

# XC2311 Series

VCXO ICs with Built-in Variable Capacitor



- ◆ Power Supply Voltage Range: 2.6V~ 3.6V
- ◆ Operating Frequency Range : 16MHz~50MHz  
(varies with version)
- ◆ Supply Current : 3mA (TYP.)  
(when VDD is 3.6V, 27MHz and output is enable)
- ◆ CMOS Output
- ◆ Ultra Small Packages : SOT-26, USP-6C  
SOP-8
- ◆ Chip Form

## APPLICATIONS

- VCXO modules
- Communication equipment

## GENERAL DESCRIPTION

The XC2311 Series is VCXO (Voltage Controlled Crystal Oscillator) ICs with built-in variable capacitor diode.

With the originally developed variable capacitor diode and a constant-voltage circuit built-in, the series achieves the wide variable frequency range, frequency stability to supply voltage and low power consumption.

By combining with the AT-cut crystal oscillator, the ultra small and highly accurate Frequency Voltage Controlled Crystal Oscillator of 16 to 50MHz can be formed.

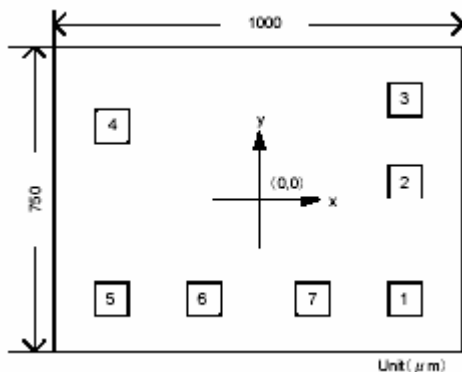
The small SOT-26, USP-6C, and SOP-8 packages make high density mounting possible.

## FEATURES

- Supply Voltage Range** : 2.6V ~ 3.6V
- Output Frequency Range** : 16MHz ~ 50MHz  
Version : V2B0 = 16MHz~36MHz,  
V3B0 = 30MHz~50MHz \*)
- Pull Range** : more than  $\pm 110$ ppm  
Condition : XC2311V2B0xx,  
Vc = 1.65V $\pm$ 1.35V
- Output Waveform Symmetry** : 50%  $\pm$ 5 %
- Operating Ambient Temperature** : -40°C ~ +85°C
- Ultra Small Packages** : SOT-26, USP-6C, SOP-8
- Chip Form** : Chip size 1000 x 750um

\* Please refer to the Electrical Characteristics for versions' details.

## CHIP PAD LAYOUT



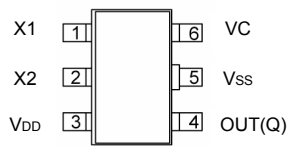
## PAD COORDINATE

PAD NAME	PAD No.	X (um)	Y (um)
VC	1	359	-244
OE (/INH)	2	359	44
VSS	3	359	244
OUT(Q)	4	359	179
VDD	5	-359	-244
X2	6	-132	-244
X1	7	132	-244

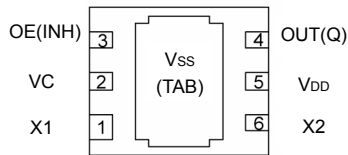
\* The coordinate origin of XY-coordinate is a chip center.

Pad Size	80 x 80 um
Chip Thickness	200 $\pm$ 20um

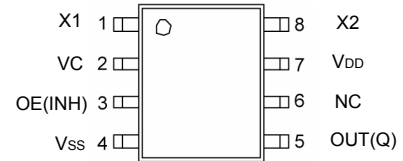
## PIN CONFIGURATION



SOT-26  
(TOP VIEW)



USP-6C  
(BOTTOM VIEW)



SOP-8  
(TOP VIEW)

## PIN ASSIGNMENT

### ● SOP-8

PIN NUMBER	PIN NAME	I/O	FUNCTIONS
1	X1	I	Crystal Oscillator Connection (Input)
2	Vc	I	Oscillation Frequency Control Input
3	OE (/INH)	I	Output Control Input
4	Vss	-	(-) Ground
5	OUT (Q)	O	Output
6	NC	-	No Connection
7	VDD	-	(+) Power Supply
8	X2		Crystal Oscillator Connection (Output)

### ● SOT-26 Note : No OE (/INH) function available.

PIN NUMBER	PIN NAME	I/O	FUNCTIONS
1	X1	I	Crystal Oscillator Connection (Input)
2	X2		Crystal Oscillator Connection (Output)
3	VDD	-	(+) Power Supply
4	OUT (Q)	O	Output
5	Vss	-	(-) Ground
6	Vc	I	Oscillation Frequency Control Input

### ● USP-6C

PIN NUMBER	PIN NAME	I/O	FUNCTIONS
1	X1	I	Crystal Oscillator Connection (Input)
2	Vc	I	Oscillation Frequency Control Input
3	OE (/INH)	I	Output Control Input
TAB	Vss	-	(-) Ground
4	OUT (Q)	O	Output
5	VDD	-	(+) Power Supply
6	X2	-	Crystal Oscillator Connection (Output)

## OE (/INH), OUT (Q) PIN FUNCTION

OE (/INH)	OUT (Q)
"H" or OPEN	Clock Output
"L"	High Impedance

## ■ PRODUCT INFORMATION

● Ordering Information

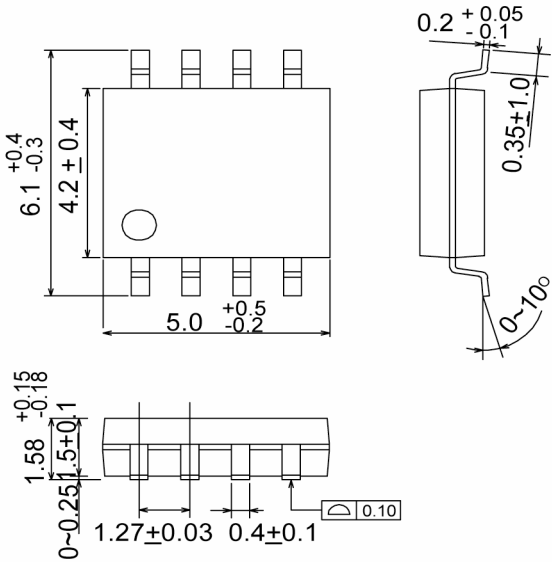
XC2311①②③④⑤⑥

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	VCXO product	V	: Fixed number
②	Oscillation Frequency	2	: 16MHz ~ 36MHz
		3	: 30MHz ~ 50MHz
③	-	B	: Fixed number
④	-	0	: Fixed number
⑤	Package	S	: SOP-8
		M	: SOT-26
		E	: USP-6C
		C	: Chip form
⑥	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed
		T	: Chip tray

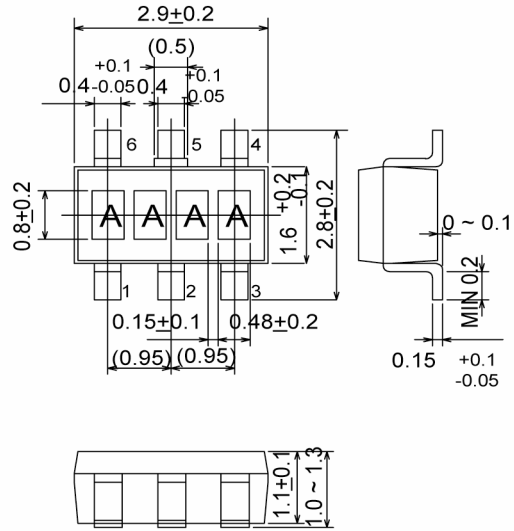
# XC2311 Series

## PACKAGING INFORMATION

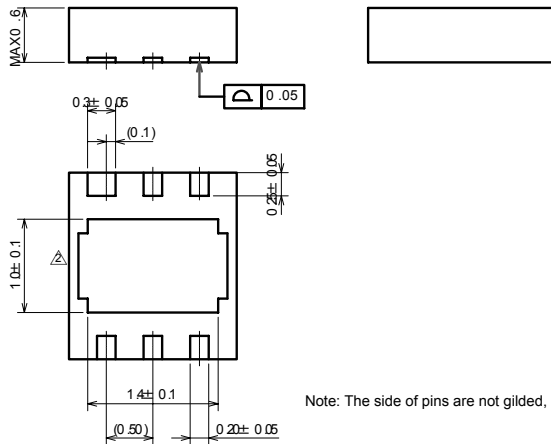
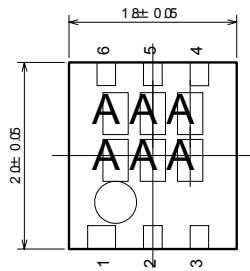
### ●SOP-8



### ●SOT-26



### ●USP-6C



Note: The side of pins are not gilded, but nickel is used.

## MARKING RULE

### ● SOP-8

① ② Represents product series

MARK		PRODUCT SERIES
①	②	
2	1	XC2311xxxxx

③ Represents VCXO product

MARK	PRODUCT SERIES
V	XC2311Vxxxxx

④ Represents oscillation frequency range

MARK	FREQUENCY RANGE	PRODUCT SERIES
2	16MHz ~ 36MHz	XC2311x2xxxx
3	30MHz ~ 50MHz	XC2311x3xxxx

⑤ Represents operating voltage range

MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V ~ 3.6V	XC2311xxBxxx

⑥ Represents divider circuit

MARK	DIVIDER CIRCUIT	PRODUCT SERIES
0	No Divider	XC2311xxx0xx

⑦ Represents last digit of production year

ex)

MARK	YEAR
5	2005
6	2006

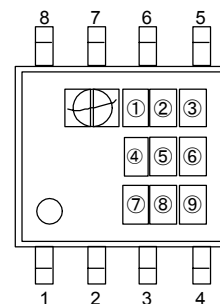
⑧ ⑨ Represents production lot number

0 to 9, A to Z repeated (G, I, J, O, Q, W excepted. No high-order zero marked. )

Note: No character inversion used.

ex)

MARK		PRODUCTION LOT NUMBER
⑧	⑨	
-	3	03
1	A	A



SOP-8  
(TOP VIEW)

## MARKING RULE (Continued)

### ●SOT-26

① Represents oscillation frequency range

MARK	FREQUENCY RANGE	PRODUCT SERIES
L	16MHz ~ 36MHz	XC2311x2xxxx
M	30MHz ~ 50MHz	XC2311x3xxxx

② Represents operating voltage range

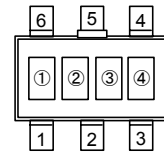
MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V ~ 3.6V	XC2311xxBxxx

③ Represents divider circuit

MARK	DIVIDER CIRCUIT	PRODUCT SERIES
0	No Divider	XC2311xxx0xx

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 excepted.)



SOT-26  
(TOP VIEW)

### ●USP-6C

①② Represents product series

MARK		PRODUCT SERIES
①	②	
2	1	XC2311xxxxxx

③ Represents oscillation frequency range

MARK	FREQUENCY RANGE	PRODUCT SERIES
2	16MHz~36MHz	XC2311x2xxxx
3	30MHz~50MHz	XC2311x3xxxx

④ Represents operating voltage range

MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V~3.6V	XC2311xxBxxx

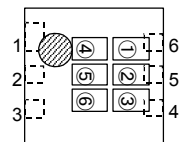
⑤ Represents divider circuit

MARK	DIVIDER CIRCUIT	PRODUCT SERIES
0	No Divider	XC2311xxx0xx

⑥ Represents production lot number

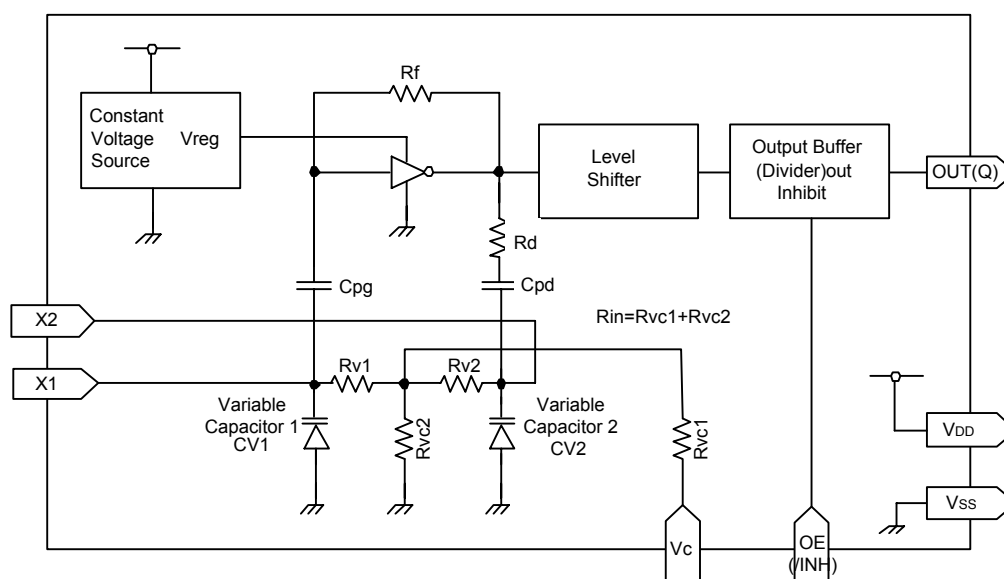
0 to 9, A to Z repeated (G, I, J, O, Q, W excepted.)

Note: No character inversion used.



USP-6C  
(TOP VIEW)

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATINGS

V<sub>SS</sub>=0V, T<sub>a</sub>=25°C

PARAMETER	SYMBOL	RATINGS			UNIT
		MIN.	TYP.	MAX.	
Supply Voltage	V <sub>DD</sub>	V <sub>SS</sub> -0.5	-	+7.0	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> -0.5	-	V <sub>DD</sub> +0.5	V
Output Voltage	V <sub>OUT</sub>	V <sub>SS</sub> -0.5	-	V <sub>DD</sub> +0.5	V
Output Current	I <sub>OUT</sub>	-	-	30	mA
Power Dissipation	SOP-8	P <sub>d</sub>	300		mW
	SOT-26		250		
	USP-6C		100		
Operating Ambient Temperature	T <sub>opr</sub>	-40	-	+85	°C
Storage Temperature Range	T <sub>stg</sub>	-55	-	+125	°C

## ■ RECOMMENDED OPERATING CONDITIONS

### ● XC2311VxB0 Series

Recommended Operating Conditions : V<sub>SS</sub> = 0V, T<sub>a</sub> = -40°C ~ +85°C

Unless otherwise stated, the item is common in XC2311V2B0 or XC2311V3B0.

PARAMETER	SYMBOL	CONDITIONS	RATINGS			UNIT
			MIN.	TYP.	MAX.	
Operating Supply Voltage	V <sub>DD</sub>	-	2.6	3.3	3.6	V
"H" Level Input Voltage	V <sub>IH</sub>	OE (/INH) Pin	0.7 x V <sub>DD</sub>	-	-	V
"L" Level Input Voltage	V <sub>IL</sub>	OE (/INH) Pin	-	-	0.3 x V <sub>DD</sub>	V
Input Voltage	V <sub>IN</sub>	OE (/INH) Pin	V <sub>SS</sub>	-	V <sub>DD</sub>	V
Control Voltage	V <sub>C</sub>	2.6V ≤ V <sub>DD</sub> ≤ 3.6V	0	-	V <sub>DD</sub> + 1.0	V
Oscillation Frequency Range	f <sub>0</sub>	XC2311V2B0	16	-	36	MHz
		XC2311V3B0	30	-	50	MHz

## ■ ELECTRICAL CHARACTERISTICS

### ● XC2311VxB0 Series

Condition : Unless otherwise stated,  $V_{SS} = 0V$ ,  $V_{DD} = 3.3V$ ,  $V_C = 1.65V$ ,  $T_a = 25^\circ C$  and the item is common in XC2311V2B0 or XC2311V3B0.

PARAMETER	SYMBOL	CONDITIONS	RATINGS			UNIT
			MIN.	TYP.	MAX.	
Pull Range	fcntr	$V_C = 1.65 \pm 1.35V$ (*1), XC2311V2B0, 27MHz	$\pm 110$	-	-	ppm
		$V_C = 1.65 \pm 1.35V$ (*1), XC2311V3B0, 47MHz	$\pm 100$	-	-	
Operating Supply Current	IDD1	XC2311V2B0, $V_{DD}=3.6V$ , $f_{osc}=27MHz$ , $CL=15pF$	-	3.0	5.0	mA
		XC2311V3B0, $V_{DD}=3.6V$ , $f_{osc}=47MHz$ , $CL=15pF$	-	6.0	12.0	
Supply Current Disable (*3)	IDD2	$f_{osc}=27MHz$ , $CL=15pF$ , OE(/INH) = "L"	-	1.0	2.0	mA
		$f_{osc}=47MHz$ , $CL=15pF$ , OE(/INH) = "L"	-	1.5	3.0	
"H" Level Output Voltage	VOH	IOH = -5mA	$V_{DD}-0.4$	-	-	V
"L" Level Output Voltage	VOL	IOL = 5mA	-	-	0.4	V
Input Pull-up Resistance	Rup	OE(/INH) = 0V	1.0	2.5	5.0	M $\Omega$
Output Off Leak Current (*3)	Ioz	$V_{DD} = 3.6V$ , OE(/INH) = "L"	-	-	10	$\mu A$
Output Waveform Symmetry	DUTY	CL = 15pF	45	50	55	%
Input Resistance (*2)	Rin	Between the VC and the Ground pins	100	-	-	k $\Omega$
Pull Range Linearity (*2)	Lin	$V_C = 1.65 \pm 1.35V$ (*1)	-	-	10	%
Cut-off Frequency at Modulation (*2)	fc	$V_C = 1.65 \pm 1.35V$ (*1), Sine wave input	15	-	-	kHz
Output Rise Time (*2)	tr	XC2311V2B0, CL = 15pF (from 10% to 90%)	-	4.5	-	ns
		XC2311V3B0, CL = 15pF (from 10% to 90%)	-	3.0	-	
Output Fall Time (*2)	tf	XC2311V2B0, CL = 15pF (from 10% to 90%)	-	4.5	-	ns
		XC2311V3B0, CL = 15pF (from 10% to 90%)	-	3.0	-	
Output Enable Delay Time (*2), (*3)	tpe	-	-	-	100	ns
Output Disable Delay Time (*2), (*3)	tpd	-	-	-	100	ns
Oscillation Start-up Time (*2)	tstart	-	-	1.5	-	ms
Feedback Resistance (*2)	Rf	-	-	100	-	k $\Omega$
DC Block Capacity (*2)	Cpg	-	13	16	19	pF
DC Block Capacity (*2)	Cpd	-	40	50	60	pF
Output Load Capacity (*2)	CL	XC2311V2B0, CMOS level	-	15	30	pF
		XC2311V3B0, CMOS level	-	-	15	

NOTE:

\*1: Crystal Oscillator Equivalent Parameter,  $\gamma = CO/C1 < 300$

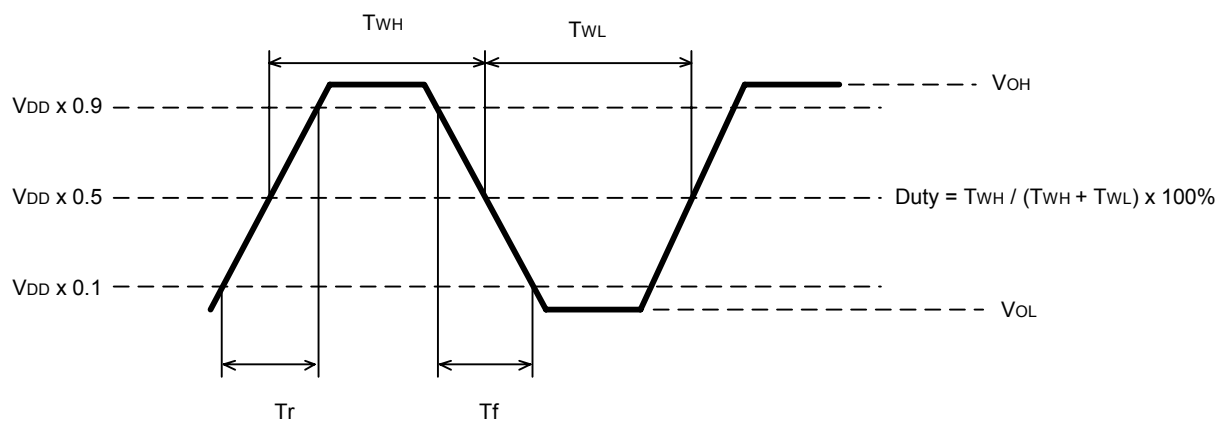
\*2: The value shown above indicates a design value.

\*3: For the SOT-26 package products, the OE (/INH) pin is fixed by an internal pull-up. No OE (/INH) function available.

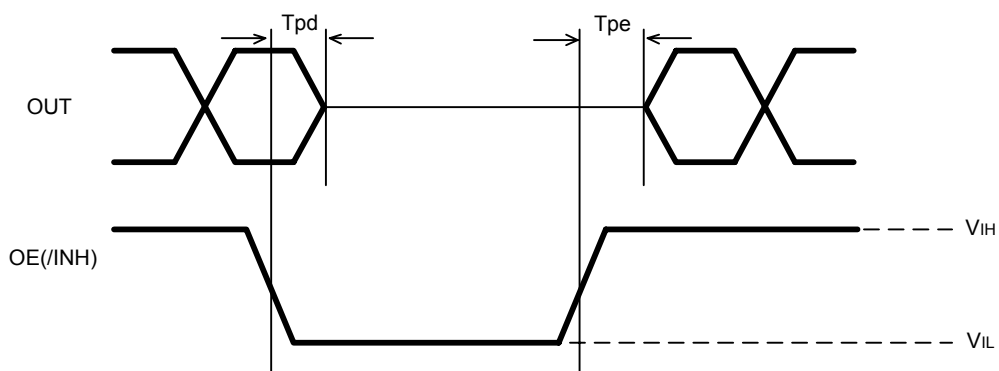


## ■ OUTPUT WAVEFORMS (Duty, Tr, Tf, Tpe, Tpd)

Duty / Tr, Tf: Output Duty, Output Rise / Fall Time

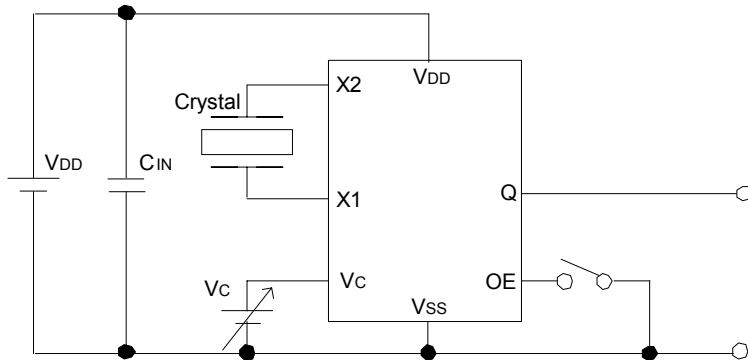


Tpe / Tpd: Output Enable / Disable Time



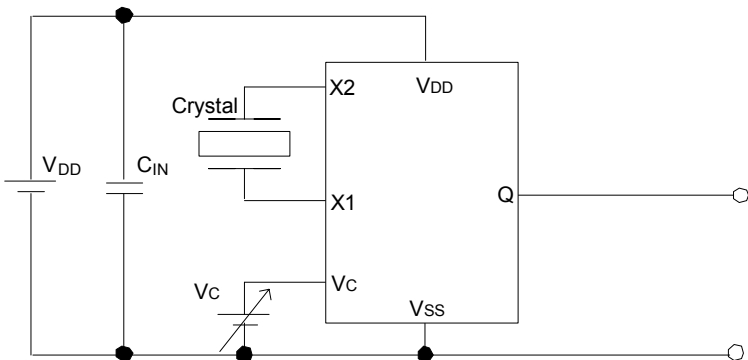
## ■ TYPICAL APPLICATION CIRCUITS

### 1) SOP-8 and USP-6C



\*) Please mount the C<sub>IN</sub> in a near position from both the VDD and the VSS pins as much as possible.

### 2) SOT-26



\*) Please mount the C<sub>IN</sub> in a near position from both the VDD and the VSS pins as much as possible.

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