

## Quick Charge Protocol Controller for DCDC and ACDC Converter

### DESCRIPTION

The ETA7901 is a quick charge controller which will manipulate the feedback node of a DCDC or ACDC converter to generate desired output voltage required by a portable device. It supports Qualcomm's QC3.0, QC2.0, Huawei's SCP and FCP, Samsung's AFC, Oppo's VOOC, BC1.2 protocols and Apple's 2.4A output setting.

ETA7901 will communicate with portable device (the quick charge protocol requester) thru D+/D- pins and once shake-hand is done, it will source or sink a current at FB node of a DCDC or ACDC converter, to change the output voltage gradually to the desired value. It can control the output voltage as accurate as 20mV.

ETA7901 is available in a space saving SOT23-6 package.

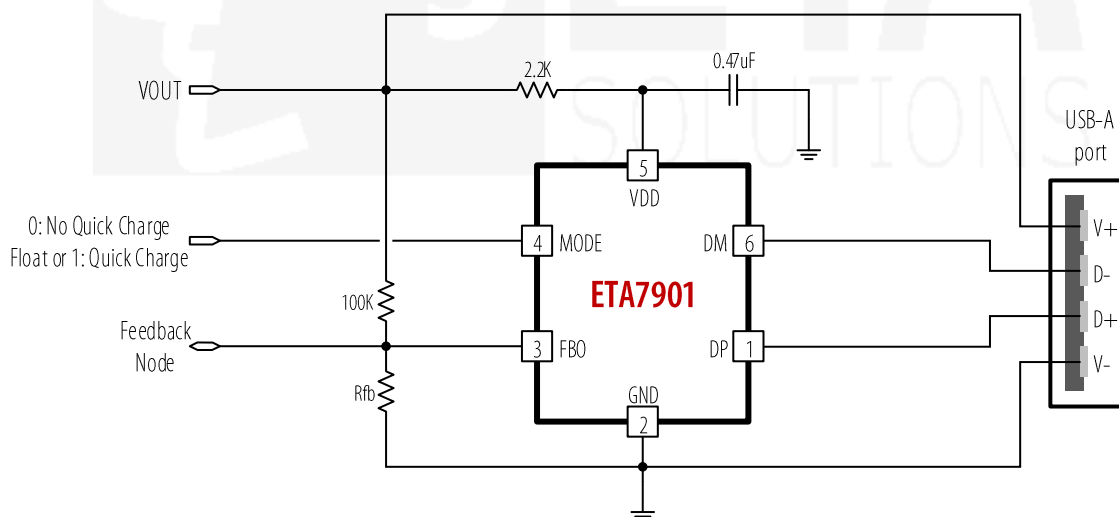
### FEATURES

- ◆ Qualcomm's QC3.0 /QC2.0 compliant
- ◆ Huawei's SCP and FCP compliant
- ◆ Samsung's AFC compliant
- ◆ Oppo's VOOC compliant
- ◆ Apple's 2.4A output setting
- ◆ USB BC1.2
- ◆ Works with both AC/DC and DC/DC
- ◆ Quiescent current 90uA
- ◆ SOT23-6 package

### APPLICATIONS

- ◆ AC/DC adaptor
- ◆ Car Charger
- ◆ Power Bank

### TYPICAL APPLICATION



### ORDERING INFORMATION

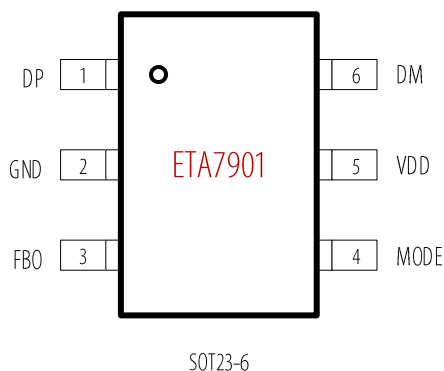
**PART No.**  
ETA7901S2G

**PACKAGE**  
SOT23-6

**TOP MARK**  
ABYW

**Pcs/Reel**  
3000

## PIN CONFIGURATION



## ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

VDD Voltage .....–0.3V to 7V, internally clamped  
 DP, DM Voltage .....–0.3V to 16V  
 FBO, MODE Voltage .....–0.3V to 7V  
 Operating Ambient Temperature Range.....–40°C to 85°C  
 Storage Temperature Range .....–55°C to 150°C  
 Thermal Resistance  $\theta_{JC}$   $\theta_{JA}$   
 SOT23-6.....110 .....220.....°C/W  
 Lead Temperature (Soldering, 10sec) .....260°C  
 ESD HBM (Human Body Mode) .....8KV

## ELECTRICAL CHARACTERISTICS

( $V_{IN}$  = 5V, unless otherwise specified. Typical values are at  $T_A$  = 25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Power Supply</b>					
VDD Voltage Range		2.9		6	V
VDD Clamping Voltage	Vout to Vdd resistor 2.2K		5.0		V
Quiescent Current	Vout to Vdd resistor 2.2K, Vout=5V		95		µA
FBO Current	Vout rise by 1V		10		µA
<b>HVDCP</b>					
Data Detect Voltage VDAT(REF)		0.25	0.325	0.4	V
Output Voltage Selection Reference		1.8	2	2.2	V
D+ High Glitch Filter Time		1	1.25	1.5	S
D- Pull-Down Resistance	Use a 41K res between DM and S13K PIN, a 13.5K res between S13K and GND PIN.	14.25	19.73	24.8	kΩ
D+ short to D- Resistance			17	25	Ω
Continuous Mode Glitch Filter Time		100		200	µS

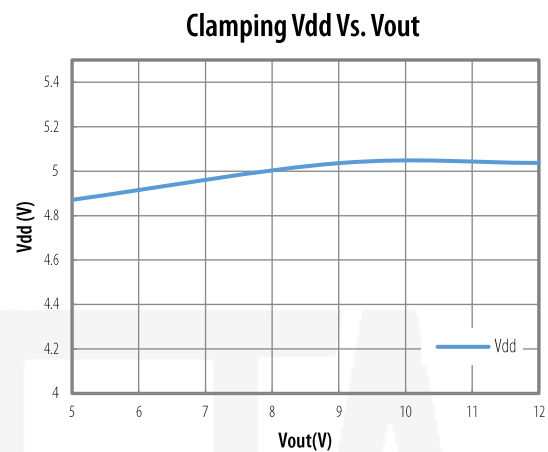
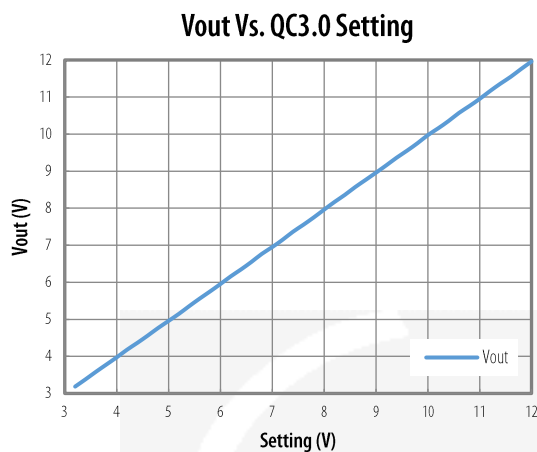
## PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	DP	The pin connected to USB port's D+
2	GND	Ground
3	FBO	Connected to feedback node of a DCDC and ACDC system to control the output voltage
4	MODE	Quick charge enable pin, Float or pulling this pin high will enable all quick charge protocol, pulling low will disable quick charge function.
5	VDD	The chip's power supply.

PIN #	NAME	DESCRIPTION
6	DM	The pin connected to USB port's D-

## TYPICAL CHARACTERISTICS

(Typical values are at  $T_A = 25^\circ\text{C}$  unless otherwise specified.)



## APPLICATION INFORMATION

The ETA7901 is designed to operate as an output voltage controller for USB chargers. It enables voltage manipulating by various quick charge protocols based on the request from the portable device in order to optimize the battery charge time. The ETA7901 is compatible with Qualcomm QC 3.0/2.0, Huawei SCP and FCP, Samsung AFC, Oppo VOOC specifications, as well as conventional BC1.2 and Apple 2.4A setting. The output voltage can be stepped following the powered device's request. The internal discharge switch discharges the output capacitors to a safe voltage level in a case of the cable unplug.

### Quick Charge 3.0

After power startup, ETA7901 turns on internal switch N1 short-circuiting DP and DM for the initial handshake between AC-DC adapter (DCP) and powered device (PD) as described in the USB Battery Charging specification revision 1.2. After the USB BC 1.2 handshake is completed, ETA7901 will turn off the internal switch N1 if it detects a Quick Charge 3.0 or Quick Charge 2.0 compliant PD. At this point the Quick Charge 2.0 handshake followed by the Quick Charge 3.0 handshake can take place as described in the Quick Charge 2.0 and Quick Charge 3.0 protocol specification. Upon completion of the Quick Charge 2.0 and Quick Charge 3.0 handshakes, ETA7901 will turn on the internal switch N2 connecting a 19.53 k $\Omega$  pull-down resistor to pin DM. Please refer to figure 1 for internal blocks mentioned above.

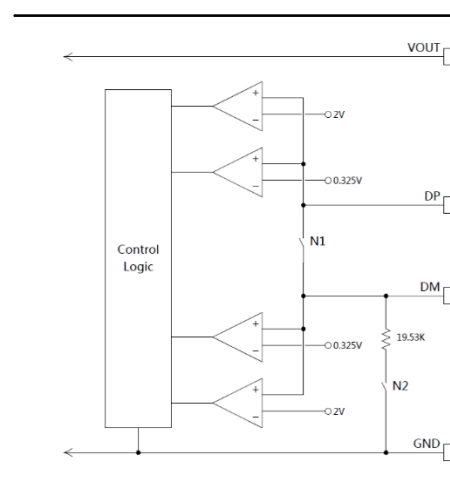


Figure1. Internal functioning blocks of QC3.0 protocol detection on DP and DM pins

When the USB cable is unplugged the voltage level at DP pin is pulled down by ETA7901's internal resistor. Once it drops below 0.325V, ETA7901 will enter default mode and sets the default output voltage of 5 V.

Powered Device (PD)		ETA7901	
D+	D-	Power Supply Output	Note
0.6V	0.6V	12V	Class A
3.3V	0.6V	9V	Class A
0.6V	3.3V	Continuous Mode	Class A with $\pm 0.2V$ step size
0.6V	GND	5V	Default mode

Table 1. QC 3.0 Output Voltage Lookup and Mode Select table

### VDD Voltage Clamping

There is an internal voltage clamping at Vdd pin to maintain Vdd pin voltage is around 5V when Vout is setting higher than 5V. So an external shunt resistor (recommended to be 2.2K, decoupled by a 0.47uF MLCC capacitor) has to be connected between Vout and Vdd pin. There is also a discharge path at this Vdd pin to quickly decrease the output voltage back to 5V soon after portable device is suddenly unplugged during quick charge while Vout is higher than 5V, for example, 12V.

### Mode Selection

ETA7901's mode pin is designed for user to enable/disable quick charge function. When MODE pin is float or pulled high, all quick charge protocols are enabled. When the pin is pulled low, ETA7901 stop manipulating the system's output voltage, but keep D+/-D- pin compatible with BC1.2 specification and Apple 2.4A setting. The MODE pin is useful at multi-USB ports system with one DC/DC or ACDC system, when 2 or more portable devices are plugged into the USB ports, all ports have to output 5V, and the quick charge protocol has to be disabled on the Quick Charge Port.

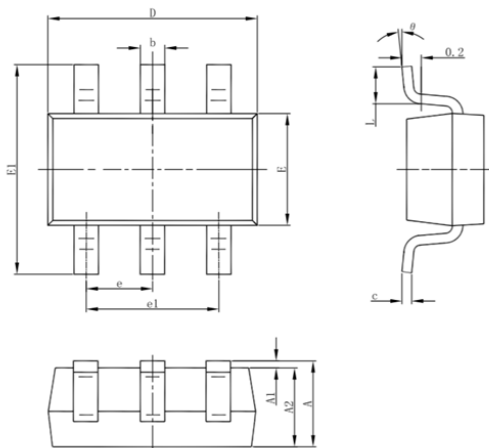
### Resistor Setting at Feedback Node

ETA7901 controls the output voltage by sourcing or sinking an accurate current from FBO pin. It is preset to be 1V/10uA, so the resistor between Vout to system's feedback node has to be 100Kohm. And the resistor Rfb, which is connected from feedback node to GND is related to the feedback voltage ( $V_{FB}$ ) of DC/DC or ACDC converter. The relation is given by following equation:

$$R_{fb} = \frac{100K \times V_{FB}}{5V - V_{FB}}$$

## PACKAGE OUTLINE

Package: SOT23-6



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°