Description

The CLA7913 is a Power Delivery (PD) SINK controller IC. The CLA7913 can request the maximum or specified voltage from the power supplies that complied with the Type-C PD protocol. The CLA7913 built in pull-low resistor on CC1 and CC2 pins. When the CLA7913 connected to the TYPE-C source device, the PD communication will be triggered and started automatically. The selected voltage will be requested and all related PD protocol will be completed.

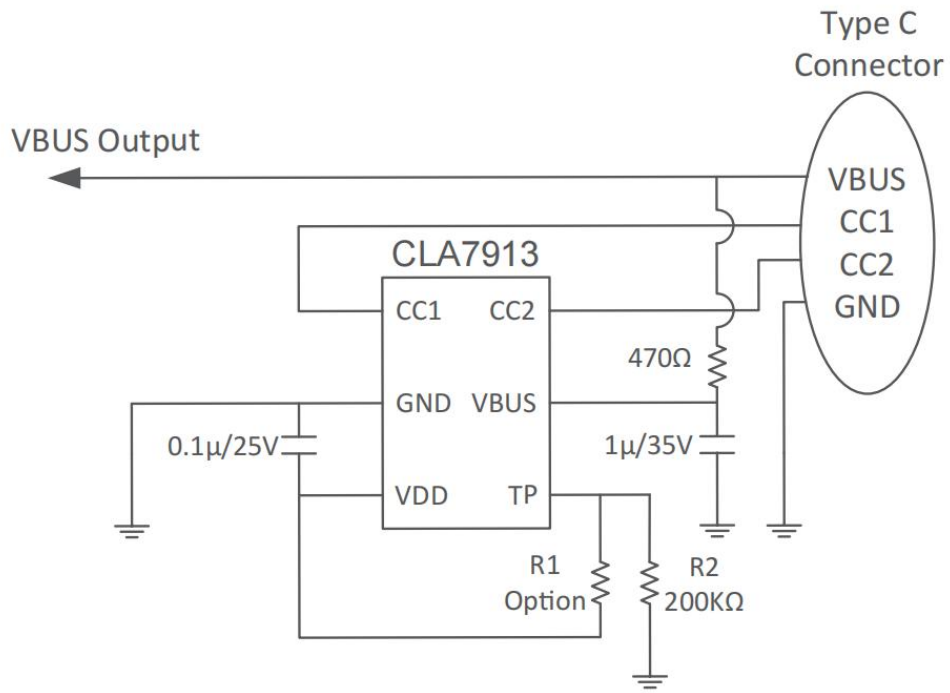
Features

- Support USB Type-C Specification Release 1.3
- Support USB PD2.0 and PD3.0 communication protocol up to seven Power Object
- Operating voltage: 4.6V to 20V
- Package type: SOT23-6L

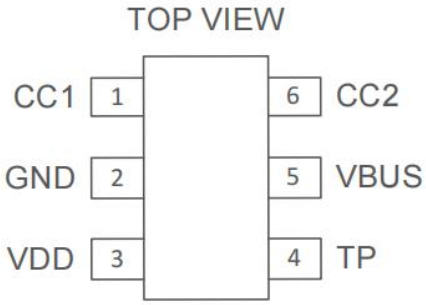
Applications

- Audio
- STB
- Router
- Home Application
- Lighting

Application circuit



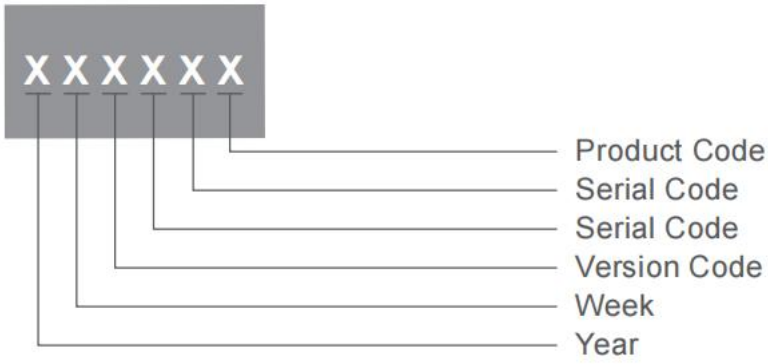
Pin Configuration



Pin Description

NAME	NO	DESCRIPTION
CC1	1	PD CC1
GND	2	Ground
VDD	3	Regulator out
TP	4	Test and option pin
VBUS	5	PD VBUS IN
CC2	6	PD CC2

Marking Information



Ordering Information

ORDER NUMBER	OPERATING TEMPERATURE	PACKAGE	MOQ
CLA7913	-20℃ ~ +85℃	SOT-23-6L	3000EA/Reel

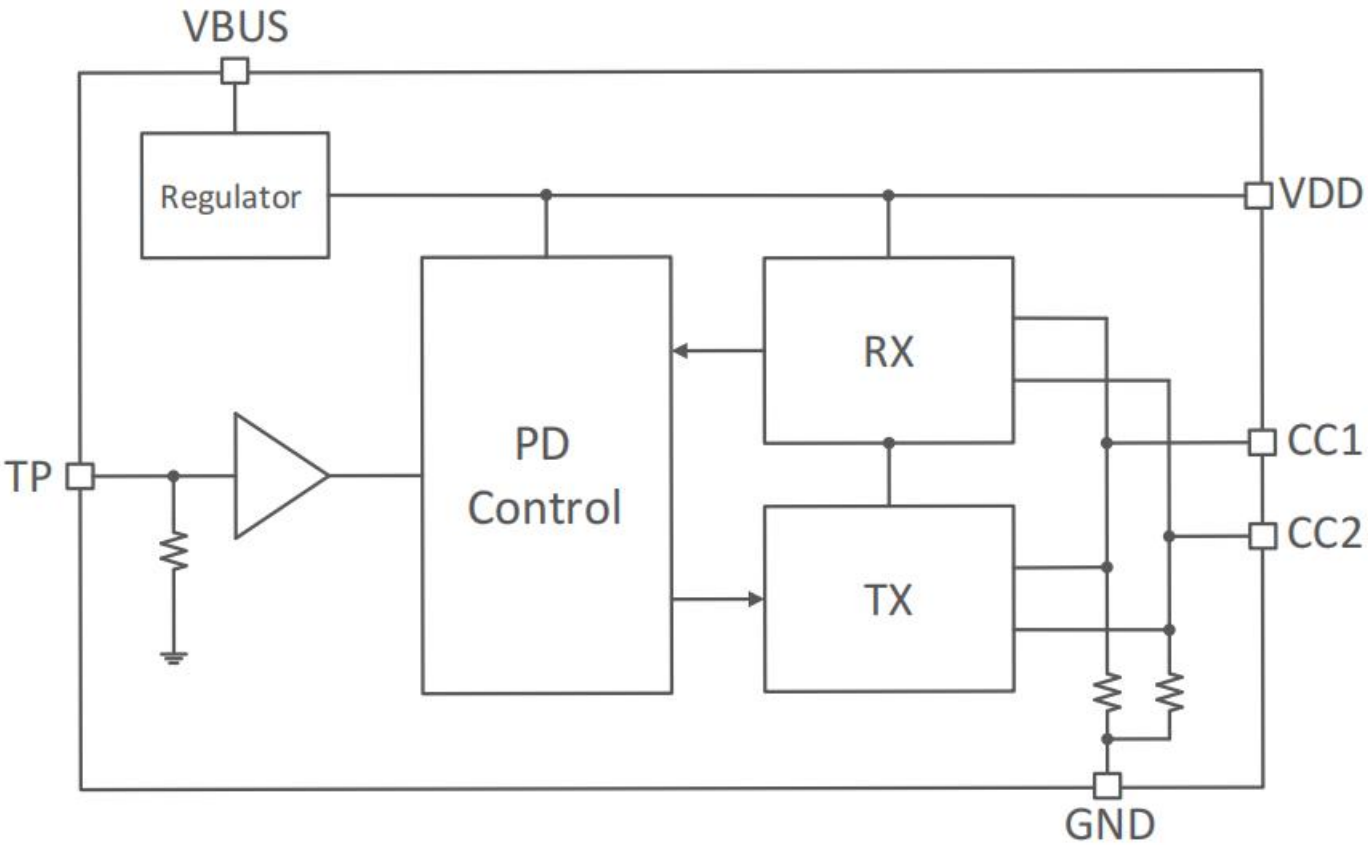
Absolute Maximum Ratings

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply voltage	V_{BUS}		0	-	28	V
CC1, CC2 voltage	V_{CC1}, V_{CC2}		-0.3		28	V
VDD, TP Voltage	VDD, VTP		-0.3		3.3	V
Thermal resistance (SOT-23-6)	θ_{JA}	SOT-23-6L	-	-	220	℃/W
Allowable power dissipation	P_D	SOT-23-6L, $T_A \leqq +25$℃			455	mW
Operation temperature			-25		+85	℃
Storage temperature	T_S	SOT-23-6L	-40		+150	℃
Lead temperature		soldering time 10sec	-	-	+260	℃

Recommended Operating Conditions

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply voltage	V_{BUS}		4.6		20	V
Operating temperature			-25		+85	℃

Functional Block Diagram



DC Electrical Characteristics

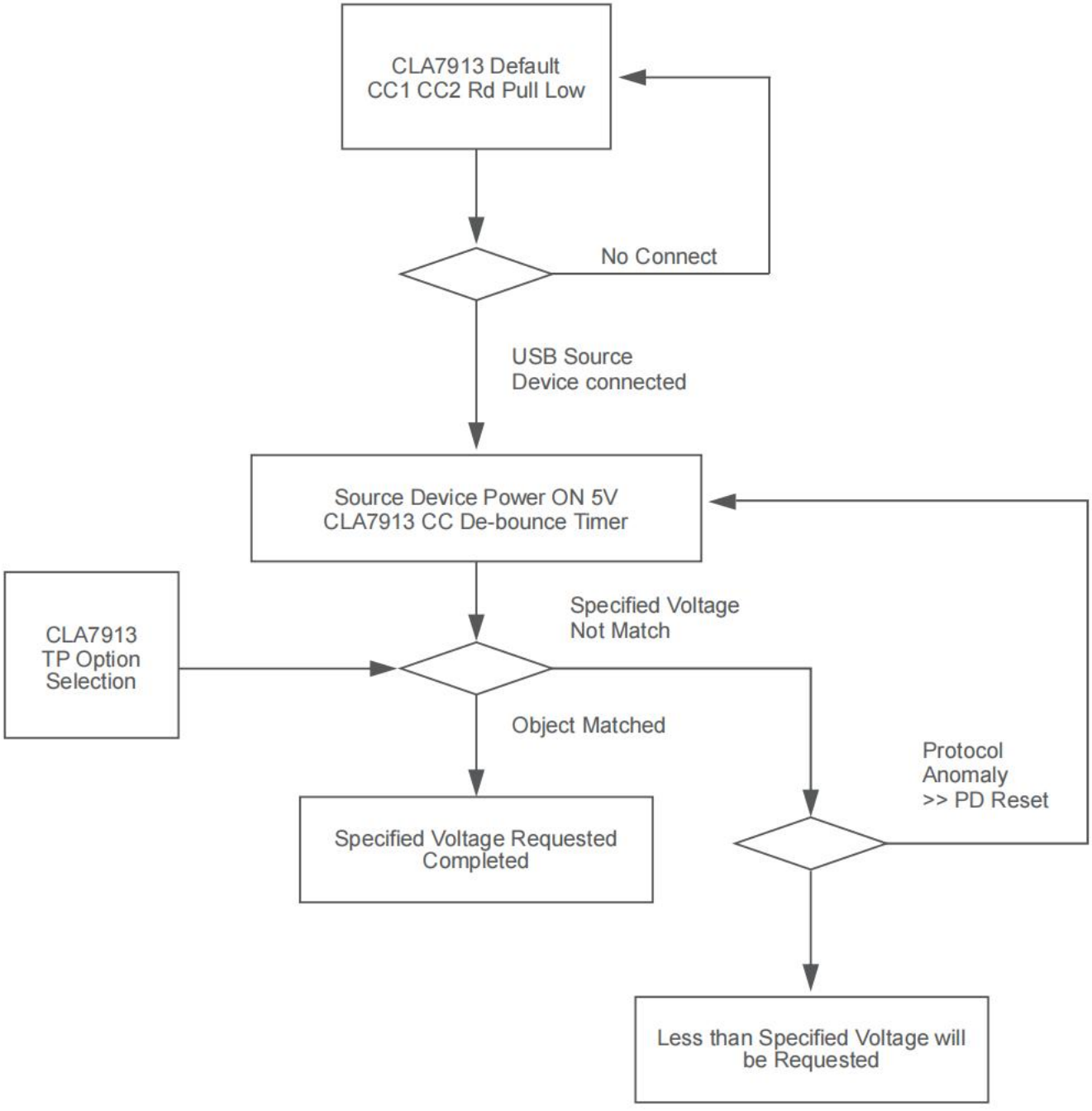
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
VDD regulator	V_{BUS}=5V		3.3		V
Operation current	V_{BUS}=5V		1.28		mA
Option voltage (max)	V_{BUS}=5V		0		V
Option voltage (≦15V)	V_{BUS}=5V		3/8*VDD		V
Option voltage (≦12V)	V_{BUS}=5V		5/8*VDD		V
Option voltage (≦9V)	V_{BUS}=5V		7/8*VDD		V

PD Electrical Characteristics

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Pull down resistance through each C_CC pin when in a disconnect state	RD_CC		4.85	5.1	5.35	kΩ
Threshold voltage of the pull-down FET in series with RD during dead battery	VTH_DB		0.5	0.9	1.2	V
PD data bit rate	PD_BITRATE		270	300	330	Kbps
Unit interval (1/PD BITRATE)	UI		3.03	3.33	3.7	μs
Capacitance for a cable plug (each plug on a cable may have up 25pF to this value	CCBLPLUG				25	pF
Cable characteristic impedance	ZCABLE		32		65	Ω
Receiver capacitance. Capacitance looking into C_CCn pin when in receiver mode	CRECEIVER		70		120	pf
TX Transmit Peak Voltage	VTXP		1.14	1.2	1.26	V
TX output impedance. Source output impedance at the Nyquist frequency of USB2.0 low speed (750kHz) while the source is driving the C_CCn line	ZDRIVER		33		75	Ω
Rise Time. 10% to 90% amplitude points, minimum is under an unloaded condition. Maximum set by TX mask	TRISE		300			ns
Fall Time. 90% to 10% amplitude points, minimum is under an unloaded condition. Maximum set by TX mask	TFALL		300			ns
Rx Receive Rising Input threshold	VRXTR		605	630	655	mV
Rx Receive Rising Input threshold	VRXTF		450	470	490	mV
Receiver input impedance	ZBMCRX		10			MΩ
Rx bandwidth limiting filter. Time constant of a single pole filter to limit broadband noise ingression	TRXFILTER		100			ns

Operating Algorithm

The CLA7913 will complete the PD protocol negotiation after PD source device connected. The following diagram shows the PD connection algorithm.



Option Voltage Selection

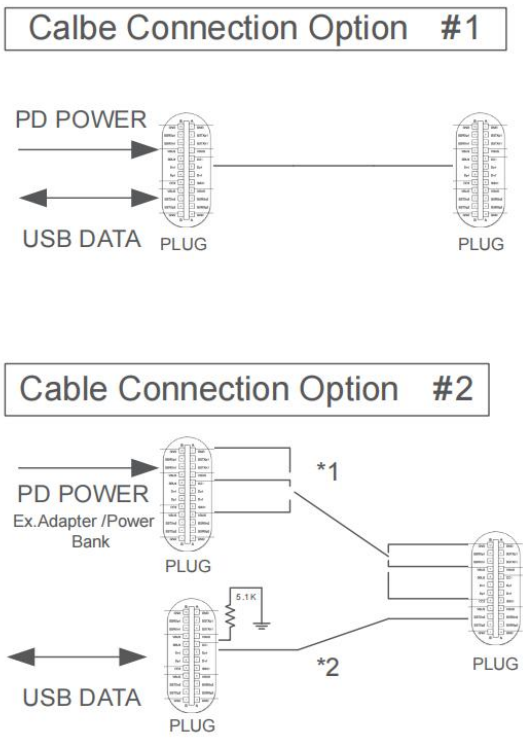
The CLA7913 will request maximum voltage of the source device. The TP option can select the other voltage object. The following table shows TP voltage and request voltage selection.

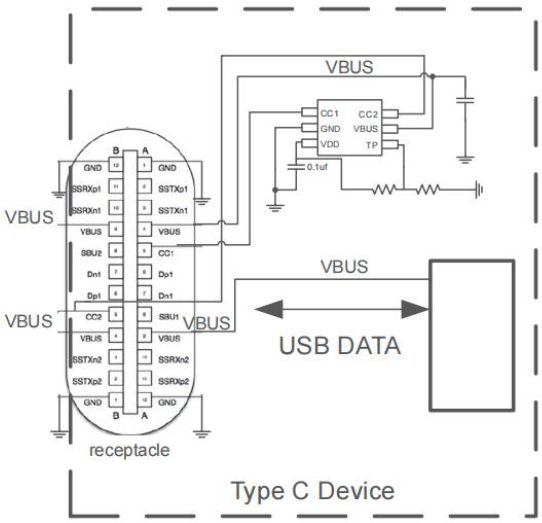
OPTION	TP VOLTAGE	PD REQUEST	DESCRIPTION
OPT1	Default (0V)	MAX OBJ	Request maximum voltage of the source device
OPT2	3/8*VDD	15V	Request voltage must ≦15V
OPT3	5/8*VDD	12V	Request voltage must ≦12V
OPT4	7/8*VDD	9V	Request voltage must ≦9V

The option selection of CLA7913 is used to protect the connected device. The following example shows the result of requested voltage.

SOURCE POWER (W)	PD SOURCE SUPPLY					CLA7913 REQUEST VOLTAGE			
	OBJECT 20V	OBJECT 15V	OBJECT 12V	OBJECT 9V	OBJECT 5V	OPTION 1	OPTION 2	OPTION 3	OPTION 4
60	√	√	√	√	√	20	15	12	9
45		√	√	√	√	15	15	12	9
30		√	√	√	√	15	15	12	9
30		√		√	√	15	15	9	9
15				√	√	9	9	9	9
-	√				√	20	5	5	5
-		√			√	15	15	5	5

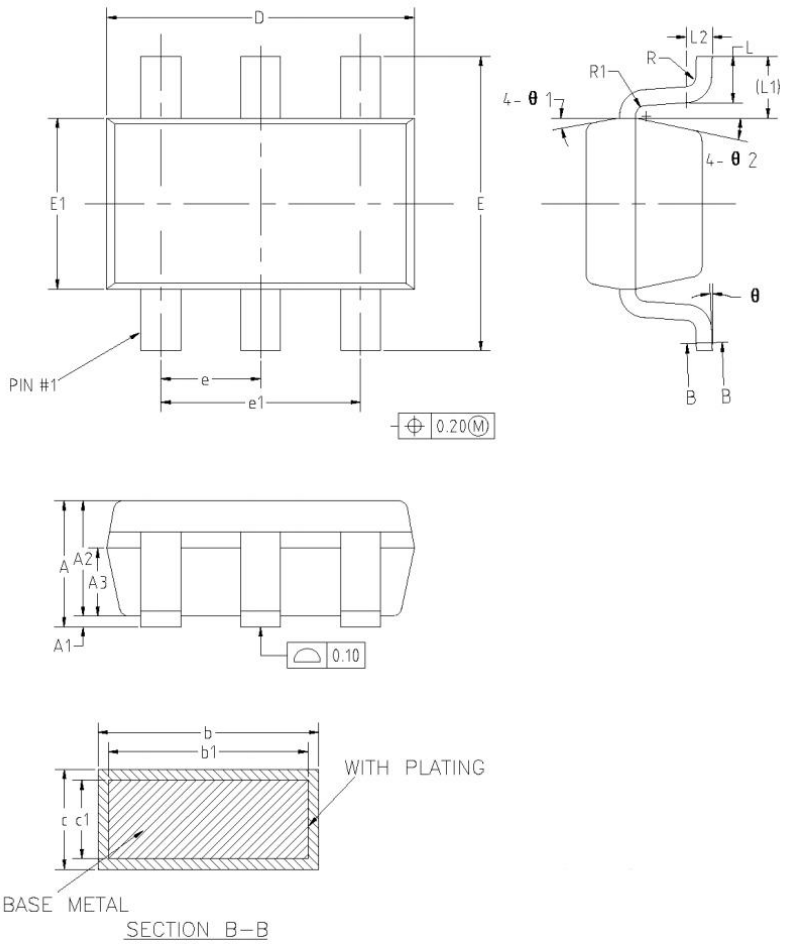
Appendix
Data Transmission & PD





*1 Either CC1 or CC2 can be used for connection, and both CC1 and CC2 can not be connected on this end of TYPE-C cable at the same time.
*2 Choose one and only one of the CC1 or CC2, connect to ground with a resistance of 5.1KΩ.

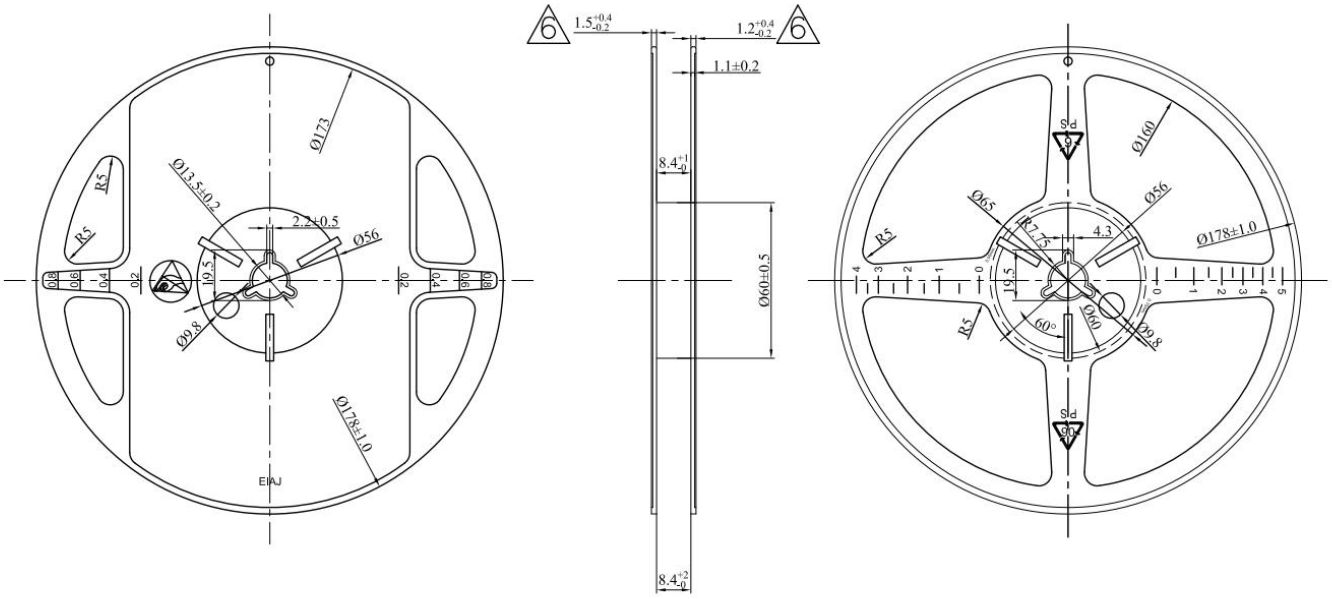
Package Outline



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	–	–	1.25
A1	0	–	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	–	0.45
b1	0.35	0.38	0.41
c	0.14	–	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.30	0.44	0.60
L1		0.59REF	
L2		0.25BSC	
R	0.05	–	0.20
R1	0.05	–	0.20
θ	0°	–	8°
θ 1	8°	10°	12°
θ 2	10°	12°	14°

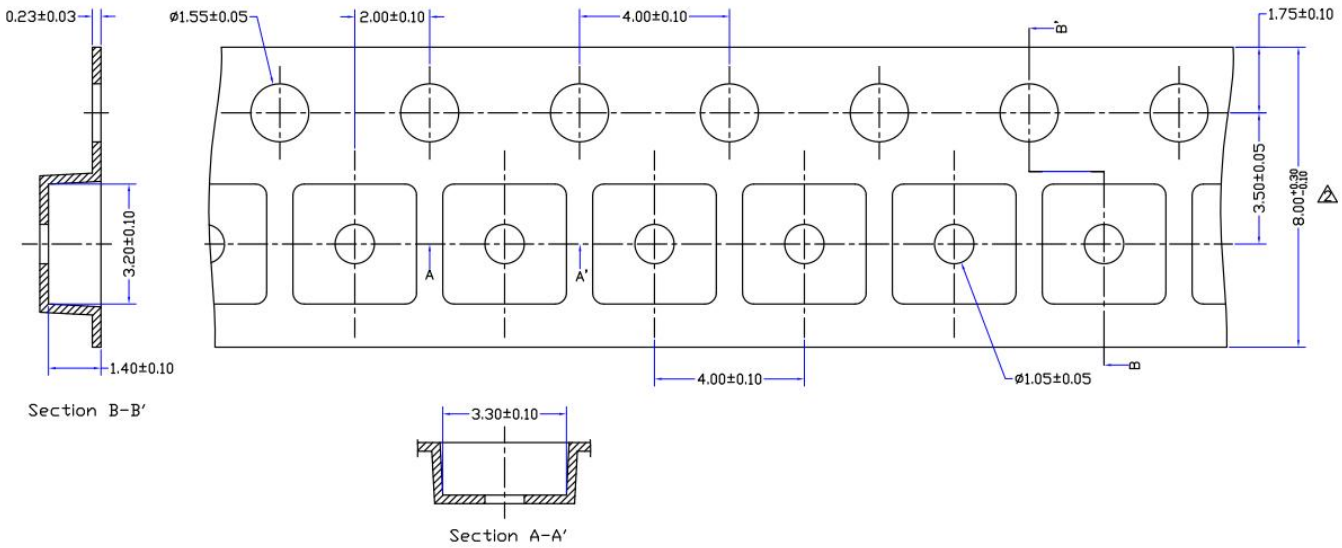
Package Outline



Notes:

1. Material: PS(Blue)
2. Flatness: maximum allowance of 3mm
3. All dimensions in millimeters
4. Surface resistance: 10^5 TO 10^{10} OHMS/SQ
5. All unremarked tolerance: ±0.25

Package Outline



NOTES:
1.MATERIAL:CONDUCTIVE PS
2.ALL DIMS IN MM
3.There must not be foreign body adhesion and the state of the surface must be excellent
4.A permissible difference of the accumulation pitch of the sending hole is assumed to be ±0.2 up to 10 pitches
5.ø560 PAPER-Reel, 255000pockets(1020m)
6.Surface resistance 1X10E5~1X10E9 OHMS/SQ

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