XC6403/XC6404 Series

ETR1002_001

High Current, High Speed LDO Regulators, Voltage Detector Function

■GENERAL DESCRIPTION

The XC6403/04 series are highly precise, low noise, high current, positive voltage low dropout regulators with built-in voltage detector. They are fabricated using Torex's CMOS process. Performance features of the series includes high ripple rejection and low dropout voltage, and the series features a voltage reference, an error amplifier, a current limiter and a phase compensation circuit plus a driver transistor.

Detect voltage is selectable in 100mV increments within the range of 0.9V to 5.6V and the LDO output voltage is selectable within a range of 0.9V to 5.6V (XC6403) 0.9V to 5.1V (XC6404), also in 100mV increments. The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series. The current limiter's foldback circuit also operates as a short circuit protection for the output current limiter and the output pin. The series provides options to the user to select from a variety of circuit features, such as detector monitoring, detector output logic, CE and EN pin input logic, internal pull-up / down resistance, and power ready. The IC's internal regulator circuit can be placed in stand-by mode via the EN function (XC6403/04 A to C series). The whole IC can be put in to stand-by mode via the CE function with the XC6403/04D series (semi-custom). In the stand-by mode, power consumption is greatly reduced. The XC6403/04A and B series features the toggle operation function. The regulator output can be OFF when the XC6403/04B series detects voltage (semi-custom). The XC6403/04E series can monitor another power source by using the V_{SEN} pin (semi-custom). The XC6403/04F series can delay the detector output: the delay time can be controlled by the use of an external capacitor (semi-custom).

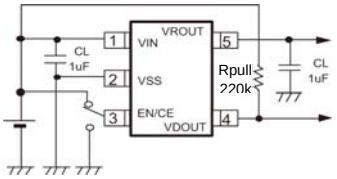
■APPLICATIONS

- ●CD-ROM, CD-R / RW drive
- ●DVD drive
- ●HDD drive
- ●Cameras, Video recorders
- ●Portable AV equipment
- ●Battery powered equipment

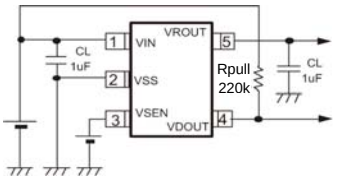
■FEATURES

Maximum Output Current	: More than 300mA (380mA limit) ($1.8 \leqq V_{ROUT} \leqq 5.3V$) [XC6403] More than 500mA (600mA limit) ($2.5V \leqq V_{ROUT} \leqq 4.9V$) [XC6404]
Dropout Voltage	: 200mV @ 100mA
Operating Voltage Range	: 2.0V ~ 6.0V
VR Output Voltage	: 0.9V ~ 5.6V [XC6403] 0.9V ~ 5.1V [XC6404]
Detect Voltage	: 0.9V ~ 5.5V (± 2%) More than 2.0V (V_{IN} sensing)
VR.VD Temp. Coefficient	: ±100ppm/℃(TYP.)
Low Power Consumption	: 35μA (TYP.)
High Ripple Rejection	: 65dB @10kHz
Highly Accurate	: ±2%
Operating Temperature	: - 40 ~ 85℃
Low ESR Capacitor Compatible	
Ultra Small Packages	: SOT-25 (SOT-23-5) SOT-89-5 USP-6B

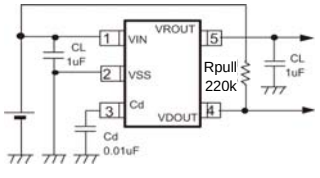
■TYPICAL APPLICATION CIRCUITS



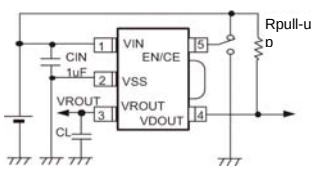
XC6403A ~ D Series



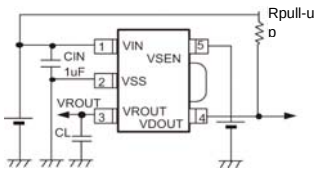
XC6403E Series



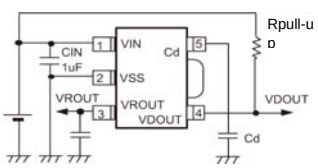
XC6403F Series



XC6404A ~ D Series

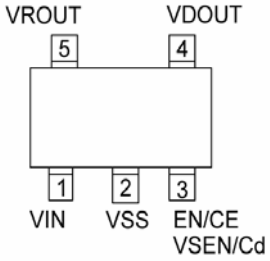


XC6404E Series

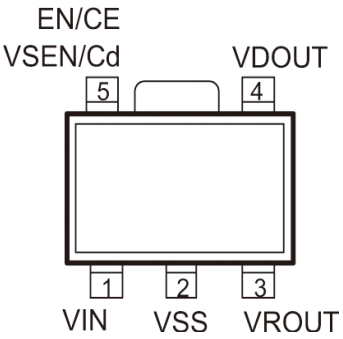


XC6404F Series

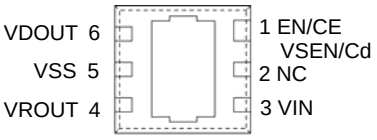
■PIN CONFIGURATION



SOT-25 (TOP VIEW)



SOT-89-5 (TOP VIEW)



USP-6B (BOTTOM VIEW)

■PIN ASSIGNMENT

PIN NUMBER			PIN NAME	FUNCTION
SOT-25	SOT-89-5	USP-6B		
1	1	3	V_{IN}	Power Input
2	2	5	V_{SS}	Ground
3	5	1	EN	VR ON / OFF Control
3	5	1	CE	ON / OFF Control
3	5	1	V_{SEN}	VD Monitoring
3	5	1	Cd	Delay Capacitor Connection
4	4	6	V_{DOUT}	VD Output
5	3	4	V_{ROUT}	VR Output
-	-	2	NC	No connection

*The dissipation pad for the USP-6B package should be solder-plated in recommended mount pattern and metal masking so as to enhance mounting strength and heat release. If the pad needs to be connected to other pins, it should be connected to the V_{SS} pin.

■PRODUCT CLASSIFICATION

●Selection Guide

1. TOGGLE FUNCTION, VD SELF-SATURATION AS OPTION

SERIES	TOGGLE FUNCTION (BUILT-IN)
XC6403/04A	VD with Toggle Function
XC6403/04B	VD with Toggle Function and Self-Saturation
XC6403/04C ~ F	VD with No Toggle Function

2. STAND-BY MODE FUNCTION AS OPTION

SERIES	STAND-BY MODE FUNCTION
XC6403/04A ~ C	VR with Stand-By Mode Function
XC6403/04D	Chip Stand-By Mode Function
XC6403/04E, F	No Stand-By Mode Function

3. CE / EN INPUT LOGIC, INTERNAL PULL-UP/DOWN AS OPTION (*A ~ D Series)

SERIES	CE INPUT LOGIC
XC6403/04 * A ~ D	High Active with Pull Down
XC6403/04 * E ~ K	High Active with No Pull Down
XC6403/04 * L ~ P	Low Active with Pull Up
XC6403/04 * R ~ U	Low Active with No Pull Up

4. VD SENSE AS OPTION (*A ~ D and F Series)

SERIES	VD SENSE PIN
XC6403/04 * A, B, E, F, L, M, R, S, V, X	V_{IN}
XC6403/04 * C, D, H, K, N, P, T, U, Y, Z	V_{OUT}
XC6403/04 E V ~ Z	V_{SEN}

5. VD OUTPUT LOGIC AS OPTION

SERIES	VD OUTPUT LOGIC FUNCTION
XC6403/04A ~ F	Detect L or Detect H

6. VD DELAY FUNCTION AS OPTION

SERIES	DELAY FUNCTION
XC6403/04A ~ E	No Delay
XC6403/04F	Delay Time Adjustable by Connecting Cd

■PRODUCT CLASSIFICATION (Continued)

●Ordering Information

XC6403/04 ①②③④⑤⑥

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Operational Function	A	: Toggle and EN function (preliminary)
		B	: Toggle, EN function, VD signal/VR OFF function (preliminary)
		C	: EN function
		D	: CE function
		E	: VSEN Pin
		F	: Cd pin
②	Type of Regulator	-	: As in the chart below.
③ ④	Output Voltage & Detect Voltage	-	: Internally set sequential number relating to output voltage and detect voltage (refer to the chart below) VR setting output voltage range: 0.9V~5.6V [XC6403] 0.9V~5.1V [XC6404] Detect voltage setting range: 0.9V ~5.5V 100mV increments are available
⑤	Package	M	: SOT-25
		P	: SOT-89-5
		D	: USP-6B
⑥	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed

PIN NUMBER : ② Types

②	EN / CE FUNCTION	EN / CE LOGIC	PULL UP/DOWN RESISTANCE	VD SENSE PIN	VD OUTPUT LOGIC	PIN NUMBER①
A	Function	High Active	Pull-down Function	VIN	Detect L	A ~ D Series
B	Function	High Active	Pull-down Function	VIN	Detect H	
C	Function	High Active	Pull-down Function	VROUT	Detect L	
D	Function	High Active	Pull-down Function	VROUT	Detect H	
E	Function	High Active	Nonfunctional	VIN	Detect L	
F	Function	High Active	Nonfunctional	VIN	Detect H	
H	Function	High Active	Nonfunctional	VROUT	Detect L	
K	Function	High Active	Nonfunctional	VROUT	Detect H	
L	Function	Low Active	Pull-up Function	VIN	Detect L	
M	Function	Low Active	Pull-up Function	VIN	Detect H	
N	Function	Low Active	Pull-up Function	VROUT	Detect L	
P	Function	Low Active	Pull-up Function	VROUT	Detect H	
R	Function	Low Active	Nonfunctional	VIN	Detect L	
S	Function	Low Active	Nonfunctional	VIN	Detect H	
T	Function	Low Active	Nonfunctional	VROUT	Detect L	
U	Function	Low Active	Nonfunctional	VROUT	Detect H	
V	Nonfunctional	-	-	VIN / VSEN	Detect L	E & F Series
X	Nonfunctional	-	-	VIN / VSEN	Detect H	
Y	Nonfunctional	-	-	VROUT	Detect L	F Series
Z	Nonfunctional	-	-	VROUT	Detect H	

*The XC6403/04A and XC6403/04B series are under development. For further detail, please ask your sales contacts.

■PRODUCT CLASSIFICATION (Continued)

●Ordering Information (Continued)

●Pin Number ③, ④ Type (80 ~ 99 : Standard voltage products)

●XC6403 Series

③④	VROUT	VDOUT	③④	VROUT	VDOUT	③④	VROUT	VDOUT	③④	VROUT	VDOUT
01	1.80	2.40	21	3.30	3.10	-	-	-	80	1.80	1.60
02	1.80	2.90	22	2.80	3.10	-	-	-	81	2.80	3.10
03	1.60	1.80	23	-	-	-	-	-	82	1.80	2.00
04	1.80	2.00	24	1.80	2.40	-	-	-	83	2.50	2.80
05	3.00	3.30	25	3.20	2.80	-	-	-	84	2.85	3.20
06	1.80	2.40	26	-	-	-	-	-	85	3.00	3.30
07	1.80	2.90	27	-	-	-	-	-	86	3.50	3.80
08	1.80	2.00	28	-	-	-	-	-	87	3.00	4.20
09	3.00	3.30	29	-	-	-	-	-	88	3.30	4.00
10	2.80	3.10	30	4.00	4.30	-	-	-	89	-	-
11	1.80	1.70	31	2.85	2.70	-	-	-	90	-	-
12	3.00	4.20	32	2.60	2.40	-	-	-	91	-	-
13	1.80	3.00	33	2.70	2.80	-	-	-	92	-	-
14	1.80	3.00	34	2.85	2.55	-	-	-	93	-	-
15	1.80	2.40	35	-	-	-	-	-	94	-	-
16	2.50	2.90	36	-	-	-	-	-	95	-	-
17	1.80	2.30	37	-	-	-	-	-	96	-	-
18	2.80	3.40	38	-	-	-	-	-	97	-	-
19	-	-	39	-	-	-	-	-	98	-	-
20	3.30	3.00	40	-	--	-	-	-	99	-	-

34 : Hysteresis Range 3.0% (TYP.) for an error flag

For the other voltages, please ask your sales contacts.

●XC6404 Series

③④	VROUT	VDOUT	③④	VROUT	VDOUT	③④	VROUT	VDOUT	③④	VROUT	VDOUT
01	2.70	4.20	21	1.80	3.60	-	-	-	80	1.80	1.60
02	2.70	4.20	22	1.80	4.20	-	-	-	81	2.80	3.10
03	2.50	2.60	23	2.50	2.90	-	-	-	82	1.80	2.00
04	3.30	4.30	24	2.50	3.60	-	-	-	83	2.50	2.80
05	3.30	4.40	25	2.50	4.20	-	-	-	84	2.85	3.20
06	3.30	4.00	26	4.30	4.00	-	-	-	85	3.00	3.30
07	3.30	5.20	27	2.50	3.90	-	-	-	86	3.50	3.80
08	2.80	4.30	28	3.30	3.70	-	-	-	87	3.00	4.20
09	4.30	2.80	29	2.60	3.90	-	-	-	88	3.30	4.00
10	3.30	3.60	30	3.30	4.20	-	-	-	89	-	-
11	2.80	2.10	31	3.30	4.50	-	-	-	90	-	-
12	2.80	2.80	32	2.85	2.60	-	-	-	91	-	-
13	3.30	3.60	33	3.30	2.80	-	-	-	92	-	-
14	3.30	3.60	34	3.40	4.20	-	-	-	93	-	-
15	3.30	3.60	35	-	-	-	-	-	94	-	-
16	3.00	2.70	36	-	-	-	-	-	95	-	-
17	2.80	2.50	37	-	-	-	-	-	96	-	-
18	3.00	2.70	38	-	-	-	-	-	97	-	-
19	2.80	2.50	39	-	-	-	-	-	98	-	-
20	1.80	2.90	40	-	-	-	-	-	99	-	-

For the other voltages, please ask your sales contacts.

■PRODUCT CLASSIFICATION (Continued)

●Ordering Example (Standard Products)

PRODUCT NAME	PRODUCT DESCRIPTION	VOLTAGE	
		VROUT	VDOUT
XC6403/04CH80MR	EN Function, High Active, VROUT Sense, Detect L	1.80	1.60
XC6403/04CE81MR	EN Function, High Active, VIN Sense, Detect L	2.80	3.10
XC6403/04DE82MR	CE Function, High Active, VIN Sense, Detect L	1.80	2.00
XC6403/04DE83MR	CE Function, High Active, VIN Sense, Detect L	2.50	2.80
XC6403/04DE84MR	CE Function, High Active, VIN Sense, Detect L	2.85	3.20
XC6403/04DE85MR	CE Function, High Active, VIN Sense, Detect L	3.00	3.30
XC6403/04DE86MR	CE Function, High Active, VIN Sense, Detect L	3.50	3.80
XC6403/04FV87MR	Cd Function, VIN Sense, Detect L	3.00	4.20
XC6403/04FV88MR	Cd Function, VIN Sense, Detect L	3.30	4.00
XC6404DE89MR	CE Function, High Active, VIN Sense, Detect L	1.20	2.00
XC6404DE90MR	CE Function, High Active, VIN Sense, Detect L	1.30	2.00
XC6404DE91MR	CE Function, High Active, VIN Sense, Detect L	1.50	2.00

■ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		V_{IN}	7.0	V
VR Output Current		V_{RIOUT}	700	mA
VR Output Voltage		V_{ROUT}	V_{SS} -0.3 ~ V_{IN} + 0.3	V
VD Output Current		V_{DIOUT}	50	mA
VD Output Voltage		V_{DOUT}	V_{SS} -0.3 ~ 7.0	V
V_{CE} / V_{SEN} / Cd Pin Voltage		V_{CE} / V_{SEN} / Cd	V_{SS} -0.3 ~ V_{IN} + 0.3	V
Power Dissipation	SOT-25	Pd	250	mW
	SOT-89-5		500	
	USP-6B		100	
Operating Temperature Range		Topr	- 40 ~ + 85	℃
Storage Temperature Range		Tstg	- 55 ~ + 125	℃

■ELECTRICAL CHARACTERISTICS

XC6403/04 Series

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
VOLTAGE REGULATOR	Output Voltage (*2, 3)	$V_{ROUT(E)}$	I_{ROUT}=30mA	×0.98	$V_{ROUT(T)}$	×1.02	V	①
	Maximum Output Current XC6403 (0.9~1.7V product)	$I_{ROUTMAX}$	V_{IN} = 3.1V	150	-	-	mA	①
	Maximum Output Current XC6403 (1.8~5.3V product)	$I_{ROUTMAX}$	V_{IN}=3.1V @ V_{ROUT}≦2.1V	300	-	-	mA	①
	Maximum Output Current XC6404 (0.9~2.4V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V	400	-	-	mA	①
	Maximum Output Current XC6404 (2.5~4.9V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	-	-	mA	①
	Load Regulation	△V_{ROUT}	1mA≦I_{ROUT}≦100mA	-	15	50	mV	①
	Dropout Voltage (*4)	Vdif1	I_{ROUT}=30mA	E-1			mV	①
		Vdif2	I_{ROUT}=100mA	E-2			mV	①
	Supply Current (No Pull-up Resistor)	I_{DD}	V_{IN}=$V_{ROUT(T)}$+1.0V, V_{EN}/CE=ON V_{ROUT}≦0.9V, V_{IN}=2.0V, V_{EN}/CE =V_{IN} or V_{SS}	-	35	70	μA	②
	Supply Current (With Pull-up Resistor)	I_{DD}	V_{IN}=$V_{ROUT(T)}$+1.0V, V_{EN}/CE=ON V_{ROUT}≦0.9V, V_{IN}=2.0V, V_{EN}/CE =V_{IN} or V_{SS}	-	40	75	μA	②
	Line Regulation	$\frac{\triangle V_{ROUT}}{\triangle V_{IN} \cdot V_{ROUT}}$	$V_{ROUT(T)}$+1.0V≦V_{IN}≦6.0V When V_{ROUT}≦0.9V, 2.0V≦V_{IN}≦6.0V, I_{ROUT}=30mA, When V_{ROUT}≦1.75V, I_{ROUT}=10mA	-	0.01	0.20	% / V	①
	Input Voltage	V_{IN}	-	2.0	-	6.0	V	-
	Output Voltage Temperature Characteristics	$\frac{\triangle V_{ROUT}}{\triangle Topr \cdot V_{ROUT}}$	I_{ROUT}=30mA -40℃≦Topr≦85℃	-	±100	-	ppm /℃	①
	Ripple Rejection Rate	PSRR	V_{IN}=[$V_{ROUT(T)}$+1.0]V+0.5Vp-pAC When $V_{ROUT(T)}$≦1.25V → V_{IN}=2.25V+0.5Vp-pAC When $V_{ROUT(T)}$≧4.75V → V_{IN}=5.75V+0.5Vp-pAC I_{ROUT}=50mA, f=10kHz	-	65	-	dB	③
	Current Limiter XC6403 (1.8V or more)	I_{Rlim}	V_{IN}=3.1V @ V_{ROUT}≦2.1V	300	380	-	mA	①
	Current Limiter XC6403 (1.7V or less)	I_{Rlim}	V_{IN}=3.1V	-	380	-	mA	①
	XC6403 Short-Circuit Current	I_{Rshort}	V_{IN}=3.1V @ V_{ROUT}≦2.1V	-	50	-	mA	①
	Current Limiter XC6404 (2.4V or less)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V	-	600	-	mA	①
	Current Limiter XC6404 (2.5V or more)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	600	-	mA	①
	XC6404 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	-	50	-	mA	①

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 Series (Continued) Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS		MIN.	TYP.	MAX.	UNITS	CIRCUIT
VOLTAGE DETECTOR	Detect Voltage (*7, 8)	$V_{DF(E)}$	-		×0.98	$V_{DF(T)}$	×1.02	V	④
	Hysteresis Range (*7)	V_{HYS}	-		$V_{DF(T)}$ ×0.02	$V_{DF(T)}$ ×0.05	$V_{DF(T)}$ ×0.08	V	④
	Supply Current	I_{DDVD}	V_{IN} = 2.0V		-	6.5	14.5	μA	②
			V_{IN} = 3.0V		-	7.0	15.0		
			V_{IN} = 4.0V		-	7.5	15.5		
			V_{IN} = 5.0V		-	8.0	16.0		
			V_{IN} = 6.0V		-	9.0	17.0		
	Output Current (*9)	I_{DOUT}	V_{DOUT} = 0.5V	V_{IN} = 2.0V	3.0	6.0	-	mA	⑤
				V_{IN} = 3.0V	4.0	8.0	-		
				V_{IN} = 4.0V	5.0	10.0	-		
				V_{IN} = 5.0V	7.0	12.0	-		
				V_{IN} = 6.0V	10.0	15.0	-		
	Detect Voltage Temperature Characteristics	$\frac{\triangle V_{DF}}{\triangle Topr \cdot V_{DF}}$	-40℃≦Topr≦85℃		-	±100	-	ppm/℃	④
SWITCH (NO PULL-UP RESISTOR)									
	CE/EN "High" Level Voltage	$V_{CE/EN\ H}$	-		1.60	-	V_{IN}	V	①
	CE/EN "Low" Level Voltage	$V_{CE/EN\ L}$	-		-	-	0.25	V	①
	CE/EN "High" Level Current	$I_{CE/EN\ H}$	$V_{CE/EN}=V_{IN}=V_{ROUT(T)}+1.0V$		-0.10	-	5.00	μA	②
	CE/EN "Low" Level Current	$I_{CE/EN\ L}$	$V_{IN}=V_{ROUT(T)}+1.0V$, $V_{CE/EN}=V_{SS}$		-0.10	-	0.10	μA	②
OPTION									
	Delay Resistance	Rdelay	V_{IN}=6.0V, Cd=0V Delay Resistance=6.0V/Delay Current		1.0	2.0	3.5	MΩ	⑥

NOTE:

*1 : Unless otherwise stated, $V_{IN}=V_{OUT(T)}+1.0V$

*2 : $V_{ROUT(T)}$=Specified VR output voltage

*3 : $V_{OUT(E)}$=Effective VR output voltage
(i.e. the VR output voltage when "$V_{ROUT(T)}$+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{ROUT} value).

*4 : $Vdif=\{V_{IN1}^{(*6)}-V_{ROUT1}^{(*5)}\}$

*5 : A voltage equal to 98% of the VR output voltage whenever a stabilized $V_{ROUT1}=I_{ROUT}\{V_{ROUT(T)}+1.0V\}$ is input.

*6 : V_{IN1}=The input voltage when V_{OUT1}, which appears as input voltage is gradually decreased.

*7 : $V_{DF(T)}$: Specified detect voltage value

*8 : $V_{DF(E)}$: Effective detect voltage value. Refer to the E-0 chart for $V_{DF(T)}$ values less than 1.5V.

*9 : VD output current value of Detect 'L' type equal to current value during detection and that of Detect 'H' type equal to current value before detection.

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 AA / AD / AE / AH Series

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
VOLTAGE REGULATOR	Output Voltage (*2, 3)	$V_{ROUT(E)}$	I_{ROUT}=30mA	×0.98	$V_{ROUT(T)}$	×1.02	V	①
	Maximum Output Current XC6403 (0.9~1.7V product)	$I_{ROUTMAX}$	V_{IN} = 3.1V	150	-	-	mA	①
	Maximum Output Current XC6403 (1.8~5.3V product)	$I_{ROUTMAX}$	V_{IN}=3.1V @ V_{ROUT}≦2.1V	300	-	-	mA	①
	Maximum Output Current XC6404 (0.9~2.4V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V	400	-	-	mA	①
	Maximum Output Current XC6404 (2.5~4.9V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	-	-	mA	①
	Load Regulation	△V_{ROUT}	1mA≦I_{ROUT}≦100mA	-	15	50	mV	①
	Dropout Voltage (*4)	Vdif1	I_{ROUT}=30mA		E-1		mV	①
		Vdif2	I_{ROUT}=100mA		E-2		mV	①
	Supply Current (AA / AD Series)	I_{DD}	V_{IN}=V_{EN}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V	-	40	75	μA	②
	Supply Current (AE / AH Series)	I_{DD}	V_{IN}=V_{EN}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.1V	-	35	70	μA	②
	Line Regulation	$\frac{\triangle V_{ROUT}}{\triangle V_{IN} \cdot V_{ROUT}}$	$V_{ROUT(T)}$+1.0V≦V_{IN}≦6.0V When V_{ROUT}≦0.9V, 2.0V≦V_{IN}≦6.0V, I_{ROUT}=30mA When V_{ROUT}≦1.75V, I_{ROUT}=10mA	-	0.01	0.20	% / V	①
	Input Voltage	V_{IN}	-	2.0	-	6.0	V	-
	Output Voltage Temperature Characteristics	$\frac{\triangle V_{ROUT}}{\triangle Topr \cdot V_{ROUT}}$	I_{ROUT}=30mA -40℃≦Topr≦85℃	-	±100	-	ppm /℃	①
	Ripple Rejection Rate	PSRR	VIN=[$V_{ROUT(T)}$+1.0]V+0.5Vp-pAC When $V_{ROUT(T)}$≦1.25V → V_{IN}=2.25V+0.5Vp-pAC When $V_{ROUT(T)}$≦4.75V → V_{IN}=5.75V+0.5Vp-pAC I_{ROUT}=50mA, f=10kHz	-	65	-	dB	③
	Current Limiter XC6403 (1.8V or more)	I_{Rlim}	V_{IN}=3.1V @ V_{ROUT}≦2.1V V_{EN} = V_{IN}	300	380	-	mA	①
	Current Limiter XC6403 (1.7V or less)	I_{Rlim}	V_{IN}=3.1V, V_{EN}=V_{IN}	-	380	-	mA	①
	XC6403 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+1.0V, V_{EN}=V_{IN} V_{IN}=3.1V @ V_{ROUT}≦2.1V	-	50	-	mA	①
	Current Limiter XC6404 (2.4V or less)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V	-	600	-	mA	①
	Current Limiter XC6404 (2.5V or more)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	600	-	mA	①
	XC6404 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	-	50	-	mA	①
VOLTAGE DETECTOR	Detect Voltage (*7, 8)	$V_{DF(E)}$	-	×0.98	$V_{DF(T)}$	×1.02	V	④
	Hysteresis Range (*8)	V_{HYS}	-	$V_{DF(T)}$ ×0.02	$V_{DF(T)}$ ×0.05	$V_{DF(T)}$ ×0.08	V	④
	Supply Current (*9)	I_{DDVD}	V_{IN} = 2.0V	-	6.5	14.5	μA	②
			V_{IN} = 3.0V	-	7.0	15.0		
			V_{IN} = 4.0V	-	7.5	15.5		
			V_{IN} = 5.0V	-	8.0	16.0		
			V_{IN} = 6.0V	-	9.0	17.0		
	Output Current (*10)	I_{DOUT}	V_{DOUT} = 0.5V, V_{IN} = 2.0V	3.0	6.0	-		
			V_{IN} = 3.0V	4.0	8.0	-		
			V_{IN} = 4.0V	5.0	10.0	-		
			V_{IN} = 5.0V	7.0	12.0	-		
			V_{IN} = 6.0V	10.0	15.0	-		
	Detect Voltage Temperature Characteristics	$\frac{\triangle V_{DF}}{\triangle Topr \cdot V_{DF}}$	-40℃≦Topr≦85℃	-	±100	-	ppm/℃	④

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 AA / AD / AE / AH Series (Continued)

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
SWITCH	EN "High" Level Voltage	V_{ENH}	-	1.60	-	VIN	V	①
	EN "Low" Level Voltage	V_{ENL}	-	-	-	0.25	V	①
	EN "High" Level Current (AA / AD Series)	I_{ENH}	$V_{EN}=V_{IN}=V_{ROUT(T)}+1.0V$	-0.10	-	5.00	μA	②
	EN "High" Level Current (AE /AH Series)	I_{ENH}	$V_{EN}=V_{IN}=V_{ROUT(T)}+1.0V$	-0.10	-	0.10	μA	②
	EN "Low" Level Current	I_{ENL}	$V_{IN}=V_{ROUT(T)}+1.0V$, $V_{EN}=V_{SS}$	-0.10	-	0.10	μA	②

NOTE:

*1 : Unless otherwise stated, $V_{IN}=V_{OUT(T)}+1.0V$

*2 : $V_{ROUT(T)}$=Specified VR output voltage

*3 : $V_{OUT(E)}$=Effective VR output voltage
(i.e. the VR output voltage when "$V_{ROUT(T)}+1.0V$" is provided at the V_{IN} pin while maintaining a certain I_{ROUT} value).

*4 : $Vdif=\{V_{IN1}^{(*6)}-V_{ROUT1}^{(*5)}\}$

*5 : A voltage equal to 98% of the VR output voltage whenever a stabilized $V_{ROUT1}=I_{ROUT}\{V_{ROUT(T)}+1.0V\}$ is input.

*6 : V_{IN1}=The input voltage when V_{OUT1}, which appears as input voltage is gradually decreased.

*7 : $V_{DF(T)}$: Specified detect voltage value

*8 : $V_{DF(E)}$: Effective detect voltage value. Refer to the E-0 chart for $V_{DF(T)}$ values less than 1.5V.

*9 : VD supply current = supply current when $V_{EN}=V_{SS}$

*10: VD output current = sink current during detection.

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 CA / CD / CE / CH Series

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
VOLTAGE REGULATOR	Output Voltage (*2, 3)	$V_{ROUT(E)}$	I_{ROUT}=30mA	×0.98	$V_{ROUT(T)}$	×1.02	V	①
	Maximum Output Current XC6403 (0.9~1.7V product)	$I_{ROUTMAX}$	V_{IN} = 3.1V	150	-	-	mA	①
	Maximum Output Current XC6403 (1.8~5.3V product)	$I_{ROUTMAX}$	V_{IN}=3.1V @ V_{ROUT}≦2.1V	300	-	-	mA	①
	Maximum Output Current XC6404 (0.9~2.4V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V	400	-	-	mA	①
	Maximum Output Current XC6404 (2.5~4.9V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	-	-	mA	①
	Load Regulation	△V_{ROUT}	1mA≦I_{ROUT}≦100mA	-	15	50	mV	①
	Dropout Voltage (*4)	Vdif1	I_{ROUT}=30mA		E-1		mV	①
		Vdif2	I_{ROUT}=100mA		E-2		mV	①
	Supply Current (CA / CD Series)	I_{DD}	V_{IN}=V_{EN}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V	-	40	75	μA	②
	Supply Current (CE / CH Series)	I_{DD}	V_{IN}=V_{EN}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V	-	35	70	μA	②
	Line Regulation	$\frac{\triangle V_{ROUT}}{\triangle V_{IN} \cdot V_{ROUT}}$	$V_{ROUT(T)}$+1.0V≦V_{IN}≦6.0V When V_{ROUT}≦0.9V, 2.0V≦V_{IN}≦6.0V, I_{ROUT}=30mA When V_{ROUT}≧1.75V, I_{ROUT}=10mA	-	0.01	0.20	% / V	①
	Input Voltage	VIN	-	2.0		6.0	V	-
	Output Voltage Temperature Characteristics	$\frac{\triangle V_{ROUT}}{\triangle Topr \cdot V_{ROUT}}$	I_{ROUT}=30mA -40℃≦Topr≦85℃	-	±100	-	ppm /℃	①
	Ripple Rejection Rate	PSRR	V_{IN}=[$V_{ROUT(T)}$+1.0]V+0.5V When $V_{ROUT(T)}$≦1.25V → V_{IN}=2.25V+0.5Vp-pAC When $V_{ROUT(T)}$≧4.75V → V_{IN}=5.75V+0.5Vp-pAC I_{ROUT}=50mA, f=10kHz	-	65	-	dB	③
	Current Limiter XC6403 (1.8V or more)	I_{Rlim}	V_{IN}=3.1V @ V_{ROUT}≦2.1V V_{EN}=V_{IN}	300	380	-	mA	①
	Current Limiter XC6403 (1.7V or less)	I_{Rlim}	V_{IN}=3.1V, V_{EN}=V_{IN}	-	380	-	mA	①
	XC6403 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+1.0V, V_{EN}=V_{IN} V_{IN}=3.1V @ V_{ROUT}≦2.1V	-	50	-	mA	①
	Current Limiter XC6404 (2.4V or less)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V	-	600	-	mA	①
	Current Limiter XC6404 (2.5V or more)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	600	-	mA	①
	XC6404 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	-	50	-	mA	①
VOLTAGE DETECTOR	Detect Voltage (*7, 8)	$V_{DF(E)}$	-	x 0.98	$V_{DF(T)}$	x 1.02	V	④
	Hysteresis Range (*8)	V_{HYS}	-	$V_{DF(T)}$ ×0.02	$V_{DF(T)}$ ×0.05	$V_{DF(T)}$ ×0.08	V	④
	Supply Current (*9)	I_{DDVD}	V_{IN} = 2.0V		6.5	14.5	μA	②
			V_{IN} = 3.0V	-	7.0	15.0		
			V_{IN} = 4.0V	-	7.5	15.5		
			V_{IN} = 5.0V	-	8.0	16.0		
			V_{IN} = 6.0V	-	9.0	17.0		
	Output Current (*10)	I_{DOUT}	V_{DOUT} = 0.5V, V_{IN} = 2.0V	3.0	6.0	-		
			V_{IN} = 3.0V	4.0	8.0	-		
			V_{IN} = 4.0V	5.0	10.0	-		
			V_{IN} = 5.0V	7.0	12.0	-		
			V_{IN} = 6.0V	10.0	15.0	-		
	Detect Voltage Temperature Characteristics	$\frac{\triangle V_{DF}}{\triangle Topr \cdot V_{DF}}$	-40℃≦Topr≦85℃	-	±100	-	ppm/℃	④

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 CA / CD / CE / CH Series (Continued)

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
SWITCH	EN "High" Level Voltage	V_{ENH}	-	1.6	-	VIN	V	①
	EN "Low" Level Voltage	V_{ENL}	-	-	-	0.25	V	①
	EN "High" Level Current (CA / CD Series)	I_{ENH}	$V_{EN}=V_{IN}=V_{ROUT(T)}+1.0V$	-0.10	-	5.00	μA	②
	EN "High" Level Current (CE /CH Series)	I_{ENH}	$V_{EN}=V_{IN}=V_{ROUT(T)}+1.0V$	-0.10	-	0.10	μA	②
	EN "Low" Level Current	I_{ENL}	$V_{IN}=V_{ROUT(T)}+1.0V$, $V_{EN}=V_{SS}$	-0.10	-	0.10	μA	②

NOTE:

*1 : Unless otherwise stated, $V_{IN}=V_{OUT(T)}+1.0V$

*2 : $V_{ROUT(T)}$=Specified VR output voltage

*3 : $V_{OUT(E)}$= Effective VR output voltage
(i.e. the VR output voltage when "$V_{ROUT(T)}+1.0V$" is provided at the V_{IN} pin while maintaining a certain I_{ROUT} value).

*4 : $Vdif=\{V_{IN1}^{(*6)}-V_{ROUT1}^{(*5)}\}$

*5 : A voltage equal to 98% of the VR output voltage whenever a stabilized $V_{ROUT1}=I_{ROUT}\{V_{ROUT(T)}+1.0V\}$ is input.

*6 : V_{IN1}=The input voltage when V_{OUT1}, which appears as input voltage is gradually decreased.

*7 : $V_{DF(T)}$: Specified detect voltage value

*8 : $V_{DF(E)}$: Effective detect voltage value. Refer to the E-0 chart on page 15 for $V_{DF(T)}$ values less than 1.5V.

*9 : VD supply current = supply current when $V_{EN}=V_{SS}$

*10 : VD output current = sink current during detection.

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 DA / DD / DE / DH Series

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
VOLTAGE REGULATOR	Output Voltage (*2, 3)	$V_{ROUT(E)}$	I_{ROUT}=30mA	×0.98	$V_{ROUT(T)}$	×1.02	V	①
	Maximum Output Current XC6403 (0.9~1.7V product)	$I_{ROUTMAX}$	V_{IN} = 3.1V	150	-	-	mA	①
	Maximum Output Current XC6403 (1.8~5.3V product)	$I_{ROUTMAX}$	V_{IN}=3.1V @ V_{ROUT}≦2.1V	300	-	-	mA	①
	Maximum Output Current XC6404 (0.9~2.4V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V	400	-	-	mA	①
	Maximum Output Current XC6404 (2.5~4.9V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	-	-	mA	①
	Load Regulation	△V_{ROUT}	1mA≦I_{ROUT}≦100mA	-	15	50	mV	①
	Dropout Voltage (*4)	Vdif1	I_{ROUT}=30mA		E-1		mV	①
		Vdif2	I_{ROUT}=100mA		E-2		mV	①
	Supply Current (DA / DD Series)	I_{DD}	V_{IN}=V_{CE}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V	-	40	75	μA	②
	Supply Current (DE / DH Series)	I_{DD}	V_{IN}=V_{CE}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V	-	35	70	μA	②
	Stand-by Current (DA / DD / DE / DH Series)	I_{DD}	V_{IN}=$V_{ROUT(T)}$+1.0V, V_{CE}=0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V	-	0.01	0.10	% / V	②
	Line Regulation	$\frac{\triangle V_{ROUT}}{\triangle V_{IN} \cdot V_{ROUT}}$	$V_{ROUT(T)}$+1.0V≦V_{IN}≦6.0V When V_{ROUT}≦0.9V, 2.0V≦V_{IN}≦6.0V, I_{ROUT}=30mA When V_{ROUT}≦1.75V, I_{ROUT}=10mA	-	0.01	0.20	% / V	①
	Input Voltage	V_{IN}	-	2.0	-	6.0	V	-
	Output Voltage Temperature Characteristics	$\frac{\triangle V_{ROUT}}{\triangle Topr \cdot V_{ROUT}}$	I_{ROUT}=30mA -40℃≦Topr≦85℃	-	±100	-	ppm /℃	①
	Ripple Rejection Rate	PSRR	V_{IN}=[$V_{ROUT(T)}$+1.0]V+0.5Vp-pAC When $V_{ROUT(T)}$≦1.25V → V_{IN}=2.25V+0.5Vp-pAC When $V_{ROUT(T)}$≧4.75V → V_{IN}=5.75V+0.5Vp-pAC I_{ROUT}=50mA, f=10kHz	-	65	-	dB	③
	Current Limiter XC6403 (1.8V or more)	I_{Rlim}	V_{IN}=3.1V @ V_{ROUT}≦2.1V V_{CE} = V_{IN}	300	380	-	mA	①
	Current Limiter XC6403 (1.7V or less)	I_{Rlim}	V_{IN}=3.1V, V_{CE} = V_{IN}	-	380	-	mA	①
	XC6403 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+1.0V, V_{CE} = V_{IN} V_{IN}=3.1V @ V_{ROUT}≦2.1V	-	50	-	mA	①
	Current Limiter XC6404 (2.4V or less)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V	-	600	-	mA	①
	Current Limiter XC6404 (2.5V or more)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V, When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	600	-	mA	①
	XC6404 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+2.0V, When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	-	50	-	mA	①
VOLTAGE DETECTOR	Detect Voltage (*7, 8)	$V_{DF(E)}$	-	×0.98	$V_{DF(T)}$	×1.02	V	④
	Hysteresis Range (*8)	V_{HYS}	-	$V_{DF(T)}$ ×0.02	$V_{DF(T)}$ ×0.05	$V_{DF(T)}$ ×0.08	V	④
	Supply Current (*9)	I_{DOUT}	V_{DOUT} = 0.5V, V_{IN} = 2.0V	3.0	6.0	-	mA	⑤
			V_{IN} = 3.0V	4.0	8.0	-		
			V_{IN} = 4.0V	5.0	10.0	-		
			V_{IN} = 5.0V	7.0	12.0	-		
			V_{IN} = 6.0V	10.0	15.0	-		
	Detect Voltage Temperature Characteristics	$\frac{\triangle V_{DF}}{\triangle Topr \cdot V_{DF}}$	-40℃≦Topr≦85℃	-	±100	-	ppm/℃	④

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 DA / DD / DE / DH Series (Continued)

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
SWITCH	CE "High" Level Voltage	V_{CEH}	-	1.6	-	V_{IN}	V	①
	CE "Low" Level Voltage	V_{CEL}	-	-	-	0.25	V	①
	CE "High" Level Current (DA / DD Series)	I_{CEH}	$V_{CE}=V_{IN}=V_{ROUT(T)}+1.0V$	-0.10	-	5.00	μA	②
	CE "High" Level Current (DE /DH Series)	I_{CEH}	$V_{CE}=V_{IN}=V_{ROUT(T)}+1.0V$	-0.10	-	0.10	μA	②
	CE "Low" Level Current	I_{CEL}	$V_{IN}=V_{ROUT(T)}+1.0V$, $V_{CE}=V_{SS}$	-0.10	-	0.10	μA	②

NOTE:

*1 : Unless otherwise stated, $V_{IN}=V_{OUT(T)}+1.0V$

*2 : $V_{ROUT(T)}$=Specified VR output voltage

*3 : $V_{OUT(E)}$= Effective VR output voltage

(i.e. the VR output voltage when "$V_{ROUT(T)}+1.0V$" is provided at the V_{IN} pin while maintaining a certain I_{ROUT} value).

*4 : $Vdif=\{V_{IN1}^{(*6)}-V_{ROUT1}^{(*5)}\}$

*5 : A voltage equal to 98% of the VR output voltage whenever a stabilized $V_{ROUT1}=I_{ROUT}\{V_{ROUT(T)}+1.0V\}$ is input.

*6 : V_{IN1}=The input voltage when V_{OUT1}, which appears as input voltage is gradually decreased.

*7 : $V_{DF(T)}$: Specified detect voltage value

*8 : $V_{DF(E)}$: Effective detect voltage value. Refer to the E-0 chart for $V_{DF(T)}$ values less than 1.5V.

*9 : VD output current = sink current during detection.

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 EV / EX Series

Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS		MIN.	TYP.	MAX.	UNITS	CIRCUIT
VOLTAGE REGULATOR	Output Voltage	$V_{ROUT(E)}$	I_{ROUT}=30mA		×0.98	$V_{ROUT(T)}$	×1.02	V	①
	Maximum Output Current XC6403 (0.9~1.7V product)	$I_{ROUTMAX}$	V_{IN} = 3.1V		150	-	-	mA	①
	Maximum Output Current XC6403 (1.8~5.3V product)	$I_{ROUTMAX}$	V_{IN}=3.1V @ V_{ROUT}≦2.1V		300	-	-	mA	①
	Maximum Output Current XC6404 (0.9~2.4V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V		400	-	-	mA	①
	Maximum Output Current XC6404 (2.5~4.9V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V		500	-	-	mA	①
	Load Regulation	△V_{ROUT}	1mA≦I_{ROUT}≦100mA		-	15	50	mV	①
	Dropout Voltage	Vdif1	I_{ROUT}=30mA		E-1			mV	①
		Vdif2	I_{ROUT}=100mA		E-2			mV	①
	Supply Current (EV / EX Series)	I_{DD}	V_{IN}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V		-	35	70	μA	②
	Line Regulation	$\frac{\triangle V_{ROUT}}{\triangle V_{IN} \cdot V_{ROUT}}$	$V_{ROUT(T)}$+1.0V≦V_{IN}≦6.0V When V_{ROUT}≦0.9V, 2.0V≦V_{IN}≦6.0V,I_{ROUT}=30mA When V_{ROUT}≦1.75V, I_{ROUT}=10mA		-	0.01	0.20	% / V	①
	Input Voltage	V_{IN}	-		2.0	-	6.0	V	-
	Output Voltage Temperature Characteristics	$\frac{\triangle V_{ROUT}}{\triangle Topr \cdot V_{ROUT}}$	I_{ROUT}=30mA -40℃≦Topr≦85℃		-	±100	-	ppm /℃	①
	Ripple Rejection Rate	PSRR	V_{IN}=[$V_{ROUT(T)}$+1.0]V+0.5Vp-pAC When $V_{ROUT(T)}$≦1.25V → V_{IN}=2.25V+0.5Vp-pAC When $V_{ROUT(T)}$≧4.75V → V_{IN}=5.75V+0.5Vp-pAC I_{ROUT}=50mA, f=10kHz		-	65	-	dB	③
	Current Limiter XC6403 (1.8V or more)	I_{Rlim}	V_{IN}=3.1V @ V_{ROUT}≦2.1V		300	380	-	mA	①
	Current Limiter XC6403 (1.7V or less)	I_{Rlim}	V_{IN}=3.1V		-	380	-	mA	①
	XC6403 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+1.0V V_{IN}=3.1V @ V_{ROUT}≦2.1V		-	50	-	mA	①
	Current Limiter XC6404 (2.4V or less)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V		-	600	-	mA	①
	Current Limiter XC6404 (2.5V or more)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V		500	600	-	mA	①
	XC6404 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V		-	50	-	mA	①
VOLTAGE DETECTOR	Detect Voltage	$V_{DF(E)}$	-		×0.98	$V_{DF(T)}$	×1.02	V	④
	Hysteresis Range	V_{HYS}	-		$V_{DF(T)}$ ×0.02	$V_{DF(T)}$ ×0.05	$V_{DF(T)}$ ×0.08	V	④
	Supply Current (*9)	I_{DOUT}	V_{DOUT} = 0.5V	V_{IN} = 2.0V	3.0	6.0	-	mA	⑤
				V_{IN} = 3.0V	4.0	8.0	-		
				V_{IN} = 4.0V	5.0	10.0	-		
				V_{IN} = 5.0V	7.0	12.0	-		
				V_{IN} = 6.0V	10.0	15.0	-		
	Detect Voltage Temperature Characteristics	$\frac{\triangle V_{DF}}{\triangle Topr \cdot V_{DF}}$	-40℃≦Topr≦85℃		-	±100	-	ppm/℃	④

NOTE:

*1 : Unless otherwise stated, V_{IN}=$V_{OUT(T)}$+1.0V

*2 : $V_{ROUT(T)}$=Specified VR output voltage

*3 : $V_{OUT(E)}$=Actual VR output voltage.
(i.e. the VR output voltage when "$V_{ROUT(T)}$+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{ROUT} value).

*4 : Vdif={$V_{IN1}^{(*6)}$-$V_{ROUT1}^{(*5)}$}

*5 : A voltage equal to 98% of the VR output voltage whenever a stabilized V_{ROUT1}=I_{ROUT}{$V_{ROUT(T)}$+1.0V} is input.

*6 : V_{IN1}=The input voltage when V_{OUT1}, which appears as input voltage is gradually decreased.

*7 : $V_{DF(T)}$: Specified detect voltage value

*8 : $V_{DF(E)}$: Actual detect voltage value. Refer to the E-0 chart for $V_{DF(T)}$ less than 1.5V.

*9 : VD output current = sink current during detection.

■ELECTRICAL CHARACTERISTICS (Continued)

XC6403/04 FV / FX / FY / FZ Series — Ta=25℃

	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
VOLTAGE REGULATOR	Output Voltage (*2, 3)	$V_{ROUT(E)}$	I_{ROUT}=30mA	×0.98	$V_{ROUT(T)}$	×1.02	V	①
	Maximum Output Current XC6403 (0.9~1.7V product)	$I_{ROUTMAX}$	V_{IN} = 3.1V	150	-	-	mA	①
	Maximum Output Current XC6403 (1.8~5.3V product)	$I_{ROUTMAX}$	V_{IN}=3.1V @ V_{ROUT}≦2.1V	300	-	-	mA	①
	Maximum Output Current XC6404 (0.9~2.4V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V	400	-	-	mA	①
	Maximum Output Current XC6404 (2.5~4.9V product)	$I_{ROUTMAX}$	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	-	-	mA	①
	Load Regulation	△V_{ROUT}	1mA≦I_{ROUT}≦100mA	-	15	50	mV	①
	Dropout Voltage (*4)	Vdif1	I_{ROUT}=30mA		E-1		mV	①
		Vdif2	I_{ROUT}=100mA		E-2		mV	①
	Supply Current (FV / FX / FY / FZ Series)	I_{DD}	V_{IN}=$V_{ROUT(T)}$+1.0V, When V_{ROUT}≦0.9V, V_{IN}=2.0V	-	35	70	μA	②
	Line Regulation	$\frac{\triangle V_{ROUT}}{\triangle V_{IN} \cdot V_{ROUT}}$	$V_{ROUT(T)}$+1.0V≦V_{IN}≦6.0V When V_{ROUT}≦0.9V, 2.0V≦V_{IN}≦6.0V, I_{ROUT}=30mA When V_{ROUT}≦1.75V, I_{ROUT}=10mA	-	0.01	0.20	% / V	①
	Input Voltage	V_{IN}	-	2.0	-	6.0	V	-
	Output Voltage Temperature Characteristics	$\frac{\triangle V_{ROUT}}{\triangle Topr \cdot V_{ROUT}}$	I_{ROUT}=30mA -40℃≦Topr≦85℃	-	±100	-	ppm /℃	①
	Ripple Rejection Rate	PSRR	V_{IN}=[$V_{ROUT(T)}$+1.0]V+0.5Vp-pAC When $V_{ROUT(T)}$≦1.25V → V_{IN}=2.25V+0.5Vp-pAC When $V_{ROUT(T)}$≧4.75V → V_{IN}=5.75V+0.5Vp-pAC I_{ROUT}=50mA, f=10kHz	-	65	-	dB	③
	Current Limiter XC6403 (1.8V or more)	I_{Rlim}	V_{IN}=3.1V @ V_{ROUT}≦2.1V	300	380	-	mA	①
	Current Limiter XC6403 (1.7V or less)	I_{Rlim}	V_{IN}=3.1V	-	380	-	mA	①
	XC6403 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+1.0V, V_{IN}=3.1V @ V_{ROUT}≦2.1V	-	50	-	mA	①
	Current Limiter XC6404 (2.4V or less)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V	-	600	-	mA	①
	Current Limiter XC6404 (2.5V or more)	I_{Rlim}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	500	600	-	mA	①
	XC6404 Short-Circuit Current	I_{Rshort}	V_{IN}=$V_{ROUT(T)}$+2.0V When $V_{ROUT(T)}$≧4.0V, V_{IN}=6.0V	-	50	-	mA	①
VOLTAGE DETECTOR	Detect Voltage (*7, 8)	$V_{DF(E)}$	-	×0.98	$V_{DF(T)}$	×1.02	V	④
	Hysteresis Range (*8)	V_{HYS}	-	$V_{DF(T)}$ ×0.02	$V_{DF(T)}$ ×0.05	$V_{DF(T)}$ ×0.08	V	④
	Output Current (*9)	I_{DOUT}	V_{DOUT} = 0.5V, V_{IN} = 2.0V	3.0	6.0	-	mA	⑤
			V_{IN} = 3.0V	4.0	8.0	-		
			V_{IN} = 4.0V	5.0	10.0	-		
			V_{IN} = 5.0V	7.0	12.0	-		
			V_{IN} = 6.0V	10.0	15.0	-		
	Detect Voltage Temperature Characteristics	$\frac{\triangle V_{DF}}{\triangle Topr \cdot V_{DF}}$	-40℃≦Topr≦85℃	-	±100	-	ppm/℃	④
	Delay Resistance	Rdelay	V_{IN}=6.0V, Cd=0V Delay Resistance=6.0V/Delay Current	1.0	2.0	3.5	MΩ	⑥

NOTE:

*1 : Unless otherwise stated, V_{IN}=$V_{OUT(T)}$+1.0V

*2 : $V_{ROUT(T)}$=Specified VR output voltage

*3 : $V_{OUT(E)}$=Actual VR output voltage
(i.e. the VR output voltage when "$V_{ROUT(T)}$+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{ROUT} value).

*4 : Vdif={V_{IN1}(*6)-V_{ROUT1}(*5)}

*5 : A voltage equal to 98% of the VR output voltage whenever a stabilized V_{ROUT1}=I_{ROUT}{$V_{ROUT(T)}$+1.0V} is input.

*6 : V_{IN1}=The input voltage when V_{OUT1}, which appears as Input voltage is gradually decreased.

*7 : $V_{DF(T)}$: Specified detect voltage value

*8 : $V_{DF(E)}$: Actual detect voltage value. Refer to the E-0 chart for $V_{DF(T)}$ values less than 1.5V.

*9 : VD supply current = sink current during detection.

■ELECTRICAL CHARACTERISTICS (Continued)

●VR Dropout Voltage 1

XC6403/6404

SYMBOL	E-0		E-1		E-1	
PARAMETER / SPECIFIED DETECT VOLTAGE OUTPUT VOLTAGE	OUTPUT VOLTAGE DETECT VOLTAGE (V)		DROPOUT VOLTAGE 1 (mV) (I_{OUT}=30mA)		DROPOUT VOLTAGE 2 (mV) (I_{OUT}=100mA)	
			Ta=25℃		Ta=25℃	
$V_{ROUT(T)}$ $V_{DF(T)}$	V_{ROUT} / V_{DF}		Vdif1	Vdif1	Vdif2	Vdif2
	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.
0.90	0.870	0.930	1050	1100	1150	1200
1.00	0.970	1.030	1000	1100	1050	1200
1.10	1.070	1.130	900	1000	950	1100
1.20	1.170	1.230	800	900	850	1000
1.30	1.270	1.330	700	800	750	900
1.40	1.370	1.430	600	700	650	800
1.50	1.470	1.530	500	600	550	700
1.60	1.568	1.632	400	500	500	600
1.70	1.666	1.734	300	400	400	500
1.80	1.764	1.836	200	300	300	400
1.90	1.862	1.938	120	150	280	380
2.00	1.960	2.040	80	120	240	350
2.10	2.058	2.142	80	120	240	330
2.20	2.156	2.244	80	120	240	330
2.30	2.254	2.346	80	120	240	310
2.40	2.352	2.448	80	120	240	310
2.50	2.450	2.550	70	100	220	290
2.60	2.548	2.652	70	100	220	290
2.70	2.646	2.754	70	100	220	290
2.80	2.744	2.856	70	100	220	270
2.90	2.842	2.958	70	100	220	270
3.00	2.940	3.060	60	90	200	270
3.10	3.038	3.162	60	90	200	250
3.20	3.136	3.264	60	90	200	250
3.30	3.234	3.366	60	90	200	250
3.40	3.332	3.468	60	90	200	250
3.50	3.430	3.570	60	90	200	250
3.60	3.528	3.672	60	90	200	250
3.70	3.626	3.774	60	90	200	250
3.80	3.724	3.876	60	90	200	250
3.90	3.822	3.978	60	90	200	250
4.00	3.920	4.080	60	80	180	230
4.10	4.018	4.182	60	80	180	230
4.20	4.116	4.284	60	80	180	230
4.30	4.214	4.386	60	80	180	230
4.40	4.312	4.488	60	80	180	230
4.50	4.410	4.590	60	80	180	230

■ELECTRICAL CHARACTERISTICS (Continued)

●VR Dropout Voltage 2

XC6403

SYMBOL	E-0		E-1		E-1	
PARAMETER / SPECIFIED DETECT VOLTAGE OUTPUT VOLTAGE	OUTPUT VOLTAGE DETECT VOLTAGE (V)		DROPOUT VOLTAGE 1 (mV) (I_{OUT}=30mA)		DROPOUT VOLTAGE 2 (mV) (I_{OUT}=100mA)	
			Ta=25℃		Ta=25℃	
$V_{ROUT(T)}$ $V_{DF(T)}$	V_{ROUT} / V_{DF}		Vdif1	Vdif1	Vdif2	Vdif2
	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.
4.60	4.508	4.692	60	80	180	230
4.70	4.606	4.794	60	80	180	230
4.80	4.704	4.896	60	80	180	230
4.90	4.802	4.998	60	80	180	230
5.00	4.900	5.100	50	70	160	210
5.10	4.998	5.202	50	70	160	210
5.20	5.096	5.304	50	70	160	210
5.30	5.194	5.406	50	70	160	210
5.40	5.292	5.508	50	70	160	210
5.50	5.390	5.610	50	70	160	210
5.60	5.488	5.712	50	70	160	210

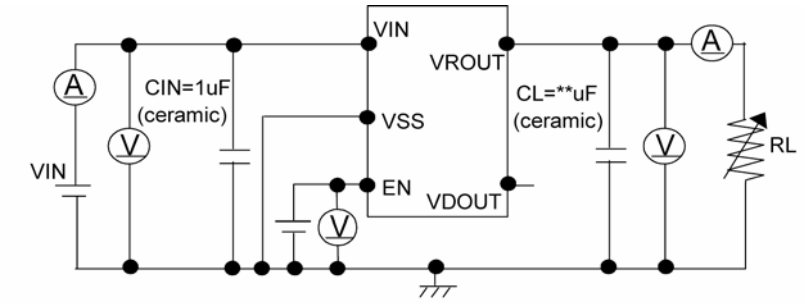
XC6404

SYMBOL	E-0		E-1		E-1	
PARAMETER / SPECIFIED DETECT VOLTAGE OUTPUT VOLTAGE	OUTPUT VOLTAGE DETECT VOLTAGE (V)		DROPOUT VOLTAGE 1 (mV) (I_{OUT}=30mA)		DROPOUT VOLTAGE 2 (mV) (I_{OUT}=100mA)	
			Ta=25℃		Ta=25℃	
$V_{ROUT(T)}$ $V_{DF(T)}$	V_{ROUT} / V_{DF}		Vdif1	Vdif1	Vdif2	Vdif2
	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.
4.60	4.508	4.692	60	80	180	230
4.70	4.606	4.794	60	80	180	230
4.80	4.704	4.896	60	80	180	230
4.90	4.802	4.998	60	80	180	230
5.00	4.900	5.100	50	70	160	210
5.10	4.998	5.202	50	70	160	210
5.20	5.096	5.304				
5.30	5.194	5.406				
5.40	5.292	5.508				
5.50	5.390	5.610				

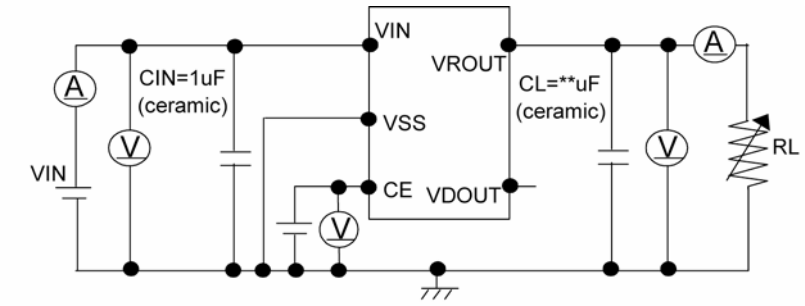
■TEST CIRCUITS

●Circuit ①

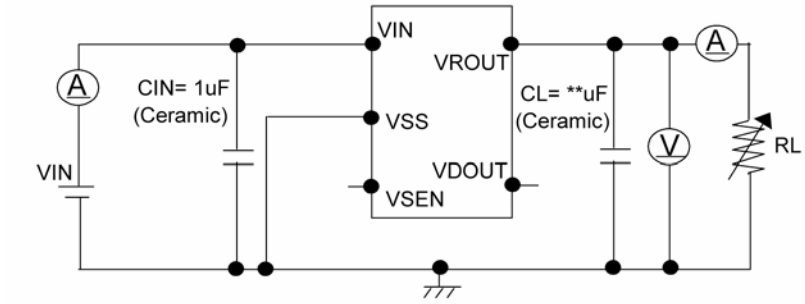
XC6403/04A ~ C Series



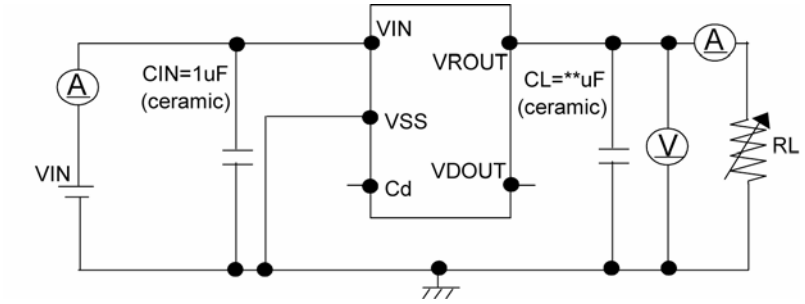
XC6403/04D Series



XC6403/04E Series



XC6403/04F Series



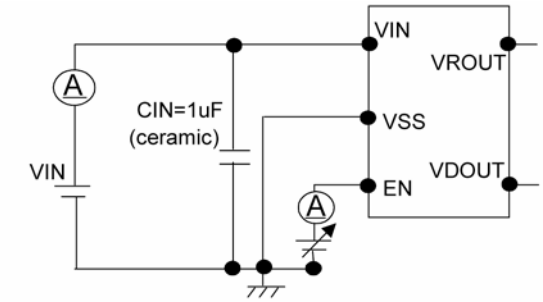
Output Capacitor Corresponding Chart

VROUT	0.9 ~1.2V	1.3 ~ 1.7V	1.8V ~
CL	More Than 4.7μF	More Than 2.2μF	More Than 1.0μF

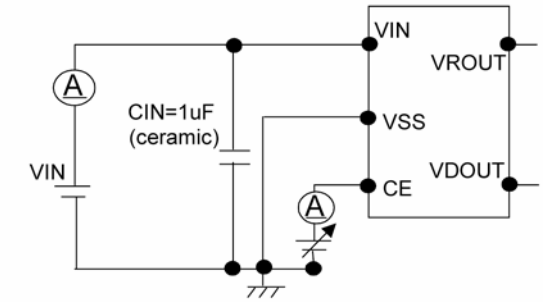
■TEST CIRCUITS (Continued)

●Circuit ②

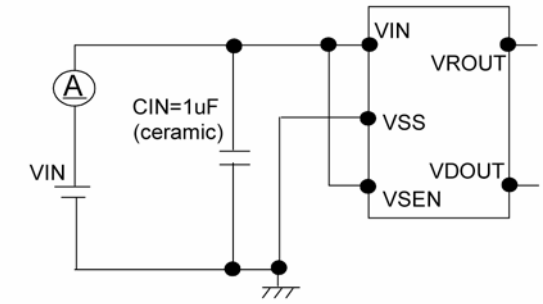
XC6403/04A ~ C Series



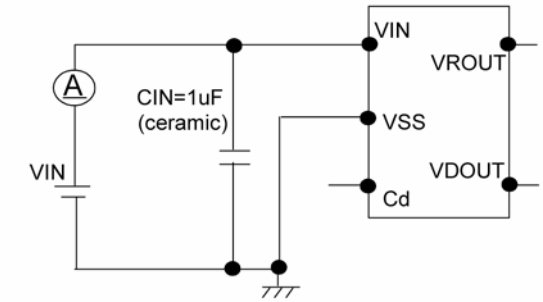
XC6403/04D Series



XC6403/04E Series



XC6403/04F Series



■TEST CIRCUITS (Continued)

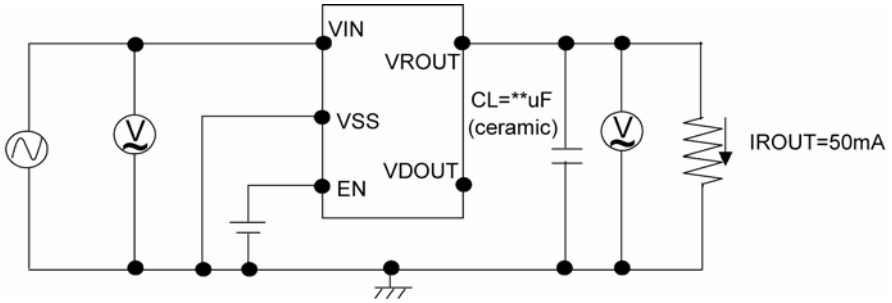
●Circuit ③

XC6403/04A ~ C Series

VROUT≦1.25V
VIN={2.25V}VDC
+0.5Vp-pAC

VIN={VROUT+1.0V}VDC
+0.5Vp-pAC

VROUT≧4.75V
VIN={5.75V}VDC
+0.5Vp-pAC

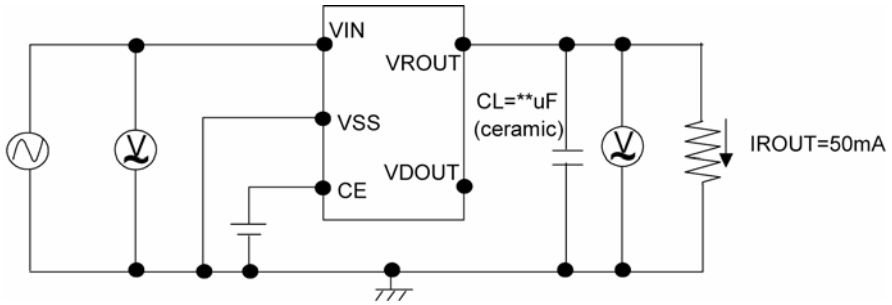


XC6403/04D Series

VROUT≦1.25V
VIN={2.25V}VDC
+0.5Vp-pAC

VIN={VROUT+1.0V}VDC
+0.5Vp-pAC

VROUT≧4.75V
VIN={5.75V}VDC
+0.5Vp-pAC

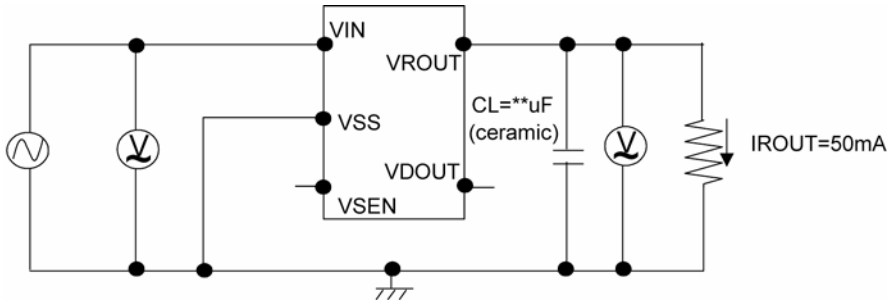


XC6403/04E Series

VROUT≦1.25V
VIN={2.25V}VDC
+0.5Vp-pAC

VIN={VROUT+1.0V}VDC
+0.5Vp-pAC

VROUT≧4.75V
VIN={5.75V}VDC
+0.5Vp-pAC

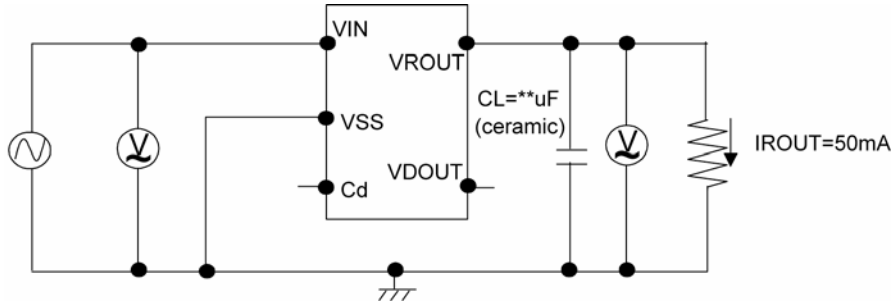


XC6403/04F Series

VROUT≦0.9V
VIN={2.0V}VDC
+0.5Vp-pAC

VIN={VROUT+1.0V}VDC
+0.5Vp-pAC

VROUT≧4.75V
VIN={5.75V}VDC
+0.5Vp-pAC



Output Capacitor Corresponding Chart

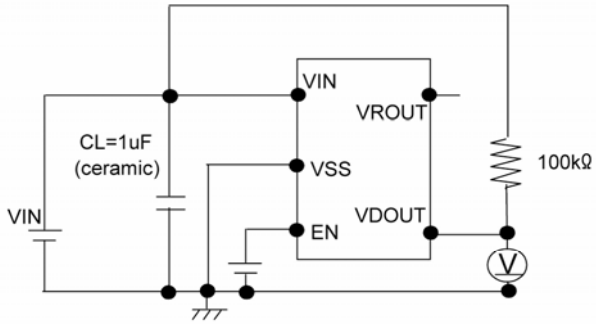
VROUT	0.9 ~1.2V	1.3 ~ 1.7V	1.8 ~
CL	More Than 4.7 μF	More Than 2.2 μF	More Than 1.0 μF

■TEST CIRCUITS (Continued)

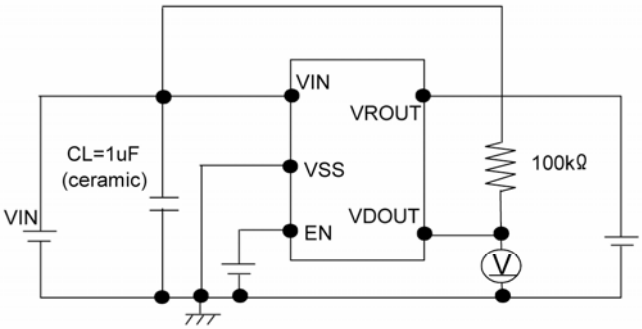
●Circuit ④

XC6403/04A ~ C Series

[VD Sense, VIN Type]

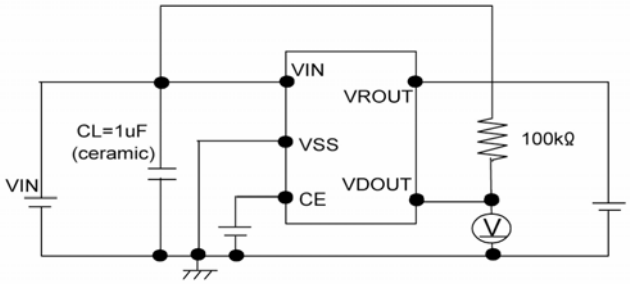


[VD Sense, VROUT Type]

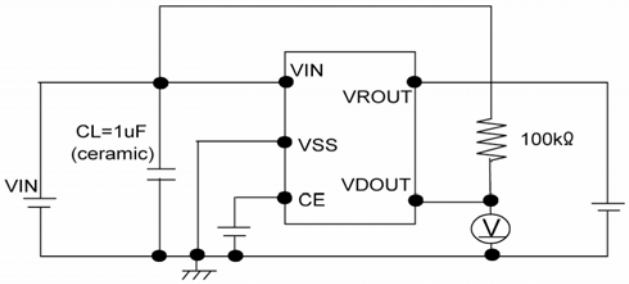


XC6403/04D Series

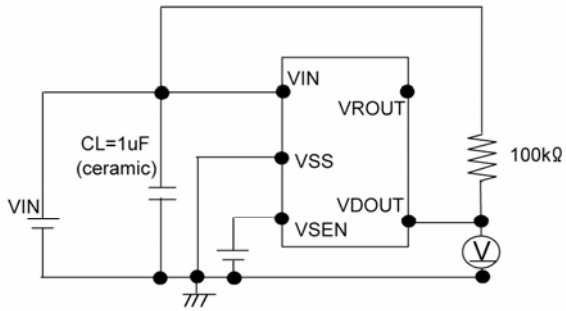
[VD Sense, VIN Type]



[VD Sense, VROUT Type]

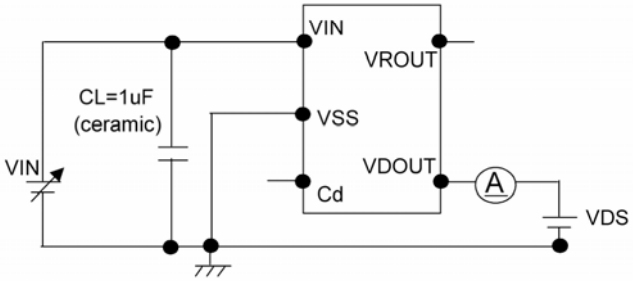


XC6403/04E Series

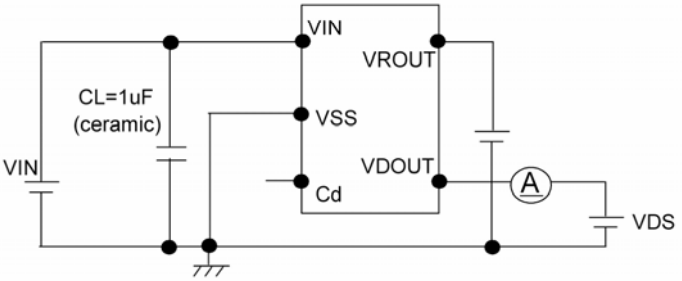


XC6403/04F Series

[VD Sense, VIN Type]



[VD Sense, VROUT Type]

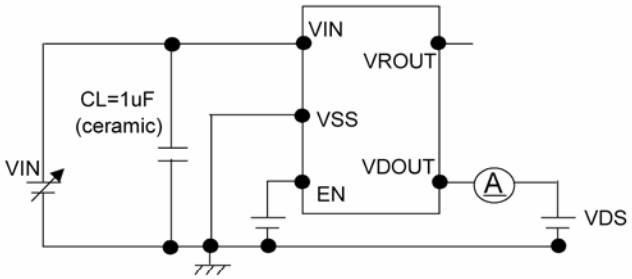


■TEST CIRCUITS (Continued)

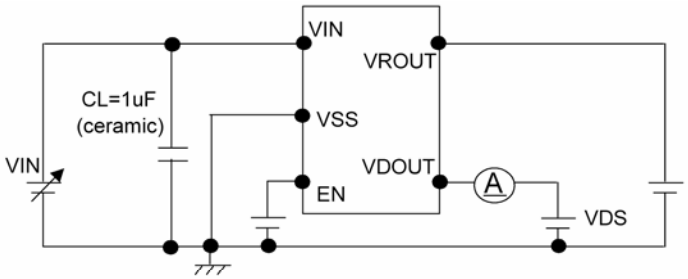
●Circuit ⑤

XC6403/04A ~ C Series

[VD Sense, VIN Type]

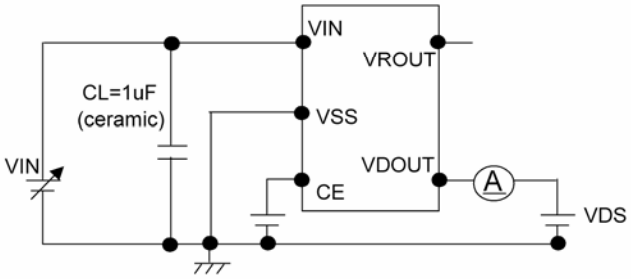


[VD Sense, VROUT Type]

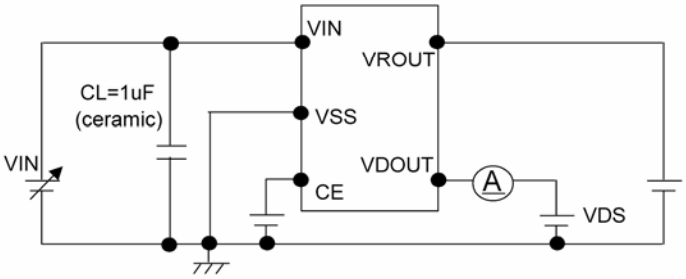


XC6403/04D Series

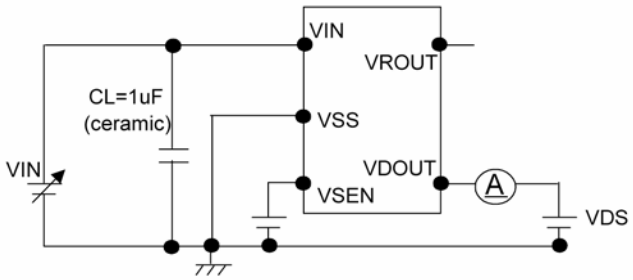
[VD Sense, VIN Type]



[VD Sense, VROUT Type]

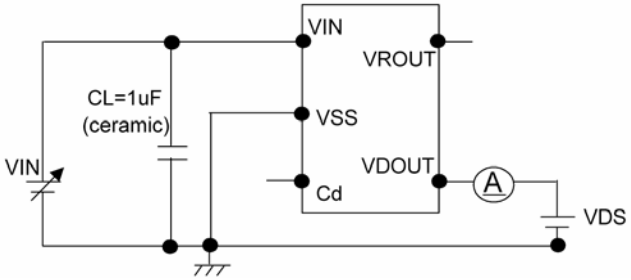


XC6403/04E Series

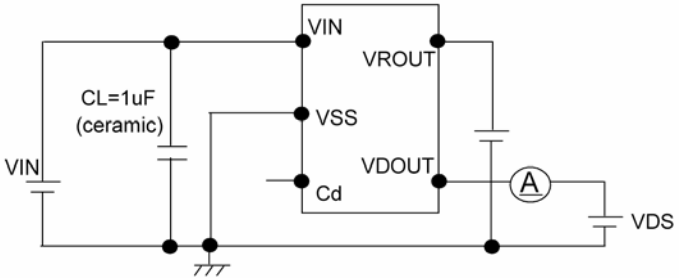


XC6403/04F Series

[VD Sense, VIN Type]



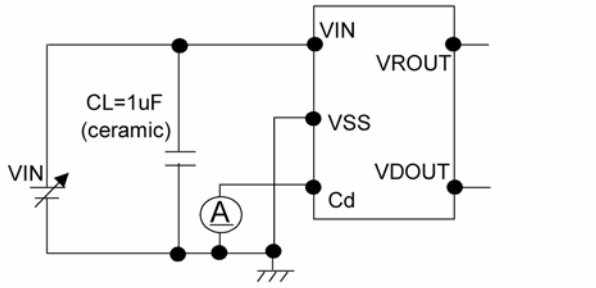
[VD Sense, VROUT Type]



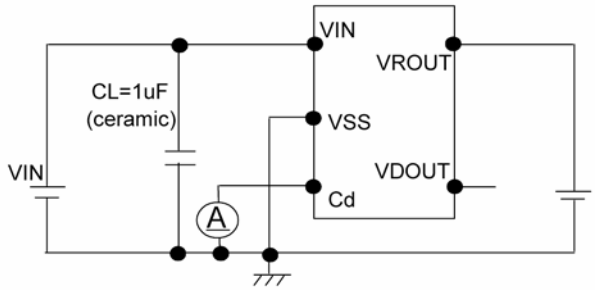
■TEST CIRCUITS (Continued)

●Circuit ⑥

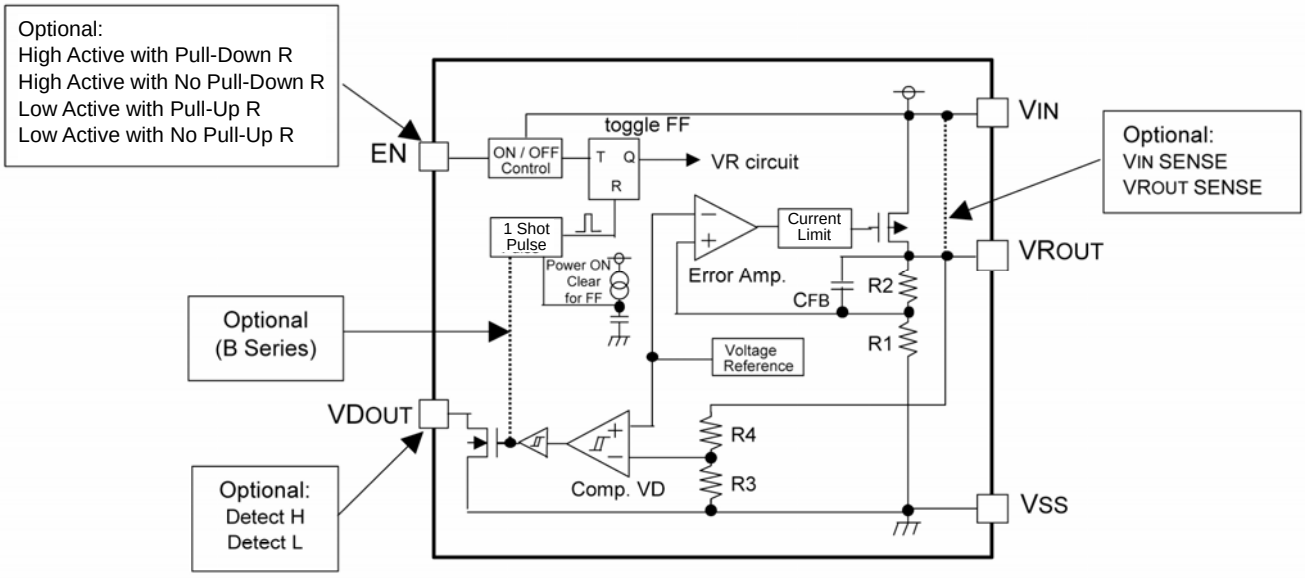
XC6403/04F Series
[VD Sense, VIN Type]



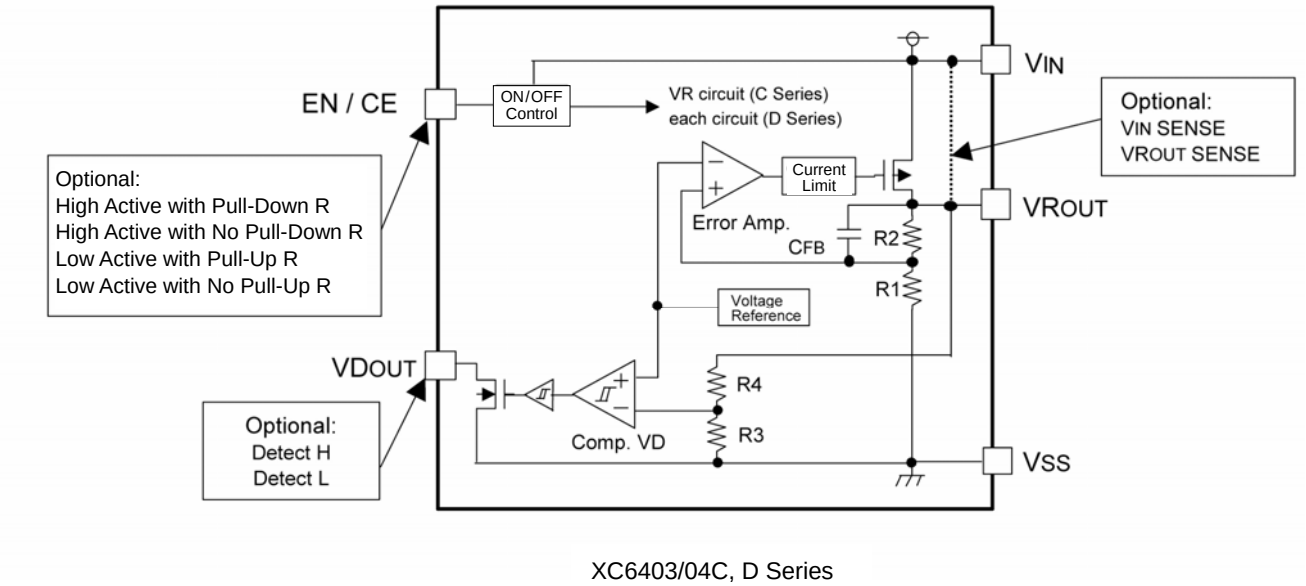
[VD Sense, VROUT Type]



■BLOCK DIAGRAMS

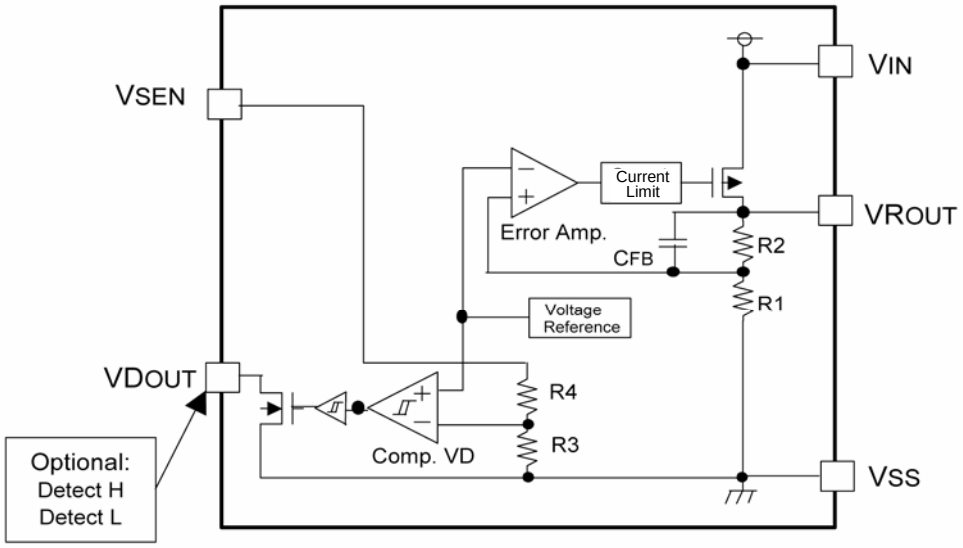


XC6403/04A, B Series

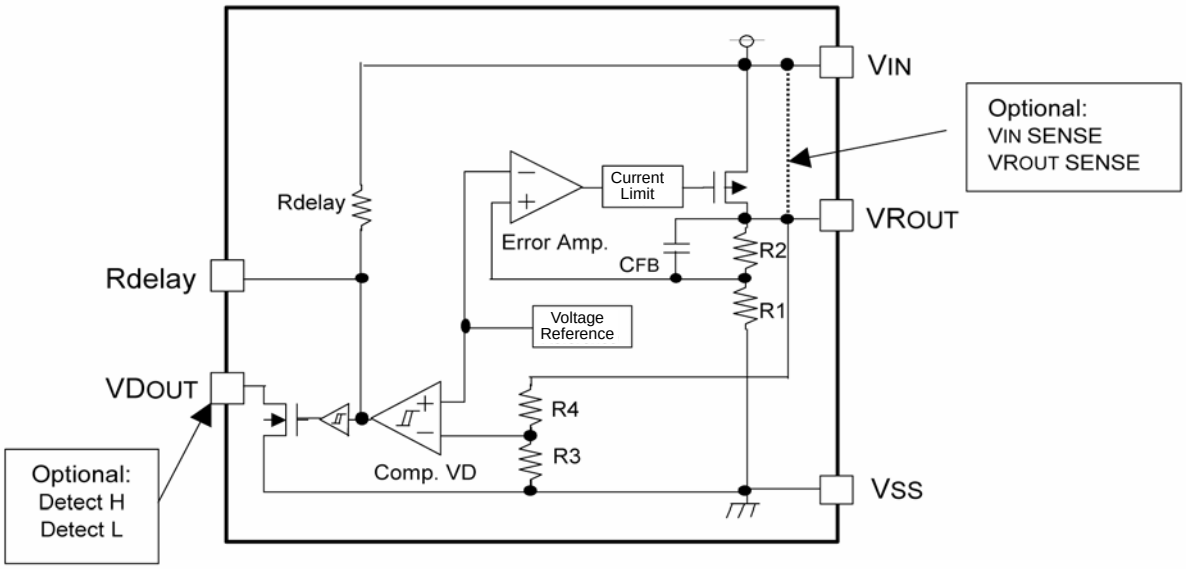


XC6403/04C, D Series

■BLOCK DIAGRAMS (Continued)



XC6403/04E Series



XC6403/04F Series

■OPERATIONAL EXPLANATION

<Output Voltage Regulator Control>

The voltage, divided by resistors R1 & R2 which are connected to the VROUT pin is compared with the internal reference voltage by the error amplifier. The P-channel MOSFET, which is connected to the VROUT pin, is then driven by the subsequent output signal. The output voltage at the VROUT pin is controlled & stabilized by negative feedback. The current limit circuit and short circuit protection operate in relation to the level of output current. Further, the voltage regulator's internal circuitry can be shutdown via the EN or CE pin's signal.

<Detector Function with the XC6403/04 Series>

The series' detector function monitors the voltage divided by resistors R3 & R4 which are connected to the VROUT pin or the VIN pin or the VSEN pin, as well as monitoring the voltage of the internal reference voltage source via the comparator. The VDSEN pin has options (please refer to the Selection Guide, item 4). A 'High' or 'Low' signal level can be output from the VDOUT pin when the VD pin voltage level goes below the detect voltage. The VD output logic has options (please refer to the Selection Guide, item 5). As VDOUT is an open-drain N-channel output, a pull-up resistor of about 220kΩ is needed to achieve a voltage output. Because of hysteresis at the detector function, output at the VDOUT pin will invert when the detect voltage level increases above the release voltage (105% of the detect voltage). Even when the XC6403/04A, B, C, series are in stand-by mode, the voltage detector function operates and the output voltage at VDOUT will output according to the voltage level at VDSENSE voltage.

For the XC6403/04A, B, C types, in stand-by, if a voltage of the recovery voltage is present at the VROUT pin (from another power source), the VDOUT pin will be high impedance mode, and the pull up voltage will be output at VDOUT. By connecting the Cdelay pin to a capacitor (Cd), the XC6403/04F series can apply a delay time to VDOUT voltage when releasing voltage. The delay time can be calculated from the internal resistance, Rdelay (2MΩ fixed) and the value of Cd as per the following equation.

Delay Time = Cdelay x Rdelay x 0.7

Delay Time Rdelay standard : 1.0 ~ 3.5MΩ TYP : 2.0MΩ

Cdelay	DELAY TIME (TYP.)	DELAY TIME (TYP.)
0.01μF	14 msec	7.0 ~ 24.5 msec
0.022μF	30.8 msec	15.4 ~ 53.9 msec
0.047μF	65.8 msec	32.9 ~ 115.15 msec
0.1μF	140 msec	70.0 ~ 245.0 msec
0.22μmF	308 msec	154.0 ~ 539.0 msec
0.47μF	658 msec	329.0 ~ 1151.5 msec
1μF	1400 msec	700.0 ~ 2450.0 msec

<Low ESR Capacitors>

With the XC6403/04 series regulator, a stable output voltage is achievable even if low ESR capacitors are used, as a phase compensation circuit is built-in to the regulator. In order to ensure the effectiveness of the phase compensation, we suggest that an output capacitor (CL) be connected as close as possible, between the output pin (VROUT) and the VSS pin. Please use an output capacitor (CL) with a capacitance, based on the chart below. We also suggest an input capacitor (CIN) of 1 μF : this should be connected between VIN and VSS in order to stabilize input power source.

Output Capacitor

VROUT	0.9 ~1.2V	1.3 ~ 1.7V	1.8 ~
CL	More Than 4.7μF	More Than 2.2μF	More Than 1.0μF

<Current Limiter, Short-Circuit Protection>

The XC6403/04 series regulator offers a combination of current limit and circuit protection by means of a built-in fixed current limiter circuit and a foldback circuit. When the load current reaches the current limit level, the fixed current limiter circuit operates and output voltage drops. As a result of this drop in output voltage, the foldback circuit operates, the output voltage drops further and output current decreases. When the output pin is shorted, a current of about 50mA flows.

■OPERATIONAL EXPLANATION (Continued)

<EN / CE Pin>

The IC's internal regulator circuitry can be shut down via the signal from the EN pin with the XC6403/04A, B, C series. In shutdown mode, output at the V_{ROUT} pin will be pulled down to the V_{SS} level via R1 & R2. The whole IC's circuitry can be shut down via CE pin with the XC6403/04D series and power consumption can be reduced to around 0μA (TYP.). While the voltage detector is in shutdown mode, the voltage detector output is in a post-detection state. When choosing Detect L, input current can be set by using the following formula.

Input Current = V_{IN} voltage / Pull-Up Resistance

In stand-by mode, the above input current can be reduced by connecting a pull-up resistor between V_{ROUT} and V_{DOUT}.

Note that as the XC6403/04*E to K types of the XC6404A to D series are ' High Active / No Pull-Down' and XC6403/04*R to U types of the XC6404A to D series are ' Low Active / No Pull-Up', operations will become unstable with the CE pin open (See the chart below).

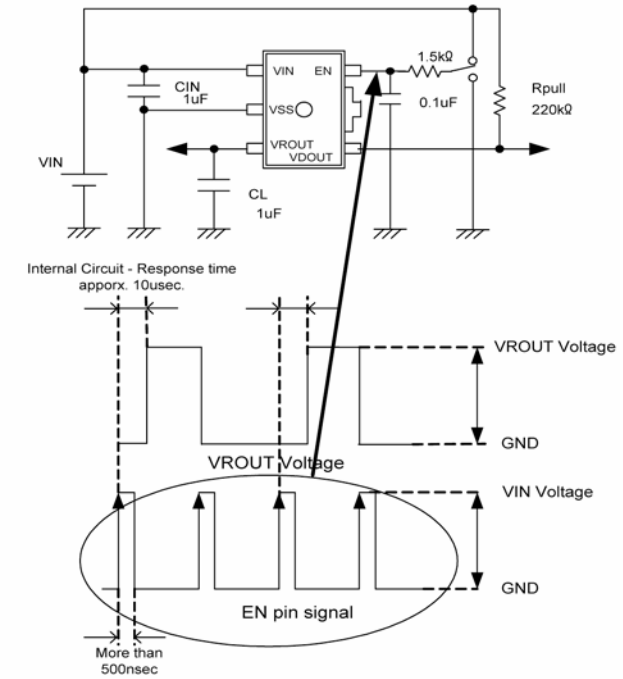
SERIES	EN/CE INPUT LOGIC
XC6403/04 * A ~ D	High Active with Pull-Down
XC6403/04 * E ~ K	High Active with No Pull-Down
XC6403/04 * L ~ P	Low Active with Pull-Up
XC6403/04 * R ~ U	Low Active with No Pull-Up

(* A ~ D Series)

We suggest that you use this IC with either a V_{IN} voltage or a V_{SS} voltage input at the EN or CE pin. If this IC is used with the correct specifications for the EN or CE pin, the IC will operate normally. However, supply current may increase as a result of through current in the IC's internal circuitry if a voltage other than V_{IN} or V_{SS} is applied.

<Toggle Operation>

The XC6403/04 A and B series have a built-in toggle ON/OFF switch which repeats an on/off operation via the EN pin's leading edge signal when the EN logic is Active HIGH, and via the EN pin's falling edge signal when the EN logic is Active LOW (Please also refer the figure below). The EN input signal duration should be over 500nsec. If the EN input signal is less than 500nsec, it is possible that the circuit fails to respond and the toggle function does not operate. To operate the toggle function properly when the EN pin voltage noise is large, a RC filter should be used to reduce the noise in the signal to the EN pin. In the case where input delay time is required, it is possible to set the time constant by connecting an RC network to the EN pin.

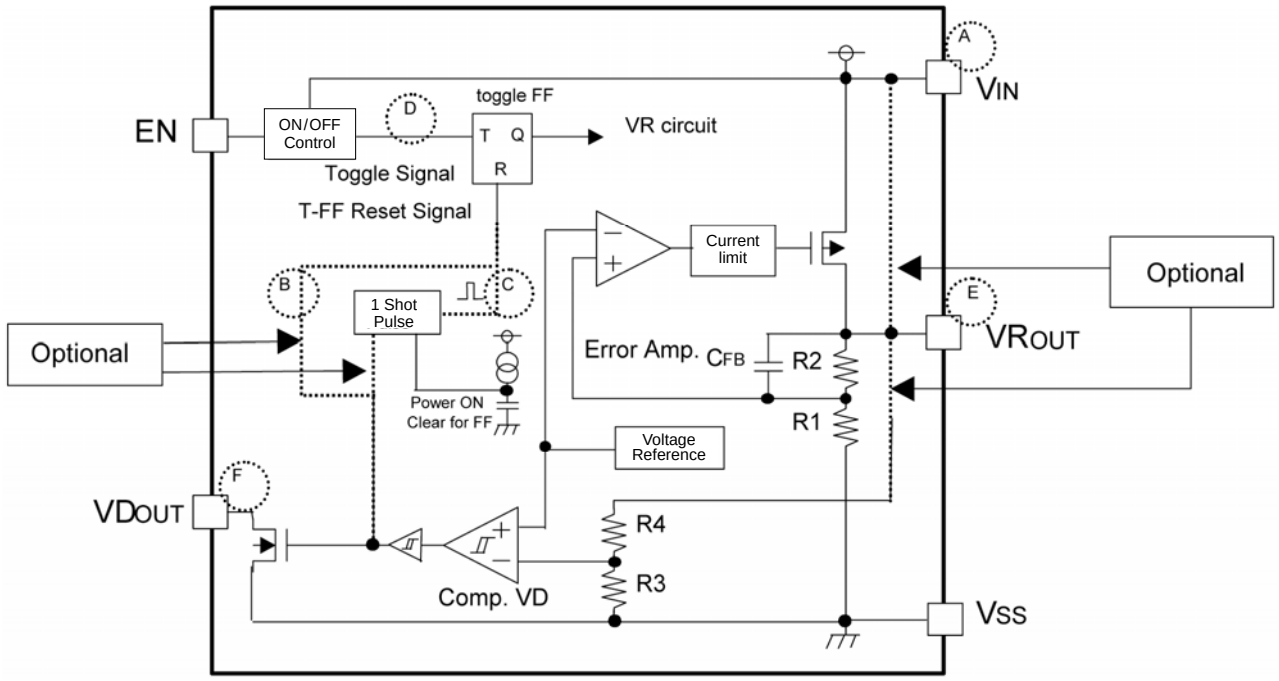


EN Logic Active "HIGH"

■OPERATIONAL EXPLANATION (Continued)

<Toggle Operation> (Continued)
For the XC6403/04B series, there are two types of toggle selection; one is a T-type flip-flop (T-FF) used for toggle operation which can be reset internally by a signal directly from the voltage detector (VIN Sense type only. See also the Selection Guide). The other type is where the reset is applied internally through a one shot pulse circuit (VIN, VROUT type only. See also the Selection Guide). The type, which applies the reset directly via the signal from the voltage detector function, applies the voltage detector comparator's output signal (reset signal) to the reset of T-FF reset, and turns the VR output OFF when the input voltage decreases below the detect voltage due to battery consumption, etc.. In order to return the VR output, apply a voltage larger than the release voltage to VIN and input a toggle signal to the T-FF. In the case where input voltage is below the release voltage, the VR output does not return even though the toggle signal is input into the T-FF.

The type which applies the reset signal to the T-FF internally via a one-shot pulse circuit changes the voltage detector comparator output signal to a one-shot signal internally. Like the type which applies the reset directly via the signal from voltage detector function, this type also applies the reset to the T-FF and sets the VR output to OFF when the input voltage (VIN Sense type) and output voltage (VROUT Sense type) drop below the detect voltage level. This type can return the VR output by inputting a toggle signal, even when the Sense pin voltage (VIN or VROUT pin voltage) is below the release voltage. Please refer to the block diagram below and the timing chart on the following page. Please choose the option suitable to the application.

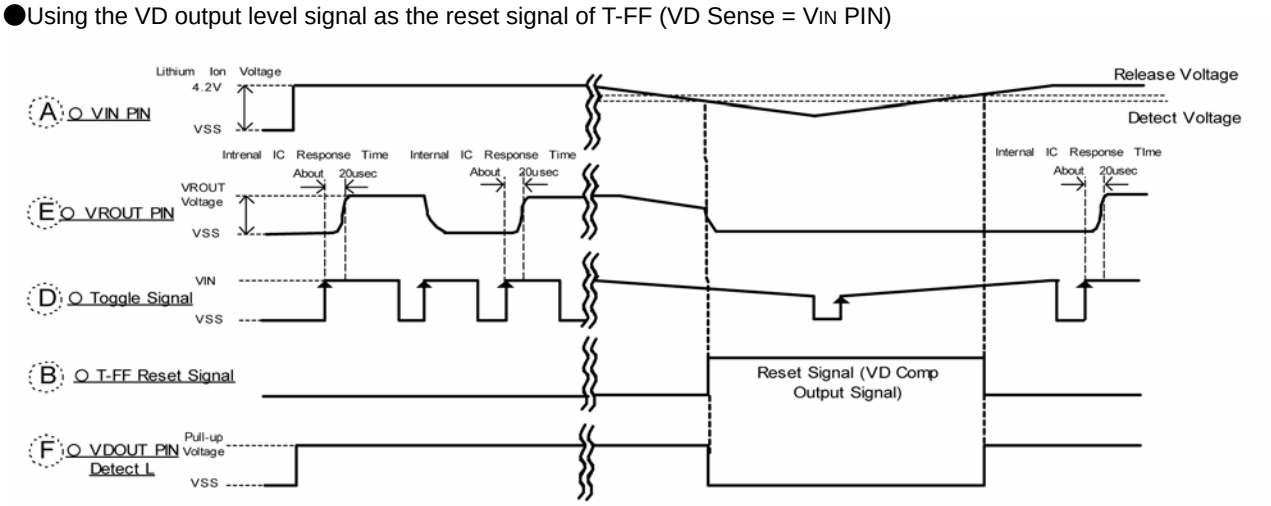


Block Diagram for XC6403/04B series Timing Chart

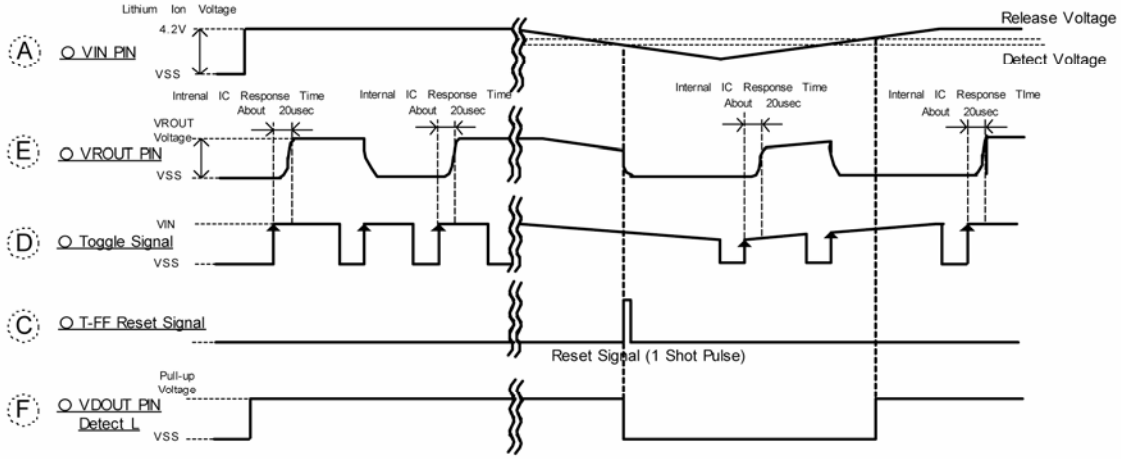
■TIMING CHART

XC6403/04B Series

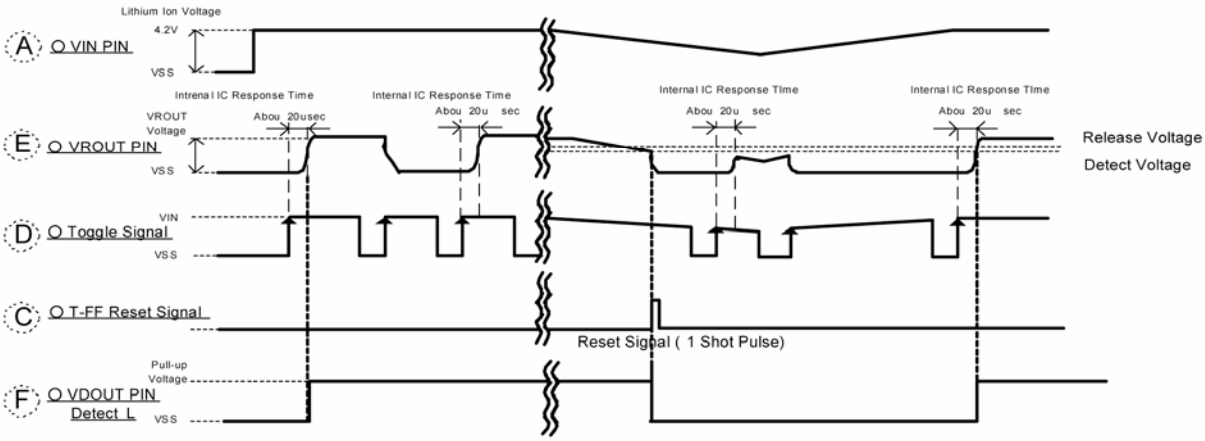
●Using the VD output level signal as the reset signal of T-FF (VD Sense = VIN PIN)



●Changing the VD output level signal into a one shot pulse to use T-FF as the reset signal (VD Sense = VIN PIN)



●Changing the VD output level signal into a one shot pulse to use T-FF as the reset signal (VD Sense = VROUT PIN)



The circled letters correspond to those shown on the block diagrams.

■NOTES ON USE

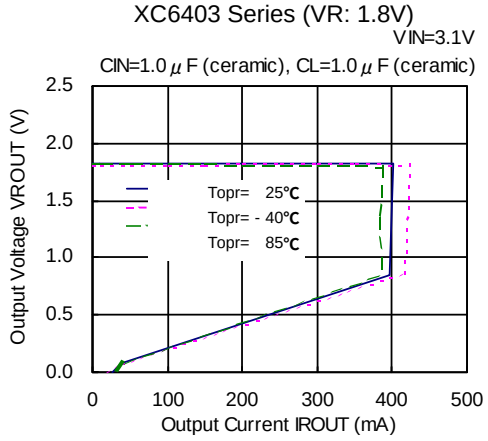
1. Please use this IC within the stated absolute maximum ratings. The IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending on output current. Please strengthen V_{IN} and V_{SS} wiring in particular.
3. Please wire the input capacitor (C_{IN}) and the output capacitor (C_L) as close to the IC as possible.
   Should rapid input fluctuation or load fluctuation occur, please increase the capacitor value such as C_{IN} or C_L to stabilize the operation.

■TYPICAL PERFORMANCE CHARACTERISTICS

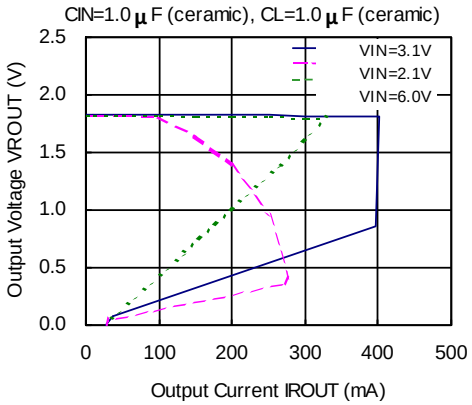
●XC6403 Series

(1) VR Output Voltage vs. VR Output Current

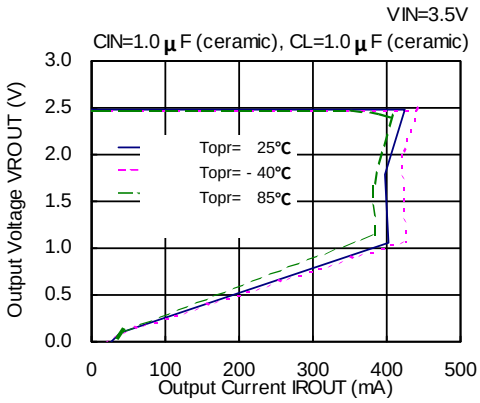
XC6403 Series (VR: 1.8V)



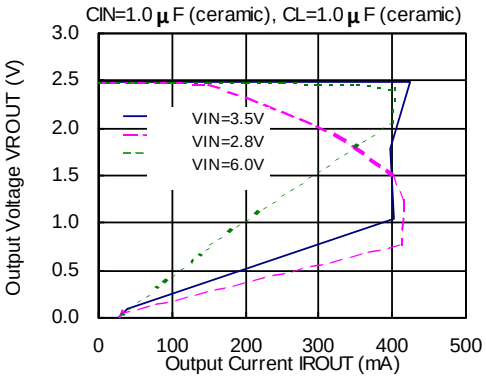
XC6403 Series (VR: 1.8V)



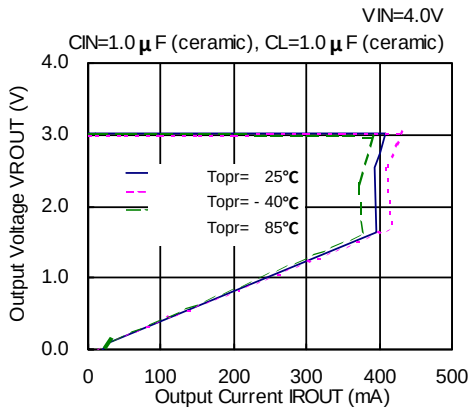
XC6403 Series (VR: 2.5V)



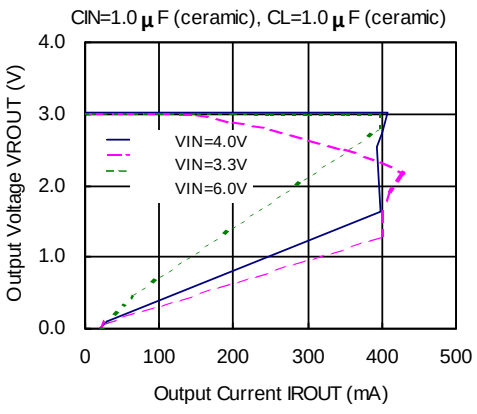
XC6403 Series (VR: 2.5V)



XC6403 Series (VR: 3.0V)



XC6403 Series (VR: 3.0V)

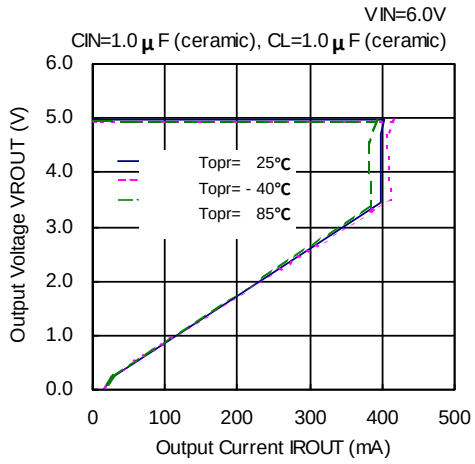


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

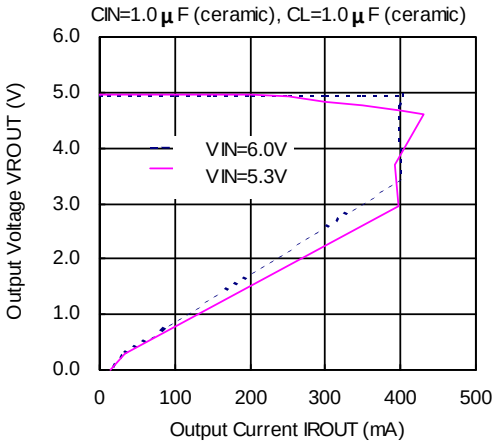
●XC6403 Series (Continued)

(1) VR Output Voltage vs. VR Output Current (Continued)

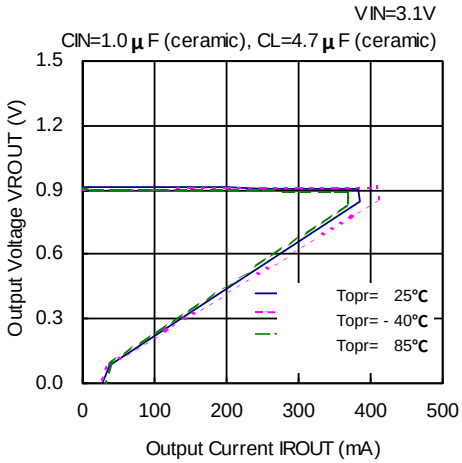
XC6403 Series (VR: 5.0V)



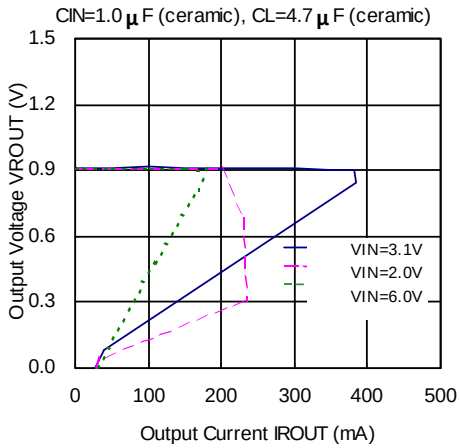
XC6403 Series (VR: 5.0V)



XC6403 Series (VR: 0.9V)



XC6403 Series (VR: 0.9V)

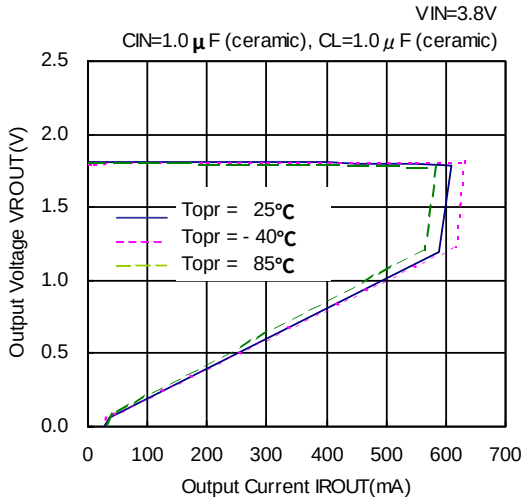


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

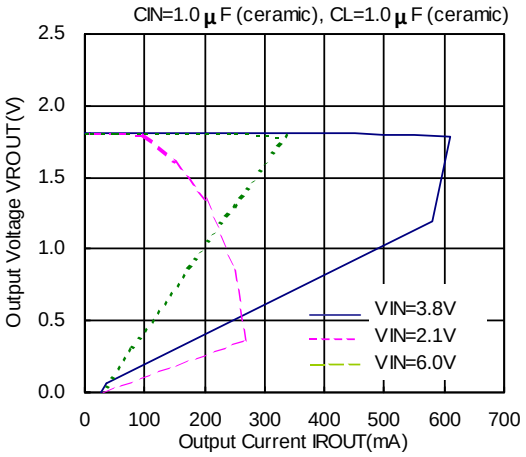
●XC6404 Series

(1) VR Output Voltage vs. VR Output Current

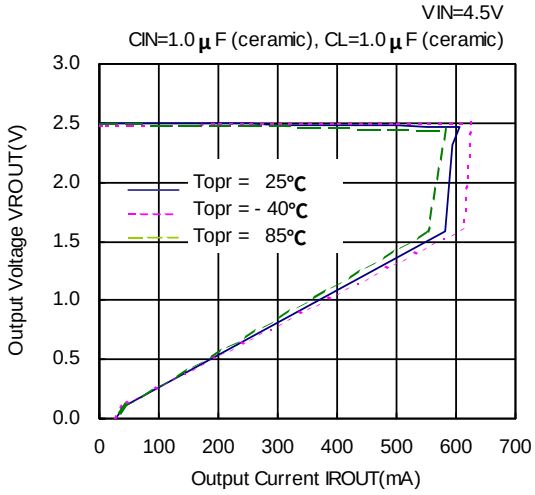
XC6404 Series (VR: 1.8V)



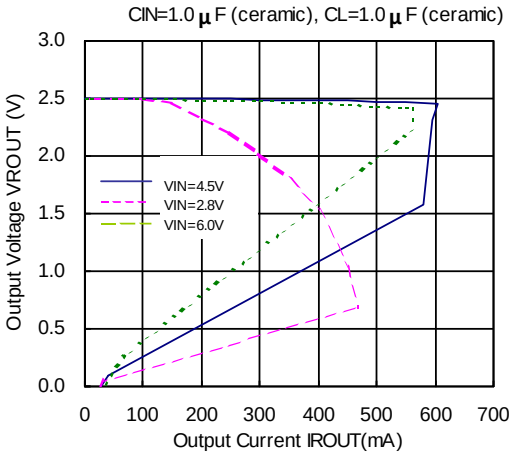
XC6404 Series (VR: 1.8V)



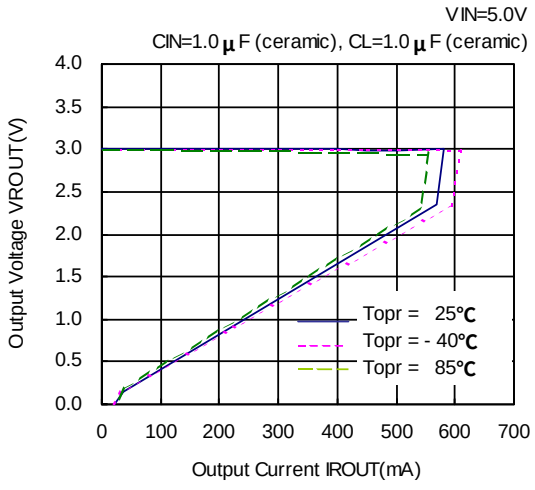
XC6404 Series (VR: 2.5V)



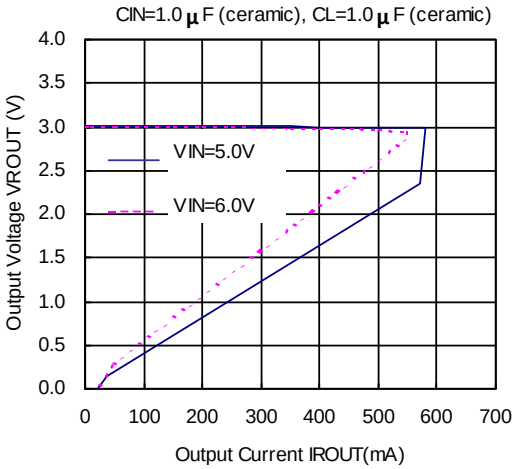
XC6404 Series (VR: 2.5V)



XC6404 Series (VR: 3.0V)



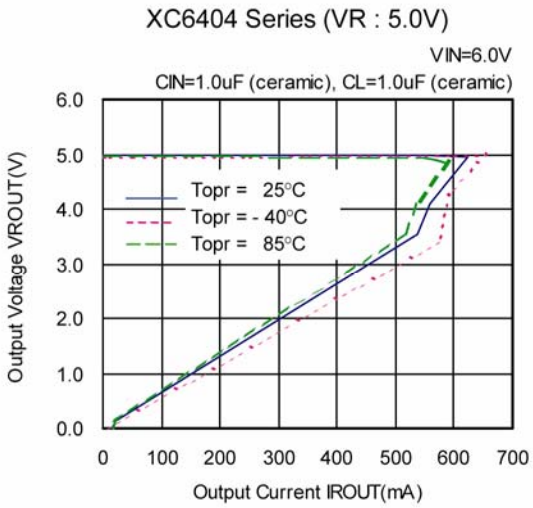
XC6404 Series (VR: 3.0V)

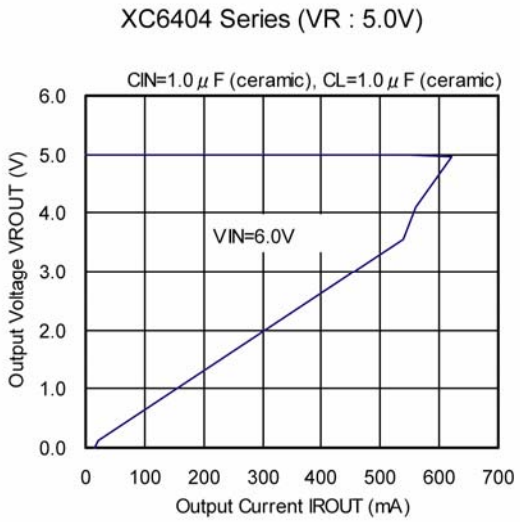


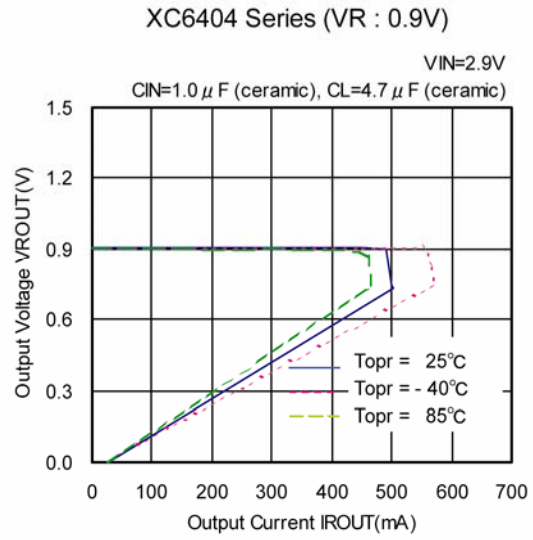
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

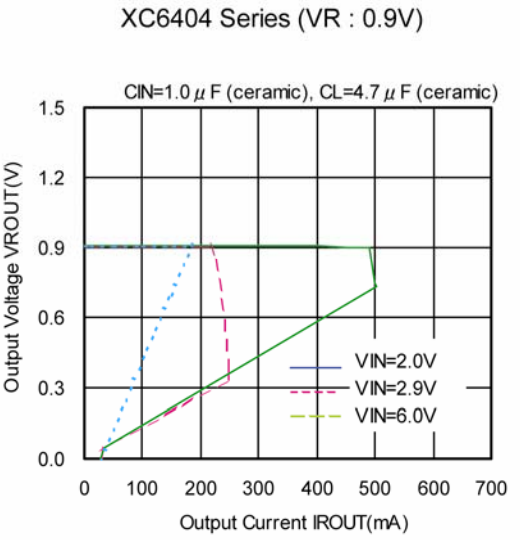
●XC6404 Series (Continued)

(1) VR Output Voltage vs. VR Output Current (Continued)







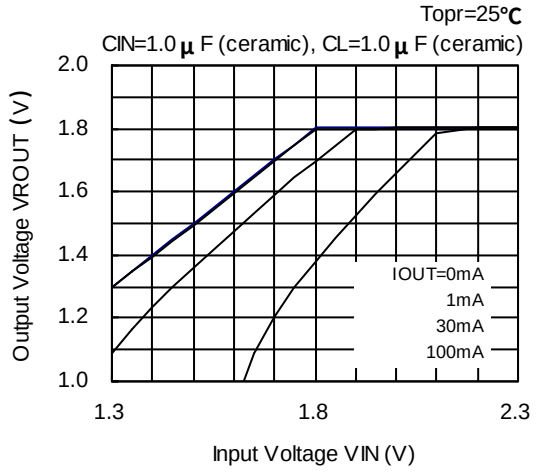


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

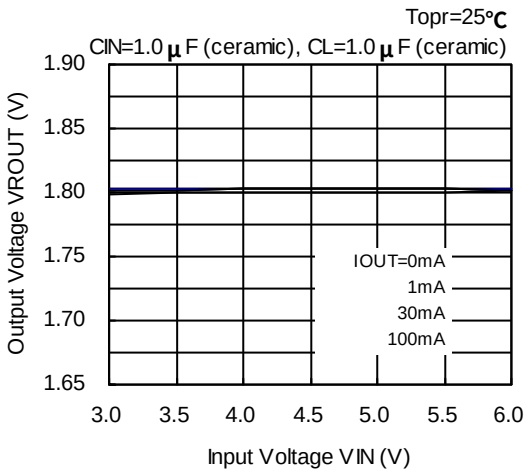
●XC6403/04 Series

(2) VR Output Voltage vs. Input Voltage

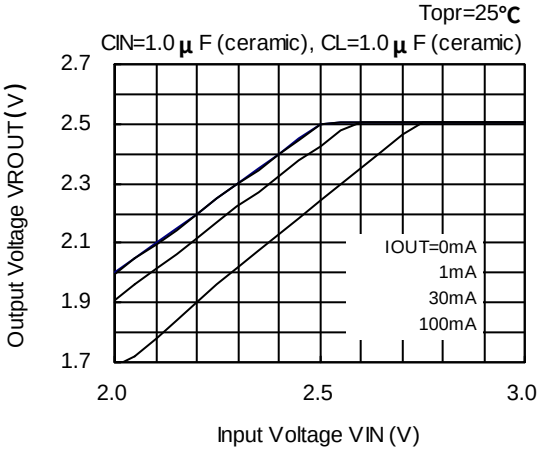
XC6403/04 Series (VR: 1.8V)



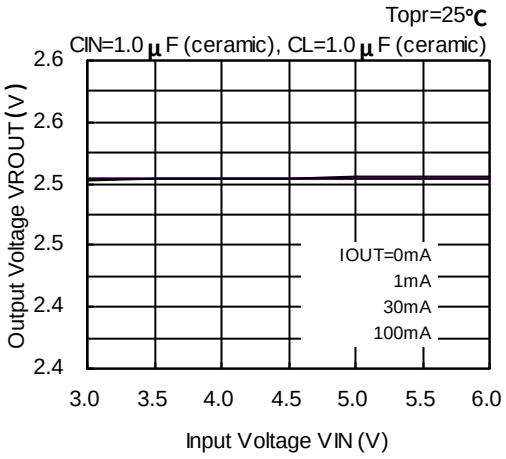
XC6403/04 Series (VR: 1.8V)



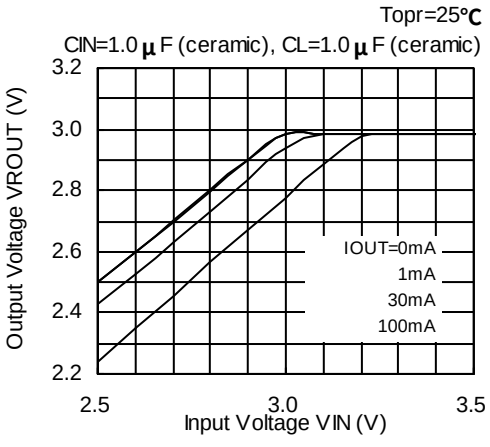
XC6403/04 Series (VR: 2.5V)



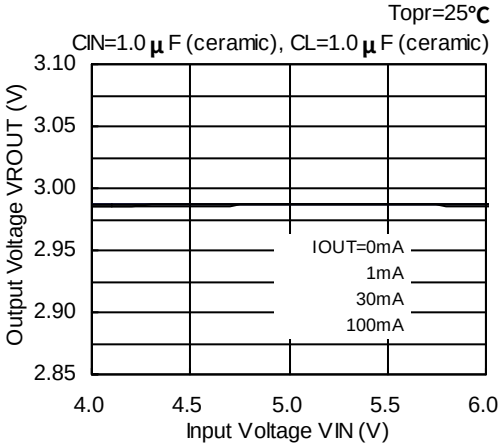
XC6403/04 Series (VR: 2.5V)



XC6403/04 Series (VR: 3.0V)



XC6403/04 Series (VR: 3.0V)

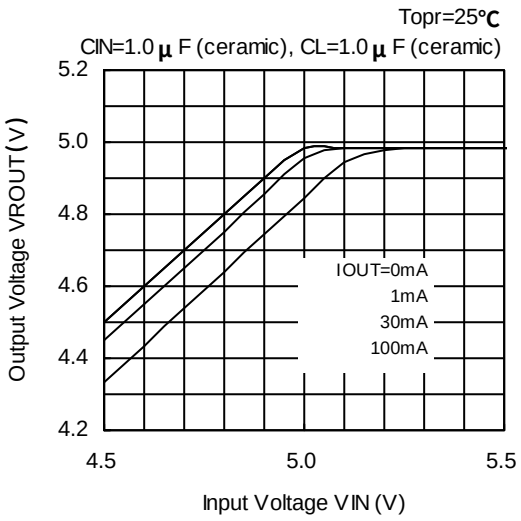


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

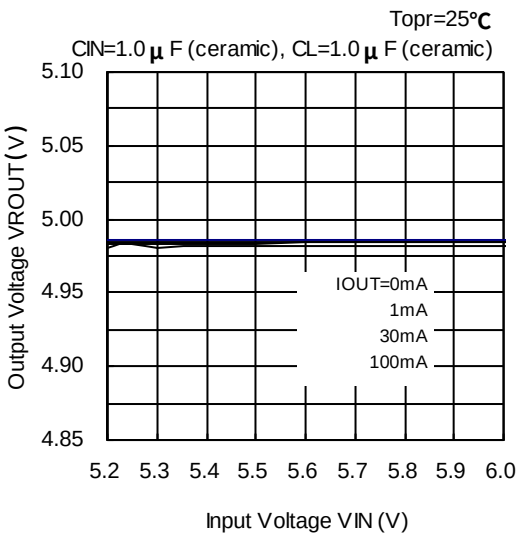
●XC6403/04 Series (Continued)

(2) VR Output Voltage vs. Input Voltage (Continued)

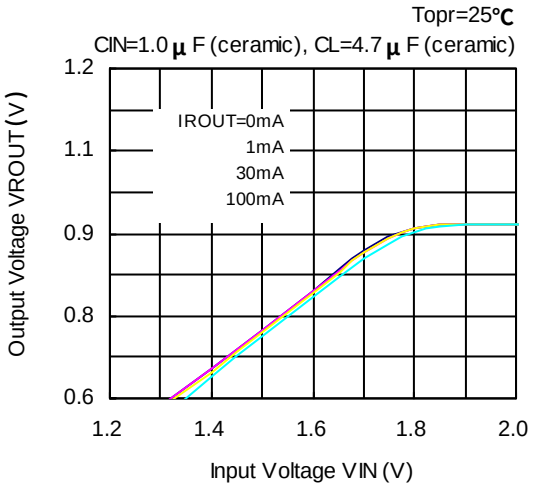
XC6403/04 Series (VR: 5.0V)



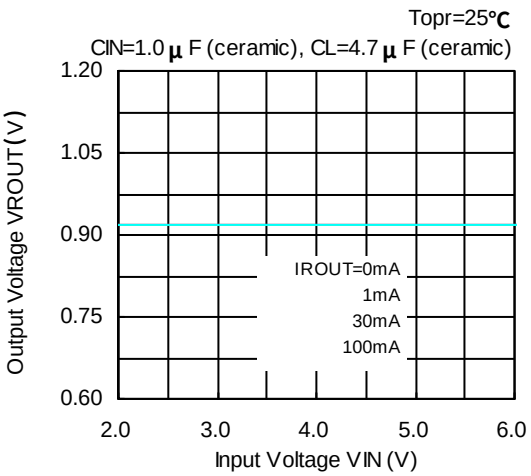
XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 0.9V)



XC6403/04 Series (VR: 0.9V)

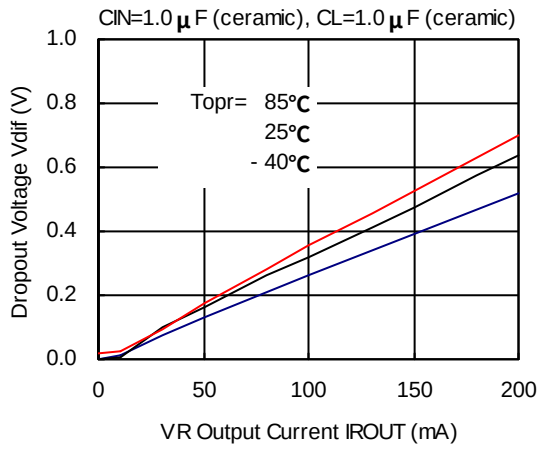


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

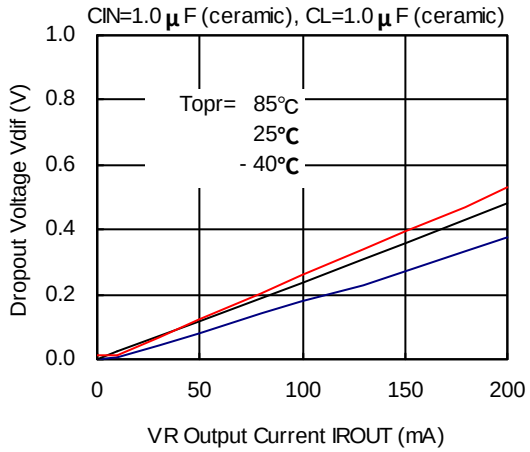
●XC6403/04 Series (Continued)

(3) Dropout Voltage vs. VR Output Current

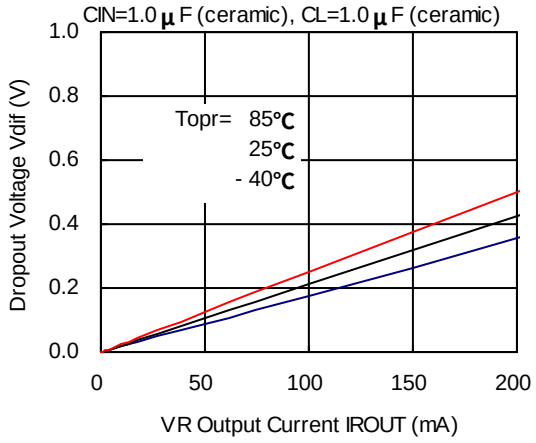
XC6403/04 Series (VR: 1.8V)



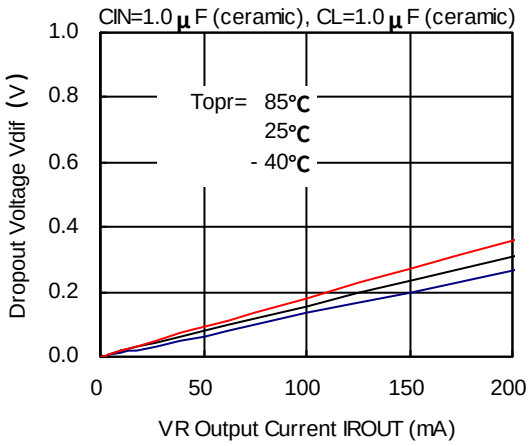
XC6403/04 Series (VR: 2.5V)



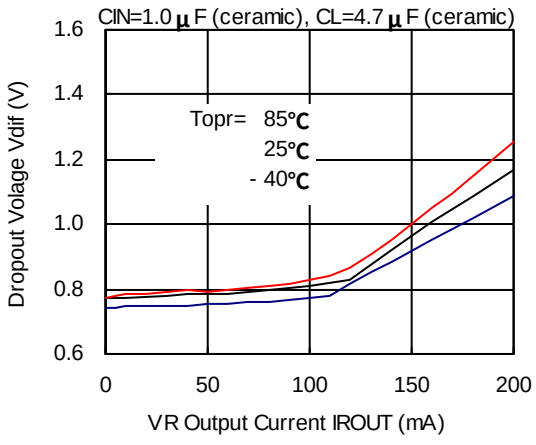
XC6403/04 Series (VR: 3.0V)



XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 0.9V)

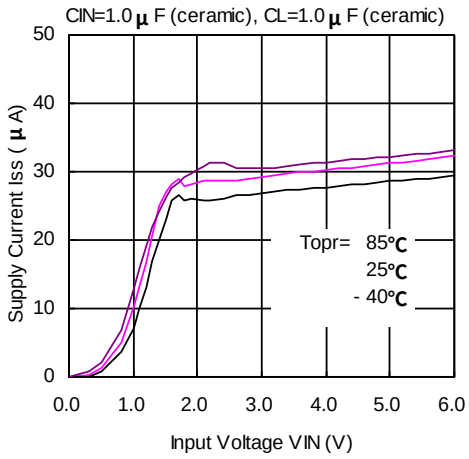


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

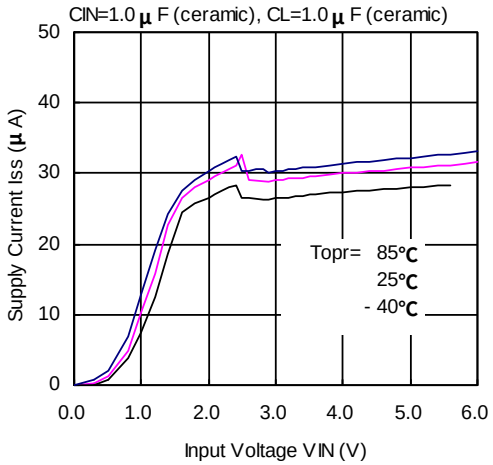
●XC6403/04 Series (Continued)

(4) Supply Current vs. Input Voltage

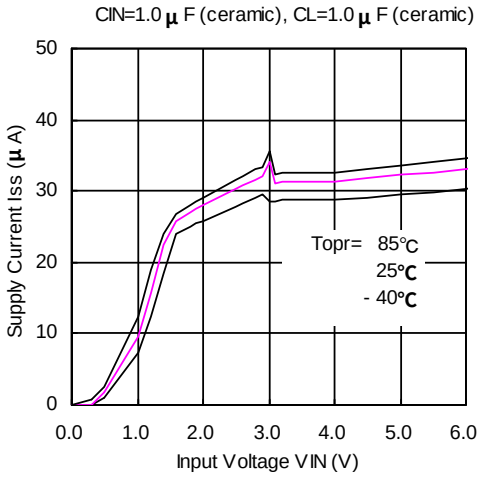
XC6403/04 Series (VR: 1.8V)



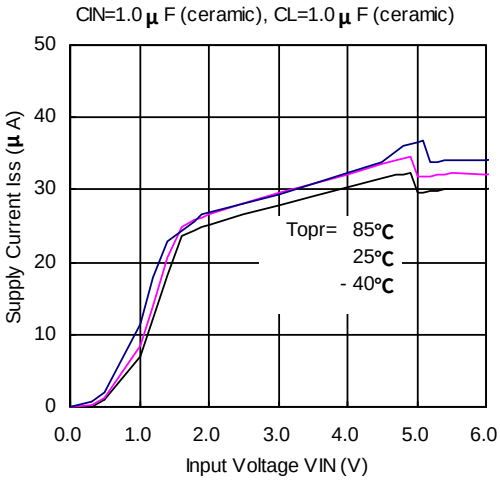
XC6403/04 Series (VR: 2.5V)



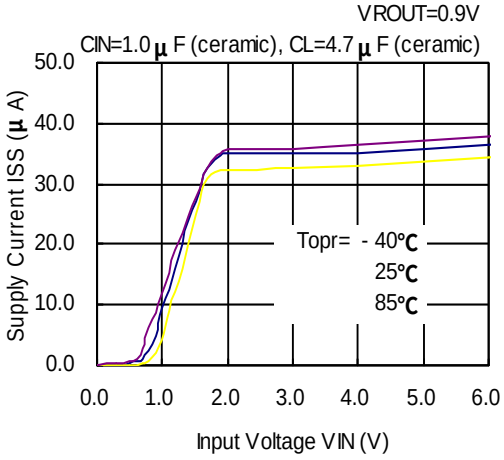
XC6403/04 Series (VR: 3.0V)



XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 0.9V)

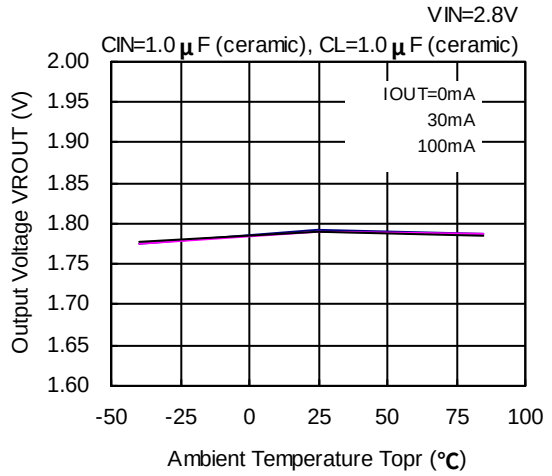


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

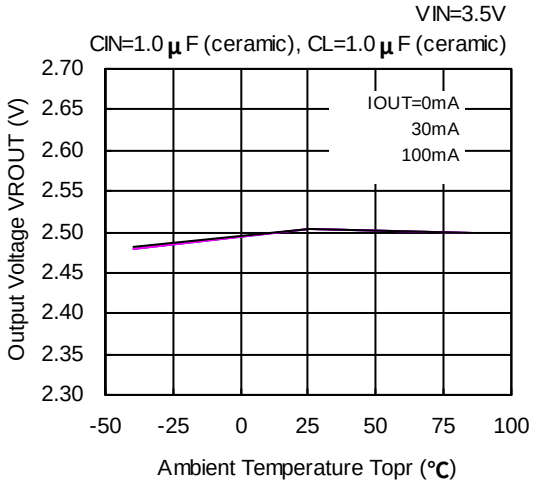
●XC6403/04 Series (Continued)

(5) VR Output Voltage vs. Ambient Temperature

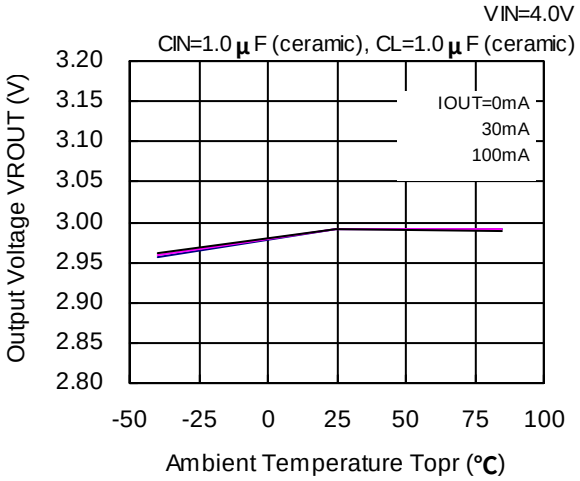
XC6403/04 Series (VR: 1.8V)



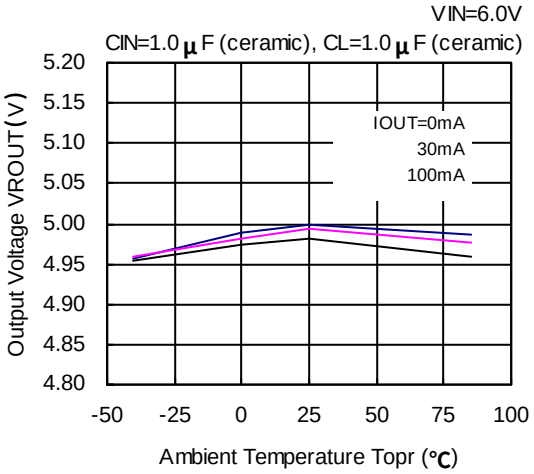
XC6403/04 Series (VR: 2.5V)



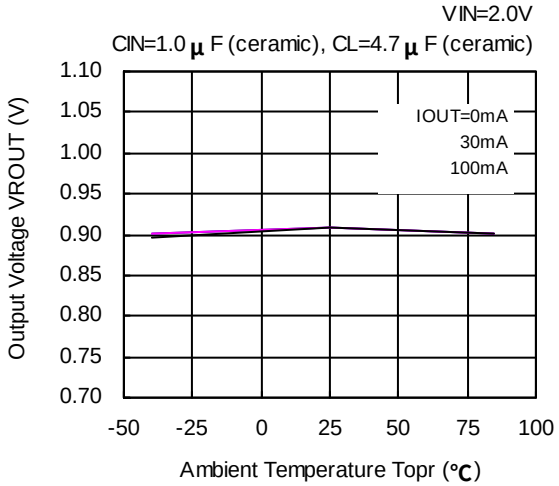
XC6403/04 Series (VR: 3.0V)



XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 0.9V)

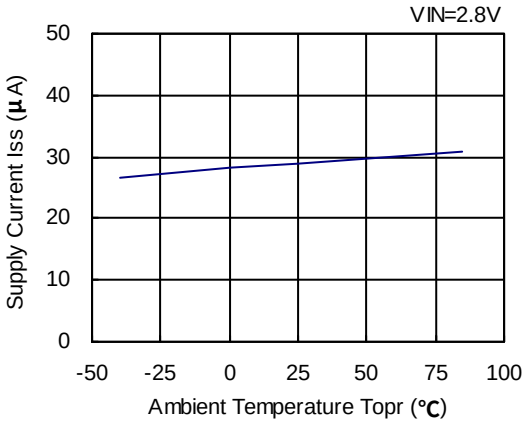


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

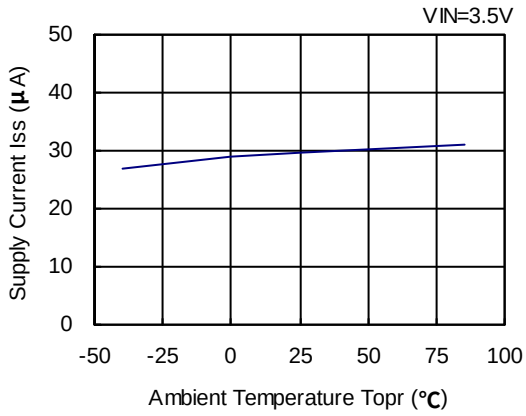
●XC6403/04 Series (Continued)

(6) Supply Current vs. Ambient Temperature

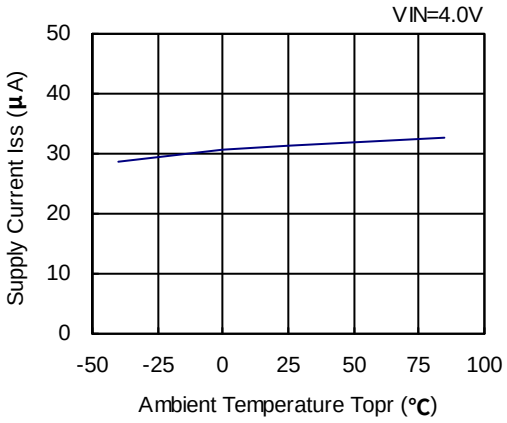
XC6403/04 Series (VR: 1.8V)



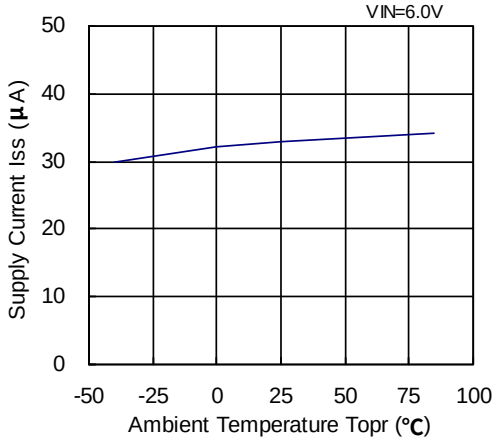
XC6403/04 Series (VR: 2.5V)



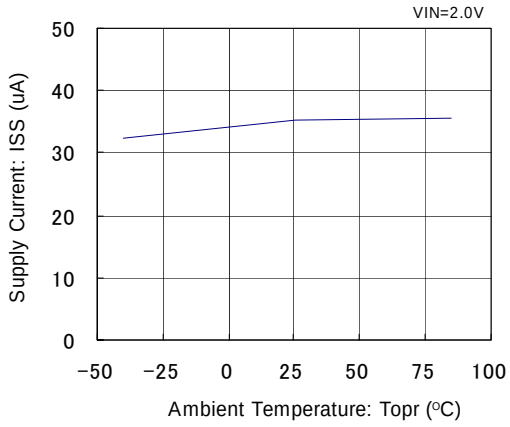
XC6403/04 Series (VR: 3.0V)



XC6403/04 Series (VR: 5.0V)



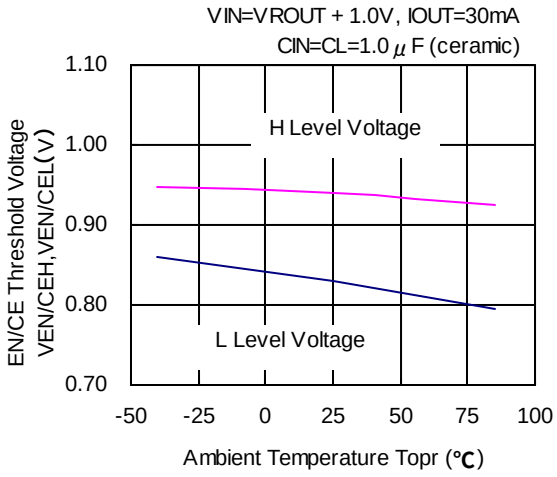
XC6403/04 Series (VR: 0.9V)



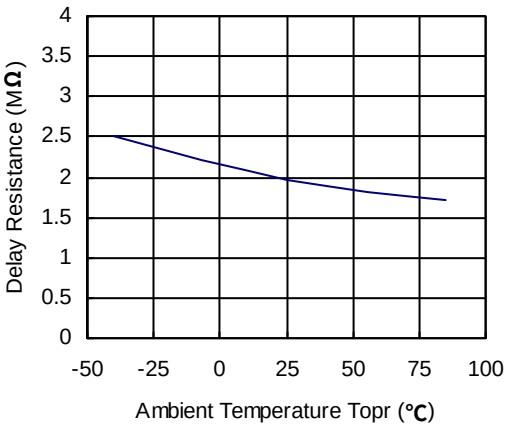
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

●XC6403/04 Series (Continued)

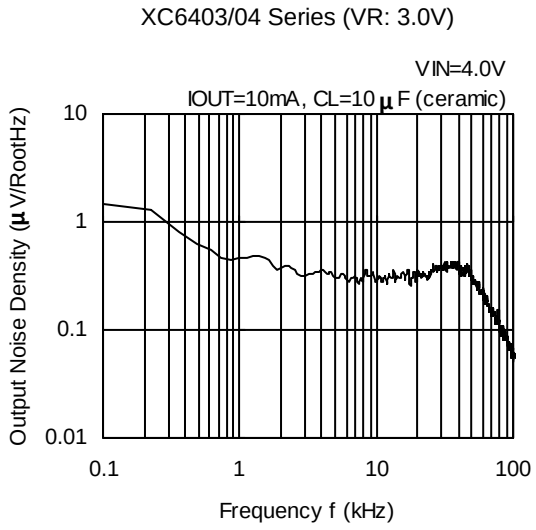
(7) EN/CE Threshold Voltage vs. Ambient Temperature



(8) Rdelay vs. Ambient Temperature



(9) Output Noise Density

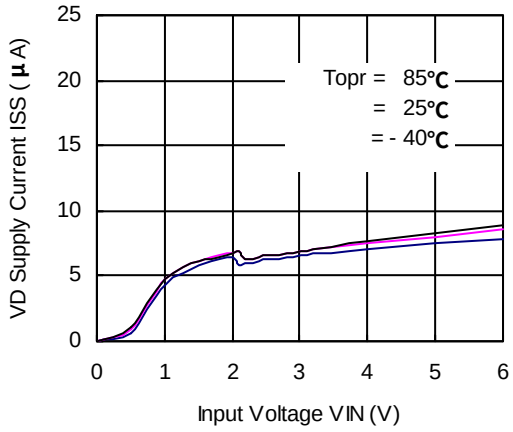


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

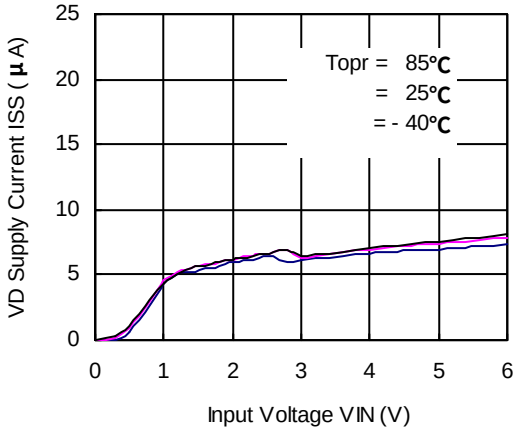
●XC6403/04 Series (Continued)

(10) VD Supply Current vs. Input Voltage (Only A ~ C Types)

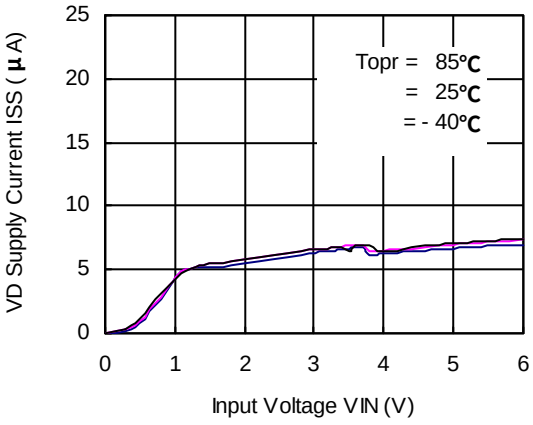
XC6403/04 Series (VD: 2.0V)



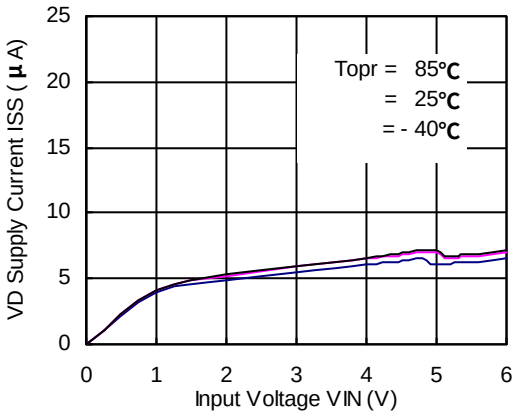
XC6403/04 Series (VD: 2.7V)



XC6403/04 Series (VD: 3.6V)



XC6403/04 Series (VD:5.0V)

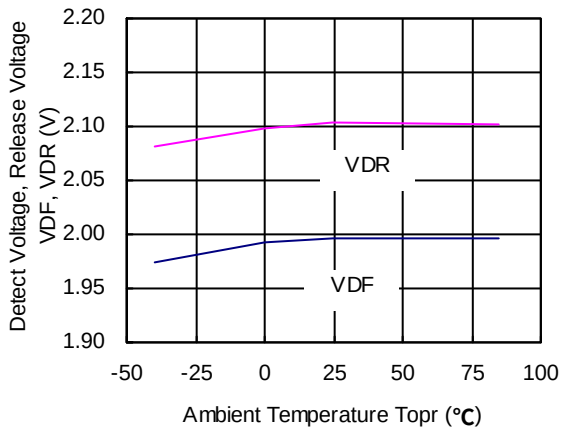


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

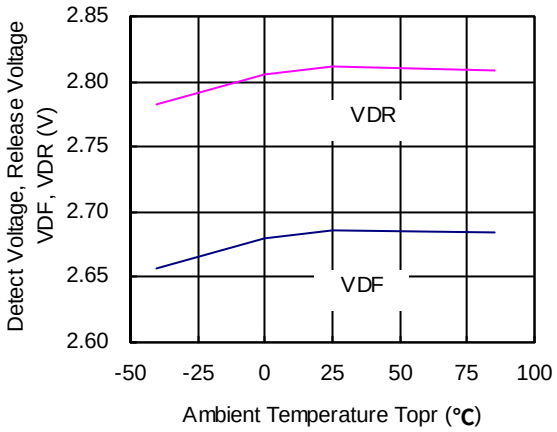
●XC6403/04 Series (Continued)

(11) Detect Voltage, Release Voltage vs. Ambient Temperature

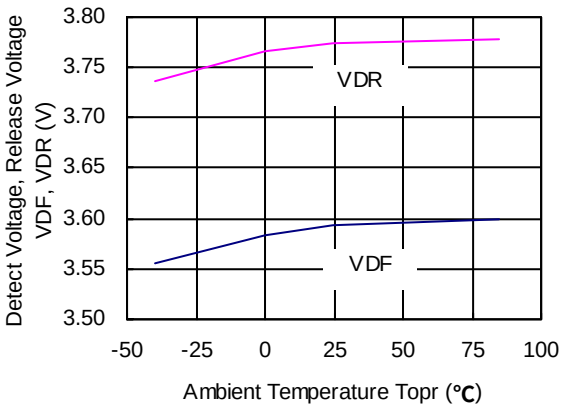
XC6403/04 Series (VD: 2.0V)



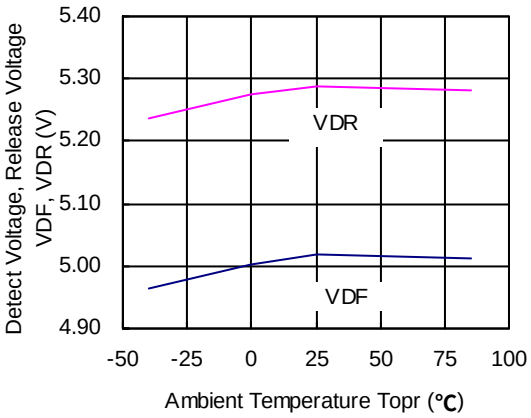
XC6403/04 Series (VD: 2.7V)



XC6403/04 Series (VD: 3.6V)



XC6403/04 Series (VD: 5.0V)

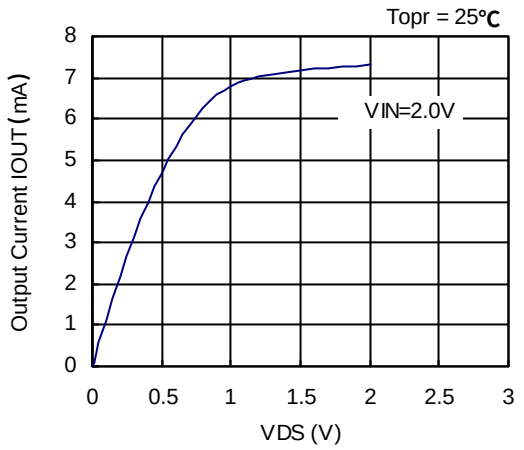


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

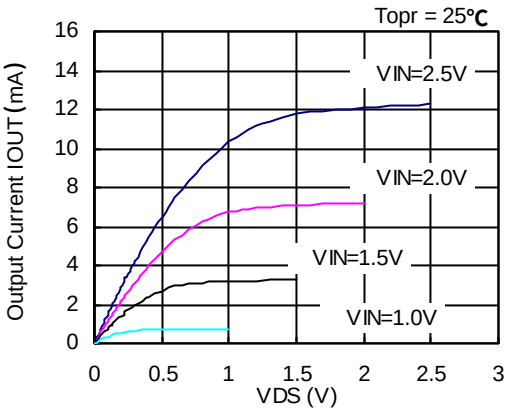
●XC6403/04 Series (Continued)

(12) VD N-ch Driver Output Current vs. VDS

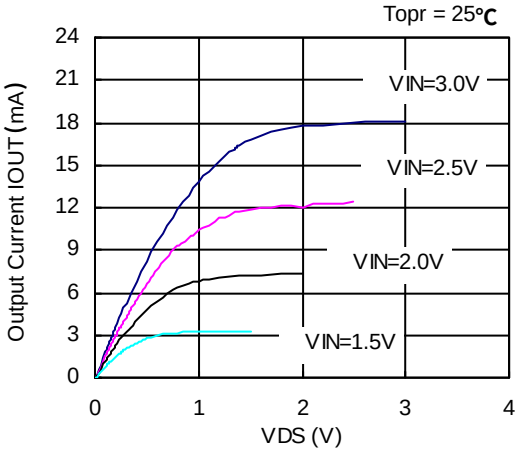
XC6403/04 Series (VD: 2.4V)



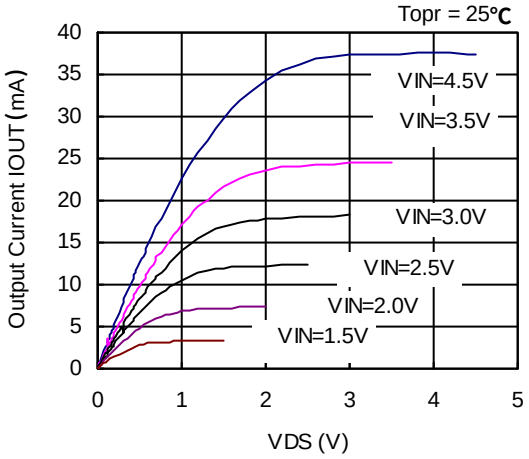
XC6403/04 Series (VD: 2.7V)



XC6403/04 Series (VD: 3.6V)



XC6403/04 Series (VD: 5.0V)

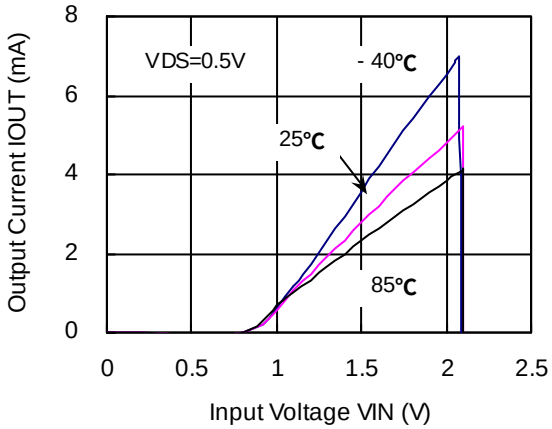


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

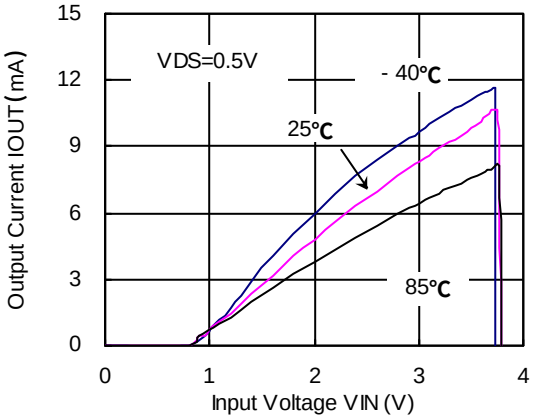
●XC6403/04 Series (Continued)

(13) VDN N-ch Driver Output Current vs. Input Voltage

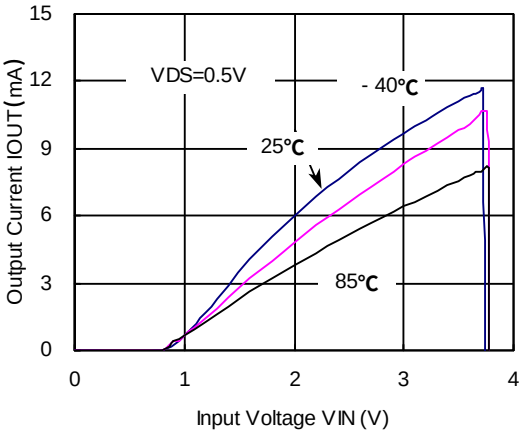
XC6403/04 Series (VD: 2.0V)



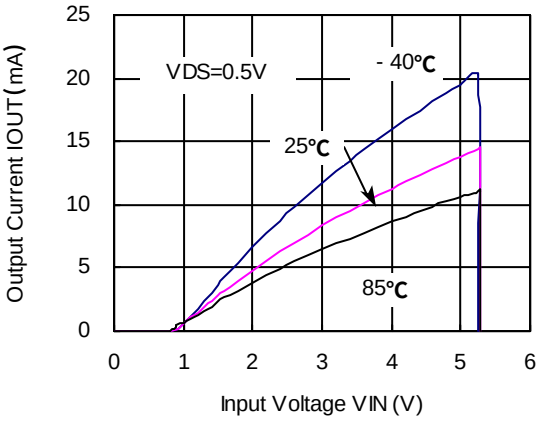
XC6403/04 Series (VD: 2.7V)



XC6403/04 Series (VD: 3.6V)



XC6403/04 Series (VD: 5.0V)

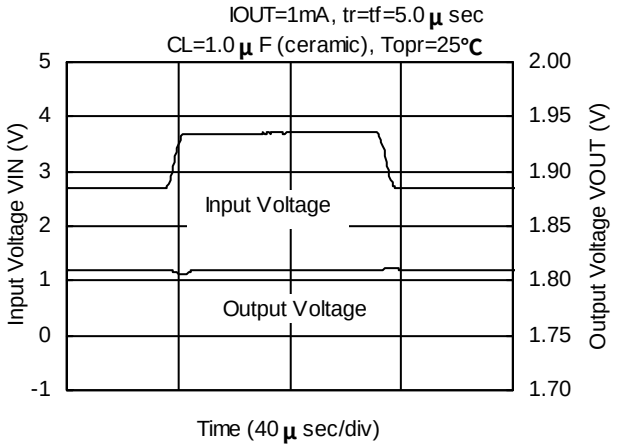


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

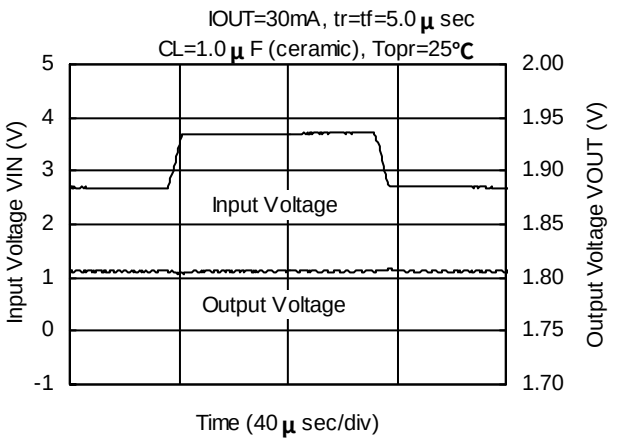
●XC6403/04 Series (Continued)

(14) Input Transient Response

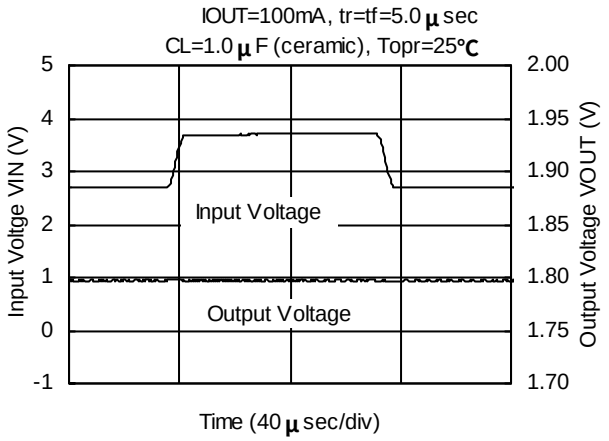
XC6403/04 Series (VR: 1.8V)



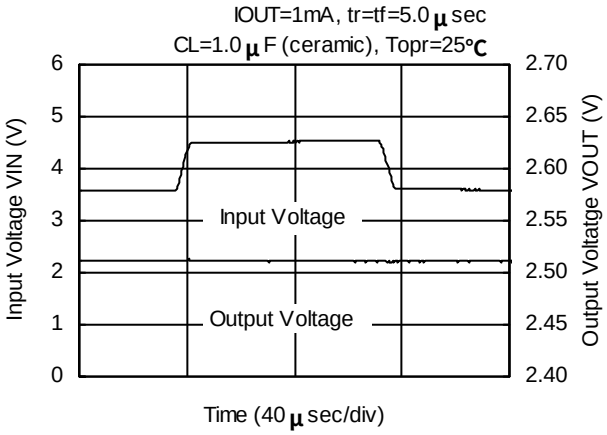
XC6403/04 Series (VR: 1.8V)



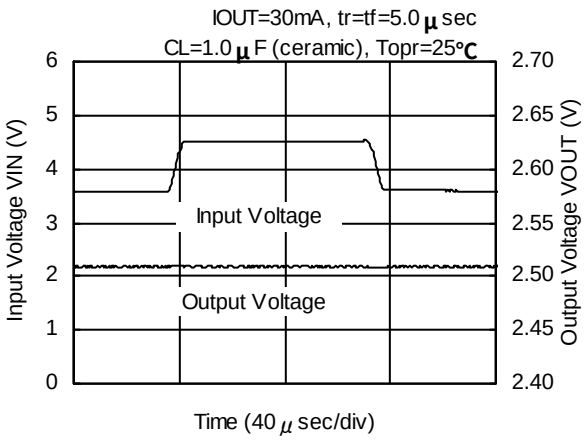
XC6403/04 Series (VR: 1.8V)



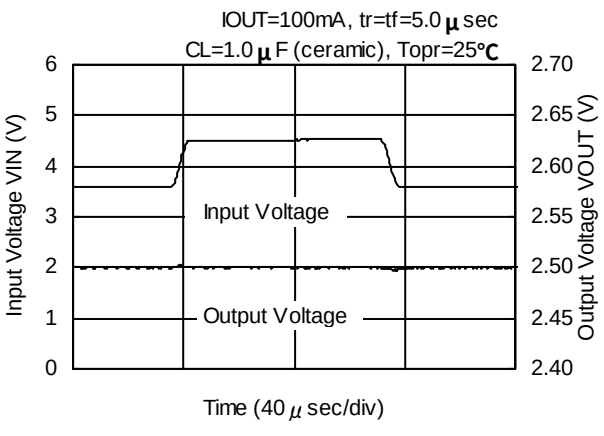
XC6403/04 Series (VR: 2.5V)



XC6403/04 Series (VR: 2.5V)



XC6403/04 Series (VR: 2.5V)

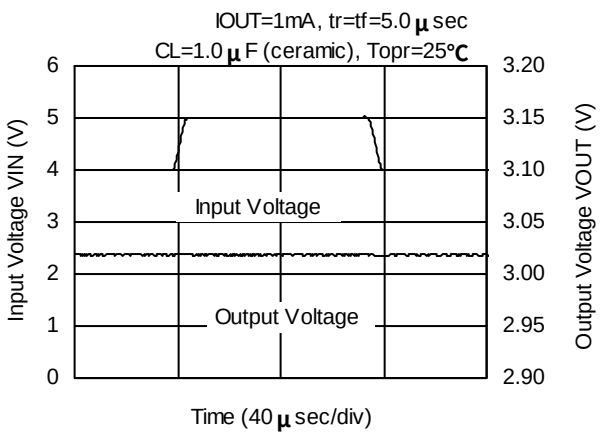


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

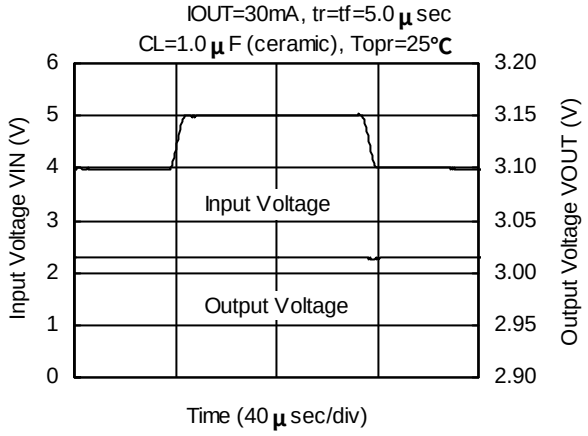
●XC6403/04 Series (Continued)

(14) Input Transient Response (Continued)

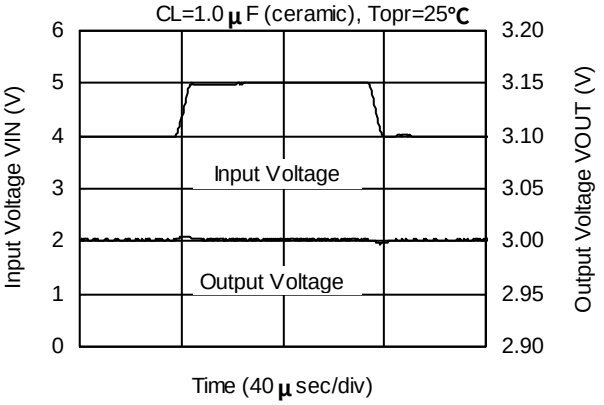
XC6403/04 Series (VR: 3.0V)



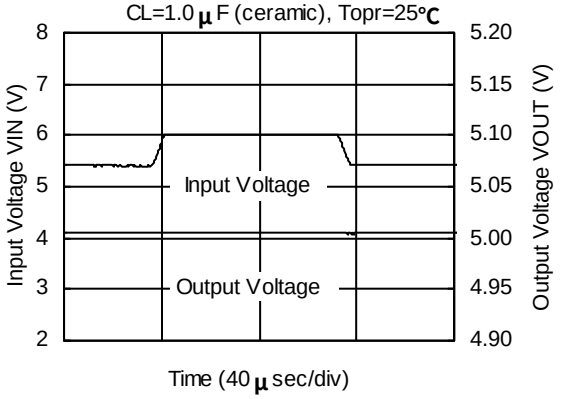
XC6403/04 Series (VR: 3.0V)



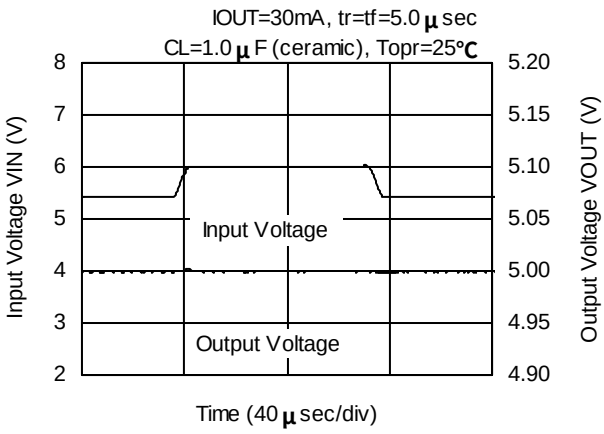
XC6403/04 Series (VR: 3.0V)



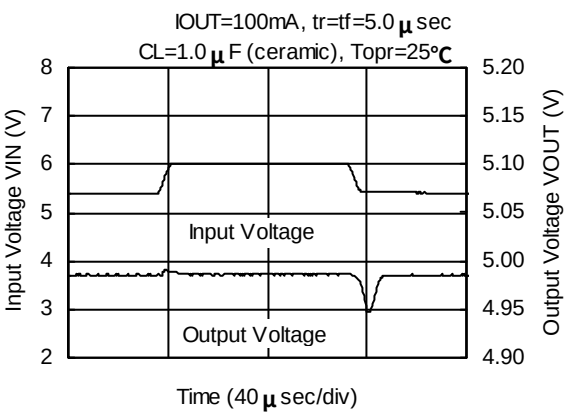
XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 5.0V)

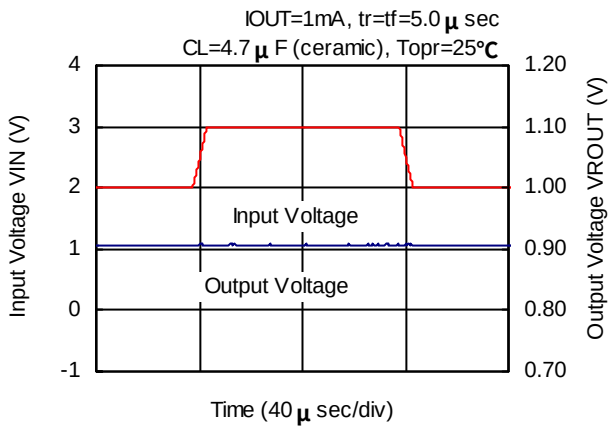


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

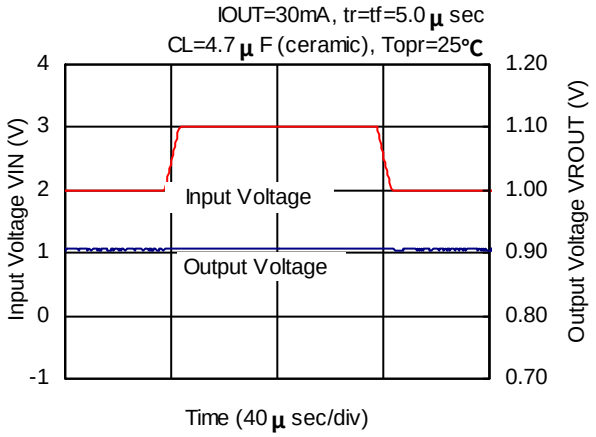
●XC6403/04 Series (Continued)

(14) Input Transient Response (Continued)

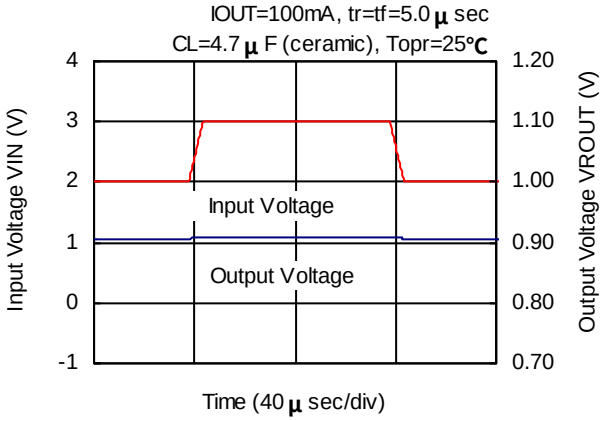
XC6403/04 Series (VR: 0.9V)



XC6403/04 Series (VR: 0.9V)



XC6403/04 Series (VR: 0.9V)

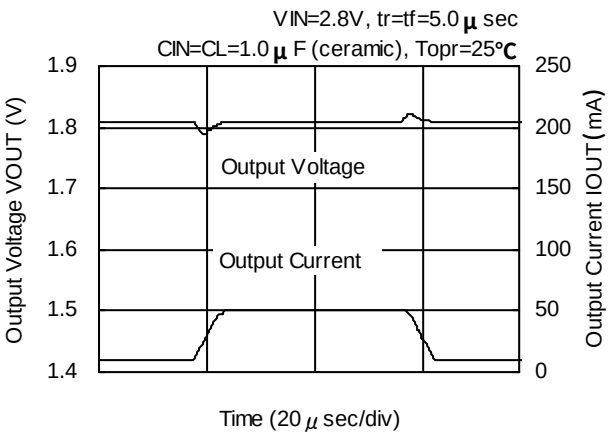


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

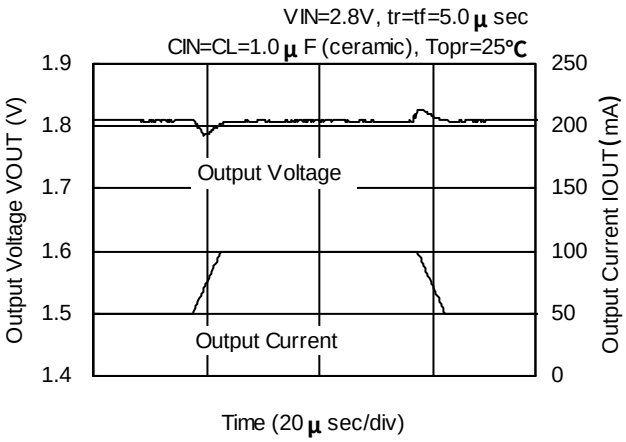
●XC6403/04 Series (Continued)

(15) Load Transient Response

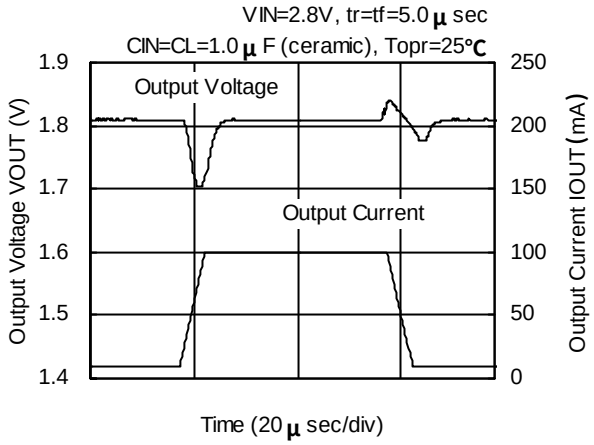
XC6403/04 Series (VR: 1.8V)



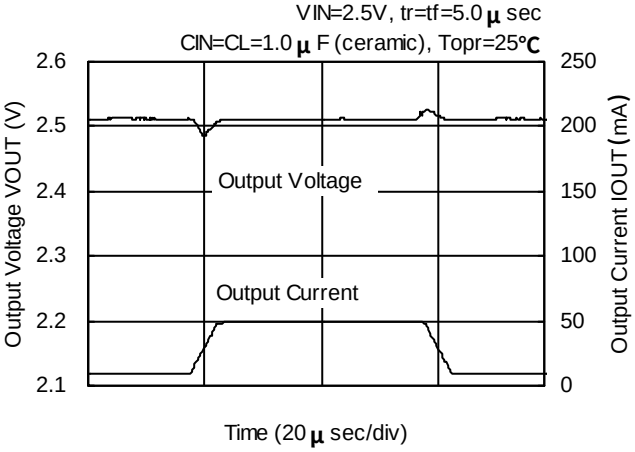
XC6403/04 Series (VR: 1.8V)



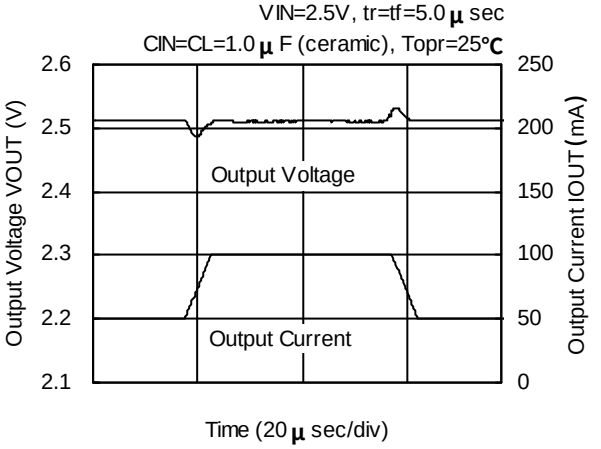
XC6403/04 Series (VR: 1.8V)



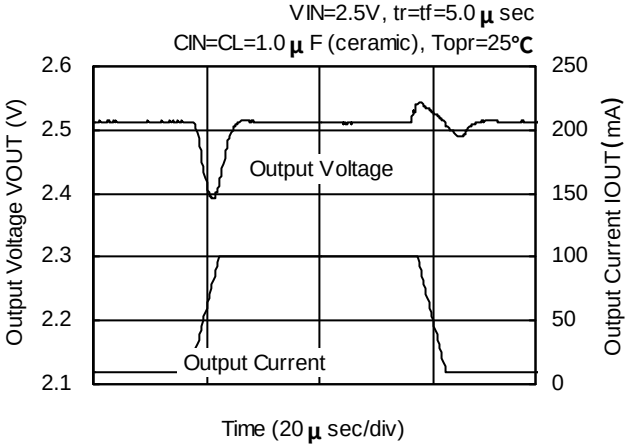
XC6403/04 Series (VR: 2.5V)



XC6403/04 Series (VR: 2.5V)



XC6403/04 Series (VR: 2.5V)

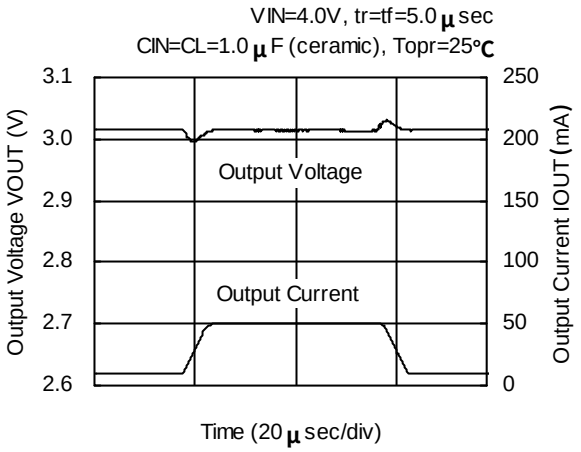


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

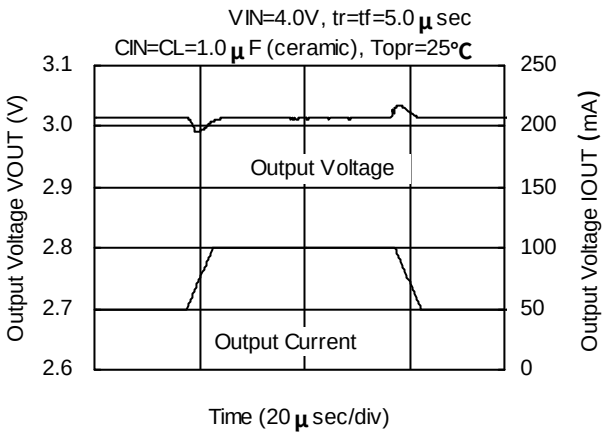
●XC6403/04 Series (Continued)

(15) Load Transient Response (Continued)

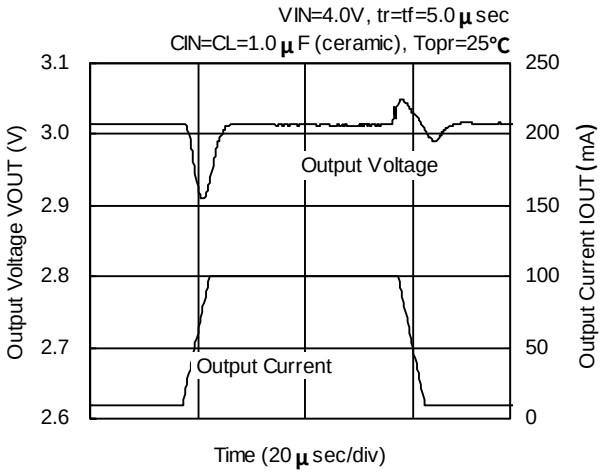
XC6403/04 Series (VR: 3.0V)



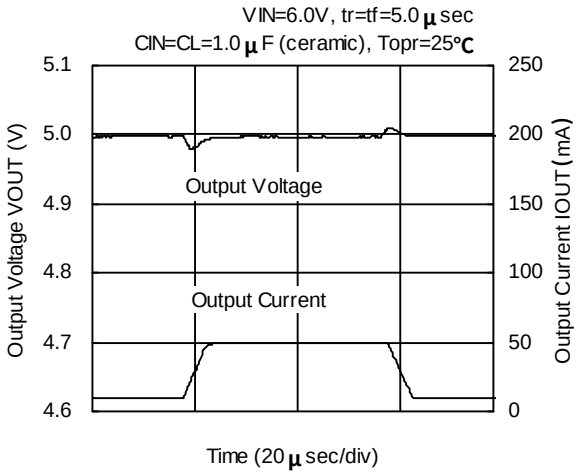
XC6403/04 Series (VR: 3.0V)



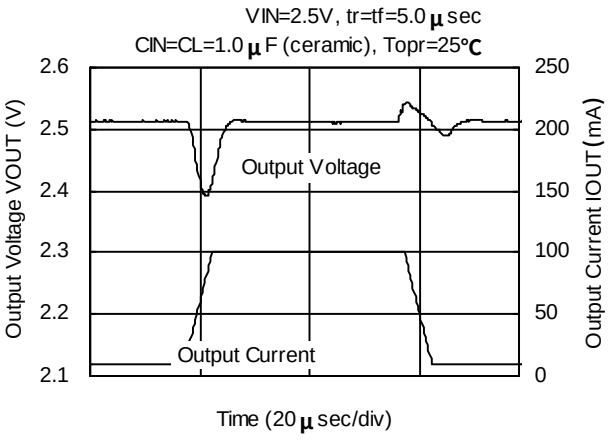
XC6403/04 Series (VR: 3.0V)



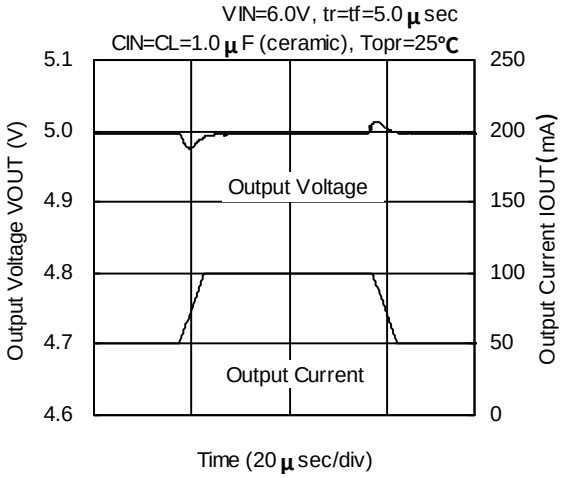
XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 5.0V)



XC6403/04 Series (VR: 5.0V)

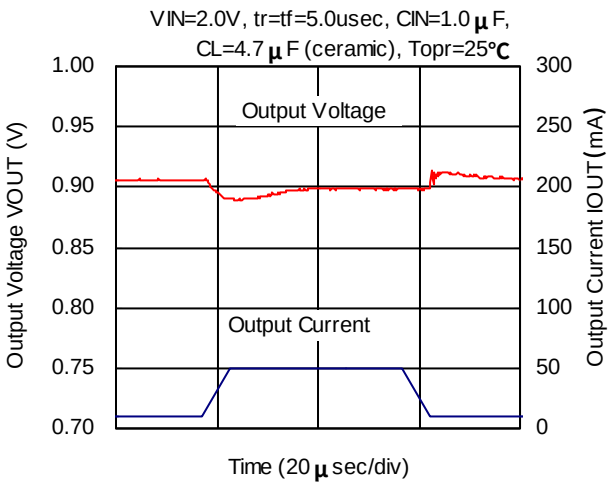


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

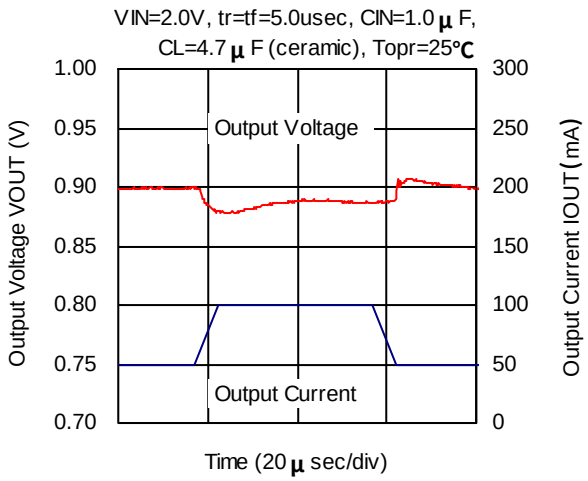
●XC6403/04 Series (Continued)

(15) Load Transient Response (Continued)

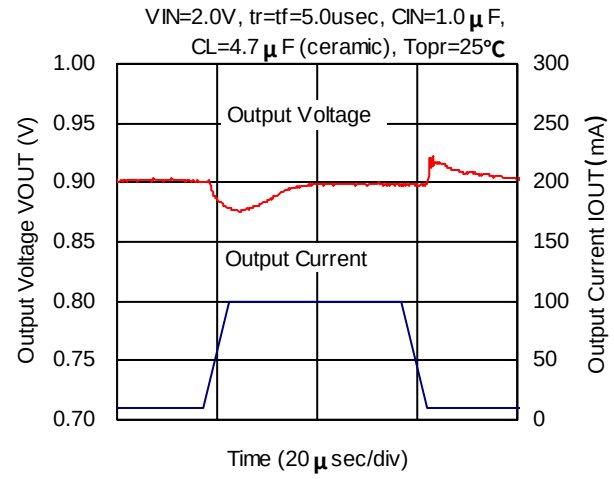
XC6403/04 Series (VR: 0.9V)



XC6403/04 Series (VR: 0.9V)



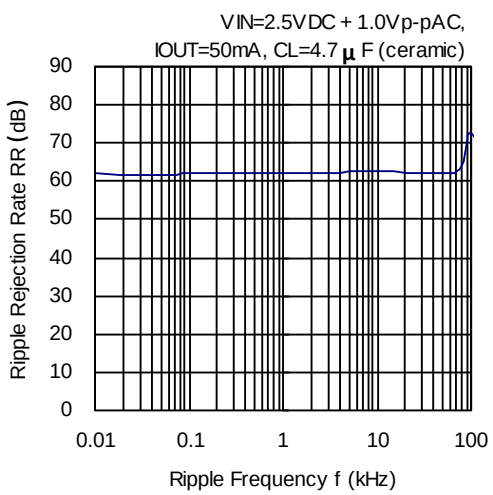
XC6403/04 Series (VR: 0.9V)



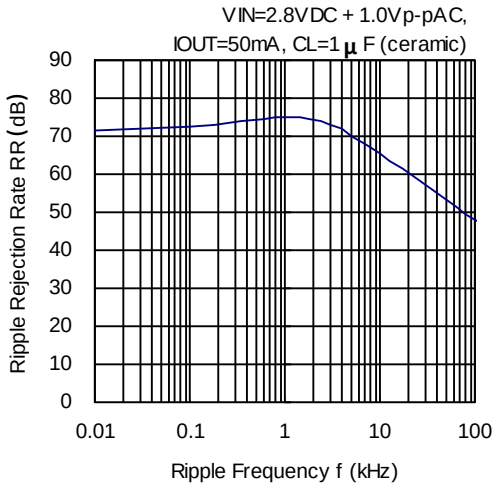
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(16) Ripple Rejection Rate

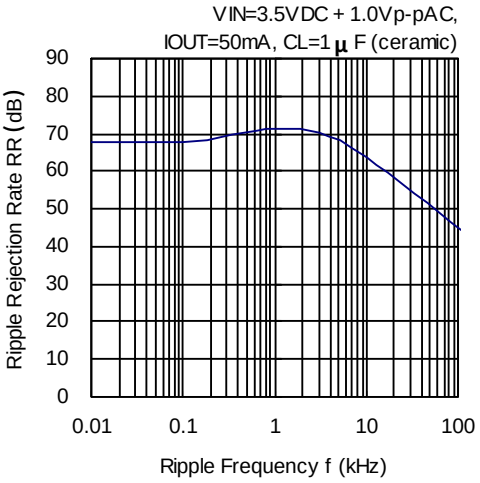
XC6403/04 Series (VR: 0.9V)



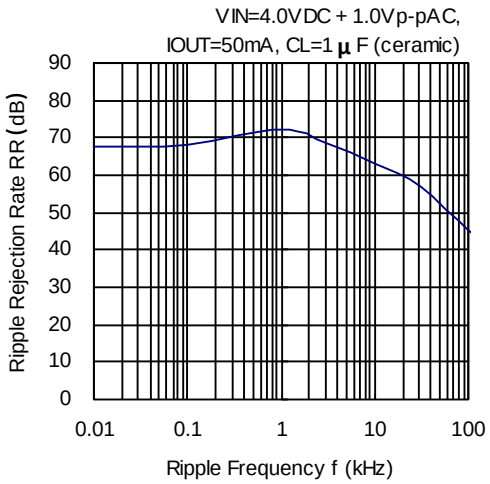
XC6403/04 Series (VR: 1.8V)



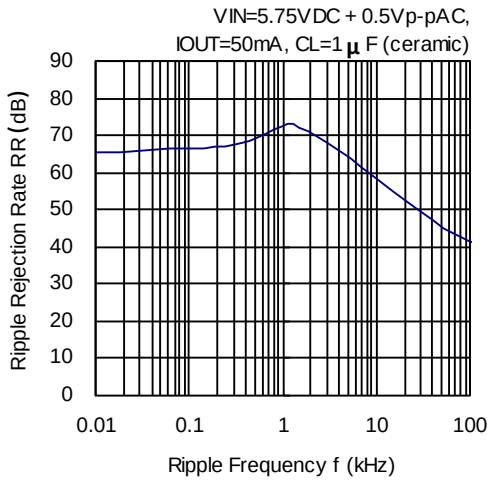
XC6403/04 Series (VR: 2.5V)



XC6403/04 Series (VR: 3.0V)

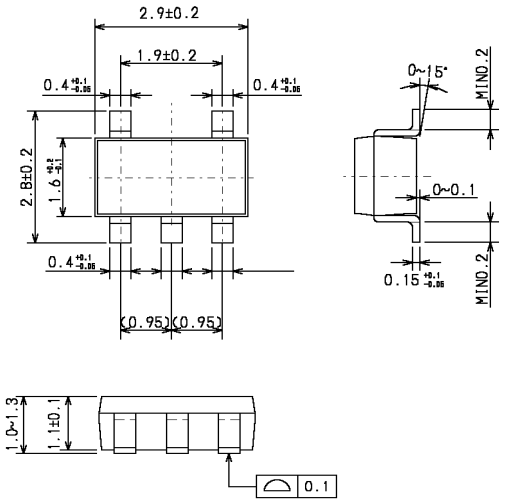


XC6403/04 Series (VR: 5.0V)

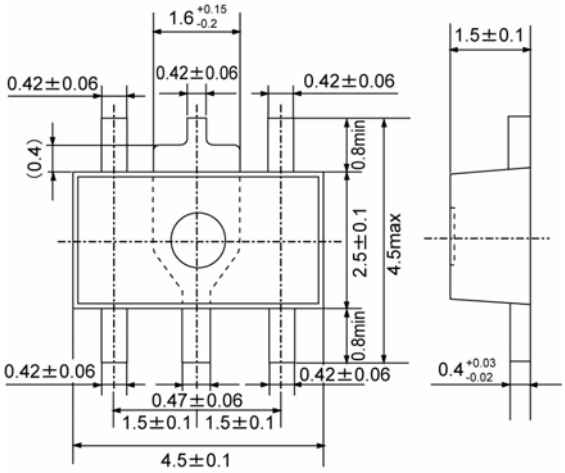


■PACKAGING INFORMATION

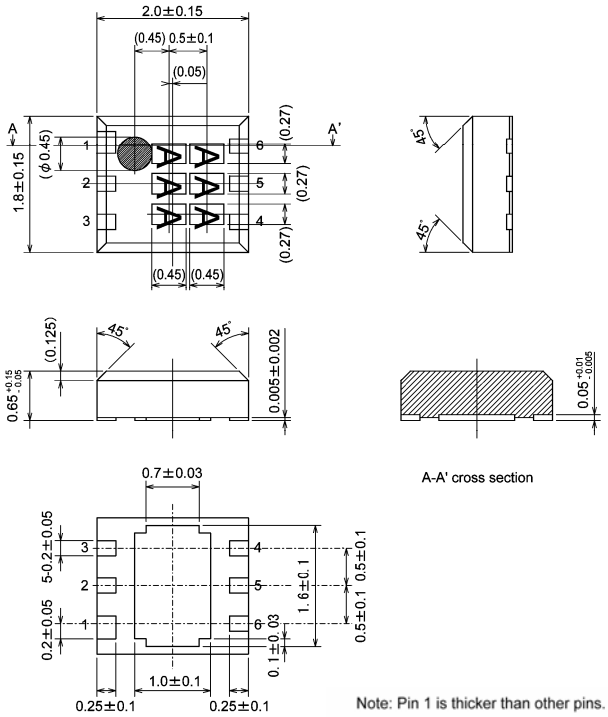
●SOT-25



●SOT-89-5

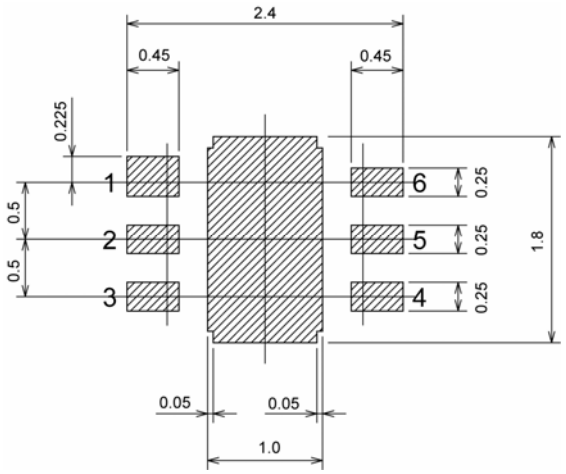


●USP-6B

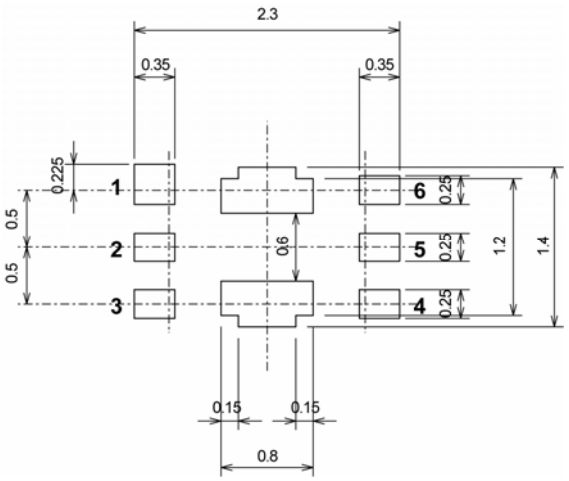


■PACKAGING INFORMATION (Continued)

●USP-6B Recommended Pattern Layout

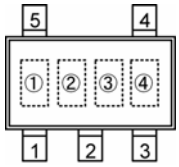


●USP-6B Recommended Metal Mask Design

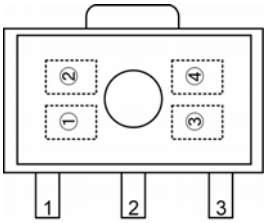


■MARKING RULE

●SOT-25 / SOT-89-5



SOT-25
(TOP VIEW)



SOT-89-5
(TOP VIEW)

① Represents product series

MARK	PRODUCT SERIES
3	XC6403xxxxxx
4	XC6404xxxxxx

②③ Represents internal sequential number
Sequential numbering rule

1) Order

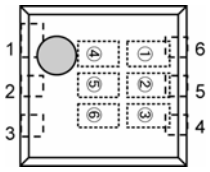
MARK	NUMBERING RULE
1	01~09
2	10~99
3	A0~A9
4	B0~B9
5	~Z9

*G, I, J, O, Q, W excepted

2) The same marking is printed on the product with same optional functions, product type, detect voltage, and output voltage although packages are different.

④ Represents production lot number
0 to 9,A to Z reverse character 0 to 9, A to Z repeated (G, I, J, O, Q, W excepted)

●USP-6B



USP-6B
(TOP VIEW)

① Represents product series

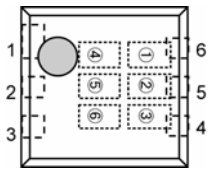
MARK	PRODUCT SERIES
2	XC6403xxxxDx
3	XC6404xxxxDx

② Represents optional functions

MARK	OPTIONAL FUNCTIONS	PRODUCT SERIES
A	Toggle and EN Function	XC6403/04AxxDx
B	Toggle, EN Function, VD signal/VR OFF Function	XC6403/04BxxDx
C	EN Function	XC6403/04CxxDx
D	CE Function	XC6403/04DxxDx
E	V_{SEN} Pin	XC6403/04ExxDx
F	Cd Pin	XC6403/04FxxDx

■MARKING RULE (Continued)

●USP-6B (Continued)



USP-6B
(TOP VIEW)

③ Represents product type

MARK	CE/EN FUNCTION	EN / CE LOGIC	PULL-UP/DOWN RESISTANCE	VD SENSE PIN	VD OUTPUT LOGIC	PRODUCT SERIES
A	Function	High Active	Pull-Down Function	VIN	Detect L	XC6403/04xAxxDx
B	Function	High Active	Pull-Down Function	VIN	Detect H	XC6403/04xBxxDx
C	Function	High Active	Pull-Down Function	VROUT	Detect L	XC6403/04xCxxDx
D	Function	High Active	Pull-Down Function	VROUT	Detect H	XC6403/04xDxxDx
E	Function	High Active	Nonfunctional	VIN	Detect L	XC6403/04xExxDx
F	Function	High Active	Nonfunctional	VIN	Detect H	XC6403/04xFxxDx
H	Function	High Active	Nonfunctional	VROUT	Detect L	XC6403/04xHxxDx
K	Function	High Active	Nonfunctional	VROUT	Detect H	XC6403/04xKxxDx
L	Function	Low Active	Pull-Up Function	VIN	Detect L	XC6403/04xLxxDx
M	Function	Low Active	Pull-Up Function	VIN	Detect H	XC6403/04xMxxDx
N	Function	Low Active	Pull-Up Function	VROUT	Detect L	XC6403/04xNxxDx
P	Function	Low Active	Pull-Up Function	VROUT	Detect H	XC6403/04xPxxDx
R	Function	Low Active	Nonfunctional	VIN	Detect L	XC6403/04xRxxDx
S	Function	Low Active	Nonfunctional	VIN	Detect H	XC6403/04xSxxDx
T	Function	Low Active	Nonfunctional	VROUT	Detect L	XC6403/04xTxxDx
U	Function	Low Active	Nonfunctional	VROUT	Detect H	XC6403/04xUxxDx
V	Nonfunctional	-	-	VIN / VSEN	Detect L	XC6403/04xVxxDx
X	Nonfunctional	-	-	VROUT/VSEN	Detect H	XC6403/04xXxxDx
Y	Nonfunctional	-	-	VROUT/VSEN	Detect L	XC6403/04xYxxDx
Z	Nonfunctional	-	-	VROUT/VSEN	Detect H	XC6403/04xZxxDx

④,⑤ Represents output voltage and detect voltage
ex.)

MARK		OUTPUT VOLTAGE		PRODUCT SERIES
③	④	VROUT (V)	VDOUT (V)	
3	0	4.0	4.3	XC6403/04**30D*

⑥ Represents production lot number
0 to 9,A to Z repeated (G, I, J, O, Q, W excepted)
Note: No character inversion used.

1. The products and product specifications contained herein are subject to change without notice to improve performance characteristics. Consult us, or our representatives before use, to confirm that the information in this catalog is up to date.
2. We assume no responsibility for any infringement of patents, patent rights, or other rights arising from the use of any information and circuitry in this catalog.
3. Please ensure suitable shipping controls (including fail-safe designs and aging protection) are in force for equipment employing products listed in this catalog.
4. The products in this catalog are not developed, designed, or approved for use with such equipment whose failure of malfunction can be reasonably expected to directly endanger the life of, or cause significant injury to, the user.
   (e.g. Atomic energy; aerospace; transport; combustion and associated safety equipment thereof.)
5. Please use the products listed in this catalog within the specified ranges.
   Should you wish to use the products under conditions exceeding the specifications, please consult us or our representatives.
6. We assume no responsibility for damage or loss due to abnormal use.
7. All rights reserved. No part of this catalog may be copied or reproduced without the prior permission of Torex Semiconductor Ltd.

TOREX SEMICONDUCTOR LTD.