XC6210 Series

ETR0317_006

High Current, High Speed LDO Regulators

■GENERAL DESCRIPTION

The XC6210 series are precise, low noise, high current, positive voltage low dropout regulators. They are fabricated using Torex's CMOS process.
The series features a voltage reference, an error amplifier, a current limiter, and a phase compensation circuit plus a driver transistor.
With a low ON resistance driver transistor built into, batteries can be used until input-output voltage differential is minimal and can accordingly be used for a longer time.
The series is also compatible with low ESR ceramic capacitors which give added output stability.
The output voltage of the LDO is selectable in 0.05V increments within the range of 0.80V to 5.00V.
The current limiter's foldback circuit also operates as the output current limiter and the output pin protection.
The IC's internal regulator circuit can be placed in stand-by mode via the CE function. In the stand-by mode, power consumption is greatly reduced.

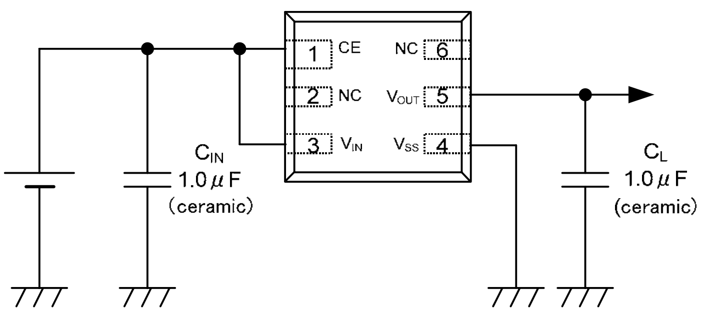
■APPLICATIONS

- ●Optical disk drive
- ●Magnetic disk drive
- ●Digital still cameras / Camcorders
- ●Digital audio equipments
- ●Multi-function power supplies

■FEATURES

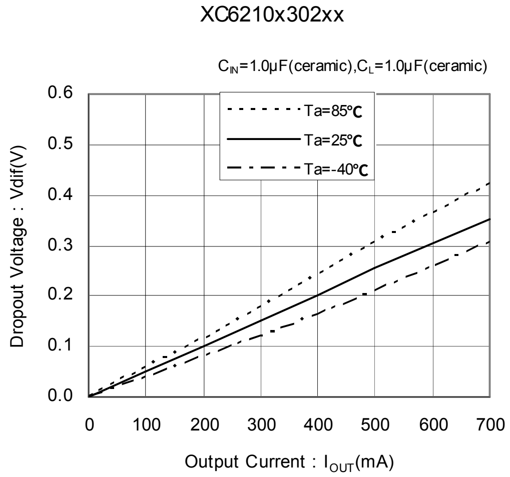
Maximum Output Current : More than 700mA (800mA limit, TYP.) (1.60V≦V_{OUT}≦5.00V)
Dropout Voltage : 50mV @ 100mA
: 100mV @ 200mA
Operating Voltage Range : 1.50V ~ 6.00V
Output Voltage Range : 0.80V ~ 5.00V (0.05V increments)
Highly Accurate : ±2% (1.55V≦V_{OUT}≦5.00V)
±30mV (0.80V≦V_{OUT}≦1.50V)
Low Power Consumption : 35μA (TYP.)
High Ripple Rejection : 60dB @1kHz
Operational Ambient Temperature : -40℃ ~ +85℃
CMOS
Low ESR Capacitor Compatible
Packages : SOT-25
SOT-89-5
USP-6B
Environmentally Friendly : EU RoHS Compliant, Pb Free

■TYPICAL APPLICATION CIRCUIT

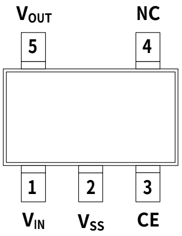


■TYPICAL PERFORMANCE CHARACTERISTICS

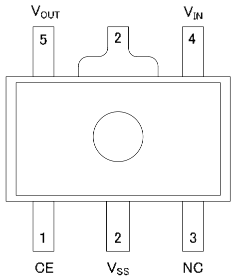
●Dropout Voltage vs. Output Current



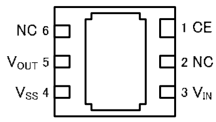
■PIN CONFIGURATION



SOT-25
(TOP VIEW)



SOT-89-5
(TOP VIEW)



USP-6B
(BOTTOM VIEW)

*The dissipation pad for the USP-6B package should be solder-plated in reference 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} pins.

■PIN ASSIGNMENT

PIN NUMBER			PIN NAME	FUNCTION
SOT-25	SOT-89-5	USP-6B		
3	1	1	CE	ON/OFF Control
1	4	3	V_{IN}	Power Input
2	2	4	V_{SS}	Ground
5	5	5	V_{OUT}	Output
4	3	2, 6	NC	No Connection

■LOGIC CONDIFION FOR THE PIN

PIN NAME	DESIGNATOR	CONDITIONS
CE	H	$1.3V \leqq V_{CE} \leqq 6.0V$
	L	$V_{CE} \leqq 0.25V$

* V_{CE} ： CE pin voltage

■PIN FUNCTION ASSIGNMENT

1) XC6210A Type (CE High Active、CE pull-down resistor)

CE	IC Operation ON/OFF
"H" Level	ON
"L" Level	OFF
"OPEN"	OFF

2) XC6210B Type (CE High Active、CE no pull-down resistor)

CE	IC Operation ON/OFF
"H" Level	ON
"L" Level	OFF
"OPEN"	Undefined state

3) XC6210C Type (CE Low Active、CE pull-up resistor)

CE	IC Operation ON/OFF
"H" Level	OFF
"L" Level	ON
"OPEN"	OFF

4) XC6210D Type (CE Low Active、CE no pull-up resistor)

CE	IC Operation ON/OFF
"H" Level	OFF
"L" Level	ON
"OPEN"	Undefined state

■PRODUCT CLASSIFICATION

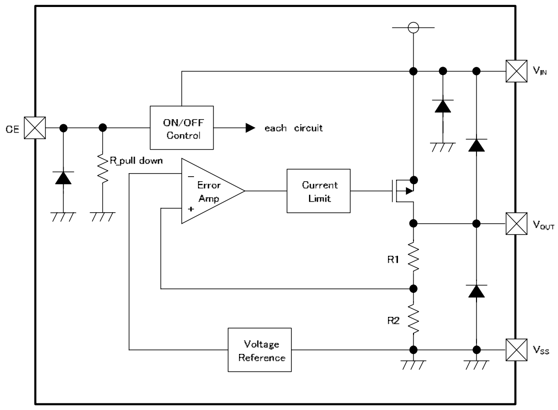
●Ordering Information

XC6210 ①②③④⑤⑥-⑦(*1)

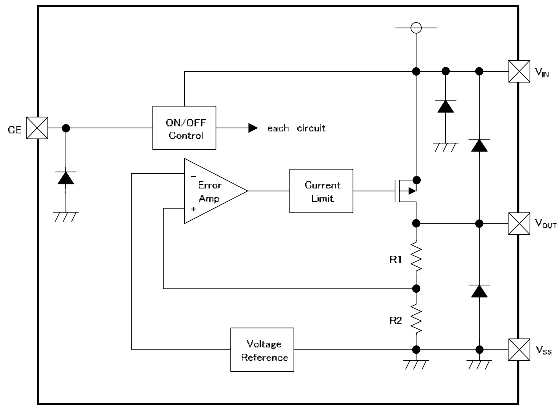
DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	CE Pin Functions	A	High Active with pull-down resistor
		B	High Active with no pull-down resistor
		C	Low Active with pull-up resistor
		D	Low Active with no pull-up resistor
②③	Output Voltage	08~50	ex.) 3.00V → ②=3, ③=0
④	Output Voltage (The second place of decimal point)	2	0.10V increments ex.) 3.00V→②=3, ③=0, ④=2
		A	0.05V increments ex.) 3.05V→②=3, ③=0, ④=A
⑤⑥-⑦(*1)	Packages (Oder Unit)	MR	SOT-25 (3,000/Reel)
		MR-G	SOT-25 (3,000/Reel)
		PR	SOT-89-5 (1,000/Reel)
		PR-G	SOT-89-5 (1,000/Reel)
		DR	USP-6B (3,000/Reel)
		DR-G	USP-6B (3,000/Reel)

(*1) The “-G” suffix indicates that the products are Halogen and Antimony free as well as being fully EU RoHS compliant.

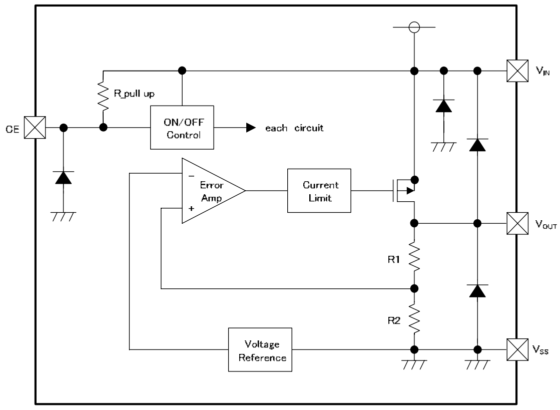
■BLOCK DIAGRAM



XC6210A Series



XC6210B/D Series



XC6210C Series

*Diodes shown in the above circuit are ESD protection diodes and parasitic diodes

■ABSOLUTE MAXIMUM RATINGS

Ta=25℃

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		V_{IN}	6.5	V
Output Current *		I_{OUT}	900	mA
Output Voltage		V_{OUT}	V_{SS} -0.3 ~ V_{IN} +0.3	V
CE Pin Voltage		V_{CE}	V_{SS} -0.3 ~ 6.5	V
Power Dissipation	SOT-25	Pd	250	mW
			600 (**PCB mounted**) *2	
	SOT-89-5		500	
			1300 (**PCB mounted**) *2	
	USP-6B		100	
			1000 (**PCB mounted**) *2	
Operating Temperature Range		Topr	- 40 ~ + 85	℃
Storage Temperature Range		Tstg	- 55 ~ + 125	℃

*1: I_{OUT}=Pd / (V_{IN} – V_{OUT})

*2: The power dissipation figure shown is PCB mounted. Please refer to pages 22 to 24 for details.

■ELECTRICAL CHARACTERISTICS

●XC6210 series

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage	$V_{OUT(E)}$ (*3)	$V_{IN}=V_{OUT(T)}+1.0V$, $I_{OUT}=30mA$ V_{CE}=ON (V_{IN} or V_{SS}) ($V_{OUT(T)}>1.50V$)	x 0.98	$V_{OUT(T)}$ (*2)	x 1.02	V	①
		$V_{IN}=V_{OUT(T)}+1.0V$, $I_{OUT}=30mA$, V_{CE}=ON(V_{IN} or V_{SS})($V_{OUT(T)}\leqq 1.50V$)	(-30mV)	$V_{OUT(T)}$ (*2)	(+30mV)		
Maximum Output Current	I_{OUTMAX}	$V_{IN}=V_{OUT(T)}+1.0V$, V_{CE}=ON(V_{IN} or V_{SS}) ($V_{OUT(T)}>1.50V$)	700	-	-	mA	①
		$V_{IN}=V_{OUT(T)}+1.0V$, V_{CE}=ON(V_{IN} or V_{SS}) ($V_{OUT(T)}\leqq 1.50V$)	500	-	-		
Load Regulation	$\triangle V_{OUT}$	$1mA \leq I_{OUT} \leq 100mA$, V_{CE}=ON(V_{IN} or V_{SS})	-	15	60	mV	①
Dropout Voltage	Vdif1 (*4)	$I_{OUT}=30mA$, V_{CE}=ON(V_{IN} or V_{SS})	E-1			mV	①
	Vdif2 (*4)	$I_{OUT}=100mA$, V_{CE}=ON(V_{IN} or V_{SS})	E-2				
Supply Current (A type)	I_{DD}	$V_{IN}=V_{CE}=V_{OUT(T)}+1.0V$	E-3			μA	②
Supply Current (B type)		$V_{IN}=V_{CE}=V_{OUT(T)}+1.0V$	-	35	55		
Supply Current (C type)		$V_{IN}=V_{OUT(T)}+1.0V$, $V_{CE}=V_{SS}$	E-3				
Supply Current (D type)		$V_{IN}=V_{OUT(T)}+1.0V$, $V_{CE}=V_{SS}$	-	35	55		
Stand-by Current	I_{STBY}	$V_{IN}=6.0V$, V_{CE}=OFF(V_{IN} or V_{SS})	-0.10	-	0.10	μA	②
Line Regulation	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	$V_{OUT(T)}+1.0V \leqq V_{IN} \leqq 6.0V$ V_{CE}=ON(V_{IN} or V_{SS}), $I_{OUT}=30mA$ $V_{OUT(T)}<4.50V$	-	0.01	0.20	% / V	①
		$5.5V \leqq V_{IN} \leqq 6.0V$ V_{CE}=ON(V_{IN} or V_{SS}), $I_{OUT}=30mA$ $V_{OUT(T)}\geqq 4.50V$					
Input Voltage	V_{IN}	-	1.5	-	6.0	V	-
Output Voltage Temperature Characteristics	$\frac{\triangle V_{OUT}}{\triangle Topr \cdot \triangle V_{OUT}}$	$I_{OUT}=30mA$, V_{CE}=ON (V_{IN} or V_{SS}) $-40℃ \leqq Topr \leqq 85℃$	-	±100	-	ppm/℃	①
Ripple Rejection Rate	PSRR	$V_{IN}=[V_{OUT(T)}+1.0]V_{DC}+0.5V_{P-PAC}$ V_{CE}=ON(V_{IN} or V_{SS}), $I_{OUT}=30mA$, f=1kHz $V_{OUT(T)}<4.75V$	-	60	-	dB	③
		$V_{IN}=5.75V_{DC}+0.5V_{P-PAC}$ V_{CE}=ON(V_{IN} or V_{SS}), $I_{OUT}=30mA$, f=1kHz $V_{OUT(T)}\geqq 4.75V$					
Current Limiter	I_{LIM}	$V_{IN}=V_{OUT(T)}+1.0V$, V_{CE}=ON(V_{IN} or V_{SS}) $V_{OUT(T)}>1.50V$	700	800	-	mA	①
		$V_{IN}=V_{OUT(T)}+1.0V$, V_{CE}=ON(V_{IN} or V_{SS}) $V_{OUT(T)}\leqq 1.50V$	-	800	-		
Short-Circuit Current	I_{SHORT}	$V_{IN}=V_{OUT(T)}+1.0V$, V_{CE}=ON(V_{IN} or V_{SS})	-	50	-	mA	①
CE "High" Level Voltage	V_{CEH}	-	1.3	-	6.0	V	①
CE "Low" Level Voltage	V_{CEL}	-	-	-	0.25		
CE "High" Level Current (A type)	I_{CEH}	$V_{CE}=V_{IN}=V_{OUT(T)}+1.0V$	E-4	-	E-4	μA	①
CE "High" Level Current (B / C / D type)		$V_{CE}=V_{IN}=V_{OUT(T)}+1.0V$	- 0.10	-	0.10		
CE "Low" Level Current (C type)	I_{CEL}	$V_{IN}=V_{OUT(T)}+1.0V$, $V_{CE}=V_{SS}$	E-5	-	E-5	μA	①
CE "Low" Level Current (A / B / D type)		$V_{IN}=V_{OUT(T)}+1.0V$, $V_{CE}=V_{SS}$	- 0.10	-	0.10		

NOTE:

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

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

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

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

*4: Vdif ={V_{IN1} (*6) - V_{OUT1} (*5) }

*5: A voltage equal to 98% of the output voltage whenever a stabilized $V_{OUT1}=I_{OUT}\{V_{OUT(T)}+1.0V\}$ is input.

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

*7: V_{CE} conditions: XC6210A / B type: ON=V_{IN}, OFF=V_{SS}

XC6210C / D type: ON=V_{SS}, OFF=V_{IN}

■VOLTAGE CHART

●Dropout Voltage, Supply Current, CE “H / L” Level Current Chart

Ta=25℃

<table>
<tr><th rowspan="2">SETTING OUTPUT VOLTAGE</th><th colspan="2" rowspan="2">OUTPUT VOLTAGE</th><th colspan="2">E-1</th><th colspan="2">E-2</th><th colspan="2">E-3</th><th colspan="2">E-4</th><th colspan="2">E-5</th></tr>
<tr><th colspan="2">DROPOUT VOLTAGE 1 (I_{OUT}=30mA)</th><th colspan="2">DROPOUT VOLTAGE 2 (I_{OUT}=100mA)</th><th colspan="2">SUPPLY CURRENT</th><th colspan="2">CE “H” LEVEL CURRENT</th><th colspan="2">CE “L” LEVEL CURRENT</th></tr>
<tr><th>(V)</th><th colspan="2">(V)</th><th colspan="2">(mV)</th><th colspan="2">(mV)</th><th colspan="2">(μA)</th><th colspan="2">(μA)</th><th colspan="2">(μA)</th></tr>
<tr><th rowspan="2">$V_{OUT(T)}$</th><th colspan="2">V_{OUT}</th><th colspan="2">Vdif1</th><th colspan="2">Vdif2</th><th colspan="2">I_{DD}</th><th colspan="2">I_{CEH}</th><th colspan="2">I_{CEL}</th></tr>
<tr><th>MIN.</th><th>MAX.</th><th>TYP.</th><th>MAX.</th><th>TYP.</th><th>MAX.</th><th>TYP.</th><th>MAX.</th><th>MIN.</th><th>MAX.</th><th>MIN.</th><th>MAX.</th></tr>
<tr><td>0.80</td><td>0.770</td><td>0.830</td><td rowspan="4">100.0</td><td rowspan="2">700.0</td><td rowspan="4">250.0</td><td rowspan="2">800.0</td><td rowspan="4">38.0</td><td rowspan="4">60.0</td><td rowspan="4">1.50</td><td rowspan="4">5.00</td><td rowspan="4">-5.00</td><td rowspan="4">-1.50</td></tr>
<tr><td>0.85</td><td>0.820</td><td>0.880</td></tr>
<tr><td>0.90</td><td>0.870</td><td>0.930</td><td rowspan="2">600.0</td><td rowspan="2">700.0</td></tr>
<tr><td>0.95</td><td>0.920</td><td>0.980</td></tr>
<tr><td>1.00</td><td>0.970</td><td>1.030</td><td rowspan="4">50.0</td><td rowspan="2">500.0</td><td rowspan="4">150.0</td><td rowspan="2">600.0</td><td rowspan="10">38.5</td><td rowspan="10">61.5</td><td rowspan="10">2.00</td><td rowspan="10">6.50</td><td rowspan="10">-6.50</td><td rowspan="10">-2.00</td></tr>
<tr><td>1.05</td><td>1.020</td><td>1.080</td></tr>
<tr><td>1.10</td><td>1.070</td><td>1.130</td><td rowspan="2">400.0</td><td rowspan="2">500.0</td></tr>
<tr><td>1.15</td><td>1.120</td><td>1.180</td></tr>
<tr><td>1.20</td><td>1.170</td><td>1.230</td><td rowspan="6">30.0</td><td rowspan="2">300.0</td><td rowspan="6">100.0</td><td rowspan="2">400.0</td></tr>
<tr><td>1.25</td><td>1.220</td><td>1.280</td></tr>
<tr><td>1.30</td><td>1.270</td><td>1.330</td><td rowspan="2">200.0</td><td rowspan="2">300.0</td></tr>
<tr><td>1.35</td><td>1.320</td><td>1.380</td></tr>
<tr><td>1.40</td><td>1.370</td><td>1.430</td><td rowspan="2">100.0</td><td rowspan="2">250.0</td></tr>
<tr><td>1.45</td><td>1.420</td><td>1.480</td></tr>
<tr><td>1.50</td><td>1.470</td><td>1.530</td><td rowspan="10">27.0</td><td rowspan="10">41.0</td><td rowspan="10">90.0</td><td rowspan="10">135.0</td><td rowspan="10">39.0</td><td rowspan="10">63.0</td><td rowspan="10">2.50</td><td rowspan="10">8.00</td><td rowspan="10">-8.00</td><td rowspan="10">-2.50</td></tr>
<tr><td>1.55</td><td>1.519</td><td>1.581</td></tr>
<tr><td>1.60</td><td>1.568</td><td>1.632</td></tr>
<tr><td>1.65</td><td>1.617</td><td>1.683</td></tr>
<tr><td>1.70</td><td>1.666</td><td>1.734</td></tr>
<tr><td>1.75</td><td>1.715</td><td>1.785</td></tr>
<tr><td>1.80</td><td>1.764</td><td>1.836</td></tr>
<tr><td>1.85</td><td>1.813</td><td>1.887</td></tr>
<tr><td>1.90</td><td>1.862</td><td>1.938</td></tr>
<tr><td>1.95</td><td>1.911</td><td>1.989</td></tr>
<tr><td>2.00</td><td>1.960</td><td>2.040</td><td rowspan="10">25.0</td><td rowspan="10">37.0</td><td rowspan="10">80.0</td><td rowspan="10">120.0</td><td rowspan="10">39.5</td><td rowspan="10">64.5</td><td rowspan="10">3.00</td><td rowspan="10">9.50</td><td rowspan="10">-9.50</td><td rowspan="10">-3.00</td></tr>
<tr><td>2.05</td><td>2.009</td><td>2.091</td></tr>
<tr><td>2.10</td><td>2.058</td><td>2.142</td></tr>
<tr><td>2.15</td><td>2.107</td><td>2.193</td></tr>
<tr><td>2.20</td><td>2.156</td><td>2.244</td></tr>
<tr><td>2.25</td><td>2.205</td><td>2.295</td></tr>
<tr><td>2.30</td><td>2.254</td><td>2.346</td></tr>
<tr><td>2.35</td><td>2.303</td><td>2.397</td></tr>
<tr><td>2.40</td><td>2.352</td><td>2.448</td></tr>
<tr><td>2.45</td><td>2.401</td><td>2.499</td></tr>
<tr><td>2.50</td><td>2.450</td><td>2.550</td><td rowspan="10">18.0</td><td rowspan="10">28.0</td><td rowspan="10">60.0</td><td rowspan="10">90.0</td><td rowspan="10">40.0</td><td rowspan="10">66.0</td><td rowspan="10">3.50</td><td rowspan="10">11.00</td><td rowspan="10">-11.00</td><td rowspan="10">-3.50</td></tr>
<tr><td>2.55</td><td>2.499</td><td>2.601</td></tr>
<tr><td>2.60</td><td>2.548</td><td>2.652</td></tr>
<tr><td>2.65</td><td>2.597</td><td>2.703</td></tr>
<tr><td>2.70</td><td>2.646</td><td>2.754</td></tr>
<tr><td>2.75</td><td>2.695</td><td>2.805</td></tr>
<tr><td>2.80</td><td>2.744</td><td>2.856</td></tr>
<tr><td>2.85</td><td>2.793</td><td>2.907</td></tr>
<tr><td>2.90</td><td>2.842</td><td>2.958</td></tr>
<tr><td>2.95</td><td>2.891</td><td>3.009</td></tr>
</table>

■VOLTAGE CHART (Continued)

●Dropout Voltage, Supply Current, CE “H / L” Level Current Chart

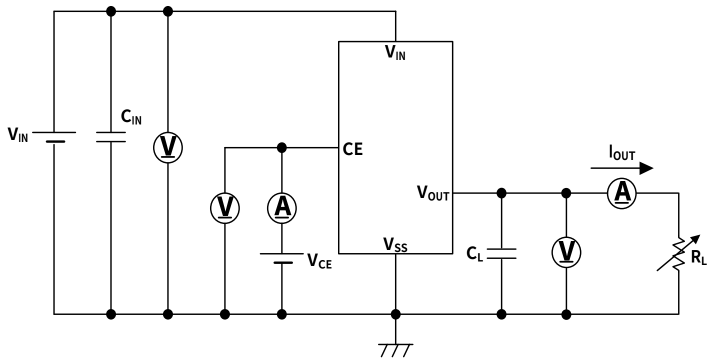
Ta=25℃

SETTING OUTPUT VOLTAGE	OUTPUT VOLTAGE		E-1 DROPOUT VOLTAGE 1 (I_{OUT}=30mA)		E-2 DROPOUT VOLTAGE 2 (I_{OUT}=100mA)		E-3 SUPPLY CURRENT		E-4 CE “H” LEVEL CURRENT		E-5 CE “L” LEVEL CURRENT	
(V)	(V)		(mV)		(mV)		(μA)		(μA)		(μA)	
$V_{OUT(T)}$	V_{OUT}		Vdif1		Vdif2		I_{DD}		I_{CEH}		I_{CEL}	
	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.
3.00	2.940	3.060	15.0	23.0	50.0	75.0	40.5	67.5	4.00	12.50	-12.50	-4.00
3.05	2.989	3.111										
3.10	3.038	3.162										
3.15	3.087	3.213										
3.20	3.136	3.264										
3.25	3.185	3.315										
3.30	3.234	3.366										
3.35	3.283	3.417										
3.40	3.332	3.468										
3.45	3.381	3.519										
3.50	3.430	3.570	15	23	50	75	41.0	69.0	4.40	14.00	-14.00	-4.40
3.55	3.479	3.621										
3.60	3.528	3.672										
3.65	3.577	3.723										
3.70	3.626	3.774										
3.75	3.675	3.825										
3.80	3.724	3.876										
3.85	3.773	3.927										
3.90	3.822	3.978										
3.95	3.871	4.029										
4.00	3.920	4.080	15.0	23.0	50.0	75.0	41.5	70.5	4.85	15.50	-15.50	-4.85
4.05	3.969	4.131										
4.10	4.018	4.182										
4.15	4.067	4.233										
4.20	4.116	4.284										
4.25	4.165	4.335										
4.30	4.214	4.386										
4.30	4.214	4.386										
4.40	4.312	4.488										
4.45	4.361	4.539										
4.50	4.410	4.590					42.0	72.0	5.30	17.00	-17.00	-5.30
4.55	4.459	4.641										
4.60	4.508	4.692										
4.65	4.557	4.743										
4.70	4.606	4.794										
4.75	4.655	4.845										
4.80	4.704	4.896										
4.85	4.753	4.947										
4.90	4.802	4.998										
4.95	4.851	5.049										
5.00	4.900	5.100										

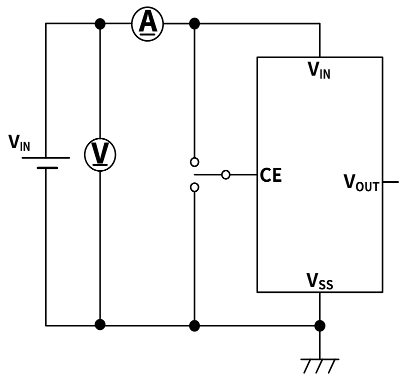
■TEST CIRCUITS

●Circuit①

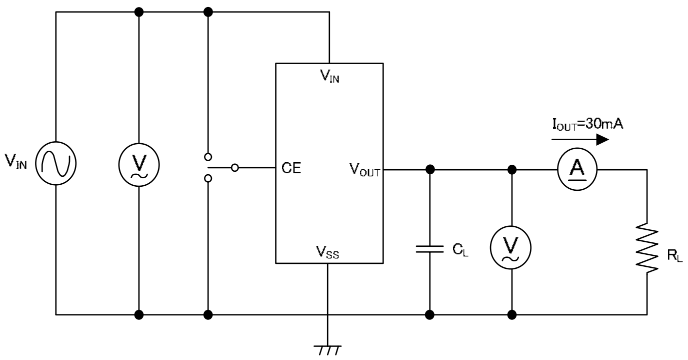
（Output Voltage, Maximum Output Voltage, Load Regulation, Dropout Voltage, Line Regulation, Output Voltage Temperature Characteristics, Current Limiter, Short-Circuit Current, CE “H” “L” Level Voltage, CE “H” “L” Level Current)



●Circuit ② (Supply Current, Stand-by Current)



●Circuit ③ (Ripple Rejection Rate)



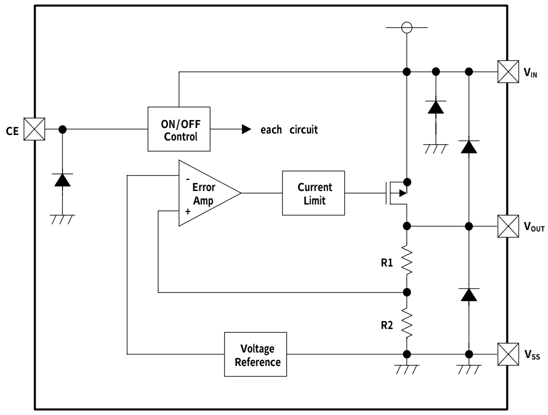
●Output Capacitor Corresponding Chart

OUTPUT VOLTAGE	CL
0.80V～1.45V	More than 6.8μF
1.50V～1.75V	More than 4.7μF
1.80V～5.00V	More than 1.0μF

■OPERATIONAL EXPLANATION

<Output Voltage Regulator Control>

The voltage, divided by resistors R1 & R2, which are connected to the V_{OUT} pin is compared with the internal reference voltage by the error amplifier. The P-channel MOSFET, which is connected to the V_{OUT} pin, is then driven by the subsequent output signal. The output voltage at the V_{OUT} pin is controlled & stabilized by negative feedback. The constant current limit circuit and short circuit protection operate in relation to the level of output current.



<Low ESR Capacitor>

With the XC6210 series regulator, a stable output voltage is achievable even if low ESR capacitors are used, as a phase compensation circuit is built into the regulator. In order to ensure the effectiveness of the phase compensation, we suggest that an output capacitor (C_L) be connected as close as possible, between the output pin (V_{OUT}) and the V_{SS} pin. Please use an output capacitor (C_L) with a capacitance, based on the chart below. We also suggest an input capacitor (C_{IN}) of 1.0μF: this should be connected between V_{IN} and V_{SS} in order to stabilize input power source.

Output Capacitor Corresponding Chart

V_{OUT}	C_L
0.80V ~ 1.45V	More than 6.8μF
1.50V ~ 1.75V	More than 4.7μF
1.80V ~ 5.00V	More than 1.0μF

<Current Limiter, Short-Circuit Protection>

The XC6210 series regulator offers a combination of current limit and short 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.

<CE Pin>

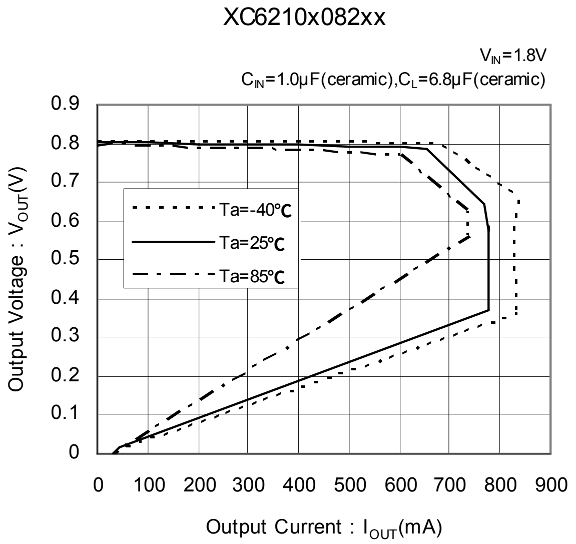
The IC's internal regulator circuitry can be shut down via the signal from the CE pin with the XC6210 series. In shutdown mode, output at the V_{OUT} pin will be pulled down to the V_{SS} level via R1 & R2. Options are available for the CE pin logic (See the product classification). Note that as the XC6210B types are 'High Active / No Pull-Down', operations will become unstable with the CE pin open. Although the CE pin is equal to an inverter input with CMOS hysteresis, with either the pull-up or pull-down options, the CE pin input current will increase when the IC is in operation. We suggest that you use this IC with either a V_{IN} voltage or a V_{SS} voltage input at the CE pin. If this IC is used with the correct specifications for the 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 VIN or V_{SS} is applied.

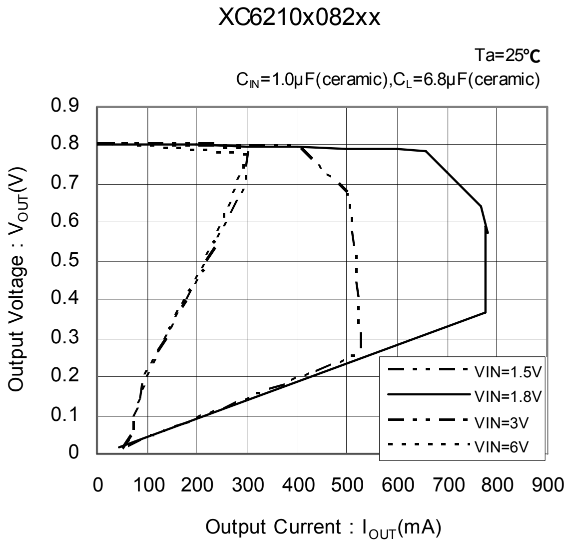
■NOTES ON USE

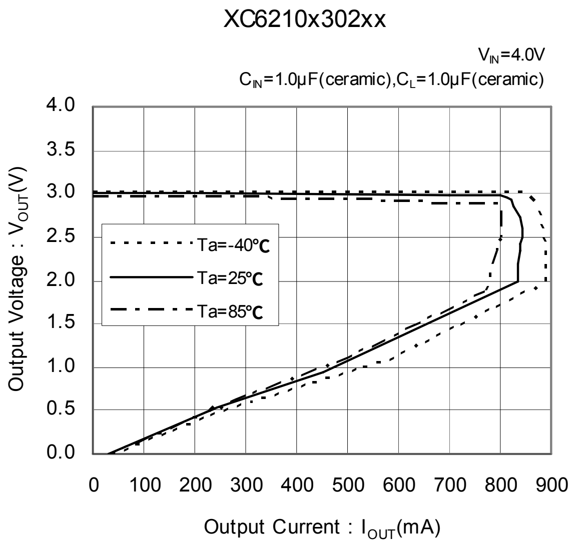
1. Please use this IC within the stated absolute maximum ratings. For temporary, transitional voltage drop or voltage rising phenomenon, the IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending 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. If rapid input fluctuation or load fluctuation should occur, please increase the capacitor value such as C_{IN} or C_L more than the recommended values to stabilize the operation.
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.

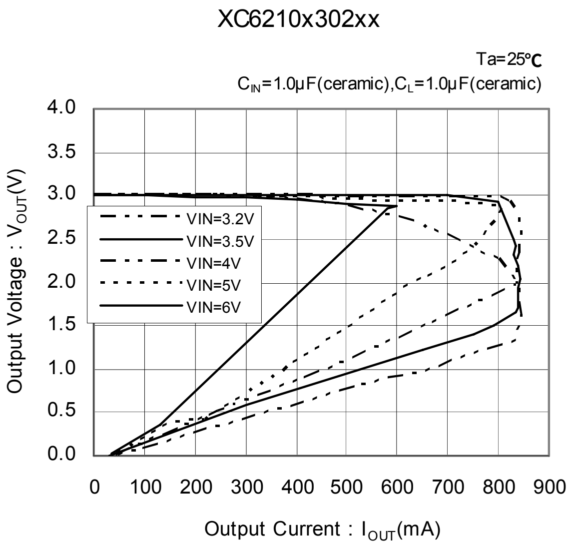
■TYPICAL PERFORMANCE CHARACTERISTICS

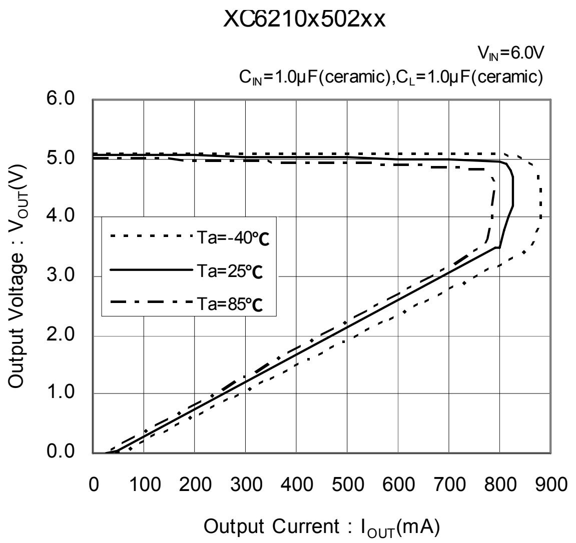
(1) Output Voltage vs. Output Current

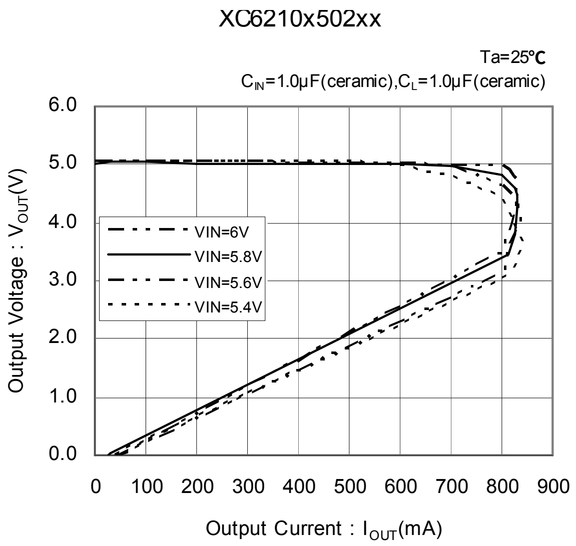






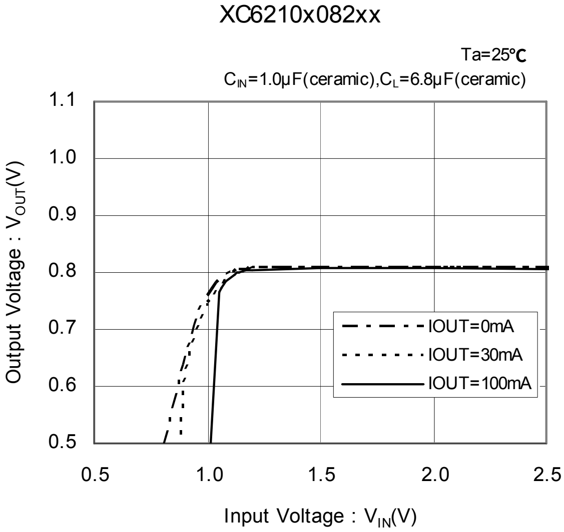


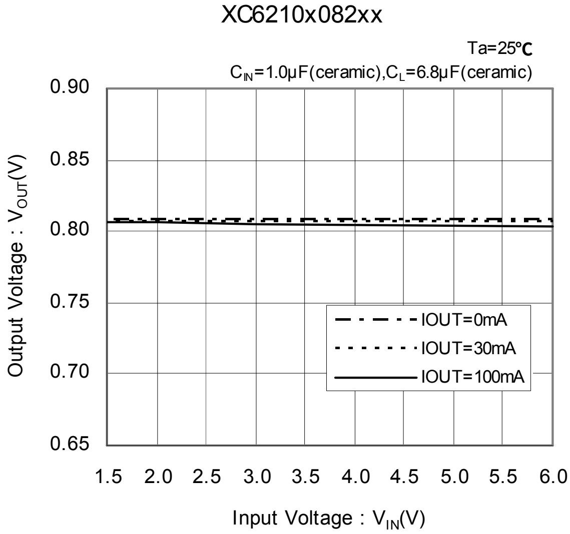


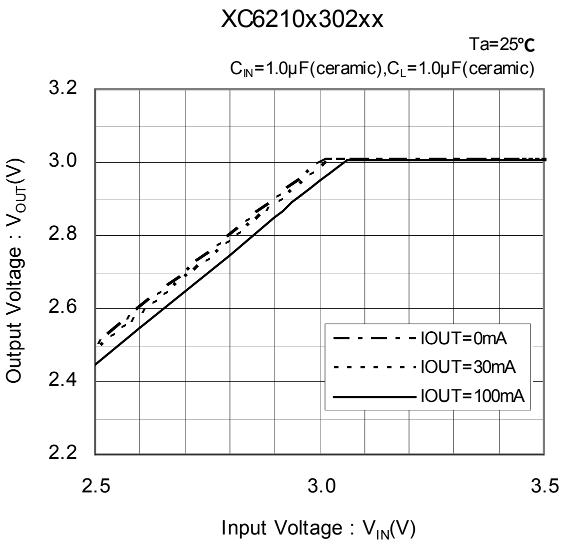


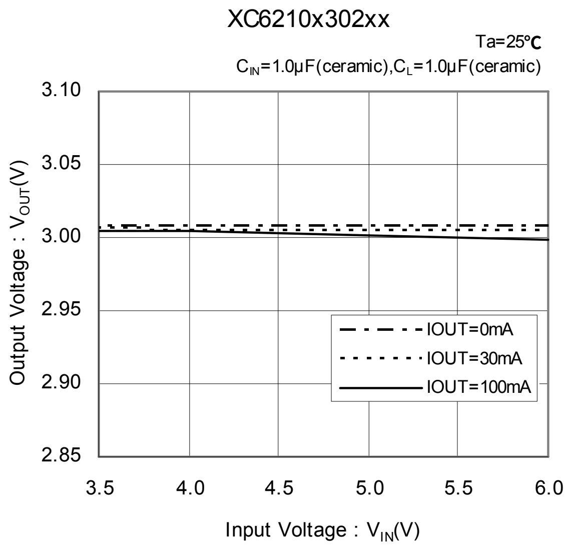
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

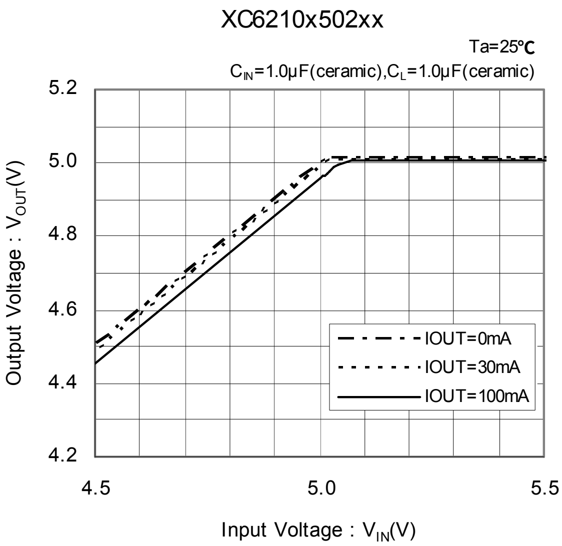
(2) Output Voltage vs. Input Voltage

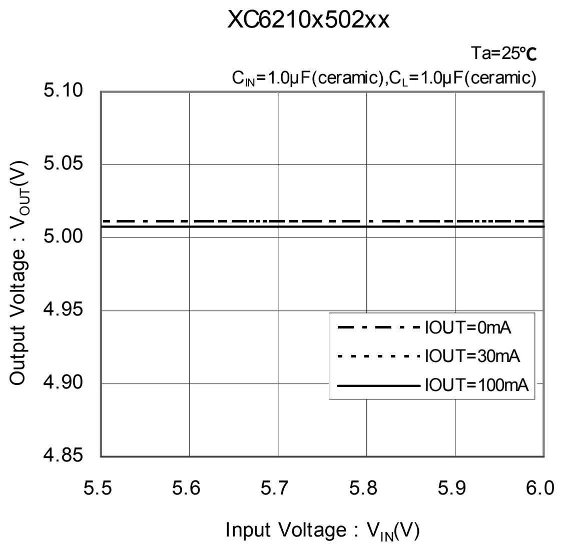








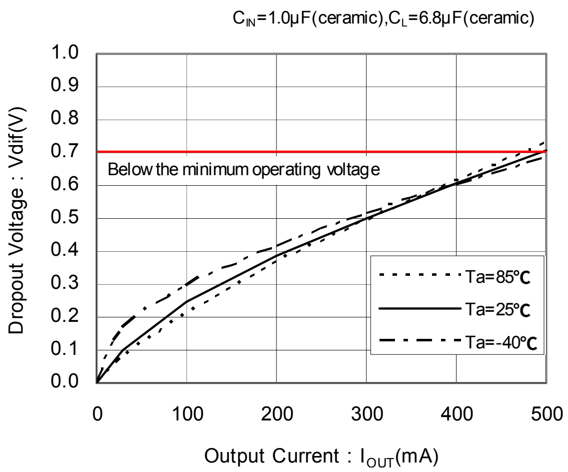




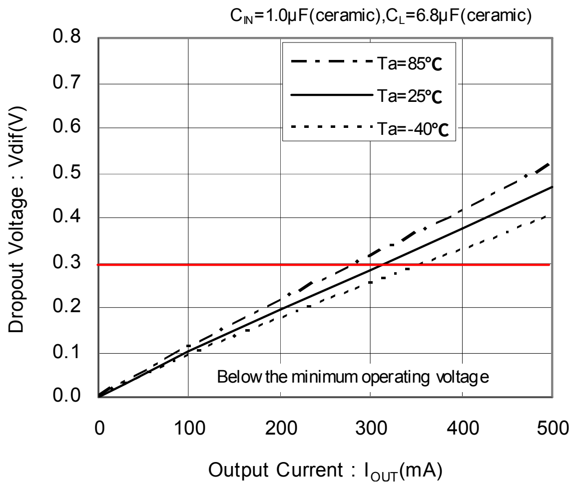
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) Dropout Voltage vs. Output Current

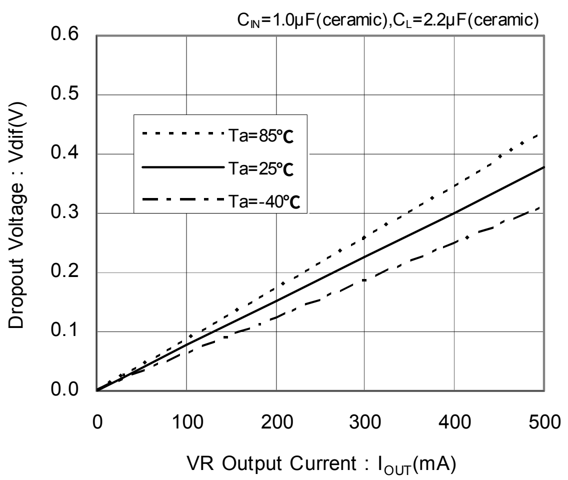
XC6210x082xx



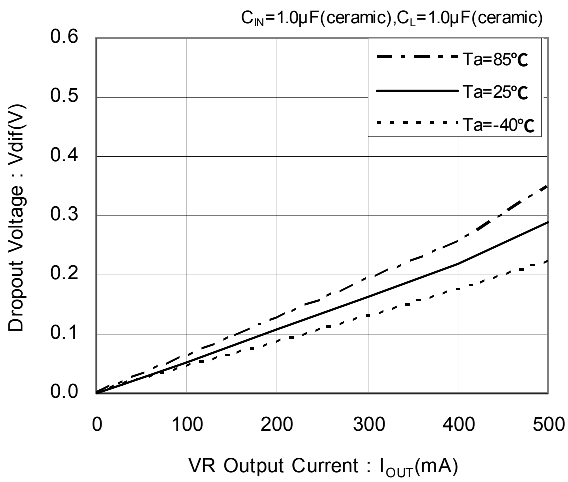
XC6210x122xx



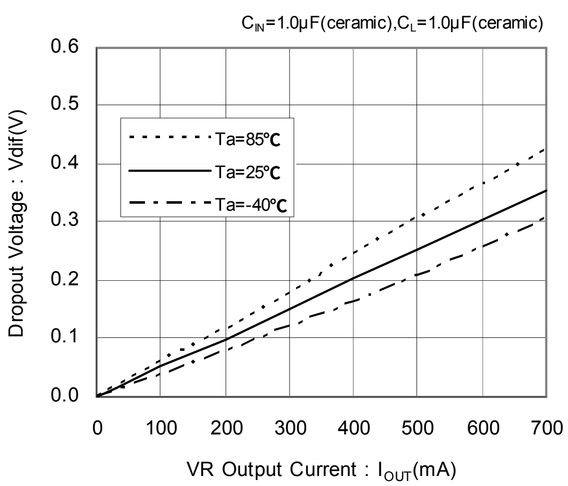
XC6210x152xx



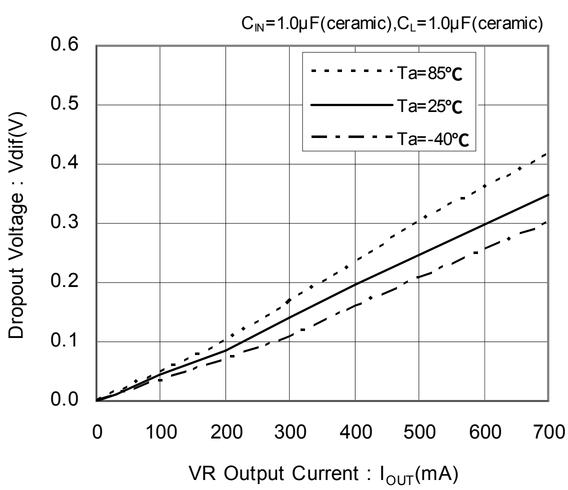
XC6210x252xx



XC6210x302xx

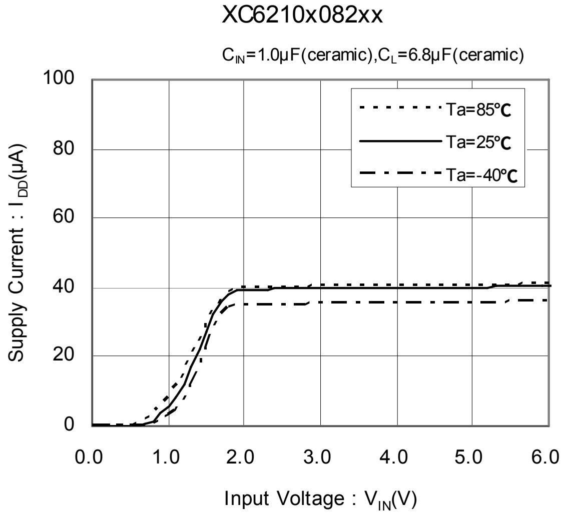


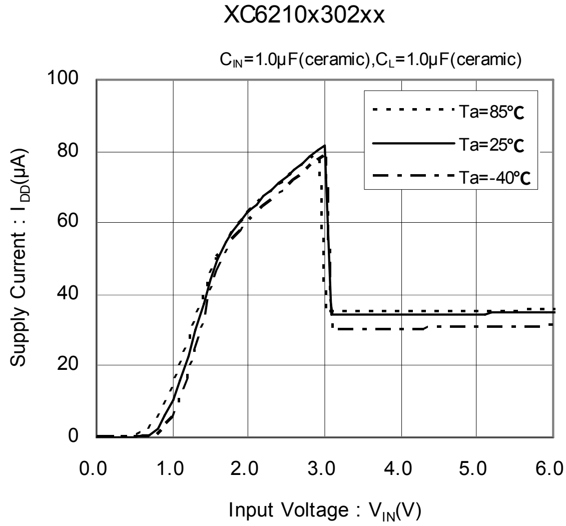
XC6210x502xx

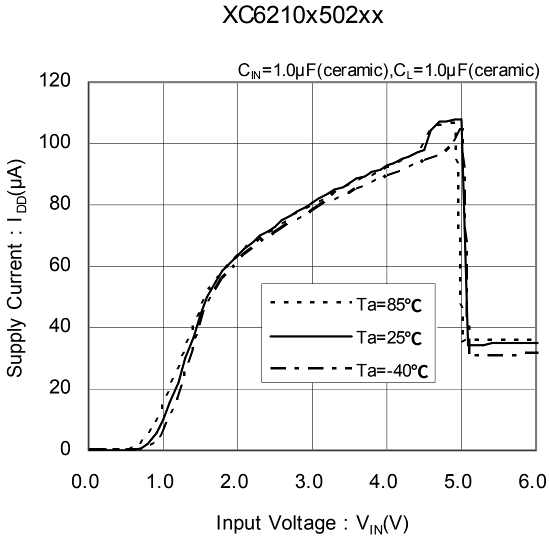


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

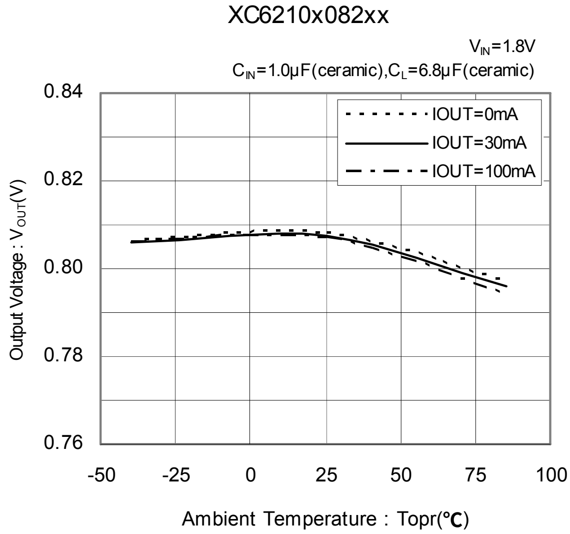
(4) Supply Current vs. Input Voltage

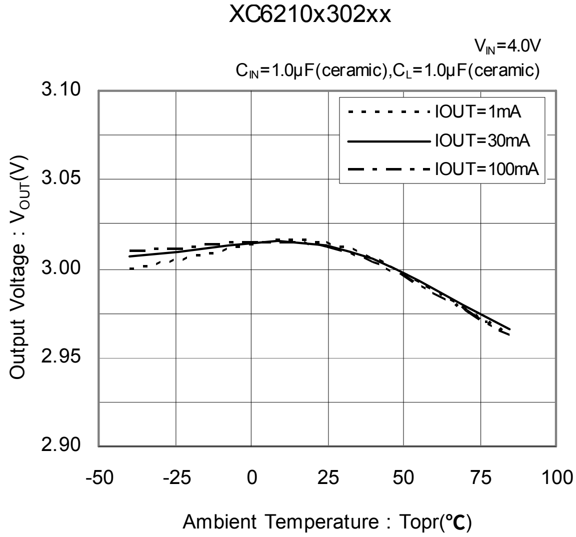


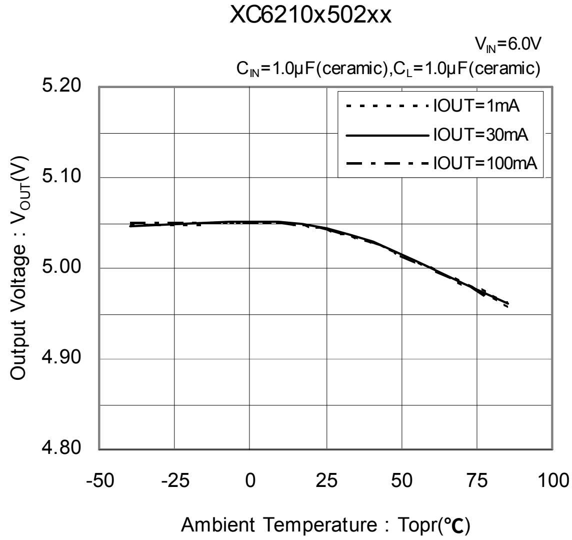




(5) Output Voltage vs. Ambient Temperature

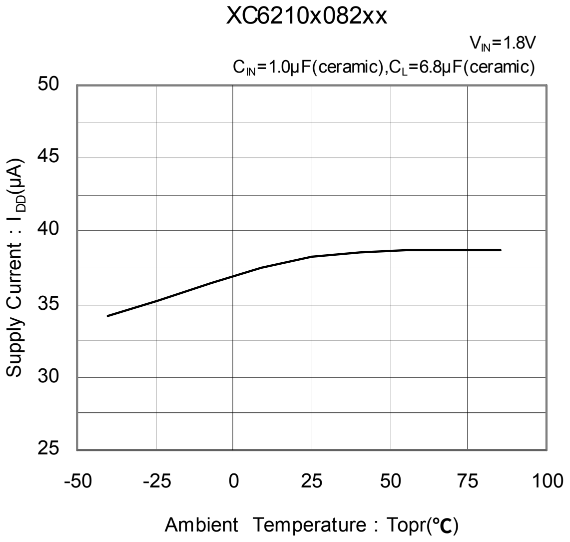


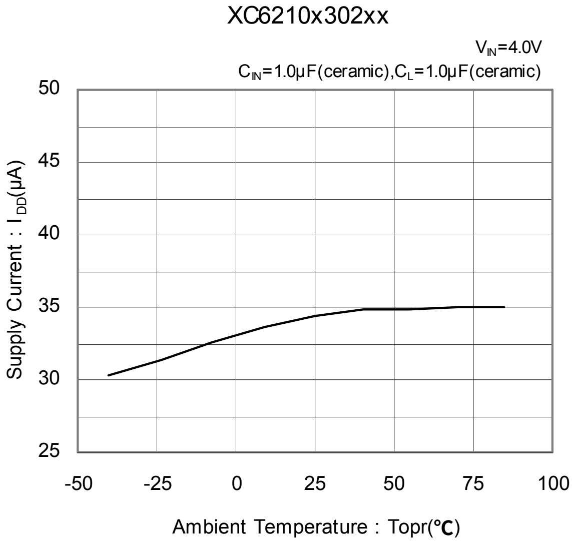


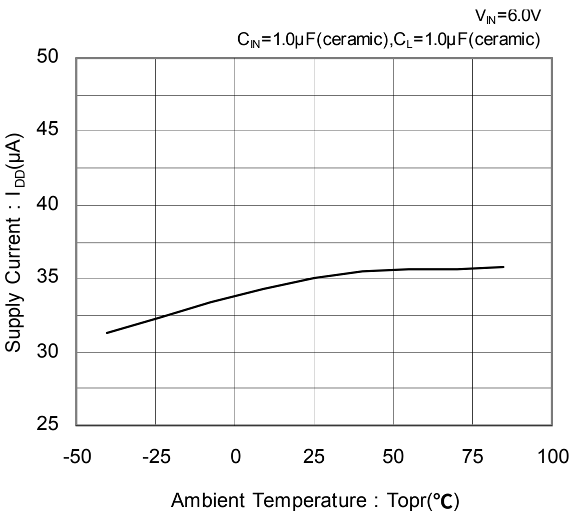


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

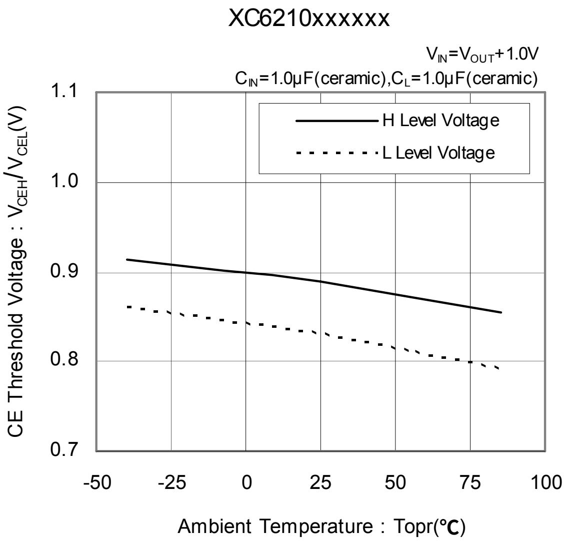
(6) Supply Current vs. Ambient Temperature





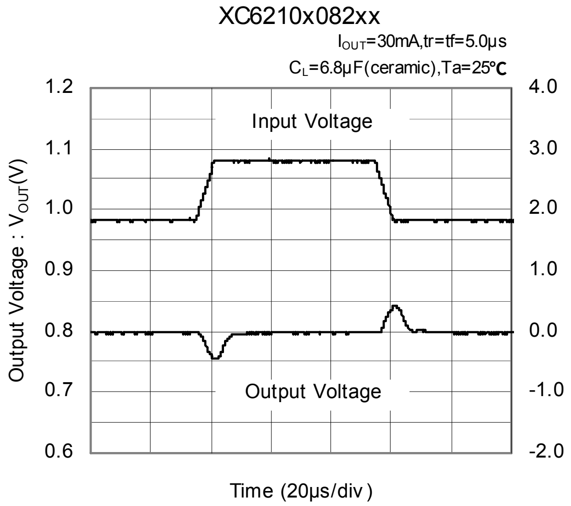


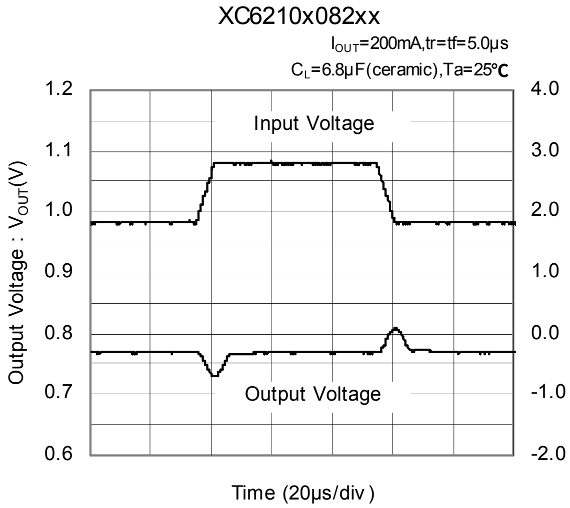
(7) CE Pin Threshold Voltage vs. Ambient Temperature

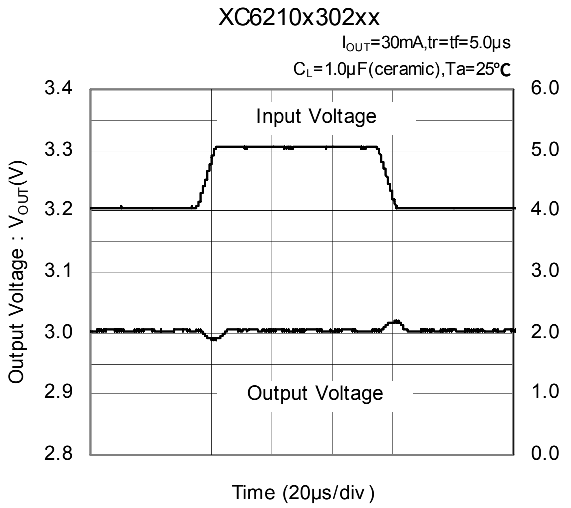


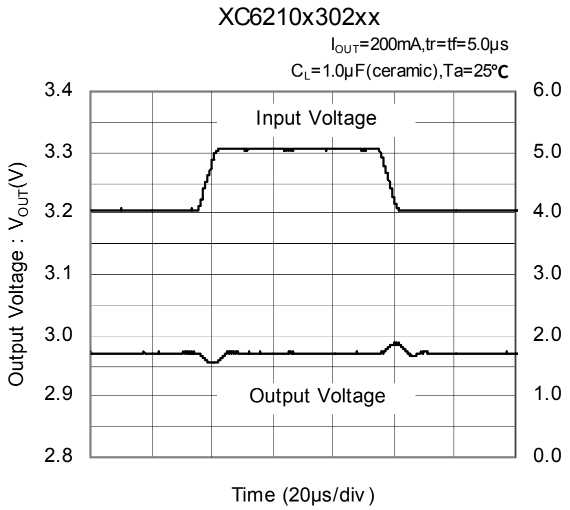
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

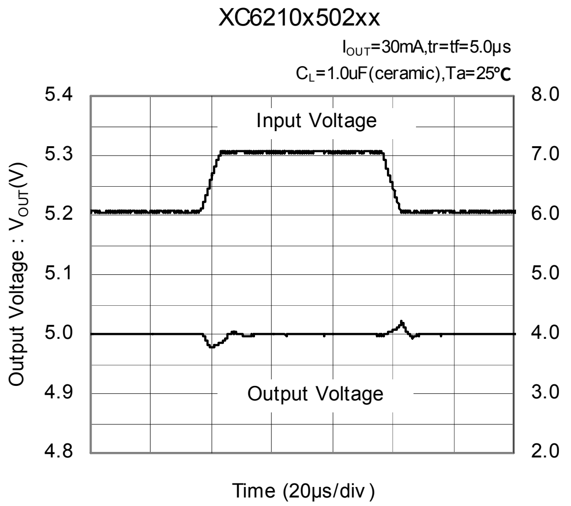
(8) Input Transient Response 1

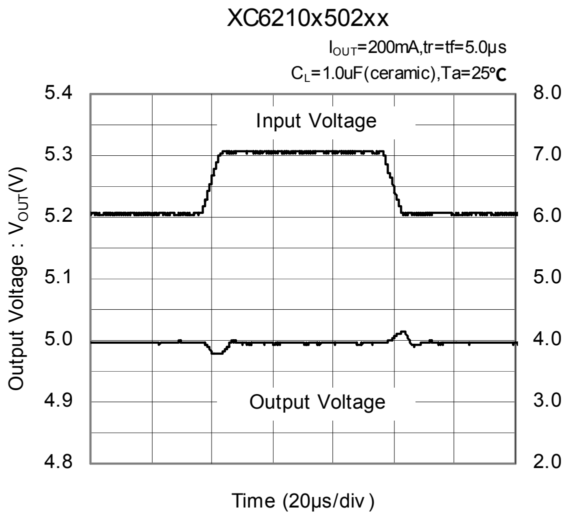






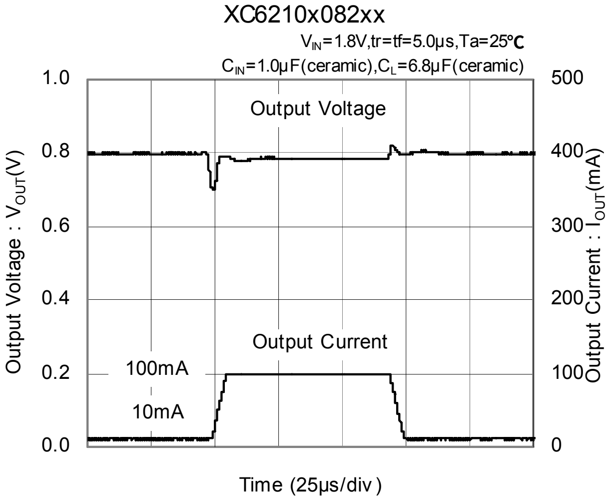


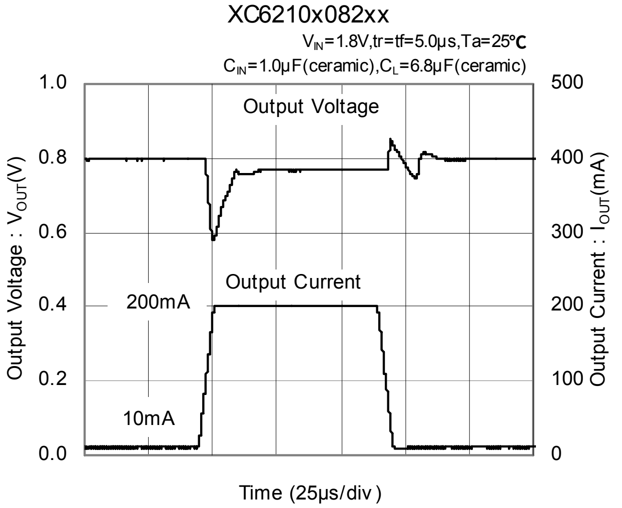


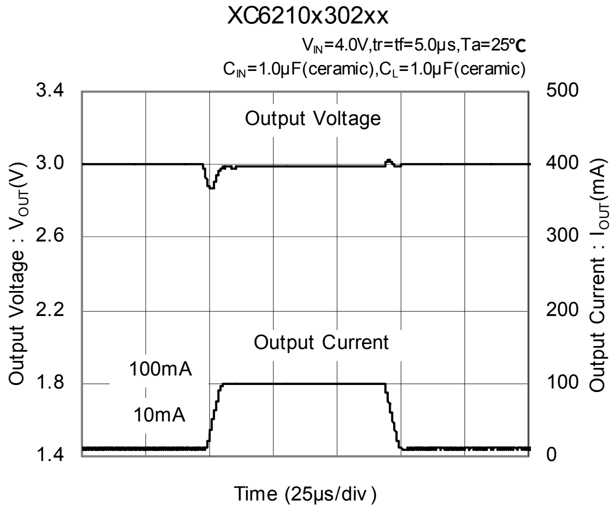


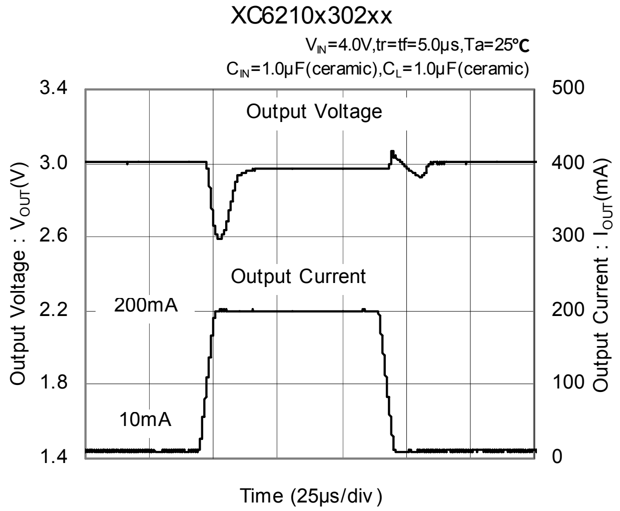
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

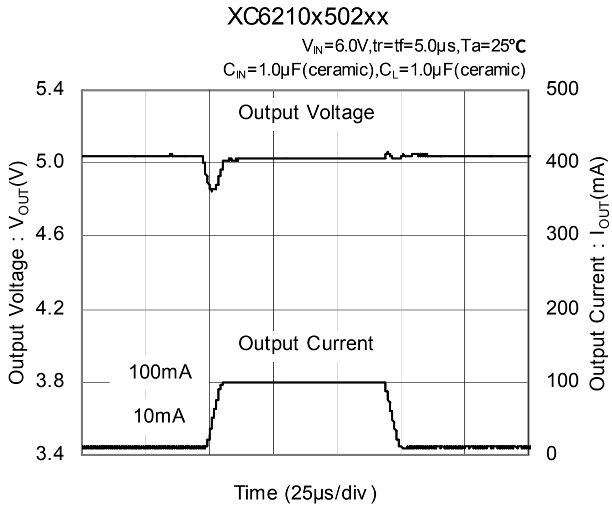
(9) Load Transient Response

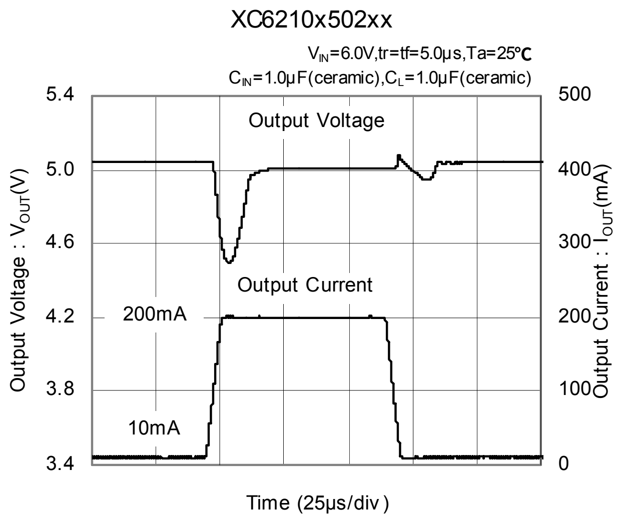






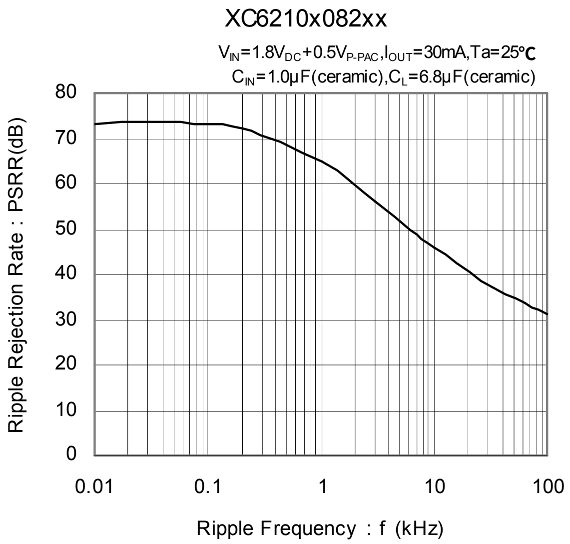


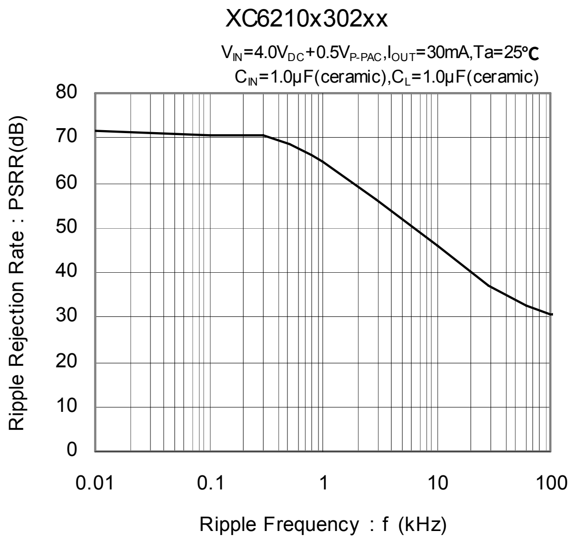


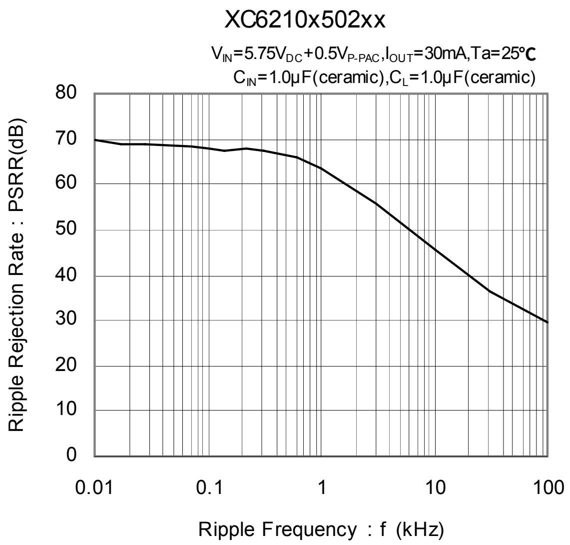


■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(10) Ripple Rejection Rate

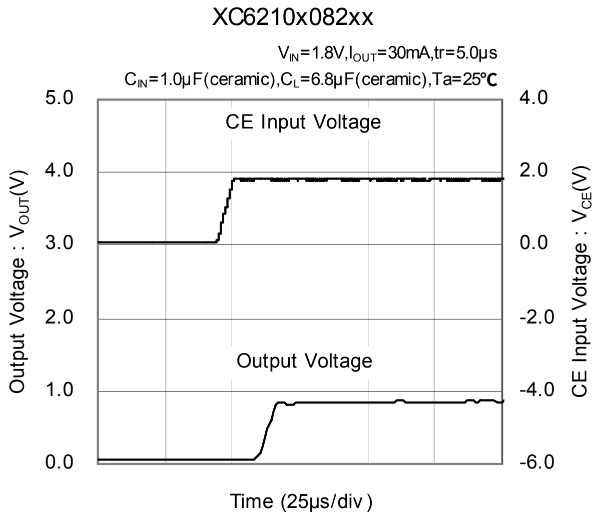


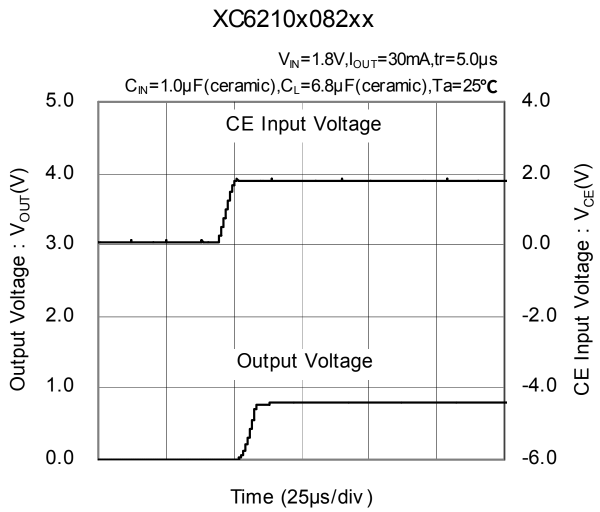


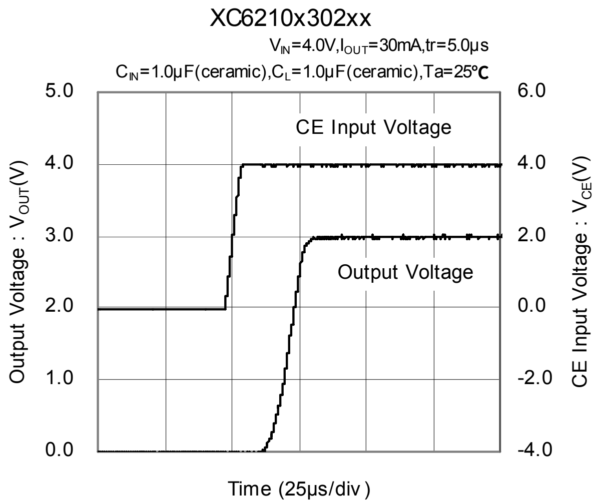


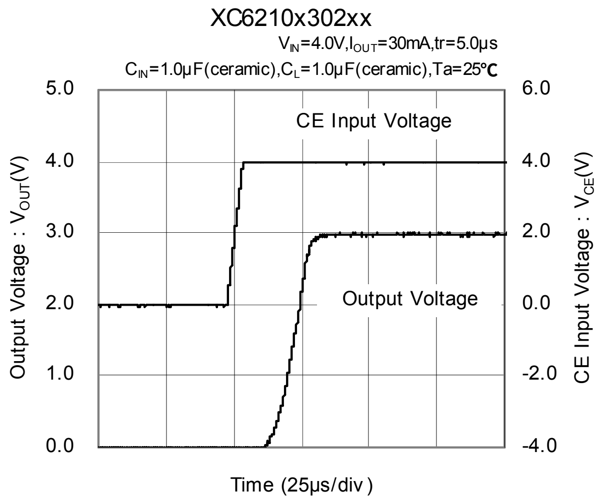
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

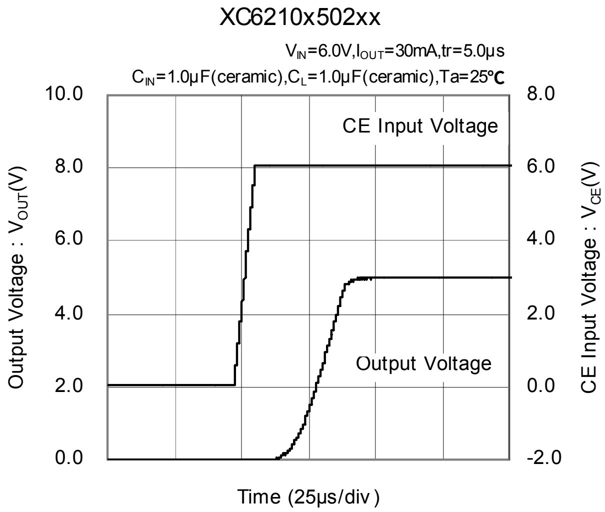
(11) Input Transient Response 2

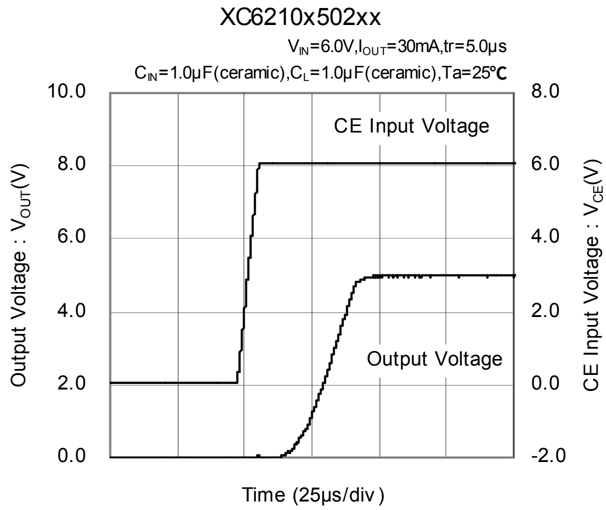






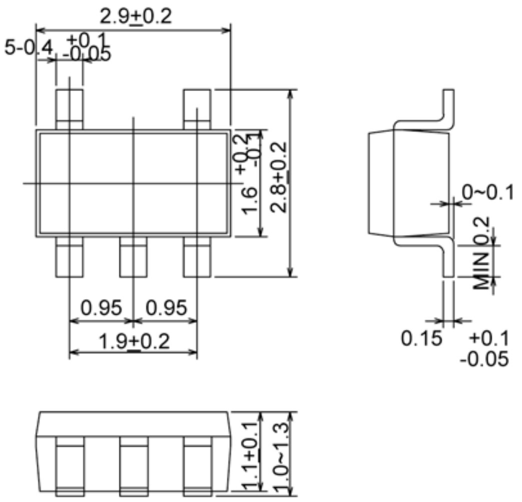






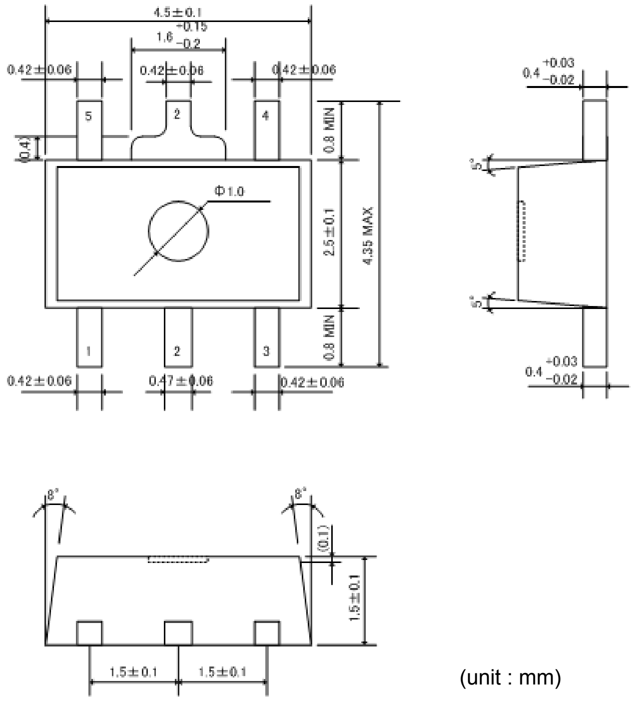
PACKAGING INFORMATION

●SOT-25



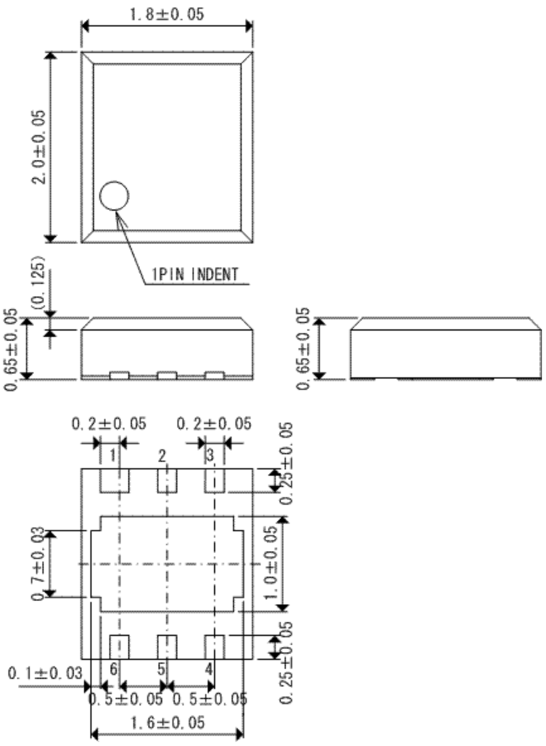
(unit : mm)

●SOT-89-5



(unit : mm)

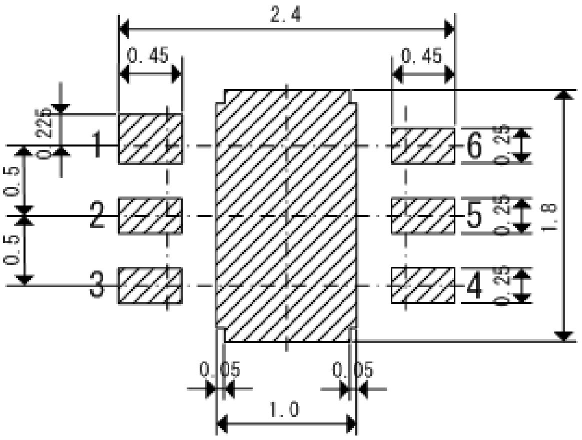
●USP-6B



(unit : mm)

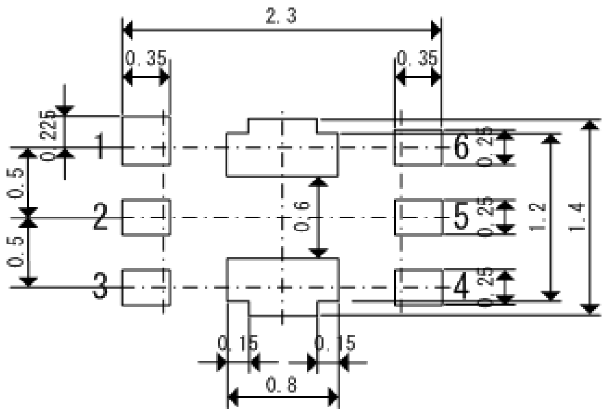
■PACKAGING INFORMATION (Continued)

●USP-6B Reference Pattern Layout



(unit : mm)

●USP-6B Reference Metal Mask Design



(unit : mm)

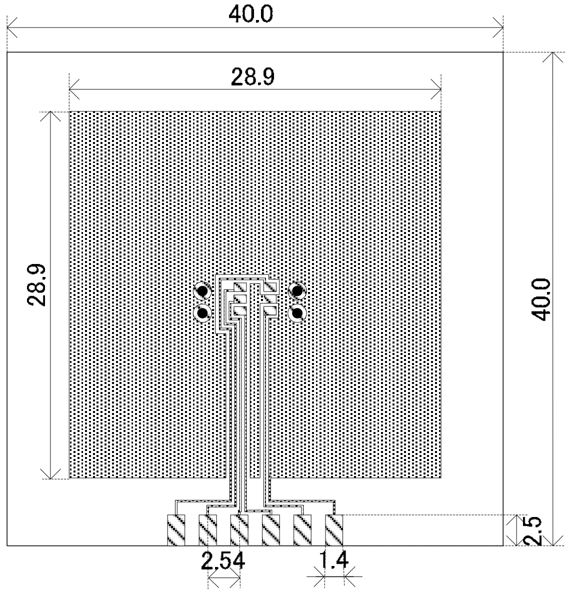
■PACKAGING INFORMATION (Continued)

●SOT-25 Power Dissipation

Power dissipation data for the SOT-25 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as one of reference data taken in the described condition.

1. Measurement Condition (Reference data)

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 (Board of SOT-26 is used.)
Material:	Glass Epoxy (FR-4)
Thickness:	1.6 mm
Through-hole:	4 x 0.8 Diameter

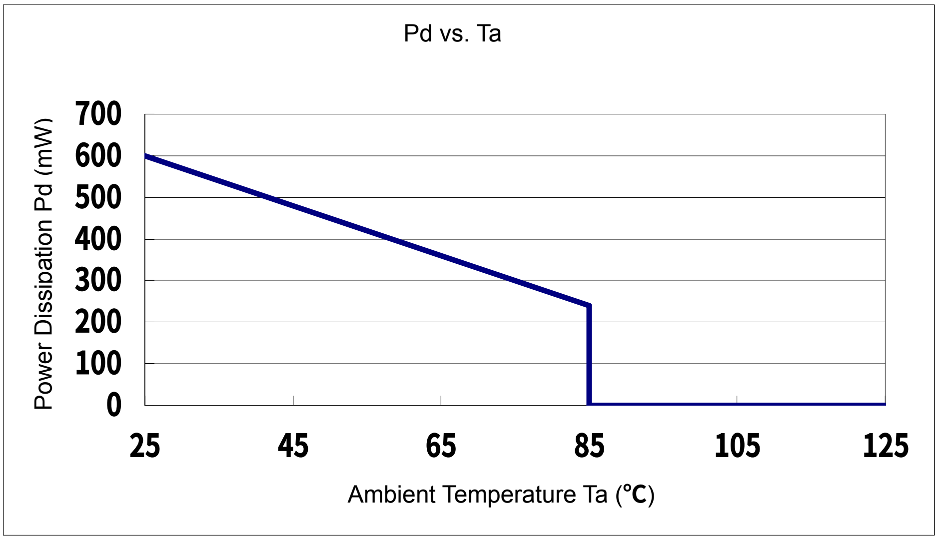


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	



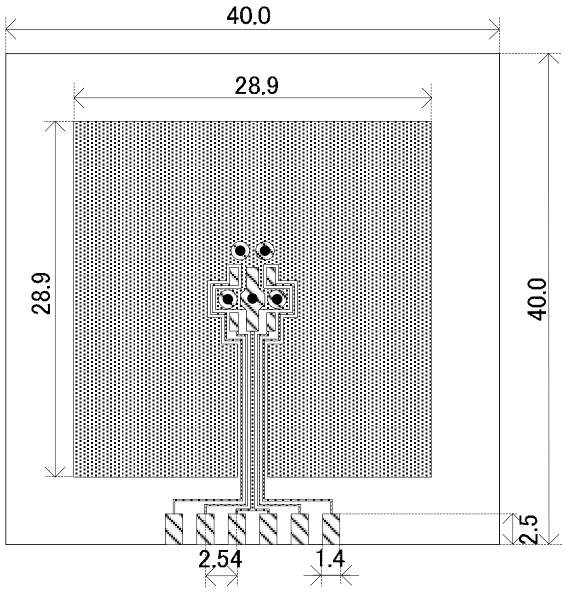
■PACKAGING INFORMATION (Continued)

● SOT-89-5 Power Dissipation

Power dissipation data for the SOT-89-5 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as one of reference data taken in the described condition.

1. Measurement Condition (Reference data)

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:	5 x 0.8 Diameter

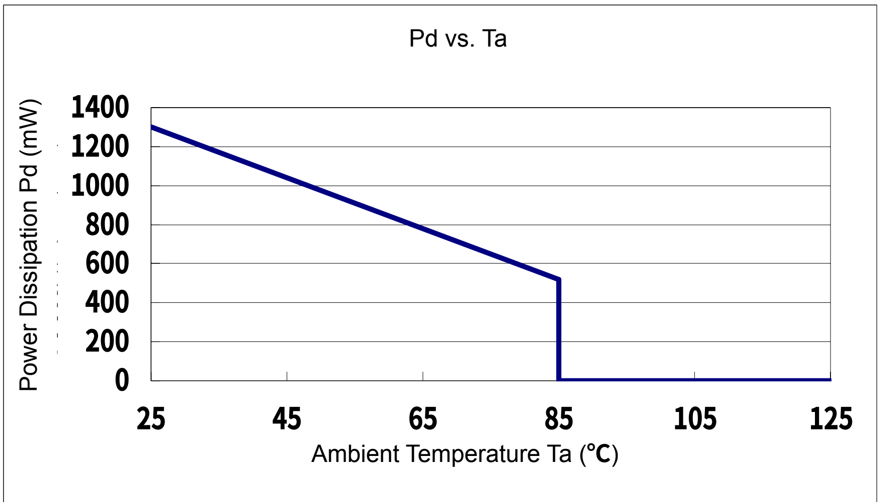


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

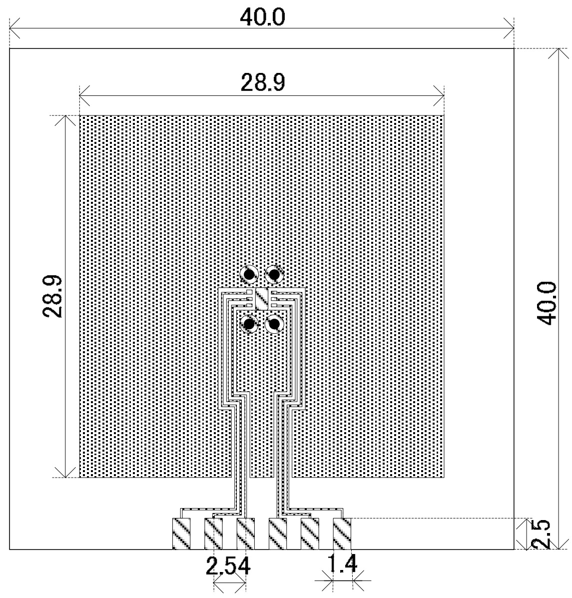
Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1300	76.92
85	520	



■PACKAGING INFORMATION (Continued)

● USP-6B Power Dissipation

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



Evaluation Board (Unit: mm)

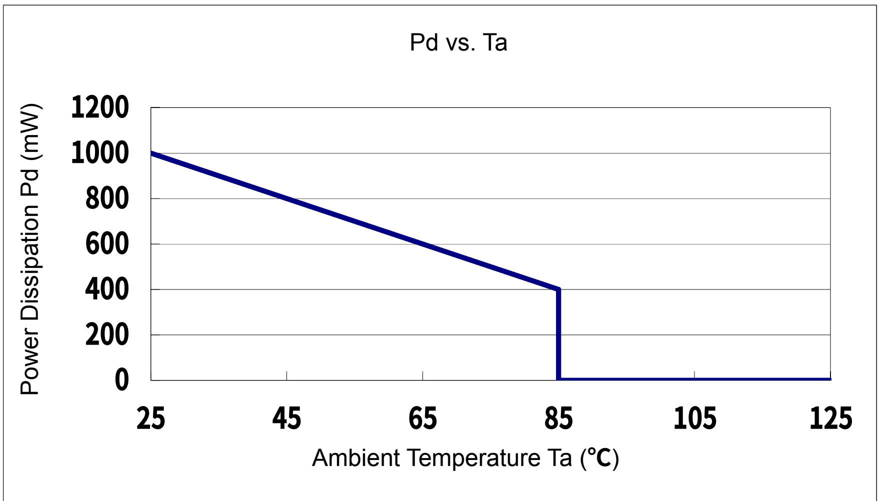
1. Measurement Condition (Reference data)

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

2. Power Dissipation vs. Ambient temperature

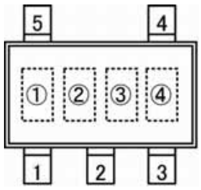
Board Mount (Tj max = 125℃)

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



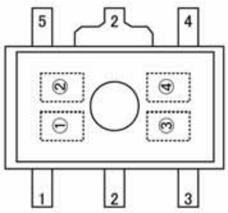
■MARKING RULE

●SOT-25



SOT-25
(TOP VIEW)

●SOT-89-5



SOT-89-5
(TOP VIEW)

① represents product series

MARK	PRODUCT SERIES
0	XC6210xxxxxx

② represents CE function

MARK				PRODUCT SERIES
OUTPUT VOLTAGE= 0.80~3.00V	OUTPUT VOLTAGE= 3.10~5.00V	OUTPUT VOLTAGE= 0.85~3.05V	OUTPUT VOLTAGE= 3.15~4.95V	
V	A	E	L	XC6210Axxxxx
X	B	F	M	XC6210Bxxxxx
Y	C	H	N	XC6210Cxxxxx
Z	D	K	P	XC6210Dxxxxx

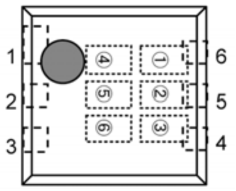
③ represents output voltage

MARK	OUTPUT VOLTAGE (V)				MARK	OUTPUT VOLTAGE (V)			
0	-	3.10	-	3.15	F	1.60	4.60	1.65	4.65
1	-	3.20	-	3.25	H	1.70	4.70	1.75	4.75
2	-	3.30	-	3.35	K	1.80	4.80	1.85	4.85
3	-	3.40	-	3.45	L	1.90	4.90	1.95	4.95
4	-	3.50	-	3.55	M	2.00	5.00	2.05	-
5	-	3.60	-	3.65	N	2.10	-	2.15	-
6	-	3.70	-	3.75	P	2.20	-	2.25	-
7	0.80	3.80	0.85	3.85	R	2.30	-	2.35	-
8	0.90	3.90	0.95	3.95	S	2.40	-	2.45	-
9	1.00	4.00	1.05	4.05	T	2.50	-	2.55	-
A	1.10	4.10	1.15	4.15	U	2.60	-	2.65	-
B	1.20	4.20	1.25	4.25	V	2.70	-	2.75	-
C	1.30	4.30	1.35	4.35	X	2.80	-	2.85	-
D	1.40	4.40	1.45	4.45	Y	2.90	-	2.95	-
E	1.50	4.50	1.55	4.55	Z	3.00	-	3.05	-

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 excluded)

■MARKING RULE (Continued)

●USP-6B



USP-6B
(TOP VIEW)

①② represents product series

MARK		PRODUCT SERIES
①	②	
1	0	XC6210xxxxxx

③ represents CE Function

MARK	TYPE	PRODUCT SERIES
A	CE High Active with pull-down resistor	XC6210AxxxDx
B	CE High Active with no pull-down resistor	XC6210BxxxDx
C	CE Low Active with pull-up resistor	XC6210CxxxDx
D	CE Low Active with no pull-up resistor	XC6210DxxxDx

④ represents the integer number of output voltage
ex.)

MARK	VOLTAGE (V)	PRODUCT SERIES
3	3.x	XC6210x3xxDx
5	5.x	XC6210x5xxDx

⑤ represents the decimal point of output voltage

MARK	VOLTAGE (V)	PRODUCT SERIES	MARK	VOLTAGE (V)	PRODUCT SERIES
0	x.00	XC6210xx02Dx	A	x.05	XC6210xx0ADx
1	x.10	XC6210xx12Dx	B	x.15	XC6210xx1ADx
2	x.20	XC6210xx22Dx	C	x.25	XC6210xx2ADx
3	x.30	XC6210xx32Dx	D	x.35	XC6210xx3ADx
4	x.40	XC6210xx42Dx	E	x.45	XC6210xx4ADx
5	x.50	XC6210xx52Dx	F	x.55	XC6210xx5ADx
6	x.60	XC6210xx62Dx	H	x.65	XC6210xx6ADx
7	x.70	XC6210xx72Dx	K	x.75	XC6210xx7ADx
8	x.80	XC6210xx82Dx	L	x.85	XC6210xx8ADx
9	x.90	XC6210xx92Dx	M	x.95	XC6210xx9ADx

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