

■ **INTRODUCTION:**

The devices are USB dedicated charging port (DCP) controllers. A Smart-detect feature monitors USB data line voltage, and automatically provides the correct electrical signatures on the data line to charge compliant devices among the following dedicated charging schemes:

1. Divider1 DCP, required to apply 2.0V and 2.7V on the D+ and D- Lines respectively (CE1501, CE1502)
2. Divider 2 DCP, required to apply 2.7V and 2.0V on the D+ and D- Lines respectively (CE1501, CE1502)
3. Divider 3 DCP, required to apply 2.7V and 2.7V on the D+ and D- Lines respectively (CE1503, CE1504)
4. BC1.2 DCP, required to short the D+ Line to the D- Line
5. Chinese Telecom Standard YD/T 1591-2009 Short Mode, required to short the D+ Line to the D- Line
6. 1.2V on both D+ and D-Lines

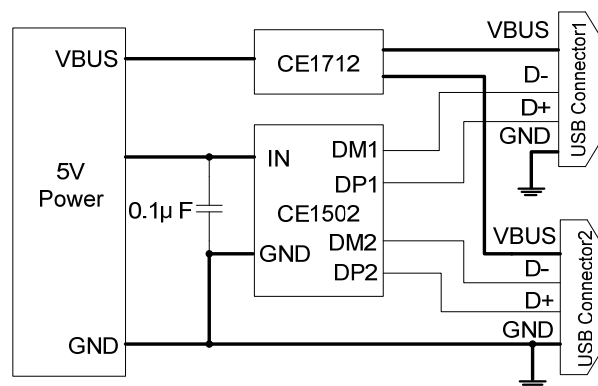
■ **APPLICATIONS:**

- Vehicle USB Power Charger
- AC-DC Adapter with USB Port
- Other USB Charger

■ **FEATURES:**

- Supports USB DCP Shorting D+ Line to D- Line per USB Battery Charging Specification, Revision 1.2(BC1.2)
- Supports Short Mode(Shorting)D+ Line to D- Line) per Chinese Telecommunication Industry Standard YD/T 1591-2009
- Support USB DCP Applying 2.7V on D+ Line and 2.0V on D- Line(or USB DCP Applying 2.0V on D+ line and 2.7V on D- Line) (CE1501, CE1502)
- Support USB DCP Applying 2.7V on D+ Line and 2.7V on D- Lines(CE1503, CE1504)
- Supports USB DCP Applying 1.2 V on D+ and D- Lines
- Automatically switch D+ and D- Lines Connections for an Attached Device
- Single USB Port Controller(CE1501, CE1503)
- Dual USB Port Controller(CE1502, CE1504)
- Operating Range: 4.5V to 5.5V
- Input Over Voltage Protection
- Available in SOT23-5 and SOT23-6 Packages

■ **TYPICAL APPLICATION CIRCUIT**



■ ORDER INFORMATION⁽¹⁾

Table 1. Product Information

| DEVICE | NUMBER OF CONTROLLER | CHARGING SCHEMES (DCP_AUTO) | | | 1.2V mode (D+/D- shorted and bias to 1.2V) | BC1.2 and YD/T 1591-2009 mode (D+/D- shorted) |
|----------|----------------------|-------------------------------|-------------------------------|-------------------------------|--|---|
| | | Divider 1 (D+/D- = 2.0V/2.7V) | Divider 2 (D+/D- = 2.7V/2.0V) | Divider 3 (D+/D- = 2.7V/2.7V) | | |
| CE1501AE | Single | Yes ⁽¹⁾ | Yes | No | Yes | Yes |
| CE1501AM | Single | Yes ⁽¹⁾ | Yes | No | | |
| CE1502AE | Dual | Yes ⁽¹⁾ | Yes | No | | |
| CE1503AE | Single | No | No | Yes | | |
| CE1503AM | Single | No | No | Yes | | |
| CE1504AE | Dual | No | No | Yes | | |

(1) See to Figure 14.

■ PIN CONFIGURATION

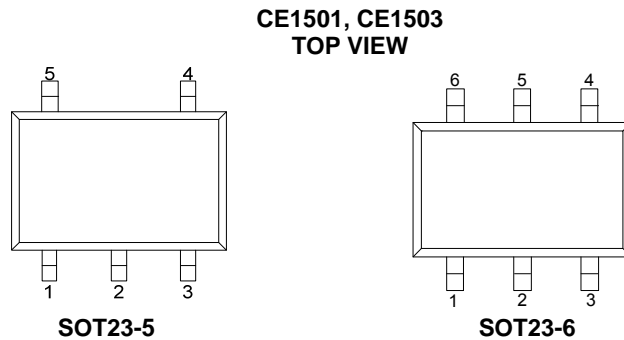


Table 2. SOT23-5, Pin Functions, CE1501/CE1503

| NO. | NAME | TYPE ⁽¹⁾ | DESCRIPTION |
|-----|------|---------------------|---|
| 1 | N/C | - | No connect pin. Can be grounded or left floating. |
| 2 | GND | G | Ground connection. |
| 3 | IN | P | Power supply. Connect a ceramic capacitor with a value of 0.1μF or greater from the IN pin to GND as close to the device as possible. |
| 4 | DP1 | I/O | Connected to the D+ or D- line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |
| 5 | DM1 | I/O | Connected to the D+ or D- line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |

(1) G=Ground, I=Input, O=Output, P=Power

Table 3. SOT23-6. Pin Functions, CE1501/CE1503

| NO. | NAME | TYPE ⁽¹⁾ | DESCRIPTION |
|-----|------|---------------------|---|
| 1 | DP1 | I/O | Connected to the D+ or D– line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |
| 2 | GND | G | Ground connection. |
| 3 | N/C | - | No connect pin. Can be grounded or left floating. |
| 4 | N/C | - | No connect pin. Can be grounded or left floating. |
| 5 | IN | P | Power supply. Connect a ceramic capacitor with a value of 0.1μF or greater from the IN pin to GND as close to the device as possible. |
| 6 | DM1 | I/O | Connected to the D+ or D– line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |

(1) G=Ground, I=Input, O=Output, P=Power

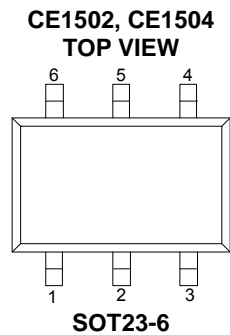


Table 4. SOT23-6. Pin Functions, CE1502/CE1504

| NO. | NAME | TYPE ⁽¹⁾ | DESCRIPTION |
|-----|------|---------------------|---|
| 1 | DP1 | I/O | Connected to the D+ or D– line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |
| 2 | GND | G | Ground connection. |
| 3 | DP2 | I/O | Connected to the D+ or D– line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |
| 4 | DM2 | I/O | Connected to the D+ or D– line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |
| 5 | IN | P | Power supply. Connect a ceramic capacitor with a value of 0.1μF or greater from the IN pin to GND as close to the device as possible. |
| 6 | DM1 | I/O | Connected to the D+ or D– line of USB connector, provide the correct voltage with attached portable equipment for DCP detection. |

(1) G=Ground, I=Input, O=Output, P=Power

■ ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Over recommended junction temperature range, voltages are referenced to GND (unless otherwise noted)

| PARAMETER | SYMBOL | MIN. | MAX. | UNITS |
|----------------------------------|--|-----------------|------|-------|
| Voltage range | V_{IN} | -0.3 | 20 | V |
| | DP1, DP2 output voltage, DM1, DM2 output voltage | -0.3 | 6 | V |
| | DP1, DP2 input voltage, DM1, DM2 input voltage | -0.3 | 6 | V |
| Continuous output sink current | DP1, DP2 input current, DM1, DM2 input current | | 35 | mA |
| Continuous output source current | DP1, DP2 output current, DM1, DM2 output current | | 35 | mA |
| ESD rating | Human Body Model-(HBM) | IN | 8 | kV |
| | | DP1,DP2,DM1,DM2 | 6 | kV |
| | Charging Device Model (CDM) | | 500 | V |
| Operating Junction Temperature | T_J | -40 | 125 | °C |
| Storage Temperature Range | T_{stg} | -65 | 150 | °C |

- (1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

■ RECOMMENDED OPERATING CONDITIONS

Voltage are referenced to GND (unless otherwise noted), positive current are into pins.

| PARAMETER | SYMBOL | MIN. | MAX. | UNITS |
|-----------------------------------|-----------|------|------|-------|
| Supply voltage at IN | V_{IN} | 4.5 | 5.5 | V |
| DP1 data line input voltage | V_{DP1} | 0 | 5.5 | V |
| DM1 data line input voltage | V_{DM1} | 0 | 5.5 | V |
| Continuous sink or source current | I_{DP1} | | ±10 | mA |
| Continuous sink or source current | I_{DM1} | | ±10 | mA |
| DP2 data line input voltage | V_{DP2} | 0 | 5.5 | V |
| DM2 data line input voltage | V_{DM2} | 0 | 5.5 | V |
| Continuous sink or source current | I_{DP2} | | ±10 | mA |
| Continuous sink or source current | I_{DM2} | | ±10 | mA |
| Operating junction temperature | T_J | -40 | 125 | °C |

■ ELECTRICAL CHARACTERISTICS

Conditions are $-40^{\circ}\text{C} \leq (T_J = T_A) \leq 125^{\circ}\text{C}$, $4.5\text{V} \leq V_{\text{IN}} \leq 5.5\text{V}$. Positive current are into pins. Typical values are at 25°C . All voltages are with respect to GND (unless otherwise noted).

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|------------------------------------|---|------|------|------|---------------|
| UNDERVOLTAGE LOCKOUT | | | | | | |
| UVLO threshold voltage | V_{UVLO} | V_{IN} Rising | 3.9 | 4.1 | 4.3 | V |
| Hysteresis | | | | 100 | | mV |
| OVERVOLTAGE LOCKOUT | | | | | | |
| Input Voltage Over Voltage Protection | V_{INOV} | V_{IN} Rising | | 7.3 | | V |
| Input Voltage OVP Hysteresis | | | | 30 | | mV |
| SUPPLY CURRENT | | | | | | |
| IN supply current | I_{IN} | $4.5\text{V} \leq V_{\text{IN}} \leq 5.5\text{V}$ | | 150 | 200 | μA |
| BC 1.2 DCP MODE(SHORT MODE) | | | | | | |
| DP1 and DM1 shorting resistance | $R_{\text{DPM_SHORT1}}$ | $V_{\text{DP1}}=0.8\text{V}$, $I_{\text{DM1}}=1\text{mA}$ | | 150 | 200 | Ω |
| Resistance between DP1/DM1 and GND | $R_{\text{DCHG_SHORT1}}$ | $V_{\text{DP1}}=0.8\text{V}$ | 350 | 650 | 1150 | k Ω |
| Voltage threshold on DP1 under which the device goes back to divider mode | $V_{\text{DPL_TH_DETACH1}}$ | | 310 | 330 | 350 | mV |
| Hysteresis ⁽¹⁾ | $V_{\text{DPL_TH_DETACH_HYS1}}$ | | | 50 | | mV |
| DP2 and DM2 shorting resistance | $R_{\text{DPM_SHORT2}}$ | $V_{\text{DP2}}=0.8\text{V}$, $I_{\text{DM2}}=1\text{mA}$ | | 150 | 200 | Ω |
| Resistance between DP2/DM2 and GND | $R_{\text{DCHG_SHORT2}}$ | $V_{\text{DP2}}=0.8\text{V}$ | 350 | 650 | 1150 | k Ω |
| Voltage threshold on DP2 under which the device goes back to divider mode | $V_{\text{DPL_TH_DETACH2}}$ | | 310 | 330 | 350 | mV |
| Hysteresis ⁽¹⁾ | $V_{\text{DPL_TH_DETACH_HYS2}}$ | | | 50 | | mV |
| DIVIDER MODE(CE1501, CE1502) | | | | | | |
| DP1 output voltage | $V_{\text{DP1_2.7V}}$ | $V_{\text{IN}}=5\text{V}$ | 2.57 | 2.7 | 2.84 | V |
| DM1 output voltage | $V_{\text{DM1_2.0V}}$ | $V_{\text{IN}}=5\text{V}$ | 1.9 | 2.0 | 2.1 | V |
| DP1 output impedance | $R_{\text{DP1_PAD1}}$ | $I_{\text{DP1}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |
| DM1 output impedance | $R_{\text{DM1_PAD1}}$ | $I_{\text{DM1}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |
| DP2 output voltage | $V_{\text{DP2_2.7V}}$ | $V_{\text{IN}}=5\text{V}$ | 2.57 | 2.7 | 2.84 | V |
| DM2 output voltage | $V_{\text{DM2_2.0V}}$ | $V_{\text{IN}}=5\text{V}$ | 1.9 | 2.0 | 2.1 | V |
| DP2 output impedance | $R_{\text{DP2_PAD1}}$ | $I_{\text{DP2}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |
| DM2 output impedance | $R_{\text{DM2_PAD1}}$ | $I_{\text{DM2}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |

(1) Parameters provided for reference only, and do not constitute part of CHIPPOWER's published device specifications for purposes of CHIPPOWER 's product warranty

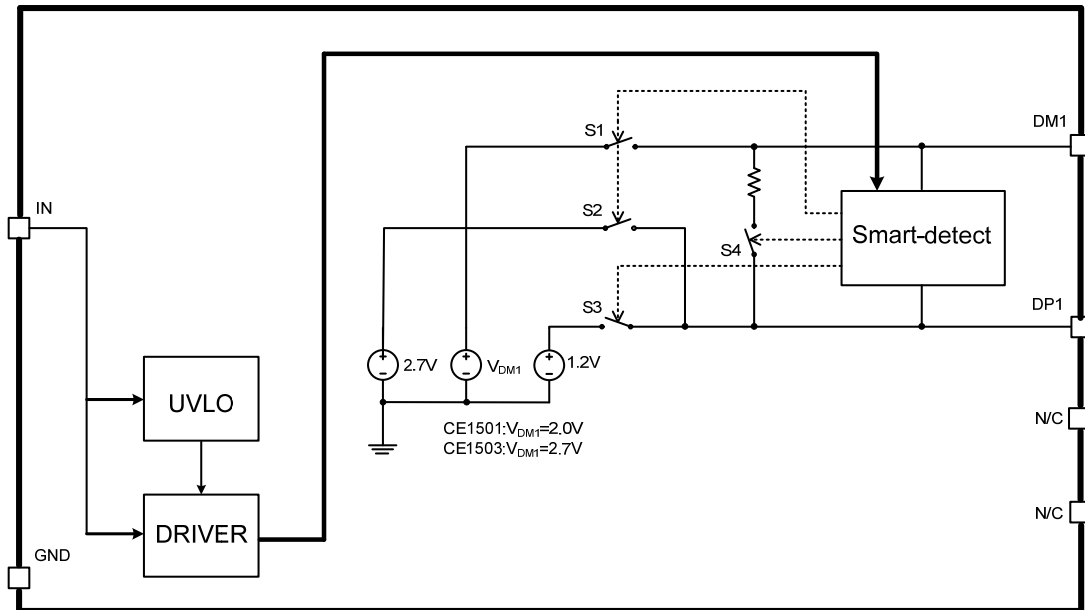
■ ELECTRICAL CHARACTERISTICS(CONTINUED)

Conditions are $-40^{\circ}\text{C} \leq (T_J = T_A) \leq 125^{\circ}\text{C}$, $4.5\text{V} \leq V_{\text{IN}} \leq 5.5\text{V}$. Positive current are into pins. Typical values are at 25°C . All voltages are with respect to GND (unless otherwise noted).

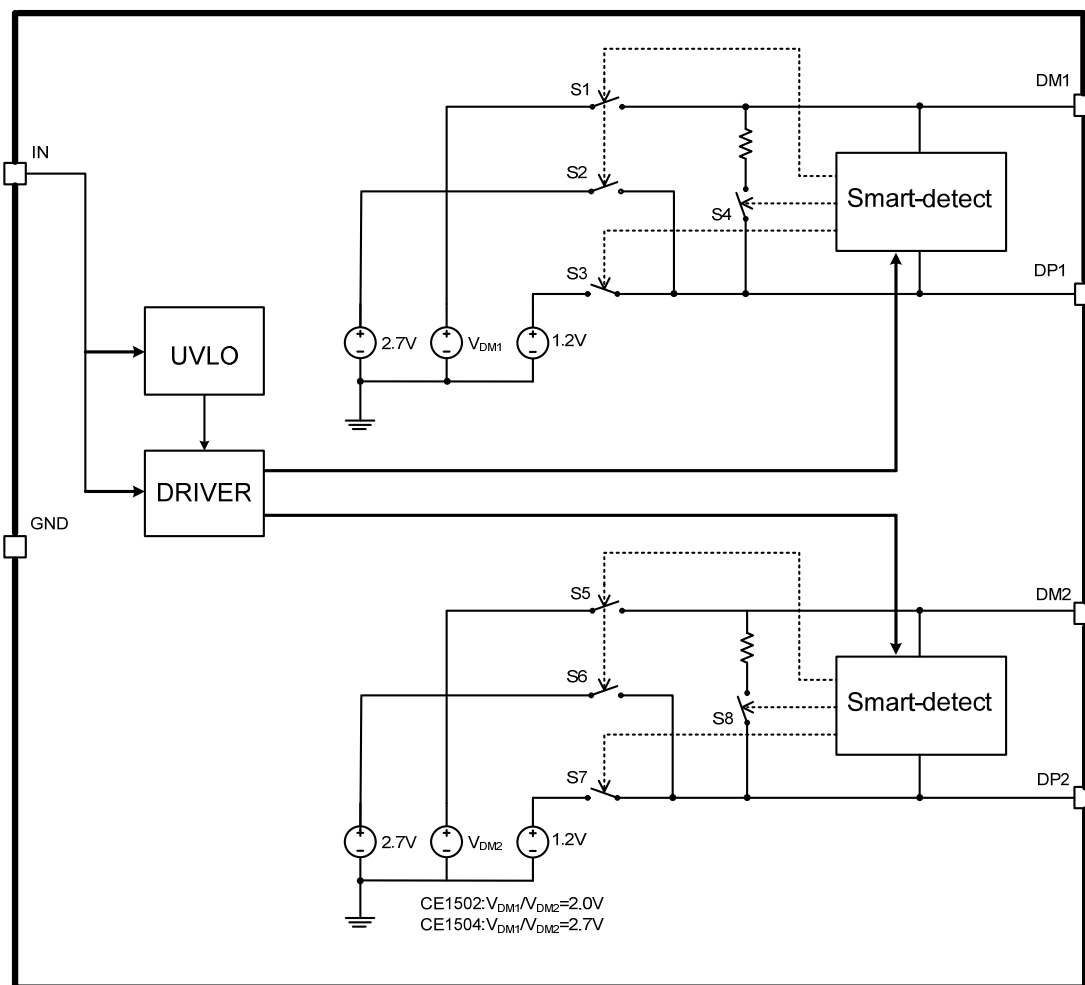
| DIVIDER MODE(CE1503, CE1504) | | | | | | |
|------------------------------|------------------------------|--------------------------------|------|-----|------|------------|
| DP1 output voltage | $V_{\text{DP1}_2.7\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 2.57 | 2.7 | 2.84 | V |
| DM1 output voltage | $V_{\text{DM1}_2.7\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 2.57 | 2.7 | 2.84 | V |
| DP1 output impedance | $R_{\text{DP1_PAD1}}$ | $I_{\text{DP1}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |
| DM1 output impedance | $R_{\text{DM1_PAD1}}$ | $I_{\text{DM1}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |
| DP2 output voltage | $V_{\text{DP2}_2.7\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 2.57 | 2.7 | 2.84 | V |
| DM2 output voltage | $V_{\text{DM2}_2.7\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 2.57 | 2.7 | 2.84 | V |
| DP2 output impedance | $R_{\text{DP2_PAD1}}$ | $I_{\text{DP2}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |
| DM2 output impedance | $R_{\text{DM2_PAD1}}$ | $I_{\text{DM2}}=-5\mu\text{A}$ | 24 | 30 | 36 | k Ω |
| 1.2V/1.2V MODE | | | | | | |
| DP1 output voltage | $V_{\text{DP1}_1.2\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 1.12 | 1.2 | 1.28 | V |
| DM1 output voltage | $V_{\text{DM1}_1.2\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 1.12 | 1.2 | 1.28 | V |
| DP1 output impedance | $R_{\text{DP1_PAD2}}$ | $I_{\text{DP1}}=-5\mu\text{A}$ | 80 | 100 | 130 | k Ω |
| DM1 output impedance | $R_{\text{DM1_PAD2}}$ | $I_{\text{DM1}}=-5\mu\text{A}$ | 80 | 100 | 130 | k Ω |
| DP2 output voltage | $V_{\text{DP2}_1.2\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 1.12 | 1.2 | 1.28 | V |
| DM2 output voltage | $V_{\text{DM2}_1.2\text{V}}$ | $V_{\text{IN}}=5\text{V}$ | 1.12 | 1.2 | 1.28 | V |
| DP2 output impedance | $R_{\text{DP2_PAD2}}$ | $I_{\text{DP2}}=-5\mu\text{A}$ | 80 | 100 | 130 | k Ω |
| DM2 output impedance | $R_{\text{DM2_PAD2}}$ | $I_{\text{DM2}}=-5\mu\text{A}$ | 80 | 100 | 130 | k Ω |

■ BLOCK DIAGRAM

FUNCTIONAL BLOCK DIAGRAM, CE1501, CE1503



FUNCTIONAL BLOCK DIAGRAM, CE1502, CE1504



■ TYPICAL CHARACTERISTICS

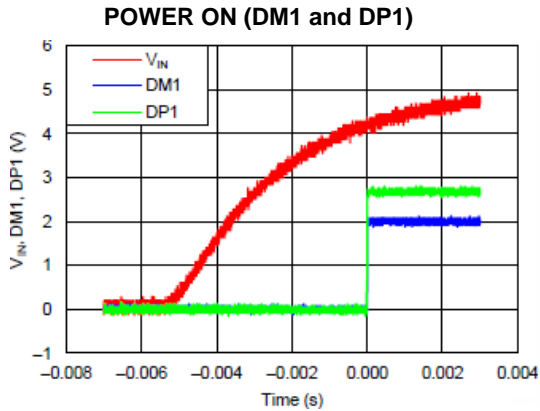


Figure 1.

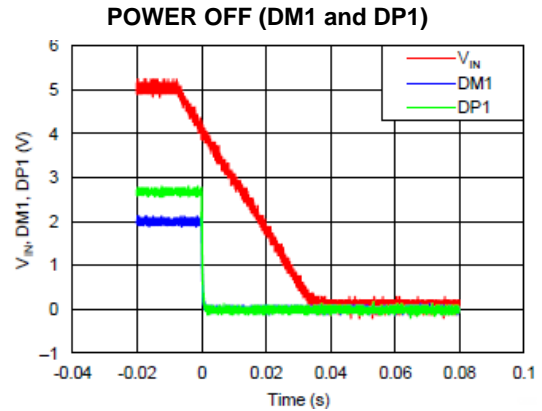


Figure 2.

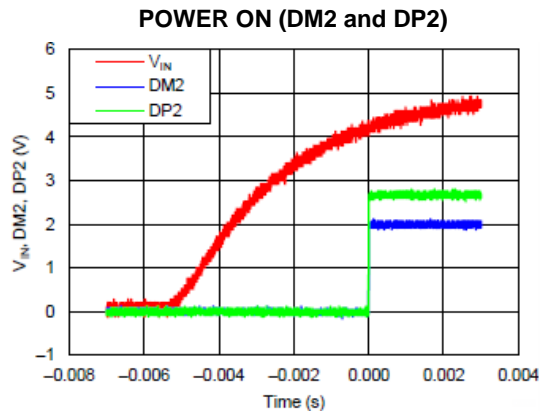


Figure 3.

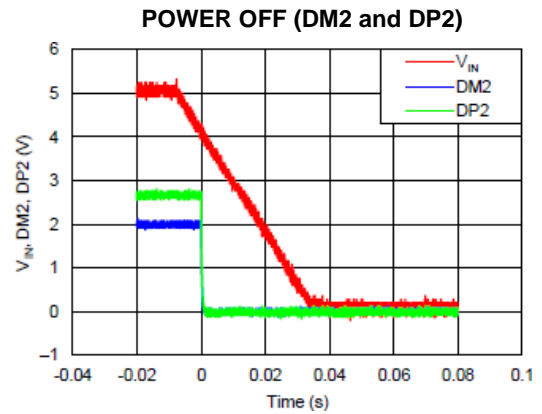


Figure 4.

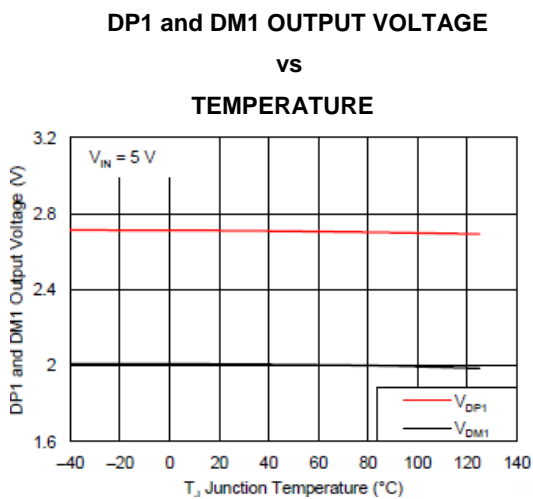


Figure 5.

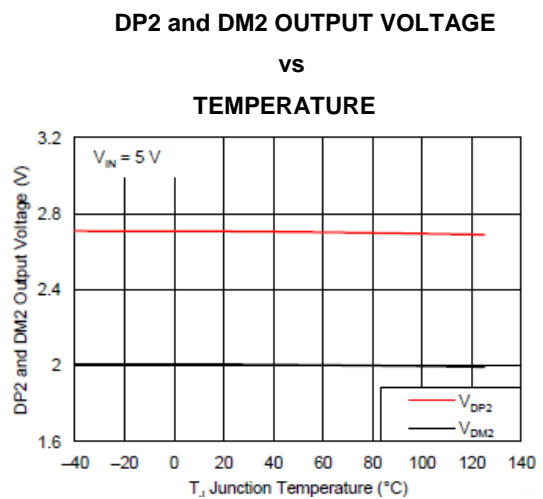


Figure 6.

■ TYPICAL CHARACTERISTICS (continued)

SUPPLY CURRENT
vs
TEMPERATURE

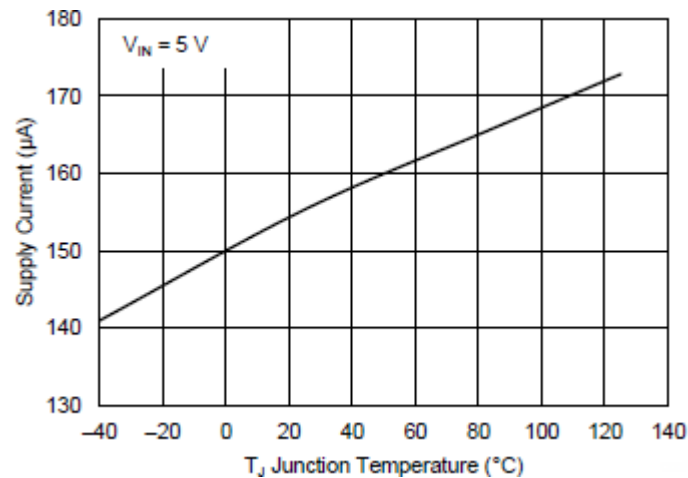


Figure 7.

■ DETAILED DESCRIPTION

OVERVIEW

The following overview references various industry standards. It is always recommended to consult the latest standard to ensure the most recent and accurate information.

Rechargeable portable equipment requires an external power source to charge its batteries. USB ports are convenient locations for charging because of an available 5V power source. Universally accepted standards are required to ensure host and client-side devices meet the power management requirements. Traditionally, USB host ports following the USB 2.0 Specification must provide at least 500mA to downstream client-side devices. Because multiple USB devices can be attached to a single USB port through a bus-powered hub, it is the responsibility of the client-side device to negotiate the power allotment from the host to guarantee the total current draw does not exceed 500mA. In general, each USB device can subsequently request more current, which is granted in steps of 100mA up 500mA total. The host may grant or deny the request based on the available current.

Additionally, the success of the USB technology makes the micro-USB connector a popular choice for wall adapter cables. This allows a portable device to charge from both a wall adapter and USB port with only one connector.

One common difficulty has resulted from this. As USB charging has gained popularity, the 500mA minimum defined by the USB 2.0 Specification or 900mA defined in the USB 3.0 Specification, has become insufficient for many handsets, tablets and personal media players (PMP) which have a higher rated charging current. Wall adapters and car chargers can provide much more current than 500mA or 900mA to fast charge portable devices. Several new standards have been introduced defining protocol handshaking methods that allow host and client devices to acknowledge and draw additional current beyond the 500mA (defined in the USB 2.0 Specification) or 900mA (defined in the USB 3.0 Specification) minimum while using a single micro-USB input connector.

The devices support four of the most common protocols:

- USB Battery Charging Specification, Revision 1.2 (BC1.2)
- Chinese Telecommunications Industry Standard YD/T 1591-2009
- Divider mode
- 1.2 V on both D+ and D- lines

YD/T 1591-2009 is a subset of the BC1.2 specification supported by the vast majority of devices that implement USB charging. Divider and 1.2V charging schemes are supported in devices from specific yet popular device makers. BC1.2 has three different port types, listed as follows.

- Standard downstream port (SDP)
- Charging downstream port (CDP)
- Dedicated charging port (DCP)

The BC1.2 Specification defines a charging port as a downstream facing USB port that provides power for charging portable equipment.

Table 5 shows different port operating modes according to the BC1.2 Specification.

Table 5. Operating Modes Table

| PORT TYPE | SUPPORTS USB2.0 COMMUNICATION | MAXIMUM ALLOWABLE CURRENT DRAWN BY PORTABLE EQUIPMENT (A) |
|-------------|-------------------------------|---|
| SDP(USB2.0) | Yes | 0.5 |
| SDP(USB3.0) | Yes | 0.9 |
| CDP | Yes | 1.5 |
| DCP | No | 1.5 |

The BC1.2 Specification defines the protocol necessary to allow portable equipment to determine what type of port it is connected to so that it can allot its maximum allowable current drawn. The hand-shaking process is two steps. During step one, the primary detection, the portable equipment outputs a nominal 0.6V output on its D+ line and reads the voltage input on its D- line. The portable device concludes it is connected to a SDP if the voltage is less than the nominal data detect voltage of 0.3V. The portable device concludes that it is connected to a Charging Port if the D- voltage is greater than the nominal data detect voltage of 0.3V and less than 0.8V. The second step, the secondary detection, is necessary for portable equipment to determine between a CDP and a DCP. The portable device outputs a nominal 0.6V output on its D- line and reads the voltage input on its D+ line. The portable device concludes it is connected to a CDP if the data line being remains is less than the nominal data detect voltage of 0.3V. The portable device concludes it is connected to a DCP if the data line being read is greater than the nominal data detect voltage of 0.3V and less than 0.8V.

Dedicated Charging Port (DCP)

A dedicated charging port (DCP) is a downstream port on a device that outputs power through a USB connector, but is not capable of enumerating a downstream device, which generally allows portable devices to fast charge at their maximum rated current. A USB charger is a device with a DCP, such as a wall adapter or car power adapter. A DCP is identified by the electrical characteristics of its data lines. The following DCP identification circuits are usually used to meet the handshaking detections of different portable devices.

Short the D+ Line to the D- Line

The USB BC1.2 Specification and the Chinese Telecommunications Industry Standard YD/T 1591-2009 define that the D+ and D- data lines should be shorted together with a maximum series impedance of 200 Ω . This is shown in Figure 8.

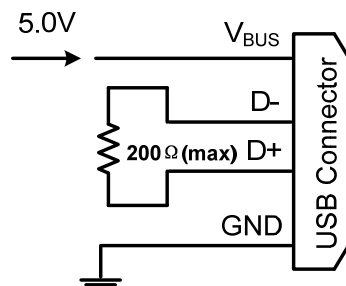


Figure 8. DCP Short Mode

Divider DCP

There are three charging schemes for divider DCP. They are named after Divider 1, Divider 2, and Divider 3 DCPs that are shown in Figure 9, Figure 10, and Figure 11. The Divider 1 charging scheme is used for 5W adapters, and applies 2V to the D+ line and 2.7V to the D– data line. The Divider 2 charging scheme is used for 10W adapters, and applies 2.7V on the D+ line and 2V is applied on the D– line. The Divider 3 charging scheme is used for 12W adapters, and applies 2.7V on D+ and D- lines.

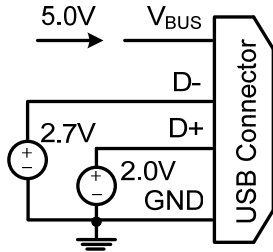


Figure 9. Divider 1 DCP

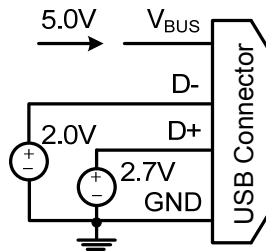


Figure 10. Divider 2 DCP

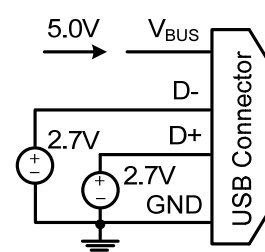


Figure 11. Divider 3 DCP

Applying 1.2 V to the D+ Line and 1.2 V to the D– Line

As shown in Figure 12, some tablet USB chargers require 1.2V on the shorted data lines of the USB connector. The maximum resistance between the D+ line and the D- line is 200Ω.

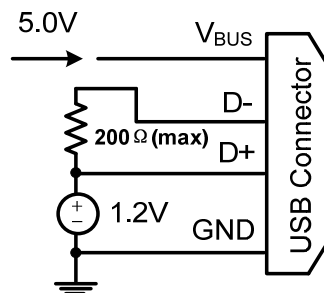


Figure 12. DCP Applying 1.2V to the D+ Line and 1.2V to the D-Line

The devices are USB dedicated charging port (DCP) controllers. Applications include vehicle power charger, wall adapters with USB DCP and other USB chargers. The device DCP controllers have the Smart-detect feature that monitors the D+ and D– line voltages of the USB connector, providing the correct electrical signatures on the DP and DM pins for the correct detections of compliant portable devices to fast charge. These portable devices include smart phones, 5V tablets and personal media players.

DCP Smart-detect

The devices integrate an Smart-detect feature to support divider mode, short mode and 1.2 V/1.2V modes. If a divider device is attached, 2.7V is applied to the DP pin and 2V is applied to the DM pin. If a BC1.2-compliant device is attached, the CE1501 and CE1502 automatically switches into short mode. If a device compliant with the 1.2V/1.2V charging scheme is attached, 1.2V is applied on both the DP pin and the DM pin. The functional diagram of DCP Smart-detect feature (DM1 and DP1) is shown in Figure 13. DCP Smart-detect feature (DM2 and DP2 of CE1502) has the same functional configuration. For CE1503 and CE1504, the devices also have DCP Smart-detect feature and the Smart-detect have the same functional configuration expect for the default mode is Divider 3 (D+/D- = 2.7V/2.7V).

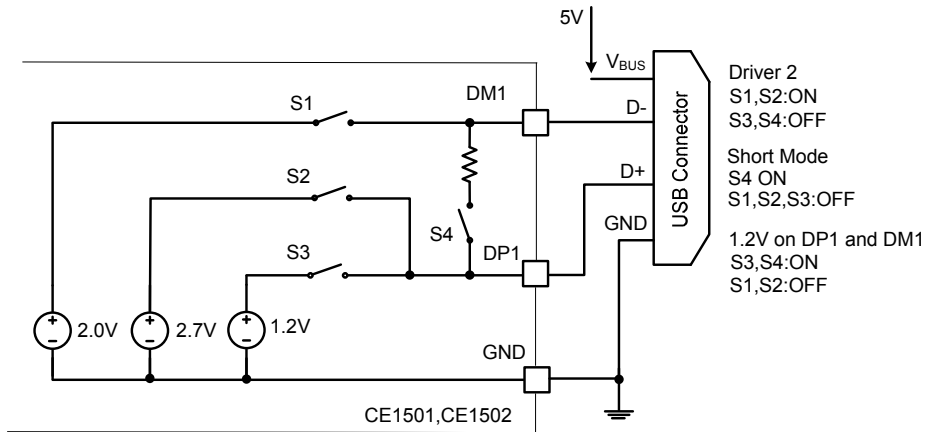


Figure 13. CE1501 and CE1502 DCP Smart-detect Function Diagram

Undervoltage Lockout (UVLO)

The undervoltage lockout (UVLO) circuit disables DP1, DM1, DP2 and DM2 output voltage until the input voltage reaches the UVLO turn-on threshold. Built-in hysteresis prevents unwanted oscillations due to input voltage drop from large current surges.

APPLICATION INFORMATION

The devices only provide the correct electrical signatures on the data line of USB charger port and do not provide any power for the VBUS.

Divide Mode Selection of 5W and 10W USB Chargers

The CE1501 and CE1502 provide two types of connections between the DP pin and the DM pin and between the D+ data line and the D- data line of the USB connector for a 5W USB charger and a 10W USB charger with a single USB port. For 5W USB charger, the DP1 pin is connected to the D- line and the DM1 pin is connected to the D+ line. This is shown in Figure 14. For 10W USB charger, the DP1 pin is connected to the D+ line and the DM1 pin is connected to the D- line. This is shown in Figure 15. Table 6 shows different charging schemes for both 5W and 10W USB charger solutions. DP2 and DM2 of CE1502 also provides this two types of connections.

Table 6. Charging Schemes for 5W and 10W USB Chargers

| USB CHARGER TYPE | CONTAINING CHARGING SHCEMES | | |
|------------------|-----------------------------|-----------------------------|-----------|
| 5W | Divider1 | 1.2V on both D+ and D-Lines | BC1.2 DCP |
| 10W | Divider2 | 1.2V on both D+ and D-Lines | BC1.2 DCP |

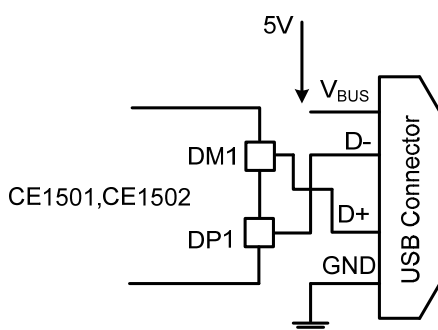


Figure14 5W USB Charger Application

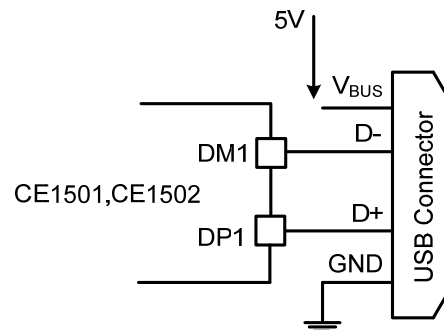
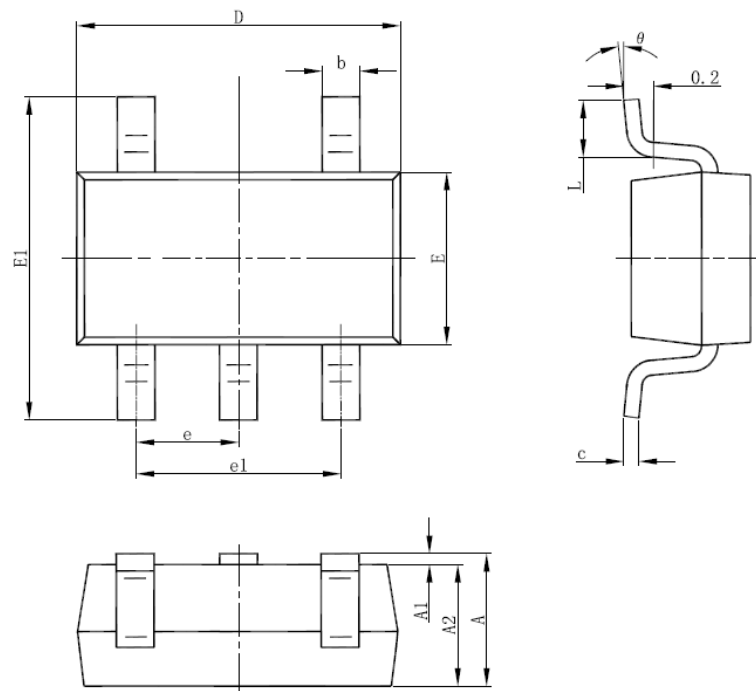


Figure15 10W USB Charger Application

Layout Guidelines

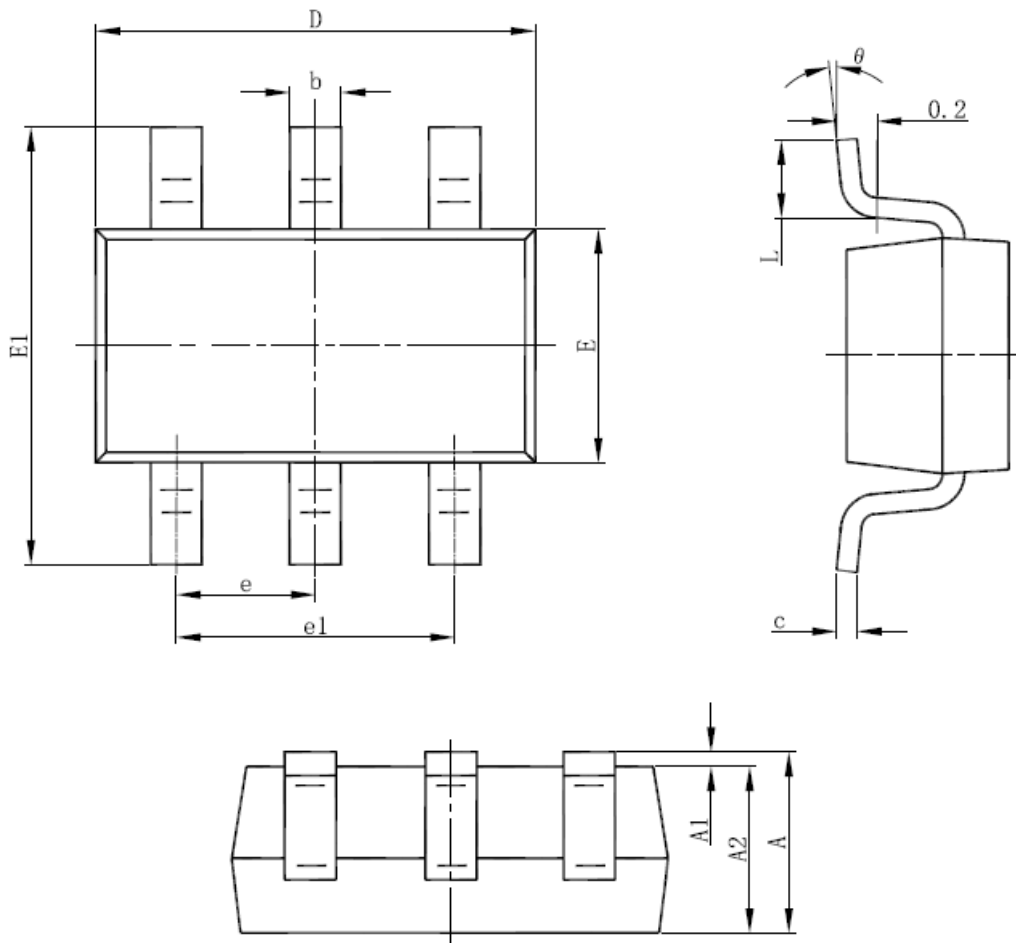
Place the devices near the USB output connector and place the 0.1µF bypass capacitor near the IN pin.

■ PACKAGING INFORMATION
● SOT23-5 Package Outline Dimensions



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

● SOT23-6 Package Outline Dimensions



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

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