RES MF 2.7KR +/-5% 1/16W CH 0402 RO	1	R215

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