# LDR6023 USB Type-C PD Controller

REV2.2

**Document History**

| | | |
|---|---|---|
| REV1.0 | New data sheet. | 2015-10-08 |
| REV2.0 | Updated Packaging. | 2016-03-16 |
| REV2.1 | Add the sop14 and ssop16 | 2017-10-27 |
| REV2.2 | Revise ssop16 Package Dimension | 2018-05-07 |

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# Contents

# 1.General Description

LDR6023 is a dual USB-C DRP interface USB PD communication chip developed by Legendary Technologies Co, Ltd for Bridge devices in the USB Type-C standard. With the function of transparently transferring power negotiation data packets, switching the data role , and enabling the intelligent device by VDM negotiation to enter the ALT Mode output DP signal, It especially applied to USB TYPE-C Docking and HUB applications.

# 2 Features

- ◇ USB Type-C Spec Rev1.2 compatible and USB PD Spec Rev3.0 compatible
- ◇ Supporting two USB-C DRP ports
- ◇ Supporting the consultation of PDO and REQUEST between Transparent adapter and intelligent device(PC,tablet PC,mobile phone)
- ◇ Automatically switching DR_SWAP to UFP mode
- ◇ Enabling the intelligent device by VDM negotiation to enter the ALT Mode output DP signal

# 3 Applications

- ◇ TYPE-C Docking, Hub, TYPE-C to HDMI/DP/VGA converter
- ◇ USB-C To HDMI Cable

# 4 Pin-outs

## 4.1 LDR6023 Pin-out Diagram

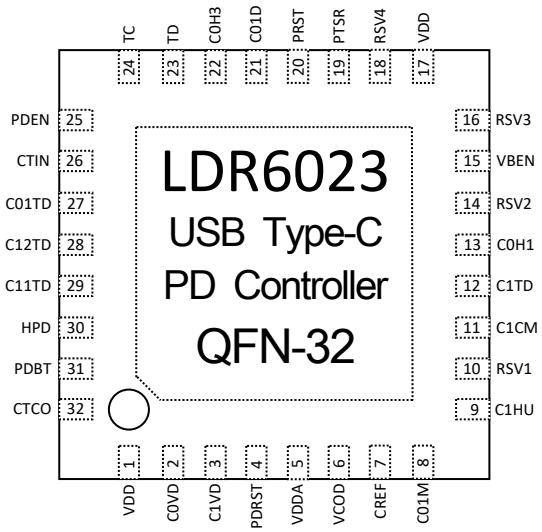



Figure 1. LDR6023 Pin-out

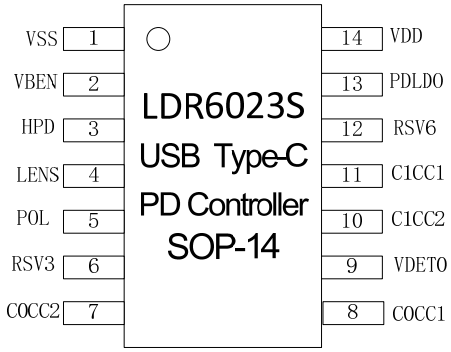



Figure 2. LDR6023S Pin-out

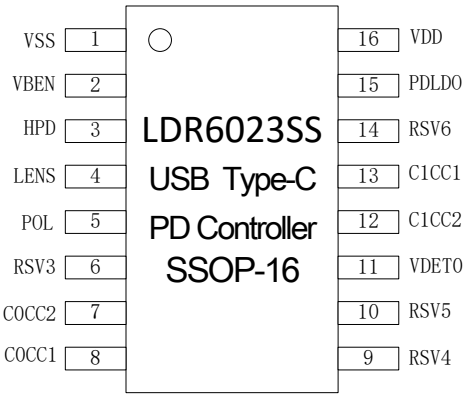



Figure 3. LDR6023SS Pin-out

## 4.2 LDR6023 Pin-out Description

### LDR6023Q Pin-out Description

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | VDD | P | Power Input Vcc=3.3V |
| 2 | C0VD | I | C0 Port VBUS Detect |
| 3 | C1VD | I | C1 Port VBUS Detect |
| 4 | PDRST | I | External Chip Reset |
| 5 | VDDA | P | Analog Power Input Vcc=3.3V |
| 6 | VCOD | I | VCONN Detect |
| 7 | CREF | I | USB PD Voltage Reference |
| 8 | C01M | G | C0 Port CC1 Voltage Detect |
| 9 | C1HU | P | C1 Port Rp for Default USB Power |
| 10 | RSV1 | - | Reserved |
| 11 | C1CM | I | C1 Port CC1 Voltage Detect |
| 12 | C1TD | O | C1 Port CC BMC Transport |
| 13 | C0H1 | I | C0 Port Rp for 1.5 A |
| 14 | RSV2 | - | Reserved |
| 15 | VBEN | O | VBUS Enable |
| 16 | RSV3 | - | Reserved |
| 17 | VDD | P | Power Input Vcc=3.3V |
| 18 | RSV4 | - | Reserved |
| 19 | PTSR | - | Reserved |
| 20 | PRST | - | Reserved |
| 21 | C01D | O | C0 Port Rd |
| 22 | C0H3 | O | C0 Port Rp for 3.0 A |
| 23 | TA | IO | Firmware upgrade interface A, connect to C1 port A8 pin |

| | | | |
|---|---|---|---|
| 24 | TB | IO | Firmware upgrade interface B, connect to C1 port B8 pin |
| 25 | PDEN | O | C0 Port PD engine enable |
| 26 | CTIN | I | External clock input |
| 27 | C01TD | O | C0 Port CC1 BMC Transport |
| 28 | C12TD | O | C1 Port CC2 BMC Transport |
| 29 | C11TD | O | C1 Port CC2 BMC Transport |
| 30 | HPD | I | DP Hot Plug Detect |
| 31 | PDBT | I | System Reference input, connect 100K to GND |
| 32 | CTCO | O | System clock output |
| PAD | PAD | G | Ground |

Type: P-Power; G-Ground; I-Input; O-Output; IO-Input/Output.

## LDR6023S Pin-out Description

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | VSS | G | Ground |
| 2 | VBEN | O | VBUS Enable |
| 3 | HPD | I | DP Hot Plug Detect, DP signal output enabled by high level |
| 4 | LENS | I | DP Mode Configuration, pull-dowm 10k resistance means 4 lane,float means 2 lane |
| 5 | POL | O | The way of C0 port locked, low level means CC1, high level means CC2 |
| 6 | RESV3 | -- | Reserved |
| 7 | C0CC2 | IO | C0 Port CC2 BMC Transport |
| 8 | C0CC1 | IO | C0 Port CC1 BMC Transport |
| 9 | VDET0 | I | C1 Port VBUS Detect |
| 10 | C1CC2 | IO | C1 Port CC2 BMC Transport |
| 11 | C1CC1 | IO | C1 Port CC1 BMC Transport |
| 12 | RSV6 | -- | Reserved |
| 13 | PDLDO | O | LDO for USB PD,connect to the capacitor |

| | | | |
|---|---|---|---|
| 14 | VDD | -- | Power |

Type: P-Power; G-Ground; I-Input; O-Output; IO-Input/Output.

## LDR6023SS Pin-out Description

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | VSS | G | Ground |
| 2 | VBEN | O | VBUS Enable |
| 3 | HPD | I | DP Hot Plug Detect, DP signal output enabled by high level |
| 4 | LENS | I | DP Mode Configuration, pull-dowm 10k resistance means 4 lane,float means 2 lane |
| 5 | POL | O | The way of C0 port locked, low level means CC1, high level means CC2 |
| 6 | RSV3 | -- | Reserved |
| 7 | C0CC2 | IO | C0 Port CC2 BMC Transport |
| 8 | C0CC1 | IO | C0 Port CC1 BMC Transport |
| 9 | RSV4 | -- | Reserved |
| 10 | RSV5 | -- | Reserved |
| 11 | VDET0 | I | C1 Port VBUS Detect |
| 12 | C1CC2 | IO | C1 Port CC2 BMC Transport |
| 13 | C1CC1 | IO | C1 Port CC1 BMC Transport |
| 14 | RSV6 | -- | Reserved |
| 15 | PDLDO | O | LDO for USB PD,connect to the capacitor |
| 16 | VDD | P | Power |

Type: P-Power; G-Ground; I-Input; O-Output; IO-Input/Output.

# 5 Electrical Characteristics

## 5.1 Maximum Ratings

| Parameter | Description | Min/Max | Unit |
|---|---|---|---|
| VCC | Power supply | -0.3/3.6 | V |
| $V_I$ | Voltage input | -0.3/3.6 | V |
| $V_O$ | Voltage output | -0.3/3.6 | V |
| $T_{stg}$ | Storage temperature | -65/150 | ℃ |

## 5.2 ESD Characteristics

| Parameter | Description | Range | Unit |
|---|---|---|---|
| $V_{ESD}$ | Human body model ESD | ±2000 | V |
| | Machine model ESD | ±1000 | V |

## 5.3 Operating Ranges

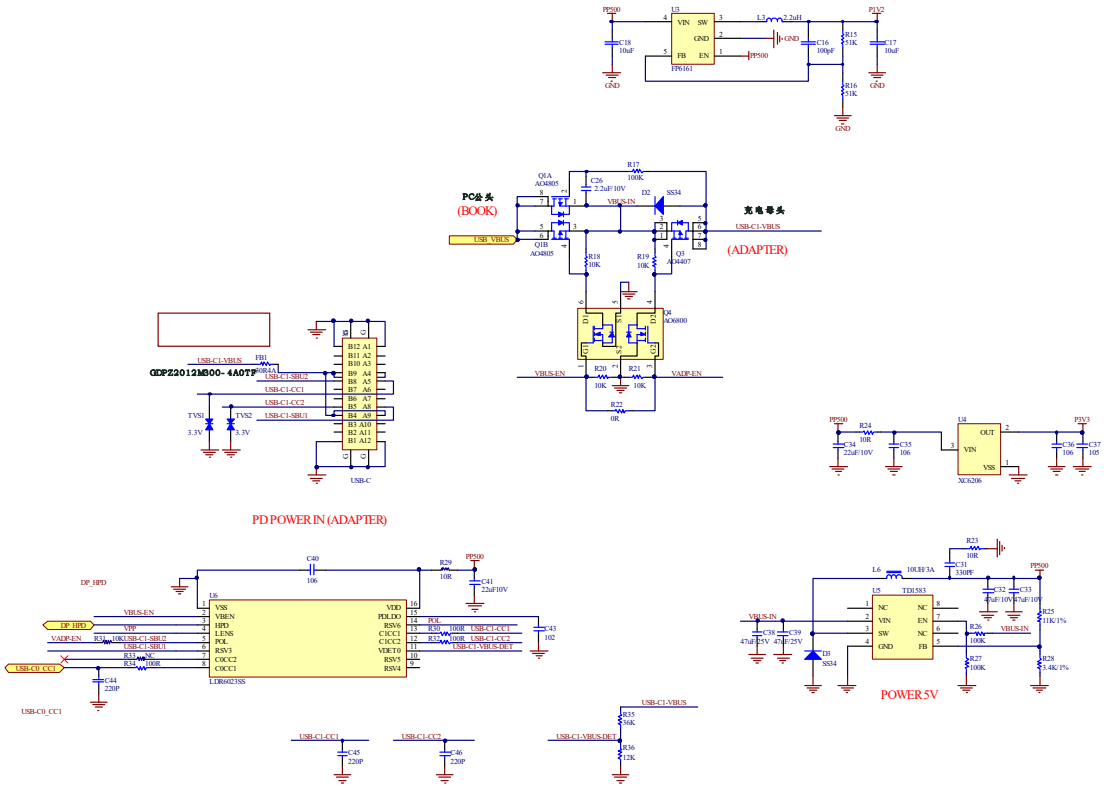
| Parameter | Description | Min/Max | Unit |
|---|---|---|---|
| VCC | Power supply | 3.0/3.6 | V |
| Ta | Storage temperature | -40/85 | ℃ |

# 6 Application Solution

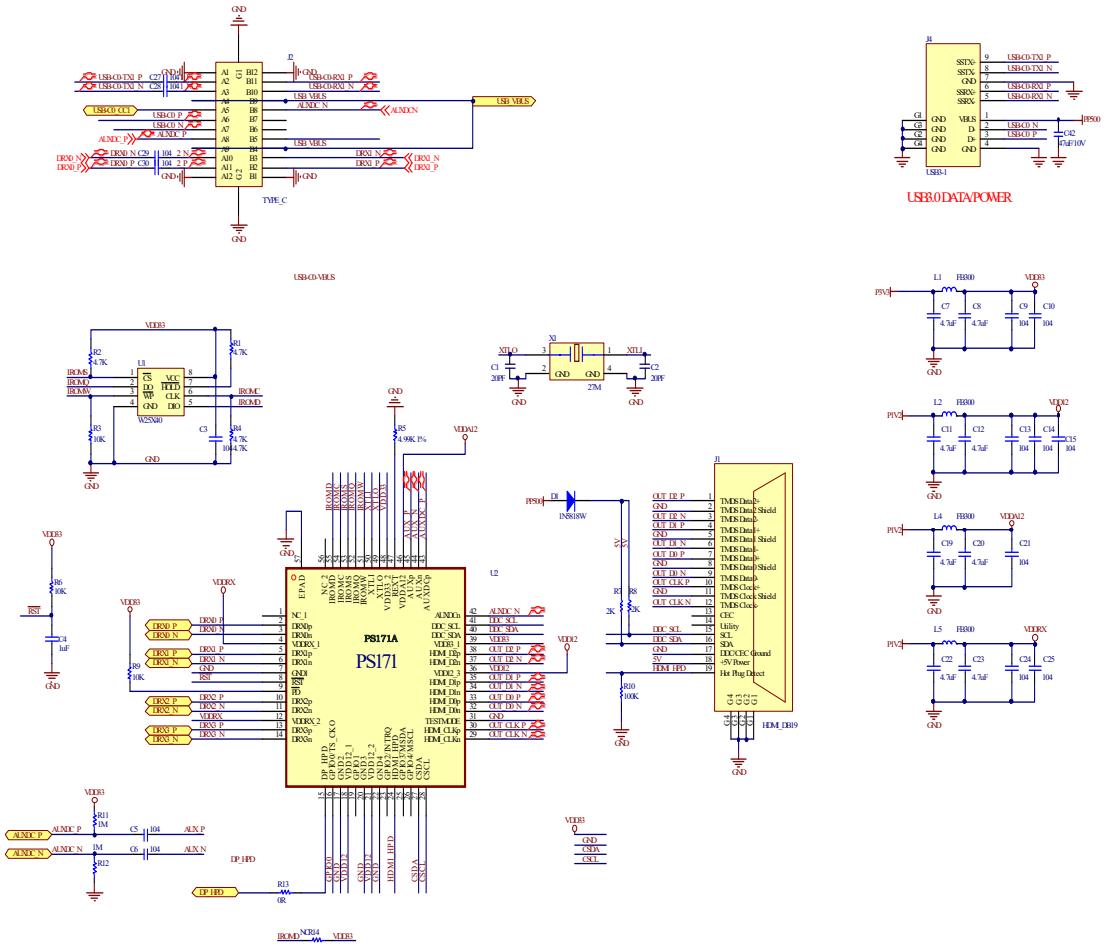
**NOTE**: Information in the following applications sections is not part of the LDR component specification, and LDR does not warrant its accuracy or completeness. LDR's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

## 6.1 Type-C Docking

Power supply and USB PD modules



HDMI module


PS171A
PS171
TYPE_C
USB3.0 DATA/POWER
W25N40
1N4148W
HDMI_DB19

# 7 Package Dimension

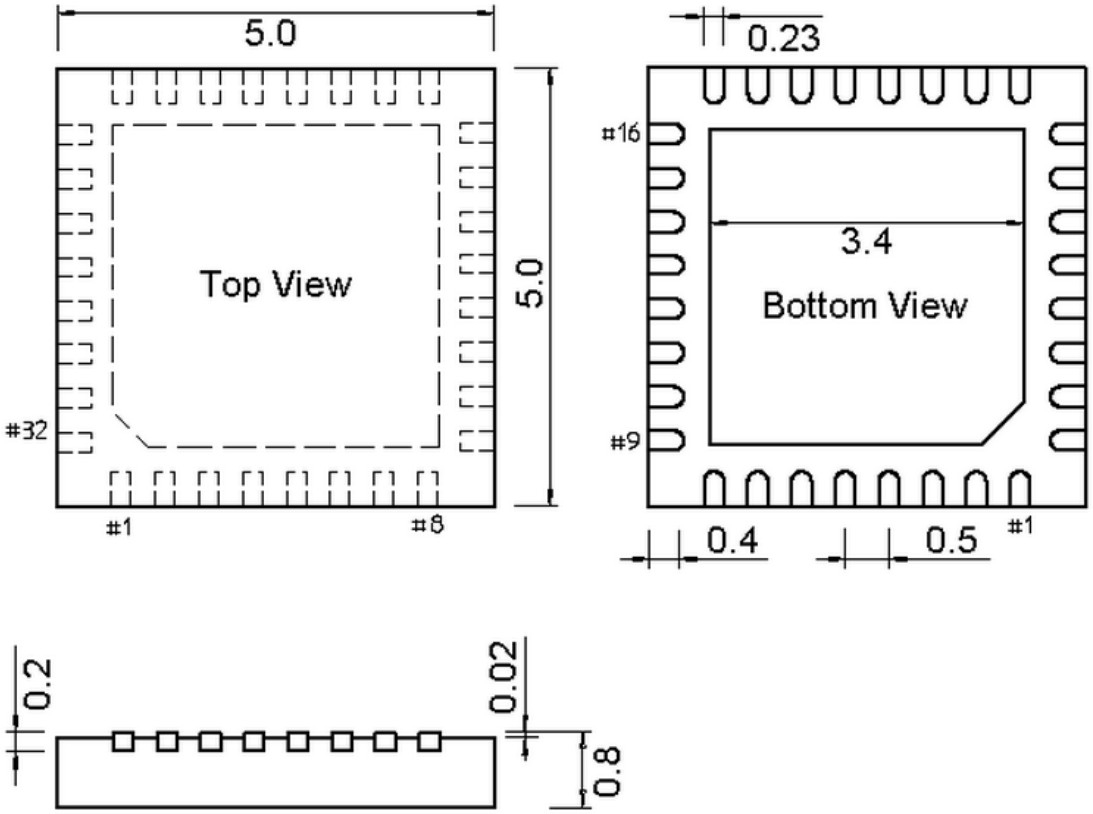
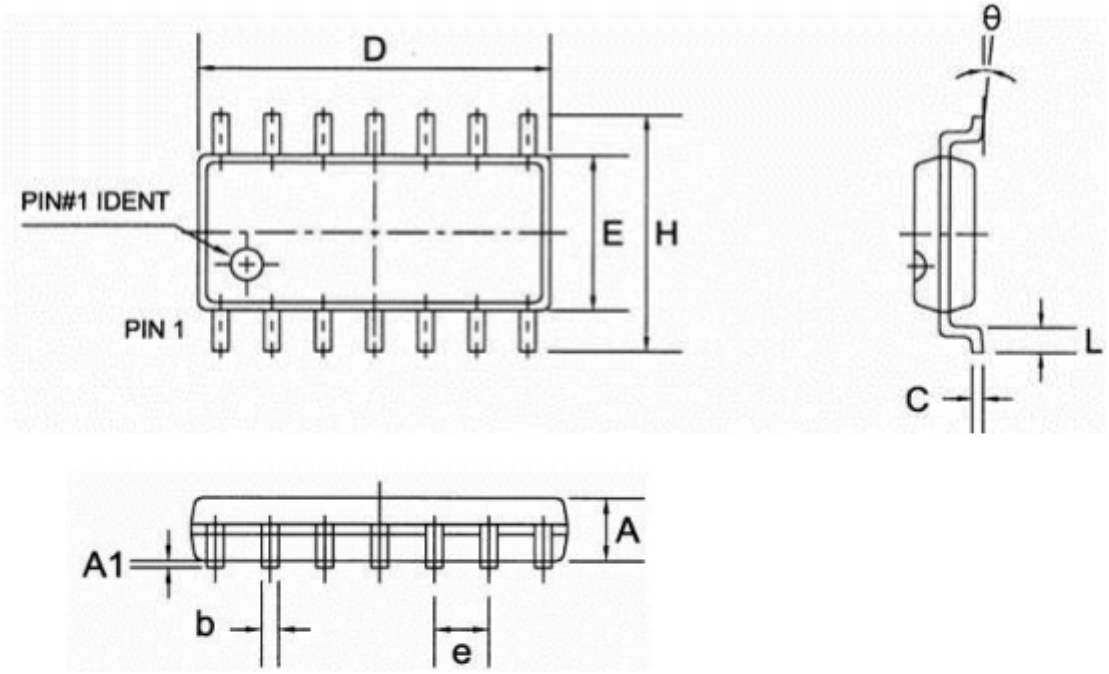
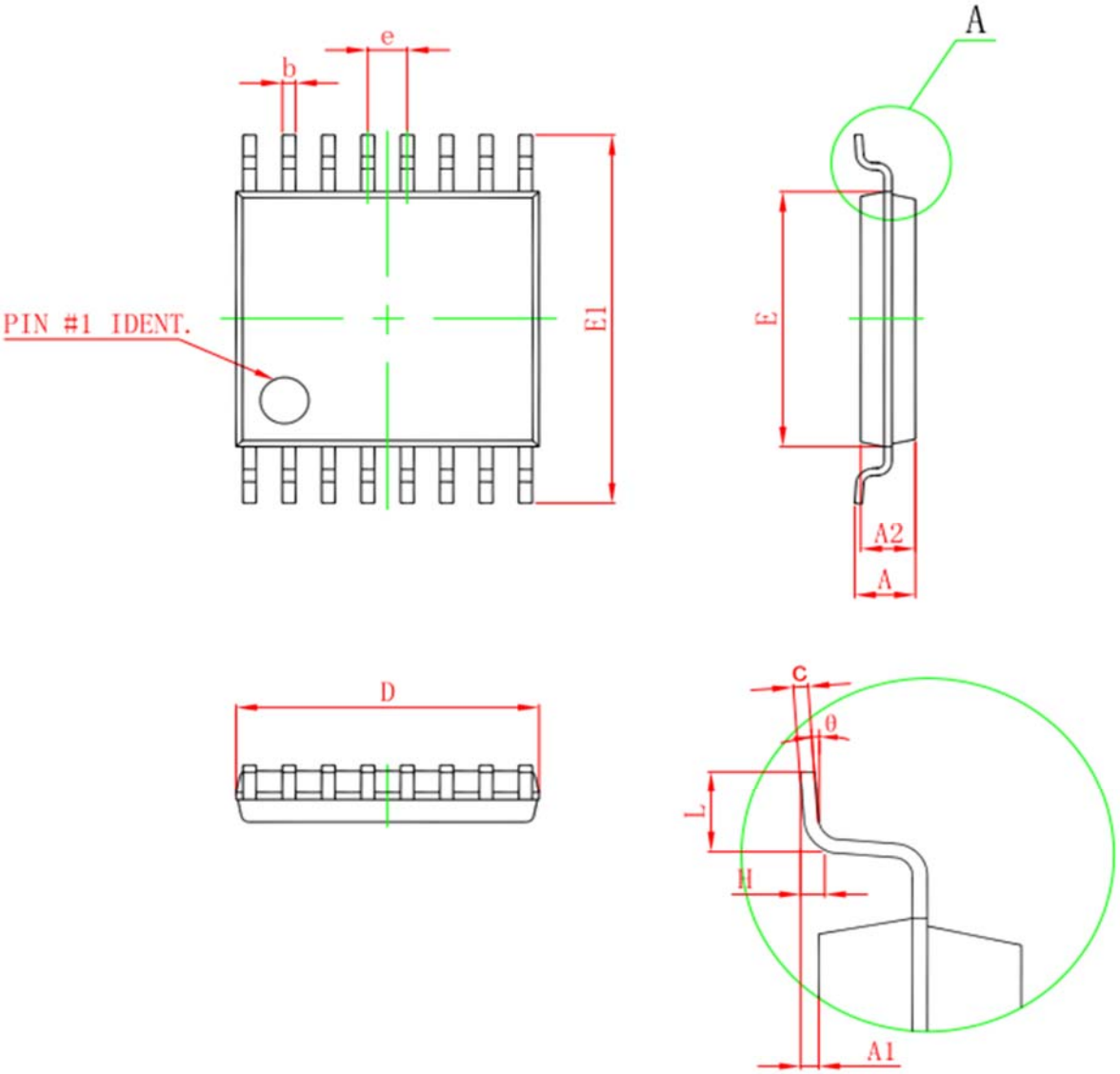



Figure 4. LDR6023Q Package Dimension(QFN32)




| Symbol | Dimensions In Millmeters | | | Dimensions In Inches | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A | 1.30 | 1.50 | 1.70 | 0.051 | 0.059 | 0.067 |
| A1 | 0.08 | 0.16 | 0.24 | 0.003 | 0.006 | 0.009 |
| b | — | 0.40 | — | — | 0.016 | — |
| C | — | 0.25 | — | — | 0.010 | — |
| D | 8.25 | 8.55 | 8.85 | 0.325 | 0.337 | 0.348 |
| E | 3.75 | 3.95 | 4.15 | 0.148 | 0.156 | 0.163 |
| e | — | 1.27 | — | — | 0.050 | — |
| H | 5.70 | 6.00 | 6.30 | 0.224 | 0.236 | 0.248 |
| L | 0.45 | 0.65 | 0.85 | 0.018 | 0.026 | 0.033 |
| θ | 0° | — | 8° | 0° | — | 8° |

Figure 5. LDR6023S Package Dimension(SOP-14)




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| D | 4.900 | 5.100 | 0.193 | 0.201 |
| E | 4.300 | 4.500 | 0.169 | 0.177 |
| b | 0.190 | 0.300 | 0.007 | 0.012 |
| c | 0.090 | 0.200 | 0.004 | 0.008 |
| E1 | 6.250 | 6.550 | 0.246 | 0.258 |
| A | | 1.100 | | 0.043 |
| A2 | 0.800 | 1.000 | 0.031 | 0.039 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| e | 0.65 (BSC) | | 0.026 (BSC) | |
| L | 0.500 | 0.700 | 0.020 | 0.028 |
| H | 0.25 (TYP) | | 0.01 (TYP) | |
| θ | 1° | 7° | 1° | 7° |

Figure 6. LDR6023SS Package Dimension(SSOP-16)