Look up equivalent 153 BGA Swissbit takes 4 days to send Data sheet

Found Micron automotive data sheet for 153 BGA eMMC

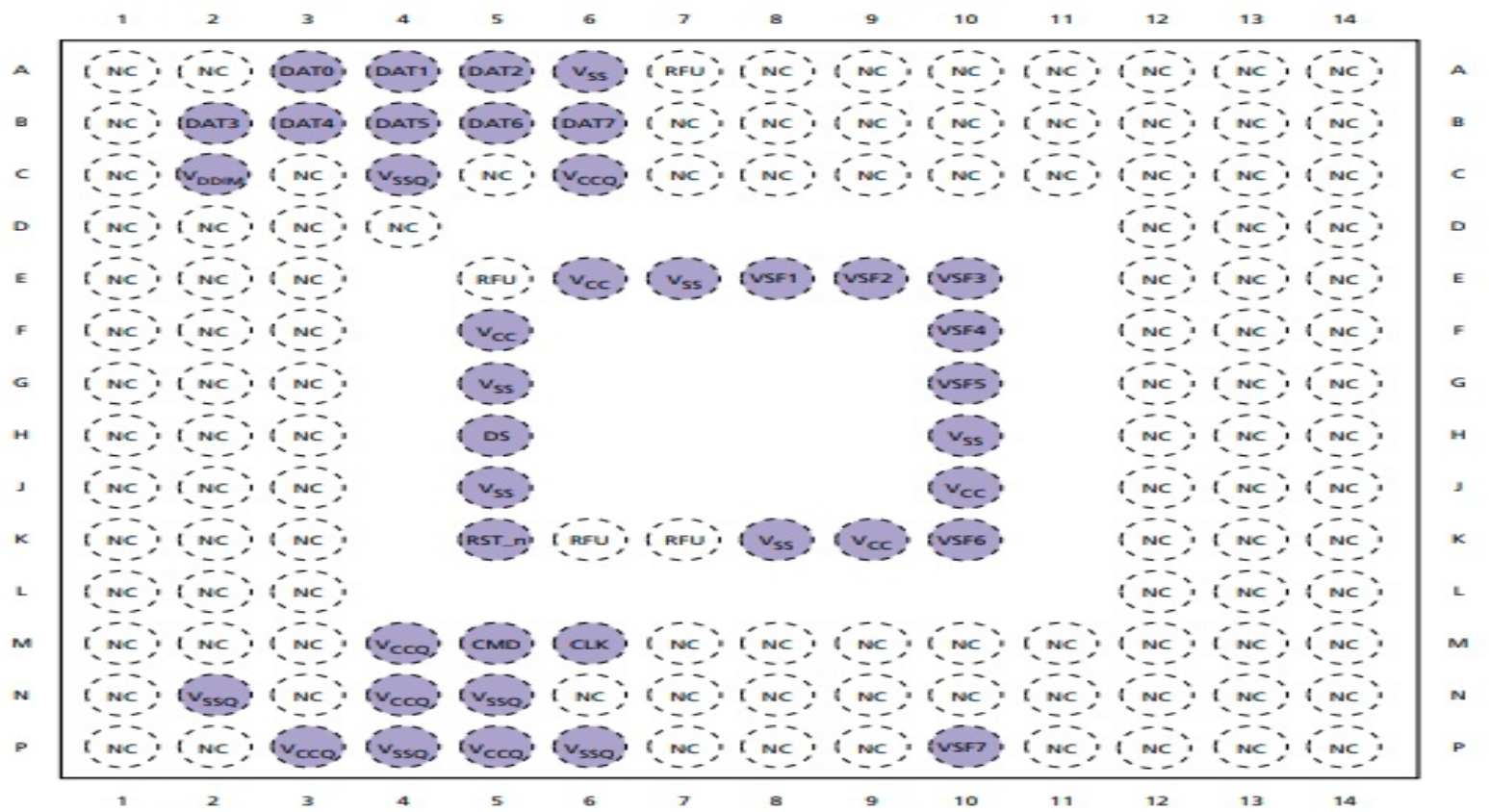
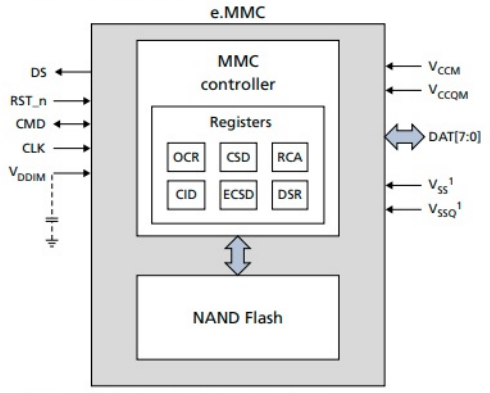


Image of 153 BGA (Top View Ball Down)

NC Not Connected
RFU reserved for future use

V_{CC}, V_{CCQ}, V_{SS}, and V_{SSQ} balls Must Connect to the system Board.

Figure 7: e.MMC Functional Block Diagram



Note: 1. V_{SS} and V_{SSQ} are internally connected.

1/17/2020 Notes

eMMC change questions

Power rail

Parts added eMMC LDO

Pins:

UHF Transceiver — L Band only
Recieve on L Band primary
UHF listen Backup

UN Requires
Ability to shut down always

External RF Project Front end

- Pin allocation for Swissbit e MMC adding to schematic

Removed { SD Card
Transistor — MMC PWR
Resistor

Pins
STM32F446xC/E
LQFP64

	Pin #	function		Pin Name		Check Existing Layout if Free
	39	SDIO	D0	PC 8		PC8 ✓
26	40	SDIO	D1	(26) PB 0	(40) PC9	PC9 ✓
27	51	SDIO	D2	(27) PB 1	(51) PC 10	PC 10 ✓
	52	SDIO	D3	PC 11		PC 11 ✓
	61	SDIO	D4	PB 8		NOT Free
	62	SDIO	D5	PB 9		Not Free
	37	SDIO	D6	PC6		NOT Free
	38	SDIO	D7	PC7		Not Free
28	53	SDIO	CK	(28) PB2	(53) PC 12	PC 12 ✓
	54	SDIO	CMD	PD2		PD2 ~~Not Free~~ *

Problems — Already in use

PB 8	OPD_SCI
PB 9	OPD_SDA
PC 6	RADIO1_CS
PC 7	RADIO2_CS
PD2	TP7

- * Team discussion
PD2 is Free
and just use D0 D3
Use PC13 if
Power control (on/off) is
needed

Wiring Notes using Swissbit_AN_EM-10_RGL.pdf

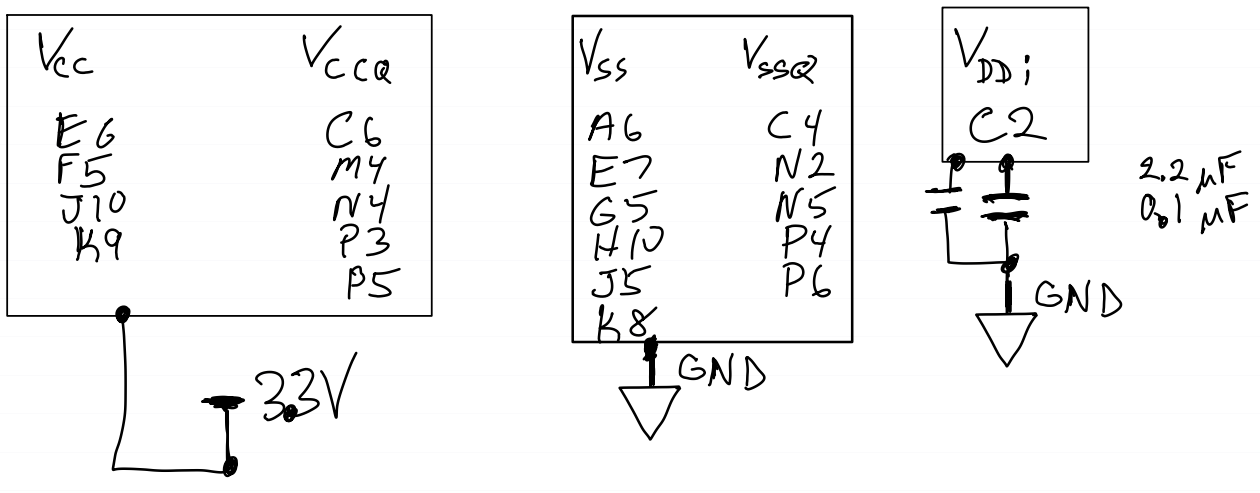
STM32F446xC/E

Pin #	function	Pin Name
39	SDIO D0	PC 8
40	SDIO D1	PC9
51	SDIO D2	PC 10
52	SDIO D3	PC 11
53	SDIO CK	PC 12
54	SDIO CMD	PD2
	MMC_PWR	PC 13

Swissbit EM-10

Pin #	function	Pin Name
A3	SDIO D0	DAT 0
A4	SDIO D1	DAT 1
A5	SDIO D2	DAT 2
B2	SDIO D3	DAT 3
M6	SDIO CK	CLK
M5	SDIO CMD	CMD

Swissbit EM-10



- MMC_PWR - Turn on/off eMMC Added ☑

USE - EAGLE Command "run length-freq-ri" to get length data

USE - Meander to change the length of the lines.

Make the length of the lines for SDIO_D0-3 the same

	SDIO_D0	SDIO_D1	SDIO_D2	SDIO_D3
Length	25.624	25.350	33.347	31.664
	33.58	38.277	33.347	36.037
		34.392		

Made Changes to the U-Generic eMMC library
U-C3-..... library

Done to make wiring easier

Added library to Git

Talk to Robin

1) Plan going forward with board
   - move eMMC to left of M4
   - Remove Pin Header of unused pins

2) Get better understanding for signal line connections for eMMC

5.1 BGA 153 Ball Layout

The following figure provides the BGA layout recommendation.

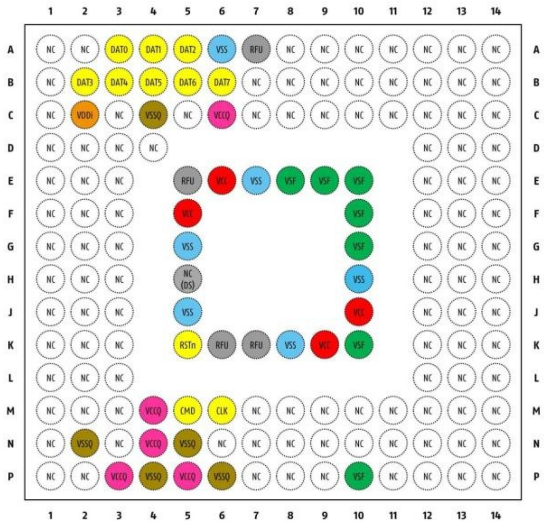


Figure 3: BGA Layout

Note: Do not connect the RFU and VSF balls. These are reserved for future use.
VSF balls could be connected to test pads for debugging, especially:

P10: ROM Boot
F10, G10, K10: Debug interface

NC (DS) pin is not used for EM-10 operation, but required by higher e.MMC standards

5.3 BGA 153 Ball Layout High Speed Signal Breakout Example

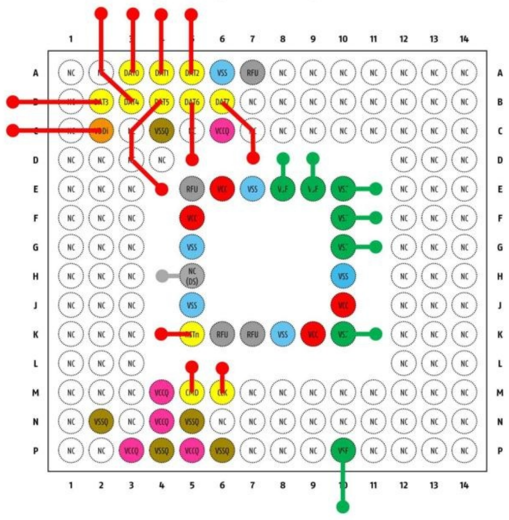


Figure 5: High Speed Example

Routing the high speed signals over a maximum of two no connect (NC) pins is allowed. To compensate for the different capacitive loading of the NC ball signals, use a shorter trace routing length.

DS routing is not necessary for EM-10 but is suggested for compatibility with e.MMC5.x speed

3.1 eMMC Signal Layout Guidelines

Signal routing should be implemented either in Microstrip line or Stripline as long as the trace impedance is maintained for all signals at 50 ohm ± 10%. See Figure 1 for the line definitions.

The suggested total signal trace lengths is <2000 mil.

The signal trace length skew constraints are as follows:

- **ABS (CLK-DAT0~DAT7):** 250 mil
- **ABS (CLK-CMD):** 250 mil
- **ABS (CLK-RST_N):** 1000 mil

The signal spacing constraints from other signals are:

- **DAT0~DAT7, CMD:** > 2H
- **RST_N:** > 1.5H

For these constraints, *H* is the height of the dielectric between signal and GND (reference layer).

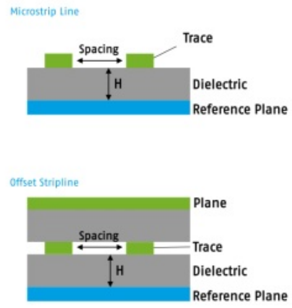


Figure 1: Line Definitions

Recommendations for the signal branch include:

- Keep the signal trace branch lengths below 200 mil.
- Place the CLK test pad (if present) as close as possible to the eMMC package.

If there is enough space, it is recommended to use the GND (ground) shielding to reduce crosstalk effects between the eMMC signals.