LDR6035 USB Type-C PD Controller

REV1.3

Document History

REV1.0	New data sheet.	2016-11-01
REV1.1	Added SSOP16 package information.	2016-12-26
REV1.2	Update CE and DR pin description	2017-8-28
REV1.3	Update PWM depiction	2020-5-4

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Contents

1.General Description

LDR6035 is a single port USB Type-C and USB Power Delivery controller dedicates to smart power source applications. The LDR6035 also support Qualcomm® Quick Charge™2.0/3.0. It provides a complete USB Type-C and USB power port control solution for applications such as adapters, car chargers, and power banks. It supports auto DR_SWAP.
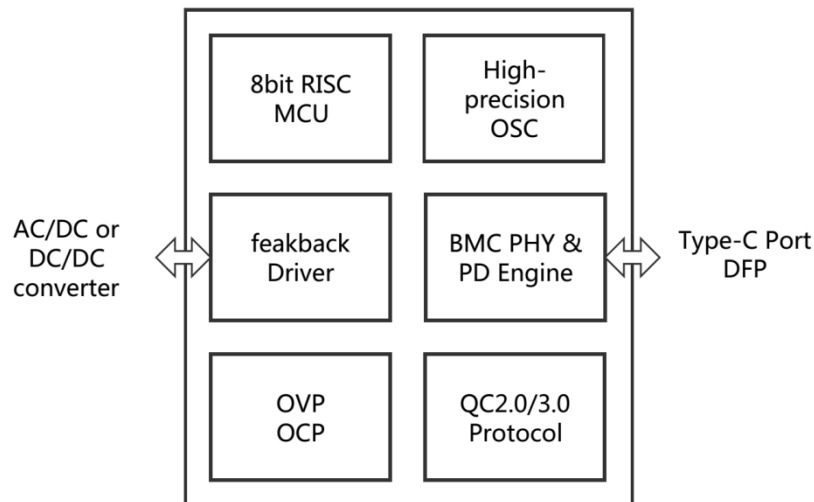

Figure 1. LDR6035 Block Diagram

1.1 Features

◇ USB Type-C Spec Rev1.3 compatible
◇ USB PD Spec Rev3.0 compatible
◇ OVP,OCP support
◇ Support Qualcomm® Quick Charge™2.0/3.0
◇ Support constant current output mode
◇ Support linear voltage output mode

1.2 Applications

◇ AC adapters
◇ Smart Charger
◇ Car chargers
◇ Power banks
◇ USB PD converter
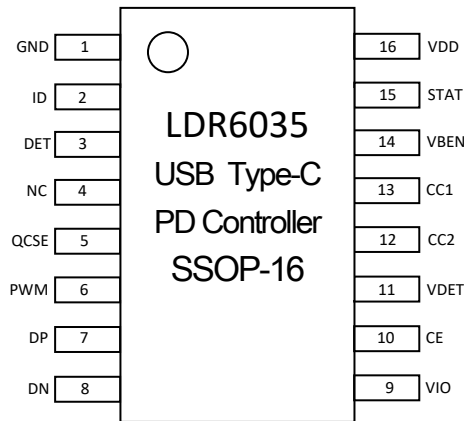
1.3 Pin-outs

1.3.1. LDR6035 Pin-out Diagram

Figure 2. LDR6035-S16 Pin-out

1.3.2. LDR6035 Pin-out Description

Pin No.	Name	Type	Description
1	GND	G	Ground
2	ID	O	Default output 0, Output 1 when an UFP is attach to CC1 or CC2.
3	DET	O	Default output 0, Output 1 when a DFP is attached to CC1 or CC2, output charging current limiting signal, Charging Current Limiting Signal Low Time=(Current Limiting Value /0.5A)*50mS
9	VIO	I	External wake-up, a rising edge at this pin will wake up LDR6035(not necessary, USB-C attach event can also wakeup LDR6035)
5	NC/QCSE	O	QC function selection
6	PWM*	O	PWM output; control external voltage adjustment
11	VDET	I	VBUS Detect
7	DP	IO	QC identification pin DP
8	NC/DN	IO	QC identification pin DN
4	NC/DR	I	Data_role define. 0 for auto DR_swap to UFP when current data role is dfp. 1 for nothing.

10	CE	I	High voltage output enable input pin. Low active. When this pin is set high only 5V PDO is enabled and QC output is not supported. After a falling edge is detected at this pin a hardest will be sent.
12	CC2	IO	Configuration Channel 2
13	CC1	IO	Configuration Channel 1
14	VBEN	o	VBUS enable
15	STAT	I	Regulator output for filter capacitor
16	VDD	P	System Power Input

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

*PWM signal define for pin6：

The working frequency for PWM is 14.4MHZ

For Example:

C_OutVol_5V	equ	73	The output Low phase is 73/14.4=5.07us
C_OutVol_9V	equ	133	The output Low phase is 133/14.4=9.24us
C_OutVol_12V	equ	143	The output Low phase is 143/14.4=9.93us
C_OutVol_15V	equ	173	The output Low phase is 173/14.4=12.01us
C_outVol_19V	equ	213	The output Low phase is 213/14.4=14.79us
C_outVol_19_5V	equ	218	The output Low phase is 218/14.4=15.14us
C_OutVol_20V	equ	223	The output Low phase is 223/14.4=15.49us

2. Functions

LDR6035 is a USB Type-C PD Controller that can be configured to be a Try.SRC device or a DFP device. The Source Capability and Sink Capability of LDR6035 support maximum 7 PDOs and can be user defined.

2.1. DRP mode

In this mode the LDR6035 can be configured as a Try.SRC device. When the attached device is DFP, the LDR6035 defines itself as a UFP. When the attached device is UFP / DRP, LDR6035 will define itself as DFP. When the attached device is a TRY.SRC it will still act as a DFP.

2.2 DFP mode

The LDR6035 can be configured as a DFP device. When connected to a DFP, the LDR6035 will no function. When the attached device is UFP / DRP, the LDR6035 defines itself as DFP.

2.3 QC function

LDR6035 built-in QC3.0 protocol, when the access device supports PD protocol, QC3.0 protocol does not work. When the access device does not support the PD protocol, QC3.0 is working properly. If the attached device supports the QC3.0 protocol, the handshake communication can be carried out through the QC3.0 protocol.

2.4 OVP/OCP

The VDET/DET pins are the ADC input pins for voltage/ current detection functions. The tolerance limit of LDR6035's OVP and OCP is 20%.

3. Electrical Characteristics

3.1 Maximum Ratings

Parameter	Description	Min/Max	Unit
VCC	Power supply	−0.3/6.0	V
V_I	Voltage input	−0.3/5.5	V
V_0	Voltage output	−0.3/5.5	V
T_{stg}	Storage temperature	−65/150	℃

3.2 ESD Characteristics

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

3.3 Operating Ranges

| Parameter	Description	Min/Max	Unit
VCC	Power supply	3.3/5.5	V
Ta	Storage temperature	−40/85	℃

*VCC is also the reference voltage for output

4. 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.
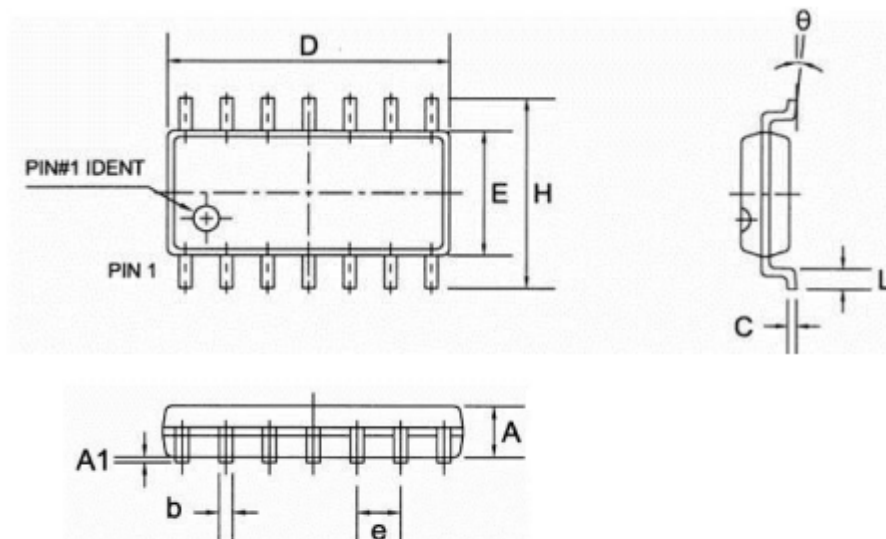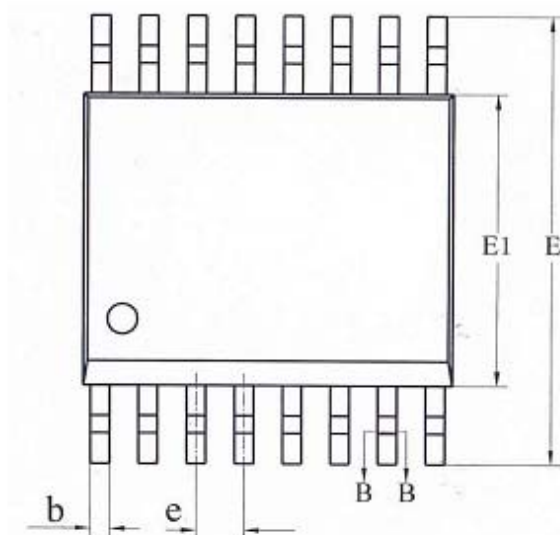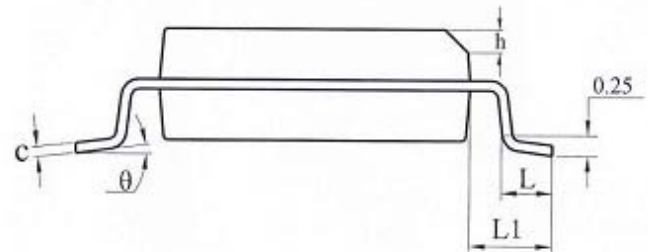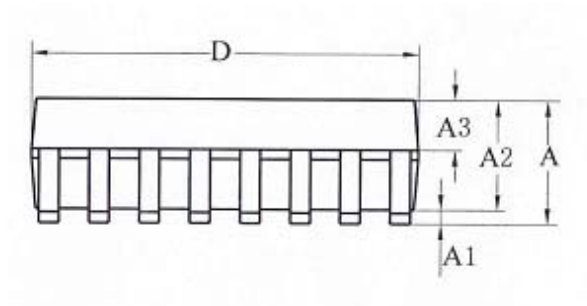
4.1. PD Smart Charger
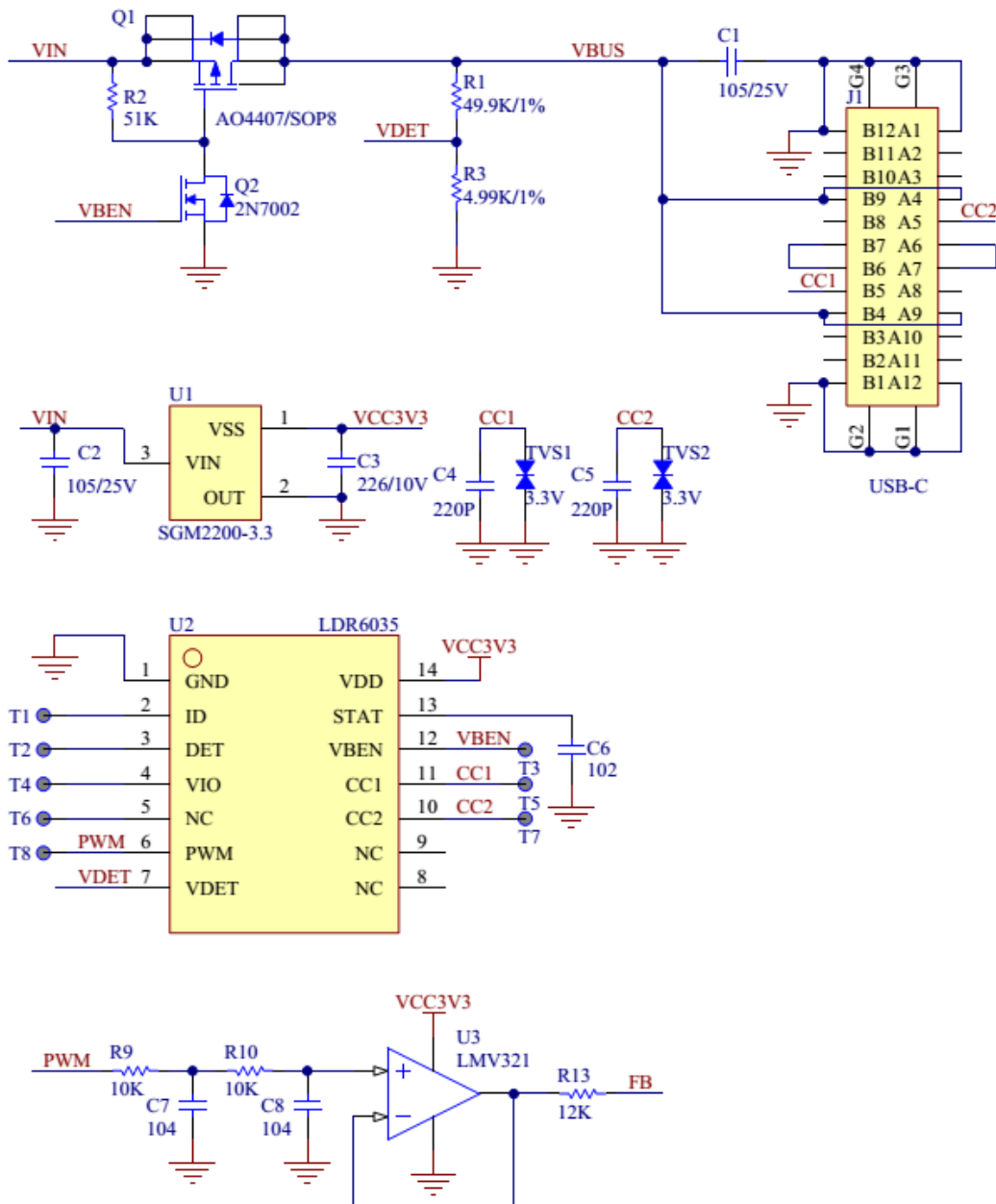
5. Package Dimension

5.1 SOP14

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°

5.2 SSOP16

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.55	0.60	0.65
b	0.23	—	0.31
b1	0.22	0.25	0.28
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	0.635BSC		
h	0.25	—	0.50
L	0.50	0.65	0.80
L1	1.05REF		
θ	0	—	8°