

# IF Filters for Narrowband Cellular Phones

## Series/Type: B4864

The following products presented in this data sheet are being withdrawn.

Ordering Code	Substitute Product	Date of Withdrawal	Deadline Last Orders	Last Shipments
B39181B4864Z710		14.06.2006	31.08.2006	30.09.2006

For further information please contact your nearest EPCOS sales office, which will also support you in selecting a suitable substitute. The addresses of our worldwide sales network are presented at www.epcos.com/sales.

	EPCOS	
SAW Components		B4864
Low Loss Filter for M	obile Communication	183,60 MHz
Data Sheet	SMD	

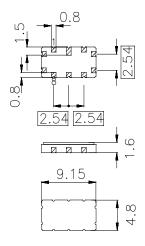
## Features

- Low-loss IF filter for mobile telephone
- Channel selection in AMPS systems
- Filter surface passivated
- Balanced or unbalanced operation possible
- Package for Surface Mounted Technology (SMT)

## Terminals

Ni, gold plated

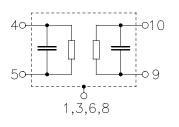
## Ceramic package QCC10B



Dimensions in mm, approx. weight 0,23 g

## **Pin configuration**

10	Input
5	Output
9	Balanced input or input ground
4	Balanced output or output ground
1,3,6,8	Case ground
2,7	Not connected



Туре	Ordering code	Marking and Package	Packing
		according to	according to
B4864	B39181-B4864-Z710	C61157-A7-A49	F61064-V8035-Z000

Electrostatic Sensitive Device (ESD)

### **Maximum ratings**

Operable temperature range	Т	- 25/+ 75	°C
Storage temperature range	$T_{stg}$	- 40/+ 85	°C
DC voltage	V <sub>DC</sub>	13	V
Source power	Ps	10	dBm

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July 25, 2001



SAW Components		B4864
Low Loss Filter for Mobile Con	nmunication	183,60 MHz
Data Sheet Characteristics		
Operating temperature range: Terminating source impedance:	<i>T</i> = -25°C 75°C <i>Z</i> <sub>S</sub> = 410 Ω    - 0,4 pF	

Terminating source impedance:	<i>Z</i> <sub>S</sub> = 410 Ω    - 0,4 pF
Terminating load impedance:	$Z_{\rm L}$ = 410 $\Omega$    - 0,4 pF

		min.	typ.	max.	
Nominal center frequency	f <sub>N</sub>	_	183,60		MHz
Filter bandwidth at -5 dB		+-11	62	_	kHz
Minimum insertion attenuation (including losses in the matching network without loss of the balun)	$lpha_{min}$	_	4,8	6,0	dB
<b>Group delay ripple</b> (p-p) f <sub>N</sub> – 13,0 kHz f <sub>N</sub> + 13,0 kHz	Δτ	_	2,0	10,0	μs
<b>Relative attenuation</b> (relative to $\alpha_{min}$ )	$\alpha_{\text{rel}}$				
f <sub>N</sub> – 11,0 kHz		-	0,5	5	dB
f <sub>N</sub> + 11,0 kHz		_	0,5	5	dB
f <sub>N</sub> – 120,0 kHz f <sub>N</sub> – 60,0 kHz		11	30	—	dB
f <sub>N</sub> + 60,0 kHz f <sub>N</sub> + 120,0 kHz		11	24	_	dB
$f_N \pm 120,0 \text{ kHz} \dots f_N \pm 130,0 \text{ kHz}$		43	50	—	dB
$f_{N} \pm 130,0 \text{ kHz} \dots f_{N} \pm 360,0 \text{ kHz}$		45	55	—	dB
$f_N \pm 360,0 \text{ kHz} \dots f_N \pm 1,4 \text{ MHz}$		40	60	—	dB
Impedance within the passband					
Input: $Z_{IN} = R_{IN}    C_{IN}$		-	410    0,4	_	Ω    pF
Output: $Z_{OUT} = R_{OUT} \parallel C_{OUT}$		_	410    0,4	—	Ω    pF
Temperature coefficient of frequency 1)	$TC_{\rm f}$	_	- 0,036	_	ppm/K <sup>2</sup>
Turnover temperature	$T_0$	-	25	—	°C

<sup>1)</sup> Temperature dependance of  $f_c$ :  $f_c(T) = f_c(T_0)(1 + TC_f(T - T_0)^2)$ 

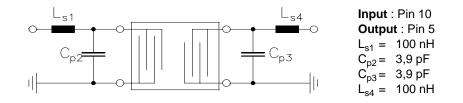
Output: $Z_{OUT} = R_{OUT} \parallel C_{OUT}$ 410 \parallel 0,4 $\Omega \parallel p$		Â					
Low Loss Filter for Mobile Communication         183,60 MH           Data Sheet         Image: Characteristics         Mean Properties         Mean Properies         Mean Properies         No "C Terminating source impedance: $Z_3 = 410 \Omega \parallel - 0,4 \text{ pF}$ Terminating load impedance: $Z_L = 410 \Omega \parallel - 0,4 \text{ pF}$ max.         Mean Properies           Nominal center frequency $f_N$ -         183,60         -         MHz           Filter bandwidth         at -5 dB         +-11         62         -         kHz           Minimum insertion attenuation (including losses in the matching network without loss of the balun) $\alpha_{min}$ -         4,8         6,0         dB           Group delay ripple (p-p) $\Delta \tau$ -         0,5         5         dB $f_N - 11,0$ kHz         -         0,5         5         dB         -         dB         -         dB $f_N - 120,0$ kHz $f_N + 130,0$ kHz         -         0,5         5         dB         -         dB $f_N + 130,0$ kHz $f_N + 120,0$ kHz         8         30         -         dB $f_N + 120,0$ kHz $f_N + 130,0$ kHz         40         50         -         dB         - <th></th> <th>PCOS</th> <th></th> <th></th> <th></th> <th>D 4004</th>		PCOS				D 4004	
Data SheetCharacteristicsOperating temperature range: $T = -30^{\circ}$ C $80^{\circ}$ CTerminating source impedance: $Z_{s} = 410 \Omega \parallel - 0.4 \text{ pF}$ Terminating load impedance: $Z_{L} = 410 \Omega \parallel - 0.4 \text{ pF}$ Terminating load impedance: $Z_{L} = 410 \Omega \parallel - 0.4 \text{ pF}$ Nominal center frequency $f_{N}$ -183,60Filter bandwidth at -5 dB+-11 $62$ -Kinimum insertion attenuation (including losses in the matching network without loss of the balun) $\alpha_{min}$ - $4.8$ Group delay ripple (p-p) $f_{N} - 13,0 \text{ kHz}$ $\Delta \tau$ - $2,0$ $10,0$ $f_{N} - 11,0 \text{ kHz}$ $n_{N} + 13,0 \text{ kHz}$ - $2,0$ $10,0$ $f_{N} - 11,0 \text{ kHz}$ $n_{N} + 13,0 \text{ kHz}$ - $0,5$ 5 $f_{N} + 11,0 \text{ kHz}$ - $0,5$ 5dB $f_{N} + 11,0 \text{ kHz}$ - $0,5$ 5dB $f_{N} + 120,0 \text{ kHz} \dots f_{N} + 120,0 \text{ kHz}$ 8 $24$ -dB $f_{N} + 13,0,0 \text{ kHz}$ 4050-dB $f_{N} \pm 130,0 \text{ kHz} \dots f_{N} \pm 360,0 \text{ kHz}$ 4255-dB $f_{N} \pm 360,0 \text{ kHz} \dots f_{N} \pm 1,4 \text{ MHz}$ -410    0,4- $\Omega    p$ Impedance within the passband $\ln put: Z_{IN} = R_{IN}    C_{IN}$ -410    0,4- $\Omega    p$ Temperature coefficient of frequency 1) $TC_{f}$ 0,036-ppm/			_	_	400	_	
CharacteristicsOperating temperature range: $T = -30^{\circ}$ C $80^{\circ}$ CTerminating source impedance: $Z_{\rm S} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel - 0.4 \ pF$ Terminating load impedance: <th col<="" th=""><th></th><th></th><th></th><th></th><th>183,</th><th>60 MHZ</th></th>	<th></th> <th></th> <th></th> <th></th> <th>183,</th> <th>60 MHZ</th>					183,	60 MHZ
Operating temperature range: Terminating source impedance: $T = -30^{\circ}$ C $Z_{\rm S} = 410 \Omega \parallel - 0.4 \text{ pF}$ Terminating load impedance: $Z_{\rm L} = 410 \Omega \parallel - 0.4 \text{ pF}$ Nominal center frequency $f_{\rm N}$ $-$ 183,60 $-$ MHzFilter bandwidth at -5 dB+-1162 $-$ kHzMinimum insertion attenuation (including losses in the matching network without loss of the balun) $\alpha_{min}$ $-$ 4.86,0dBGroup delay ripple (p-p) $f_{\rm N}  \Delta \tau$ $-$ 2,010,0 $\mu$ sRelative attenuation (relative to $\alpha_{min}$ ) $f_{\rm N} +$ $\alpha_{\rm rel}$ $ 0.5$ 5dB $f_{\rm N} -$ 11,0 kHz $ 0.5$ 5dB $f_{\rm N} +$ 12,0,0 kHz $m_{\rm N} +$ 13,0,0 kHz $ 0.5$ 5dB $f_{\rm N} +$ 13,0,0 kHz $m_{\rm N} +$ 13,0,0 kHz $40$ 50 $-$ dB $f_{\rm N} +$ 13,0,0 kHz $m_{\rm N} +$ 13,0,0 kHz4050 $-$ dB $f_{\rm N} +$ 13,0,0 kHz $m_{\rm N} \pm$ 360,0 kHz4255 $-$ dB $f_{\rm N} \pm$ 130,0 kHz $M_{\rm H} \pm$ 4060 $ \Omega \parallel$ p $f_{\rm N} \pm$ $m_{\rm N} \pm$ $m_{\rm N} \pm$ $m_{\rm N} \pm$ $m_{\rm N} \pm$ $\Omega \parallel$ $f_{\rm N} =$ $m_{\rm N} \pm$ $f_{\rm N} =$ $m_{\rm N} \pm$ $f_{\rm N} \pm$ <th>Data Sheet</th> <th>1 WI - 1</th> <th></th> <th></th> <th></th> <th></th>	Data Sheet	1 WI - 1					
Terminating source impedance: $Z_{\rm S} = 410 \ \Omega \parallel \cdot 0.4 \ \rm pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel \cdot 0.4 \ \rm pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel \cdot 0.4 \ \rm pF$ Terminating load impedance: $Z_{\rm L} = 410 \ \Omega \parallel \cdot 0.4 \ \rm pF$ Filter bandwidth at -5 dB $+11$ 62 $-$ kHz Minimum insertion attenuation $\alpha_{\rm min}$ $-$ 4.8 6,0 dB (including losses in the matching network without loss of the balun) Group delay ripple (p-p) $\Delta \tau$ $f_{\rm N} - 13,0 \ \rm kHz \dots f_{\rm N} + 13,0 \ \rm kHz$ $-$ 2,0 10,0 $\mu$ s Relative attenuation (relative to $\alpha_{\rm min}$ ) $\alpha_{\rm rel}$ $-$ 0,5 5 dB $f_{\rm N} - 11,0 \ \rm kHz \dots f_{\rm N} + 13,0 \ \rm kHz$ $-$ 0,5 5 dB $f_{\rm N} - 12,0 \ \rm kHz \dots f_{\rm N} + 120,0 \ \rm kHz$ $-$ 0,5 5 dB $f_{\rm N} + 120,0 \ \rm kHz \dots f_{\rm N} + 120,0 \ \rm kHz$ $-$ 0,5 5 dB $f_{\rm N} + 120,0 \ \rm kHz \dots f_{\rm N} + 130,0 \ \rm kHz$ $-$ 0,5 5 dB $f_{\rm N} \pm 130,0 \ \rm kHz \dots f_{\rm N} \pm 130,0 \ \rm kHz$ $-$ 0,60 $-$ dB $f_{\rm N} \pm 130,0 \ \rm kHz \dots f_{\rm N} \pm 130,0 \ \rm kHz$ $-$ 0,7 $-$ 0,8 $-$ 0,9 $-$	Characteristics						
Terminating load impedance: $Z_L = 410 \Omega \parallel - 0.4 \text{ pF}$ min.       typ.       max.         Nominal center frequency $f_N$ -       183,60       -       MHz         Filter bandwidth       at -5 dB       +-11       62       -       kHz         Minimum insertion attenuation (including losses in the matching network without loss of the balun) $\alpha_{min}$ -       4,8       6,0       dB         Group delay ripple (p-p) $f_N - 13,0$ kHz $\Delta \tau$ -       2,0       10,0 $\mu$ s         Relative attenuation (relative to $\alpha_{min}$ ) $\alpha_{rel}$ -       0,5       5       dB $f_N - 11,0$ kHz       -       0,5       5       dB       -       dB       -       dB $f_N - 12,0$ kHz $f_N - 60,0$ kHz       8       30       -       dB $f_N + 12,0$ kHz       -       0,5       5       dB $f_N + 30,0$ kHz       -       8       24       -       dB $f_N + 13,0,0$ kHz       -       6,0       -       dB       - $f_N + 13,0,0$ kHz       -       6,0       -       dB       -       -       dB       - $f_N + $	Operating temperature range: 7	- = -30° (	C 80°C				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $							
Nominal center frequency $f_N$ -         183,60         -         MHz           Filter bandwidth at -5 dB         +-11         62         -         kHz           Minimum insertion attenuation (including losses in the matching network without loss of the balun) $\alpha_{min}$ -         4,8         6,0         dB           Group delay ripple (p-p) $f_N - 13,0$ kHz $\Delta \tau$ -         2,0         10,0 $\mu$ s           Relative attenuation (relative to $\alpha_{min}$ ) $f_N - 11,0$ kHz $\Delta \tau$ -         0,5         5         dB $f_N - 120,0$ kHz $f_N + 13,0$ kHz         -         0,5         5         dB         -         0,5         5         dB $f_N - 120,0$ kHz $f_N + 120,0$ kHz         8         30         -         dB         -	Terminating load impedance: Z	L = 410	Ω    - 0,4 pl	F			
Filter bandwidth       at -5 dB       +-11       62       —       kHz         Minimum insertion attenuation (including losses in the matching network without loss of the balun) $\alpha_{min}$ —       4,8       6,0       dB         Group delay ripple (p-p) $f_N - 13,0$ kHz $\Delta \tau$ $f_N - 11,0$ kHz       —       2,0       10,0 $\mu$ s         Relative attenuation (relative to $\alpha_{min}$ ) $f_N - 11,0$ kHz $-$ 0,5       5       dB $f_N - 11,0$ kHz       —       0,5       5       dB $f_N - 120,0$ kHz $f_N - 60,0$ kHz       8       30       —       dB $f_N + 120,0$ kHz $m_N + 120,0$ kHz       8       24       —       dB $f_N + 120,0$ kHz $f_N \pm 130,0$ kHz       40       50       —       dB $f_N \pm 130,0$ kHz $m_N \pm 360,0$ kHz       42       55       —       dB $f_N \pm 360,0$ kHz $f_N \pm 1,4$ MHz       40       60       —       dB         Impedance within the passband       — $m_{10} \parallel 0,4$ — $\Omega \parallel p$ Output: $Z_{OUT} = R_{OUT} \parallel C_{OUT}$ — $410 \parallel 0,4$ — $\Omega \parallel p$ Temperature coefficient of frequency 1)			min.	typ.	max.		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Nominal center frequency	f <sub>N</sub>	—	183,60		MHz	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Filter bandwidth at -5 dB		+-11	62	_	kHz	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Minimum insertion attenuation	$\alpha_{min}$	_	4,8	6,0	dB	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		out					
Relative attenuation (relative to $\alpha_{min}$ ) $\alpha_{rel}$ 0,5       5       dB $f_N - 11,0 \text{ kHz}$ 0,5       5       dB $f_N + 11,0 \text{ kHz}$ 0,5       5       dB $f_N + 11,0 \text{ kHz}$ 0,5       5       dB $f_N + 120,0 \text{ kHz}$ $f_N - 60,0 \text{ kHz}$ 8       30        dB $f_N + 60,0 \text{ kHz}$ $f_N + 120,0 \text{ kHz}$ 8       24        dB $f_N \pm 120,0 \text{ kHz}$ $f_N \pm 130,0 \text{ kHz}$ 40       50        dB $f_N \pm 130,0 \text{ kHz}$ $f_N \pm 360,0 \text{ kHz}$ 42       55        dB $f_N \pm 360,0 \text{ kHz}$ $f_N \pm 1,4 \text{ MHz}$ 40       60        dB         Impedance within the passband          410    0,4 $\Omega \mid    p$ Output: $Z_{IN} = R_{IN} \mid    C_{IN}$ 410    0,4 $\Omega \mid    p$ Temperature coefficient of frequency 1) $TC_f$ -0,036        ppm/	Group delay ripple (p-p)	$\Delta \tau$					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	f <sub>N</sub> – 13,0 kHz f <sub>N</sub> + 13,0 kHz		-	2,0	10,0	μs	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Relative attenuation (relative to $\alpha_{min}$ )	$\alpha_{rel}$					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	f <sub>N</sub> – 11,0 kHz		-	0,5	5	dB	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	f <sub>N</sub> + 11,0 kHz		-	0,5	5	dB	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	f <sub>N</sub> – 120,0 kHz f <sub>N</sub> – 60,0 kHz		8	30	—	dB	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	f <sub>N</sub> + 60,0 kHz f <sub>N</sub> + 120,0 kHz		8	24	—	dB	
$f_{N} \pm 360,0 \text{ kHz } \dots f_{N} \pm 1,4 \text{ MHz}$ $40  60  -  dB$ $Inpedance \text{ within the passband}$ $Input:  Z_{IN}  = R_{IN}      C_{IN} \qquad - \qquad 410 \mid     0,4 \qquad - \qquad \Omega \mid  p$ $Output:  Z_{OUT}  = R_{OUT} \mid     C_{OUT} \qquad - \qquad 410 \mid     0,4 \qquad - \qquad \Omega \mid  p$ $Temperature \ coefficient \ of \ frequency \ ^{1)}  TC_{f}  - \qquad -0,036 \qquad - \qquad ppm/$			40	50	—	dB	
Impedance within the passband Input: $Z_{IN} = R_{IN} \parallel C_{IN}$ 410 $\parallel 0,4$ $\Omega \parallel p$ Output: $Z_{OUT} = R_{OUT} \parallel C_{OUT}$ 410 $\parallel 0,4$ $\Omega \parallel p$ Temperature coefficient of frequency 1) $TC_{f}$ 0,036 $ppm/$			42	55	—	dB	
Input: $Z_{IN} = R_{IN} \parallel C_{IN}$ -410 \parallel 0,4- $\Omega \parallel p$ Output: $Z_{OUT} = R_{OUT} \parallel C_{OUT}$ -410 \parallel 0,4- $\Omega \parallel p$ Temperature coefficient of frequency 1) $TC_f$	$f_N \pm 360,0 \text{ kHz} \dots f_N \pm 1,4 \text{ MHz}$		40	60		dB	
Output: $Z_{OUT} = R_{OUT} \parallel C_{OUT}$ 410 $\parallel 0.4$ $\Omega \parallel p$ Temperature coefficient of frequency 1) $TC_f$ $ -0.036$ $-$	Impedance within the passband						
Temperature coefficient of frequency 1) $TC_{f}$ $ -0,036$ $ ppm/$	Input: $Z_{IN} = R_{IN} \parallel C_{IN}$		_	410    0,4	—	Ω    pF	
Temperature coefficient of frequency 1) $TC_f$ $-0,036$ $ppm/$	Output: $Z_{OUT} = R_{OUT} \parallel C_{OUT}$		_	410    0,4	—	Ω    pF	
Turnover temperature $T_0$ —25—°C	Temperature coefficient of frequency <sup>1)</sup>	TC <sub>f</sub>	-	- 0,036		ppm/K	
	Turnover temperature	$T_0$	—	25	—	°C	

<sup>1)</sup> Temperature dependance of  $f_c$ :  $f_c(T) = f_c(T_0)(1 + TC_f(T - T_0)^2)$ 

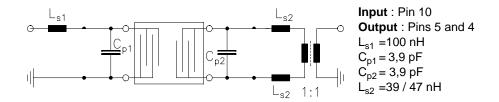
	EPCOS	
SAW Components		B4864
Low Loss Filter for Mo	bile Communication	183,60 MHz
Data Sheet	<u>smd</u>	

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Recommended pin configurations / test matching networks: a) single-ended 50  $\Omega$  / single-ended 50  $\Omega$ 



#### b) single-ended 50 $\Omega$ / balanced 50 $\Omega$



Note :

The balanced network is realized using TOKO 1:1 balun B5FL. The insertion attenuation of a balun is 0.3 dB at 183.6 MHz. The loss of the balun is not included in the specified filter insertion attenuation.

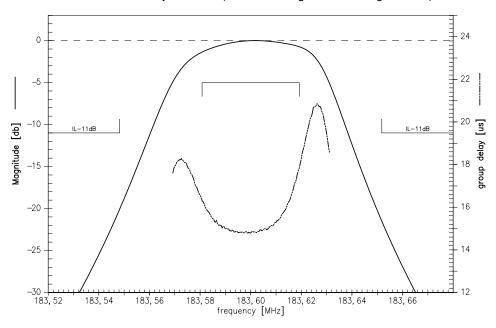
The level of ultimate suppression may be limited by electromagnetic feedthrough depending on the layout of the pcb and the arrangement of the matching components.

The above mentioned characteristics can be realized either in balanced or in unbalanced mode of operation.

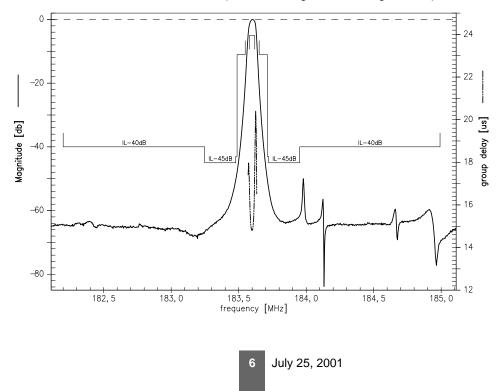
July 25, 2001



Normalized transfer function passband (measured single ended / single ended)







	ÉPCOS	
SAW Components		B4864
Low Loss Filter for Mob	vile Communication	183,60 MHz
Data Sheet	SMD	

## Published by EPCOS AG Surface Acoustic Wave Components Division, OFW E MF P.O. Box 80 17 09, D-81617 München

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July 25, 2001