

Charge Pump Voltage Inverter IC

■ GENERAL DESCRIPTION

The XC6351A series are charge pump voltage inverter ICs that have 4 MOSFETs built in. Since highly efficient negative voltages can be generated with only 2 external capacitors connected, GaAs bias power supplies & OpAmp's negative power supplies etc., can be easily accommodated on a standard PCB.

A mini-molded, 6 pin, SOT-26 and USP-6B packages provides for space saving and makes high density mounting possible.

Low power consumption and high efficiency make this series perfect for use with battery operated applications.

Since the IC's operations stop when output is shutdown via the CE (chip enable) function, total power consumption reduction is possible in applications which use this IC.

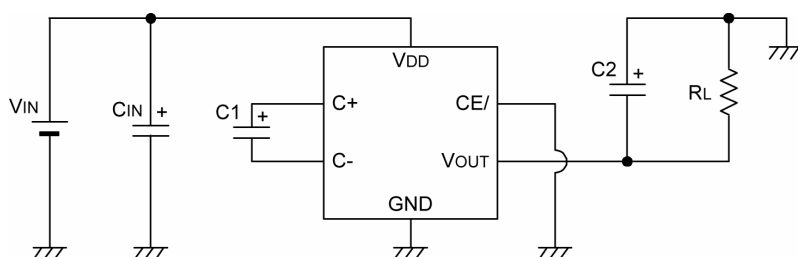
■ APPLICATIONS

- Cellular and portable phones
- Miniature LCD panels
- Palmtop computers, PDAs
- Various battery powered systems

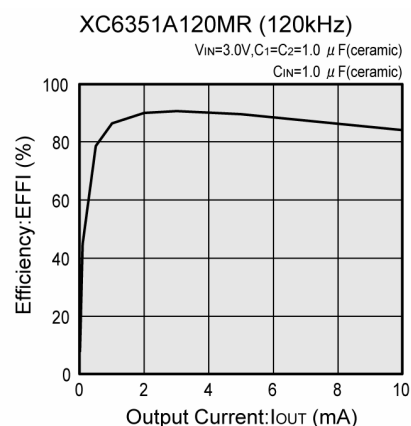
■ FEATURES

- Operating Voltage Range** : 1.2V ~ 5.0V
- Oscillation Frequency** : 120kHz
: 35kHz (custom)
- Low Supply Current** : 310 μ A (TYP.)
100 μ A
(35kHz custom TYP.)
- High Efficiency** : 90% (TYP.) ($R_L = 2k\Omega$)
- Stand-by Current** : 2.0 μ A (MAX.)
- CE(Chip Enable) Function**
- Ultra Small Package** : SOT-26 , USP-6B

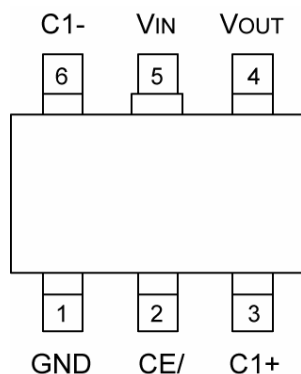
■ TYPICAL APPLICATION CIRCUIT



■ TYPICAL PERFORMANCE CHARACTERISTICS

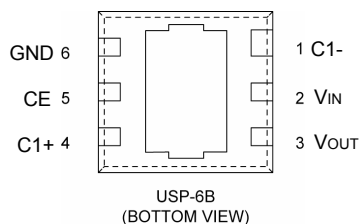


PIN CONFIGURATION



SOT-26

(TOP VIEW)



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

PIN ASSIGNMENT

PIN NUMBER		SYMBOL	FUNCTION
SOT-26	USP-6B		
1	6	GND	Ground
2	5	CE/	Chip Enable (Low Active)
3	4	C1+	External Capacitor +Pin
4	3	VOUT	Reverse Output
5	2	VIN	Power Supply
6	1	C1-	External Capacitor -Pin

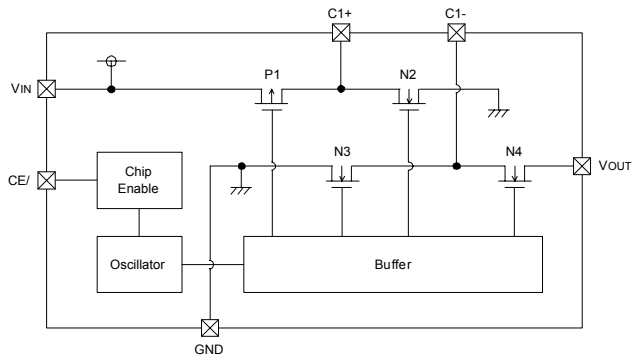
PRODUCT CLASSIFICATION

Ordering Information

XC6351A ①②③④⑤

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
① ② ③	Oscillation Frequency	120	: 120kHz
		035	: 35kHz (custom)
④	Package	M	: SOT-26
		D	: USP-6B
⑤	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed

■ BLOCK DIAGRAM



Note:

1. In operation, the following conditions will be repeated alternately:
P1 & N3 ON: N2 & N4 OFF
P1 & N3 OFF: N2 & N4 ON
2. In standby mode, P1, N3 & N4 will be ON and N2 will be OFF.
The output pin VOUT will be connected to GND.

■ ABSOLUTE MAXIMUM RATINGS

Ta = 25°C

PARAMETER		SYMBOL	RATINGS	UNITS
VIN Input Voltage		VIN	6.0	V
VOUT Pin Voltage		VOUT	-6~0.3	V
C1+ Pin Voltage		C1+	-0.3~VIN + 0.3	V
C1- Pin Voltage		C1-	VOUT - 0.3~0.3	V
CE/ Pin Voltage		CE/	-0.3~VIN + 0.3	V
IOUT Pin Current		IOUT	50	mA
Power Dissipation	SOT-26	Pd	150	mW
	USP-6B		100	
Operating Temperature Range		Topr	-30~+80	°C
Storage Temperature Range		Tstg	-40~+125	°C

Note: Voltage is all ground standardized.

ELECTRICAL CHARACTERISTICS

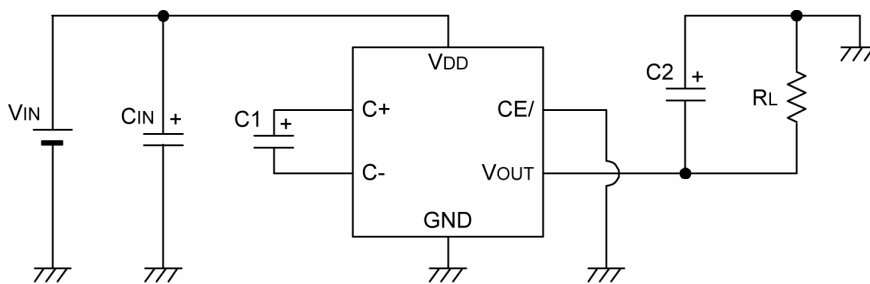
FOSC=120kHz, Ta=25°C

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Supply Current	I _{DD}		-	310	520	μA	1
Operating Voltage Range	V _{IN}	R _L =5kΩ	1.2	-	5.0	V	2
Oscillation Frequency	FOSC		75	120	192	kHz	1
Power Transition Efficiency	EFFI	R _L =2kΩ	-	90	-	%	2
Voltage Transition Efficiency	VEFFI	R _L =∞	95	-	-	%	2
Output Impedance	R _{OUT}	R _L =5kΩ	-	45	90	Ω	2
Stand -by Current	I _{STB}	CE/=V _{IN}	-	-	2.0	μA	3
CE/ 'H' Level Voltage	V _{CEH}		0.9	-	-	V	3
CE/ 'L' Level Voltage	V _{CEL}		-	-	0.25	V	3

Measuring Conditions: Unless otherwise stated, V_{IN} = 5.0V, CE/ = 0V

TYPICAL APPLICATION CIRCUIT

● Standard Circuit



External components:

C_{IN} = 1 μF (ceramic capacitor)

C₁ = C₂ = 1 μF (ceramic capacitor)*

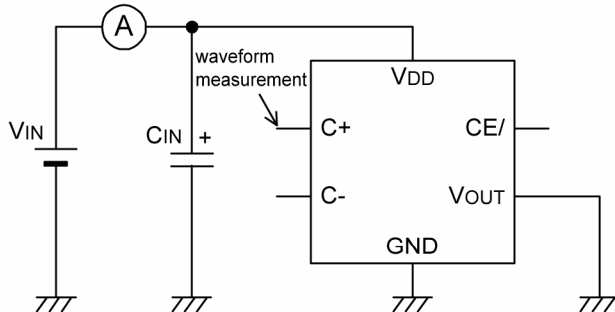
* With the custom 35kHz frequency, C₁ = C₂ = 3.3 μF

NOTES ON USE

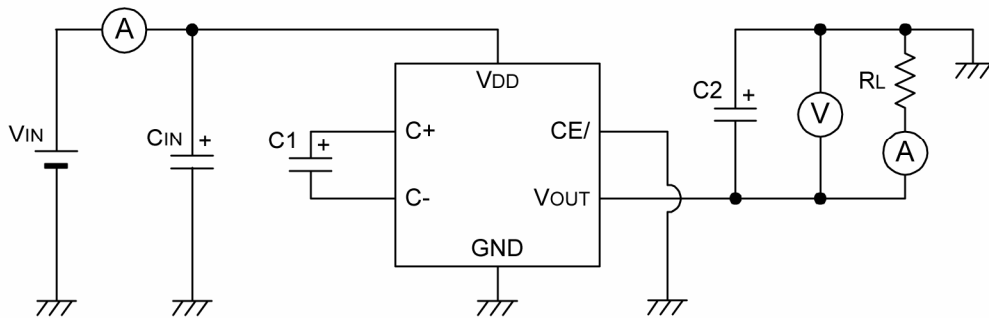
1. Please use the IC & external components: within the specified electrical characteristics range and ensure that absolute maximum ratings are not exceeded.
2. For C₁ & C₂, please use a capacitor with as small an ESR value as possible.
3. In order to reduce impedance between the IC's input pin and the power supply, we recommend that a capacitor (C_{IN}) be connected to the input side.
4. If an external power supply is applied to the output pin in order to have V_{OUT} connected to GND during standby, large current flows through the IC are a possibility. Further, do not use a capacitor at C₂ that has a large capacitance value.

■ TEST CIRCUITS

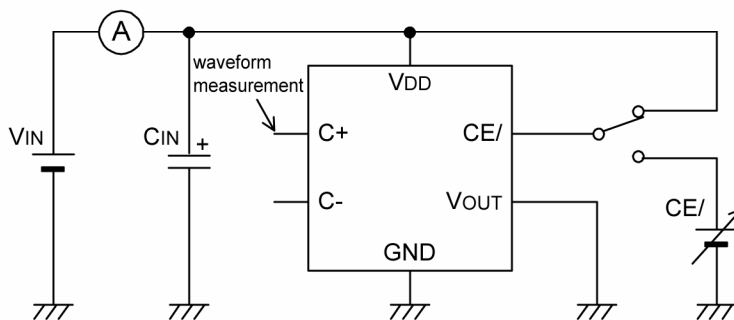
Circuit 1



Circuit 2



Circuit 3



External components:

$C_{IN} = 1 \mu F$ (ceramic capacitor)

$C1 = C2 = 1 \mu F$ (ceramic capacitor)*

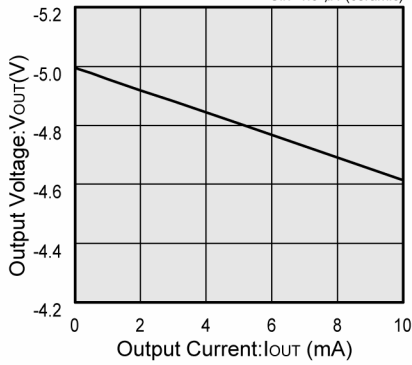
* With the custom 35kHz frequency, $C1 = C2 = 3.3 \mu F$

TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current

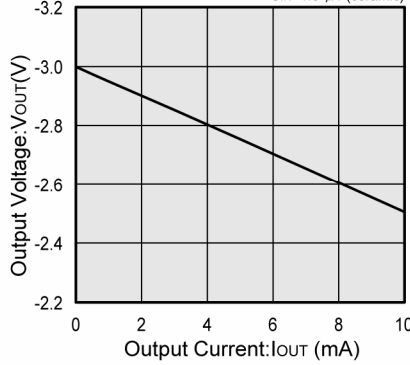
XC6351A120MR (120kHz)

$V_{IN}=5.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$
 $C_{IN}=1.0 \mu F(\text{ceramic})$



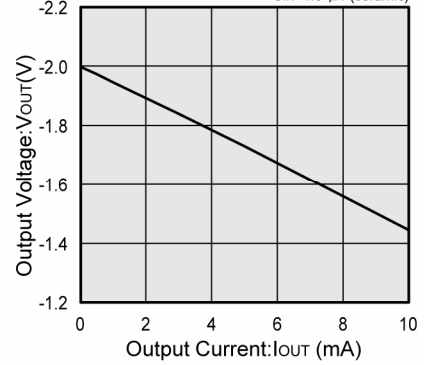
XC6351A120MR (120kHz)

$V_{IN}=3.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$
 $C_{IN}=1.0 \mu F(\text{ceramic})$



XC6351A120MR (120kHz)

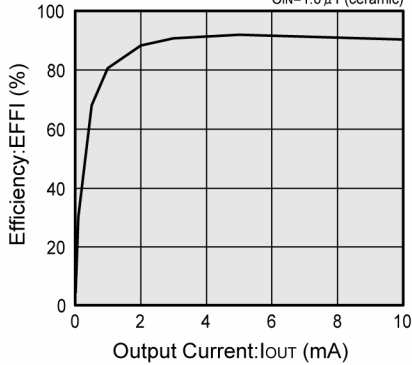
$V_{IN}=2.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$
 $C_{IN}=1.0 \mu F(\text{ceramic})$



(2) Efficiency vs. Output Current

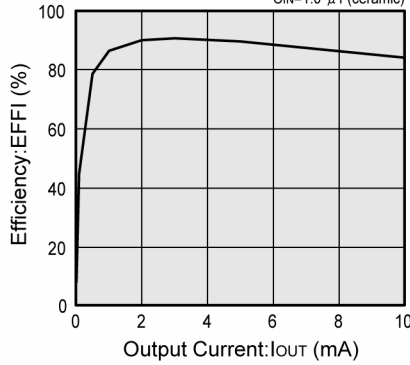
XC6351A120MR (120kHz)

$V_{IN}=5.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$
 $C_{IN}=1.0 \mu F(\text{ceramic})$



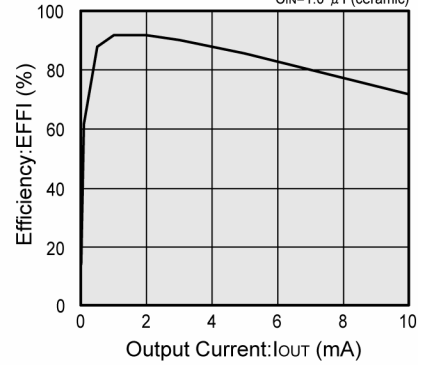
XC6351A120MR (120kHz)

$V_{IN}=3.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$
 $C_{IN}=1.0 \mu F(\text{ceramic})$



XC6351A120MR (120kHz)

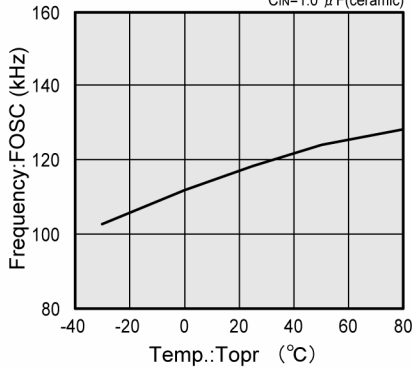
$V_{IN}=2.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$
 $C_{IN}=1.0 \mu F(\text{ceramic})$



(3) Oscillation Frequency vs. Ambient Temperature

XC6351A120MR (120kHz)

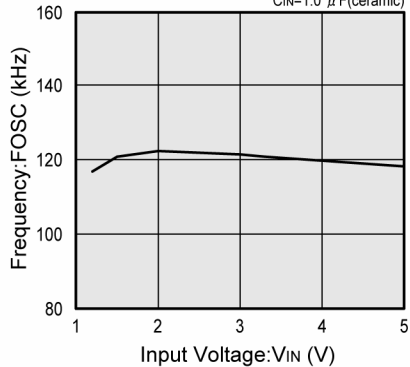
$V_{IN}=5.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$
 $C_{IN}=1.0 \mu F(\text{ceramic})$



(4) Oscillation Frequency vs. Input Voltage

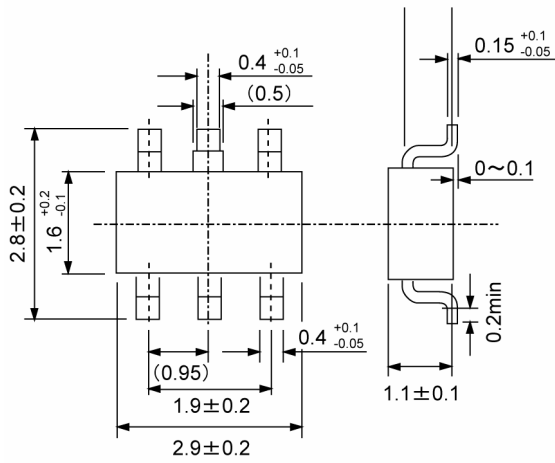
XC6351A120MR (120kHz)

$C_1=C_2=1.0 \mu F(\text{ceramic}), T_{OPR}=25 (^\circ C)$
 $C_{IN}=1.0 \mu F(\text{ceramic})$

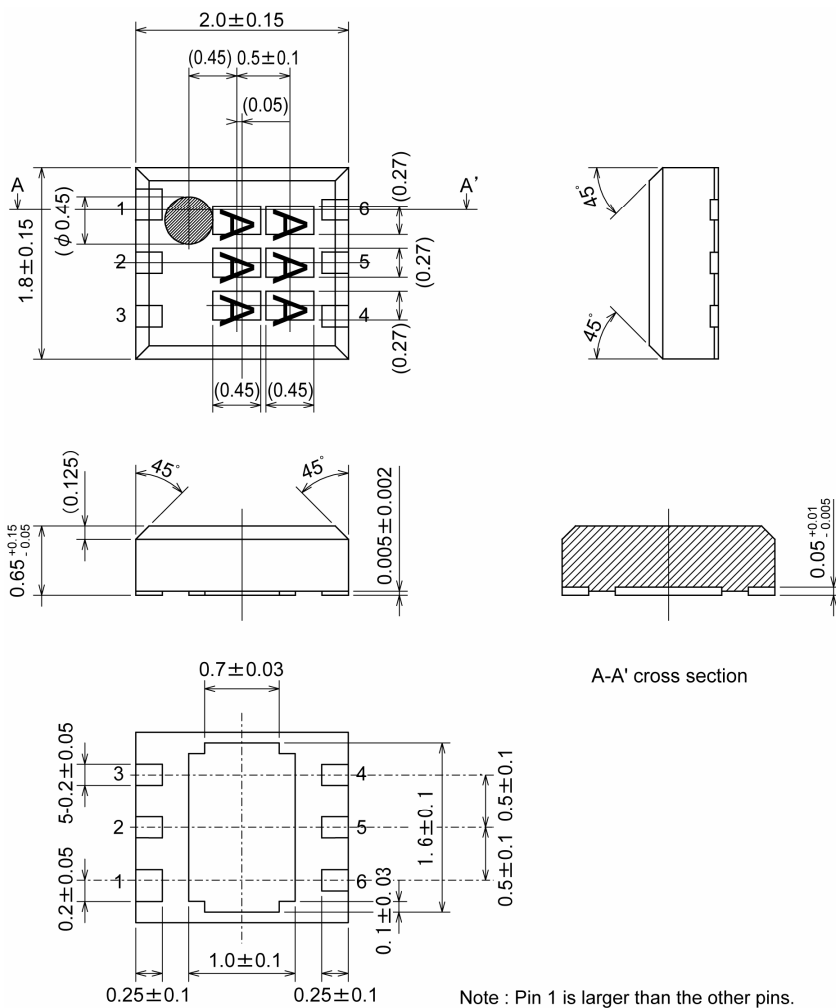


PACKAGING INFORMATION

●SOT-26

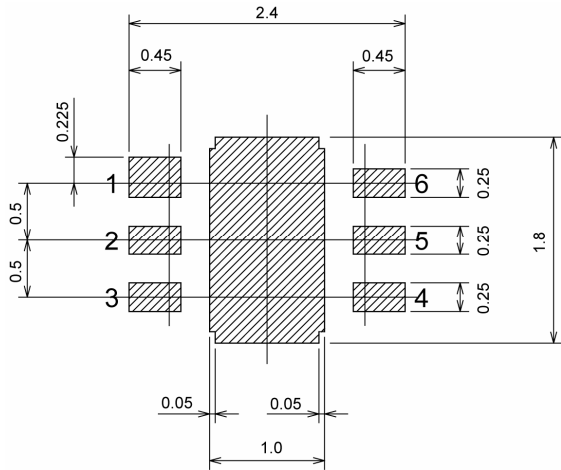


●USP-6B

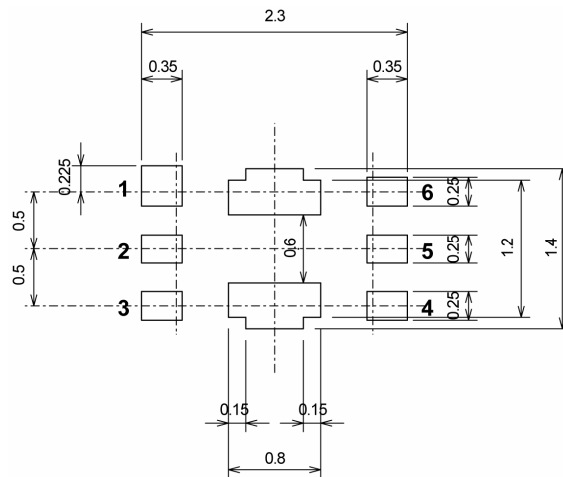


■ PACKAGING INFORMATION (Continued)

● USP-6B Recommended Pattern Layout

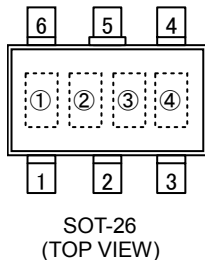


●USP-6B Recommended Metal Mask Design

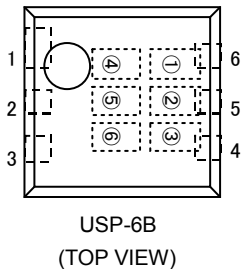


■ MARKING RULE

●SOT-26



●USP-6B



- ① Represents product series

MARK	PRODUCT SERIES
A	XC6351AxxxMx

- ②,③ Represents oscillation frequency

MARK		OSCILLATION FREQUENCY	PRODUCT SERIES
②	③		
0	3	35kHz	XC6351A035Mx
1	2	120kHz	XC6351A120Mx

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

- ①,②,③ Represents product series

MARK			PRODUCT SERIES
①	②	③	
5	1	A	XC6351AxxxDx

- ④,⑤ Represents oscillation frequency

MARK		OSCILLATION FREQUENCY	PRODUCT SERIES
④	⑤		
0	3	35kHz	XC6351A035Dx
1	2	120kHz	XC6351A120Dx

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

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