XC6421 Series

ETR03053-005

300mA Small High Speed Dual LDO Regulator, Built-in Inrush Current Protection

■GENERAL DESCRIPTION

The XC6421 series is an ultra small CMOS dual LDO regulator, mounting 300mA 2-channel small high speed LDO. The series features high accuracy, high ripple rejection and low dropout voltage.
The series is capable of high density board installation by the ultra small package of two low on-resistance regulators. Both output accuracies are ±1% by laser trimming.

Each regulator can be turned off independently to be in stand-by mode by controlling EN pin.
In this state, the electric charge at the output capacitor (C_L) is discharged via the internal auto-discharge switch, and as a result the V_{OUT} voltage quickly returns to the V_{SS} level.
The output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors.
The high level of output stability is maintained even during frequent load fluctuations, due to the excellent transient response performance.

Over current protection circuit and over heat protection circuit are mounted, these circuits start working when output current reaches junction temperature or limit current.
The two regulators are completely isolated so that a cross talk during load fluctuations is minimized

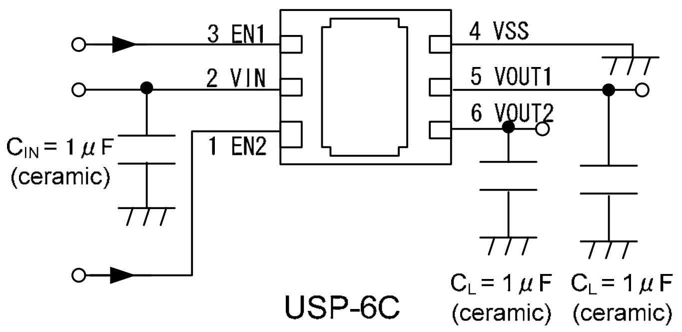
■APPLICATIONS

- Smart phones / Mobile phones
- Portable game consoles
- Digital audio equipments
- Digital still cameras / Camcorders

■FEATURES

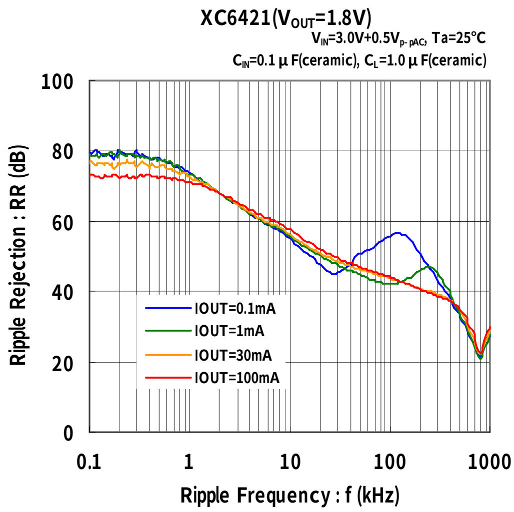
Maximum Output Current	:	300mA
Operating Voltage Range	:	1.6V～5.5V
Output Voltages	:	1.2V～3.6V (0.05V increments)
Output Accuracy	:	±1% (V_{OUT}≧2.00V) ±20mV(V_{OUT}≦1.95V)
Dropout Voltage	:	210mV@I_{OUT}=300mA (V$_{OUT}$=3.0V)
Low Power Consumption	:	90 μA / ch (TYP.)
Stand-by Current	:	0.1 μA
Ripple Rejection	:	75dB@1kHz
ON/OFF Control	:	Active High C_L Discharge
Protection		Current Limit 450mA (TYP.) Short Circuit 125mA (TYP.) Inrush Current Protection Thermal Shutdown
Low ESR Capacitor	:	1.0 μF Ceramic Capacitor
Operating Ambient Temperature	:	-40℃ ～ +85℃
Package	:	USP-6C
Environmentally Friendly	:	EU RoHS Compliant, Pb Free

■TYPICAL APPLICATION CIRCUITS

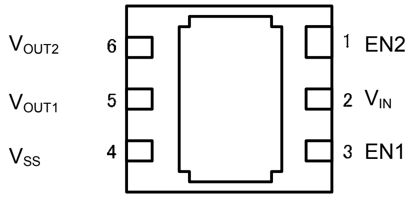


USP-6C
(BOTTOM VIEW)

■TYPICAL PERFORMANCE CHARACTERISTICS



■PIN CONFIGURATION



USP-6C
(BOTTOM VIEW)

* The dissipation pad for the USP-6C package should be solder-plated in recommended mount pattern and metal masking 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} (No. 4) pin.

■PIN ASSIGNMENT

PIN NUMBER USP-6C	PIN NAME	FUNCTIONS
1	EN2	ON/OFF Control 2
2	V_{IN}	Power Input
3	EN1	ON/OFF Control 1
4	V_{SS}	Ground
5	V_{OUT1}	Output 1
6	V_{OUT2}	Output 2

■ PRODUCT CLASSIFICATION

●Ordering Information

XC6421①②③④⑤⑥-⑦[(*1)]

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Basic Function	A	EN1: Active High , EN2: Active High Built-in Thermal Shutdown Inrush Current Protection V_{OUT1}: C_L Discharge, V_{OUT2}: C_L Discharge
②	Enable Pin	B	EN1: With Pull-down EN2: With Pull-down
③④	Output Voltage	01～	See the chart below
⑤⑥-⑦	Package (Order Unit)	ER-G	USP-6C (3,000/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

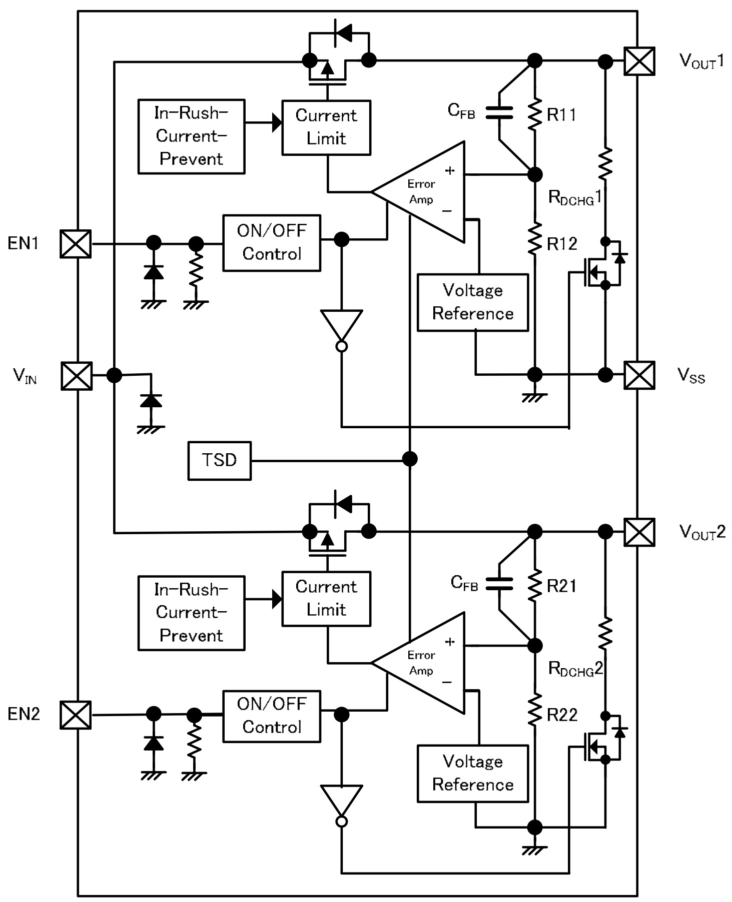
DESIGNATOR ③④: Output Voltage

③④	VR1(V)	VR2(V)	③④	VR1(V)	VR2(V)
01	1.20	1.20	34	2.80	3.00
02	1.20	1.50	35	2.80	3.30
03	1.20	2.50	36	1.20	3.60
04	1.20	2.85	37	3.60	1.20
05	1.20	3.00	38	1.20	2.80
06	1.20	3.30	39	3.30	2.00
07	1.50	1.50	40	3.00	3.30
08	1.50	1.80	41	3.30	3.30
09	1.50	2.50	42	1.30	1.50
10	1.50	2.85	43	2.60	2.80
11	1.50	3.00	44	3.10	3.30
12	1.50	3.30	45	1.50	2.60
13	1.80	1.80	46	2.60	3.30
14	1.80	2.50	47	3.40	3.40
15	2.85	2.85	48	2.85	2.60
16	1.80	2.85	49	3.30	1.80
17	1.80	3.00	50	1.80	1.20
18	3.00	1.80	51	3.10	3.10
19	1.80	3.30	52	1.50	3.10
20	2.50	2.50	53	3.30	2.80
21	2.50	2.80	54	3.00	2.80
22	2.50	2.85	55	3.30	3.00
23	3.30	1.50	56	3.60	3.60
24	2.50	3.00	57	3.30	3.10
25	2.50	3.30	58	3.10	3.00
26	2.85	3.00	59	3.10	2.90
27	2.85	3.30	60	3.10	2.50
28	3.00	3.00	61	3.00	2.90
29	1.20	1.80	62	3.00	2.50
30	1.30	2.80	63	1.80	1.90
31	1.50	2.80	64	1.80	1.85
32	1.80	2.80	65	1.70	1.70
33	2.80	2.80			

*For other output voltage combinations, please contact your local Torex sales office or representative.

■BLOCK DIAGRAM

XC6421ABxxxxseries



* Diodes inside the circuits are ESD protection diodes and parasitic diodes.

■ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		V_{IN}	Vss-0.3～Vss +7.0	V
Output Current		$I_{OUT1}+I_{OUT2}$	800 (*1)	mA
Output Voltage 1, Output Voltage2		V_{OUT1}, V_{OUT2}	V_{SS}-0.3～V_{IN}+0.3≦Vss +7.0	V
EN1, EN2 Input Voltage		V_{EN1}, V_{EN2}	V_{SS}-0.3～Vss +7.0	V
Power Dissipation	USP-6C	Pd	120	mW
			1000 (PCB mounted) (*2)	
Operating Ambient Temperature		Topr	-40～+85	℃
Storage Temperature		Tstg	-55～+125	℃

(*1) Pd > { (V_{IN}-V_{OUT1})×I_{OUT1} + (V_{IN}-V_{OUT2})×I_{OUT2} }

(*2) The power dissipation figure shown is PCB mounted. Please refer to page 23 for details.

■ELECTRICAL CHARACTERISTICS

●XC6421 Series

Regulator 1, Regulator 2

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUITS
Output Voltage	$V_{OUT(E)}$ (*2)	V_{OUT}≧2.0V, V_{EN}=V_{IN}, I_{OUT}=10mA	$V_{OUT(T)}$×0.99 (*2)	$V_{OUT(T)}$ (*3)	$V_{OUT(T)}$×1.01 (*2)	V	①
		V_{OUT}<2.0V, V_{EN}=V_{IN}, I_{OUT}=10mA	$V_{OUT(T)}$- 20mV (*2)	$V_{OUT(T)}$ (*3)	$V_{OUT(T)}$+20mV (*2)	V	①
Maximum Output Current	I_{OUTMAX}	V_{EN}=V_{IN}	300	-	-	mA	①
Load Regulation	ΔV_{OUT}	V_{EN}=V_{IN}, 0.1mA≦I_{OUT}≦300mA	-	25	45	mV	①
Dropout Voltage (*4)	Vdif	I_{OUT}=300mA, V_{EN}=V_{IN}	See the chart below			mV	①
Supply Current	I_{SS}	V_{EN}=V_{IN}, I_{OUT}=0mA	-	90	190	μA	②
Stand-by Current	I_{STB}	V_{EN}=V_{SS}		0.01	0.1	μA	②
Line Regulation	ΔV_{OUT}/ (ΔV_{IN}・V_{OUT})	2.5V≦V_{IN}≦5.5V, ($V_{OUT(T)}$≦2.0V), V_{EN}=V_{IN}, I_{OUT}=30mA $V_{OUT(T)}$+0.5V≦V_{IN}≦5.5V, ($V_{OUT(T)}$≧2.05V), V_{EN}=V_{IN}, I_{OUT}=30mA	-	0.02	0.1	%/V	①
Input Voltage	V_{IN}	-	1.6	-	5.5	V	①
Output Voltage Temperature Characteristics (R&D Value)	ΔV_{OUT}/ (ΔTa・V_{OUT})	V_{EN}=V_{IN}, I_{OUT}=10mA, -40℃≦Ta≦85℃	-	±100	-	ppm /℃	①
Power Supply Rejection Ratio	PSRR	V_{EN}=V_{IN}, V_{IN}= {$V_{OUT(T)}$+1.0} +0.5Vp-pAC, I_{OUT}=30mA, f=1kHz	-	75	-	dB	③
Limit Current	I_{LIM}	V_{EN}=V_{IN}	310	450	-	mA	①
Short-Circuit Current	I_{SHORT}	V_{EN} =V_{IN}, V_{OUT}=V_{SS}	-	125	-	mA	①
EN"H"Level Voltage	V_{ENH}	-	1.0	-	5.5	V	①
EN"L"Level Voltage	V_{ENL}	-	0	-	0.3	V	①
EN"H"Level Current	I_{ENH}	V_{EN}=V_{IN}=5.5V	2.9	6.0	9.5	μA	①
EN"L"Level Current	I_{ENL}	V_{EN}=V_{SS}	-0.1	-	0.1	μA	①
C_L Discharge Resistance	R_{DCHG}	V_{IN} =5.5V, V_{EN} =V_{SS}, V_{OUT} =2.0V	-	230	-	Ω	①
Inrush Current	I_{RUSH}	-	-	150	-	mA	①
Thermal Shutdown Detect Temperature	T_{TSD}	Junction Temperature	-	150	-	℃	①
Thermal Shutdown Release Temperature	T_{TSR}	Junction Temperature	-	125	-	℃	①
Thermal Shutdown Release Temperature	$T_{TSD}-T_{TSR}$	Junction Temperature	-	25	-	℃	①

NOTE:
Unless otherwise stated, {V_{IN}=$V_{OUT(T)}$+1.0V}
Each channel is measured when the other channel is turned off (V_{EN}=V_{SS}).

(*1) $V_{OUT(E)}$: Effective output voltage (see the voltage chart)
(ie. The output voltage when "$V_{OUT(T)}$+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{OUT} value.
(*2) Characteristics of the actual $V_{OUT(E)}$ by nominal output voltage is shown in the voltage chart.
(*3) $V_{OUT(T)}$: Nominal output voltage
(*4) Vdif={V_{IN1}−V_{OUT1}}
V_{OUT1}: A voltage equal to 98% of the output voltage whenever an amply stabilized {$V_{OUT(T)}$+1.0V} is input with every I_{OUT}.
V_{IN1}: The input voltage when V_{OUT1} appears as input voltage is gradually decreased.

■OUTPUT VOLTAGE CHART

Regulator 1, Regulator 2

●Voltage chart

Ta=25℃

NOMINAL OUTPUT VOLTAE (V)	OUTPUT VOLTAGE (V)		DROPOUT VOLTAGE (mV)	
$V_{OUT(T)}$	$V_{OUT(E)}$		Vdif	
	MIN.	MAX.	TYP.	MAX.
1.200	1.1800	1.2200	580	680
1.250	1.2300	1.2700		
1.300	1.2800	1.3200	515	610
1.350	1.3300	1.3700		
1.400	1.3800	1.4200	460	550
1.450	1.4300	1.4700		
1.500	1.4800	1.5200		
1.550	1.5300	1.5700		
1.600	1.5800	1.6200	380	450
1.650	1.6300	1.6700		
1.700	1.6800	1.7200		
1.750	1.7300	1.7700		
1.800	1.7800	1.8200	330	390
1.850	1.8300	1.8700		
1.900	1.8800	1.9200		
1.950	1.9300	1.9700		
2.000	1.9800	2.0200	295	350
2.050	2.0295	2.0705		
2.100	2.0790	2.1210		
2.150	2.1285	2.1715		
2.200	2.1780	2.2220		
2.250	2.2275	2.2725		
2.300	2.2770	2.3230		
2.350	2.3265	2.3735		
2.400	2.3760	2.4240		
2.450	2.4255	2.4745		

NOMINAL OUTPUT VOLTAE (V)	OUTPUT VOLTAGE (V)		DROPOUT VOLTAGE (mV)	
$V_{OUT(T)}$	$V_{OUT(E)}$		Vdif	
	MIN.	MAX.	TYP.	MAX.
2.500	2.4750	2.5250	240	290
2.550	2.5245	2.5755		
2.600	2.5740	2.6260		
2.650	2.6235	2.6765		
2.700	2.6730	2.7270		
2.750	2.7225	2.7775		
2.800	2.7720	2.8280		
2.850	2.8215	2.8785		
2.900	2.8710	2.9290		
2.950	2.9205	2.9795		
3.000	2.9700	3.0300	210	260
3.050	3.0195	3.0805		
3.100	3.0690	3.1310		
3.150	3.1185	3.1815		
3.200	3.1680	3.2320		
3.250	3.2175	3.2825		
3.300	3.2670	3.3330		
3.350	3.3165	3.3835		
3.400	3.3660	3.4340		
3.450	3.4155	3.4845		
3.500	3.4650	3.5350		
3.550	3.5145	3.5855		
3.600	3.5640	3.6360		

■OPERATIONAL EXPLANATION

The voltage divided by resistors Rx1 & Rx2 is compared with the internal reference voltage by the error amplifier. The P-channel MOSFET which is connected to the Output pin (V_{OUT}) is then driven by the subsequent control signal. The output voltage at the Output pin (V_{OUT}) is controlled and stabilized by a system of negative feedback. The current limit circuit, short circuit protection and thermal protection operate in relation to the level of output current and heat dissipation. Further, the IC's internal circuitry can be shutdown via the EN pin signal.

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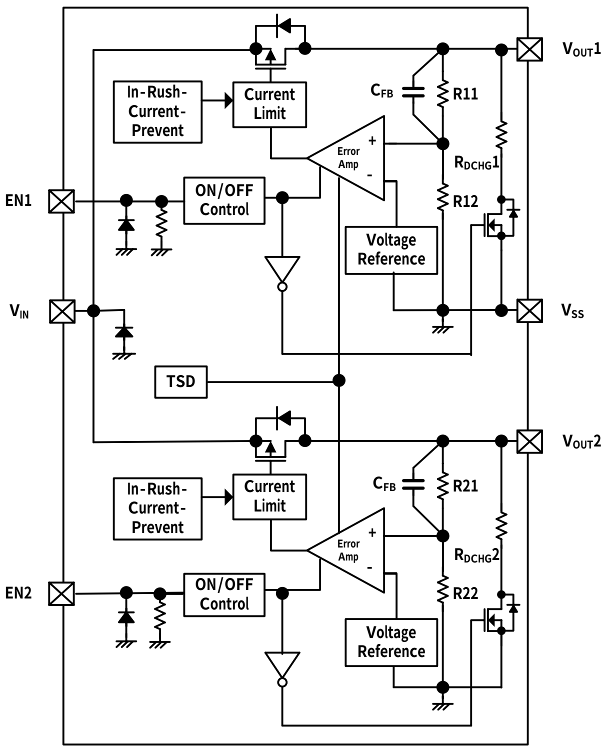


<Low ESR Capacitor>

The XC6421 series needs an output capacitor (C_L) for phase compensation. In order to ensure the stable phase compensation, please place an output capacitor (C_L) of 1.0μF or bigger at the V_{OUT} pin and V_{SS} pin as close as possible. For a stable power input, please connect an input capacitor (C_{IN}) of 1.0μF between V_{IN} pin and V_{SS} pin.

<Current Limiter, Short-Circuit Protection>

The XC6421 series has current limiter and droop shape of fold-back circuit. When the load current reaches the current limit, the droop current limiter circuit operates and the output voltage drops. When the output voltage dropped, the fold-back circuit operates and the output current goes to decrease. The output current finally falls at the level of 125mA when the output pin is short-circuited.

<EN Pin>

The IC's internal circuitry can be shutdown via the signal from the EN pin. In shutdown mode, the XC6421 series enables the electric charge at the output capacitor (C_L) to be discharged via the internal auto-discharge switch, and as a result the output pin (V_{OUT}) quickly returns to the ground pin (V_{SS}) level.

On the other hand, the XC6421 series has a pull-down resistor at the EN pin inside, so that the EN pin input current flows. If this EN pin voltage is set with the specified voltage range, the logic is fixed and the IC will operate normally. However, the supply current may increase as a result of shoot-through current in the IC's internal circuitry when a medium voltage is input to the EN pin.

■OPERATIONAL EXPLANATION (Continued)

<C_L Auto-Discharge Function>

XC6421 series can quickly discharge the electric charge at the output capacitor (C_L), when a low signal is inputted to the EN pin, which enables a part of the IC circuit put into OFF state, via the N-channel transistor located between the V_{OUT} pin and the V_{SS} pin (cf. BLOCK DIAGRAM). The C_L discharge resistance is set to 230Ω when V_{IN} is 5.5V (TYP.) and V_{OUT} is 2.0V (TYP.). Moreover, discharge time of the output capacitor (C_L) is set by the C_L auto-discharge resistance and the output capacitance (C_L). By setting time constant of a C_L auto-discharge resistance [R_{DCHG}] and an output capacitance (C_L) as τ ($\tau = C_L \times R_{DCHG}$), the output voltage after discharge via the N channel transistor is calculated by the following formulas.

$$V = V_{OUT(E)} \times e^{-t/\tau}, \quad \text{or} \quad t = \tau \ln (V_{OUT(E)} / V)$$

V : Output voltage after discharge
$V_{OUT(E)}$: Output voltage
t: Discharge time,
τ : $R_{DCHG} \times C_L$
C_L : Output capacitance
R_{DCHG} : C_L auto-discharge resistance

<Thermal Shutdown>

When the junction temperature of the built-in driver transistor reaches the temperature limit, the thermal shutdown circuit operates and the driver transistor will be set to OFF. The IC resumes its operation when the thermal shutdown function is released and the IC's operation is automatically restored because the junction temperature drops to the level of the thermal shutdown release voltage.

<Inrush Current Protection>

The inrush current protection circuit is built in the XC6421 series.
When the IC starts to operate, the protection circuit limits the inrush current as 150mA (TYP.) from input pin (V_{IN}) to output pin (V_{OUT}) for charging C_L capacitor.

■NOTES ON USE

1. For temporary, transitional voltage drop or voltage rising phenomenon, the IC is liable to malfunction should the ratings be exceeded.

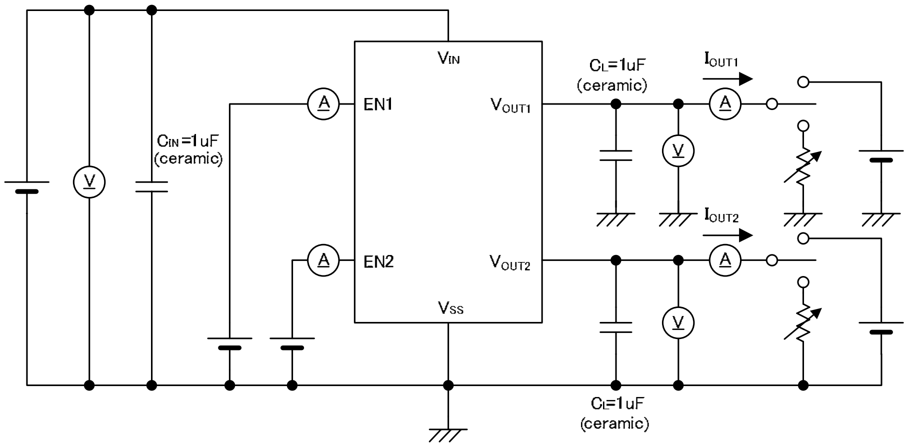
2. Where wiring impedance is high, operations may become unstable due to the noise and/or phase lag depending on output current. Please strengthen V_{IN} and V_{SS} wiring in particular.

3. Please wire the input capacitor (C_{IN}) and the output capacitor (C_L) as close to the IC as possible.

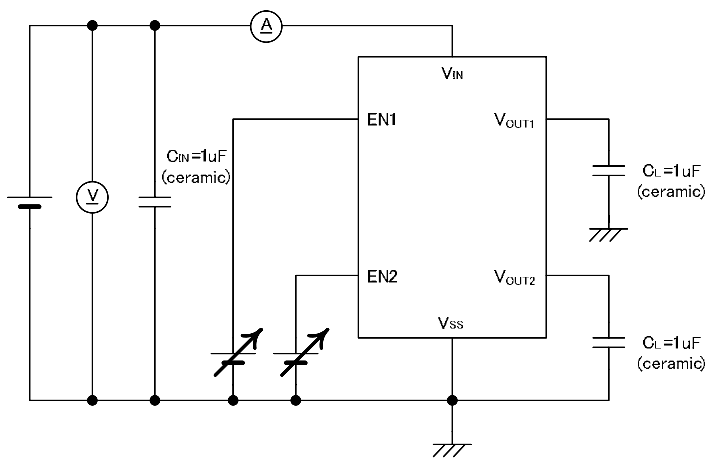
4. Torex places an importance on improving our products and its reliability.
   However, by any possibility, we would request user fail-safe design and post-aging treatment on system or equipment.

■TEST CIRCUITS

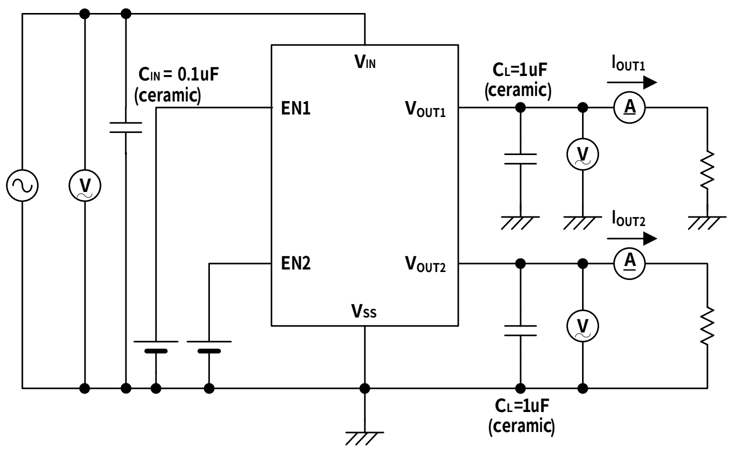
●Circuit ①



●Circuit ②



●Circuit ③

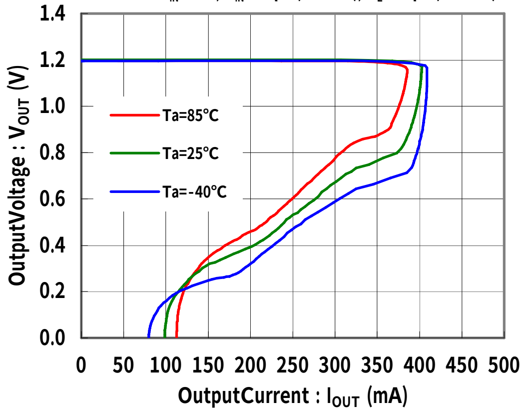


■TYPICAL PERFORMANCE CHARACTERISTICS

(1) OutputVoltage vs. OutputCurrent

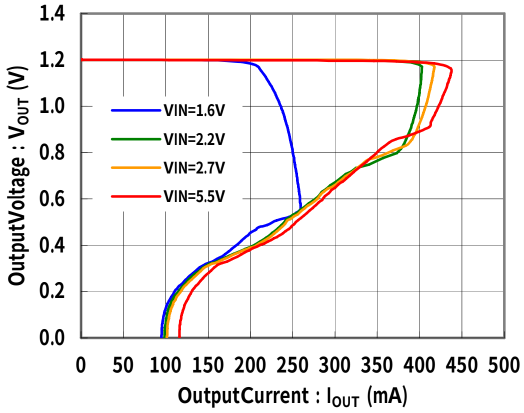
XC6421(V_{OUT}=1.2V)

V_{IN}=2.2V, C_{IN}=1.0μF(ceramic), C_L=1.0μF(ceramic)



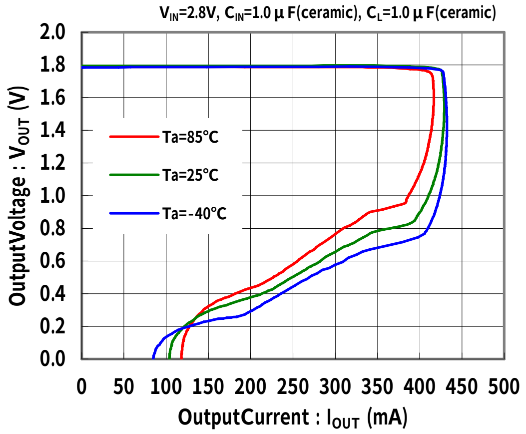
XC6421(V_{OUT}=1.2V)

Ta=25°C
C_{IN}=1.0μF(ceramic), C_L=1.0μF(ceramic)



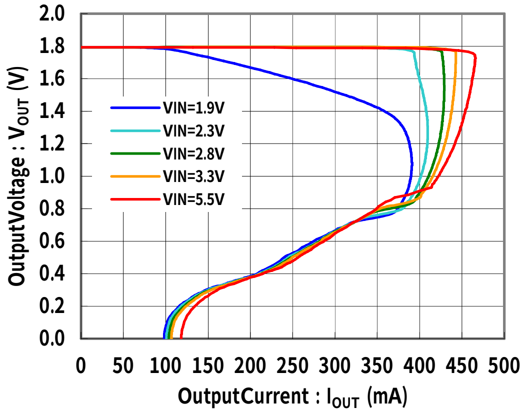
XC6421(V_{OUT}=1.8V)

V_{IN}=2.8V, C_{IN}=1.0μF(ceramic), C_L=1.0μF(ceramic)



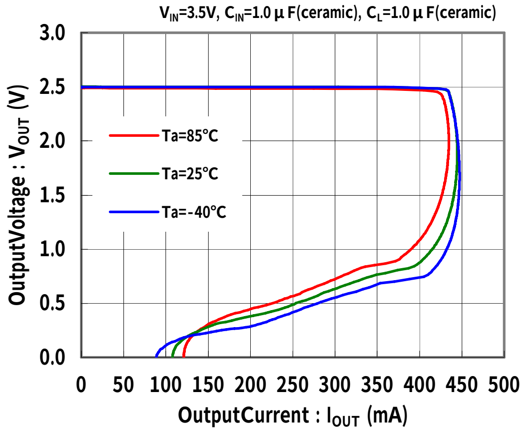
XC6421(V_{OUT}=1.8V)

Ta=25°C
C_{IN}=1.0μF(ceramic), C_L=1.0μF(ceramic)



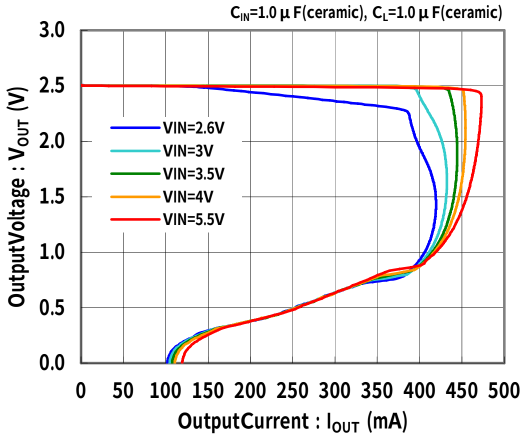
XC6421(V_{OUT}=2.5V)

V_{IN}=3.5V, C_{IN}=1.0μF(ceramic), C_L=1.0μF(ceramic)



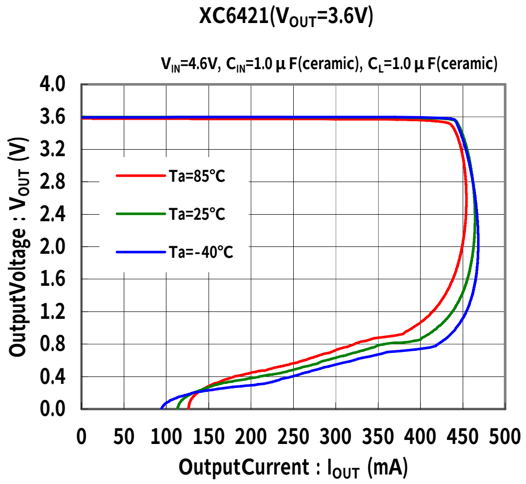
XC6421(V_{OUT}=2.5V)

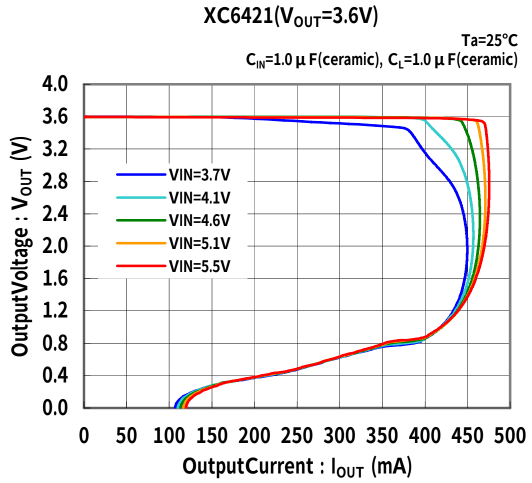
Ta=25°C
C_{IN}=1.0μF(ceramic), C_L=1.0μF(ceramic)



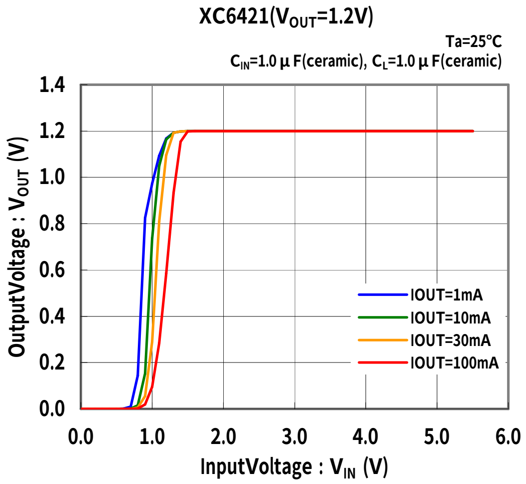
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

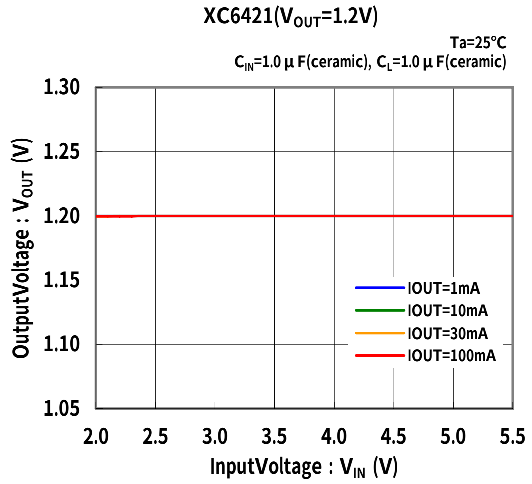
(1) OutputVoltage vs. OutputCurrent

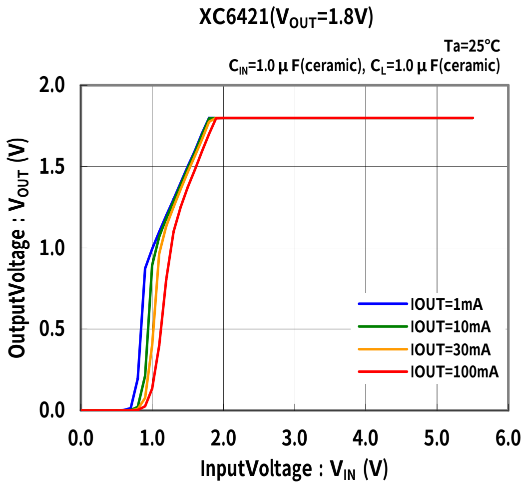


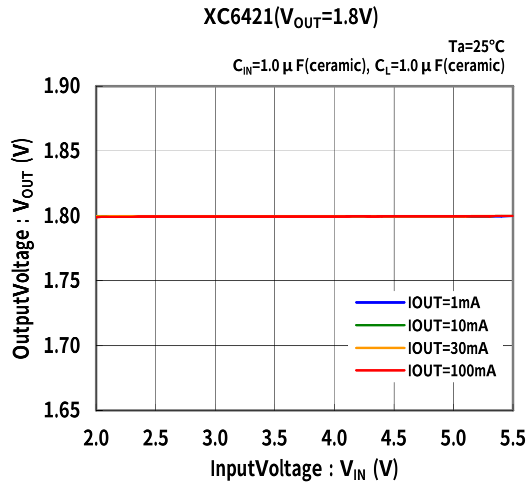


(2) OutputVoltage vs. InputVoltage



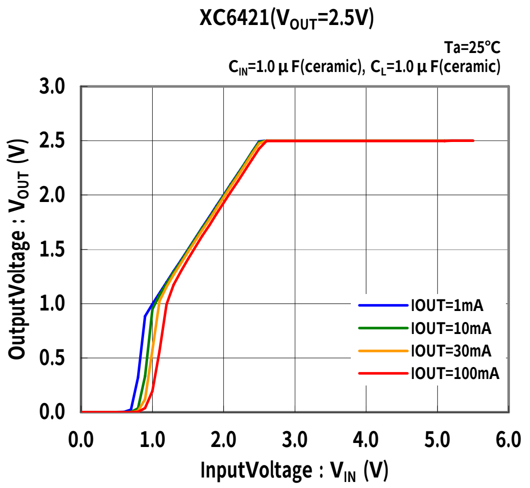


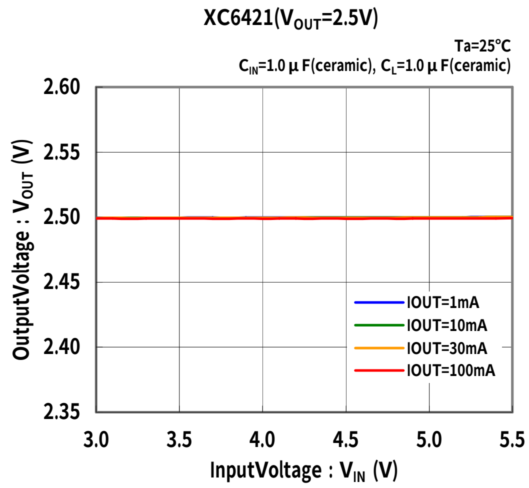


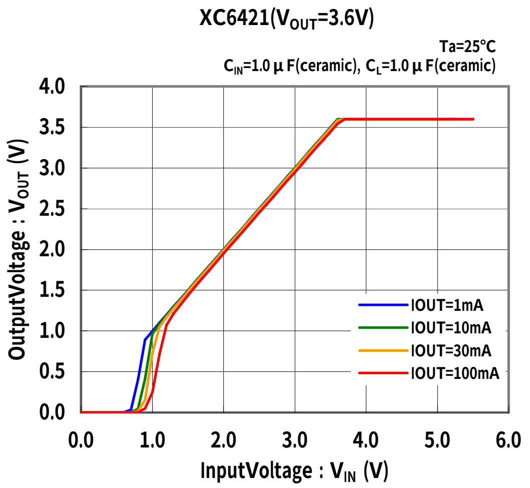


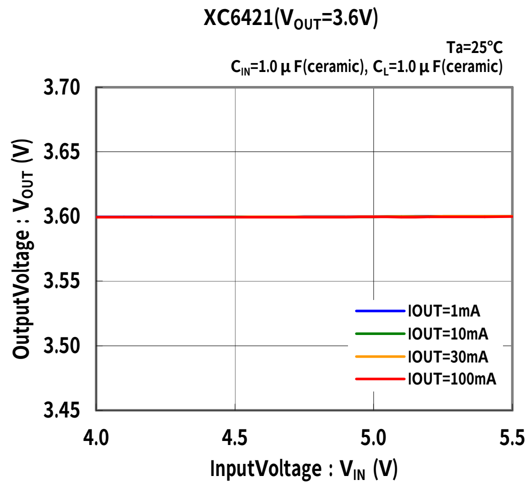
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(2) OutputVoltage vs. InputVoltage

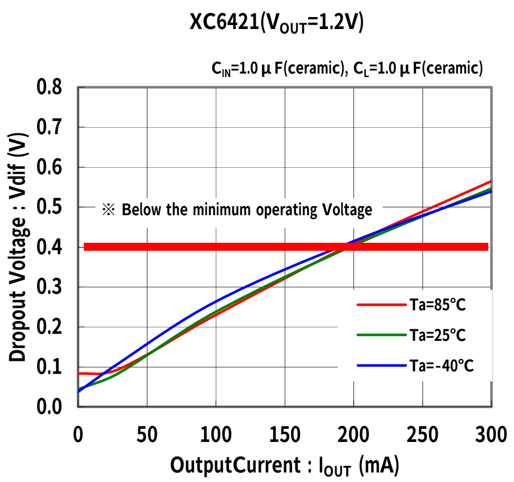


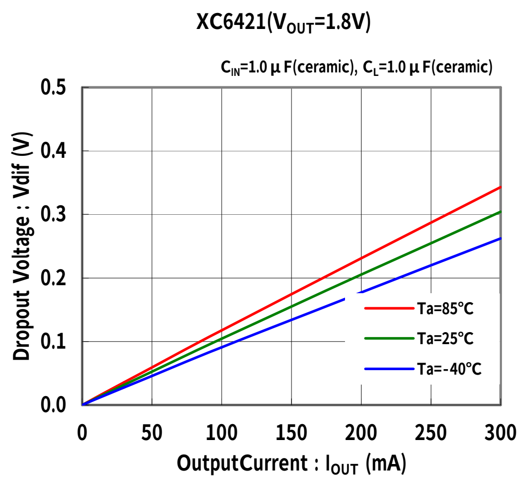






(3) DropoutVoltage vs. OutputCurrent

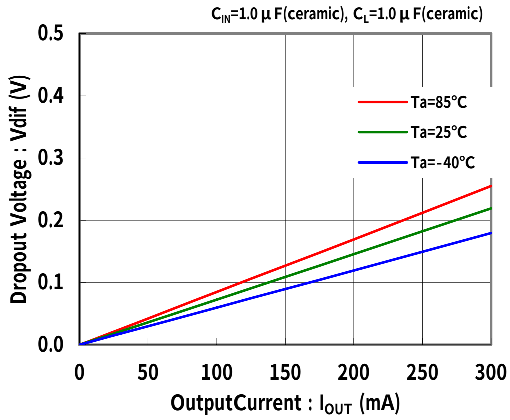




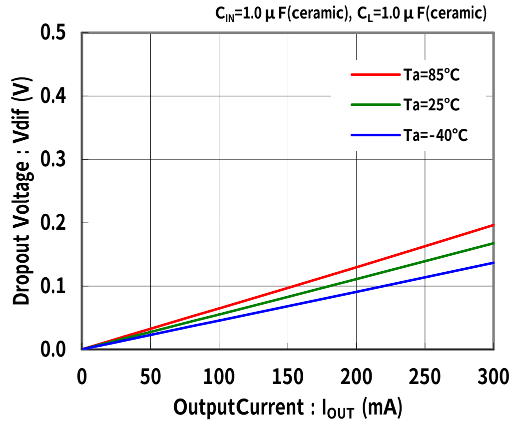
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) DropoutVoltage vs. OutputCurrent

XC6421(V_{OUT}=2.5V)

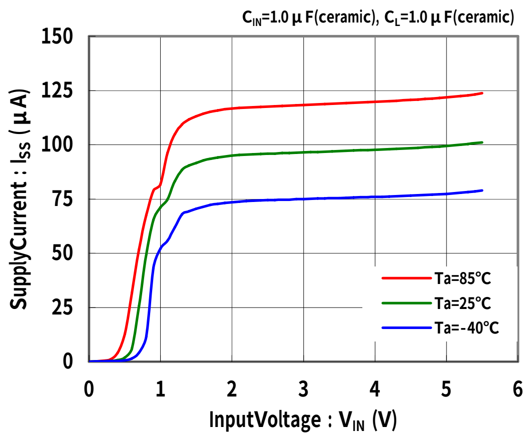


XC6421(V_{OUT}=3.6V)

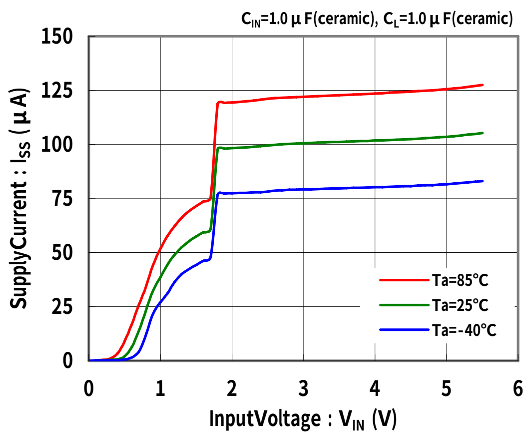


(4) SupplyCurrent vs. InputVoltage

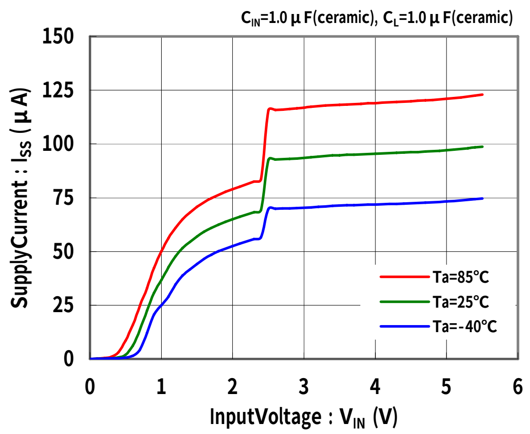
XC6421(V_{OUT}=1.2V)



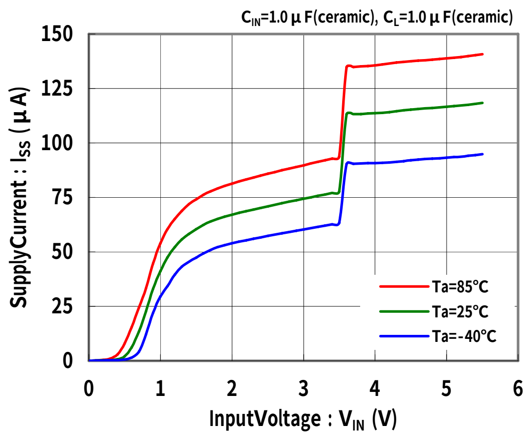
XC6421(V_{OUT}=1.8V)



XC6421(V_{OUT}=2.5V)



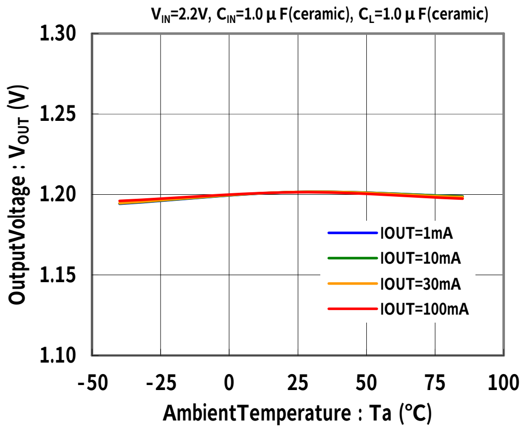
XC6421(V_{OUT}=3.6V)



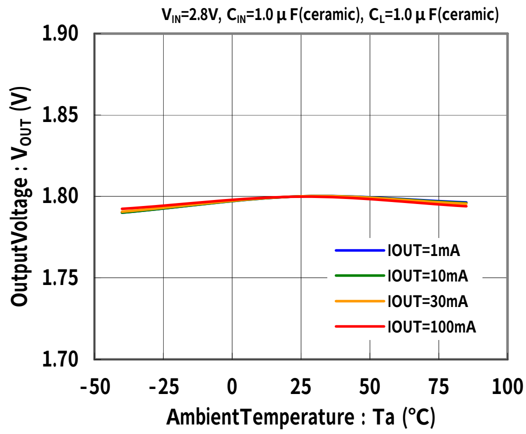
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(5) OutputVoltage vs. AmbientTemperature

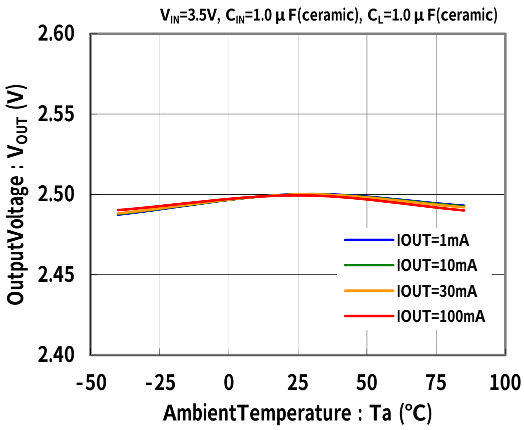
XC6421(V_{OUT}=1.2V)



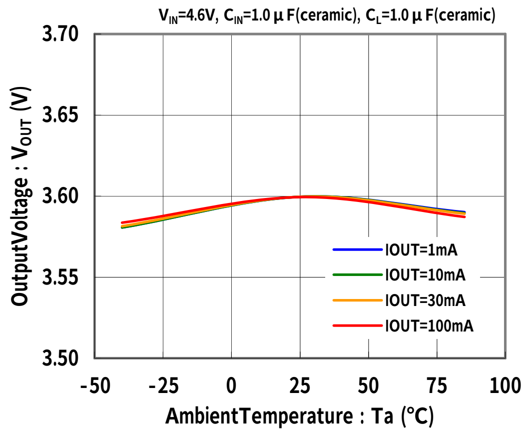
XC6421(V_{OUT}=1.8V)



XC6421(V_{OUT}=2.5V)

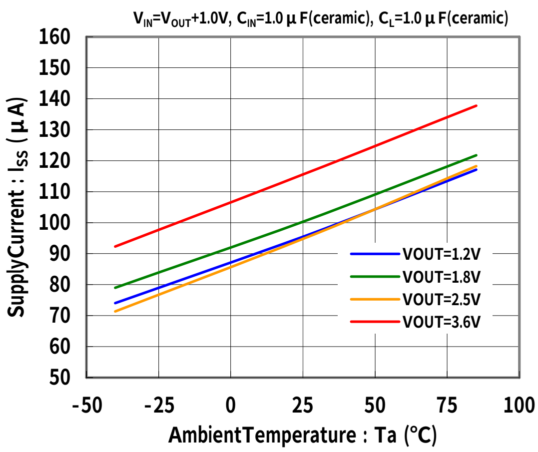


XC6421(V_{OUT}=3.6V)



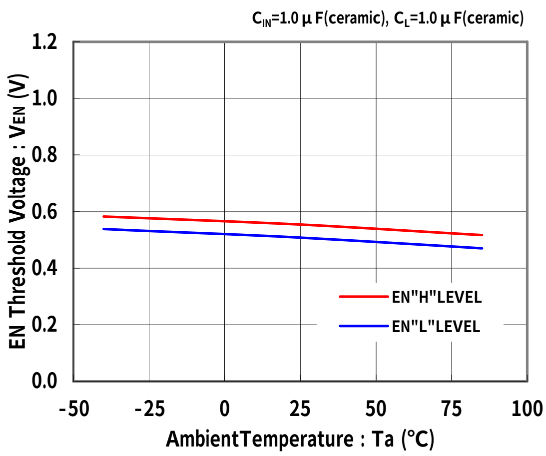
(6) SupplyCurrent vs. AmbientTemperature

XC6421



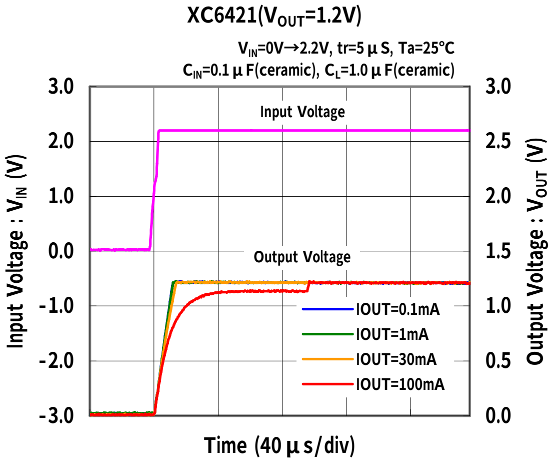
(7) EN Threshold Voltage vs. AmbientTemperature

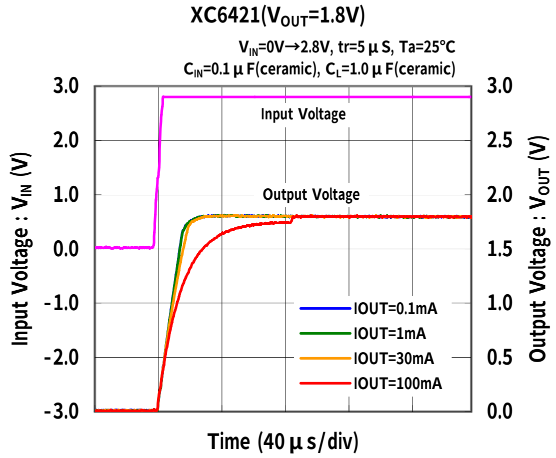
XC6421

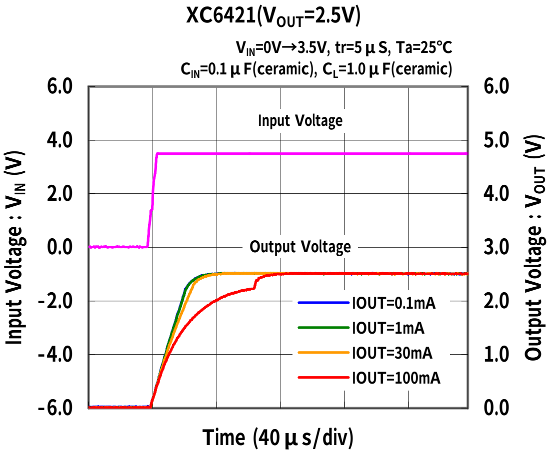


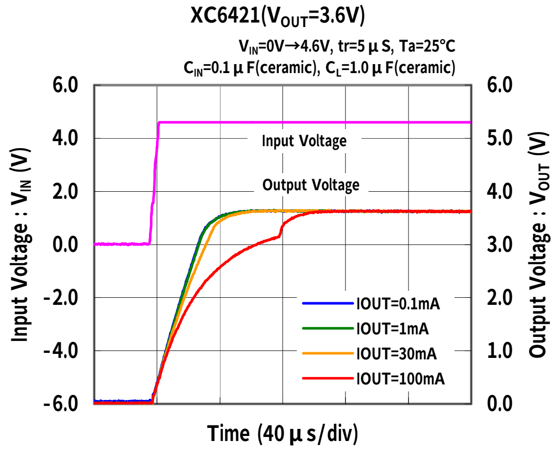
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(8) Rising Response Time

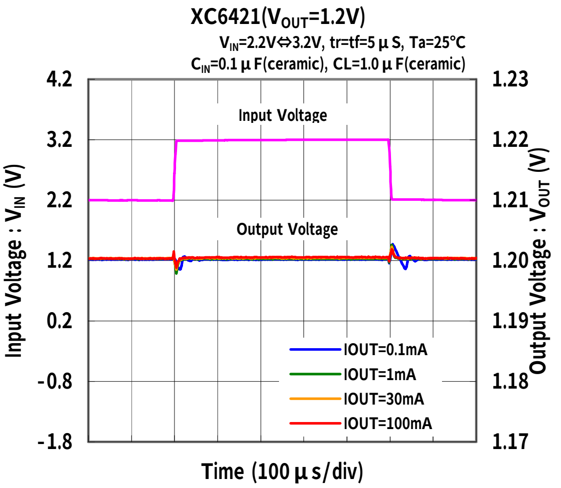


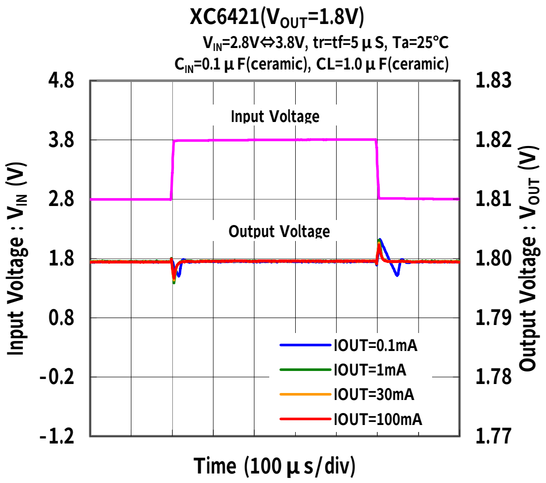






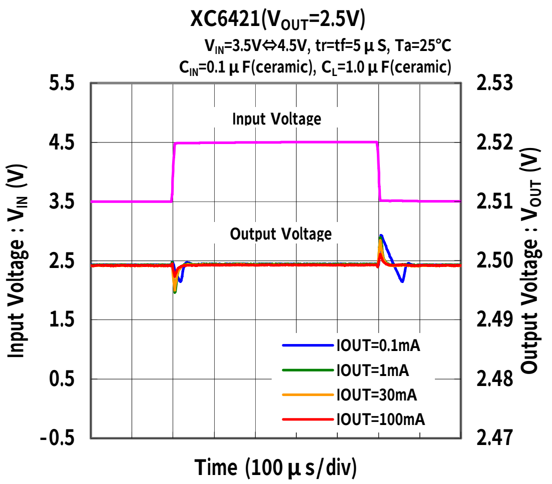
(9) Input Transient Response

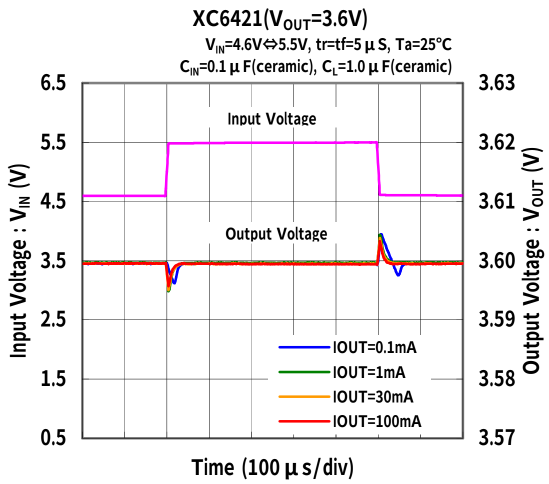




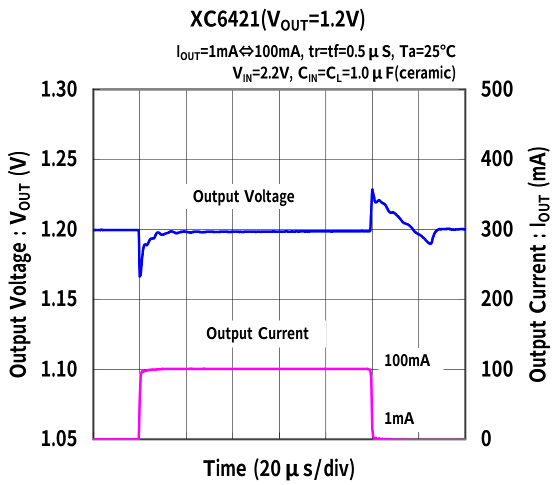
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

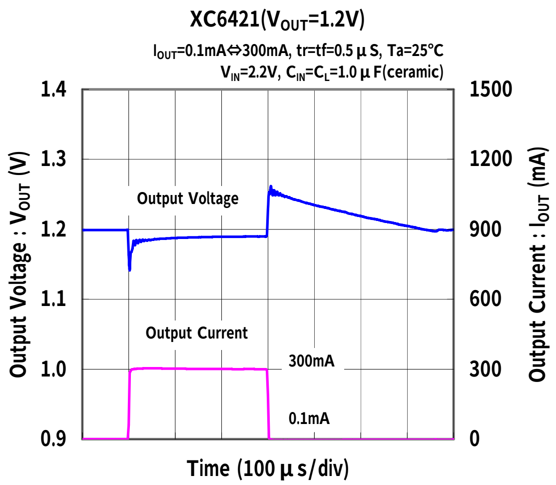
(9) Input Transient Response

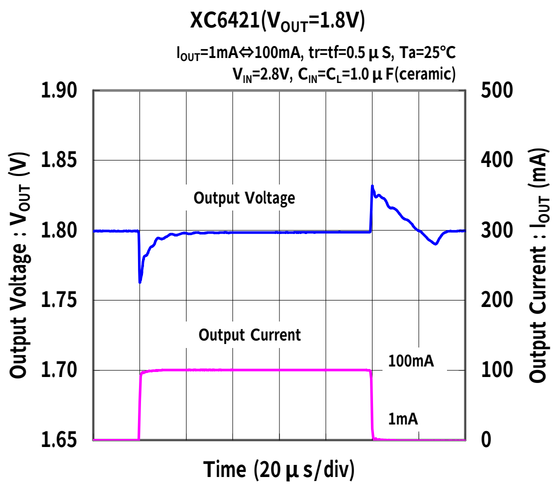


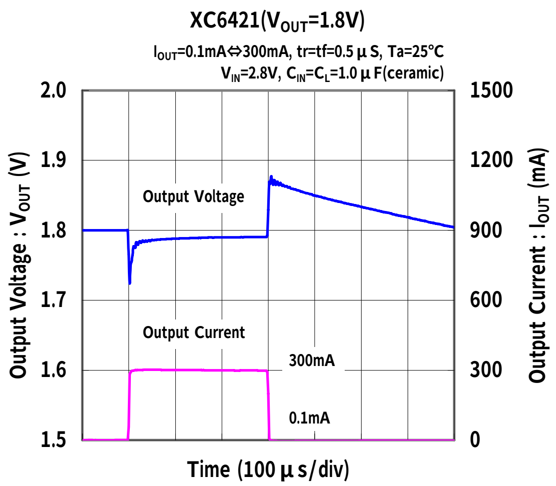


(10) Load Transient Response



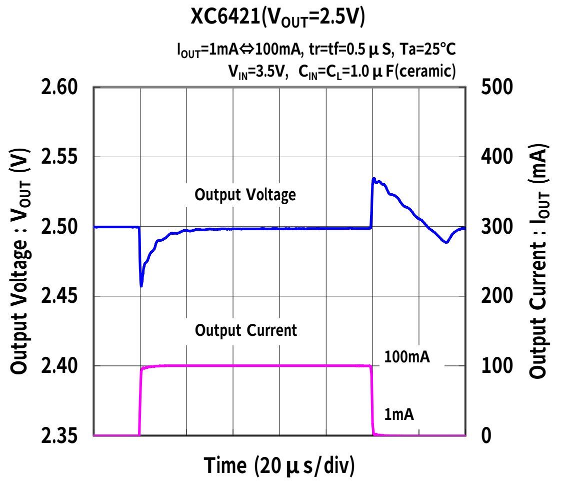


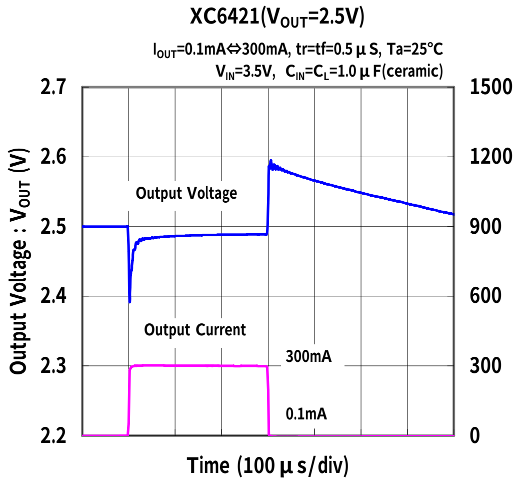


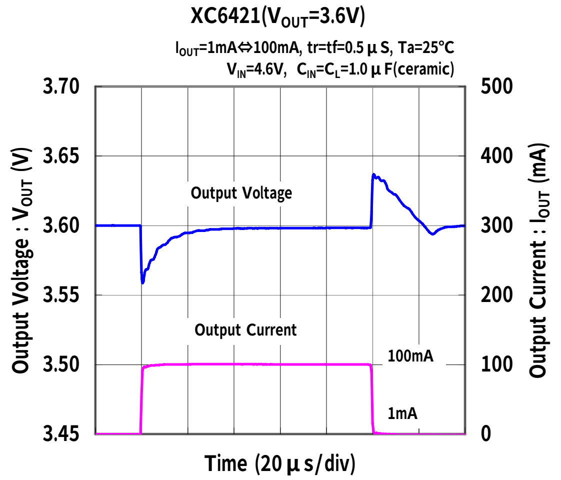


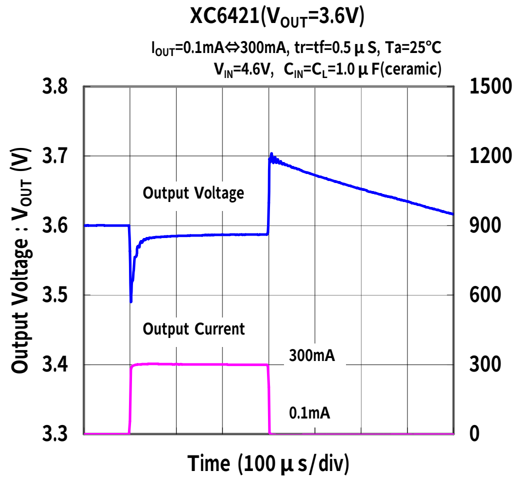
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(10) Load Transient Response

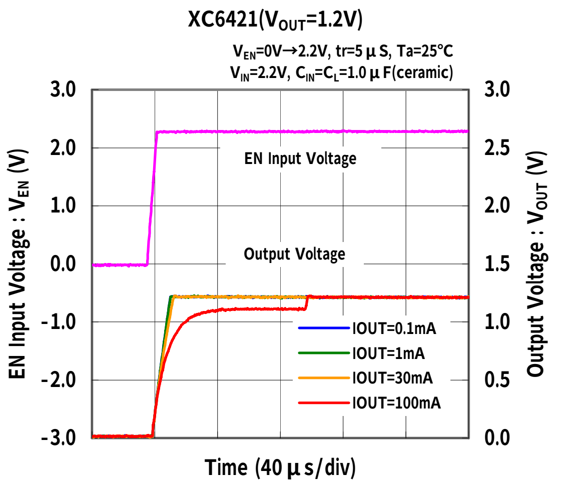


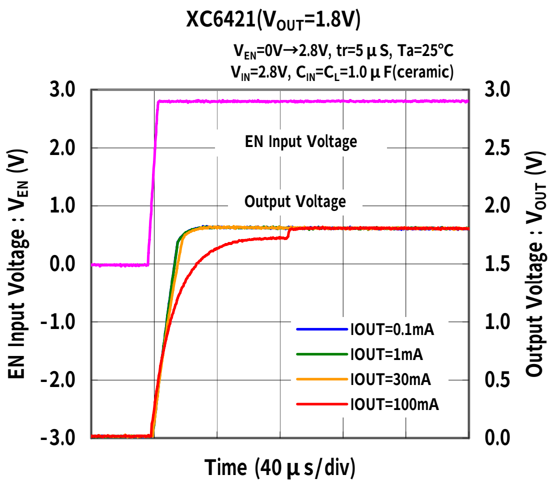






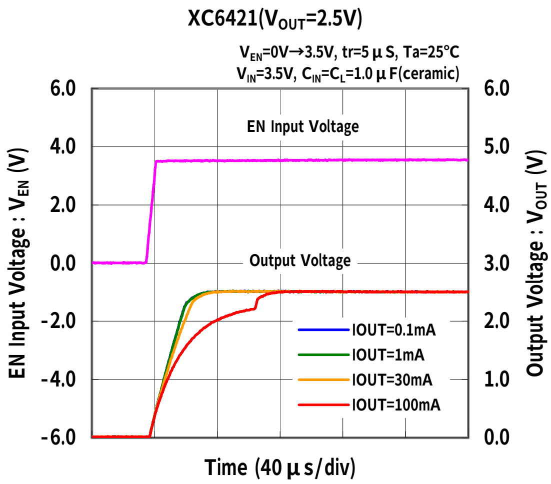
(11) EN Rising Respose Time

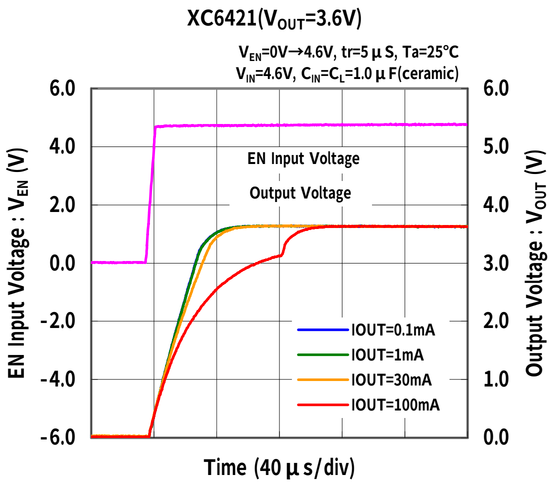




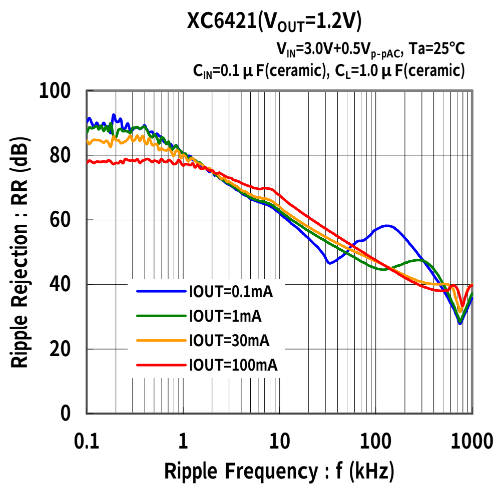
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

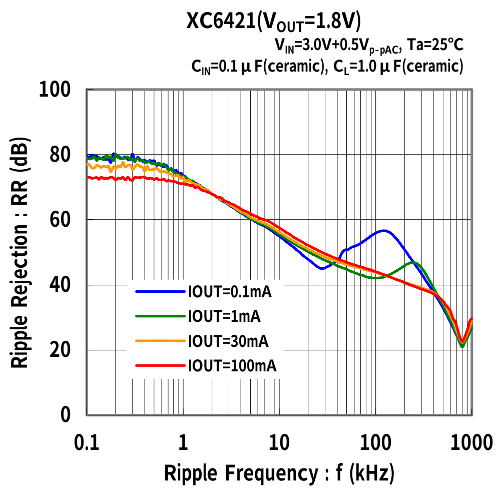
(11) EN Rising Respose Time

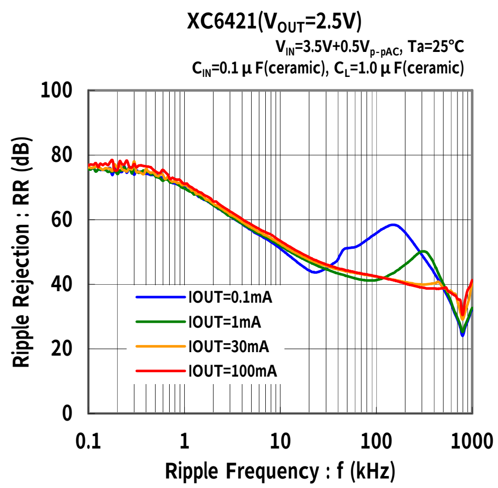


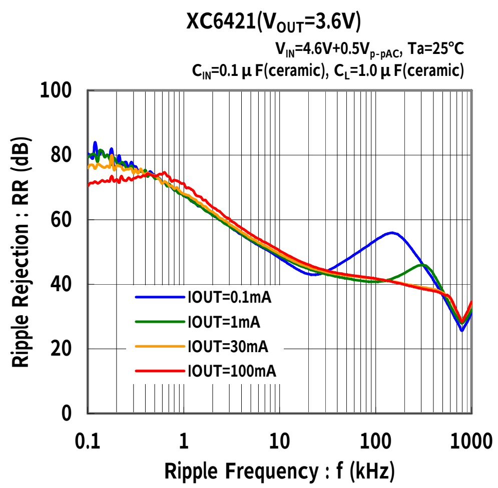


(12) Ripple Rejection Rate



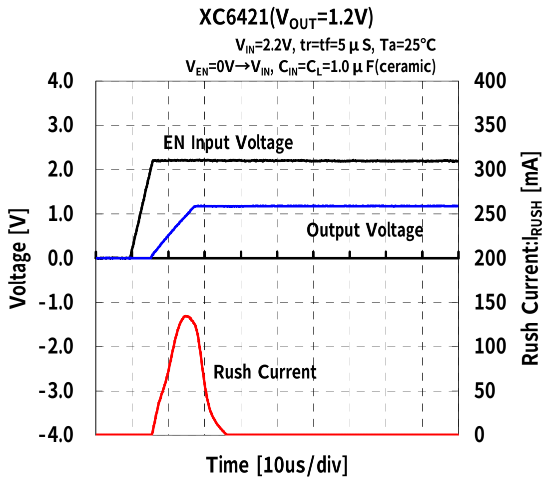


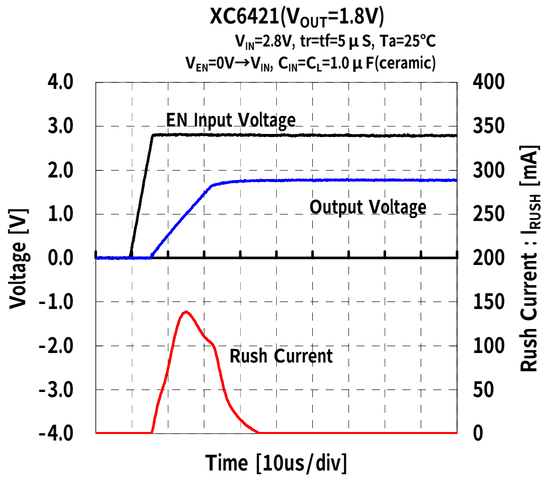


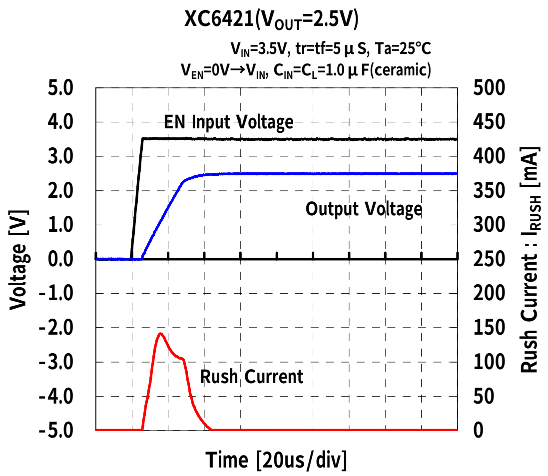


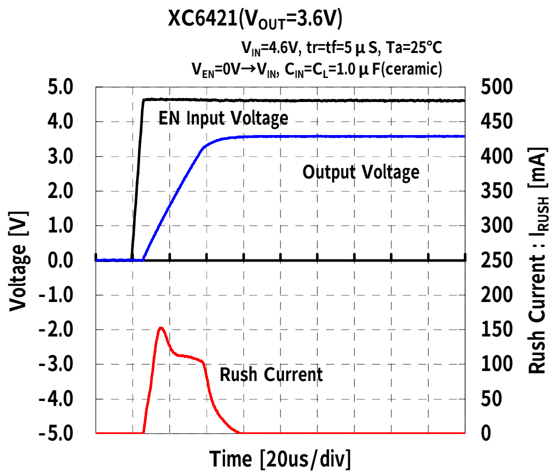
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(13) Inrush Current Response

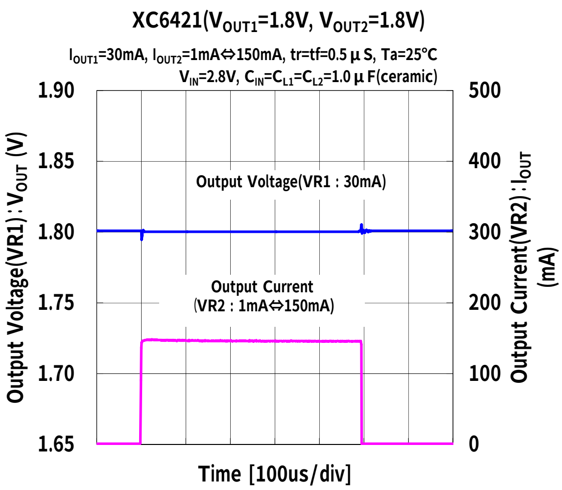


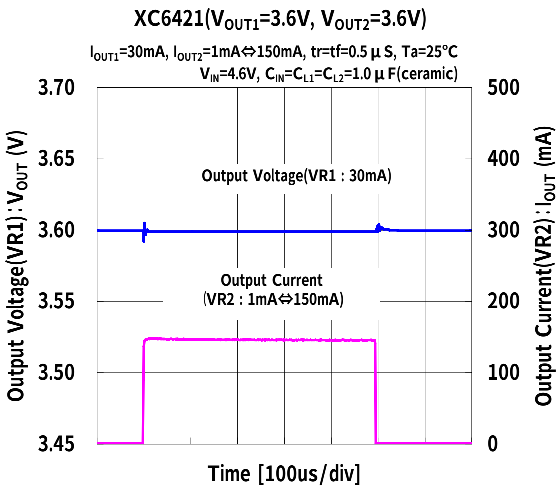






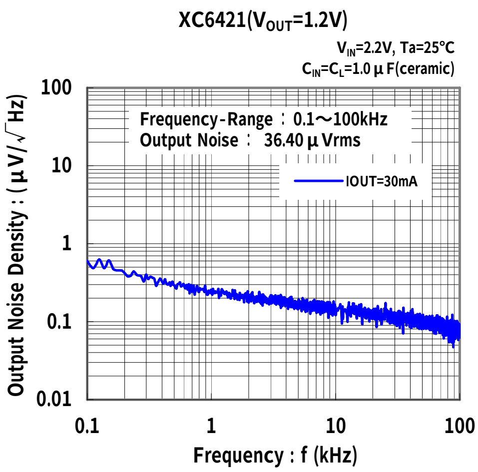
(14) Cross Talk

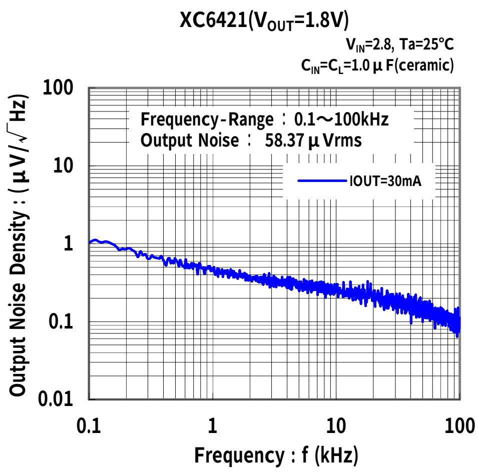


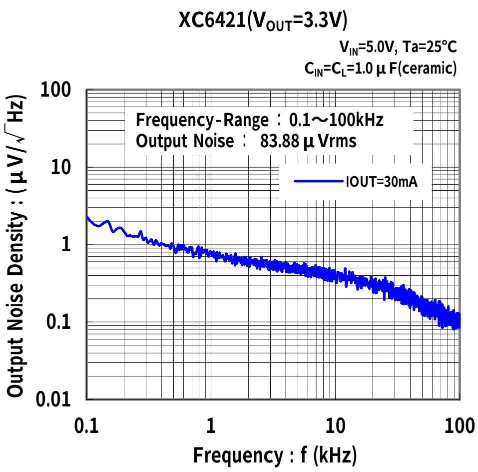


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(15) Output Noise Density



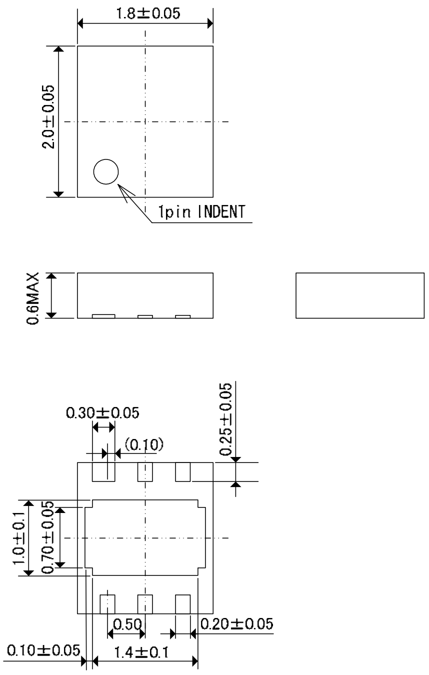




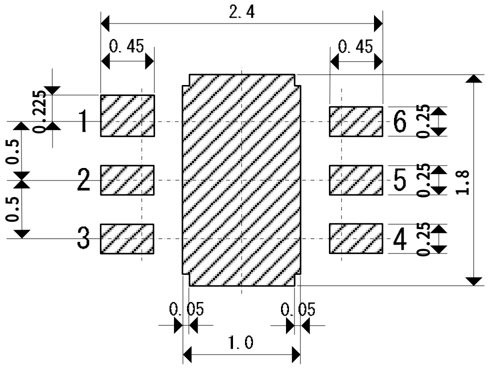
■PACKAGING INFORMATION

●USP-6C

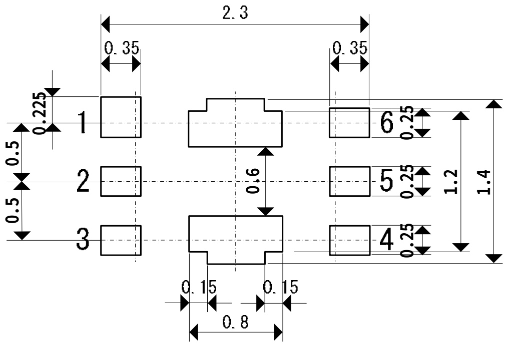
(unit : mm)



●USP-6C Reference Pattern Layout



●USP-6C Reference Metal Mask Design



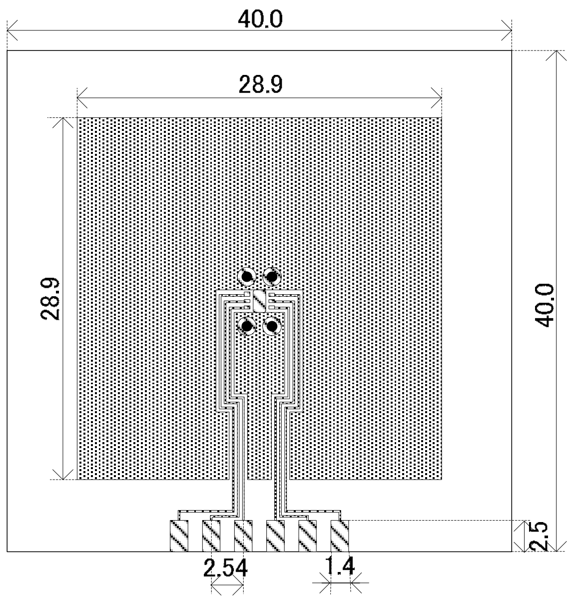
■PACKAGING INFORMATION (Continued)

● USP-6C Power Dissipation

Power dissipation data for the USP-6C is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area
In top and back faces
Package heat-sink is tied to the copper traces
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

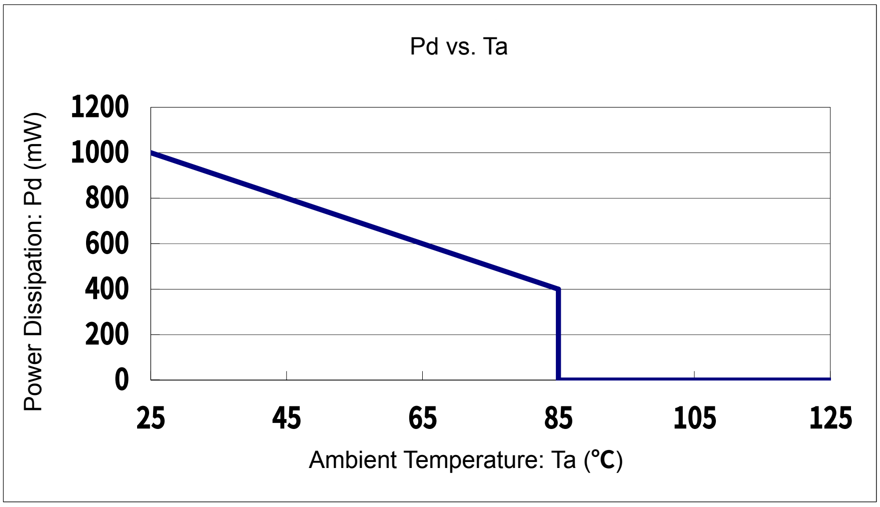


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	400	

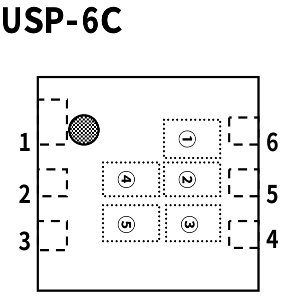


■MARKING RULE

●USP-6C

① represents product series

MARK	PRODUCT SERIES
R	XC6421******-G



②③ represents output voltage
ex.)

MARK		PRODUCT SERIES
②	③	
0	1	XC6421**01**-G

④⑤ represents production lot number
01 to 09, 0A to 0Z, 11 to 9Z, A1 to A9, AA to Z9, ZA to ZZ in order.
(G, I, J, O, Q, W excluded. No character inversion used.)

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   (e.g. Atomic energy; aerospace; transport; combustion and associated safety equipment thereof.)
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