uP1816Q

Three-Channel Current Console with SMBus Programmable Current DAC

General Description

The uP1816Q is a high precision current console consisting of three sets SMBus programmable current DACs. Each current DAC is capable of sinking 128-step and sourcing 128-step output currents that are programmed by the SMBus interface. The sinking and sourcing currents of OUT1, OUT2, and OUT3 are programmable for 2x boost respectively. The uP1816Q features soft-jump, easily interfacing with standard DC/DC converter for current console. The uP1816Q is available in the space-saving WDFN2x2 - 8L package.

Features

- **SMBus 2.0 Compatible Interface**
- **Provide 3 Sets of Current DACs**
  - **5% Accuracy**
  - **SMBus Programmable 128-Step Sourcing Current**
  - **SMBus Programmable 128-Step Sinking Current**
  - **Programmable Full Scale Current**
- **Internal Soft-Jump Function**
- **Low External Component Count**
- **Low Cost and Easy-to-Use**
- **Small Footprint in WDFN2x2-8L Package**
- **RoHS Compliant and Halogen Free**

Applications

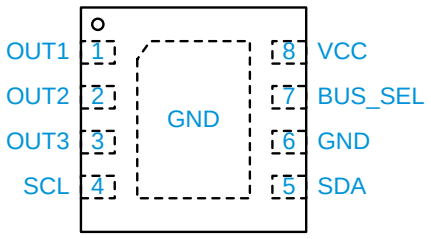
- **Power Supply Adjustment for M/B and VGA**
- **Power Supply Margining**
- **Adjustable Current Sink and Source**

Ordering Information

Order Number	Package Type	Top Marking
uP1816QDN8	WDFN2x2-8L	uP1816Q

Note:
(1) Please check the sample/production availability with uPI representatives.
(2) uPI products are compatible with the current IPC/JEDEC J-STD-020 requirement. They are halogen-free, RoHS compliant and 100% matte tin (Sn) plating that are suitable for use in SnPb or Pb-free soldering processes.

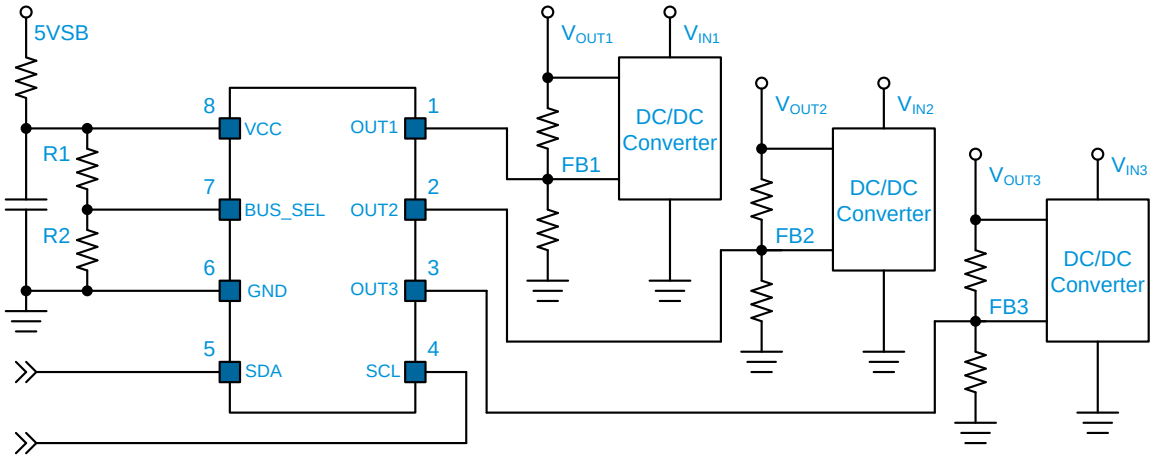
Pin Configuration



WDFN2x2-8L

uP1816Q

Typical Application Circuit

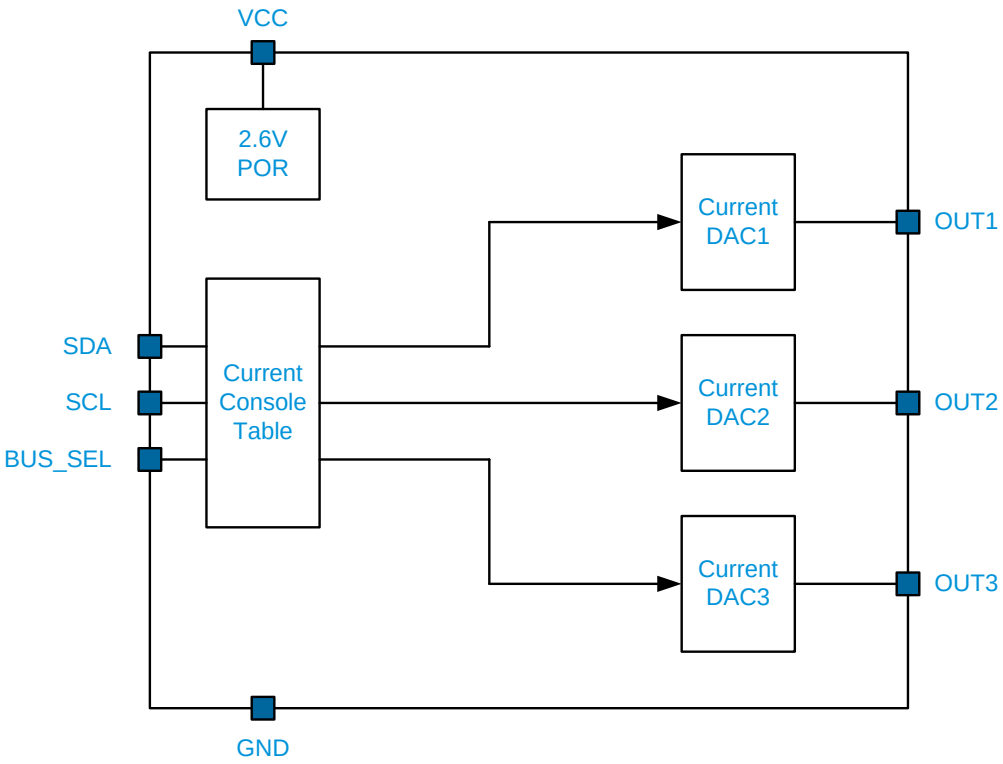


Functional Pin Description

Pin No.	Name	Pin Function
1	OUT1	**Current Output 1.**
2	OUT2	**Current Output 2.**
3	OUT3	**Current Output 3.**
4	SCL	**Serial Clock Input.** This pin receieves serial bus clock signal.
5	SDA	**Serial Data Input.** This pin is input or output of serial bus data signal.
6	GND	**Ground.**
7	BUS_SEL	**Bus Address Selection.** Connect a voltage divider to program the bus address of the uP1816Q.
8	VCC	**Supply Voltage Input.** This pin is power input of uP1816Q. This pin is continuously monitored for power-on reset (POR). The POR threshold level is 2.6V. Connect this pin to 5VSB with a ceramic decoupling capacitor directly to GND pin.
Exposed Pad		**Ground.** Tie this pin to ground island/plane through the lowest impedance connection available.

uP1816Q

Functional Block Diagram



Functional Description

The uP1816Q is a high precision current console consisting of three sets of SMBus programmable current DACs. Each current DAC is capable of sinking 128-step and sourcing 128-step output currents that are programmed by the SMBus interface. The sinking and sourcing currents of OUT1, OUT2 and OUT3 are programmable for 2x boost respectively.
The uP1816Q features soft-jump, easily interfacing with standard DC/DC converter for current console. The uP1816Q is available in the space-saving WDFN2x2 - 8L package.

Power On Reset

The uP1816Q continuously monitors supply voltage at VCC pin for power on reset circuit POR. The POR threshold at VCC rising is typically 2.6V. All three current DAC outputs are disabled if the supply voltage is lower than the POR threshold level.

SMBus Address Programming

The uP1816Q features user programmable address by a voltage divider from VCC-to-BUS_SEL-to-GND as shown in the *Typical Application Circuit*. BUS_SEL pin voltage is compared with internal reference voltage for address programming. There are total 6 addresses available. Table 1 illustrates recommended external voltage divider for address programming.

Table 1. Recommended Address Programming

Address	0x2A	0x28	0x26	0x24	0x22	0x20
R1(kΩ)	open	3.9	3	2.2	1.3	10
R2(kΩ)	10	1.3	2.2	3	3.9	open
BUS_SEL Voltage (% of VCC)	0	25	42	58	75	100

SMBus Programming Interface

The uP1816Q integrates 3-channel current DAC OUT1, OUT2 and OUT3 that are programmed by Reg0x01, Reg0x02 and Reg0x03 respectively. Each output can sink 128-step current (0~1270uA) and source 128 step current (0~1270uA) as shown in Table 2. When bit 0, bit2, or bit 4 of Reg0x05 is set to 1, the corresponding output current has 2x value boost.
When the undefined value for Reg0x01~03 is selected, the output current will keep the last value.

Soft Jump

The uP1816Q features soft jump function that changes output current gradually to its final value. Each step takes about 10us. This makes the output voltage of accompanying DC/DC converter smooth transition to is final value, resulting in minimum inrush current from its supply input and avoiding false trigger of over current protection.

Bit 7 Transition

The uP1816Q current DAC supports bit 7 direct transition (from 0 to 1 or 1 to 0) by using SMBus program. In the transition, the output current is changed gradually and crosses zero to the new target by soft jump function. It increases/decreases from initial value to zero, and then keep increasing/decreasing to reach its final value. For example, when Reg0x01 is programmed from 0x8F to 0x0F, the output current transition is executed in an order as Reg0x01 = 0x80 → 0x00 → 0x0F

Functional Description

0x04 Watchdog Timer Delay; Default 0x00

Bit 7: Enable Watchdog Timer

1: Start watchdog counter and reset all registers to default after time-out.

0: Stop watchdog counter and reset watchdog timer.

Bit 6: Watchdog Timer Status; Read Only

This bit is set 1 when watchdog time-out happens.

This bit is clear to 0 once this register is read out.

Bits 5~4: Watchdog Timer. Accuracy 50%

11: 11000ms

10: 5500ms

01: 2800ms

00: 1400ms

Bit 3~2: Step Speed Controller Delay

11: 40us

10: 30us

01: 20us

00: 10us

Bit 1~0: Version Identification

0x05 Current DAC control and Power Saving

Bit 7, 5, 3, 1: Reserved

Bit 6: Power Saving

1: Power saving function enabled

0: Power saving function disabled

Bit 4, 2, 0: Output current 2x for OUT3, OUT2, and OUT1

1: Output current 2x enabled

0: Output current 2x disabled

0x5D Vendor ID1

0x5E Vendor ID2

Functional Description

Table 2. Current DAC Table with Bit7=0

Step	Bit 7~0	OUT1(uA)	OUT2(uA)	OUT3(uA)	Step	Bit 7~0	OUT1(uA)	OUT2(uA)	OUT3(uA)
0	0000,0000	0	0	0	42	0010,1010	-420	-420	-420
1	0000,0001	-10	-10	-10	43	0010,1011	-430	-430	-430
2	0000,0010	-20	-20	-20	44	0010,1100	-440	-440	-440
3	0000,0011	-30	-30	-30	45	0010,1101	-450	-450	-450
4	0000,0100	-40	-40	-40	46	0010,1110	-460	-460	-460
5	0000,0101	-50	-50	-50	47	0010,1111	-470	-470	-470
6	0000,0110	-60	-60	-60	48	0011,0000	-480	-480	-480
7	0000,0111	-70	-70	-70	49	0011,0001	-490	-490	-490
8	0000,1000	-80	-80	-80	50	0011,0010	-500	-500	-500
9	0000,1001	-90	-90	-90	51	0011,0011	-510	-510	-510
10	0000,1010	-100	-100	-100	52	0011,0100	-520	-520	-520
11	0000,1011	-110	-110	-110	53	0011,0101	-530	-530	-530
12	0000,1100	-120	-120	-120	54	0011,0110	-540	-540	-540
13	0000,1101	-130	-130	-130	55	0011,0111	-550	-550	-550
14	0000,1110	-140	-140	-140	56	0011,1000	-560	-560	-560
15	0000,1111	-150	-150	-150	57	0011,1001	-570	-570	-570
16	0001,0000	-160	-160	-160	58	0011,1010	-580	-580	-580
17	0001,0001	-170	-170	-170	59	0011,1011	-590	-590	-590
18	0001,0010	-180	-180	-180	60	0011,1100	-600	-600	-600
19	0001,0011	-190	-190	-190	61	0011,1101	-610	-610	-610
20	0001,0100	-200	-200	-200	62	0011,1110	-620	-620	-620
21	0001,0101	-210	-210	-210	63	0011,1111	-630	-630	-630
22	0001,0110	-220	-220	-220	64	0100,0000	-640	-640	-640
23	0001,0111	-230	-230	-230	65	0100,0001	-650	-650	-650
24	0001,1000	-240	-240	-240	66	0100,0010	-660	-660	-660
25	0001,1001	-250	-250	-250	67	0100,0011	-670	-670	-670
26	0001,1010	-260	-260	-260	68	0100,0100	-680	-680	-680
27	0001,1011	-270	-270	-270	69	0100,0101	-690	-690	-690
28	0001,1100	-280	-280	-280	70	0100,0110	-700	-700	-700
29	0001,1101	-290	-290	-290	71	0100,0111	-710	-710	-710
30	0001,1110	-300	-300	-300	72	0100,1000	-720	-720	-720
31	0001,1111	-310	-310	-310	73	0100,1001	-730	-730	-730
32	0010,0000	-320	-320	-320	74	0100,1010	-740	-740	-740
33	0010,0001	-330	-330	-330	75	0100,1011	-750	-750	-750
34	0010,0010	-340	-340	-340	76	0100,1100	-760	-760	-760
35	0010,0011	-350	-350	-350	77	0100,1101	-770	-770	-770
36	0010,0100	-360	-360	-360	78	0100,1110	-780	-780	-780
37	0010,0101	-370	-370	-370	79	0100,1111	-790	-790	-790
38	0010,0110	-380	-380	-380	80	0101,0000	-800	-800	-800
39	0010,0111	-390	-390	-390	81	0101,0001	-810	-810	-810
40	0010,1000	-400	-400	-400	82	0101,0010	-820	-820	-820
41	0010,1001	-410	-410	-410	83	0101,0011	-830	-830	-830

Table 2. Current DAC Table with Bit7=0 (cont.)

Step	Bit 7~0	OUT1(uA)	OUT2(uA)	OUT3(uA)
84	0101,0100	-840	-840	-840
85	0101,0101	-850	-850	-850
86	0101,0110	-860	-860	-860
87	0101,0111	-870	-870	-870
88	0101,1000	-880	-880	-880
89	0101,1001	-890	-890	-890
90	0101,1010	-900	-900	-900
91	0101,1011	-910	-910	-910
92	0101,1100	-920	-920	-920
93	0101,1101	-930	-930	-930
94	0101,1110	-940	-940	-940
95	0101,1111	-950	-950	-950
96	0110,0000	-960	-960	-960
97	0110,0001	-970	-970	-970
98	0110,0010	-980	-980	-980
99	0110,0011	-990	-990	-990
100	0110,0100	-1000	-1000	-1000
101	0110,0101	-1010	-1010	-1010
102	0110,0110	-1020	-1020	-1020
103	0110,0111	-1030	-1030	-1030
104	0110,1000	-1040	-1040	-1040
105	0110,1001	-1050	-1050	-1050
106	0110,1010	-1060	-1060	-1060
107	0110,1011	-1070	-1070	-1070
108	0110,1100	-1080	-1080	-1080
109	0110,1101	-1090	-1090	-1090
110	0110,1110	-1100	-1100	-1100
111	0110,1111	-1110	-1110	-1110
112	0111,0000	-1120	-1120	-1120
113	0111,0001	-1130	-1130	-1130
114	0111,0010	-1140	-1140	-1140
115	0111,0011	-1150	-1150	-1150
116	0111,0100	-1160	-1160	-1160
117	0111,0101	-1170	-1170	-1170
118	0111,0110	-1180	-1180	-1180
119	0111,0111	-1190	-1190	-1190
120	0111,1000	-1200	-1200	-1200
121	0111,1001	-1210	-1210	-1210
122	0111,1010	-1220	-1220	-1220
123	0111,1011	-1230	-1230	-1230
124	0111,1100	-1240	-1240	-1240
125	0111,1101	-1250	-1250	-1250
126	0111,1110	-1260	-1260	-1260
127	0111,1111	-1270	-1270	-1270

Functional Description

Table 3. Current DAC Table with Bit7=1

Step	Bit 7~0	OUT1(uA)	OUT2(uA)	OUT3(uA)	Step	Bit 7~0	OUT1(uA)	OUT2(uA)	OUT3(uA)
0	1000,0000	0	0	0	42	1010,1010	420	420	420
1	1000,0001	10	10	10	43	1010,1011	430	430	430
2	1000,0010	20	20	20	44	1010,1100	440	440	440
3	1000,0011	30	30	30	45	1010,1101	450	450	450
4	1000,0100	40	40	40	46	1010,1110	460	460	460
5	1000,0101	50	50	50	47	1010,1111	470	470	470
6	1000,0110	60	60	60	48	1011,0000	480	480	480
7	1000,0111	70	70	70	49	1011,0001	490	490	490
8	1000,1000	80	80	80	50	1011,0010	500	500	500
9	1000,1001	90	90	90	51	1011,0011	510	510	510
10	1000,1010	100	100	100	52	1011,0100	520	520	520
11	1000,1011	110	110	110	53	1011,0101	530	530	530
12	1000,1100	120	120	120	54	1011,0110	540	540	540
13	1000,1101	130	130	130	55	1011,0111	550	550	550
14	1000,1110	140	140	140	56	1011,1000	560	560	560
15	1000,1111	150	150	150	57	1011,1001	570	570	570
16	1001,0000	160	160	160	58	1011,1010	580	580	580
17	1001,0001	170	170	170	59	1011,1011	590	590	590
18	1001,0010	180	180	180	60	1011,1100	600	600	600
19	1001,0011	190	190	190	61	1011,1101	610	610	610
20	1001,0100	200	200	200	62	1011,1110	620	620	620
21	1001,0101	210	210	210	63	1011,1111	630	630	630
22	1001,0110	220	220	220	64	1100,0000	640	640	640
23	1001,0111	230	230	230	65	1100,0001	650	650	650
24	1001,1000	240	240	240	66	1100,0010	660	660	660
25	1001,1001	250	250	250	67	1100,0011	670	670	670
26	1001,1010	260	260	260	68	1100,0100	680	680	680
27	1001,1011	270	270	270	69	1100,0101	690	690	690
28	1001,1100	280	280	280	70	1100,0110	700	700	700
29	1001,1101	290	290	290	71	1100,0111	710	710	710
30	1001,1110	300	300	300	72	1100,1000	720	720	720
31	1001,1111	310	310	310	73	1100,1001	730	730	730
32	1010,0000	320	320	320	74	1100,1010	740	740	740
33	1010,0001	330	330	330	75	1100,1011	750	750	750
34	1010,0010	340	340	340	76	1100,1100	760	760	760
35	1010,0011	350	350	350	77	1100,1101	770	770	770
36	1010,0100	360	360	360	78	1100,1110	780	780	780
37	1010,0101	370	370	370	79	1100,1111	790	790	790
38	1010,0110	380	380	380	80	1101,0000	800	800	800
39	1010,0111	390	390	390	81	1101,0001	810	810	810
40	1010,1000	400	400	400	82	1101,0010	820	820	820
41	1010,1001	410	410	410	83	1101,0011	830	830	830

Table 3. Current DAC Table with Bit7=1 (cont.)

Step	Bit 7~0	OUT1(uA)	OUT2(uA)	OUT3(uA)
84	1101,0100	840	840	840
85	1101,0101	850	850	850
86	1101,0110	860	860	860
87	1101,0111	870	870	870
88	1101,1000	880	880	880
89	1101,1001	890	890	890
90	1101,1010	900	900	900
91	1101,1011	910	910	910
92	1101,1100	920	920	920
93	1101,1101	930	930	930
94	1101,1110	940	940	940
95	1101,1111	950	950	950
96	1110,0000	960	960	960
97	1110,0001	970	970	970
98	1110,0010	980	980	980
99	1110,0011	990	990	990
100	1110,0100	1000	1000	1000
101	1110,0101	1010	1010	1010
102	1110,0110	1020	1020	1020
103	1110,0111	1030	1030	1030
104	1110,1000	1040	1040	1040
105	1110,1001	1050	1050	1050
106	1110,1010	1060	1060	1060
107	1110,1011	1070	1070	1070
108	1110,1100	1080	1080	1080
109	1110,1101	1090	1090	1090
110	1110,1110	1100	1100	1100
111	1110,1111	1110	1110	1110
112	1111,0000	1120	1120	1120
113	1111,0001	1130	1130	1130
114	1111,0010	1140	1140	1140
115	1111,0011	1150	1150	1150
116	1111,0100	1160	1160	1160
117	1111,0101	1170	1170	1170
118	1111,0110	1180	1180	1180
119	1111,0111	1190	1190	1190
120	1111,1000	1200	1200	1200
121	1111,1001	1210	1210	1210
122	1111,1010	1220	1220	1220
123	1111,1011	1230	1230	1230
124	1111,1100	1240	1240	1240
125	1111,1101	1250	1250	1250
126	1111,1110	1260	1260	1260
127	1111,1111	1270	1270	1270

Absolute Maximum Rating

(Note 1)

Supply Input Voltage, V_{CC} ---------- -0.3V to +6V
Other Pins ---------- -0.3V to (V_{CC}+0.3V)
Storage Temperature Range ---------- -65°C to +150°C
Junction Temperature ---------- 150°C
Lead Temperature (Soldering,10 sec) ---------- 260°C
ESD Rating (Note 2)
HBM (Human Body Mode) ---------- 2kV

Thermal Information

Package Thermal Resistance (Note 3)
WDFN2x2-8L θ_{JA} ---------- 155°C/W
WDFN2x2-8L θ_{JC} ---------- 20°C/W
Power Dissipation, P_D @ T_A = 25°C
WDFN2x2-8L ---------- 0.645W

Recommended Operation Conditions

(Note 4)

Operating Junction Temperature Range ---------- -40°C to +125 °C
Operating Ambient Temperature Range ---------- -40°C to +85 °C
Supply Input Voltage, V_{CC} ---------- +3V to +5.5V

Note 1. Stresses listed as the above *Absolute Maximum Ratings* may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability

Note 2. Devices are ESD sensitive. Handling precaution recommended.

Note 3. θ_{JA} is measure in the natural convection at T_A = 25°C on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard. P_D is determined by *Operation Junction Temperature* T_{JMAX} in ROC.

Note 4. Device is not guaranteed to function outside its operating conditions.

Electrical Characteristics

V_{CC} = 5V (T_A = 25°C, unless otherwise specified)

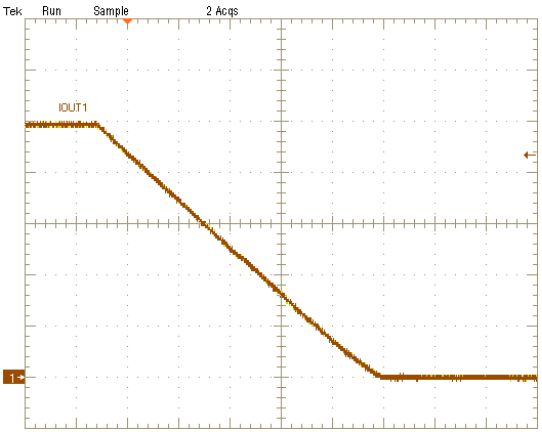
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Input Voltage						
POR Threshold	V_{CC_RTH}		--	2.6	--	V
Supply Input Current	I_{CC}	I_{OUT1} = I_{OUT2} = I_{OUT3} = 0uA	0.5	--	1.5	mA
Supply Input Current in Power Saving Mode	I_{CC_PSM}	I_{OUT1} = I_{OUT2} = I_{OUT3} = 0uA	0.3	--	0.6	mA
Input High Leakage	I_{IH}		--	--	1	uA
Input Low Leakage	I_{IL}		-1	--	--	uA
Current DAC Output						
Output Offset Current	I_{OUT_OFST}	I_{OUT} programmed as 0uA, V_{OUT}=0V~5V	-1	--	1	uA
Output Current Accuracy		I_{OUT} programmed as 110uA~2540uA, V_{OUT}=0.8V	-5	--	5	%
		I_{OUT} programmed as 0uA~100uA, V_{OUT}=0.8V	-5	--	5	uA
Output Current Line Regulation		I_{OUT} sinking, V_{OUT}=0.5V~V_{CC} - 1V	-1.2	--	1.2	%/V
		I_{OUT} sourcing, V_{OUT}=0.5V~V_{CC} - 1V	-1	--	1	%/V
Step Speed Accuracy			--	80	--	%
Watchdog Delay Accuracy			--	80	--	%
SMBus Interface						
SCL, SDA Input High Level	V_{IH}		2.1	--	V_{PULLUP}	V
SCL, SDA Input Low Level	V_{IL}		--	--	0.6	V
SDA Output Low Voltage	V_{OL}	I_{OL} = I_{PULLUP}	--	--	0.4	V
Nominal Pull-Up Voltage	V_{PULLUP}		2.7	--	5.5	V
Current Sinking	I_{PULLUP}	V_{OL}=0.4V	12	--	--	mA

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Address Selection						
Address 1 Voltage Range		Address =0x2A	--	--	15	$\%V_{CC}$
Address 2 Voltage Range		Address =0x28	20	25	30	$\%V_{CC}$
Address 3 Voltage Range		Address =0x26	37	42	47	$\%V_{CC}$
Address 4 Voltage Range		Address =0x24	53	58	62	$\%V_{CC}$
Address 5 Voltage Range		Address =0x22	70	75	80	$\%V_{CC}$
Address 6 Voltage Range		Address =0x20	85	--	--	$\%V_{CC}$

Typical Operation Characteristics

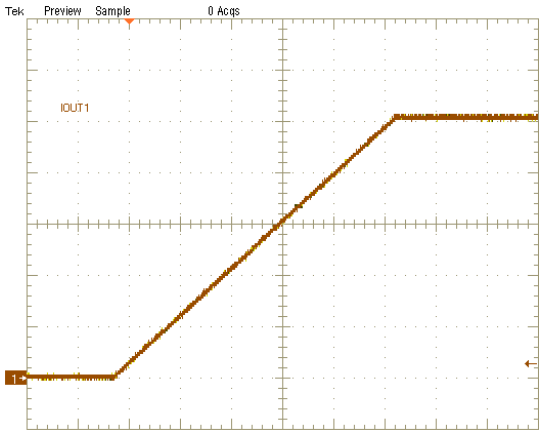
Output Current Transition



CH1 = IOUT1, 250uA/div, Time(200us/div)

Reg0x01 = 00 to 7F, Reg0x05 bit 0 = 0, Output Voltage = 0.8V

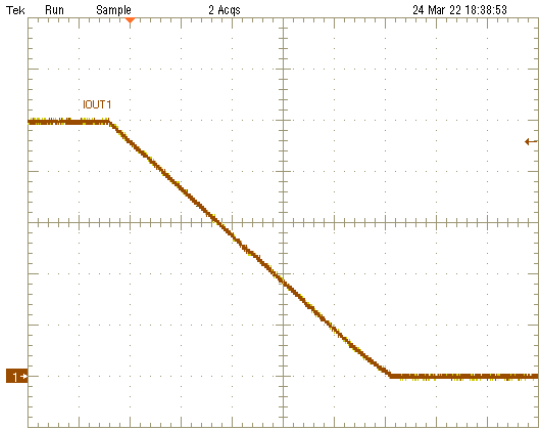
Output Current Transition



CH1 = IOUT1, 250uA/div, Time(200us/div)

Reg0x01 = 80 to FF, Reg0x05 bit 0 = 0, Output Voltage = 0.8V

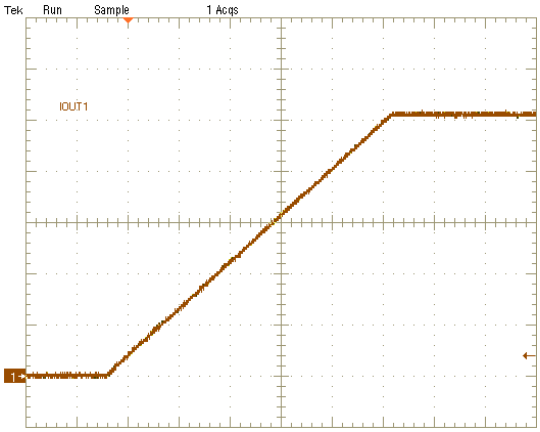
Output Current Transition



CH1 = IOUT1, 500uA/div, Time(200us/div)

Reg0x01 = 00 to 7F, Reg0x05 bit 0 = 1, Output Voltage = 0.8V

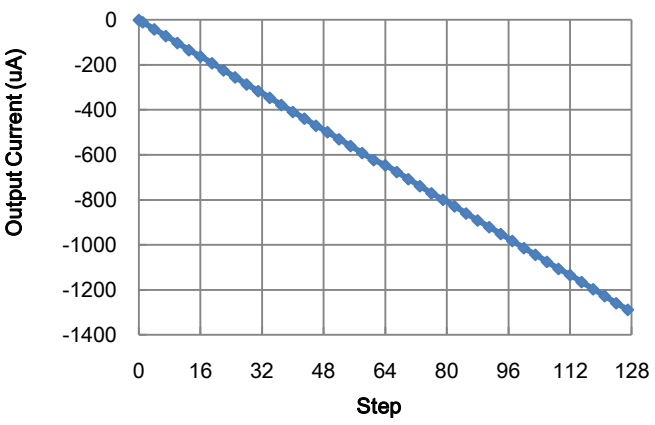
Output Current Transition



CH1 = IOUT1, 500uA/div, Time(200us/div)

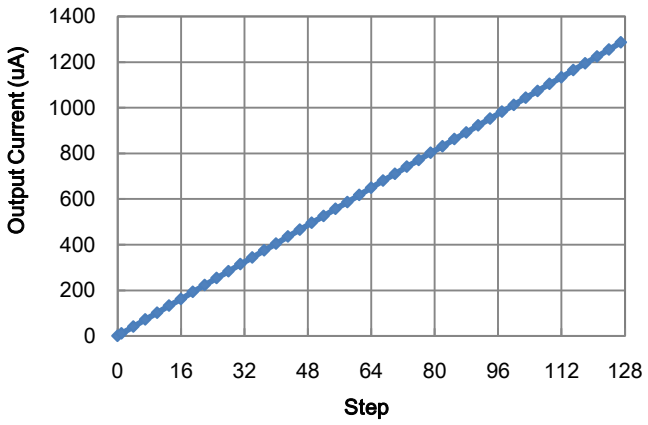
Reg0x01 = 80 to FF, Reg0x05 bit 0 = 1, Output Voltage = 0.8V

Output Current with Bit 7 = 0



Reg0x05 Bit 4,2,0 = 0
Output Voltage = 0.8V

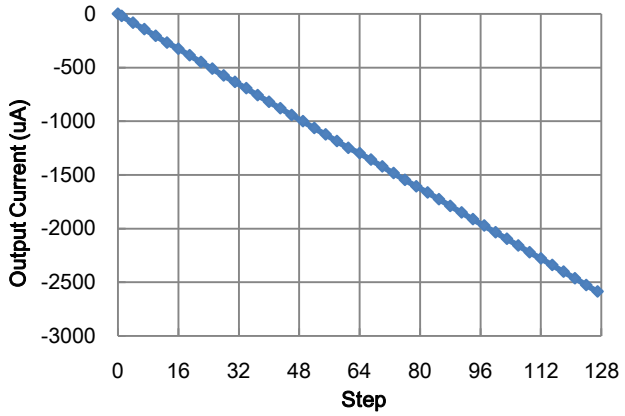
Output Current with Bit 7 = 1



Reg0x05 Bit 4,2,0 = 0
Output Voltage = 0.8V

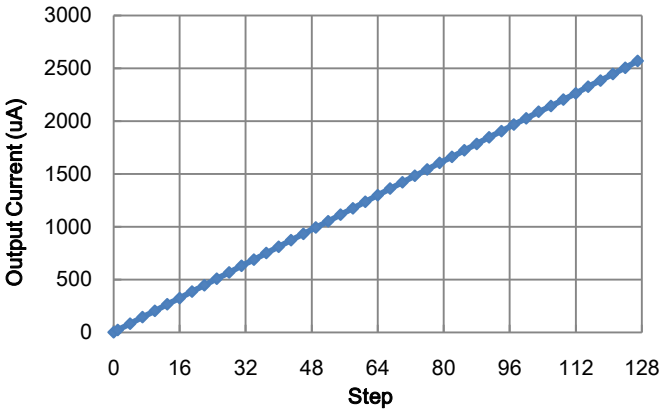
Typical Operation Characteristics

Output Current with Bit 7 = 0



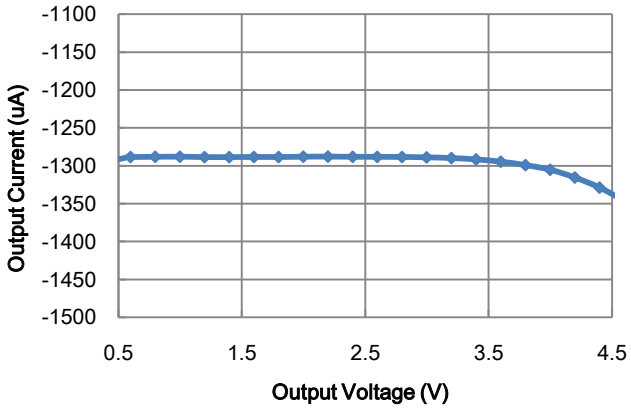
Reg0x05 Bit 4,2,0 = 1
Output Voltage = 0.8V

Output Current with Bit 7 = 1



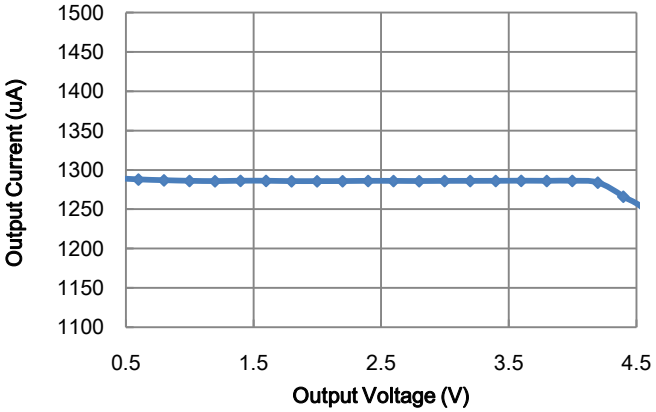
Reg0x05 Bit 4,2,0 = 1
Output Voltage = 0.8V

Output Current vs. Output Voltage



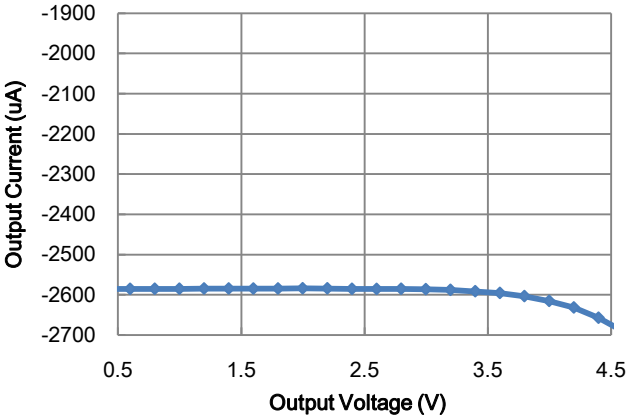
V_{CC}=5V, Reg0x05 Bit 4,2,0 = 0
Reg0x01~0x03 = 0x7F (1270uA Sinking)

Output Current vs. Output Voltage



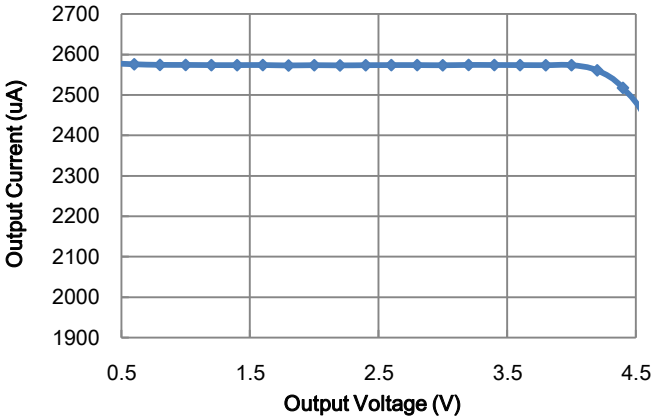
V_{CC}=5V, Reg0x05 Bit 4,2,0 = 0
Reg0x01~0x03 =0xFF (1270uA Sourcing)

Output Current vs. Output Voltage



V_{CC}=5V, Reg0x05 Bit 4,2,0 = 1
Reg0x01~0x03 = 0x7F (2540uA Sinking)

Output Current vs. Output Voltage

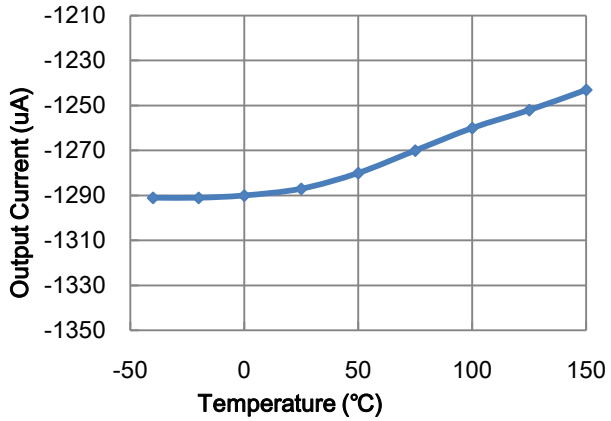


V_{CC}=5V, Reg0x05 Bit 4,2,0 = 1
Reg0x01~0x03 = 0xFF (2540uA Sourcing)

uP1816Q

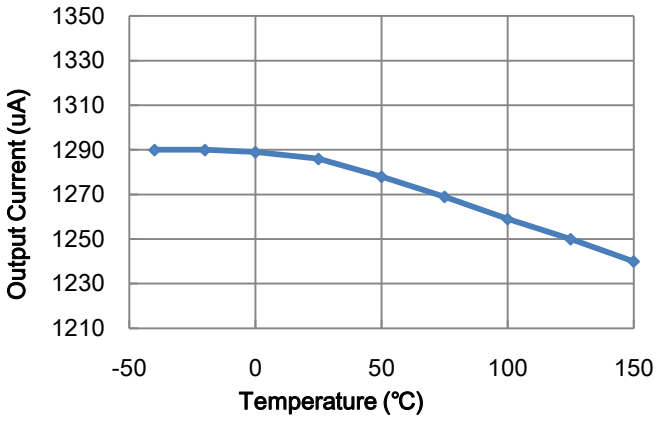
Typical Operation Characteristics

Output Current vs. Temperature



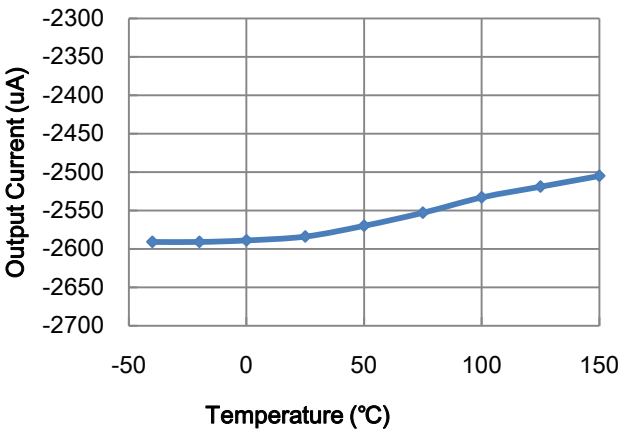
V_{CC}=5V, Reg0x05 Bit 4,2,0 = 0
Reg0x01~0x03 = 0x7F (1270uA Sinking)

Output Current vs. Temperature



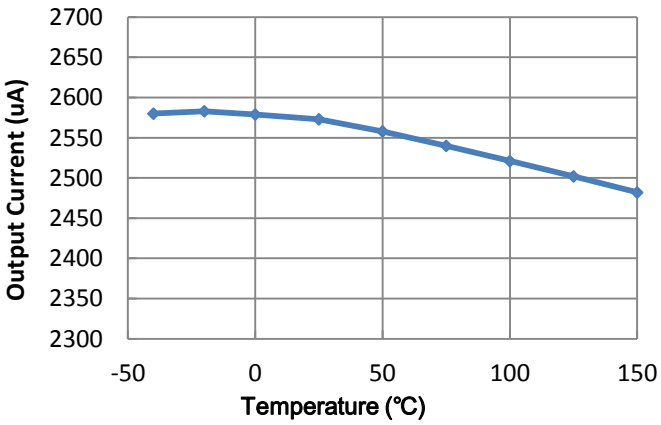
V_{CC}=5V, Reg0x05 Bit 4,2,0 = 0
Reg0x01~0x03 = 0xFF (1270uA Sourcing)

Output Current vs. Temperature



V_{CC}=5V, Reg0x05 Bit 4,2,0 = 1
Reg0x01~0x03 = 0x7F (2540uA Sinking)

Output Current vs. Temperature



V_{CC}=5V, Reg0x05 Bit 4,2,0 = 1
Reg0x01~0x03 = 0xFF (2540uA Sourcing)

Application Information

The uP1816Q is a high precision current console consisting of three sets SMBus programmable current DACs. Each current DAC is capable of sinking 128-step and sourcing 128-step output current that are programmed by the SMBus interface. The sinking and sourcing current of OUT1, OUT2 and OUT3 are programmable for 2x boost respectively. The uP1816Q features soft-jump, easily interfacing with standard DC/DC converter for current console. The uP1816Q is available in the space-saving WDFN2x2 - 8L package.

Output Voltage Programming of DC/DC Converter

Figure 2 shows a typical interface between uP1816Q and a general-purpose DC/DC converter. It is convenient to program the output voltage V_{OUT} by selecting appropriate output current I_{OUT} of uP1816Q.

The output voltage difference when I_{OUT} is applied is calculated as:

$$\Delta V_{OUT} = V_{OUT} - V_{OUT\_NORM} = -I_{OUT} \times R1$$

For example, if I_{OUT} = -630uA (sinking) is selected and R1 = 1kΩ, the output voltage will increase by amount as:

$$\Delta V_{OUT} = 630uA \times 1k\Omega = 0.63V$$

It is noted the calculation above is independent of R2. Users can select R2 according to the required nominal output voltage.

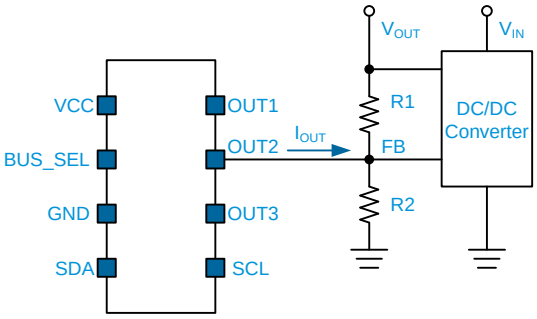


Figure 2. Interfacing the uP1816Q and DC/DC Converter

Extra Current for Charging/Discharging Output Capacitor

Extra current besides normal loading is required to charge/discharge the output capacitors to its new level when the output voltage is making transition due to I_{OUT} change of uP1816Q. For example, I_{OUT} changes from 0uA to -630uA in 63 steps and ΔV_{OUT} changes from 0V to 0.63V accordingly. It takes about 630us for I_{OUT} to change from 0uA to -630uA. The extra current to charge the output capacitor C_{OUT} = 2000uF is calculated as:

$$I_{EXTRA} = \frac{C_{OUT} \times \Delta V_{OUT}}{\Delta T} = \frac{2000uF \times 0.63V}{630us} = 2A$$

Make sure the DC/DC converter can afford the extra current without false triggering any protection functions.

Application Information

Layout Considerations

The PCB layout is an important part of design for uP1816Q. The FB pin of the DC/DC converter is a noise sensitive pin. Great care should be taken when placing the parts and routing the FB trace.

Place the uP1816Q physically near the FB pin of the DC/DC converter. Keep the FB traces short and away from noisy nodes to avoid noise pick-up.

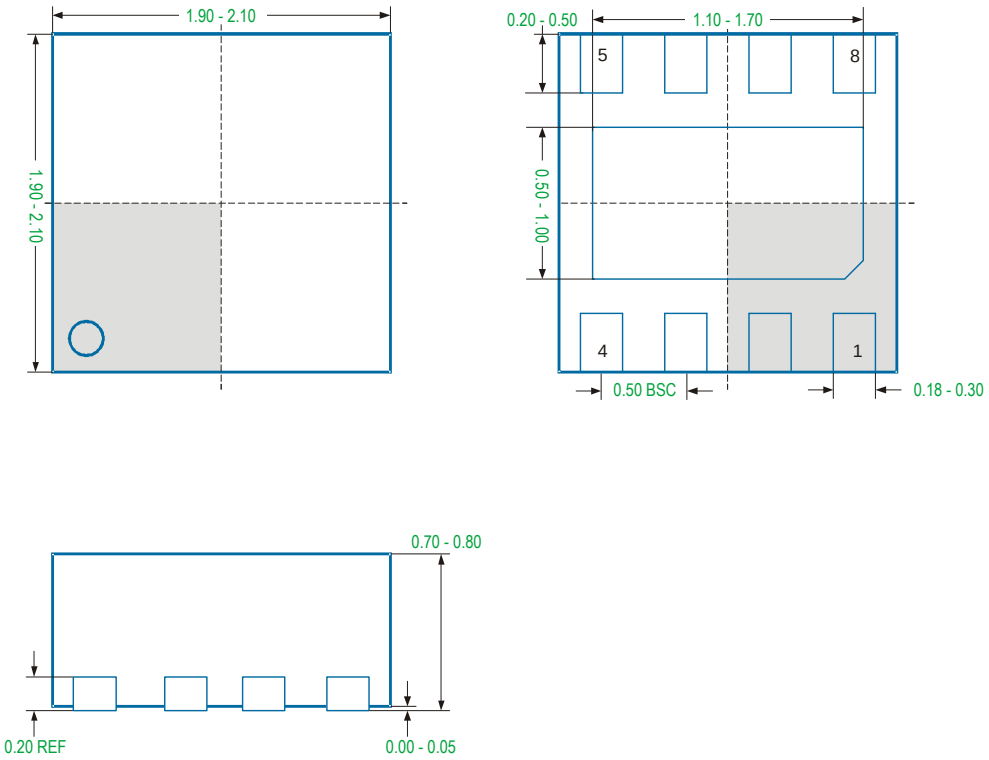
Check Transient Response and Stability

Even though the output impedance of uP1816Q is quite high over a wide frequency range, the insertion of uP1816Q does affect voltage control loop design of the DC/DC converter. It is highly recommended to check the transient response and stability of the converter when uP1816Q is applied.

uP1816Q

Package Information

WDFN2x2-8L



Note

1. Package Outline Unit Description:
   MIN: Minimum dimension specified.
   NOM: Nominal. Provided as a general value.
   MAX: Maximum dimension specified.
   BSC: Basic. Represents theoretical exact dimension or dimension target.
   REF: Reference. Represents dimension for reference use only. This value is not a device specification.
2. Dimensions in Millimeters.
3. Drawing not to scale.
4. These dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm.

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