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# SAW Components

## BAW/SAW Duplexer

WCDMA Band II

<b>Series/type:</b>	<b>B8004</b>
<b>Ordering code:</b>	<b>B39202B8004P810</b>
Date:	September 02, 2014
Version:	2.0

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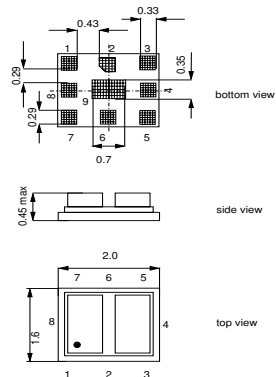
**Data sheet**

**Application**

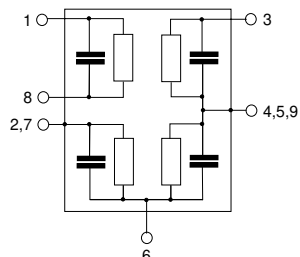
- Low-loss BAW/SAW duplexer for mobile telephone WCDMA Band II systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 60 MHz
- Single ended to balanced transformation in Antenna - Rx path
- Impedance transformation 50Ω to 100Ω in Antenna - Rx path


**Features**

- Package size 2.0 x 1.6 mm<sup>2</sup>, max. height 0.45 mm
- RoHS compatible
- Approx. weight 0.0056g
- Package for **Surface Mount Technology (SMT)**
- Ni, gold-plated terminals
- Fully matched by integrated matching network
- **Electrostatic Sensitive Device (ESD)**
- **Moisture Sensitivity Level 3**


**Pin configuration**

- 3 TX Input
- 1, 8 RX Output (balanced)
- 6 Antenna
- 4, 5, 9 To be grounded
- 2, 7 To be grounded



**Data sheet**

**Characteristics**

Temperature range for specification:	T = -20 °C to +85 °C
ANT terminating impedance:	Z <sub>ANT</sub> = 50 Ω
RX differential mode terminating impedance:	Z <sub>RXd</sub> = 100 Ω and matching (refer to page 6)
RX common mode terminating impedance:	Z <sub>RXc</sub> = 25 Ω
TX terminating impedance:	Z <sub>TX</sub> = 50 Ω

Characteristics TX - ANT		min.	typ. @ 25 °C	max.	
<b>Center frequency</b>	f <sub>C</sub>	—	1880.0	—	MHz
<b>Maximum insertion attenuation</b>					
@f <sub>Carrier</sub> 1852.4 ... 1907.6 MHz	α <sub>WCDMA</sub> <sup>1)</sup>	—	2.2	3.0	dB
@f <sub>Carrier</sub> 1852.4 ... 1907.6 MHz	α <sub>WCDMA</sub> <sup>1)</sup>	—	2.2	2.5 <sup>3)</sup>	dB
<b>Error Vector Magnitude</b>					
@f <sub>Carrier</sub> 1852.4 ... 1907.6 MHz	EVM <sup>2)</sup>	—	1.1	3.0	%
@f <sub>Carrier</sub> 1852.4 ... 1907.6 MHz	EVM <sup>2)</sup>	—	1.1	2.0 <sup>3)</sup>	%
<b>Input VSWR (TX port)</b>					
1850.0 ... 1910.0 MHz		—	1.5	2.0	
<b>Output VSWR (ANT port)</b>					
1850.0 ... 1910.0 MHz		—	1.7	2.0	
<b>Attenuation</b>					
	α				
10.0 ... 728.0 MHz		30	32	—	dB
728.0 ... 764.0 MHz		30	33	—	dB
869.0 ... 894.0 MHz		30	34	—	dB
1574.0 ... 1577.0 MHz		36	38	—	dB
1577.0 ... 1680.0 MHz		30	38	—	dB
@f <sub>Carrier</sub> 1932.4 ... 1987.6 MHz	α <sub>WCDMA</sub> <sup>1)</sup>	45	50	—	dB
2110.0 ... 2155.0 MHz		35	41	—	dB
2400.0 ... 2500.0 MHz		23	27	—	dB
3690.0 ... 3830.0 MHz		20	25	—	dB
5150.0 ... 5350.0 MHz		16	21	—	dB
5540.0 ... 5860.0 MHz		14	17	—	dB

<sup>1)</sup> Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (6).

<sup>2)</sup> Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

<sup>3)</sup> Valid for room temperature 25 °C

**Data sheet**

**Characteristics**

Temperature range for specification:	T = -20 °C to +85 °C
ANT terminating impedance:	Z <sub>ANT</sub> = 50 Ω
RX differential mode terminating impedance:	Z <sub>RXd</sub> = 100 Ω and matching (refer to page 6)
RX common mode terminating impedance:	Z <sub>RXc</sub> = 25 Ω
TX terminating impedance:	Z <sub>TX</sub> = 50 Ω

Characteristics ANT - RX		min.	typ. @ 25 °C	max.	
<b>Center frequency</b>	f <sub>C</sub>	—	1960.0	—	MHz
<b>Maximum insertion attenuation</b>					
@f <sub>Carrier</sub>	1932.4 ... 1987.6MHz α <sub>WCDMA</sub> <sup>1)</sup>	—	2.5	3.7	dB
@f <sub>Carrier</sub>	1932.4 ... 1987.6MHz α <sub>WCDMA</sub> <sup>1)</sup>	—	2.5	3.0 <sup>2)</sup>	dB
<b>Error Vector Magnitude</b>					
@f <sub>Carrier</sub>	1932.4 ... 1987.6MHz EVM <sup>3)</sup>	—	1.6	6.0	%
@f <sub>Carrier</sub>	1932.4 ... 1987.6MHz EVM <sup>3)</sup>	—	1.6	3.5 <sup>5)</sup>	%
@f <sub>Carrier</sub>	1932.4 ... 1987.6MHz EVM <sup>3)</sup>	—	1.6	3.2 <sup>4)</sup>	%
<b>Input VSWR (ANT port)</b>					
	1930.0 ... 1990.0MHz	—	2.0	2.6	
	1935.0 ... 1990.0MHz	—	1.5	2.0 <sup>5)</sup>	
<b>Output VSWR (RX port)</b>					
	1930.0 ... 1990.0MHz	—	1.8	2.4	
	1930.0 ... 1990.0MHz	—	1.8	2.0 <sup>5)</sup>	
<b>Attenuation</b>					
	10.0 ... 1765.0MHz α	30	49	—	dB
	1835.0 ... 1850.0MHz	30	52	—	dB
@f <sub>Carrier</sub>	1852.4 ... 1907.6MHz α <sub>WCDMA</sub> <sup>1)</sup>	45	56	—	dB
	2025.0 ... 2050.0MHz	10	27	—	dB
	2050.0 ... 2075.0MHz	25	31	—	dB
	2400.0 ... 2484.0MHz	30	52	—	dB
	2810.0 ... 2910.0MHz	30	56	—	dB
	3775.0 ... 3905.0MHz	30	60	—	dB
	5625.0 ... 5815.0MHz	30	63	—	dB
	2075.0 ... 6000.0MHz	30	35	—	dB

1) Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (6).

2) Valid for the temperature range from 0 °C to 85 °C.

3) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

4) Valid for room temperature 25 °C.

5) Valid for the temperature range from 25 °C to 85 °C.

<b>SAW Components</b>	<b>B8004</b>
<b>BAW/SAW Duplexer</b>	<b>1880.0 / 1960.0 MHz</b>

Data sheet



**Characteristics**

Temperature range for specification:  $T = -20\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$   
 ANT terminating impedance:  $Z_{ANT} = 50\ \Omega$   
 RX differential mode terminating impedance:  $Z_{RXd} = 100\ \Omega$  and matching (refer to page 6)  
 RX common mode terminating impedance:  $Z_{RXc} = 25\ \Omega$   
 TX terminating impedance:  $Z_{TX} = 50\ \Omega$

Characteristics ANT - RX	min.	typ. @ 25 °C	max.	
<b>Common Mode Rejection Ratio CMRR</b> 1930.0 ... 1990.0 MHz	21 <sup>1)</sup>	26	—	dB
<b>IMD Product Level Limits<sup>2)</sup></b> <b>at <math>f_{TX}=1880\text{MHz}</math>, <math>f_{RX}=1960\text{MHz}</math></b>				
Blocker 1                      80.0 MHz	—	-94	—	dBm
Blocker 2                      1800.0 MHz	—	-115	—	dBm
Blocker 3                      3840.0 MHz	—	-110	—	dBm

<sup>1)</sup> A combination of 10° phase balance and 1dB amplitude balance corresponds to 19.6 dB CMRR  
<sup>2)</sup> IMD product level limits for power levels  $P_{TX}=21.5\text{dBm}$  (antenna port output power) and  $P_{Blocker}=-15\text{dBm}$  (antenna port input power)

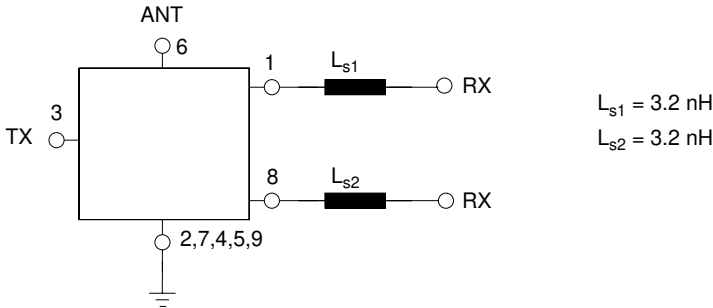
Characteristics TX - RX	min.	typ. @ 25 °C	max.	
<b>Isolation</b>				
@ $f_{Carrier}$ 1852.4 ... 1907.6 MHz $\alpha_{WCDMA}^{1)}$	50	57	—	dB
@ $f_{Carrier}$ 1852.4 ... 1907.6 MHz $\alpha_{WCDMA}^{1) 2)}$	53	57	—	dB
@ $f_{Carrier}$ 1932.4 ... 1987.6 MHz $\alpha_{WCDMA}^{1)}$	46	52	—	dB

<sup>1)</sup> Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (6).  
<sup>2)</sup> Valid for the temperature range from -20 °C to +25 °C.

Data sheet



**Matching network** (element values depend on PCB layout)



**Maximum ratings**

Operable temperature range <sup>1)</sup>	T	-30/+85	°C	machine model, 10 pulses source and load impedance 50 Ω } continuous wave T = 55°C, 50.000 h
Storage temperature range	T <sub>stg</sub>	-40/+85	°C	
DC voltage	V <sub>DC</sub>	5.0	V	
ESD voltage	V <sub>ESD</sub>	50 <sup>2)</sup>	V	
Input power at 1850.0 ... 1910.0 MHz	P <sub>IN</sub>	29	dBm	
elsewhere		10	dBm	

1) Defines the temperature range in which the BAW / SAW device keeps its typical characteristics, however the specification values are not valid for the extended range.

2) acc. to JESD22-A115B (machine model), 10 negative & 10 positive pulses.

**Annotation for characteristics section**

Attenuation of WCDMA signal (“Powertransferfunction”, α<sub>WCDMA</sub>) is determined by

$$\int_{-\infty}^{\infty} |S_{ds21}(f)H_{RRC}(f - f_{Carrier})|^2 df$$

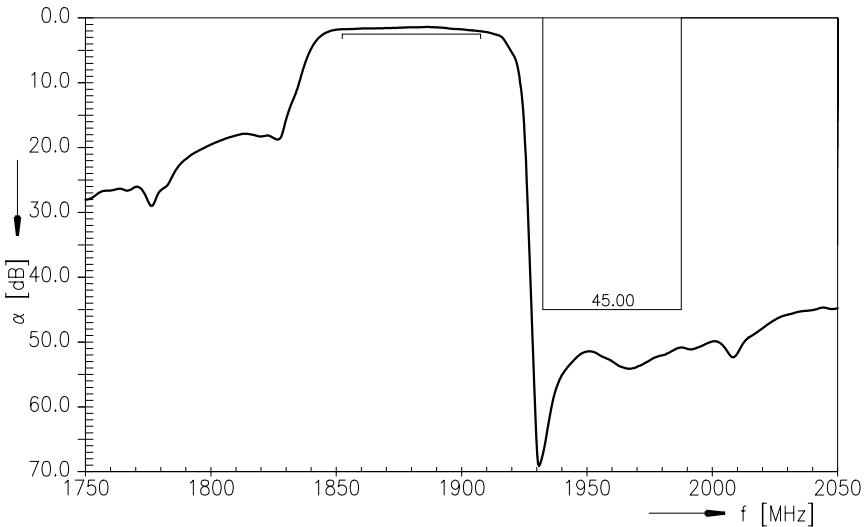
f<sub>Carrier</sub> according to 3GPP TS 25.101 (e.g. for WCDMA Band 2 Passband, f<sub>Carrier</sub> ranges from 1852.4 MHz (lowest Tx channel) to 1907.6 MHz (highest Tx channel)). H<sub>RRC</sub>(f) is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:

$$\int_{-\infty}^{\infty} |H_{RRC}(f)|^2 df = 1$$

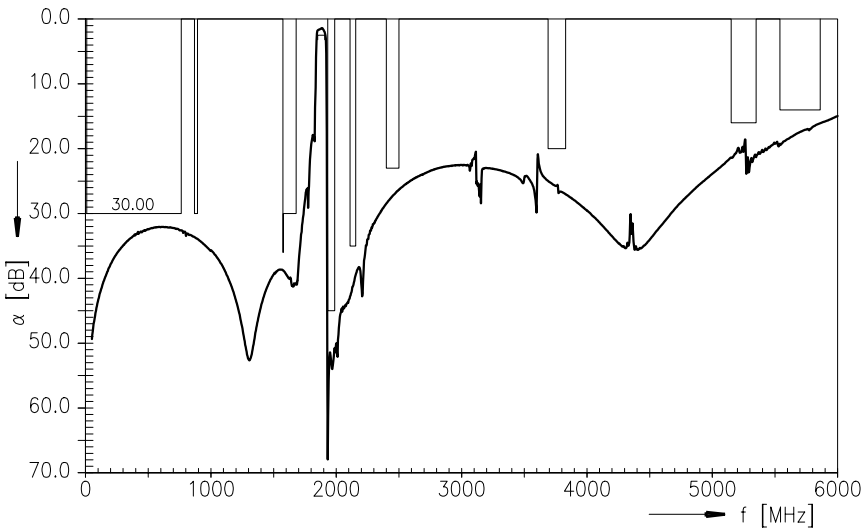
Data sheet



**Frequency Response TX-ANT (PTF)**



**Frequency Response TX-ANT (wideband)**

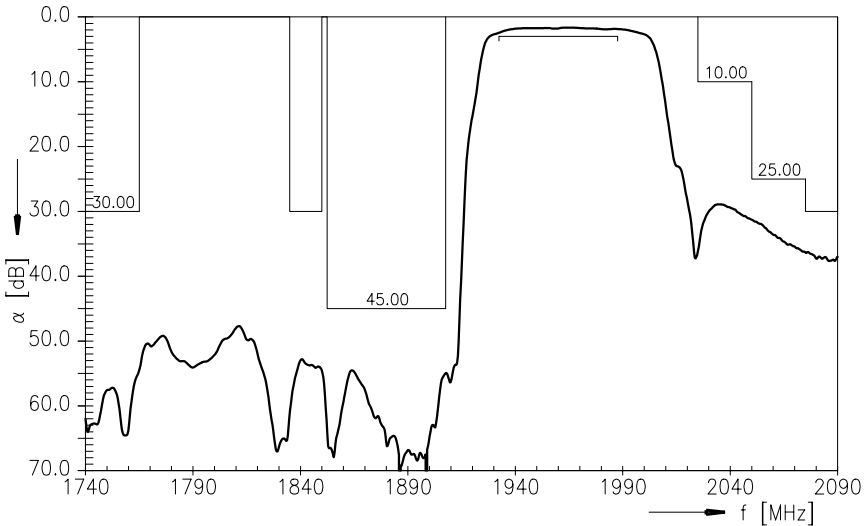




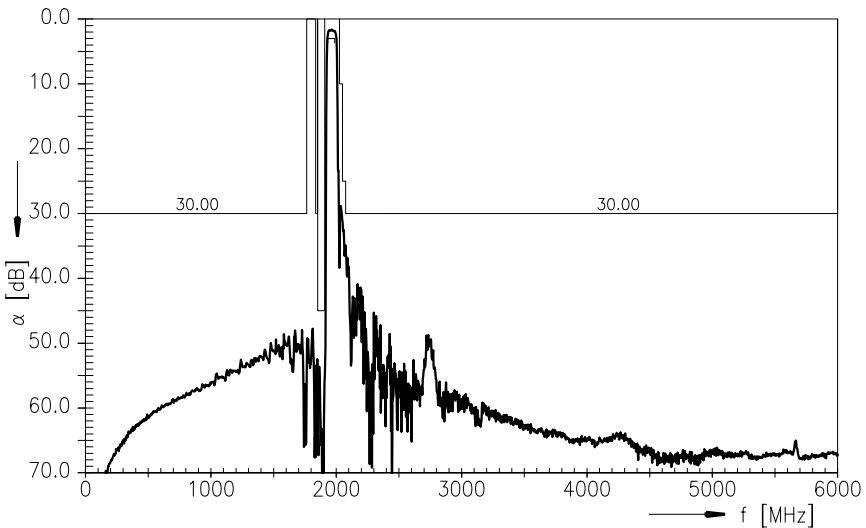
Data sheet



**Frequency Response ANT-RX (PTF), also spec lines for CW plotted**



**Frequency Response ANT-RX (wideband)**

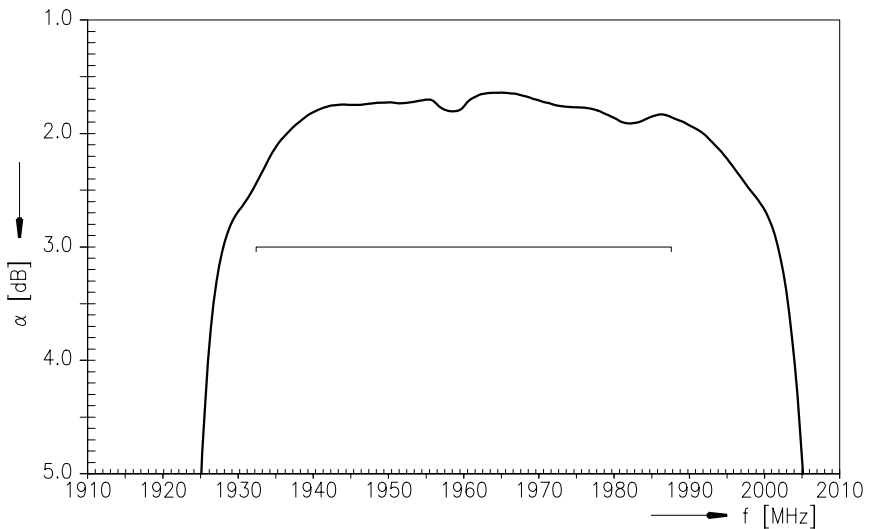




Frequency Response TX-ANT Passband (PTF)



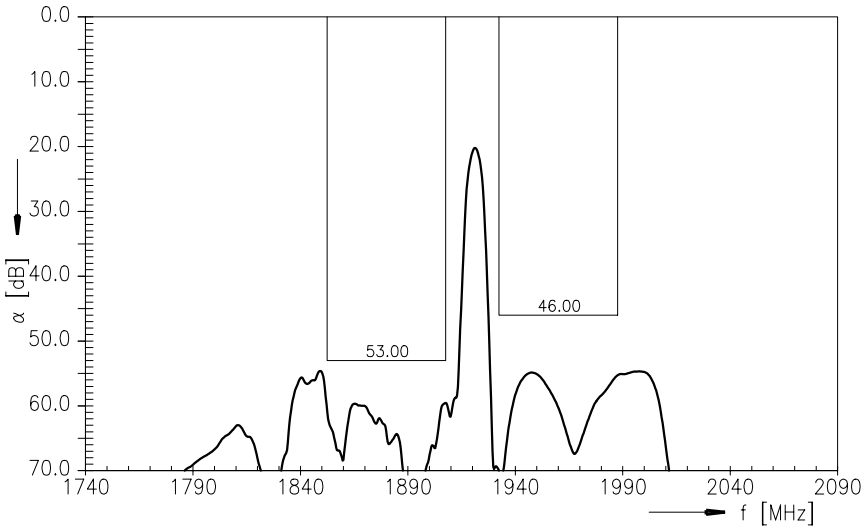
Frequency Response ANT-RX Passband (PTF)



Data sheet



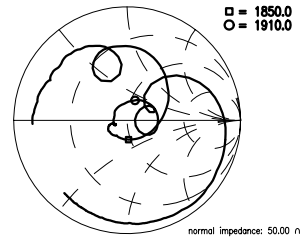
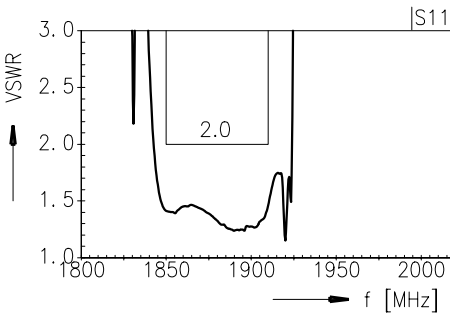
Frequency Response TX-RX (PTF)



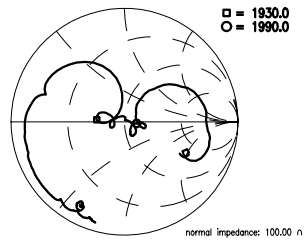
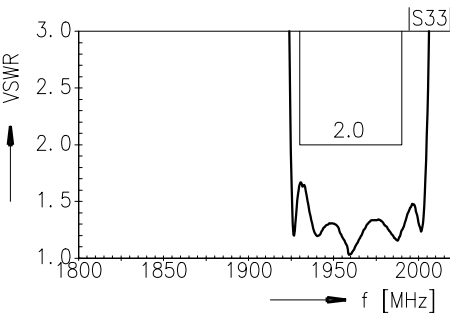
Data sheet



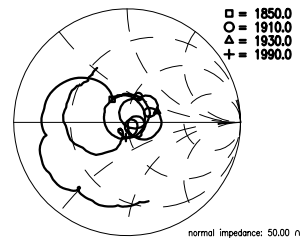
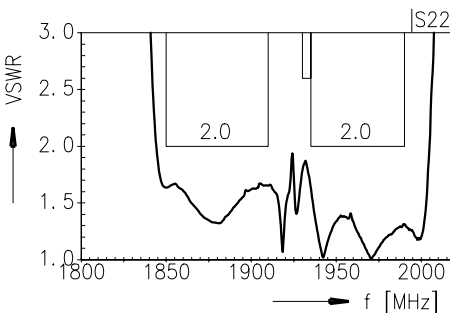
**VSWR TX-port**



**VSWR RX-port (differential mode)**



**VSWR ANT-port**



<b>SAW Components</b>	<b>B8004</b>
<b>BAW/SAW Duplexer</b>	<b>1880.0 / 1960.0 MHz</b>

Data sheet



<b>Type</b>	B8004
<b>Ordering code</b>	B39202B8004P810
<b>Marking and package</b>	C61157-A8-A81
<b>Packaging</b>	F61074-V8247-Z000
<b>Date codes</b>	L_1126
<b>S-parameters</b>	B8004_NB_UN.s4p (unmatched, nearby) B8004_WB_UN.s4p (unmatched, wideband) see file header for port/pin assignment table
<b>Soldering profile</b>	S_6001
<b>RoHS compatible</b>	RoHS-compatible means that products are compatible with the requirements according to Art. 4 (substance restrictions) of Directive 2011/65/EU of the European Parliament and of the Council of June 8 <sup>th</sup> , 2011, on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("Directive") with due regard to the application of exemptions as per Annex III of the Directive in certain cases.
<b>Moldability</b>	Before using in overmolding environment, please contact your EPCOS sales office.
<b>Matching coils</b>	See Inductor pdf-catalog <a href="http://www.tdk.co.jp/tefe02/coil.htm#aname1">http://www.tdk.co.jp/tefe02/coil.htm#aname1</a> and Data Library for circuit simulation <a href="http://www.tdk.co.jp/etvcl/index.htm">http://www.tdk.co.jp/etvcl/index.htm</a>

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