

## FEATURES

- Supports 9.95Gb/s to 11.3Gb/s bit rates
- Scalable to 8.5Gbp/s
- Maximum link length of 80km
- 3.3V power supplies required
- SFP+ package with Duplex LC connector
- Temperature-stabilized DWDM EML transmitter and High performance APD receiver
- Commercial temperature range:-5°C to 70°C
- Built-in CDR
- Digital diagnostic monitor interface
- RoHS-6 Compliant
- SFI electrical interface

## APPLICATIONS

- DWDM Network
- 10GBASE-ZR/ZW
- 10Gb/s Fiber Channel
- 8Gb/s Fiber Channel

## STANDARDS

- Complies with IEEE802.3ae
- Complies with SFP+ MSA (SFF-8431)
- Complies with SFF-8472
- Complies with FCC 47 CFR Part 15, Class B
- Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

## Absolute Maximum Ratings

Table 3- Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	Ts	-40	-	85	°C	
Supply Voltage	Vcc5	-0.5	-	4.0	V	
Operating Humidity	RH	-	-	+95	%	

## Recommended Operating Conditions

Table 4- Recommended operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	Top	0	-	70	°C	
Power Supply Voltage	VCC	3.14	3.3	3.46	V	
Power Supply Current	ICC	-	-	450	mA	
Data Rate	BR	9.95/8.5		11.3	Gbps	

## Electrical Characteristics

Table 5- Electrical Characteristics

Parameter	Symbol	Unit	Min.	Typ.	Max.	Notes
<b>Transmitter</b>						
Differential Data Input swing	V <sub>in,p-p</sub>	mVpp	180	-	700	
Input Differential impedance	Z <sub>in</sub>	Ω	85	100	115	
Tx_Disable,P_Down/RST	V <sub>IL</sub>	V	-0.3		0.8	
	V <sub>IH</sub>	V	2.0	-	V <sub>CC</sub> +0.3	
<b>Receiver</b>						
Differential Data Output	V <sub>out,p-p</sub>	mVpp	300		850	
Output Differential impedance	Z <sub>in</sub>	Ω	80	100	120	
Output Rise Time,20%-80%	T <sub>r</sub>	Ps	28			
Output Fall Time,20%-80%	T <sub>f</sub>	Ps	28			
Rx_Los,Mod_NR,Interrupt	V <sub>oL</sub>	V	0		0.4	
	V <sub>oH</sub>	V	V <sub>CC</sub> -0.5		V <sub>CC</sub> +0.3	

## Transmitter Performance:

Table 6- optical TX Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Center Wavelength Spacing			100		Ghz	

			0.8		nm	
Average Launch Optical Power	Pout	0	-	+4	dBm	1
Extinction Ratio	ER	8.2	-	-	dB	
Average Launch power of OFF TX	Poff	-	-	-30	dBm	
Dispersion penalty@9.95/10.7Gpbs	DP1	-	-	2	dB	
Dispersion penalty@11.1/11.3Gpbs	DP2	-	-	3	dB	
Side Mode Suppression Ratio	SMSR	35	-	-	dB	
TX Jitter	TXj	Per 802.3ae requirements				

Note: 1. The optical power is launched into 9/125 $\mu$ mSMF.

## Receiver Performance:

Table 7- optical RX Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Receiver Sensitivity @9.95Gpbs/10.7Gpbs	PIN_SENS1	-	-	-23	dBm	1
Receiver Sensitivity @11.1Gpbs/11.3Gpbs	PIN_SENS2	-	-	-24	dBm	1
Overload	PIN_OL	-7.0	-		dBm	3
Optical Center Wavelength	$\lambda$ C	1260	-	1600	nm	
Los Assert	LOSA	-40	-	-	dBm	
Los De-assert	LOSD	-	-	-27	dBm	
Los hysteresis	LOSH	0.5	-		dB	

Notes:1. Minimum average optical power measured at the BER less than 1E-12. The measure pattern is PRBS 2<sup>31</sup>-1

3. CML logic, internally AC coupled.

### Recommended Host Board Power Supply Circuit

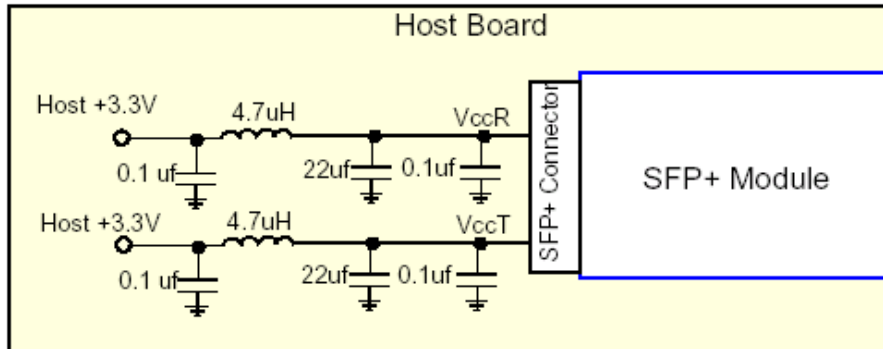
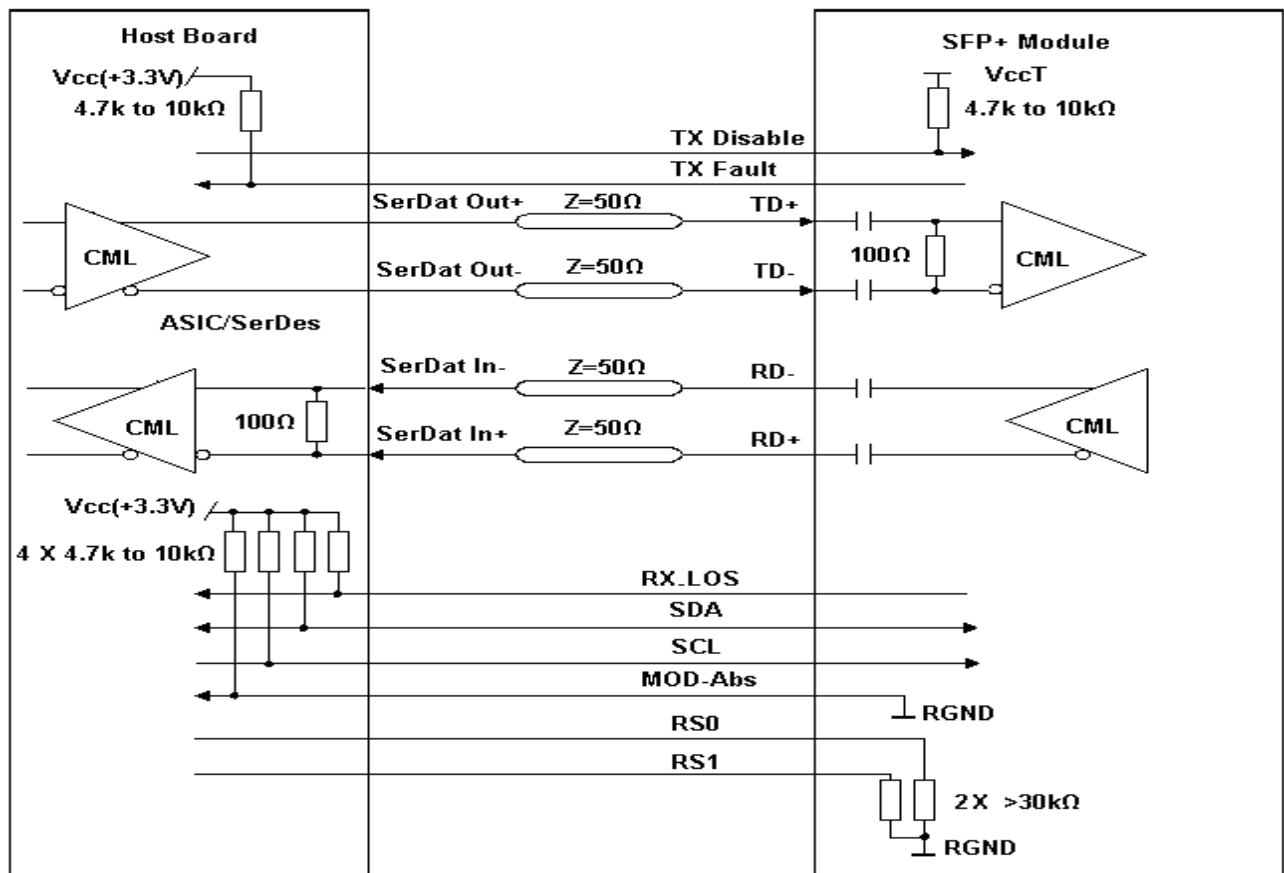


Figure 1, Recommended Host Board Power Supply Circuit

### Recommended interface Circuit



## Pin arrangement

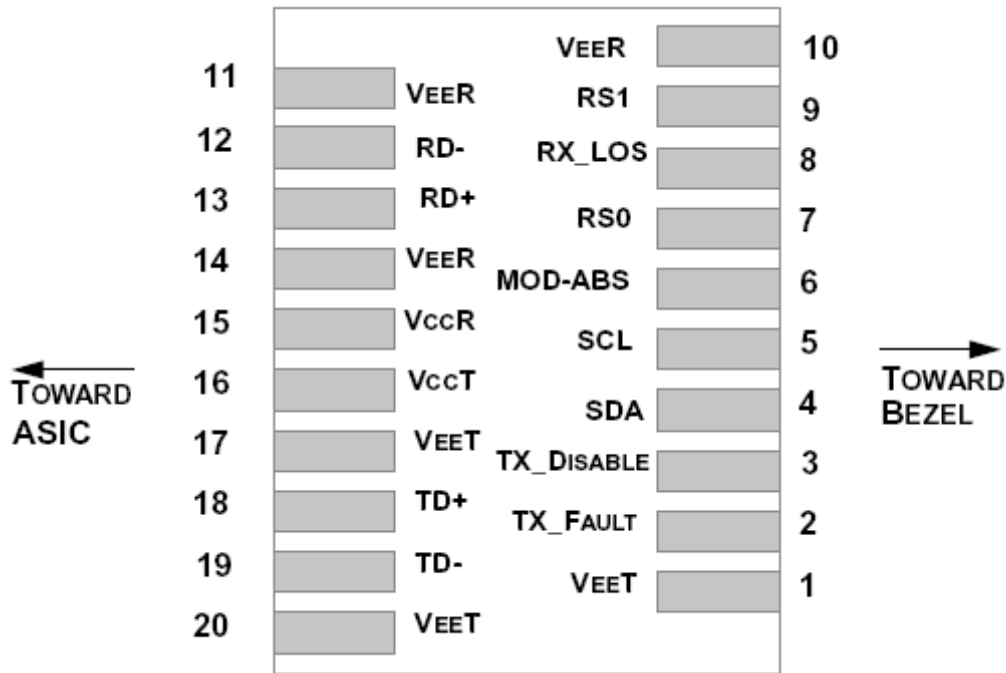


Figure 3, Pin View

**Table 8-Pin Function Definitions**

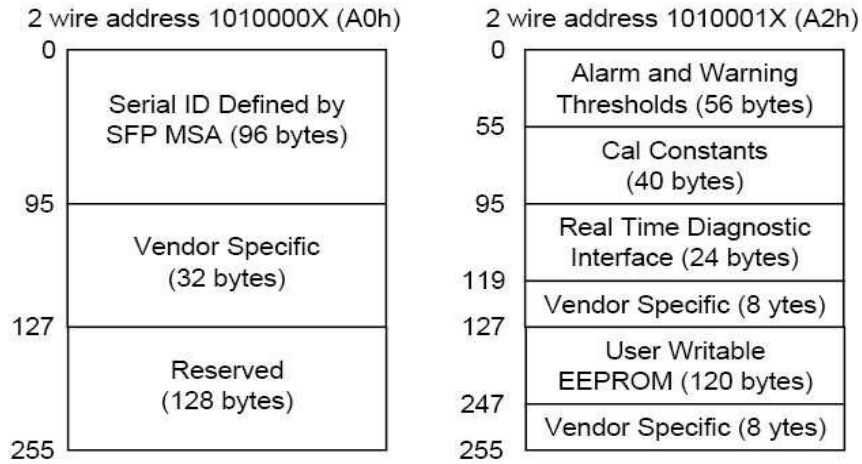
Pin	Name	FUNCTION	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	SDA	Module Definition 2	3	2-wire Serial Interface Data Line.
5	SCL	Module Definition 1	3	2-wire Serial Interface Clock.
6	MOD_ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	Rate Select 0, optionally controls SFP+ module receiver. This pin is pulled low to VeeT with a >30K resistor..
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	Rate Select 1, optionally controls SFP+ module transmitter. This pin is pulled low to VeeT with a >30K resistor.
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6

13	RD+	Received Data Out	3	Note 6
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

Note:

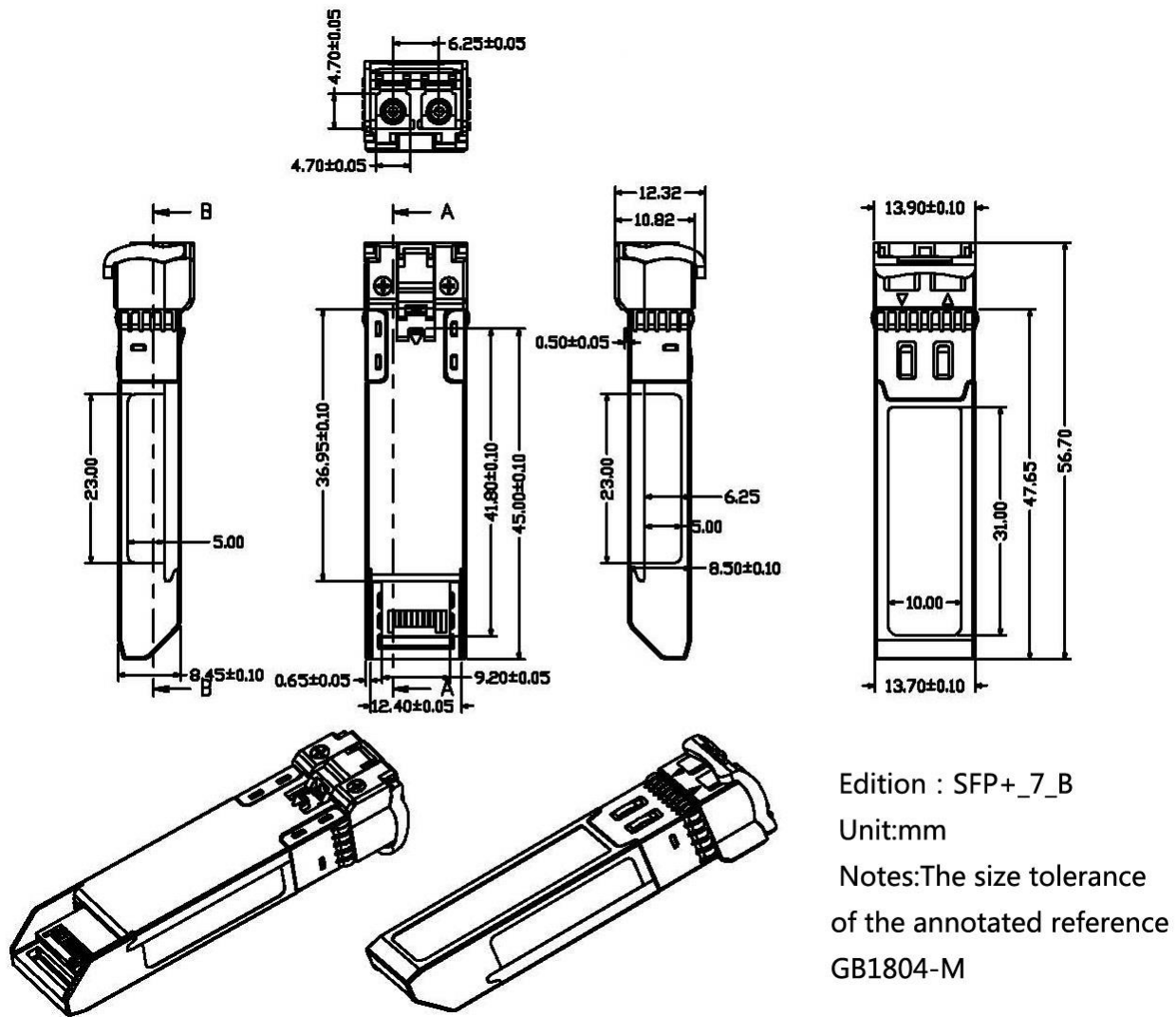
- TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT/R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K – 10 KΩ resistor. Its states are: Low (0 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined High (2.0 – 3.465V): Transmitter Disabled Open: Transmitter Disabled
- Module Absent, connected to VeeT or VeeR in the module.
- LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT/ R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
- RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 350 and 700 mV differential (175 –350 mV single ended) when properly terminated.
- VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin. Maximum supply current is 725mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.
- TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 150 – 1200 mV (75 – 600mV single-ended).

### Digital Diagnostic Memory Map



### Mechanical Dimension:





### Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compatible with standards Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.

Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compatible with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL file E317337 TüV Certificate No. 50135086 (CB scheme )
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards* <sup>note2</sup>

Note1: For update of the equipment and strict control of raw materials, Honlus has the ability to supply the customized products since Jan 1, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Honlus' transceivers, because Honlus' transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

### ORDERING INFORMATION

Part No.	Tx/Rx	Data Rate	Operating Temp	Distance
HOLS-PPDxx8077-LD-CE	EML/PIN	10.3125G	0 to +70°C	80km
HOLS-PPDxx8077-LD-IE	EML/PIN	10.3125G	-40 to +85°C	80km

Note:

XX is ITU-T DWDM channel code as in the table below:

### C-band λc Wavelength Guide

ITU Channel Code	Frequency (THz)	Wavelength	ITU Channel Code	Frequency (THz)	Wavelength
17	191.7	1563.86	40	194.0	1545.32
18	191.8	1563.05	41	194.1	1544.53
19	191.9	1562.23	42	194.2	1543.73
20	192.0	1561.42	43	194.3	1542.94
21	192.1	1560.61	44	194.4	1542.14
22	192.2	1559.79	45	194.5	1541.35

23	192.3	1558.98	46	194.6	1540.56
24	192.4	1558.17	47	194.7	1539.77
25	192.5	1557.36	48	194.8	1538.98
26	192.6	1556.55	49	194.9	1538.19
27	192.7	1555.75	50	195.0	1537.40
28	192.8	1554.94	51	195.1	1536.61
29	192.9	1554.13	52	195.2	1535.82
30	193.0	1553.33	53	195.3	1535.04
31	193.1	1552.52	54	195.4	1534.25
32	193.2	1551.72	55	195.5	1533.47
33	193.3	1550.92	56	195.6	1532.68
34	193.4	1550.12	57	195.7	1531.90
35	193.5	1549.32	58	195.8	1531.12
36	193.6	1548.51	59	195.9	1530.33
37	193.7	1547.72	60	196.0	1529.55
38	193.8	1546.92	61	196.1	1528.77
39	193.9	1546.12			

#### WARNINGS

- Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.
- Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

#### Revision history

Version	Initiated	Reviewed	Revision History	Release Date
A0	Simon	Smith	Initialization	2012-04-08
A1	Code	Smith	Updated output power value.	2013-03-28
A2	code	Lucky	Add the extended temperature range	2015-03-18

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