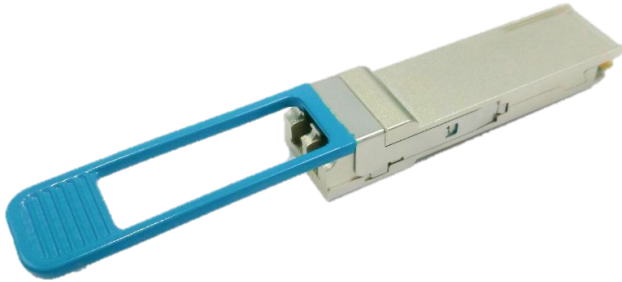


100-Gbps QSFP28 4WDM 10km Optical Transceiver P/N: WST-QS28-4ML-C



Applications:

- 100GBASE Ethernet links up to 10km over SMF
- InfiniBand EDR, FDR, & QDR
- HPC Interconnects
- Proprietary Interconnections
-

Features:

- Compliant to IEEE 802.3bm electrical specifications Clause 83E (CAUI-4)
- Compliant to 4WDM-10 MSA
- Compliant to QSFP28 MSA Specifications, including SFF-8665 Rev. 1.9
- Up to 10km link length over single mode fiber at 100Gbps
- Duplex LC receptacles
- Low power consumption: Max. 3.5W
- BER better than 10^{-12} with FEC-Off
- I²C Management Interface
- Hot pluggable electrical interface
- 0 to 70°C case temperature operating range
- RoHS-6 Compliant (lead-free)

Product Specification

WST-QSFP+LR4L-C

Parameter		Min.	Typ.	Max	Unit	Notes
Data Rate per Lane		-	25.78125	-	Gbps	
Bit Error Rate (BER)		-	10-12	-	-	FEC-Off
Link Length Reach		-	2	-	Km	
Operating Case Temperature		0	-	70	Deg. C	
Power Supply Voltage		3.135	3.3	3.465	V	
Power Consumption(Retiming)		-	-	3.5	W	
Transmit Optical Eye Margin		0	20		%	
Transmit Extinction Ratio		3.5	-	-	dB	
Transmit Optical Amplitude (OMA), each lane		-4	-	2.5	dBm	
Transmit Average Launch Power, each lane		-	-	2.5	dBm	
Lane Center Wavelengths(Range)	Ch0 Ch1 Ch2 Ch3		1264.5 –1277.5 1284.5 –1297.5 1304.5 –1317.5 1324.5 –1337.5		nm	
Receiver Non-Stressed Sensitivity (OMA), at 5 x 10-5 BER				-10	dBm	
I2C Interface Clock Rate				400	kHz	
Electrical I/O Interface	CAUI-4 Standard at TP1 and TP4					

Absolute Maximum Rating

WST-QSFP+LR4L-C

Not necessarily applied together. Exceeding these values may cause permanent damage.

Functional operation under these conditions is not implied.

Parameter	Min	Max	Unit	Note
Storage Temperature	0	85	°C	1
3.3V Power Supply Voltage	-0.3	3.6	V	
Data Input Voltage- Single Ended	-0.3	V _{cc} +0.3	V	
Control Input Voltage	-0.3	3.6	V	
Relative Humidity	5	85	%	2

Notes:

1. Limited by the fiber cable jacket, not the active ends.
2. Non-condensing.

Recommended Operating Conditions

Parameter	Min	Typical	Max	Unit	Note
Case Operating Temperature	0		70	°C	
Power Supply Voltage	3.135	3.3	3.465	V	
Data Rate per Channel			25.78125	Gbps	
Bit Error Ratio		10 ⁻¹²			
Control Input Voltage High	2.6		3.6	V	
Control Input Voltage Low			0.6	V	
Two Wire Serial (TWS) Interface Clock Rate	0	100	400	kHz	
Differential Data Input / Output Load		100		Ohms	
Link Reach			10	km	

Electrical Characteristics

WST-QSFP+LR4L-C

Parameter	Symbol	Min	Typical	Max	Unit	Note
Transceiver Electrical Characteristics						
TRx Power Consumption				3.5	W	
Transmitter Electrical Characteristics						
Data Input Differential Peak-to-Peak Voltage Swing	Δ V _{DI PP}			900	mV _{pp}	
Common Mode Voltage (Max)				1.9	V	
Common Mode Voltage (Min)		0			V	
Differential Input Return Loss		9.5-0.37f, 0.01<=f<8 GHz, 4.75 - 7.4Log ₁₀ (f/14), 8<=f<19 GHz			dB	
Differential to common mode input return loss		22-20(f/25.78), 0.01<=f<12.89 GHz, 15-6(f/25.78), 12.89<=f<19 GHz				
Receiver Electrical Characteristics						
Differential Output Return Loss		9.5-0.37f, 0.1<=f<8 GHz, 4.75 - 7.4Log ₁₀ (f/14), 8<=f<19 GHz			dB	
Differential to common mode output return loss		22-20(f/25.78), 0.01<=f<12.89 GHz, 15-6(f/25.78), 12.89<=f<19 GHz			dB	
Differential Output Voltage				900	mV	
Eye Width		0.57			UI	
Eye Height, Differential		228			mV	

Optical Characteristics

WST-QSFP+LR4L-C

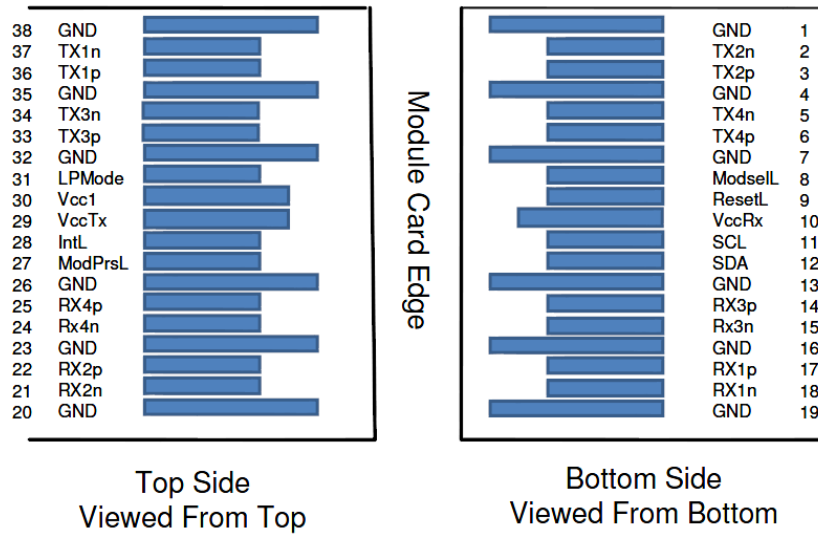
Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter Optical Characteristics						
Lane Center Wavelengths (Range)	Ch0	1264.5 – 1277.5		nm		
	Ch1	1284.5 – 1297.5				
	Ch2	1304.5 – 1317.5				
	Ch3	1324.5 – 1337.5				
Side-Mode Suppression Ratio	SMSR	30			dB	
Output Optical Power: Average	PO AVE	-6.5		2.5	dBm	
Output Optical Modulation Amplitude, per Lane	OMA	-4		2.5	dBm	1
Extinction Ratio	ER	3.5			dB	
Transmitter Eye Mask		0			%	2
Receiver Optical Characteristics						
Lane Center Wavelengths (Range)	Ch0	1264.5 – 1277.5		nm		
	Ch1	1284.5 – 1297.5				
	Ch2	1304.5 – 1317.5				
	Ch3	1324.5 – 1337.5				
Damage Threshold		3.5			dBm	
Average receive power, Each Lane		-13		2.5	dBm	3
Optical Modulation Amplitude (OMA)				2.5	dBm	
Non-stressed Receiver Sensitivity in OMA				-11.5	dBm	4
Receiver Reflectance				-26	dB	

Notes:

1. TDP value and dependent parameters are subject to confirmation.
2. Transmitter eye mask is defined by 4WDM-10 Specification 1.0.
3. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
4. Measured with conformance test signal at TP3 for BER = 5×10^{-5}

QSFP+ Module Pad Assignments and Descriptions

WST-QSFP+LR4L-C

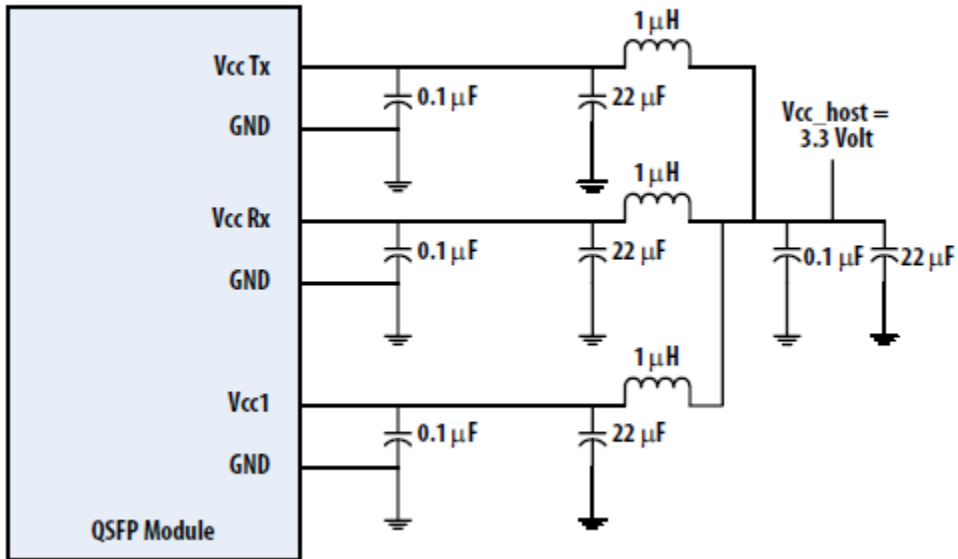


Pin	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1	
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	
8	LVTTTL-I	ModSelL	Module Select	3	
9	LVTTTL-I	ResetL	Module Reset	3	
10		Vcc Rx	+3.3V Power Supply Receiver	2	
11	LVC MOS-I/O	SCL	2-wire serial interface clock	3	
12	LVC MOS-I/O	SDA	2-wire serial interface data	3	
13		GND	Ground	1	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	

Pin	Logic	Symbol	Description	Plug Sequence	Notes
19		GND	Ground	1	
20		GND	Ground	1	
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	
27	LVTTTL-O	ModPrsL	Module Present	3	
28	LVTTTL-O	IntL	Interrupt	3	
29		Vcc Tx	+3.3V Power supply transmitter	2	
30		Vcc1	+3.3V Power supply	2	
31	LVTTTL-I	LPMode	Low Power Mode	3	
32		GND	Ground	1	
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	

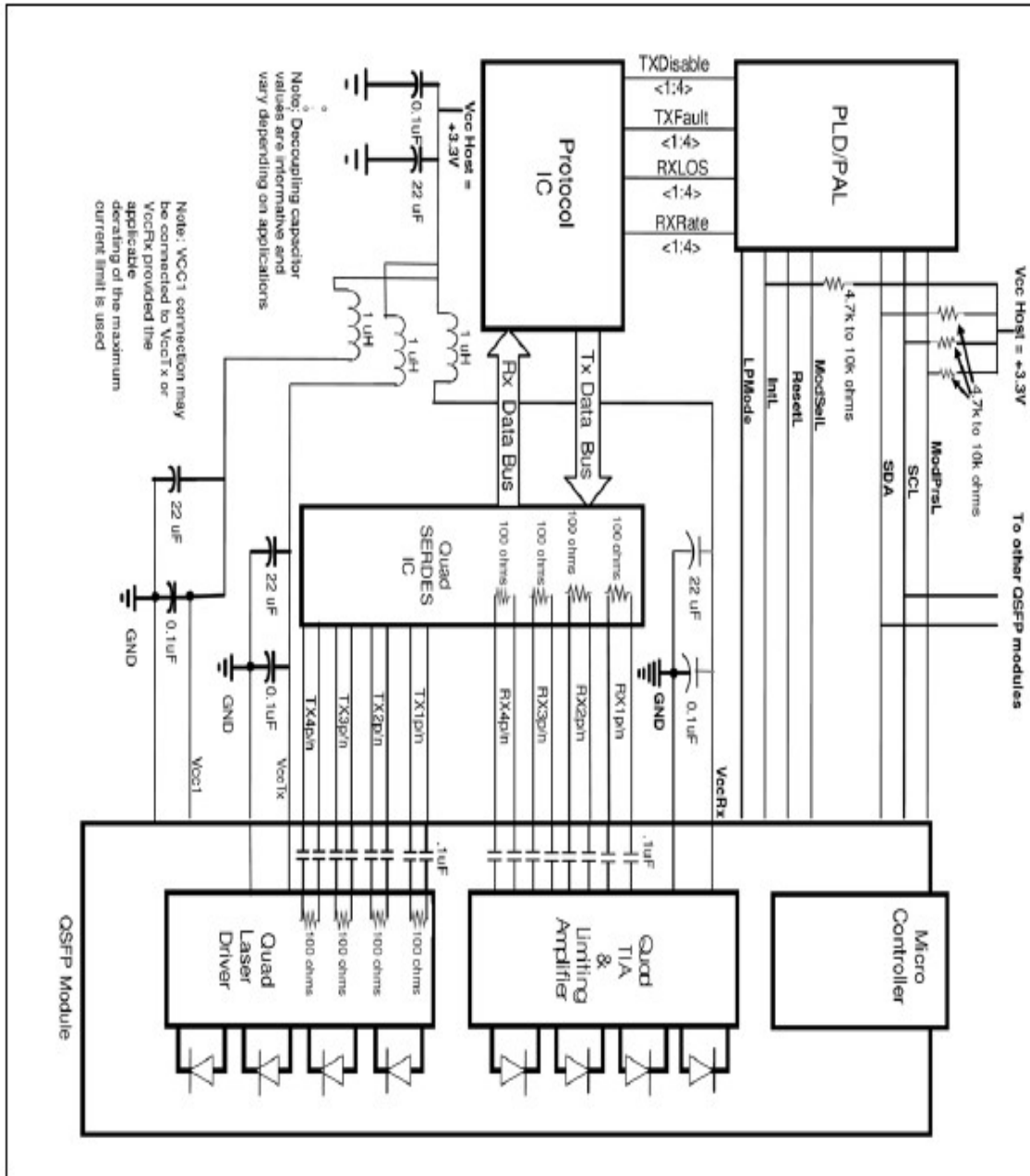
Recommended Host Board Power Supply Circuit

WST-OSFP+LR4L-C



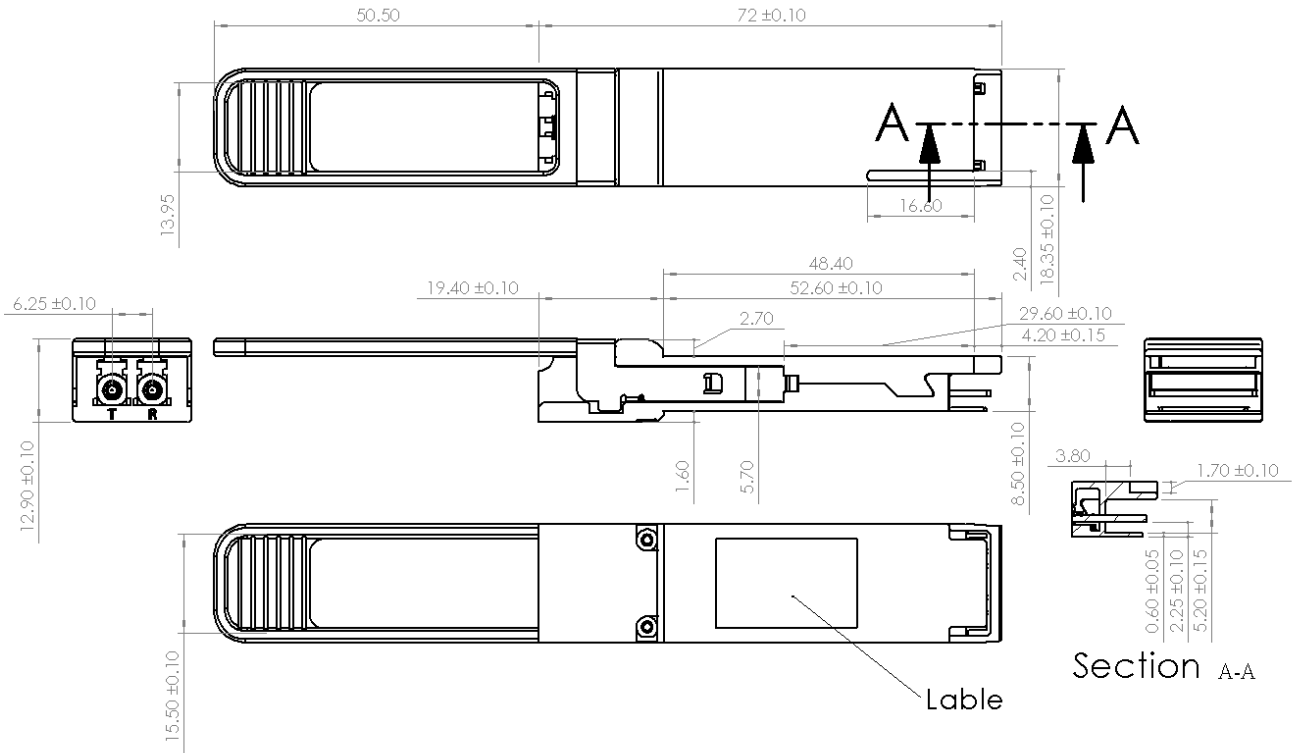
Recommended Interface Circuit

WST-OSFP+LR4L-C



Mechanical Design Diagram

WST-OSFP+LR4L-C

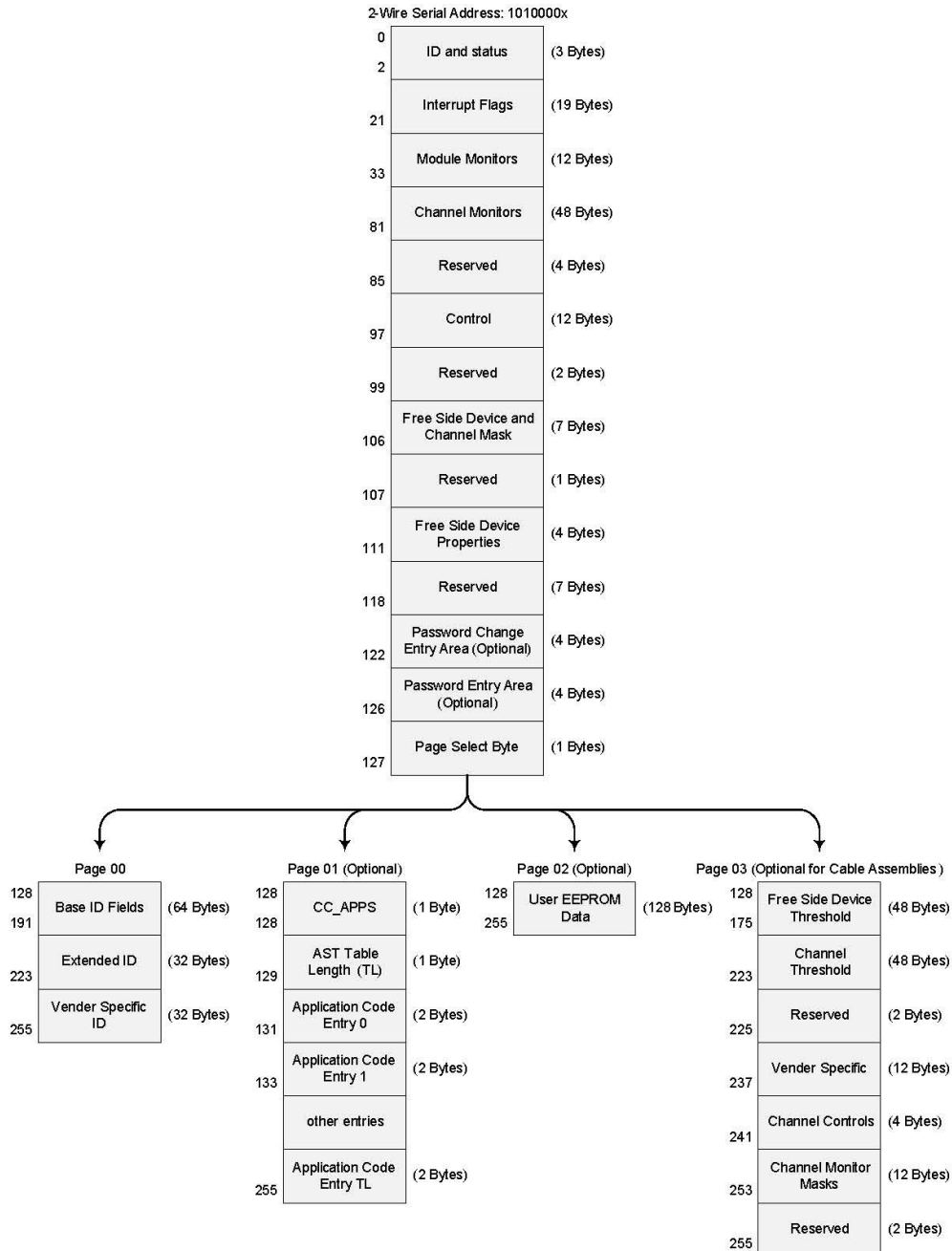


Unit: mm

Memory Map

WST-QSFP+LR4L-C

The memory map is structured as a single address and multiple page approaches, according to the QSFP+ SFF-8436 MSA specification as shown in the below. For more detailed description of this memory map or lower pages, please see our Memory Map document with flexible customization settings.



Ordering Information

Part No	Specification									
	Package	Data rate per Lane	Laser	Optical Power	Detector	Max. Receive Sensitivity	Temp	Reach	Other	Application code
WST-QS28-4ML-C	QSFP28	25.78 Gbps each Channel	4-ch CWDM DML	-4.0~2.5 dBm each Channel	PIN	-11.5dBm each Channel	0~70°C	10km	DDM RoHS	100G Ethernet

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	20-Jan-2017	New release	Ivy Chen	Wayne Liao	Wayne Liao
V1.1	08-Mar-2017	P/N revised	Ivy Chen	Wayne Liao	Wayne Liao
V2.0	4-May-2017	Data sheet finalization	Ivy Chen	Wayne Liao	Wayne Liao