

## Description

The Renesas XL devices (XO and VCXO options) are ultra-precision crystal oscillators with 750 to 890fs typical phase jitter over 12kHz to 20MHz bandwidth. Available in a wide frequency range from 0.750MHz to 1350MHz, the XL series crystal oscillators utilize a family of proprietary ASICs, with a key focus on noise reduction technologies.

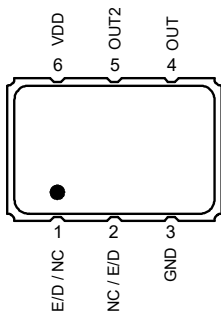
The 3rd order Delta Sigma Modulator reduces noise to the levels that are comparable to traditional Bulk Quartz and SAW oscillators. With short lead-time, low cost, low noise, wide frequency range, excellent ambient performance, the XL devices are an excellent choice over the conventional technologies. The XL (XO option) devices have stabilities as tight as  $\pm 20$ ppm and the XL (VCXO option) devices have  $\pm 50$ ppm APR. Either option provides extremely quick delivery for both standard and custom frequencies.

## Features

- Output types: LVDS, LVPECL, LVCMOS
- Phase jitter (12kHz to 20MHz): 750fs to 890fs typical
- Supply voltage: 2.5V or 3.3V
- Package options:
  - $3.2 \times 2.5 \times 1.0$  mm (not available for VCXO)
  - $5.0 \times 3.2 \times 1.2$  mm
  - $7.0 \times 5.0 \times 1.3$  mm
- Operating temperature:  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ 
  - Frequency stability options:  $\pm 20$ ,  $\pm 25$ ,  $\pm 50$ , or  $\pm 100$  ppm (XO only)
  - $\pm 50$ ppm APR (VCXO only)
- Operating temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ 
  - Frequency stability options:  $\pm 25$ ,  $\pm 50$ , or  $\pm 100$  ppm (XO only)
  - $\pm 50$ ppm APR (VCXO only)
- Operating temperature:  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  (XO only)
  - Frequency stability options:  $\pm 50$  or  $\pm 100$  ppm
- kV of 85ppm/volt typical from 0.5VDC to VDD (VCXO only)
  - Better than  $\pm 10\%$  linearity for Vc range

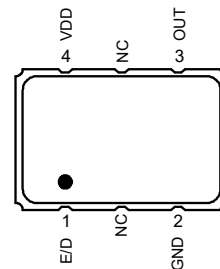
## Pin Assignments (XO option)

**NOTE:** To minimize power supply line noise, a  $0.01\mu\text{F}$  bypass capacitor should be placed between  $V_{\text{DD}}$  (Pin 6) and GND (Pin 3) on 6-pin devices, or  $V_{\text{DD}}$  (Pin 4) and GND (Pin 2) on 4-pin devices.



**Table 1. XO 6-pin Package**

Number	Name	Description
1	E/D NC	Enable/Disable <sup>[a][b]</sup> No connect
2	NC E/D	No connect Enable/Disable <sup>[a][b]</sup>
3	GND	Connect to ground
4	OUT	Output
5	OUT2	Complementary output
6	$V_{\text{DD}}$	Supply voltage



**Table 2. XO 4-pin Package**

Number	Name	Description
1	E/D	Enable/Disable <sup>[a][b]</sup>
2	GND	Connect to ground
3	OUT	Output
4	$V_{\text{DD}}$	Supply voltage

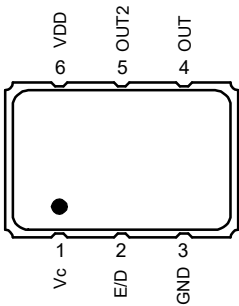
[a] Pulled high internally.

[b] Low = output disabled.

See [Ordering Information \(XO\)](#) for more details.

## Pin Assignments (VCXO option)

**NOTE:** To minimize power supply line noise, a 0.01μF bypass capacitor should be placed between V<sub>DD</sub> (Pin 6) and GND (Pin 3).



**Table 3. VCXO 6-pin Package**

Number	Name	Description
1	Vc	Voltage control
2	E/D	Enable/Disable <sup>[a]</sup> <sub>[b]</sub>
3	GND	Connect to ground
4	OUT	Output
5	OUT2	Complementary output (NC LVCMOS)
6	V <sub>DD</sub>	Supply voltage

[a] Pulled high internally.

[b] Low = output disabled.

See [Ordering Information \(VCXO\)](#) for more details.

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## Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the device. These ratings, which are standard values for Renesas commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

**Table 4. Absolute Maximum Ratings**

Item	Rating					
V <sub>DD</sub>	-0.5 to +5.0V					
E/D	-0.5V to V <sub>DD</sub> + 0.5V					
OUT	-0.5V to V <sub>DD</sub> + 0.5V					
Storage Temperature	-55°C to 125°C					
Maximum Junction Temperature	125°C					
Core Current	65mA maximum					
Theta J <sub>A</sub>	JU6	75.9 °C/W	JS6	89.6 °C/W	JX6	94.7 °C/W
Theta J <sub>B</sub>	7.0 × 5.0 × 1.3 mm	48.6°C/W	5.0 × 3.2 × 1.2 mm	54.3 °C/W	3.2 × 2.5 × 1.0 mm	66.8 °C/W

## ESD Compliance

**Table 5. ESD Compliance**

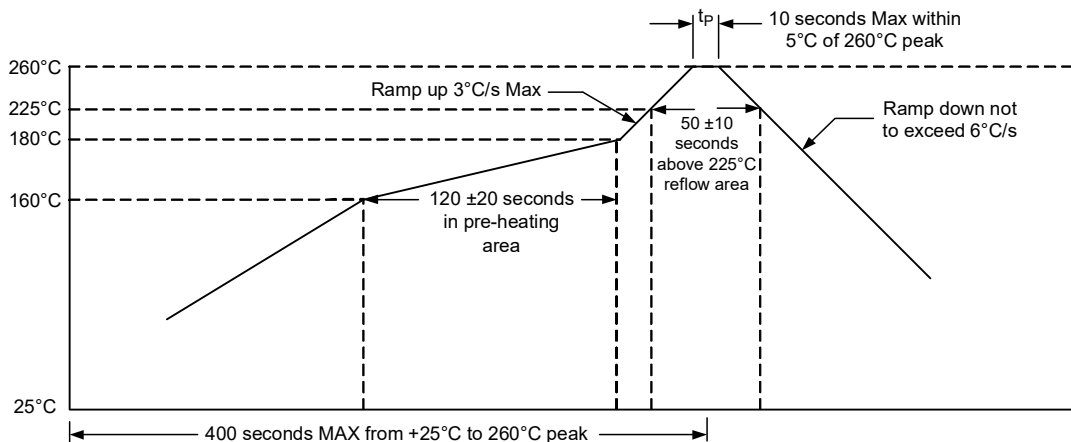
Human Body Model (HBM)	1000V
Machine Model (MM)	150V

## Mechanical Testing

**Table 6. Mechanical Testing**

Parameter	Test Method
Mechanical Shock	Drop from 75cm to hardwood surface–3 times.
Mechanical Vibration	10–55Hz, 1.5mm amplitude, 1 minute sweep; 2 hours each in 3 directions (X, Y, Z).
High Temperature Burn-in	Under power at 125°C for 2000 hours.
Hermetic Seal	He pressure: 4 ±1kgf/cm <sup>2</sup> 2 hour soak.

## Solder Reflow Profile



## DC Electrical Characteristics

**Table 7. 3.3V IDD DC Electrical Characteristics**

$V_{DD} = 3.3V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ .

Symbol	Parameter	Output Type	Conditions	Minimum	Typical	Maximum	Units
$I_{DD}$	Power Supply Current	LVDS	0.75MHz to 40MHz.	—	32	37	mA
			40+MHz to 220MHz.	—	40	47	
			220+MHz to 630MHz.	—	49	57	
			630+MHz to 1350MHz.	—	72	100	
		LVPECL <sup>[a]</sup>	0.75MHz to 40MHz.	—	26	31	
			40+MHz to 220MHz.	—	38	45	
			220+MHz to 630MHz.	—	56	64	
			630+MHz to 1350MHz.	—	96	120	
		LVCMOS	0.75MHz to 20MHz.	—	27	32	
			20+MHz to 50MHz.	—	32	35	
			50+MHz to 130MHz.	—	43	47	
			130+MHz to 200MHz.	—	48	55	
200+MHz to 250MHz.	—		48	60			

[a] Without termination resistors.

**Table 8. 2.5V IDD DC Electrical Characteristics**

$V_{DD} = 2.5V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ .

Symbol	Parameter	Output Type	Conditions	Minimum	Typical	Maximum	Units
$I_{DD}$	Power Supply Current	LVDS	0.75MHz to 20MHz.	—	24	26	mA
			20+MHz to 220MHz.	—	29	34	
			220+MHz to 630MHz.	—	36	44	
			630+MHz to 1000MHz.	—	46	65	
		LVPECL <sup>[a]</sup>	0.75MHz to 20MHz.	—	20	33	
			20+MHz to 220MHz.	—	28	41	
			220+MHz to 630MHz.	—	41	63	
			630+MHz to 1000MHz.	—	56	72	
		LVCMOS	0.75MHz to 20MHz.	—	17	22	
			20+MHz to 50MHz.	—	23	25	
			50+MHz to 100MHz.	—	28	29	
			100+MHz to 130MHz.	—	30	32	
130+MHz to 160MHz.	—		32	35			
160+MHz to 180MHz.	—		33	37			

[a] Without termination resistors.

**Table 9. LVDS DC Electrical Characteristics**

$V_{DD} = 3.3V, 2.5V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ . Below are guaranteed for listed standard frequencies.

Symbol	Parameter	Conditions	Minimum	Typical	Maximum	Units
$V_{OD}$	Differential Output Voltage	$V_{DD} = 3.3V \pm 5\%$ .	—	—	0.6	V
		$V_{DD} = 2.5V \pm 5\%$ .	—	—	0.4	
$V_{OS}$	Output Offset Voltage	$V_{DD} = 3.3V \pm 5\%$ .	—	—	1.3	
		$V_{DD} = 2.5V \pm 5\%$ .	—	—	1.25	
$V_{IH}$	Enable/Disable Input High Voltage (Output enabled)	—	70% $V_{DD}$	—	—	
$V_{IL}$	Enable/Disable Input Low Voltage (Output disabled)	—	—	—	30% $V_{DD}$	

**Table 10. LVPECL DC Electrical Characteristics**

$V_{DD} = 3.3V, 2.5V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ . Below are guaranteed for listed standard frequencies.

Symbol	Parameter	Conditions	Minimum	Typical	Maximum	Units
$V_{OD}$	Differential Output Voltage	$V_{DD} = 3.3V \pm 5\%$ .	2.055	—	2.405	V
		$V_{DD} = 2.5V \pm 5\%$ .	—	1.4	—	
$V_{OS}$	Output Offset Voltage	$V_{DD} = 3.3V \pm 5\%$ .	1.305	—	1.65	
		$V_{DD} = 2.5V \pm 5\%$ .	—	0.68	—	
$V_{IH}$	Enable/Disable Input High Voltage (Output enabled)	—	70% $V_{DD}$	—	—	
$V_{IL}$	Enable/Disable Input Low Voltage (Output disabled)	—	—	—	30% $V_{DD}$	

**Table 11. LVC MOS DC Electrical Characteristics**

$V_{DD} = 3.3V, 2.5V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ . Below are guaranteed for listed standard frequencies.

Symbol	Parameter	Conditions		Minimum	Typical	Maximum	Units
$V_{OH}$	Output High Voltage	$V_{DD} = 3.3V \pm 5\%$ .	0.75MHz to 150MHz.	90% $V_{DD}$	—	—	V
			150+MHz to 250MHz.	80% $V_{DD}$	—	—	
		$V_{DD} = 2.5V \pm 5\%$ .	0.75MHz to 160MHz.	90% $V_{DD}$	—	—	
			160+MHz to 180MHz.	80% $V_{DD}$	—	—	
$V_{OL}$	Output Low Voltage	$V_{DD} = 3.3V \pm 5\%$ .	0.75MHz to 150MHz.	—	—	10% $V_{DD}$	
			150+MHz to 250MHz.	—	—	20% $V_{DD}$	
		$V_{DD} = 2.5V \pm 5\%$ .	0.75MHz to 160MHz.	—	—	10% $V_{DD}$	
			160+MHz to 180MHz.	—	—	20% $V_{DD}$	
$V_{IH}$	Enable/Disable Input High Voltage (Output enabled)	—	—	70% $V_{DD}$	—	—	
$V_{IL}$	Enable/Disable Input Low Voltage (Output disabled)	—	—	—	—	30% $V_{DD}$	

## AC Electrical Characteristics

**Table 12. 3.3V AC Electrical Characteristics**

$V_{DD} = 3.3V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ .

Symbol	Parameter	Test Condition		Minimum	Typical	Maximum	Units
F	Output Frequency Range	LVDS.		0.75	—	1350	MHz
		LVPECL.		0.75	—	1350	
		LVCMOS.		0.75	—	250	
	Frequency Stability	Temperature = $-20^\circ C$ to $+70^\circ C$ .		$\pm 20$	—	$\pm 100$	ppm
		Temperature = $-40^\circ C$ to $+85^\circ C$ .		$\pm 25$	—	$\pm 100$	ppm
		Temperature = $-40^\circ C$ to $+105^\circ C$ .		$\pm 50$	—	$\pm 100$	ppm
	Aging (1st year)	$T_A = 25^\circ C$ .		—	—	$\pm 3$	ppm
	Aging (10 years)	$T_A = 25^\circ C$ .		—	—	$\pm 10$	ppm
	Output Load	LVDS.	Differential.	—	100	—	$\Omega$
		LVPECL.	$V_{DD} - 2.0V$ .	—	50	—	
		LVCMOS.	To GND.	—	15	—	pF
$T_{ST}$	Start-up Time	Output valid time after $V_{DD}$ meets minimum specified level.		—	—	10	ms
$t_R$	Output Rise Time	LVDS.	20% to 80% $V_{pp}$ .	—	—	400	ps
		LVPECL.		—	—	400	
		LVCMOS.	10% to 90% $V_{DD}$ .	—	—	3	ns
$t_F$	Output Fall Time	LVDS.	80% to 20% $V_{pp}$ .	—	—	400	ps
		LVPECL.		—	—	400	
		LVCMOS.	90% to 10% $V_{DD}$ .	—	—	3	ns
$O_{DC}$	Output Clock Duty Cycle	LVDS.		45	—	55	%
		LVPECL.		45	—	55	
		LVCMOS.	$F_{OUT} \leq 62.5MHz$ .	45	—	55	
			$F_{OUT} > 62.5MHz$ .	40	—	60	
$T_{OE}$	Output Enable/ Disable Time	—		—	—	100	ns
$J_{PER}$	Period Jitter, RMS	LVDS.		—	3	—	ps
		LVPECL.		—	5.8	—	
		LVCMOS.	$F_{OUT} = 125MHz$ .	—	5	—	
$R_J$	Random Jitter	LVDS.		—	1.3	—	ps
		LVPECL.		—	1.29	—	
		LVCMOS.	$F_{OUT} = 125MHz$ .	—	0.6	—	
$D_J$	Deterministic Jitter	LVDS.		—	5.8	—	ps
		LVPECL.		—	9.3	—	
		LVCMOS.	$F_{OUT} = 125MHz$ .	—	10	—	



**Table 12. 3.3V AC Electrical Characteristics (Cont.)**

$V_{DD} = 3.3V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ .

Symbol	Parameter	Test Condition	Minimum	Typical	Maximum	Units
$T_J$	Total Jitter	LVDS.	—	23.6	—	ps
		LVPECL.	—	27.7	—	
		LVC MOS.	$F_{OUT} = 125MHz.$	—	19	
$f_{JITTER}$	Phase Jitter (12kHz–20MHz)	LVDS.	—	890	—	fs
		LVPECL.	—	860	—	
		LVC MOS.	$F_{OUT} = 125MHz.$	—	750	

**Table 13. 2.5V AC Electrical Characteristics**

$V_{DD} = 2.5V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ .

Symbol	Parameter	Test Condition	Minimum	Typical	Maximum	Units	
F	Output Frequency Range	LVDS.	0.75	—	1000	MHz	
		LVPECL.	0.75	—	1000		
		LVC MOS.	0.75	—	180		
	Frequency Stability	Temperature = $-20^\circ C$ to $+70^\circ C$ .	$\pm 20$	—	$\pm 100$	ppm	
		Temperature = $-40^\circ C$ to $+85^\circ C$ .	$\pm 25$	—	$\pm 100$	ppm	
		Temperature = $-40^\circ C$ to $+105^\circ C$ .	$\pm 50$	—	$\pm 100$	ppm	
	Aging (1st year)	$T_A = 25^\circ C$ .	—	—	$\pm 3$	ppm	
	Aging (10 years)	$T_A = 25^\circ C$ .	—	—	$\pm 10$	ppm	
	Output Load	LVDS.	Differential.	—	100	—	$\Omega$
		LVPECL.	$V_{DD} - 2.0V$ .	—	50	—	
		LVC MOS.	To GND.	—	15	—	pF
$T_{ST}$	Start-up Time	Output valid time after $V_{DD}$ meets minimum specified level.	—	—	10	ms	
$t_R$	Output Rise Time	LVDS.	20% to 80% $V_{pp}$ .	—	—	400	ps
		LVPECL.		—	—	400	
		LVC MOS.	10% to 90% $V_{DD}$ .	—	—	3.5	ns
$t_F$	Output Fall Time	LVDS.	80% to 20% $V_{pp}$ .	—	—	400	ps
		LVPECL.		—	—	400	
		LVC MOS.	90% to 10% $V_{DD}$ .	—	—	3	ns
$O_{DC}$	Output Clock Duty Cycle	LVDS.	45	—	55	%	
		LVPECL.	45	—	55		
		LVC MOS.	45	—	55		
$T_{OE}$	Output Enable/ Disable Time	—	—	—	100	ns	

**Table 13. 2.5V AC Electrical Characteristics (Cont.)**

$V_{DD} = 2.5V \pm 5\%$ ,  $T_A = -20^\circ C$  to  $+70^\circ C$ ;  $-40^\circ C$  to  $+85^\circ C$ ,  $-40^\circ C$  to  $+105^\circ C$ .

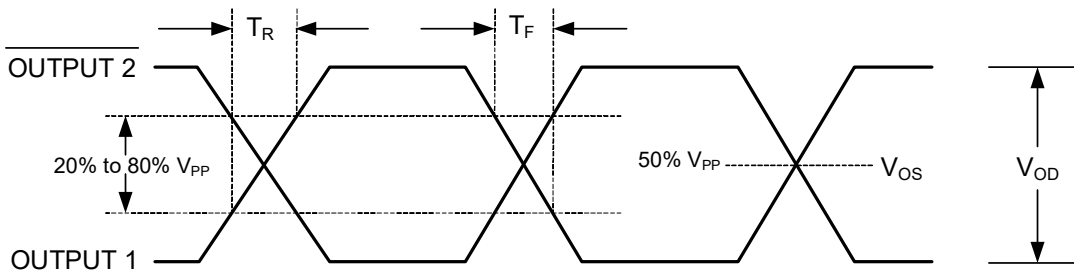
Symbol	Parameter	Test Condition	Minimum	Typical	Maximum	Units
$J_{PER}$	Period Jitter, RMS	LVDS.	—	4	—	ps
		LVPECL.	—	5.12	—	
		LVC MOS.	$F_{OUT} = 125MHz.$	—	3.3	
$R_J$	Random Jitter	LVDS.	—	1.4	—	ps
		LVPECL.	—	1.36	—	
		LVC MOS.	$F_{OUT} = 125MHz.$	—	1.3	
$D_J$	Deterministic Jitter	LVDS.	—	9.2	—	ps
		LVPECL.	—	10	—	
		LVC MOS.	$F_{OUT} = 125MHz.$	—	6.7	
$T_J$	Total Jitter	LVDS.	—	29.2	—	ps
		LVPECL.	—	29.3	—	
		LVC MOS.	$F_{OUT} = 125MHz.$	—	25.6	
$f_{JITTER}$	Phase Jitter (12kHz–20MHz)	LVDS.	—	1040	—	fs
		LVPECL.	—	1200	—	
		LVC MOS.	$F_{OUT} = 125MHz.$	—	850	

Notes for all AC Electrical Characteristics tables:

<sup>1</sup> All jitter values provided at 156.25MHz, unless noted otherwise.

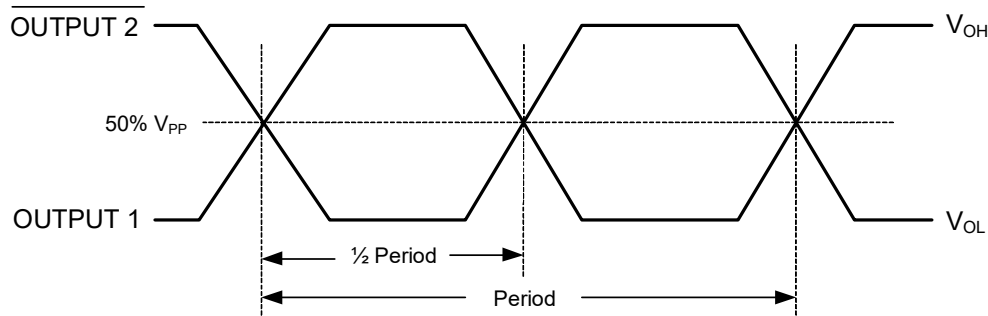
## Output Waveforms – LVDS

Output Levels/Rise Time/Fall Time Measurements



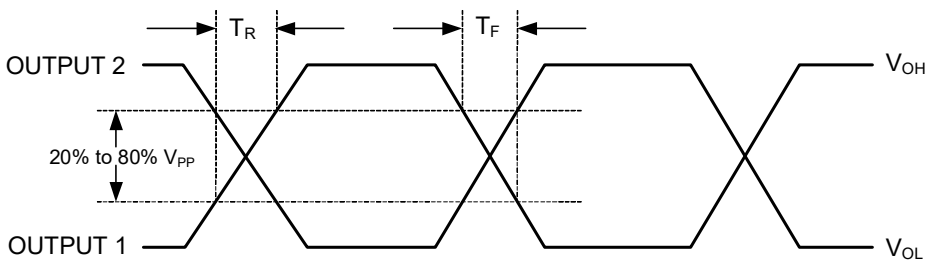
Oscillator Symmetry

Ideally, Symmetry should be 50/50 for  $\frac{1}{2}$  period –Other expressions are 45/55 or 55/45

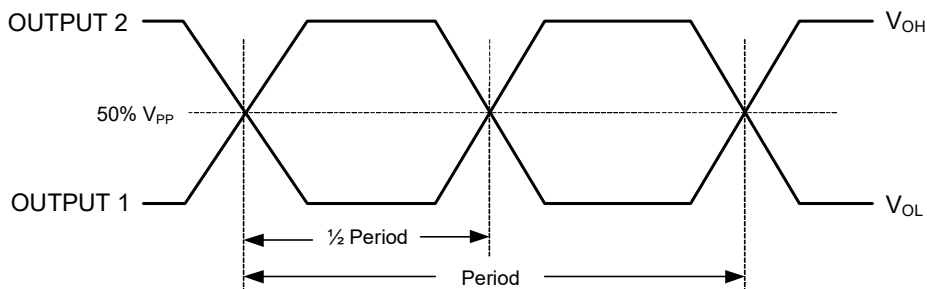


## Output Waveforms – LVPECL

Rise Time/Fall Time Measurements

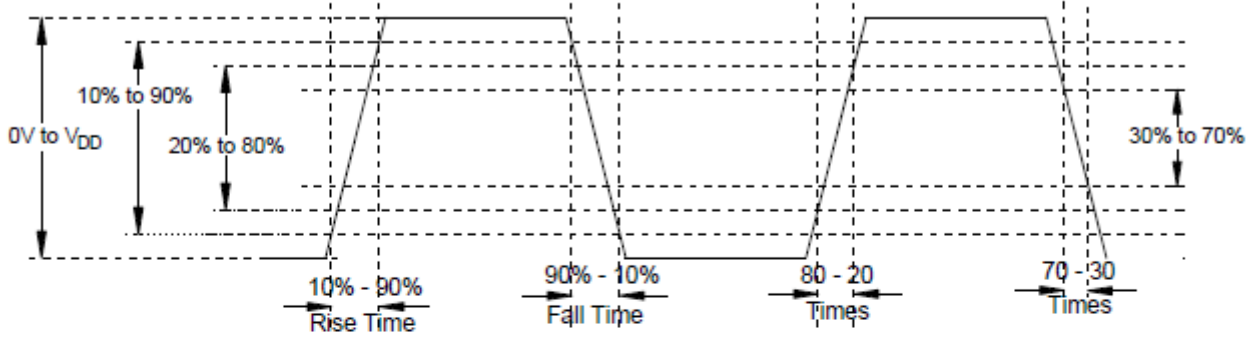


Oscillator Symmetry

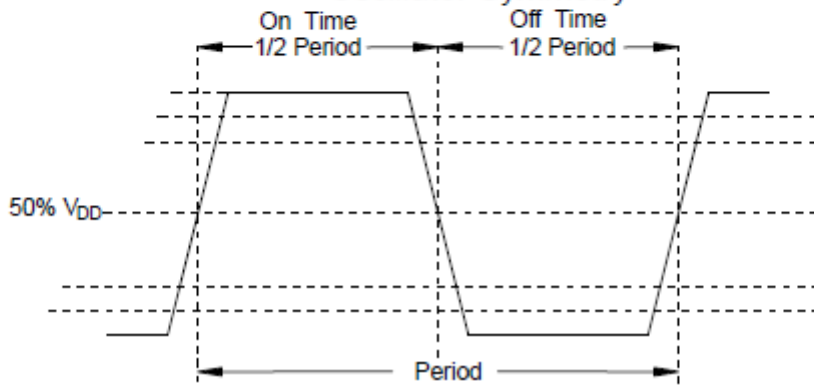


## Output Waveforms – LVCMOS

Rise Time / Fall Time Measurements



Oscillator Symmetry



## Package Outline Drawings

The package outline drawings are appended at the end of this document and are accessible from the links below. The package information is the most current data available.

[www.idt.com/document/psc/js6-package-outline-50-x-32-mm-body-11-mm-thick](http://www.idt.com/document/psc/js6-package-outline-50-x-32-mm-body-11-mm-thick)

[www.idt.com/document/psc/jx6-package-outline-32-x-25-mm-body-09-mm-thick](http://www.idt.com/document/psc/jx6-package-outline-32-x-25-mm-body-09-mm-thick)

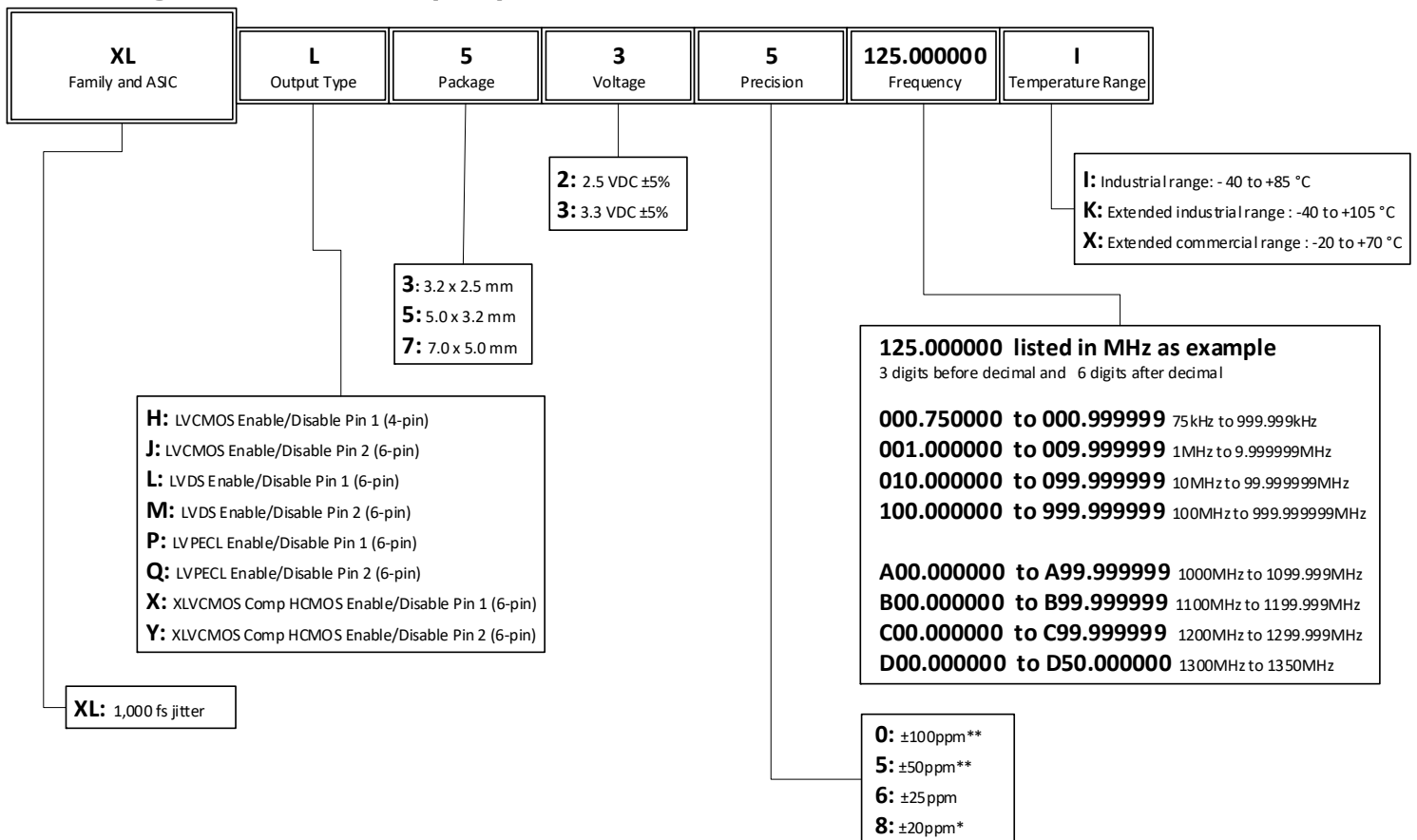
[www.idt.com/document/psc/ju6-package-outline-70-x-50-mm-body-13-mm-thick](http://www.idt.com/document/psc/ju6-package-outline-70-x-50-mm-body-13-mm-thick)

[www.idt.com/document/psc/js4-package-outline-50-x-32-mm-body-11-mm-thick](http://www.idt.com/document/psc/js4-package-outline-50-x-32-mm-body-11-mm-thick)

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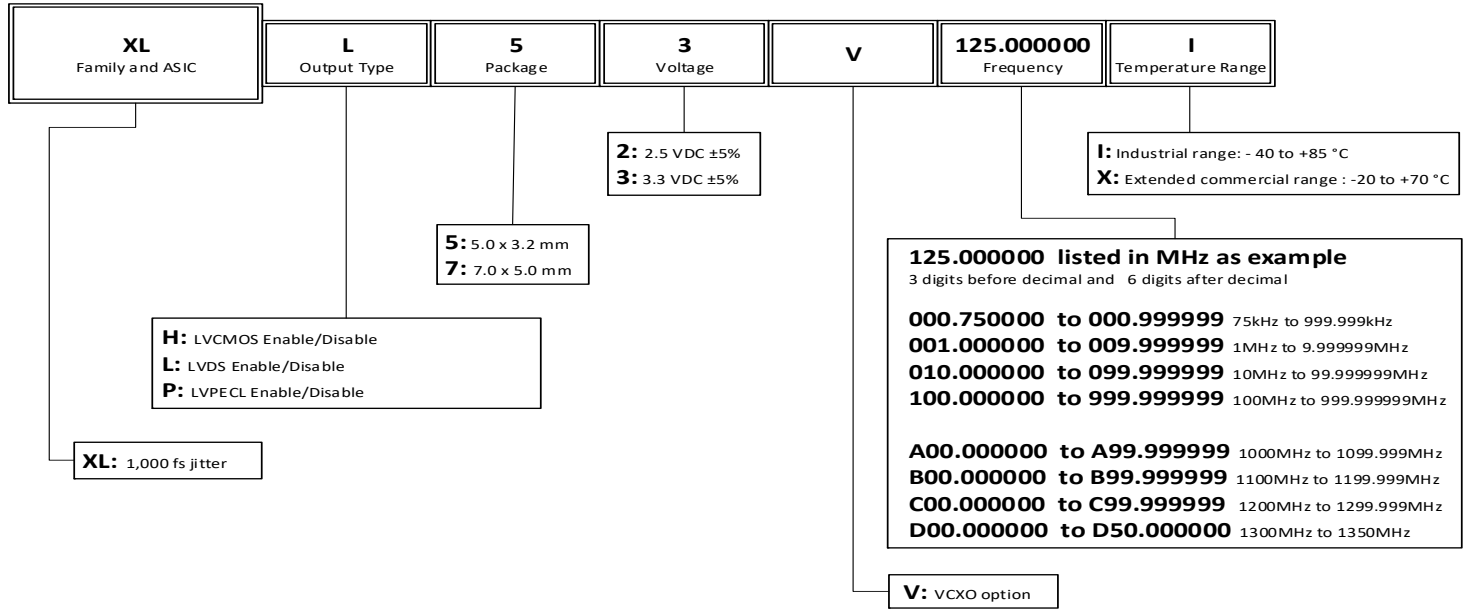
## Ordering Information (XO)



\* ±20ppm for X (-20° to +70°C) only.

\*\* ±100ppm and ±50ppm for K (-40°C to +105°C) only.

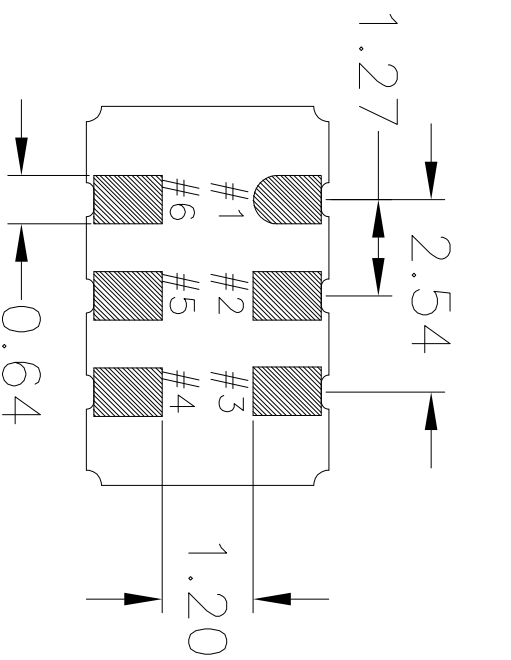
## Ordering Information (VCXO)



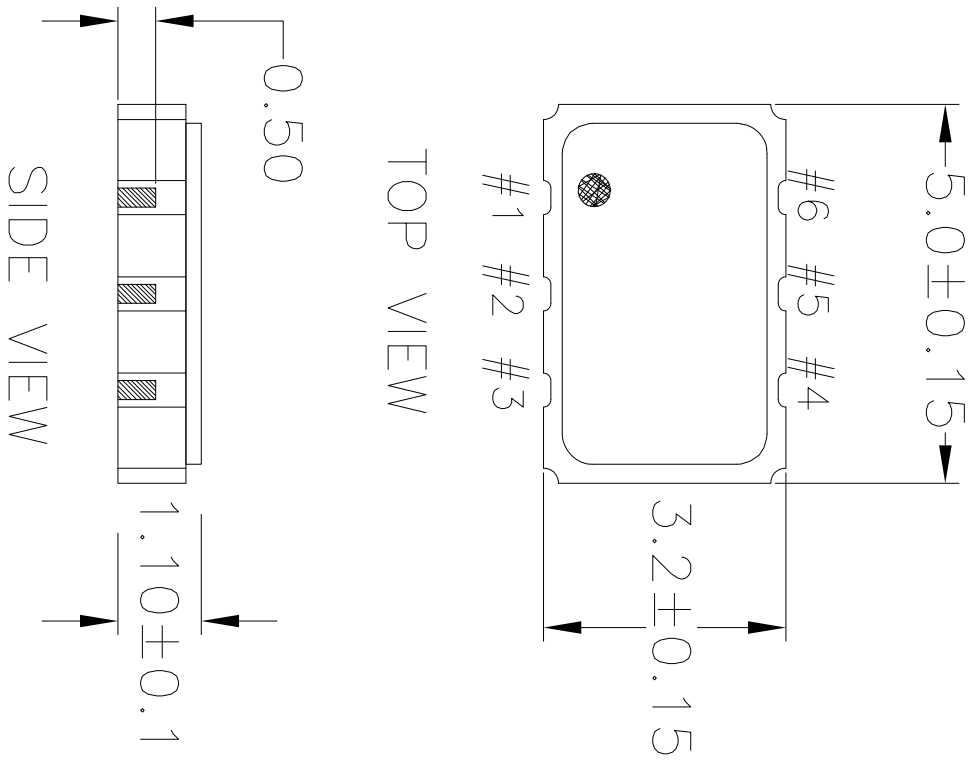
## Revision History

Revision Date	Description of Change
October 27, 2020	Added pin counts to Output Type in XO ordering table.
September 21, 2020	Added typical IDD to tables. Added more frequency ranges to IDD tables. Updated H to be LVCMOS in order code.
April 27, 2020	Updated ODC parameter. 2nd LVCMOS row to be changed from <= to > 62.5 MHz.
September 7, 2018	Updated frequency stability options value from ±20ppm to ±25ppm for -40°C to +85°C XO only.
June 25, 2018	<ul style="list-style-type: none"> <li>Updated Package Outline Drawings section.</li> </ul>
May 4, 2018	<ul style="list-style-type: none"> <li>Added XO and VCXO options.</li> <li>Updated description and Features sections.</li> <li>Updated Package Outline Drawings section.</li> <li>Added VCXO Ordering Information decoder diagram.</li> </ul>
January 12, 2018	Initial release.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	04/2/12	DP
01	ADDED LID IN TOP VIEW	07/12/12	KS
02	UPDATED LID TOLERANCES	12/03/12	KS
03	UPDATE PACKAGE DRAWING	8/8/14	JHUA



BOTTOM VIEW



TOP VIEW

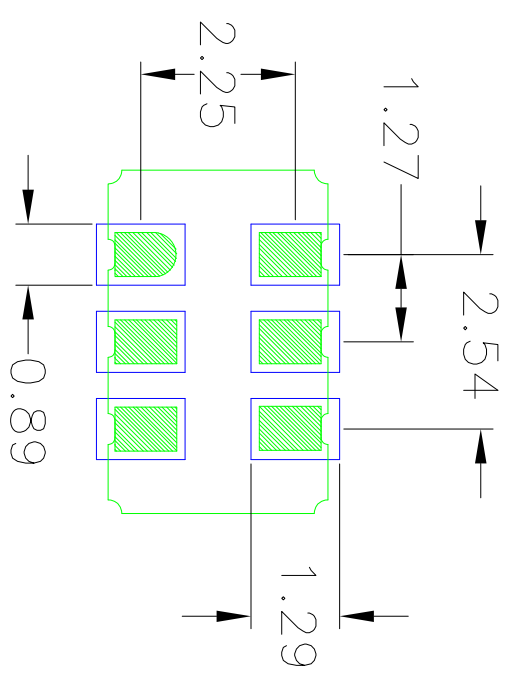
SIDE VIEW

NOTES:  
1. ALL DIMENSIONS IN MM.

TOLERANCES UNLESS SPECIFIED		6024 Silver Creek Valley Rd	
DECIMAL	ANGULAR	Son Jose, CA 95138	
XXX±	±	PHONE: (408) 727-6116	
XXXX±		FAX: (408) 492-8874	
XXXX±			
APPROVALS	DATE	TITLE	SIZE
DRAWN <i>QAC</i>	04/2/12	JS6 PACKAGE OUTLINE	DRAWING No.
CHECKED		5.0 x 3.2 mm BODY	PSC-4411
		1.1 mm Thick	REV
			03
DO NOT SCALE DRAWING			SHEET 1 OF 2



REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	04/2/12	DP
01	ADDED LID IN TOP VIEW	07/12/12	KS
02	UPDATED LID TOLERANCES	12/03/12	KS
03	UPDATE PACKAGE DRAWING	8/8/14	JHUA



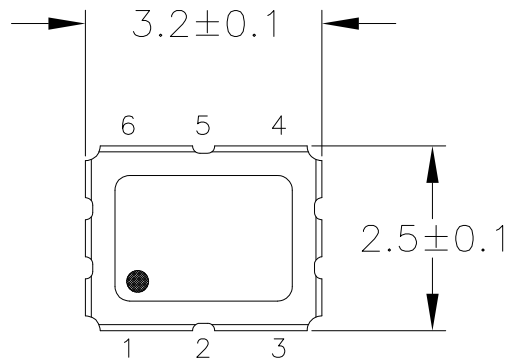
RECOMMENDED LAND PATTERN

- NOTES:
1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
  2. TOP DOWN VIEW. AS VIEWED ON PCB.
  3. COMPONENT OUTLINE SHOW FOR REFERENCE IN GREEN.
  4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
  5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

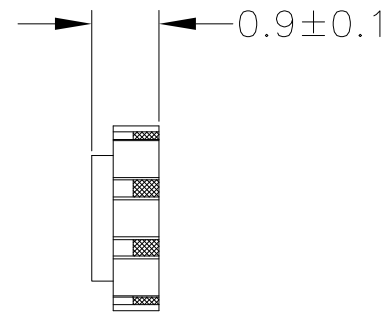
TOLERANCES UNLESS SPECIFIED		6024 Silver Creek Valley Rd	
DECIMAL	ANGULAR	San Jose, CA 95138	
XXX±	±	PHONE: (408) 727-6176	
XXXX±		FAX: (408) 492-8674	
APPROVALS		www.IDT.com	
DRAWN	DATE	TITLE	
04/2/12		J56 PACKAGE OUTLINE	
CHECKED		5.0 x 3.2 mm BODY	
		1.1 mm Thick	
SIZE	DRAWING No.	REV	
C	PSC-4411	03	
DO NOT SCALE DRAWING			SHEET 2 OF 2



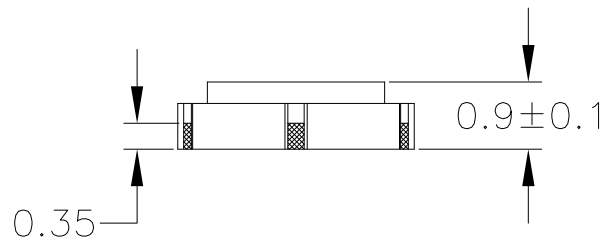
REVISIONS			
REV	DESCRIPTION	DATE CREATED	AUTHOR
00	INITIAL RELEASE	8/11/14	J.HUA
01	ADD PITCH	11/17/16	J.HUA
REFER TO DCP FOR OFFICIAL RELEASE DATE			



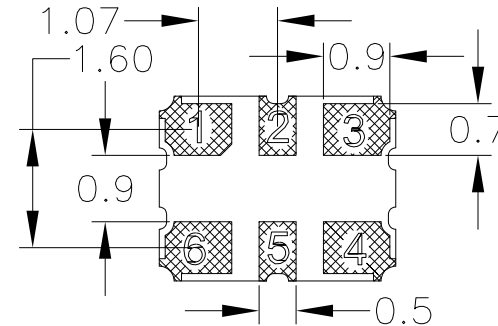
TOP VIEW



END VIEW




SIDE VIEW



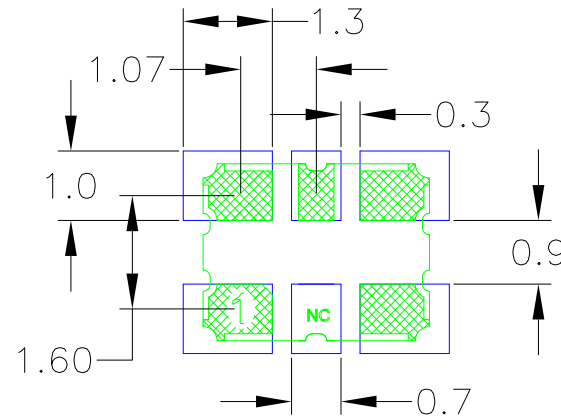
BOTTOM VIEW

NOTES:

1. ALL DIMENSIONS IN MM.

TOLERANCES UNLESS SPECIFIED		 6024 Silver Creek Valley Rd San Jose, CA 95138 PHONE: (408) 727-6116 FAX: (408) 492-8674 <a href="http://www.IDT.com">www.IDT.com</a>
DECIMAL	ANGULAR	
XX±	±	
XXX±		
XXXX±		
TITLE		JX6 PACKAGE OUTLINE
		3.2 x 2.5 mm BODY
		0.9 mm Thick
SIZE	DRAWING No.	REV
C	PSC-4412	01
DO NOT SCALE DRAWING		SHEET 1 OF 2


REVISIONS			
REV	DESCRIPTION	DATE CREATED	AUTHOR
00	INITIAL RELEASE	8/11/14	J.HUA
01	ADD PITCH	11/17/16	J.HUA
REFER TO DCP FOR OFFICIAL RELEASE DATE			



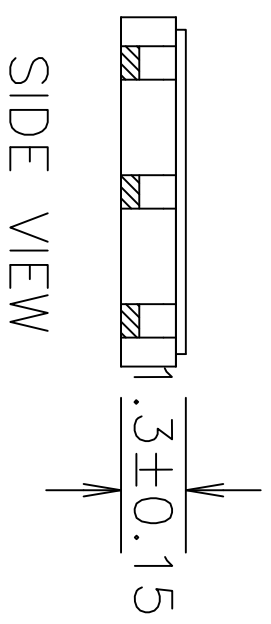
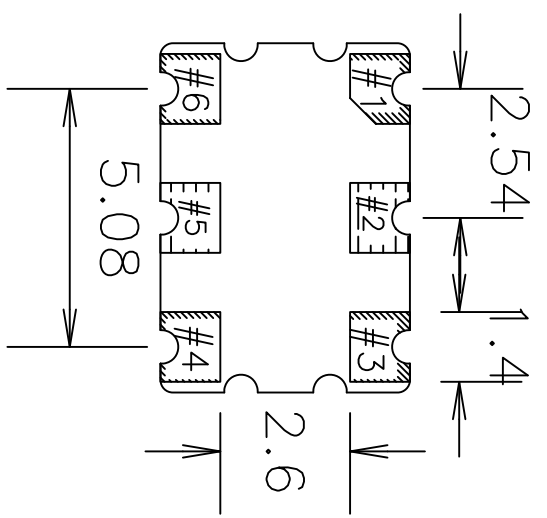
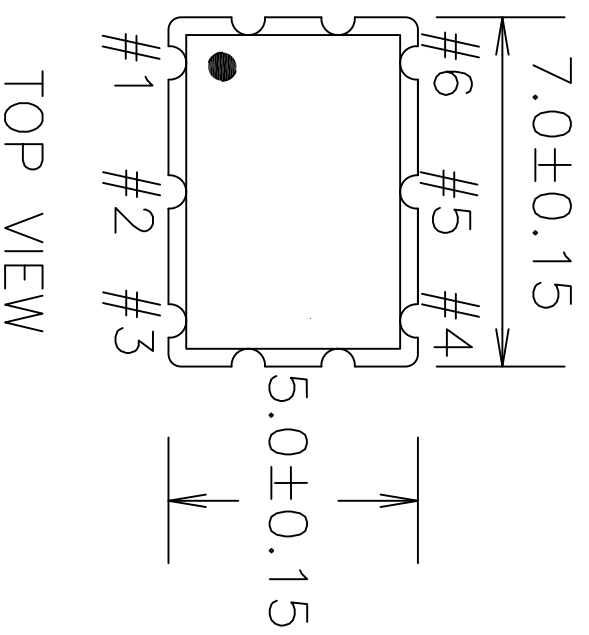
### RECOMMENDED LAND PATTERN DIMENSION

#### NOTES:


1. ALL DIMENSIONS ARE IN MM. ANGLES IN DEGREES.
2. TOP DOWN VIEW. AS VIEWED ON PCB.
3. COMPONENT OUTLINE SHOWS FOR REFERENCE IN GREEN.
4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

TOLERANCES UNLESS SPECIFIED		 <b>IDT</b> 6024 Silver Creek Valley Rd San Jose, CA 95138 PHONE: (408) 727-6116 FAX: (408) 492-8674 <a href="http://www.IDT.com">www.IDT.com</a>	
DECIMAL	ANGULAR		
XX±	±		
XXX±			
XXXX±			
TITLE		JX6 PACKAGE OUTLINE	
		3.2 x 2.5 mm BODY	
		0.9 mm Thick	
SIZE	DRAWING No.	REV	
C	PSC-4412	01	
DO NOT SCALE DRAWING		SHEET 2 OF 2	

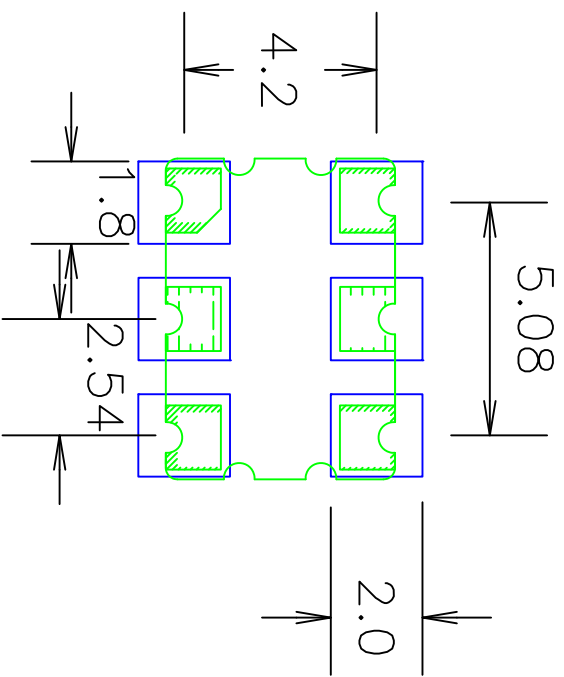
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	10/5/12	KS
01	UPDATE PACKAGE DRWING	8/12/14	JHUA



NOTES:  
1. ALL DIMENSIONS IN MM.

TOLERANCES UNLESS SPECIFIED		www.IDT.com	
DECIMAL	ANGULAR	 <b>IDT</b> <sup>TM</sup> 6024 Silver Creek Valley Rd San Jose, CA 95138 PHONE: (408) 727-6116 FAX: (408) 482-9874	
XXX±	±		
XXXX±		DATE	
APPROVALS	DATE	TITLE	
DRAWN XJS	10/03/12	JUG PACKAGE OUTLINE	
CHECKED		7.0 x 5.0 mm BODY	
		1.3 mm Thick	
		SIZE	REV
		C	01
DRAWING No. PSC-4430		DO NOT SCALE DRAWING	
		SHEET 1 OF 2	

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	10/5/12	KS
01	UPDATE PACKAGE DRAWING	8/12/14	JLHUA



RECOMMENDED LAND PATTERN

- NOTES:
1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
  2. TOP DOWN VIEW. AS VIEWED ON PCB.
  3. COMPONENT OUTLINE SHOW FOR REFERENCE IN GREEN.
  4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
  5. LAND PATTERN RECOMMENDATION PER IPC-7351B. GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

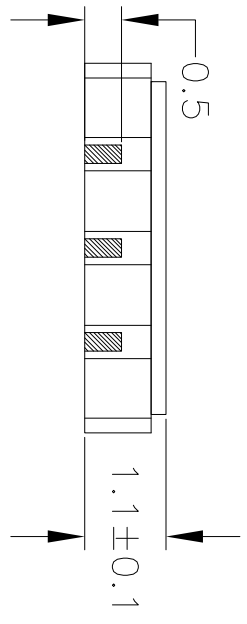
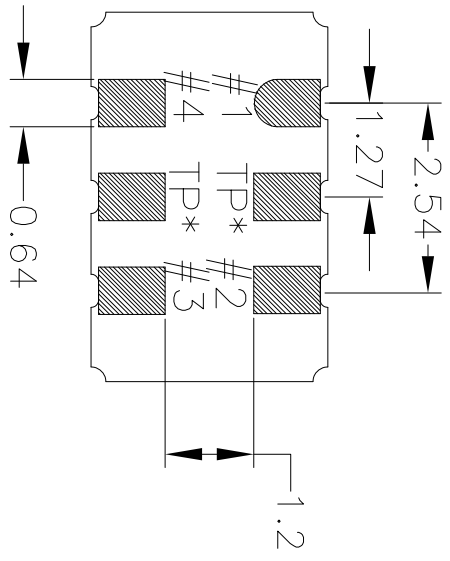
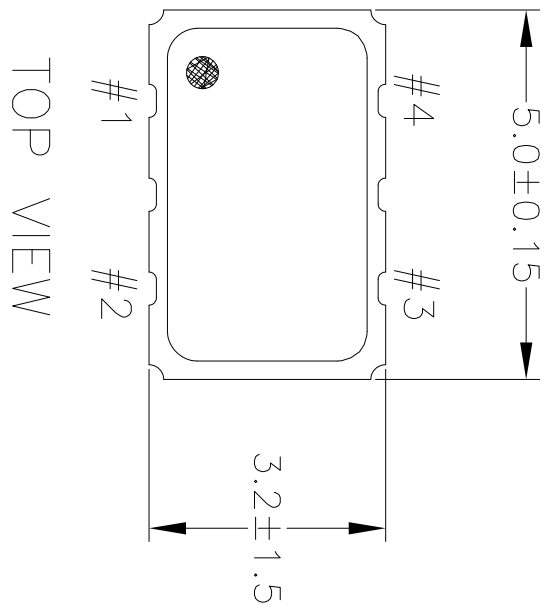
TOLERANCES UNLESS SPECIFIED	
DECIMAL	ANGULAR
XX.X	±
XX.XX	
XX.XXX	
APPROVALS	DATE
DRAWN <i>KS</i>	10/05/12
CHECKED	
SIZE	DRAWING No.
C	FSC-4430
DO NOT SCALE DRAWING	
SHEET	2 OF 2

6024 Silver Creek Valley Rd  
San Jose, CA 95138  
PHONE: (408) 757-6116  
FAX: (408) 492-8874  
www.IDT.com

TITLE J06 PACKAGE OUTLINE  
7.0 x 5.0 mm BODY  
1.3 mm Thick

REV	DESCRIPTION
01	

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	08/21/12	K. Stahn
01	UPDATED IJD TOLERANCES	12/03/12	K. Stahn
02	UPDATE PACKAGE DRAWING	8/8/14	JHUA



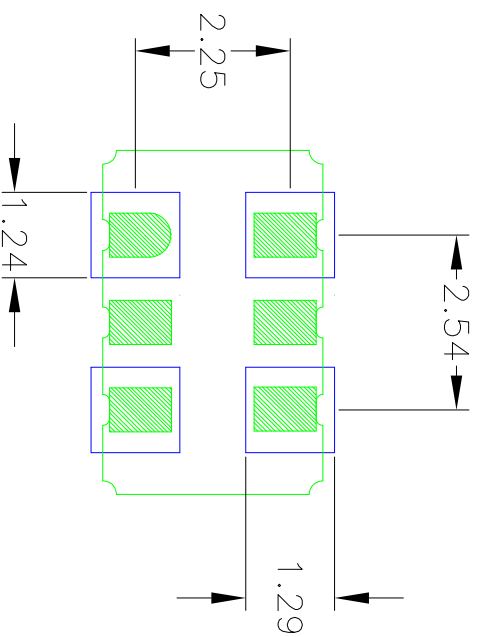
SIDE VIEW

BOTTOM VIEW

NOTES:  
1. ALL DIMENSIONS IN MM.

TOLERANCES UNLESS SPECIFIED		6024 Silver Creek Valley Rd	
DECIMAL	ANGULAR	San Jose, CA 95138	
±	F	PHONE: (408) 727-8116	
XXX	XXXX	FAX: (408) 492-8574	
WWW.IDT.COM		IDT™	
APPROVALS		TITLE JS4 PACKAGE OUTLINE	
DATE	07/18/12	5.0 x 3.2 mm BODY	
DRAWN BY		1.1 mm Thick	
CHECKED		SIZE C	
DRAWING No. PSC-4429		REV 02	
DO NOT SCALE DRAWING		SHEET 1 OF 2	

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	08/21/12	K. Stahn
01	UPDATED LID TOLERANCES	12/03/12	K. Stahn
02	UPDATE PACKAGE DRAWING	8/8/14	JHUA




### RECOMMENDED LAND PATTERN

#### NOTES:

1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
2. TOP DOWN VIEW. AS VIEWED ON PCB.
3. COMPONENT OUTLINE SHOW FOR REFERENCE IN GREEN.
4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

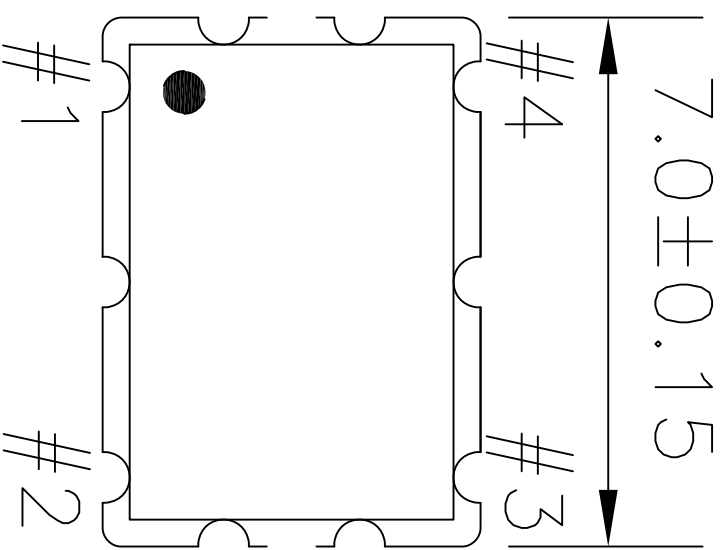
TOLERANCES UNLESS SPECIFIED	
DECIMAL	±
ANGULAR	±
XXX°	
XXXX	
XXXXX	
APPROVALS	DATE
DRAWN <i>XS</i>	07/16/12
CHECKED	
SIZE	DRAWING No.
C	FSC-4429
DO NOT SCALE DRAWING	SHEET 2 OF 2


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 San Jose, CA 95138  
 PHONE: (408) 727-6118  
 FAX: (408) 492-8674  
[www.IDT.com](http://www.IDT.com)

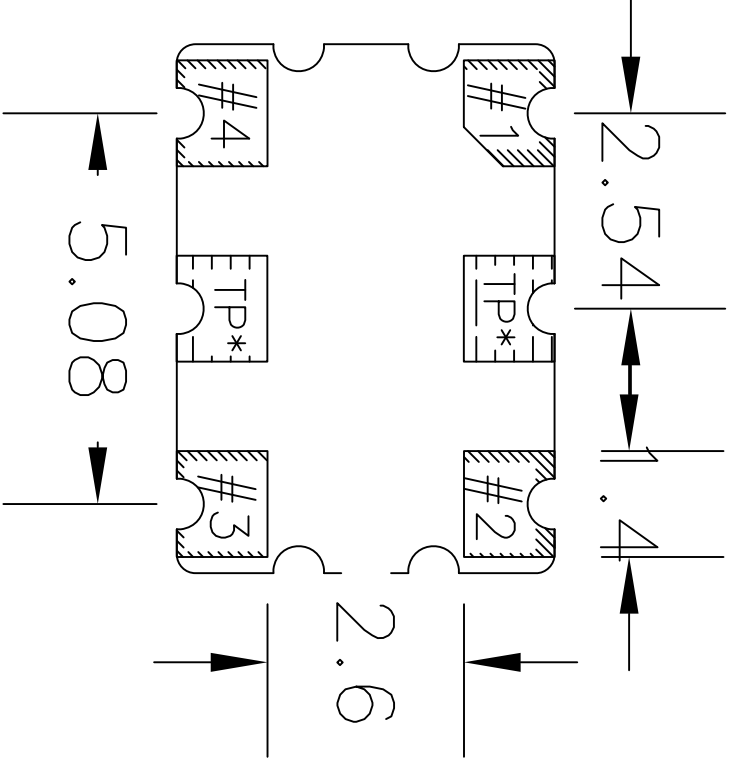
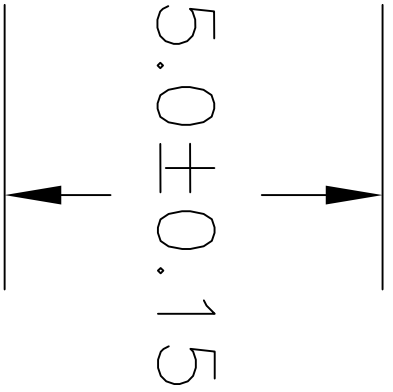
TITLE	DATE
JS4 PACKAGE OUTLINE	07/16/12
5.0 x 3.2 mm BODY	
1.1 mm Thick	

REV	DATE	DESCRIPTION
02		

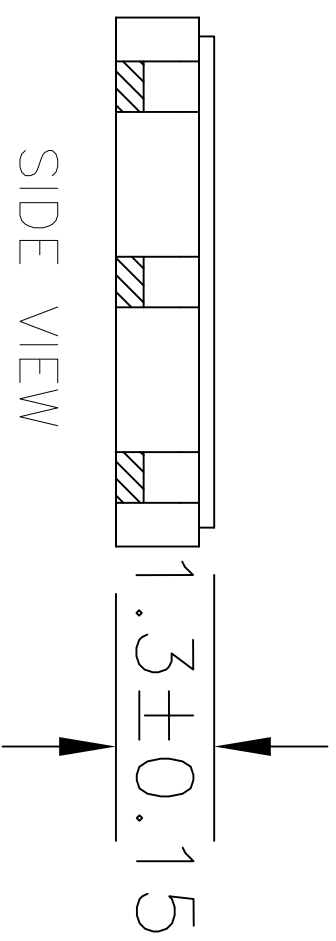
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	10/09/12	KS
01	UPDATE PACKAGE DRAWING	8/11/14	JHUA



TOP VIEW



BOTTOM VIEW

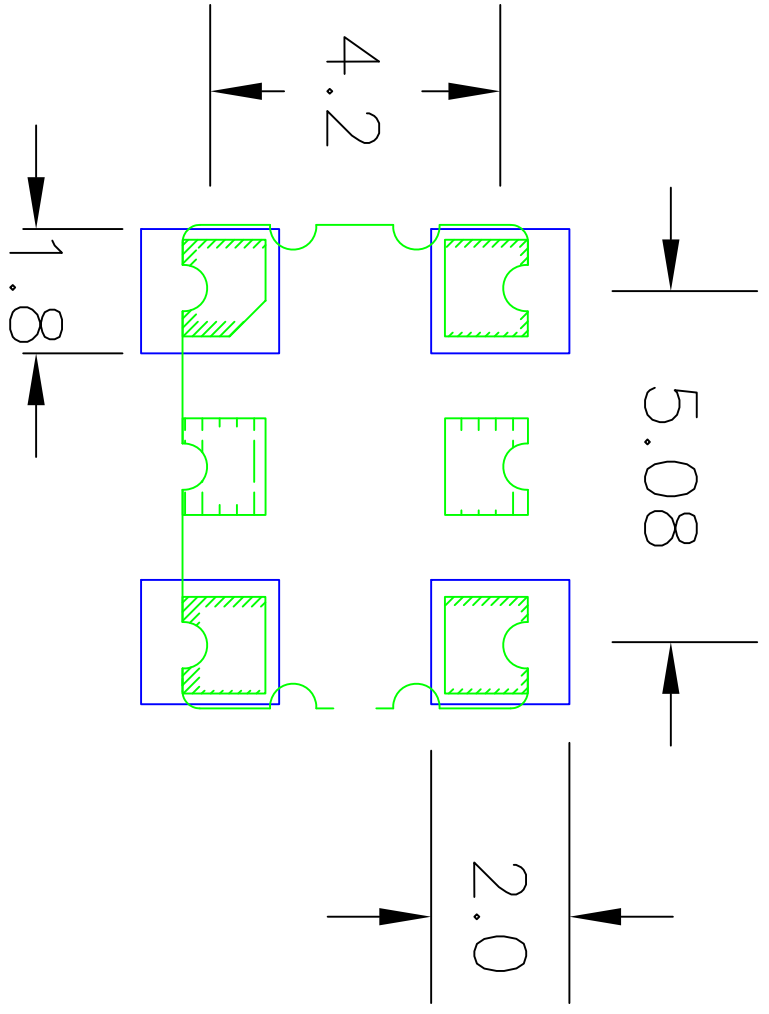


SIDE VIEW

NOTES:  
1. ALL DIMENSIONS IN MM.

TOLERANCES UNLESS SPECIFIED		6024 Silver Creek Valley Rd San Jose, CA 95138	
DECIMAL	±	PHONE: (408) 727-6116	
ANGULAR	±	FAX: (408) 492-8674	
XXX°			
XXXX			
XXXXE			
APPROVALS	DATE	TITLE	www.IDT.com
DRAWN JCS	10/09/12	JU4 PACKAGE OUTLINE	
CHECKED		7.0 x 5.0 mm BODY	
		1.3 mm Thick	
SIZE	DRAWING NO.	REV	
C	PSC-4431	01	
DO NOT SCALE DRAWING			SHEET 1 OF 2

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	10/09/12	KS
01	UPDATE PACKAGE DRAWING	8/11/14	JHUA



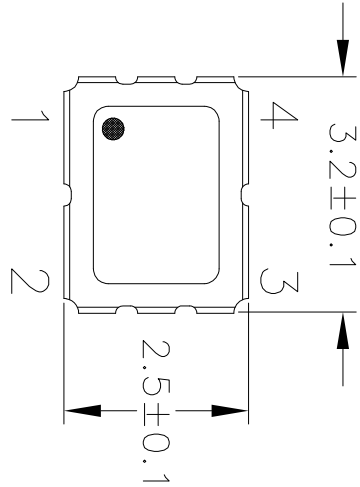
RECOMMENDED LAND PATTERN

- NOTES:
1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
  2. TOP DOWN VIEW. AS VIEWED ON PCB.
  3. COMPONENT OUTLINE SHOW FOR REFERENCE IN GREEN.
  4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
  5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

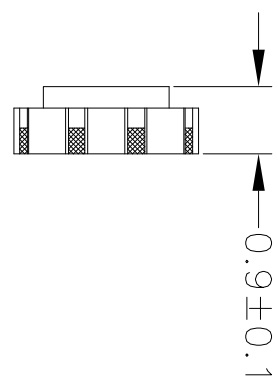
TOLERANCES UNLESS SPECIFIED		6024 Silver Creek Valley Rd	
DECIMAL	ANGULAR	San Jose, CA 95128	
XXX±		PHONE: (408) 727-6116	
XXXX±		FAX: (408) 492-8674	
XXXX±		www.IDT.com	
APPROVALS	DATE	TITLE	JU4 PACKAGE OUTLINE
DRAWN %28	10/05/12	7.0 x 5.0 mm BODY	
CHECKED		1.3 mm Thick	
		SIZE DRAWING No.	REV
		C PSC-4431	01
DO NOT SCALE DRAWING			SHEET 2 OF 2



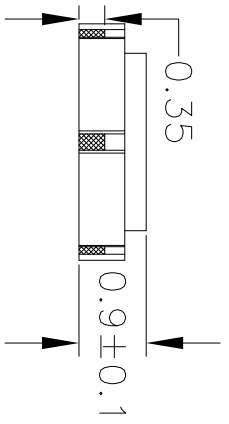
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	8/8/14	JHUA
01	ADD OPTION 1 & 2	4/2/15	JHUA



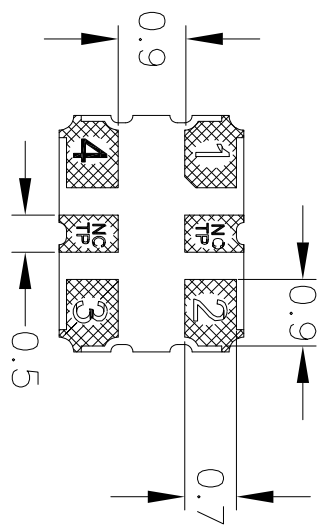
TOP VIEW



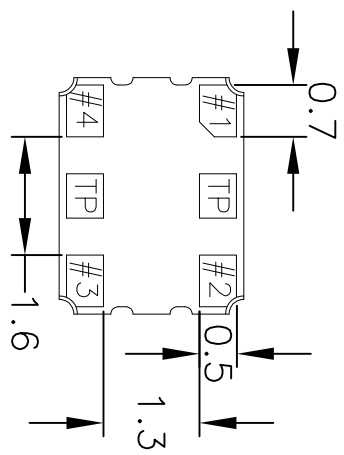
END VIEW



SIDE VIEW




OPTION 1  
BOTTOM VIEW

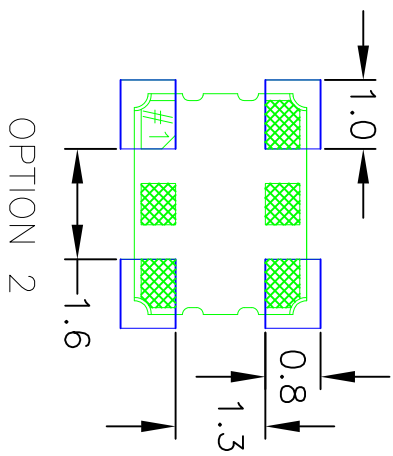
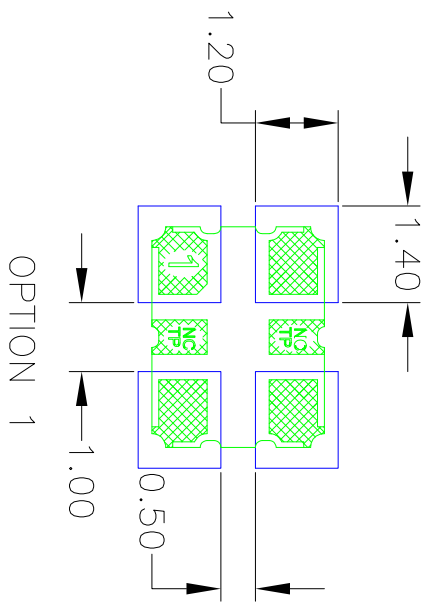


OPTION 2  
BOTTOM VIEW

NOTES:  
1. ALL DIMENSIONS IN MM.

TOLERANCES UNLESS SPECIFIED		 <b>IDT</b> <sup>TM</sup>	6024 Silver Creek Valley Rd San Jose, CA 95138 PHONE: (408) 727-6116 FAX: (408) 492-8674
DECIMAL	ANGULAR		
XXX±	±		
XXXX±			
APPROVALS	DATE	TITLE	SIZE
DRAWN <i>RAC</i>	8/8/14	JX4 PACKAGE OUTLINE	3.2 x 2.5 mm BODY
CHECKED		0.9 mm Thick	
		DRAWING No.	REV
		PSC-4489	01
DO NOT SCALE DRAWING			SHEET 1 OF 2

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	8/8/14	JHUA
01	ADD OPTION 1 & 2	4/2/15	JHUA



RECOMMENDED LAND PATTERN

- NOTES:
1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
  2. TOP DOWN VIEW AS VIEWED ON PCB.
  3. COMPONENT OUTLINE SHOWN FOR REFERENCE IN GREEN.
  4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
  5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

TOLERANCES UNLESS SPECIFIED	
DECIMAL ±	ANGULAR ±
XXX±	
XXX±	
APPROVALS	DATE
DRAWN <i>DA/C</i>	8/8/14
CHECKED	
SIZE C	DRAWING No. PSC-4489
	REV 01
DO NOT SCALE DRAWING	
SHEET 2 OF 2	

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TITLE JY4 PACKAGE OUTLINE  
 3.2 x 2.5 mm BODY  
 0.9 mm Thick

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(Rev.1.0 Mar 2020)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

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