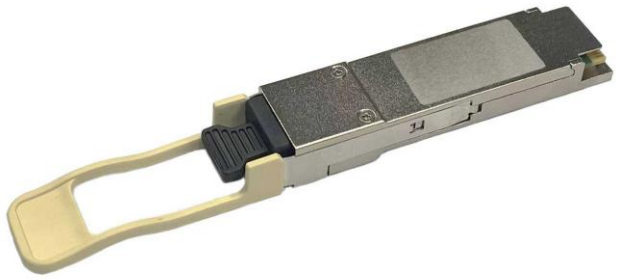
WAVESPLITTER™ TECHNOLOGIES, INC.

Data Sheet

100G QSFP28 SR4, 100m Transceiver

P/N: WST-QS28-SR4-C



Features:

- MPO/MTP optical interface
- Up to 100m OM4 MMF Distance
- Single +3.3V power supply
- Hot-pluggable QSFP28 MSA form factor
- Compliant with IEEE 802.3bm 100GBASE-SR4
- 4x25G Electrical Serial Interface
- Transmitter: 4x25Gb/s 850nm VCSEL
- Receiver: 4x25Gb/s PIN
- Low power dissipation (Max:2.5W)
- I2C Communication Interface and built in digital diagnostic function
- Operating case temperature range:0℃ to 70℃

Applications:

- 100GBASE-SR4
- InfiniBand EDR
- 100G Datacom connections

Description

The 100G QSFP28 SR4 transmitter integrates a four-channel 850 nm VCSEL (Vertical Cavity Surface Emitting Laser) array, a four-channel input buffer and laser driver, together with control, bias, and diagnostic monitoring circuits.

Module control and monitoring are implemented through a 2-wire (I^2C) serial interface. Diagnostic functions monitor VCSEL bias current, module temperature, transmit optical power, receive optical power, and supply voltage. The monitored values and alarm/warning thresholds are accessible via the I^2C interface.

When monitored parameters exceed defined thresholds, corresponding flags and interrupts are asserted. Additional flags and interrupts are generated for loss of signal (LOS) and transmitter fault conditions. All flags are latched until cleared by reading the appropriate register. Interrupts can be masked via software control. The optical output is squelched upon loss of input signal unless the squelch function is disabled. Individual channels can be disabled through the I^2C interface for fault isolation or power management.

General Product Characteristics

Parameter	Value	Comments
Management Interface	Serial, I^2C-based, 400 kHz maximum frequency	As defined by SFF-8636
BER	$< 5*10^{-5}$	stress testing：PRBS:2^{31}-1 test pattern, input signal Vpp 800mV differential

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V_{cc_max}	-0.5		3.6	V	
Storage Temperature	T_s	-40		85	℃	
Rx Damage Threshold, each lane	P_{Rdmg}	+3.4			dBm	
Relative Humidity	R_H	5		85	%	

Note1: Exceeding the limits below may damage the active optical cable permanently.

Note2: Stress in excess of the maximum absolute ratings can cause permanent damage to the transceiver.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Notes
Data Rate	DR		103.125		Gb/s	
Supply Voltage	V_{cc}	3.135	3.3	3.465	V	
Power Consumption	P_C			2.5	W	
Operating Case Temp.	T_C	0		70	˚C	
Transmission Distance	TD			70	m	OM3 MMF
				100	m	OM4 MMF

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transceiver Power Supply Current	I_{cc}			797.5	mA	
Transmitter						
Differential data input swing per lane	$V_{in,pp,dif}$			900	mV	
Differential Input Return Loss		Per Section 83E.3.3.1, IEEE 802.3bm				
Differential to common mode input return loss		Per Section 83E.3.3.1, IEEE 802.3bm				
Module stressed input test		Per Section 83E.3.4.1, IEEE 802.3bm				
Differential termination mismatch				10	%	
DC Common Mode Voltage		-0.35		2.85	V	1
Signaling rate per lane		25.78125±100ppm			Gb/s	
Receiver						
Differential data output swing	$V_{out,pp}$			900	mV	
Differential termination mismatch				10	%	
DC Common Mode Voltage		-0.35		2.85	V	1
Common Mode Noise, RMS				17.5	mV	
Differential Output Return Loss		Per Section 83E.3.1.3, IEEE 802.3bm				
Common to differential mode conversion return loss		Per Section 83E.3.1.3, IEEE 802.3bm				
Eye width		0.57			UI	
Eye height, differential		228			mV	
Vertical eye closure	VEC			5.5	dB	
Transition Time, 20% to 80%	T_r, T_f	12			ps	
Signaling rate per lane		25.78125±100ppm			Gb/s	

Notes:

1. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

Optical Characteristics(Under Recommended Operating Conditions)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Transmit Rate for Each Lane	DR_{PL}	25.78125 ± 100ppm			Gb/s	
Center Wavelength	λ	840	850	860	nm	
RMS Spectral Width	RSW			0.6	nm	
Average launch power, each lane	P_{avg}	-8.4		2.4	dBm	
Optical modulation amplitude, each lane (OMA)	OMA	-6.4		3	dBm	1
Optical return loss tolerance				12	dB	
Extinction ratio	ER	2			dB	
Average Launch Power of OFF Transmitter, per Lane	P_{off}			-30	dBm	
Encircled flux		≥ 86% at 19μm ≤ 30% at 4.5μm				
Transmitter eye mask definition {X1,X2,X3,Y1,Y2,Y3}		{0.3, 0.38, 0.45, 0.35, 0.41, 0.50}				2
Receiver						
Receive Rate for Each Lane	DR_{PL}	25.78125 ± 100ppm			Gb/s	
Four Lane Wavelength Range	λ	840	850	860	nm	
Damage threshold	THd	+3.4			dBm	
Average power at receiver input, each lane	P_{in}	-10.3		2.4	dBm	
Receive Power, each lane (OMA)	P_{OMA}			3	dBm	
Receiver Reflectance	Rref			-12	dB	
Receiver sensitivity in OMA, each lane	P_{sens}			-8.5	dBm	3
Stressed Receiver Sensitivity (OMA), each Lane				-5.2	dBm	4
LOS De-Assert	LOSD			-13	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis	LOSH	0.5			dB	5
Conditions of stressed receiver sensitivity test:						6
Stressed eye closure (SEC), lane under test			4.3		dB	
Stressed eye J2 Jitter, lane under test			0.39		UI	

Stressed eye J4 Jitter, lane under test				0.53	UI	
OMA of each aggressor lane			3		dBm	
Stressed receiver eye mask definition {X1, X2, X3, Y1, Y2, Y3},Hit ratio 5 × 10^{-5} hits per sample		{0.28, 0.5, 0.5, 0.33, 0.33, 0.4}				

Notes:

1. Even if the TDP < 0.9 dB, the OMA min must exceed the minimum value specified here.
2. Hit ratio 1.5 × 10^{-3} hits per sample.
3. Measured with a PRBS 2^{31} -1 test pattern, BER =5x10^{-5} @25.78Gb/s.
4. Measured with conformance test signal at receiver input for BER = 5x10^{-5}.
5. LOSH=LOSD-LOSA, LOS Hysteresis ≥ 0.5 dB @IEEE 802.3, MSA
6. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

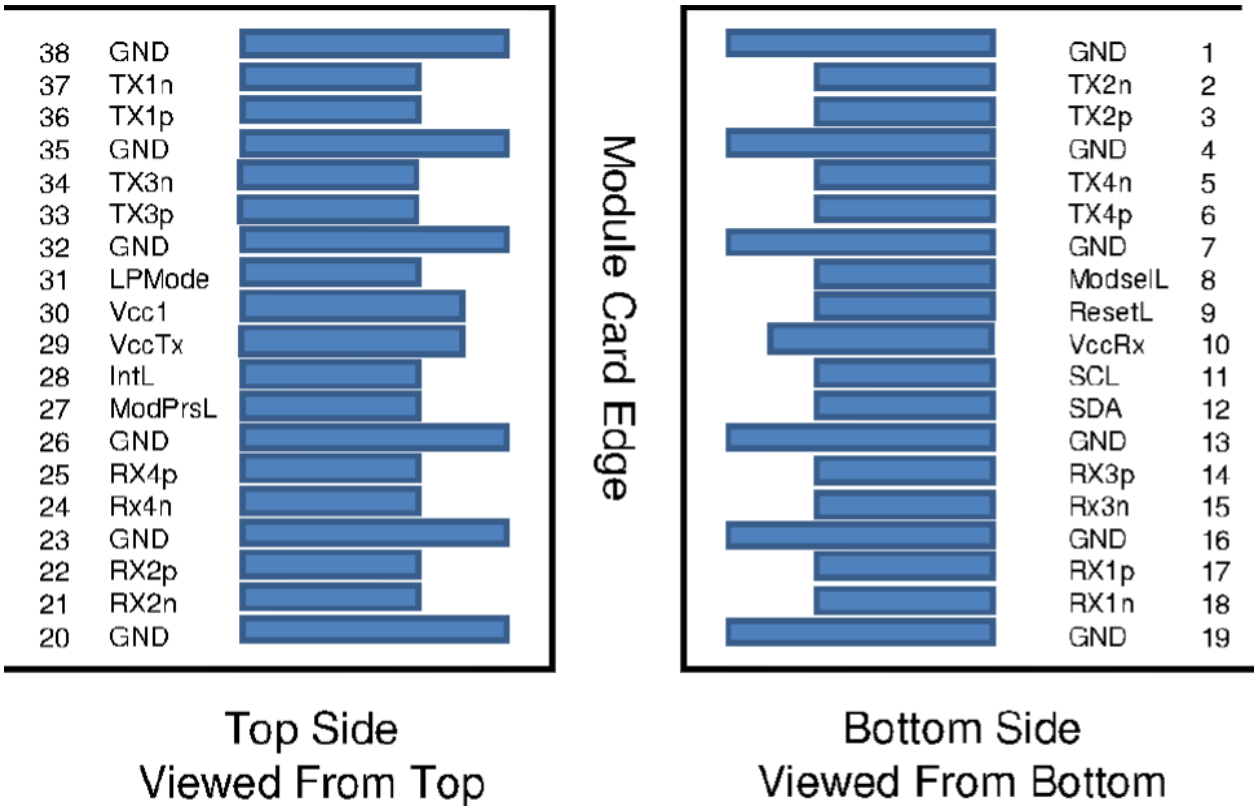
Pin Definition

Pin	Name	Logic	Description	Notes
1	GND			1
2	Tx2n	CML-I	Transmitter Inverted Data Input	
3	Tx2p	CML-I	Transmitter Non-Inverted Data Input	
4	GND		Ground	1
5	Tx4n	CML-I	Transmitter Inverted Data Input	
6	Tx4p	CML-I	Transmitter Non-Inverted Data Input	
7	GND		Ground	1
8	ModselL	LVTTL-I	Module Select	
9	ResetL	LVTTL-I	Module Reset	
10	VccRx		+3.3V Power Supply Receiver	2
11	SCL	LVCMOS	2-wire serial interface clock	
12	SDA	LVCMOS	2-wire serial interface data	
13	GND		Ground	1
14	Rx3p	CML-O	Receiver Non-Inverted Data Output	
15	Rx3n	CML-O	Receiver Inverted Data Output	
16	GND		Ground	1

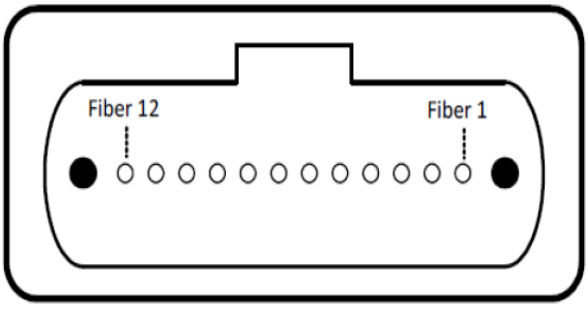
17	Rx1p	CML-O	Receiver Non-Inverted Data Output	
18	Rx1n	CML-O	Receiver Inverted Data Output	
19	GND		Ground	1
20	GND		Ground	1
21	Rx2n	CML-O	Receiver Inverted Data Output	
22	Rx2p	CML-O	Receiver Non-Inverted Data Output	
23	GND		Ground	1
24	Rx4n	CML-O	Receiver Inverted Data Output	
25	Rx4p	CML-O	Receiver Non-Inverted Data Output	
26	GND		Ground	1
27	ModPrsL	LVTTL-O	Module Present	
28	IntL	LVTTL-O	Interrupt	
29	VccTx		+3.3V Power supply transmitter	2
30	Vcc1		+3.3V Power supply	2
31	LPMode	LVTTL-I	Low Power Mode	
32	GND		Ground	1
33	Tx3p	CML-I	Transmitter Non-Inverted Data Input	
34	Tx3n	CML-I	Transmitter Inverted Data Input	
35	GND		Ground	1
36	Tx1p	CML-I	Transmitter Non-Inverted Data Input	
37	Tx1n	CML-I	Transmitter Inverted Data Input	
38	GND		Ground	1

Notes:

1. GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, Vcc1 and VccTx shall be applied concurrently. VccRx Vcc1 and VccTx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000 mA. Recommended host board power supply filtering is shown below.

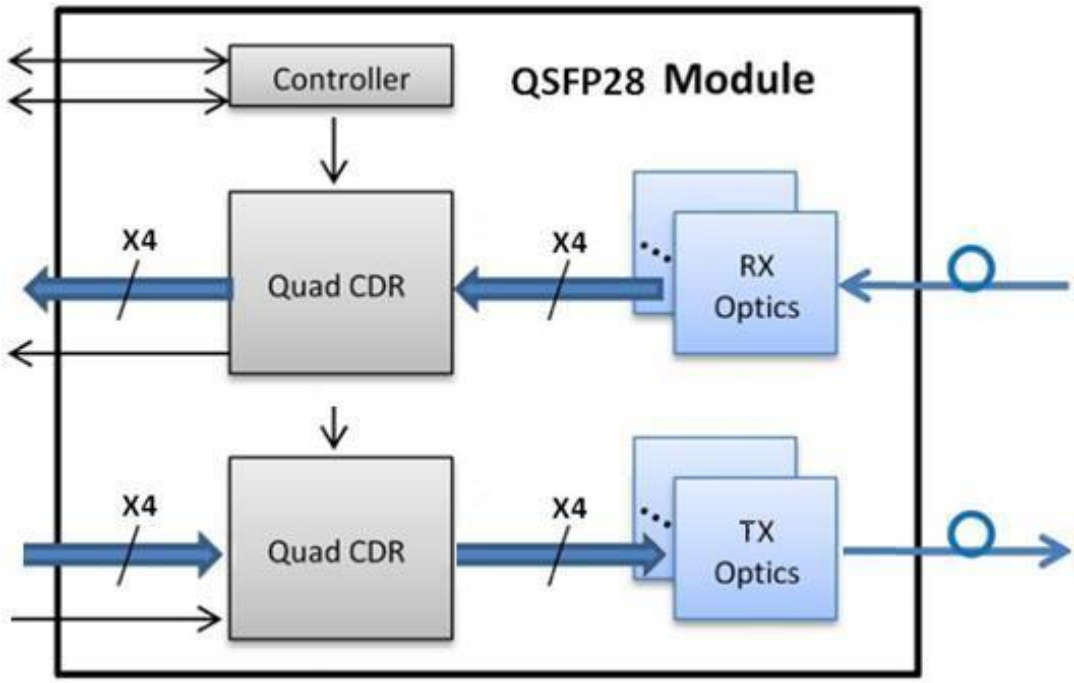


Optical Interface Lanes and Assignment in Receptacle

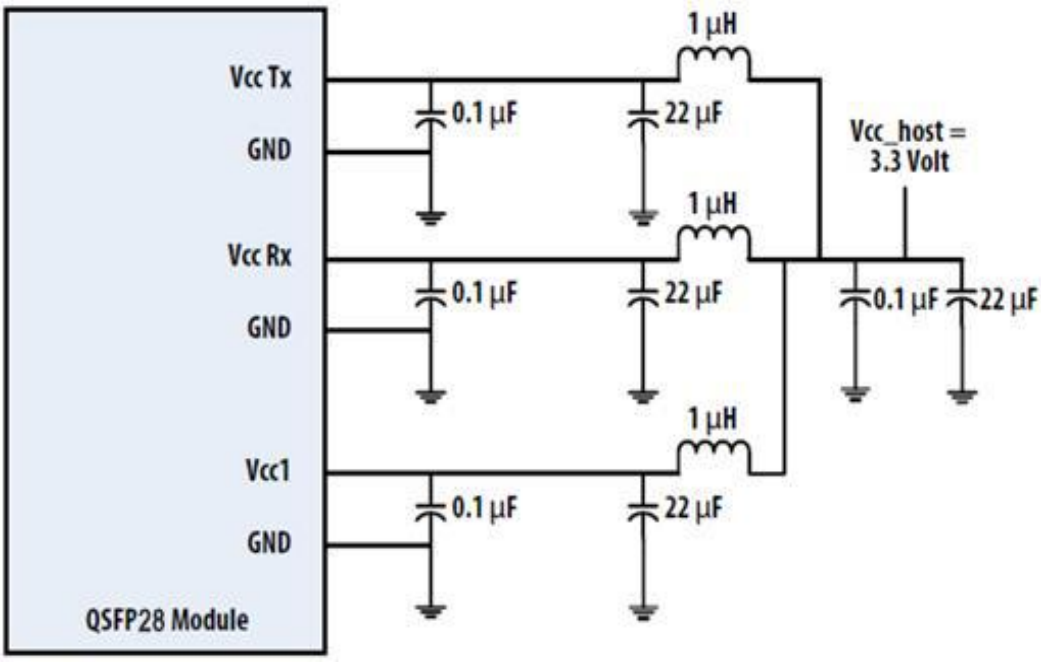


Fiber	Lane
1	RX0
2	RX1
3	RX2
4	RX3
5678	Not used
9	TX3
10	TX2
11	TX1
12	TX0

Transceiver Block Diagram



Recommended Power Supply Filter



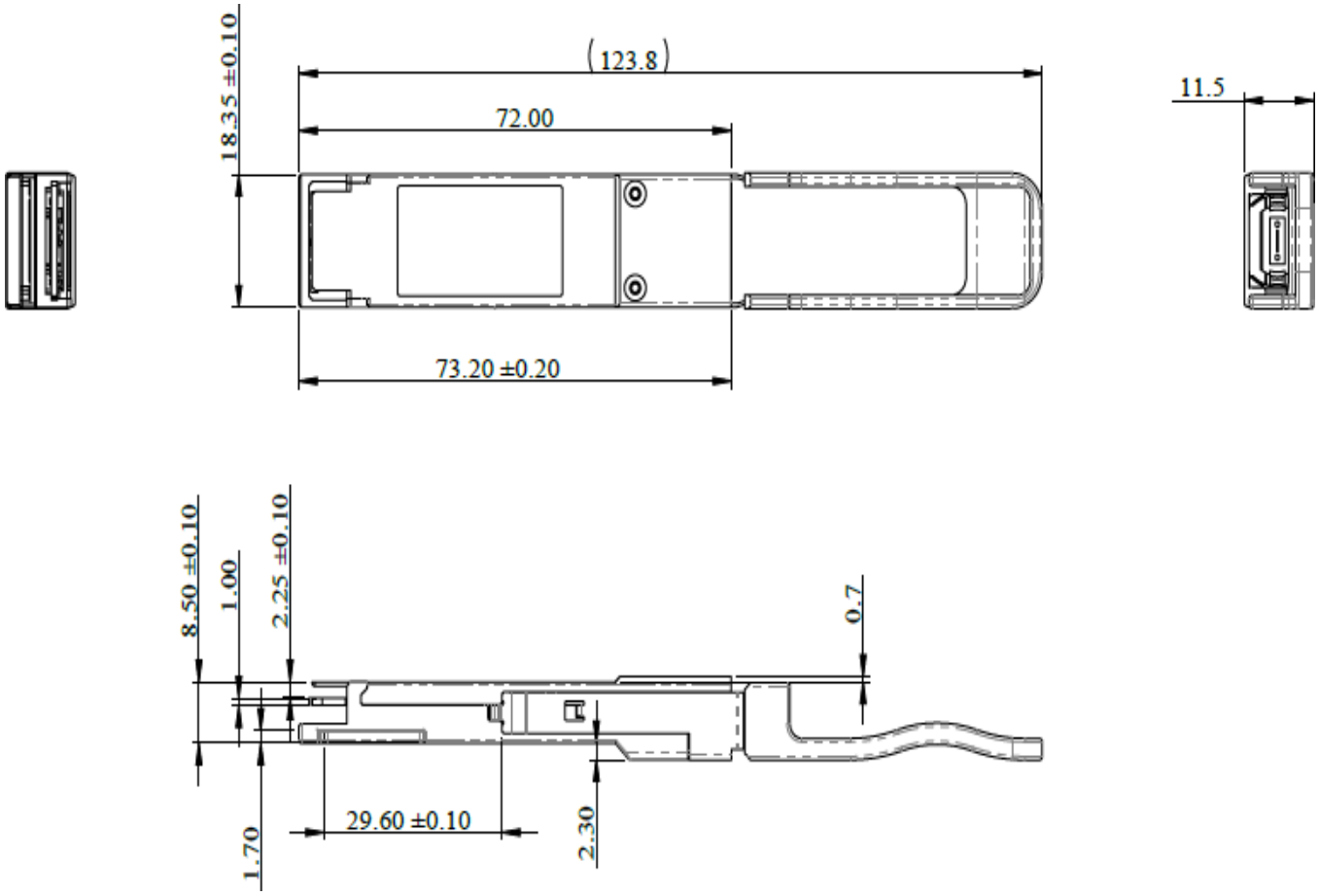
Memory Map

	2-Wire Serial Address 1010000x
	Lower Page 00h
0	Identifier
1 - 2	Status
3 - 21	Interrupt Flags
22-23	Free Side Device Monitors
34-81	Channel Monitors
82-85	Reserved
86-98	Control
99	Reserved
100 - 104	Hardware Interrupt Pin Masks
105 - 106	Vendor Specific
107	Reserved
108 - 110	Free Side Device Properties
111 - 112	Assigned for use by PCI Express
113	Free Side Device Properties
114 - 118	Reserved
119 - 122	Password Change Entry Area (Optional)
123 -	Password Entry Area (Optional) 126
127	Page Select Byte

	Optional	Optional	Optional
Upper Page 00h	Page 01h	Page 02h	Page 03h
128 Identifier	128 CC_APPS		
129-191 Base ID Fields	129 AST Table Length (TL)		128-175 Free Side Device Thresholds
	130-131 Application Code Entry 0		
	132-133 Application Code Entry 1		
192-223 Extended ID	134-253 other entries	128-255 User EEPROM data	176-223 Channel Thresholds
224-255 Vendor Specific ID			224 TX EQ & RX Emphasis Magnitude ID
			225 RX output amplitude indicators
			226-241 Channel Monitor Masks
	254-255 Application Code Entry TL		252-255 Reserved

Mechanical Design Diagram

Product shall be of design, construction and physical dimensions specified on applicable product drawing.



Unit: mm

Laser Safety

This transceiver is a Class I product per CDRH 21 CFR 1040 and Laser Notice 50 standards. It must be operated under specified operating conditions.

Ordering Information

Part No	Specification									
	Package	Data rate per Lane	Laser	Optical Power	Detector	Max. Receive Sensitivity in OMA	Temp	Reach	Other	Application code
WST-QS28-SR4-C	QSFP28	25.78125 Gbps	850nm VCSEL	-8.4~ +3dBm each Channel	PIN	-8.5dBm each Channel	0~70°C	70m via OM3 and 100m via OM4 MMF	DDM	100GBASE-SR4 Ethernet

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	29-Oct-2025	New Issue	Amy Lee	Kai-Hsu Cheng	Wayne Liao

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