

# Precision Devices DLI mmWave Solutions

**Moving to mmWave brings about new filtering challenges.**

### Shrinking Wavelengths

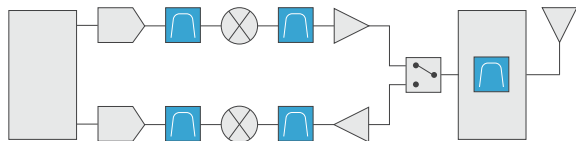
At 700MHz, the wavelength in free space is about 430mm, and at 2.6GHz, wavelengths are 115mm. Yet at 39GHz, wavelengths are only 7.7mm.

### Reduced Size of the RF Front End

As wavelength shrinks so do antenna sizes, and for arrays to avoid diffraction effects, antenna spacing needs to be similarly shrunk. Filters in RF front ends need to be compact.

### Increase In Number of RF Paths RF Front End

The enabling technologies for mmWave, Beam Steering and MIMO, rely on arrays of antennas, which in turn rely on arrays of RF paths further necessitating compact filtering components.



TECHNOLOGY	LTE Macro RRH
FREQUENCY	2.6GHz
CLOSE TO ANTENNA	Cavity Filter
RF SECTION	SMT RF Filters
IF SECTION	SMT IF Filters

### Increased Temperature

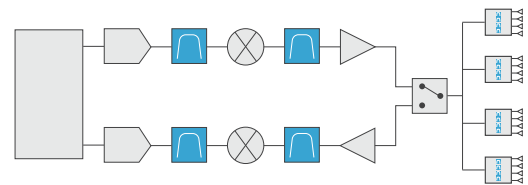
In dense board environments temperatures rise, and front ends will need to operate at increased temperature and with inherent temperature stability.

### Increased Need for Performance Repeatability

High frequency circuits are sensitive to variations in performance from part to part. Repeatability in filter component performance is key to avoid costly 'set at test' scenarios.

### Ever Present Need to Perform

Filter components for the mmWave RF front end need to encompass all of these factors, and they still need to perform to ensure the best spectral efficiency and rejection possible.



TECHNOLOGY	5G mmWave Beamforming
FREQUENCY	28 & 39GHz
CLOSE TO ANTENNA	SMT RF Filters
RF SECTION	SMT RF Filters
IF SECTION	SMT IF Filters

Knowles Precision Devices meet the **5G mmWave filter** challenge through our **DLI filter technology**.

#### Small Size

Filter size reduction of up to 20x

#### High Repeatability

Precise manufacturing = No tuning

#### High Performance

Very broad band, high rejection and low insertion loss

#### Temperature Stable

Stable operation from -55°C to +125°C

← **Sub 6GHz** →

700MHz  
(43cm)

6GHz  
(50mm)

← **mmWave** →

24GHz  
(12.5mm)

38GHz  
(7.7mm)

70GHz  
(4.3mm)

## 5G Kit 26GHz - B259MC1S

PART NUMBER	TYPE	FC (GHz)	FL	FH	INSERTION LOSS (@FC, dB 25°C)	L, INCHES (mm)	W, INCHES (mm)	H, INCHES (mm)
B259MC1S	26GHz Bandpass	25.9	24.25	27.5	3.5	0.2165 (5.4991)	0.090 (2.286)	0.070 (1.778)
DEB-B259MC1S	26GHz Bandpass, mounted on eval board	25.9	24.25	27.5	3.5			
B280MC1S	28GHz Bandpass	28	26.5	29.5	3.5	0.216 (5.5)	0.090 (2.3)	0.064 (1.8)
B280LB0S	28GHz Bandpass	28	27	29	1.5	0.350 (8.89)	0.120 (3.048)	0.098 (2.4892)
B280LA0S	28GHz Bandpass	28	27.5	28.5	4	0.550 (13.97)	0.140 (3.556)	0.083 (2.1082)
FPC07182	20dB Coupler		20	40	0.3	0.065 (1.651)	0.050 (1.27)	0.010 (0.254)
FPC07181	10dB Coupler		20	40	0.6	0.065 (1.651)	0.050 (1.27)	0.010 (0.254)
PDW07069	4-way Power Divider		25	32	1	0.140 (3.556)	0.170 (4.318)	0.010 (0.254)
PDW07630	2-way Power Divider		25	32	0.25	0.070 (1.778)	0.070 (1.778)	0.010 (0.254)

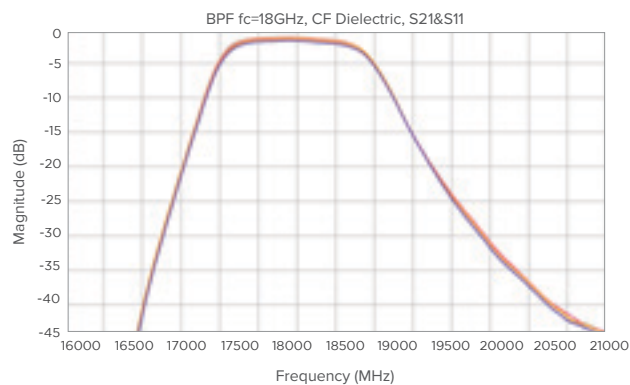
## 5G Kit 28GHz - B280MC1S

PART NUMBER	TYPE	FC (GHz)	FL	FH	INSERTION LOSS (@FC, dB 25°C)	L, INCHES (mm)	W, INCHES (mm)	H, INCHES (mm)
B280MC1S	28GHz Bandpass	28	26.5	29.5	3.5	0.216 (5.5)	0.090 (2.3)	0.064 (1.8)
DEB-B280MC1S	28GHz Bandpass, mounted on eval board	28	26.5	29.5	3.5			
B280LB0S	28GHz Bandpass	28	27	29	1.5	0.350 (8.89)	0.120 (3.048)	0.098 (2.4892)
B280LA0S	28GHz Bandpass	28	27.5	28.5	4	0.550 (13.97)	0.140 (3.556)	0.083 (2.1082)
PDW07069	4-way Power Divider		25	32	1	0.140 (3.556)	0.170 (4.318)	0.010 (0.254)
PDW07630	2-way Power Divider		25	32	.25	0.070 (1.778)	0.070 (1.778)	0.010 (0.254)
FPC07182	20dB Coupler		20	40	0.3	0.065 (1.651)	0.050 (1.27)	0.010 (0.254)
FPC07181	10dB Coupler		20	40	0.6	0.065 (1.651)	0.050 (1.27)	0.010 (0.254)

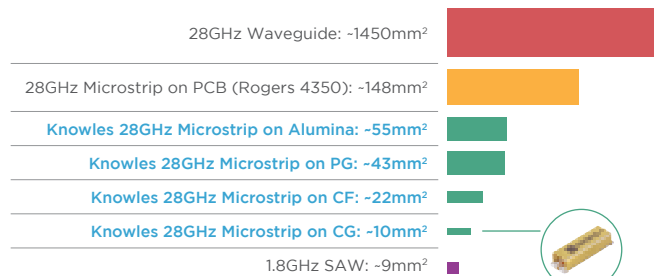
## 5G Kit 39GHz - B385MD0S

PART NUMBER	TYPE	FC (GHz)	FL	FH	INSERTION LOSS (@FC, dB 25°C)	L, INCHES (mm)	W, INCHES (mm)	H, INCHES (mm)
B385MD0S	39GHz Bandpass	38.5	37	40	2.5	0.275 (6.985)	0.080 (2.032)	0.075 (1.905)
DEB-B385MD0S	39GHz Bandpass, mounted on eval board	38.5	37	40	2.5			
PDW08323	2-way Power Divider		37	42	0.5	0.070 (1.778)	0.070 (1.778)	0.010 (0.254)
PDW08324	4-way Power Divider		37	42	0.7	0.170 (4.318)	0.140 (3.556)	0.010 (0.254)
FPC07182	20dB Coupler		20	40	0.3	0.065 (1.651)	0.050 (1.27)	0.010 (0.254)
FPC07181	10dB Coupler		20	40	0.6	0.065 (1.651)	0.050 (1.27)	0.010 (0.254)

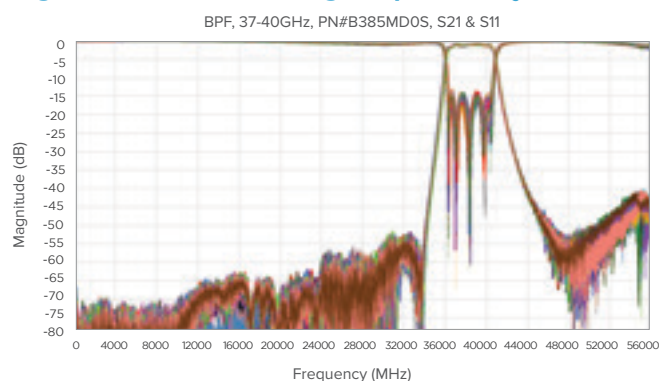
### Temp Stable from -55°C TO +125°C



### Small Size



### High Performance with High Repeatability



Request a **sample kit** to get your 5G project off the ground.