



actual size

# SMD Quartz Crystal · SMU2

## 2 Pad Version · 11.5 x 4.8 mm

- for automotive type, see automotive datasheet
- extended temperature ranges available
- reflow soldering temperature: 260 °C max.
- package height 3.0 mm max.



### General Data

type		SMU2
frequency range	fund. AT-cut	4.0 ~ 33.0 MHz
	3rd OT AT-cut	ask for availability
	fund. BT-cut	ask for availability
frequency tolerance at 25 °C		± 20 ppm / ± 30 ppm / ± 50 ppm
load capacitance $C_L$		12 pF ~ 32 pF or series
shunt capacitance $C_0$		< 5 pF
storage temperature		-40 °C ~ +125 °C
shock resistance		> 100 g (half sine pulse, 0.6 ms)
drive level max.		500 µW (100 µW recommended)
aging		< ± 5 ppm first year

### ESR (series resistance Rs)

frequency in MHz	vibration mode	ESR max. in Ω	ESR typ. in Ω
4.0 ~ 5.999	fund. AT	80	60
6.0 ~ 6.999	fund. AT	70	35
7.0 ~ 7.999	fund. AT	50	25
8.0 ~ 8.999	fund. AT	50	25
9.0 ~ 13.999	fund. AT	35	15
14.0 ~ 33.000	fund. AT	30	10
ask	3rd OT AT	(100)	(60)
ask	fund. BT	(50)	(20)

### Frequency Stability vs. Temperature

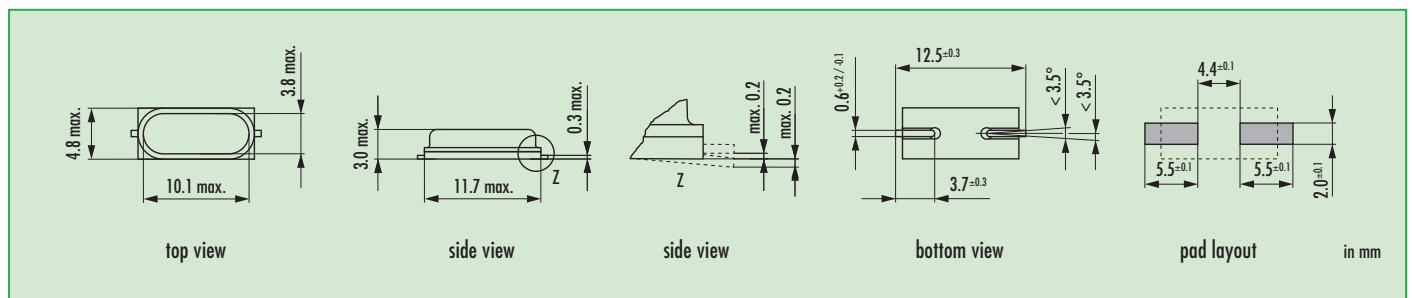
		± 20 ppm	± 30 ppm	± 50 ppm	± 100 ppm	± 150 ppm	+10/-100 ppm
-20 °C ~ +70 °C	STD	D	○	●			○ BT-cut
-40 °C ~ +85 °C	T1		○	○	●		
-40 °C ~ +105 °C	T2			○	○		
-40 °C ~ +125 °C	T3					○	

● standard ○ available D ask, if available

### Automotive application note

- automotive quartz crystals have superior environmental performance in case of shock, vibration and temperature
- extended operating temperatures up to +125 °C
- production is certified according to: ISO 9001 / TS 16949 / ISO 14001

### Dimensions



### Order Information

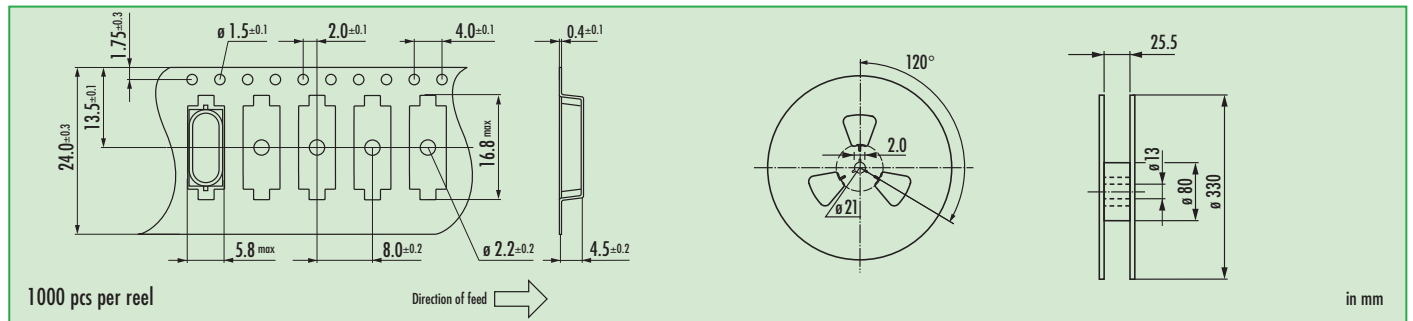
<b>Q</b>	frequency	type	load capacitance in pF	stability at 25 °C	stability vs. temp. range	option
Quartz	4.0 ~ 33.0 MHz	SMU2	12 pF ~ 32 pF S for series	30 = ± 30 ppm std 20 = ± 20 ppm 50 = ± 50 ppm	see table	blank = -20 °C ~ +70 °C T1 = -40 °C ~ +85 °C T2 = -40 °C ~ +105 °C T3 = -40 °C ~ +125 °C FU = for fundamental frequencies ≥ 20 MHz 30T = 3rd overtone (if available) BT = fundamental BT-cut (if available)

Example: Q 25.0-SMU2-30-30/50-FU-LF (Suffix LF = RoHS compliant / Pb free pins or pads)

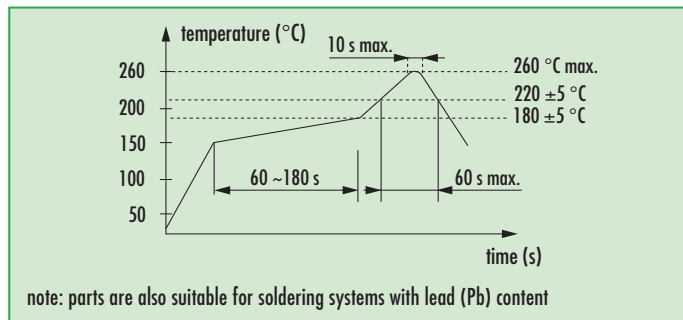


# SMD Quartz Crystal · SMU2

## Taping Specification



## Reflow Soldering Profile



## Load Capacitance Codes

7 pF: m	13 pF: v	20 pF: c	32 pF: e
8 pF: k	14 pF: x	22 pF: g	series: s
9 pF: n	15 pF: j	24 pF: d	T: 3rd OT
10 pF: h	16 pF: b	25 pF: r	
11 pF: l	17 pF: t	27 pF: w	
12 pF: a	18 pF: f	30 pF: .	

example 10.0 MHz / 12 pF: 10a000

## Marking

frequency with load capacitance code  
company code / date code / internal code

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
2011	2015	a	b	c	d	e	f	g	h	i	k	m
2012	2016	n	p	q	r	s	t	u	v	w	x	z
2013	2017	A	B	C	D	E	F	G	H	J	K	M
2014	2018	N	P	Q	R	S	T	U	V	W	X	Z



actual size

# SMD Quartz Crystal · SMU3

## 2 Pad Version · 11.5 x 4.8 mm

- for automotive type, see automotive datasheet
- extended temperature ranges available
- reflow soldering temperature: 260 °C max.
- package height 4.0 mm max.



RoHS compliant



Pb free: pins / pads

### General Data

type		SMU3
frequency range	fund. AT-cut	3.27680 ~ 33.0 MHz
	3rd OT AT-cut	ask for availability
	fund. BT-cut	ask for availability
frequency tolerance at 25 °C		± 20 ppm ~ ± 50 ppm / ± 50 ppm if ≤ 3.57 MHz
load capacitance $C_L$		12 pF ~ 32 pF or series
shunt capacitance $C_0$		< 5 pF
storage temperature		-40 °C ~ +125 °C
shock resistance		> 100 g (half sine pulse, 0.6 ms)
drive level max.		500 µW (100 µW recommended)
aging		< ± 5 ppm first year

### ESR (series resistance Rs)

frequency in MHz	vibration mode	ESR max. in Ω	ESR typ. in Ω
3.276 ~ 3.499	fund. AT	200	100
3.500 ~ 3.999	fund. AT	120	80
4.000 ~ 5.999	fund. AT	80	60
6.000 ~ 6.999	fund. AT	70	35
7.000 ~ 8.999	fund. AT	50	25
9.000 ~ 13.999	fund. AT	35	15
14.000 ~ 33.000	fund. AT	30	10
ask	3rd OT AT	(100)	(60)
ask	fund. BT	(50)	(20)

numbers in brackets ( ) only for reference

### Frequency Stability vs. Temperature

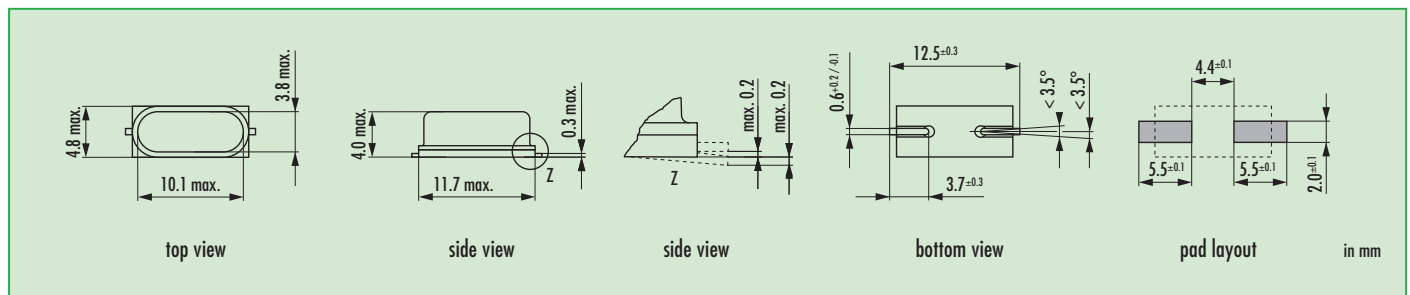
		± 20 ppm	± 30 ppm	± 50 ppm	± 100 ppm	± 150 ppm	+10/-100 ppm
-20 °C ~ +70 °C	STD	D	○	●			○ BT-cut
-40 °C ~ +85 °C	T1		○	● (*)	○		
-40 °C ~ +105 °C	T2			○	○		
-40 °C ~ +125 °C	T3					○	

● standard ○ available D ask, if available (\*) if ≤ 3.57 MHz, not better than ± 100 ppm at temp. range T1

### Automotive application note

- automotive quartz crystals have superior environmental performance in case of shock, vibration and temperature
- extended operating temperatures up to +125 °C
- production is certified according to: ISO 9001 / TS 16949 / ISO 14001

### Dimensions



### Order Information

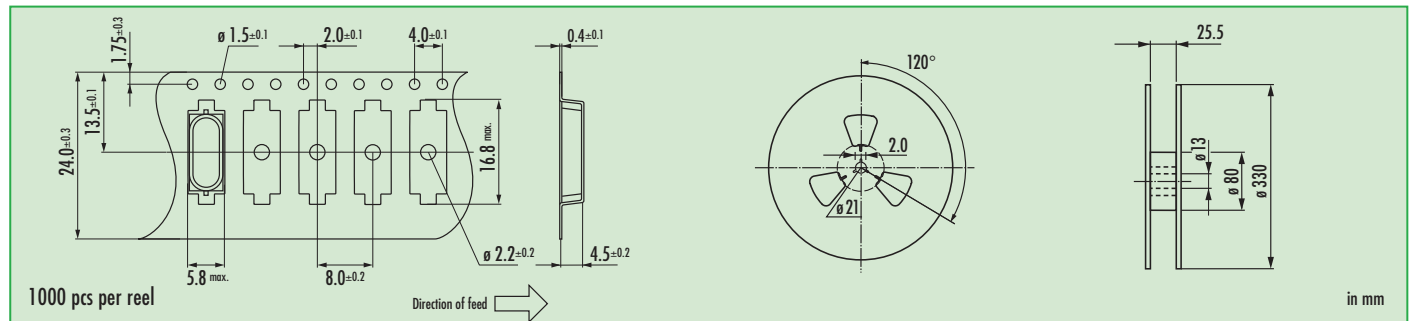
Q	frequency	type	load capacitance in pF	stability at 25 °C	stability vs. temp. range	option
Quartz	3.27680 ~ 33.0 MHz	SMU3	12 pF ~ 32 pF S for series 30 pF standard	30 = ± 30 ppm std 20 = ± 20 ppm 50 = ± 50 ppm	see table	blank = -20 °C ~ +70 °C T1 = -40 °C ~ +85 °C T2 = -40 °C ~ +105 °C T3 = -40 °C ~ +125 °C FU = for fundamental frequencies ≥ 20 MHz 3OT = 3rd overtone (if available) BT = fundamental BT-cut (if available)

Example: Q 30.0-SMU3-30-30/50-T1-FU-LF (Suffix LF = RoHS compliant / Pb free pins or pads) BT = fundamental BT-cut (if available)

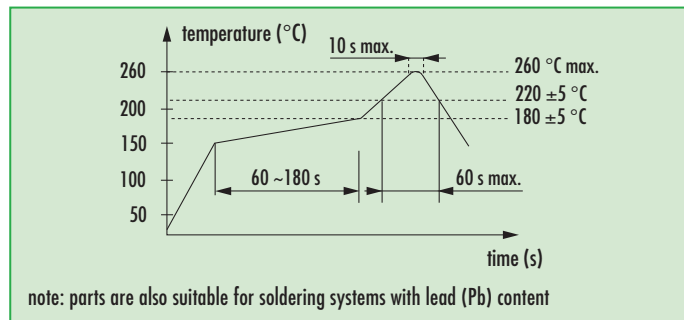


# SMD Quartz Crystal · SMU3 · Automotive Applications

## Taping Specification



## Reflow Soldering Profile



## Load Capacitance Codes

7 pF: m	13 pF: v	20 pF: c	32 pF: e
8 pF: k	14 pF: x	22 pF: g	series: s
9 pF: n	15 pF: j	24 pF: d	T: 3rd OT
10 pF: h	16 pF: b	25 pF: r	
11 pF: l	17 pF: t	27 pF: w	
12 pF: a	18 pF: f	30 pF: .	

example 4.0 MHz / 12 pF: 4a000

## Marking

frequency with load capacitance code  
company code / date code / internal code

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
2011	2015	a	b	c	d	e	f	g	h	i	k	m
2012	2016	n	p	q	r	s	t	u	v	w	x	z
2013	2017	A	B	C	D	E	F	G	H	J	L	M
2014	2018	N	P	Q	R	S	T	U	V	W	X	Z



actual size

# SMD Quartz Crystal · SMU4

2 Pad Version · 11.5 x 4.8 mm

- low cost SMD type
- reflow soldering temperature: 260 °C max.
- package height 4.0 mm max.



## General Data

type		SMU4
frequency range	fund. AT-cut	3.27680 ~ 33.0 MHz (> 33.0 MHz, ask if available)
	3rd OT AT-cut	ask for availability
	fund. BT-cut	ask for availability
frequency tolerance at 25 °C		± 20 ppm ~ ± 50 ppm / ± 50 ppm if ≤ 3.57 MHz
load capacitance $C_L$		12 pF ~ 32 pF or series / 30 pF standard
shunt capacitance $C_0$		< 5 pF
storage temperature		-40 °C ~ +125 °C
drive level max.		500 µW (100 µW recommended)
aging		< ± 5 ppm first year

## ESR (series resistance Rs)

frequency in MHz	vibration mode	ESR max. in Ω	ESR typ. in Ω
3.276 ~ 3.499	fund. AT	200	100
3.500 ~ 3.999	fund. AT	120	80
4.000 ~ 5.999	fund. AT	80	60
6.000 ~ 6.999	fund. AT	70	35
7.000 ~ 8.999	fund. AT	50	25
9.000 ~ 13.999	fund. AT	35	15
14.000 ~ 33.000	fund. AT	30	10
(33.000 ~ 40.000)	fund. AT	(30)	(10)
ask	3rd OT AT	(100)	(60)
ask	fund. BT	(50)	(20)

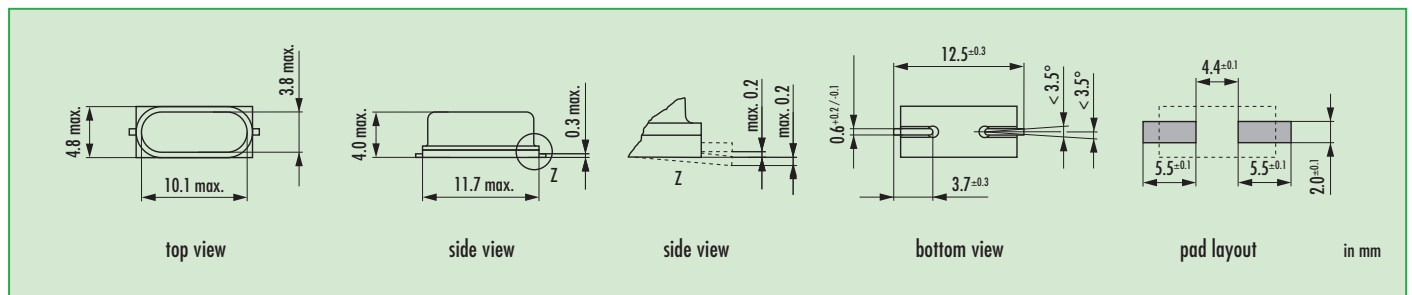
numbers in brackets ( ) only for reference

## Frequency Stability vs. Temperature

		± 20 ppm	± 30 ppm	± 50 ppm	± 100 ppm	± 150 ppm	+10/-100 ppm
-20 °C ~ +70 °C	STD	D	●	●			○ BT-cut
-40 °C ~ +85 °C	T1		○	○ (*)	●		

● standard ○ available D ask, if available (\*) if ≤ 3.57 MHz, not better than ± 100 ppm at temp. range T1

## Dimensions



## Order Information

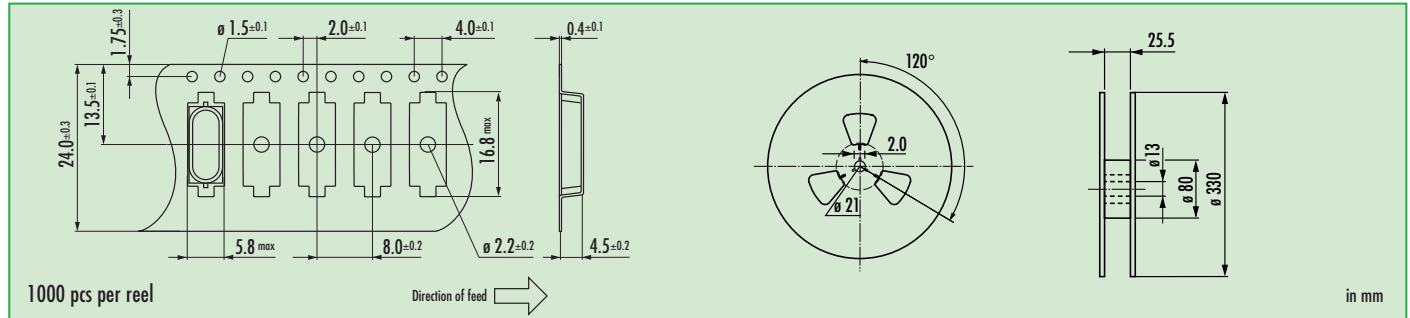
Q	frequency	type	load capacitance in pF	stability at 25 °C	stability vs. temp. range	option
Quartz	3.27680 ~ 33.0 MHz	SMU4	12 pF ~ 32 pF S for series 30 pF standard	30 = ± 30 ppm std 20 = ± 20 ppm 50 = ± 50 ppm	see table	blank = -20 °C ~ +70 °C T1 = -40 °C ~ +85 °C FU = for fundamental frequencies ≥ 20 MHz 30T = 3rd overtone (if available) BT = fundamental BT-cut (if available)

Example: Q 30.0-SMU4-30-30/50-T1-FU-LF (Suffix LF = RoHS compliant / Pb free pins or pads)

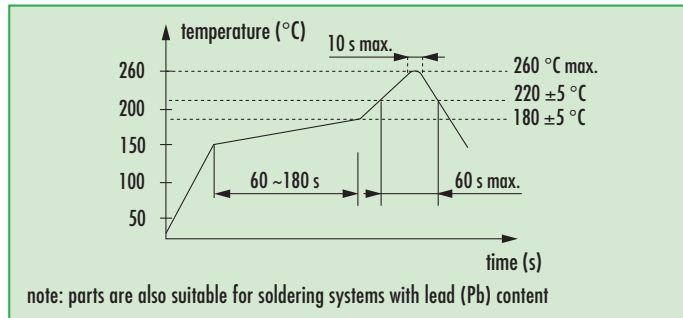


# SMD Quartz Crystal · SMU4

## Taping Specification



## Reflow Soldering Profile



## Load Capacitance Codes

7 pF: m	13 pF: v	20 pF: c	32 pF: e
8 pF: k	14 pF: x	22 pF: g	series: s
9 pF: n	15 pF: j	24 pF: d	T: 3rd OT
10 pF: h	16 pF: b	25 pF: r	
11 pF: l	17 pF: t	27 pF: w	
12 pF: a	18 pF: f	30 pF: .	

example 4.0 MHz / 12 pF: 4a000

## Marking

frequency with load capacitance code  
company code / date code / internal code

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
2011	2015	a	b	c	d	e	f	g	h	i	k	l	m
2012	2016	n	p	q	r	s	t	u	v	w	x	y	z
2013	2017	A	B	C	D	E	F	G	H	J	K	L	M
2014	2018	N	P	Q	R	S	T	U	V	W	X	Y	Z



actual size

# SMD Quartz Crystal · SMU5

4 Pad Version · 13.1 x 5.0 mm

- MG3A replacement type
- reflow soldering temperature: 260 °C max.
- package height 5 mm



## General Data

type		SMU5
frequency range	fund. AT-cut	3.27680 ~ 33.0 MHz (> 33.0 MHz, ask if available)
	3rd OT AT-cut	ask for availability
	fund. BT-cut	ask for availability
frequency tolerance at 25 °C		± 20 ppm ~ ± 50 ppm / ± 50 ppm if ≤ 3.57 MHz
load capacitance $C_L$		12 pF ~ 32 pF or series / 30 pF standard
shunt capacitance $C_0$		< 5 pF
storage temperature		-40 °C ~ +125 °C
drive level max.		500 µW (100 µW recommended)
aging		< ± 5 ppm first year

## ESR (series resistance Rs)

frequency in MHz	vibration mode	ESR max. in Ω	ESR typ. in Ω
3.276 ~ 3.499	fund. AT	200	100
3.500 ~ 3.999	fund. AT	120	80
4.000 ~ 5.999	fund. AT	80	60
6.000 ~ 6.999	fund. AT	70	35
7.000 ~ 8.999	fund. AT	50	25
9.000 ~ 13.999	fund. AT	35	15
14.000 ~ 19.999	fund. AT	30	10
20.000 ~ 40.000	fund. AT	20	10
ask	3rd OT AT	(100)	(60)
ask	fund. BT	(50)	(20)

numbers in brackets ( ) only for reference

## Frequency Stability vs. Temperature

		± 20 ppm	± 30 ppm	± 50 ppm	± 100 ppm	± 150 ppm	+10/-100 ppm
-20 °C ~ +70 °C	STD	D	●	○			○ BT-cut
-40 °C ~ +85 °C	T1		○	● (*)	○		
-40 °C ~ +105 °C	T2			○	○		
-40 °C ~ +125 °C	T3				D	○	

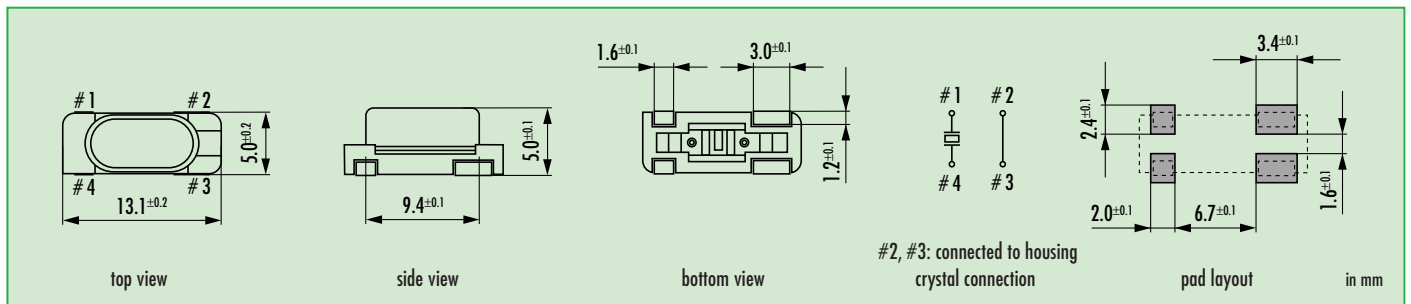
● standard ○ available D ask, if available (\*) if ≤ 3.57 MHz, not better than ± 100 ppm at temp. range T1

## Marking

frequency with load capacitance code  
company code / date code / internal code

	Jan.	Febr.	Mar.	Apr.	May	June	July	Aug.	Sept.	Okt.	Nov.	Dec.
2012	n	p	q	r	s	t	u	v	w	x	y	z
2013	A	B	C	D	E	F	G	H	J	K	L	M
2014	N	P	Q	R	S	T	U	V	W	X	Y	Z
2015	a	b	c	d	e	f	g	h	i	k	l	m

## Dimensions



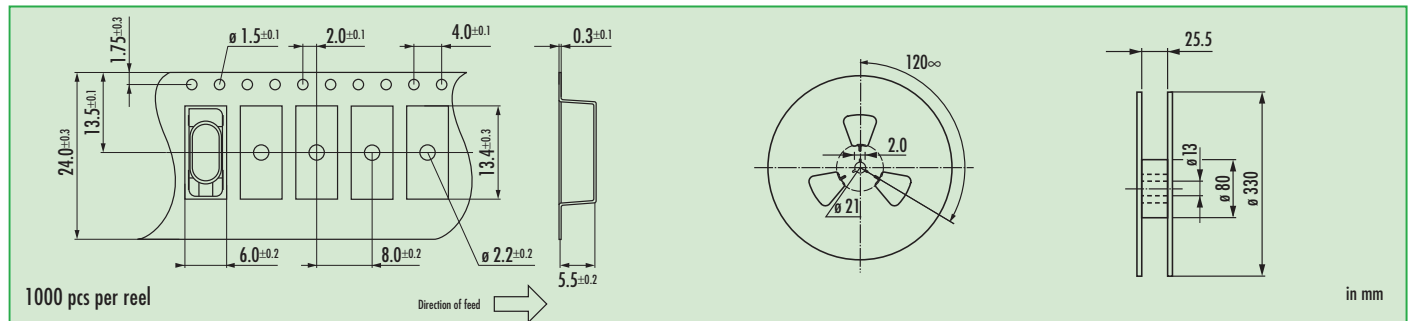
## Order Information

Q	frequency	type	load capacitance	stability at 25 °C	stability vs. temp. range	option
Quartz	3.27680 ~ 33.0 MHz	SMU5	30 pF standard 12 pF ~ 32 pF S for series	30 = ± 30 ppm std 20 = ± 20 ppm 50 = ± 50 ppm	see table	blank = -20 °C ~ +70 °C T1 = -40 °C ~ +85 °C T2 = -40 °C ~ +105 °C T3 = -40 °C ~ +125 °C FU = for fundamental frequencies ≥ 20 MHz 30T = 3rd overtone (if available) BT = fundamental BT-cut (if available)

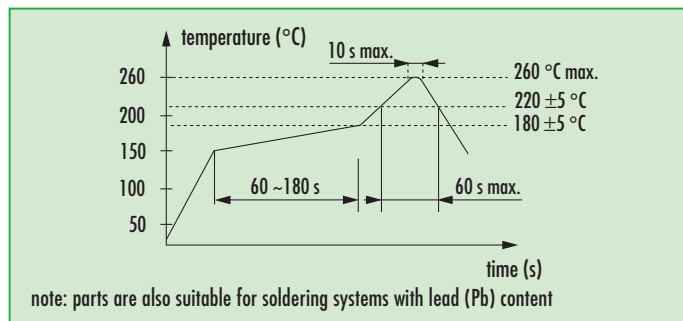
Example: Q 30.0-SMU5-30-30/50-T1-FU-LF (Suffix LF = RoHS compliant / Pb free pins or pads) BT = fundamental BT-cut (if available)

# SMD Quartz Crystal · SMU5

## Taping Specification



## Reflow Soldering Profile



## Load Capacitance Codes

7 pF: m	13 pF: v	20 pF: c	32 pF: e
8 pF: k	14 pF: x	22 pF: g	series: s
9 pF: n	15 pF: j	24 pF: d	T: 3rd OT
10 pF: h	16 pF: b	25 pF: r	
11 pF: l	17 pF: t	27 pF: w	
12 pF: a	18 pF: f	30 pF: .	

example 4.0 MHz / 12 pF: 4a000