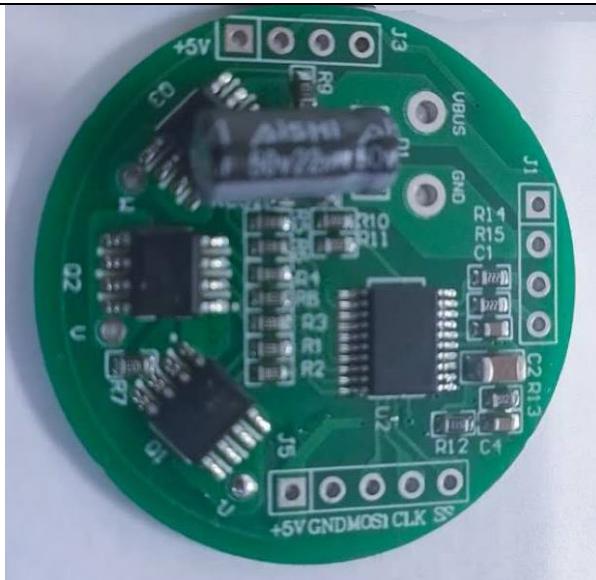


Subject**OB6625 Demo Board Manual**

Board Model: OB6625_20P_2122

Doc. No.: OB_DOC_DBM_A_662501

**Key Feature:**

- Single chip PMSM controller solution
- High integration of MCU, pre-driver, high precision LDO.
- Single shunt sensorless FOC control.
- PCB size small, and assemble conveniently

Revision history:

Revise Date	Version	Reason/Issue
2021-05-27	00	First Issue
2021-06-03	01	Update BOM

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1. System Electrical Specification

1.1 Input Characteristic

- | | |
|---------------------------|------------|
| ▪ DC input voltage rating | 12V/24V DC |
| ▪ DC input voltage | 10V to 25V |

1.2 System parameters

- | | |
|--|------------------|
| ▪ PWM frequency | 16KHz |
| ▪ MCU supply voltage | 5V \pm 2% |
| ▪ 5V supply current | 50mA |
| ▪ Current sampling resistance | 50m Ω |
| ▪ Current sampling amplification | 4 |
| ▪ Current sampling amplifier offset | Self-calibration |
| ▪ Gate driver supply voltage | DC source supply |
| ▪ Max of MOSFET drain source voltage value | 30V |

1.3 Output characteristic

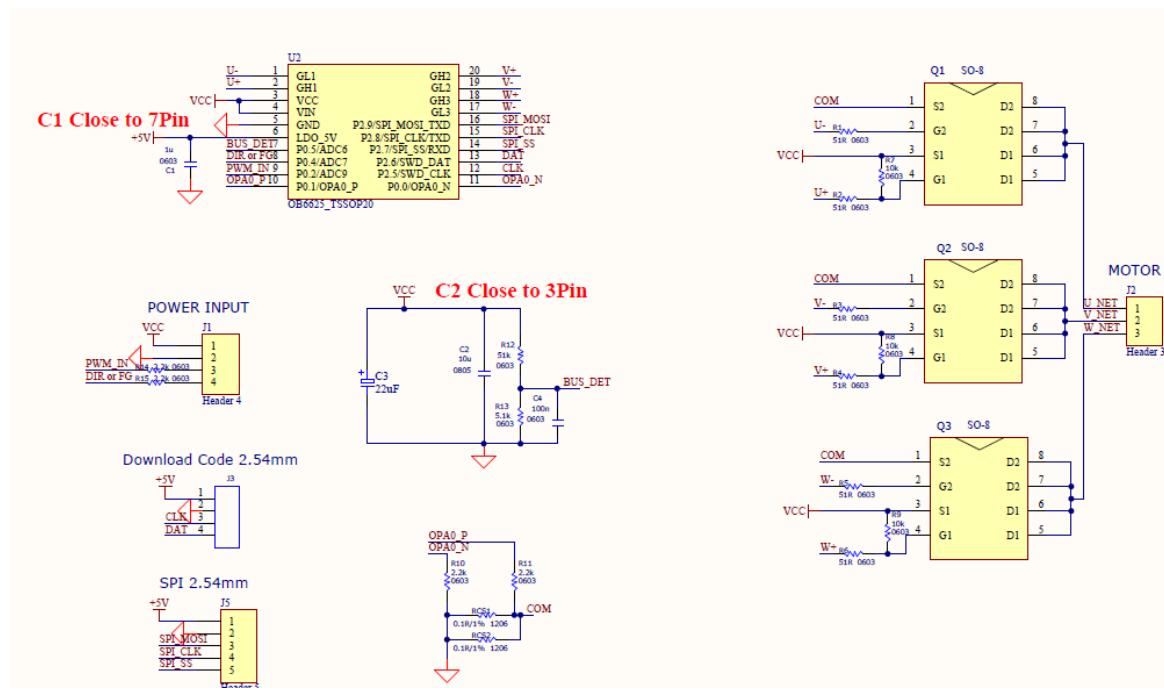
- | | |
|----------------------------|------|
| ▪ Phase current limitation | 3.5A |
| ▪ Maximum of PWM duty | 90% |
| ▪ Minimum of PWM duty | 10% |

1.4 Environmental

- | | |
|---------------------------------|------------------|
| ▪ Operating Ambient Temperature | -20°C to 60°C |
| ▪ Storage Temperature | -40 °C to 100 °C |
| ▪ Storage Humidity | 0% to 95% R.H. |

2. Board Information

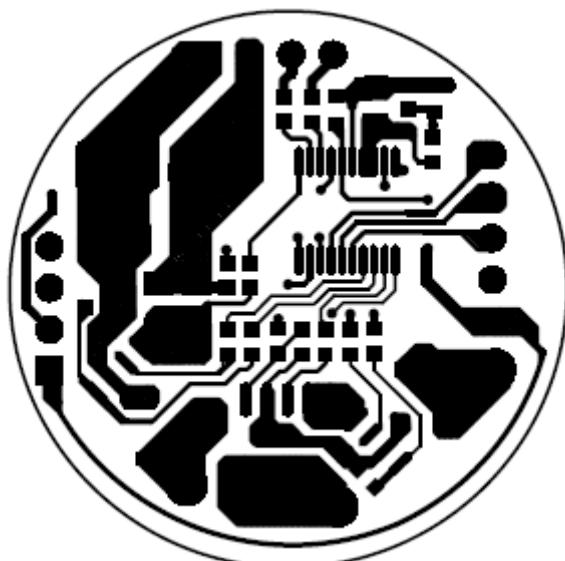
2.1 Schematic



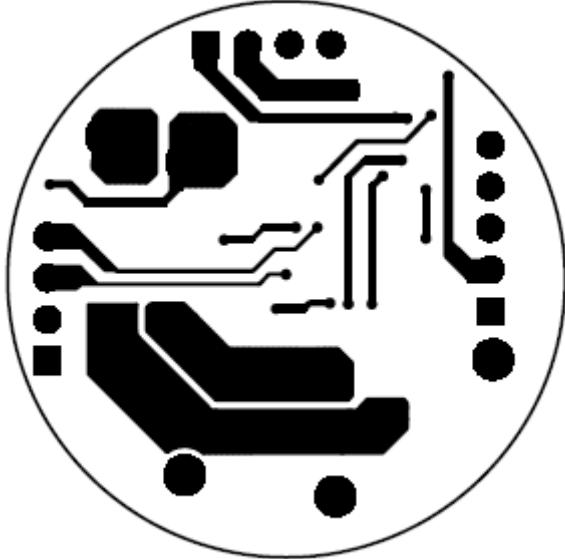
2.2 Bill of material

Position	Description	Package	QTY
C3	Capacitor, aluminum electrolytic,22uf/35V(22uf/50V),-40/105°C	EC5	1
C1	Capacitor,ceramic,1uf/16V,X7R,10%	0603	1
C2	Capacitor,ceramic,10uf/25V,X7R,10%	0805	1
C4	Capacitor,ceramic,100nf/16V,X7R,10%	0603	1
Q1,Q2,Q3	P+N MOS, NCE4606 / OBS3006, 30V6A	SOP8	3
U2	OB6625VIP, PMSM FOC Controller SOC	TSSOP20	1
R1,R2,R3,R4,R5,R6	Resistor,chip,51R,5%	0603	6
R10,R11,R14,R15	Resistor,chip,2.2k,5%	0603	4
R7,R8,R9	Resistor,chip,10k,5%	0603	3
R12	Resistor,chip,51k,1%	0603	1
R13	Resistor,chip,5.1k,1%	0603	1
RCS1,RCS2	Resistor,chip,0.1R,1%	1206	2

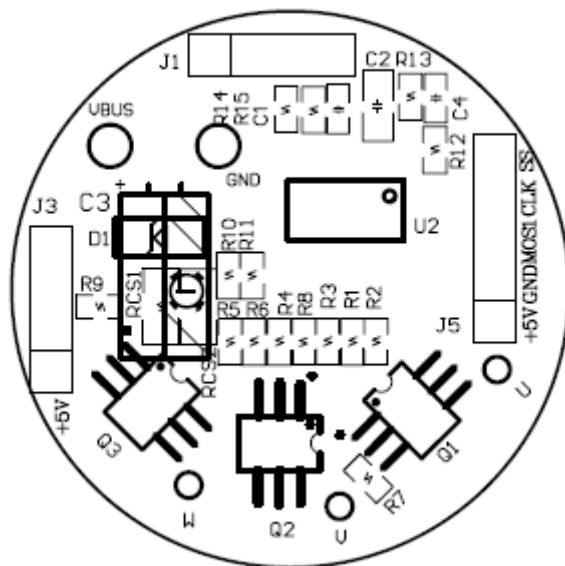
2.3 PCB Garber File



Top Layer

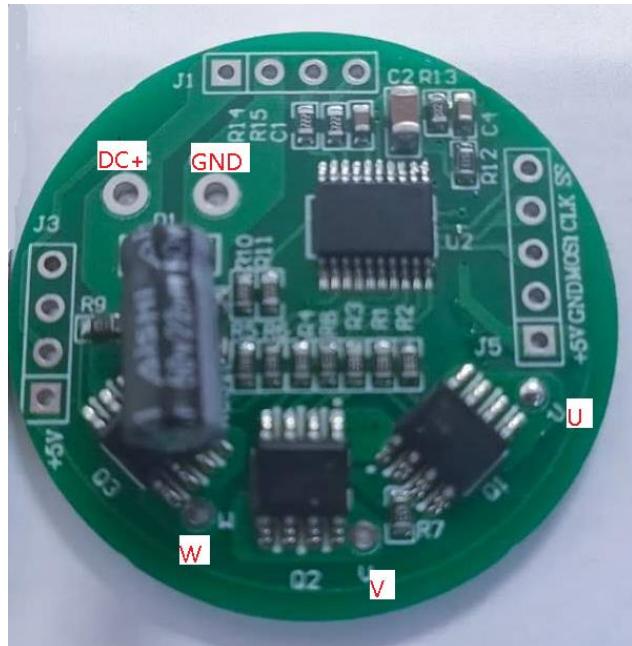


Bottom Layer



Silkscreen Top

2.4 Connector Function Description

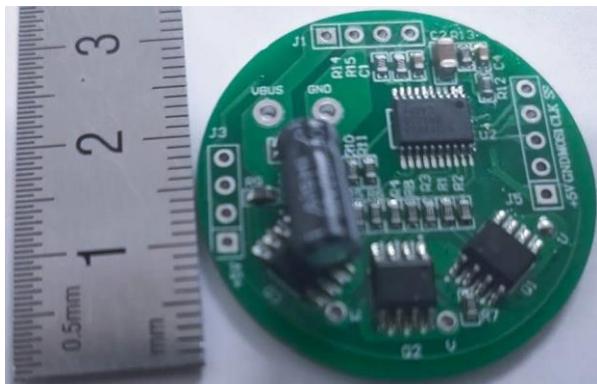


Name	Description
DC+	DC source power in
GND	GND
U	Motor U phase output
V	Motor V phase output
W	Motor W phase output

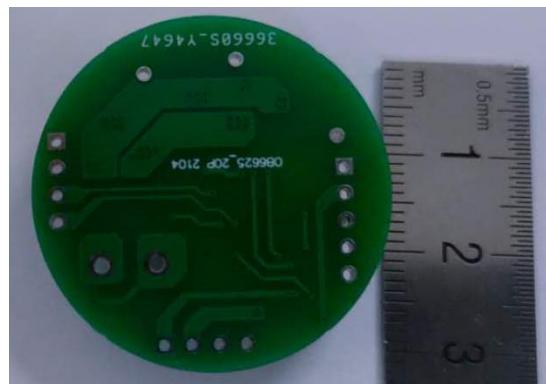
J1- 4pin connector

Pin Num	Description	Voltage Range
1	DC source power in	24V
2	GND	0
3	Motor speed command (PWM)	0~5V
4	Motor speed feedback(FG)	0~5V

2.5 BLDC Controller Board Snapshot



Top



Bottom

3. Performance Evaluation

This session presents the test results of OB6625 FOC demo. TA=25°C

No	Parameter	Symbol	Min	Type	Max	Unit
1	Power Supply			12 / 24		V
2	MCU supply	LDO_5V	4.9	5	5.1	V
3	NMOS gate driver supply			12		V
4	PMOS gate driver supply			-11		V
5	Highside MOSFET Rise time	Tr_h		170		ns
6	Highside MOSFET Fall time	Tf_h		140		ns
7	Lowside MOSFET Rise time	Tr_l		350		ns
8	Lowside MOSFET Fall time	Tf_l		250		ns
9	PWM frequency	f_PWM		16		kHz
10	MOSFET Vds				30	V

Test Equipments

Item	Module
DC source	LW12050KD
Oscilloscope	LeCroy HDO420
Current meter	Tek TCPA300
Differential probe	CATIII
Multi-meter	VC9808

3.1 Power Supply

3.1.1 Power On

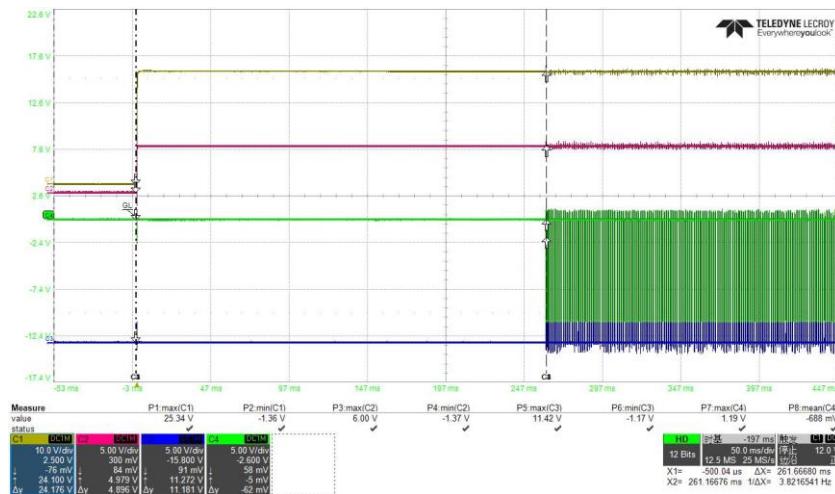


Fig. 1 Measured Bus voltage(Yellow), MCU supply voltage(Red), Lowside MOS GS(Blue), Highside MOS GS(Green) @ Bus = 24V

3.1.2 Power OFF

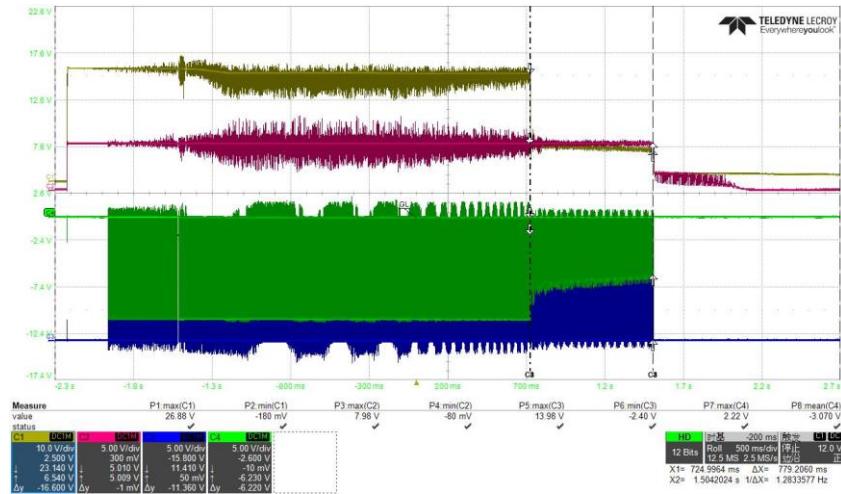
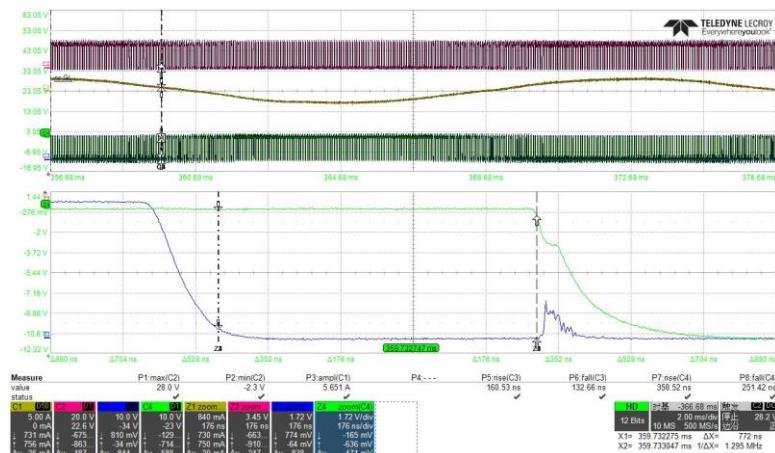


Fig. 2 Measured Bus voltage(Yellow), MCU supply voltage(Red), Lowside MOS GS(Blue), Highside MOS GS(Green) @ Bus = 24V

3.2 MOSFET

3.2.1 Vgs, Vds, Deadtime Waveform



3.2.4 Deadtime

Setup: Vbus = 24V, Phase Current = 2.8A

	U	V	W
GL to GH/ns	784	779	802
GH to GL/ns	682	666	696

3.3 Motor Start

3.3.1 Motor in stationary

Setup: Vbus = 24V, Phase Current = 2.8A

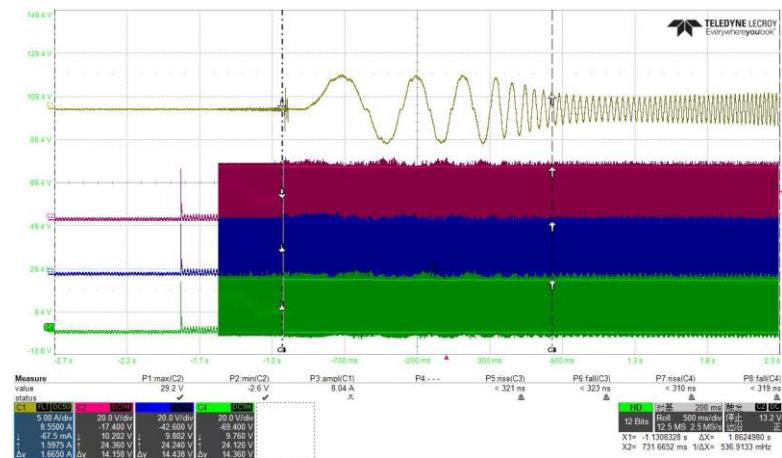


Fig. 5 Measured Phase Current(Yellow), U(Red),V(Blue),W(Green) @ Bus = 24V

3.3.2 Motor in spinning in the forward direction

Setup: Vbus = 24V, Phase Current = 2.8A

Motor Speed = 40RPM

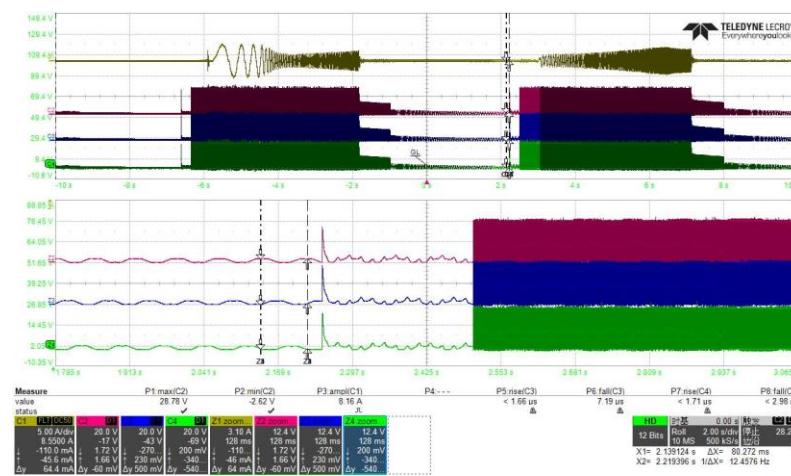


Fig. 6 Measured Phase Current(Yellow), U(Red),V(Blue),W(Green) @ Bus = 24V

3.3.3 Motor in spinning in the reverse direction

Setup: Vbus = 24V, Phase Current = 2.8A

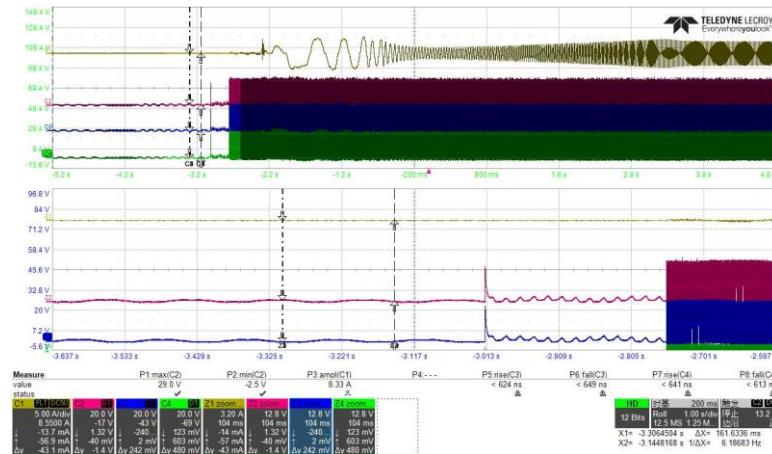


Fig. 7 Measured Phase Current(Yellow), U(Red),V(Blue),W(Green) @ Bus = 24V

3.4 Motor Control

3.4.1 Phase Shift

Phase Shift Time = 2.7us

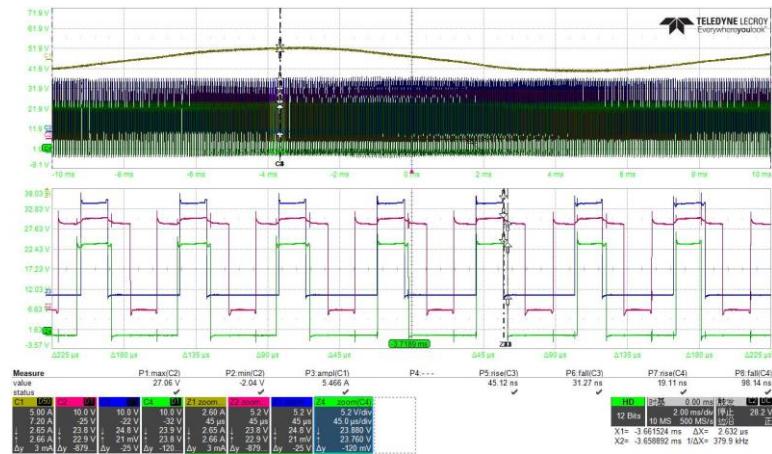


Fig. 8 Measured Phase Current(Yellow), Vds(Blue) , Lowside MOS GS(Blue), Highside MOS GS(Green) @ Bus = 24V

3.5 Temperature Test

3.5.1 Temperature Measure

Setup : Bus voltage = 22.4V, Bus Current = 1.9A, Pha Current = 3.8A, TA = 25°C

	U-MOS	V-MOS	W-MOS	OB6625	Bus-Cap
3min	52.6	61.9	66.6	78	73.7
60min	66.7	75.3	76.3	94.2	86.7

Setup : Bus voltage = 22.4V, Bus Current = 1.9A, Pha Current = 3.8A, TA = 60°C

	U-MOS	V-MOS	W-MOS	OB6625	Bus-Cap
30min	79.1	92.2	94.1	106	100.1

Setup : Bus voltage = 24V, Bus Current = 1.8A, Pha Current = 3.5A, TA = 60°C

	U-MOS	V-MOS	W-MOS	OB6625	Bus-Cap
30min	78.9	92.6	93.3	108.5	100.2

3.6 Reliability

3.6.1 Low Temperature Reliability

Setup: TA = -40°C, Bus Voltage = 24V

Result: Pass

3.6.2 High Temperature Reliability

Setup: TA = 60°C, Bus Voltage = 24V

Result: Pass

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