Aku tidak selalu
mengetahui jawabannya…
karena jawabannya
tidak selalu ada
di dalam buku,

namun aku mengetahui
bahwa imanku
dapat menemukannya…
karena iman tahu
ke mana harus
mencari jawaban.

Aku tidak mengetahui
jalan menuju surga…
karena aku belum pernah
ke sana sebelumnya
namun aku mengetahui
dengan pasti
bahwa Yesus adalah jalan,
dan Ia akan menunjukkan kepadaku…

Akulah jalan dan kebenaran
dan hidup.
(Yohanes 14 : 6)

LAMPIRAN A

Data Sheet Philip

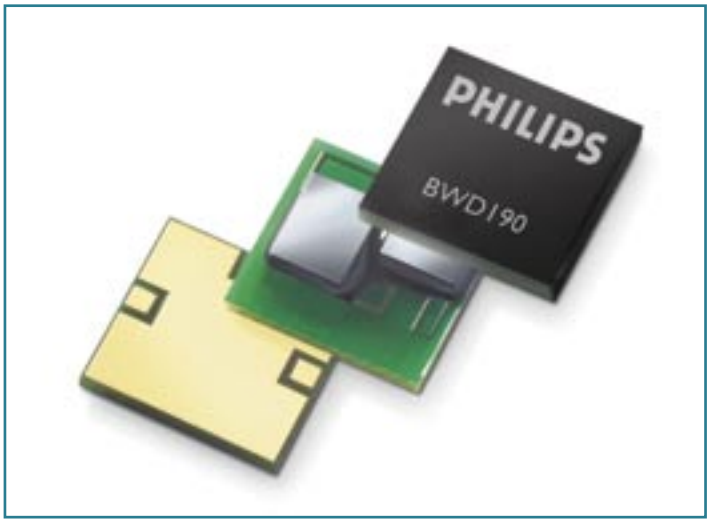
Pictures on Bulk Acoustic Wave filters

If you want to download high-resolution versions of the pictures below, please click at the thumbnail. The use of the pictures is free but in publications the source of these pictures must be mentioned. The source can be found below the caption of the pictures.

	Caption & Acknowledgement of source
	17 x 17 cm, 300 dpi, 1118 KB **Bulk Acoustic Wave filters** Measuring the performance of a BAW filter sample. *Photo: Philips*
	17 x 17 cm, 300 dpi, 1089 KB **Bulk Acoustic Wave filters** Sample of a BAW filter shown on top of a mobile-phone displays, showing its small dimensions. *Photo: Philips*
	11 x 9 cm, 300 dpi, 379 KB **Bulk Acoustic Wave filters** Philips' new BAW filter technology allows wafer-scale production of finished devices. Example shows 1 x 1.3 mm^2 GSM 1900 filter in a chip-scale package. *Photo: Philips*

BAW filters/ duplexers

Designed for seamless integration into the RF front-end modules of (W)CDMA/GSM mobile phones, these high-performance BAW filters and duplexers provide low insertion loss and high selectivity. Philips-patented Chip Scale Packaging delivers an ultra-small footprint.



Customer benefits

- High-performance BAW filters and duplexers
  - Low insertion loss
  - High stopband rejection
  - Low temperature drift
- Optimized for latest cellular standards
  - 1900 MHz US PCS
  - 900/1800/1900 GSM
  - UMTS
- Ultra-small, Philips-patented Chip Scale Packaging
  - Ultra-small footprint (as small as 1.3 mm^2)
  - Very low profile (height < 450 µm after solder reflow)
  - Flip-chip assembly
- Easy integration into RF front-end module
- Integrated balun option via Philips PASSI™ passive integration process technology

Ultra-small Bulk Acoustic Wave filters and duplexers for cellular phones

Semiconductors

The Philips series of high-performance Bulk Acoustic Wave (BAW) filters and duplexers is optimized for (W)CDMA/GSM cellular phones. Available in Philips-patented Chip Scale Packaging (CSP), they provide superior performance in an ultra-small size.

Compared to Surface Acoustic Wave (SAW) filters, BAW filters typically offer smaller size, reduced in-band insertion loss, and an increased steepness of the filter skirts in lower and upper transition bands. BAW filters also offer less center frequency drift versus temperature change and are more suitable for applications that use frequencies ranging from 1 to 20 GHz.

Latest cellular standards

Designed for easy integration into front-end modules that use the latest cellular standards. The BAW filters and duplexers support receive (Rx) and transmit (Tx) applications in (W)CDMA and GSM phones:

- US PCS (1900 MHz)
  - BWT190 high-rejection Tx BAW filter
  - BWD190 high-performance BAW duplexer
- GSM (900/1800/1900)
  - BWR190 high-performance Rx BAW filter (1900 MHz)
  - BWR180 high-performance Rx BAW filter (1800 MHz)
  - BWR090 high-performance Rx BAW filter (900 MHz)
- UMTS
  - BWD210 high-performance BAW duplexer

Higher integration in an ultra-small format

Using the patented Chip Scale Packaging technique, Philips is able to maximize performance while minimizing footprint. The BAW filters for GSM, for example, are as small as 1.3 mm^2. The BAW devices are typically less than 450 µm in height after solder reflow and are suitable for flip-chip assembly. The use of the proprietary PASSI™ passive integration process technology also enables easy integration of baluns, providing additional savings in space, cost and time.

PHILIPS

BAW filters/duplexers

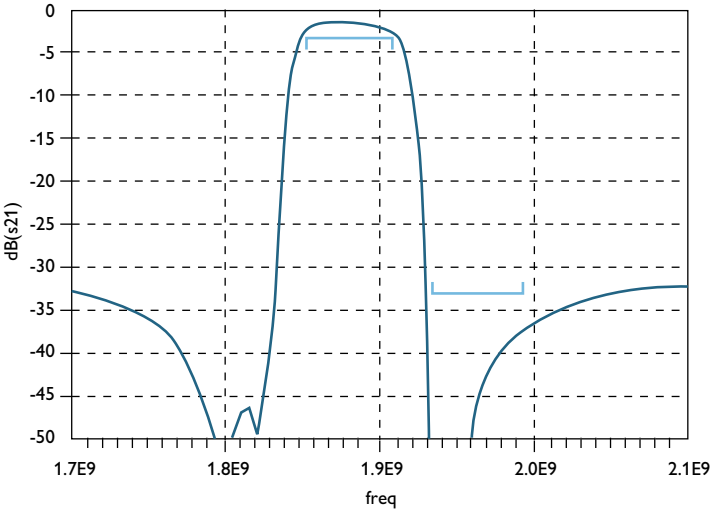
Ultra-small Bulk Acoustic Wave filters and duplexers for cellular phones

www.semiconductors.philips.com

Philips Semiconductors BAW devices

Product No.	Description	Standard	Frequency	Size	Package
BWT190	Tx BAW filter	PCS	1900 MHz	1.2 x 2 mm^2	Chip Scale or Moulded
BWD190	BAW duplexer	PCS	1900 MHz	5 x 5 mm^2	Moulded on laminate
BWR190	Rx BAW filter	GSM	1900 MHz	1.3 mm^2	Chip Scale or Moulded
BWR180	Rx BAW filter	GSM	1800 MHz	1.3 mm^2	Chip Scale or Moulded
BWR090	Rx BAW filter	GSM	900 MHz	1.7 mm^2	Chip Scale or Moulded
BWD210	BAW duplexer	UMTS	2100 MHz	5 x 5 mm^2	Moulded on laminate

Passband Characteristics of US PCS Tx BWT190



Characteristics of BWT190 high-rejection US PCS Tx BAW filter

Frequency	1850 to 1910 MHz	
Insertion loss	< 3 dB	
In-band return loss	> 11 dB	
Minimum rejection	1930 – 1990 MHz	33 dB
	100 – 1800 MHz	25 dB
	1990 – 6000 MHz	25 dB

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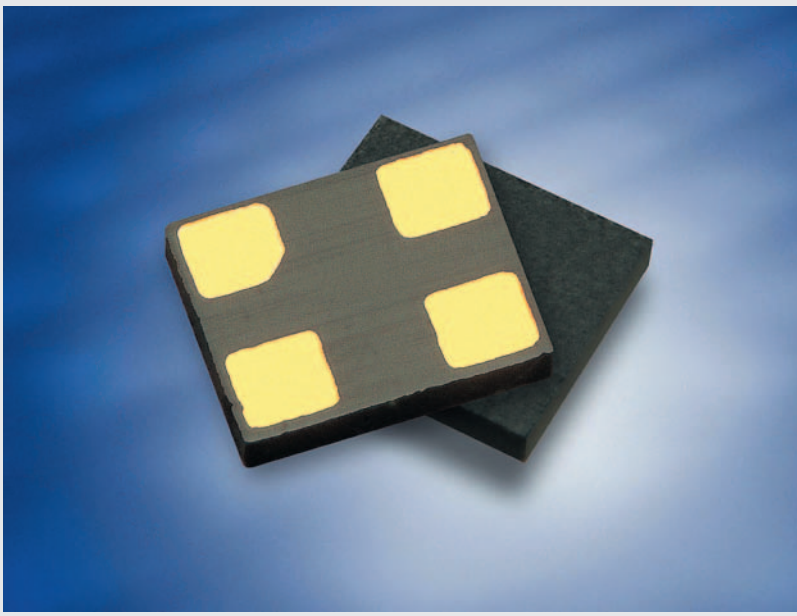
Date of release: June 2004
Document order number: 9397 750 13322

Published in The Netherlands

LAMPIRAN B

Data Sheet Infineon

Bulk Acoustic Wave Filters with Outstanding Performance



Infineon's new BAW (FBAR) filters offer high precision RF filtering for wireless applications. Key benefits of this technology are low insertion losses and very high Q-Values, allowing improved range e.g. for GSM handsets. The superior power handling capability also allows a significant size reduction for duplexers.

New system approaches in RF front-end designs are made possible, resulting in cost and size reduction as well as increased performance in talk time for GSM/CDMA/3G cellular phones.

With innovative concepts and proven silicon based manufacturing processes, these filters offer superior ruggedness and ESD capability. This state of the art technology combines well with plastic packaging and further integration of RF functions.

Small size and low temperature drift also make our BAW filters excellent for module integration.

BAW

Features

- Frequencies 500 MHz to 6 GHz serving all mobile standards; GSM, CDMA, UMTS, etc.
- Improved insertion loss
- Low temperature drift -20 ppm/K
- Superior Power Handling up to 3 W
- CDMA/UMTS Duplexer possible
- Enhanced ESD robustness 1.5 kV HBM
- Excellent stop band performance
- High Q-Values (1500 possible)
- Low Cost Packaging options: No need for hermetic encapsulation
- Possible integration of further passive devices
- 50 Ω single ended input/output (25-200 Ω feasible)
- Balanced input/output optional
- Full band PCN filters further reduces cost

Type	Application	Band Width [MHz]	Insertion Loss [dB] typical	Ripple over Freq. [dB] typical	Availability
NWA19P	GSM 1900 w. LNA & BALUN	60	Gain = 13	2.5	Samples Q2-2003
NWD918	GSM/DCS	35/75	2.1/2.0	0.8/1.0	In volume*
NWT190	CDMA Tx Fullband	60	2.5	1.5 max.	Samples
NWR190	CDMA Rx Fullband	60	2.0	1.5 max.	Samples

*Demonstrator product in ceramic package

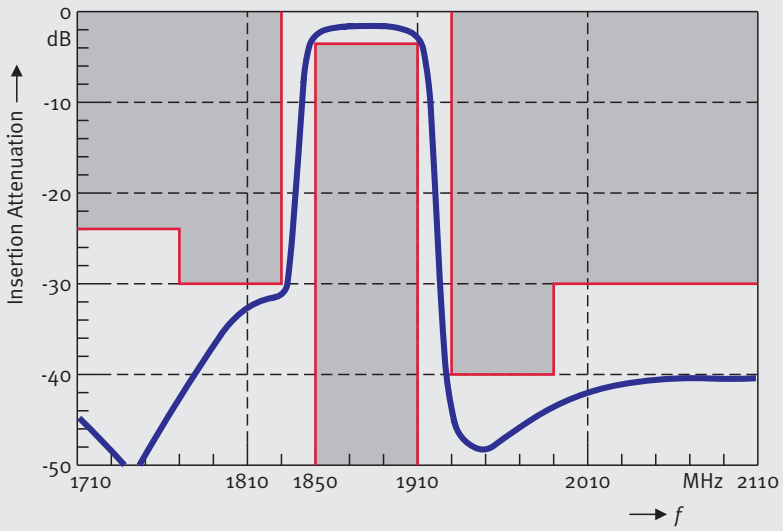
BAW Filters

Superior Performance, Ruggedness and Stability for High Volume Applications

Infineon technologies

Never stop thinking.

Passband Characteristics for PCN1900 Tx BAW Filter NWT190



Key Parameters for PCN Tx BAW Filter (T_{amb} = -30...+85°C)

Parameter	Values
Frequency	1850 - 1910 MHz
Insertion Loss	‹ 3.5 dB
Ripple over Frequency	‹ 1.5 dB
Max. VSWR	‹ 2.0
Input/Output Impedance	50 Ω
TCR Drift Only	-20 ppm/K
Stopband Attenuation: 0.3 - 1570 MHz 1570 - 1580 MHz 1580 - 1770 MHz 1770 - 1830 MHz 1930 - 1990 MHz 1990 - 2500 MHz 2500 - 6000 MHz	 › 24 dB › 30 dB › 24 dB › 30 dB › 40 dB › 30 dB › 15 dB

Applications

- Small Signal Rx & Tx Filtering
  - GSM
  - PCN
  - GPS
  - CDMA
  - UMTS
  - WLAN
- Duplexers
  - UMTS
  - CDMA
- Radio Base Stations
  - Rx/Tx Filtering

How to reach us:
http://www.infineon.com

Published by
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Printed in Germany
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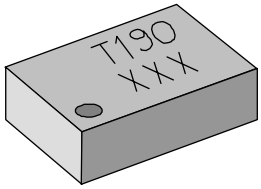
P R E L I M I N A R Y

Datasheet (Version 2.2)

NWT190
CDMA TX Full Band BAW-filter for US PCS

Features



P-TSLP-4-5

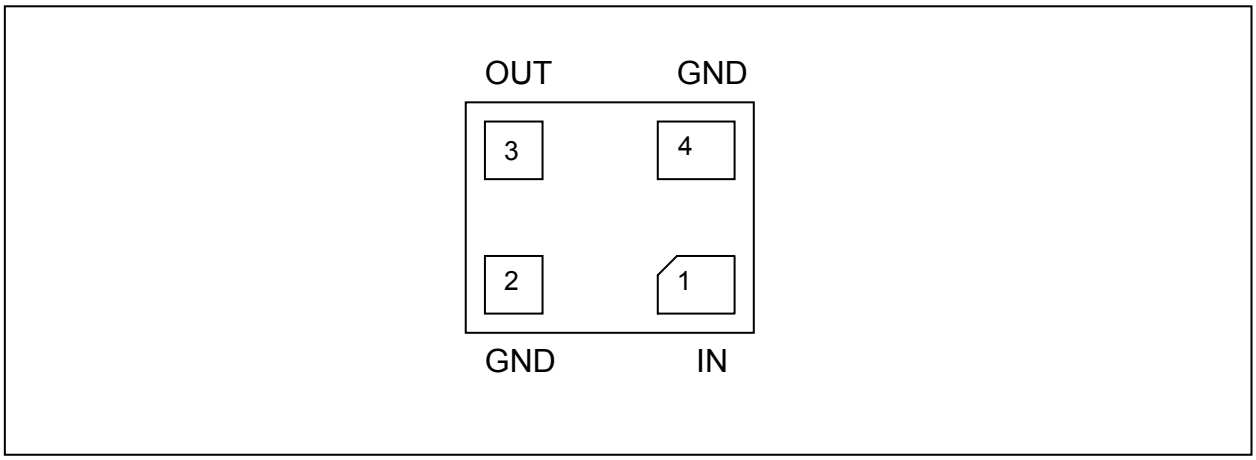
- Low-loss and high-selectivity Bulk-Acoustic-Wave Filter
- Passband: CDMA Tx 1850 .. 1910 MHz
- High selectivity and low temperature drift (TCF = -18 ppm/K)
- Leadless Plastic Package for **S**urface **M**ounted **T**echnology (**SMT**)
- **T**hin **S**mall **L**eadless **P**ackage (**TSLP**)
- Small Package dimensions of 2.0 x 1.6mm²
- Package height 0.6 mm
- “Green” package, suitable for 260°C reflow temperature
- Excellent ESD robustness, pyroelectric charge generation does not occur

Type	Marking	Ordering Code	Package
NWT190	T190	available on request	TSLP-4-5

Description:

NWT190 is a full-band PCS Tx Filter for US-CDMA and US W-CDMA that utilizes Bulk-Acoustic-Wave Filter technology. In typical cellular phone architectures, the transmit filter fits between the driver amplifier and the power amplifier. Benefits of this new transmit filter are reduced insertion loss, very low temperature drift and increased steepness of the filter skirts in lower and upper transition bands. NWT190 is packaged in a low profile plastic package.

Pin Configuration
(bottom view)



Pin Definitions and Functions

Pin No.	Symbol	Function
1	IN	unbalanced TX input
2	GND	ground
3	OUT	unbalanced TX output
4	GND	ground

Absolute Maximum Ratings		Unit
Operating temperature range	-30 .. +85	°C
Storage temperature range	-65 .. +150	°C
ESD (Machine Model)	100	V
ESD (Human Body Model)	1	kV
Power handling capability (10kh)	20	dBm

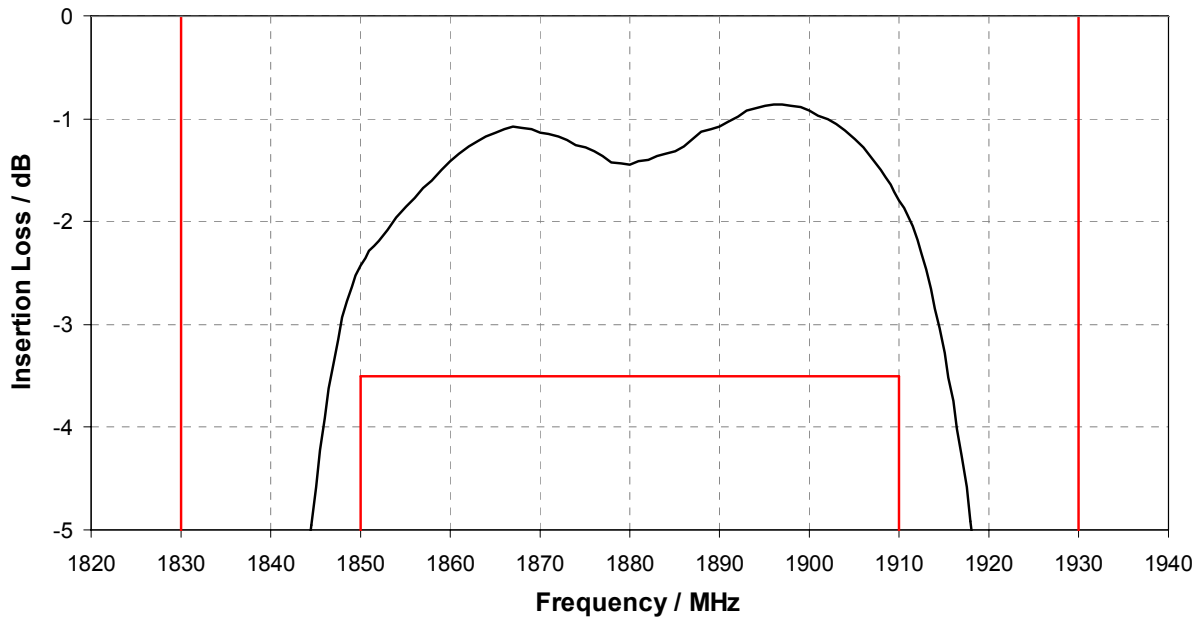
Electrical specifications

All parameters are valid over full operating temperature range unless otherwise stated. Parameters are tested at room temperature, variations over temperature are considered by temperature margins.

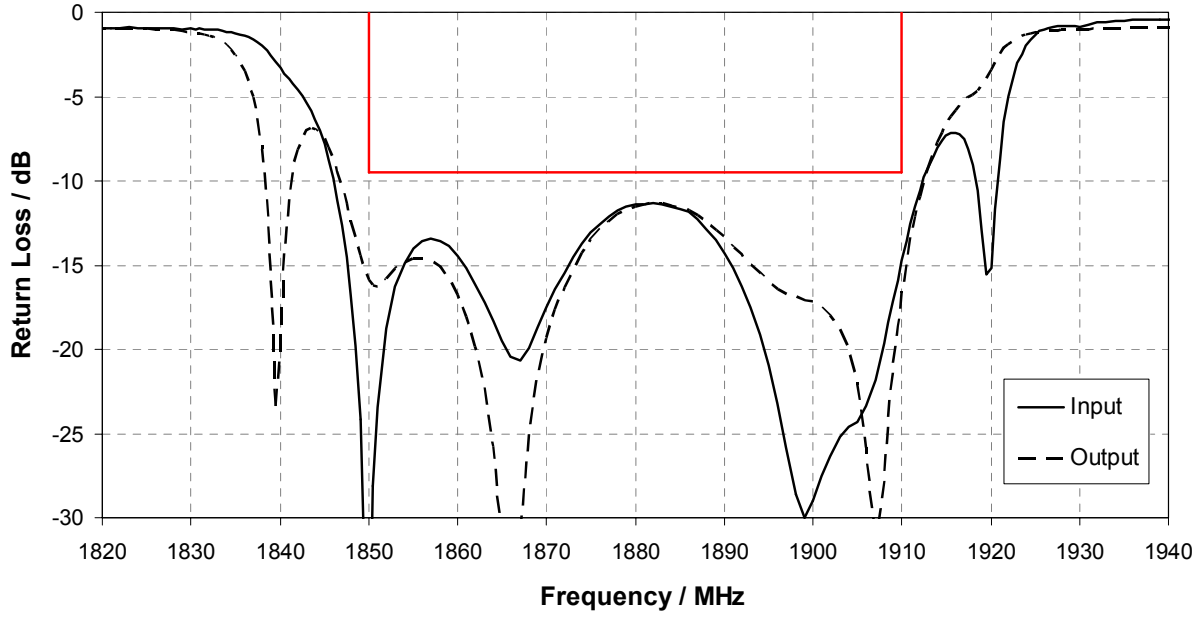
Passband Parameter	Min.	Typ.	Max.	Unit
Frequency	1850.6		1909.4	MHz
Insertion loss (+25°C) (-30 .. +85°C) (1855 to 1905 MHz)		2.3 2.8 1.8	3.5	dB
Total ripple over frequency		1.5	2.0	dB
Input impedance		50		Ω unbal.
Output impedance		50		Ω unbal.
Return loss	9.5	11		dB
Input/Output DC bias RF performance must not change			5	V

Stopband Parameter	Min.	Typ.	Max.	Unit
attenuation 0.3 to 1570 MHz	24			dB
attenuation 1570 to 1580 MHz	30			dB
attenuation 1580 to 1770 MHz	24			dB
attenuation 1770 to 1830 MHz	25	30		dB
attenuation 1930.6 to 1990 MHz (-10° ... +85°C) (-30° ... -10°C)	 38 35	44		dB
attenuation 1990 to 2500 MHz	30			dB
attenuation 2500 to 3700 MHz	15	25		dB
attenuation 3700 to 3820 MHz	23	27		dB
attenuation 3820 to 6000 MHz	15			dB

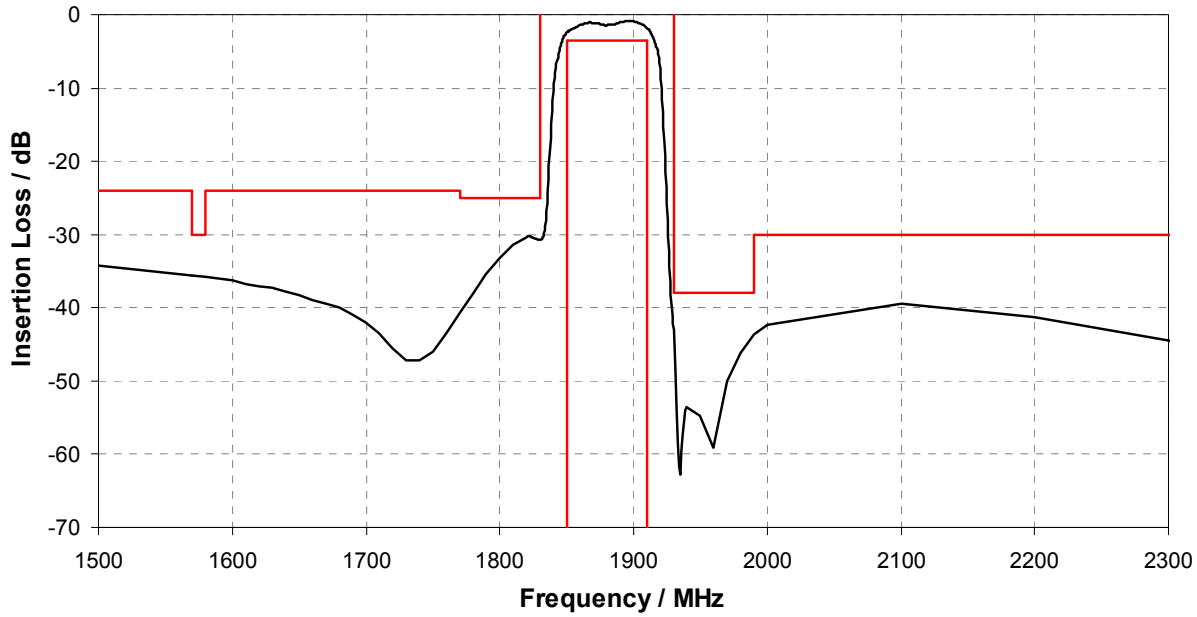
Insertion Loss (Passband)



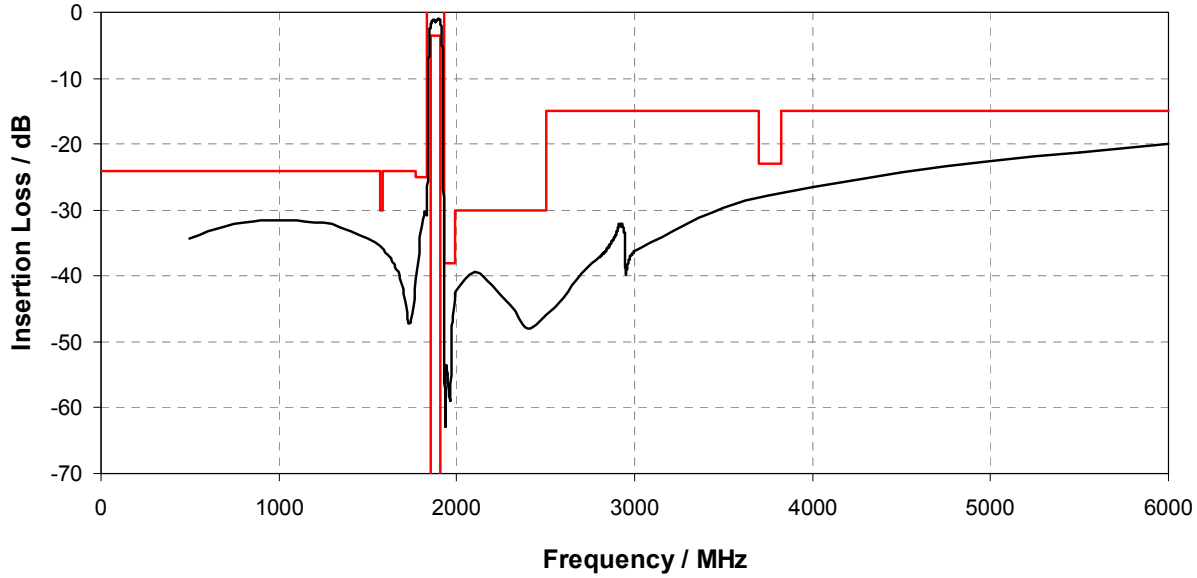
Return Loss (Passband)



Insertion Loss (Narrowband)

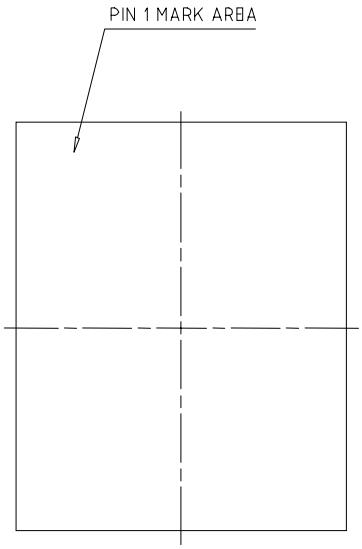


Insertion Loss (Wideband)

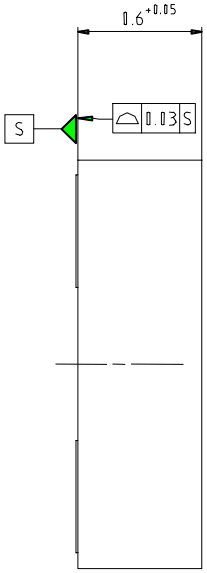


Package Dimensions

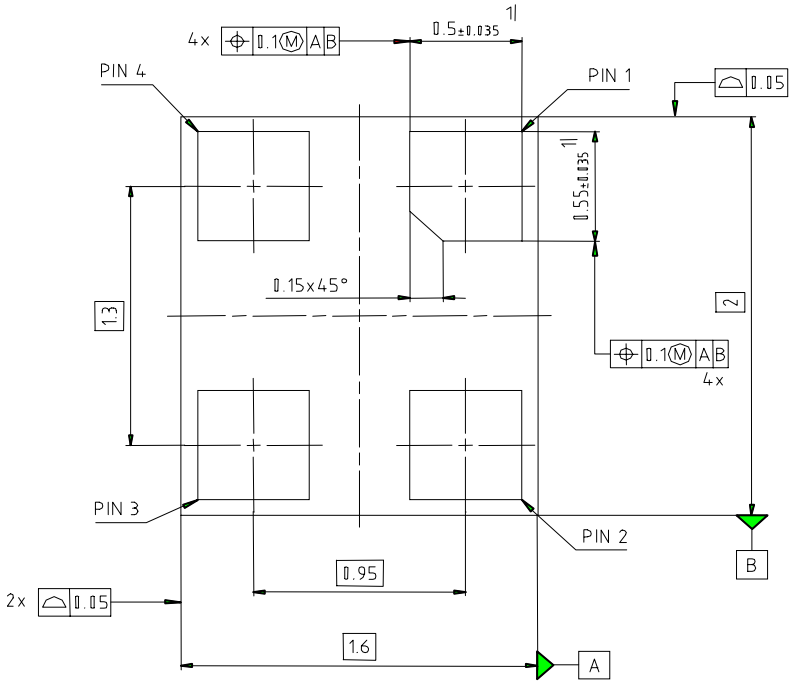
Top View



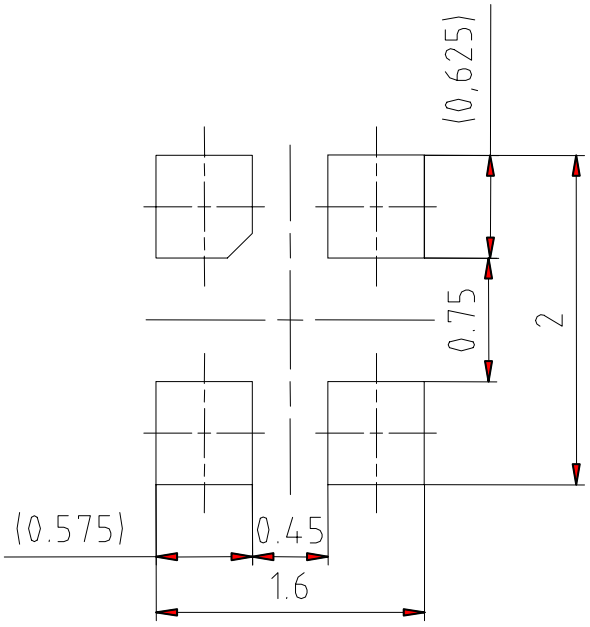
Side View



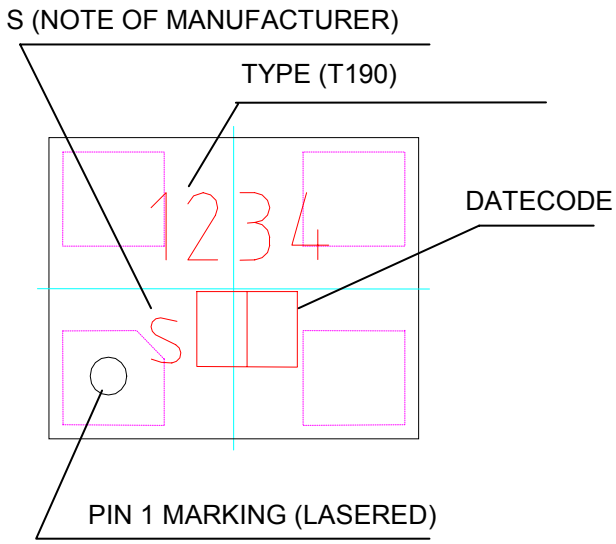
Bottom View



Recommended Landing Pad



Pin 1 Marking / Labeling



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