

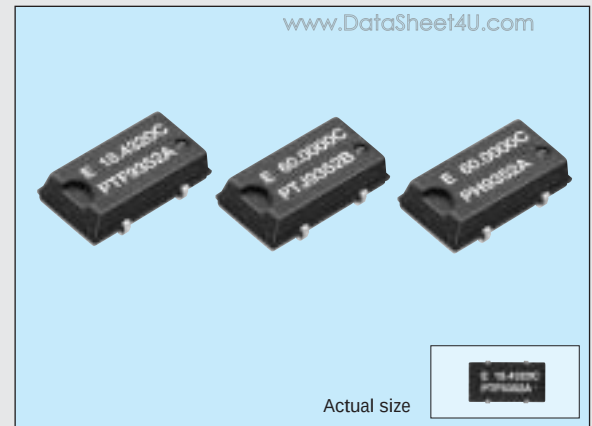
## HIGH-FREQUENCY CRYSTAL OSCILLATOR

## SG-636 series

Product number (please refer to page 1)

Q33636xxxxxx00

- A small SMD that enables high-density mounting.
- A general-purpose device with builtin heat-resisting cylindrical AT-cut crystal and allowing almost the same temperature condition for soldering as SMD IC.
- Low current consumption by output enable function(OE) or standby function(ST).



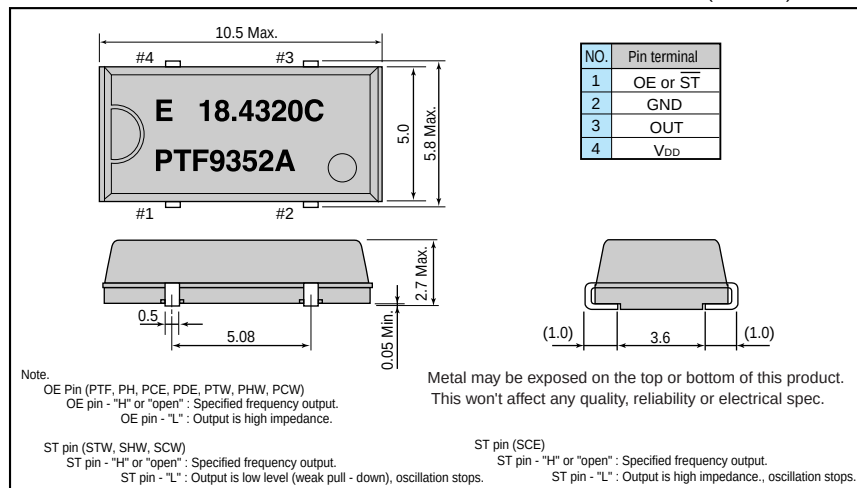
## Specifications (characteristics)

| Item                                |                       | Symbol               | Specifications                   |                                                |                            |                                      | Remarks                                                                                                                         |
|-------------------------------------|-----------------------|----------------------|----------------------------------|------------------------------------------------|----------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|                                     |                       |                      | SG-636PTF                        | SG-636PH                                       | SG-636SCE/PCE              | SG-636PDE                            |                                                                                                                                 |
| Output frequency range              |                       | f <sub>0</sub>       | 2.21675 MHz to 41.0000 MHz       | 41.0001 MHz to 70.0000 MHz                     | 2.21675 MHz to 40.0000 MHz | 2.21675MHz to 40.0000MHz             | Refer to page 31. "Frequency range"                                                                                             |
| Power source voltage                | Max. supply voltage   | V <sub>DD</sub> -GND | -0.5 V to +7.0 V                 |                                                |                            |                                      |                                                                                                                                 |
|                                     | Operating voltage     | V <sub>DD</sub>      | 5.0 V ±0.5 V                     |                                                | 3.3 V ±0.3 V               | 2.5 V ±0.25 V                        |                                                                                                                                 |
| Temperature range                   | Storage temperature   | T <sub>STG</sub>     | -55 °C to +100 °C                |                                                |                            |                                      | Stored as bare product after unpacking                                                                                          |
|                                     | Operating temperature | T <sub>OPR</sub>     | -20 °C to +70 °C                 |                                                |                            |                                      | Refer to page 31. "Frequency range"                                                                                             |
| Frequency stability                 |                       | Δf/f <sub>0</sub>    | C: ±100 x 10 <sup>-6</sup>       |                                                |                            |                                      |                                                                                                                                 |
| Current consumption                 |                       | I <sub>OP</sub>      | 17 mA Max.                       | 35 mA Max.                                     | 9 mA Max.                  | 5 mA Max.                            | No load condition                                                                                                               |
| Output disable current              |                       | I <sub>OE</sub>      | 10 mA Max.                       | 20 mA Max.                                     | 5 mA Max.                  | 3 mA Max.                            | OE=GND, $\overline{ST}$ =GND 2 μA Max.(SCE)                                                                                     |
| Duty                                | CMOS level            | t <sub>w</sub> /t    | 40 % to 60 %                     |                                                | 45 % to 55 %               |                                      | CMOS load: 1/2 V <sub>DD</sub> level                                                                                            |
|                                     | TTL level             |                      | 45 % to 55 %                     | —                                              |                            | TTL load: 1.4 V level                |                                                                                                                                 |
| Output voltage                      |                       | V <sub>OH</sub>      | V <sub>DD</sub> -0.4 V Min.      |                                                |                            |                                      | I <sub>OH</sub> =8 mA (PTF) /-4 mA (PH / SCE / PCE / PDE)                                                                       |
|                                     |                       | V <sub>OL</sub>      | 0.4 V Max.                       |                                                |                            |                                      | I <sub>OL</sub> =16 mA (PTF) /4 mA (PH / SCE / PCE / PDE)                                                                       |
| Output load condition (fan out)     | CMOS level            | C <sub>L</sub>       | 50 pF Max.                       | 20 pF Max.( ≤ 55 MHz)<br>15 pF Max.( > 55 MHz) | 30 pF Max.                 | 15 pF Max.                           |                                                                                                                                 |
|                                     | TTL level             | N                    | 10 TTL Max.                      | 5 LSTTL Max.                                   | —                          |                                      | C <sub>L</sub> ≤15 pF                                                                                                           |
| Output enable/disable input voltage |                       | V <sub>IH</sub>      | 2.0 V Min.                       |                                                | 0.8 V <sub>DD</sub> Min.   |                                      | OE, $\overline{ST}$ (SCE)                                                                                                       |
|                                     |                       | V <sub>IL</sub>      | 0.8 V Max.                       |                                                | 0.2 V <sub>DD</sub> Max.   |                                      |                                                                                                                                 |
| Output rise time                    | CMOS level            | t <sub>TLH</sub>     | 7 ns Max.                        | 5 ns Max.                                      |                            | CMOS load: 20 %→80 % V <sub>DD</sub> |                                                                                                                                 |
|                                     | TTL level             |                      | 5 ns Max.                        | —                                              |                            | TTL load: 0.4 V→2.4 V                |                                                                                                                                 |
| Output fall time                    | CMOS level            | t <sub>THL</sub>     | 7 ns Max.                        | 5 ns Max.                                      |                            | CMOS load: 80 %→20 % V <sub>DD</sub> |                                                                                                                                 |
|                                     | TTL level             |                      | 5 ns Max.                        | —                                              |                            | TTL load: 2.4 V→0.4 V                |                                                                                                                                 |
| Oscillation start up time           |                       | t <sub>OSC</sub>     | 4 ms Max.                        | 10 ms Max.                                     | 4 ms Max.                  |                                      | Time at minimum operating voltage to be 0 s                                                                                     |
| Aging                               |                       | f <sub>a</sub>       | ±5 x 10 <sup>-6</sup> /year Max. |                                                |                            |                                      | T <sub>a</sub> =+25 °C,V <sub>DD</sub> =5.0 V / 3.3 V / 2.5 V,first year                                                        |
| Shock resistance                    |                       | S.R.                 | ±20 x 10 <sup>-6</sup> Max.      |                                                |                            |                                      | Three drops on a hard board from 750 mm or excitation test with 29400 m/s <sup>2</sup> x 0.3 ms x 1/2 sine wave in 3 directions |

Note: • Unless otherwise stated, characteristics (specifications) shown in the above table are based on the rated operating temperature and voltage condition.  
• External by-pass capacitor is required.

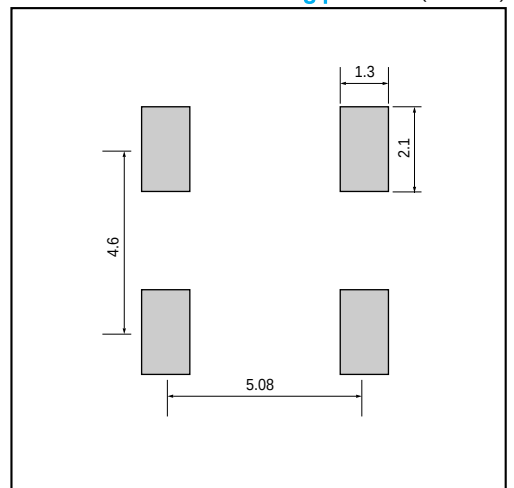
## External dimensions

(Unit: mm)



## Recommended soldering pattern

(Unit: mm)



## ■ Specifications (characteristics)

| Item                                |                       | Symbol              | Specifications                                          |                             |                             | Remarks                                                                                                                         |
|-------------------------------------|-----------------------|---------------------|---------------------------------------------------------|-----------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|                                     |                       |                     | SG-636PTG                                               | SG-636PHG                   | SG-636PCG/SCG               |                                                                                                                                 |
| Output frequency range              |                       | f <sub>0</sub>      | 2.21675 MHz to 33.0000 MHz                              |                             |                             | Refer to page 31. "Frequency range"                                                                                             |
| Power source voltage                | Max. supply voltage   | V <sub>DD-GND</sub> | -0.5 V to +7.0 V                                        |                             |                             |                                                                                                                                 |
|                                     | Operating voltage     | V <sub>DD</sub>     | 4.5 V to 5.5 V                                          | 2.7 V to 3.6 V              |                             |                                                                                                                                 |
| Temperature range                   | Storage temperature   | T <sub>STG</sub>    | -55 °C to +100 °C                                       |                             |                             | Stored as bare product after unpacking                                                                                          |
|                                     | Operating temperature | T <sub>OPR</sub>    | -20 °C to +70 °C                                        |                             |                             | Refer to page 31. "Frequency range"                                                                                             |
| Frequency stability                 |                       | Δf/f <sub>0</sub>   | B : ±50 x 10 <sup>-6</sup> °C : ±100 x 10 <sup>-6</sup> |                             |                             | -20 °C to +70 °C                                                                                                                |
| Current consumption                 |                       | I <sub>OP</sub>     | 25 mA Max.                                              |                             | 12 mA Max.                  | No load condition                                                                                                               |
| Output disable current              |                       | I <sub>OE</sub>     | 20 mA Max.                                              |                             | 10 mA Max.                  | OE=GND (P*G)                                                                                                                    |
| Standby current                     |                       | I <sub>ST</sub>     | —                                                       |                             | 50 μA Max.                  | ST=GND (SCG)                                                                                                                    |
| Duty                                | CMOS level            | tw/t                | —                                                       | 45 % to 55 %                |                             | 50 % V <sub>DD</sub> , CL = 25 pF                                                                                               |
|                                     | TTL level             |                     | 40 % to 60 %                                            | —                           |                             | 1.4 V Level, CL = 25 pF                                                                                                         |
| Output voltage                      |                       | V <sub>OH</sub>     | 2.4 V Min.                                              | —                           | V <sub>DD</sub> -0.4 V Min. | I <sub>OH</sub> = -8 mA                                                                                                         |
|                                     |                       |                     | —                                                       | V <sub>DD</sub> -0.4 V Max. |                             | I <sub>OH</sub> = -16 mA                                                                                                        |
|                                     |                       | V <sub>OL</sub>     | —                                                       | 0.4 V Max.                  |                             | I <sub>OL</sub> = 8 mA                                                                                                          |
|                                     |                       |                     | 0.4 V Max.                                              | —                           |                             | I <sub>OL</sub> = 16 mA                                                                                                         |
| Output load condition (fan out)     |                       | CL                  | 25 pF                                                   |                             |                             |                                                                                                                                 |
| Output enable disable input voltage | CMOS level            | V <sub>IH</sub>     | 2.0 V Min.                                              |                             | 70 % V <sub>DD</sub> Min.   | OE, $\overline{\text{ST}}$                                                                                                      |
|                                     | TTL level             | V <sub>IL</sub>     | 0.8 V Max.                                              |                             | 20 % V <sub>DD</sub> Max.   | OE, $\overline{\text{ST}}$                                                                                                      |
| Output rise time                    | CMOS level            | t <sub>TLH</sub>    | —                                                       | 3.4 ns Max.                 | 4.0 ns Max.                 | 20 % to 80 % V <sub>DD</sub> , CL ≤ 25 pF                                                                                       |
|                                     | TTL level             |                     | 1.2 ns Max.<br>2.4 ns Max.                              | —                           | —                           | 0.8 V to 2.0 V CL ≤ 25 pF<br>0.4 V to 2.4 V CL ≤ 25 pF                                                                          |
| Output fall time                    | CMOS level            | t <sub>THL</sub>    | —                                                       | 3.4 ns Max.                 | 4.0 ns Max.                 | 80 % to 20 % V <sub>DD</sub> CL ≤ 25 pF                                                                                         |
|                                     | TTL level             |                     | 1.2 ns Max.<br>2.4 ns Max.                              | —                           | —                           | 2.0 V to 0.8 V CL ≤ 25 pF<br>2.4 V to 0.4 V CL ≤ 25 pF                                                                          |
| Oscillation start up time           |                       | t <sub>OSC</sub>    | 12 ms Max.                                              |                             |                             | Time at minimum operating voltage to be 0 s                                                                                     |
| Aging                               |                       | fa                  | ±5 x 10 <sup>-6</sup> /year Max.                        |                             |                             | Ta=+25 °C, V <sub>DD</sub> =5.0 V / 3.3 V, First year                                                                           |
| Shock resistance                    |                       | S.R.                | ±20 x 10 <sup>-6</sup> Max.                             |                             |                             | Three drops on a hard board from 750 mm or excitation test with 29400 m/s <sup>2</sup> x 0.3 ms x 1/2 sine wave in 3 directions |

## ■ Specifications (characteristics)

| Item                                |                       | Symbol                      | Specifications                                         |                           |                                                                                                                     | Remarks                                                                                                                   |
|-------------------------------------|-----------------------|-----------------------------|--------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|                                     |                       |                             | SG-636PTW/STW                                          | SG-636PHW/SHW             | SG-636PCW/SCW                                                                                                       |                                                                                                                           |
| Output frequency range              |                       | f <sub>o</sub>              | 32.0001 MHz to 135.0000 MHz                            |                           |                                                                                                                     | Refer to page 31. "Frequency range"                                                                                       |
| Power source voltage                | Max. supply voltage   | V <sub>DD-GND</sub>         | -0.5 V to +7.0 V                                       |                           |                                                                                                                     |                                                                                                                           |
|                                     | Operating voltage     | V <sub>DD</sub>             | 5.0 V ± 0.5 V                                          |                           | 3.3 V ± 0.3 V                                                                                                       |                                                                                                                           |
| Temperature range                   | Storage temperature   | T <sub>STG</sub>            | -55 °C to +100 °C                                      |                           |                                                                                                                     | Stored as bare product after unpacking                                                                                    |
|                                     | Operating temperature | T <sub>OPR</sub>            | -20 °C to +70 °C                                       |                           |                                                                                                                     | Refer to page 31. "Frequency range"                                                                                       |
| Frequency stability                 |                       | Δf/f <sub>o</sub>           | B : ±50 x 10 <sup>-6</sup> C : ±100 x 10 <sup>-6</sup> |                           |                                                                                                                     |                                                                                                                           |
| Current consumption                 |                       | I <sub>OP</sub>             | 45 mA Max.                                             |                           | 28 mA Max.                                                                                                          | No load condition                                                                                                         |
| Output disable current              |                       | I <sub>OE</sub>             | 30 mA Max.                                             |                           | 16 mA Max.                                                                                                          | OE=GND(P*W)                                                                                                               |
| Standby current                     |                       | I <sub>ST</sub>             | 50 μA Max.                                             |                           |                                                                                                                     | ST=GND(S*W)                                                                                                               |
| Duty                                | tw/t                  | 40 % to 60 %                | —                                                      | —                         |                                                                                                                     | TTL load : 1.4 V, CL = Max.                                                                                               |
|                                     |                       | 45 % to 55 %                | —                                                      | —                         |                                                                                                                     | TTL load : 1.4 V, 5TTL + 15 pF, f <sub>o</sub> ≤ 66.6667 MHz                                                              |
|                                     |                       | —<br>—                      | 40 % to 60 %<br>45 % to 55%                            | 40 % to 60 %<br>—         |                                                                                                                     | CMOS load : 50% V <sub>DD</sub> , CL = Max.<br>CMOS load : 50% V <sub>DD</sub> , CL = 25 pF, f <sub>o</sub> ≤ 66.6667 MHz |
| Output voltage                      | V <sub>OH</sub>       | V <sub>DD</sub> -0.4 V Min. |                                                        |                           | I <sub>OH</sub> = -16 mA (*TW/HW)/-8 mA(*CW)                                                                        |                                                                                                                           |
|                                     | V <sub>OL</sub>       | 0.4 V Max.                  |                                                        |                           | I <sub>OL</sub> = 16 mA (*TW/HW)/8 mA(*CW)                                                                          |                                                                                                                           |
| Output load condition (fan out)     | CL                    | 15 pF                       | —                                                      | —                         | f <sub>o</sub> ≤ 135 MHz                                                                                            |                                                                                                                           |
|                                     |                       | 5 TTL + 15 pF               | —                                                      | —                         | f <sub>o</sub> ≤ 90 MHz                                                                                             |                                                                                                                           |
|                                     |                       | 25 pF                       | —                                                      | —                         | f <sub>o</sub> ≤ 66.6667 MHz                                                                                        |                                                                                                                           |
|                                     |                       | —                           | 15 pF                                                  | 15 pF                     | f <sub>o</sub> ≤ 135 MHz                                                                                            |                                                                                                                           |
|                                     |                       | —                           | 25 pF                                                  | —                         | f <sub>o</sub> ≤ 90 MHz                                                                                             |                                                                                                                           |
|                                     |                       | —                           | 50 pF                                                  | —                         | f <sub>o</sub> ≤ 66.6667MHz                                                                                         |                                                                                                                           |
| Output enable disable input voltage | V <sub>IH</sub>       | 2.0 V Min.                  |                                                        | 70 % V <sub>DD</sub> Min. | OE,ST                                                                                                               |                                                                                                                           |
|                                     | V <sub>IL</sub>       | 0.8 V Max.                  |                                                        | 20 % V <sub>DD</sub> Max. | OE,ST                                                                                                               |                                                                                                                           |
| Output rise time                    | t <sub>TLH</sub>      | 2.0 ns Max.                 | —                                                      | —                         | TTL load: 0.8 V→2.0 V, CL = Max.                                                                                    |                                                                                                                           |
|                                     |                       | 4.0 ns Max.                 | —                                                      | —                         | TTL load: 0.4 V→2.4 V, CL = Max.                                                                                    |                                                                                                                           |
|                                     |                       | —                           | 3.0 ns Max.                                            | —                         | CMOS load: 20 %→80 % V <sub>DD</sub> , CL= 25 pF                                                                    |                                                                                                                           |
|                                     |                       | —                           | 4.0 ns Max.                                            | —                         | CMOS load: 20 %→80 % V <sub>DD</sub> , CL= 50 pF                                                                    |                                                                                                                           |
| Output fall time                    | t <sub>THL</sub>      | —                           | —                                                      | 3.0 ns Max.               | CMOS load: 20 %→80 % V <sub>DD</sub> , CL= 15 pF                                                                    |                                                                                                                           |
|                                     |                       | 2.0 ns Max.                 | —                                                      | —                         | TTL load: 2.0 V→0.8 V, CL = Max.                                                                                    |                                                                                                                           |
|                                     |                       | 4.0 ns Max.                 | —                                                      | —                         | TTL load: 2.4 V→0.4V, CL = Max.                                                                                     |                                                                                                                           |
|                                     |                       | —                           | 3.0 ns Max.                                            | —                         | CMOS load: 80 %→20 % V <sub>DD</sub> , CL= 25 pF                                                                    |                                                                                                                           |
| Oscillation start up time           | t <sub>osc</sub>      | —                           | 4.0 ns Max.                                            | —                         | CMOS load: 80 %→20 % V <sub>DD</sub> , CL= 50 pF                                                                    |                                                                                                                           |
|                                     |                       | —                           | —                                                      | 3.0 ns Max.               | CMOS load: 80 %→20 % V <sub>DD</sub> , CL= 15 pF                                                                    |                                                                                                                           |
|                                     |                       | —                           | —                                                      | —                         | —                                                                                                                   |                                                                                                                           |
| Aging                               |                       | fa                          | ±5 x 10 <sup>-6</sup> /year Max.                       |                           | Time at minimum operating voltage to be 0 s<br>Ta=+25 °C, VDD =5.0 V / 3.3 V, first year                            |                                                                                                                           |
| Shock resistance                    |                       | S.R.                        | ±20 x 10 <sup>-6</sup> Max.                            |                           | Three drops on a hard board from 750 mm or excitation test with 29400 m/s2 x 0.3 ms x 1/2 sine wave in 3 directions |                                                                                                                           |