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Appnote AN056: Replacing TMC236 with TMC246

R&D, 05.02.2020

Background

- TMC236 and TMC246 share the same silicon core, meaning:
All electrical parameters are identical.
- The ICs are fully pin-compatible. No circuit changes required.

Background

- Difference is the StallGuard™ function, which exists in TMC246 but not in TMC236.
- Consequently, the register values in TMC236 are mapped to all zeros while they show the StallGuard™ value in TMC246.
- If this function is not used, the TMC246 is a drop in replacement that does not need to be qualified as a replacement.

Details

- The TMC236 and TMC246 have identical command data words via SPI (from MCU to TMC2x6).

Serial data word transmitted to TMC236

(MSB transmitted first)

Bit	Name	Function	Remark
11	MDA	mixed decay enable phase A	"1" = mixed decay
10	CA3	current bridge A.3	MSB
9	CA2	current bridge A.2	
8	CA1	current bridge A.1	
7	CA0	current bridge A.0	LSB
6	PHA	polarity bridge A	"0" = current flow from OA1 to OA2
5	MDB	mixed decay enable phase B	"1" = mixed decay
4	CB3	current bridge B.3	MSB
3	CB2	current bridge B.2	
2	CB1	current bridge B.1	
1	CB0	current bridge B.0	LSB
0	PHB	polarity bridge B	"0" = current flow from OB1 to OB2

Serial data word transmitted to TMC246

(MSB transmitted first)

Bit	Name	Function	Remark
11	MDA	mixed decay enable phase A	"1" = mixed decay
10	CA3	current bridge A.3	MSB
9	CA2	current bridge A.2	
8	CA1	current bridge A.1	
7	CA0	current bridge A.0	LSB
6	PHA	polarity bridge A	"0" = current flow from OA1 to OA2
5	MDB	mixed decay enable phase B	"1" = mixed decay
4	CB3	current bridge B.3	MSB
3	CB2	current bridge B.2	
2	CB1	current bridge B.1	
1	CB0	current bridge B.0	LSB
0	PHB	polarity bridge B	"0" = current flow from OB1 to OB2

Details

The TMC236 and TMC246 only differ in the upper 3 bits of the status datagram (from TMC2x6 to MCU).

While bits 9..11 are always zero at TMC236, they contain the StallGuard™ value when using TMC246.

Since StallGuard™ has not been used before with TMC236 there should be either NO changes at all in a customer's firmware or (if special checks are implemented) the dynamic content of bits 9-11 must be ignored.

Serial data word transmitted from TMC236

(MSB transmitted first)

Bit	Name	Function	Remark
11	0	always "0"	
10	0	always "0"	
9	0	always "0"	
8	1	always "1"	
7	OT	overtemperature	"1" = chip off due to overtemperature
6	OTPW	temperature prewarning	"1" = prewarning temperature exceeded
5	UV	driver undervoltage	"1" = undervoltage on VS
4	OCHS	overcurrent high side	3 PWM cycles with overcurrent within 63 PWM cycles
3	OLB	open load bridge B	no PWM switch off for 14 oscillator cycles
2	OLA	open load bridge A	no PWM switch off for 14 oscillator cycles
1	OCB	overcurrent bridge B low side	3 PWM cycles with overcurrent within 63 PWM cycles
0	OCA	overcurrent bridge A low side	3 PWM cycles with overcurrent within 63 PWM cycles

Serial data word transmitted from TMC246

(MSB transmitted first)

Bit	Name	Function	Remark
11	LD2	load indicator bit 2	MSB
10	LD1	load indicator bit 1	
9	LD0	load indicator bit 0	LSB
8	1	always "1"	
7	OT	over temperature	"1" = chip off due to over temperature
6	OTPW	temperature pre-warning	"1" = pre-warning temperature exceeded
5	UV	driver undervoltage	"1" = undervoltage on VS
4	OCHS	overcurrent high side	3 PWM cycles with overcurrent within 63 PWM cycles
3	OLB	open load bridge B	no PWM switch off for 14 oscillator cycles
2	OLA	open load bridge A	no PWM switch off for 14 oscillator cycles
1	OCB	overcurrent bridge B low side	3 PWM cycles with overcurrent within 63 PWM cycles
0	OCA	overcurrent bridge A low side	3 PWM cycles with overcurrent within 63 PWM cycles