ON Semiconductor®

Product Bulletin

Document # : PB22733Z
Issue Date: 1 July 2019

Title of Change:	Added comments and corrected typos in LV8907UWR2G datasheet and application note.
Effective date:	1 July 2019
Contact information:	Contact your local ON Semiconductor Sales Office or <Kei.Nagai@onsemi.com>
Type of notification:	This Product Bulletin is for notification purposes only. ON Semiconductor will proceed with implementation of this change upon publication of this Product Bulletin.
Change Category:	☐ Wafer Fab Change ☐ Assembly Change ☑ Test Change ☑ Other Added comments in datasheet and application note

Change Sub-Category(s):

- ☐ Manufacturing Site Addition
- ☐ Manufacturing Site Transfer
- ☐ Manufacturing Process Change
- ☐ Material Change
- ☐ Product specific change
- ☑ Datasheet/Product Doc change
- ☐ Shipping/Packaging/Marking
- ☐ Other: _____

Sites Affected:	ON Semiconductor Sites: None	External Foundry/Subcon Sites: None

Description and Purpose:

The change of datasheet and application note are additional disclaimer of the application risk which is possible of physical damage by unexpected over current which would be caused by the loss of commutation synchronization. Also this is to update the 11 typos which has been found.

The change will not impact form, fit, or function of product.

Add the notice in datasheet

Notice
There is the risk of physical damage caused by unexpected over current in some case of loss of Commutation synchronization. Its detail and mitigation are described in the application note, "Lessons Learned from using LV8907UW in a BLDC Motor Application".

Add in application note

Loss of Commutation Synchronization and Over Current

Risk

The loss of commutation synchronization can be caused by the following cases:

- The connection(s) between the driver and the motor are momentally disconnected and then reconnected such as a loose or worn connector.
- The PWM duty cycle is changed drastically.
- The rotor speed is changed (acceleration, deceleration, or reverse) drastically by an external force.

LV8907UW doesn't always detect this loss of commutation synchronization and keeps trying to apply current to the motor windings based on a false BEMF zero cross detection. When the BEMF voltage polarity is inverted against the applied driving voltage, over current of the motor coil will occur. Therefore, there is the risk of physical damage caused by this unexpected over current.

Detection

When the commutation synchronization is lost, a BEMF zero crossing cannot be found within the detection window, or a false detection is generated. It can be estimated with the FG (tachometer) pulse period by external monitoring. The condition to determine the loss of commutation synchronization is:

- The rotation speed recognized from FG pulse period is much higher or much lower than the physical rotor speed.
- The FG pulse period difference from the previous cycle is much larger than the possible physical rotor rate of change.

Figure 5 shows example waveform in the case that the commutation synchronization is lost. The coil current (Orange plot) shows abnormally high currents. FG pulse period changes drastically.

Mitigation

The connections between the controller and the motor must be insured, and it is always maintained.

The difference of PWM duty cycle change within short time must be limited.

The FG pulse must be monitored. When the loss of commutation synchronization is detected by the abnormal FG pulse train described above, LV8907UW must be restarted. By setting the rotation enable pin, EN, to a logical low state, the driver output is deactivated to halt the over current situation. After this deactivation, the pin EN should be set logical high to restart. The LV8907UW will enter its normal startup sequence and regain synchronization. To enable this resynchronization of LV8907UW, the register bit named FRREN must be set 0. (See datasheet for detail).

Figure 5 also shows example waveform of resynchronization by toggling EN pin. The EN pin should be set low immediately when incoherent FG pulse detected in an actual application.

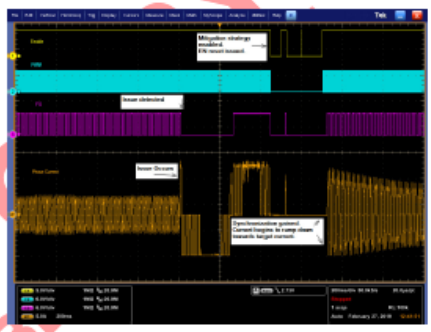


Figure 5. Example Waveform

Fix the following 11 typos

1. The unit of the supply current of sleep mode must be micro ampere "µA".

It is not specification value change. In the original (April 2016 – Rev. 0) datasheet, it had been represented correctly. This unit was changed unexpectedly in the latest (June, 2018 – Rev. 1) one.

ELECTRICAL CHARACTERISTICS

Valid at a junction temperature range from −40°C to 150°C, for supply Voltage 6.0 V ≤ VS ≤ 20 V. Typical values at 25°C and VS = 12 V unless specified otherwise. (Note 4)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply−voltage Range	VS		6	12	20	V
		Device fully functional	5.5		20	V
		Full logic functionality, driver stage off	4.5		40	V
Supply Current Into VS	I_{s1}	V3RO = V3RI		15	25	mA
	Is_2	Sleep Mode		40	80	mA
Operational Junction Temperature	Topj		−40		150	°C

2. to 5. A metric prefix kilo must be lowercase.

6. The unit of the output leakage current must be micro ampere "µA".

It is not specification value change. In the original (April 2016 – Rev. 0) datasheet, it had been represented correctly. This unit was changed unexpectedly in the latest (June, 2018 – Rev. 1) one.

DIGITAL INPUT PIN (CSB, TXD)						
High−level Input Voltage	VIH1		0.8×V3RO			V
Low−level Input Voltage	VIL1				0.2×V3RO	V
Input Hysteresis Voltage	VIHYS1		0.1	0.35	0.6×V3RO	V
Pull−up Resistance.	RDVI1		15	30	60	KΩ
DIGITAL INPUT PIN (SCLK, SI, PWMIN, TEST)						
High−level Input Voltage	VIH2		0.8×V3RO			V
Low−level Input Voltage	VIL2				0.2×V3RO	V
Input Hysteresis Voltage	VIHYS2		0.1	0.35	0.6×V3RO	V
Pull−down Resistance	RDVI2		50	100	200	KΩ
WAKE INPUT PIN						
High−level Input Voltage	VIH3		2.5			V
Low−level Input Voltage	VIL3				0.6	V
Internal Pull−down Resistance	RDVI3		50	100	200	KΩ
EN INPUT PIN						
High−level Input Voltage	VIH4		0.8×V3RO			V
Low−level Input Voltage	VIL4				0.2×V3RO	V
Input Hysteresis Voltage	VIHYS4		0.1	0.35	0.6×V3RO	V
Pull−down Resistance	RDVI4		50	100	200	KΩ
DIGITAL OUTPUT PIN (SO, FG, DIAG, RXD)						
Output Voltage	VOL	Io = 1 mA pull−up current			0.2	V
Output Leakage Current	ILOLK				10	mA

7. The unit of the thermal warning temperature must be ˚C.

THERMAL PROTECTION						
Thermal Warning Temperature	TTW0 TTW1	Junction Temperature (Note 5) TSTS = 0 TSTS = 1	125 150			C

8. A metric prefix micro should be written in the Greek alphabet.

LIN_PWMIN PIN (LIN TRANSMITTER)						
LIN Output Current Bus in Dominant State	Ibus_pas_dom	Driver OFF Vbus = 0 V,VS = 7 V & 18 V	−1			mA
LIN Output Current Bus in Recessive State	Ibus_pas_rec	Driver OFF Vbus = VS,VS = 7 V & 18 V			20	uA

9. A metric prefix kilo must be lowercase.

The charge pump circuit operates nominally at 52.1 KHz. A SSCG function is provided to add a spread–spectrum component for EMI reduction.

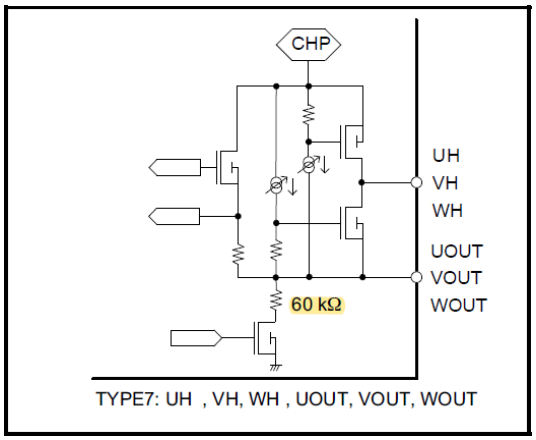
10. SMOD [1:0] must be "01" in the device start up time.

It is not design change. In the original (April 2016 – Rev. 0) datasheet, it had been represented correctly. This was changed unexpectedly in the latest (June, 2018 – Rev. 1) one.

GSDAT[7:0]

Bit7	6	5	4	3	2	1	Bit0	
ORBEN	STUPO	SACF	DIAGS	LATCH	OBSY	SMOD[1:0]		
						0	0	Sleep mode (MRACK[7:0] = FFh)
						0	0	Device start up time
						1	0	Standby mode
						1	1	Normal mode (MRACK [7:0] = 55h)

11. **The resistance marked yellow in the schematic below must be 60kΩ.**



List of Affected Part:

Note: Only the standard (off the shelf) part numbers are listed in the parts list. Any custom parts affected by this PCN are shown in the customer specific PCN addendum in the PCN email notification, or on the **PCN Customized Portal.**

LV8907UWR2G

Appendix A: Changed Products

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Product	Customer Part Number
LV8907UWR2G	