

**Microchip****Filter specification****TFS230C****1/5****Measurement condition**

|                          |              |        |
|--------------------------|--------------|--------|
| Ambient temperature:     | 23           | °C     |
| Input power level:       | 0            | dBm    |
| Terminating impedance: * |              |        |
| Input:                   | 230 $\Omega$ | -9 pF  |
| Output:                  | 200 $\Omega$ | -10 pF |

**Characteristics**

Remark:

The reference level for the relative attenuation  $a_{rel}$  of the TFS230C is the minimum of the pass band attenuation. This value is defined as the insertion loss  $a_e$ . The nominal frequency  $f_N$  is fixed at 230.4 MHz without any tolerance. The values of relative attenuation  $a_{rel}$  are guaranteed for the whole operating temperature range. The frequency shift of the filter in the operating temperature range is included in the production tolerance scheme.

| <b>D a t a</b>                              |           | <b>typ. value</b> |       | <b>tolerance / limit</b> |       |     |
|---------------------------------------------|-----------|-------------------|-------|--------------------------|-------|-----|
| <b>Insertion loss</b><br>(reference level)  | $a_e$     | 10                | dB    | max.                     | 12.1  | dB  |
| <b>Nominal frequency</b>                    | $f_N$     |                   |       |                          | 230.4 | MHz |
| <b>Passband</b>                             | PB        | 72                | MHz   | $f_N \pm$                | 32.5  | MHz |
| <b>Pass band ripple</b>                     |           | 0.6               | dB    | max.                     | 1.5   | dB  |
| <b>Relative attenuation**)</b>              | $a_{rel}$ |                   |       |                          |       |     |
| $f_N$ ... $f_N \pm$ 32.5 MHz                |           | 0.6               | dB    | max.                     | 1.5   | dB  |
| 10 MHz ... 110 MHz                          |           | 81                | dB    | min.                     | 40    | dB  |
| 350 MHz ... 1000 MHz                        |           | 73                | dB    | min.                     | 35    | dB  |
| <b>Group delay ripple</b>                   |           | 20                | ns    | max.                     | 100   | ns  |
| <b>Input power level</b>                    |           |                   |       | max.                     | 10    | dBm |
| <b>Operating temperature range</b>          | OTR       |                   |       | - 40 °C ... + 85 °C      |       |     |
| <b>Storage temperature range</b>            |           |                   |       | - 45 °C ... + 85 °C      |       |     |
| <b>Temperature coefficient of frequency</b> | $TC_f^*$  | -97               | ppm/K |                          |       |     |

\*)  $\Delta f(\text{Hz}) = TC_f(\text{ppm/K}) \times (T - T_0) \times f_{T0}(\text{MHz})$ ,  $f_{T0}$ : frequency at room temperature

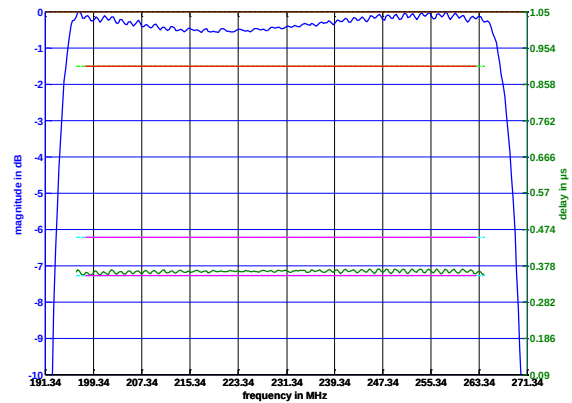
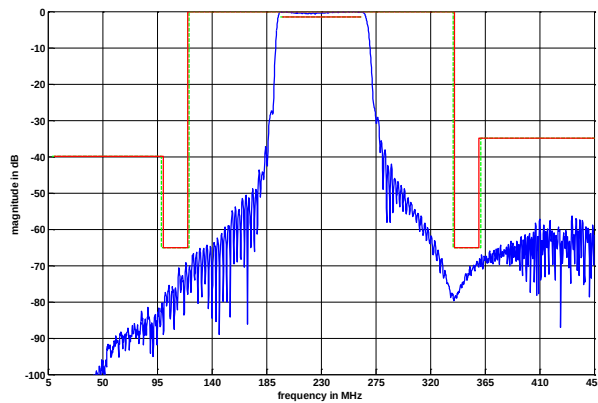
\*\*) 75dBc (min) at 100MHz...120MHz and 340MHz...360MHz

**Generated:****Checked / Approved:**

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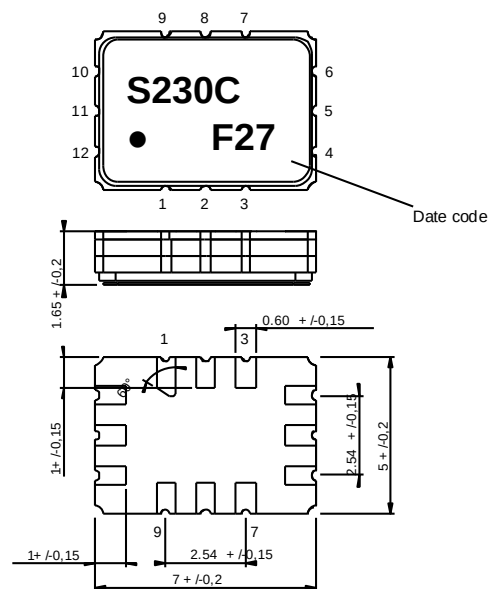
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## Filter characteristic



## Construction and pin connection

(All dimensions in mm)



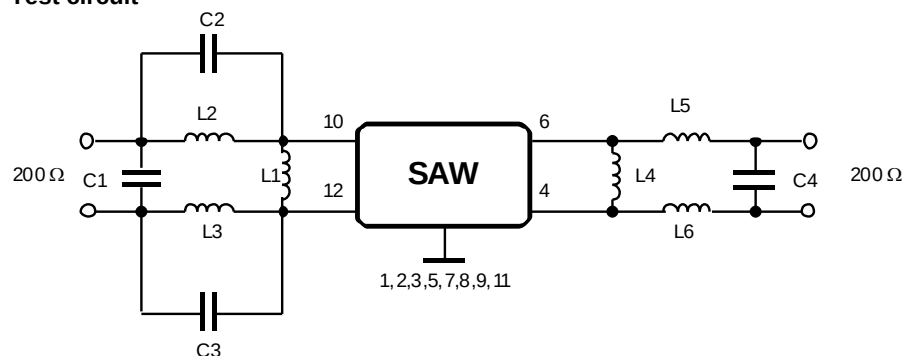
|    |                  |
|----|------------------|
| 1  | Ground           |
| 2  | Ground           |
| 3  | Ground           |
| 4  | Output           |
| 5  | Ground           |
| 6  | Output RF Return |
| 7  | Ground           |
| 8  | Ground           |
| 9  | Ground           |
| 10 | Input            |
| 11 | Ground           |
| 12 | Input RF Return  |

Date code: Year + week

|   |      |
|---|------|
| F | 2015 |
| G | 2016 |
| H | 2017 |

...

## Test circuit



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**Stability characteristics, reliability**

After the following tests the filter shall meet the whole specification:

1. Shock: 500g, 1 ms, half sine wave, 3 shocks each plane;  
DIN IEC 68 T2 - 27
2. Vibration: 10 Hz to 500 Hz, 0.35 mm or g respectively, 1 octave per min, 10 cycles per plane, 3 planes; DIN IEC 68 T2 - 6
3. Change of temperature: -55 °C to 125°C / 15 min. each / 100 cycles  
DIN IEC 68 part 2 – 14 Test N
4. Resistance to solder heat (reflow): reflow possible: three times max.;  
for temperature conditions, see page 4: "Air reflow temperature conditions"
5. ESD ANSI/ESD S20.20-1999, class 1A for HBM

This filter is RoHS compliant (2011/65/EU)

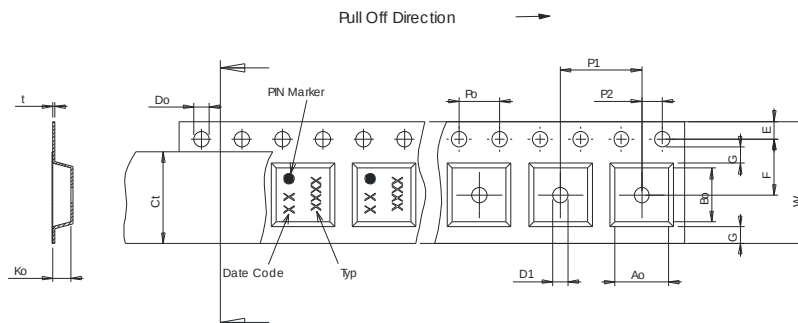
**Packing**

Tape & Reel: IEC 286 – 3, with exception of value for N and minimum bending radius;  
tape type II, embossed carrier tape with top cover tape on the upper side;

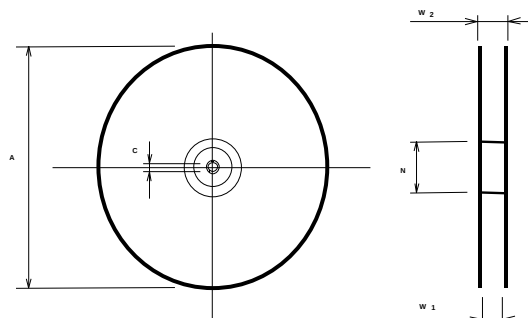
|                                                     |             |
|-----------------------------------------------------|-------------|
| max. pieces of filters per reel:                    | 3000        |
| reel of empty components at start:                  | min. 300 mm |
| reel of empty components at start including leader: | min. 500 mm |
| trailer:                                            | min. 300 mm |

**Tape (all dimensions in mm)**

|         |                   |
|---------|-------------------|
| W       | : 16,00 +0,3/-0,1 |
| Po      | : 4,00 ± 0,1      |
| Do      | : 1,50 +0,1/-0    |
| E       | : 1,75 ± 0,1      |
| F       | : 7,50 ± 0,1      |
| G(min)  | : 0,75            |
| P2      | : 2,00 ± 0,1      |
| P1      | : 8,00 ± 0,1      |
| D1(min) | : 1,50            |
| Ao      | : 5,40 ± 0,1      |
| Bo      | : 7,60 ± 0,1      |
| Ct      | : 13,3 ± 0,1      |

**Reel (all dimensions in mm)**

|         |                  |
|---------|------------------|
| A       | : 330 or 180     |
| W1      | : 16,4 +2/-0     |
| W2(max) | : 22,4           |
| N(min)  | : 50             |
| C       | : 13,0 +0,5/-0,2 |



The minimum bending radius is 45 mm.

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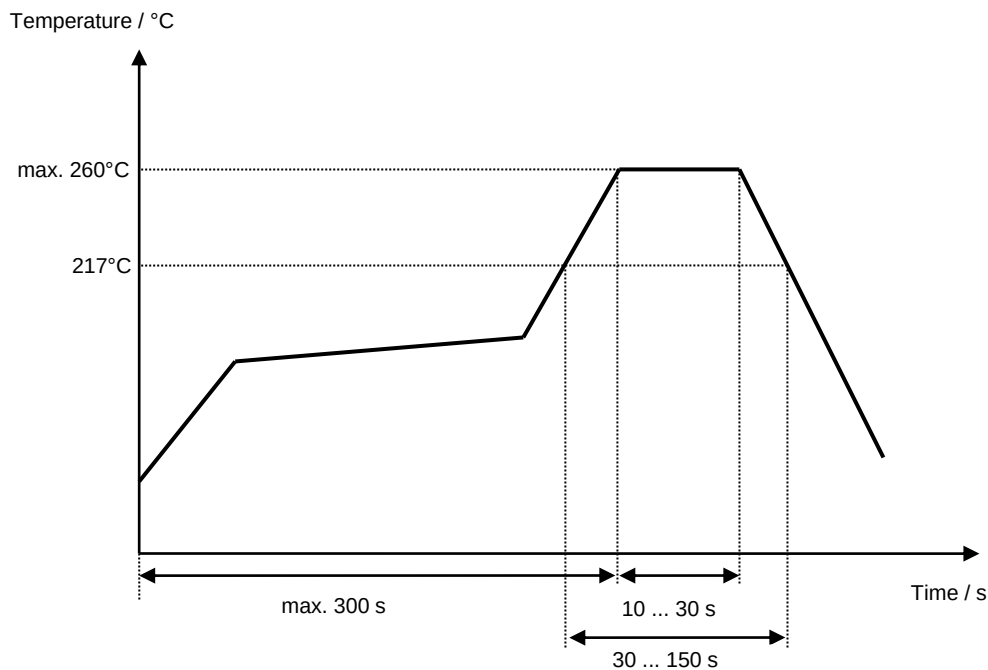
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**Air reflow temperature conditions**

| <b>Conditions</b>                          | <b>Exposure</b>             |
|--------------------------------------------|-----------------------------|
| Average ramp-up rate (30°C to 217°C)       | less than 3°C/second        |
| > 100°C                                    | between 300 and 600 seconds |
| > 150°C                                    | between 240 and 500 seconds |
| > 217°C                                    | between 30 and 150 seconds  |
| Peak temperature                           | max. 260°C                  |
| Time within 5°C of actual peak temperature | between 10 and 30 seconds   |
| Cool-down rate (Peak to 50°C)              | less than 6°C/second        |
| Time from 30°C to Peak temperature         | no greater than 300 seconds |

**Chip-mount air reflow profile**

**Microchip****Filter specification****TFS230C****5/5****History**

| <b>Version</b> | <b>Reason of Changes</b>                                                                                                                             | <b>Name</b> | <b>Date</b> |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|
| 1.0            | - Generation of development specification                                                                                                            | Chilla      | 12.12.2014  |
| 1.1            | - Changed passband and centre frequency<br>- Changed relative attenuation and amplitude ripple<br>- Added group delay ripple<br>- Added test circuit | Chilla      | 22.06.2015  |
| 2.0            | - Created filter specification<br>- Added terminating impedance<br>- Added typical values<br>- Added filter characteristics                          | Chilla      | 03.07.2015  |

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