RICOH

3-MODE 150mA LDO REGULATOR with Reverse Current Protection

R1163x SERIES

OUTLINE

The R1163x Series consist of CMOS-based voltage regulator ICs with high output voltage accuracy and low supply current. These ICs perform with the chip enable function and realize a standby mode with ultra low supply current. To prevent the destruction by over current, the current limit circuit is included. The R1163x Series have 3-mode. One is standby mode with CE or standby control pin. Other two modes are realized with ECO pin™. Fast Transient Mode (FT mode) and Low Power Mode (LP mode) are alternative with ECO pin™. Consumption current is reduced at Low Power Mode compared with Fast Transient Mode. The output voltage is maintained between FT mode and LP mode.

Further, the reverse current protection circuit is built-in. Therefore, if a higher voltage than V_{DD} pin is forced to the output pin, the reverse current to V_{DD} pin is very small (Max. 0.1μA) , so it is suitable for backup circuit.

Since the packages for these ICs are SOT-23-5, thin SON-6, and PLP1616-6 packages, high density mounting of the ICs on boards is possible.

FEATURES

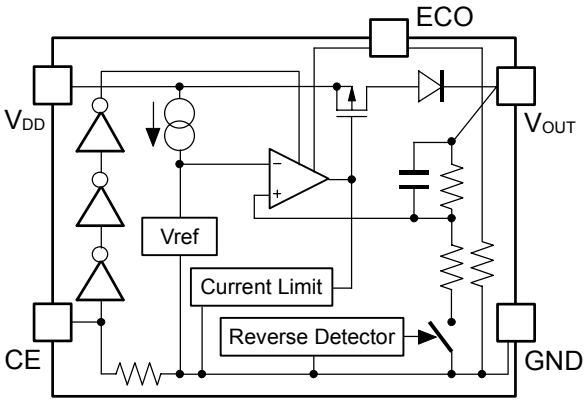
- Ultra-Low Supply Current ..... Typ. 6.0μA (Low Power Mode),
  Typ. 70μA (Fast Transient Mode)
- Standby Mode ..... Typ. 0.6μA
- Reverse Current ..... Max. 0.1μA
- Low Dropout Voltage ..... Typ. 0.25V (I_{OUT}=150mA Output Voltage=3.0V Type)
- High Ripple Rejection ..... Typ. 70dB (f=1kHz, FT Mode)
- Low Temperature-Drift Coefficient of Output Voltage Typ. ±100ppm/°C
- Excellent Line Regulation ..... Typ. 0.02%/V
- High Output Voltage Accuracy ..... ±1.5%(±2.5% at LP Mode)
- Small Package ..... SOT-23-5 (Super Mini-mold), SON-6, PLP1616-6
- Output Voltage ..... Stepwise setting with a step of 0.1V
  in the range of 1.5V to 4.0V is possible
- Built-in fold-back protection circuit ..... Typ. 40mA (Current at short mode)
- Performs with Ceramic Capacitors ..... C_{IN}=1.0μF,C_{OUT}=Ceramic 0.47μF

APPLICATIONS

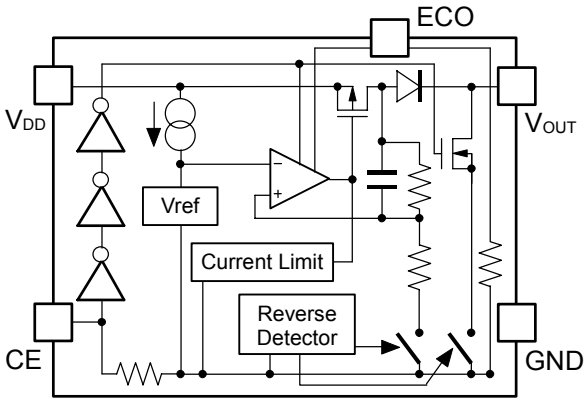
- Precision Voltage References.
- Power source for electrical appliances such as cameras, VCRs and hand-held communication equipment.
- Power source for battery-powered equipment.

BLOCK DIAGRAM

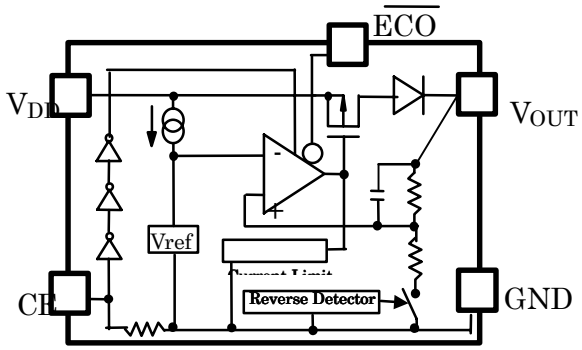
R1163xxx1B



R1163xxx1D



R1163xxx1E



SELECTION GUIDE

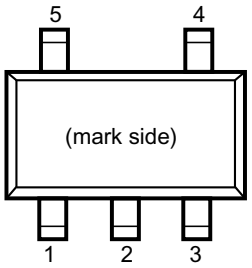
The output voltage, the auto-discharge function, the package and the taping type for the ICs can be selected at the user's request. The selection can be available by designating the part number as shown below;

R1163xxx1x-xx ←Part Number
↑↑ ↑ ↑
a b c d

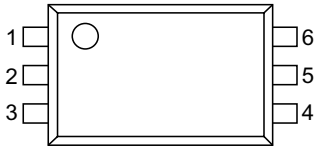
Code	Contents
a	Designation of Package Type : N: SOT-23-5 (Mini-mold) D: SON-6 K: PLP1616-6
b	Setting Output Voltage (V_{OUT}) : Stepwise setting with a step of 0.1V in the range of 1.5V to 4.0V is possible. New options: 2.85V type: R1163x281x5-xx, 1.85V type: R1163x181x5-xx.
c	Designation of Chip Enable Options: B: "H" active type and without auto-discharge function. D: "H" active and with auto-discharge function. E: "H" active type and without auto-discharge function. ECO logic reverse type (Low Power mode at ECO="H")
d	Designation of Taping Type: Refer to Taping Specifications: TR type is the standard direction.

PIN CONFIGURATIONS

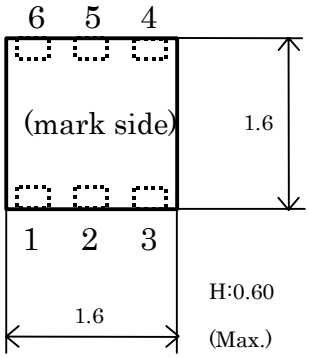
● **SOT-23-5**



● **SON-6**



● **PLP1616-6**



PIN DESCRIPTIONS

● **SOT-23-5**

Pin No	Symbol	Pin Description
1	V_{DD}	Input Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin
4	ECO	MODE alternative pin
5	V_{OUT}	Output pin

● **SON-6**

Pin No	Symbol	Pin Description
1	V_{DD}	Input Pin
2	NC	No Connection
3	V_{OUT}	Output pin
4	ECO	MODE alternative pin
5	GND	Ground Pin
6	CE	Chip Enable Pin

● **PLP1616-6**

Pin No	Symbol	Pin Description
1	V_{OUT}	Output pin
2	GND	Ground Pin
3	ECO	MODE alternative pin
4	CE	Chip Enable pin
5	NC	No Connection
6	V_{DD}	Input Pin

*Tab and tab suspension leads for SON-6 and PLP1616-6 should not be connected to other voltage level areas except GND.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	6.5	V
V_{ECO}	Input Voltage (ECO Pin)	−0.3 ~ 6.5	V
V_{CE}	Input Voltage (CE Pin)	−0.3 ~ 6.5	V
V_{OUT}	Output Voltage	−0.3 ~ 6.5	V
I_{OUT}	Output Current	180	mA
P_D	Power Dissipation	250(SOT23-5/SON6) T.B.D.(PLP1616-6)	mW
Topt	Operating Temperature Range	−40 ~ 85	°C
Tstg	Storage Temperature Range	−55 ~ 125	°C

ELECTRICAL CHARACTERISTICS

R1163xxx1B, D

Topt=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	V_{IN} = Set V_{OUT}+1V V_{ECO} = V_{IN} 1mA ≦ I_{OUT} ≦ 30mA	V_{OUT} ×0.985		V_{OUT} ×1.015	V
		V_{IN} = Set V_{OUT} + 1V V_{ECO} =GND 1mA ≦ I_{OUT} ≦ 30mA	V_{OUT} ×0.975		V_{OUT} ×1.025	
ΔV_{OUT}	Output Voltage Deviation between FT Mode and LP Mode	V_{IN} = Set V_{OUT}+1V, I_{OUT} =30mA V_{OUT} ≧ 2.0V	−1.2	0.0	1.2	%
		V_{OUT} ≦ 2.0V	-24	0	+24	mV
I_{OUT}	Output Current	V_{IN} − V_{OUT} = 1.0V	150			mA
ΔV_{OUT}/ ΔI_{OUT}	Load Regulation (FT Mode)	V_{IN} =Set V_{OUT}+1V, V_{ECO}=V_{IN} 1mA ≦ I_{OUT} ≦ 150mA		20	40	mV
	Load Regulation (LP Mode)	V_{IN} = Set V_{OUT}+1V,V_{ECO}=GND 1mA ≦ I_{OUT} ≦ 150mA		20	45	
V_{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I_{SS1}	Supply Current (FT Mode)	V_{IN} = Set V_{OUT}+1V V_{ECO} = V_{IN}, I_{OUT}=0mA		70	100	µA
I_{SS2}	Supply Current (LP Mode)	V_{IN} = Set V_{OUT}+1V V_{ECO} = GND, I_{OUT}=0mA		6.0	10.0	µA
Istandby	Supply Current (Standby)	V_{IN} = Set V_{OUT}+1V, V_{CE} = GND V_{ECO}=GND		0.6	1.0	µA
ΔV_{OUT}/ ΔV_{IN}	Line Regulation (FT Mode)	Set V_{OUT}+0.5V ≦ V_{IN} ≦ 6.0V I_{OUT} = 30mA, V_{ECO} = V_{IN}		0.02	0.10	%/V
	Line Regulation (LP Mode)	Set V_{OUT} + 0.5V ≦ V_{IN} ≦ 6.0V I_{OUT} = 30mA, V_{ECO} = GND		0.05	0.20	
RR	Ripple Rejection (FT Mode)	f = 1kHz f = 10kHz, Ripple 0.2Vp-p V_{IN} = Set V_{OUT} + 1V I_{OUT} = 30mA, V_{ECO} = V_{IN} If V_{OUT} ≦ 1.7V,then V_{IN} = Set V_{OUT}+1V		70 60		dB
V_{IN}	Input Voltage		2.0		6.0	V
ΔV_{OUT}/ ΔT	Output Voltage Temperature Coefficient	I_{OUT} = 30mA −40°C ≦ Topt ≦ 85°C		±100		ppm /°C
I_{LIM}	Short Current Limit	V_{OUT} = 0V		40		mA
I_{PD}	CE Pull-down Constant Current			0.3	0.6	µA
R_{PD}	ECO Pull-down Resistance		2	5	30	MΩ
V_{CEH}	CE, ECO Input Voltage “H”		1.0		6.0	V
V_{CEL}	CE, ECO Input Voltage “L”		0.0		0.4	V
en	Output Noise ”H” (FT Mode)	BW = 10Hz to 100kHz		30		µVrms
	Output Noise ”L” (LP Mode)	BW = 10Hz to 100kHz		40		
R_{LOW}	Nch Tr. On Resistance for auto-discharge function (Applied only to D version)	V_{CE}=0V		60		Ω
I_{REV}	Reverse Current	V_{OUT}>0.5V, 0V ≦ V_{IN} ≦ 6V		0.0	0.1	µA

R1163xxx1E

Topt=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	V_{IN} = Set V_{OUT}+1V V_{ECO}=GND 1mA ≦ I_{OUT} ≦ 30mA	V_{OUT} ×0.985		V_{OUT} ×1.015	V
		V_{IN} = Set V_{OUT} + 1V V_{ECO}=V_{IN} 1mA ≦ I_{OUT} ≦ 30mA	V_{OUT} ×0.975		V_{OUT} ×1.025	
ΔV_{OUT}	Output Voltage Deviation between FT Mode and LP Mode	V_{IN} = Set V_{OUT}+1V, I_{OUT} =30mA V_{OUT} ≧ 2.0V	−1.2	0.0	1.2	%
		V_{OUT} ≦ 2.0V	-24	0	+24	mV
I_{OUT}	Output Current	V_{IN} − V_{OUT} = 1.0V	150			mA
ΔV_{OUT}/ ΔI_{OUT}	Load Regulation (FT Mode)	V_{IN} =Set V_{OUT}+1V, V_{ECO}=GND 1mA ≦ I_{OUT} ≦ 150mA		20	40	mV
	Load Regulation (LP Mode)	V_{IN} = Set V_{OUT}+1V,V_{ECO}=V_{IN} 1mA ≦ I_{OUT} ≦ 150mA		20	45	
V_{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I_{SS1}	Supply Current (FT Mode)	V_{IN} = Set V_{OUT}+1V V_{ECO} = GND, I_{OUT}=0mA		70	100	µA
I_{SS2}	Supply Current (LP Mode)	V_{IN} = Set V_{OUT}+1V V_{ECO} = V_{IN}, I_{OUT}=0mA		6.0	10.0	µA
Istandby	Supply Current (Standby)	V_{IN} = Set V_{OUT}+1V, V_{CE} = GND V_{ECO}=GND		0.6	1.0	µA
ΔV_{OUT}/ ΔV_{IN}	Line Regulation (FT Mode)	Set V_{OUT}+0.5V ≦ V_{IN} ≦ 6.0V I_{OUT} = 30mA, V_{ECO} = GND		0.02	0.10	%/V
	Line Regulation (LP Mode)	Set V_{OUT} + 0.5V ≦ V_{IN} ≦ 6.0V I_{OUT} = 30mA, V_{ECO} = V_{IN}		0.05	0.20	
RR	Ripple Rejection (FT Mode)	f = 1kHz f = 10kHz, Ripple 0.2Vp-p V_{IN} = Set V_{OUT} + 1V I_{OUT} = 30mA, V_{ECO} = GND If V_{OUT} ≦ 1.7V,then V_{IN} = Set V_{OUT}+1V		70 60		dB
V_{IN}	Input Voltage		2.0		6.0	V
ΔV_{OUT}/ ΔT	Output Voltage Temperature Coefficient	I_{OUT} = 30mA −40°C ≦ Topt ≦ 85°C		±100		ppm /°C
I_{LIM}	Short Current Limit	V_{OUT} = 0V		40		mA
I_{PD}	CE Pull-down Constant Current			0.3	0.6	µA
V_{CEH}	CE, ECO Input Voltage “H”		1.0		6.0	V
V_{CEL}	CE, ECO Input Voltage “L”		0.0		0.4	V
en	Output Noise ”H” (FT Mode)	BW = 10Hz to 100kHz		30		µVrms
	Output Noise ”L” (LP Mode)	BW = 10Hz to 100kHz		40		
I_{REV}	Reverse Current	V_{OUT}>0.5V, 0V ≦ V_{IN} ≦ 6V		0.0	0.1	µA

ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE

Topt = 25°C

Output Voltage V_{OUT} (V)	Dropout Voltage (V)				
	Condition	V_{DIF}(ECO=H)		V_{DIF}(ECO=L)	
		Typ.	Max.	Typ.	Max.
1.5 ≦ V_{OUT} < 1.6	I_{OUT} = 150mA	0.400	0.680	0.420	0.680
1.6 ≦ V_{OUT} < 1.7		0.380	0.550	0.390	0.550
1.7 ≦ V_{OUT} < 1.8		0.350	0.520	0.370	0.520
1.8 ≦ V_{OUT} < 2.0		0.340	0.490	0.350	0.490
2.0 ≦ V_{OUT} < 2.8		0.290	0.425	0.300	0.425
2.8 ≦ V_{OUT} ≦ 4.0		0.250	0.350	0.250	0.350

TECHNICAL NOTES

When using these ICs, consider the following points:

Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a 0.47µF or more ceramic capacitor C_{OUT}.

(Test these ICs with as same external components as ones to be used on the PCB.)

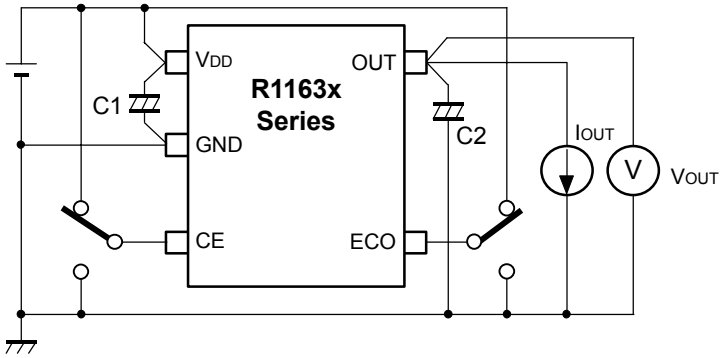
When a tantalum capacitor is used with this IC, if the equivalent series resistor (ESR) of the capacitor is large, output voltage may be unstable.

PCB Layout

Make V_{DD} and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor with as much as 1.0µF capacitor between V_{DD} and GND pin as close as possible.

Set external components such as an output capacitor, as close as possible to the ICs and make wiring as short as possible.

TYPICAL APPLICATION



∗External Components Ex.: C1: Ceramic Capacitor 1.0µF

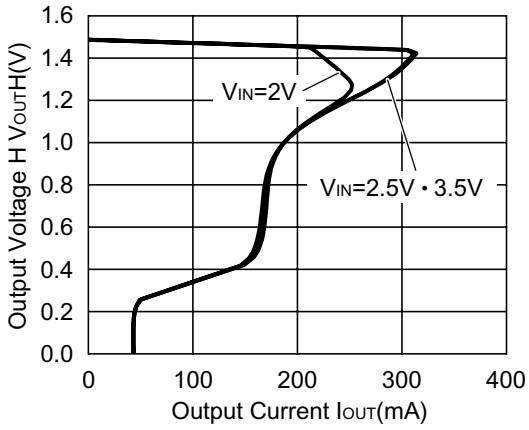
C2: Ceramic Capacitor 0.47µF (Murata GRM40B474K)

TYPICAL CHARACTERISTICS

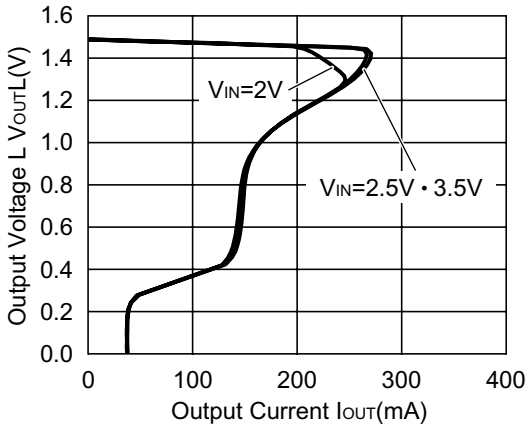
Unless otherwise provided, capacitors are ceramic type.

1) Output Voltage vs. Output Current

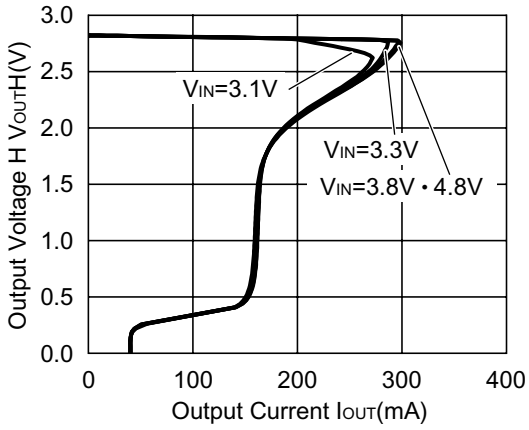
R1163x151x Fast Mode



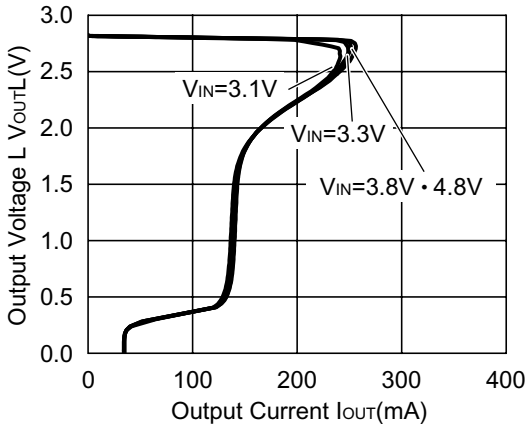
R1163x151x Low Power Mode



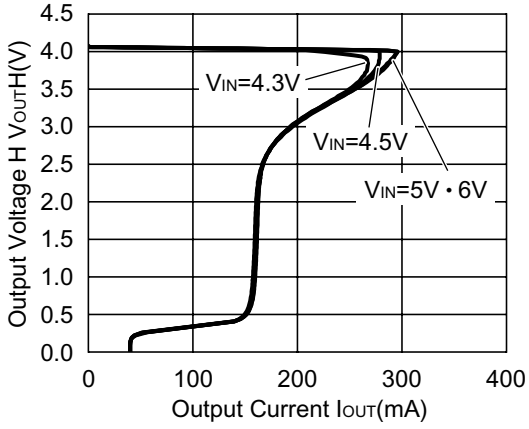
R1163x281x Fast Mode



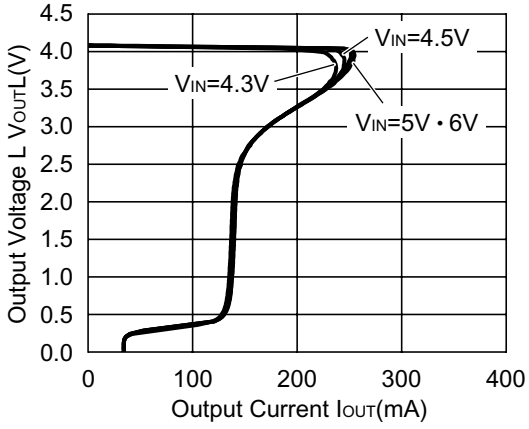
R1163x281x Low Power Mode



R1163x40x Fast Mode

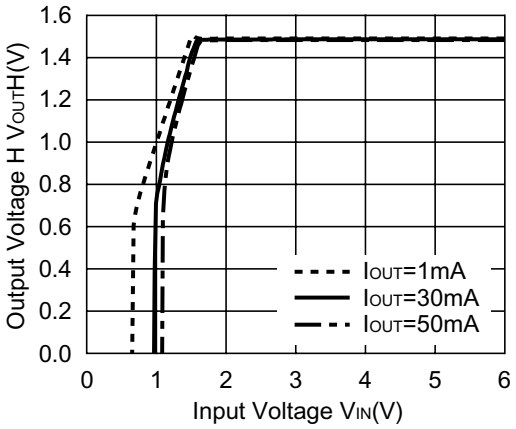


R1163x40x Low Power Mode

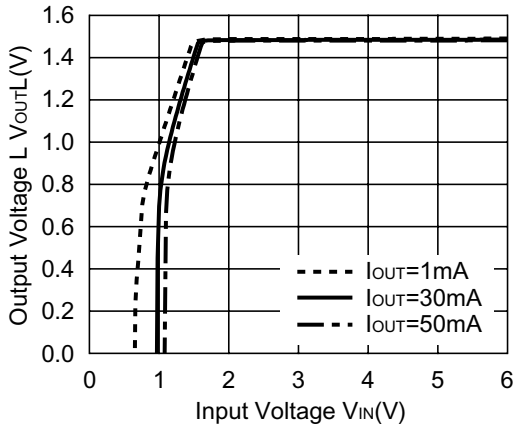


2) Output Voltage vs. Input Voltage

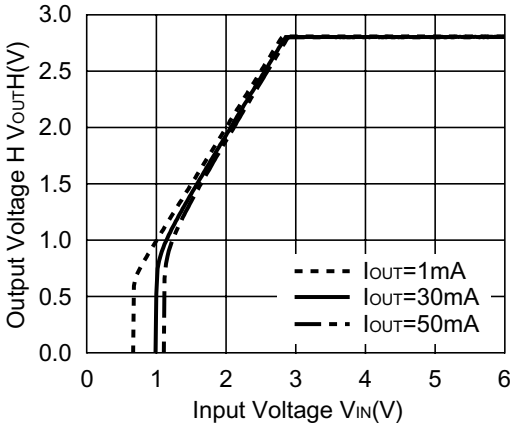
R1163x151x Fast Mode



R1163x15x Low Power Mode



R1163x28x Fast Mode



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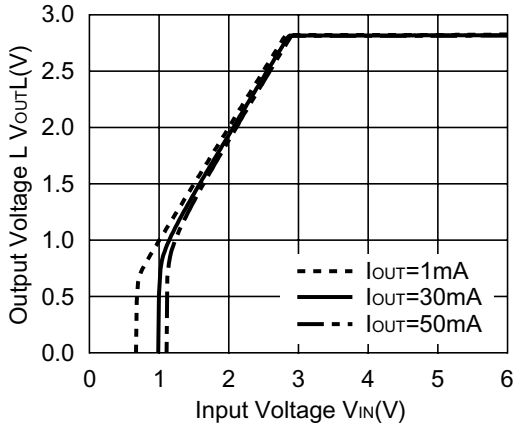

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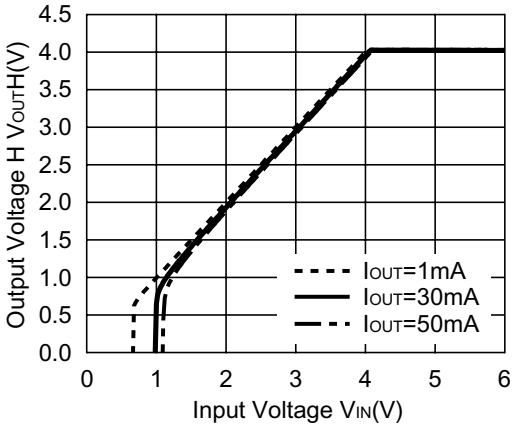
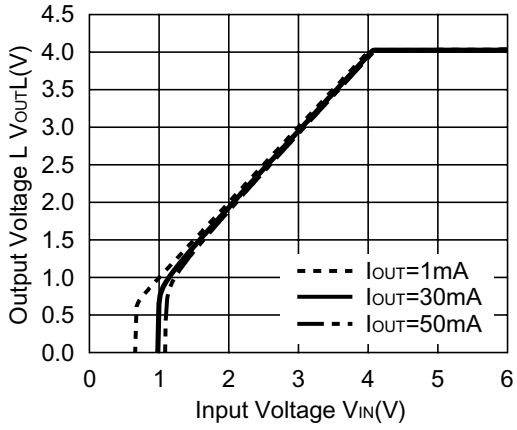
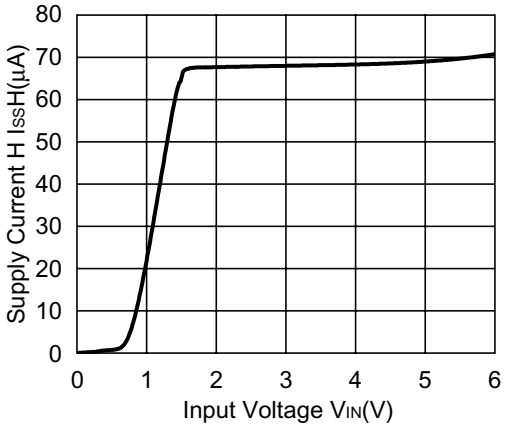


R1163x40x Low Power Mode

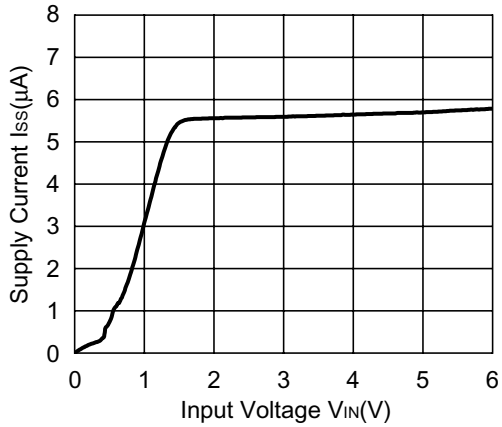


3) Supply Current vs. Input Voltage

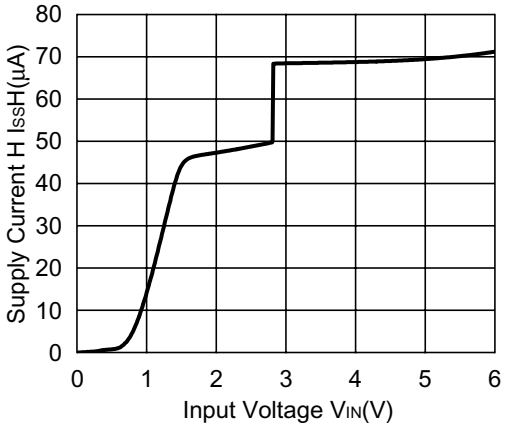
R1163x151x Fast Mode



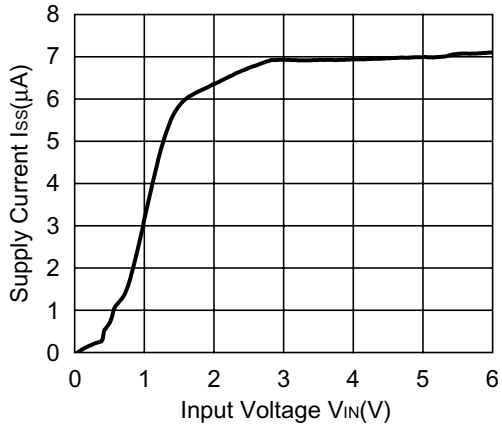
R1163x151x Low Power Mode



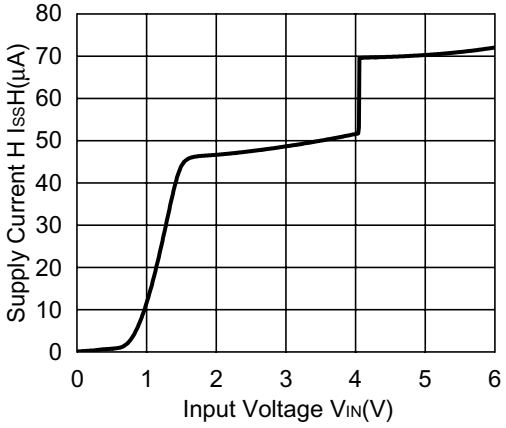
R1163x281x Fast Mode



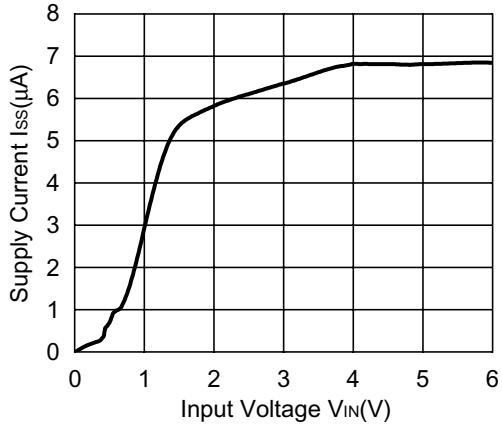
R1163x281x Low Power Mode



R1163x401x Fast Mode

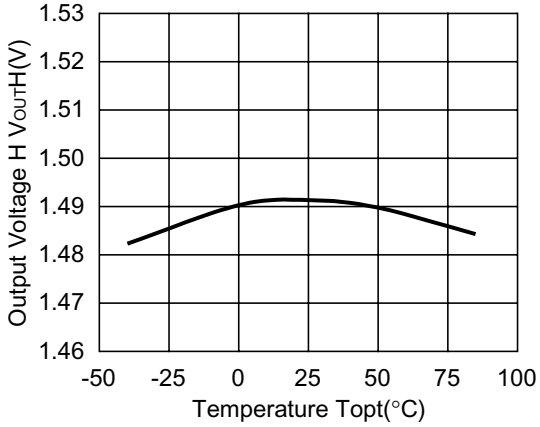


R1163x401x Low Power Mode

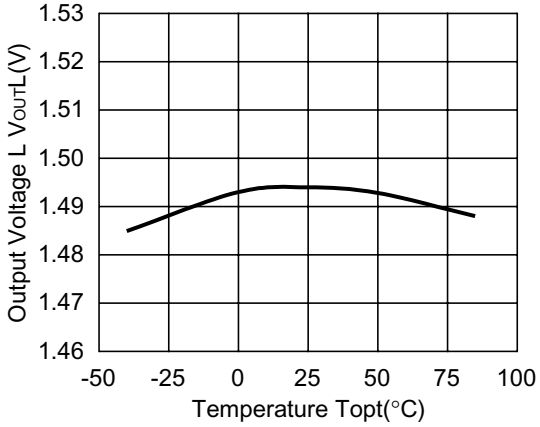


4) Output Voltage vs. Temperature

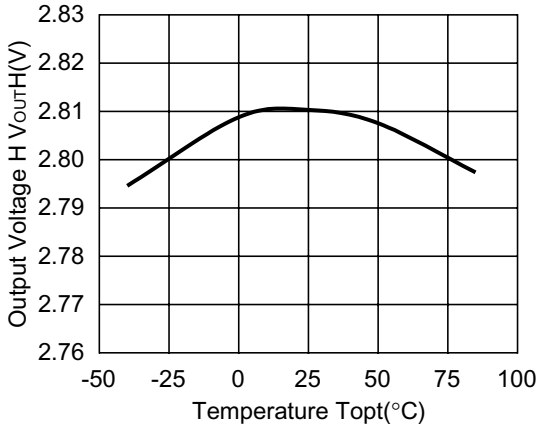
R1163x151x Fast Mode



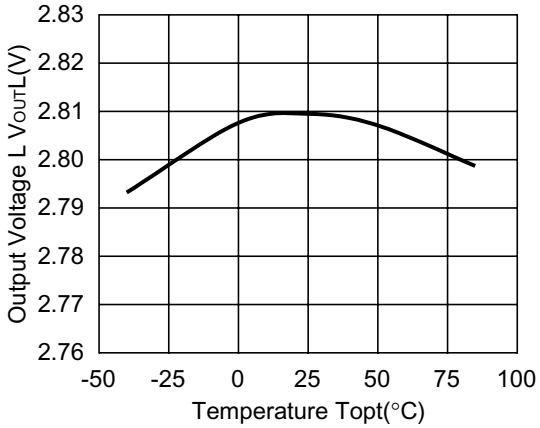
R1163x151x Low Power Mode



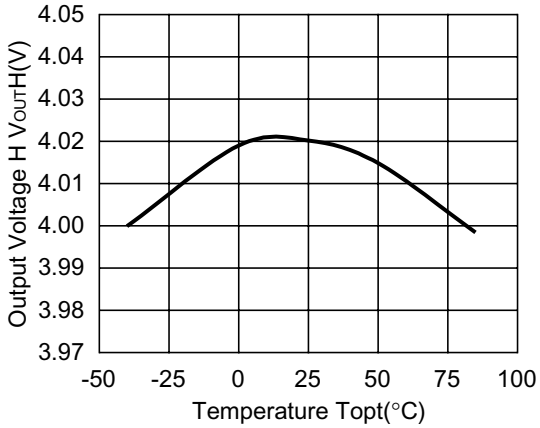
R1163x281x Fast Mode



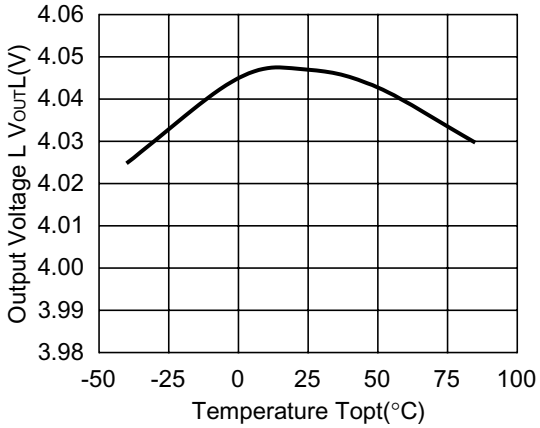
R1163x281x Low Power Mode



R1163x401x Fast Mode

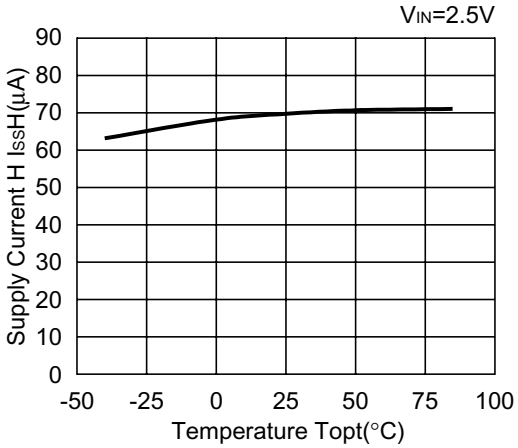


R1163x401x Low Power Mode

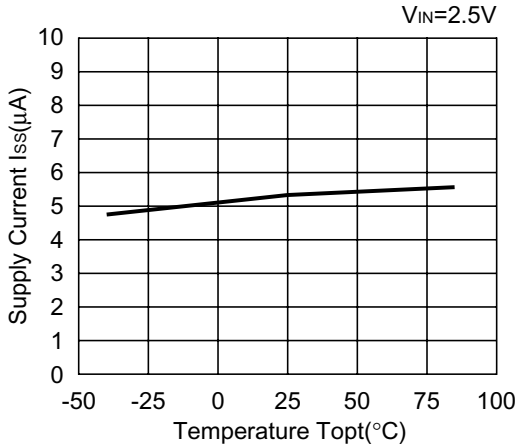


5) Supply Current vs. Temperature

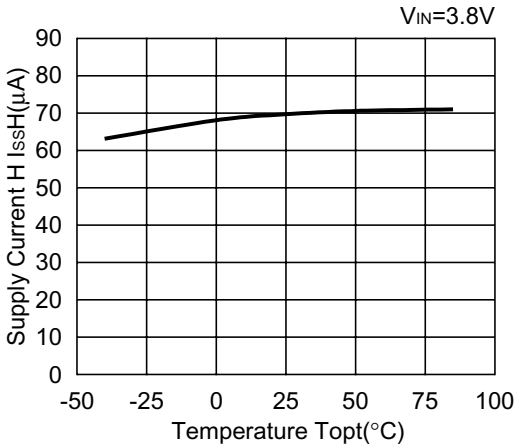
R1163x151x Fast Mode



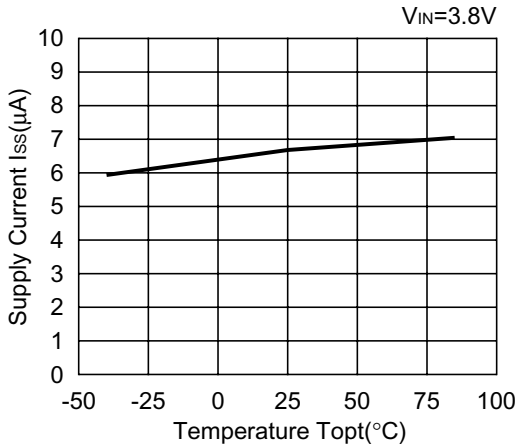
R1163x151x Low Power Mode



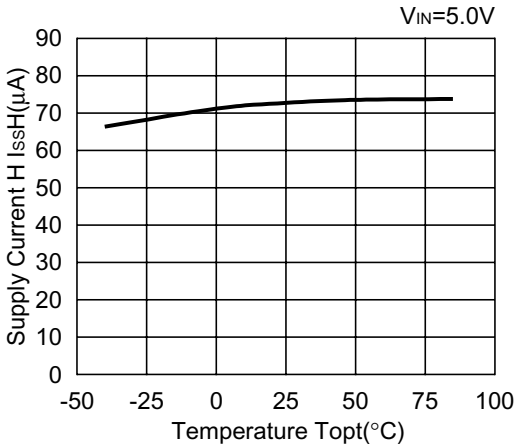
R1163x281x Fast Mode



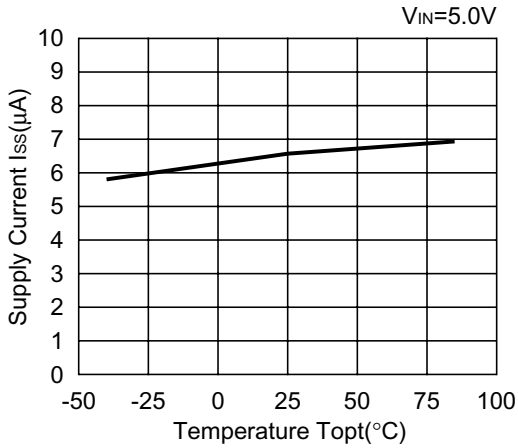
R1163x281x Low Power Mode



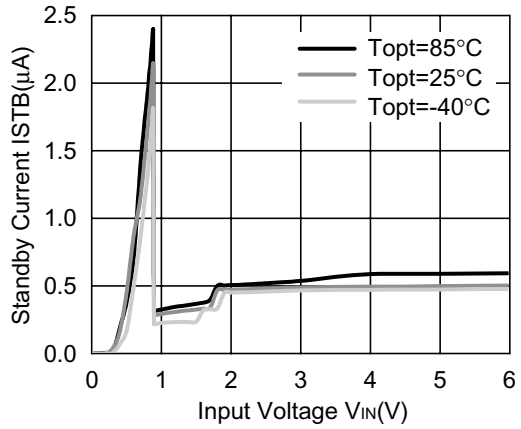
R1163x401x Fast Mode



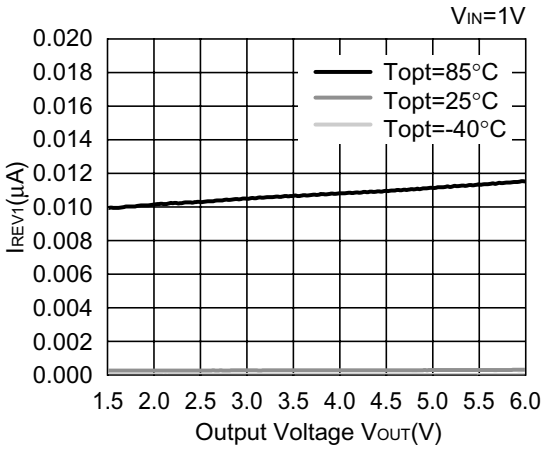
R1163x401x Low Power Mode

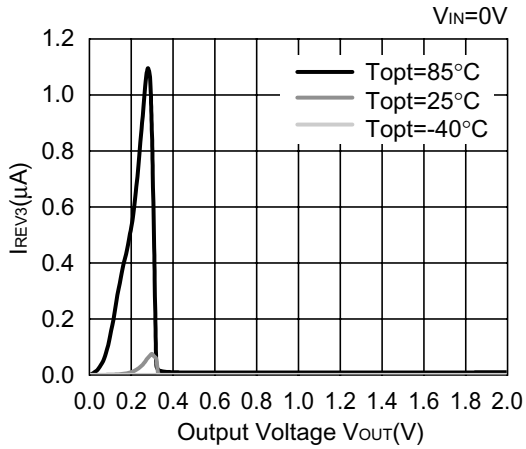


6) Standby Current vs. Input Voltage



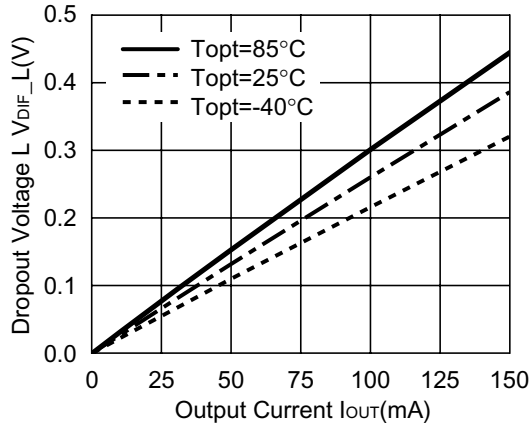
7) Reverse Current vs. Output Voltage



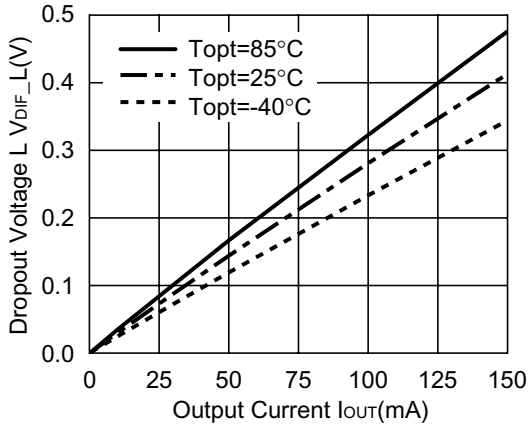


8) Dropout Voltage vs. Output Current

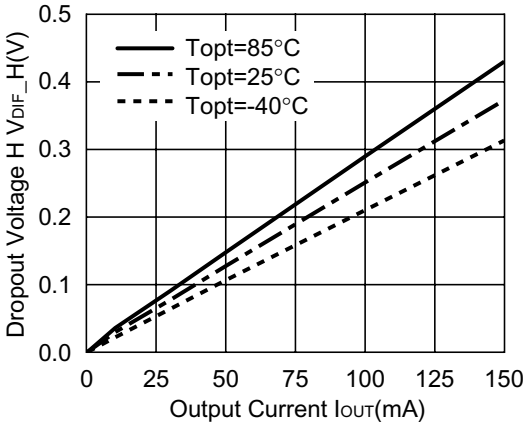
R1163x151x Fast Mode



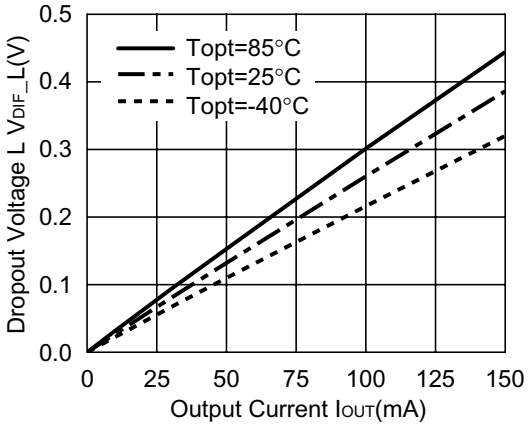
R1163x151x Low Power Mode



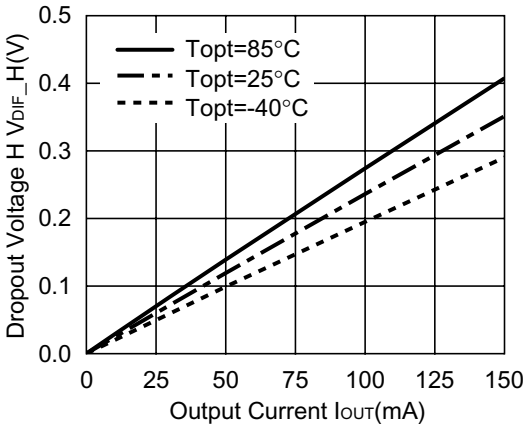
R1163x161x Fast Mode



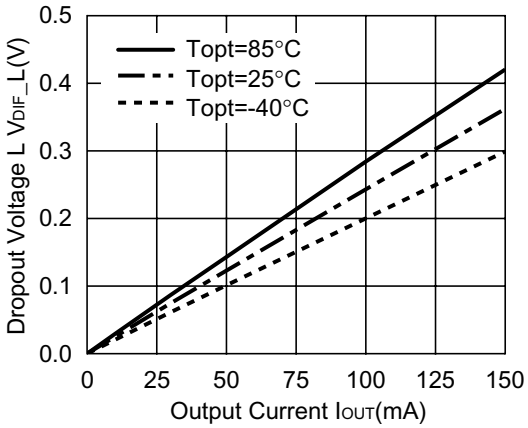
R1163x161x Low Power Mode



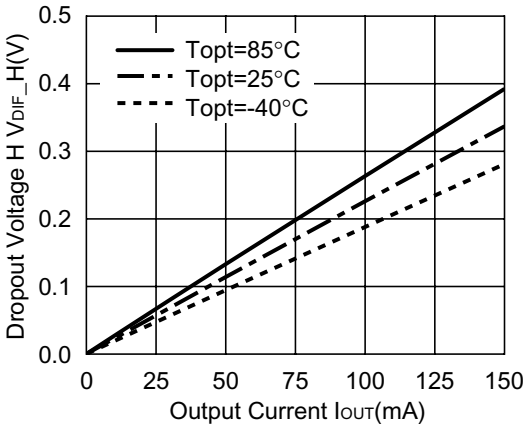
R1163x171x Fast Mode



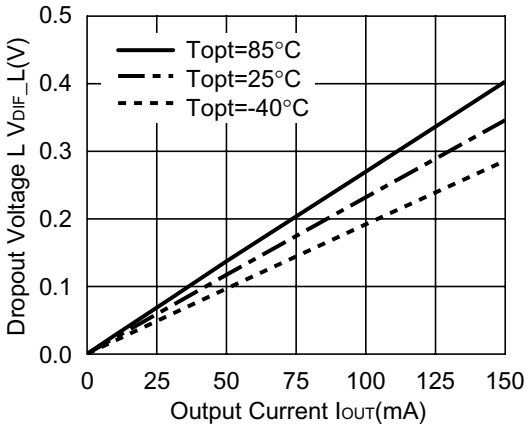
R1163x171x Low Power Mode



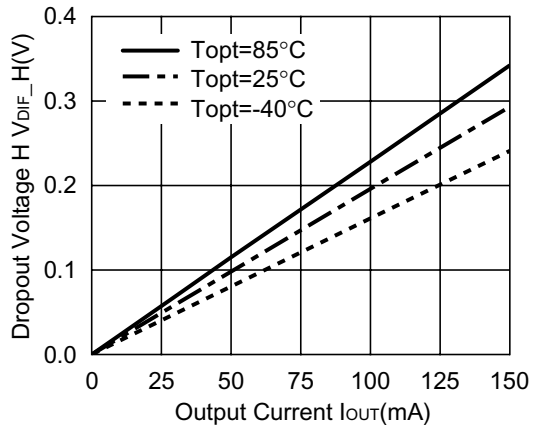
R1163x181x Fast Mode



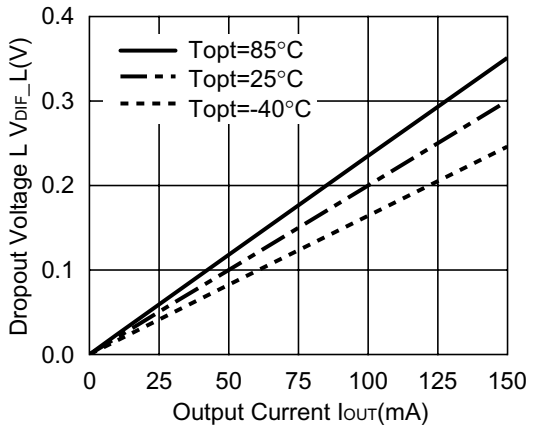
R1163x181x Low Power Mode



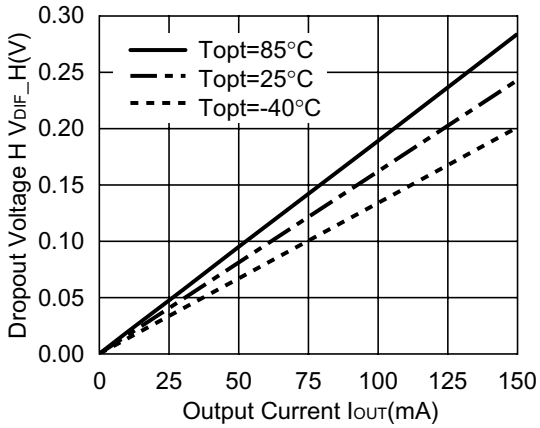
R1163x211x Fast Mode



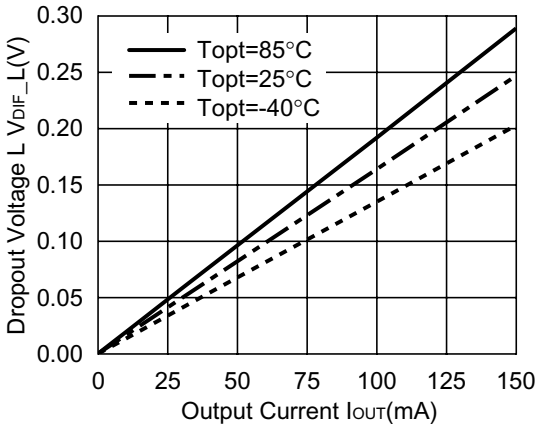
R1163x211x Low Power Mode



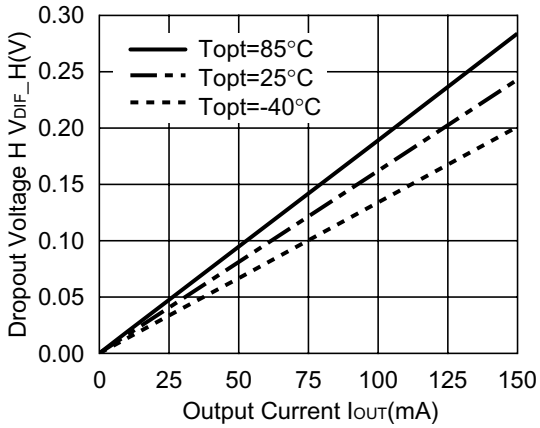
R1163x281x Fast Mode



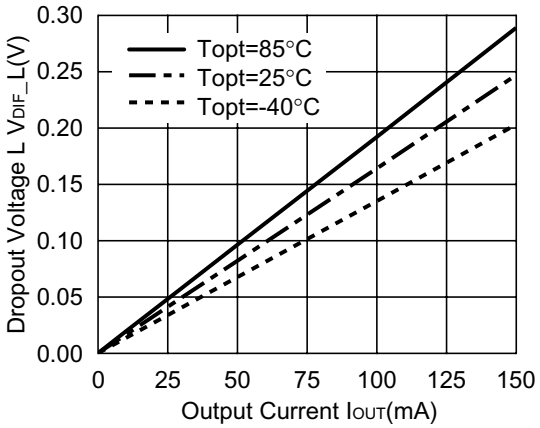
R1163x281x Low Power Mode



R1163x401x Fast Mode

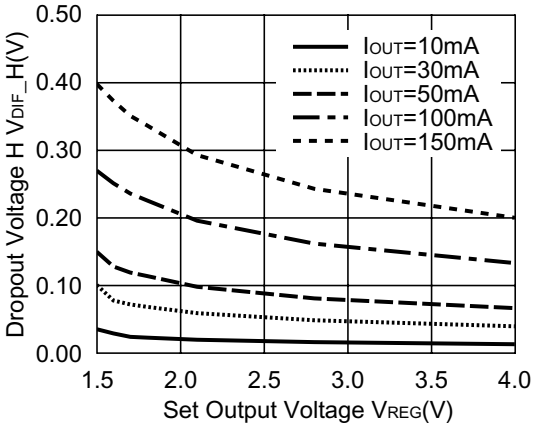


R1163x401x Low Power Mode

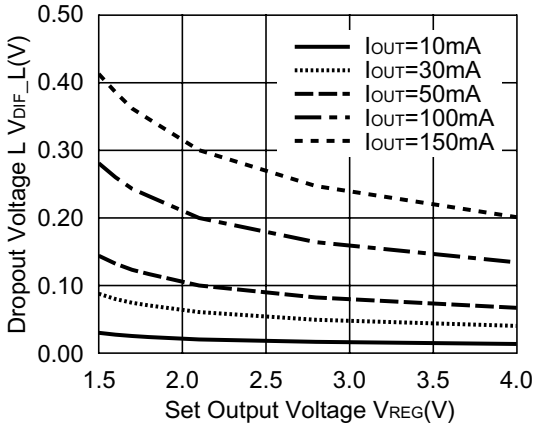


9) Dropout Voltage vs. Set Output Voltage

R1163x Fast Mode



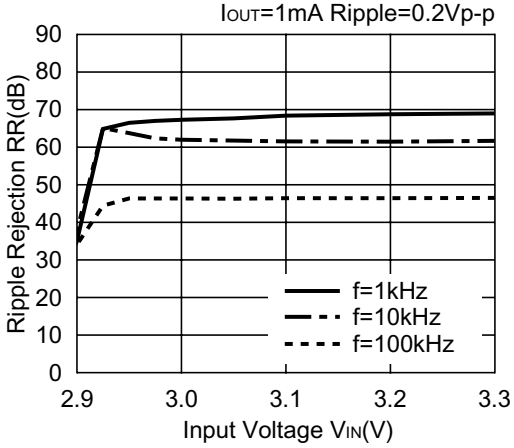
R1163x Low Power Mode



10) Ripple Rejection vs. Input Bias Voltage

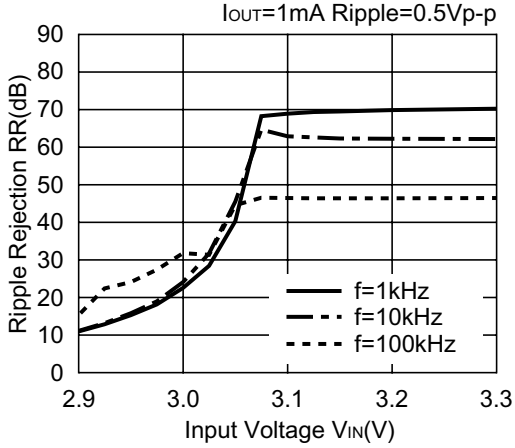
R1163x281x Fast Mode

CIN=none, COUT=0.47µF,
IOUT=1mA Ripple=0.2Vp-p



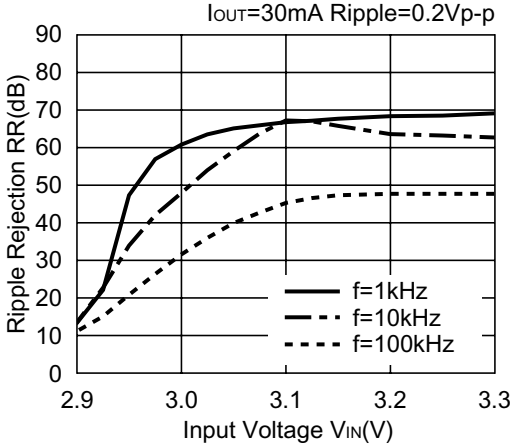
R1163x281x Fast Mode

CIN=none, COUT=0.47µF,
IOUT=1mA Ripple=0.5Vp-p



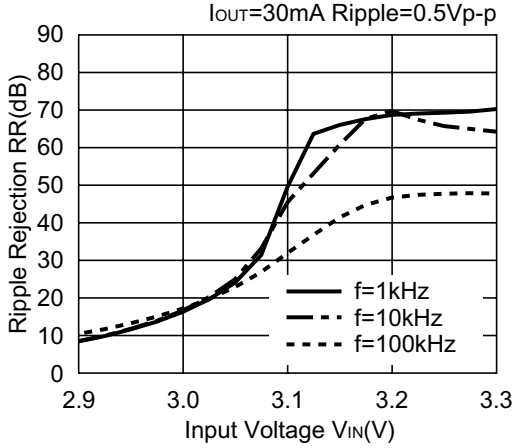
R1163x281x Fast Mode

CIN=none, COUT=0.47µF,
IOUT=30mA Ripple=0.2Vp-p



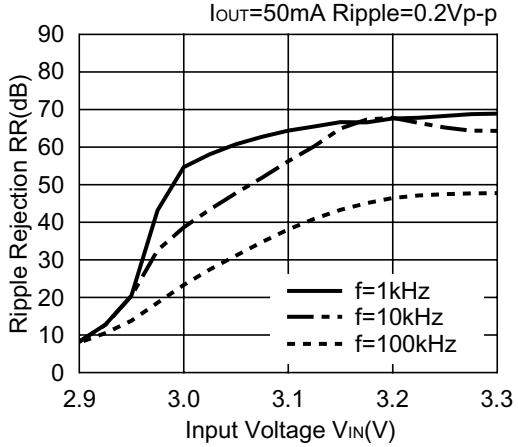
R1163x281x Fast ModeECO=H

CIN=none, COUT=0.47µF,
IOUT=30mA Ripple=0.5Vp-p



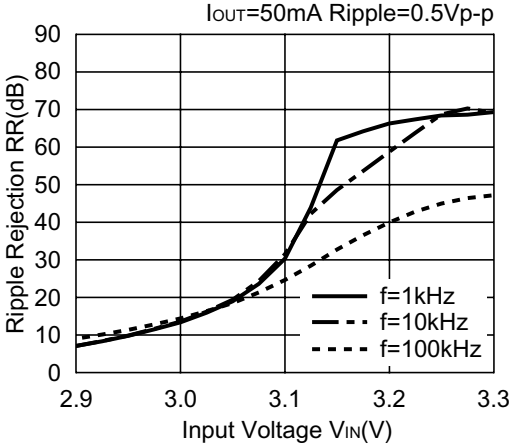
R1163x281x Fast Mode

C_{IN}=none, C_{OUT}=0.47µF,
I_{OUT}=50mA Ripple=0.2Vp-p



R1163x281x Fast Mode

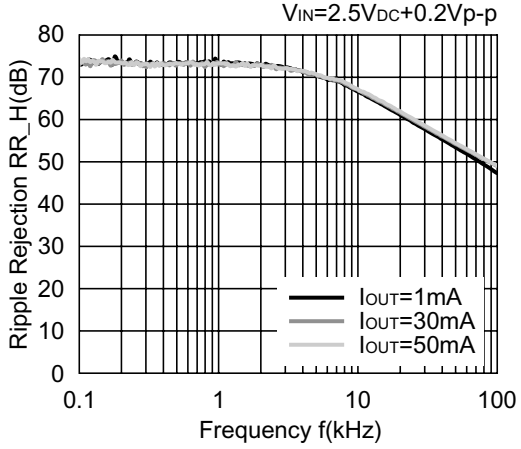
C_{IN}=none, C_{OUT}=0.47µF,
I_{OUT}=50mA Ripple=0.5Vp-p



11) Ripple Rejection vs. Frequency (C_{IN}=none)

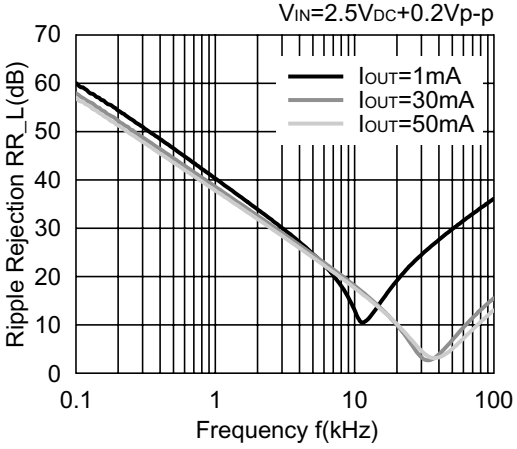
R1163x151x Fast Mode

C_{IN}=none, C_{OUT}=0.47µF,
V_{IN}=2.5V_{DC}+0.2Vp-p



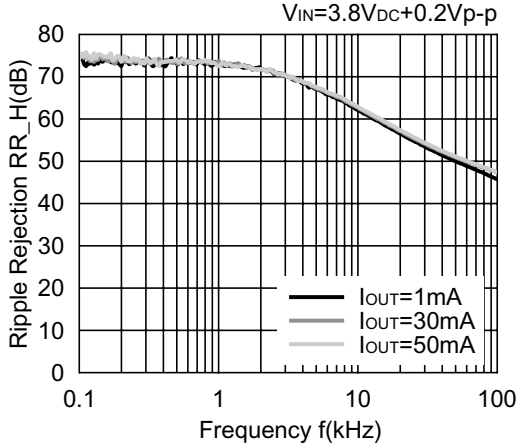
R1163x151x Low Power Mode

C_{IN}=none, C_{OUT}=0.47µF,
V_{IN}=2.5V_{DC}+0.2Vp-p



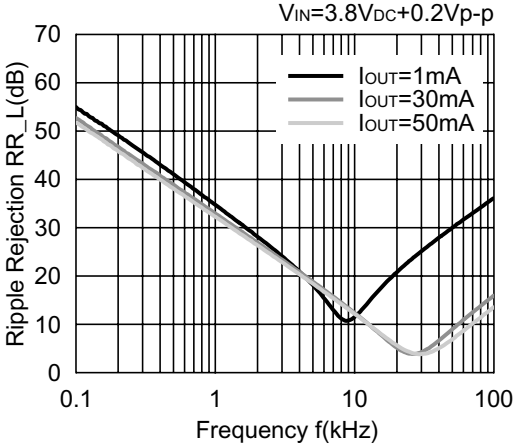
R1163x281x Fast Mode

C_{IN}=none, C_{OUT}=0.47µF,
V_{IN}=3.8V_{DC}+0.2Vp-p

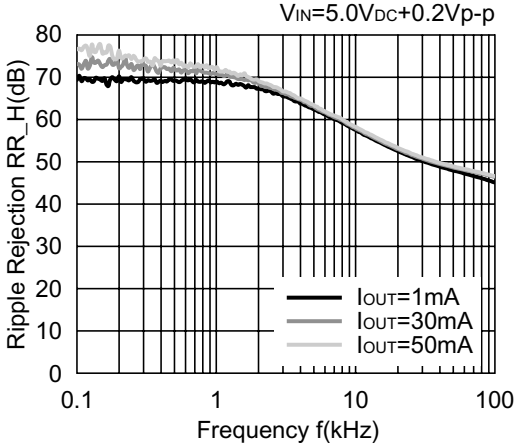


R1163x281x Low Power Mode

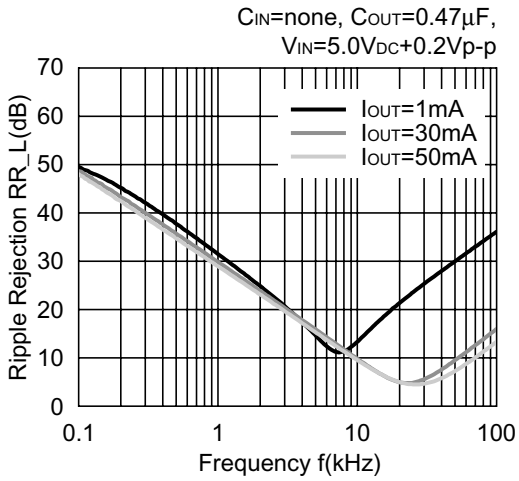
C_{IN}=none, C_{OUT}=0.47µF,
V_{IN}=3.8V_{DC}+0.2Vp-p



R1163x401x Fast Mode

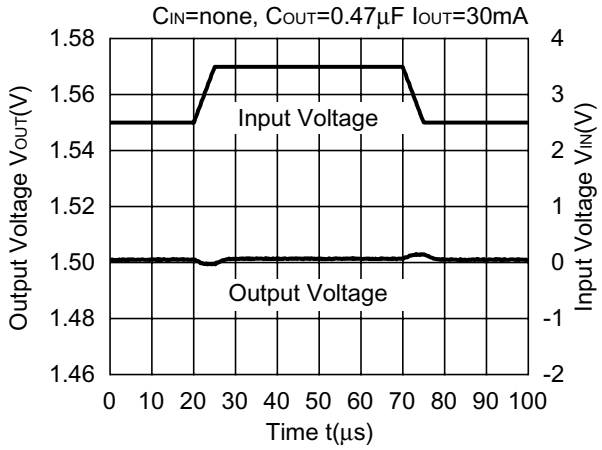


R1163x401x Low Power Mode

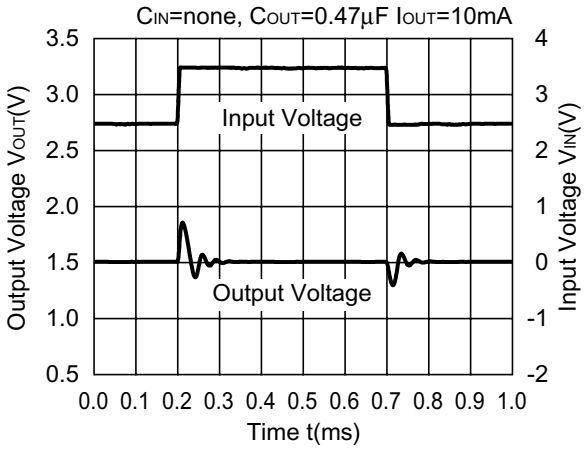


12) Input Transient Response

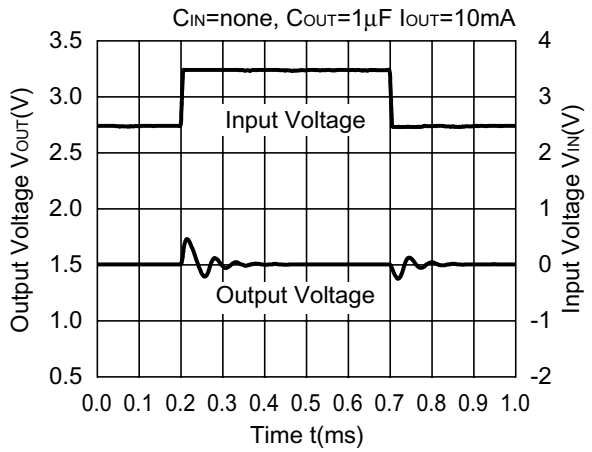
R1163x151x Fast Mode



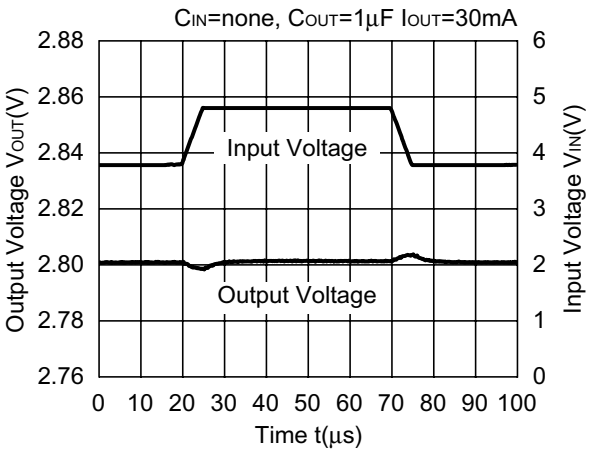
R1163x151x Low Power Mode



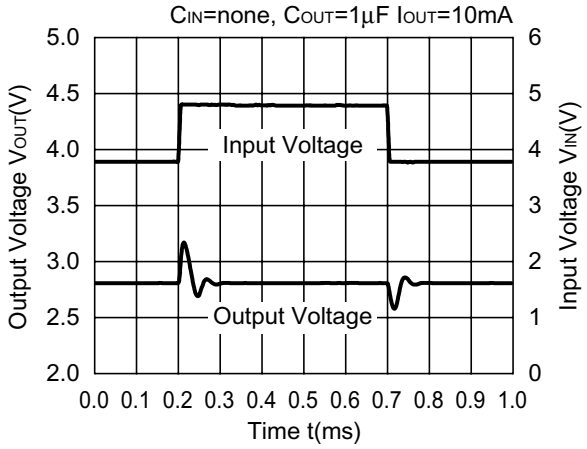
R1163x151x Low Power Mode



R1163x281x Fast Mode

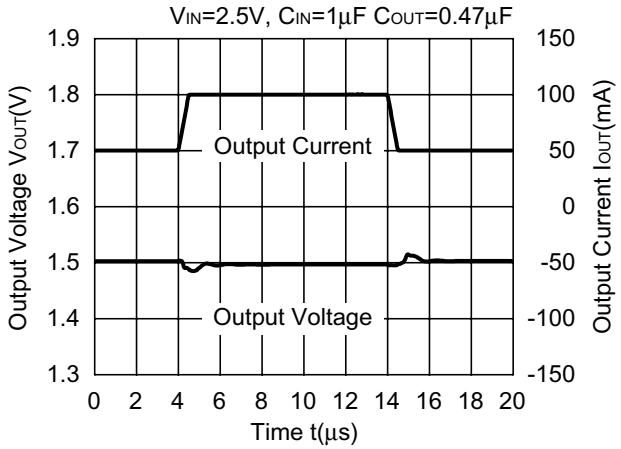


R1163x281x Fast Mode

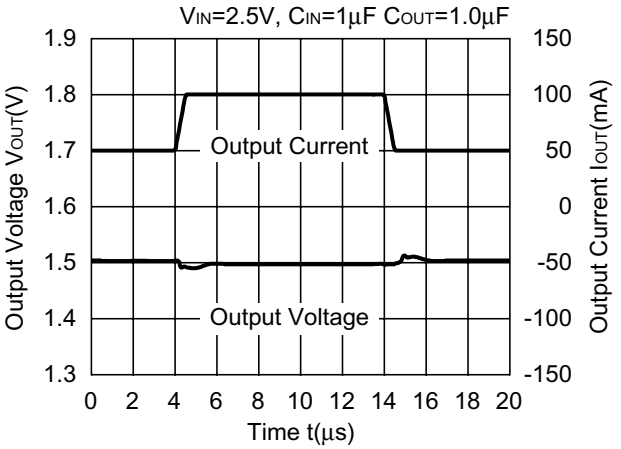


13) Load Transient Response

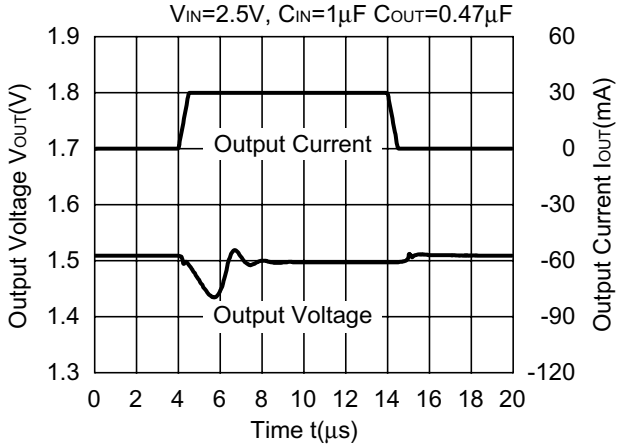
R1163x151x Fast Mode



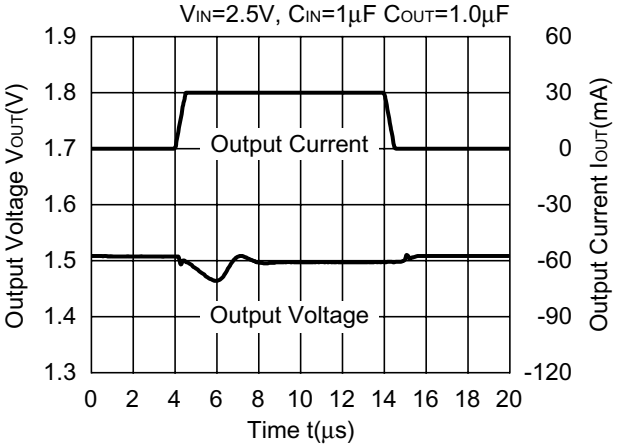
R1163x151x Fast Mode



R1163x151x Fast Mode

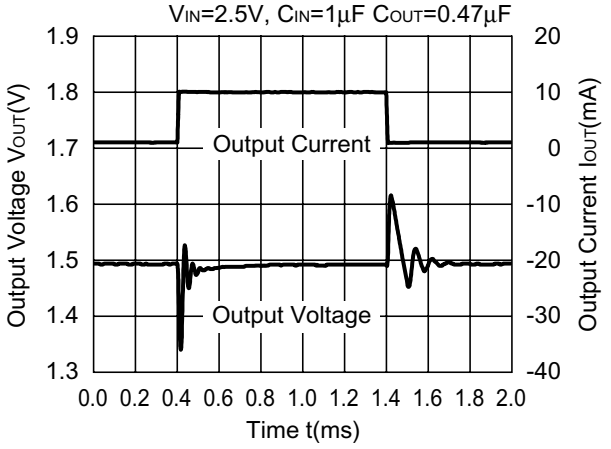


R1163x151x Fast Mode



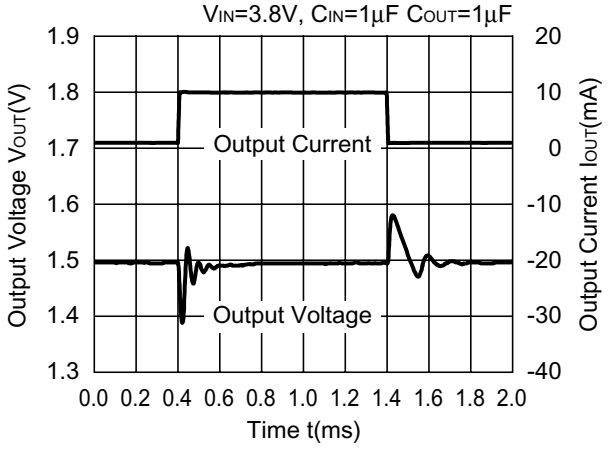
R1163x151x Low Power Mode

V_{IN}=2.5V, C_{IN}=1µF C_{OUT}=0.47µF



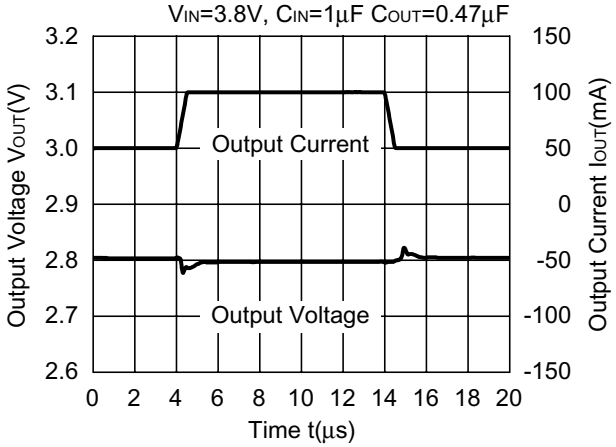
R1163x151x Low Power Mode

V_{IN}=3.8V, C_{IN}=1µF C_{OUT}=1µF



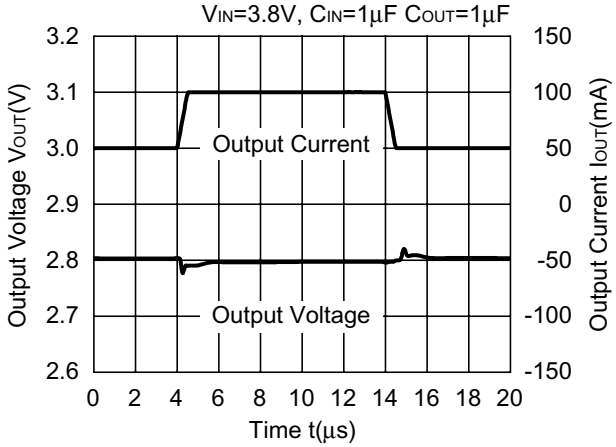
R1163x281x Fast Mode

V_{IN}=3.8V, C_{IN}=1µF C_{OUT}=0.47µF



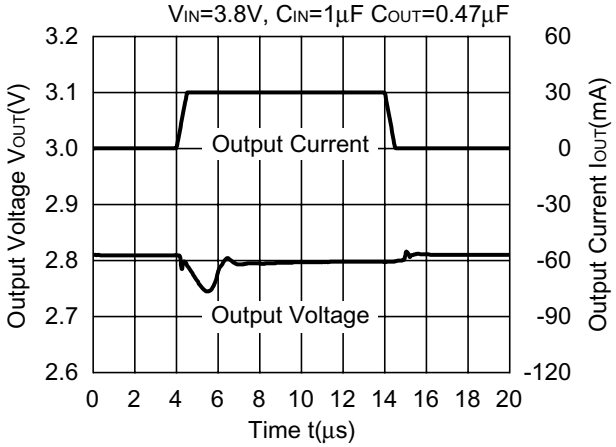
R1163x281x Fast Mode

V_{IN}=3.8V, C_{IN}=1µF C_{OUT}=1µF



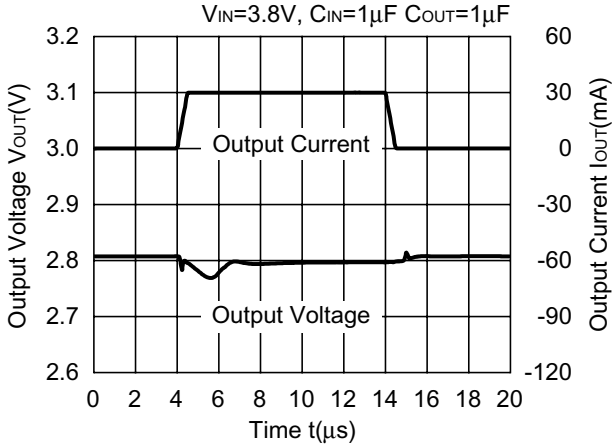
R1163x281x Fast Mode

V_{IN}=3.8V, C_{IN}=1µF C_{OUT}=0.47µF

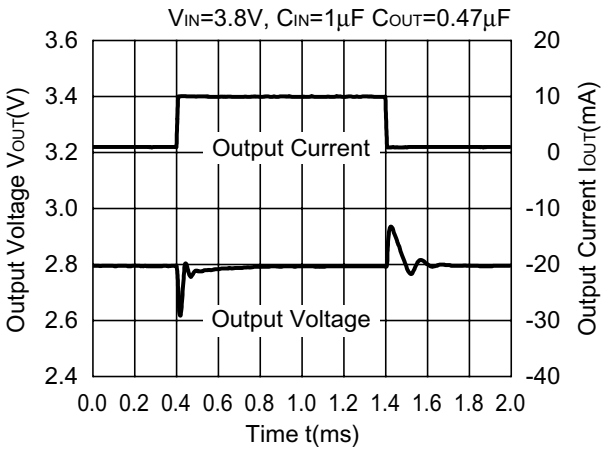


R1163x281x Fast Mode

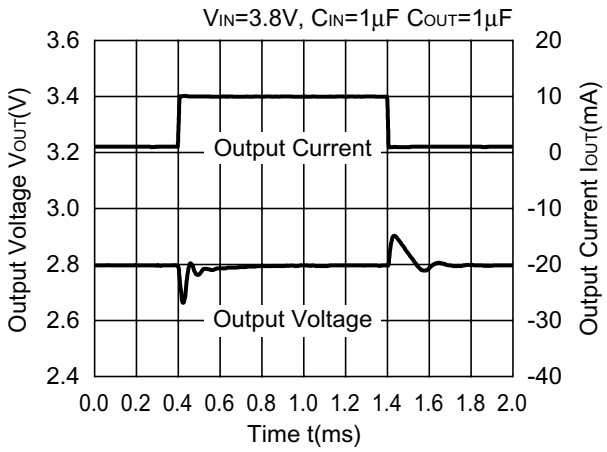
V_{IN}=3.8V, C_{IN}=1µF C_{OUT}=1µF



R1163x281x Low Power Mode

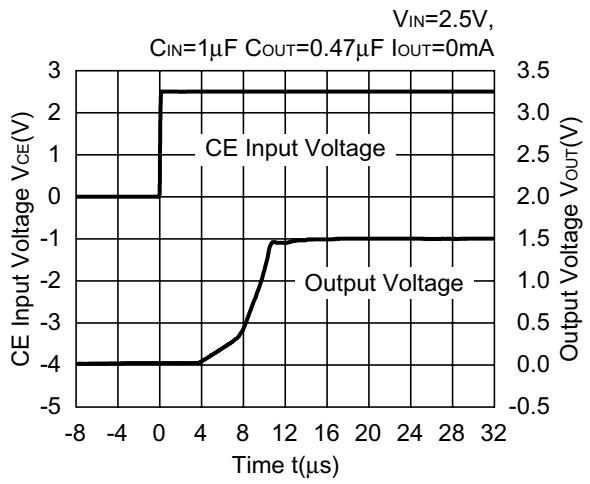


R1163x281x Low Power Mode

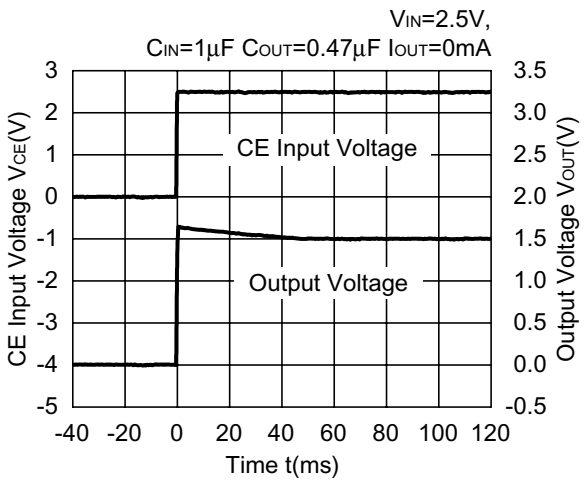


14) Turn on speed with CE pin

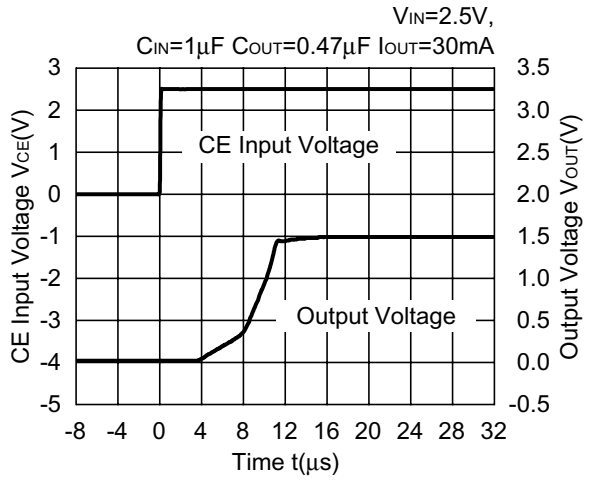
R1163x151x Fast Mode



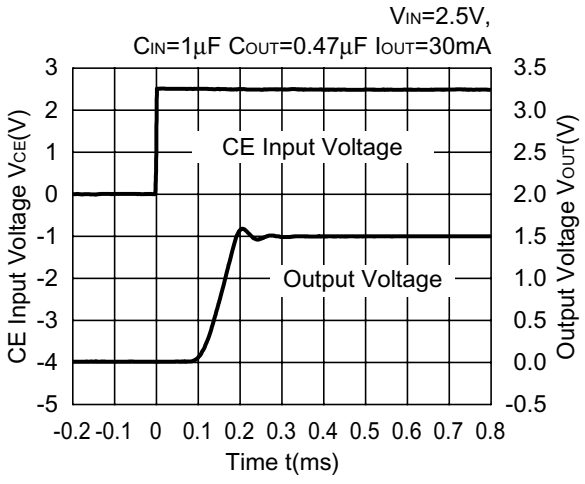
R1163x151x Low Power Mode



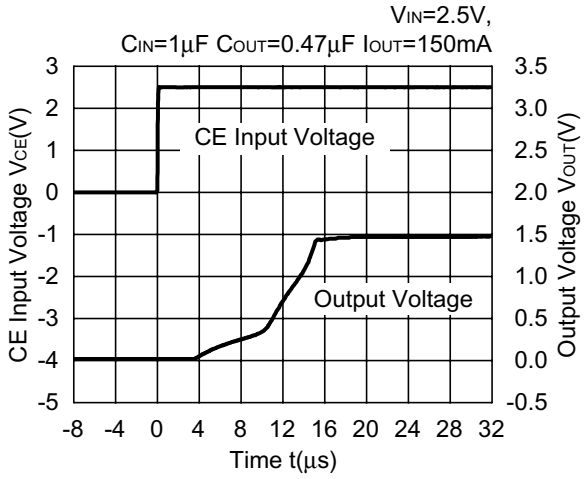
R1163x151x Fast Mode



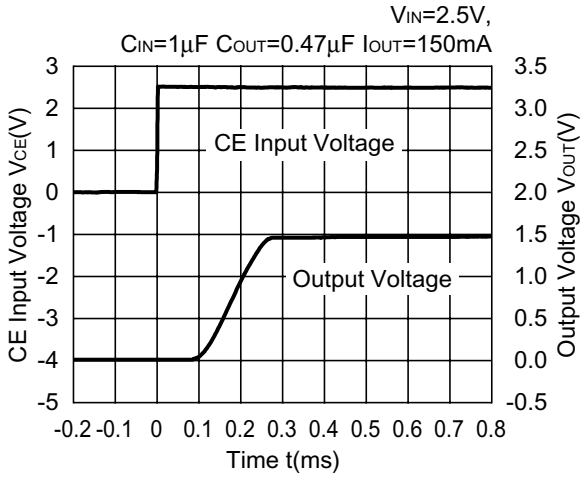
R1163x151x Low Power Mode



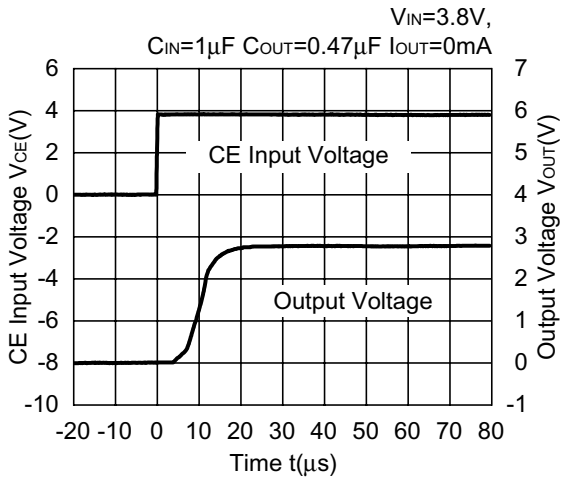
R1163x151x Fast Mode



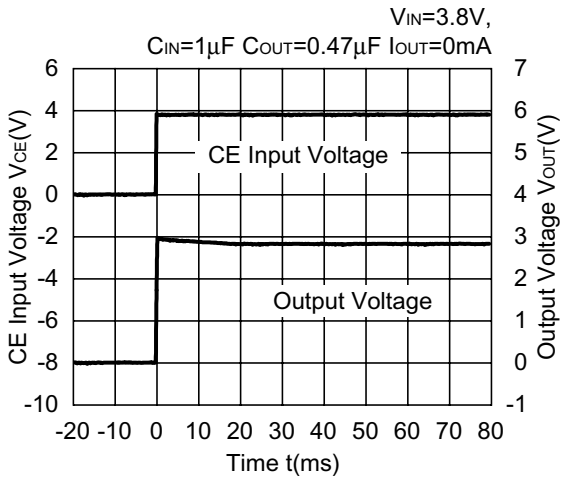
R1163x151x Low Power Mode



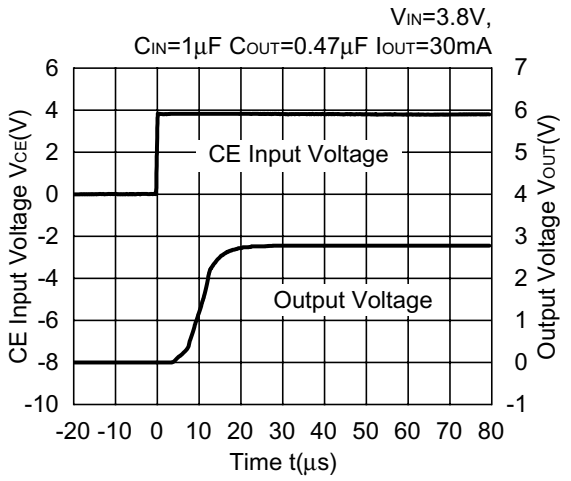
R1163x281x Fast Mode



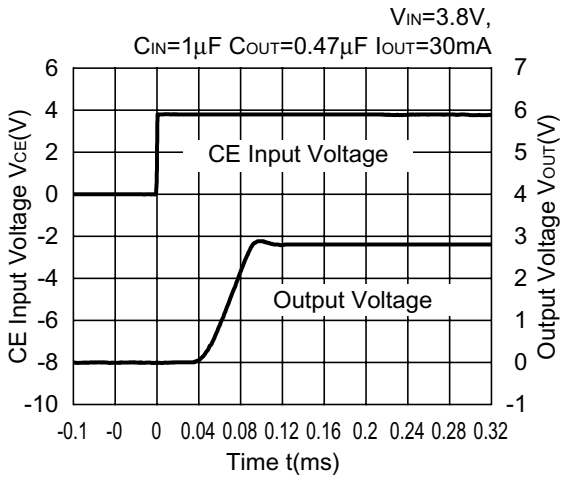
R1163x281x Low Power Mode



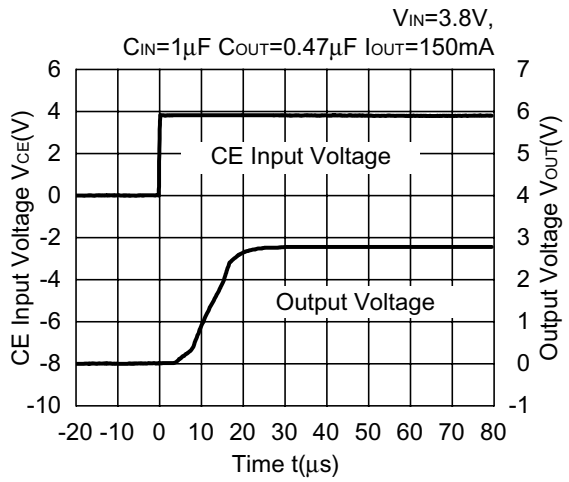
R1163x281x Fast Mode



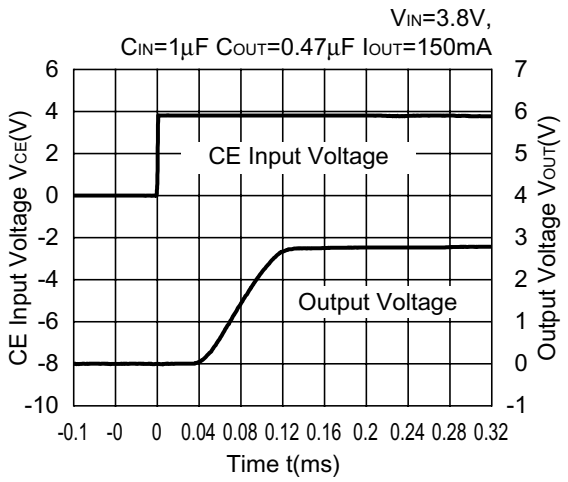
R1163x281x Low Power Mode



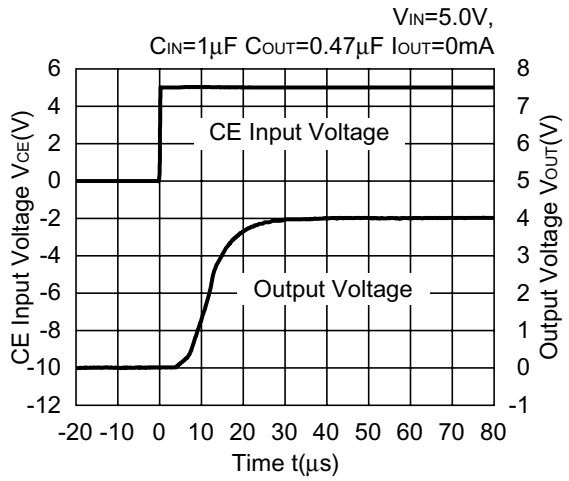
R1163x281x Fast Mode



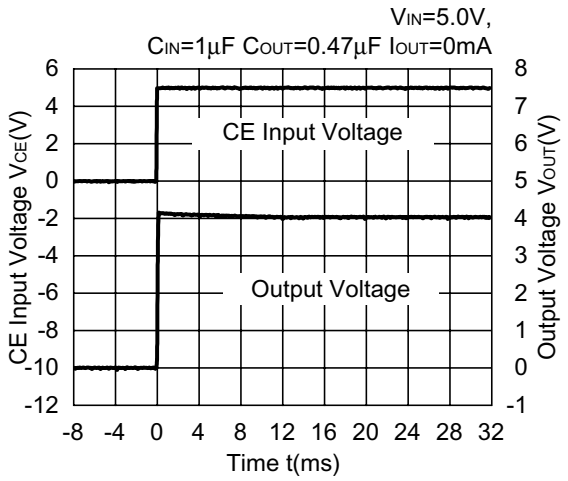
R1163x281x Low Power Mode



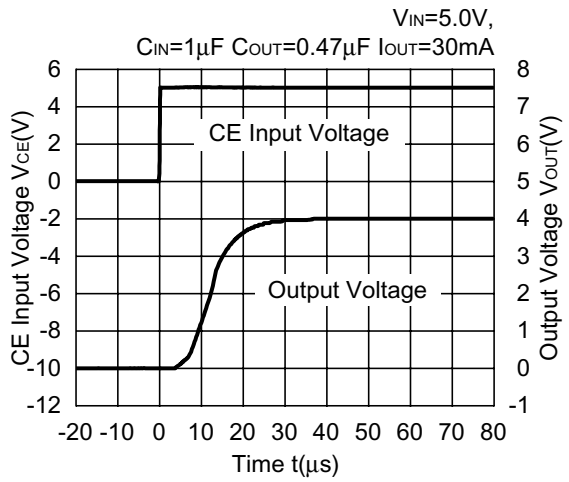
R1163x401x Fast Mode



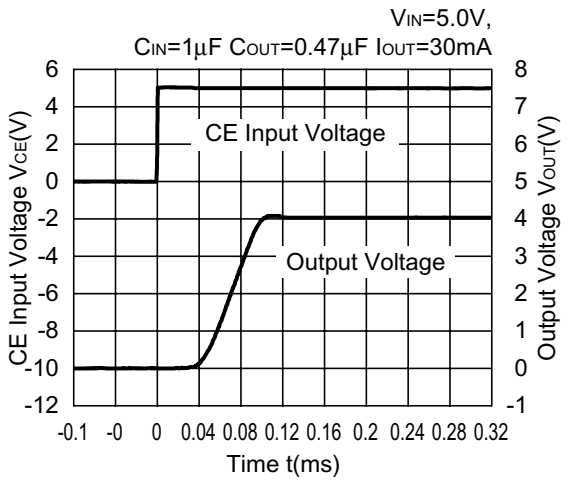
R1163x401x Low Power Mode



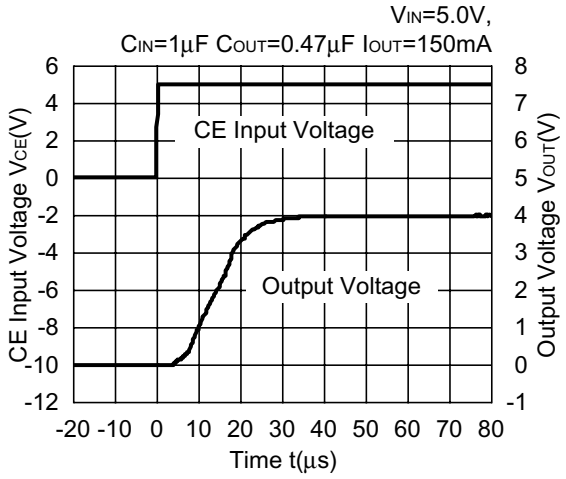
R1163x401x Fast Mode



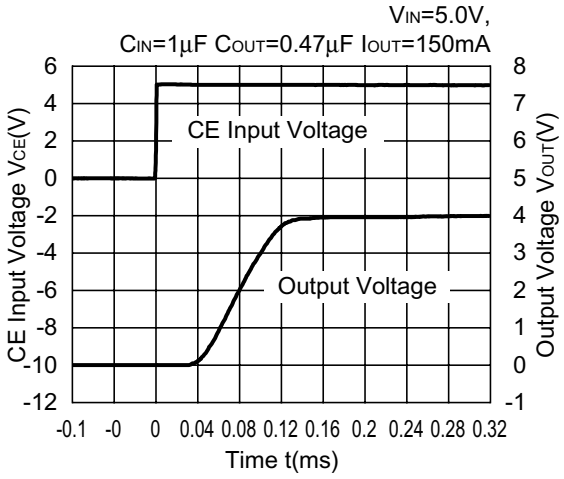
R1163x401x Low Power Mode



R1163x401x Fast Mode

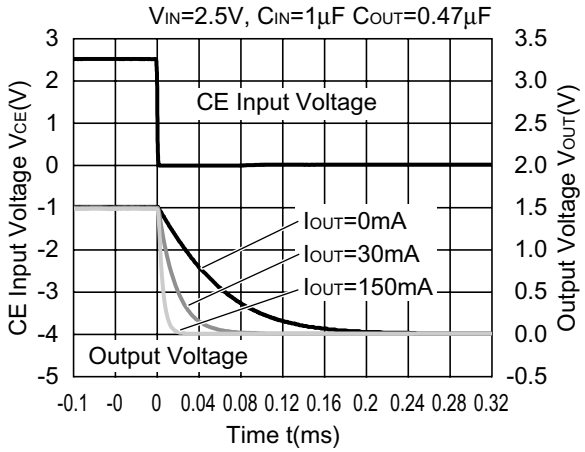


R1163x401x Low Power Mode

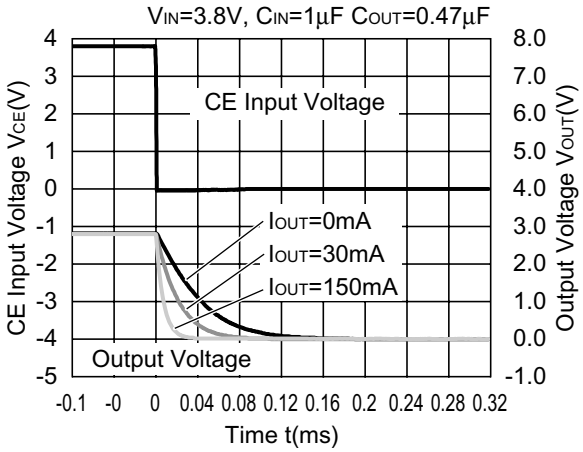


15) Turn off speed with CE pin

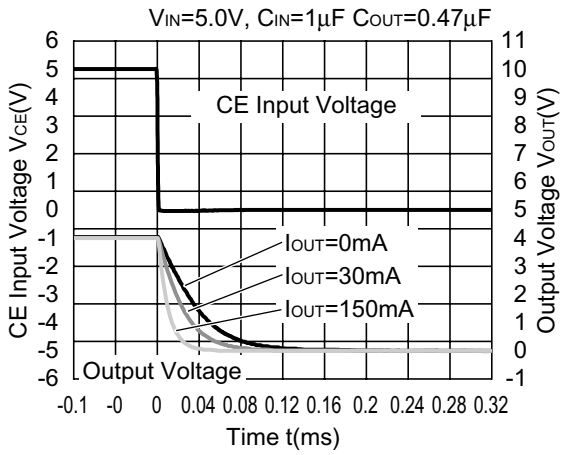
R1163x151xD



R1163x281xD



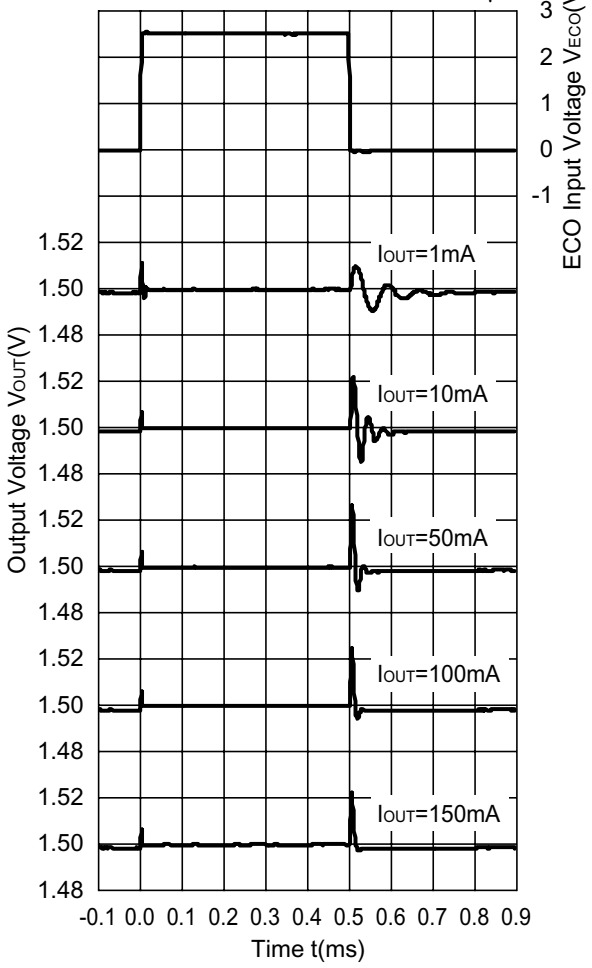
R1163x401xD



16) Output Voltage at Mode alternative point

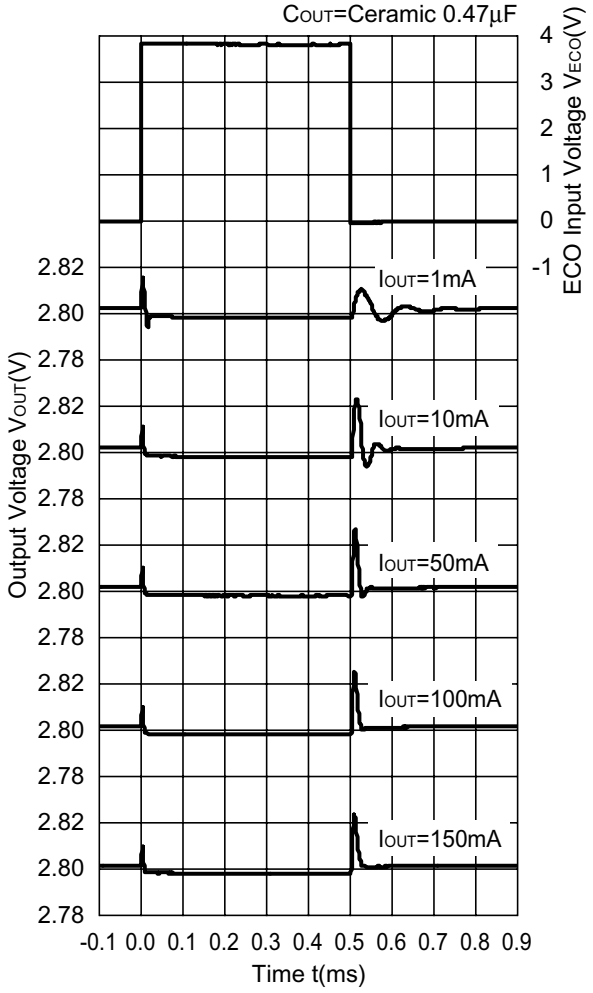
R1163x151B/D

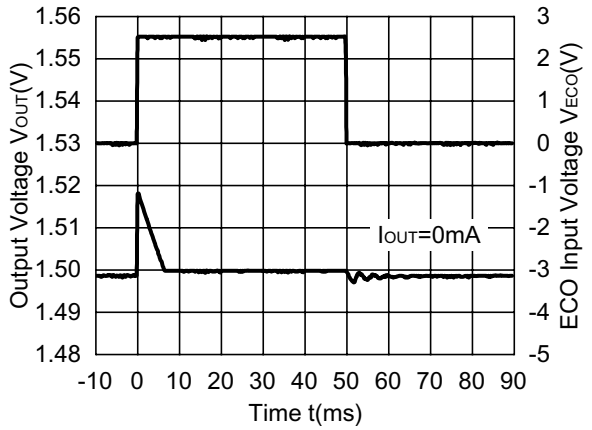
V_{IN}=2.5V, C_{IN}=Ceramic 1.0µF,
C_{OUT}=Ceramic 0.47µF

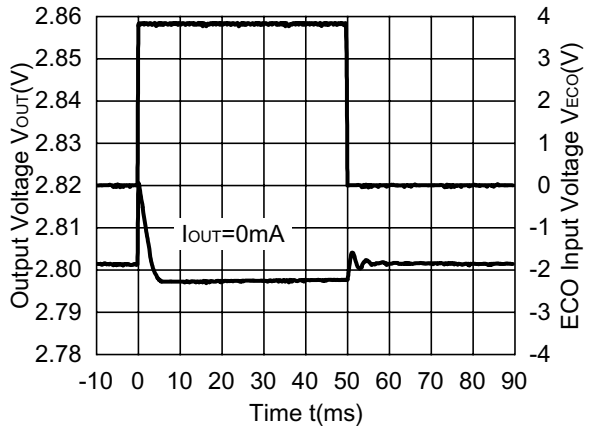


R1163x281B/D

V_{IN}=3.8V, C_{IN}=Ceramic 1.0µF,
C_{OUT}=Ceramic 0.47µF







TECHNICAL NOTES

When using these ICs, consider the following points:

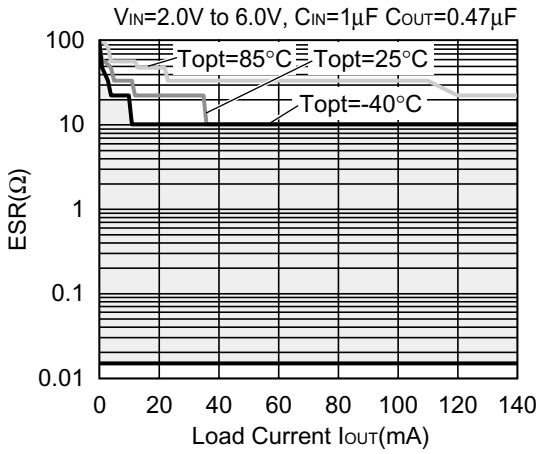
In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a capacitor C_{OUT} with good frequency characteristics and ESR (Equivalent Series Resistance) in the range described as follows:

The relations between I_{OUT} (Output Current) and ESR of Output Capacitor are shown below. The conditions when the white noise level is under 40μV (Avg.) are marked as the hatched area in the graph.

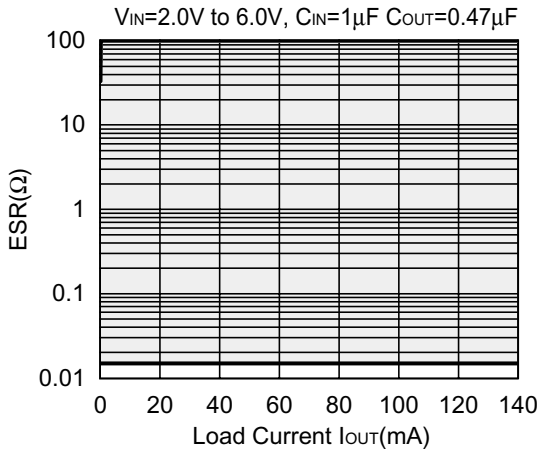
<Test conditions>

(1) Frequency band: 10Hz to 2MHz

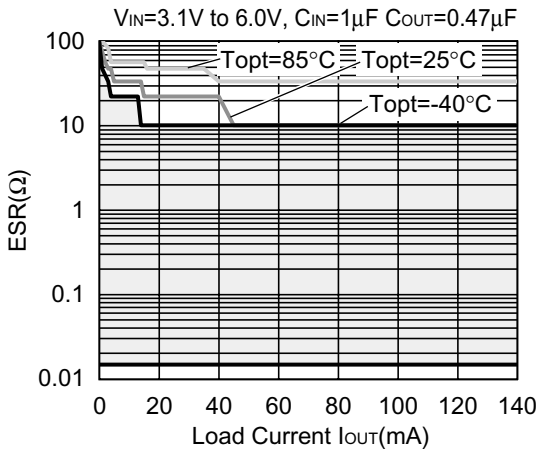
R1163x151x Fast Mode



R1163x151x Low Power Mode



R1163x281x Fast Mode



R1163x281x Low Power Mode