

THE SPECIALISTS

FOR FREQUENCY CONTROL AND BATTERY TECHNOLOGY

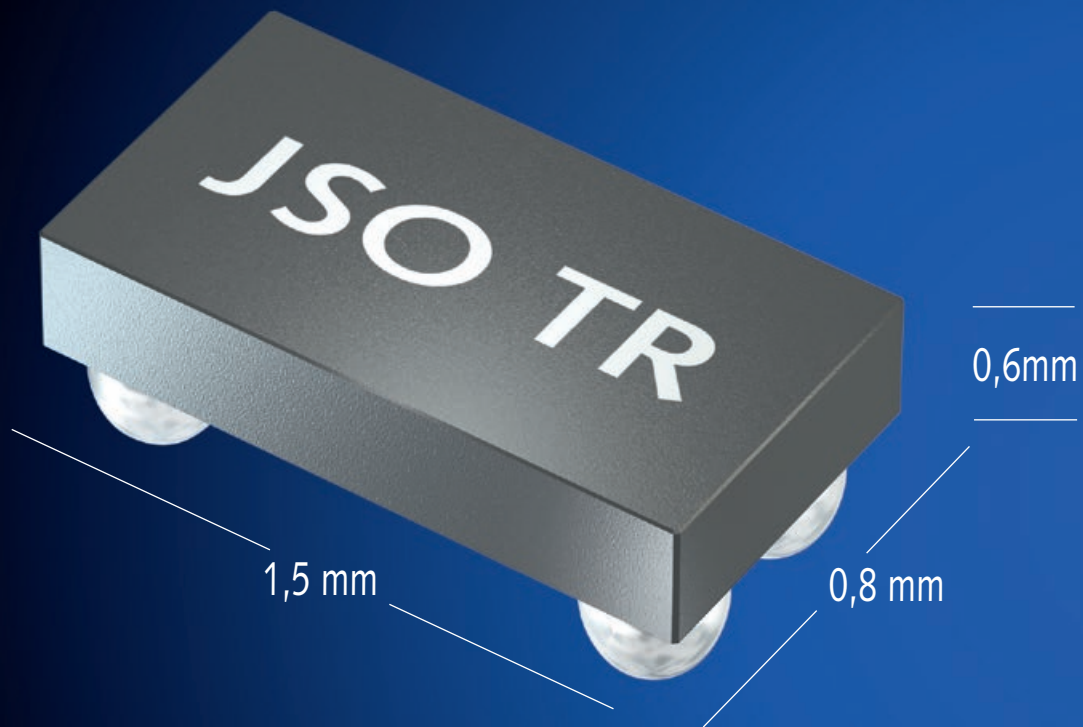


MEMS TIMING



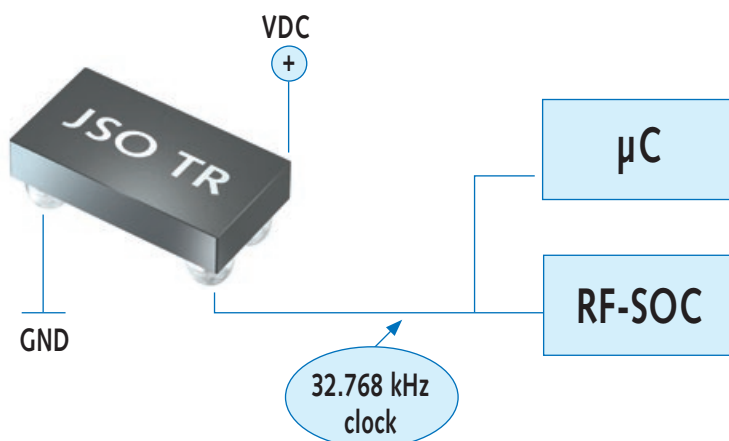
MEMS OSCILLATORS





NEW AT JAUCH:
TEMPERATURE COMPENSATED MEMS OSCILLATORS

EASY TO USE:
JUST CONNECT VDC, FEED MULTIPLE CLOCK RECEIVERS



JS015 TR

HIGHEST ACCURACY FOR RTC APPLICATIONS

Product Features

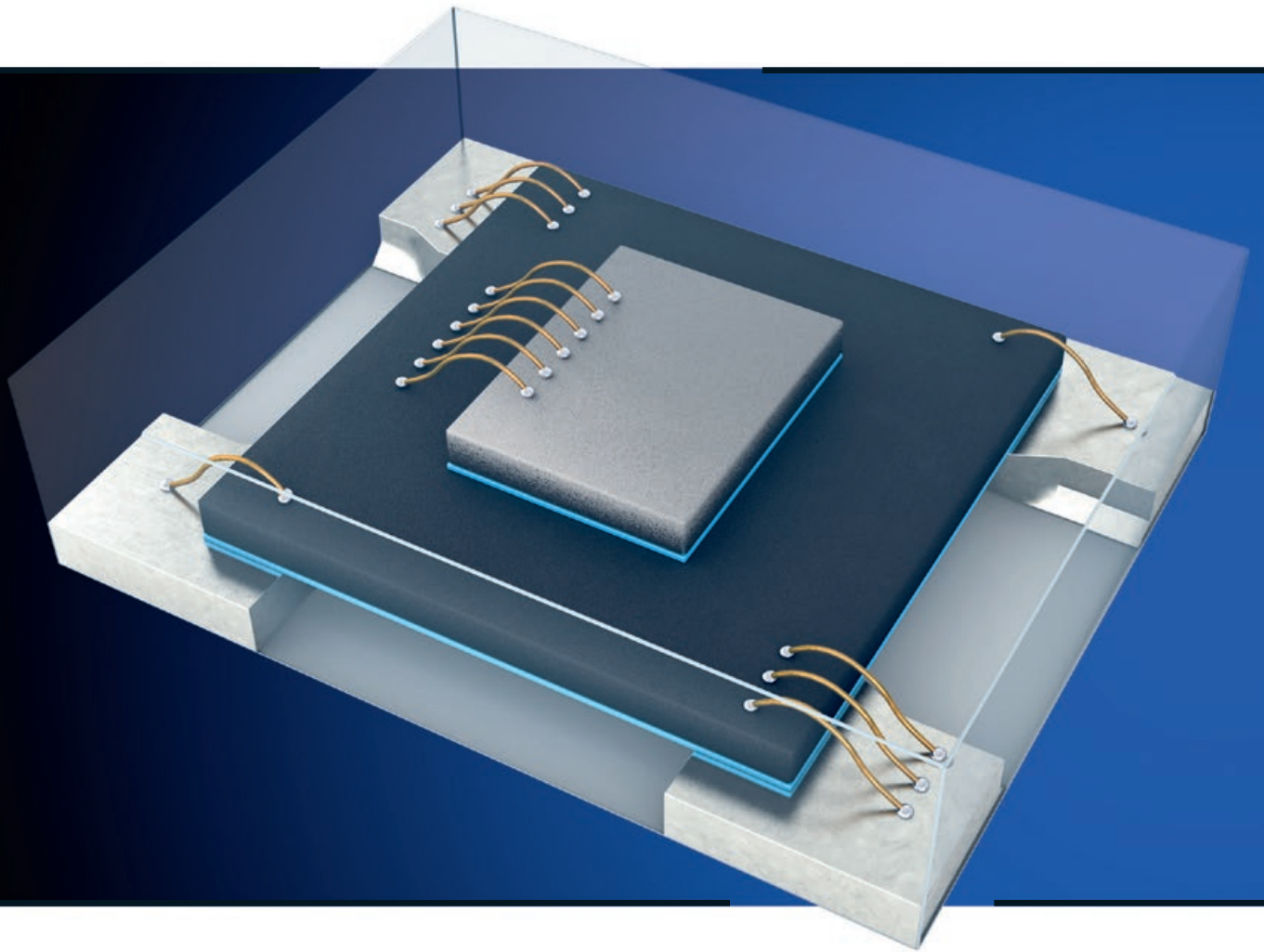
- Temperature compensated MEMS oscillator (TCMO)
- Output frequency 32.768 kHz
- Best temperature stability ± 5 ppm
- Temperature range $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- Variable supply voltage range 1.5 Volt \sim 3.63 Volt
- CSP 1.5 x 0.8 x 0.6 (chip scale package)
- High shock and vibration resistance
- Extremely high reliability

Applications

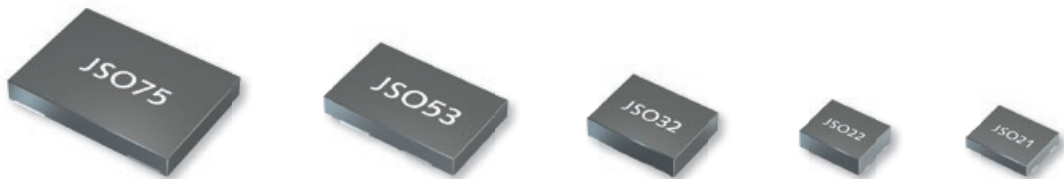
- Highly accurate Real Time Clocks (RTC)
- Smart Meters / Automated Meter Reading (AMR)
- Wearables / Activity Trackers / Smart Watches
- Mobile Medical Instruments
- Health and Wellness Monitors
- Tablets / Mobile Phones

Additional Services

- Samples of JS015 TR typically available from stock
- Free samples shipped without delivery charge within 48 hours
- Technical customer support by field application engineers



NEW AT JAUCH: MEMS OSCILLATORS



EASY TO CONFIGURE: CHECK OUT OUR WEBSITE



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J50 LC SERIES

LOW POWER FOR VERSATILE APPLICATIONS

Product Features

- Silicon MEMS resonator based oscillators
- Frequency range 1 MHz ~ 137 MHz
- Best temperature stability ± 20 ppm
- Widest temperature range $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Supply voltage range 1.8 Volt ~ 3.3 Volt
- Compatible to all standard oscillator packages and pad layouts
- 50,000 G shock and 70 G vibration resistance
- Extremely high reliability

Drop-in Replacement for the Following Packages

- 2016 (2.0 x 1.6 x 0.75 mm)
- 2520 (2.5 x 2.0 x 0.75 mm)
- 3225 (3.2 x 2.5 x 0.75 mm)
- 5032 (5.0 x 3.2 x 0.75 mm)
- 7050 (7.5 x 5.0 x 0.90 mm)

Additional Services

- Local configuration center in Germany
- Technical customer support by field application engineers
- Free samples shipped without delivery charge within 48 hours



actual size

MEMS-TCXO · JSO TR · 32.768kHz

- ultra-stable 32.768 kHz clock source
- ultra-small CSP package 1.5 x 0.8 mm
- very short start-up time
- can replace tuning fork crystals
- wide supply voltage range 1.5 V ~ 3.63 V
- very low supply current

General Data

type		JSO15B1TR
supply voltage V_{DC}		1.5 V ~ 3.63 V
current consumption typ.		1.2 μ A (rail-to-rail mode, no load, $V_{DC} = 1.8$ V)
output frequency		32.768 kHz
frequency stability vs. temp.		± 10 ppm ~ ± 22 ppm (see table 1)
frequency stability vs. voltage		± 0.75 ppm at 1.8 V ± 0.18 V ± 1.5 ppm at 1.5 V ~ 3.63 V
aging	at +25°C	± 1 ppm first year
temperature	operating	0°C ~ +70°C / -40°C ~ +85°C
	storage	-50°C ~ +125°C
output	low level max.	0.1 x V_{DC}
	high level min.	0.9 x V_{DC}
	load max.	15 pF
	current max.	1.0 μ A
	rise & fall time	200 ns max. (15 pF, 10 <-> 90 %) 50 ns max. (5 pF, 10 <-> 90 %)
start-up time max.		400 ms
power supply ramp max.		100 ms
period jitter RMS typ.		35 ns

Table 1: Frequency Stability Code

stability code / temp. code	D	K	F		
including frequency tolerance*	± 22 ppm	± 13 ppm	± 10 ppm		
excluding frequency tolerance**	± 20 ppm	± 10 ppm	± 5 ppm		
0°C ~ +70°C	T0	○	○	○	
-40°C ~ +85°C	T1	○	○	○	
○ available					

* includes tolerance at 25°C and frequency stability in operating temp. range.
** frequency stability in operating temp. range, frequency tolerance excluded.

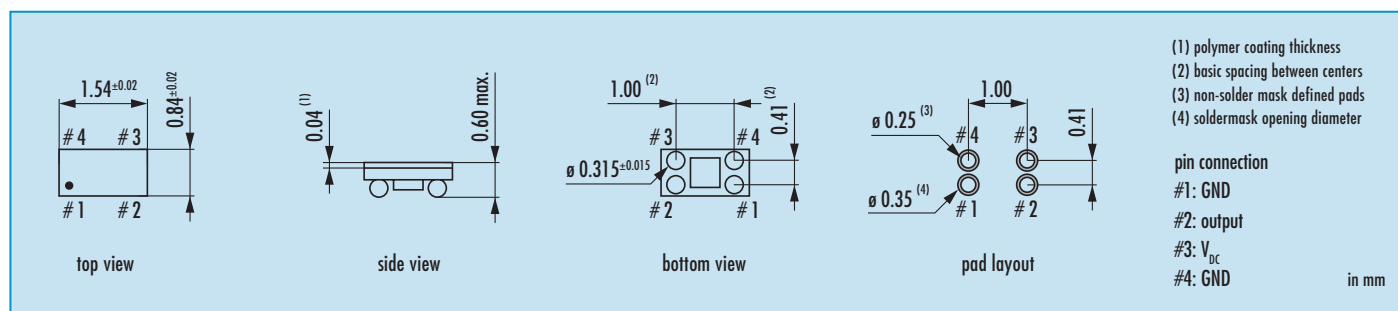
Table 2: Current Consumption typ. (for max. add 40%)

supply current at load	none	5 pF	10 pF	15 pF	unit
at startup (150 ms max.)	30.0				μ A
during temp. compensation*	6.0				μ A
$V_{RR} = 1.80$ V, compensation inactive	1.2	1.5	1.8	2.1	μ A
$V_{RR} = 2.50$ V, compensation inactive	1.3	1.7	2.0	2.5	μ A
$V_{RR} = 3.30$ V, compensation inactive	1.4	1.9	2.5	3.0	μ A

* repetitive temp. compensation consuming 6 μ A for 10 ms, repeating every 350 ms

More information about the features of the JSO TR 32.768 kHz TCXO can be found [here](#).

Dimensions



Packing Note / Marking

QTY < 1K pcs. → cut tape
QTY 1K/3K → tape and reel
Marking: identifier for pin 1

Pin Connection



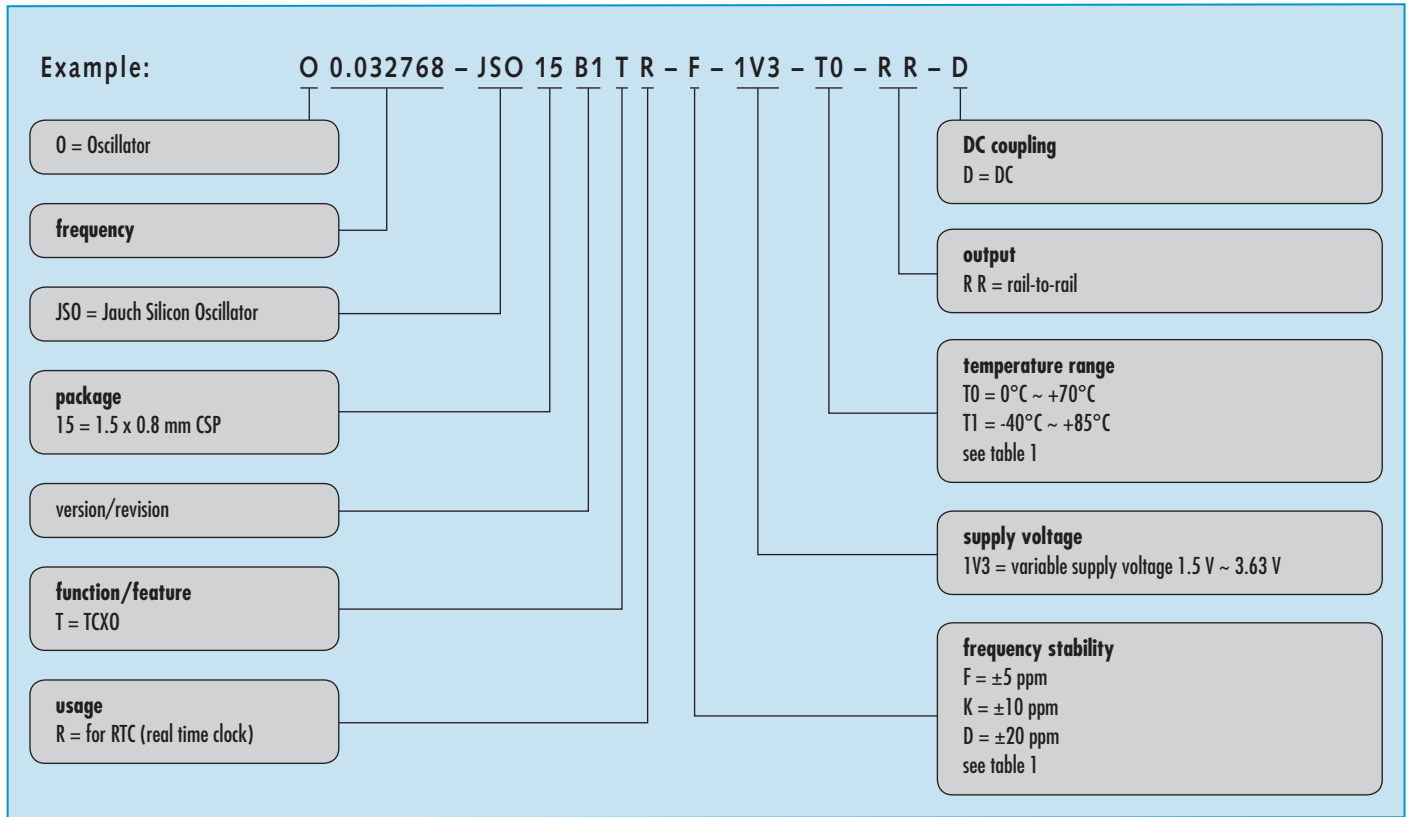
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Jauch Quartz GmbH • e-mail: info@jauch.de
full data can be found under: www.jauch.de / www.jauch.co.uk / www.jauch.fr / www.jauchusa.com
All specifications are subject to change without notice

MEMS-TCXO · JSO TR · 32.768kHz

Order Information

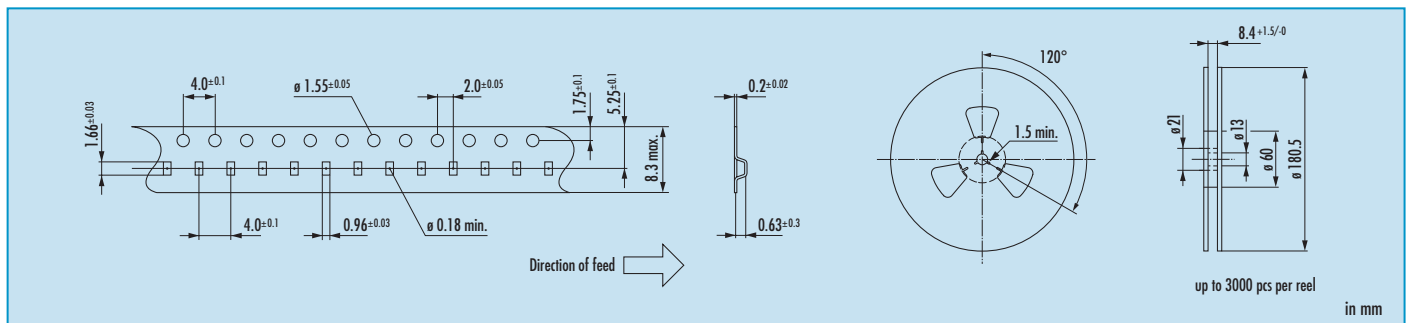


Note

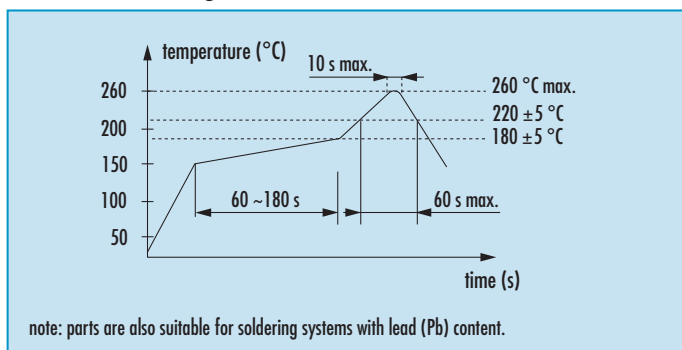
Standard type O 0.032768-JSO15B1TR-F-1V3-T1-RR-D typically available from stock

Frequency stability (table 1): F = ±5 ppm
 Operating temperature range: T1 = -40°C ~ +85°C
 Supply voltage: 1V3 = 1.5 V ~ 3.63 V variable

Taping Specification



Reflow Soldering Profile





actual sizes



MEMS-Oscillator · JSO LC series · 1.8 V

- low power oscillator with HCMOS/LVCMOS output
- compatible to industry standard packages 2016 – 7050
- configured to customer's specification
- extended shock & vibration resistance
- very fast delivery service
- 500 million hours MTBF

General Data

type		JSOxxCxLC 1.8 V
frequency range		1.0 ~ 110.0 MHz (temp. range T0 ~ T8)
		115.0 ~ 137.0 MHz (temp. range T0 ~ T1)
frequency stability over all		±20 ppm ~ ±50 ppm (see table 1)
current consumption		see table 2
supply voltage V_{DC}		1.8 V ± 10%
temperature	operating	T0 = -20°C ~ +70°C
		T1 = -40°C ~ +85°C
		T2 = -40°C ~ +105°C
		T3 = -40°C ~ +125°C
		T8 = -55°C ~ +125°C
	storage	-55°C ~ +150°C
output	logic	HCMOS/LVCMOS
	rise & fall time	4.2 ns max. at 15 pF / 6.8 ns max. at 30 pF (see table 4)
	load max.	30 pF max. recommended (≤ 74.0 MHz)
		15 pF max. recommended (> 74.0 MHz)
		other load capacitances possible, see supplementary document
	current max.	2 mA
low level max.	0.1 x V_{DC}	
high level min.	0.9 x V_{DC}	
standby function (e/d)		stop (S), tristate-only (T) or none (N), see table 3
output enable time max.		5 ms (S) / 150 ns (T)
output disable time max.		150 ns
start-up time max.		5 ms
standby current max.		2 µA (for stop (S), see table 3)
phase jitter 12 kHz ~ 20 MHz		< 3.0 ps RMS
symmetry at 0.5 x V_{DC}		45% ~ 55% (standard)

note: some frequencies can't be configured, see table 5.

Packing Note / Marking

QTY < 250 pcs. → cut tape
 QTY 250/500/1K/3K pcs. → tape and reel
 Marking: lot code only



RoHS compliant



Pb free



REACH compliant



Conflict mineral free

Table 1: Frequency Stability Code

stability code / temp. code*		B	G	C	D
		±50 ppm	±30 ppm	±25 ppm	±20 ppm
-20°C ~ +70°C	T0	○	○	○	○
-40°C ~ +85°C	T1	○	○	○	○
-40°C ~ +105°C	T2	○	○	○	○
-40°C ~ +125°C	T3	○	○	○	○
-55°C ~ +125°C	T8	○	○	○	○
○ available					

* includes stability at 25°C, operating temp. range, supply voltage change, shock and vibration, aging 1st year.

Table 2: Current Consumption typ. (for max. add 30%)

current at load	5 pF	15 pF	30 pF	60 pF	unit
output disabled	3.5	3.5	3.5	3.5	mA
1.0 ~ 19.9 MHz	3.6	3.9	4.4	5.5	mA
20.0 ~ 29.9 MHz	4.2	4.5	5.4	6.5	mA
30.0 ~ 49.9 MHz	4.5	5.1	6.5		mA
50.0 ~ 79.9 MHz	4.9	6.3			mA
80.0 ~ 110.0 MHz	5.7	7.6			mA
115.0 ~ 137.0 MHz	(8.0)	(13.0)			mA

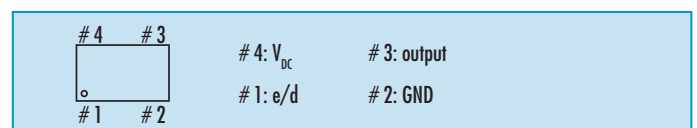
note: current at default edge control setting "D", also refer to table 4.

Table 3: Configurable Standby Function Options (e/d)

pin #1 (e/d control)	option	functionality
low "0" ($V_{IL} \leq 0.2 V_{DC}$)	S = Stop	output weakly pulled down, oscillator in sleep mode
	T = TriState	output high impedance, oscillator operates
	N = None	oscillator output active
high "1" ($V_{IH} \geq 0.8 V_{DC}$)	all	oscillator output active
open*	all	oscillator output active

* a pull up resistor is recommended in EMI stressed circuit environments.

Pin Connection



note: a capacitor of 0.1 µF between V_{DC} and GND is recommended.

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 All specifications are subject to change without notice

MEMS-Oscillator · JSO LC series · 1.8 V

Table 4: Max. Rise & Fall Time vs. Load Capacitance

C_L	5 pF	15 pF	30 pF	5 pF	15 pF	30 pF
edge control	at 10% ~ 90% of V_{DC} (ns)			at 20% ~ 80% of V_{DC} (ns)		
D = 0*	1.8	4.2	6.8	1.2	2.8	4.8
1	2.2	5.0	7.6	1.4	3.4	5.2
2	2.4	5.6	8.8	1.6	3.8	6.0
3	2.8	6.0	10.0	1.8	4.2	6.8
4	4.8	9.8	17.0	3.4	6.6	11.6
5	6.6	12.6	21.0	4.4	8.6	15.0
6	10.0	18.0	32.0	6.6	12.0	22.0
7	18.0	34.0	62.0	12.4	24.0	44.0

* default edge control setting "D" at $V_{DC} = 1.8$ V, please also refer to the [supplementary information](#) on our homepage for typical values and more details.

Table 5: Non-Configurable Frequencies

operating temperature option		operating temperature option	
T2 – (-40°C ~ +105°C)		T8 – (-55°C ~ +125°C)	
T3 – (-40°C ~ +125°C)			
from (MHz)	to (MHz)	from (MHz)	to (MHz)
61.223	61.674	61.223	61.974
69.796	70.485	69.240	70.827
79.063	79.162	78.715	79.561
81.428	82.232	80.160	80.174
91.834	92.155	80.780	82.632
94.249	94.430	91.834	95.474
94.875	94.994	96.192	96.209
97.714	98.679	96.936	99.158
110.0	115.194	110.0	119.342
117.811	118.038	–	–
118.594	118.743	120.239	120.262
122.142	122.705	121.170	121.243
123.022	123.348	121.601	123.948

Order Information

Example: O 26.123456 – JSO 75 C1 L C – B – 1.8 – T0 – S – D

O = Oscillator

frequency (8 digits), see also table 5
1.0 ~ 110.0 MHz
115.0 ~ 137.0 MHz

JSO = Jauch Silicon Oscillator

package
75 = 7050 22 = 2520
53 = 5032 21 = 2016
32 = 3225

frequency range
C1 = 1.0 ~ 110.0 MHz
C2 = 115.0 ~ 137.0 MHz

function/feature
L = lowpower

output I/F
C = (H)CMOS

edge control
D = default
0 – 7, see table 4

standby function options
S = Stop
T = TriState
N = None

temperature range
T0 = -20°C ~ +70°C T3 = -40°C ~ +125°C
T1 = -40°C ~ +85°C T8 = -55°C ~ +125°C
T2 = -40°C ~ +105°C

supply voltage
3.3 = 3.3 V 2.5 = 2.5 V
3.0 = 3.0 V 1.8 = 1.8 V
2.8 = 2.8 V 2V3 = 2.5 V ~ 3.3 V

frequency stability overall
B = ± 50 ppm C = ± 25 ppm
G = ± 30 ppm D = ± 20 ppm



actual sizes



MEMS-Oscillator · JSO LC series · 2.5 V

- low power oscillator with HCMOS/LVCMOS output
- compatible to industry standard packages 2016 – 7050
- configured to customer's specification
- extended shock & vibration resistance
- very fast delivery service
- 500 million hours MTBF

General Data

type		JSOxxCxLC 2.5 V
frequency range		1.0 ~ 110.0 MHz (temp. range T0 ~ T8)
		115.0 ~ 137.0 MHz (temp. range T0 ~ T1)
frequency stability over all		±20 ppm ~ ±50 ppm (see table 1)
current consumption		see table 2
supply voltage V_{DC}		2.5 V ± 10%
temperature	operating	T0 = -20°C ~ +70°C
		T1 = -40°C ~ +85°C
		T2 = -40°C ~ +105°C
		T3 = -40°C ~ +125°C
		T8 = -55°C ~ +125°C
	storage	-55°C ~ +150°C
output	logic	HCMOS/LVCMOS
	rise & fall time	3.0 ns max. at 15 pF / 6.0 ns max. at 30 pF (see table 4)
	load max.	30 pF max. recommended (≤ 83.0 MHz)
		15 pF max. recommended (> 83.0 MHz)
		other load capacitances possible, see supplementary document
	current max.	3 mA
low level max.	0.1 x V_{DC}	
high level min.	0.9 x V_{DC}	
standby function (e/d)		stop (S), tristate-only (T) or none (N), see table 3
output enable time max.		5 ms (S) / 150 ns (T)
output disable time max.		150 ns
start-up time max.		5 ms
standby current max.		3 µA (for stop (S), see table 3)
phase jitter 12 kHz ~ 20 MHz		< 3.0 ps RMS
symmetry at 0.5 x V_{DC}		45% ~ 55% (standard)

note: some frequencies can't be configured, see table 5.

Packing Note / Marking

QTY < 250 pcs. → cut tape
 QTY 250/500/1K/3K pcs. → tape and reel
 Marking: lot code only



RoHS compliant



Pb free



REACH compliant



Conflict mineral free

Table 1: Frequency Stability Code

stability code / temp. code*	B				G				C				D				
	±50 ppm				±30 ppm				±25 ppm				±20 ppm				
-20°C ~ +70°C	T0	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +85°C	T1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +105°C	T2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +125°C	T3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-55°C ~ +125°C	T8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○ available																	

* includes stability at 25°C, operating temp. range, supply voltage change, shock and vibration, aging 1st year.

Table 2: Current Consumption typ. (for max. add 30%)

current at load	5 pF	15 pF	30 pF	60 pF	unit
output disabled	3.7	3.7	3.7	3.7	mA
1.0 ~ 19.9 MHz	3.8	4.2	5.0	6.4	mA
20.0 ~ 29.9 MHz	4.3	5.0	6.4	9.0	mA
30.0 ~ 49.9 MHz	4.7	5.8	7.8	11.6	mA
50.0 ~ 79.9 MHz	5.6	7.6	10.7		mA
80.0 ~ 110.0 MHz	6.6	9.2			mA
115.0 ~ 137.0 MHz	(8.5)	(13.0)			mA

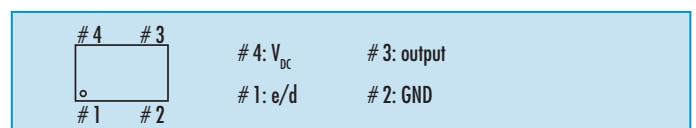
note: current at default edge control setting "D", also refer to table 4.

Table 3: Configurable Standby Function Options (e/d)

pin #1 (e/d control)	option	functionality
low "0" ($V_{IL} \leq 0.2 V_{DC}$)	S = Stop	output weakly pulled down, oscillator in sleep mode
	T = TriState	output high impedance, oscillator operates
	N = None	oscillator output active
high "1" ($V_{IH} \geq 0.8 V_{DC}$)	all	oscillator output active
open*	all	oscillator output active

* a pull up resistor is recommended in EMI stressed circuit environments.

Pin Connection



note: a capacitor of 0.1 µF between V_{DC} and GND is recommended.

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 full data can be found under: www.jauch.de / www.jauch.co.uk / www.jauch.fr / www.jauchusa.com
 All specifications are subject to change without notice

MEMS-Oscillator · JSO LC series · 2.5 V

Table 4: Max. Rise & Fall Time vs. Load Capacitance

C_L	5 pF	15 pF	30 pF	5 pF	15 pF	30 pF
edge control	at 10% ~ 90% of V_{DC} (ns)			at 20% ~ 80% of V_{DC} (ns)		
0	1.2	2.4	5.2	0.8	1.7	3.4
1	1.4	2.6	5.8	0.9	1.9	3.8
D = 2*	1.6	3.0	6.0	1.1	2.1	4.0
3	1.8	4.0	6.6	1.2	2.6	4.6
4	3.2	6.4	11.0	2.2	4.4	7.8
5	4.4	8.4	14.6	2.9	5.8	10.4
6	6.6	12.4	23.0	4.4	8.6	15.2
7	12.8	25.0	46.0	8.6	16.6	30.0

* default edge control setting "D" at $V_{DC} = 2.5$ V, please also refer to the [supplementary information](#) on our homepage for typical values and more details.

Table 5: Non-Configurable Frequencies

operating temperature option		operating temperature option	
T2 – (-40°C ~ +105°C)		T8 – (-55°C ~ +125°C)	
T3 – (-40°C ~ +125°C)			
from (MHz)	to (MHz)	from (MHz)	to (MHz)
61.223	61.674	61.223	61.974
69.796	70.485	69.240	70.827
79.063	79.162	78.715	79.561
81.428	82.232	80.160	80.174
91.834	92.155	80.780	82.632
94.249	94.430	91.834	95.474
94.875	94.994	96.192	96.209
97.714	98.679	96.936	99.158
110.0	115.194	110.0	119.342
117.811	118.038	–	–
118.594	118.743	120.239	120.262
122.142	122.705	121.170	121.243
123.022	123.348	121.601	123.948

Order Information

Example: O 26.123456 – JSO 75 C1 L C – B – 2.5 – T0 – S – D

0 = Oscillator

frequency (8 digits), see also table 5
1.0 ~ 110.0 MHz
115.0 ~ 137.0 MHz

JSO = Jauch Silicon Oscillator

package
75 = 7050 22 = 2520
53 = 5032 21 = 2016
32 = 3225

frequency range
C1 = 1.0 ~ 110.0 MHz
C2 = 115.0 ~ 137.0 MHz

function/feature
L = lowpower

output I/F
C = (H)CMOS

edge control
D = default
0 – 7, see table 4

standby function options
S = Stop
T = TriState
N = None

temperature range
T0 = -20°C ~ +70°C T3 = -40°C ~ +125°C
T1 = -40°C ~ +85°C T8 = -55°C ~ +125°C
T2 = -40°C ~ +105°C

supply voltage
3.3 = 3.3 V 2.5 = 2.5 V
3.0 = 3.0 V 1.8 = 1.8 V
2.8 = 2.8 V 2V3 = 2.5 V ~ 3.3 V

frequency stability overall
B = ± 50 ppm C = ± 25 ppm
G = ± 30 ppm D = ± 20 ppm



actual sizes



MEMS-Oscillator · JSO LC series · 2.8 V

- low power oscillator with HCMOS/LVCMOS output
- compatible to industry standard packages 2016 – 7050
- configured to customer's specification
- extended shock & vibration resistance
- very fast delivery service
- 500 million hours MTBF

General Data

type		JSOxxCxLC 2.8 V
frequency range		1.0 ~ 110.0 MHz (temp. range T0 ~ T8)
		115.0 ~ 137.0 MHz (temp. range T0 ~ T1)
frequency stability over all		±20 ppm ~ ±50 ppm (see table 1)
current consumption		see table 2
supply voltage V_{DC}		2.8 V ± 10%
temperature	operating	T0 = -20°C ~ +70°C
		T1 = -40°C ~ +85°C
		T2 = -40°C ~ +105°C
		T3 = -40°C ~ +125°C
		T8 = -55°C ~ +125°C
	storage	-55°C ~ +150°C
	output	logic
	rise & fall time	2.9 ns max. at 15 pF / 5.7 ns max. at 30 pF (see table 4)
	load max.	30 pF max. recommended (≤ 88.0 MHz)
		15 pF max. recommended (> 88.0 MHz)
		other load capacitances possible, see supplementary document
	current max.	3 mA
	low level max.	0.1 × V_{DC}
	high level min.	0.9 × V_{DC}
standby function (e/d)		stop (S), tristate-only (T) or none (N), see table 3
output enable time max.		5 ms (S) / 150 ns (T)
output disable time max.		150 ns
start-up time max.		5 ms
standby current max.		4 µA (for stop (S), see table 3)
phase jitter 12 kHz ~ 20 MHz		< 3.0 ps RMS
symmetry at 0.5 × V_{DC}		45% ~ 55% (standard)

note: some frequencies can't be configured, see table 5.

Packing Note / Marking

QTY < 250 pcs. → cut tape
 QTY 250/500/1K/3K pcs. → tape and reel
 Marking: lot code only



RoHS compliant



Pb free



REACH compliant



Conflict mineral free

Table 1: Frequency Stability Code

stability code / temp. code*	B				G				C				D			
	±50 ppm				±30 ppm				±25 ppm				±20 ppm			
-20°C ~ +70°C	T0	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
-40°C ~ +85°C	T1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
-40°C ~ +105°C	T2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
-40°C ~ +125°C	T3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
-55°C ~ +125°C	T8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
○ available																

* includes stability at 25°C, operating temp. range, supply voltage change, shock and vibration, aging 1st year.

Table 2: Current Consumption typ. (for max. add 30%)

current at load	5 pF	15 pF	30 pF	60 pF	unit
output disabled	3.8	3.8	3.8	3.8	mA
1.0 ~ 19.9 MHz	4.1	4.3	5.2	6.9	mA
20.0 ~ 29.9 MHz	4.4	5.2	6.7	9.8	mA
30.0 ~ 49.9 MHz	4.8	6.2	8.3	12.7	mA
50.0 ~ 79.9 MHz	6.1	8.1	11.7		mA
80.0 ~ 110.0 MHz	7.0	10.0			mA
115.0 ~ 137.0 MHz	(9.0)	(14.0)			mA

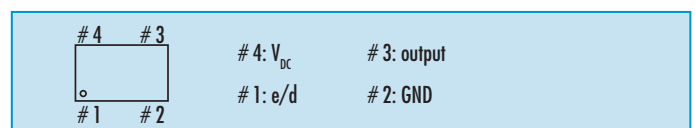
note: current at default edge control setting "D", also refer to table 4.

Table 3: Configurable Standby Function Options (e/d)

pin #1 (e/d control)	option	functionality
low "0" ($V_{IL} \leq 0.2 V_{DC}$)	S = Stop	output weakly pulled down, oscillator in sleep mode
	T = TriState	output high impedance, oscillator operates
	N = None	oscillator output active
high "1" ($V_{IH} \geq 0.8 V_{DC}$)	all	oscillator output active
open*	all	oscillator output active

* a pull up resistor is recommended in EMI stressed circuit environments.

Pin Connection



note: a capacitor of 0.1 µF between V_{DC} and GND is recommended.

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MEMS-Oscillator · JSO LC series · 2.8 V

Table 4: Max. Rise & Fall Time vs. Load Capacitance

C_L	5 pF	15 pF	30 pF	5 pF	15 pF	30 pF
edge control	at 10% ~ 90% of V_{DC} (ns)			at 20% ~ 80% of V_{DC} (ns)		
0	1.2	2.2	4.6	0.8	1.6	3.0
1	1.3	2.4	5.2	0.9	1.8	3.5
D = 2*	1.5	2.9	5.7	1.0	2.0	3.8
3	1.6	3.6	6.4	1.1	2.4	4.4
4	3.0	6.2	10.4	2.0	4.2	7.4
5	4.0	7.6	13.6	2.8	5.4	9.4
6	5.8	11.6	21.0	4.0	8.0	14.2
7	12.0	23.0	42.0	8.2	15.2	28.0

* default edge control setting "D" at $V_{DC} = 2.8$ V, please also refer to the [supplementary information](#) on our homepage for typical values and more details.

Table 5: Non-Configurable Frequencies

operating temperature option		operating temperature option	
T2 – (-40°C ~ +105°C)		T8 – (-55°C ~ +125°C)	
T3 – (-40°C ~ +125°C)			
from (MHz)	to (MHz)	from (MHz)	to (MHz)
61.223	61.674	61.223	61.974
69.796	70.485	69.240	70.827
79.063	79.162	78.715	79.561
81.428	82.232	80.160	80.174
91.834	92.155	80.780	82.632
94.249	94.430	91.834	95.474
94.875	94.994	96.192	96.209
97.714	98.679	96.936	99.158
110.0	115.194	110.0	119.342
117.811	118.038	–	–
118.594	118.743	120.239	120.262
122.142	122.705	121.170	121.243
123.022	123.348	121.601	123.948

Order Information

Example: O 26.123456 – JSO 75 C1 L C – B – 2.8 – T0 – S – D

0 = Oscillator

frequency (8 digits), see also table 5
1.0 ~ 110.0 MHz
115.0 ~ 137.0 MHz

JSO = Jauch Silicon Oscillator

package
75 = 7050 22 = 2520
53 = 5032 21 = 2016
32 = 3225

frequency range
C1 = 1.0 ~ 110.0 MHz
C2 = 115.0 ~ 137.0 MHz

function/feature
L = lowpower

output I/F
C = (H)CMOS

edge control
D = default
0 – 7, see table 4

standby function options
S = Stop
T = TriState
N = None

temperature range
T0 = -20°C ~ +70°C T3 = -40°C ~ +125°C
T1 = -40°C ~ +85°C T8 = -55°C ~ +125°C
T2 = -40°C ~ +105°C

supply voltage
3.3 = 3.3 V 2.5 = 2.5 V
3.0 = 3.0 V 1.8 = 1.8 V
2.8 = 2.8 V 2V3 = 2.5 V ~ 3.3 V

frequency stability overall
B = ± 50 ppm C = ± 25 ppm
G = ± 30 ppm D = ± 20 ppm



actual sizes



MEMS-Oscillator · JSO LC series · 3.0 V

- low power oscillator with HCMOS/LVCMOS output
- compatible to industry standard packages 2016 – 7050
- configured to customer's specification
- extended shock & vibration resistance
- very fast delivery service
- 500 million hours MTBF

General Data

type		JSOxxCxLC 3.0 V
frequency range		1.0 ~ 110.0 MHz (temp. range T0 ~ T8)
		115.0 ~ 137.0 MHz (temp. range T0 ~ T1)
frequency stability over all		±20 ppm ~ ±50 ppm (see table 1)
current consumption		see table 2
supply voltage V_{DC}		3.0 V ± 10%
temperature	operating	T0 = -20°C ~ +70°C
		T1 = -40°C ~ +85°C
		T2 = -40°C ~ +105°C
		T3 = -40°C ~ +125°C
		T8 = -55°C ~ +125°C
	storage	-55°C ~ +150°C
	output	logic
rise & fall time		3.3 ns max. at 15 pF / 6.2 ns max. at 30 pF (see table 4)
load max.		30 pF max. recommended (≤ 81.0 MHz)
		15 pF max. recommended (> 81.0 MHz)
		other load capacitances possible, see supplementary document
current max.		4 mA
low level max.	0.1 x V_{DC}	
high level min.	0.9 x V_{DC}	
standby function (e/d)		stop (S), tristate-only (T) or none (N), see table 3
output enable time max.		5 ms (S) / 150 ns (T)
output disable time max.		150 ns
start-up time max.		5 ms
standby current max.		5 µA (for stop (S), see table 3)
phase jitter 12 kHz ~ 20 MHz		< 3.0 ps RMS
symmetry at 0.5 x V_{DC}		45% ~ 55% (standard)

note: some frequencies can't be configured, see table 5.

Packing Note / Marking

QTY < 250 pcs. → cut tape
 QTY 250/500/1K/3K pcs. → tape and reel
 Marking: lot code only



RoHS compliant



Pb free



REACH compliant



Conflict mineral free

Table 1: Frequency Stability Code

stability code / temp. code*	B				G				C				D				
	±50 ppm				±30 ppm				±25 ppm				±20 ppm				
-20°C ~ +70°C	T0	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +85°C	T1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +105°C	T2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +125°C	T3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-55°C ~ +125°C	T8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○ available																	

* includes stability at 25°C, operating temp. range, supply voltage change, shock and vibration, aging 1st year.

Table 2: Current Consumption typ. (for max. add 30%)

current at load	5 pF	15 pF	30 pF	60 pF	unit
output disabled	3.9	3.9	3.9	3.9	mA
1.0 ~ 19.9 MHz	4.1	4.5	5.4	7.2	mA
20.0 ~ 29.9 MHz	4.5	5.4	6.9	10.1	mA
30.0 ~ 49.9 MHz	4.9	6.3	8.6	13.2	mA
50.0 ~ 79.9 MHz	6.1	8.4	12.2		mA
80.0 ~ 110.0 MHz	7.3	10.5	15.5		mA
115.0 ~ 137.0 MHz	(9.5)	(14.0)			mA

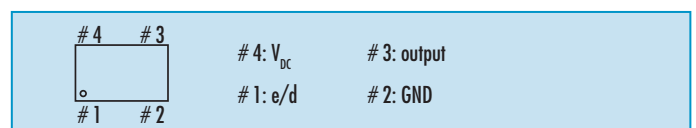
note: current at default edge control setting "D", also refer to table 4.

Table 3: Configurable Standby Function Options (e/d)

pin #1 (e/d control)	option	functionality
low "0" ($V_{IL} \leq 0.2 V_{DC}$)	S = Stop	output weakly pulled down, oscillator in sleep mode
	T = TriState	output high impedance, oscillator operates
	N = None	oscillator output active
high "1" ($V_{IH} \geq 0.8 V_{DC}$)	all	oscillator output active
open*	all	oscillator output active

* a pull up resistor is recommended in EMI stressed circuit environments.

Pin Connection



note: a capacitor of 0.1 µF between V_{DC} and GND is recommended.

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Jauch Quartz GmbH • e-mail: info@jauch.de
 full data can be found under: www.jauch.de / www.jauch.co.uk / www.jauch.fr / www.jauchusa.com
 All specifications are subject to change without notice

MEMS-Oscillator · JSO LC series · 3.0 V

Table 4: Max. Rise & Fall Time vs. Load Capacitance

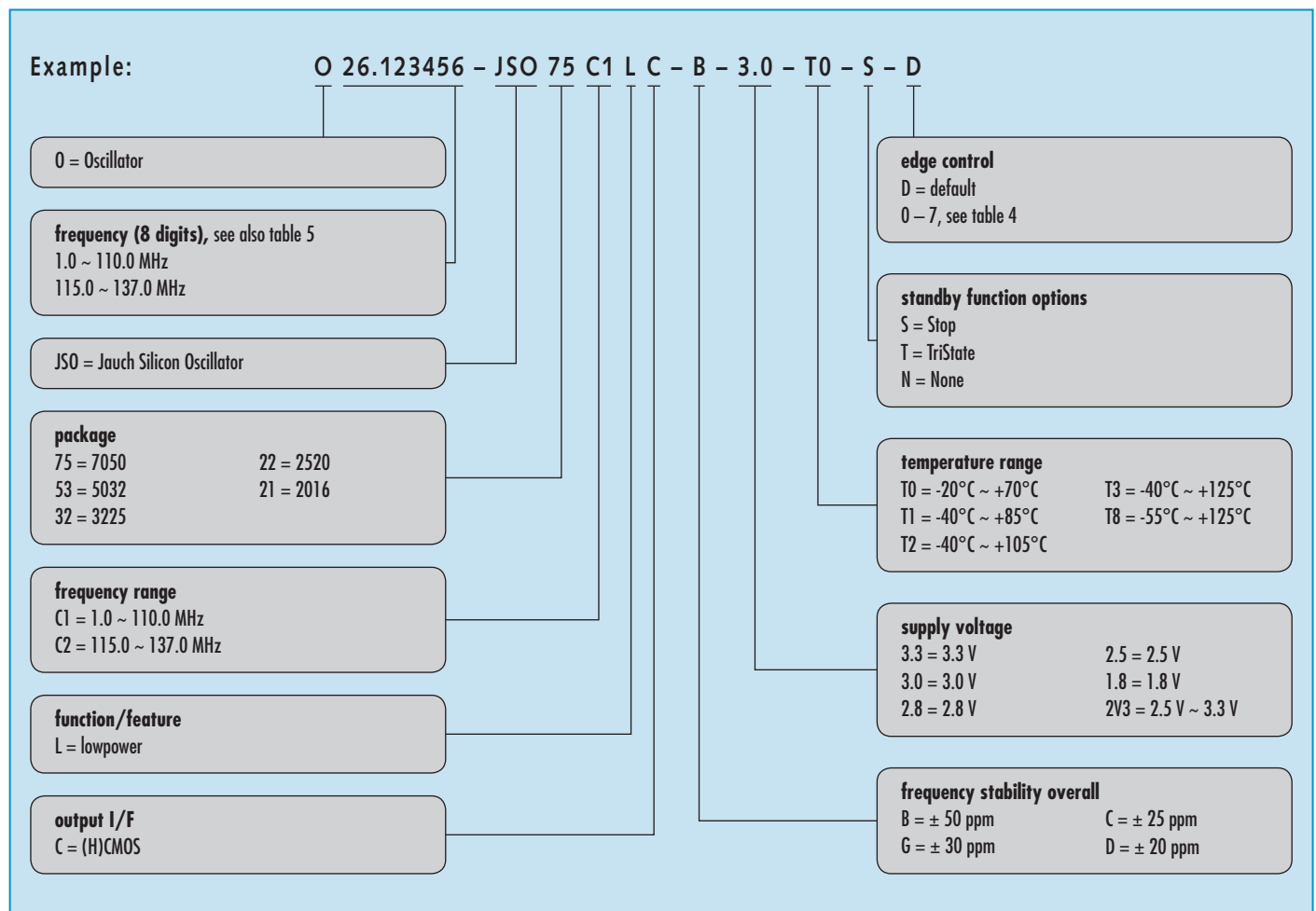
C_L	5 pF	15 pF	30 pF	5 pF	15 pF	30 pF
edge control	at 10% ~ 90% of V_{DC} (ns)			at 20% ~ 80% of V_{DC} (ns)		
0	1.1	2.0	4.2	0.7	1.4	2.8
1	1.2	2.2	4.8	0.8	1.6	3.3
2	1.3	2.8	5.4	0.9	1.9	3.6
D = 3*	1.5	3.3	6.2	1.0	2.2	4.0
4	2.8	5.8	10.0	1.8	4.0	6.8
5	3.8	7.4	13.0	2.6	5.2	9.0
6	5.5	11.0	19.0	3.8	7.6	13.4
7	11.4	22.0	40.0	7.8	14.6	27.0

* default edge control setting "D" at $V_{DC} = 3.0$ V, please also refer to the [supplementary information](#) on our homepage for typical values and more details.

Table 5: Non-Configurable Frequencies

operating temperature option		operating temperature option	
T2 – (-40°C ~ +105°C)		T8 – (-55°C ~ +125°C)	
T3 – (-40°C ~ +125°C)			
from (MHz)	to (MHz)	from (MHz)	to (MHz)
61.223	61.674	61.223	61.974
69.796	70.485	69.240	70.827
79.063	79.162	78.715	79.561
81.428	82.232	80.160	80.174
91.834	92.155	80.780	82.632
94.249	94.430	91.834	95.474
94.875	94.994	96.192	96.209
97.714	98.679	96.936	99.158
110.0	115.194	110.0	119.342
117.811	118.038	–	–
118.594	118.743	120.239	120.262
122.142	122.705	121.170	121.243
123.022	123.348	121.601	123.948

Order Information





actual sizes



MEMS-Oscillator · JSO LC series · 3.3 V

- low power oscillator with HCMOS/LVCOS output
- compatible to industry standard packages 2016 – 7050
- configured to customer's specification
- extended shock & vibration resistance
- very fast delivery service
- 500 million hours MTBF

General Data

type		JSOxxCxLC 3.3 V
frequency range		1.0 ~ 110.0 MHz (temp. range T0 ~ T8)
		115.0 ~ 137.0 MHz (temp. range T0 ~ T1)
frequency stability over all		±20 ppm ~ ±50 ppm (see table 1)
current consumption		see table 2
supply voltage V_{DC}		3.3 V ± 10%
temperature	operating	T0 = -20°C ~ +70°C
		T1 = -40°C ~ +85°C
		T2 = -40°C ~ +105°C
		T3 = -40°C ~ +125°C
		T8 = -55°C ~ +125°C
	storage	-55°C ~ +150°C
output	logic	HCMOS/LVCOS
	rise & fall time	3 ns max. at 15 pF / 6 ns max. at 30 pF (see table 4)
	load max.	30 pF max. recommended (≤ 83.0 MHz)
		15 pF max. recommended (> 83.0 MHz)
		other load capacitances possible, see supplementary document
	current max.	4 mA
low level max.	0.1 x V_{DC}	
high level min.	0.9 x V_{DC}	
standby function (e/d)		stop (S), tristate-only (T) or none (N), see table 3
output enable time max.		5 ms (S) / 150 ns (T)
output disable time max.		150 ns
start-up time max.		5 ms
standby current max.		5 µA (for stop (S), see table 3)
phase jitter 12 kHz ~ 20 MHz		< 3.0 ps RMS
symmetry at 0.5 x V_{DC}		45% ~ 55% (standard)

note: some frequencies can't be configured, see table 5.

Packing Note / Marking

QTY < 250 pcs. → cut tape
 QTY 250/500/1K/3K pcs. → tape and reel
 Marking: lot code only



RoHS compliant



Pb free



REACH compliant



Conflict mineral free

Table 1: Frequency Stability Code

stability code / temp. code*	B				G				C				D				
	±50 ppm				±30 ppm				±25 ppm				±20 ppm				
-20°C ~ +70°C	T0	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +85°C	T1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +105°C	T2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-40°C ~ +125°C	T3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
-55°C ~ +125°C	T8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○ available																	

* includes stability at 25°C, operating temp. range, supply voltage change, shock and vibration, aging 1st year.

Table 2: Current Consumption typ. (for max. add 30%)

current at load	5 pF	15 pF	30 pF	60 pF	unit
output disabled	4.0	4.0	4.0	4.0	mA
1.0 ~ 19.9 MHz	4.0	4.6	5.6	7.6	mA
20.0 ~ 29.9 MHz	4.6	5.7	7.4	10.9	mA
30.0 ~ 49.9 MHz	5.1	6.7	9.2	14.3	mA
50.0 ~ 79.9 MHz	6.4	9.0	13.2		mA
80.0 ~ 110.0 MHz	7.7	11.2	17.0		mA
115.0 ~ 137.0 MHz	(10.0)	(14.5)			mA

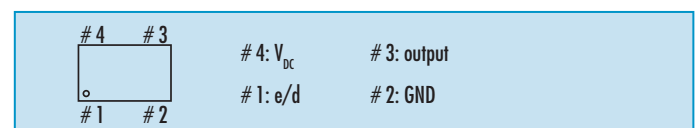
note: current at default edge control setting "D", also refer to table 4.

Table 3: Configurable Standby Function Options (e/d)

pin #1 (e/d control)	option	functionality
low "0" ($V_{IL} \leq 0.2 V_{DC}$)	S = Stop	output weakly pulled down, oscillator in sleep mode
	T = TriState	output high impedance, oscillator operates
	N = None	oscillator output active
high "1" ($V_{IH} \geq 0.8 V_{DC}$)	all	oscillator output active
open*	all	oscillator output active

* a pull up resistor is recommended in EMI stressed circuit environments.

Pin Connection



note: a capacitor of 0.1 µF between V_{DC} and GND is recommended.

Jauch MEMS – Uses SiTime's MEMS First™ technology



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 full data can be found under: www.jauch.de / www.jauch.co.uk / www.jauch.fr / www.jauchusa.com
 All specifications are subject to change without notice

MEMS-Oscillator · JSO LC series · 3.3 V

Table 4: Max. Rise & Fall Time vs. Load Capacitance

C_L	5 pF	15 pF	30 pF	5 pF	15 pF	30 pF
edge control	at 10% ~ 90% of V_{DC} (ns)			at 20% ~ 80% of V_{DC} (ns)		
0	1.0	1.7	3.6	0.7	1.2	2.6
1	1.1	1.8	4.4	0.7	1.3	3.0
2	1.2	2.6	5.0	0.8	1.8	3.3
D = 3*	1.3	3.0	6.0	0.9	2.0	3.8
4	2.6	5.4	9.4	1.5	3.8	6.4
5	3.4	6.6	12.0	2.4	5.0	8.6
6	5.2	10.0	17.0	3.6	7.0	12.4
7	10.4	21.0	35.0	7.4	14.0	25.0

* default edge control setting "D" at $V_{DC} = 3.3$ V, please also refer to the [supplementary information](#) on our homepage for typical values and more details.

Table 5: Non-Configurable Frequencies

operating temperature option		operating temperature option	
T2 – (-40°C ~ +105°C)		T8 – (-55°C ~ +125°C)	
T3 – (-40°C ~ +125°C)			
from (MHz)	to (MHz)	from (MHz)	to (MHz)
61.223	61.674	61.223	61.974
69.796	70.485	69.240	70.827
79.063	79.162	78.715	79.561
81.428	82.232	80.160	80.174
91.834	92.155	80.780	82.632
94.249	94.430	91.834	95.474
94.875	94.994	96.192	96.209
97.714	98.679	96.936	99.158
110.0	115.194	110.0	119.342
117.811	118.038	–	–
118.594	118.743	120.239	120.262
122.142	122.705	121.170	121.243
123.022	123.348	121.601	123.948

Order Information

Example: O 26.123456 – JSO 75 C1 L C – B – 3.3 – T0 – S – D

0 = Oscillator

frequency (8 digits), see also table 5
1.0 ~ 110.0 MHz
115.0 ~ 137.0 MHz

JSO = Jauch Silicon Oscillator

package
75 = 7050 22 = 2520
53 = 5032 21 = 2016
32 = 3225

frequency range
C1 = 1.0 ~ 110.0 MHz
C2 = 115.0 ~ 137.0 MHz

function/feature
L = lowpower

output I/F
C = (H)CMOS

edge control
D = default
0 – 7, see table 4

standby function options
S = Stop
T = TriState
N = None

temperature range
T0 = -20°C ~ +70°C T3 = -40°C ~ +125°C
T1 = -40°C ~ +85°C T8 = -55°C ~ +125°C
T2 = -40°C ~ +105°C

supply voltage
3.3 = 3.3 V 2.5 = 2.5 V
3.0 = 3.0 V 1.8 = 1.8 V
2.8 = 2.8 V 2V3 = 2.5 V ~ 3.3 V

frequency stability overall
B = ± 50 ppm C = ± 25 ppm
G = ± 30 ppm D = ± 20 ppm



actual sizes



MEMS-Oscillator · JSO LC series · 2.5 V ~ 3.3 V

- low power oscillator with HCMOS/LVC MOS output
- compatible to industry standard packages 2016 – 7050
- configured to customer's specification
- extended shock & vibration resistance
- very fast delivery service
- 500 million hours MTBF

General Data

type		JSOxxCxLC 2.5 V ~ 3.3 V
frequency range		1.0 ~ 110.0 MHz (temp. range T0 ~ T8)
		115.0 ~ 137.0 MHz (temp. range T0 ~ T1)
frequency stability over all		±20 ppm ~ ±50 ppm (see table 1)
current consumption		see table 2
supply voltage V_{DC}		2.5 V – 10% ~ 3.3 V + 10%
temperature	operating	T0 = -20°C ~ +70°C
		T1 = -40°C ~ +85°C
		T2 = -40°C ~ +105°C
		T3 = -40°C ~ +125°C
		T8 = -55°C ~ +125°C
	storage	-55°C ~ +150°C
output	logic	HCMOS/LVC MOS
	rise & fall time	4.0 ns max. at 15 pF / 6.6 ns max. at 30 pF (see table 4)
	load max.	30 pF max. recommended (≤ 76.0 MHz)
		15 pF max. recommended (> 76.0 MHz)
		other load capacitances possible, see supplementary document
	current max.	3 mA
low level max.	0.1 x V_{DC}	
high level min.	0.9 x V_{DC}	
standby function (e/d)		stop (S), tristate-only (T) or none (N), see table 3
output enable time max.		5 ms (S) / 150 ns (T)
output disable time max.		150 ns
start-up time max.		5 ms
standby current max.		3 µA (for stop (S), see table 3)
phase jitter 12 kHz ~ 20 MHz		< 3.0 ps RMS
symmetry at 0.5 x V_{DC}		45% ~ 55% (standard)

note: some frequencies can't be configured, see table 5.

Packing Note / Marking

QTY < 250 pcs. → cut tape
 QTY 250/500/1K/3K pcs. → tape and reel
 Marking: lot code only



RoHS compliant



Pb free



REACH compliant



Conflict mineral free

Table 1: Frequency Stability Code

stability code / temp. code*		B	G	C	D
		±50 ppm	±30 ppm	±25 ppm	±20 ppm
-20°C ~ +70°C	T0	○	○	○	○
-40°C ~ +85°C	T1	○	○	○	○
-40°C ~ +105°C	T2	○	○	○	○
-40°C ~ +125°C	T3	○	○	○	○
-55°C ~ +125°C	T8	○	○	○	○

○ available

* includes stability at 25°C, operating temp. range, supply voltage change, shock and vibration, aging 1st year.

Table 2: Current Consumption typ. (for max. add 30%)

current at load	5 pF	15 pF	30 pF	60 pF	unit
output disabled	4.0	4.0	4.0	4.0	mA
1.0 ~ 19.9 MHz	4.0	4.6	5.6	7.6	mA
20.0 ~ 29.9 MHz	4.6	5.7	7.4	10.9	mA
30.0 ~ 49.9 MHz	5.1	6.7	9.2	14.3	mA
50.0 ~ 79.9 MHz	6.4	9.0	13.2		mA
80.0 ~ 110.0 MHz	7.7	11.2	17.0		mA
115.0 ~ 137.0 MHz	(10.0)	(14.5)			mA

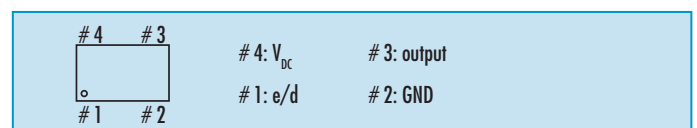
note: current at default edge control setting "D", also refer to table 4.

Table 3: Configurable Standby Function Options (e/d)

pin #1 (e/d control)	option	functionality
low "0" ($V_{IL} \leq 0.2 V_{DC}$)	S = Stop	output weakly pulled down, oscillator in sleep mode
	T = TriState	output high impedance, oscillator operates
	N = None	oscillator output active
high "1" ($V_{IH} \geq 0.8 V_{DC}$)	all	oscillator output active
open*	all	oscillator output active

* a pull up resistor is recommended in EMI stressed circuit environments.

Pin Connection



note: a capacitor of 0.1 µF between V_{DC} and GND is recommended.

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 full data can be found under: www.jauch.de / www.jauch.co.uk / www.jauch.fr / www.jauchusa.com
 All specifications are subject to change without notice

MEMS-Oscillator · JSO LC series · 2.5V ~ 3.3V

Table 4: Max. Rise & Fall Time vs. Load Capacitance

C_L	5 pF	15 pF	30 pF	5 pF	15 pF	30 pF
edge control	at 10% ~ 90% of V_{DC} (ns)			at 20% ~ 80% of V_{DC} (ns)		
0	1.2	2.4	5.2	0.8	1.7	3.4
1	1.4	2.6	5.8	0.9	1.9	3.8
2	1.6	3.0	6.0	1.1	2.1	4.0
D = 3*	1.8	4.0	6.6	1.2	2.6	4.6
4	3.2	6.4	11.0	2.2	4.4	7.8
5	4.4	8.4	14.6	2.9	5.8	10.4
6	6.6	12.4	23.0	4.4	8.6	15.2
7	12.8	25.0	46.0	8.6	16.6	30.0

* default edge control setting "D" at $V_{DC} = 2.5V \sim 3.3V$, please also refer to the [supplementary information](#) on our homepage for typical values and more details.

Table 5: Non-Configurable Frequencies

operating temperature option		operating temperature option	
T2 – (-40°C ~ +105°C)		T8 – (-55°C ~ +125°C)	
T3 – (-40°C ~ +125°C)			
from (MHz)	to (MHz)	from (MHz)	to (MHz)
61.223	61.674	61.223	61.974
69.796	70.485	69.240	70.827
79.063	79.162	78.715	79.561
81.428	82.232	80.160	80.174
91.834	92.155	80.780	82.632
94.249	94.430	91.834	95.474
94.875	94.994	96.192	96.209
97.714	98.679	96.936	99.158
110.0	115.194	110.0	119.342
117.811	118.038	–	–
118.594	118.743	120.239	120.262
122.142	122.705	121.170	121.243
123.022	123.348	121.601	123.948

Order Information

Example: O 26.123456 – JSO 75 C1 L C – B – 2V3 – T0 – S – D

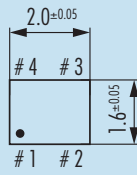
The diagram breaks down the part number into the following components:

- O** = Oscillator
- frequency (8 digits)**, see also table 5: 1.0 ~ 110.0 MHz, 115.0 ~ 137.0 MHz
- JSO** = Jauch Silicon Oscillator
- package**: 75 = 7050, 22 = 2520, 53 = 5032, 21 = 2016, 32 = 3225
- frequency range**: C1 = 1.0 ~ 110.0 MHz, C2 = 115.0 ~ 137.0 MHz
- function/feature**: L = lowpower
- output I/F**: C = (H)CMOS
- edge control**: D = default, 0 – 7, see table 4
- standby function options**: S = Stop, T = TriState, N = None
- temperature range**: T0 = -20°C ~ +70°C, T1 = -40°C ~ +85°C, T2 = -40°C ~ +105°C, T3 = -40°C ~ +125°C, T8 = -55°C ~ +125°C
- supply voltage**: 3.3 = 3.3 V, 3.0 = 3.0 V, 2.8 = 2.8 V, 2.5 = 2.5 V, 1.8 = 1.8 V, 2V3 = 2.5 V ~ 3.3 V
- frequency stability overall**: B = ± 50 ppm, G = ± 30 ppm, C = ± 25 ppm, D = ± 20 ppm

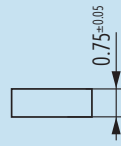
MEMS-Oscillator · JSO LC series

Dimensions

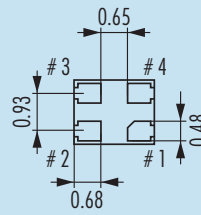
2.0 x 1.6 x 0.75
JSO21



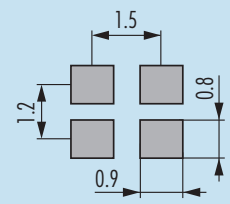
top view



side view

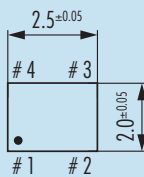


bottom view

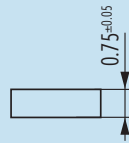


pad layout

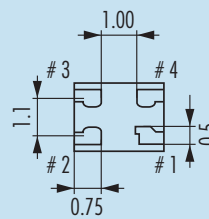
2.5 x 2.0 x 0.75
JSO22



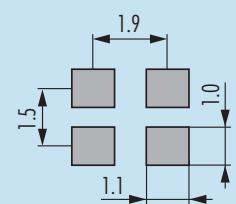
top view



side view

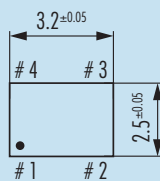


bottom view

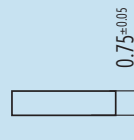


pad layout

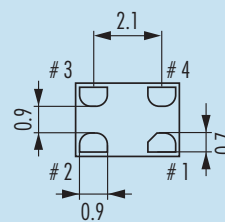
3.2 x 2.5 x 0.75
JSO32



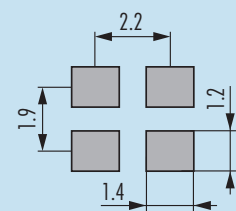
top view



side view

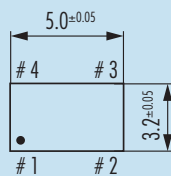


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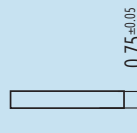


pad layout

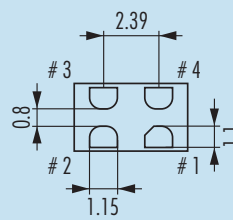
5.0 x 3.2 x 0.75
JSO53



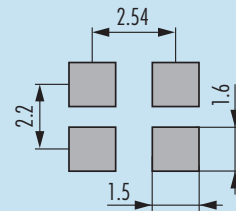
top view



side view

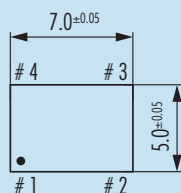


bottom view

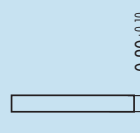


pad layout

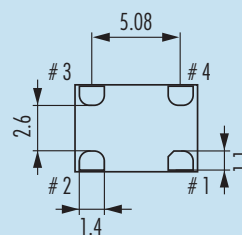
7.0 x 5.0 x 0.90
JSO75



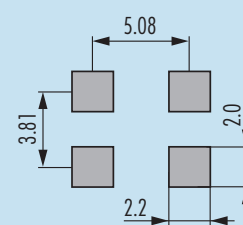
top view



side view



bottom view



pad layout

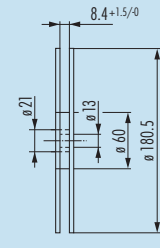
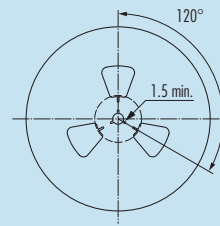
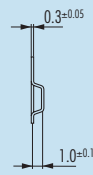
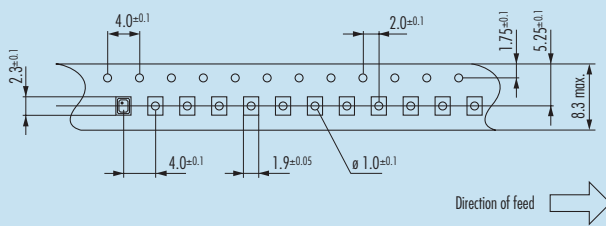
Pin connection # 1: e/d # 2: GND # 3: output # 4: V_{DC} note: a capacitor of 0.1 μF between V_{DC} and GND is recommended

in mm

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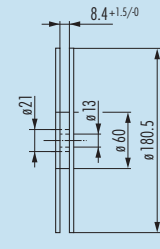
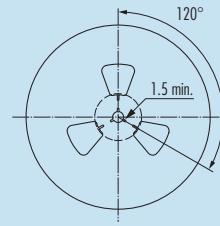
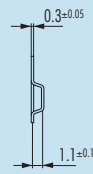
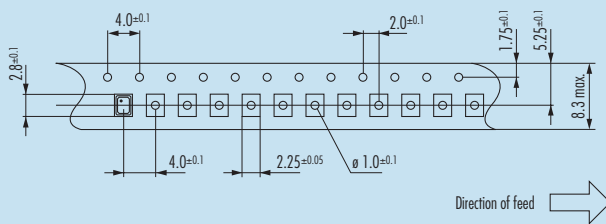
Taping Specification

2.0 x 1.6 x 0.75
JSO21



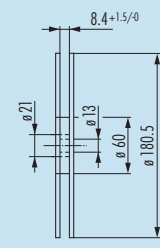
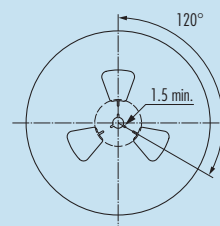
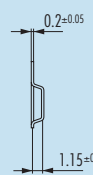
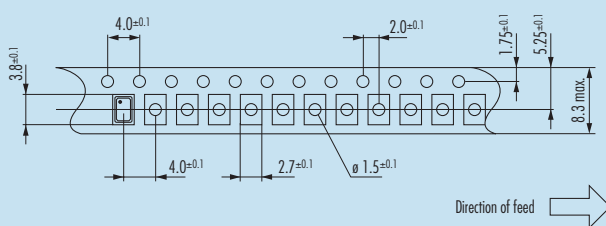
up to 3000 pcs per reel

2.5 x 2.0 x 0.75
JSO22



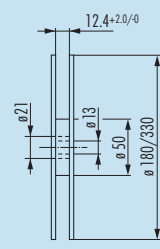
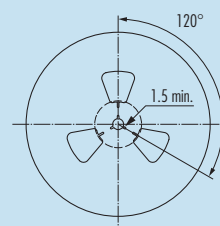
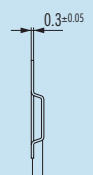
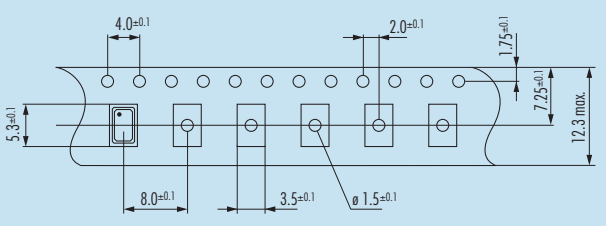
up to 3000 pcs per reel

3.2 x 2.5 x 0.75
JSO32



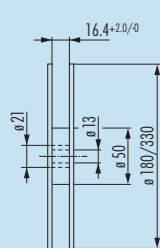
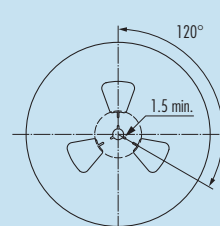
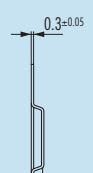
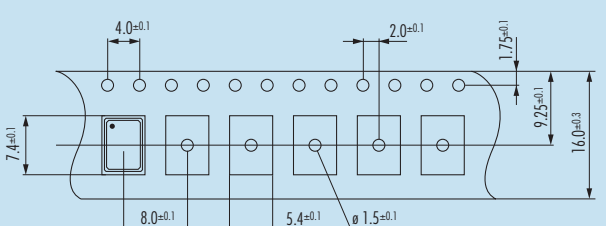
up to 3000 pcs per reel

5.0 x 3.2 x 0.75
JSO53



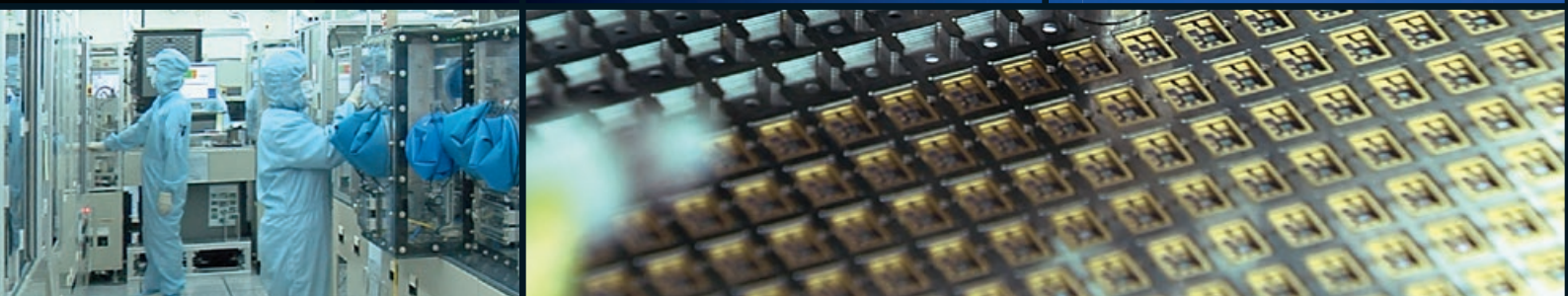
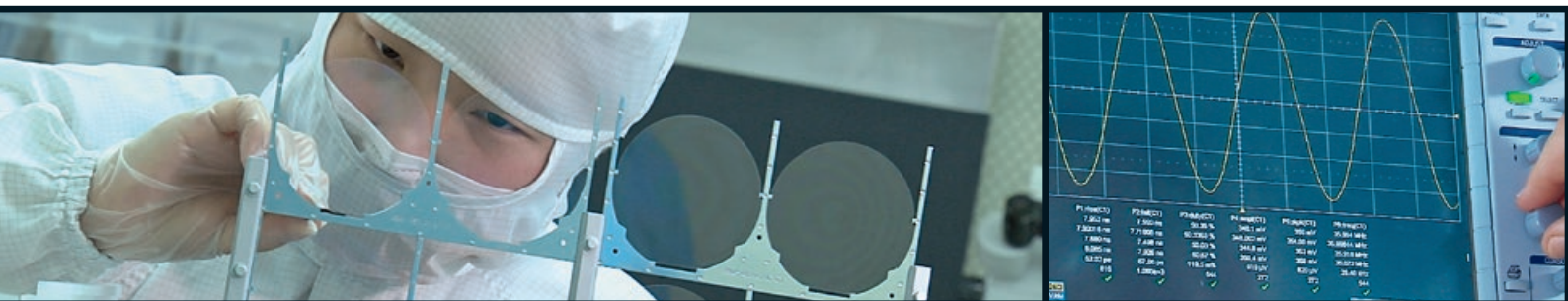
Ø 180: up to 1000 pcs per reel
Ø 330: up to 3000 pcs per reel

7.0 x 5.0 x 0.90
JSO75



Ø 180: up to 1000 pcs per reel
Ø 330: up to 3000 pcs per reel

in mm



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