

The schematic diagram illustrates the power supply and peripheral connections for the STM32F405VGT6 evaluation board. Key components and connections include:

- Power Supply:** Two 3.3V regulators (U1L and U1K) are used to provide power to the system. U1L is connected to the 3.3V input and provides power to the V12PHY and VCAP1/2 pins. U1K is connected to the 3.3V input and provides power to the BYPASS_REG and REXTPHY pins. Decoupling capacitors (C1-C15) are connected to the 3.3V lines.
- Microcontroller (U1J):** The STM32F405VGT6 is connected to the J5 connector (tag-connect-swd) for SWCLK, SWDIO, NRST, and SWO. The microcontroller is also connected to the V12PHY and VCAP1/2 pins.
- Pin Headers:** The V12PHY and VCAP1/2 pins are connected to the J5 connector. The VCAP1 and VCAP2 pins are connected to the J5 connector. The VCAP1 and VCAP2 pins are connected to the J5 connector.
- Oscillator (U2):** A 12 MHz oscillator is connected to the OSC pin of the microcontroller.

Target SWD/JTAG port with ESD protection

DESIGN NOTE:
For SWD + SWO, SPI1 + USART1 is used
For JTAG, SPI2 is used (SWO not available)

DESIGN NOTE:
T_VCC is read before
enabling 3.3V power.

Pin Connections:

Signal	U5	STDC14
PROTECTED_5V	1	5V
T_VCC	2	V_PROBE
T_VCC	3	T_VCC
GND	5	GND
GND	7	GND
T_GNDDetect	11	GNDDetect
T_SWDIO_TMS	4	T_TMS/T_SWDIO
T_SWDCLK_CCLK	6	T_CCLK/T_SWCLK
T_SWO_TDO	8	T_TDO/T_SWO
T_TDI	9	T_TRCLK
T_RESET	10	T_TDI
T_RESET	12	T_NRST
T_VCP_RX	13	T_VCP_RX
T_VCP_TX	14	T_VCP_TX

Design Notes:

- DESIGN NOTE: For SWD + SWO, SPI1 + USART1 is used. For JTAG, SPI2 is used (SWO not available).
- DESIGN NOTE: T_VCC is read before enabling 3.3V power.

ESD protection + 100 ohm current limiting chip

Board-edge castellated vias

The diagram illustrates the board-edge castellated vias for various pins. It shows two columns of pins, each with a signal trace and a via. The vias are labeled with their respective pin numbers in green text.

Left Column:

- T_SWDIO_TMS: 9
- T_SWDCCLK_CCLK: 8
- T_SWO_TDO: 7
- T_GNDDetect: 6
- T_IDI: 5
- T_RESET: 4
- T_VCP_TX: 3
- T_VCP_RX: 2
- 1

Right Column:

- PROTECTED_SV: 3
- T_VCC: 3
- GPI01: 2
- GPI02: 1

U1A
hs-probe-stm32

PA0-WKUP	N3	X
PA1	N2	X
PA2	P2	X
PA3/ADC1_IN3	R2	T_VCC_MEAS
PA4	N4	X
PA5	P4	X
PA6	P3	X
PA7	R3	X
PA8	F15	X
PA9/USB_OTG_FS_VBUS	F15	FS_VBUS
PA10	D15	X
PA11/USB_OTG_FS_DM	C15	D_FS_N
PA12/USB_OTG_FS_DP	B15	D_FS_P
PA15	A13	X

U1D
hs-probe-stm32

PD0	B12	X
PD1	C12	X
PD2	D12	X
PD3	D11	X
PD4	D10	X
PD5/USART2_TX	C11	USART2_TX
PD6/USART2_RX	B11	USART2_RX
PD7	A11	X
PD8/GPIO1	P15	X
PD9	P14	X
PD10/GPIO2	N15	X
PD11	N14	X
PD12	N13	X
PD13	M15	X
PD14	M14	X
PD15	L14	X

U1I
hs-probe-stm32

PI0	F14	X
PI1/SPI2_SCK	D14	SPI2_CLK
PI2/SPI2_MISO	C14	SPI2_MISO
PI3/SPI2_MOSI	C13	SPI2_MOSI
PI4	D4	X
PI5	C4	X
PI6	C3	X
PI7	D2	X
PI8	D3	X
PI9	E3	X
PI10	F3	X
PI11	F4	X

U1B
hs-probe-stm32

PB0	R5	X
PB1	R4	T_ENABLE
PB2	M6	X
PB3/SPI1_SCK	A10	SPI1_CLK
PB4/SPI1_MISO	A9	SPI1_MISO
PB5/SPI1_MOSI	A6	SPI1_MOSI
PB6/USART1_TX	B6	USART1_TX
PB7/USART1_RX	B5	USART1_RX
PB8/LED2	A5	LED2
PB9	B4	X
PB10/USB_SEL	R12	USB_SEL
PB11	R13	X
PB12	P12	X
PB13/USB_OTG_HS_VBUS	P13	HS_VBUS
PB14/USB_OTG_HS_DM	R14	D_HS_N
PB15/USB_OTG_HS_DP	R15	D_HS_P

U1E
hs-probe-stm32

PE0/LED3	A4	LED3
PE1	A3	X
PE2/T_VCC_EN	A2	T_VCC_EN
PE3	A1	X
PE4	B1	X
PE5	B2	X
PE6	B3	X
PE7	R8	X
PE8	P8	X
PE9	P9	X
PE10	R9	X
PE11	P10	X
PE12	R10	X
PE13	N11	X
PE14	P11	X
PE15	R11	X

U1C
hs-probe-stm32

PC0	M2	X
PC1	M3	X
PC2	M4	X
PC3	M5	X
PC4	N5	X
PC5	P5	X
PC6	H15	X
PC7	G15	X
PC8	G14	X
PC9	F14	X
PC10/LED1	B14	LED1
PC11	B13	X
PC12	A12	X
PC13	D1	X
PC14-OSC32_IN	F1	X
PC15-OSC32_OUT	F1	X

U1G
hs-probe-stm32

PG0	N7	X
PG1	M7	X
PG2	L15	X
PG3	K15	X
PG4	K14	X
PG5	K13	X
PG6	H14	X
PG8	C10	X
PG9	B10	X
PG10	B9	X
PG11	B8	X
PG12	B8	X
PG13/RESET	A8	RESET
PG14/GNDDet	A7	GNDDetect
PG15	B7	X

Additional Circuits:

T_VCC_MEAS: A voltage divider circuit with two 5.1k resistors (R102 and R101) connected to T_VCC and ground. The midpoint is connected to T_VCC_MEAS.

FS_VBUS: A voltage follower circuit with a 3k resistor (R9) connected to FS_VBUS and ground. The other end of the resistor is connected to HS_VBUS, which is then connected to +5V.

LED Driver: A circuit using an LTST-C19HE1WT LED driver (D1) to drive three LEDs (LED1, LED2, LED3). The driver is connected to +5V and ground. The LEDs are connected to the driver's output pins (1, 2, 3) through resistors (R5, R6, R7).

Probe power and optional target power

The diagram illustrates the power supply for the probe and an optional target. A 5V input is connected through a fuse (FB1) to a common rail. This rail provides power to the VDD pin of the MAX40203AUK (U6) and the VIN pin of the MIC5353 (U3). The MAX40203AUK's EN pin is connected to T_ENABLE, and its OUT pin provides PROTECTED_5V to the VIN pin of the MIC5353. The MIC5353's EN pin is connected to PWR_FLAG, and its VOUT pin provides +3.3V. Both U6 and U7 have bypass capacitors (C26, C27) and are connected to GND. T_VCC_EN is connected to the GND of U7.

USB-C port with USB MUX

USB-C port with USB MUX

Design Note:

On startup the FS port is connected for access to the STM32 USB bootloader. The firmware can then switch over to the HS port.

Sheet: /		
File: hs-probe.sch		
Title: Rusty High-Speed Probe		
Size: A3	Date: 2020-10-20	Rev: v1
KiCad E.D.A.	kidcad 5.1.7	Id: 1/1