

## 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.

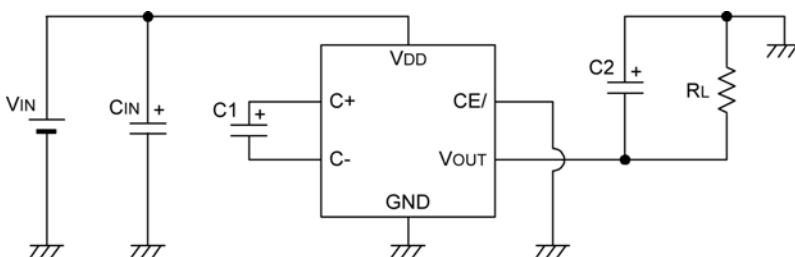
## ■ APPLICATIONS

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

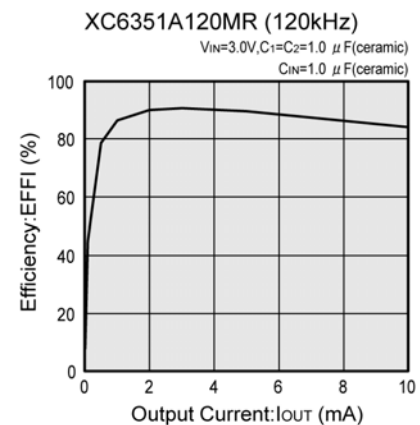
## ■ FEATURES

- Operating Voltage Range** : 1.2V ~ 5.0V
- Oscillation Frequency** : 120kHz  
: 35kHz ( custom )
- Low Supply Current** : 310  $\mu$ A ( TYP. )  
100  $\mu$ A  
(35kHz custom TYP.)
- High Efficiency** : 90% (TYP.) ( RL = 2k $\Omega$  )
- Stand-by Current** : 2.0  $\mu$ A (MAX.)
- CE(Chip Enable) Function**
- Packages** : SOT-26 ,USP-6B
- Environmentally Friendly** : EU RoHS Compliant, Pb Free

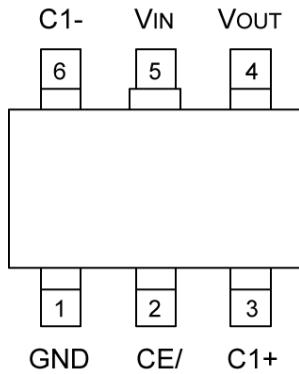
## ■ TYPICAL APPLICATION CIRCUIT



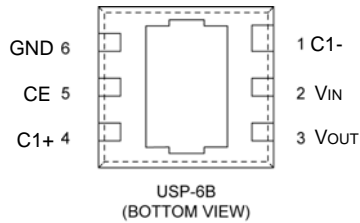
## ■ TYPICAL PERFORMANCE CHARACTERISTICS



## 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

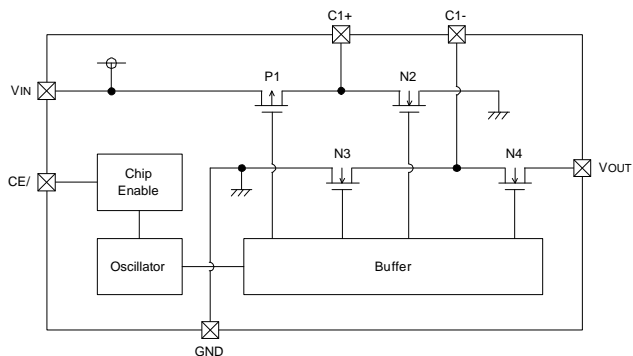
XC6351A ①②③④⑤-⑥<sup>(\*)</sup>

| DESIGNATOR | DESCRIPTION                         | SYMBOL | DESCRIPTION    |
|------------|-------------------------------------|--------|----------------|
| ①②③        | Oscillation Frequency               | 120    | 120kHz         |
|            |                                     | 035    | 35kHz (custom) |
| ④⑤-⑥       | Packages Taping Type <sup>(*)</sup> | MR     | SOT-26         |
|            |                                     | MR-G   | SOT-26         |
|            |                                     | DR     | USP-6B         |
|            |                                     | DR-G   | USP-6B         |

<sup>(\*)</sup> The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.

<sup>(\*)</sup> The device orientation is fixed in its embossed tape pocket. For reverse orientation, please contact your local Torex sales office or representative. (Standard orientation: ④R-⑥, Reverse orientation: ④L-⑥)

## ■ BLOCK DIAGRAM



### Note:

- In operation, the following conditions will be repeated alternately:  
 P1 & N3 ON: N2 & N4 OFF  
 P1 & N3 OFF: N2 & N4 ON
- 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 | 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

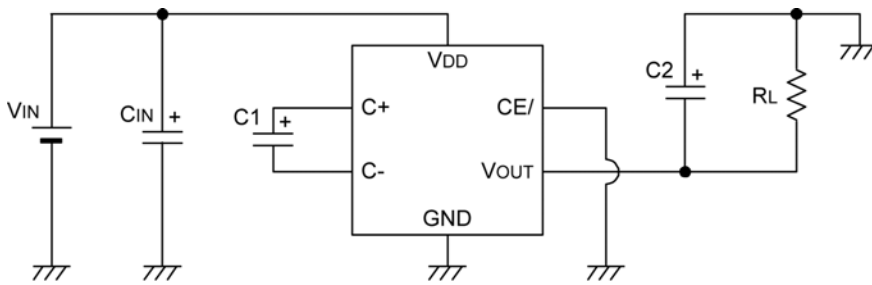
FOSC=120kHz, Ta=25°C

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

Measuring Conditions: Unless otherwise stated, V<sub>IN</sub> = 5.0V, CE/ = 0V

## TYPICAL APPLICATION CIRCUIT

### ● Standard Circuit



External components:

C<sub>IN</sub> = 1 μF (ceramic capacitor)

C<sub>1</sub> = C<sub>2</sub> = 1 μF (ceramic capacitor)\*

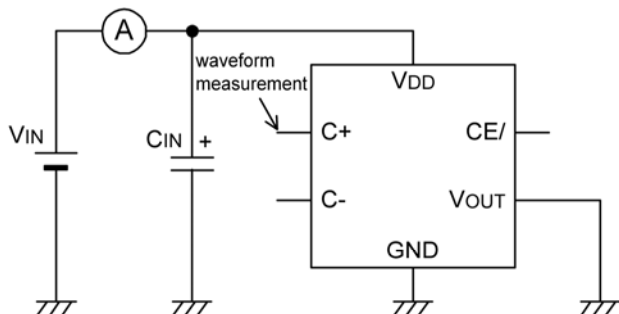
\* With the custom 35kHz frequency, C<sub>1</sub> = C<sub>2</sub> = 3.3 μF

## NOTES ON USE

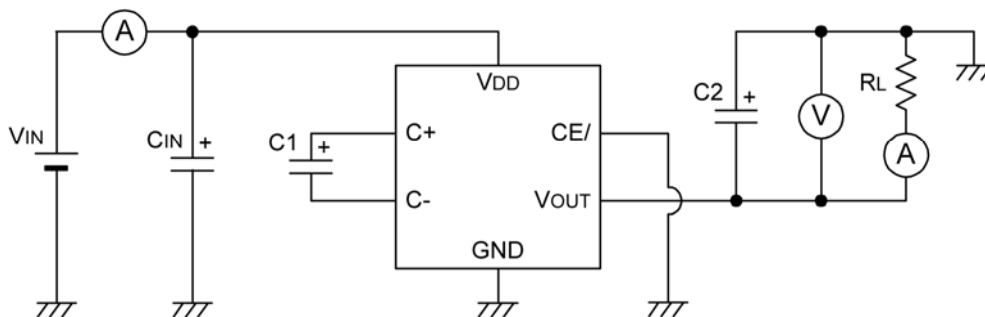
1. Please use the IC & external components: within the specified electrical characteristics range and ensure that absolute maximum ratings are not exceeded.
2. For C<sub>1</sub> & C<sub>2</sub>, please use a capacitor with as small an ESR value as possible.
3. In order to reduce impedance between the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

## TEST CIRCUITS

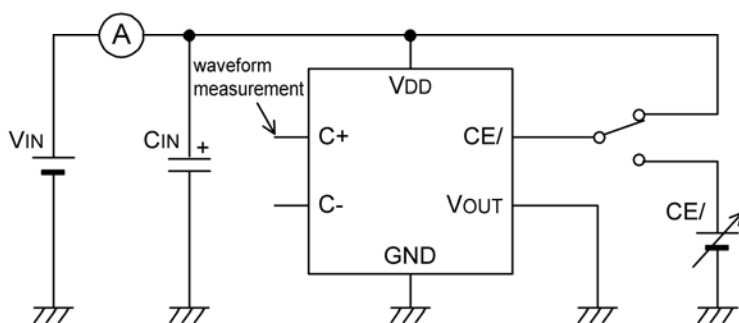
Circuit 1



Circuit 2



Circuit 3



External components:

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

$C_1 = C_2 = 1 \mu F$  (ceramic capacitor)\*

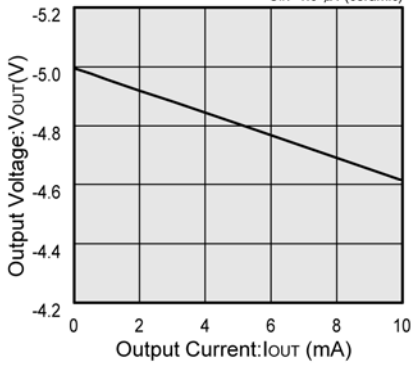
\* With the custom 35kHz frequency,  $C_1 = C_2 = 3.3 \mu F$

## TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current

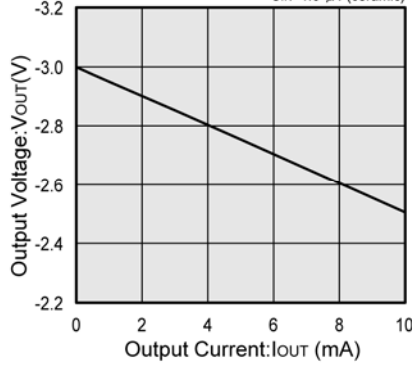
XC6351A120MR (120kHz)

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



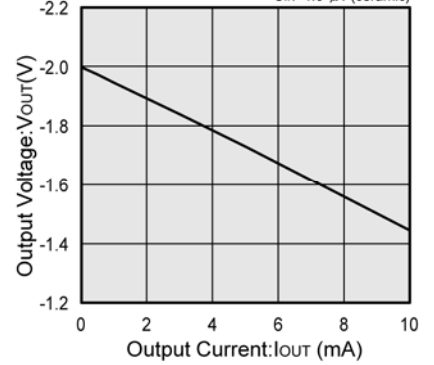
XC6351A120MR (120kHz)

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



XC6351A120MR (120kHz)

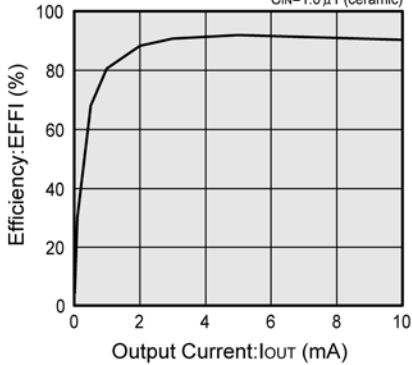
$V_{IN}=2.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$   
 $C_{IN}=1.0 \mu F(\text{ceramic})$



(2) Efficiency vs. Output Current

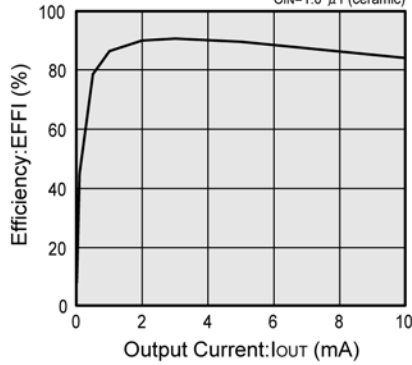
XC6351A120MR (120kHz)

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



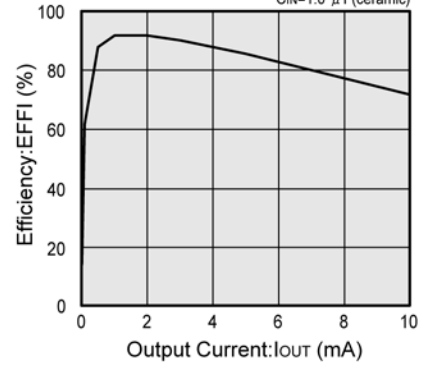
XC6351A120MR (120kHz)

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



XC6351A120MR (120kHz)

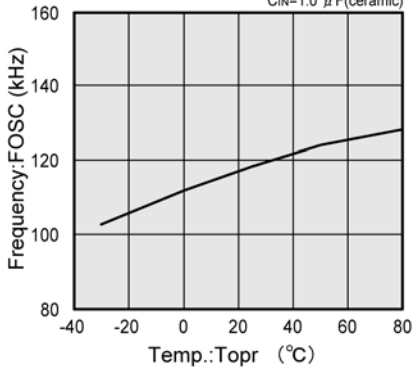
$V_{IN}=2.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$   
 $C_{IN}=1.0 \mu F(\text{ceramic})$



(3) Oscillation Frequency vs. Ambient Temperature

XC6351A120MR (120kHz)

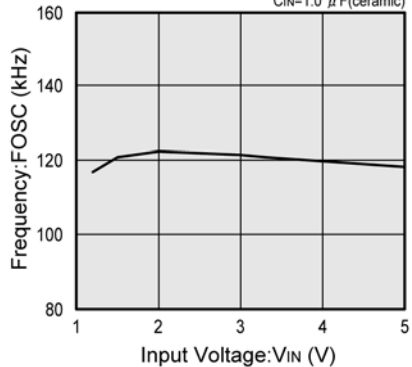
$V_{IN}=5.0V, C_1=C_2=1.0 \mu F(\text{ceramic})$   
 $C_{IN}=1.0 \mu F(\text{ceramic})$



(4) Oscillation Frequency vs. Input Voltage

XC6351A120MR (120kHz)

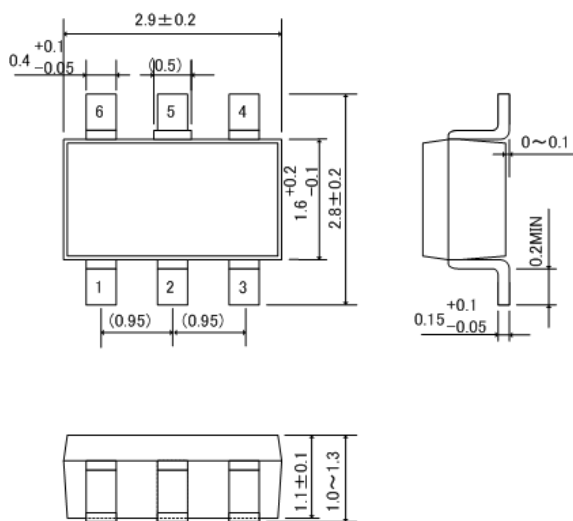
$C_1=C_2=1.0 \mu F(\text{ceramic}), T_{opr}=25 (C)$   
 $C_{IN}=1.0 \mu F(\text{ceramic})$



**PACKAGING INFORMATION**

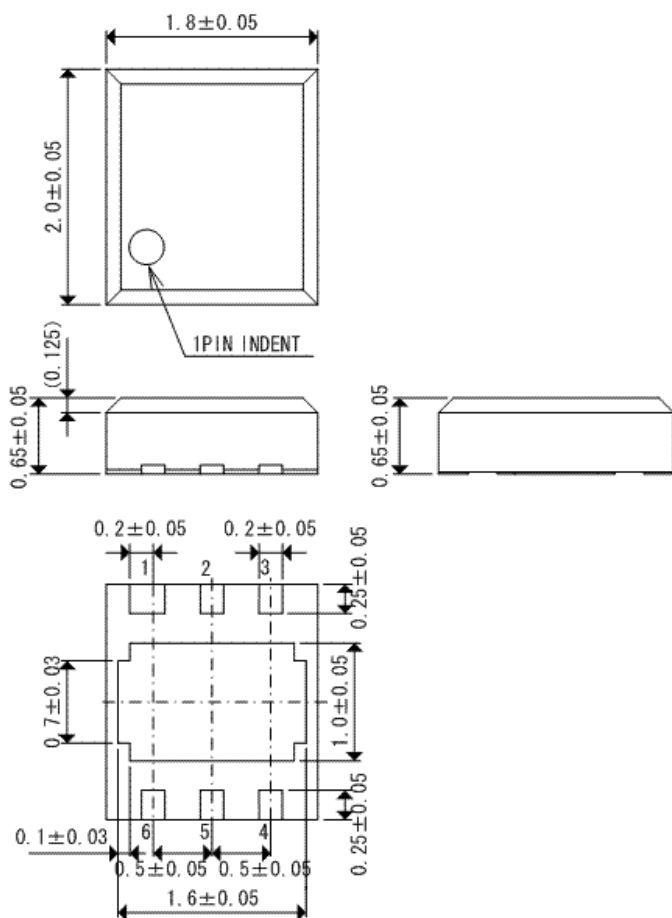
● SOT-26

Unit : mm

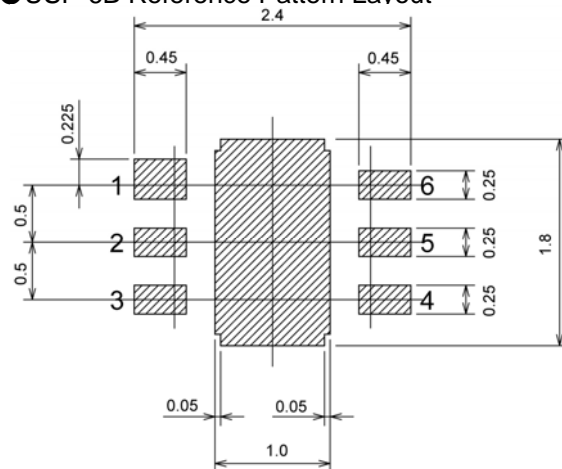


● USP-6B

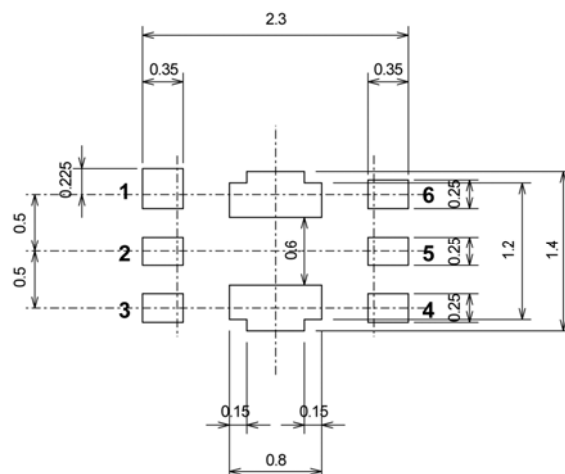
Unit : mm



● USP-6B Reference Pattern Layout

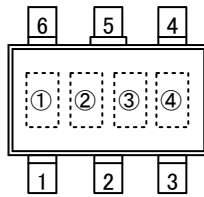


● USP-6B Reference Metal Mask Design



## MARKING RULE

### ● SOT-26



SOT-26  
(TOP VIEW)

① represents product series

| MARK |  | PRODUCT SERIES |
|------|--|----------------|
| A    |  | XC6351AxxxMx   |

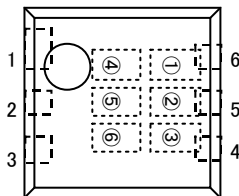
②,③ represents oscillation frequency

| 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 excluded)

### ● USP-6B



USP-6B  
(TOP VIEW)

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 excluded)

Note: No character inversion used.



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