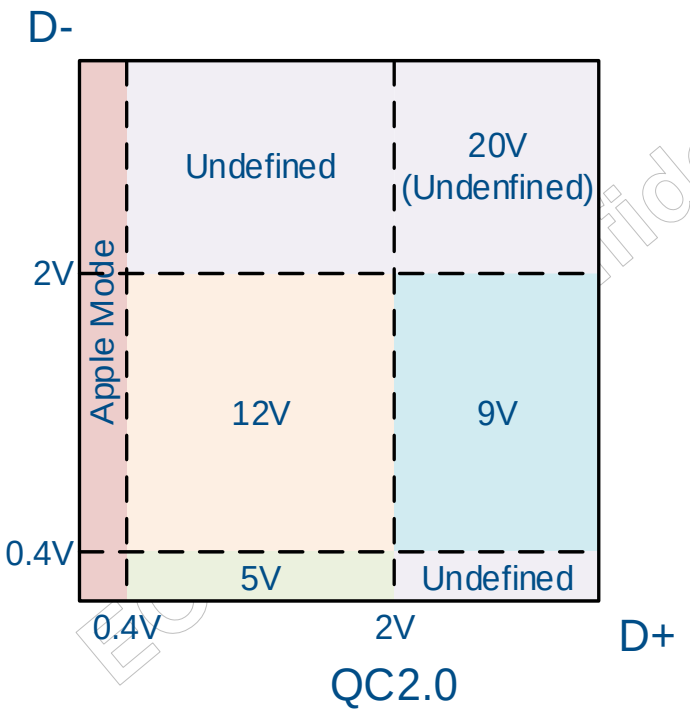
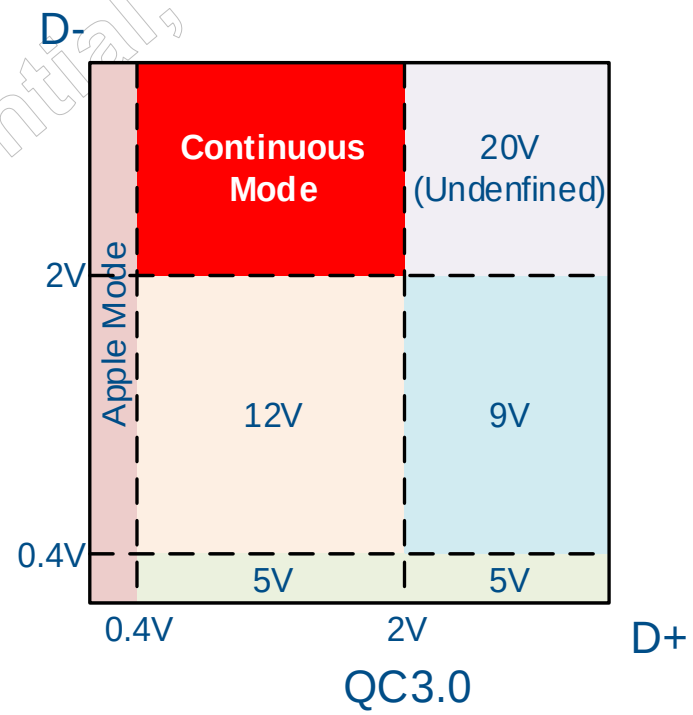
QC3.0 & NT6008 Introduction

2015/10/06

QC3.0 vs. QC2.0

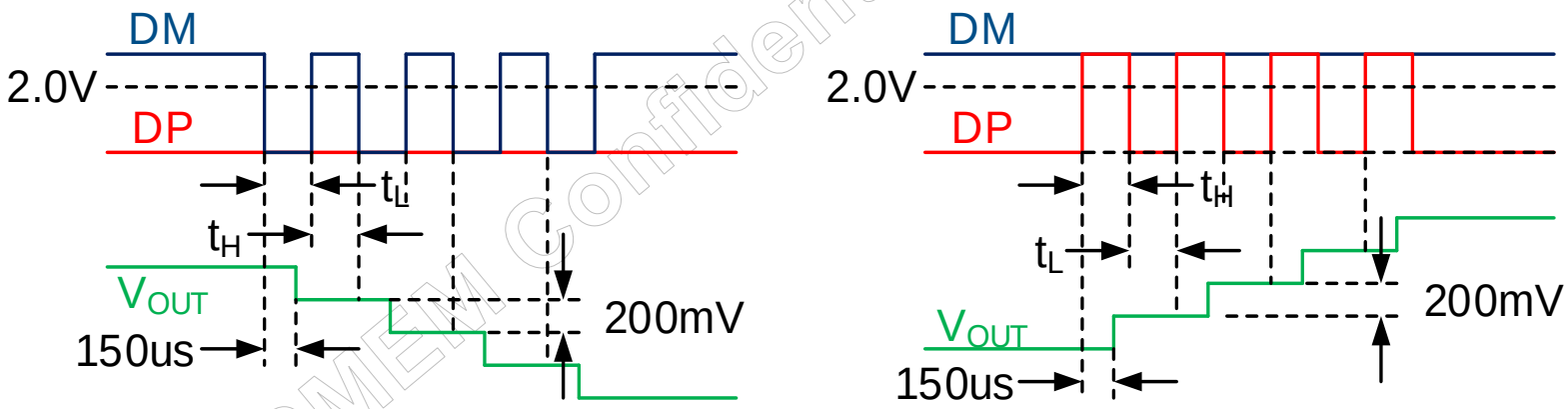
- QC3.0 defines continuous mode as D+ = 0.6, D- = 3.3V
- Output voltage increases/decreases 200mV upon each D+/D- toggle
- Output voltage range: 3.6V ~ 20V (12V for class A)





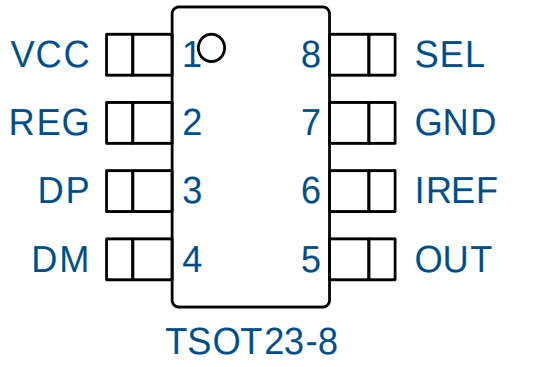
Output Voltage Increment/Decrement

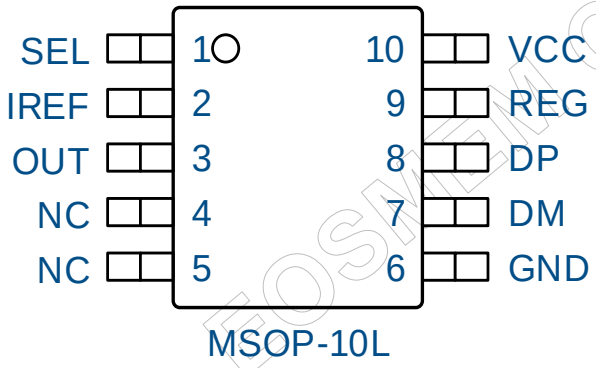
- D+ > 2.0V pulse increases output voltage by 200mV
- D- < 2.0V pulse decreases output voltage by 200mV
- Pulses < 150us will be skipped
- Once entering QC3.0, stay at QC3.0 unless D+ or D - < 0.4V

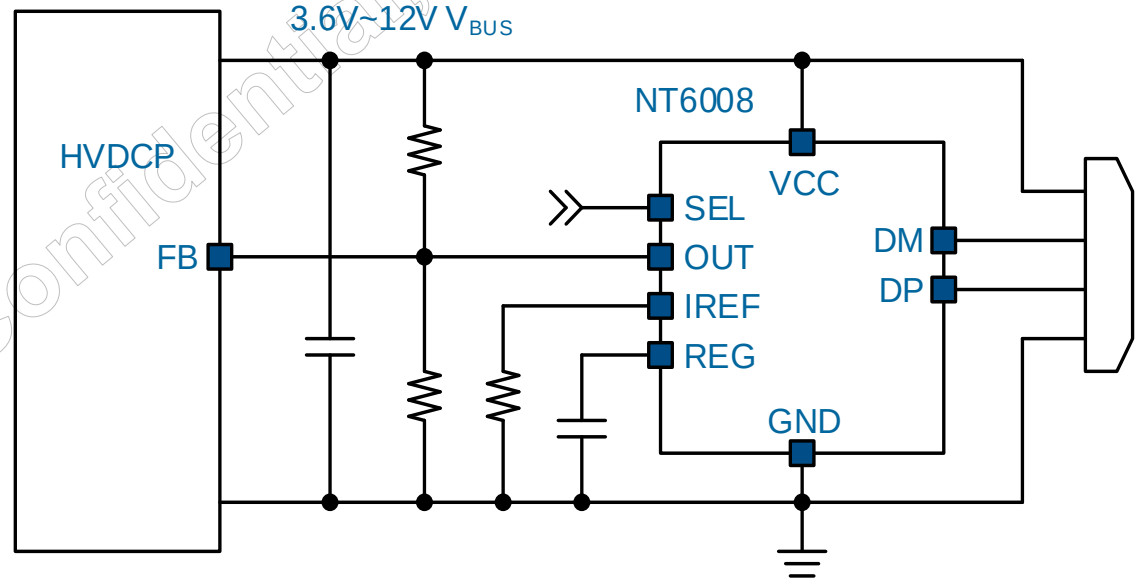


Application Circuit

- OUT pin sinks/sources current to adjust output voltage of HVDCP according to QC2.0/3.0 protocol
- MSOP-10L easy to co-layout with other QC2.0 parts





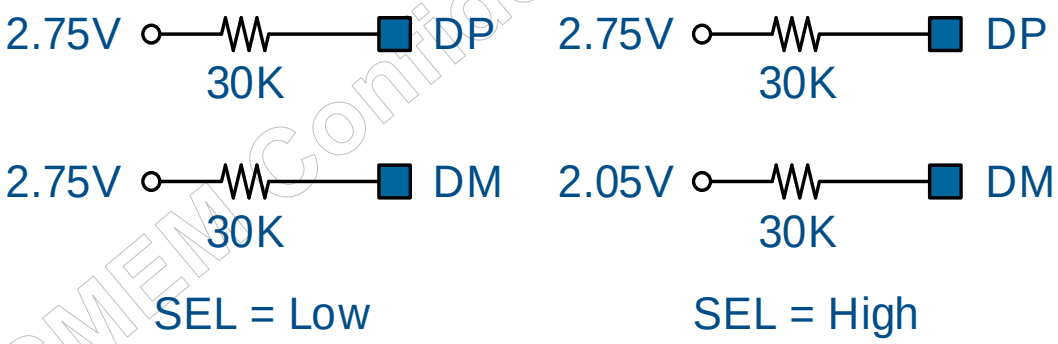


Features

- 3.3V ~ 13.5V Single Supply Operation
- Smart USB Charger Identification Circuit
  - Compliant with QC2.0/3.0 Class A
  - Selectable Apple iPad 2.4A/2.1A Applications
  - Support Samsung Galaxy Note 2.0A Applications
  - Support BC1.2 & YD/T 1591 Battery Charging Specifications
- 8kV High ESD
- Smooth Voltage Transition
- OVP Protection
- Discharge Function
- -40^{O}C ~ +125^{O}C Operating Ambient Temperature
- TSOT23-8L or MSOP-10L Package
- RoHS Compliant and Halogen-Free

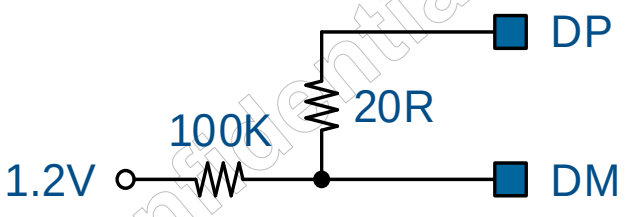
Operation Mode I – Apple Mode

- Enter mode 2 if data line detection, primary detection
  - V_{DP} > 2.875V for 2ms
  - V_{DM} < 2.0V (1.5V if Apple 2.1A selected) for 10ms
  - V_{DP} < 2.0V for 10ms



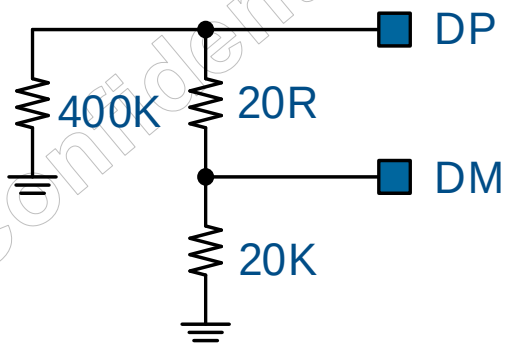
Operation Mode II – Samsung Mode

- Enter mode 3 if $0.4 < V_{DP} < 1.05V$ for one second
- Otherwise enters mode 1 when the 3-second counter expires



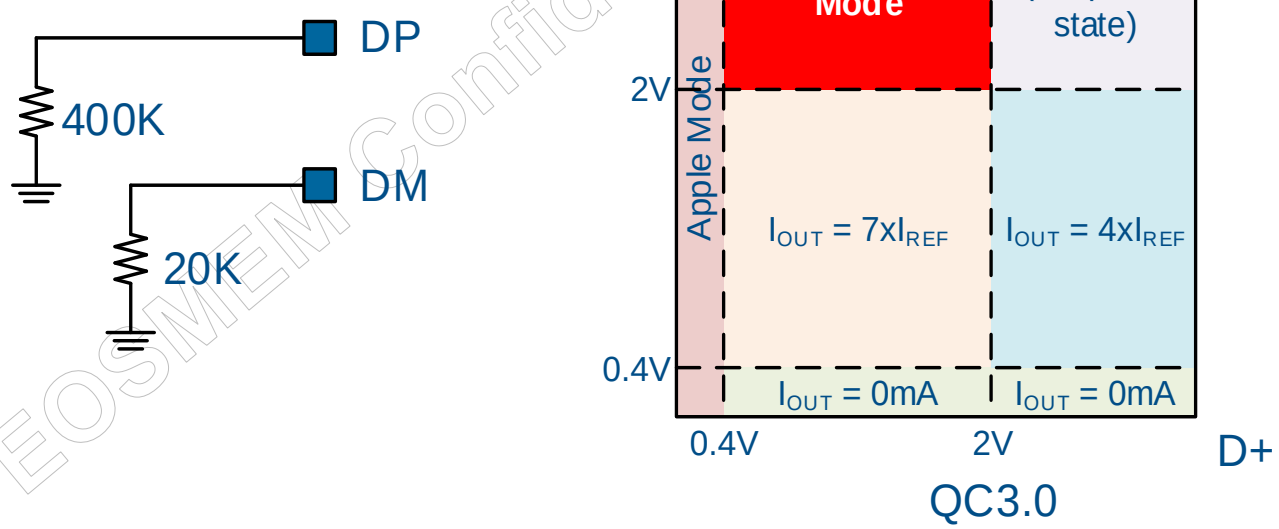
Operation Mode III – BC1.2 Mode

- Enters mode 4 (QC2.0 mode) if 0.4V < V_{DP} < 1.05V for 0.2s.
- Otherwise enters mode 1 when the 3-second counter expires



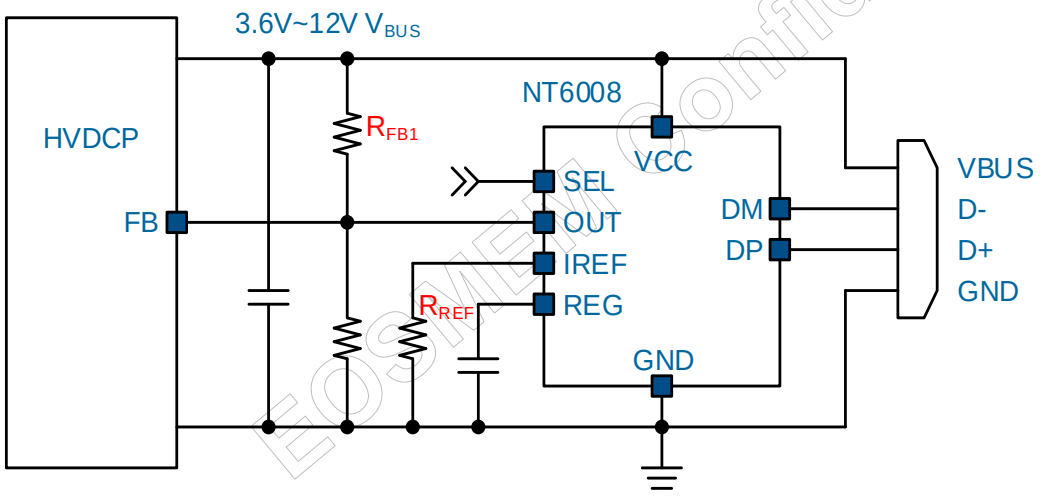
Operation Mode IV – QC Mode

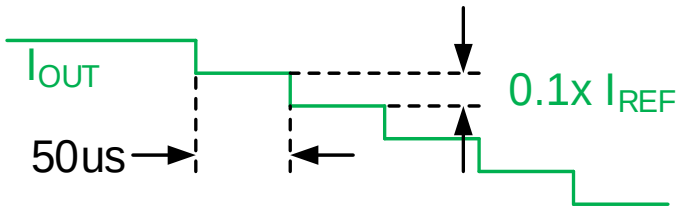
- Leaves mode 4 and enter mode 1 if V_{DP} < 0.4V 2ms or V_{CC} overvoltage protection is triggered
- QC2.0 is confirmed if V_{DM} < 0.4V for 2ms
- NT6008 adjusts output voltage according to QC2.0/3.0 protocol



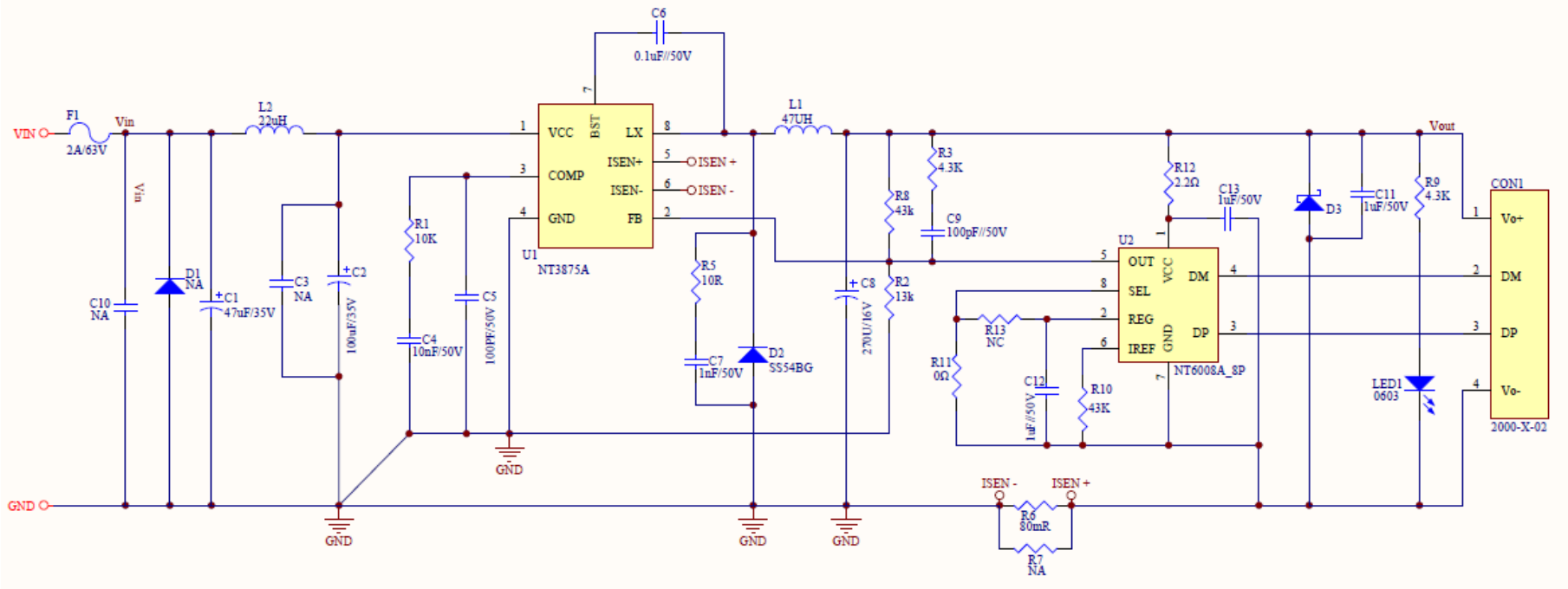
Output Voltage Adjustment

- $I_{REF} = V_{REF} / R_{REF} = 1V/R_{REF}$
- $\Delta V_{BUS} = \Delta K \times I_{REF} * R_{REF} = \Delta K$ (V)
- K = 0 for 5V; = 4 for 9V; K = 7 for 12V
- $0.1xI_{REF}$, 50us per step to ensure smooth voltage transition
- When voltage decreasing, discharges with 10mA/500ms





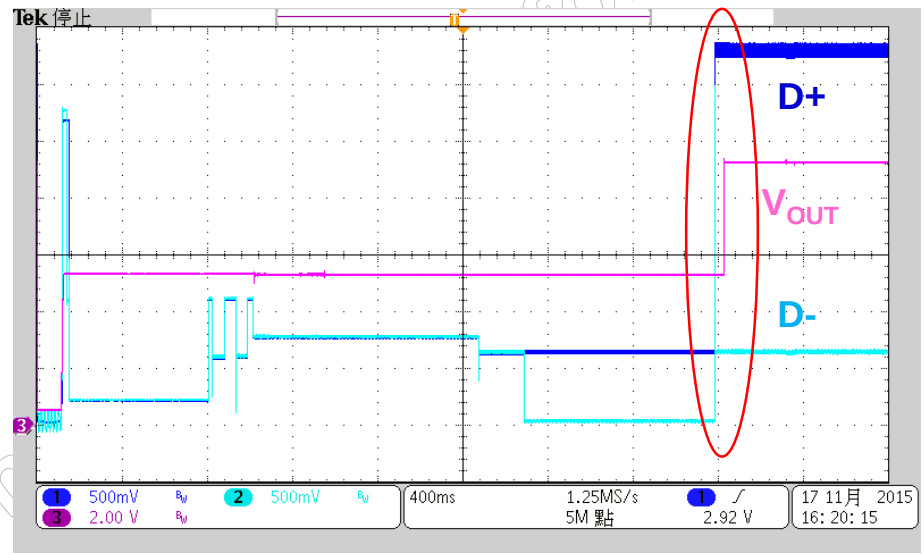
EVB BOM Schematic

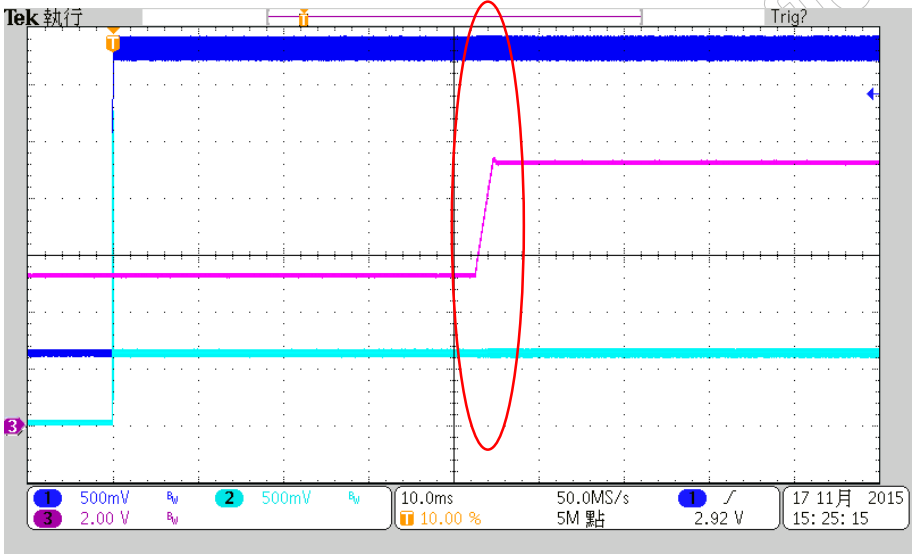


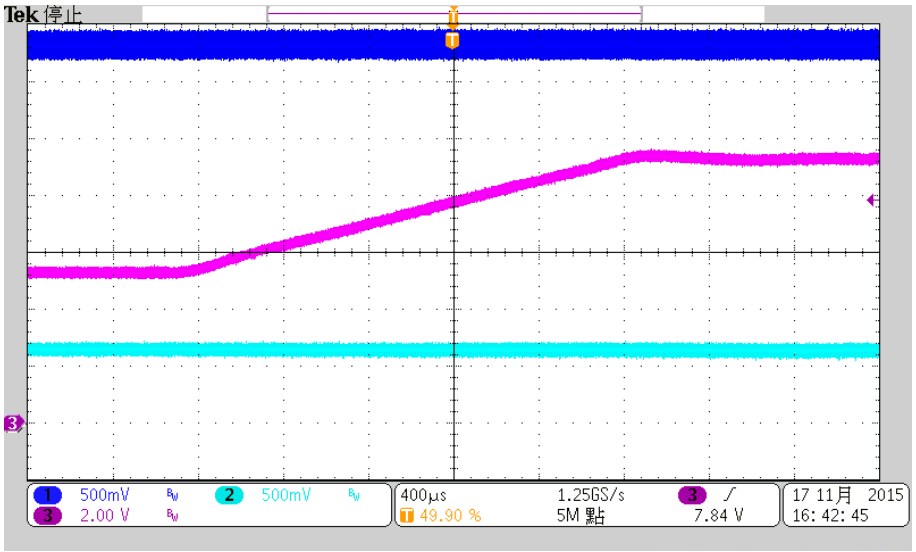
- V_{IN} = 20V to ensure 12V output

NT6008 vs. QC2.0 Supporting Phone

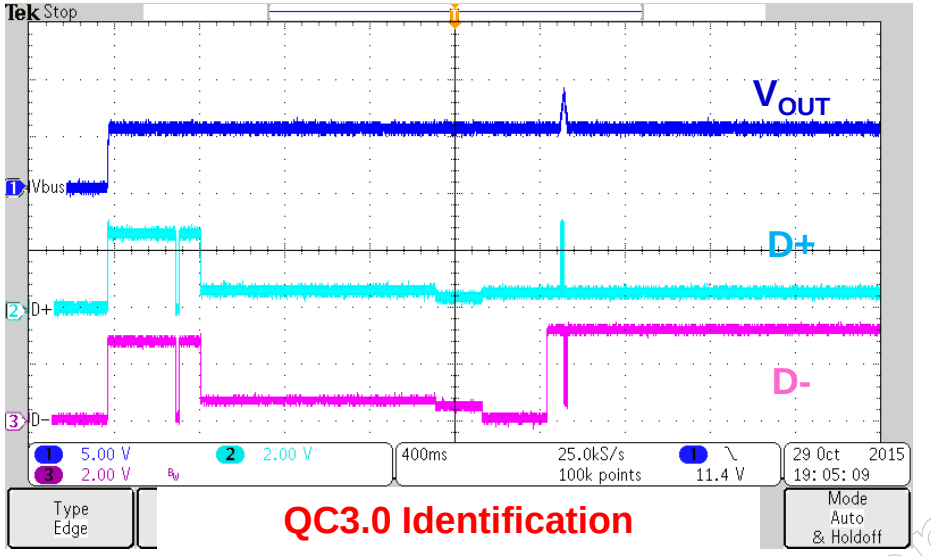
- Smooth voltage transition w/o overshoot



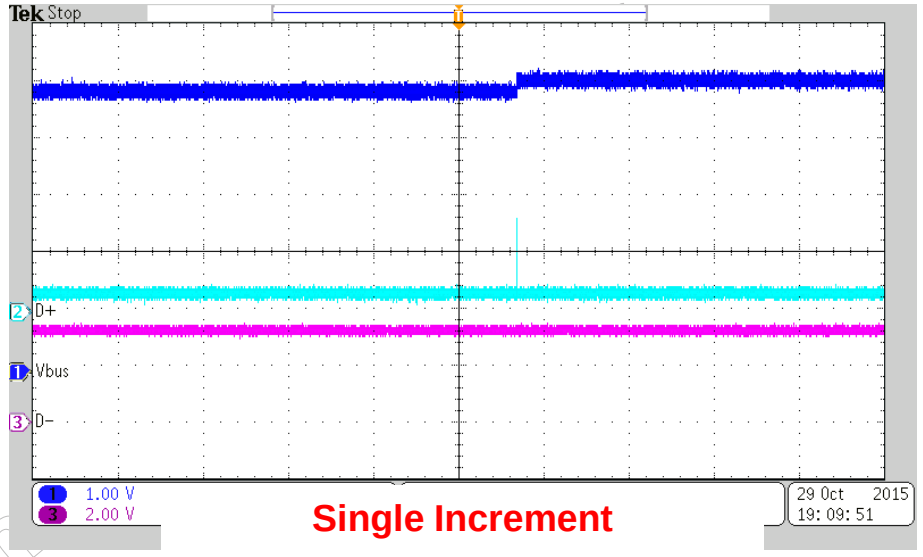




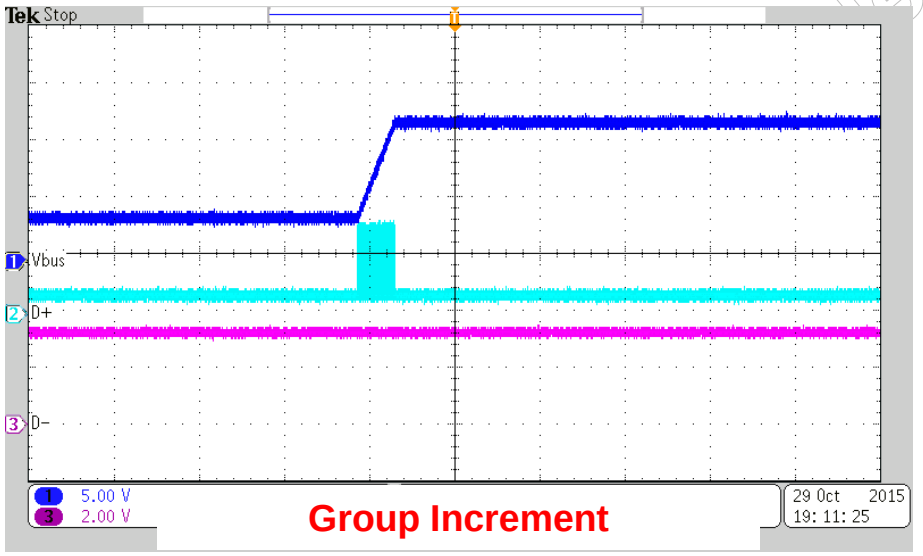
NT6008 vs. QC3.0 Supporting Phone



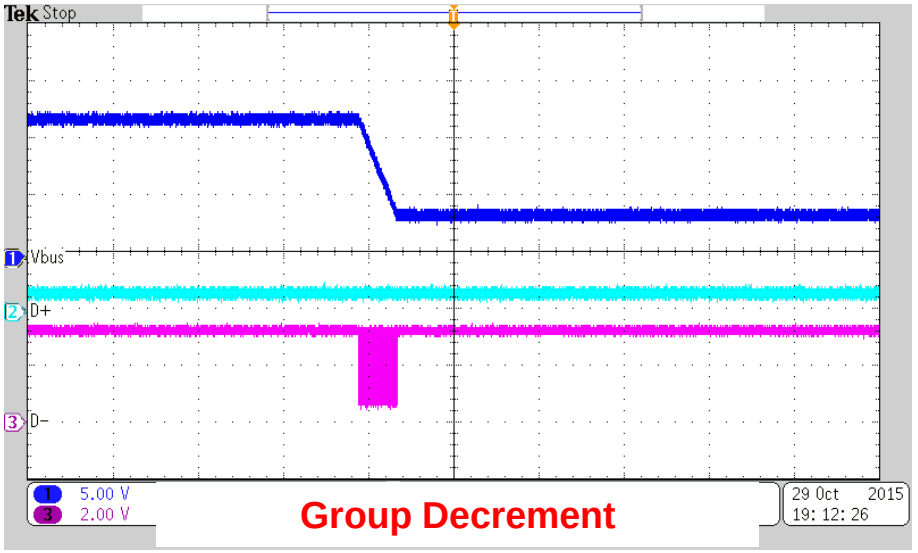
QC3.0 Identification



Single Increment



Group Increment



Group Decrement