

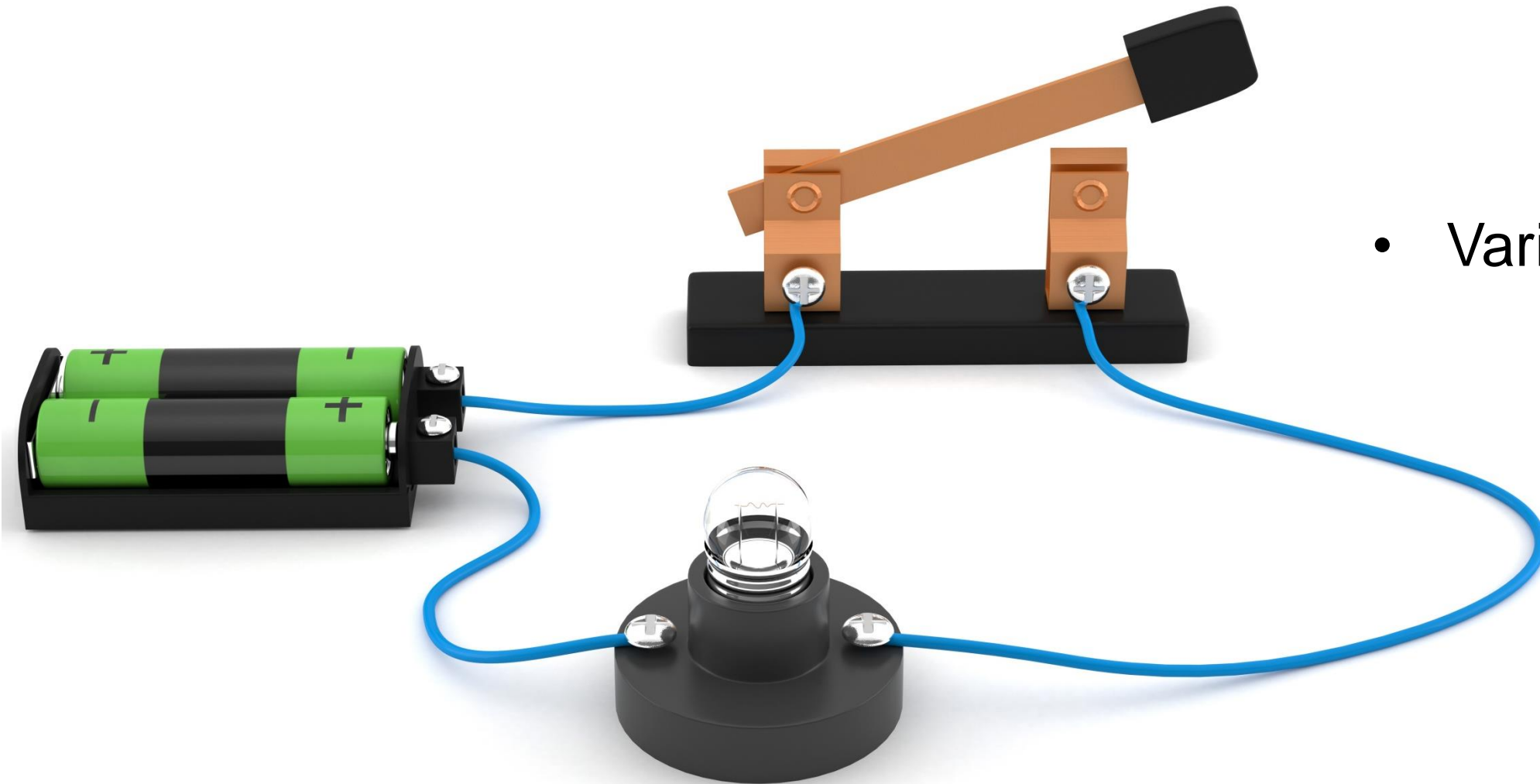
Motor Technology 6: Diagnostic Features Open Load Detection and Offline Diagnostics

TI Precision Labs - Motor Drivers

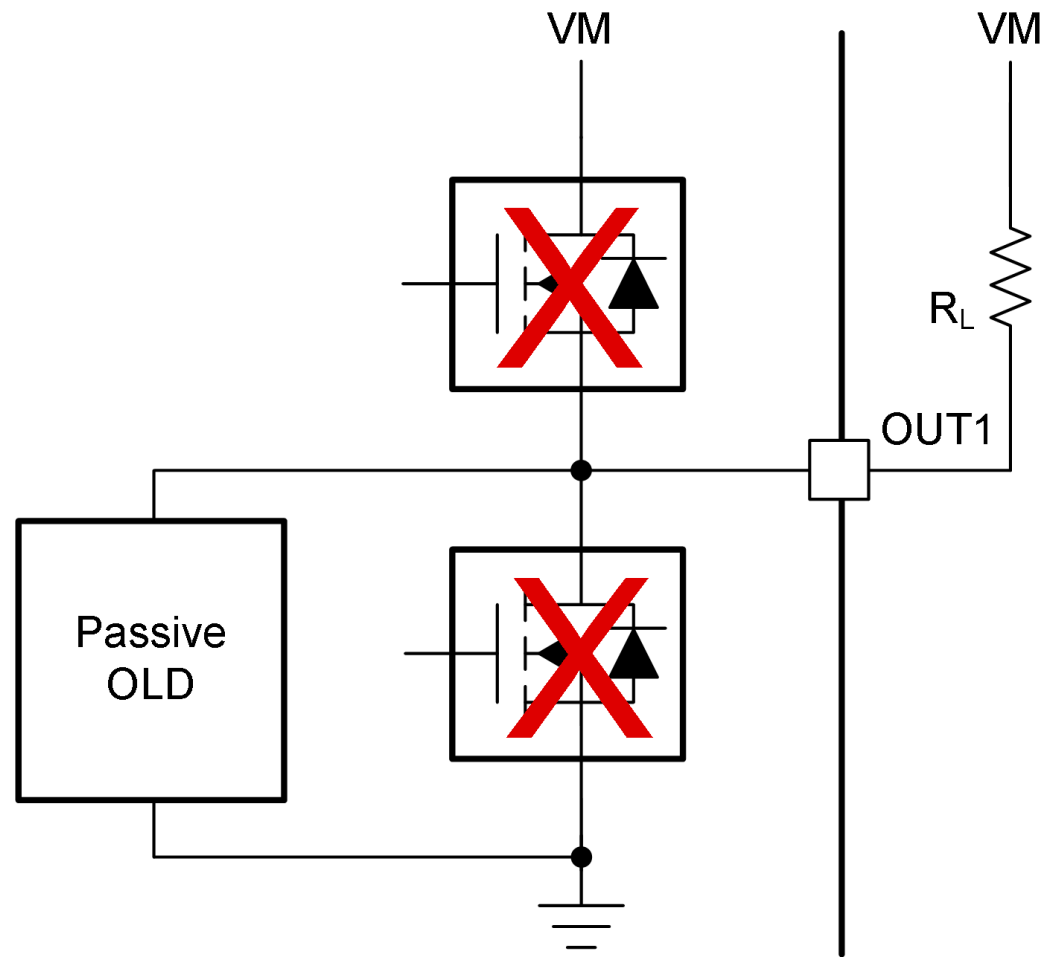
Presented and prepared by Hector Hernandez

What is open load detection?

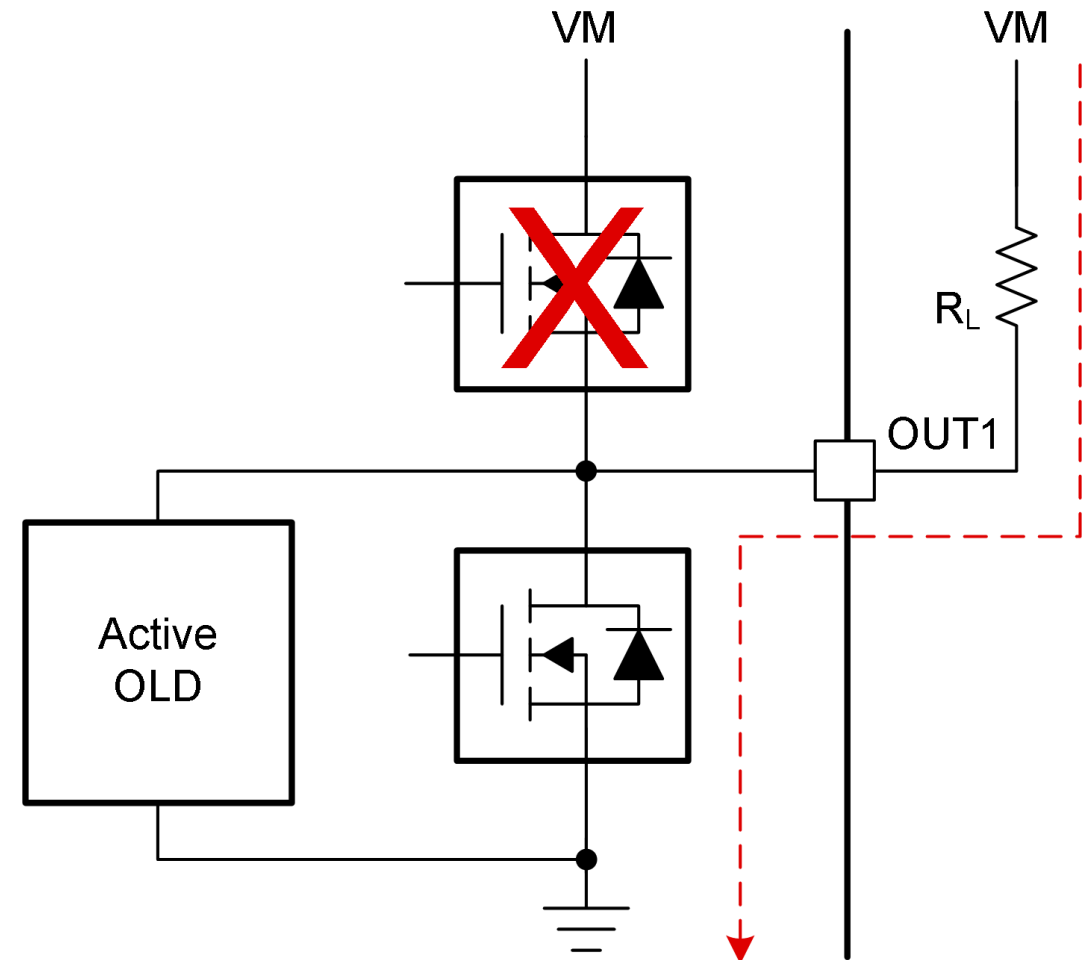
- Protection diagnostic which determines a load's connectivity to the power-stage of an motor driver
- Two types of OLD
 - Passive OLD
 - Active OLD
 - Types of active OLD types
 - Active
 - Low-current active
 - Negative-current active
- Variations based on driver type



Load connections in OLD

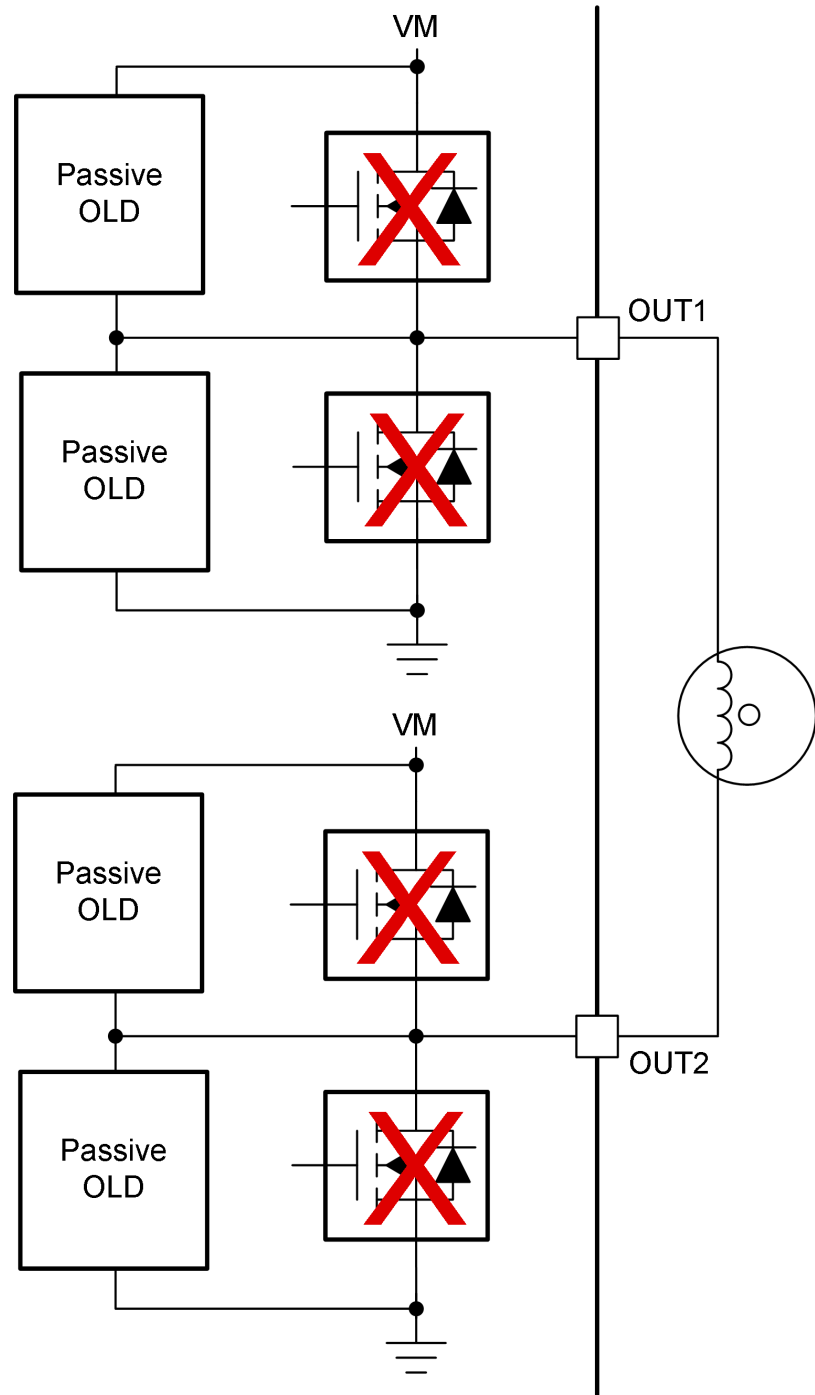


Passive OLD ~~VM~~ Load

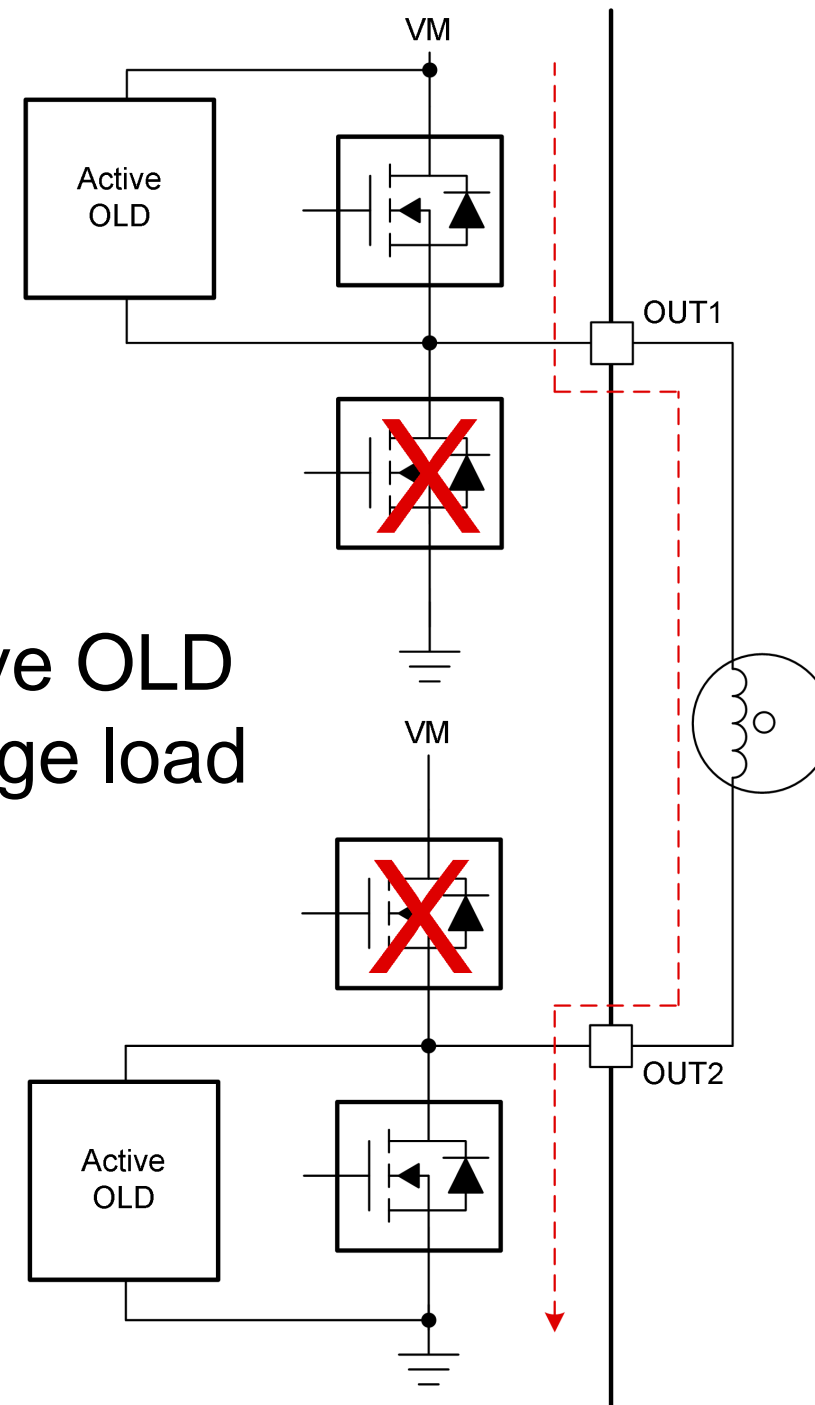


Active OLD ~~VM~~ Load

Load connections in OLD cont.

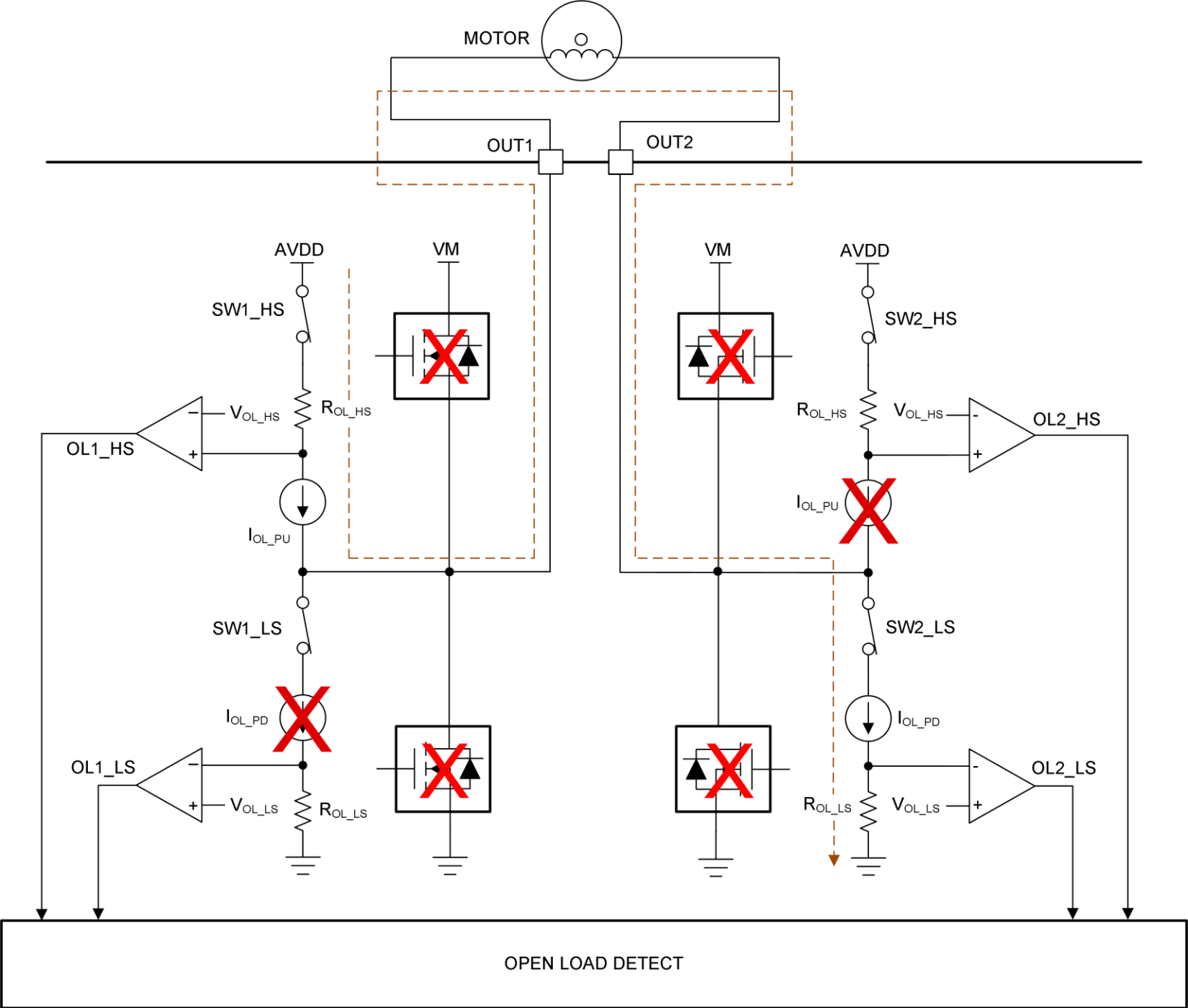


Passive OLD
H-bridge load

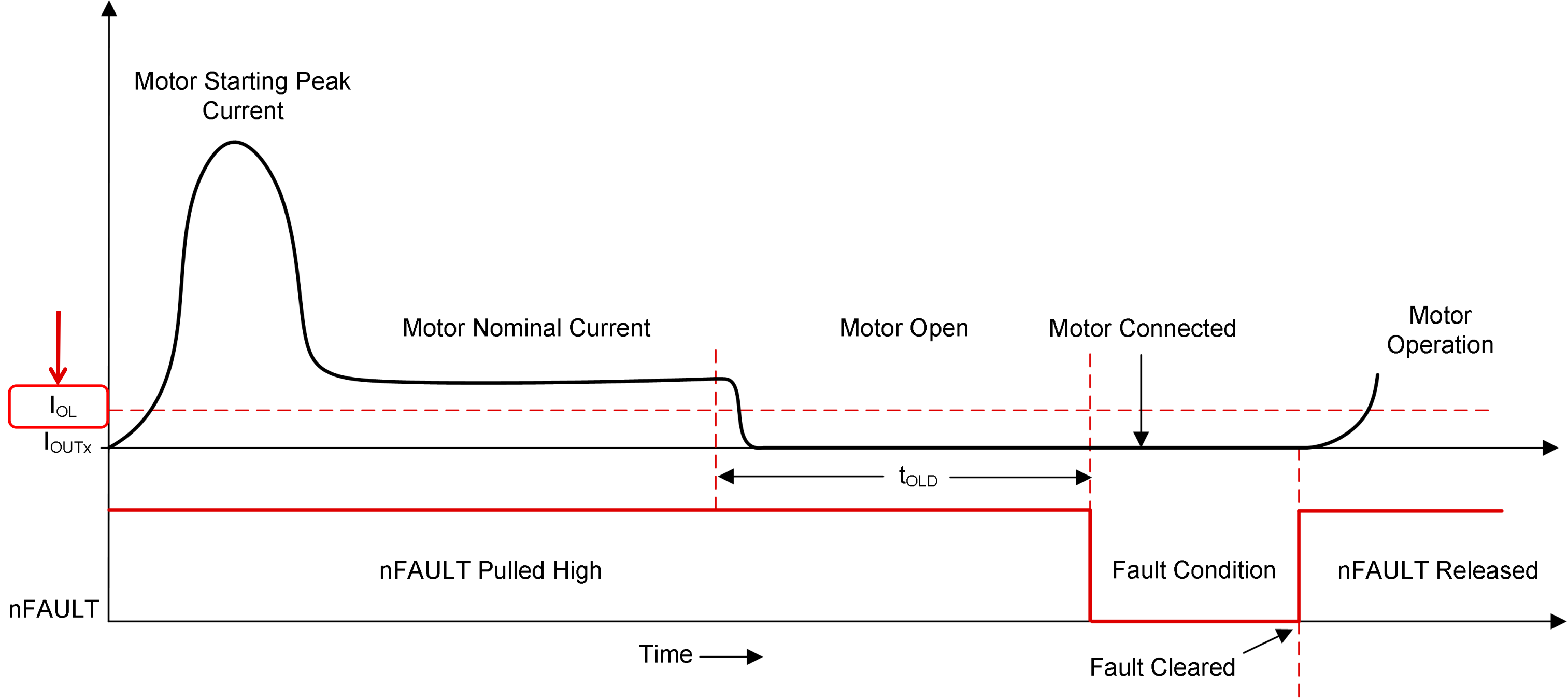


Active OLD
H-bridge load

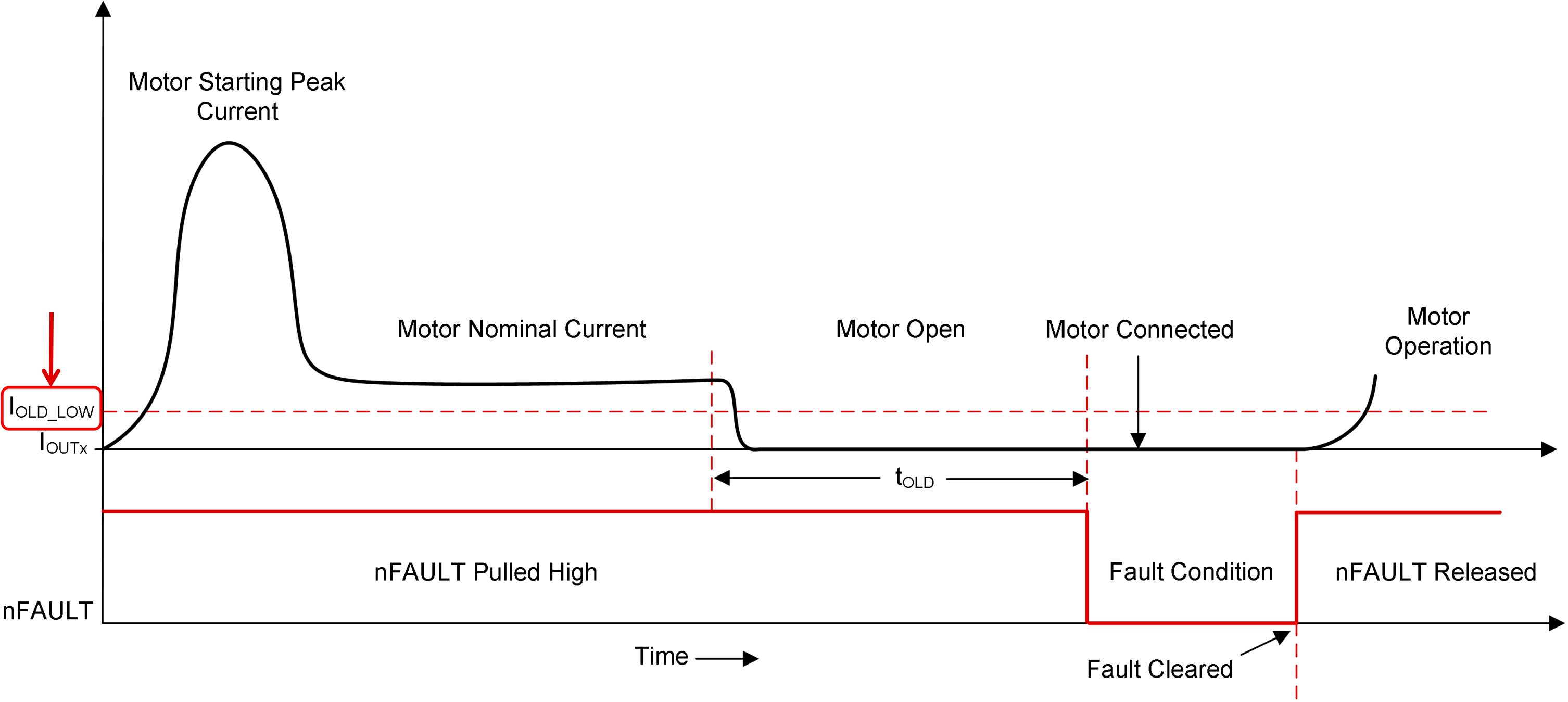
What is passive OLD?



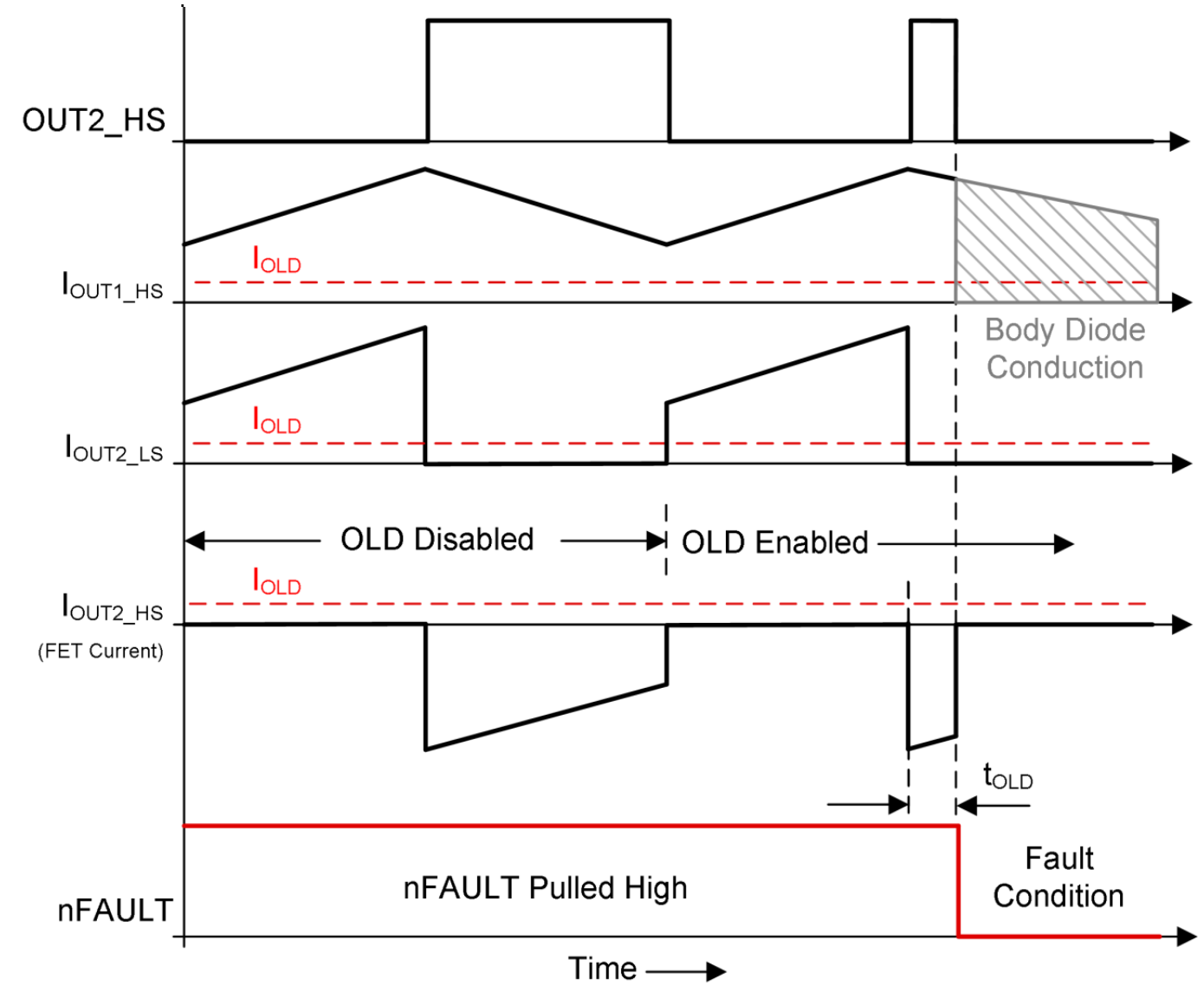
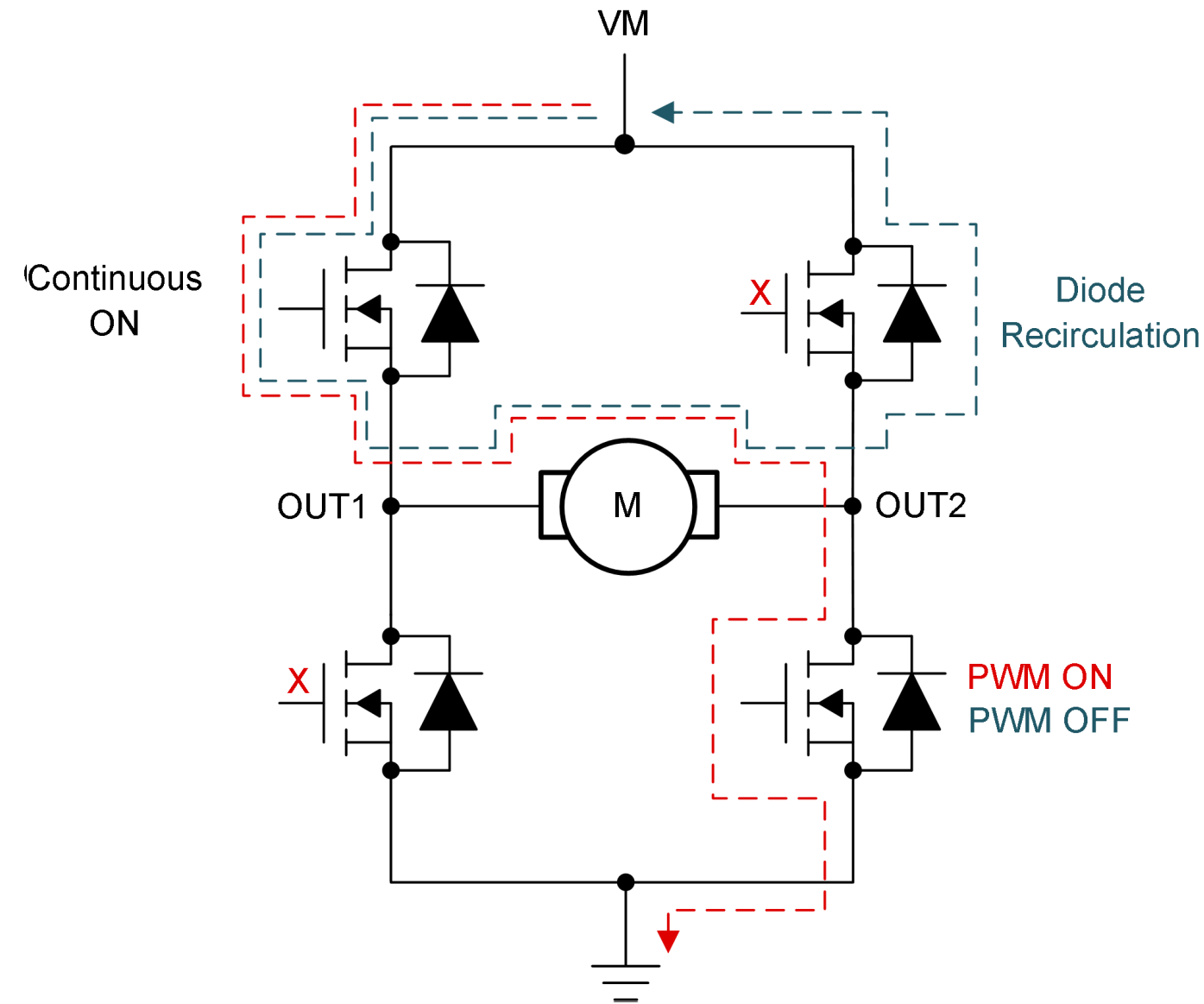
What is active OLD?



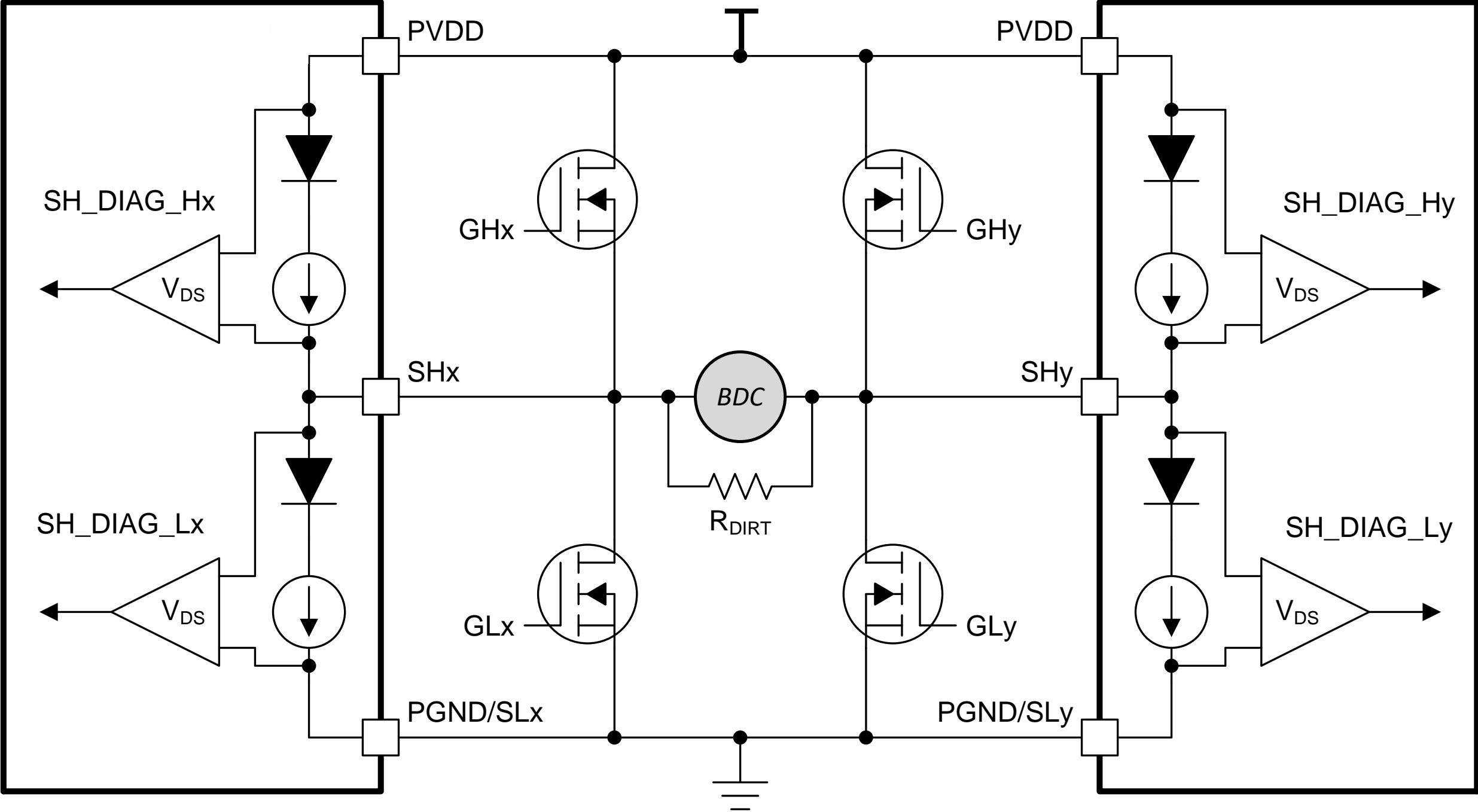
What is low-current active OLD?



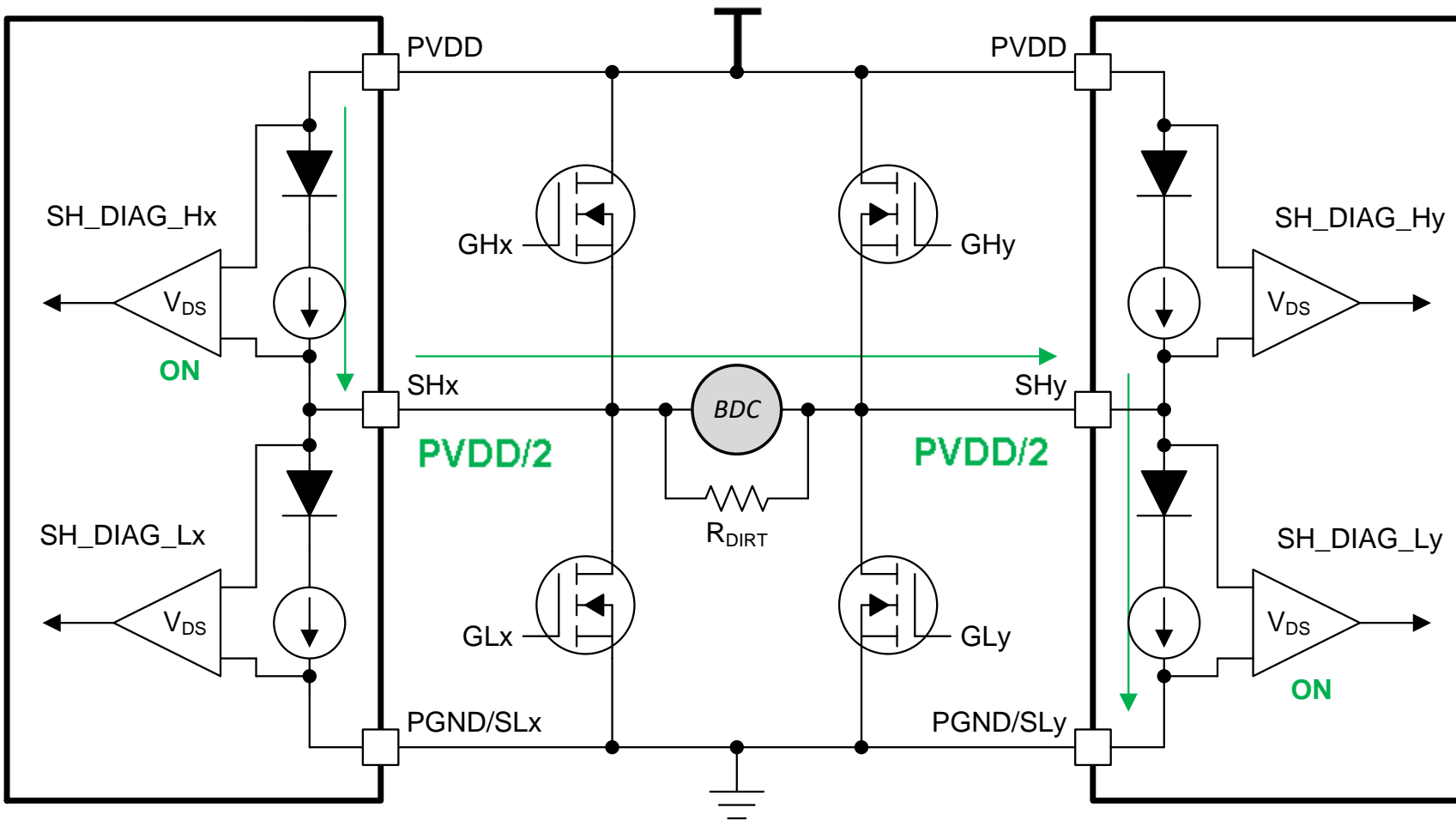
What is negative-current active OLD?



What is offline open load diagnostic?



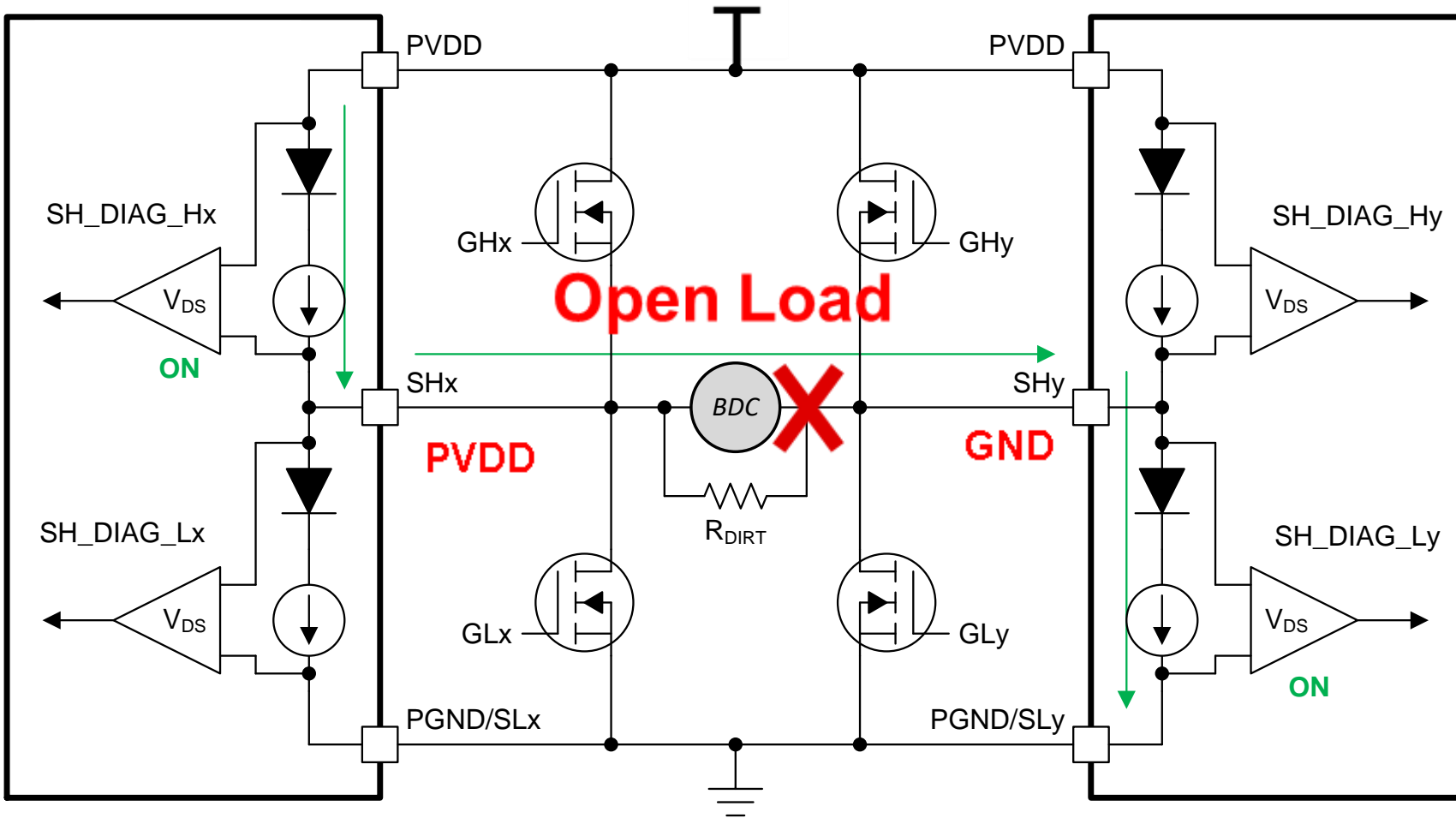
No fault example



No fault

Node voltage			
SHX	PVDD / 2	SHY	PVDD / 2
Enabled current sources			
SH_DIAG_HX	1	SH_DIAG_HY	0
SH_DIAG_LX	0	SH_DIAG_LY	1
V _{DS} comparators			
VDS_HX	1	VDS_HY	1
VDS_LX	1	VDS_LY	1

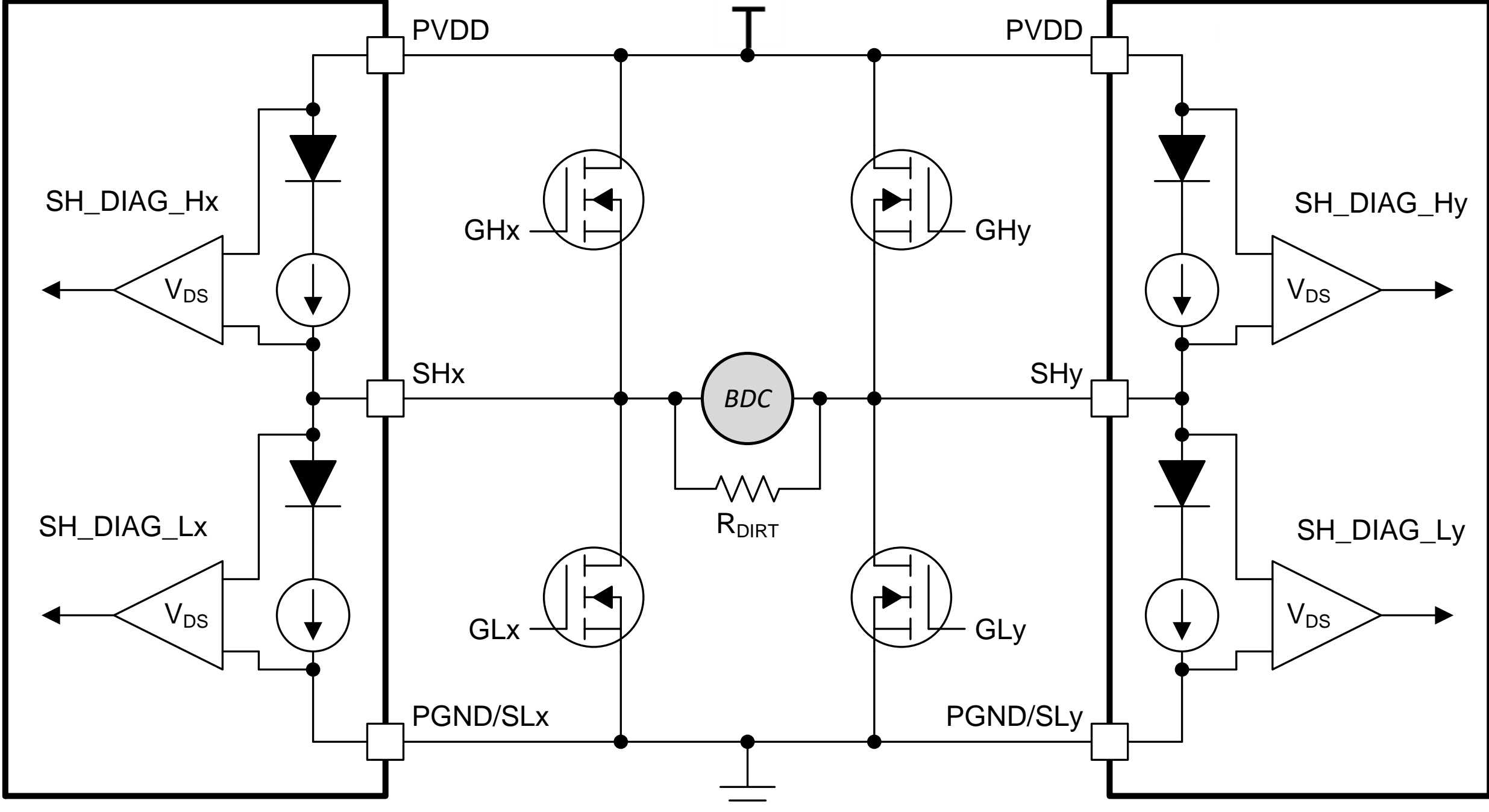
Open load fault example



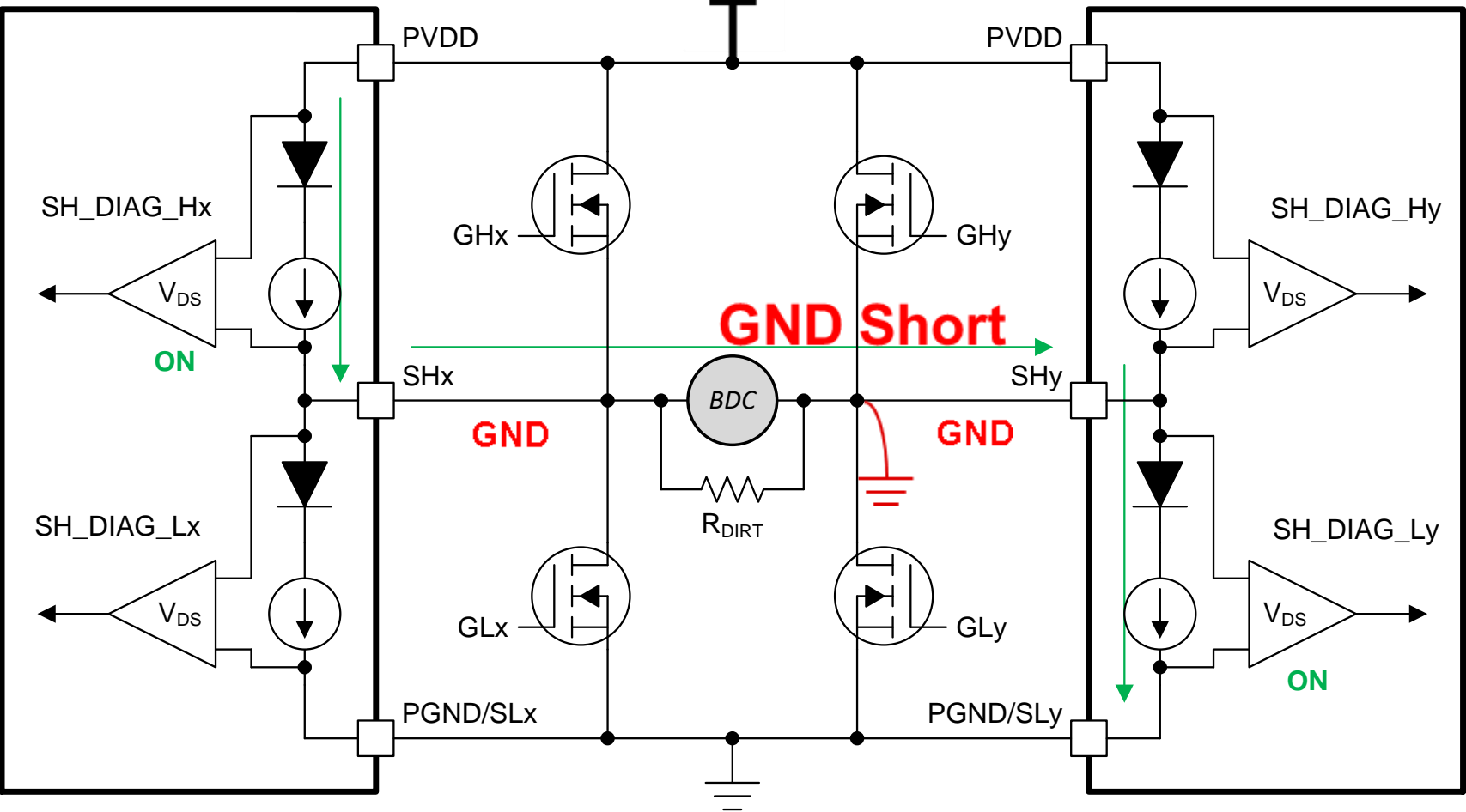
Open load fault detected

Node voltage			
SHX	PVDD	SHY	GND
Enabled current sources			
SH_DIAG_HX	1	SH_DIAG_HY	0
SH_DIAG_LX	0	SH_DIAG_LY	1
V _{DS} comparators			
VDS_HX	0	VDS_HY	1
VDS_LX	1	VDS_LY	0

What is offline short circuit diagnostic?



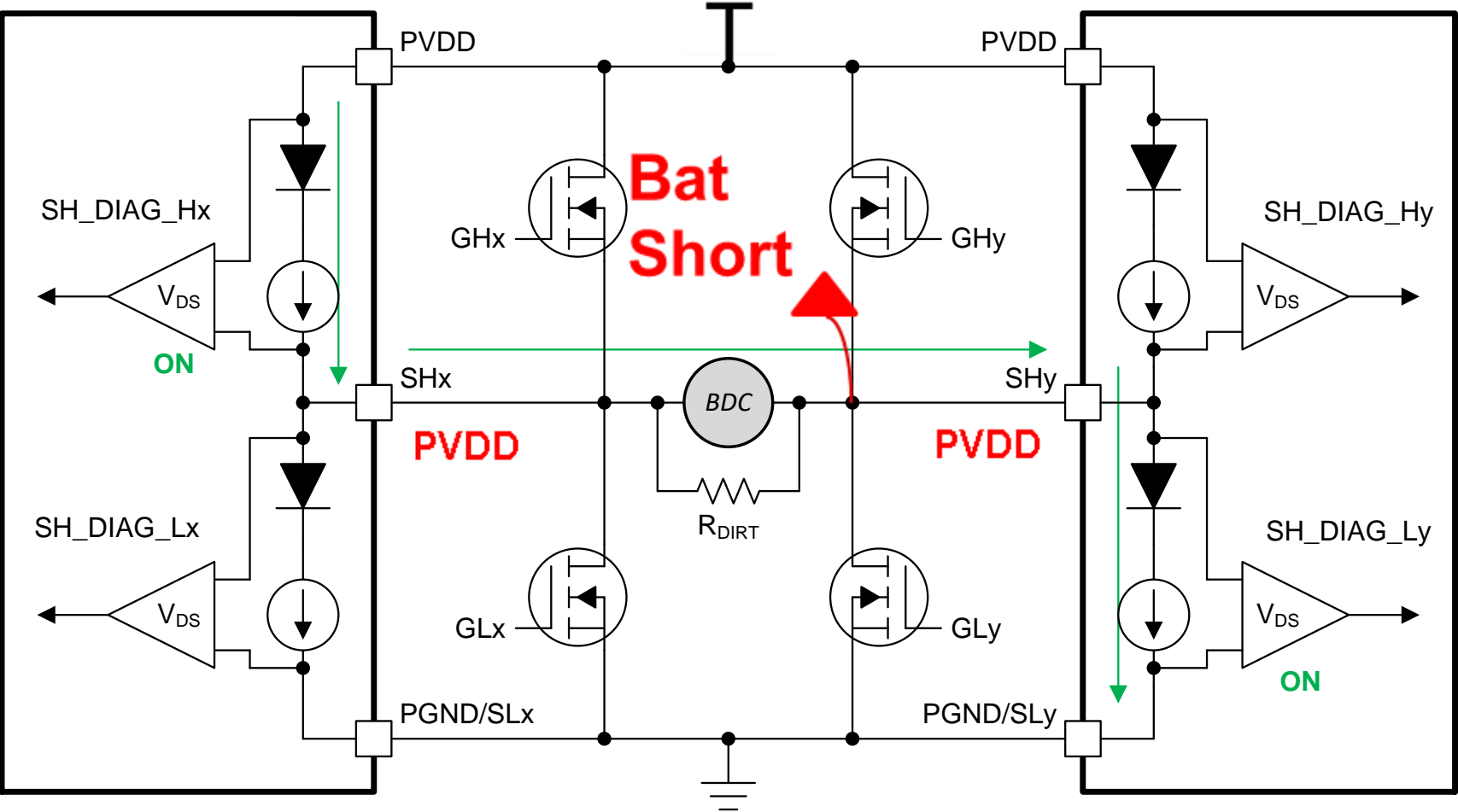
Short circuit to GND fault example



GND short circuit fault detected

Node voltage			
SHX	GND	SHY	GND
Enabled current sources			
SH_DIAG_HX	1	SH_DIAG_HY	0
SH_DIAG_LX	0	SH_DIAG_LY	1
V _{DS} comparators			
VDS_HX	1	VDS_HY	1
VDS_LX	0	VDS_LY	0

Short circuit to battery fault example



Battery short circuit fault detected

Node voltage			
SHX	PVDD	SHY	PVDD
Enabled current sources			
SH_DIAG_HX	1	SH_DIAG_HY	0
SH_DIAG_LX	0	SH_DIAG_LY	1
V _{DS} comparators			
VDS_HX	0	VDS_HY	0
VDS_LX	1	VDS_LY	1

To find more motor driver technical resources and search products, visit <http://www.ti.com/motor-drivers/overview.html>