XC6415 Series

Dual LDO Regulators with ON/OFF Switch

■GENERAL DESCRIPTION

XC6415 series are highly accurate, Dual, low noise, CMOS LDO voltage regulators. Performance features of the series include low output noise, high ripple rejection rate, and low dropout. Extremely dense power supply circuit can be organized with a 2 channeled high speed voltage regulator in low ON resistance which is built-in to an ultra small USP-6C package. The output voltage for each regulator is set independently by laser trimming and selectable in 0.05V increments within a range of 0.8 to 5.0V. The EN function allows the output of each regulator to be turned off independently. In this state, with the XC6415 series, the IC turns on the internal switch located between the V_{OUT} and the V_{SS} pins. This short enables the electric charge at the output capacitor (C_L) to be discharged via the internal auto-discharge resistance, and as a result the V_{OUT} pin quickly returns to the V_{SS} level. The series' 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. Because regulator 1 and 2 are completely isolated, a cross talk between each channel, which causes a problem during load fluctuations, can be greatly reduced

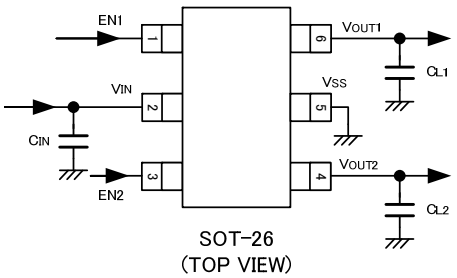
■APPLICATIONS

- Mobile phones
- Cordless phones, Wireless communication equipment
- Portable games
- Digital still cameras, Digital video cameras
- Portable audio equipment
- PDAs

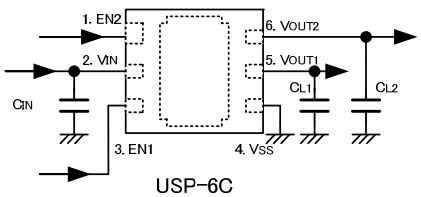
■FEATURES

Output Current	: 200mA (300mA limit, TYP.)
Dropout Voltage	: 95mV @ I_{OUT}=100mA $V_{OUT(T)}$=3.0V
Operating Voltage Range	: 1.5V~6.0V
Output Voltage Range	: 0.8V~5.0V (0.05V increments)
High Accuracy	: ± 1% @ V_{OUT}>2.0V : ± 2% @ V_{OUT}≧1.5V : ± 20mV @V_{OUT}≦2.0V : ± 30mV @V_{OUT}＜1.5V
Low Power Consumption	: 28 μA/ch (TYP.)
Stand-by Current	: Less than 0.1 μA
Ripple Rejection	: 65dB@1kHz
Operating Temperature Range	: - 40°C ~ 85°C
Low ESR Capacitor	: 1.0 μF ceramic capacitor compatible
Small Packages	: USP-6C, SOT-26, USPN-6

■TYPICAL APPLICATION CIRCUITS



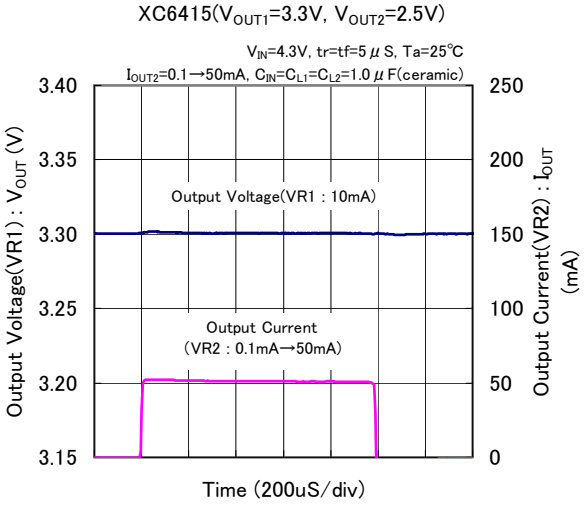
SOT-26
(TOP VIEW)



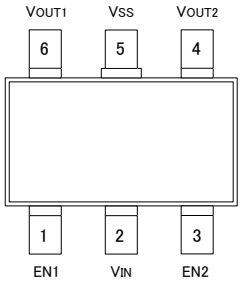
USP-6C
(TOP VIEW)

■TYPICAL PERFORMANCE CHARACTERISTICS

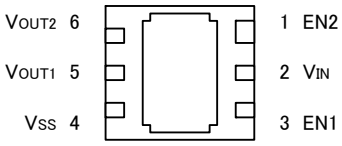
● Cross Talk



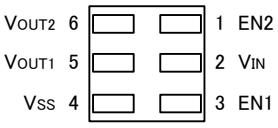
■PIN CONFIGURATION



SOT-26
(TOP VIEW)



USP-6C *
(BOTTOM VIEW)



USPN-6
(BOTTOM VIEW)

*The dissipation pad for the USP-6C 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, if should be connected to the V_{SS} (No. 4) pin.

■PIN ASSIGNMENT

PIN NUMBER			PIN NAME	FUNCTIONS
SOT-26	USP-6C	USPN-6		
1	3	3	EN1	ON/OFF Control 1
2	2	2	V_{IN}	Power Input
3	1	1	EN2	ON/OFF Control 2
4	6	6	V_{OUT2}	Output 2
5	4	4	V_{SS}	Ground
6	5	5	V_{OUT1}	Output 1

■PRODUCT CLASSIFICATION

●Ordering Information

XC6415①②③④⑤⑥-⑦ (*1)

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTON
①	Type of Regulator 1 (All EN High Active)	A	(without EN1 pulled down resistor) (Accuracy 1%) (without C_L discharge)
		B	(without EN1 pulled down resistor) (Accuracy 1%) (with C_L discharge)
		C	(without EN1 pulled down resistor) (Accuracy 2%) (without C_L discharge)
		D	(without EN1 pulled down resistor) (Accuracy 2%) (with C_L discharge)
		E	(with EN1 pulled down resistor) (Accuracy 1%) (without C_L discharge)
		F	(with EN1 pulled down resistor) (Accuracy 1%) (with C_L discharge)
		G	(with EN1 pulled down resistor) (Accuracy 2%) (without C_L discharge)
		H	(with EN1 pulled down resistor) (Accuracy 2%) (with C_L discharge)
②	Type of Regulator 2 (All EN High Active)	A	(without EN2 pulled down resistor) (Accuracy 1%) (without C_L discharge)
		B	(without EN2 pulled down resistor) (Accuracy 1%) (with C_L discharge)
		C	(without EN2 pulled down resistor) (Accuracy 2%) (without C_L discharge)
		D	(without EN2 pulled down resistor) (Accuracy 2%) (with C_L discharge)
		E	(with EN2 pulled down resistor) (Accuracy 1%) (without C_L discharge)
		F	(with EN2 pulled down resistor) (Accuracy 1%) (with C_L discharge)
		G	(with EN2 pulled down resistor) (Accuracy 2%) (without C_L discharge)
		H	(with EN2 pulled down resistor) (Accuracy 2%) (with C_L discharge)
③④	Output Voltage	01 ~	Internally set sequential number relating output voltage of each regulators; Regulator 1 Output Voltage Setting Range: 0.8 ~ 5.0V (0.05V increments) Regulator 2 Output Voltage Setting Range: 0.8 ~ 5.0V (0.05V increments)
⑤⑥-⑦	Packages Taping Type (*2)	MR	SOT-26
		ER-G	USP-6C (Halogen & Antimony free)
		ER	USP-6C
		7R-G	USPN-6 (Halogen & Antimony free)

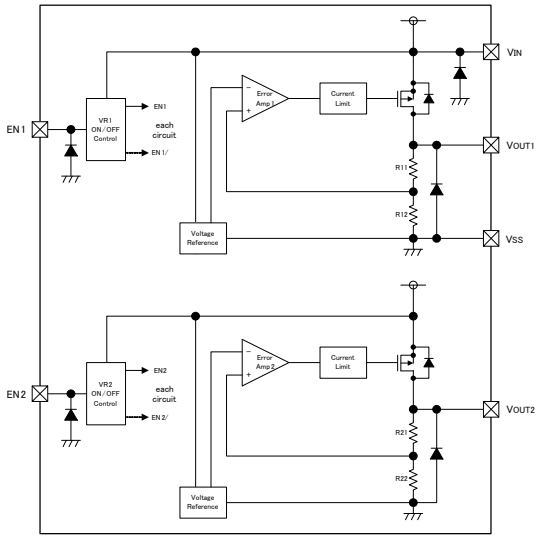
(*1) The “-G” suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.
(*2) The device orientation is fixed in its embossed tape pocket. For reverse orientation, please contact your local Torex sales office or representative. (Standard orientation: ⑤R-⑦, Reverse orientation: ⑤L-⑦)

DESIGNATOR ③④

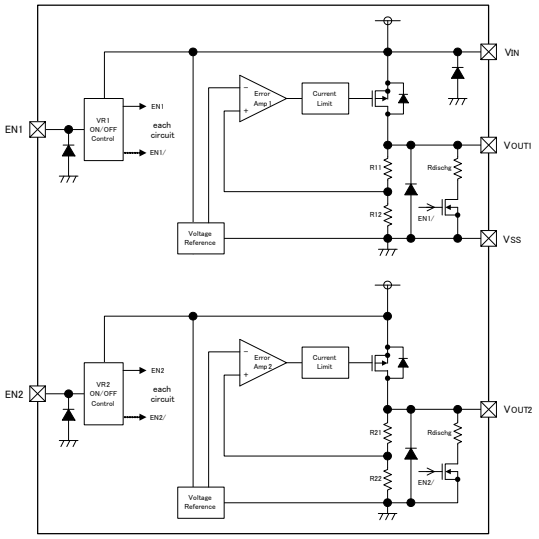
③④	VR1	VR2	③④	VR1	VR2	③④	VR1	VR2
01	1.80	2.80	11	1.30	1.50	21	1.50	2.80
02	1.20	2.90	12	2.80	2.80	22	1.80	3.00
03	1.80	1.80	13	2.50	3.30	23	1.85	2.80
04	1.50	2.70	14	3.00	3.30	24	1.85	3.30
05	2.85	2.85	15	1.20	1.80	25	2.60	2.80
06	1.80	3.30	16	2.80	3.30	26	1.50	1.50
07	3.00	3.00	17	3.30	3.30	27	2.00	3.00
08	2.80	1.80	18	3.10	3.10	28	3.30	1.80
09	1.20	1.20	19	2.80	1.50	29	3.30	1.75
10	1.10	1.30	20	1.30	2.80	30	2.10	4.10

*For other combinations, output voltages and etc., please ask Torex sales contacts.

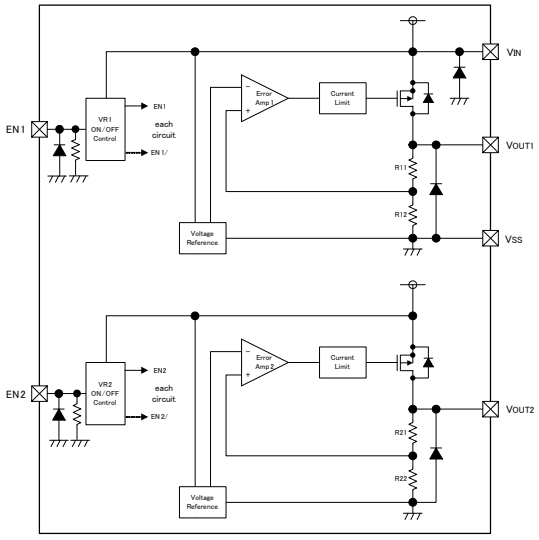
■BLOCK DIAGRAMS



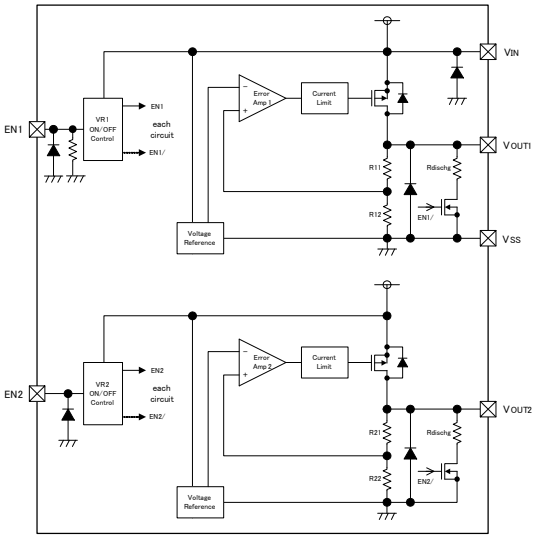
〈XC6415AA, CC Series〉



〈XC6415BB, DD Series〉



〈XC6415EE, GG Series〉



〈XC6415FB, HD Series〉

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

■ABSOLUTE MAXIMUM RATINGS

Ta=25°C

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		V_{IN}	- 0.3 ~ + 6.5	V
Output Current		$I_{OUT1} + I_{OUT2}$	500 (*1)	mA
Output Voltage 1 / Output Voltage 2		V_{OUT1} / V_{OUT2}	V_{SS} - 0.3 ~ V_{IN} + 0.3	V
EN1/EN2 Input Voltage		V_{EN1} / V_{EN2}	V_{SS} - 0.3 ~ + 6.5	V
Power Dissipation	SOT-26	Pd	250	mW
	USP-6C		100	
			1000 (PCB mounted)(*2)	
	USPN-6		100	
Operating Temperature Range		Topr	- 40 ~ + 85	°C
Storage Temperature Range		Tstg	- 55 ~ + 125	°C

*1: Please use within the range of Pd > { $(V_{IN}-V_{OUT1})\times I_{OUT1} + (V_{IN}-V_{OUT2})\times I_{OUT2}$ }

*2: The power dissipation figure shown is PCB mounted. Please refer to page 21 for details.

■ELECTRICAL CHARACTERISTICS

● XC6415 Series

Regulator 1, Regulator 2

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUITS
Output Voltage	$V_{OUT(E)}$ (*2)	$V_{OUT(T)} \geqq 2.0V$, $V_{EN}=V_{IN}$, $I_{OUT}=10mA$	×0.99 (*3)	$V_{OUT(T)}$ (*4)	×1.01 (*3)	V	①
		$V_{OUT} \leqq 1.95V$, $V_{EN}=V_{IN}$, $I_{OUT}=10mA$	-0.02 (*3)		+0.02 (*3)		
		$V_{OUT(T)} \geqq 1.5V$ $V_{EN}=V_{IN}$、$I_{OUT}=10mA$	×0.98 (*3)		×1.02 (*3)		
		$V_{OUT} \leqq 1.45V$ $V_{EN}=V_{IN}$、$I_{OUT}=10mA$	-0.03 (*3)		+0.03 (*3)		
Output Current	I_{OUTMAX}		200	-	-	mA	①
Load Regulation	ΔV_{OUT}	$V_{EN}=V_{IN}$, 0.1mA≦I_{OUT}≦100mA	E-1			mV	①
Dropout Voltage (*5)	Vdif	I_{OUT}=100mA, $V_{EN}=V_{IN}$	E-2			mV	①
Supply Current	I_{SS}	$V_{IN}=V_{EN}=V_{OUT(T)}$+1.0V, I_{OUT}=0mA	-	28	60	μA	②
Stand-by Current	I_{STBY}	V_{IN}=6.0V, $V_{EN}=V_{SS}$	-	0.01	0.10	μA	②
Line Regulation	$\Delta V_{OUT}/(\Delta V_{IN} \cdot V_{OUT})$	$V_{OUT(T)}$+0.5V≦V_{IN}≦6.0V : $V_{OUT(T)} \geqq 1.0V$, $V_{EN}=V_{IN}$, $I_{OUT}=10mA$	-	0.01	0.20	%/V	①
		1.5V≦V_{IN}≦6.0V : $V_{OUT(T)} \leqq 0.95V$ $V_{EN}=V_{IN}$, $I_{OUT}=10mA$					
Input Voltage	V_{IN}		1.5	-	6.0	V	①
Output Voltage Temperature Characteristics	$\Delta V_{OUT}/(\Delta Ta \cdot V_{OUT})$	$V_{EN}=V_{IN}$, I_{OUT}=30mA -40℃≦Ta≦85℃	-	±100	-	ppm/℃	①
Ripple Rejection Rate	PSRR	$V_{IN}=\{V_{OUT(T)}+1.0\}V_{DC}$+0.5Vp-pAC : $V_{OUT(T)} \leqq 4.75V$, $V_{EN}=V_{IN}$, I_{OUT}=30mA, f=1kHz	-	65	-	dB	③
		V_{IN}=5.75V_{DC}+0.5Vp-pAC : $V_{OUT(T)} \geqq 4.8V$, $V_{EN}=V_{IN}$, I_{OUT}=30mA, f=1kHz					
Limit Current	I_{LIM}	$V_{EN}=V_{IN}$	210	300	-	mA	①
Short Current	I_{SHORT}	$V_{EN}=V_{IN}$, Short V_{OUT} to V_{SS} level	-	20	-	mA	①
EN "H" Level Voltage	V_{ENH}		1.2	-	6.0	V	①
EN "L" Level Voltage	V_{ENL}		-	-	0.3	V	①
EN "H" Level Current	I_{ENH}	$V_{EN}=V_{IN}$（A～D Series）	-0.1	-	0.1	μA	①
		$V_{EN}=V_{IN}$=6V（E～H Series）	-	3.0	-		
EN "L" Level Current	I_{ENL}	$V_{EN}=V_{SS}$	-0.1	-	0.1	μA	①
C_L Discharge Resistor (*8)	R_{DCHG}	V_{IN}=6.0V, V_{OUT}=4.0V, $V_{CE}=V_{SS}$	-	550	-	Ω	①

NOTE:
*1) Unless otherwise stated, $V_{IN}=V_{OUT(T)}$ +1.0V.
*2) $V_{OUT(E)}$= 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.
*3) Characteristics of the actual $V_{OUT(E)}$ by setting output voltage is shown in the voltage chart.
*4) $V_{OUT(T)}$: Nominal output voltage
*5) Vdif={V_{IN1}(*7) - V_{OUT1}(*6)}
*6) V_{OUT1}: A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT}{$V_{OUT(T)}$+1.0V} is input.
*7) V_{IN1}: The input voltage when V_{OUT1} appears as input voltage is gradually decreased.
*8) For XC6415B, D, F, H series only.
XC6415A, C, E, G series discharge with only Rx1 and Rx2 resistors as shown in the BLOCK DIAGRAMS.
*9) Each channel is measured when the other channel is turned off ($V_{EN}=V_{SS}$).

■ELECTRICAL CHARACTERISTICS (Continued)

●Voltage Chart

NOMINAL OUTPUT VOLTAGE (V)	OUTPUT VOLTAGE (V)				LOAD REGULATION E-1 (mV)		DROPOUT VOLTAGE E-2 (mV)	
	$V_{OUT(E)}$ 1% Accuracy		$V_{OUT(E)}$2% Accuracy		$\triangle V_{OUT}$		Vdif	
$V_{OUT(T)}$	MIN.	MAX.	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.
0.80	0.7800	0.8200	0.7700	0.8300	10	30	500	850
0.85	0.8300	0.8700	0.8200	0.8800				
0.90	0.8800	0.9200	0.8700	0.9300			410	750
0.95	0.9300	0.9700	0.9200	0.9800				
1.00	0.9800	1.0200	0.9700	1.0300			360	600
1.05	1.0300	1.0700	1.0200	1.0800				
1.10	1.0800	1.1200	1.0700	1.1300			330	600
1.15	1.1300	1.1700	1.1200	1.1800				
1.20	1.1800	1.2200	1.1700	1.2300			280	420
1.25	1.2300	1.2700	1.2200	1.2800				
1.30	1.2800	1.3200	1.2700	1.3300			240	360
1.35	1.3300	1.3700	1.3200	1.3800				
1.40	1.3800	1.4200	1.3700	1.4300			200	300
1.45	1.4300	1.4700	1.4200	1.4800				
1.50	1.4800	1.5200	1.4700	1.5300			180	260
1.55	1.5300	1.5700	1.5190	1.5810				
1.60	1.5800	1.6200	1.5680	1.6320			170	240
1.65	1.6300	1.6700	1.6170	1.6830				
1.70	1.6800	1.7200	1.6660	1.7340				
1.75	1.7300	1.7700	1.7150	1.7850				
1.80	1.7800	1.8200	1.7640	1.8360			150	200
1.85	1.8300	1.8700	1.8130	1.8870				
1.90	1.8800	1.9200	1.8620	1.9380				
1.95	1.9300	1.9700	1.9110	1.9890				
2.00	1.9800	2.0200	1.9600	2.0400	20	50		
2.05	2.0295	2.0705	2.0090	2.0910				
2.10	2.0790	2.1210	2.0580	2.1420				
2.15	2.1285	2.1715	2.1070	2.1930				
2.20	2.1780	2.2220	2.1560	2.2440			120	180
2.25	2.2275	2.2725	2.2050	2.2950				
2.30	2.2770	2.3230	2.2540	2.3460				
2.35	2.3265	2.3735	2.3030	2.3970				
2.40	2.3760	2.4240	2.3520	2.4480				
2.45	2.4255	2.4745	2.4010	2.4990				
2.50	2.4750	2.5250	2.4500	2.5500			110	
2.55	2.5245	2.5755	2.4990	2.6010				
2.60	2.5740	2.6260	2.4580	2.6520				
2.65	2.6235	2.6765	2.8970	2.7030				
2.70	2.6730	2.7270	2.6460	2.7540				
2.75	2.7225	2.7775	2.6950	2.8050				
2.80	2.7720	2.8280	2.7440	2.8560			95	150
2.85	2.8215	2.8785	2.7930	2.9070				
2.90	2.8710	2.9290	2.8420	2.9580				
2.95	2.9205	2.9795	2.8910	3.0090				

■ELECTRICAL CHARACTERISTICS (Continued)

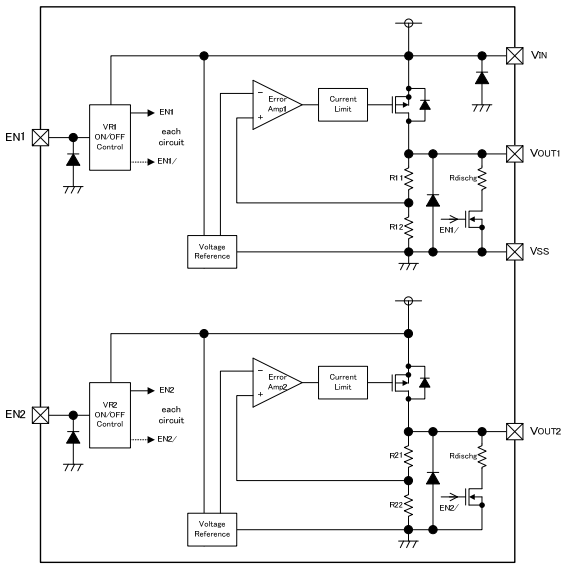
●Voltage Chart (Continued)

NOMINAL OUTPUT VOLTAGE (V)	OUTPUT VOLTAGE (V)				LOAD REGULATION E-1 (mV)		DROPOUT VOLTAGE E-2 (mV)	
	$V_{OUT(E)}$ 1% Accuracy		$V_{OUT(E)}$2% Accuracy		$\triangle V_{OUT}$		Vdif	
$V_{OUT(T)}$	MIN.	MAX.	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.
3.00	2.9700	3.0300	2.9400	3.0600	20	50	95	150
3.05	3.0195	3.0805	2.9890	3.1110				
3.10	3.0690	3.1310	3.0380	3.1620				
3.15	3.1185	3.1815	3.0870	3.2130				
3.20	3.1680	3.2320	3.1360	3.2640				
3.25	3.2175	3.2825	3.1850	3.3150				
3.30	3.2670	3.3330	3.2340	3.3660			80	
3.35	3.3165	3.3835	3.2830	3.4170				
3.40	3.3660	3.4340	3.3320	3.4680				
3.45	3.4155	3.4845	3.3810	3.5190				
3.50	3.4650	3.5350	3.4300	3.5700				
3.55	3.5145	3.5855	3.4790	3.6210				
3.60	3.5640	3.6360	3.5280	3.6720				
3.65	3.6135	3.6865	3.5770	3.7230				
3.70	3.6630	3.7370	3.6260	3.7740				
3.75	3.7125	3.7875	3.6750	3.8250				
3.80	3.7620	3.8380	3.7240	3.8760				
3.85	3.8115	3.8885	3.7730	3.9270				
3.90	3.8610	3.9390	3.8220	3.9780				
3.95	3.9105	3.9895	3.8710	4.0290				
4.00	3.9600	4.0400	3.9200	4.0800	30	60		120
4.05	4.0095	4.0905	3.9690	4.1310				
4.10	4.0590	4.1410	4.0180	4.1820				
4.15	4.1085	4.1915	4.0670	4.2330				
4.20	4.1580	4.2420	4.1160	4.2840				
4.25	4.2075	4.2925	4.1650	4.3350				
4.30	4.2570	4.3430	4.2140	4.3860				
4.35	4.3065	4.3935	4.2630	4.4370				
4.40	4.3560	4.4440	4.3120	4.4880				
4.45	4.4055	4.4945	4.3610	4.5390				
4.50	4.4550	4.5450	4.4100	4.5900				
4.55	4.5045	4.5955	4.4590	4.6410				
4.60	4.5540	4.6460	4.5080	4.6920				
4.65	4.6035	4.6965	4.5570	4.7430				
4.70	4.6530	4.7470	4.6060	4.7940				
4.75	4.7025	4.7975	4.6550	4.8450				
4.80	4.7520	4.8480	4.7040	4.8960				
4.85	4.8015	4.8985	4.7530	4.9470				
4.90	4.8510	4.9490	4.8020	4.9980				
4.95	4.9005	4.9995	4.8510	5.0490				
5.00	4.9500	5.0500	4.9000	5.1000				

■OPERATIONAL DESCRIPTION

<Output Voltage Control>

The voltage divided by resistors Rx1 and Rx2 is compared with the internal reference voltage by the error amplifier. The P-channel MOSFET which is connected to the VOUT pin is then driven by the subsequent output signal. The output voltage at the VOUT pin is controlled and stabilized by a system of negative feedback. The current limit circuit and short protect circuit operate in relation to the level of output current. Further, the IC's internal circuitry can be shutdown via the EN pin's signal.



< XC6415BB Series >

<CL Auto-Discharge Function>

XC6415B, D, F, H series can quickly discharge the electric charge at the output capacitor (C_L), when a low signal to the EN pin, which enables a whole IC circuit put into OFF state, is inputted via the N-channel transistor located between the VOUT pin and the VSS pin (cf. BLOCK DIAGRAM). The C_L discharge resistance is set to 550Ω when V_{IN} is 6.0V (TYP.) and V_{OUT} is 4.0V (TYP.). Moreover, discharge time of the output capacitor (C_L) is set by the C_L auto-discharge resistance (R) and the output capacitor (C_L). By setting time constant of a C_L auto-discharge resistance value [R] and an output capacitor value (C_L) as τ (τ =C x R), the output voltage after discharge via the N channel transistor is calculated by the following formulas.

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

(V : Output voltage after discharge, $V_{OUT(E)}$: Output voltage, t: Discharge time,
τ : C_L auto-discharge resistance R × Output capacitor (C_L) value C)

C_L high-speed discharge function can be set by each regulator.

<Current Limiter, Short-Circuit Protection>

The XC6415 series includes a fold-back circuit, which aid the operations of the current limiter and circuit protection. When the load current reaches the current limit level, the fold-back circuit operates and output voltage drops. As a result of this drop in output voltage, output current also decreases. When the output pin is shorted, a current of about 20mA flows.

<EN Pin>

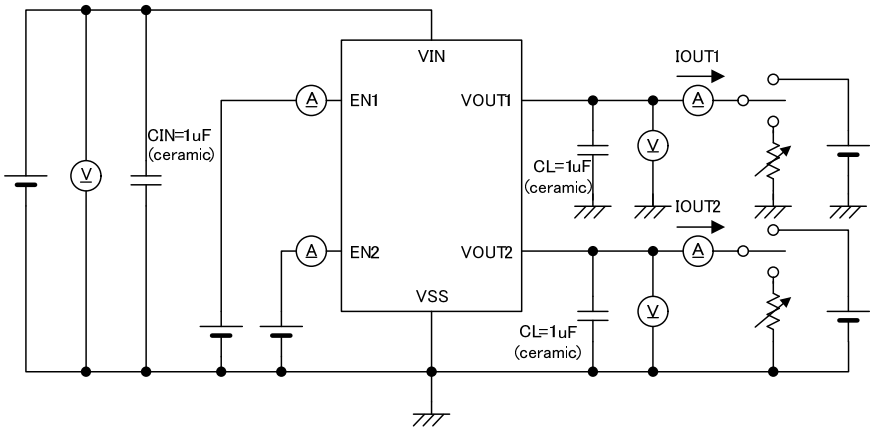
The IC's internal circuitry can be shutdown via the signal from the EN pin with the XC6415 series. In shutdown mode, output at the VOUT pin will be pulled down to the VSS level via Rx1 & Rx2. However, as for the XC6415B, D, F, H series, the C_L auto-discharge resistor is connected in parallel to Rx1 and Rx2 while the power supply is applied to the VIN pin. Therefore, time until the VOUT pin reaches the VSS level becomes short. The EN pin is CMOS input, but in case the EN pin with pulled down resistor, the EN input current will be increase when the IC operates. Also, in case of the EN pin without pulled down resistor, the output voltage becomes unstable when the EN pin is left open. If this IC is used with the correct output voltage for the EN pin, the logic is fixed and the IC will operate normally. However, supply current may increase as a result of through current in the IC's internal circuitry when medium voltage is input.

■NOTES ON USE

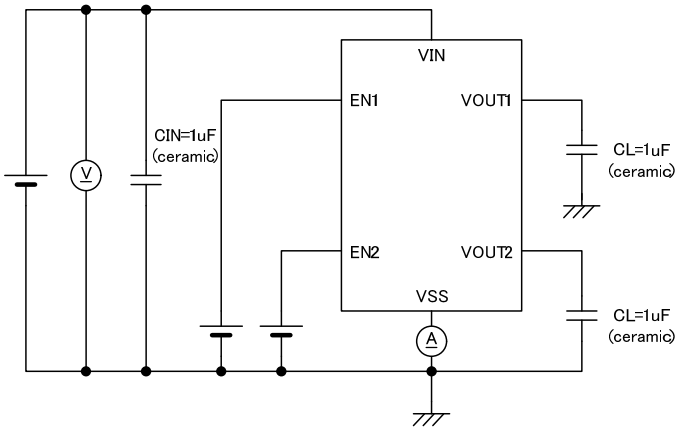
1. Please use this IC within the stated absolute maximum ratings. The IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending on output current. Please wire the input capacitor (C_{IN}) and the output capacitor (C_L) as close to the IC as possible.

■TEST CIRCUITS

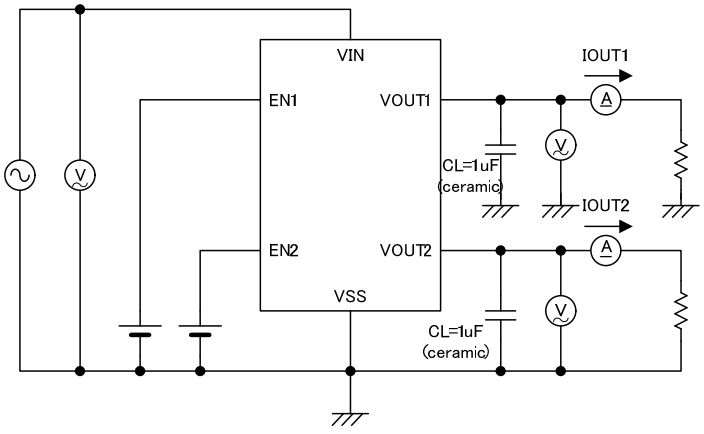
●Circuit ①



●Circuit ②



●Circuit ③

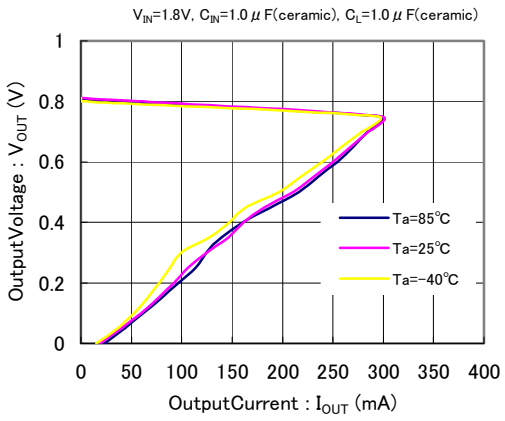


■TYPICAL PERFORMANCE CHARACTERISTICS

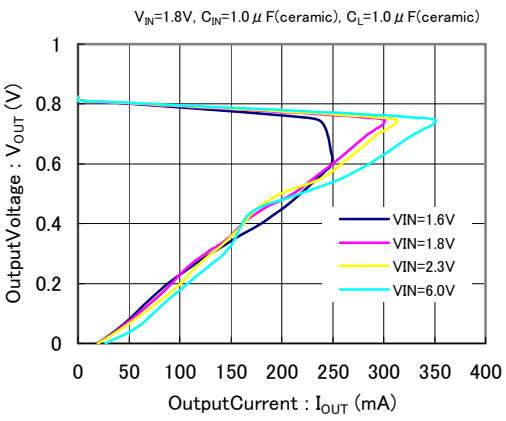
* EN Voltage condition: Unless otherwise stated, $V_{EN}=V_{IN}$

(1) OutputVoltage vs. OutputCurrent

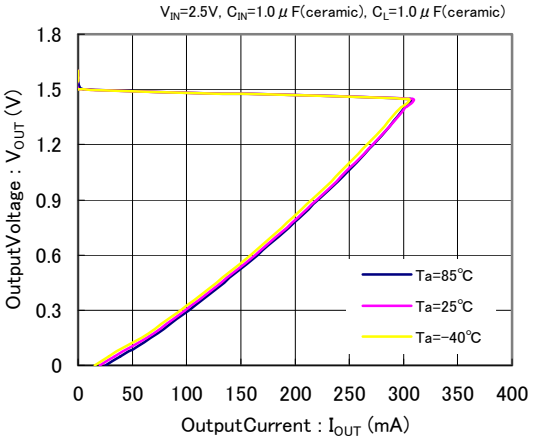
XC6415(V_{OUT}=0.8V)



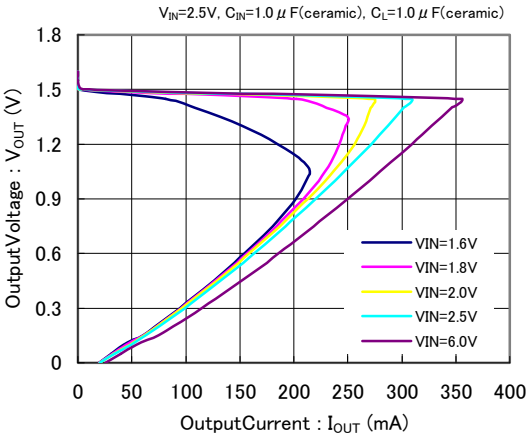
XC6415(V_{OUT}=0.8V)



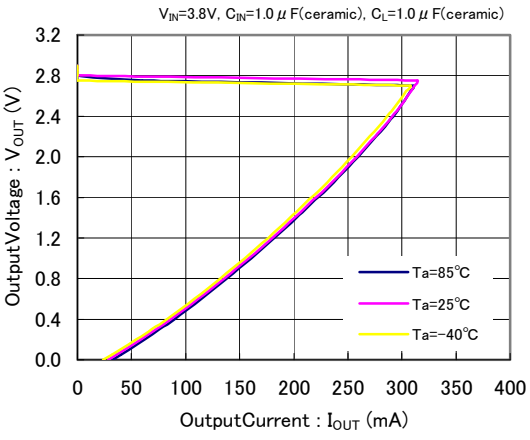
XC6415(V_{OUT}=1.5V)



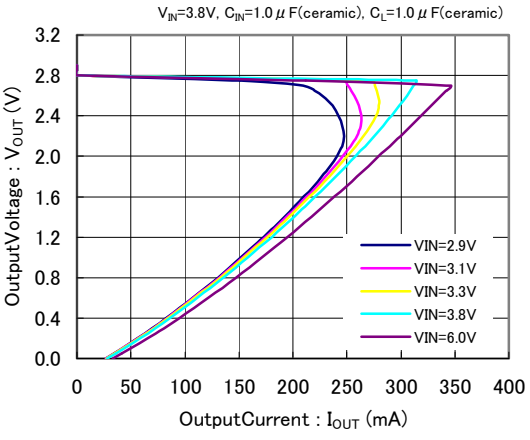
XC6415(V_{OUT}=1.5V)



XC6415(V_{OUT}=2.8V)



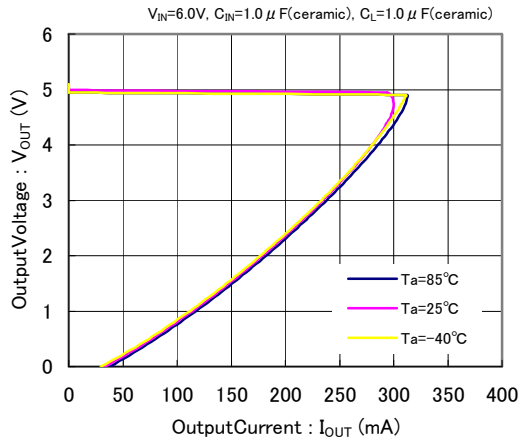
XC6415(V_{OUT}=2.8V)



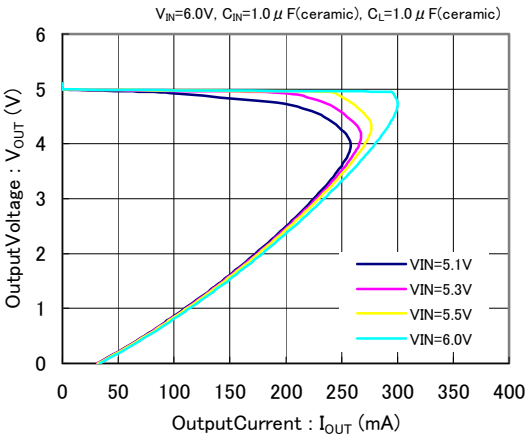
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(1) OutputVoltage vs. OutputCurrent (Continued)

XC6415(V_{OUT}=5.0V)

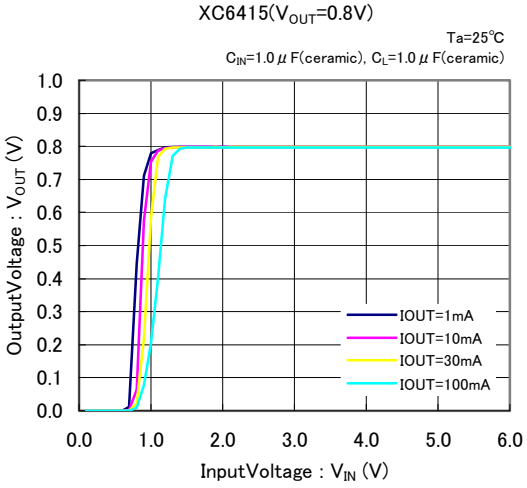


XC6415(V_{OUT}=5.0V)

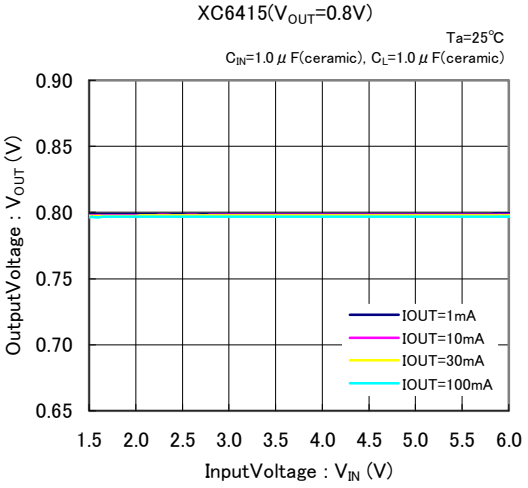


(2) OutputVoltage vs. InputVoltage

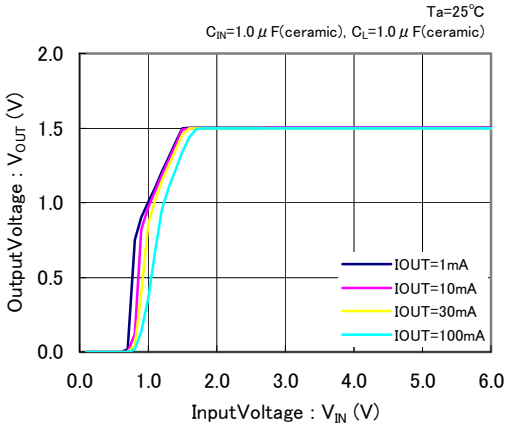
XC6415(V_{OUT}=0.8V)



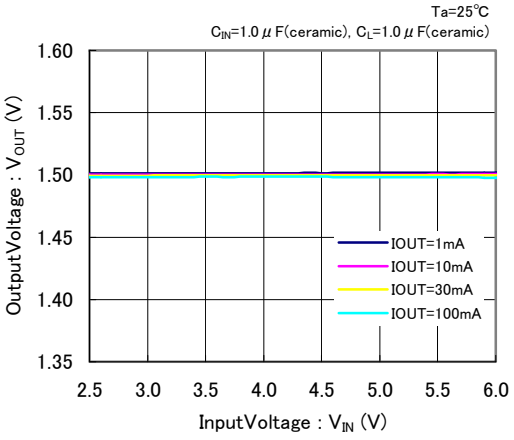
XC6415(V_{OUT}=0.8V)



XC6415(V_{OUT}=1.5V)



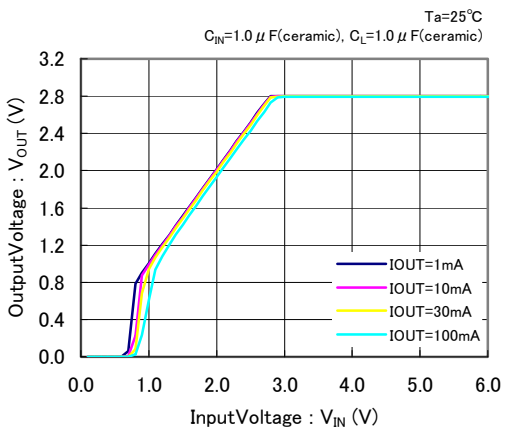
XC6415(V_{OUT}=1.5V)



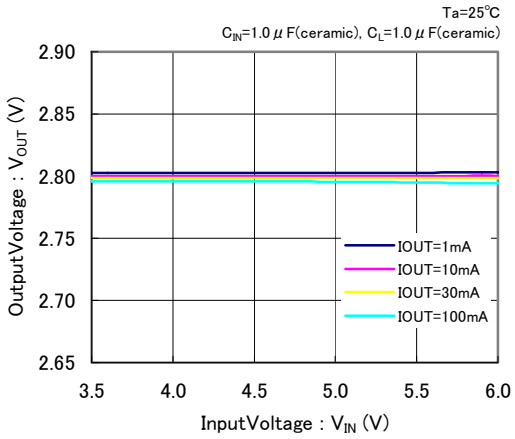
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(2) OutputVoltage vs. InputVoltage (Continued)

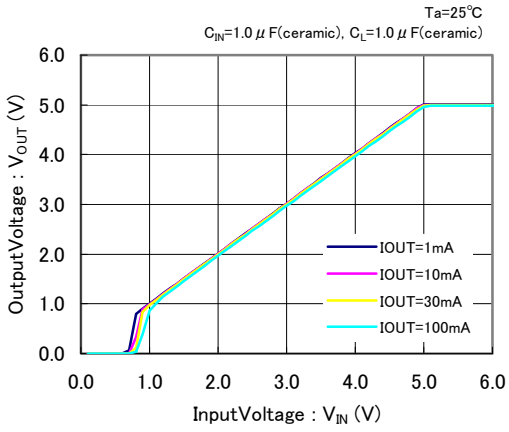
XC6415(V_{OUT}=2.8V)



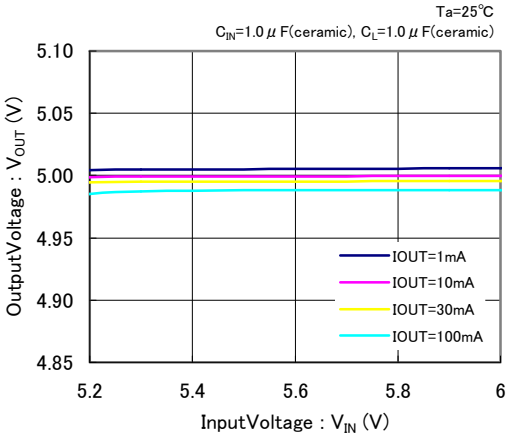
XC6415(V_{OUT}=2.8V)



XC6415(V_{OUT}=5.0V)

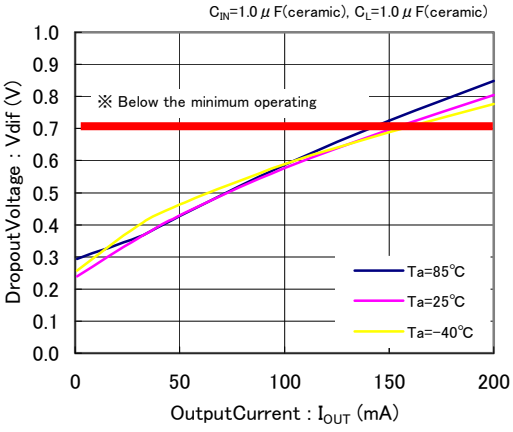


XC6415(V_{OUT}=5.0V)

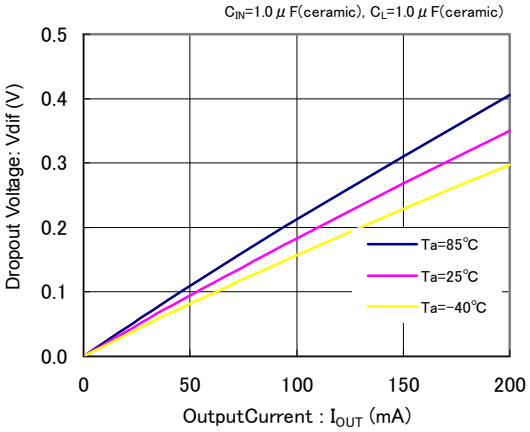


(3) DropoutVoltage vs. OutputCurrent

XC6415(V_{OUT}=0.8V)



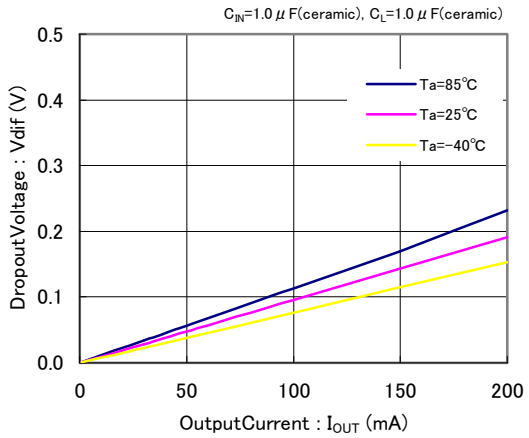
XC6415(V_{OUT}=1.5V)



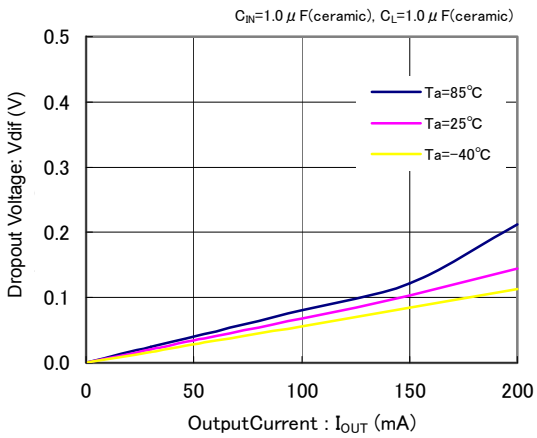
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) DropoutVoltage vs. OutputCurrent (Continued)

XC6415(V_{OUT}=2.8V)

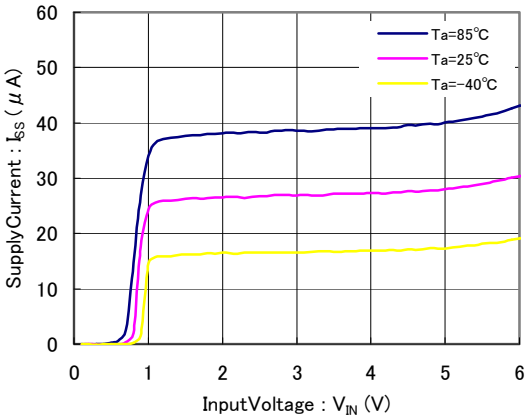


XC6415(V_{OUT}=5.0V)

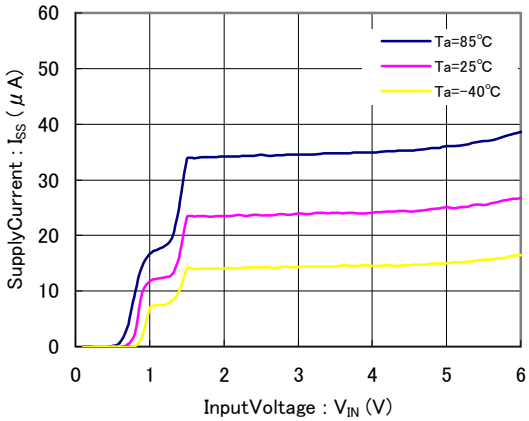


(4) SupplyCurrent vs. InputVoltage

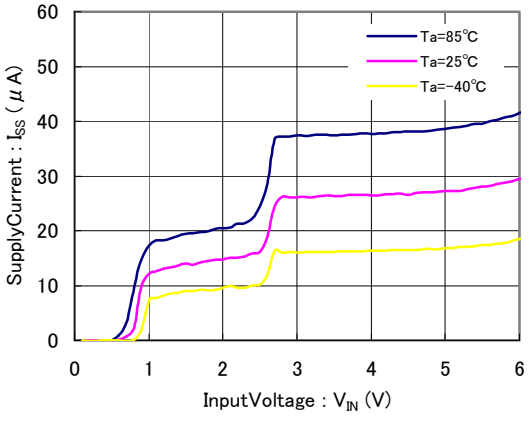
XC6415(V_{OUT}=0.8V)



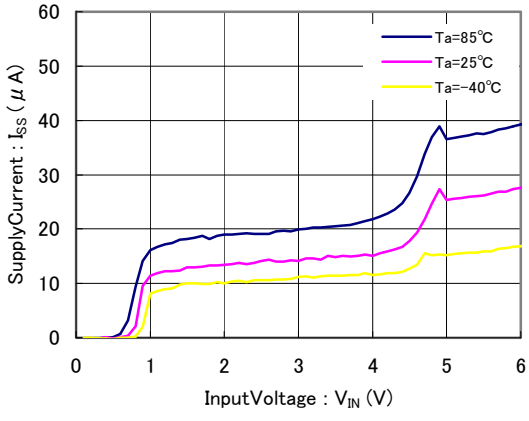
XC6415(V_{OUT}=1.5V)



XC6415(V_{OUT}=2.8V)



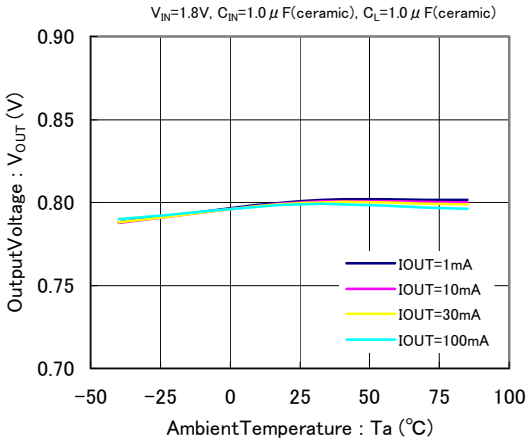
XC6415(V_{OUT}=5.0V)



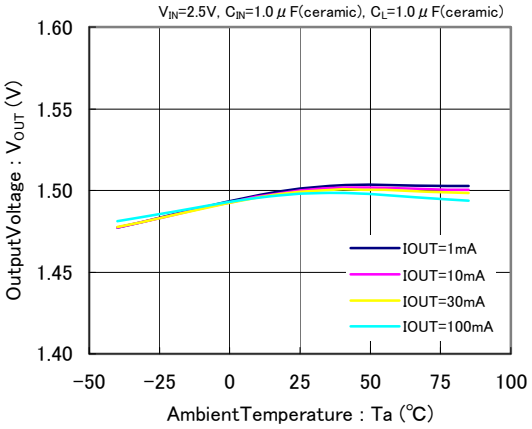
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(5) OutputVoltage vs. AmbientTemperature

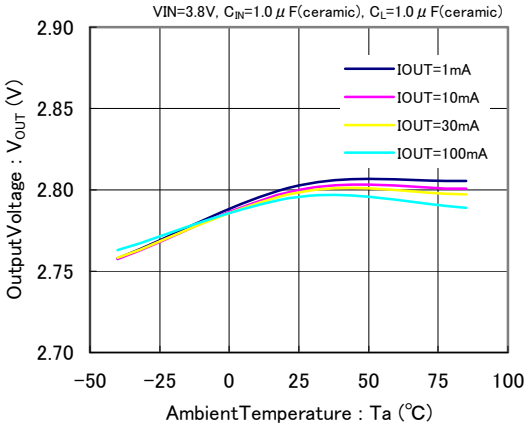
XC6415(V_{OUT}=0.8V)



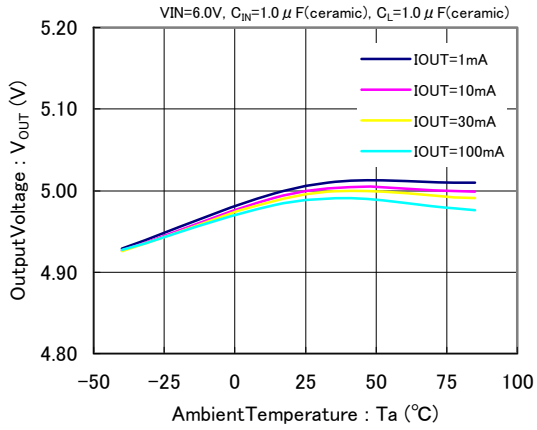
XC6415(V_{OUT}=1.5V)



XC6415(V_{OUT}=2.8V)

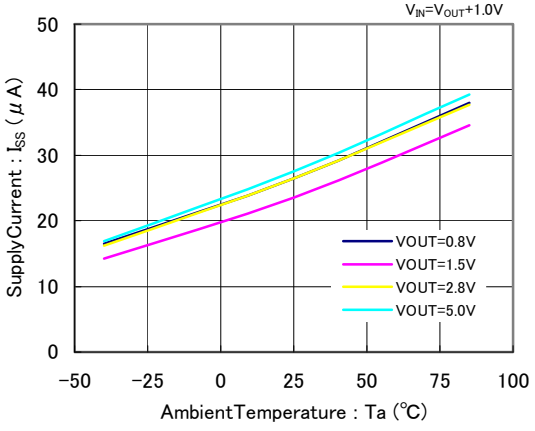


XC6415(V_{OUT}=5.0V)



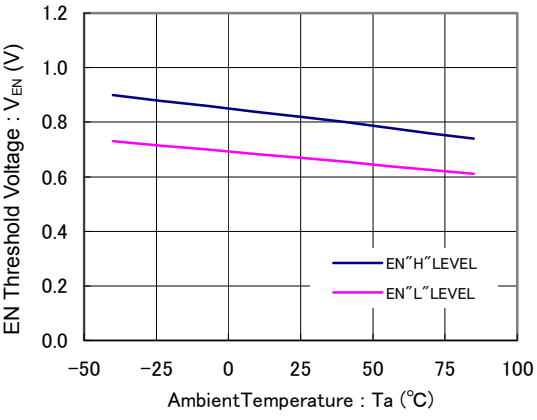
(6) SupplyCurrent vs. AmbientTemperature

XC6415



(7) EN Threshold Voltage vs. AmbientTemperature

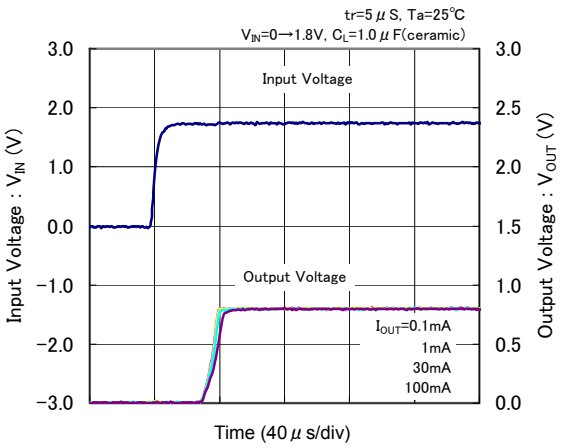
XC6415



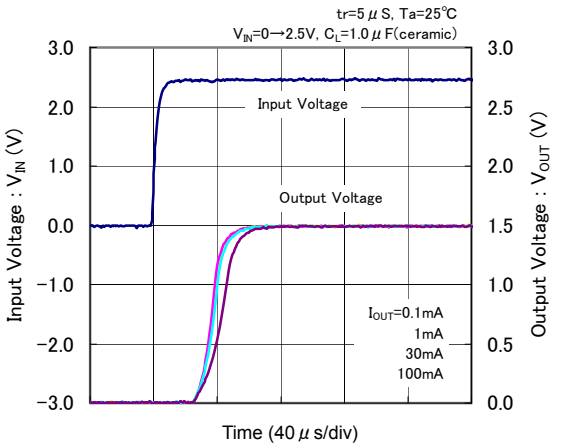
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(8) Rising Response Time

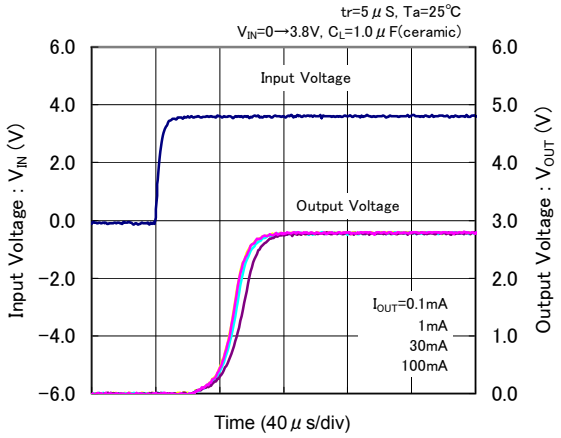
XC6415(V_{OUT}=0.8V)



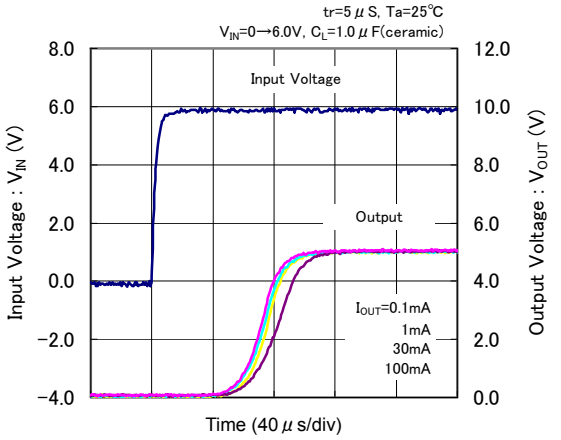
XC6415(V_{OUT}=1.5V)



XC6415(V_{OUT}=2.8V)

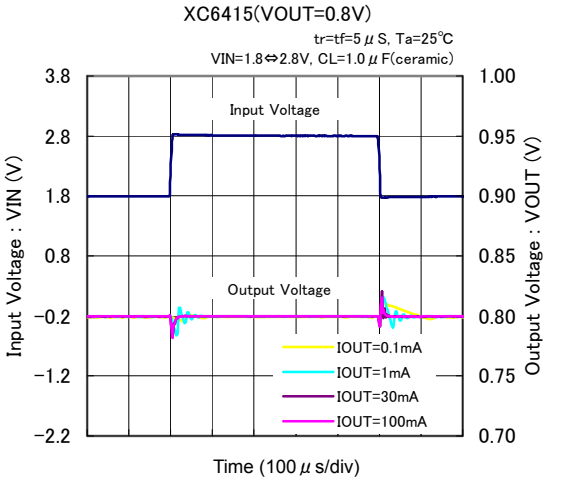


XC6415(V_{OUT}=5.0V)

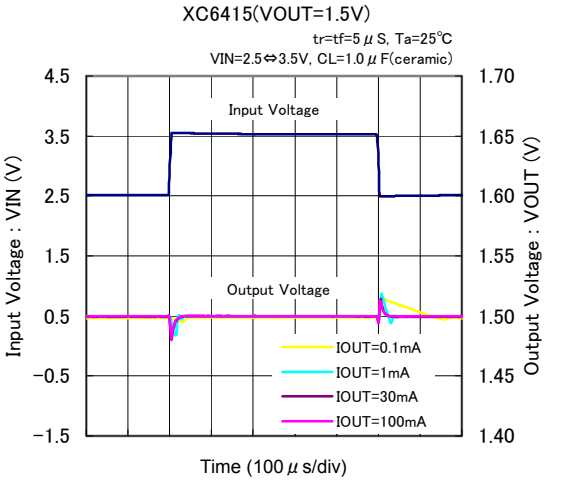


(9) Input Transient Response

XC6415(VOUT=0.8V)

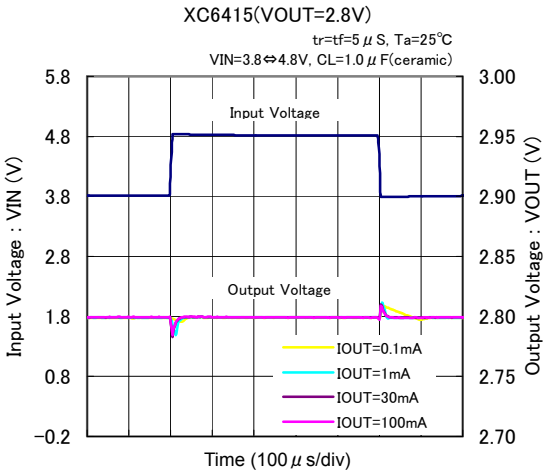


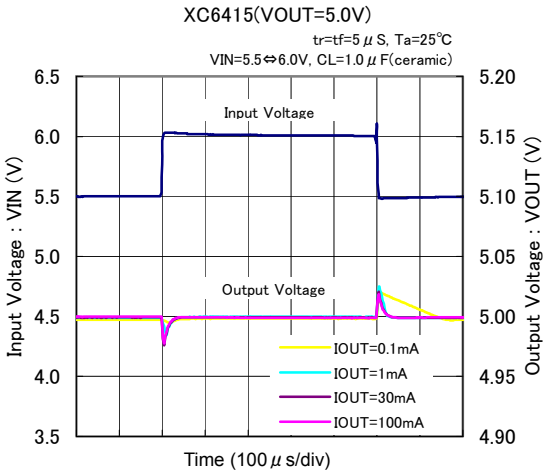
XC6415(VOUT=1.5V)



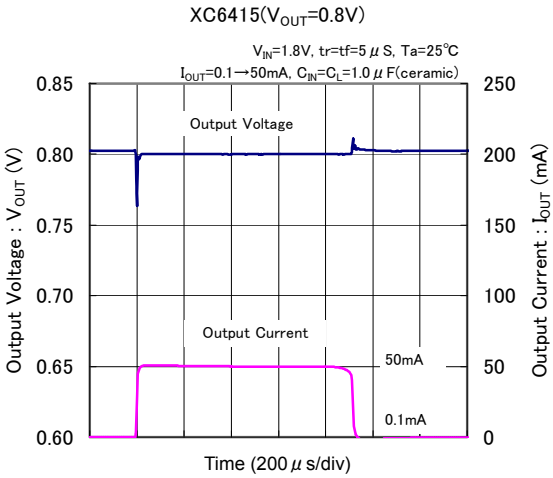
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

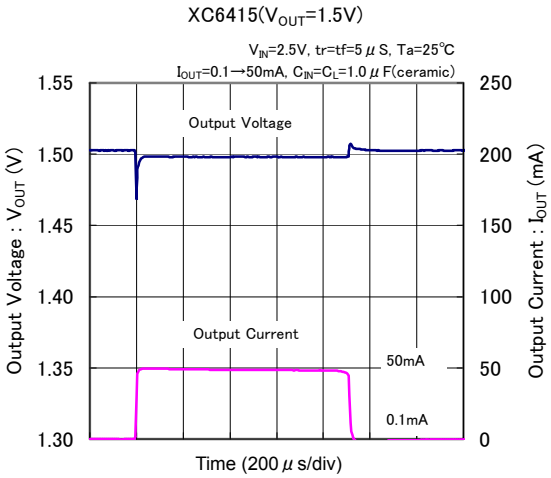
(9) Input Transient Response (Continued)

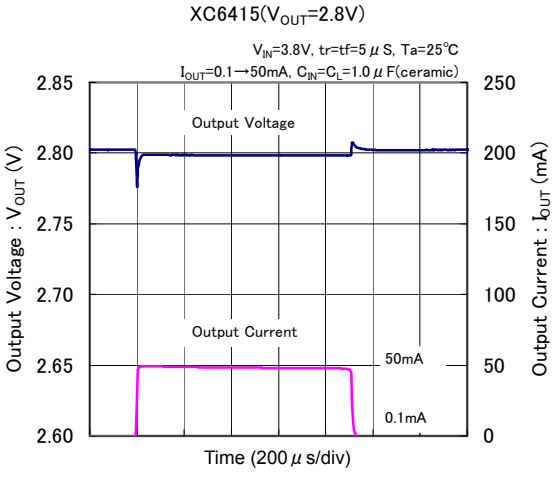


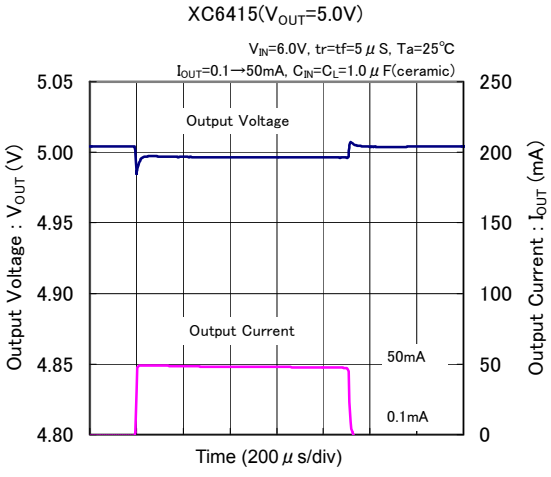


(10) Load Transient Response





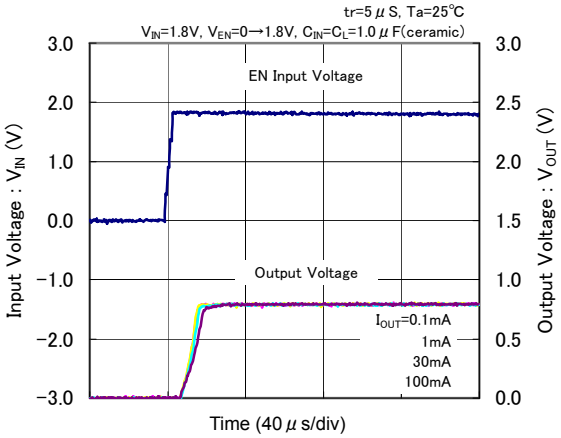




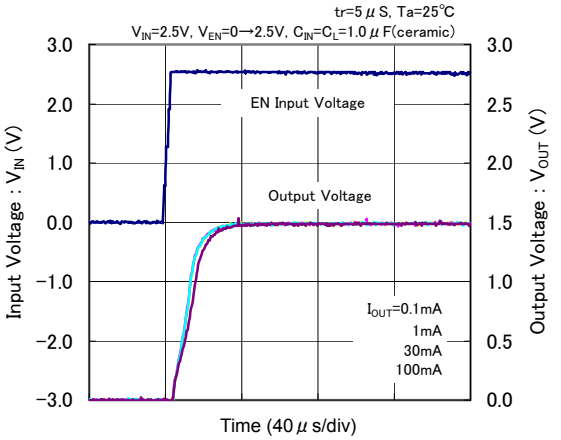
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(11) EN Rising Respose Time

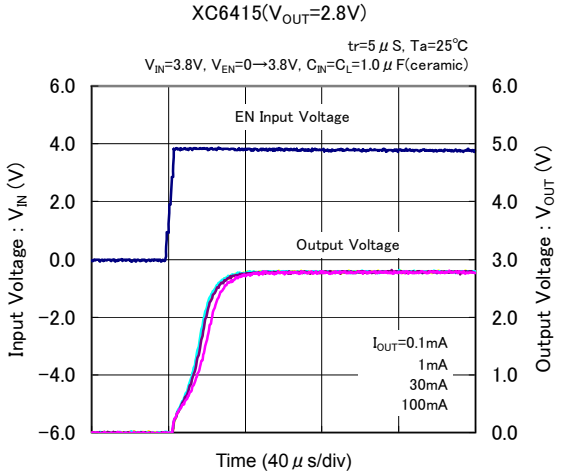
XC6415(V_{OUT}=0.8V)



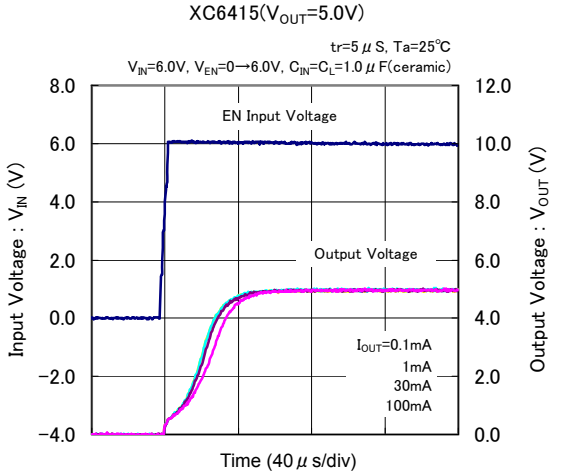
XC6415(V_{OUT}=1.5V)



XC6415(V_{OUT}=2.8V)

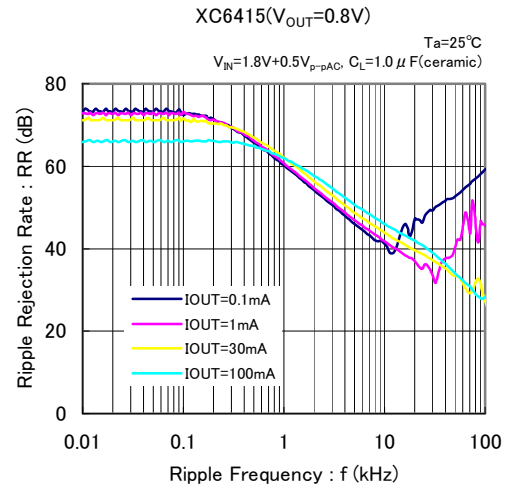


XC6415(V_{OUT}=5.0V)

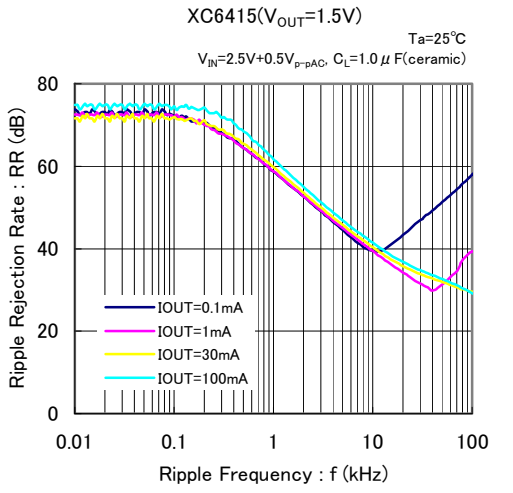


(12) Ripple Rejection Rate

XC6415(V_{OUT}=0.8V)

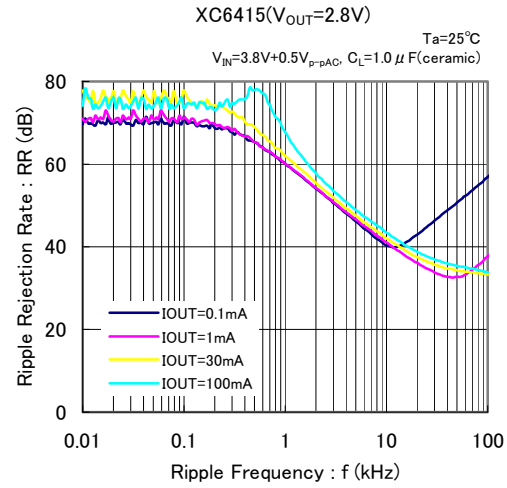


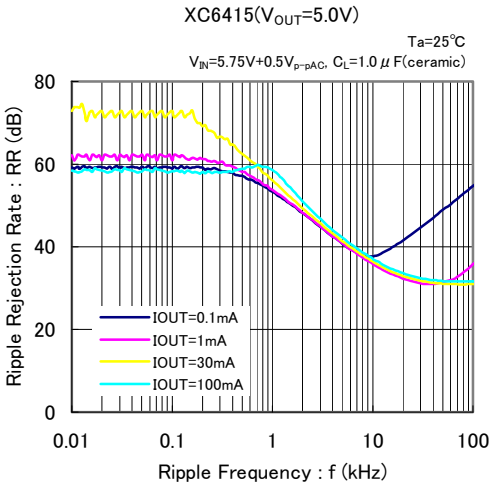
XC6415(V_{OUT}=1.5V)



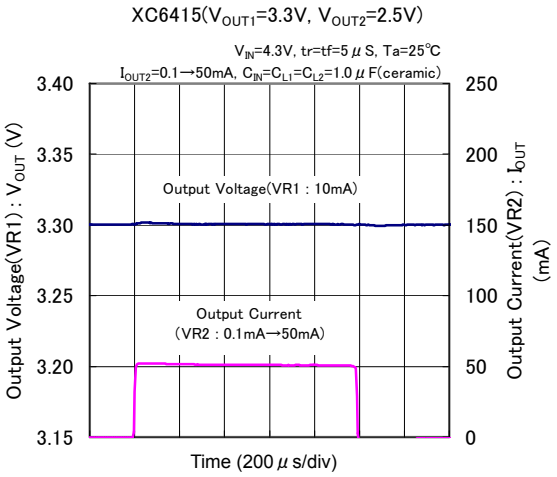
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(12) Ripple Rejection Rate (Continued)





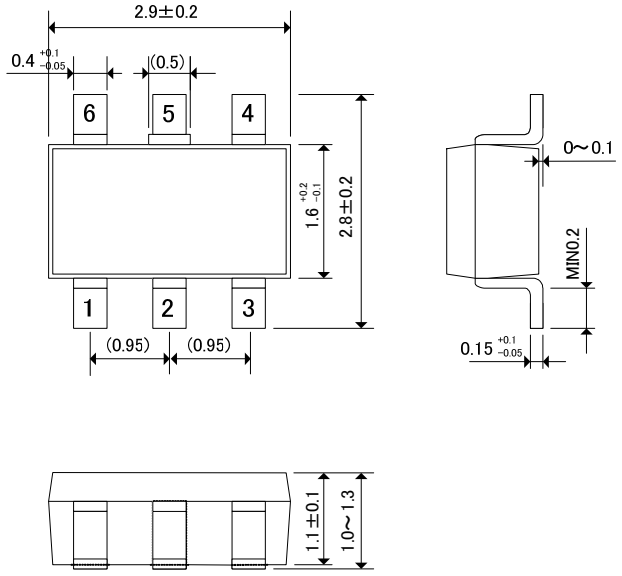
(13) Cross Talk



■PACKAGING INFORMATION

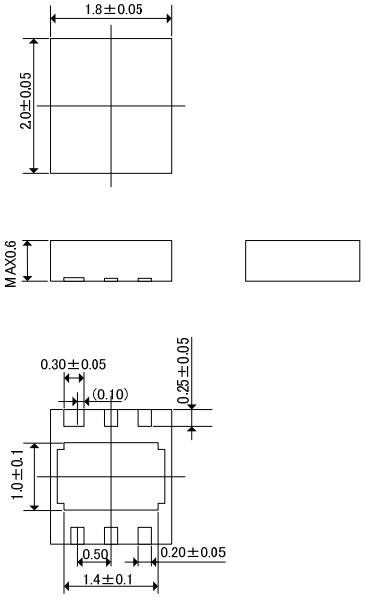
●SOT-26

(unit : mm)

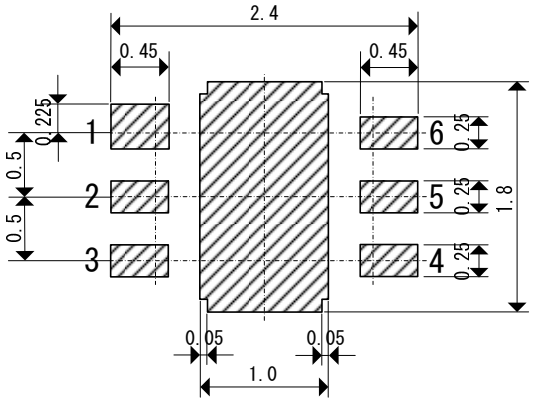


●USP-6C

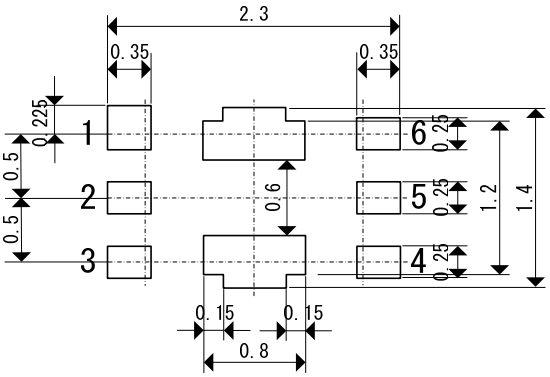
(unit : mm)



●USP-6C Reference Pattern Layout



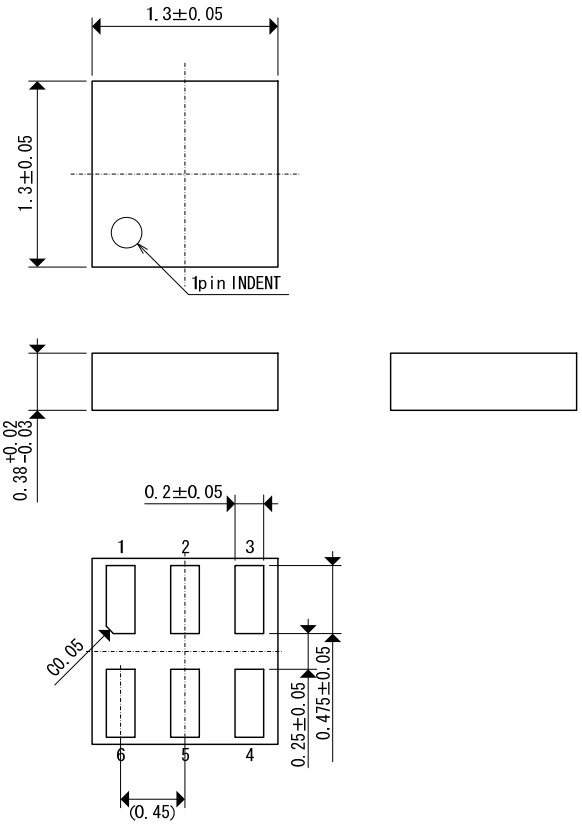
●USP-6C Reference Metal Mask Design



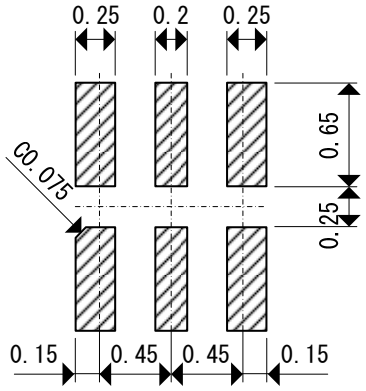
■PACKAGING INFORMATION (Continued)

●USPN-6

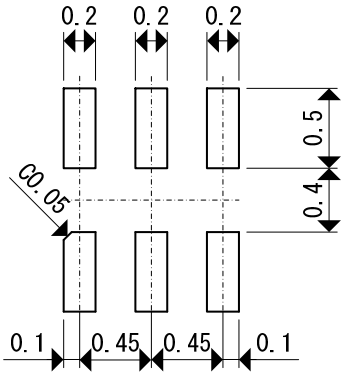
(unit : mm)



●USPN-6　Reference Pattern Layout



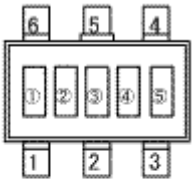
●USPN-6　Reference Metal Mask Design



■MARKING RULE

●SOT-26, USP-6C

SOT-26

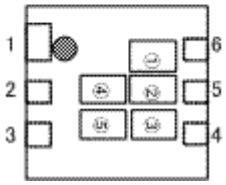


①Represents product series

MARK	PRODUCT SERIES
1	XC6415xxxxx

②③Represents internal sequential number
01～09, 10～99, A0～A9, B0～, B9～, Z9～repeated.
(G, I, J, O, Q, W excluded)

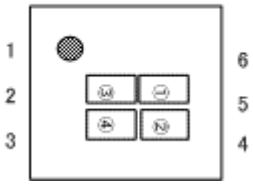
USP-6C



④⑤Represents production lot number
01～09, 10, 11～99, 0A～0Z, 1A～9Z, A0～Z9, AA～ZZ repeated.
(G, I, J, O, Q, W excluded)
*No character inversion used.

●USPN-6

USPN-6



①Represents product series

MARK	PRODUCT SERIES
1	XC6415xxxxx

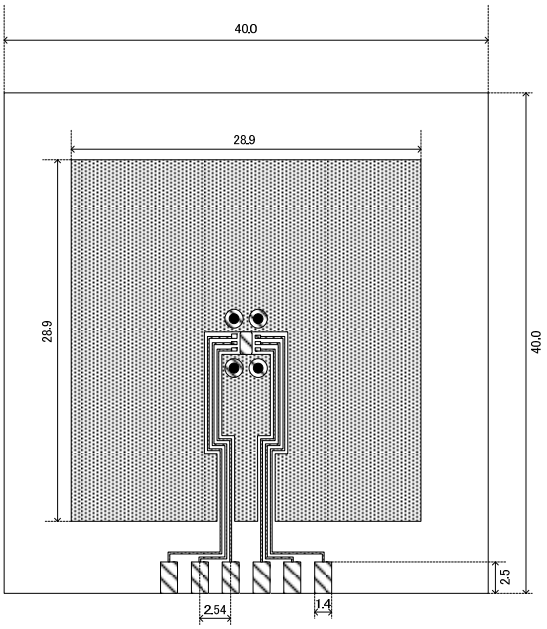
②Represents internal sequential number
0, 1～9, A, B～Z repeated.
(G, I, J, O, Q, W excluded)
*Once the sequential number of the mark② is used to Z, a mark① symbol will be added.

③④Represents production lot number
01～09, 10, 11～99, 0A～0Z, 1A～9Z, A0～Z9, AA～ZZ repeated.
(G, I, J, O, Q, W excluded)
*No character inversion used.

■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 one of reference data taken in the described condition.



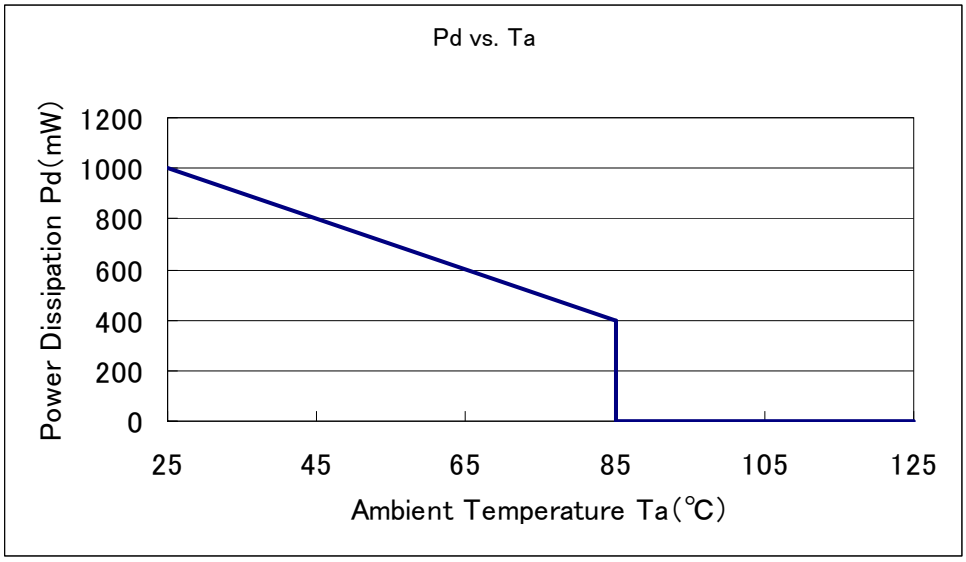
Evaluation Board (Unit: mm)

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. Operating temperature

Board Mount (Tj max = 125℃)

Ambient Temperature(℃)	Power Dissipation Pd(mW)	Thermal Resistance (℃/W)
25	1000	100
85	400	



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