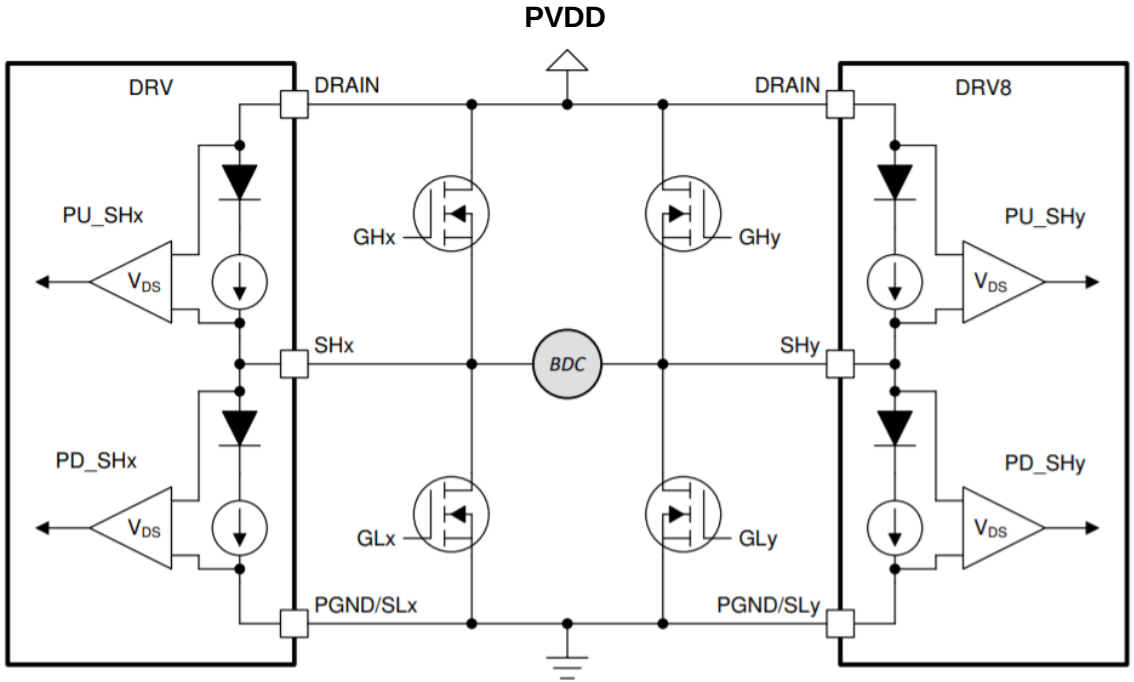
DRV87xx Offline Diagnostic for High side drive

Aug 2022

Offline Diagnostics

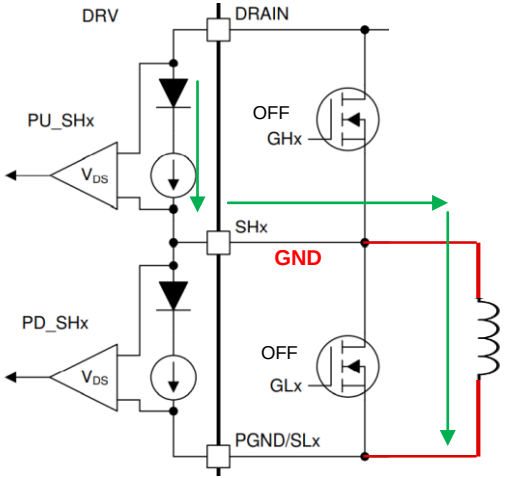
- HW provided in the DRV, controlled through SPI interface by an MCU
- Pull up and pull down current sources available for each output.
- PU_SHx,y & PD_SHx,y = ~3 mA
- V_{DS} monitors to detect SHx and SHy voltages.
- V_{DS} monitors threshold can be programmed between 1 and 2V.
- Current sources enabled/disabled through SPI interface.
- Each half-bridge can be individually enabled to deal with half-bridge, H-bridge, or group/zoning configurations.
- Real-time voltage status through V_{DS} monitors SPI bits (consider capacitive or inductive delays).



No Fault Example – High Side Drive

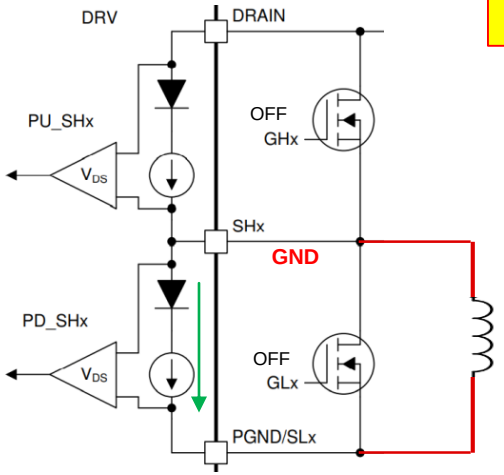
Example for inductive(low impedance) load

No Fault: Test 1



Voltage	
SHx	~GND
SPI Config. (Enable Current Sources)	
PU_SHx	1
PD_SHx	0
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	1
VDS_Lx	0

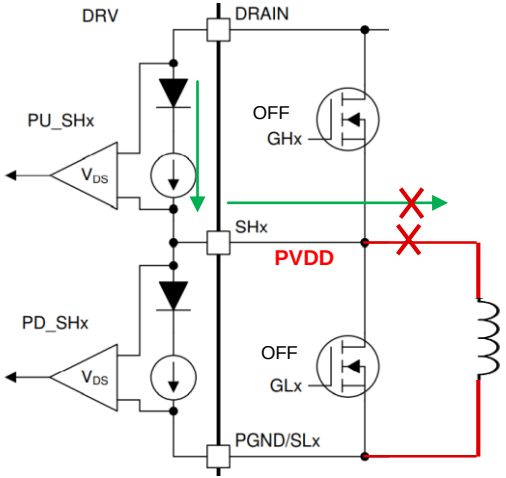
No Fault: Test 2



Voltage	
SHx	~GND
SPI Config. (Enable Current Sources)	
PU_SHx	0
PD_SHx	1
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	1
VDS_Lx	0

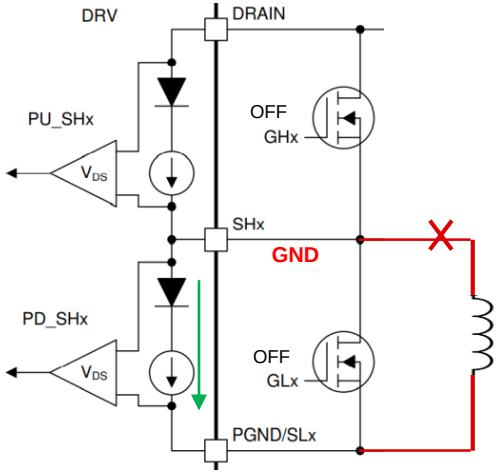
Open Fault Example – High Side Drive

No Fault: Test 1



Voltage	
SHx	~PVDD
SPI Config. (Enable Current Sources)	
PU_SHx	1
PD_SHx	0
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	0
VDS_Lx	1

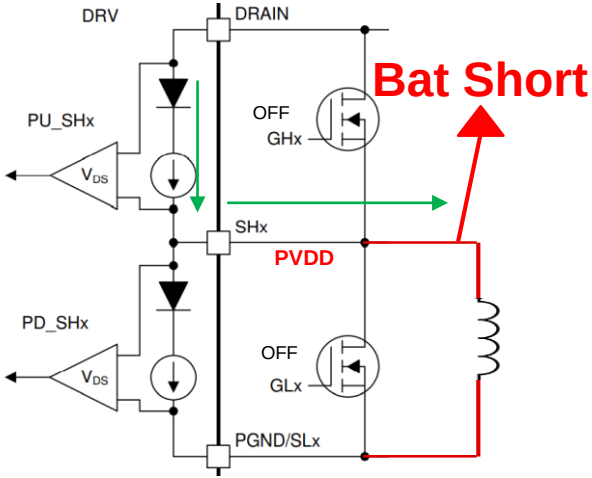
No Fault: Test 2



Voltage	
SHx	~GND
SPI Config. (Enable Current Sources)	
PU_SHx	0
PD_SHx	1
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	1
VDS_Lx	0

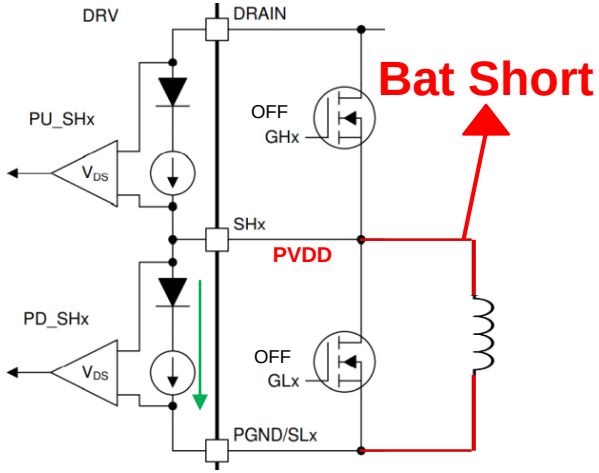
Battery Short Fault example – High Side Drive

No Fault: Test 1



Voltage	
SHx	~PVDD
SPI Config. (Enable Current Sources)	
PU_SHx	1
PD_SHx	0
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	0
VDS_Lx	1

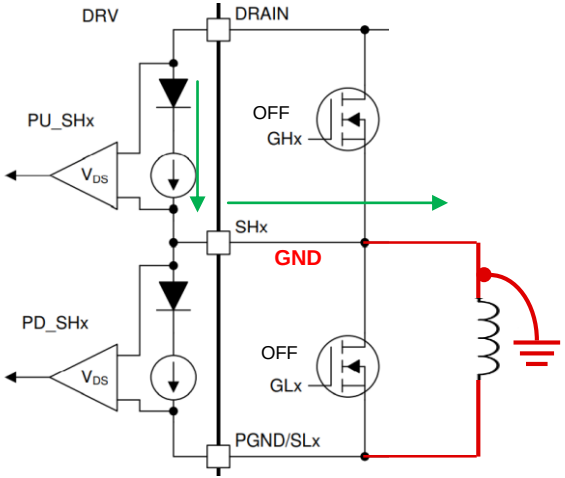
No Fault: Test 2



Voltage	
SHx	~PVDD
SPI Config. (Enable Current Sources)	
PU_SHx	0
PD_SHx	1
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	0
VDS_Lx	1

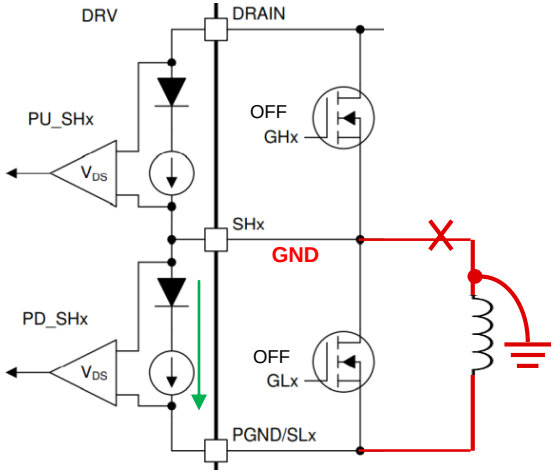
GND Short Fault example – High Side Drive

No Fault: Test 1



Voltage	
SHx	~GND
SPI Config. (Enable Current Sources)	
PU_SHx	1
PD_SHx	0
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	1
VDS_Lx	0

No Fault: Test 2



Voltage	
SHx	~GND
SPI Config. (Enable Current Sources)	
PU_SHx	0
PD_SHx	1
SPI Report (Read V_{DS} Comparators)	
VDS_Hx	1
VDS_Lx	0

Summary – Inductive(low impedance) Load

	SPI Config		SPI Report	
	PU_SHx	PD_SHx	VDS_Hx	VDS_Lx
No Fault Example	1	0	1	0
	0	1	1	0
Open Fault Example	1	0	0	1
	0	1	1	0
Battery Short Fault Example	1	0	0	1
	0	1	0	1
GND Short Fault Example	1	0	1	0
	0	1	1	0

- Open and Battery short can be detected due to different pattern of SPI report from No Fault.
- GND short cannot be detected in case inductive(low impedance) load.
  - Because output is low impedance even in No fault condition.