



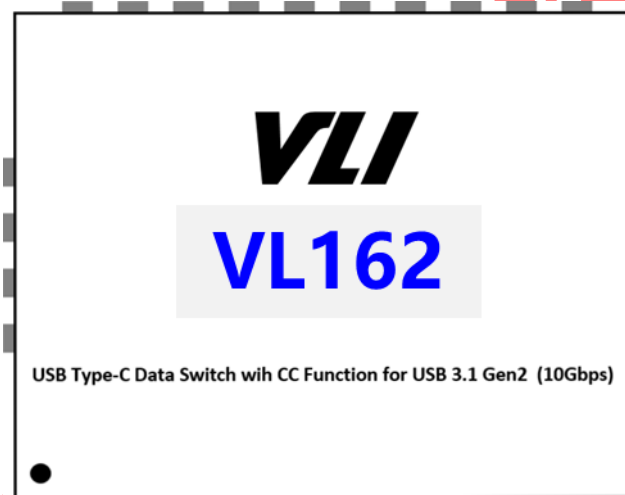
Data Sheet

VL162

**USB Type-C Data Switch with CC Function
for USB 3.1 Gen2 (10Gbps)**

Jan 19th, 2021

Revision 0.91



Revision History

Rev	Draft Date	History	Initial
0.90	12/31/2020	Preliminary Release	TH
0.91	1/19/2021	Update REXT value typo	TH

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Product Feature

VL162

USB Type-C Data Switch with CC Function for USB 3.1 Gen2 (10 Gbps)

■ 4:2 10Gbps USB Type-C Data Switch

■ Support up to 10Gbps

■ 2 Differential Channel, 2:1 MUX/DeMUX

■ Compatible with 10Gbps USB3.1 Gen2

■ Low power consumption with 6mW active at device mode

■ High DC common mode voltage supporting to 2.0V

■ 28 pins QFN 3.5 x 4.5mm package

■ ESD > 2.5kV, CDM > 500V

■ Lead(Pb)-Free and RoHS compliant

■ MUX / DEMUX

– Insertion loss: -1.4dB @ 5GHz typ.

-1.95dB @ 8GHz typ.

-2.25dB @ 10GHz typ.

– Return loss: -20dB @ 5GHz typ.

-20dB @ 8GHz typ.

-18dB @ 10GHz typ.

– Crosstalk Isolation: -50dB @ 5GHz typ.

-47dB @ 8GHz typ.

-45dB @ 10GHz typ.

– Off Isolation: -22dB @ 5GHz typ.

-19dB @ 8GHz typ.

-16dB @ 10GHz typ.

■ CC Functional

– Define Role: Device (UFP, default) or Host (DFP)

– Plug Orientation: Flipped or Not, and control Switch SEL

– (UFP) Current Capability Detect: 3.0A, 1.5A, or 0.9A

– (UFP) Rd

– (DFP) Rp (or Ip), Vconn SW if Ra

– (DFP) VBUS_EN to turn on Host VBUS SW

■ Vconn

– 5V, max Power is 1.5W, max current is 380mA

– Over current protection

Block Diagram

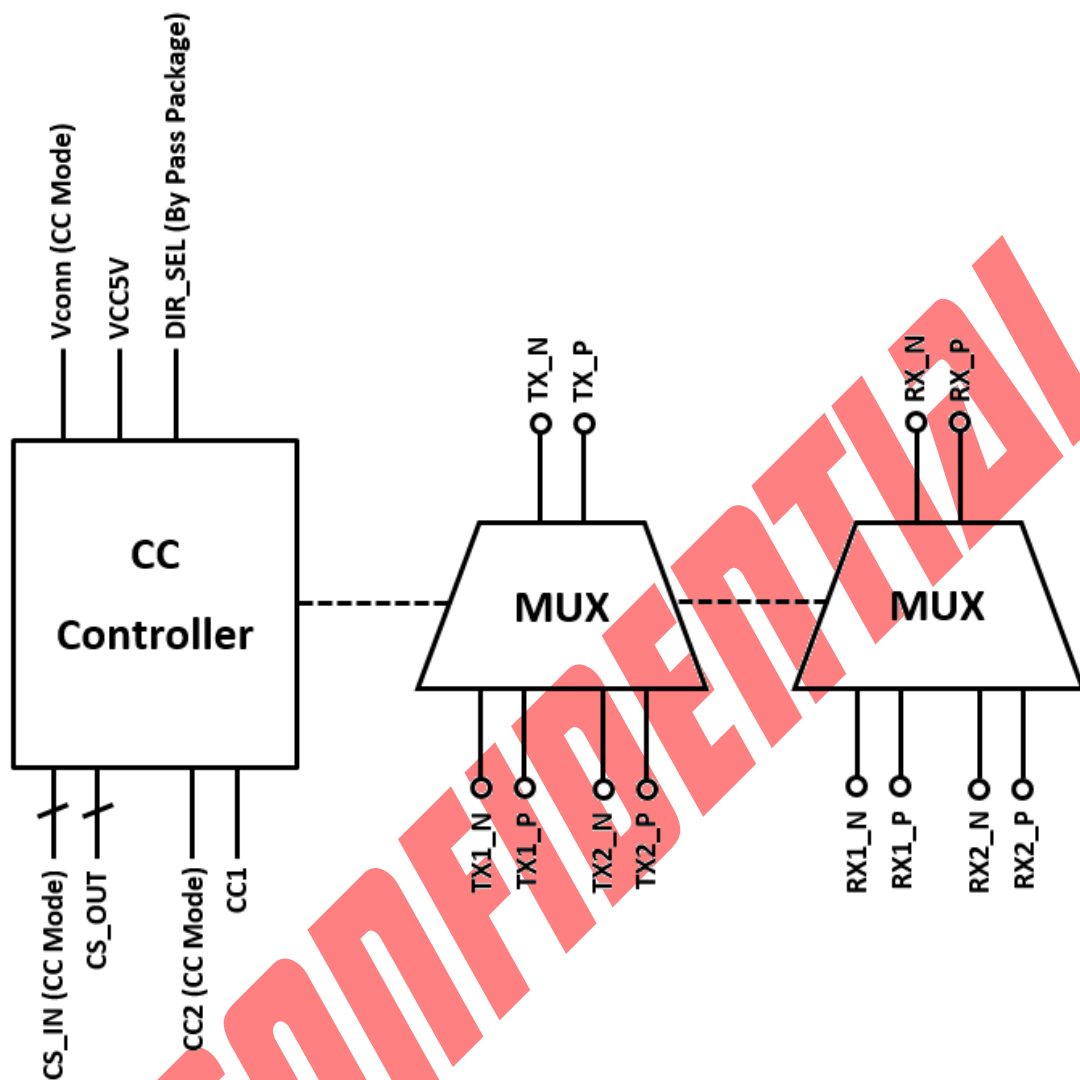


Figure 1 - Block Diagram

Pinout

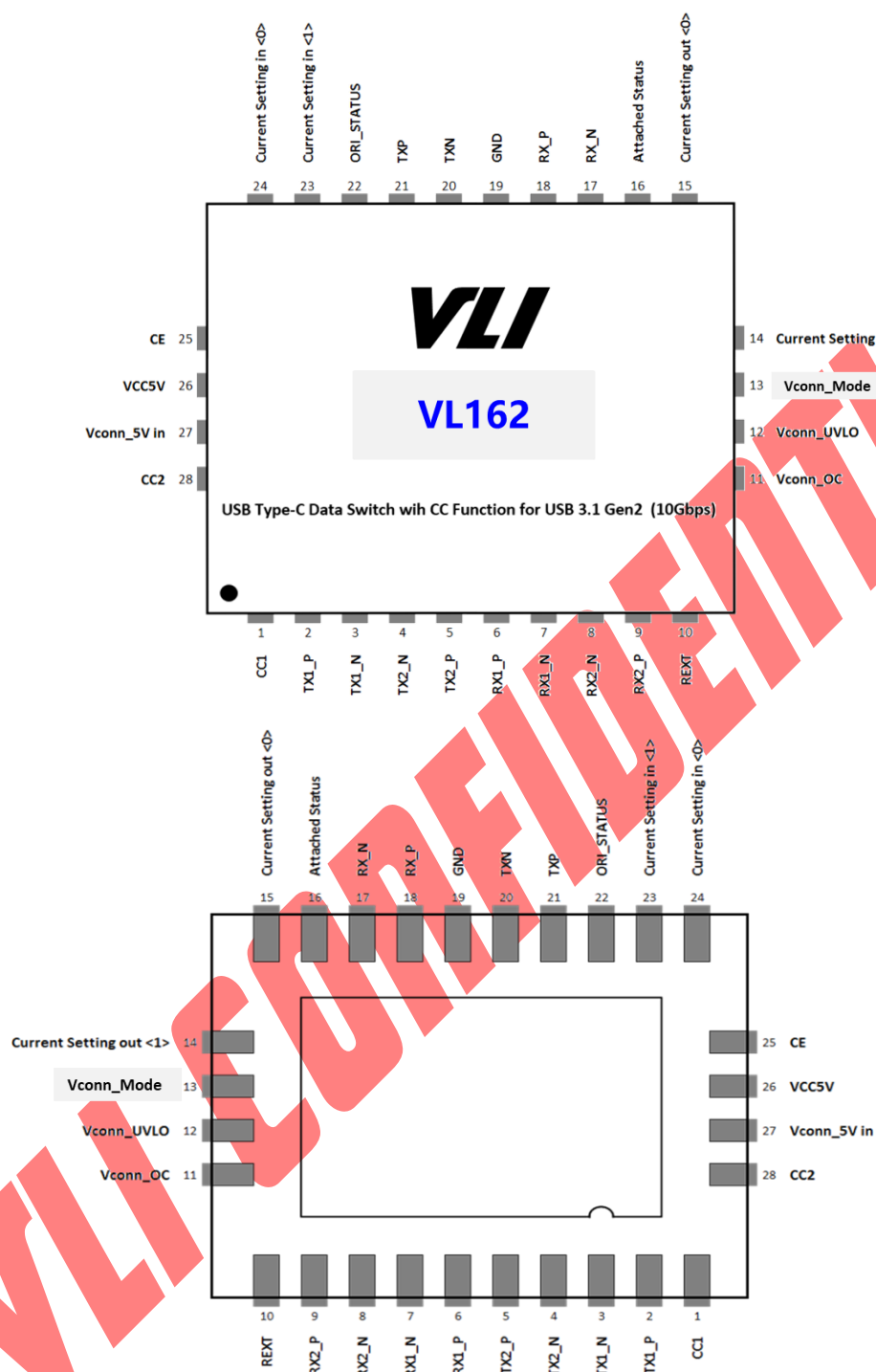


Figure 2 - Pin Diagram (QFN-28)

Pin List

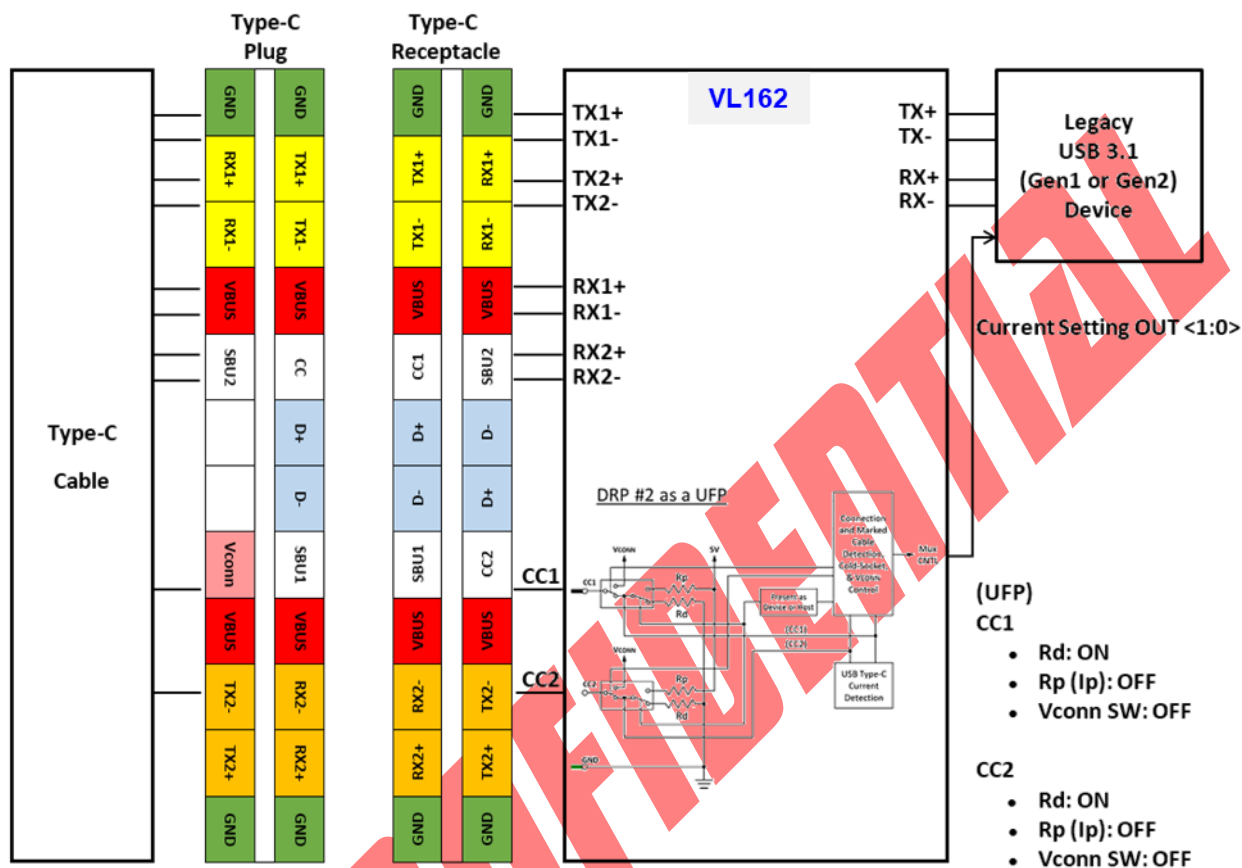
Pin	Pin Name	Pin	Pin Name
1	CC1	15	Current Setting out <0>
2	TX1_P	16	Attached_Status
3	TX1_N	17	RX_N
4	TX2_N	18	RX_P
5	TX2_P	19	GND
6	RX1_P	20	TXN
7	RX1_N	21	TXP
8	RX2_N	22	ORI_STATUS
9	RX2_P	23	Current Setting in <1>
10	REXT	24	Current Setting in <0>
11	Vconn_OC	25	CE
12	Vconn_UVLO	26	VCC5V
13	Vconn_Mode	27	Vconn_5V in
14	Current Setting out <1>	28	CC2

Pin Descriptions

Pin Name	Pin #	I/O	Description
CC1	1	AI/O	0~5V analog input
TX1_P	2	High Speed I/O	USB differential pair
TX1_N	3		
TX2_N	4	High Speed I/O	USB differential pair
TX2_P	5		
RX1_P	6	High Speed I/O	USB differential pair
RX1_N	7		
RX2_N	8	High Speed I/O	USB differential pair
RX2_P	9		
REXT	10		External resister 124k 1% connect to GND
Vconn_OC	11	DO	Vconn Over current, 3.3V = Over current
Vconn_UVLO	12	DO	Vconn Under voltage, 3.3V = under voltage
Vconn_Mode	13	DI	1)Vconn_Mode =GND: DFP supply Vconn when Rd attach 2) Vconn_Mode = Floating: Supply Vconn both in Rd & Ra attach
Current Setting out <1>	14	DO	(3.3V logic) 11: CC Support 3A 10: CC Support 1.5A 01: UNDEFINED 00: CC Support Legacy
Current Setting out <0>	15	DO	Reasoning: Easily identify 3A vs 1.5A or Legacy/1.5A or Legacy using just 1 pin. If they need to differentiate between 1.5A and 3A, then use 2 pins
Attached_Status	16	DO	Indication for port attached, 3.3V = attached
RX_N	17	High Speed I/O	USB differential pair
RX_P	18		
GND	19	GND	Ground
TXN	20	High Speed I/O	USB differential pair
TXP	21		
ORI_STATUS	22	DO	Orientation status 0 = TX1/RX1, 3.3V = TX2/RX2
Current Setting in <1>	23	AI	(3.3V logic) Rp/Rd setting input 00: Ip = 80uA 01: Ip = 180uA 10: Ip = 330uA 11: Rd = 5.1kΩ
Current Setting in <0>	24	AI	00: Rp = 36kΩ 01: Rp = 12kΩ 10: Rp = 4.7kΩ 11: Rd = 5.1kΩ
CE	25	DI	1)CE=5V: Chip Enable 2)CE=GND: Chip Disable
VCC5V	26	PWR	VCC5V for controller
VCONN_5V in	27	PWR	5V input for Vconn
CC2	28	AI/O	0~5V analog input

Application Diagram

Application for Cable + Device





The diagram illustrates the pin configurations for a USB Type-C cable and device, specifically for the VL162 component. It shows the connection between a Legacy USB 3.1 (Gen1 or Gen2) Host and a USB Type-C Cable + Device (Ra + Rd) or a Type-C Device (Rd).

Pin Configurations:

- Legacy USB 3.1 (Gen1 or Gen2) Host:** TX+, TX-, RX+, RX-.
- VL162:** TX1+, TX1-, TX2+, TX2-, RX1+, RX1-, RX2+, RX2-.
- USB Type-C Cable + Device (Ra + Rd) or Type-C Device (Rd):** GND, TX1+, TX1-, RX1+, RX1-, VBUS, CC1, SBU2, D+, D-, SBU1, CC2, VCONN, VBUS, RX2+, RX2-, TX2+, TX2-, GND.

Current Setting in <1:0>

CC1

- Rd: OFF
- Rp (Ip): ON
- Vconn SW: ON if Ra

CC2

- Rd: OFF
- Rp (Ip): ON
- Vconn SW: ON if Ra

DRP #1 as a DFP

The diagram shows the internal circuitry of the DRP #1 as a DFP (Data Rate Pin 1 as a Data Rate Pin 1). It includes a Connection and Marked Cable Detection, Gold Socket, & Vconn Control block, a USB Type-C Current Detection block, and a Present as Device or Host block. The circuit is connected to SW, Vconn, and GND pins.

Electrical Specification

Absolute Maximum Rating

Symbol	Parameter	Min	Max	Unit	Note
T _{STG}	Storage Temperature	-55	125	°C	-
VDD	Supply voltage	-0.3	6.0	V	
V _{ESD}	Electrostatic Discharge	2kV		V	Human Body Model
θ _{jc}	Thermal resistance between junction and case	4L PCB	36.7	°C/W	
		2L PCB	28.1		
T _j	Junction Temperature	0	125	°C	

Note: Stress above conditions may cause permanent damage to the device.
Functional operation of this device should be restricted to the conditions described.

Note: About thermal factors, T_a is the concerned ambient temperature, and

$$\theta_{ca} = \theta_{ja} - \theta_{jc}$$

$$T_j = \theta_{ja} * P_D + T_a$$

$$T_c = \theta_{ca} * P_D + T_a$$

Operating Conditions

Symbol	Parameter	Min	Typ.	Max	Unit	Note
VDD	Supply voltage	4.5	5.0	5.5	V	
T _A	Ambient Temperature	-45		85	°C	

Static characteristics:

VDD = 5.0V ± 10%; Temp = -40°C to +85°C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
IDD	Supply current	Operation mode		1.2		mA
		Shutdown mode		0.5		mA
VIH	High-level input voltage		2.7			V
VIL	Low-level input voltage				0.4	V
Vcom	Input Common mode voltage		0		2	V

Reflow Profile

Follow: IPC/JEDEC J-STD-020 D.1

Condition

Average ramp-up rate (217°C to peak): 1~2°C/sec max.

Preheat: 150~200°C, 60~120 seconds

Temperature maintained above 217°C: 60~150 seconds

Time (tp)* within 5°C of the specified classification temperature ($T_c = (260^\circ\text{C})$), (the time above 255°C) ≥ 30 sec.

Peak temperature: $260 \pm 5/0^\circ\text{C}$

Ramp-down rate: 3°C/sec. max.

Time 25°C to peak temperature: 8 minutes max.

Cycle interval: 5 minus

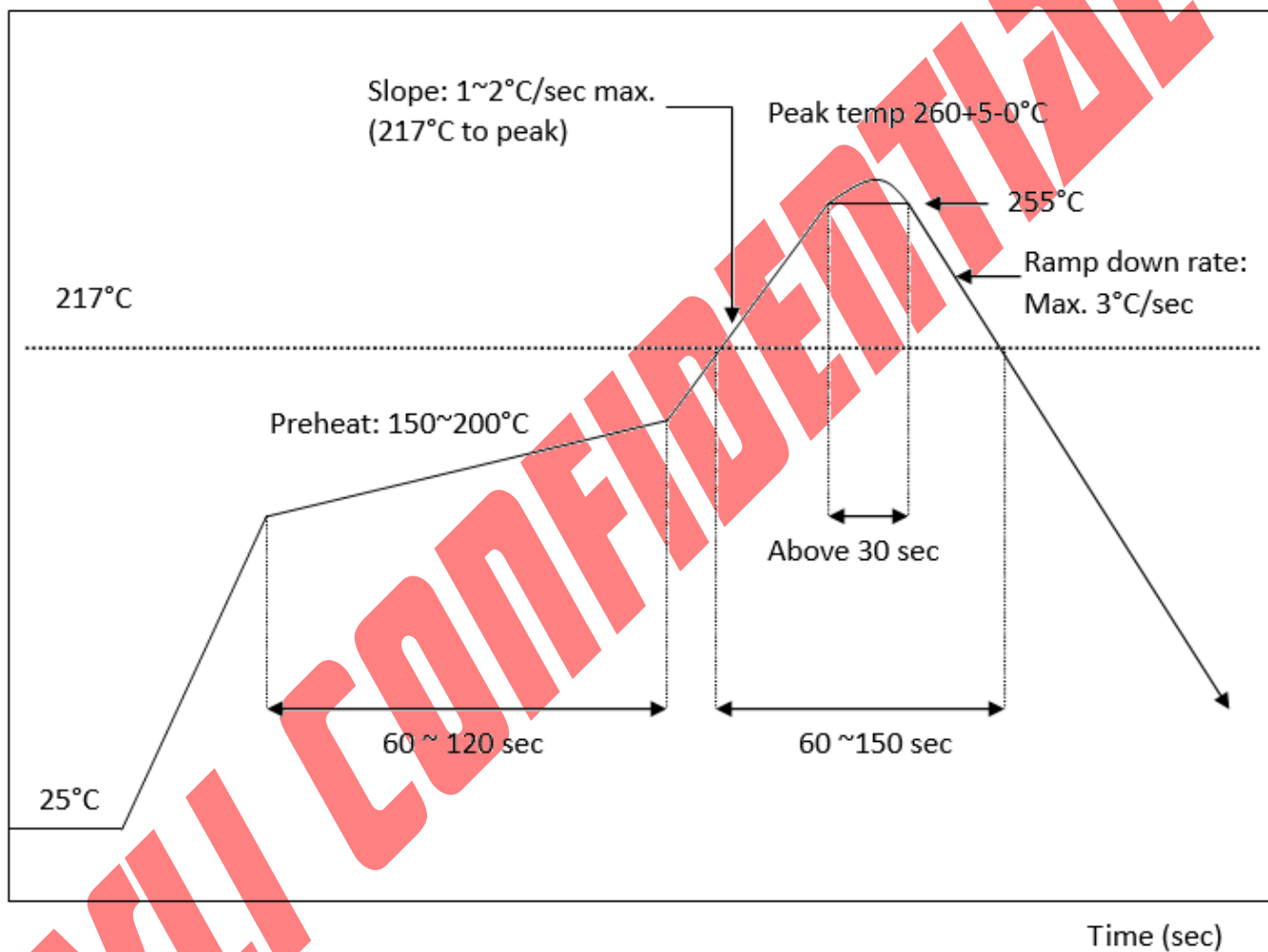


Figure 3 - Reflow

Package Mechanical Specifications

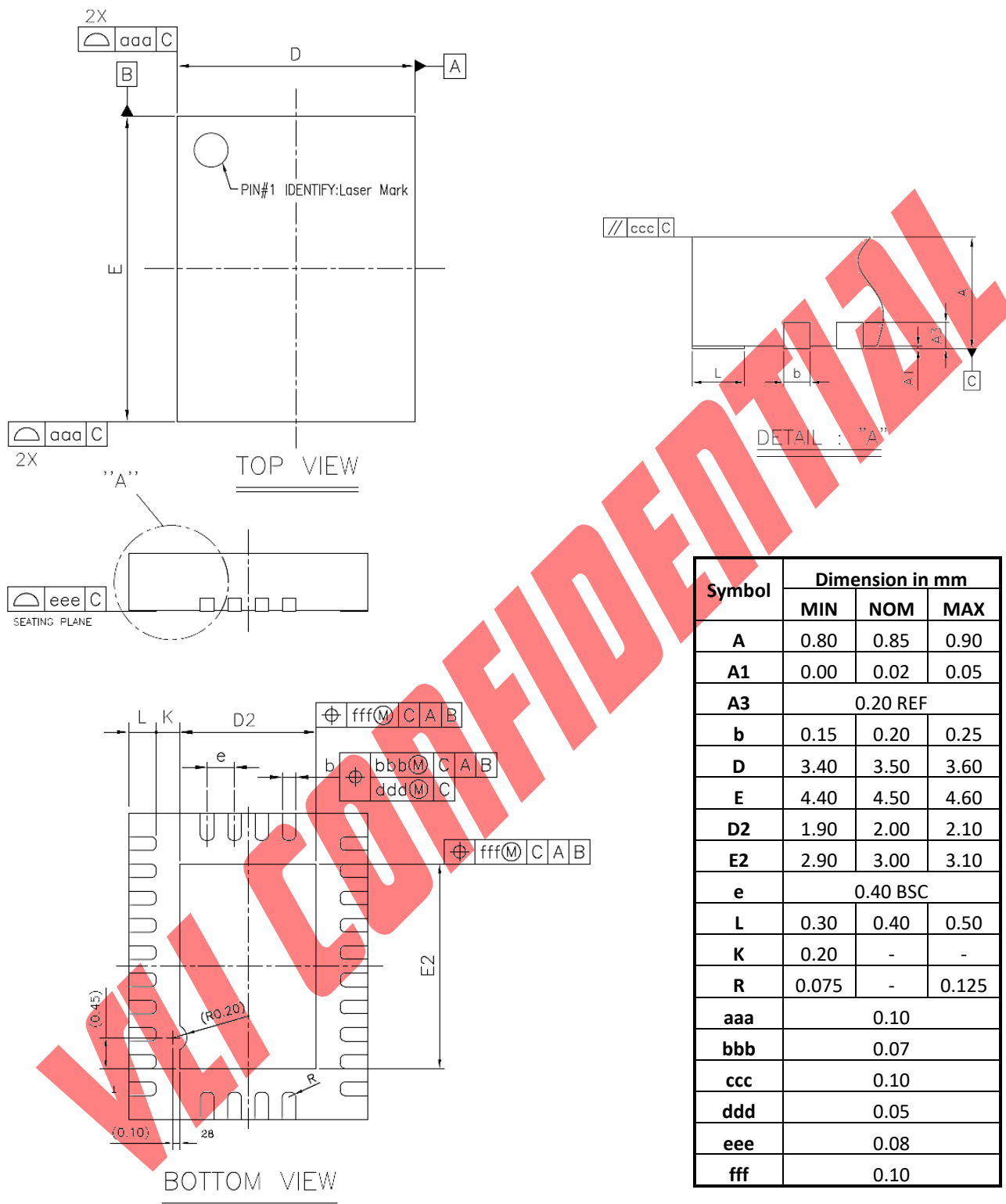


Figure 4 - Mechanical Specification

Package Top Side Marking

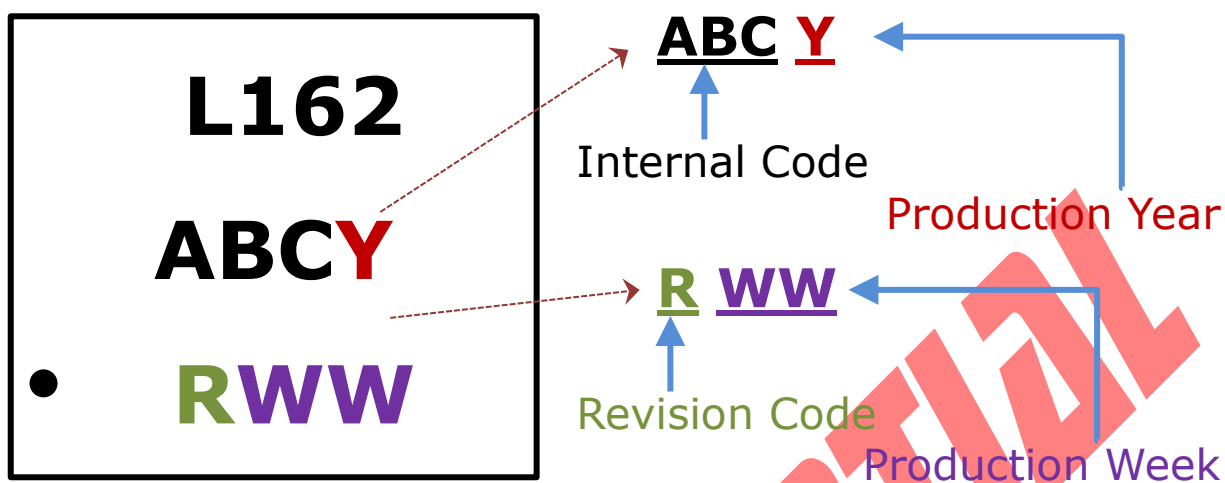
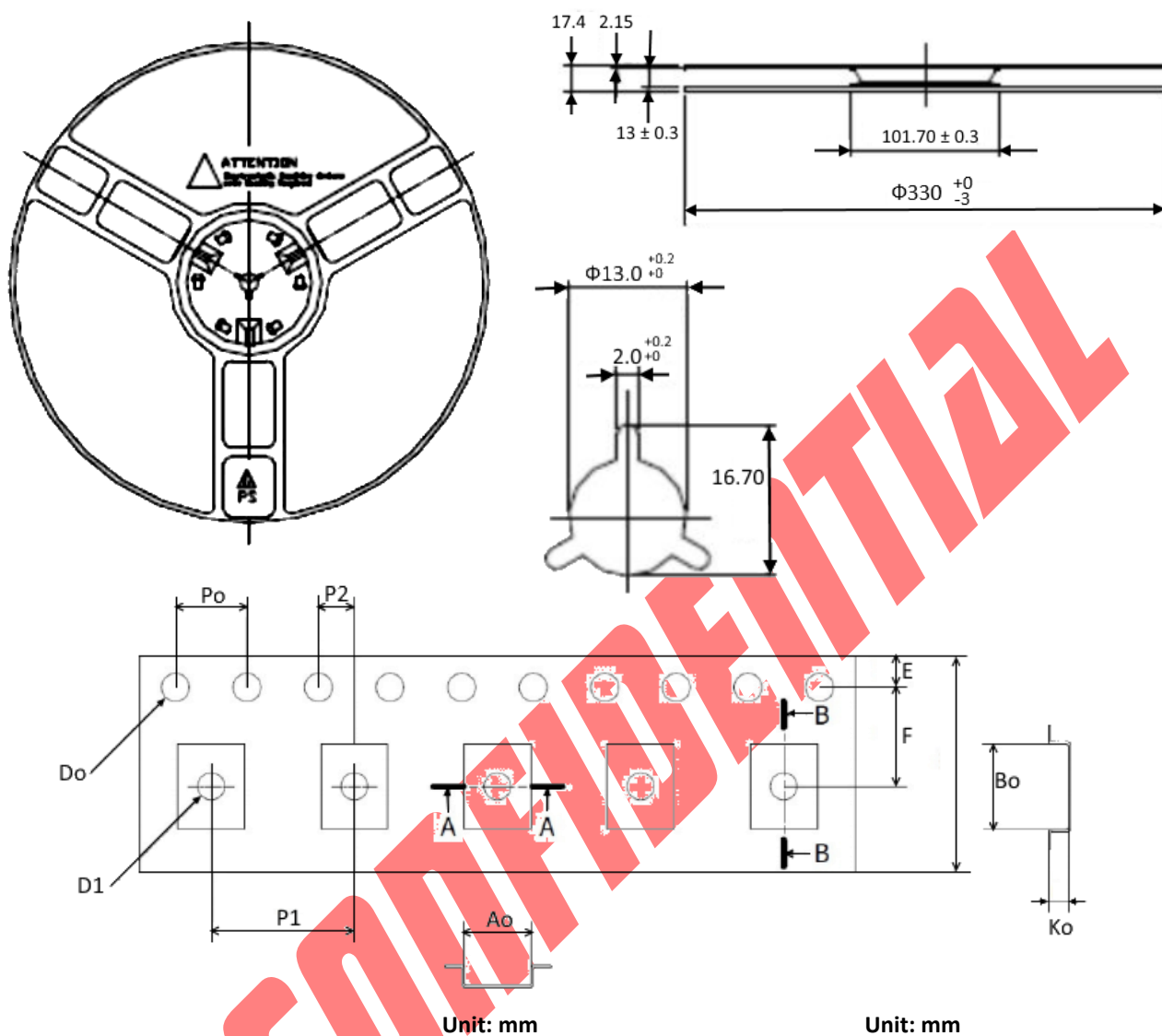


Figure 5 - Package Top Side Marking

Ordering Information

Please contact VIA Labs sales representative or distributor in your region for ordering part number details.

Tape and Reel Information



Unit: mm

Symbol	Spec	Tolerance
Ao	3.75	± 0.10
Bo	4.75	± 0.10
Ko	1.10	± 0.10

Unit: mm

Symbol	Spec	Tolerance
Po	4.00	± 0.10
P1	8.00	± 0.10
P2	2.00	± 0.05
Do	1.55	± 0.05
D1	1.50	(Min.)
E	1.75	± 0.10
F	5.50	± 0.05
10Po	40.00	± 0.20
W	12.00	± 0.20
T	0.25	± 0.05

Figure 6 - Tape & Reel Information

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VIA Labs, Inc.

www.via-labs.com

7F, 529-1, Zhongzheng Rd.,
Xindian District, New Taipei City 23148 Taiwan, R.O.C.
TEL: 886-2-2218-1838

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