XC6351A Series

ETR0801_004

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.

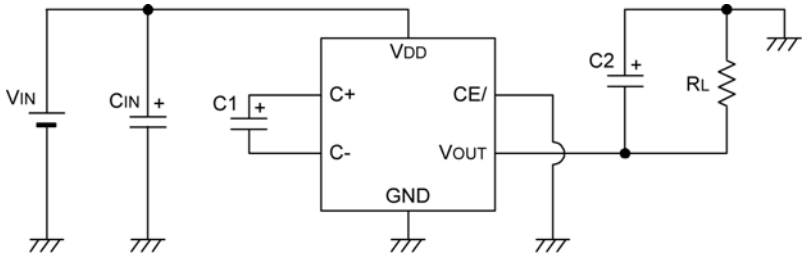
■APPLICATIONS

- ●Negative power supplies
- ●Power supplies for Opamp
- ●Cellular and portable phones
- ●Miniature LCD panels
- ●PDAs
- ●Various battery powered systems

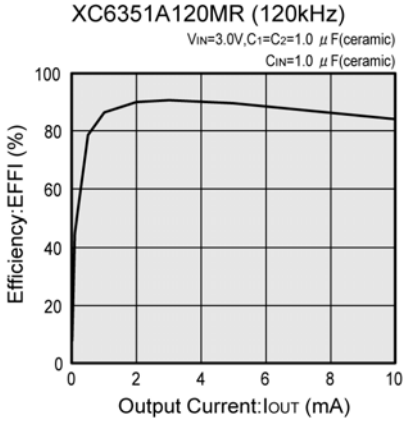
■FEATURES

Operating Voltage Range	: 1.2V ~ 5.0V
Oscillation Frequency	: 120kHz
	: 35kHz (custom)
Low Supply Current	: 310μA (TYP.)
	: 100μA (35kHz custom TYP.)
High Efficiency	: 90% (TYP.) (RL = 2kΩ)
Stand-by Current	: 2.0μA (MAX.)
CE(Chip Enable) Function	
Operating Ambient Temperature	: -30°C ～ +80°C
Packages	: SOT-26 ,USP-6B
Environmentally Friendly	: EU RoHS Compliant, Pb Free

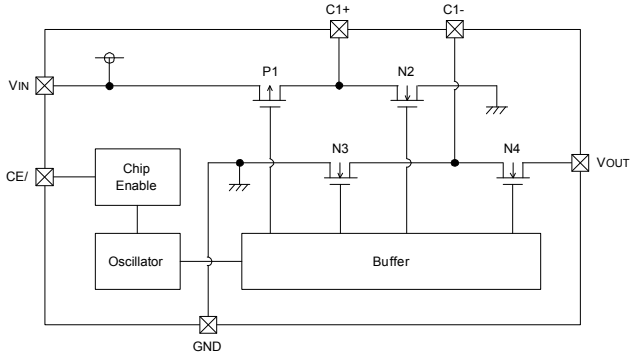
■TYPICAL APPLICATION CIRCUIT



■TYPICAL PERFORMANCE CHARACTERISTICS



■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.

■PRODUCT CLASSIFICATION

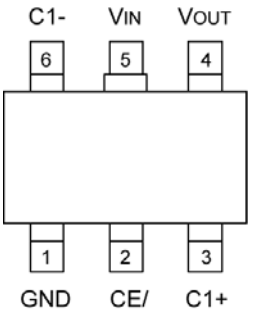
●Ordering Information

XC6351A ①②③④⑤–⑥(*1)

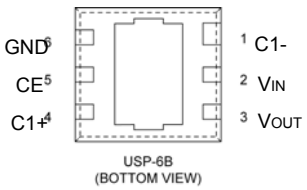
DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①②③	Oscillation Frequency	120	120kHz
		035	35kHz (custom)
④⑤-⑥	Packages Taping Type	MR	SOT-26(3,000pcs/Reel)
		MR-G	SOT-26(3,000pcs/Reel)
		DR	USP-6B(3,000pcs/Reel)
		DR-G	USP-6B(3,000pcs/Reel)

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

■PIN CONFIGURATION



SOT-26
(TOP VIEW)



USP-6B
(BOTTOM 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 (No. 2) 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

■PIN FUNCTIOS ASSIGNMENT

CE/PIN	STATUS
H	Stand-by
L	Active

■ABSOLUTE MAXIMUM RATINGS

Ta = 25℃

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
VOUT Pin Current		IOUT	50	mA
Power Dissipation	SOT-26	Pd	150	mW
			600 (40mm x 40mm Standard board) (*1)	
	USP-6B		100	
			1000 (40mm x 40mm Standard board) (*1)	
Operating Temperature Range		Topr	-30～＋80	℃
Storage Temperature Range		Tstg	-40～＋125	℃

Each rating voltage is based on the GND

(*1) This is a reference data taken by using the test board. Please see the power dissipation page for the mounting condition.

■ELECTRICAL CHARACTERISTICS

fosc＝120kHz, Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Supply Current	IDD		-	310	520	μA	1
Operating Voltage Range	VIN	RL＝5kΩ	1.2	-	5.0	V	2
Oscillation Frequency	fOSC		75	120	192	kHz	1
Power Transition Efficiency	EFFI	RL＝2kΩ	-	90	-	%	2
Voltage Transition Efficiency	VEFFI	RL＝∞	95	-	-	%	2
Output Impedance	ROUT	RL＝5kΩ	-	45	90	Ω	2
Stand -by Current	ISTB	CE/＝VIN	-	-	2.0	μA	3
CE/ 'H' Level Voltage	VCEH		0.9	-	-	V	3
CE/ 'L' Level Voltage	VCEL		-	-	0.25	V	3

Measuring Conditions: Unless otherwise stated, VIN = 5.0V, CE/ = 0V

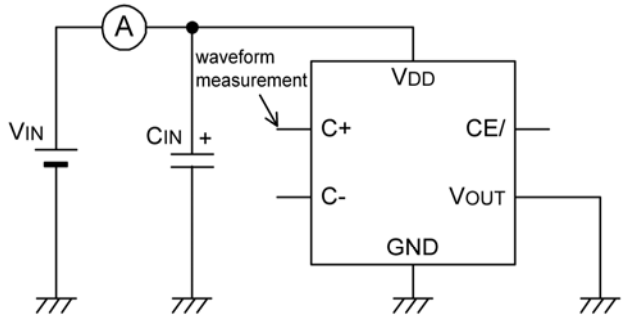
fosc＝35kHz, Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Supply Current	IDD		-	100	170	μA	1
Operating Voltage Range	VIN	RL＝5kΩ	1.2	-	5.0	V	2
Oscillation Frequency	fOSC		21	35	56	kHz	1
Power Transition Efficiency	EFFI	RL＝2kΩ	-	90	-	%	2
Voltage Transition Efficiency	VEFFI	RL＝∞	95	-	-	%	2
Output Impedance	ROUT	RL＝5kΩ	-	45	90	Ω	2
Stand -by Current	ISTB	CE/＝VIN	-	-	2.0	μA	3
CE/ 'H' Level Voltage	VCEH		0.9	-	-	V	3
CE/ 'L' Level Voltage	VCEL		-	-	0.25	V	3

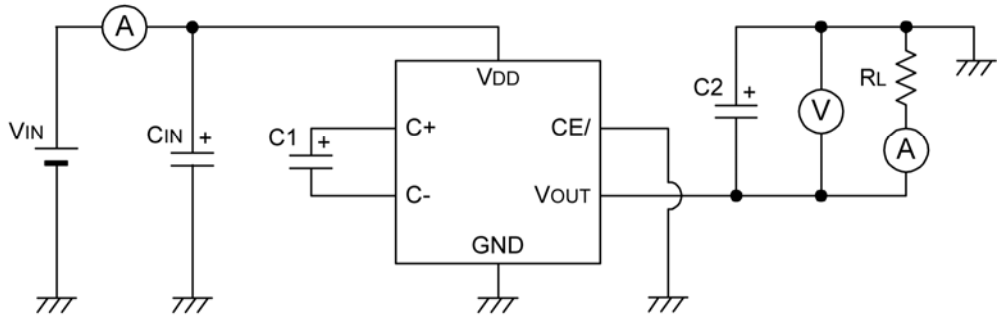
Measuring Conditions: Unless otherwise stated, VIN = 5.0V, CE/ = 0V

■TEST CIRCUITS

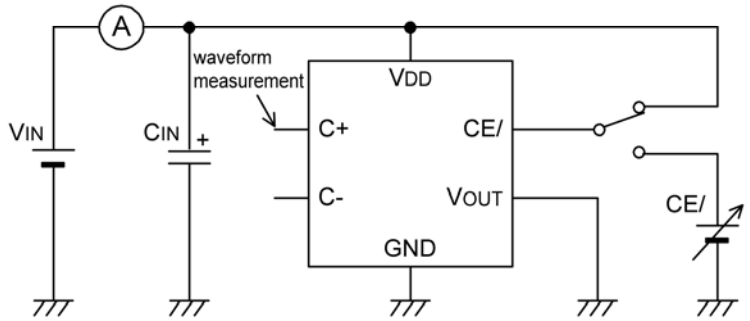
Circuit 1



Circuit 2



Circuit 3



External components:

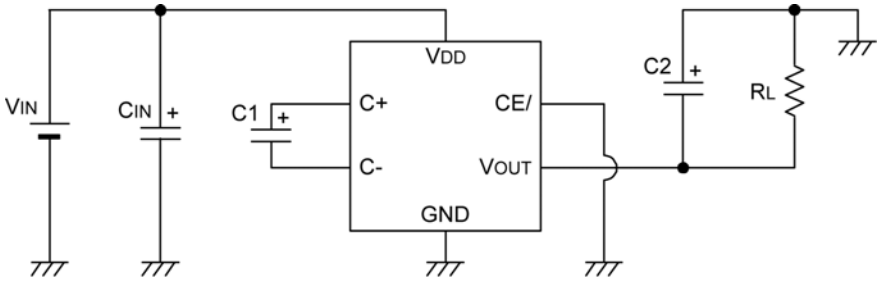
CIN = 1 μF (ceramic capacitor)

C1 = C2 = 1 μF (ceramic capacitor)*

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

■ TYPICAL APPLICATION CIRCUIT

●Standard Circuit



External components:

CIN = 1 μF (ceramic capacitor)

C1 = C2 = 1 μF (ceramic capacitor)*

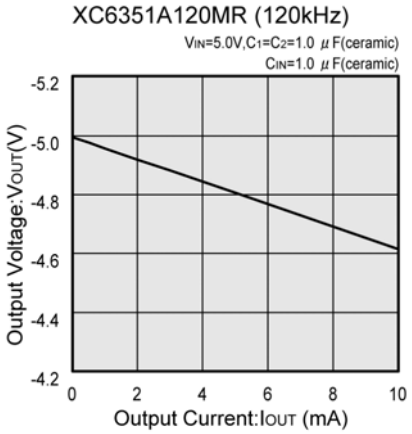
* With the custom 35kHz frequency, C1 = C2 = 3.3 μF

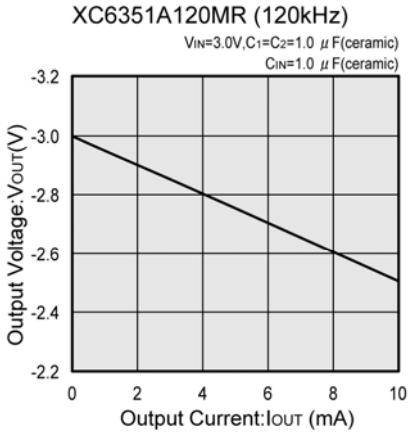
■ NOTES ON USE

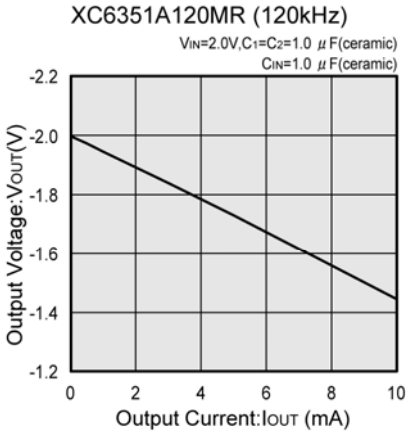
1. Please use the IC & external components: within the specified electrical characteristics range and ensure that absolute maximum ratings are not exceeded.
2. For C1 & C2, please use a capacitor with as small an ESR value as possible.
3. In order to reduce impedance between the IC's input pin and the power supply, we recommend that a capacitor (CIN) be connected to the input side.
4. If an external power supply is applied to the output pin in order to have VOUT 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.

■TYPICAL PERFORMANCE CHARACTERISTICS

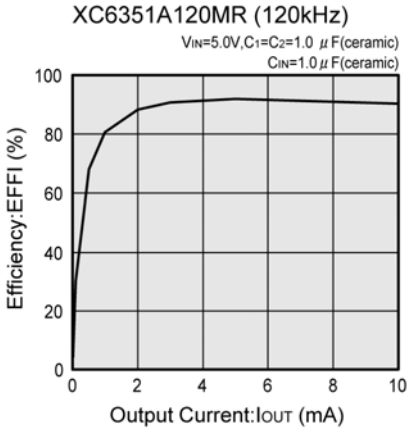
(1) Output Voltage vs. Output Current

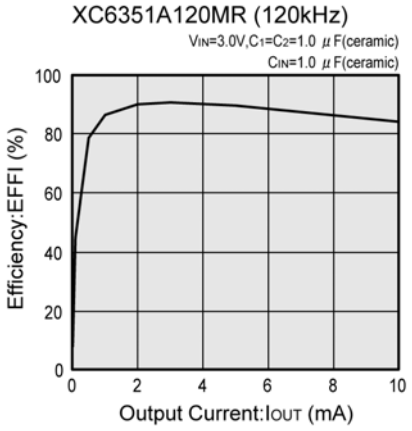


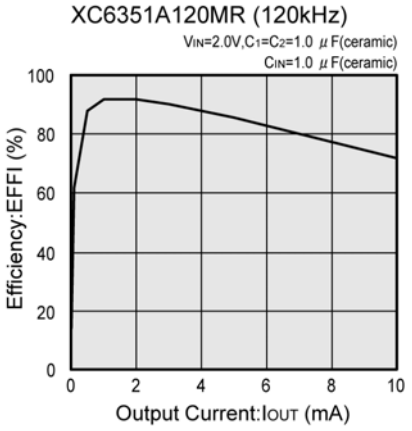




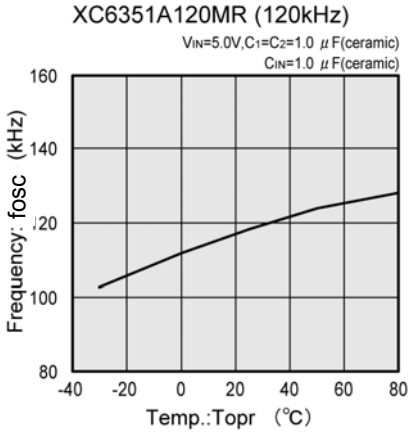
(2) Efficiency vs. Output Current



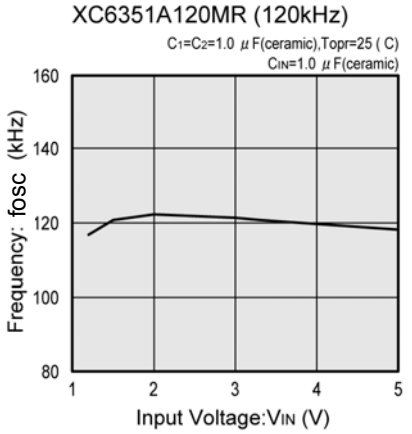




(3) Oscillation Frequency vs. Ambient Temperature



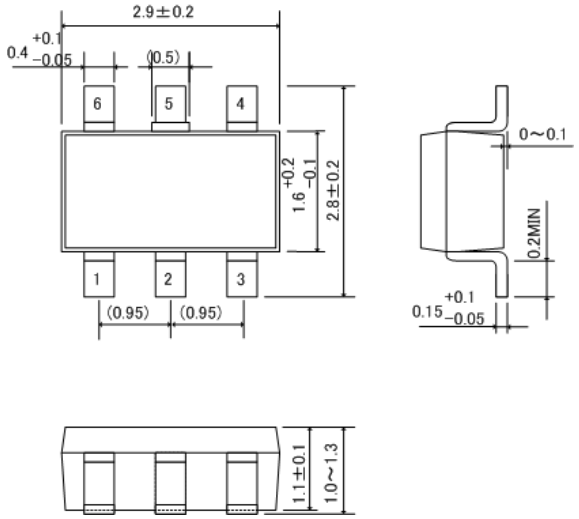
(4) Oscillation Frequency vs. Input Voltage



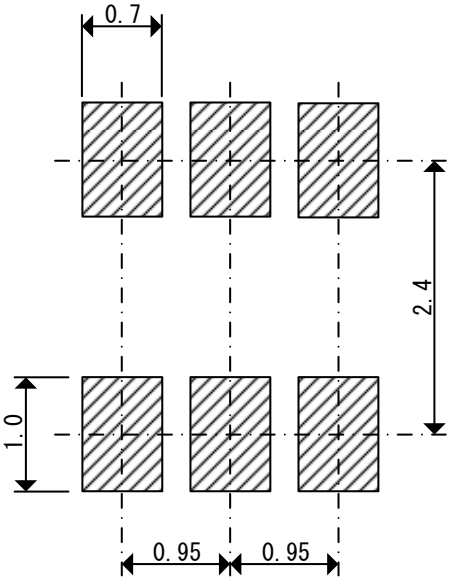
■PACKAGING INFORMATION

●SOT-26

Unit : mm

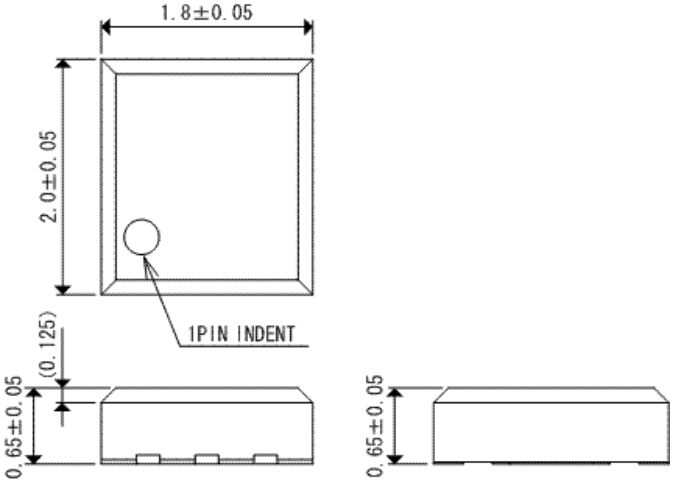


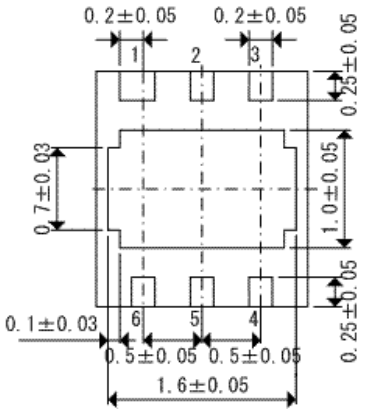
●SOT-26 Reference Pattern Layout



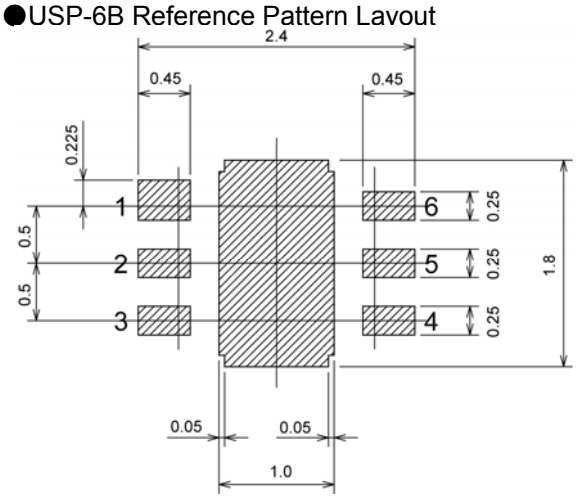
●USP-6B

Unit : mm

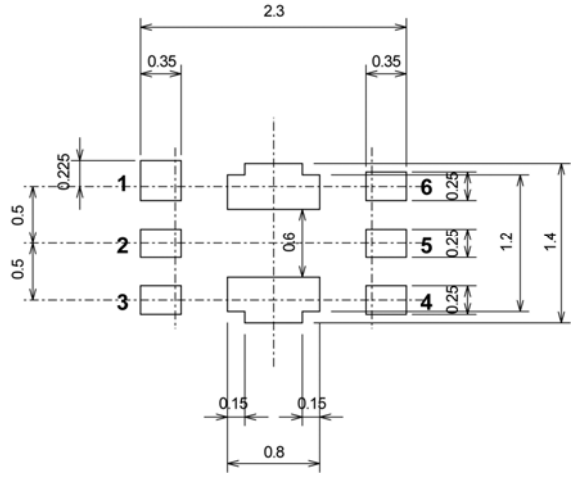




●USP-6B Reference Pattern Lavout



●USP-6B Reference Metal Mask Design

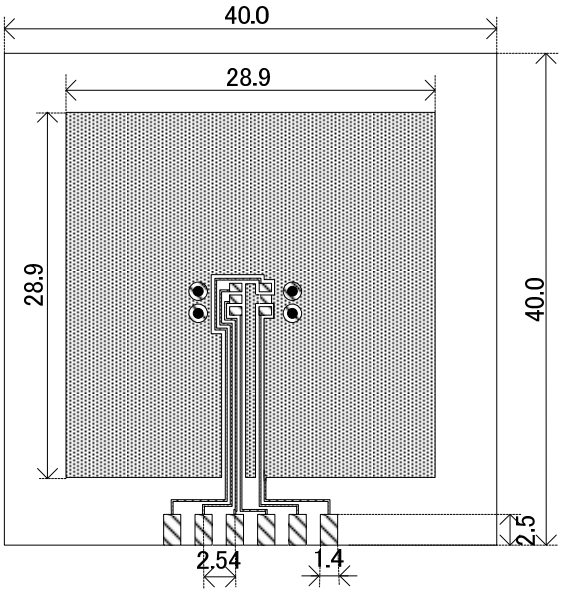


●SOT-26 Power Dissipation (40mm x 40mm Standard board)

Power dissipation data for the SOT-26 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm
(1600 mm2 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: 1.6mm
Through-hole: 4 x 0.8 Diameter

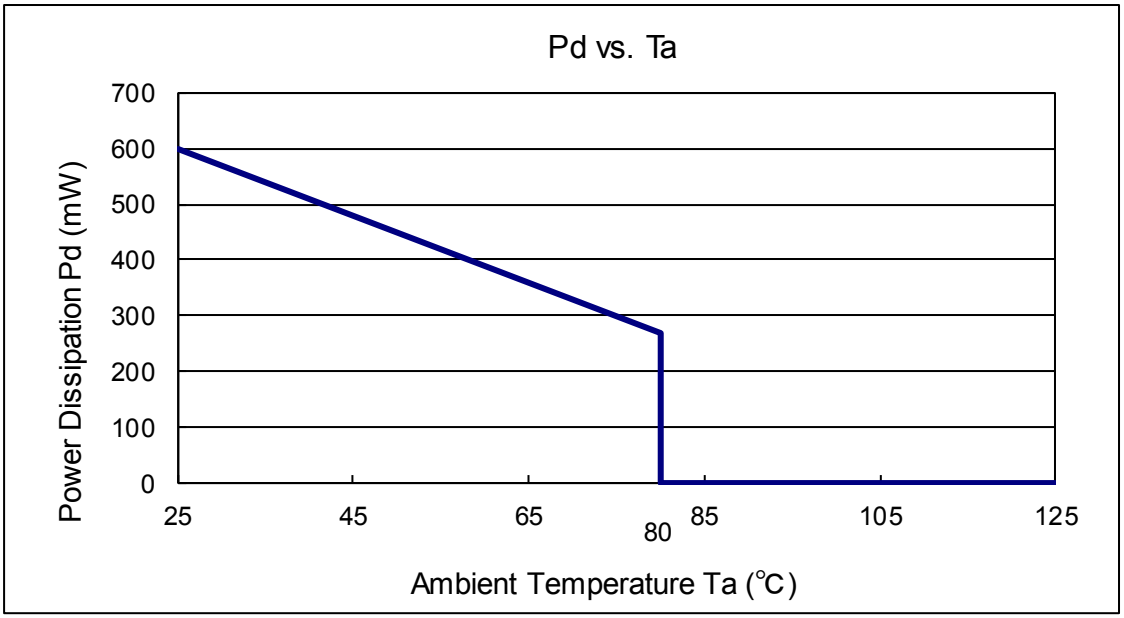


Evaluation Board (Unit: mm)

2.Power Dissipation vs. Ambient Temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
80	270	

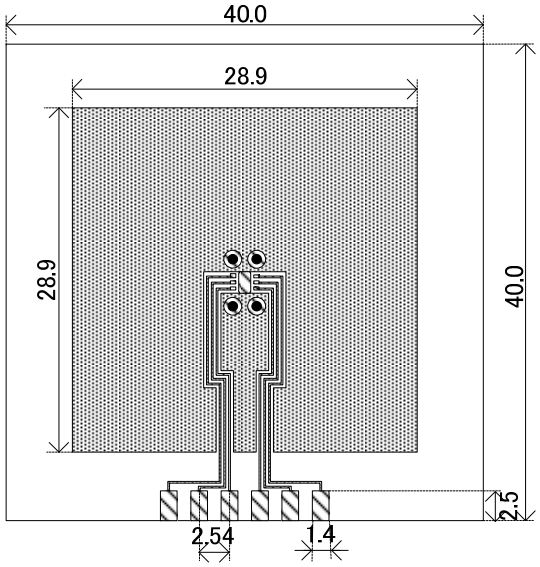


●USP-6B Power Dissipation (40mm x 40mm Standard board)

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

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm
(1600 mm2 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: 1.6mm
Through-hole: 4 x 0.8 Diameter

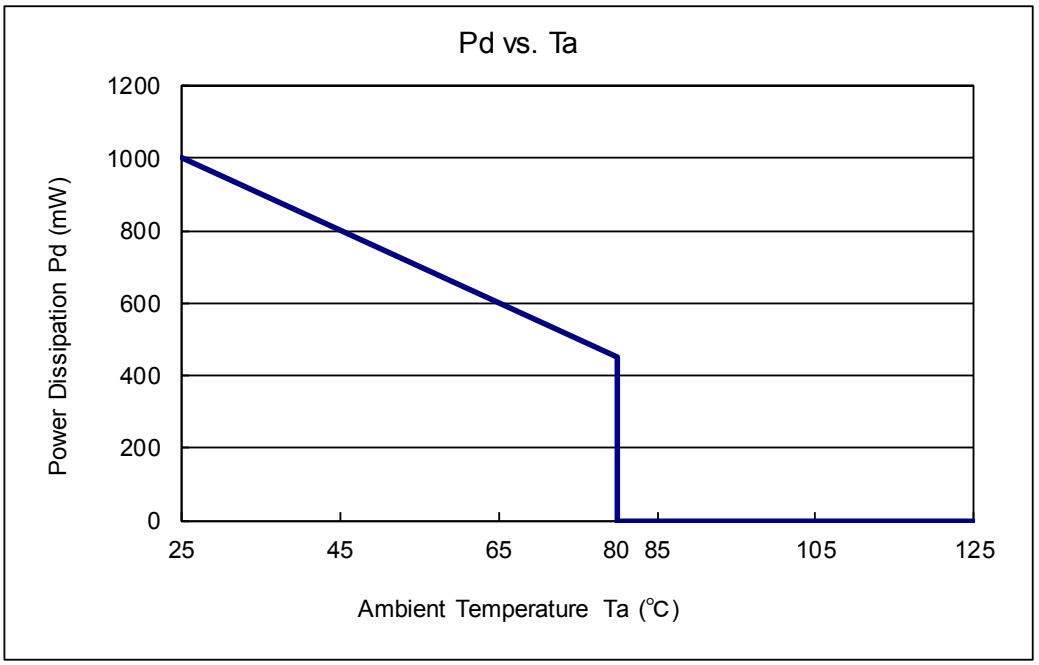


Evaluation Board (Unit: mm)

2.Power Dissipation vs. Ambient Temperature

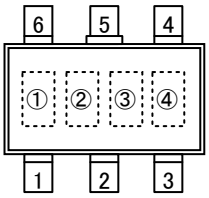
Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
80	450	



■MARKING RULE

●SOT-26



SOT-26
(TOP VIEW)

① represents product series

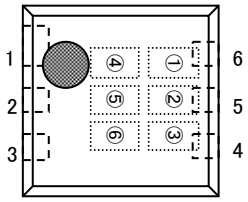
MARK	PRODUCT SERIES
A	XC6351AxxxMx-G

②,③ represents oscillation frequency

MARK		OSCILLATION FREQUENCY	PRODUCT SERIES
②	③		
0	3	35kHz	XC6351A035MR-G
1	2	120kHz	XC6351A120MR-G

④ represents production lot number
0 to 9, A to Z repeated (G, I, J, O, Q, W excluded)

●USP-6B



①,②,③ represents product series

MARK			PRODUCT SERIES
①	②	③	
5	1	A	XC6351AxxxDR-G

④,⑤ represents oscillation frequency

MARK		OSCILLATION FREQUENCY	PRODUCT SERIES
④	⑤		
0	3	35kHz	XC6351A035DR-G
1	2	120kHz	XC6351A120DR-G

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